

# FCC LTE REPORT

## Certification

**Applicant Name:**  
SAMSUNG Electronics Co., Ltd.

**Date of Issue:**  
November 04, 2021

**Address:**  
129, Samsung-ro, Yeongtong-gu,  
Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

**Location:**  
HCT CO., LTD.,  
74, Seoicheon-ro 578beon-gil, Majang-myeon,  
Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA

**Report No.:** HCT-RF-2110-FC040-R1

**FCC ID:** A3LSMN980F1

**APPLICANT:** SAMSUNG Electronics Co., Ltd.

**According to the Evaluation report, all of the data contained herein is reused from the reference  
 FCC ID : A3LSMN981B1 report.**

Model(s): SM-N980F/DS  
 Additional Model(s): SM-N980F  
 EUT Type: Mobile phone  
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)  
 FCC Rule Part(s): §27, §2

| Mode (MHz)           | Tx Frequency (MHz) | Emission Designator | Modulation | EIRP           |                  |
|----------------------|--------------------|---------------------|------------|----------------|------------------|
|                      |                    |                     |            | Max. Power (W) | Max. Power (dBm) |
| LTE – Band66/4 (1.4) | 1710.7 – 1779.3    | 1M10G7D             | QPSK       | 0.131          | 21.18            |
|                      |                    | 1M10W7D             | 16QAM      | 0.109          | 20.37            |
|                      |                    | 1M10W7D             | 64QAM      | 0.086          | 19.35            |
|                      |                    | 1M10W7D             | 256QAM     | 0.042          | 16.25            |
| LTE – Band66/4 (3)   | 1711.5 – 1778.5    | 2M72G7D             | QPSK       | 0.134          | 21.26            |
|                      |                    | 2M71W7D             | 16QAM      | 0.113          | 20.54            |
|                      |                    | 2M71W7D             | 64QAM      | 0.090          | 19.53            |
|                      |                    | 2M71W7D             | 256QAM     | 0.043          | 16.36            |
| LTE – Band66/4 (5)   | 1712.5 – 1777.5    | 4M52G7D             | QPSK       | 0.136          | 21.33            |
|                      |                    | 4M52W7D             | 16QAM      | 0.113          | 20.52            |
|                      |                    | 4M52W7D             | 64QAM      | 0.089          | 19.49            |
|                      |                    | 4M51W7D             | 256QAM     | 0.044          | 16.48            |
| LTE – Band66/4 (10)  | 1715.0 – 1775.0    | 9M01G7D             | QPSK       | 0.142          | 21.54            |
|                      |                    | 9M01W7D             | 16QAM      | 0.120          | 20.79            |
|                      |                    | 8M99W7D             | 64QAM      | 0.095          | 19.77            |
|                      |                    | 8M98W7D             | 256QAM     | 0.046          | 16.60            |
| LTE – Band66/4 (15)  | 1717.5 – 1772.5    | 13M5G7D             | QPSK       | 0.140          | 21.47            |
|                      |                    | 13M5W7D             | 16QAM      | 0.116          | 20.63            |
|                      |                    | 13M5W7D             | 64QAM      | 0.091          | 19.59            |
|                      |                    | 13M4W7D             | 256QAM     | 0.046          | 16.60            |
| LTE – Band66/4 (20)  | 1720.0 – 1770.0    | 18M0G7D             | QPSK       | 0.146          | 21.64            |
|                      |                    | 18M0W7D             | 16QAM      | 0.122          | 20.85            |
|                      |                    | 18M0W7D             | 64QAM      | 0.096          | 19.84            |
|                      |                    | 18M0W7D             | 256QAM     | 0.046          | 16.67            |

The measurements shown in this report were made in accordance with the procedures specified in CFR47 section §2.947. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.  
 HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)

Report No.: HCT-RF-2110-FC040-R1

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REVIEWED BY



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Report prepared by : Jae Ryang Do  
Engineer of Telecommunication Testing Center

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Report approved by : Jong Seok Lee  
Manager of Telecommunication Testing Center

This test results were applied only to the test methods required by the standard.

This laboratory is not accredited for the test results marked \*.

The above Test Report is the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA. (HCT Accreditation No.: KT197)

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## Version

| TEST REPORT NO.      | DATE              | DESCRIPTION             |
|----------------------|-------------------|-------------------------|
| HCT-RF-2110-FC040    | October 29, 2021  | - First Approval Report |
| HCT-RF-2110-FC040-R1 | November 04, 2021 | - Revised the 17 page.  |

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.

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# MEASUREMENT REPORT

## 1. GENERAL INFORMATION

|                             |   |
|-----------------------------|---|
| <b>Applicant Name:</b>      | SAMSUNG Electronics Co., Ltd.   |
| <b>Address:</b>             | 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea  |
| <b>FCC ID:</b>              | A3LSMN980F1   |
| <b>Application Type:</b>    | Certification   |
| <b>FCC Classification:</b>  | PCS Licensed Transmitter Held to Ear (PCE)  |
| <b>FCC Rule Part(s):</b>    | §27, §2   |
| <b>EUT Type:</b>            | Mobile phone  |
| <b>Model(s):</b>            | SM-N980F/DS   |
| <b>Additional Model(s):</b> | SM-N980F  |
| <b>Tx Frequency:</b>        | 1710.7 MHz – 1779.3 MHz (LTE – Band 66/4 (1.4 MHz))<br>1711.5 MHz – 1778.5 MHz (LTE – Band 66/4 (3 MHz))<br>1712.5 MHz – 1777.5 MHz (LTE – Band 66/4 (5 MHz))<br>1715.0 MHz – 1775.0 MHz (LTE – Band 66/4 (10 MHz))<br>1717.5 MHz – 1772.5 MHz (LTE – Band 66/4 (15 MHz))<br>1720.0 MHz – 1770.0 MHz (LTE – Band 66/4 (20 MHz)) |
| <b>Date(s) of Tests:</b>    | October 04, 2021 ~ October 28, 2021   |
| <b>Serial number:</b>       | Radiated: R3CR90LSAZJ<br>Conducted: R3CR90LSB3M   |

## **2. INTRODUCTION**

### **2.1. DESCRIPTION OF EUT**

The EUT was a Mobile Phone with GSM/GPRS/EGPRS/UMTS and LTE.

It also supports IEEE 802.11 a/b/g/n/ac/ax (HT20/40/80), Bluetooth, BT LE, NFC, WPT.

### **2.2. MEASURING INSTRUMENT CALIBRATION**

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

### **2.3. TEST FACILITY**

The Fully-anechoic chamber and conducted measurement facility used to collect the radiated data are located at the **74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA.**

### 3. DESCRIPTION OF TESTS

#### 3.1 TEST PROCEDURE

| Test Description  | Test Procedure Used   |
|---|---|
| Occupied Bandwidth  | - KDB 971168 D01 v03r01 – Section 4.3<br>- ANSI C63.26-2015 – Section 5.4.4   |
| Band Edge   | - KDB 971168 D01 v03r01 – Section 6.0<br>- ANSI C63.26-2015 – Section 5.7   |
| Spurious and Harmonic Emissions at Antenna Terminal             | - KDB 971168 D01 v03r01 – Section 6.0<br>- ANSI C63.26-2015 – Section 5.7   |
| Conducted Output Power  | - N/A (See SAR Report)  |
| Peak- to- Average Ratio   | - KDB 971168 D01 v03r01 – Section 5.7<br>- ANSI C63.26-2015 – Section 5.2.3.4<br>- ANSI C63.26-2015 – Section 5.2.6(only GSM) |
| Frequency stability   | - ANSI C63.26-2015 – Section 5.6  |
| Effective Radiated Power/<br>Effective Isotropic Radiated Power | - KDB 971168 D01 v03r01 – Section 5.2 & 5.8<br>- ANSI/TIA-603-E-2016 – Section 2.2.17   |
| Radiated Spurious and Harmonic Emissions                        | - KDB 971168 D01 v03r01 – Section 6.2<br>- ANSI/TIA-603-E-2016 – Section 2.2.12   |

## 3.2 RADIATED POWER

### Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

The equipment under test is placed on a non-conductive table 3-meters away from the receive antenna in accordance with ANSI/TIA-603-E-2016 Clause 2.2.17.

### Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5 % of the expected OBW, not to exceed 1 MHz
3. VBW  $\geq$  3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points  $>$  2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

### Test Note

1. The turntable is rotated through 360 degrees, and the receiving antenna scans in order to determine the level of the maximized emission.
2. A half wave dipole is then substituted in place of the EUT. For emissions above 1 GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.

The power is calculated by the following formula;

$$P_d \text{ (dBm)} = P_g \text{ (dBm)} - \text{cable loss (dB)} + \text{antenna gain (dB)}$$

Where:  $P_d$  is the dipole equivalent power and  $P_g$  is the generator output power into the substitution antenna.

3. The maximum value is calculated by adding the forward power to the calibrated source plus its appropriate gain value.

These steps are repeated with the receiving antenna in both vertical and horizontal polarization. the difference

between the gain of the horn and an isotropic antenna are taken into consideration

4. The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
5. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

### 3.3 RADIATED SPURIOUS EMISSIONS

#### Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA-603-E-2016.

#### Test Settings

1. RBW = 100 kHz for emissions below 1 GHz and 1 MHz for emissions above 1 GHz
2. VBW  $\geq 3 \times$  RBW
3. Span = 1.5 times the OBW
4. No. of sweep points  $> 2 \times$  span / RBW
5. Detector = Peak
6. Trace mode = Max Hold
7. The trace was allowed to stabilize
8. Test channel : Low/ Middle/ High
9. Frequency range : We are performed all frequency to 10<sup>th</sup> harmonics from 9 kHz.

#### Test Note

1. Measurements value show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin  $> 20$  dB from the applicable limit) and considered that's already beyond the background noise floor.
2. The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the test data
3. For spurious emissions above 1 GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.

The spurious emissions is calculated by the following formula;

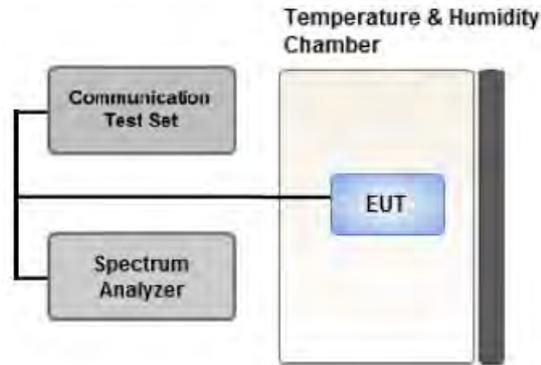
$$\text{Result}_{(dBm)} = P_g_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dBi)}$$

Where:  $P_g$  is the generator output power into the substitution antenna.

If the fundamental frequency is below 1 GHz, RF output power has been converted to EIRP.

$$\text{EIRP}_{(dBm)} = \text{ERP}_{(dBm)} + 2.15$$

### 3.4 PEAK- TO- AVERAGE RATIO



**Test setup**

#### ① CCDF Procedure for PAPR

##### **Test Settings**

1. Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Set the measurement interval as follows:
  - for continuous transmissions, set to 1 ms,
  - or burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.
4. Record the maximum PAPR level associated with a probability of 0.1 %.

**② Alternate Procedure for PAPR**

Use one of the procedures presented in 5.2(ANSI C63.26-2015) to measure the total peak power and record as  $P_{Pk}$ .

Use one of the applicable procedures presented 5.2(ANSI C63.26-2015) to measure the total average power and record as  $P_{Avg}$ . Determine the P.A.R. from:

$$P.A.R. (dB) = P_{Pk} (dBm) - P_{Avg} (dBm) \quad (P_{Avg} = \text{Average Power} + \text{Duty cycle Factor})$$

**Test Settings(Peak Power)**

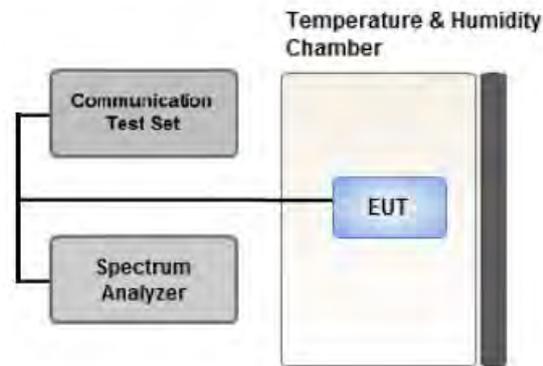
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW  $\geq 3 \times$  RBW.

1. Set the RBW  $\geq$  OBW.
2. Set VBW  $\geq 3 \times$  RBW.
3. Set span  $\geq 2 \times$  OBW.
4. Sweep time  $\geq 10 \times$  (number of points in sweep)  $\times$  (transmission symbol period).
5. Detector = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the peak amplitude level.

**Test Settings(Average Power)**

1. Set span to  $2 \times$  to  $3 \times$  the OBW.
2. Set RBW  $\geq$  OBW.
3. Set VBW  $\geq 3 \times$  RBW.
4. Set number of measurement points in sweep  $\geq 2 \times$  span / RBW.
5. Sweep time:  
Set  $\geq [10 \times (\text{number of points in sweep}) \times (\text{transmission period})]$  for single sweep (automation-compatible) measurement. The transmission period is the (on + off) time.
6. Detector = power averaging (rms).
7. Set sweep trigger to "free run."
8. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. (To accurately determine the average power over the on and off period of the transmitter, it can be necessary to increase the number of traces to be averaged above 100 or, if using a manually configured sweep time, increase the sweep time.)
9. Use the peak marker function to determine the maximum amplitude level.
10. Add  $[10 \log (1/\text{duty cycle})]$  to the measured maximum power level to compute the average power during continuous transmission. For example, add  $[10 \log (1/0.25)] = 6$  dB if the duty cycle is a constant 25 %.

### 3.5 OCCUPIED BANDWIDTH.



#### Test setup

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

The EUT makes a call to the communication simulator.

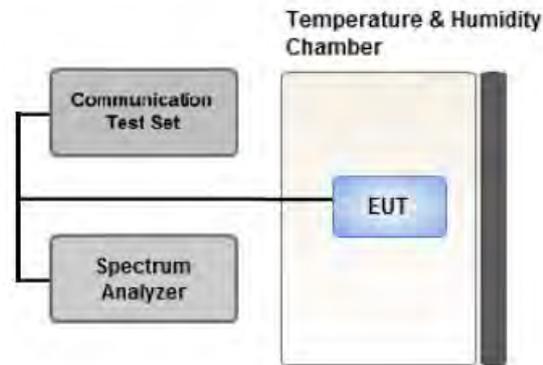
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth

#### Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99 % occupied bandwidth and the 26 dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5 % of the expected OBW
3. VBW  $\geq$  3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5 % of the 99 % occupied bandwidth observed in Step 7

### 3.6 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL



**Test setup**

#### **Test Overview**

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic.

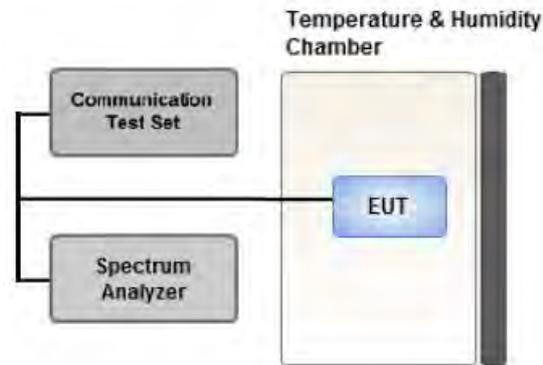
All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

#### **Test Settings**

1. RBW = 1 MHz
2. VBW  $\geq$  3 MHz
3. Detector = RMS
4. Trace Mode = trace average
5. Sweep time = auto
6. Number of points in sweep  $\geq$  2 x Span / RBW

### 3.7 BAND EDGE



**Test setup**

#### **Test Overview**

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

#### **Test Settings**

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW > 1 % of the emission bandwidth
4. VBW > 3 x RBW
5. Detector = RMS
6. Number of sweep points  $\geq 2 \times \text{Span}/\text{RBW}$
7. Trace mode = trace average
8. Sweep time = auto couple
9. The trace was allowed to stabilize

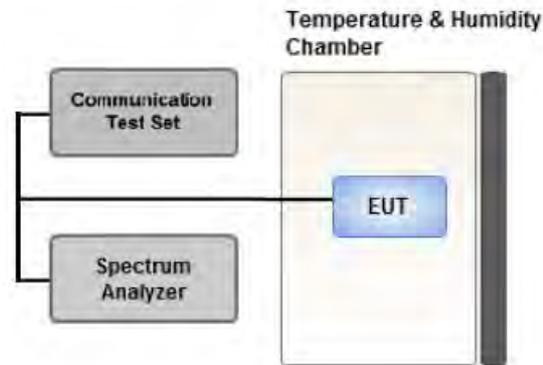
**Test Notes**

According to FCC 22.917, 24.238, 27.53 specified that power of any emission outside of The authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

All measurements were done at 2 channels(low and high operational frequency range.)

The band edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

### 3.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE



#### Test setup

#### Test Overview

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015.

The frequency stability of the transmitter is measured by:

1. Temperature:

The temperature is varied from -30 °C to +50 °C in 10 °C increments using an environmental chamber.

2. Primary Supply Voltage:

.- Unless otherwise specified, vary primary supply voltage from 85 % to 115 % of the nominal value for other than hand carried battery equipment.

.- For hand carried, battery powered equipment, reduce the primary ac or dc supply voltage to the battery operating end point, which shall be specified by the manufacturer.

#### Test Settings

1. The carrier frequency of the transmitter is measured at room temperature

(20 °C to provide a reference).

2. The equipment is turned on in a "standby" condition for fifteen minutes before applying power to the transmitter.

Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.

3. Frequency measurements are made at 10 °C intervals ranging from -30 °C to +50 °C. A period of at

least one half-hour is provided to allow stabilization of the equipment at each temperature level.

**3.9 WORST CASE(RADIATED TEST)**

- The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
- All modes of operation were investigated and the worst case configuration results are reported.
- In the case of radiated spurious emissions, all bandwidth of operation were investigated and the worst case bandwidth results are reported. (Worst case : 20 MHz)
- The worst case is reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the test data.
- Please refer to the table below.
- LTE Band 66 (1710 – 1780 MHz) overlaps the entire frequency range of LTE Band 4 (1710 - 1755 MHz) and they have the same Tune-up power.  
Therefore, test data provided in this report covers Band 4 as well as Band 66.
- Please refer to the table below.
- All modes of operation were investigated and the worst case configuration results are reported.  
Mode : Stand alone, Stand alone + External accessories (Earphone, AC adapter, etc)  
Worst case : Stand alone
- SM-N980F/DS & additional models were tested and the worst case results are reported.  
(Worst case : SM-N980F/DS)

[ Worst case ]

| Test Description                         | Modulation                          | RB size | RB offset | Axis |
|--|-------------------------------------|---------|-----------|------|
| Effective Isotropic Radiated Power       | QPSK,<br>16QAM,<br>64QAM,<br>256QAM | 1       | 0         | Z    |
| Radiated Spurious and Harmonic Emissions | QPSK                                | 1       | 0         | X    |

**3.10 WORST CASE(CONDUCTED TEST)**

- All modes of operation were investigated and the worst case configuration results are reported.
- LTE Band 66 (1710 – 1780 MHz) overlaps the entire frequency range of LTE Band 4 (1710 - 1755 MHz) and they have the same Tune-up power.

Therefore, test data provided in this report covers Band 4 as well as Band 66.

- SM-N980F/DS & additional models were tested and the worst case results are reported.

(Worst case : SM-N980F/DS)

[ Worst case ]

| Test Description      | Modulation                 | Bandwidth (MHz)                                     | Frequency | RB size               | RB offset      |         |   |
|-----------------------|----------------------------|---|-----------|-----------------------|----------------|---------|---|
| Occupied Bandwidth    | QPSK, 16QAM, 64QAM, 256QAM | 1.4, 3, 5, 10, 15, 20                               | Mid       | Full RB               | 0              |         |   |
| Peak-To-Average Ratio | QPSK, 16QAM, 64QAM, 256QAM | 1.4, 3, 5, 10, 15, 20                               | Mid       | Full RB               | 0              |         |   |
| Band Edge             | QPSK                       | 1.4   | Low       | 1                     | 0              |         |   |
|                       |                            |   | High      | 1                     | 5              |         |   |
|                       |                            | 3   | Low       | 1                     | 0              |         |   |
|                       |                            |   | High      | 1                     | 14             |         |   |
|                       |                            | 5   | Low       | 1                     | 0              |         |   |
|                       |                            |   | High      | 1                     | 24             |         |   |
|                       |                            | 10  | Low       | 1                     | 0              |         |   |
|                       |                            |   | High      | 1                     | 49             |         |   |
|                       |                            | 15  | Low       | 1                     | 0              |         |   |
|                       |                            |   | High      | 1                     | 74             |         |   |
|                       |                            | 20  | Low       | 1                     | 0              |         |   |
|                       |                            |   | High      | 1                     | 99             |         |   |
|                       |                            |   |           | 1.4, 3, 5, 10, 15, 20 | Low, High      | Full RB | 0 |
|                       |                            | Spurious and Harmonic Emissions at Antenna Terminal | QPSK      | 1.4, 3, 5, 10, 15, 20 | Low, Mid, High | 1       | 0 |

#### 4. LIST OF TEST EQUIPMENT

| Equipment  | Model                       | Manufacture            | Serial No.  | Due to Calibration | Calibration Interval |
|--|-----------------------------|------------------------|-------------|--------------------|----------------------|
| Precision Dipole Antenna                             | UHAP                        | Schwarzbeck            | 01273       | 05/30/2022         | Biennial             |
| Precision Dipole Antenna                             | UHAP                        | Schwarzbeck            | 01274       | 05/30/2022         | Biennial             |
| Horn Antenna(1~18GHz)                                | BBHA 9120D                  | Schwarzbeck            | 02289       | 05/08/2022         | Biennial             |
| Horn Antenna(1~18GHz)                                | BBHA 9120D                  | Schwarzbeck            | 9120D-1299  | 05/04/2022         | Biennial             |
| Horn Antenna(15~40GHz)                               | BBHA 9170                   | Schwarzbeck            | BBHA9170342 | 10/13/2022         | Biennial             |
| Horn Antenna(15~40GHz)                               | BBHA 9170                   | Schwarzbeck            | BBHA9170124 | 02/11/2022         | Biennial             |
| Loop Antenna(9kHz~30 MHz)                            | FMZB1513                    | Rohde & Schwarz        | 1513-175    | 05/18/2022         | Biennial             |
| Bilog Antenna  | VULB9160                    | Schwarzbeck            | 3150        | 03/03/2023         | Biennial             |
| Hybrid Antenna                                       | VULB9160                    | Schwarzbeck            | 760         | 02/22/2023         | Biennial             |
| High Pass Filter                                     | WHKX10-900-1000-15000-40SS  | Wainwright Instruments | 15          | 06/15/2022         | Annual               |
| High Pass Filter                                     | WHKX10-2700-3000-18000-40SS | Wainwright Instruments | 145         | 06/15/2022         | Annual               |
| High Pass Filter                                     | WHNX6-4740-6000-26500-40CC  | Wainwright Instruments | 11          | 06/15/2022         | Annual               |
| LOW NOISE AMP (100 MHz ~ 18GHz)                      | CBLU1183540B-01             | CERNEC                 | 26822       | 06/15/2022         | Annual               |
| Power Amplifier                                      | CBL18265035                 | CERNEC                 | 22966       | 12/04/2021         | Annual               |
| Power Amplifier                                      | CBL26405040                 | CERNEC                 | 25956       | 03/23/2022         | Annual               |
| DC Power Supply                                      | E3632A                      | Hewlett Packard        | MY40004427  | 09/15/2022         | Annual               |
| Power Splitter(DC~26.5 GHz)                          | 11667B                      | Hewlett Packard        | 11275       | 04/07/2022         | Annual               |
| Chamber  | SU-642                      | ESPEC                  | 93008124    | 03/15/2022         | Annual               |
| Signal Analyzer(10Hz~26.5GHz)                        | N9020A                      | Agilent                | MY51110063  | 04/22/2022         | Annual               |
| ATTENUATOR(20dB)                                     | 8493C                       | Hewlett Packard        | 17280       | 06/01/2022         | Annual               |
| Spectrum Analyzer(10Hz~40GHz)                        | FSV40                       | REOHDE & SCHWARZ       | 101436      | 03/02/2022         | Annual               |
| Base Station   | 8960 (E5515C)               | Agilent                | MY48360800  | 08/18/2022         | Annual               |
| Wideband Radio Communication Tester                  | MT8821C                     | Anritsu Corp.          | 6262116770  | 07/12/2022         | Annual               |
| Wideband Radio Communication Tester                  | MT8820C                     | Anritsu Corp.          | 6201026545  | 01/07/2022         | Annual               |
| SIGNAL GENERATOR (100kHz~40GHz)                      | SMB100A                     | REOHDE & SCHWARZ       | 177633      | 07/05/2022         | Annual               |
| Signal Analyzer(5Hz~40.0GHz)                         | N9030B                      | KEYSIGHT               | MY55480167  | 06/02/2022         | Annual               |
| FCC LTE Mobile Conducted RF Automation Test Software | -                           | HCT CO., LTD.,         | -           | -                  | -                    |

Note:

1. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.
2. Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).

## 5. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4:2014. All measurement uncertainty values are shown with a coverage factor of  $k = 2$  to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

| Parameter                                | Expanded Uncertainty ( $\pm$ dB)           |
|--|--|
| Conducted Disturbance (150 kHz ~ 30 MHz) | 1.82 (Confidence level about 95 %, $k=2$ ) |
| Radiated Disturbance (9 kHz ~ 30 MHz)    | 3.40 (Confidence level about 95 %, $k=2$ ) |
| Radiated Disturbance (30 MHz ~ 1 GHz)    | 4.80 (Confidence level about 95 %, $k=2$ ) |
| Radiated Disturbance (1 GHz ~ 18 GHz)    | 5.70 (Confidence level about 95 %, $k=2$ ) |
| Radiated Disturbance (18 GHz ~ 40 GHz)   | 5.05 (Confidence level about 95 %, $k=2$ ) |

## 6. SUMMARY OF TEST RESULTS

### 6.1 Test Condition : Conducted Test

| Test Description   | FCC Part Section(s) | Test Limit   | Test Result             |
|--|---------------------|--|-------------------------|
| Occupied Bandwidth   | §2.1049             | N/A  | PASS                    |
| Band Edge / Spurious and Harmonic Emissions at Antenna Terminal. | §2.1051, §27.53(h)  | < 43 + 10log10 (P[Watts]) at Band Edge and for all out-of-band emissions | PASS                    |
| Conducted Output Power   | §2.1046             | N/A  | <b><u>See Note1</u></b> |
| Peak- to- Average Ratio  | §27.50(d)(5)        | < 13 dB  | PASS                    |
| Frequency stability / variation of ambient temperature           | §2.1055, § 27.54    | Emission must remain in band   | PASS                    |

**Note:**

1. See SAR Report

### 6.2 Test Condition : Radiated Test

| Test Description                         | FCC Part Section(s) | Test Limit  | Test Result |
|--|---------------------|---|-------------|
| Equivalent Isotropic Radiated Power      | §27.50(d)(4)        | < 1 Watts max. EIRP                                     | PASS        |
| Radiated Spurious and Harmonic Emissions | §2.1053, §27.53(h)  | < 43 + 10log10 (P[Watts]) for all out-of band emissions | PASS        |

## 7. SAMPLE CALCULATION

### 7.1 ERP Sample Calculation

| Ch./ Freq. |            | Measured Level (dBm) | Substitute Level (dBm) | Ant. Gain (dBd) | C.L  | Pol. | ERP   |       |
|------------|------------|----------------------|------------------------|-----------------|------|------|-------|-------|
| channel    | Freq.(MHz) |                      |                        |                 |      |      | W     | dBm   |
| 128        | 824.20     | -21.37               | 38.40                  | -10.61          | 0.95 | H    | 0.483 | 26.84 |

**ERP = Substitute LEVEL(dBm) + Ant. Gain – CL(Cable Loss)**

- 1) The EUT mounted on a non-conductive turntable is 2.5 meter above test site ground level.
- 2) During the test , the turn table is rotated until the maximum signal is found.
- 3) Record the field strength meter's level.
- 4) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.
- 5) Increase the signal generator output till the field strength meter's level is equal to the item (3).
- 6) The signal generator output level with Ant. Gain and cable loss are the rating of effective radiated power.

### 7.2 EIRP Sample Calculation

| Ch./ Freq. |            | Measured Level (dBm) | Substitute Level (dBm) | Ant. Gain (dBi) | C.L  | Pol. | EIRP  |       |
|------------|------------|----------------------|------------------------|-----------------|------|------|-------|-------|
| channel    | Freq.(MHz) |                      |                        |                 |      |      | W     | dBm   |
| 132322     | 1,732.50   | -15.75               | 18.45                  | 9.90            | 1.76 | H    | 0.456 | 26.59 |

**EIRP = Substitute LEVEL(dBm) + Ant. Gain – CL(Cable Loss)**

- 1) The EUT mounted on a non-conductive turntable is 2.5 meter above test site ground level.
- 2) During the test , the turn table is rotated until the maximum signal is found.
- 3) Record the field strength meter's level.
- 4) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.
- 5) Increase the signal generator output till the field strength meter's level is equal to the item (3).
- 6) The signal generator output level with Ant. Gain and cable loss are the rating of equivalent isotropic radiated power.

### 7.3. Emission Designator

#### GSM Emission Designator

**Emission Designator = 249KGXW**

GSM BW = 249 kHz

G = Phase Modulation

X = Cases not otherwise covered

W = Combination (Audio/Data)

#### EDGE Emission Designator

**Emission Designator = 249KG7W**

GSM BW = 249 kHz

G = Phase Modulation

7 = Quantized/Digital Info

W = Combination (Audio/Data)

#### WCDMA Emission Designator

**Emission Designator = 4M17F9W**

WCDMA BW = 4.17 MHz

F = Frequency Modulation

9 = Composite Digital Info

W = Combination (Audio/Data)

#### QPSK Modulation

**Emission Designator = 4M48G7D**

LTE BW = 4.48 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

#### QAM Modulation

Emission Designator = 4M48W7D

LTE BW = 4.48 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

## 8. TEST DATA

### 8.1 EQUIVALENT ISOTROPIC RADIATED POWER

| Freq (MHz) | Mod/ Bandwidth         | Modulation | Measured Level (dBm) | Substitute Level (dBm) | Ant. Gain (dBi) | C.L  | Pol | Limit  | EIRP  |       |
|------------|------------------------|------------|----------------------|------------------------|-----------------|------|-----|--------|-------|-------|
|            |                        |            |                      |                        |                 |      |     | W      | W     | dBm   |
| 1710.7     | LTE B66/ B4<br>1.4 MHz | QPSK       | -19.65               | 13.21                  | 9.76            | 2.08 | V   | < 2.00 | 0.123 | 20.89 |
|            |                        | 16-QAM     | -20.44               | 12.42                  | 9.76            | 2.08 | V   |        | 0.102 | 20.10 |
|            |                        | 64-QAM     | -21.47               | 11.39                  | 9.76            | 2.08 | V   |        | 0.081 | 19.07 |
|            |                        | 256-QAM    | -24.60               | 8.26                   | 9.76            | 2.08 | V   |        | 0.039 | 15.94 |
| 1745.0     |                        | QPSK       | -19.93               | 13.20                  | 9.97            | 1.99 | V   |        | 0.131 | 21.18 |
|            |                        | 16-QAM     | -20.74               | 12.39                  | 9.97            | 1.99 | V   |        | 0.109 | 20.37 |
|            |                        | 64-QAM     | -21.76               | 11.37                  | 9.97            | 1.99 | V   |        | 0.086 | 19.35 |
|            |                        | 256-QAM    | -24.86               | 8.27                   | 9.97            | 1.99 | V   |        | 0.042 | 16.25 |
| 1779.3     |                        | QPSK       | -20.11               | 13.03                  | 10.12           | 2.15 | V   |        | 0.126 | 21.00 |
|            |                        | 16-QAM     | -20.86               | 12.28                  | 10.12           | 2.15 | V   |        | 0.106 | 20.25 |
|            |                        | 64-QAM     | -21.98               | 11.16                  | 10.12           | 2.15 | V   |        | 0.082 | 19.13 |
|            |                        | 256-QAM    | -24.96               | 8.18                   | 10.12           | 2.15 | V   |        | 0.041 | 16.15 |

| Freq (MHz) | Mod/ Bandwidth       | Modulation | Measured Level (dBm) | Substitute Level (dBm) | Ant. Gain (dBi) | C.L  | Pol | Limit  | EIRP  |       |
|------------|----------------------|------------|----------------------|------------------------|-----------------|------|-----|--------|-------|-------|
|            |                      |            |                      |                        |                 |      |     | W      | W     | dBm   |
| 1711.5     | LTE B66/ B4<br>3 MHz | QPSK       | -19.67               | 13.19                  | 9.76            | 2.08 | V   | < 2.00 | 0.122 | 20.87 |
|            |                      | 16-QAM     | -20.41               | 12.45                  | 9.76            | 2.08 | V   |        | 0.103 | 20.13 |
|            |                      | 64-QAM     | -21.50               | 11.36                  | 9.76            | 2.08 | V   |        | 0.080 | 19.04 |
|            |                      | 256-QAM    | -24.58               | 8.28                   | 9.76            | 2.08 | V   |        | 0.039 | 15.96 |
| 1745.0     |                      | QPSK       | -19.85               | 13.28                  | 9.97            | 1.99 | V   |        | 0.134 | 21.26 |
|            |                      | 16-QAM     | -20.57               | 12.56                  | 9.97            | 1.99 | V   |        | 0.113 | 20.54 |
|            |                      | 64-QAM     | -21.58               | 11.55                  | 9.97            | 1.99 | V   |        | 0.090 | 19.53 |
|            |                      | 256-QAM    | -24.75               | 8.38                   | 9.97            | 1.99 | V   |        | 0.043 | 16.36 |
| 1778.5     |                      | QPSK       | -19.90               | 13.24                  | 10.12           | 2.15 | V   |        | 0.132 | 21.21 |
|            |                      | 16-QAM     | -20.70               | 12.44                  | 10.12           | 2.15 | V   |        | 0.110 | 20.41 |
|            |                      | 64-QAM     | -21.67               | 11.47                  | 10.12           | 2.15 | V   |        | 0.088 | 19.44 |
|            |                      | 256-QAM    | -24.80               | 8.34                   | 10.12           | 2.15 | V   |        | 0.043 | 16.31 |

| Freq (MHz) | Mod/ Bandwidth       | Modulation | Measured Level (dBm) | Substitute Level (dBm) | Ant. Gain (dBi) | C.L  | Pol | Limit  |       | EIRP  |     |
|------------|----------------------|------------|----------------------|------------------------|-----------------|------|-----|--------|-------|-------|-----|
|            |                      |            |                      |                        |                 |      |     | W      | W     | dBm   | dBm |
| 1712.5     | LTE B66/ B4<br>5 MHz | QPSK       | -19.59               | 13.27                  | 9.76            | 2.08 | V   | < 2.00 | 0.125 | 20.95 |     |
|            |                      | 16-QAM     | -20.38               | 12.48                  | 9.76            | 2.08 | V   |        | 0.104 | 20.16 |     |
|            |                      | 64-QAM     | -21.44               | 11.42                  | 9.76            | 2.08 | V   |        | 0.081 | 19.10 |     |
|            |                      | 256-QAM    | -24.57               | 8.29                   | 9.76            | 2.08 | V   |        | 0.040 | 15.97 |     |
| 1745.0     |                      | QPSK       | -19.78               | 13.35                  | 9.97            | 1.99 | V   |        | 0.136 | 21.33 |     |
|            |                      | 16-QAM     | -20.59               | 12.54                  | 9.97            | 1.99 | V   |        | 0.113 | 20.52 |     |
|            |                      | 64-QAM     | -21.62               | 11.51                  | 9.97            | 1.99 | V   |        | 0.089 | 19.49 |     |
|            |                      | 256-QAM    | -24.63               | 8.50                   | 9.97            | 1.99 | V   |        | 0.044 | 16.48 |     |
| 1777.5     |                      | QPSK       | -20.36               | 12.78                  | 10.12           | 2.15 | V   |        | 0.119 | 20.75 |     |
|            |                      | 16-QAM     | -21.22               | 11.92                  | 10.12           | 2.15 | V   |        | 0.098 | 19.89 |     |
|            |                      | 64-QAM     | -22.31               | 10.83                  | 10.12           | 2.15 | V   |        | 0.076 | 18.80 |     |
|            |                      | 256-QAM    | -25.26               | 7.88                   | 10.12           | 2.15 | V   |        | 0.038 | 15.85 |     |

| Freq (MHz) | Mod/ Bandwidth        | Modulation | Measured Level (dBm) | Substitute Level (dBm) | Ant. Gain (dBi) | C.L  | Pol | Limit  |       | EIRP  |     |
|------------|-----------------------|------------|----------------------|------------------------|-----------------|------|-----|--------|-------|-------|-----|
|            |                       |            |                      |                        |                 |      |     | W      | W     | dBm   | dBm |
| 1715.0     | LTE B66/ B4<br>10 MHz | QPSK       | -19.71               | 13.31                  | 9.79            | 2.07 | V   | < 2.00 | 0.127 | 21.03 |     |
|            |                       | 16-QAM     | -20.51               | 12.51                  | 9.79            | 2.07 | V   |        | 0.105 | 20.23 |     |
|            |                       | 64-QAM     | -21.53               | 11.49                  | 9.79            | 2.07 | V   |        | 0.083 | 19.21 |     |
|            |                       | 256-QAM    | -24.59               | 8.43                   | 9.79            | 2.07 | V   |        | 0.041 | 16.15 |     |
| 1745.0     |                       | QPSK       | -19.57               | 13.56                  | 9.97            | 1.99 | V   |        | 0.142 | 21.54 |     |
|            |                       | 16-QAM     | -20.32               | 12.81                  | 9.97            | 1.99 | V   |        | 0.120 | 20.79 |     |
|            |                       | 64-QAM     | -21.34               | 11.79                  | 9.97            | 1.99 | V   |        | 0.095 | 19.77 |     |
|            |                       | 256-QAM    | -24.51               | 8.62                   | 9.97            | 1.99 | V   |        | 0.046 | 16.60 |     |
| 1775.0     |                       | QPSK       | -19.79               | 13.44                  | 10.10           | 2.14 | V   |        | 0.138 | 21.40 |     |
|            |                       | 16-QAM     | -20.56               | 12.67                  | 10.10           | 2.14 | V   |        | 0.116 | 20.63 |     |
|            |                       | 64-QAM     | -21.54               | 11.69                  | 10.10           | 2.14 | V   |        | 0.092 | 19.65 |     |
|            |                       | 256-QAM    | -24.73               | 8.50                   | 10.10           | 2.14 | V   |        | 0.044 | 16.46 |     |

| Freq (MHz) | Mod/ Bandwidth        | Modulation | Measured Level (dBm) | Substitute Level (dBm) | Ant. Gain (dBi) | C.L  | Pol | Limit  |       | EIRP  |     |
|------------|-----------------------|------------|----------------------|------------------------|-----------------|------|-----|--------|-------|-------|-----|
|            |                       |            |                      |                        |                 |      |     | W      | W     | dBm   | dBm |
| 1717.5     | LTE B66/ B4<br>15 MHz | QPSK       | -19.46               | 13.53                  | 9.82            | 2.07 | V   | < 2.00 | 0.134 | 21.28 |     |
|            |                       | 16-QAM     | -20.26               | 12.73                  | 9.82            | 2.07 | V   |        | 0.112 | 20.48 |     |
|            |                       | 64-QAM     | -21.27               | 11.72                  | 9.82            | 2.07 | V   |        | 0.089 | 19.47 |     |
|            |                       | 256-QAM    | -24.43               | 8.56                   | 9.82            | 2.07 | V   |        | 0.043 | 16.31 |     |
| 1745.0     |                       | QPSK       | -19.64               | 13.49                  | 9.97            | 1.99 | V   |        | 0.140 | 21.47 |     |
|            |                       | 16-QAM     | -20.48               | 12.65                  | 9.97            | 1.99 | V   |        | 0.116 | 20.63 |     |
|            |                       | 64-QAM     | -21.52               | 11.61                  | 9.97            | 1.99 | V   |        | 0.091 | 19.59 |     |
|            |                       | 256-QAM    | -24.51               | 8.62                   | 9.97            | 1.99 | V   |        | 0.046 | 16.60 |     |
| 1772.5     |                       | QPSK       | -20.38               | 12.94                  | 10.08           | 2.13 | V   |        | 0.123 | 20.89 |     |
|            |                       | 16-QAM     | -21.20               | 12.12                  | 10.08           | 2.13 | V   |        | 0.102 | 20.07 |     |
|            |                       | 64-QAM     | -22.27               | 11.05                  | 10.08           | 2.13 | V   |        | 0.079 | 19.00 |     |
|            |                       | 256-QAM    | -25.23               | 8.09                   | 10.08           | 2.13 | V   |        | 0.040 | 16.04 |     |

| Freq (MHz) | Mod/ Bandwidth        | Modulation | Measured Level (dBm) | Substitute Level (dBm) | Ant. Gain (dBi) | C.L  | Pol | Limit  |       | EIRP  |     |
|------------|-----------------------|------------|----------------------|------------------------|-----------------|------|-----|--------|-------|-------|-----|
|            |                       |            |                      |                        |                 |      |     | W      | W     | dBm   | dBm |
| 1720.0     | LTE B66/ B4<br>20 MHz | QPSK       | -19.60               | 13.57                  | 9.82            | 2.05 | V   | < 2.00 | 0.136 | 21.34 |     |
|            |                       | 16-QAM     | -20.39               | 12.78                  | 9.82            | 2.05 | V   |        | 0.113 | 20.55 |     |
|            |                       | 64-QAM     | -21.45               | 11.72                  | 9.82            | 2.05 | V   |        | 0.089 | 19.49 |     |
|            |                       | 256-QAM    | -24.44               | 8.73                   | 9.82            | 2.05 | V   |        | 0.045 | 16.50 |     |
| 1745.0     |                       | QPSK       | -19.47               | 13.66                  | 9.97            | 1.99 | V   |        | 0.146 | 21.64 |     |
|            |                       | 16-QAM     | -20.26               | 12.87                  | 9.97            | 1.99 | V   |        | 0.122 | 20.85 |     |
|            |                       | 64-QAM     | -21.27               | 11.86                  | 9.97            | 1.99 | V   |        | 0.096 | 19.84 |     |
|            |                       | 256-QAM    | -24.44               | 8.69                   | 9.97            | 1.99 | V   |        | 0.046 | 16.67 |     |
| 1770.0     |                       | QPSK       | -20.04               | 13.28                  | 10.08           | 2.13 | V   |        | 0.133 | 21.23 |     |
|            |                       | 16-QAM     | -20.88               | 12.44                  | 10.08           | 2.13 | V   |        | 0.109 | 20.39 |     |
|            |                       | 64-QAM     | -21.87               | 11.45                  | 10.08           | 2.13 | V   |        | 0.087 | 19.40 |     |
|            |                       | 256-QAM    | -24.93               | 8.39                   | 10.08           | 2.13 | V   |        | 0.043 | 16.34 |     |

**8.2 RADIATED SPURIOUS EMISSIONS**

- ▣ OPERATING FREQUENCY: 1745.0 MHz
- ▣ MEASURED OUTPUT POWER: 21.64 dBm = 0.146 W
- ▣ MODE: LTE B66 / B4
- ▣ MODULATION SIGNAL: 20 MHz QPSK
- ▣ DISTANCE: 3 meters
- ▣ LIMIT:  $43 + 10 \log_{10}(W) =$  34.64 dBc

| Ch                 | Freq (MHz) | Measured Level (dBm) | Ant. Gain (dBi) | Substitute Level (dBm) | C.L  | Pol | Result (dBm) | dBc   |
|--------------------|------------|----------------------|-----------------|------------------------|------|-----|--------------|-------|
| 132072<br>(1720.0) | 3 440.00   | -61.02               | 11.30           | -61.77                 | 3.07 | V   | -53.54       | 75.18 |
|                    | 5 160.00   | -61.28               | 11.42           | -56.64                 | 3.70 | H   | -48.92       | 70.56 |
|                    | 6 880.00   | -62.44               | 11.14           | -50.44                 | 4.48 | V   | -43.78       | 65.41 |
| 132322<br>(1745.0) | 3 490.00   | -60.81               | 11.46           | -62.12                 | 3.05 | V   | -53.71       | 75.34 |
|                    | 5 235.00   | -60.45               | 11.57           | -55.14                 | 3.79 | V   | -47.36       | 69.00 |
|                    | 6 980.00   | -64.67               | 11.16           | -52.44                 | 4.51 | V   | -45.79       | 67.43 |
| 132572<br>(1770.0) | 3 540.00   | -59.90               | 11.66           | -61.61                 | 3.07 | H   | -53.02       | 74.65 |
|                    | 5 310.00   | -61.98               | 11.72           | -57.12                 | 3.87 | H   | -49.27       | 70.91 |
|                    | 7 080.00   | -64.78               | 11.08           | -50.95                 | 4.48 | H   | -44.35       | 65.98 |

**8.3 PEAK-TO-AVERAGE RATIO**

| Band   | Band Width | Frequency (MHz) | Modulation | Resource Block Size | Resource Block Offset | Data (dB) |
|--------|------------|-----------------|------------|---------------------|-----------------------|-----------|
| 66/4   | 1.4 MHz    | 1745.0          | QPSK       | 6                   | 0                     | 6.17      |
|        |            |                 | 16-QAM     |                     |                       | 6.37      |
|        |            |                 | 64-QAM     |                     |                       | 6.49      |
|        |            |                 | 256-QAM    |                     |                       | 6.65      |
|        | 3 MHz      |                 | QPSK       | 15                  |                       | 6.15      |
|        |            |                 | 16-QAM     |                     |                       | 6.39      |
|        |            |                 | 64-QAM     |                     |                       | 6.40      |
|        |            |                 | 256-QAM    |                     |                       | 6.58      |
|        | 5 MHz      |                 | QPSK       | 25                  |                       | 6.06      |
|        |            |                 | 16-QAM     |                     |                       | 6.38      |
|        |            |                 | 64-QAM     |                     |                       | 6.45      |
|        |            |                 | 256-QAM    |                     |                       | 6.57      |
|        | 10 MHz     |                 | QPSK       | 50                  |                       | 6.05      |
|        |            |                 | 16-QAM     |                     |                       | 6.31      |
|        |            |                 | 64-QAM     |                     |                       | 6.39      |
|        |            |                 | 256-QAM    |                     |                       | 6.60      |
|        | 15 MHz     |                 | QPSK       | 75                  |                       | 5.84      |
|        |            |                 | 16-QAM     |                     |                       | 6.39      |
|        |            |                 | 64-QAM     |                     |                       | 6.44      |
|        |            |                 | 256-QAM    |                     |                       | 6.62      |
| 20 MHz | QPSK       | 100             | 5.81       |                     |                       |           |
|        | 16-QAM     |                 | 6.34       |                     |                       |           |
|        | 64-QAM     |                 | 6.47       |                     |                       |           |
|        | 256-QAM    |                 | 6.67       |                     |                       |           |

**Note:**

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 111 ~ 134.

**8.4 OCCUPIED BANDWIDTH**

| Band   | Band Width | Frequency (MHz) | Modulation | Resource Block Size | Resource Block Offset | Data (MHz) |
|--------|------------|-----------------|------------|---------------------|-----------------------|------------|
| 66/4   | 1.4 MHz    | 1745.0          | QPSK       | 6                   | 0                     | 1.0947     |
|        |            |                 | 16-QAM     |                     |                       | 1.0947     |
|        |            |                 | 64-QAM     |                     |                       | 1.0998     |
|        |            |                 | 256-QAM    |                     |                       | 1.0972     |
|        | 3 MHz      |                 | QPSK       | 15                  |                       | 2.7226     |
|        |            |                 | 16-QAM     |                     |                       | 2.7141     |
|        |            |                 | 64-QAM     |                     |                       | 2.7106     |
|        |            |                 | 256-QAM    |                     |                       | 2.7102     |
|        | 5 MHz      |                 | QPSK       | 25                  |                       | 4.5236     |
|        |            |                 | 16-QAM     |                     |                       | 4.5234     |
|        |            |                 | 64-QAM     |                     |                       | 4.5164     |
|        |            |                 | 256-QAM    |                     |                       | 4.5105     |
|        | 10 MHz     |                 | QPSK       | 50                  |                       | 9.0091     |
|        |            |                 | 16-QAM     |                     |                       | 9.0074     |
|        |            |                 | 64-QAM     |                     |                       | 8.9900     |
|        |            |                 | 256-QAM    |                     |                       | 8.9831     |
|        | 15 MHz     |                 | QPSK       | 75                  |                       | 13.453     |
|        |            |                 | 16-QAM     |                     |                       | 13.513     |
|        |            |                 | 64-QAM     |                     |                       | 13.500     |
|        |            |                 | 256-QAM    |                     |                       | 13.444     |
| 20 MHz | QPSK       | 100             | 17.993     |                     |                       |            |
|        | 16-QAM     |                 | 17.966     |                     |                       |            |
|        | 64-QAM     |                 | 17.974     |                     |                       |            |
|        | 256-QAM    |                 | 17.958     |                     |                       |            |

**Note:**

1. Plots of the EUT's Occupied Bandwidth are shown Page 87~ 110.

**8.5 CONDUCTED SPURIOUS EMISSIONS**

| Band | Band Width (MHz) | Frequency (MHz) | Frequency of Maximum Harmonic (GHz) | Factor (dB) | Measurement Maximum Data (dBm) | Result (dBm) | Limit (dBm) |
|------|------------------|-----------------|-------------------------------------|-------------|--------------------------------|--------------|-------------|
| 66/4 | 1.4              | 1710.7          | 3.4208                              | 27.976      | -75.963                        | -47.987      | -13.00      |
|      |                  | 1745.0          | 3.4896                              | 27.976      | -75.533                        | -47.557      |             |
|      |                  | 1779.3          | 3.5599                              | 27.976      | -76.428                        | -48.452      |             |
|      | 3                | 1711.5          | 3.4213                              | 27.976      | -76.117                        | -48.141      |             |
|      |                  | 1745.0          | 3.4881                              | 27.976      | -74.925                        | -46.949      |             |
|      |                  | 1778.5          | 3.5604                              | 27.976      | -76.105                        | -48.129      |             |
|      | 5                | 1712.5          | 3.4213                              | 27.976      | -74.919                        | -46.943      |             |
|      |                  | 1745.0          | 3.4866                              | 27.976      | -76.622                        | -48.646      |             |
|      |                  | 1777.5          | 3.5599                              | 27.976      | -75.672                        | -47.696      |             |
|      | 10               | 1715.0          | 3.4218                              | 27.976      | -74.047                        | -46.071      |             |
|      |                  | 1745.0          | 3.4821                              | 27.976      | -75.799                        | -47.823      |             |
|      |                  | 1775.0          | 3.5599                              | 27.976      | -75.713                        | -47.737      |             |
|      | 15               | 1717.5          | 3.4223                              | 27.976      | -75.780                        | -47.804      |             |
|      |                  | 1745.0          | 3.4771                              | 27.976      | -75.162                        | -47.186      |             |
|      |                  | 1772.5          | 3.5589                              | 27.976      | -75.904                        | -47.928      |             |
|      | 20               | 1720.0          | 3.4228                              | 27.976      | -74.765                        | -46.789      |             |
|      |                  | 1745.0          | 3.4731                              | 27.976      | -76.618                        | -48.642      |             |
|      |                  | 1770.0          | 3.5584                              | 27.976      | -75.646                        | -47.670      |             |

**Note:**

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 135 ~ 170.
2. Conducted Spurious Emissions was Tested QPSK Modulation, Resource Block Size 1 and Resource Block Offset 0
3. Result (dBm) = Measurement Maximum Data (dBm) + Factor (dB)
4. Factor (dB) = Cable Loss + Attenuator + Power Splitter

| Frequency Range (GHz) | Factor [dB] |
|-----------------------|-------------|
| 0.03 – 1              | 25.270      |
| 1 – 5                 | 27.976      |
| 5 – 10                | 28.591      |
| 10 – 15               | 29.116      |
| 15 – 20               | 29.489      |
| Above 20(26.5)        | 30.131      |

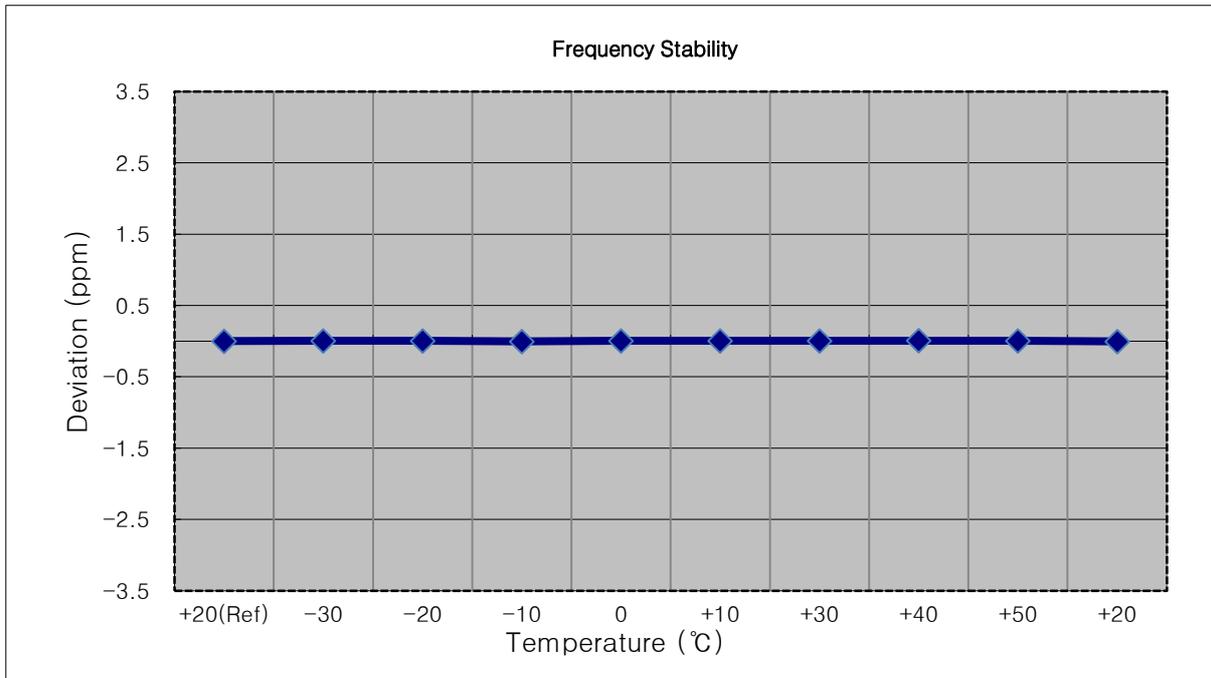
## 8.6 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 51 ~ 86.

**8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE**

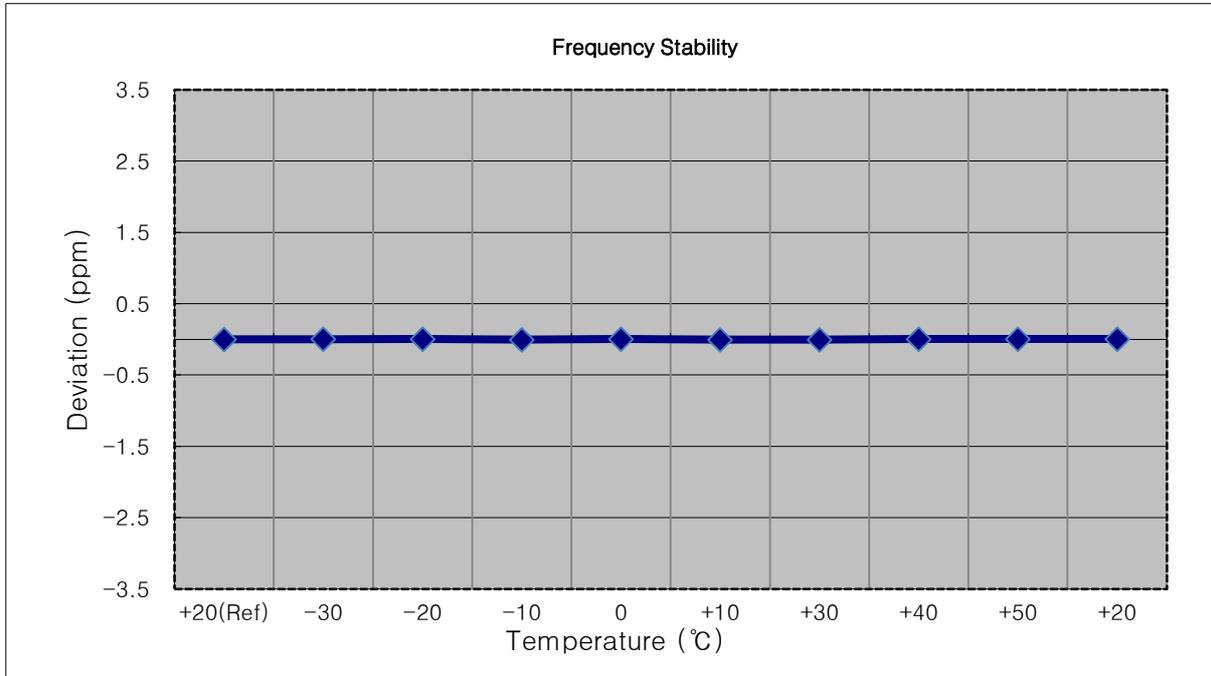
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1710,700,000 Hz
- ▣ CHANNEL: 131979 (1.4 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%)    | Power (VDC) | Temp. (°C) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm       |
|----------------|-------------|------------|----------------|----------------------|---------------|-----------|
| 100 %          | 3.880       | +20(Ref)   | 1710 700 007   | 0.0                  | 0.000 000     | 0.000     |
| 100 %          |             | -30        | 1710 700 015   | 7.1                  | 0.000 000     | 0.004     |
| 100 %          |             | -20        | 1710 700 013   | 5.7                  | 0.000 000     | 0.003     |
| 100 %          |             | -10        | 1710 700 000   | -7.3                 | 0.000 000     | -0.004    |
| 100 %          |             | 0          | 1710 700 015   | 7.9                  | 0.000 000     | 0.005     |
| 100 %          |             | +10        | 1710 700 014   | 6.3                  | 0.000 000     | 0.004     |
| 100 %          |             | +30        | 1710 700 015   | 7.2                  | 0.000 000     | 0.004     |
| 100 %          |             | +40        | 1710 700 018   | 10.3                 | 0.000 001     | 0.006     |
| 100 %          |             | +50        | 1710 700 017   | 9.3                  | 0.000 001     | 0.005     |
| Batt. Endpoint |             | 3.400      | +20            | 1710 700 001         | -6.8          | 0.000 000 |



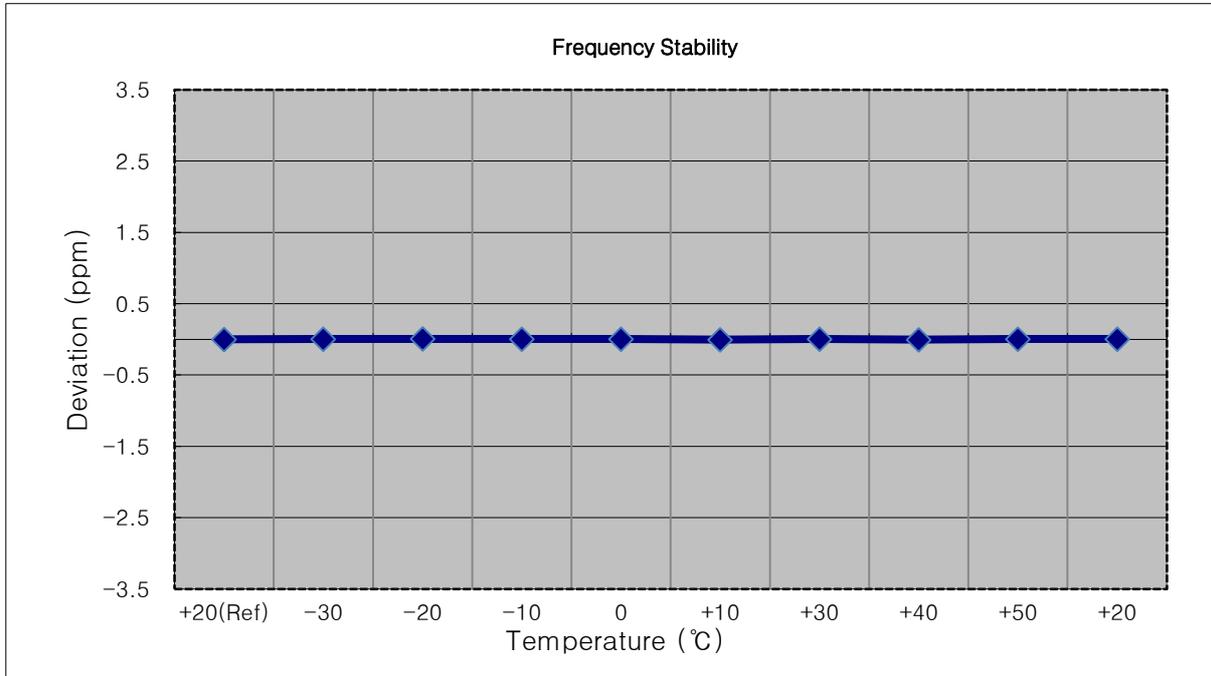
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1711,500,000 Hz
- ▣ CHANNEL: 131987 (3 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%)    | Power (VDC) | Temp. (°C) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm    |
|----------------|-------------|------------|----------------|----------------------|---------------|--------|
| 100 %          | 3.880       | +20(Ref)   | 1711 499 993   | 0.0                  | 0.000 000     | 0.000  |
| 100 %          |             | -30        | 1711 499 998   | 5.3                  | 0.000 000     | 0.003  |
| 100 %          |             | -20        | 1711 500 000   | 7.2                  | 0.000 000     | 0.004  |
| 100 %          |             | -10        | 1711 499 986   | -6.8                 | 0.000 000     | -0.004 |
| 100 %          |             | 0          | 1711 500 001   | 8.1                  | 0.000 000     | 0.005  |
| 100 %          |             | +10        | 1711 499 985   | -7.6                 | 0.000 000     | -0.004 |
| 100 %          |             | +30        | 1711 499 987   | -5.9                 | 0.000 000     | -0.003 |
| 100 %          |             | +40        | 1711 500 001   | 8.0                  | 0.000 000     | 0.005  |
| 100 %          |             | +50        | 1711 500 001   | 8.4                  | 0.000 000     | 0.005  |
| Batt. Endpoint | 3.400       | +20        | 1711 499 999   | 6.0                  | 0.000 000     | 0.004  |



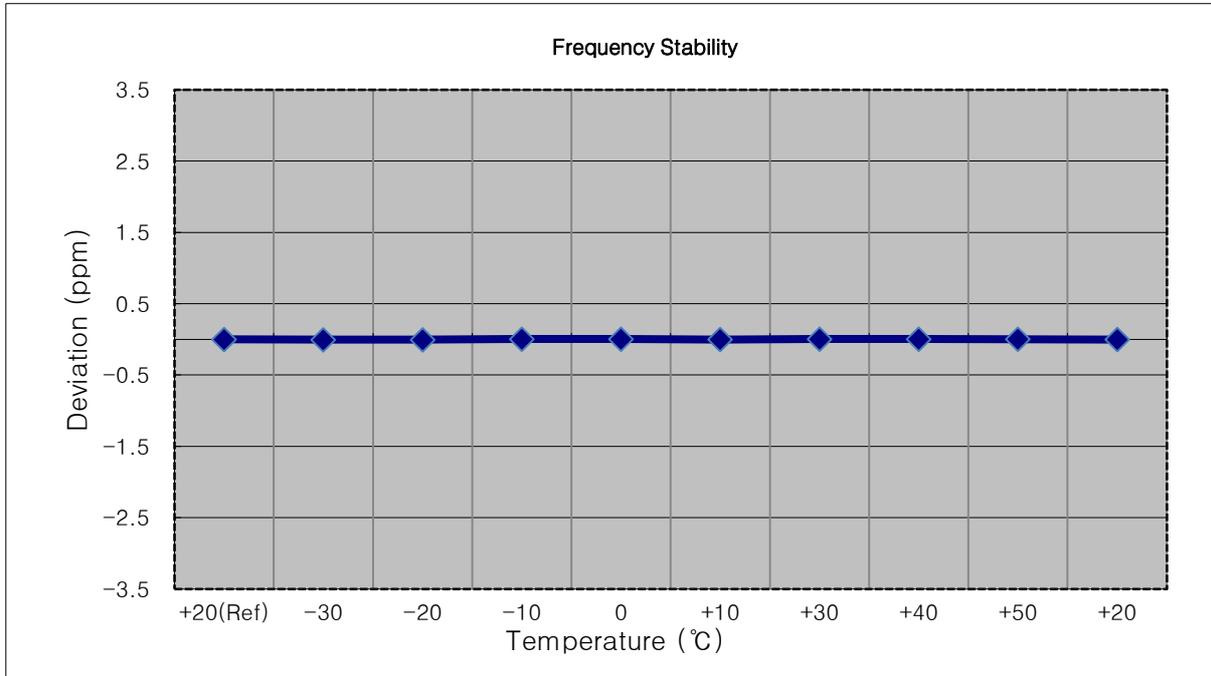
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1712,500,000 Hz
- ▣ CHANNEL: 131997 (5 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%)    | Power (VDC) | Temp. (°C) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm    |
|----------------|-------------|------------|----------------|----------------------|---------------|--------|
| 100 %          | 3.880       | +20(Ref)   | 1712 500 009   | 0.0                  | 0.000 000     | 0.000  |
| 100 %          |             | -30        | 1712 500 016   | 7.9                  | 0.000 000     | 0.005  |
| 100 %          |             | -20        | 1712 500 018   | 9.6                  | 0.000 001     | 0.006  |
| 100 %          |             | -10        | 1712 500 016   | 7.1                  | 0.000 000     | 0.004  |
| 100 %          |             | 0          | 1712 500 017   | 8.1                  | 0.000 000     | 0.005  |
| 100 %          |             | +10        | 1712 500 001   | -7.7                 | 0.000 000     | -0.004 |
| 100 %          |             | +30        | 1712 500 015   | 6.8                  | 0.000 000     | 0.004  |
| 100 %          |             | +40        | 1712 500 002   | -6.9                 | 0.000 000     | -0.004 |
| 100 %          |             | +50        | 1712 500 016   | 7.1                  | 0.000 000     | 0.004  |
| Batt. Endpoint | 3.400       | +20        | 1712 500 017   | 8.3                  | 0.000 000     | 0.005  |



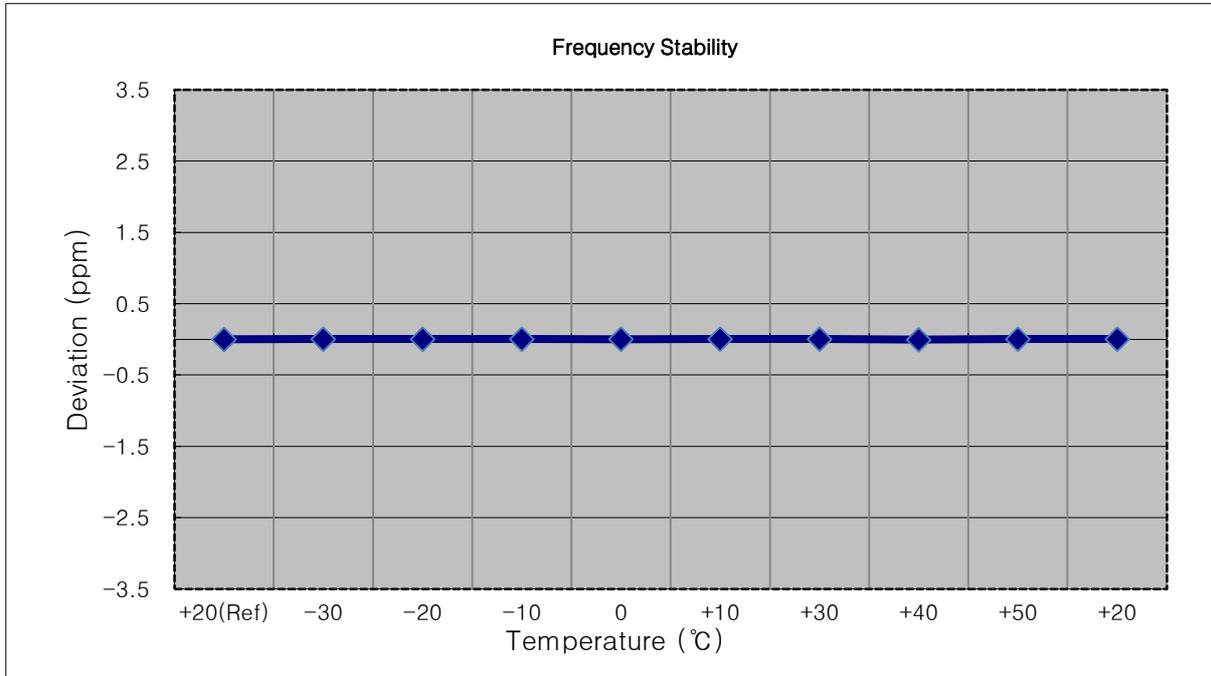
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1715,000,000 Hz
- ▣ CHANNEL: 132022 (10 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%)    | Power (VDC) | Temp. (°C) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm    |
|----------------|-------------|------------|----------------|----------------------|---------------|--------|
| 100 %          | 3.880       | +20(Ref)   | 1715 000 006   | 0.0                  | 0.000 000     | 0.000  |
| 100 %          |             | -30        | 1715 000 000   | -6.4                 | 0.000 000     | -0.004 |
| 100 %          |             | -20        | 1715 000 000   | -6.2                 | 0.000 000     | -0.004 |
| 100 %          |             | -10        | 1715 000 012   | 6.2                  | 0.000 000     | 0.004  |
| 100 %          |             | 0          | 1715 000 013   | 6.5                  | 0.000 000     | 0.004  |
| 100 %          |             | +10        | 1715 000 001   | -5.5                 | 0.000 000     | -0.003 |
| 100 %          |             | +30        | 1715 000 013   | 7.1                  | 0.000 000     | 0.004  |
| 100 %          |             | +40        | 1715 000 013   | 6.6                  | 0.000 000     | 0.004  |
| 100 %          |             | +50        | 1715 000 012   | 5.5                  | 0.000 000     | 0.003  |
| Batt. Endpoint | 3.400       | +20        | 1715 000 001   | -5.3                 | 0.000 000     | -0.003 |



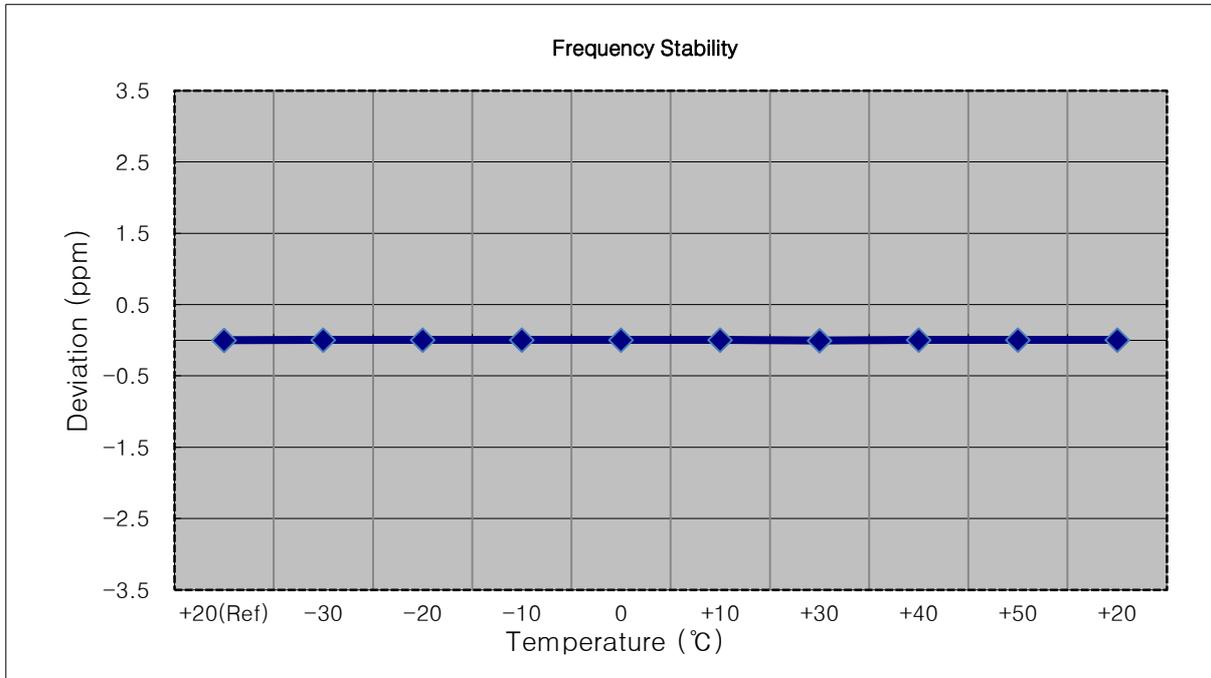
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1717,500,000 Hz
- ▣ CHANNEL: 132047 (15 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%)    | Power (VDC) | Temp. (°C) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm    |
|----------------|-------------|------------|----------------|----------------------|---------------|--------|
| 100 %          | 3.880       | +20(Ref)   | 1717 500 007   | 0.0                  | 0.000 000     | 0.000  |
| 100 %          |             | -30        | 1717 500 015   | 7.6                  | 0.000 000     | 0.004  |
| 100 %          |             | -20        | 1717 500 014   | 7.1                  | 0.000 000     | 0.004  |
| 100 %          |             | -10        | 1717 500 015   | 7.7                  | 0.000 000     | 0.004  |
| 100 %          |             | 0          | 1717 500 013   | 5.7                  | 0.000 000     | 0.003  |
| 100 %          |             | +10        | 1717 500 013   | 6.2                  | 0.000 000     | 0.004  |
| 100 %          |             | +30        | 1717 500 013   | 6.1                  | 0.000 000     | 0.004  |
| 100 %          |             | +40        | 1717 500 001   | -6.1                 | 0.000 000     | -0.004 |
| 100 %          |             | +50        | 1717 500 014   | 7.3                  | 0.000 000     | 0.004  |
| Batt. Endpoint | 3.400       | +20        | 1717 500 014   | 7.4                  | 0.000 000     | 0.004  |



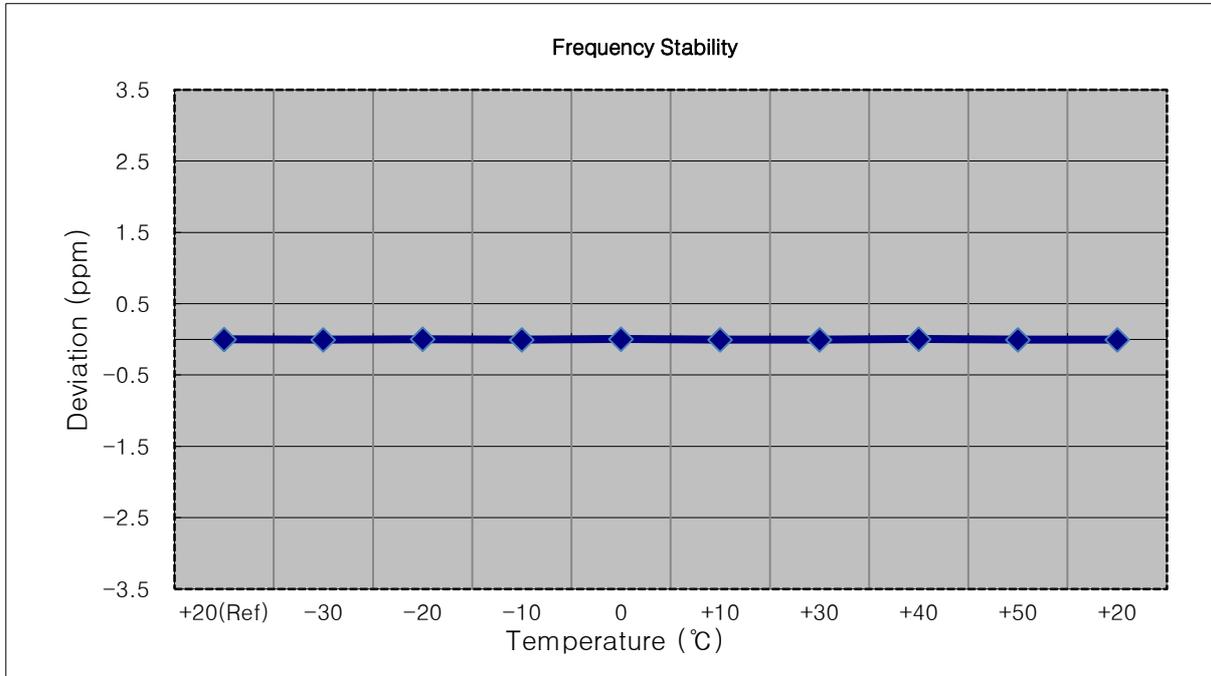
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1720,000,000 Hz
- ▣ CHANNEL: 132072 (20 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%)    | Power (VDC) | Temp. (°C) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm       |
|----------------|-------------|------------|----------------|----------------------|---------------|-----------|
| 100 %          | 3.880       | +20(Ref)   | 1720 000 008   | 0.0                  | 0.000 000     | 0.000     |
| 100 %          |             | -30        | 1720 000 014   | 6.0                  | 0.000 000     | 0.003     |
| 100 %          |             | -20        | 1720 000 016   | 7.9                  | 0.000 000     | 0.005     |
| 100 %          |             | -10        | 1720 000 014   | 5.8                  | 0.000 000     | 0.003     |
| 100 %          |             | 0          | 1720 000 015   | 7.0                  | 0.000 000     | 0.004     |
| 100 %          |             | +10        | 1720 000 016   | 8.0                  | 0.000 000     | 0.005     |
| 100 %          |             | +30        | 1720 000 001   | -7.2                 | 0.000 000     | -0.004    |
| 100 %          |             | +40        | 1720 000 015   | 7.0                  | 0.000 000     | 0.004     |
| 100 %          |             | +50        | 1720 000 015   | 6.5                  | 0.000 000     | 0.004     |
| Batt. Endpoint |             | 3.400      | +20            | 1720 000 014         | 6.1           | 0.000 000 |



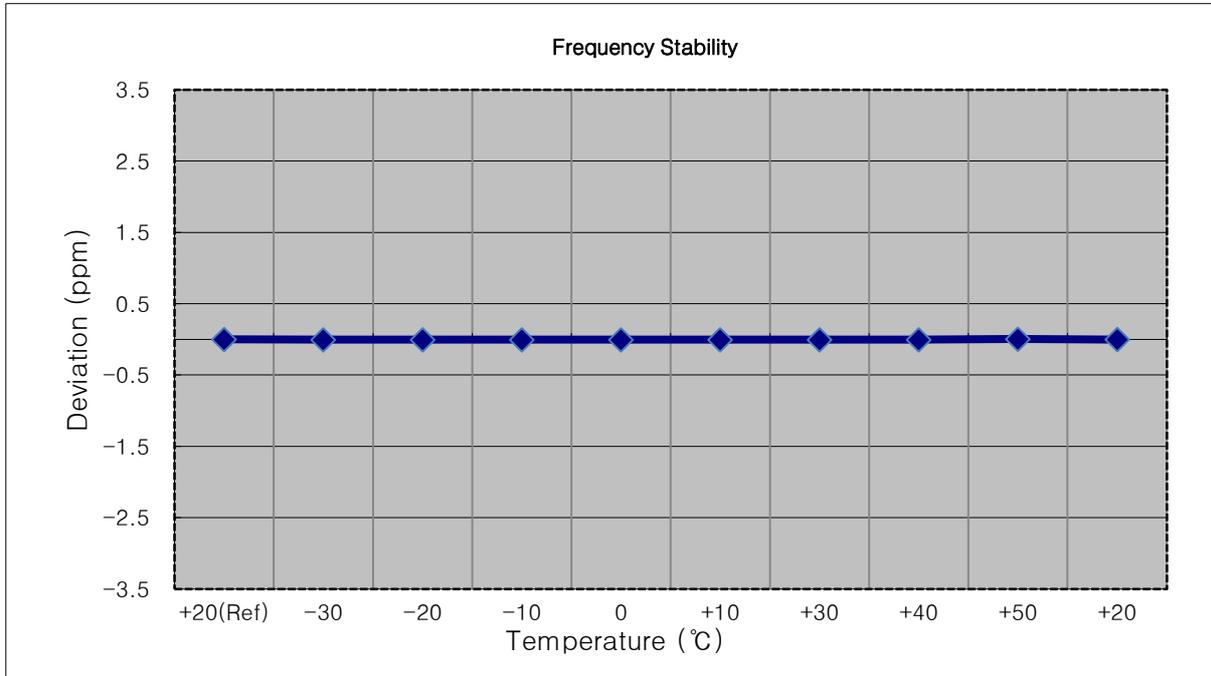
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1745,000,000 Hz
- ▣ CHANNEL: 132322 (1.4 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%)    | Power (VDC) | Temp. (°C) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm    |
|----------------|-------------|------------|----------------|----------------------|---------------|--------|
| 100 %          | 3.880       | +20(Ref)   | 1745 000 006   | 0.0                  | 0.000 000     | 0.000  |
| 100 %          |             | -30        | 1744 999 998   | -7.7                 | 0.000 000     | -0.004 |
| 100 %          |             | -20        | 1745 000 011   | 4.8                  | 0.000 000     | 0.003  |
| 100 %          |             | -10        | 1744 999 998   | -8.2                 | 0.000 000     | -0.005 |
| 100 %          |             | 0          | 1745 000 012   | 5.9                  | 0.000 000     | 0.003  |
| 100 %          |             | +10        | 1744 999 997   | -9.5                 | -0.000 001    | -0.005 |
| 100 %          |             | +30        | 1744 999 997   | -9.5                 | -0.000 001    | -0.005 |
| 100 %          |             | +40        | 1745 000 013   | 6.8                  | 0.000 000     | 0.004  |
| 100 %          |             | +50        | 1744 999 997   | -8.8                 | -0.000 001    | -0.005 |
| Batt. Endpoint | 3.400       | +20        | 1744 999 999   | -7.4                 | 0.000 000     | -0.004 |



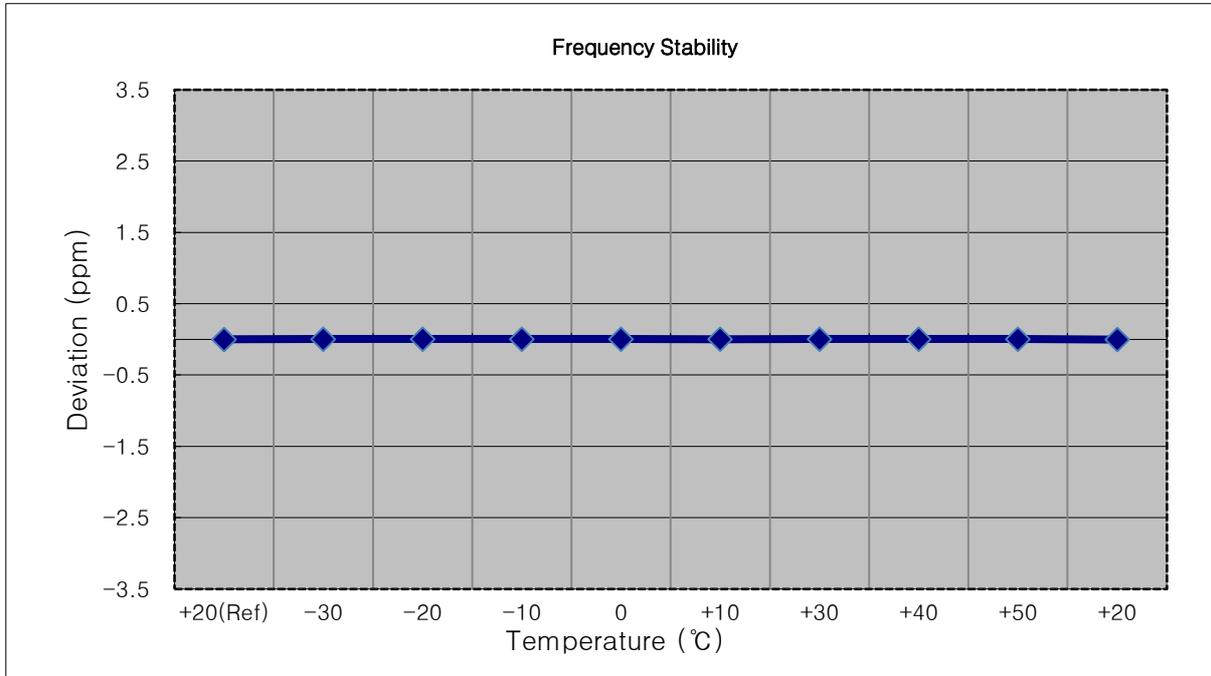
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1745,000,000 Hz
- ▣ CHANNEL: 132322 (3 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%)    | Power (VDC) | Temp. (°C) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm    |
|----------------|-------------|------------|----------------|----------------------|---------------|--------|
| 100 %          | 3.880       | +20(Ref)   | 1745 000 006   | 0.0                  | 0.000 000     | 0.000  |
| 100 %          |             | -30        | 1744 999 998   | -7.6                 | 0.000 000     | -0.004 |
| 100 %          |             | -20        | 1744 999 997   | -9.4                 | -0.000 001    | -0.005 |
| 100 %          |             | -10        | 1744 999 999   | -6.6                 | 0.000 000     | -0.004 |
| 100 %          |             | 0          | 1744 999 999   | -7.3                 | 0.000 000     | -0.004 |
| 100 %          |             | +10        | 1744 999 998   | -7.5                 | 0.000 000     | -0.004 |
| 100 %          |             | +30        | 1744 999 999   | -6.8                 | 0.000 000     | -0.004 |
| 100 %          |             | +40        | 1745 000 000   | -6.4                 | 0.000 000     | -0.004 |
| 100 %          |             | +50        | 1745 000 014   | 7.7                  | 0.000 000     | 0.004  |
| Batt. Endpoint | 3.400       | +20        | 1745 000 001   | -4.9                 | 0.000 000     | -0.003 |



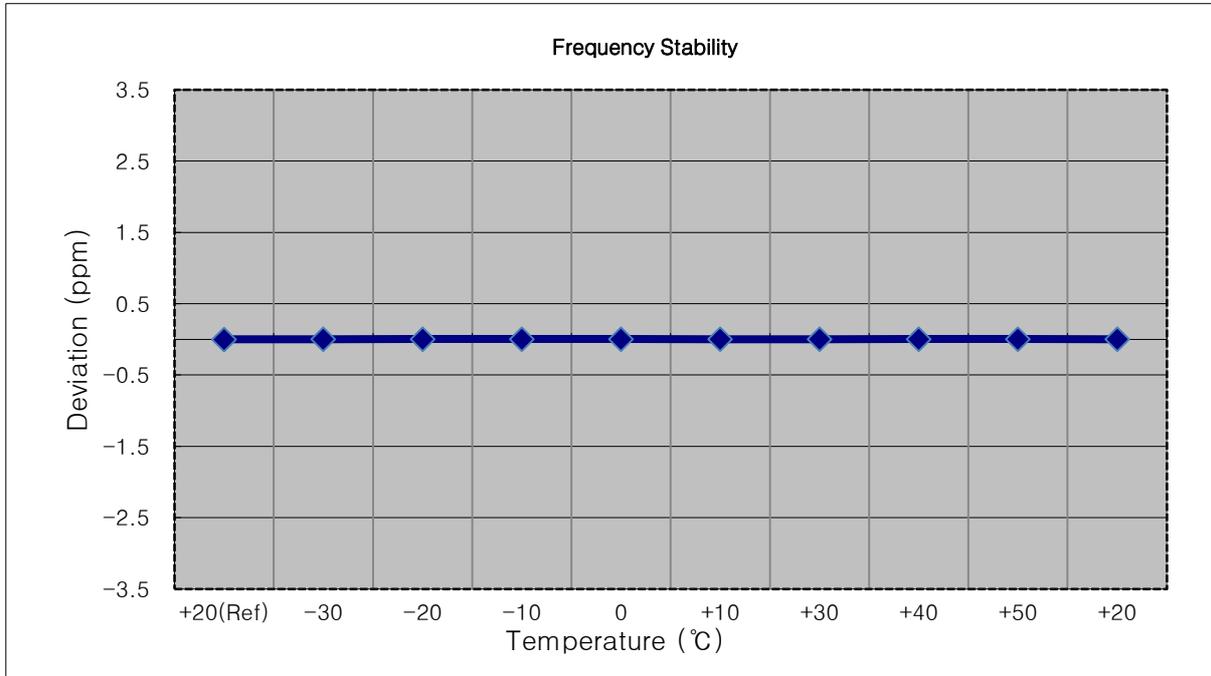
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1745,000,000 Hz
- ▣ CHANNEL: 132322 (5 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%)    | Power (VDC) | Temp. (°C) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm    |
|----------------|-------------|------------|----------------|----------------------|---------------|--------|
| 100 %          | 3.880       | +20(Ref)   | 1745 000 007   | 0.0                  | 0.000 000     | 0.000  |
| 100 %          |             | -30        | 1745 000 014   | 7.3                  | 0.000 000     | 0.004  |
| 100 %          |             | -20        | 1745 000 013   | 6.5                  | 0.000 000     | 0.004  |
| 100 %          |             | -10        | 1745 000 014   | 6.8                  | 0.000 000     | 0.004  |
| 100 %          |             | 0          | 1745 000 014   | 7.0                  | 0.000 000     | 0.004  |
| 100 %          |             | +10        | 1745 000 012   | 5.4                  | 0.000 000     | 0.003  |
| 100 %          |             | +30        | 1745 000 014   | 7.3                  | 0.000 000     | 0.004  |
| 100 %          |             | +40        | 1745 000 016   | 9.5                  | 0.000 001     | 0.005  |
| 100 %          |             | +50        | 1745 000 014   | 7.1                  | 0.000 000     | 0.004  |
| Batt. Endpoint | 3.400       | +20        | 1745 000 001   | -5.5                 | 0.000 000     | -0.003 |



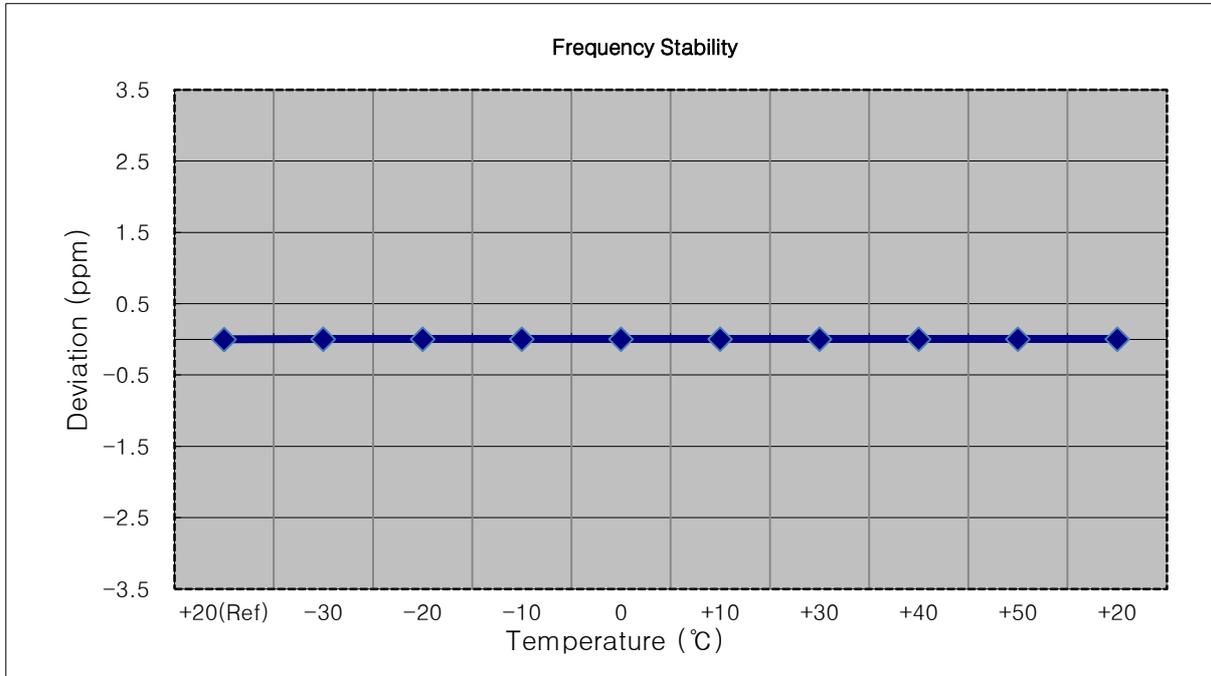
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1745,000,000 Hz
- ▣ CHANNEL: 132322 (10 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%)    | Power (VDC) | Temp. (°C) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm   |
|----------------|-------------|------------|----------------|----------------------|---------------|-------|
| 100 %          | 3.880       | +20(Ref)   | 1745 000 006   | 0.0                  | 0.000 000     | 0.000 |
| 100 %          |             | -30        | 1745 000 012   | 5.7                  | 0.000 000     | 0.003 |
| 100 %          |             | -20        | 1745 000 013   | 7.5                  | 0.000 000     | 0.004 |
| 100 %          |             | -10        | 1745 000 013   | 7.1                  | 0.000 000     | 0.004 |
| 100 %          |             | 0          | 1745 000 012   | 6.0                  | 0.000 000     | 0.003 |
| 100 %          |             | +10        | 1745 000 012   | 5.6                  | 0.000 000     | 0.003 |
| 100 %          |             | +30        | 1745 000 011   | 5.4                  | 0.000 000     | 0.003 |
| 100 %          |             | +40        | 1745 000 012   | 6.1                  | 0.000 000     | 0.003 |
| 100 %          |             | +50        | 1745 000 015   | 8.6                  | 0.000 000     | 0.005 |
| Batt. Endpoint | 3.400       | +20        | 1745 000 012   | 5.7                  | 0.000 000     | 0.003 |



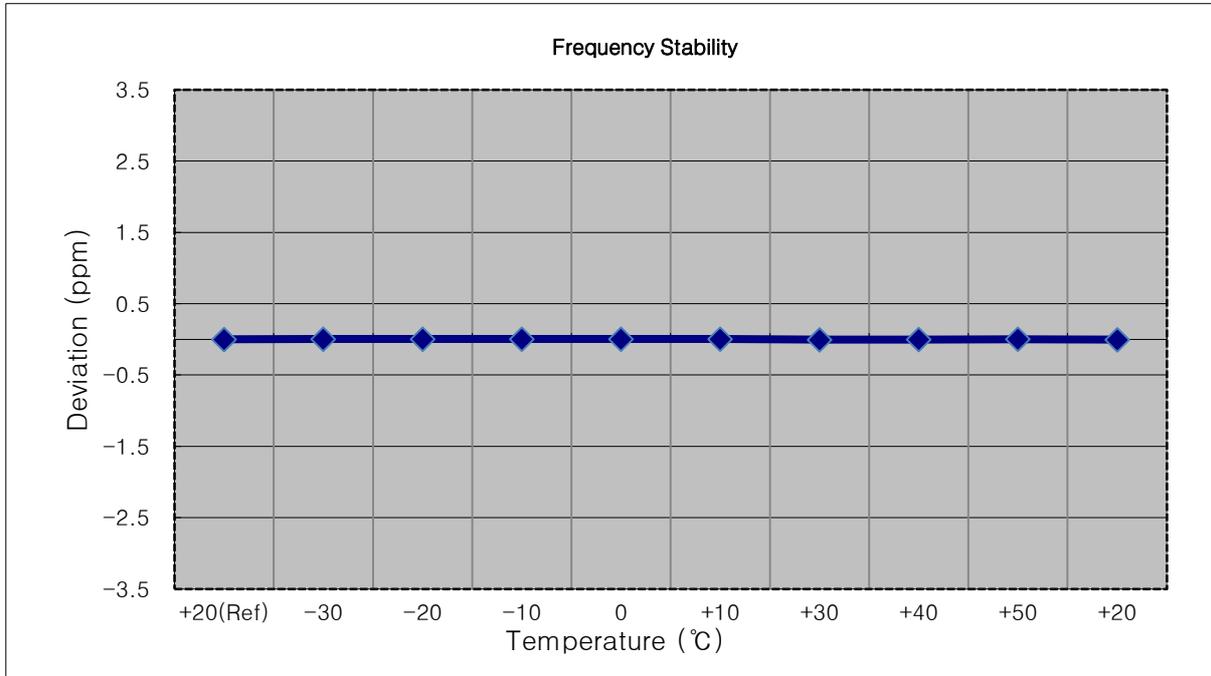
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1745,000,000 Hz
- ▣ CHANNEL: 132322 (15 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%)    | Power (VDC) | Temp. (°C) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm   |
|----------------|-------------|------------|----------------|----------------------|---------------|-------|
| 100 %          | 3.880       | +20(Ref)   | 1745 000 007   | 0.0                  | 0.000 000     | 0.000 |
| 100 %          |             | -30        | 1745 000 014   | 7.1                  | 0.000 000     | 0.004 |
| 100 %          |             | -20        | 1745 000 014   | 6.9                  | 0.000 000     | 0.004 |
| 100 %          |             | -10        | 1745 000 014   | 7.7                  | 0.000 000     | 0.004 |
| 100 %          |             | 0          | 1745 000 013   | 6.7                  | 0.000 000     | 0.004 |
| 100 %          |             | +10        | 1745 000 014   | 6.9                  | 0.000 000     | 0.004 |
| 100 %          |             | +30        | 1745 000 013   | 6.7                  | 0.000 000     | 0.004 |
| 100 %          |             | +40        | 1745 000 013   | 6.2                  | 0.000 000     | 0.004 |
| 100 %          |             | +50        | 1745 000 014   | 6.8                  | 0.000 000     | 0.004 |
| Batt. Endpoint | 3.400       | +20        | 1745 000 014   | 7.0                  | 0.000 000     | 0.004 |



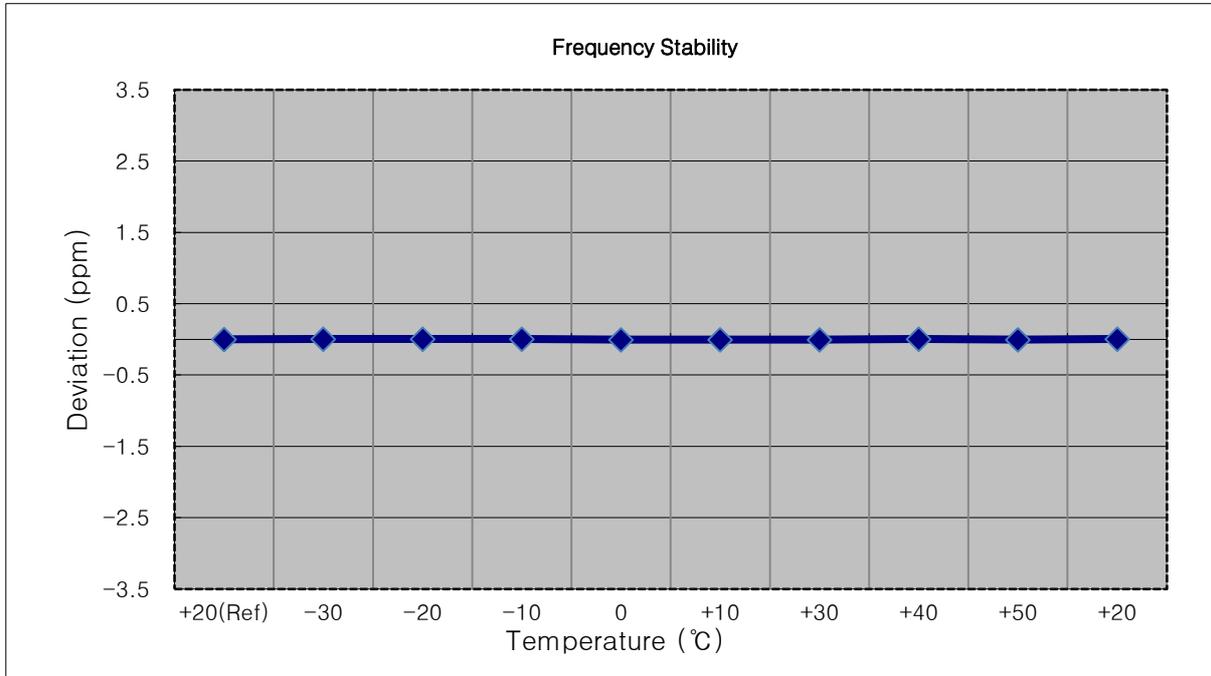
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1745,000,000 Hz
- ▣ CHANNEL: 132322 (20 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%)    | Power (VDC) | Temp. (°C) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm    |
|----------------|-------------|------------|----------------|----------------------|---------------|--------|
| 100 %          | 3.880       | +20(Ref)   | 1745 000 006   | 0.0                  | 0.000 000     | 0.000  |
| 100 %          |             | -30        | 1745 000 012   | 6.0                  | 0.000 000     | 0.003  |
| 100 %          |             | -20        | 1745 000 013   | 6.9                  | 0.000 000     | 0.004  |
| 100 %          |             | -10        | 1745 000 013   | 6.4                  | 0.000 000     | 0.004  |
| 100 %          |             | 0          | 1745 000 013   | 6.7                  | 0.000 000     | 0.004  |
| 100 %          |             | +10        | 1745 000 012   | 5.9                  | 0.000 000     | 0.003  |
| 100 %          |             | +30        | 1745 000 000   | -6.2                 | 0.000 000     | -0.004 |
| 100 %          |             | +40        | 1745 000 001   | -5.9                 | 0.000 000     | -0.003 |
| 100 %          |             | +50        | 1745 000 012   | 5.6                  | 0.000 000     | 0.003  |
| Batt. Endpoint | 3.400       | +20        | 1745 000 000   | -6.1                 | 0.000 000     | -0.003 |



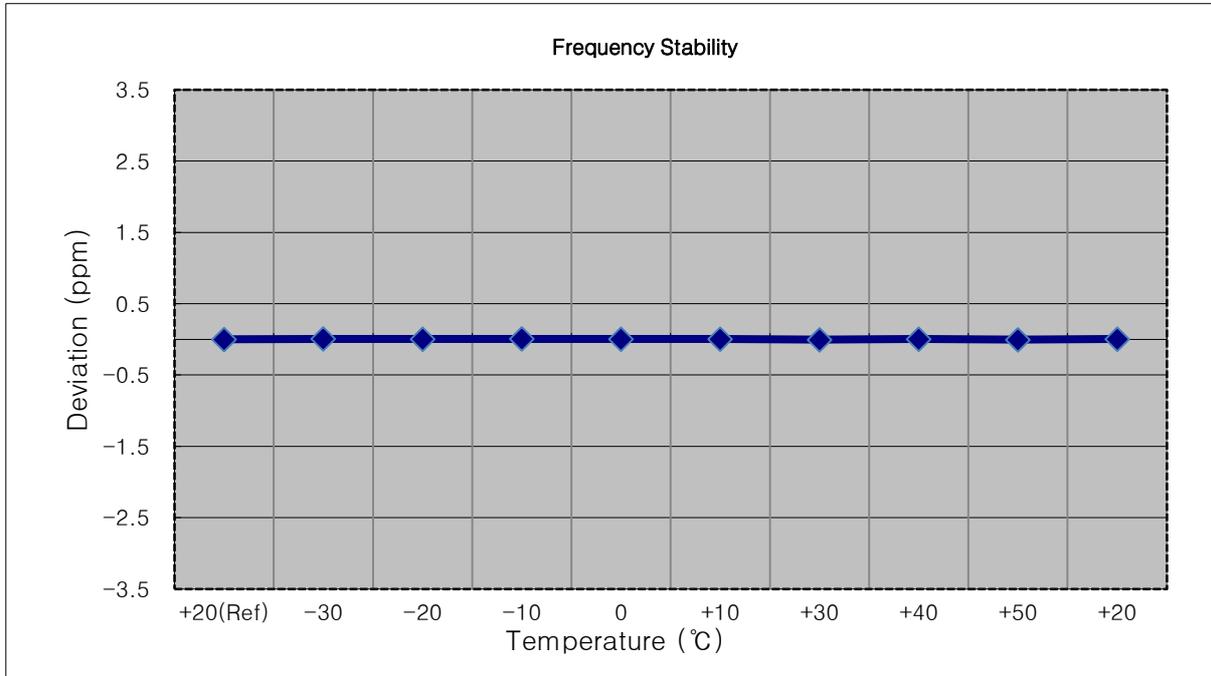
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1779,300,000 Hz
- ▣ CHANNEL: 132665 (1.4 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%)    | Power (VDC) | Temp. (°C) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm    |
|----------------|-------------|------------|----------------|----------------------|---------------|--------|
| 100 %          | 3.880       | +20(Ref)   | 1779 300 007   | 0.0                  | 0.000 000     | 0.000  |
| 100 %          |             | -30        | 1779 300 014   | 7.7                  | 0.000 000     | 0.004  |
| 100 %          |             | -20        | 1779 300 016   | 8.9                  | 0.000 001     | 0.005  |
| 100 %          |             | -10        | 1779 300 014   | 7.3                  | 0.000 000     | 0.004  |
| 100 %          |             | 0          | 1779 300 000   | -7.1                 | 0.000 000     | -0.004 |
| 100 %          |             | +10        | 1779 299 999   | -7.2                 | 0.000 000     | -0.004 |
| 100 %          |             | +30        | 1779 299 999   | -7.8                 | 0.000 000     | -0.004 |
| 100 %          |             | +40        | 1779 300 015   | 8.8                  | 0.000 000     | 0.005  |
| 100 %          |             | +50        | 1779 300 000   | -6.9                 | 0.000 000     | -0.004 |
| Batt. Endpoint | 3.400       | +20        | 1779 300 013   | 6.7                  | 0.000 000     | 0.004  |



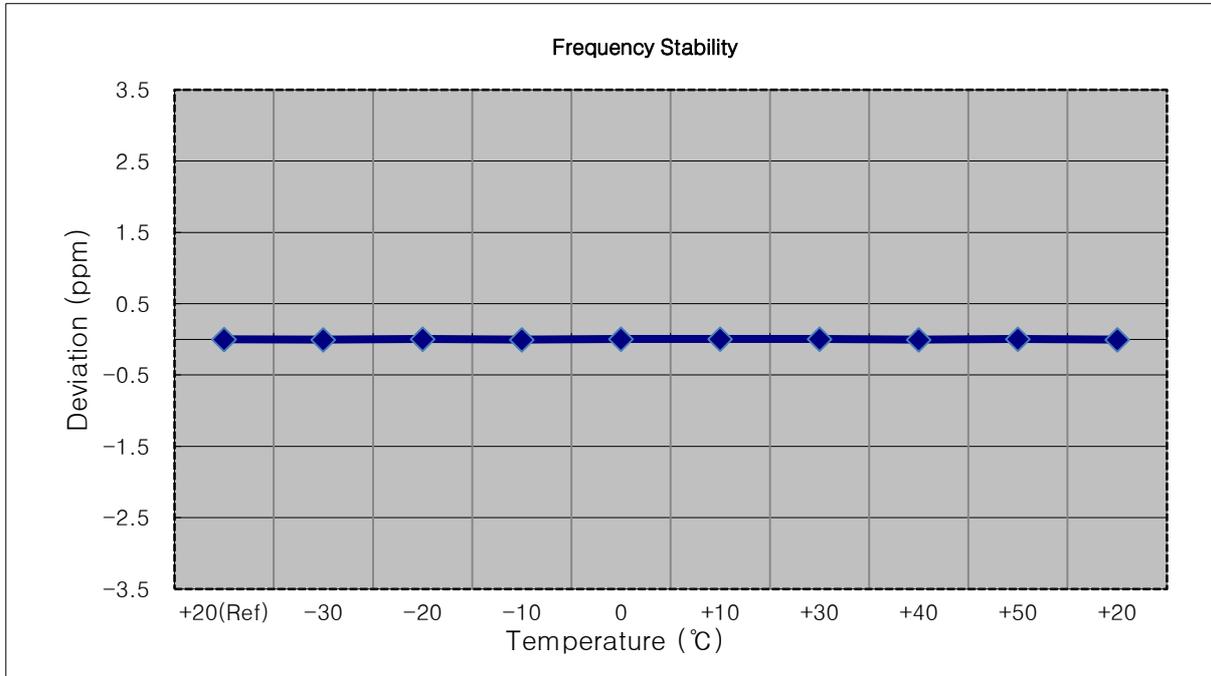
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1778,500,000 Hz
- ▣ CHANNEL: 132657 (3 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%)    | Power (VDC) | Temp. (°C) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm    |
|----------------|-------------|------------|----------------|----------------------|---------------|--------|
| 100 %          | 3.880       | +20(Ref)   | 1778 500 010   | 0.0                  | 0.000 000     | 0.000  |
| 100 %          |             | -30        | 1778 500 020   | 10.2                 | 0.000 001     | 0.006  |
| 100 %          |             | -20        | 1778 500 019   | 9.1                  | 0.000 001     | 0.005  |
| 100 %          |             | -10        | 1778 500 020   | 10.1                 | 0.000 001     | 0.006  |
| 100 %          |             | 0          | 1778 500 017   | 7.6                  | 0.000 000     | 0.004  |
| 100 %          |             | +10        | 1778 500 017   | 7.4                  | 0.000 000     | 0.004  |
| 100 %          |             | +30        | 1778 500 003   | -7.0                 | 0.000 000     | -0.004 |
| 100 %          |             | +40        | 1778 500 017   | 7.3                  | 0.000 000     | 0.004  |
| 100 %          |             | +50        | 1778 500 002   | -7.8                 | 0.000 000     | -0.004 |
| Batt. Endpoint | 3.400       | +20        | 1778 500 019   | 9.8                  | 0.000 001     | 0.006  |



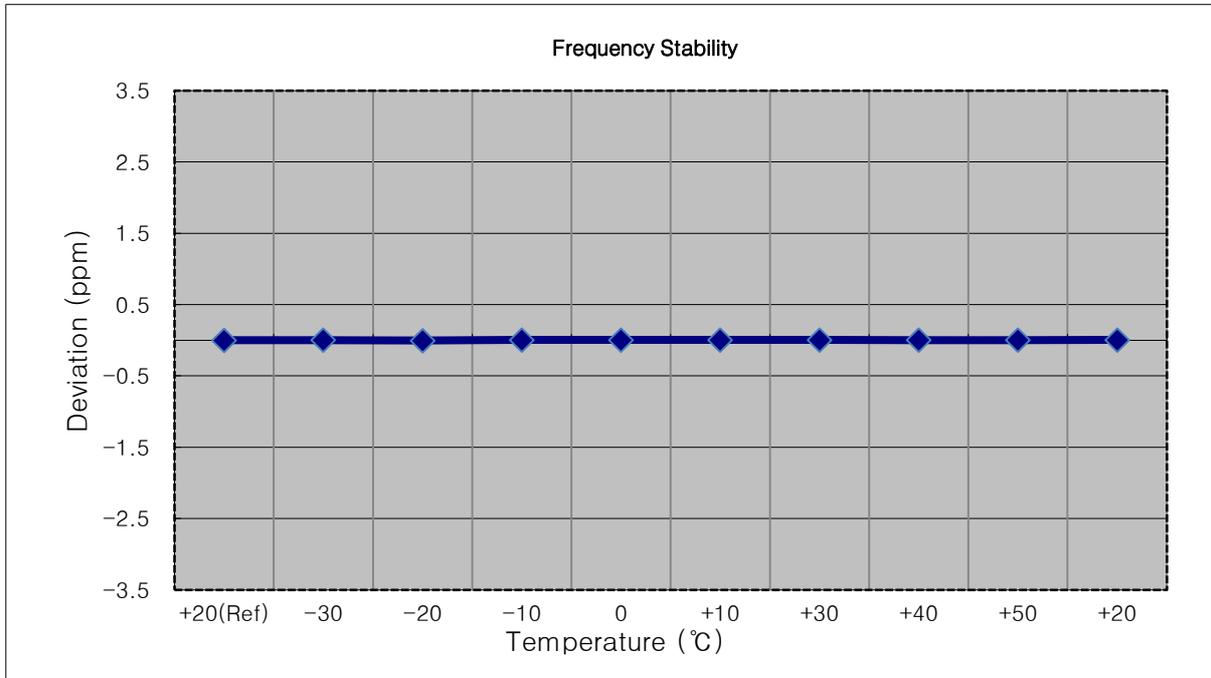
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1777,500,000 Hz
- ▣ CHANNEL: 132647 (5 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%)    | Power (VDC) | Temp. (°C) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm    |
|----------------|-------------|------------|----------------|----------------------|---------------|--------|
| 100 %          | 3.880       | +20(Ref)   | 1777 500 007   | 0.0                  | 0.000 000     | 0.000  |
| 100 %          |             | -30        | 1777 500 000   | -6.8                 | 0.000 000     | -0.004 |
| 100 %          |             | -20        | 1777 500 014   | 6.7                  | 0.000 000     | 0.004  |
| 100 %          |             | -10        | 1777 500 001   | -6.3                 | 0.000 000     | -0.004 |
| 100 %          |             | 0          | 1777 500 015   | 7.9                  | 0.000 000     | 0.004  |
| 100 %          |             | +10        | 1777 500 015   | 7.4                  | 0.000 000     | 0.004  |
| 100 %          |             | +30        | 1777 500 014   | 6.4                  | 0.000 000     | 0.004  |
| 100 %          |             | +40        | 1777 500 000   | -7.2                 | 0.000 000     | -0.004 |
| 100 %          |             | +50        | 1777 500 015   | 8.0                  | 0.000 000     | 0.005  |
| Batt. Endpoint | 3.400       | +20        | 1777 500 000   | -7.2                 | 0.000 000     | -0.004 |



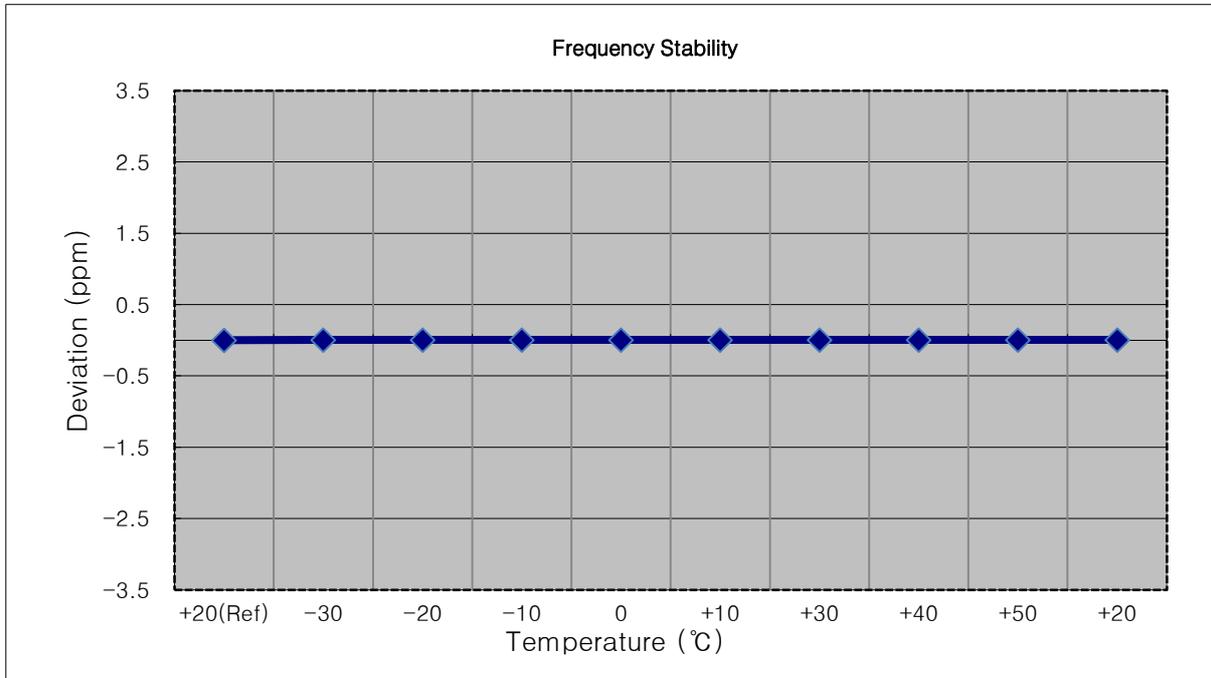
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1775,000,000 Hz
- ▣ CHANNEL: 132622 (10 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%)    | Power (VDC) | Temp. (°C) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm       |
|----------------|-------------|------------|----------------|----------------------|---------------|-----------|
| 100 %          | 3.880       | +20(Ref)   | 1775 000 007   | 0.0                  | 0.000 000     | 0.000     |
| 100 %          |             | -30        | 1775 000 013   | 5.7                  | 0.000 000     | 0.003     |
| 100 %          |             | -20        | 1775 000 001   | -6.5                 | 0.000 000     | -0.004    |
| 100 %          |             | -10        | 1775 000 014   | 6.6                  | 0.000 000     | 0.004     |
| 100 %          |             | 0          | 1775 000 015   | 8.0                  | 0.000 000     | 0.005     |
| 100 %          |             | +10        | 1775 000 014   | 6.6                  | 0.000 000     | 0.004     |
| 100 %          |             | +30        | 1775 000 014   | 6.5                  | 0.000 000     | 0.004     |
| 100 %          |             | +40        | 1775 000 013   | 5.1                  | 0.000 000     | 0.003     |
| 100 %          |             | +50        | 1775 000 013   | 5.7                  | 0.000 000     | 0.003     |
| Batt. Endpoint |             | 3.400      | +20            | 1775 000 014         | 6.5           | 0.000 000 |



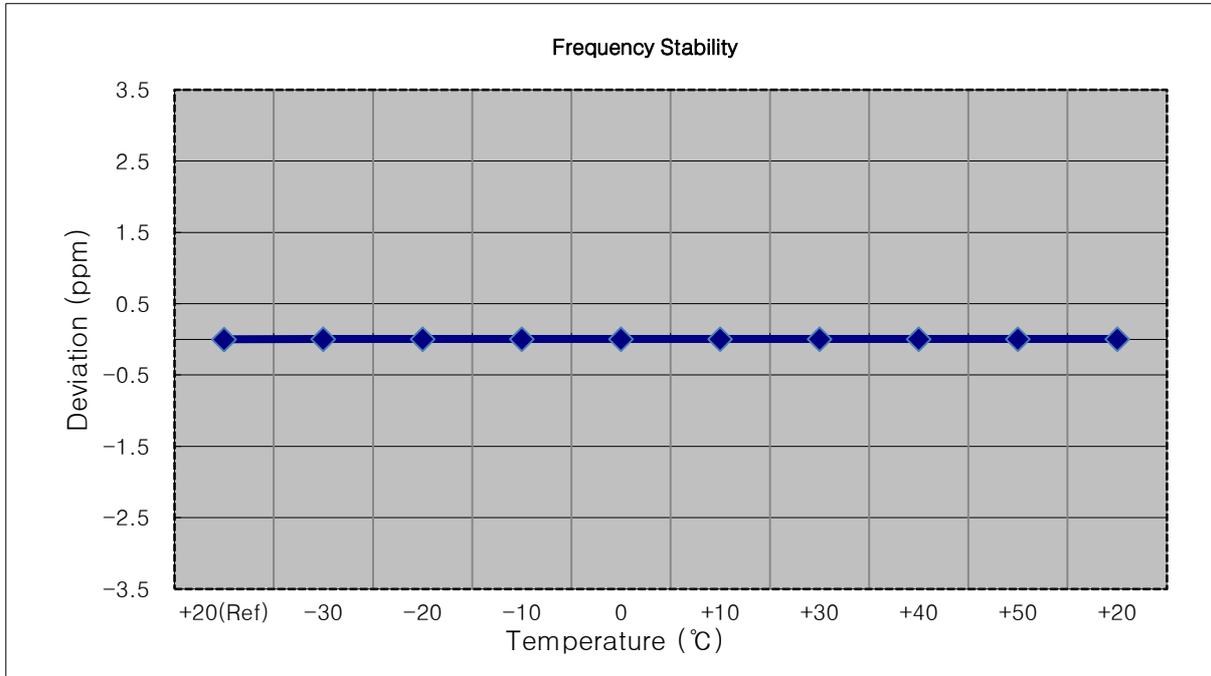
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1772,500,000 Hz
- ▣ CHANNEL: 132597 (15 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%)    | Power (VDC) | Temp. (°C) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm       |
|----------------|-------------|------------|----------------|----------------------|---------------|-----------|
| 100 %          | 3.880       | +20(Ref)   | 1772 500 006   | 0.0                  | 0.000 000     | 0.000     |
| 100 %          |             | -30        | 1772 500 012   | 5.9                  | 0.000 000     | 0.003     |
| 100 %          |             | -20        | 1772 500 014   | 7.9                  | 0.000 000     | 0.004     |
| 100 %          |             | -10        | 1772 500 013   | 7.2                  | 0.000 000     | 0.004     |
| 100 %          |             | 0          | 1772 500 014   | 8.1                  | 0.000 000     | 0.005     |
| 100 %          |             | +10        | 1772 500 013   | 7.4                  | 0.000 000     | 0.004     |
| 100 %          |             | +30        | 1772 500 014   | 8.0                  | 0.000 000     | 0.005     |
| 100 %          |             | +40        | 1772 500 013   | 7.8                  | 0.000 000     | 0.004     |
| 100 %          |             | +50        | 1772 500 012   | 6.8                  | 0.000 000     | 0.004     |
| Batt. Endpoint |             | 3.400      | +20            | 1772 500 012         | 6.4           | 0.000 000 |



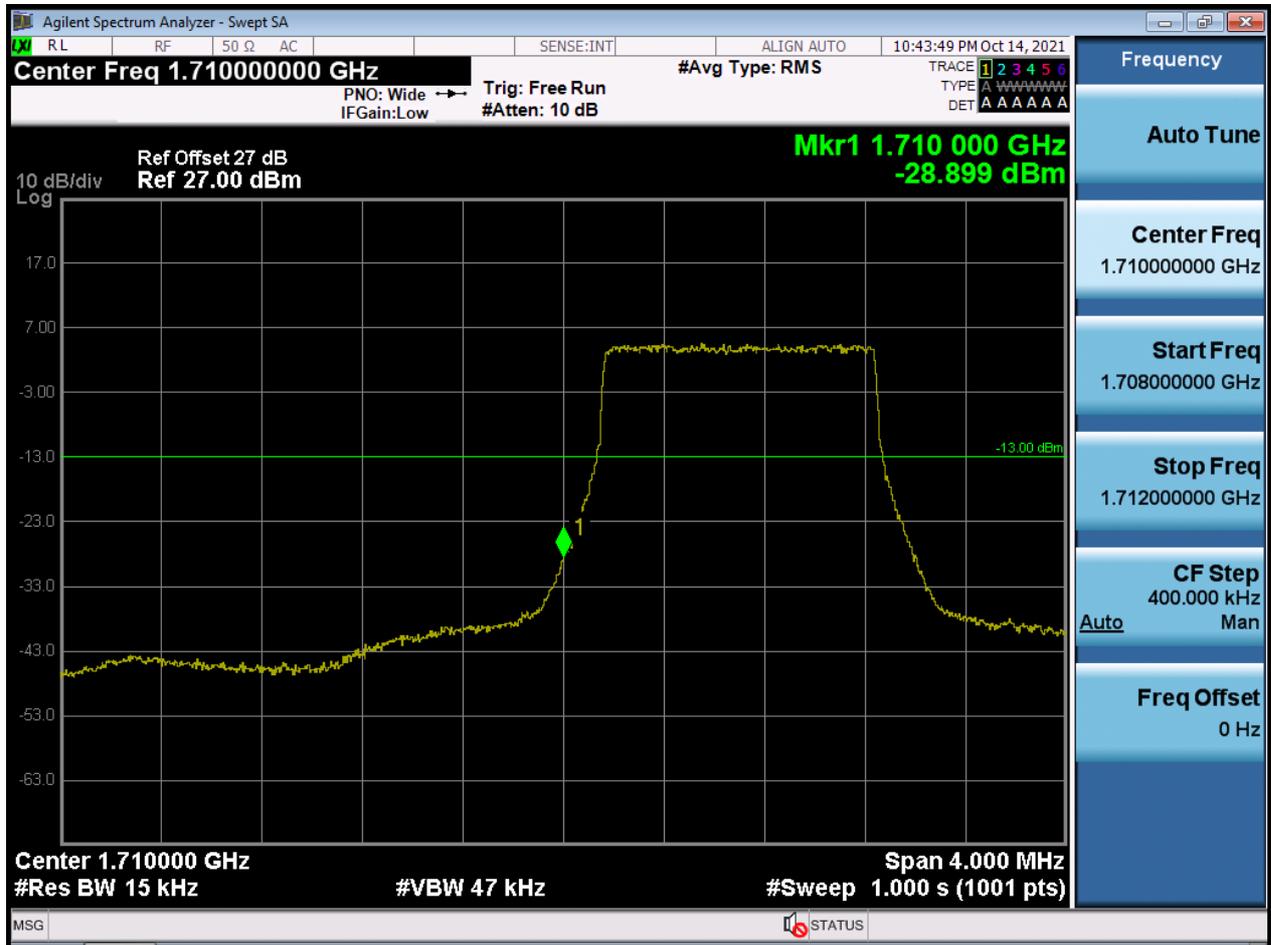
- ▣ MODE: LTE 66/4
- ▣ OPERATING FREQUENCY: 1770,000,000 Hz
- ▣ CHANNEL: 132572 (20 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

| Voltage (%)    | Power (VDC) | Temp. (°C) | Frequency (Hz) | Frequency Error (Hz) | Deviation (%) | ppm   |
|----------------|-------------|------------|----------------|----------------------|---------------|-------|
| 100 %          | 3.880       | +20(Ref)   | 1770 000 009   | 0.0                  | 0.000 000     | 0.000 |
| 100 %          |             | -30        | 1770 000 015   | 6.8                  | 0.000 000     | 0.004 |
| 100 %          |             | -20        | 1770 000 017   | 8.1                  | 0.000 000     | 0.005 |
| 100 %          |             | -10        | 1770 000 015   | 6.7                  | 0.000 000     | 0.004 |
| 100 %          |             | 0          | 1770 000 015   | 6.4                  | 0.000 000     | 0.004 |
| 100 %          |             | +10        | 1770 000 015   | 6.3                  | 0.000 000     | 0.004 |
| 100 %          |             | +30        | 1770 000 016   | 7.3                  | 0.000 000     | 0.004 |
| 100 %          |             | +40        | 1770 000 015   | 6.3                  | 0.000 000     | 0.004 |
| 100 %          |             | +50        | 1770 000 015   | 6.6                  | 0.000 000     | 0.004 |
| Batt. Endpoint | 3.400       | +20        | 1770 000 016   | 7.1                  | 0.000 000     | 0.004 |

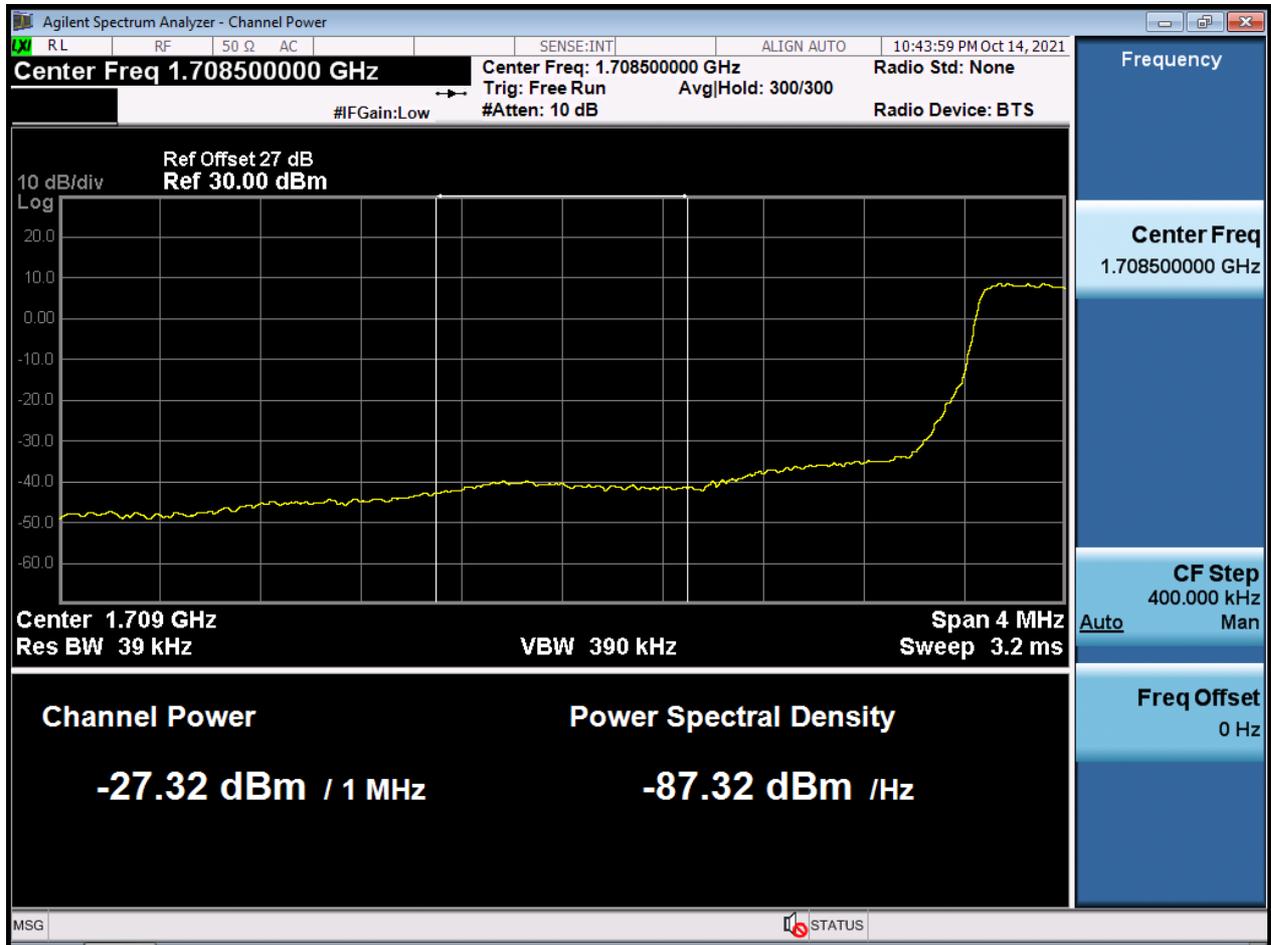


## 9. TEST PLOTS

BW1.4 M\_BandEdge\_Lowest Channel\_QPSK\_FullRB(1)



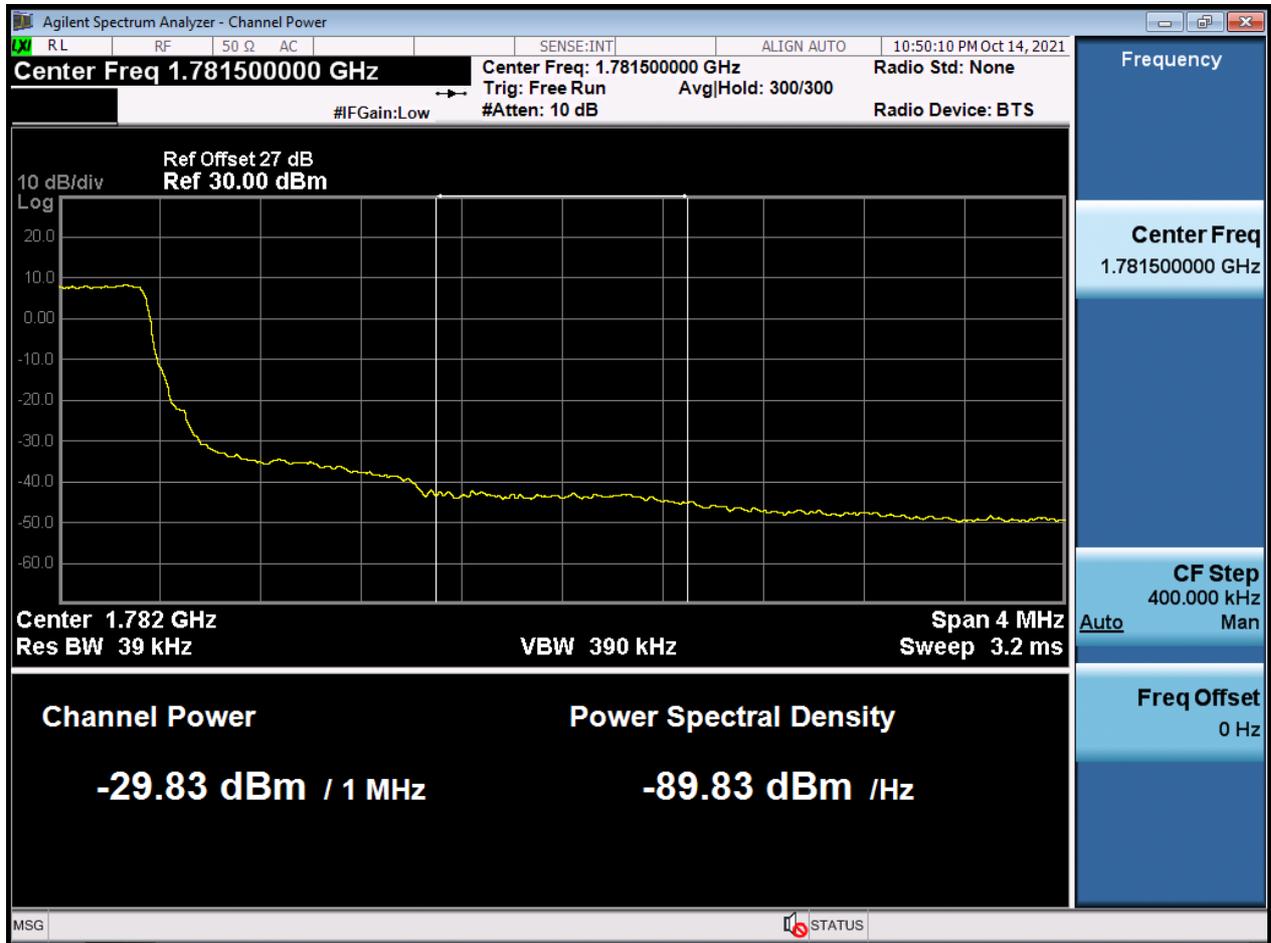
BW1.4 M\_BandEdge\_Lowest Channel\_QPSK\_FullRB(2)



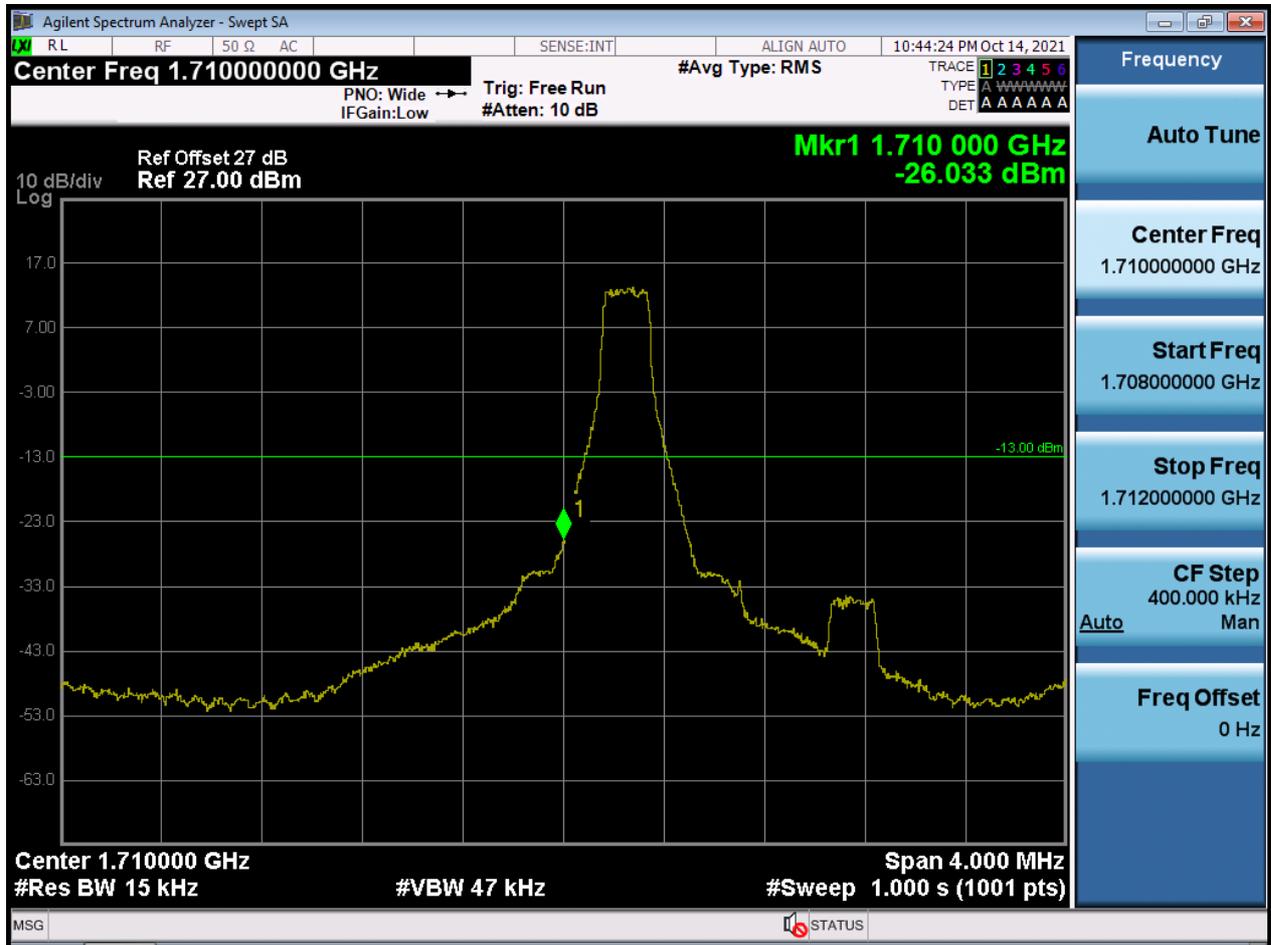
BW1.4 M\_BandEdge\_Highest Channel\_QPSK\_FullIRB(1)



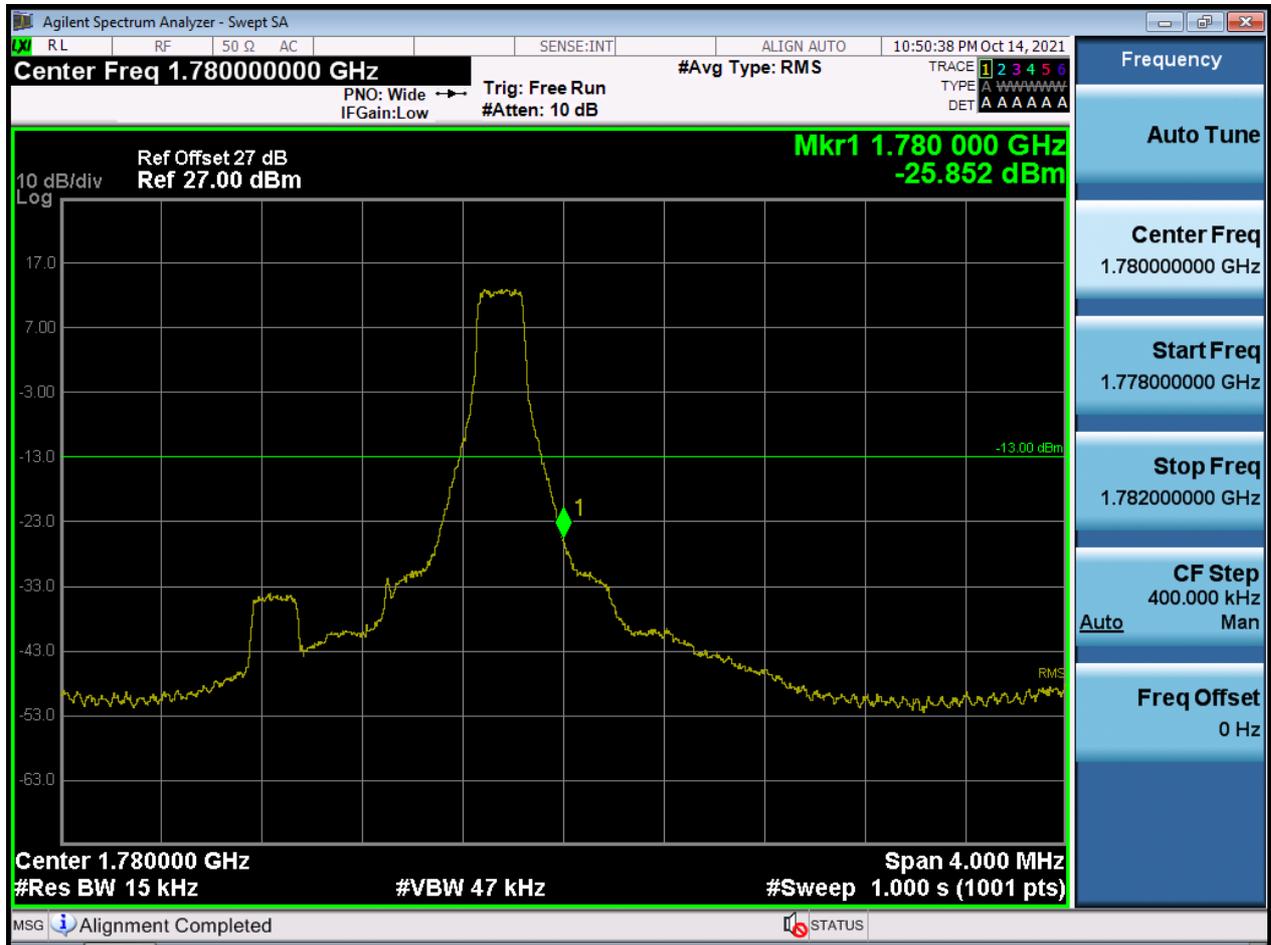
BW1.4 M\_BandEdge\_Highest Channel\_QPSK\_FullIRB(2)



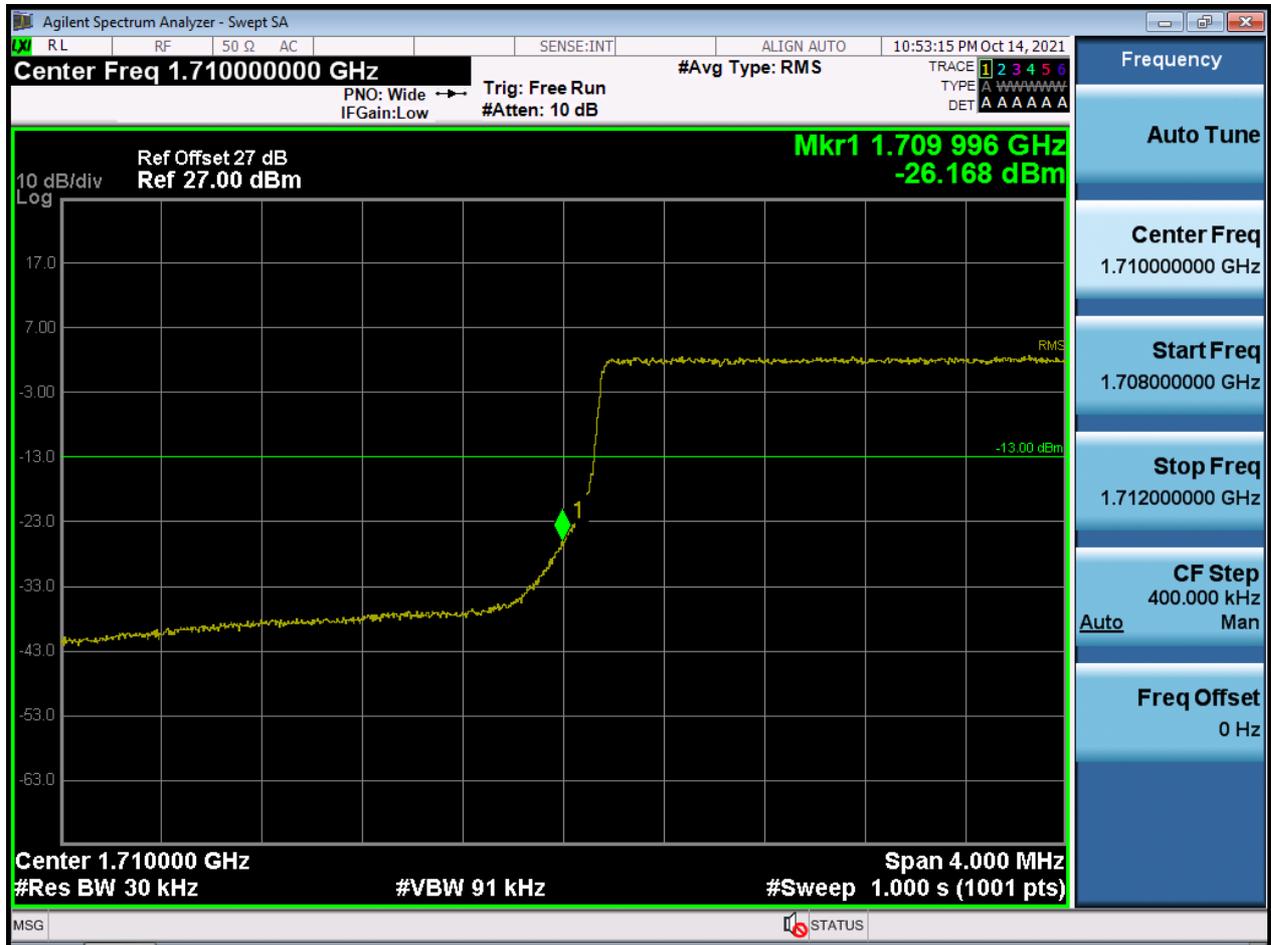
BW1.4 M\_BandEdge\_Lowest Channel\_QPSK\_1RB



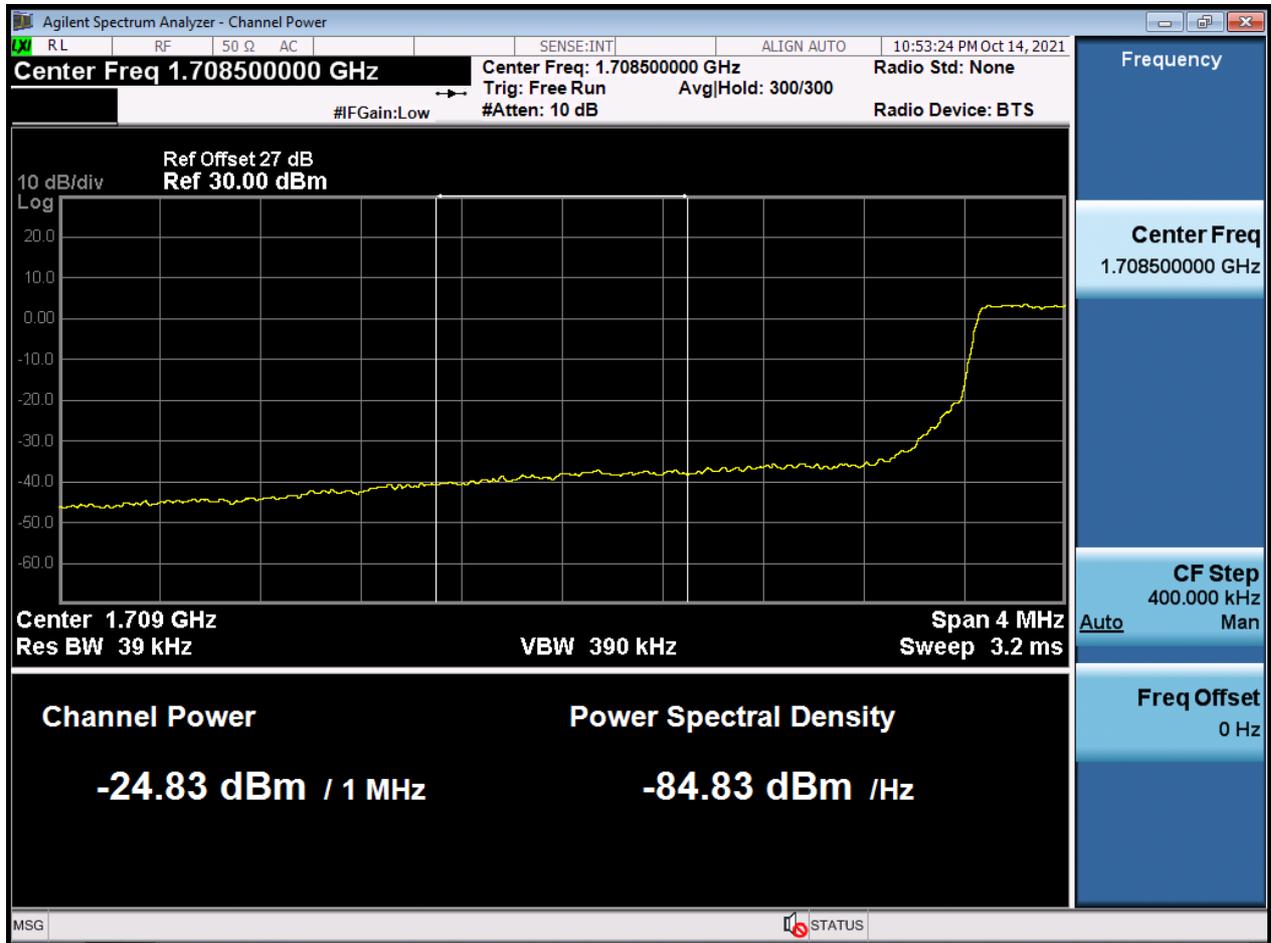
BW1.4 M\_BandEdge\_Highest Channel\_QPSK\_1RB



BW3 M\_BandEdge\_Lowest Channel\_QPSK\_FullIRB(1)



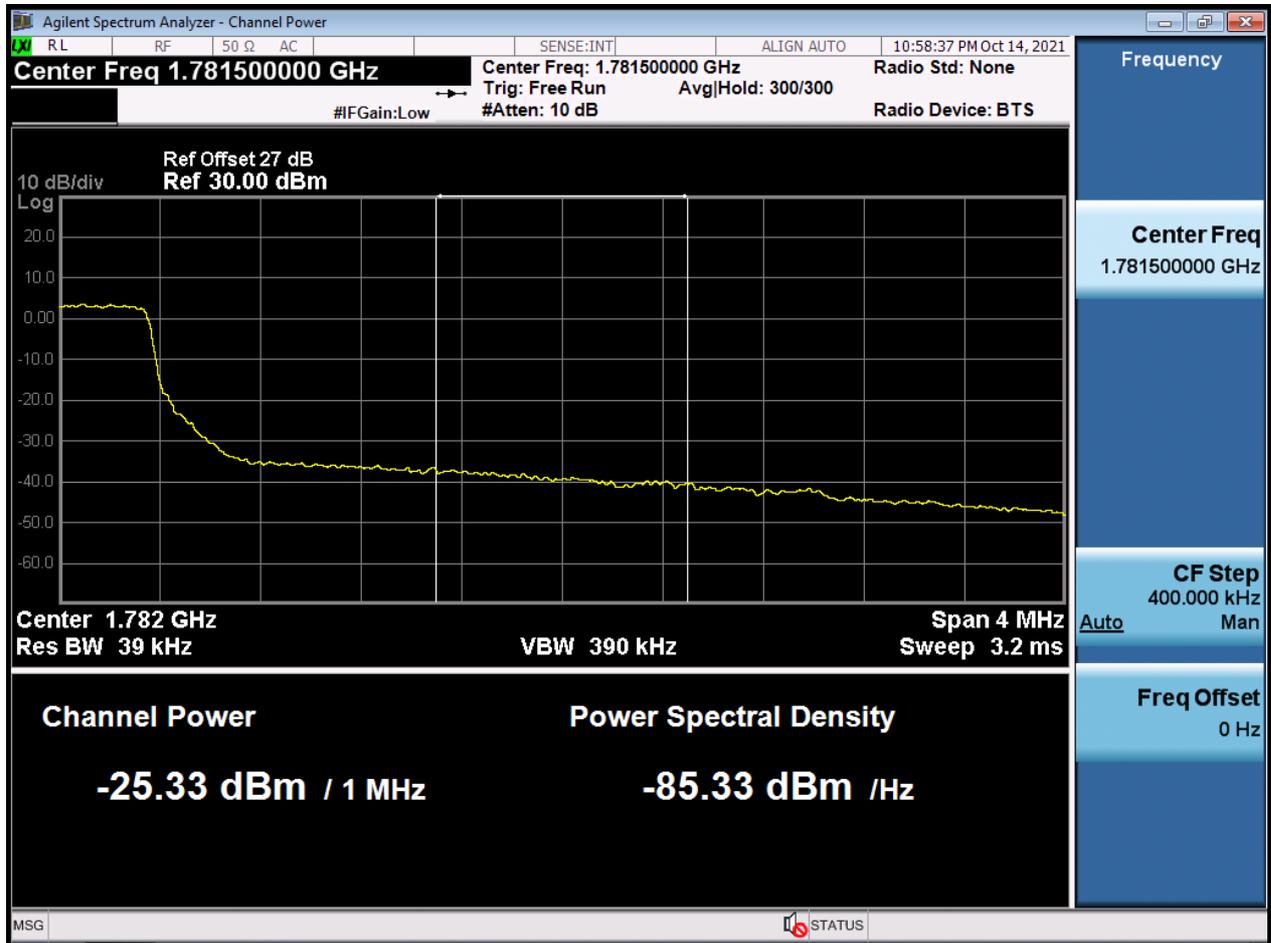
BW3 M\_BandEdge\_Lowest Channel\_QPSK\_FullIRB(2)



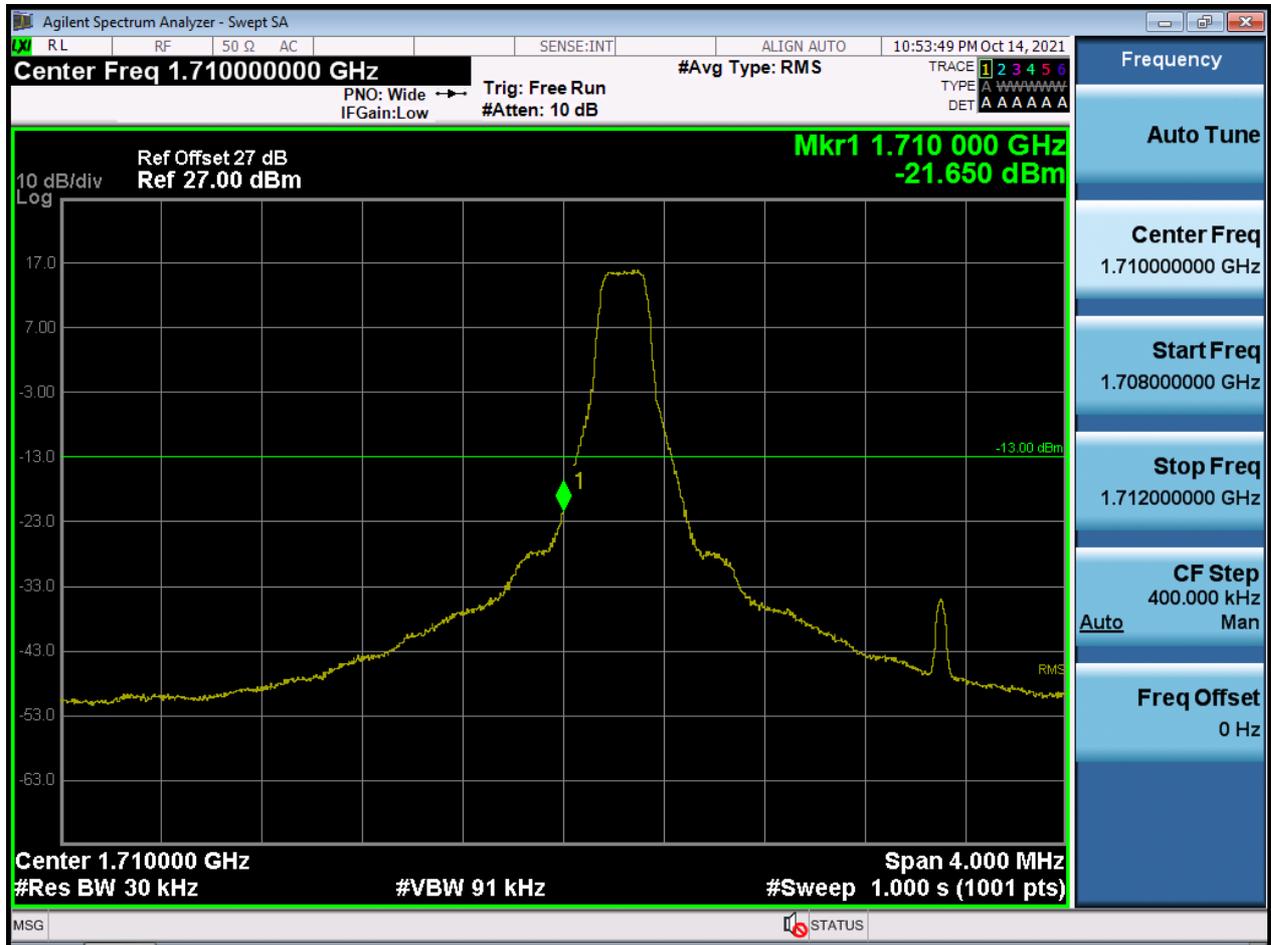
BW3 M\_BandEdge\_Highest Channel\_QPSK\_FullRB(1)



BW3 M\_BandEdge\_Highest Channel\_QPSK\_FullRB(2)



BW3 M\_BandEdge\_Lowest Channel\_QPSK\_1RB



BW3 M\_BandEdge\_Highest Channel\_QPSK\_1RB



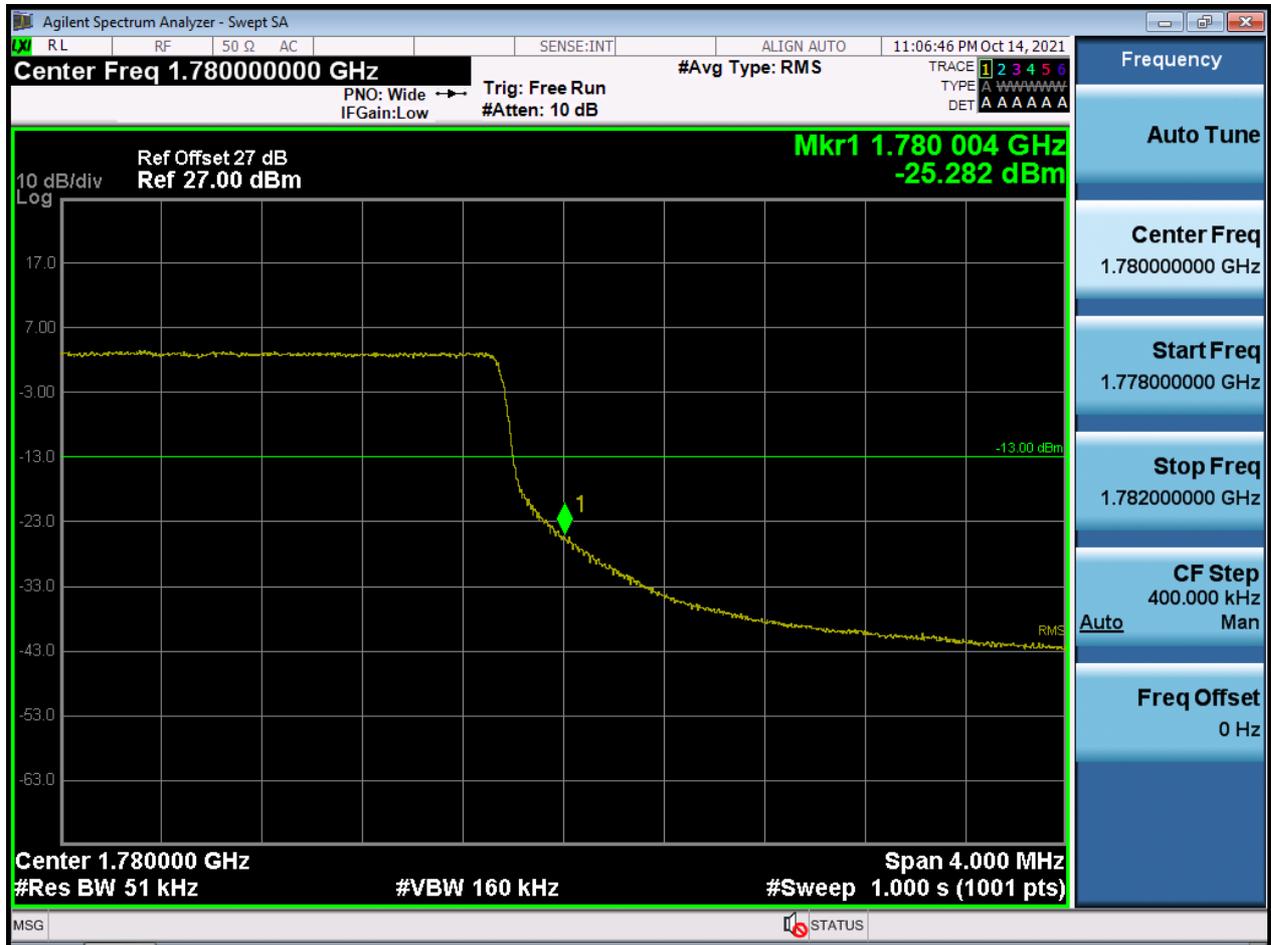
BW5 M\_BandEdge\_Lowest Channel\_QPSK\_FullIRB(1)



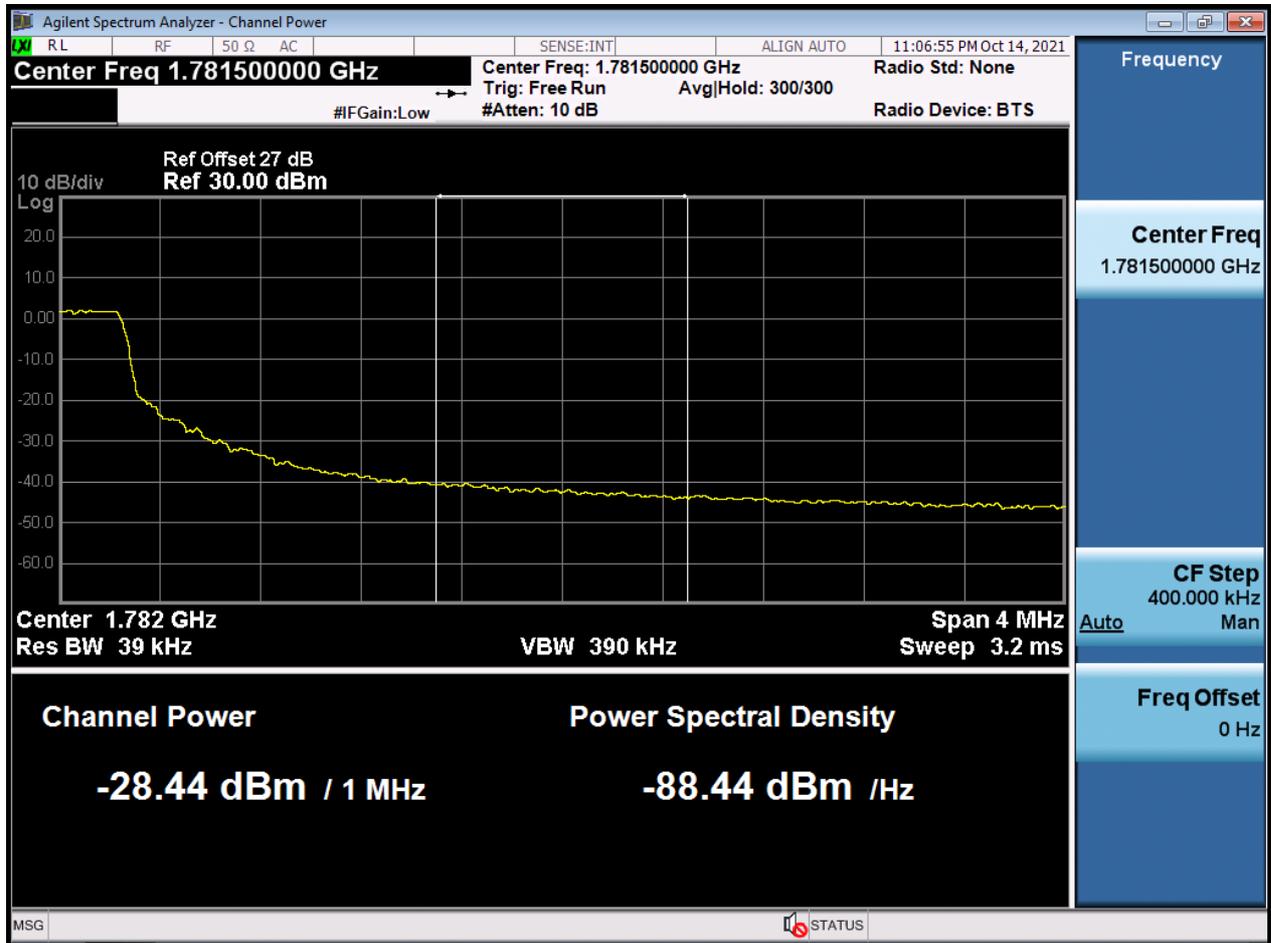
BW5 M\_BandEdge\_Lowest Channel\_QPSK\_FullIRB(2)



BW5 M\_BandEdge\_Highest Channel\_QPSK\_FullRB(1)



BW5 M\_BandEdge\_Highest Channel\_QPSK\_FullRB(2)



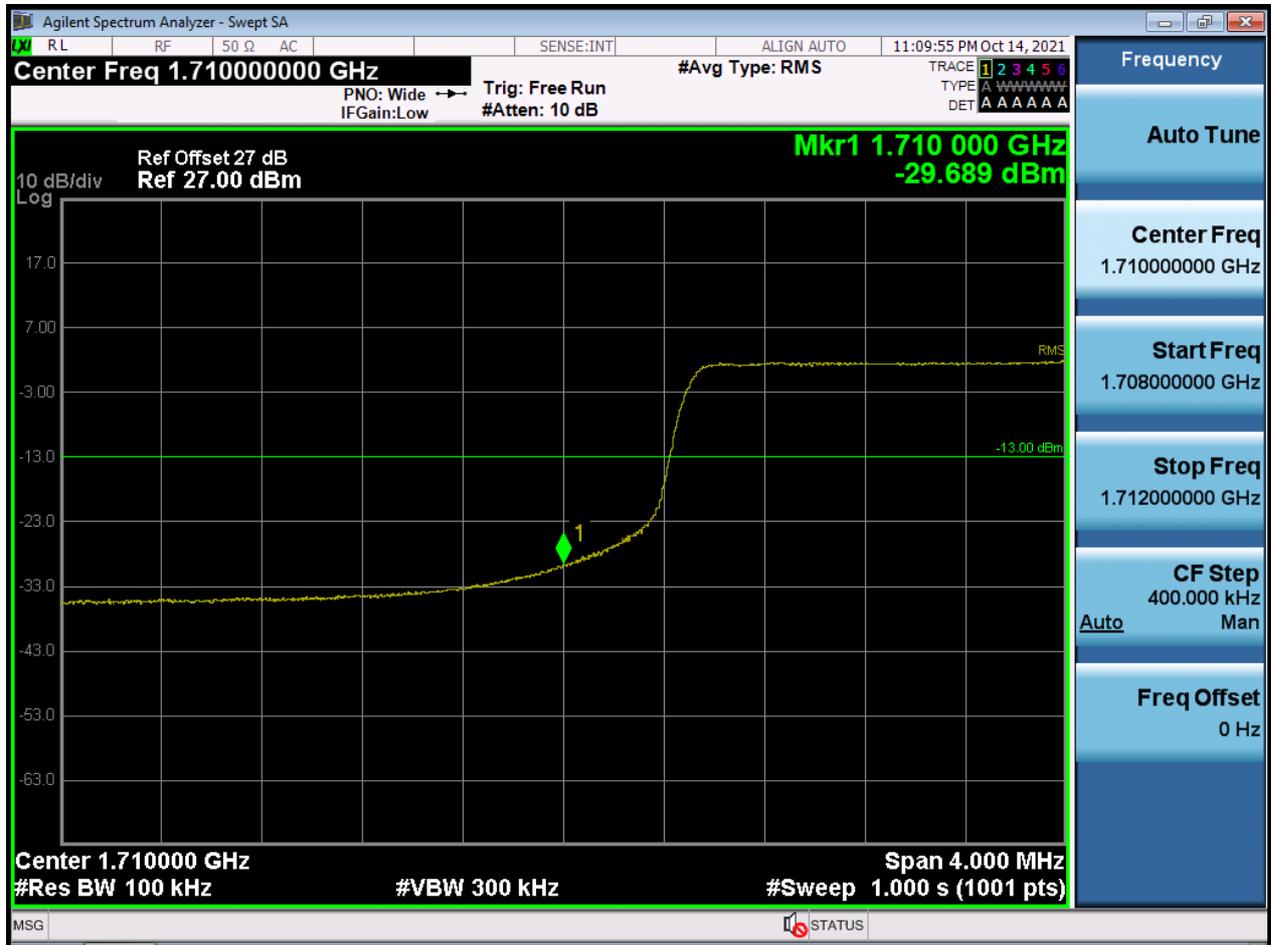
BW5 M\_BandEdge\_Lowest Channel\_QPSK\_1RB



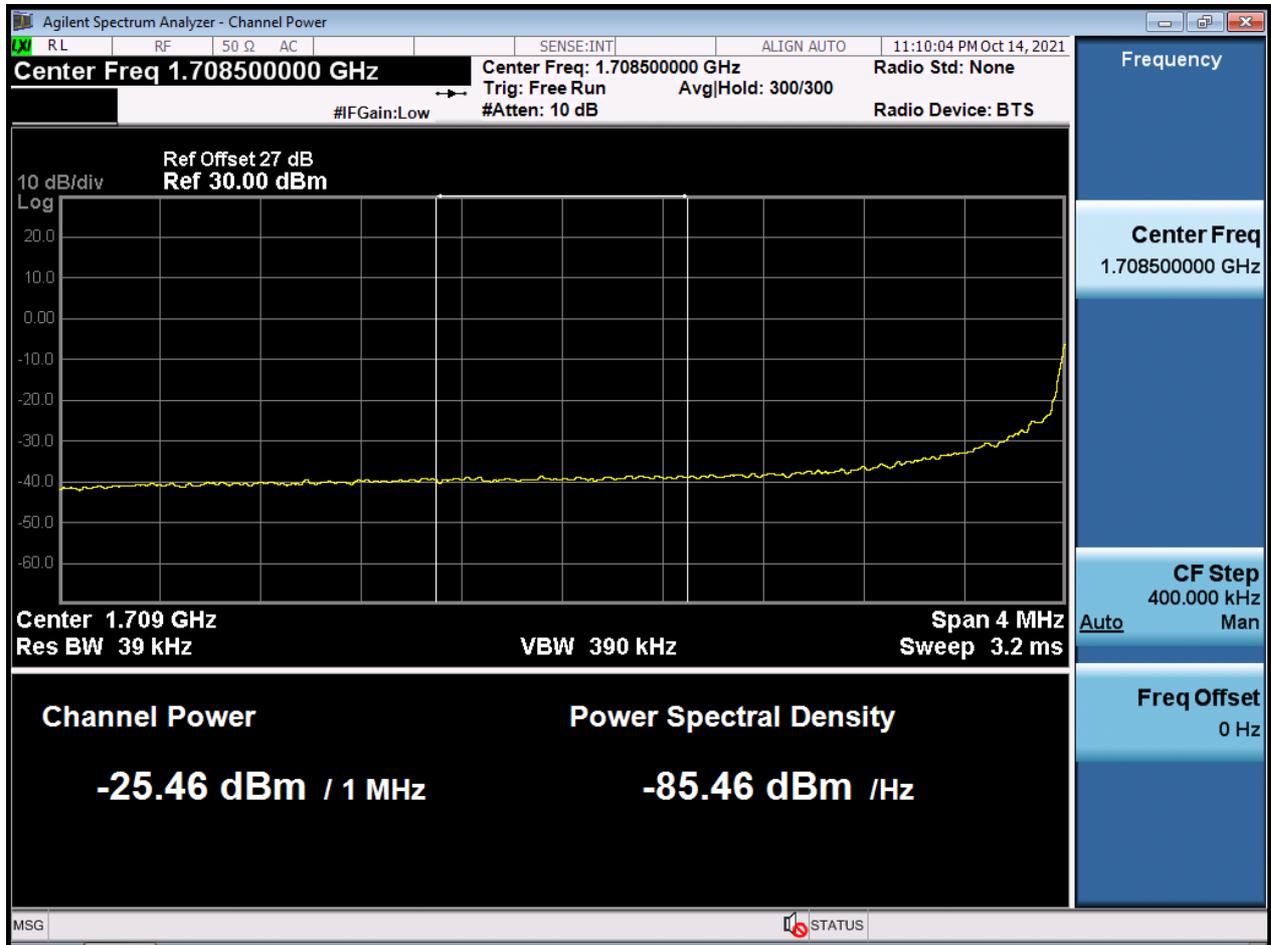
BW5 M\_BandEdge\_Highest Channel\_QPSK\_1RB



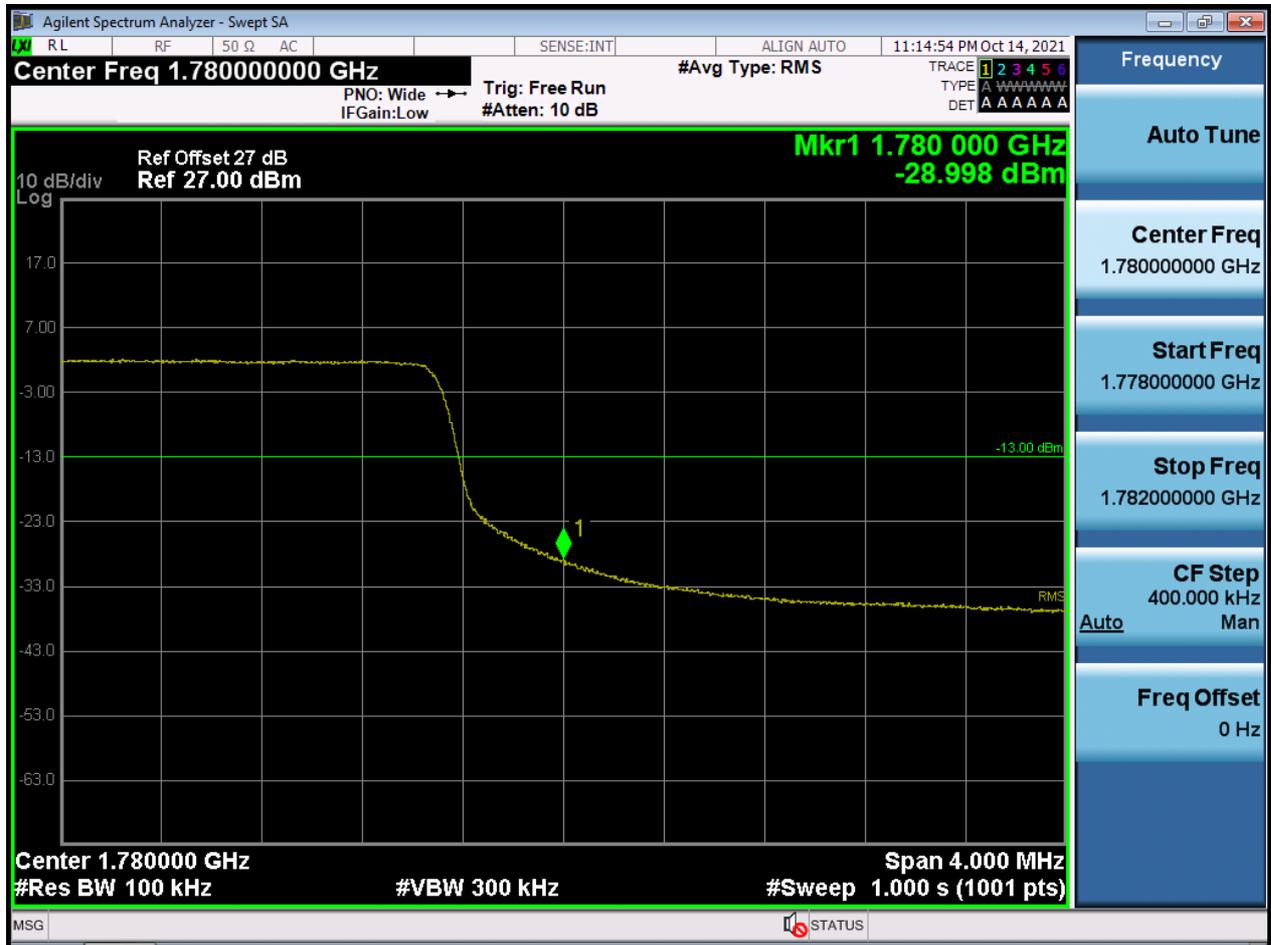
BW10 M\_BandEdge\_Lowest Channel\_QPSK\_FullRB(1)



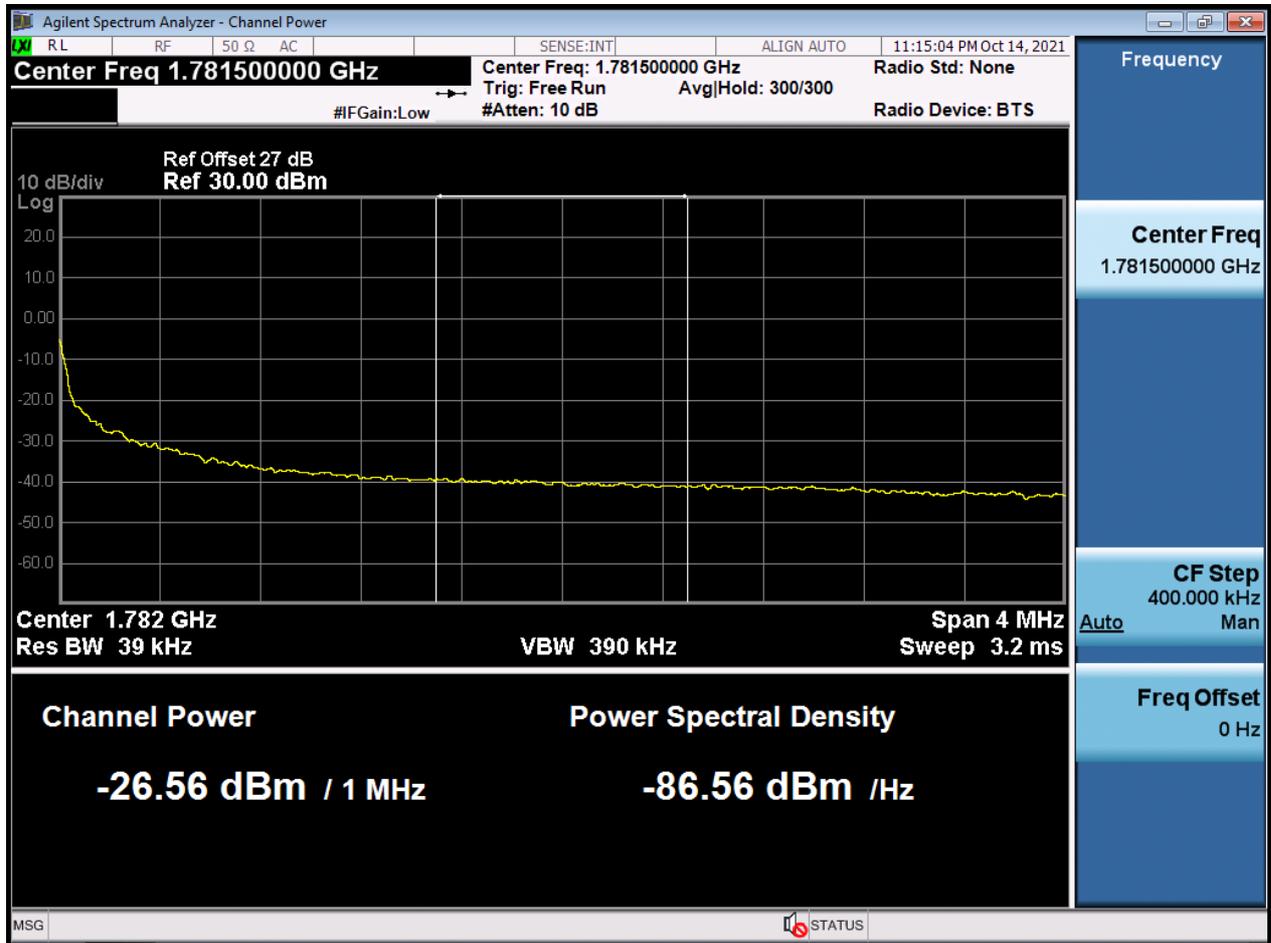
BW10 M\_BandEdge\_Lowest Channel\_QPSK\_FullRB(2)



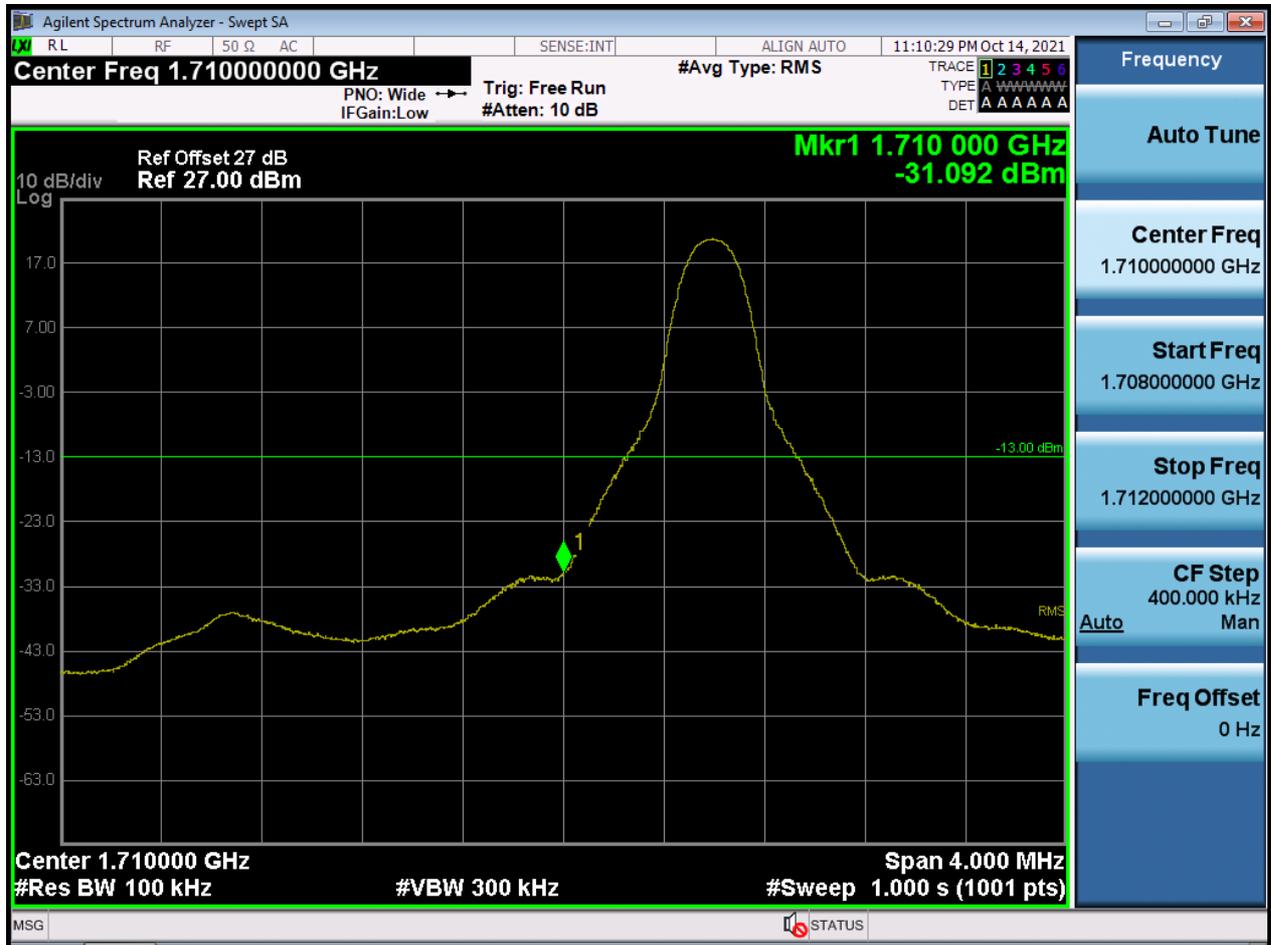
BW10 M\_BandEdge\_Highest Channel\_QPSK\_FullRB(1)



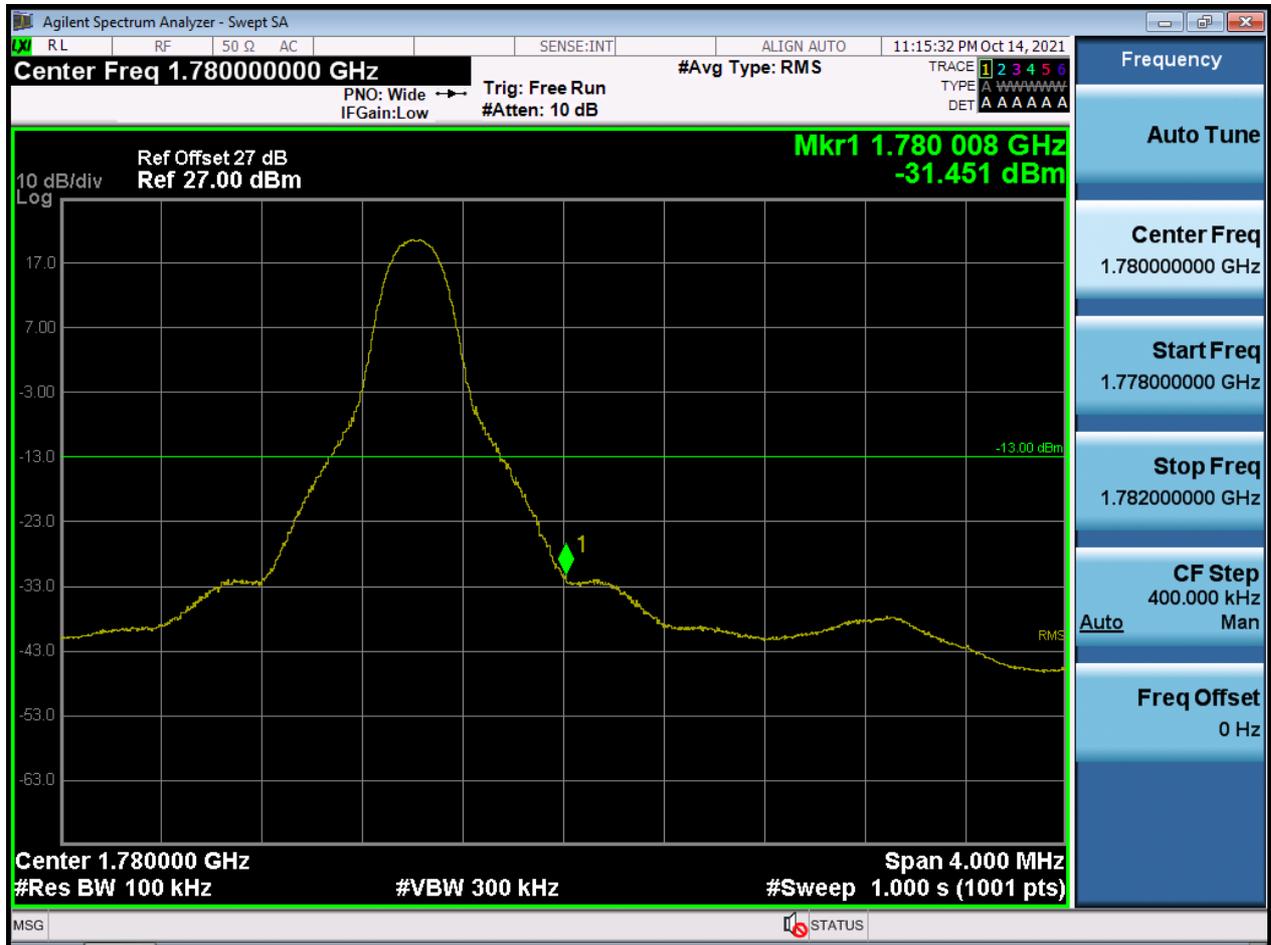
BW10 M\_BandEdge\_Highest Channel\_QPSK\_FullRB(2)



BW10 M\_BandEdge\_Lowest Channel\_QPSK\_1RB



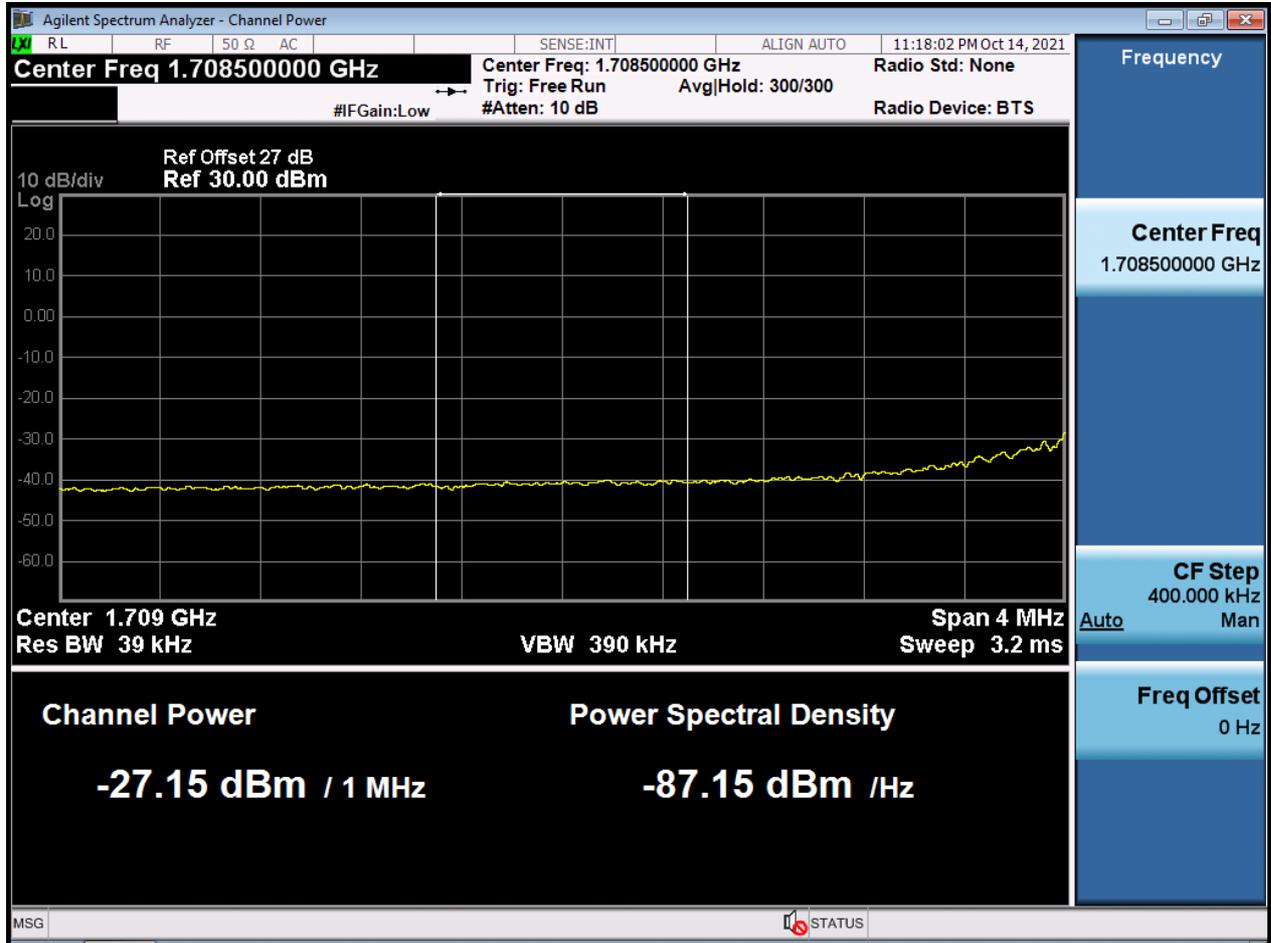
BW10 M\_BandEdge\_Highest Channel\_QPSK\_1RB



BW15 M\_BandEdge\_Lowest Channel\_QPSK\_FullRB(1)



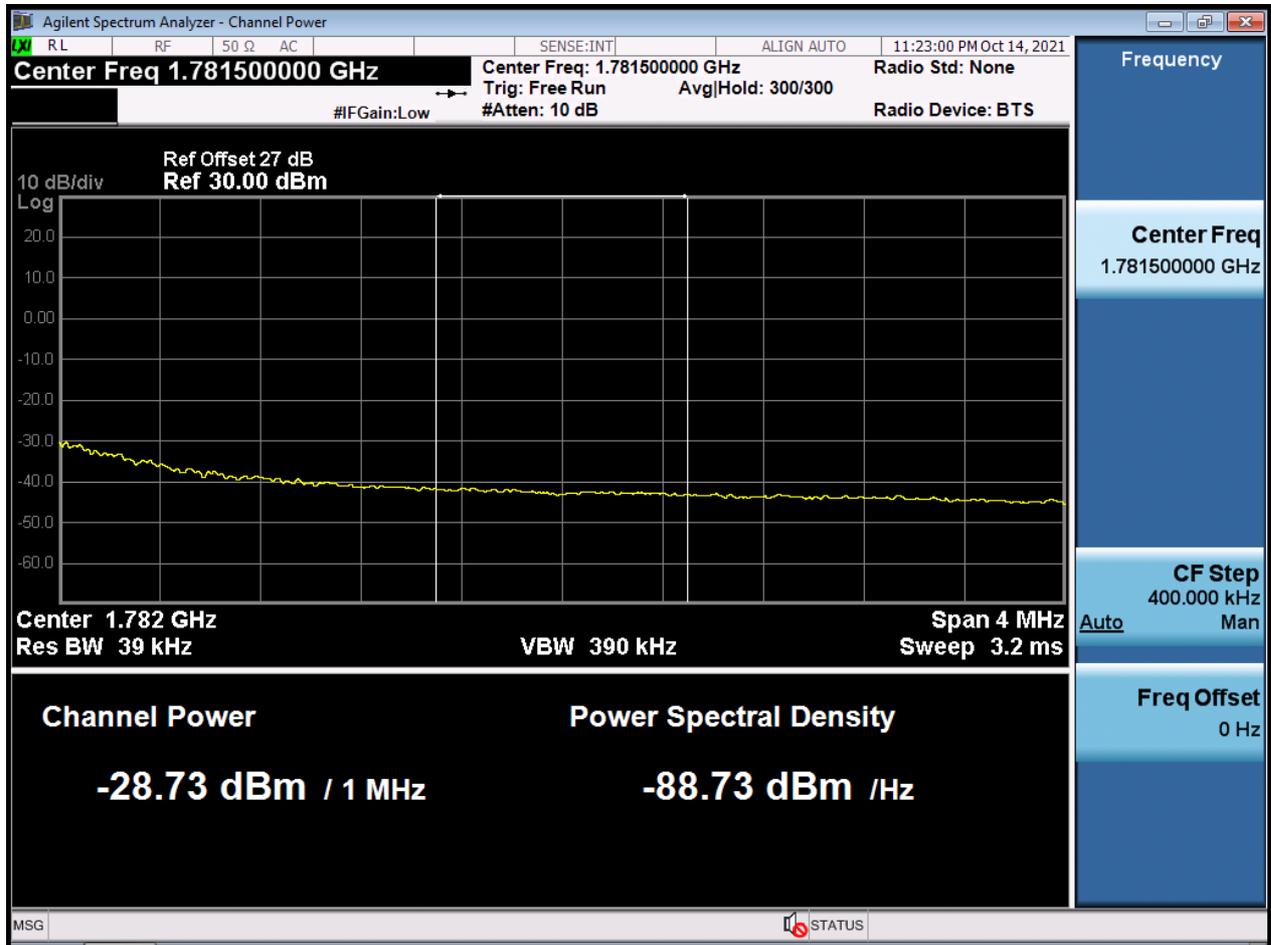
BW15 M\_BandEdge\_Lowest Channel\_QPSK\_FullRB(2)



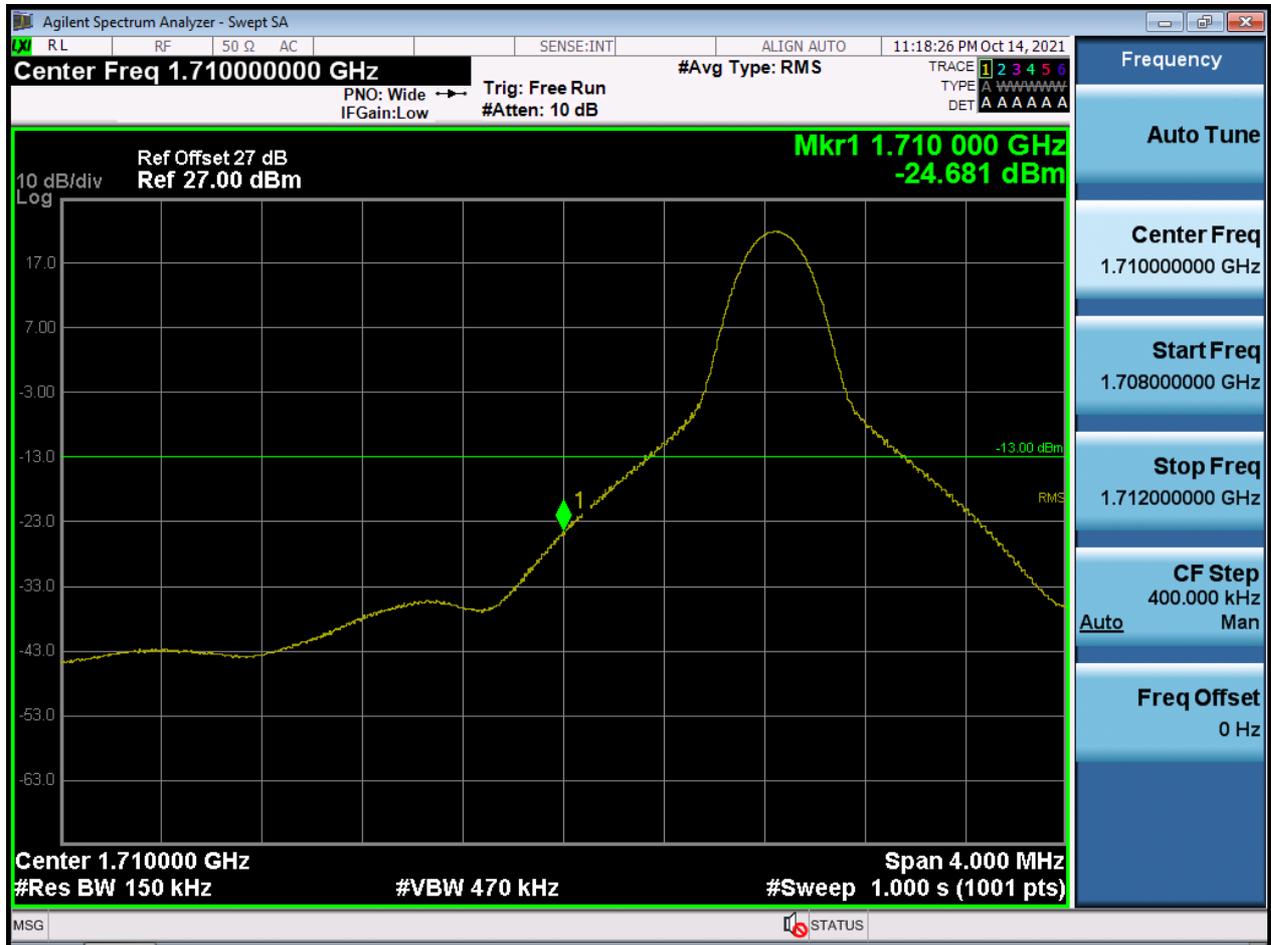
BW15 M\_BandEdge\_Highest Channel\_QPSK\_FullRB(1)



BW15 M\_BandEdge\_Highest Channel\_QPSK\_FullRB(2)



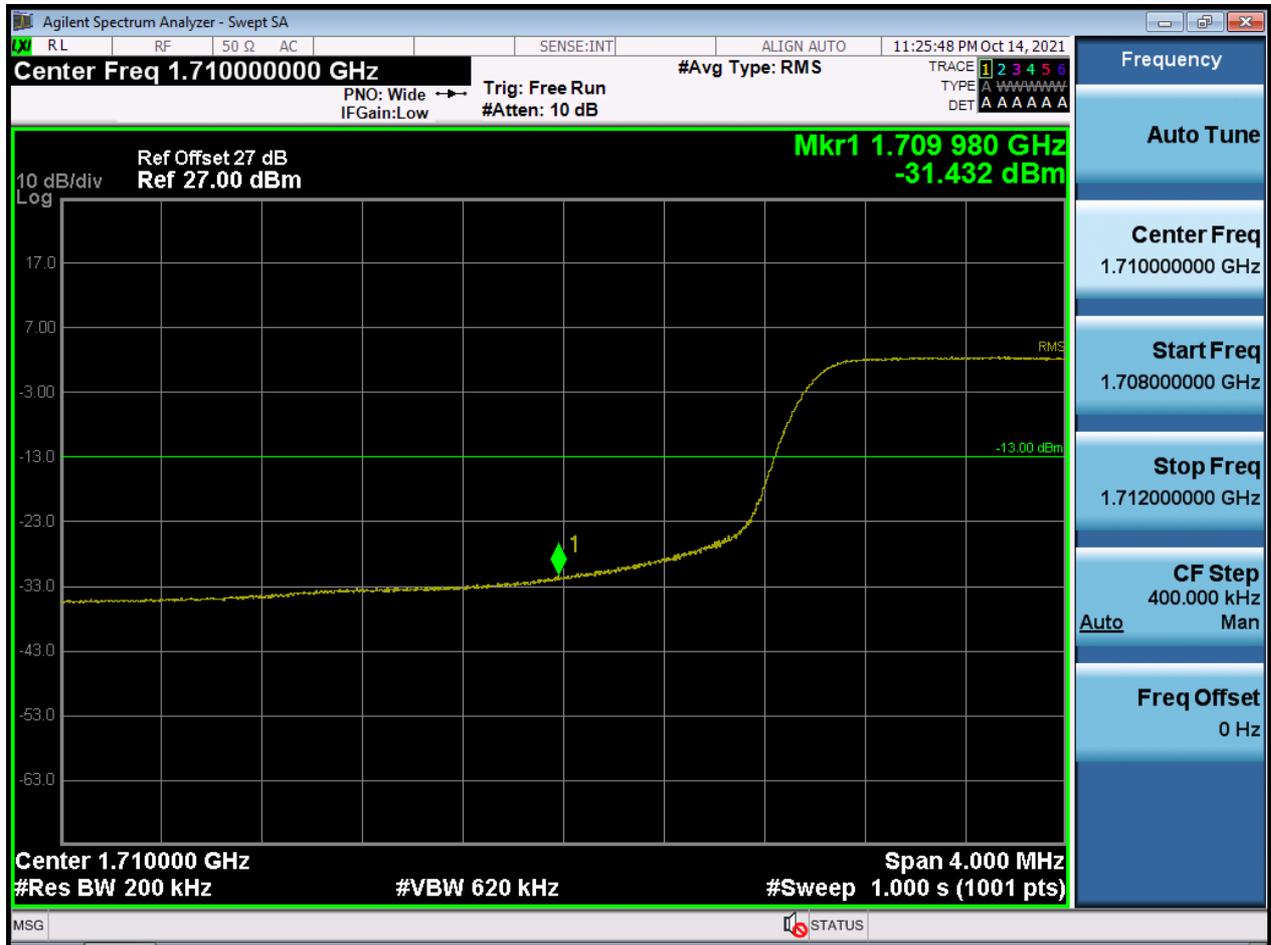
BW15 M\_BandEdge\_Lowest Channel\_QPSK\_1RB



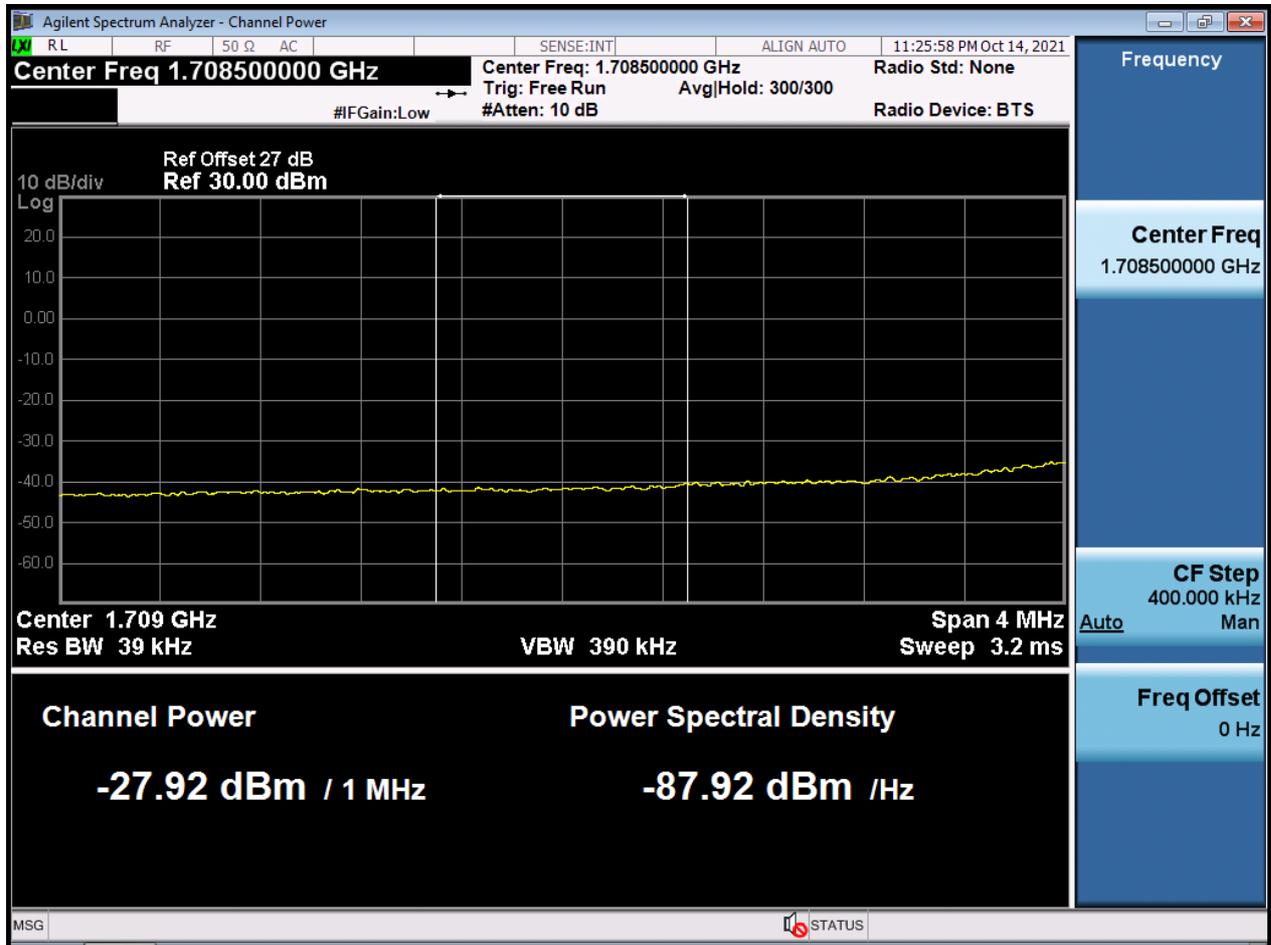
BW15 M\_BandEdge\_Highest Channel\_QPSK\_1RB



BW20 M\_BandEdge\_Lowest Channel\_QPSK\_FullRB(1)



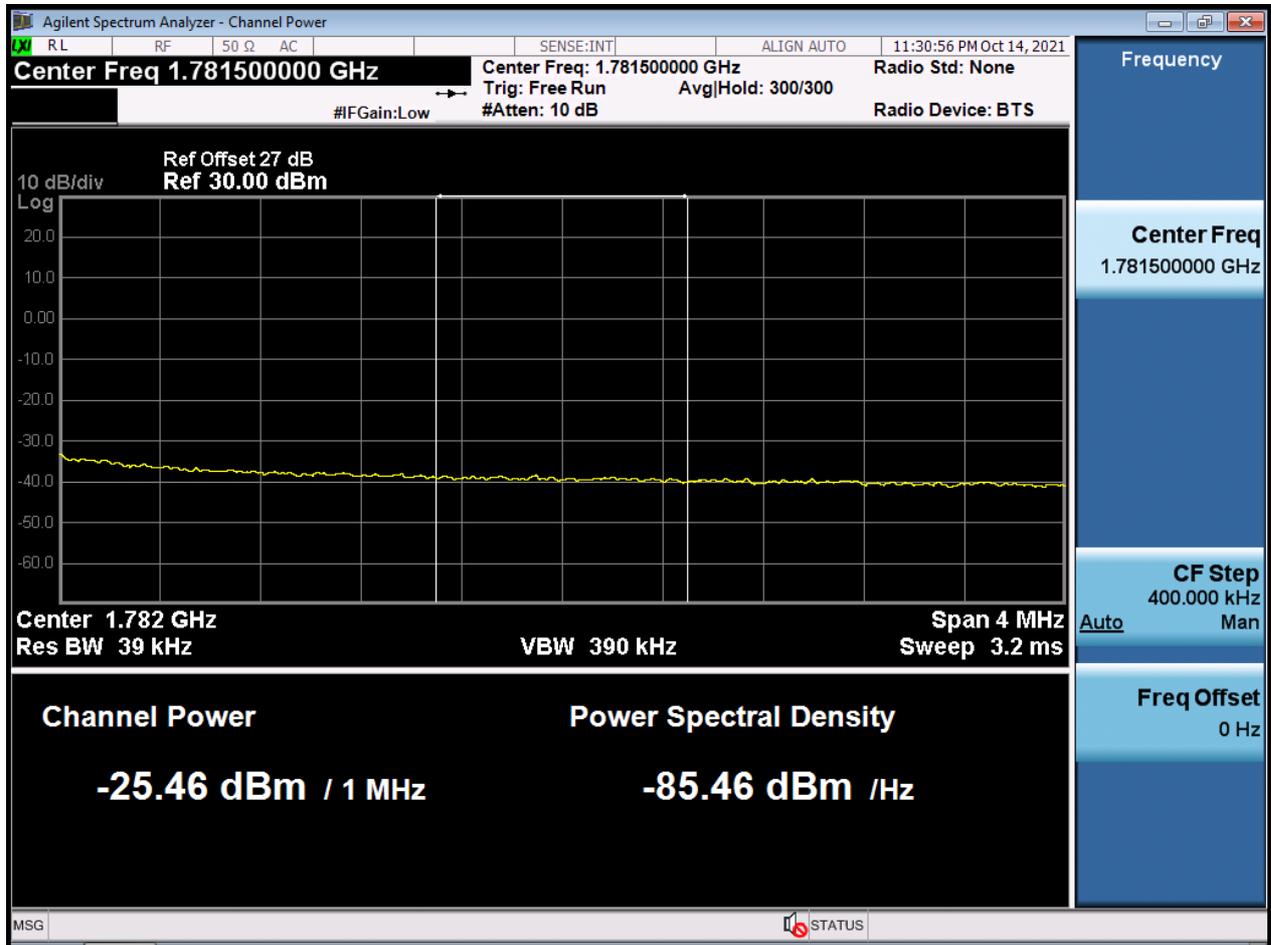
BW20 M\_BandEdge\_Lowest Channel\_QPSK\_FullRB(2)



BW20 M\_BandEdge\_Highest Channel\_QPSK\_FullRB(1)



BW20 M\_BandEdge\_Highest Channel\_QPSK\_FullRB(2)



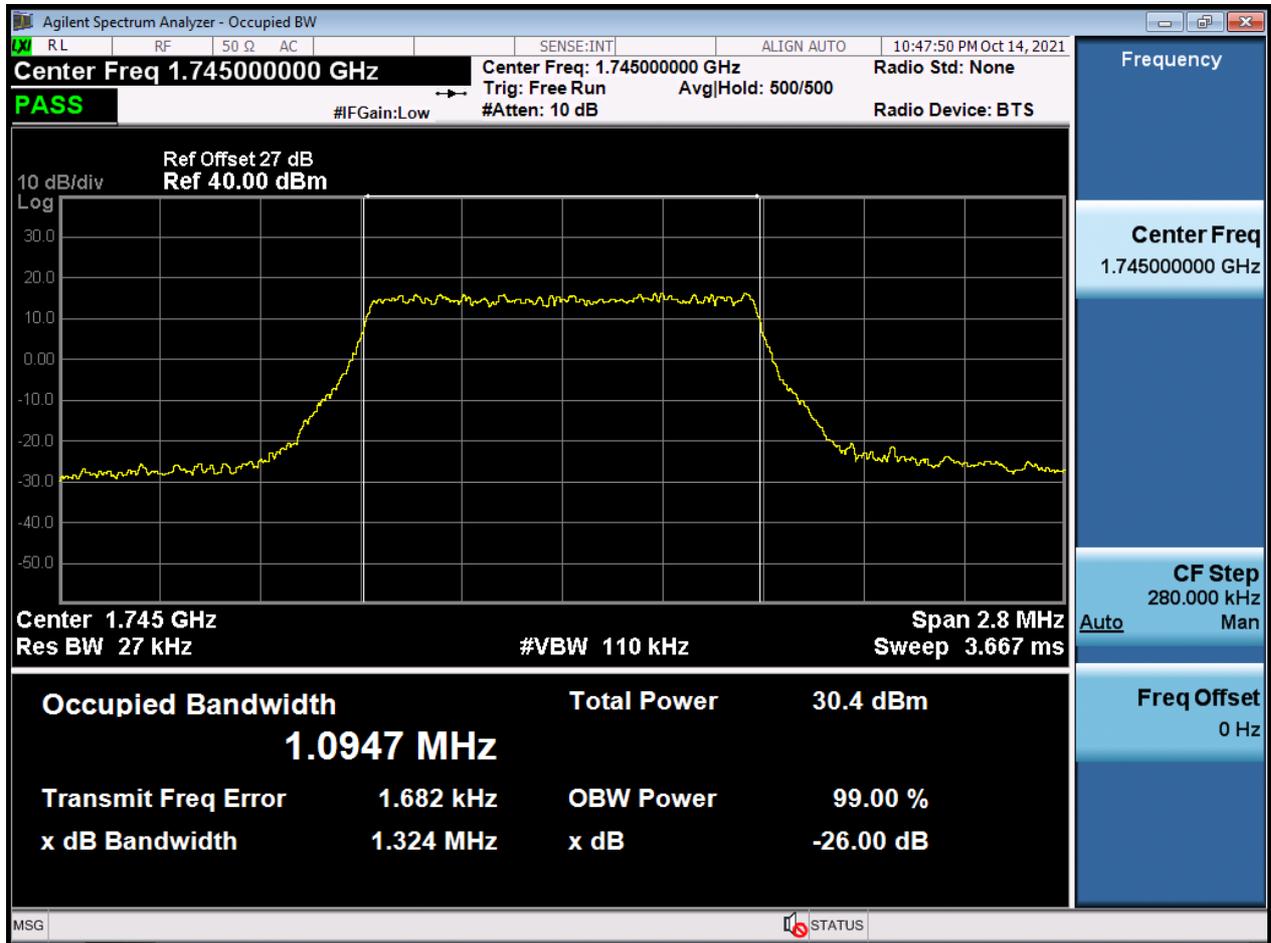
BW20 M\_BandEdge\_Lowest Channel\_QPSK\_1RB



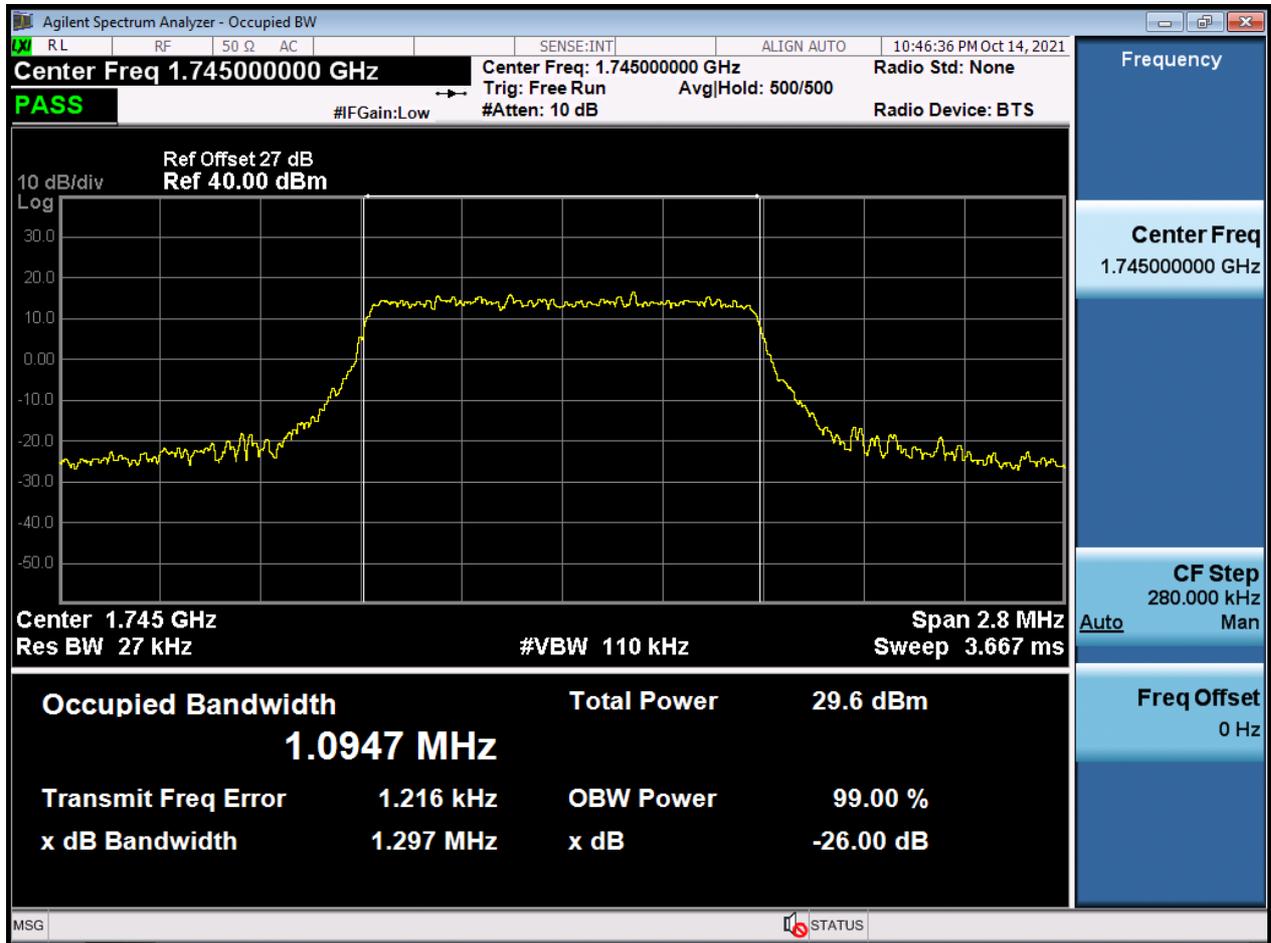
BW20 M\_BandEdge\_Highest Channel\_QPSK\_1RB



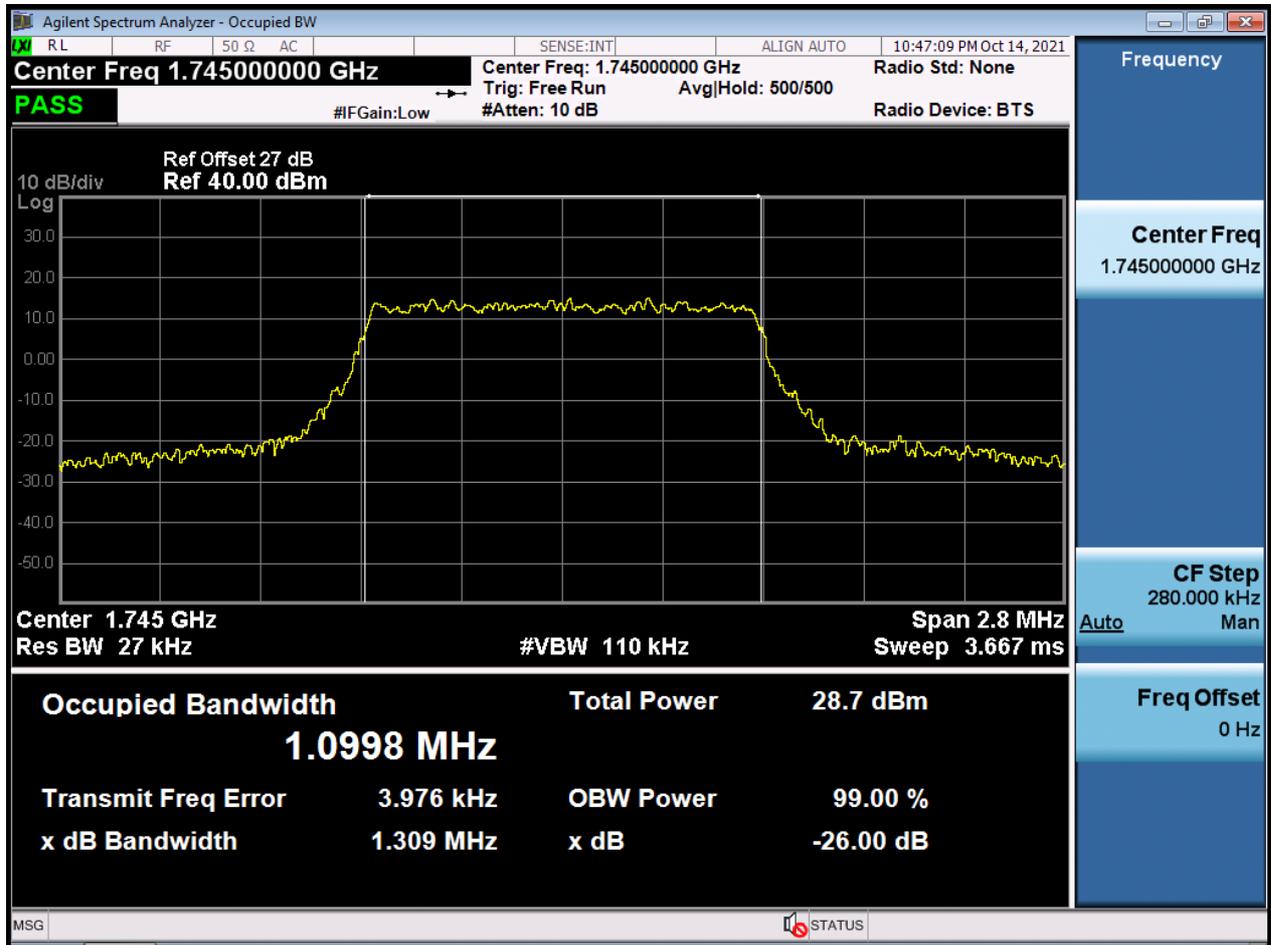
BW1.4 M\_OBW\_Middle Channel\_QPSK\_FullRB



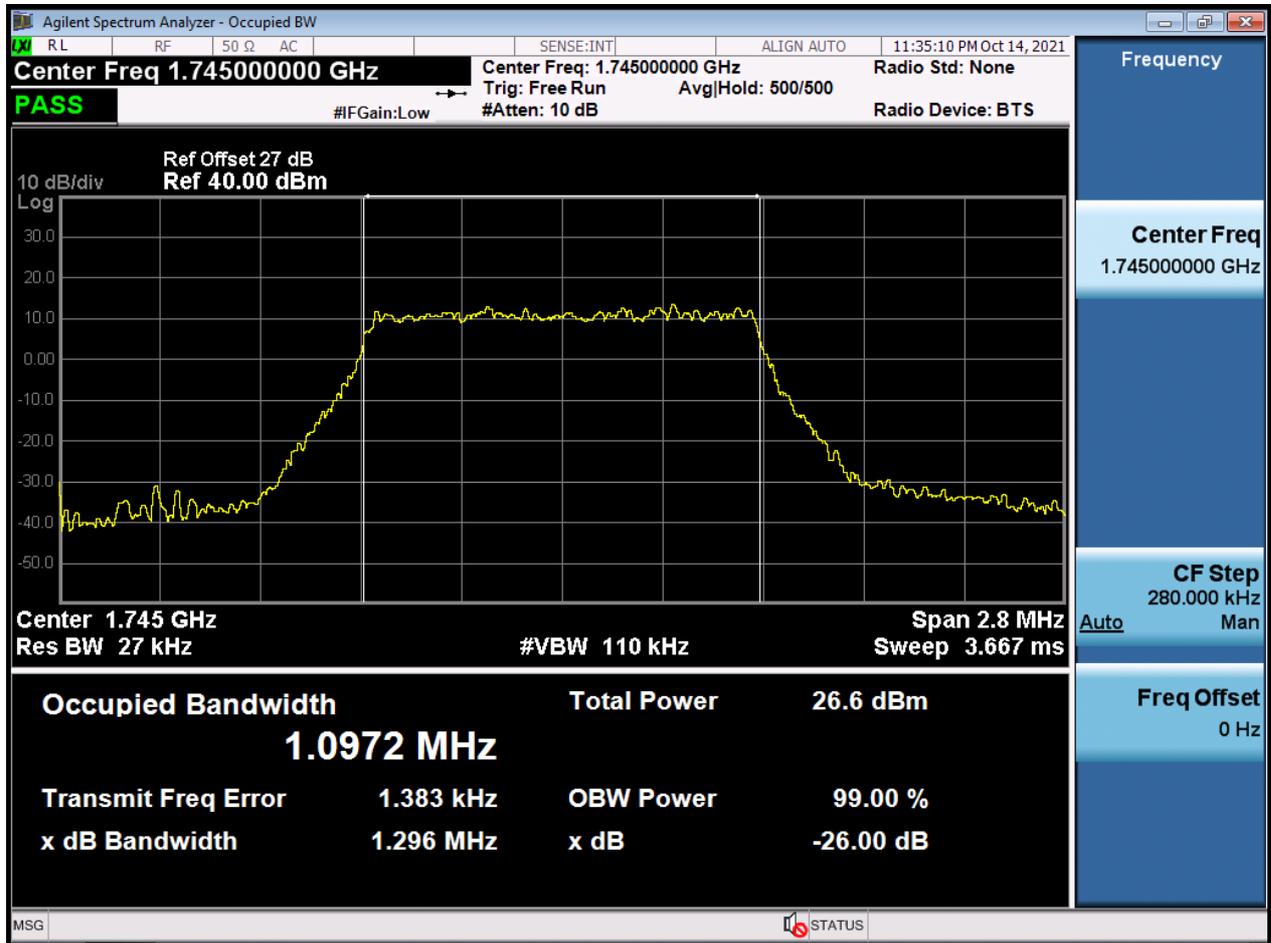
BW1.4 M\_OBW\_Middle Channel\_16QAM\_FullRB



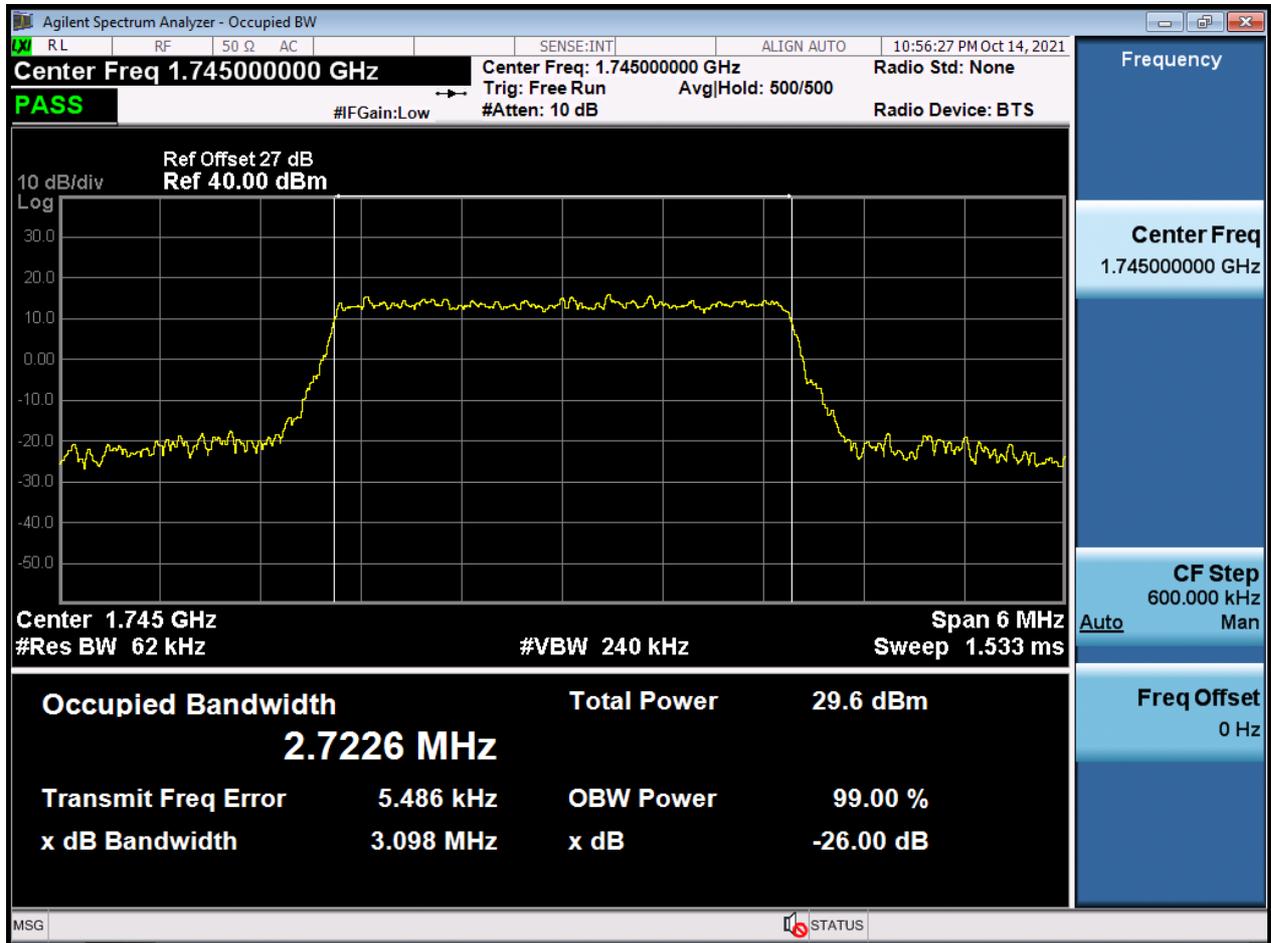
BW1.4 M\_OBW\_Middle Channel\_64QAM\_FullRB



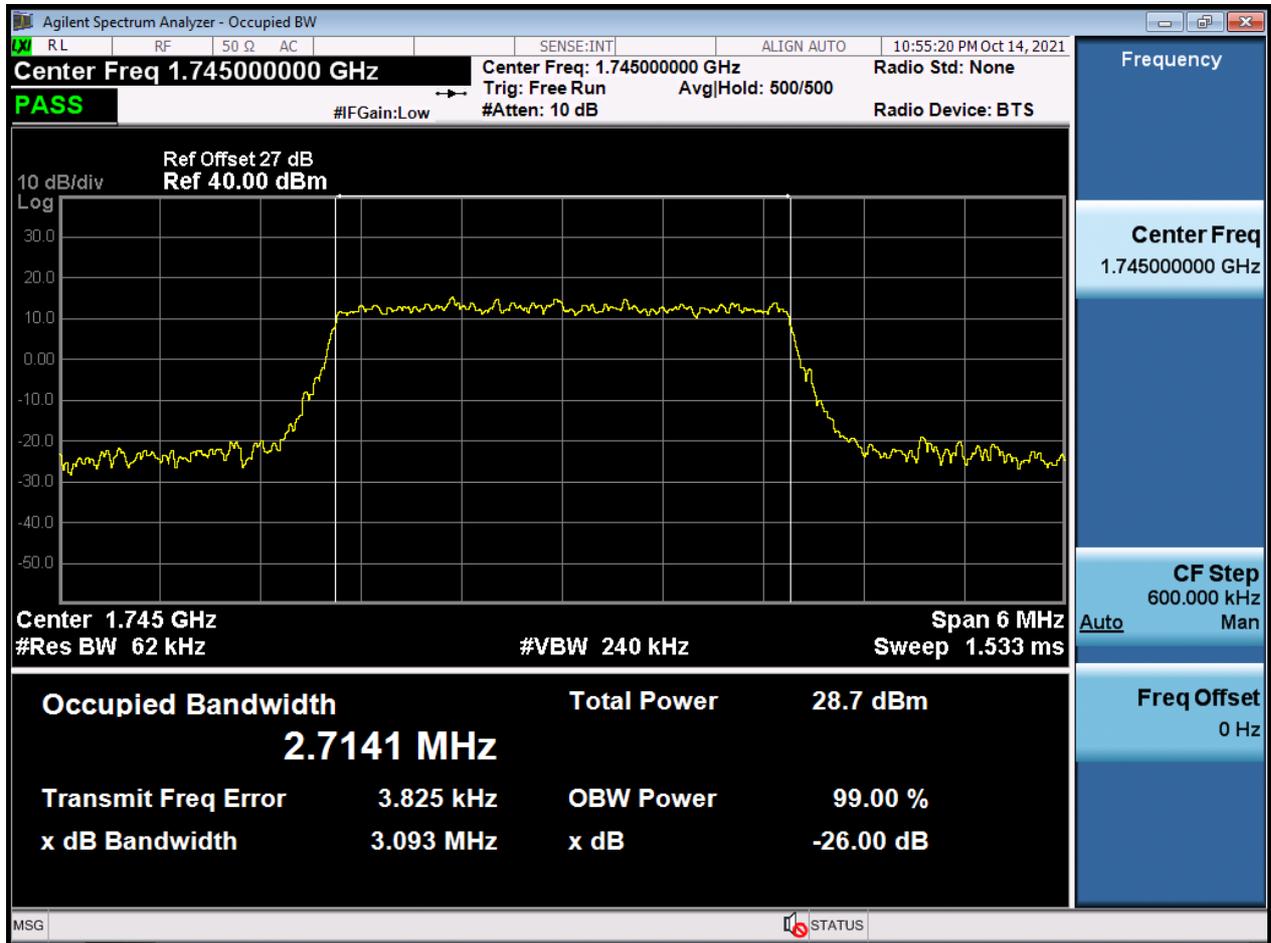
BW1.4 M\_OBW\_Middle Channel\_256QAM\_FullRB



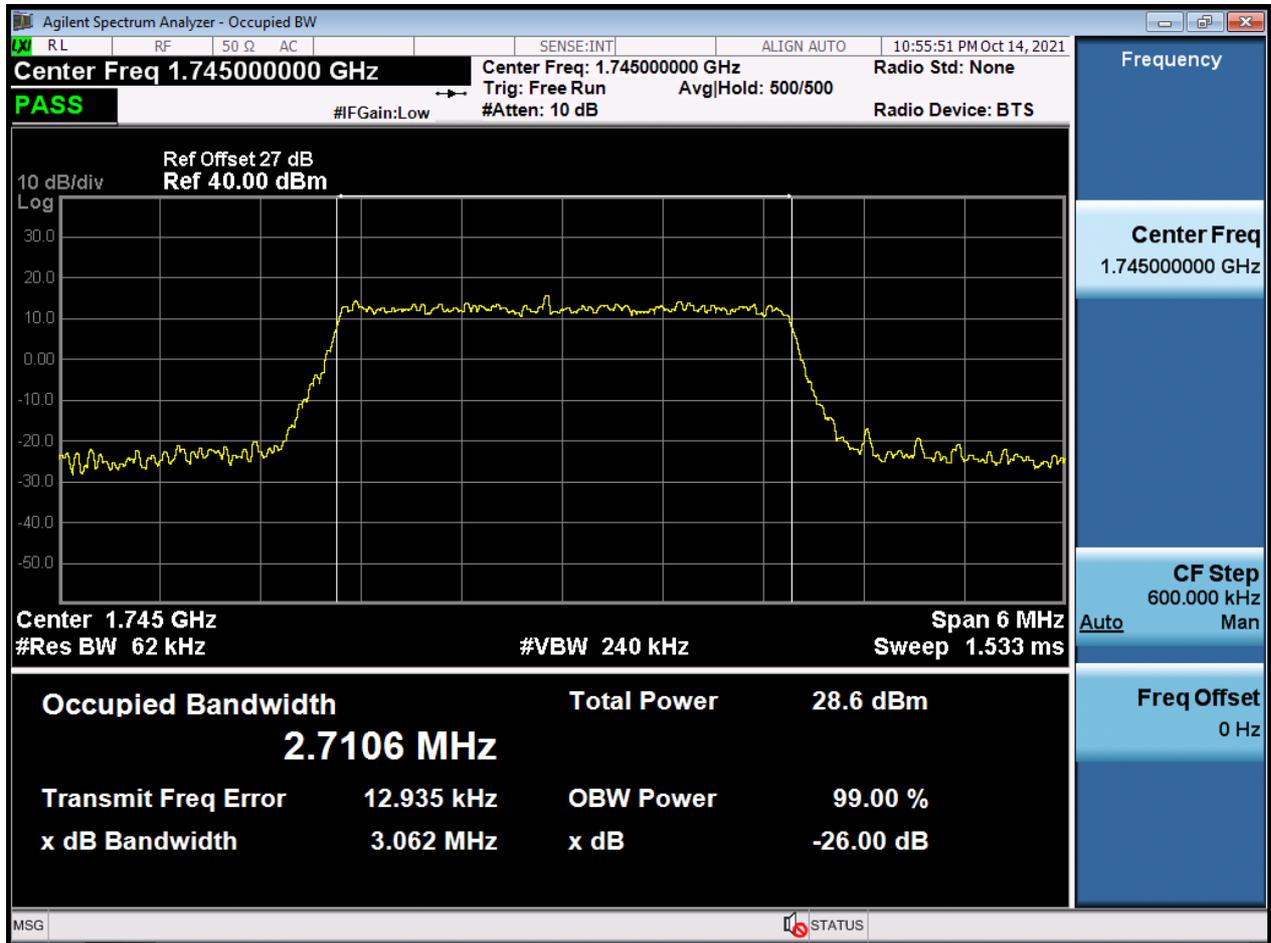
BW3 M\_OBW\_Middle Channel\_QPSK\_FullIRB



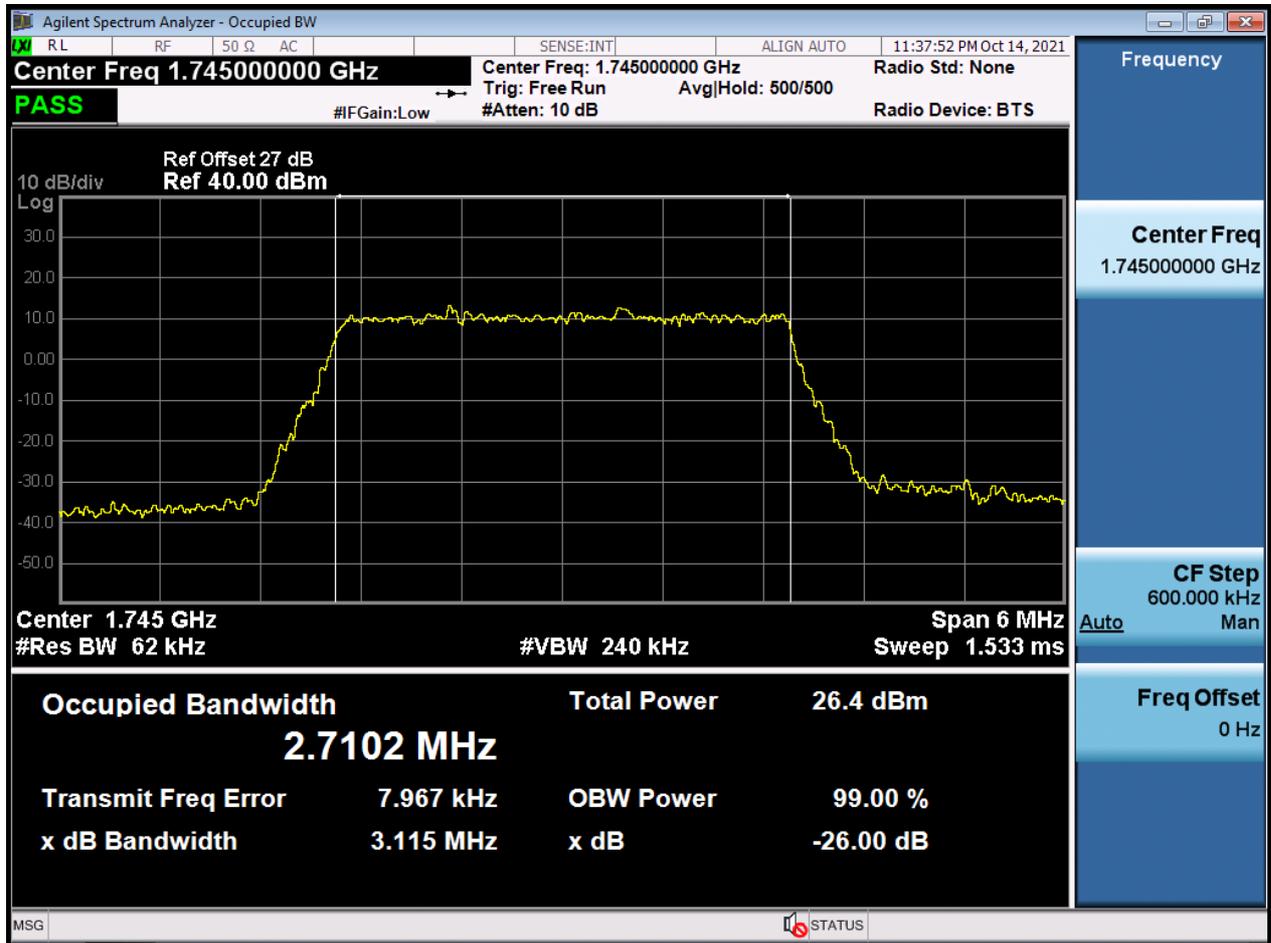
BW3 M\_OBW\_Middle Channel\_16QAM\_FullIRB



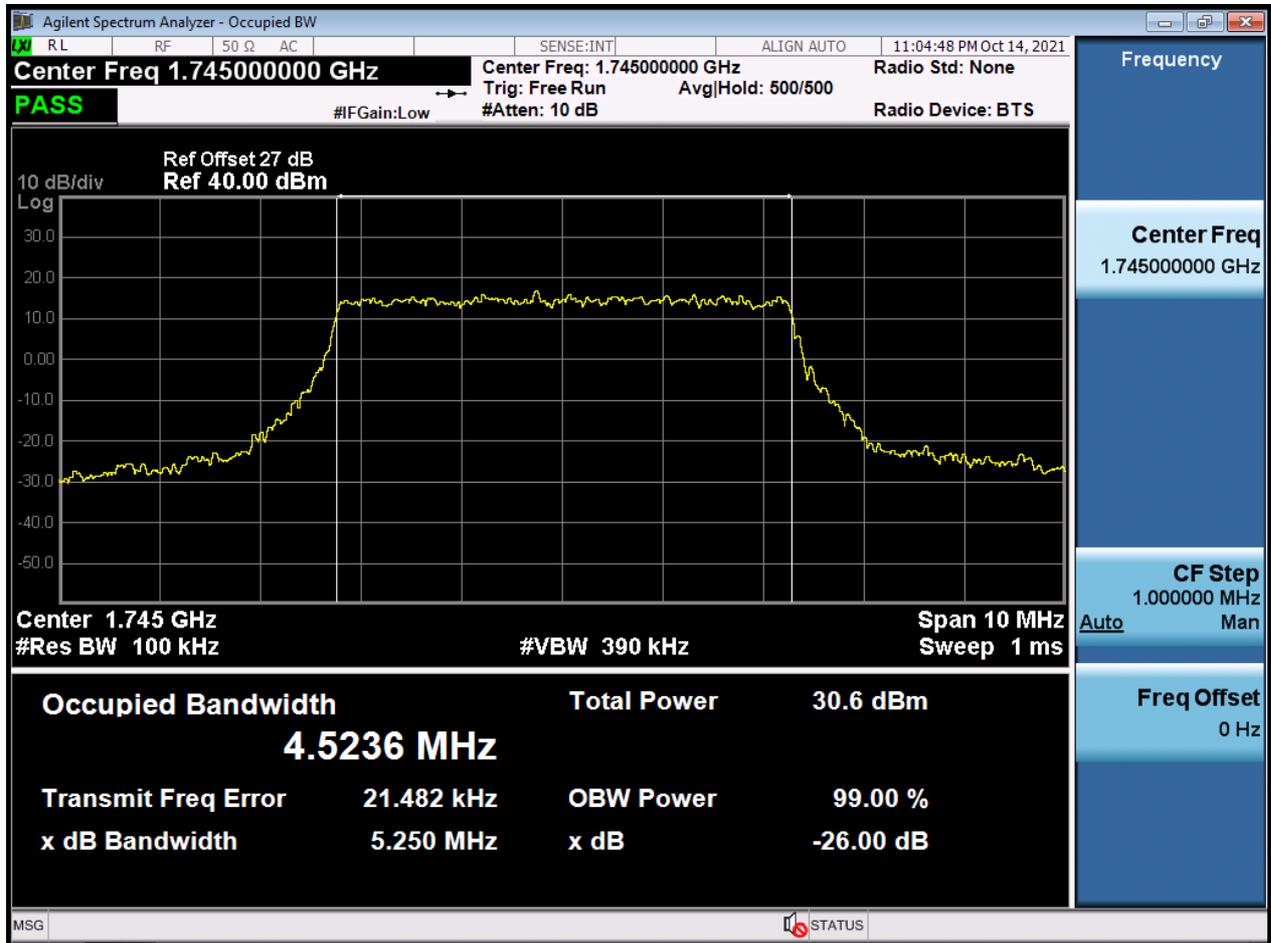
BW3 M\_OBW\_Middle Channel\_64QAM\_FullIRB



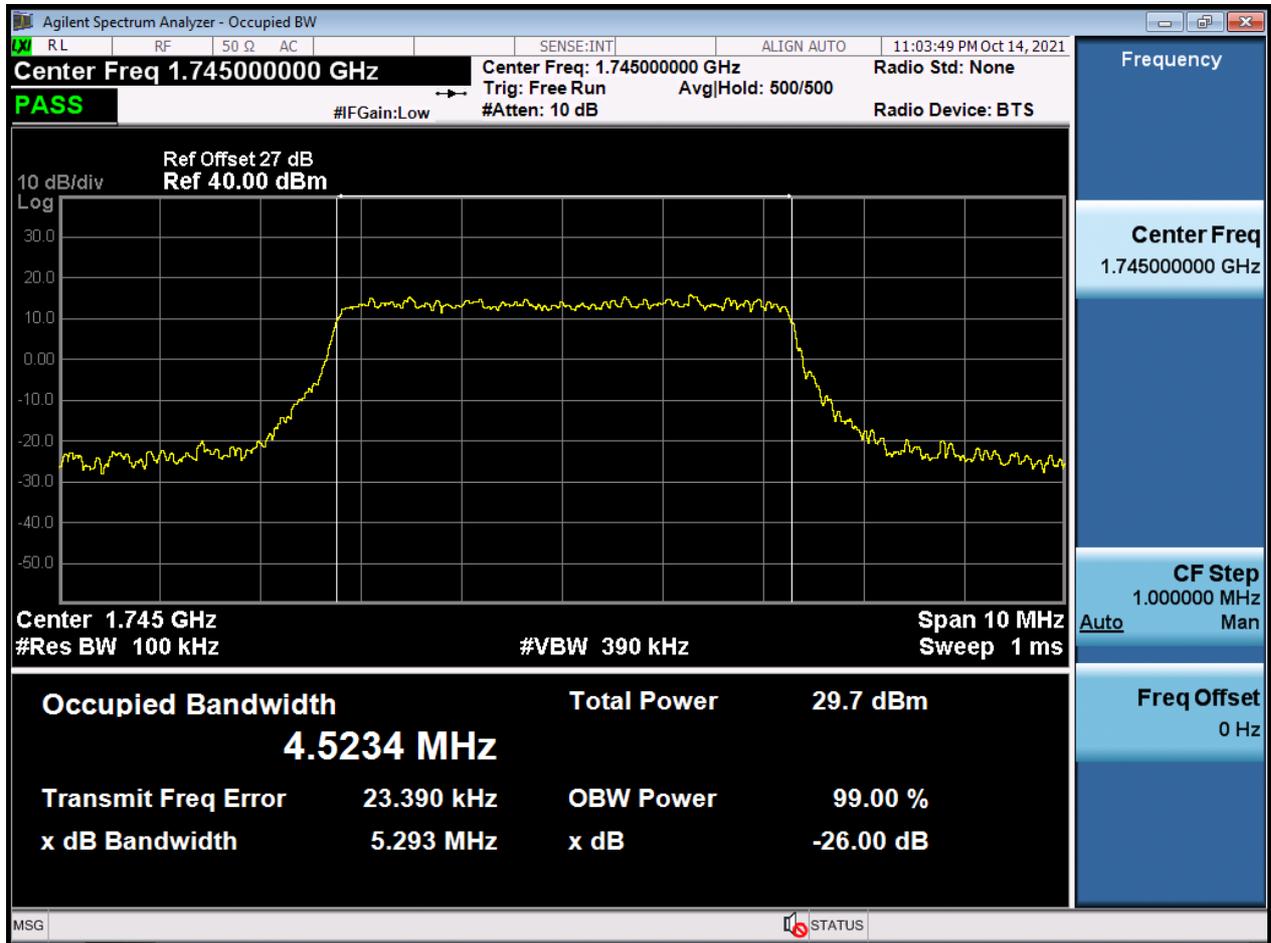
BW3 M\_OBW\_Middle Channel\_256QAM\_FullIRB



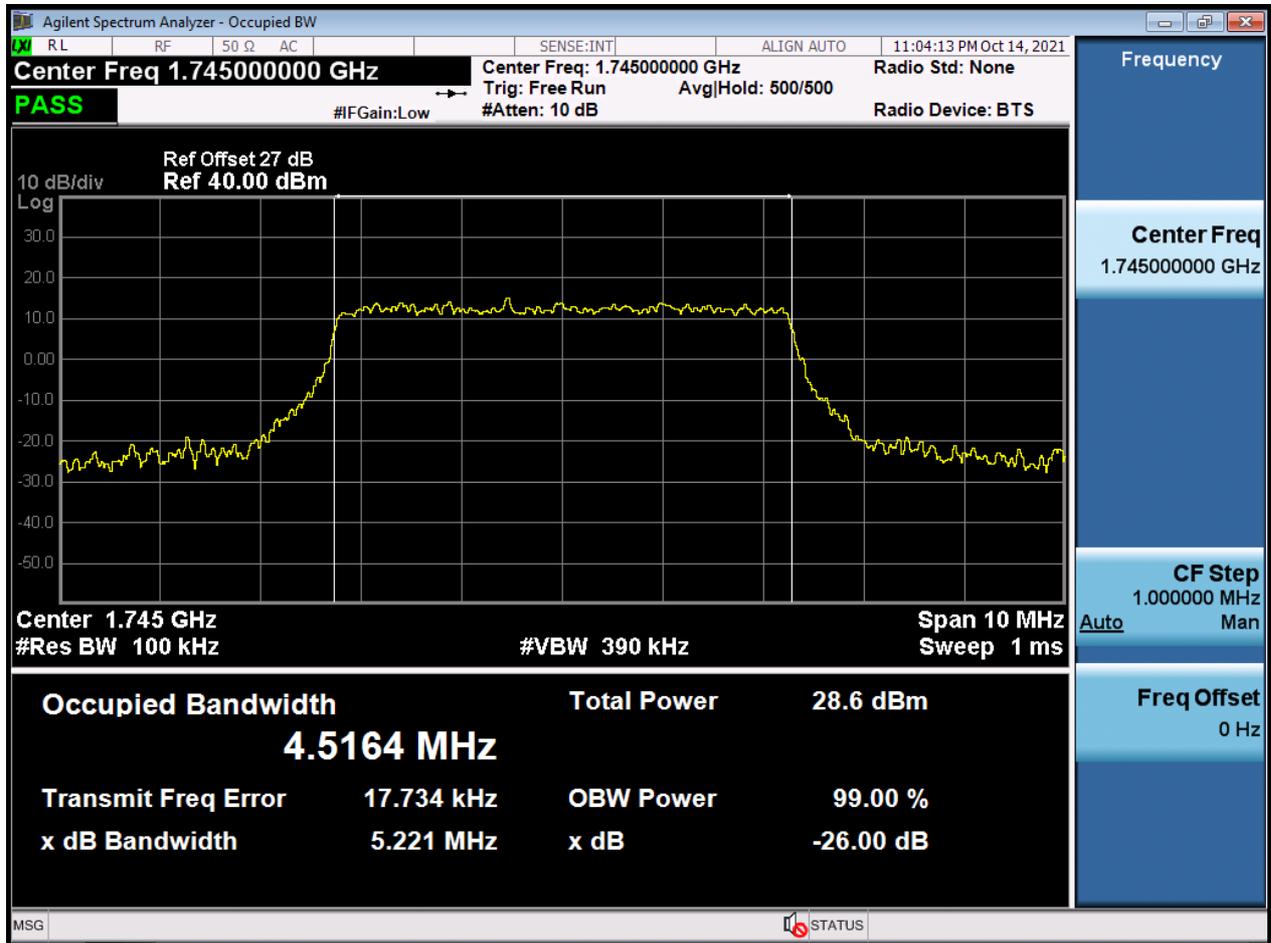
BW5 M\_OBW\_Middle Channel\_QPSK\_FullIRB



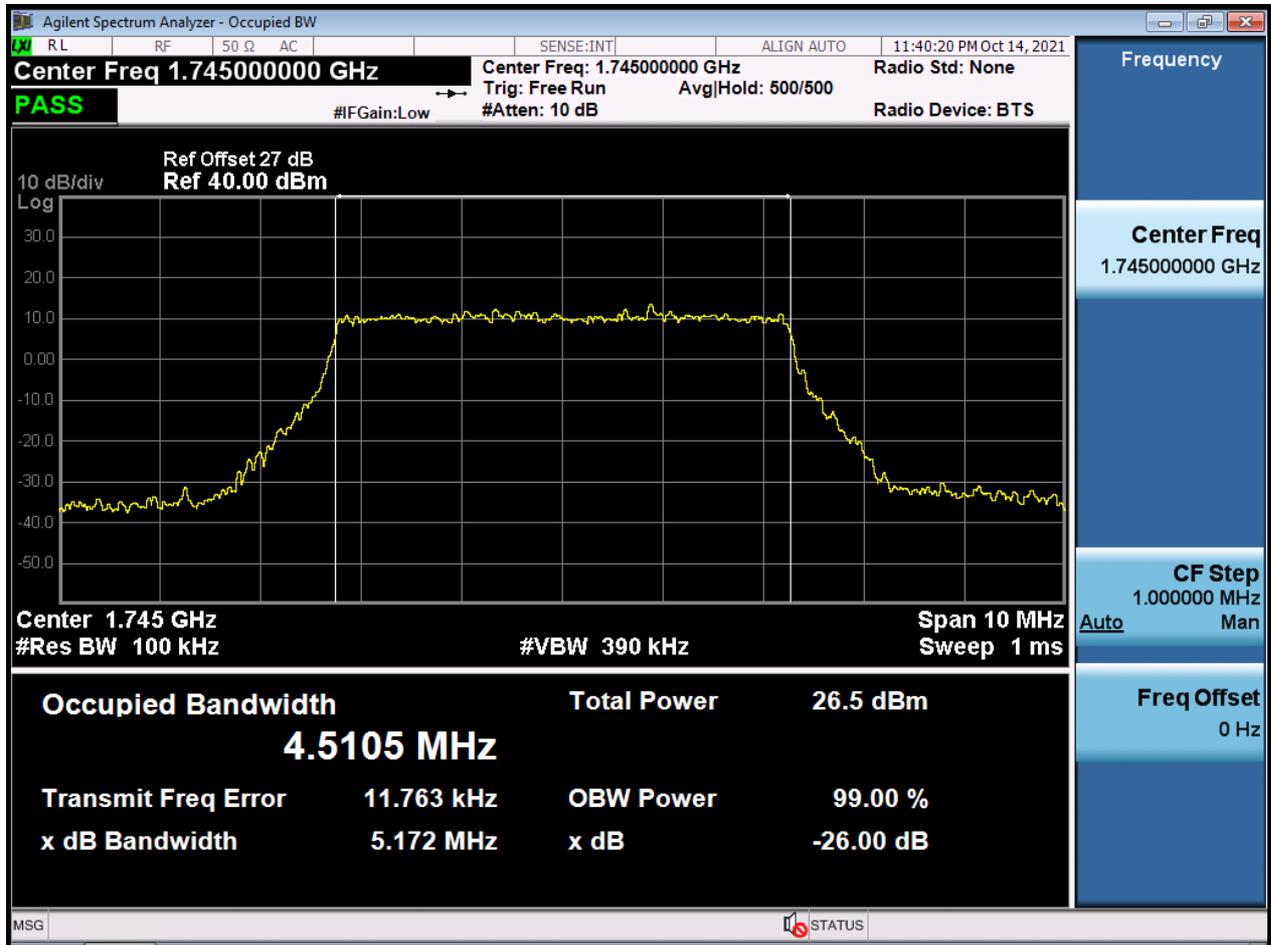
BW5 M\_OBW\_Middle Channel\_16QAM\_FullIRB



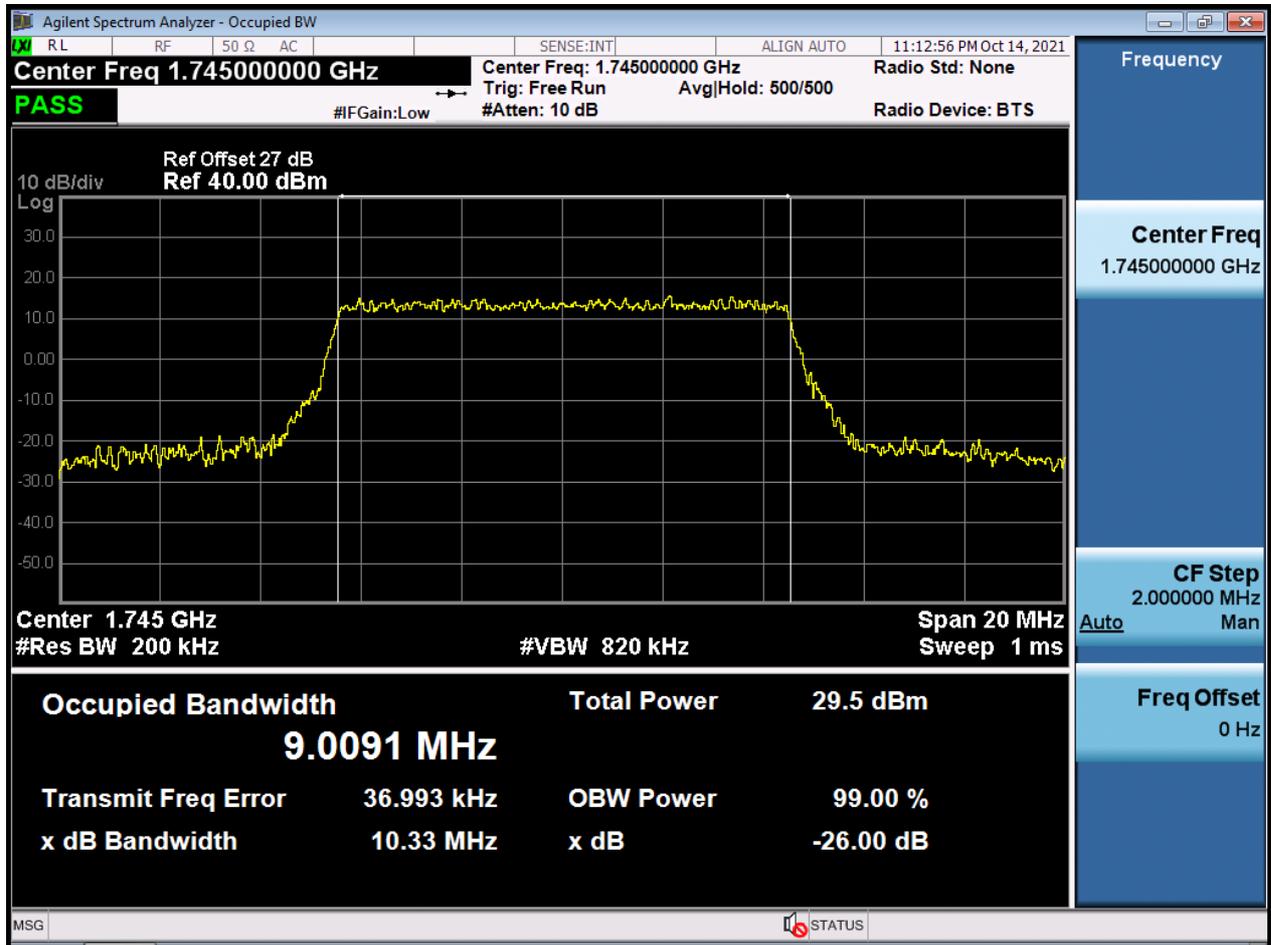
BW5 M\_OBW\_Middle Channel\_64QAM\_FullIRB



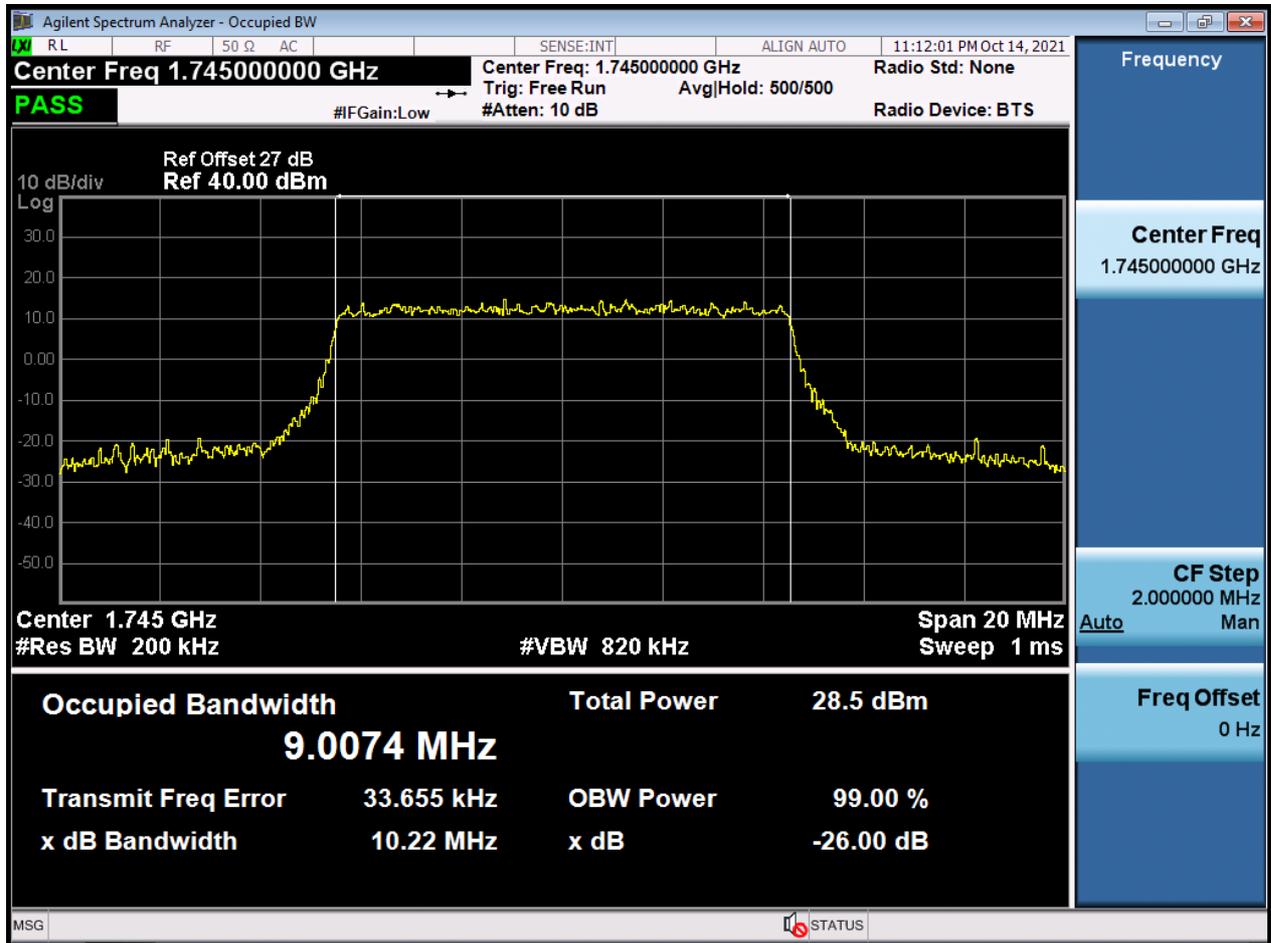
BW5 M\_OBW\_Middle Channel\_256QAM\_FullIRB



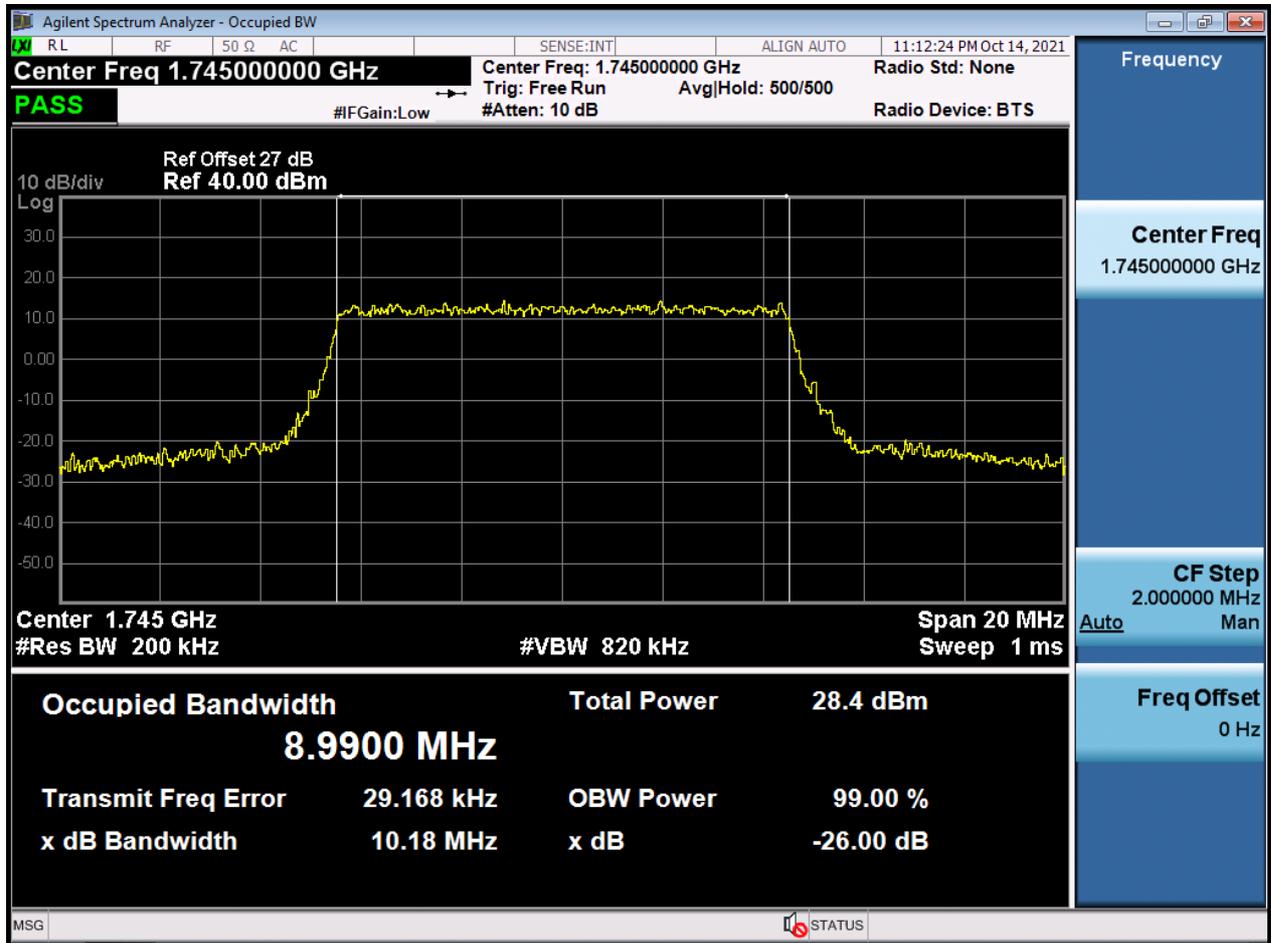
BW10 M\_OBW\_Middle Channel\_QPSK\_FullIRB



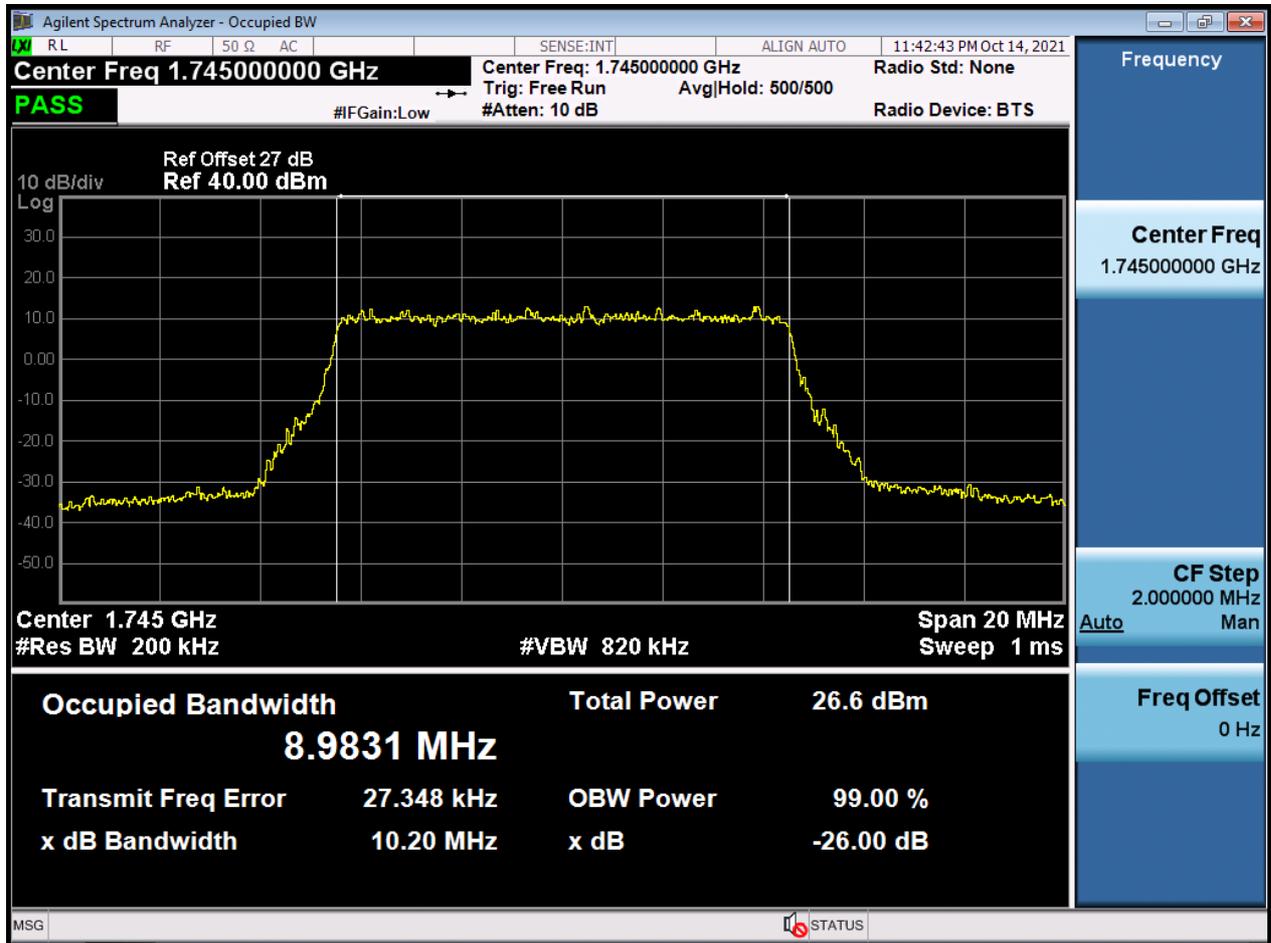
BW10 M\_OBW\_Middle Channel\_16QAM\_FullIRB



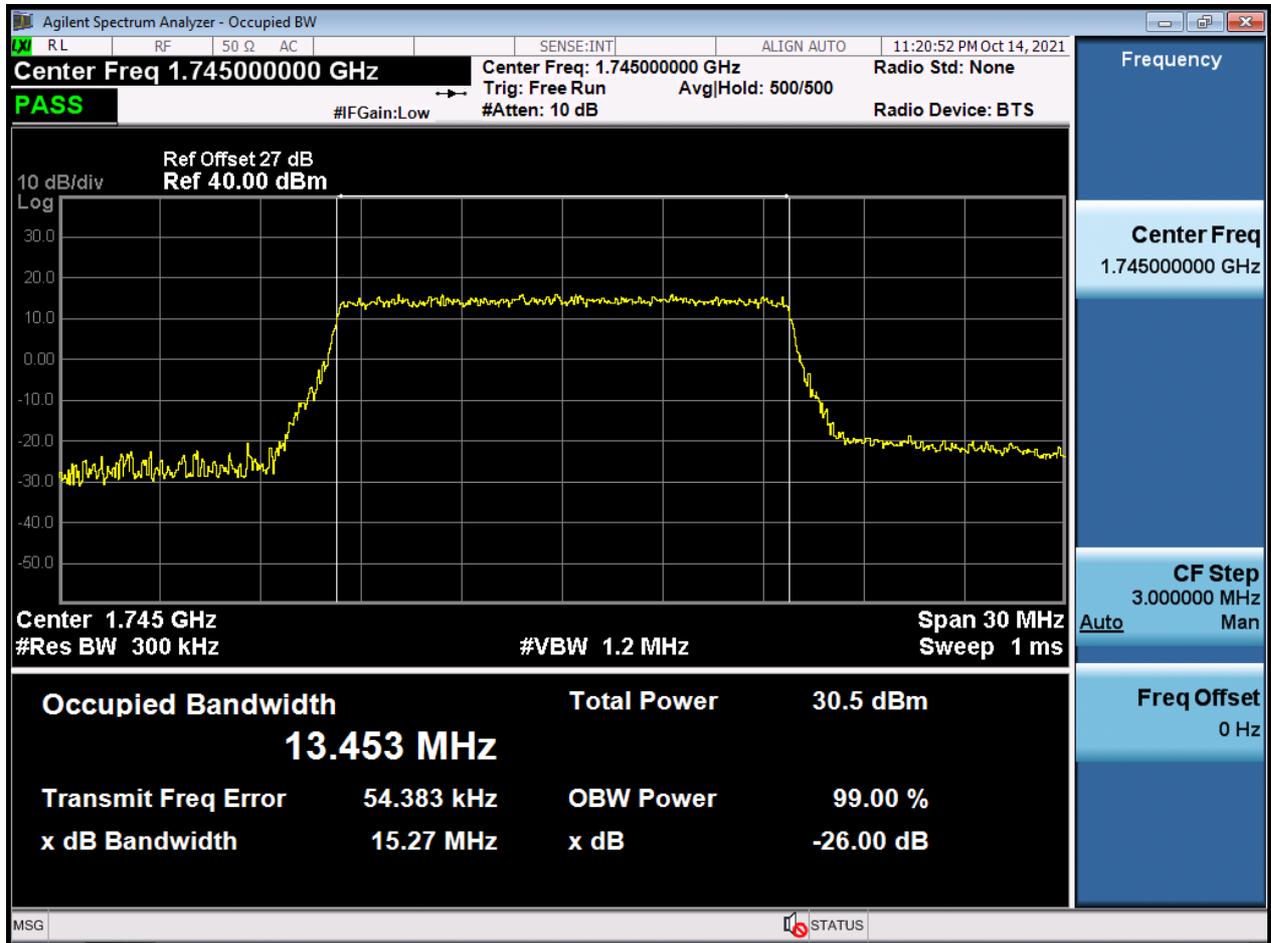
BW10 M\_OBW\_Middle Channel\_64QAM\_FullIRB



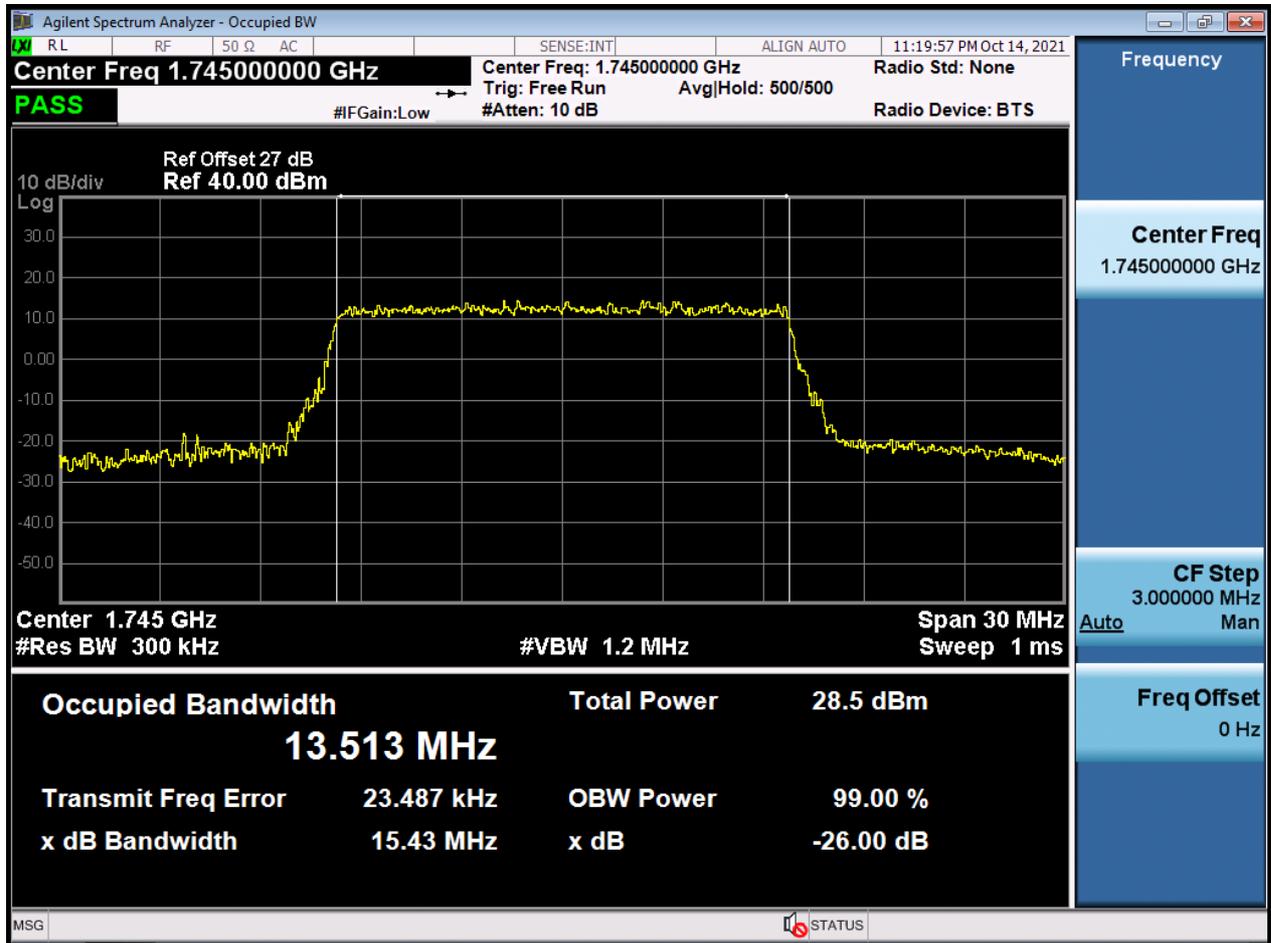
BW10 M\_OBW\_Middle Channel\_256QAM\_FullRB



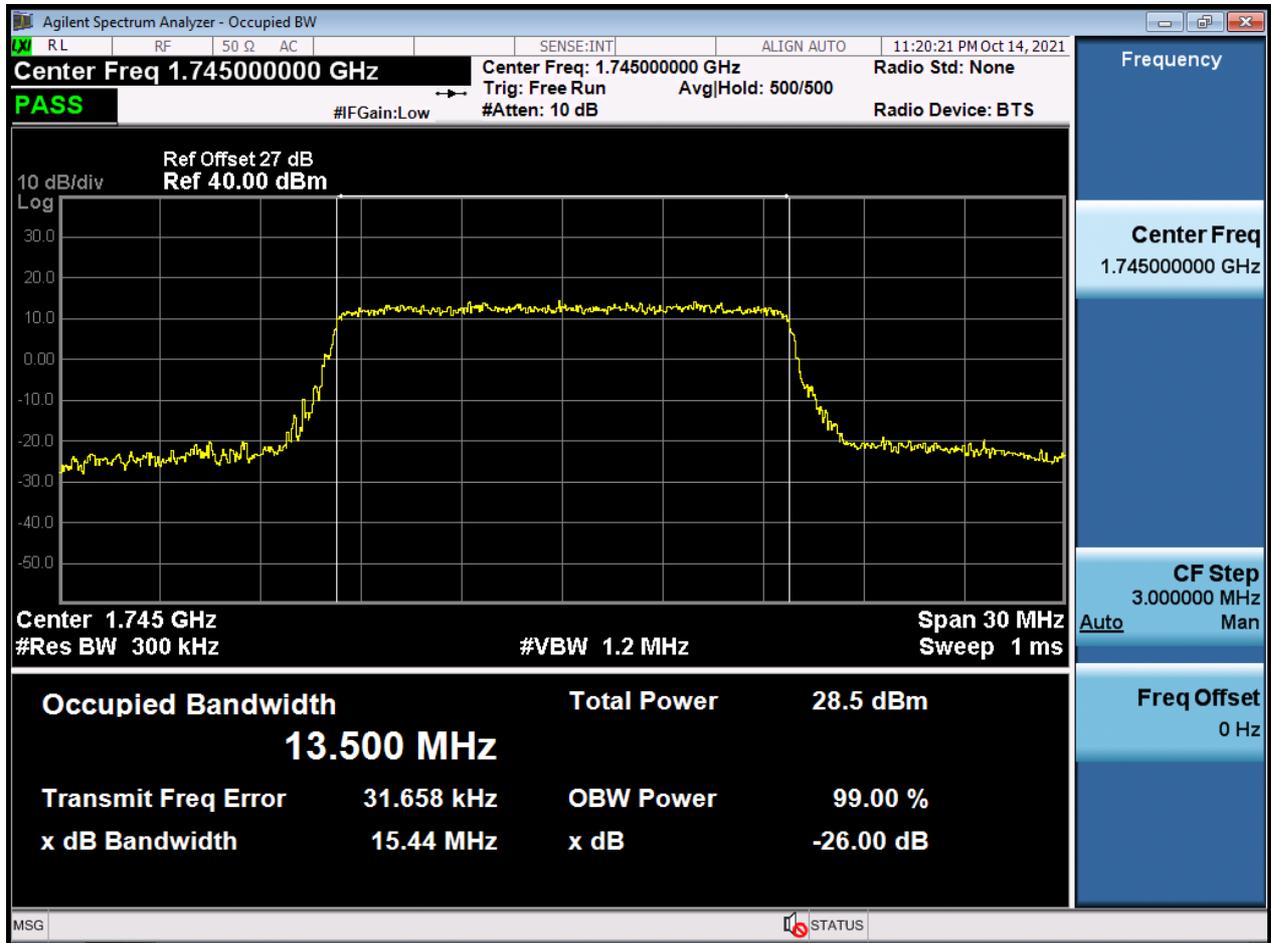
BW15 M\_OBW\_Middle Channel\_QPSK\_FullIRB



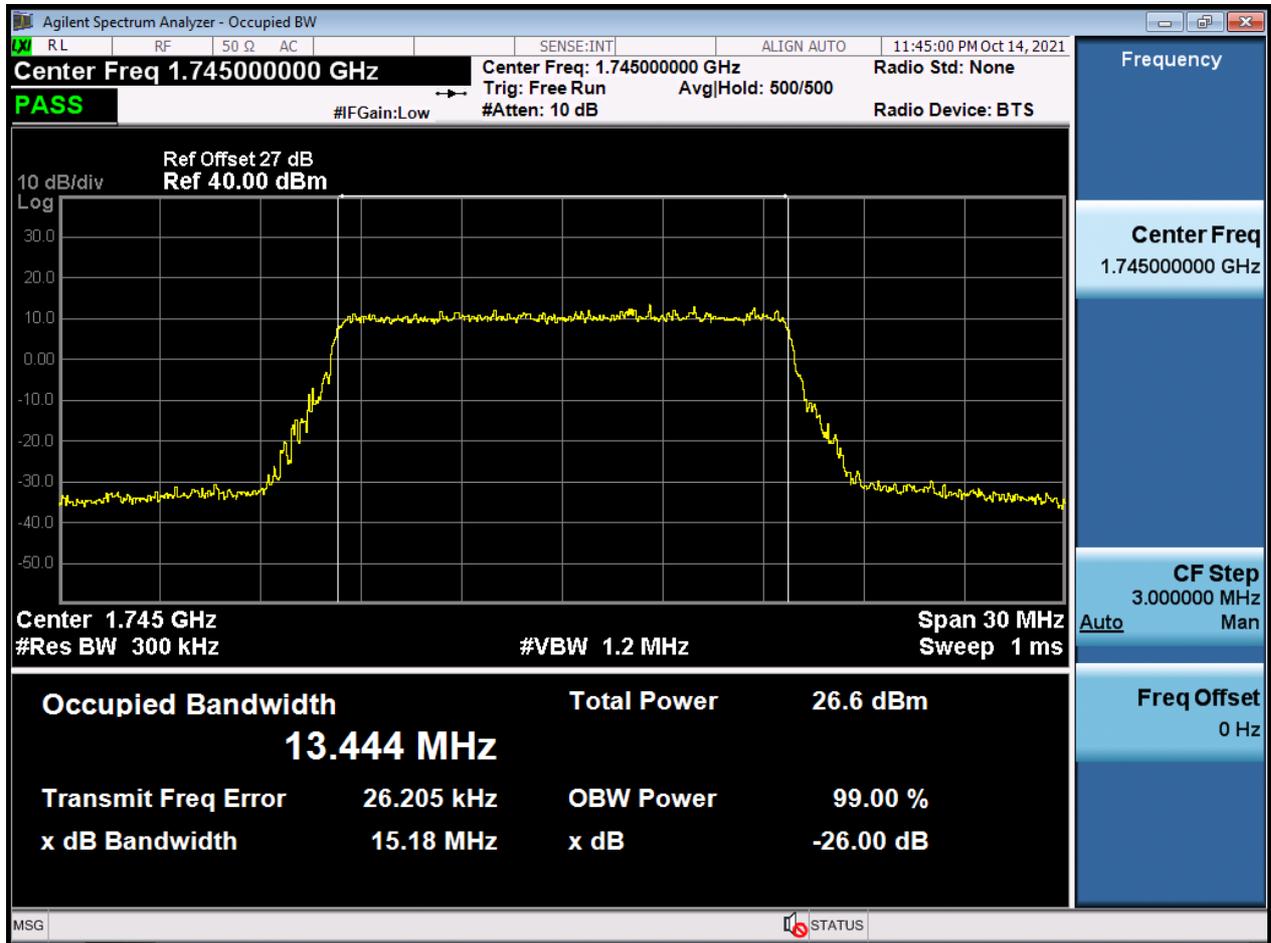
BW15 M\_OBW\_Middle Channel\_16QAM\_FullIRB



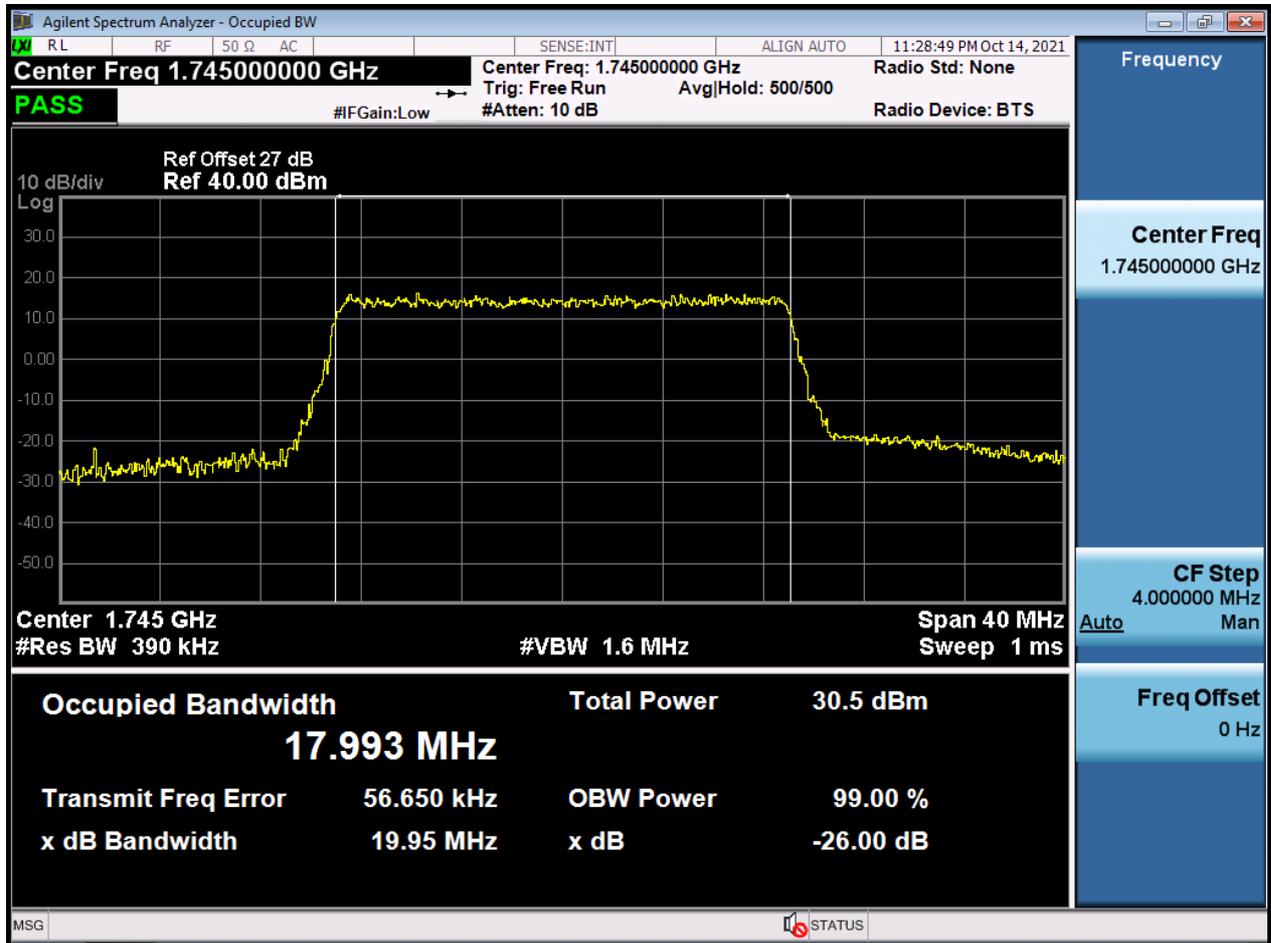
BW15 M\_OBW\_Middle Channel\_64QAM\_FullIRB



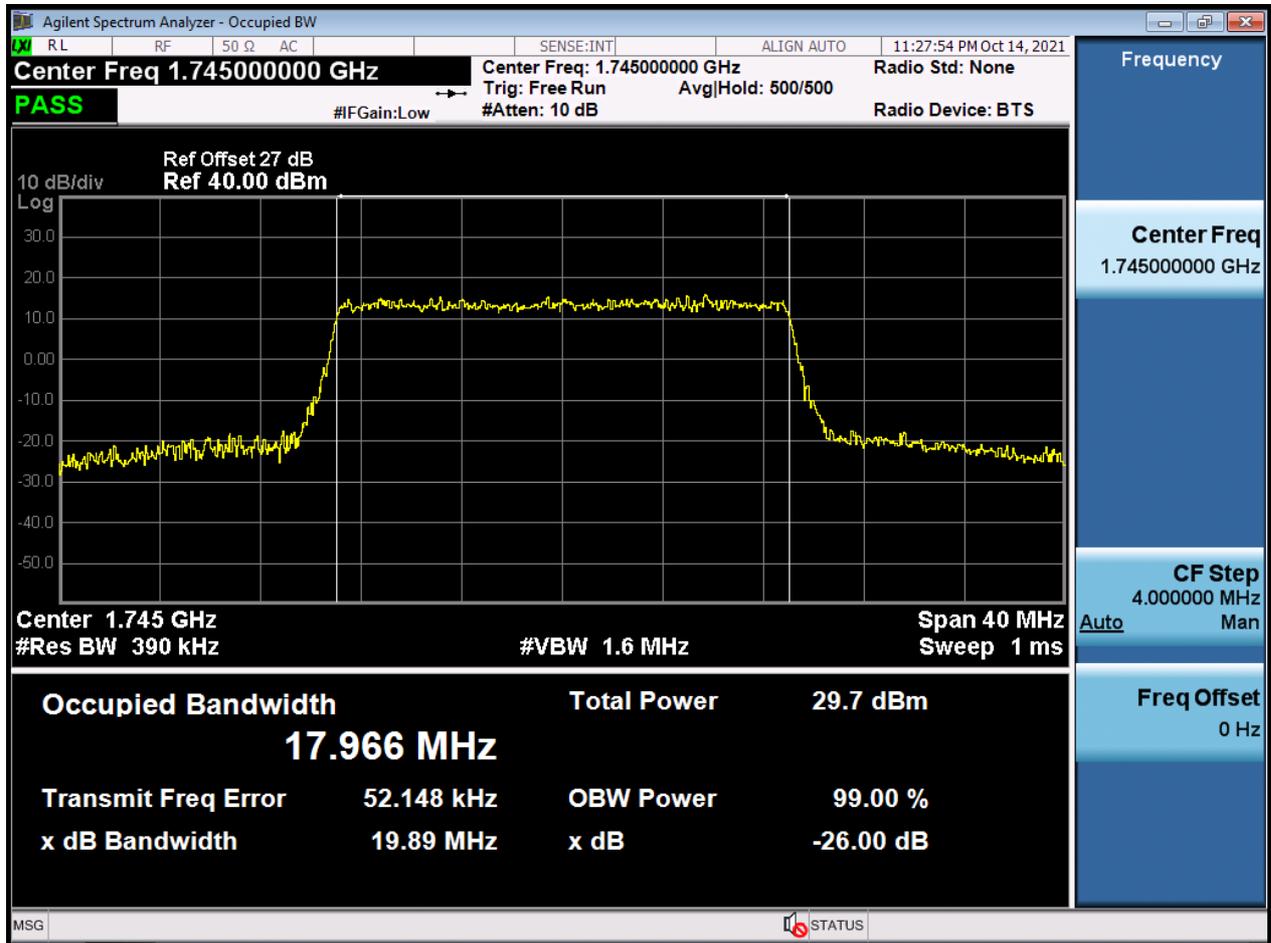
BW15 M\_OBW\_Middle Channel\_256QAM\_FullRB



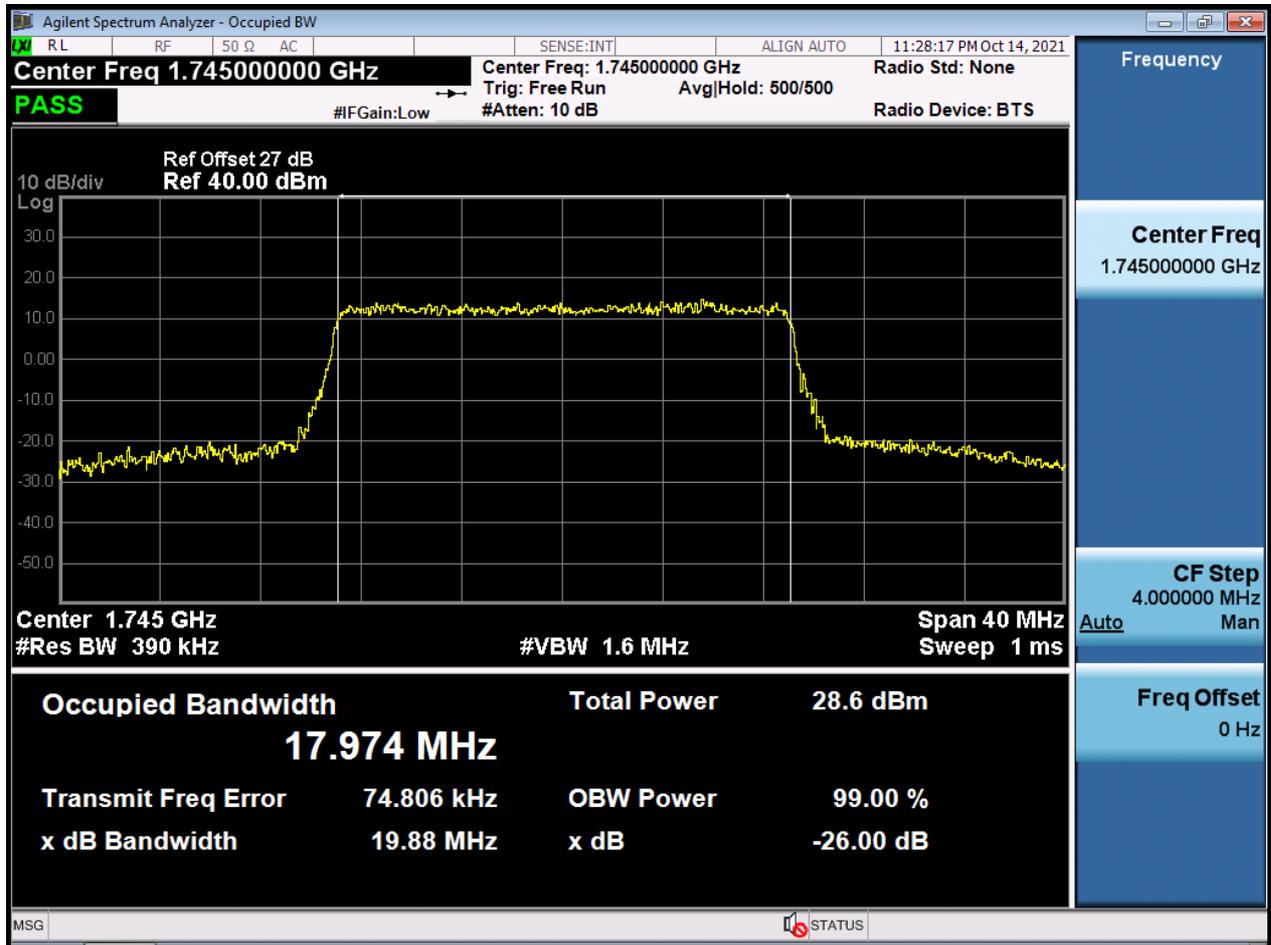
BW20 M\_OBW\_Middle Channel\_QPSK\_FullIRB



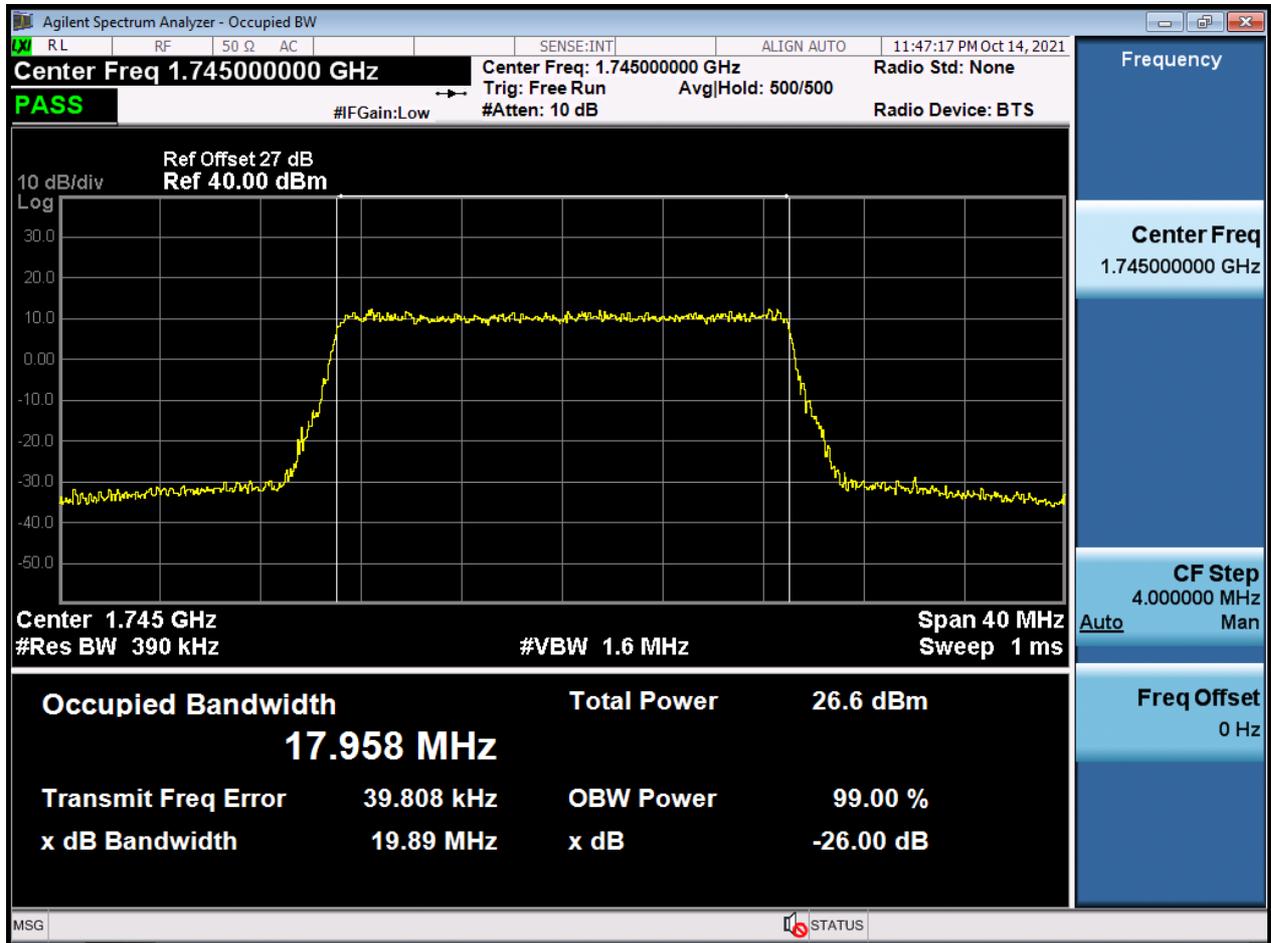
BW20 M\_OBW\_Middle Channel\_16QAM\_FullIRB



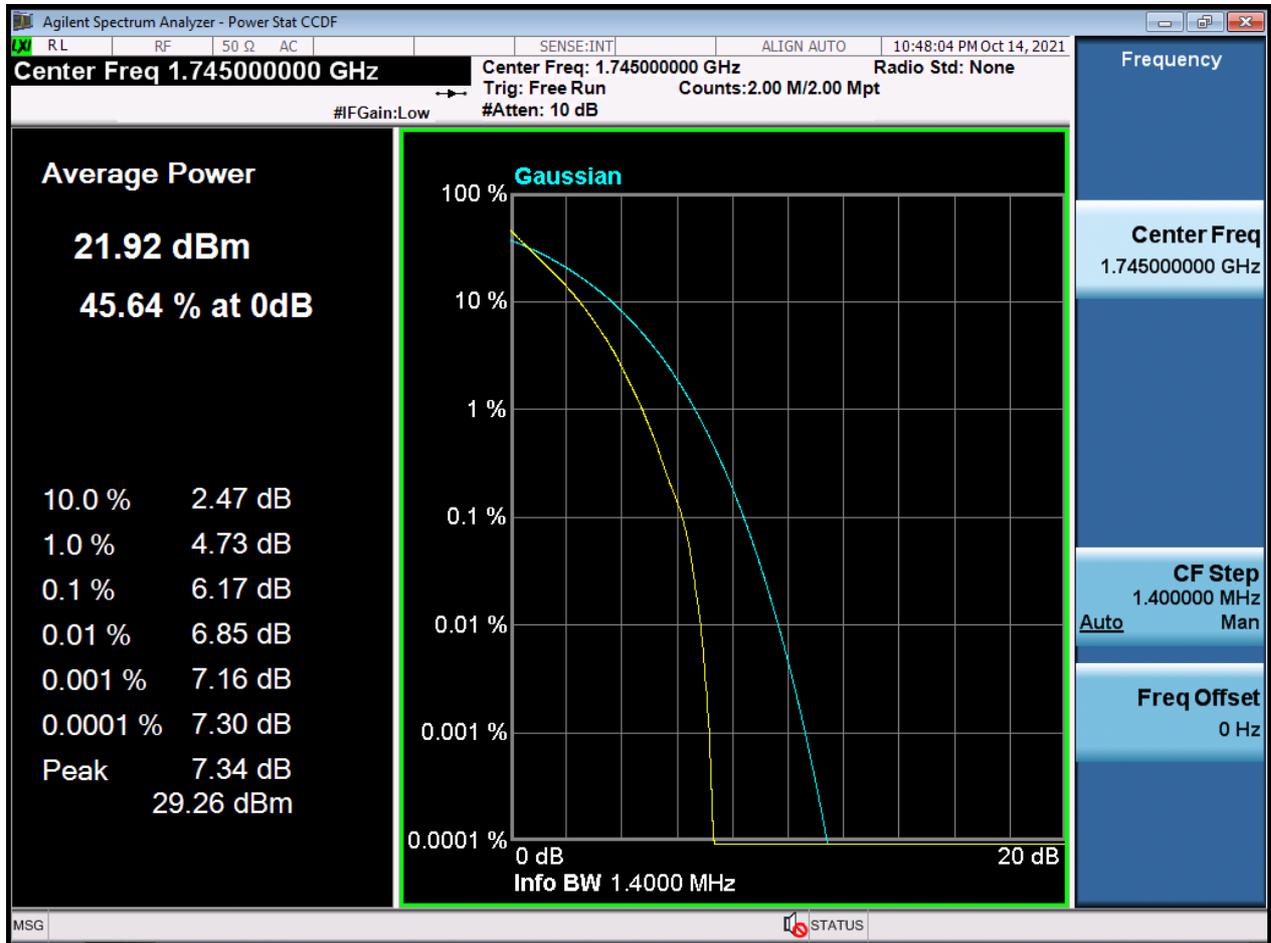
BW20 M\_OBW\_Middle Channel\_64QAM\_FullIRB



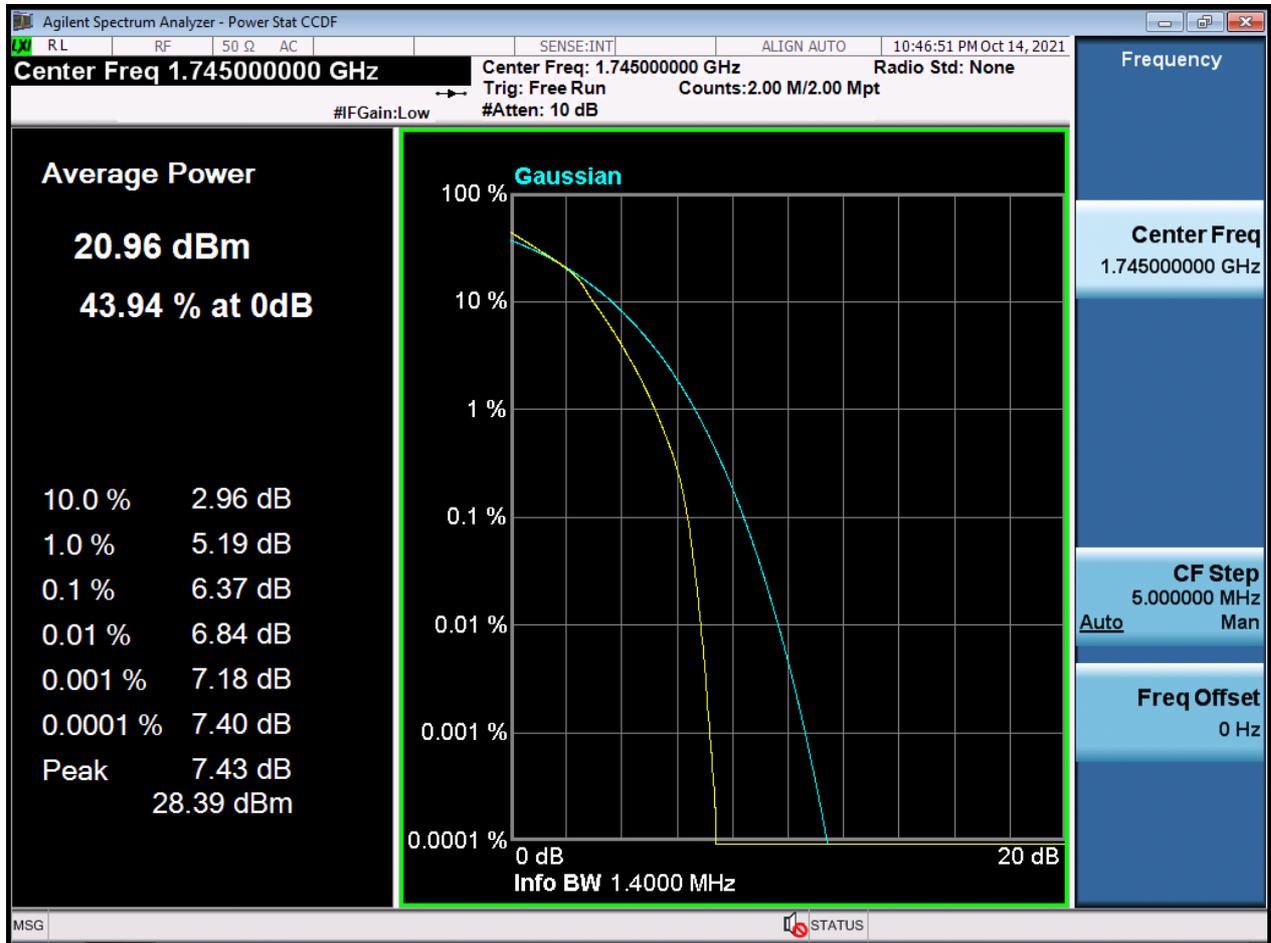
BW20 M\_OBW\_Middle Channel\_256QAM\_FullRB



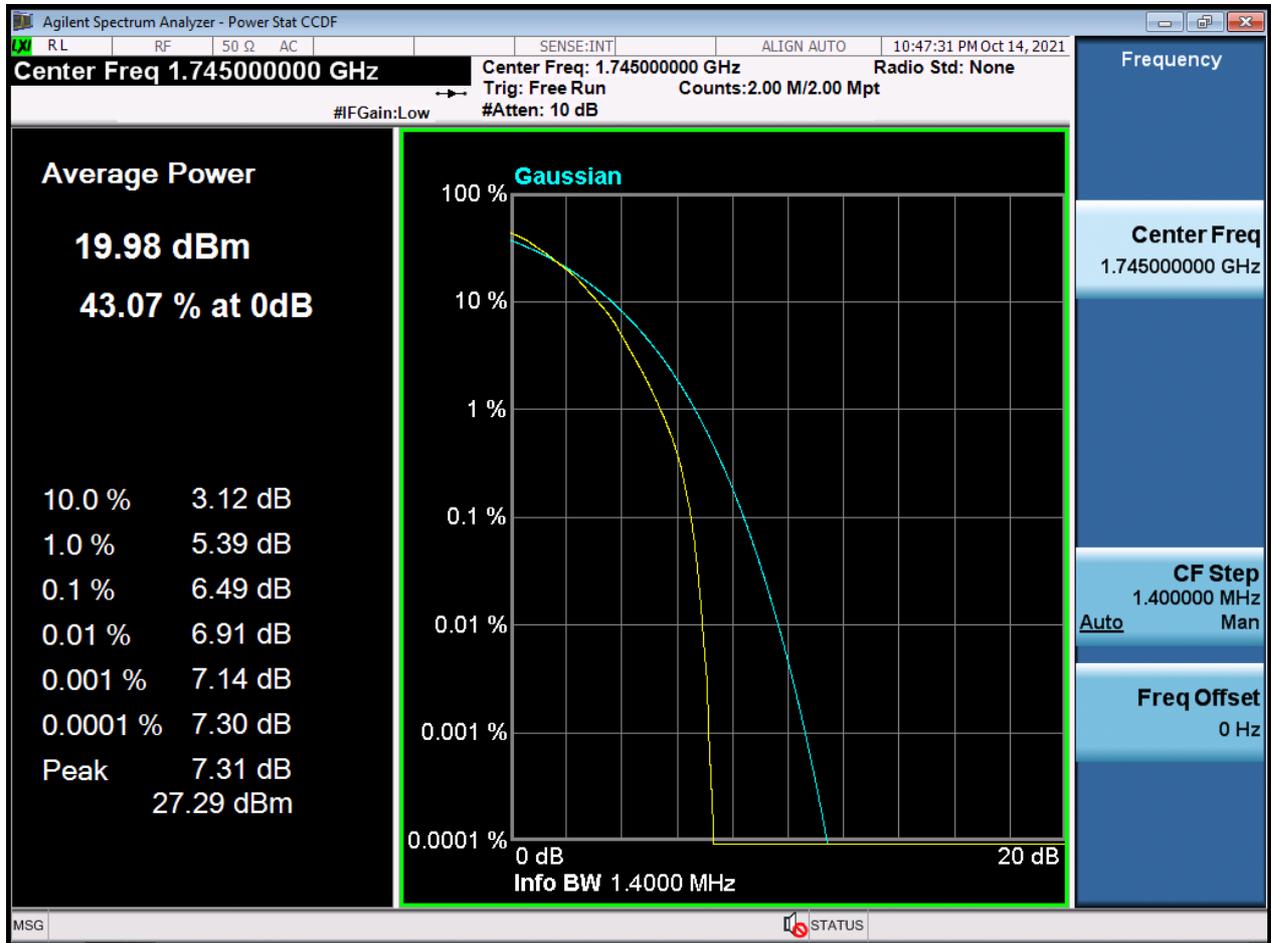
BW1.4 M\_PAR\_Middle Channel\_QPSK\_FullIRB



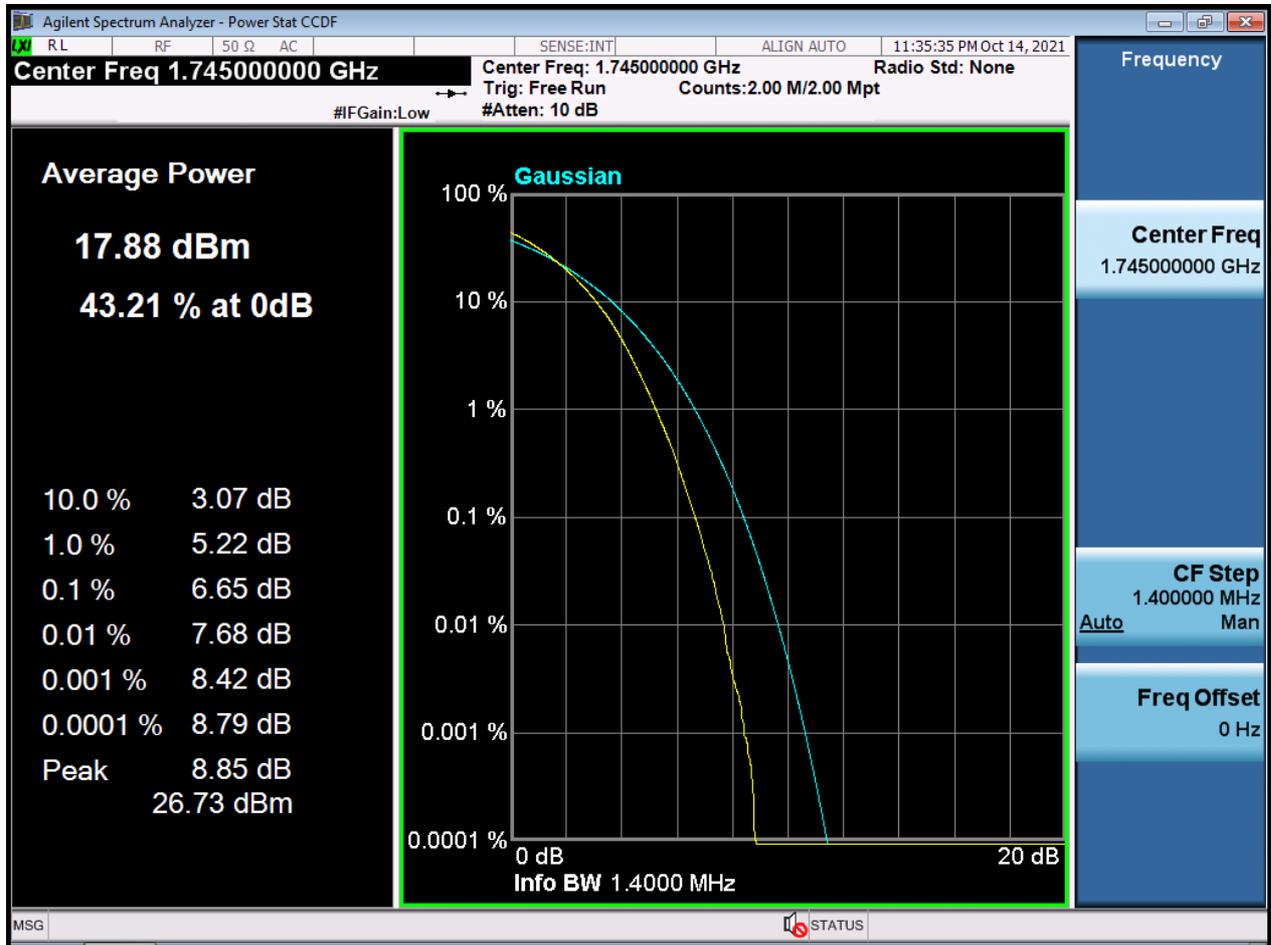
BW1.4 M\_PAR\_Middle Channel\_16QAM\_FullIRB



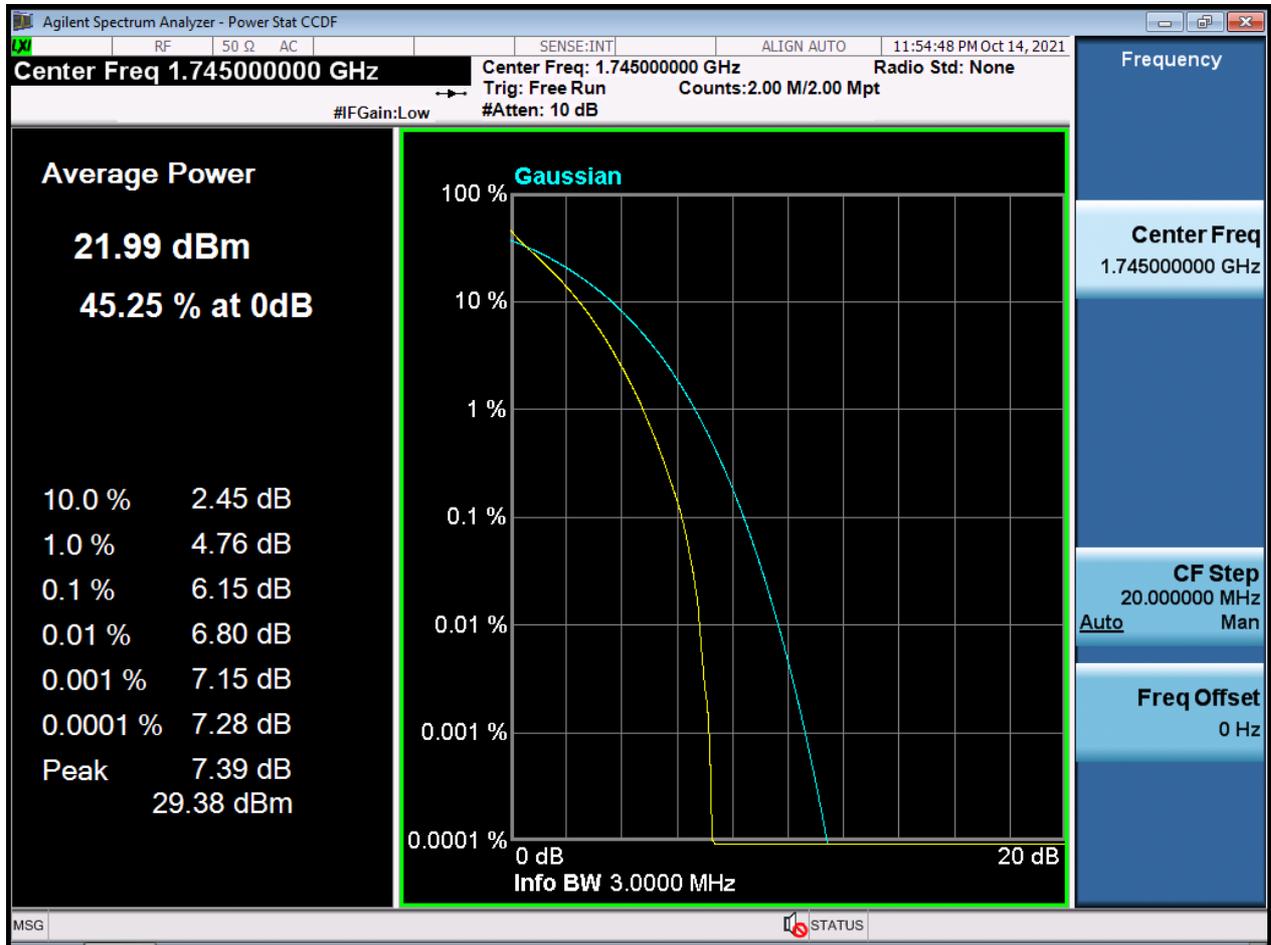
BW1.4 M\_PAR\_Middle Channel\_64QAM\_FullIRB



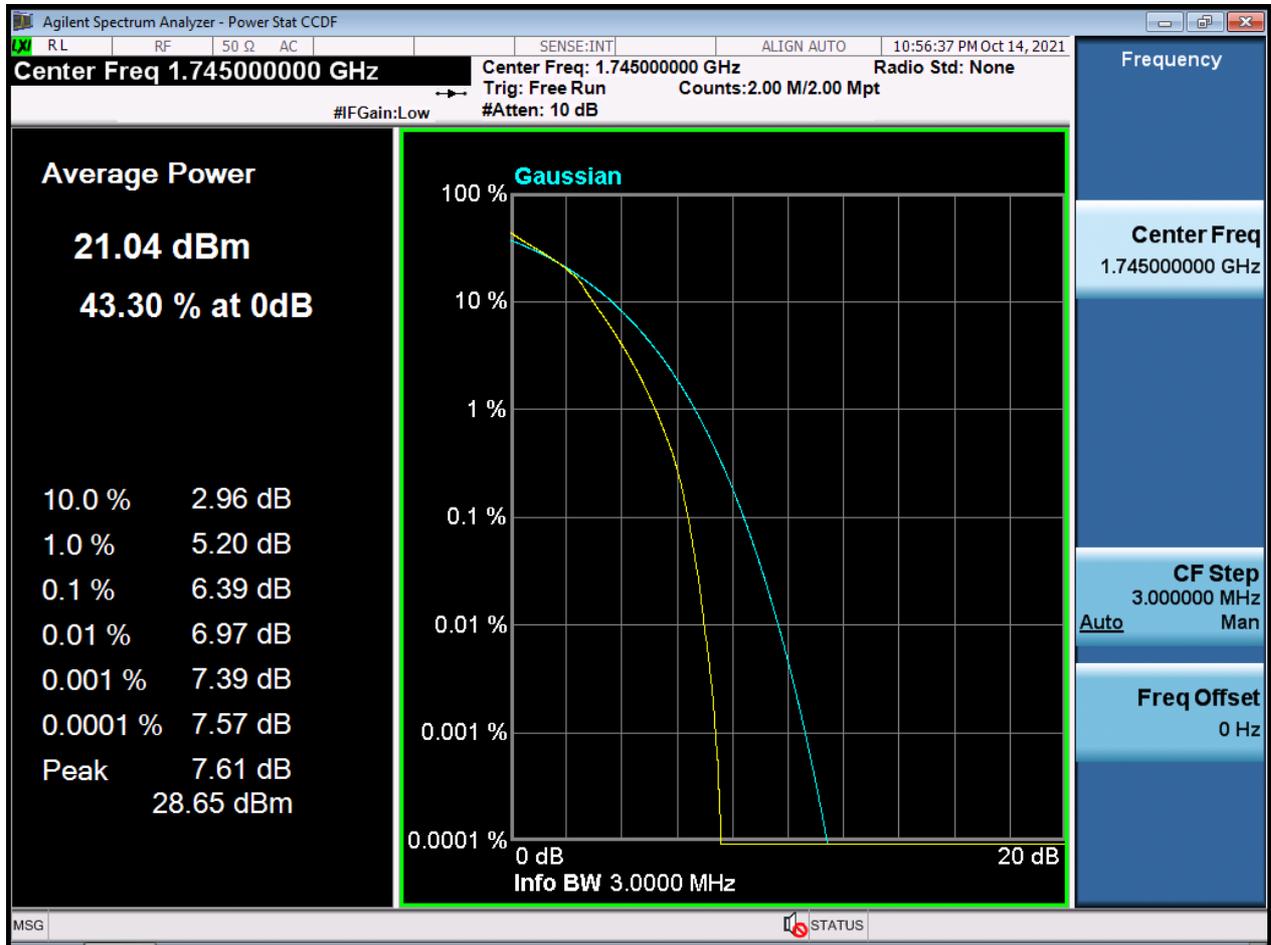
BW1.4 M\_PAR\_Middle Channel\_256QAM\_FullRB



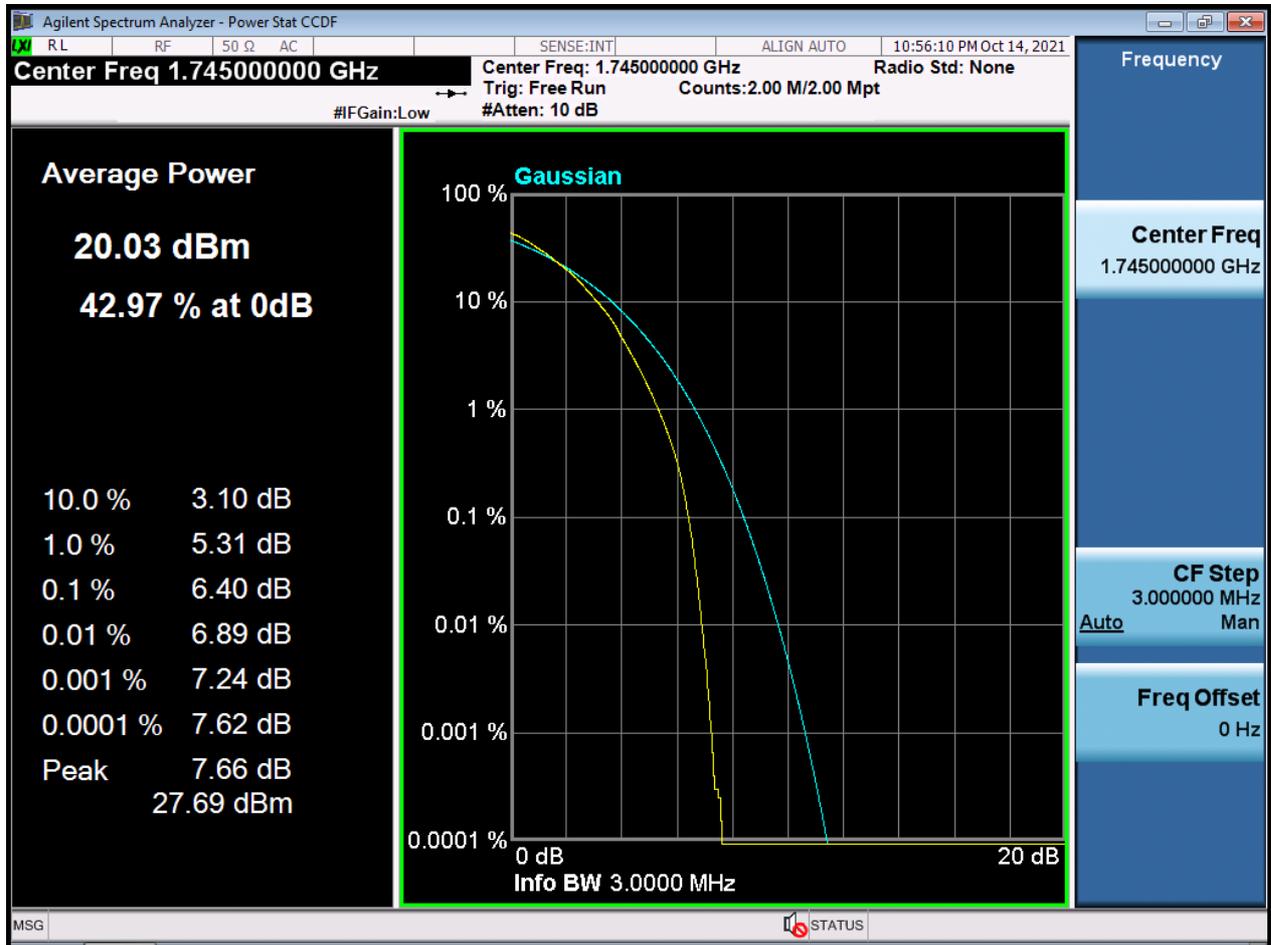
BW3 M\_PAR\_Middle Channel\_QPSK\_FullIRB



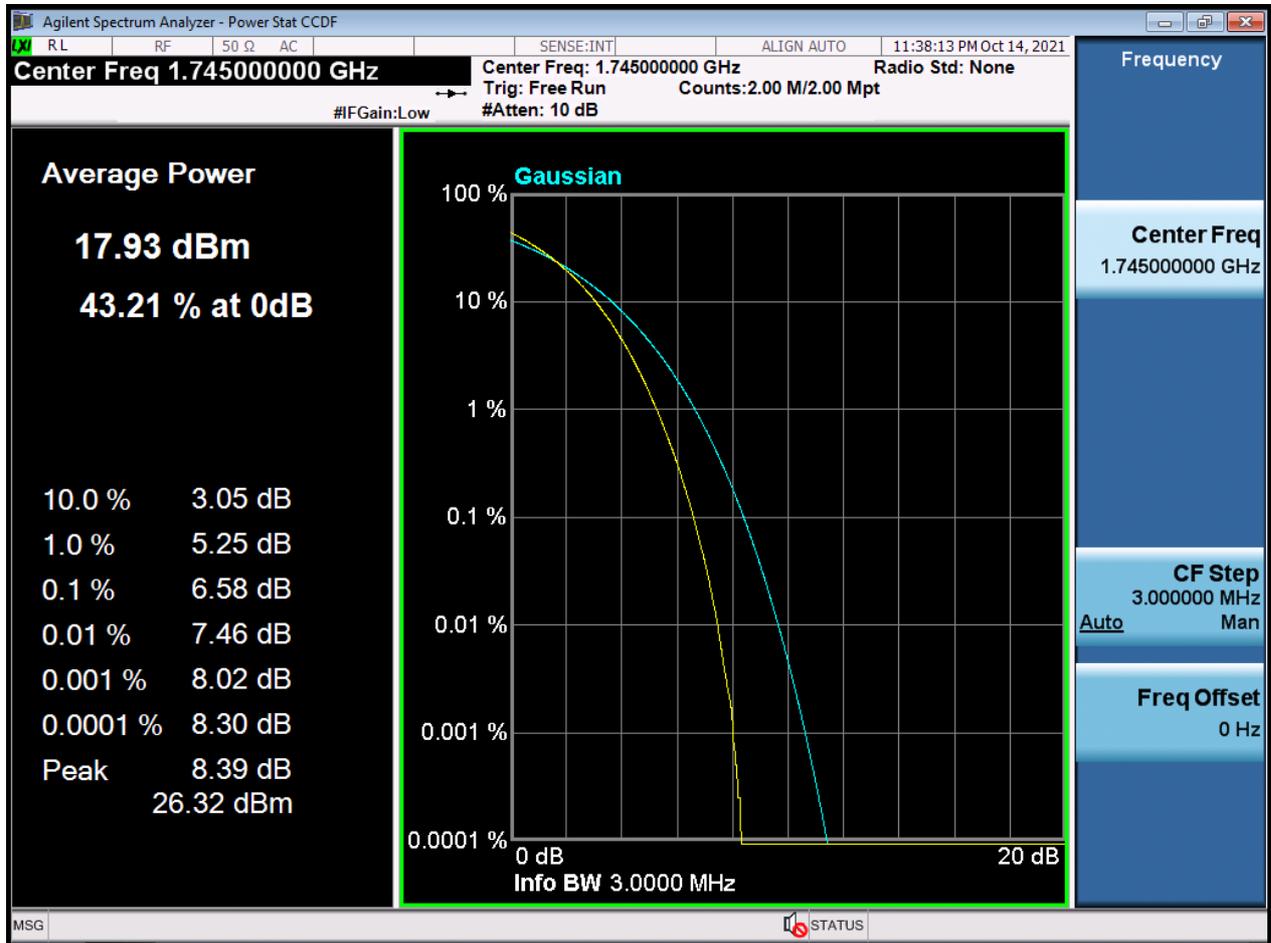
BW3 M\_PAR\_Middle Channel\_16QAM\_FullRB



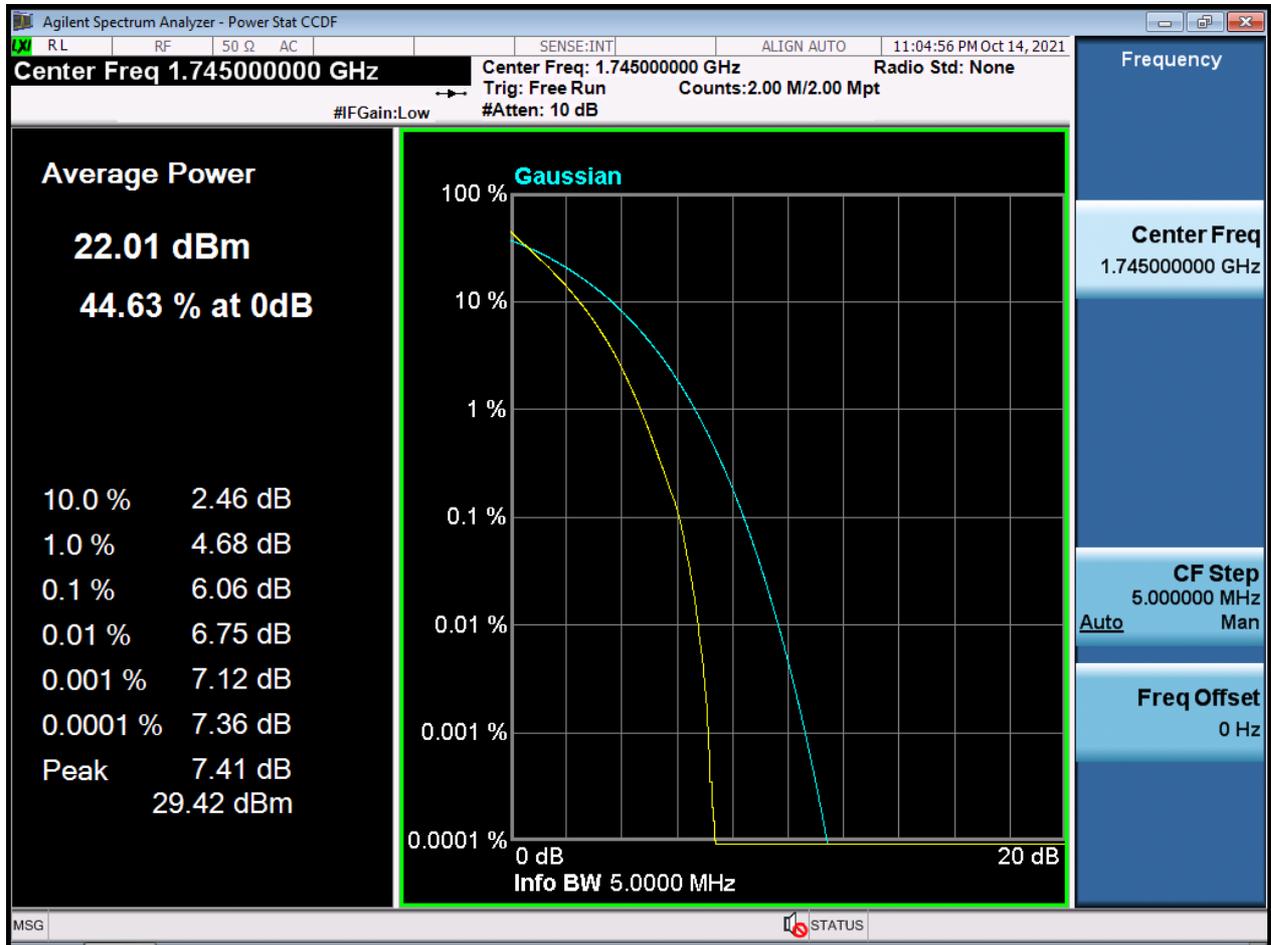
BW3 M\_PAR\_Middle Channel\_64QAM\_FuIRB



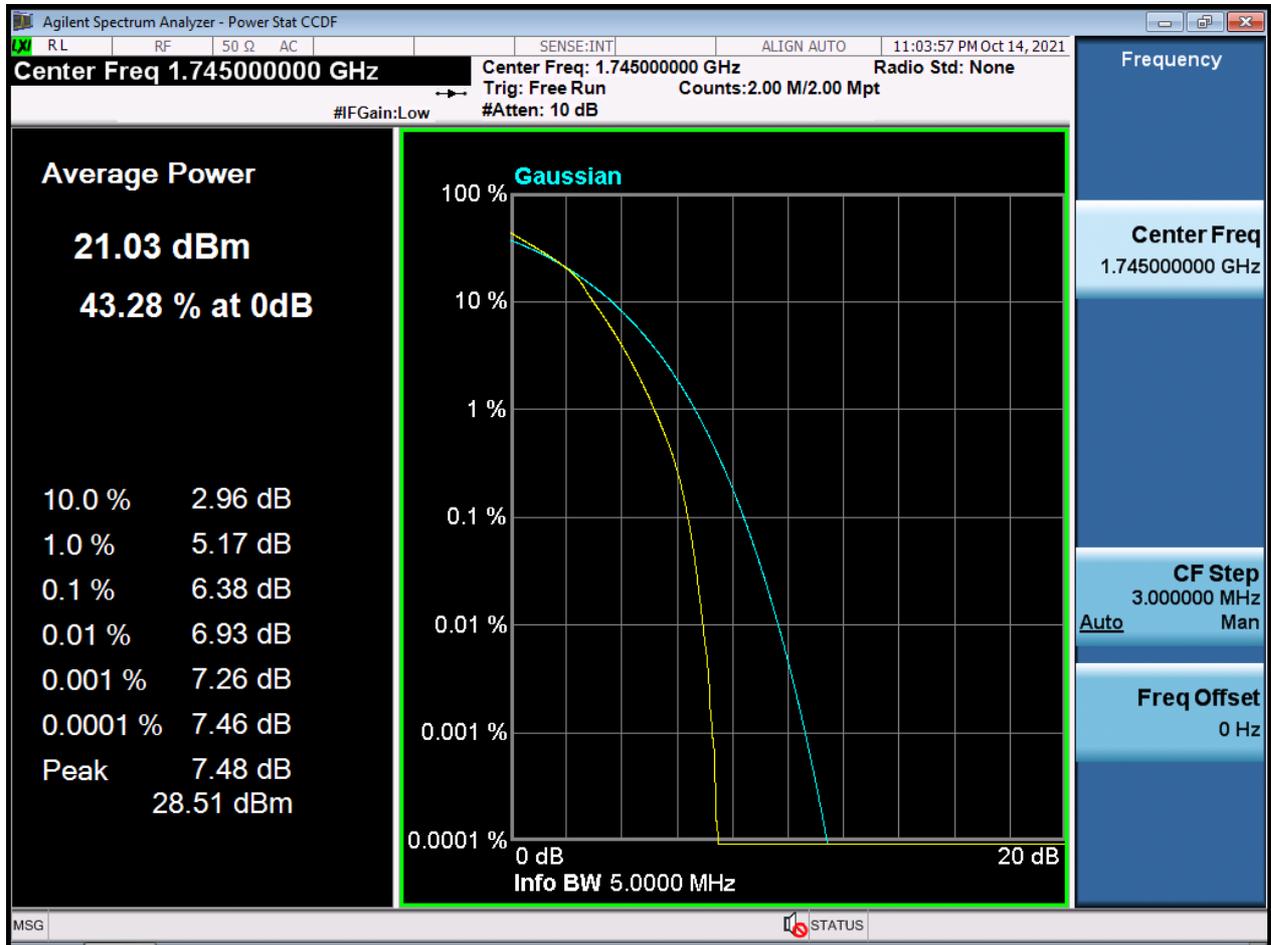
BW3 M\_PAR\_Middle Channel\_256QAM\_FullRB



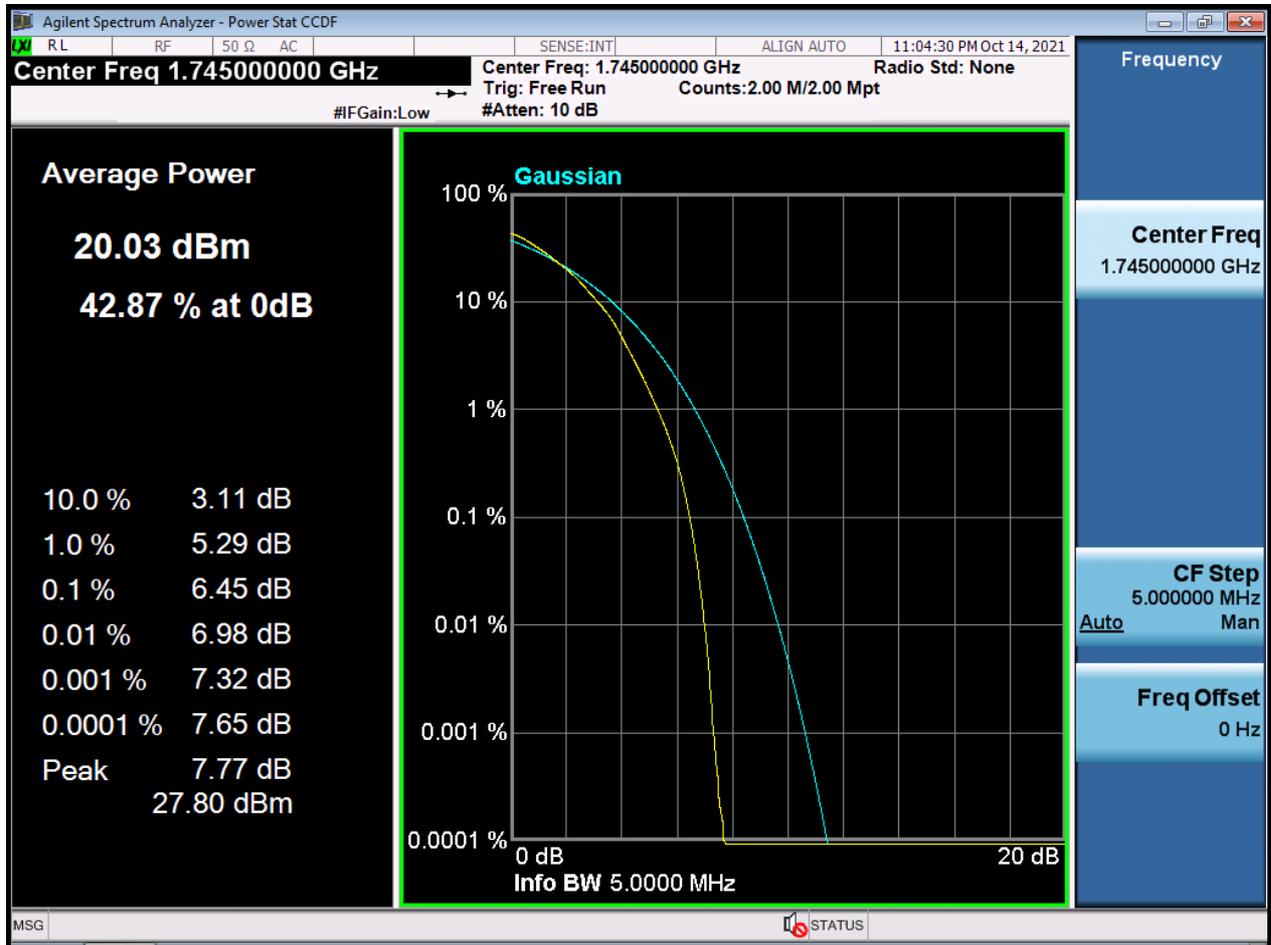
BW5 M\_PAR\_Middle Channel\_QPSK\_FullIRB



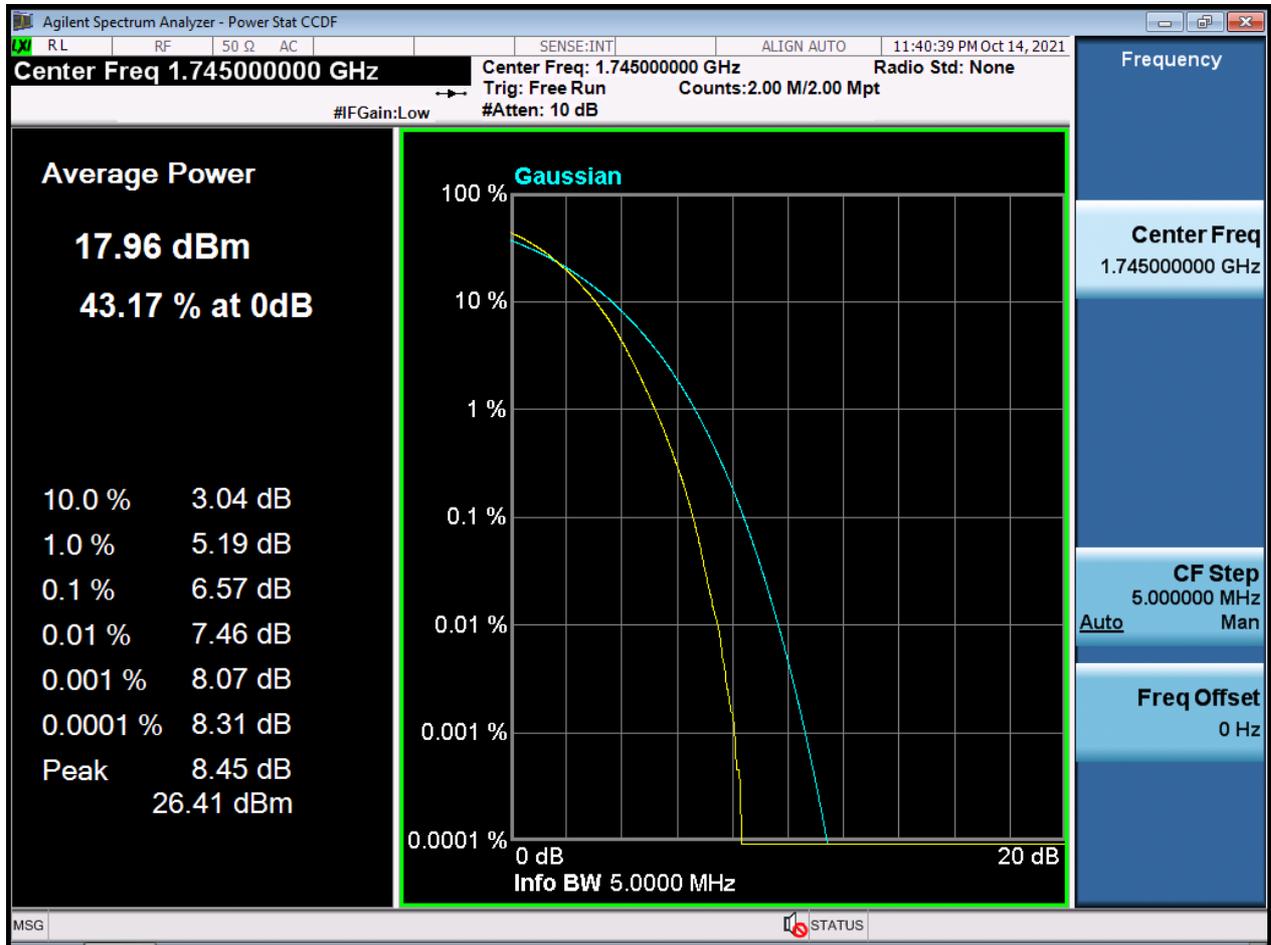
BW5 M\_PAR\_Middle Channel\_16QAM\_FullRB



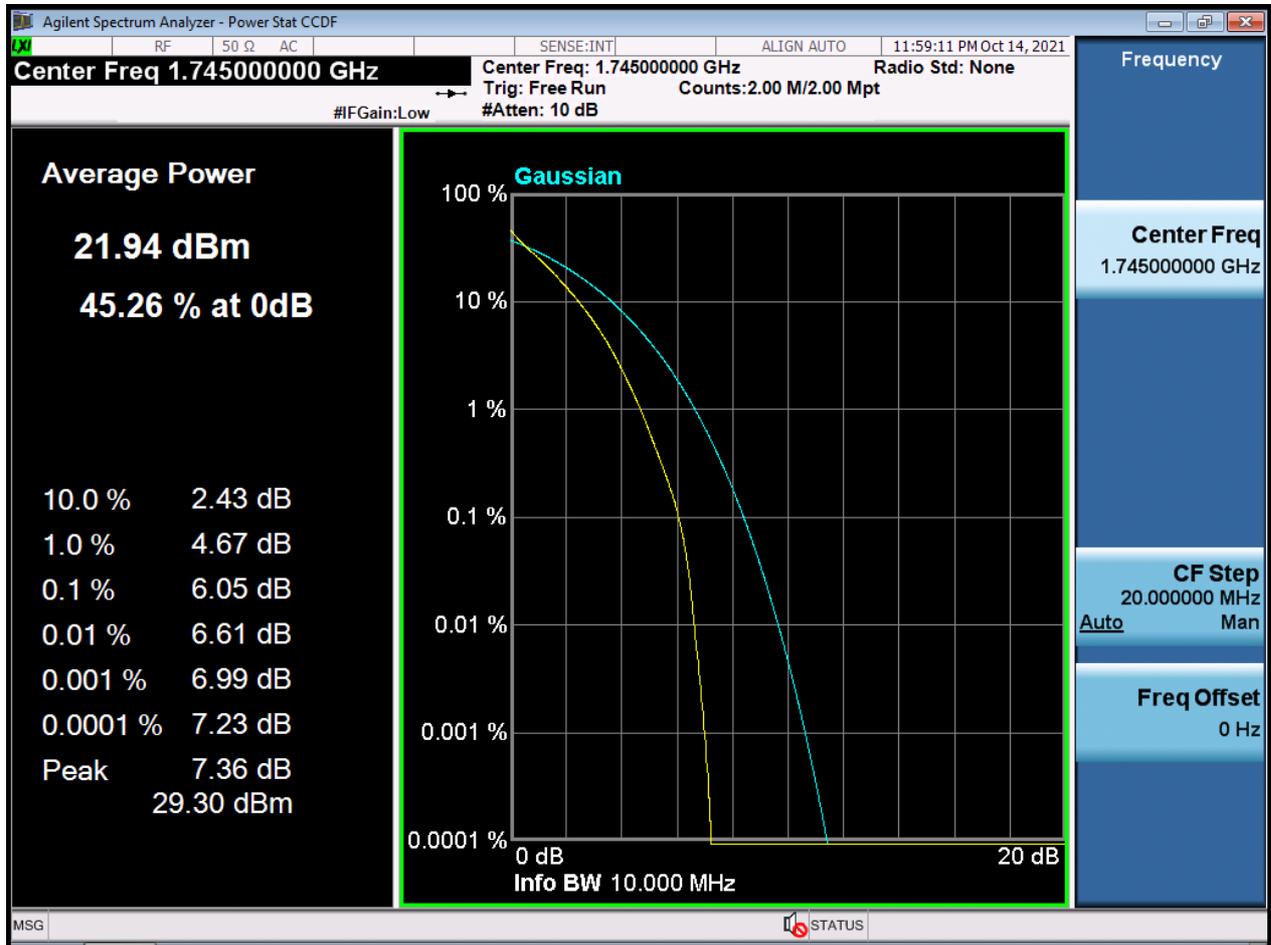
BW5 M\_PAR\_Middle Channel\_64QAM\_FullRB



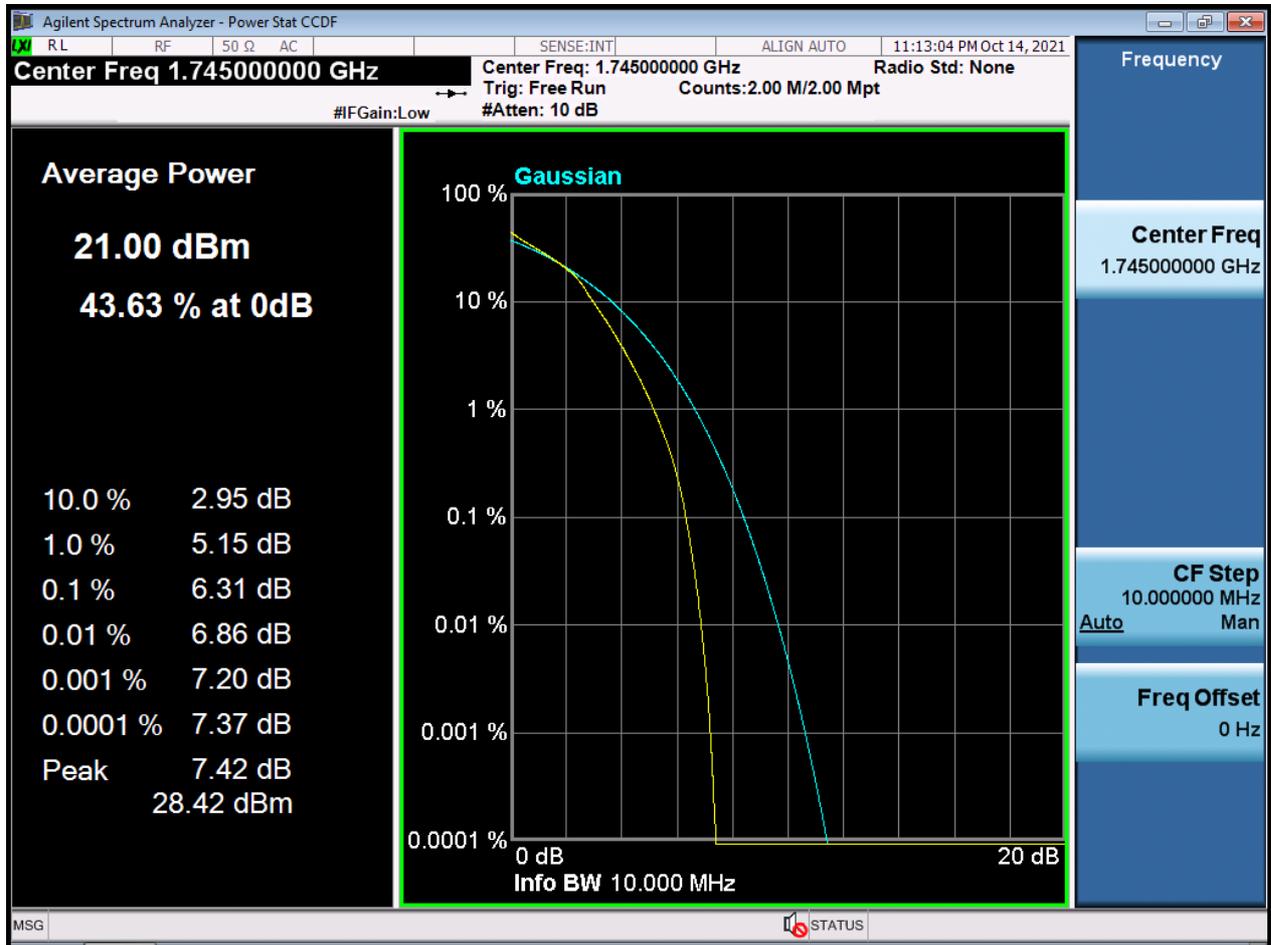
BW5 M\_PAR\_Middle Channel\_256QAM\_FullRB



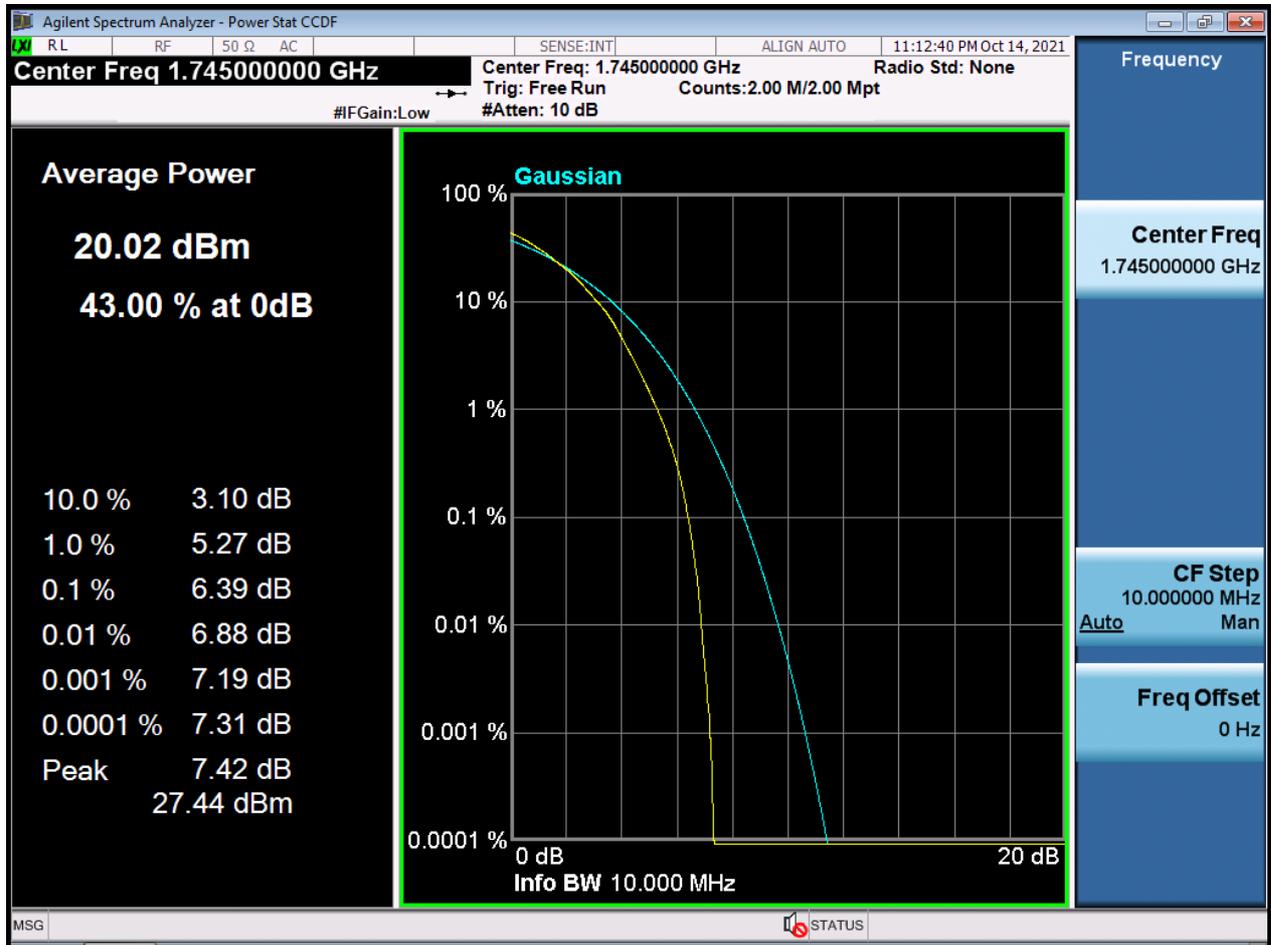
BW10 M\_PAR\_Middle Channelz\_QPSK\_FullRB



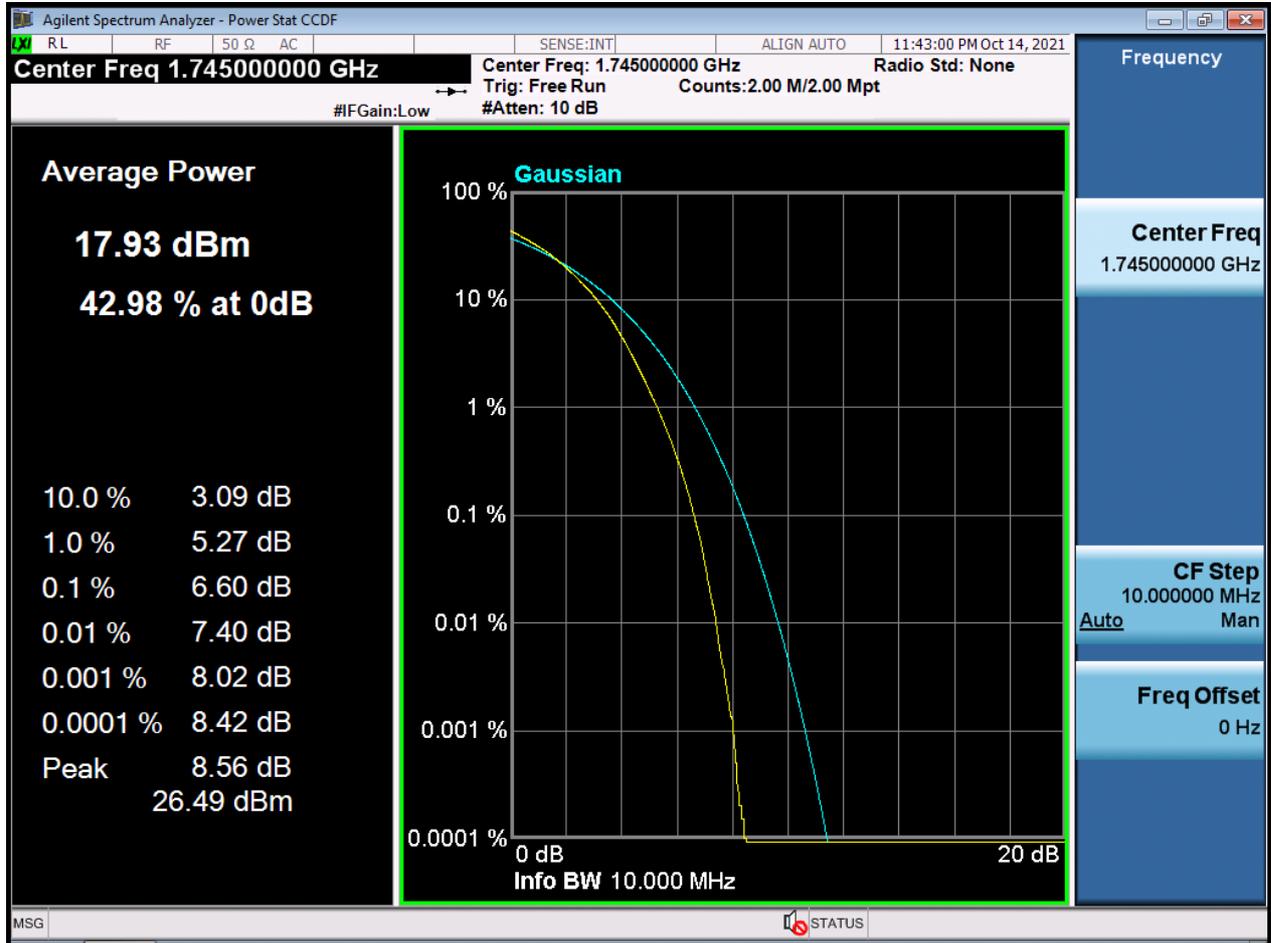
BW10 M\_PAR\_Middle Channel\_16QAM\_FullRB



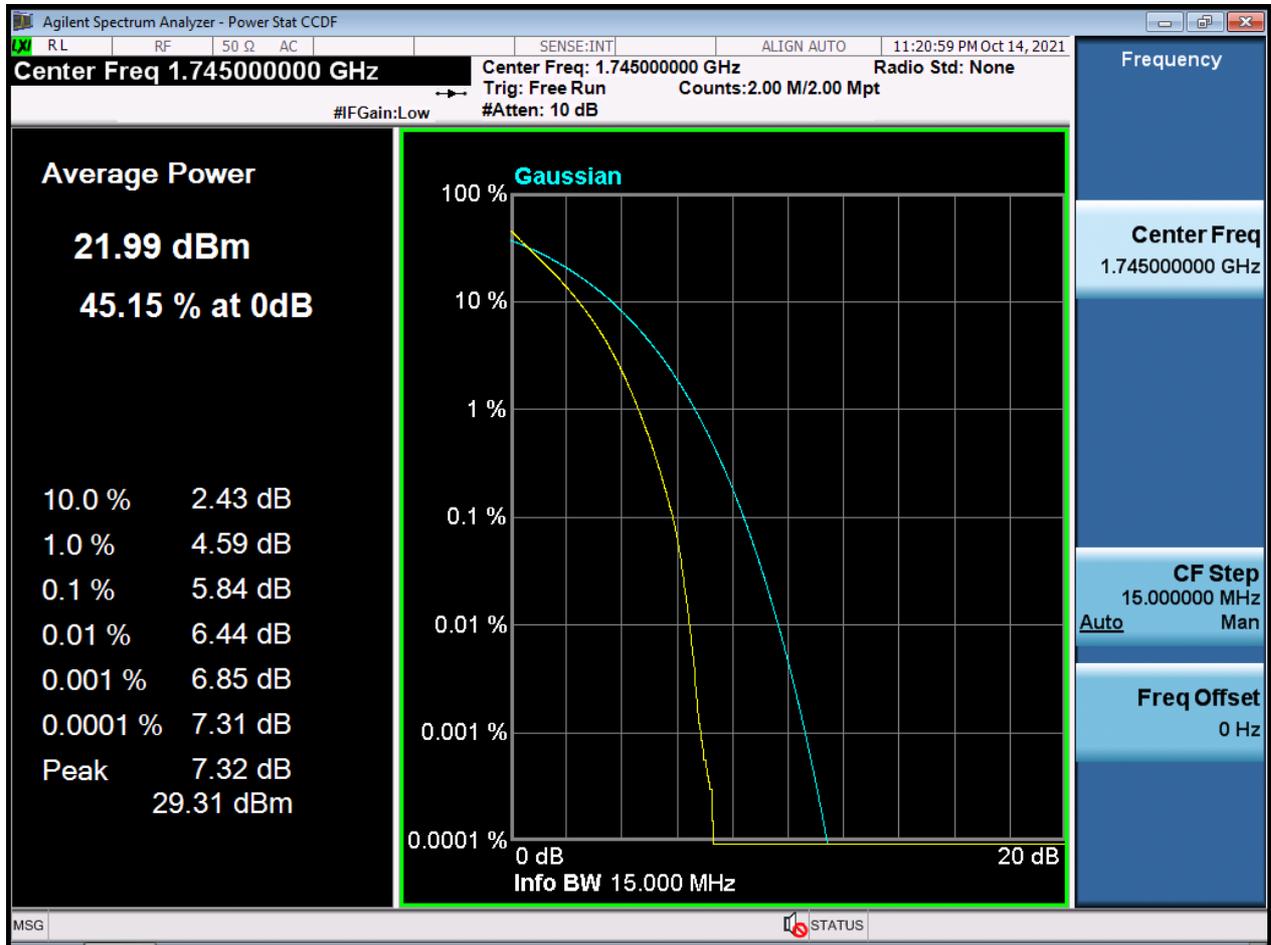
BW10 M\_PAR\_Middle Channel\_64QAM\_FullRB



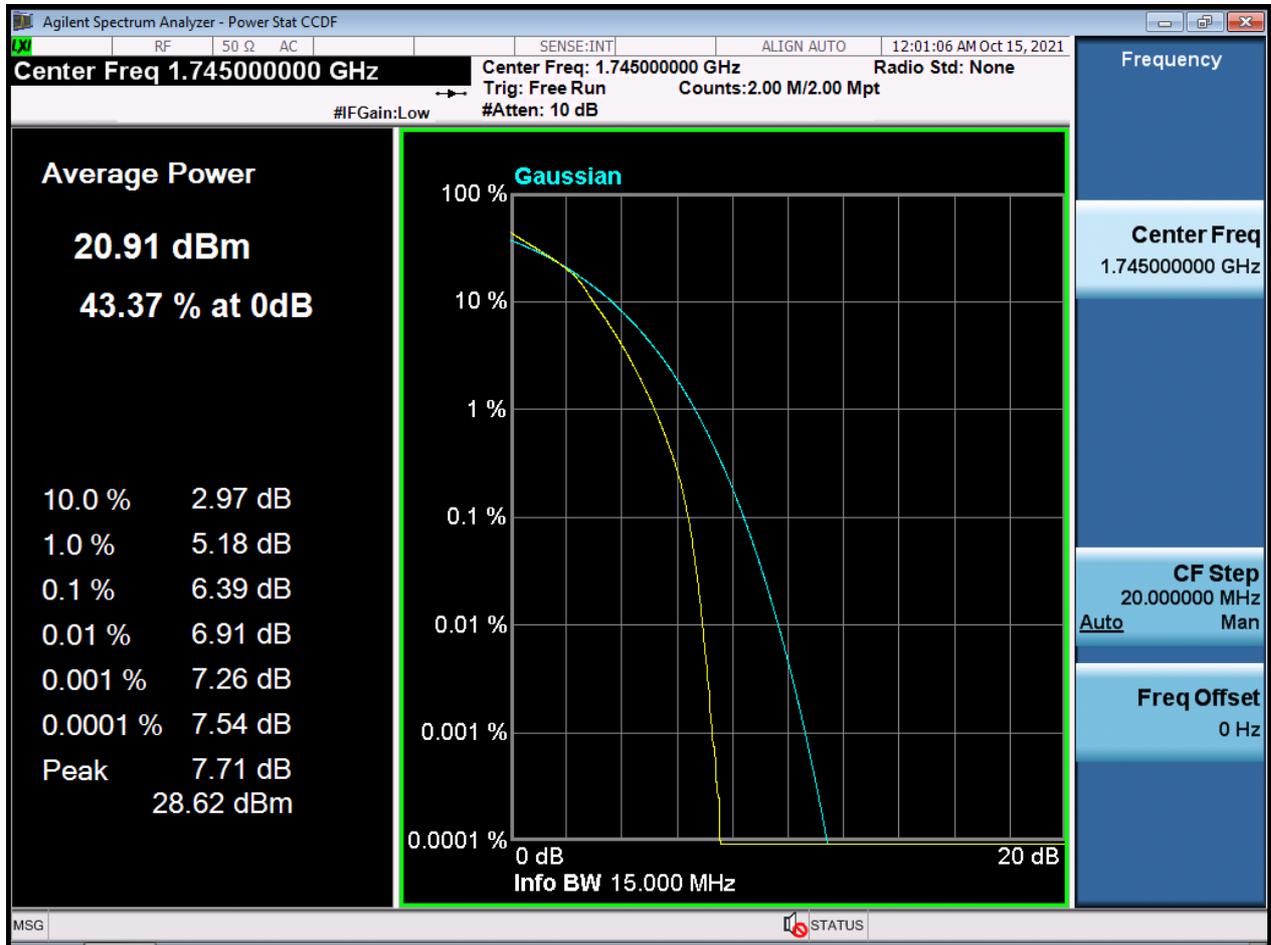
BW10 M\_PAR\_Middle Channel\_256QAM\_FullIRB



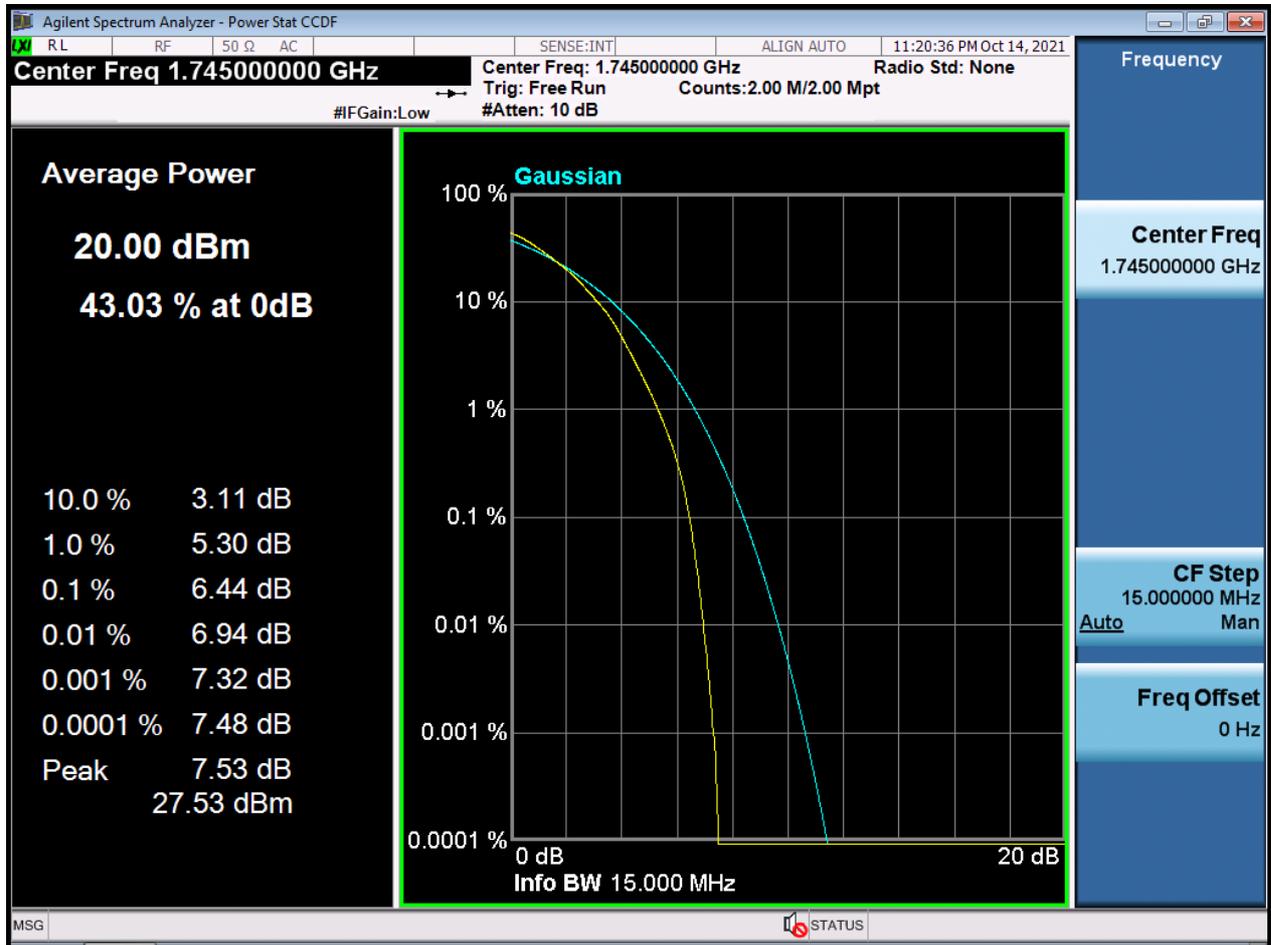
BW15 M\_PAR\_Middle Channel\_QPSK\_FullRB



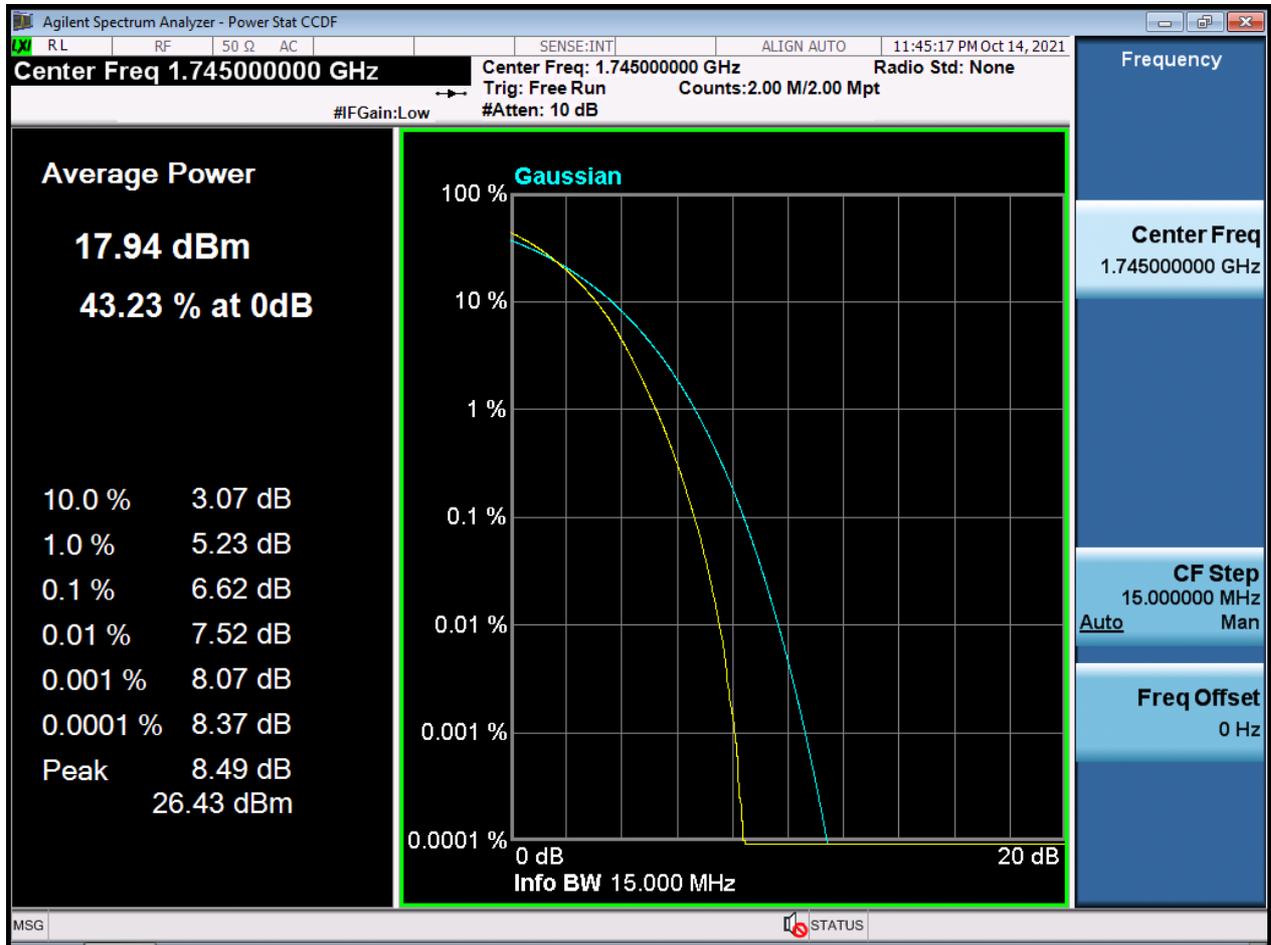
BW15 M\_PAR\_Middle Channel\_16QAM\_FullRB



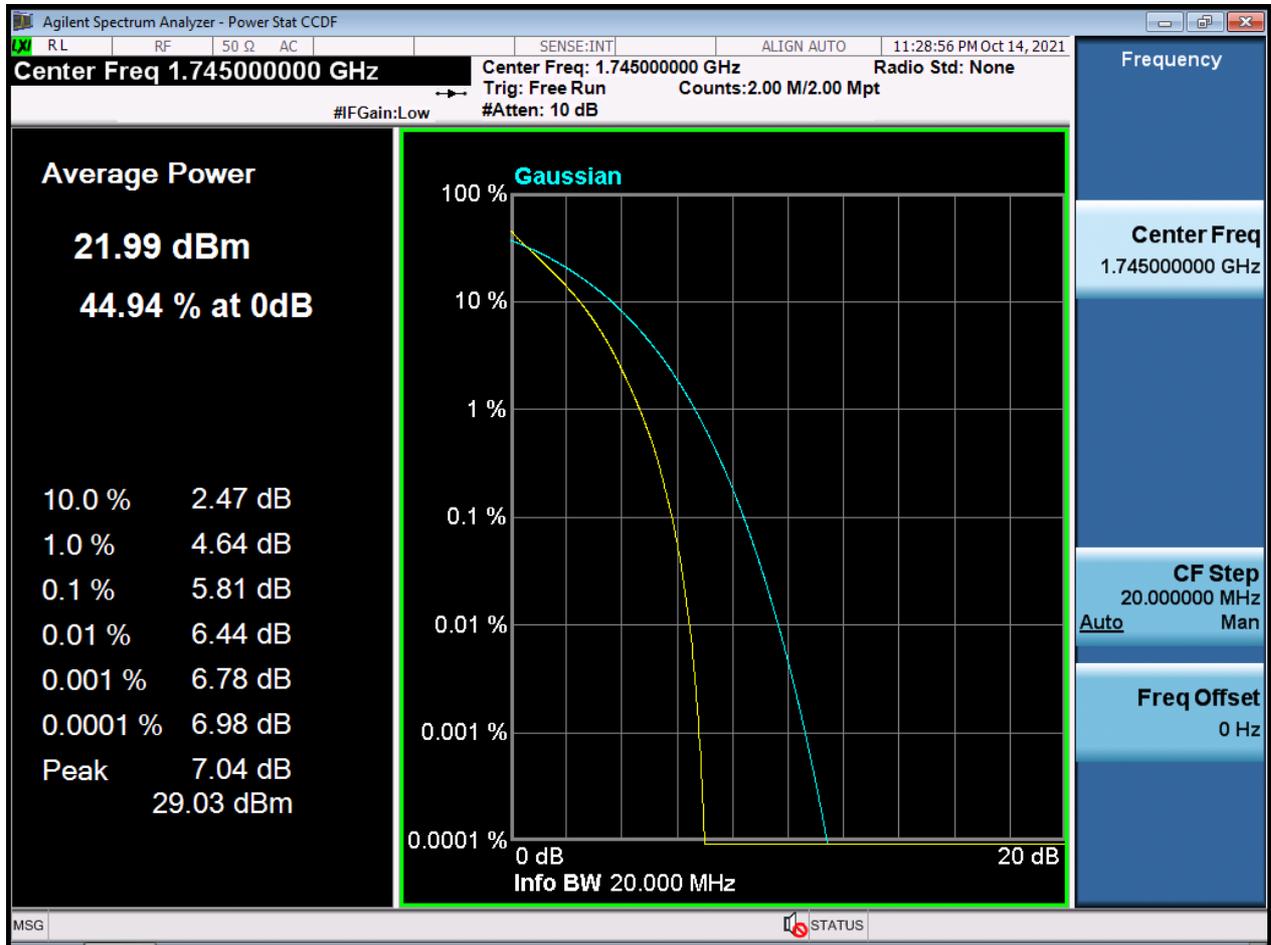
BW15 M\_PAR\_Middle Channel\_64QAM\_FullRB



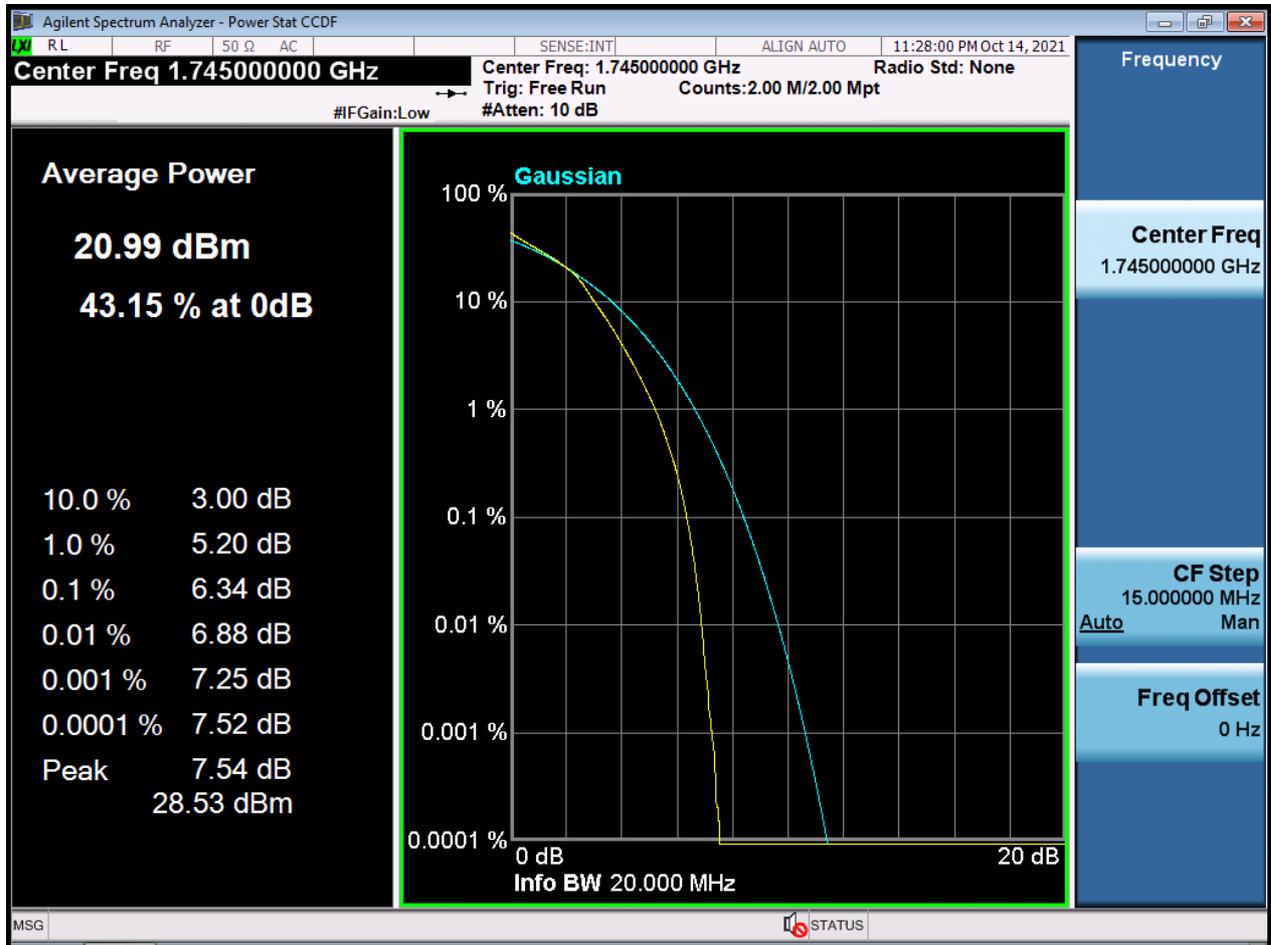
BW15 M\_PAR\_Middle Channel\_256QAM\_FullIRB



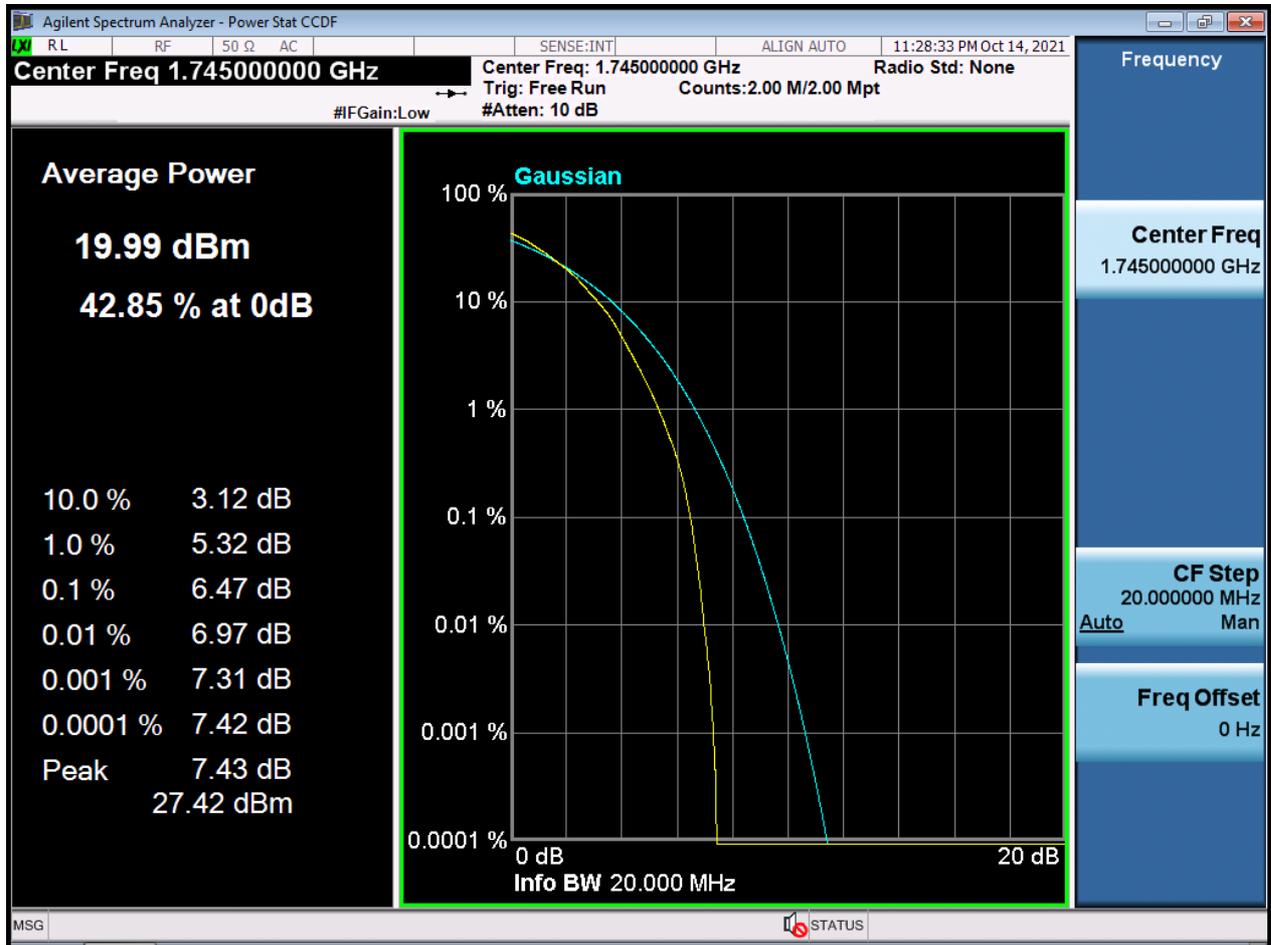
BW20 M\_PAR\_Middle Channel\_QPSK\_FullRB



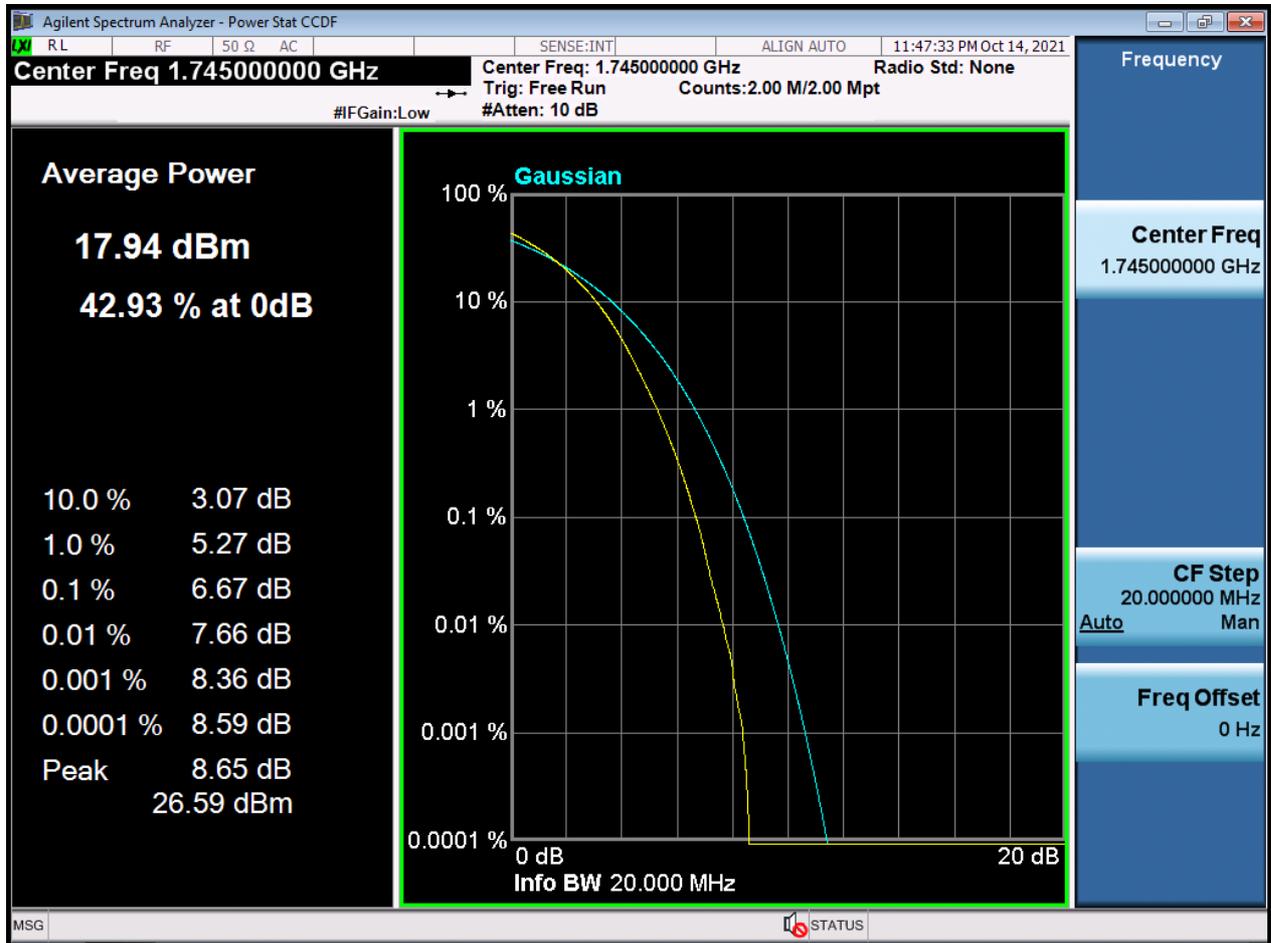
BW20 M\_PAR\_Middle Channel\_16QAM\_FullRB



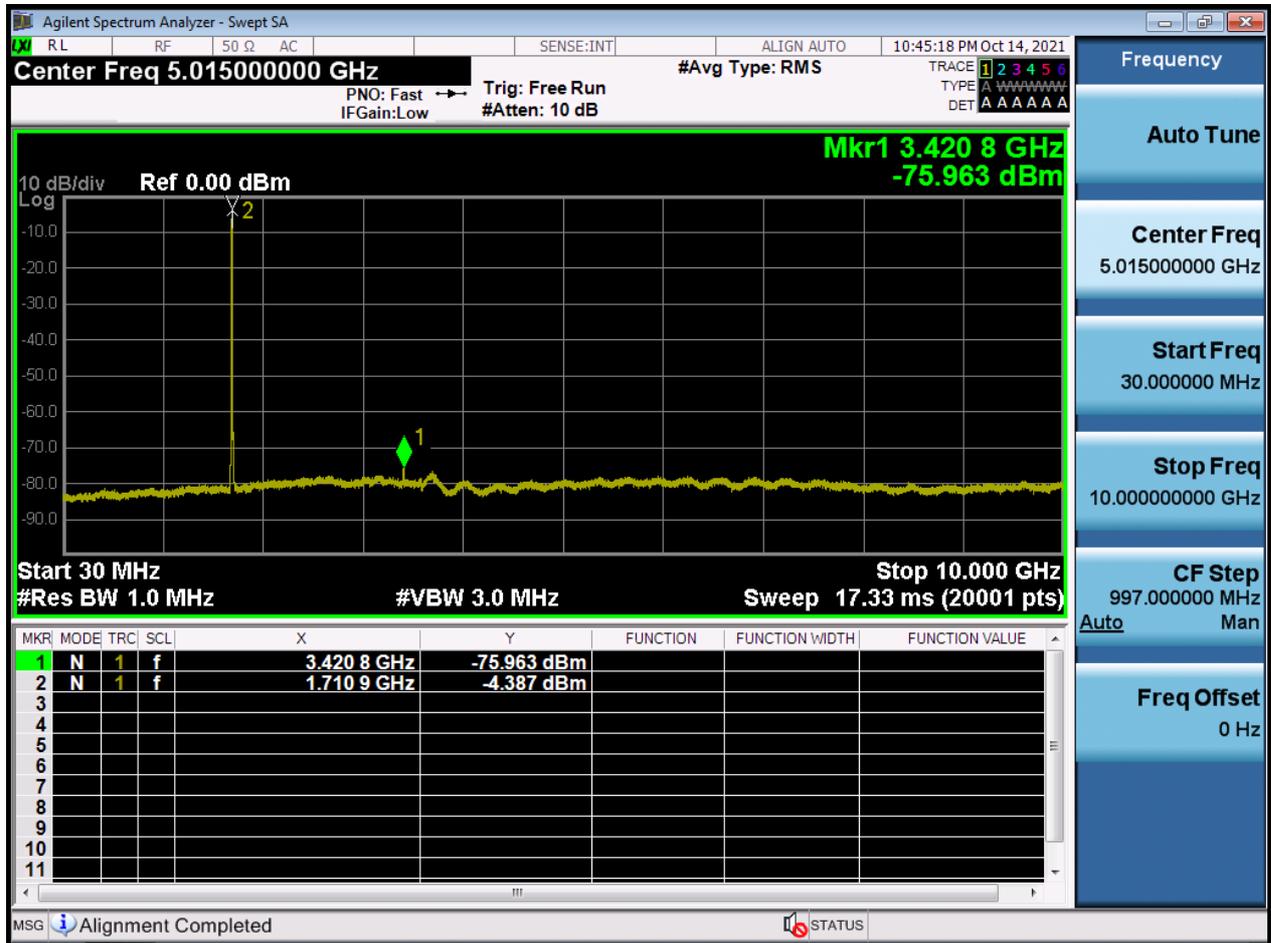
BW20 M\_PAR\_Middle Channel\_64QAM\_FullRB



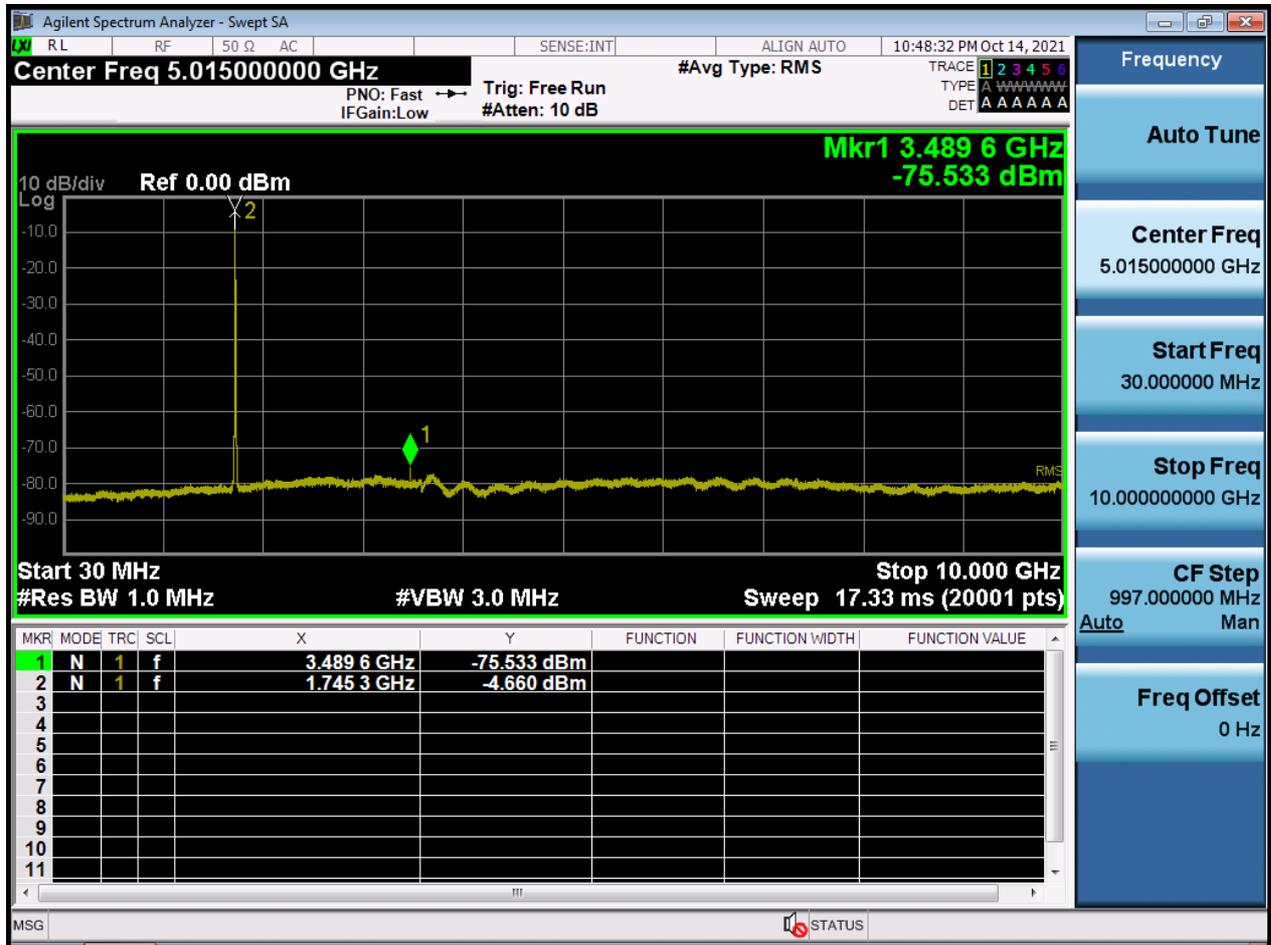
BW20 M\_PAR\_Middle Channel\_256QAM\_FullIRB



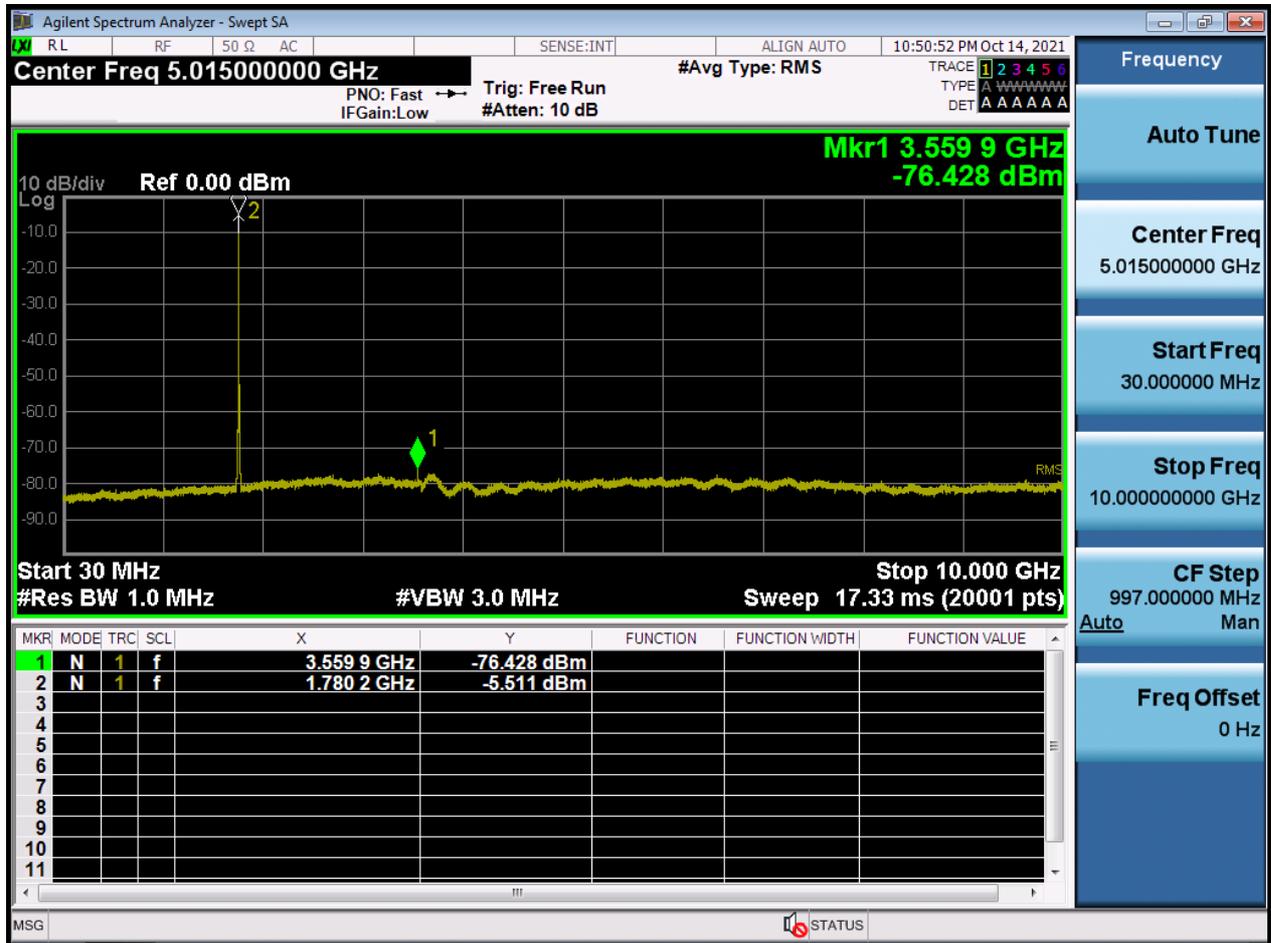
BW1.4 M\_CSE(30 M-10 G)\_Lowest Channel\_QPSK\_1RB



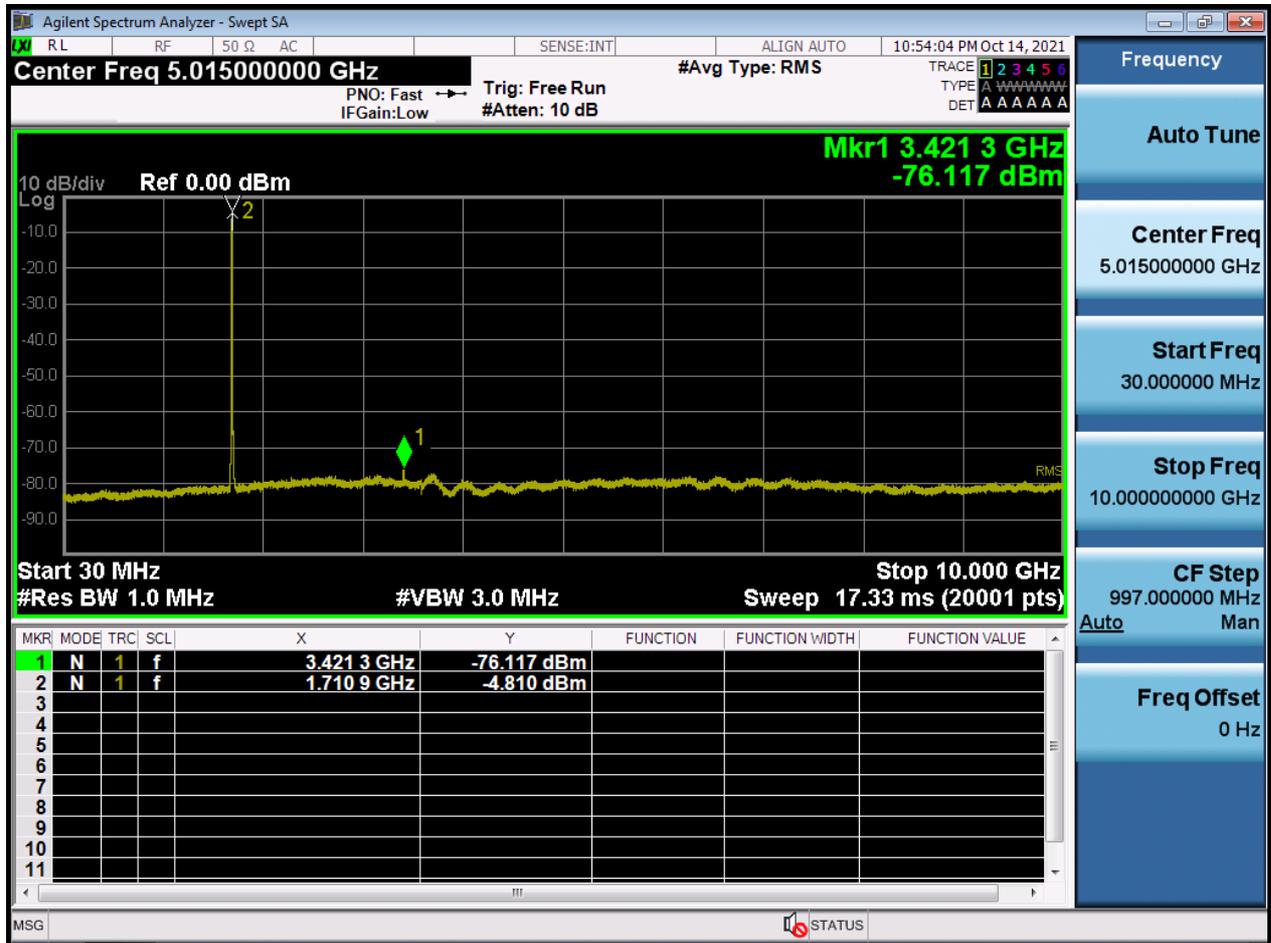
BW1.4 M\_CSE(30 M-10 G)\_Middle Channel\_QPSK\_1RB



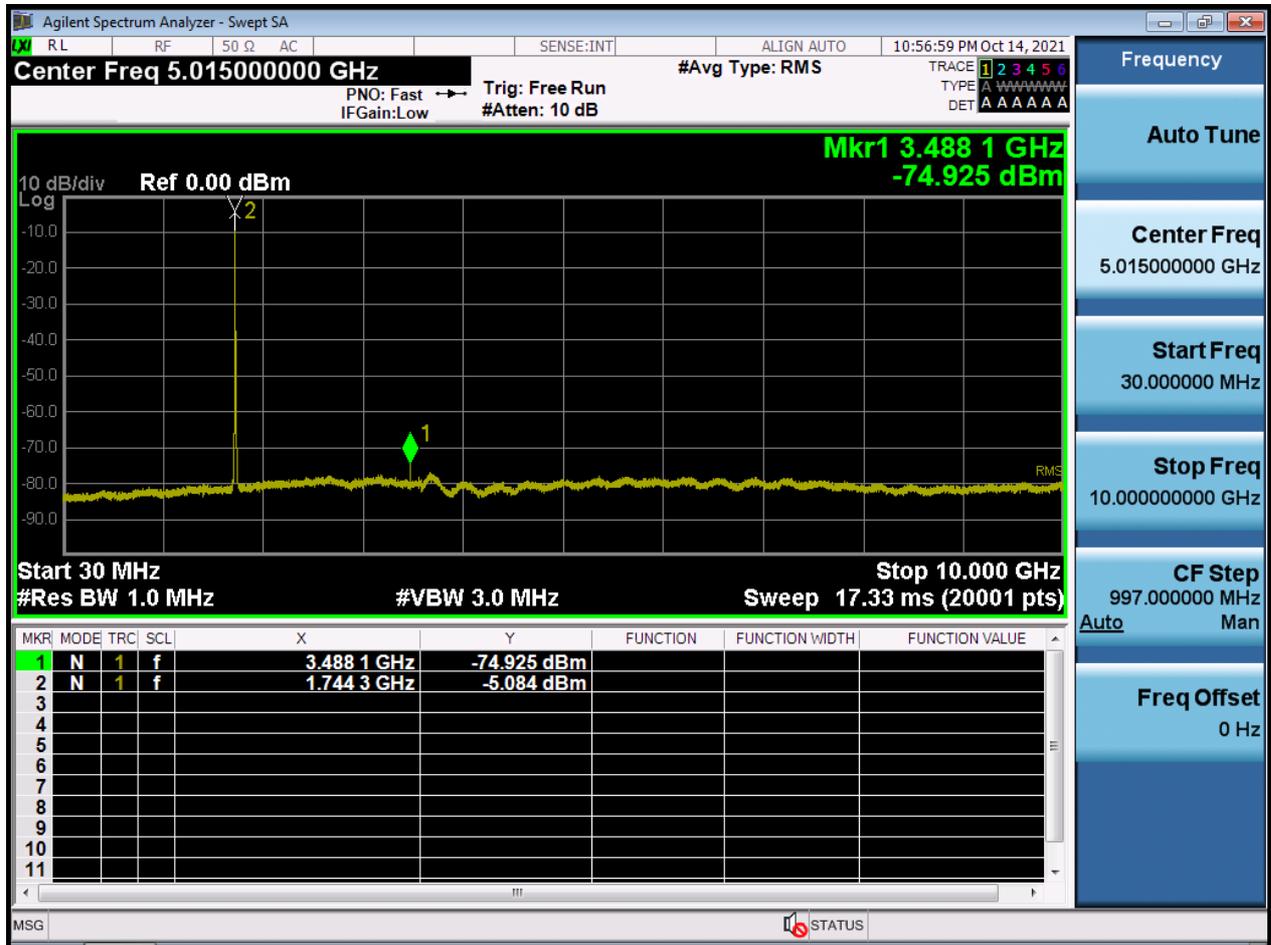
BW1.4 M\_CSE(30 M-10 G)\_Highest Channel\_QPSK\_1RB



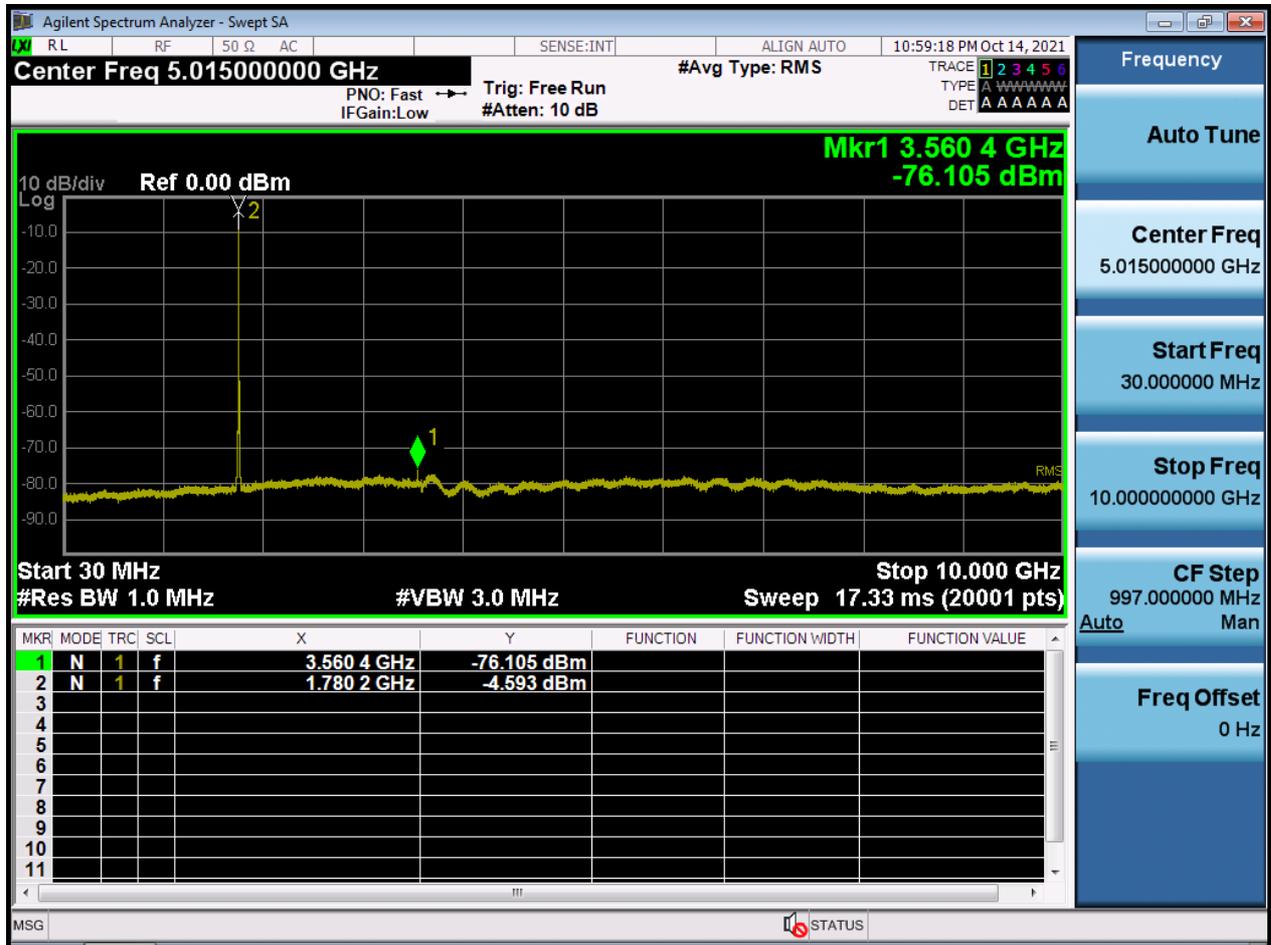
BW3 M\_CSE(30 M-10 G)\_Lowest Channel\_QPSK\_1RB



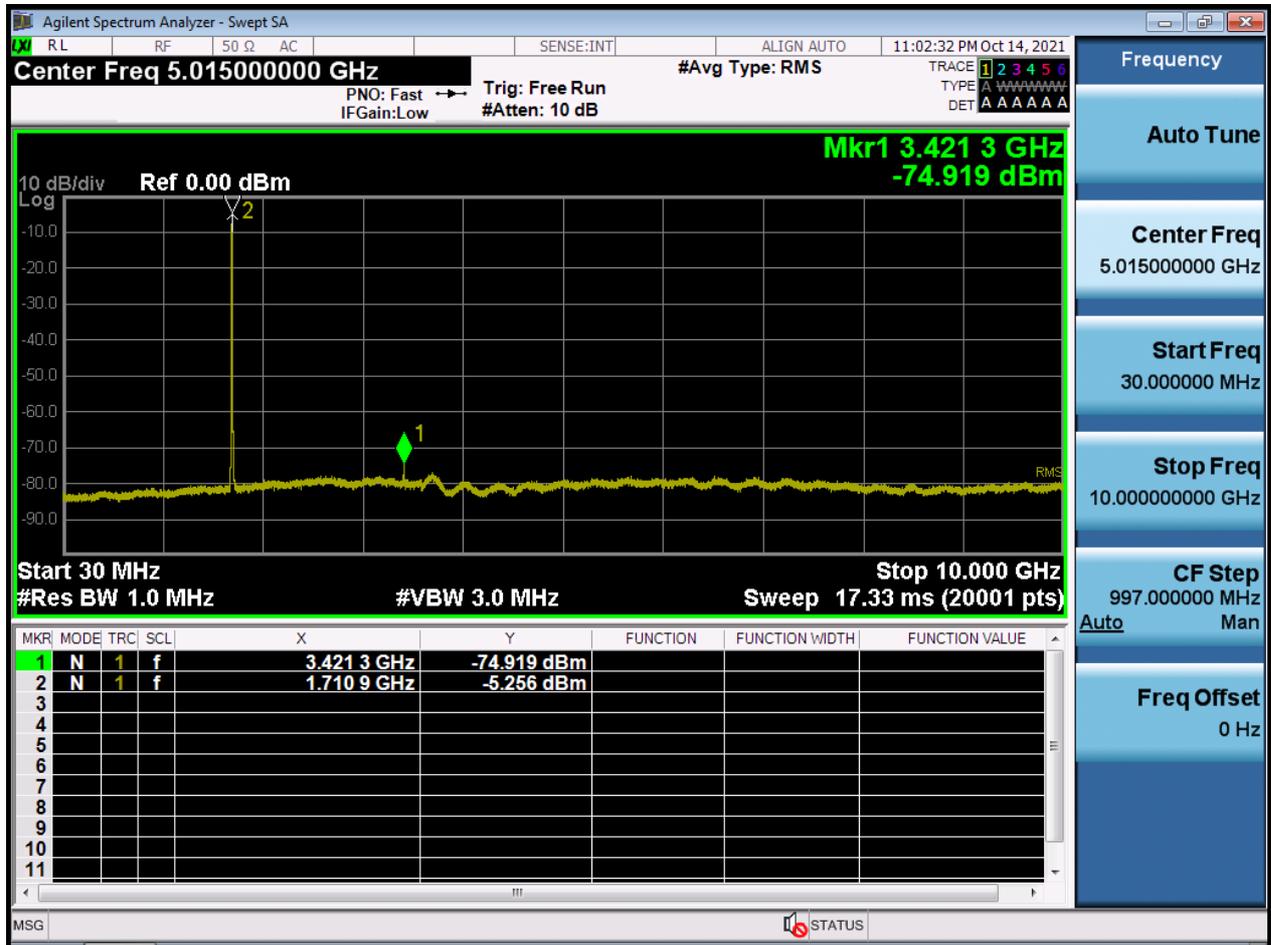
BW3 M\_CSE(30 M-10 G)\_Middle Channel\_QPSK\_1RB



BW3 M\_CSE(30 M-10 G)\_Highest Channel\_QPSK\_1RB



BW5 M\_CSE(30 M-10 G)\_Lowest Channel\_QPSK\_1RB



BW5 M\_CSE(30 M-10 G)\_Middle Channel\_QPSK\_1RB

