Test Lab
Cert 2951.01

# FCC TEST REPORT
# (PART 22)

**REPORT NO.:** RF140801N015-4
**MODEL NO.:** XP7700
**Type Number:** L12V012AA;L13V012AA
**FCC ID:** WYPL11V012AA
**RECEIVED:** May 06, 2014
**TESTED:** May. 06 ~ Jun. 06, 2014
**ISSUED:** Aug. 01, 2014

**APPLICANT:** Sonim Technologies, Inc.

**ADDRESS:** 1825 S. Grant St., Suite 200., San Mateo,CA,94402

**ISSUED BY:** Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch

**LAB ADDRESS:** No. 34, Chenwulu Section, Guantai Road, Houjie Town, Dongguan City, Guangdong 523942, China

**TEST LOCATION:** No. 34, Chenwulu Section, Guantai Road, Houjie Town, Dongguan City, Guangdong 523942, China

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# RELEASE CONTROL RECORD

| ISSUE NO. | REASON FOR CHANGE | DATE ISSUED |
|---|---|---|
| RF140801N015-4 | Original release | Aug. 01, 2014 |

# 1 CERTIFICATION

| | |
|---|---|
| **PRODUCT:** | LTE Smartphone |
| **MODEL:** | XP7700 |
| **Type Number:** | L12V012AA;L13V012AA |
| **BRAND:** | Sonim |
| **APPLICANT:** | Sonim Technologies, Inc. |
| **TESTED:** | May. 06 ~ Jun. 06, 2014 |
| **TEST SAMPLE:** | ENGINEERING SAMPLE |
| **STANDARDS:** | **FCC PART 22, Subpart H** |

The above equipment (model: XP7700) 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 :** Aug. 04, 2014

Glyn He/ Project Engineer

**APPROVED BY** : _____ **DATE :** Aug. 04, 2014

Sam Tung / Technical Manager

# 2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: FCC Part 22 & Part 2 | | | |
|---|---|---|---|
| **STANDARD SECTION** | **1.1.1.1.1.1TEST TYPE** | **RESULT** | **REMARK** |
| 2.1046<br>22.913 (a) | Effective Radiated Power | PASS | Meet the requirement of limit. |
| 2.1055<br>22.355 | Frequency Stability | PASS | Meet the requirement of limit. |
| 2.1049 | Occupied Bandwidth | PASS | Meet the requirement of limit. |
| 22.917 | Band Edge Measurements | PASS | Meet the requirement of limit. |
| 2.1051<br>22.917 | Conducted Spurious Emissions | PASS | Meet the requirement of limit. |
| 2.1053<br>22.917 | Radiated Spurious Emissions | PASS | Meet the requirement of limit.<br>Minimum passing margin is -22.98dB at4182MHz. |

## 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 | 2.67dB |
| Radiated emissions | 9KHz ~ 30MHz | 2.74dB |
| | 30MHz ~ 1GHz | 4.36dB |
| | 1GHz ~ 18GHz | 3.9dB |
| | 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 18,14 | May 17,15 |
| Loop antenna (9kHz~30MHz) | Daze | ZN30900A | 0708 | Nov. 28,13 | Nov. 27,14 |
| 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. 17,13 | Sep. 16,14 |
| Universal Radio Communication Tester | Rohde&Schwarz | CMU 200 | 123259 | Apr. 16,13 | Apr. 15,15 |
| RADIO COMMUNICATION ANALYZER | Anritsu | 8820C | 6201300716 | Sep. 26,13 | Sep. 26,14 |
| Test Software | ADT | ADT_Radiated _V7.6.15.9.2 | 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 494399.

# 3 GENERAL INFORMATION

## 3.1 GENERAL DESCRIPTION OF EUT

| | | |
|---|---|---|
| **EUT** | LTE Smartphone | |
| **MODEL NO.** | XP7700 | |
| **Type Number** | L12V012AA;L13V012AA | |
| **POWER SUPPLY** | 5.0Vdc (adapter or host equipment)<br>3.7Vdc (battery) | |
| **MODULATION TYPE** | **GSM/GPRS** | GMSK |
| | **EDGE** | GMSK, 8PSK |
| | **WCDMA** | BPSK |
| | **LTE** | QPSK, 16QAM |
| **FREQUENCY RANGE** | **GSM/GPRS/EDGE** | 824.2MHz ~ 848.8MHz |
| | **WCDMA** | 826.4MHz ~ 846.6MHz |
| | **LTE Band 5 (Channel Bandwidth: 1.4MHz)** | 824.7MHz ~ 848.3MHz |
| | **LTE Band 5 (Channel Bandwidth: 3MHz)** | 825.5MHz ~ 847.5MHz |
| | **LTE Band 5 (Channel Bandwidth: 5MHz)** | 826.5MHz ~ 846.5MHz |
| | **LTE Band 5 (Channel Bandwidth: 10MHz)** | 829MHz ~ 844MHz |
| **MAX. ERP POWER** | **GSM** | 648.63mW |
| | **EDGE** | 481.9mW |
| | **WCDMA** | 166.72mW |
| | **LTE Band 5 (Channel Bandwidth: 1.4MHz)** | 323.59 mW |
| | **LTE Band 5 (Channel Bandwidth: 3MHz)** | 329.61 mW |
| | **LTE Band 5 (Channel Bandwidth: 5MHz)** | 325.84 mW |
| | **LTE Band 5 (Channel Bandwidth: 10MHz)** | 327.34 mW |
| **EMISSION DESIGNATOR** | **GSM** | 244KGXW |
| | **EDGE** | 247KG7W |
| | **WCDMA** | 4M17F9W |
| | **LTE Band 5 (Channel Bandwidth: 1.4MHz)** | 1M10W7D |
| | **LTE Band 5 (Channel Bandwidth: 3MHz)** | 2M70G7D |
| | **LTE Band 5 (Channel Bandwidth: 5MHz)** | 4M50G7D |

| | LTE Band 5<br>(Channel Bandwidth: 10MHz) | 9M00G7D |
|---|---|---|
| **ANTENNA TYPE** | Fixed Internal antenna with -1.0dBi gain | |
| **HW VERSION** | A | |
| **SW VERSION** | 7A.0.0-00-4.4.2-11.04.16 | |
| **I/O PORTS** | Refer to user's manual | |
| **DATA CABLE** | USB cable : Shielded, Detachable, 1.1m<br>Earphone cable: Unshielded, Detachable, 1.2m | |

**NOTE:**

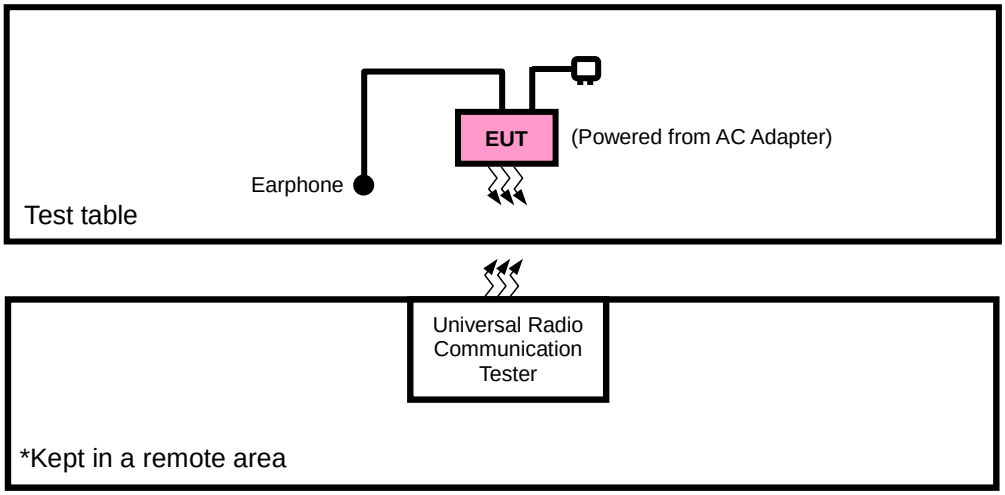
1 The EUT consumes power from the following adapter.

| **ADAPTER** | |
|---|---|
| **BRAND:** | Sonim |
| **MODEL:** | S11C02 |
| **INPUT:** | 100-240Vac, 50-60Hz, 450mA |
| **OUTPUT:** | 5Vdc, 2100mA |
| **DC LINE:** | N/A |

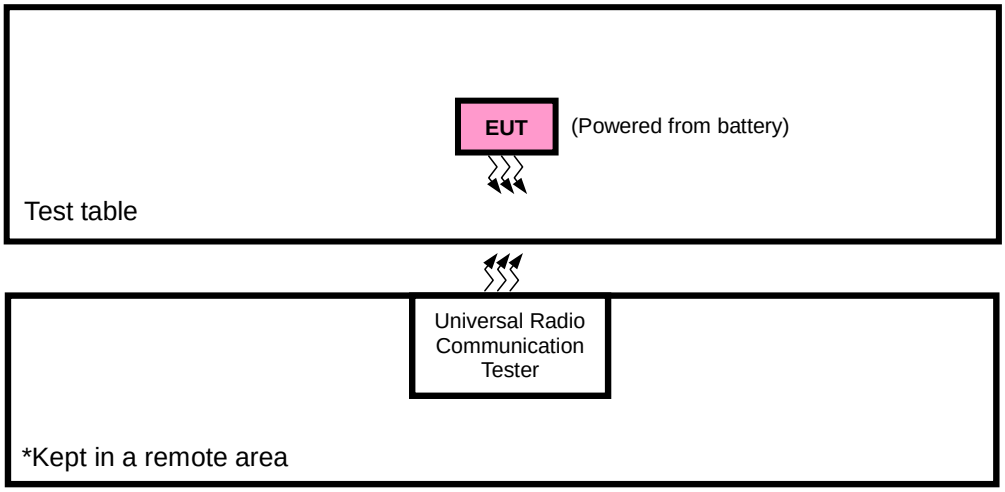
2 The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

## 3.2 CONFIGURATION OF SYSTEM UNDER TEST

### FOR RADIATION EMISSION TEST




### FOR E.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 | N/A | N/A | N/A | N/A | N/A |
| | | | | | |

| NO. | SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS |
|---|---|
| 1. | N/A |
| | |

## 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 ERP 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 with GSM ,WCDMA or LTE link** |
| B | EUT + Battery with **GSM ,WCDMA or LTE link** |

**GSM MODE**

| EUT CONFIGURE MODE | TEST ITEM | AVAILABLE CHANNEL | TESTED CHANNEL | MODE |
|---|---|---|---|---|
| B | ERP | 128 to 251 | 128, 190, 251 | GSM, EDGE |
| B | FREQUENCY STABILITY | 128 to 251 | 190 | GSM, EDGE |
| B | OCCUPIED BANDWIDTH | 128 to 251 | 128, 190, 251 | GSM, GPRS, EDGE |
| B | BAND EDGE | 128 to 251 | 128, 251 | GSM, GPRS, EDGE |
| B | CONDCUDETED EMISSION | 128 to 251 | 128, 190, 251 | GSM |
| A | RADIATED EMISSION | 128 to 251 | 190 | GSM, EDGE |

## WCDMA MODE

| EUT CONFIGURE MODE | TEST ITEM | AVAILABLE CHANNEL | TESTED CHANNEL | MODE |
|---|---|---|---|---|
| B | ERP | 4132 to 4233 | 4132, 4182, 4233 | WCDMA |
| B | FREQUENCY STABILITY | 4132 to 4233 | 4182 | WCDMA |
| B | OCCUPIED BANDWIDTH | 4132 to 4233 | 4132, 4182, 4233 | WCDMA, HSDPA, HSUPA |
| B | BAND EDGE | 4132 to 4233 | 4132, 4233 | WCDMA, HSDPA, HSUPA |
| B | CONDCUDETED EMISSION | 4132 to 4233 | 4132, 4182, 4233 | WCDMA |
| A | RADIATED EMISSION | 4132 to 4233 | 4182 | WCDMA |

## LTE BAND 5 MODE

| TEST ITEM | Available Channel | Tested Channel | Channel bandwidth | modulation | mode |
|---|---|---|---|---|---|
| ERP | 20407 to 20643 | 20407, 20525, 20643 | 1.4MHz | QPSK,16QAM | 1 RB / 0 RB Offset |
| | 20415 to 20635 | 20415, 20525, 20635 | 3MHz | QPSK,16QAM | 1 RB / 0 RB Offset |
| | 20425 to 20625 | 20425, 20525, 20625 | 5MHz | QPSK,16QAM | 1 RB / 0 RB Offset |
| | 20450 to 20600 | 20450, 20525, 20600 | 10MHz | QPSK,16QAM | 1 RB / 0 RB Offset |
| FREQUENCY STABILITY | 20407 to 20643 | 20525 | 1.4MHz | QPSK | 1 RB / 0 RB Offset |
| | 20415 to 20635 | 20525 | 3MHz | QPSK | 1 RB / 0 RB Offset |
| | 20425 to 20625 | 20525 | 5MHz | QPSK | 1 RB / 0 RB Offset |
| | 20450 to 20600 | 20525 | 10MHz | QPSK | 1 RB / 0 RB Offset |
| OCCUPIED BANDWIDTH | 20407 to 20643 | 20407, 20525, 20643 | 1.4MHz | QPSK | 6 RB / 0 RB Offset |
| | | | | 16QAM | 6 RB / 0 RB Offset |
| | 20415 to 20635 | 20415, 20525, 20635 | 3MHz | QPSK | 15 RB / 0 RB Offset |
| | | | | 16QAM | 15 RB / 0 RB Offset |
| | 20425 to 20625 | 20425, 20525, 20625 | 5MHz | QPSK | 25 RB / 0 RB Offset |
| | | | | 16QAM | 25 RB / 0 RB Offset |
| | 20450 to 20600 | 20450, 20525, 20600 | 10MHz | QPSK | 50 RB / 0 RB Offset |
| | | | | 16QAM | 50 RB / 0 RB Offset |

| | | | | | |
|---|---|---|---|---|---|
| BAND EDGE | 20407 to 20643 | 20407 | 1.4 MHz | QPSK | 1 RB / 0 RB Offset |
| | | | | | 6 RB / 0 RB Offset |
| | 20407 to 20643 | 20643 | 1.4 MHz | QPSK | 1 RB / 5 RB Offset |
| | | | | | 6 RB / 0 RB Offset |
| | 20415 to 20635 | 20415 | 3 MHz | QPSK | 1 RB / 0 RB Offset |
| | | | | | 15 RB / 0 RB Offset |
| | 20415 to 20635 | 20635 | 3 MHz | QPSK | 1 RB / 14 RB Offset |
| | | | | | 15 RB / 0 RB Offset |
| | 20425 to 20625 | 20425 | 5MHz | QPSK | 1 RB / 0 RB Offset |
| | | | | | 25 RB / 0 RB Offset |
| | 20425 to 20625 | 20625 | 5MHz | QPSK | 1 RB / 24 RB Offset |
| | | | | | 25 RB / 0 RB Offset |
| | 20450 to 20600 | 20450 | 10MHz | QPSK | 1 RB / 0 RB Offset |
| | | | | | 50 RB / 0 RB Offset |
| | 20450 to 20600 | 20600 | 10MHz | QPSK | 1 RB / 49 RB Offset |
| | | | | | 50 RB / 0 RB Offset |
| CONDCUDETED EMISSION | 20407 to 20643 | 20525 | 1.4MHz | QPSK | 1 RB / 0 RB Offset |
| | 20415 to 20635 | 20525 | 3MHz | QPSK | 1 RB / 0 RB Offset |
| | 20425 to 20625 | 20525 | 5MHz | QPSK | 1 RB / 0 RB Offset |
| | 20450 to 20600 | 20525 | 10MHz | QPSK | 1 RB / 0 RB Offset |
| RADIATED EMISSION | 20407 to 20643 | 20525 | 1.4MHz | QPSK | 1 RB / 0 RB Offset |
| | 20415 to 20635 | 20525 | 3MHz | QPSK | 1 RB / 0 RB Offset |
| | 20425 to 20625 | 20525 | 5MHz | QPSK | 1 RB / 0 RB Offset |
| | 20450 to 20600 | 20525 | 10MHz | QPSK | 1 RB / 0 RB Offset |

| TEST ITEM | ENVIRONMENTAL CONDITIONS | INPUT POWER | TESTED BY |
|---|---|---|---|
| ERP | 23deg. C, 62%RH | 3.7Vdc from Battery | Yuqiang Yin |
| FREQUENCY STABILITY | 23deg. C, 62%RH | 3.7Vdc from Battery | Yuqiang Yin |
| OCCUPIED BANDWIDTH | 23deg. C, 62%RH | 3.7Vdc from Battery | Yuqiang Yin |
| BAND EDGE | 23deg. C, 62%RH | 3.7Vdc from Battery | Yuqiang Yin |
| CONDCUDETED EMISSION | 23deg. C, 62%RH | 5Vdc from adapter | Yuqiang Yin |
| RADIATED EMISSION | 25deg. C, 63.6%RH | 5Vdc from adapter | Blue Zheng |

## 3.5 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

## 3.6 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 22**

**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

Mobile / Portable station are limited to 7 watts e.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 1MHz for GSM, GPRS & EDGE, 5MHz for WCDMA mode, and 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

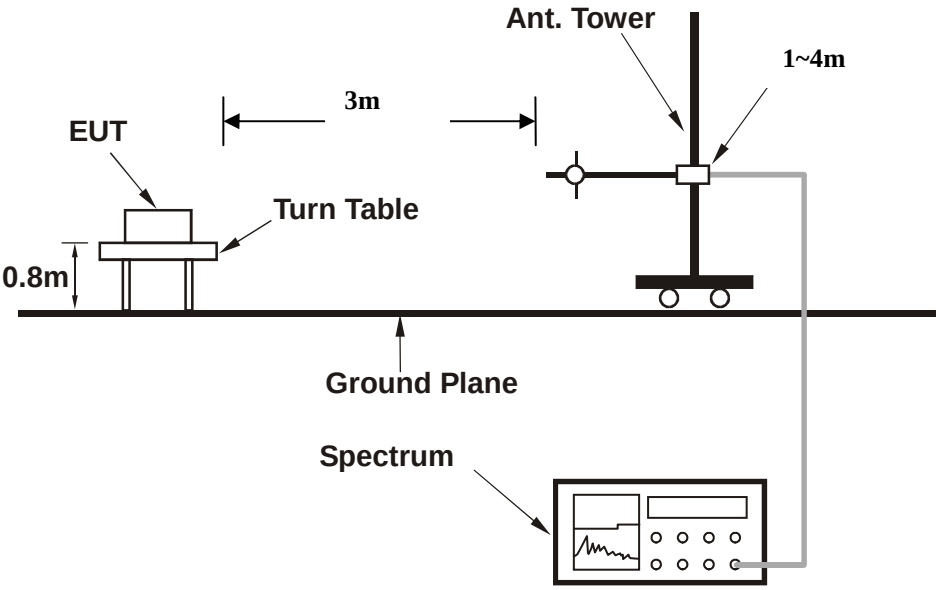
d. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15dBi.

**CONDUCTED POWER MEASUREMENT:**

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

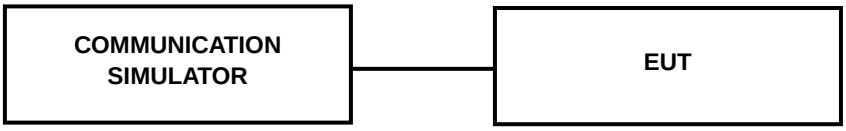
### 4.1.3 TEST SETUP

**EIRP / ERP MEASUREMENT:**




For 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

### CONDUCTED OUTPUT POWER (dBm)

| Band | GSM850 | | |
|---|---|---|---|
| Channel | 128 | 190 | 251 |
| Frequency (MHz) | 824.2 | 836.6 | 848.8 |
| GSM | 31.09 | 31.17 | 31.21 |
| GPRS 8 | 31.15 | 31.18 | 31.17 |
| GPRS 10 | 30.13 | 30.24 | 30.26 |
| EDGE 8 (MCS1) | 31.16 | 31.12 | 31.11 |
| EDGE 10 (MCS1) | 30.23 | 30.21 | 30.25 |
| EDGE 8 (MCS9) | 26.03 | 26.08 | 26.05 |
| EDGE 10 (MCS9) | 24.50 | 24.51 | 24.51 |

| Band | WCDMA V | | |
|---|---|---|---|
| Channel | 4132 | 4182 | 4233 |
| Frequency (MHz) | 826.4 | 836.4 | 846.6 |
| RMC 12.2K | 24.56 | 24.53 | 24.40 |
| HSPA | | | |
| HSDPA Subtest-1 | 23.54 | 23.56 | 23.51 |
| HSDPA Subtest-2 | 23.55 | 23.58 | 23.50 |
| HSDPA Subtest-3 | 23.17 | 23.06 | 23.00 |
| HSDPA Subtest-4 | 23.16 | 23.06 | 23.02 |
| HSUPA Subtest-1 | 23.51 | 23.57 | 23.58 |
| HSUPA Subtest-2 | 21.59 | 21.51 | 21.53 |
| HSUPA Subtest-3 | 22.54 | 22.59 | 22.54 |
| HSUPA Subtest-4 | 21.59 | 21.50 | 21.58 |
| HSUPA Subtest-5 | 23.53 | 23.53 | 23.42 |
| HSPA+ | | | |
| HSDPA Subtest-1 | 23.26 | 23.28 | 23.14 |
| HSDPA Subtest-2 | 23.25 | 23.27 | 23.13 |
| HSDPA Subtest-3 | 22.80 | 22.82 | 22.68 |
| HSDPA Subtest-4 | 22.78 | 22.80 | 22.66 |
| HSUPA Subtest-1 | 22.74 | 22.76 | 22.62 |
| HSUPA Subtest-2 | 20.57 | 20.59 | 20.45 |
| HSUPA Subtest-3 | 21.94 | 21.96 | 21.82 |
| HSUPA Subtest-4 | 20.59 | 20.51 | 20.57 |
| HSUPA Subtest-5 | 23.03 | 23.05 | 22.91 |

| Band/BW | Modulation | RB Size | RB Offset | Low CH 20407 | Mid CH 20525 | High CH 20643 | 3GPP MPR (dB) |
|---|---|---|---|---|---|---|---|
| | | | | Frequency 824.7 MHz | Frequency 836.5 MHz | Frequency 848.3 MHz | |
| 5/1.4 | QPSK | 1 | 0 | 23.08 | 22.99 | 23.03 | 0 |
| | | 1 | 2 | 23.03 | 23.04 | 23.03 | 0 |
| | | 1 | 5 | 22.96 | 23.04 | 22.99 | 0 |
| | | 3 | 0 | 23.03 | 23.05 | 23.04 | 0 |
| | | 3 | 1 | 23.04 | 23.02 | 23.07 | 0 |
| | | 3 | 3 | 23.05 | 23.01 | 23.01 | 0 |
| | | 6 | 0 | 22.11 | 22.08 | 22.03 | 1 |
| | 16QAM | 1 | 0 | 21.95 | 21.91 | 22.06 | 1 |
| | | 1 | 2 | 21.98 | 21.96 | 21.98 | 1 |
| | | 1 | 5 | 22.02 | 22.01 | 22.09 | 1 |
| | | 3 | 0 | 22.03 | 21.98 | 21.92 | 1 |
| | | 3 | 1 | 22.09 | 21.97 | 22.04 | 1 |
| | | 3 | 3 | 21.96 | 22.03 | 22.09 | 1 |
| | | 6 | 0 | 21.12 | 21.05 | 21.02 | 2 |

| Band/BW | Modulation | RB Size | RB Offset | Low CH 20415 | Mid CH 20525 | High CH 20635 | 3GPP MPR (dB) |
|---|---|---|---|---|---|---|---|
| | | | | Frequency 825.5 MHz | Frequency 836.5 MHz | Frequency 847.5 MHz | |
| 5/3 | QPSK | 1 | 0 | 23.01 | 23.07 | 23.04 | 0 |
| | | 1 | 7 | 23.04 | 22.98 | 23.05 | 0 |
| | | 1 | 14 | 23.05 | 22.98 | 23.02 | 0 |
| | | 8 | 0 | 22.03 | 21.97 | 21.99 | 1 |
| | | 8 | 3 | 22.08 | 21.95 | 22.03 | 1 |
| | | 8 | 7 | 22.02 | 22.02 | 22.05 | 1 |
| | | 15 | 0 | 22.04 | 21.96 | 21.99 | 1 |
| | 16QAM | 1 | 0 | 21.97 | 21.93 | 22.09 | 1 |
| | | 1 | 7 | 21.98 | 21.97 | 22.15 | 1 |
| | | 1 | 14 | 22.06 | 21.90 | 21.96 | 1 |
| | | 8 | 0 | 21.01 | 21.05 | 20.99 | 2 |
| | | 8 | 3 | 21.09 | 21.03 | 20.93 | 2 |
| | | 8 | 7 | 21.03 | 20.98 | 20.94 | 2 |
| | | 15 | 0 | 21.10 | 21.04 | 21.03 | 2 |

| Band/BW | Modulation | RB Size | RB Offset | Low CH 20425 | Mid CH 20525 | High CH 20625 | 3GPP MPR (dB) |
|---|---|---|---|---|---|---|---|
| | | | | Frequency 826.5 MHz | Frequency 836.5 MHz | Frequency 846.5 MHz | |
| 5/5 | QPSK | 1 | 0 | 23.08 | 23.02 | 22.99 | 0 |
| | | 1 | 12 | 23.02 | 23.04 | 22.96 | 0 |
| | | 1 | 24 | 23.07 | 23.03 | 23.06 | 0 |
| | | 12 | 0 | 22.08 | 22.04 | 21.96 | 1 |
| | | 12 | 6 | 22.07 | 22.05 | 22.04 | 1 |
| | | 12 | 13 | 22.06 | 21.99 | 22.07 | 1 |
| | | 25 | 0 | 21.97 | 22.05 | 21.94 | 1 |
| | 16QAM | 1 | 0 | 21.95 | 22.08 | 21.91 | 1 |
| | | 1 | 12 | 21.94 | 21.92 | 22.08 | 1 |
| | | 1 | 24 | 22.02 | 22.03 | 22.05 | 1 |
| | | 12 | 0 | 20.97 | 21.06 | 21.01 | 2 |
| | | 12 | 6 | 21.09 | 21.07 | 21.04 | 2 |
| | | 12 | 13 | 21.08 | 21.03 | 21.08 | 2 |
| | | 25 | 0 | 21.03 | 21.06 | 21.07 | 2 |

| Band/BW | Modulation | RB Size | RB Offset | Low CH 20450 | Mid CH 20525 | High CH 20600 | 3GPP MPR (dB) |
|---|---|---|---|---|---|---|---|
| | | | | Frequency 829 MHz | Frequency 836.5 MHz | Frequency 844 MHz | |
| 5/10 | QPSK | 1 | 0 | 23.09 | 23.07 | 23 | 0 |
| | | 1 | 24 | 23.07 | 23.05 | 23.08 | 0 |
| | | 1 | 49 | 23.06 | 23.01 | 23.03 | 0 |
| | | 25 | 0 | 22.1 | 22.07 | 21.97 | 1 |
| | | 25 | 12 | 22.06 | 21.97 | 21.93 | 1 |
| | | 25 | 25 | 21.99 | 22.02 | 22.1 | 1 |
| | | 50 | 0 | 22.13 | 22.03 | 22.02 | 1 |
| | 16QAM | 1 | 0 | 22.03 | 22.04 | 22 | 1 |
| | | 1 | 24 | 22.06 | 21.93 | 22.12 | 1 |
| | | 1 | 49 | 21.95 | 21.97 | 21.94 | 1 |
| | | 25 | 0 | 21.09 | 21.14 | 21.06 | 2 |
| | | 25 | 12 | 21.06 | 21.06 | 21.07 | 2 |
| | | 25 | 25 | 21.04 | 21.13 | 21.11 | 2 |
| | | 50 | 0 | 21.14 | 21.03 | 21.02 | 2 |

## ERP POWER (dBm)

### GSM

| Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | ERP(dBm) | ERP(mW) | Polarization (H/V) |
|---|---|---|---|---|---|---|
| 128 | 824.2 | -6.87 | 35.85 | 26.83 | 481.95 | H |
| 189 | 836.4 | -6.90 | 37.09 | 28.04 | 636.80 | H |
| 251 | 848.8 | -6.69 | 36.96 | 28.12 | 648.63 | H |
| 128 | 824.2 | -10.98 | 36.88 | 23.75 | 237.14 | V |
| 189 | 836.4 | -11.60 | 37.56 | 23.81 | 240.44 | V |
| 251 | 848.8 | -12.31 | 37.72 | 23.26 | 211.84 | V |

### EDGE

| Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | ERP(dBm) | ERP(mW) | Polarization (H/V) |
|---|---|---|---|---|---|---|
| 4132 | 826.4 | -7.86 | 35.85 | 25.84 | 383.71 | H |
| 4182 | 836.4 | -8.65 | 37.09 | 26.29 | 425.60 | H |
| 4233 | 846.6 | -8.02 | 37 | 26.83 | 481.95 | H |
| 4132 | 826.4 | -15.24 | 36.85 | 19.46 | 88.31 | V |
| 4182 | 836.4 | -15.65 | 37.56 | 19.76 | 94.62 | V |
| 4233 | 846.6 | -16.05 | 37.77 | 19.57 | 90.57 | V |

### WCDMA

| Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | ERP(dBm) | ERP(mW) | Polarization (H/V) |
|---|---|---|---|---|---|---|
| 4132 | 826.4 | -12.56 | 35.85 | 21.14 | 130.02 | H |
| 4182 | 836.4 | -12.60 | 37.09 | 22.34 | 171.40 | H |
| 4233 | 846.6 | -12.63 | 37 | 22.22 | 166.72 | H |
| 4132 | 826.4 | -17.25 | 36.85 | 17.45 | 55.59 | V |
| 4182 | 836.4 | -17.63 | 37.56 | 17.78 | 59.98 | V |
| 4233 | 846.6 | -18.02 | 37.77 | 17.60 | 57.54 | V |

## LTE BAND 5

### CHANNEL BANDWIDTH: 1.4MHz QPSK

| Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | ERP(dBm) | ERP(mW) | Polarization (H/V) |
|---|---|---|---|---|---|---|
| 20407 | 824.7 | -9.48 | 35.47 | 23.84 | 242.10 | H |
| 20525 | 836.5 | -9.63 | 36.88 | 25.10 | 323.59 | H |
| 20643 | 848.3 | -10.11 | 36.92 | 24.66 | 292.42 | H |
| 20407 | 824.7 | -15.60 | 36.59 | 18.84 | 76.56 | V |
| 20525 | 836.5 | -15.10 | 37.35 | 20.10 | 102.33 | V |
| 20643 | 848.3 | -15.91 | 37.71 | 19.65 | 92.26 | V |

### CHANNEL BANDWIDTH: 1.4MHz 16QAM

| Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | ERP(dBm) | ERP(mW) | Polarization (H/V) |
|---|---|---|---|---|---|---|
| 20407 | 824.7 | -10.61 | 35.47 | 22.71 | 186.64 | H |
| 20525 | 836.5 | -10.71 | 36.88 | 24.02 | 252.35 | H |
| 20643 | 848.3 | -11.08 | 36.92 | 23.69 | 233.88 | H |
| 20407 | 824.7 | -16.73 | 36.59 | 17.71 | 59.02 | V |
| 20525 | 836.5 | -16.18 | 37.35 | 19.02 | 79.80 | V |
| 20643 | 848.3 | -16.88 | 37.71 | 18.68 | 73.79 | V |

### CHANNEL BANDWIDTH: 3MHz QPSK

| Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | ERP(dBm) | ERP(mW) | Polarization (H/V) |
|---|---|---|---|---|---|---|
| 20415 | 825.5 | -9.55 | 35.45 | 23.75 | 237.14 | H |
| 20525 | 836.5 | -9.55 | 36.88 | 25.18 | 329.61 | H |
| 20635 | 847.5 | -10.10 | 36.82 | 24.57 | 286.42 | H |
| 20415 | 825.5 | -15.67 | 36.54 | 18.72 | 74.47 | V |
| 20525 | 836.5 | -15.02 | 37.35 | 20.18 | 104.23 | V |
| 20635 | 847.5 | -15.90 | 37.64 | 19.59 | 90.99 | V |

## CHANNEL BANDWIDTH: 3MHz 16QAM

| Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | ERP(dBm) | ERP(mW) | Polarization (H/V) |
|---|---|---|---|---|---|---|
| 20415 | 825.5 | -10.59 | 35.45 | 22.71 | 186.64 | H |
| 20525 | 836.5 | -10.69 | 36.88 | 24.04 | 253.51 | H |
| 20635 | 847.5 | -11.05 | 36.82 | 23.62 | 230.14 | H |
| 20415 | 825.5 | -16.71 | 36.54 | 17.68 | 58.61 | V |
| 20525 | 836.5 | -16.16 | 37.35 | 19.04 | 80.17 | V |
| 20635 | 847.5 | -16.85 | 37.64 | 18.64 | 73.11 | V |

## CHANNEL BANDWIDTH: 5MHz QPSK

| Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | ERP(dBm) | ERP(mW) | Polarization (H/V) |
|---|---|---|---|---|---|---|
| 20425 | 826.5 | -9.48 | 35.59 | 23.96 | 248.89 | H |
| 20525 | 836.5 | -9.60 | 36.88 | 25.13 | 325.84 | H |
| 20625 | 846.5 | -10.15 | 36.9 | 24.60 | 288.40 | H |
| 20425 | 826.5 | -15.60 | 36.51 | 18.76 | 75.16 | V |
| 20525 | 836.5 | -15.07 | 37.35 | 20.13 | 103.04 | V |
| 20625 | 846.5 | -15.95 | 37.62 | 19.52 | 89.54 | V |

## CHANNEL BANDWIDTH: 5MHz 16QAM

| Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | ERP(dBm) | ERP(mW) | Polarization (H/V) |
|---|---|---|---|---|---|---|
| 20425 | 826.5 | -10.61 | 35.59 | 22.83 | 191.87 | H |
| 20525 | 836.5 | -10.54 | 36.88 | 24.19 | 262.42 | H |
| 20625 | 846.5 | -11.23 | 36.9 | 23.52 | 224.91 | H |
| 20425 | 826.5 | -16.73 | 36.51 | 17.63 | 57.94 | V |
| 20525 | 836.5 | -16.01 | 37.35 | 19.19 | 82.99 | V |
| 20625 | 846.5 | -17.03 | 37.62 | 18.44 | 69.82 | V |

## CHANNEL BANDWIDTH: 10MHz QPSK

| Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | ERP(dBm) | ERP(mW) | Polarization (H/V) |
|---|---|---|---|---|---|---|
| 20450 | 829 | -9.47 | 35.71 | 24.09 | 256.45 | H |
| 20525 | 836.5 | -9.55 | 36.85 | 25.15 | 327.34 | H |
| 20600 | 844 | -10.14 | 37.01 | 24.72 | 296.48 | H |
| 20450 | 829 | -15.59 | 36.56 | 18.82 | 76.21 | V |
| 20525 | 836.5 | -15.02 | 37.32 | 20.15 | 103.51 | V |
| 20600 | 844 | -15.94 | 37.62 | 19.53 | 89.74 | V |

## CHANNEL BANDWIDTH: 10MHz 16QAM

| Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | ERP(dBm) | ERP(mW) | Polarization (H/V) |
|---|---|---|---|---|---|---|
| 20450 | 829 | -10.53 | 35.71 | 23.03 | 200.91 | H |
| 20525 | 836.5 | -10.58 | 36.85 | 24.12 | 258.23 | H |
| 20600 | 844 | -11.14 | 37.01 | 23.72 | 235.50 | H |
| 20450 | 829 | -16.65 | 36.56 | 17.76 | 59.70 | V |
| 20525 | 836.5 | -16.05 | 37.32 | 19.12 | 81.66 | V |
| 20600 | 844 | -16.94 | 37.62 | 18.53 | 71.29 | V |

**REMARKS:** 1. ERP Output Power (dBm) = SPA Reading (dBm) + Correction Factor (dB).
2. Correction factor (dB) = Free Space Loss + Antenna Factor + Cable Loss.

## 4.2 FREQUENCY STABILITY MEASUREMENT

### 4.2.1 LIMITS OF FREQUENCY STABILIITY MEASUREMENT

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

### 4.2.2 TEST PROCEDURE

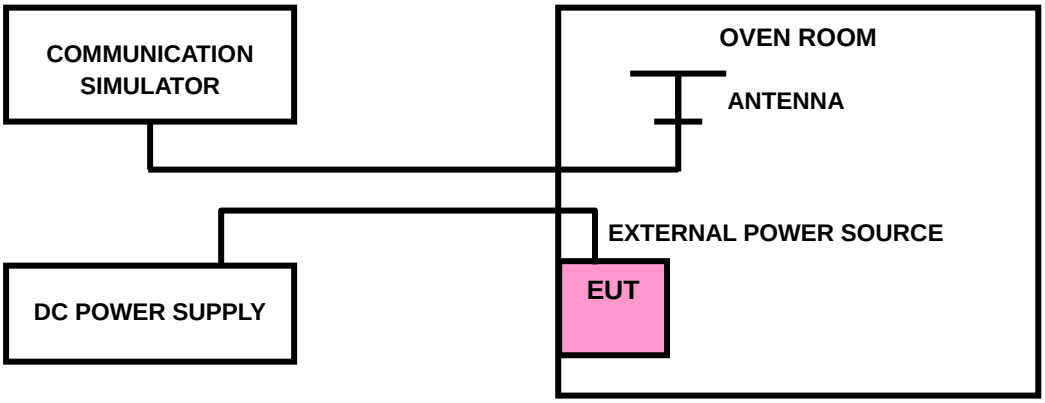
a. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.

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) |
|---|---|---|---|---|---|---|---|---|
| | GSM | EDGE | WCDMA | LTE Band 5 | | | | |
| | | | | 1.4 MHz | 3 MHz | 5 MHz | 10MHz | |
| 3.8 | -0.02 | -0.02 | 0.01 | -0.01 | -0.01 | 0.01 | 0.01 | 2.5 |
| 3.5 | -0.02 | -0.02 | 0.01 | -0.02 | -0.01 | 0.02 | 0.02 | 2.5 |
| 4.35 | -0.02 | -0.02 | 0.01 | -0.02 | -0.02 | 0.01 | 0.02 | 2.5 |

**NOTE:** The applicant defined the normal working voltage of the battery is from 3.5Vdc to 4.2Vdc.

**FREQUENCY ERROR vs. TEMPERATURE.**

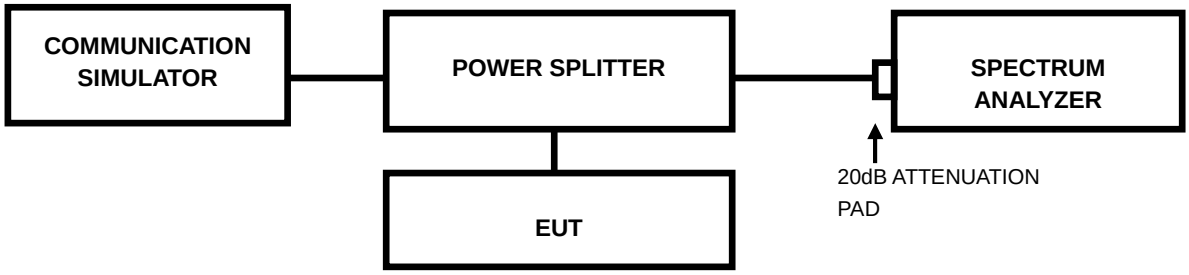
| Voltage (Volts) | Frequency Error (ppm) | | | | | | | Limit (ppm) |
|---|---|---|---|---|---|---|---|---|
| | GSM | EDGE | WCDMA | LTE Band 5 | | | | |
| | | | | 1.4 MHz | 3 MHz | 5 MHz | 10MHz | |
| -30 | -0.02 | -0.02 | 0.02 | -0.02 | -0.02 | 0.02 | 0.02 | 2.5 |
| -20 | -0.02 | -0.02 | 0.02 | -0.02 | -0.02 | 0.01 | 0.02 | 2.5 |
| -10 | -0.02 | -0.02 | 0.02 | -0.02 | -0.01 | 0.01 | 0.02 | 2.5 |
| 0 | -0.02 | -0.02 | 0.02 | -0.01 | -0.01 | 0.01 | 0.02 | 2.5 |
| 10 | -0.02 | -0.02 | 0.02 | -0.01 | -0.01 | 0.01 | 0.02 | 2.5 |
| 20 | -0.02 | -0.02 | 0.02 | -0.01 | -0.01 | 0.01 | 0.01 | 2.5 |
| 30 | -0.02 | -0.02 | 0.01 | -0.01 | 0.00 | 0.01 | 0.01 | 2.5 |
| 40 | -0.02 | -0.02 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 2.5 |
| 50 | -0.02 | -0.01 | 0.01 | 0.01 | 0.01 | -0.01 | 0.00 | 2.5 |
| 60 | -0.01 | -0.01 | 0.01 | 0.01 | 0.01 | -0.01 | -0.01 | 2.5 |

## 4.3 OCCUPIED BANDWIDTH MEASUREMENT

### 4.3.1 TEST PROCEDURES

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.

### 4.3.2 TEST SETUP

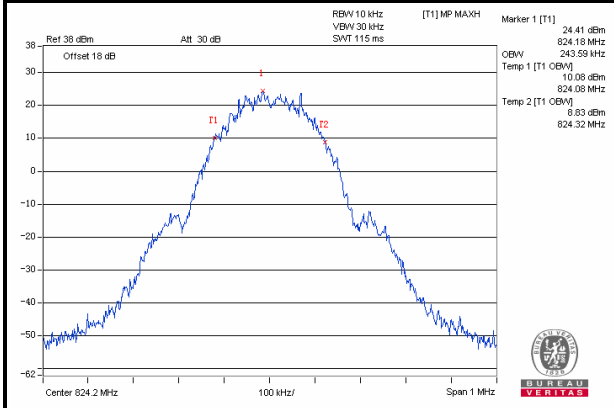


## 4.3.3 TEST RESULTS

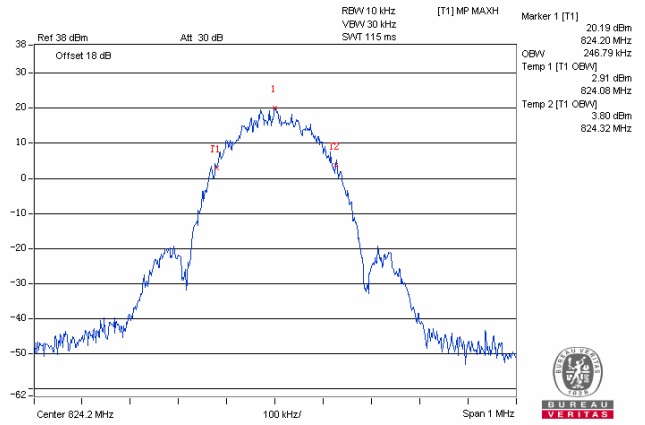
| CHANNEL | Frequency (MHz) | 99% OCCUPIED Bandwidth (kHz) | | CHANNEL | Frequency (MHz) | 99% OCCUPIED Bandwidth (MHz) |
|---|---|---|---|---|---|---|
| | | GSM | EDGE | | | WCDMA |
| 128 | 824.2 | 243.59 | 246.79 | 4132 | 826.4 | 4.17 |
| 190 | 836.6 | 240.38 | 240.38 | 4182 | 836.4 | 4.17 |
| 251 | 848.8 | 243.59 | 243.59 | 4233 | 846.6 | 4.17 |

**SPECTRUM PLOT OF WORST VALUE**

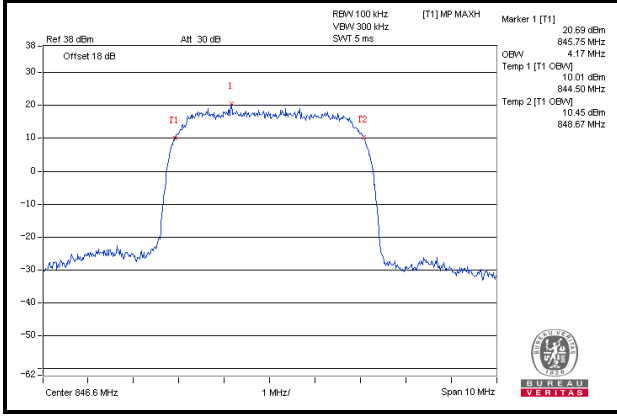
**GSM**




**EDGE**



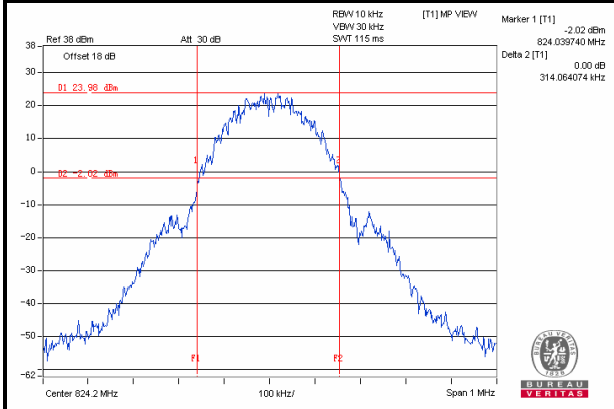

**WCDMA**



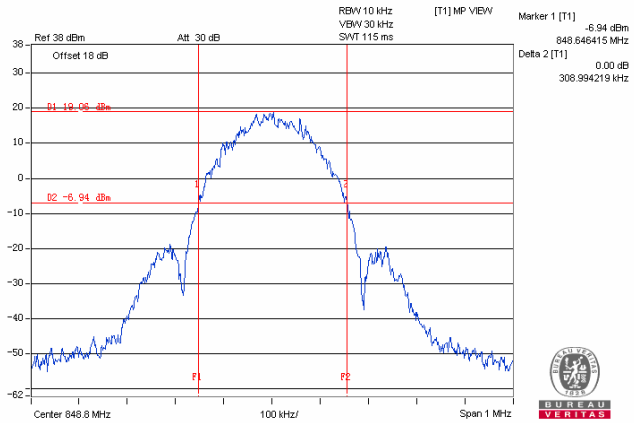
| CHANNEL | Frequency (MHz) | 26dB Bandwidth (kHz) | | CHANNEL | Frequency (MHz) | 26dB Bandwidth (MHz) |
|---|---|---|---|---|---|---|
| | | GSM | EDGE | | | WCDMA |
| 128 | 824.2 | 314.06 | 306.64 | 4132 | 826.4 | 4.675 |
| 190 | 836.6 | 311.11 | 300.77 | 4182 | 836.4 | 4.654 |
| 251 | 848.8 | 311.17 | 308.99 | 4233 | 846.6 | 4.670 |

**SPECTRUM PLOT OF WORST VALUE**

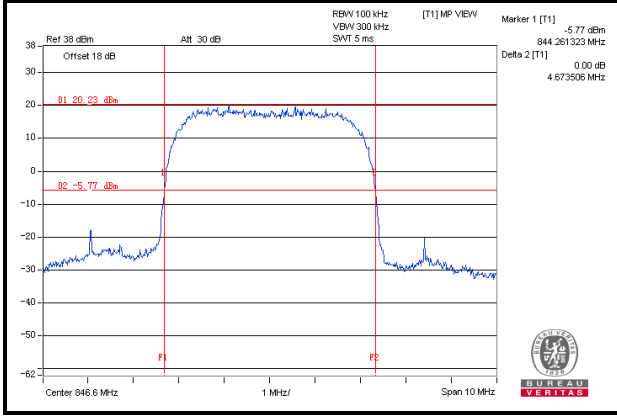
**GSM**




**EDGE**



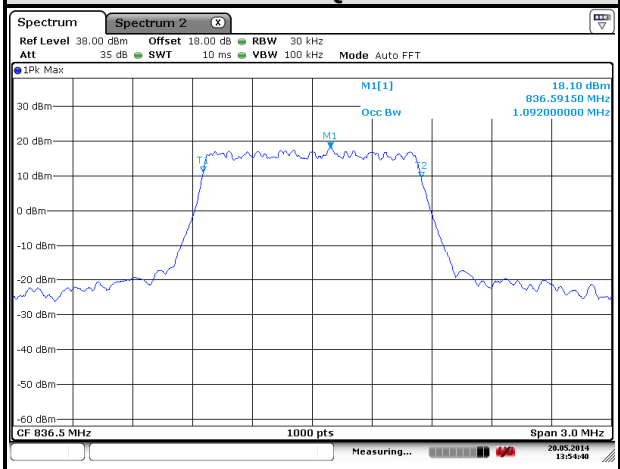

**WCDMA**



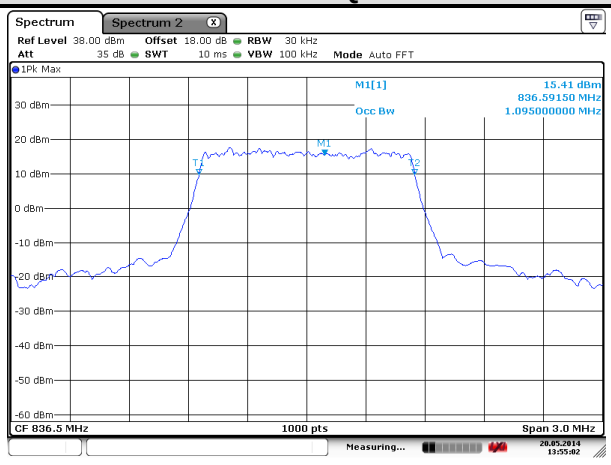
| LTE band 5 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Channel Bandwidth : 1.4MHz | | | | | | | |
| Channel | Frequency (MHz) | 99% Occupied bandwidth (MHz) | | Channel | Frequency (MHz) | 26 dB bandwidth (MHz) | |
| | | QPSK | 16QAM | | | QPSK | 16QAM |
| 20407 | 824.7 | 1.09 | 1.10 | 20407 | 824.7 | 1.25 | 1.26 |
| 20525 | 836.5 | 1.09 | 1.10 | 20525 | 836.5 | 1.25 | 1.28 |
| 20643 | 848.3 | 1.08 | 1.10 | 20643 | 848.3 | 1.24 | 1.27 |

**SPECTRUM PLOT OF WORST VALUE of 99% Occupied Bandwidth**

**1.4MHz/QPSK**

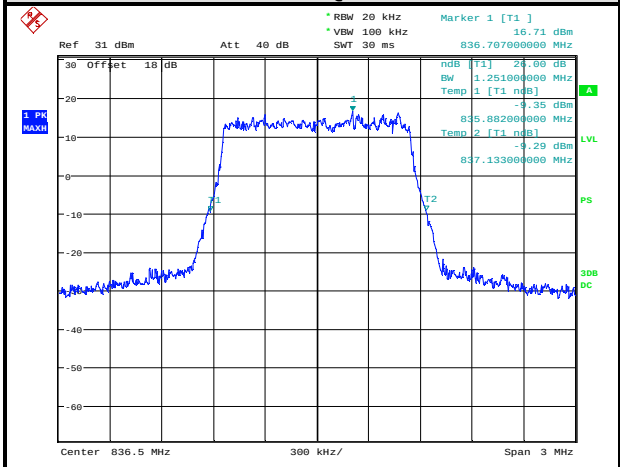



**1.4MHz/16QAM**

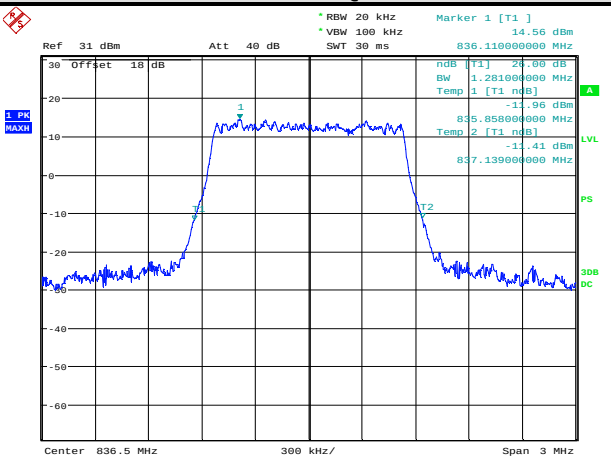



**SPECTRUM PLOT OF WORST VALUE of 26dB Occupied Bandwidth**

**1.4MHz/QPSK**



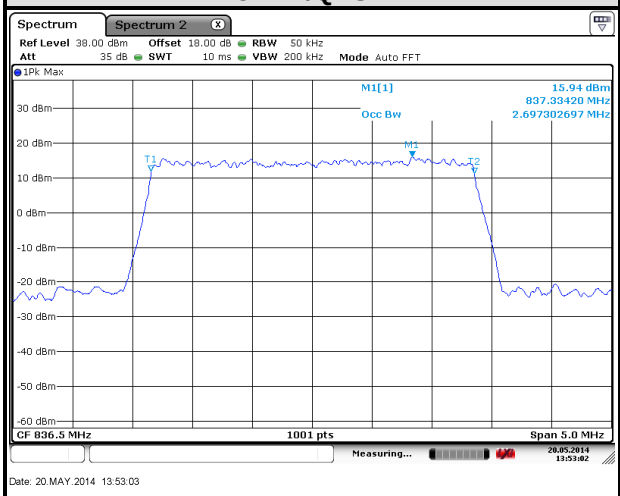

**1.4MHz/16QAM**



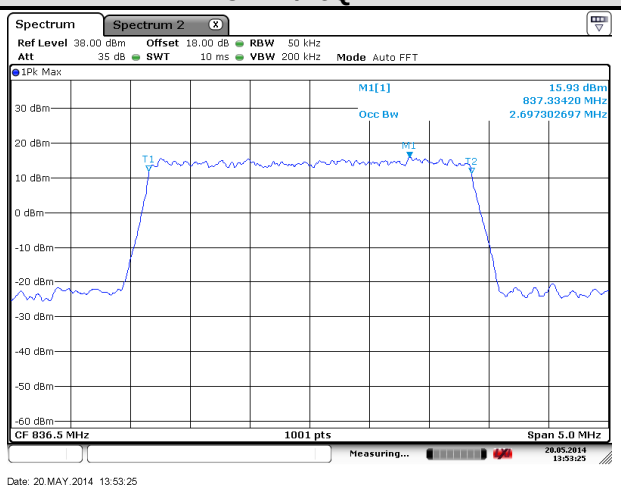
| LTE band 5 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Channel Bandwidth : 3MHz | | | | | | | |
| Channel | Frequency (MHz) | 99% Occupied bandwidth (MHz) | | Channel | Frequency (MHz) | 26 dB bandwidth (MHz) | |
| | | QPSK | 16QAM | | | QPSK | 16QAM |
| 20415 | 825.5 | 2.70 | 2.69 | 20415 | 825.5 | 2.95 | 2.97 |
| 20525 | 836.5 | 2.70 | 2.70 | 20525 | 836.5 | 2.96 | 2.98 |
| 20635 | 847.5 | 2.69 | 2.69 | 20635 | 847.5 | 2.95 | 2.96 |

**SPECTRUM PLOT OF WORST VALUE of 99% Occupied Bandwidth**

**3MHz/QPSK**

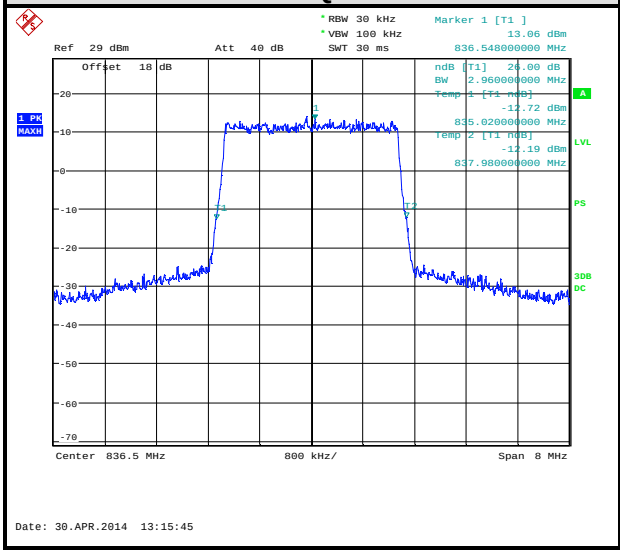



**3MHz/16QAM**

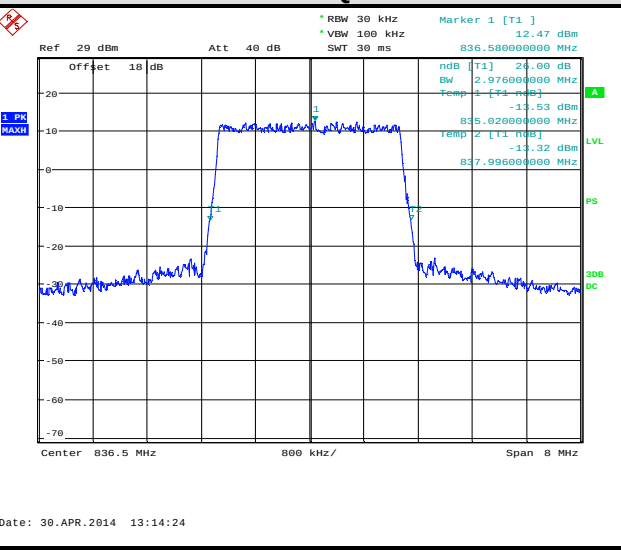



**SPECTRUM PLOT OF WORST VALUE of 26dB Occupied Bandwidth**

**3MHz/QPSK**



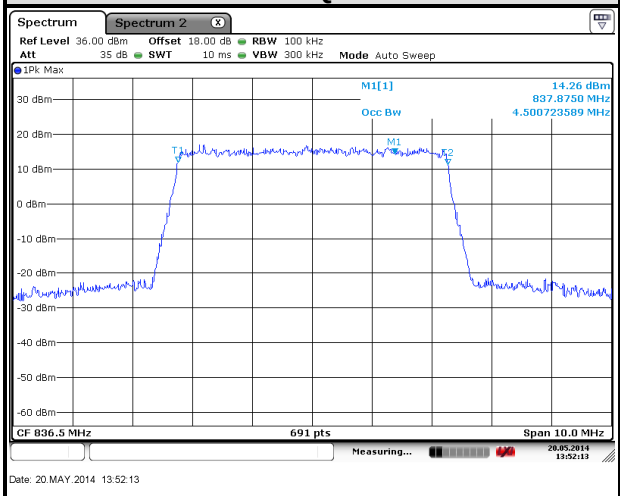

**3MHz/16QAM**



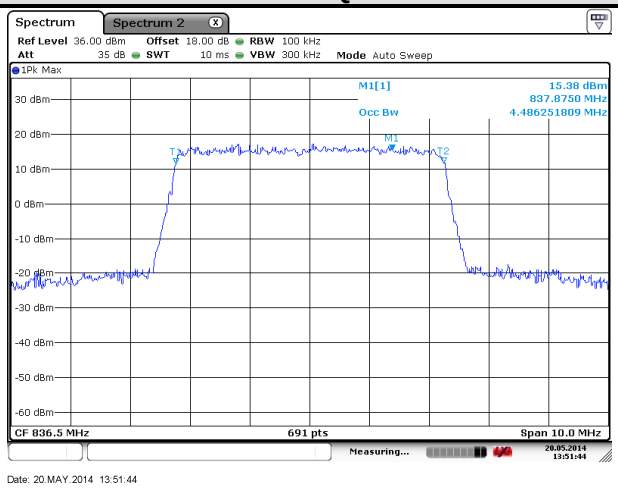
| LTE band 5 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Channel Bandwidth : 5 MHz | | | | | | | |
| Channel | Frequency (MHz) | 99% Occupied bandwidth (MHz) | | Channel | Frequency (MHz) | 26 dB bandwidth (MHz) | |
| | | QPSK | 16QAM | | | QPSK | 16QAM |
| 20425 | 826.5 | 4.49 | 4.49 | 20425 | 826.5 | 4.87 | 4.86 |
| 20525 | 836.5 | 4.5 | 4.49 | 20525 | 836.5 | 4.88 | 4.86 |
| 20625 | 846.5 | 4.5 | 4.48 | 20625 | 846.5 | 4.87 | 4.85 |

**SPECTRUM PLOT OF WORST VALUE of 99% Occupied Bandwidth**

**5MHz/QPSK**

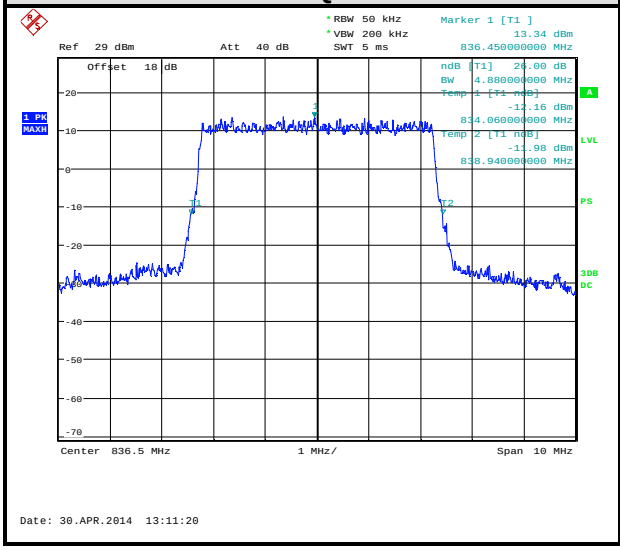



**5MHz/16QAM**

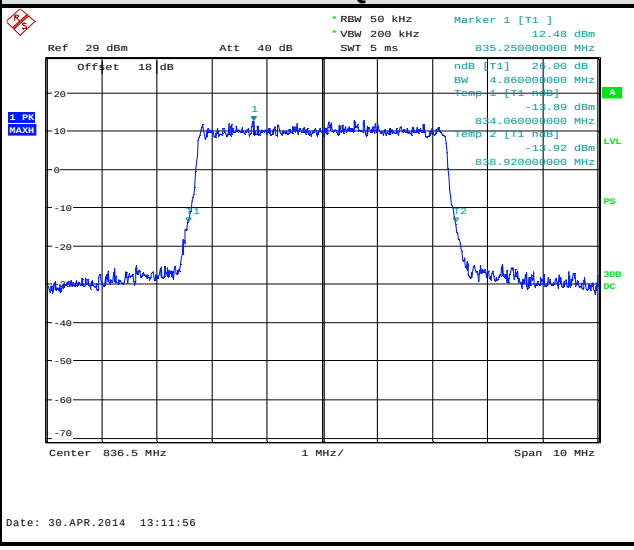



**SPECTRUM PLOT OF WORST VALUE of 26dB Occupied Bandwidth**

**5MHz/QPSK**



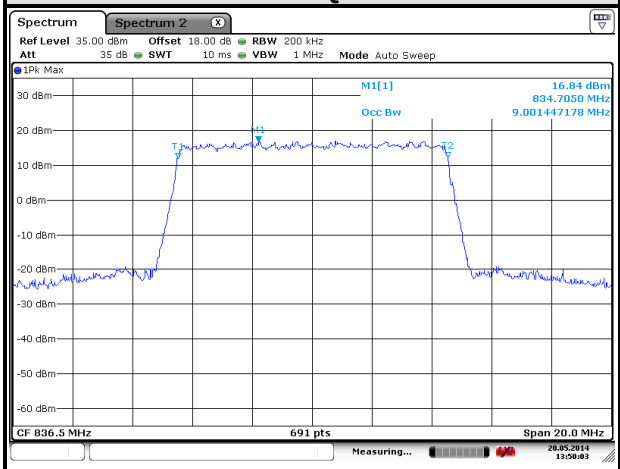

**5MHz/16QAM**



| LTE band 5 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Channel Bandwidth : 10 MHz | | | | | | | |
| Channel | Frequency (MHz) | 99% Occupied bandwidth (MHz) | | Channel | Frequency (MHz) | 26 dB bandwidth (MHz) | |
| | | QPSK | 16QAM | | | QPSK | 16QAM |
| 20425 | 826.5 | 8.99 | 8.97 | 20425 | 826.5 | 9.65 | 9.76 |
| 20525 | 836.5 | 9 | 8.97 | 20525 | 836.5 | 9.66 | 9.76 |
| 20625 | 846.5 | 8.9 | 8.88 | 20625 | 846.5 | 9.66 | 9.75 |

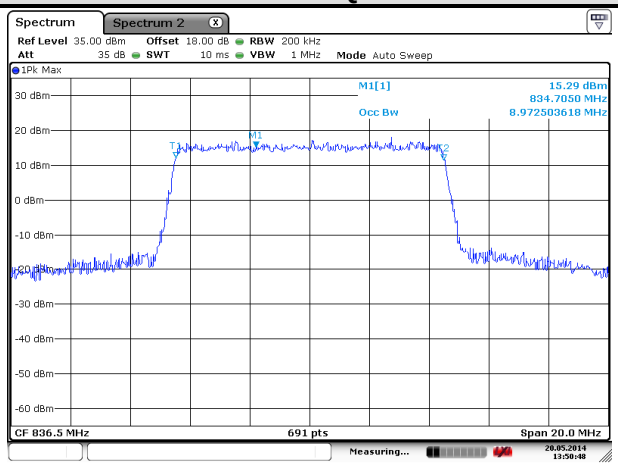
**SPECTRUM PLOT OF WORST VALUE of 99% Occupied Bandwidth**

**10MHz/QPSK**




Date: 20.MAY.2014 13:50:03

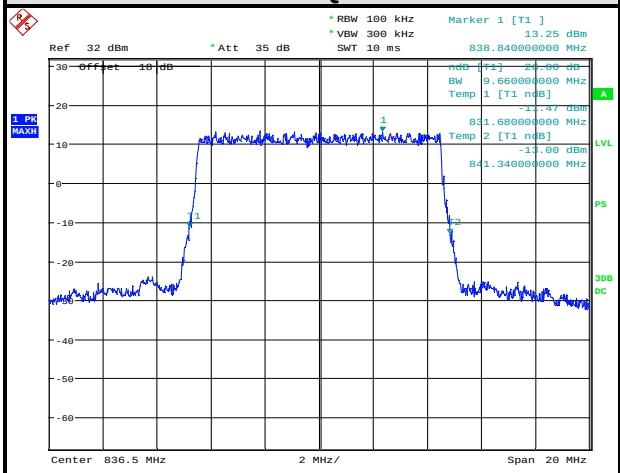
**10MHz/16QAM**




Date: 20.MAY.2014 13:50:49

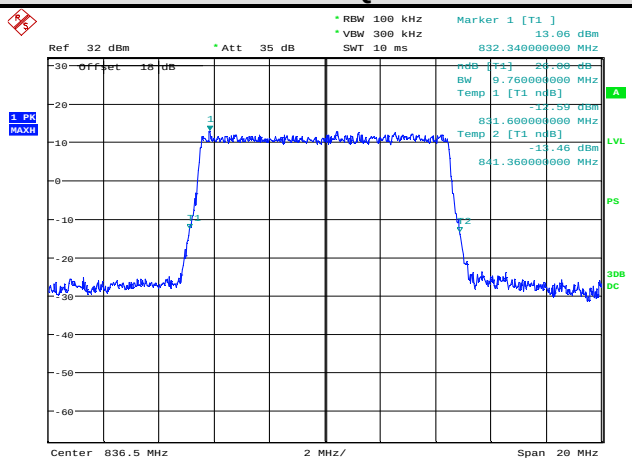
**SPECTRUM PLOT OF WORST VALUE of 26dB Occupied Bandwidth**

**10MHz/QPSK**




Date: 30.APR.2014 12:40:30

**10MHz/16QAM**



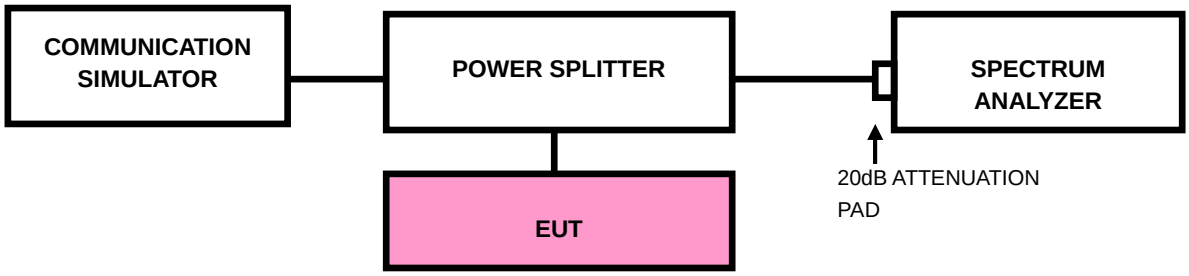

Date: 30.APR.2014 12:41:25

## 4.4 BAND EDGE MEASUREMENT

### 4.4.1 LIMITS OF BAND EDGE MEASUREMENT

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

### 4.4.2 TEST SETUP




### 4.4.3 TEST PROCEDURES

a. All measurements were done at low and high operational frequency range.

b. The center frequency of spectrum is the band edge frequency and span is 1.5MHz. RBW of the spectrum is 10kHz and VBW of the spectrum is 30kHz (GSM/GPRS/ EDGE).

c. The center frequency of spectrum is the band edge frequency and span is 10MHz. RBW of the spectrum is 100kHz and VBW of the spectrum is 300kHz (WCDMA).

d. The center frequency of spectrum is the band edge frequency and span is 1~5 MHz. RB of the spectrum is 20kHz and VB of the spectrum is 100 kHz. (LTE bandwidth 1.4MHz).

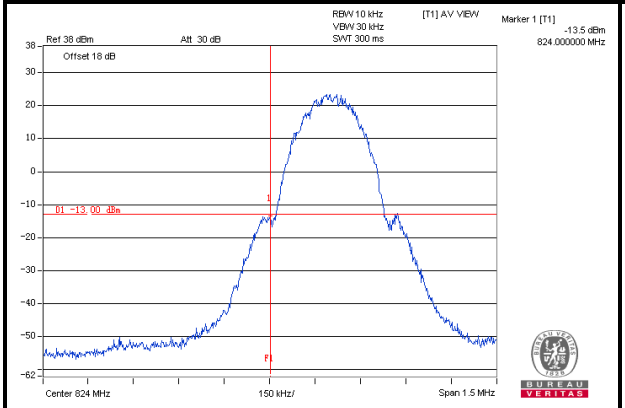
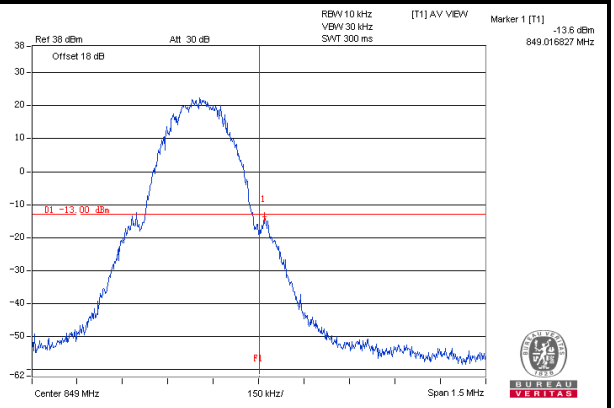
e. The center frequency of spectrum is the band edge frequency and span is 1~5 MHz. RB of the spectrum is 30kHz and VB of the spectrum is 100kHz. (LTE bandwidth 3MHz)

f. The center frequency of spectrum is the band edge frequency and span is 1~5 MHz. RB of the spectrum is 50kHz and VB of the spectrum is 200kHz. (LTE bandwidth 5MHz)

g. The center frequency of spectrum is the band edge frequency and span is 1~5 MHz. RB of the spectrum is 100kHz and VB of the spectrum is 300kHz. (LTE bandwidth 10MHz)

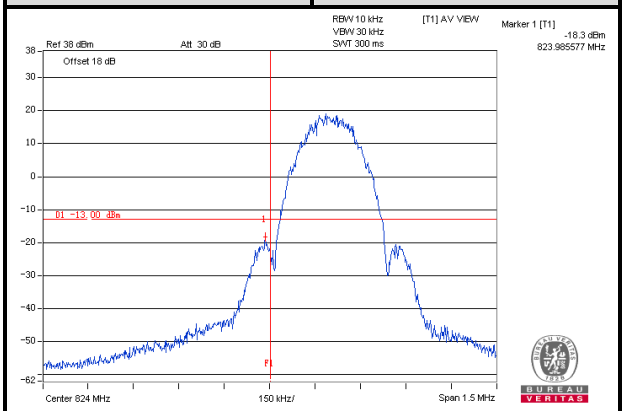
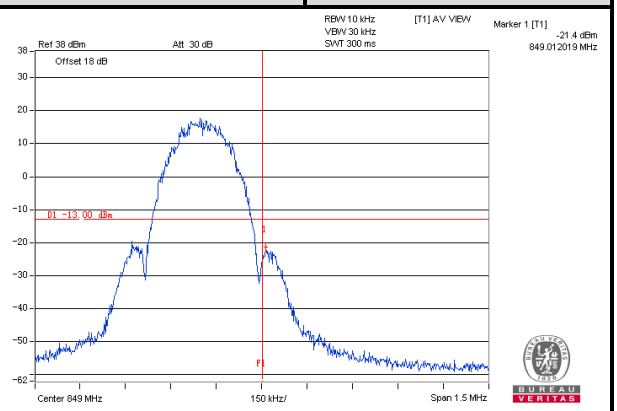
h. Record the max trace plot into the test report.

## 4.4.4 TEST RESULTS

| GSM | | | |
|---|---|---|---|
| CHANNEL | 128 | CHANNEL | 251 |
|  | |  | |

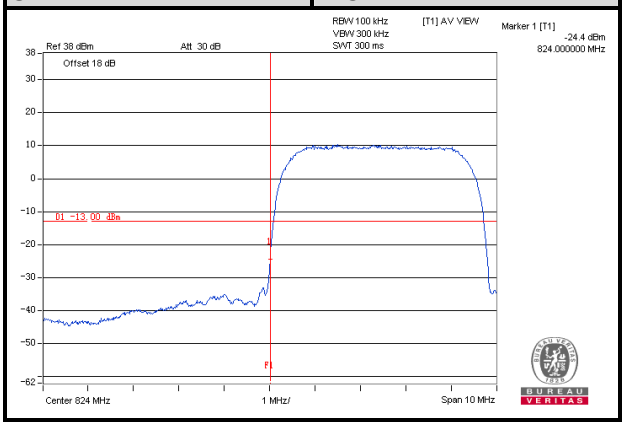
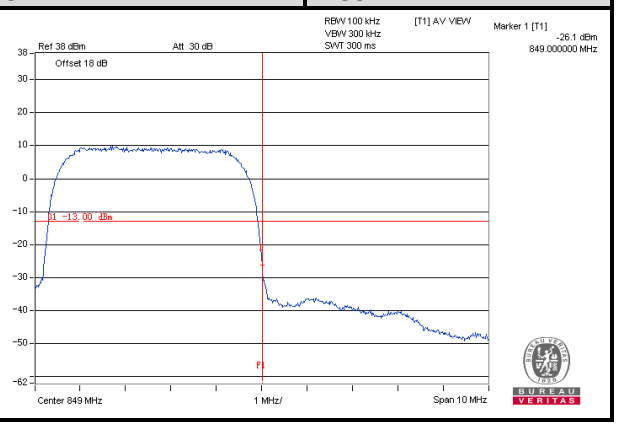




| EDGE | | | |
|---|---|---|---|
| CHANNEL | 128 | CHANNEL | 251 |
|  | |  | |



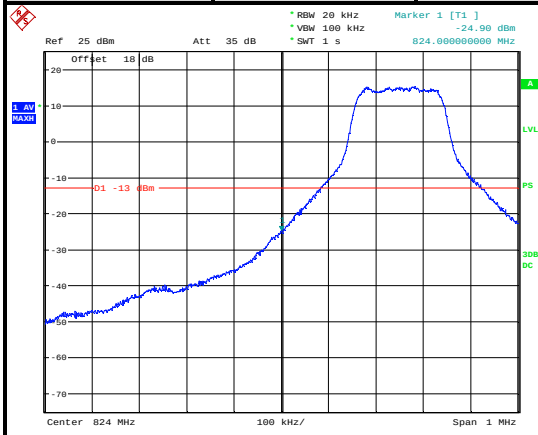


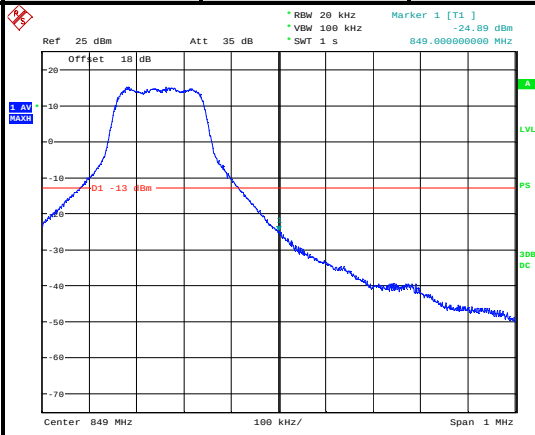
| WCDMA | | | |
|---|---|---|---|
| CHANNEL | 4132 | CHANNEL | 4233 |
|  | |  | |

## LTE Band5

### Channel Bandwidth: 1.4MHz

| CHANNEL | 20407 | 1 RB | CHANNEL | 20643 | 1 RB |
|---|---|---|---|---|---|

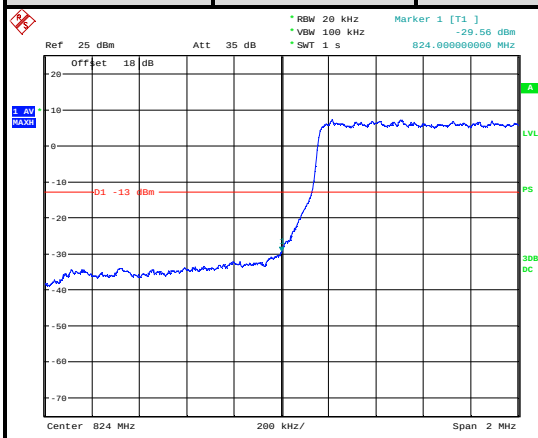


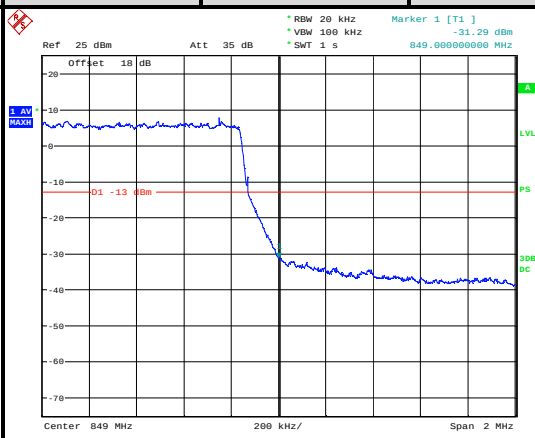




## LTE Band5

### Channel Bandwidth: 1.4MHz

| CHANNEL | 20407 | Full RB | CHANNEL | 20643 | Full RB |
|---|---|---|---|---|---|

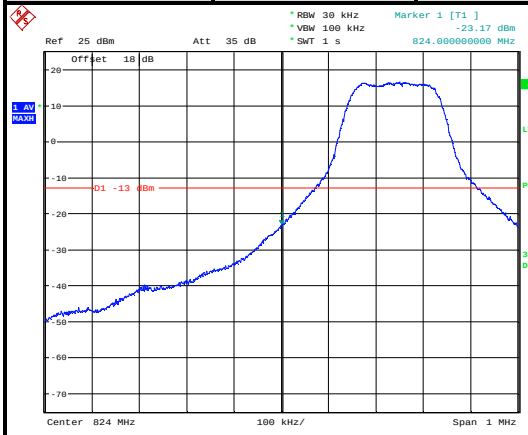


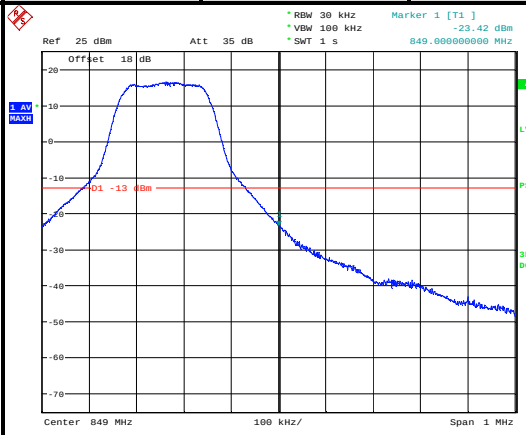
## LTE Band5

### Channel Bandwidth: 3MHz

| CHANNEL | 20415 | 1 RB | CHANNEL | 20635 | 1 RB |
|---|---|---|---|---|---|




Date: 30.APR.2014 13:18:58

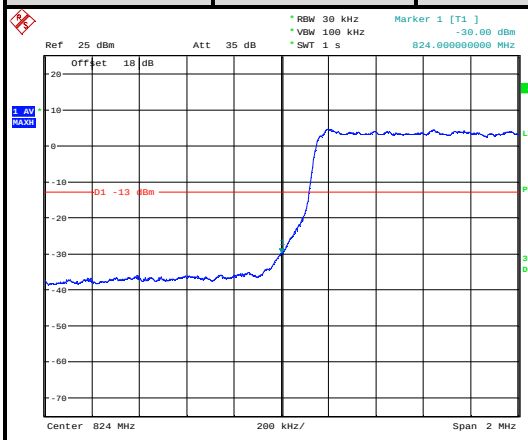



Date: 30.APR.2014 13:20:02

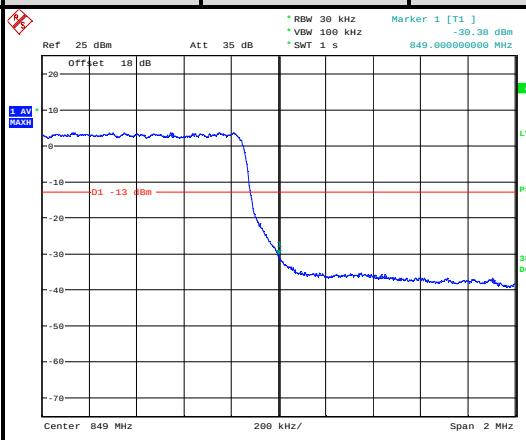
## LTE Band5

### Channel Bandwidth: 3MHz

| CHANNEL | 20415 | Full RB | CHANNEL | 20635 | Full RB |
|---|---|---|---|---|---|




Date: 30.APR.2014 13:18:21

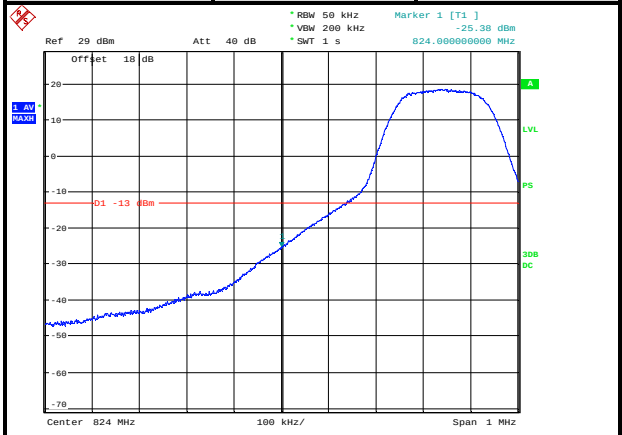


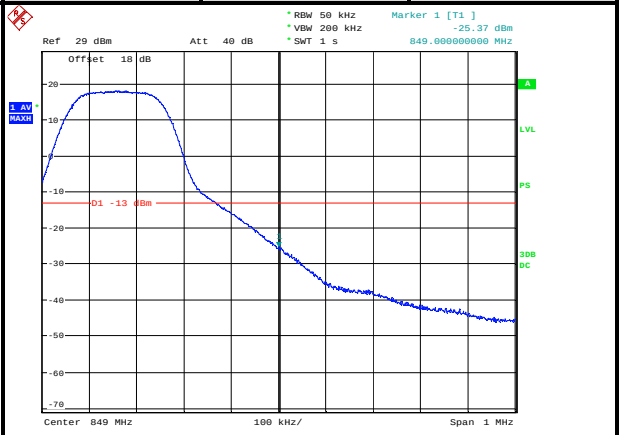

Date: 30.APR.2014 13:20:50

## LTE Band5

### Channel Bandwidth: 5MHz

| CHANNEL | 20425 | 1 RB | CHANNEL | 20625 | 1 RB |
|---|---|---|---|---|---|

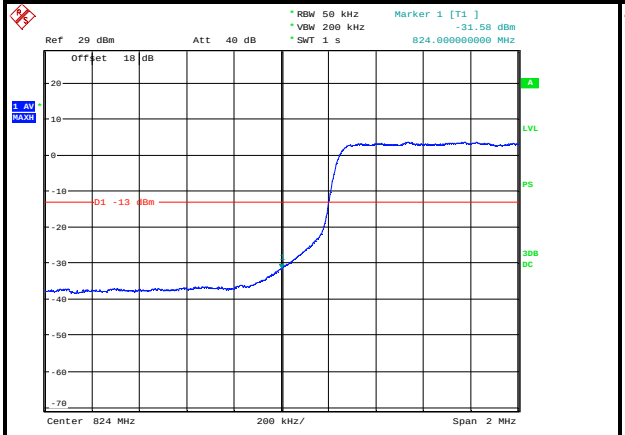


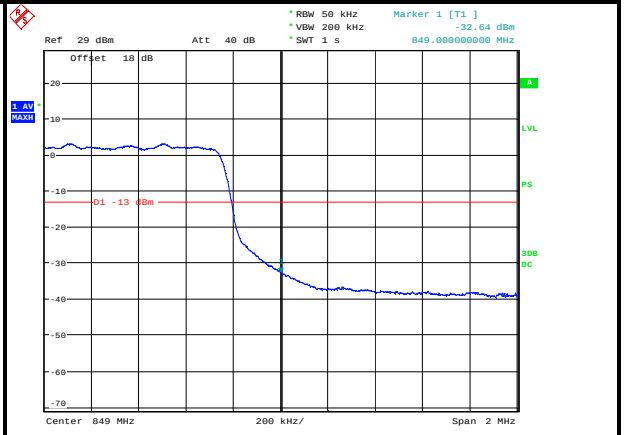




## LTE Band5

### Channel Bandwidth: 5MHz

| CHANNEL | 20425 | Full RB | CHANNEL | 20625 | Full RB |
|---|---|---|---|---|---|

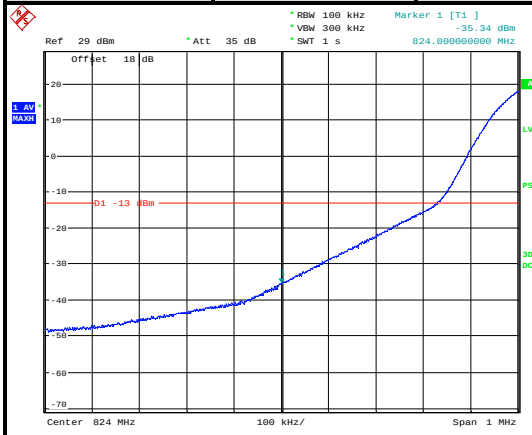


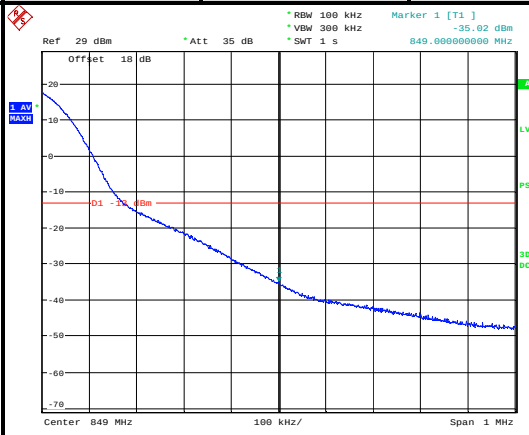
## LTE Band5

### Channel Bandwidth: 10MHz

| CHANNEL | 20450 | 1 RB | CHANNEL | 20600 | 1 RB |
|---|---|---|---|---|---|




Date: 30.APR.2014 12:46:55

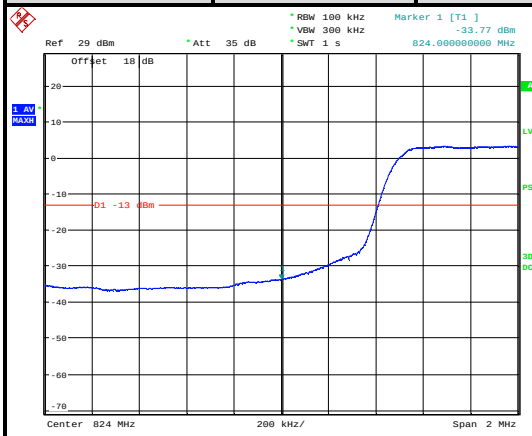



Date: 30.APR.2014 12:48:54

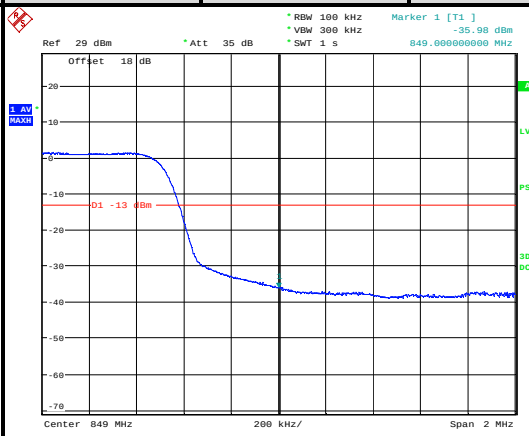
## LTE Band5

### Channel Bandwidth: 10MHz

| CHANNEL | 20450 | Full RB | CHANNEL | 20600 | Full RB |
|---|---|---|---|---|---|




Date: 30.APR.2014 12:46:06




Date: 30.APR.2014 12:49:51

## 4.5 CONDUCTED SPURIOUS EMISSIONS

### 4.5.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

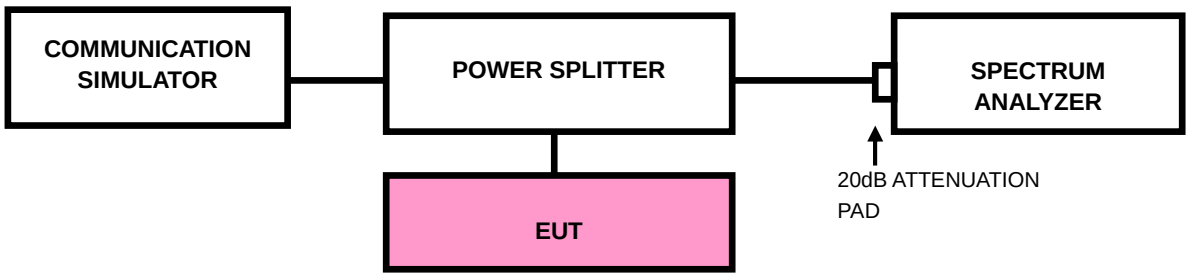
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit equal to –13dBm.

### 4.5.2 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 9 kHz to 9GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement.

### 4.5.3 TEST SETUP

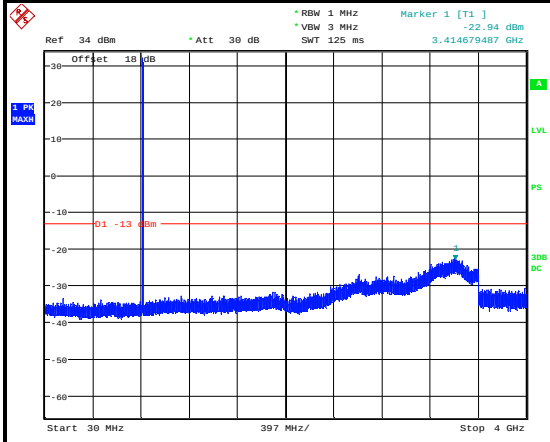


## 4.5.4 TEST RESULTS

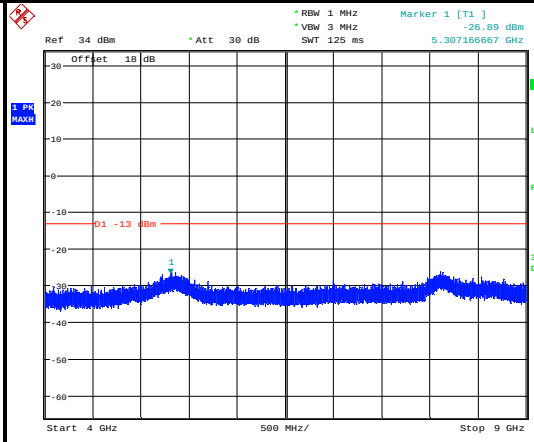
**GSM**

**CHANNEL 189**

**FREQUENCY RANGE : 30MHz~4GHz**



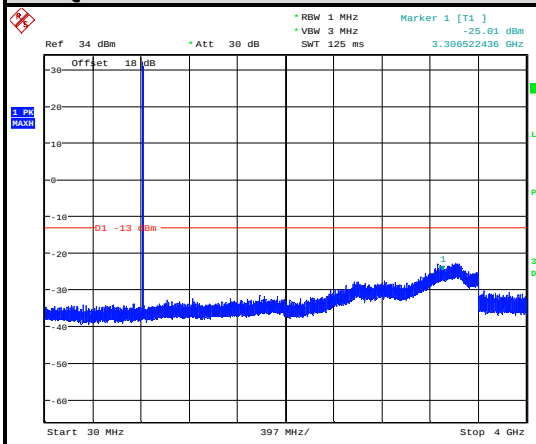

**FREQUENCY RANGE : 4GHz~9GHz**



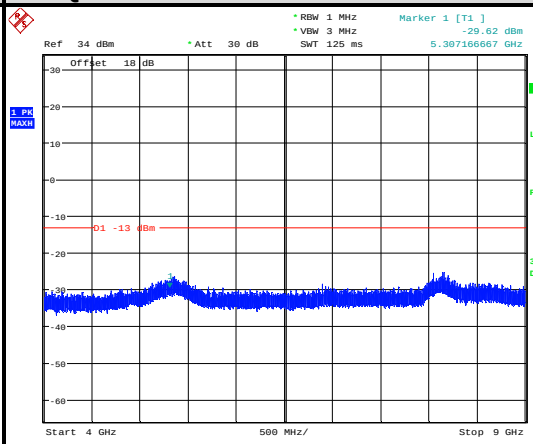

**EDGE**

**CHANNEL 189**

**FREQUENCY RANGE : 30MHz~4GHz**



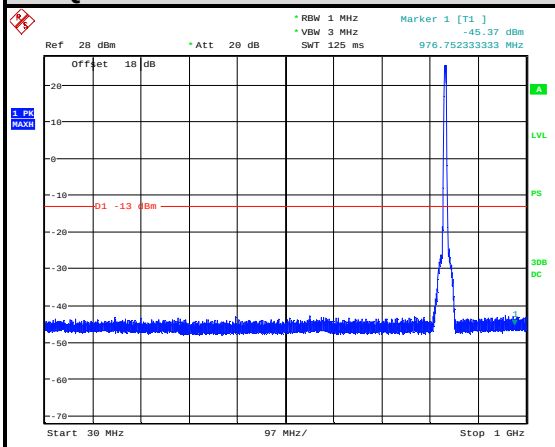

**FREQUENCY RANGE : 4GHz~9GHz**



## WCDMA

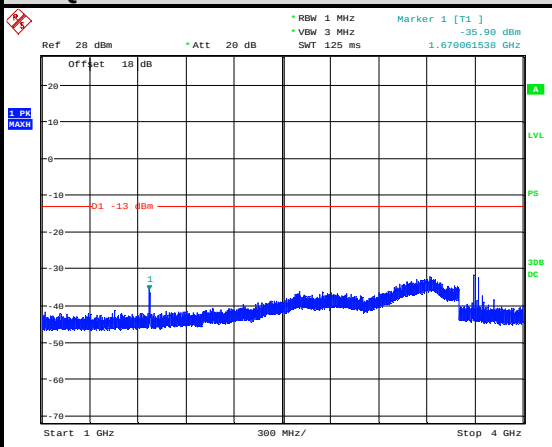
## CHANNEL 4182

### FREQUENCY RANGE : 30MHz~1GHz



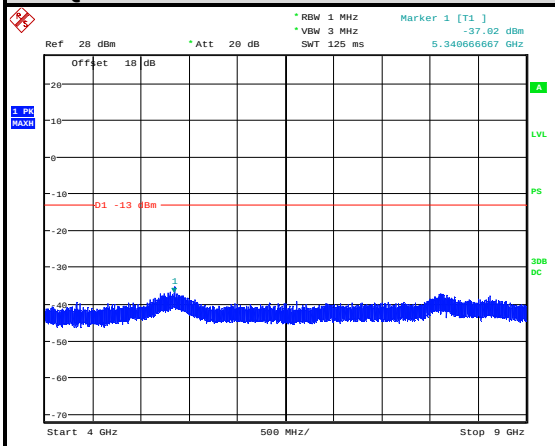

Date: 19.APR.2014 14:14:27

### FREQUENCY RANGE : 1GHz~4GHz

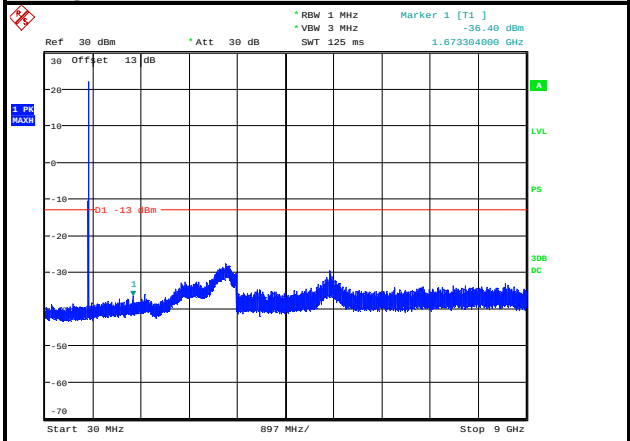
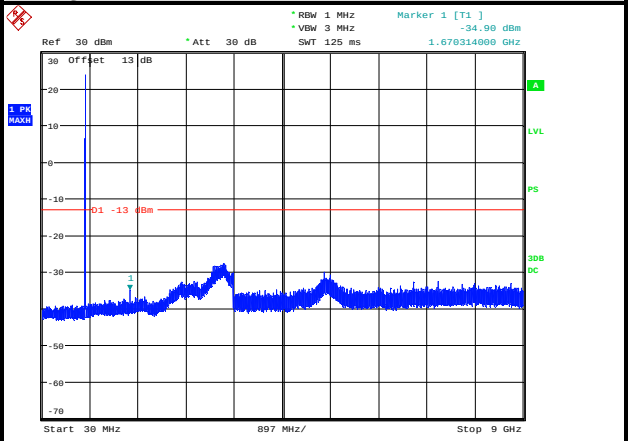
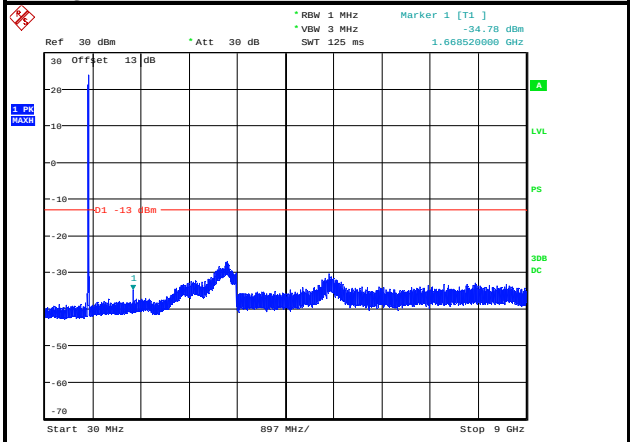
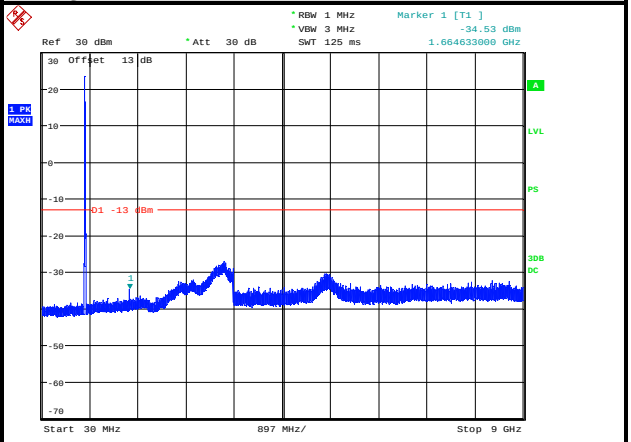



Date: 19.APR.2014 14:15:21

### FREQUENCY RANGE : 4GHz~9GHz




Date: 19.APR.2014 14:15:41

| LTE Band 5 (Channel Bandwidth: 1.4MHz) | LTE Band 5 (Channel Bandwidth: 3MHz) |
|---|---|
| CHANNEL 20525 | CHANNEL 20525 |
| FREQUENCY RANGE : 30MHz~9GHz | FREQUENCY RANGE : 30MHz~9GHz |
|  |  |
| Date: 30.APR.2014 13:44:34 | Date: 30.APR.2014 13:44:06 |
| LTE Band 5 (Channel Bandwidth: 5MHz) | LTE Band 5 (Channel Bandwidth: 10MHz) |
| CHANNEL 20525 | CHANNEL 20525 |
| FREQUENCY RANGE : 30MHz~9GHz | FREQUENCY RANGE : 30MHz~9GHz |
|  |  |
| Date: 30.APR.2014 13:43:28 | Date: 30.APR.2014 13:42:29 |

## 4.6 RADIATED EMISSION MEASUREMENT

### 4.6.1 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 equal to –13dBm.

### 4.6.2 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.

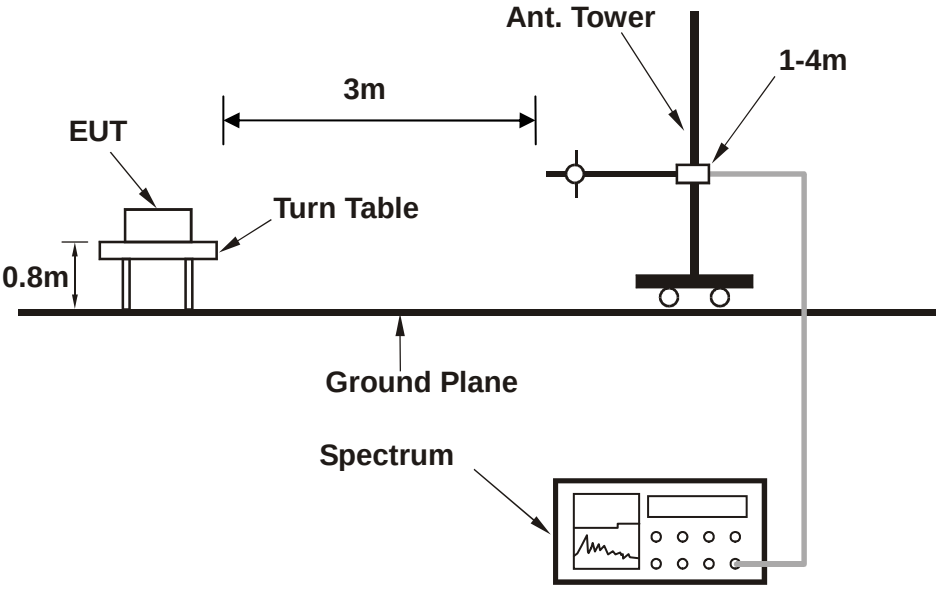
d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15dBi.

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

### 4.6.3 DEVIATION FROM TEST STANDARD

No deviation

### 4.6.4 TEST SETUP




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

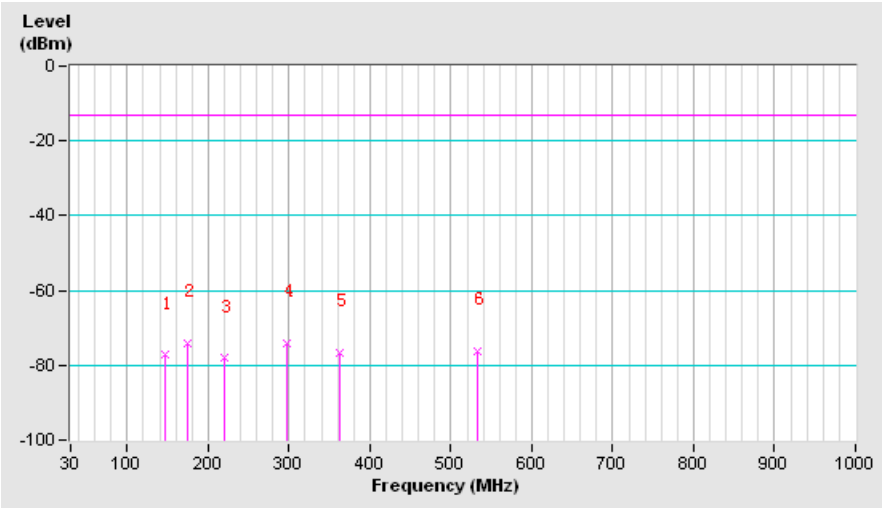
## 4.6.5 TEST RESULTS

**BELOW 1GHz WORST-CASE DATA：LTE BAND 5**

| SPURIOUS EMISSION FREQUENCY RANGE | Below 1000MHz | OPERATING CHANNEL | Channel 20525 |
|---|---|---|---|

| SPURIOUS EMISSION LEVEL | | | | |
|---|---|---|---|---|
| **Frequency (MHz)** | **Antenna Polarization** | **Level (dBm)** | **Limit (dBm)** | **Margin (dB)** |
| 99.52 | H | -66.14 | -13.00 | -53.14 |
| 146.40 | H | -67.28 | -13.00 | -54.28 |
| 219.15 | H | -68.14 | -13.00 | -55.14 |
| 296.75 | H | -64.13 | -13.00 | -51.13 |
| 363.03 | H | -66.79 | -13.00 | -53.79 |
| 560.27 | H | -65.00 | -13.00 | -52.00 |

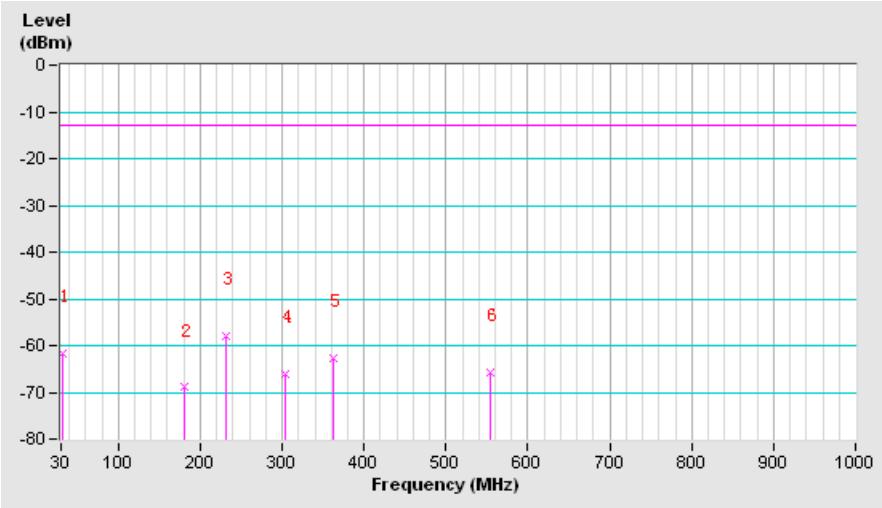
**REMARKS:** Margin value = Emission level – Limit value.



| SPURIOUS EMISSION FREQUENCY RANGE | Below 1000MHz | OPERATING CHANNEL | Channel 20525 |
|---|---|---|---|

| SPURIOUS EMISSION LEVEL | | | | |
|---|---|---|---|---|
| Frequency (MHz) | Antenna Polarization | Level (dBm) | Limit (dBm) | Margin (dB) |
| 31.62 | V | -61.62 | -13.00 | -48.62 |
| 180.35 | V | -68.96 | -13.00 | -55.96 |
| **230.47** | **V** | **-58.03** | **-13.00** | **-45.03** |
| 303.22 | V | -66.12 | -13.00 | -53.12 |
| 363.03 | V | -62.56 | -13.00 | -49.56 |
| 553.80 | V | -65.73 | -13.00 | -52.73 |

**REMARKS:** Margin value = Emission level – Limit value.



## ABOVE 1GHz DATA

### GSM:

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | |
|---|---|---|---|---|---|---|---|
| No. | Freq. (MHz) | SPA READING (dBm) | Limit (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Margin (dB) |
| 1 | 1672 | -62.3 | -13 | -55.78 | 0.11 | -55.67 | -42.67 |
| 2 | 2509 | -61.25 | -13 | -51.13 | -0.06 | -51.19 | -38.19 |
| 3 | 3345 | -58.63 | -13 | -47.01 | 0.69 | -46.32 | -33.32 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | |
| No. | Freq. (MHz) | SPA READING (dBm) | Limit (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Margin (dB) |
| 1 | 1672 | -60.32 | -13 | -49.37 | 0.11 | -49.26 | -36.26 |
| 2 | 2509 | -58.67 | -13 | -46.80 | -0.06 | -46.86 | -33.86 |
| 3 | 3345 | -57.64 | -13 | -45.21 | 0.69 | -44.52 | -31.52 |

**REMARKS:**

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB) - 2.15 (dB)

### EDGE:

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | |
|---|---|---|---|---|---|---|---|
| No. | Freq. (MHz) | Emission Level (dBuV) | Limit (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Margin (dB) |
| 1 | 1672 | -62.3 | -13 | -55.78 | 0.11 | -55.67 | -42.67 |
| 2 | 2509 | -61.25 | -13 | -51.13 | -0.06 | -51.19 | -38.19 |
| 3 | 3345 | -58.63 | -13 | -47.01 | 0.69 | -46.32 | -33.32 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | |
| No. | Freq. (MHz) | Emission Level (dBuV) | Limit (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Margin (dB) |
| 1 | 1672 | -60.32 | -13 | -49.37 | 0.11 | -49.26 | -36.26 |
| 2 | 2509 | -58.67 | -13 | -46.80 | -0.06 | -46.86 | -33.86 |
| 3 | 3345 | -57.64 | -13 | -45.21 | 0.69 | -44.52 | -31.52 |

**REMARKS:**

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB) - 2.15 (dB)

## WCDMA:

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | |
|---|---|---|---|---|---|---|---|
| No. | Freq. (MHz) | SPA READING (dBm) | Limit (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Margin (dB) |
| 1 | 1672 | -61.35 | -13 | -54.82 | 0.11 | -54.71 | -41.71 |
| 2 | 2509 | -60.24 | -13 | -50.12 | -0.06 | -50.18 | -37.18 |
| 3 | 3345 | -57.61 | -13 | -45.98 | 0.69 | -45.29 | -32.29 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | |
| No. | Freq. (MHz) | SPA READING (dBm) | Limit (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Margin (dB) |
| 1 | 1672 | -57.63 | -13 | -46.68 | 0.11 | -46.57 | -33.57 |
| 2 | 2509 | -55.54 | -13 | -43.60 | -0.06 | -43.66 | -30.66 |
| 3 | 3345 | -54.65 | -13 | -42.20 | 0.69 | -41.51 | -28.51 |

**REMARKS:**

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB) - 2.15 (dB)

## LTE BAND 5

### CHANNEL BANDWIDTH: 1.4MHz / QPSK

| | | | |
|---|---|---|---|
| **MODE** | TX channel 20525 | **FREQUENCY RANGE** | Above 1000MHz |
| **ENVIRONMENTAL CONDITIONS** | 24deg. C, 60%RH | **INPUT POWER** | 5V DC 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) | ERP (dBm) | Margin (dB) |
| 1 | 1672 | -51.29 | -13 | -44.68 | 0.11 | -44.57 | -31.57 |
| 2 | 2509 | -49.28 | -13 | -39.11 | -0.06 | -39.17 | -26.17 |
| 3 | 3345 | -61.56 | -13 | -49.95 | 0.69 | -49.26 | -36.26 |
| 4 | 4182 | -60.35 | -13 | -46.48 | 0.12 | -46.36 | -33.36 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | |
| No. | Freq. (MHz) | Reading (dBm) | Limit (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Margin (dB) |
| 1 | 1672 | -49.05 | -13 | -38.10 | 0.11 | -37.99 | -43.20 |
| 2 | 2509 | -49.4 | -13 | -37.27 | -0.06 | -37.33 | -44.44 |
| 3 | 3345 | -60.69 | -13 | -48.28 | 0.69 | -47.59 | -35.17 |
| 4 | 4182 | -60.75 | -13 | -43.65 | 0.12 | -43.53 | -40.49 |

**REMARKS:**

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB) - 2.15 (dB)

## CHANNEL BANDWIDTH: 3MHz / QPSK

| | | | |
|---|---|---|---|
| **MODE** | TX channel 20525 | **FREQUENCY RANGE** | Above 1000MHz |
| **ENVIRONMENTAL CONDITIONS** | 24deg. C, 60%RH | **INPUT POWER** | 5V DC 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)** | **ERP (dBm)** | **Margin (dB)** |
| 1 | 1672 | -52.78 | -13 | -46.18 | 0.11 | -46.07 | -33.07 |
| 2 | 2509 | -49.59 | -13 | -39.43 | -0.06 | -39.49 | -26.49 |
| 3 | 3345 | -61.68 | -13 | -50.07 | 0.69 | -49.38 | -36.38 |
| 4 | 4182 | -60.75 | -13 | -46.88 | 0.12 | -46.76 | -33.76 |
| **ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M** | | | | | | | |
| **No.** | **Freq. (MHz)** | **Reading (dBm)** | **Limit (dBm)** | **S.G Power Value (dBm)** | **Correction Factor (dB)** | **ERP (dBm)** | **Margin (dB)** |
| 1 | 1672 | -50.78 | -13 | -39.83 | 0.11 | -39.72 | -26.72 |
| 2 | 2509 | -50.07 | -13 | -37.96 | -0.06 | -38.02 | -25.02 |
| 3 | 3345 | -60.75 | -13 | -48.34 | 0.69 | -47.65 | -33.65 |
| 4 | 4182 | -60.38 | -13 | -43.28 | 0.12 | -43.16 | -30.16 |

**REMARKS:**

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB) - 2.15 (dB)

## CHANNEL BANDWIDTH: 5MHz / QPSK

| MODE | TX channel 20525 | FREQUENCY RANGE | Above 1000MHz |
|---|---|---|---|
| ENVIRONMENTAL CONDITIONS | 24deg. C, 60%RH | INPUT POWER | 5V DC 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) | ERP (dBm) | Margin (dB) |
| 1 | 1672 | -54.28 | -13 | -47.70 | 0.11 | -47.59 | -34.59 |
| 2 | 2509 | -49.75 | -13 | -39.59 | -0.06 | -39.65 | -26.65 |
| 3 | 3345 | -61.4 | -13 | -49.79 | 0.69 | -49.10 | -36.10 |
| 4 | 4182 | -60.45 | -13 | -46.58 | 0.12 | -46.46 | -33.46 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | |
| No. | Freq. (MHz) | Reading (dBm) | Limit (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Margin (dB) |
| 1 | 1672 | -51.57 | -13 | -40.62 | 0.11 | -40.51 | -27.51 |
| 2 | 2509 | -51.13 | -13 | -39.04 | -0.06 | -39.10 | -26.10 |
| 3 | 3345 | -60.65 | -13 | -48.24 | 0.69 | -47.55 | -34.55 |
| 4 | 4182 | -59.98 | -13 | -42.88 | 0.12 | -42.76 | -29.76 |

**REMARKS:**

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB) - 2.15 (dB)

## CHANNEL BANDWIDTH: 10MHz / QPSK

| MODE | TX channel 20525 | FREQUENCY RANGE | Above 1000MHz |
|---|---|---|---|
| ENVIRONMENTAL CONDITIONS | 24deg. C, 60%RH | INPUT POWER | 5V DC 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) | ERP (dBm) | Margin (dB) |
| 1 | 1672 | -55.77 | -13 | -49.20 | 0.11 | -49.09 | -36.09 |
| 2 | 2509 | -50.15 | -13 | -39.99 | -0.06 | -40.05 | -27.05 |
| 3 | 3345 | -61.34 | -13 | -49.73 | 0.69 | -49.04 | -36.04 |
| 4 | 4182 | -59.98 | -13 | -46.10 | 0.12 | -45.98 | -22.98 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | |
| No. | Freq. (MHz) | Reading (dBm) | Limit (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | ERP (dBm) | Margin (dB) |
| 1 | 1672 | -52.68 | -13 | -41.73 | 0.11 | -41.62 | -28.62 |
| 2 | 2509 | -51.77 | -13 | -39.70 | -0.06 | -39.76 | -26.76 |
| 3 | 3345 | -60.46 | -13 | -48.05 | 0.69 | -47.36 | -34.36 |
| 4 | 4182 | -59.67 | -13 | -42.57 | 0.12 | -42.45 | -29.45 |

**REMARKS:**

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB) - 2.15 (dB)

# 5 PHOTOGRAPHS OF THE TEST CONFIGURATION

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

# 6 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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Tel: +86-769-85935656
Fax: +86-769-85931080

**Email:** customerservice.dg@cn.bureauveritas.com
**Web Site**: www.adt.com.tw

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

# 7 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---**