# FCC Test Report

## (Part 24: WCDMA Band 2 & LTE Band 2_Spot Check)

| | |
|---|---|
| **Report No.:** | RF171206E01C-4 |
| **FCC ID:** | NKRM14Q2SG |
| **Test Model:** | M14Q2SG |
| **Received Date:** | Jan. 02, 2019 |
| **Test Date:** | Jan. 08 ~ Jan. 14, 2019 |
| **Issued Date:** | Jan. 24, 2019 |
| **Applicant:** | Wistron NeWeb Corporation |
| **Address:** | 20 Park Ave. II, Hsinchu Science Park, Hsichu 308, Taiwan |
| **Issued By:** | Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch |
| **Lab Address:** | No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan ( R.O.C ) |
| **Test Location:** | No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C. |
| **FCC Registration / Designation Number:** | 788550 / TW0003 |

Testing Laboratory
2021

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The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

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## Release Control Record

| Issue No. | Description | Date Issued |
|---|---|---|
| RF171206E01C-4 | Original Release | Jan. 24, 2019 |

## 1 Certificate of Conformity

**Product:** LGA Module

**Brand:** Wistron NeWeb Corporation

**Test Model:** M14Q2SG

**Sample Status:** Engineering Sample

**Applicant:** Wistron NeWeb Corporation

**Test Date:** Jan. 08 ~ Jan. 14, 2019

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

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

**Prepared by :** _____ , **Date:** Jan. 24, 2019

Polly Chien / Specialist

**Approved by :** _____ , **Date:** Jan. 24, 2019

Bruce Chen / Project Engineer

## 2 Summary of Test Results

| Applied Standard: FCC Part 24 & Part 2 | | | |
|---|---|---|---|
| **FCC Clause** | **Test Item** | **Result** | **Remarks** |
| 2.1046<br>24.232 | Effective Isotropic Radiated Power | Pass | Meet the requirement of limit. |
| 2.1046<br>24.232(d) | Peak to Average Ratio | Pass | Meet the requirement of limit. |
| 2.1055<br>24.235 | Frequency Stability | NA | Refer to note 1 |
| 2.1049<br>24.238(b) | Occupied Bandwidth | Pass | Meet the requirement of limit. |
| 24.238(b) | Band Edge Measurements | NA | Refer to note |
| 2.1051<br>24.238 | Conducted Spurious Emissions | Pass | Meet the requirement of limit. |
| 2.1053<br>24.238 | Radiated Spurious Emissions | Pass | Meet the requirement of limit.<br>Minimum passing margin is -41.0 dB at 59.10 MHz. |

Note:

1. Exhibit prepared for FCC Spot Check Verification report, the format, test items and amount of spot–check test data are decided by applicant's engineering judgment, for more details please refer to declaration letter exhibit. The original report please refer to report no.: RF171206E01B-1.
2. 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 | Expended Uncertainty (k=2) (±) |
|---|---|---|
| Radiated Emissions up to 1 GHz | 30MHz ~ 200MHz | 3.63 dB |
| | 200MHz ~1000MHz | 3.64 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 29, 2018 | May 28, 2019 |
| Spectrum Analyzer<br>ROHDE & SCHWARZ | FSP40 | 100040 | Sep. 25, 2018 | Sep. 24, 2019 |
| BILOG Antenna<br>SCHWARZBECK | VULB9168 | 9168-155 | Nov. 21, 2018 | Nov. 20, 2019 |
| HORN Antenna<br>SCHWARZBECK | BBHA 9120D | 9120D-1170 | Nov. 25, 2018 | Nov. 24, 2019 |
| HORN Antenna<br>SCHWARZBECK | BBHA 9170 | BBHA9170241 | Nov. 25, 2018 | Nov. 24, 2019 |
| Preamplifier<br>Agilent<br>(Below 1GHz) | 8447D | 2944A10631 | Aug. 08, 2018 | Aug. 07, 2019 |
| Preamplifier<br>KEYSIGHT<br>(Above 1GHz) | 83017A | MY53270295 | Jul. 02, 2018 | Jul. 01, 2019 |
| RF signal cable<br>HUBER+SUHNER | SUCOFLEX 104 | MY 13380+295012/04 | Aug. 08, 2018 | Aug. 07, 2019 |
| RF signal cable<br>HUBER+SUHNER | SUCOFLEX 104 | Cable-CH4-03 (250724) | Aug. 08, 2018 | Aug. 07, 2019 |
| Software<br>BV ADT | ADT_Radiated_<br>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. 04, 2018 | Jun. 03, 2019 |
| JFW 20dB attenuation | 50HF-020-SMA | NA | NA | NA |

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. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
4. The IC Site Registration No. is 7450F-4.

## 3 General Information

### 3.1 General Description of EUT

| | | |
|---|---|---|
| **Product** | LGA Module | |
| **Brand** | Wistron NeWeb Corporation | |
| **Test Model** | M14Q2SG | |
| **Model Difference** | Refer to Note | |
| **Status of EUT** | Engineering Sample | |
| **Power Supply Rating** | 5.0 Vdc (host equipment) | |
| **Modulation Type** | WCDMA | QPSK |
| | LTE | QPSK, 16QAM |
| **Frequency Range** | WCDMA | 1852.4 ~ 1907.6 MHz |
| | LTE Band 2 (Channel Bandwidth: 1.4 MHz) | 1850.7 ~ 1909.3 MHz |
| | LTE Band 2 (Channel Bandwidth: 3 MHz) | 1851.5 ~ 1908.5 MHz |
| | LTE Band 2 (Channel Bandwidth: 5 MHz) | 1852.5 ~ 1907.5 MHz |
| | LTE Band 2 (Channel Bandwidth: 10 MHz) | 1855.0 ~ 1905.0 MHz |
| | LTE Band 2 (Channel Bandwidth: 15 MHz) | 1857.5 ~ 1902.5 MHz |
| | LTE Band 2 (Channel Bandwidth: 20 MHz) | 1860.0 ~ 1900.0 MHz |
| **Max. EIRP Power** | WCDMA | 218.776mW (23.4dBm) |
| | LTE Band 2 (Channel Bandwidth: 20 MHz) | 338.844mW (25.3dBm) |
| **Emission Designator** | WCDMA | 4M16F9W |
| | LTE Band 2 (Channel Bandwidth: 20 MHz) | 17M9W7D |
| **Antenna Type** | Dipole Antenna with 0.6 dBi gain | |
| **Accessory Device** | N/A | |
| **Data Cable Supplied** | N/A | |

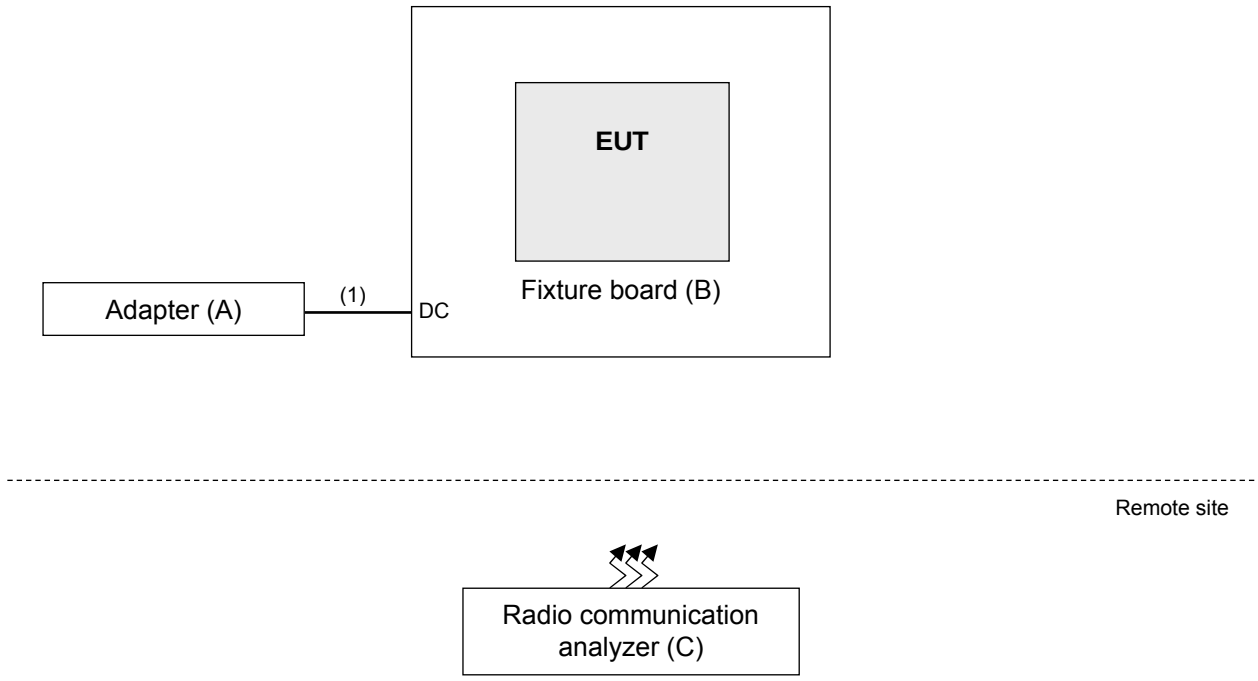
Note:

1. Exhibit prepared for FCC Spot Check Verification report, the format, test items and amount of spot–check test data are decided by applicant's engineering judgment, for more details please refer to declaration letter exhibit. The original report please refer to report no.: RF171206E01B-1.
2. The EUT uses following adapter. (For support unit only)

| | |
|---|---|
| Brand | I.T.E POWER SUPPLY |
| Model | MU24-Y120200-A1 |
| Input Power | 100-240Vac, 50/60Hz, 0.7A |
| Output Power | 12Vdc, 2A |
| Power Line | 1.5m cable without core attached on adapter |

3. The above EUT information is declared by manufacturer and for more detailed features description, please refer 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 |
|---|---|---|---|---|---|---|
| 1. | Adapter | I.T.E POWER SUPPLY | MU24-Y120200-A1 | NA | NA | Provided by manufacturer |
| 2. | Fixture board | NA | NA | NA | NA | Provided by manufacturer |
| 3. | Radio Communication Analyzer | Anritsu | MT8860C | 1702001 | NA | - |

Note:

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

| ID | Descriptions | Qty. | Length (m) | Shielding (Yes/No) | Cores (Qty.) | Remarks |
|---|---|---|---|---|---|---|
| 1. | DC cable | 1 | 1.5 | - | 0 | Attached on adapter |

## 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.

### WCDMA

| EUT Configure Mode | Test Item | Available Channel | Tested Channel | Mode |
|---|---|---|---|---|
| - | Conducted Output Power | 9262 to 9538 | 9262 (1852.4MHz), 9400 (1880.0MHz), 9538 (1907.6MHz) | WCDMA |
| | EIRP | 9262 to 9538 | 9400 (1880.0MHz), | WCDMA |
| - | Occupied Bandwidth | 9262 to 9538 | 9400 (1880.0MHz) | WCDMA |
| - | Peak to Average Ratio | 9262 to 9538 | 9400 (1880.0MHz) | WCDMA |
| - | Conducted Emission | 9262 to 9538 | 9400 (1880.0MHz) | WCDMA |
| - | Radiated Emission | 9262 to 9538 | 9400 (1880.0MHz) | WCDMA |

### LTE Band 2

| EUT Configure Mode | Test Item | Available Channel | Tested Channel | Channel Bandwidth | Modulation | Mode |
|---|---|---|---|---|---|---|
| - | Conducted Output Power | 18607 to 19193 | 18607 (1850.70MHz), 18900 (1880.00MHz), 19193 (1909.30MHz) | 1.4 MHz | QPSK, 16QAM | 1 RB / 0 RB Offset |
| | | 18615 to 19185 | 18615 (1851.50MHz), 18900 (1880.00MHz), 19185 (1908.50MHz) | 3 MHz | QPSK, 16QAM | 1 RB / 0 RB Offset |
| | | 18625 to 19175 | 18625 (1852.50MHz), 18900 (1880.00MHz), 19175 (1907.50MHz) | 5 MHz | QPSK, 16QAM | 1 RB / 0 RB Offset |
| | | 18650 to 19150 | 18650 (1855.00MHz), 18900 (1880.00MHz), 19150 (1905.00MHz) | 10 MHz | QPSK, 16QAM | 1 RB / 0 RB Offset |
| | | 18675 to 19125 | 18675 (1857.50MHz), 18900 (1880.00MHz), 19125 (1902.50MHz) | 15 MHz | QPSK, 16QAM | 1 RB / 0 RB Offset |
| | | 18700 to 19100 | 18700 (1860.00MHz), 18900 (1880.00MHz), 19100 (1900.00MHz) | 20 MHz | QPSK, 16QAM | 1 RB / 0 RB Offset |
| - | EIRP | 18700 to 19100 | 18900 (1880.00MHz), | 20 MHz | QPSK, 16QAM | 1 RB / 0 RB Offset |
| - | Occupied Bandwidth | 18700 to 19100 | 118900 (1880.00MHz), | 20 MHz | QPSK, 16QAM | 100 RB / 0 RB Offset |
| - | Peak to Average Ratio | 18700 to 19100 | 118900 (1880.00MHz) | 20 MHz | QPSK, 16QAM | 1 RB / 0 RB Offset |
| - | Conducted Emission | 18700 to 19100 | 118900 (1880.00MHz) | 20 MHz | QPSK | 1 RB / 0 RB Offset |
| - | Radiated Emission | 18700 to 19100 | 118900 (1880.00MHz) | 20 MHz | QPSK | 1 RB / 0 RB Offset |

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

**Test Condition:**

| Test Item | Environmental Conditions | Input Power (System) | Tested By |
|---|---|---|---|
| EIRP | 25deg. C, 70%RH | 120Vac, 60Hz | Noah Chang |
| Occupied Bandwidth | 25deg. C, 70%RH | 120Vac, 60Hz | Noah Chang |
| Peak to Average Ratio | 25deg. C, 70%RH | 120Vac, 60Hz | Noah Chang |
| Conducted Emission | 25deg. C, 70%RH | 120Vac, 60Hz | Noah Chang |
| Radiated Emission | 25deg. C, 70%RH | 120Vac, 60Hz | 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 24**
**KDB 971168 D01 Power Meas License Digital Systems v03r01**
**ANSI/TIA/EIA-603-E 2016**
**ANSI 63.26-2015**

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

# 4 Test Types and Results

## 4.1 Output Power Measurement

### 4.1.1 Limits of Output Power Measurement

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

### 4.1.2 Test Procedures

**EIRP / ERP Measurement:**

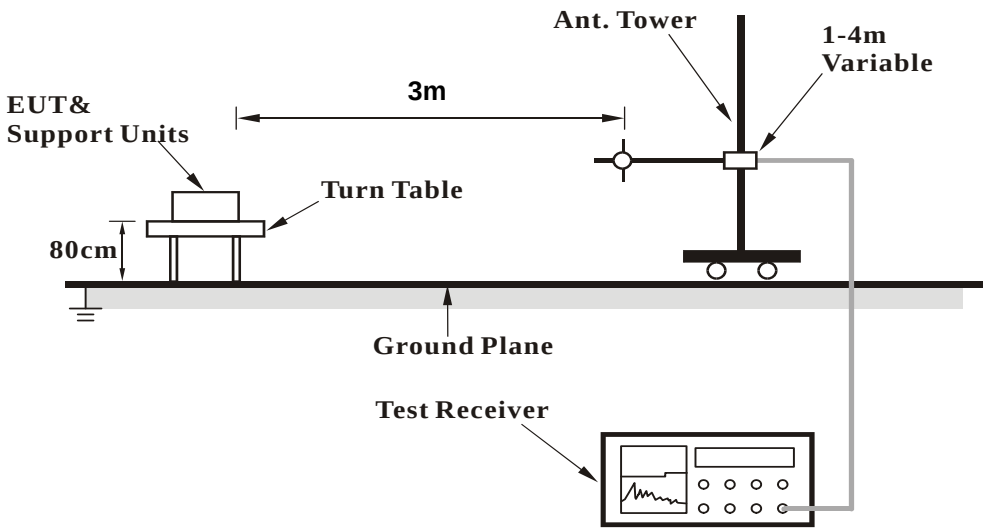
a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 5 MHz for WCDMA, and 10 MHz for LTE mode.
b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
c. 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.
d. EIRP = Output power level of S.G – TX cable loss + 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 power = E.I.P.R power - 2.15 dBi.

**Conducted Power Measurement:**

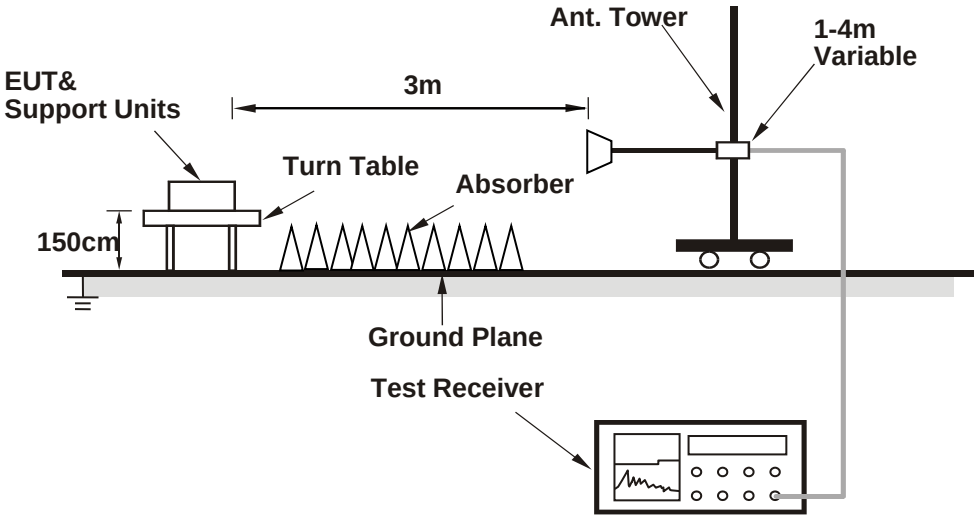
The EUT was set up for the maximum power with WCDMA, and LTE link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

4.1.3 Test Setup

**EIRP / ERP Measurement:**
**<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).

**Conducted Power Measurement:**

4.1.4 Test Results

**Conducted Output Power (dBm)**

| Band | WCDMA II | | |
|---|---|---|---|
| Channel | 9262 | 9400 | 9538 |
| Frequency (MHz) | 1852.4 | 1880.0 | 1907.6 |
| | 22.38 | 22.45 | 22.20 |

| Band / BW | RB Size | RB Offset | QPSK | | | 3GPP MPR (dB) | 16QAM | | | 3GPP MPR (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Low Ch 18607 | Mid Ch 18900 | High Ch 19193 | | Low Ch 18607 | Mid Ch 18900 | High Ch 19193 | |
| | | | 1850.7 MHz | 1880.0 MHz | 1909.3 MHz | | 1850.7 MHz | 1880.0 MHz | 1909.3 MHz | |
| 2 / 1.4M | 1 | 0 | 22.88 | 23.10 | 22.49 | 0 | 22.50 | 23.08 | 22.48 | 1 |
| | 1 | 2 | 22.78 | 23.03 | 22.54 | 0 | 22.76 | 23.00 | 22.48 | 1 |
| | 1 | 5 | 22.50 | 22.75 | 22.37 | 0 | 22.05 | 23.05 | 22.50 | 1 |
| | 3 | 0 | 21.96 | 21.79 | 21.54 | 0 | 21.96 | 21.75 | 21.80 | 1 |
| | 3 | 1 | 21.63 | 22.04 | 21.48 | 0 | 22.11 | 21.83 | 21.59 | 1 |
| | 3 | 3 | 22.01 | 21.88 | 22.01 | 0 | 22.28 | 21.88 | 21.74 | 1 |
| | 6 | 0 | 21.93 | 21.75 | 21.67 | 1 | 21.11 | 21.07 | 20.64 | 2 |

| Band / BW | RB Size | RB Offset | QPSK | | | 3GPP MPR (dB) | 16QAM | | | 3GPP MPR (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Low Ch 18615 | Mid Ch 18900 | High Ch 19185 | | Low Ch 18615 | Mid Ch 18900 | High Ch 19185 | |
| | | | 1851.5 MHz | 1880.0 MHz | 1908.5 MHz | | 1851.5 MHz | 1880.0 MHz | 1908.5 MHz | |
| 2 / 3M | 1 | 0 | 22.18 | 23.15 | 22.56 | 0 | 22.08 | 22.14 | 21.66 | 1 |
| | 1 | 7 | 22.15 | 23.04 | 22.62 | 0 | 22.13 | 21.91 | 21.60 | 1 |
| | 1 | 14 | 22.08 | 23.08 | 22.58 | 0 | 22.09 | 21.91 | 21.62 | 1 |
| | 8 | 0 | 22.07 | 22.10 | 21.54 | 1 | 22.01 | 21.11 | 21.24 | 2 |
| | 8 | 3 | 22.21 | 22.30 | 21.47 | 1 | 21.19 | 20.95 | 20.60 | 2 |
| | 8 | 7 | 21.93 | 21.84 | 21.13 | 1 | 21.08 | 20.90 | 20.46 | 2 |
| | 15 | 0 | 21.20 | 20.90 | 20.56 | 1 | 21.01 | 20.86 | 20.65 | 2 |

| Band / BW | RB Size | RB Offset | QPSK | | | 3GPP MPR (dB) | 16QAM | | | 3GPP MPR (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Low Ch 18625 1852.5 MHz | Mid Ch 18900 1880.0 MHz | High Ch 19175 1907.5 MHz | | Low Ch 18625 1852.5 MHz | Mid Ch 18900 1880.0 MHz | High Ch 19175 1907.5 MHz | |
| 2 / 5M | 1 | 0 | 22.88 | 23.14 | 22.32 | 0 | 21.98 | 22.01 | 21.62 | 1 |
| | 1 | 12 | 23.14 | 22.99 | 22.75 | 0 | 21.99 | 21.81 | 21.62 | 1 |
| | 1 | 24 | 22.77 | 22.76 | 22.34 | 0 | 21.97 | 21.81 | 21.50 | 1 |
| | 12 | 0 | 21.94 | 22.00 | 21.60 | 1 | 21.58 | 21.70 | 21.41 | 2 |
| | 12 | 6 | 21.61 | 21.74 | 21.35 | 1 | 20.98 | 20.94 | 20.50 | 2 |
| | 12 | 13 | 21.95 | 21.86 | 21.63 | 1 | 20.88 | 20.84 | 20.70 | 2 |
| | 25 | 0 | 20.76 | 20.79 | 20.63 | 1 | 21.03 | 20.89 | 20.62 | 2 |

| Band / BW | RB Size | RB Offset | QPSK | | | 3GPP MPR (dB) | 16QAM | | | 3GPP MPR (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Low Ch 18650 1855.0 MHz | Mid Ch 18900 1880.0 MHz | High Ch 19150 1905.0 MHz | | Low Ch 18650 1855.0 MHz | Mid Ch 18900 1880.0 MHz | High Ch 19150 1905.0 MHz | |
| 2 / 10M | 1 | 0 | 22.87 | 23.04 | 22.82 | 0 | 21.93 | 22.01 | 21.87 | 1 |
| | 1 | 24 | 22.87 | 22.92 | 22.80 | 0 | 21.95 | 21.83 | 21.90 | 1 |
| | 1 | 49 | 22.90 | 22.74 | 22.65 | 0 | 21.89 | 21.80 | 21.78 | 1 |
| | 25 | 0 | 21.88 | 21.81 | 21.88 | 1 | 22.00 | 21.81 | 21.70 | 2 |
| | 25 | 12 | 22.06 | 21.71 | 21.81 | 1 | 20.94 | 20.83 | 20.84 | 2 |
| | 25 | 25 | 22.32 | 22.14 | 21.99 | 1 | 21.04 | 20.90 | 20.84 | 2 |
| | 50 | 0 | 20.83 | 20.70 | 20.89 | 1 | 21.00 | 20.79 | 20.82 | 2 |

| Band / BW | RB Size | RB Offset | QPSK | | | 3GPP MPR (dB) | 16QAM | | | 3GPP MPR (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Low Ch 18675 1857.5 MHz | Mid Ch 18900 1880.0 MHz | High Ch 19125 1902.5 MHz | | Low Ch 18675 1857.5 MHz | Mid Ch 18900 1880.0 MHz | High Ch 19125 1902.5 MHz | |
| 2 / 15M | 1 | 0 | 23.11 | 23.27 | 22.65 | 0 | 21.95 | 21.97 | 21.58 | 1 |
| | 1 | 37 | 23.06 | 22.66 | 22.75 | 0 | 21.87 | 21.85 | 21.63 | 1 |
| | 1 | 74 | 22.94 | 22.50 | 22.55 | 0 | 21.94 | 21.81 | 21.43 | 1 |
| | 36 | 0 | 22.54 | 22.36 | 22.56 | 1 | 21.67 | 21.43 | 21.20 | 2 |
| | 36 | 19 | 21.41 | 21.55 | 21.11 | 1 | 21.56 | 21.41 | 21.30 | 2 |
| | 36 | 39 | 22.13 | 21.97 | 21.37 | 1 | 21.58 | 21.40 | 21.22 | 2 |
| | 75 | 0 | 21.31 | 21.84 | 21.49 | 1 | 21.00 | 20.79 | 21.52 | 2 |

| Band / BW | RB Size | RB Offset | QPSK | | | 3GPP MPR (dB) | 16QAM | | | 3GPP MPR (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Low Ch 18700 1860.0 MHz | Mid Ch 18900 1880.0 MHz | High Ch 19100 1900.0 MHz | | Low Ch 18700 1860.0 MHz | Mid Ch 18900 1880.0 MHz | High Ch 19100 1900.0 MHz | |
| 2 / 20M | 1 | 0 | 22.83 | 23.40 | 22.57 | 0 | 22.03 | 22.97 | 21.70 | 1 |
| | 1 | 50 | 22.10 | 23.13 | 22.84 | 0 | 21.92 | 21.92 | 21.60 | 1 |
| | 1 | 99 | 22.71 | 23.21 | 22.56 | 0 | 21.99 | 21.82 | 21.48 | 1 |
| | 50 | 0 | 21.80 | 21.54 | 21.35 | 1 | 21.81 | 21.76 | 21.40 | 2 |
| | 50 | 25 | 21.90 | 21.38 | 21.37 | 1 | 21.78 | 21.48 | 21.21 | 2 |
| | 50 | 50 | 22.13 | 21.91 | 21.55 | 1 | 21.77 | 21.58 | 21.13 | 2 |
| | 100 | 0 | 21.80 | 21.78 | 21.11 | 1 | 21.67 | 21.70 | 21.20 | 2 |

**EIRP Power (dBm)**
WCDMA Band 2

| MODE | | TX channel 9400 | | | | | |
|---|---|---|---|---|---|---|---|
| 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 | 1880.00 | -22.2 | 17.9 | 1.1 | 19.0 | 33.0 | -14.0 |
| 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 | 1880.00 | -16.2 | 22.3 | 1.1 | **23.4** | 33.0 | -9.6 |

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

**Modulation Type: QPSK**
LTE Band 2, Channel Bandwidth 20MHz

| MODE | | TX channel 18900 | | | | | |
|---|---|---|---|---|---|---|---|
| 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 | 1880.00 | -16.7 | 23.4 | 1.1 | 24.5 | 33.0 | -8.5 |
| 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 | 1880.00 | -14.3 | 24.2 | 1.1 | **25.3** | 33.0 | -7.7 |

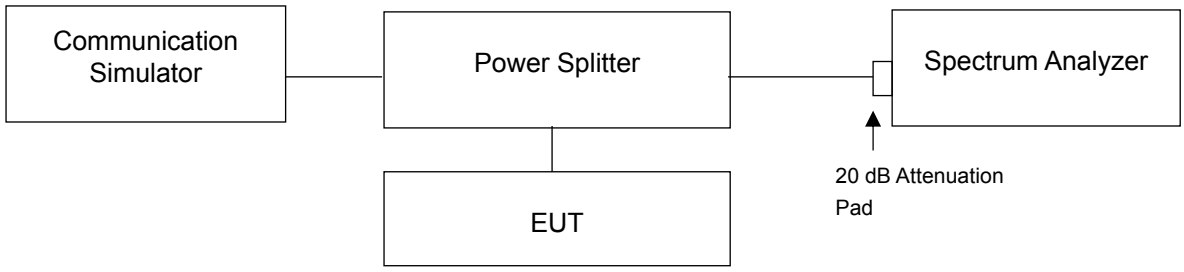
Note: EIRP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

## 4.2 Occupied Bandwidth Measurement

### 4.2.1 Test Procedure

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

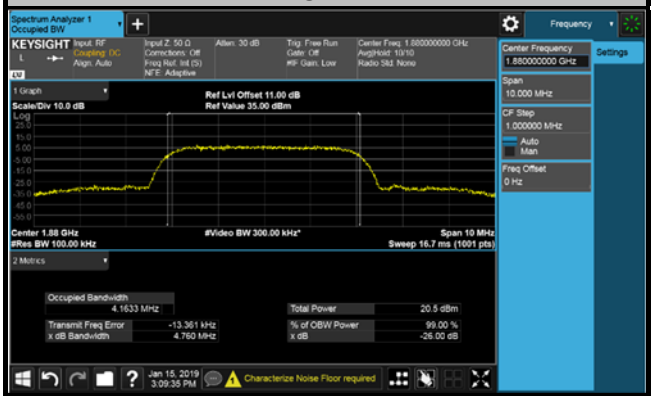
### 4.2.2 Test Setup



### 4.2.3 Test Result

| Channel | Frequency (MHz) | 99 % Occupied Bandwidth (MHz) |
|---|---|---|
| | | WCDMA |
| 9400 | 1880.0 | 4.16 |

| Spectrum Plot of Worst Value |
|---|
| WCDMA |




| LTE Band 2 | | | |
|---|---|---|---|
| Channel Bandwidth: 20 MHz | | | |
| Channel | Frequency (MHz) | 99 % Occupied Bandwidth (MHz) | |
| | | QPSK | 16QAM |
| 18900 | 1880.0 | 17.91 | 17.93 |

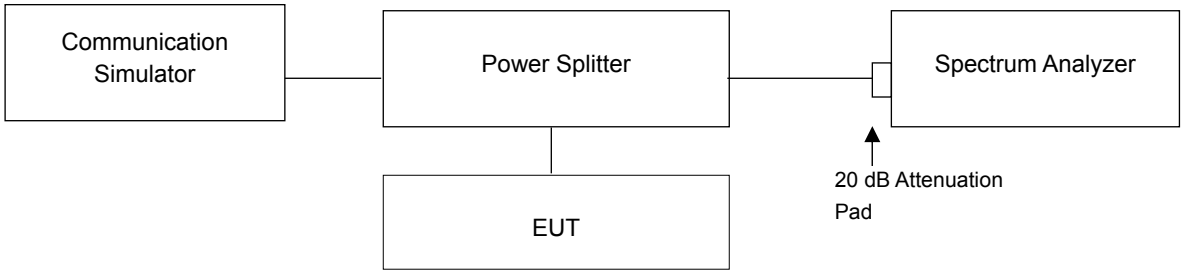
| Spectrum Plot of Worst Value |
|---|
| 20 MHz / 16QAM |

## 4.3 Peak to Average Ratio

### 4.3.1 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.

### 4.3.2 Test Setup



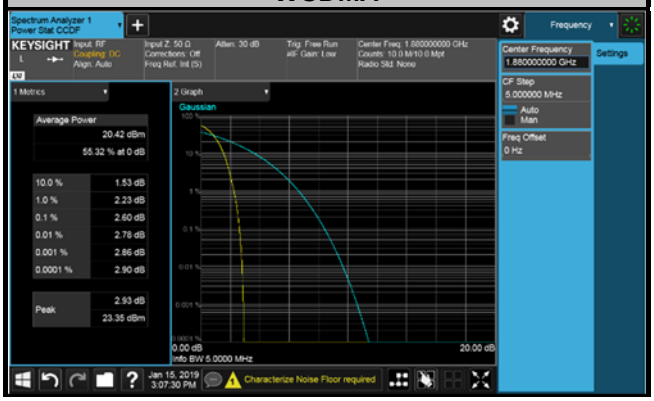

### 4.3.3 Test Procedures

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 %.

### 4.3.4 Test Results

| Channel | Frequency (MHz) | Peak to Average Ratio (dB) |
|---|---|---|
| | | WCDMA |
| 9400 | 1880.0 | 2.60 |

| Spectrum Plot of Worst Value |
|---|
| WCDMA |




| LTE Band 2 | | | |
|---|---|---|---|
| Channel Bandwidth: 20 MHz | | | |
| Channel | Frequency (MHz) | Peak to Average Ratio (dB) | |
| | | QPSK | 16QAM |
| 18900 | 1880.0 | 4.66 | 4.68 |

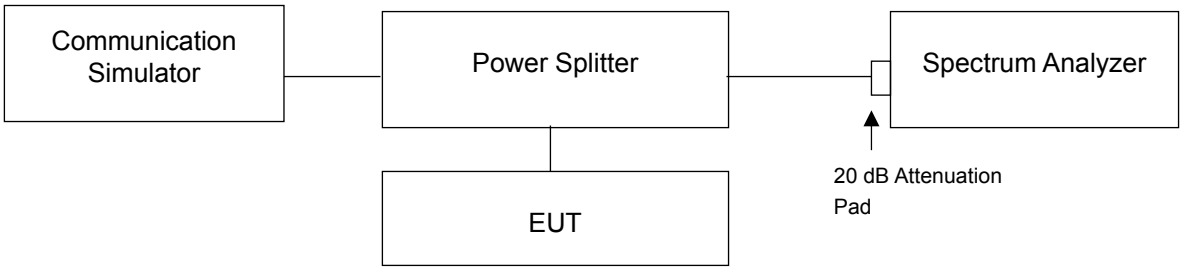
| Spectrum Plot of Worst Value |
|---|
| 20 MHz / 16QAM |

## 4.4 Conducted Spurious Emissions

### 4.4.1 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.

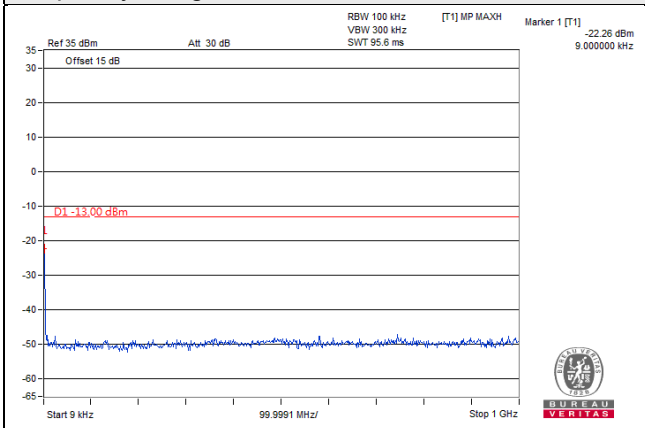
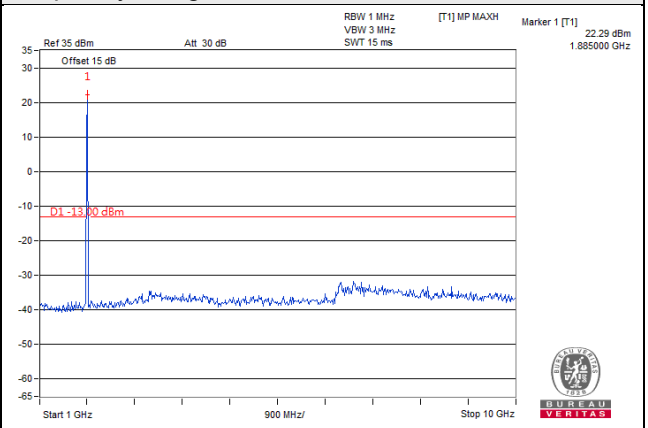
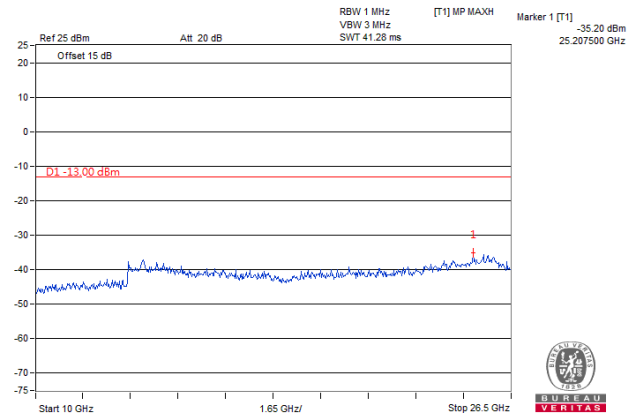
### 4.4.2 Test Setup

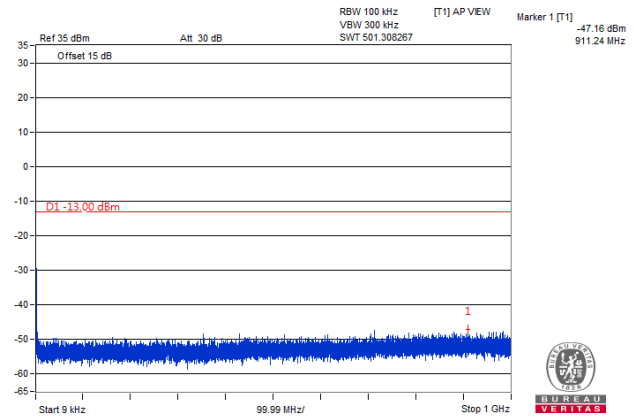
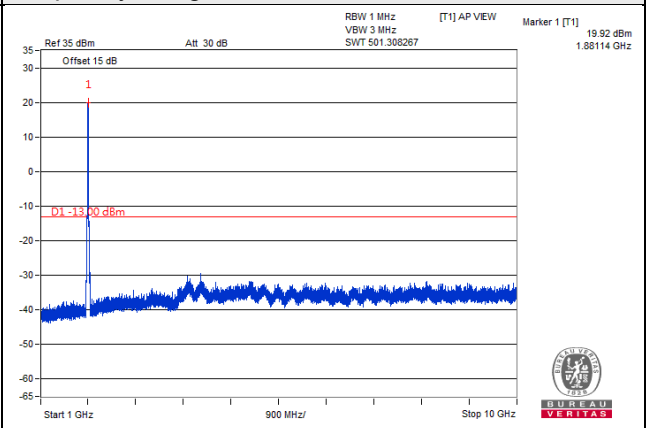
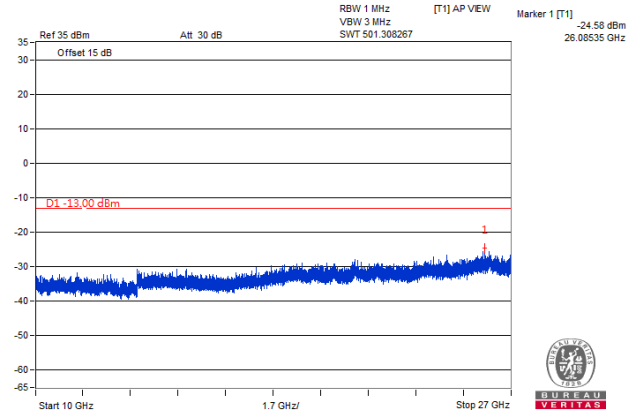



### 4.4.3 Test Procedure

a. The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
b. Measuring frequency range is from 9 kHz to 1GHz. 20dB attenuation pad is connected with spectrum. RBW=100kHz and VBW=300kHz is used for conducted emission measurement.
c. Measuring frequency range is from 1GHz to 27GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement.

### 4.4.4 Test Results

| WCDMA | |
|---|---|
| Channel 9400 (1880.0MHz) | |
| Frequency Range : 9kHz~1GHz | Frequency Range : 1GHz~10GHz |
|  |  |
| Frequency Range : 10GHz~26.5GHz | |
|  | |

| LTE Band 2, Channel Bandwidth 20MHz | |
|---|---|
| Channel 18900 (1880.00MHz) | |
| Frequency Range : 9kHz~1GHz | Frequency Range : 1GHz~10GHz |
|   |   |
| Frequency Range : 10GHz~27GHz | |
|   | |

## 4.5 Radiated Emission Measurement

### 4.5.1 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.

### 4.5.2 Test Procedure

a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
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 = Output power level of S.G – TX cable loss + 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 power = E.I.P.R power - 2.15 dBi.

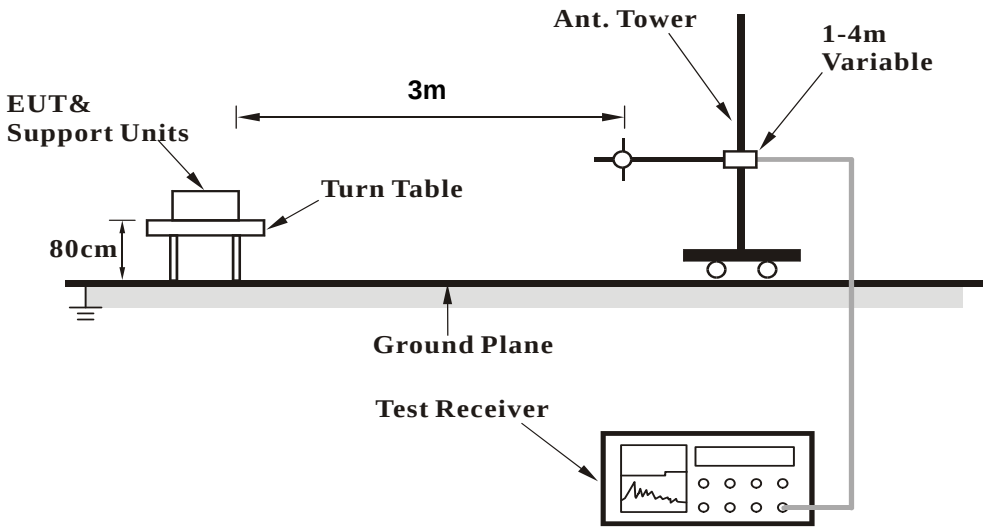
**NOTE:** The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.

### 4.5.3 Deviation from Test Standard

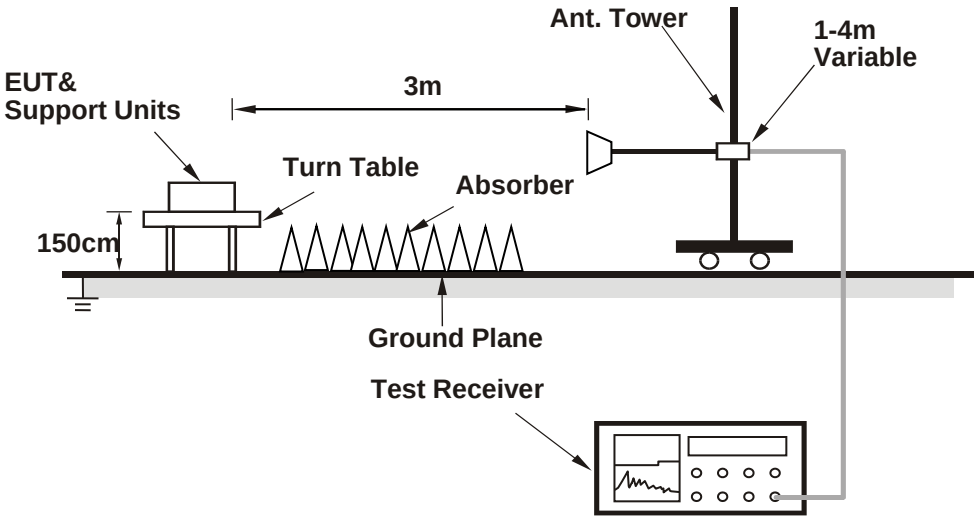
No deviation.

4.5.4 Test Setup

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




**<Radiated Emission above 1 GHz>**



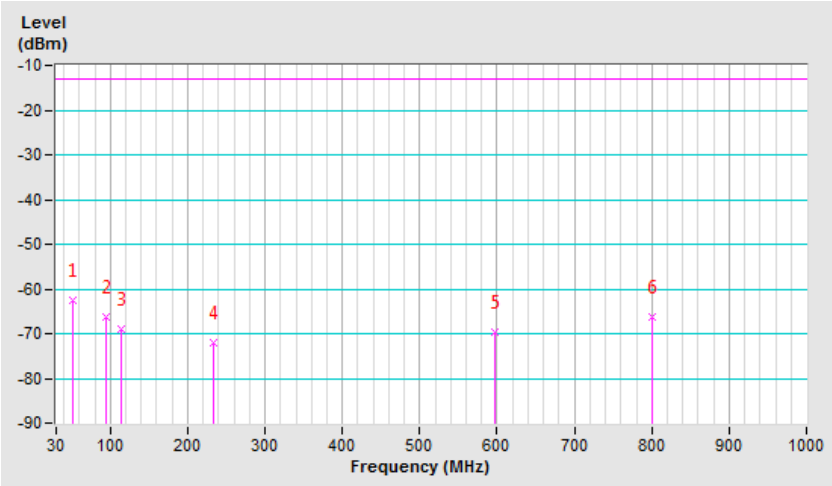

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.5.5 Test Results
Below 1GHz
WCDMA Band 2

| | | | |
|---|---|---|---|
| Mode | TX channel 9400 (1880.00MHz) | Frequency Range | Below 1000 MHz |
| 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 | 51.34 | -61.2 | -53.5 | -8.9 | -62.4 | -13.0 | -49.4 |
| 2 | 94.02 | -58.4 | -67.2 | 1.0 | -66.2 | -13.0 | -53.2 |
| 3 | 113.42 | -61.5 | -69.4 | 0.3 | -69.1 | -13.0 | -56.1 |
| 4 | 233.70 | -63.6 | -77.5 | 5.4 | -72.1 | -13.0 | -59.1 |
| 5 | 596.48 | -70.0 | -74.0 | 4.4 | -69.6 | -13.0 | -56.6 |
| 6 | 800.18 | -71.5 | -70.2 | 4.0 | -66.2 | -13.0 | -53.2 |

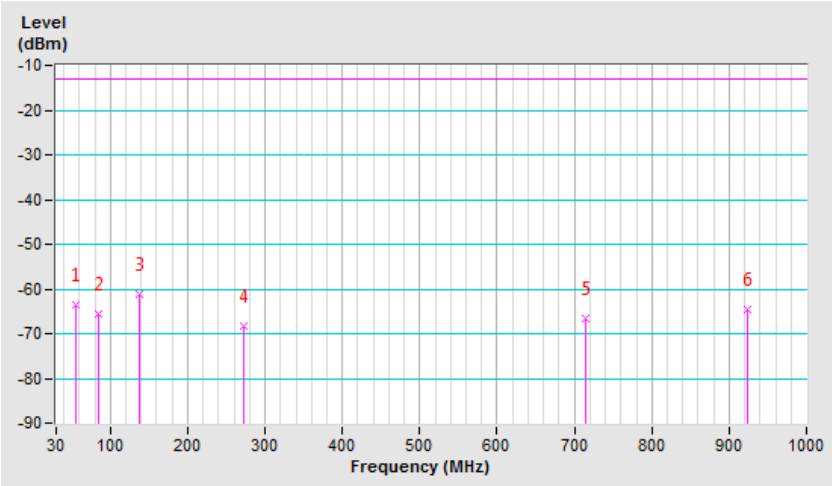
Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).



| | | | |
|---|---|---|---|
| Mode | TX channel 9400 (1880.00MHz) | Frequency Range | Below 1000 MHz |
| Environmental Conditions | 25deg. C, 70%RH | Input Power | 120Vac, 60Hz |
| Tested By | Noah Chang | | |

| 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 | 55.22 | -57.0 | -54.9 | -8.7 | -63.6 | -13.0 | -50.6 |
| 2 | 84.32 | -61.5 | -65.2 | -0.5 | -65.7 | -13.0 | -52.7 |
| 3 | 136.70 | -57.0 | -60.9 | -0.3 | -61.2 | -13.0 | -48.2 |
| 4 | 272.50 | -71.3 | -73.5 | 5.3 | -68.2 | -13.0 | -55.2 |
| 5 | 714.82 | -72.0 | -71.6 | 5.0 | -66.6 | -13.0 | -53.6 |
| 6 | 924.34 | -72.8 | -68.5 | 3.9 | -64.6 | -13.0 | -51.6 |

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

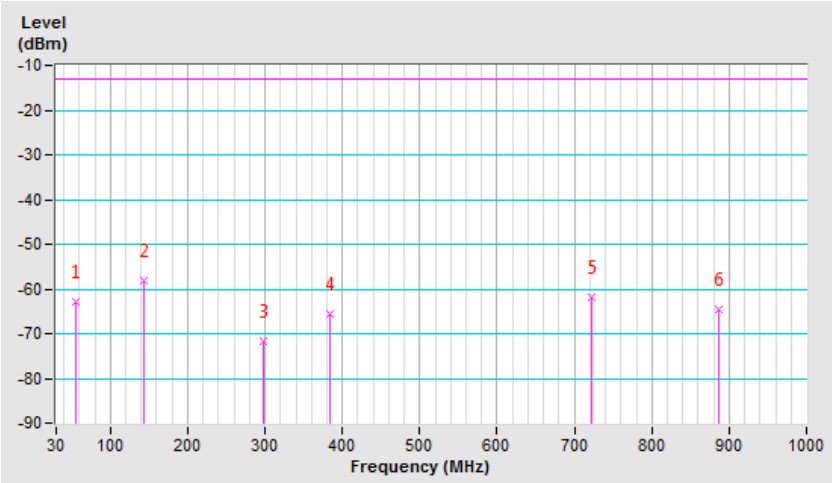


LTE Band 2, Channel Bandwidth: 20MHz

| | | | |
|---|---|---|---|
| Mode | TX channel 18900 (1880.00MHz) | Frequency Range | Below 1000 MHz |
| 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 | 55.22 | -60.6 | -54.1 | -8.7 | -62.8 | -13.0 | -49.8 |
| 2 | 142.52 | -52.8 | -57.8 | -0.3 | -58.1 | -13.0 | -45.1 |
| 3 | 297.72 | -68.3 | -76.9 | 5.1 | -71.8 | -13.0 | -58.8 |
| 4 | 383.08 | -64.6 | -70.8 | 5.3 | -65.5 | -13.0 | -52.5 |
| 5 | 722.58 | -64.7 | -67.0 | 5.0 | -62.0 | -13.0 | -49.0 |
| 6 | 887.48 | -71.1 | -68.4 | 3.9 | -64.5 | -13.0 | -51.5 |

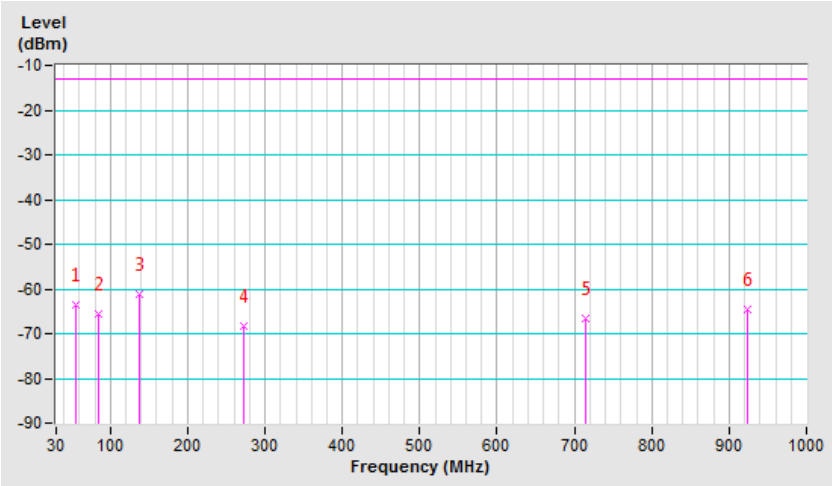
Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).



| | | | |
|---|---|---|---|
| Mode | TX channel 18900 (1880.00MHz) | Frequency Range | Below 1000 MHz |
| Environmental Conditions | 25deg. C, 70%RH | Input Power | 120Vac, 60Hz |
| Tested By | Noah Chang | | |

| 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 | 33.88 | -54.1 | -52.0 | -11.7 | -63.7 | -13.0 | -50.7 |
| **2** | **59.10** | **-46.8** | **-46.2** | **-7.8** | **-54.0** | **-13.0** | **-41.0** |
| 3 | 95.96 | -57.0 | -63.7 | 1.0 | -62.7 | -13.0 | -49.7 |
| 4 | 136.70 | -51.6 | -55.5 | -0.3 | -55.8 | -13.0 | -42.8 |
| 5 | 241.46 | -68.8 | -74.5 | 5.5 | -69.0 | -13.0 | -56.0 |
| 6 | 747.80 | -67.3 | -66.4 | 4.7 | -61.7 | -13.0 | -48.7 |

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).



Above 1GHz
WCDMA Band 2

| | | | |
|---|---|---|---|
| Mode | TX channel 9400 (1880.0MHz) | Frequency Range | 1GHz ~ 18GHz |
| 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 | 3760.00 | -75.0 | -68.5 | 7.1 | -61.4 | -13.0 | -48.4 |
| 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 | 3760.00 | -74.8 | -67.4 | 7.1 | -60.3 | -13.0 | -47.3 |

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

LTE Band 2, Channel Bandwidth 20MHz

| | | | |
|---|---|---|---|
| Mode | TX channel 18900 (1880.00MHz) | Frequency Range | 1GHz ~ 18GHz |
| 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 | 3760.00 | -75.3 | -68.8 | 7.1 | -61.7 | -13.0 | -48.7 |
| 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 | 3760.00 | -74.9 | -67.5 | 7.1 | -60.4 | -13.0 | -47.4 |

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

## 5 Pictures of Test Arrangements

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

## Appendix – Information of the Testing Laboratories

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

If you have any comments, please feel free to contact us at the following: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The address and road map of all our labs can be found in our web site also.

**--- END ---**