



REPORT No. : SZ21070331W08

# TEST REPORT

**APPLICANT** : Reliance Communications LLC

**PRODUCT NAME** : Orbic AirSurf 5G UW

**MODEL NAME** : R141TL5

**BRAND NAME** : Orbic

**FCC ID** : 2ABGH-R141TL5

**STANDARD(S)** : 47 CFR Part 2  
47 CFR Part 96

**RECEIPT DATE** : 2021-07-29

**TEST DATE** : 2021-09-16 to 2021-11-30

**ISSUE DATE** : 2021-12-01



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| Change History |            |                   |
|----------------|------------|-------------------|
| Version        | Date       | Reason for change |
| 1.0            | 2021-12-01 | First edition     |
|                |            |                   |



# 1. Technical Information

**Note:** Provide by applicant.

## 1.1. Applicant and Manufacturer Information

|                              |                                                                                       |
|------------------------------|---------------------------------------------------------------------------------------|
| <b>Applicant:</b>            | Reliance Communications LLC                                                           |
| <b>Applicant Address:</b>    | 91 Colin Drive, Unit 1, HOLBROOK, New York 11741, United States                       |
| <b>Manufacturer:</b>         | Unimaxcomm                                                                            |
| <b>Manufacturer Address:</b> | 35F,HBC HuiLong Center Building-II Minzhi Street,Longhua, Shenzhen, P.R. China 518110 |

## 1.2. Equipment Under Test (EUT) Description

|                               |                       |                               |
|-------------------------------|-----------------------|-------------------------------|
| <b>Product Name:</b>          | Orbic AirSurf 5G UW   |                               |
| <b>Sample No.:</b>            | 26#                   |                               |
| <b>Hardware Version:</b>      | R141-REV12            |                               |
| <b>Software Version:</b>      | ORB141TL5_V1.1.9_SVZ  |                               |
| <b>Modulation Type:</b>       | QPSK, 16QAM, 64QAM    |                               |
| <b>Operation Band:</b>        | Band 48               |                               |
| <b>Frequency Range:</b>       | LTE Band 48           | Tx: 3550MHz–3700MHz           |
|                               |                       | Rx: 3550MHz–3700MHz           |
| <b>Channel Bandwidth</b>      | LTE Band 48           | 5MHz, 10MHz, 15MHz, 20MHz     |
| <b>Antenna Type:</b>          | PIFA Antenna          |                               |
| <b>Antenna Gain:</b>          | LTE Band 48           | 1.70dBi                       |
| <b>Accessory Information:</b> | Battery               |                               |
|                               | <b>Brand Name:</b>    | Orbic                         |
|                               | <b>Model No.:</b>     | BTE-4401                      |
|                               | <b>Serial No.:</b>    | (N/A, marked #1 by test site) |
|                               | <b>Capacity:</b>      | 4400mAh                       |
|                               | <b>Rated Voltage:</b> | 3.80V                         |
|                               | <b>Charge Limit:</b>  | 4.35V                         |
|                               | <b>Manufacturer:</b>  | HUIZHOU DXDRAGON INC          |



|                               |               |                                      |
|-------------------------------|---------------|--------------------------------------|
| <b>Accessory Information:</b> | AC Adapter    |                                      |
|                               | Brand Name:   | Orbic                                |
|                               | Model No.:    | TPA-23A050200UU01                    |
|                               | Serial No.:   | (N/A, marked #1 by test site)        |
|                               | Rated Output: | 5V=2A                                |
|                               | Rated Input:  | 100-240V~50/60Hz, 0.3A               |
|                               | Manufacturer: | Dongguan summer electronics Co., LTD |

**Note 1:** The test results of all conducted test items please refer to the module FCC test report (Report No.: SZ21060072W08), which issued on Jul 02, 2021 by Shenzhen Morlab Communications Technology Co., Ltd. We only recorded the radiated test result in this report.

**Note 2:** For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

### 1.3. Maximum E.R.P./E.I.R.P. and Emission Designator

| LTE Band 48 | Maximum E.R.P./E.I.R.P. (W) |       |       |
|-------------|-----------------------------|-------|-------|
| BW(MHz)     | QPSK                        | 16QAM | 64QAM |
| 20          | 0.230                       | 0.191 | 0.191 |
| 15          | 0.223                       | 0.190 | 0.280 |
| 10          | 0.221                       | 0.189 | 0.188 |
| 5           | 0.222                       | 0.189 | 0.185 |



## 1.4. Test Standards and Results

The objective of the report is to perform testing according to Part 2 and Part 96 for the EUT FCC ID Certification:

| No | Identity       | Document Title                                                                |
|----|----------------|-------------------------------------------------------------------------------|
| 1  | 47 CFR Part 2  | Frequency Allocations and Radio Treaty Matters; General Rules and Regulations |
| 2  | 47 CFR Part 96 | CITIZENS BROADBAND RADIO SERVICE                                              |

Test detailed items/section required by FCC rules and results are as below:

| Section          | Description                                     | Test Date    | Test Engineer              | Result | Method Determination /Remark |
|------------------|-------------------------------------------------|--------------|----------------------------|--------|------------------------------|
| 2.1046, 96.41(b) | Transmitter Conducted Output Power and ERP/EIRP | Nov 30, 2021 | Liang Yumei<br>Gao Jianrou | PASS   | No deviation                 |
| 2.1049           | Occupied Bandwidth                              | Sep 17, 2021 | Li Huaijie                 | PASS   | No deviation                 |
| 96.41(g)         | Peak -Average Ratio                             | Sep 17, 2021 | Li Huaijie                 | PASS   | No deviation                 |
| 2.1055           | Frequency Stability                             | Sep 18, 2021 | Li Huaijie                 | PASS   | No deviation                 |
| 2.1051, 96.41(e) | Conducted Spurious Emissions                    | Sep 17, 2021 | Li Huaijie                 | PASS   | No deviation                 |
| 2.1051, 96.41(e) | Band Edge                                       | Sep 16, 2021 | Li Huaijie                 | PASS   | No deviation                 |
| 2.1051, 96.41(e) | Radiated Spurious Emissions                     | Nov 19, 2021 | Gao Jianrou                | PASS   | No deviation                 |

**Note 1:** The test results of all conducted test items please refer to the module FCC test report (Report No.: SZ21060072W08), which issued on Jul 02, 2021 by Shenzhen Morlab Communications Technology Co., Ltd.

**Note 2:** The tests were performed according to the method of measurements prescribed in KDB971168 D01 v03 and ANSI/TIA-603-E-2016.

**Note 3:** The path loss during the RF test is calibrated to correct the results by the offset setting in the test equipments. The Ref offset 5.5dB means the cable loss is 5.5dB.

**Note 4:** Additions to, deviation, or exclusions from the method shall be judged in the "method



determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.

**Note 5:** When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% confidence intervals.

## 1.5. Environmental Conditions

During the measurement, the environmental conditions were within the listed ranges:

|                             |        |
|-----------------------------|--------|
| Temperature (°C):           | 15-35  |
| Relative Humidity (%):      | 30-60  |
| Atmospheric Pressure (kPa): | 86-106 |

## 2.47 CFR Part 2, Part 96 Requirements

### 2.1. Transmitter Conducted Output Power and E.R.P./E.I.R.P.

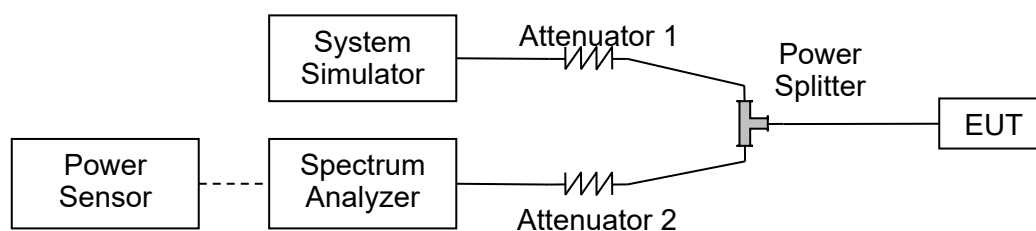
#### 2.1.1. Requirement

According to FCC section 2.1046(a), for transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in FCC section 2.1033(c)(8).

The maximum effective isotropic radiated power (EIRP) and maximum Power Spectral Density (PSD) of any CBSD and End User Device must comply with the limits shown in the table as below. paragraph

| Device                       | Maximum EIRP (dBm/10 megahertz) | Maximum PSD (dBm/MHz) |
|------------------------------|---------------------------------|-----------------------|
| End User Device              | 23                              | n/a                   |
| Category A CBSD              | 30                              | 20                    |
| Category B CBSD <sup>1</sup> | 47                              | 37                    |

#### 2.1.2. Test Description



The EUT is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power. A call is established between the EUT and the SS.



### 2.1.3.Test procedure

KDB 971168 D01v03 Section 5.2 and ANSI/TIA-603-E-2016.

$EIRP \text{ (dBm)} = \text{Conducted Output Power (dBm)} + \text{Antenna Gain (dBi)}$

$ERP \text{ (dBm)} = EIPR \text{ (dBm)} - 2.15$

### 2.1.4.Result

#### Conducted Output Power:

| LTE Band 48     |            |         |           |                               |                                  |                                |
|-----------------|------------|---------|-----------|-------------------------------|----------------------------------|--------------------------------|
| BW [MHz]        | Modulation | RB Size | RB Offset | Average Power Low Ch. / Freq. | Average Power Middle Ch. / Freq. | Average Power High Ch. / Freq. |
| Channel         |            |         |           | 55340                         | 55990                            | 56640                          |
| Frequency (MHz) |            |         |           | 3560                          | 3625                             | 3690                           |
| 20              | QPSK       | 1       | 0         | 23.31                         | 23.41                            | 23.31                          |
| 20              | QPSK       | 1       | 49        | 23.13                         | 23.21                            | 23.08                          |
| 20              | QPSK       | 1       | 99        | 23.10                         | 23.00                            | 23.19                          |
| 20              | QPSK       | 50      | 0         | 22.20                         | 22.31                            | 22.19                          |
| 20              | QPSK       | 50      | 24        | 22.10                         | 22.15                            | 22.17                          |
| 20              | QPSK       | 50      | 50        | 22.16                         | 22.26                            | 22.13                          |
| 20              | QPSK       | 100     | 0         | 22.13                         | 22.12                            | 22.03                          |
| 20              | 16QAM      | 1       | 0         | 22.31                         | 22.21                            | 22.26                          |
| 20              | 16QAM      | 1       | 49        | 22.18                         | 22.06                            | 22.17                          |
| 20              | 16QAM      | 1       | 99        | 22.20                         | 22.10                            | 22.09                          |
| 20              | 16QAM      | 50      | 0         | 22.15                         | 22.13                            | 21.90                          |
| 20              | 16QAM      | 50      | 24        | 22.09                         | 22.05                            | 21.93                          |
| 20              | 16QAM      | 50      | 50        | 22.01                         | 22.18                            | 22.06                          |
| 20              | 16QAM      | 100     | 0         | 22.12                         | 22.23                            | 22.03                          |
| 20              | 64QAM      | 1       | 0         | 22.40                         | 22.28                            | 22.21                          |
| 20              | 64QAM      | 1       | 49        | 22.37                         | 22.45                            | 22.20                          |
| 20              | 64QAM      | 1       | 99        | 22.30                         | 22.39                            | 22.18                          |
| 20              | 64QAM      | 50      | 0         | 21.34                         | 21.62                            | 21.44                          |
| 20              | 64QAM      | 50      | 24        | 21.36                         | 21.22                            | 21.54                          |
| 20              | 64QAM      | 50      | 50        | 21.42                         | 21.20                            | 21.33                          |
| 20              | 64QAM      | 100     | 0         | 21.22                         | 21.33                            | 21.21                          |



| LTE Band 48     |            |         |           |                               |                                  |                                |
|-----------------|------------|---------|-----------|-------------------------------|----------------------------------|--------------------------------|
| BW [MHz]        | Modulation | RB Size | RB Offset | Average Power Low Ch. / Freq. | Average Power Middle Ch. / Freq. | Average Power High Ch. / Freq. |
| Channel         |            |         |           | 55315                         | 55990                            | 56665                          |
| Frequency (MHz) |            |         |           | 3557.5                        | 3625                             | 3692.5                         |
| 15              | QPSK       | 1       | 0         | 23.20                         | 23.30                            | 23.20                          |
| 15              | QPSK       | 1       | 37        | 23.02                         | 23.10                            | 22.97                          |
| 15              | QPSK       | 1       | 74        | 22.99                         | 22.89                            | 23.08                          |
| 15              | QPSK       | 36      | 0         | 22.09                         | 22.20                            | 22.08                          |
| 15              | QPSK       | 36      | 20        | 21.99                         | 22.04                            | 22.06                          |
| 15              | QPSK       | 36      | 39        | 22.05                         | 22.15                            | 22.02                          |
| 15              | QPSK       | 75      | 0         | 22.02                         | 22.01                            | 21.92                          |
| 15              | 16QAM      | 1       | 0         | 22.20                         | 22.10                            | 22.15                          |
| 15              | 16QAM      | 1       | 37        | 22.07                         | 21.95                            | 22.06                          |
| 15              | 16QAM      | 1       | 74        | 22.09                         | 21.99                            | 21.98                          |
| 15              | 16QAM      | 36      | 0         | 22.04                         | 22.02                            | 21.79                          |
| 15              | 16QAM      | 36      | 20        | 21.98                         | 21.94                            | 21.82                          |
| 15              | 16QAM      | 36      | 39        | 21.90                         | 22.07                            | 21.95                          |
| 15              | 16QAM      | 75      | 0         | 22.01                         | 22.12                            | 21.92                          |
| 15              | 64QAM      | 1       | 0         | 22.29                         | 22.17                            | 22.10                          |
| 15              | 64QAM      | 1       | 37        | 22.26                         | 22.34                            | 22.09                          |
| 15              | 64QAM      | 1       | 74        | 22.19                         | 22.28                            | 22.07                          |
| 15              | 64QAM      | 36      | 0         | 21.23                         | 21.51                            | 21.33                          |
| 15              | 64QAM      | 36      | 20        | 21.25                         | 21.11                            | 21.43                          |
| 15              | 64QAM      | 36      | 39        | 21.31                         | 21.09                            | 21.22                          |
| 15              | 64QAM      | 75      | 0         | 21.11                         | 21.22                            | 21.10                          |



| LTE Band 48     |            |         |           |                               |                                  |                                |
|-----------------|------------|---------|-----------|-------------------------------|----------------------------------|--------------------------------|
| BW [MHz]        | Modulation | RB Size | RB Offset | Average Power Low Ch. / Freq. | Average Power Middle Ch. / Freq. | Average Power High Ch. / Freq. |
| Channel         |            |         |           | 55290                         | 55990                            | 56690                          |
| Frequency (MHz) |            |         |           | 3555                          | 3625                             | 3695                           |
| 10              | QPSK       |         | 0         | 23.08                         | 23.18                            | 23.08                          |
| 10              | QPSK       | 1       | 25        | 22.90                         | 22.98                            | 22.85                          |
| 10              | QPSK       | 1       | 49        | 22.87                         | 22.77                            | 22.96                          |
| 10              | QPSK       | 25      | 0         | 21.97                         | 22.08                            | 21.96                          |
| 10              | QPSK       | 25      | 12        | 21.87                         | 21.92                            | 21.94                          |
| 10              | QPSK       | 25      | 25        | 21.93                         | 22.03                            | 21.90                          |
| 10              | QPSK       | 50      | 0         | 21.90                         | 21.89                            | 21.80                          |
| 10              | 16QAM      | 1       | 0         | 22.08                         | 21.98                            | 22.03                          |
| 10              | 16QAM      | 1       | 25        | 21.95                         | 21.83                            | 21.94                          |
| 10              | 16QAM      | 1       | 49        | 21.97                         | 21.87                            | 21.86                          |
| 10              | 16QAM      | 25      | 0         | 21.92                         | 21.90                            | 21.67                          |
| 10              | 16QAM      | 25      | 12        | 21.86                         | 21.82                            | 21.70                          |
| 10              | 16QAM      | 25      | 25        | 21.78                         | 21.95                            | 21.83                          |
| 10              | 16QAM      | 50      | 0         | 21.89                         | 22.00                            | 21.80                          |
| 10              | 64QAM      | 1       | 0         | 22.17                         | 22.05                            | 21.98                          |
| 10              | 64QAM      | 1       | 25        | 22.14                         | 22.22                            | 21.97                          |
| 10              | 64QAM      | 1       | 49        | 22.07                         | 22.16                            | 21.95                          |
| 10              | 64QAM      | 25      | 0         | 21.11                         | 21.39                            | 21.21                          |
| 10              | 64QAM      | 25      | 12        | 21.13                         | 20.99                            | 21.31                          |
| 10              | 64QAM      | 25      | 25        | 21.19                         | 20.97                            | 21.10                          |
| 10              | 64QAM      | 50      | 0         | 20.99                         | 21.10                            | 20.98                          |



| LTE Band 48     |            |         |           |                               |                                  |                                |
|-----------------|------------|---------|-----------|-------------------------------|----------------------------------|--------------------------------|
| BW [MHz]        | Modulation | RB Size | RB Offset | Average Power Low Ch. / Freq. | Average Power Middle Ch. / Freq. | Average Power High Ch. / Freq. |
| Channel         |            |         |           | 55265                         | 55990                            | 56175                          |
| Frequency (MHz) |            |         |           | 3552.5                        | 3625                             | 3697.5                         |
| 5               | QPSK       | 1       | 0         | 22.96                         | 23.06                            | 22.96                          |
| 5               | QPSK       | 1       | 12        | 22.78                         | 22.86                            | 22.73                          |
| 5               | QPSK       | 1       | 24        | 22.75                         | 22.65                            | 22.84                          |
| 5               | QPSK       | 12      | 0         | 21.85                         | 21.96                            | 21.84                          |
| 5               | QPSK       | 12      | 7         | 21.75                         | 21.80                            | 21.82                          |
| 5               | QPSK       | 12      | 13        | 21.81                         | 21.91                            | 21.78                          |
| 5               | QPSK       | 25      | 0         | 21.78                         | 21.77                            | 21.68                          |
| 5               | 16QAM      | 1       | 0         | 21.96                         | 21.86                            | 21.91                          |
| 5               | 16QAM      | 1       | 12        | 21.83                         | 21.71                            | 21.82                          |
| 5               | 16QAM      | 1       | 24        | 21.85                         | 21.75                            | 21.74                          |
| 5               | 16QAM      | 12      | 0         | 21.80                         | 21.78                            | 21.55                          |
| 5               | 16QAM      | 12      | 7         | 21.74                         | 21.70                            | 21.58                          |
| 5               | 16QAM      | 12      | 13        | 21.66                         | 21.83                            | 21.71                          |
| 5               | 16QAM      | 25      | 0         | 21.77                         | 21.88                            | 21.68                          |
| 5               | 64QAM      | 1       | 0         | 22.05                         | 21.93                            | 21.86                          |
| 5               | 64QAM      | 1       | 12        | 22.02                         | 22.10                            | 21.85                          |
| 5               | 64QAM      | 1       | 24        | 21.95                         | 22.04                            | 21.83                          |
| 5               | 64QAM      | 12      | 0         | 20.99                         | 21.27                            | 21.09                          |
| 5               | 64QAM      | 12      | 7         | 21.01                         | 20.87                            | 21.19                          |
| 5               | 64QAM      | 12      | 13        | 21.07                         | 20.85                            | 20.98                          |
| 5               | 64QAM      | 25      | 0         | 20.87                         | 20.98                            | 20.86                          |

**Effective Radiated Power and Effective Isotropic Radiated Power:**

| LTE Band 48     |            |         |           | Measured E.I.R.P. |       |                    |       |                  |       |
|-----------------|------------|---------|-----------|-------------------|-------|--------------------|-------|------------------|-------|
| BW [MHz]        | Modulation | RB Size | RB Offset | Low Ch. / Freq.   |       | Middle Ch. / Freq. |       | High Ch. / Freq. |       |
| Channel         |            |         |           | 55340             |       | 55990              |       | 56640            |       |
| Frequency (MHz) |            |         |           | 3560              |       | 3625               |       | 3690             |       |
|                 |            |         |           | dBm               | W     | dBm                | W     | dBm              | W     |
| 20              | QPSK       | 1       | 0         | 23.57             | 0.228 | 23.56              | 0.227 | 23.61            | 0.230 |
| 20              | QPSK       | 1       | 49        | 23.34             | 0.216 | 23.53              | 0.225 | 23.54            | 0.226 |
| 20              | QPSK       | 1       | 99        | 23.27             | 0.212 | 23.54              | 0.226 | 23.59            | 0.229 |
| 20              | QPSK       | 50      | 0         | 22.47             | 0.177 | 22.69              | 0.186 | 22.71            | 0.187 |
| 20              | QPSK       | 50      | 24        | 22.53             | 0.179 | 22.54              | 0.179 | 22.44            | 0.175 |
| 20              | QPSK       | 50      | 50        | 22.48             | 0.177 | 22.68              | 0.185 | 22.47            | 0.177 |
| 20              | QPSK       | 100     | 0         | 22.47             | 0.177 | 22.47              | 0.177 | 22.48            | 0.177 |
| 20              | 16QAM      | 1       | 0         | 22.44             | 0.175 | 22.64              | 0.184 | 22.54            | 0.179 |
| 20              | 16QAM      | 1       | 49        | 22.48             | 0.177 | 22.52              | 0.179 | 22.42            | 0.175 |
| 20              | 16QAM      | 1       | 99        | 22.47             | 0.177 | 22.44              | 0.175 | 22.52            | 0.179 |
| 20              | 16QAM      | 50      | 0         | 22.54             | 0.179 | 22.54              | 0.179 | 22.77            | 0.189 |
| 20              | 16QAM      | 50      | 24        | 22.47             | 0.177 | 22.75              | 0.188 | 22.54            | 0.179 |
| 20              | 16QAM      | 50      | 50        | 22.51             | 0.178 | 22.81              | 0.191 | 22.51            | 0.178 |
| 20              | 16QAM      | 100     | 0         | 22.54             | 0.179 | 22.74              | 0.188 | 22.58            | 0.181 |
| 20              | 64QAM      | 1       | 0         | 22.43             | 0.175 | 22.49              | 0.177 | 22.52            | 0.179 |
| 20              | 64QAM      | 1       | 49        | 22.50             | 0.178 | 22.61              | 0.182 | 22.80            | 0.191 |
| 20              | 64QAM      | 1       | 99        | 22.54             | 0.179 | 22.56              | 0.180 | 22.56            | 0.180 |
| 20              | 64QAM      | 50      | 0         | 22.47             | 0.177 | 22.53              | 0.179 | 22.45            | 0.176 |
| 20              | 64QAM      | 50      | 24        | 22.59             | 0.182 | 22.69              | 0.186 | 22.54            | 0.179 |
| 20              | 64QAM      | 50      | 50        | 22.48             | 0.177 | 22.68              | 0.185 | 22.60            | 0.182 |
| 20              | 64QAM      | 100     | 0         | 22.50             | 0.178 | 22.78              | 0.190 | 22.42            | 0.175 |



| LTE Band 48     |            |         |           | Measured E.I.R.P. |       |                    |       |                  |       |
|-----------------|------------|---------|-----------|-------------------|-------|--------------------|-------|------------------|-------|
| BW [MHz]        | Modulation | RB Size | RB Offset | Low Ch. / Freq.   |       | Middle Ch. / Freq. |       | High Ch. / Freq. |       |
| Channel         |            |         |           | 55315             |       | 55990              |       | 56665            |       |
| Frequency (MHz) |            |         |           | 3557.5            |       | 3625               |       | 3692.5           |       |
|                 |            |         |           | dBm               | W     | dBm                | W     | dBm              | W     |
| 15              | QPSK       | 1       | 0         | 23.27             | 0.212 | 23.30              | 0.214 | 23.37            | 0.217 |
| 15              | QPSK       | 1       | 37        | 23.17             | 0.207 | 23.48              | 0.223 | 23.37            | 0.217 |
| 15              | QPSK       | 1       | 74        | 23.17             | 0.207 | 23.46              | 0.222 | 23.30            | 0.214 |
| 15              | QPSK       | 36      | 0         | 22.27             | 0.169 | 22.64              | 0.184 | 22.69            | 0.186 |
| 15              | QPSK       | 36      | 20        | 22.44             | 0.175 | 22.69              | 0.186 | 22.65            | 0.184 |
| 15              | QPSK       | 36      | 39        | 22.58             | 0.181 | 22.72              | 0.187 | 22.68            | 0.185 |
| 15              | QPSK       | 75      | 0         | 22.43             | 0.175 | 22.74              | 0.188 | 22.71            | 0.187 |
| 15              | 16QAM      | 1       | 0         | 22.34             | 0.171 | 22.55              | 0.180 | 22.49            | 0.177 |
| 15              | 16QAM      | 1       | 37        | 22.45             | 0.176 | 22.72              | 0.187 | 22.55            | 0.180 |
| 15              | 16QAM      | 1       | 74        | 22.53             | 0.179 | 22.64              | 0.184 | 22.39            | 0.173 |
| 15              | 16QAM      | 36      | 0         | 22.47             | 0.177 | 22.71              | 0.187 | 22.58            | 0.181 |
| 15              | 16QAM      | 36      | 20        | 22.34             | 0.171 | 22.65              | 0.184 | 22.54            | 0.179 |
| 15              | 16QAM      | 36      | 39        | 22.54             | 0.179 | 22.78              | 0.190 | 22.58            | 0.181 |
| 15              | 16QAM      | 75      | 0         | 22.33             | 0.171 | 22.79              | 0.190 | 22.58            | 0.181 |
| 15              | 64QAM      | 1       | 0         | 22.50             | 0.178 | 22.50              | 0.178 | 22.38            | 0.173 |
| 15              | 64QAM      | 1       | 37        | 22.53             | 0.179 | 22.64              | 0.184 | 22.51            | 0.178 |
| 15              | 64QAM      | 1       | 74        | 22.47             | 0.177 | 22.57              | 0.181 | 22.85            | 0.193 |
| 15              | 64QAM      | 36      | 0         | 22.39             | 0.173 | 22.63              | 0.183 | 22.59            | 0.182 |
| 15              | 64QAM      | 36      | 20        | 22.48             | 0.177 | 22.74              | 0.188 | 22.52            | 0.179 |
| 15              | 64QAM      | 36      | 39        | 22.54             | 0.179 | 22.73              | 0.187 | 22.58            | 0.181 |
| 15              | 64QAM      | 75      | 0         | 24.47             | 0.280 | 22.74              | 0.188 | 22.62            | 0.183 |



| LTE Band 48     |            |         |           | Measured E.I.R.P. |       |                    |       |                  |       |
|-----------------|------------|---------|-----------|-------------------|-------|--------------------|-------|------------------|-------|
| BW [MHz]        | Modulation | RB Size | RB Offset | Low Ch. / Freq.   |       | Middle Ch. / Freq. |       | High Ch. / Freq. |       |
| Channel         |            |         |           | 55290             |       | 55990              |       | 56690            |       |
| Frequency (MHz) |            |         |           | 3555              |       | 3625               |       | 3695             |       |
|                 |            |         |           | dBm               | W     | dBm                | W     | dBm              | W     |
| 10              | QPSK       | 1       | 0         | 23.14             | 0.206 | 23.39              | 0.218 | 23.35            | 0.216 |
| 10              | QPSK       | 1       | 25        | 23.27             | 0.212 | 23.44              | 0.221 | 23.30            | 0.214 |
| 10              | QPSK       | 1       | 49        | 23.18             | 0.208 | 23.31              | 0.214 | 23.54            | 0.226 |
| 10              | QPSK       | 25      | 0         | 23.25             | 0.211 | 22.69              | 0.186 | 22.53            | 0.179 |
| 10              | QPSK       | 25      | 12        | 22.44             | 0.175 | 22.68              | 0.185 | 22.53            | 0.179 |
| 10              | QPSK       | 25      | 25        | 22.47             | 0.177 | 22.77              | 0.189 | 22.57            | 0.181 |
| 10              | QPSK       | 50      | 0         | 22.54             | 0.179 | 22.81              | 0.191 | 22.55            | 0.180 |
| 10              | 16QAM      | 1       | 0         | 22.34             | 0.171 | 22.16              | 0.164 | 22.56            | 0.180 |
| 10              | 16QAM      | 1       | 25        | 22.41             | 0.174 | 22.25              | 0.168 | 22.39            | 0.173 |
| 10              | 16QAM      | 1       | 49        | 22.44             | 0.175 | 22.21              | 0.166 | 22.52            | 0.179 |
| 10              | 16QAM      | 25      | 0         | 22.54             | 0.179 | 22.24              | 0.167 | 22.70            | 0.186 |
| 10              | 16QAM      | 25      | 12        | 22.27             | 0.169 | 22.21              | 0.166 | 22.64            | 0.184 |
| 10              | 16QAM      | 25      | 25        | 22.34             | 0.171 | 22.28              | 0.169 | 22.77            | 0.189 |
| 10              | 16QAM      | 50      | 0         | 22.38             | 0.173 | 22.24              | 0.167 | 22.66            | 0.185 |
| 10              | 64QAM      | 1       | 0         | 22.47             | 0.177 | 22.59              | 0.182 | 22.53            | 0.179 |
| 10              | 64QAM      | 1       | 25        | 22.47             | 0.177 | 22.71              | 0.187 | 22.58            | 0.181 |
| 10              | 64QAM      | 1       | 49        | 22.41             | 0.174 | 22.60              | 0.182 | 22.49            | 0.177 |
| 10              | 64QAM      | 25      | 0         | 22.53             | 0.179 | 22.74              | 0.188 | 22.62            | 0.183 |
| 10              | 64QAM      | 25      | 12        | 22.45             | 0.176 | 22.71              | 0.187 | 22.62            | 0.183 |
| 10              | 64QAM      | 25      | 25        | 22.47             | 0.177 | 22.75              | 0.188 | 22.59            | 0.182 |
| 10              | 64QAM      | 50      | 0         | 22.53             | 0.179 | 22.72              | 0.187 | 22.68            | 0.185 |



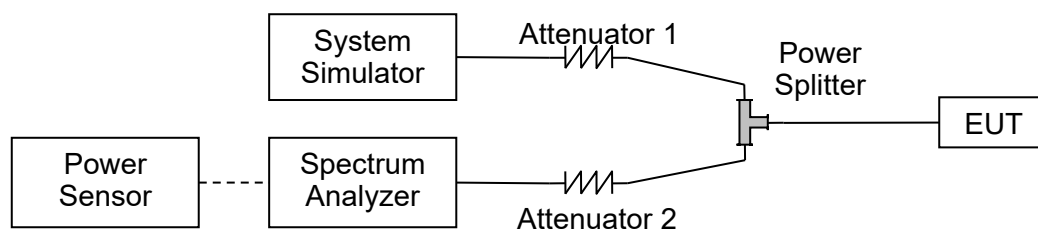
| LTE Band 48     |            |         |           | Measured E.I.R.P. |       |                    |       |                  |       |
|-----------------|------------|---------|-----------|-------------------|-------|--------------------|-------|------------------|-------|
| BW [MHz]        | Modulation | RB Size | RB Offset | Low Ch. / Freq.   |       | Middle Ch. / Freq. |       | High Ch. / Freq. |       |
| Channel         |            |         |           | 55265             |       | 55990              |       | 56175            |       |
| Frequency (MHz) |            |         |           | 3552.5            |       | 3625               |       | 3697.5           |       |
|                 |            |         |           | dBm               | W     | dBm                | W     | dBm              | W     |
| 5               | QPSK       | 1       | 0         | 23.14             | 0.206 | 23.24              | 0.211 | 23.44            | 0.221 |
| 5               | QPSK       | 1       | 12        | 23.24             | 0.211 | 23.39              | 0.218 | 23.47            | 0.222 |
| 5               | QPSK       | 1       | 24        | 23.44             | 0.221 | 23.30              | 0.214 | 23.17            | 0.207 |
| 5               | QPSK       | 12      | 0         | 22.54             | 0.179 | 22.62              | 0.183 | 22.75            | 0.188 |
| 5               | QPSK       | 12      | 7         | 22.47             | 0.177 | 22.75              | 0.188 | 22.81            | 0.191 |
| 5               | QPSK       | 12      | 13        | 22.34             | 0.171 | 22.75              | 0.188 | 22.87            | 0.194 |
| 5               | QPSK       | 25      | 0         | 22.47             | 0.177 | 22.76              | 0.189 | 22.89            | 0.195 |
| 5               | 16QAM      | 1       | 0         | 22.54             | 0.179 | 22.59              | 0.182 | 22.44            | 0.175 |
| 5               | 16QAM      | 1       | 12        | 22.49             | 0.177 | 22.76              | 0.189 | 22.60            | 0.182 |
| 5               | 16QAM      | 1       | 24        | 22.34             | 0.171 | 22.62              | 0.183 | 22.45            | 0.176 |
| 5               | 16QAM      | 12      | 0         | 22.53             | 0.179 | 22.17              | 0.165 | 22.57            | 0.181 |
| 5               | 16QAM      | 12      | 7         | 22.38             | 0.173 | 22.12              | 0.163 | 22.68            | 0.185 |
| 5               | 16QAM      | 12      | 13        | 22.41             | 0.174 | 22.25              | 0.168 | 22.61            | 0.182 |
| 5               | 16QAM      | 25      | 0         | 22.49             | 0.177 | 22.13              | 0.163 | 22.68            | 0.185 |
| 5               | 64QAM      | 1       | 0         | 22.53             | 0.179 | 22.44              | 0.175 | 22.46            | 0.176 |
| 5               | 64QAM      | 1       | 12        | 22.47             | 0.177 | 22.65              | 0.184 | 22.55            | 0.180 |
| 5               | 64QAM      | 1       | 24        | 22.53             | 0.179 | 22.50              | 0.178 | 22.41            | 0.174 |
| 5               | 64QAM      | 12      | 0         | 22.41             | 0.174 | 22.68              | 0.185 | 22.49            | 0.177 |
| 5               | 64QAM      | 12      | 7         | 22.45             | 0.176 | 22.16              | 0.164 | 22.67            | 0.185 |
| 5               | 64QAM      | 12      | 13        | 22.53             | 0.179 | 22.15              | 0.164 | 22.55            | 0.180 |
| 5               | 64QAM      | 25      | 0         | 22.46             | 0.176 | 22.15              | 0.164 | 22.64            | 0.184 |

## 2.2. Occupied Bandwidth

### 2.2.1. Requirement

According to FCC section 2.1049, the occupied bandwidth 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 percent of the total mean power radiated by a given emission. Occupied bandwidth is also known as the 99% emission bandwidth.

### 2.2.2. Test Description



The EUT is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power. A call is established between the EUT and the SS.

### 2.2.3. Test procedure

KDB 971168 D01v03 Section 4.1 and ANSI/TIA-603-E-2016.

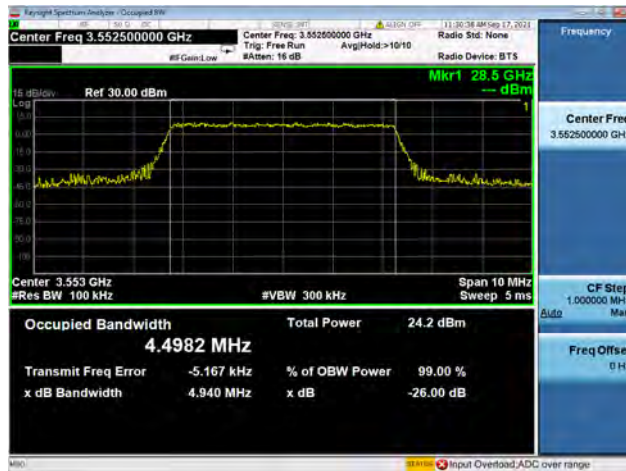
### 2.2.4. Test Result



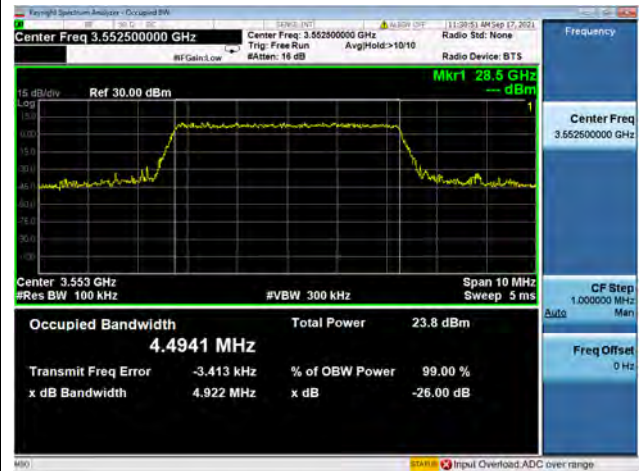
| LTE Band 48 |               |            |             |              |
|-------------|---------------|------------|-------------|--------------|
| BW(MHz)     | Channel Level | Modulation | 99% BW(MHz) | 26dB BW(MHz) |
| 5           | Low           | QPSK       | 4.50        | 4.94         |
|             | Low           | 16QAM      | 4.49        | 4.92         |
|             | Low           | 64QAM      | 4.49        | 4.95         |
|             | Mid           | QPSK       | 4.48        | 4.95         |
|             | Mid           | 16QAM      | 4.50        | 4.86         |
|             | Mid           | 64QAM      | 4.48        | 4.78         |
|             | High          | QPSK       | 4.47        | 4.88         |
|             | High          | 16QAM      | 4.52        | 4.85         |
|             | High          | 64QAM      | 4.49        | 4.85         |
| 10          | Low           | QPSK       | 8.98        | 9.80         |
|             | Low           | 16QAM      | 8.99        | 9.73         |
|             | Low           | 64QAM      | 8.99        | 9.72         |
|             | Mid           | QPSK       | 8.96        | 9.50         |
|             | Mid           | 16QAM      | 8.98        | 9.45         |
|             | Mid           | 64QAM      | 8.99        | 9.58         |
|             | High          | QPSK       | 8.98        | 9.54         |
|             | High          | 16QAM      | 8.97        | 9.62         |
|             | High          | 64QAM      | 8.99        | 9.77         |
| 15          | Low           | QPSK       | 13.47       | 14.62        |
|             | Low           | 16QAM      | 13.50       | 14.58        |
|             | Low           | 64QAM      | 13.47       | 14.63        |
|             | Mid           | QPSK       | 13.47       | 14.39        |
|             | Mid           | 16QAM      | 13.45       | 14.23        |
|             | Mid           | 64QAM      | 13.45       | 14.20        |
|             | High          | QPSK       | 13.43       | 14.17        |
|             | High          | 16QAM      | 13.48       | 14.07        |
|             | High          | 64QAM      | 13.52       | 14.53        |
| 20          | Low           | QPSK       | 18.11       | 22.41        |
|             | Low           | 16QAM      | 18.09       | 21.56        |
|             | Low           | 64QAM      | 18.12       | 22.55        |
|             | Mid           | QPSK       | 18.05       | 21.03        |
|             | Mid           | 16QAM      | 17.97       | 20.01        |
|             | Mid           | 64QAM      | 18.10       | 21.66        |
|             | High          | QPSK       | 18.03       | 21.07        |
|             | High          | 16QAM      | 18.04       | 20.71        |
|             | High          | 64QAM      | 18.05       | 20.69        |



Band48 / 5MHz / Low CH / QPSK



Band48 / 5MHz / Low CH / 16QAM



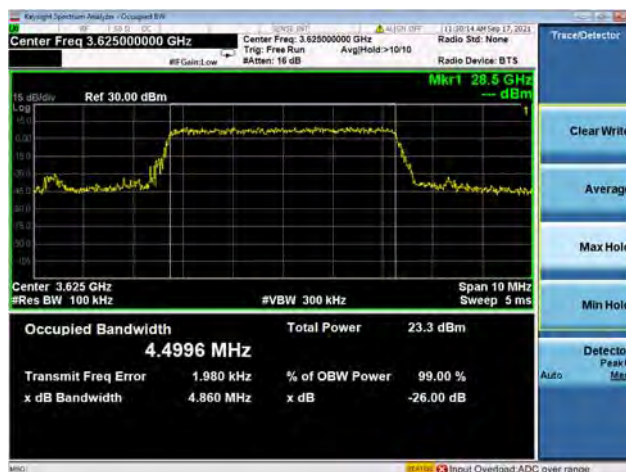
Band48 / 5MHz / Low CH / 64QAM



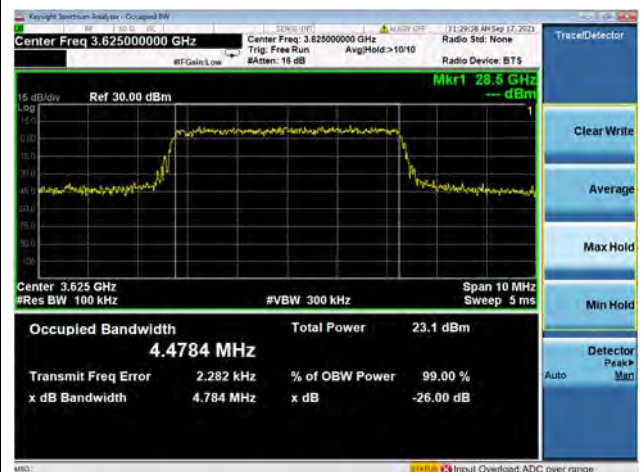
Band48 / 5MHz / Mid CH / QPSK



Band48 / 5MHz / Mid CH / 16QAM

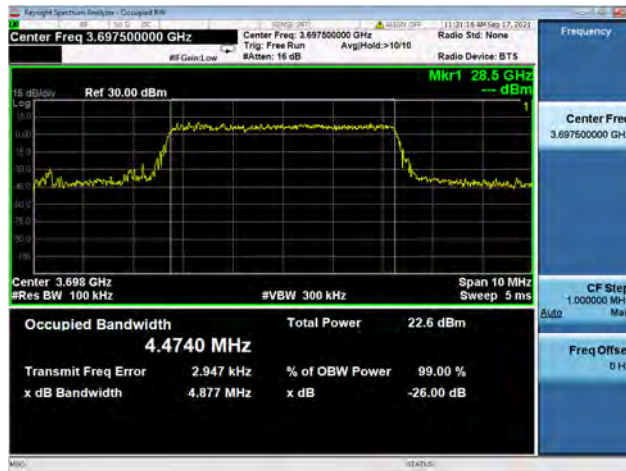


Band48 / 5MHz / Mid CH / 64QAM

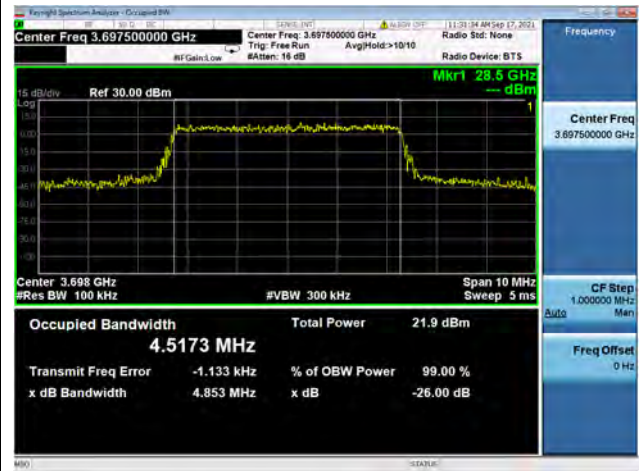




Band48 / 5MHz / High CH / QPSK



Band48 / 5MHz / High CH / 16QAM



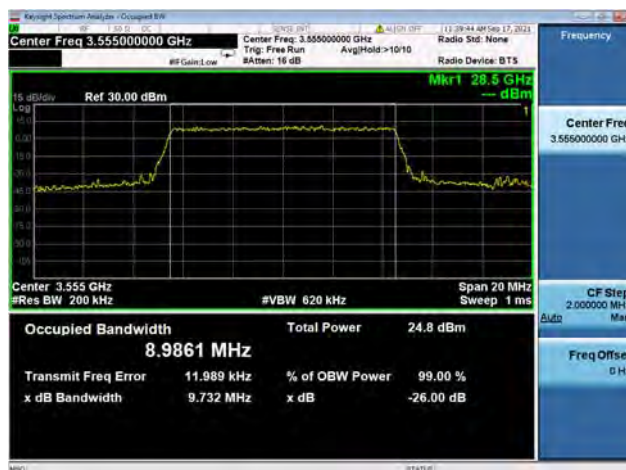
Band48 / 5MHz / High CH / 64QAM



Band48 / 10MHz / Low CH / QPSK



Band48 / 10MHz / Low CH / 16QAM

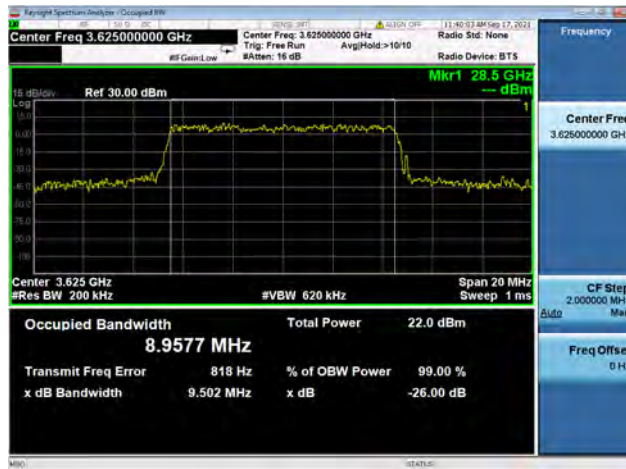


Band48 / 10MHz / Low CH / 64QAM

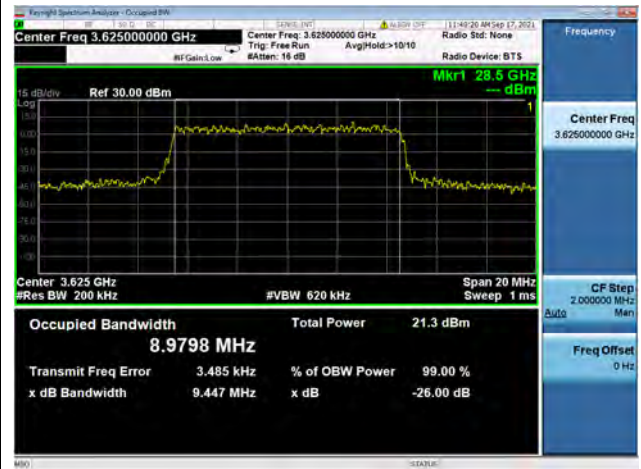




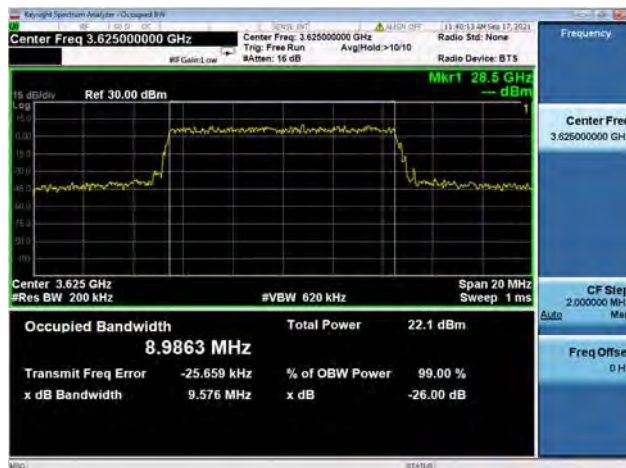
Band48 / 10MHz / Mid CH / QPSK



Band48 / 10MHz / Mid CH / 16QAM



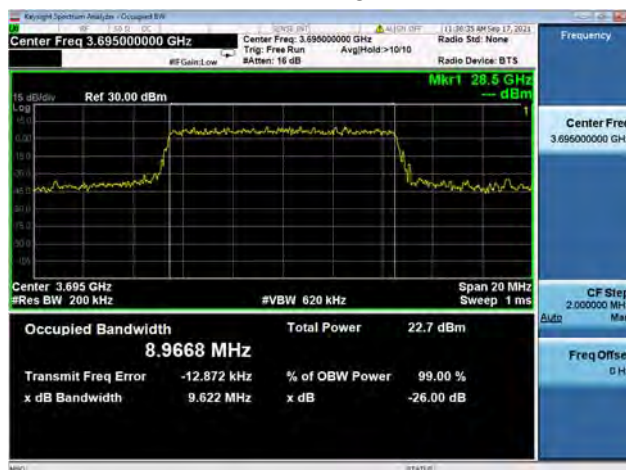
Band48 / 10MHz / Mid CH / 64QAM



Band48 / 10MHz / High CH / QPSK



Band48 / 10MHz / High CH / 16QAM



Band48 / 10MHz / High CH / 64QAM





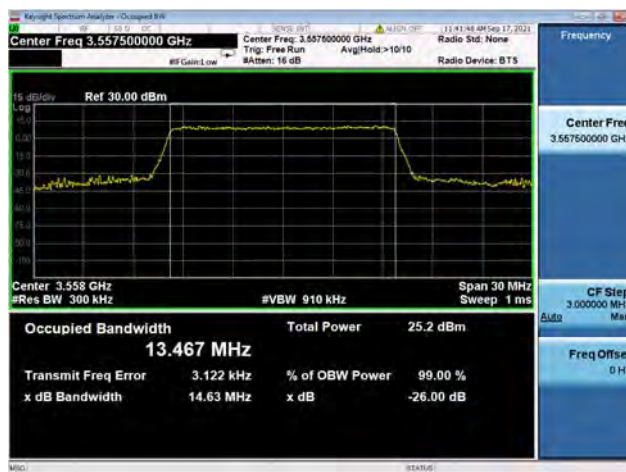
Band48 / 15MHz / Low CH / QPSK



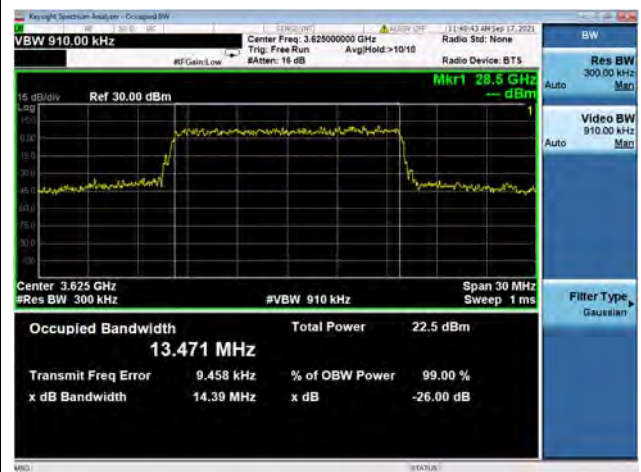
Band48 / 15MHz / Low CH / 16QAM



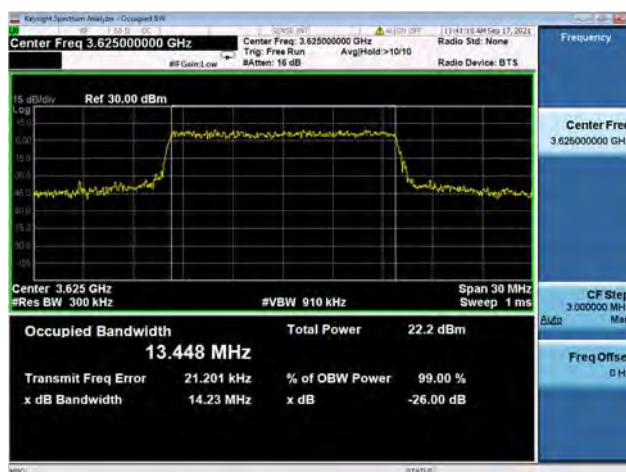
Band48 / 15MHz / Low CH / 64QAM



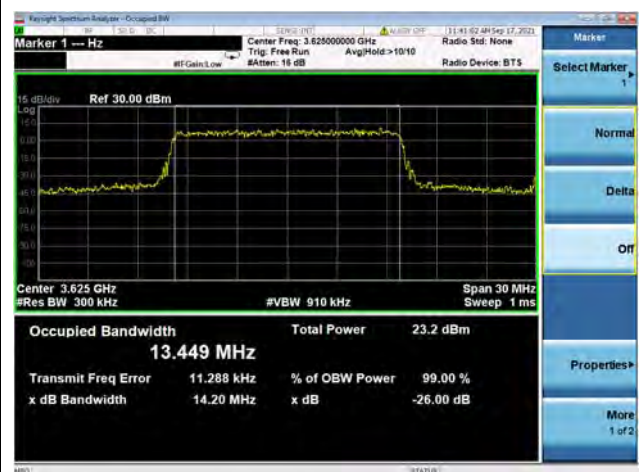
Band48 / 15MHz / Mid CH / QPSK



Band48 / 15MHz / Mid CH / 16QAM

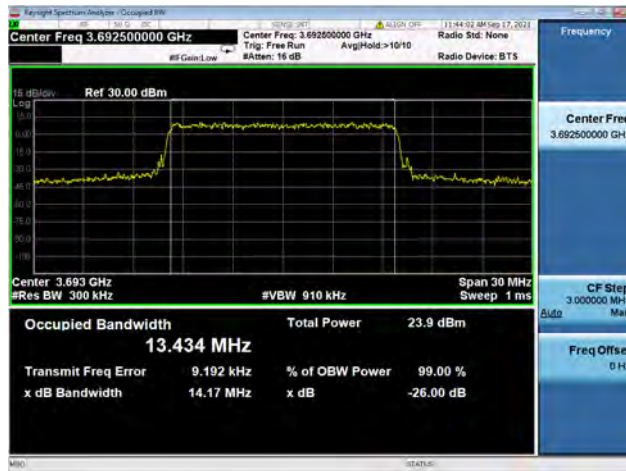


Band48 / 15MHz / Mid CH / 64QAM

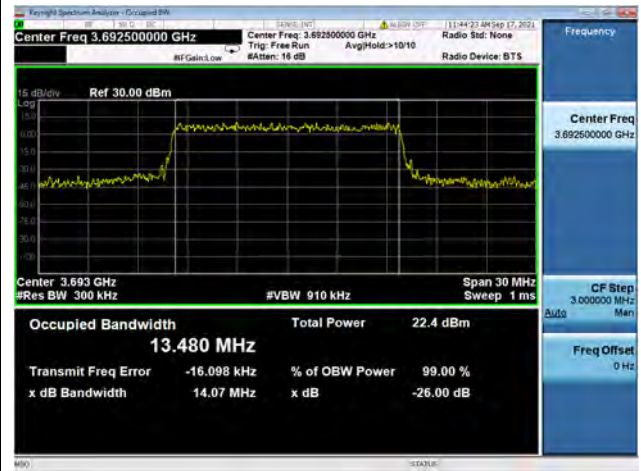




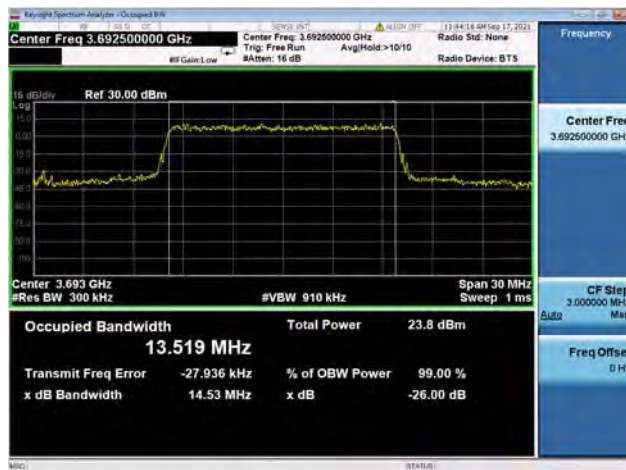
Band48 / 15MHz / High CH / QPSK



Band48 / 15MHz / High CH / 16QAM



Band48 / 15MHz / High CH / 64QAM



Band48 / 20MHz / Low CH / QPSK



Band48 / 20MHz / Low CH / 16QAM

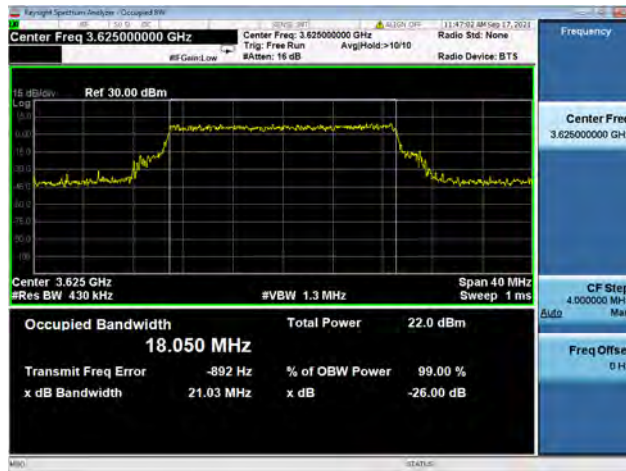


Band48 / 20MHz / Low CH / 64QAM

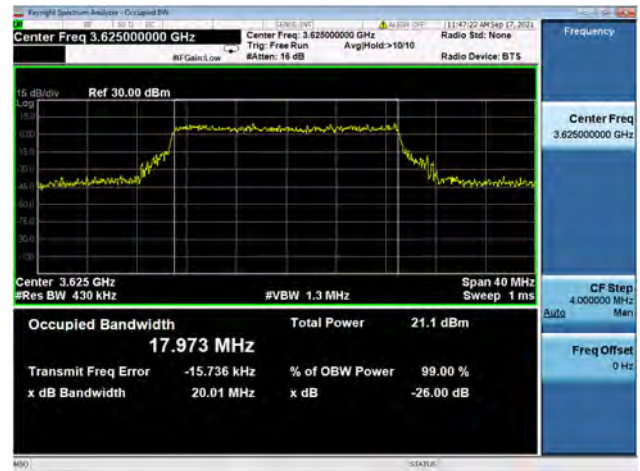




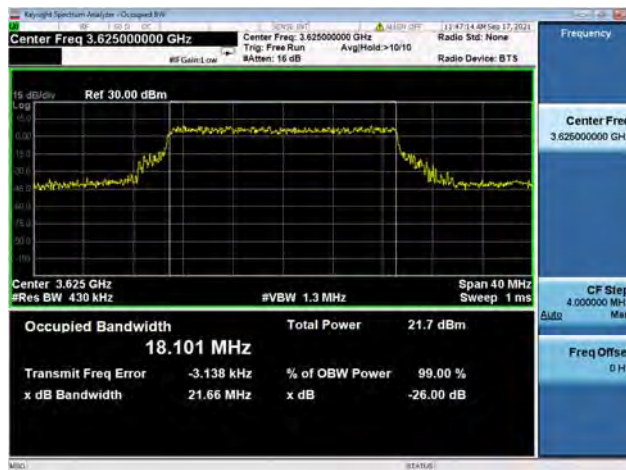
Band48 / 20MHz / Mid CH / QPSK



Band48 / 20MHz / Mid CH / 16QAM



Band48 / 20MHz / Mid CH / 64QAM



Band48 / 20MHz / High CH / QPSK



Band48 / 20MHz / High CH / 16QAM



Band48 / 20MHz / High CH / 64QAM



## 2.3. Frequency Stability

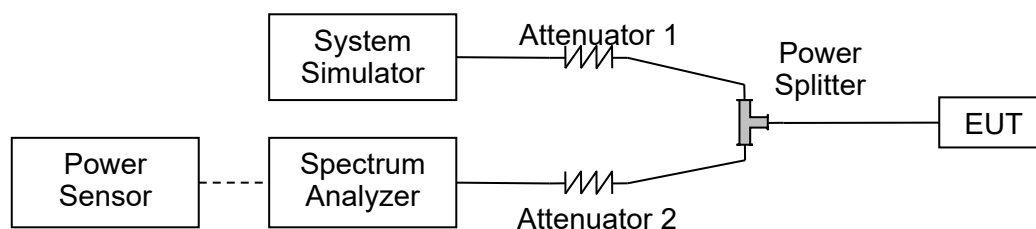
### 2.3.1. Requirement

According to FCC section 2.1055 & 90.213, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. According to FCC section 2.1055, the test conditions are:

- (a) The temperature is varied from -30°C to +50°C at intervals of not more than 10°C.
- (b) For hand carried battery powered equipment, the primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacture. The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

**Note:** The operating temperature of EUT is from 0°C to 55°C, which are specified by the applicant.

### 2.3.2. Test Description



The EUT which is powered by the DC Power Supply directly, is located in the Temperature Chamber. The EUT is commanded by the System Simulator (SS) to operate at the maximum output power. A call is established between the EUT and the SS via a Common Antenna.

### 2.3.3. Test procedure

KDB 971168 D01v03 Section 9.0 and ANSI/TIA-603-E-2016.

**2.3.4.Test Result**

The nominal, highest and lowest extreme voltages are separately 3.85V, 4.40V and 3.55V, which are specified by the applicant; the normal temperature here used is 20°C.

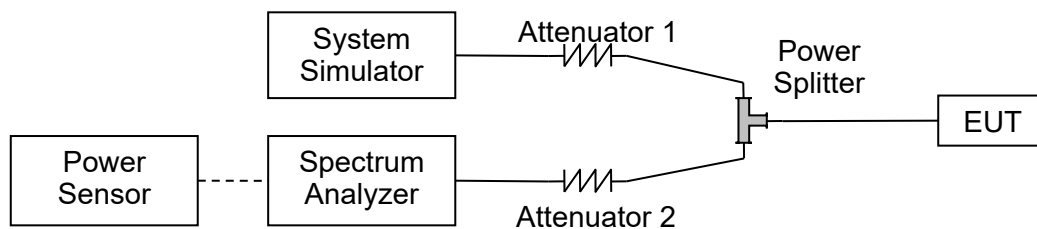
| <b>LTE Band 48, QPSK, Channel 55990, Frequency 3625.0MHz</b> |                    |                 |                      |                        |               |
|--------------------------------------------------------------|--------------------|-----------------|----------------------|------------------------|---------------|
| <b>Limit =Within Authorized Band</b>                         |                    |                 |                      |                        |               |
| <b>Voltage (%)</b>                                           | <b>Power (VDC)</b> | <b>Temp(°C)</b> | <b>Fre. Dev.(Hz)</b> | <b>Deviation (ppm)</b> | <b>Result</b> |
| 100                                                          | 3.80               | +20(Ref)        | -18                  | -0.005                 | PASS          |
| 100                                                          |                    | 0               | 17                   | 0.005                  |               |
| 100                                                          |                    | +10             | -19                  | -0.005                 |               |
| 100                                                          |                    | +20             | 16                   | 0.004                  |               |
| 100                                                          |                    | +30             | 15                   | 0.004                  |               |
| 100                                                          |                    | +40             | -54                  | -0.015                 |               |
| 100                                                          |                    | +50             | 45                   | 0.012                  |               |
| 100                                                          |                    | +55             | -31                  | -0.009                 |               |
| 115                                                          | 4.20               | +20             | -48                  | -0.013                 |               |
| 85                                                           | 3.60               | +20             | 21                   | 0.006                  |               |

## 2.4. Peak to Average Radio

### 2.4.1. Requirement

According to FCC 96.41(g), the peak-to-average power ratio (PAPR) of any CBSD transmitter output power must not exceed 13 dB.

### 2.4.2. Test Description



The EUT is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power. A call is established between the EUT and the SS.

### 2.4.3. Test procedure

KDB 971168 D01v03 Section 5.7 and ANSI/TIA-603-E-2016.

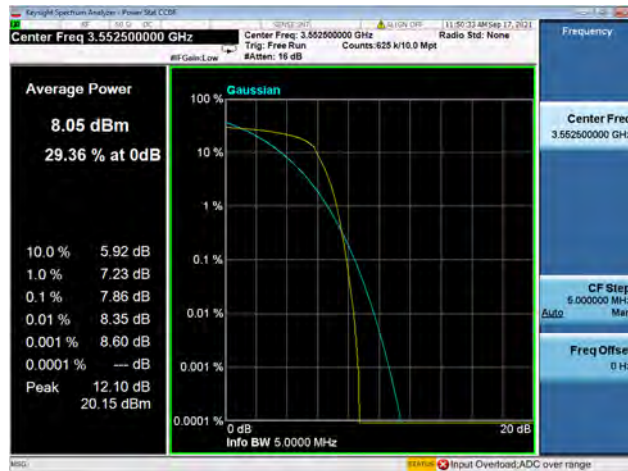
### 2.4.4. Test Result



| LTE Band 48 |               |            |               |           |         |
|-------------|---------------|------------|---------------|-----------|---------|
| BW(MHz)     | Channel Level | Modulation | PAR Radio(dB) | Limit(dB) | Verdict |
| 5           | Low           | QPSK       | 7.86          | <=13      | PASS    |
|             | Low           | 16QAM      | 8.34          | <=13      | PASS    |
|             | Low           | 64QAM      | 8.85          | <=13      | PASS    |
|             | Mid           | QPSK       | 7.84          | <=13      | PASS    |
|             | Mid           | 16QAM      | 7.83          | <=13      | PASS    |
|             | Mid           | 64QAM      | 8.28          | <=13      | PASS    |
|             | High          | QPSK       | 7.93          | <=13      | PASS    |
|             | High          | 16QAM      | 7.88          | <=13      | PASS    |
|             | High          | 64QAM      | 8.20          | <=13      | PASS    |
| 10          | Low           | QPSK       | 8.71          | <=13      | PASS    |
|             | Low           | 16QAM      | 7.23          | <=13      | PASS    |
|             | Low           | 64QAM      | 9.30          | <=13      | PASS    |
|             | Mid           | QPSK       | 9.21          | <=13      | PASS    |
|             | Mid           | 16QAM      | 8.98          | <=13      | PASS    |
|             | Mid           | 64QAM      | 9.73          | <=13      | PASS    |
|             | High          | QPSK       | 7.97          | <=13      | PASS    |
|             | High          | 16QAM      | 9.21          | <=13      | PASS    |
|             | High          | 64QAM      | 9.26          | <=13      | PASS    |
| 15          | Low           | QPSK       | 8.32          | <=13      | PASS    |
|             | Low           | 16QAM      | 7.57          | <=13      | PASS    |
|             | Low           | 64QAM      | 9.55          | <=13      | PASS    |
|             | Mid           | QPSK       | 7.50          | <=13      | PASS    |
|             | Mid           | 16QAM      | 7.64          | <=13      | PASS    |
|             | Mid           | 64QAM      | 8.49          | <=13      | PASS    |
|             | High          | QPSK       | 8.27          | <=13      | PASS    |
|             | High          | 16QAM      | 7.57          | <=13      | PASS    |
|             | High          | 64QAM      | 8.49          | <=13      | PASS    |
| 20          | Low           | QPSK       | 7.95          | <=13      | PASS    |
|             | Low           | 16QAM      | 7.53          | <=13      | PASS    |
|             | Low           | 64QAM      | 8.05          | <=13      | PASS    |
|             | Mid           | QPSK       | 5.83          | <=13      | PASS    |
|             | Mid           | 16QAM      | 7.73          | <=13      | PASS    |
|             | Mid           | 64QAM      | 7.28          | <=13      | PASS    |
|             | High          | QPSK       | 7.56          | <=13      | PASS    |
|             | High          | 16QAM      | 7.77          | <=13      | PASS    |
|             | High          | 64QAM      | 8.24          | <=13      | PASS    |



Band48 / 5MHz / Low CH / QPSK



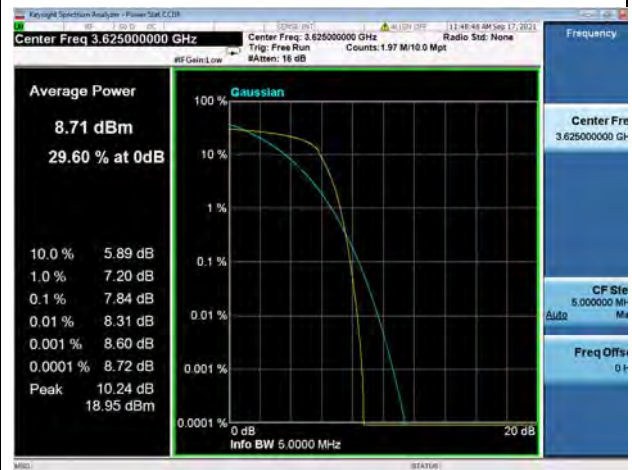
Band48 / 5MHz / Low CH / 16QAM



Band48 / 5MHz / Low CH / 64QAM



Band48 / 5MHz / Mid CH / QPSK



Band48 / 5MHz / Mid CH / 16QAM



Band48 / 5MHz / Mid CH / 64QAM

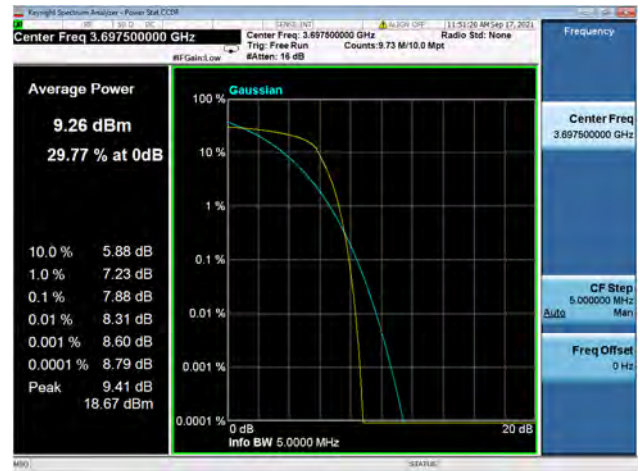




Band48 / 5MHz / High CH / QPSK



Band48 / 5MHz / High CH / 16QAM



Band48 / 5MHz / High CH / 64QAM



Band48 / 10MHz / Low CH / QPSK



Band48 / 10MHz / Low CH / 16QAM

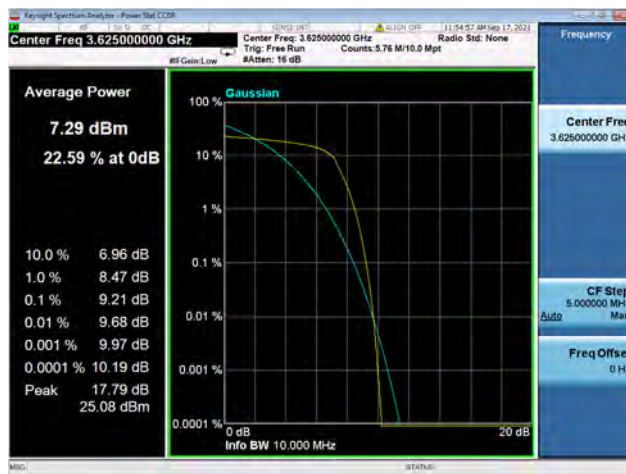


Band48 / 10MHz / Low CH / 64QAM





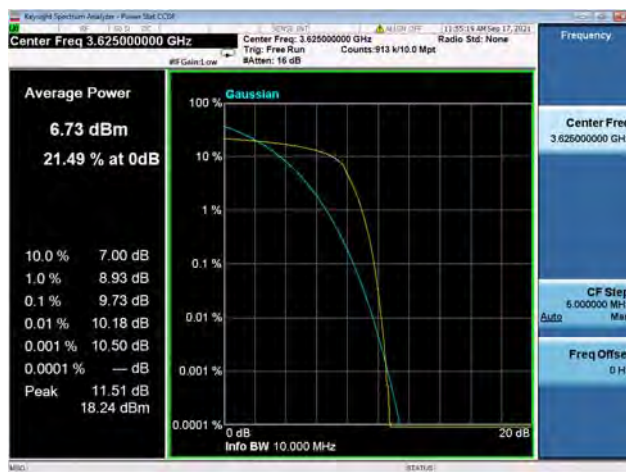
Band48 / 10MHz / Mid CH / QPSK



Band48 / 10MHz / Mid CH / 16QAM



Band48 / 10MHz / Mid CH / 64QAM



Band48 / 10MHz / High CH / QPSK



Band48 / 10MHz / High CH / 16QAM

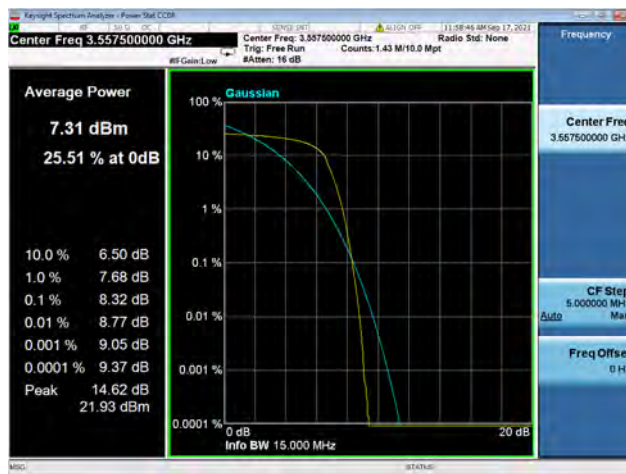


Band48 / 10MHz / High CH / 64QAM





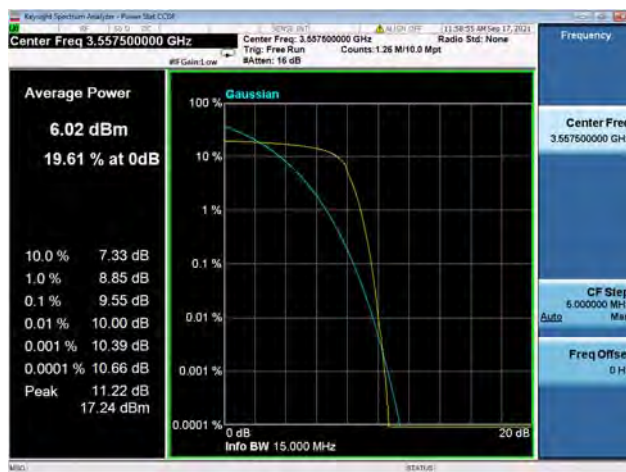
Band48 / 15MHz / Low CH / QPSK



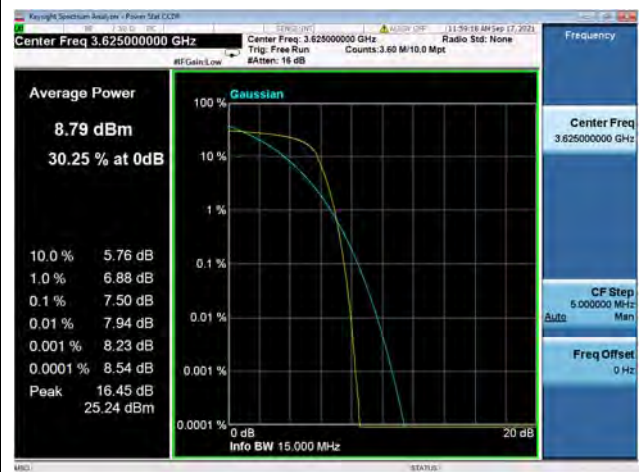
Band48 / 15MHz / Low CH / 16QAM



Band48 / 15MHz / Low CH / 64QAM



Band48 / 15MHz / Mid CH / QPSK



Band48 / 15MHz / Mid CH / 16QAM

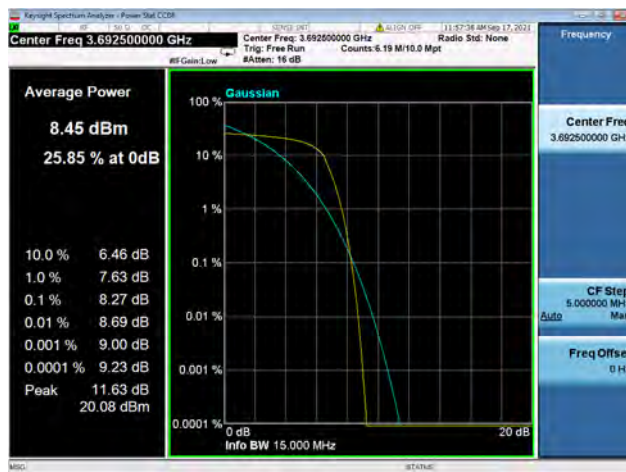


Band48 / 15MHz / Mid CH / 64QAM





Band48 / 15MHz / High CH / QPSK



Band48 / 15MHz / High CH / 16QAM



Band48 / 15MHz / High CH / 64QAM



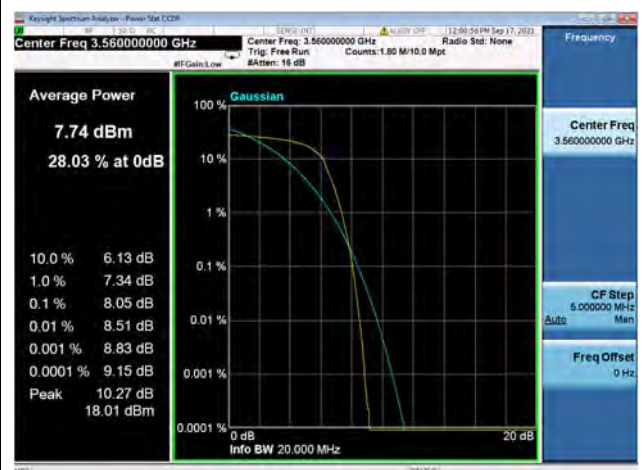
Band48 / 20MHz / Low CH / QPSK



Band48 / 20MHz / Low CH / 16QAM

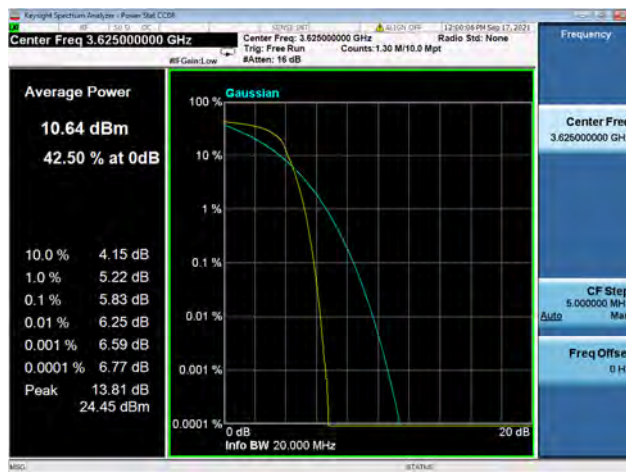


Band48 / 20MHz / Low CH / 64QAM





Band48 / 20MHz / Mid CH / QPSK



Band48 / 20MHz / Mid CH / 16QAM



Band48 / 20MHz / Mid CH / 64QAM



Band48 / 20MHz / High CH / QPSK



Band48 / 20MHz / High CH / 16QAM



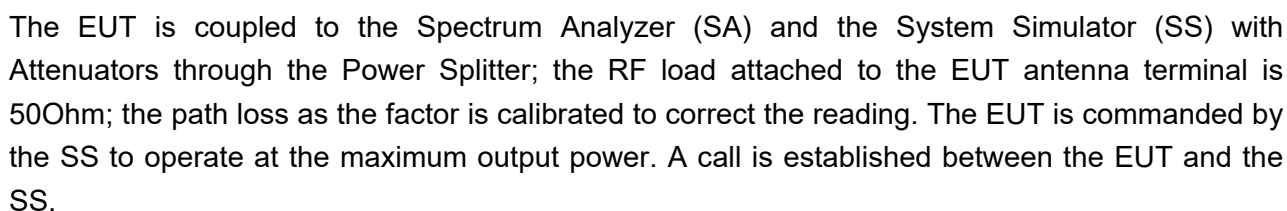
Band48 / 20MHz / High CH / 64QAM





### 2.5.1.Requirement

### 2.5.2. Test Description

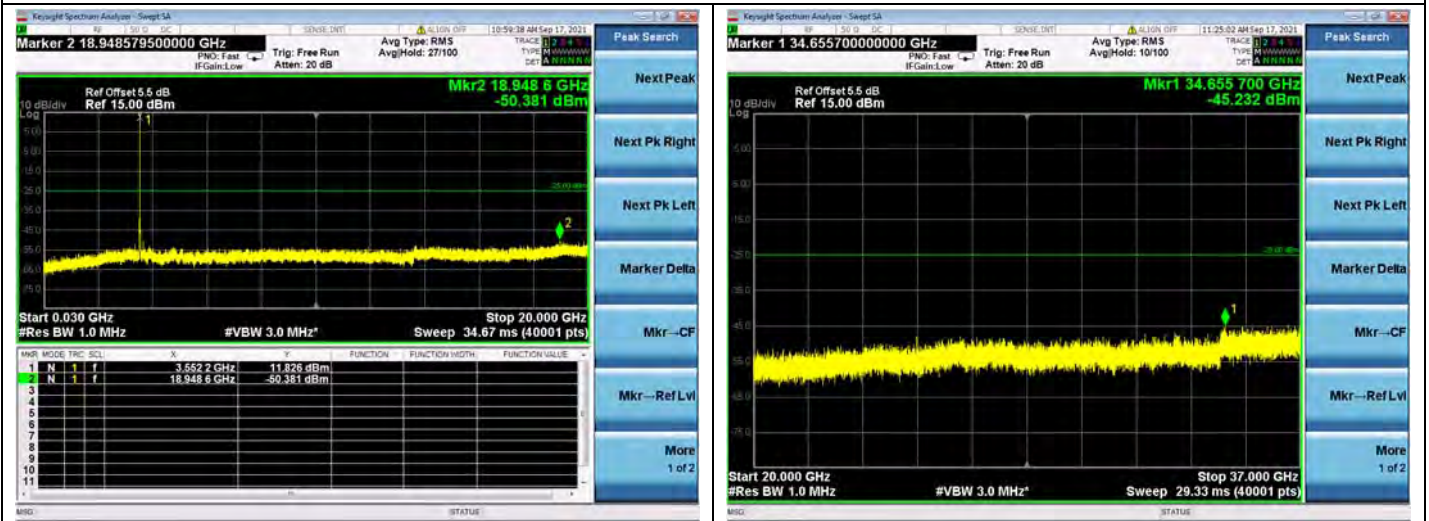


### 2.5.1. Test procedure

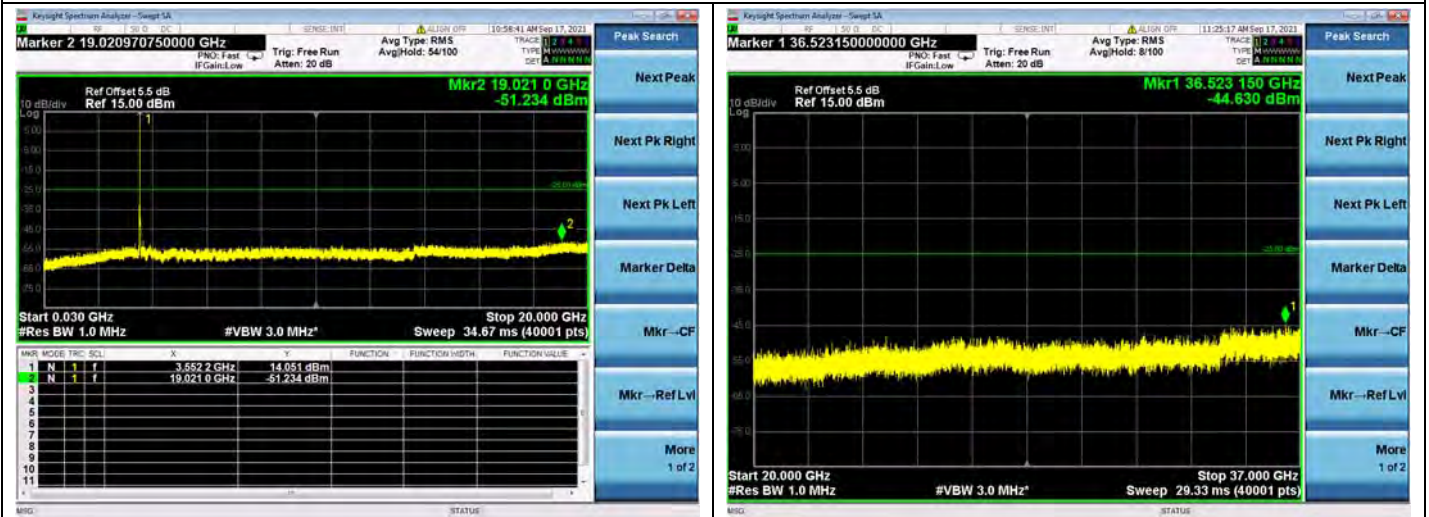
### 2.5.2. Test Result



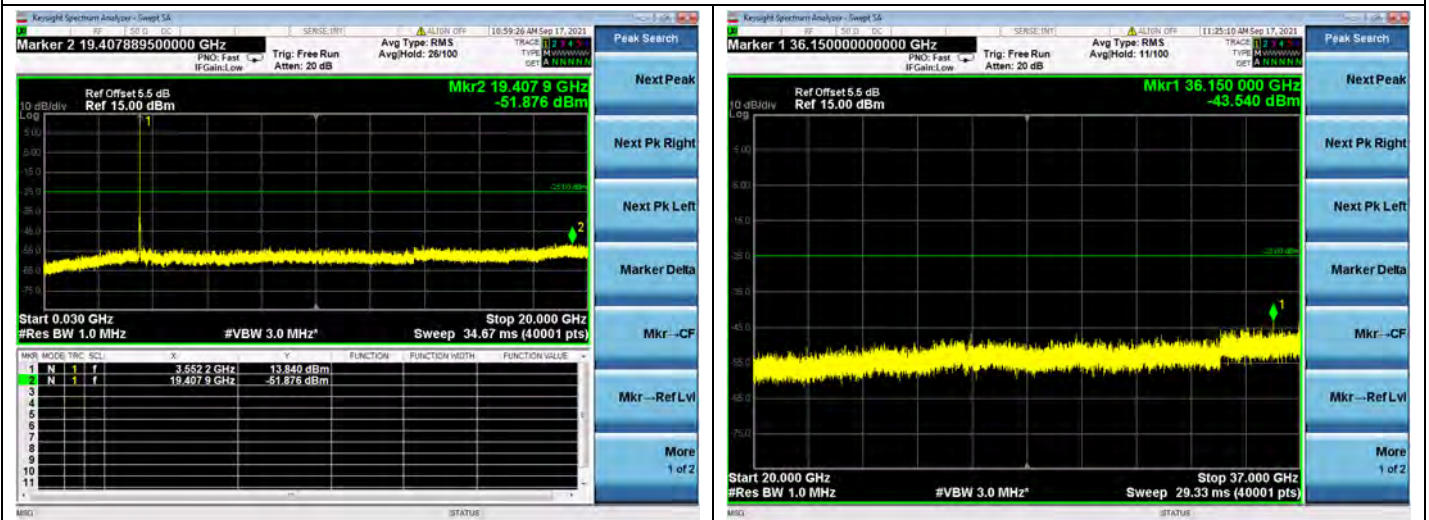
## Band 48 / 5MHz / Low CH / QPSK



## Band 48 / 5MHz / Low CH / 16QAM

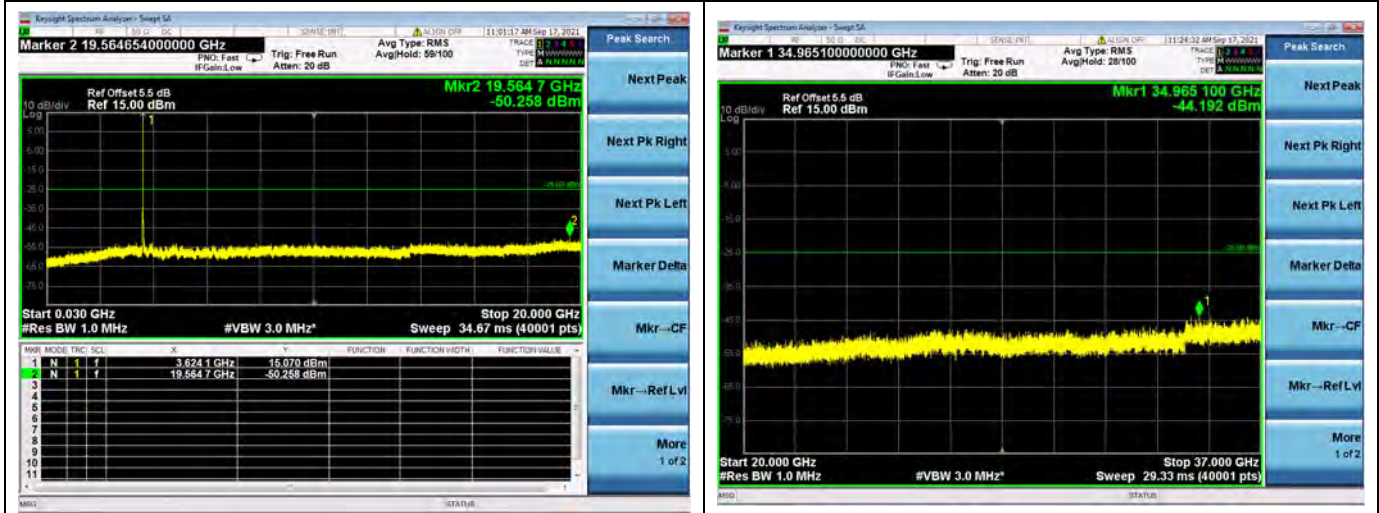


## Band 48 / 5MHz / Low CH / 64QAM

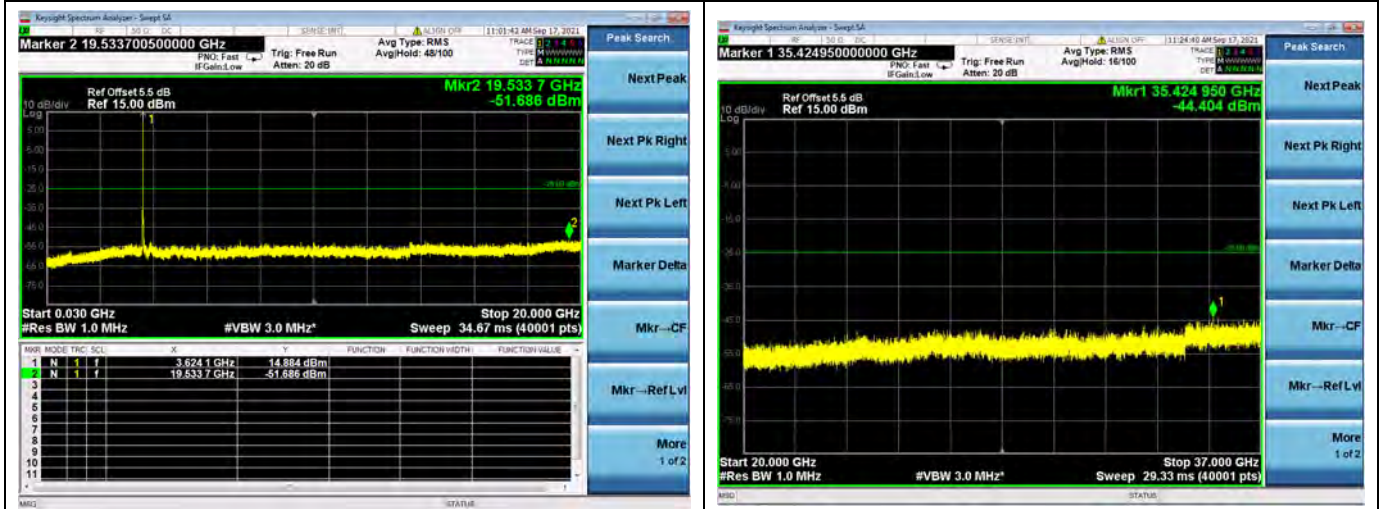




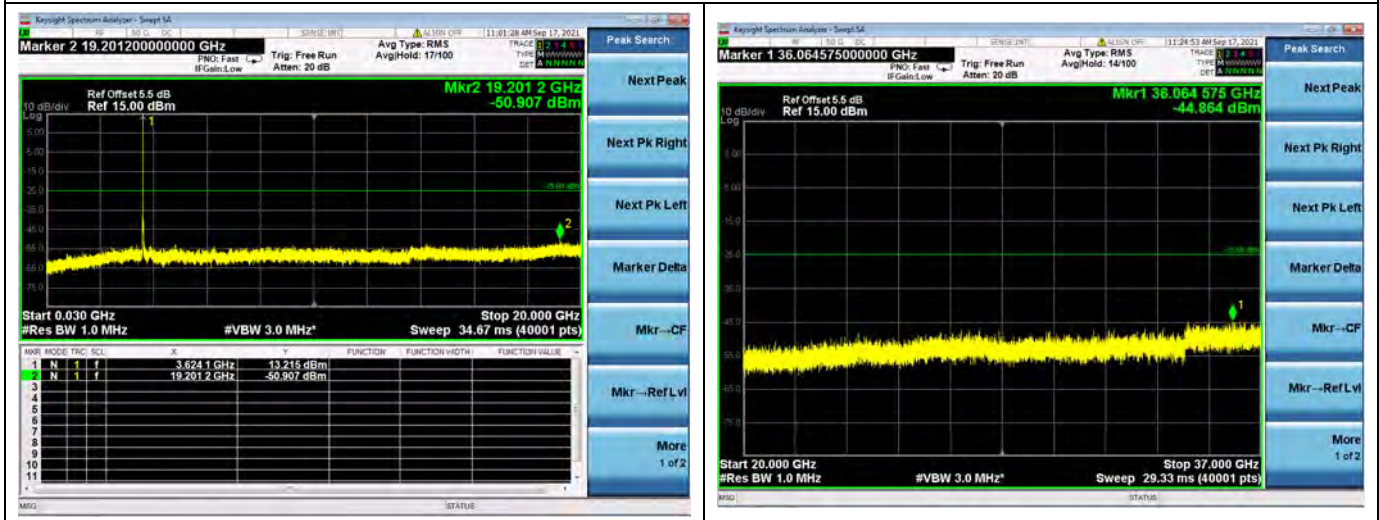
## Band 48 / 5MHz / Mid CH / QPSK



## Band 48 / 5MHz / Mid CH / 16QAM

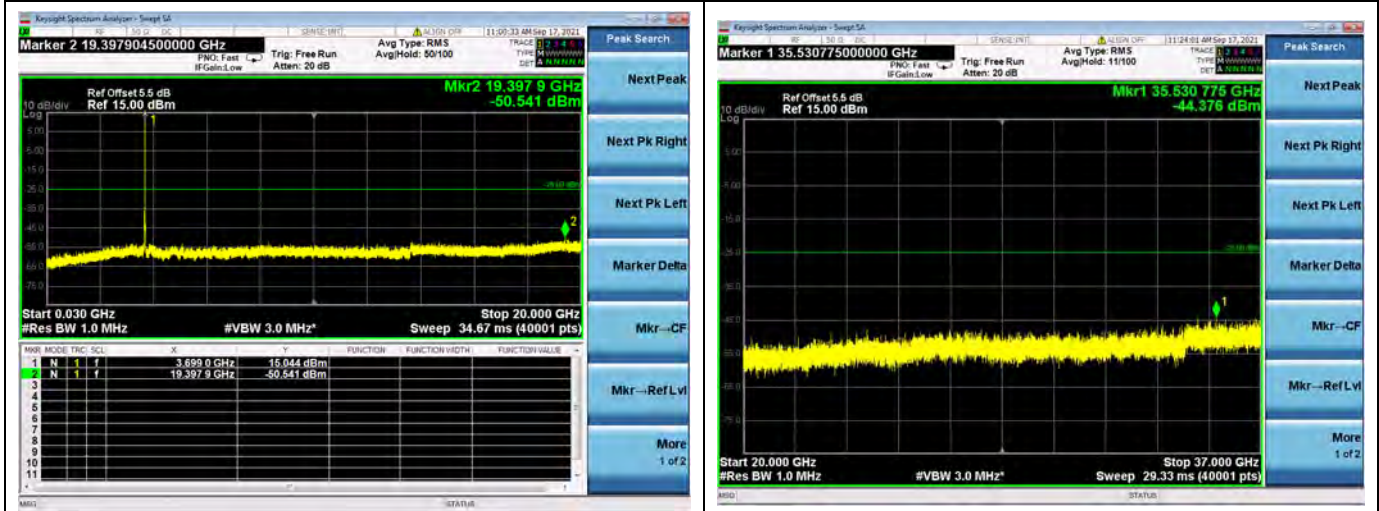


## Band 48 / 5MHz / Mid CH / 64QAM

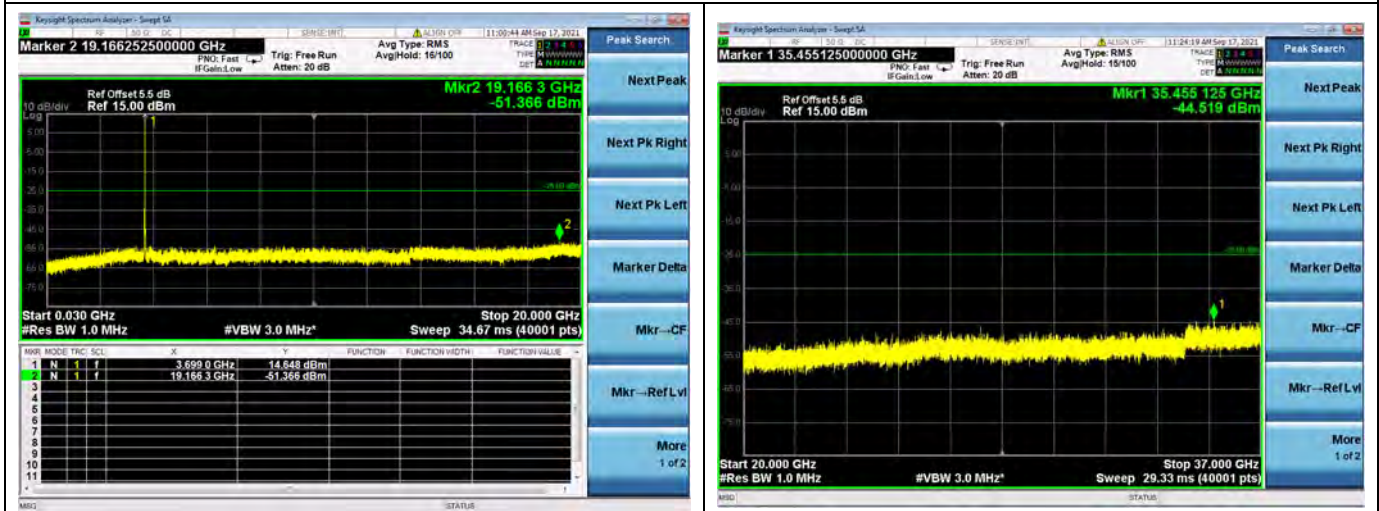




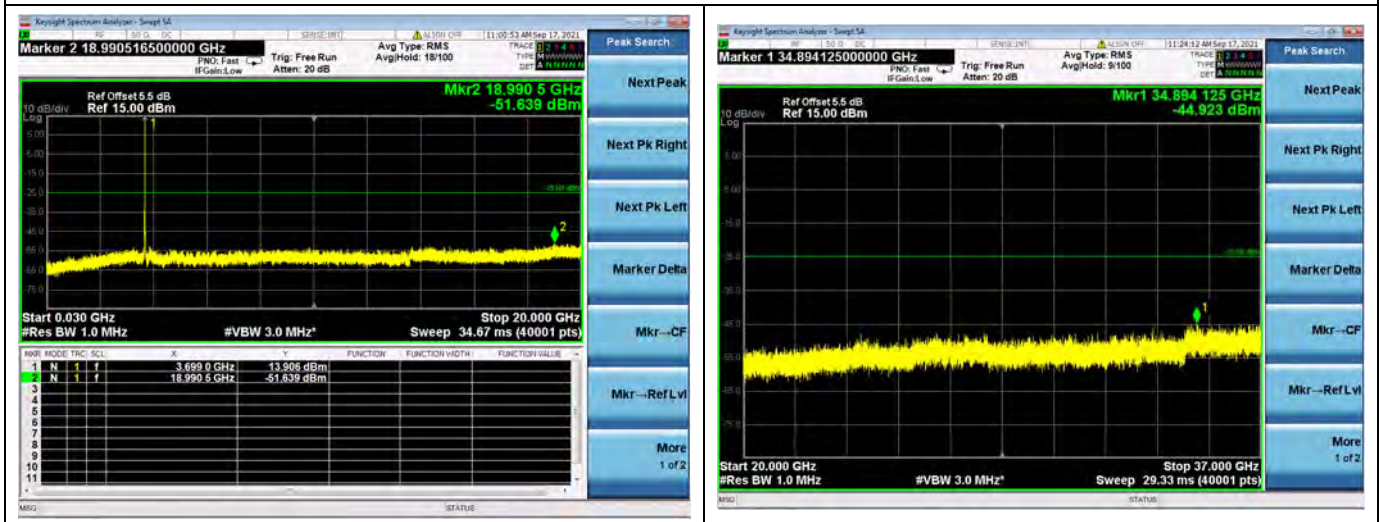
## Band 48 / 5MHz / High CH / QPSK



## Band 48 / 5MHz / High CH / 16QAM

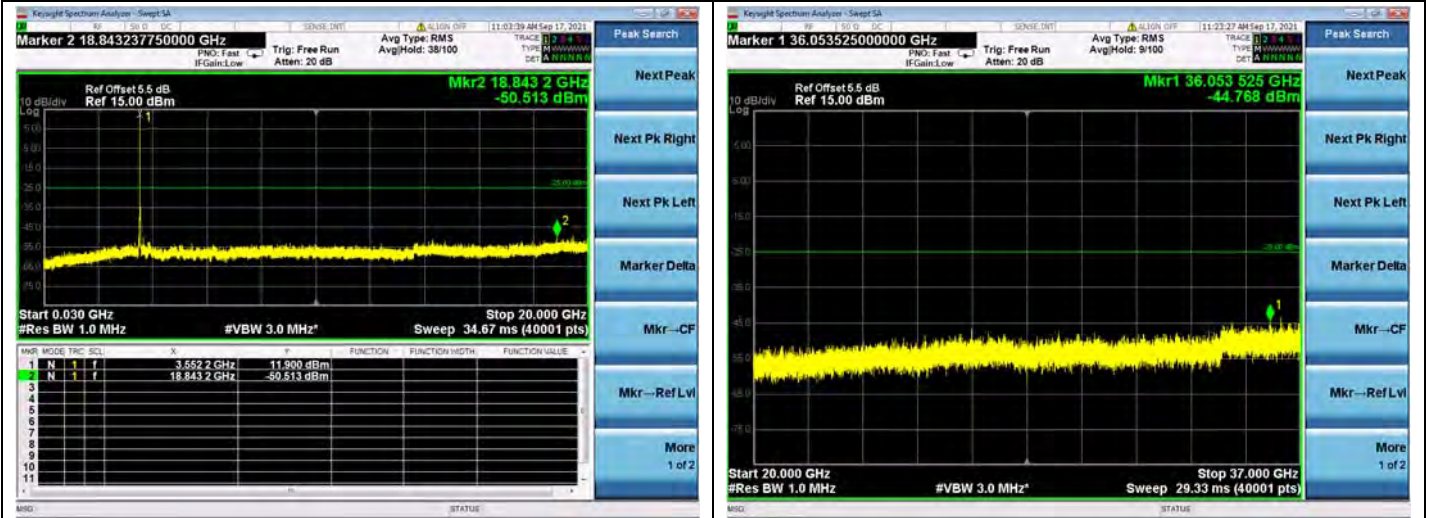


## Band 48 / 5MHz / High CH / 64QAM

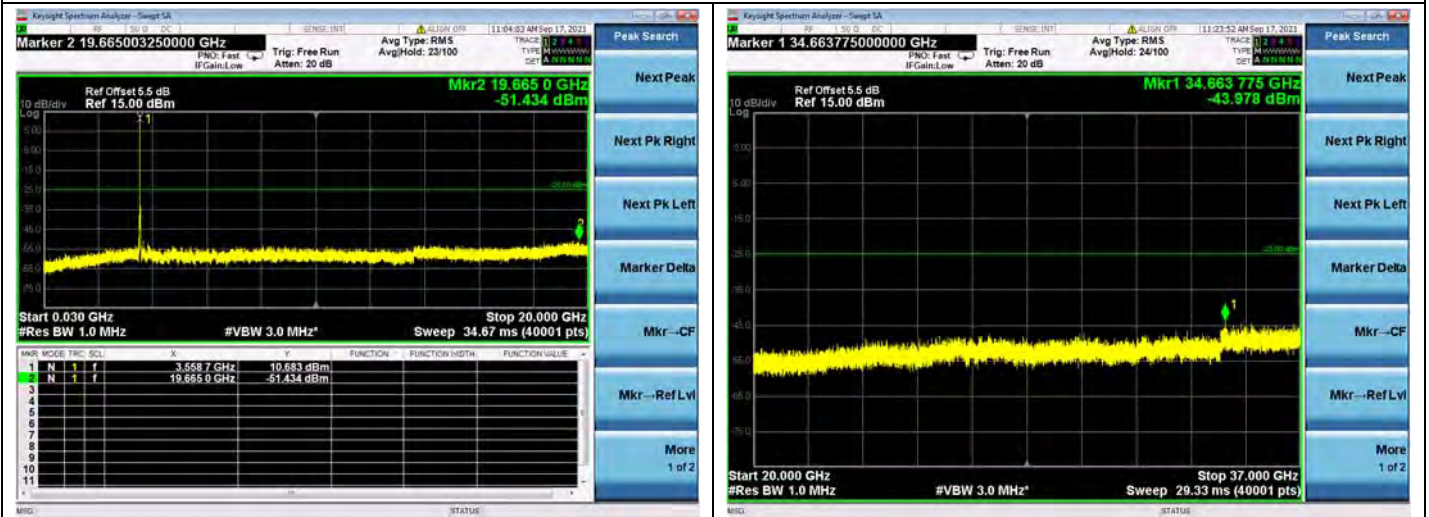




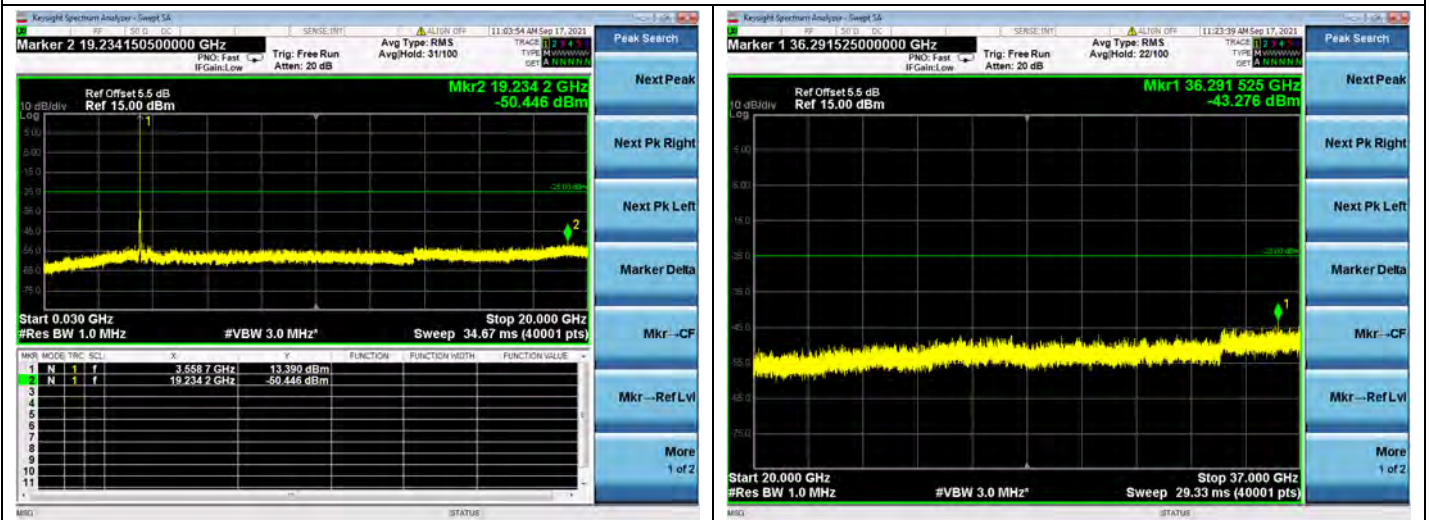
## Band 48 / 10MHz / Low CH / QPSK



## Band 48 / 10MHz / Low CH / 16QAM

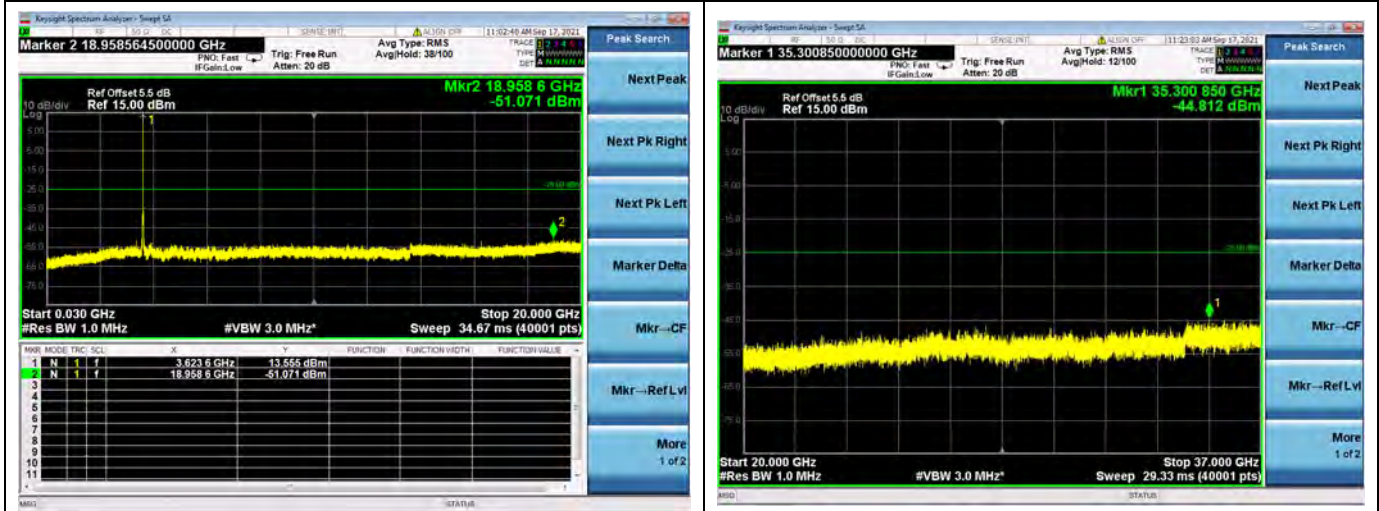


## Band 48 / 10MHz / Low CH / 64QAM

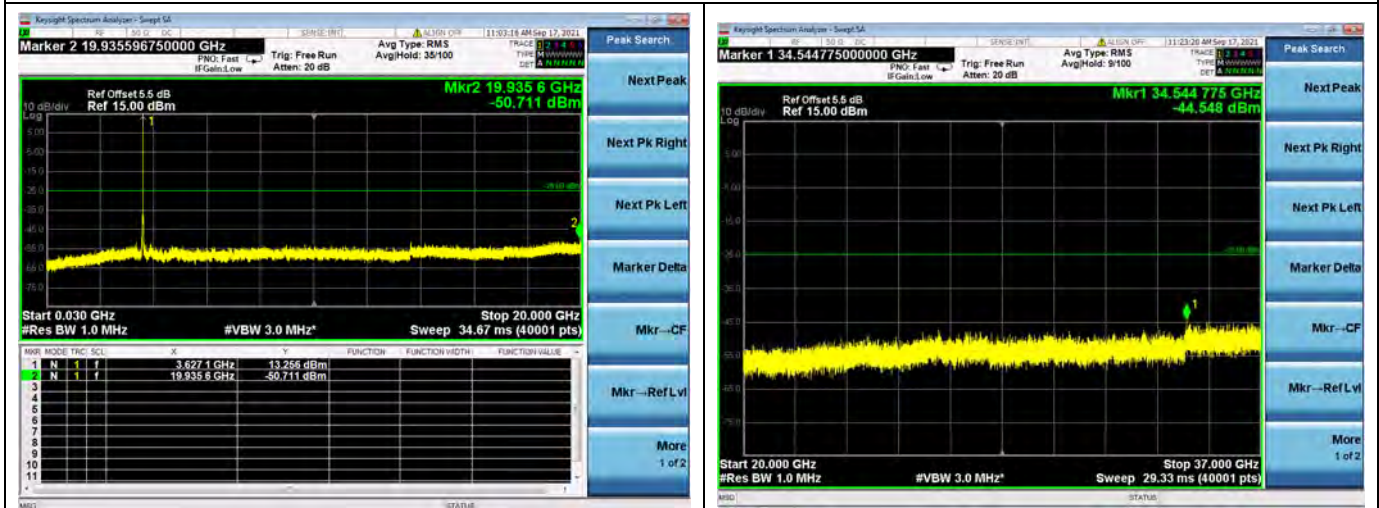




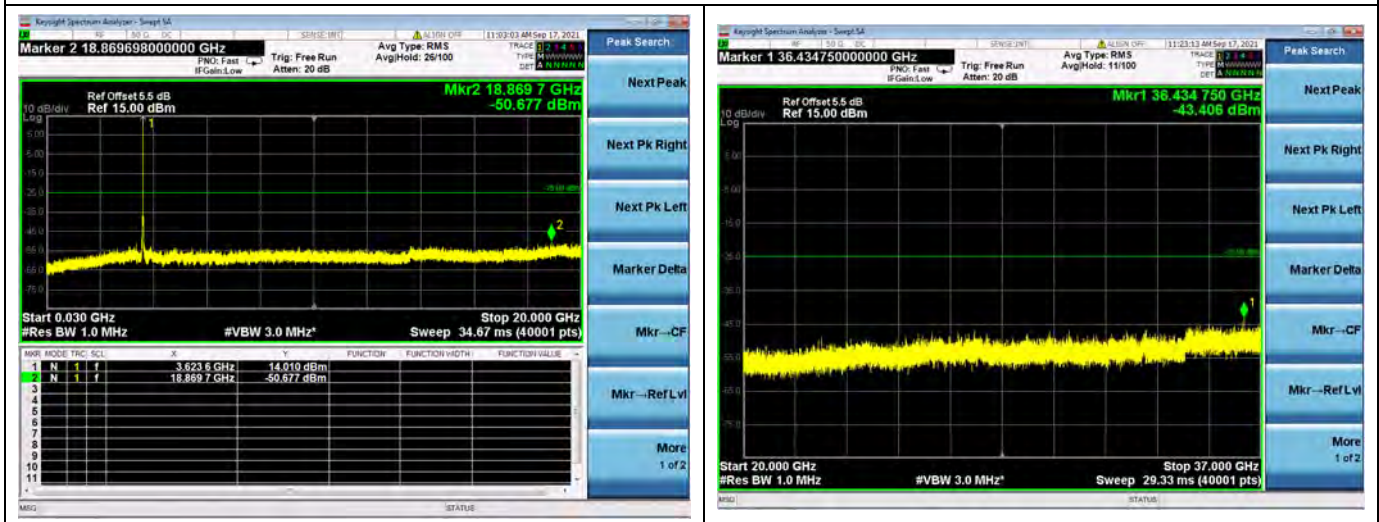
## Band 48 / 10MHz / Mid CH / QPSK



## Band 48 / 10MHz / Mid CH / 16QAM

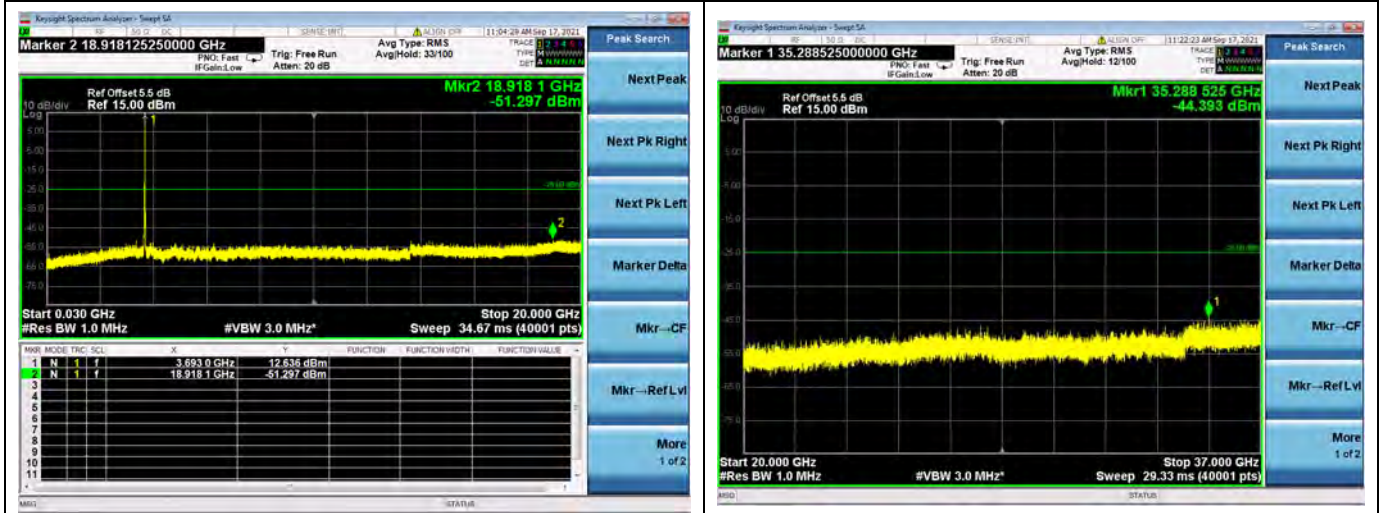


## Band 48 / 10MHz / Mid CH / 64QAM

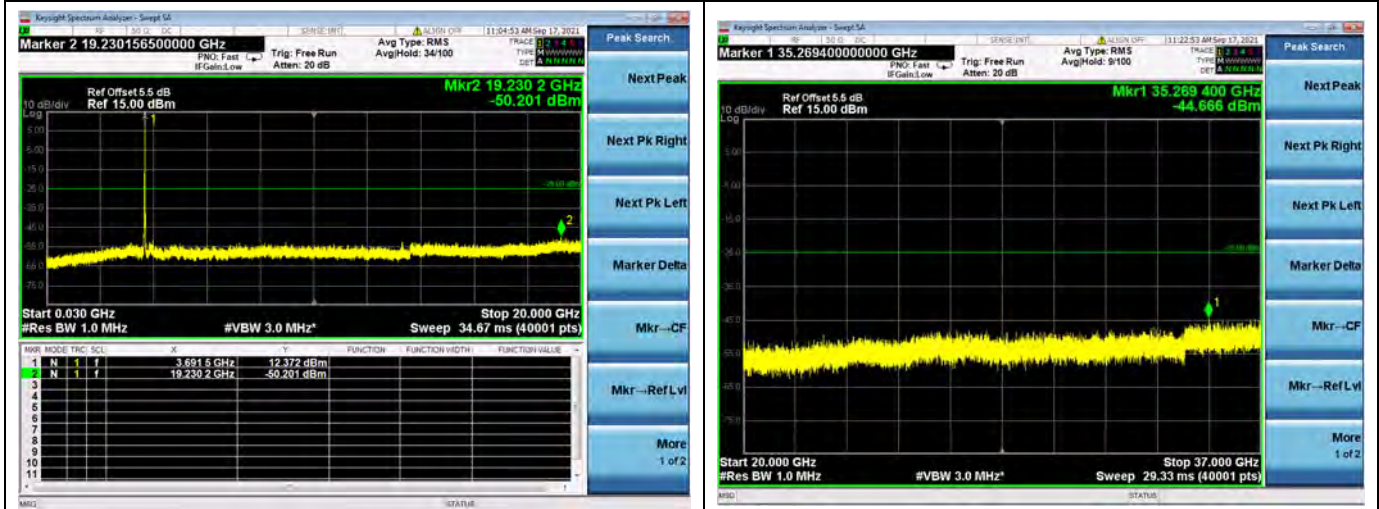




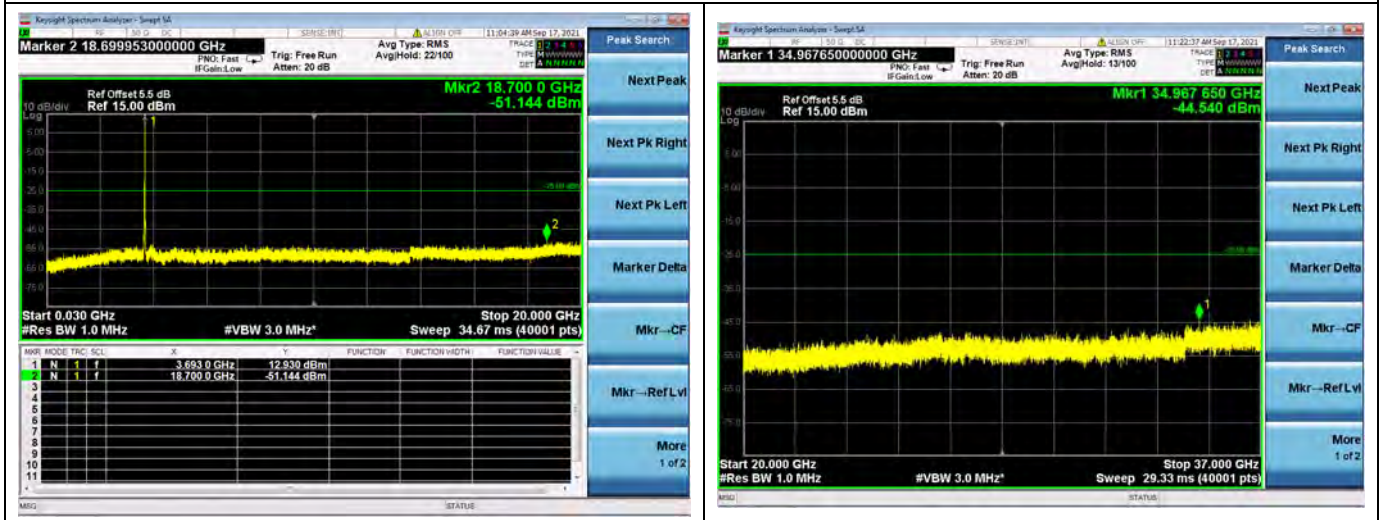
## Band 48 / 10MHz / High CH / QPSK



## Band 48 / 10MHz / High CH / 16QAM

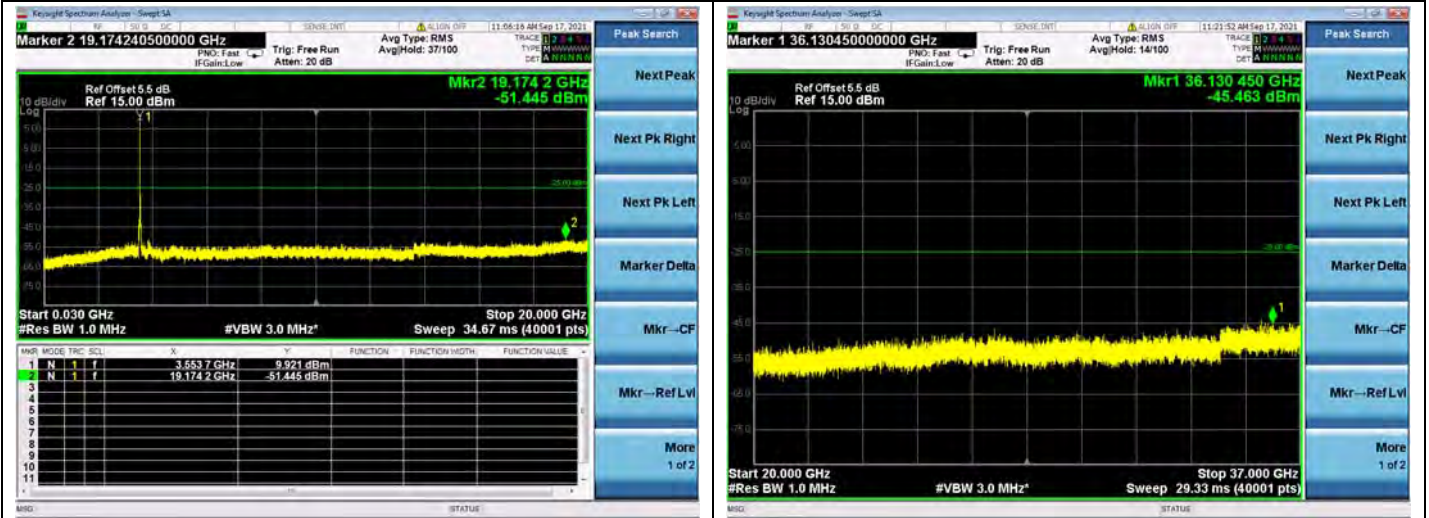


## Band 48 / 10MHz / High CH / 64QAM

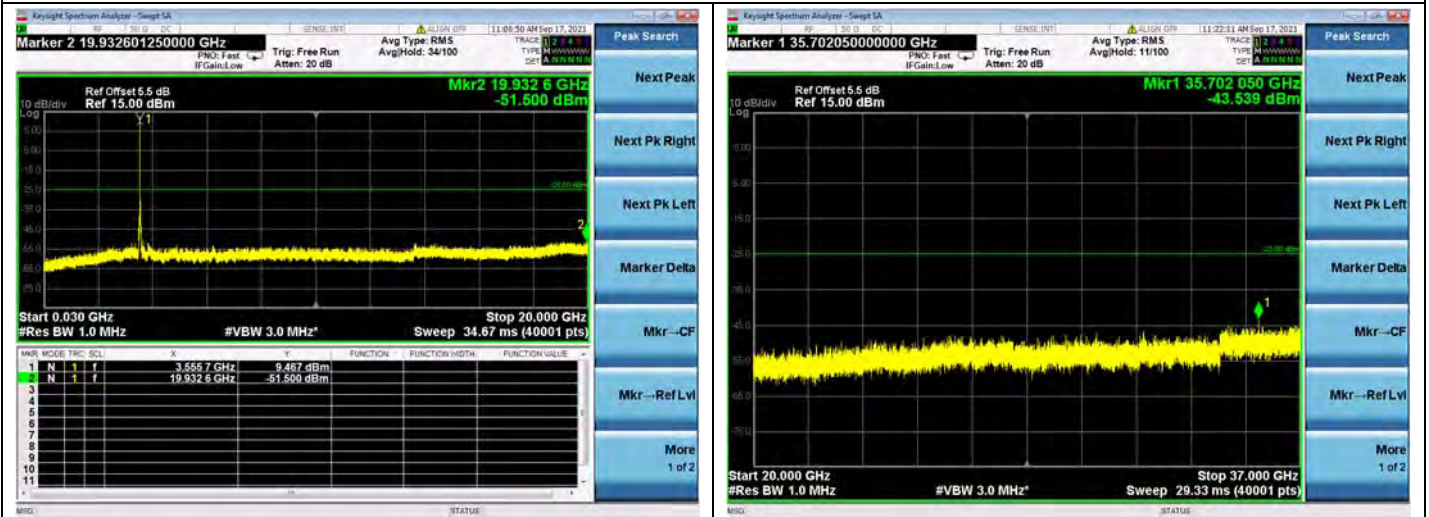




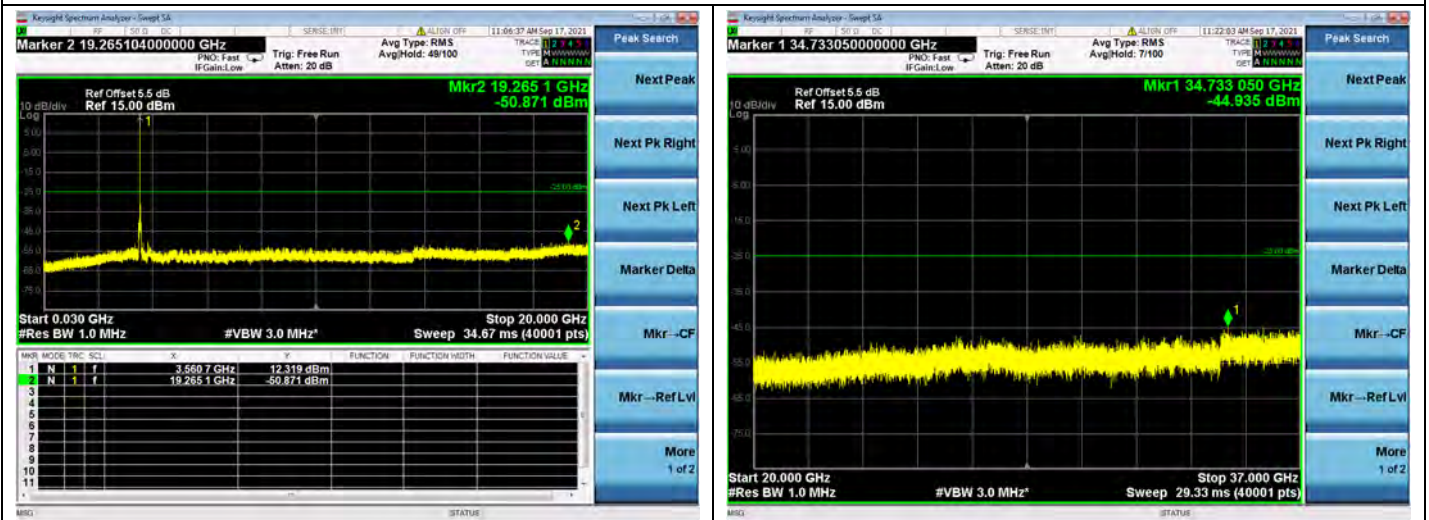
## Band 48 / 15MHz / Low CH / QPSK



## Band 48 / 15MHz / Low CH / 16QAM

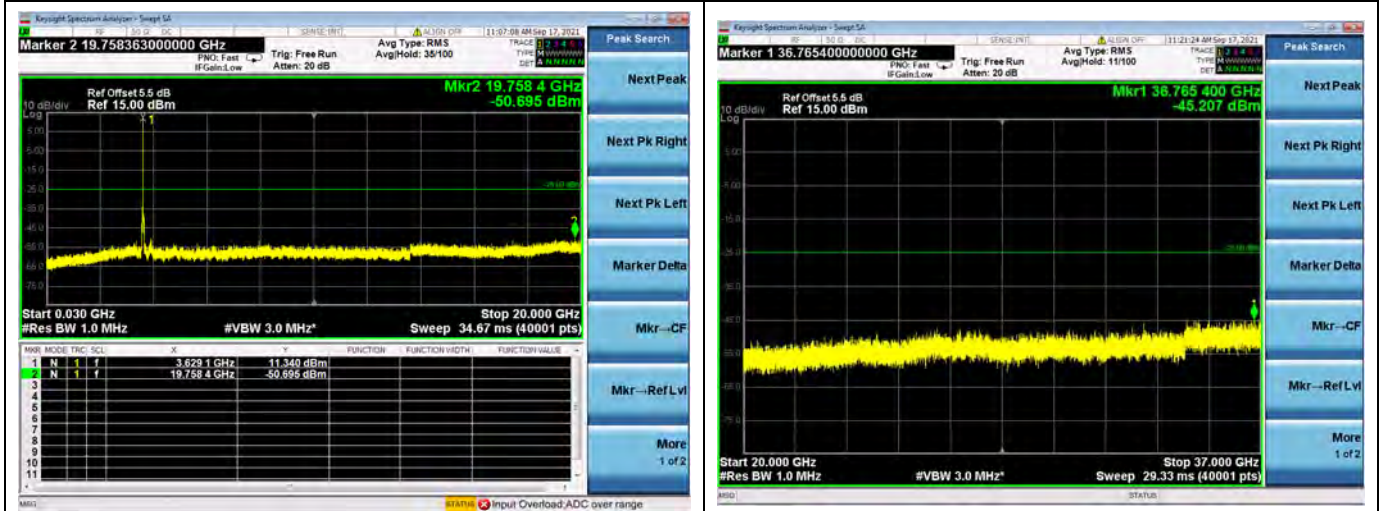


## Band 48 / 15MHz / Low CH / 64QAM

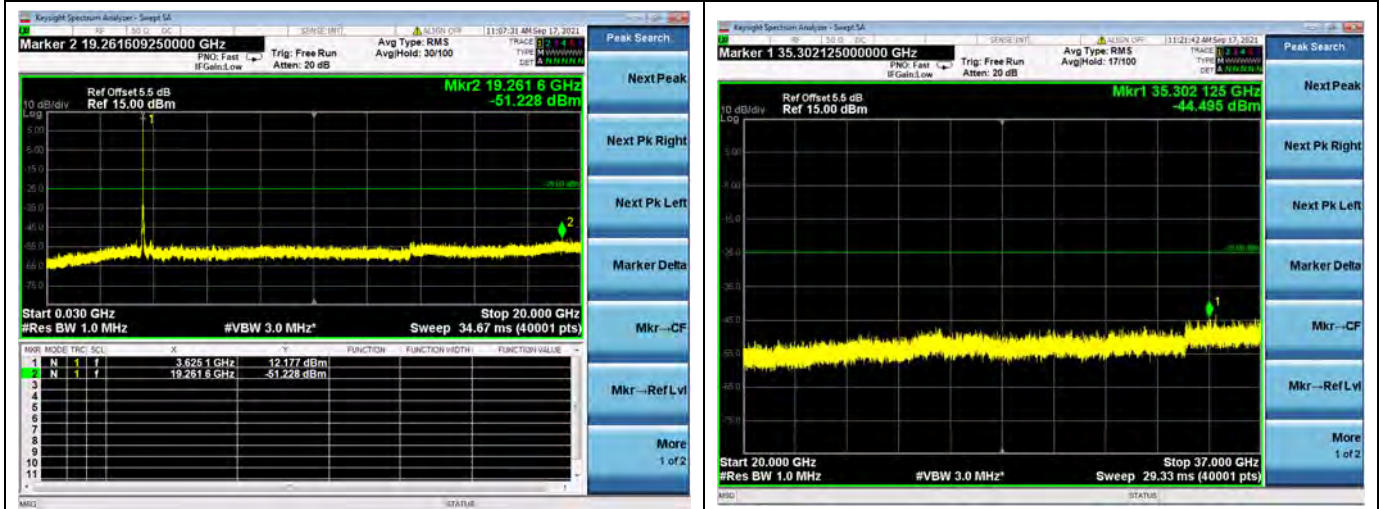




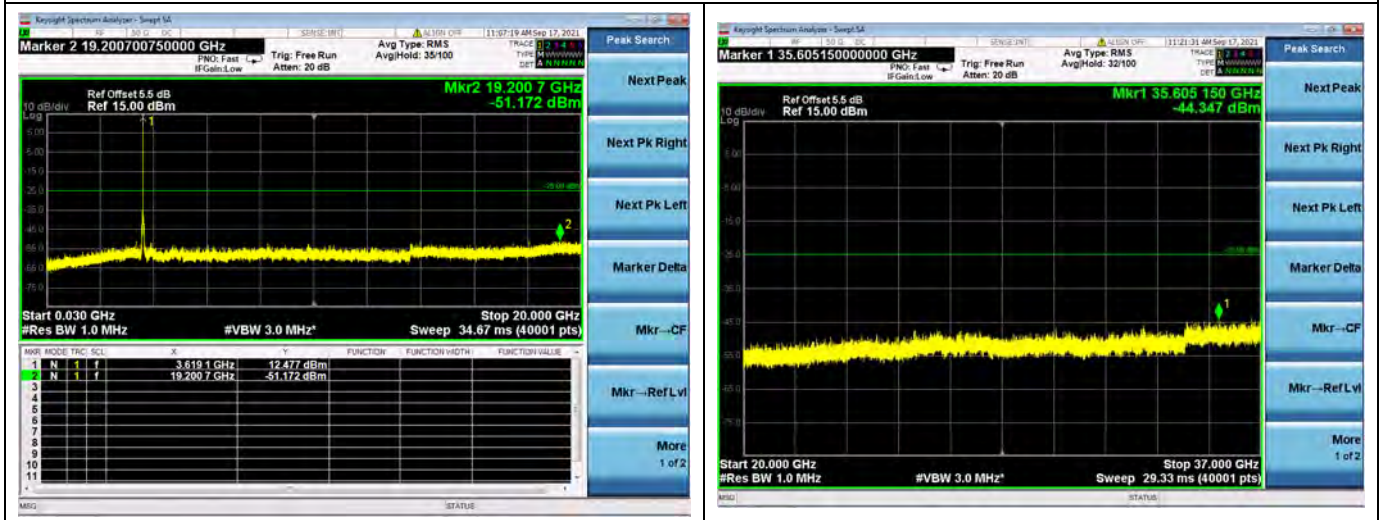
## Band 48 / 15MHz / Mid CH / QPSK



## Band 48 / 15MHz / Mid CH / 16QAM

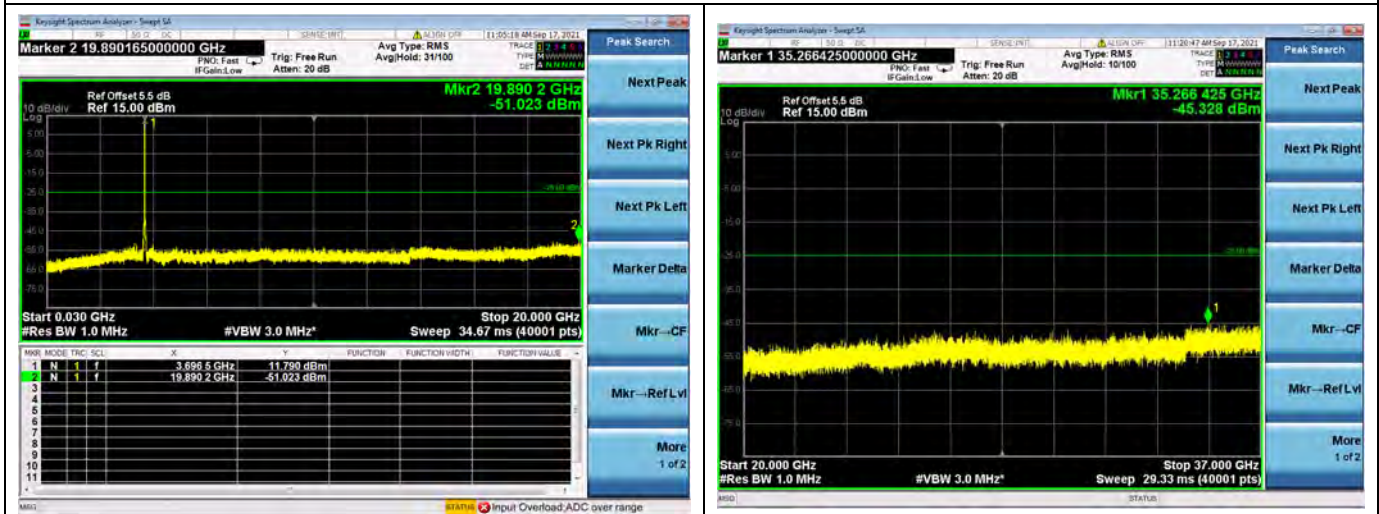


## Band 48 / 15MHz / Mid CH / 64QAM

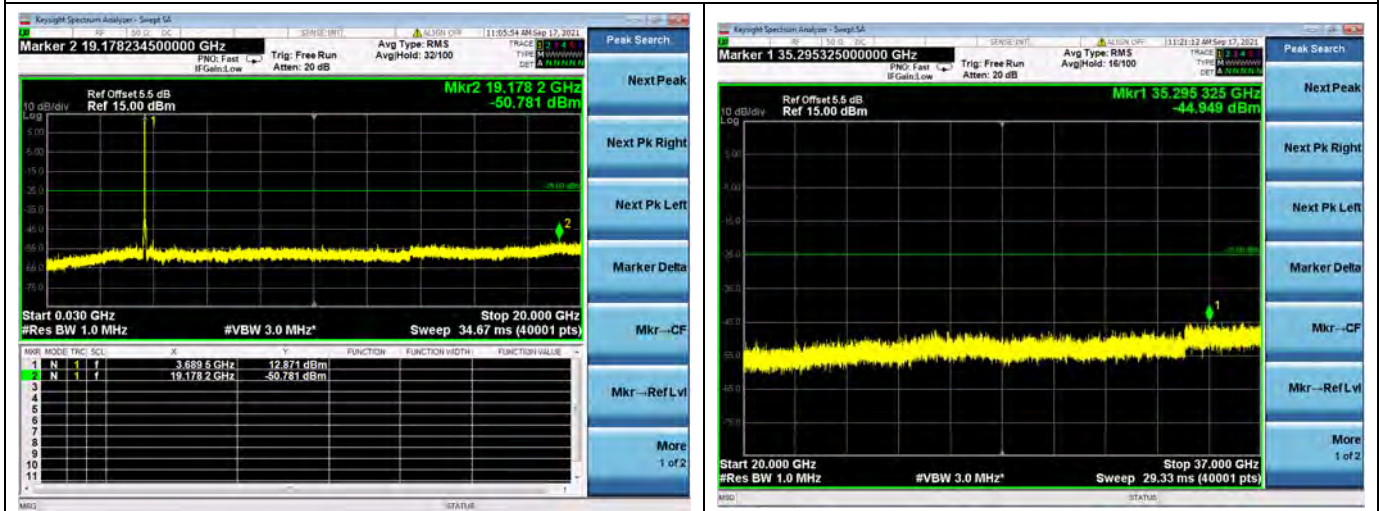




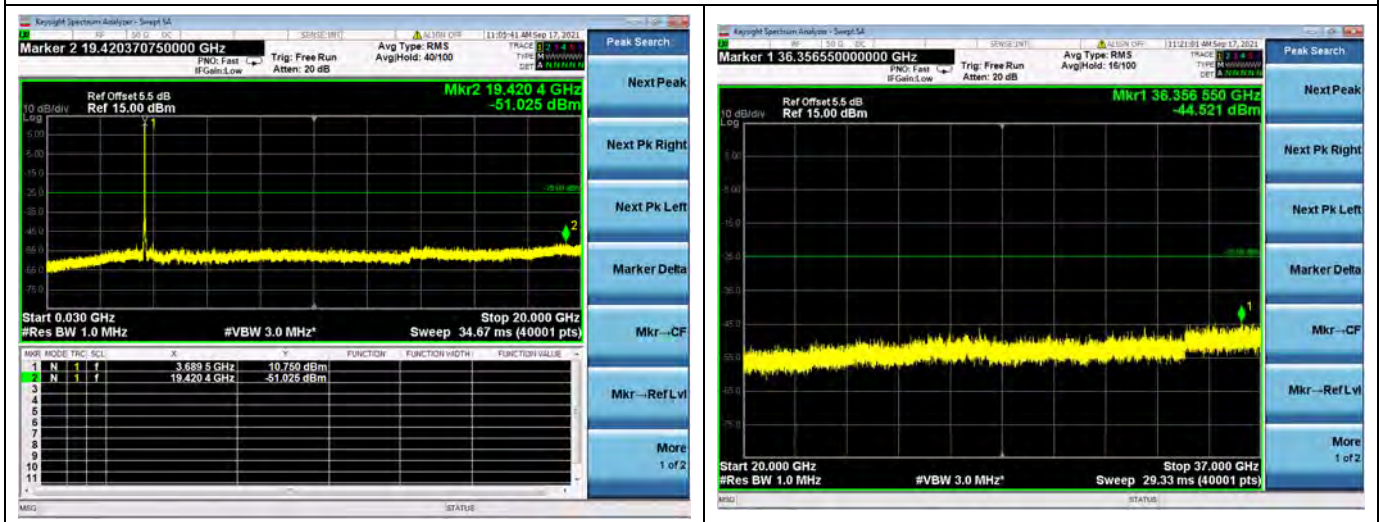
## Band 48 / 15MHz / High CH / QPSK



## Band 48 / 15MHz / High CH / 16QAM

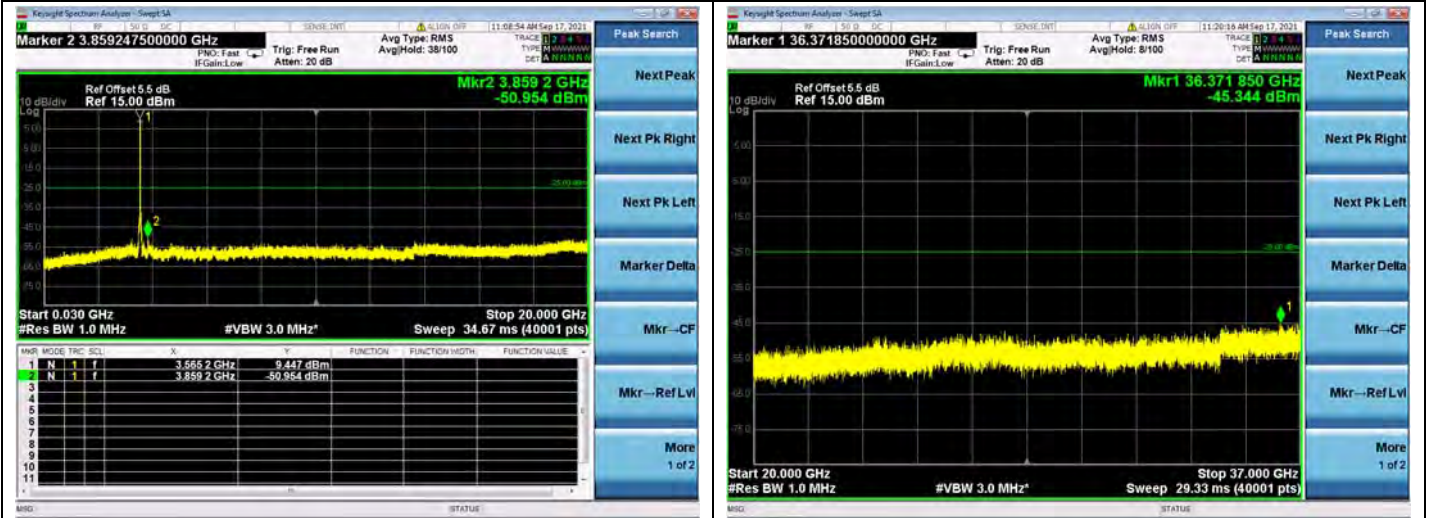


## Band 48 / 15MHz / High CH / 64QAM

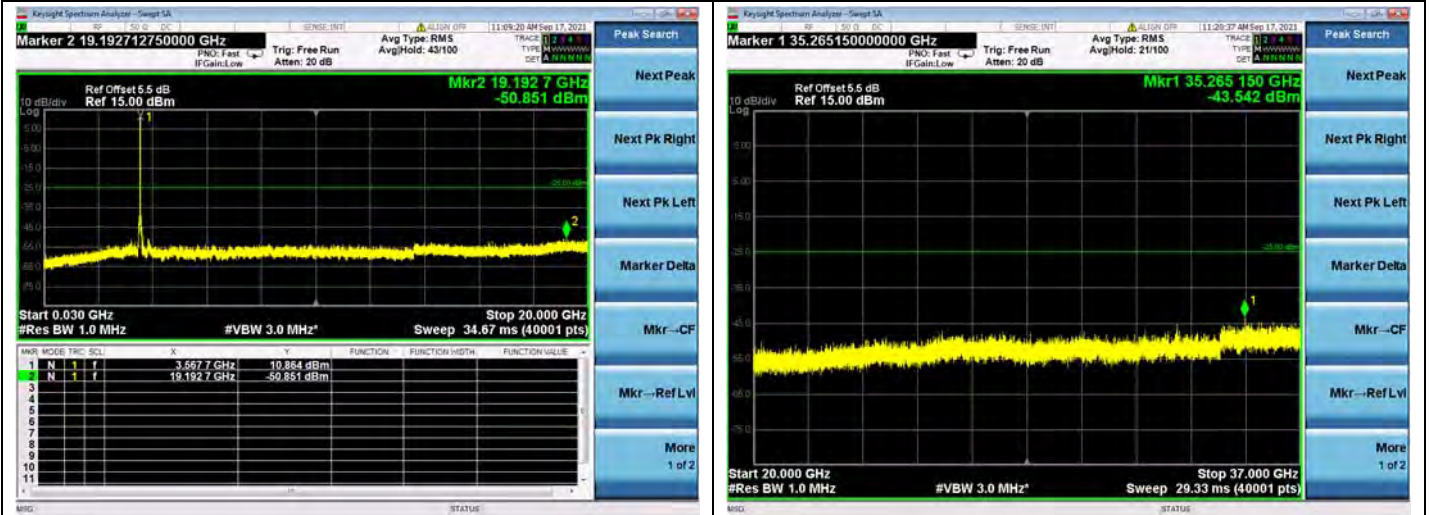




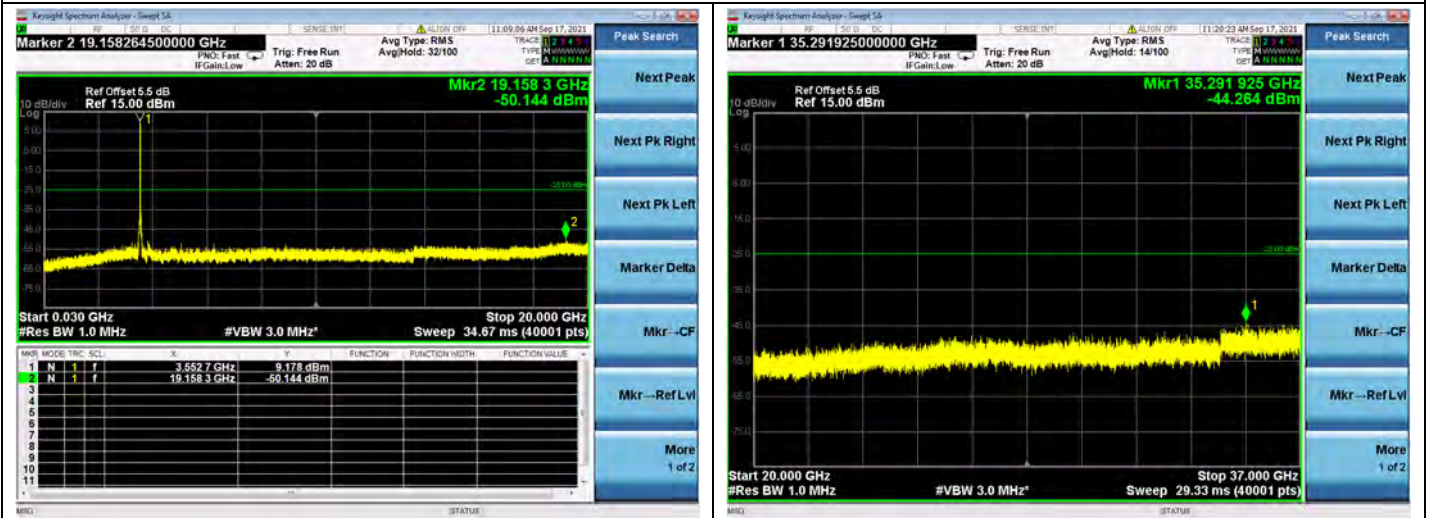
## Band 48 / 20MHz / Low CH / QPSK



## Band 48 / 20MHz / Low CH / 16QAM

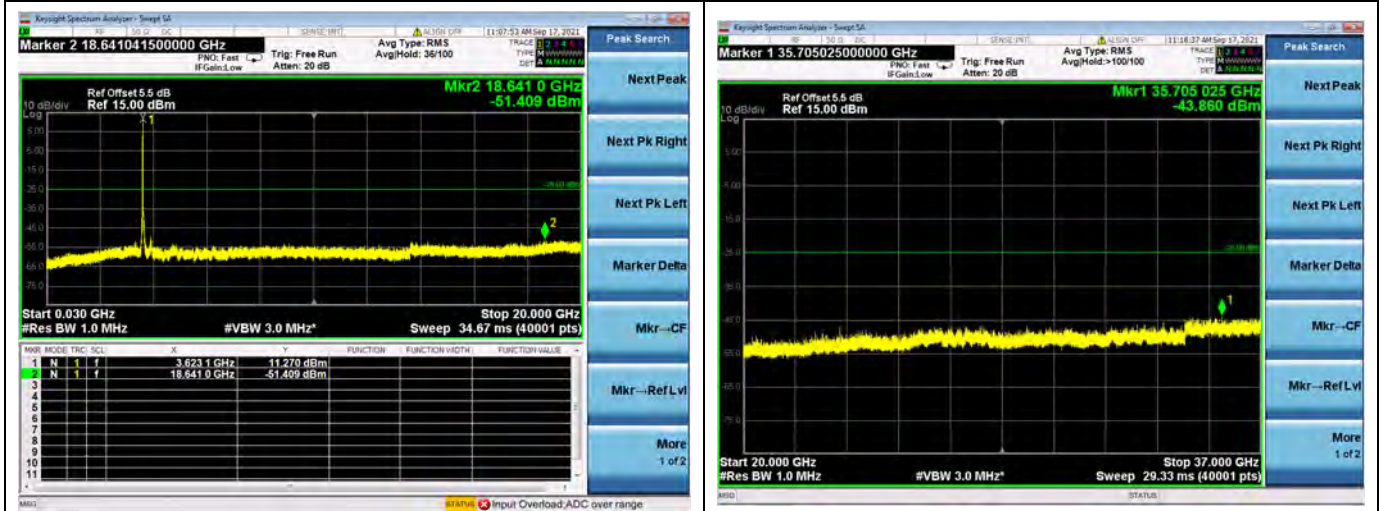


## Band 48 / 20MHz / Low CH / 64QAM

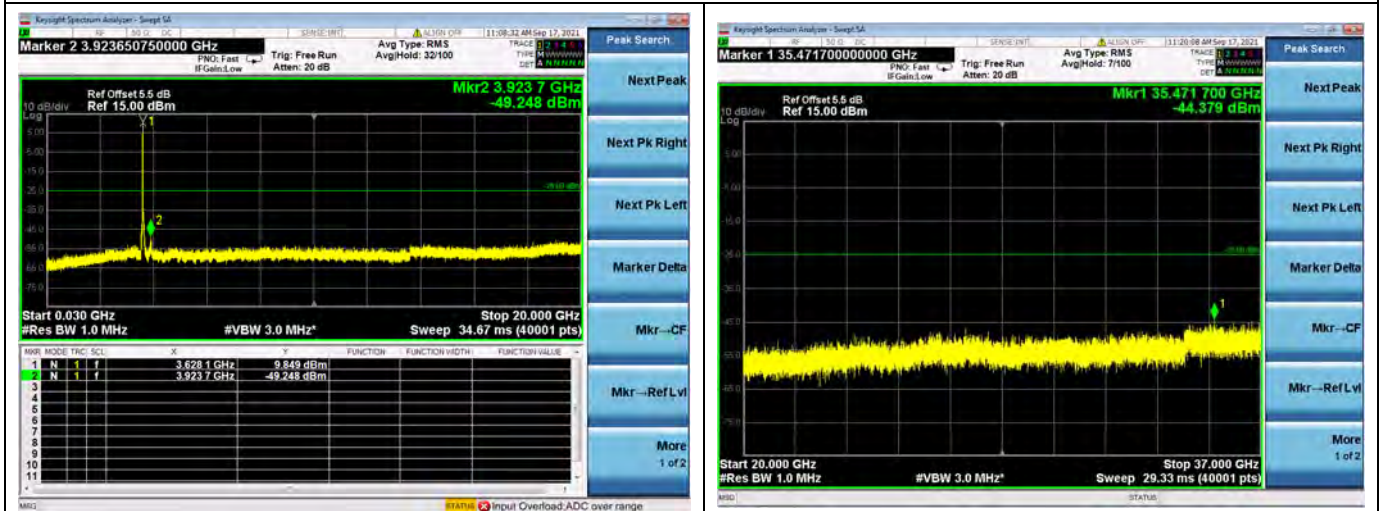




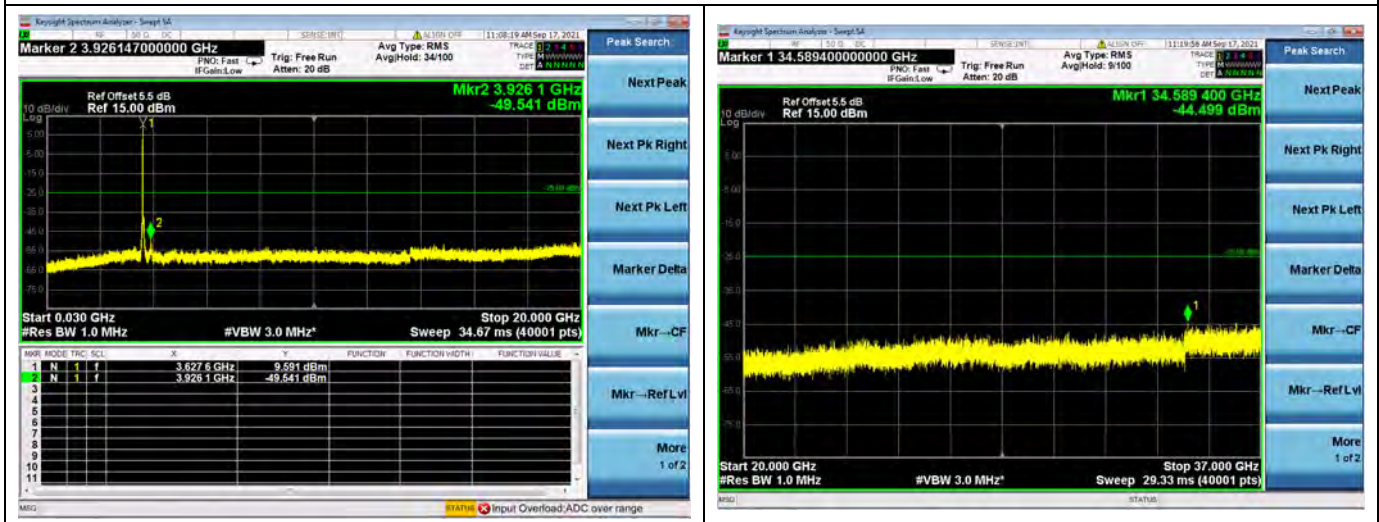
## Band 48 / 20MHz / Mid CH / QPSK



## Band 48 / 20MHz / Mid CH / 16QAM



## Band 48 / 20MHz / Mid CH / 64QAM

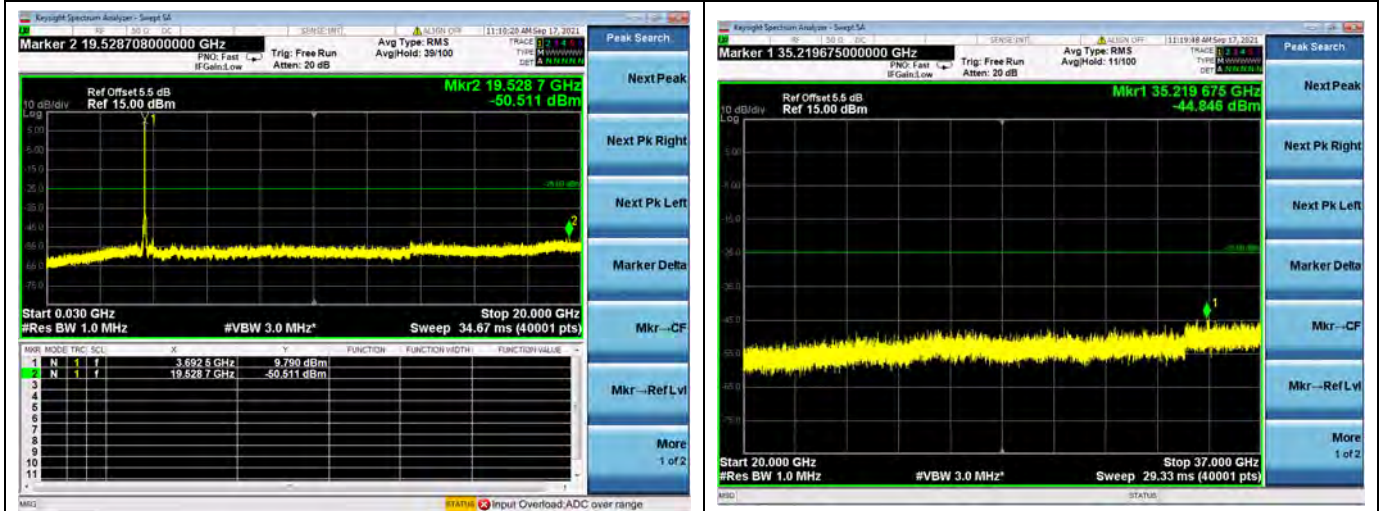




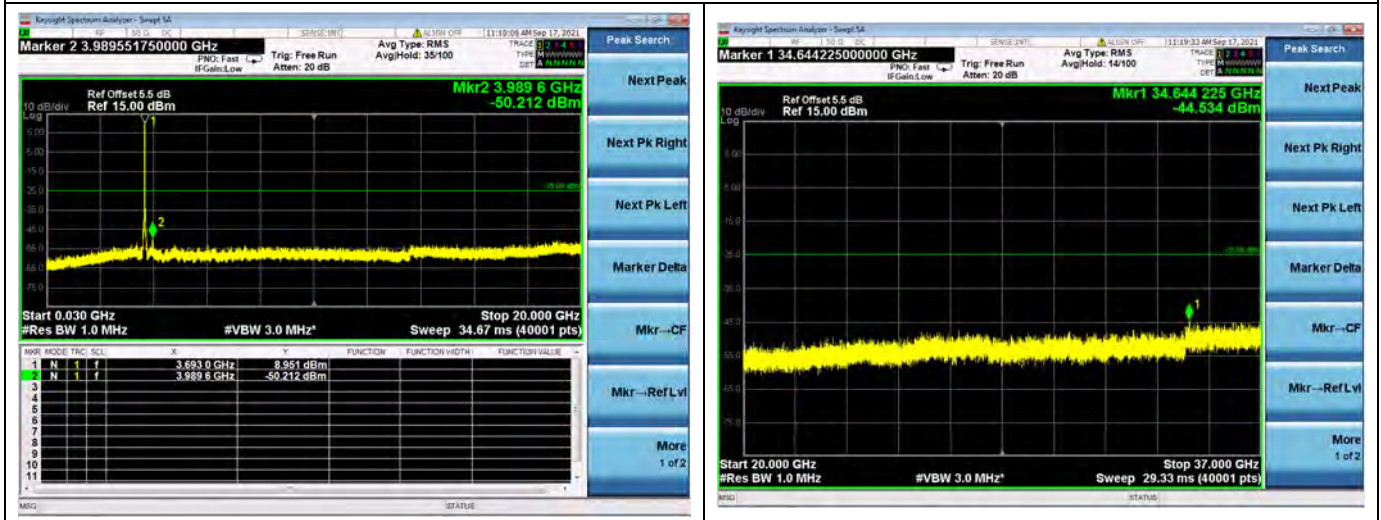
## Band 48 / 20MHz / High CH / QPSK



## Band 48 / 20MHz / High CH / 16QAM



## Band 48 / 20MHz / High CH / 64QAM



## 2.6. Band Edge

### 2.6.1. Requirement

#### Part 96.41(e)(1)(i)

For channel and frequency assignments made by the SAS to CBSDs, the conducted power of any CBSD emission outside the fundamental emission bandwidth as specified in paragraph (e)(3) of this section (whether the emission is inside or outside of the authorized band) shall not exceed  $-13$  dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any CBSD emission shall not exceed  $-25$  dBm/MHz.

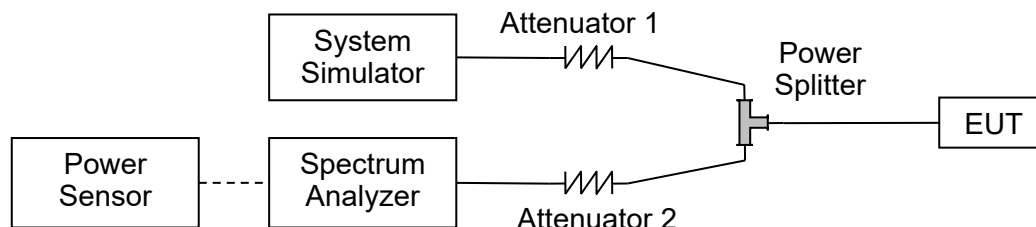
#### Part 96.41(e)(1)(ii)

For channel and frequency assignments made by a CBSD to End User Devices, the conducted power of any End User Device emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed  $-13$  dBm/MHz within 0 to B megahertz (where B is the bandwidth in megahertz of the assigned channel or multiple contiguous channels of the End User Device) above the upper CBSD-assigned channel edge and within 0 to B megahertz below the lower CBSD-assigned channel edge. At all frequencies greater than B megahertz above the upper CBSD assigned channel edge and less than B megahertz below the lower CBSD-assigned channel edge, the conducted power of any End User Device emission shall not exceed  $-25$  dBm/MHz.

#### Part 96.41(e)(2)

For CBSDs and End User Devices, the conducted power of emissions below 3540 MHz or above 3710 MHz shall not exceed  $-25$  dBm/MHz, and the conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed  $-40$  dBm/MHz.

### 2.6.2. Test Description



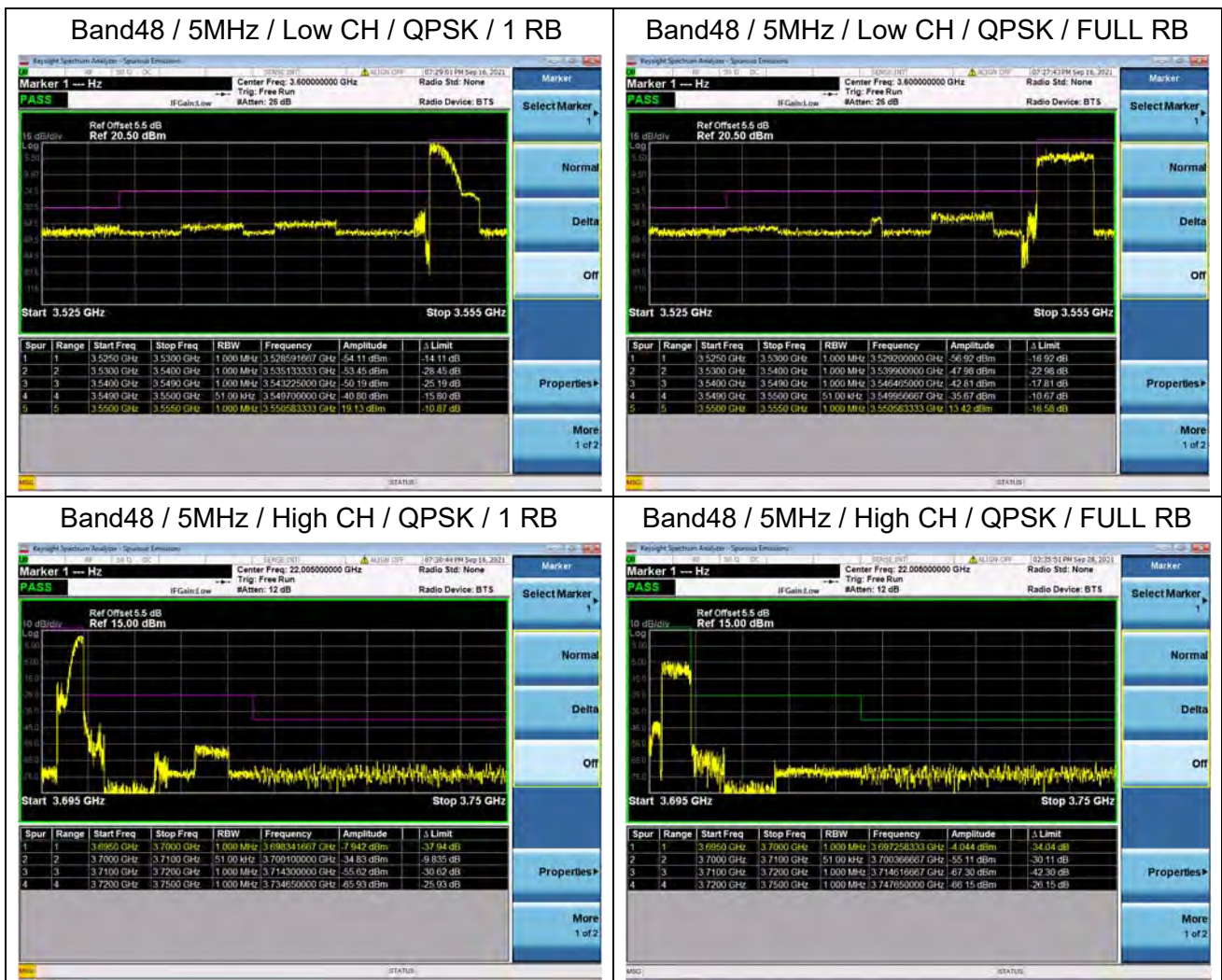
The EUT is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with

Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power. A call is established between the EUT and the SS.

### 2.6.3.Test procedure

KDB 971168 D01v03 Section 6.0 and ANSI/TIA-603-E-2016.

### 2.6.4.Test Result

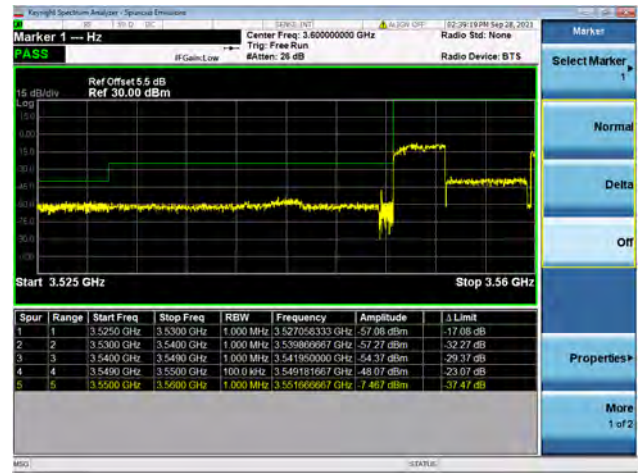




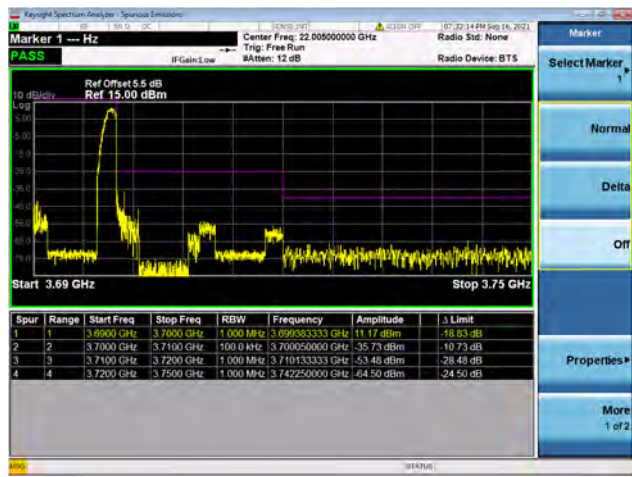
Band48 / 10MHz / Low CH / QPSK / 1 RB



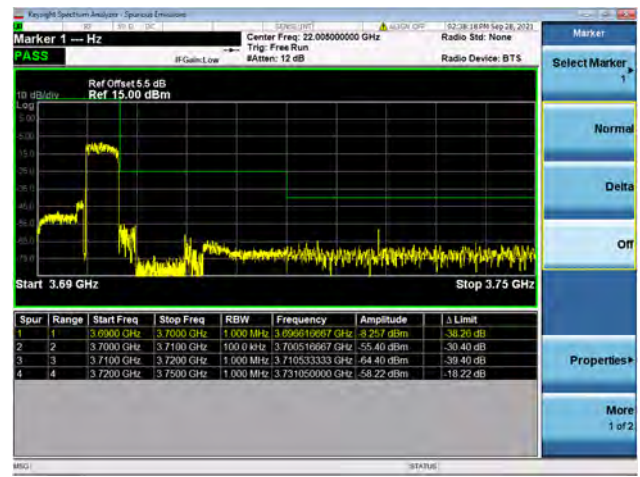
Band48 / 10MHz / Low CH / QPSK / FULL RB



Band48 / 10MHz / High CH / QPSK / 1 RB



Band48 / 10MHz / High CH / QPSK / FULL RB





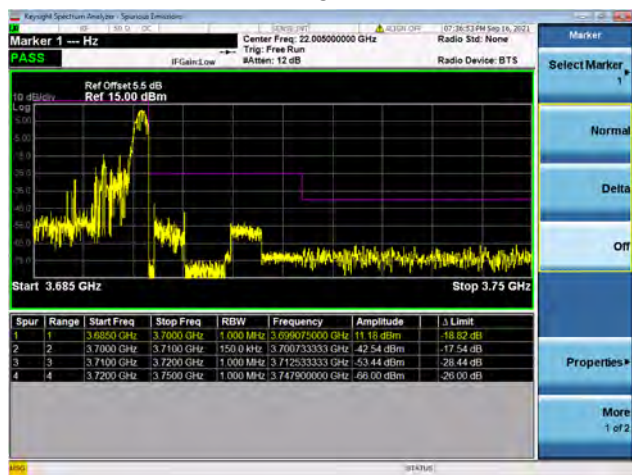
Band48 / 15MHz / Low CH / QPSK / 1 RB



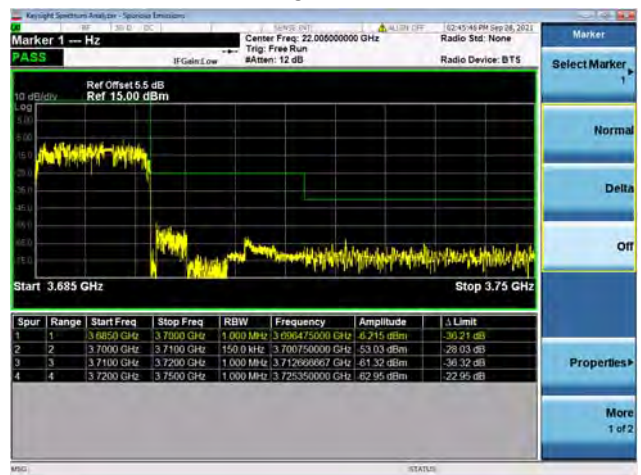
Band48 / 15MHz / Low CH / QPSK / FULL RB



Band48 / 15MHz / High CH / QPSK / 1 RB



Band48 / 15MHz / High CH / QPSK / FULL RB





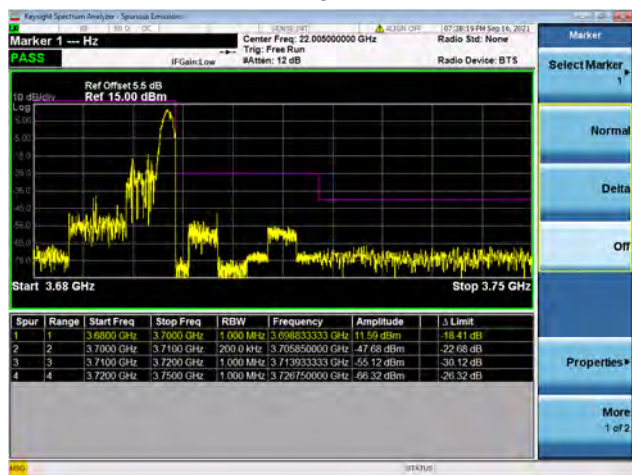
Band48 / 20MHz / Low CH / QPSK / 1 RB



Band48 / 20MHz / Low CH / QPSK / FULL RB



Band48 / 20MHz / High CH / QPSK / 1 RB



Band48 / 20MHz / High CH / QPSK / FULL RB

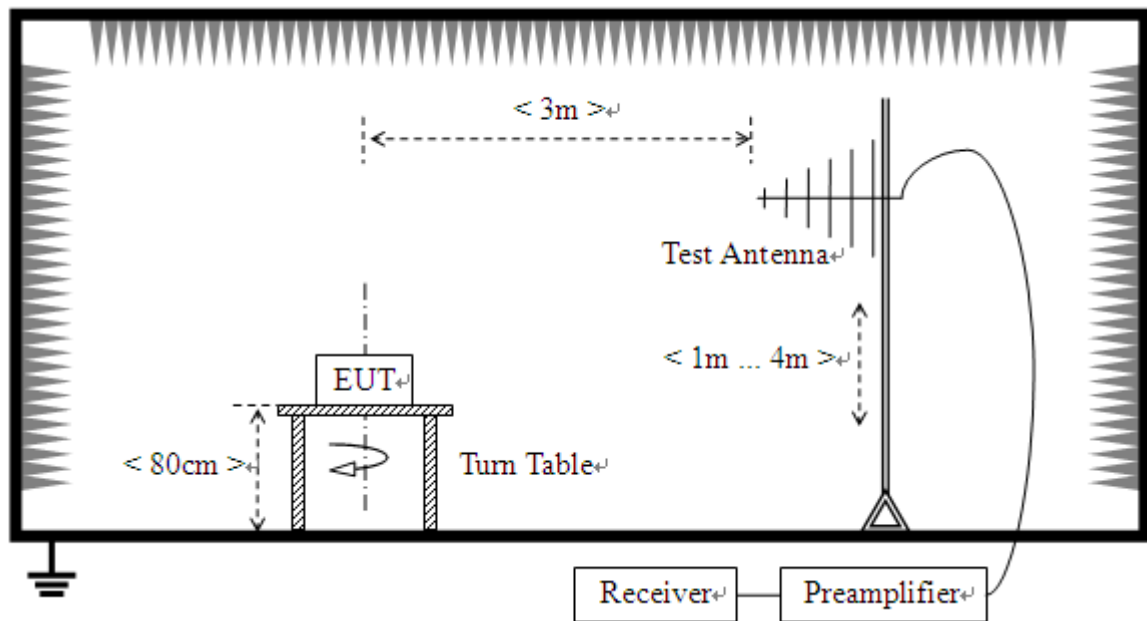


## 2.7. Radiated Spurious Emissions

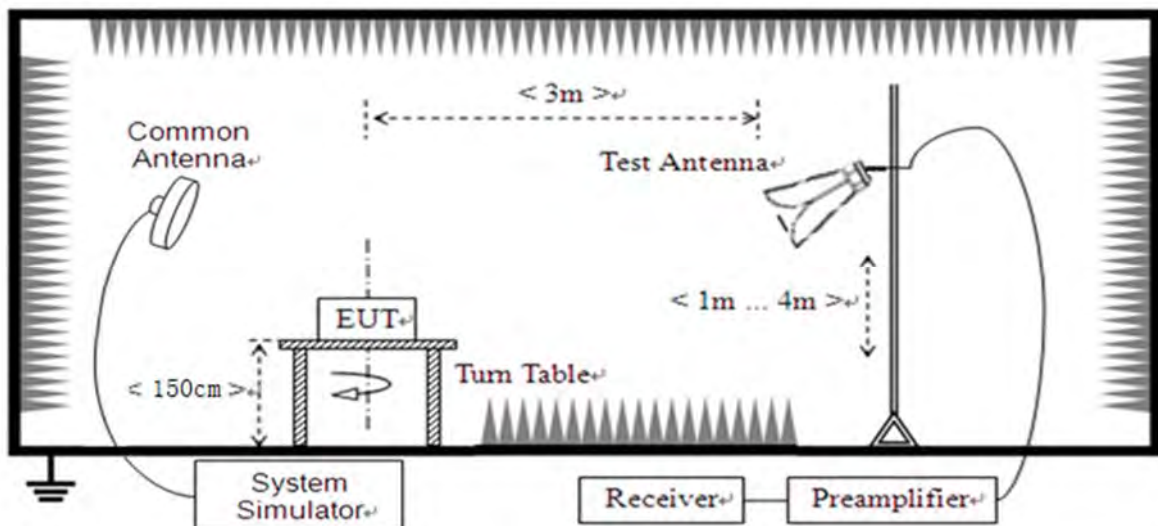
### 2.7.1. Requirement

The power of any emissions below 3530 MHz or above 3720 MHz shall not exceed  $-40\text{dBm/MHz}$ .

### 2.7.2. Test Description



(For the test frequency from 30MHz to 1GHz)



(For the test frequency above 1GHz)



The EUT is located in a 3m Full-Anechoic Chamber, the cable loss, air loss and so on of the site as factors are pre-calibrated using the "Substitution" method, and calculated to correct the reading.

A call is established between the EUT and the SS via a Common Antenna. The EUT is commanded by the SS to operate at the maximum and minimum output power, and only the test result of the maximum output power was recorded.

In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground and the Turn Table is actuated to turn from 0° to 360° to determine the maximum value of the radiated power. The emission levels at both horizontal and vertical polarizations should be tested. The Filters consists of Notch Filters and High Pass Filter.

**Note:** when doing measurements above 1GHz, the EUT has been within the 3dB cone width of the horn antenna during horizontal antenna.

### 2.7.3.Test procedure

KDB 971168 D01v03 Section 5.8 and ANSI/TIA-603-E-2016.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements.

For measurements above 1GHz the resolution bandwidth is set to 1MHz, the video band width is set to 3MHz for peak measurements.



#### 2.7.4. Test Result

The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. The lowest, middle and highest channels are tested to verify the out of band emissions.

The substitution corrections are obtained as described below:

$$A_{\text{SUBST}} = P_{\text{SUBST\_TX}} - P_{\text{SUBST\_RX}} - L_{\text{SUBST\_CABLES}} + G_{\text{SUBST\_TX\_ANT}}$$

$$A_{\text{TOT}} = L_{\text{CABLES}} + A_{\text{SUBST}}$$

Where  $A_{\text{SUBST}}$  is the final substitution correction including receive antenna gain.

$P_{\text{SUBST\_TX}}$  is signal generator level,

$P_{\text{SUBST\_RX}}$  is receiver level,

$L_{\text{SUBST\_CABLES}}$  is cable losses including TX cable,

$G_{\text{SUBST\_TX\_ANT}}$  is substitution antenna gain.

$A_{\text{TOT}}$  is total correction factor including cable loss and substitution correction

During the test, the data of  $A_{\text{TOT}}$  was added in the test spectrum analyze, so spectrum analyze reading is the final values which contain the data of  $A_{\text{TOT}}$ .

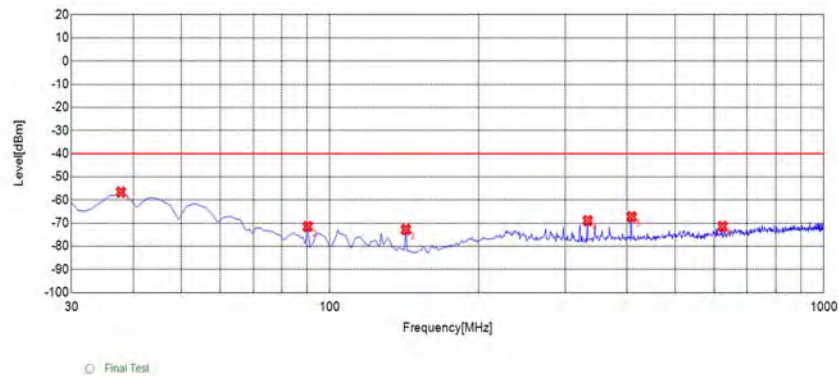
**Note1:** The power of the EUT transmitting frequency should be ignored.

**Note2:** All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

**Note3:** All bandwidth and modulation were considered and evaluated respectively by performing full test for each band, only the worst cases (Max Bandwidth and QPSK mode) were recorded in this test report.

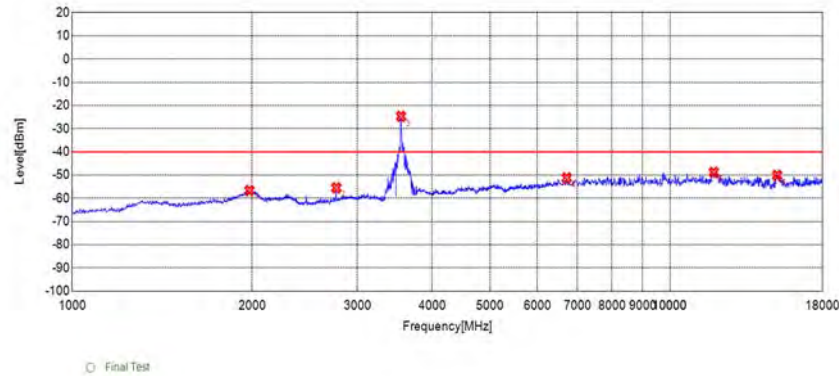
**Note4:** N/A means the frequency is the basic frequency or the base station frequency, they are no need to verdict.

## LTE Band 48, 20MHz BW, Low Channel, QPSK, 30M-1G



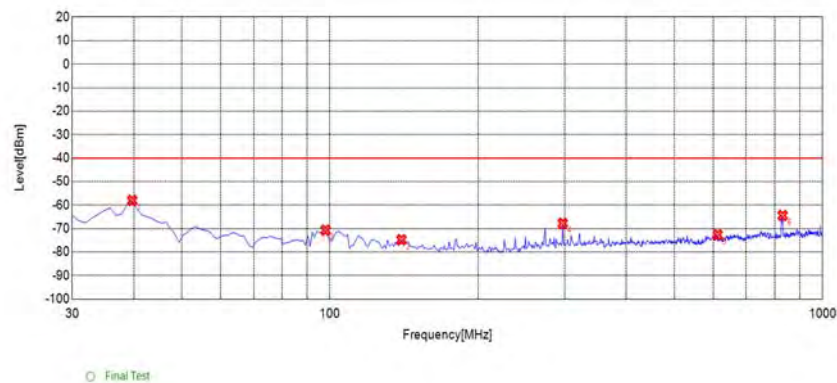
| No. | Fre.(MHz) | PK (dBm) | Limit (dBm) | Antenna    | Verdict |
|-----|-----------|----------|-------------|------------|---------|
| 1   | 37.7680   | -56.6    | -40.00      | Horizontal | PASS    |
| 2   | 90.2000   | -71.47   | -40.00      | Horizontal | PASS    |
| 3   | 142.6330  | -72.77   | -40.00      | Horizontal | PASS    |
| 4   | 332.9430  | -68.92   | -40.00      | Horizontal | PASS    |
| 5   | 408.6790  | -67.28   | -40.00      | Horizontal | PASS    |
| 6   | 624.2340  | -71.46   | -40.00      | Horizontal | PASS    |

## LTE Band 48, 20MHz BW, Low Channel, QPSK, 1G-18G



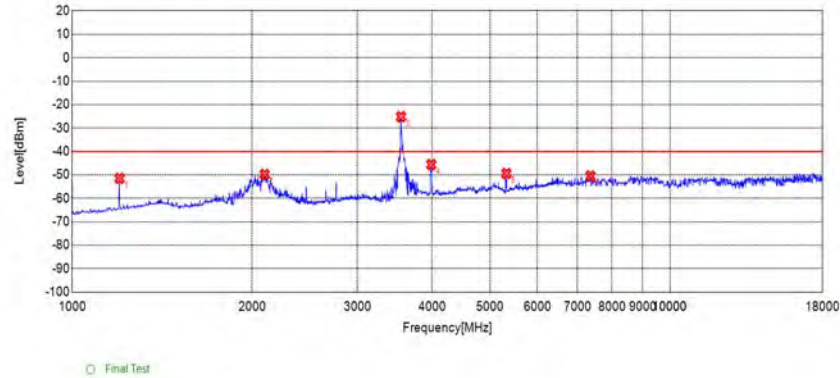
| No. | Fre.(MHz)  | PK (dBm) | Limit (dBm) | Antenna    | Verdict |
|-----|------------|----------|-------------|------------|---------|
| 1   | 1978.9790  | -56.68   | -40.00      | Horizontal | PASS    |
| 2   | 2765.7660  | -55.48   | -40.00      | Horizontal | PASS    |
| 3   | 3550.0500  | -24.67   | -40.00      | Horizontal | N/A     |
| 4   | 6718.7190  | -51.18   | -40.00      | Horizontal | PASS    |
| 5   | 11841.3410 | -48.82   | -40.00      | Horizontal | PASS    |
| 6   | 15110.6110 | -50.1    | -40.00      | Horizontal | PASS    |

## LTE Band 48, 20MHz BW, Low Channel, QPSK, 30M-1G



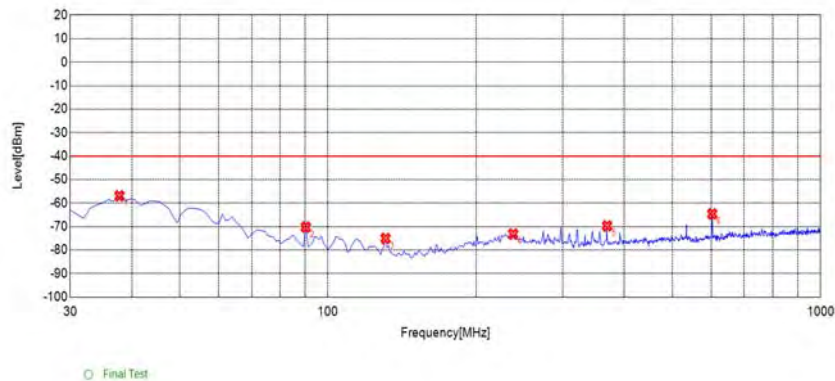
| No. | Fre.(MHz) | PK (dBm) | Limit (dBm) | Antenna  | Verdict |
|-----|-----------|----------|-------------|----------|---------|
| 1   | 39.7100   | -58.04   | -40.00      | Vertical | PASS    |
| 2   | 97.9680   | -70.69   | -40.00      | Vertical | PASS    |
| 3   | 139.7200  | -74.77   | -40.00      | Vertical | PASS    |
| 4   | 297.0170  | -67.76   | -40.00      | Vertical | PASS    |
| 5   | 612.5830  | -72.64   | -40.00      | Vertical | PASS    |
| 6   | 830.0800  | -64.42   | -40.00      | Vertical | PASS    |

## LTE Band 48, 20MHz BW, Low Channel, QPSK, 1G-18G



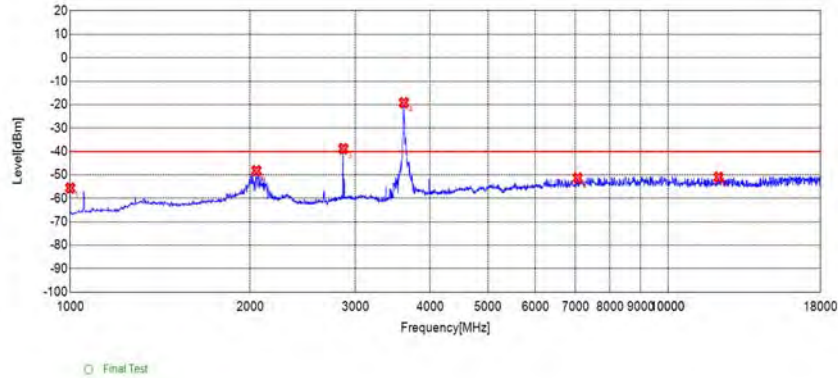
| No. | Fre.(MHz) | PK (dBm) | Limit (dBm) | Antenna  | Verdict |
|-----|-----------|----------|-------------|----------|---------|
| 1   | 1200.2000 | -51.48   | -40.00      | Vertical | PASS    |
| 2   | 2099.0990 | -49.79   | -40.00      | Vertical | PASS    |
| 3   | 3550.0500 | -25.17   | -40.00      | Vertical | N/A     |
| 4   | 3987.9880 | -45.55   | -40.00      | Vertical | PASS    |
| 5   | 5326.3260 | -49.39   | -40.00      | Vertical | PASS    |
| 6   | 7363.3630 | -50.46   | -40.00      | Vertical | PASS    |

## LTE Band 48, 20MHz BW, Mid Channel, QPSK, 30M-1G



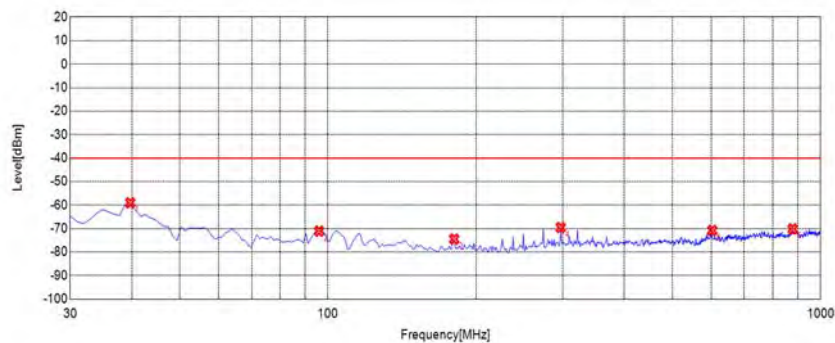
| No. | Fre.(MHz) | PK (dBm) | Limit (dBm) | Antenna    | Verdict |
|-----|-----------|----------|-------------|------------|---------|
| 1   | 37.7680   | -56.92   | -40.00      | Horizontal | PASS    |
| 2   | 90.2000   | -70.21   | -40.00      | Horizontal | PASS    |
| 3   | 130.9810  | -75.03   | -40.00      | Horizontal | PASS    |
| 4   | 237.7880  | -73.19   | -40.00      | Horizontal | PASS    |
| 5   | 368.8690  | -69.72   | -40.00      | Horizontal | PASS    |
| 6   | 602.8730  | -64.56   | -40.00      | Horizontal | PASS    |

## LTE Band 48, 20MHz BW, Mid Channel, QPSK, 1G-18G



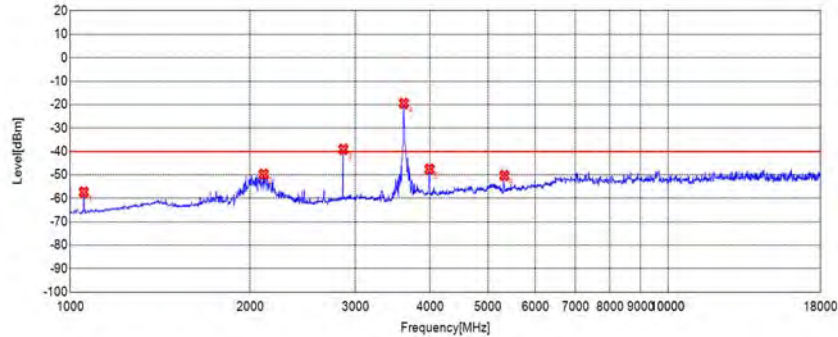
| No. | Fre.(MHz)  | PK (dBm) | Limit (dBm) | Antenna    | Verdict |
|-----|------------|----------|-------------|------------|---------|
| 1   | 1000.0000  | -55.58   | -40.00      | Horizontal | PASS    |
| 2   | 2049.0490  | -48.19   | -40.00      | Horizontal | PASS    |
| 3   | 2863.8640  | -22.25   | -40.00      | Horizontal | PASS    |
| 4   | 3616.6170  | -19.19   | -40.00      | Horizontal | PASS    |
| 5   | 7064.0640  | -51.31   | -40.00      | Horizontal | PASS    |
| 6   | 12152.1520 | -50.98   | -40.00      | Horizontal | PASS    |

## LTE Band 48, 20MHz BW, Mid Channel, QPSK, 30M-1G



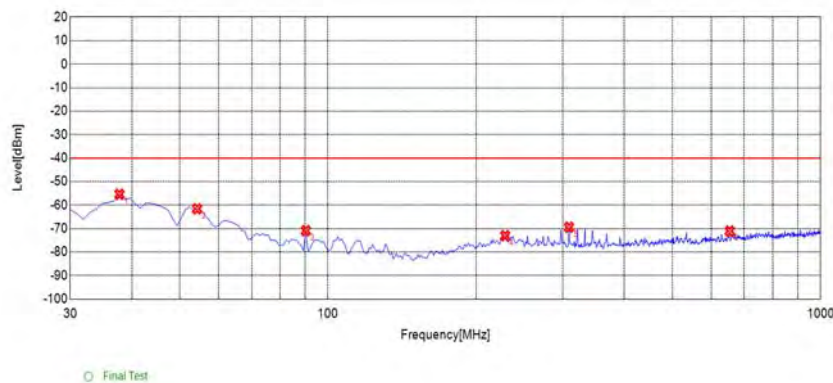
| No. | Fre.(MHz) | PK (dBm) | Limit (dBm) | Antenna  | Verdict |
|-----|-----------|----------|-------------|----------|---------|
| 1   | 39.7100   | -59      | -40.00      | Vertical | PASS    |
| 2   | 96.0260   | -71.08   | -40.00      | Vertical | PASS    |
| 3   | 180.5010  | -74.44   | -40.00      | Vertical | PASS    |
| 4   | 297.0170  | -69.54   | -40.00      | Vertical | PASS    |
| 5   | 602.8730  | -70.79   | -40.00      | Vertical | PASS    |
| 6   | 877.6580  | -70.12   | -40.00      | Vertical | PASS    |

## LTE Band 48, 20MHz BW, Mid Channel, QPSK, 1G-18G



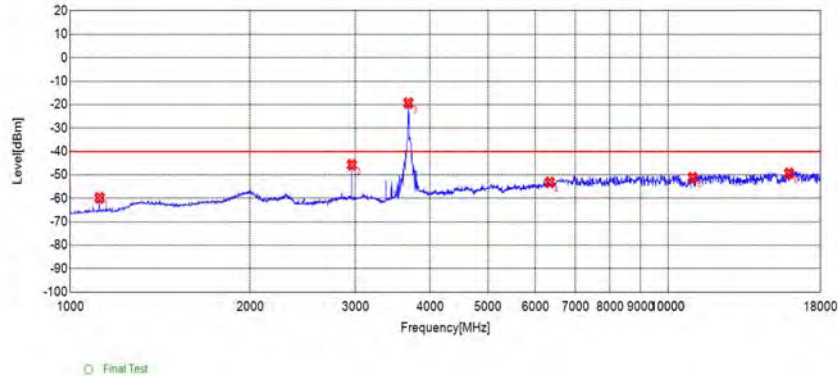
| No. | Fre.(MHz) | PK (dBm) | Limit (dBm) | Antenna  | Verdict |
|-----|-----------|----------|-------------|----------|---------|
| 1   | 1054.0540 | -57.33   | -40.00      | Vertical | PASS    |
| 2   | 2107.1070 | -49.72   | -40.00      | Vertical | PASS    |
| 3   | 2863.8640 | -21.28   | -40.00      | Vertical | PASS    |
| 4   | 3616.6170 | -19.47   | -40.00      | Vertical | PASS    |
| 5   | 3991.4910 | -47.54   | -40.00      | Vertical | PASS    |
| 6   | 5326.3260 | -50.24   | -40.00      | Vertical | PASS    |

## LTE Band 48, 20MHz BW, High Channel, QPSK, 30M-1G



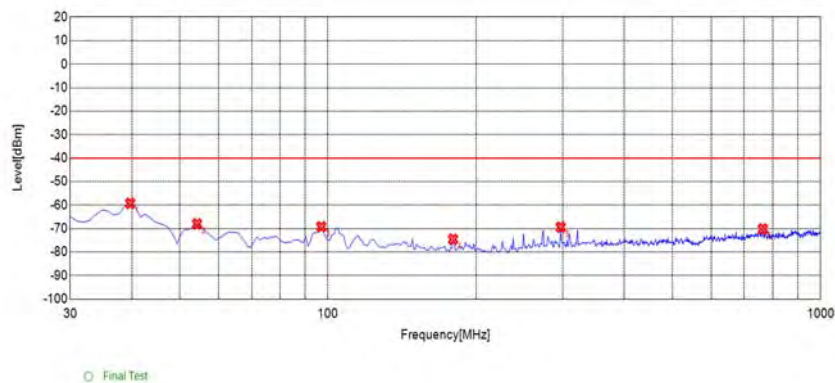
| No. | Fre.(MHz) | PK (dBm) | Limit (dBm) | Antenna    | Verdict |
|-----|-----------|----------|-------------|------------|---------|
| 1   | 37.7680   | -55.38   | -40.00      | Horizontal | PASS    |
| 2   | 54.2740   | -61.59   | -40.00      | Horizontal | PASS    |
| 3   | 90.2000   | -70.9    | -40.00      | Horizontal | PASS    |
| 4   | 229.0490  | -73.04   | -40.00      | Horizontal | PASS    |
| 5   | 308.6690  | -69.42   | -40.00      | Horizontal | PASS    |
| 6   | 654.3340  | -71.04   | -40.00      | Horizontal | PASS    |

## LTE Band 48, 20MHz BW, High Channel, QPSK, 1G-18G



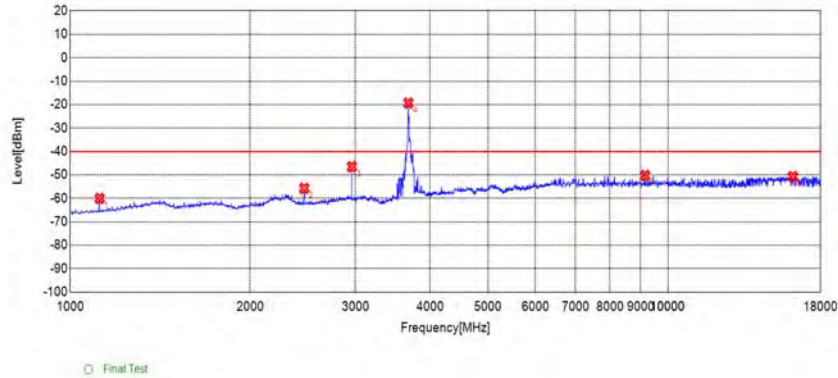
| No. | Fre.(MHz)  | PK (dBm) | Limit (dBm) | Antenna    | Verdict |
|-----|------------|----------|-------------|------------|---------|
| 1   | 1120.1200  | -59.8    | -40.00      | Horizontal | PASS    |
| 2   | 2959.9600  | -45.68   | -40.00      | Horizontal | PASS    |
| 3   | 3679.6800  | -19.34   | -40.00      | Horizontal | N/A     |
| 4   | 6345.8460  | -53.18   | -40.00      | Horizontal | PASS    |
| 5   | 11001.0010 | -51.16   | -40.00      | Horizontal | PASS    |
| 6   | 15950.9510 | -49.34   | -40.00      | Horizontal | PASS    |

## LTE Band 48, 20MHz BW, High Channel, QPSK, 30M-1G



| No. | Fre.(MHz) | PK (dBm) | Limit (dBm) | Antenna  | Verdict |
|-----|-----------|----------|-------------|----------|---------|
| 1   | 39.7100   | -59.22   | -40.00      | Vertical | PASS    |
| 2   | 54.2740   | -67.99   | -40.00      | Vertical | PASS    |
| 3   | 96.9970   | -69.22   | -40.00      | Vertical | PASS    |
| 4   | 179.5300  | -74.53   | -40.00      | Vertical | PASS    |
| 5   | 297.0170  | -69.4    | -40.00      | Vertical | PASS    |
| 6   | 764.0540  | -70.14   | -40.00      | Vertical | PASS    |

## LTE Band 48, 20MHz BW, High Channel, QPSK, 1G-18G



| No. | Fre.(MHz)  | PK (dBm) | Limit (dBm) | Antenna  | Verdict |
|-----|------------|----------|-------------|----------|---------|
| 1   | 1120.1200  | -60.01   | -40.00      | Vertical | PASS    |
| 2   | 2463.4630  | -55.72   | -40.00      | Vertical | PASS    |
| 3   | 2959.9600  | -46.5    | -40.00      | Vertical | PASS    |
| 4   | 3679.6800  | -19.34   | -40.00      | Vertical | N/A     |
| 5   | 9159.1590  | -50.25   | -40.00      | Vertical | PASS    |
| 6   | 16181.1810 | -50.72   | -40.00      | Vertical | PASS    |



## Annex A Test Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for test performed on the EUT as specified in CISPR 16-1-2:

| Test Items                          | Uncertainty   |
|-------------------------------------|---------------|
| Output Power                        | $\pm 2.22$ dB |
| Bandwidth                           | $\pm 5\%$     |
| Conducted Spurious Emission         | $\pm 2.77$ dB |
| Band Edge                           | $\pm 2.77$ dB |
| Equivalent Isotropic Radiated Power | $\pm 2.22$ dB |
| Radiated Spurious Emissions         | $\pm 6$ dB    |

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



## Annex B Testing Laboratory Information

### 1. Identification of the Responsible Testing Laboratory

|                            |                                                                                                                                  |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>Laboratory Name:</b>    | Shenzhen Morlab Communications Technology Co., Ltd.                                                                              |
| <b>Laboratory Address:</b> | FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China |
| <b>Telephone:</b>          | +86 755 36698555                                                                                                                 |
| <b>Facsimile:</b>          | +86 755 36698525                                                                                                                 |

### 2. Identification of the Responsible Testing Location

|                 |                                                                                                                                  |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>Name:</b>    | Shenzhen Morlab Communications Technology Co., Ltd.                                                                              |
| <b>Address:</b> | FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China |

### 3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10-2013 and CISPR Publication 22; the FCC designation number is CN1192, the test firm registration number is 226174.



#### 4. Test Equipments Utilized

##### 4.1 List of Software Used

| Description            | Manufacturer | Software Version |
|------------------------|--------------|------------------|
| Morlab FCC Test System | MORLAB       | V2.8             |
| MORLAB EMCR V1.2       | MORLAB       | V1.0             |

##### 4.2 Radiated Test Equipments

| Equipment Name                       | Serial No.  | Type         | Manufacturer | Cal. Date  | Due Date   |
|--------------------------------------|-------------|--------------|--------------|------------|------------|
| System Simulator                     | 152038      | CMW500       | R&S          | 2020.11.19 | 2021.11.18 |
|                                      |             |              |              | 2021.10.20 | 2022.10.19 |
| System Simulator                     | 6200995016  | MT8820C      | Anritsu      | 2020.10.28 | 2021.10.27 |
|                                      |             |              |              | 2021.10.21 | 2022.10.20 |
| Receiver                             | MY54130016  | N9038A       | Agilent      | 2021.07.16 | 2022.07.15 |
| Test Antenna - Bi-Log                | 9163-519    | VULB 9163    | Schwarzbeck  | 2019.05.24 | 2022.05.23 |
| Test Antenna - Horn                  | 9170C-531   | BBHA9170     | Schwarzbeck  | 2019.07.26 | 2022.07.25 |
| Test Antenna - Horn                  | 01774       | BBHA 9120D   | Schwarzbeck  | 2019.07.26 | 2022.07.25 |
| Coaxial cable (N male) (9KHz-30MHz)  | CB04        | EMC04        | Morlab       | N/A        | N/A        |
| Coaxial cable (N male) (30MHz-26GHz) | CB02        | EMC02        | Morlab       | N/A        | N/A        |
| Coaxial cable (N male) (30MHz-26GHz) | CB03        | EMC03        | Morlab       | N/A        | N/A        |
| Coaxial cable (N male) (30MHz-40GHz) | CB05        | EMC05        | Morlab       | N/A        | N/A        |
| 1-18GHz pre-Amplifier                | 61171/61172 | S020180L3203 | Tonscend     | 2021.07.16 | 2022.07.15 |
| 18-26.5GHz pre-Amplifier             | 46732       | S10M100L3802 | Tonscend     | 2021.07.16 | 2022.07.15 |



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| Equipment Name         | Serial No. | Type          | Manufacturer | Cal. Date  | Due Date   |
|------------------------|------------|---------------|--------------|------------|------------|
| 26-40GHz pre-Amplifier | 56774      | S40M400L4002  | Tonscend     | 2021.07.16 | 2022.07.15 |
| Notch Filter           | N/A        | WRCGV-LTE B48 | Wainwright   | 2021.07.16 | 2022.07.15 |
| Anechoic Chamber       | N/A        | 9m*6m*6m      | CRT          | 2019.07.13 | 2022.07.12 |

\_\_\_\_\_ END OF REPORT \_\_\_\_\_