# FCC Test Report

# (PART 22)

| | |
|---|---|
| **Report No.:** | RFBFBE-WTW-P22030942 |
| **FCC ID:** | 2AJLF-VAB-1 |
| **Test Model:** | VAB-1 |
| **Received Date:** | 2022/6/7 |
| **Test Date:** | 2022/7/14 ~ 2022/7/30 |
| **Issued Date:** | 2022/8/22 |
| **Applicant:** | DataRemote Incorporated |
| **Address:** | 18001 Old Cutler Rd. Suite 600, Miami, FL 33157 |
| **Issued By:** | Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch<br>Lin Kou Laboratories |
| **Lab Address:** | No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan |
| **Test Location (1):** | No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan |
| **Test Location (2):** | B2F., No.215, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan |
| **FCC Registration / Designation Number:** | 788550 / TW0003<br>427177 / TW0011 |

Testing Laboratory
2021

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## Release Control Record

| Issue No. | Description | Date Issued |
|---|---|---|
| RFBFBE-WTW-P22030942 | Original Release | 2022/8/22 |

## 1 Certificate of Conformity

| | |
|---|---|
| **Product:** | Cellular Backup Router |
| **Brand:** | DATAREMOTE |
| **Test Model:** | VAB-1 |
| **Sample Status:** | Engineering Sample |
| **Applicant:** | DataRemote Incorporated |
| **Test Date:** | 2022/7/14 ~ 2022/7/30 |
| **Standards:** | FCC Part 22, Subpart H |

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 :** Vera Huang , **Date:** 2022/8/22

Vera Huang / Specialist

**Approved by :** Jeremy Lin , **Date:** 2022/8/22

Jeremy Lin / Project Engineer

## 2 Summary of Test Results

| Applied Standard: FCC Part 22 & Part 2 | | | |
|---|---|---|---|
| **FCC Clause** | **Test Item** | **Result** | **Remarks** |
| 2.1046<br>22.913 (a) | Effective Radiated Power | Pass | Meet the requirement of limit. |
| 2.1047 | Modulation Characteristics | Pass | Meet the requirement. |
| 22.913 (d) | Peak to Average Ratio | Pass | Meet the requirement of limit. |
| 2.1055<br>22.355 | Frequency Stability | Pass | Meet the requirement of limit. |
| 2.1049 | Occupied Bandwidth | Pass | Meet the requirement of limit. |
| 22.917 | Band Edge Measurements | Pass | Meet the requirement of limit. |
| 2.1051<br>22.917 | Conducted Spurious Emissions | Pass | Meet the requirement of limit. |
| 2.1053<br>22.917 | Radiated Spurious Emissions | Pass | Meet the requirement of limit.<br>Minimum passing margin is -37.31 dB at 1649.00 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 (k=2) (±)** |
|---|---|---|
| Radiated Emissions up to 1 GHz | 9 kHz ~ 30 MHz | 3.0400 dB |
| | 30 MHz ~ 200 MHz | 2.0153 dB |
| | 200 MHz ~ 1000 MHz | 2.0224 dB |
| Radiated Emissions above 1 GHz | 1 GHz ~ 18 GHz | 1.0121 dB |
| | 18 GHz ~ 40 GHz | 1.1508 dB |

## 2.2 Test Site and Instruments

| Description<br>Manufacturer | Model No. | Serial No. | Calibrated Date | Calibrated Until |
|---|---|---|---|---|
| Antenna Tower<br>Max-Full | UNAT_5+ | PAD-CH6-01 | N/A | N/A |
| Antenna Tower Controller<br>Max-Full | MF-7802 | N/A | N/A | N/A |
| Bi_Log Antenna<br>Schwarzbeck | VULB9168 | 9168-616 | 2021/10/27 | 2022/10/26 |
| Preamplifier<br>Agilent | 310N | 187226 | 2022/6/14 | 2023/6/13 |
| Pre-amplifier<br>EMCI | EMC001340 | 980201 | 2021/9/15 | 2022/9/14 |
| RF Coaxial Cable<br>EMCI | 5D-NM-BM | 140903+140902 | 2022/1/15 | 2023/1/14 |
| RF Coaxial Cable<br>ETS-Lindgren | EMC104-SM-SM-10000 | Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-4 | 2022/6/14 | 2023/6/13 |
| | RFC-SMS-100-SMS-24-IN | Cable-CH1-02(RFC-SMS-100-SMS-24) | 2022/6/14 | 2023/6/13 |
| Software<br>BV ADT | ADT_Radiated_<br>V7.6.15.9.5 | N/A | N/A | N/A |
| Test Receiver<br>Agilent | N9038A | MY52260177 | 2021/9/1 | 2022/8/31 |
| Turn Table<br>Max-Full | TT-1510 | N/A | N/A | N/A |
| Turn Table Controller<br>Max-Full | MF-7802 | N/A | N/A | N/A |
| Boresight antenna tower fixture<br>BV | BAF-02 | 8 | N/A | N/A |
| Horn Antenna<br>ETS-Lindgren | 3117 | 00143293 | 2021/11/14 | 2022/11/13 |
| Horn Antenna<br>Schwarzbeck | BBHA 9170 | BBHA9170241 | 2021/10/26 | 2022/10/25 |
| Radio Communication Analyzer<br>Anritsu | MT8821C | 6261806803 | 2022/2/16 | 2023/2/15 |

Notes:
1. The test was performed in XD - 966 chamber 6.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

## 3 General Information

### 3.1 General Description of EUT

| | | |
|---|---|---|
| **Product** | Cellular Backup Router | |
| **Brand** | DATAREMOTE | |
| **Test Model** | VAB-1 | |
| **Status of EUT** | Engineering Sample | |
| **Power Supply Rating** | 12Vdc / 19Vdc (from adapter) | |
| **Modulation Type** | WCDMA: BPSK, QPSK<br>HSDPA: BPSK<br>HSUPA: QPSK<br>LTE: QPSK, 16QAM | |
| **Frequency Range** | WCDMA Band 5 | 826.4 ~ 846.6 MHz |
| | LTE Band 5 (Channel Bandwidth: 1.4 MHz) | 824.7 ~ 848.3 MHz |
| | LTE Band 5 (Channel Bandwidth: 3 MHz) | 825.5 ~ 847.5 MHz |
| | LTE Band 5 (Channel Bandwidth: 5 MHz) | 826.5 ~ 846.5 MHz |
| | LTE Band 5 (Channel Bandwidth: 10 MHz) | 829 ~ 844 MHz |
| **Max. ERP Power** | WCDMA Band 5 | 251.768 mW (24.01dBm) |
| | LTE Band 5 (Channel Bandwidth: 1.4 MHz) | 225.944 mW (23.54dBm) |
| | LTE Band 5 (Channel Bandwidth: 3 MHz) | 223.357 mW (23.49dBm) |
| | LTE Band 5 (Channel Bandwidth: 5 MHz) | 226.464 mW (23.55dBm) |
| | LTE Band 5 (Channel Bandwidth: 10 MHz) | 227.510 mW (23.57dBm) |
| **Emission Designator** | WCDMA Band 5 | 4M17F9W |
| | LTE Band 5 (Channel Bandwidth: 1.4 MHz) | 1M09G7D |
| | LTE Band 5 (Channel Bandwidth: 3 MHz) | 2M70D7W |
| | LTE Band 5 (Channel Bandwidth: 5 MHz) | 4M49G7D |
| | LTE Band 5 (Channel Bandwidth: 10 MHz) | 8M97D7W |
| **Antenna Type** | Refer to Note as below | |
| **Accessory Device** | Refer to Note as below | |
| **Data Cable Supplied** | Refer to Note as below | |

Note:

1. The EUT contains following accessory devices.

| | | |
|---|---|---|
| **AC Adapter 1** | **Brand** | MOSO |
| | **Model** | MSS-V2500WR120-030E0-US |
| | **AC Input** | 100-240V, 50/60Hz, 1A max. |
| | **DC Output** | 12V, 2.5A |
| | **DC Output Cable** | 1.5m, Non-shielded |
| **AC Adapter 2** | **Brand** | MOSO |
| | **Model** | MS-V3420R190-065L0-US |
| | **AC Input** | 100-240V, 50/60Hz, 1.5A max. |
| | **DC Output** | 19V, 3.42A |
| | **DC Output Cable** | 1.5m, Non-shielded |
| **Ethernet Cable 1** | **Signal Line** | 1.5m, Non-shielded, yellow |
| **Ethernet Cable 2** | **Signal Line** | 1.5m, Non-shielded, red |
| **Phone Cable** | **Signal Line** | 1.5m, Non-shielded, gray |
| **Power Cable 1** | **Model** | BGW-210 |
| | **Signal Line** | 1.5m, Non-shielded, black |
| **Power Cable 2** | **Model** | BGW-320 |
| | **Signal Line** | 1.5m, Non-shielded, white |

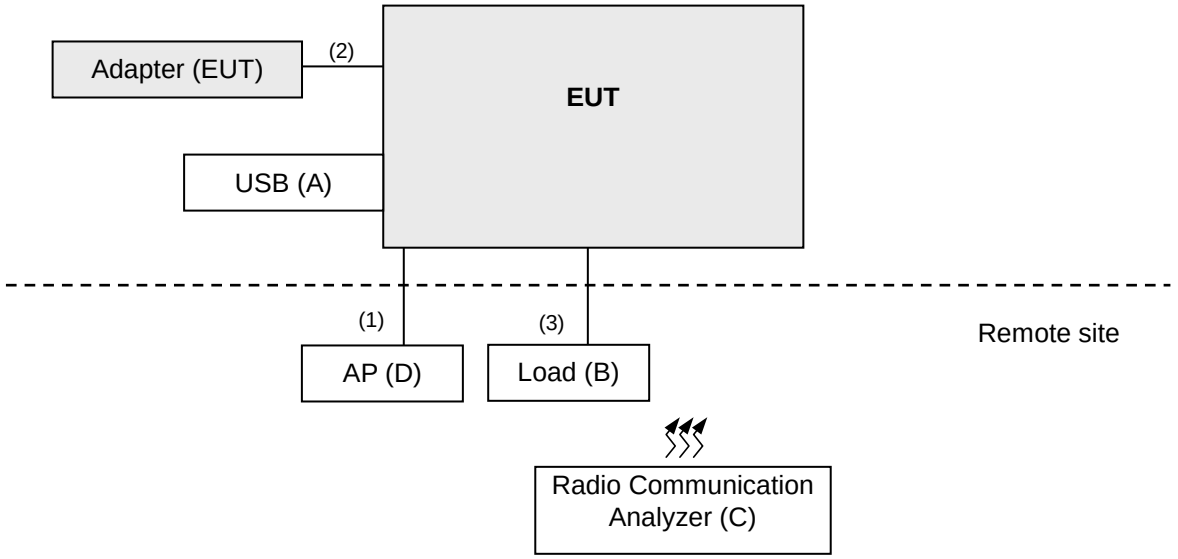
*After pretesting, Adapter 1 was the worst case and chosen for final test.

2. The antenna information is listed as below.

| **Antenna Type** | Dipole Antenna | |
|---|---|---|
| **Band** | **Antenna Gain (dBi)** | |
| | **Ant. 1** | **Ant. 2** |
| WCDMA 5 / LTE 5 | 2.13 | 2.13 |

3. Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.
4. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

## 3.2 Configuration of System under Test




### 3.2.1 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. 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 | USB | SanDisk | BM210257950Z | N/A | N/A | Supplied by lab |
| B | Load | N/A | N/A | N/A | N/A | Supplied by lab |
| C | Radio Communication Analyzer | Anritsu | MT8821C | 6261806803 | N/A | Supplied by lab |
| D | AP | ASUS | AC750 | H7ITDV002001 | NA | Supplied by lab |

| ID | Descriptions | Qty. | Length (m) | Shielding (Yes/No) | Cores (Qty.) | Remarks |
|---|---|---|---|---|---|---|
| 1. | RJ-45 Cable | 4 | 2 | No | 0 | Supplied by lab |
| 2. | AC Cable | 1 | 1.5 | No | 0 | Supplied by applicant |
| 3. | RJ-41 Cable | 1 | 2 | No | 0 | Supplied by lab |

### 3.3 Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis, and antenna ports.
The worst case was found when positioned as the table below. Following channel(s) was (were) selected for the final test as listed below:

| Band | Radiated Emission |
|---|---|
| **WCDMA Band 5** | 90 degree |
| **LTE Band 5** | 90 degree |

**WCDMA Band 5**

| EUT Configure Mode | Test Item | Available Channel | Tested Channel | Mode |
|---|---|---|---|---|
| - | ERP | 4132 to 4233 | 4132, 4182, 4233 | WCDMA, HSDPA, HSUPA |
| - | Modulation Characteristics | 4132 to 4233 | 4182 | WCDMA, HSDPA, HSUPA |
| - | Frequency Stability | 4132 to 4233 | 4132, 4233 | WCDMA |
| - | Occupied Bandwidth | 4132 to 4233 | 4132, 4182, 4233 | WCDMA, HSDPA, HSUPA |
| - | Band Edge | 4132 to 4233 | 4132, 4233 | WCDMA, HSDPA, HSUPA |
| - | Peak to Average Ratio | 4132 to 4233 | 4132, 4182, 4233 | WCDMA, HSDPA, HSUPA |
| - | Conducted Emission | 4132 to 4233 | 4132, 4182, 4233 | WCDMA, HSDPA, HSUPA |
| - | Radiated Emission Below 1GHz | 4132 to 4233 | 4233 | WCDMA |
| - | Radiated Emission Above 1GHz | 4132 to 4233 | 4132, 4182, 4233 | WCDMA |

Note: For radiated emission below 1GHz, select the worst radiated emission channel (above 1GHz) for final testing.

## LTE Band 5

| EUT Configure Mode | Test Item | Available Channel | Tested Channel | Channel Bandwidth | Modulation | RB # |
|---|---|---|---|---|---|---|
| - | ERP | 20407 to 20643 | 20407, 20525, 20643 | 1.4 MHz | QPSK / 16QAM | 1<br>Half<br>Full |
| | | 20415 to 20635 | 20415, 20525, 20635 | 3 MHz | QPSK / 16QAM | 1<br>Half<br>Full |
| | | 20425 to 20625 | 20425, 20525, 20625 | 5 MHz | QPSK / 16QAM | 1<br>Half<br>Full |
| | | 20450 to 20600 | 20450, 20525, 20600 | 10 MHz | QPSK / 16QAM | 1<br>Half<br>Full |
| - | Modulation Characteristics | 20450 to 20600 | 20525 | 10 MHz | QPSK / 16QAM | Full |
| - | Frequency Stability | 20407 to 20643 | 20407, 20643 | 1.4 MHz | QPSK | Full |
| | | 20415 to 20635 | 20415, 20635 | 3 MHz | QPSK | Full |
| | | 20425 to 20625 | 20425, 20625 | 5 MHz | QPSK | Full |
| | | 20450 to 20600 | 20450, 20600 | 10 MHz | QPSK | Full |
| - | Occupied Bandwidth | 20407 to 20643 | 20407, 20525, 20643 | 1.4 MHz | QPSK / 16QAM | Full |
| | | 20415 to 20635 | 20415, 20525, 20635 | 3 MHz | QPSK / 16QAM | Full |
| | | 20425 to 20625 | 20425, 20525, 20625 | 5 MHz | QPSK / 16QAM | Full |
| | | 20450 to 20600 | 20450, 20525, 20600 | 10 MHz | QPSK / 16QAM | Full |
| - | Band Edge | 20407 to 20643 | 20407, 20643 | 1.4MHz | QPSK | 1<br>Half<br>Full |
| | | 20415 to 20635 | 20415, 20635 | 3 MHz | QPSK | 1<br>Half<br>Full |
| | | 20425 to 20625 | 20425, 20625 | 5 MHz | QPSK | 1<br>Half<br>Full |
| | | 20450 to 20600 | 20450, 20600 | 10 MHz | QPSK | 1<br>Half<br>Full |
| - | Peak to Average Ratio | 20407 to 20643 | 20407, 20525, 20643 | 1.4 MHz | QPSK / 16QAM | 1 |
| | | 20415 to 20635 | 20415, 20525, 20635 | 3 MHz | QPSK / 16QAM | 1 |
| | | 20425 to 20625 | 20425, 20525, 20625 | 5 MHz | QPSK / 16QAM | 1 |
| | | 20450 to 20600 | 20450, 20525, 20600 | 10 MHz | QPSK / 16QAM | 1 |
| - | Conducted Emission | 20407 to 20643 | 20407, 20525, 20643 | 1.4 MHz | QPSK | 1 |
| | | 20415 to 20635 | 20415, 20525, 20635 | 3 MHz | QPSK | 1 |
| | | 20425 to 20625 | 20425, 20525, 20625 | 5 MHz | QPSK | 1 |
| | | 20450 to 20600 | 20450, 20525, 20600 | 10 MHz | QPSK | 1 |
| - | Radiated Emission Below 1GHz | 20407 to 20643 | 20407 | 1.4 MHz | QPSK | 1 |
| - | Radiated Emission Above 1GHz | 20407 to 20643 | 20407, 20525, 20643 | 1.4 MHz | QPSK | 1 |
| | | 20425 to 20625 | 20425, 20525, 20625 | 5 MHz | QPSK | 1 |
| | | 20450 to 20600 | 20450, 20525, 20600 | 10 MHz | QPSK | 1 |

**Note:**

1. This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation. Therefore, only ERP, modulation characteristics, occupied bandwidth and peak to average ratio items had been tested under QPSK, 16QAM mode, the other items were performed under QPSK mode only.
2. For radiated emission above 1 GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5 MHz & highest channel bandwidth for final test.
3. For radiated emissions below 1 GHz, select the worst radiated emission channel for final testing.

**Test Condition:**

| Test Item | Environmental Conditions | Input Power | Tested By |
|---|---|---|---|
| ERP | 25 deg. C, 65 % RH | 120 Vac, 60 Hz | James Yang |
| Modulation Characteristics | 25 deg. C, 65 % RH | 120 Vac, 60 Hz | James Yang |
| Frequency Stability | 25 deg. C, 65 % RH | 120 Vac, 60 Hz | James Yang |
| Occupied Bandwidth | 25 deg. C, 65 % RH | 120 Vac, 60 Hz | James Yang |
| Band Edge | 25 deg. C, 65 % RH | 120 Vac, 60 Hz | James Yang |
| Peak to Average Ratio | 25 deg. C, 65 % RH | 120 Vac, 60 Hz | James Yang |
| Conducted Emission | 25 deg. C, 65 % RH | 120 Vac, 60 Hz | James Yang |
| Radiated Emission Below 1GHz | 26 deg. C, 62 % RH | 120 Vac, 60 Hz | Charles Hsiao |
| Radiated Emission Above 1GHz | 25 deg. C, 60 % RH | 120 Vac, 60 Hz | 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 and references:

**Test Standard:**
**FCC 47 CFR Part 2**
**FCC 47 CFR Part 22**
**ANSI/TIA/EIA-603-E 2016**
**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**

**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

Mobile / Portable station are limited to 7 watts e.r.p.

### 4.1.2 Test Procedures

**Conducted Power Measurement:**

The EUT was set up for the maximum power with WCDMA and 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:

$EIRP = P_{Meas} + G_T$

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

where

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

$P_{Meas}$ 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)**

| Band | WCDMA V | | |
|---|---|---|---|
| Channel | 4132 | 4182 | 4233 |
| Frequency (MHz) | 826.4 | 836.4 | 846.6 |
| RMC 12.2K | 23.94 | 24.03 | 23.88 |
| HSDPA Subtest-1 | 23.34 | 23.45 | 23.25 |
| HSUPA Subtest-1 | 22.66 | 22.74 | 22.65 |

| LTE Band 5 | | | | | | |
|---|---|---|---|---|---|---|
| BW | MCS Index | RB Size | RB Offset | Low | Mid | High |
| | | Channel | | 20407 | 20525 | 20643 |
| | | Frequency (MHz) | | 824.7 | 836.5 | 848.3 |
| 1.4M | QPSK | 1 | 0 | 23.51 | 23.42 | 23.56 |
| | | 1 | 2 | 23.32 | 23.22 | 23.54 |
| | | 1 | 5 | 23.31 | 23.39 | 23.43 |
| | | 3 | 0 | 22.55 | 22.50 | 22.41 |
| | | 3 | 1 | 22.69 | 22.59 | 22.41 |
| | | 3 | 3 | 22.59 | 22.62 | 22.78 |
| | | 6 | 0 | 22.58 | 22.42 | 22.79 |
| | 16QAM | 1 | 0 | 22.72 | 22.58 | 22.55 |
| | | 1 | 2 | 22.42 | 22.68 | 22.72 |
| | | 1 | 5 | 22.45 | 22.41 | 22.59 |
| | | 3 | 0 | 21.75 | 21.62 | 21.86 |
| | | 3 | 1 | 21.90 | 21.87 | 21.81 |
| | | 3 | 3 | 21.61 | 21.82 | 21.99 |
| | | 6 | 0 | 21.90 | 21.82 | 21.85 |

| LTE Band 5 | | | | | | |
|---|---|---|---|---|---|---|
| BW | MCS Index | RB Size | RB Offset | Low | Mid | High |
| | | Channel | | 20415 | 20525 | 20635 |
| | | Frequency (MHz) | | 825.5 | 836.5 | 847.5 |
| 3M | QPSK | 1 | 0 | 23.51 | 23.48 | 23.51 |
| | | 1 | 7 | 23.44 | 23.41 | 23.21 |
| | | 1 | 14 | 23.23 | 23.24 | 23.33 |
| | | 8 | 0 | 22.50 | 22.42 | 22.46 |
| | | 8 | 3 | 22.65 | 22.62 | 22.40 |
| | | 8 | 7 | 22.59 | 22.44 | 22.43 |
| | | 15 | 0 | 22.50 | 22.68 | 22.77 |
| | 16QAM | 1 | 0 | 22.54 | 22.67 | 22.68 |
| | | 1 | 7 | 22.52 | 22.74 | 22.63 |
| | | 1 | 14 | 22.68 | 22.44 | 22.67 |
| | | 8 | 0 | 21.63 | 22.00 | 22.00 |
| | | 8 | 3 | 21.62 | 21.81 | 21.74 |
| | | 8 | 7 | 21.75 | 21.70 | 21.82 |
| | | 15 | 0 | 21.85 | 21.77 | 21.76 |

| LTE Band 5 | | | | | | |
|---|---|---|---|---|---|---|
| BW | MCS Index | RB Size | RB Offset | Low | Mid | High |
| | | Channel | | 20425 | 20525 | 20625 |
| | | Frequency (MHz) | | 826.5 | 836.5 | 846.5 |
| 5M | QPSK | 1 | 0 | 23.50 | 23.25 | 23.57 |
| | | 1 | 12 | 23.40 | 23.35 | 23.40 |
| | | 1 | 24 | 23.44 | 23.53 | 23.37 |
| | | 12 | 0 | 22.56 | 22.72 | 22.65 |
| | | 12 | 6 | 22.45 | 22.76 | 22.50 |
| | | 12 | 13 | 22.54 | 22.76 | 22.41 |
| | | 25 | 0 | 22.43 | 22.76 | 22.51 |
| | 16QAM | 1 | 0 | 22.64 | 22.44 | 22.51 |
| | | 1 | 12 | 22.75 | 22.47 | 22.71 |
| | | 1 | 24 | 22.78 | 22.52 | 22.66 |
| | | 12 | 0 | 21.90 | 21.60 | 21.98 |
| | | 12 | 6 | 21.70 | 21.67 | 21.60 |
| | | 12 | 13 | 21.63 | 21.71 | 21.66 |
| | | 25 | 0 | 21.72 | 21.96 | 21.87 |

| LTE Band 5 | | | | | | |
|---|---|---|---|---|---|---|
| BW | MCS Index | RB Size | RB Offset | Low | Mid | High |
| | | Channel | | 20450 | 20525 | 20600 |
| | | Frequency (MHz) | | 829 | 836.5 | 844 |
| 10M | QPSK | 1 | 0 | 23.26 | 23.50 | 23.51 |
| | | 1 | 24 | 23.41 | 23.20 | 23.59 |
| | | 1 | 49 | 23.26 | 23.47 | 23.34 |
| | | 25 | 0 | 22.51 | 22.46 | 22.45 |
| | | 25 | 12 | 22.75 | 22.77 | 22.74 |
| | | 25 | 25 | 22.54 | 22.79 | 22.69 |
| | | 50 | 0 | 22.49 | 22.41 | 22.69 |
| | 16QAM | 1 | 0 | 22.59 | 22.45 | 22.56 |
| | | 1 | 24 | 22.72 | 22.47 | 22.43 |
| | | 1 | 49 | 22.60 | 22.43 | 22.53 |
| | | 25 | 0 | 21.84 | 21.89 | 21.71 |
| | | 25 | 12 | 21.60 | 21.91 | 21.73 |
| | | 25 | 25 | 21.91 | 21.71 | 21.81 |
| | | 50 | 0 | 21.98 | 21.69 | 21.94 |

**ERP Power (dBm)**

| Band | WCDMA V | | |
|---|---|---|---|
| TX Channel | 4132 | 4182 | 4233 |
| Rx Channel | 4357 | 4407 | 4458 |
| Frequency (MHz) | 826.4 | 836.4 | 846.6 |
| RMC 12.2K | 23.92 | **24.01** | 23.86 |
| HSDPA Subtest-1 | 23.32 | 23.43 | 23.23 |
| HSUPA Subtest-1 | 22.64 | 22.72 | 22.63 |

*ERP = Conducted + antenna gain (2.13dBi)-2.15

| LTE Band 5 | | | | | | |
|---|---|---|---|---|---|---|
| BW | MCS Index | RB Size | RB Offset | Low | Mid | High |
| | | Channel | | 20407 | 20525 | 20643 |
| | | Frequency (MHz) | | 824.7 | 836.5 | 848.3 |
| 1.4M | QPSK | 1 | 0 | 23.49 | 23.40 | **23.54** |
| | | 1 | 2 | 23.30 | 23.20 | 23.52 |
| | | 1 | 5 | 23.29 | 23.37 | 23.41 |
| | | 3 | 0 | 22.53 | 22.48 | 22.39 |
| | | 3 | 1 | 22.67 | 22.57 | 22.39 |
| | | 3 | 3 | 22.57 | 22.60 | 22.76 |
| | | 6 | 0 | 22.56 | 22.40 | 22.77 |
| | 16QAM | 1 | 0 | 22.70 | 22.56 | 22.53 |
| | | 1 | 2 | 22.40 | 22.66 | 22.70 |
| | | 1 | 5 | 22.43 | 22.39 | 22.57 |
| | | 3 | 0 | 21.73 | 21.60 | 21.84 |
| | | 3 | 1 | 21.88 | 21.85 | 21.79 |
| | | 3 | 3 | 21.59 | 21.80 | 21.97 |
| | | 6 | 0 | 21.88 | 21.80 | 21.83 |

*ERP = Conducted + antenna gain (2.13dBi)-2.15

| LTE Band 5 | | | | | | |
|---|---|---|---|---|---|---|
| BW | MCS Index | RB Size | RB Offset | Low | Mid | High |
| | | Channel | | 20415 | 20525 | 20635 |
| | | Frequency (MHz) | | 825.5 | 836.5 | 847.5 |
| 3M | QPSK | 1 | 0 | 23.49 | 23.46 | **23.49** |
| | | 1 | 7 | 23.42 | 23.39 | 23.19 |
| | | 1 | 14 | 23.21 | 23.22 | 23.31 |
| | | 8 | 0 | 22.48 | 22.40 | 22.44 |
| | | 8 | 3 | 22.63 | 22.60 | 22.38 |
| | | 8 | 7 | 22.57 | 22.42 | 22.41 |
| | | 15 | 0 | 22.48 | 22.66 | 22.75 |
| | 16QAM | 1 | 0 | 22.52 | 22.65 | 22.66 |
| | | 1 | 7 | 22.50 | 22.72 | 22.61 |
| | | 1 | 14 | 22.66 | 22.42 | 22.65 |
| | | 8 | 0 | 21.61 | 21.98 | 21.98 |
| | | 8 | 3 | 21.60 | 21.79 | 21.72 |
| | | 8 | 7 | 21.73 | 21.68 | 21.80 |
| | | 15 | 0 | 21.83 | 21.75 | 21.74 |

*ERP = Conducted + antenna gain (2.13dBi)-2.15

| LTE Band 5 | | | | | | |
|---|---|---|---|---|---|---|
| BW | MCS Index | RB Size | RB Offset | Low | Mid | High |
| | | Channel | | 20425 | 20525 | 20625 |
| | | Frequency (MHz) | | 826.5 | 836.5 | 846.5 |
| 5M | QPSK | 1 | 0 | 23.48 | 23.23 | **23.55** |
| | | 1 | 12 | 23.38 | 23.33 | 23.38 |
| | | 1 | 24 | 23.42 | 23.51 | 23.35 |
| | | 12 | 0 | 22.54 | 22.70 | 22.63 |
| | | 12 | 6 | 22.43 | 22.74 | 22.48 |
| | | 12 | 13 | 22.52 | 22.74 | 22.39 |
| | | 25 | 0 | 22.41 | 22.74 | 22.49 |
| | 16QAM | 1 | 0 | 22.62 | 22.42 | 22.49 |
| | | 1 | 12 | 22.73 | 22.45 | 22.69 |
| | | 1 | 24 | 22.76 | 22.50 | 22.64 |
| | | 12 | 0 | 21.88 | 21.58 | 21.96 |
| | | 12 | 6 | 21.68 | 21.65 | 21.58 |
| | | 12 | 13 | 21.61 | 21.69 | 21.64 |
| | | 25 | 0 | 21.70 | 21.94 | 21.85 |

*ERP = Conducted + antenna gain (2.13dBi)-2.15

| LTE Band 5 | | | | | | |
|---|---|---|---|---|---|---|
| BW | MCS Index | RB Size | RB Offset | Low | Mid | High |
| | | Channel | | 20450 | 20525 | 20600 |
| | | Frequency (MHz) | | 829 | 836.5 | 844 |
| 10M | QPSK | 1 | 0 | 23.24 | 23.48 | 23.49 |
| | | 1 | 24 | 23.39 | 23.18 | **23.57** |
| | | 1 | 49 | 23.24 | 23.45 | 23.32 |
| | | 25 | 0 | 22.49 | 22.44 | 22.43 |
| | | 25 | 12 | 22.73 | 22.75 | 22.72 |
| | | 25 | 25 | 22.52 | 22.77 | 22.67 |
| | | 50 | 0 | 22.47 | 22.39 | 22.67 |
| | 16QAM | 1 | 0 | 22.57 | 22.43 | 22.54 |
| | | 1 | 24 | 22.70 | 22.45 | 22.41 |
| | | 1 | 49 | 22.58 | 22.41 | 22.51 |
| | | 25 | 0 | 21.82 | 21.87 | 21.69 |
| | | 25 | 12 | 21.58 | 21.89 | 21.71 |
| | | 25 | 25 | 21.89 | 21.69 | 21.79 |
| | | 50 | 0 | 21.96 | 21.67 | 21.92 |

*ERP = Conducted + antenna gain (2.13dBi)-2.15

## 4.2 Modulation Characteristics Measurement

### 4.2.1 Limits of Modulation Characteristics

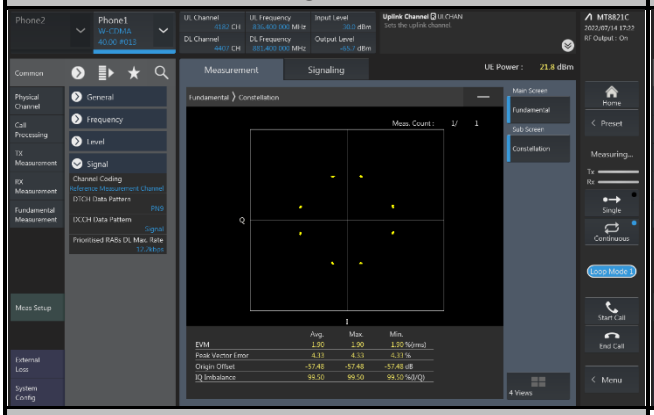
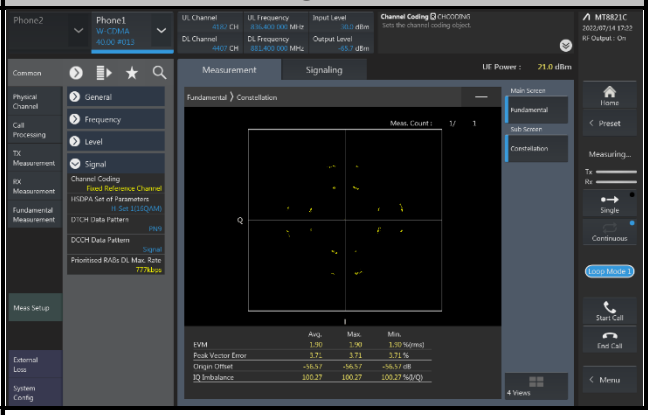
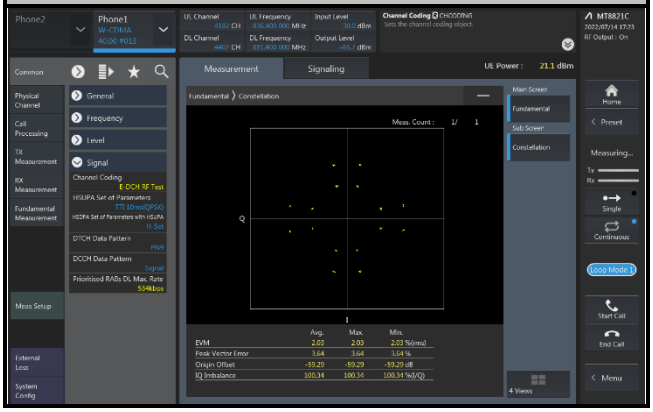
N/A

### 4.2.2 Test Setup

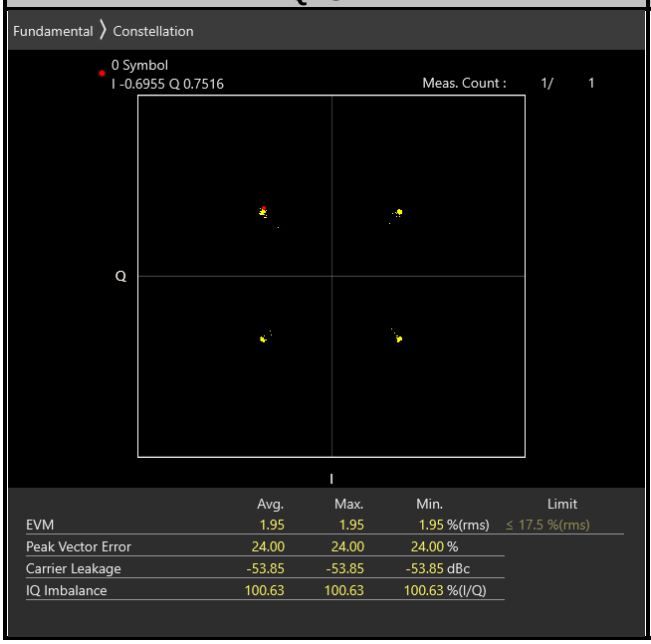

### 4.2.3 Test Procedure

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.

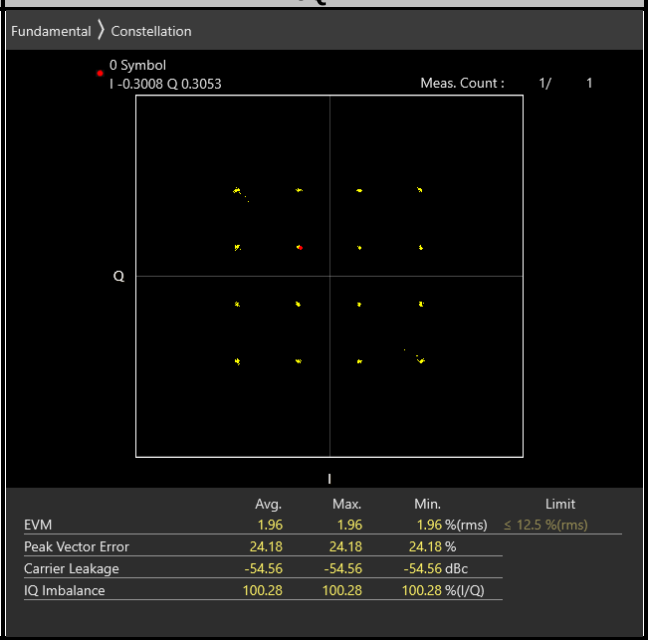
### 4.2.4 Test Results

| Spectrum Plot of Measurement | |
|---|---|
| Channel 4182 | |
| WCDMA | HSDPA |
|  |  |
| HSUPA | |
|  | |

| Spectrum Plot of Measurement | |
|---|---|
| LTE Band 5 | |
| Channel 20525 | |
| QPSK | 16QAM |




| | Avg. | Max. | Min. | Limit |
|---|---|---|---|---|
| EVM | 1.95 | 1.95 | 1.95 %(rms) | ≤ 17.5 %(rms) |
| Peak Vector Error | 24.00 | 24.00 | 24.00 % | |
| Carrier Leakage | -53.85 | -53.85 | -53.85 dBc | |
| IQ Imbalance | 100.63 | 100.63 | 100.63 %(I/Q) | |




| | Avg. | Max. | Min. | Limit |
|---|---|---|---|---|
| EVM | 1.96 | 1.96 | 1.96 %(rms) | ≤ 12.5 %(rms) |
| Peak Vector Error | 24.18 | 24.18 | 24.18 % | |
| Carrier Leakage | -54.56 | -54.56 | -54.56 dBc | |
| IQ Imbalance | 100.28 | 100.28 | 100.28 %(I/Q) | |

## 4.3 Frequency Stability Measurement

### 4.3.1 Limits of Frequency Stability Measurement

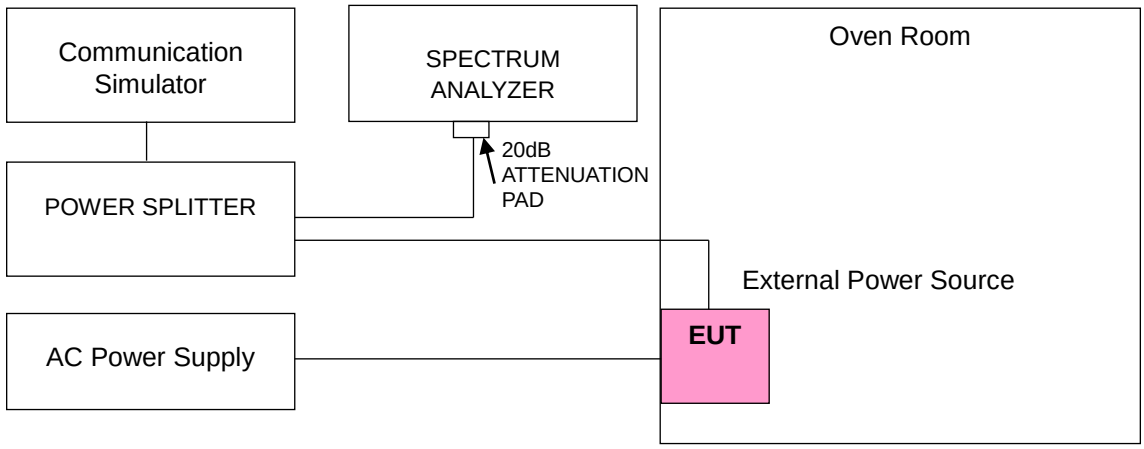
1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

### 4.3.2 Test Procedure

a. 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.
b. EUT is connected the external power supply to control the AC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
c. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the ±0.5 ℃ 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 (Volts) | WCDMA | | | |
|---|---|---|---|---|
| | Low Channel | | High Channel | |
| | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| 108 | 826.4000034 | 0.004 | 846.600003 | 0.004 |
| 120 | 826.4000028 | 0.003 | 846.600002 | 0.003 |
| 132 | 826.4000038 | 0.005 | 846.600002 | 0.002 |

**Note:** The applicant defined the normal working voltage is from 108 Vac to 132 Vac.

Frequency Error vs. Temperature

| Temp. (℃) | WCDMA | | | |
|---|---|---|---|---|
| | Low Channel | | High Channel | |
| | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| -30 | 826.4000026 | 0.003 | 846.600002 | 0.002 |
| -20 | 826.4000020 | 0.002 | 846.600001 | 0.001 |
| -10 | 826.4000018 | 0.002 | 846.600003 | 0.003 |
| 0 | 826.4000029 | 0.004 | 846.600003 | 0.004 |
| 10 | 826.4000033 | 0.004 | 846.600003 | 0.003 |
| 20 | 826.3999975 | -0.003 | 846.599997 | -0.004 |
| 30 | 826.3999965 | -0.004 | 846.599997 | -0.004 |
| 40 | 826.3999968 | -0.004 | 846.599997 | -0.004 |
| 50 | 826.3999975 | -0.003 | 846.599997 | -0.004 |

Frequency Error vs. Voltage

| Voltage (Volts) | LTE Band 5 | | | |
|---|---|---|---|---|
| | Channel Bandwidth: 1.4 MHz | | | |
| | Low Channel | | High Channel | |
| | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| 108 | 824.7000024 | 0.003 | 848.3000011 | 0.001 |
| 120 | 824.7000031 | 0.004 | 848.3000020 | 0.002 |
| 132 | 824.7000022 | 0.003 | 848.3000019 | 0.002 |

**Note:** The applicant defined the normal working voltage is from 108 Vac to 132 Vac.

Frequency Error vs. Temperature

| Temp. (℃) | LTE Band 5 | | | |
|---|---|---|---|---|
| | Channel Bandwidth: 1.4 MHz | | | |
| | Low Channel | | High Channel | |
| | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| -30 | 824.7000010 | 0.001 | 848.3000035 | 0.004 |
| -20 | 824.7000030 | 0.004 | 848.3000035 | 0.004 |
| -10 | 824.7000029 | 0.004 | 848.3000016 | 0.002 |
| 0 | 824.7000038 | 0.005 | 848.3000024 | 0.003 |
| 10 | 824.7000029 | 0.004 | 848.3000013 | 0.002 |
| 20 | 824.6999977 | -0.003 | 848.2999989 | -0.001 |
| 30 | 824.6999982 | -0.002 | 848.2999975 | -0.003 |
| 40 | 824.6999976 | -0.003 | 848.2999960 | -0.005 |
| 50 | 824.6999988 | -0.001 | 848.2999968 | -0.004 |

Frequency Error vs. Voltage

| Voltage (Volts) | LTE Band 5 | | | |
|---|---|---|---|---|
| | Channel Bandwidth: 3 MHz | | | |
| | Low Channel | | High Channel | |
| | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| 108 | 825.5000032 | 0.004 | 847.5000029 | 0.003 |
| 120 | 825.5000017 | 0.002 | 847.5000020 | 0.002 |
| 132 | 825.5000026 | 0.003 | 847.5000038 | 0.004 |

**Note:** The applicant defined the normal working voltage is from 108 Vac to 132 Vac.

Frequency Error vs. Temperature

| Temp. (℃) | LTE Band 5 | | | |
|---|---|---|---|---|
| | Channel Bandwidth: 3 MHz | | | |
| | Low Channel | | High Channel | |
| | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| -30 | 825.5000015 | 0.002 | 847.5000022 | 0.003 |
| -20 | 825.5000034 | 0.004 | 847.5000015 | 0.002 |
| -10 | 825.5000022 | 0.003 | 847.5000010 | 0.001 |
| 0 | 825.5000021 | 0.003 | 847.5000027 | 0.003 |
| 10 | 825.5000014 | 0.002 | 847.5000029 | 0.003 |
| 20 | 825.4999986 | -0.002 | 847.4999989 | -0.001 |
| 30 | 825.4999973 | -0.003 | 847.4999980 | -0.002 |
| 40 | 825.4999973 | -0.003 | 847.4999965 | -0.004 |
| 50 | 825.4999961 | -0.005 | 847.4999987 | -0.002 |

Frequency Error vs. Voltage

| Voltage (Volts) | LTE Band 5 | | | |
|---|---|---|---|---|
| | Channel Bandwidth: 5 MHz | | | |
| | Low Channel | | High Channel | |
| | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| 108 | 826.5000031 | 0.004 | 846.5000034 | 0.004 |
| 120 | 826.5000031 | 0.004 | 846.5000011 | 0.001 |
| 132 | 826.5000037 | 0.004 | 846.5000039 | 0.005 |

**Note:** The applicant defined the normal working voltage is from 108 Vac to 132 Vac.

Frequency Error vs. Temperature

| Temp. (℃) | LTE Band 5 | | | |
|---|---|---|---|---|
| | Channel Bandwidth: 5 MHz | | | |
| | Low Channel | | High Channel | |
| | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| -30 | 826.5000027 | 0.003 | 846.5000016 | 0.002 |
| -20 | 826.5000035 | 0.004 | 846.5000024 | 0.003 |
| -10 | 826.5000029 | 0.004 | 846.5000040 | 0.005 |
| 0 | 826.5000026 | 0.003 | 846.5000034 | 0.004 |
| 10 | 826.5000040 | 0.005 | 846.5000040 | 0.005 |
| 20 | 826.4999973 | -0.003 | 846.4999974 | -0.003 |
| 30 | 826.4999960 | -0.005 | 846.4999986 | -0.002 |
| 40 | 826.4999978 | -0.003 | 846.4999977 | -0.003 |
| 50 | 826.4999971 | -0.004 | 846.4999984 | -0.002 |

Frequency Error vs. Voltage

| Voltage (Volts) | LTE Band 5 | | | |
|---|---|---|---|---|
| | Channel Bandwidth: 10 MHz | | | |
| | Low Channel | | High Channel | |
| | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| 108 | 829.0000022 | 0.003 | 844.0000035 | 0.004 |
| 120 | 829.0000032 | 0.004 | 844.0000022 | 0.003 |
| 132 | 829.0000027 | 0.003 | 844.0000018 | 0.002 |

**Note:** The applicant defined the normal working voltage is from 108 Vac to 132 Vac.

Frequency Error vs. Temperature

| Temp. (℃) | LTE Band 5 | | | |
|---|---|---|---|---|
| | Channel Bandwidth: 10 MHz | | | |
| | Low Channel | | High Channel | |
| | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| -30 | 829.0000032 | 0.004 | 844.0000033 | 0.004 |
| -20 | 829.0000023 | 0.003 | 844.0000022 | 0.003 |
| -10 | 829.0000017 | 0.002 | 844.0000023 | 0.003 |
| 0 | 829.0000034 | 0.004 | 844.0000038 | 0.005 |
| 10 | 829.0000016 | 0.002 | 844.0000020 | 0.002 |
| 20 | 828.9999967 | -0.004 | 843.9999988 | -0.001 |
| 30 | 828.9999964 | -0.004 | 843.9999964 | -0.004 |
| 40 | 828.9999963 | -0.004 | 843.9999987 | -0.002 |
| 50 | 828.9999968 | -0.004 | 843.9999982 | -0.002 |

## 4.4 Occupied Bandwidth Measurement

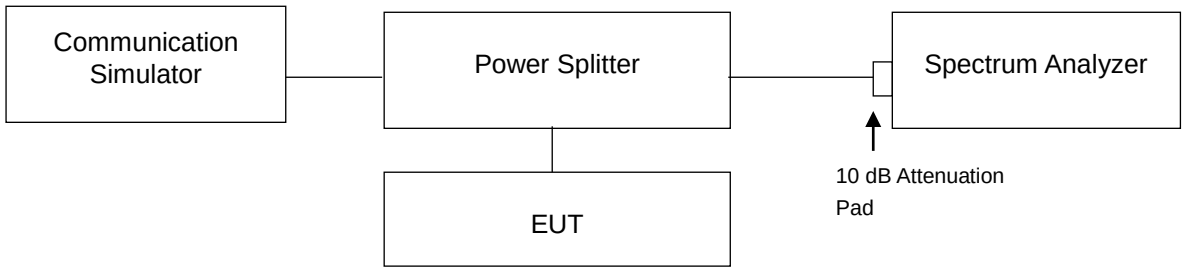
### 4.4.1 Test Procedure

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

a) 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.
b) The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.
c) 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.
d) 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.
e) Set spectrum analyzer detection mode to peak, and the trace mode to max hold.
f) 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).
g) 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.
h) 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.
i) 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.

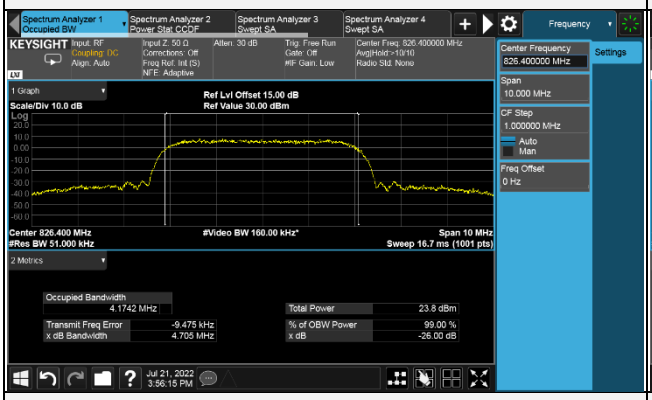
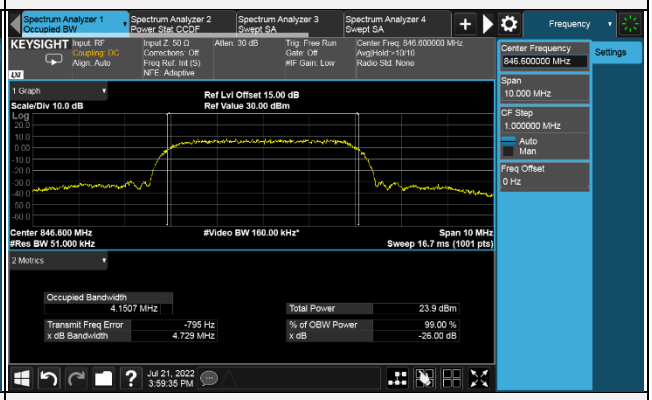
### 4.4.2 Test Setup



### 4.4.3 Test Result

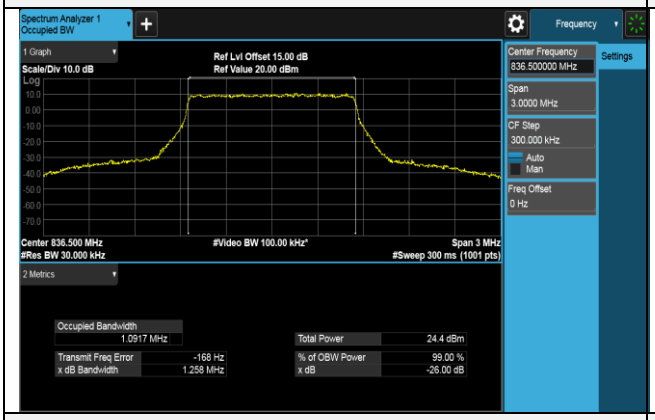
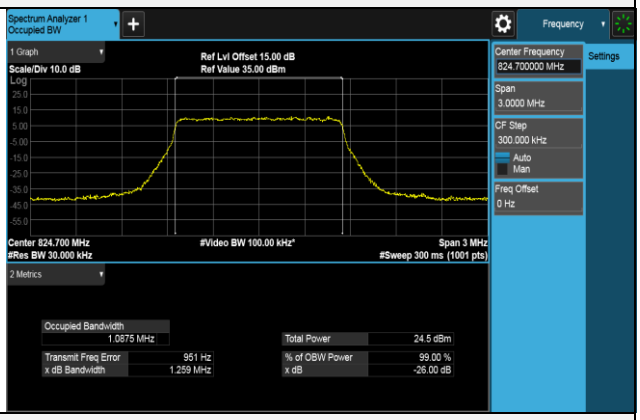
WCDMA

| Test Condition | Channel | Frequency (MHz) | Occupied bandwidth (MHz) | 26dB Bandwidth (MHz) |
|---|---|---|---|---|
| WCDMA | 4132 | 826.4 | 4.17 | 4.69 |
| WCDMA | 4182 | 836.4 | 4.16 | 4.69 |
| WCDMA | 4233 | 846.6 | 4.16 | 4.71 |
| HSDPA | 4132 | 826.4 | 4.16 | 4.72 |
| HSDPA | 4182 | 836.4 | 4.15 | 4.72 |
| HSDPA | 4233 | 846.6 | 4.15 | 4.72 |
| HSUPA | 4132 | 826.4 | 4.17 | 4.71 |
| HSUPA | 4182 | 836.4 | 4.15 | 4.72 |
| HSUPA | 4233 | 846.6 | 4.15 | 4.73 |

| Spectrum Plot of Worst Value | |
|---|---|
| Occupied bandwidth | 26dB Bandwidth |
|  |  |
| HSUPA CH 4132 (826.4MHz) | HSUPA CH 4233 (846.6MHz) |

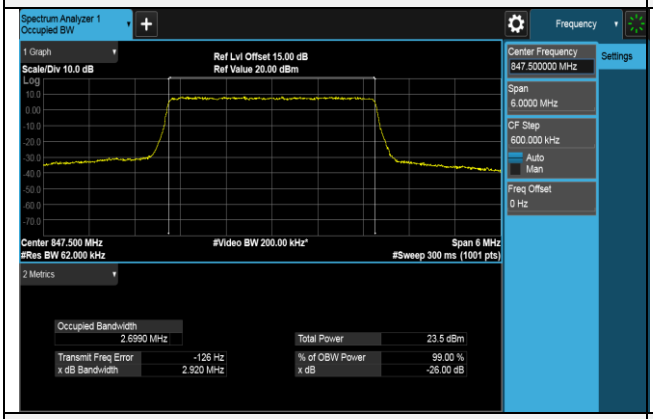
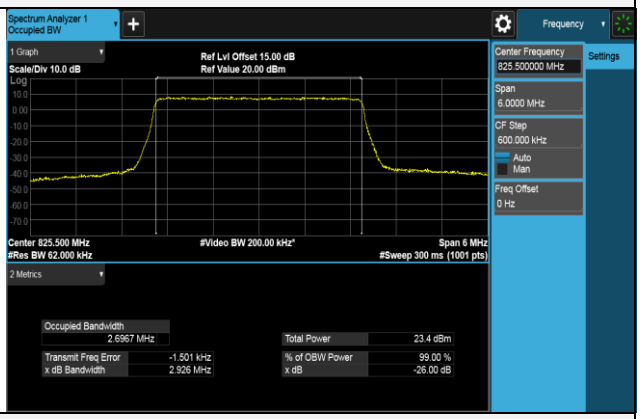
## LTE Band 5 (Channel Bandwidth 1.4MHz)

| Test Condition | Channel | Frequency (MHz) | Occupied bandwidth (MHz) | 26dB Bandwidth (MHz) |
|---|---|---|---|---|
| QPSK | 20407 | 824.7 | 1.0875 | 1.259 |
| QPSK | 20525 | 836.5 | 1.0917 | 1.258 |
| QPSK | 20643 | 848.3 | 1.0914 | 1.255 |
| 16QAM | 20407 | 824.7 | 1.0878 | 1.236 |
| 16QAM | 20525 | 836.5 | 1.0888 | 1.252 |
| 16QAM | 20643 | 848.3 | 1.0901 | 1.250 |

| Spectrum Plot of Worst Value | |
|---|---|
| Occupied bandwidth | 26dB Bandwidth |
|  |  |
| QPSK CH 20525 (836.5MHz) | QPSK CH 20407 (824.7MHz) |

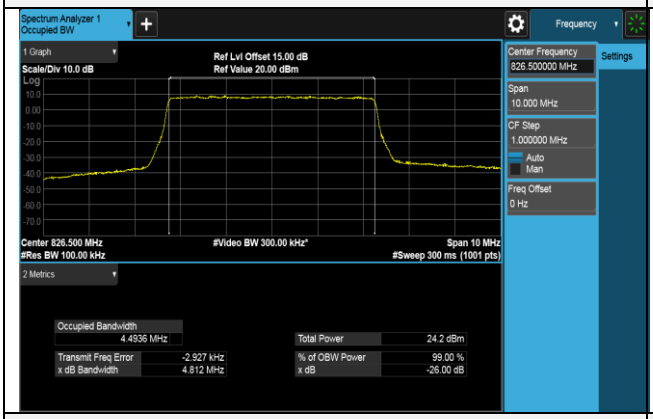
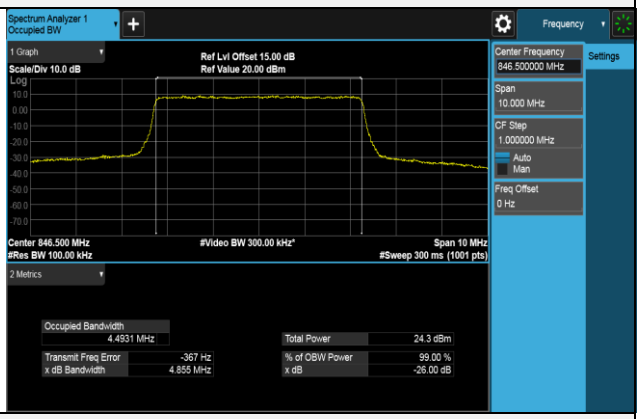
## LTE Band 5 (Channel Bandwidth 3MHz)

| Test Condition | Channel | Frequency (MHz) | Occupied bandwidth (MHz) | 26dB Bandwidth (MHz) |
|---|---|---|---|---|
| QPSK | 20415 | 825.5 | 2.6966 | 2.918 |
| QPSK | 20525 | 836.5 | 2.6969 | 2.916 |
| QPSK | 20635 | 847.5 | 2.6971 | 2.920 |
| 16QAM | 20415 | 825.5 | 2.6967 | 2.926 |
| 16QAM | 20525 | 836.5 | 2.6976 | 2.916 |
| 16QAM | 20635 | 847.5 | 2.6990 | 2.920 |

| Spectrum Plot of Worst Value | |
|---|---|
| Occupied bandwidth | 26dB Bandwidth |
|  |  |
| 16QAM CH 20635 (847.5MHz) | 16QAM CH 20415 (825.5MHz) |

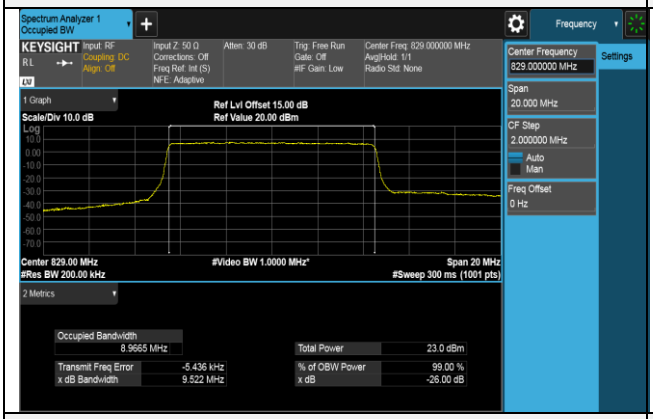
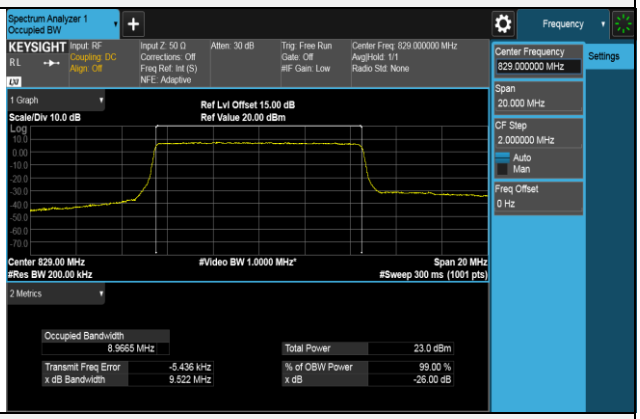
## LTE Band 5 (Channel Bandwidth 5MHz)

| Test Condition | Channel | Frequency (MHz) | Occupied bandwidth (MHz) | 26dB Bandwidth (MHz) |
|---|---|---|---|---|
| QPSK | 20425 | 826.5 | 4.4936 | 4.812 |
| QPSK | 20525 | 836.5 | 4.4902 | 4.818 |
| QPSK | 20625 | 846.5 | 4.4931 | 4.855 |
| 16QAM | 20425 | 826.5 | 4.4900 | 4.816 |
| 16QAM | 20525 | 836.5 | 4.4891 | 4.810 |
| 16QAM | 20625 | 846.5 | 4.4930 | 4.807 |

| Spectrum Plot of Worst Value | |
|---|---|
| Occupied bandwidth | 26dB Bandwidth |
|  |  |
| QPSK CH 20425 (826.5MHz) | QPSK CH 20625 (846.5MHz) |

## LTE Band 5 (Channel Bandwidth 10MHz)

| Test Condition | Channel | Frequency (MHz) | Occupied bandwidth (MHz) | 26dB Bandwidth (MHz) |
|---|---|---|---|---|
| QPSK | 20450 | 829 | 8.9637 | 9.520 |
| QPSK | 20525 | 836.5 | 8.9529 | 9.505 |
| QPSK | 20600 | 844 | 8.9624 | 9.518 |
| 16QAM | 20450 | 829 | 8.9665 | 9.522 |
| 16QAM | 20525 | 836.5 | 8.9510 | 9.509 |
| 16QAM | 20600 | 844 | 8.9636 | 9.516 |

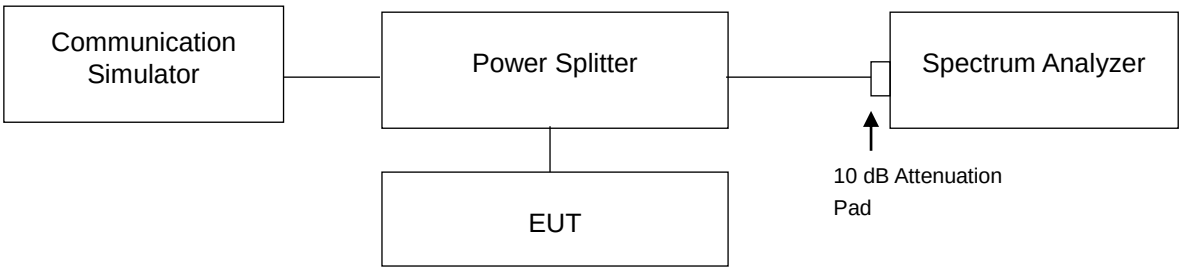
| Spectrum Plot of Worst Value | |
|---|---|
| Occupied bandwidth | 26dB Bandwidth |
|  |  |
| 16QAM CH 20450 (829MHz) | 16QAM CH 20450 (829MHz) |

## 4.5 Band Edge Measurement

### 4.5.1 Limits of Band Edge Measurement

Power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

### 4.5.2 Test Setup

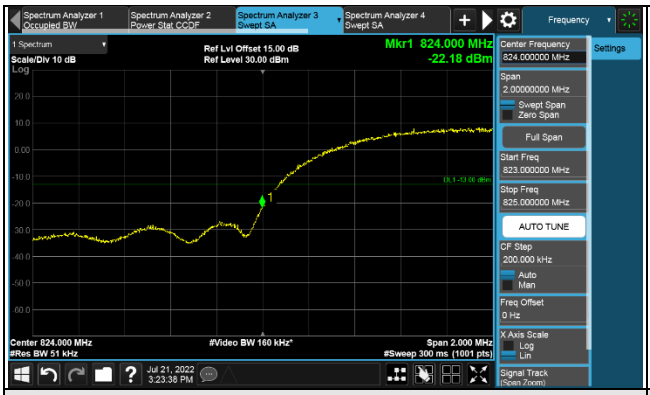
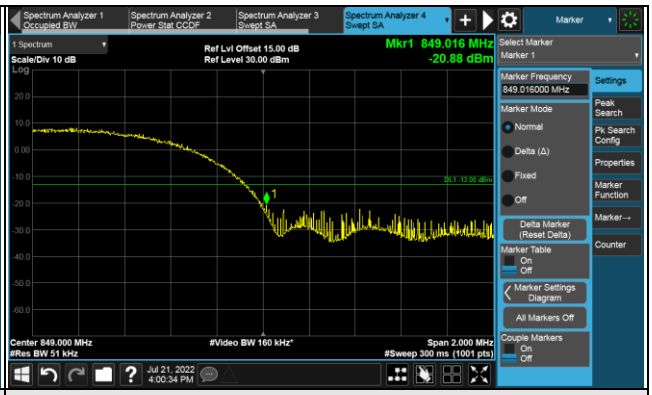



### 4.5.3 Test Procedures

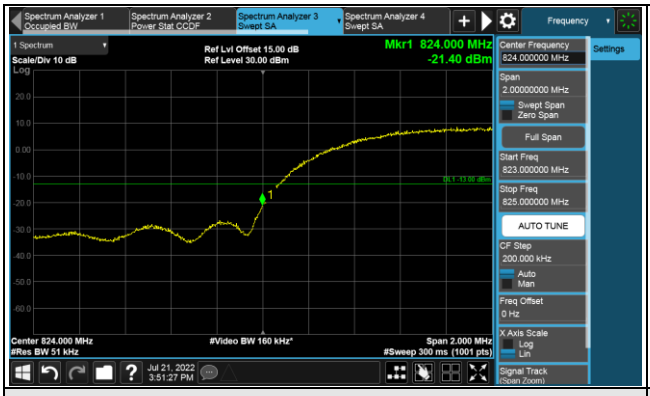
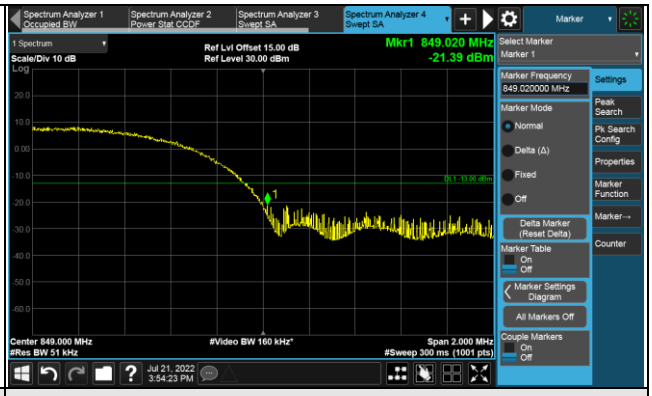
a. All measurements were done at low and high operational frequency range.
b. The detector of the spectrum is RMS, and if the device can be configured to transmit continuously (duty cycle ≥ 98%), set the (sweep time) > (number of points in sweep) × (symbol period) (e.g., by a factor of 10 × symbol period × number of points). Increasing the sweep time (i.e., slowing the sweep speed) will allow for averaging over multiple symbols.
c. The center frequency of spectrum is the band edge frequency and span is 5 MHz. RB of the spectrum is 51 kHz and VB of the spectrum is 160 kHz (WCDMA / HSDPA / HSUPA).
d. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 15 kHz and VB of the spectrum is 51 kHz (LTE Bandwidth 1.4 MHz).
e. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 30 kHz and VB of the spectrum is 100 kHz (LTE Bandwidth 3 MHz).
f. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 51 kHz and VB of the spectrum is 160 kHz (LTE Bandwidth 5 MHz).
g. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 100 kHz and VB of the spectrum is 300 kHz (LTE Bandwidth 10 MHz).
h. Record the max trace plot into the test report.

### 4.5.4 Test Results

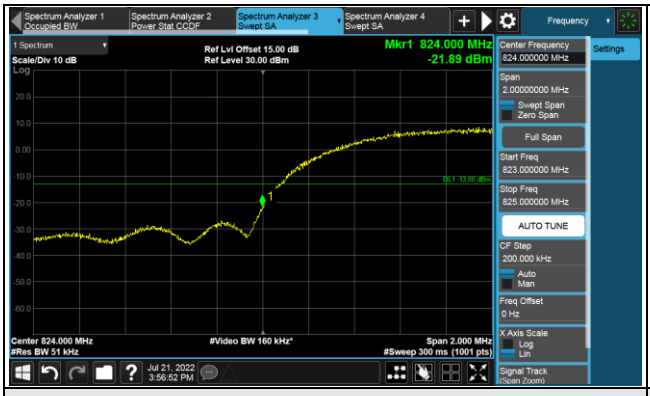
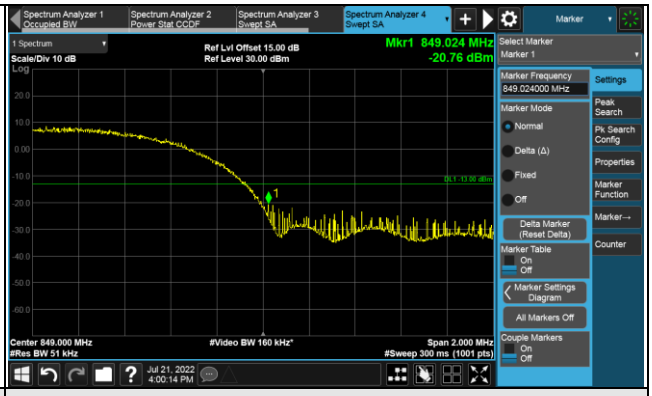
WCDMA

| | |
|---|---|
|  |  |
| 826.4MHz | 846.6MHz |

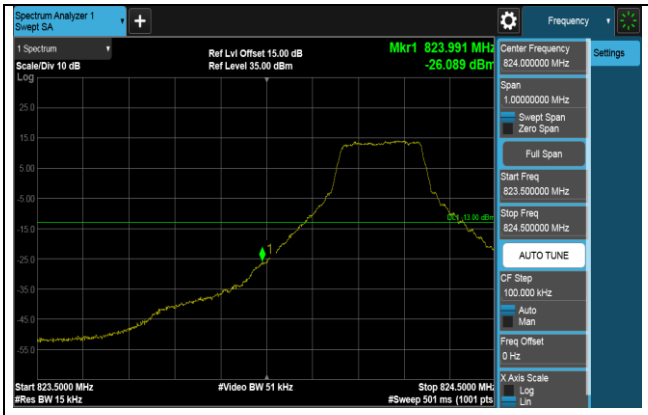
HSDPA

| | |
|---|---|
|  |  |
| 826.4MHz | 846.6MHz |

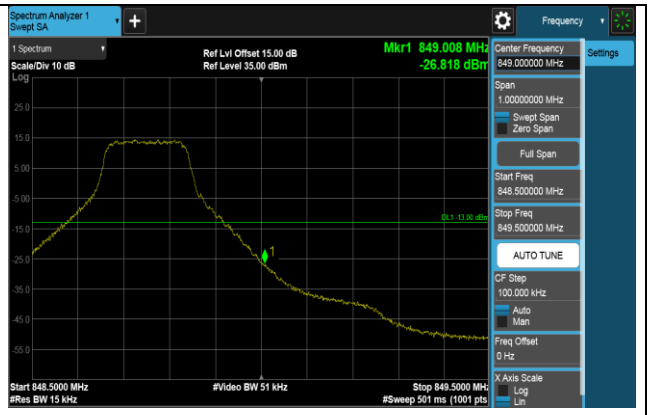
HSUPA

| | |
|---|---|
|  |  |
| 826.4MHz | 846.6MHz |

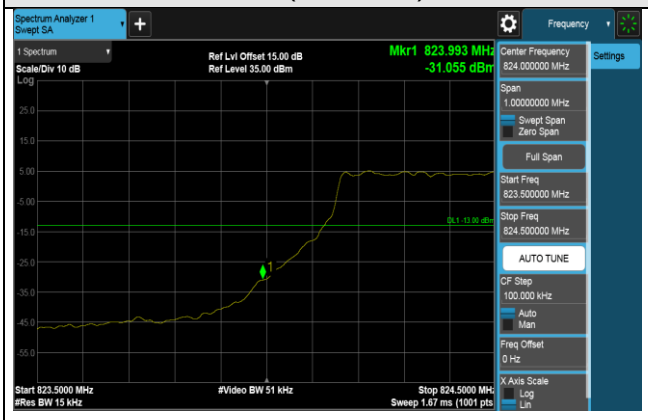
## LTE Band 5 (Channel Bandwidth 1.4MHz)



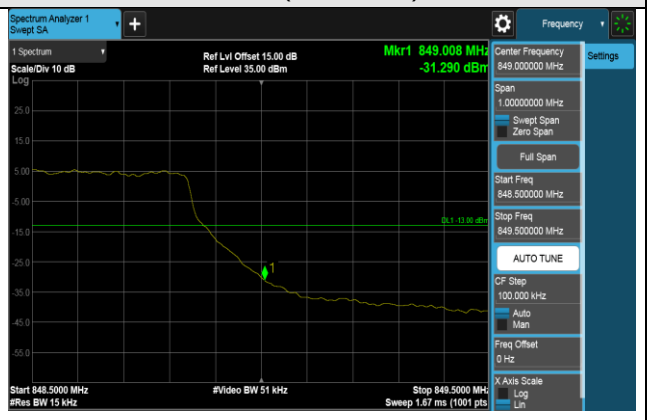

1RB (824.7MHz)




1RB (848.3MHz)

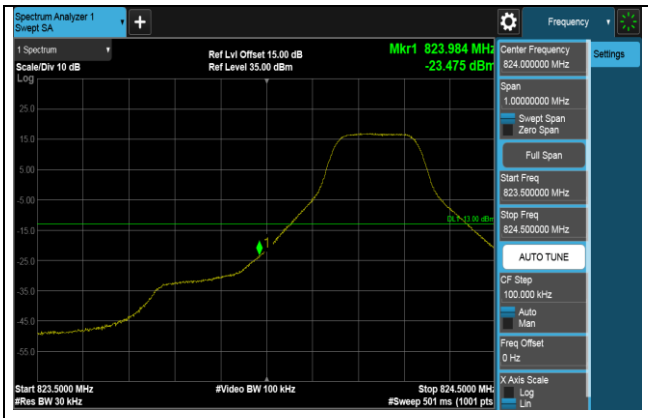
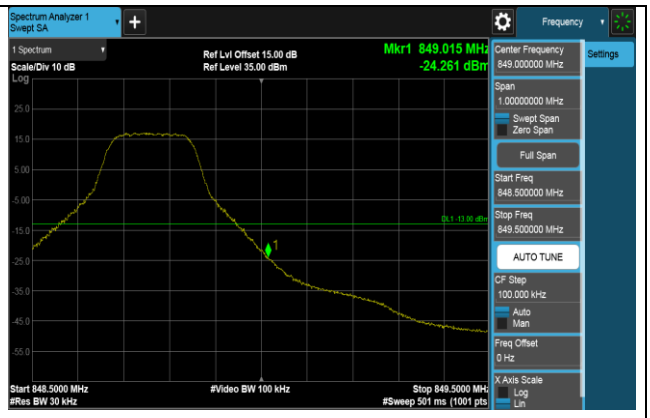
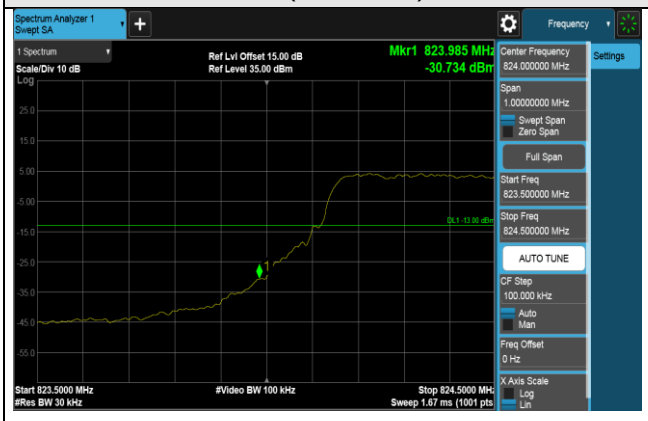
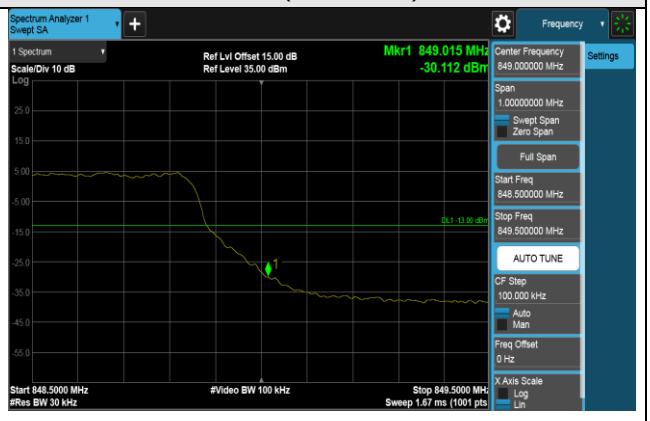



FULL (824.7MHz)

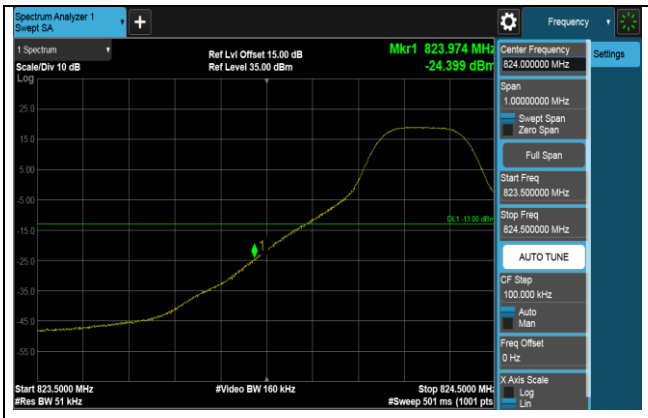
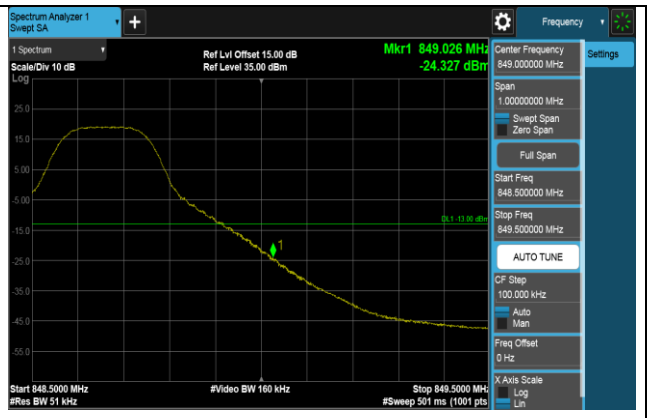
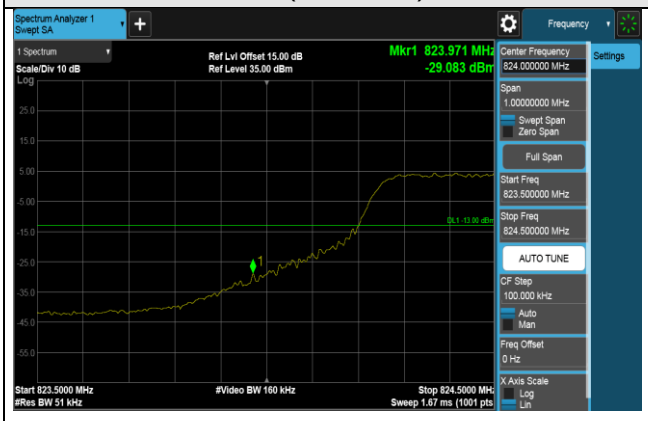
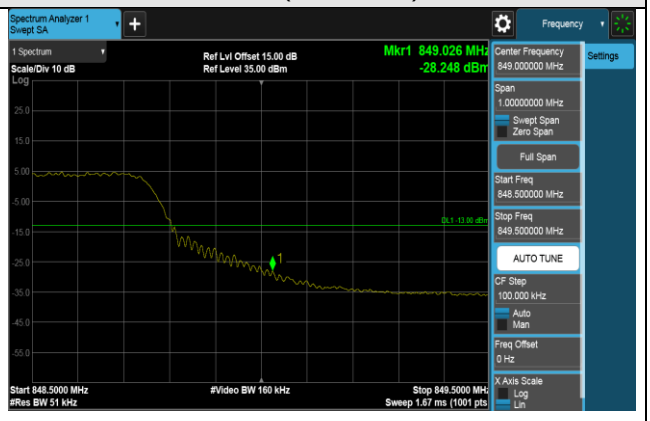



FULL (848.3MHz)

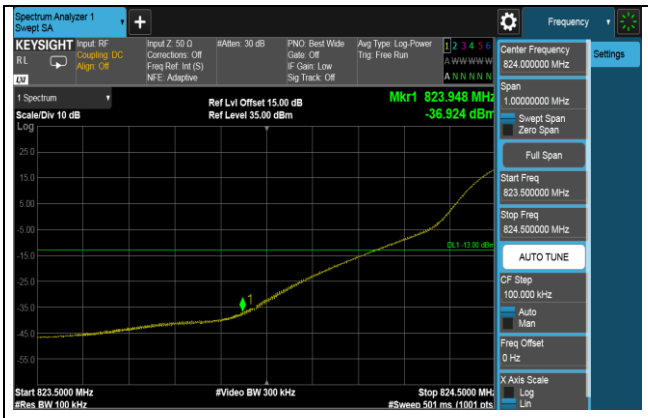
## LTE Band 5 (Channel Bandwidth 3MHz)

| | |
|---|---|
|  |  |
| 1RB (825.5MHz) | 1RB (847.5MHz) |
|  |  |
| FULL (825.5MHz) | FULL (847.5MHz) |

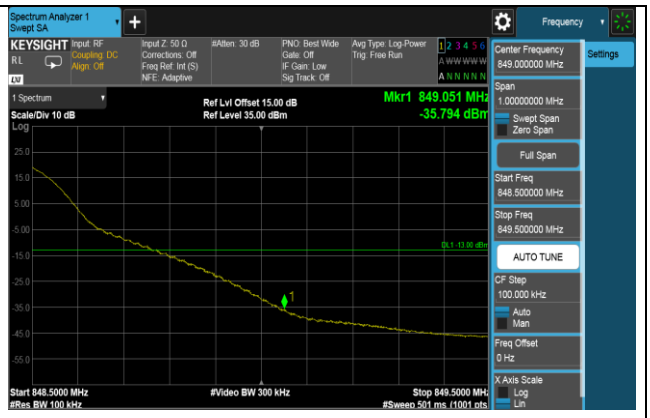
## LTE Band 5 (Channel Bandwidth 5MHz)

| | |
|---|---|
|  |  |
| 1RB (826.5MHz) | 1RB (846.5MHz) |
|  |  |
| FULL (826.5MHz) | FULL (846.5MHz) |

## LTE Band 5 (Channel Bandwidth 10MHz)

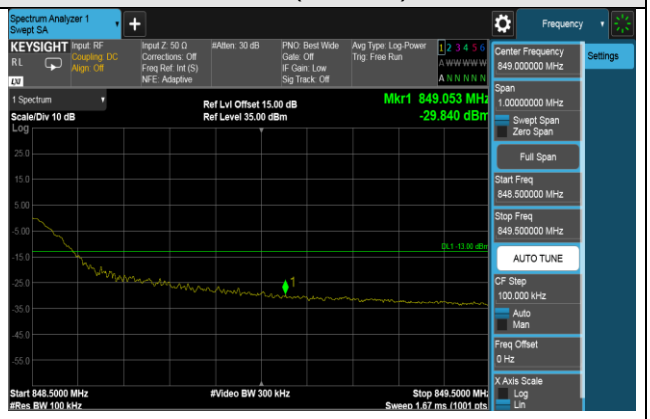



1RB (829MHz)




1RB (844MHz)


FULL (829MHz)



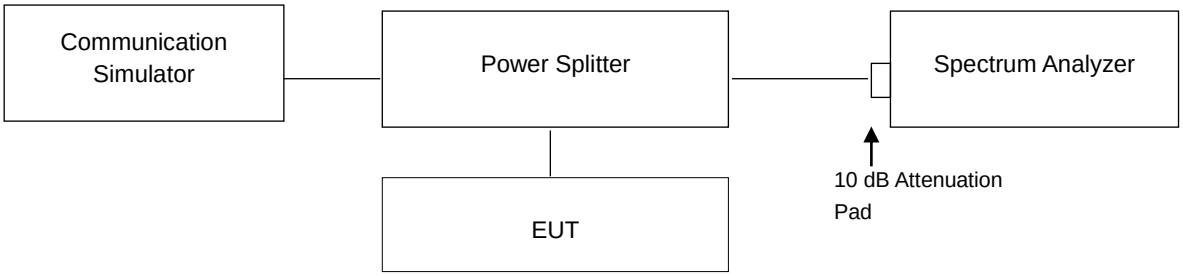

FULL (844MHz)

## 4.6 Peak to Average Ratio

### 4.6.1 Limits of Peak to Average Ratio Measurement

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

### 4.6.2 Test Setup



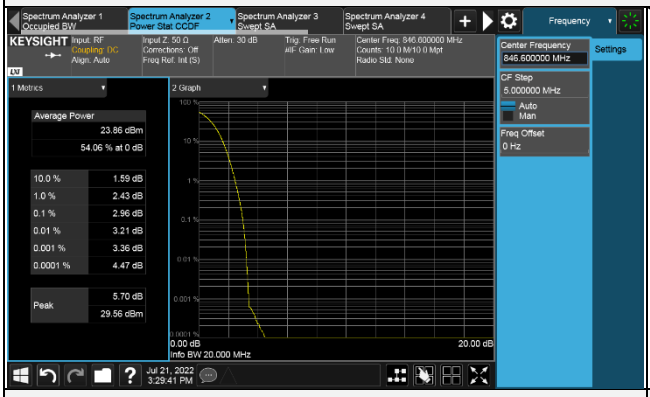
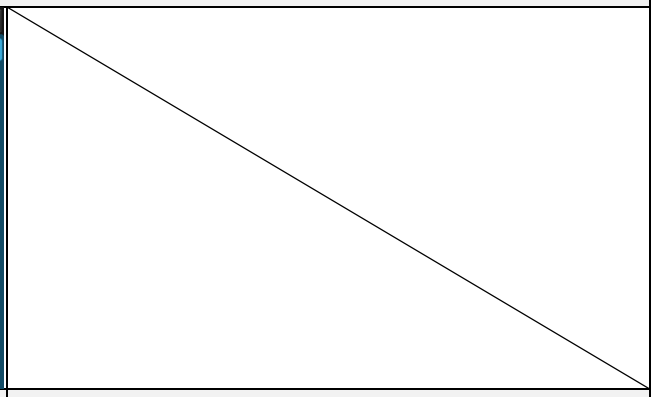

### 4.6.3 Test Procedures

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

4.6.4 Test Results

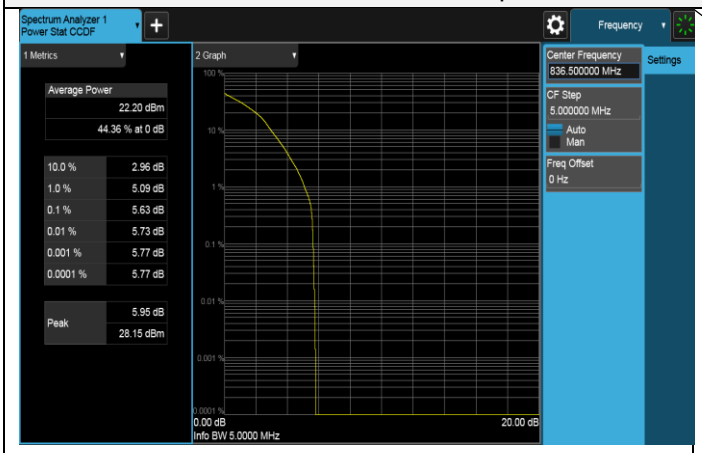
WCDMA

| Test Condition | Channel | Frequency (MHz) | Measure. Value (dB) | Limit (dB) | Result |
|---|---|---|---|---|---|
| WCDMA | 4132 | 826.4 | 2.77 | 13 | Pass |
| WCDMA | 4182 | 836.4 | 2.86 | 13 | Pass |
| WCDMA | 4233 | 846.6 | 2.96 | 13 | Pass |
| HSDPA | 4132 | 826.4 | 2.78 | 13 | Pass |
| HSDPA | 4182 | 836.4 | 2.86 | 13 | Pass |
| HSDPA | 4233 | 846.6 | 2.95 | 13 | Pass |
| HSUPA | 4132 | 826.4 | 2.79 | 13 | Pass |
| HSUPA | 4182 | 836.4 | 2.87 | 13 | Pass |
| HSUPA | 4233 | 846.6 | 2.95 | 13 | Pass |

| Spectrum Plot of Worst Value | |
|---|---|
|  |  |
| WCDMA CH 4233 (846.6MHz) | |

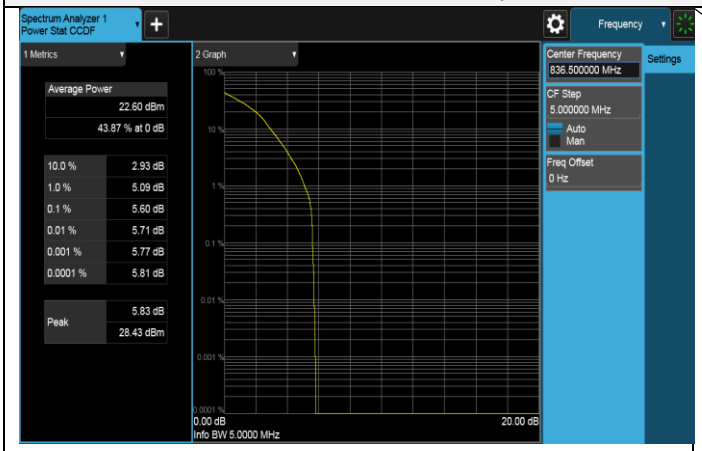
LTE Band 5 (Channel Bandwidth 1.4MHz)

| Test Condition | Channel | Frequency (MHz) | Measure. Value(dB) | Limit dB | Result |
|---|---|---|---|---|---|
| QPSK | 20407 | 824.7 | 4.25 | 13 | PASS |
| QPSK | 20525 | 836.5 | 4.64 | 13 | PASS |
| QPSK | 20643 | 848.3 | 4.32 | 13 | PASS |
| 16QAM | 20407 | 824.7 | 5.38 | 13 | PASS |
| 16QAM | 20525 | 836.5 | 5.63 | 13 | PASS |
| 16QAM | 20643 | 848.3 | 5.32 | 13 | PASS |

| Spectrum Plot of Worst Value | |
|---|---|
|  | |
| 16QAM CH 20525 (836.5MHz) | |

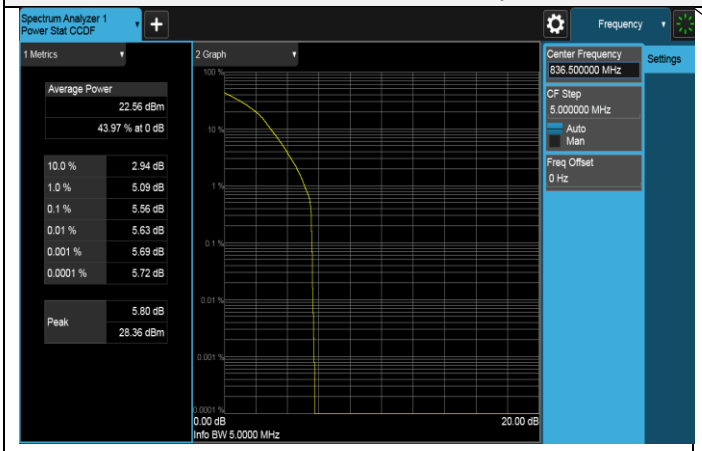
LTE Band 5 (Channel Bandwidth 3MHz)

| Test Condition | Channel | Frequency (MHz) | Measure. Value(dB) | Limit dB | Result |
|---|---|---|---|---|---|
| QPSK | 20415 | 825.5 | 4.18 | 13 | PASS |
| QPSK | 20525 | 836.5 | 4.62 | 13 | PASS |
| QPSK | 20635 | 847.5 | 4.02 | 13 | PASS |
| 16QAM | 20415 | 825.5 | 5.15 | 13 | PASS |
| 16QAM | 20525 | 836.5 | 5.60 | 13 | PASS |
| 16QAM | 20635 | 847.5 | 5.09 | 13 | PASS |

| Spectrum Plot of Worst Value | |
|---|---|
|  | |
| 16QAM CH 20525 (836.5MHz) | |

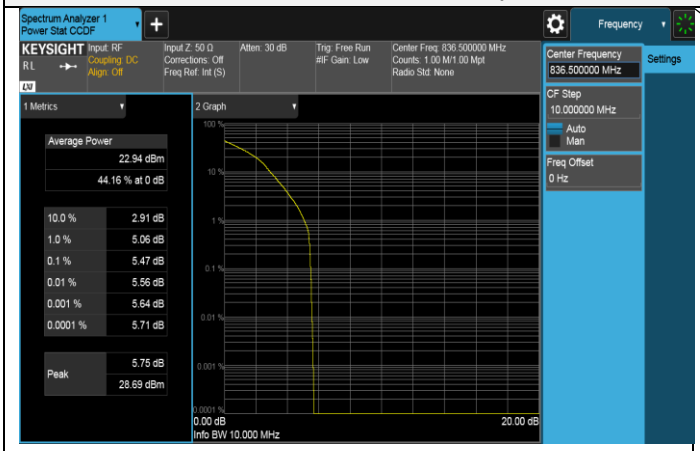
LTE Band 5 (Channel Bandwidth 5MHz)

| Test Condition | Channel | Frequency (MHz) | Measure. Value(dB) | Limit dB | Result |
|---|---|---|---|---|---|
| QPSK | 20425 | 826.5 | 4.10 | 13 | PASS |
| QPSK | 20525 | 836.5 | 4.57 | 13 | PASS |
| QPSK | 20625 | 846.5 | 3.73 | 13 | PASS |
| 16QAM | 20425 | 826.5 | 5.12 | 13 | PASS |
| 16QAM | 20525 | 836.5 | 5.56 | 13 | PASS |
| 16QAM | 20625 | 846.5 | 4.71 | 13 | PASS |

| Spectrum Plot of Worst Value | |
|---|---|
|  | |
| 16QAM CH 20525 (836.5MHz) | |

LTE Band 5 (Channel Bandwidth 10MHz)

| Test Condition | Channel | Frequency (MHz) | Measure. Value(dB) | Limit dB | Result |
|---|---|---|---|---|---|
| QPSK | 20450 | 829 | 4.13 | 13 | PASS |
| QPSK | 20525 | 836.5 | 4.48 | 13 | PASS |
| QPSK | 20600 | 844 | 4.06 | 13 | PASS |
| 16QAM | 20450 | 829 | 5.04 | 13 | PASS |
| 16QAM | 20525 | 836.5 | 5.47 | 13 | PASS |
| 16QAM | 20600 | 844 | 5.06 | 13 | PASS |

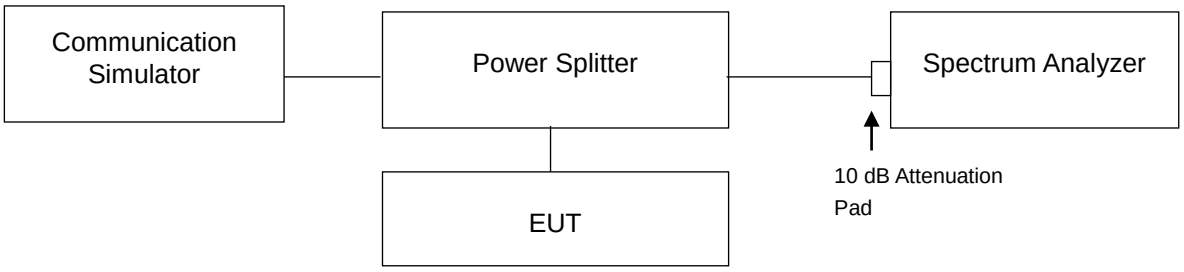
| Spectrum Plot of Worst Value | |
|---|---|
|  | |
| 16QAM CH 20525 (836.5MHz) | |

## 4.7 Conducted Spurious Emissions

### 4.7.1 Limits of Conducted Spurious Emissions Measurement

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

### 4.7.2 Test Setup

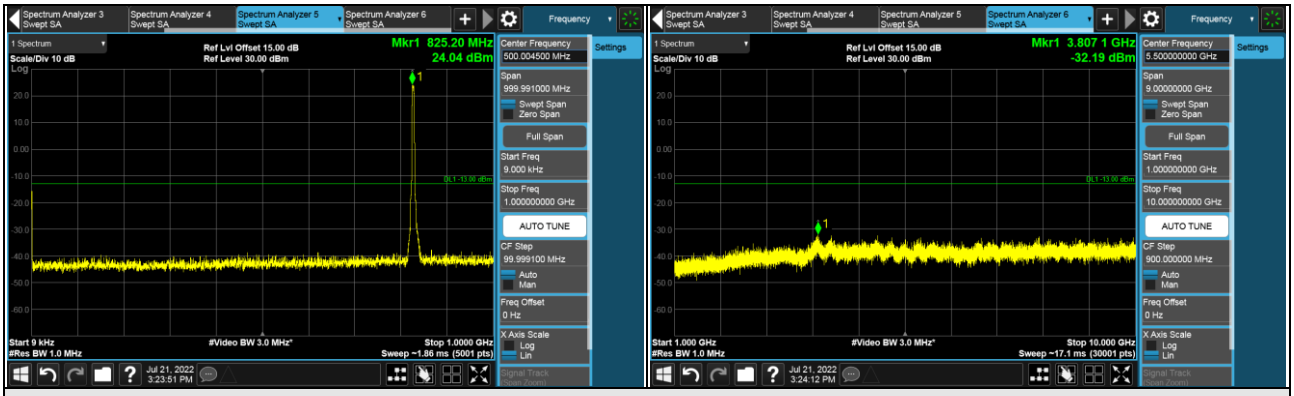



### 4.7.3 Test Procedure

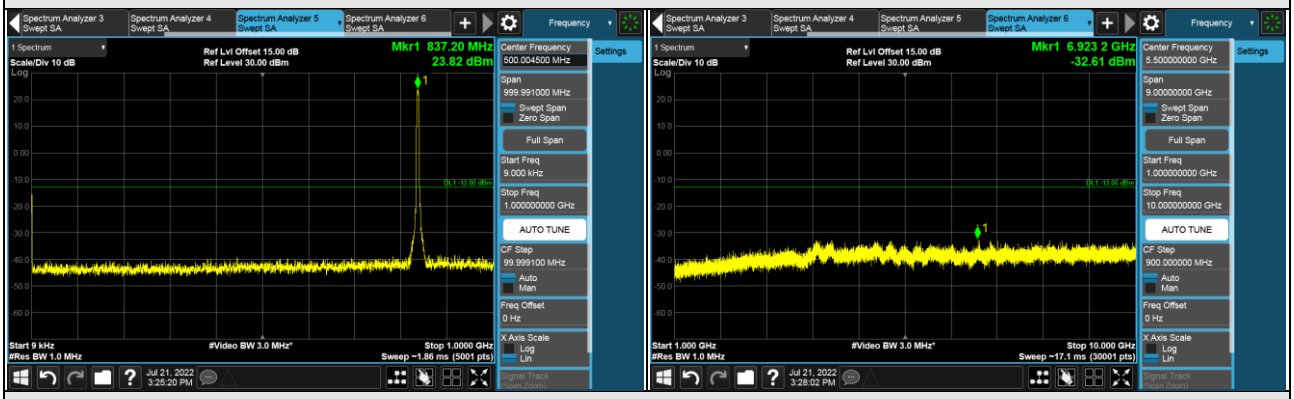
a. The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
b. The detector of the spectrum is RMS, and if the device can be configured to transmit continuously (duty cycle ≥ 98%), set the (sweep time) > (number of points in sweep) × (symbol period) (e.g., by a factor of 10 × symbol period × number of points). Increasing the sweep time (i.e., slowing the sweep speed) will allow for averaging over multiple symbols.
c. Measuring frequency range is from 9 kHz to 1 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz is used for conducted emission measurement.
d. Measuring frequency range is from 1 GHz to 10 GHz for WCDMA / HSDPA / HSUPA and 1 GHz to 9 GHz for LTE. 10 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz is used for conducted emission measurement.

### 4.7.4 Test Results

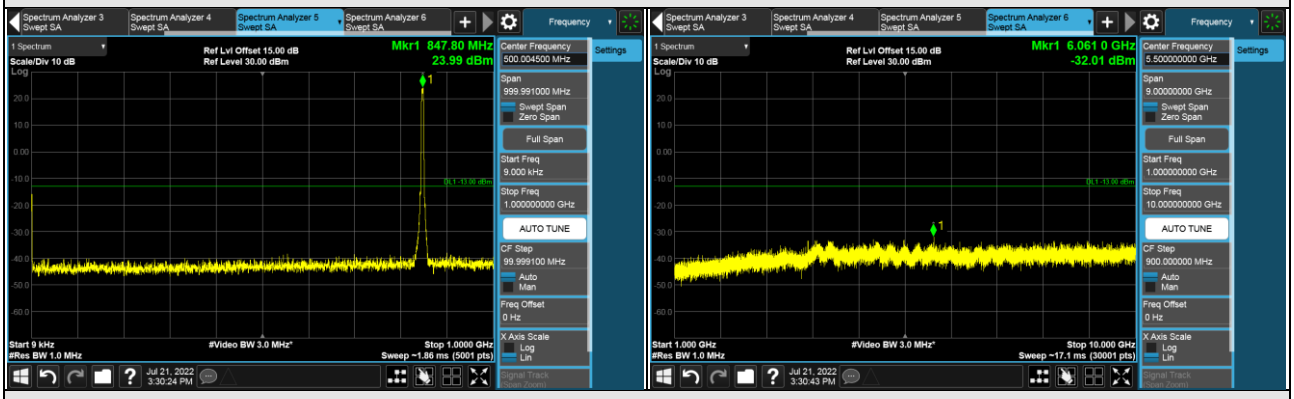
WCDMA




CH 4132 (826.4MHz)



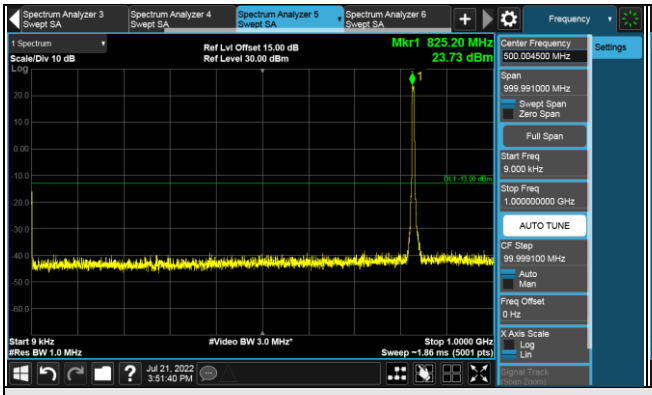

CH 4182 (836.4MHz)

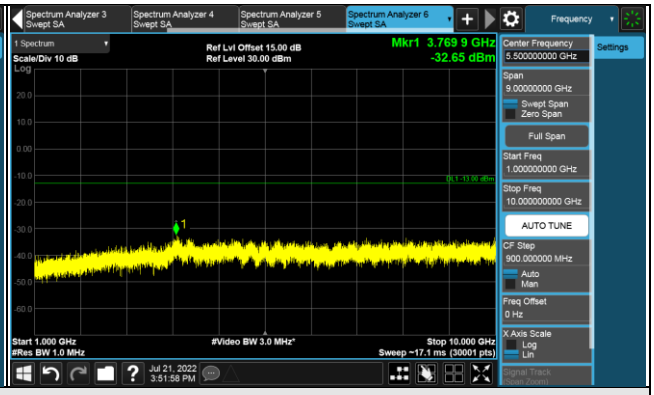



CH 4233 (846.6MHz)

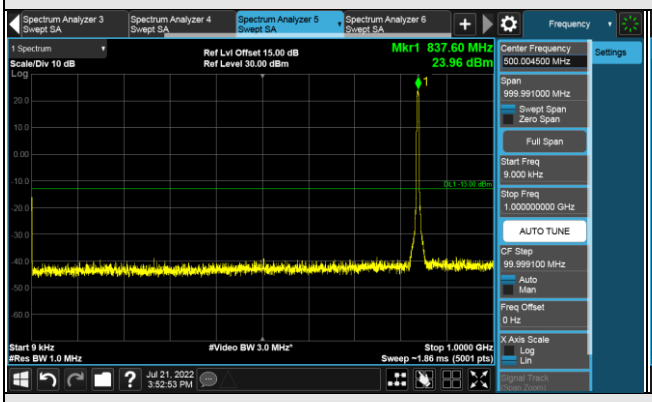
*The 9kHz signal over the limit is from Spectrum.

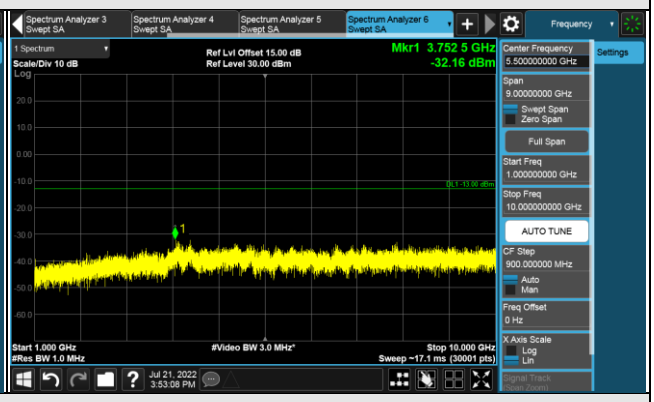
## HSDPA



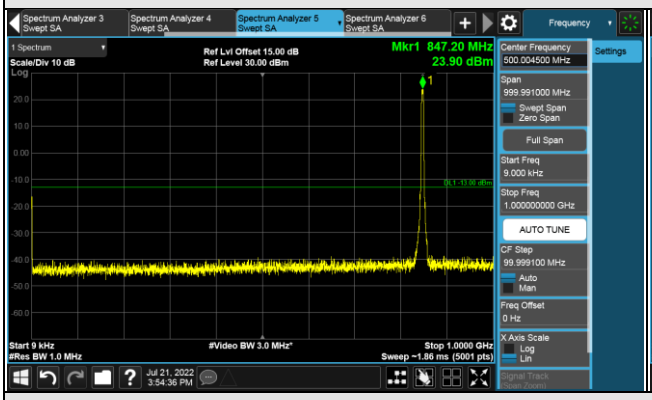



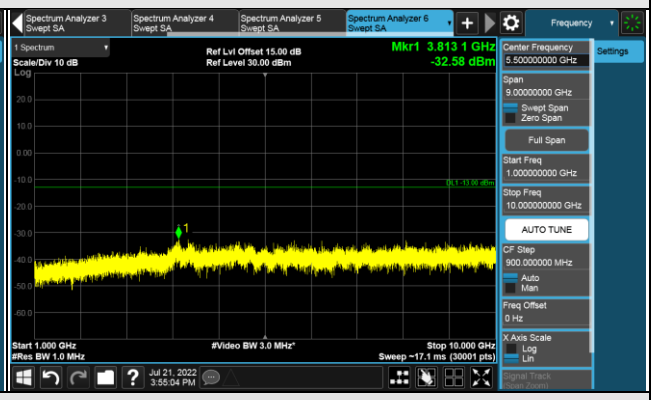

CH 4132 (826.4MHz)




CH 4182 (836.4MHz)

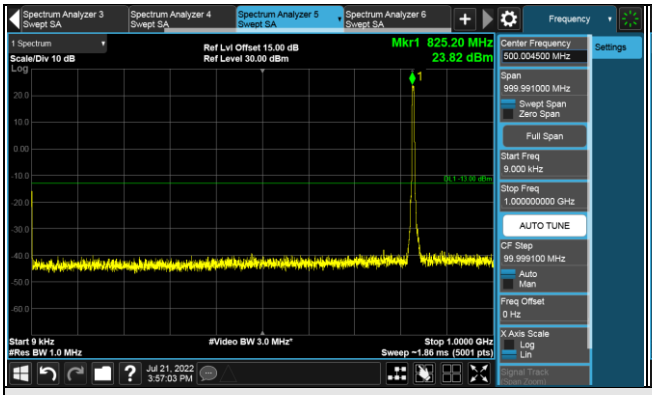


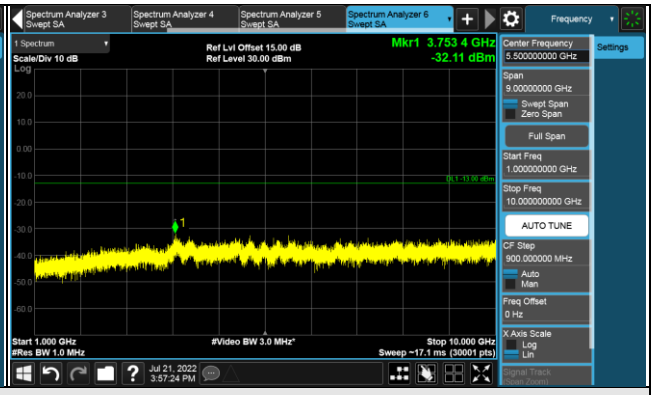




CH 4233 (846.6MHz)

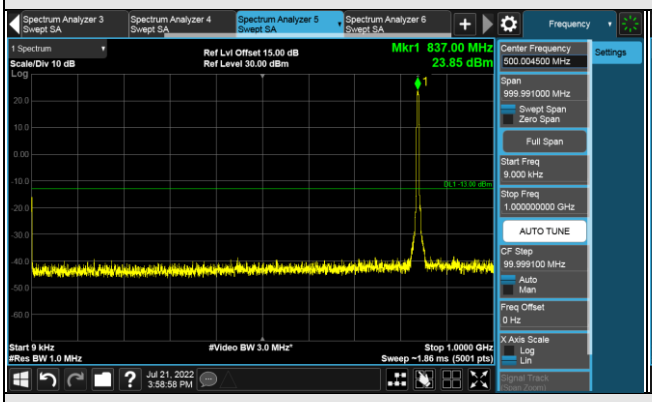
*The 9kHz signal over the limit is from Spectrum.

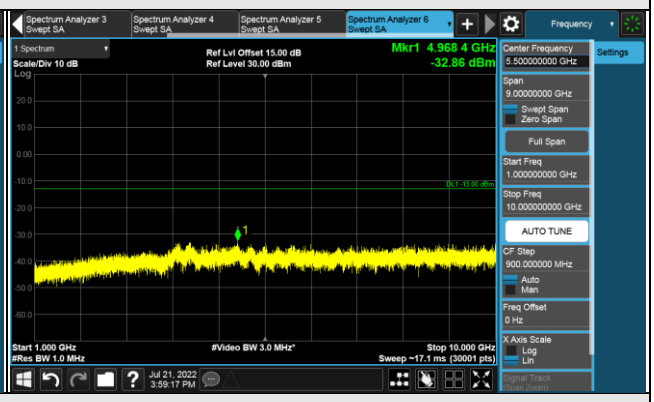
## HSUPA



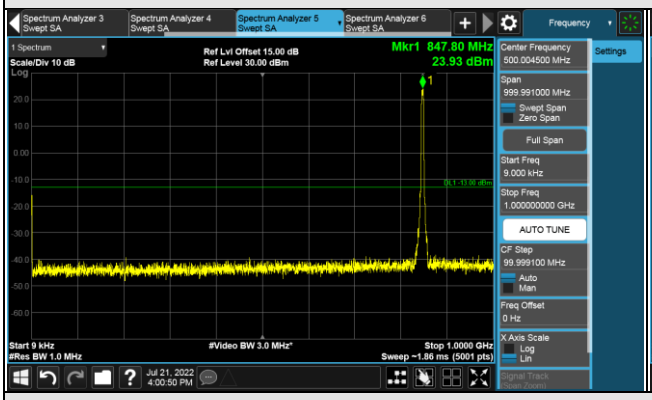



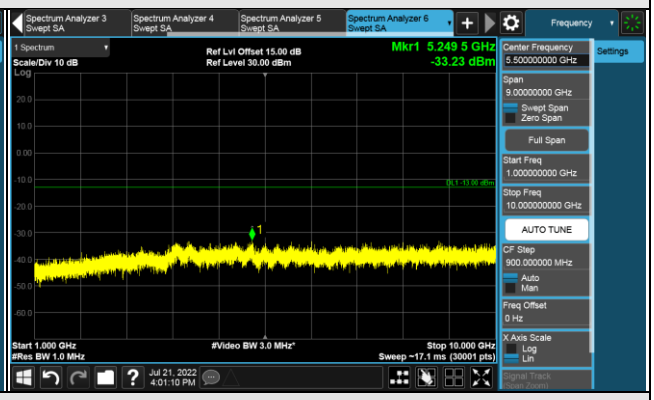

CH 4132 (826.4MHz)




CH 4182 (836.4MHz)

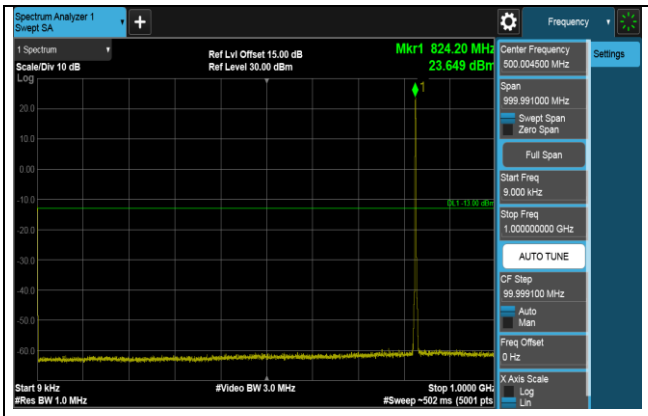


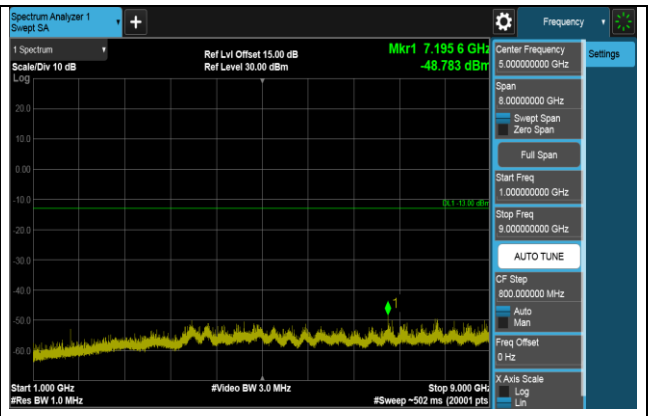




CH 4233 (846.6MHz)

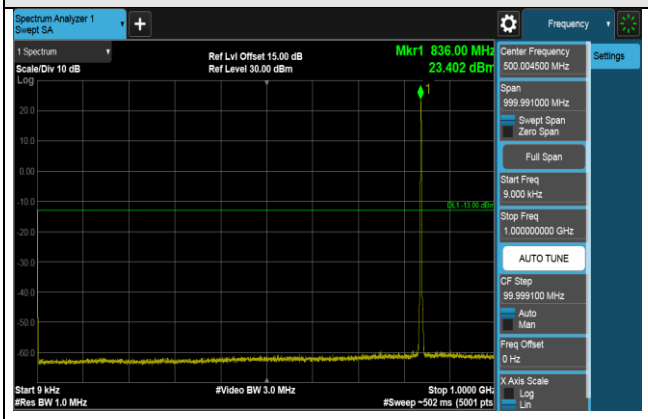
*The 9kHz signal over the limit is from Spectrum.

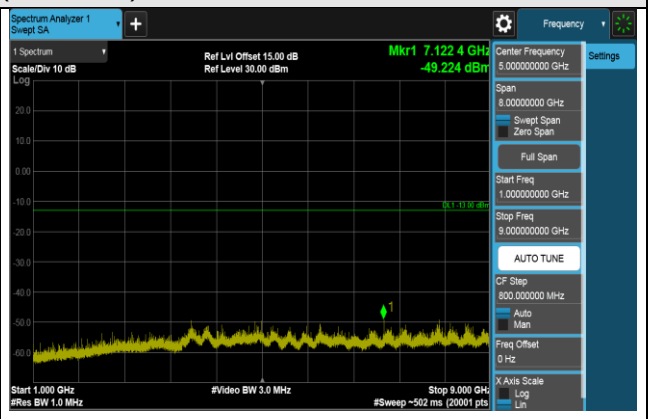
## LTE Band 5 (Channel Bandwidth 1.4MHz)



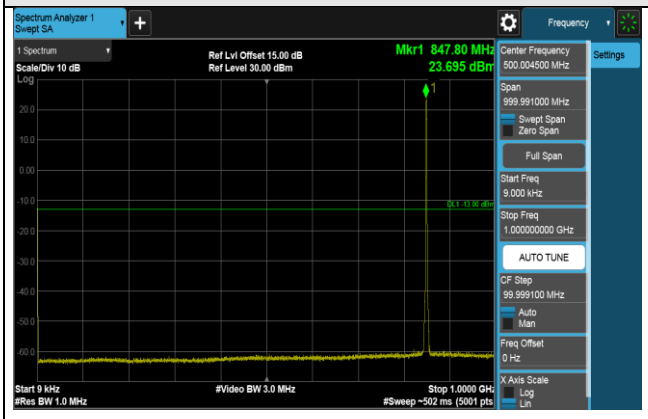



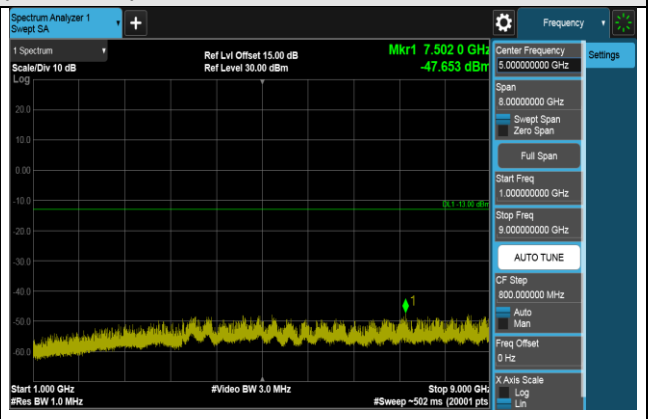

CH 20407 (824.7MHz)




CH 20525 (836.5MHz)

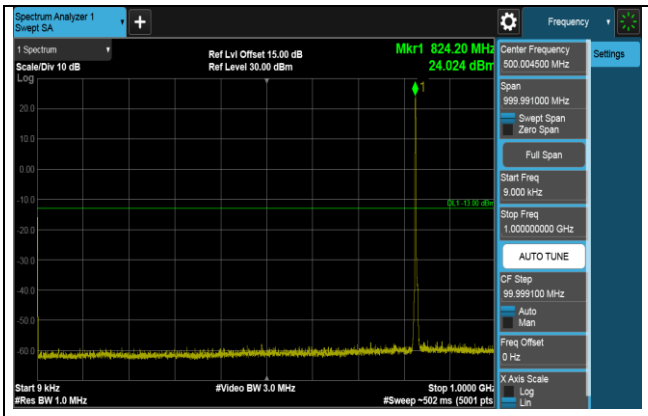


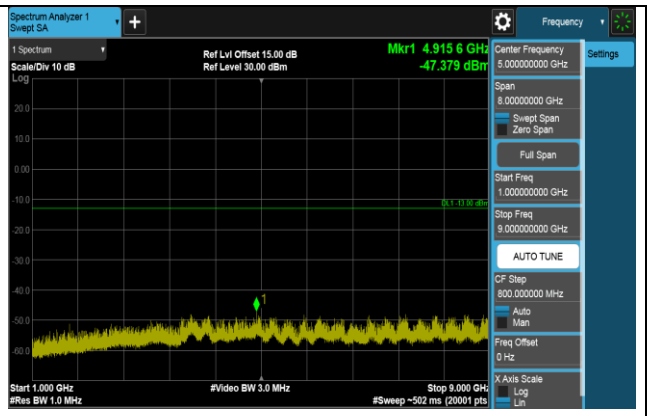




CH 20643 (848.3MHz)

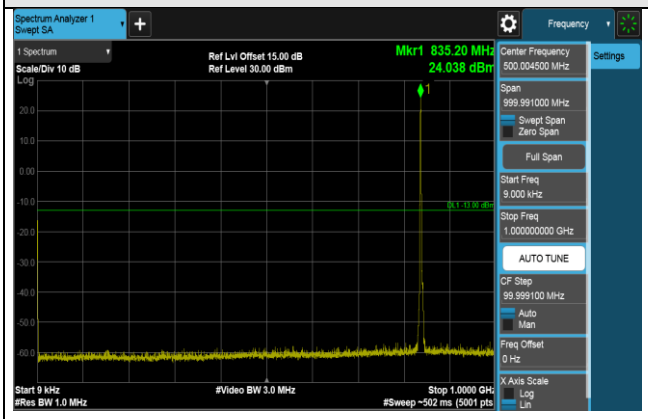
*The 9kHz signal over the limit is from Spectrum.

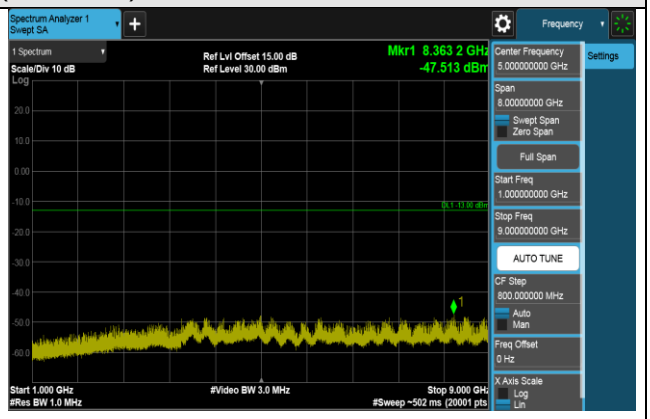
## LTE Band 5 (Channel Bandwidth 3MHz)



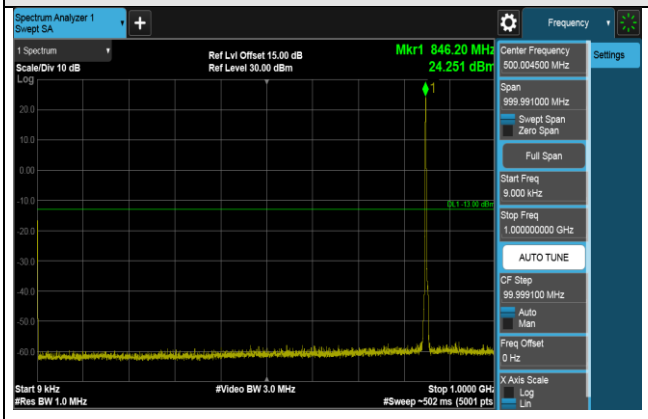



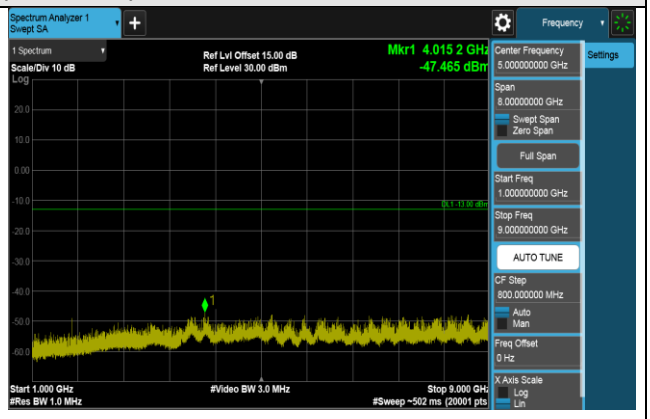

CH 20415 (825.5MHz)




CH 20525 (836.5MHz)

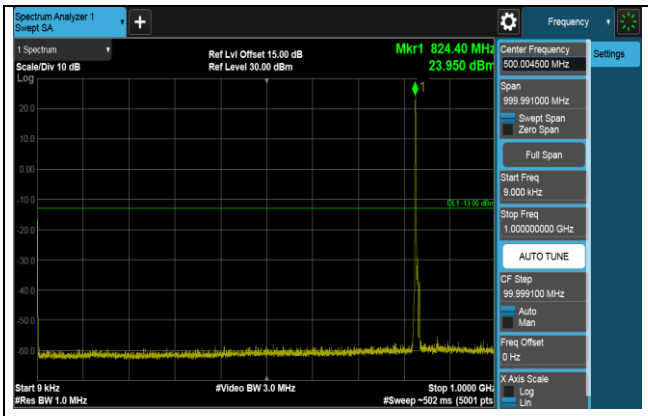


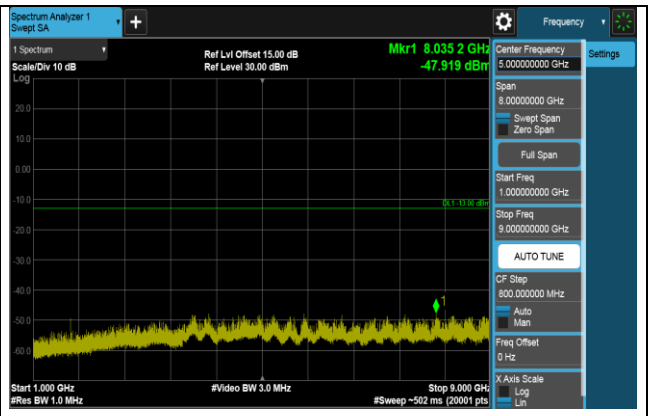




CH 20635 (847.5MHz)

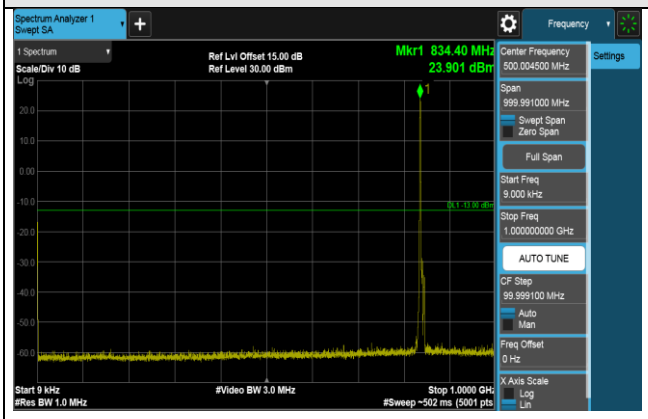
*The 9kHz signal over the limit is from Spectrum.

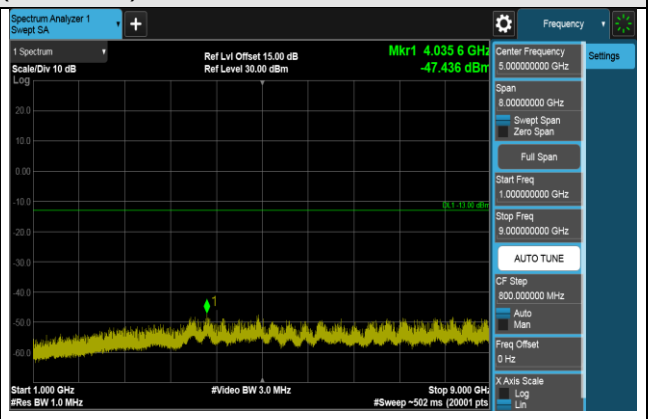
## LTE Band 5 (Channel Bandwidth 5MHz)



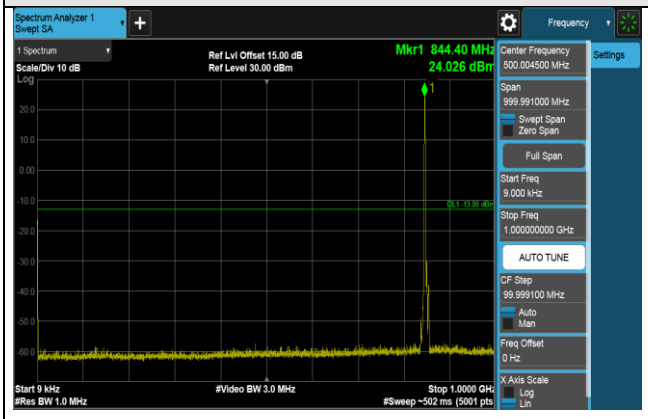



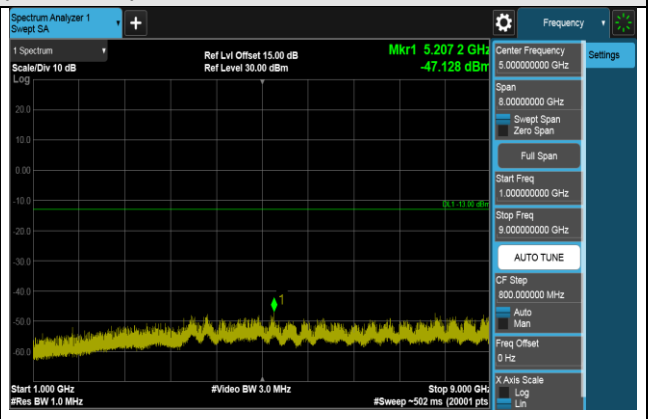

CH 20425 (826.5MHz)




CH 20525 (836.5MHz)

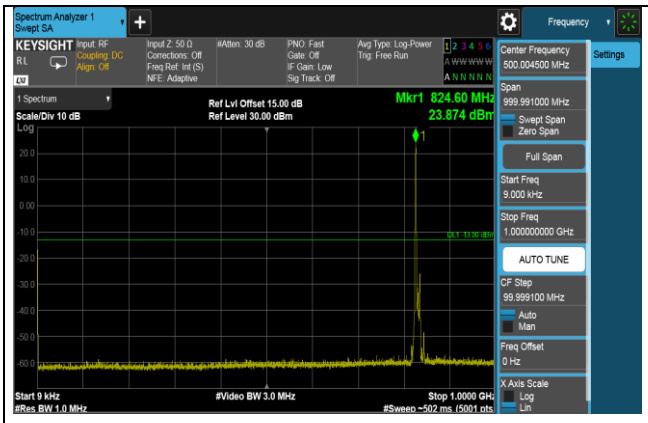


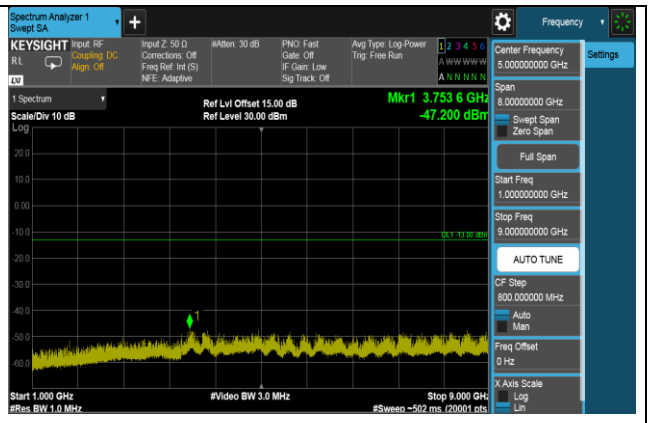




CH 20625 (846.5MHz)

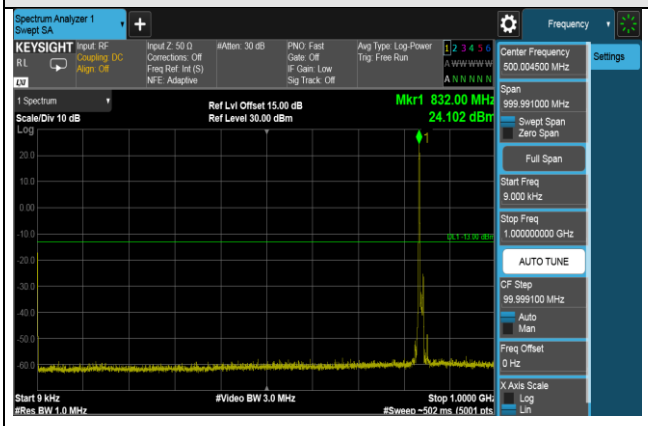
*The 9kHz signal over the limit is from Spectrum.

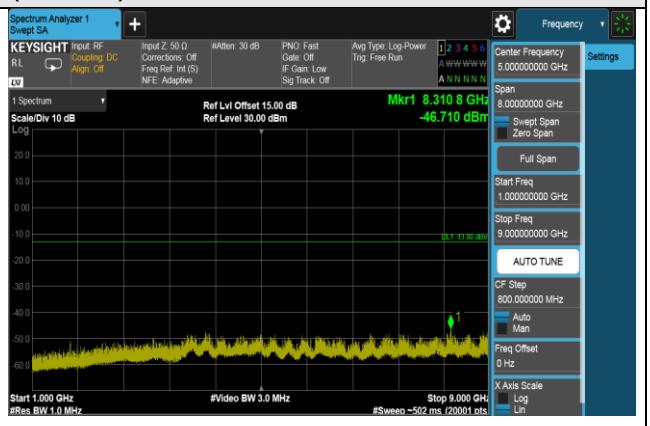
## LTE Band 5 (Channel Bandwidth 10MHz)



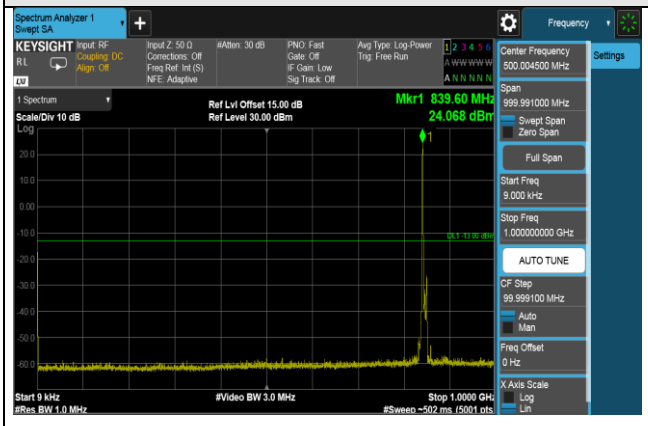



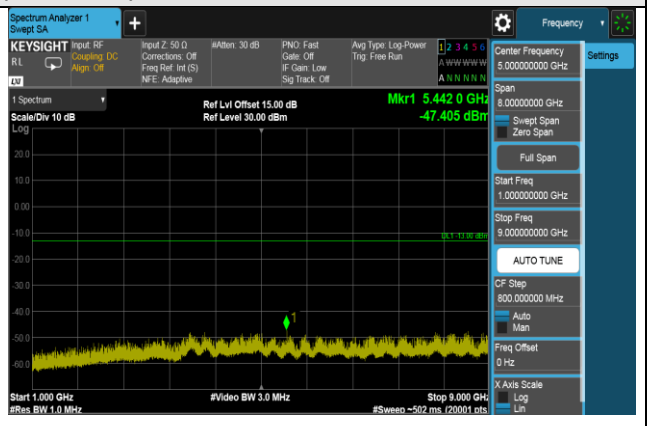

CH 20450 (829MHz)




CH 20525 (836.5MHz)




CH 20600 (844MHz)

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

## 4.8 Radiated Emission Measurement

### 4.8.1 Limits of Radiated Emission Measurement

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

### 4.8.2 Test Procedure

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
   EIRP (dBm) = E (dBμV/m) + 20log(D) - 104.8; where D is the measurement distance (in the far field region) in m.
   ERP (dBm) = E (dBμV/m) + 20log(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 1 MHz/3 MHz.
2. The emission levels were against the limit of frequency range 9 kHz ~ 30 MHz:

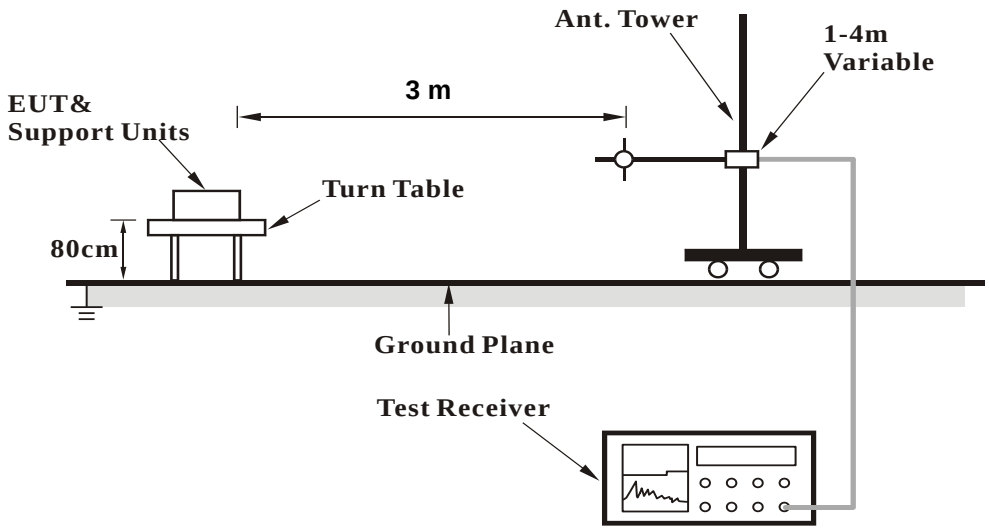
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

### 4.8.3 Deviation from Test Standard

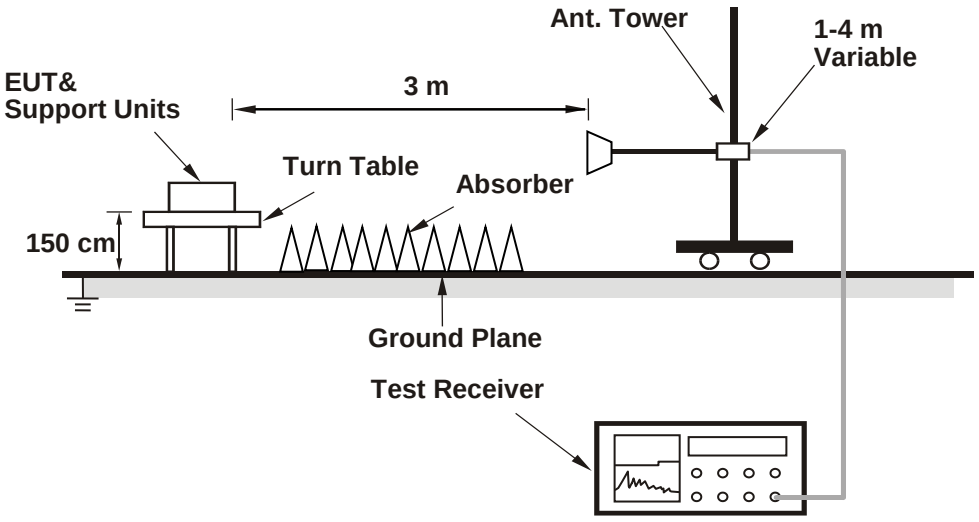
No deviation.

4.8.4 Test Setup

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




**<Radiated Emission above 1 GHz>**




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

4.8.5 Test Results

Below 1GHz

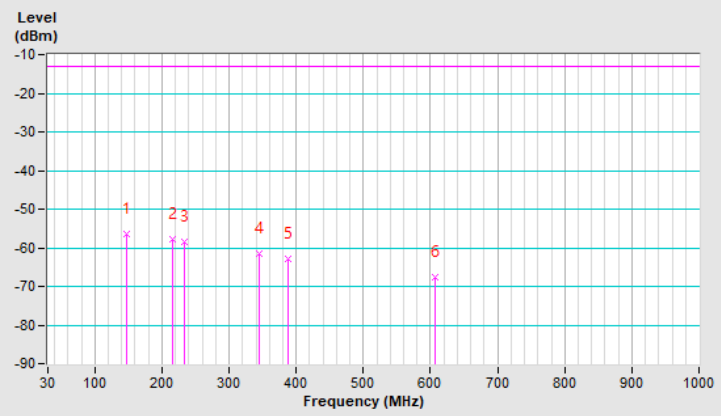
WCDMA Band 5

| Mode | TX channel 4233 (846.6MHz) | Frequency Range | Below 1000 MHz |
|---|---|---|---|
| Environmental Conditions | 26deg. C, 62%RH | Input Power | 120Vac, 60Hz |
| Tested By | Charles Hsiao | | |

| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 146.90 | -56.36 | -13.00 | -43.36 | 1.97 H | 119 | 58.60 | -114.96 |
| 2 | 215.40 | -57.86 | -13.00 | -44.86 | 1.18 H | 154 | 60.31 | -118.17 |
| 3 | 233.66 | -58.48 | -13.00 | -45.48 | 1.54 H | 129 | 58.76 | -117.24 |
| 4 | 345.54 | -61.45 | -13.00 | -48.45 | 1.15 H | 44 | 52.08 | -113.53 |
| 5 | 388.85 | -62.88 | -13.00 | -49.88 | 1.57 H | 159 | 49.49 | -112.37 |
| 6 | 607.44 | -67.66 | -13.00 | -54.66 | 1.15 H | 198 | 39.99 | -107.65 |

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) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

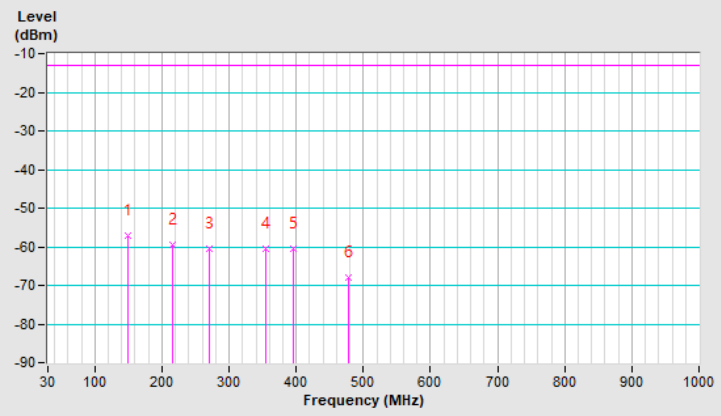


| | | | |
|---|---|---|---|
| Mode | TX channel 4233 (846.6MHz) | Frequency Range | Below 1000 MHz |
| Environmental Conditions | 26deg. C, 62%RH | Input Power | 120Vac, 60Hz |
| Tested By | Charles Hsiao | | |

| Antenna Polarity & Test Distance : Vertical at 3m | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 148.88 | -57.00 | -13.00 | -44.00 | 1.89 V | 99 | 58.02 | -115.02 |
| 2 | 215.22 | -59.60 | -13.00 | -46.60 | 1.19 V | 64 | 58.57 | -118.17 |
| 3 | 270.40 | -60.41 | -13.00 | -47.41 | 1.52 V | 202 | 55.14 | -115.55 |
| 4 | 355.41 | -60.62 | -13.00 | -47.62 | 1.52 V | 180 | 52.68 | -113.30 |
| 5 | 396.66 | -60.37 | -13.00 | -47.37 | 1.37 V | 333 | 51.85 | -112.22 |
| 6 | 477.80 | -67.80 | -13.00 | -54.80 | 1.15 V | 0 | 42.55 | -110.35 |

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) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.



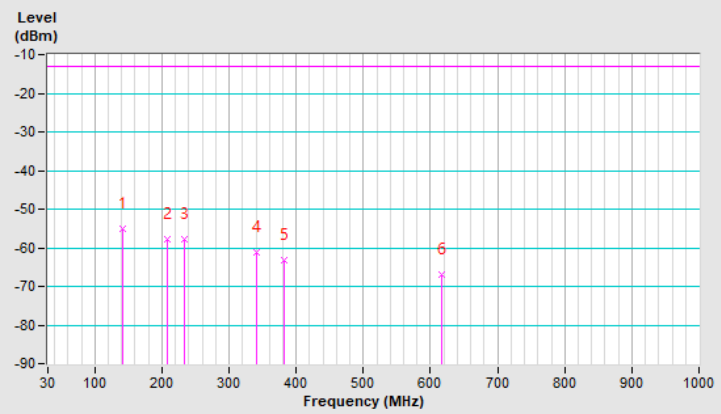
LTE Band 5 (Channel Bandwidth 1.4MHz)

| Mode | TX channel 20407 (824.7MHz) | Frequency Range | Below 1000 MHz |
|---|---|---|---|
| Environmental Conditions | 26deg. C, 62%RH | Input Power | 120Vac, 60Hz |
| Tested By | Charles Hsiao | | |

| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 140.50 | -55.22 | -13.00 | -42.22 | 1.24 H | 202 | 60.28 | -115.50 |
| 2 | 208.92 | -57.68 | -13.00 | -44.68 | 1.19 H | 345 | 60.64 | -118.32 |
| 3 | 233.00 | -57.77 | -13.00 | -44.77 | 1.17 H | 127 | 59.56 | -117.33 |
| 4 | 341.10 | -61.09 | -13.00 | -48.09 | 1.83 H | 229 | 52.43 | -113.52 |
| 5 | 382.26 | -63.10 | -13.00 | -50.10 | 1.65 H | 116 | 49.41 | -112.51 |
| 6 | 616.65 | -66.99 | -13.00 | -53.99 | 1.13 H | 285 | 40.60 | -107.59 |

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) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

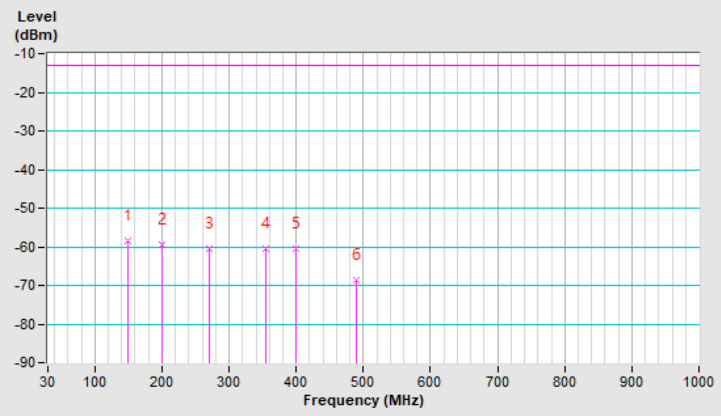


| | | | |
|---|---|---|---|
| Mode | TX channel 20407 (824.7MHz) | Frequency Range | Below 1000 MHz |
| Environmental Conditions | 26deg. C, 62%RH | Input Power | 120Vac, 60Hz |
| Tested By | Charles Hsiao | | |

| Antenna Polarity & Test Distance : Vertical at 3m | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 149.90 | -58.32 | -13.00 | -45.32 | 1.96 V | 118 | 56.60 | -114.92 |
| 2 | 200.54 | -59.45 | -13.00 | -46.45 | 1.18 V | 318 | 58.95 | -118.40 |
| 3 | 270.50 | -60.56 | -13.00 | -47.56 | 1.65 V | 209 | 54.99 | -115.55 |
| 4 | 354.40 | -60.66 | -13.00 | -47.66 | 1.89 V | 180 | 52.66 | -113.32 |
| 5 | 399.90 | -60.56 | -13.00 | -47.56 | 1.15 V | 315 | 51.58 | -112.14 |
| 6 | 488.97 | -68.70 | -13.00 | -55.70 | 1.14 V | 145 | 41.54 | -110.24 |

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) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.



Above 1GHz

WCDMA Band 5

| Mode | TX channel 4132 (826.4MHz) | Frequency Range | 1GHz ~ 20GHz |
|---|---|---|---|
| Environmental Conditions | 25deg. C, 60%RH | Input Power | 120Vac, 60Hz |
| Tested By | Karl Lee | | |

| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1648.00 | -57.76 | -13.00 | -44.76 | 2.20 H | 146 | 38.87 | -96.63 |
| Antenna Polarity & Test Distance : Vertical at 3 m | | | | | | | | |
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1648.00 | -57.94 | -13.00 | -44.94 | 1.45 V | 37 | 38.69 | -96.63 |

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) + 20log(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 4182 (836.4MHz) | Frequency Range | 1GHz ~ 20GHz |
|---|---|---|---|
| Environmental Conditions | 25deg. C, 60%RH | Input Power | 120Vac, 60Hz |
| Tested By | Karl Lee | | |

| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1673.00 | -57.27 | -13.00 | -44.27 | 2.06 H | 18 | 38.93 | -96.20 |
| Antenna Polarity & Test Distance : Vertical at 3 m | | | | | | | | |
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1673.00 | -56.28 | -13.00 | -43.28 | 1.51 V | 209 | 39.92 | -96.20 |

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) + 20log(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 4233 (846.6MHz) | Frequency Range | 1GHz ~ 20GHz |
| Environmental Conditions | 25deg. C, 60%RH | Input Power | 120Vac, 60Hz |
| Tested By | Karl Lee | | |

| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1698.00 | -56.25 | -13.00 | -43.25 | 1.94 H | 165 | 39.50 | -95.75 |
| Antenna Polarity & Test Distance : Vertical at 3 m | | | | | | | | |
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1698.00 | -57.24 | -13.00 | -44.24 | 2.08 V | 224 | 38.51 | -95.75 |

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) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

LTE Band 5 (Channel Bandwidth 1.4MHz)

| | | | |
|---|---|---|---|
| Mode | TX channel 20407 (824.7MHz) | Frequency Range | 1GHz ~ 20GHz |
| Environmental Conditions | 25deg. C, 60%RH | Input Power | 120Vac, 60Hz |
| Tested By | Karl Lee | | |

| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1649.00 | -53.60 | -13.00 | -40.60 | 1.63 H | 85 | 43.02 | -96.62 |
| Antenna Polarity & Test Distance : Vertical at 3 m | | | | | | | | |
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| **1** | **1649.00** | **-50.31** | **-13.00** | **-37.31** | **2.15 V** | **22** | **46.31** | **-96.62** |

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) + 20log(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 20525 (836.5MHz) | Frequency Range | 1GHz ~ 20GHz |
| Environmental Conditions | 25deg. C, 60%RH | Input Power | 120Vac, 60Hz |
| Tested By | Karl Lee | | |

| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1673.00 | -55.46 | -13.00 | -42.46 | 2.32 H | 28 | 40.74 | -96.20 |
| Antenna Polarity & Test Distance : Vertical at 3 m | | | | | | | | |
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1673.00 | -55.56 | -13.00 | -42.56 | 1.77 V | 21 | 40.64 | -96.20 |

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) + 20log(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 20643 (848.3MHz) | Frequency Range | 1GHz ~ 20GHz |
| Environmental Conditions | 25deg. C, 60%RH | Input Power | 120Vac, 60Hz |
| Tested By | Karl Lee | | |

| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1696.60 | -56.42 | -13.00 | -43.42 | 3.01 H | 211 | 39.37 | -95.79 |
| Antenna Polarity & Test Distance : Vertical at 3 m | | | | | | | | |
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1696.60 | -55.15 | -13.00 | -42.15 | 2.05 V | 288 | 40.64 | -95.79 |

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) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

LTE Band 5 (Channel Bandwidth 5MHz)

| | | | |
|---|---|---|---|
| Mode | TX channel 20425 (826.5MHz) | Frequency Range | 1GHz ~ 20GHz |
| Environmental Conditions | 25deg. C, 60%RH | Input Power | 120Vac, 60Hz |
| Tested By | Karl Lee | | |

| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1653.00 | -52.04 | -13.00 | -39.04 | 1.26 H | 273 | 44.51 | -96.55 |
| Antenna Polarity & Test Distance : Vertical at 3 m | | | | | | | | |
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1653.00 | -51.44 | -13.00 | -38.44 | 1.94 V | 78 | 45.11 | -96.55 |

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) + 20log(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 20525 (836.5MHz) | Frequency Range | 1GHz ~ 20GHz |
| Environmental Conditions | 25deg. C, 60%RH | Input Power | 120Vac, 60Hz |
| Tested By | Karl Lee | | |

| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1673.00 | -56.86 | -13.00 | -43.86 | 1.89 H | 241 | 39.34 | -96.20 |
| Antenna Polarity & Test Distance : Vertical at 3 m | | | | | | | | |
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1673.00 | -55.64 | -13.00 | -42.64 | 1.42 V | 39 | 40.56 | -96.20 |

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) + 20log(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 20625 (846.5MHz) | Frequency Range | 1GHz ~ 20GHz |
| Environmental Conditions | 25deg. C, 60%RH | Input Power | 120Vac, 60Hz |
| Tested By | Karl Lee | | |

| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1693.00 | -56.49 | -13.00 | -43.49 | 1.59 H | 45 | 39.36 | -95.85 |
| Antenna Polarity & Test Distance : Vertical at 3 m | | | | | | | | |
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1693.00 | -52.62 | -13.00 | -39.62 | 2.01 V | 187 | 43.23 | -95.85 |

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) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

LTE Band 5 (Channel Bandwidth 10MHz)

| Mode | TX channel 20450 (829.0MHz) | Frequency Range | 1GHz ~ 20GHz |
|---|---|---|---|
| Environmental Conditions | 25deg. C, 60%RH | Input Power | 120Vac, 60Hz |
| Tested By | Karl Lee | | |

| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1658.00 | -55.68 | -13.00 | -42.68 | 1.32 H | 184 | 40.78 | -96.46 |
| Antenna Polarity & Test Distance : Vertical at 3 m | | | | | | | | |
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1648.00 | -57.94 | -13.00 | -44.94 | 1.45 V | 37 | 38.69 | -96.63 |

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) + 20log(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 20525 (836.5MHz) | Frequency Range | 1GHz ~ 20GHz |
|---|---|---|---|
| Environmental Conditions | 25deg. C, 60%RH | Input Power | 120Vac, 60Hz |
| Tested By | Karl Lee | | |

| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1673.00 | -56.45 | -13.00 | -43.45 | 2.21 H | 19 | 39.75 | -96.20 |
| Antenna Polarity & Test Distance : Vertical at 3 m | | | | | | | | |
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1673.00 | -53.30 | -13.00 | -40.30 | 2.05 V | 121 | 42.90 | -96.20 |

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) + 20log(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 20600 (844.0MHz) | Frequency Range | 1GHz ~ 20GHz |
| Environmental Conditions | 25deg. C, 60%RH | Input Power | 120Vac, 60Hz |
| Tested By | Karl Lee | | |

| Antenna Polarity & Test Distance : Horizontal at 3 m | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1688.00 | -57.19 | -13.00 | -44.19 | 1.14 H | 49 | 38.75 | -95.94 |
| Antenna Polarity & Test Distance : Vertical at 3 m | | | | | | | | |
| No | Frequency (MHz) | ERP (dBm) | Limit (dBm) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1688.00 | -55.65 | -13.00 | -42.65 | 2.41 V | 177 | 40.29 | -95.94 |

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) + 20log(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 according to ISO/IEC 17025.

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

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