Test Lab
Cert 2951.01

# FCC TEST REPORT
# (PART 27)

| | |
|---|---|
| **Product:** | LTE Smartphone |
| **Model No.:** | Ex-Handy 09 |
| **FCC ID:** | XAM500055GR01 |
| **Applicant:** | ecom instruments GmbH |
| **Address:** | Industriestraße. 2, 97959 Assamstadt, Germany |
| **Manufacturer:** | ecom instruments GmbH |
| **Address:** | Industriestraße. 2, 97959 Assamstadt, Germany |
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| **Report No.:** | RF140812N017-2 |
| **Received Date:** | Aug. 12, 2014 |
| **Test Date:** | Aug. 12, 2014~ Oct. 12, 2014 |
| **Issued Date:** | Oct. 15, 2014 |

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# RELEASE CONTROL RECORD

| ISSUE NO. | REASON FOR CHANGE | DATE ISSUED |
|---|---|---|
| RF140812N017-2 | Original release | Oct. 15, 2014 |

# 1 CERTIFICATION

| | |
|---|---|
| **PRODUCT:** | LTE Smartphone |
| **BRAND:** | ecom MOBILE SAFETY |
| **MODEL NO.:** | Ex-Handy 09 |
| **APPLICANT:** | ecom instruments GmbH |
| **TESTED:** | Aug. 12, 2014 ~ Oct. 12, 2014 |
| **TEST SAMPLE:** | Identical Prototype |
| **STANDARDS:** | **FCC Part 27, Subpart C, M** |
| | **FCC Part 2** |
| | ANSI C63.4-2003 |

The above equipment has been tested by **Bureau Veritas Shenzhen Co., Ltd. Dongguan 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 EMC characteristics under the conditions specified in this report.

**TESTED BY** : _____ , **DATE :** Oct. 15, 2014

Glyn He/ Project Engineer

**APPROVED BY** : _____ , **DATE :** Oct. 15, 2014

Sam Tung / Technical Manager

# 2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: FCC Part 27 & Part 2 | | | |
|---|---|---|---|
| **STANDARD SECTION** | **TEST TYPE AND LIMIT** | **RESULT** | **REMARK** |
| 2.1046<br>27.50(h) | Equivalent Isotropically Radiated Power | PASS | Meet the requirement of limit. |
| 2.1055<br>27.54 | Frequency Stability | PASS | Meet the requirement of limit. |
| 2.1049 | Occupied Bandwidth | PASS | Meet the requirement of limit. |
| 27.50(d)(5) | Peak to average ratio | PASS | Meet the requirement of limit. |
| 2.1051<br>27.53(l) | Band Edge Measurements | PASS | Meet the requirement of limit. |
| 2.1051<br>27.53(l) | Conducted Spurious Emissions | PASS | Meet the requirement of limit. |
| 2.1053<br>27.53(l) | Radiated Spurious Emissions | PASS | Meet the requirement of limit.<br>Minimum passing margin is -6.13dB at 12675MHz. |

## 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 | UNCERTAINTY |
|---|---|---|
| Conducted emissions | 9kHz~30MHz | 2.66dB |
| Radiated emissions | 9KHz ~ 30MHz | 2.74dB |
| | 30MHz ~ 1GMHz | 3.55dB |
| | 1GHz ~ 18GHz | 4.84dB |
| | 18GHz ~ 40GHz | 1.94dB |

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

## 2.2 TEST SITE AND INSTRUMENTS

| Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
|---|---|---|---|---|---|
| Spectrum Analyzer | Agilent | E4446A | MY46180622 | Apr. 29,14 | Apr. 28,15 |
| Spectrum Analyzer (10Hz–40GHz) | Rohde&Schwarz | FSV40 | 101003 | Apr. 09,14 | Apr. 08,15 |
| Signal Analyzer | Rohde&Schwarz | FSV7 | 102331 | Nov. 25,13 | Nov. 24,14 |
| EMI Test Receiver | Rohde&Schwarz | ESVD | ESVS10 | May 17,14 | May 16,15 |
| Loop antenna (9kHz~30MHz) | Daze | ZN30900A | 0708 | Nov. 27,14 | Nov. 26,15 |
| Bilog Antenna (20MHz~2GHz) | Teseq | CBL 6111D | 30643 | Jul. 27, 14 | Jul. 26, 15 |
| Horn Antenna (1GHz -18GHz) | ETS -Lindgren | 3117 | 00062558 | Oct. 18, 12 | Oct. 17, 14 |
| Horn Antenna (15GHz-40GHz) | SCHWARZBECK | BBHA 9170 | BBHA9170242 | Feb. 13,14 | Feb. 12,15 |
| Signal Amplifier | Agilent | 8447D | 2944A10488 | Jun. 25,14 | Jun. 24,15 |
| Pre-Amplifier (100MHz-26.5GHz) | Agilent | 8449B | 3008A00409 | May 13,14 | May 12,15 |
| Pre-Amplifier (18GHz-40GHz) | EMCI | EMC 184045 | 980102 | Nov. 04,13 | Nov. 03,14 |
| Digital Multimeter | FLUKE | 15B | A1220010DG | Oct. 30, 13 | Oct. 29, 14 |
| Power Sensor | Anritsu | MA2411B | 1126068 | Feb. 21,14 | Feb. 20,15 |
| Power Meter | Anritsu | ML2495A | 1139001 | Feb. 21,14 | Feb. 20,15 |
| 3m Semi-anechoic Chamber | ETS-LINDGREN | 9m*6m*6m | NSEMC003 | Apr. 19,14 | Apr. 18,15 |
| Humid & Temp Programmable Tester | Haida | HD-2257 | 110807201 | Sep. 16,14 | Sep. 15,15 |
| Signal Generator | Agilent | N5183A | MY50140980 | Nov. 04,13 | Nov. 03,14 |
| ESG Vector Signal Generator | Agilent | E4438C | MY49072505 | Mar.14, 14 | Mar.13, 15 |
| Test Software | ADT | ADT_Radiated _V7.6.15.9.2 | N/A | N/A | N/A |
| Bluetooth Tester | Rohde&Schwarz | CBT32 | N/A | N/A | N/A |

**NOTE:** 1. The calibration interval of the above test instruments is 12 months or 24 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

2. The test was performed in Dongguan 966 Chamber.

3. The horn antenna are used only for the measurement of emission frequency above 1GHz if tested.

4. The FCC Site Registration No. is 502831.

# 3 GENERAL INFORMATION

## 3.1 GENERAL DESCRIPTION OF EUT

| | | |
|---|---|---|
| **PRODUCT** | LTE Smartphone | |
| **MODEL NO.** | Ex-Handy 09 | |
| **TYPE NUMBER** | L12V011BB, L12V011AB, L13V011AB | |
| **POWER SUPPLY** | 5.0Vdc (adapter or host equipment)<br>3.7Vdc (Li-ion battery) | |
| **MODULATION TECHNOLOGY** | **LTE Band 7** | QPSK, 16QAM |
| **FREQUENCY RANGE** | **LTE Band 7 Channel Bandwidth: 5MHz** | 2502.5MHz ~ 2567.5MHz |
| | **LTE Band 7 Channel Bandwidth: 10MHz** | 2505MHz ~ 2565MHz |
| | **LTE Band 7 Channel Bandwidth: 15MHz** | 2507.5MHz ~ 2562.5MHz |
| | **LTE Band 7 Channel Bandwidth: 20MHz** | 2510MHz ~ 2560MHz |
| **EMISSION DESIGNATOR** | **LTE Band 7 Channel Bandwidth: 5MHz** | QPSK: 4M49G7D |
| | | 16QAM: 4M47W7D |
| | **LTE Band 7 Channel Bandwidth: 10MHz** | QPSK: 8M94G7D |
| | | 16QAM: 8M97W7D |
| | **LTE Band 7 Channel Bandwidth: 15MHz** | QPSK: 13M4G7D |
| | | 16QAM: 13M4W7D |
| | **LTE Band 7 Channel Bandwidth: 20MHz** | QPSK: 17M9G7D |
| | | 16QAM: 17M8W7D |
| **MAX. EIRP POWER** | **LTE Band 7 Channel Bandwidth: 5MHz** | 553mW |
| | **LTE Band 7 Channel Bandwidth: 10MHz** | 548mW |
| | **LTE Band 7 Channel Bandwidth: 15MHz** | 569mW |
| | **LTE Band 7 Channel Bandwidth: 20MHz** | 548mW |
| **ANTENNA TYPE** | Fixed Internal antenna with 3.5dBi gain | |
| **HW VERSION** | A | |
| **SW VERSION** | 6A.2.0-01-4.4.2-16.02.11 | |
| **I/O PORTS** | Refer to users' manual | |
| **DATA CABLE** | See note 3 | |

**NOTE**:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. The EUT was powered by the following adapter:

| **ADAPTER** | |
|---|---|
| **BRAND:** | Sonim |
| **MODEL:** | S11C02 |
| **INPUT:** | AC 100-240V, 450mA |
| **OUTPUT:** | DC 5V, 2100mA |

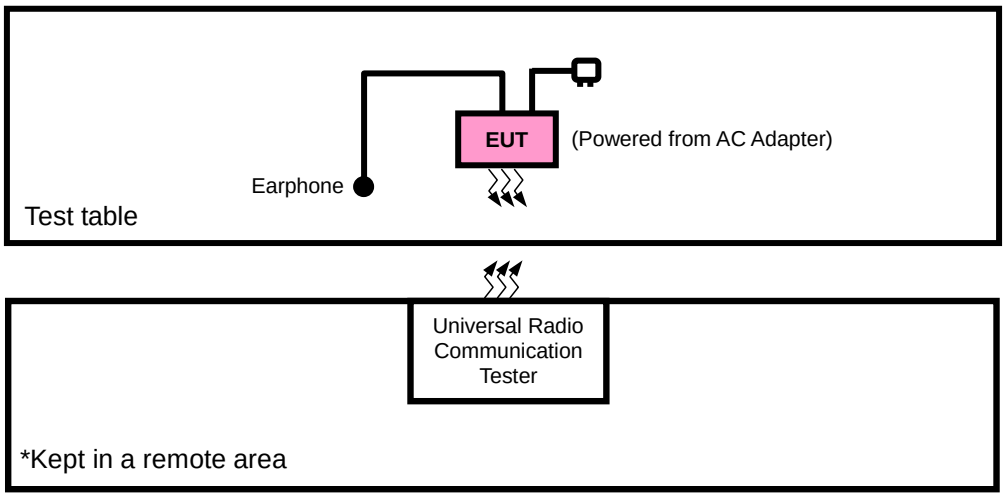
3. The EUT matched the following USB cable:

| **USB CABLE** | |
|---|---|
| **BRAND:** | ecom MOBILE SAFETY |
| **MODEL:** | Safety Box SB S01 |
| **SIGNAL LINE:** | 1.1 METER |

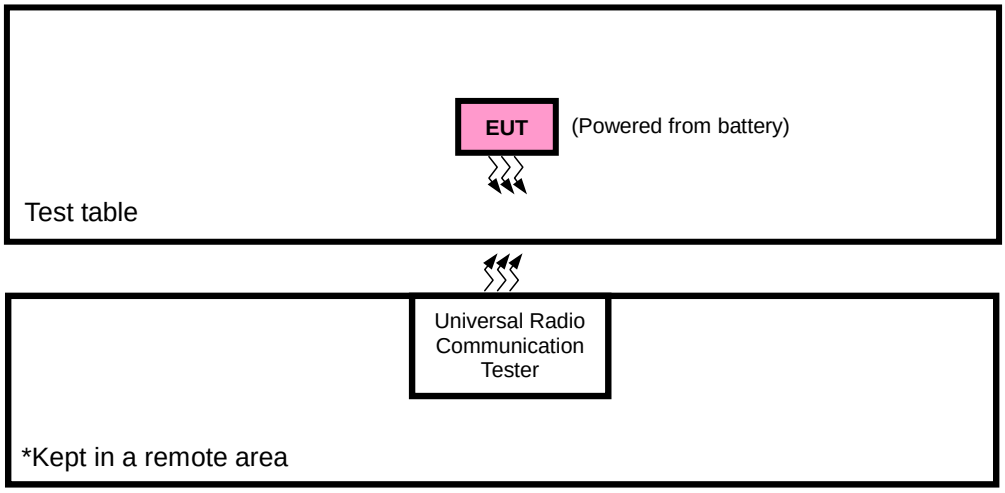
4. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

## 3.2 CONFIGURATION OF SYSTEM UNDER TEST

### FOR RADIATION EMISSION TEST




### FOR E.I.R.P TEST



## 3.3 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.

| NO. | PRODUCT | BRAND | MODEL NO. | SERIAL NO. | FCC ID |
|---|---|---|---|---|---|
| 1 | DC source | LONG WEI | PS-6403D | 010934269 | N/A |
| 2 | PC | HP | A6608CN | 3CR83825X3 | N/A |
| 3 | Earphone | Minami | ME-816B5-E | N/A | N/A |

| NO. | SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS |
|---|---|
| 1 | DC Line: Unshielded, Detachable 1.0m |
| 2 | AC Line: Unshielded, Detachable 1.5m |
| 3 | DC Line: Unshielded, Detachable 1.2m |

**NOTE:** All power cords of the above support units are non shielded (1.8m).

## 3.4 TEST ITEM AND TEST CONFIGURATION

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 Y-plane for EIRP and X-axis for radiated emission. Following channel(s) was (were) selected for the final test as listed below:

| EUT CONFIGURE MODE | DESCRIPTION |
|---|---|
| **A** | **EUT + Adapter + Earphone with LTE link** |
| B | EUT + Battery + Earphone with **LTE link** |

## LTE BAND 7

| EUT CONFIGURE MODE | TEST ITEM | AVAILABLE CHANNEL | TESTED CHANNEL | CHANNEL BANDWIDTH | MODULATION | MODE |
|---|---|---|---|---|---|---|
| B | EIRP | 20775 to 21425 | 20775, 21100, 21425 | 5MHz | QPSK, 16QAM | 1 RB / 0 RB Offset |
| | | 20800 to 21400 | 20800, 21100, 21400 | 10MHz | QPSK, 16QAM | 1 RB / 0RB Offset |
| | | 20825 to 21375 | 20825, 21100, 21375 | 15MHz | QPSK, 16QAM | 1 RB / 0 RB Offset |
| | | 20850 to 21350 | 20850, 21100 21350 | 20MHz | QPSK, 16QAM | 1 RB / 0 RB Offset |
| B | FREQUENCY STABILITY | 20775 to 21425 | 21100 | 5MHz | QPSK | 1 RB / 0 RB Offset |
| | | 20800 to 21400 | 21100 | 10MHz | QPSK | 1 RB / 0RB Offset |
| | | 20825 to 21375 | 21100 | 15MHz | QPSK | 1 RB / 0 RB Offset |
| | | 20850 to 21350 | 21100 | 20MHz | QPSK | 1 RB / 0 RB Offset |
| B | OCCUPIED BANDWIDTH | 20775 to 21425 | 20775, 21100, 21425 | 5MHz | QPSK, 16QAM | 25 RB / 0 RB Offset |
| | | 20800 to 21400 | 20800, 21100, 21400 | 10MHz | QPSK, 16QAM | 50 RB / 0 RB Offset |
| | | 20825 to 21375 | 20825, 21100, 21375 | 15MHz | QPSK, 16QAM | 75 RB / 0 RB Offset |
| | | 20850 to 21350 | 20850, 21100 21350 | 20MHz | QPSK, 16QAM | 100 RB / 0 RB Offset |
| B | PEAK TO AVERAGE RATIO | 20775 to 21425 | 20775, 21100, 21425 | 5MHz | QPSK, 16QAM | 1 RB / 0 RB Offset |
| | | 20800 to 21400 | 20800, 21100, 21400 | 10MHz | QPSK, 16QAM | 1 RB / 0RB Offset |
| | | 20825 to 21375 | 20825, 21100, 21375 | 15MHz | QPSK, 16QAM | 1 RB / 0 RB Offset |
| | | 20850 to 21350 | 20850, 21100 21350 | 20MHz | QPSK, 16QAM | 1 RB / 0 RB Offset |
| B | BAND EDGE | 20775 to 21425 | 20775, 21425 | 5MHz | QPSK | 1 RB / 12 RB Offset |
| | | | | | | 25 RB / 0 RB Offset |
| | | 20800 to 21400 | 20800, 21400 | 10MHz | QPSK | 1 RB / 24 RB Offset |
| | | | | | | 50 RB / 0 RB Offset |
| | | 20825 to 21375 | 20825, 21375 | 15MHz | QPSK | 1 RB / 37 RB Offset |
| | | | | | | 75 RB / 0 RB Offset |
| | | 20850 to 21350 | 20850, 21350 | 20MHz | QPSK | 1 RB / 50 RB Offset |
| | | | | | | 100 RB / 0 RB Offset |
| B | CONDCUDETED EMISSION | 20775 to 21425 | 21100 | 5MHz | QPSK | 1 RB / 0 RB Offset |
| | | 20800 to 21400 | 21100 | 10MHz | QPSK | 1 RB / 0RB Offset |
| | | 20825 to 21375 | 21100 | 15MHz | QPSK | 1 RB / 0 RB Offset |
| | | 20850 to 21350 | 21100 | 20MHz | QPSK | 1 RB / 0 RB Offset |
| A | RADIATED EMISSION | 20775 to 21425 | 21100 | 5MHz | QPSK | 1 RB / 0 RB Offset |
| | | 20800 to 21400 | 21100 | 10MHz | QPSK | 1 RB / 0RB Offset |
| | | 20825 to 21375 | 21100 | 15MHz | QPSK | 1 RB / 0 RB Offset |
| | | 20850 to 21350 | 21100 | 20MHz | 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 | TESTED BY |
|---|---|---|---|
| EIRP | 24deg. C, 60%RH | 3.7Vdc from Battery | Blue Zheng |
| FREQUENCY STABILITY | 24deg. C, 61%RH | 3.7Vdc from Battery | Yuqiang Yin |
| OCCUPIED BANDWIDTH | 24deg. C, 61%RH | 3.7Vdc from Battery | Yuqiang Yin |
| PEAK TO AVERAGE RATIO | 24deg. C, 61%RH | 3.7Vdc from Battery | Yuqiang Yin |
| BAND EDGE | 24deg. C, 61%RH | 3.7Vdc from Battery | Yuqiang Yin |
| CONDCUDETED EMISSION | 24deg. C, 61%RH | 3.7Vdc from Battery | Yuqiang Yin |
| RADIATED EMISSION | 24deg. C, 60%RH | 5Vdc from adapter | Blue Zheng |

## 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 27**

**ANSI C63.4-2003**

**ANSI/TIA/EIA-603-C 2004**

**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

The radiated peak output power shall be according to the specific rule Part 27.50(h)(2) that “User stations are limited to 2 watts” and 27.50(i) specific that “Peak transmit power must be measure over any interval of continuous transmission using instrumentation calibration in terms of rms-equivalent voltage.”

### 4.1.2 TEST PROCEDURES

**EIRP MEASUREMENT:**

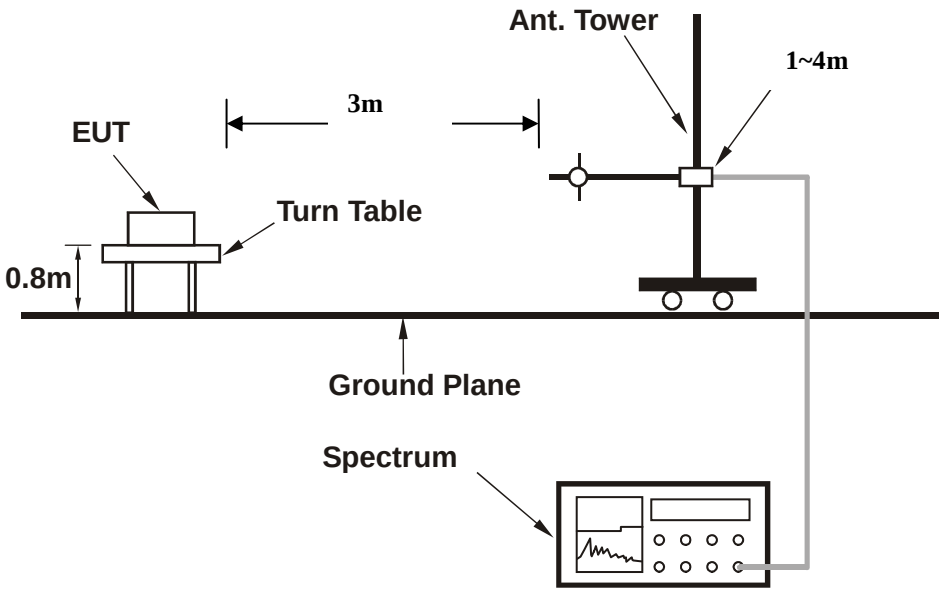
a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 10MHz for LTE mode.
b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum 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.
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.

**CONDUCTED POWER MEASUREMENT:**

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

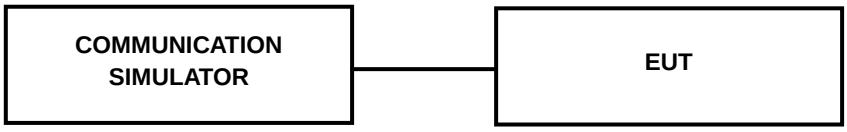
## 4.1.3 TEST SETUP

**EIRP MEASUREMENT:**




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

**CONDUCTED POWER MEASUREMENT:**




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

## 4.1.4 TEST RESULTS

### AVERAGE CONDUCTED OUTPUT POWER (dBm)

| LTE Band 7 | | | | | | | |
|---|---|---|---|---|---|---|---|
| BW | Modulation | RB Size | RB Offset | Low CH 20775 | Mid CH 21100 | High CH 21425 | MPR |
| | | | | Frequency 2502.5 MHz | Frequency 2535 MHz | Frequency 2567.5 MHz | |
| 5 MHz | QPSK | 1 | 0 | **21.19** | 21.17 | 21.1 | 0 |
| | | 1 | 12 | 21.14 | 21.08 | 21.04 | 0 |
| | | 1 | 24 | 21.07 | 21.05 | 20.98 | 0 |
| | | 12 | 0 | **20.21** | 20.19 | 20.12 | 1 |
| | | 12 | 6 | 20.16 | 20.1 | 20.06 | 1 |
| | | 12 | 13 | 20.09 | 20.07 | 20 | 1 |
| | | 25 | 0 | **20.2** | 20.18 | 20.11 | 1 |
| | 16QAM | 1 | 0 | **20.19** | 20.17 | 20.1 | 1 |
| | | 1 | 12 | 20.14 | 20.08 | 20.04 | 1 |
| | | 1 | 24 | 20.07 | 20.05 | 19.98 | 1 |
| | | 12 | 0 | **19.11** | 19.09 | 19.02 | 2 |
| | | 12 | 6 | 19.06 | 19 | 19.02 | 2 |
| | | 12 | 13 | 18.99 | 18.97 | 18.9 | 2 |
| | | 25 | 0 | **19.1** | 19.08 | 19.01 | 2 |

| LTE Band 7 | | | | | | | |
|---|---|---|---|---|---|---|---|
| BW | Modulation | RB Size | RB Offset | Low CH 20800 Frequency 2505 MHz | Mid CH 21100 Frequency 2535 MHz | High CH 21400 Frequency 2565 MHz | MPR |
| 10 MHz | QPSK | 1 | 0 | **21.2** | 21.18 | 21.11 | 0 |
| | | 1 | 24 | 21.15 | 21.09 | 21.05 | 0 |
| | | 1 | 49 | 21.08 | 21.06 | 20.99 | 0 |
| | | 25 | 0 | **20.22** | 20.2 | 20.13 | 1 |
| | | 25 | 12 | 20.17 | 20.11 | 20.07 | 1 |
| | | 25 | 25 | 20.1 | 20.08 | 20.01 | 1 |
| | | 50 | 0 | **20.21** | 20.19 | 20.12 | 1 |
| | 16QAM | 1 | 0 | **20.2** | 20.18 | 20.11 | 1 |
| | | 1 | 24 | 20.15 | 20.09 | 20.05 | 1 |
| | | 1 | 49 | 20.08 | 20.06 | 19.99 | 1 |
| | | 25 | 0 | **19.12** | 19.1 | 19.03 | 2 |
| | | 25 | 12 | 19.07 | 19.01 | 19.03 | 2 |
| | | 25 | 25 | 19 | 18.98 | 18.91 | 2 |
| | | 50 | 0 | **19.11** | 19.09 | 19.02 | 2 |
| BW | Modulation | RB Size | RB Offset | Low CH 20825 Frequency 2507.5 MHz | Mid CH 21100 Frequency 2535 MHz | High CH 21375 Frequency 2562.5 MHz | MPR |
| 15 MHz | QPSK | 1 | 0 | **21.24** | 21.22 | 21.15 | 0 |
| | | 1 | 37 | 21.19 | 21.13 | 21.09 | 0 |
| | | 1 | 74 | 21.12 | 21.1 | 21.03 | 0 |
| | | 36 | 0 | **20.26** | 20.24 | 20.17 | 1 |
| | | 36 | 19 | 20.21 | 20.15 | 20.11 | 1 |
| | | 36 | 39 | 20.14 | 20.12 | 20.05 | 1 |
| | | 75 | 0 | **20.25** | 20.23 | 20.16 | 1 |
| | 16QAM | 1 | 0 | **20.24** | 20.22 | 20.15 | 1 |
| | | 1 | 37 | 20.19 | 20.13 | 20.09 | 1 |
| | | 1 | 74 | 20.12 | 20.1 | 20.03 | 1 |
| | | 36 | 0 | **19.16** | 19.14 | 19.07 | 2 |
| | | 36 | 19 | 19.11 | 19.05 | 19.01 | 2 |
| | | 36 | 39 | 19.04 | 19.02 | 18.95 | 2 |
| | | 75 | 0 | **19.15** | 19.13 | 19.06 | 2 |

| LTE Band 7 | | | | | | | |
|---|---|---|---|---|---|---|---|
| BW | Modulation | RB Size | RB Offset | Low CH 20850 | Mid CH 21100 | High CH 21350 | MPR |
| | | | | Frequency 2510 MHz | Frequency 2535 MHz | Frequency 2560 MHz | |
| 20 MHz | QPSK | 1 | 0 | **21.3** | 21.28 | 21.29 | 0 |
| | | 1 | 50 | 21.25 | 21.19 | 21.15 | 0 |
| | | 1 | 99 | 21.18 | 21.16 | 21.09 | 0 |
| | | 50 | 0 | **20.32** | 20.3 | 20.23 | 1 |
| | | 50 | 25 | 20.27 | 20.21 | 20.17 | 1 |
| | | 50 | 50 | 20.2 | 20.18 | 20.11 | 1 |
| | | 100 | 0 | **20.31** | 20.29 | 20.22 | 1 |
| | 16QAM | 1 | 0 | **20.3** | 20.28 | 20.21 | 1 |
| | | 1 | 50 | 20.25 | 20.19 | 20.15 | 1 |
| | | 1 | 99 | 20.18 | 20.16 | 20.09 | 1 |
| | | 50 | 0 | **19.22** | 19.2 | 19.13 | 2 |
| | | 50 | 25 | 19.17 | 19.11 | 19.07 | 2 |
| | | 50 | 50 | 19.1 | 19.08 | 19.01 | 2 |
| | | 100 | 0 | **19.21** | 19.19 | 19.12 | 2 |

## EIRP

### LTE BAND 7

### CHANNEL BANDWIDTH: 5MHz QPSK

| Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) | Limit (W) |
|---|---|---|---|---|---|---|---|
| 20775 | 2502.5 | -23.65 | 42.48 | 18.83 | 76.38 | H | 1 |
| 21100 | 2535.0 | -23.85 | 42.78 | 18.93 | 78.16 | H | 1 |
| 21425 | 2567.5 | -23.76 | 43.97 | 20.21 | 104.95 | H | 1 |
| 20775 | 2502.5 | -17.66 | 45.09 | 27.43 | **553.35** | V | 1 |
| 21100 | 2535.0 | -17.42 | 44.26 | 26.84 | 483.06 | V | 1 |
| 21425 | 2567.5 | -17.88 | 45.15 | 27.27 | 533.33 | V | 1 |

**NOTE:** EIRP (dBm) = LVL (dBm) + Correction Factor (dB)

### CHANNEL BANDWIDTH: 5MHz 16QAM

| Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) | Limit (W) |
|---|---|---|---|---|---|---|---|
| 20775 | 2502.5 | -24.42 | 42.48 | 18.06 | 63.97 | H | 1 |
| 21100 | 2535.0 | -24.47 | 42.78 | 18.31 | 67.76 | H | 1 |
| 21425 | 2567.5 | -24.67 | 43.97 | 19.30 | 85.11 | H | 1 |
| 20775 | 2502.5 | -18.86 | 45.09 | 26.23 | 419.76 | V | 1 |
| 21100 | 2535.0 | -18.52 | 44.26 | 25.74 | 374.97 | V | 1 |
| 21425 | 2567.5 | -18.66 | 45.15 | 26.49 | 445.66 | V | 1 |

**NOTE:** EIRP (dBm) = LVL (dBm) + Correction Factor (dB)-2.15dB.

## CHANNEL BANDWIDTH: 10MHz QPSK

| Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) | Limit (W) |
|---|---|---|---|---|---|---|---|
| 20800 | 2505.0 | -24.01 | 42.41 | 18.40 | 69.18 | H | 1 |
| 21100 | 2535.0 | -23.98 | 42.78 | 18.80 | 75.86 | H | 1 |
| 21400 | 2565.0 | -23.79 | 43.95 | 20.16 | 103.75 | H | 1 |
| 20800 | 2505.0 | -17.43 | 44.77 | 27.34 | 542.00 | V | 1 |
| 21100 | 2535.0 | -17.88 | 44.26 | 26.38 | 434.51 | V | 1 |
| 21400 | 2565.0 | -17.67 | 45.06 | 27.39 | **548.28** | V | 1 |

**NOTE:** EIRP (dBm) = LVL (dBm) + Correction Factor (dB)

## CHANNEL BANDWIDTH: 10MHz 16QAM

| Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) | Limit (W) |
|---|---|---|---|---|---|---|---|
| 20800 | 2505.0 | -24.96 | 42.41 | 17.45 | 55.59 | H | 1 |
| 21100 | 2535.0 | -24.74 | 42.78 | 18.04 | 63.68 | H | 1 |
| 21400 | 2565.0 | -25.03 | 43.95 | 18.92 | 77.98 | H | 1 |
| 20800 | 2505.0 | -18.65 | 44.77 | 26.12 | 409.26 | V | 1 |
| 21100 | 2535.0 | -18.35 | 44.26 | 25.91 | 389.94 | V | 1 |
| 21400 | 2565.0 | -18.49 | 45.06 | 26.57 | 453.94 | V | 1 |

**NOTE:** EIRP (dBm) = LVL (dBm) + Correction Factor (dB)

## CHANNEL BANDWIDTH: 15MHz QPSK

| Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) | Limit (W) |
|---|---|---|---|---|---|---|---|
| 20825 | 2507.5 | -23.16 | 42.42 | 19.26 | 84.33 | H | 1 |
| 21100 | 2535.0 | -23.62 | 42.78 | 19.16 | 82.41 | H | 1 |
| 21375 | 2562.5 | -23.25 | 43.81 | 20.56 | 113.76 | H | 1 |
| 20825 | 2507.5 | -17.84 | 44.54 | 26.70 | 467.74 | V | 1 |
| 21100 | 2535.0 | -17.69 | 44.26 | 26.57 | 453.94 | V | 1 |
| 21375 | 2562.5 | -17.64 | 45.19 | 27.55 | **568.85** | V | 1 |

**NOTE:** EIRP (dBm) = LVL (dBm) + Correction Factor (dB)

## CHANNEL BANDWIDTH: 15MHz 16QAM

| Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) | Limit (W) |
|---|---|---|---|---|---|---|---|
| 20825 | 2507.5 | -24.65 | 42.42 | 17.77 | 59.84 | H | 1 |
| 21100 | 2535.0 | -24.88 | 42.78 | 17.90 | 61.66 | H | 1 |
| 21375 | 2562.5 | -24.67 | 43.81 | 19.14 | 82.04 | H | 1 |
| 20825 | 2507.5 | -18.99 | 44.54 | 25.55 | 358.92 | V | 1 |
| 21100 | 2535.0 | -18.25 | 44.26 | 26.01 | 399.02 | V | 1 |
| 21375 | 2562.5 | -18.86 | 45.19 | 26.33 | 429.54 | V | 1 |

**NOTE:** EIRP (dBm) = LVL (dBm) + Correction Factor (dB)

## CHANNEL BANDWIDTH: 20MHz QPSK

| Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) | Limit (W) |
|---|---|---|---|---|---|---|---|
| 20850 | 2510.0 | -23.65 | 42.63 | 18.98 | 79.07 | H | 1 |
| 21100 | 2535.0 | -23.40 | 42.78 | 19.38 | 86.70 | H | 1 |
| 21350 | 2560.0 | -23.86 | 43.65 | 19.79 | 95.28 | H | 1 |
| 20850 | 2510.0 | -17.35 | 44.58 | 27.23 | 528.45 | V | 1 |
| 21100 | 2535.0 | -17.52 | 44.26 | 26.74 | 472.06 | V | 1 |
| 21350 | 2560.0 | -17.69 | 45.08 | 27.39 | **548.28** | V | 1 |

**NOTE:** EIRP (dBm) = LVL (dBm) + Correction Factor (dB)

## CHANNEL BANDWIDTH: 20MHz 16QAM

| Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) | Limit (W) |
|---|---|---|---|---|---|---|---|
| 20850 | 2510.0 | -24.75 | 42.63 | 17.88 | 61.38 | H | 1 |
| 21100 | 2535.0 | -24.53 | 42.78 | 18.25 | 66.83 | H | 1 |
| 21350 | 2560.0 | -24.77 | 43.65 | 18.88 | 77.27 | H | 1 |
| 20850 | 2510.0 | -18.45 | 44.58 | 26.13 | 410.20 | V | 1 |
| 21100 | 2535.0 | -18.32 | 44.26 | 25.94 | 392.64 | V | 1 |
| 21350 | 2560.0 | -18.59 | 45.08 | 26.49 | 445.66 | V | 1 |

**NOTE:** EIRP (dBm) = LVL (dBm) + Correction Factor (dB)

## 4.2 FREQUENCY STABILITY MEASUREMENT

### 4.2.1 LIMITS OF FREQUENCY STABILIITY MEASUREMENT

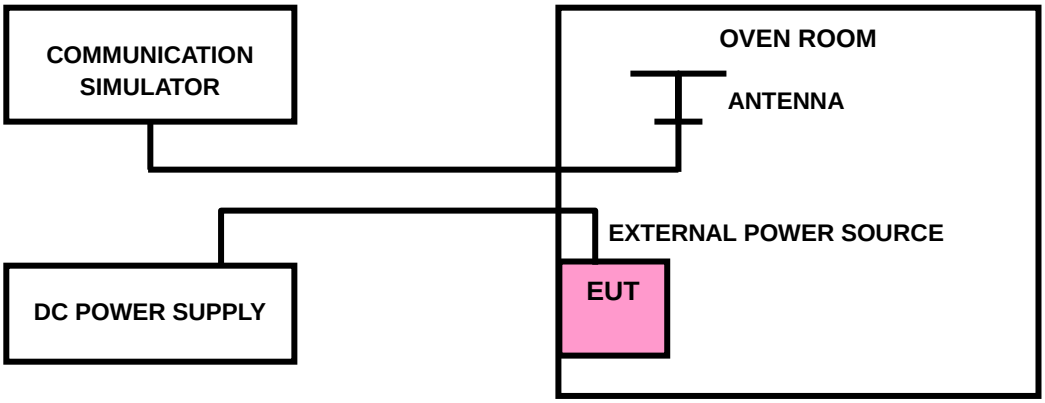
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

### 4.2.2 TEST PROCEDURE

a. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
b. EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
c. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the ±0.5℃ during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

**NOTE:** The frequency error was recorded frequency error from the communication simulator.

### 4.2.3 TEST SETUP



## 4.2.4 TEST RESULTS

**FREQUENCY ERROR vs. VOLTAGE**

| VOLTAGE (Volts) | FREQUENCY ERROR (ppm) | | | | LIMIT (ppm) |
|---|---|---|---|---|---|
| | LTE BAND 7 | | | | |
| | 5MHz | 10MHz | 15MHz | 20MHz | |
| 3.8 | -0.002 | -0.003 | -0.003 | -0.005 | 2.5 |
| 3.5 | -0.002 | -0.003 | -0.001 | -0.002 | 2.5 |
| 4.35 | 0.001 | 0.002 | 0.002 | -0.004 | 2.5 |

**NOTE:** The applicant defined the normal working voltage of the battery is from 3.5Vdc to 4.35Vdc.

**FREQUENCY ERROR vs. TEMPERATURE**

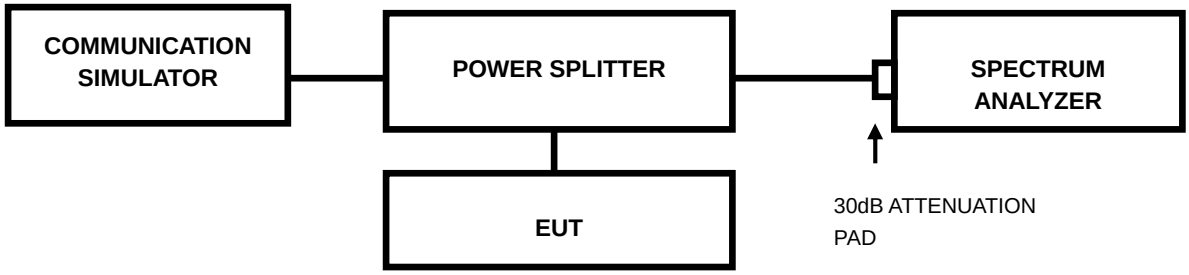
| TEMP. (℃) | FREQUENCY ERROR (ppm) | | | | LIMIT (ppm) |
|---|---|---|---|---|---|
| | LTE BAND 7 | | | | |
| | 5MHz | 10MHz | 15MHz | 20MHz | |
| -30 | -0.006 | -0.005 | -0.007 | 0.005 | 2.5 |
| -20 | -0.005 | -0.005 | -0.006 | 0.005 | 2.5 |
| -10 | -0.004 | -0.004 | -0.005 | 0.004 | 2.5 |
| 0 | -0.003 | -0.003 | -0.004 | 0.004 | 2.5 |
| +10 | -0.003 | -0.003 | -0.003 | 0.003 | 2.5 |
| +20 | -0.002 | -0.003 | -0.003 | 0.003 | 2.5 |
| +30 | -0.004 | -0.003 | -0.002 | 0.003 | 2.5 |
| +40 | -0.004 | -0.003 | 0.002 | 0.002 | 2.5 |
| +50 | -0.005 | -0.004 | 0.003 | -0.001 | 2.5 |
| +60 | -0.005 | -0.005 | 0.004 | -0.002 | 2.5 |

## 4.3 OCCUPIED BANDWIDTH MEASUREMENT

### 4.3.1 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.

### 4.3.2 TEST SETUP




### 4.3.3 TEST PROCEDURES

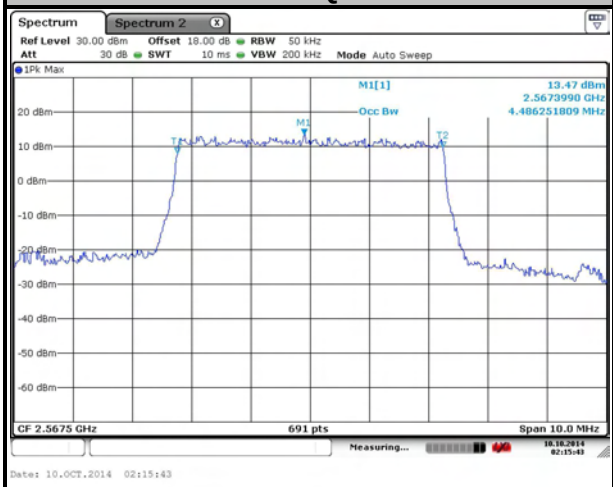
a. The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
b. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

## 4.3.4 TEST RESULTS

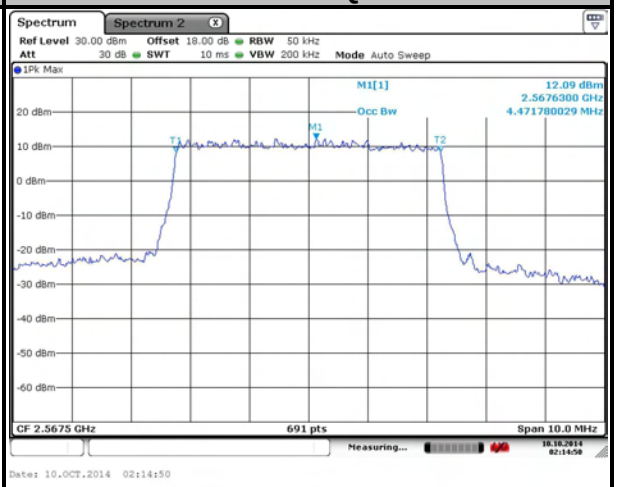
| LTE BAND 7 | | | | | | | |
|---|---|---|---|---|---|---|---|
| CHANNEL BANDWIDTH: 5MHz | | | | CHANNEL BANDWIDTH: 10MHz | | | |
| CHANNEL | FREQUENCY (MHz) | 99% OCCUPIED BANDWIDTH (MHz) | | CHANNEL | FREQUENCY (MHz) | 99% OCCUPIED BANDWIDTH (MHz) | |
| | | QPSK | 16QAM | | | QPSK | 16QAM |
| 20775 | 2502.5 | 4.47 | 4.47 | 20800 | 2505 | 8.94 | 8.94 |
| 21100 | 2535 | 4.47 | 4.46 | 21100 | 2535 | 8.91 | 8.97 |
| 21425 | 2567.5 | 4.49 | 4.47 | 21400 | 2565 | 8.94 | 8.94 |

**SPECTRUM PLOT OF WORST VALUE**

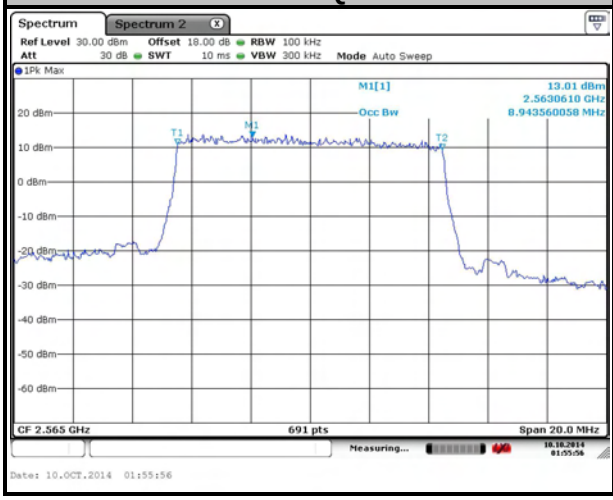
**5MHz / QPSK**



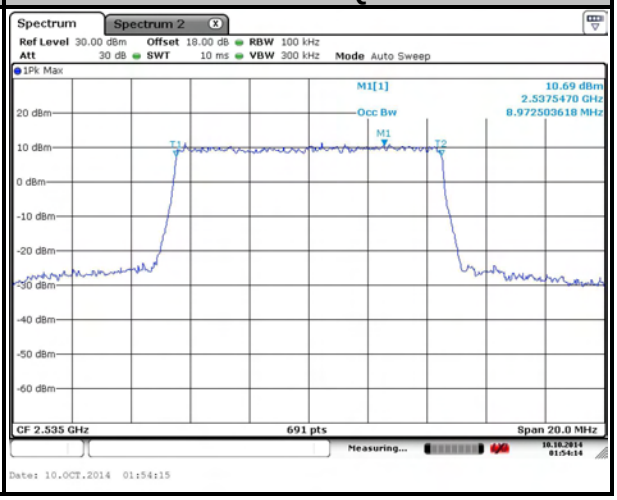

**5MHz / 16QAM**




**10MHz / QPSK**



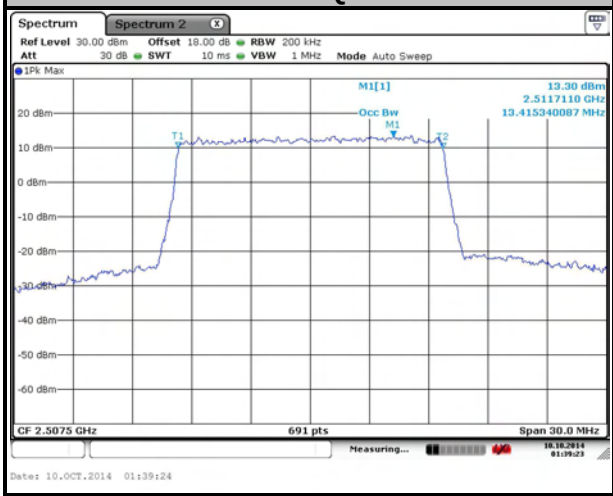

**10MHz / 16QAM**



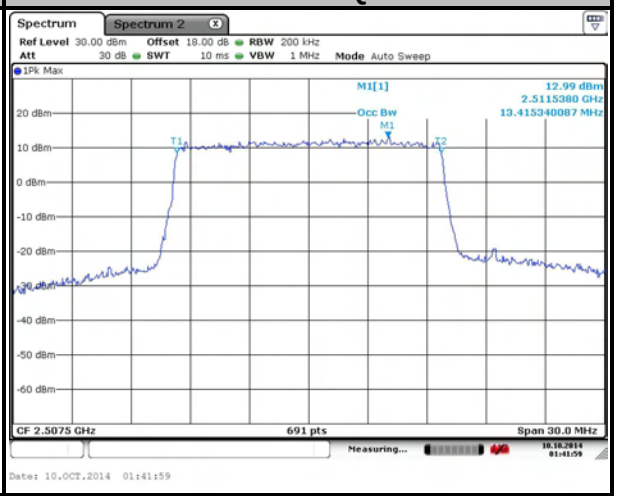
| LTE BAND 7 | | | | | | | |
|---|---|---|---|---|---|---|---|
| CHANNEL BANDWIDTH: 15MHz | | | | CHANNEL BANDWIDTH: 20MHz | | | |
| CHANNEL | FREQUENCY (MHz) | 99% OCCUPIED BANDWIDTH (MHz) | | CHANNEL | FREQUENCY (MHz) | 99% OCCUPIED BANDWIDTH (MHz) | |
| | | QPSK | 16QAM | | | QPSK | 16QAM |
| 20825 | 2507.5 | 13.42 | 13.42 | 20850 | 2510 | 17.89 | 17.83 |
| 21100 | 2535 | 13.42 | 13.42 | 21100 | 2535 | 17.89 | 17.83 |
| 21375 | 2562.5 | 13.42 | 13.42 | 21350 | 2560 | 17.89 | 17.77 |

**SPECTRUM PLOT OF WORST VALUE**

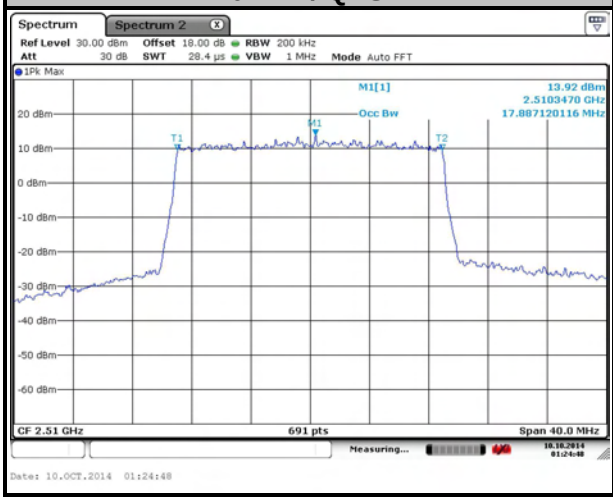
**15MHz / QPSK**



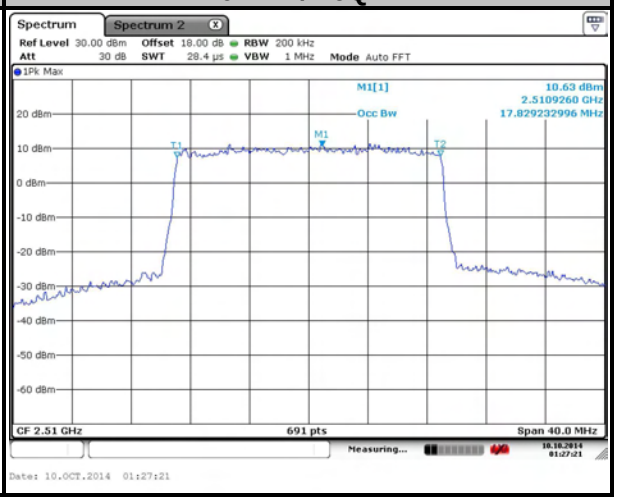

**15MHz / 16QAM**




**20MHz / QPSK**




**20MHz / 16QAM**

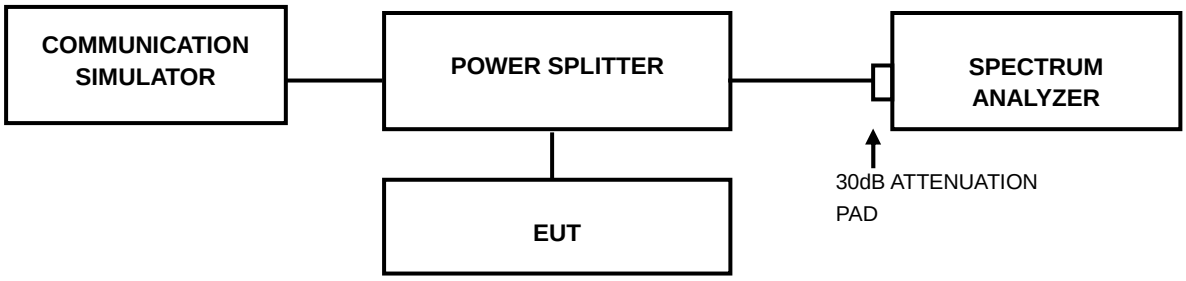


## 4.4 PEAK TO AVERAGE RATIO

### 4.4.1 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.

### 4.4.2 TEST SETUP




### 4.4.3 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%.

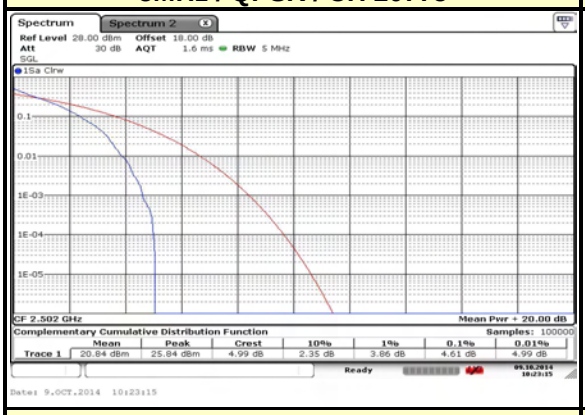
## 4.4.4 TEST RESULTS

### LTE BAND 7

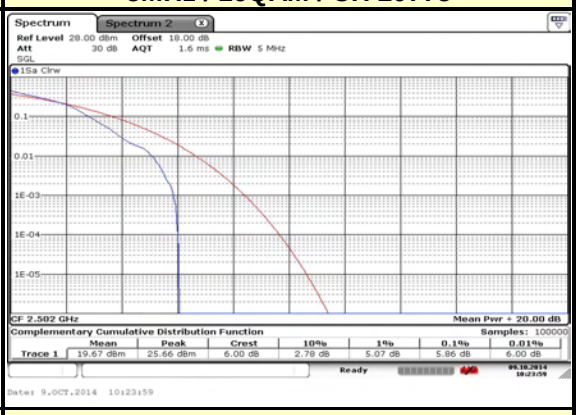
| CHANNEL BANDWIDTH: 5MHz | | | |
|---|---|---|---|
| CHANNEL | FREQUENCY (MHz) | PEAK TO AVERAGE RATIO (dB) | |
| | | QPSK | 16QAM |
| 20775 | 2502.5 | 4.61 | 5.86 |
| 21100 | 2535 | 4.72 | 6.06 |
| 21425 | 2567.5 | 4.46 | 5.68 |

**SPECTRUM PLOT OF WORST VALUE**

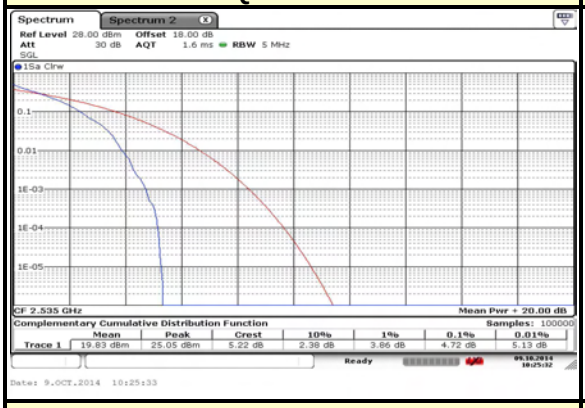
**5MHz / QPSK / CH 20775**



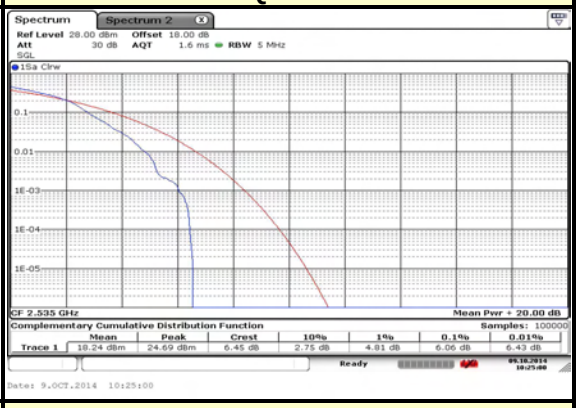

**5MHz / 16QAM / CH 20775**



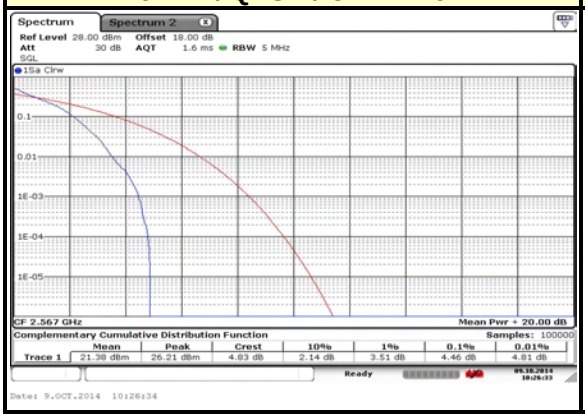

**5MHz / QPSK / CH 21100**



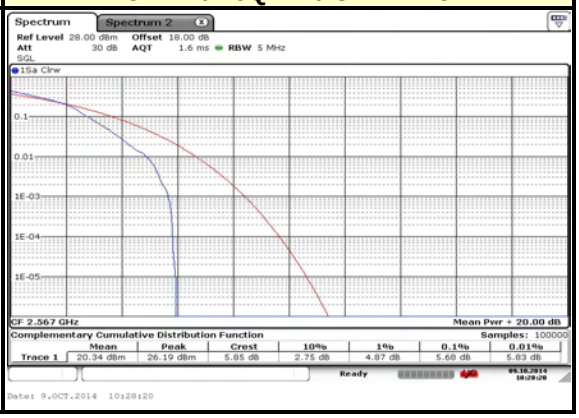

**5MHz / 16QAM / CH 21100**




**5MHz / QPSK / CH 21425**



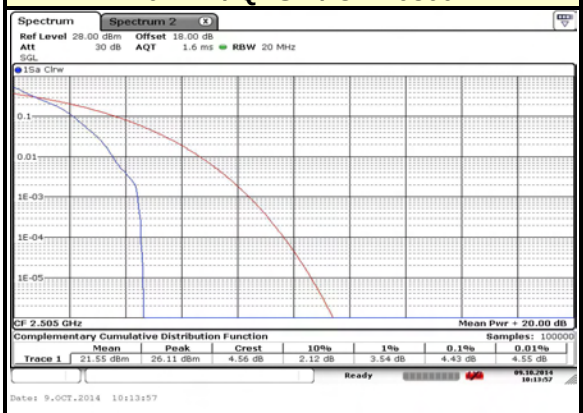

**5MHz / 16QAM / CH 21425**



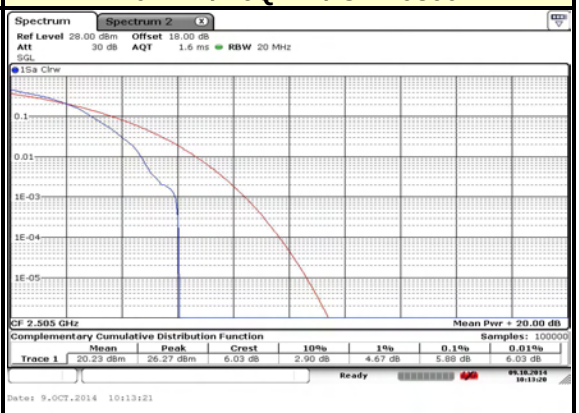
| CHANNEL BANDWIDTH: 10MHz | | | |
|---|---|---|---|
| CHANNEL | FREQUENCY (MHz) | PEAK TO AVERAGE RATIO (dB) | |
| | | QPSK | 16QAM |
| 20800 | 2505 | 4.43 | 5.88 |
| 21100 | 2535 | 5.10 | 5.51 |
| 21400 | 2565 | 4.41 | 5.25 |

**SPECTRUM PLOT OF WORST VALUE**

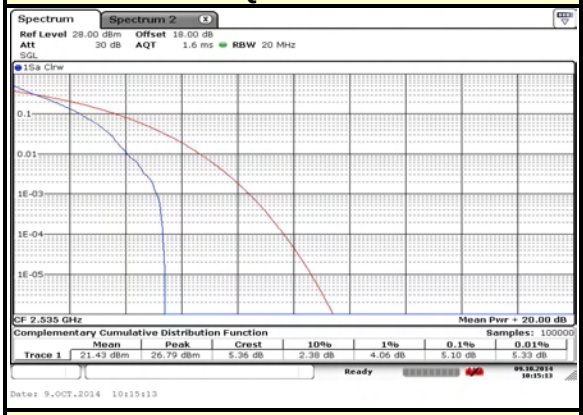
**10MHz / QPSK / CH 20800**



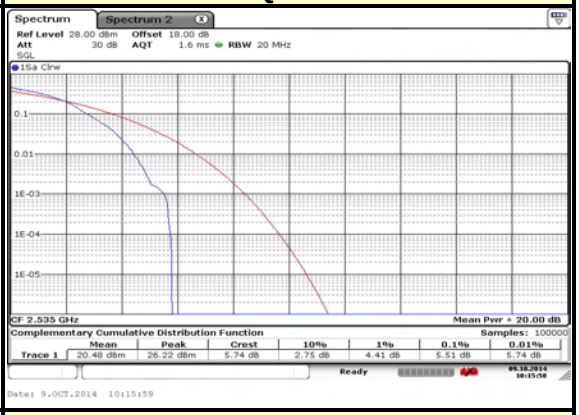

**10MHz / 16QAM / CH 20800**



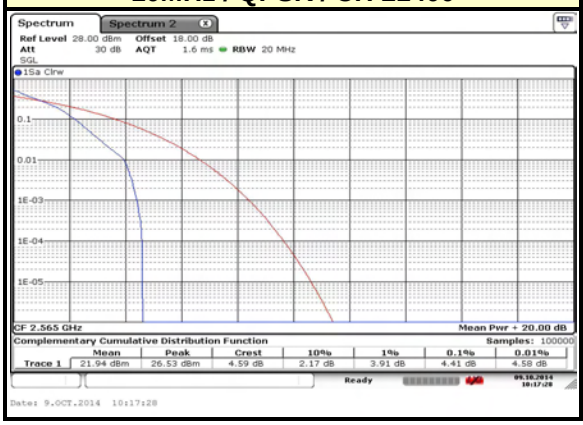

**10MHz / QPSK / CH 21100**



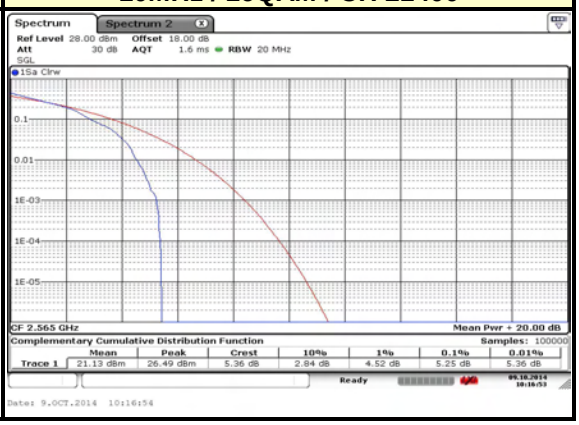

**10MHz / 16QAM / CH 21100**




**10MHz / QPSK / CH 21400**



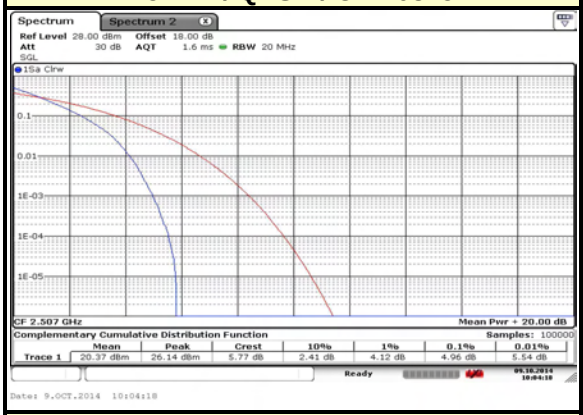

**10MHz / 16QAM / CH 21400**



| CHANNEL BANDWIDTH: 15MHz | | | |
|---|---|---|---|
| CHANNEL | FREQUENCY (MHz) | PEAK TO AVERAGE RATIO (dB) | |
| | | QPSK | 16QAM |
| 20825 | 2507.5 | 4.96 | 5.77 |
| 21100 | 2535 | 5.01 | 6.26 |
| 21375 | 2562.5 | 4.09 | 5.22 |

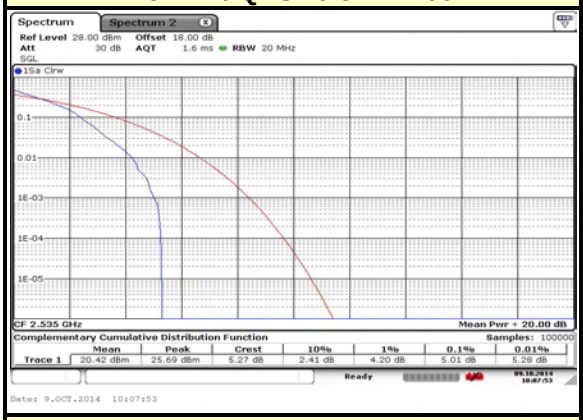
**SPECTRUM PLOT OF WORST VALUE**

**15MHz / QPSK / CH 20825**

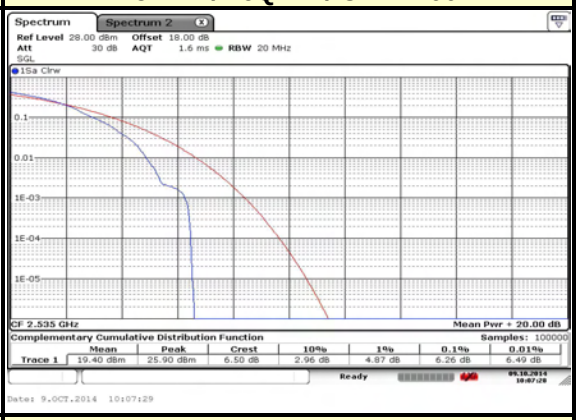



**15MHz / 16QAM / CH 20825**

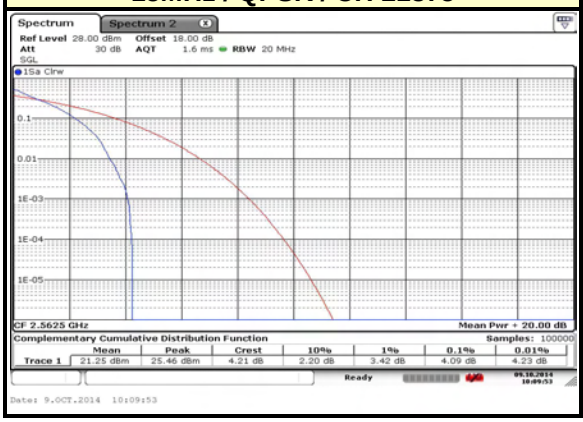
**15MHz / QPSK / CH 21100**



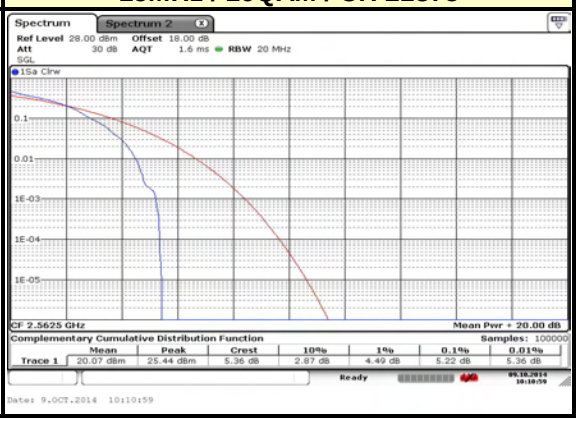

**15MHz / 16QAM / CH 21100**




**15MHz / QPSK / CH 21375**



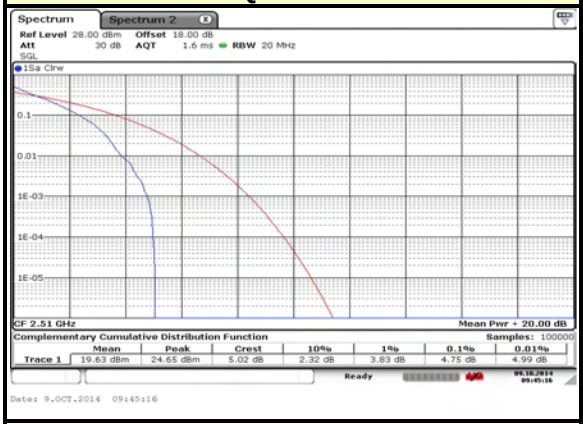

**15MHz / 16QAM / CH 21375**



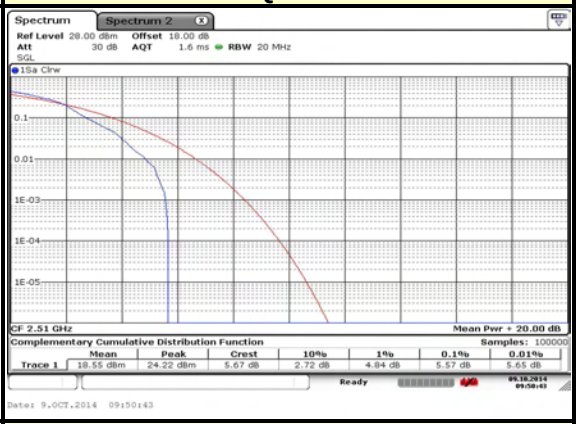
| CHANNEL BANDWIDTH: 20MHz | | | |
|---|---|---|---|
| CHANNEL | FREQUENCY (MHz) | PEAK TO AVERAGE RATIO (dB) | |
| | | QPSK | 16QAM |
| 20850 | 2510 | 4.75 | 5.57 |
| 21100 | 2535 | 5.01 | 6.35 |
| 21350 | 2560 | 3.80 | 5.19 |

**SPECTRUM PLOT OF WORST VALUE**

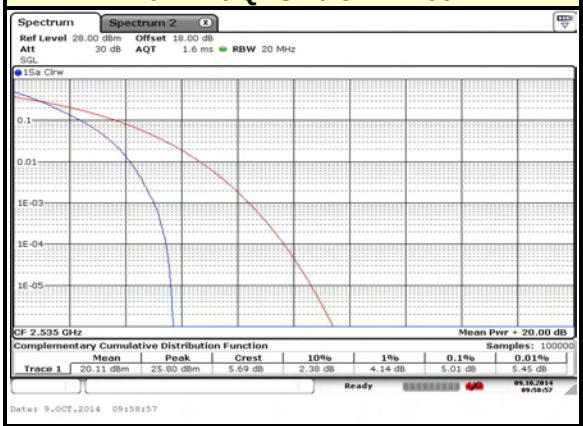
**20MHz / QPSK / CH 20850**



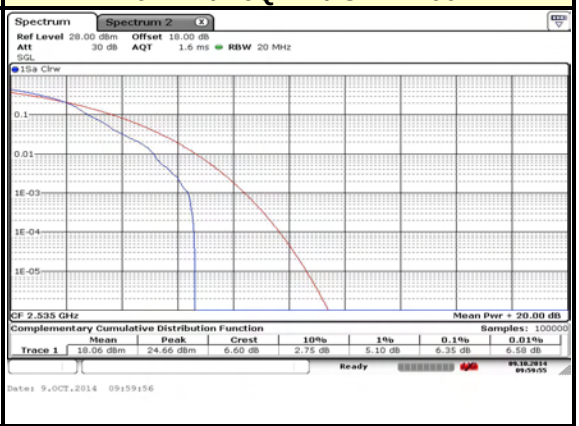

**20MHz / 16QAM / CH 20850**



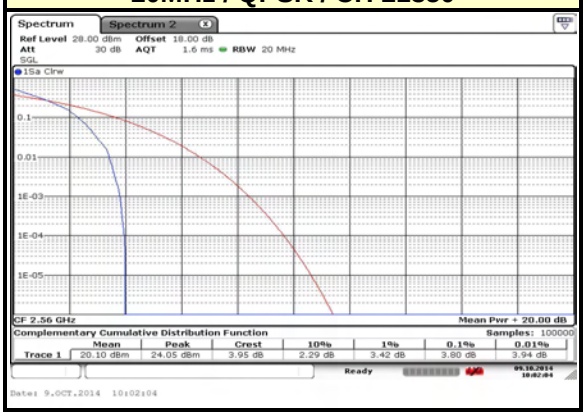

**20MHz / QPSK / CH 21100**



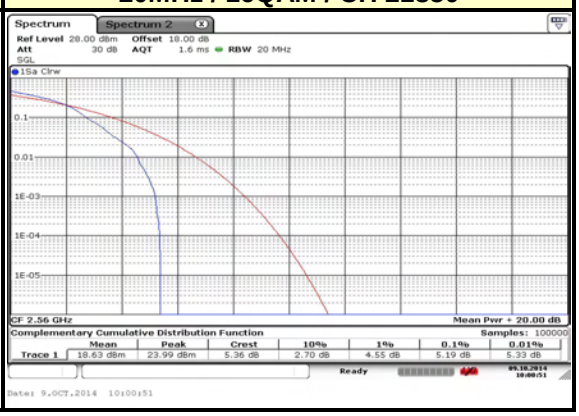

**20MHz / 16QAM / CH 21100**




**20MHz / QPSK / CH 21350**




**20MHz / 16QAM / CH 21350**

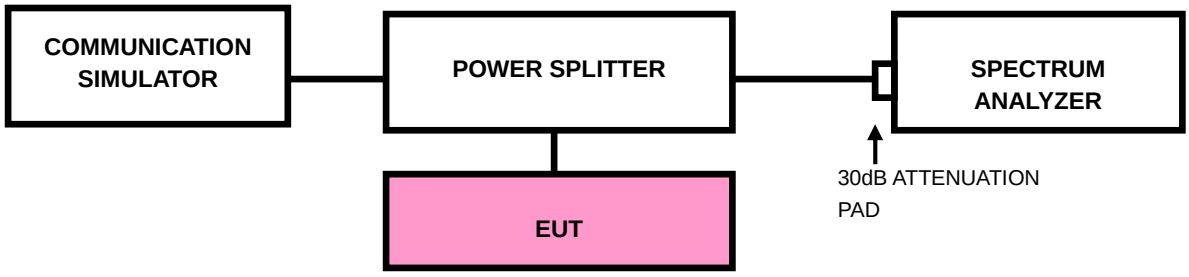


## 4.5 BAND EDGE MEASUREMENT

### 4.5.1 LIMITS OF BAND EDGE MEASUREMENT

According to FCC 27.53(m)(4) specified that For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

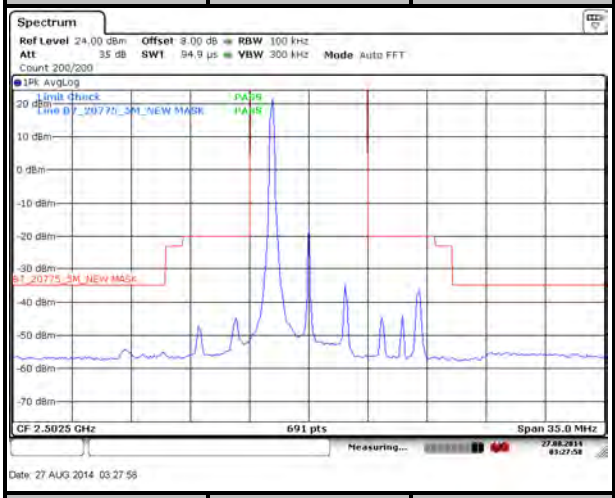
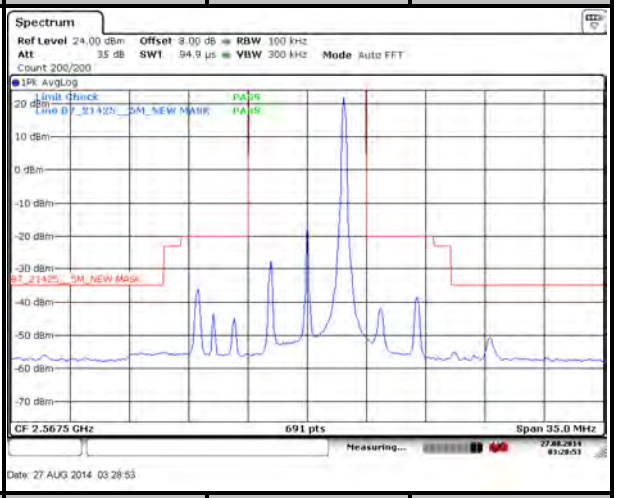
### 4.5.2 TEST SETUP

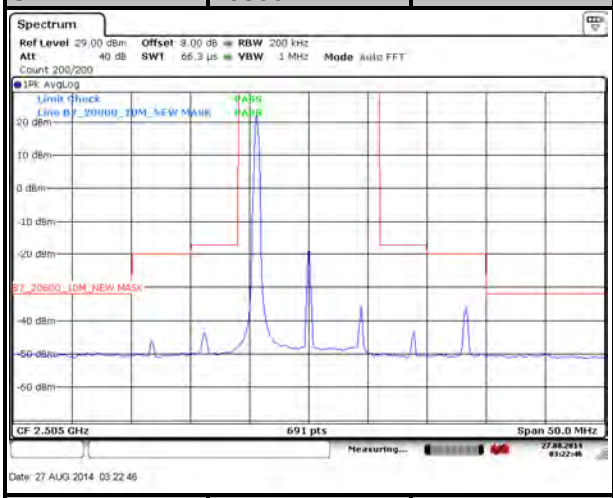
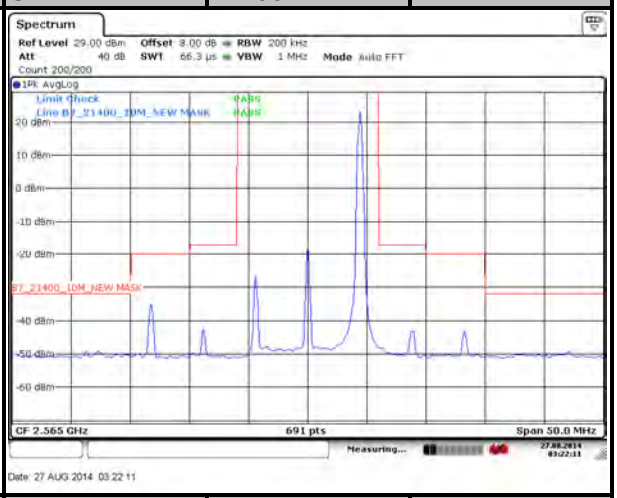


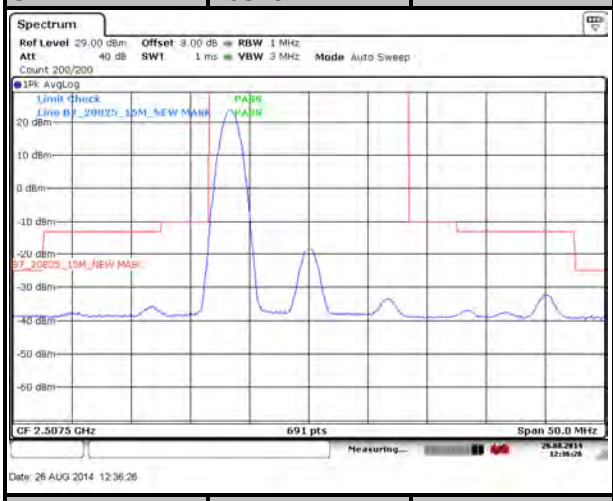
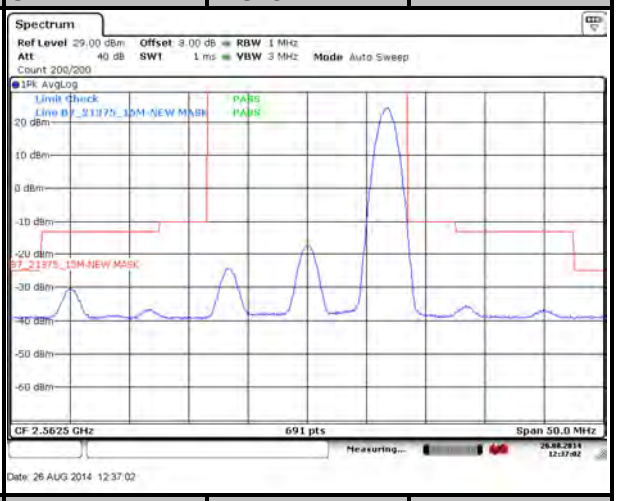
### 4.5.3 TEST PROCEDURES

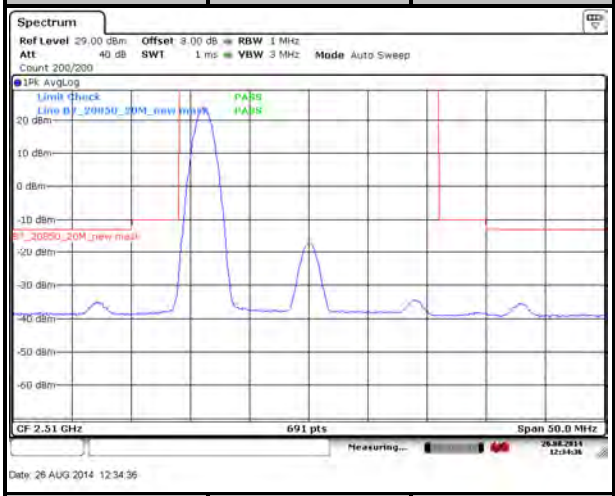
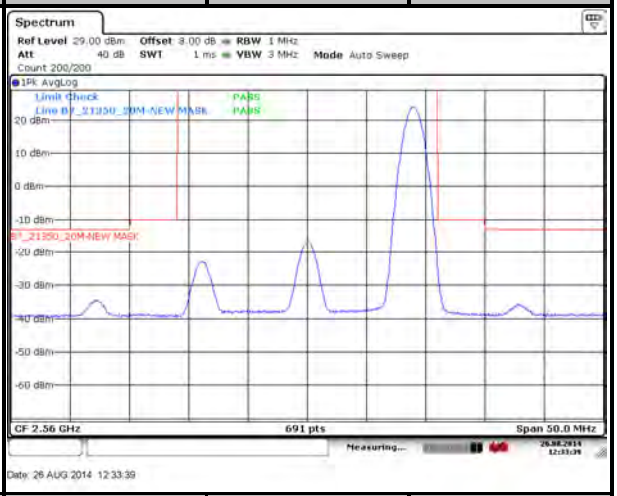
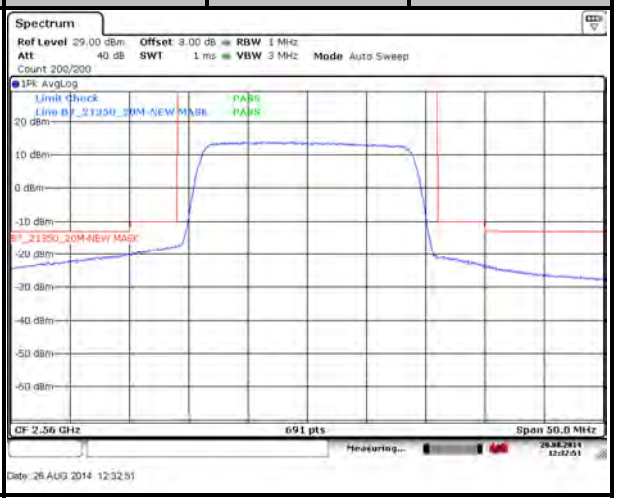
a. The EUT was set up for the maximum peak power with LTE link data modulation. The power was measured with R&S Spectrum Analyzer. All measurements were done at 2 channels (low and high operational frequency range.).
b. The band edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
c. The center frequency of spectrum is the band edge frequency and span is 30MHz. RBW of the spectrum is 100kHz and VBW of the spectrum is 300kHz (Channel bandwidth 5MHz).
d. The center frequency of spectrum is the band edge frequency and span is 40MHz. RBW of the spectrum is 200kHz and VBW of the spectrum is 1MHz (Channel bandwidth 10MHz).
e. The center frequency of spectrum is the band edge frequency and span is 40MHz. RBW of the spectrum is 1MHz and VBW of the spectrum is 3MHz (Channel bandwidth 15MHz).
f. The center frequency of spectrum is the band edge frequency and span is 50MHz. RBW of the spectrum is 1MHz and VBW of the spectrum is 3MHz (Channel bandwidth 20MHz).
g. Record the max trace plot into the test report.

## 4.5.4 TEST RESULTS

| LTE BAND 7 | | | | | |
|---|---|---|---|---|---|
| Channel Bandwidth: 5MHz / QPSK | | | | | |
| CHANNEL | 20775 | 1 RB | CHANNEL | 21425 | 1 RB |
|  | | |  | | |
| CHANNEL | 20775 | Full RB | CHANNEL | 21425 | Full RB |
| | | | | | |
| **Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth. | | | **Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth. | | |

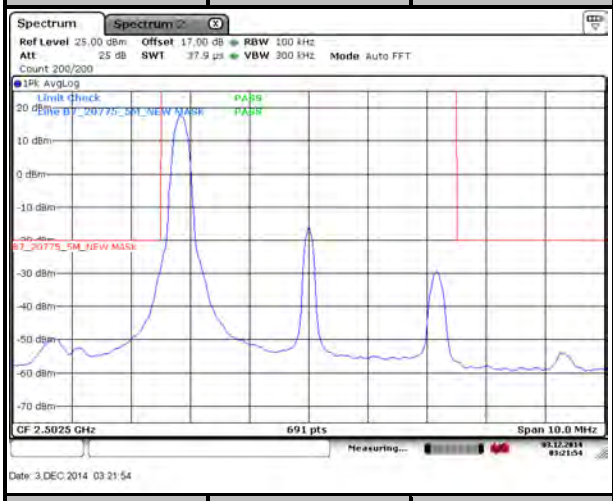
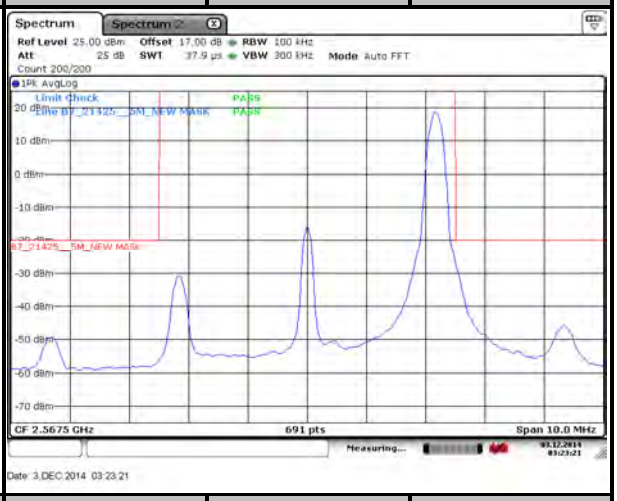
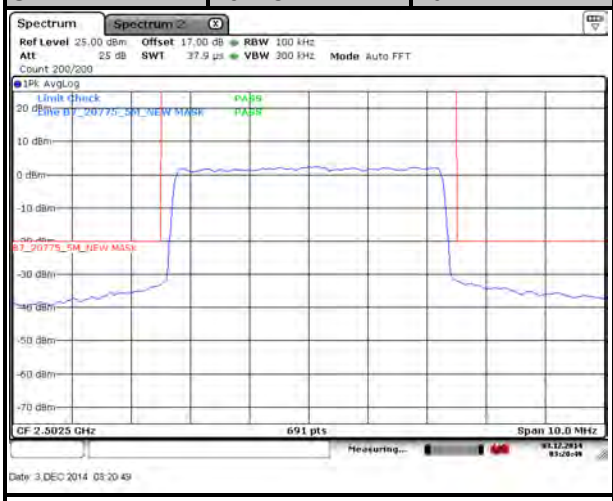
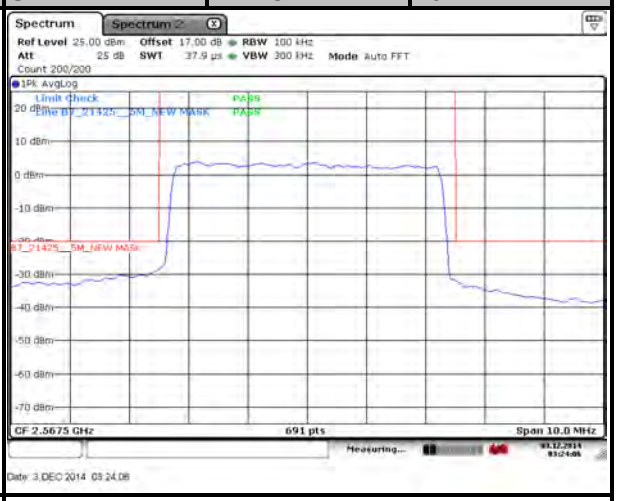
| LTE BAND 7 | | | | | |
|---|---|---|---|---|---|
| Channel Bandwidth: 10MHz / QPSK | | | | | |
| CHANNEL | 20800 | 1 RB | CHANNEL | 21400 | 1 RB |
|  | | |  | | |
| CHANNEL | 20800 | Full RB | CHANNEL | 21400 | Full RB |
| | | | | | |
| **Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth. | | | **Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth. | | |

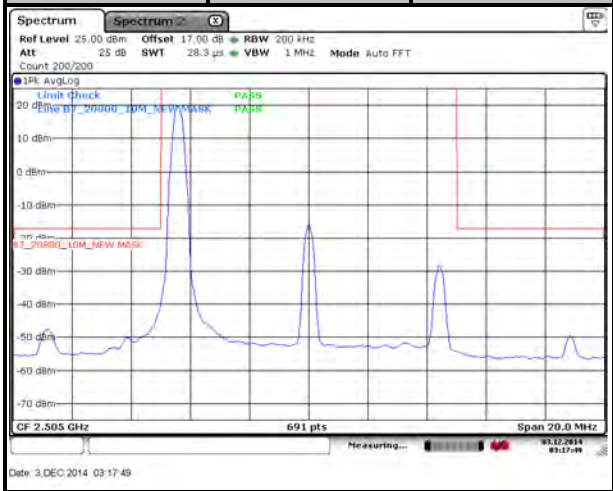
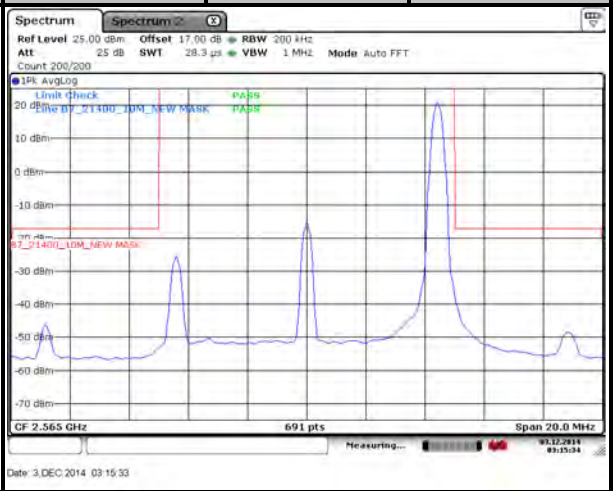
| LTE BAND 7 | | | | | |
|---|---|---|---|---|---|
| Channel Bandwidth: 15MHz / QPSK | | | | | |
| CHANNEL | 20825 | 1 RB | CHANNEL | 21375 | 1 RB |
|  | | |  | | |
| CHANNEL | 20825 | Full RB | CHANNEL | 21375 | Full RB |
| | | | | | |
| **Note:** NA | | | **Note:** NA | | |

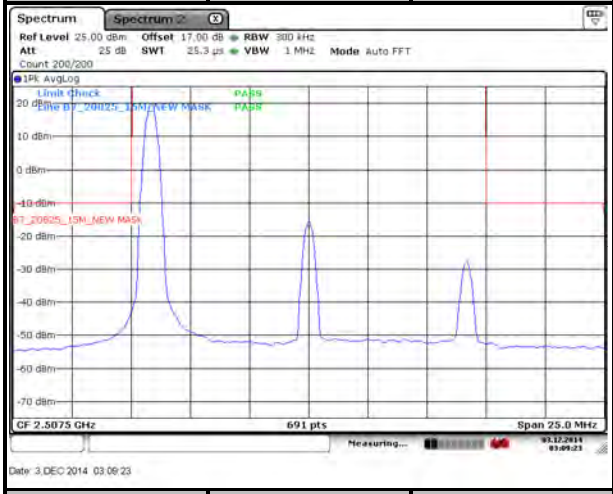
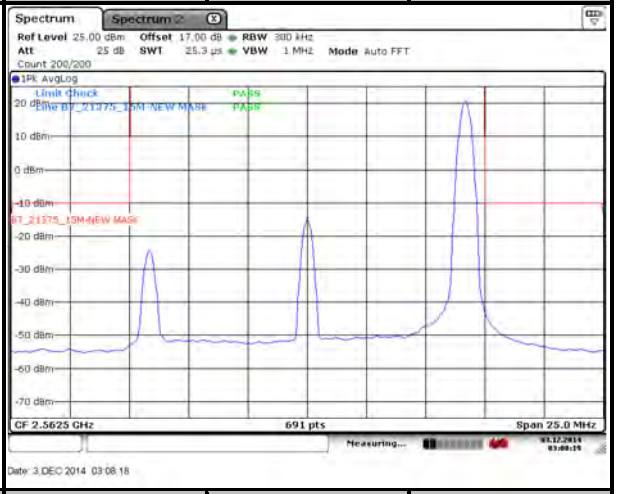
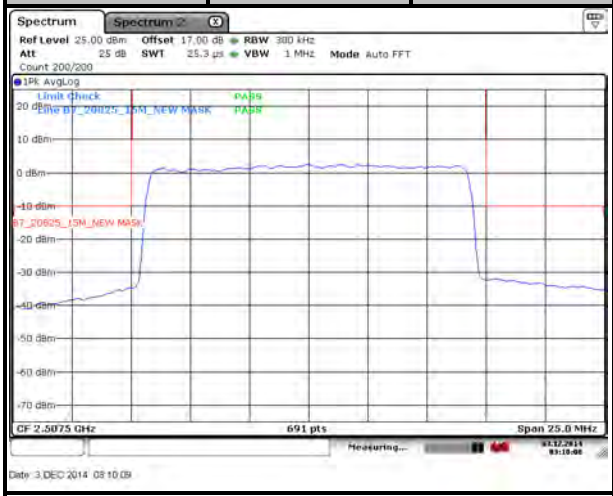
| LTE BAND 7 | | | | | |
|---|---|---|---|---|---|
| Channel Bandwidth: 20MHz / QPSK | | | | | |
| CHANNEL | 20850 | 1 RB | CHANNEL | 21350 | 1 RB |
|  | | |  | | |
| CHANNEL | 20850 | Full RB | CHANNEL | 21350 | Full RB |
| | | |  | | |
| **Note:** NA | | | **Note:** NA | | |

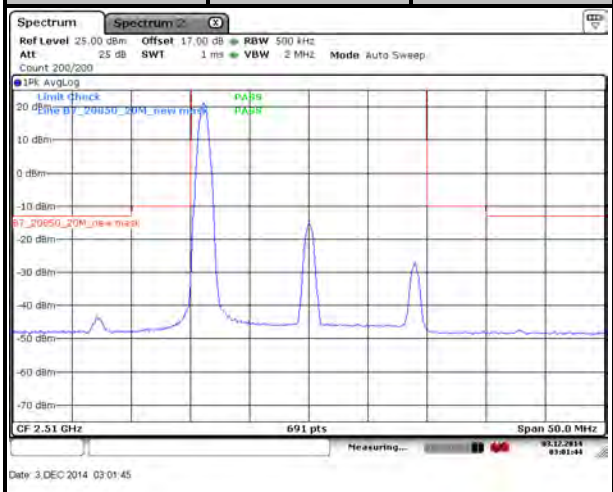
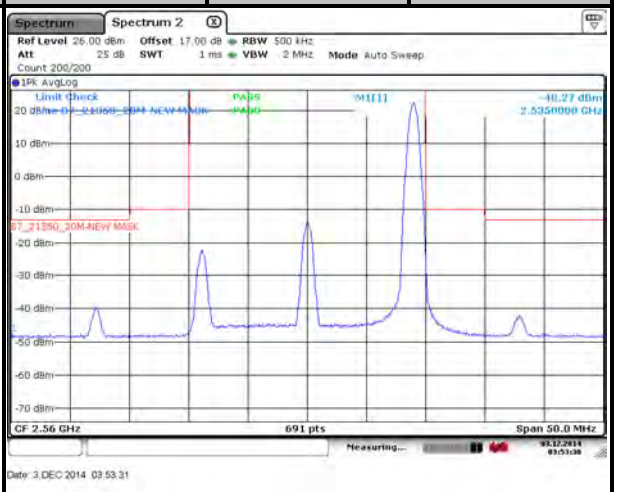
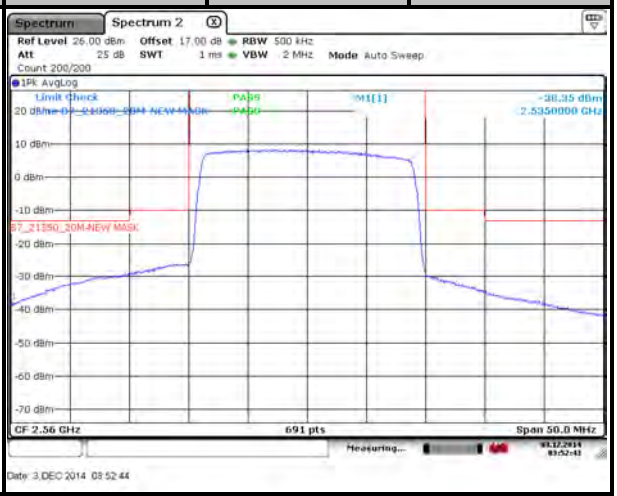
## CHANNEL EDGE EMISSION:

For mobile digital stations, in the 1 megahertz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed.

| LTE BAND 7 | | | | | |
|---|---|---|---|---|---|
| Channel Bandwidth: 5MHz / QPSK | | | | | |
| CHANNEL | 20775 | 1 RB | CHANNEL | 21425 | 1 RB |
|  | | |  | | |
| CHANNEL | 20775 | Full RB | CHANNEL | 21425 | Full RB |
|  | | |  | | |
| **Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth. | | | **Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth. | | |

| LTE BAND 7 | | | | | |
|---|---|---|---|---|---|
| Channel Bandwidth: 10MHz / QPSK | | | | | |
| CHANNEL | 20800 | 1 RB | CHANNEL | 21400 | 1 RB |
|  | | |  | | |
| CHANNEL | 20800 | Full RB | CHANNEL | 21400 | Full RB |
| | | | | | |
| **Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth. | | | **Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth. | | |

| LTE BAND 7 | | | | | |
|---|---|---|---|---|---|
| Channel Bandwidth: 15MHz / QPSK | | | | | |
| CHANNEL | 20825 | 1 RB | CHANNEL | 21375 | 1 RB |
|  | | |  | | |
| CHANNEL | 20825 | Full RB | CHANNEL | 21375 | Full RB |
|  | | | | | |
| **Note:** NA | | | **Note:** NA | | |

| LTE BAND 7 | | | | | |
|---|---|---|---|---|---|
| Channel Bandwidth: 20MHz / QPSK | | | | | |
| CHANNEL | 20850 | 1 RB | CHANNEL | 21350 | 1 RB |
|  | | |  | | |
| CHANNEL | 20850 | Full RB | CHANNEL | 21350 | Full RB |
| | | |  | | |
| **Note:** NA | | | **Note:** NA | | |

## 4.6 CONDUCTED SPURIOUS EMISSIONS

### 4.6.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

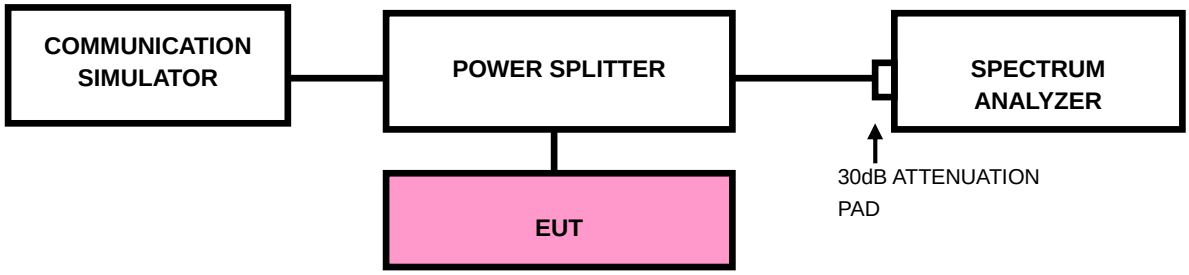
The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 55 +10 log10(P) dB. The limit of emission is equal to -25dBm.

### 4.6.2 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.

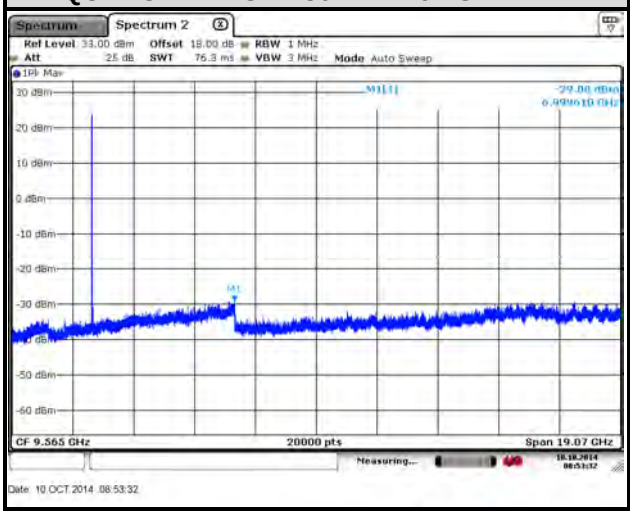
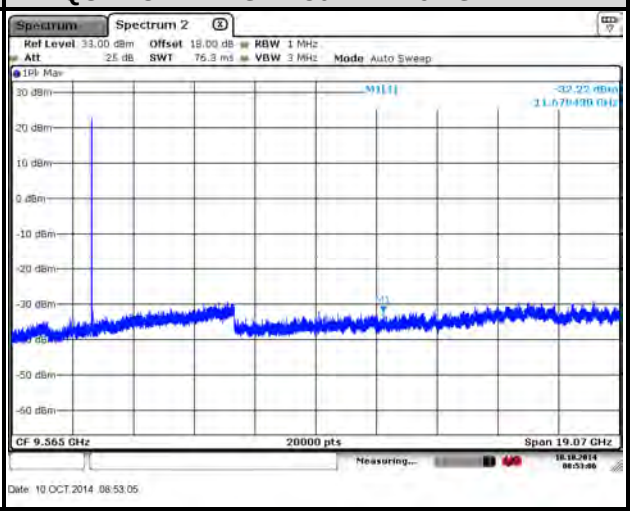
b. Measuring frequency range is from 30MHz to 26GHz for LTE Band 7. 10dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz are used for conducted emission measurement.

### 4.6.3 TEST SETUP



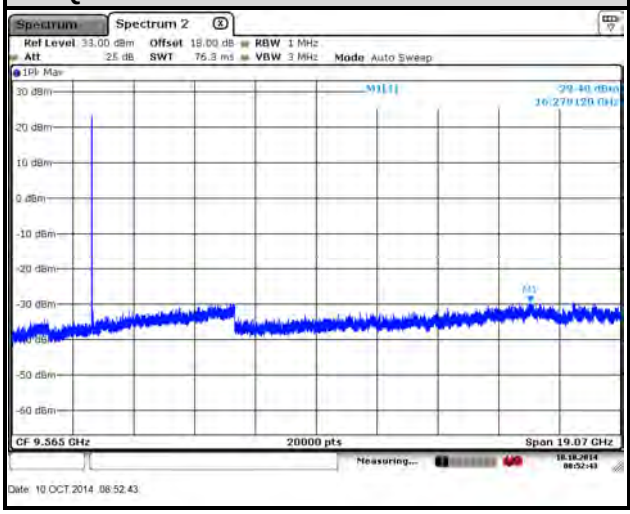
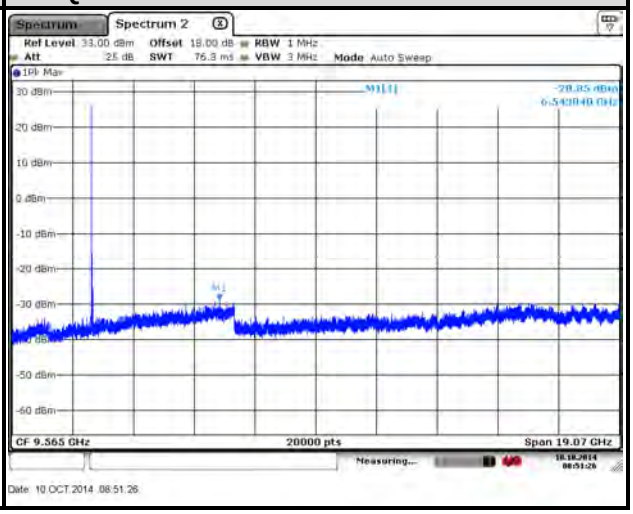
## 4.6.4 TEST RESULTS

### LTE BAND 7

| CHANNEL 21100 | CHANNEL 21100 |
|---|---|
| 5MHz / QPSK | 10MHz / QPSK |
| FREQUENCY RANGE : 30MHz~19.1GHz | FREQUENCY RANGE : 30MHz~19.1GHz |
|  |  |





| CHANNEL 21100 | CHANNEL 21100 |
|---|---|
| 15MHz / QPSK / | 20MHz / QPSK / |
| FREQUENCY RANGE : 30MHz~19.1GHz | FREQUENCY RANGE : 30MHz~19.1GHz |
|  |  |

## 4.7 RADIATED EMISSION MEASUREMENT

### 4.7.1 LIMITS OF RADIATED EMISSION MEASUREMENT

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 55 +10 log10(P) dB. The limit of emission is equal to -25dBm.

### 4.7.2 TEST PROCEDURES

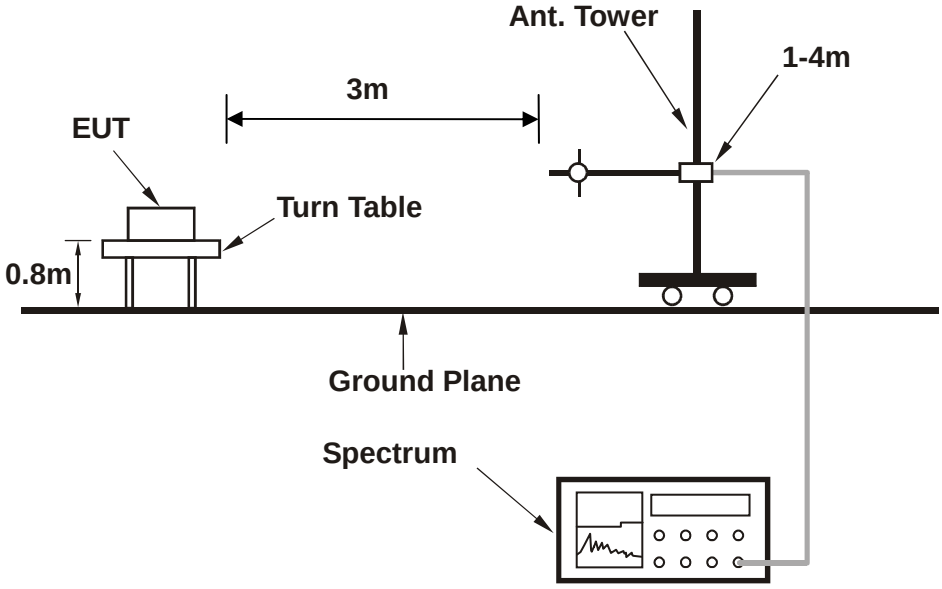
a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 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 = 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 - 2.15dBi.

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

### 4.7.3 DEVIATION FROM TEST STANDARD

No deviation

## 4.7.4 TEST SETUP




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

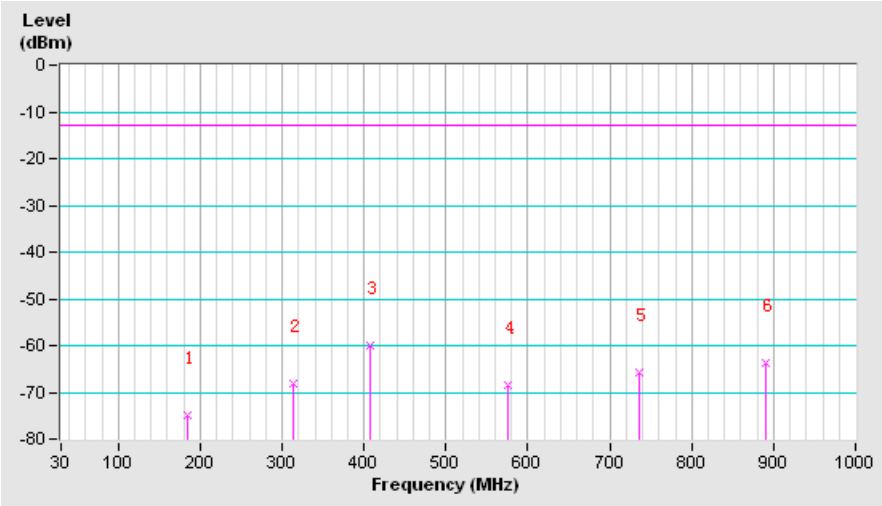
## 4.7.5 TEST RESULTS

### BELOW 1GHz WORST-CASE DATA：LTE BAND 7

| SPURIOUS EMISSION FREQUENCY RANGE | Below 1000MHz | OPERATING CHANNEL | Channel 21100 |
|---|---|---|---|

| SPURIOUS EMISSION LEVEL | | | | |
|---|---|---|---|---|
| Frequency (MHz) | Antenna Polarization | Level (dBm) | Limit (dBm) | Margin (dB) |
| 183.60 | H | -74.92 | -25.00 | -49.92 |
| 312.90 | H | -67.98 | -25.00 | -42.98 |
| 406.70 | H | -59.87 | -25.00 | -34.87 |
| 574.80 | H | -68.31 | -25.00 | -43.31 |
| 736.50 | H | -65.62 | -25.00 | -40.62 |
| 890.10 | H | -63.74 | -25.00 | -38.74 |

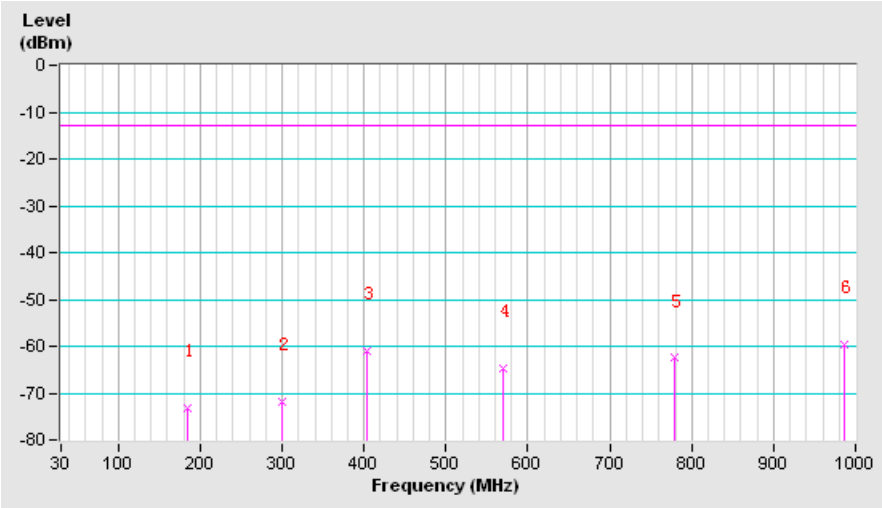
**NOTE:** The emission behavior belongs to narrowband spurious emission.



| SPURIOUS EMISSION FREQUENCY RANGE | Below 1000MHz | OPERATING CHANNEL | Channel 21100 |
|---|---|---|---|

| SPURIOUS EMISSION LEVEL | | | | |
|---|---|---|---|---|
| Frequency (MHz) | Antenna Polarization | Level (dBm) | Limit (dBm) | Margin (dB) |
| 183.60 | V | -73.30 | -25 | -48.3 |
| 300.00 | V | -71.72 | -25 | -46.72 |
| 403.40 | V | -60.92 | -25 | -35.92 |
| 570.00 | V | -64.83 | -25 | -39.83 |
| 778.50 | V | -62.51 | -25 | -37.51 |
| **987.10** | **V** | **-59.61** | -25 | **-34.61** |

**NOTE:** The emission behavior belongs to narrowband spurious emission.



## ABOVE 1GHz

## CHANNEL BANDWIDTH: 5MHz / QPSK

| MODE | TX channel 21100 | FREQUENCY RANGE | Above 1000MHz |
|---|---|---|---|
| ENVIRONMENTAL CONDITIONS | 24deg. C, 60%RH | INPUT POWER | DC 5V from adapter |
| TESTED BY | Blue Zheng | | |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | |
|---|---|---|---|---|---|---|---|
| No. | Freq. (MHz) | Reading (dBm) | Limit (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Margin (dB) |
| 1 | 5070 | -67.86 | -25 | -52.26 | 2.54 | -49.72 | -24.72 |
| 2 | 7605 | -66.95 | -25 | -47.22 | 4.38 | -42.84 | -17.84 |
| 3 | 10140 | -67.45 | -25 | -43.85 | 3.27 | -40.58 | -15.58 |
| 4 | 12675 | -65.25 | -25 | -36.91 | 4.76 | -32.15 | -7.15 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | |
| No. | Freq. (MHz) | Reading (dBm) | Limit (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Margin (dB) |
| 1 | 5070 | -68.69 | -25 | -50.94 | 2.54 | -48.40 | -23.40 |
| 2 | 7605 | -67.49 | -25 | -49.12 | 4.38 | -44.74 | -19.74 |
| 3 | 10140 | -66.45 | -25 | -44.34 | 3.27 | -41.07 | -16.07 |
| 4 | 12675 | -65.99 | -25 | -42.00 | 4.76 | -37.24 | -12.24 |

**NOTE:** EIRP (dBum) = S.G Power Value (dBm) + Correction Factor (dB).

## CHANNEL BANDWIDTH: 10MHz / QPSK

| MODE | TX channel 21100 | FREQUENCY RANGE | Above 1000MHz |
|---|---|---|---|
| ENVIRONMENTAL CONDITIONS | 24deg. C, 60%RH | INPUT POWER | DC 5V from adapter |
| TESTED BY | Blue Zheng | | |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | |
|---|---|---|---|---|---|---|---|
| No. | Freq. (MHz) | Reading (dBm) | Limit (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Margin (dB) |
| 1 | 5070 | -68.64 | -25 | -53.05 | 2.54 | -50.51 | -25.51 |
| 2 | 7605 | -68.23 | -25 | -48.51 | 4.38 | -44.13 | -19.13 |
| 3 | 10140 | -67.49 | -25 | -43.89 | 3.27 | -40.62 | -15.62 |
| 4 | 12675 | -64.82 | -25 | -36.48 | 4.76 | -31.72 | -6.72 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | |
| No. | Freq. (MHz) | Reading (dBm) | Limit (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Margin (dB) |
| 1 | 5070 | -68.53 | -25 | -50.78 | 2.54 | -48.24 | -23.24 |
| 2 | 7605 | -68.42 | -25 | -50.06 | 4.38 | -45.68 | -20.68 |
| 3 | 10140 | -65.82 | -25 | -43.69 | 3.27 | -40.42 | -15.42 |
| 4 | 12675 | -65.44 | -25 | -41.38 | 4.76 | -36.62 | -11.62 |

**NOTE:** EIRP (dBum) = S.G Power Value (dBm) + Correction Factor (dB).

## CHANNEL BANDWIDTH: 15MHz / QPSK

| MODE | TX channel 21100 | FREQUENCY RANGE | Above 1000MHz |
|---|---|---|---|
| ENVIRONMENTAL CONDITIONS | 24deg. C, 60%RH | INPUT POWER | DC 5V from adapter |
| TESTED BY | Blue Zheng | | |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | |
|---|---|---|---|---|---|---|---|
| No. | Freq. (MHz) | Reading (dBm) | Limit (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Margin (dB) |
| 1 | 5070 | -67.26 | -25 | -51.66 | 2.54 | -49.12 | -24.12 |
| 2 | 7605 | -68.45 | -25 | -48.74 | 4.38 | -44.36 | -19.36 |
| 3 | 10140 | -67.22 | -25 | -43.62 | 3.27 | -40.35 | -15.35 |
| 4 | 12675 | -65.33 | -25 | -36.99 | 4.76 | -32.23 | -7.23 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | |
| No. | Freq. (MHz) | Reading (dBm) | Limit (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Margin (dB) |
| 1 | 5070 | -70.35 | -25 | -52.58 | 2.54 | -50.04 | -25.04 |
| 2 | 7605 | -69.34 | -25 | -50.99 | 4.38 | -46.61 | -21.61 |
| 3 | 10140 | -66.34 | -25 | -44.23 | 3.27 | -40.96 | -15.96 |
| 4 | 12675 | -64.28 | -25 | -40.07 | 4.76 | -35.31 | -10.31 |

**NOTE:** EIRP (dBum) = S.G Power Value (dBm) + Correction Factor (dB).

## CHANNEL BANDWIDTH: 20MHz / QPSK

| MODE | TX channel 21100 | FREQUENCY RANGE | Above 1000MHz |
|---|---|---|---|
| ENVIRONMENTAL CONDITIONS | 24deg. C, 60%RH | INPUT POWER | DC 5V from adapter |
| TESTED BY | Blue Zheng | | |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | |
|---|---|---|---|---|---|---|---|
| No. | Freq. (MHz) | Reading (dBm) | Limit (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Margin (dB) |
| 1 | 5070 | -68.59 | -25 | -53.00 | 2.54 | -50.46 | -25.46 |
| 2 | 7605 | -68.44 | -25 | -48.73 | 4.38 | -44.35 | -19.35 |
| 3 | 10140 | -67.25 | -25 | -43.65 | 3.27 | -40.38 | -15.38 |
| **4** | **12675** | **-64.23** | **-25** | **-35.89** | **4.76** | **-31.13** | **-6.13** |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | |
| No. | Freq. (MHz) | Reading (dBm) | Limit (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Margin (dB) |
| 1 | 5070 | -69.76 | -25 | -52.00 | 2.54 | -49.46 | -24.46 |
| 2 | 7605 | -68.46 | -25 | -50.10 | 4.38 | -45.72 | -20.72 |
| 3 | 10140 | -65.22 | -25 | -43.08 | 3.27 | -39.81 | -14.81 |
| 4 | 12675 | -63.85 | -25 | -39.58 | 4.76 | -34.82 | -9.82 |

**NOTE:** EIRP (dBum) = S.G Power Value (dBm) + Correction Factor (dB).

# 5 INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch, were founded in 2002 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are 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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**Web Site**: www.adt.com.tw

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

# 6 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

**---END---**