

## FCC Test Report

### (PART 27)

**Report No.:** RFBCKT-WTW-P22080510-3 R1

**FCC ID:** HFS-GW03

**Test Model:** QTAX57

**Received Date:** 2022/3/21

**Test Date:** 2022/8/23 ~ 2022/9/7

**Issued Date:** 2022/11/9

**Applicant:** Quanta Computer Inc.

**Address:** NO.188, Wenhua 2nd Rd., Guishan Dist., Taoyuan City 33377, Taiwan

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

**Lab Address:** No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

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

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



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### Release Control Record

| Issue No.                 | Description                       | Date Issued |
|---------------------------|-----------------------------------|-------------|
| RFBCKT-WTW-P22080510-3    | Original Release                  | 2022/9/19   |
| RFBCKT-WTW-P22080510-3 R1 | Add 2 <sup>nd</sup> Charger cable | 2022/11/9   |

## 1 Certificate of Conformity

**Product:** Smart Watch

**Brand:** NA

**Test Model:** QTAX57

**Sample Status:** Engineering Sample

**Applicant:** Quanta Computer Inc.

**Test Date:** 2022/8/23 ~ 2022/9/7

**Standards:** FCC Part 27, Subpart C, F, L

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 :** Gina Liu , **Date:** 2022/11/9  
Gina Liu / Specialist

**Approved by :** Jeremy Lin , **Date:** 2022/11/9  
Jeremy Lin / Project Engineer

## 2 Summary of Test Results

| Applied Standard: FCC Part 27 & Part 2 (LTE 4) |                                         |        |                                                                                     |
|------------------------------------------------|-----------------------------------------|--------|-------------------------------------------------------------------------------------|
| FCC Clause                                     | Test Item                               | Result | Remarks                                                                             |
| 2.1046 27.50(d)                                | Equivalent Isotropically radiated power | Pass   | Meet the requirement of limit.                                                      |
| 2.1047                                         | Modulation characteristics              | Pass   | Meet the requirement.                                                               |
| 2.1055<br>27.54                                | Frequency Stability                     | Pass   | Meet the requirement of limit.                                                      |
| 2.1049                                         | Emission Bandwidth                      | Pass   | Meet the requirement of limit.                                                      |
| 2.1051<br>27.53(h)                             | Out of Band Emission Measurements       | Pass   | Meet the requirement of limit.                                                      |
| 27.50(d)(5)                                    | Peak To Average Ratio                   | Pass   | Meet the requirement of limit.                                                      |
| 2.1051 27.53(h)                                | Conducted Spurious Emissions            | Pass   | Meet the requirement of limit.                                                      |
| 2.1053 27.53(h)                                | Radiated Spurious Emissions             | Pass   | Meet the requirement of limit.<br>Minimum passing margin is -38.6 dB at 932.10 MHz. |

| Applied Standard: FCC Part 27 & Part 2 (LTE 13) |                                   |        |                                                                                       |
|-------------------------------------------------|-----------------------------------|--------|---------------------------------------------------------------------------------------|
| FCC Clause                                      | Test Item                         | Result | Remarks                                                                               |
| 2.1046 27.50(b)                                 | Equivalent radiated power         | Pass   | Meet the requirement of limit.                                                        |
| 2.1047                                          | Modulation characteristics        | Pass   | Meet the requirement.                                                                 |
| 2.1055<br>27.54                                 | Frequency Stability               | Pass   | Meet the requirement of limit.                                                        |
| 2.1049                                          | Emission Bandwidth                | Pass   | Meet the requirement of limit.                                                        |
| 2.1051<br>27.53(c)                              | Out of Band Emission Measurements | Pass   | Meet the requirement of limit.                                                        |
| --                                              | Peak To Average Ratio             | Pass   | Meet the requirement of limit.                                                        |
| 2.1051<br>27.53(c)(f)                           | Conducted Spurious Emissions      | Pass   | Meet the requirement of limit.                                                        |
| 2.1053<br>27.53(c)(f)                           | Radiated Spurious Emissions       | Pass   | Meet the requirement of limit.<br>Minimum passing margin is -13.06 dB at 1564.00 MHz. |

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<br>(k=2) ( $\pm$ ) |
|--------------------------------|--------------------|-----------------------------------------|
| Radiated Emissions up to 1 GHz | 9 kHz ~ 30 MHz     | 3.04 dB                                 |
|                                | 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.                | Cal. Date     | Cal. Due      |
|-----------------------------------|--------------------------|---------------------------|---------------|---------------|
| Antenna Tower & Turn Max-Full     | MFA-440H                 | AT93021705                | N/A           | N/A           |
| Bi_Log Antenna Schwarbeck         | VULB9168                 | 9168-472                  | Oct. 28, 2021 | Oct. 27, 2022 |
| Loop Antenna TESEQ                | HLA 6121                 | 45745                     | Jul. 27, 2022 | Jul. 26, 2023 |
| HORN Antenna SCHWARZBECK          | BBHA 9120D               | 9120D-969                 | May. 14, 2022 | May. 13, 2023 |
| HORN Antenna SCHWARZBECK          | BBHA 9170                | 9170-480                  | May. 14, 2022 | May. 13, 2023 |
| Preamplifier EMC                  | EMC 012645               | 980115                    | Oct. 05, 2021 | Oct. 04, 2022 |
| Preamplifier Agilent              | 8447D                    | 2944A10638                | May. 14, 2022 | May. 13, 2023 |
| Pre-amplifier EMC                 | EMC 330H                 | 980112                    | Oct. 05, 2021 | Oct. 04, 2022 |
| Pre-amplifier EMC                 | EMC 184045               | 980116                    | Oct. 05, 2021 | Oct. 04, 2022 |
| RF Coaxial Cable EMC              | EMC104-SM-SM-8000        | 171005                    | Oct. 05, 2021 | Oct. 04, 2022 |
| RF Coaxial Cable HUBER SUHNER     | SUCOFLEX 104             | EMC104-SM-SM-1000(140807) | Oct. 05, 2021 | Oct. 04, 2022 |
| RF Coaxial Cable WOKEN            | 8D-FB                    | Cable-Ch10-01             | Oct. 05, 2021 | Oct. 04, 2022 |
| Software BV ADT                   | ADT_Radiated_V7.6.15.9.5 | N/A                       | N/A           | N/A           |
| Spectrum Analyzer ROHDE & SCHWARZ | FSP40                    | 100040                    | Sep. 15, 2021 | Sep. 14, 2022 |
| Signal Analyzer Agilent           | N9010A                   | MY52220207                | Jan. 06, 2022 | Jan. 05, 2023 |
| Test Receiver Agilent             | N9038A                   | MY51210203                | Sep. 22, 2021 | Sep. 21, 2022 |
| Turn Table Max-Full               | MFT-201SS                | NA                        | N/A           | N/A           |
| Turn Table Controller Max-Full    | MG-7802                  | NA                        | N/A           | N/A           |
| Wideband Power Sensor KEYSIGHT    | N1923A                   | MY58020002                | Jan. 17, 2022 | Jan. 16, 2023 |
| Peak Power Analyzer KEYSIGHT      | 8990B                    | MY51000485                | Jan. 18, 2022 | Jan. 17, 2023 |

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 HY - 966 chamber 5.



### 3 General Information

#### 3.1 General Description of EUT

|                            |                                             |                      |
|----------------------------|---------------------------------------------|----------------------|
| <b>Product</b>             | Smart Watch                                 |                      |
| <b>Brand</b>               | NA                                          |                      |
| <b>Test Model</b>          | QTAX57                                      |                      |
| <b>Status of EUT</b>       | Engineering Sample                          |                      |
| <b>Power Supply Rating</b> | 3.85 Vdc (Battery)<br>100-240 Vac (Adapter) |                      |
| <b>Modulation Type</b>     | LTE                                         | QPSK, 16QAM          |
| <b>Frequency Range</b>     | LTE Band 4 (Channel Bandwidth: 1.4 MHz)     | 1710.7 ~ 1754.3 MHz  |
|                            | LTE Band 4 (Channel Bandwidth: 3 MHz)       | 1711.5 ~ 1753.5 MHz  |
|                            | LTE Band 4 (Channel Bandwidth: 5 MHz)       | 1712.5 ~ 1752.5 MHz  |
|                            | LTE Band 4 (Channel Bandwidth: 10 MHz)      | 1715.0 ~ 1750.0 MHz  |
|                            | LTE Band 4 (Channel Bandwidth: 15 MHz)      | 1717.5 ~ 1747.5 MHz  |
|                            | LTE Band 4 (Channel Bandwidth: 20 MHz)      | 1720.0 ~ 1745.0 MHz  |
|                            | LTE Band 13 (Channel Bandwidth: 5 MHz)      | 779.5 ~ 784.5 MHz    |
|                            | LTE Band 13 (Channel Bandwidth: 10 MHz)     | 782.0 MHz            |
| <b>Emission Designator</b> | LTE Band 4 (Channel Bandwidth: 1.4 MHz)     | 1M09G7D              |
|                            | LTE Band 4 (Channel Bandwidth: 3 MHz)       | 2M70D7W              |
|                            | LTE Band 4 (Channel Bandwidth: 5 MHz)       | 4M50G7D              |
|                            | LTE Band 4 (Channel Bandwidth: 10 MHz)      | 8M96G7D              |
|                            | LTE Band 4 (Channel Bandwidth: 15 MHz)      | 13M4G7D              |
|                            | LTE Band 4 (Channel Bandwidth: 20 MHz)      | 17M9G7D              |
|                            | LTE Band 13 (Channel Bandwidth: 5 MHz)      | 4M50G7D              |
|                            | LTE Band 13 (Channel Bandwidth: 10 MHz)     | 8M96G7D              |
| <b>Max. ERP Power</b>      | LTE Band 13 (Channel Bandwidth: 5 MHz)      | 16.827 mW (12.26dBm) |
|                            | LTE Band 13 (Channel Bandwidth: 10 MHz)     | 16.904 mW (12.28dBm) |
| <b>Max. EIRP Power</b>     | LTE Band 4 (Channel Bandwidth: 1.4 MHz)     | 66.988 mW (18.26dBm) |
|                            | LTE Band 4 (Channel Bandwidth: 3 MHz)       | 66.069 mW (18.20dBm) |
|                            | LTE Band 4 (Channel Bandwidth: 5 MHz)       | 66.988 mW (18.26dBm) |
|                            | LTE Band 4 (Channel Bandwidth: 10 MHz)      | 66.069 mW (18.20dBm) |
|                            | LTE Band 4 (Channel Bandwidth: 15 MHz)      | 66.988 mW (18.26dBm) |
|                            | LTE Band 4 (Channel Bandwidth: 20 MHz)      | 67.453 mW (18.29dBm) |
| <b>Antenna Type</b>        | PIFA Antenna                                |                      |
| <b>Antenna Gain</b>        | LTE Band 4                                  | -4.7 dBi             |
|                            | LTE Band 13                                 | -8.8 dBi             |
| <b>Accessory Device</b>    | Refer to Note as below                      |                      |
| <b>Data Cable Supplied</b> | Refer to Note as below                      |                      |

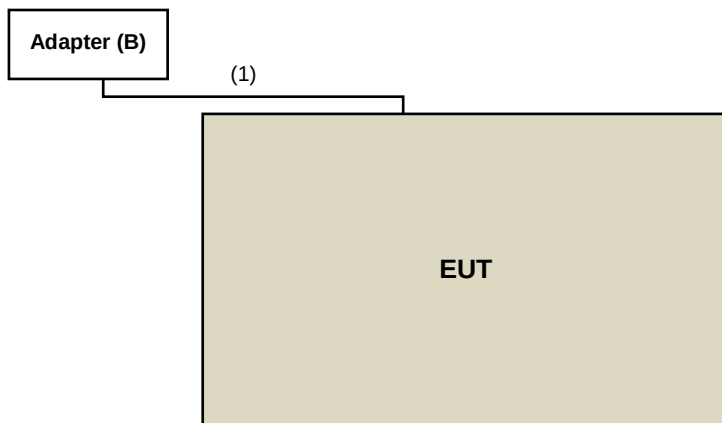
Note:

1. The EUT contains following accessory devices.

| Product         | Brand                                            | Model       | Description           |
|-----------------|--------------------------------------------------|-------------|-----------------------|
| Battery         | EVE<br>(EVE Energy Co., Ltd.)                    | P0963       | 3.85V, 495mAh, 1.91Wh |
| Charger Cable 1 | GREATLAND<br>(Greatland Electronics Taiwan Ltd.) | DDEMU080009 | Line length : 800mm   |
| Charger Cable 2 | GREATLAND<br>(Greatland Electronics Taiwan Ltd.) | DDEMU080012 | Line length : 800mm   |

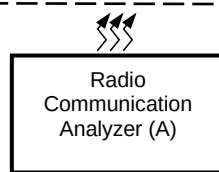
2. The above Antenna information refers to the manufacturer's antenna specifications, the laboratory shall not be held responsible.
3. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.
4. 16QAM only supports up to 25RB.

### 3.2 Configuration of System under Test



Under Table

Remote Site



#### 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          | 6201010284 | -      | Radio Communication Analyzer |
| B  | Adapter                      | JIANGSU CHENYANG ELECTRON CO.,LTD | CYSM06-050120-UL | N/A        | N/A    | Supplied by applicant        |

| ID | Cable Descriptions | Qty. | Length (m) | Shielding (Yes/No) | Cores (Qty.) | Remarks          |
|----|--------------------|------|------------|--------------------|--------------|------------------|
| 1  | Adapter Cable      | 1    | 1          | Y                  | N            | Accessory of EUT |

### 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 on Z-plane. Following channel(s) was (were) selected for the final test as listed below:

#### LTE Band 4

| EUT Configure Mode | Test Item                  | Available Channel | Tested Channel      | Channel Bandwidth | Modulation   | RB #              |
|--------------------|----------------------------|-------------------|---------------------|-------------------|--------------|-------------------|
| -                  | EIRP                       | 19957 to 20393    | 19957, 20175, 20393 | 1.4 MHz           | QPSK / 16QAM | 1<br>Half<br>Full |
|                    |                            | 19965 to 20385    | 19965, 20175, 20385 | 3 MHz             | QPSK / 16QAM | 1<br>Half<br>Full |
|                    |                            | 19975 to 20375    | 19975, 20175, 20375 | 5 MHz             | QPSK / 16QAM | 1<br>Half<br>Full |
|                    |                            | 20000 to 20350    | 20000, 20175, 20350 | 10 MHz            | QPSK / 16QAM | 1<br>Half<br>Full |
|                    |                            | 20025 to 20325    | 20025, 20175, 20325 | 15 MHz            | QPSK / 16QAM | 1<br>Half<br>Full |
|                    |                            | 20050 to 20300    | 20050, 20175, 20300 | 20 MHz            | QPSK / 16QAM | 1<br>Half<br>Full |
| -                  | Modulation Characteristics | 20050 to 20300    | 20175               | 20 MHz            | QPSK / 16QAM | Full              |
| -                  | Frequency Stability        | 19957 to 20393    | 19957, 20393        | 1.4 MHz           | QPSK         | Full              |
|                    |                            | 19965 to 20385    | 19965, 20385        | 3 MHz             | QPSK         | Full              |
|                    |                            | 19975 to 20375    | 19975, 20375        | 5 MHz             | QPSK         | Full              |
|                    |                            | 20000 to 20350    | 20000, 20350        | 10 MHz            | QPSK         | Full              |
|                    |                            | 20025 to 20325    | 20025, 20325        | 15 MHz            | QPSK         | Full              |
|                    |                            | 20050 to 20300    | 20050, 20300        | 20 MHz            | QPSK         | Full              |
| -                  | Occupied Bandwidth         | 19957 to 20393    | 19957, 20175, 20393 | 1.4 MHz           | QPSK / 16QAM | Full              |
|                    |                            | 19965 to 20385    | 19965, 20175, 20385 | 3 MHz             | QPSK / 16QAM | Full              |
|                    |                            | 19975 to 20375    | 19975, 20175, 20375 | 5 MHz             | QPSK / 16QAM | Full              |
|                    |                            | 20000 to 20350    | 20000, 20175, 20350 | 10 MHz            | QPSK / 16QAM | Full              |
|                    |                            | 20025 to 20325    | 20025, 20175, 20325 | 15 MHz            | QPSK / 16QAM | Full              |
|                    |                            | 20050 to 20300    | 20050, 20175, 20300 | 20 MHz            | QPSK / 16QAM | Full              |
| -                  | Peak to Average Ratio      | 19957 to 20393    | 19957, 20175, 20393 | 1.4 MHz           | QPSK / 16QAM | 1                 |
|                    |                            | 19965 to 20385    | 19965, 20175, 20385 | 3 MHz             | QPSK / 16QAM | 1                 |
|                    |                            | 19975 to 20375    | 19975, 20175, 20375 | 5 MHz             | QPSK / 16QAM | 1                 |
|                    |                            | 20000 to 20350    | 20000, 20175, 20350 | 10 MHz            | QPSK / 16QAM | 1                 |
|                    |                            | 20025 to 20325    | 20025, 20175, 20325 | 15 MHz            | QPSK / 16QAM | 1                 |
|                    |                            | 20050 to 20300    | 20050, 20175, 20300 | 20 MHz            | QPSK / 16QAM | 1                 |

| EUT Configure Mode | Test Item                    | Available Channel | Tested Channel      | Channel Bandwidth | Modulation | RB #              |
|--------------------|------------------------------|-------------------|---------------------|-------------------|------------|-------------------|
| -                  | Band Edge                    | 19957 to 20393    | 19957, 20393        | 1.4 MHz           | QPSK       | 1<br>Half<br>Full |
|                    |                              | 19965 to 20385    | 19965, 20385        | 3 MHz             | QPSK       | 1<br>Half<br>Full |
|                    |                              | 19975 to 20375    | 19975, 20375        | 5 MHz             | QPSK       | 1<br>Half<br>Full |
|                    |                              | 20000 to 20350    | 20000, 20350        | 10 MHz            | QPSK       | 1<br>Half<br>Full |
|                    |                              | 20025 to 20325    | 20025, 20325        | 15 MHz            | QPSK       | 1<br>Half<br>Full |
|                    |                              | 20050 to 20300    | 20050, 20300        | 20 MHz            | QPSK       | 1<br>Half<br>Full |
| -                  | Conducted Emission           | 19957 to 20393    | 19957, 20175, 20393 | 1.4 MHz           | QPSK       | 1                 |
|                    |                              | 19965 to 20385    | 19965, 20175, 20385 | 3 MHz             | QPSK       | 1                 |
|                    |                              | 19975 to 20375    | 19975, 20175, 20375 | 5 MHz             | QPSK       | 1                 |
|                    |                              | 20000 to 20350    | 20000, 20175, 20350 | 10 MHz            | QPSK       | 1                 |
|                    |                              | 20025 to 20325    | 20025, 20175, 20325 | 15 MHz            | QPSK       | 1                 |
|                    |                              | 20050 to 20300    | 20050, 20175, 20300 | 20 MHz            | QPSK       | 1                 |
| -                  | Radiated Emission Below 1GHz | 20050 to 20300    | 20175               | 20 MHz            | QPSK       | 1                 |
| -                  | Radiated Emission Above 1GHz | 19957 to 20393    | 19957, 20175, 20393 | 1.4 MHz           | QPSK       | 1                 |
|                    |                              | 19975 to 20375    | 19975, 20175, 20375 | 5 MHz             | QPSK       | 1                 |
|                    |                              | 20050 to 20300    | 20050, 20175, 20300 | 20 MHz            | 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 EIRP, 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.

## LTE Band 13

| EUT Configure Mode | Test Item                    | Available Channel | Tested Channel      | Channel Bandwidth | Modulation   | RB #              |
|--------------------|------------------------------|-------------------|---------------------|-------------------|--------------|-------------------|
| -                  | ERP                          | 23205 to 23255    | 23205, 23230, 23255 | 5 MHz             | QPSK / 16QAM | 1<br>Half<br>Full |
|                    |                              | 23230             | 23230               | 10 MHz            | QPSK / 16QAM | 1<br>Half<br>Full |
| -                  | Modulation Characteristics   | 23230             | 23230               | 10 MHz            | QPSK / 16QAM | Full              |
| -                  | Frequency Stability          | 23205 to 23255    | 23205, 23255        | 5 MHz             | QPSK         | Full              |
|                    |                              | 23230             | 23230               | 10 MHz            | QPSK         | Full              |
| -                  | Occupied Bandwidth           | 23205 to 23255    | 23205, 23230, 23255 | 5 MHz             | QPSK / 16QAM | Full              |
|                    |                              | 23230             | 23230               | 10 MHz            | QPSK / 16QAM | Full              |
| -                  | Peak to Average Ratio        | 23205 to 23255    | 23205, 23230, 23255 | 5 MHz             | QPSK / 16QAM | 1                 |
|                    |                              | 23230             | 23230               | 10 MHz            | QPSK / 16QAM | 1                 |
| -                  | Band Edge                    | 23205 to 23255    | 23205, 23255        | 5 MHz             | QPSK         | 1<br>Half<br>Full |
|                    |                              | 23230             | 23230, 23230        | 10 MHz            | QPSK         | 1<br>Half<br>Full |
| -                  | Conducted Emission           | 23205 to 23255    | 23205, 23230, 23255 | 5 MHz             | QPSK         | 1                 |
|                    |                              | 23230             | 23230               | 10 MHz            | QPSK         | 1                 |
| -                  | Radiated Emission Below 1GHz | 23205 to 23255    | 23205               | 5 MHz             | QPSK         | 1                 |
| -                  | Radiated Emission Above 1GHz | 23205 to 23255    | 23205, 23230, 23255 | 5 MHz             | QPSK         | 1                 |
|                    |                              | 23230             | 23230               | 10 MHz            | QPSK         | 1                 |

Note:

- For radiated emission below 1GHz, select the worst radiated emission channel (above 1GHz) for final testing.
- The output power for QPSK and 16QAM, measured value of QPSK is higher than 16QAM mode. Therefore, only ERP, 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 / EIRP                 | 25 deg. C, 65 % RH       | 3.85 Vdc       | Noah Chang                    |
| Modulation Characteristics | 25 deg. C, 65 % RH       | 3.85 Vdc       | Noah Chang                    |
| Frequency Stability        | 25 deg. C, 65 % RH       | 3.85 Vdc       | Noah Chang                    |
| Occupied Bandwidth         | 25 deg. C, 65 % RH       | 3.85 Vdc       | Noah Chang                    |
| Band Edge                  | 25 deg. C, 65 % RH       | 3.85 Vdc       | Noah Chang                    |
| Peak to Average Ratio      | 25 deg. C, 65 % RH       | 3.85 Vdc       | Noah Chang                    |
| Conducted Emission         | 25 deg. C, 65 % RH       | 3.85 Vdc       | Noah Chang                    |
| Radiated Emission          | 25 deg. C, 65 % RH       | 120 Vac, 60 Hz | Vincent Chen,<br>Thomas Cheng |

### 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 and references:

**Test Standard:**

**FCC 47 CFR Part 2**

**FCC 47 CFR Part 27**

**ANSI 63.26-2015**

**Note:** 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**

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

**Note:** 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

For LTE Band 13:

Control stations and mobile stations in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands and fixed stations transmitting in the 787-788 MHz and 805-806 MHz bands are limited to 30 watts ERP.

Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

For LTE Band 4:

Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

#### 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 (Built-in power meter). 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

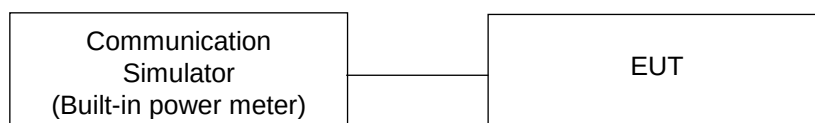
ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively  
(expressed in the same units as  $P_{\text{Meas}}$ , e.g., dBm or dBW)

$P_{\text{Meas}}$  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 4 |           |                 |    |        |        |        |
|------------|-----------|-----------------|----|--------|--------|--------|
| BW         | MCS Index | Channel         |    | 19957  | 20175  | 20393  |
|            |           | Frequency (MHz) |    | 1710.7 | 1732.5 | 1754.3 |
| 1.4M       | QPSK      | 1               | 0  | 22.81  | 22.90  | 22.80  |
|            |           | 1               | 2  | 22.57  | 22.96  | 22.76  |
|            |           | 1               | 5  | 22.22  | 22.70  | 22.76  |
|            |           | 3               | 0  | 22.82  | 22.83  | 22.58  |
|            |           | 3               | 1  | 22.71  | 22.65  | 22.56  |
|            |           | 3               | 3  | 22.45  | 22.56  | 22.51  |
|            |           | 6               | 0  | 21.48  | 21.45  | 21.37  |
|            | 16QAM     | 1               | 0  | 21.29  | 21.67  | 21.52  |
|            |           | 1               | 2  | 21.66  | 21.55  | 21.24  |
|            |           | 1               | 5  | 21.52  | 21.56  | 21.38  |
|            |           | 3               | 0  | 21.71  | 21.84  | 21.62  |
|            |           | 3               | 1  | 21.78  | 21.74  | 21.70  |
|            |           | 3               | 3  | 21.71  | 21.69  | 21.68  |
|            |           | 6               | 0  | 20.64  | 20.68  | 20.62  |
| LTE Band 4 |           |                 |    |        |        |        |
| BW         | MCS Index | Channel         |    | 19965  | 20175  | 20385  |
|            |           | Frequency (MHz) |    | 1711.5 | 1732.5 | 1753.5 |
| 3M         | QPSK      | 1               | 0  | 22.78  | 22.90  | 22.72  |
|            |           | 1               | 7  | 22.49  | 22.86  | 22.63  |
|            |           | 1               | 14 | 22.25  | 22.63  | 22.74  |
|            |           | 8               | 0  | 21.87  | 21.89  | 21.59  |
|            |           | 8               | 3  | 21.63  | 21.67  | 21.43  |
|            |           | 8               | 7  | 21.44  | 21.70  | 21.45  |
|            |           | 15              | 0  | 21.45  | 21.55  | 21.31  |
|            | 16QAM     | 1               | 0  | 21.28  | 21.70  | 21.57  |
|            |           | 1               | 7  | 21.72  | 21.64  | 21.26  |
|            |           | 1               | 14 | 21.56  | 21.57  | 21.33  |
|            |           | 8               | 0  | 20.74  | 20.87  | 20.72  |
|            |           | 8               | 3  | 20.85  | 20.77  | 20.71  |
|            |           | 8               | 7  | 20.70  | 20.68  | 20.68  |
|            |           | 15              | 0  | 20.75  | 20.68  | 20.53  |

## LTE Band 4

| BW | MCS Index | Channel         |    | 19975  | 20175  | 20375  |
|----|-----------|-----------------|----|--------|--------|--------|
|    |           | Frequency (MHz) |    | 1712.5 | 1732.5 | 1752.5 |
| 5M | QPSK      | 1               | 0  | 22.89  | 22.80  | 22.82  |
|    |           | 1               | 12 | 22.50  | 22.96  | 22.86  |
|    |           | 1               | 24 | 22.25  | 22.67  | 22.65  |
|    |           | 12              | 0  | 21.83  | 21.88  | 21.59  |
|    |           | 12              | 6  | 21.73  | 21.74  | 21.56  |
|    |           | 12              | 13 | 21.44  | 21.64  | 21.47  |
|    |           | 25              | 0  | 21.41  | 21.54  | 21.26  |
|    | 16QAM     | 1               | 0  | 21.27  | 21.73  | 21.62  |
|    |           | 1               | 12 | 21.73  | 21.58  | 21.28  |
|    |           | 1               | 24 | 21.53  | 21.46  | 21.28  |
|    |           | 12              | 0  | 20.78  | 20.72  | 20.68  |
|    |           | 12              | 6  | 20.75  | 20.74  | 20.71  |
|    |           | 12              | 13 | 20.75  | 20.69  | 20.54  |
|    |           | 25              | 0  | 20.76  | 20.69  | 20.60  |

## LTE Band 4

| BW  | MCS Index | Channel         |    | 20000 | 20175  | 20350 |
|-----|-----------|-----------------|----|-------|--------|-------|
|     |           | Frequency (MHz) |    | 1715  | 1732.5 | 1750  |
| 10M | QPSK      | 1               | 0  | 22.79 | 22.90  | 22.85 |
|     |           | 1               | 24 | 22.55 | 22.88  | 22.74 |
|     |           | 1               | 49 | 22.21 | 22.71  | 22.74 |
|     |           | 25              | 0  | 21.83 | 21.89  | 21.63 |
|     |           | 25              | 12 | 21.60 | 21.79  | 21.49 |
|     |           | 25              | 25 | 21.56 | 21.68  | 21.47 |
|     |           | 50              | 0  | 21.49 | 21.55  | 21.37 |
|     | 16QAM     | 1               | 0  | 21.30 | 21.81  | 21.58 |
|     |           | 1               | 24 | 21.73 | 21.59  | 21.25 |
|     |           | 1               | 49 | 21.58 | 21.53  | 21.32 |
|     |           | 25              | 0  | 20.86 | 20.79  | 20.76 |
|     |           | 25              | 12 | 20.79 | 20.83  | 20.69 |
|     |           | 25              | 25 | 20.76 | 20.69  | 20.67 |

| LTE Band 4 |           |                 |    |        |        |        |
|------------|-----------|-----------------|----|--------|--------|--------|
| BW         | MCS Index | Channel         |    | 20025  | 20175  | 20325  |
|            |           | Frequency (MHz) |    | 1717.5 | 1732.5 | 1747.5 |
| 15M        | QPSK      | 1               | 0  | 22.90  | 22.93  | 22.94  |
|            |           | 1               | 37 | 22.64  | 22.96  | 22.86  |
|            |           | 1               | 74 | 22.32  | 22.76  | 22.80  |
|            |           | 36              | 0  | 21.89  | 21.91  | 21.65  |
|            |           | 36              | 19 | 21.74  | 21.80  | 21.61  |
|            |           | 36              | 39 | 21.56  | 21.71  | 21.61  |
|            |           | 75              | 0  | 21.53  | 21.59  | 21.37  |
|            | 16QAM     | 1               | 0  | 21.35  | 21.81  | 21.62  |
|            |           | 1               | 37 | 21.81  | 21.67  | 21.39  |
|            |           | 1               | 74 | 21.61  | 21.57  | 21.43  |
| LTE Band 4 |           |                 |    |        |        |        |
| BW         | MCS Index | Channel         |    | 20050  | 20175  | 20300  |
|            |           | Frequency (MHz) |    | 1720   | 1732.5 | 1745   |
| 20M        | QPSK      | 1               | 0  | 22.95  | 22.99  | 22.98  |
|            |           | 1               | 50 | 22.66  | 22.97  | 22.94  |
|            |           | 1               | 99 | 22.38  | 22.81  | 22.81  |
|            |           | 50              | 0  | 21.89  | 21.91  | 21.71  |
|            |           | 50              | 25 | 21.75  | 21.83  | 21.67  |
|            |           | 50              | 50 | 21.63  | 21.72  | 21.66  |
|            |           | 100             | 0  | 21.61  | 21.68  | 21.46  |
|            | 16QAM     | 1               | 0  | 21.38  | 21.87  | 21.66  |
|            |           | 1               | 50 | 21.86  | 21.75  | 21.45  |
|            |           | 1               | 99 | 21.71  | 21.60  | 21.51  |

## LTE Band 13

| BW | MCS Index | Channel         |    | 23205 | 23230 | 23255 |
|----|-----------|-----------------|----|-------|-------|-------|
|    |           | Frequency (MHz) |    | 779.5 | 782   | 784.5 |
| 5M | QPSK      | 1               | 0  | 23.14 | 23.13 | 23.21 |
|    |           | 1               | 12 | 23.10 | 23.11 | 23.11 |
|    |           | 1               | 24 | 22.84 | 22.79 | 22.77 |
|    |           | 12              | 0  | 22.07 | 22.07 | 22.10 |
|    |           | 12              | 6  | 22.02 | 21.96 | 22.04 |
|    |           | 12              | 13 | 21.92 | 21.96 | 21.86 |
|    |           | 25              | 0  | 21.88 | 21.85 | 21.84 |
|    | 16QAM     | 1               | 0  | 22.08 | 22.00 | 22.08 |
|    |           | 1               | 12 | 21.82 | 21.79 | 21.82 |
|    |           | 1               | 24 | 21.45 | 21.47 | 21.53 |
|    |           | 12              | 0  | 21.26 | 21.35 | 21.32 |
|    |           | 12              | 6  | 21.18 | 21.16 | 21.26 |
|    |           | 12              | 13 | 21.00 | 20.95 | 20.96 |
|    |           | 25              | 0  | 21.28 | 21.26 | 21.36 |

## LTE Band 13

| BW  | MCS Index | Channel         |    | 23230 |
|-----|-----------|-----------------|----|-------|
|     |           | Frequency (MHz) |    | 782   |
| 10M | QPSK      | 1               | 0  | 23.23 |
|     |           | 1               | 24 | 23.17 |
|     |           | 1               | 49 | 22.84 |
|     |           | 25              | 0  | 22.17 |
|     |           | 25              | 12 | 22.06 |
|     |           | 25              | 25 | 21.96 |
|     |           | 50              | 0  | 21.93 |
|     | 16QAM     | 1               | 0  | 22.08 |
|     |           | 1               | 24 | 21.89 |
|     |           | 1               | 49 | 21.53 |
|     |           | 25              | 0  | 21.35 |
|     |           | 25              | 12 | 21.26 |
|     |           | 25              | 25 | 21.01 |

**EIRP Power(dBm)**

| LTE Band 4 |           |                 |    |        |        |        |
|------------|-----------|-----------------|----|--------|--------|--------|
| BW         | MCS Index | Channel         |    | 19957  | 20175  | 20393  |
|            |           | Frequency (MHz) |    | 1710.7 | 1732.5 | 1754.3 |
| 1.4M       | QPSK      | 1               | 0  | 18.11  | 18.20  | 18.10  |
|            |           | 1               | 2  | 17.87  | 18.26  | 18.06  |
|            |           | 1               | 5  | 17.52  | 18.00  | 18.06  |
|            |           | 3               | 0  | 18.12  | 18.13  | 17.88  |
|            |           | 3               | 1  | 18.01  | 17.95  | 17.86  |
|            |           | 3               | 3  | 17.75  | 17.86  | 17.81  |
|            |           | 6               | 0  | 16.78  | 16.75  | 16.67  |
|            | 16QAM     | 1               | 0  | 16.59  | 16.97  | 16.82  |
|            |           | 1               | 2  | 16.96  | 16.85  | 16.54  |
|            |           | 1               | 5  | 16.82  | 16.86  | 16.68  |
|            |           | 3               | 0  | 17.01  | 17.14  | 16.92  |
|            |           | 3               | 1  | 17.08  | 17.04  | 17.00  |
|            |           | 3               | 3  | 17.01  | 16.99  | 16.98  |
|            |           | 6               | 0  | 15.94  | 15.98  | 15.92  |
| LTE Band 4 |           |                 |    |        |        |        |
| BW         | MCS Index | Channel         |    | 19965  | 20175  | 20385  |
|            |           | Frequency (MHz) |    | 1711.5 | 1732.5 | 1753.5 |
| 3M         | QPSK      | 1               | 0  | 18.08  | 18.20  | 18.02  |
|            |           | 1               | 7  | 17.79  | 18.16  | 17.93  |
|            |           | 1               | 14 | 17.55  | 17.93  | 18.04  |
|            |           | 8               | 0  | 17.17  | 17.19  | 16.89  |
|            |           | 8               | 3  | 16.93  | 16.97  | 16.73  |
|            |           | 8               | 7  | 16.74  | 17.00  | 16.75  |
|            |           | 15              | 0  | 16.75  | 16.85  | 16.61  |
|            | 16QAM     | 1               | 0  | 16.58  | 17.00  | 16.87  |
|            |           | 1               | 7  | 17.02  | 16.94  | 16.56  |
|            |           | 1               | 14 | 16.86  | 16.87  | 16.63  |
|            |           | 8               | 0  | 16.04  | 16.17  | 16.02  |
|            |           | 8               | 3  | 16.15  | 16.07  | 16.01  |
|            |           | 8               | 7  | 16.00  | 15.98  | 15.98  |
|            |           | 15              | 0  | 16.05  | 15.98  | 15.83  |

\*EIRP = Conducted + antenna gain (-4.7dBi)

| LTE Band 4 |           |                 |    |        |        |        |
|------------|-----------|-----------------|----|--------|--------|--------|
| BW         | MCS Index | Channel         |    | 19975  | 20175  | 20375  |
|            |           | Frequency (MHz) |    | 1712.5 | 1732.5 | 1752.5 |
| 5M         | QPSK      | 1               | 0  | 18.19  | 18.10  | 18.12  |
|            |           | 1               | 12 | 17.80  | 18.26  | 18.16  |
|            |           | 1               | 24 | 17.55  | 17.97  | 17.95  |
|            |           | 12              | 0  | 17.13  | 17.18  | 16.89  |
|            |           | 12              | 6  | 17.03  | 17.04  | 16.86  |
|            |           | 12              | 13 | 16.74  | 16.94  | 16.77  |
|            |           | 25              | 0  | 16.71  | 16.84  | 16.56  |
|            | 16QAM     | 1               | 0  | 16.57  | 17.03  | 16.92  |
|            |           | 1               | 12 | 17.03  | 16.88  | 16.58  |
|            |           | 1               | 24 | 16.83  | 16.76  | 16.58  |
|            |           | 12              | 0  | 16.08  | 16.02  | 15.98  |
|            |           | 12              | 6  | 16.05  | 16.04  | 16.01  |
|            |           | 12              | 13 | 16.05  | 15.99  | 15.84  |
|            |           | 25              | 0  | 16.06  | 15.99  | 15.90  |
| LTE Band 4 |           |                 |    |        |        |        |
| BW         | MCS Index | Channel         |    | 20000  | 20175  | 20350  |
|            |           | Frequency (MHz) |    | 1715   | 1732.5 | 1750   |
| 10M        | QPSK      | 1               | 0  | 18.09  | 18.20  | 18.15  |
|            |           | 1               | 24 | 17.85  | 18.18  | 18.04  |
|            |           | 1               | 49 | 17.51  | 18.01  | 18.04  |
|            |           | 25              | 0  | 17.13  | 17.19  | 16.93  |
|            |           | 25              | 12 | 16.90  | 17.09  | 16.79  |
|            |           | 25              | 25 | 16.86  | 16.98  | 16.77  |
|            |           | 50              | 0  | 16.79  | 16.85  | 16.67  |
|            | 16QAM     | 1               | 0  | 16.60  | 17.11  | 16.88  |
|            |           | 1               | 24 | 17.03  | 16.89  | 16.55  |
|            |           | 1               | 49 | 16.88  | 16.83  | 16.62  |
|            |           | 25              | 0  | 16.16  | 16.09  | 16.06  |
|            |           | 25              | 12 | 16.09  | 16.13  | 15.99  |
|            |           | 25              | 25 | 16.06  | 15.99  | 15.97  |

\*EIRP = Conducted + antenna gain (-4.7dBi)

| LTE Band 4 |           |                 |    |        |        |        |
|------------|-----------|-----------------|----|--------|--------|--------|
| BW         | MCS Index | Channel         |    | 20025  | 20175  | 20325  |
|            |           | Frequency (MHz) |    | 1717.5 | 1732.5 | 1747.5 |
| 15M        | QPSK      | 1               | 0  | 18.20  | 18.23  | 18.24  |
|            |           | 1               | 37 | 17.94  | 18.26  | 18.16  |
|            |           | 1               | 74 | 17.62  | 18.06  | 18.10  |
|            |           | 36              | 0  | 17.19  | 17.21  | 16.95  |
|            |           | 36              | 19 | 17.04  | 17.10  | 16.91  |
|            |           | 36              | 39 | 16.86  | 17.01  | 16.91  |
|            |           | 75              | 0  | 16.83  | 16.89  | 16.67  |
|            | 16QAM     | 1               | 0  | 16.65  | 17.11  | 16.92  |
|            |           | 1               | 37 | 17.11  | 16.97  | 16.69  |
|            |           | 1               | 74 | 16.91  | 16.87  | 16.73  |
| LTE Band 4 |           |                 |    |        |        |        |
| BW         | MCS Index | Channel         |    | 20050  | 20175  | 20300  |
|            |           | Frequency (MHz) |    | 1720   | 1732.5 | 1745   |
| 20M        | QPSK      | 1               | 0  | 18.25  | 18.29  | 18.28  |
|            |           | 1               | 50 | 17.96  | 18.27  | 18.24  |
|            |           | 1               | 99 | 17.68  | 18.11  | 18.11  |
|            |           | 50              | 0  | 17.19  | 17.21  | 17.01  |
|            |           | 50              | 25 | 17.05  | 17.13  | 16.97  |
|            |           | 50              | 50 | 16.93  | 17.02  | 16.96  |
|            |           | 100             | 0  | 16.91  | 16.98  | 16.76  |
|            | 16QAM     | 1               | 0  | 16.68  | 17.17  | 16.96  |
|            |           | 1               | 50 | 17.16  | 17.05  | 16.75  |
|            |           | 1               | 99 | 17.01  | 16.90  | 16.81  |

\*EIRP = Conducted + antenna gain (-4.7dBi)

**ERP Power (dBm)**

| LTE Band 13 |           |                 |    |       |       |       |
|-------------|-----------|-----------------|----|-------|-------|-------|
| BW          | MCS Index | Channel         |    | 23205 | 23230 | 23255 |
|             |           | Frequency (MHz) |    | 779.5 | 782   | 784.5 |
| 5M          | QPSK      | 1               | 0  | 12.19 | 12.18 | 12.26 |
|             |           | 1               | 12 | 12.15 | 12.16 | 12.16 |
|             |           | 1               | 24 | 11.89 | 11.84 | 11.82 |
|             |           | 12              | 0  | 11.12 | 11.12 | 11.15 |
|             |           | 12              | 6  | 11.07 | 11.01 | 11.09 |
|             |           | 12              | 13 | 10.97 | 11.01 | 10.91 |
|             |           | 25              | 0  | 10.93 | 10.90 | 10.89 |
|             | 16QAM     | 1               | 0  | 11.13 | 11.05 | 11.13 |
|             |           | 1               | 12 | 10.87 | 10.84 | 10.87 |
|             |           | 1               | 24 | 10.50 | 10.52 | 10.58 |
|             |           | 12              | 0  | 10.31 | 10.40 | 10.37 |
|             |           | 12              | 6  | 10.23 | 10.21 | 10.31 |
|             |           | 12              | 13 | 10.05 | 10.00 | 10.01 |
|             |           | 25              | 0  | 10.33 | 10.31 | 10.41 |
| LTE Band 13 |           |                 |    |       |       |       |
| BW          | MCS Index | Channel         |    | 23230 |       |       |
|             |           | Frequency (MHz) |    | 782   |       |       |
| 10M         | QPSK      | 1               | 0  | 12.28 |       |       |
|             |           | 1               | 24 | 12.22 |       |       |
|             |           | 1               | 49 | 11.89 |       |       |
|             |           | 25              | 0  | 11.22 |       |       |
|             |           | 25              | 12 | 11.11 |       |       |
|             |           | 25              | 25 | 11.01 |       |       |
|             |           | 50              | 0  | 10.98 |       |       |
|             | 16QAM     | 1               | 0  | 11.13 |       |       |
|             |           | 1               | 24 | 10.94 |       |       |
|             |           | 1               | 49 | 10.58 |       |       |
|             |           | 25              | 0  | 10.40 |       |       |
|             |           | 25              | 12 | 10.31 |       |       |
| 25          | 25        | 10.06           |    |       |       |       |

\*ERP = Conducted + antenna gain (-8.8dBi)-2.15



## 4.2 Modulation Characteristics Measurement

### 4.2.1 Limits of Modulation Characteristics

N/A

### 4.2.2 Test Setup

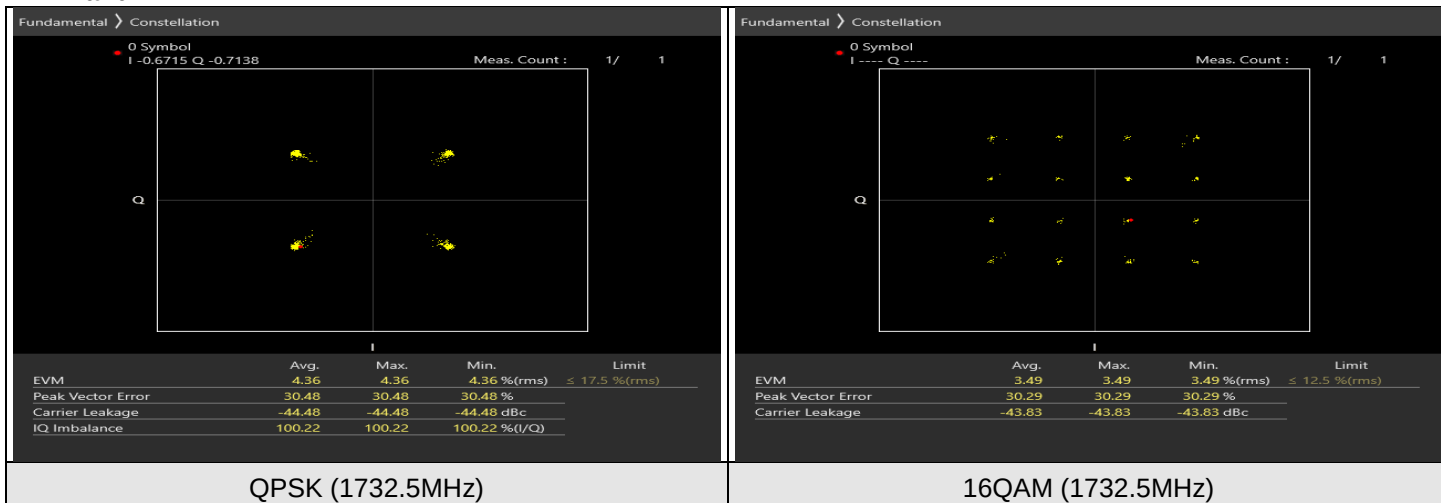


### 4.2.3 Test Procedure

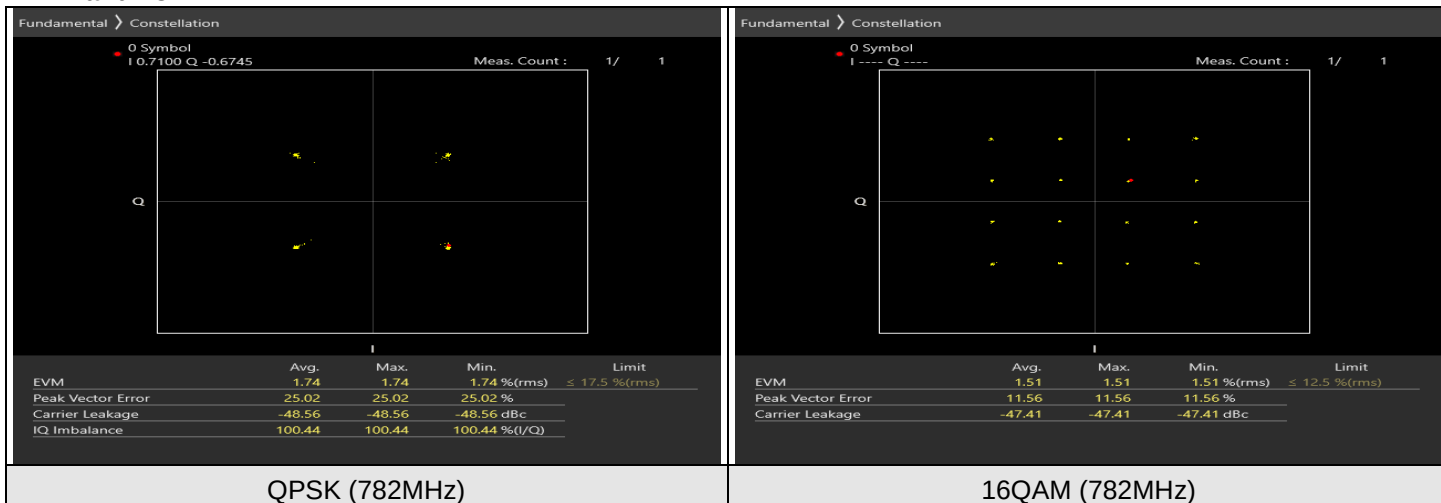
Connect the EUT to Communication Simulator via the antenna connector. The frequency band is set as EUT supported Modulation and Channels, the EUT output is matched with 50 ohm load, the waveform quality and constellation of the EUT was tested.

## 4.2.4 Test Results

### LTE Band 4



### LTE Band 13



### 4.3 Frequency Stability Measurement

#### 4.3.1 Limits of Frequency Stability Measurement

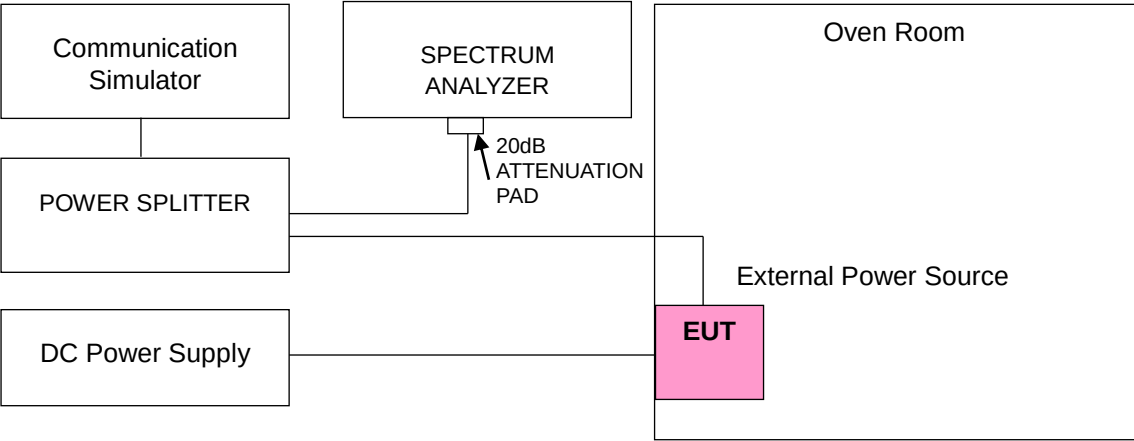
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

#### 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>(Volts) | LTE Band 4                 |                       |                 |                       |
|--------------------|----------------------------|-----------------------|-----------------|-----------------------|
|                    | Channel Bandwidth: 1.4 MHz |                       |                 |                       |
|                    | Low Channel                |                       | High Channel    |                       |
|                    | Frequency (MHz)            | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| 3.27               | 1710.7000030               | 0.002                 | 1754.2999960    | -0.002                |
| 3.85               | 1710.6999970               | -0.002                | 1754.3000020    | 0.001                 |
| 4.43               | 1710.7000020               | 0.001                 | 1754.3000040    | 0.002                 |

**Note:** The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

##### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 4                 |                       |                 |                       |
|------------|----------------------------|-----------------------|-----------------|-----------------------|
|            | Channel Bandwidth: 1.4 MHz |                       |                 |                       |
|            | Low Channel                |                       | High Channel    |                       |
|            | Frequency (MHz)            | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| -30        | 1710.7000010               | 0.001                 | 1754.2999970    | -0.002                |
| -20        | 1710.6999980               | -0.001                | 1754.2999970    | -0.002                |
| -10        | 1710.6999990               | -0.001                | 1754.2999960    | -0.002                |
| 0          | 1710.7000040               | 0.002                 | 1754.3000040    | 0.002                 |
| 10         | 1710.6999960               | -0.002                | 1754.3000030    | 0.002                 |
| 20         | 1710.6999960               | -0.002                | 1754.3000010    | 0.001                 |
| 30         | 1710.6999990               | -0.001                | 1754.3000010    | 0.001                 |
| 40         | 1710.7000030               | 0.002                 | 1754.2999970    | -0.002                |
| 50         | 1710.7000010               | 0.001                 | 1754.3000040    | 0.002                 |
| 60         | 1710.6999960               | -0.002                | 1754.2999960    | -0.002                |

#### Frequency Error vs. Voltage

| Voltage<br>(Volts) | LTE Band 4               |                       |                 |                       |
|--------------------|--------------------------|-----------------------|-----------------|-----------------------|
|                    | Channel Bandwidth: 3 MHz |                       |                 |                       |
|                    | Low Channel              |                       | High Channel    |                       |
|                    | Frequency (MHz)          | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| 3.85               | 1711.5000010             | 0.001                 | 1753.5000010    | 0.001                 |
| 3.27               | 1711.4999970             | -0.002                | 1753.4999960    | -0.002                |
| 4.43               | 1711.4999960             | -0.002                | 1753.5000030    | 0.002                 |

**Note:** The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

#### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 4               |                       |                 |                       |
|------------|--------------------------|-----------------------|-----------------|-----------------------|
|            | Channel Bandwidth: 3 MHz |                       |                 |                       |
|            | Low Channel              |                       | High Channel    |                       |
|            | Frequency (MHz)          | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| -30        | 1711.4999980             | -0.001                | 1753.5000040    | 0.002                 |
| -20        | 1711.5000030             | 0.002                 | 1753.4999970    | -0.002                |
| -10        | 1711.5000040             | 0.002                 | 1753.5000020    | 0.001                 |
| 0          | 1711.4999980             | -0.001                | 1753.5000040    | 0.002                 |
| 10         | 1711.4999990             | -0.001                | 1753.4999980    | -0.001                |
| 20         | 1711.4999990             | -0.001                | 1753.4999970    | -0.002                |
| 30         | 1711.4999960             | -0.002                | 1753.4999970    | -0.002                |
| 40         | 1711.5000040             | 0.002                 | 1753.4999990    | -0.001                |
| 50         | 1711.4999990             | -0.001                | 1753.5000010    | 0.001                 |
| 60         | 1711.4999970             | -0.002                | 1753.4999970    | -0.002                |

### Frequency Error vs. Voltage

| Voltage<br>(Volts) | LTE Band 4               |                       |                 |                       |
|--------------------|--------------------------|-----------------------|-----------------|-----------------------|
|                    | Channel Bandwidth: 5 MHz |                       |                 |                       |
|                    | Low Channel              |                       | High Channel    |                       |
|                    | Frequency (MHz)          | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| 3.85               | 1712.4999960             | -0.002                | 1752.5000020    | 0.001                 |
| 3.27               | 1712.5000040             | 0.002                 | 1752.4999980    | -0.001                |
| 4.43               | 1712.4999980             | -0.001                | 1752.5000030    | 0.002                 |

**Note:** The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 4               |                       |                 |                       |
|------------|--------------------------|-----------------------|-----------------|-----------------------|
|            | Channel Bandwidth: 5 MHz |                       |                 |                       |
|            | Low Channel              |                       | High Channel    |                       |
|            | Frequency (MHz)          | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| -30        | 1712.5000030             | 0.002                 | 1752.4999990    | -0.001                |
| -20        | 1712.4999980             | -0.001                | 1752.5000040    | 0.002                 |
| -10        | 1712.4999970             | -0.002                | 1752.5000020    | 0.001                 |
| 0          | 1712.5000040             | 0.002                 | 1752.4999990    | -0.001                |
| 10         | 1712.4999990             | -0.001                | 1752.4999980    | -0.001                |
| 20         | 1712.5000030             | 0.002                 | 1752.5000020    | 0.001                 |
| 30         | 1712.4999970             | -0.002                | 1752.5000040    | 0.002                 |
| 40         | 1712.4999990             | -0.001                | 1752.4999990    | -0.001                |
| 50         | 1712.5000040             | 0.002                 | 1752.5000030    | 0.002                 |
| 60         | 1712.5000030             | 0.002                 | 1752.5000040    | 0.002                 |

### Frequency Error vs. Voltage

| Voltage<br>(Volts) | LTE Band 4                |                       |                 |                       |
|--------------------|---------------------------|-----------------------|-----------------|-----------------------|
|                    | Channel Bandwidth: 10 MHz |                       |                 |                       |
|                    | Low Channel               |                       | High Channel    |                       |
|                    | Frequency (MHz)           | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| 3.85               | 1714.9999970              | -0.002                | 1750.0000040    | 0.002                 |
| 3.27               | 1714.9999970              | -0.002                | 1749.9999970    | -0.002                |
| 4.43               | 1715.0000030              | 0.002                 | 1750.0000020    | 0.001                 |

**Note:** The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 4                |                       |                 |                       |
|------------|---------------------------|-----------------------|-----------------|-----------------------|
|            | Channel Bandwidth: 10 MHz |                       |                 |                       |
|            | Low Channel               |                       | High Channel    |                       |
|            | Frequency (MHz)           | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| -30        | 1714.9999990              | -0.001                | 1750.0000010    | 0.001                 |
| -20        | 1714.9999990              | -0.001                | 1749.9999960    | -0.002                |
| -10        | 1714.9999980              | -0.001                | 1750.0000040    | 0.002                 |
| 0          | 1715.0000010              | 0.001                 | 1749.9999990    | -0.001                |
| 10         | 1715.0000020              | 0.001                 | 1749.9999970    | -0.002                |
| 20         | 1714.9999980              | -0.001                | 1749.9999990    | -0.001                |
| 30         | 1715.0000010              | 0.001                 | 1750.0000040    | 0.002                 |
| 40         | 1715.0000030              | 0.002                 | 1749.9999980    | -0.001                |
| 50         | 1714.9999980              | -0.001                | 1749.9999960    | -0.002                |
| 60         | 1714.9999990              | -0.001                | 1750.0000010    | 0.001                 |

### Frequency Error vs. Voltage

| Voltage<br>(Volts) | LTE Band 4                |                       |                 |                       |
|--------------------|---------------------------|-----------------------|-----------------|-----------------------|
|                    | Channel Bandwidth: 15 MHz |                       |                 |                       |
|                    | Low Channel               |                       | High Channel    |                       |
|                    | Frequency (MHz)           | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| 3.85               | 1717.4999990              | -0.001                | 1747.4999980    | -0.001                |
| 3.27               | 1717.4999990              | -0.001                | 1747.5000020    | 0.001                 |
| 4.43               | 1717.4999980              | -0.001                | 1747.5000030    | 0.002                 |

**Note:** The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 4                |                       |                 |                       |
|------------|---------------------------|-----------------------|-----------------|-----------------------|
|            | Channel Bandwidth: 15 MHz |                       |                 |                       |
|            | Low Channel               |                       | High Channel    |                       |
|            | Frequency (MHz)           | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| -30        | 1717.4999970              | -0.002                | 1747.5000040    | 0.002                 |
| -20        | 1717.5000040              | 0.002                 | 1747.5000010    | 0.001                 |
| -10        | 1717.5000020              | 0.001                 | 1747.4999960    | -0.002                |
| 0          | 1717.5000030              | 0.002                 | 1747.4999990    | -0.001                |
| 10         | 1717.4999980              | -0.001                | 1747.5000010    | 0.001                 |
| 20         | 1717.5000010              | 0.001                 | 1747.4999980    | -0.001                |
| 30         | 1717.4999960              | -0.002                | 1747.5000010    | 0.001                 |
| 40         | 1717.4999970              | -0.002                | 1747.4999980    | -0.001                |
| 50         | 1717.5000020              | 0.001                 | 1747.4999980    | -0.001                |
| 60         | 1717.4999960              | -0.002                | 1747.5000020    | 0.001                 |



#### Frequency Error vs. Voltage

| Voltage<br>(Volts) | LTE Band 4                |                       |                 |                       |
|--------------------|---------------------------|-----------------------|-----------------|-----------------------|
|                    | Channel Bandwidth: 20 MHz |                       |                 |                       |
|                    | Low Channel               |                       | High Channel    |                       |
|                    | Frequency (MHz)           | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| 3.85               | 1720.0000040              | 0.002                 | 1744.9999990    | -0.001                |
| 3.27               | 1720.0000030              | 0.002                 | 1744.9999960    | -0.002                |
| 4.43               | 1719.9999970              | -0.002                | 1744.9999960    | -0.002                |

**Note:** The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

#### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 4                |                       |                 |                       |
|------------|---------------------------|-----------------------|-----------------|-----------------------|
|            | Channel Bandwidth: 20 MHz |                       |                 |                       |
|            | Low Channel               |                       | High Channel    |                       |
|            | Frequency (MHz)           | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| -30        | 1720.0000030              | 0.002                 | 1745.0000010    | 0.001                 |
| -20        | 1719.9999990              | -0.001                | 1745.0000030    | 0.002                 |
| -10        | 1719.9999970              | -0.002                | 1745.0000030    | 0.002                 |
| 0          | 1719.9999960              | -0.002                | 1744.9999990    | -0.001                |
| 10         | 1719.9999970              | -0.002                | 1745.0000030    | 0.002                 |
| 20         | 1720.0000010              | 0.001                 | 1744.9999980    | -0.001                |
| 30         | 1719.9999990              | -0.001                | 1744.9999970    | -0.002                |
| 40         | 1720.0000040              | 0.002                 | 1744.9999960    | -0.002                |
| 50         | 1720.0000040              | 0.002                 | 1745.0000040    | 0.002                 |
| 60         | 1719.9999980              | -0.001                | 1745.0000030    | 0.002                 |

# Frequency Error vs. Voltage

| Voltage<br>(Volts) | LTE Band 13              |                       |                 |                       |
|--------------------|--------------------------|-----------------------|-----------------|-----------------------|
|                    | Channel Bandwidth: 5 MHz |                       |                 |                       |
|                    | Low Channel              |                       | High Channel    |                       |
|                    | Frequency (MHz)          | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| 3.85               | 779.4999980              | -0.003                | 784.4999970     | -0.004                |
| 3.27               | 779.4999960              | -0.005                | 784.4999980     | -0.003                |
| 4.43               | 779.4999980              | -0.003                | 784.5000040     | 0.005                 |

**Note:** The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

# Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 13              |                       |                 |                       |
|------------|--------------------------|-----------------------|-----------------|-----------------------|
|            | Channel Bandwidth: 5 MHz |                       |                 |                       |
|            | Low Channel              |                       | High Channel    |                       |
|            | Frequency (MHz)          | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| -30        | 779.4999990              | -0.001                | 784.5000040     | 0.005                 |
| -20        | 779.4999970              | -0.004                | 784.5000040     | 0.005                 |
| -10        | 779.5000010              | 0.001                 | 784.5000040     | 0.005                 |
| 0          | 779.4999980              | -0.003                | 784.5000040     | 0.005                 |
| 10         | 779.4999960              | -0.005                | 784.4999990     | -0.001                |
| 20         | 779.4999970              | -0.004                | 784.5000040     | 0.005                 |
| 30         | 779.5000030              | 0.004                 | 784.4999970     | -0.004                |
| 40         | 779.5000030              | 0.004                 | 784.4999960     | -0.005                |
| 50         | 779.5000040              | 0.005                 | 784.5000020     | 0.003                 |
| 60         | 779.5000040              | 0.005                 | 784.4999990     | -0.001                |

### Frequency Error vs. Voltage

| Voltage<br>(Volts) | LTE Band 13               |                       |
|--------------------|---------------------------|-----------------------|
|                    | Channel Bandwidth: 10 MHz |                       |
|                    | Frequency (MHz)           | Frequency Error (ppm) |
| 3.85               | 782.0000020               | 0.003                 |
| 3.27               | 782.0000030               | 0.004                 |
| 4.43               | 781.9999970               | -0.004                |

**Note:** The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.43 Vdc.

### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 13               |                       |
|------------|---------------------------|-----------------------|
|            | Channel Bandwidth: 10 MHz |                       |
|            | Frequency (MHz)           | Frequency Error (ppm) |
| -30        | 781.9999960               | -0.005                |
| -20        | 781.9999970               | -0.004                |
| -10        | 781.9999990               | -0.001                |
| 0          | 781.9999980               | -0.003                |
| 10         | 782.0000010               | 0.001                 |
| 20         | 782.0000030               | 0.004                 |
| 30         | 781.9999970               | -0.004                |
| 40         | 781.9999970               | -0.004                |
| 50         | 781.9999990               | -0.001                |
| 60         | 781.9999960               | -0.005                |

## 4.4 Occupied Bandwidth Measurement

### 4.4.1 Limits of Occupied Bandwidth Measurement

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

### 4.4.2 Test Procedure

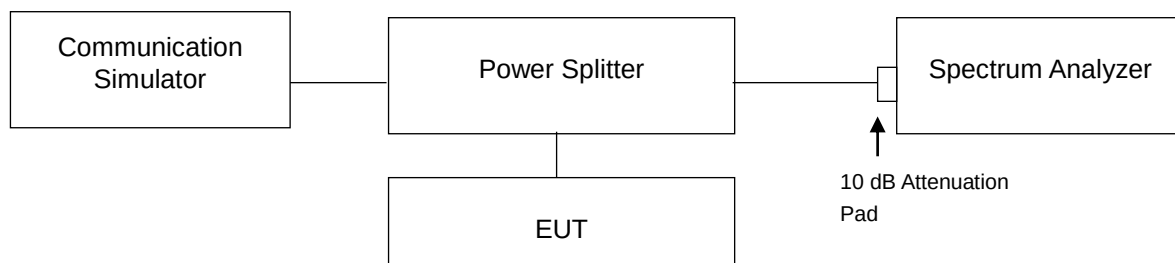
The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency.

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





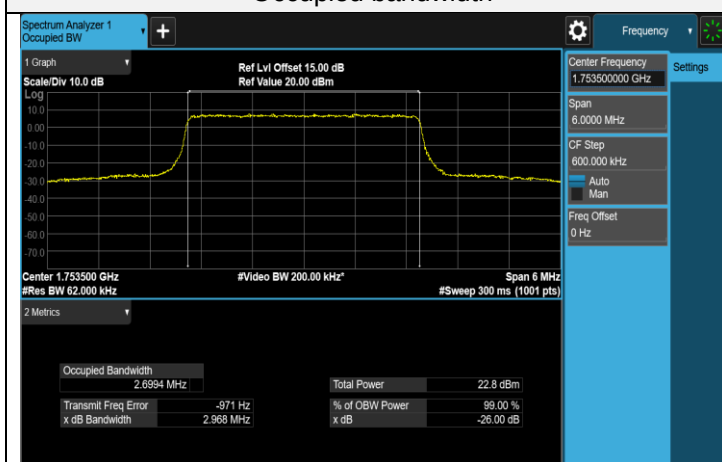
# LTE Band 4 (Channel Bandwidth 3MHz)

| Test Condition | Channel | Frequency (MHz) | Occupied bandwidth (MHz) | 26 dB Bandwidth (MHz) |
|----------------|---------|-----------------|--------------------------|-----------------------|
| QPSK           | 19965   | 1711.5          | 2.6952                   | 2.936                 |
| QPSK           | 20175   | 1732.5          | 2.6972                   | 2.936                 |
| QPSK           | 20385   | 1753.5          | 2.6993                   | 2.980                 |
| 16QAM          | 19965   | 1711.5          | 2.6976                   | 2.934                 |
| 16QAM          | 20175   | 1732.5          | 2.6967                   | 2.942                 |
| 16QAM          | 20385   | 1753.5          | 2.6994                   | 2.968                 |

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

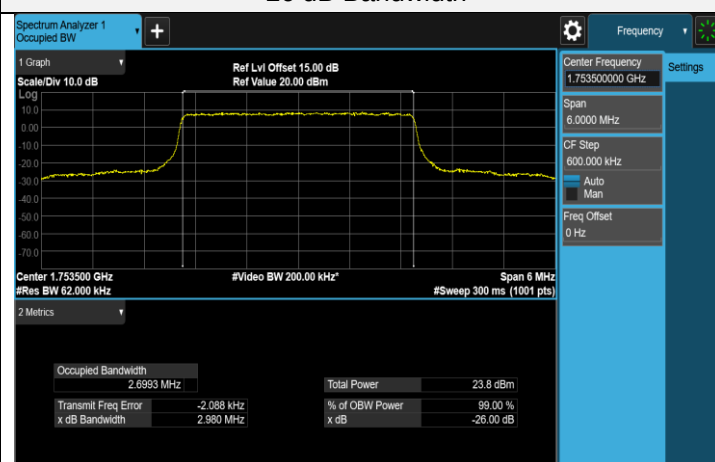
## Spectrum Plot of Worst Value

### Occupied bandwidth



16QAM CH 20385 (1753.5MHz)

### 26 dB Bandwidth



QPSK CH 20385 (1753.5MHz)

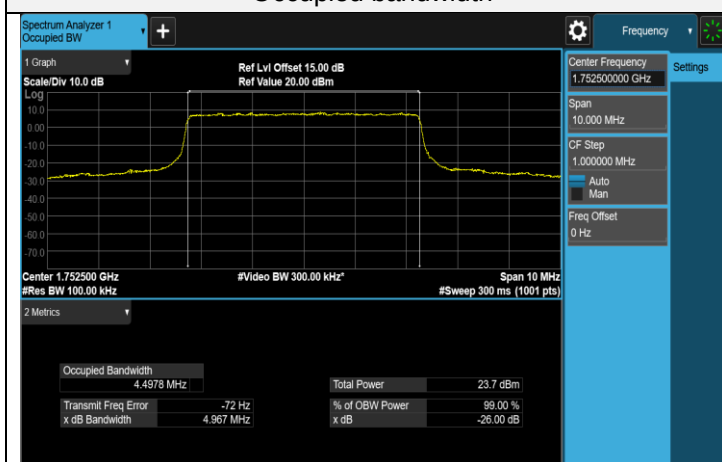
# LTE Band 4 (Channel Bandwidth 5MHz)

| Test Condition | Channel | Frequency (MHz) | Occupied bandwidth (MHz) | 26 dB Bandwidth (MHz) |
|----------------|---------|-----------------|--------------------------|-----------------------|
| QPSK           | 19975   | 1712.5          | 4.4929                   | 4.864                 |
| QPSK           | 20175   | 1732.5          | 4.4940                   | 4.852                 |
| QPSK           | 20375   | 1752.5          | 4.4978                   | 4.967                 |
| 16QAM          | 19975   | 1712.5          | 4.4878                   | 4.843                 |
| 16QAM          | 20175   | 1732.5          | 4.4907                   | 4.858                 |
| 16QAM          | 20375   | 1752.5          | 4.4932                   | 4.901                 |

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

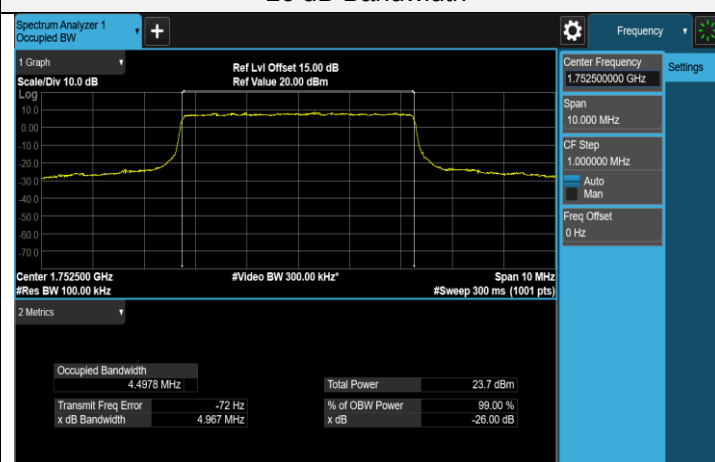
## Spectrum Plot of Worst Value

### Occupied bandwidth



QPSK CH 20375 (1752.5MHz)

### 26 dB Bandwidth



QPSK CH 20375 (1752.5MHz)

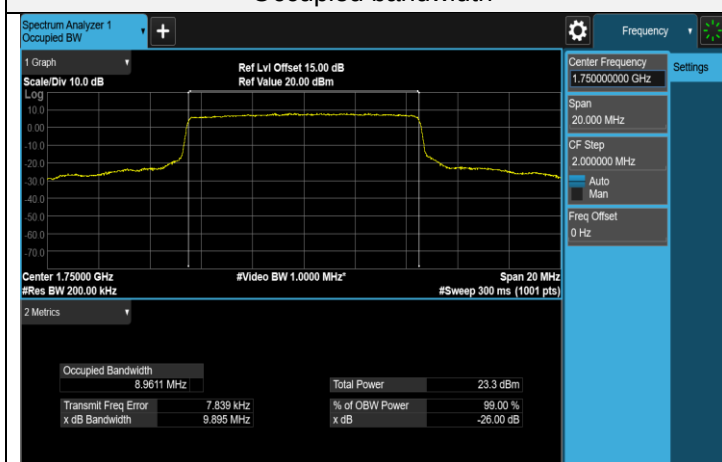
# LTE Band 4 (Channel Bandwidth 10MHz)

| Test Condition | Channel | Frequency (MHz) | Occupied bandwidth (MHz) | 26 dB Bandwidth (MHz) |
|----------------|---------|-----------------|--------------------------|-----------------------|
| QPSK           | 20000   | 1715            | 8.9466                   | 9.700                 |
| QPSK           | 20175   | 1732.5          | 8.9514                   | 9.617                 |
| QPSK           | 20350   | 1750            | 8.9611                   | 9.895                 |
| 16QAM          | 20000   | 1715            | 4.5786                   | 5.213                 |
| 16QAM          | 20175   | 1732.5          | 4.5770                   | 5.276                 |
| 16QAM          | 20350   | 1750            | 4.5876                   | 5.674                 |

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

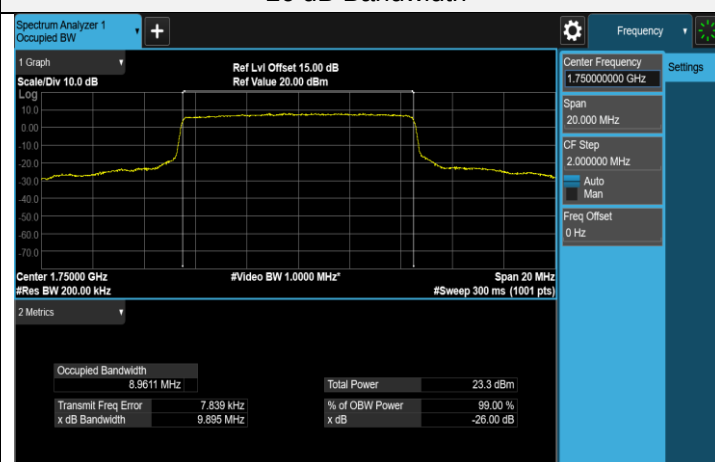
## Spectrum Plot of Worst Value

### Occupied bandwidth



QPSK CH 20350 (1750MHz)

### 26 dB Bandwidth



QPSK CH 20350 (1750MHz)



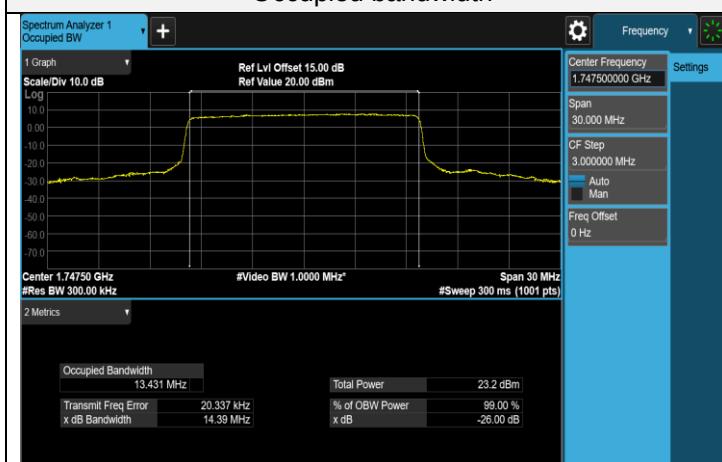
# LTE Band 4 (Channel Bandwidth 15MHz)

| Test Condition | Channel | Frequency (MHz) | Occupied bandwidth (MHz) | 26 dB Bandwidth (MHz) |
|----------------|---------|-----------------|--------------------------|-----------------------|
| QPSK           | 20025   | 1717.5          | 13.4065                  | 14.294                |
| QPSK           | 20175   | 1732.5          | 13.4248                  | 14.285                |
| QPSK           | 20325   | 1747.5          | 13.4311                  | 14.389                |
| 16QAM          | 20025   | 1717.5          | 4.6848                   | 5.596                 |
| 16QAM          | 20175   | 1732.5          | 4.6811                   | 5.555                 |
| 16QAM          | 20325   | 1747.5          | 4.6904                   | 5.628                 |

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

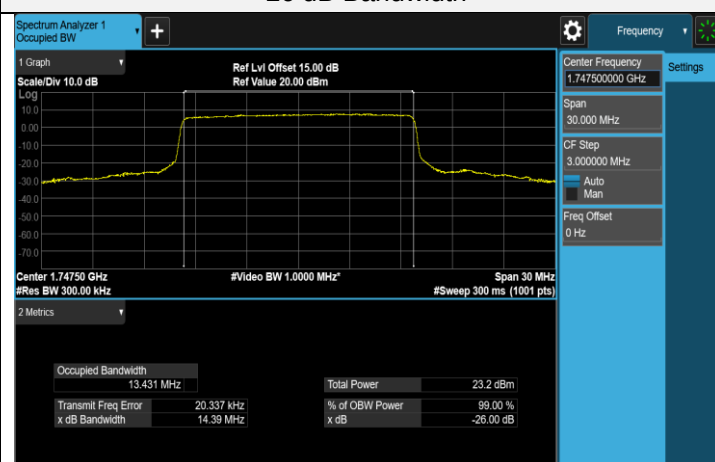
## Spectrum Plot of Worst Value

### Occupied bandwidth



QPSK CH 20325 (1747.5MHz)

### 26 dB Bandwidth



QPSK CH 20325 (1747.5MHz)

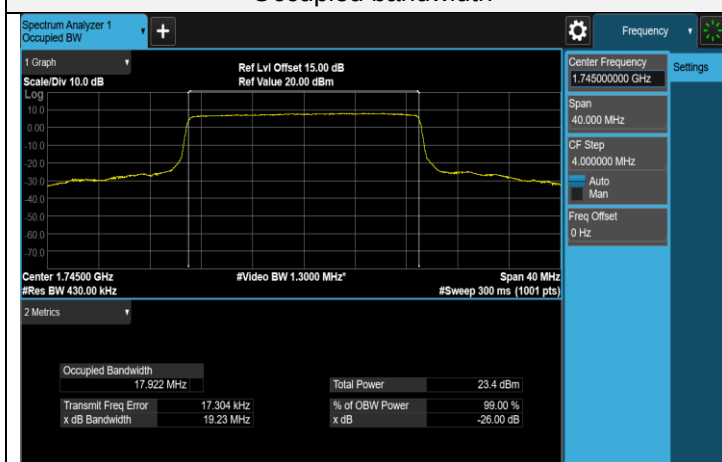
# LTE Band 4 (Channel Bandwidth 20MHz)

| Test Condition | Channel | Frequency (MHz) | Occupied bandwidth (MHz) | 26 dB Bandwidth (MHz) |
|----------------|---------|-----------------|--------------------------|-----------------------|
| QPSK           | 20050   | 1720            | 17.8203                  | 19.048                |
| QPSK           | 20175   | 1732.5          | 17.8875                  | 19.097                |
| QPSK           | 20300   | 1745            | 17.9218                  | 19.232                |
| 16QAM          | 20050   | 1720            | 4.8417                   | 5.835                 |
| 16QAM          | 20175   | 1732.5          | 4.8305                   | 5.756                 |
| 16QAM          | 20300   | 1745            | 4.8353                   | 5.767                 |

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

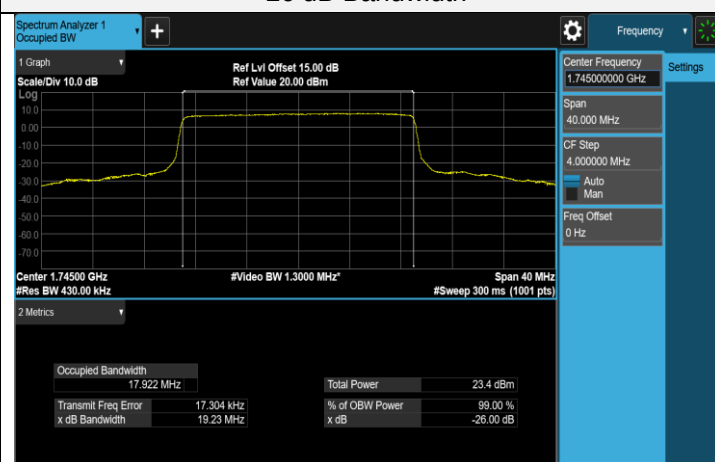
## Spectrum Plot of Worst Value

### Occupied bandwidth



QPSK CH 20300 (1745MHz)

### 26 dB Bandwidth



QPSK CH 20300 (1745MHz)

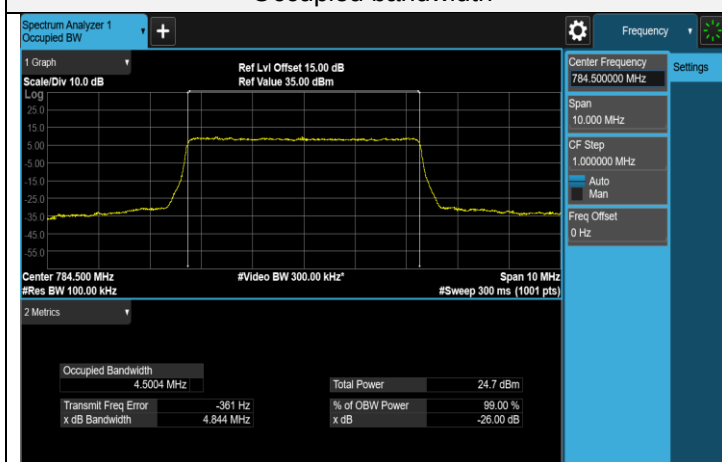
# LTE Band 13 (Channel Bandwidth 5MHz)

| Test Condition | Channel | Frequency (MHz) | Occupied bandwidth (MHz) | 26 dB Bandwidth (MHz) |
|----------------|---------|-----------------|--------------------------|-----------------------|
| QPSK           | 23205   | 779.5           | 4.4927                   | 4.827                 |
| QPSK           | 23230   | 782             | 4.4826                   | 4.810                 |
| QPSK           | 23255   | 784.5           | 4.5004                   | 4.844                 |
| 16QAM          | 23205   | 779.5           | 4.4954                   | 4.832                 |
| 16QAM          | 23230   | 782             | 4.4788                   | 4.797                 |
| 16QAM          | 23255   | 784.5           | 4.4957                   | 4.818                 |

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

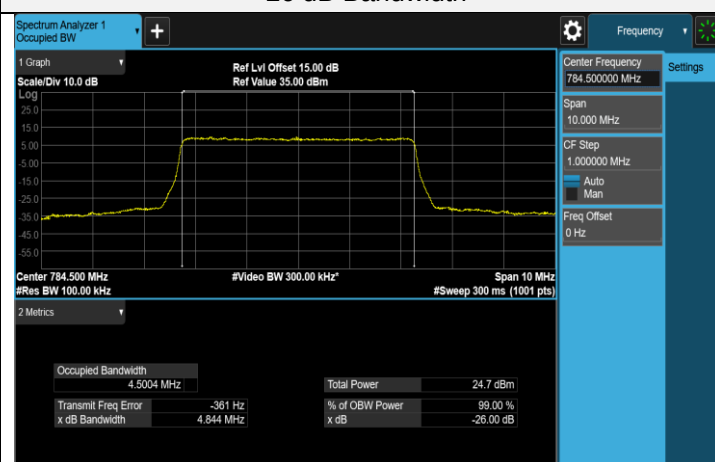
## Spectrum Plot of Worst Value

### Occupied bandwidth



QPSK CH 23255 (784.5MHz)

### 26 dB Bandwidth



QPSK CH 23255 (784.5MHz)

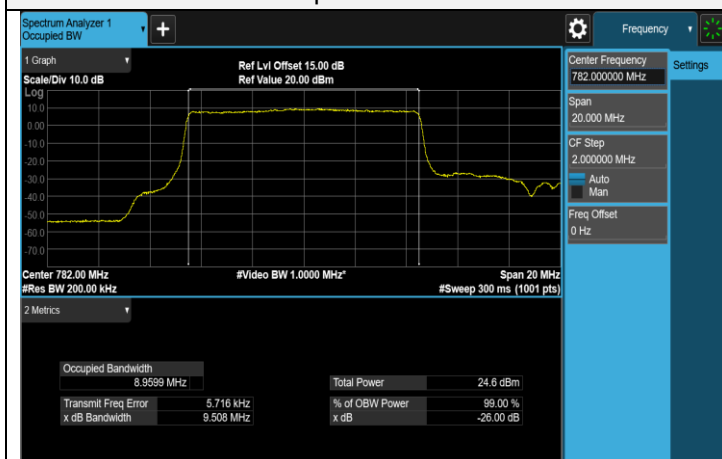
# LTE Band 13 (Channel Bandwidth 10MHz)

| Test Condition | Channel | Frequency (MHz) | Occupied bandwidth (MHz) | 26 dB Bandwidth (MHz) |
|----------------|---------|-----------------|--------------------------|-----------------------|
| QPSK           | 23230   | 782             | 8.9599                   | 9.508                 |
| 16QAM          | 23230   | 782             | 4.5530                   | 5.052                 |

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

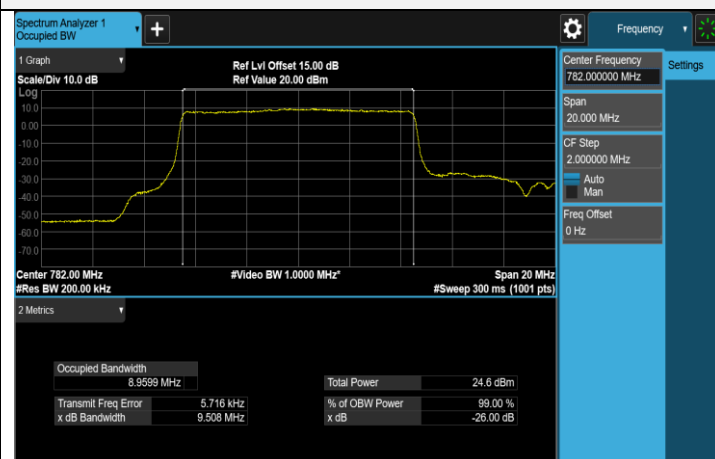
## Spectrum Plot of Worst Value

### Occupied bandwidth



QPSK CH 23230 (782MHz)

### 26 dB Bandwidth



QPSK CH 23230 (782MHz)

## 4.5 Channel Edge / Out-of-Band Emissions Measurement

### 4.5.1 Limits of Band Edge / Out-of-Band Emissions Measurement

For LTE Band 4:

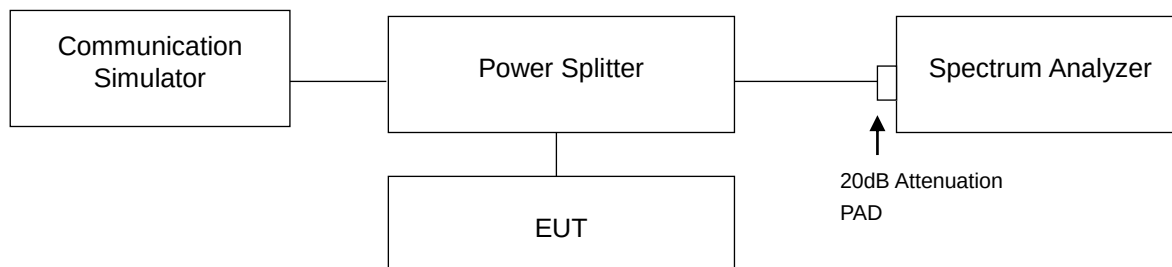
According to FCC 27.53(h), for operations in the 1695-1710MHz, 1710-1755MHz, 1755-1780 MHz, 1915-1920MHz, 1995-2000 MHz, 2000-2020MHz, 2110-2155MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log (P)$  dB. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

For LTE Band 13:

According to FCC 27.53(c)(2), for on any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

According to 27.53(c)(4), on all frequencies between 763-775MHz and 793-805MHz, by a factor not less than  $65 + 10 \log (P)$  dB in a 6.25 kHz band segment, for mobile and portable stations

### 4.5.2 Test Setup

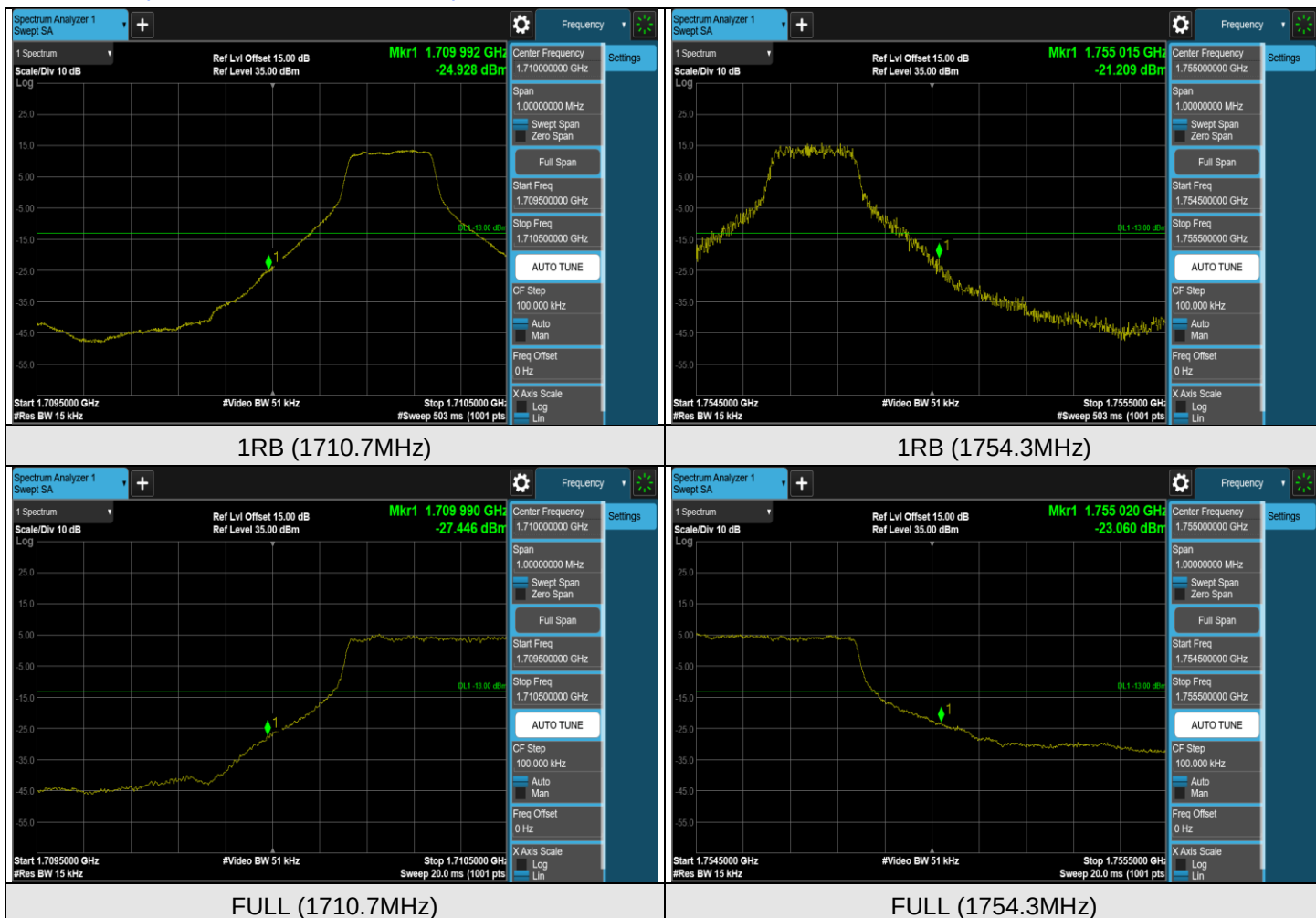


### 4.5.3 Test Procedures

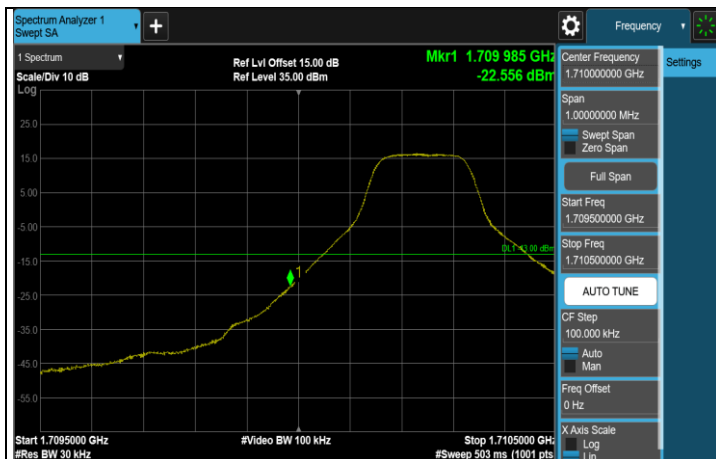
- All measurements were done at low and high operational frequency range.
- The detector of the spectrum is RMS, and if the device can be configured to transmit continuously (duty cycle  $\geq 98\%$ ), set the (sweep time)  $> (\text{number of points in sweep}) \times (\text{symbol period})$  (e.g., by a factor of  $10 \times \text{symbol period} \times \text{number of points}$ ). Increasing the sweep time (i.e., slowing the sweep speed) will allow for averaging over multiple symbols
- The center frequency of spectrum is the band edge frequency and span is 1 MHz or 2MHz. RB of the spectrum is 30 kHz and VB of the spectrum is 100 kHz.
- Measurement method refers to ANSI C63.26 section 5.7.2 and 5.7.3.
- For LTE Band 13 measurements in the 763 - 775 MHz and 793 - 805 MHz band, the FCC limit is  $65 + 10 \log (P[\text{watt}])$  in a 6.25 kHz bandwidth. Since it was not possible to set the resolution bandwidth to 6.25 kHz with the available equipment, a bandwidth of 6.8 kHz was used instead to show compliance, and the correction factor is compensated at the spectrum.
- Record the max. trace plot into the test report.

## 4.5.4 Test Results

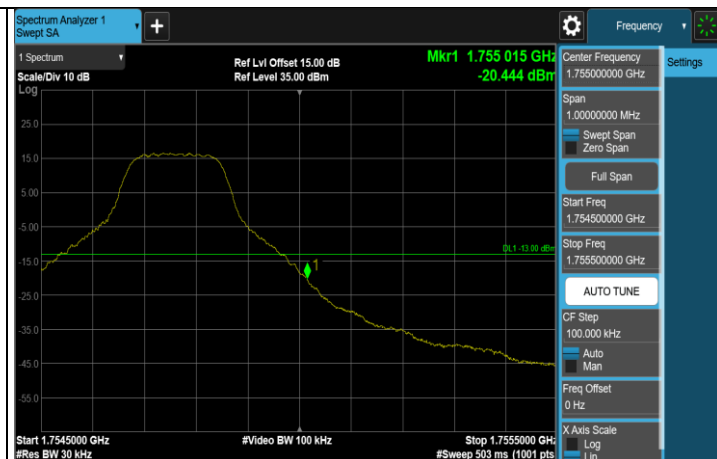
### LTE Band 4 (Channel Bandwidth 1.4MHz)



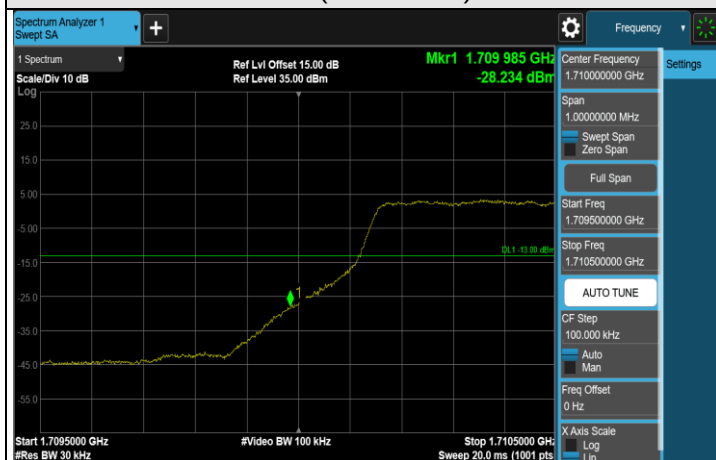
## LTE Band 4 (Channel Bandwidth 3MHz)



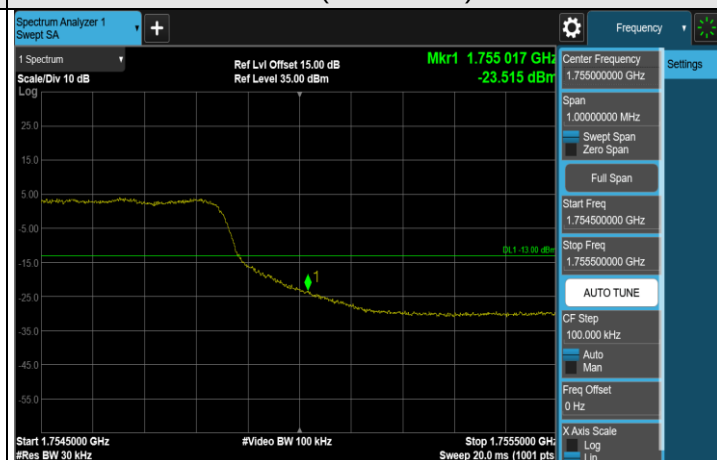
1RB (1711.5MHz)



1RB (1753.5MHz)

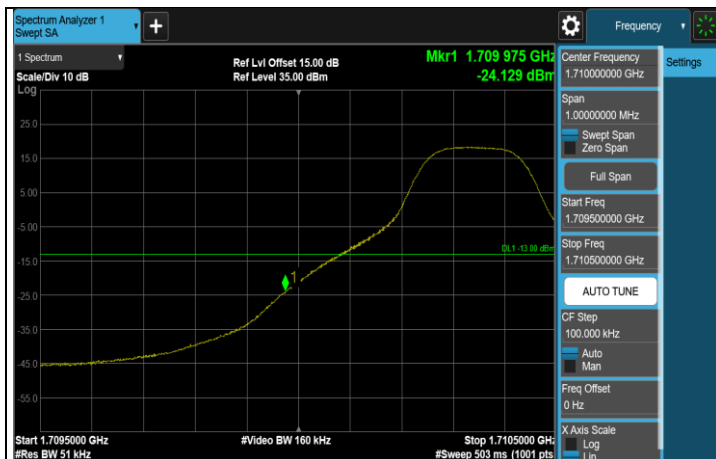


FULL (1711.5MHz)

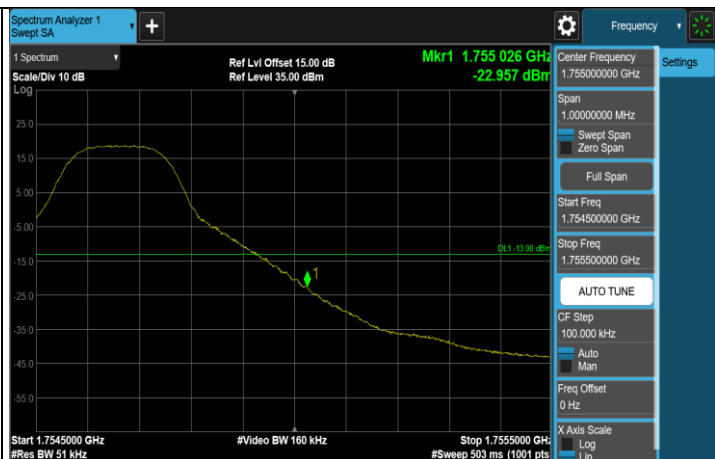


FULL (1753.5MHz)

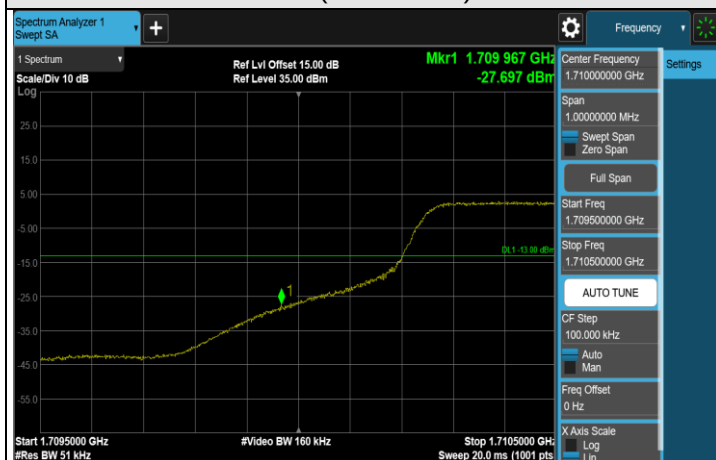
## LTE Band 4 (Channel Bandwidth 5MHz)



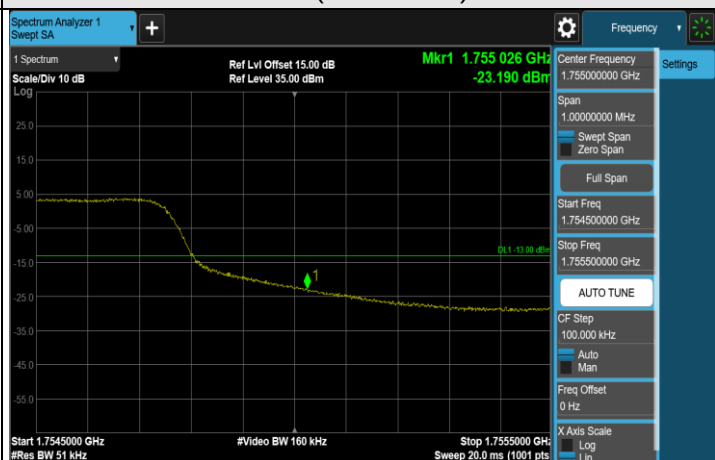
1RB (1712.5MHz)



1RB (1752.5MHz)



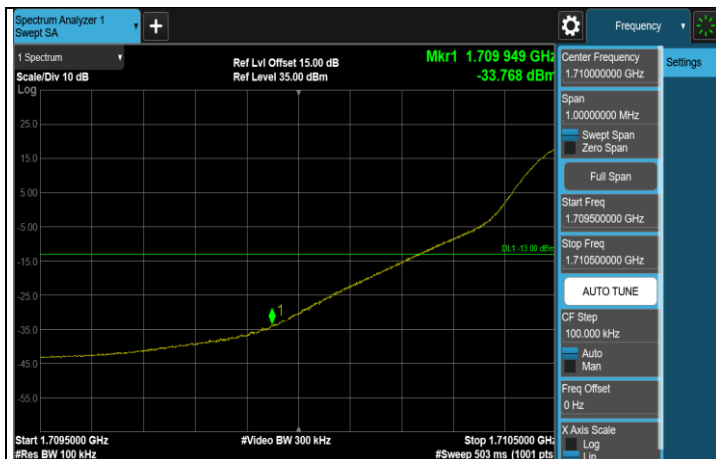
FULL (1712.5MHz)



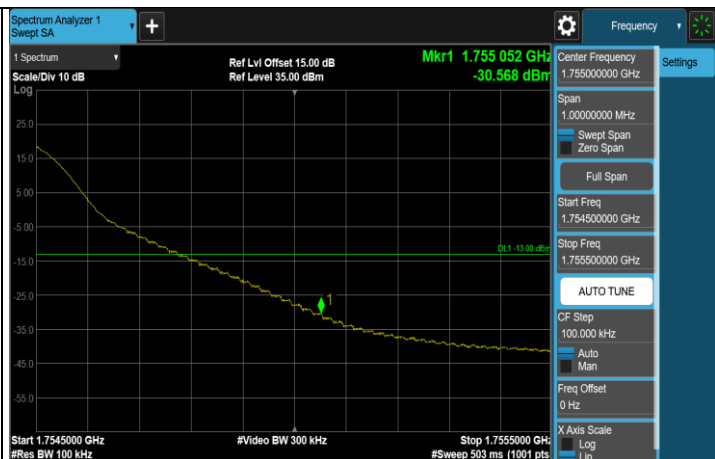
FULL (1752.5MHz)



## LTE Band 4 (Channel Bandwidth 10MHz)



1RB (1715MHz)



1RB (1750MHz)

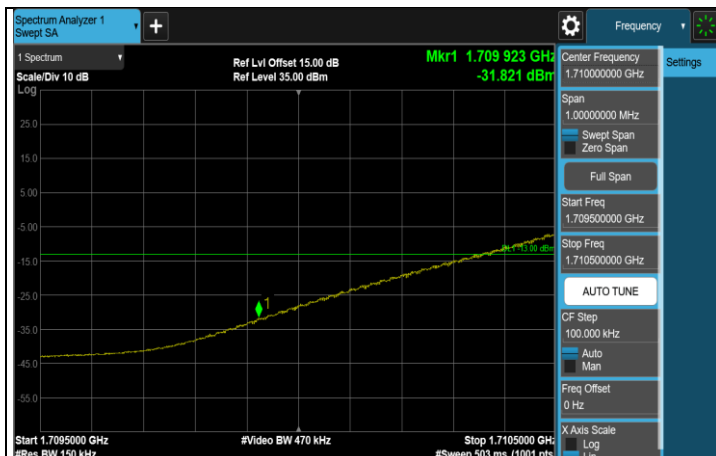


FULL (1715MHz)



FULL (1750MHz)

## LTE Band 4 (Channel Bandwidth 15MHz)



1RB (1717.5MHz)



1RB (1747.5MHz)



FULL (1717.5MHz)



FULL (1747.5MHz)