

# TEST REPORT

## CERTIFICATE OF CONFORMITY

**Standard:** 47 CFR FCC Part 27  
47 CFR FCC Part 2

**Report No.:** RFBCMA-WTW-P25090589

**FCC ID:** RAXS90

**Product:** Light Sense node - 120-277V Gray, Light Sense node - 120-277V Gray w/Last Gasp

**Brand:** Verizon

**Model No.:** S90-000200

**Series Model:** S90-000100 (refer to item 3.1 for more details)

**Received Date:** 2025/9/19

**Test Date:** 2025/10/7 ~ 2025/10/14

**Issued Date:** 2025/10/27

**Applicant:** Arcadyan Technology Corporation

**Address:** No.8, Sec.2, Guangfu Rd., Hsinchu City 30071, Taiwan, R.O.C.

**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
Lin Kou Laboratories

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**FCC Registration /** 281270 / TW0032

**Designation Number:** 788550 / TW0003

Approved by:



, Date:

2025/10/27

Jeremy Lin / Project Engineer

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Prepared by : Lena Wang / Specialist

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| Issue No.            | Description      | Date Issued |
|----------------------|------------------|-------------|
| RFBCMA-WTW-P25090589 | Original Release | 2025/10/27  |

## 1 Certificate

**Product:** Light Sense node - 120-277V Gray, Light Sense node - 120-277V Gray w/Last Gasp

**Brand:** Verizon

**Test Model:** S90-000200

**Series Model:** S90-000100 (refer to item 3.1 for more details)

**Sample Status:** Engineering sample

**Applicant:** Arcadyan Technology Corporation

**Test Date:** 2025/10/7 ~ 2025/10/14

**Standard:** 47 CFR FCC Part 27  
47 CFR FCC Part 2

**Measurement procedure:** ANSI/TIA/EIA-603-E 2016  
ANSI C63.26-2015  
KDB 971168 D01 Power Meas License Digital Systems v03r01  
KDB 971168 D02 Misc Rev Approv License Devices v02r02

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

## 2 Summary of Test Results

| Standard / Clause                                | Test Item                                                            | Result | Remark                                            |
|--------------------------------------------------|----------------------------------------------------------------------|--------|---------------------------------------------------|
| Part 2.1046<br>Part 27.50(d)<br>Part 27.50(b)    | Effective Radiated Power and Equivalent Isotropically Radiated Power | Pass   | Meet the requirement of limit.                    |
| Part 2.1047                                      | Modulation Characteristics                                           | Pass   | Meet the requirement of limit.                    |
| Part 27.50(d)                                    | Peak to Average Ratio                                                | Pass   | Meet the requirement of limit.                    |
| Part 2.1049                                      | Bandwidth                                                            | Pass   | Meet the requirement of limit.                    |
| Part 2.1051<br>Part 27.53(h)<br>Part 27.53(c)(f) | Conducted Spurious Emissions                                         | Pass   | Meet the requirement of limit.                    |
| Part 2.1053<br>Part 27.53(h)<br>Part 27.53(c)(f) | Radiated Spurious Emissions below 1GHz                               | Pass   | Minimum passing margin is -27.85 dB at 105.66 MHz |
| Part 2.1053<br>Part 27.53(h)<br>Part 27.53(c)(f) | Radiated Spurious Emissions above 1GHz                               | Pass   | Minimum passing margin is -6.29 dB at 1564.00 MHz |
| Part 2.1055<br>Part 27.54                        | Frequency Stability                                                  | Pass   | Meet the requirement of limit.                    |

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

### 2.1 Measurement Uncertainty

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

| Parameter                                                            | Specification  | Uncertainty (±) |
|----------------------------------------------------------------------|----------------|-----------------|
| Effective Radiated Power and Equivalent Isotropically Radiated Power | -              | 1.371 dB        |
| Peak to Average Ratio                                                | -              | 0.920 dB        |
| Bandwidth                                                            | -              | 960 Hz          |
| Conducted Spurious Emissions                                         | -              | 2.12 dB         |
| Radiated Spurious Emissions below 1GHz                               | 9 kHz ~ 30 MHz | 3 dB            |
|                                                                      | 30 MHz ~ 1 GHz | 2.93 dB         |
| Radiated Spurious Emissions above 1GHz                               | 1 GHz ~ 18 GHz | 1.76 dB         |
| Frequency Stability                                                  | -              | 0.176 ppm       |

The other instruments specified are routine verified to remain within the calibrated levels, no measurement uncertainty is required to be calculated.

### 2.2 Supplementary Information

There is not any deviation from the test standards for the test method, and no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

|                           |                                                                                |
|---------------------------|--------------------------------------------------------------------------------|
| Product                   | Light Sense node - 120-277V Gray, Light Sense node - 120-277V Gray w/Last Gasp |
| Brand                     | Verizon                                                                        |
| Test Model                | S90-000200                                                                     |
| Series Model              | S90-000100                                                                     |
| Model Difference          | Refer to Note as below                                                         |
| Status of EUT             | Engineering sample                                                             |
| Power Supply Rating       | 120V-277V                                                                      |
| EUT Category              | Mobile station                                                                 |
| Modulation Type           | Cat-M1: QPSK, 16QAM                                                            |
| Cat-M1 support SISO bands | B4, B13                                                                        |

Note:

1. All models are listed as below.

| Brand   | Product                                      | Model      | Difference            |
|---------|----------------------------------------------|------------|-----------------------|
| Verizon | Light Sense node - 120-277V Gray             | S90-000100 | for marketing purpose |
|         | Light Sense node - 120-277V Gray w/Last Gasp | S90-000200 |                       |

2. EUT Overview

#### Cat-M1 Band 4

| Bandwidth | TX Frequency Range (MHz) | Modulation | Max. EIRP (W) | Max. EIRP (dBm) | Emission Designator |
|-----------|--------------------------|------------|---------------|-----------------|---------------------|
| 1.4 MHz   | 1710.7 ~ 1754.3          | QPSK       | 0.356         | 25.52           | 1M09G7D             |
|           |                          | 16QAM      | 0.346         | 25.39           | 917KD7W             |
| 3 MHz     | 1711.5 ~ 1753.5          | QPSK       | 0.363         | 25.6            | 1M09G7D             |
|           |                          | 16QAM      | 0.352         | 25.47           | 916KD7W             |
| 5 MHz     | 1712.5 ~ 1752.5          | QPSK       | 0.37          | 25.68           | 1M09G7D             |
|           |                          | 16QAM      | 0.359         | 25.55           | 916KD7W             |
| 10 MHz    | 1715 ~ 1750              | QPSK       | 0.376         | 25.75           | 1M10G7D             |
|           |                          | 16QAM      | 0.366         | 25.63           | 917KD7W             |
| 15 MHz    | 1717.5 ~ 1747.5          | QPSK       | 0.382         | 25.82           | 1M09G7D             |
|           |                          | 16QAM      | 0.372         | 25.71           | 915KD7W             |
| 20 MHz    | 1720 ~ 1745              | QPSK       | 0.388         | 25.89           | 1M09G7D             |
|           |                          | 16QAM      | 0.379         | 25.79           | 918KD7W             |

#### Cat-M1 Band 13

| Bandwidth | TX Frequency Range (MHz) | Modulation | Max. ERP (W) | Max. ERP (dBm) | Emission Designator |
|-----------|--------------------------|------------|--------------|----------------|---------------------|
| 5 MHz     | 779.5 ~ 784.5            | QPSK       | 0.159        | 22.01          | 1M09G7D             |
|           |                          | 16QAM      | 0.158        | 22             | 914KD7W             |
| 10 MHz    | 782                      | QPSK       | 0.164        | 22.14          | 1M09G7D             |
|           |                          | 16QAM      | 0.162        | 22.1           | 910KD7W             |

3. For detailed information about each WWAN bands frequency range, bandwidth mode of the product, please refer to section 3.3 of the report.
4. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

### 3.2 Antenna Description of EUT

1. The antenna information is listed as below.

|            |           |            |
|------------|-----------|------------|
| Type       | Dipole    |            |
| Connector  | ipex(MHF) |            |
| Band       | Cat-M1 B4 | Cat-M1 B13 |
| Gain (dBi) | 2.3       | 0.8        |

\*The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

### 3.3 Test Mode Applicability and Tested Channel Detail

Following channel(s) was (were) selected for the final test as listed below:

|             |                                                                                                                                        |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Pre-Scan:   | Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates. |
| Worst Case: | The test model S90-000100 of EUT is represented in this report.                                                                        |

#### 3.3.1 Cat-M1 Band 4

| Test Item                               | Tested Channel                                                 | Channel Bandwidth | Modulation   | Mode                       |
|-----------------------------------------|----------------------------------------------------------------|-------------------|--------------|----------------------------|
| Equivalent Isotropically Radiated Power | 19957(1710.70 MHz)<br>20175(1732.50 MHz)<br>20393(1754.30 MHz) | 1.4 MHz           | QPSK / 16QAM | 1 RB<br>Half RB<br>Full RB |
|                                         | 19965(1711.50 MHz)<br>20175(1732.50 MHz)<br>20385(1753.50 MHz) | 3 MHz             | QPSK / 16QAM | 1 RB<br>Half RB<br>Full RB |
|                                         | 19975(1712.50 MHz)<br>20175(1732.50 MHz)<br>20375(1752.50 MHz) | 5 MHz             | QPSK / 16QAM | 1 RB<br>Half RB<br>Full RB |
|                                         | 20000(1715.00 MHz)<br>20175(1732.50 MHz)<br>20350(1750.00 MHz) | 10 MHz            | QPSK / 16QAM | 1 RB<br>Half RB<br>Full RB |
|                                         | 20025(1717.50 MHz)<br>20175(1732.50 MHz)<br>20325(1747.50 MHz) | 15 MHz            | QPSK / 16QAM | 1 RB<br>Half RB<br>Full RB |
|                                         | 20050(1720.00 MHz)<br>20175(1732.50 MHz)<br>20300(1745.00 MHz) | 20 MHz            | QPSK / 16QAM | 1 RB<br>Half RB<br>Full RB |
| Modulation Characteristics              | 20175(1732.50 MHz)                                             | 20 MHz            | QPSK / 16QAM | Full RB                    |
| Peak to Average Ratio                   | 19957(1710.70 MHz)<br>20175(1732.50 MHz)<br>20393(1754.30 MHz) | 1.4 MHz           | QPSK / 16QAM | 1 RB                       |
|                                         | 19965(1711.50 MHz)<br>20175(1732.50 MHz)<br>20385(1753.50 MHz) | 3 MHz             | QPSK / 16QAM | 1 RB                       |
|                                         | 19975(1712.50 MHz)<br>20175(1732.50 MHz)<br>20375(1752.50 MHz) | 5 MHz             | QPSK / 16QAM | 1 RB                       |
|                                         | 20000(1715.00 MHz)<br>20175(1732.50 MHz)<br>20350(1750.00 MHz) | 10 MHz            | QPSK / 16QAM | 1 RB                       |
|                                         | 20025(1717.50 MHz)<br>20175(1732.50 MHz)<br>20325(1747.50 MHz) | 15 MHz            | QPSK / 16QAM | 1 RB                       |
|                                         | 20050(1720.00 MHz)<br>20175(1732.50 MHz)<br>20300(1745.00 MHz) | 20 MHz            | QPSK / 16QAM | 1 RB                       |

| Test Item                              | Tested Channel                                                 | Channel Bandwidth | Modulation   | Mode            |
|----------------------------------------|----------------------------------------------------------------|-------------------|--------------|-----------------|
| Bandwidth                              | 19957(1710.70 MHz)<br>20175(1732.50 MHz)<br>20393(1754.30 MHz) | 1.4 MHz           | QPSK / 16QAM | Full RB         |
|                                        | 19965(1711.50 MHz)<br>20175(1732.50 MHz)<br>20385(1753.50 MHz) | 3 MHz             | QPSK / 16QAM | Full RB         |
|                                        | 19975(1712.50 MHz)<br>20175(1732.50 MHz)<br>20375(1752.50 MHz) | 5 MHz             | QPSK / 16QAM | Full RB         |
|                                        | 20000(1715.00 MHz)<br>20175(1732.50 MHz)<br>20350(1750.00 MHz) | 10 MHz            | QPSK / 16QAM | Full RB         |
|                                        | 20025(1717.50 MHz)<br>20175(1732.50 MHz)<br>20325(1747.50 MHz) | 15 MHz            | QPSK / 16QAM | Full RB         |
|                                        | 20050(1720.00 MHz)<br>20175(1732.50 MHz)<br>20300(1745.00 MHz) | 20 MHz            | QPSK / 16QAM | Full RB         |
| Conducted Spurious Emissions           | 19957(1710.70 MHz)<br>20175(1732.50 MHz)<br>20393(1754.30 MHz) | 1.4 MHz           | QPSK         | 1 RB<br>Full RB |
|                                        | 19965(1711.50 MHz)<br>20175(1732.50 MHz)<br>20385(1753.50 MHz) | 3 MHz             | QPSK         | 1 RB<br>Full RB |
|                                        | 19975(1712.50 MHz)<br>20175(1732.50 MHz)<br>20375(1752.50 MHz) | 5 MHz             | QPSK         | 1 RB<br>Full RB |
|                                        | 20000(1715.00 MHz)<br>20175(1732.50 MHz)<br>20350(1750.00 MHz) | 10 MHz            | QPSK         | 1 RB<br>Full RB |
|                                        | 20025(1717.50 MHz)<br>20175(1732.50 MHz)<br>20325(1747.50 MHz) | 15 MHz            | QPSK         | 1 RB<br>Full RB |
|                                        | 20050(1720.00 MHz)<br>20175(1732.50 MHz)<br>20300(1745.00 MHz) | 20 MHz            | QPSK         | 1 RB<br>Full RB |
| Radiated Spurious Emissions below 1GHz | 20375(1752.50 MHz)                                             | 5 MHz             | QPSK         | 1 RB            |
| Radiated Spurious Emissions above 1GHz | 19957(1710.70 MHz)<br>20175(1732.50 MHz)<br>20393(1754.30 MHz) | 1.4 MHz           | QPSK         | 1 RB            |
|                                        | 19975(1712.50 MHz)<br>20175(1732.50 MHz)<br>20375(1752.50 MHz) | 5 MHz             | QPSK         | 1 RB            |
|                                        | 20050(1720.00 MHz)<br>20175(1732.50 MHz)<br>20300(1745.00 MHz) | 20 MHz            | QPSK         | 1 RB            |
| Frequency Stability                    | 20050(1720.00 MHz)<br>20300(1745.00 MHz)                       | 20 MHz            | QPSK         | Full RB         |

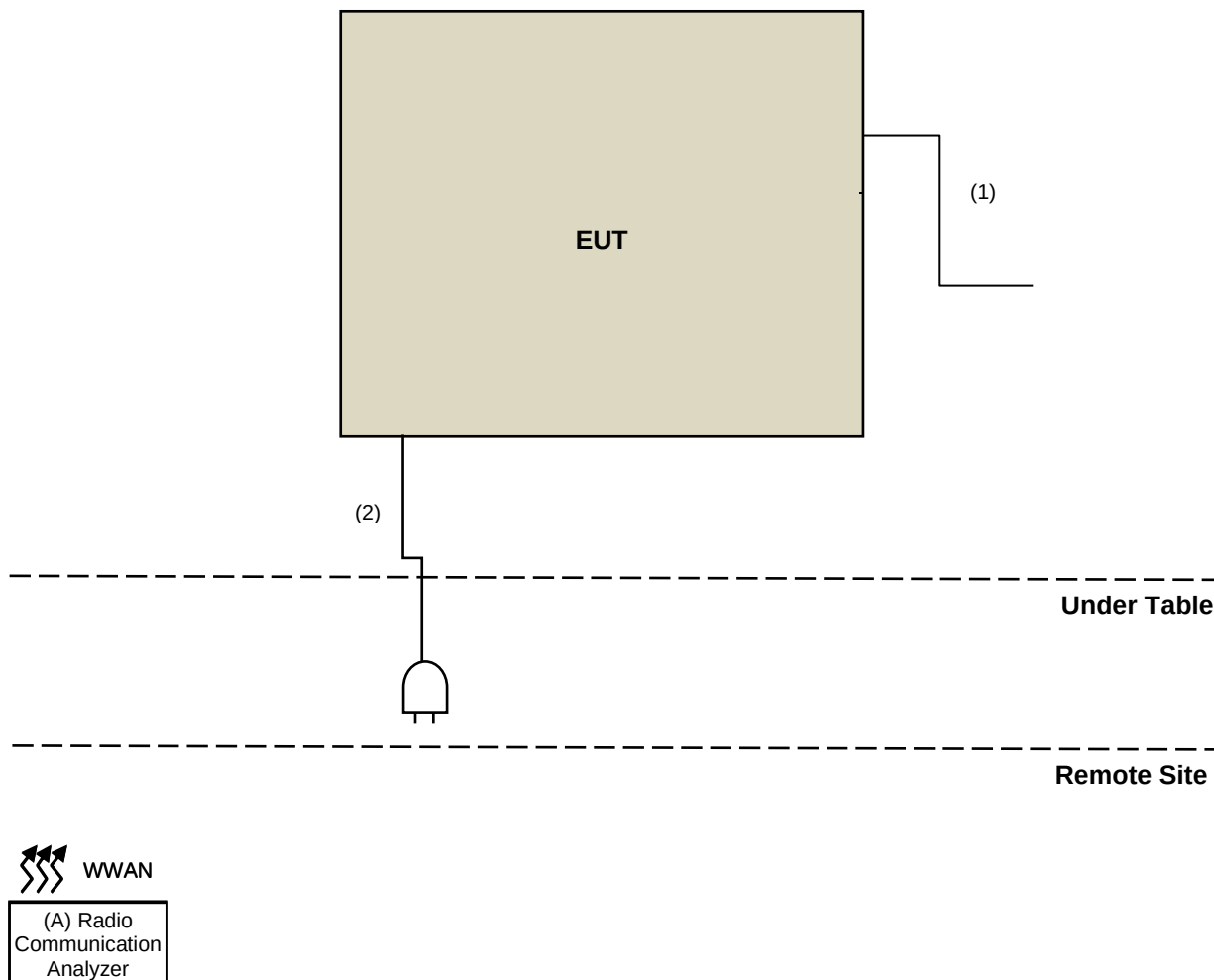
### 3.3.2 Cat-M1 Band 13

| Test Item                              | Tested Channel                                              | Channel Bandwidth | Modulation   | Mode                       |
|----------------------------------------|-------------------------------------------------------------|-------------------|--------------|----------------------------|
| Effective Radiated Power               | 23205(779.50 MHz)<br>23230(782.00 MHz)<br>23255(784.50 MHz) | 5 MHz             | QPSK / 16QAM | 1 RB<br>Half RB<br>Full RB |
|                                        | 23230(782.00 MHz)                                           | 10 MHz            | QPSK / 16QAM | 1 RB<br>Half RB<br>Full RB |
| Modulation Characteristics             | 23230(782.00 MHz)                                           | 10 MHz            | QPSK / 16QAM | Full RB                    |
| Peak to Average Ratio                  | 23205(779.50 MHz)<br>23230(782.00 MHz)<br>23255(784.50 MHz) | 5 MHz             | QPSK / 16QAM | 1 RB                       |
|                                        | 23230(782.00 MHz)                                           | 10 MHz            | QPSK / 16QAM | 1 RB                       |
| Bandwidth                              | 23205(779.50 MHz)<br>23230(782.00 MHz)<br>23255(784.50 MHz) | 5 MHz             | QPSK / 16QAM | Full RB                    |
|                                        | 23230(782.00 MHz)                                           | 10 MHz            | QPSK / 16QAM | Full RB                    |
| Conducted Spurious Emissions           | 23205(779.50 MHz)<br>23230(782.00 MHz)<br>23255(784.50 MHz) | 5 MHz             | QPSK         | 1 RB<br>Full RB            |
|                                        | 23230(782.00 MHz)                                           | 10 MHz            | QPSK         | 1 RB<br>Full RB            |
| Radiated Spurious Emissions below 1GHz | 23230(782.00 MHz)                                           | 10 MHz            | QPSK         | 1 RB                       |
| Radiated Spurious Emissions above 1GHz | 23205(779.50 MHz)<br>23230(782.00 MHz)<br>23255(784.50 MHz) | 5 MHz             | QPSK         | 1 RB                       |
|                                        | 23230(782.00 MHz)                                           | 10 MHz            | QPSK         | 1 RB                       |
| Frequency Stability                    | 23230(782.00 MHz)                                           | 10 MHz            | QPSK         | Full RB                    |

### 3.4 Test Program Used and Operation Descriptions

There is no need to controlling software during the test, and the EUT can be paired with the Radio Communication Analyzer to test the connection when it is powered on.

### 3.5 Connection Diagram of EUT and Peripheral Devices



### 3.6 Configuration of Peripheral Devices and Cable Connections

| ID | Product                      | Brand   | Model No. | Serial No. | FCC ID | Remarks         |
|----|------------------------------|---------|-----------|------------|--------|-----------------|
| A  | Radio Communication Analyzer | Anritsu | MT8821C   | 6201462755 | N/A    | Provided by Lab |

| ID | Cable Descriptions | Qty. | Length (m) | Shielding (Yes/No) | Cores (Qty.) | Remarks               |
|----|--------------------|------|------------|--------------------|--------------|-----------------------|
| 1  | USB Cable          | 1    | 1          | NO                 | 0            | Supplied by applicant |
| 2  | AC Cable           | 1    | 2          | NO                 | 0            | Supplied by applicant |

## 4 Test Instruments

The calibration interval of the all test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

### 4.1 Effective Radiated Power and Equivalent Isotropically Radiated Power

| Description<br>Manufacturer               | Model No.                        | Serial No.        | Calibrated<br>Date | Calibrated<br>Until |
|-------------------------------------------|----------------------------------|-------------------|--------------------|---------------------|
| Fixed Attenuator<br>Woken                 | 00800A1K01A-10                   | 00800A1K01A-10-01 | 2025/5/23          | 2026/5/22           |
| PXA Signal Analyzer<br>Keysight           | N9030B                           | MY57140938        | 2025/3/24          | 2026/3/23           |
| Radio Communication Analyzer<br>Anritsu   | MT8821C                          | 6201462755        | 2025/4/8           | 2026/4/7            |
| Software<br>BV                            | ADT_RF Test Software<br>V7.6.5.4 | N/A               | N/A                | N/A                 |
| UXM 5G Wireless Test Platform<br>Keysight | E7515B                           | MY60102115        | 2025/5/26          | 2026/5/25           |

Notes:

1. The test was performed in Oven room.
2. Tested Date: 2025/10/7 ~ 2025/10/8

### 4.2 Modulation Characteristics

Refer to section 4.1 to get the tested date and information of the instruments.

### 4.3 Peak to Average Ratio

| Description<br>Manufacturer               | Model No.                        | Serial No.        | Calibrated<br>Date | Calibrated<br>Until |
|-------------------------------------------|----------------------------------|-------------------|--------------------|---------------------|
| Fixed Attenuator<br>Woken                 | 00800A1K01A-10                   | 00800A1K01A-10-01 | 2025/5/23          | 2026/5/22           |
| PXA Signal Analyzer<br>Keysight           | N9030B                           | MY57140938        | 2025/3/24          | 2026/3/23           |
| Software<br>BV                            | ADT_RF Test Software<br>V7.6.5.4 | N/A               | N/A                | N/A                 |
| UXM 5G Wireless Test Platform<br>Keysight | E7515B                           | MY60102115        | 2025/5/26          | 2026/5/25           |

Notes:

1. The test was performed in Oven room.
2. Tested Date: 2025/10/7 ~ 2025/10/8

### 4.4 Bandwidth

Refer to section 4.3 to get the tested date and information of the instruments.

### 4.5 Conducted Spurious Emissions

Refer to section 4.3 to get the tested date and information of the instruments.

#### 4.6 Radiated Spurious Emissions below 1GHz

| Description<br>Manufacturer       | Model No.                    | Serial No.       | Calibrated<br>Date | Calibrated<br>Until |
|-----------------------------------|------------------------------|------------------|--------------------|---------------------|
| Antenna Tower<br>Max-Full         | MFT-151SS-0.5T               | N/A              | N/A                | N/A                 |
| Bi_Log Antenna<br>Schwarzbeck     | VULB 9168                    | 9168-1213        | 2025/9/18          | 2026/9/17           |
| EXA Signal Analyzer<br>Agilent    | N9010A                       | MY52220207       | 2024/12/30         | 2025/12/29          |
| Loop Antenna<br>TESEQ             | HLA 6121                     | 45745            | 2025/9/1           | 2026/8/31           |
| MXE EMI Receiver<br>Keysight      | N9038B                       | MY60180019       | 2025/1/15          | 2026/1/14           |
| Preamplifier<br>EMCI              | EMC330N                      | 980782           | 2025/1/14          | 2026/1/13           |
| RF Coaxial Cable<br>EMCI          | EMCCFD400-NM-NM-500          | 201233           | 2025/1/14          | 2026/1/13           |
|                                   | EMCCFD400-NM-NM-3000         | 201235           | 2025/1/14          | 2026/1/13           |
|                                   | EMCCFD400-NM-NM-9000         | 201236(with PAD) | 2025/1/14          | 2026/1/13           |
| Software<br>BV ADT                | ADT_Radiated_<br>V7.6.15.9.5 | N/A              | N/A                | N/A                 |
| Turn Table<br>Max-Full            | MF-7802BS                    | N/A              | N/A                | N/A                 |
| Turn Table Controller<br>Max-Full | MF-7802BS                    | MF780208674      | N/A                | N/A                 |

Notes:

1. The test was performed in WM - 966 chamber 8.
2. Tested Date: 2025/10/14

#### 4.7 Radiated Spurious Emissions above 1GHz

| Description<br>Manufacturer       | Model No.                    | Serial No.  | Calibrated<br>Date | Calibrated<br>Until |
|-----------------------------------|------------------------------|-------------|--------------------|---------------------|
| Antenna Tower<br>Max-Full         | MFT-151SS-0.5T               | N/A         | N/A                | N/A                 |
| EXA Signal Analyzer<br>Agilent    | N9010A                       | MY52220207  | 2024/12/30         | 2025/12/29          |
| Horn Antenna<br>RFSPIN            | DRH18-E                      | 210103A18E  | 2024/11/10         | 2025/11/9           |
| MXE EMI Receiver<br>Keysight      | N9038B                       | MY60180019  | 2025/1/15          | 2026/1/14           |
| Preamplifier<br>EMCI              | EMC118A45SE                  | 980808      | 2024/12/26         | 2025/12/25          |
| RF Coaxial Cable<br>EMCI          | EMC104-SM-SM-1000            | 210102      | 2025/1/14          | 2026/1/13           |
|                                   | EMC104-SM-SM-3000            | 201231      | 2025/1/14          | 2026/1/13           |
|                                   | EMC104-SM-SM-9000            | 201243      | 2025/1/14          | 2026/1/13           |
| Software<br>BV ADT                | ADT_Radiated_<br>V7.6.15.9.5 | N/A         | N/A                | N/A                 |
| Turn Table<br>Max-Full            | MF-7802BS                    | N/A         | N/A                | N/A                 |
| Turn Table Controller<br>Max-Full | MF-7802BS                    | MF780208674 | N/A                | N/A                 |

Notes:

1. The test was performed in WM - 966 chamber 8.
2. Tested Date: 2025/10/14

#### 4.8 Frequency Stability

| Description<br>Manufacturer               | Model No.                        | Serial No.        | Calibrated<br>Date | Calibrated<br>Until |
|-------------------------------------------|----------------------------------|-------------------|--------------------|---------------------|
| AC Power Supply<br>Extech Electronics Co. | 6905S                            | 1720444           | N/A                | N/A                 |
| Digital Multimeter<br>Fluke               | 8050A                            | 4660081           | 2025/6/6           | 2026/6/5            |
| Fixed Attenuator<br>Woken                 | 00800A1K01A-10                   | 00800A1K01A-10-01 | 2025/5/23          | 2026/5/22           |
| Signal & Spectrum Analyzer<br>R&S         | FSV3044                          | 101504            | 2025/6/18          | 2026/6/17           |
| Software<br>BV                            | ADT_RF Test Software<br>V7.6.5.4 | N/A               | N/A                | N/A                 |
| Temperature & Humidity Chamber<br>Terchy  | MHU-225AU                        | 920842            | 2025/6/25          | 2026/6/24           |

Notes:

1. The test was performed in Oven room.
2. Tested Date: 2025/10/9

## 5 Limits of Test Items

### 5.1 Effective Radiated Power and Equivalent Isotropically Radiated Power

#### For Cat-M1 Band 13:

Control stations and mobile stations transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands and fixed stations transmitting in the 787-788 MHz and 805-806 MHz bands are limited to 30 watts ERP.

#### For Cat-M1 Band 4:

Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

### 5.2 Modulation Characteristics

A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

### 5.3 Peak to Average Ratio

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.

### 5.4 Bandwidth

According to FCC 47 CFR part 2.1049, the occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5% of the total mean power radiated by a given emission.

### 5.5 Conducted Spurious Emissions

#### For Cat-M1 Band 13:

According to FCC 47 CFR part 27.53(c)(2), for on any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

According to FCC 47 CFR part 27.53(c)(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than  $65 + 10 \log (P)$  dB in a 6.25 kHz band segment, for mobile and portable stations.

For operations in the 775-788 MHz, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz (EIRP). The limit of emissions is equal to -40 dBm.

#### For Cat-M1 Band 4:

According to FCC 47 CFR part 27.53(h), for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log (P)$  dB. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

### 5.6 Radiated Spurious Emissions below 1GHz

#### For Cat-M1 Band 13:

According to FCC 47 CFR part 27.53(c)(2), for on any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB. The limit of emissions is equal to -13 dBm.

#### For Cat-M1 Band 4:

According to FCC 47 CFR part 27.53(h), for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log (P)$  dB. The limit of emission is equal to -13 dBm.

## 5.7 Radiated Spurious Emissions above 1GHz

### For Cat-M1 Band 13:

According to FCC 47 CFR part 27.53(c)(2), for on any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB. The limit of emissions is equal to -13 dBm.

For operations in the 775-788 MHz, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz (EIRP). The limit of emissions is equal to -40 dBm.

### For Cat-M1 Band 4:

According to FCC 47 CFR part 27.53(h), for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log (P)$  dB. The limit of emission is equal to -13 dBm.

## 5.8 Frequency Stability

### For Cat-M1 Band 4, Cat-M1 Band 13:

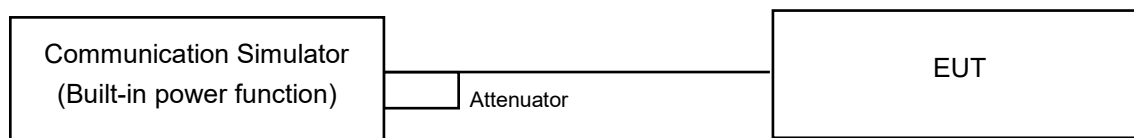
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation (authorized frequency block).

## 6 Test Arrangements

### 6.1 Effective Radiated Power and Equivalent Isotropically Radiated Power

#### 6.1.1 Test Setup

##### Conducted Power Measurement:



#### 6.1.2 Test Procedure

##### Conducted Power Measurement:

The EUT is configured by emulator to set data modulation and maximum power using WWAN technology. The average (rms) power measurement was performed on emulator and power value was measured from power function on emulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

##### Maximum EIRP / ERP

The relevant equation for determining the maximum ERP or EIRP from the measured RF output power is given in Equation as follows:

$$\text{EIRP} = P_{\text{Meas}} + G_T$$

$$\text{ERP} = P_{\text{Meas}} + G_T - 2.15$$

where

ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively

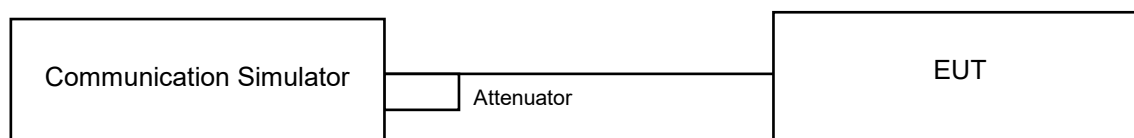
(expressed in the same units as  $P_{\text{Meas}}$ , e.g., dBm or dBW)

$P_{\text{Meas}}$  measured transmitter output power or PSD, in dBm or dBW

$G_T$  gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

### 6.2 Modulation Characteristics

#### 6.2.1 Test Setup

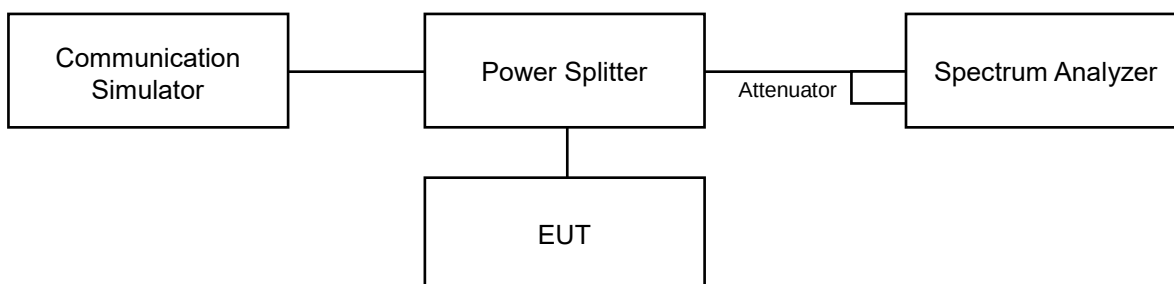


#### 6.2.2 Test Procedure

Connect the EUT to Communication Simulator via the antenna connector, the frequency band is set as EUT supported Modulation and Channels, the EUT output is matched with 50 ohm load, the waveform quality and constellation of the EUT was tested.

## 6.3 Peak to Average Ratio

### 6.3.1 Test Setup

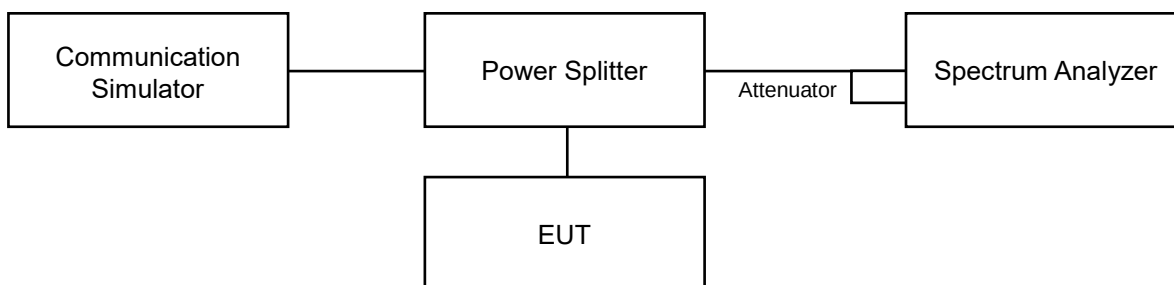


### 6.3.2 Test Procedure

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

## 6.4 Bandwidth

### 6.4.1 Test Setup



### 6.4.2 Test Procedure

For the 26 dBc bandwidth measurement method, please refer to section 5.4.3 of ANSI C63.26.

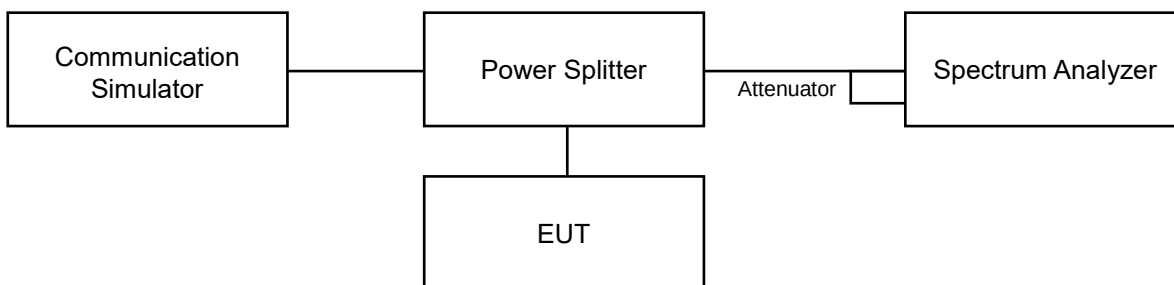
- The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be wide enough to see sufficient roll off of the signal to make the measurement.
- The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set  $\geq 3 \times$  RBW.
- Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.
- The dynamic range of the spectrum analyzer at the selected RBW shall be more than 10 dB below the target “-X dB” requirement, i.e., if the requirement calls for measuring the -26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 36 dB below the reference level.
- Set spectrum analyzer detection mode to peak, and the trace mode to max hold.
- Determine the following reference values: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).
- Determine the “-X dB amplitude” as equal to (Reference Value - X). Alternatively, this calculation can be performed on the spectrum analyzer using the delta-marker measurement function.
- Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the “-X dB amplitude” determined in step f). If a marker is below this “-X dB amplitude” value it should be as close as possible to this value. The OBW is the positive frequency difference between the two markers.
- The OBW shall be reported by providing plot(s) of the measuring instrument display, to include markers depicting the relevant frequency and amplitude information (e.g., marker table). The frequency and amplitude axis and scale shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

For the occupied bandwidth measurement method, please refer to section 5.4.4 of ANSI C63.26.

- a. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be wide enough to see sufficient roll off of the signal to make the measurement.
- b. The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set  $\geq 3 \times$  RBW.
- c. Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.
- d. The dynamic range of the spectrum analyzer at the selected RBW shall be more than 10 dB below the target “-X dB” requirement, i.e., if the requirement calls for measuring the -26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 36 dB below the reference level.
- e. Set spectrum analyzer detection mode to peak, and the trace mode to max hold.
- f. Determine the reference value by either of the following:
  - g. 1) Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).
  - h. 2) Set the EUT to transmit an unmodulated carrier. Set the spectrum analyzer marker to the level of the carrier.
- i. Determine the “-X dB amplitude” as equal to (Reference Value - X). Alternatively, this calculation can be performed on the spectrum analyzer using the delta-marker measurement function.
- j. If the reference value was determined using an unmodulated carrier, turn the EUT modulation on, then either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise the trace from step f) shall be used for step i).
- k. Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the “-X dB amplitude” determined in step f). If a marker is below this “-X dB amplitude” value it should be as close as possible to this value. The OBW is the positive frequency difference between the two markers. The spectral envelope can cross the “-X dB amplitude” at multiple points. The lowest or highest frequency shall be selected as the frequencies that are the farthest away from the center frequency at which the spectral envelope crosses the “-X dB amplitude.”
- l. The OBW shall be reported by providing plot(s) of the measuring instrument display, to include markers depicting the relevant frequency and amplitude information (e.g., marker table). The frequency and amplitude axis and scale shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

## 6.5 Conducted Spurious Emissions

### 6.5.1 Test Setup



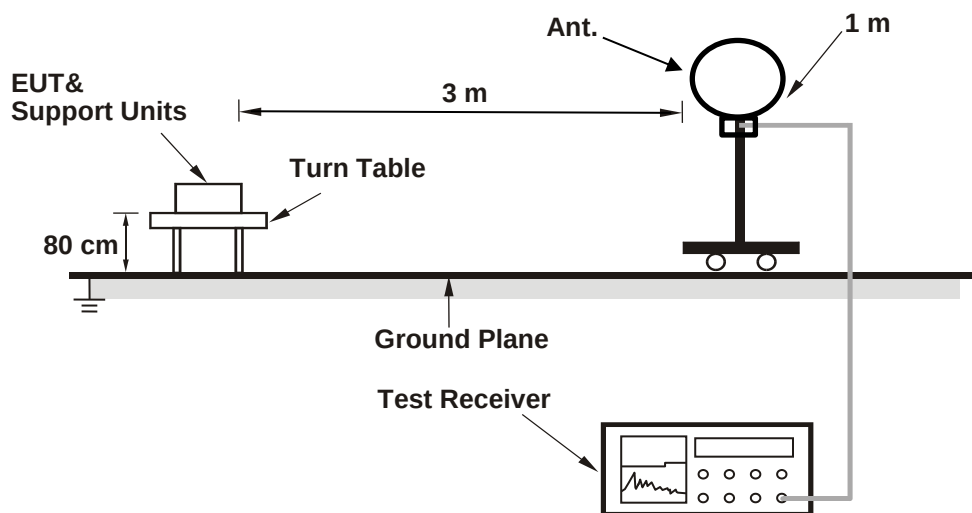
### 6.5.2 Test Procedure

- Measurement refer to ANSI C63.26 section 5.7.
- All measurements were done at 3 channels: low, middle and high operational frequency range.
- Measuring frequency range is from 9 kHz up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower. 20 dB attenuation pad is connected with spectrum.
- The fundamental frequency above 1 GHz, the spectrum set RBW = 1 MHz, VBW = 3 MHz, Detector = Average.
- The fundamental frequency below 1 GHz, the spectrum set RBW  $\geq$  100 kHz, VBW  $\geq$  3 x RBW, Detector = Average.
- Measuring frequency band edge, narrow RBW (no less than 1% of the OBW) is used for conducted emission measurement.
- For the emissions measurement method, certain channel BW modes demonstrate compliance by integrating with the smaller RBW allowed by the rule.  
For example: Where Reference RBW = 1 MHz and a smaller RBW = 100 kHz is used, worst-case integrated BW power = [Max Measured Value (dBm) with RBW = 100 kHz] +  $10 \cdot \log(1000/100)$ . To compensate for this integration before comparison to the value, the adjusted reference level offset was increase by 10 dB accordingly.
- Record the maximum power value test plot.

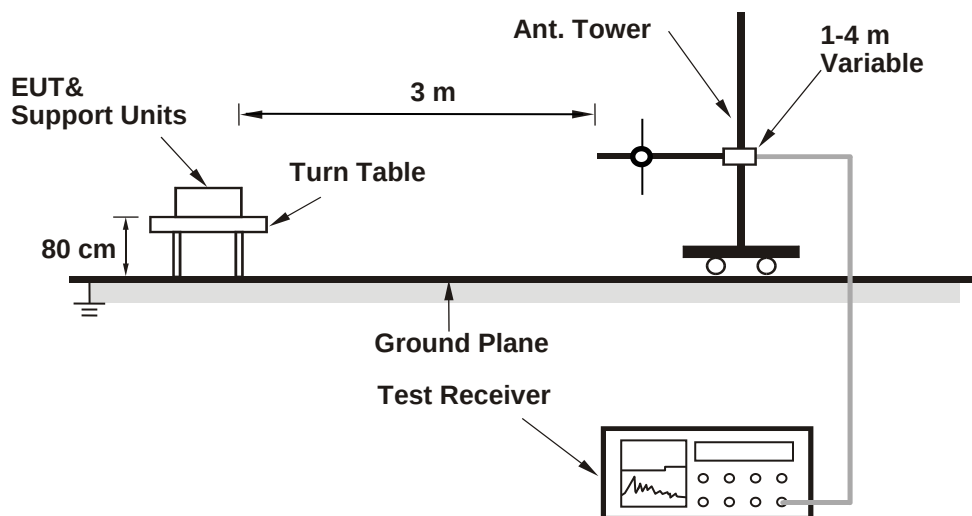
## 6.6 Radiated Spurious Emissions below 1GHz

### 6.6.1 Test Setup

#### For Radiated emission below 30 MHz



#### For Radiated emission above 30 MHz



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

### 6.6.2 Test Procedure

The EUT is configured to set data modulation and maximum power using WWAN technology.

- a. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) height of turn table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- b. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- c. Perform a field strength measurement and record the worse read value, is the field strength value via a spectrum reading obtained corrected for antenna factor, cable loss and pre-amplifier factor and then mathematically convert the measured field strength level to EIRP/ERP level.
- d. Following ANSI C63.26 section 5.5 and 5.2.7
- e.  $EIRP (dBm) = E (dB\mu V/m) + 20\log(D) - 104.8$ ; where D is the measurement distance (in the far field region) in m.
- f.  $ERP (dBm) = E (dB\mu V/m) + 20\log(D) - 104.8 - 2.15$ ; where D is the measurement distance (in the far field region) in m.

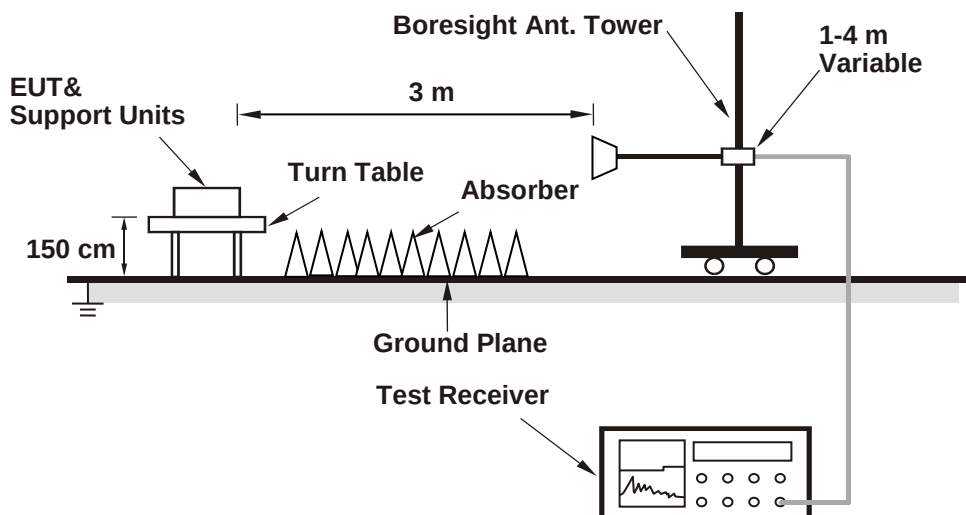
Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz. Set detector = average.
2. The amplitude of spurious emissions in the range 9 kHz to 30 MHz which are attenuated more than 20 dB below the permissible value need not be reported.

## 6.7 Radiated Spurious Emissions above 1GHz

### 6.7.1 Test Setup

For radiated emission above 1 GHz



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

### 6.7.2 Test Procedure

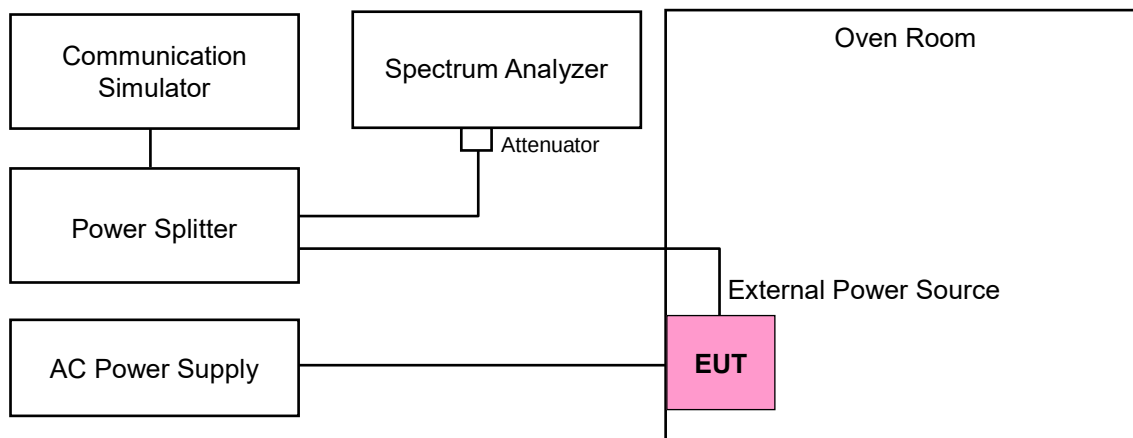
The EUT is configured to set data modulation and maximum power using WWAN technology.

- In the semi-anechoic chamber, EUT placed on the 1.5 m height of turn table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- Perform a field strength measurement and record the worse read value, is the field strength value via a spectrum reading obtained corrected for antenna factor, cable loss and pre-amplifier factor and then mathematically convert the measured field strength level to EIRP/ERP level.
- Following ANSI C63.26 section 5.5 and 5.2.7
- $EIRP \text{ (dBm)} = E \text{ (dB}\mu\text{V/m)} + 20\log(D) - 104.8$ ; where D is the measurement distance (in the far field region) in m.
- $ERP \text{ (dBm)} = E \text{ (dB}\mu\text{V/m)} + 20\log(D) - 104.8 - 2.15$ ; where D is the measurement distance (in the far field region) in m.

Note: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz. Set detector = average.

## 6.8 Frequency Stability

### 6.8.1 Test Setup



### 6.8.2 Test Procedure

The EUT is configured by emulator to set data modulation and maximum power using WWAN technology.

- 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.
- EUT is connected the external power supply to control the AC input power. 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.

## 7 Test Results of Test Item

### 7.1 Effective Radiated Power and Equivalent Isotropically Radiated Power

|              |                |                           |              |            |            |
|--------------|----------------|---------------------------|--------------|------------|------------|
| Input Power: | 120 Vac, 60 Hz | Environmental Conditions: | 24°C, 64% RH | Tested By: | Match Tsui |
|--------------|----------------|---------------------------|--------------|------------|------------|

#### 7.1.1 Cat-M1 Band 4

##### Cat-M1 Band 4, Channel Bandwidth: 1.4 MHz

| CAT-M1 Band 4 1.4M |         |           |                                   |            |            |
|--------------------|---------|-----------|-----------------------------------|------------|------------|
| Modulation         | RB Size | RB Offset | Measurement Conducted Power (dBm) |            |            |
|                    |         |           | CH 19957                          | CH 20175   | CH 20393   |
|                    |         |           | 1710.7 MHz                        | 1732.5 MHz | 1754.3 MHz |
| QPSK               | 1       | 0         | 23.10                             | 23.22      | 23.15      |
|                    | 1       | 5         | 22.67                             | 22.62      | 22.75      |
|                    | 6       | 0         | 21.25                             | 21.38      | 21.31      |
| 16QAM              | 1       | 0         | 22.99                             | 23.09      | 23.04      |
|                    | 1       | 5         | 22.62                             | 22.64      | 22.68      |
|                    | 6       | 0         | 20.51                             | 20.63      | 20.57      |

| Output Power |                           |                           |                    |                    |                  |
|--------------|---------------------------|---------------------------|--------------------|--------------------|------------------|
| Modulation   | Minimum Cond. Power (dBm) | Maximum Cond. Power (dBm) | Minimum EIRP (dBm) | Maximum EIRP (dBm) | EIRP Limit (dBm) |
| QPSK         | 21.25                     | 23.22                     | 23.55              | 25.52              | 30.00            |
| 16QAM        | 20.51                     | 23.09                     | 22.81              | 25.39              | 30.00            |

Note: EIRP (dBm) = Cond. Power (dBm) + Antenna Gain (dBi) + Array Gain (if applicable)

### Cat-M1 Band 4, Channel Bandwidth: 3 MHz

| CAT-M1 Band 4 3M |         |           |                                   |            |            |
|------------------|---------|-----------|-----------------------------------|------------|------------|
| Modulation       | RB Size | RB Offset | Measurement Conducted Power (dBm) |            |            |
|                  |         |           | CH 19965                          | CH 20175   | CH 20385   |
|                  |         |           | 1711.5 MHz                        | 1732.5 MHz | 1753.5 MHz |
| QPSK             | 1       | 0         | 23.19                             | 23.30      | 23.22      |
|                  | 1       | 5         | 22.74                             | 22.70      | 22.83      |
|                  | 6       | 0         | 21.33                             | 21.45      | 21.39      |
| 16QAM            | 1       | 0         | 23.07                             | 23.17      | 23.12      |
|                  | 1       | 5         | 22.69                             | 22.71      | 22.75      |
|                  | 6       | 0         | 20.60                             | 20.70      | 20.64      |

| Output Power |                           |                           |                    |                    |                  |
|--------------|---------------------------|---------------------------|--------------------|--------------------|------------------|
| Modulation   | Minimum Cond. Power (dBm) | Maximum Cond. Power (dBm) | Minimum EIRP (dBm) | Maximum EIRP (dBm) | EIRP Limit (dBm) |
| QPSK         | 21.33                     | 23.3                      | 23.63              | 25.6               | 30.00            |
| 16QAM        | 20.6                      | 23.17                     | 22.9               | 25.47              | 30.00            |

Note: EIRP (dBm) = Cond. Power (dBm) + Antenna Gain (dBi) + Array Gain (if applicable)

### Cat-M1 Band 4, Channel Bandwidth: 5 MHz

| CAT-M1 Band 4 5M |         |           |                                   |            |            |
|------------------|---------|-----------|-----------------------------------|------------|------------|
| Modulation       | RB Size | RB Offset | Measurement Conducted Power (dBm) |            |            |
|                  |         |           | CH 19975                          | CH 20175   | CH 20375   |
|                  |         |           | 1712.5 MHz                        | 1732.5 MHz | 1752.5 MHz |
| QPSK             | 1       | 0         | 23.27                             | 23.38      | 23.29      |
|                  | 1       | 5         | 22.81                             | 22.78      | 22.91      |
|                  | 6       | 0         | 21.42                             | 21.53      | 21.46      |
| 16QAM            | 1       | 0         | 23.16                             | 23.25      | 23.20      |
|                  | 1       | 5         | 22.77                             | 22.79      | 22.83      |
|                  | 6       | 0         | 20.68                             | 20.77      | 20.71      |

| Output Power |                           |                           |                    |                    |                  |
|--------------|---------------------------|---------------------------|--------------------|--------------------|------------------|
| Modulation   | Minimum Cond. Power (dBm) | Maximum Cond. Power (dBm) | Minimum EIRP (dBm) | Maximum EIRP (dBm) | EIRP Limit (dBm) |
| QPSK         | 21.42                     | 23.38                     | 23.72              | 25.68              | 30.00            |
| 16QAM        | 20.68                     | 23.25                     | 22.98              | 25.55              | 30.00            |

Note: EIRP (dBm) = Cond. Power (dBm) + Antenna Gain (dBi) + Array Gain (if applicable)

### Cat-M1 Band 4, Channel Bandwidth: 10 MHz

| CAT-M1 Band 4 10M |         |           |                                   |            |          |
|-------------------|---------|-----------|-----------------------------------|------------|----------|
| Modulation        | RB Size | RB Offset | Measurement Conducted Power (dBm) |            |          |
|                   |         |           | CH 20000                          | CH 20175   | CH 20350 |
|                   |         |           | 1715 MHz                          | 1732.5 MHz | 1750 MHz |
| QPSK              | 1       | 0         | 23.35                             | 23.45      | 23.37    |
|                   | 1       | 5         | 22.88                             | 22.86      | 22.98    |
|                   | 6       | 0         | 21.51                             | 21.60      | 21.53    |
| 16QAM             | 1       | 0         | 23.24                             | 23.33      | 23.27    |
|                   | 1       | 5         | 22.84                             | 22.86      | 22.90    |
|                   | 6       | 0         | 20.76                             | 20.85      | 20.78    |

| Output Power |                           |                           |                    |                    |                  |
|--------------|---------------------------|---------------------------|--------------------|--------------------|------------------|
| Modulation   | Minimum Cond. Power (dBm) | Maximum Cond. Power (dBm) | Minimum EIRP (dBm) | Maximum EIRP (dBm) | EIRP Limit (dBm) |
| QPSK         | 21.51                     | 23.45                     | 23.81              | 25.75              | 30.00            |
| 16QAM        | 20.76                     | 23.33                     | 23.06              | 25.63              | 30.00            |

Note: EIRP (dBm) = Cond. Power (dBm) + Antenna Gain (dBi) + Array Gain (if applicable)

### Cat-M1 Band 4, Channel Bandwidth: 15 MHz

| CAT-M1 Band 4 15M |         |           |                                   |            |            |
|-------------------|---------|-----------|-----------------------------------|------------|------------|
| Modulation        | RB Size | RB Offset | Measurement Conducted Power (dBm) |            |            |
|                   |         |           | CH 20025                          | CH 20175   | CH 20325   |
|                   |         |           | 1717.5 MHz                        | 1732.5 MHz | 1747.5 MHz |
| QPSK              | 1       | 0         | 23.43                             | 23.52      | 23.45      |
|                   | 1       | 5         | 22.96                             | 22.94      | 23.05      |
|                   | 6       | 0         | 21.59                             | 21.68      | 21.60      |
| 16QAM             | 1       | 0         | 23.33                             | 23.41      | 23.35      |
|                   | 1       | 5         | 22.91                             | 22.93      | 22.98      |
|                   | 6       | 0         | 20.85                             | 20.93      | 20.86      |

| Output Power |                           |                           |                    |                    |                  |
|--------------|---------------------------|---------------------------|--------------------|--------------------|------------------|
| Modulation   | Minimum Cond. Power (dBm) | Maximum Cond. Power (dBm) | Minimum EIRP (dBm) | Maximum EIRP (dBm) | EIRP Limit (dBm) |
| QPSK         | 21.59                     | 23.52                     | 23.89              | 25.82              | 30.00            |
| 16QAM        | 20.85                     | 23.41                     | 23.15              | 25.71              | 30.00            |

Note: EIRP (dBm) = Cond. Power (dBm) + Antenna Gain (dBi) + Array Gain (if applicable)

# Cat-M1 Band 4, Channel Bandwidth: 20 MHz

| CAT-M1 Band 4 20M |         |           |                                   |            |          |
|-------------------|---------|-----------|-----------------------------------|------------|----------|
| Modulation        | RB Size | RB Offset | Measurement Conducted Power (dBm) |            |          |
|                   |         |           | CH 20050                          | CH 20175   | CH 20300 |
|                   |         |           | 1720 MHz                          | 1732.5 MHz | 1745 MHz |
| QPSK              | 1       | 0         | 23.52                             | 23.59      | 23.52    |
|                   | 1       | 5         | 23.03                             | 23.02      | 23.13    |
|                   | 6       | 0         | 21.68                             | 21.75      | 21.68    |
| 16QAM             | 1       | 0         | 23.42                             | 23.49      | 23.42    |
|                   | 1       | 5         | 22.99                             | 23.00      | 23.06    |
|                   | 6       | 0         | 20.93                             | 21.00      | 20.93    |

| Output Power |                           |                           |                    |                    |                  |
|--------------|---------------------------|---------------------------|--------------------|--------------------|------------------|
| Modulation   | Minimum Cond. Power (dBm) | Maximum Cond. Power (dBm) | Minimum EIRP (dBm) | Maximum EIRP (dBm) | EIRP Limit (dBm) |
| QPSK         | 21.68                     | 23.59                     | 23.98              | 25.89              | 30.00            |
| 16QAM        | 20.93                     | 23.49                     | 23.23              | 25.79              | 30.00            |

Note: EIRP (dBm) = Cond. Power (dBm) + Antenna Gain (dBi) + Array Gain (if applicable)

### 7.1.2 Cat-M1 Band 13

#### Cat-M1 Band 13, Channel Bandwidth: 5 MHz

| CAT-M1 Band 13 5M |         |           |                                   |          |           |
|-------------------|---------|-----------|-----------------------------------|----------|-----------|
| Modulation        | RB Size | RB Offset | Measurement Conducted Power (dBm) |          |           |
|                   |         |           | CH 23205                          | CH 23230 | CH 23255  |
|                   |         |           | 779.5 MHz                         | 782 MHz  | 784.5 MHz |
| QPSK              | 1       | 0         | 23.28                             | 23.36    | 23.30     |
|                   | 1       | 5         | 22.89                             | 22.53    | 22.79     |
|                   | 6       | 0         | 21.79                             | 21.75    | 21.69     |
| 16QAM             | 1       | 0         | 23.29                             | 23.35    | 23.22     |
|                   | 1       | 5         | 23.19                             | 23.15    | 22.67     |
|                   | 6       | 0         | 20.98                             | 20.09    | 20.88     |

| Output Power |                           |                           |                   |                   |                 |
|--------------|---------------------------|---------------------------|-------------------|-------------------|-----------------|
| Modulation   | Minimum Cond. Power (dBm) | Maximum Cond. Power (dBm) | Minimum ERP (dBm) | Maximum ERP (dBm) | ERP Limit (dBm) |
| QPSK         | 21.69                     | 23.36                     | 20.34             | 22.01             | 44.77           |
| 16QAM        | 20.09                     | 23.35                     | 18.74             | 22                | 44.77           |

Note: EIRP (dBm) = Cond. Power (dBm) + Antenna Gain (dBi) + Array Gain (if applicable)

ERP (dBm) = EIRP (dBm) - 2.15

# Cat-M1 Band 13, Channel Bandwidth: 10 MHz

| CAT-M1 Band 13 10M |         |           |                                   |
|--------------------|---------|-----------|-----------------------------------|
| Modulation         | RB Size | RB Offset | Measurement Conducted Power (dBm) |
|                    |         |           | CH 23230                          |
|                    |         |           | 782 MHz                           |
| QPSK               | 1       | 0         | 23.49                             |
|                    | 1       | 5         | 22.59                             |
|                    | 6       | 0         | 21.77                             |
| 16QAM              | 1       | 0         | 23.45                             |
|                    | 1       | 5         | 23.09                             |
|                    | 6       | 0         | 22.04                             |

| Output Power |                           |                           |                   |                   |                 |
|--------------|---------------------------|---------------------------|-------------------|-------------------|-----------------|
| Modulation   | Minimum Cond. Power (dBm) | Maximum Cond. Power (dBm) | Minimum ERP (dBm) | Maximum ERP (dBm) | ERP Limit (dBm) |
| QPSK         | 21.77                     | 23.49                     | 20.42             | 22.14             | 44.77           |
| 16QAM        | 22.04                     | 23.45                     | 20.69             | 22.1              | 44.77           |

Note: EIRP (dBm) = Cond. Power (dBm) + Antenna Gain (dBi) + Array Gain (if applicable)

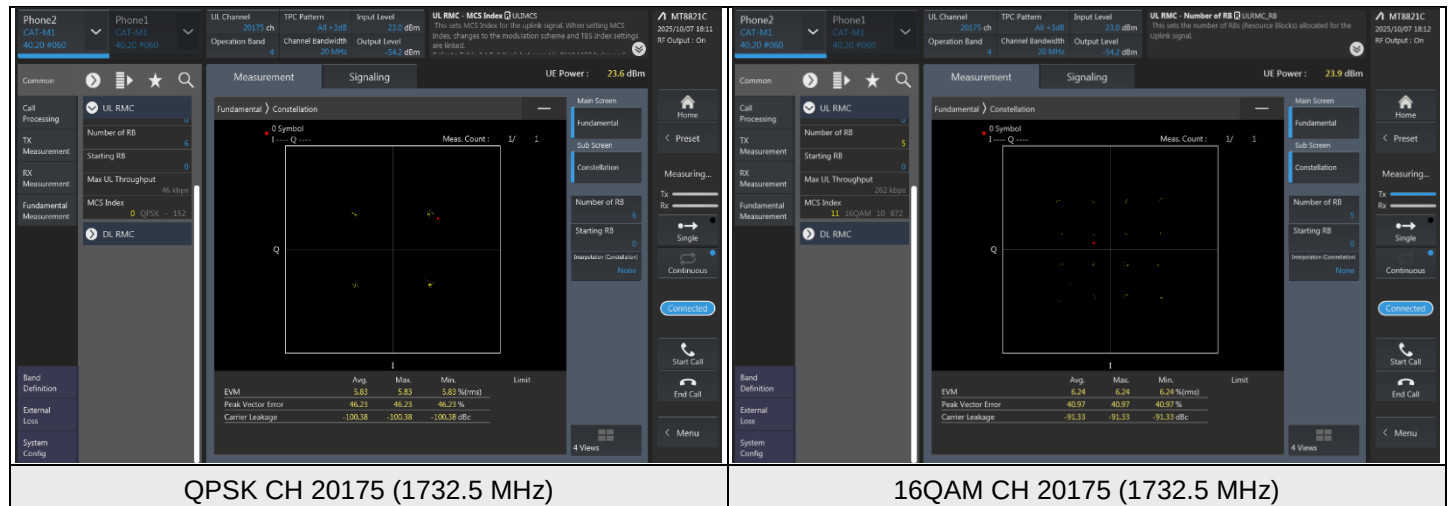
ERP (dBm) = EIRP (dBm) - 2.15

## 7.2 Modulation Characteristics

|              |                |                           |              |            |            |
|--------------|----------------|---------------------------|--------------|------------|------------|
| Input Power: | 120 Vac, 60 Hz | Environmental Conditions: | 25°C, 68% RH | Tested By: | Noah Chang |
|--------------|----------------|---------------------------|--------------|------------|------------|

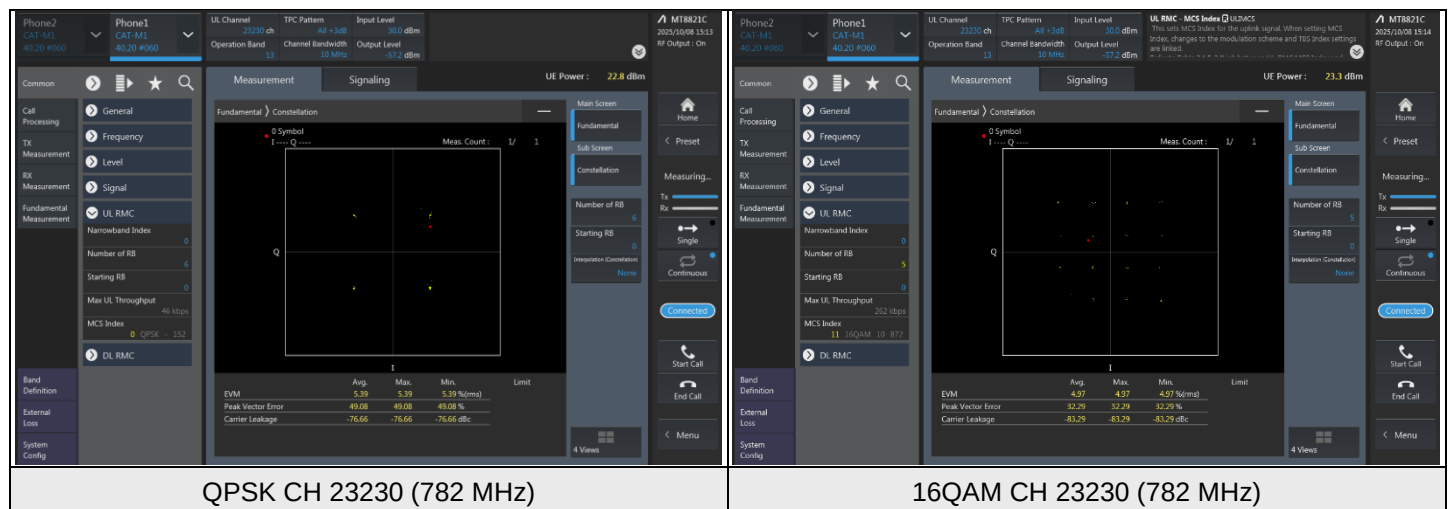
### 7.2.1 Cat-M1 Band 4

#### Cat-M1 Band 4, Channel Bandwidth: 20 MHz



### 7.2.2 Cat-M1 Band 13

#### Cat-M1 Band 13, Channel Bandwidth: 10 MHz



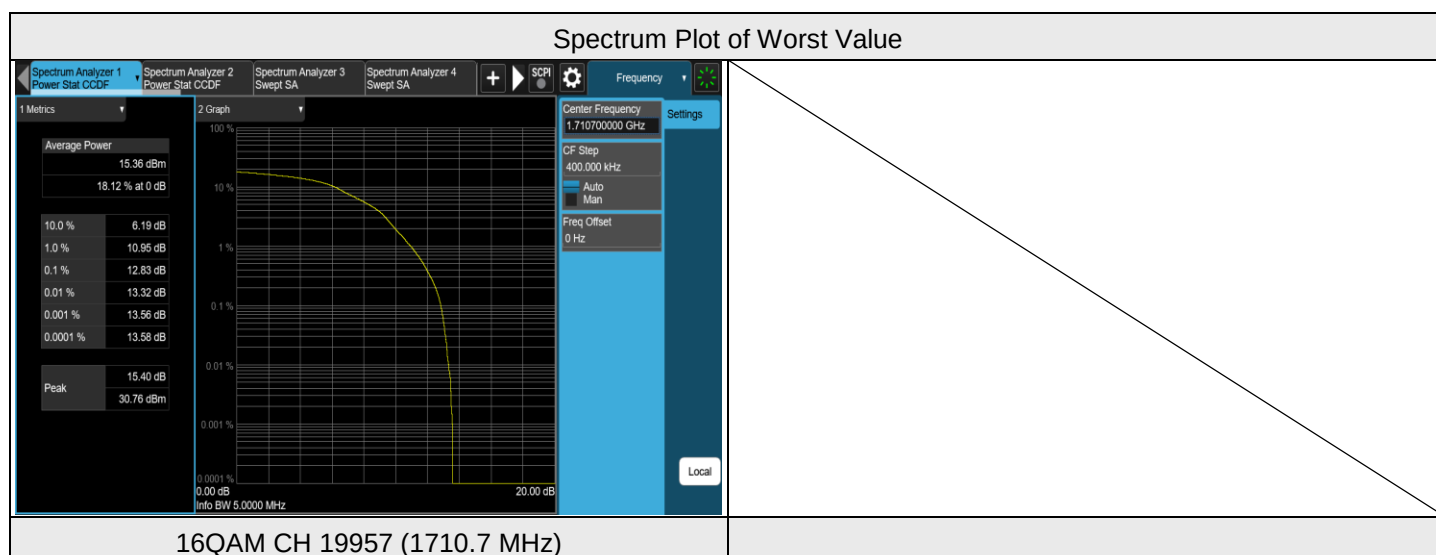
### 7.3 Peak to Average Ratio

|              |                |                           |              |            |            |
|--------------|----------------|---------------------------|--------------|------------|------------|
| Input Power: | 120 Vac, 60 Hz | Environmental Conditions: | 25°C, 68% RH | Tested By: | Noah Chang |
|--------------|----------------|---------------------------|--------------|------------|------------|

#### 7.3.1 Cat-M1 Band 4

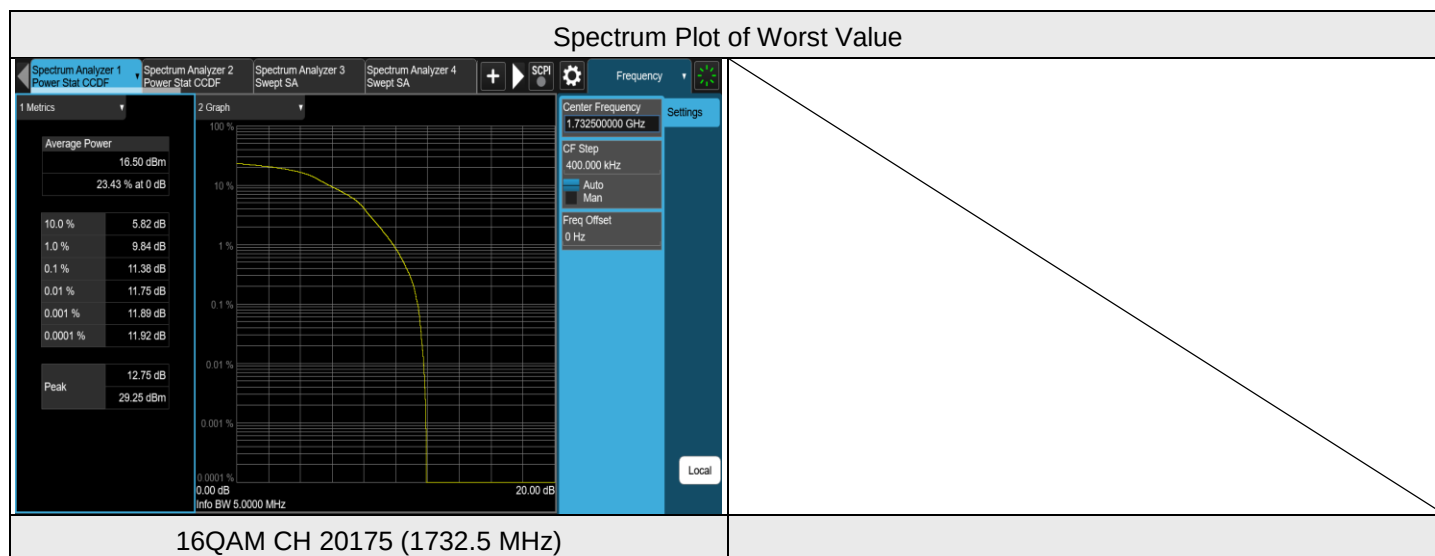
##### Cat-M1 Band 4, Channel Bandwidth: 1.4 MHz

| Modulation | Channel | Frequency (MHz) | Measurement Value(dB) | Limit (dB) | Result |
|------------|---------|-----------------|-----------------------|------------|--------|
| QPSK       | 19957   | 1710.7          | 11.47                 | 13         | PASS   |
| QPSK       | 20175   | 1732.5          | 11.45                 | 13         | PASS   |
| QPSK       | 20393   | 1754.3          | 11.72                 | 13         | PASS   |
| 16QAM      | 19957   | 1710.7          | 12.83                 | 13         | PASS   |
| 16QAM      | 20175   | 1732.5          | 12.71                 | 13         | PASS   |
| 16QAM      | 20393   | 1754.3          | 12.38                 | 13         | PASS   |



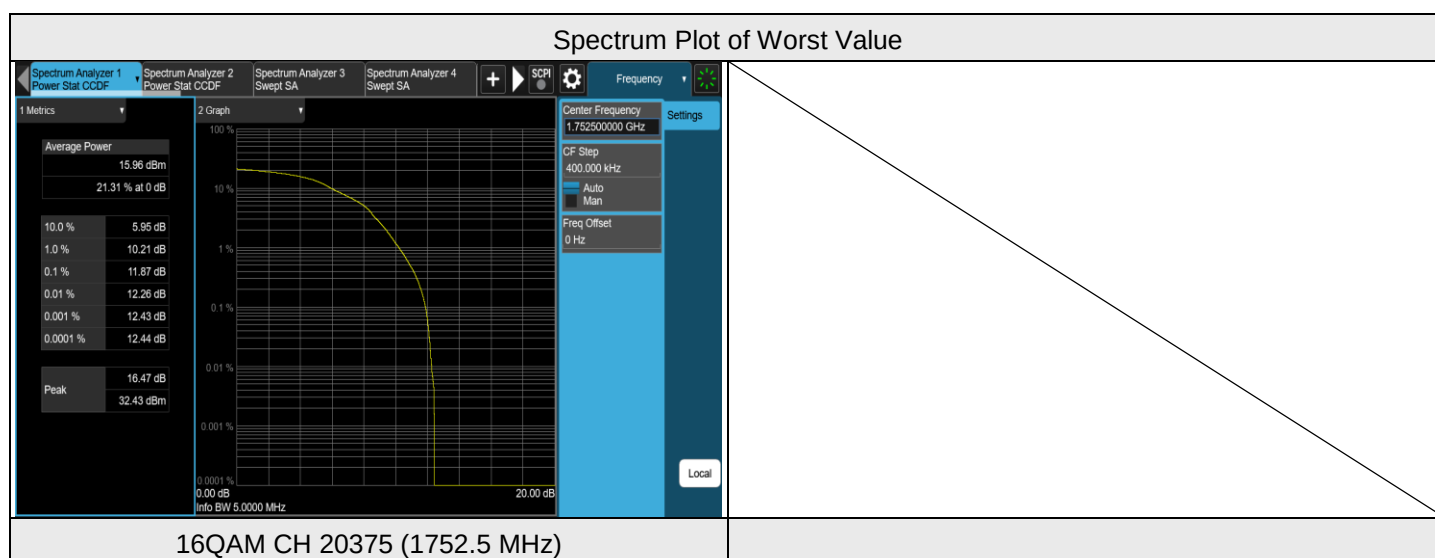
### Cat-M1 Band 4, Channel Bandwidth: 3 MHz

| Modulation | Channel | Frequency (MHz) | Measurement Value(dB) | Limit (dB) | Result |
|------------|---------|-----------------|-----------------------|------------|--------|
| QPSK       | 19965   | 1711.5          | 10.75                 | 13         | PASS   |
| QPSK       | 20175   | 1732.5          | 10.83                 | 13         | PASS   |
| QPSK       | 20385   | 1753.5          | 10.73                 | 13         | PASS   |
| 16QAM      | 19965   | 1711.5          | 11.28                 | 13         | PASS   |
| 16QAM      | 20175   | 1732.5          | 11.38                 | 13         | PASS   |
| 16QAM      | 20385   | 1753.5          | 11.36                 | 13         | PASS   |



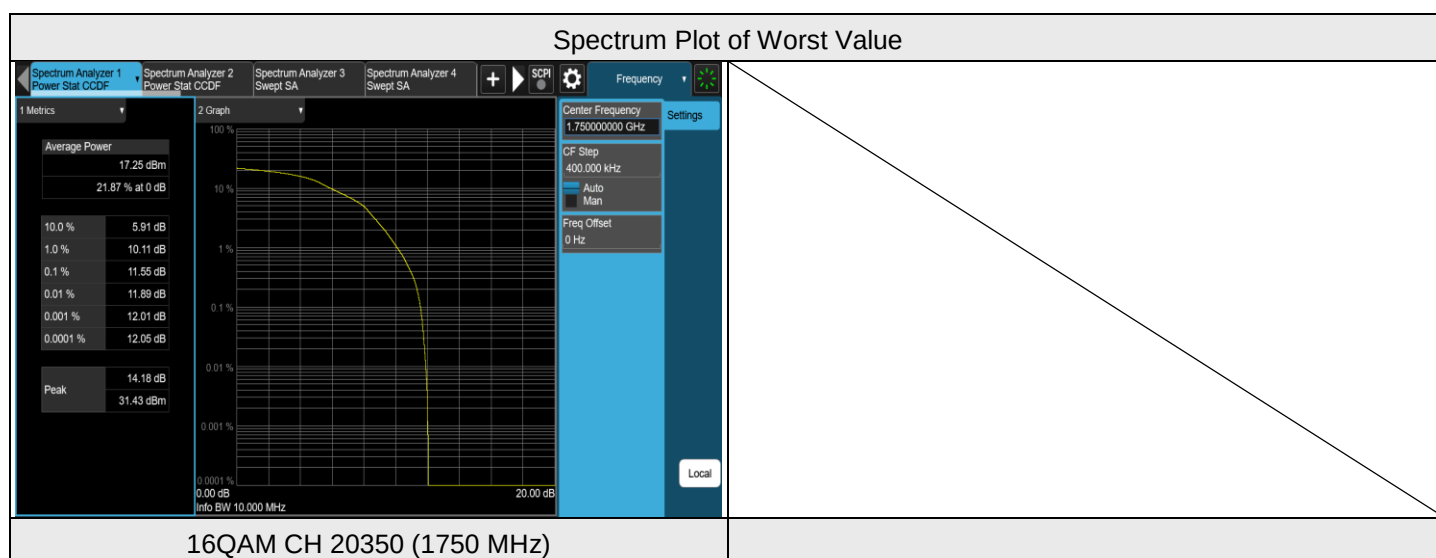
### Cat-M1 Band 4, Channel Bandwidth: 5 MHz

| Modulation | Channel | Frequency (MHz) | Measurement Value(dB) | Limit (dB) | Result |
|------------|---------|-----------------|-----------------------|------------|--------|
| QPSK       | 19975   | 1712.5          | 10.63                 | 13         | PASS   |
| QPSK       | 20175   | 1732.5          | 10.40                 | 13         | PASS   |
| QPSK       | 20375   | 1752.5          | 10.86                 | 13         | PASS   |
| 16QAM      | 19975   | 1712.5          | 11.42                 | 13         | PASS   |
| 16QAM      | 20175   | 1732.5          | 11.14                 | 13         | PASS   |
| 16QAM      | 20375   | 1752.5          | 11.87                 | 13         | PASS   |



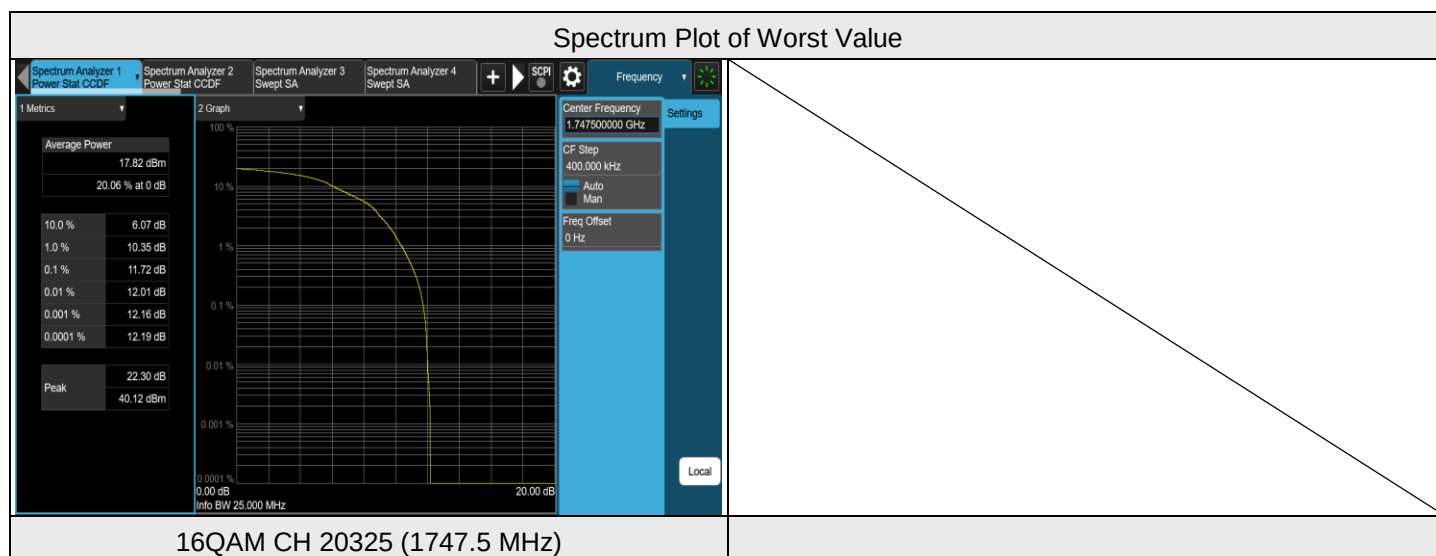
### Cat-M1 Band 4, Channel Bandwidth: 10 MHz

| Modulation | Channel | Frequency (MHz) | Measurement Value(dB) | Limit (dB) | Result |
|------------|---------|-----------------|-----------------------|------------|--------|
| QPSK       | 20000   | 1715            | 10.47                 | 13         | PASS   |
| QPSK       | 20175   | 1732.5          | 10.05                 | 13         | PASS   |
| QPSK       | 20350   | 1750            | 10.64                 | 13         | PASS   |
| 16QAM      | 20000   | 1715            | 10.81                 | 13         | PASS   |
| 16QAM      | 20175   | 1732.5          | 11.28                 | 13         | PASS   |
| 16QAM      | 20350   | 1750            | 11.55                 | 13         | PASS   |



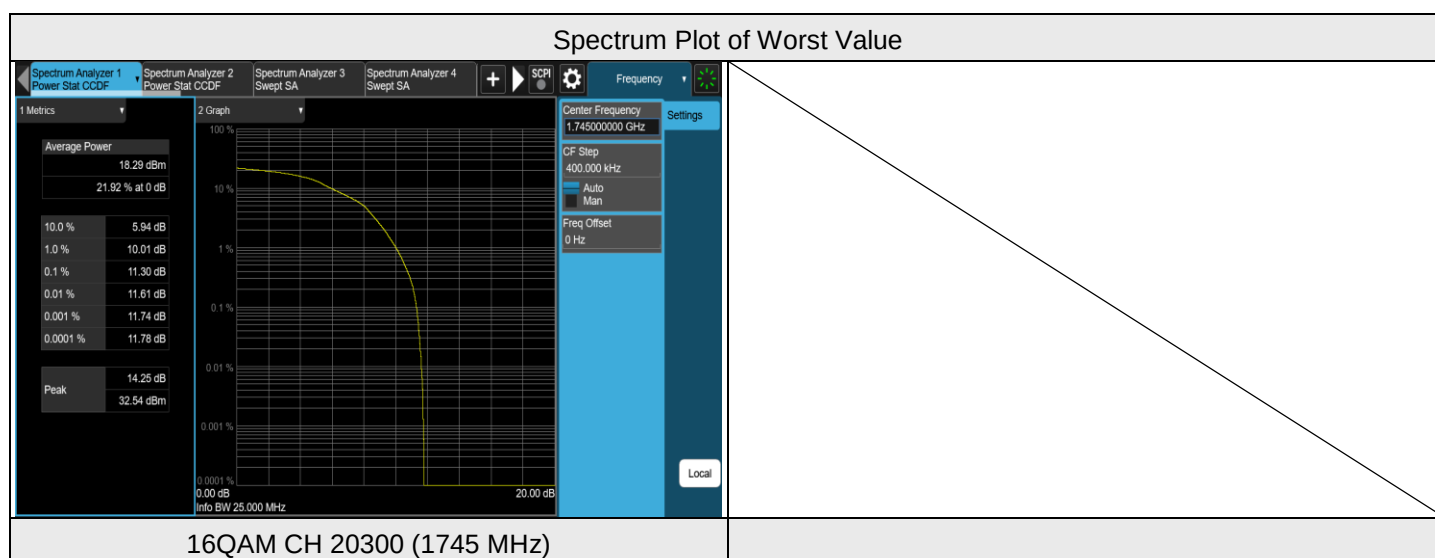
### Cat-M1 Band 4, Channel Bandwidth: 15 MHz

| Modulation | Channel | Frequency (MHz) | Measurement Value(dB) | Limit (dB) | Result |
|------------|---------|-----------------|-----------------------|------------|--------|
| QPSK       | 20025   | 1717.5          | 9.80                  | 13         | PASS   |
| QPSK       | 20175   | 1732.5          | 10.09                 | 13         | PASS   |
| QPSK       | 20325   | 1747.5          | 8.93                  | 13         | PASS   |
| 16QAM      | 20025   | 1717.5          | 9.87                  | 13         | PASS   |
| 16QAM      | 20175   | 1732.5          | 10.86                 | 13         | PASS   |
| 16QAM      | 20325   | 1747.5          | 11.72                 | 13         | PASS   |



### Cat-M1 Band 4, Channel Bandwidth: 20 MHz

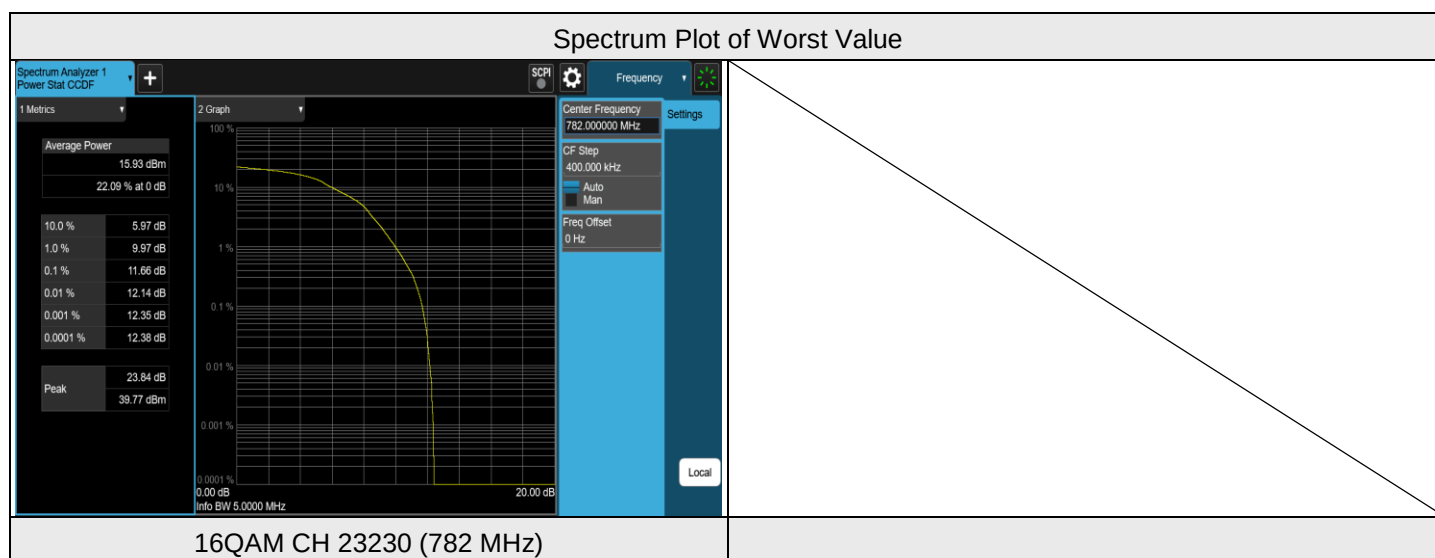
| Modulation | Channel | Frequency (MHz) | Measurement Value(dB) | Limit (dB) | Result |
|------------|---------|-----------------|-----------------------|------------|--------|
| QPSK       | 20050   | 1720            | 10.37                 | 13         | PASS   |
| QPSK       | 20175   | 1732.5          | 10.60                 | 13         | PASS   |
| QPSK       | 20300   | 1745            | 9.78                  | 13         | PASS   |
| 16QAM      | 20050   | 1720            | 9.87                  | 13         | PASS   |
| 16QAM      | 20175   | 1732.5          | 10.07                 | 13         | PASS   |
| 16QAM      | 20300   | 1745            | 11.30                 | 13         | PASS   |



### 7.3.2 Cat-M1 Band 13

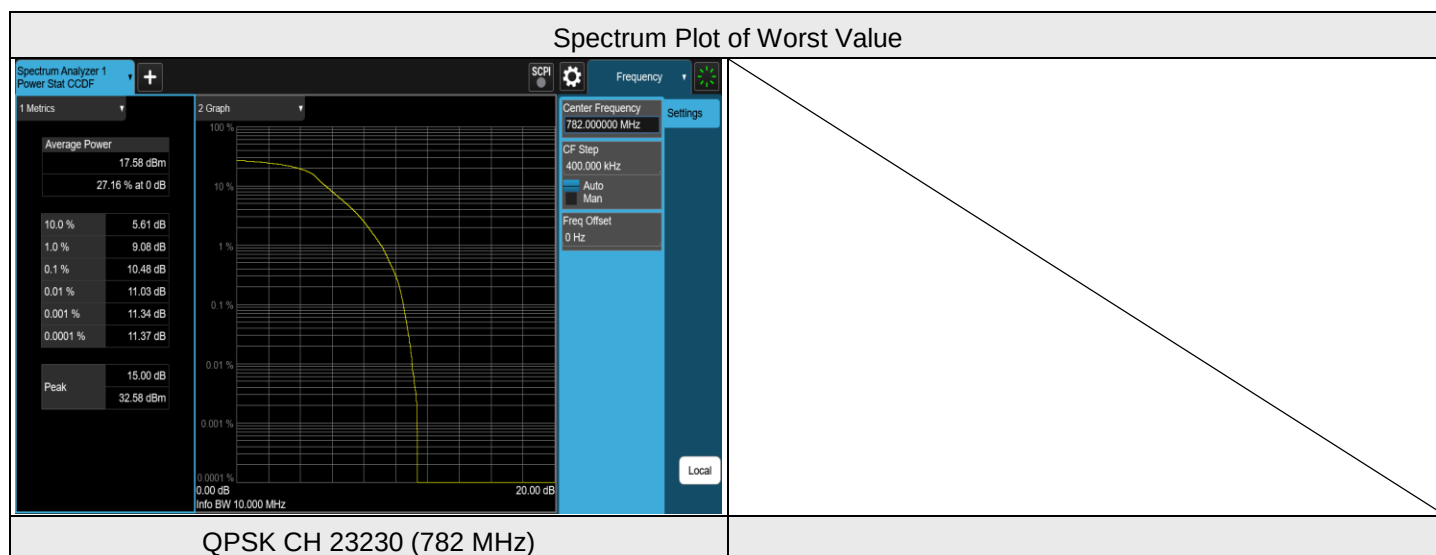
#### Cat-M1 Band 13, Channel Bandwidth: 5 MHz

| Modulation | Channel | Frequency (MHz) | Measurement Value(dB) | Limit (dB) | Result |
|------------|---------|-----------------|-----------------------|------------|--------|
| QPSK       | 23205   | 779.5           | 10.41                 | 13         | PASS   |
| QPSK       | 23230   | 782             | 10.73                 | 13         | PASS   |
| QPSK       | 23255   | 784.5           | 10.65                 | 13         | PASS   |
| 16QAM      | 23205   | 779.5           | 11.18                 | 13         | PASS   |
| 16QAM      | 23230   | 782             | 11.66                 | 13         | PASS   |
| 16QAM      | 23255   | 784.5           | 11.19                 | 13         | PASS   |



### Cat-M1 Band 13, Channel Bandwidth: 10 MHz

| Modulation | Channel | Frequency (MHz) | Measurement Value(dB) | Limit (dB) | Result |
|------------|---------|-----------------|-----------------------|------------|--------|
| QPSK       | 23230   | 782             | 10.48                 | 13         | PASS   |
| 16QAM      | 23230   | 782             | 10.11                 | 13         | PASS   |



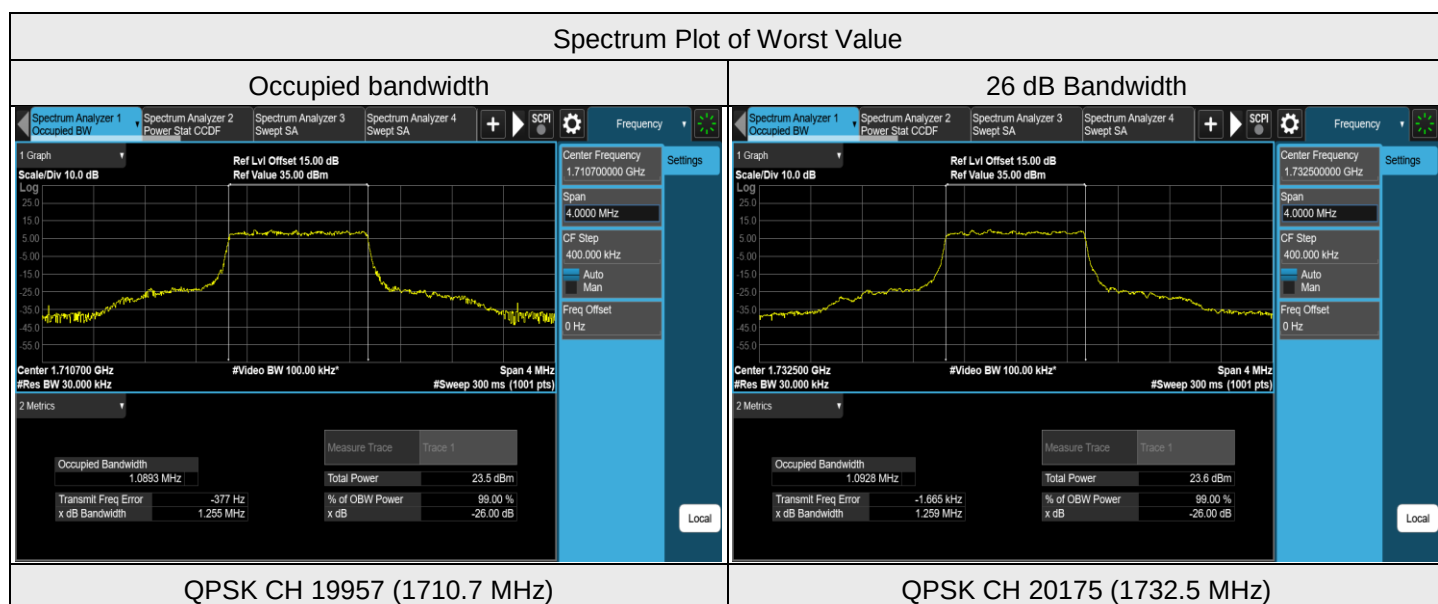
## 7.4 Bandwidth

|              |                |                           |              |            |            |
|--------------|----------------|---------------------------|--------------|------------|------------|
| Input Power: | 120 Vac, 60 Hz | Environmental Conditions: | 25°C, 68% RH | Tested By: | Noah Chang |
|--------------|----------------|---------------------------|--------------|------------|------------|

### 7.4.1 Cat-M1 Band 4

#### Cat-M1 Band 4, Channel Bandwidth: 1.4 MHz

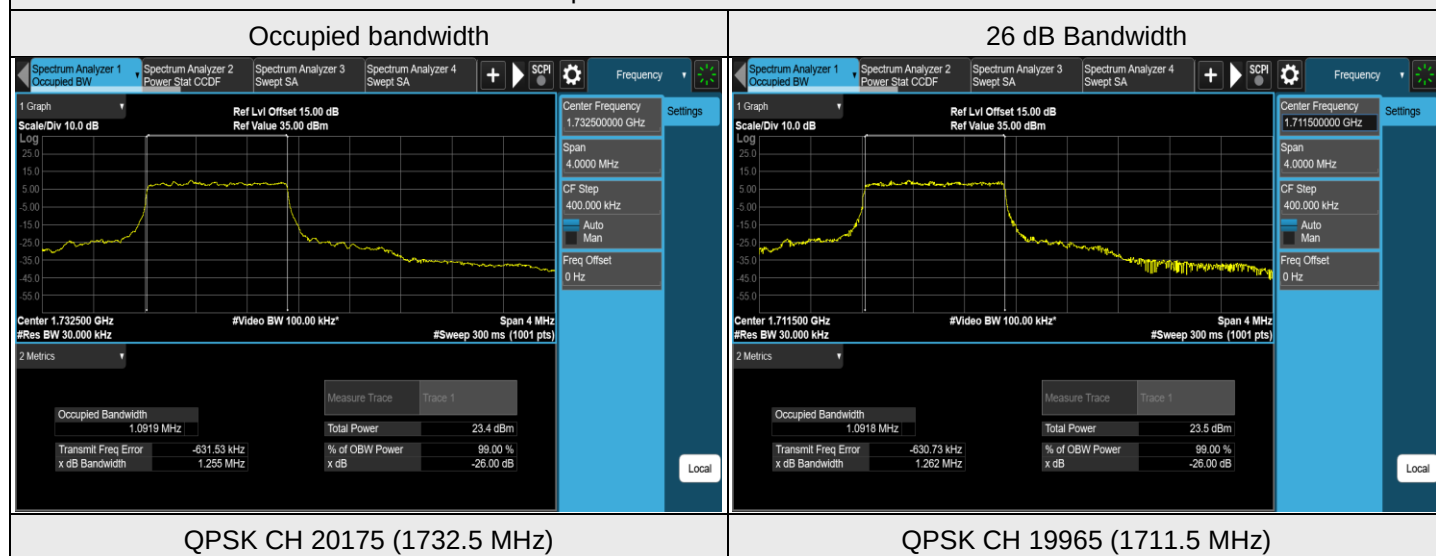
| Modulation | Channel | Frequency (MHz) | Occupied Bandwidth (MHz) | 26 dB Bandwidth (MHz) |
|------------|---------|-----------------|--------------------------|-----------------------|
| QPSK       | 19957   | 1710.7          | 1.0893                   | 1.255                 |
| QPSK       | 20175   | 1732.5          | 1.0878                   | 1.259                 |
| QPSK       | 20393   | 1754.3          | 1.0872                   | 1.252                 |
| 16QAM      | 19957   | 1710.7          | 0.9154                   | 1.088                 |
| 16QAM      | 20175   | 1732.5          | 0.9147                   | 1.079                 |
| 16QAM      | 20393   | 1754.3          | 0.9165                   | 1.084                 |



## Cat-M1 Band 4, Channel Bandwidth: 3 MHz

| Modulation | Channel | Frequency (MHz) | Occupied Bandwidth (MHz) | 26 dB Bandwidth (MHz) |
|------------|---------|-----------------|--------------------------|-----------------------|
| QPSK       | 19965   | 1711.5          | 1.0918                   | 1.262                 |
| QPSK       | 20175   | 1732.5          | 1.0919                   | 1.255                 |
| QPSK       | 20385   | 1753.5          | 1.0913                   | 1.249                 |
| 16QAM      | 19965   | 1711.5          | 0.9163                   | 1.082                 |
| 16QAM      | 20175   | 1732.5          | 0.9160                   | 1.079                 |
| 16QAM      | 20385   | 1753.5          | 0.9156                   | 1.078                 |

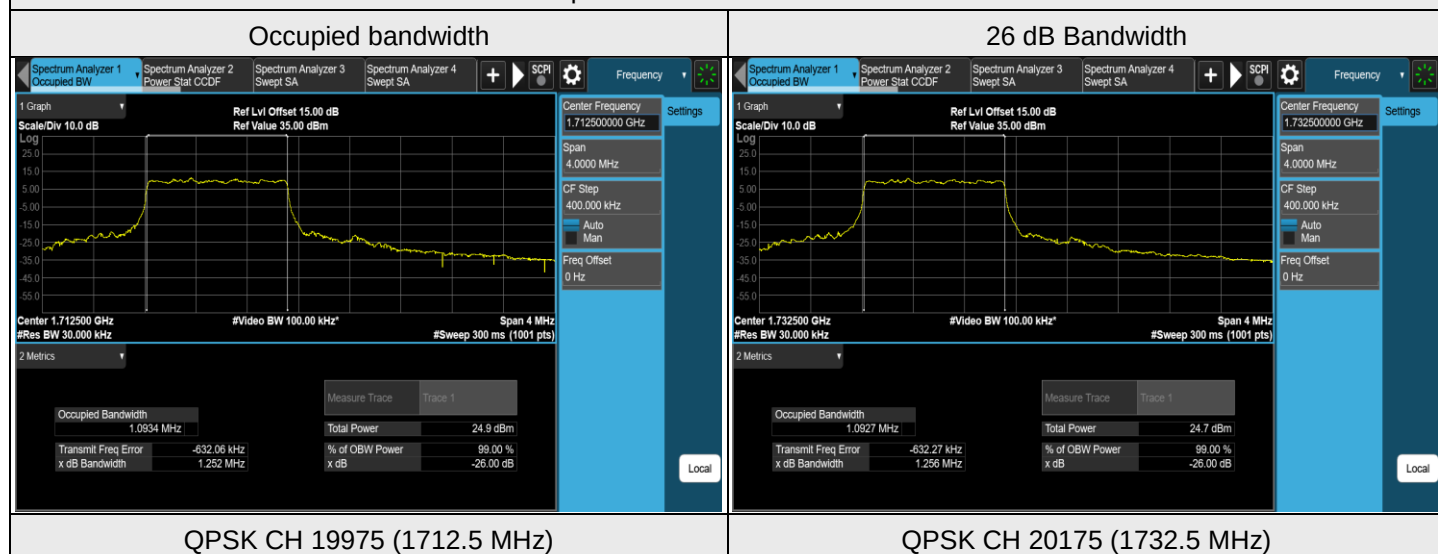
### Spectrum Plot of Worst Value



# Cat-M1 Band 4, Channel Bandwidth: 5 MHz

| Modulation | Channel | Frequency (MHz) | Occupied Bandwidth (MHz) | 26 dB Bandwidth (MHz) |
|------------|---------|-----------------|--------------------------|-----------------------|
| QPSK       | 19975   | 1712.5          | 1.0934                   | 1.252                 |
| QPSK       | 20175   | 1732.5          | 1.0927                   | 1.256                 |
| QPSK       | 20375   | 1752.5          | 1.0899                   | 1.247                 |
| 16QAM      | 19975   | 1712.5          | 0.9152                   | 1.097                 |
| 16QAM      | 20175   | 1732.5          | 0.9159                   | 1.094                 |
| 16QAM      | 20375   | 1752.5          | 0.9143                   | 1.089                 |

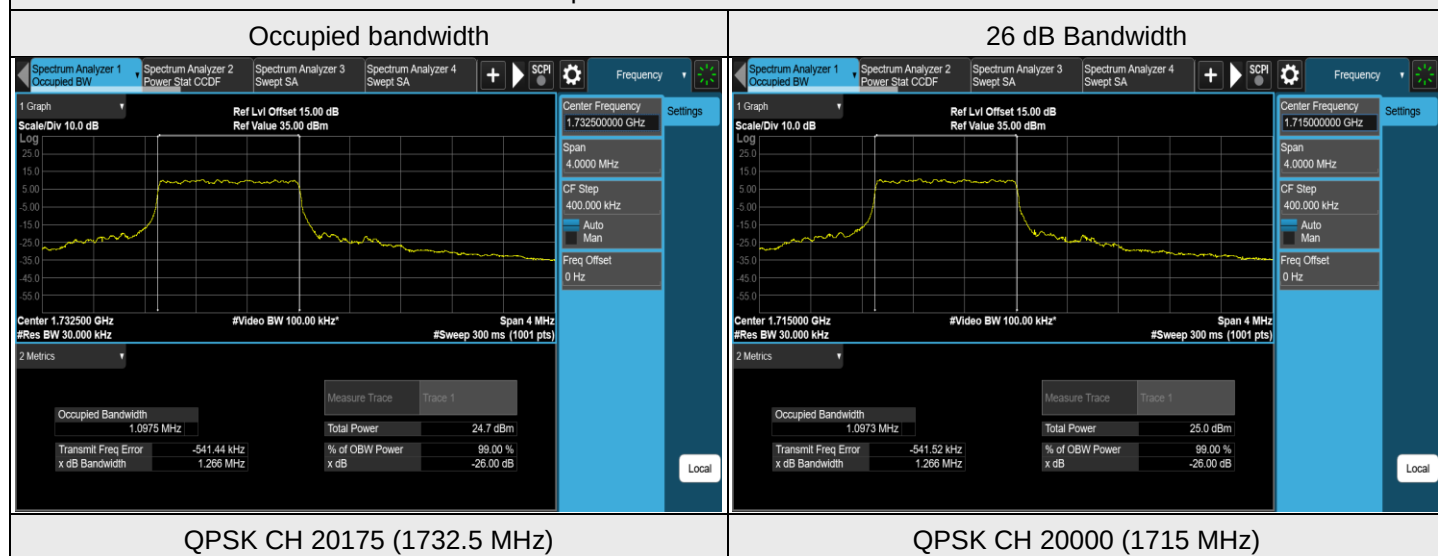
## Spectrum Plot of Worst Value



## Cat-M1 Band 4, Channel Bandwidth: 10 MHz

| Modulation | Channel | Frequency (MHz) | Occupied Bandwidth (MHz) | 26 dB Bandwidth (MHz) |
|------------|---------|-----------------|--------------------------|-----------------------|
| QPSK       | 20000   | 1715            | 1.0973                   | 1.266                 |
| QPSK       | 20175   | 1732.5          | 1.0975                   | 1.266                 |
| QPSK       | 20350   | 1750            | 1.0887                   | 1.241                 |
| 16QAM      | 20000   | 1715            | 0.9169                   | 1.106                 |
| 16QAM      | 20175   | 1732.5          | 0.9172                   | 1.109                 |
| 16QAM      | 20350   | 1750            | 0.9169                   | 1.103                 |

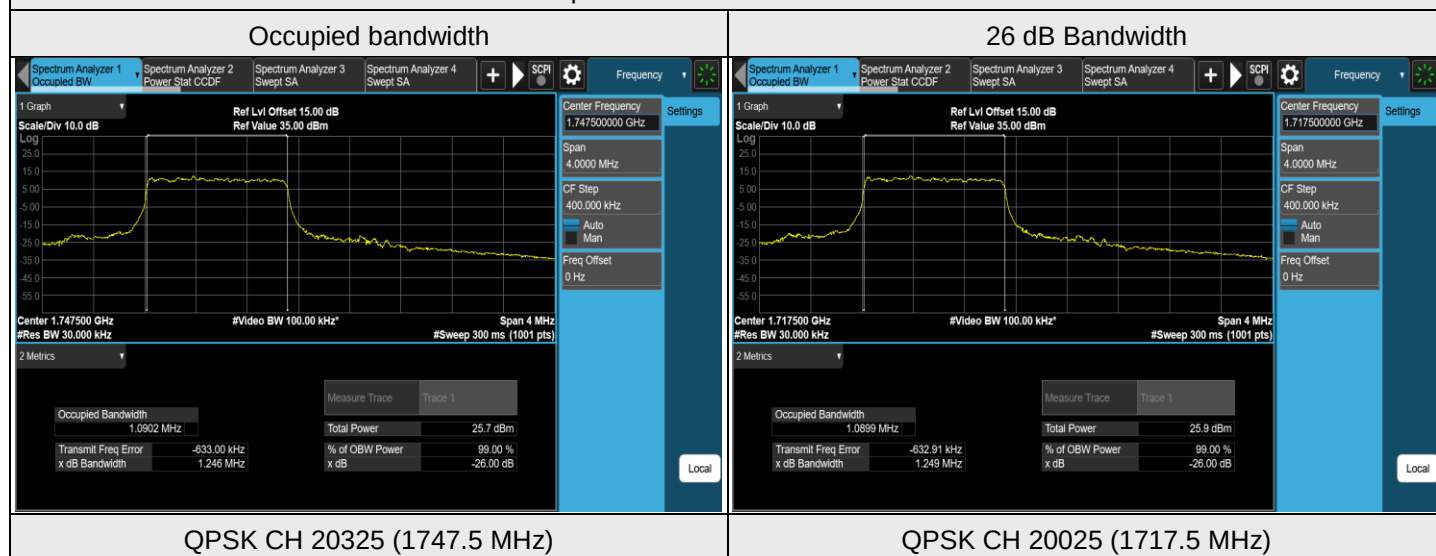
### Spectrum Plot of Worst Value



## Cat-M1 Band 4, Channel Bandwidth: 15 MHz

| Modulation | Channel | Frequency (MHz) | Occupied Bandwidth (MHz) | 26 dB Bandwidth (MHz) |
|------------|---------|-----------------|--------------------------|-----------------------|
| QPSK       | 20025   | 1717.5          | 1.0899                   | 1.249                 |
| QPSK       | 20175   | 1732.5          | 1.0842                   | 1.241                 |
| QPSK       | 20325   | 1747.5          | 1.0902                   | 1.246                 |
| 16QAM      | 20025   | 1717.5          | 0.9150                   | 1.091                 |
| 16QAM      | 20175   | 1732.5          | 0.9152                   | 1.093                 |
| 16QAM      | 20325   | 1747.5          | 0.9154                   | 1.108                 |

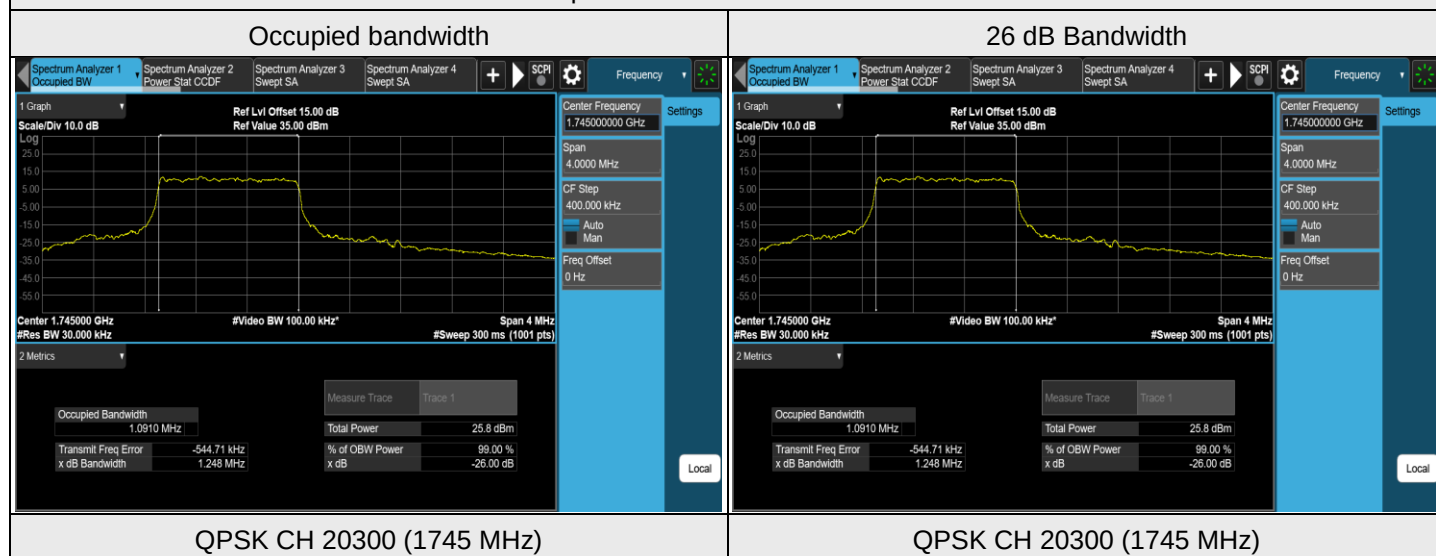
### Spectrum Plot of Worst Value



## Cat-M1 Band 4, Channel Bandwidth: 20 MHz

| Modulation | Channel | Frequency (MHz) | Occupied Bandwidth (MHz) | 26 dB Bandwidth (MHz) |
|------------|---------|-----------------|--------------------------|-----------------------|
| QPSK       | 20050   | 1720            | 1.0893                   | 1.246                 |
| QPSK       | 20175   | 1732.5          | 1.0892                   | 1.247                 |
| QPSK       | 20300   | 1745            | 1.0910                   | 1.248                 |
| 16QAM      | 20050   | 1720            | 0.9162                   | 1.104                 |
| 16QAM      | 20175   | 1732.5          | 0.9176                   | 1.109                 |
| 16QAM      | 20300   | 1745            | 0.9168                   | 1.107                 |

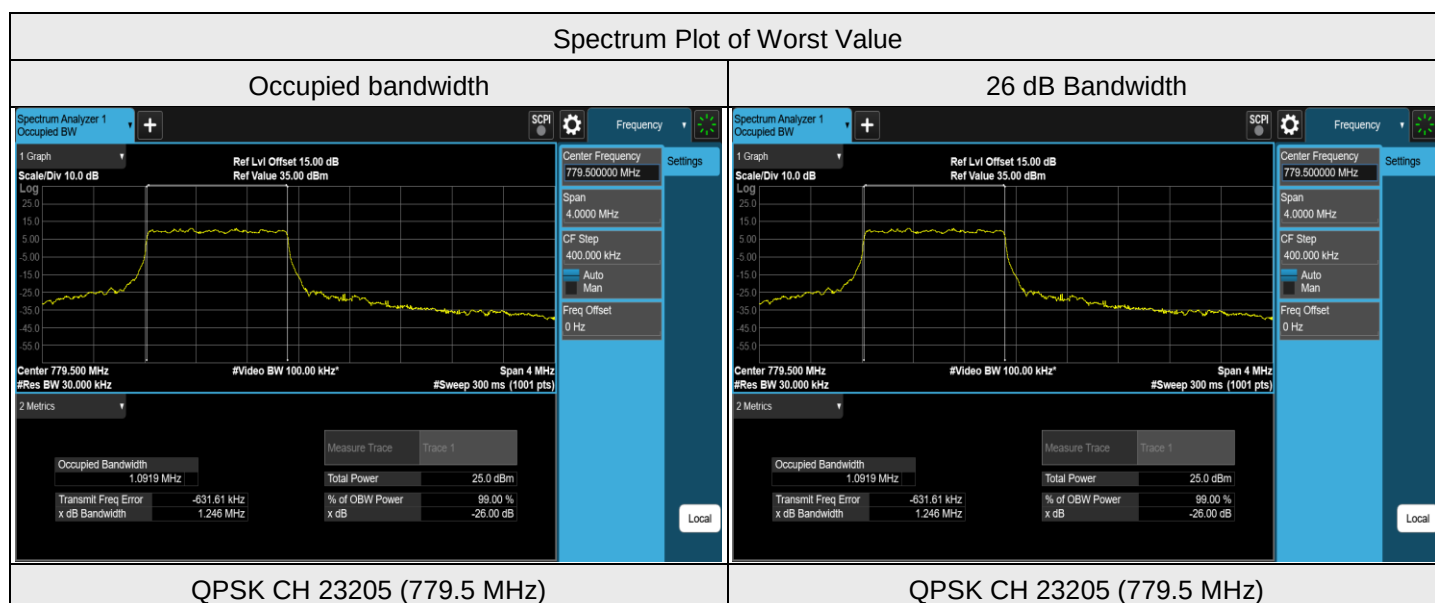
### Spectrum Plot of Worst Value



## 7.4.2 Cat-M1 Band 13

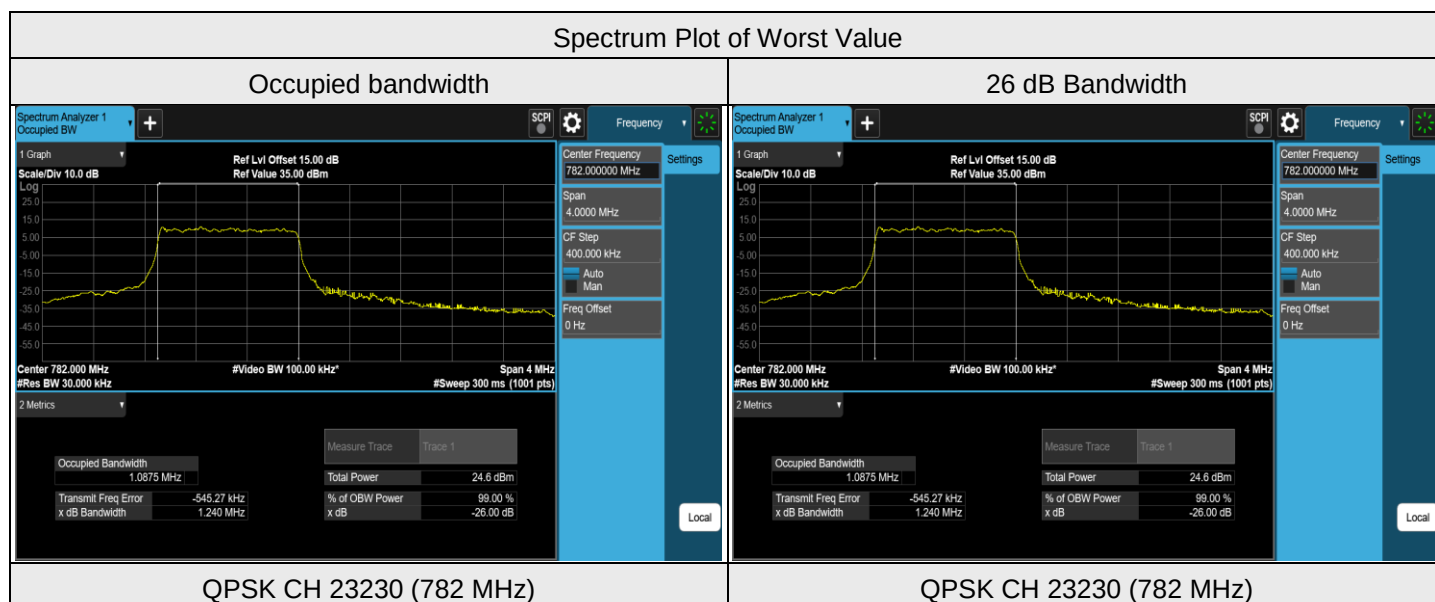
### Cat-M1 Band 13, Channel Bandwidth: 5 MHz

| Modulation | Channel | Frequency (MHz) | Occupied Bandwidth (MHz) | 26 dB Bandwidth (MHz) |
|------------|---------|-----------------|--------------------------|-----------------------|
| QPSK       | 23205   | 779.5           | 1.0919                   | 1.246                 |
| QPSK       | 23230   | 782             | 1.0881                   | 1.242                 |
| QPSK       | 23255   | 784.5           | 1.0881                   | 1.242                 |
| 16QAM      | 23205   | 779.5           | 0.9137                   | 1.076                 |
| 16QAM      | 23230   | 782             | 0.9133                   | 1.077                 |
| 16QAM      | 23255   | 784.5           | 0.9133                   | 1.075                 |



### Cat-M1 Band 13, Channel Bandwidth: 10 MHz

| Modulation | Channel | Frequency (MHz) | Occupied Bandwidth (MHz) | 26 dB Bandwidth (MHz) |
|------------|---------|-----------------|--------------------------|-----------------------|
| QPSK       | 23230   | 782             | 1.0875                   | 1.240                 |
| 16QAM      | 23230   | 782             | 0.9096                   | 1.063                 |

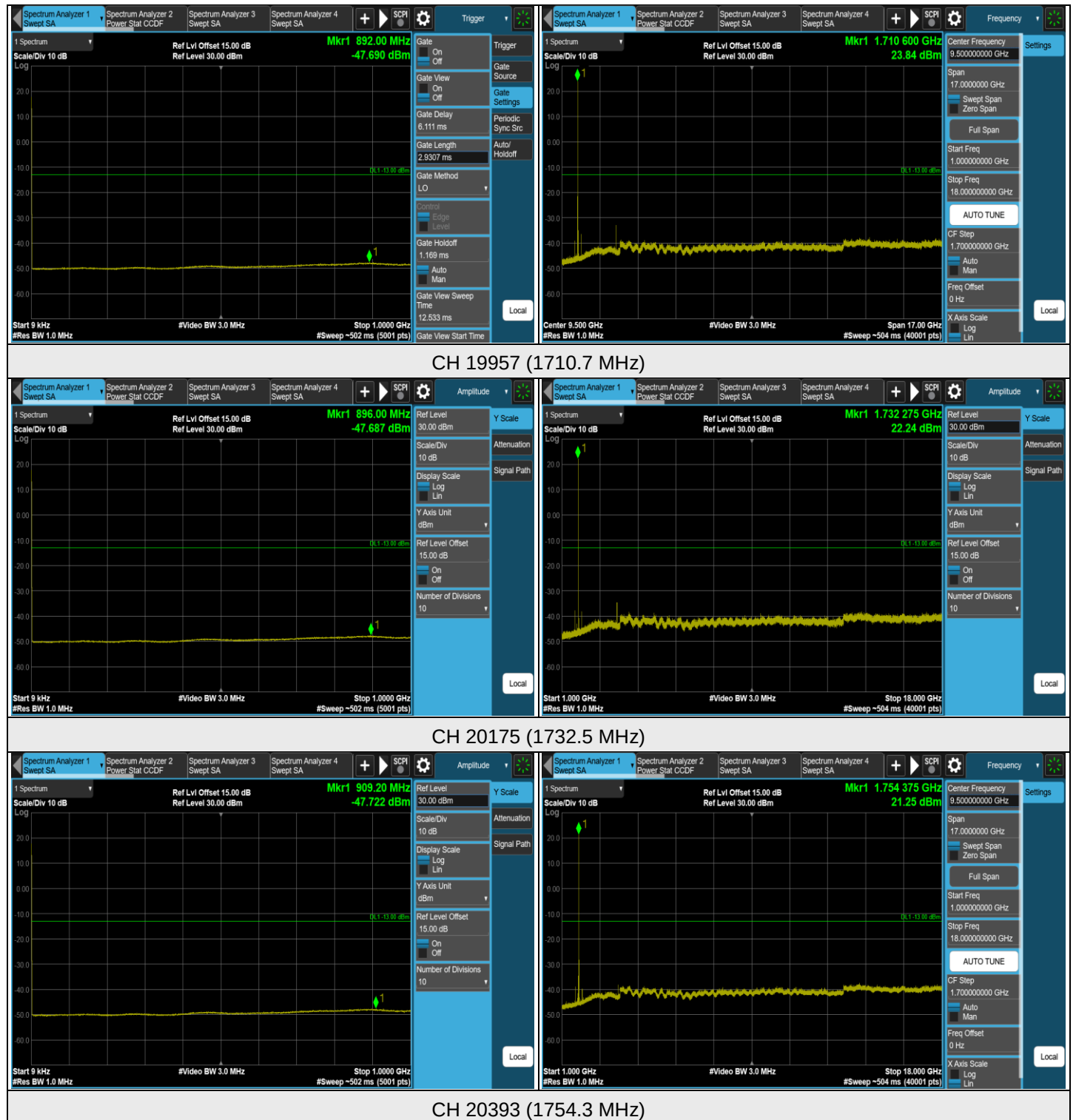


## 7.5 Conducted Spurious Emissions

|              |                |                           |              |            |            |
|--------------|----------------|---------------------------|--------------|------------|------------|
| Input Power: | 120 Vac, 60 Hz | Environmental Conditions: | 25°C, 68% RH | Tested By: | Noah Chang |
|--------------|----------------|---------------------------|--------------|------------|------------|

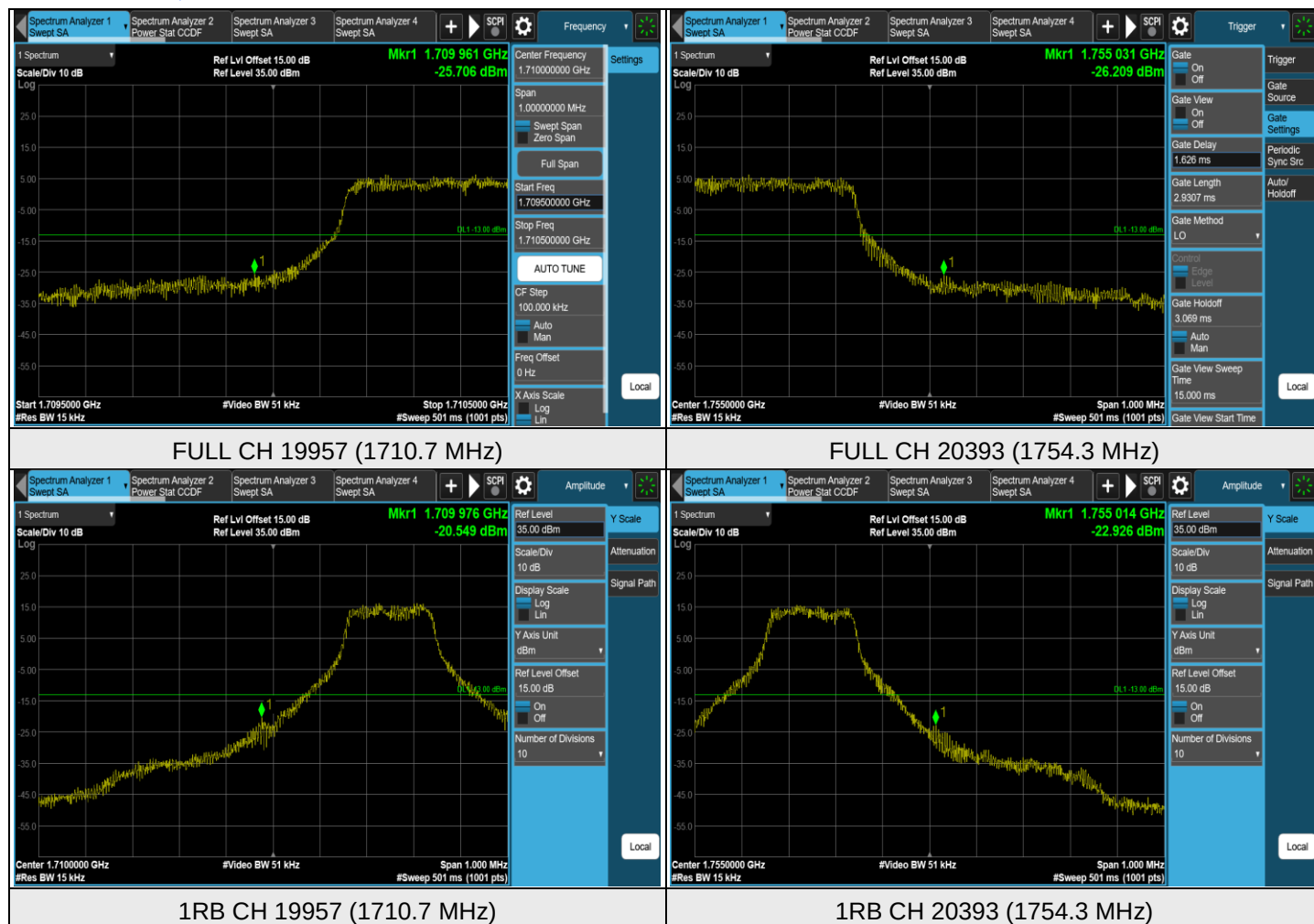
### 7.5.1 Cat-M1 Band 4

#### Cat-M1 Band 4, Channel Bandwidth: 1.4 MHz



Note: The signal at 9 kHz is IF signal from spectrum analyzer.

## Cat-M1 Band 4, Channel Bandwidth: 1.4 MHz



## Cat-M1 Band 4, Channel Bandwidth: 3 MHz



### CH 19965 (1711.5 MHz)



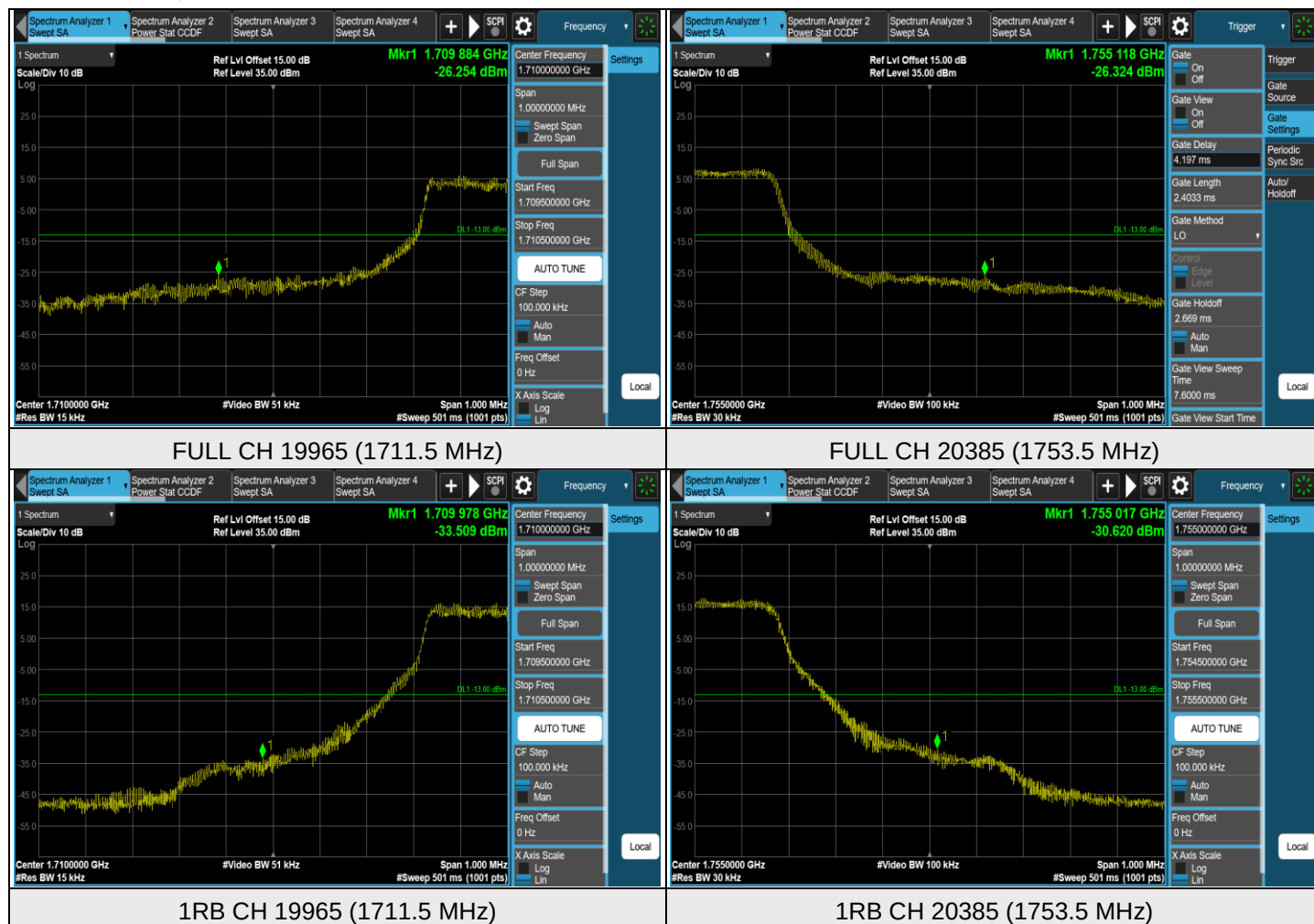
### CH 20175 (1732.5 MHz)



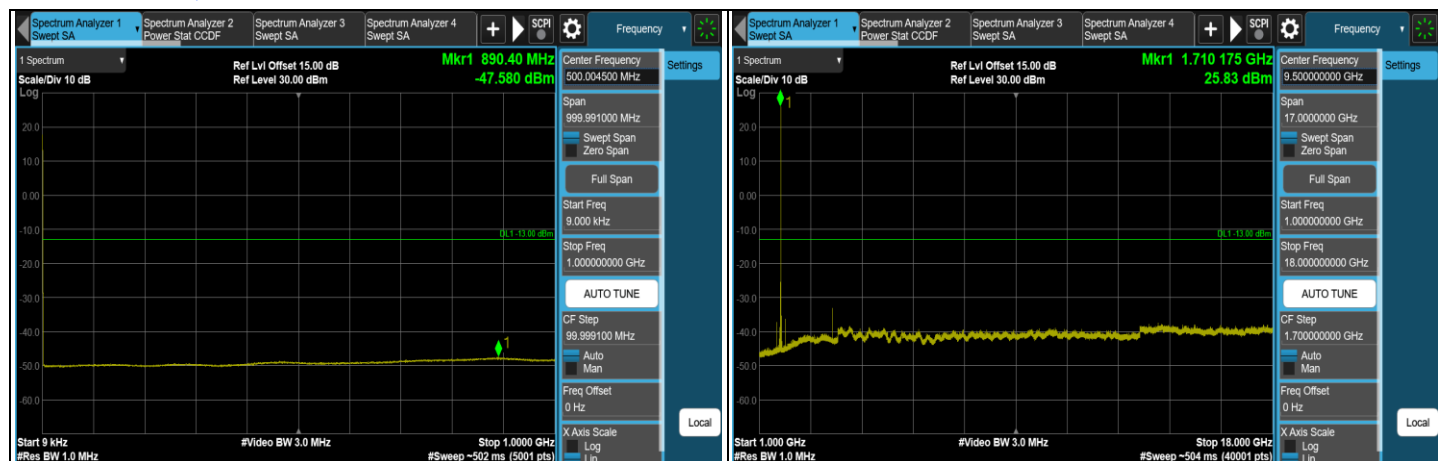
### CH 20385 (1753.5 MHz)

Note: The signal at 9 kHz is IF signal from spectrum analyzer.

## Cat-M1 Band 4, Channel Bandwidth: 3 MHz



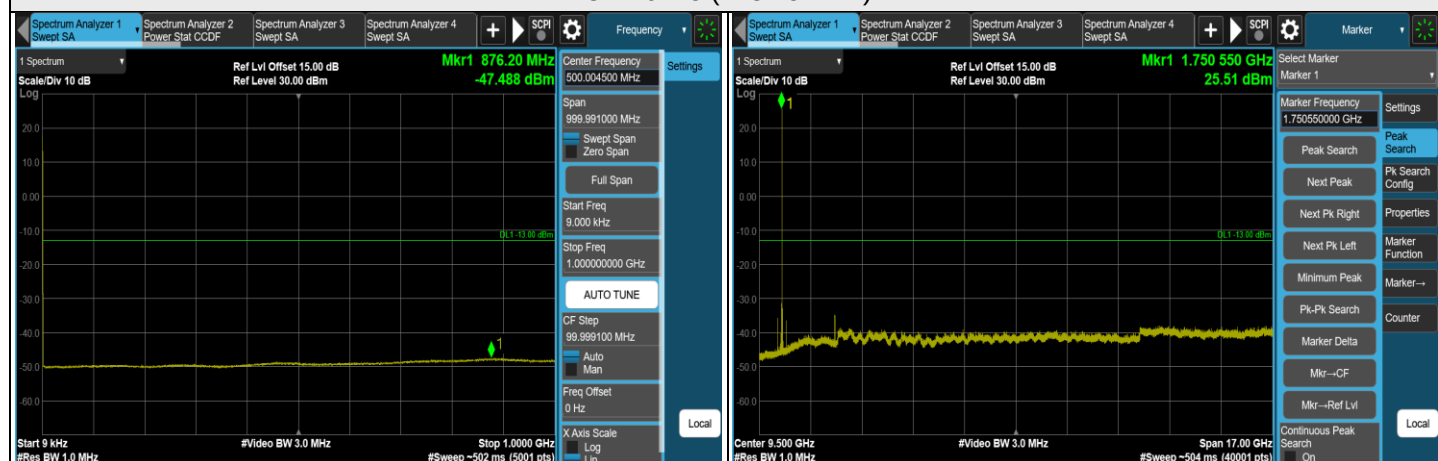
## Cat-M1 Band 4, Channel Bandwidth: 5 MHz



### CH 19975 (1712.5 MHz)



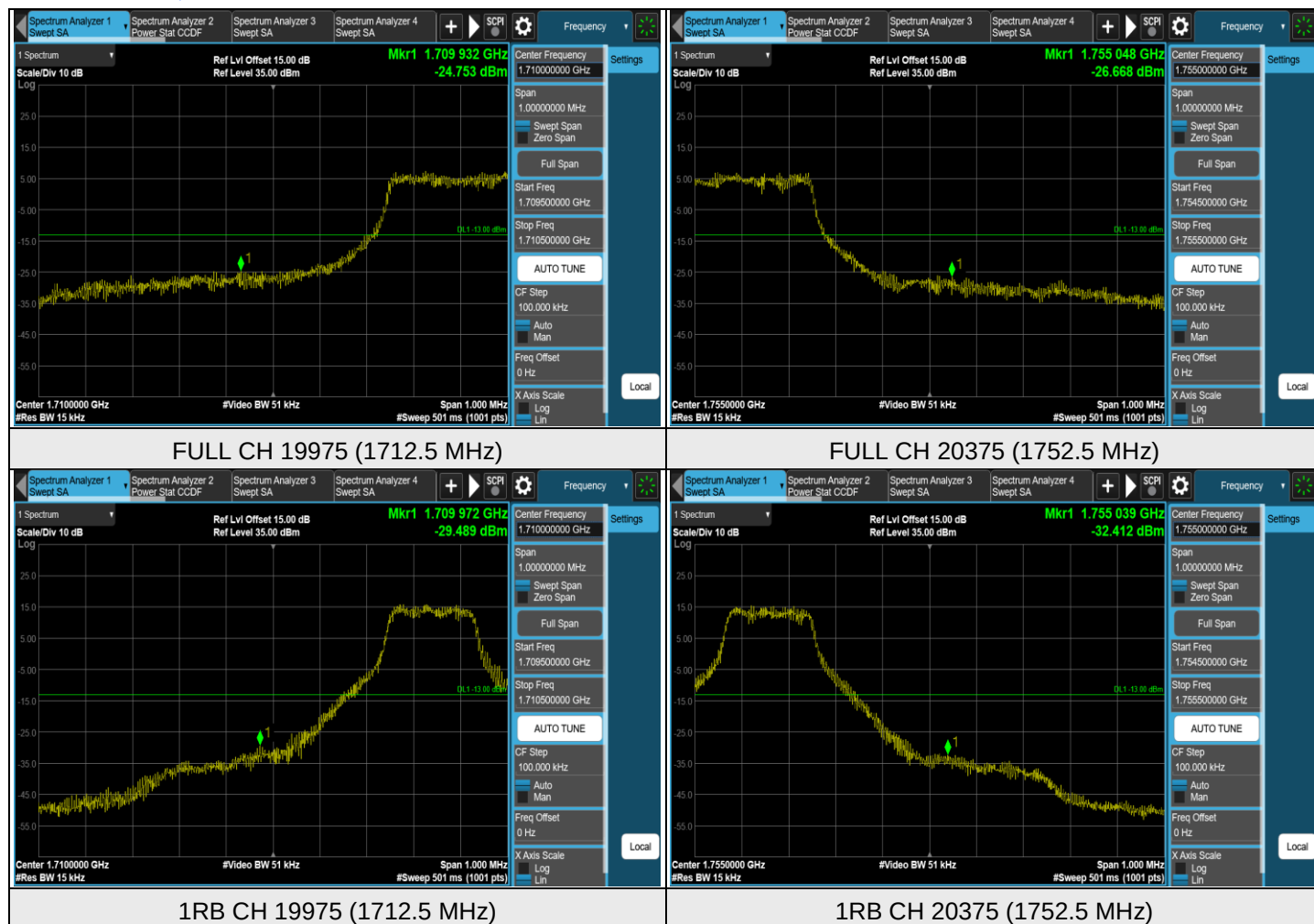
### CH 20175 (1732.5 MHz)



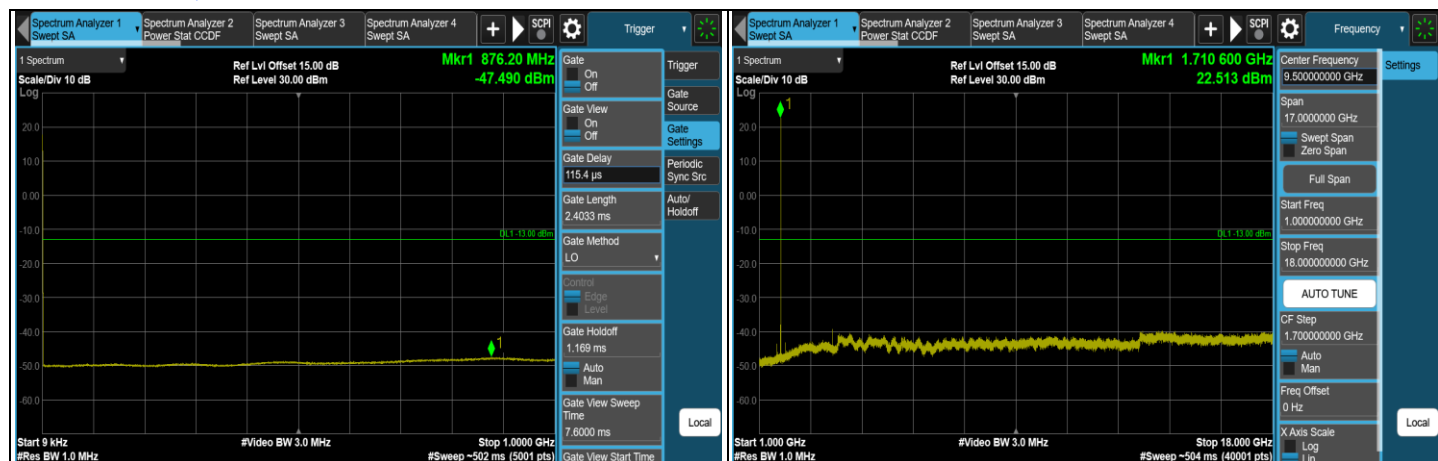
### CH 20375 (1752.5 MHz)

Note: The signal at 9 kHz is IF signal from spectrum analyzer.

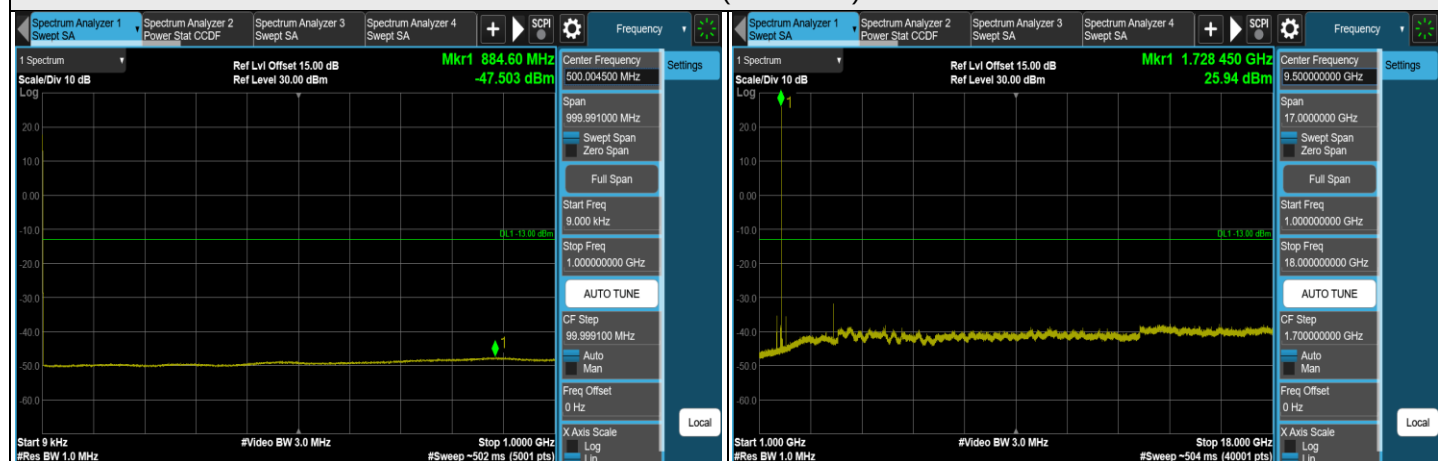
## Cat-M1 Band 4, Channel Bandwidth: 5 MHz



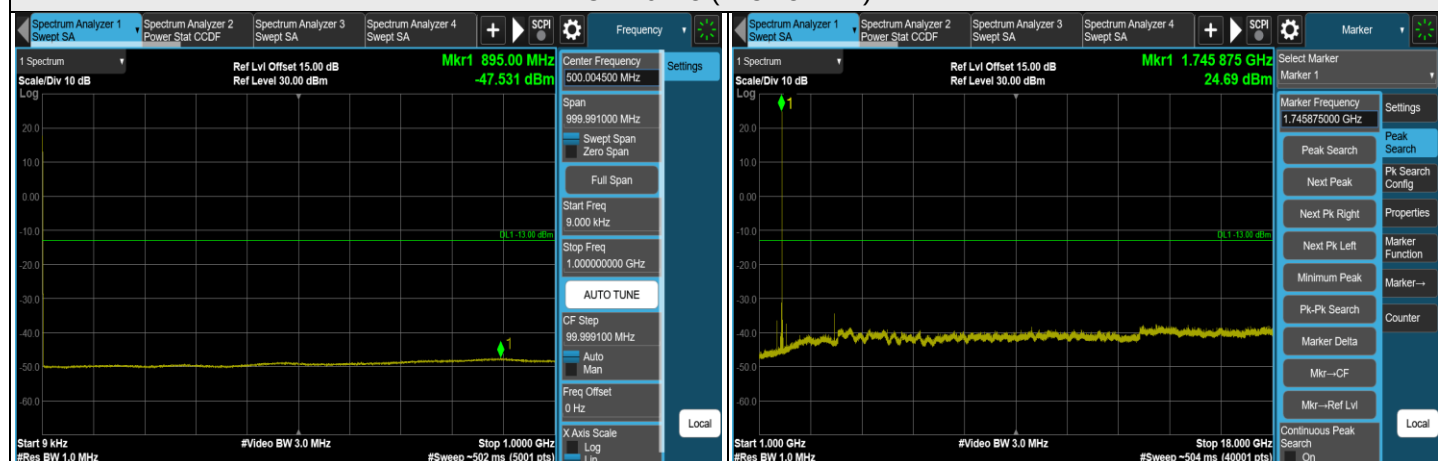
## Cat-M1 Band 4, Channel Bandwidth: 10 MHz



## CH 20000 (1715 MHz)



## CH 20175 (1732.5 MHz)



## CH 20350 (1750 MHz)

Note: The signal at 9 kHz is IF signal from spectrum analyzer.