

## FCC Test Report

### (PART 27)

**Report No.:** RF150326E02D

**FCC ID:** 2AD8UFZPFWIE01

**Test Model:** FWIE

**Received Date:** Mar. 26, 2015

**Test Date:** Apr. 01 to 07, 2015

**Issued Date:** July 27, 2015

**Applicant:** Nokia Solutions and Networks

**Address:** 1455 West Shure Drive, Arlington Heights, IL 60004, USA

**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
Hsin Chu Laboratory

**Lab Address:** No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen, Chiung Lin Hsiang, Hsin  
Chu Hsien 307, Taiwan R.O.C.

**Test Location (1):** No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen, Chiung Lin Hsiang, Hsin  
Chu Hsien 307, Taiwan R.O.C.

**Test Location (2):** No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin  
Chu Hsien 307, Taiwan R.O.C.



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A D T

### Release Control Record

| Issue No.    | Description       | Date Issued   |
|--------------|-------------------|---------------|
| RF150326E02D | Original release. | July 27, 2015 |

## 1 Certificate of Conformity

**Product:** Flexi Zone Indoor Pico BTS

**Brand:** Nokia

**Test Model:** FWIE

**Sample Status:** ENGINEERING SAMPLE

**Applicant:** Nokia Solutions and Networks

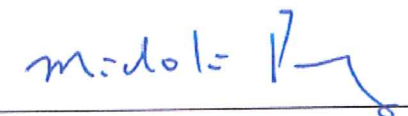
**Test Date:** Apr. 01 to 07, 2015

**Standards:** FCC Part 27

FCC Part 2

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

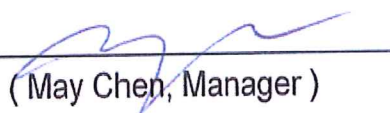
**Prepared by :**



( Midoli Peng, Specialist )

**Date:** July 27, 2015

**Approved by :**



( May Chen, Manager )

**Date:** July 27, 2015

## 2 Summary of Test Results

| Applied Standard: FCC Part 27 & Part 2 |                                                                    |        |                                                                                     |
|----------------------------------------|--------------------------------------------------------------------|--------|-------------------------------------------------------------------------------------|
| FCC Clause                             | Test Item                                                          | Result | Remarks                                                                             |
| 2.1046<br>27.50(d)(4)                  | Equivalent Isotropically radiated power                            | PASS   | Meet the requirement of limit.                                                      |
| 2.1055<br>27.54                        | Frequency Stability<br>Stay with the authorized bands of operation | PASS   | Meet the requirement of limit.                                                      |
| 2.1049<br>27.53(h)                     | Occupied Bandwidth                                                 | PASS   | Meet the requirement of limit.                                                      |
| 27.53(h)                               | Band Edge Measurements                                             | PASS   | Meet the requirement of limit.                                                      |
| ---                                    | Peak To Average Ratio                                              | PASS   | Meet the requirement of limit.                                                      |
| 2.1051<br>27.53(h)                     | Conducted Spurious Emissions                                       | PASS   | Meet the requirement of limit.                                                      |
| 2.1053<br>27.53(h)                     | Radiated Spurious Emissions                                        | PASS   | Meet the requirement of limit.<br>Minimum passing margin is -15.44dB at 19192.5MHz. |

### 2.1 Measurement Uncertainty

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

| Measurement                    | Frequency     | Expanded Uncertainty (k=2) ( $\pm$ ) |
|--------------------------------|---------------|--------------------------------------|
| Radiated Emissions up to 1 GHz | 30MHz ~ 1GHz  | 5.43 dB                              |
| Radiated Emissions above 1 GHz | 1GHz ~ 6GHz   | 3.72 dB                              |
|                                | 6GHz ~ 18GHz  | 4.00 dB                              |
|                                | 18GHz ~ 40GHz | 4.11 dB                              |

## 2.2 Test Site and Instruments

For radiated spurious emissions test:

| DESCRIPTION & MANUFACTURER              | MODEL NO.                | SERIAL NO.                                | CALIBRATED DATE | CALIBRATED UNTIL |
|-----------------------------------------|--------------------------|-------------------------------------------|-----------------|------------------|
| MXE EMI Receiver<br>Agilent             | N9038A                   | MY50010156                                | Aug. 11, 2014   | Aug. 10, 2015    |
| Pre-Amplifier<br>Mini-Circuits          | ZFL-1000VH2<br>B         | AMP-ZFL-04                                | Nov. 12, 2014   | Nov. 11, 2015    |
| Trilog Broadband Antenna<br>SCHWARZBECK | VULB 9168                | 9168-361                                  | Feb. 06, 2015   | Feb. 05, 2016    |
| RF Cable                                | NA                       | CHHCAB_001                                | Oct. 05, 2014   | Oct. 04, 2015    |
| Horn_Antenna<br>AISI                    | AIH.8018                 | 0000220091110                             | Aug. 26, 2014   | Aug. 25, 2015    |
| Pre-Amplifier<br>Agilent                | 8449B                    | 300801923                                 | Oct. 28, 2014   | Oct. 27, 2015    |
| RF Cable                                | NA                       | 131206<br>131213<br>131215<br>SNMY23685/4 | Jan. 16, 2015   | Jan. 15, 2016    |
| Spectrum Analyzer<br>R&S                | FSV40                    | 100964                                    | July 05, 2014   | July 04, 2015    |
| Pre-Amplifier<br>SPACEK LABS            | SLKKa-48-6               | 9K16                                      | Dec. 12, 2014   | Dec. 11, 2015    |
| Horn_Antenna<br>SCHWARZBECK             | BBHA 9170                | 9170-424                                  | Aug. 26, 2014   | Aug. 25, 2015    |
| RF Cable                                | NA                       | 329751/4<br>RF104-204                     | Dec. 11, 2014   | Dec. 10, 2015    |
| Software                                | ADT_Radiated<br>_V8.7.07 | NA                                        | NA              | NA               |
| Antenna Tower & Turn Table<br>CT        | NA                       | NA                                        | NA              | NA               |

### Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in 966 Chamber No. H.
4. The FCC Site Registration No. is 797305.
5. The CANADA Site Registration No. is IC 7450H-3.
6. Tested Date: Apr. 07, 2015

**For other test items:**

| DESCRIPTION & MANUFACTURER                                 | MODEL NO.                          | SERIAL NO.                            | CALIBRATED DATE | CALIBRATED UNTIL |
|------------------------------------------------------------|------------------------------------|---------------------------------------|-----------------|------------------|
| Spectrum Analyzer R&S                                      | FSP 40                             | 100037                                | Oct. 30, 2014   | Oct. 29, 2015    |
| Spectrum Analyzer Agilent                                  | E4446A                             | MY48250253                            | Dec. 18, 2014   | Dec. 17, 2015    |
| AC Power Source EXTECH Electronics                         | 6502                               | 1140503                               | NA              | NA               |
| Temperature & Humidity Chamber TERCHY                      | MHU-225AU                          | 911033                                | Dec. 08, 2014   | Dec. 07, 2015    |
| DC Power Supply GOOD WILL INSTRUMENT CO., LTD.             | GPC - 3030D                        | 7700087                               | NA              | NA               |
| ESG Vector signal generator Agilent                        | E4438C                             | MY47271330<br>506 602 UNJ             | Apr. 28, 2014   | Apr. 27, 2015    |
| Upgrade the software license on current E4438C ESG Agilent | E4438CK-403                        | ESG<br>E4_010004                      | NA              | NA               |
| ESG Vector signal generator Agilent                        | E4438C                             | MY45094468/<br>005 506 602<br>UK6 UNJ | Dec. 05, 2014   | Dec. 04, 2015    |
| Upgrade the software license on current E4438C ESG Agilent | E4438CK-403                        | ESG<br>E4_010001                      | NA              | NA               |
| Power meter Anritsu                                        | ML2495A                            | 0824006                               | May 22, 2014    | May 21, 2015     |
| Power sensor Anritsu                                       | MA2411B                            | 0738172                               | May 22, 2014    | May 21, 2015     |
| Software                                                   | Total Power Measurement Tools V7.1 | NA                                    | NA              | NA               |
| Software                                                   | ADT_RF Test Software V6.6.5.3      | NA                                    | NA              | NA               |

- NOTE:**
1. The test was performed in Oven room A.
  2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
  3. Tested Date: Apr. 01, 2015

### 3 General Information

#### 3.1 General Description of EUT

|                       |                                                                                                      |                      |
|-----------------------|------------------------------------------------------------------------------------------------------|----------------------|
| Product               | Flexi Zone Indoor Pico BTS                                                                           |                      |
| Brand                 | Nokia                                                                                                |                      |
| Test Model            | FWIE                                                                                                 |                      |
| Test Sample S/N       | EA150610120                                                                                          |                      |
| Hardware Version      | 473151A.X33 (Confirmation that the hardware version 473151A.X33 is fully identical with 473151A.101) |                      |
| Software Version      | Operating SW: FB_FZM_PS_LFS_OS_2014_05_59-0-g927a301<br>WiFi module SW: 9.8.1.0.14302702             |                      |
| Status of EUT         | ENGINEERING SAMPLE                                                                                   |                      |
| Power Supply Rating   | 12Vdc from power adapter or 55Vdc from POE                                                           |                      |
| Modulation Type       | QPSK, 16QAM, 64QAM                                                                                   |                      |
| Modulation Technology | FHSS / DSSS                                                                                          |                      |
| Transfer Rate         | Uplink : 75Mbps , Downlink : 300Mbps                                                                 |                      |
| Operating Frequency   | Channel Bandwidth: 5MHz                                                                              | 2112.5MHz ~2152.5MHz |
|                       | Channel Bandwidth: 10MHz                                                                             | 2115MHz ~2150MHz     |
|                       | Channel Bandwidth: 15MHz                                                                             | 2117.5MHz ~2147.5MHz |
|                       | Channel Bandwidth: 20MHz                                                                             | 2120MHz ~2145MHz     |
| Number of Channel     | Channel Bandwidth: 5MHz                                                                              | 401                  |
|                       | Channel Bandwidth: 10MHz                                                                             | 351                  |
|                       | Channel Bandwidth: 15MHz                                                                             | 301                  |
|                       | Channel Bandwidth: 20MHz                                                                             | 251                  |
| Max. EIRP Power       | Channel Bandwidth: 5MHz                                                                              | 1120.2mW (QPSK)      |
|                       | Channel Bandwidth: 10MHz                                                                             | 1146.3mW (QPSK)      |
|                       | Channel Bandwidth: 15MHz                                                                             | 1183.9mW (QPSK)      |
|                       | Channel Bandwidth: 20MHz                                                                             | 1154.3mW (QPSK)      |
| Emission Designator   | Channel Bandwidth: 5MHz                                                                              | QPSK: 4M52G7D        |
|                       |                                                                                                      | 16QAM: 4M52W7D       |
|                       |                                                                                                      | 64QAM: 4M52W7D       |
|                       | Channel Bandwidth: 10MHz                                                                             | QPSK: 9M00G7D        |
|                       |                                                                                                      | 16QAM: 9M00W7D       |
|                       |                                                                                                      | 64QAM: 9M00W7D       |
|                       | Channel Bandwidth: 15MHz                                                                             | QPSK: 13M7G7D        |
|                       |                                                                                                      | 16QAM: 13M7W7D       |
|                       |                                                                                                      | 64QAM: 13M7W7D       |
|                       | Channel Bandwidth: 20MHz                                                                             | QPSK: 18M1G7D        |
|                       |                                                                                                      | 16QAM: 18M1W7D       |
|                       |                                                                                                      | 64QAM: 18M1W7D       |

|                     |                        |
|---------------------|------------------------|
| Antenna Type        | Refer to note as below |
| Antenna Connector   | Refer to user's manual |
| Accessory Device    | Adapter x1             |
| Data Cable Supplied | NA                     |

Note:

1. There are BT, LTE and GPS technology used for the EUT.
2. The EUT incorporates a MIMO function for LTE mode

| Channel Bandwidth | Modulation         | TX & RX configuration |     |
|-------------------|--------------------|-----------------------|-----|
| 5MHz              | QPSK, 16QAM, 64QAM | 2TX                   | 2RX |
| 10MHz             | QPSK, 16QAM, 64QAM | 2TX                   | 2RX |
| 15MHz             | QPSK, 16QAM, 64QAM | 2TX                   | 2RX |
| 20MHz             | QPSK, 16QAM, 64QAM | 2TX                   | 2RX |

3. The EUT's spec. as below table:

| Model name | LTE        |                          | BT | GPS |
|------------|------------|--------------------------|----|-----|
|            | Freq.(MHz) | Band                     |    |     |
| FWIE       | DL         | BW 5MHz : 2112.5~2152.5  | ✓  | ✓   |
|            |            | BW 10MHz : 2115~2150     |    |     |
|            |            | BW 15MHz : 2117.5~2174.5 |    |     |
|            |            | BW 20MHz : 2120~2145     |    |     |

4. The emission of the simultaneous operation (BT & LTE) has been evaluated and no non-compliance was found.
5. The EUT must be supplied with a POE(option) or power adapter as following table:

| Brand | Model No.             | Spec.                                                                                                                                     |
|-------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| DVE   | DSA-60PFE-12 1 120500 | Input: 100-240V, 2.0A, 50/60Hz<br>AC input cable(1.8m, unshielded)<br>Output: 12V, 5A<br>DC output cable(1.2m, unshielded, with one core) |

6. The EUT was pre-tested under following test modes :

| Test Mode     | Description     |
|---------------|-----------------|
| <b>Mode A</b> | <b>With POE</b> |
| Mode B        | With adapter    |

For the above modes, the worst radiated emission (above 1GHz) test was found in **Mode A**. Therefore only the test data of the modes were recorded in this report.

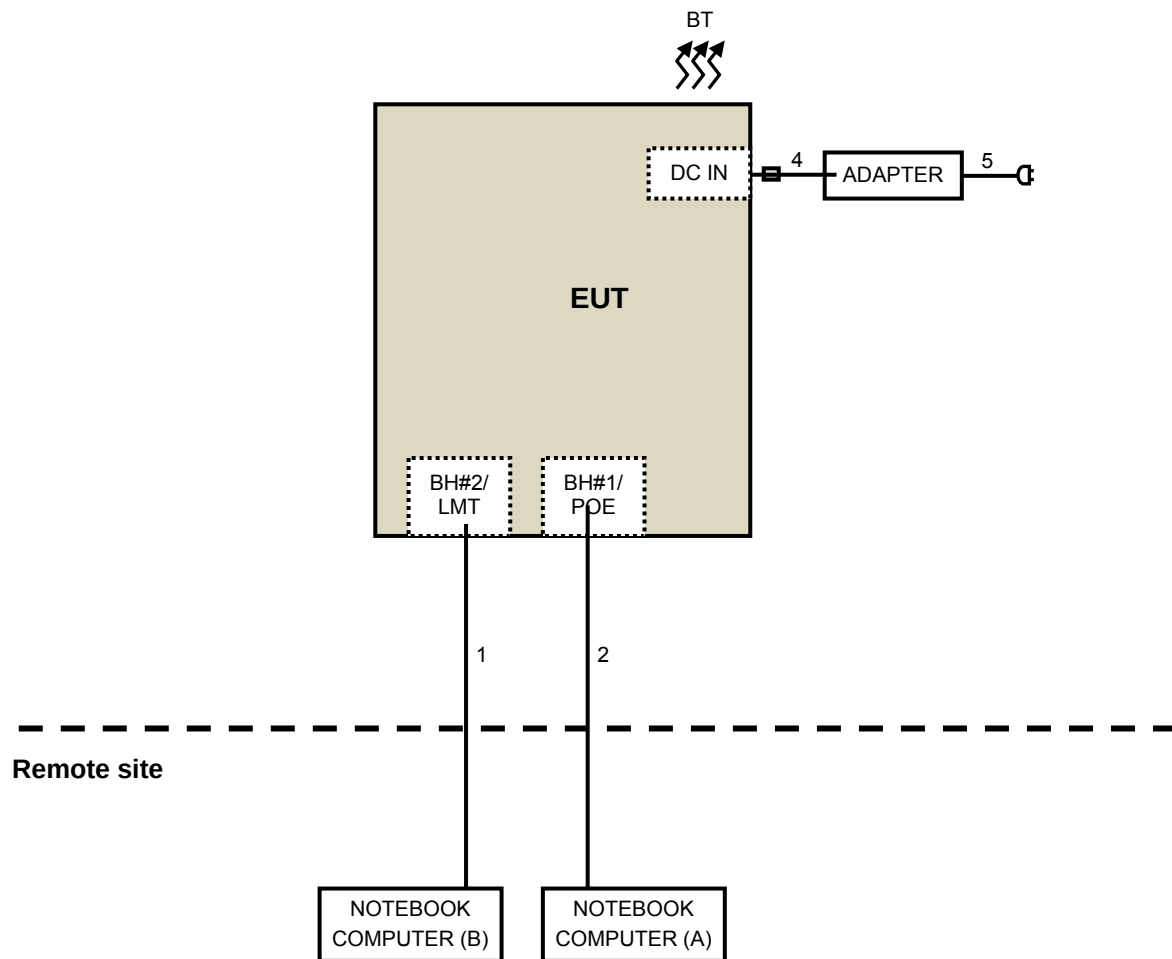
7. The antennas provided to the EUT, please refer to the following table:

| LTE Antenna Spec.             |        |                       |                                    |                                                     |                                     |                   |                                                 |
|-------------------------------|--------|-----------------------|------------------------------------|-----------------------------------------------------|-------------------------------------|-------------------|-------------------------------------------------|
| Antenna No                    | Brand  | Model                 | Antenna Type                       | Antenna Connector                                   | Gain(dBi)<br><Including cable loss> | Cable Length (mm) | Frequency (MHz)                                 |
| External LTE Ant (Main & Aux) | Pulse  | DASLTE500NFM MO-1405P | 1/4 Wave monopoles on ground plane | N-Female/1/4" low loss, low PIM, plenum rated cable | 5                                   | 500               | 1710~2170 (Band 4)                              |
| GPS Antenna Spec.             |        |                       |                                    |                                                     |                                     |                   |                                                 |
| Antenna No                    | Brand  | Model                 | Antenna Type                       | Antenna Connector                                   | Gain(dBi)<br><Including cable loss> | Cable Length (mm) | Frequency (MHz)                                 |
| External GPS Ant              | TongDa | T-543-8141037-9       | ElecPatch                          | SMA Male                                            | 4.0                                 | 9140 ± 100        | GPS : 1575.42 ± 3 MHz<br>Glonass : 1602 ± 8 MHz |
| BT Antenna Spec.              |        |                       |                                    |                                                     |                                     |                   |                                                 |
| Antenna No                    | Brand  | Model                 | Antenna Type                       | Antenna Connector                                   | Gain(dBi)<br><Including cable loss> | Cable Length (mm) | Frequency (MHz)                                 |
| Internal BT Ant               | INPAQ  | Fz PICO               | Chip                               | NA                                                  | -1.22                               | NA                | 2400~2500                                       |

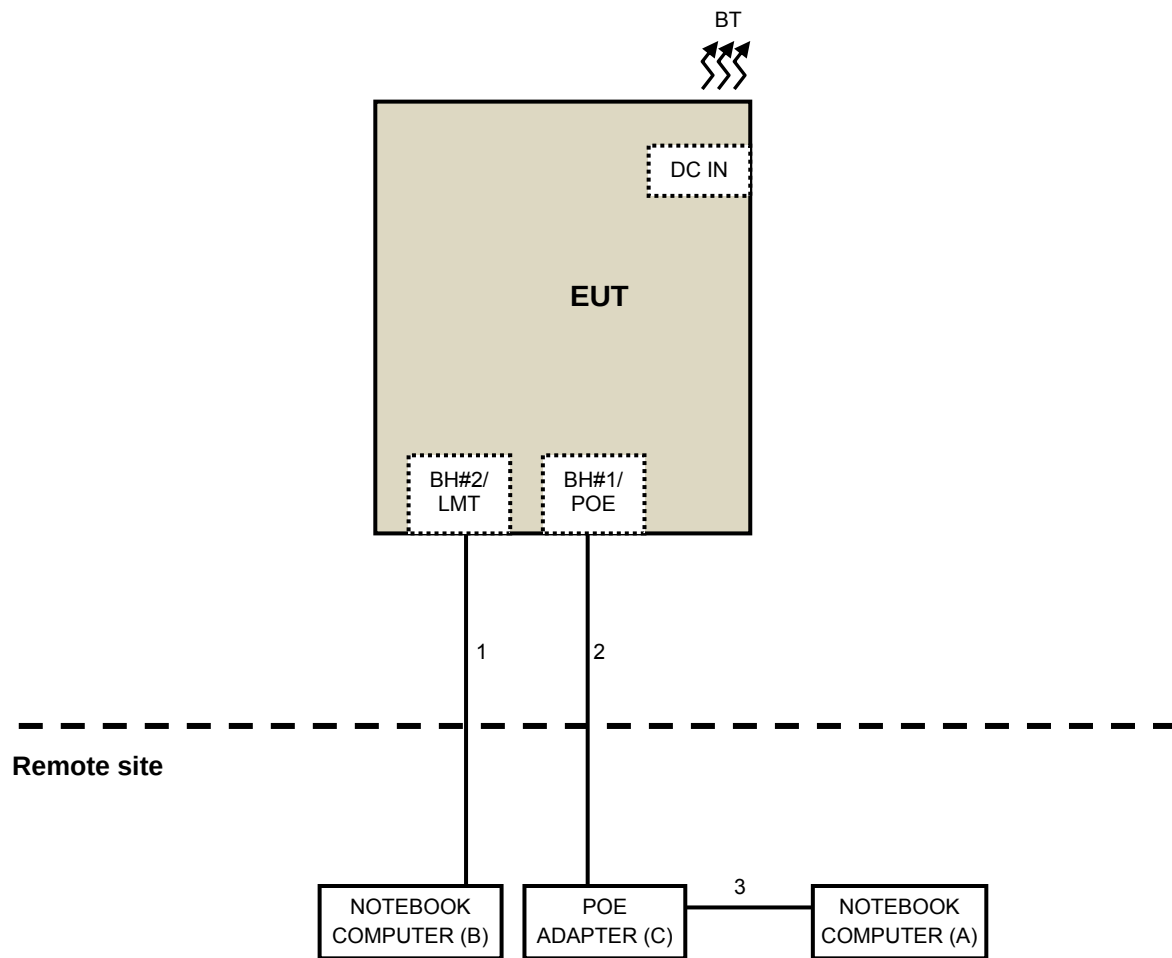
8. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

### 3.2 Configuration of System under Test

For Adapter mode:



For POE mode:



### 3.2.1 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| No. | Product           | Brand | Model No. | Serial No.         | FCC ID  | Remark          |
|-----|-------------------|-------|-----------|--------------------|---------|-----------------|
| A   | NOTEBOOK COMPUTER | DELL  | E5430     | HYV4VY1            | FCC DoC | Provided by Lab |
| B   | NOTEBOOK COMPUTER | DELL  | E6420     | H62T3R1            | FCC DoC | Provided by Lab |
| C   | POE ADAPTER       | NA    | PD-7001G  | D11326441001235A01 | FCC DoC | Provided by Lab |

**NOTE:**

1. All power cords of the above support units are non-shielded (1.8 m).

| No. | Cable | Qty. | Length (m) | Shielded (Yes/ No) | Cores (Number) | Remark          |
|-----|-------|------|------------|--------------------|----------------|-----------------|
| 1   | RJ-45 | 1    | 10         | No                 | 0              | Provided by Lab |
| 2   | RJ-45 | 1    | 10         | No                 | 0              | Provided by Lab |
| 3   | RJ-45 | 1    | 1.5        | No                 | 0              | Provided by Lab |

### 3.3 Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XY axis and antenna ports

The worst case was found when positioned on Y-plane. Following channel(s) was (were) selected for the final test as listed below:

| Test Item                    | Available Channel | Tested Channel   | Channel Bandwidth | Modulation         |
|------------------------------|-------------------|------------------|-------------------|--------------------|
| Output Power                 | 1975 to 2375      | 1975, 2175, 2375 | 5MHz              | QPSK               |
|                              | 2000 to 2350      | 2000, 2175, 2350 | 10MHz             | QPSK               |
|                              | 2025 to 2325      | 2025, 2175, 2325 | 15MHz             | QPSK               |
|                              | 2050 to 2300      | 2050, 2175, 2300 | 20MHz             | QPSK               |
| Frequency Stability          | 1975 to 2375      | 2175             | 5MHz              | QPSK               |
|                              | 2000 to 2350      | 2175             | 10MHz             | QPSK               |
|                              | 2025 to 2325      | 2175             | 15MHz             | QPSK               |
|                              | 2050 to 2300      | 2175             | 20MHz             | QPSK               |
| Emission Bandwidth           | 1975 to 2375      | 1975, 2175, 2375 | 5MHz              | QPSK, 16QAM, 64QAM |
|                              | 2000 to 2350      | 2000, 2175, 2350 | 10MHz             | QPSK, 16QAM, 64QAM |
|                              | 2025 to 2325      | 2025, 2175, 2325 | 15MHz             | QPSK, 16QAM, 64QAM |
|                              | 2050 to 2300      | 2050, 2175, 2300 | 20MHz             | QPSK, 16QAM, 64QAM |
| Channel Edge                 | 1975 to 2375      | 1975, 2375       | 5MHz              | QPSK               |
|                              | 2000 to 2350      | 2000, 2350       | 10MHz             | QPSK               |
|                              | 2025 to 2325      | 2025, 2325       | 15MHz             | QPSK               |
|                              | 2050 to 2300      | 2050, 2300       | 20MHz             | QPSK               |
| Peak To Average Ratio        | 1975 to 2375      | 1975, 2175, 2375 | 5MHz              | QPSK, 16QAM, 64QAM |
|                              | 2000 to 2350      | 2000, 2175, 2350 | 10MHz             | QPSK, 16QAM, 64QAM |
|                              | 2025 to 2325      | 2025, 2175, 2325 | 15MHz             | QPSK, 16QAM, 64QAM |
|                              | 2050 to 2300      | 2050, 2175, 2300 | 20MHz             | QPSK, 16QAM, 64QAM |
| Conducuted Emission          | 1975 to 2375      | 1975, 2175, 2375 | 5MHz              | QPSK               |
|                              | 2000 to 2350      | 2000, 2175, 2350 | 10MHz             | QPSK               |
|                              | 2025 to 2325      | 2025, 2175, 2325 | 15MHz             | QPSK               |
|                              | 2050 to 2300      | 2050, 2175, 2300 | 20MHz             | QPSK               |
| Radiated Emission Below 1GHz | 1975 to 2375      | 1975, 2175, 2375 | 5MHz              | QPSK               |
|                              | 2000 to 2350      | 2000, 2175, 2350 | 10MHz             | QPSK               |
|                              | 2025 to 2325      | 2025, 2175, 2325 | 15MHz             | QPSK               |
|                              | 2050 to 2300      | 2050, 2175, 2300 | 20MHz             | QPSK               |
| Radiated Emission Above 1GHz | 1975 to 2375      | 1975, 2175, 2375 | 5MHz              | QPSK               |
|                              | 2000 to 2350      | 2000, 2175, 2350 | 10MHz             | QPSK               |
|                              | 2025 to 2325      | 2025, 2175, 2325 | 15MHz             | QPSK               |
|                              | 2050 to 2300      | 2050, 2175, 2300 | 20MHz             | QPSK               |

#### NOTE:

1. For radiated emission, the low, mid and high channels were pre-tested in chamber. The mid channel was the worst case and chosen for final test.
2. All supported modulation types were evaluated. The Worst case emaisson of QPSK was selected. Therefore, the EIRP power, Frequency Stability, Channel Edge, Conducuted Emission and Radiated Emission were presented under QPSK mode only.

**Test Condition:**

| Test Item             | Environmental Conditions | Input Power  | Tested By  |
|-----------------------|--------------------------|--------------|------------|
| Output Power          | 25deg. C, 63%RH          | 120Vac, 60Hz | James Chan |
| Frequency Stability   | 25deg. C, 63%RH          | 120Vac, 60Hz | James Chan |
| Emission Bandwidth    | 25deg. C, 63%RH          | 120Vac, 60Hz | James Chan |
| Band Edge             | 25deg. C, 63%RH          | 120Vac, 60Hz | James Chan |
| Peak To Average Ratio | 25deg. C, 63%RH          | 120Vac, 60Hz | James Chan |
| Conducuted Emission   | 25deg. C, 63%RH          | 120Vac, 60Hz | James Chan |
| Radiated Emission     | 24deg. C, 62%RH          | 120Vac, 60Hz | Tim Ho     |

### 3.4 EUT Operating Conditions

The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency

### 3.5 General Description of Applied Standards

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

**FCC 47 CFR Part 2**

**FCC 47 CFR Part 27**

**KDB 971168 D01 Power Meas License Digital Systems v02r01**

**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(d)(2) that are limited to EIRP of 1640 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz.

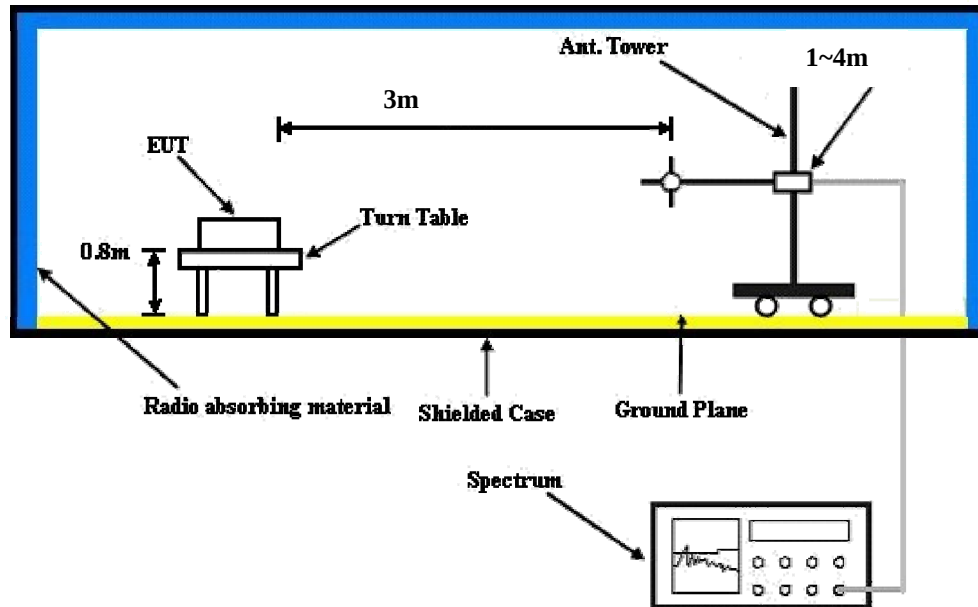
#### 4.1.2 Test Procedures

EIRP / ERP Measurement:

- a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 10MHz for LTE mode.
- b. Substitution method is used for EIRP 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.  $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}.$

#### 4.1.3 Test Setup

EIRP / ERP MEASUREMENT:



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

#### 4.1.4 Test Results

##### EIRP Power (dBm)

| LTE Band 4                     |                 |           |                       |           |          |
|--------------------------------|-----------------|-----------|-----------------------|-----------|----------|
| Channel Bandwidth: 5MHz / QPSK |                 |           |                       |           |          |
| Channel                        | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) |
| 1975                           | 2112.5          | 24.0      | 6.4                   | 30.4      | 1094.7   |
| 2175                           | 2132.5          | 24.1      | 6.4                   | 30.5      | 1120.2   |
| 2375                           | 2152.5          | 23.9      | 6.4                   | 30.3      | 1082.2   |

| LTE Band 4                      |                 |           |                       |           |          |
|---------------------------------|-----------------|-----------|-----------------------|-----------|----------|
| Channel Bandwidth: 10MHz / QPSK |                 |           |                       |           |          |
| Channel                         | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) |
| 2000                            | 2115            | 24.1      | 6.4                   | 30.5      | 1130.6   |
| 2175                            | 2132.5          | 24.2      | 6.4                   | 30.6      | 1146.3   |
| 2350                            | 2150            | 24.0      | 6.4                   | 30.5      | 1110.0   |

| LTE Band 4                      |                 |           |                       |           |          |
|---------------------------------|-----------------|-----------|-----------------------|-----------|----------|
| Channel Bandwidth: 15MHz / QPSK |                 |           |                       |           |          |
| Channel                         | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) |
| 2025                            | 2117.5          | 24.2      | 6.4                   | 30.6      | 1154.3   |
| 2175                            | 2132.5          | 24.3      | 6.4                   | 30.7      | 1183.9   |
| 2325                            | 2147.5          | 24.2      | 6.4                   | 30.6      | 1156.9   |

| LTE Band 4                      |                 |           |                       |           |          |
|---------------------------------|-----------------|-----------|-----------------------|-----------|----------|
| Channel Bandwidth: 20MHz / QPSK |                 |           |                       |           |          |
| Channel                         | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) |
| 2050                            | 2120            | 24.0      | 6.4                   | 30.4      | 1102.3   |
| 2175                            | 2132.5          | 24.2      | 6.4                   | 30.6      | 1154.3   |
| 2300                            | 2145            | 24.1      | 6.4                   | 30.5      | 1130.6   |

## 4.2 Frequency Stability Measurement

### 4.2.1 Limits of Frequency Stability Measurement

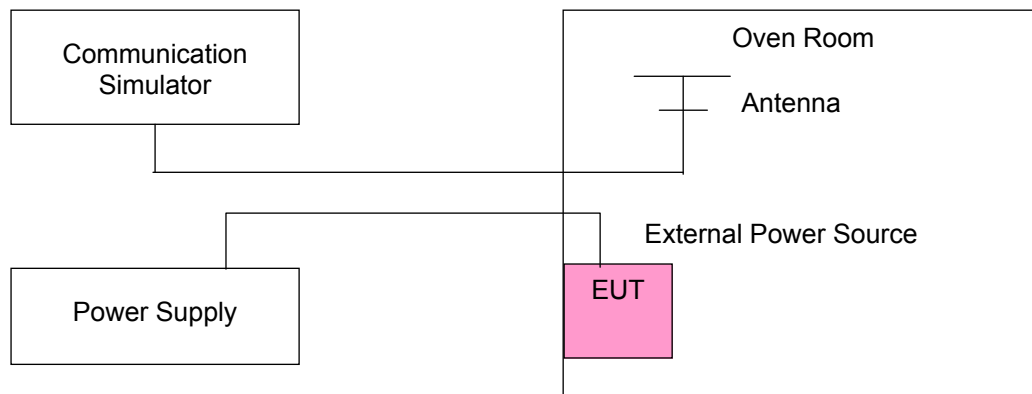
According to the FCC part 2.1055 shall be tested the frequency stability. The rule is defined that "The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block." The test extreme voltage is according to the 2.1055(d)(1) Vary primary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

### 4.2.2 Test Procedure

- Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
- The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
- The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the  $\pm 0.5^{\circ}\text{C}$  during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

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

### 4.2.3 Test Setup



#### 4.2.4 Test Results (With POE)

##### Frequency Error vs. Voltage

| Voltage<br>(Volts) | Frequency Error (ppm) |       |       |       | Limit (ppm) |
|--------------------|-----------------------|-------|-------|-------|-------------|
|                    | 5MHz                  | 10MHz | 15MHz | 20MHz |             |
| 102                | 0.001                 | 0.002 | 0.002 | 0.002 | 2.5         |
| 138                | 0.002                 | 0.002 | 0.002 | 0.002 | 2.5         |

| TEMP. (°C) | Frequency Error (ppm) |       |       |       | Limit (ppm) |
|------------|-----------------------|-------|-------|-------|-------------|
|            | 5MHz                  | 10MHz | 15MHz | 20MHz |             |
| 75         | 0.002                 | 0.002 | 0.002 | 0.002 | 2.5         |
| 70         | 0.002                 | 0.002 | 0.002 | 0.002 | 2.5         |
| 60         | 0.002                 | 0.002 | 0.001 | 0.002 | 2.5         |
| 50         | 0.001                 | 0.001 | 0.002 | 0.002 | 2.5         |
| 40         | 0.001                 | 0.001 | 0.002 | 0.002 | 2.5         |
| 30         | 0.001                 | 0.001 | 0.001 | 0.002 | 2.5         |
| 20         | 0.002                 | 0.002 | 0.002 | 0.002 | 2.5         |
| 10         | 0.002                 | 0.002 | 0.002 | 0.002 | 2.5         |
| 0          | 0.002                 | 0.002 | 0.002 | 0.001 | 2.5         |
| -10        | 0.002                 | 0.002 | 0.002 | 0.002 | 2.5         |
| -20        | 0.002                 | 0.002 | 0.002 | 0.002 | 2.5         |
| -30        | 0.002                 | 0.002 | 0.001 | 0.001 | 2.5         |

#### 4.2.5 Test Results (With Adapter)

##### Frequency Error vs. Voltage

| Voltage (Volts) | Frequency Error (ppm) |       |       |       | Limit (ppm) |
|-----------------|-----------------------|-------|-------|-------|-------------|
|                 | 5MHz                  | 10MHz | 15MHz | 20MHz |             |
| 102             | 0.002                 | 0.002 | 0.002 | 0.002 | 2.5         |
| 138             | 0.001                 | 0.002 | 0.002 | 0.001 | 2.5         |

| TEMP. (°C) | Frequency Error (ppm) |       |       |       | Limit (ppm) |
|------------|-----------------------|-------|-------|-------|-------------|
|            | 5MHz                  | 10MHz | 15MHz | 20MHz |             |
| 75         | 0.002                 | 0.001 | 0.001 | 0.001 | 2.5         |
| 70         | 0.002                 | 0.002 | 0.002 | 0.002 | 2.5         |
| 60         | 0.001                 | 0.002 | 0.002 | 0.002 | 2.5         |
| 50         | 0.002                 | 0.002 | 0.002 | 0.002 | 2.5         |
| 40         | 0.002                 | 0.002 | 0.001 | 0.001 | 2.5         |
| 30         | 0.001                 | 0.002 | 0.002 | 0.001 | 2.5         |
| 20         | 0.002                 | 0.001 | 0.001 | 0.002 | 2.5         |
| 10         | 0.002                 | 0.002 | 0.001 | 0.001 | 2.5         |
| 0          | 0.002                 | 0.001 | 0.002 | 0.002 | 2.5         |
| -10        | 0.002                 | 0.002 | 0.001 | 0.002 | 2.5         |
| -20        | 0.002                 | 0.002 | 0.001 | 0.002 | 2.5         |
| -30        | 0.002                 | 0.001 | 0.002 | 0.002 | 2.5         |

### 4.3 Emission Bandwidth Measurement

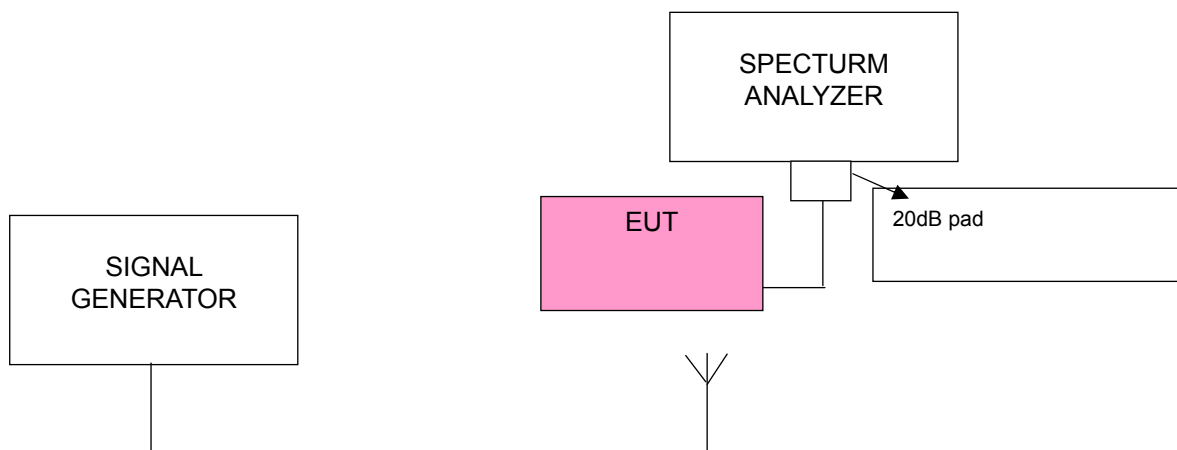
#### 4.3.1 Limits of Emission Bandwidth Measurement

According to FCC 27.53(m)(6) specified that emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power.

#### 4.3.2 Test Procedure

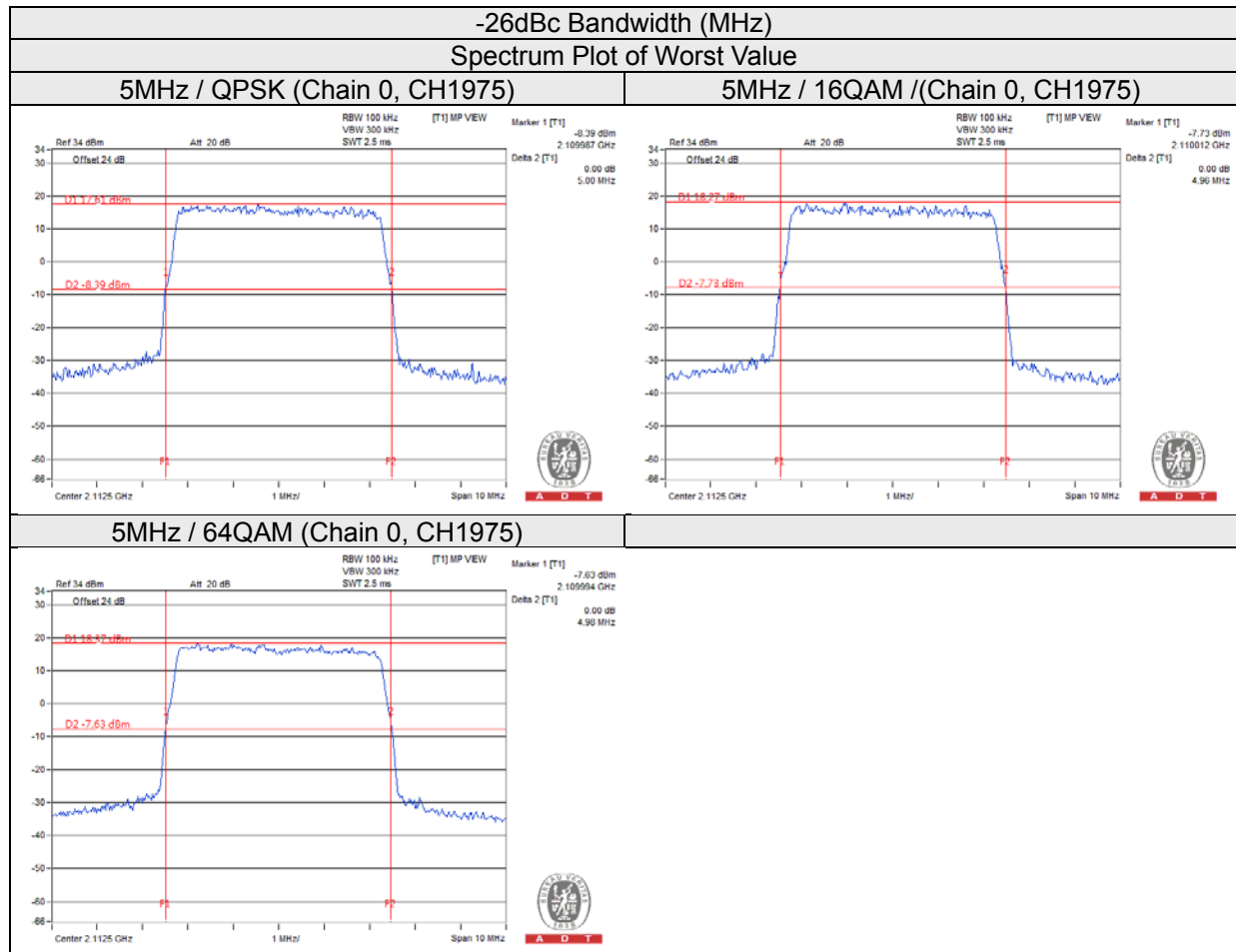
The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW = 100kHz and VBW = 300kHz (Channel Bandwidth: 5MHz), RBW = 200kHz and VBW = 620kHz (Channel Bandwidth: 10MHz), RBW = 510kHz and VBW = 1.5MHz (Channel Bandwidth: 15MHz and 20MHz).

#### 4.3.3 Test Setup



#### 4.3.4 Test Results (-26dBc Bandwidth)

| Channel Bandwidth: 5MHz |                 |                        |       |       |        |       |       |
|-------------------------|-----------------|------------------------|-------|-------|--------|-------|-------|
| Channel                 | Frequency (MHz) | -26dBc Bandwidth (MHz) |       |       |        |       |       |
|                         |                 | Chain0                 |       |       | Chain1 |       |       |
|                         |                 | QPSK                   | 16QAM | 64QAM | QPSK   | 16QAM | 64QAM |
| 1975                    | 2112.5          | 5                      | 4.96  | 4.98  | 4.94   | 4.92  | 4.98  |
| 2175                    | 2132.5          | 4.93                   | 4.96  | 4.97  | 4.92   | 4.94  | 4.91  |
| 2375                    | 2152.5          | 4.99                   | 4.95  | 4.95  | 4.99   | 4.95  | 4.96  |



## Channel Bandwidth: 10MHz

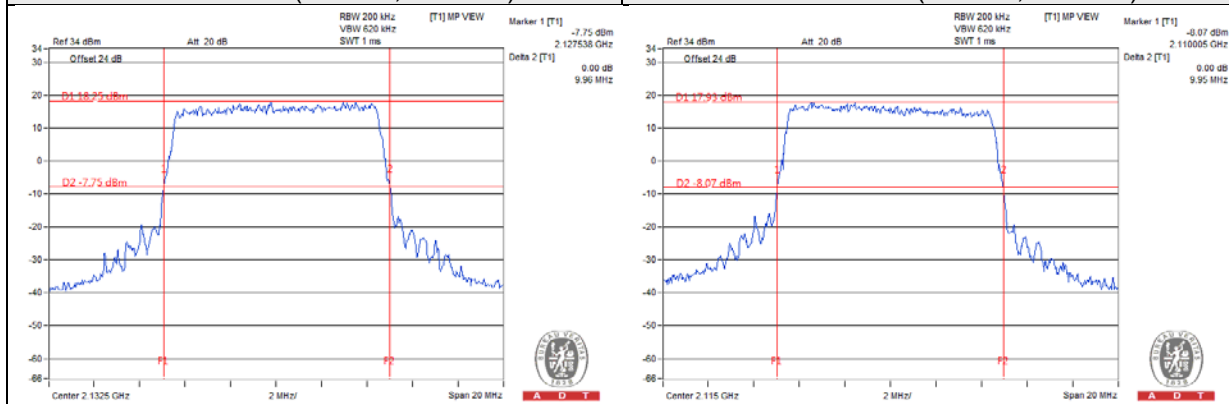
| Channel | Frequency (MHz) | -26dBc Bandwidth (MHz) |       |       |        |       |       |
|---------|-----------------|------------------------|-------|-------|--------|-------|-------|
|         |                 | Chain0                 |       |       | Chain1 |       |       |
|         |                 | QPSK                   | 16QAM | 64QAM | QPSK   | 16QAM | 64QAM |
| 2000    | 2115            | 9.87                   | 9.95  | 9.91  | 9.89   | 9.94  | 9.93  |
| 2175    | 2132.5          | 9.87                   | 9.93  | 9.93  | 9.96   | 9.89  | 9.87  |
| 2350    | 2150            | 9.92                   | 9.92  | 9.8   | 9.88   | 9.86  | 9.86  |

## -26dBc Bandwidth (MHz)

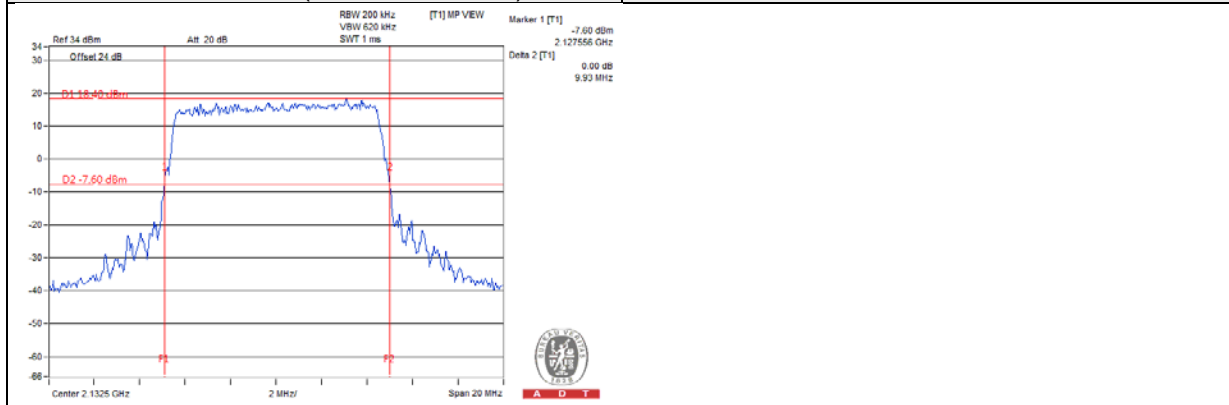
## Spectrum Plot of Worst Value

## 10MHz / QPSK(Chain 1, CH2175)

## 10MHz / 16QAM(Chain 0, CH2000)



## 10MHz / 64QAM(Chain 0, CH2175)



## Channel Bandwidth: 15MHz

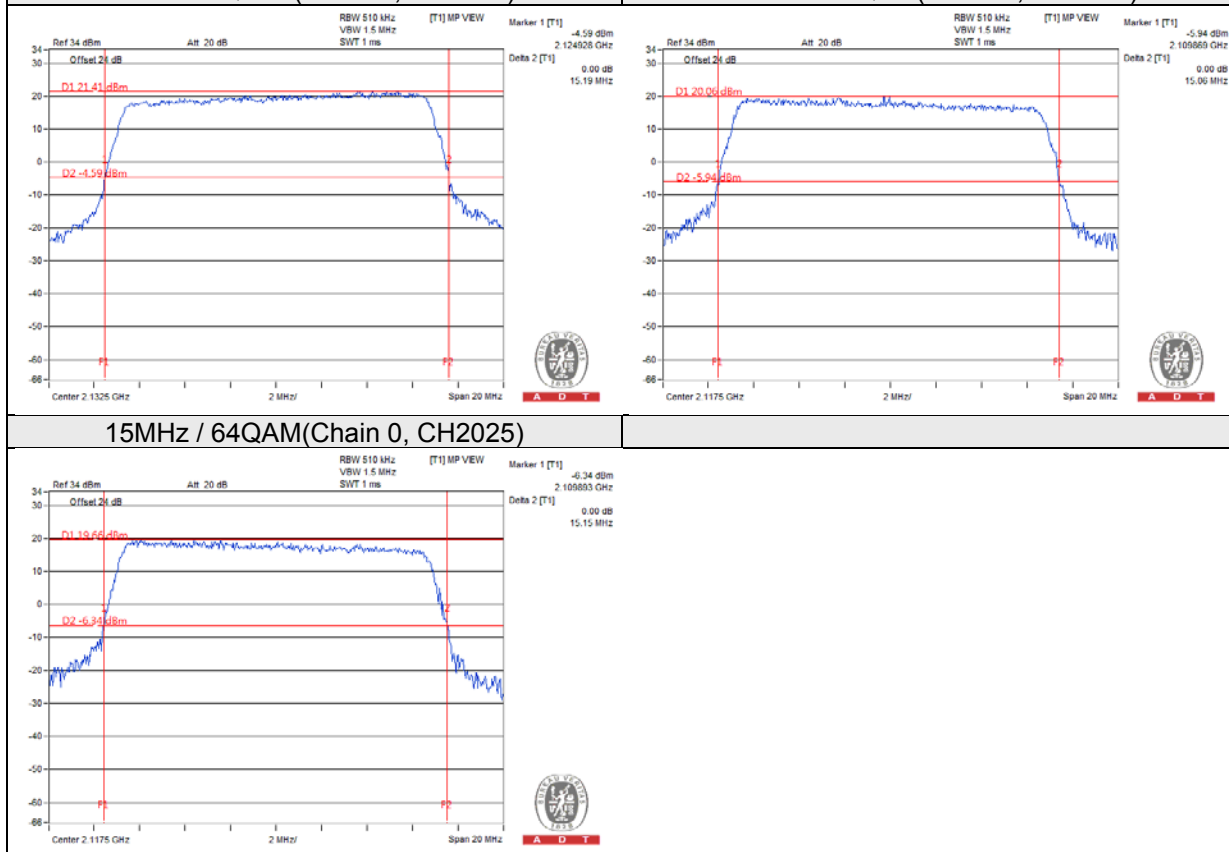
| Channel | Frequency (MHz) | -26dBc Bandwidth (MHz) |       |       |        |       |       |
|---------|-----------------|------------------------|-------|-------|--------|-------|-------|
|         |                 | Chain0                 |       |       | Chain1 |       |       |
|         |                 | QPSK                   | 16QAM | 64QAM | QPSK   | 16QAM | 64QAM |
| 2025    | 2117.5          | 15.13                  | 15.02 | 15.15 | 15.12  | 15.06 | 15.05 |
| 2175    | 2132.5          | 15.19                  | 15.05 | 14.86 | 15.09  | 15.06 | 15.09 |
| 2325    | 2147.5          | 14.92                  | 14.91 | 15    | 15.01  | 14.95 | 14.8  |

## -26dBc Bandwidth (MHz)

## Spectrum Plot of Worst Value

## 15MHz / QPSK(Chain 0, CH2175)

## 15MHz / 16QAM(Chain 1, CH2025)



## Channel Bandwidth: 20MHz

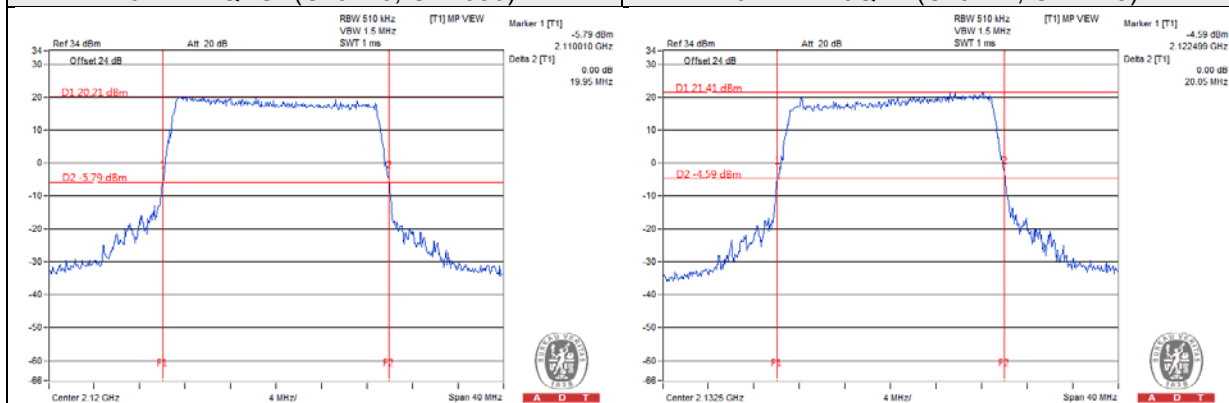
| Channel | Frequency (MHz) | -26dBc Bandwidth (MHz) |       |       |        |       |       |
|---------|-----------------|------------------------|-------|-------|--------|-------|-------|
|         |                 | Chain0                 |       |       | Chain1 |       |       |
|         |                 | QPSK                   | 16QAM | 64QAM | QPSK   | 16QAM | 64QAM |
| 2050    | 2120            | 19.95                  | 20.03 | 19.97 | 19.9   | 19.92 | 19.87 |
| 2175    | 2132.5          | 19.9                   | 19.77 | 19.98 | 19.94  | 20.05 | 19.87 |
| 2300    | 2145            | 19.76                  | 19.67 | 19.81 | 19.73  | 19.5  | 19.62 |

## -26dBc Bandwidth (MHz)

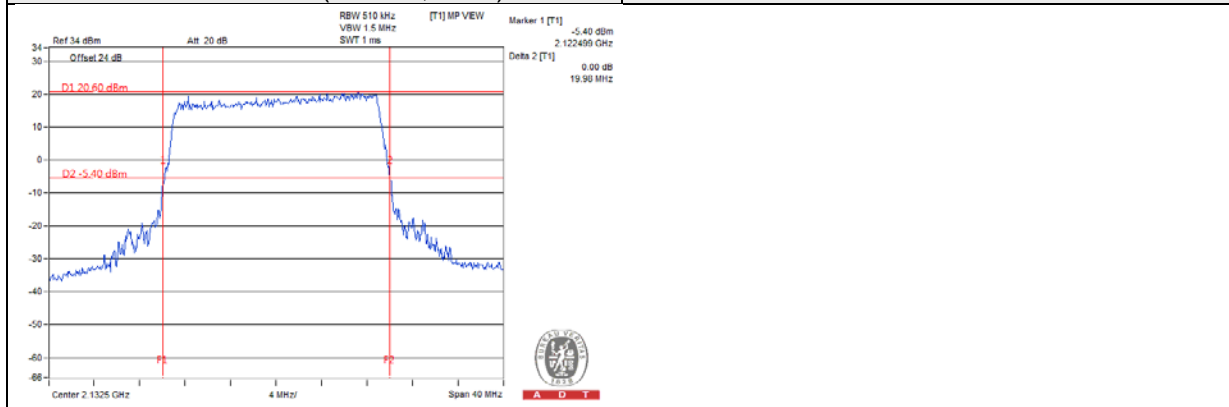
## Spectrum Plot of Worst Value

## 20MHz / QPSK(Chain 0, CH2050)

## 20MHz / 16QAM(Chain 1, CH2175)

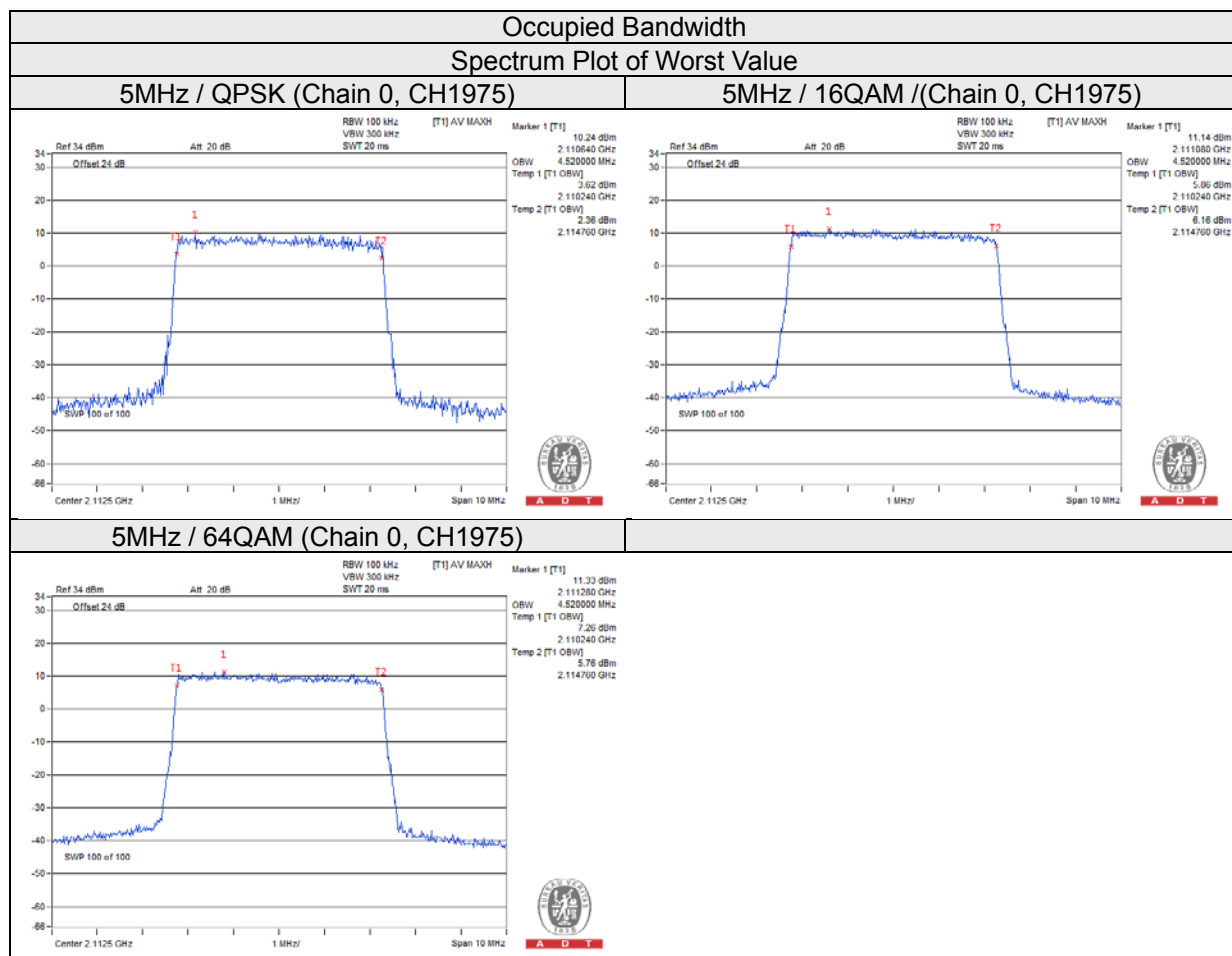


## 20MHz / 64QAM(Chain 0, 2175)



#### 4.3.5 Test Results (Occupied Bandwidth)

| Channel Bandwidth: 5MHz |                 |                          |       |       |        |       |       |
|-------------------------|-----------------|--------------------------|-------|-------|--------|-------|-------|
| Channel                 | Frequency (MHz) | Occupied Bandwidth (MHz) |       |       |        |       |       |
|                         |                 | Chain0                   |       |       | Chain1 |       |       |
|                         |                 | QPSK                     | 16QAM | 64QAM | QPSK   | 16QAM | 64QAM |
| 1975                    | 2112.5          | 4.52                     | 4.52  | 4.52  | 4.50   | 4.52  | 4.52  |
| 2175                    | 2132.5          | 4.52                     | 4.52  | 4.50  | 4.52   | 4.52  | 4.52  |
| 2375                    | 2152.5          | 4.50                     | 4.50  | 4.50  | 4.50   | 4.50  | 4.50  |



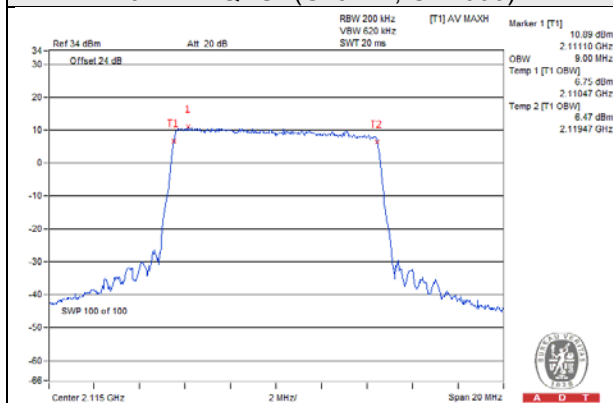
## Channel Bandwidth: 10MHz

| Channel | Frequency (MHz) | Occupied Bandwidth (MHz) |       |       |        |       |       |
|---------|-----------------|--------------------------|-------|-------|--------|-------|-------|
|         |                 | Chain0                   |       |       | Chain1 |       |       |
|         |                 | QPSK                     | 16QAM | 64QAM | QPSK   | 16QAM | 64QAM |
| 2000    | 2115            | 8.97                     | 8.97  | 9.00  | 9.00   | 9.00  | 9.00  |
| 2175    | 2132.5          | 8.97                     | 8.97  | 8.97  | 8.97   | 8.97  | 8.97  |
| 2350    | 2150            | 8.97                     | 8.97  | 8.97  | 8.97   | 8.97  | 8.97  |

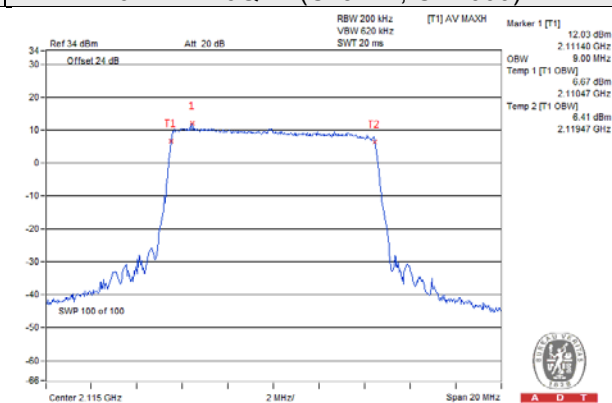
## Occupied Bandwidth

## Spectrum Plot of Worst Value

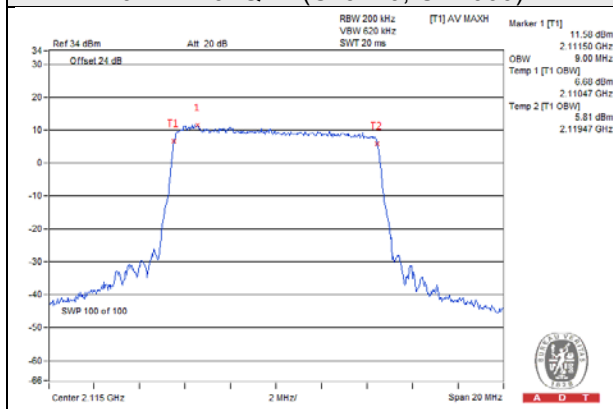
## 10MHz / QPSK(Chain 1, CH2000)



## 10MHz / 16QAM(Chain 1, CH2000)



## 10MHz / 64QAM(Chain 0, CH2000)



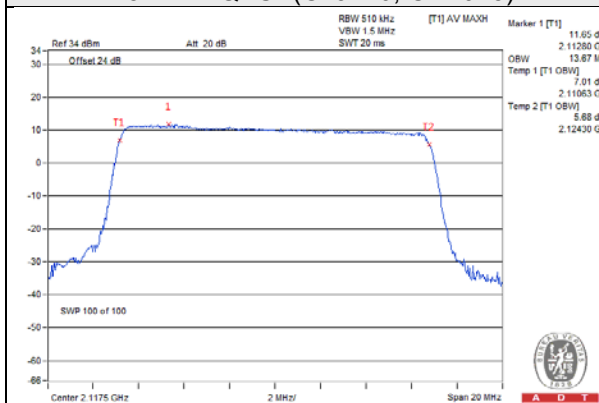
## Channel Bandwidth: 15MHz

| Channel | Frequency (MHz) | Occupied Bandwidth (MHz) |       |       |        |       |       |
|---------|-----------------|--------------------------|-------|-------|--------|-------|-------|
|         |                 | Chain0                   |       |       | Chain1 |       |       |
|         |                 | QPSK                     | 16QAM | 64QAM | QPSK   | 16QAM | 64QAM |
| 2025    | 2117.5          | 13.67                    | 13.67 | 13.67 | 13.67  | 13.63 | 13.67 |
| 2175    | 2132.5          | 13.60                    | 13.63 | 13.63 | 13.63  | 13.63 | 13.63 |
| 2325    | 2147.5          | 13.57                    | 13.57 | 13.60 | 13.53  | 13.57 | 13.60 |

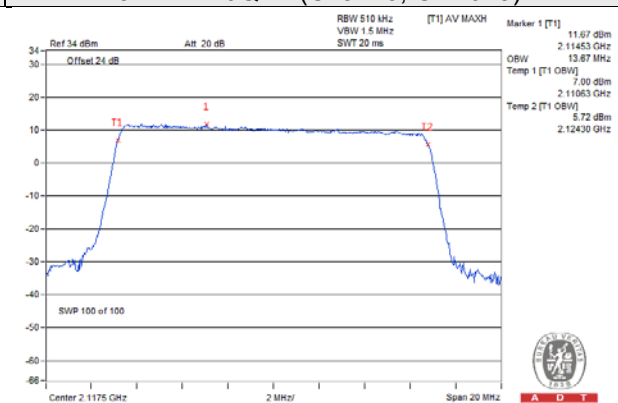
## Occupied Bandwidth

## Spectrum Plot of Worst Value

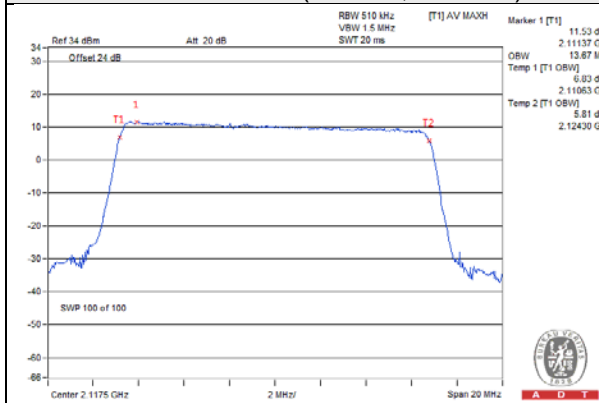
## 15MHz / QPSK(Chain 0, CH2025)



## 15MHz / 16QAM(Chain 0, CH2025)



## 15MHz / 64QAM(Chain 0, CH2025)



## Channel Bandwidth: 20MHz

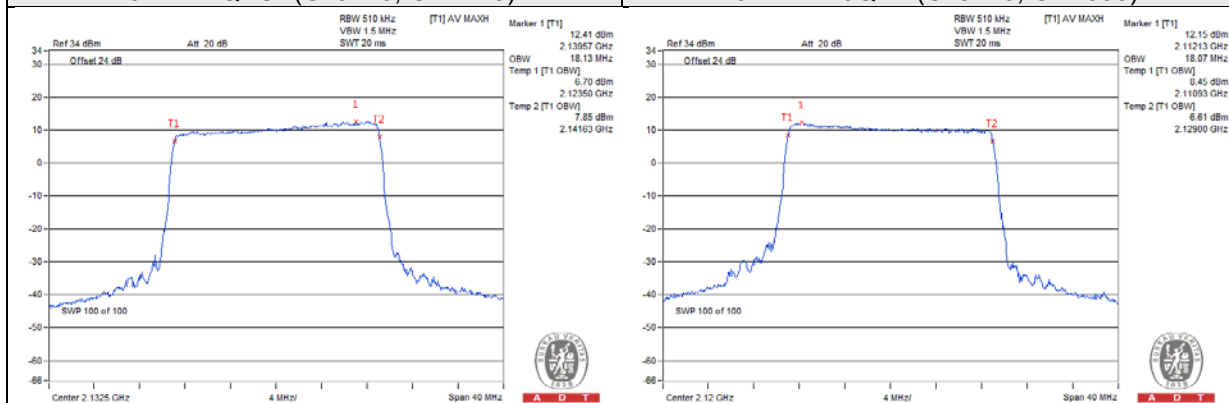
| Channel | Frequency (MHz) | Occupied Bandwidth (MHz) |       |       |        |       |       |
|---------|-----------------|--------------------------|-------|-------|--------|-------|-------|
|         |                 | Chain0                   |       |       | Chain1 |       |       |
|         |                 | QPSK                     | 16QAM | 64QAM | QPSK   | 16QAM | 64QAM |
| 2050    | 2120            | 18.07                    | 18.07 | 18.07 | 18.07  | 18.07 | 18.07 |
| 2175    | 2132.5          | 18.13                    | 18.07 | 18.07 | 18.07  | 18.07 | 18.07 |
| 2300    | 2145            | 17.87                    | 17.87 | 17.87 | 17.87  | 17.87 | 17.87 |

## Occupied Bandwidth

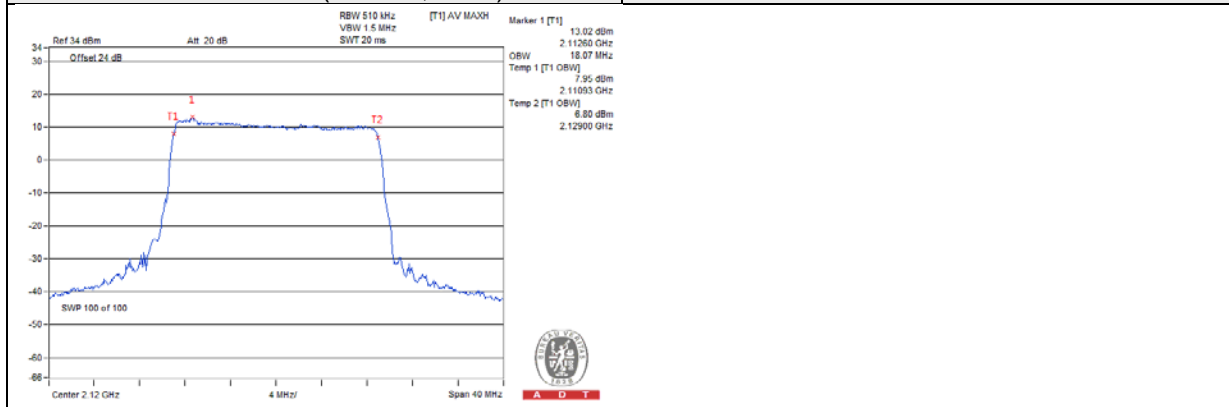
## Spectrum Plot of Worst Value

## 20MHz / QPSK(Chain 0, CH2175)

## 20MHz / 16QAM(Chain 0, CH2050)



## 20MHz / 64QAM(Chain 0, 2050)



## 4.4 Channel Edge Measurement

### 4.4.1 Limits of Channel Edge Measurement

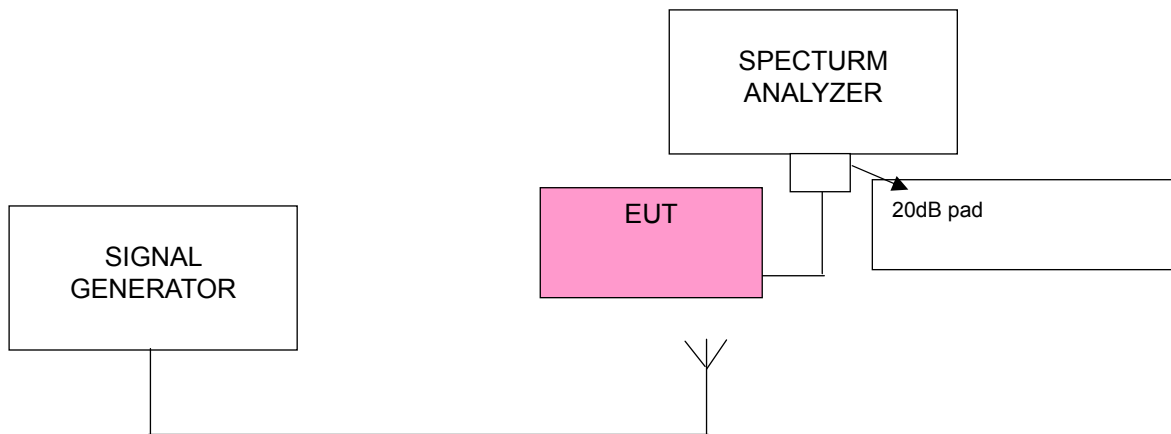
According to FCC 27.53(h) specified the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10}(P)$  dB. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

Note:

This device can be implement MIMO function, so the limit of spurious emissions needs to be reduced by  $10 \log(\text{Numbers}_{\text{Ant}})$  according to FCC KDB 662911 D01 guidance.

{The limit is adjusted to  $-13\text{dBm} - 10 \cdot \log(2) = -16.01\text{dBm}$ .}

### 4.4.2 Test Setup



### 4.4.3 Test Procedures

- The EUT was set up for the rated peak power. The power was measured with Spectrum Analyzer. All measurements were done at 3 channels: low, middle and high operational frequency range.
- The center frequency of spectrum is the band edge frequency and span is 15MHz. RBW of the spectrum is 100kHz (Channel Bandwidth: 5MHz & 10MHz) / 150kHz (Channel Bandwidth: 15MHz) / 200kHz (Channel Bandwidth: 20MHz).
- Record the max trace plot into the test report.

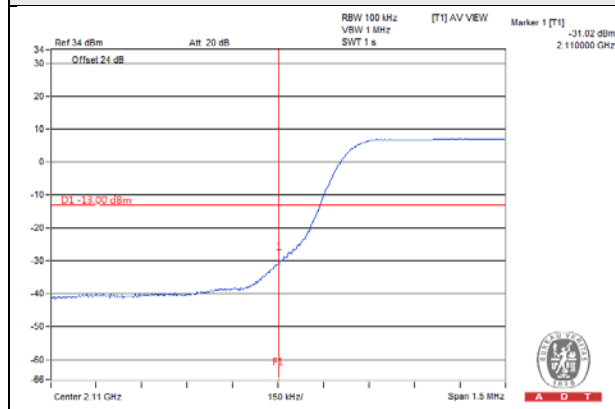
#### 4.4.4 Test Results

##### Chain 0

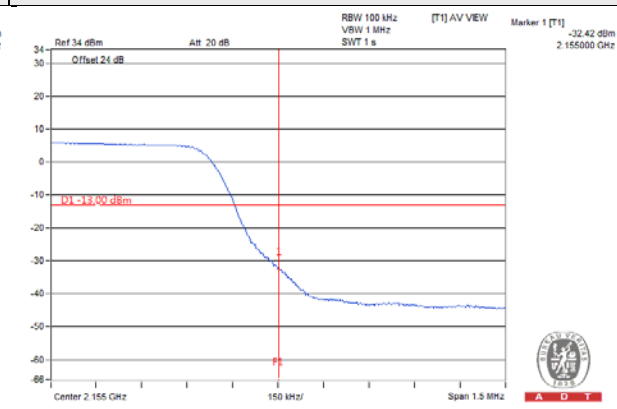
QPSK / Channel Bandwidth: 5MHz

| Frequency(MHz) | Measurement Value | Limit  | Margin | Result |
|----------------|-------------------|--------|--------|--------|
| 2110           | -31.02            | -16.01 | -15.01 | Pass   |
| 2155           | -32.42            | -16.01 | -16.41 | Pass   |

##### Ch1975



##### Ch2375

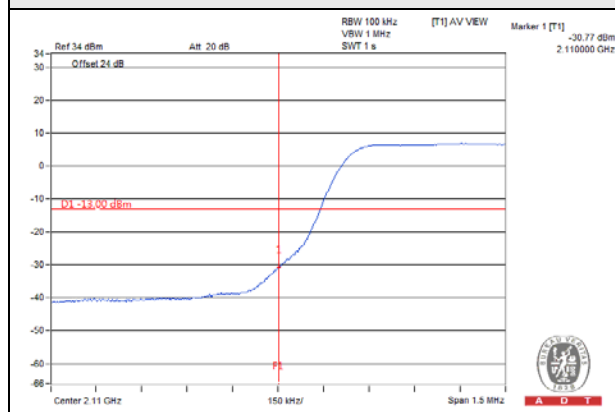


##### Chain 1

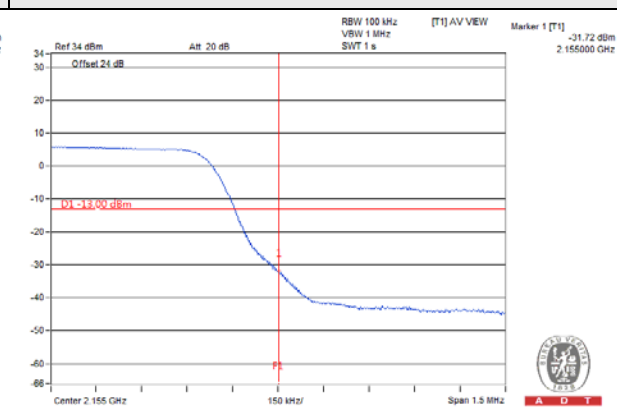
QPSK / Channel Bandwidth: 5MHz

| Frequency(MHz) | Measurement Value | Limit  | Margin | Result |
|----------------|-------------------|--------|--------|--------|
| 2110           | -30.77            | -16.01 | -14.76 | Pass   |
| 2155           | -31.72            | -16.01 | -15.71 | Pass   |

##### Ch1975



##### Ch2375



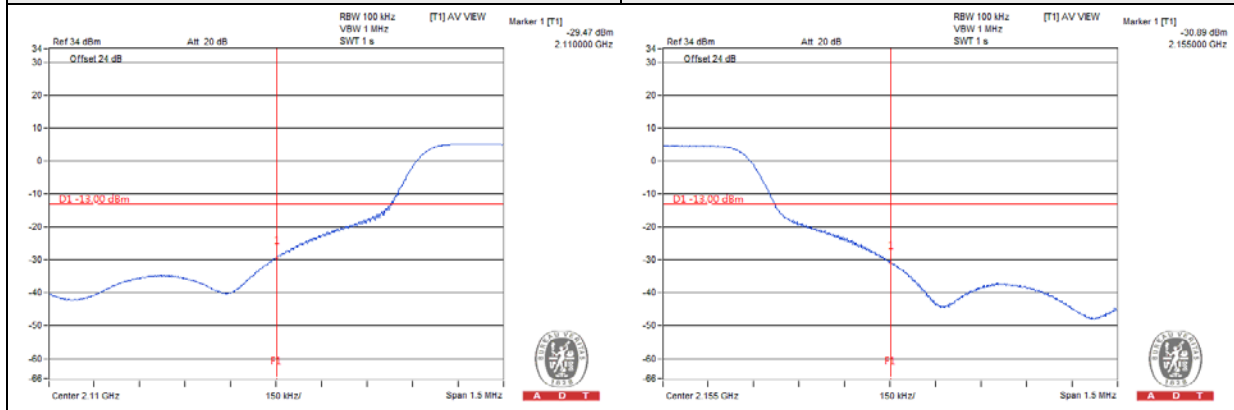
## Chain 0

QPSK / Channel Bandwidth: 10MHz

| Frequency(MHz) | Measurement Value | Limit  | Margin | Result |
|----------------|-------------------|--------|--------|--------|
| 2110           | -29.47            | -16.01 | -13.46 | Pass   |
| 2155           | -30.89            | -16.01 | -14.88 | Pass   |

## Ch2000

## Ch2350



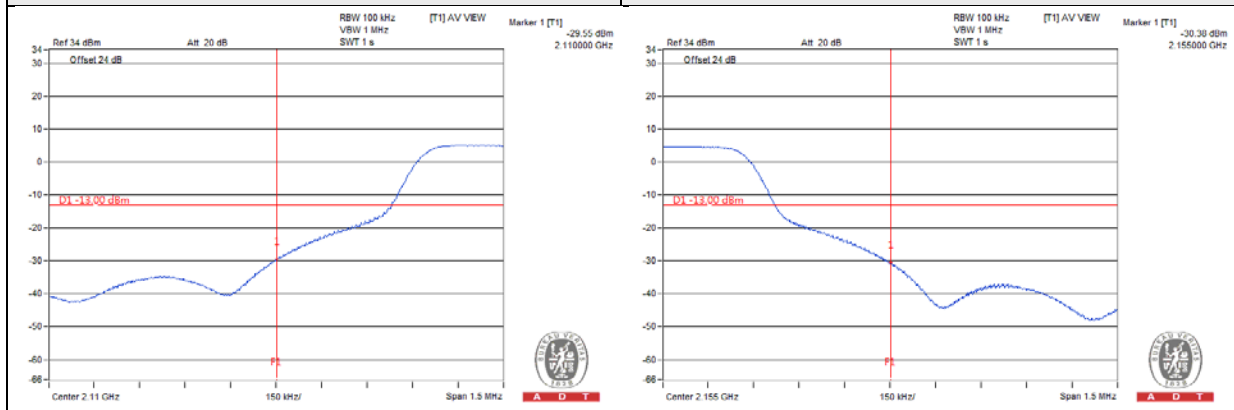
## Chain 1

QPSK / Channel Bandwidth: 10MHz

| Frequency(MHz) | Measurement Value | Limit  | Margin | Result |
|----------------|-------------------|--------|--------|--------|
| 2110           | -29.55            | -16.01 | -13.54 | Pass   |
| 2155           | -30.38            | -16.01 | -14.37 | Pass   |

## Ch2000

## Ch2350



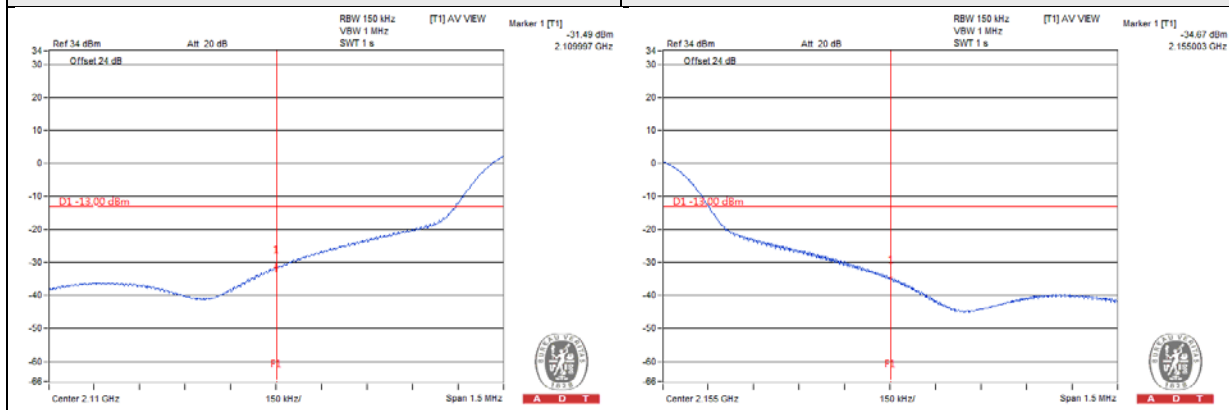
### Chain 0

QPSK / Channel Bandwidth: 15MHz

| Frequency(MHz) | Measurement Value | Limit  | Margin | Result |
|----------------|-------------------|--------|--------|--------|
| 2110           | -31.49            | -16.01 | -15.48 | Pass   |
| 2155           | -34.67            | -16.01 | -18.66 | Pass   |

### Ch2025

### Ch2325



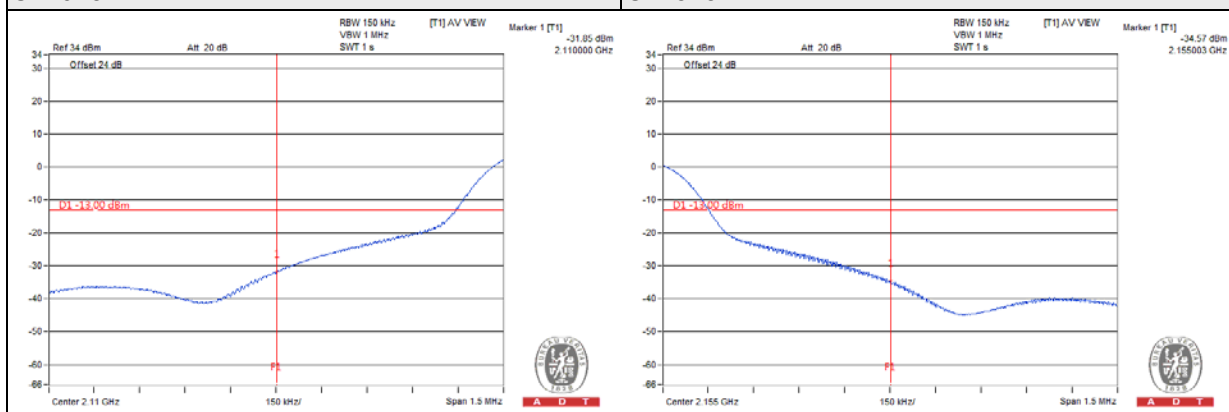
### Chain 1

QPSK / Channel Bandwidth: 15MHz

| Frequency(MHz) | Measurement Value | Limit  | Margin | Result |
|----------------|-------------------|--------|--------|--------|
| 2110           | -31.85            | -16.01 | -15.84 | Pass   |
| 2155.01        | -34.57            | -16.01 | -18.56 | Pass   |

### Ch2025

### Ch2325



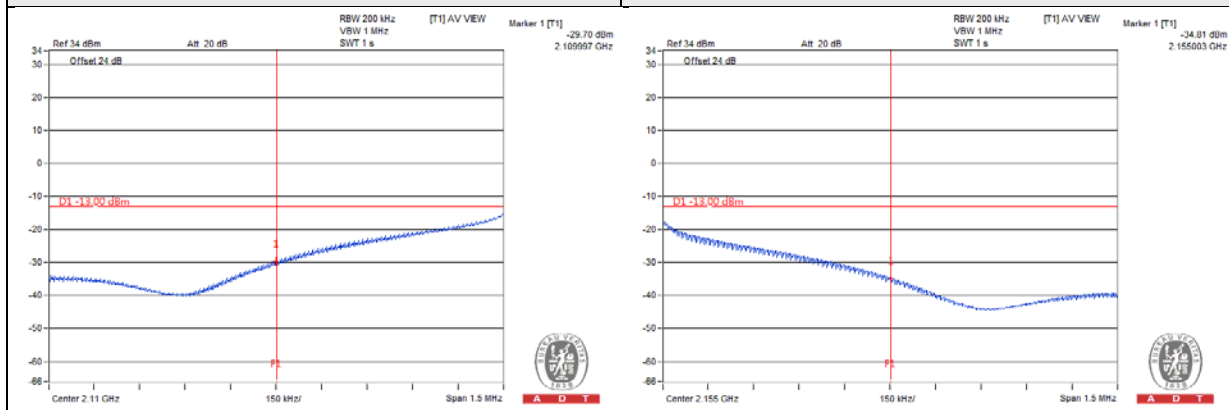
## Chain 0

QPSK / Channel Bandwidth: 20MHz

| Frequency(MHz) | Measurement Value | Limit  | Margin | Result |
|----------------|-------------------|--------|--------|--------|
| 2109.99        | -29.7             | -16.01 | -13.69 | Pass   |
| 2155           | -34.81            | -16.01 | -18.8  | Pass   |

## Ch2050

## Ch2300



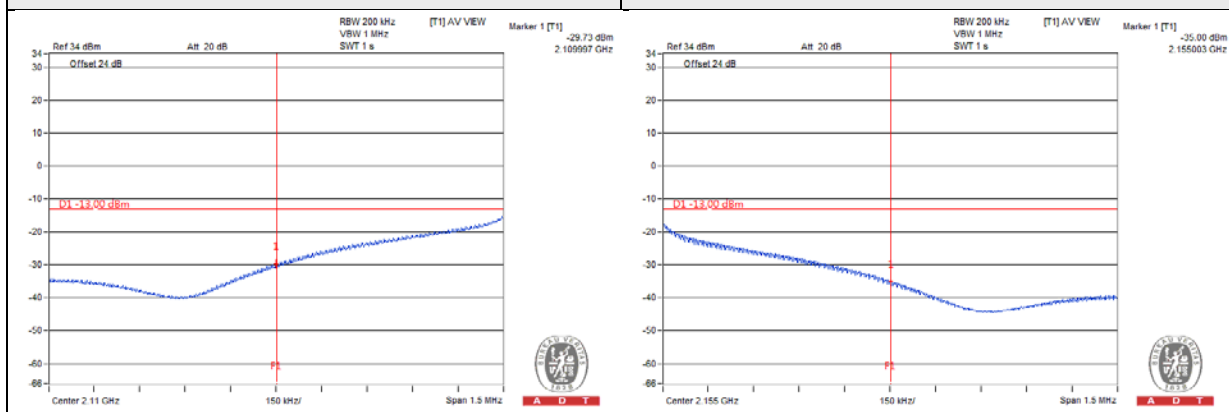
## Chain 1

QPSK / Channel Bandwidth: 20MHz

| Frequency(MHz) | Measurement Value | Limit  | Margin | Result |
|----------------|-------------------|--------|--------|--------|
| 2110           | -29.73            | -16.01 | -13.72 | Pass   |
| 2155.01        | -35               | -16.01 | -18.99 | Pass   |

## Ch2050

## Ch2300

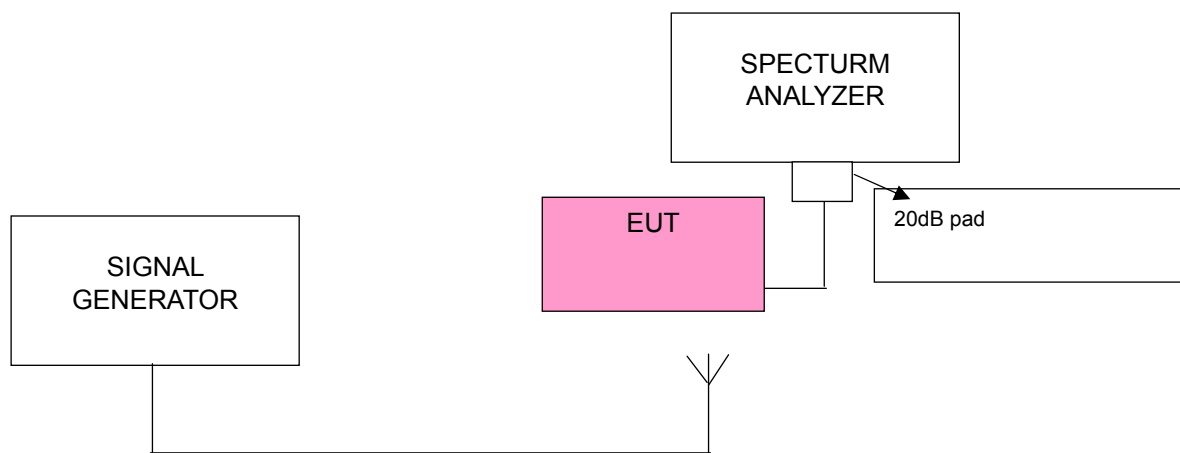


## 4.5 Peak to Average Ratio

### 4.5.1 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

### 4.5.2 Test Setup

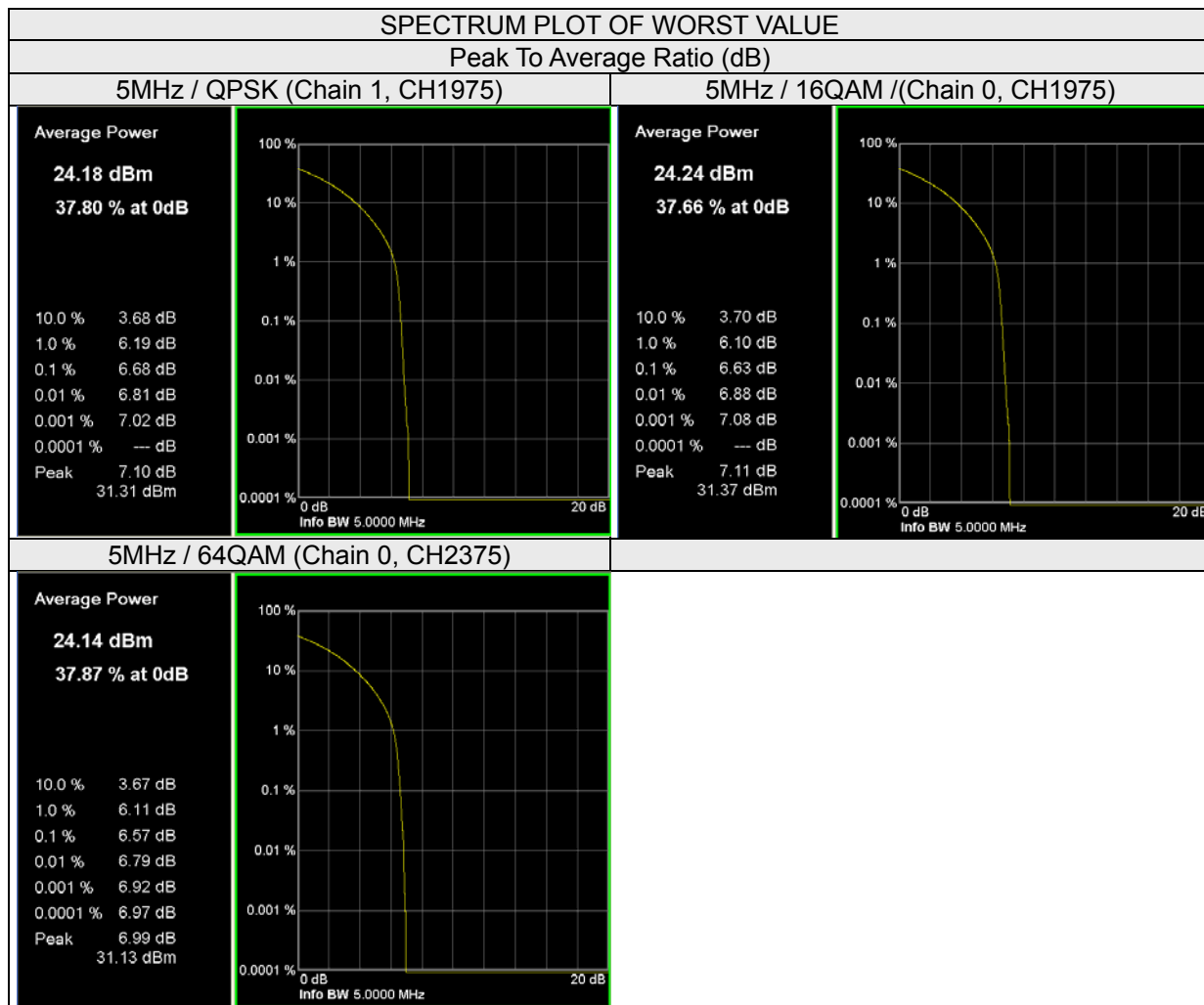


### 4.5.3 Test Procedures

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

#### 4.5.4 Test Results

| Channel Bandwidth: 5MHz |                 |                            |       |       |        |       |       |
|-------------------------|-----------------|----------------------------|-------|-------|--------|-------|-------|
| Channel                 | Frequency (MHz) | Peak To Average Ratio (dB) |       |       |        |       |       |
|                         |                 | Chain0                     |       |       | Chain1 |       |       |
|                         |                 | QPSK                       | 16QAM | 64QAM | QPSK   | 16QAM | 64QAM |
| 1975                    | 2112.5          | 6.62                       | 6.59  | 6.5   | 6.68   | 6.63  | 6.66  |
| 2175                    | 2132.5          | 6.54                       | 6.62  | 6.56  | 6.54   | 6.52  | 6.56  |
| 2375                    | 2152.5          | 6.58                       | 6.52  | 6.57  | 6.62   | 6.57  | 6.56  |



## Channel Bandwidth: 10MHz

| Channel | Frequency (MHz) | Peak To Average Ratio (dB) |       |       |        |       |       |
|---------|-----------------|----------------------------|-------|-------|--------|-------|-------|
|         |                 | Chain0                     |       |       | Chain1 |       |       |
|         |                 | QPSK                       | 16QAM | 64QAM | QPSK   | 16QAM | 64QAM |
| 2000    | 2115            | 6.66                       | 6.71  | 6.71  | 6.74   | 6.71  | 6.79  |
| 2175    | 2132.5          | 6.66                       | 6.64  | 6.68  | 6.56   | 6.66  | 6.66  |
| 2350    | 2150            | 6.67                       | 6.66  | 6.68  | 6.67   | 6.66  | 6.66  |

## SPECTRUM PLOT OF WORST VALUE

## Peak To Average Ratio (dB)

## 10MHz / QPSK (Chain 1, CH2000)

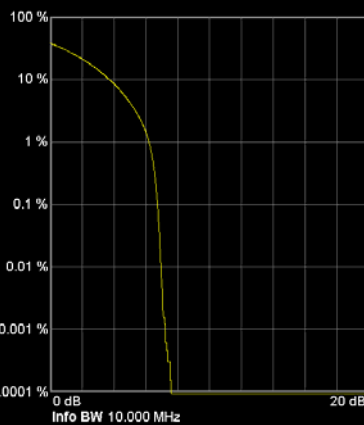
## 10MHz / 16QAM /(Chain 0, CH2000)

## Average Power

24.12 dBm

37.66 % at 0dB

10.0 % 3.73 dB  
1.0 % 6.16 dB  
0.1 % 6.74 dB  
0.01 % 6.91 dB  
0.001 % 7.22 dB  
0.0001 % --- dB  
Peak 7.55 dB  
31.65 dBm



## Average Power

24.42 dBm

37.55 % at 0dB

10.0 % 3.76 dB  
1.0 % 6.16 dB  
0.1 % 6.71 dB  
0.01 % 6.97 dB  
0.001 % --- dB  
0.0001 % --- dB  
Peak 7.07 dB  
31.51 dBm



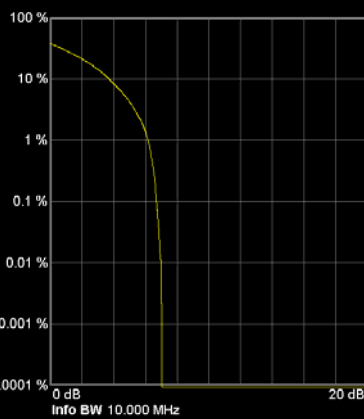
## 10MHz / 64QAM (Chain 1, CH2000)

## Average Power

24.42 dBm

37.55 % at 0dB

10.0 % 3.70 dB  
1.0 % 6.16 dB  
0.1 % 6.79 dB  
0.01 % 6.92 dB  
0.001 % --- dB  
0.0001 % --- dB  
Peak 7.07 dB  
31.57 dBm



## Channel Bandwidth: 15MHz

| Channel | Frequency (MHz) | Peak To Average Ratio (dB) |       |       |        |       |       |
|---------|-----------------|----------------------------|-------|-------|--------|-------|-------|
|         |                 | Chain0                     |       |       | Chain1 |       |       |
|         |                 | QPSK                       | 16QAM | 64QAM | QPSK   | 16QAM | 64QAM |
| 2025    | 2117.5          | 7.07                       | 7.07  | 7.07  | 7.07   | 7.07  | 7.05  |
| 2175    | 2132.5          | 6.96                       | 6.96  | 6.96  | 6.96   | 6.96  | 6.96  |
| 2325    | 2147.5          | 6.96                       | 6.96  | 6.96  | 6.95   | 6.96  | 6.86  |

## SPECTRUM PLOT OF WORST VALUE

## Peak To Average Ratio (dB)

## 15MHz / QPSK (Chain 0, CH2025)

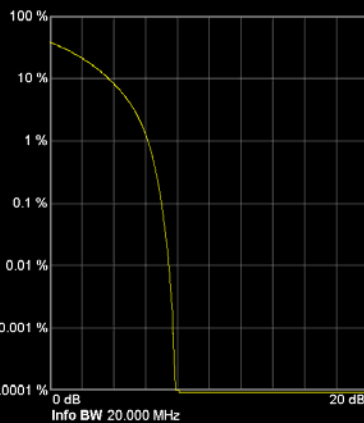
## 15MHz / 16QAM /(Chain 0, CH2025)

## Average Power

24.12 dBm

37.83 % at 0dB

10.0 % 3.63 dB  
1.0 % 6.16 dB  
0.1 % 7.07 dB  
0.01 % 7.47 dB  
0.001 % 7.77 dB  
0.0001 % --- dB  
Peak 8.08 dB  
32.28 dBm

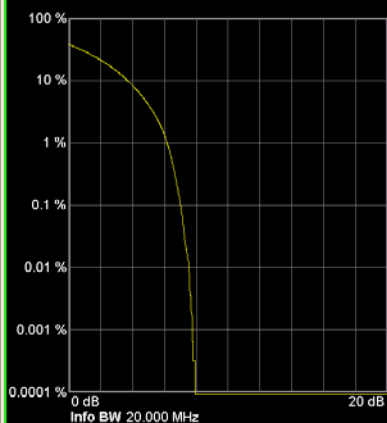


## Average Power

24.14 dBm

37.77 % at 0dB

10.0 % 3.63 dB  
1.0 % 6.16 dB  
0.1 % 7.07 dB  
0.01 % 7.57 dB  
0.001 % 7.75 dB  
0.0001 % --- dB  
Peak 7.95 dB  
32.05 dBm



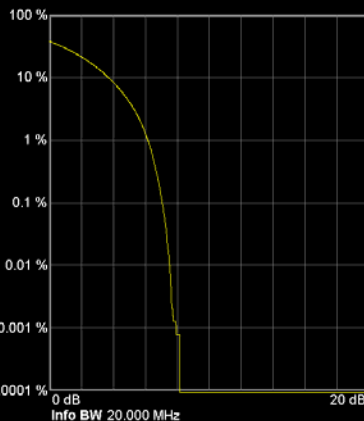
## 15MHz / 64QAM (Chain 0, CH2025)

## Average Power

24.11 dBm

37.73 % at 0dB

10.0 % 3.63 dB  
1.0 % 6.16 dB  
0.1 % 7.07 dB  
0.01 % 7.57 dB  
0.001 % 7.97 dB  
0.0001 % --- dB  
Peak 8.18 dB  
32.28 dBm



## Channel Bandwidth: 20MHz

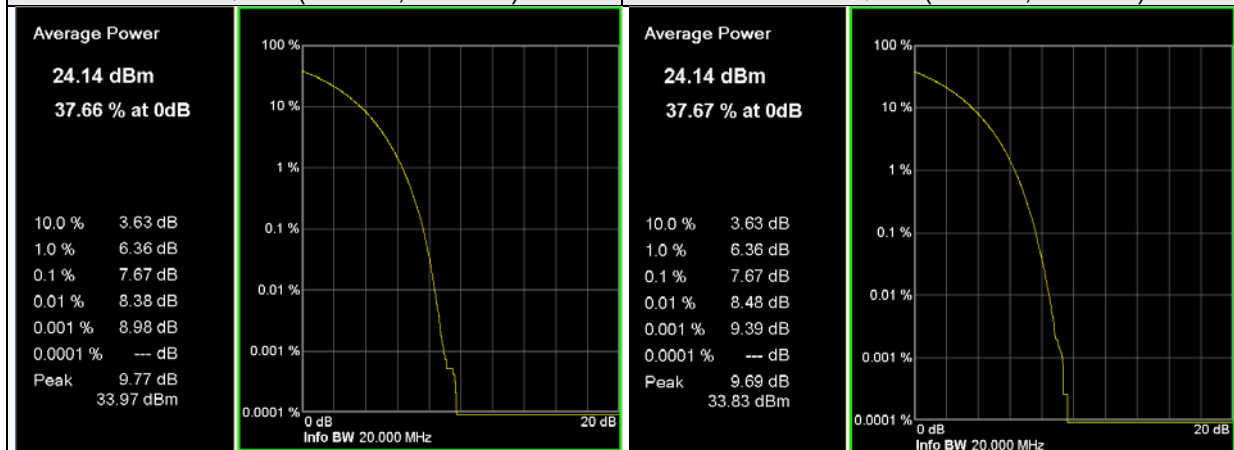
| Channel | Frequency (MHz) | Peak To Average Ratio (dB) |       |       |        |       |       |
|---------|-----------------|----------------------------|-------|-------|--------|-------|-------|
|         |                 | Chain0                     |       |       | Chain1 |       |       |
|         |                 | QPSK                       | 16QAM | 64QAM | QPSK   | 16QAM | 64QAM |
| 2050    | 2120            | 7.67                       | 7.67  | 7.64  | 7.67   | 7.67  | 7.62  |
| 2175    | 2132.5          | 7.57                       | 7.67  | 7.58  | 7.55   | 7.57  | 7.68  |
| 2300    | 2145            | 7.57                       | 7.62  | 7.64  | 7.57   | 7.58  | 7.68  |

## SPECTRUM PLOT OF WORST VALUE

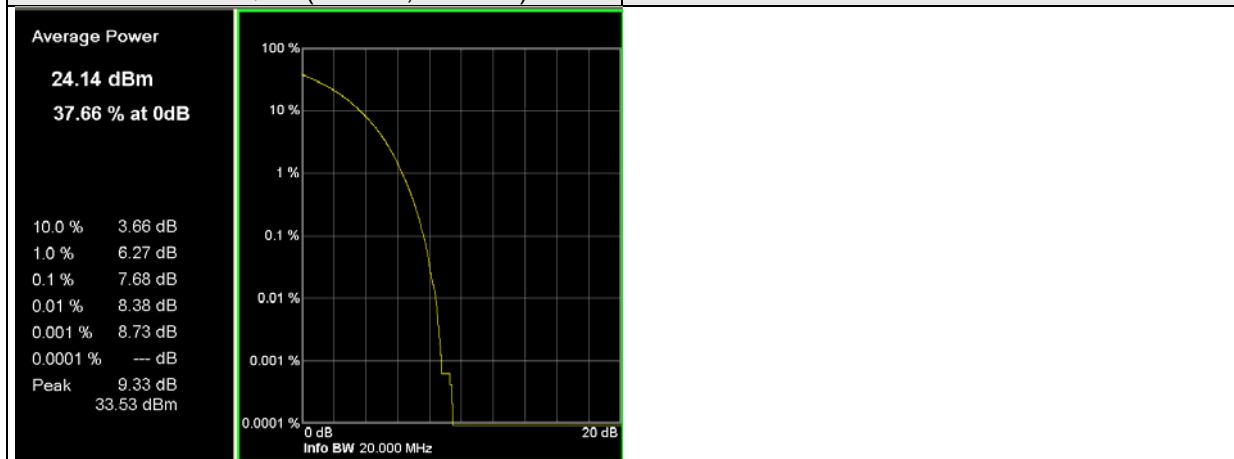
## Peak To Average Ratio (dB)

## 20MHz / QPSK (Chain 1, CH2025)

## 20MHz / 16QAM /(Chain 0, CH2050)



## 20MHz / 64QAM (Chain 1, CH2175)



## 4.6 Conducted Spurious Emissions

### 4.6.1 Limits of Conducted Spurious Emissions Measurement

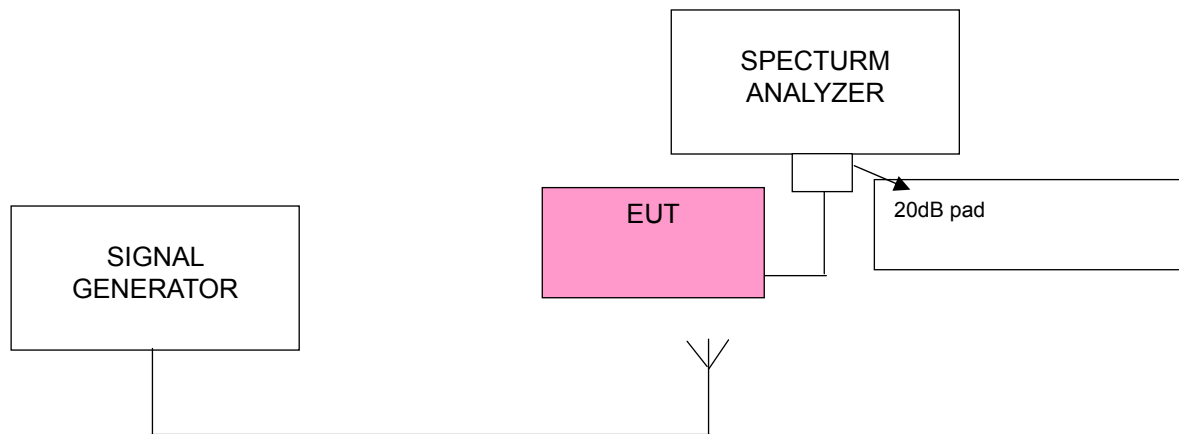
In the FCC 27.53(h), On any frequency outside a licensee's frequency block, The power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB, the emission limit equal to  $-13\text{dBm}$ .

Note:

This device can be implemenet MIMO function, so the limit of spurious emissions needs to be reduced by  $10\log(\text{Numbers}_{\text{Ant}})$  according to FCC KDB 662911 D01 guidance.

{The limit is adjusted to  $-13\text{dBm} - 10*\log(2) = -16.01\text{dBm}$ .}

### 4.6.2 Test Setup



### 4.6.3 Test Procedure

- All measurements were done at 3 channels: low, middle and high operational frequency range.
- When the spectrum scanned from 9kHz to 26.5GHz, it shall be connected to the 20dB pad attenuated the carried frequency.