

# FCC Test Report

## (Part 90 Subpart R)

**Report No.:** RF191031C08-6

**FCC ID:** PY319400469

**Test Model:** MR5100

**Received Date:** Nov. 04, 2019

**Test Date:** Dec. 27, 2019 ~ Jan. 06, 2020

**Issued Date:** Jan. 30, 2020

**Applicant:** Netgear, Inc.

**Address:** 350 E. Plumeria Drive, San Jose CA 95134, USA

**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



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification. The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agency.

## Table of Contents

|                                                          |           |
|----------------------------------------------------------|-----------|
| <b>Release Control Record</b>                            | <b>4</b>  |
| <b>1 Certificate of Conformity</b>                       | <b>5</b>  |
| <b>2 Summary of Test Results</b>                         | <b>6</b>  |
| 2.1 Measurement Uncertainty                              | 6         |
| 2.2 Test Site and Instruments                            | 7         |
| <b>3 General Information</b>                             | <b>8</b>  |
| 3.1 General Description of EUT                           | 8         |
| 3.2 Configuration of System under Test                   | 9         |
| 3.2.1 Description of Support Units                       | 9         |
| 3.3 Test Mode Applicability and Tested Channel Detail    | 10        |
| 3.4 EUT Operating Conditions                             | 11        |
| 3.5 General Description of Applied Standards             | 11        |
| <b>4 Test Types and Results</b>                          | <b>12</b> |
| 4.1 Output Power Measurement                             | 12        |
| 4.1.1 Limits of Output Power Measurement                 | 12        |
| 4.1.2 Test Procedures                                    | 12        |
| 4.1.3 Test Setup                                         | 13        |
| 4.1.4 Test Results                                       | 14        |
| 4.2 Modulation Characteristics Measurement               | 19        |
| 4.2.1 Limits of Modulation Characteristics               | 19        |
| 4.2.2 Test Procedure                                     | 19        |
| 4.2.3 Test Setup                                         | 19        |
| 4.2.4 Test Results                                       | 19        |
| 4.3 Frequency Stability Measurement                      | 20        |
| 4.3.1 Limits of Frequency Stability Measurement          | 20        |
| 4.3.2 Test Procedure                                     | 20        |
| 4.3.3 Test Setup                                         | 20        |
| 4.3.4 Test Results                                       | 21        |
| 4.4 Occupied Bandwidth Measurement                       | 23        |
| 4.4.1 Limits of Occupied Bandwidth Measurement           | 23        |
| 4.4.2 Test Procedure                                     | 23        |
| 4.4.3 Test Setup                                         | 23        |
| 4.4.4 Test Result                                        | 24        |
| 4.5 Emission Mask Measurement                            | 26        |
| 4.5.1 Limits of Emission Mask Measurement                | 26        |
| 4.5.2 Test Procedures                                    | 26        |
| 4.5.3 Test Setup                                         | 26        |
| 4.5.4 Test Results                                       | 27        |
| 4.6 Band Edge Measurement                                | 28        |
| 4.6.1 Limits of Band Edge Measurement                    | 28        |
| 4.6.2 Test Setup                                         | 28        |
| 4.6.3 Test Procedures                                    | 28        |
| 4.6.4 Test Results                                       | 29        |
| 4.7 Peak to Average Ratio                                | 31        |
| 4.7.1 Limits of Peak to Average Ratio Measurement        | 31        |
| 4.7.2 Test Setup                                         | 31        |
| 4.7.3 Test Procedures                                    | 31        |
| 4.7.4 Test Results                                       | 32        |
| 4.8 Conducted Spurious Emissions                         | 34        |
| 4.8.1 Limits of Conducted Spurious Emissions Measurement | 34        |
| 4.8.2 Test Setup                                         | 34        |
| 4.8.3 Test Procedure                                     | 34        |
| 4.8.4 Test Results                                       | 35        |

|          |                                                                 |           |
|----------|-----------------------------------------------------------------|-----------|
| 4.9      | Radiated Emission Measurement .....                             | 39        |
| 4.9.1    | Limits of Radiated Emission Measuremen .....                    | 39        |
| 4.9.2    | Test Procedure .....                                            | 39        |
| 4.9.3    | Deviation from Test Standard .....                              | 39        |
| 4.9.4    | Test Setup.....                                                 | 40        |
| 4.9.5    | Test Results .....                                              | 41        |
| <b>5</b> | <b>Pictures of Test Arrangements.....</b>                       | <b>48</b> |
|          | <b>Appendix – Information of the Testing Laboratories .....</b> | <b>49</b> |

### Release Control Record

| Issue No.     | Description      | Date Issued   |
|---------------|------------------|---------------|
| RF191031C08-6 | Original release | Jan. 30, 2020 |

## 1 Certificate of Conformity

**Product:** 5G MHS Travel Router

**Brand:** NETGEAR

**Test Model:** MR5100

**Sample Status:** ENGINEERING SAMPLE

**Applicant:** Netgear, Inc.

**Test Date:** Dec. 27, 2019 ~ Jan. 06, 2020

**Standards:** FCC Part 90, Subpart R

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

**Prepared by :** Pettie Chen, **Date:** Jan. 30, 2020  
Pettie Chen / Senior Specialist

**Approved by :** Bruce Chen, **Date:** Jan. 30, 2020  
Bruce Chen / Senior Project Engineer

## 2 Summary of Test Results

| Applied Standard: FCC Part 90 & Part 2 |                              |        |                                                                                   |
|----------------------------------------|------------------------------|--------|-----------------------------------------------------------------------------------|
| FCC Clause                             | Test Item                    | Result | Remarks                                                                           |
| 2.1046<br>90.542 (a) (7)               | Effective Radiated Power     | Pass   | Meet the requirement of limit.                                                    |
| 2.1047                                 | Modulation Characteristics   | Pass   | Meet the requirement.                                                             |
| 2.1055<br>90.539 (d)                   | Frequency Stability          | Pass   | Meet the requirement of limit.                                                    |
| 2.1049                                 | Occupied Bandwidth (*)       | Pass   | Meet the requirement of limit.                                                    |
| 90.210 (n) & (b)                       | Emission Masks               | Pass   | Meet the requirement of limit.                                                    |
| 2.1051<br>90.543 (e) (2) & (3)         | Band Edge Measurements       | Pass   | Meet the requirement of limit.                                                    |
| 2.1051<br>90.543 (c)                   | Conducted Spurious Emissions | Pass   | Meet the requirement of limit.                                                    |
| 2.1053<br>90.543 (c) & (f)             | Radiated Spurious Emissions  | Pass   | Meet the requirement of limit.<br>Minimum passing margin is -2.7dB at 1591.00MHz. |

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

### 2.1 Measurement Uncertainty

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

| Measurement                    | Frequency        | Expanded Uncertainty (k=2) (±) |
|--------------------------------|------------------|--------------------------------|
| Radiated Emissions up to 1 GHz | 9kHz ~ 30MHz     | 3.04 dB                        |
|                                | 30MHz ~ 200MHz   | 3.59 dB                        |
|                                | 200MHz ~ 1000MHz | 3.60 dB                        |
| Radiated Emissions above 1 GHz | 1GHz ~ 18GHz     | 2.29 dB                        |
|                                | 18GHz ~ 40GHz    | 2.29 dB                        |

## 2.2 Test Site and Instruments

| Description & Manufacturer                       | Model No.                | Serial No.            | Cal. Date     | Cal. Due      |
|--------------------------------------------------|--------------------------|-----------------------|---------------|---------------|
| Test Receiver<br>ROHDE & SCHWARZ                 | ESIB7                    | 100187                | May 30, 2019  | May 29, 2020  |
| Spectrum Analyzer<br>ROHDE & SCHWARZ             | FSP40                    | 100040                | Sep. 23, 2019 | Sep. 22, 2020 |
| BILOG Antenna<br>SCHWARZBECK                     | VULB9168                 | 9168-155              | Nov. 11, 2019 | Nov. 10, 2020 |
| HORN Antenna<br>SCHWARZBECK                      | BBHA 9120D               | 9120D-1170            | Nov. 24, 2019 | Nov. 23, 2020 |
| HORN Antenna<br>SCHWARZBECK                      | BBHA 9170                | BBHA9170241           | Nov. 24, 2019 | Nov. 23, 2020 |
| Preamplifier<br>Agilent<br>(Below 1GHz)          | 8447D                    | 2944A10631            | Jul. 11, 2019 | Jul. 10, 2020 |
| Preamplifier<br>KEYSIGHT<br>(Above 1GHz)         | 83017A                   | MY53270295            | Jun. 11, 2019 | Jun. 10, 2020 |
| RF Coaxial Cable<br>WORKEN<br>With 5dB PAD       | 8D-FB                    | Cable-CH4-01          | Aug. 20, 2019 | Aug. 19, 2020 |
| RF Coaxial Cable<br>EMCI                         | EMC102-KM-KM-3000        | 150929                | Aug. 20, 2019 | Aug. 19, 2020 |
| RF Coaxial Cable<br>EMCI                         | EMC102-KM-KM-600         | 150928                | Aug. 20, 2019 | Aug. 19, 2020 |
| RF signal cable<br>HUBER+SUHNER                  | SUCOFLEX 104             | MY 13380+295012/04    | Jul. 11, 2019 | Jul. 10, 2020 |
| RF signal cable<br>HUBER+SUHNER                  | SUCOFLEX 104             | Cable-CH4-03 (250724) | Jul. 11, 2019 | Jul. 10, 2020 |
| Software<br>BV ADT                               | ADT_Radiated_V7.6.15.9.5 | NA                    | NA            | NA            |
| Antenna Tower<br>inn-co GmbH                     | MA 4000                  | 010303                | NA            | NA            |
| Antenna Tower Controller<br>BV ADT               | AT100                    | AT93021703            | NA            | NA            |
| Turn Table<br>BV ADT                             | TT100                    | TT93021703            | NA            | NA            |
| Turn Table Controller<br>BV ADT                  | SC100                    | SC93021703            | NA            | NA            |
| Boresight Antenna Fixture                        | FBA-01                   | FBA-SIP01             | NA            | NA            |
| WIT Standard Temperature<br>And Humidity Chamber | TH-4S-C                  | W981030               | Jun. 03, 2019 | Jun. 02, 2020 |
| JFW 20dB attenuation                             | 50HF-020-SMA             | NA                    | NA            | NA            |
| True RMS Clamp Meter<br>Fluke                    | 325                      | 31130711WS            | May 21, 2019  | May 20, 2020  |

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 HwaYa Chamber 4.

### 3 General Information

#### 3.1 General Description of EUT

|                     |                                                                      |                         |                     |                     |                     |
|---------------------|----------------------------------------------------------------------|-------------------------|---------------------|---------------------|---------------------|
| Product             | 5G MHS Travel Router                                                 |                         |                     |                     |                     |
| Brand               | NETGEAR                                                              |                         |                     |                     |                     |
| Test Model          | MR5100                                                               |                         |                     |                     |                     |
| Status of EUT       | Engineering Sample                                                   |                         |                     |                     |                     |
| Power Supply Rating | 5 or 9Vdc (adapter)<br>5Vdc (host equipment)<br>3.85Vdc (battery)    |                         |                     |                     |                     |
| Modulation Type     | QPSK, 16QAM, 64QAM                                                   |                         |                     |                     |                     |
| Operating Frequency | LTE Band 14                                                          | Channel Bandwidth 5MHz  | 790.5MHz ~ 795.5MHz |                     |                     |
|                     |                                                                      | Channel Bandwidth 10MHz | 793MHz              |                     |                     |
| Max. ERP Power      | LTE Band 14                                                          |                         | QPSK                | 16QAM               | 64QAM               |
|                     |                                                                      | Channel Bandwidth 5MHz  | 301.995mW (24.8dBm) | 245.471mW (23.9dBm) | 199.526mW (23.0dBm) |
|                     |                                                                      | Channel Bandwidth 10MHz | 316.228mW (25.0dBm) | 251.189mW (24.0dBm) | 204.174mW (23.1dBm) |
| Emission Designator | LTE Band 14                                                          |                         | QPSK                | 16QAM               | 64QAM               |
|                     |                                                                      | Channel Bandwidth 5MHz  | 4M49G7D             | 4M49D7W             | 4M49D7W             |
|                     |                                                                      | Channel Bandwidth 10MHz | 8M97G7D             | 8M97D7W             | 8M96D7W             |
| Antenna Type        | Refer to note                                                        |                         |                     |                     |                     |
| Antenna Connector   | Refer to note                                                        |                         |                     |                     |                     |
| Accessory Device    | Adapter x1, battery x1                                               |                         |                     |                     |                     |
| Cable Supplied      | 1m shielded USB cable without core (Brand: NIENYI, model: NYS2371-1) |                         |                     |                     |                     |

Note:

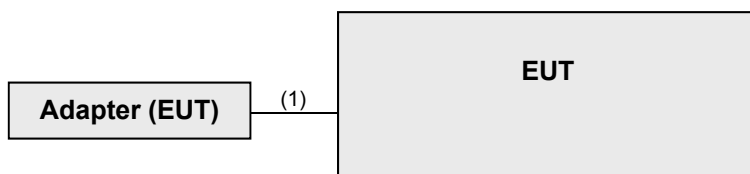
- The following antennas were provided to the EUT.

|                    |             |      |
|--------------------|-------------|------|
| Antenna Type       | monopole    |      |
| Antenna Connector  | NA          |      |
| Antenna Gain (dBi) | LTE Band 14 | 0.67 |

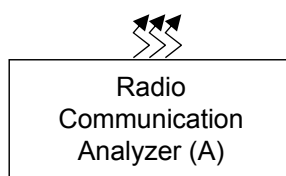
- The EUT must be supplied with a power adapter or battery as following table:

| Items   | Brand   | Model No. | Spec.                                                                |
|---------|---------|-----------|----------------------------------------------------------------------|
| Adapter | NETGEAR | AD2122F20 | Input: 100-240Vac~50/60Hz, 0.5A<br>Output: 5Vdc / 2.0A or 9Vdc /1.8A |
| Battery | NETGEAR | W-20      | 3.85Vdc, 19.40Wh                                                     |

### 3.2 Configuration of System under Test



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 | MT8860C   | 1702001    | NA     | -       |

Note:

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

| ID | Descriptions | Qty. | Length (m) | Shielding (Yes/No) | Cores (Qty.) | Remarks          |
|----|--------------|------|------------|--------------------|--------------|------------------|
| 1. | USB cable    | 1    | 1          | Y                  | 0            | 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 X-plane. Following channel(s) was (were) selected for the final test as listed below:

| EUT Configure Mode | Test item                    | Available channel | Tested channel                                          | Channel Bandwidth | Modulation           | Mode                                                           |
|--------------------|------------------------------|-------------------|---------------------------------------------------------|-------------------|----------------------|----------------------------------------------------------------|
| -                  | ERP                          | 23305 to 23355    | 23305(790.5MHz),<br>23330(793.0MHz),<br>23355(795.5MHz) | 5MHz              | QPSK / 16QAM / 64QAM | 1 RB / 0 RB Offset                                             |
|                    |                              | 23330             | 23330(793.0MHz)                                         | 10MHz             | QPSK / 16QAM / 64QAM | Full RB                                                        |
| -                  | Modulation Characteristics   | 23330             | 23330(793.0MHz)                                         | 10MHz             | QPSK / 16QAM / 64QAM | Full RB                                                        |
| -                  | Frequency Stability          | 23305 to 23355    | 23305(790.5MHz),<br>23355(795.5MHz)                     | 5MHz              | QPSK                 | Full RB                                                        |
|                    |                              | 23330             | 23330(793.0MHz)                                         | 10MHz             | QPSK                 | Full RB                                                        |
| -                  | Occupied Bandwidth           | 23305 to 23355    | 23305(790.5MHz),<br>23330(793.0MHz),<br>23355(795.5MHz) | 5MHz              | QPSK / 16QAM / 64QAM | Full RB                                                        |
|                    |                              | 23330             | 23330(793.0MHz)                                         | 10MHz             | QPSK / 16QAM / 64QAM | Full RB                                                        |
| -                  | Emission Mask                | 23305 to 23355    | 23305(790.5MHz),<br>23330(793.0MHz),<br>23355(795.5MHz) | 5MHz              | QPSK                 | Full RB                                                        |
|                    |                              | 23330             | 23330(793.0MHz)                                         | 10MHz             | QPSK                 | Full RB                                                        |
| -                  | Band Edge                    | 23305 to 23355    | 23305(790.5MHz),<br>23330(793.0MHz),<br>23355(795.5MHz) | 5MHz              | QPSK                 | 1 RB / 0 RB Offset<br>1 RB / 24 RB Offset<br>25RB / 0RB Offset |
|                    |                              | 23330             | 23330(793.0MHz)                                         | 10MHz             | QPSK                 | 1 RB / 0 RB Offset<br>1 RB / 49 RB Offset<br>50RB / 0RB Offset |
| -                  | Conducted Emission           | 23305 to 23355    | 23305(790.5MHz),<br>23330(793.0MHz),<br>23355(795.5MHz) | 5MHz              | QPSK                 | 1 RB / 0 RB Offset                                             |
|                    |                              | 23330             | 23330(793.0MHz)                                         | 10MHz             | QPSK                 | 1 RB / 0 RB Offset                                             |
| -                  | Radiated Emission below 1GHz | 23330             | 23330(793.0MHz)                                         | 5MHz, 10MHz       | QPSK                 | 1 RB / 0 RB Offset                                             |
| -                  | Radiated Emission above 1GHz | 23305 to 23355    | 23305(790.5MHz),<br>23330(793.0MHz),<br>23355(795.5MHz) | 5MHz              | QPSK                 | 1 RB / 0 RB Offset                                             |
|                    |                              | 23330             | 23330(793.0MHz)                                         | 10MHz             | QPSK                 | 1 RB / 0 RB Offset                                             |

Note: The conducted output power for QPSK, 16QAM and 64QAM measured value of QPSK is higher than 16QAM and 64QAM mode. Therefore, only Modulation Characteristics, Emission Bandwidth and Peak to average ratio items had been tested under QPSK, 16QAM and 64QAM modes, the other test items were performed under QPSK mode only.

### **Test Condition:**

| Test Item                  | Environmental Conditions | Input Power  | Tested By              |
|----------------------------|--------------------------|--------------|------------------------|
| ERP                        | 25deg. C, 70%RH          | 120Vac, 60Hz | Noah Chang             |
| Modulation characteristics | 24deg. C, 64%RH          | 120Vac, 60Hz | James Yang             |
| Frequency Stability        | 24deg. C, 64%RH          | 3.85Vdc      | James Yang             |
| Occupied Bandwidth         | 24deg. C, 64%RH          | 120Vac, 60Hz | James Yang             |
| Emission Mask              | 24deg. C, 64%RH          | 120Vac, 60Hz | James Yang             |
| Band Edge                  | 24deg. C, 64%RH          | 120Vac, 60Hz | James Yang             |
| Conducted Emission         | 24deg. C, 64%RH          | 120Vac, 60Hz | James Yang             |
| Radiated Emission          | 25deg. C, 70%RH          | 120Vac, 60Hz | Noah Chang<br>Luis 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**

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

**FCC 47 CFR Part 2**

**FCC 47 CFR Part 90**

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

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

**ANSI 63.26-2015**

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

## 4 Test Types and Results

### 4.1 Output Power Measurement

#### 4.1.1 Limits of Output Power Measurement

Portable stations (hand-held devices) transmitting in the 758-768 MHz band and the 788-798 MHz band are limited to 3 watts ERP.

#### 4.1.2 Test Procedures

##### EIRP / ERP Measurement:

- All measurements were done at low, middle and high operational frequency range. RBW and VBW is 10MHz for LTE mode.
- Substitution method is used for E.I.R.P measurement. 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.
- The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step b. Record the power level of S.G
- $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$ . E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole,  $E.R.P \text{ power} = E.I.R.P \text{ power} - 2.15\text{dBi}$ .

Where:

$$ERP/EIRP = P_{Meas} + G_T - L_C$$

$P_{Meas}$  : Measure transmitter output power.

$G_T$  : Gain of the transmitting antenna.

$L_C$  : signal attenuation in the connecting cable between the transmitter and antenna.

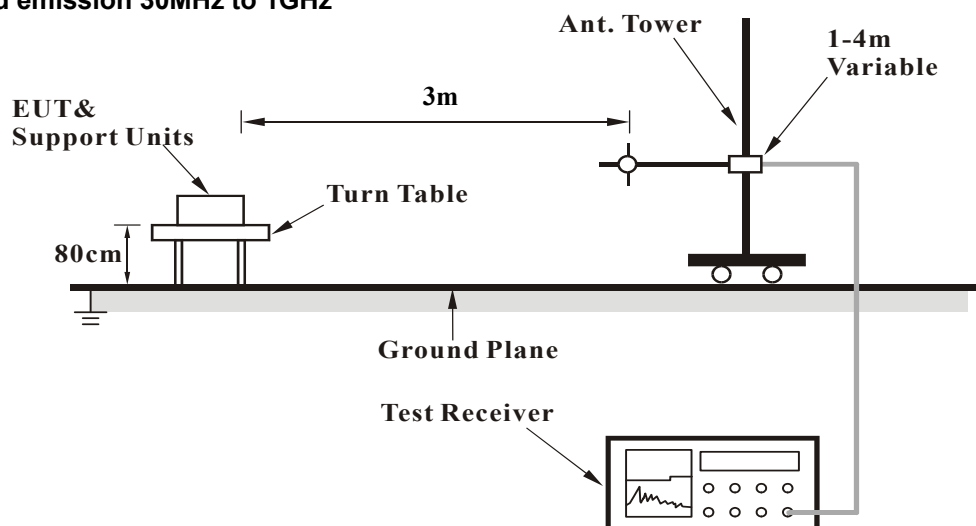
##### Conducted Power Measurement:

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

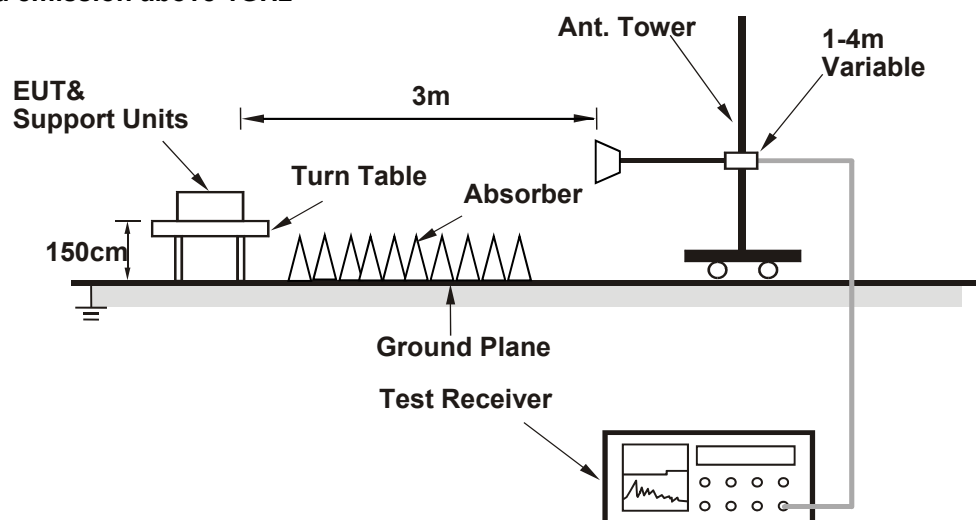
### 4.1.3 Test Setup

EIRP / ERP Measurement:

**For radiated emission 30MHz to 1GHz**

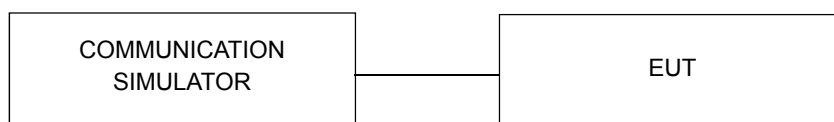


**For radiated emission above 1GHz**



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

Conducted Power Measurement:



#### 4.1.4 Test Results

Conducted Output Power (dBm)

| LTE Band 14 |           |                 |           |       |       |       |               |
|-------------|-----------|-----------------|-----------|-------|-------|-------|---------------|
| BW          | MCS Index | RB Size         | RB Offset | Low   | Mid   | High  | 3GPP MPR (dB) |
|             |           | Channel         |           | 23305 | 23330 | 23355 |               |
|             |           | Frequency (MHz) |           | 790.5 | 793   | 795.5 |               |
| 5M          | QPSK      | 1               | 0         | 22.65 | 22.90 | 22.76 | 0             |
|             |           | 1               | 12        | 22.78 | 23.03 | 22.89 | 0             |
|             |           | 1               | 24        | 22.83 | 23.08 | 22.94 | 0             |
|             |           | 12              | 0         | 21.75 | 22.00 | 21.86 | 1             |
|             |           | 12              | 6         | 21.85 | 22.10 | 21.96 | 1             |
|             |           | 12              | 13        | 21.86 | 22.11 | 21.97 | 1             |
|             |           | 25              | 0         | 21.74 | 21.99 | 21.85 | 1             |
|             | 16QAM     | 1               | 0         | 21.61 | 21.86 | 21.72 | 1             |
|             |           | 1               | 12        | 21.74 | 21.99 | 21.85 | 1             |
|             |           | 1               | 24        | 21.79 | 22.04 | 21.90 | 1             |
|             |           | 12              | 0         | 20.71 | 20.96 | 20.82 | 2             |
|             |           | 12              | 6         | 20.81 | 21.06 | 20.92 | 2             |
|             |           | 12              | 13        | 20.82 | 21.07 | 20.93 | 2             |
|             |           | 25              | 0         | 20.70 | 20.95 | 20.81 | 2             |
|             | 64QAM     | 1               | 0         | 20.56 | 20.81 | 20.67 | 2             |
|             |           | 1               | 12        | 20.69 | 20.94 | 20.80 | 2             |
|             |           | 1               | 24        | 20.74 | 20.99 | 20.85 | 2             |
|             |           | 12              | 0         | 19.66 | 19.91 | 19.77 | 3             |
|             |           | 12              | 6         | 19.76 | 20.01 | 19.87 | 3             |
|             |           | 12              | 13        | 19.77 | 20.02 | 19.88 | 3             |
|             |           | 25              | 0         | 19.65 | 19.90 | 19.76 | 3             |

| LTE Band 14 |           |                 |           |       |               |
|-------------|-----------|-----------------|-----------|-------|---------------|
| BW          | MCS Index | RB Size         | RB Offset | Mid   | 3GPP MPR (dB) |
|             |           | Channel         |           | 23330 |               |
|             |           | Frequency (MHz) |           | 793   |               |
| 10M         | QPSK      | 1               | 0         | 22.96 | 0             |
|             |           | 1               | 12        | 23.09 | 0             |
|             |           | 1               | 24        | 23.14 | 0             |
|             |           | 12              | 0         | 22.06 | 1             |
|             |           | 12              | 6         | 22.16 | 1             |
|             |           | 12              | 13        | 22.17 | 1             |
|             |           | 25              | 0         | 22.05 | 1             |
|             | 16QAM     | 1               | 0         | 21.92 | 1             |
|             |           | 1               | 12        | 22.05 | 1             |
|             |           | 1               | 24        | 22.10 | 1             |
|             |           | 12              | 0         | 21.02 | 2             |
|             |           | 12              | 6         | 21.12 | 2             |
|             |           | 12              | 13        | 21.13 | 2             |
|             |           | 25              | 0         | 21.01 | 2             |
|             | 64QAM     | 1               | 0         | 20.90 | 2             |
|             |           | 1               | 12        | 21.03 | 2             |
|             |           | 1               | 24        | 21.08 | 2             |
|             |           | 12              | 0         | 20.00 | 3             |
|             |           | 12              | 6         | 20.10 | 3             |
|             |           | 12              | 13        | 20.11 | 3             |
|             |           | 25              | 0         | 19.99 | 3             |

# ERP Power

Modulation Type: QPSK

LTE Band 14, Channel Bandwidth: 5MHz

|                                                     |             |                  |                       |                        |           |             |             |
|-----------------------------------------------------|-------------|------------------|-----------------------|------------------------|-----------|-------------|-------------|
| Mode                                                |             | TX channel 23305 |                       |                        |           |             |             |
| Antenna Polarity & Test Distance: Horizontal at 3 M |             |                  |                       |                        |           |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBm)    | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 790.50      | -6.2             | 25.0                  | -0.3                   | 24.7      | 34.8        | -10.1       |
| Antenna Polarity & Test Distance: Vertical at 3 M   |             |                  |                       |                        |           |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBm)    | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 790.50      | -13.1            | 18.9                  | -0.3                   | 18.6      | 34.8        | -16.2       |

|                                                     |             |                  |                       |                        |           |             |             |
|-----------------------------------------------------|-------------|------------------|-----------------------|------------------------|-----------|-------------|-------------|
| Mode                                                |             | TX channel 23330 |                       |                        |           |             |             |
| Antenna Polarity & Test Distance: Horizontal at 3 M |             |                  |                       |                        |           |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBm)    | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 793.00      | -6.4             | 24.7                  | -0.2                   | 24.5      | 34.8        | -10.3       |
| Antenna Polarity & Test Distance: Vertical at 3 M   |             |                  |                       |                        |           |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBm)    | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 793.00      | -13.4            | 18.5                  | -0.2                   | 18.3      | 34.8        | -16.5       |

|                                                     |             |                  |                       |                        |           |             |             |
|-----------------------------------------------------|-------------|------------------|-----------------------|------------------------|-----------|-------------|-------------|
| Mode                                                |             | TX channel 23355 |                       |                        |           |             |             |
| Antenna Polarity & Test Distance: Horizontal at 3 M |             |                  |                       |                        |           |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBm)    | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 795.50      | -5.9             | 25.0                  | -0.2                   | 24.8      | 34.8        | -10.0       |
| Antenna Polarity & Test Distance: Vertical at 3 M   |             |                  |                       |                        |           |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBm)    | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 795.50      | -13.2            | 18.7                  | -0.2                   | 18.5      | 34.8        | -16.3       |

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 14, Channel Bandwidth: 10MHz

|                                                     |             |                  |                       |                        |           |             |             |
|-----------------------------------------------------|-------------|------------------|-----------------------|------------------------|-----------|-------------|-------------|
| Mode                                                |             | TX channel 23330 |                       |                        |           |             |             |
| Antenna Polarity & Test Distance: Horizontal at 3 M |             |                  |                       |                        |           |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBm)    | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 793.00      | -5.9             | 25.2                  | -0.2                   | 25.0      | 34.8        | -9.8        |
| Antenna Polarity & Test Distance: Vertical at 3 M   |             |                  |                       |                        |           |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBm)    | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 793.00      | -12.9            | 19.1                  | -0.2                   | 18.9      | 34.8        | -15.9       |

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).



### Modulation Type: 64QAM

LTE Band 14, Channel Bandwidth: 5MHz

|                                                     |             |                  |                       |                        |           |             |             |
|-----------------------------------------------------|-------------|------------------|-----------------------|------------------------|-----------|-------------|-------------|
| Mode                                                |             | TX channel 23305 |                       |                        |           |             |             |
| Antenna Polarity & Test Distance: Horizontal at 3 M |             |                  |                       |                        |           |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBm)    | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 790.50      | -7.9             | 23.3                  | -0.3                   | 23.0      | 34.8        | -11.8       |
| Antenna Polarity & Test Distance: Vertical at 3 M   |             |                  |                       |                        |           |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBm)    | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 790.50      | -14.9            | 17.2                  | -0.3                   | 16.9      | 34.8        | -17.9       |

|                                                     |             |                  |                       |                        |           |             |             |
|-----------------------------------------------------|-------------|------------------|-----------------------|------------------------|-----------|-------------|-------------|
| Mode                                                |             | TX channel 23330 |                       |                        |           |             |             |
| Antenna Polarity & Test Distance: Horizontal at 3 M |             |                  |                       |                        |           |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBm)    | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 793.00      | -8.1             | 23.0                  | -0.2                   | 22.8      | 34.8        | -12.0       |
| Antenna Polarity & Test Distance: Vertical at 3 M   |             |                  |                       |                        |           |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBm)    | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 793.00      | -15.1            | 16.8                  | -0.2                   | 16.6      | 34.8        | -18.2       |

|                                                     |             |                  |                       |                        |           |             |             |
|-----------------------------------------------------|-------------|------------------|-----------------------|------------------------|-----------|-------------|-------------|
| Mode                                                |             | TX channel 23355 |                       |                        |           |             |             |
| Antenna Polarity & Test Distance: Horizontal at 3 M |             |                  |                       |                        |           |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBm)    | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 795.50      | -7.9             | 23.0                  | -0.2                   | 22.8      | 34.8        | -12.0       |
| Antenna Polarity & Test Distance: Vertical at 3 M   |             |                  |                       |                        |           |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBm)    | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 795.50      | -15.4            | 16.6                  | -0.2                   | 16.4      | 34.8        | -18.4       |

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 14, Channel Bandwidth: 10MHz

|                                                     |             |                  |                       |                        |           |             |             |
|-----------------------------------------------------|-------------|------------------|-----------------------|------------------------|-----------|-------------|-------------|
| Mode                                                |             | TX channel 23330 |                       |                        |           |             |             |
| Antenna Polarity & Test Distance: Horizontal at 3 M |             |                  |                       |                        |           |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBm)    | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 793.00      | -7.8             | 23.3                  | -0.2                   | 23.1      | 34.8        | -11.7       |
| Antenna Polarity & Test Distance: Vertical at 3 M   |             |                  |                       |                        |           |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBm)    | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 793.00      | -15.6            | 16.4                  | -0.2                   | 16.2      | 34.8        | -18.6       |

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

## 4.2 Modulation Characteristics Measurement

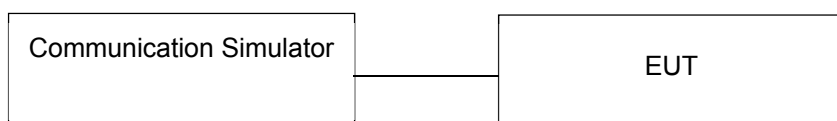
### 4.2.1 Limits of Modulation Characteristics

N/A

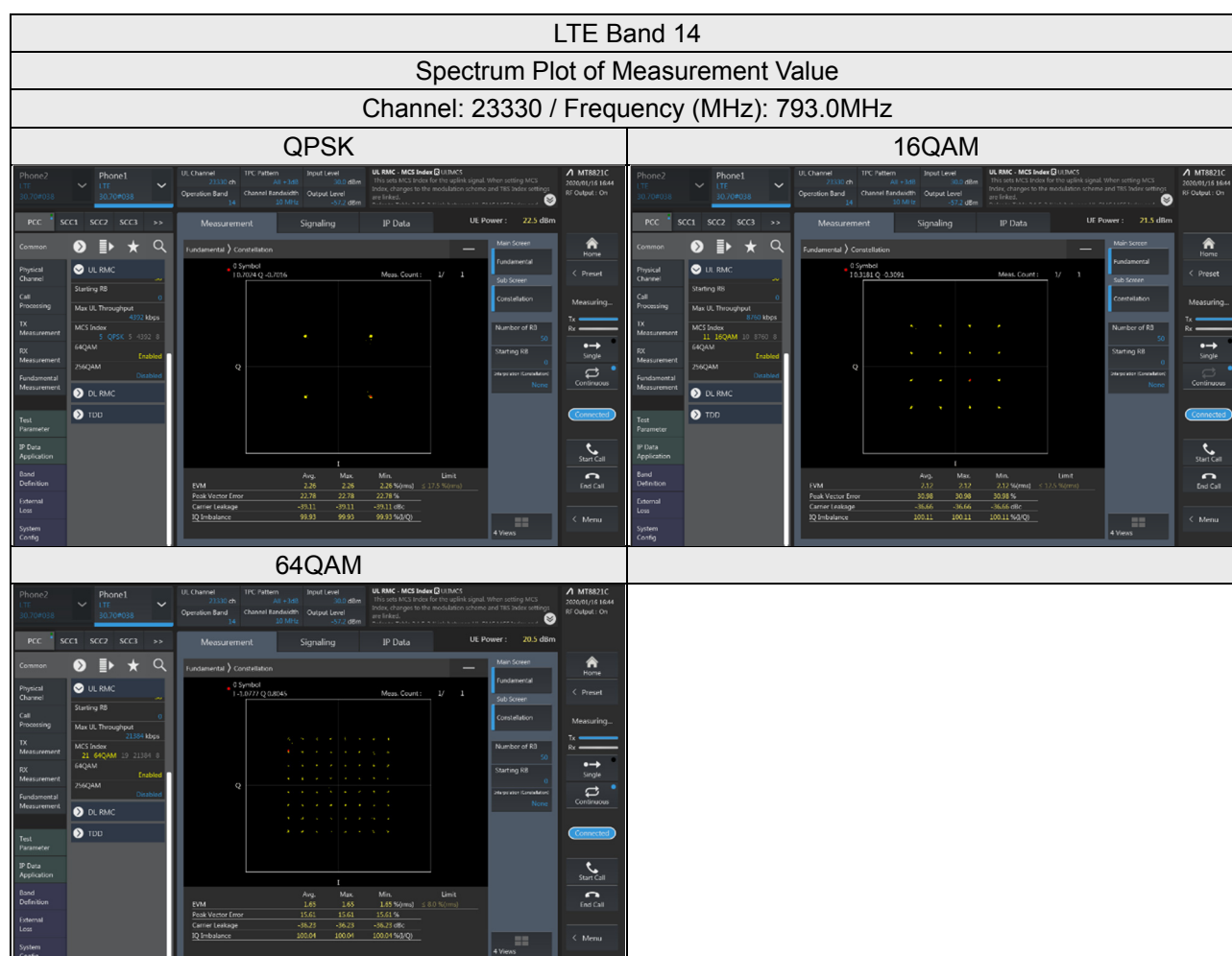
### 4.2.2 Test Procedure

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

### 4.2.3 Test Setup



### 4.2.4 Test Results



### 4.3 Frequency Stability Measurement

#### 4.3.1 Limits of Frequency Stability Measurement

The frequency stability of mobile, portable and control transmitters operating in the wideband segment must be 1.25 parts per million or better.

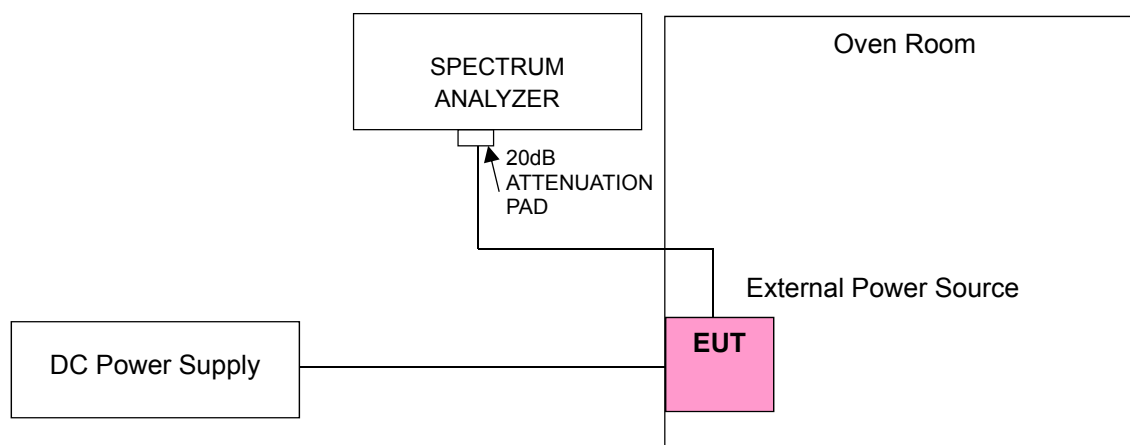
According to the FCC part 2.1055 shall be tested the frequency stability. The rule is defined that "The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block." The test extreme voltage is according to the 2.1055(d)(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment and the extreme temperature rule is comply with specification of EUT  $-30^{\circ}\text{C} \sim 50^{\circ}\text{C}$ .

#### 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 14              |                       |                 |                       |
|--------------------|--------------------------|-----------------------|-----------------|-----------------------|
|                    | Channel Bandwidth: 5 MHz |                       |                 |                       |
|                    | Low Channel              |                       | High Channel    |                       |
|                    | Frequency (MHz)          | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| 3.4                | 790.500001               | 0.002                 | 795.500000      | 0.004                 |
| 3.85               | 790.500003               | 0.004                 | 795.500000      | 0.003                 |
| 4.4                | 790.500004               | 0.004                 | 795.500000      | 0.001                 |

Note: The applicant defined the normal working voltage is from 3.4Vdc to 4.4Vdc.

##### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 14              |                       |                 |                       |
|------------|--------------------------|-----------------------|-----------------|-----------------------|
|            | Channel Bandwidth: 5 MHz |                       |                 |                       |
|            | Low Channel              |                       | High Channel    |                       |
|            | Frequency (MHz)          | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| -30        | 790.500003               | 0.004                 | 795.500000      | 0.004                 |
| -20        | 790.500004               | 0.005                 | 795.500000      | 0.005                 |
| -10        | 790.500001               | 0.002                 | 795.500000      | 0.004                 |
| 0          | 790.500004               | 0.004                 | 795.500000      | 0.003                 |
| 10         | 790.500001               | 0.002                 | 795.500000      | 0.005                 |
| 20         | 790.499998               | -0.003                | 795.500000      | -0.004                |
| 30         | 790.499997               | -0.004                | 795.500000      | -0.002                |
| 40         | 790.499999               | -0.002                | 795.500000      | -0.002                |
| 50         | 790.499998               | -0.003                | 795.500000      | -0.005                |

### Frequency Error vs. Voltage

| Voltage<br>(Volts) | LTE Band 14               |                       |
|--------------------|---------------------------|-----------------------|
|                    | Channel Bandwidth: 10 MHz |                       |
|                    | Frequency (MHz)           | Frequency Error (ppm) |
| 3.4                | 793.000003                | 0.003                 |
| 3.85               | 793.000001                | 0.001                 |
| 4.4                | 793.000003                | 0.004                 |

Note: The applicant defined the normal working voltage is from 3.4Vdc to 4.4Vdc.

### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 14               |                       |
|------------|---------------------------|-----------------------|
|            | Channel Bandwidth: 10 MHz |                       |
|            | Frequency (MHz)           | Frequency Error (ppm) |
| -30        | 793.000004                | 0.005                 |
| -20        | 793.000002                | 0.003                 |
| -10        | 793.000002                | 0.002                 |
| 0          | 793.000003                | 0.004                 |
| 10         | 793.000003                | 0.004                 |
| 20         | 792.999998                | -0.002                |
| 30         | 792.999998                | -0.002                |
| 40         | 792.999997                | -0.004                |
| 50         | 792.999998                | -0.003                |

## 4.4 Occupied Bandwidth Measurement

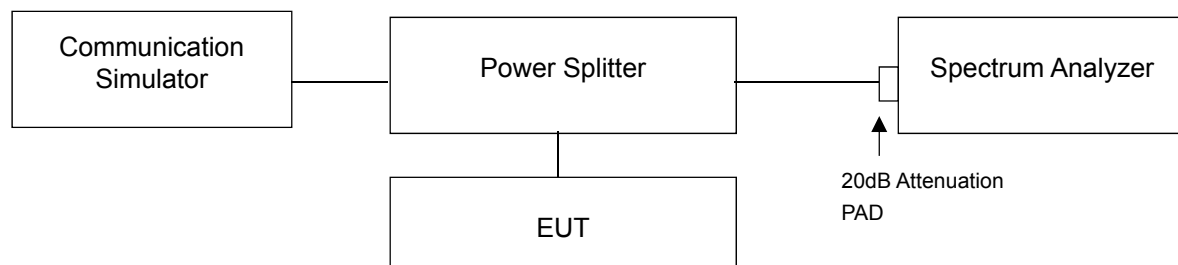
### 4.4.1 Limits of Occupied Bandwidth Measurement

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, RB of the spectrum is 1% of occupied bandwidth and VB of the spectrum is 3 times RBW. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

### 4.4.3 Test Setup



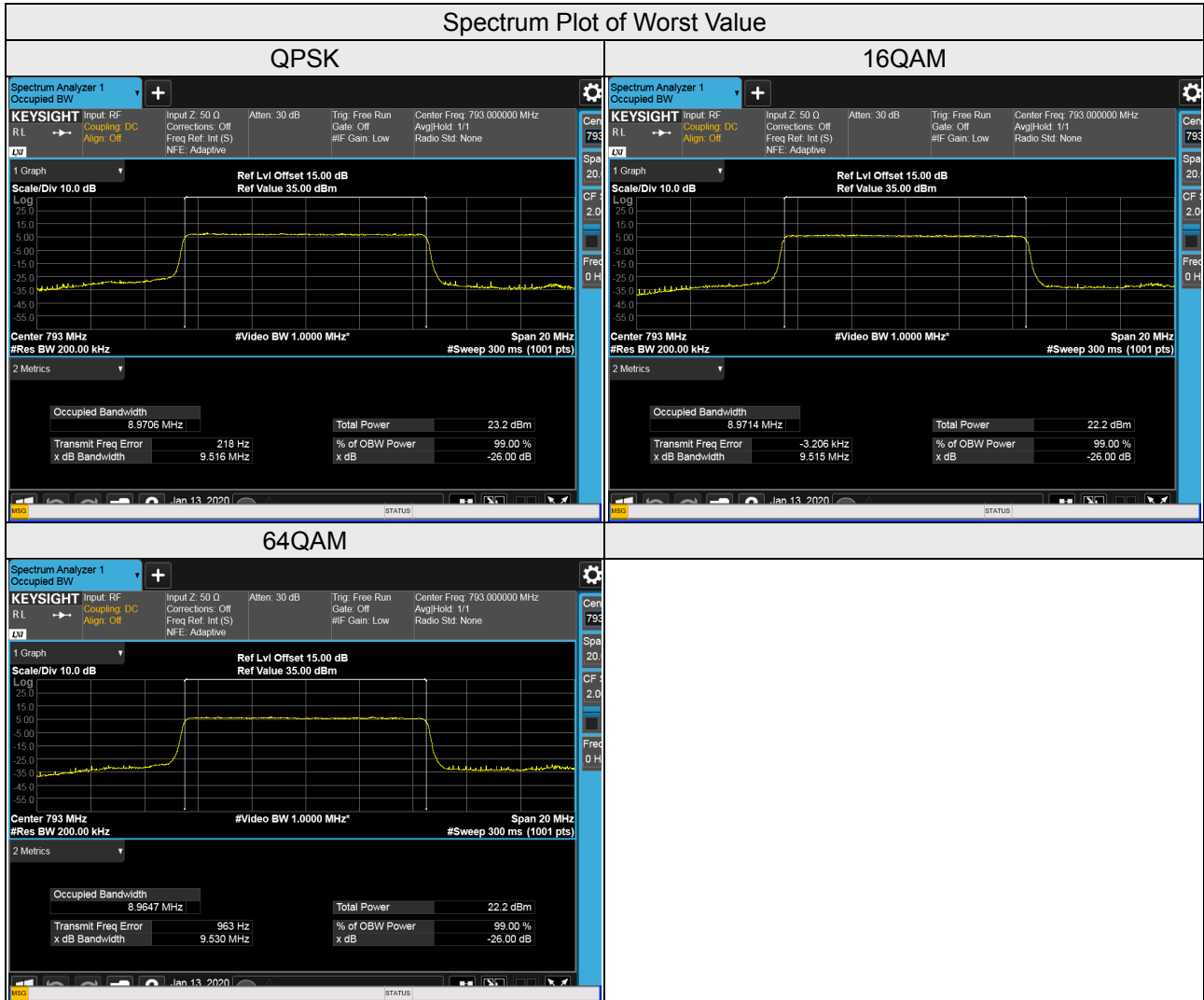
#### 4.4.4 Test Result

##### LTE Band 14

| LTE Band 14, Channel Bandwidth 5MHz |                 |                              |       |       |
|-------------------------------------|-----------------|------------------------------|-------|-------|
| Channel                             | Frequency (MHz) | 99% Occupied Bandwidth (MHz) |       |       |
|                                     |                 | QPSK                         | 16QAM | 64QAM |
| 23305                               | 790.5           | 4.49                         | 4.49  | 4.49  |
| 23330                               | 793             | 4.49                         | 4.49  | 4.49  |
| 23355                               | 795.5           | 4.49                         | 4.49  | 4.49  |



| LTE Band 14, Channel Bandwidth 10MHz |                 |                              |       |       |
|--------------------------------------|-----------------|------------------------------|-------|-------|
| Channel                              | Frequency (MHz) | 99% Occupied Bandwidth (MHz) |       |       |
|                                      |                 | QPSK                         | 16QAM | 64QAM |
| 23330                                | 793             | 8.97                         | 8.97  | 8.96  |



## 4.5 Emission Mask Measurement

### 4.5.1 Limits of Emission Mask Measurement

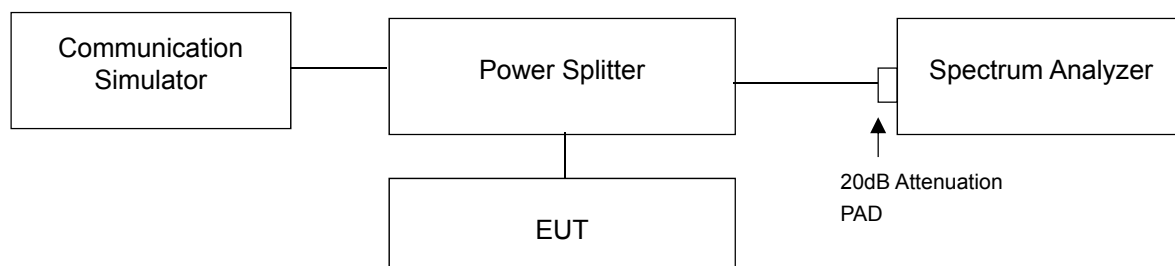
Per 90.210(n), Emission mask shall comply with 90.210(b)

- (1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.
- (2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.
- (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least  $43 + 10 \log (P)$  dB

### 4.5.2 Test Procedures

- a. The measurement used the power splitter via EUT RF power connector between signal generator and spectrum analyzer.
- b. Record the test plot.

### 4.5.3 Test Setup



#### 4.5.4 Test Results

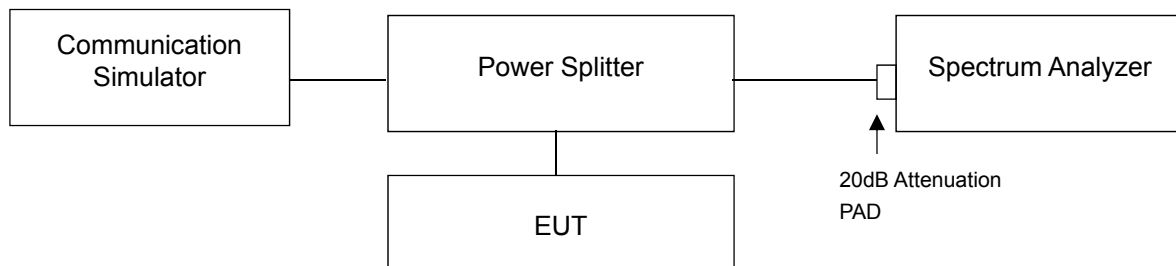


## 4.6 Band Edge Measurement

### 4.6.1 Limits of Band Edge Measurement

- (1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than  $65 + 10 \log (P)$  dB in a 6.25 kHz band segment, for mobile and portable stations.
- (2) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least  $43 + 10 \log (P)$  dB.

### 4.6.2 Test Setup

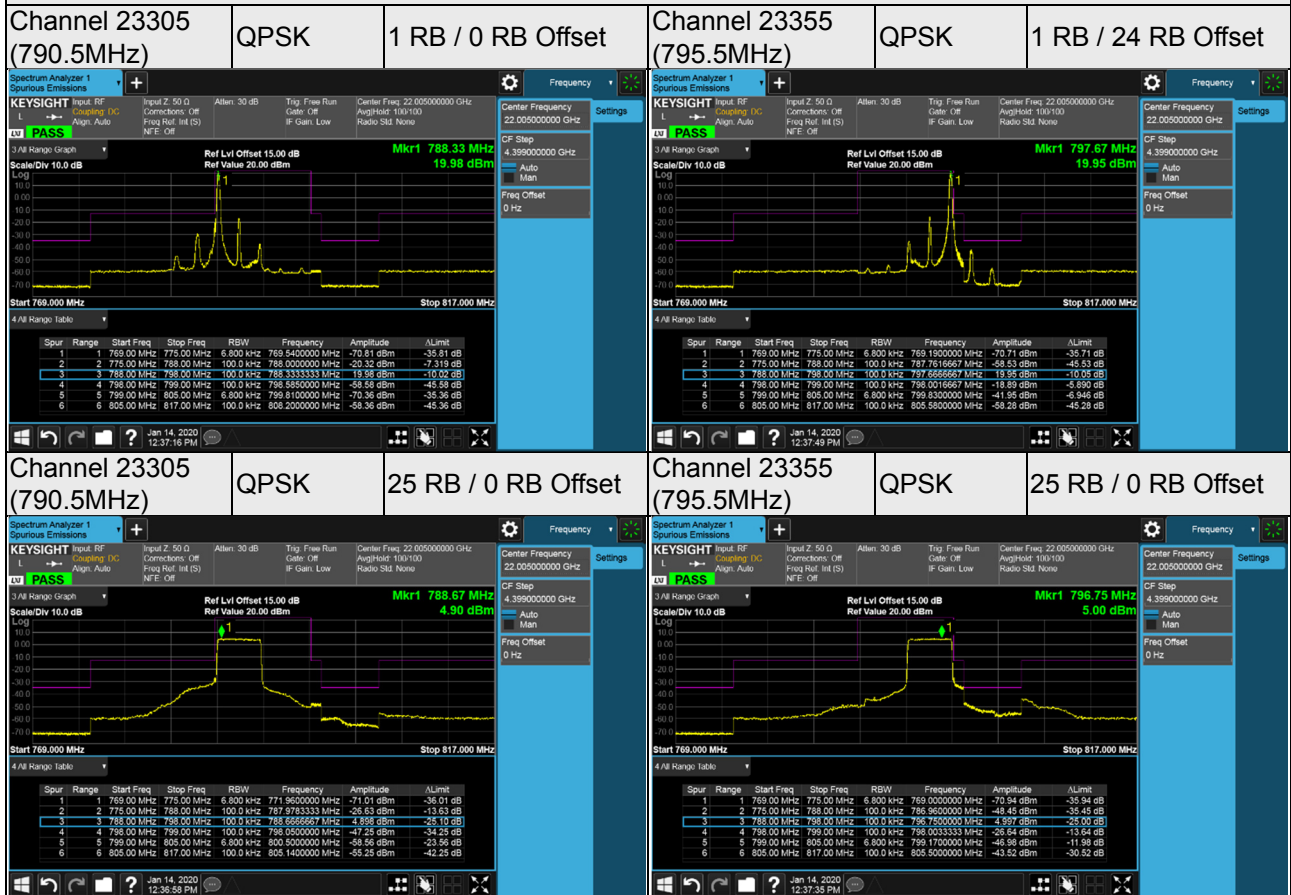


### 4.6.3 Test Procedures

- a. All measurements were done at low, middle and high operational frequency range.
- b. The band edge measurement used the power splitter via EUT RF power connector between signal generator and spectrum analyzer. This splitter loss, attenuator loss and cable loss are the worst loss 21 dB in the transmitted path track.
- c. Record the max trace plot into the test report.

## 4.6.4 Test Results

### LTE Band 14, Channel Bandwidth 5MHz



# LTE Band 14, Channel Bandwidth 10MHz

Channel 23330  
(793.0MHz)

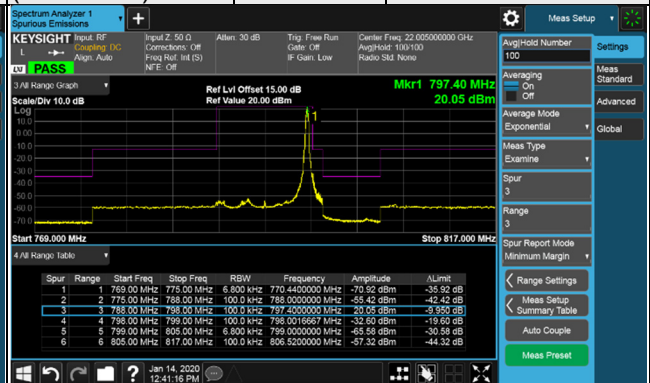
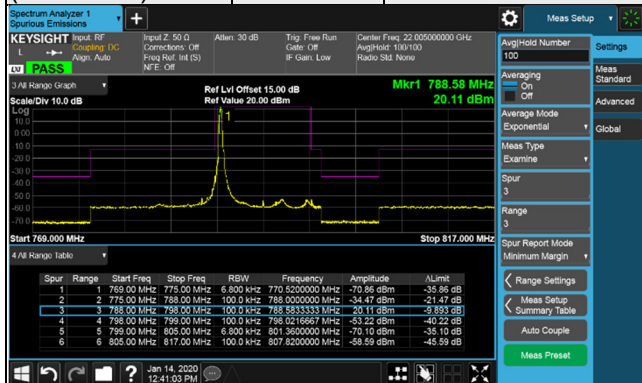
QPSK

1 RB / 0 RB Offset

Channel 23330  
(793.0MHz)

QPSK

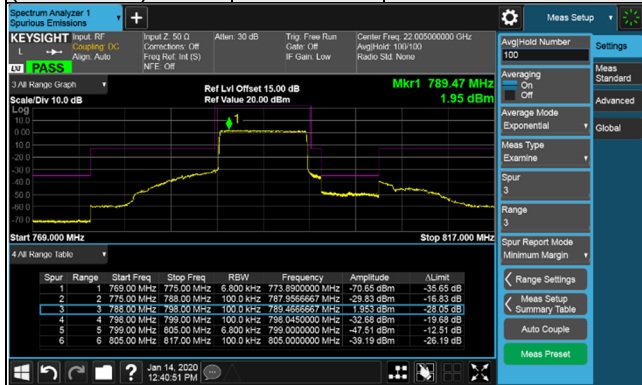
1 RB / 49 RB Offset



Channel 23330  
(793.0MHz)

QPSK

50 RB / 0 RB Offset

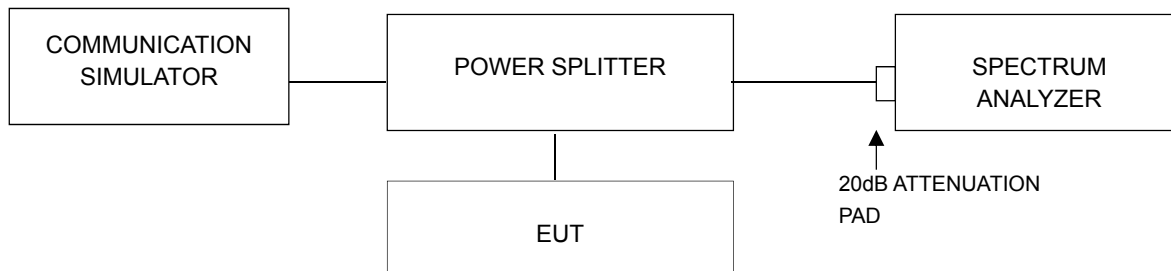


## 4.7 Peak to Average Ratio

### 4.7.1 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

### 4.7.2 Test Setup



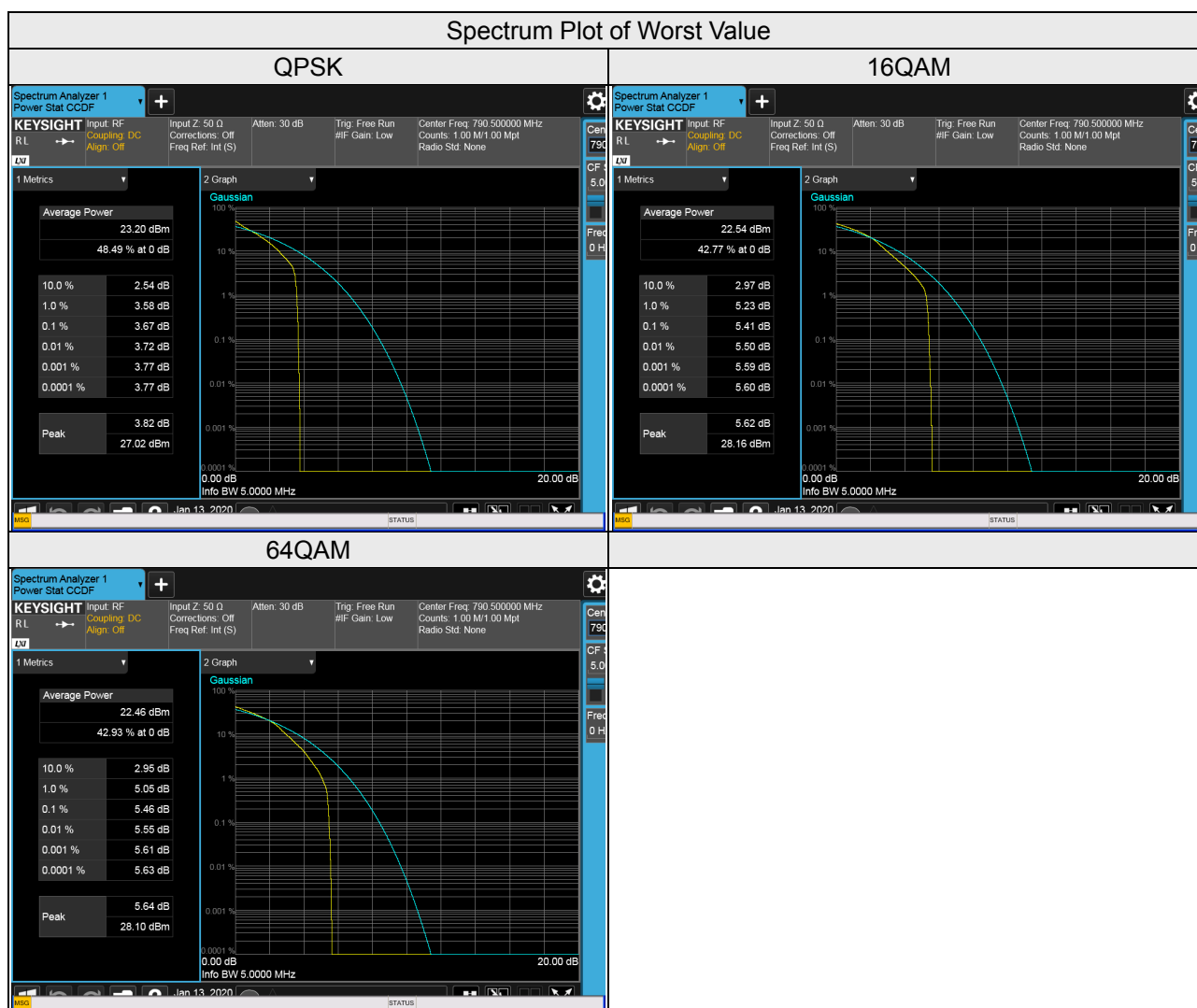
### 4.7.3 Test Procedures

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

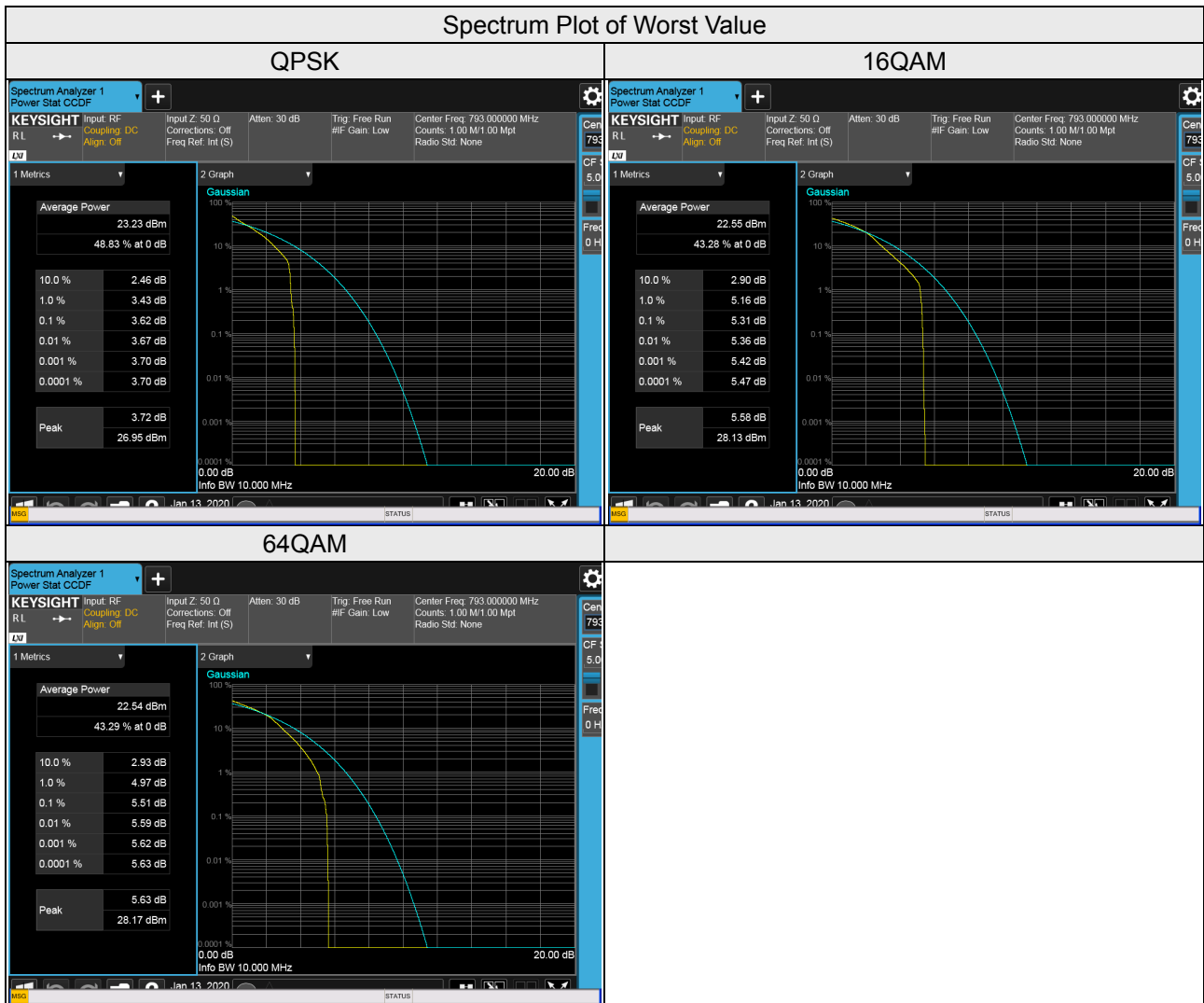
## 4.7.4 Test Results

### LTE Band 14

| LTE Band 14, Channel Bandwidth 5MHz |                 |                            |       |       |
|-------------------------------------|-----------------|----------------------------|-------|-------|
| Channel                             | Frequency (MHz) | Peak To Average Ratio (dB) |       |       |
|                                     |                 | QPSK                       | 16QAM | 64QAM |
| 23305                               | 790.5           | 3.67                       | 5.41  | 5.46  |
| 23330                               | 793             | 3.56                       | 5.32  | 5.29  |
| 23355                               | 795.5           | 3.56                       | 5.24  | 5.28  |



| LTE Band 14, Channel Bandwidth 10MHz |                 |                            |       |       |
|--------------------------------------|-----------------|----------------------------|-------|-------|
| Channel                              | Frequency (MHz) | Peak To Average Ratio (dB) |       |       |
|                                      |                 | QPSK                       | 16QAM | 64QAM |
| 23330                                | 793             | 3.62                       | 5.31  | 5.51  |

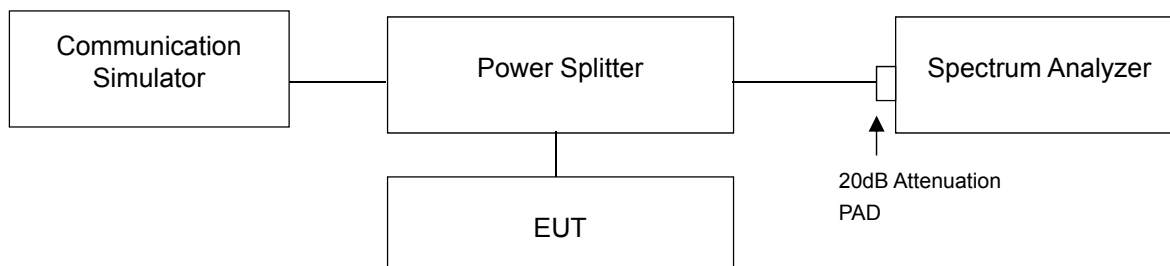


## 4.8 Conducted Spurious Emissions

### 4.8.1 Limits of Conducted Spurious Emissions Measurement

On any frequency outside of the frequency ranges covered by the ACP tables in this section, the power of any emission must be reduced below the mean output power (P) by at least  $43 + 10\log(P)$  dB measured in a 100 kHz bandwidth for frequencies less than 1 GHz, and in a 1 MHz bandwidth for frequencies greater than 1 GHz.

### 4.8.2 Test Setup



### 4.8.3 Test Procedure

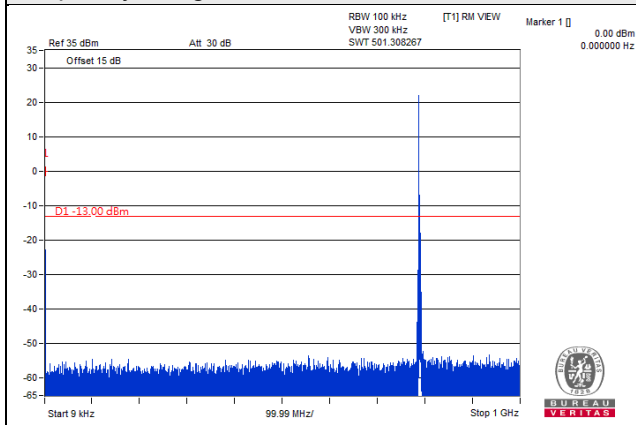
- The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- Measuring frequency range is from 9 kHz to 8GHz. 10 dB attenuation pad is connected with spectrum. RBW = 100 kHz and VBW = 300 kHz for 9 kHz to 1 GHz and RBW = 1 MHz and VBW = 3 MHz for 1 GHz to 8GHz are used for conducted emission measurement.

#### 4.8.4 Test Results

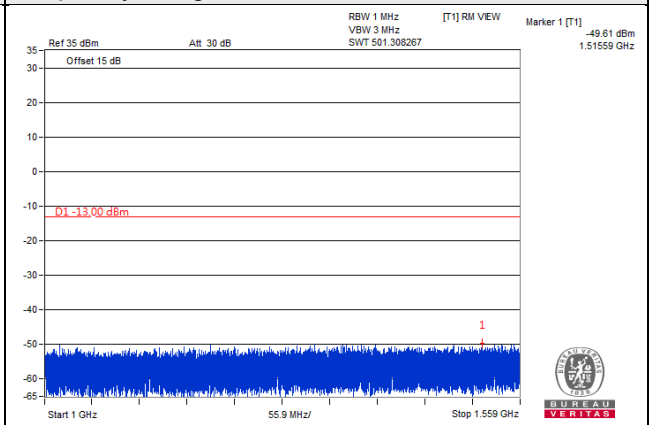
Channel Band width: 5MHz

Channel 23305 (790.5MHz)

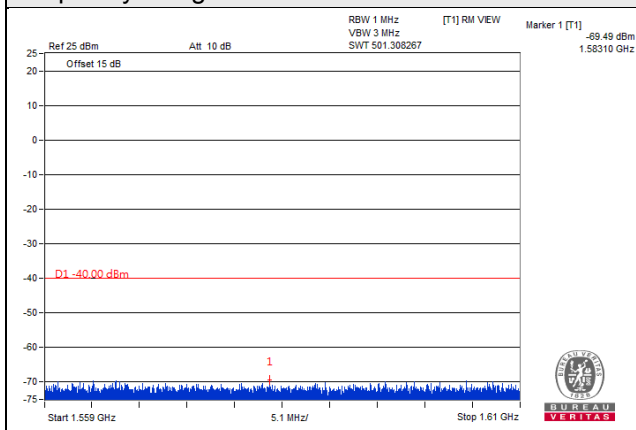
Frequency Range : 9kHz~1GHz



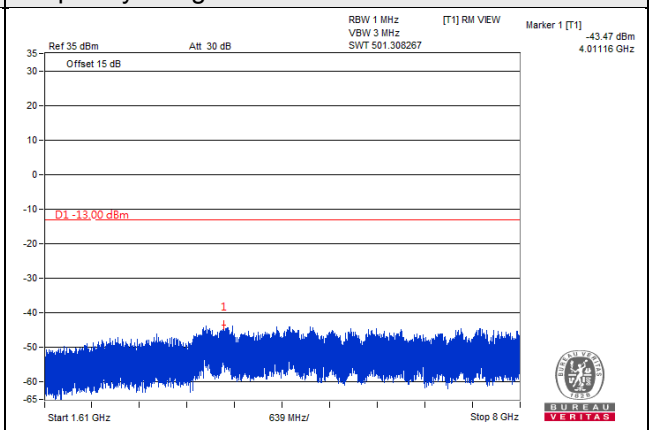
Frequency Range : 1GHz~1.559GHz



Frequency Range : 1.559GHz~1.61GHz



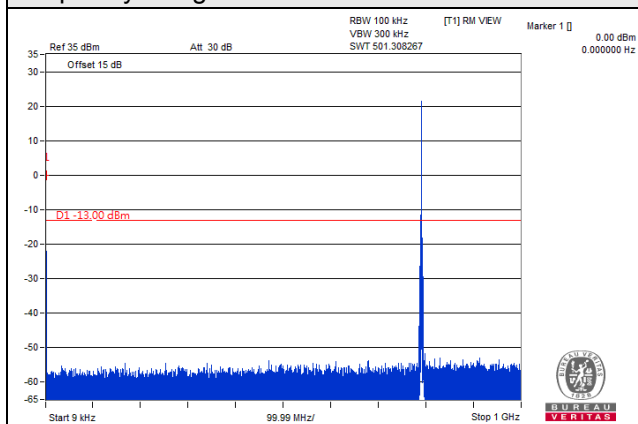
Frequency Range : 1.61GHz~8GHz



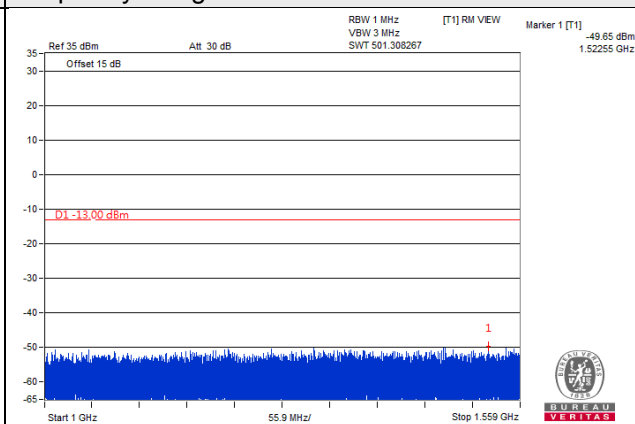
Channel Band width: 5MHz

Channel 23330 (793.0MHz)

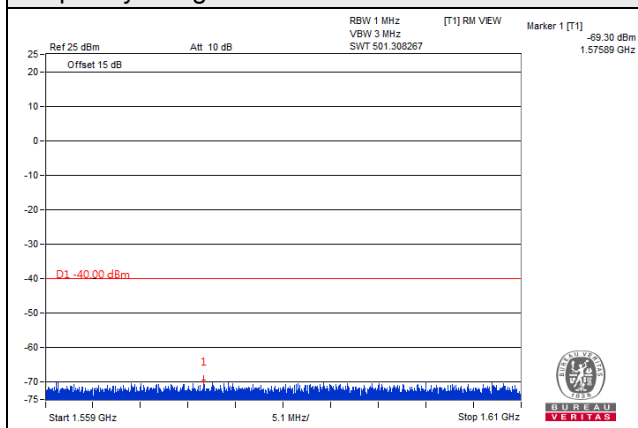
Frequency Range : 9kHz~1GHz



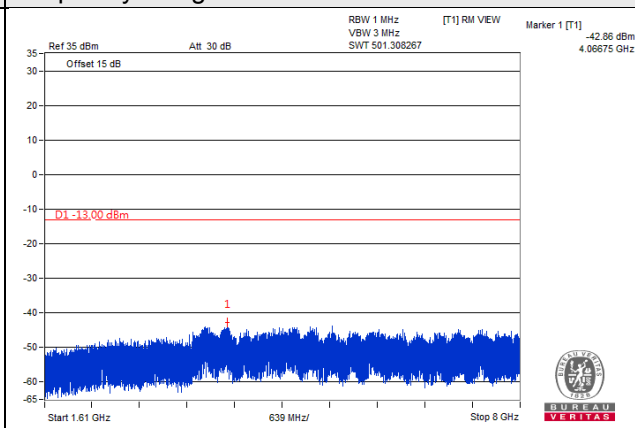
Frequency Range : 1GHz~1.559GHz



Frequency Range : 1.559GHz~1.61GHz



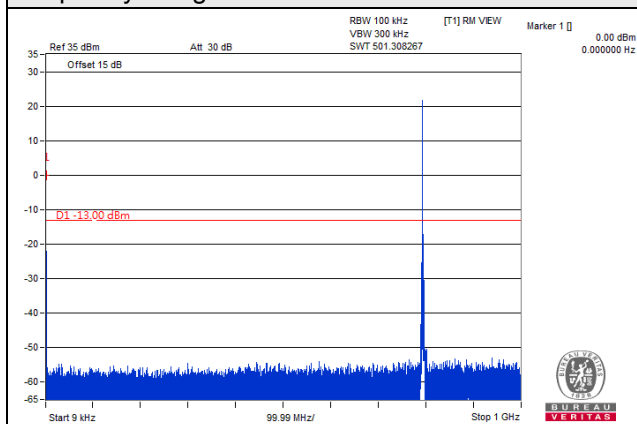
Frequency Range : 1.61GHz~8GHz



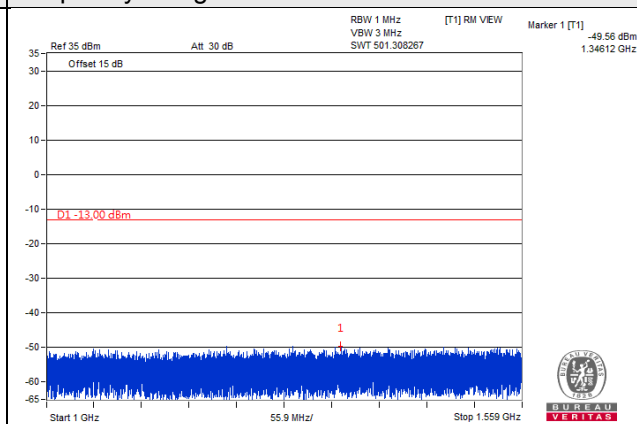
Channel Band width: 5MHz

Channel 23355 (795.5MHz)

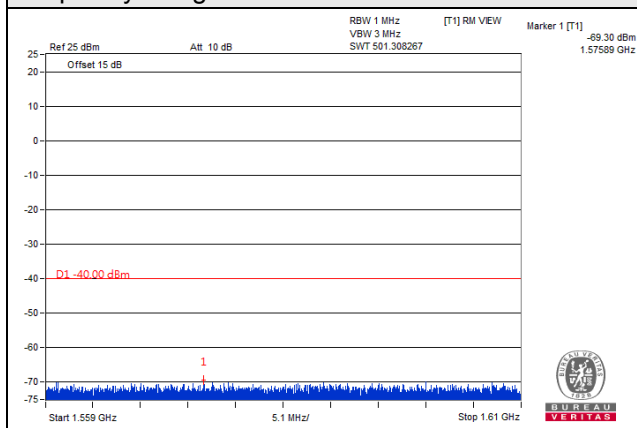
Frequency Range : 9kHz~1GHz



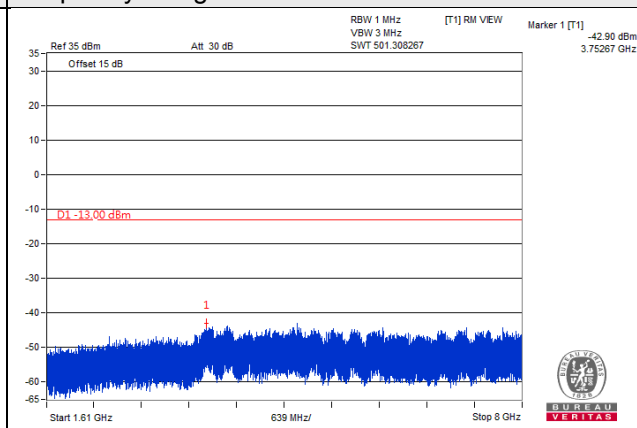
Frequency Range : 1GHz~1.559GHz



Frequency Range : 1.559GHz~1.61GHz



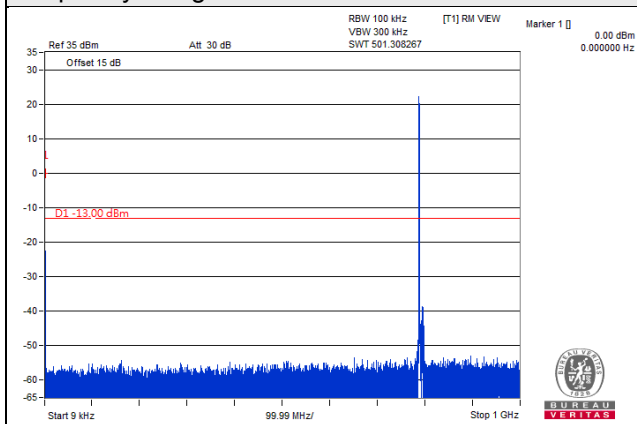
Frequency Range : 1.61GHz~8GHz



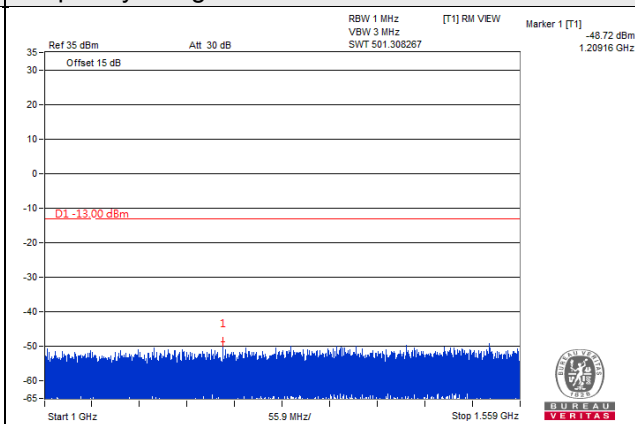
Channel Band width: 10MHz

Channel 23330 (793.0MHz)

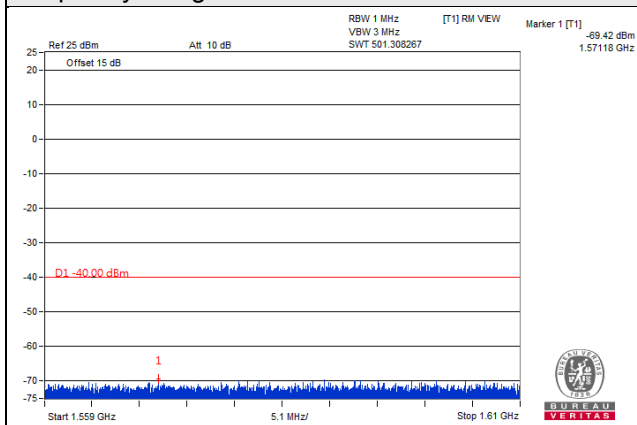
Frequency Range : 9kHz~1GHz



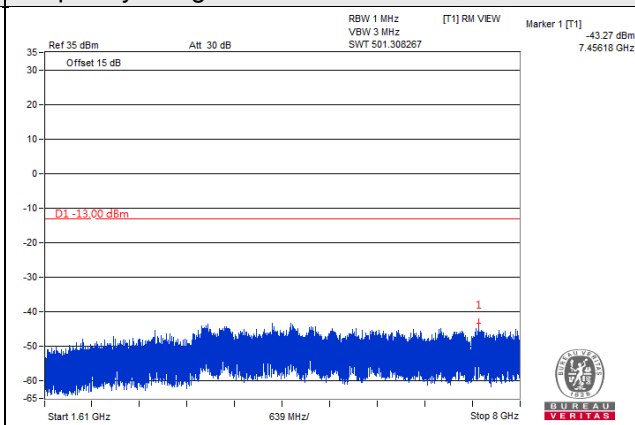
Frequency Range : 1GHz~1.559GHz



Frequency Range : 1.559GHz~1.61GHz



Frequency Range : 1.61GHz~8GHz



## 4.9 Radiated Emission Measurement

### 4.9.1 Limits of Radiated Emission Measurement

For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.

Note: Emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals.

{The limits is adjusted to -40dBm (-70dBW)}

### 4.9.2 Test Procedure

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

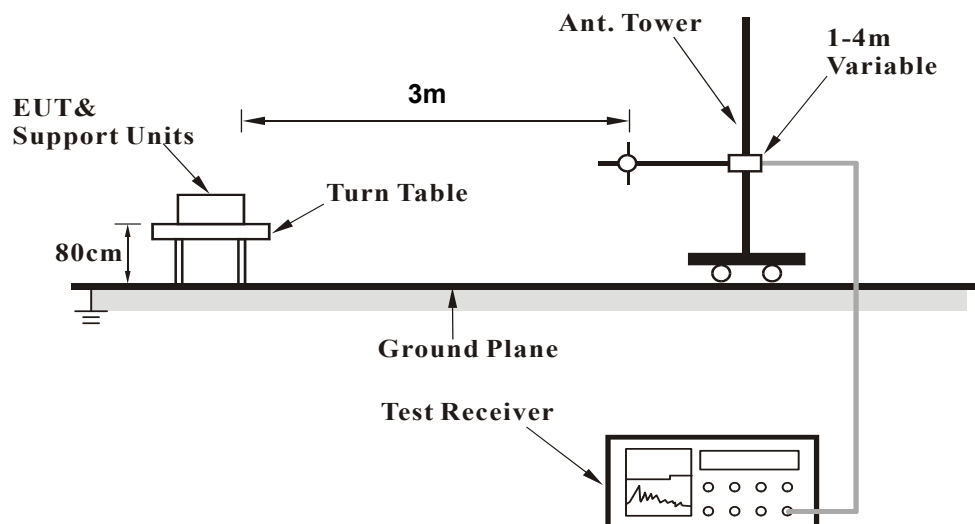
Note: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.

### 4.9.3 Deviation from Test Standard

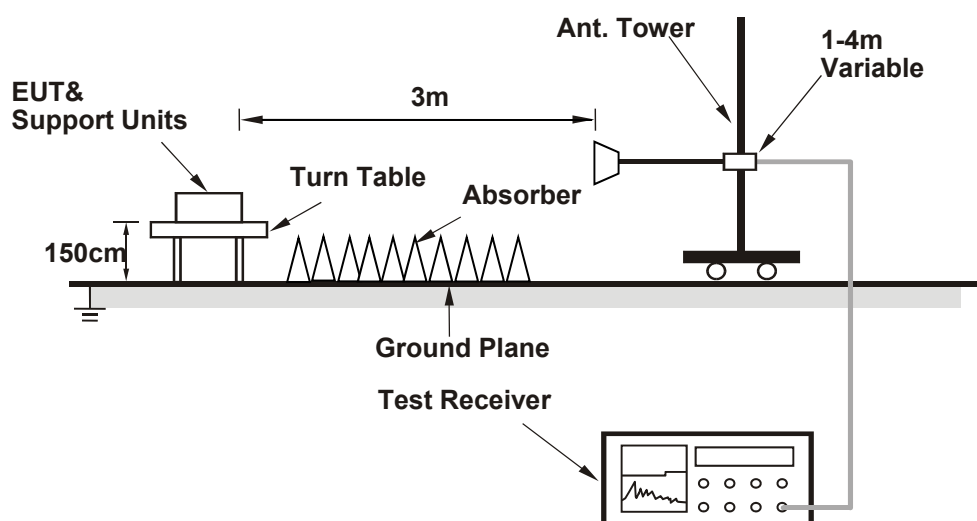
No deviation.

#### 4.9.4 Test Setup

##### For Radiated Emission below or equal 1GHz



##### For Radiated Emission above 1GHz



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

#### 4.9.5 Test Results

Below 1GHz

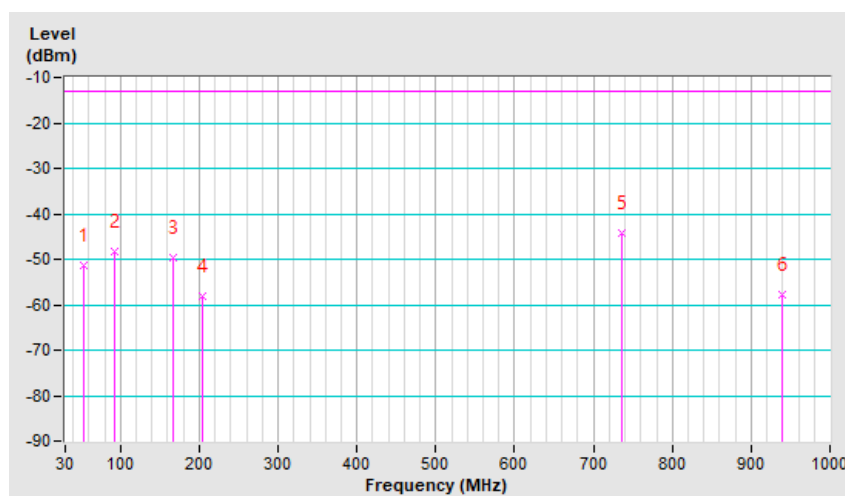
Channel Bandwidth: 5MHz

|                          |                                |                 |                |
|--------------------------|--------------------------------|-----------------|----------------|
| Mode                     | TX channel 23330<br>(793.0MHz) | Frequency Range | Below 1000 MHz |
| Environmental Conditions | 25deg. C, 70%RH                | Input Power     | 120Vac, 60Hz   |
| Tested By                | Luis Lee                       |                 |                |

| Antenna Polarity & Test Distance: Horizontal at 3 M |             |               |                       |                        |            |             |             |
|-----------------------------------------------------|-------------|---------------|-----------------------|------------------------|------------|-------------|-------------|
| No.                                                 | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 54.25       | -49.7         | -43.0                 | -8.3                   | -51.3      | -13.0       | -38.3       |
| 2                                                   | 92.08       | -40.5         | -49.5                 | 1.1                    | -48.4      | -13.0       | -35.4       |
| 3                                                   | 166.77      | -43.3         | -50.8                 | 1.2                    | -49.6      | -13.0       | -36.6       |
| 4                                                   | 203.63      | -49.3         | -63.4                 | 5.4                    | -58.0      | -13.0       | -45.0       |
| 5                                                   | 736.16      | -47.8         | -49.2                 | 4.8                    | -44.4      | -13.0       | -31.4       |
| 6                                                   | 938.89      | -65.0         | -61.8                 | 3.9                    | -57.9      | -13.0       | -44.9       |

Remarks:

1. EIRP = S.G Value + Correction Factor
2. Correction Factor = Substitution Antenna Gain (dBi) + Cable Loss.

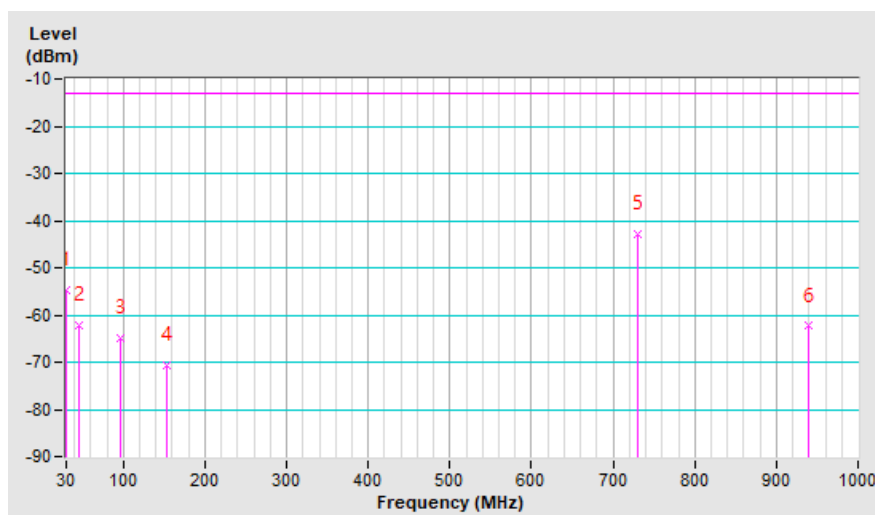


|                          |                                |                 |                |
|--------------------------|--------------------------------|-----------------|----------------|
| Mode                     | TX channel 23330<br>(793.0MHz) | Frequency Range | Below 1000 MHz |
| Environmental Conditions | 25deg. C, 70%RH                | Input Power     | 120Vac, 60Hz   |
| Tested By                | Luis Lee                       |                 |                |

| Antenna Polarity & Test Distance: Vertical at 3 M |             |               |                       |                        |            |             |             |
|---------------------------------------------------|-------------|---------------|-----------------------|------------------------|------------|-------------|-------------|
| No.                                               | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                 | 30.00       | -44.5         | -42.7                 | -12.2                  | -54.9      | -13.0       | -41.9       |
| 2                                                 | 45.52       | -55.9         | -52.3                 | -10.0                  | -62.3      | -13.0       | -49.3       |
| 3                                                 | 96.93       | -59.2         | -65.8                 | 1.0                    | -64.8      | -13.0       | -51.8       |
| 4                                                 | 153.19      | -69.6         | -70.7                 | 0.0                    | -70.7      | -13.0       | -57.7       |
| 5                                                 | 730.34      | -48.7         | -47.9                 | 4.9                    | -43.0      | -13.0       | -30.0       |
| 6                                                 | 939.86      | -71.2         | -66.3                 | 3.9                    | -62.4      | -13.0       | -49.4       |

Remarks:

1. EIRP = S.G Value + Correction Factor
2. Correction Factor = Substitution Antenna Gain (dBi) + Cable Loss.



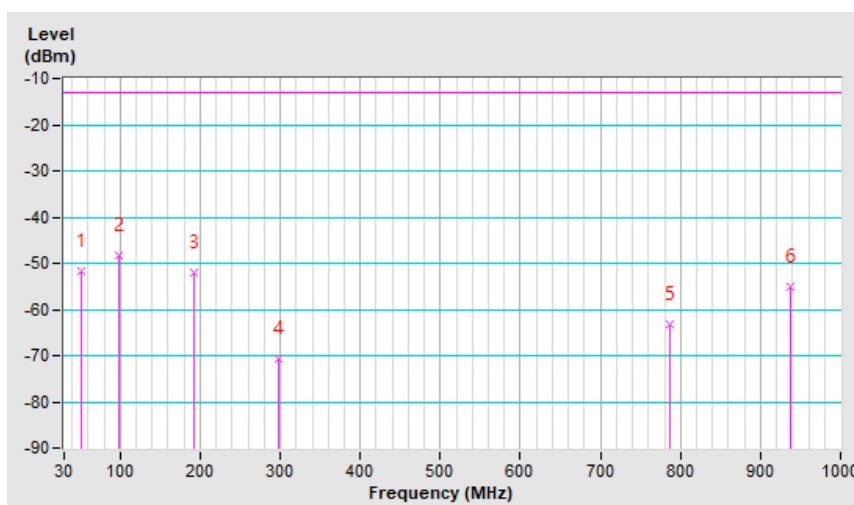
Channel Bandwidth: 10MHz

|                          |                                |                 |                |
|--------------------------|--------------------------------|-----------------|----------------|
| Mode                     | TX channel 23330<br>(793.0MHz) | Frequency Range | Below 1000 MHz |
| Environmental Conditions | 25deg. C, 70%RH                | Input Power     | 120Vac, 60Hz   |
| Tested By                | Luis Lee                       |                 |                |

| Antenna Polarity & Test Distance: Horizontal at 3 M |             |               |                       |                        |            |             |             |
|-----------------------------------------------------|-------------|---------------|-----------------------|------------------------|------------|-------------|-------------|
| No.                                                 | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 51.34       | -50.4         | -42.7                 | -8.9                   | -51.6      | -13.0       | -38.6       |
| 2                                                   | 98.87       | -40.8         | -49.2                 | 0.9                    | -48.3      | -13.0       | -35.3       |
| 3                                                   | 191.99      | -43.3         | -56.7                 | 4.5                    | -52.2      | -13.0       | -39.2       |
| 4                                                   | 298.69      | -67.1         | -75.7                 | 5.1                    | -70.6      | -13.0       | -57.6       |
| 5                                                   | 787.57      | -68.5         | -67.4                 | 4.2                    | -63.2      | -13.0       | -50.2       |
| 6                                                   | 937.92      | -62.3         | -59.1                 | 3.9                    | -55.2      | -13.0       | -42.2       |

Remarks:

1. EIRP = S.G Value + Correction Factor
2. Correction Factor = Substitution Antenna Gain (dBi) + Cable Loss.

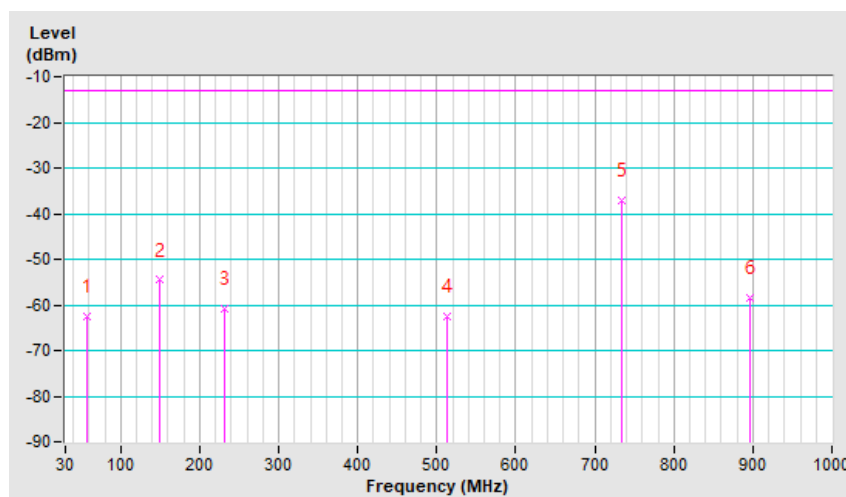


|                          |                                |                 |                |
|--------------------------|--------------------------------|-----------------|----------------|
| Mode                     | TX channel 23330<br>(793.0MHz) | Frequency Range | Below 1000 MHz |
| Environmental Conditions | 25deg. C, 70%RH                | Input Power     | 120Vac, 60Hz   |
| Tested By                | Luis Lee                       |                 |                |

| Antenna Polarity & Test Distance: Vertical at 3 M |             |               |                       |                        |            |             |             |
|---------------------------------------------------|-------------|---------------|-----------------------|------------------------|------------|-------------|-------------|
| No.                                               | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                 | 57.16       | -55.5         | -54.5                 | -8.2                   | -62.7      | -13.0       | -49.7       |
| 2                                                 | 149.31      | -52.6         | -54.4                 | -0.2                   | -54.6      | -13.0       | -41.6       |
| 3                                                 | 231.76      | -60.4         | -66.3                 | 5.4                    | -60.9      | -13.0       | -47.9       |
| 4                                                 | 513.06      | -62.0         | -67.3                 | 4.8                    | -62.5      | -13.0       | -49.5       |
| 5                                                 | 734.22      | -42.7         | -41.9                 | 4.8                    | -37.1      | -13.0       | -24.1       |
| 6                                                 | 897.18      | -65.4         | -62.3                 | 3.9                    | -58.4      | -13.0       | -45.4       |

Remarks:

1. EIRP = S.G Value + Correction Factor
2. Correction Factor = Substitution Antenna Gain (dBi) + Cable Loss.



Above 1GHz

Channel Bandwidth: 5MHz

|                          |                                |                 |              |
|--------------------------|--------------------------------|-----------------|--------------|
| Mode                     | TX channel 23305<br>(790.5MHz) | Frequency Range | 1 ~ 10GHz    |
| Environmental Conditions | 25deg. C, 70%RH                | Input Power     | 120Vac, 60Hz |
| Tested By                | Noah Chang                     |                 |              |

| Antenna Polarity & Test Distance: Horizontal at 3 M |             |               |                       |                        |            |             |             |
|-----------------------------------------------------|-------------|---------------|-----------------------|------------------------|------------|-------------|-------------|
| No.                                                 | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 1581.00     | -48.7         | -49.9                 | 5.3                    | -44.6      | -40.0       | -4.6        |
| Antenna Polarity & Test Distance: Vertical at 3 M   |             |               |                       |                        |            |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 1581.00     | -49.7         | -49.3                 | 5.3                    | -44.0      | -40.0       | -4.0        |

Remarks:

1. EIRP = S.G Value + Correction Factor
2. Correction Factor = Substitution Antenna Gain (dBi) + Cable Loss.

|                          |                                |                 |              |
|--------------------------|--------------------------------|-----------------|--------------|
| Mode                     | TX channel 23330<br>(793.0MHz) | Frequency Range | 1 ~ 10GHz    |
| Environmental Conditions | 25deg. C, 70%RH                | Input Power     | 120Vac, 60Hz |
| Tested By                | Noah Chang                     |                 |              |

| Antenna Polarity & Test Distance: Horizontal at 3 M |             |               |                       |                        |            |             |             |
|-----------------------------------------------------|-------------|---------------|-----------------------|------------------------|------------|-------------|-------------|
| No.                                                 | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 1586.00     | -47.4         | -48.7                 | 5.3                    | -43.4      | -40.0       | -3.4        |
| Antenna Polarity & Test Distance: Vertical at 3 M   |             |               |                       |                        |            |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 1586.00     | -48.7         | -48.3                 | 5.3                    | -43.0      | -40.0       | -3.0        |

Remarks:

1. EIRP = S.G Value + Correction Factor
2. Correction Factor = Substitution Antenna Gain (dBi) + Cable Loss.

|                          |                                |                 |              |
|--------------------------|--------------------------------|-----------------|--------------|
| Mode                     | TX channel 23355<br>(795.5MHz) | Frequency Range | 1 ~ 10GHz    |
| Environmental Conditions | 25deg. C, 70%RH                | Input Power     | 120Vac, 60Hz |
| Tested By                | Noah Chang                     |                 |              |

| Antenna Polarity & Test Distance: Horizontal at 3 M |             |               |                       |                        |            |             |             |
|-----------------------------------------------------|-------------|---------------|-----------------------|------------------------|------------|-------------|-------------|
| No.                                                 | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 1591.00     | -46.7         | -48.0                 | 5.3                    | -42.7      | -40.0       | -2.7        |
| Antenna Polarity & Test Distance: Vertical at 3 M   |             |               |                       |                        |            |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 1591.00     | -48.6         | -48.1                 | 5.3                    | -42.8      | -40.0       | -2.8        |

Remarks:

1. EIRP = S.G Value + Correction Factor
2. Correction Factor = Substitution Antenna Gain (dBi) + Cable Loss.

Channel Bandwidth: 10MHz

|                          |                                |                 |              |
|--------------------------|--------------------------------|-----------------|--------------|
| Mode                     | TX channel 23330<br>(793.0MHz) | Frequency Range | 1 ~ 10GHz    |
| Environmental Conditions | 25deg. C, 70%RH                | Input Power     | 120Vac, 60Hz |
| Tested By                | Noah Chang                     |                 |              |

| Antenna Polarity & Test Distance: Horizontal at 3 M |             |               |                       |                        |            |             |             |
|-----------------------------------------------------|-------------|---------------|-----------------------|------------------------|------------|-------------|-------------|
| No.                                                 | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 1586.00     | -46.9         | -48.2                 | 5.3                    | -42.9      | -40.0       | -2.9        |
| Antenna Polarity & Test Distance: Vertical at 3 M   |             |               |                       |                        |            |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 1586.00     | -49.3         | -48.9                 | 5.3                    | -43.6      | -40.0       | -3.6        |

Remarks:

1. EIRP = S.G Value + Correction Factor
2. Correction Factor = Substitution Antenna Gain (dBi) + Cable Loss.

## 5 Pictures of Test Arrangements

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

## Appendix – Information of the Testing Laboratories

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

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

### Lin Kou EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

### Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

### Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

**Email:** [service.adt@tw.bureauveritas.com](mailto:service.adt@tw.bureauveritas.com)

**Web Site:** [www.bureauveritas-adt.com](http://www.bureauveritas-adt.com)

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

--- END ---