# FCC TEST REPORT

# (PART 27)

**REPORT NO.:** RF130510C19B R1

**MODEL NO.:** CO3L

**FCC ID:** RM4-CO3L

**RECEIVED:** Sep. 09, 2013

**TESTED:** Sep. 10 ~ Sep. 24, 2013

**ISSUED:** Sep. 24, 2013

**APPLICANT:** Corin LLC

**ADDRESS:** 400 Perimeter Center Terrace N. Suite 900, Atlanta, Georgia 30346

**ISSUED BY:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

**LAB ADDRESS:** No. 47, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan, R.O.C.

**TEST LOCATION:** No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

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# RELEASE CONTROL RECORD

| ISSUE NO. | REASON FOR CHANGE | DATE ISSUED |
|---|---|---|
| RF130510C19B | Original release | Sep. 12, 2013 |
| RF130510C19B R1 | Revise band edge, conducted spurious emissions and radiated emission data | Sep. 24, 2013 |

# 1 CERTIFICATION

| | |
|---|---|
| **PRODUCT:** | LTE Data Module |
| **MODEL NO.:** | CO3L |
| **BRAND:** | Corin LLC |
| **APPLICANT:** | Corin LLC |
| **TESTED:** | Sep. 10 ~ Sep. 24, 2013 |
| **TEST SAMPLE:** | ENGINEERING SAMPLE |
| **TEST STANDARDS:** | **FCC Part 27, Subpart C, M** |
| | **FCC Part 2** |
| | ANSI C63.4-2003 |

The above equipment (model: CO3L) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch,** and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**APPROVED BY** : Sam chen , **DATE:** Sep. 24, 2013

Sam Chen / Assistant Manager

# 2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

| LTE BAND 7 | | | |
|---|---|---|---|
| **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<br>27.53(m) | Occupied Bandwidth | PASS | Meet the requirement of limit. |
| 27.50(h) | Peak to average ratio | PASS | Meet the requirement of limit. |
| 2.1051<br>27.53(m) | Band Edge Measurements | PASS | Meet the requirement of limit. |
| 2.1051<br>27.53(m) | Conducted Spurious Emissions | PASS | Meet the requirement of limit. |
| 2.1053<br>27.53(m) | Radiated Spurious Emissions | PASS | Meet the requirement of limit.<br>Minimum passing margin is -17.04dB at 44.31MHz. |

## 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 | 150kHz~30MHz | 2.44 dB |
| Radiated emissions | 30MHz ~ 200MHz | 2.93 dB |
| | 200MHz ~1000MHz | 2.95 dB |
| | 1GHz ~ 18GHz | 2.26 dB |
| | 18GHz ~ 40GHz | 1.94 dB |

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

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | DATE OF CALIBRATION | DUE DATE OF CALIBRATION |
|---|---|---|---|---|
| Test Receiver ROHDE & SCHWARZ | ESCI | 100744 | Apr. 15, 2013 | Apr. 14, 2014 |
| Spectrum Analyzer ROHDE & SCHWARZ | FSU43 | 101261 | Dec. 17, 2012 | Dec. 16, 2013 |
| BILOG Antenna SCHWARZBECK | VULB9168 | 9168-472 | Mar. 25, 2013 | Mar. 24, 2014 |
| HORN Antenna SCHWARZBECK | BBHA 9120 D | 9120D-969 | Jan. 07, 2013 | Jan. 06, 2014 |
| HORN Antenna SCHWARZBECK | BBHA 9170 | 9170-480 | Dec. 25, 2012 | Dec. 24, 2013 |
| Loop Antenna | HFH2-Z2 | 100070 | Jan. 31, 2012 | Jan. 30, 2014 |
| Preamplifier EMCI | EMC 012645 | 980115 | Dec. 28, 2012 | Dec. 27, 2013 |
| Preamplifier EMCI | EMC 184045 | 980116 | Dec. 28, 2012 | Dec. 27, 2013 |
| Preamplifier EMCI | EMC 330H | 980112 | Dec. 28, 2012 | Dec. 27, 2013 |
| RF signal cable HUBER+SUHNNER | SUCOFLEX 104 | 309219/4 | Oct. 19, 2012 | Oct. 18, 2013 |
| RF signal cable HUBER+SUHNNER | SUCOFLEX 104 | 250130/4 | Oct. 19, 2012 | Oct. 18, 2013 |
| RF signal cable Worken | RG-213 | NA | Dec. 29, 2012 | Dec. 28, 2013 |
| Software BV ADT | E3 6.120103 | NA | NA | NA |
| Antenna Tower MF | MFA-440H | NA | NA | NA |
| Turn Table MF | MFT-201SS | NA | NA | NA |
| Antenna Tower &Turn Table Controller MF | MF-7802 | NA | NA | NA |
| Mini-Circuits Power Splitter | ZN2PD-9G | NA | Jun. 18, 2013 | Jun. 17, 2014 |
| JFW 20dB attenuation | 50HF-020-SMA | NA | NA | NA |
| Communications Tester-Wireless | E5515C | MY52102544 | Sep. 05, 2012 | Sep. 04, 2014 |
| Radio Communication Analyzer | MT8820C | 6201300640 | Aug. 01, 2013 | Jul. 31, 2014 |

**NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HwaYa Chamber 10.

3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.

4. The FCC Site Registration No. is 690701.

5. The IC Site Registration No. is IC 7450F-10.

# 3 GENERAL INFORMATION

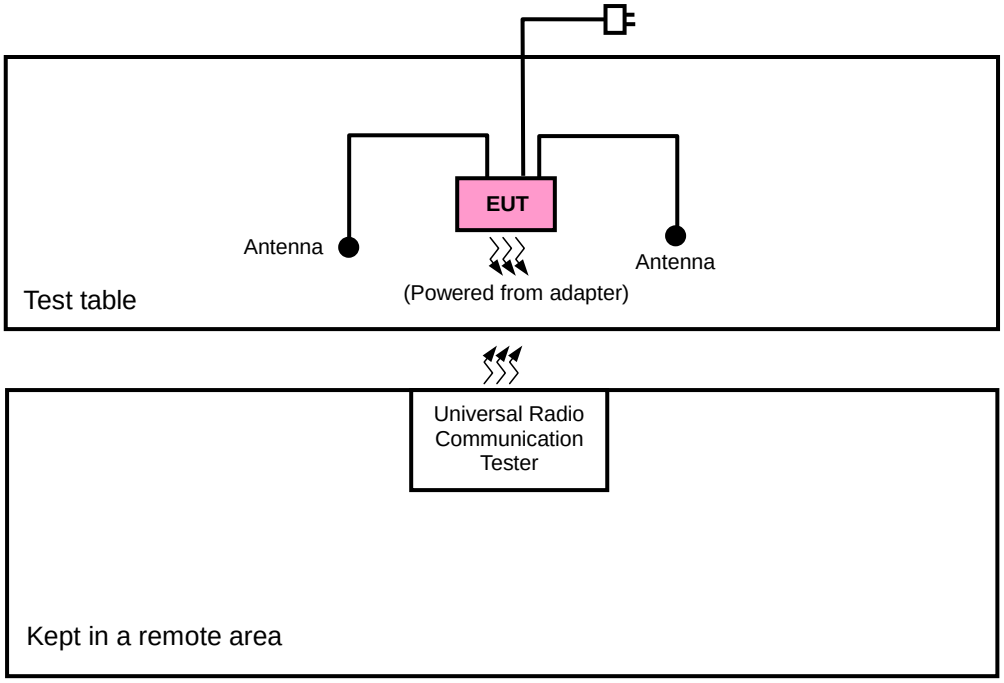
## 3.1 GENERAL DESCRIPTION OF EUT

| | | | |
|---|---|---|---|
| **PRODUCT** | LTE Data Module | | |
| **MODEL NO.** | CO3L | | |
| **POWER SUPPLY** | 4.4Vdc, 2A (from power supply) | | |
| **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 | 4M50G7D |
| | | 16QAM | 4M49W7D |
| | **LTE Band 7 Channel Bandwidth: 10MHz** | QPSK | 8M93G7D |
| | | 16QAM | 8M93W7D |
| | **LTE Band 7 Channel Bandwidth: 15MHz** | QPSK | 13M4G7D |
| | | 16QAM | 13M4W7D |
| | **LTE Band 7 Channel Bandwidth: 20MHz** | QPSK | 17M8G7D |
| | | 16QAM | 17M8W7D |
| **MAX. EIRP POWER** | **LTE Band 7 Channel Bandwidth: 5MHz** | 302.06mW | |
| | **LTE Band 7 Channel Bandwidth: 10MHz** | 304.72mW | |
| | **LTE Band 7 Channel Bandwidth: 15MHz** | 297.10mW | |
| | **LTE Band 7 Channel Bandwidth: 20MHz** | 267.92mW | |
| **CATEGORY** | 3 | | |
| **ANTENNA TYPE** | Fixed Internal Antenna | | |
| **DATA CABLE** | Refer to Note as below | | |
| **I/O PORTS** | Refer to users' manual | | |
| **ACCESSORY DEVICES** | Refer to Note as below | | |

**NOTE:**

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

## 3.2 CONFIGURATION OF SYSTEM UNDER TEST




## 3.3 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units.

## 3.4 DESCRIPTION OF TEST MODES

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

**LTE Band 7**

| EUT CONFIGURE MODE | TEST ITEM | AVAILABLE CHANNEL | TESTED CHANNEL | CHANNEL BANDWIDTH | MODULATION | MODE |
|---|---|---|---|---|---|---|
| - | 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 / 0 RB 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 |
| - | FREQUENCY STABILITY | 20775 to 21425 | 21100 | 5MHz | QPSK | 1 RB / 0 RB Offset |
| | | 20800 to 21400 | 21100 | 10MHz | QPSK | 1 RB / 0 RB Offset |
| | | 20825 to 21375 | 21100 | 15MHz | QPSK | 1 RB / 0 RB Offset |
| | | 20850 to 21350 | 21100 | 20MHz | QPSK | 1 RB / 0 RB Offset |
| - | 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 |
| - | PEAK TO AVERAGE RATIO | 20775 to 21425 | 20775, 21100, 21425 | 5MHz | QPSK, 16QAM | 1 RB / 12 RB Offset |
| | | 20800 to 21400 | 20800, 21100, 21400 | 10MHz | QPSK, 16QAM | 1 RB / 24 RB Offset |
| | | 20825 to 21375 | 20825, 21100, 21375 | 15MHz | QPSK, 16QAM | 1 RB / 37 RB Offset |
| | | 20850 to 21350 | 20850, 21100 21350 | 20MHz | QPSK, 16QAM | 1 RB / 50 RB Offset |
| - | BAND EDGE | 20775 to 21425 | 20775 | 5MHz | QPSK, 16QAM | 1 RB / 0 RB Offset |
| | | | | | | 25 RB / 0 RB Offset |
| | | | 21425 | 5MHz | QPSK, 16QAM | 1 RB / 0 RB Offset |
| | | | | | | 25 RB / 0 RB Offset |
| | | 20800 to 21400 | 20800 | 10MHz | QPSK, 16QAM | 1 RB / 0 RB Offset |
| | | | | | | 50 RB / 0 RB Offset |
| | | | 21400 | 10MHz | QPSK, 16QAM | 1 RB / 0 RB Offset |
| | | | | | | 50 RB / 0 RB Offset |
| | | 20825 to 21375 | 20825 | 15MHz | QPSK, 16QAM | 1 RB / 0 RB Offset |
| | | | | | | 75 RB / 0 RB Offset |
| | | | 21375 | 15MHz | QPSK, 16QAM | 1 RB / 0 RB Offset |
| | | | | | | 75 RB / 0 RB Offset |
| | | 20850 to 21350 | 20850 | 20MHz | QPSK, 16QAM | 1 RB / 0 RB Offset |
| | | | | | | 100 RB / 0 RB Offset |
| | | | 21350 | 20MHz | QPSK, 16QAM | 1 RB / 0 RB Offset |
| | | | | | | 100 RB / 0 RB Offset |

| EUT CONFIGURE MODE | TEST ITEM | AVAILABLE CHANNEL | TESTED CHANNEL | CHANNEL BANDWIDTH | MODULATION | MODE |
|---|---|---|---|---|---|---|
| - | CONDCUDETED EMISSION | 20775 to 21425 | 21100 | 5MHz | QPSK | 1 RB / 0 RB Offset |
| | | 20800 to 21400 | 21100 | 10MHz | QPSK | 1 RB / 0 RB Offset |
| | | 20825 to 21375 | 21100 | 15MHz | QPSK | 1 RB / 0 RB Offset |
| | | 20850 to 21350 | 21100 | 20MHz | QPSK | 1 RB / 0 RB Offset |
| - | RADIATED EMISSION | 20775 to 21425 | 21100 | 5MHz | QPSK | 1 RB / 0 RB Offset |
| | | 20800 to 21400 | 21100 | 10MHz | QPSK | 1 RB / 0 RB 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 |
|---|---|---|---|
| ERP/EIRP | 26deg. C, 58%RH | 3.8Vdc | Howard Kao |
| FREQUENCY STABILITY | 26deg. C, 58%RH | 3.8Vdc | Howard Kao |
| OCCUPIED BANDWIDTH | 26deg. C, 58%RH | 3.8Vdc | Howard Kao |
| BAND EDGE | 26deg. C, 58%RH | 3.8Vdc | Howard Kao |
| CONDCUDETED EMISSION | 26deg. C, 58%RH | 3.8Vdc | Howard Kao |
| RADIATED EMISSION | 25deg. C, 65%RH | 120Vac, 60Hz | Kay Wu |

## 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. The EUT was set up for the maximum power with LTE link data modulation. The power was measured with R&S Spectrum Analyzer. All measurements were done at 3 channels (low, middle and high operational frequency range).

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 using the spectrum analyzer “channel power” function with the integration band set to the emissions’ occupied bandwidth, a rms detector, RBW=300kHz, VBW=1MHz, and a 1 second sweep time over a minimum of 10 sweeps, per the guidelines of KDB 971168.

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.R.P power - 2.15dBi.

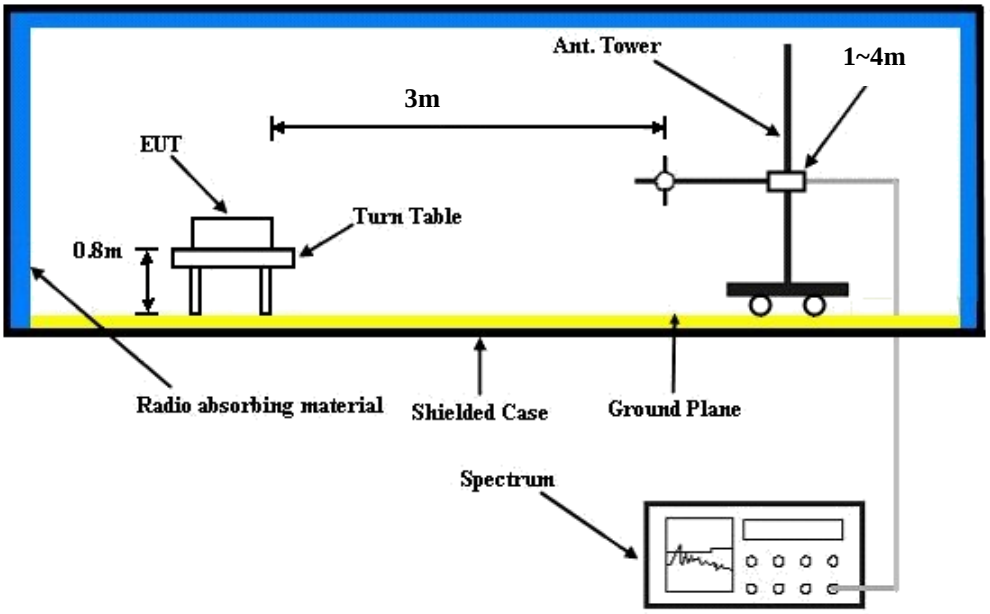
**CONDUCTED POWER MEASUREMENT:**

a. The EUT was set up for the maximum power with LTE link data modulation and link up with simulator.

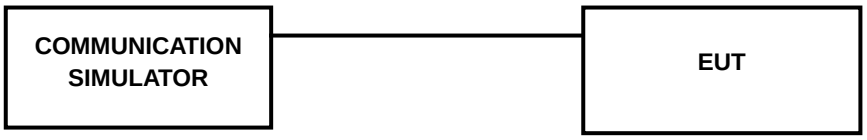
b. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

## 4.1.3 TEST SETUP

**EIRP / ERP MEASUREMENT:**




**CONDUCTED POWER MEASUREMENT:**



## 4.1.4 TEST RESULTS

### AVERAGE CONDUCTED OUTPUT POWER (dBm)

| Band / BW | Modulation | RB Size | RB Offset | Low CH 20775 Frequency 2502.5 MHz | Mid CH 21100 Frequency 2535 MHz | High CH 21425 Frequency 2567.5 MHz | 3PGG MPR (dB) |
|---|---|---|---|---|---|---|---|
| 7 / 5M | QPSK | 1 | 0 | 23.26 | 23.22 | 22.77 | 0 |
| | | 1 | 12 | 23.18 | 23.14 | 22.69 | 0 |
| | | 1 | 24 | 22.93 | 22.89 | 22.44 | 0 |
| | | 12 | 0 | 22.25 | 22.21 | 21.76 | 1 |
| | | 12 | 6 | 22.06 | 22.02 | 21.57 | 1 |
| | | 12 | 13 | 21.99 | 21.95 | 21.50 | 1 |
| | | 25 | 0 | 22.11 | 22.07 | 21.62 | 1 |
| | 16QAM | 1 | 0 | 23.16 | 23.12 | 22.67 | 1 |
| | | 1 | 12 | 23.08 | 23.04 | 22.59 | 1 |
| | | 1 | 24 | 22.83 | 22.79 | 22.34 | 1 |
| | | 12 | 0 | 22.15 | 22.11 | 21.66 | 2 |
| | | 12 | 6 | 21.96 | 21.92 | 21.47 | 2 |
| | | 12 | 13 | 21.89 | 21.85 | 21.40 | 2 |
| | | 25 | 0 | 22.01 | 21.97 | 21.52 | 2 |

| Band / BW | Modulation | RB Size | RB Offset | Low CH 20800 Frequency 2505 MHz | Mid CH 21100 Frequency 2535 MHz | High CH 21140 Frequency 2565 MHz | 3PGG MPR (dB) |
|---|---|---|---|---|---|---|---|
| 7 / 10M | QPSK | 1 | 0 | 23.27 | 23.23 | 22.78 | 0 |
| | | 1 | 24 | 23.19 | 23.15 | 22.70 | 0 |
| | | 1 | 49 | 22.94 | 22.90 | 22.45 | 0 |
| | | 25 | 0 | 22.26 | 22.22 | 21.77 | 1 |
| | | 25 | 12 | 22.07 | 22.03 | 21.58 | 1 |
| | | 25 | 25 | 22.00 | 21.96 | 21.51 | 1 |
| | | 50 | 0 | 22.12 | 22.08 | 21.63 | 1 |
| | 16QAM | 1 | 0 | 23.17 | 23.13 | 22.68 | 1 |
| | | 1 | 24 | 23.09 | 23.05 | 22.60 | 1 |
| | | 1 | 49 | 22.84 | 22.80 | 22.35 | 1 |
| | | 25 | 0 | 22.16 | 22.12 | 21.67 | 2 |
| | | 25 | 12 | 21.97 | 21.93 | 21.48 | 2 |
| | | 25 | 25 | 21.90 | 21.86 | 21.41 | 2 |
| | | 50 | 0 | 22.02 | 21.98 | 21.53 | 2 |

| Band / 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 | 3PGG MPR (dB) |
|---|---|---|---|---|---|---|---|
| 7 / 15M | QPSK | 1 | 0 | 23.30 | 23.26 | 22.81 | 0 |
| | | 1 | 37 | 23.22 | 23.18 | 22.73 | 0 |
| | | 1 | 74 | 22.97 | 22.93 | 22.48 | 0 |
| | | 36 | 0 | 22.29 | 22.25 | 21.80 | 1 |
| | | 36 | 19 | 22.10 | 22.06 | 21.61 | 1 |
| | | 36 | 39 | 22.03 | 21.99 | 21.54 | 1 |
| | | 75 | 0 | 22.15 | 22.11 | 21.66 | 1 |
| | 16QAM | 1 | 0 | 23.20 | 23.16 | 22.71 | 1 |
| | | 1 | 37 | 23.12 | 23.08 | 22.63 | 1 |
| | | 1 | 74 | 22.87 | 22.83 | 22.38 | 1 |
| | | 36 | 0 | 22.19 | 22.15 | 21.70 | 2 |
| | | 36 | 19 | 22.00 | 21.96 | 21.51 | 2 |
| | | 36 | 39 | 21.93 | 21.89 | 21.44 | 2 |
| | | 75 | 0 | 22.05 | 22.01 | 21.56 | 2 |

| Band / BW | Modulation | RB Size | RB Offset | Low CH 20850 Frequency 2510 MHz | Mid CH 21100 Frequency 2535 MHz | High CH 21350 Frequency 2560 MHz | 3PGG MPR (dB) |
|---|---|---|---|---|---|---|---|
| 7 / 20M | QPSK | 1 | 0 | 23.32 | 23.28 | 22.83 | 0 |
| | | 1 | 50 | 23.24 | 23.20 | 22.75 | 0 |
| | | 1 | 99 | 22.99 | 22.95 | 22.50 | 0 |
| | | 50 | 0 | 22.31 | 22.27 | 21.82 | 1 |
| | | 50 | 25 | 22.12 | 22.08 | 21.63 | 1 |
| | | 50 | 50 | 22.05 | 22.01 | 21.56 | 1 |
| | | 100 | 0 | 22.17 | 22.13 | 21.68 | 1 |
| | 16QAM | 1 | 0 | 23.22 | 23.18 | 22.73 | 1 |
| | | 1 | 50 | 23.14 | 23.10 | 22.65 | 1 |
| | | 1 | 99 | 22.89 | 22.85 | 22.40 | 1 |
| | | 50 | 0 | 22.21 | 22.17 | 21.72 | 2 |
| | | 50 | 25 | 22.02 | 21.98 | 21.53 | 2 |
| | | 50 | 50 | 21.95 | 21.91 | 21.46 | 2 |
| | | 100 | 0 | 22.07 | 22.03 | 21.58 | 2 |

## AVERAGE EIRP (dBm)

## LTE BAND 7

### CHANNEL BANDWIDTH: 5MHz QPSK

| Plane | Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) |
|---|---|---|---|---|---|---|---|
| X | 20775 | 2502.5 | -13.82 | 38.52 | 24.70 | 294.99 | H |
| | 21100 | 2535.0 | -13.56 | 38.36 | 24.80 | 302.06 | |
| | 21425 | 2567.5 | -14.44 | 38.58 | 24.14 | 259.60 | |
| | 20775 | 2502.5 | -18.62 | 38.92 | 20.30 | 107.25 | V |
| | 21100 | 2535.0 | -19.06 | 39.26 | 20.20 | 104.71 | |
| | 21425 | 2567.5 | -18.99 | 39.22 | 20.23 | 105.37 | |

### CHANNEL BANDWIDTH: 5MHz 16QAM

| Plane | Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) |
|---|---|---|---|---|---|---|---|
| X | 20775 | 2502.5 | -15.42 | 38.52 | 23.10 | 204.08 | H |
| | 21100 | 2535.0 | -15.15 | 38.36 | 23.21 | 209.46 | |
| | 21425 | 2567.5 | -15.10 | 38.58 | 23.48 | 223.00 | |
| | 20775 | 2502.5 | -15.59 | 38.92 | 23.33 | 215.48 | V |
| | 21100 | 2535.0 | -15.81 | 39.26 | 23.45 | 221.31 | |
| | 21425 | 2567.5 | -15.93 | 39.22 | 23.29 | 213.16 | |

**CHANNEL BANDWIDTH: 10MHz QPSK**

| Plane | Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) |
|---|---|---|---|---|---|---|---|
| X | 20800 | 2505.0 | -13.81 | 38.65 | 24.84 | 304.72 | H |
| | 21100 | 2535.0 | -13.54 | 38.36 | 24.82 | 303.39 | |
| | 21400 | 2565.0 | -14.16 | 38.49 | 24.33 | 270.89 | |
| | 20800 | 2505.0 | -18.72 | 38.84 | 20.12 | 102.83 | V |
| | 21100 | 2535.0 | -18.88 | 39.26 | 20.38 | 109.22 | |
| | 21400 | 2565.0 | -19.04 | 39.10 | 20.06 | 101.39 | |

**CHANNEL BANDWIDTH: 10MHz 16QAM**

| Plane | Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) |
|---|---|---|---|---|---|---|---|
| X | 20800 | 2505.0 | -15.56 | 38.65 | 23.09 | 203.66 | H |
| | 21100 | 2535.0 | -15.13 | 38.36 | 23.23 | 210.38 | |
| | 21400 | 2565.0 | -14.94 | 38.49 | 23.55 | 226.36 | |
| | 20800 | 2505.0 | -19.52 | 38.84 | 19.32 | 85.53 | V |
| | 21100 | 2535.0 | -19.63 | 39.26 | 19.63 | 91.90 | |
| | 21400 | 2565.0 | -19.80 | 39.10 | 19.30 | 85.11 | |

**CHANNEL BANDWIDTH: 15MHz QPSK**

| Plane | Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) |
|---|---|---|---|---|---|---|---|
| X | 20825 | 2507.5 | -13.92 | 38.65 | 24.73 | 297.10 | H |
| | 21100 | 2535.0 | -14.21 | 38.36 | 24.15 | 260.02 | |
| | 21375 | 2562.5 | -14.34 | 38.49 | 24.15 | 259.90 | |
| | 20825 | 2507.5 | -18.75 | 38.84 | 20.09 | 102.12 | V |
| | 21100 | 2535.0 | -18.51 | 39.26 | 20.75 | 118.93 | |
| | 21375 | 2562.5 | -18.53 | 39.10 | 20.57 | 114.02 | |

**CHANNEL BANDWIDTH: 15MHz 16QAM**

| Plane | Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) |
|---|---|---|---|---|---|---|---|
| X | 20825 | 2507.5 | -14.82 | 38.65 | 23.83 | 241.49 | H |
| | 21100 | 2535.0 | -14.92 | 38.36 | 23.44 | 220.80 | |
| | 21375 | 2562.5 | -15.15 | 38.49 | 23.34 | 215.68 | |
| | 20825 | 2507.5 | -19.64 | 38.84 | 19.20 | 83.20 | V |
| | 21100 | 2535.0 | -19.36 | 39.26 | 19.90 | 97.79 | |
| | 21375 | 2562.5 | -19.24 | 39.10 | 19.86 | 96.83 | |

**CHANNEL BANDWIDTH: 20MHz QPSK**

| Plane | Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) |
|---|---|---|---|---|---|---|---|
| X | 20850.0 | 2510.0 | -14.59 | 38.65 | 24.06 | 254.62 | H |
| | 21100.0 | 2535.0 | -14.08 | 38.36 | 24.28 | 267.92 | |
| | 21350.0 | 2560.0 | -14.26 | 38.49 | 24.23 | 264.73 | |
| | 20850.0 | 2510.0 | -18.83 | 38.84 | 20.01 | 100.25 | V |
| | 21100.0 | 2535.0 | -19.20 | 39.26 | 20.06 | 101.46 | |
| | 21350.0 | 2560.0 | -19.06 | 39.10 | 20.04 | 100.93 | |

**CHANNEL BANDWIDTH: 20MHz 16QAM**

| Plane | Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) |
|---|---|---|---|---|---|---|---|
| X | 20850.0 | 2510.0 | -14.91 | 38.65 | 23.74 | 236.54 | H |
| | 21100.0 | 2535.0 | -15.15 | 38.36 | 23.21 | 209.41 | |
| | 21350.0 | 2560.0 | -15.16 | 38.49 | 23.33 | 215.18 | |
| | 20850.0 | 2510.0 | -19.75 | 38.84 | 19.09 | 81.11 | V |
| | 21100.0 | 2535.0 | -20.08 | 39.26 | 19.18 | 82.85 | |
| | 21350.0 | 2560.0 | -19.80 | 39.10 | 19.30 | 85.11 | |

## 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

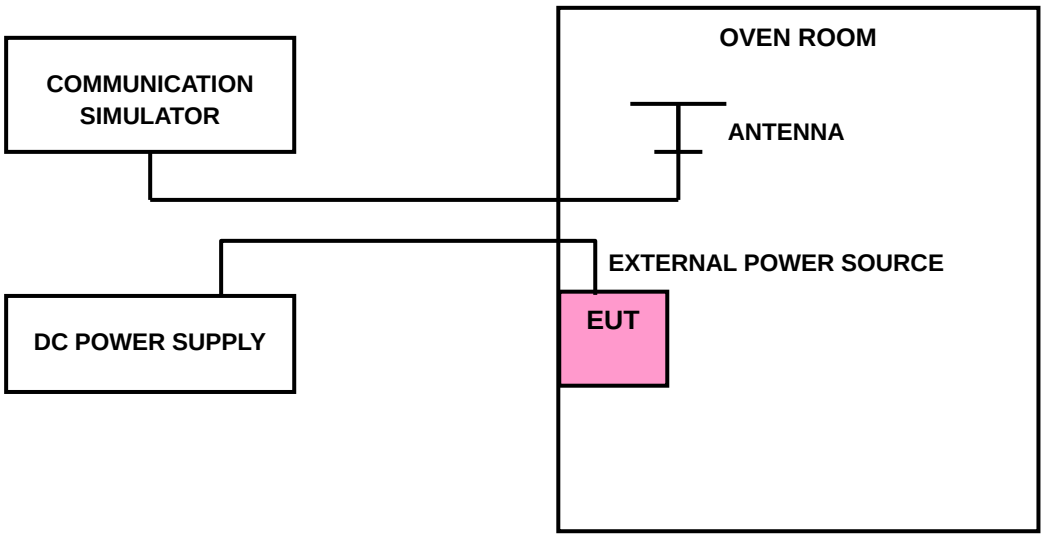
a. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.

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

| VOLTAGE (Volts) | FREQUENCY ERROR (ppm) | | | | LIMIT (ppm) |
|---|---|---|---|---|---|
| | LTE BAND 7 | | | | |
| | 5MHz | 10MHz | 15MHz | 20MHz | |
| 4.4 | -0.004 | -0.004 | -0.008 | -0.002 | 2.5 |
| 3.4 | -0.002 | -0.005 | 0.005 | -0.002 | 2.5 |

**NOTE:** The applicant defined the normal working voltage of the battery is from 3.4Vdc to 4.4Vdc.

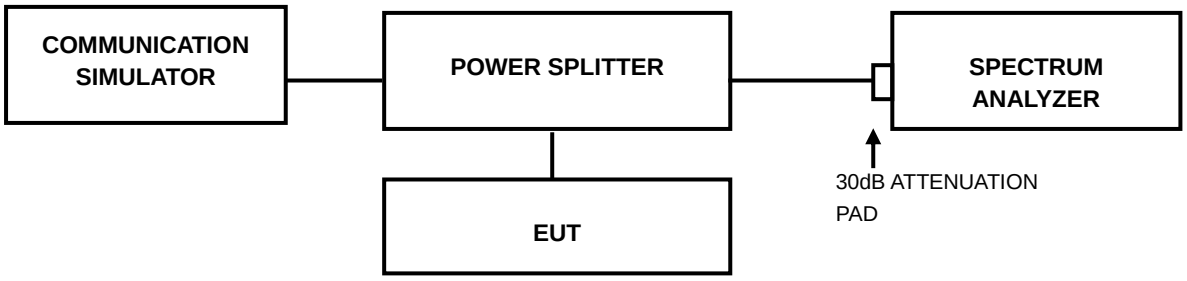
| TEMP. (℃) | FREQUENCY ERROR (ppm) | | | | LIMIT (ppm) |
|---|---|---|---|---|---|
| | LTE BAND 7 | | | | |
| | 5MHz | 10MHz | 15MHz | 20MHz | |
| -30 | -0.006 | 0.004 | -0.005 | -0.003 | 2.5 |
| -20 | -0.002 | 0.003 | 0.007 | -0.001 | 2.5 |
| -10 | -0.001 | 0.002 | 0.006 | -0.003 | 2.5 |
| 0 | -0.002 | 0.001 | 0.007 | -0.006 | 2.5 |
| 10 | 0.003 | 0.001 | -0.010 | -0.005 | 2.5 |
| 20 | 0.004 | 0.004 | 0.006 | 0.009 | 2.5 |
| 30 | 0.002 | 0.005 | -0.004 | -0.005 | 2.5 |
| 40 | -0.004 | 0.003 | -0.004 | 0.004 | 2.5 |
| 50 | -0.003 | 0.004 | -0.006 | 0.003 | 2.5 |
| 55 | 0.001 | 0.003 | -0.010 | 0.004 | 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.

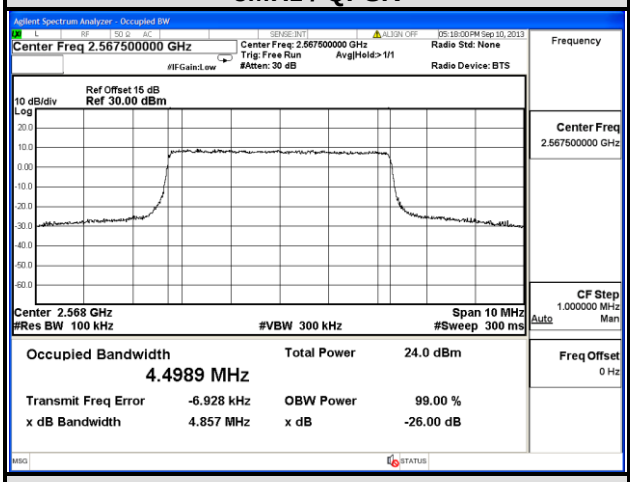
b. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

## 4.3.4 TEST RESULTS

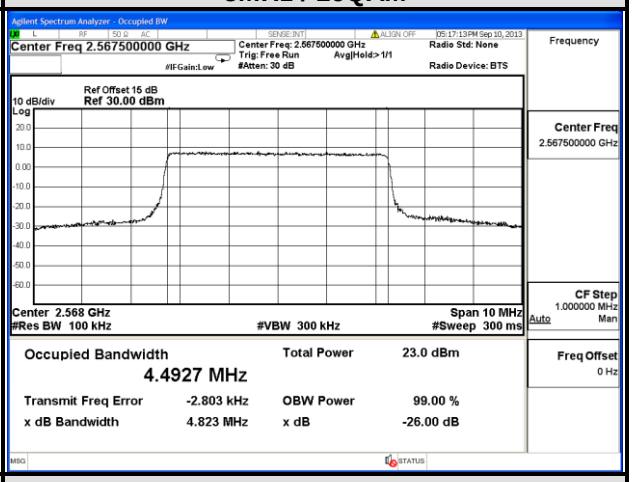
| LTE BAND 7 | | | | | | | |
|---|---|---|---|---|---|---|---|
| CHANNEL BANDWIDTH: 5MHz | | | | CHANNEL BANDWIDTH: 10MHz | | | |
| CHANNEL | FREQUENCY (MHz) | 99% OCCUPIED BANDWIDTH (MHz) | | CHANNEL | FREQUENCY (MHz) | 99% OCCUPIED BANDWIDTH (MHz) | |
| | | QPSK | 16QAM | | | QPSK | 16QAM |
| 20775 | 2502.5 | 4.4895 | 4.4925 | 20800 | 2505.0 | 8.9238 | 8.9221 |
| 21100 | 2535.0 | 4.4954 | 4.4909 | 21100 | 2535.0 | 8.9284 | 8.9283 |
| 21425 | 2567.5 | 4.4989 | 4.4927 | 21400 | 2565.0 | 8.9195 | 8.9088 |

**SPECTRUM PLOT OF WORST VALUE**

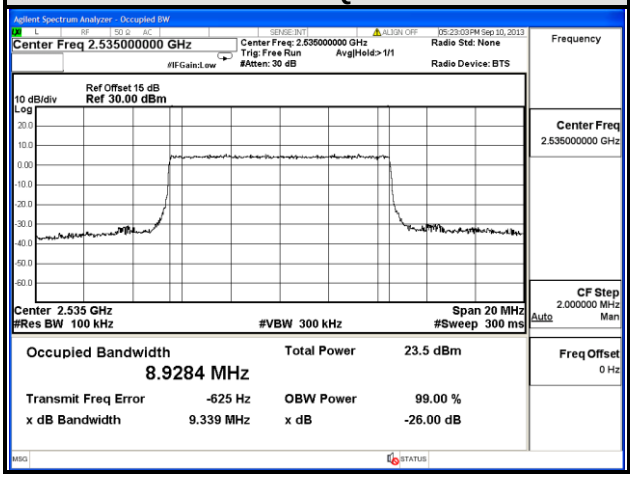
**5MHz / QPSK**



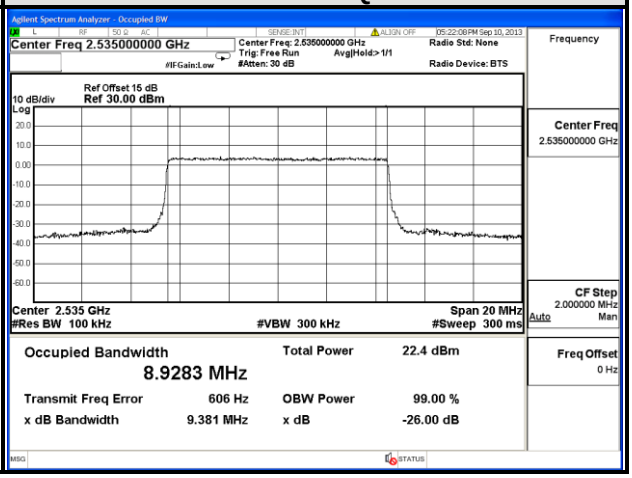

**5MHz / 16QAM**




**10MHz / QPSK**



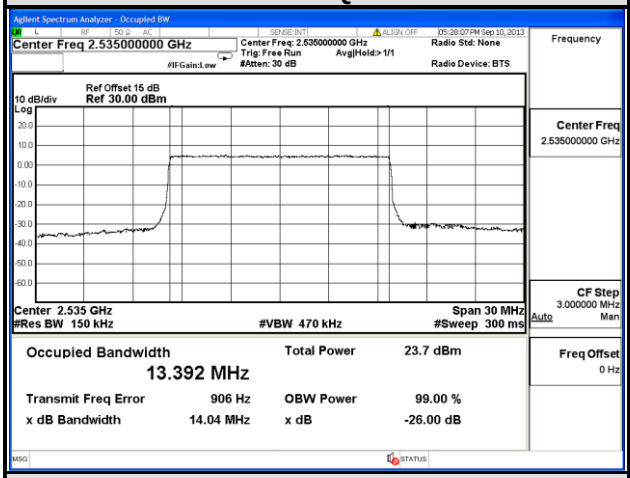

**10MHz / 16QAM**



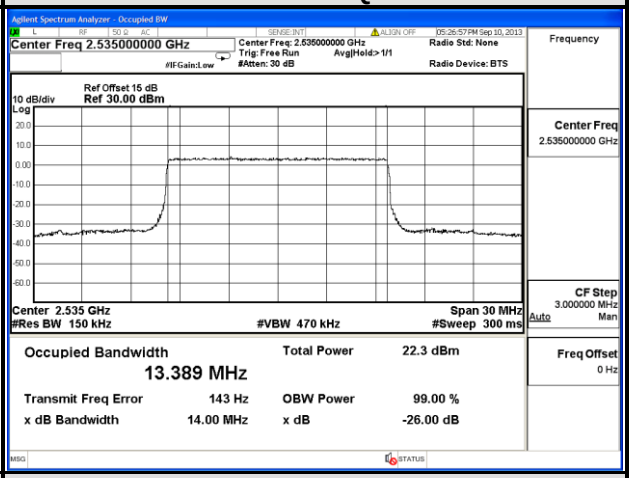
| LTE BAND 7 | | | | | | | |
|---|---|---|---|---|---|---|---|
| CHANNEL BANDWIDTH: 15MHz | | | | CHANNEL BANDWIDTH: 20MHz | | | |
| CHANNEL | FREQUENCY (MHz) | 99% OCCUPIED BANDWIDTH (MHz) | | CHANNEL | FREQUENCY (MHz) | 99% OCCUPIED BANDWIDTH (MHz) | |
| | | QPSK | 16QAM | | | QPSK | 16QAM |
| 20825 | 2507.5 | 13.384 | 13.384 | 20850 | 2510.0 | 17.843 | 17.829 |
| 21100 | 2535.0 | 13.392 | 13.389 | 21100 | 2535.0 | 17.841 | 17.834 |
| 21375 | 2562.5 | 13.366 | 13.365 | 21350 | 2560.0 | 17.789 | 17.801 |

## SPECTRUM PLOT OF WORST VALUE

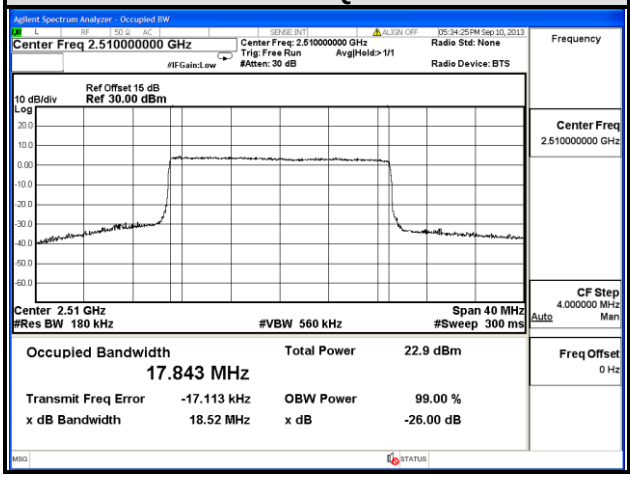
### 15MHz / QPSK



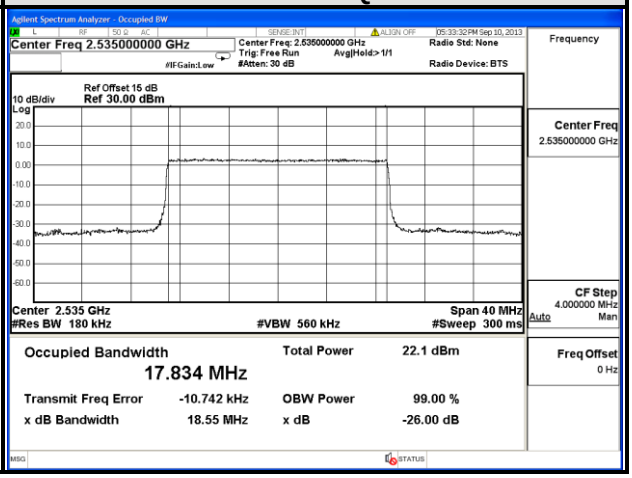

### 15MHz / 16QAM




### 20MHz / QPSK




### 20MHz / 16QAM

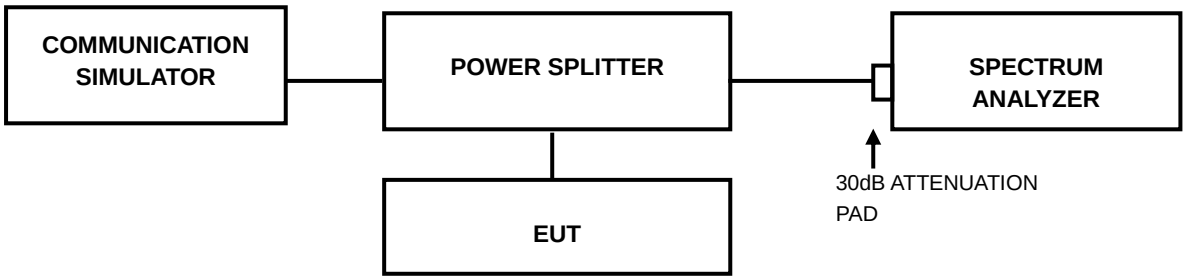


## 4.4 PEAK TO AVERAGE RATIO

### 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

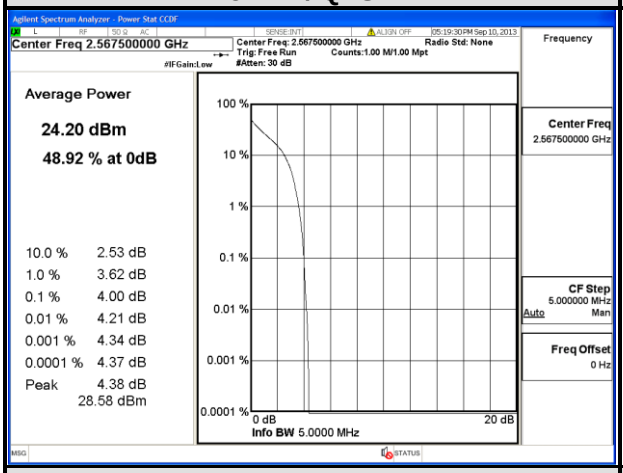
1. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1%.

## 4.4.4 TEST RESULTS

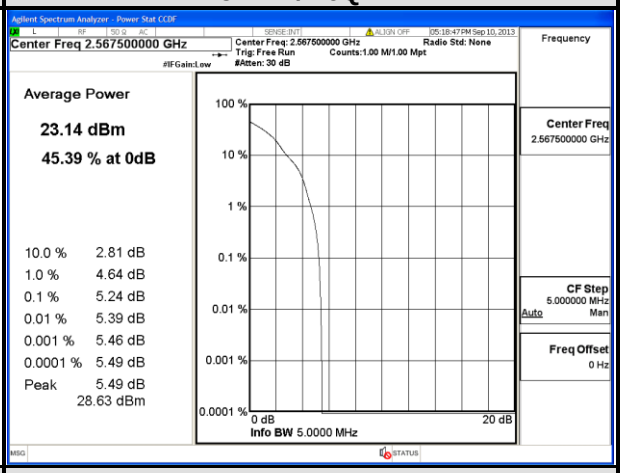
| LTE BAND 7 | | | | | | | |
|---|---|---|---|---|---|---|---|
| CHANNEL BANDWIDTH: 5MHz | | | | CHANNEL BANDWIDTH: 10MHz | | | |
| CHANNEL | FREQUENCY (MHz) | PEAK TO AVERAGE RATIO (dB) | | CHANNEL | FREQUENCY (MHz) | PEAK TO AVERAGE RATIO (dB) | |
| | | QPSK | 16QAM | | | QPSK | 16QAM |
| 20775 | 2502.5 | 3.92 | 5.00 | 20800 | 2505.0 | 4.99 | 4.94 |
| 21100 | 2535.0 | 3.96 | 5.14 | 21100 | 2535.0 | 5.26 | 5.20 |
| 21425 | 2567.5 | 4.00 | 5.24 | 21400 | 2565.0 | 5.42 | 5.42 |

**SPECTRUM PLOT OF WORST VALUE**

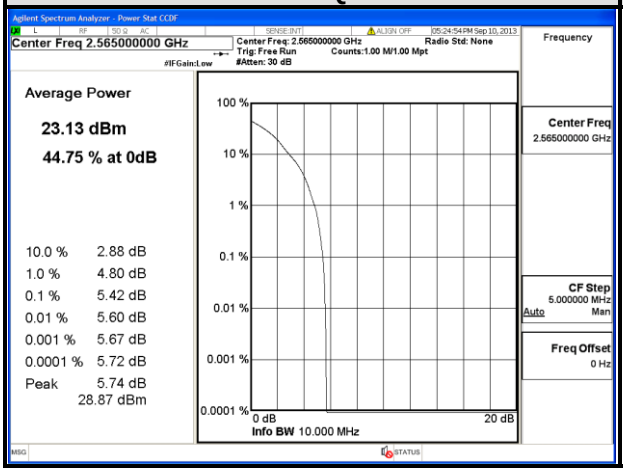
**5MHz / QPSK**



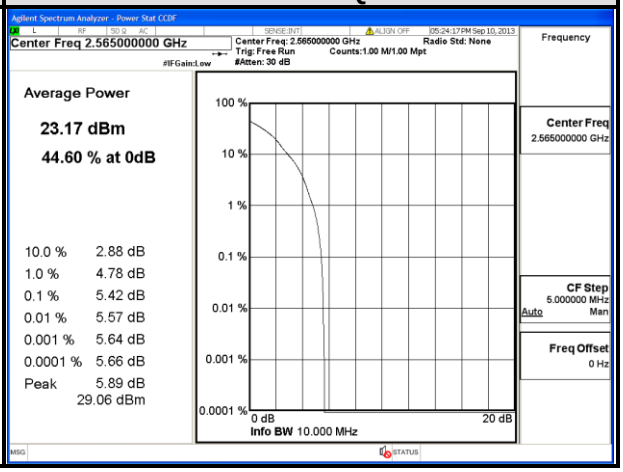

**5MHz / 16QAM**




**10MHz / QPSK**



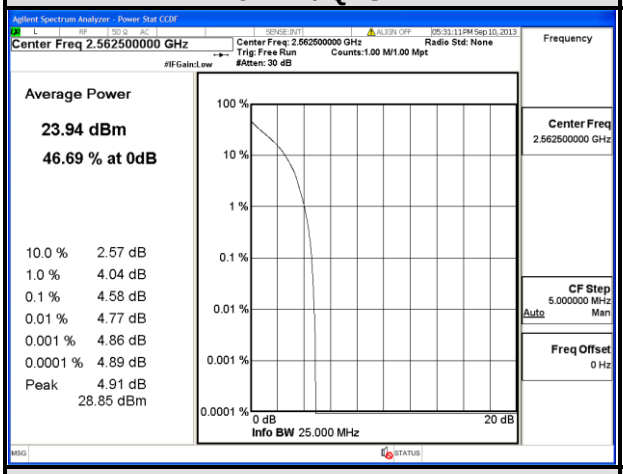

**10MHz / 16QAM**



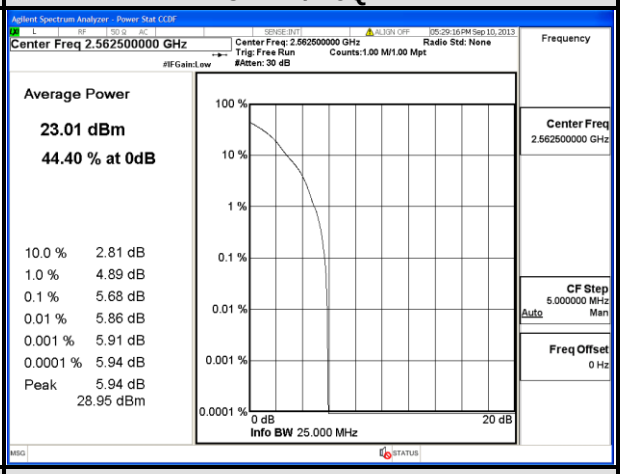
| LTE BAND 7 | | | | | | | |
|---|---|---|---|---|---|---|---|
| CHANNEL BANDWIDTH: 15MHz | | | | CHANNEL BANDWIDTH: 20MHz | | | |
| CHANNEL | FREQUENCY (MHz) | PEAK TO AVERAGE RATIO (dB) | | CHANNEL | FREQUENCY (MHz) | PEAK TO AVERAGE RATIO (dB) | |
| | | QPSK | 16QAM | | | QPSK | 16QAM |
| 20825 | 2507.5 | 3.95 | 5.04 | 20850 | 2510.0 | 3.98 | 5.08 |
| 21100 | 2535.0 | 4.15 | 5.25 | 21100 | 2535.0 | 4.17 | 5.31 |
| 21375 | 2562.5 | 4.58 | 5.68 | 21350 | 2560.0 | 4.66 | 5.92 |

## SPECTRUM PLOT OF WORST VALUE

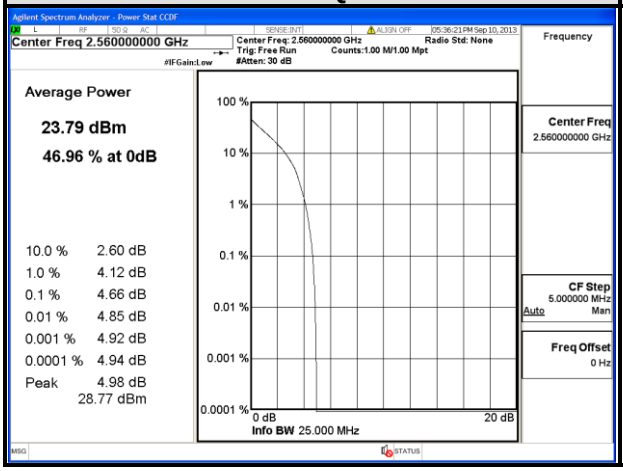
### 15MHz / QPSK



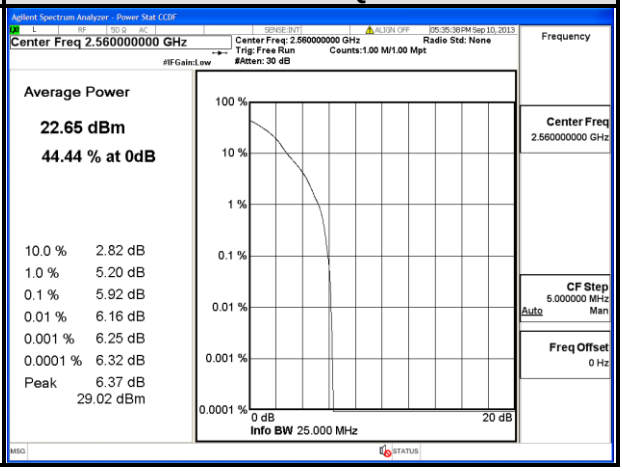

### 15MHz / 16QAM




### 20MHz / QPSK




### 20MHz / 16QAM

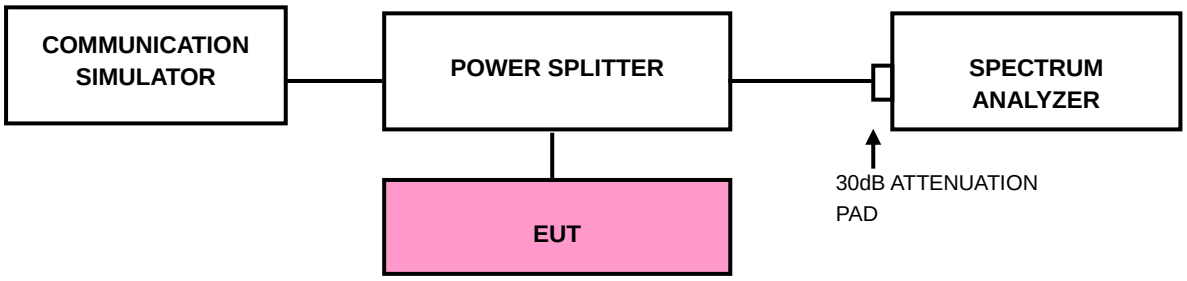


## 4.5 BAND EDGE MEASUREMENT

### 4.5.1 LIMITS OF BAND EDGE MEASUREMENT

According to FCC 27.53(m)(4) specified that power of any emission outside of the channel edge must be attenuated below the transmitting power (P) by a factor shall be not less than 43 + 10 log (P) dB at the channel edge, the limit of emission equal to –13dBm. And 55 + 10 log (P) dB at 5.5 MHz from the channel edges, the limit of emission equal to –25dBm.In the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

### 4.5.2 TEST SETUP



### 4.5.3 TEST PROCEDURES

a. 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. RB of the spectrum is 50kHz and VB of the spectrum is 200kHz (Channel bandwidth 5MHz).

d. The center frequency of spectrum is the band edge frequency. RB of the spectrum is 100kHz and VB of the spectrum is 300kHz (Channel bandwidth 10MHz).

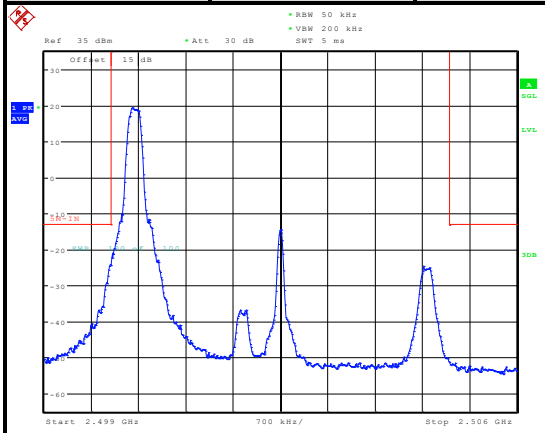
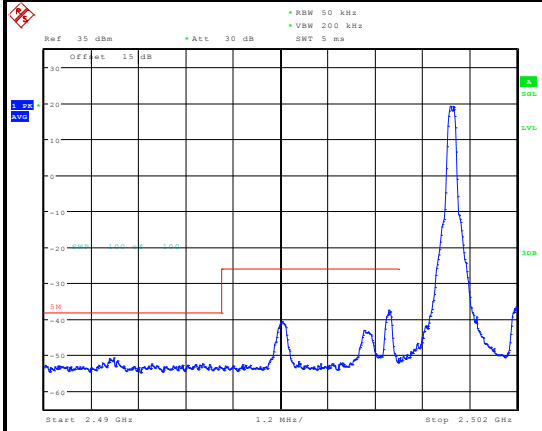
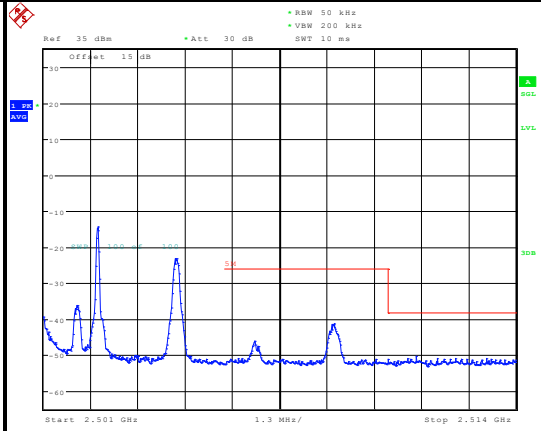
e. The center frequency of spectrum is the band edge frequency. RB of the spectrum is 200kHz and VB of the spectrum is 1MHz (Channel bandwidth 15MHz).

f. The center frequency of spectrum is the band edge frequency. RB of the spectrum is 200kHz and VB of the spectrum is 1MHz (Channel bandwidth 20MHz).

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

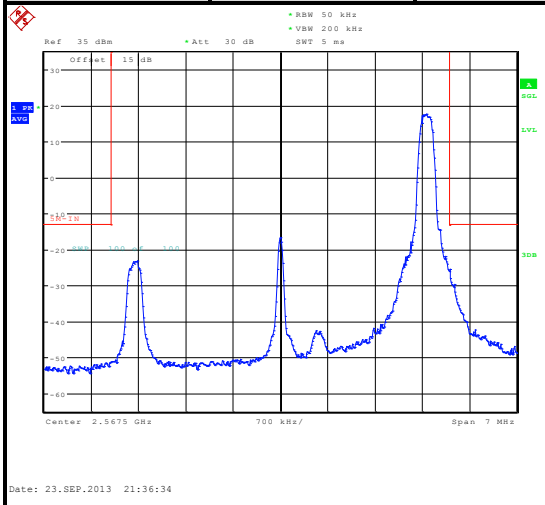
## 4.5.4 TEST RESULTS

### LTE BAND 7

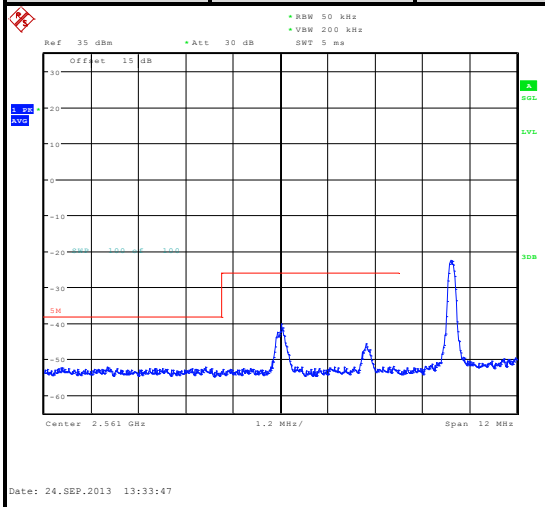
| Channel Bandwidth: 5MHz / QPSK | | | |
|---|---|---|---|
| **CHANNEL** | **20775** | **1 RB** | |
|  | | | |
| **CHANNEL** | **20775** | **1 RB** | **CHANNEL** / **20775** / **1 RB** |
|  | | |  |
| **Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth. | | | **Note:**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

## Channel Bandwidth: 5MHz / QPSK

| CHANNEL | 21425 | 1 RB |
|---|---|---|

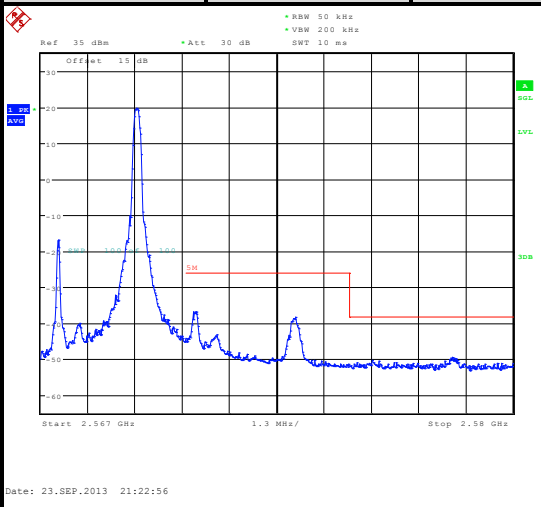



| CHANNEL | 21425 | 1 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

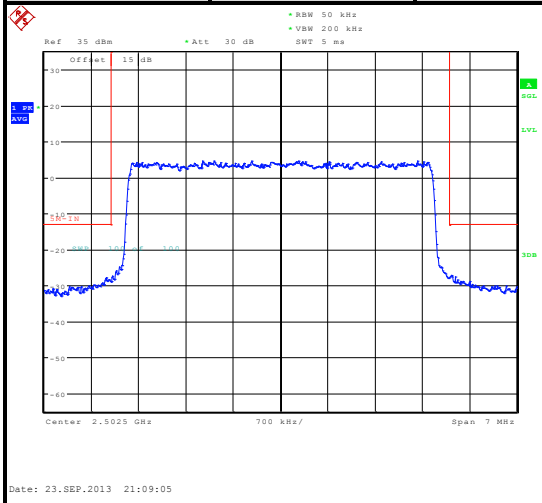
| CHANNEL | 21425 | 1 RB |
|---|---|---|



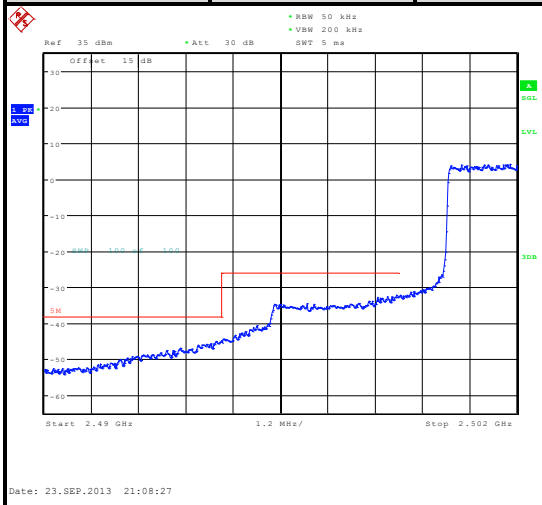

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 5MHz / QPSK

| CHANNEL | 20775 | 25 RB |
|---|---|---|

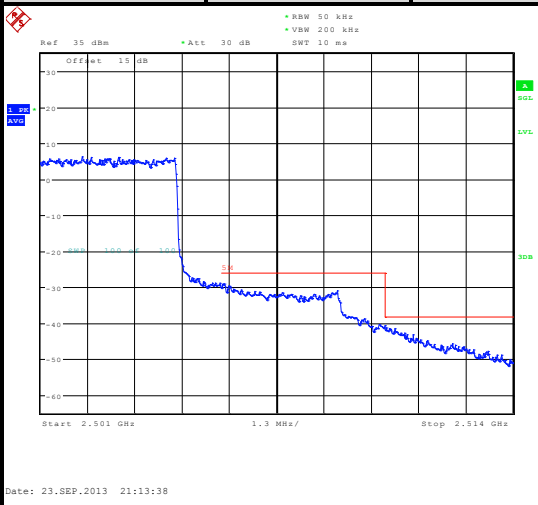



| CHANNEL | 20775 | 25 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

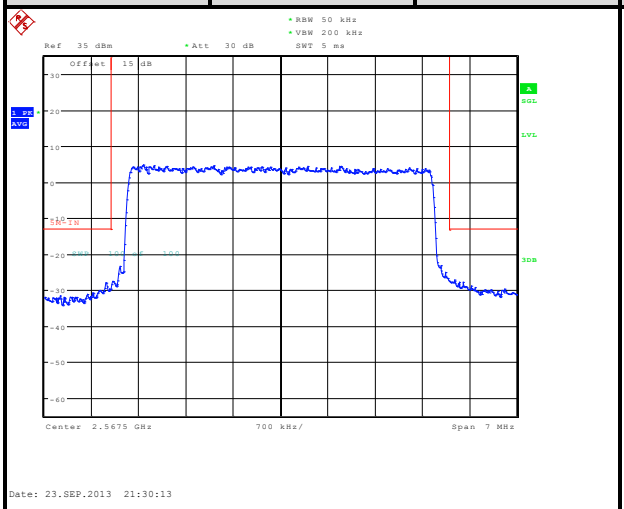
| CHANNEL | 20775 | 25 RB |
|---|---|---|



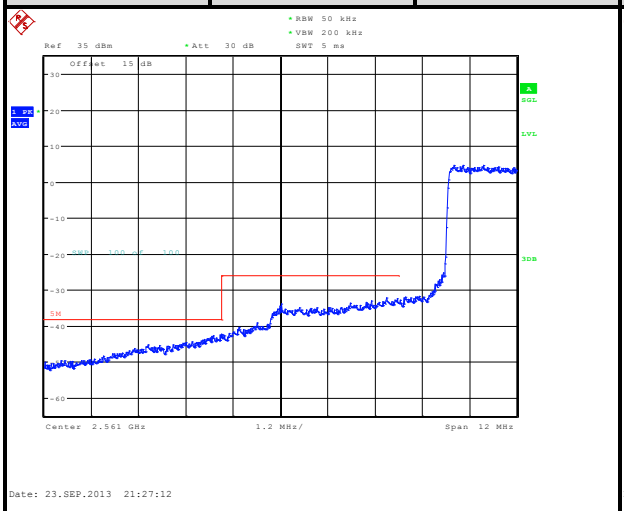

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 5MHz / QPSK

| CHANNEL | 21425 | 25 RB |
|---|---|---|

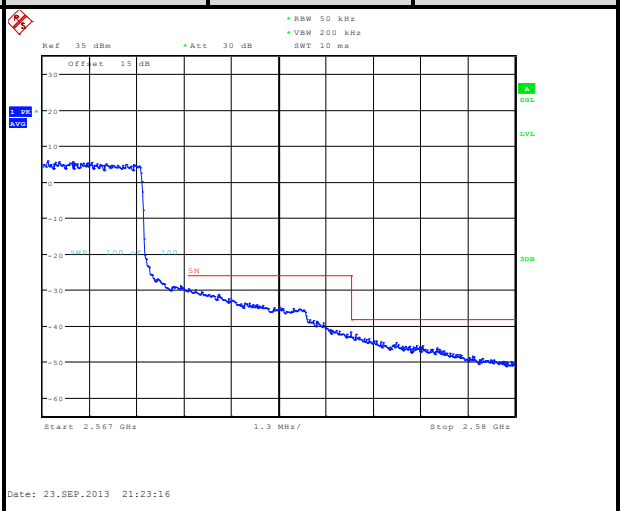



| CHANNEL | 21425 | 25 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

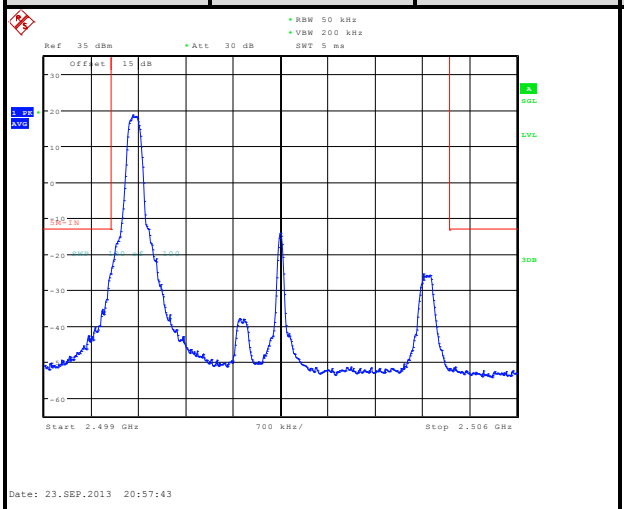
| CHANNEL | 21425 | 25 RB |
|---|---|---|



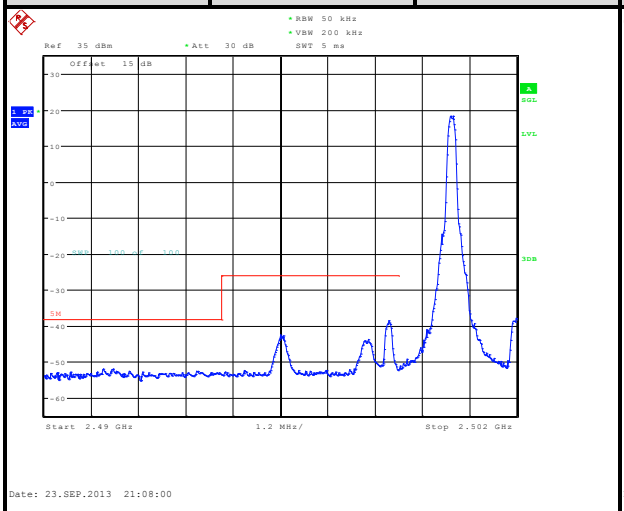

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 5MHz / 16QAM

| CHANNEL | 20775 | 1 RB |
|---|---|---|

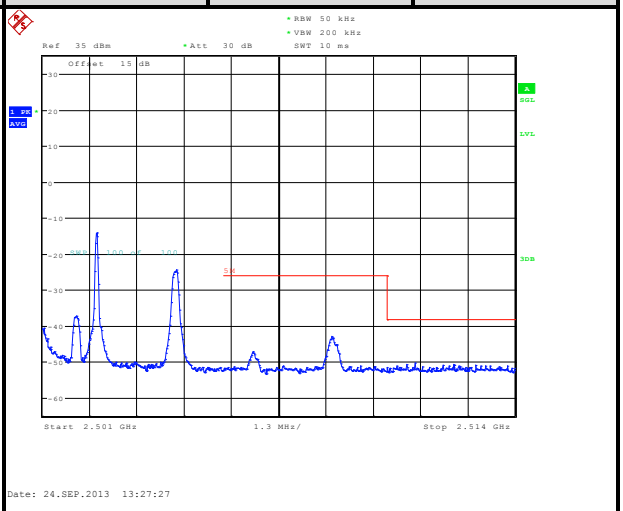



| CHANNEL | 20775 | 1 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

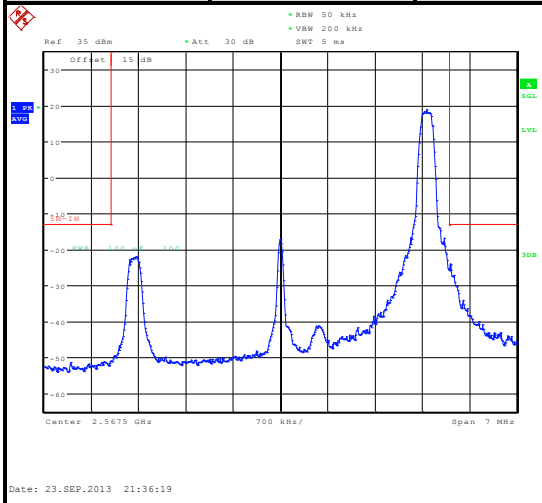
| CHANNEL | 20775 | 1 RB |
|---|---|---|



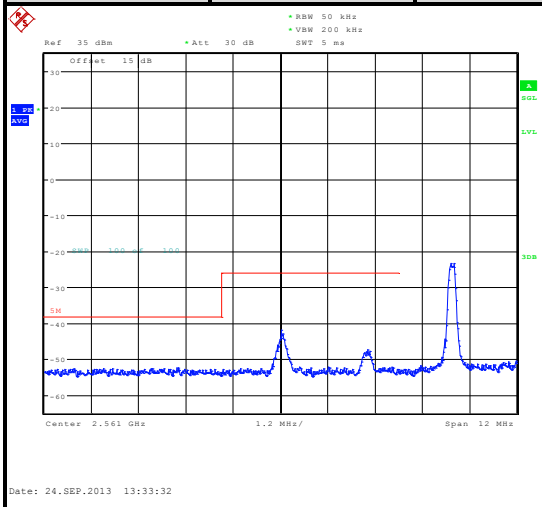

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 5MHz / 16QAM

| CHANNEL | 21425 | 1 RB |
|---|---|---|

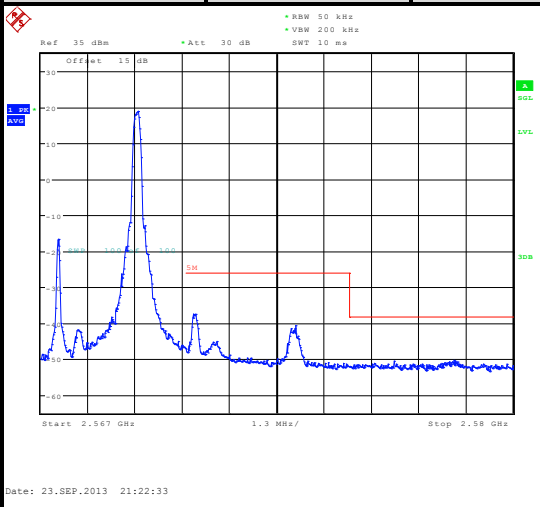



| CHANNEL | 21425 | 1 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

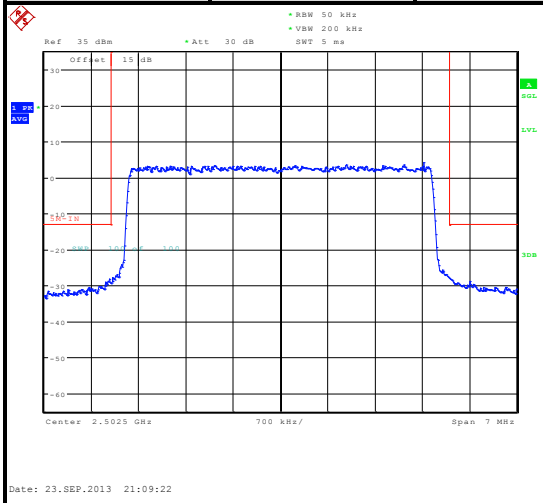
| CHANNEL | 21425 | 1 RB |
|---|---|---|



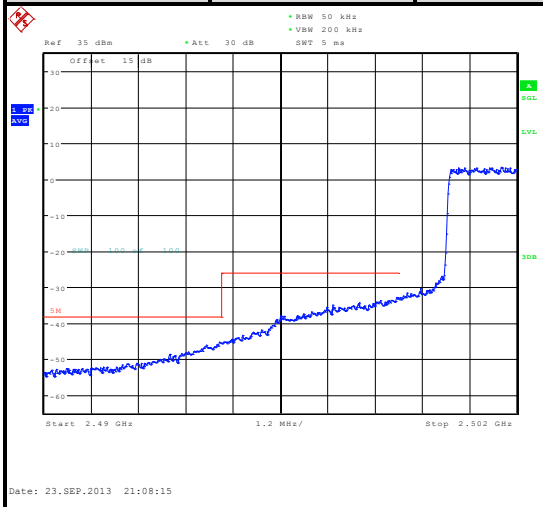

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 5MHz / 16QAM

| CHANNEL | 20775 | 25 RB |
|---|---|---|

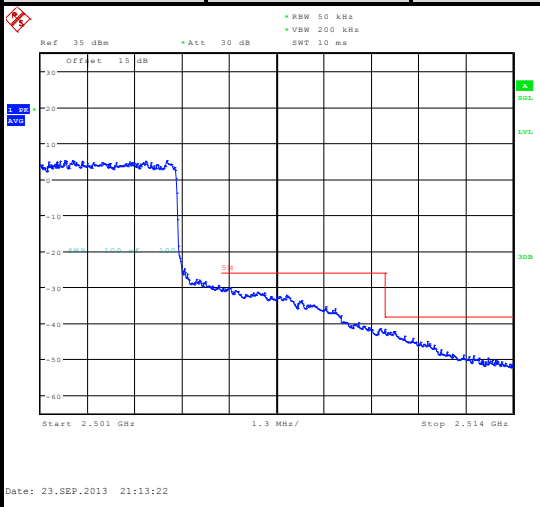



| CHANNEL | 20775 | 25 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

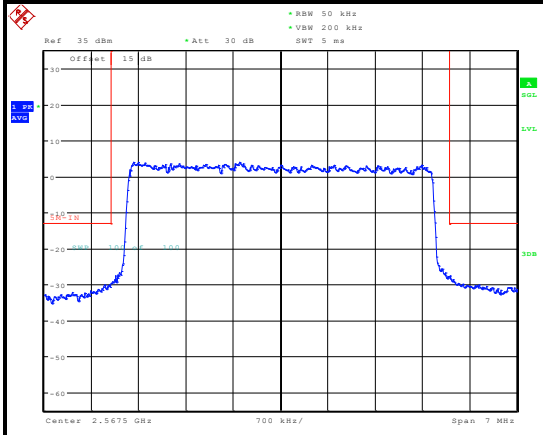
| CHANNEL | 20775 | 25 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

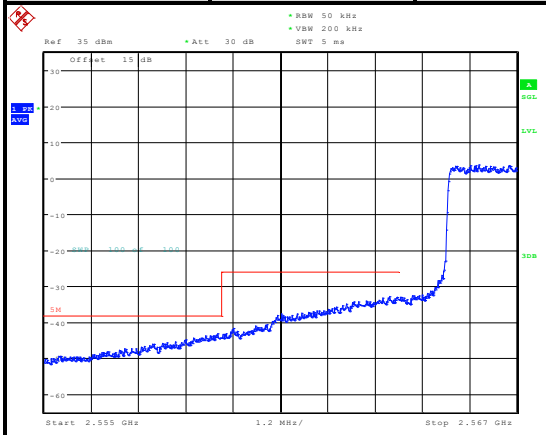
## Channel Bandwidth: 5MHz / 16QAM

| CHANNEL | 21425 | 25 RB |
|---|---|---|




Date: 23.SEP.2013 21:30:32

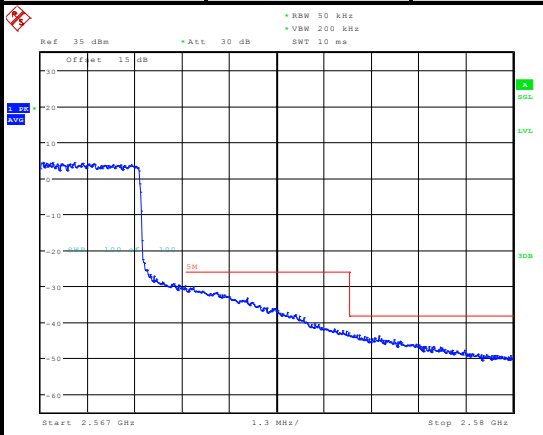
| CHANNEL | 21425 | 25 RB |
|---|---|---|




Date: 23.SEP.2013 21:26:56

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

| CHANNEL | 21425 | 25 RB |
|---|---|---|

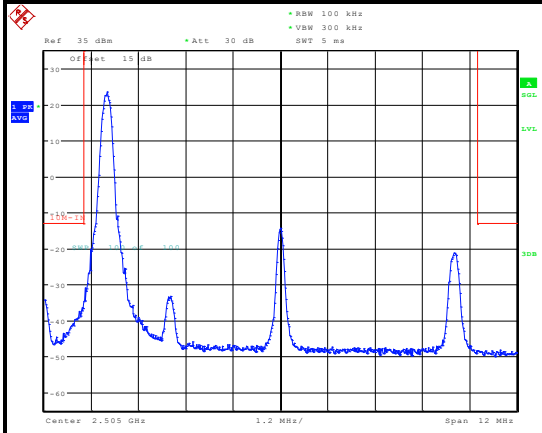



Date: 23.SEP.2013 21:23:33

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

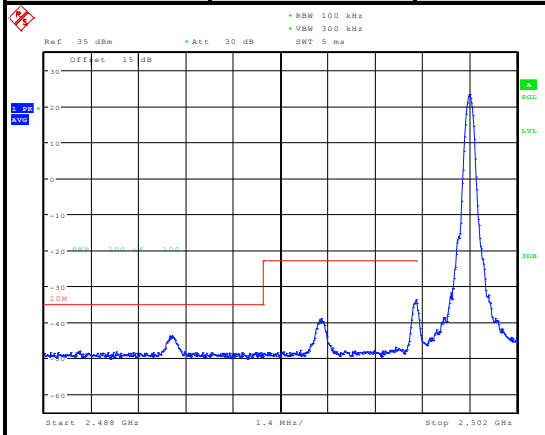
## Channel Bandwidth: 10MHz / QPSK

| CHANNEL | 20800 | 1 RB |
|---|---|---|




Date: 23.SEP.2013 21:38:01

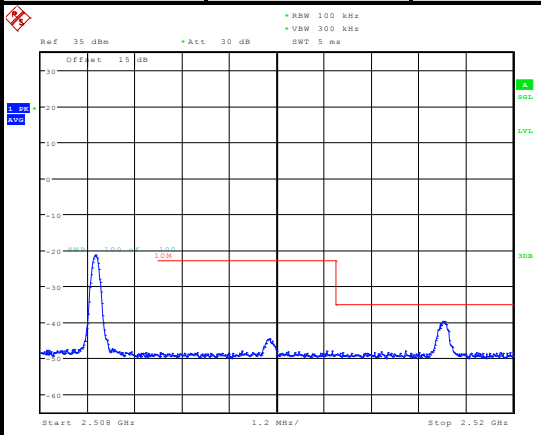
| CHANNEL | 20800 | 1 RB |
|---|---|---|




Date: 23.SEP.2013 21:44:38

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

| CHANNEL | 20800 | 1 RB |
|---|---|---|

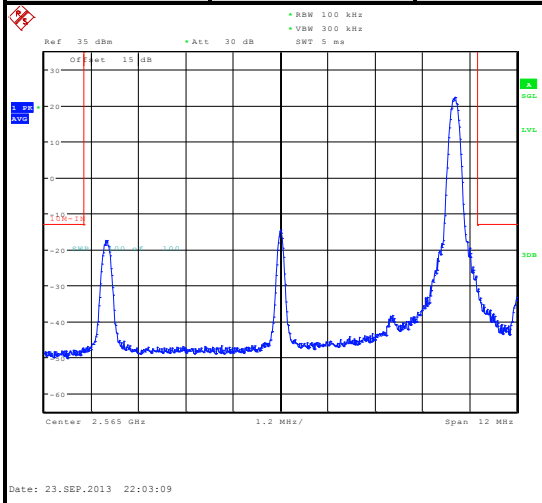



Date: 24.SEP.2013 13:42:58

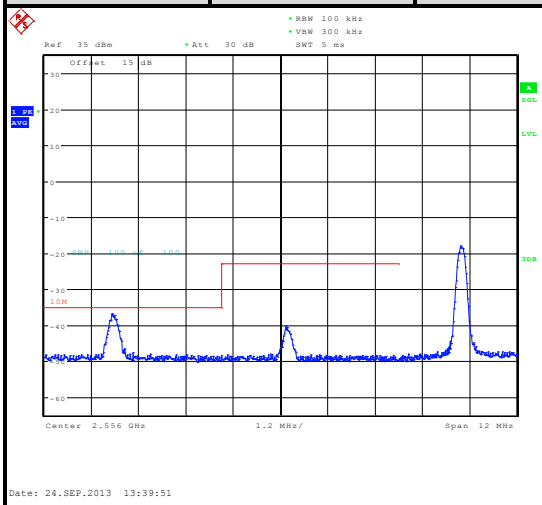
**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 10MHz / QPSK

| CHANNEL | 21400 | 1 RB |
|---|---|---|

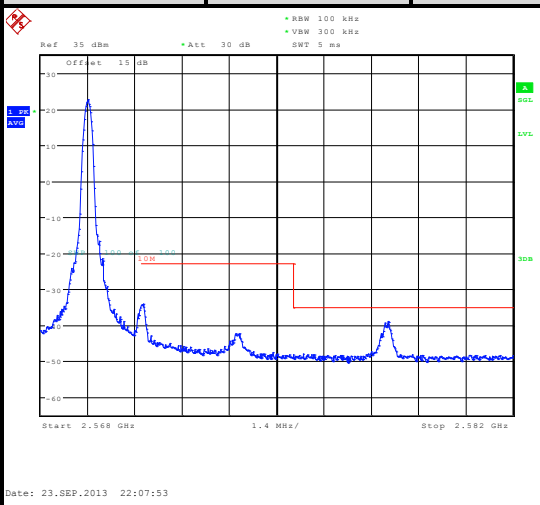



| CHANNEL | 21400 | 1 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

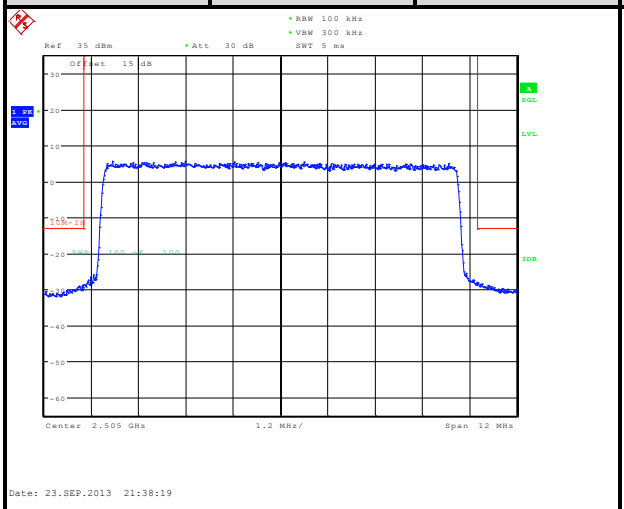
| CHANNEL | 21400 | 1 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 10MHz / QPSK

| CHANNEL | 20800 | 50 RB |
|---|---|---|




| CHANNEL | 20800 | 50 RB |
|---|---|---|

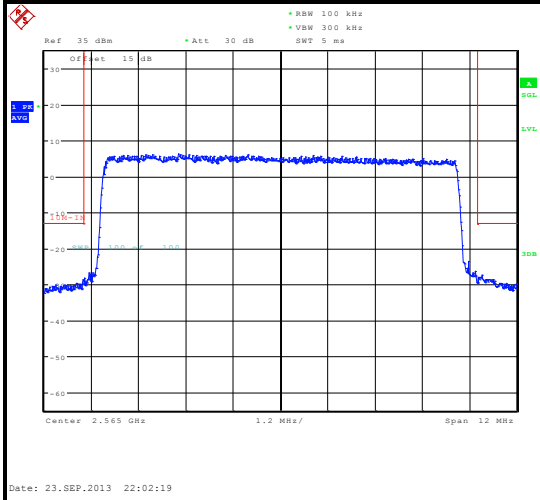
**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

| CHANNEL | 20800 | 50 RB |
|---|---|---|

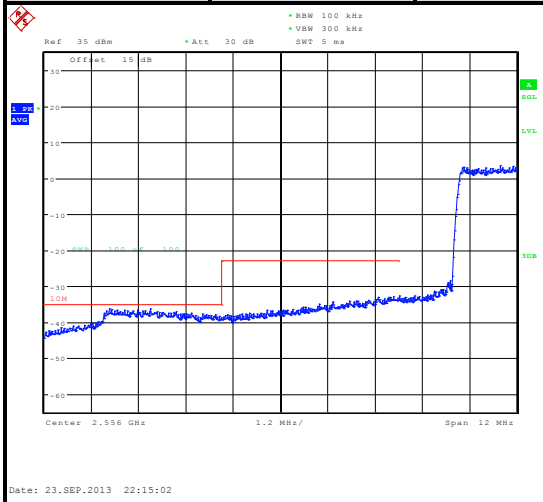
**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 10MHz / QPSK

| CHANNEL | 21400 | 50 RB |
|---|---|---|

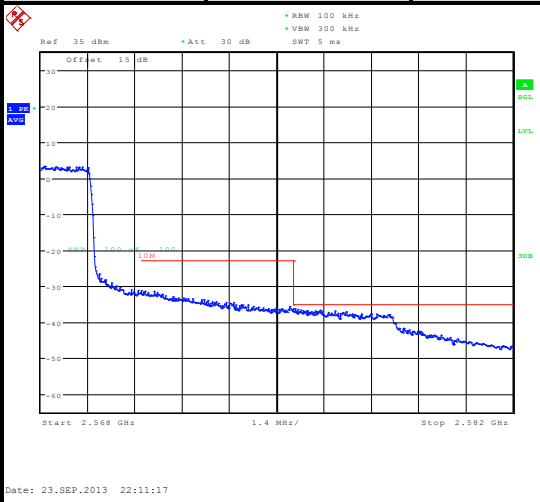



| CHANNEL | 21400 | 50 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

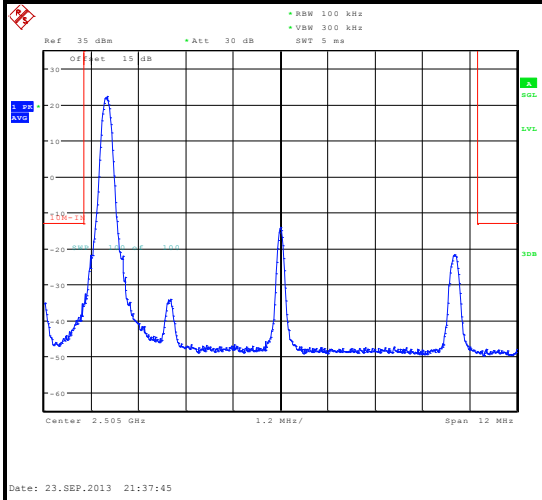
| CHANNEL | 21400 | 50 RB |
|---|---|---|



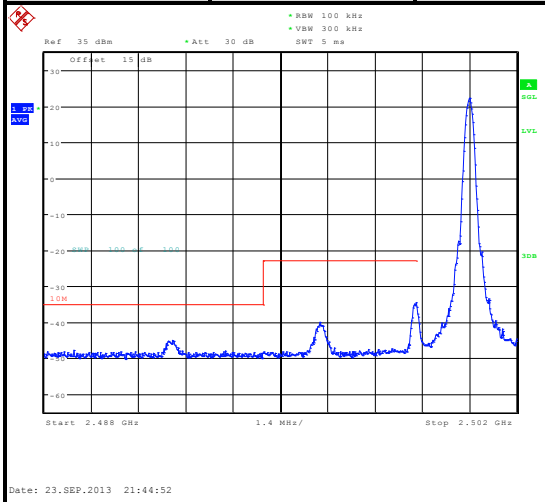

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 10MHz / 16QAM

| CHANNEL | 20800 | 1 RB |
|---|---|---|

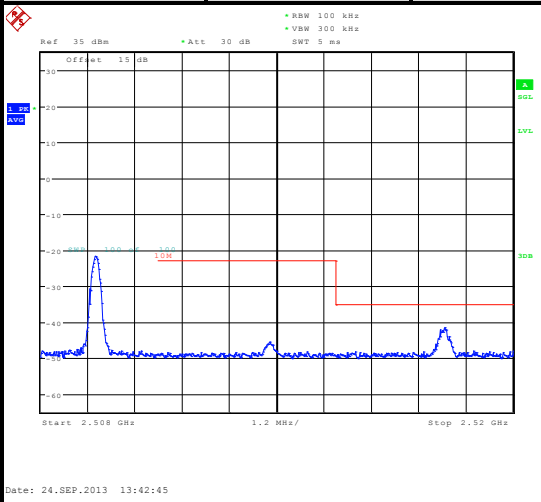



| CHANNEL | 20800 | 1 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

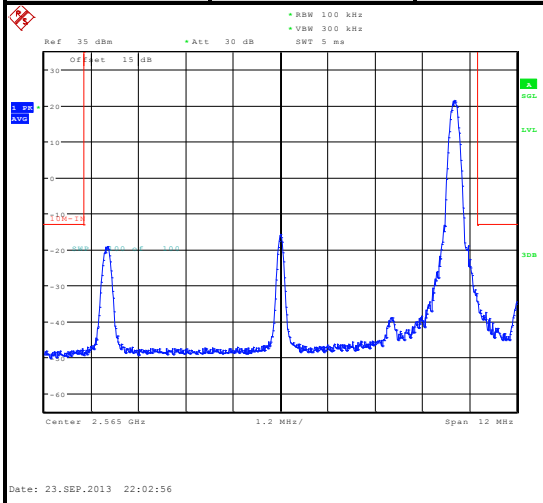
| CHANNEL | 20800 | 1 RB |
|---|---|---|



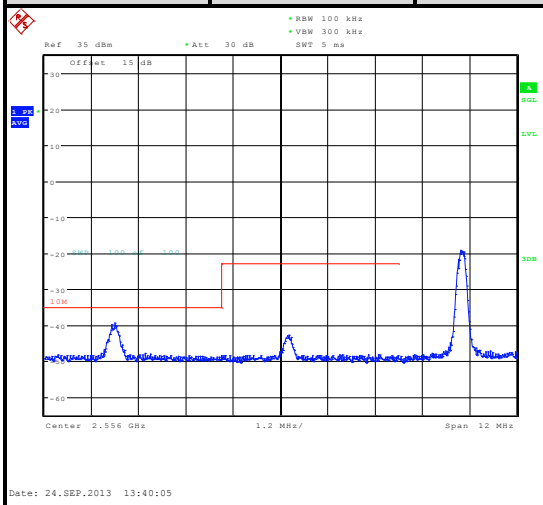

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 10MHz / 16QAM

| CHANNEL | 21400 | 1 RB |
|---|---|---|

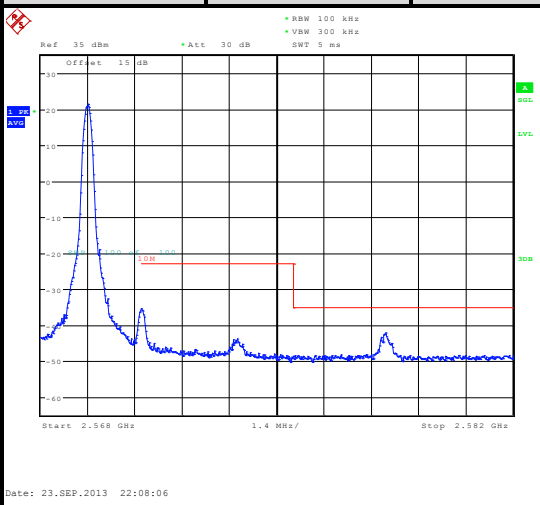



| CHANNEL | 21400 | 1 RB |
|---|---|---|



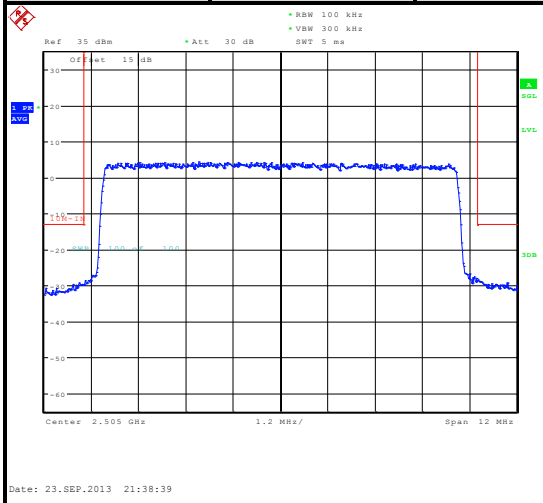

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

| CHANNEL | 21400 | 1 RB |
|---|---|---|

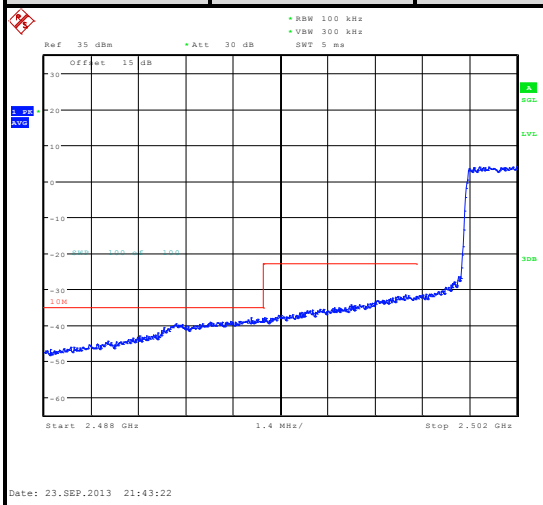
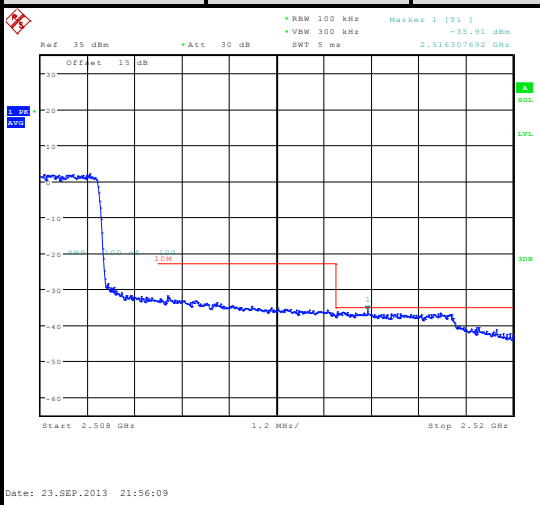



**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 10MHz / 16QAM

| CHANNEL | 20800 | 50 RB | |
|---|---|---|---|
|  | | | |



| CHANNEL | 20800 | 50 RB | CHANNEL | 20800 | 50 RB |
|---|---|---|---|---|---|
|  | | |  | | |

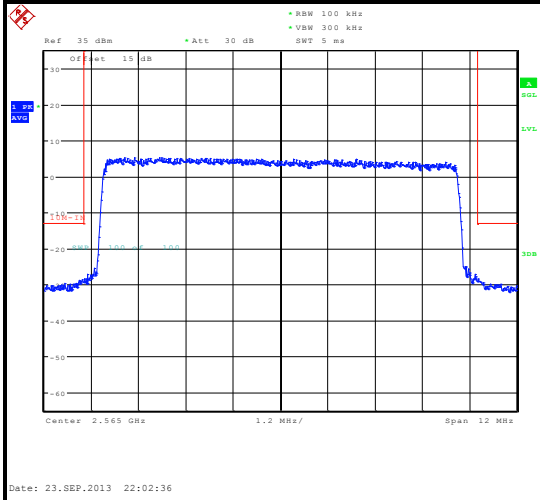




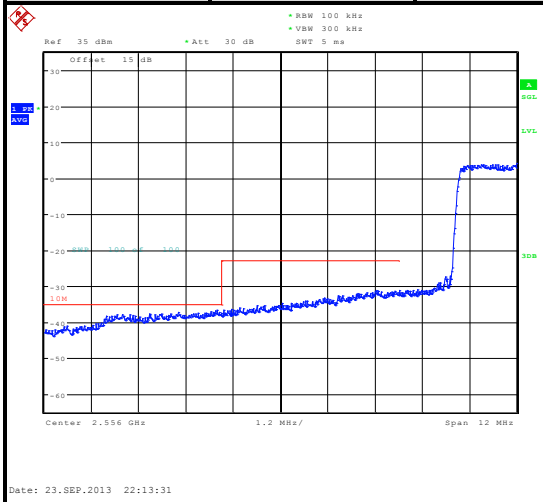
| | |
|---|---|
| **Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth. | **Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth. |

## Channel Bandwidth: 10MHz / 16QAM

| CHANNEL | 21400 | 50 RB |
|---|---|---|

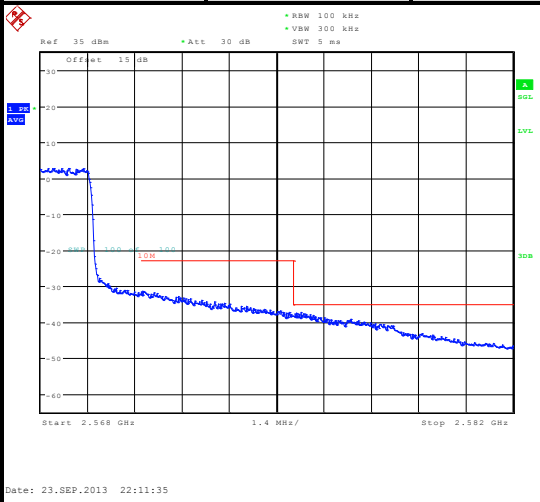



| CHANNEL | 21400 | 50 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

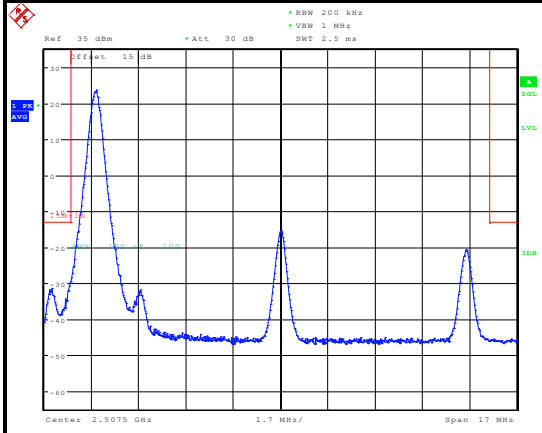
| CHANNEL | 21400 | 50 RB |
|---|---|---|



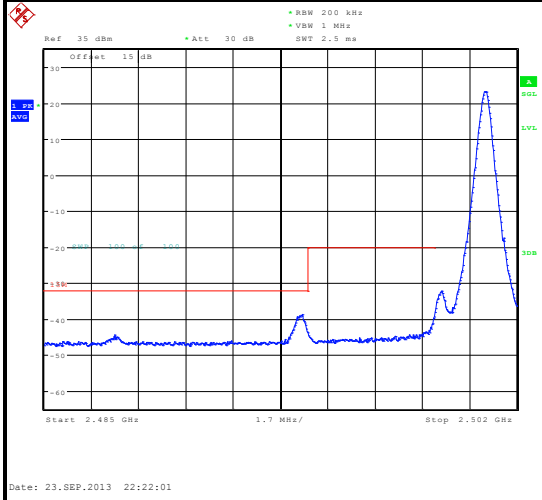

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 15MHz / QPSK

| CHANNEL | 20825 | 1 RB |
|---|---|---|

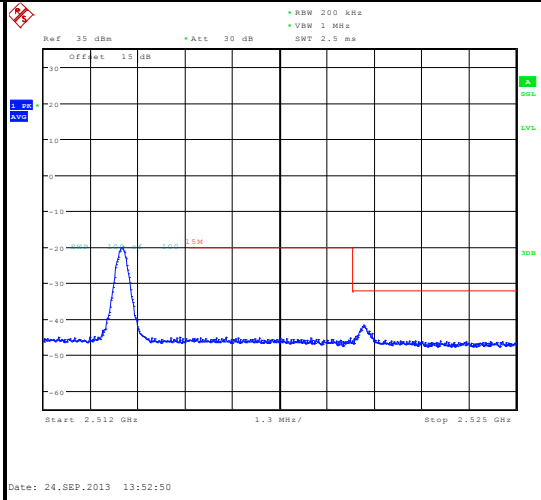



| CHANNEL | 20825 | 1 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

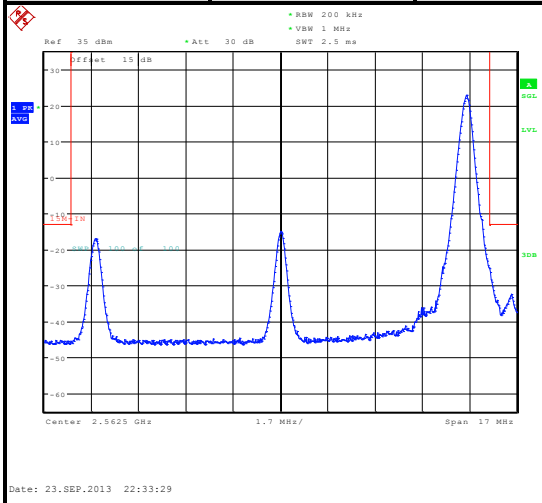
| CHANNEL | 20825 | 1 RB |
|---|---|---|



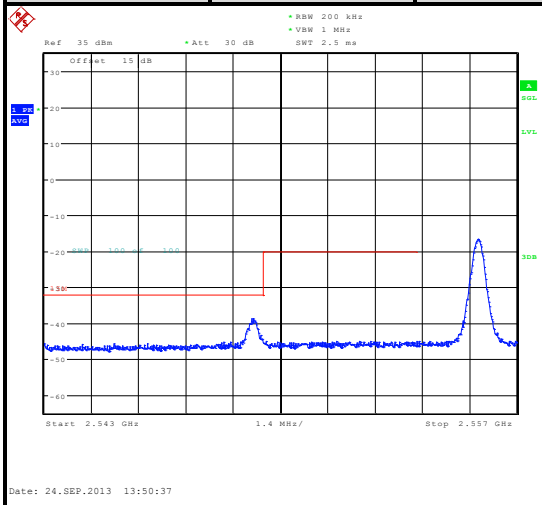

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 15MHz / QPSK

| CHANNEL | 21375 | 1 RB |
|---|---|---|

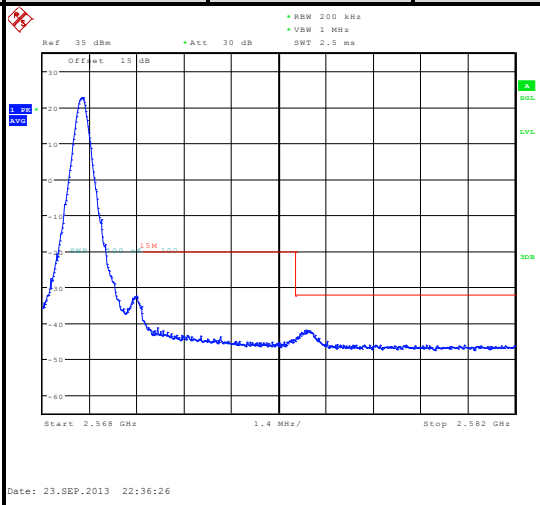



| CHANNEL | 21375 | 1 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

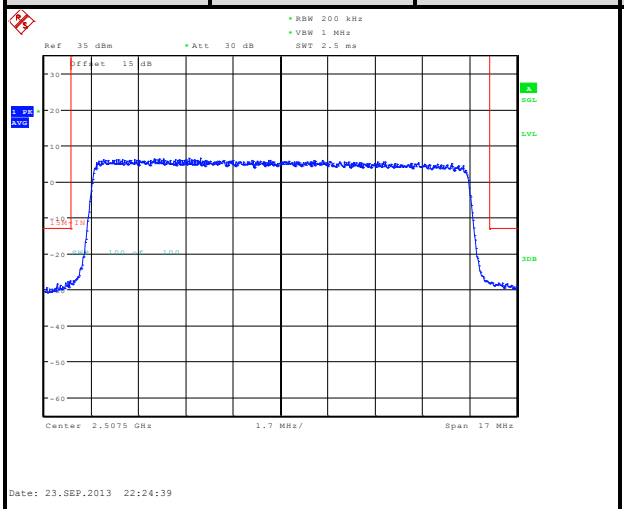
| CHANNEL | 21375 | 1 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 15MHz / QPSK

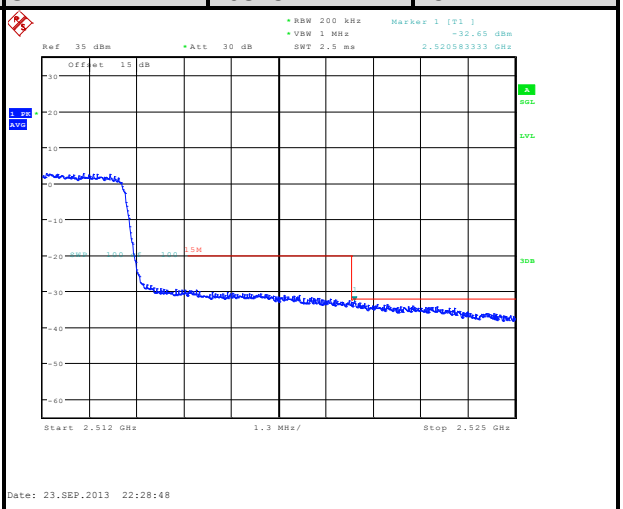
| CHANNEL | 20825 | 75 RB |
|---|---|---|




| CHANNEL | 20825 | 75 RB |
|---|---|---|

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

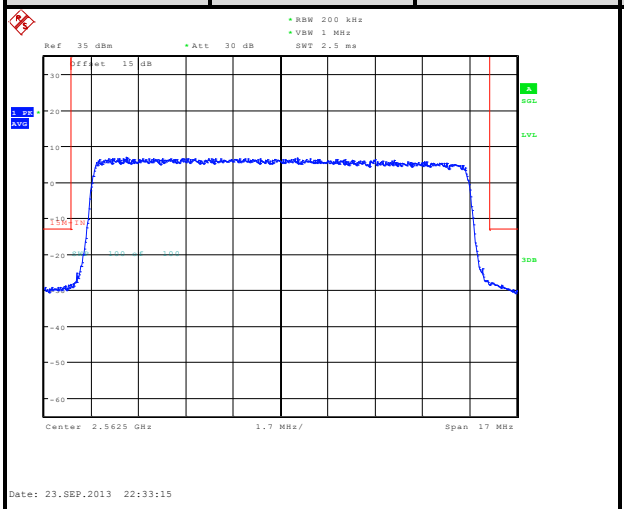
| CHANNEL | 20825 | 75 RB |
|---|---|---|



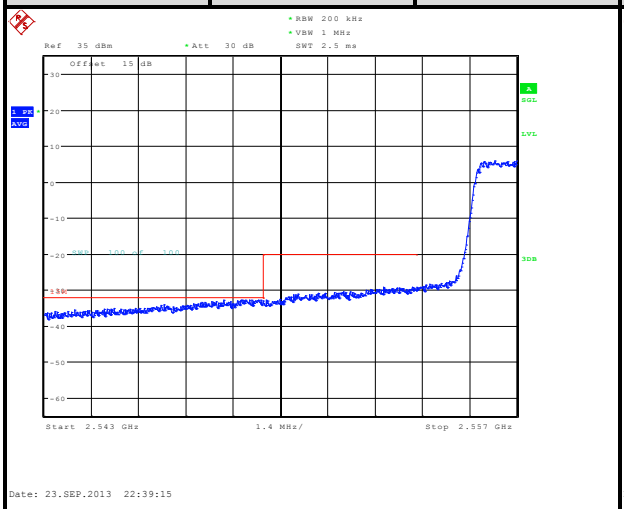

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 15MHz / QPSK

| CHANNEL | 21375 | 75 RB |
|---|---|---|

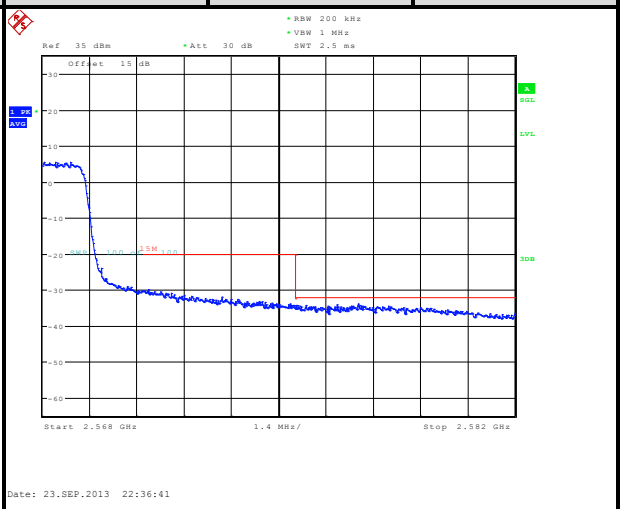



| CHANNEL | 21375 | 75 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

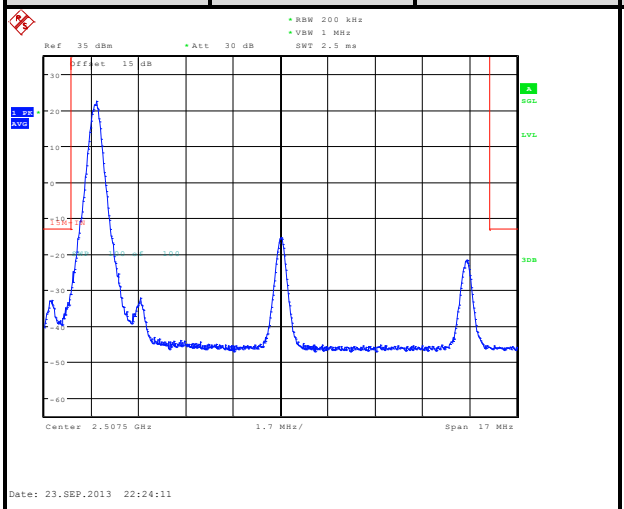
| CHANNEL | 21375 | 75 RB |
|---|---|---|



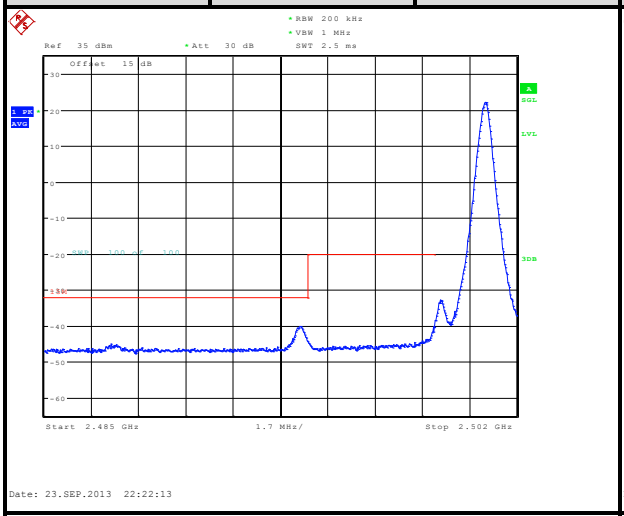

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 15MHz / 16QAM

| CHANNEL | 20825 | 1 RB |
|---|---|---|

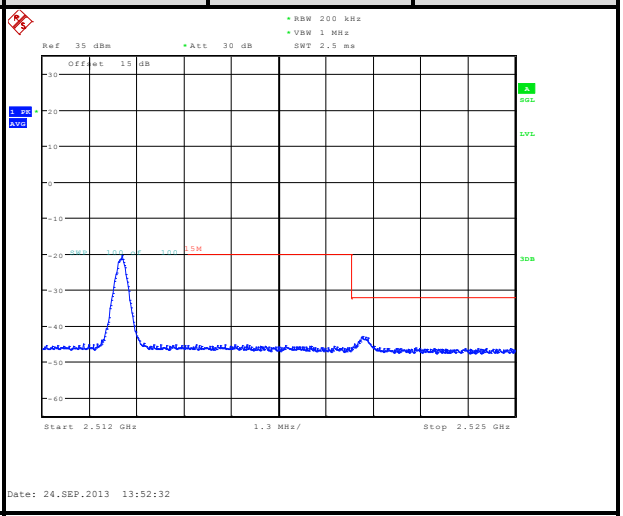



| CHANNEL | 20825 | 1 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

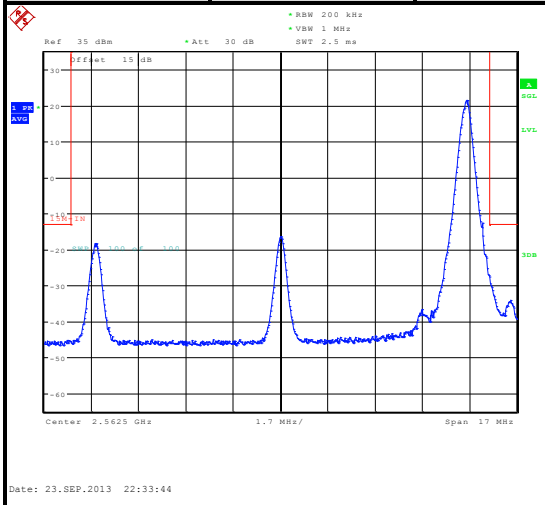
| CHANNEL | 20825 | 1 RB |
|---|---|---|



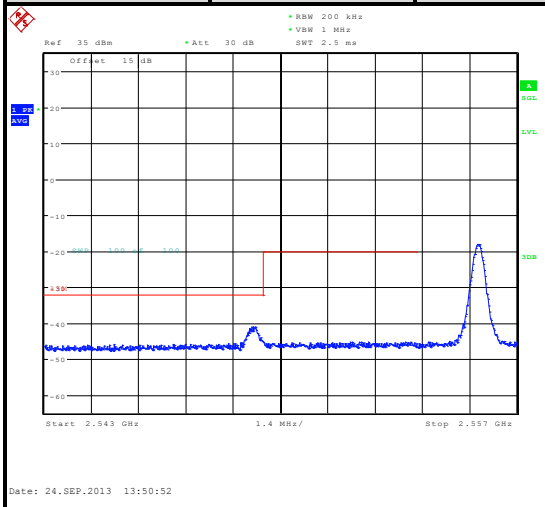

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 15MHz / 16QAM

| CHANNEL | 21375 | 1 RB |
|---|---|---|

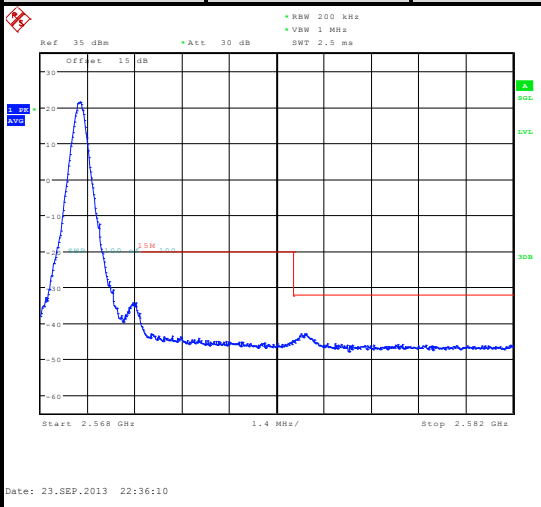



| CHANNEL | 21375 | 1 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

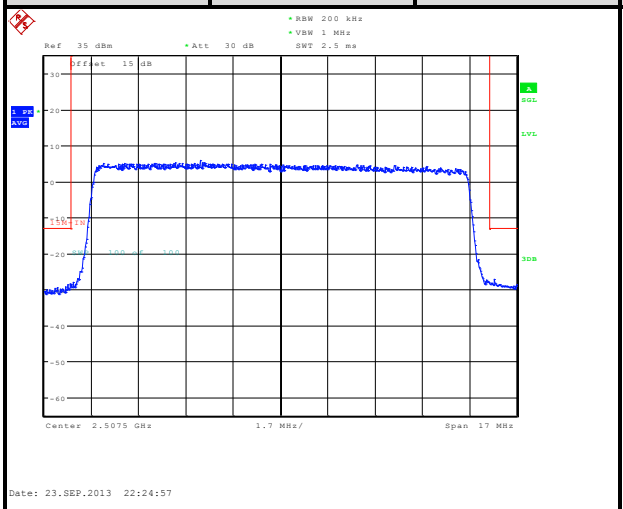
| CHANNEL | 21375 | 1 RB |
|---|---|---|



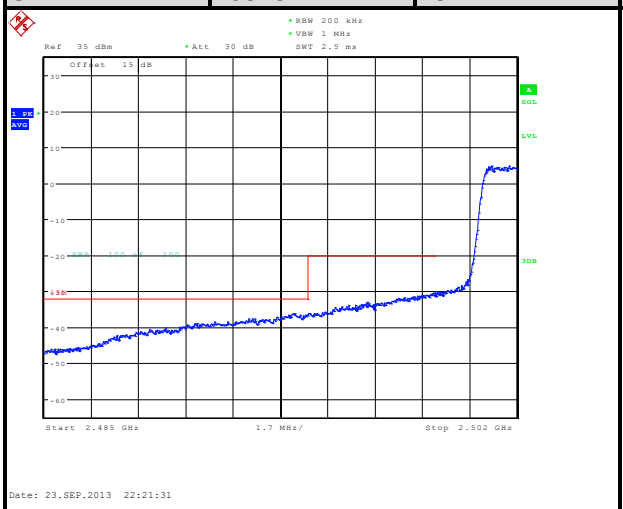

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 15MHz / 16QAM

| CHANNEL | 20825 | 75 RB |
|---|---|---|

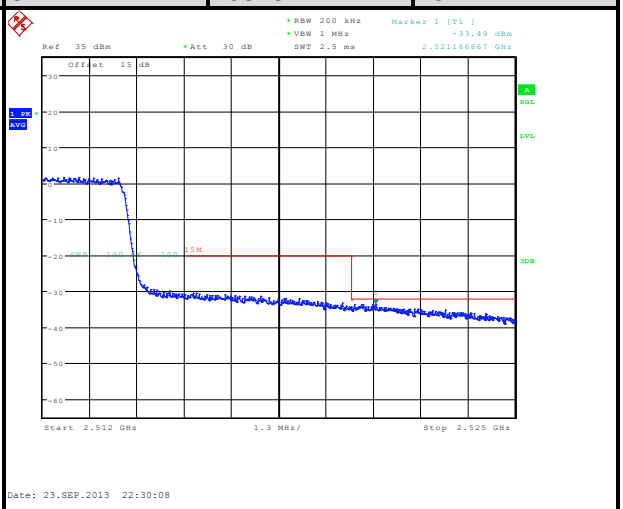



| CHANNEL | 20825 | 75 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

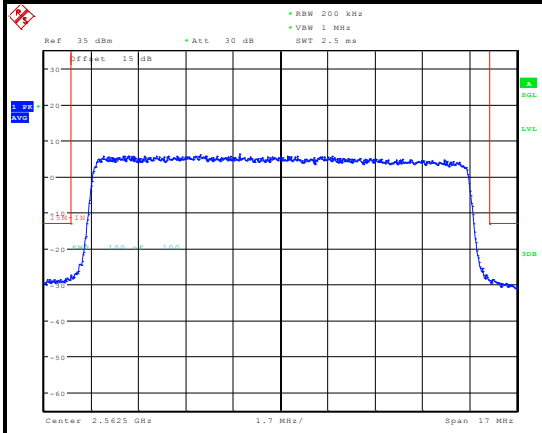
| CHANNEL | 20825 | 75 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

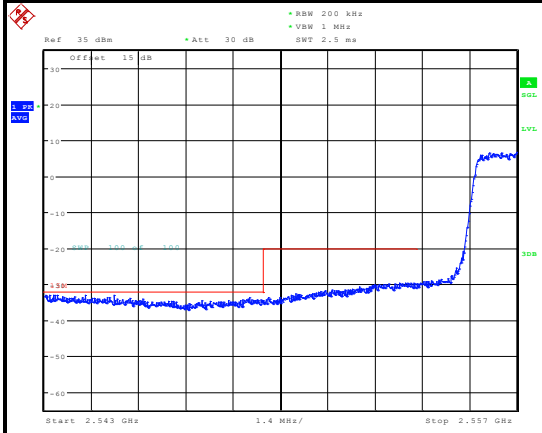
## Channel Bandwidth: 15MHz / 16QAM

| CHANNEL | 21375 | 75 RB |
|---|---|---|




Date: 23.SEP.2013 22:33:02

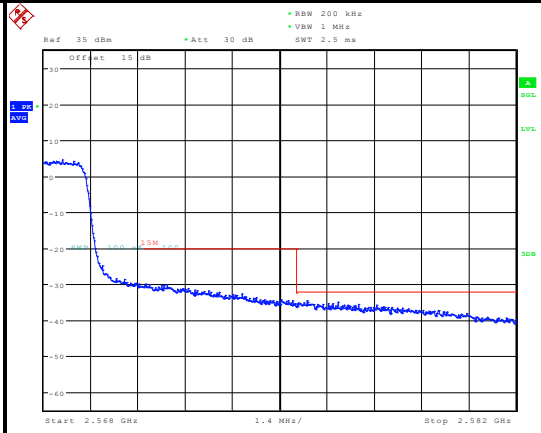
| CHANNEL | 21375 | 75 RB |
|---|---|---|




Date: 23.SEP.2013 22:38:39

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

| CHANNEL | 21375 | 75 RB |
|---|---|---|

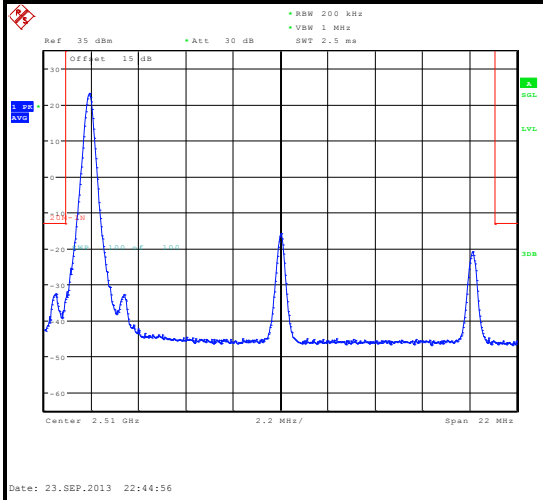



Date: 23.SEP.2013 22:36:55

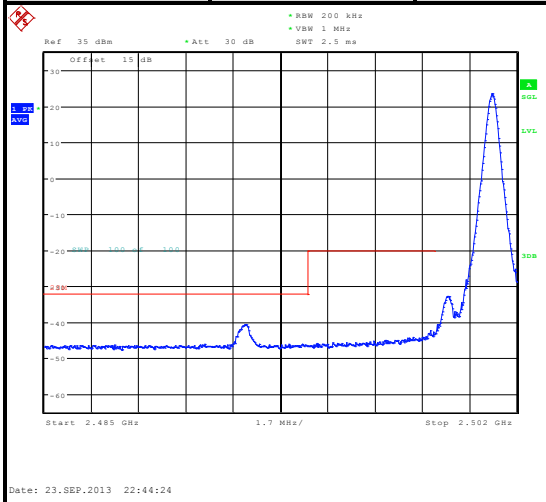
**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 20MHz / QPSK

| CHANNEL | 20850 | 1 RB |
|---|---|---|

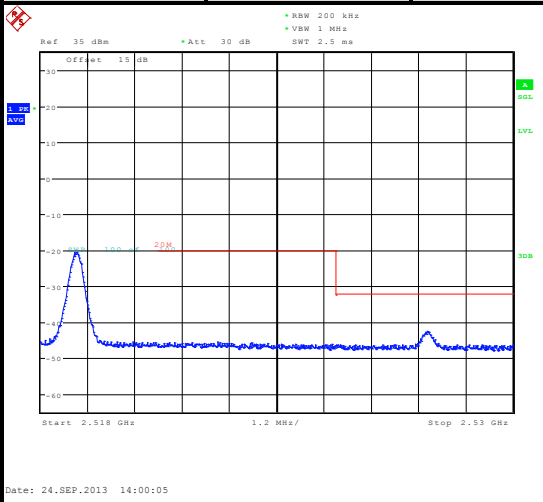



| CHANNEL | 20850 | 1 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

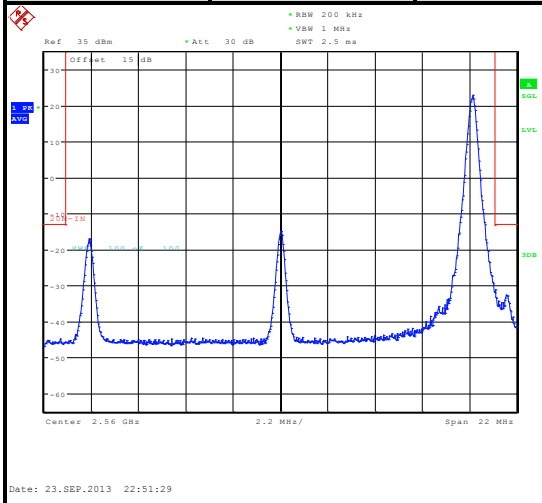
| CHANNEL | 20850 | 1 RB |
|---|---|---|



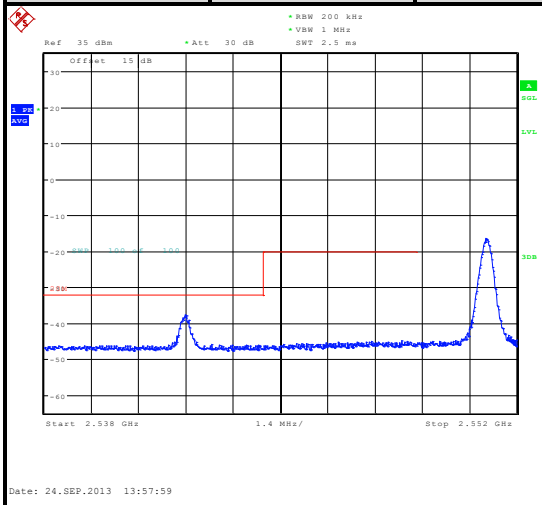

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 20MHz / QPSK

| CHANNEL | 21350 | 1 RB |
|---|---|---|

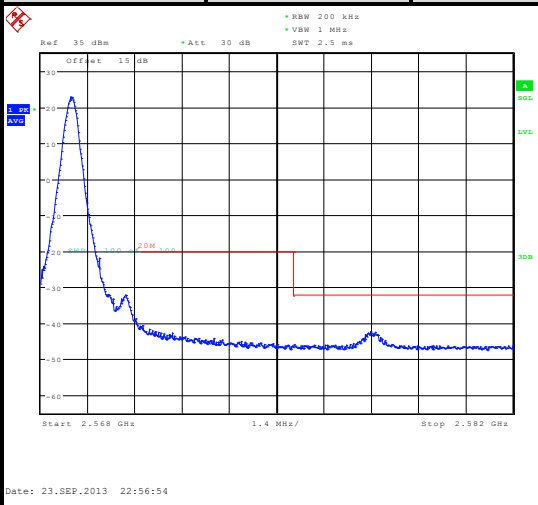



| CHANNEL | 21350 | 1 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

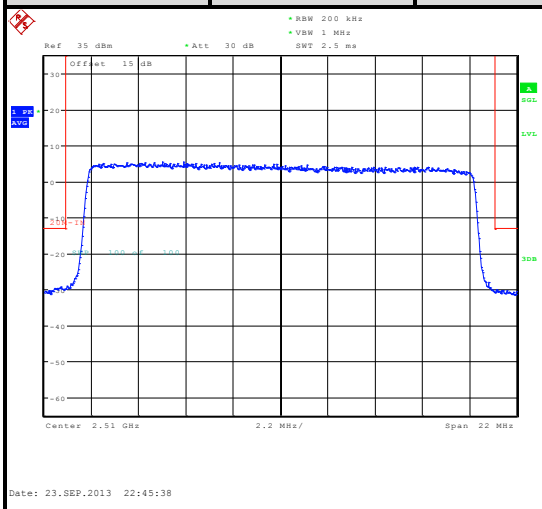
| CHANNEL | 21350 | 1 RB |
|---|---|---|



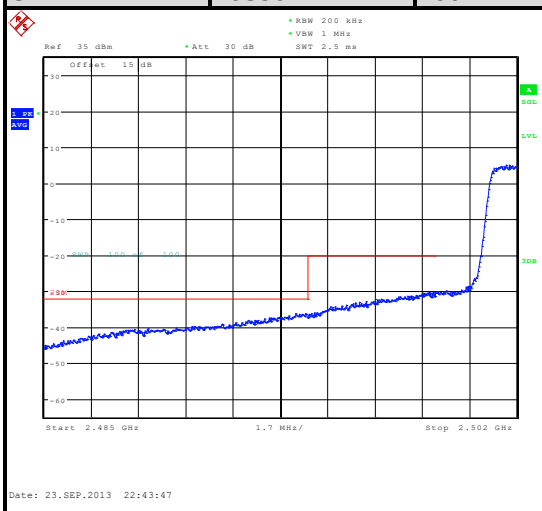

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 20MHz / QPSK

| CHANNEL | 20850 | 100 RB |
|---|---|---|

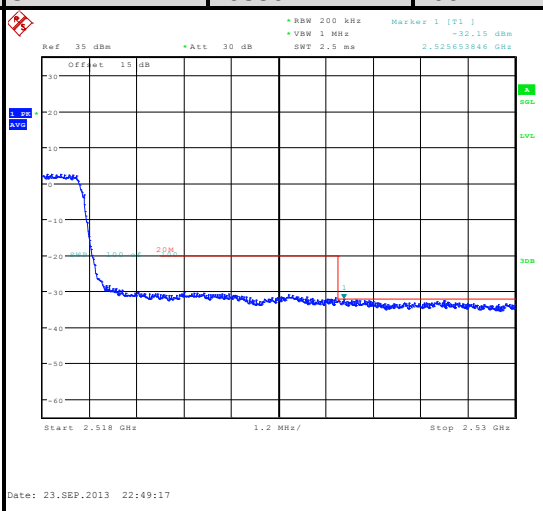



| CHANNEL | 20850 | 100 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

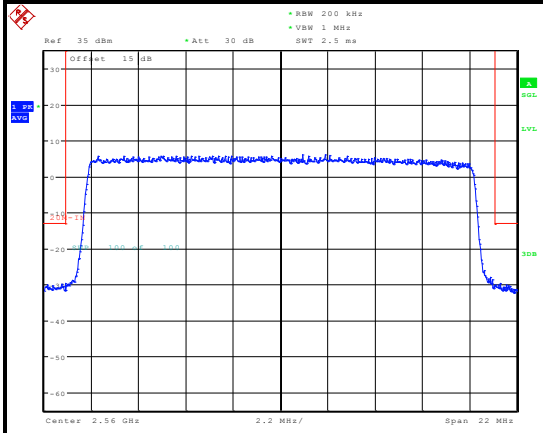
| CHANNEL | 20850 | 100 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

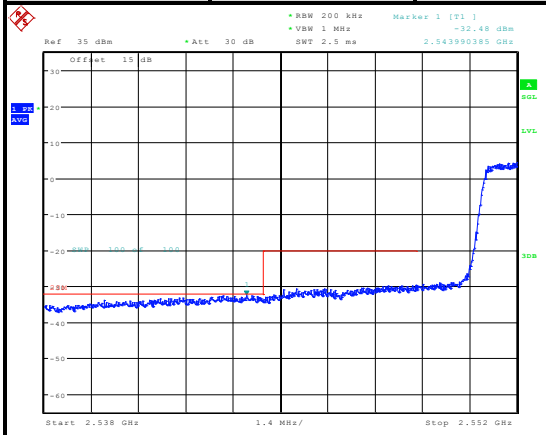
## Channel Bandwidth: 20MHz / QPSK

| CHANNEL | 21350 | 100 RB |
|---|---|---|




Date: 23.SEP.2013 22:52:27

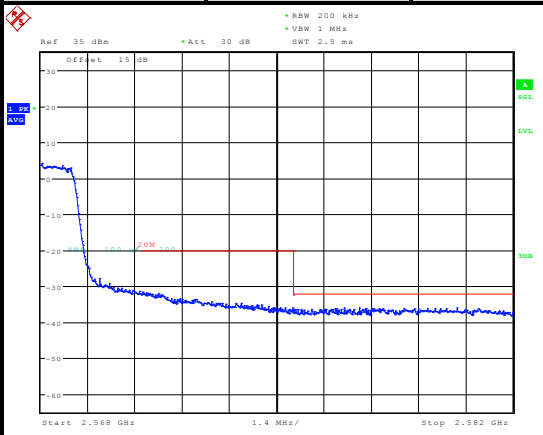
| CHANNEL | 21350 | 100 RB |
|---|---|---|




Date: 23.SEP.2013 22:55:00

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

| CHANNEL | 21350 | 100 RB |
|---|---|---|

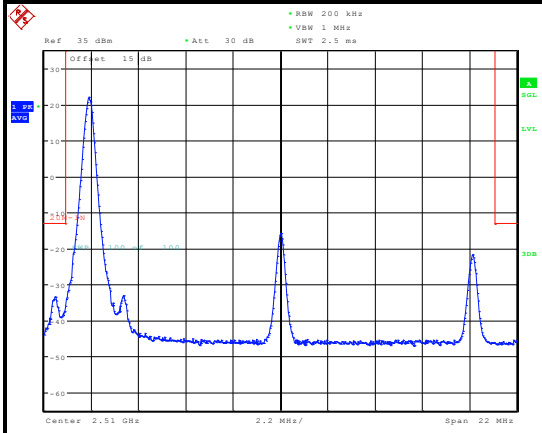



Date: 23.SEP.2013 22:57:34

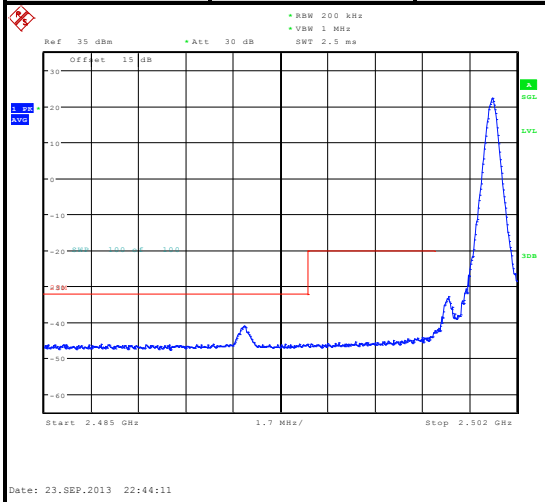
**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 20MHz / 16QAM

| CHANNEL | 20850 | 1 RB |
|---|---|---|

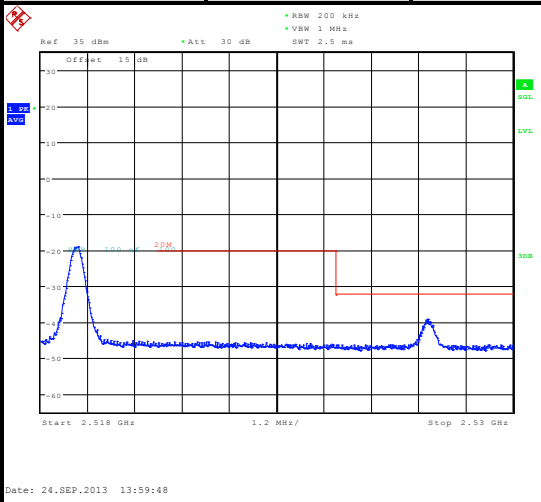



| CHANNEL | 20850 | 1 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

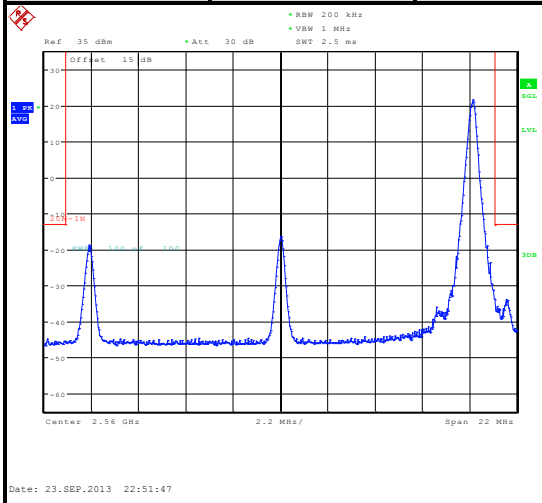
| CHANNEL | 20850 | 1 RB |
|---|---|---|



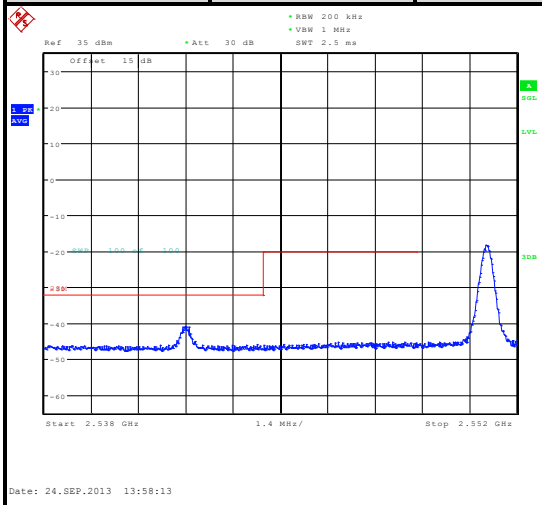

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 20MHz / 16QAM

| CHANNEL | 21350 | 1 RB |
|---|---|---|

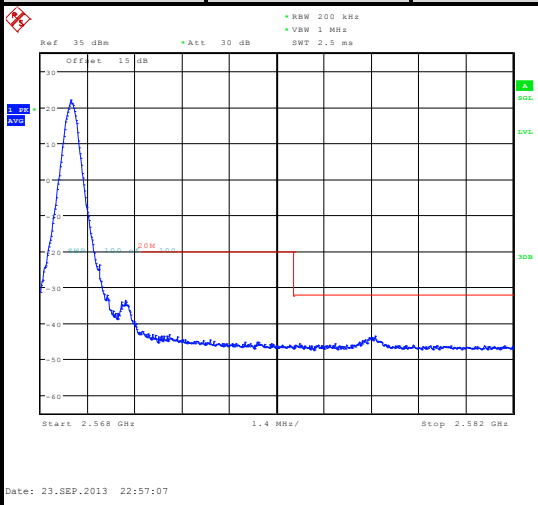



| CHANNEL | 21350 | 1 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

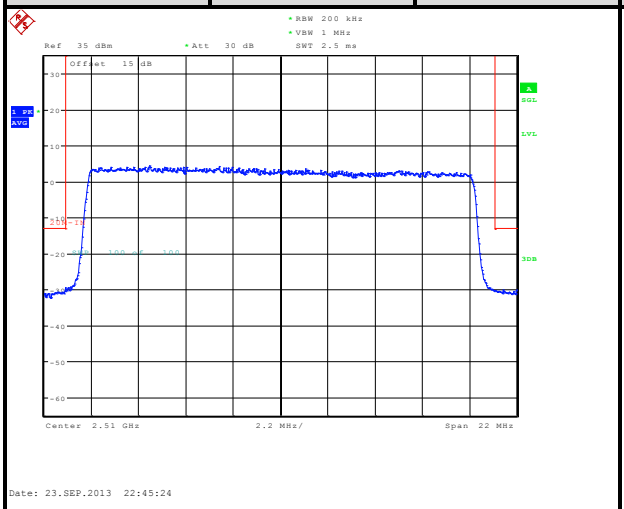
| CHANNEL | 21350 | 1 RB |
|---|---|---|



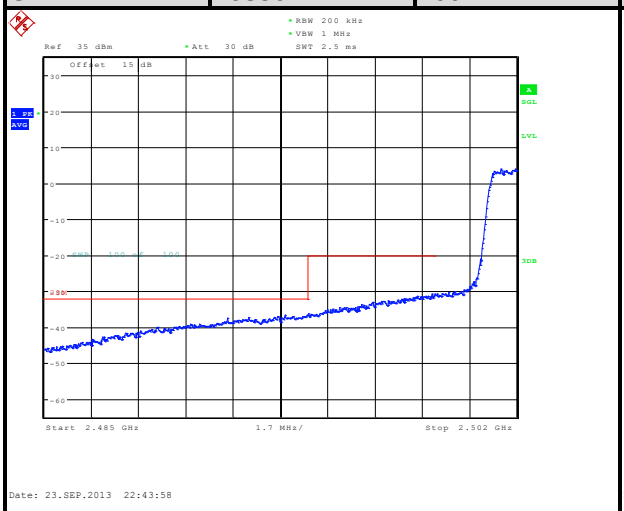

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 20MHz / 16QAM

| CHANNEL | 20850 | 100 RB |
|---|---|---|

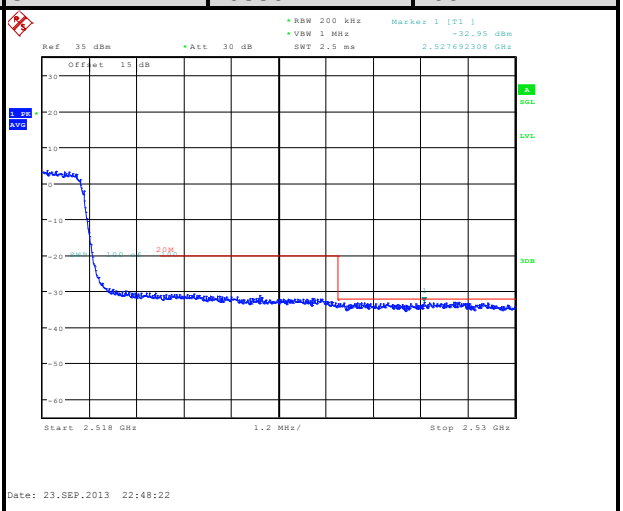



| CHANNEL | 20850 | 100 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

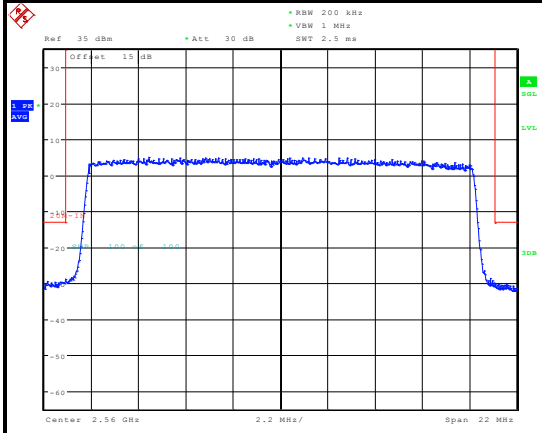
| CHANNEL | 20850 | 100 RB |
|---|---|---|



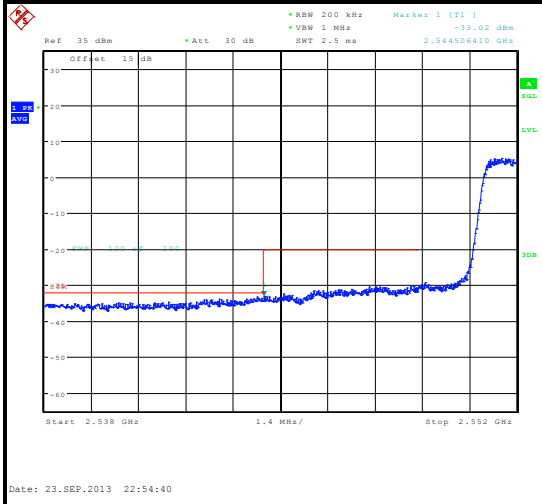

**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## Channel Bandwidth: 20MHz / 16QAM

| CHANNEL | 21350 | 100 RB |
|---|---|---|

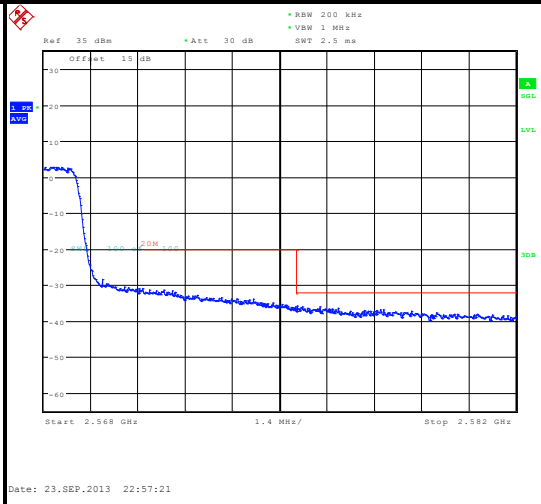



| CHANNEL | 21350 | 100 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

| CHANNEL | 21350 | 100 RB |
|---|---|---|




**Note:** Limit has been adjusted by 10*log(RBW) to reflect a 1MHz measurement bandwidth.

## 4.6 CONDUCTED SPURIOUS EMISSIONS

### 4.6.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

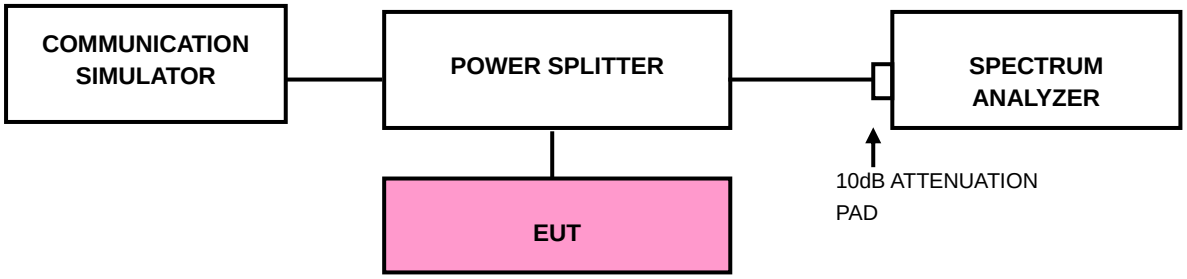
The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 55 +10 log10(P) dB. The limit of emission equal to –25dBm

### 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.

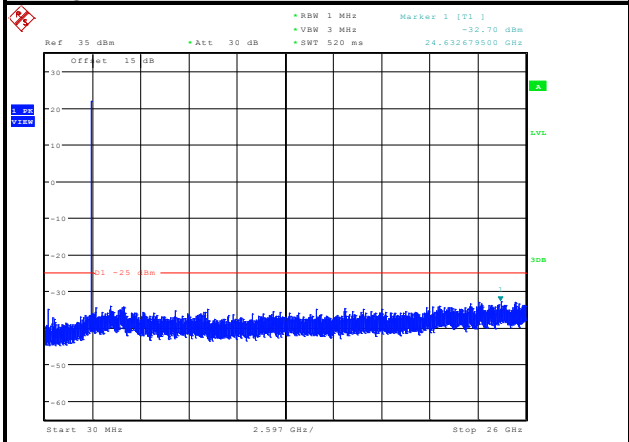
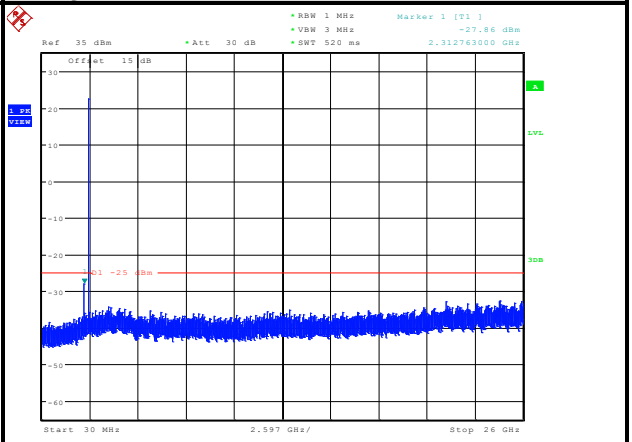
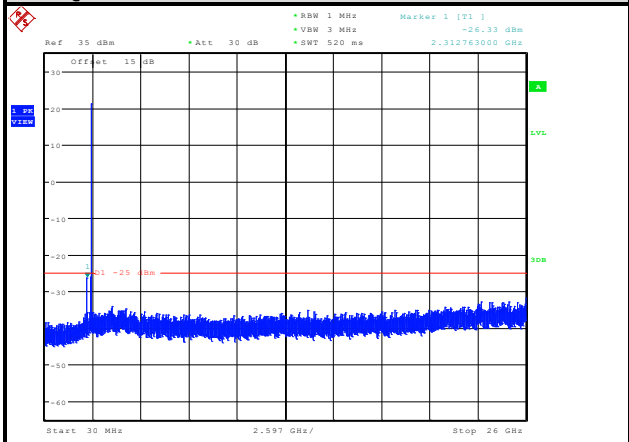
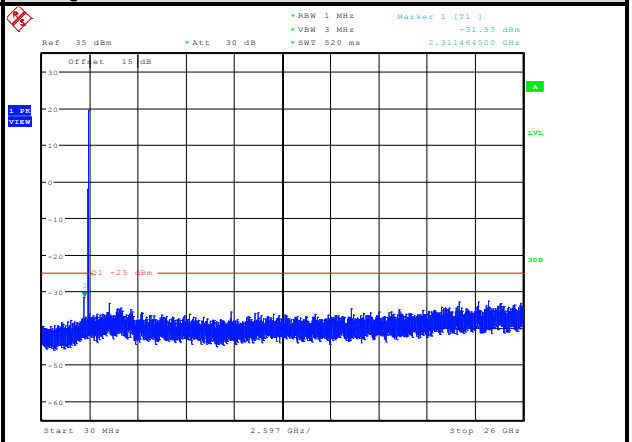
b. Measuring frequency range is from 30 MHz to 26GHz for LTE Band 7. 10dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz are used for conducted emission measurement.

### 4.6.3 TEST SETUP



## 4.6.4 TEST RESULTS

### LTE BAND 7

| CHANNEL 21100 | |
|---|---|
| **5MHz / QPSK** | **10MHz / QPSK** |
| **FREQUENCY RANGE : 30MHz~26GHz** | **FREQUENCY RANGE : 30MHz~26GHz** |
|  |  |
| Date: 23.SEP.2013 14:58:07 | Date: 23.SEP.2013 15:01:28 |
| **15MHz / QPSK** | **20MHz / QPSK** |
| **FREQUENCY RANGE : 30MHz~26GHz** | **FREQUENCY RANGE : 30MHz~26GHz** |
|  |  |
| Date: 23.SEP.2013 15:03:10 | Date: 23.SEP.2013 15:15:48 |

## 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 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.

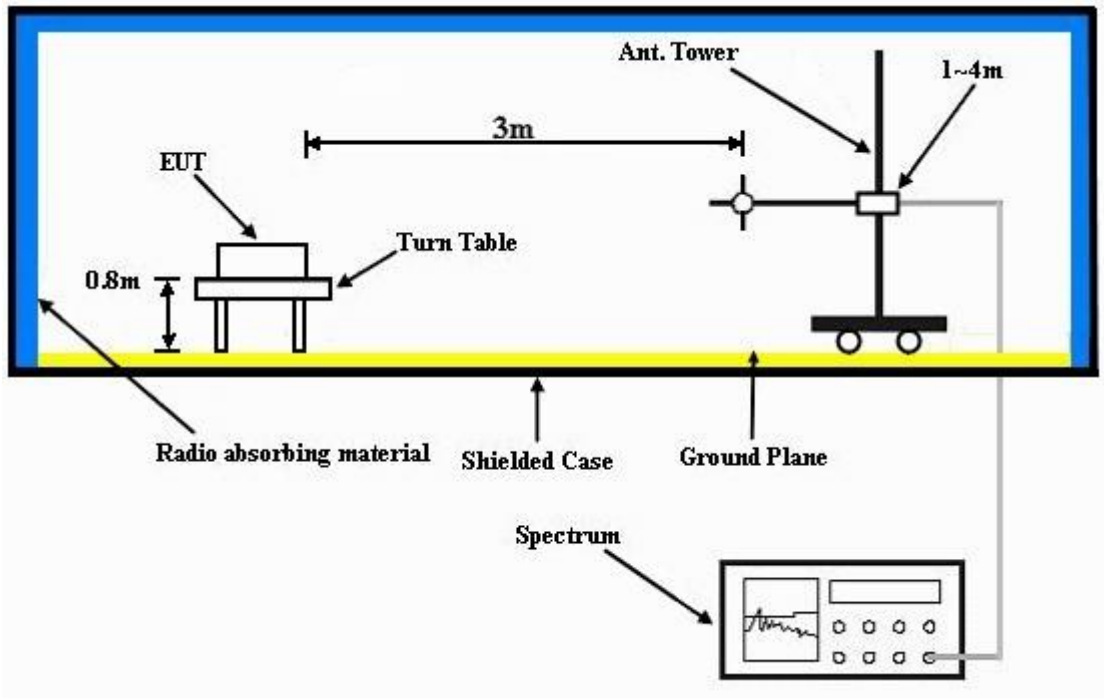
d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15dBi.

**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



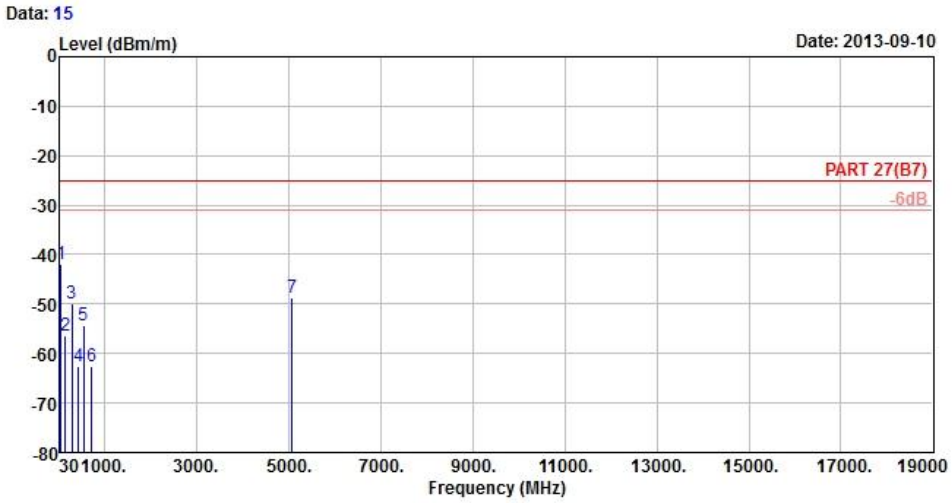

For the actual test configuration, please refer to the attached file (Test Setup Photo).

## 4.7.5 TEST RESULTS

### LTE BAND 7

**CHANNEL BANDWIDTH: 5MHz / QPSK**

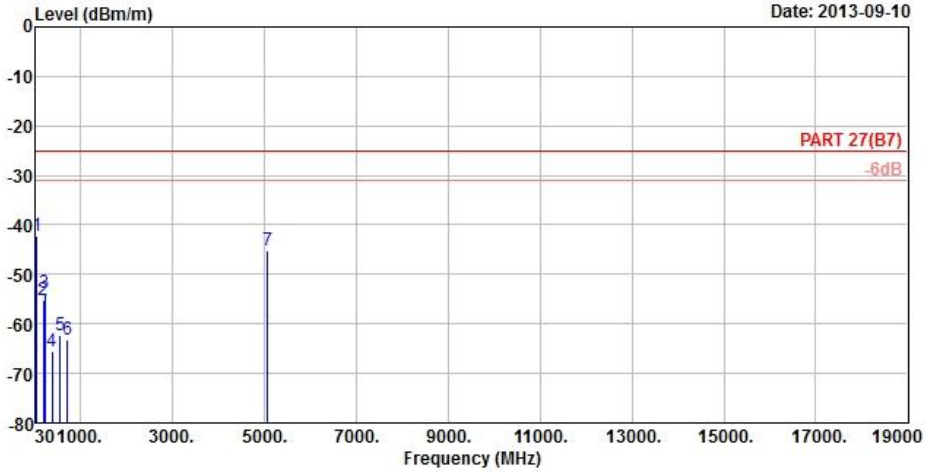
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch




Site : 966 Chamber 5
Condition : PART 27(B7) 3m HORIZONTAL
Brand/Model: CO3L
Remark : LTE_Band7 _5M_QPSK(1,0) Link
Tested by : Kay Wu
Temprature : 25℃
Humidity : 65%
Plane : X

| | Freq | Level | Read Level | Limit Line | Over Limit | Factor | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBm/m | dBm | dBm/m | dB | dB/m | |
| 1 pp | 44.31 | -42.04 | -40.85 | -25.00 | -17.04 | -1.19 | Peak |
| 2 | 146.91 | -56.28 | -50.11 | -25.00 | -31.28 | -6.17 | Peak |
| 3 | 284.07 | -49.90 | -43.74 | -25.00 | -24.90 | -6.16 | Peak |
| 4 | 439.30 | -62.71 | -58.08 | -25.00 | -37.71 | -4.63 | Peak |
| 5 | 542.20 | -54.41 | -52.46 | -25.00 | -29.41 | -1.95 | Peak |
| 6 | 715.80 | -62.61 | -64.17 | -25.00 | -37.61 | 1.56 | Peak |
| 7 | 5065.60 | -48.76 | -45.46 | -25.00 | -23.76 | -3.30 | Peak |

Data: 16

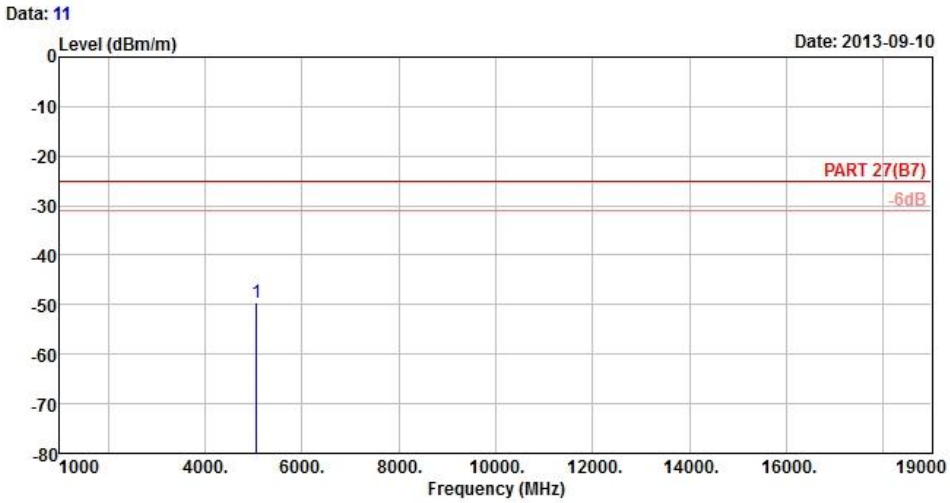



Site : 966 Chamber 5
Condition : PART 27(B7) 3m VERTICAL
Brand/Model: CO3L
Remark : LTE_Band7 _5M_QPSK(1,0) Link
Tested by : Kay Wu
Temprature : 25℃
Humidity : 65%
Plane : X

| | Freq | Level | Read Level | Limit Line | Over Limit | Factor | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBm/m | dBm | dBm/m | dB | dB/m | |
| 1 pp | 44.04 | -42.18 | -40.92 | -25.00 | -17.18 | -1.26 | Peak |
| 2 | 192.27 | -55.18 | -48.14 | -25.00 | -30.18 | -7.04 | Peak |
| 3 | 220.62 | -53.87 | -46.88 | -25.00 | -28.87 | -6.99 | Peak |
| 4 | 385.40 | -65.40 | -59.65 | -25.00 | -40.40 | -5.75 | Peak |
| 5 | 563.20 | -62.20 | -60.84 | -25.00 | -37.20 | -1.36 | Peak |
| 6 | 719.30 | -63.04 | -64.62 | -25.00 | -38.04 | 1.58 | Peak |
| 7 | 5065.60 | -45.25 | -41.95 | -25.00 | -20.25 | -3.30 | Peak |

## CHANNEL BANDWIDTH: 10MHz / QPSK

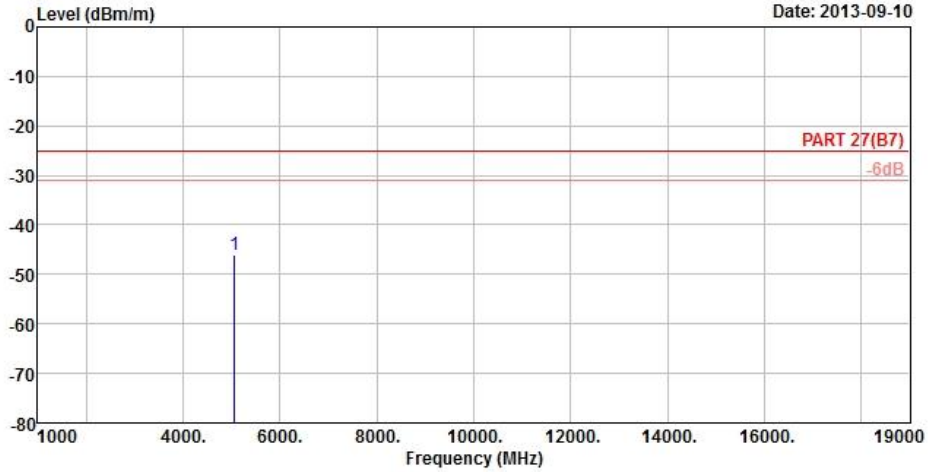
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch




Site : 966 Chamber 5
Condition : PART 27(B7) 3m HORIZONTAL
Brand/Model: CO3L
Remark : LTE_Band7 _10M_QPSK(1,0) Link
Tested by : Kay Wu
Temprature : 25℃
Humidity : 65%
Plane : X

| | Freq | Level | Read Level | Limit Line | Over Limit | Factor | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBm/m | dBm | dBm/m | dB | dB/m | |
| 1 pp | 5061.20 | -49.68 | -46.38 | -25.00 | -24.68 | -3.30 | Peak |

Data: 12

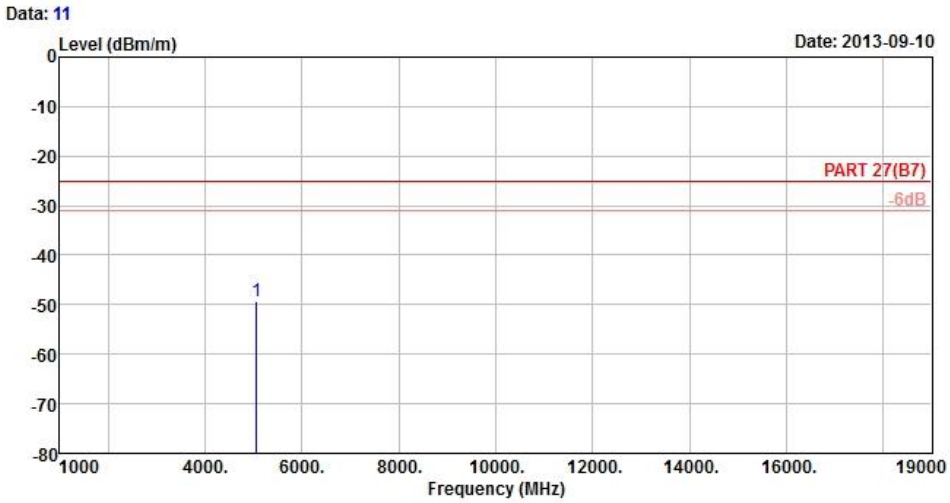



Site : 966 Chamber 5
Condition : PART 27(B7) 3m VERTICAL
Brand/Model: CO3L
Remark : LTE_Band7 _10M_QPSK(1,0) Link
Tested by : Kay Wu
Temprature : 25℃
Humidity : 65%
Plane : X

| | Freq | Level | Read Level | Limit Line | Over Limit | Factor | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBm/m | dBm | dBm/m | dB | dB/m | |
| 1 pp | 5061.20 | -46.09 | -42.79 | -25.00 | -21.09 | -3.30 | Peak |

## CHANNEL BANDWIDTH: 15MHz / QPSK

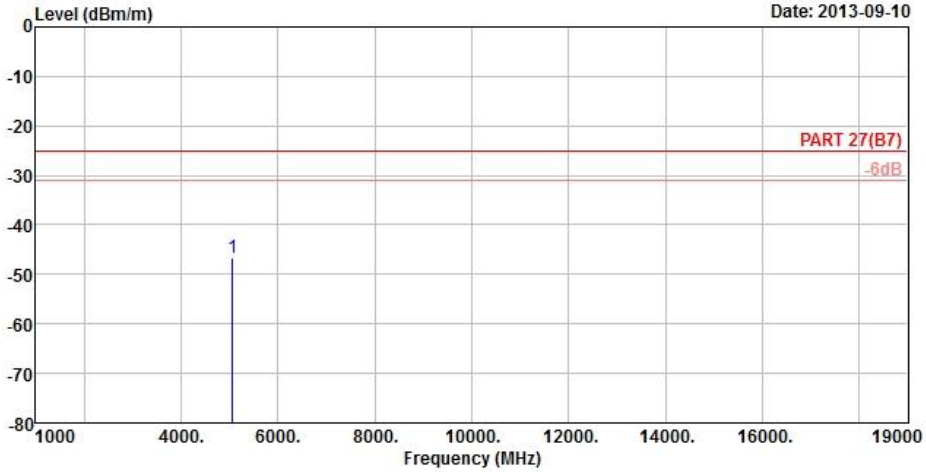
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch




Site : 966 Chamber 5
Condition : PART 27(B7) 3m HORIZONTAL
Brand/Model: CO3L
Remark : LTE_Band7 _15M_QPSK(1,0) Link
Tested by : Kay Wu
Temprature : 25℃
Humidity : 65%
Plane : X

| | Freq | Level | Read Level | Limit Line | Over Limit | Factor | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBm/m | dBm | dBm/m | dB | dB/m | |
| 1 pp | 5056.80 | -49.36 | -46.15 | -25.00 | -24.36 | -3.21 | Peak |

Data: 12

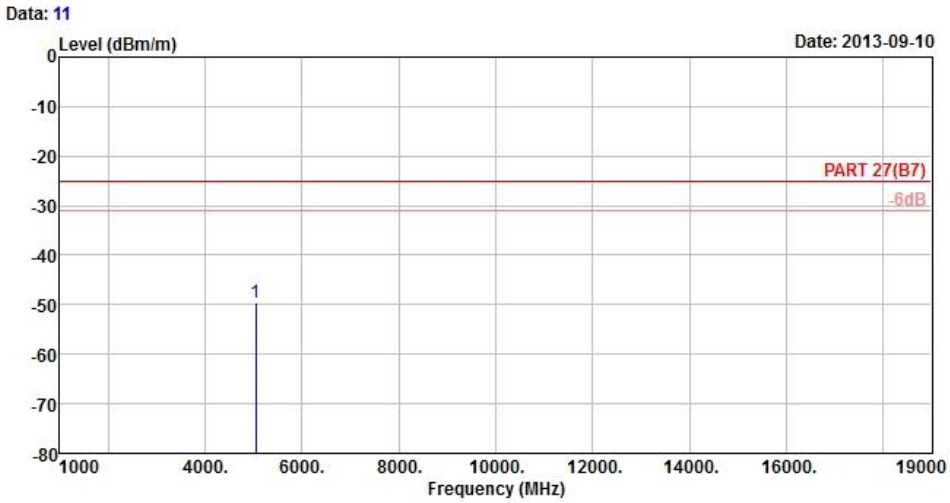



Site : 966 Chamber 5
Condition : PART 27(B7) 3m VERTICAL
Brand/Model: CO3L
Remark : LTE_Band7 _15M_QPSK(1,0) Link
Tested by : Kay Wu
Temprature : 25℃
Humidity : 65%
Plane : X

| | Freq | Level | Read Level | Limit Line | Over Limit | Factor | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBm/m | dBm | dBm/m | dB | dB/m | |
| 1 pp | 5056.80 | -46.51 | -43.30 | -25.00 | -21.51 | -3.21 | Peak |

## CHANNEL BANDWIDTH: 20MHz / QPSK

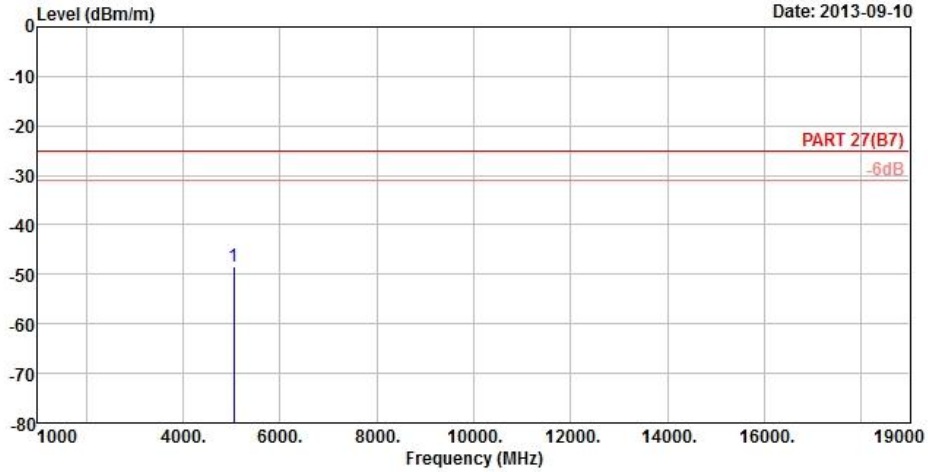
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch




Site : 966 Chamber 5
Condition : PART 27(B7) 3m HORIZONTAL
Brand/Model: CO3L
Remark : LTE_Band7 _20M_QPSK(1,0) Link
Tested by : Kay Wu
Temprature : 25℃
Humidity : 65%
Plane : X

| | Freq | Level | Read Level | Limit Line | Over Limit | Factor | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBm/m | dBm | dBm/m | dB | dB/m | |
| 1 pp | 5052.40 | -49.63 | -46.42 | -25.00 | -24.63 | -3.21 | Peak |

Data: 12




Site : 966 Chamber 5
Condition : PART 27(B7) 3m VERTICAL
Brand/Model: CO3L
Remark : LTE_Band7 _20M_QPSK(1,0) Link
Tested by : Kay Wu
Temprature : 25℃
Humidity : 65%
Plane : X

| | Freq | Level | Read Level | Limit Line | Over Limit | Factor | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBm/m | dBm | dBm/m | dB | dB/m | |
| 1 pp | 5052.40 | -48.54 | -45.33 | -25.00 | -23.54 | -3.21 | Peak |

# 5 INFORMATION ON THE TESTING LABORATORIES

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

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

**Linko EMC/RF Lab**:
Tel: 886-2-26052180
Fax: 886-2-26051924

**Hsin Chu EMC/RF Lab**:
Tel: 886-3-5935343
Fax: 886-3-5935342

**Hwa Ya EMC/RF/Safety/Telecom Lab**:
Tel: 886-3-3183232
Fax: 886-3-3270892

**Email:** service.adt@tw.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.

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

No modifications were made to the EUT by the lab during the test.

**---END---**