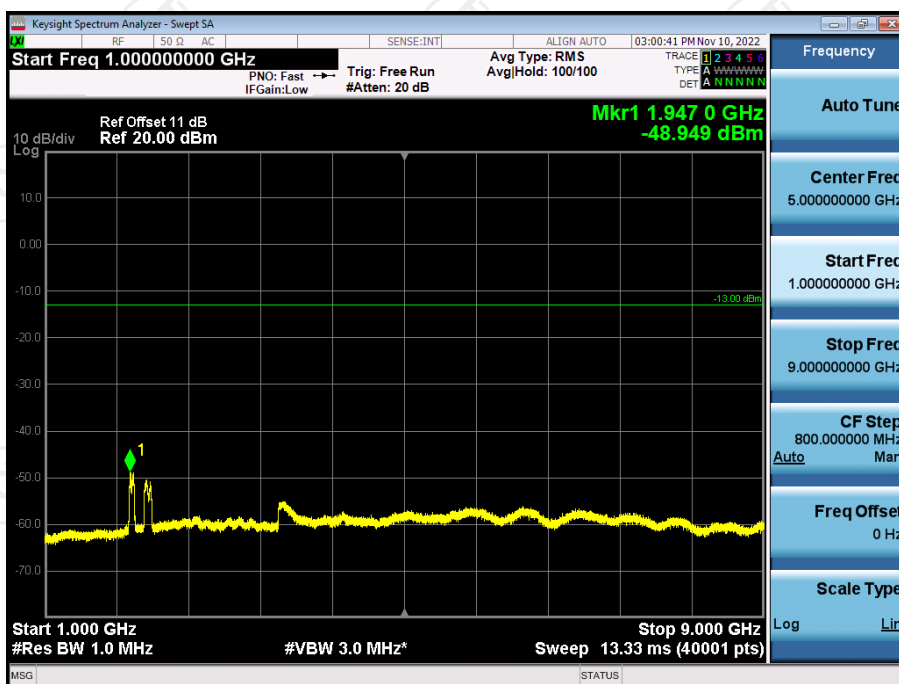
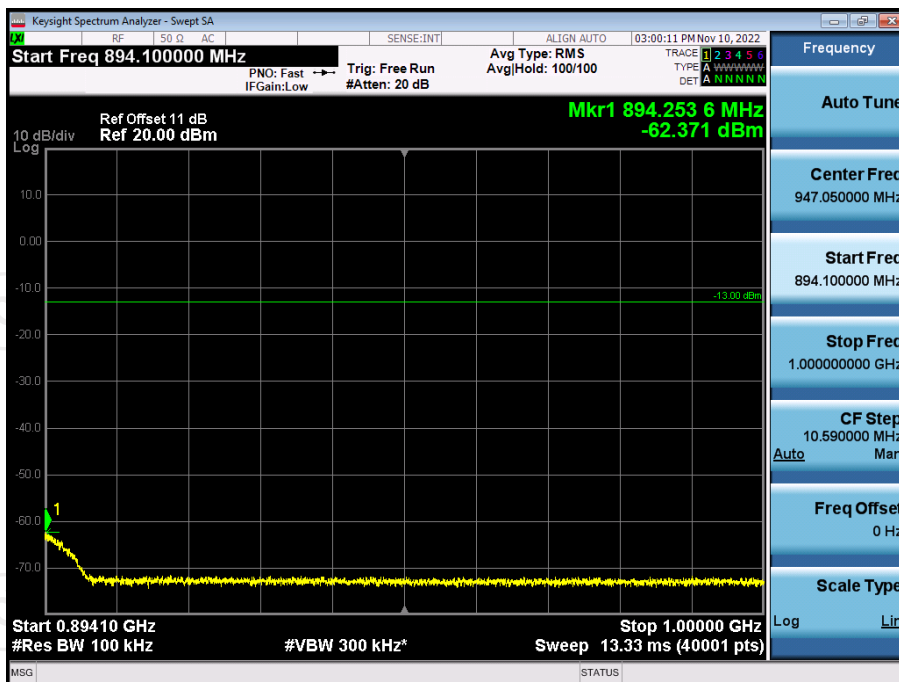
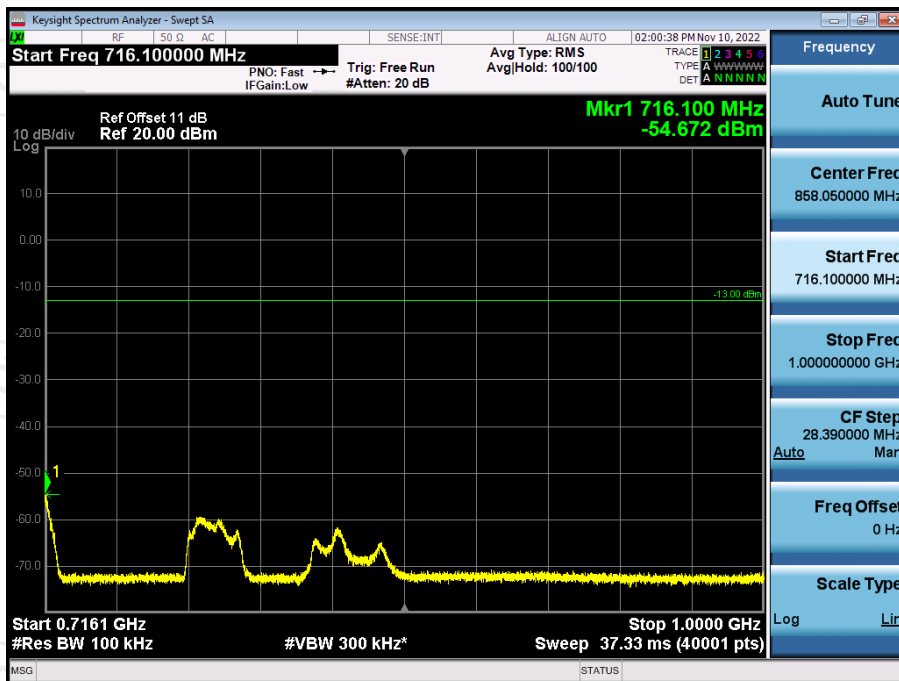
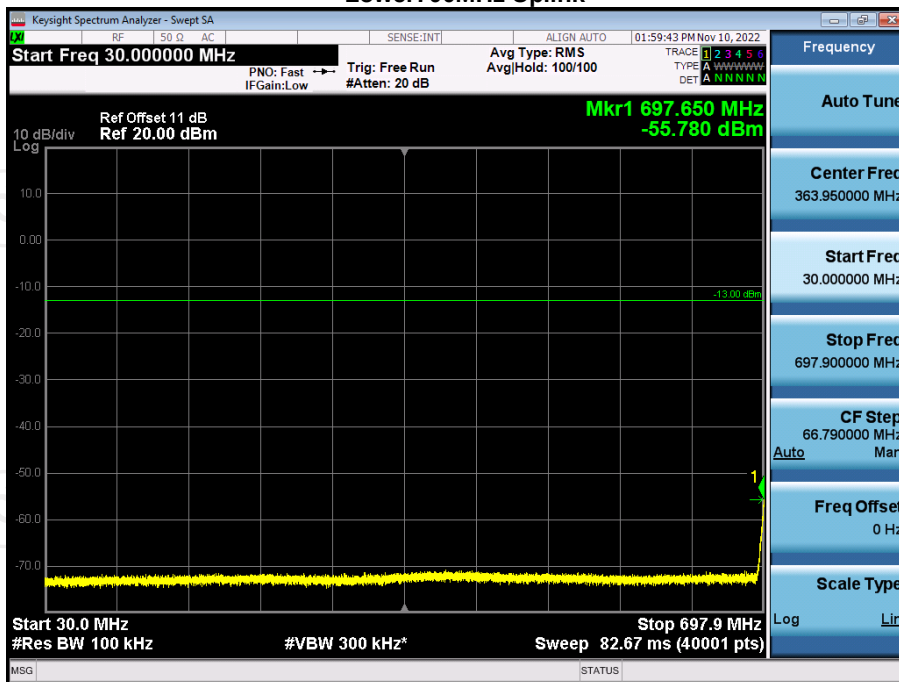
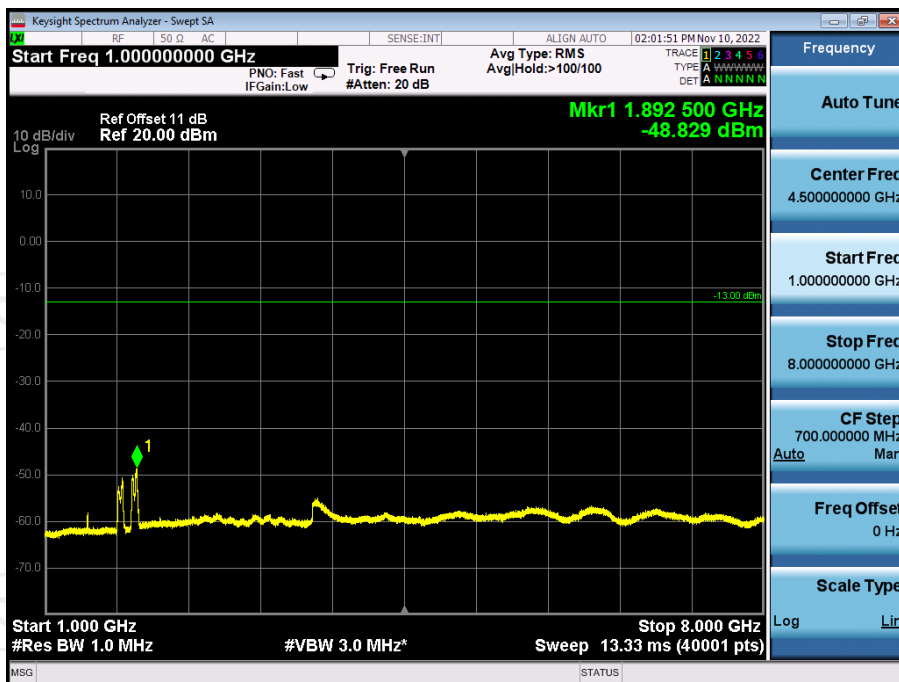




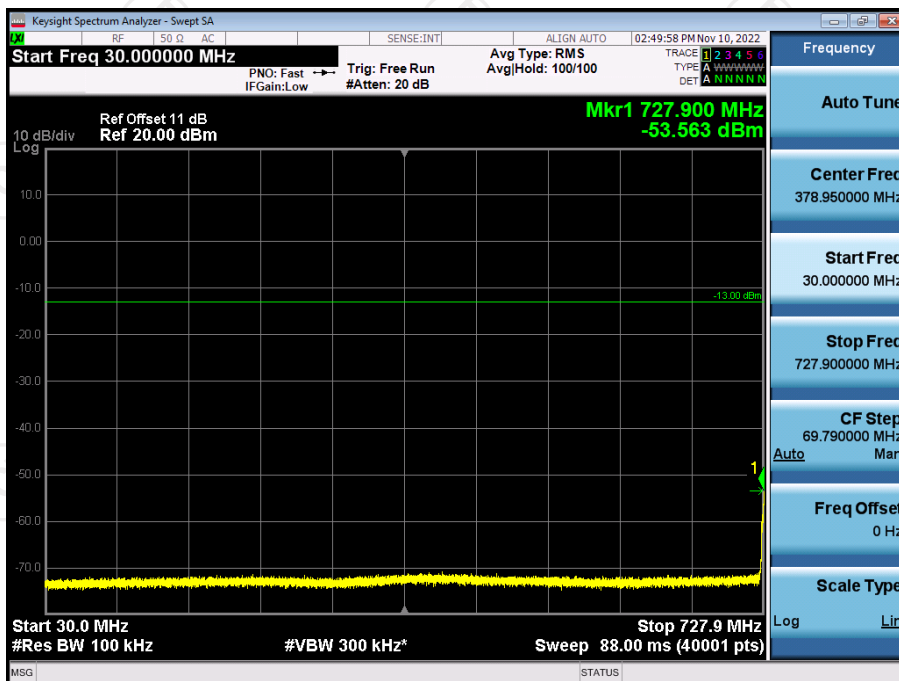
## Test Plots

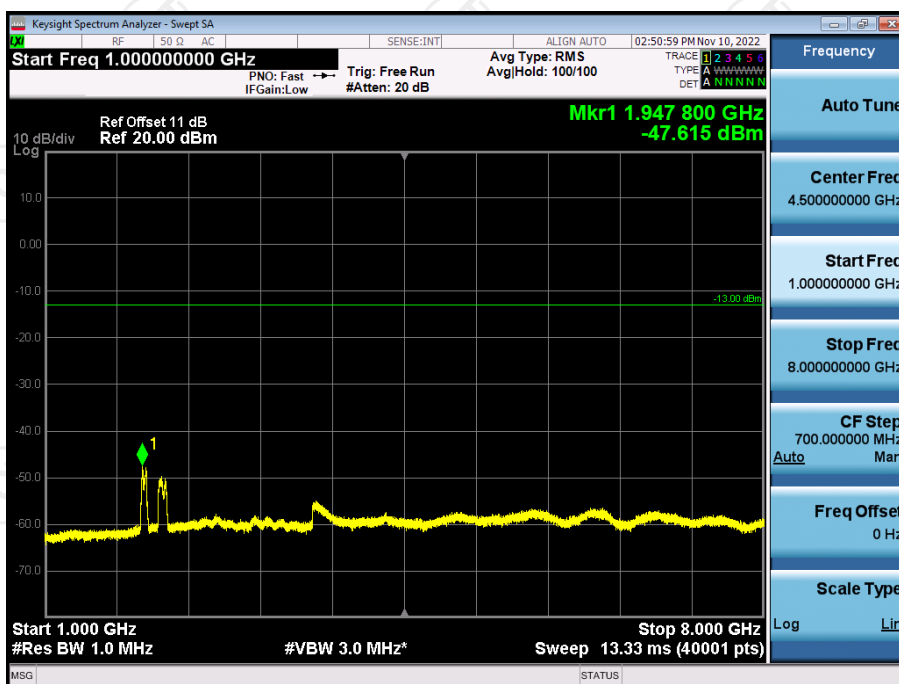
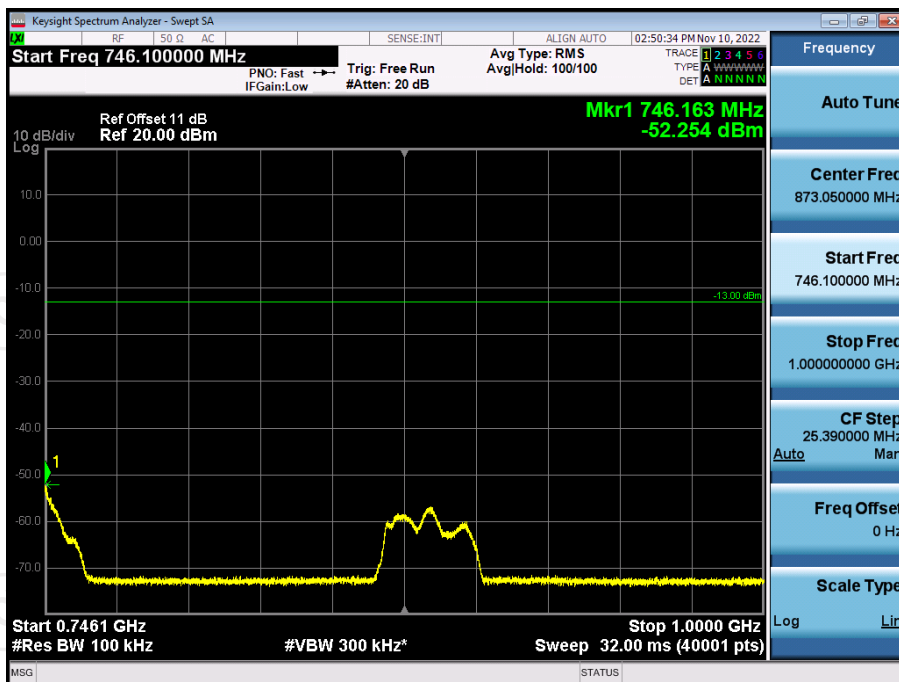
### Lower700MHz Uplink





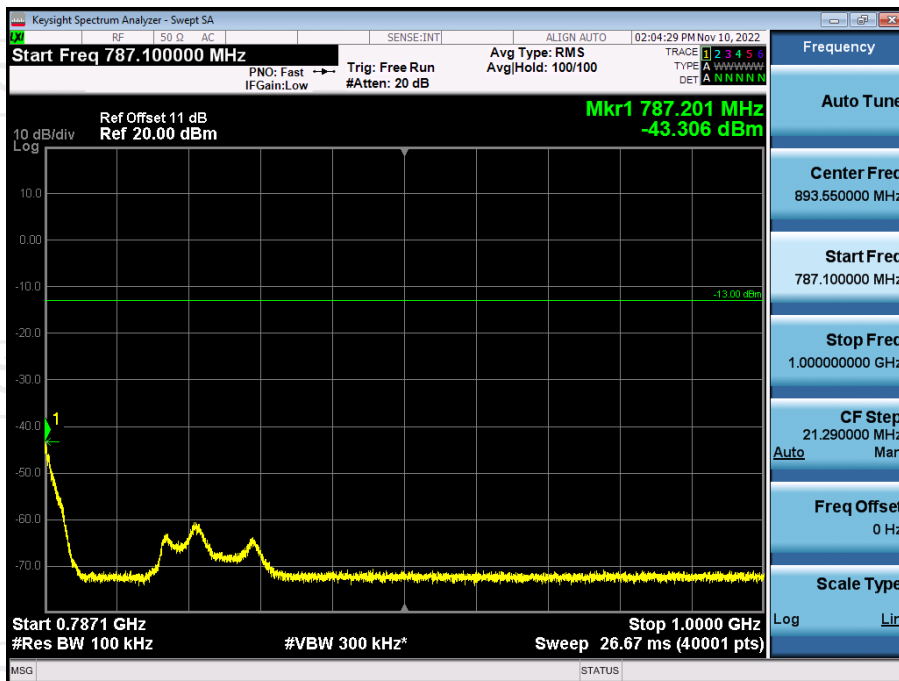
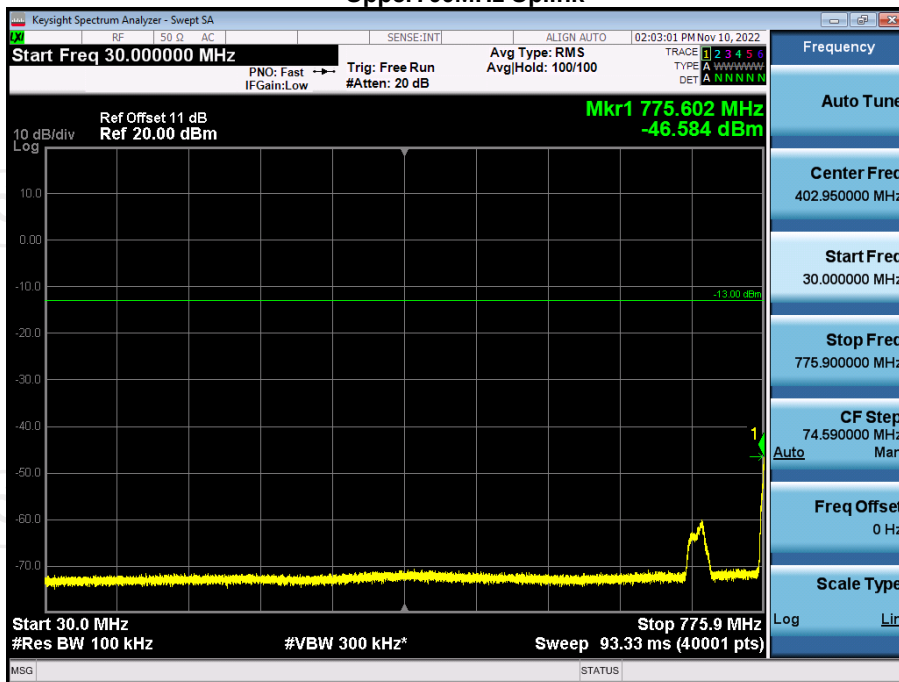
Lower700MHz Downlink

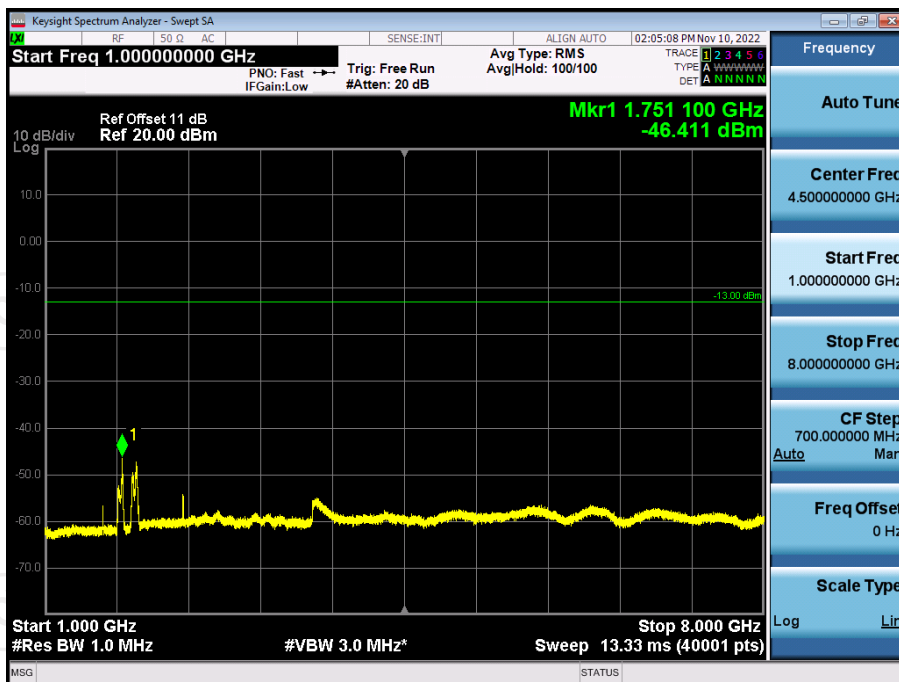




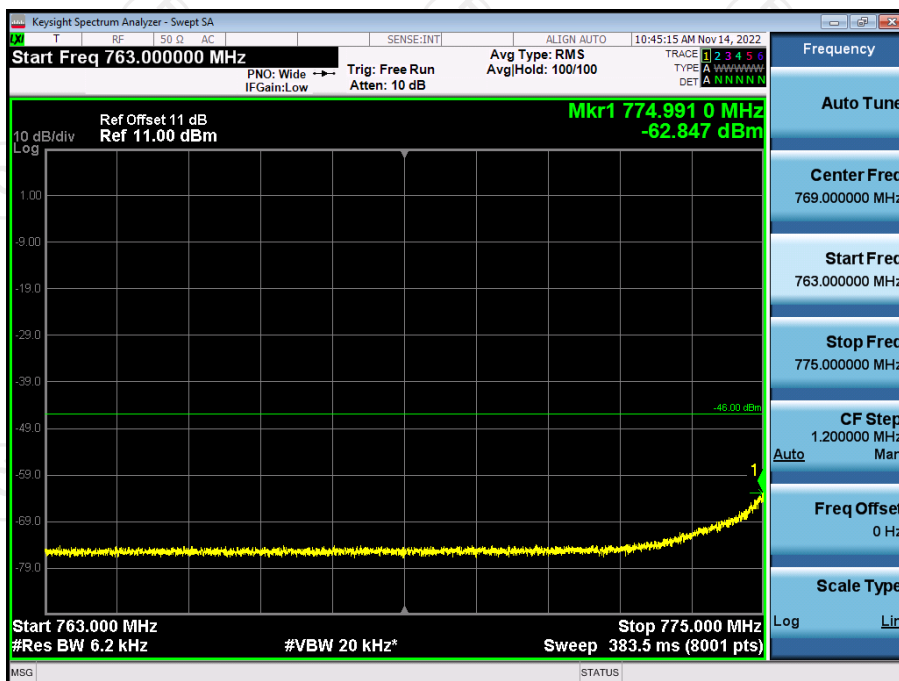
## Test Plots

### Upper700MHz Uplink

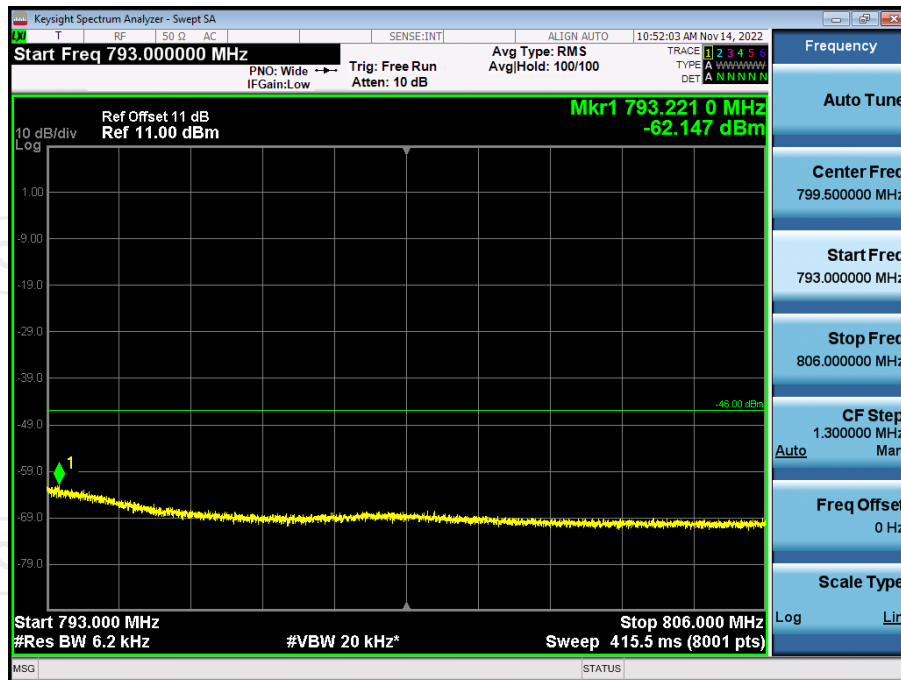




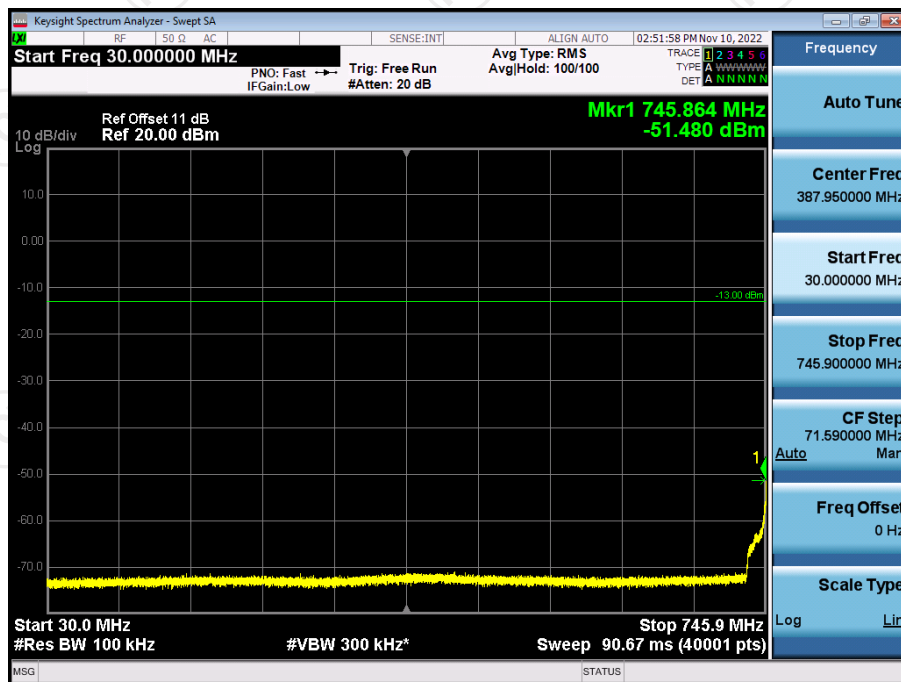
763~775MHz

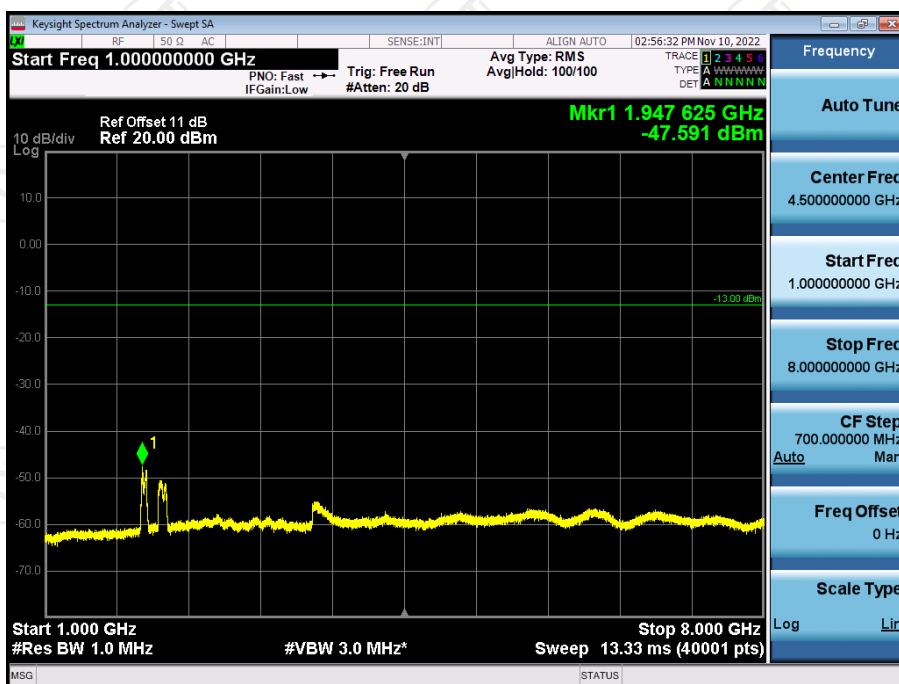
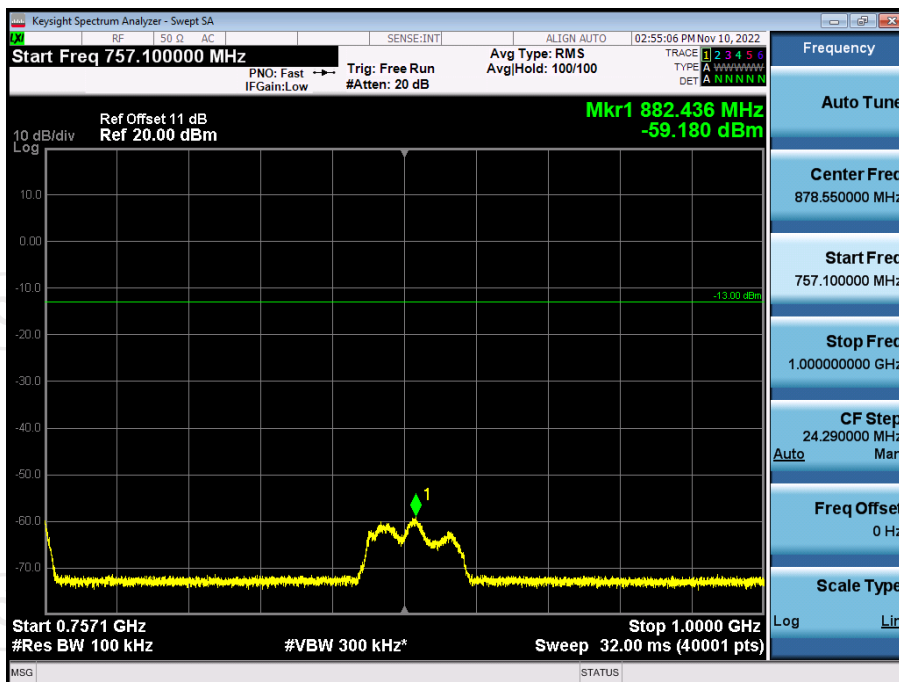


## 793~806MHz

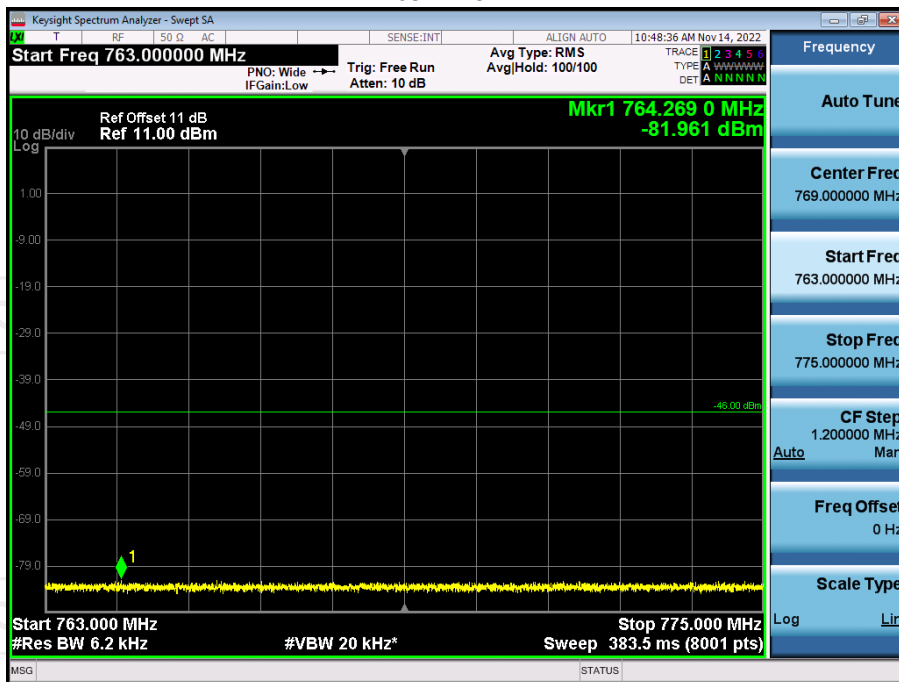


## Upper700MHz Downlink

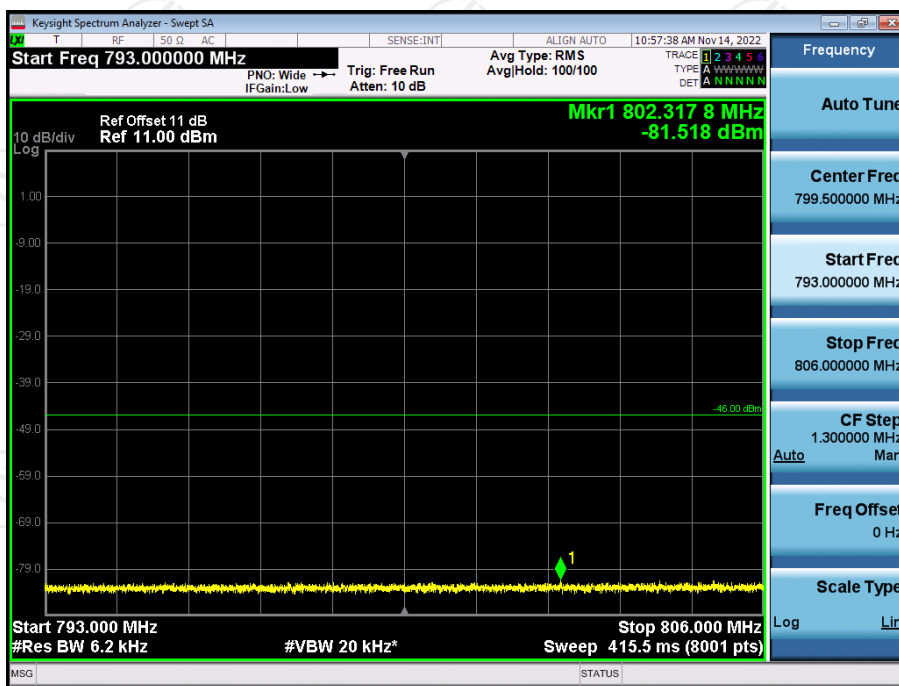




## 763~775MHz

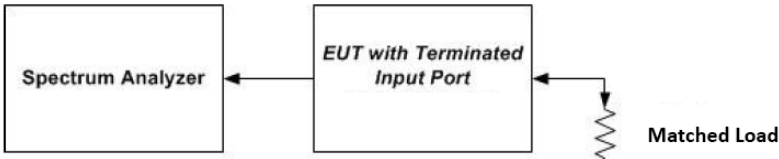
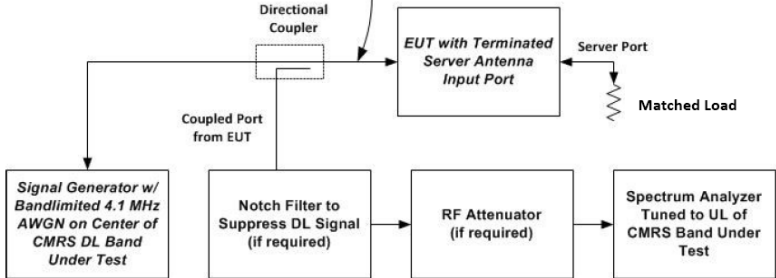


## 793~806MHz



## 5.6. Noise Limits

### 5.6.1. Test Specification

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test Requirement:</b> | FCC Part20 Section 20.21(e)(8)(i)(A); 20.21(e)(8)(i)(H)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Test Method:</b>      | KDB935210 D03 Signal Booster Measurements v04r04                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Limit:</b>            | not exceed $-103 \text{ dBm/MHz—RSSI}$ .<br>not exceed $-102.5 \text{ dBm/MHz} + 20 \log (F)$ , where Frequency is the uplink mid-band frequency of the supported spectrum bands in MHz.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Test Setup:</b>       |  <p>Figure 3 – Noise limit test setup (also used for 7.8)</p>  <p>Figure 4 – Test setup for uplink noise power measurement in the presence of a downlink signal</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Test Procedure:</b>   | <ol style="list-style-type: none"> <li>Connect the EUT to the test equipment as shown in Figure 3. Begin with the uplink output (donor) port connected to the spectrum analyzer. When measuring downlink noise, connect the downlink output (server) port to the spectrum analyzer.</li> <li>Set the spectrum analyzer RBW to 1 MHz with the VBW <math>\geq 3 \cdot</math> RBW.</li> <li>Select the power averaging (rms) detector and trace average over at least 100 traces.</li> <li>Set the center frequency of the spectrum analyzer to the center of the CMRS band under test with the span <math>\geq 2 \cdot</math> the CMRS band.</li> <li>Measure the maximum transmitter noise power level.</li> <li>Save the spectrum analyzer Test Plots as necessary for inclusion in the final test report.</li> <li>Repeat 7.7b) to 7.7f) for all operational uplink and downlink bands.</li> <li>Connect the EUT to the test equipment as shown in Figure 4 for uplink noise power measurement in the presence a downlink signal. Affirm the coupled path of the RF coupler is connected to the spectrum analyzer.</li> <li>Configure the signal generator for AWGN operation with a 99% OBW of 4.1 MHz.</li> <li>Set the spectrum analyzer RBW for 1 MHz, VBW <math>\geq 3 \cdot</math> RBW, with a power averaging (rms) detector with at least 100 trace averages.</li> <li>Set the center frequency of the spectrum analyzer to the center of</li> </ol> |

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                     | <p>the CMRS band under test, with the span <math>\geq 2</math> the CMRS band. This shall include all spectrum blocks in the particular CMRS band under test (see Appendix A).</p> <p>l) For uplink noise measurements, set the spectrum analyzer center frequency for the uplink band under test, and tune the signal generator to the center of the paired downlink band.</p> <p>m) Measure the maximum transmitter noise power level while varying the downlink signal generator output level from -90 dBm to -20 dBm, as measured at the input port (i.e., downlink signal level at the booster donor port node of Figure 4), in 1 dB steps inside the RSSI-dependent region, and in 10 dB steps outside the RSSI-dependent region. Report the six values closest to the limit, with at least two points within the RSSI-dependent region of the limit. See Appendix D for noise limits graphs.</p> <p>n) Repeat 7.7.1h) through 7.7.1m) for all operational uplink bands.</p> <p><b>Variable uplink noise timing</b></p> <p>Variable uplink noise timing is to be measured as follows, using the test setup shown in Figure 4.</p> <p>a) Set the spectrum analyzer to the uplink frequency to be measured.</p> <p>b) Set the span to 0 Hz, with a sweep time of 10 seconds.</p> <p>c) Set the power level of signal generator to the lowest level of the RSSI-dependent noise [see 7.7.1m)].</p> <p>d) Select MAX HOLD and increase the power level of signal generator by 10 dB for mobile boosters, and 20 dB for fixed boosters.</p> <p>e) Confirm that the uplink noise decreases to the specified level within 1 second for mobile devices, and within 3 seconds for fixed devices.<sup>12</sup></p> <p>f) Repeat 7.7.2a) to 7.7.2e) for all operational uplink bands.</p> <p>g) Include Test Plotss and summary table in test report.</p> |
| <b>Test Result:</b> | PASS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

## 5.6.2. Test Instruments

| Equipment         | Manufacturer | Model       | Serial Number | Calibration Date | Calibration Due |
|-------------------|--------------|-------------|---------------|------------------|-----------------|
| Signal Generator  | Agilent      | N5182A      | MY47070282    | Jul. 04, 2022    | Jul. 03, 2023   |
| Spectrum Analyzer | Agilent      | N9020A      | MY49100619    | Jul. 05, 2022    | Jul. 04, 2023   |
| RF Combiner       | SUNVNDN      | SUD-CS 0800 | 16230009      | /                | /               |
| Attenuator        | 50FP-006-H3  | JFW         | 907763        | /                | /               |

## 5.6.3. Test Data

| Max Noise Power      |                  |               |             |
|----------------------|------------------|---------------|-------------|
| Frequency Band (MHz) | Measured dBm/MHz | Limit dBm/MHz | Result (dB) |
| PCS Uplink           | -48.22           | -37.02        | PASS        |
| AWS-1 Uplink         | -50.43           | -37.73        | PASS        |
| Cellular Uplink      | -53.03           | -44.05        | PASS        |
| Lower700MHz Uplink   | -51.09           | -45.51        | PASS        |
| Upper700MHz Uplink   | -49.09           | -44.64        | PASS        |
| PCS Downlink         | -47.57           | -37.02        | PASS        |
| AWS-1 Downlink       | -50.96           | -37.73        | PASS        |
| Cellular Downlink    | -49.58           | -44.05        | PASS        |
| Lower700MHz Downlink | -50.69           | -45.51        | PASS        |
| Upper700MHz Downlink | -50.74           | -44.64        | PASS        |

**Note:** Fixed booster maximum noise power shall not exceed  $-102.5 \text{ dBm/MHz} + 20 \log (F)$ , where Frequency is the uplink mid-band frequency of the supported spectrum bands in MHz.

| Variable Uplink Noise |          |                  |               |         |
|-----------------------|----------|------------------|---------------|---------|
| Operation Bands       | RSSI dBm | Measured dBm/MHz | Limit dBm/MHz | Results |
| PCS                   | -71      | -49.71           | -37.02        | PASS    |
|                       | -69      | -50.83           | -37.02        | PASS    |
|                       | -64      | -55.73           | -39           | PASS    |
|                       | -60      | -59.17           | -43           | PASS    |
|                       | -55      | -63.60           | -48           | PASS    |
|                       | -48      | -70.30           | -55           | PASS    |
| AWS-1                 | -61      | -50.90           | -42           | PASS    |
|                       | -59      | -52.10           | -44           | PASS    |
|                       | -55      | -56.26           | -48           | PASS    |
|                       | -51      | -60.47           | -52           | PASS    |
|                       | -48      | -65.00           | -55           | PASS    |
|                       | -44      | -67.14           | -59           | PASS    |
| Cellular              | -60      | -53.54           | -44.05        | PASS    |
|                       | -57      | -56.13           | -46           | PASS    |

|             |     |        |        |      |
|-------------|-----|--------|--------|------|
|             | -52 | -61.33 | -51    | PASS |
|             | -48 | -66.45 | -55    | PASS |
|             | -45 | -68.76 | -58    | PASS |
|             | -43 | -69.53 | -60    | PASS |
| Lower700MHz | -63 | -51.16 | -45.51 | PASS |
|             | -61 | -52.51 | -45.51 | PASS |
|             | -57 | -56.64 | -46    | PASS |
|             | -53 | -60.29 | -50    | PASS |
|             | -49 | -64.20 | -54    | PASS |
|             | -46 | -67.89 | -57    | PASS |
| Upper700MHz | -64 | -49.03 | -44.64 | PASS |
|             | -60 | -52.36 | -44.64 | PASS |
|             | -57 | -54.80 | -46    | PASS |
|             | -53 | -58.56 | -50    | PASS |
|             | -50 | -61.47 | -53    | PASS |
|             | -45 | -67.17 | -58    | PASS |

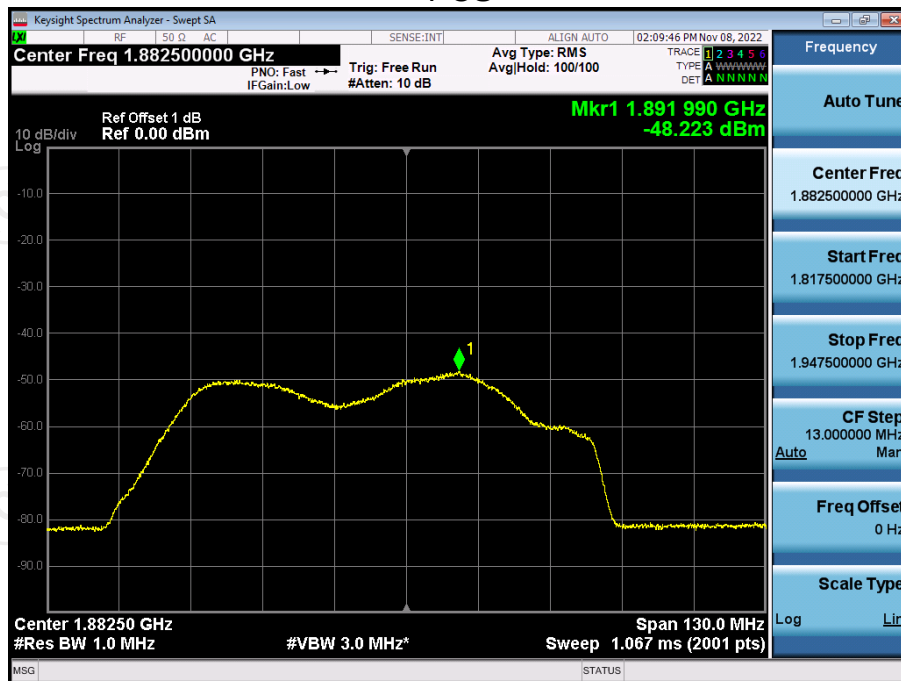
**Note:** According to the KDB 935210 D03 Signal Booster Measurements v04r04 APPENDIX D, when outside of RSSI Dependent limit (20.21.e.8.1.A.1),fixed booster maximum noise power shall not exceed  $-102.5 \text{ dBm/MHz} + 20 \log (F)$ .RSSI limit not exceed  $-103 \text{ dBm/MHz-RSSI}$ .

## Variable Uplink Noise Timing

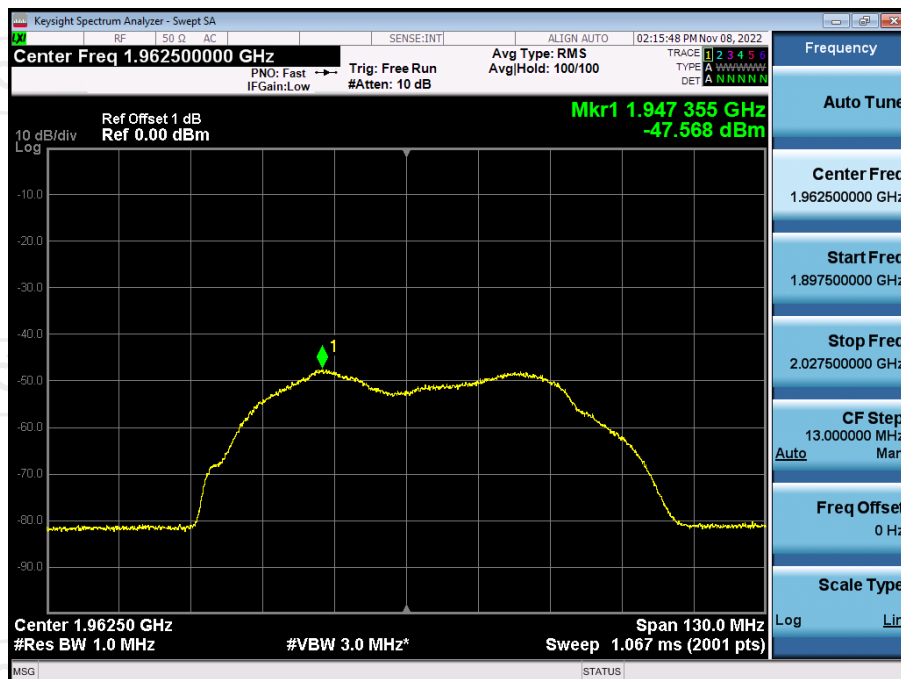
| Operation Bands | Measured Sec | Limit Sec | Results |
|-----------------|--------------|-----------|---------|
| PCS             | 0.015        | 3         | PASS    |
| AWS-1           | 0.020        | 3         | PASS    |
| Cellular        | 0.020        | 3         | PASS    |
| Lower700MHz     | 0.015        | 3         | PASS    |
| Upper700MHz     | 0.020        | 3         | PASS    |

## Test Plots

### PCS

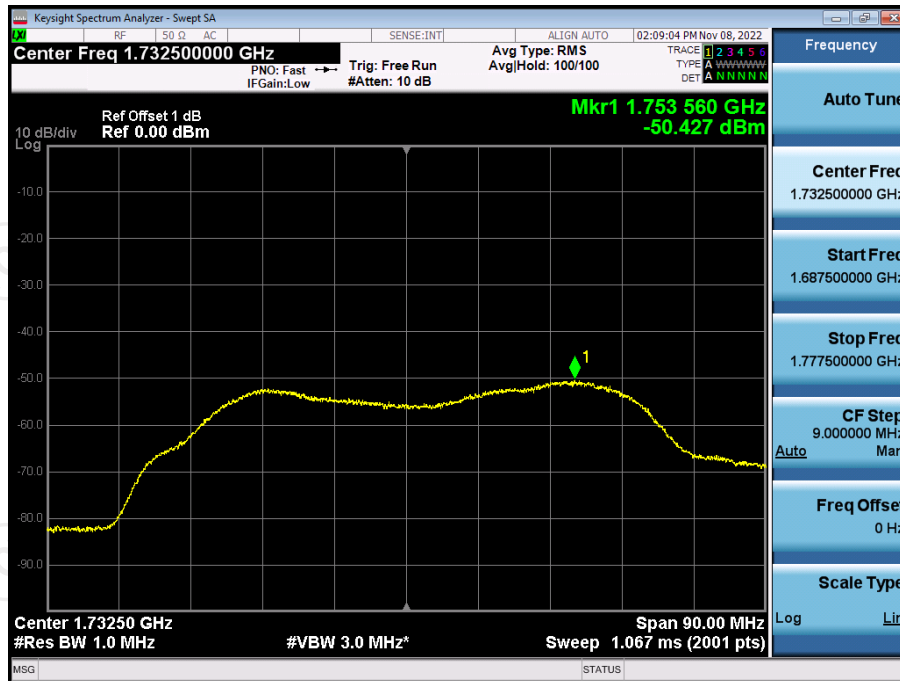


### Uplink Noise



### Downlink Noise

## AWS-1



## Uplink Noise

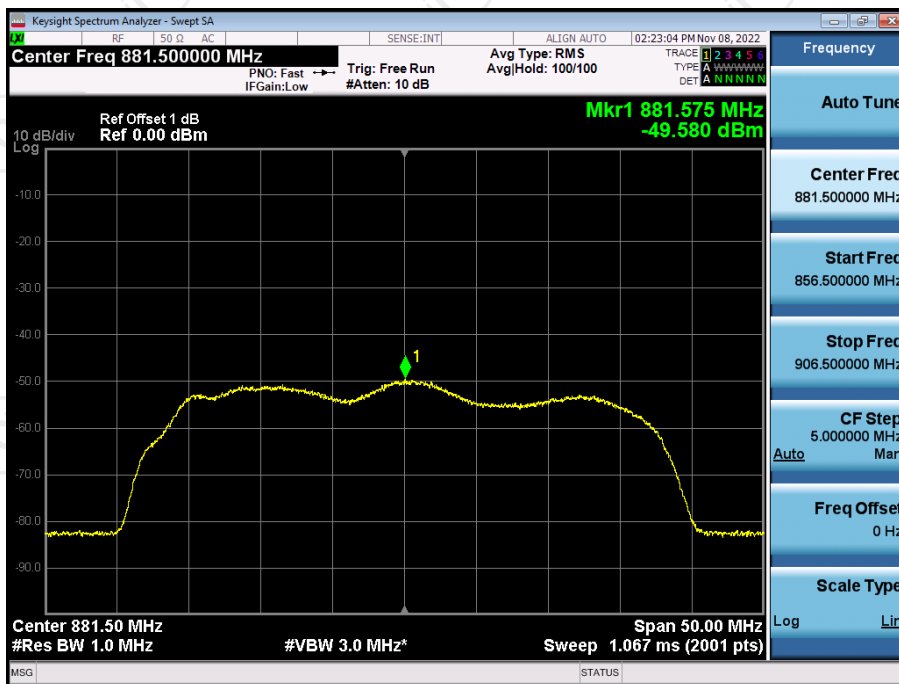


## Downlink Noise

## Cellular

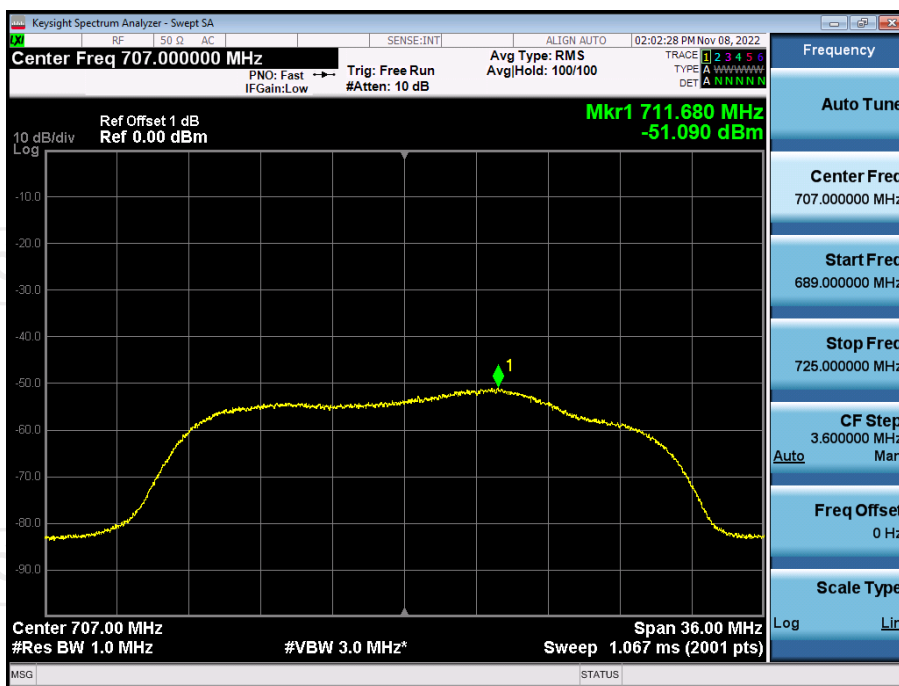


## Uplink Noise

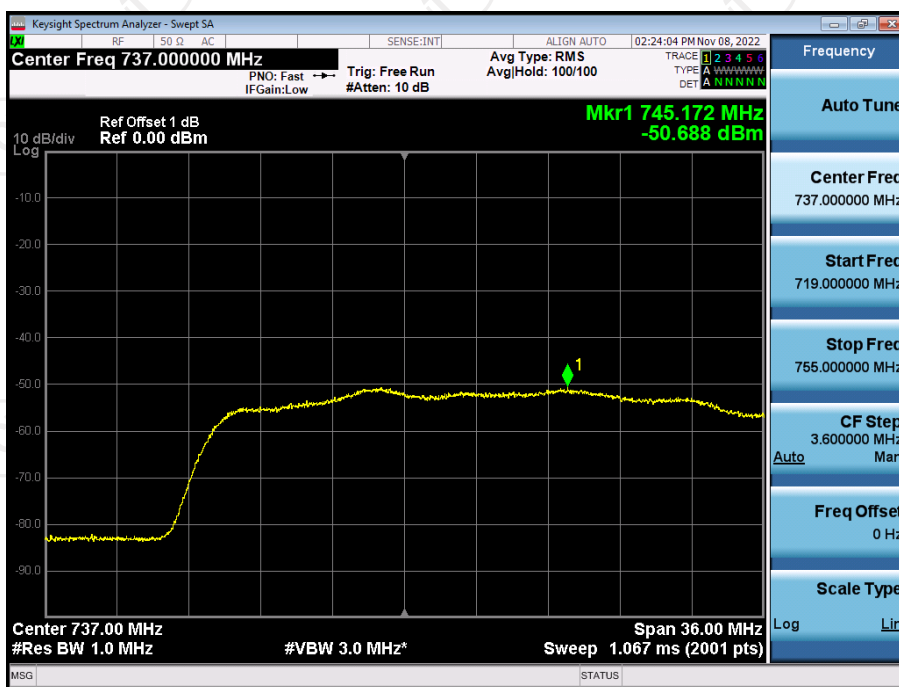


## Downlink Noise

## Lower700MHz

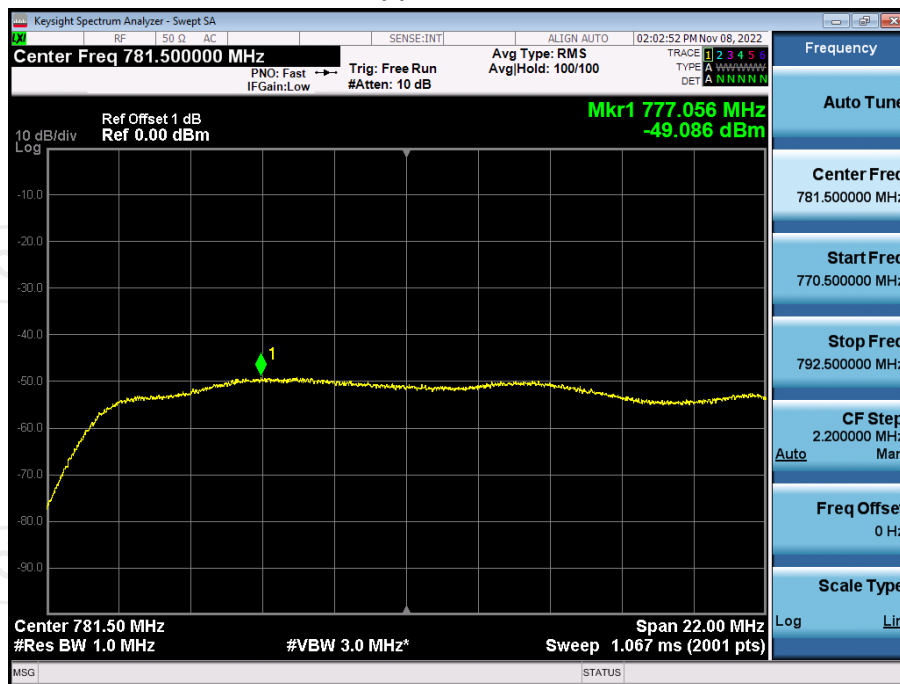


## Uplink Noise

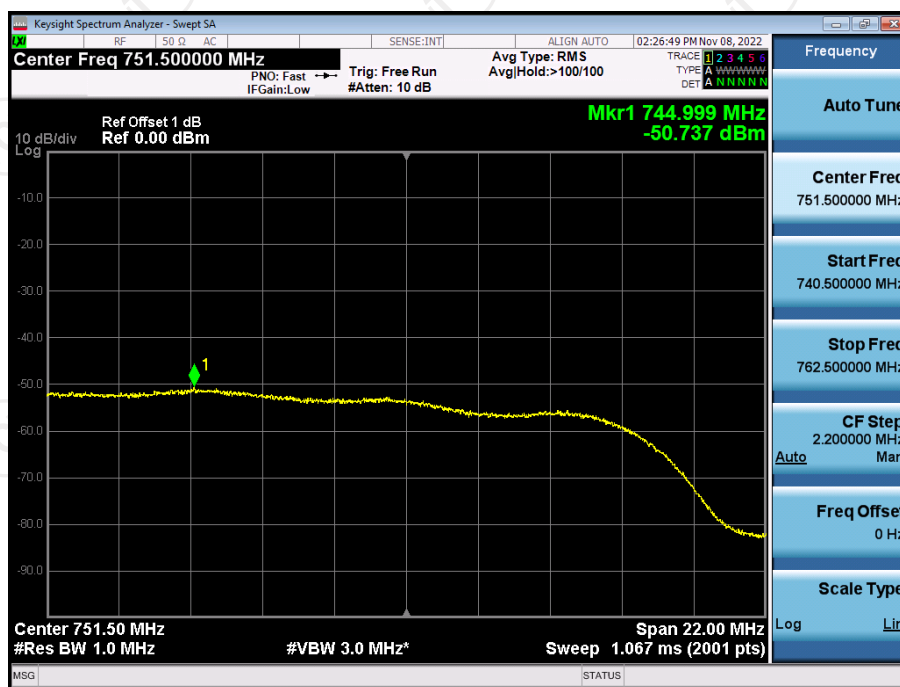


## Downlink Noise

## Upper700MHz



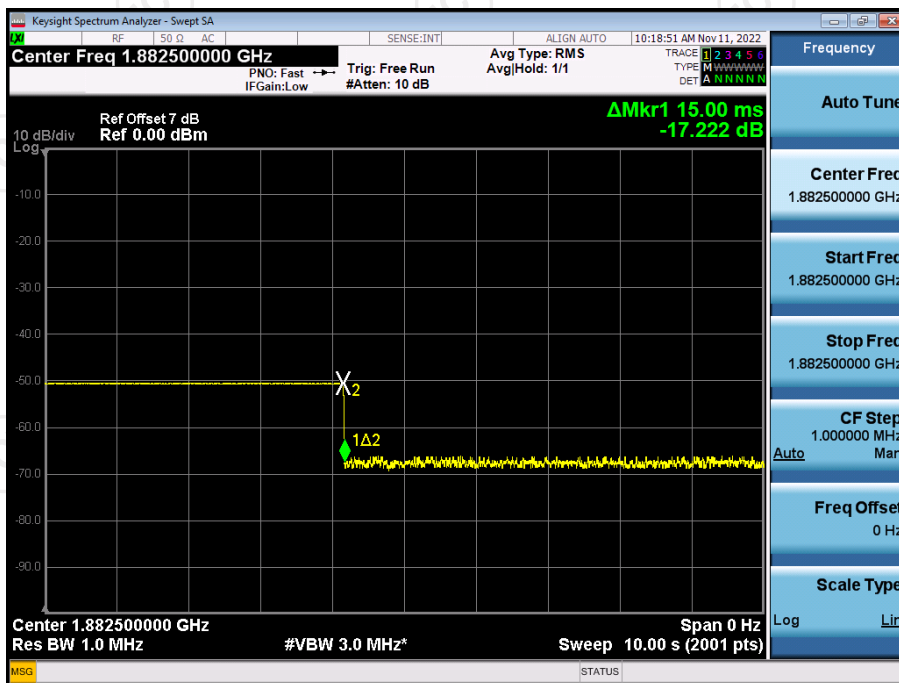
## Uplink Noise



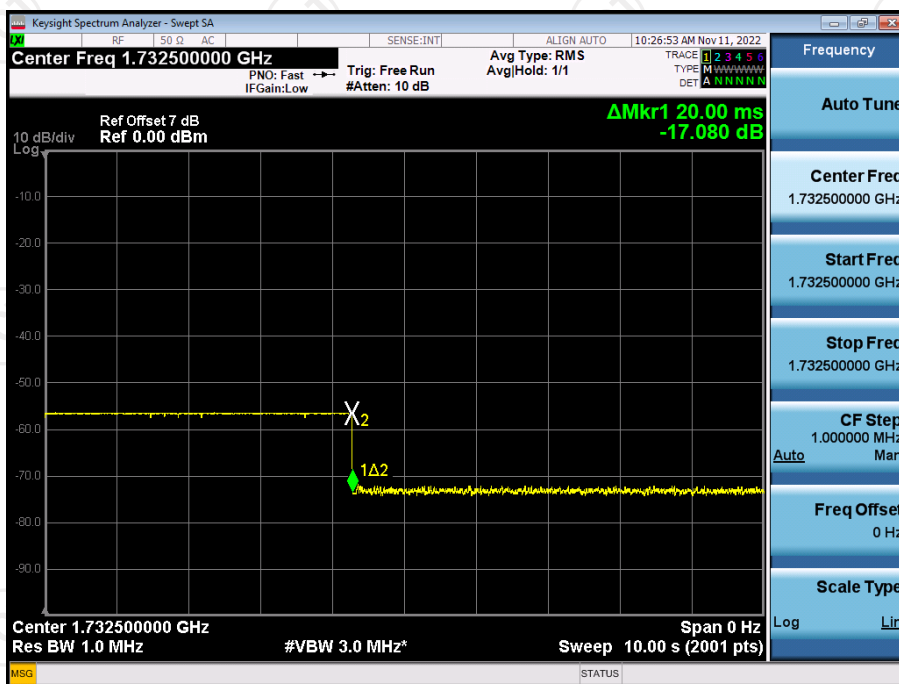
## Downlink Noise

## Variable Noise Timing Test Plots

### PCS



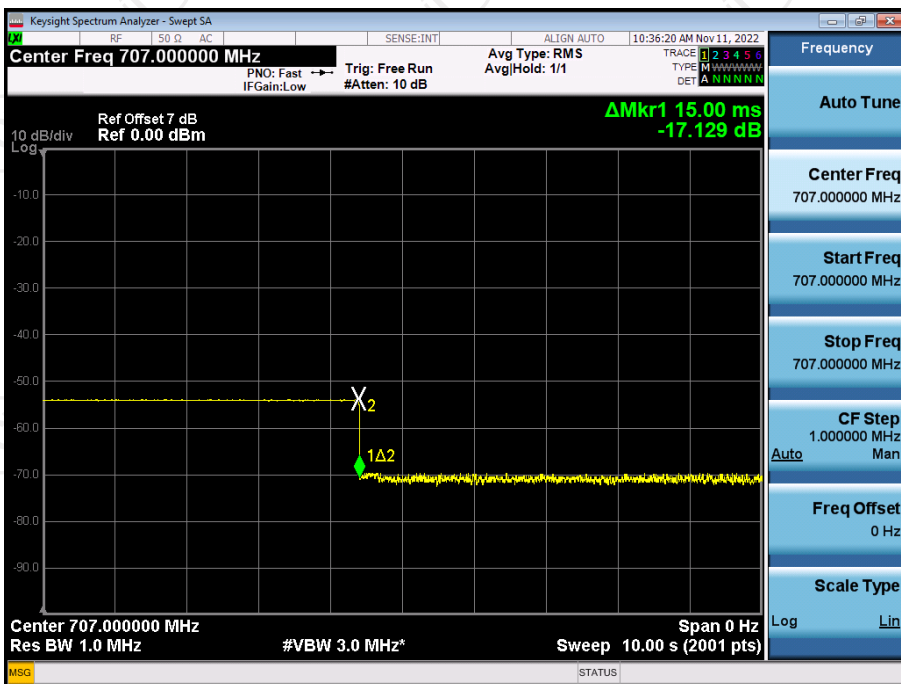
### AWS-1



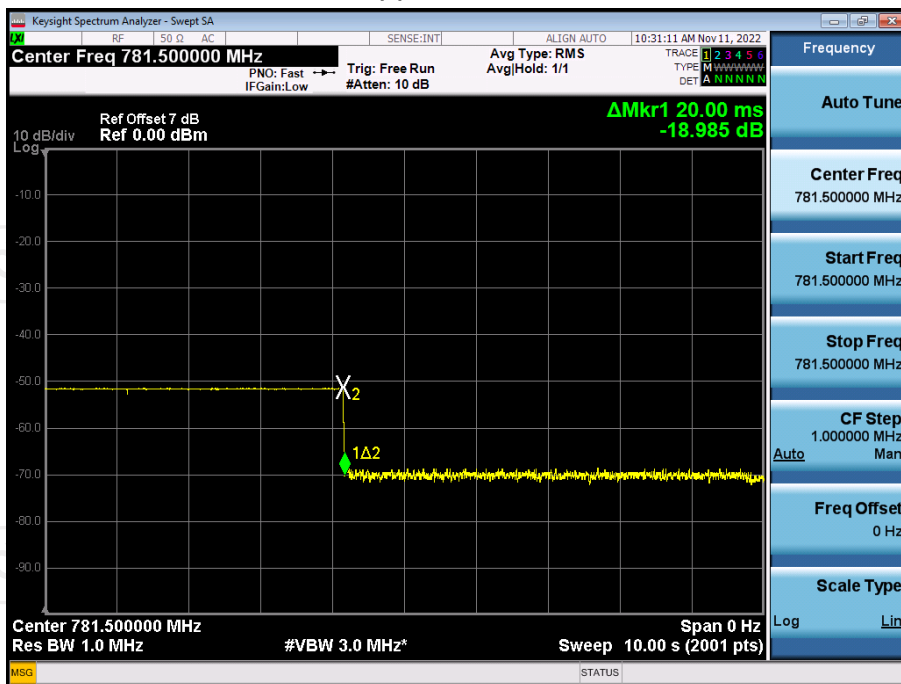
## Cellular



## Lower700MHz

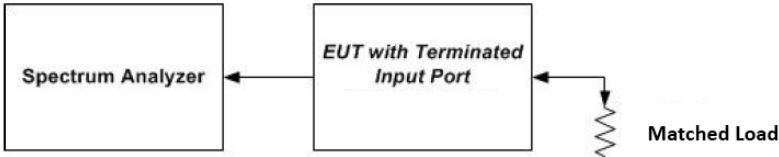


## Upper700MHz



## 5.7. Uplink Inactivity

### 5.7.1. Test Specification

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test Requirement:</b> | FCC Part20 Section 20.21(e)(8)(i)(I)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Test Method:</b>      | KDB935210 D03 Signal Booster Measurements v04r04                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Limit:</b>            | 20.21(e), When a consumer booster is not serving an active device connection after 5 minutes the uplink noise power shall not exceed -70 dBm/MHz.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Test Setup:</b>       |  <p style="text-align: center;">Figure 3 – Noise limit test setup (also used for 7.8)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Test Procedure:</b>   | <ol style="list-style-type: none"> <li>Connect the EUT to the test equipment as shown in Set-Up with the uplink output connected to the spectrum analyzer.</li> <li>Select the RMS power averaging detector.</li> <li>Set the spectrum analyzer RBW for 1 MHz with the VBW <math>\geq 3X</math> RBW.</li> <li>Set the center frequency of the spectrum analyzer to the center of the uplink operational band.</li> <li>Set the span for 0 Hz with a single sweep time for a minimum of 330 seconds.</li> <li>Start to capture a new trace using MAX HOLD.</li> <li>After approximately 15 seconds turn on the EUT power.</li> <li>Once the full spectrum analyzer trace is complete place a MARKER on the leading edge of the pulse and use the DELTA MARKER METHOD to measure the time until the uplink was squelched.</li> <li>Ensure the noise level for the squelched signal is below the uplink inactivity noise power limit, as specified by the rules.</li> <li>Capture the Test Plots for inclusion in the test report.</li> <li>Measure noise using procedures in a) to e).</li> <li>Repeat steps c) to k) for all operational uplink bands.</li> </ol> |
| <b>Test Result:</b>      | PASS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

### 5.7.2. Test Instruments

| Equipment         | Manufacturer | Model  | Serial Number | Calibration Date | Calibration Due |
|-------------------|--------------|--------|---------------|------------------|-----------------|
| Spectrum Analyzer | Agilent      | N9020A | MY49100619    | Jul. 05, 2022    | Jul. 04, 2023   |

### 5.7.3. Test Data

| Uplink Inactivity |              |           |        |
|-------------------|--------------|-----------|--------|
| Operation Bands   | Measured (s) | Limit (s) | Result |
| PCS               | 265.7        | 300.0     | PASS   |
| AWS-1             | 266.0        | 300.0     | PASS   |
| Cellular          | 266.1        | 300.0     | PASS   |
| Lower700MHz       | 265.8        | 300.0     | PASS   |
| Upper700MHz       | 266.1        | 300.0     | PASS   |

## Test Plots

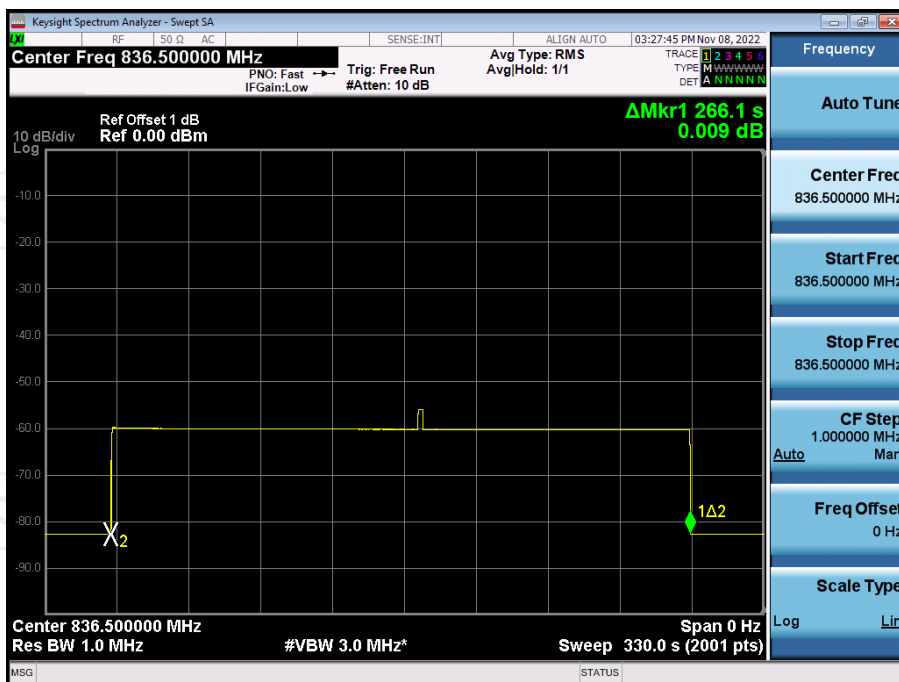
### PCS



### AWS-1



## Cellular



## Lower700MHz

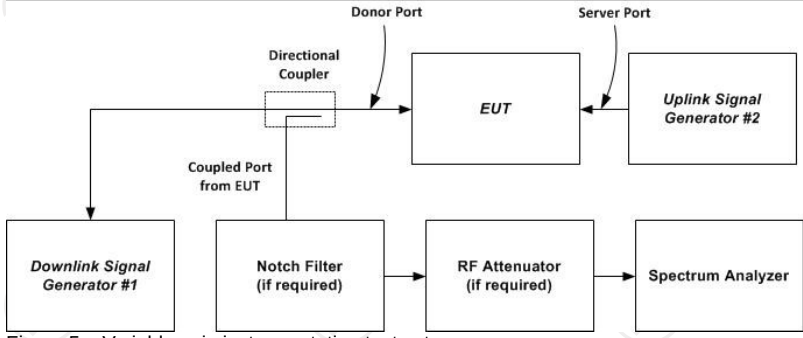


## Upper700MHz



## 5.8. Variable Booster Gain

### 5.8.1. Test Specification

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test Requirement:</b> | FCC Part20 Section 120.21(e)(8)(i)(C)(1)<br>FCC Part20 Section 120.21(e)(8)(i)(H)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Test Method:</b>      | KDB935210 D03 Signal booster Measurements v04r04                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Limit:</b>            | -34 dB - RSSI + MSCL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Test Setup:</b>       |  <p>Figure 5 – Variable gain instrumentation test setup</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Test Procedure:</b>   | <p><b>Variable gain:</b></p> <ol style="list-style-type: none"> <li>Connect the EUT to the test equipment as shown in Figure 5 with the uplink output (donor) port connected to signal generator #1. Affirm that the coupled path of the RF coupler is connected to the spectrum analyzer.</li> <li>Configure downlink signal generator #1 for AWGN operation with a 99% OBW of 4.1 MHz, tuned to the center of the operational band.</li> <li>Set the power level and frequency of signal generator #2 to a value that is 5 dB below the AGC level determined from 7.2. The signal type is AWGN with a 99% OBW of 4.1 MHz.</li> <li>Set RBW = 100 kHz.</li> <li>Set VBW ≥ 300 kHz.</li> <li>Select the CHANNEL POWER measurement mode.</li> <li>Select the power averaging (rms) detector.</li> <li>Affirm that the number of measurement points per sweep ≥ (2 . span)/RBW.</li> <li>Sweep time = auto couple or as necessary (but no less than auto couple value).</li> <li>Trace average at least 10 traces in power averaging (i.e., rms) mode.</li> <li>Measure the maximum channel power and compute maximum gain when varying the signal generator #1 output to a level from .90 dBm to .20 dBm, as measured at the input port (i.e., downlink signal level at the booster donor port node of Figure 5), in 1 dB steps inside the RSSI-dependent region, and 10 dB steps outside the RSSI-dependent region. Report the six values closest to the limit, including at least two points from within the RSSI-dependent region of operation. See gain limit in charts in Appendix D for uplink gain requirements. Additionally, document that the EUT provides equivalent uplink and downlink gain, and when operating in shutoff mode that the uplink and downlink gain is within the transmit power off mode gain limits.</li> <li>Repeat 7.9.1b) to 7.9.1k) for all operational uplink bands.</li> </ol> <p><b>Variable uplink gain timing:</b><br/>Variable uplink gain timing is to be measured as follows, using the test setup shown in Figure 5.</p> <ol style="list-style-type: none"> <li>Set the spectrum analyzer to the uplink frequency to be</li> </ol> |

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | <p>measured.</p> <p>b) Set the span to 0 Hz with a sweep time of 10 seconds.</p> <p>c) Set the power level of signal generator #1 to the lowest level of the RSSI-dependent gain [see 7.9.1k)].</p> <p>d) Select MAX HOLD and increase the power level of signal generator #1 by 10 dB for mobile boosters, and by 20 dB for fixed indoor boosters. Signal generator #2 remains same, as described in 7.9.1c).</p> <p>e) Confirm that the uplink gain decreases to the specified levels, within 1 second for mobile devices, and within 3 seconds for fixed devices.13</p> <p>f) Repeat 7.9.2a) to 7.9.2e) for all operational uplink bands.</p> |
| Test Result: | PASS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

## 5.8.2. Test Instruments

| Equipment         | Manufacturer | Model       | Serial Number | Calibration Date | Calibration Due |
|-------------------|--------------|-------------|---------------|------------------|-----------------|
| Signal Generator  | Agilent      | E4421B      | GB39340839    | Jul. 05, 2022    | Jul. 04, 2023   |
| Signal Generator  | Agilent      | N5182A      | MY47070282    | Jul. 04, 2022    | Jul. 03, 2023   |
| Spectrum Analyzer | Agilent      | N9020A      | MY49100619    | Jul. 05, 2022    | Jul. 04, 2023   |
| RF Combiner       | SUNVNDN      | SUD-CS 0800 | 16230009      | /                | /               |
| Attenuator        | 50FP-006-H3  | JFW         | 907763        | /                | /               |

## 5.8.3. Test Data

**Mobile station coupling loss (MSCL):** the minimum coupling loss (in dB) between the wireless device and the input (server) port of the consumer booster. MSCL must be calculated or measured for each band of operation and provided in compliance test reports. MSCL includes the path loss from the wireless device, and the booster's server antenna gain and cable loss. The wireless device is assumed to be an isotropic (0 dBi) antenna reference. Minimum standoff distances from inside wireless devices to the booster's server antenna must be reasonable and specified by the manufacturer in customer provided installation manuals.

| MSCL Calculation |                 |              |                |                          |                       |                   |              |
|------------------|-----------------|--------------|----------------|--------------------------|-----------------------|-------------------|--------------|
| Operation Bands  | Frequency (MHz) | Distance (m) | Path loss (dB) | Indoor Antenna Gain(dBi) | Indoor Cable Loss(dB) | Polarity Loss(dB) | MSCL (dB)    |
| PCS              | 1850            | 2            | 43.86          | 3.5                      | 1.8                   | 3.01              | <b>45.17</b> |
| AWS-1            | 1710            | 2            | 43.18          | 3.5                      | 1.9                   | 3.01              | <b>44.59</b> |
| Cellular         | 824             | 2            | 36.84          | 3                        | 1.35                  | 3.01              | <b>38.20</b> |
| Lower700 MHz     | 698             | 2            | 35.40          | 3                        | 1.3                   | 3.01              | <b>36.71</b> |
| Upper700 MHz     | 776             | 2            | 36.32          | 3                        | 1.3                   | 3.01              | <b>37.63</b> |

Note : Path loss =  $20\log f + 20\log d - 27.5$

Polarity loss =  $20\log (1/\sin (45\deg))$  dB = 3.01dB

| Variable booster gain |            |                   |                    |                    |       |       |         |
|-----------------------|------------|-------------------|--------------------|--------------------|-------|-------|---------|
| Operation Band        | RSSI (dBm) | Input Power (dBm) | Output Power (dBm) | Measured Gain (dB) | MSCL  | Limit | Results |
| PCS                   | -70        | -40.59            | 11.21              | 51.80              | 45.17 | 71.98 | PASS    |
|                       | -68        | -40.59            | 9.73               | 50.32              | 45.17 | 71.98 | PASS    |
|                       | -63        | -40.59            | 4.74               | 45.33              | 45.17 | 71.98 | PASS    |
|                       | -59        | -40.59            | 1.42               | 42.01              | 45.17 | 70.17 | PASS    |
|                       | -53        | -40.59            | -4.14              | 36.45              | 45.17 | 64.17 | PASS    |
|                       | -47        | -40.59            | -11.97             | 28.62              | 45.17 | 58.17 | PASS    |
| AWS-1                 | -62        | -35.05            | 12.48              | 47.53              | 44.59 | 71.27 | PASS    |
|                       | -60        | -35.05            | 11.68              | 46.73              | 44.59 | 70.59 | PASS    |
|                       | -55        | -35.05            | 6.76               | 41.81              | 44.59 | 65.59 | PASS    |
|                       | -52        | -35.05            | 2.94               | 37.99              | 44.59 | 62.59 | PASS    |
|                       | -48        | -35.05            | -1.13              | 33.92              | 44.59 | 58.59 | PASS    |
|                       | -41        | -35.05            | -7.92              | 27.13              | 44.59 | 51.59 | PASS    |
| Cellular              | -61        | -40.63            | 8.06               | 48.69              | 38.20 | 64.95 | PASS    |
|                       | -59        | -40.63            | 6.74               | 47.37              | 38.20 | 63.20 | PASS    |
|                       | -53        | -40.63            | 1.34               | 41.97              | 38.20 | 57.20 | PASS    |
|                       | -49        | -40.63            | -4.53              | 36.10              | 38.20 | 53.20 | PASS    |
|                       | -45        | -40.63            | -8.45              | 32.18              | 38.20 | 49.20 | PASS    |
|                       | -39        | -40.63            | -14.37             | 26.26              | 38.20 | 43.20 | PASS    |
|                       | -64        | -38.45            | 15.04              | 53.49              | 36.71 | 63.49 | PASS    |

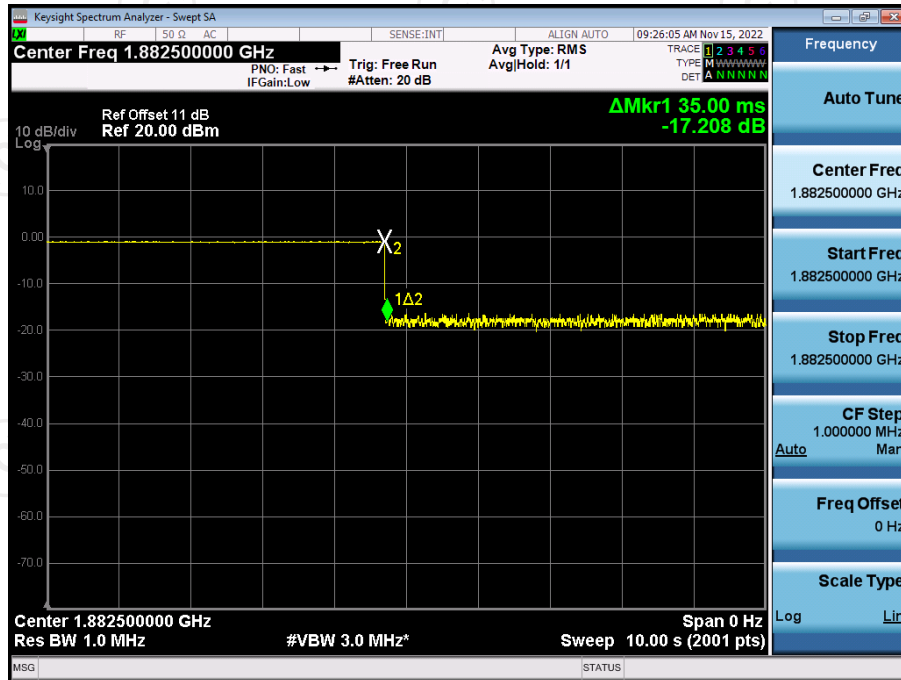
|                 |     |        |       |       |       |       |      |
|-----------------|-----|--------|-------|-------|-------|-------|------|
| Lower700M<br>Hz | -61 | -38.45 | 13.64 | 52.09 | 36.71 | 63.49 | PASS |
|                 | -56 | -38.45 | 8.66  | 47.11 | 36.71 | 58.71 | PASS |
|                 | -53 | -38.45 | 6.28  | 44.73 | 36.71 | 55.71 | PASS |
|                 | -49 | -38.45 | 2.35  | 40.80 | 36.71 | 51.71 | PASS |
|                 | -43 | -38.45 | -5.51 | 32.94 | 36.71 | 45.71 | PASS |
| Upper700M<br>Hz | -64 | -36.08 | 15.50 | 51.58 | 37.63 | 64.36 | PASS |
|                 | -59 | -36.08 | 11.36 | 47.44 | 37.63 | 62.63 | PASS |
|                 | -54 | -36.08 | 6.52  | 42.60 | 37.63 | 57.63 | PASS |
|                 | -50 | -36.08 | 2.71  | 38.79 | 37.63 | 53.63 | PASS |
|                 | -46 | -36.08 | -3.49 | 32.59 | 37.63 | 49.63 | PASS |
|                 | -41 | -36.08 | -7.81 | 28.27 | 37.63 | 44.63 | PASS |

## Variable Uplink Gain Timing

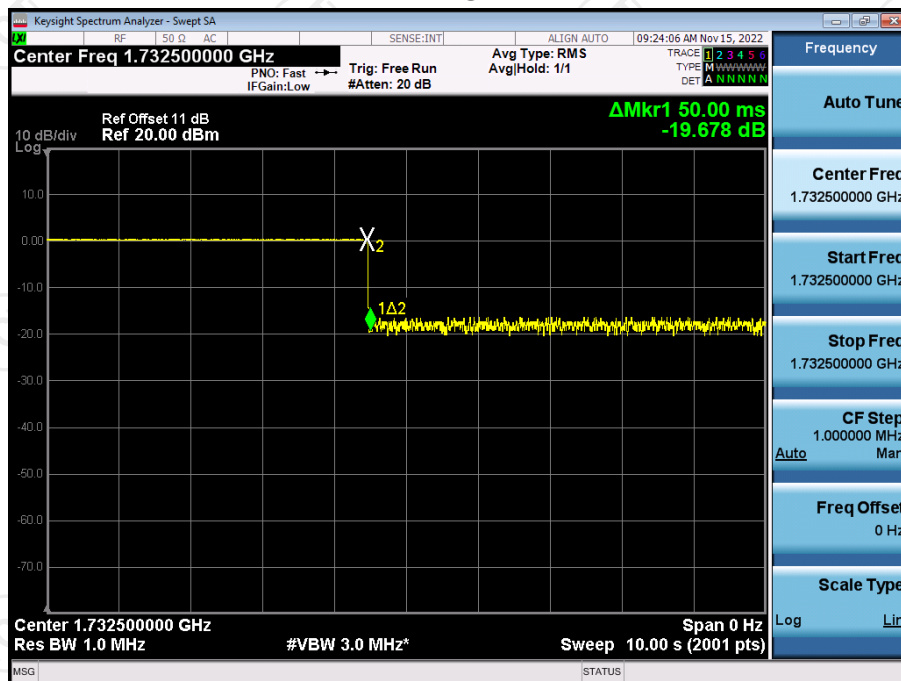
| Operation Band | Measured Sec | Limit Sec | Result |
|----------------|--------------|-----------|--------|
| PCS            | 0.035        | 3.0       | PASS   |
| AWS-1          | 0.050        | 3.0       | PASS   |
| Cellular       | 0.030        | 3.0       | PASS   |
| Lower700MHz    | 0.215        | 3.0       | PASS   |
| Upper700MHz    | 0.015        | 3.0       | PASS   |

## Variable Uplink Gain Timing Test Plots

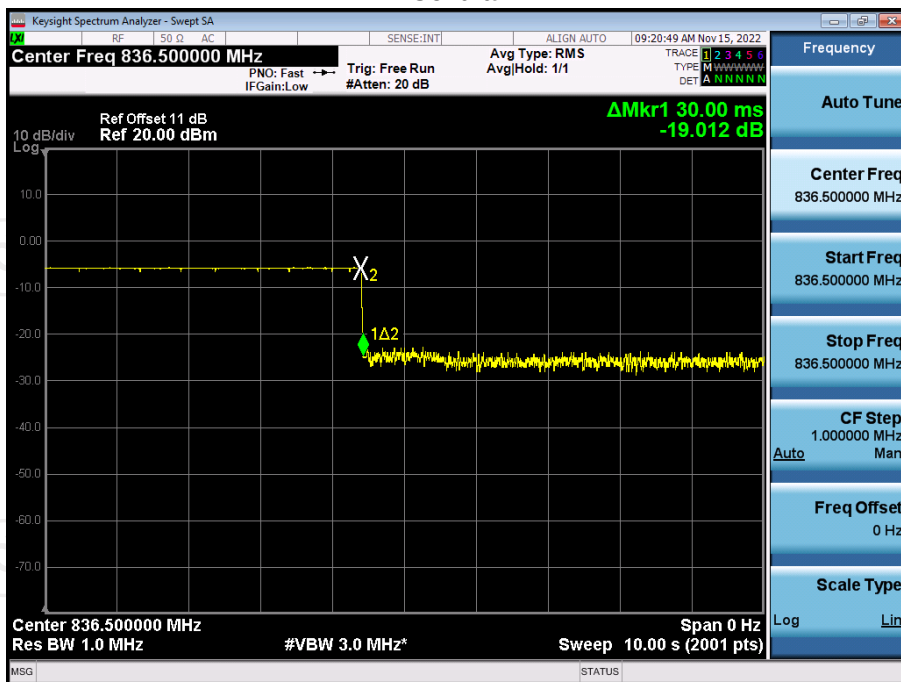
### PCS



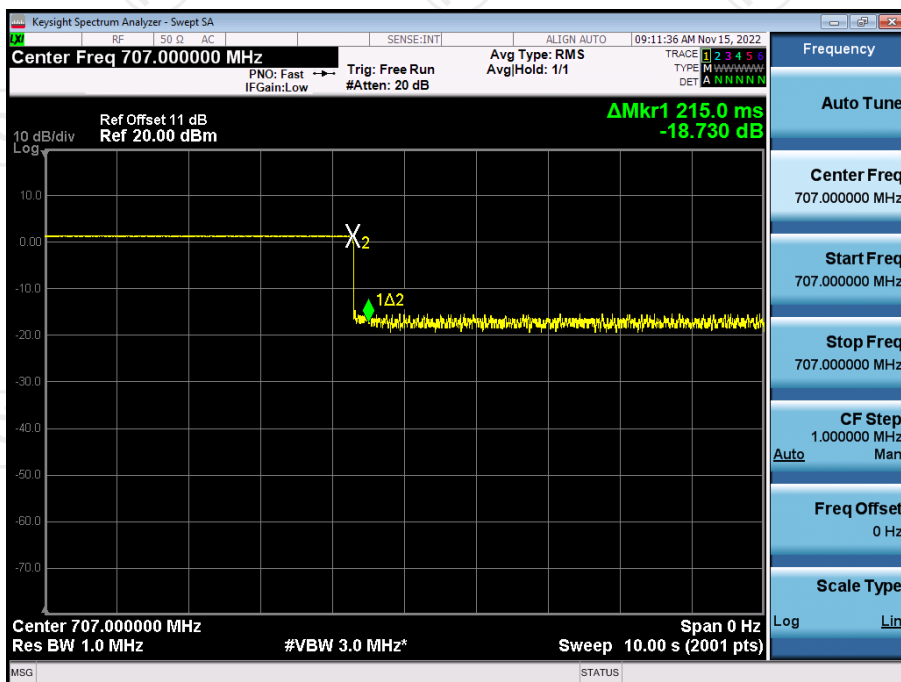
### AWS-1



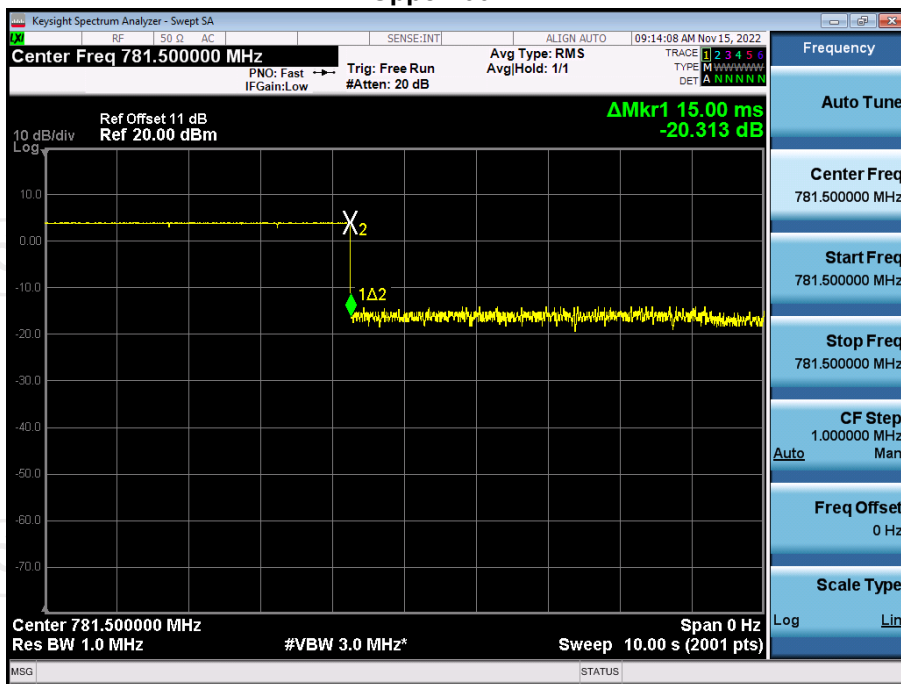
## Cellular



## Lower700MHz

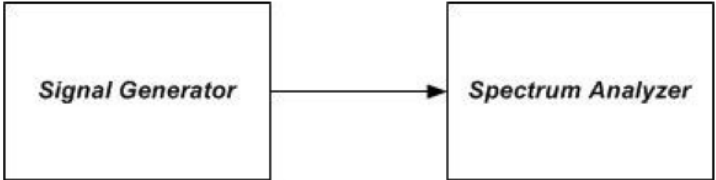


## Upper700MHz



## 5.9. Occupied Bandwidth

### 5.9.1. Test Specification

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test Requirement:</b> | FCC Part2 Section 2.1049                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Test Method:</b>      | KDB935210 D03 Signal booster Measurements v04r04                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Limit:</b>            | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Test setup:</b>       |  <p>Figure 6 – Test setup for measuring characteristics of test signals used for subsequent EUT occupied bandwidth testing</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Test Procedure:</b>   | <ol style="list-style-type: none"> <li>Connect the test equipment as shown in Figure 6 to firstly measure the characteristics of the test signals produced by the signal generator.</li> <li>Set VBW <math>\geq 3</math> RBW.</li> <li>Set the center frequency of the spectrum analyzer to the center of the operational band. The span will be adjusted for each modulation type and OBW as necessary for accurately viewing the signals.</li> <li>Set the signal generator for power level to match the values obtained from the tests of 7.2.</li> <li>Set the signal generator modulation type for GSM with a PRBS pattern and allow the trace on the signal generator to stabilize adjusting the span as necessary.</li> <li>Set the spectrum analyzer RBW for 1% to 5% of the EBW.</li> <li>Capture the spectrum analyzer trace for inclusion in the test report.</li> <li>Repeat 7.10c) to 7.10g) for CDMA and W-CDMA modulation, adjusting the span as necessary. AWGN or LTE may be used in place of W-CDMA, as an option.</li> <li>Repeat 7.10c) to 7.10h) for all uplink and downlink operational bands.</li> <li>Connect the test equipment as shown in Figure 1, with the uplink output (donor) port connected to the spectrum analyzer, and the server port connected to the signal generator.</li> <li>Repeat 7.10c) to 7.10i) with this EUT uplink path test setup.</li> <li>Connect the test equipment as shown in Figure 1, with the downlink output (server) port connected to the spectrum analyzer, and the donor port connected to the signal generator.</li> <li>Repeat 7.10c) to 7.10j) with this EUT downlink path test setup.</li> </ol> |
| <b>Test results:</b>     | PASS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

**5.9.2. Test Instruments**

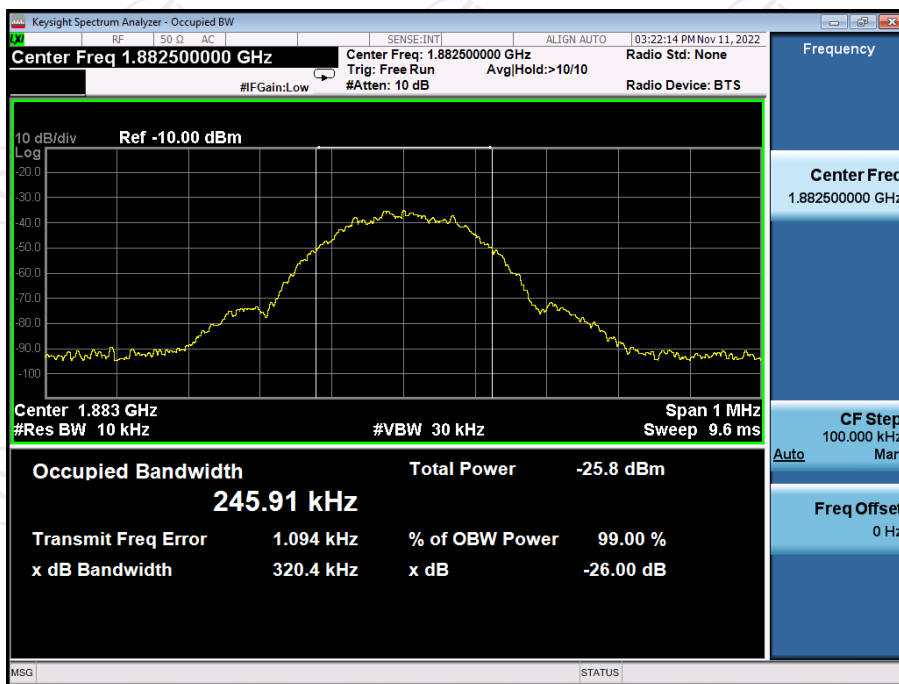
| Equipment         | Manufacturer | Model  | Serial Number | Calibration Date | Calibration Due |
|-------------------|--------------|--------|---------------|------------------|-----------------|
| Signal Generator  | Agilent      | N5182A | MY47070282    | Jul. 04, 2022    | Jul. 03, 2023   |
| Spectrum Analyzer | Agilent      | N9020A | MY49100619    | Jul. 05, 2022    | Jul. 04, 2023   |

## 5.9.3. Test Data

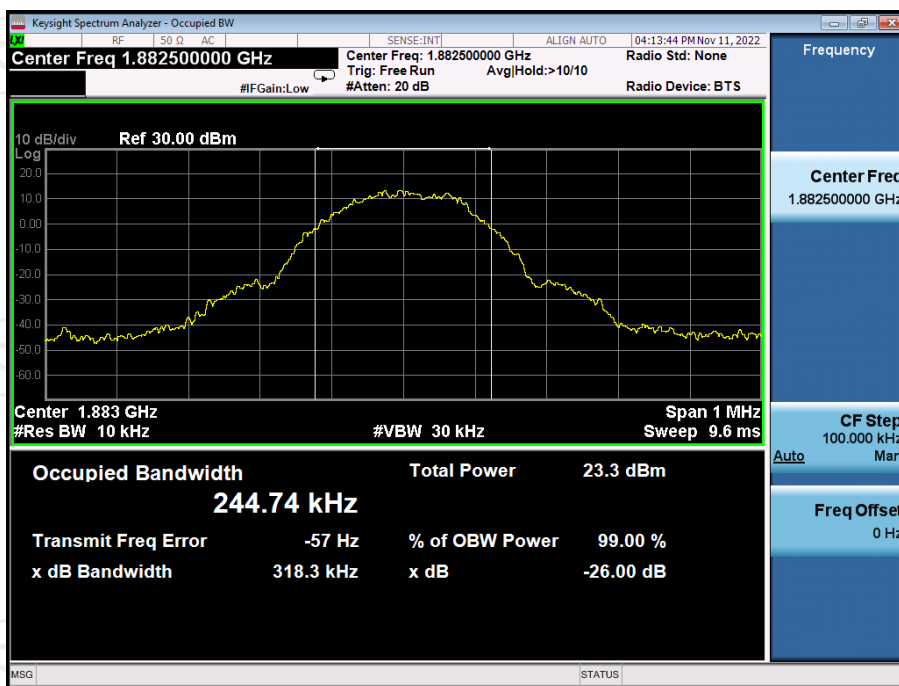
| Operation Band |              | Signal Type | Input OBW [MHz] | Output OBW [MHz] | Results |
|----------------|--------------|-------------|-----------------|------------------|---------|
| Uplink         | PCS          | GSM         | 0.246           | 0.245            | PASS    |
|                |              | CDMA        | 1.243           | 1.245            | PASS    |
|                |              | LTE         | 4.512           | 4.517            | PASS    |
|                | AWS-1        | GSM         | 0.245           | 0.241            | PASS    |
|                |              | CDMA        | 1.239           | 1.248            | PASS    |
|                |              | LTE         | 4.506           | 4.498            | PASS    |
|                | Cellular     | GSM         | 0.248           | 0.246            | PASS    |
|                |              | CDMA        | 1.241           | 1.245            | PASS    |
|                |              | LTE         | 4.514           | 4.527            | PASS    |
|                | Lower700M Hz | GSM         | 0.245           | 0.243            | PASS    |
|                |              | CDMA        | 1.249           | 1.245            | PASS    |
|                |              | LTE         | 4.515           | 4.530            | PASS    |
|                | Upper700M Hz | GSM         | 0.243           | 0.246            | PASS    |
|                |              | CDMA        | 1.247           | 1.242            | PASS    |
|                |              | LTE         | 4.519           | 4.497            | PASS    |
| Downlink       | PCS          | GSM         | 0.245           | 0.242            | PASS    |
|                |              | CDMA        | 1.246           | 1.243            | PASS    |
|                |              | LTE         | 4.522           | 4.515            | PASS    |
|                | AWS-1        | GSM         | 0.247           | 0.248            | PASS    |
|                |              | CDMA        | 1.246           | 1.243            | PASS    |
|                |              | LTE         | 4.521           | 4.513            | PASS    |
|                | Cellular     | GSM         | 0.248           | 0.253            | PASS    |
|                |              | CDMA        | 1.248           | 1.242            | PASS    |
|                |              | LTE         | 4.542           | 4.476            | PASS    |
|                | Lower700M Hz | GSM         | 0.245           | 0.251            | PASS    |
|                |              | CDMA        | 1.245           | 1.254            | PASS    |
|                |              | LTE         | 4.523           | 4.510            | PASS    |
|                | Upper700M Hz | GSM         | 0.249           | 0.245            | PASS    |
|                |              | CDMA        | 1.245           | 1.247            | PASS    |
|                |              | LTE         | 4.510           | 4.494            | PASS    |

## Test Plots

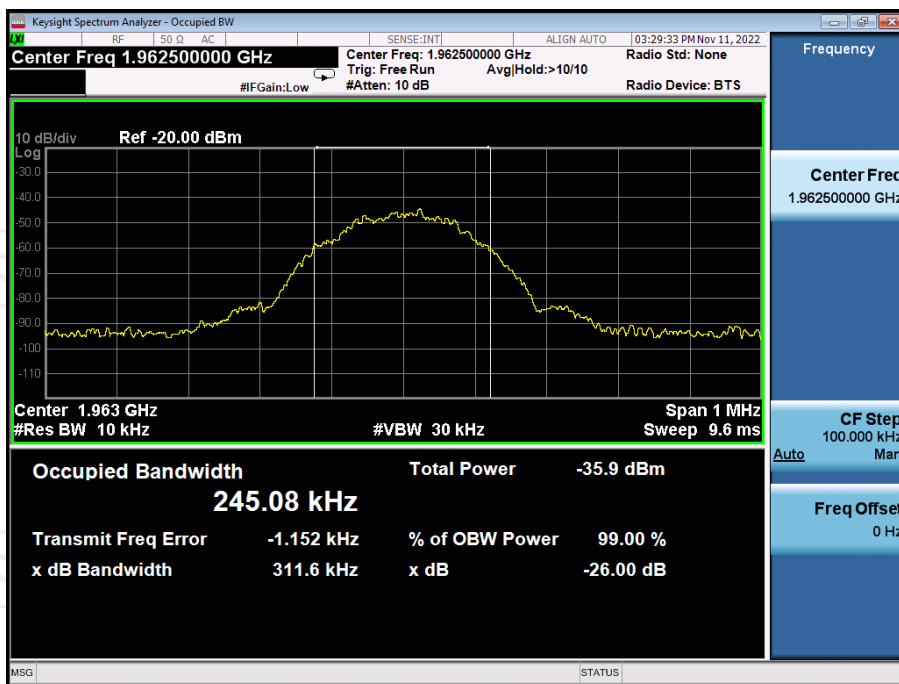
### PCS GSM UL Input



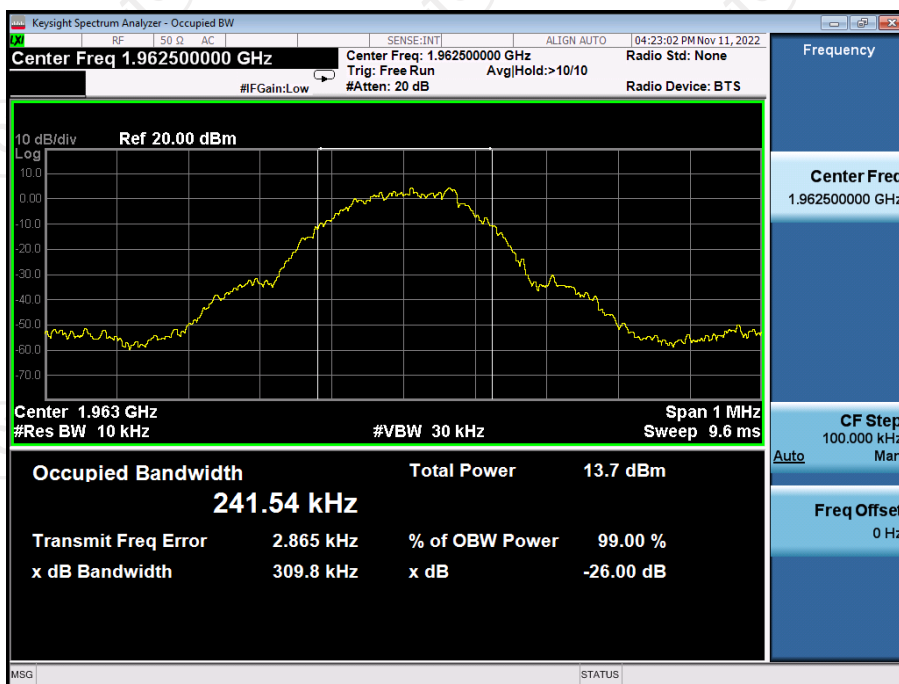
### PCS GSM UL output



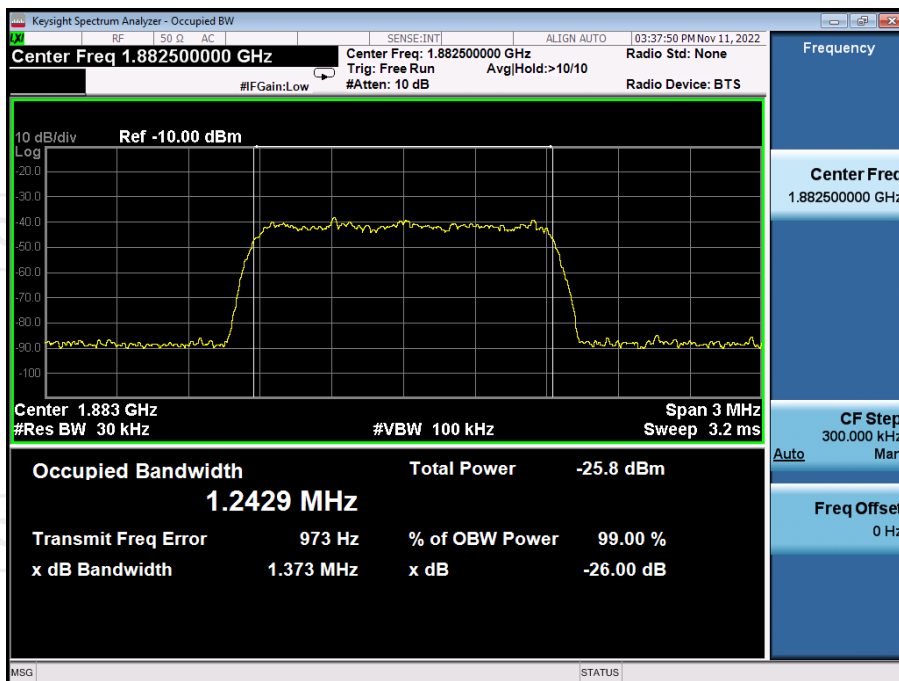
## PCS GSM DL Input



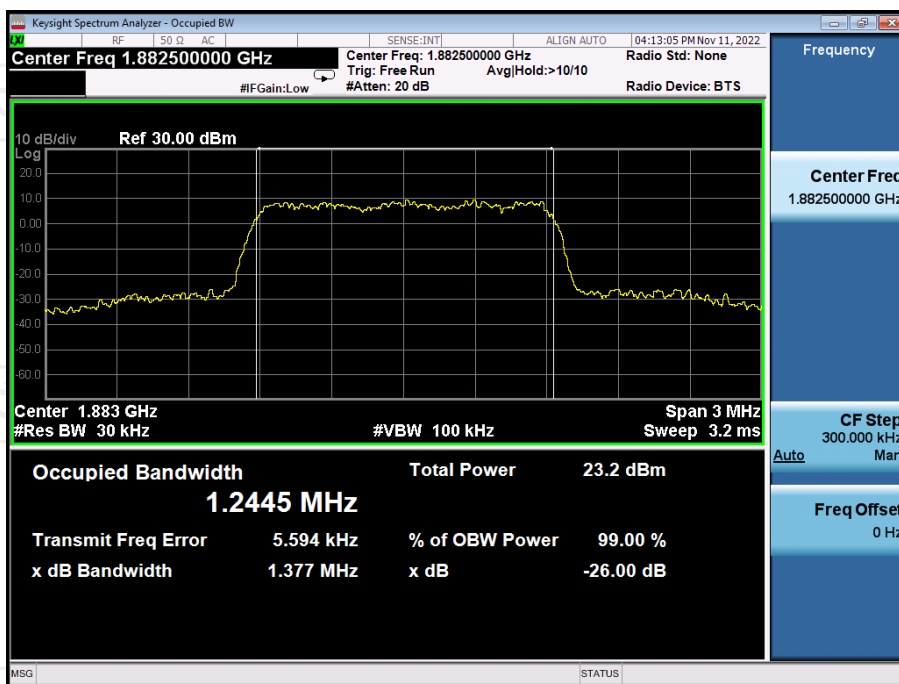
## PCS GSM DL Output



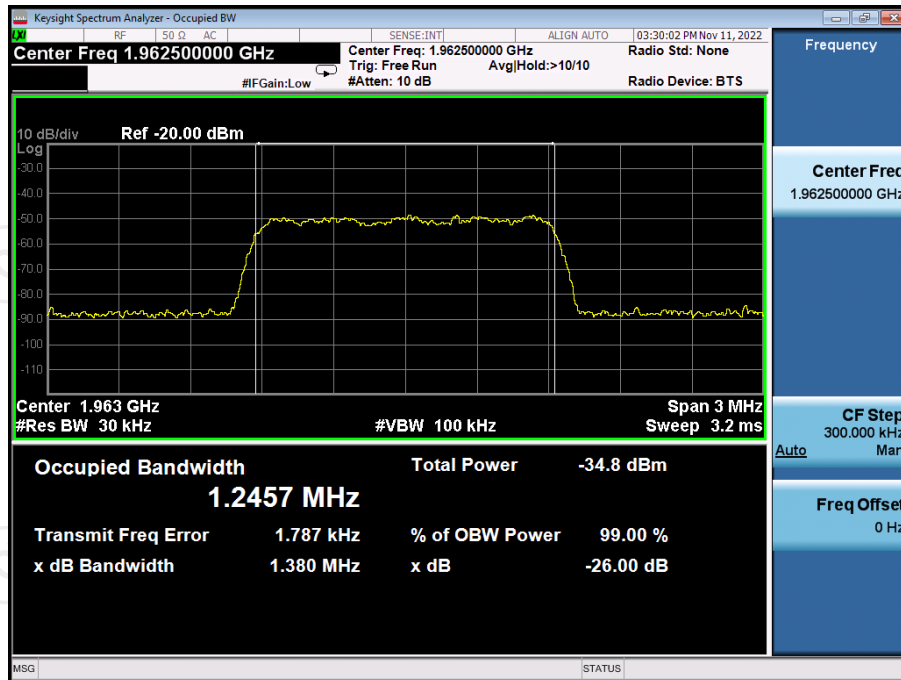
## PCS CDMA UL Input



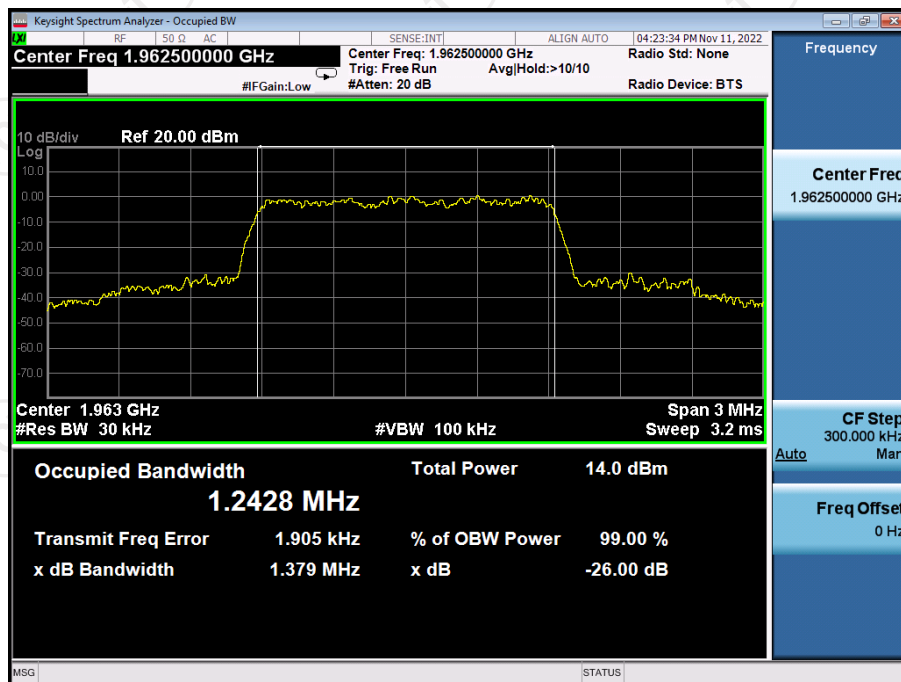
## PCS CDMA UL output



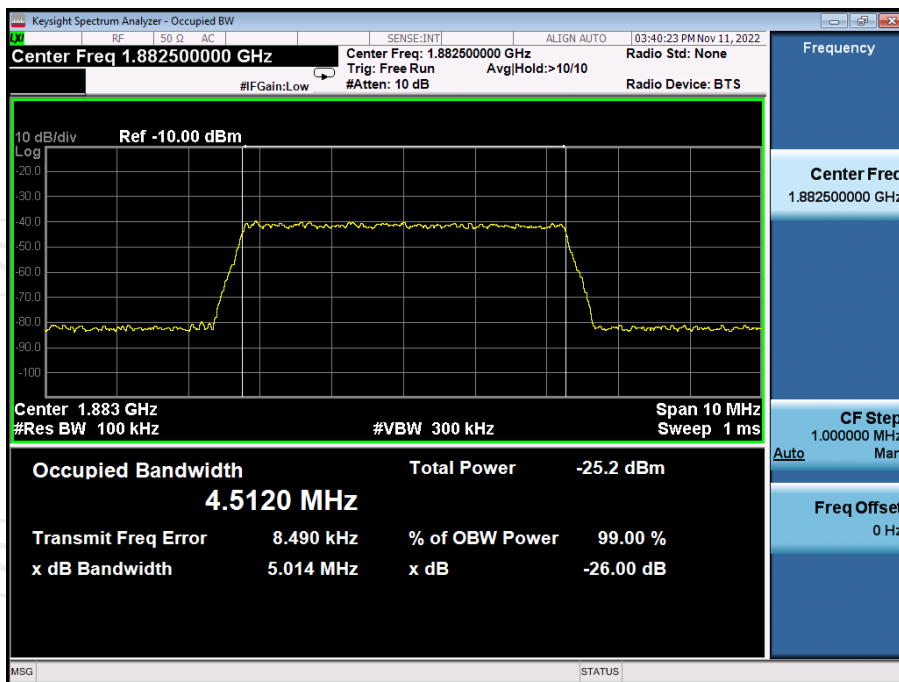
## PCS CDMA DL Input



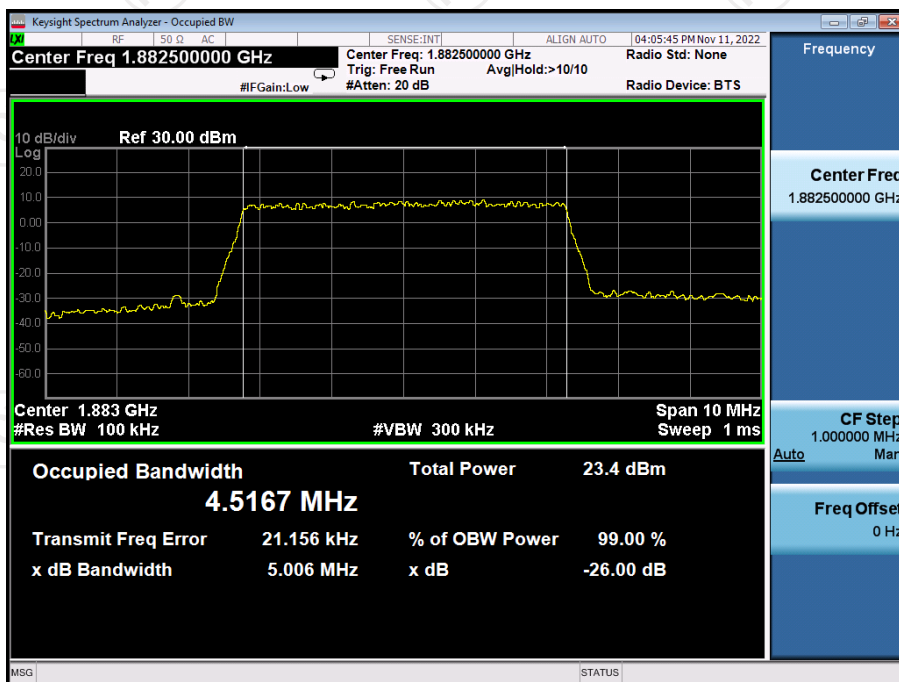
## PCS CDMA DL Output



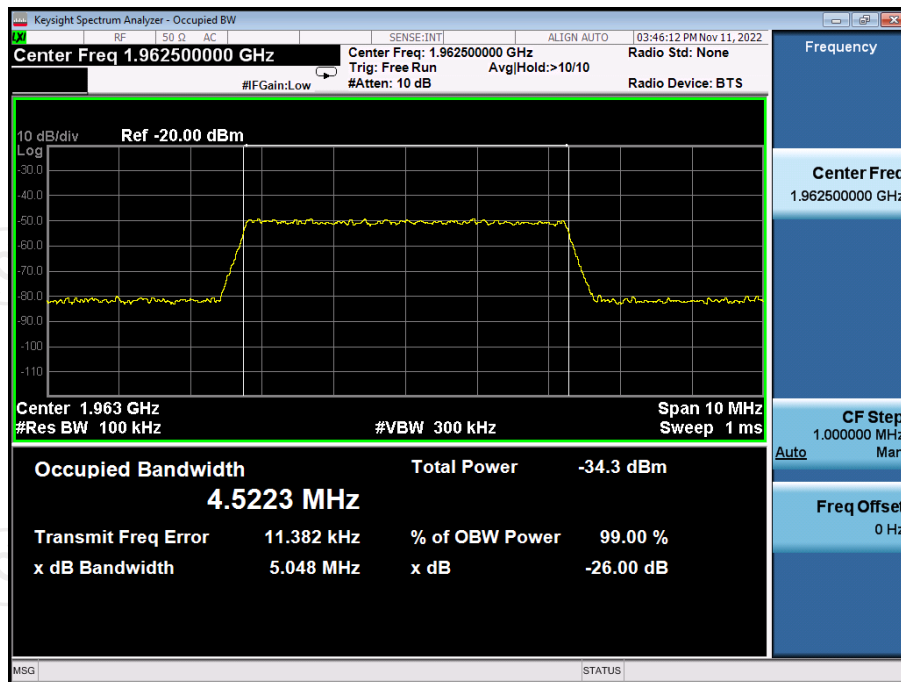
## PCS LTE UL Input



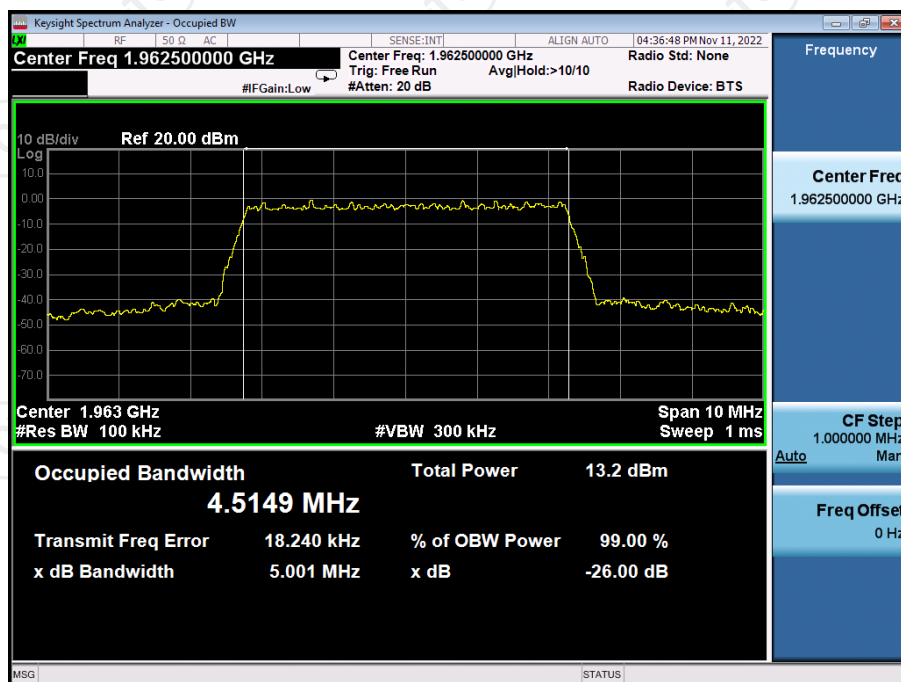
## PCS LTE UL output



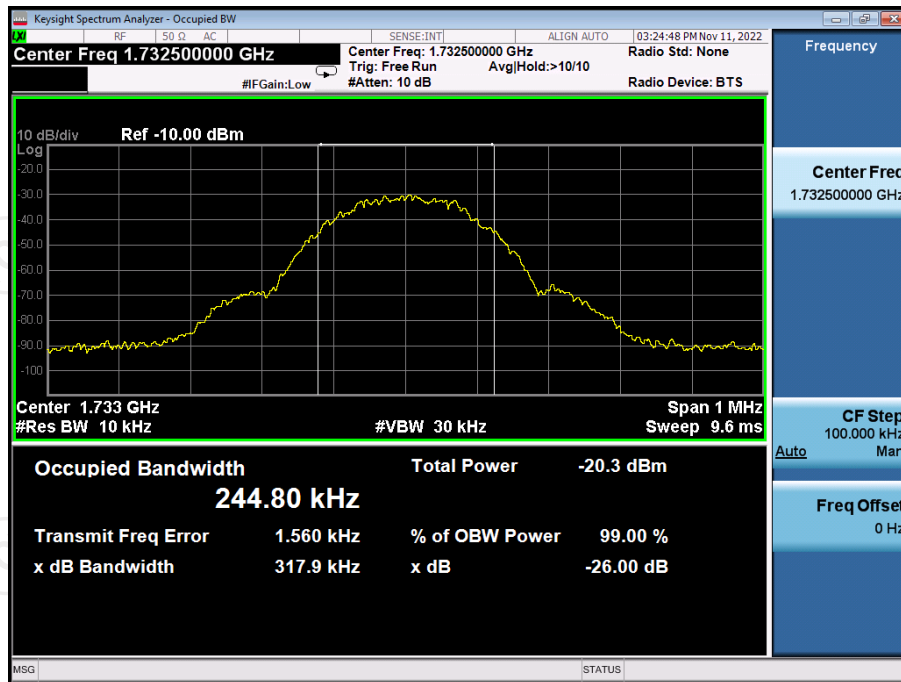
## PCS LTE DL Input



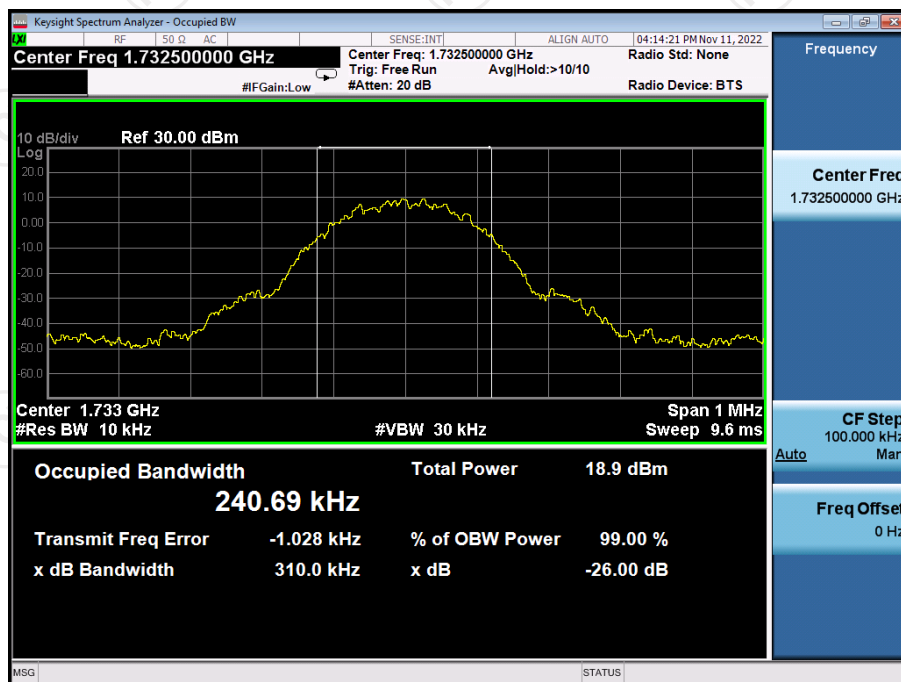
## PCS LTE DL Output



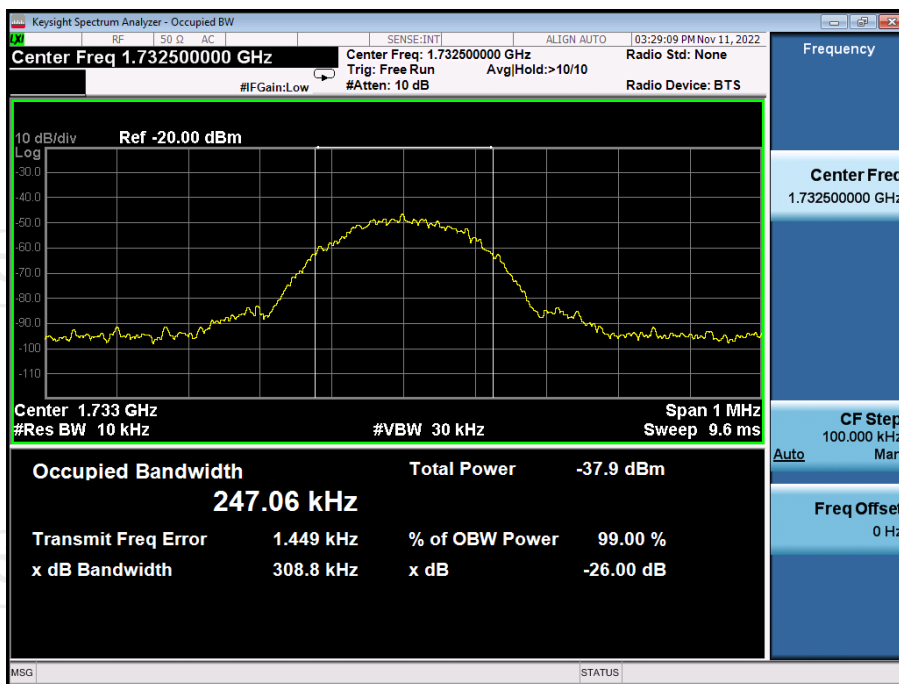
## AWS-1 GSM UL Input



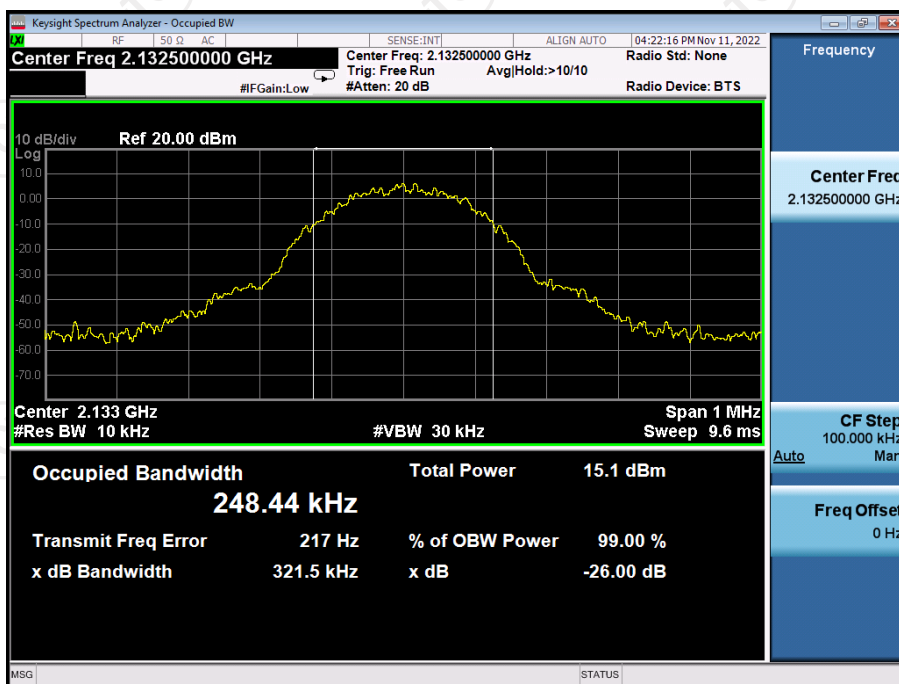
## AWS-1 GSM UL output



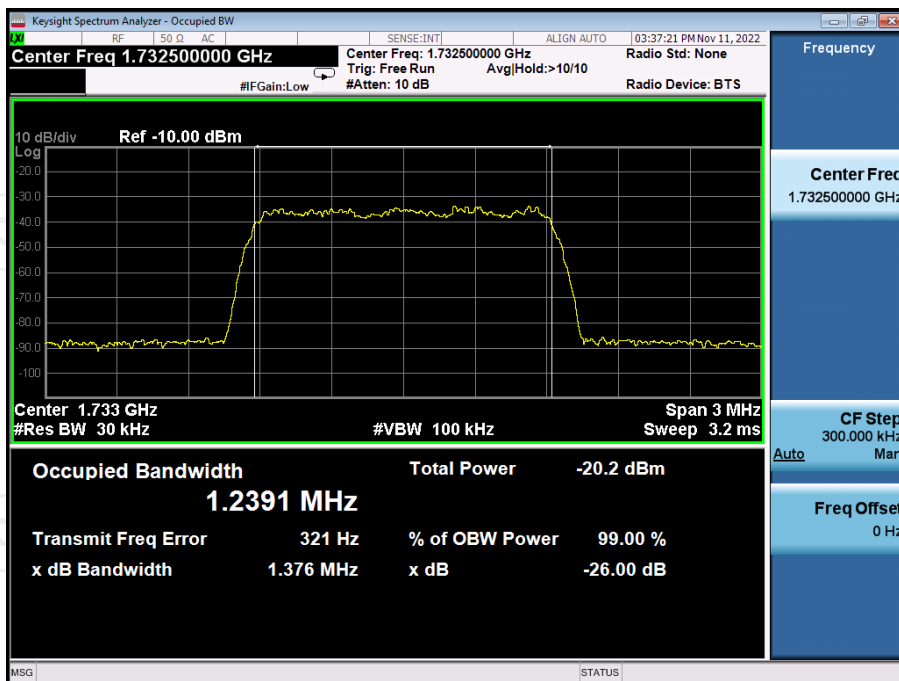
## AWS-1 GSM DL Input



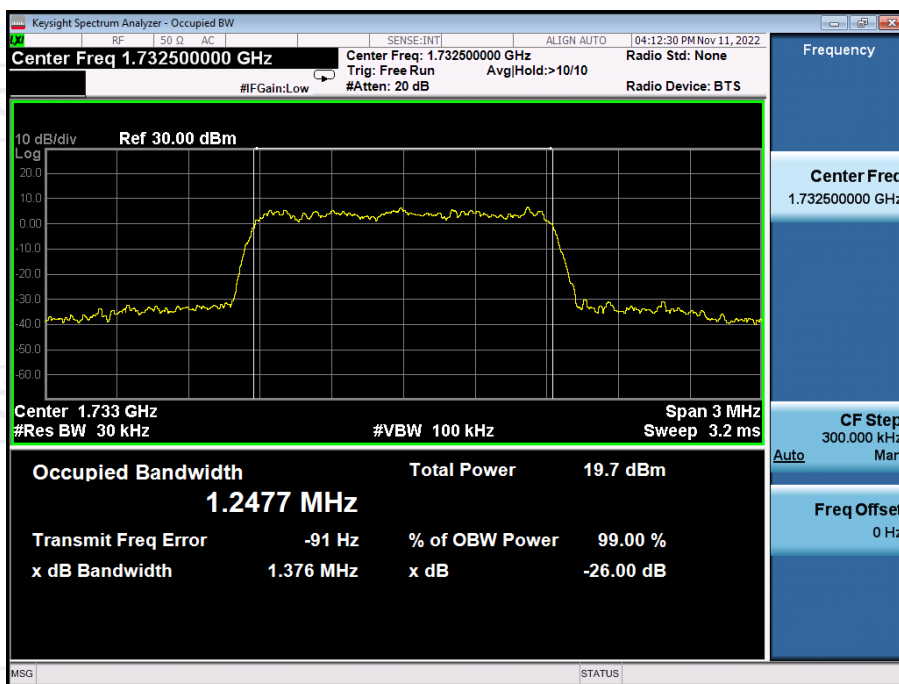
## AWS-1 GSM DL Output



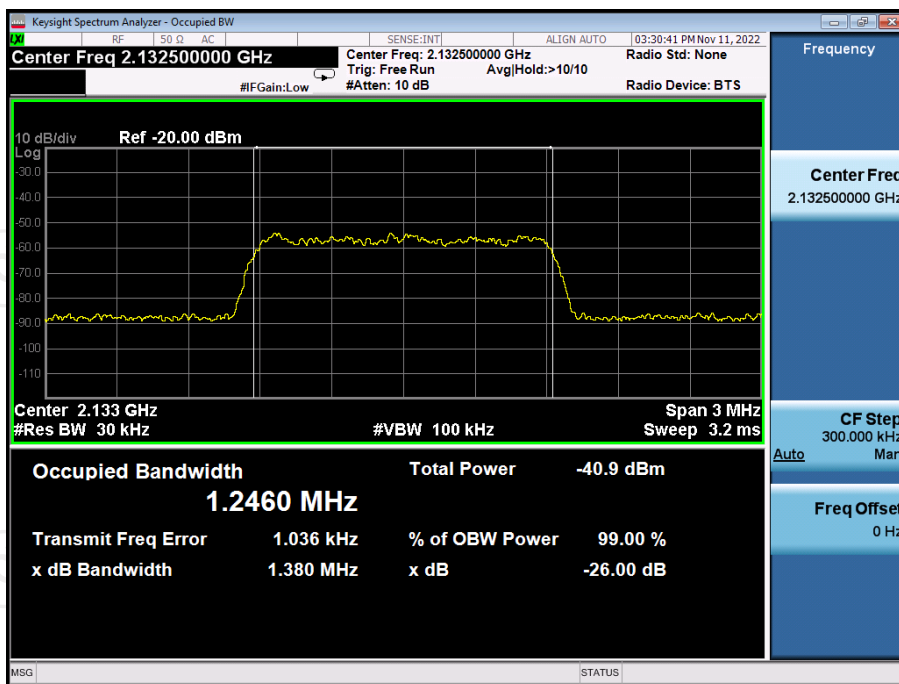
## AWS-1 CDMA UL Input



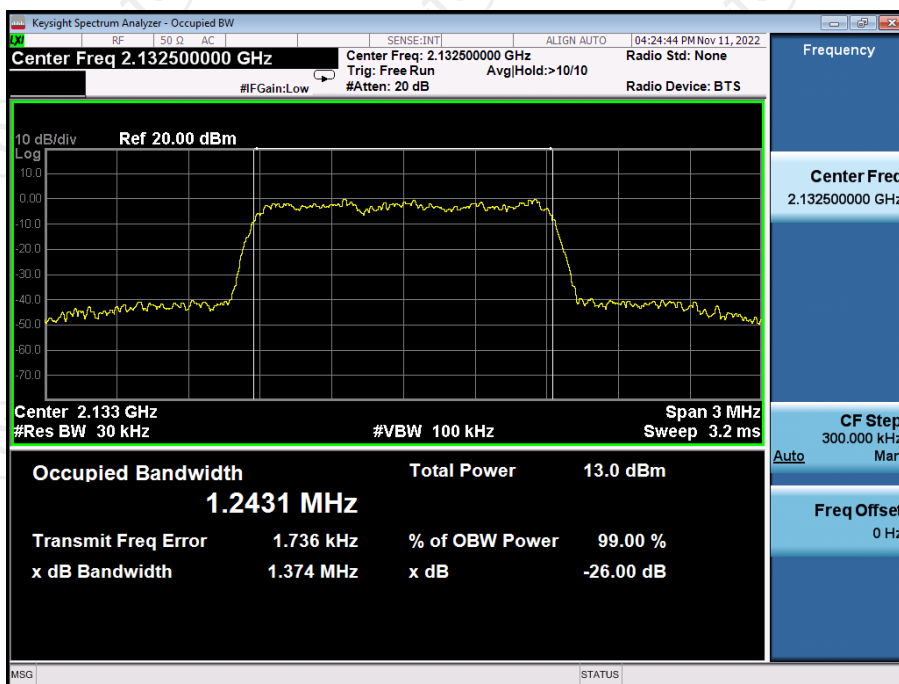
## AWS-1 CDMA UL output



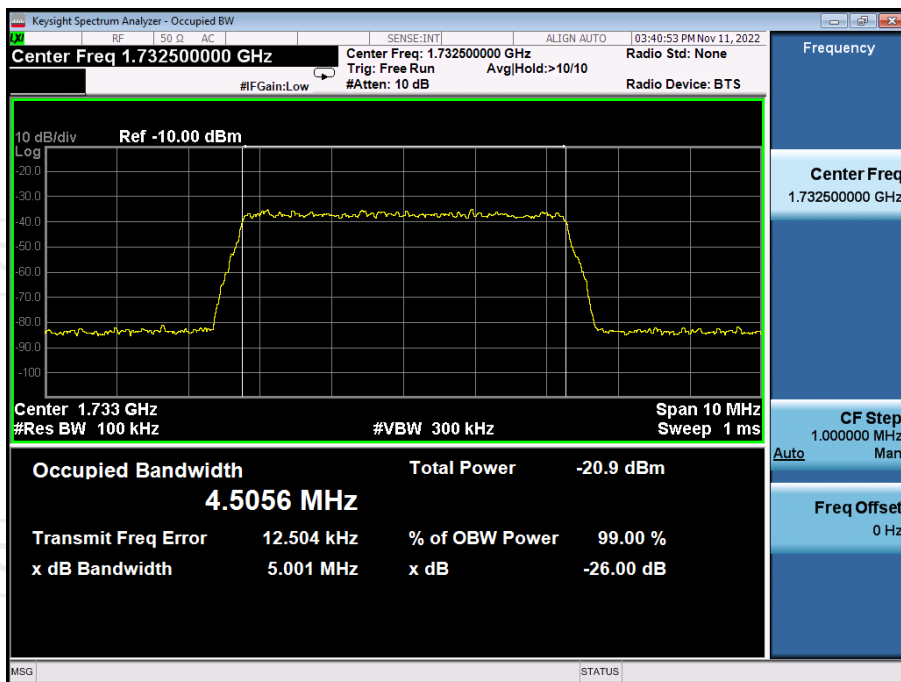
## AWS-1 CDMA DL Input



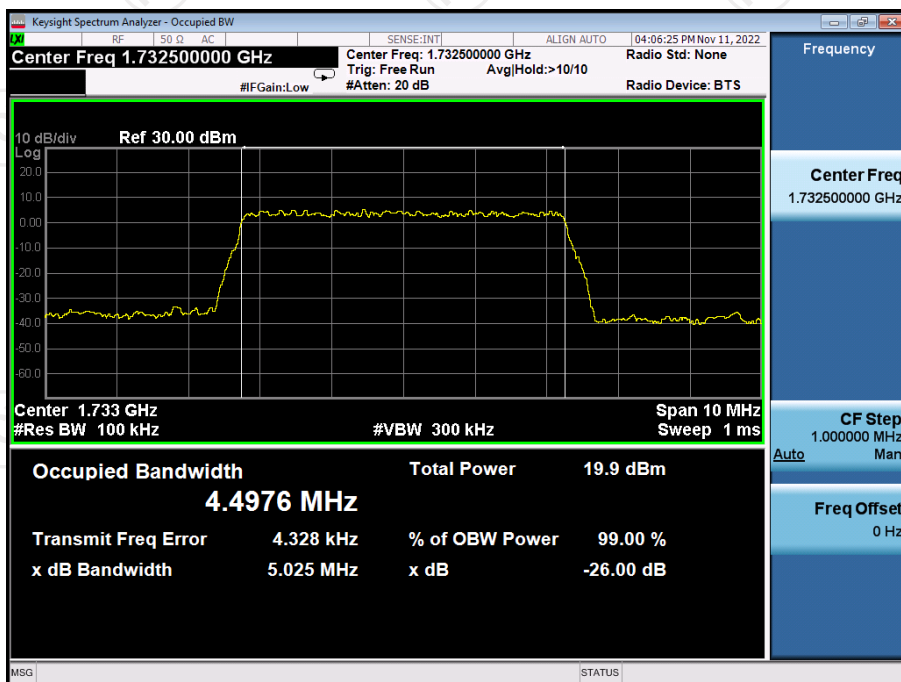
## AWS-1 CDMA DL Output



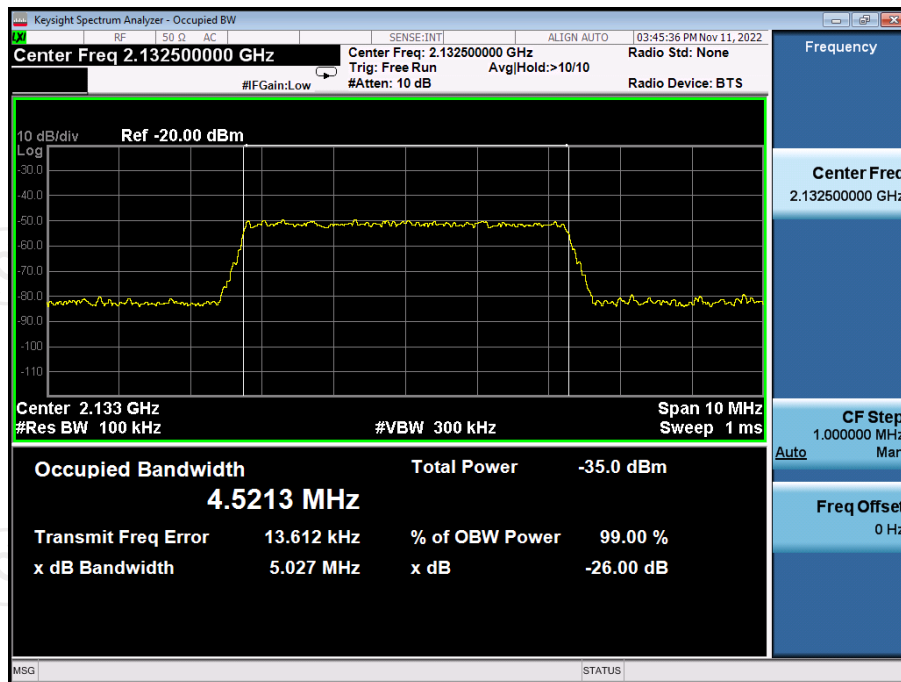
## AWS-1 LTE UL Input



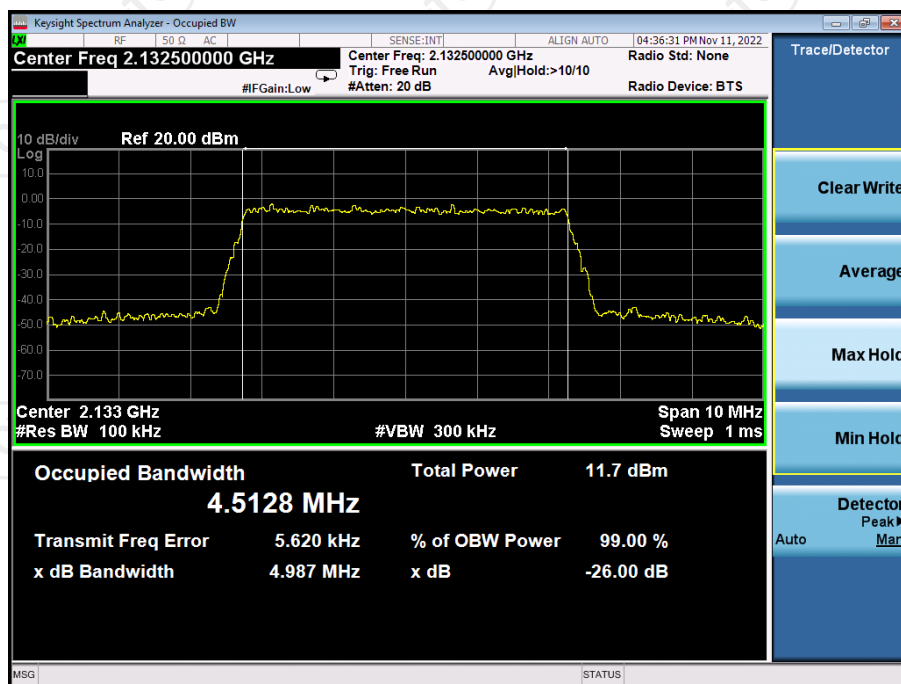
## AWS-1 LTE UL output



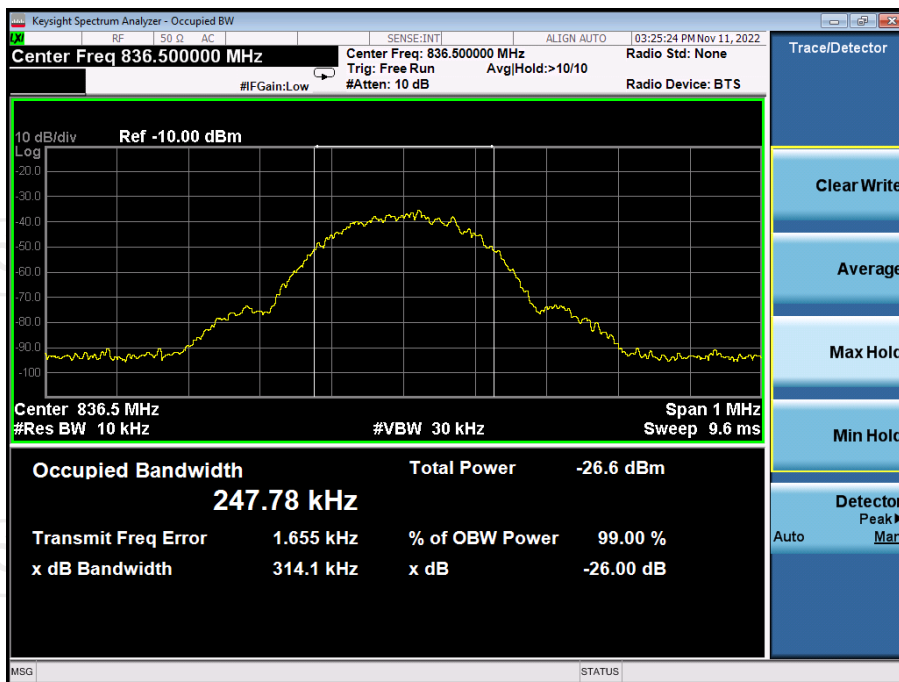
## AWS-1 LTE DL Input



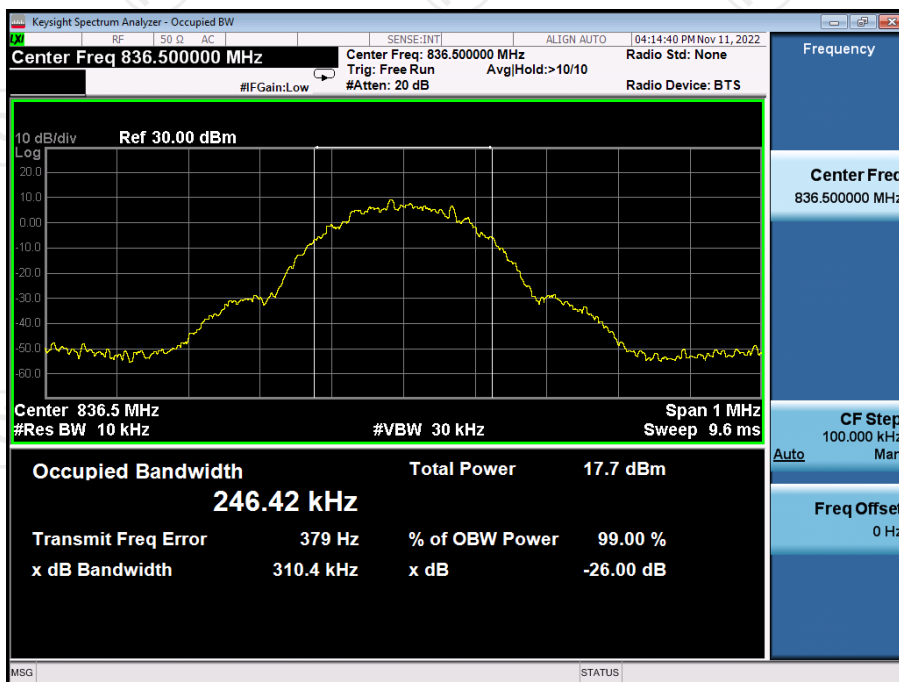
## AWS-1 LTE DL Output



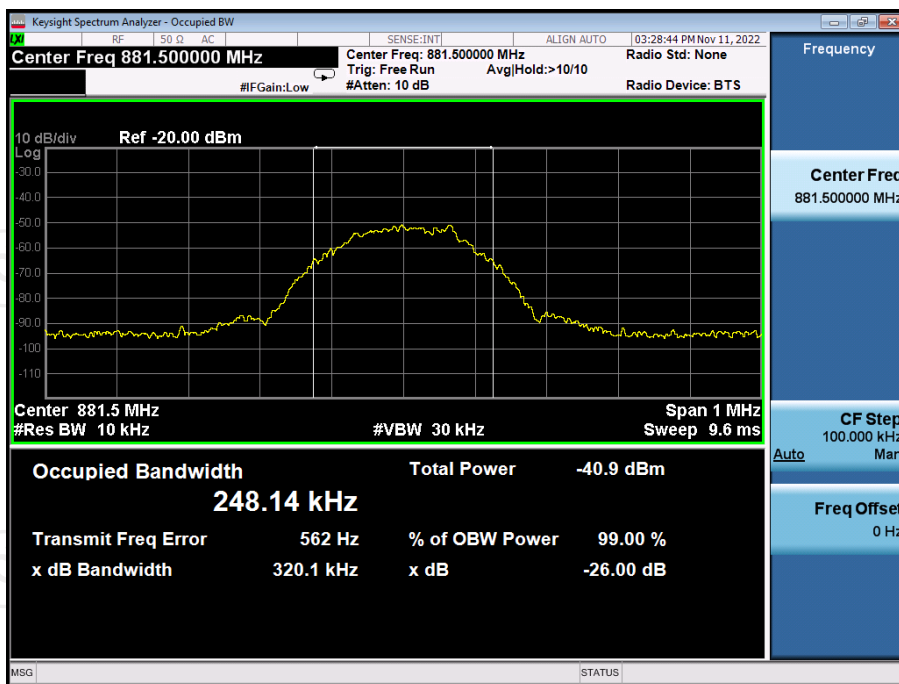
## Cellular GSM UL Input



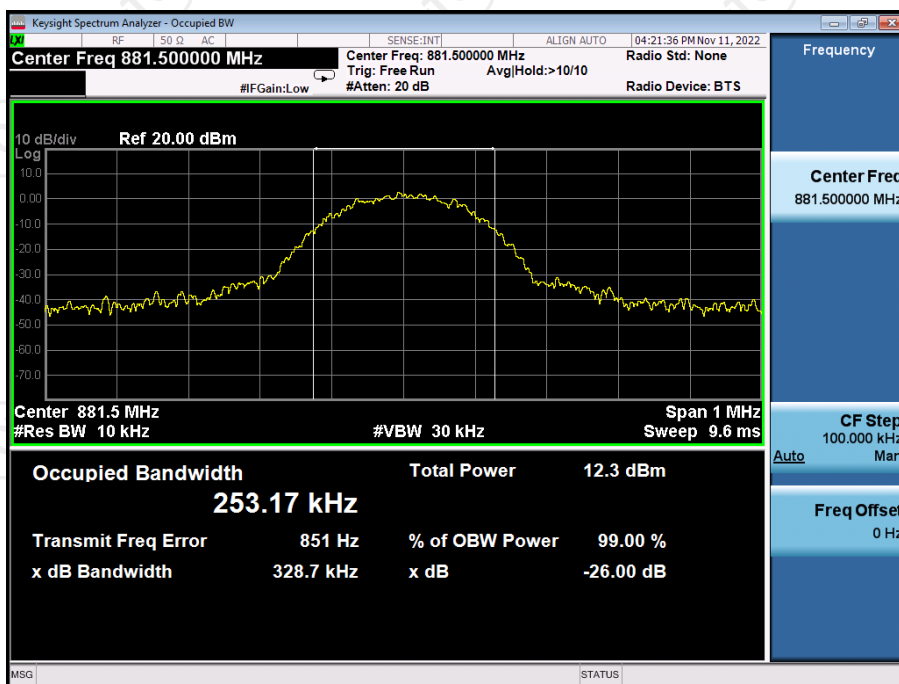
## Cellular GSM UL output



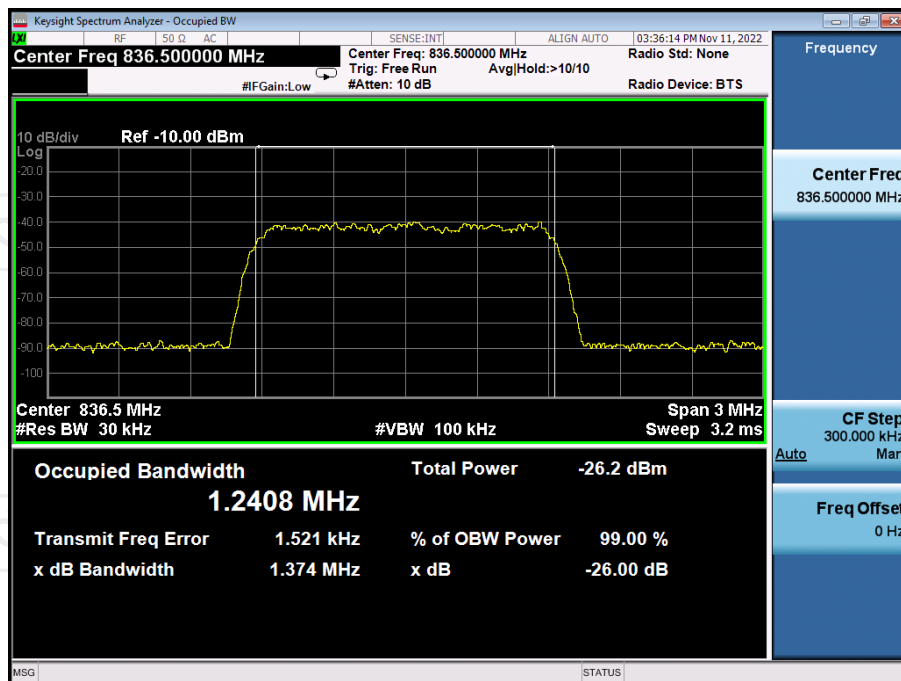
## Cellular GSM DL Input



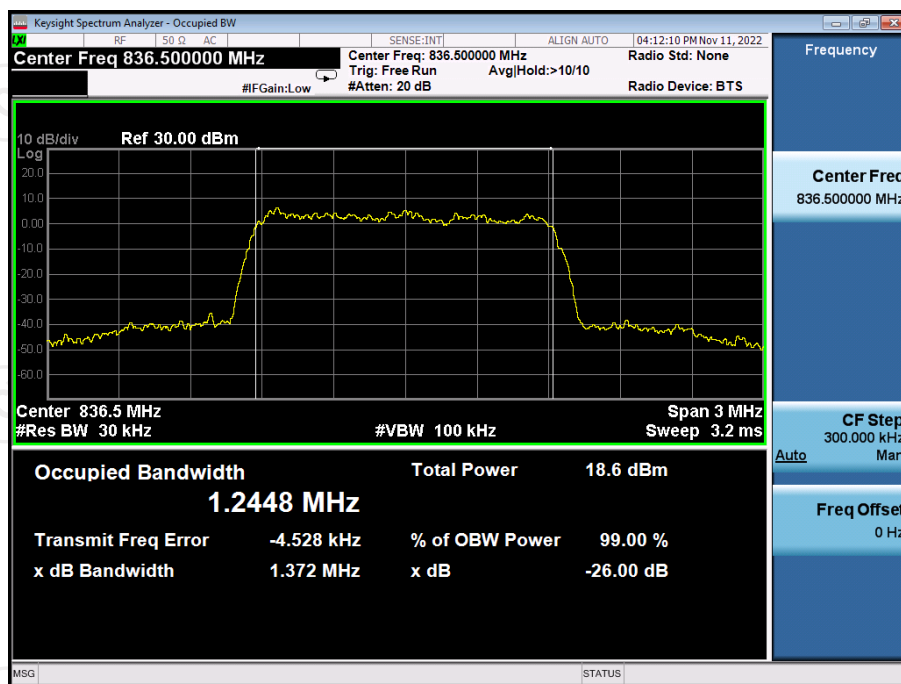
## Cellular GSM DL Output



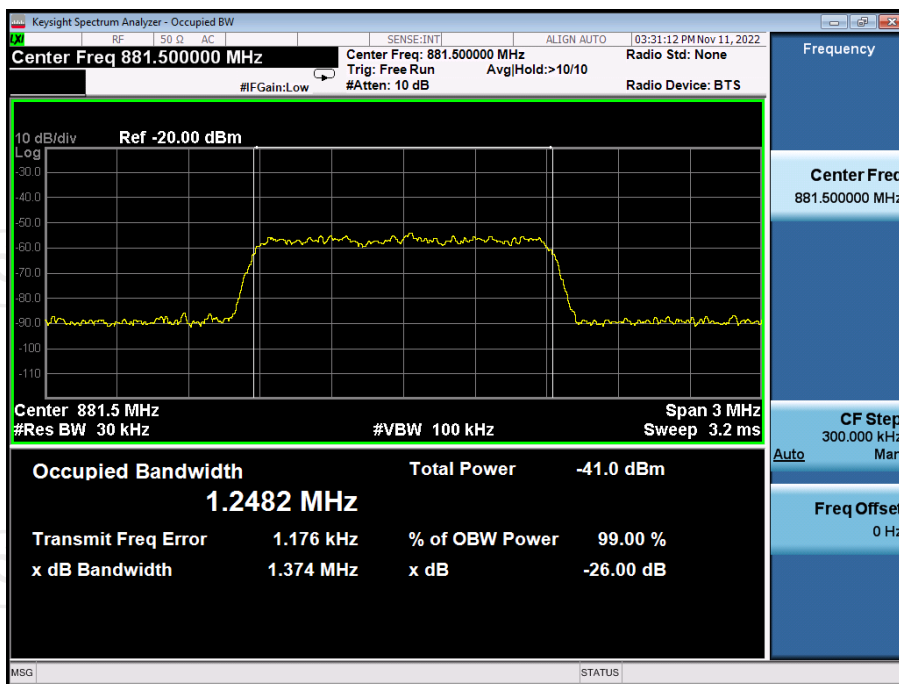
## Cellular CDMA UL Input



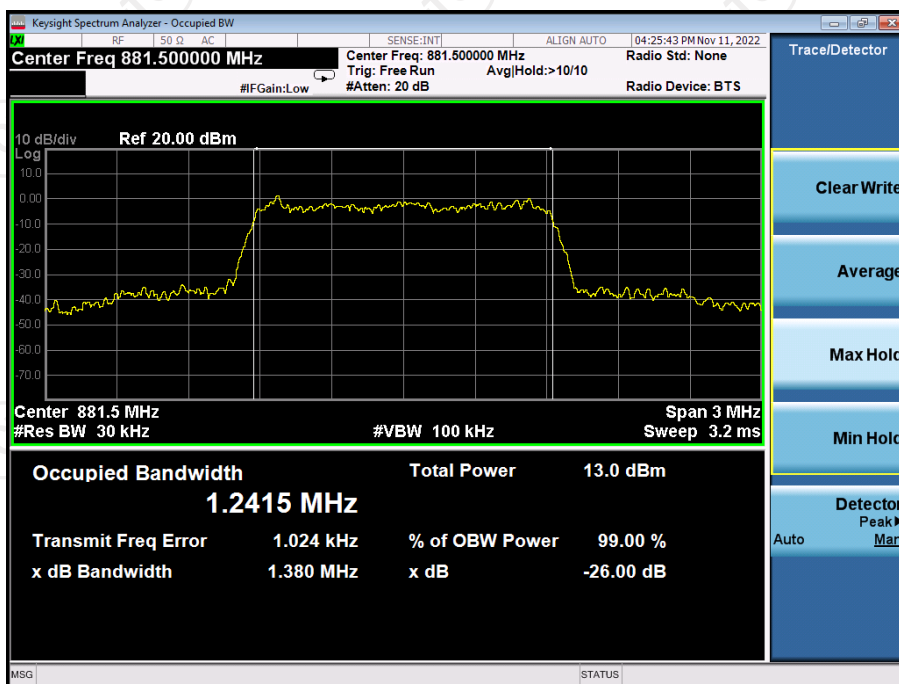
## Cellular CDMA UL output



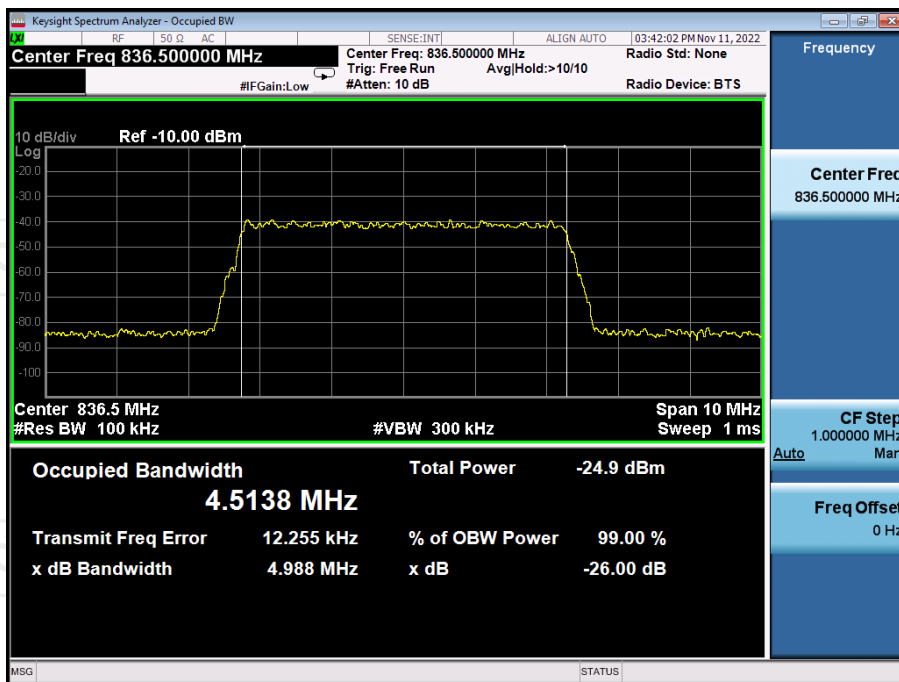
## Cellular CDMA DL Input



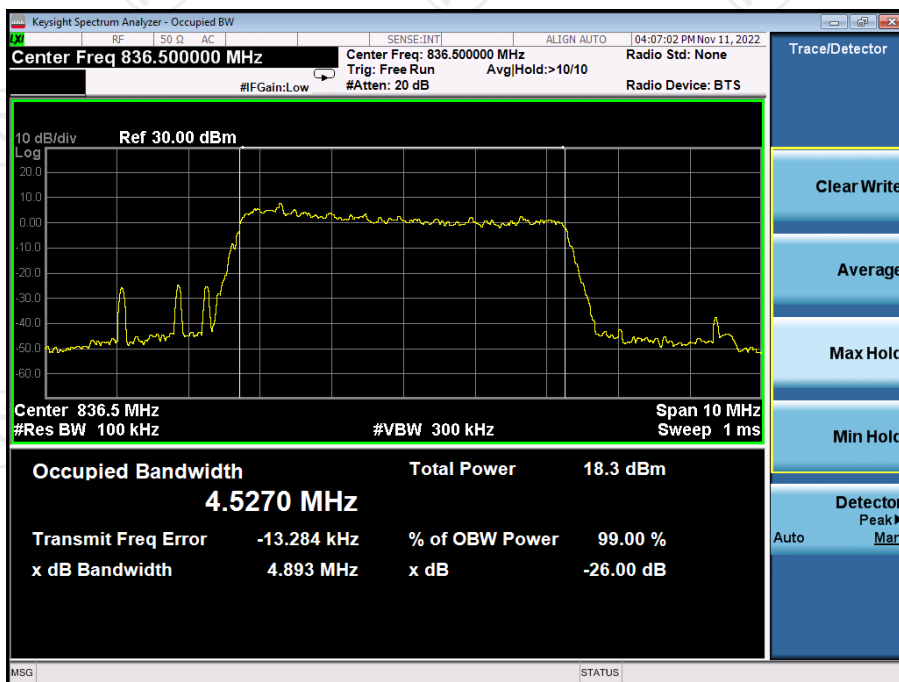
## Cellular CDMA DL Output



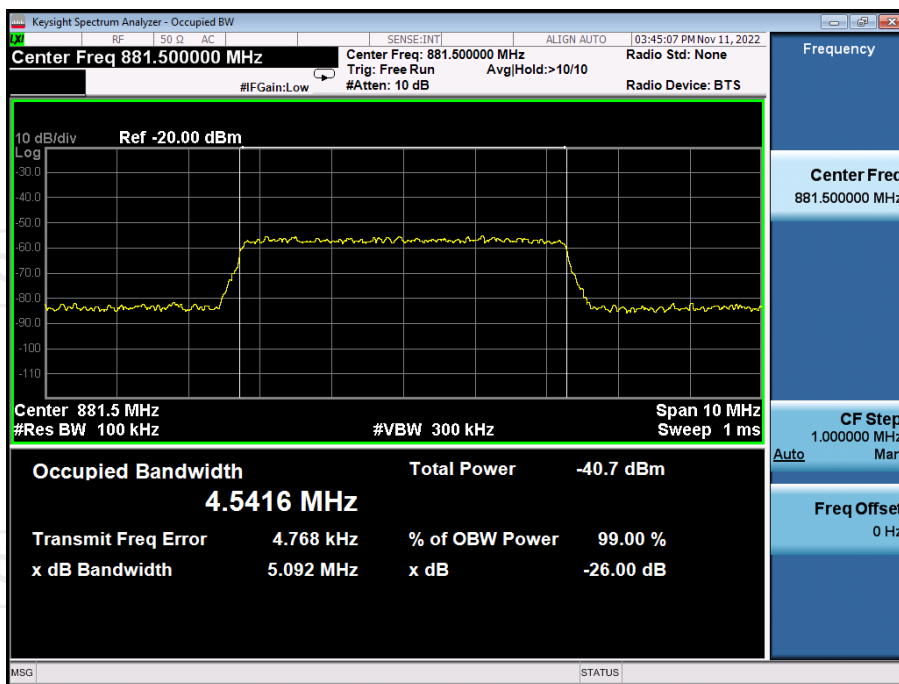
## Cellular LTE UL Input



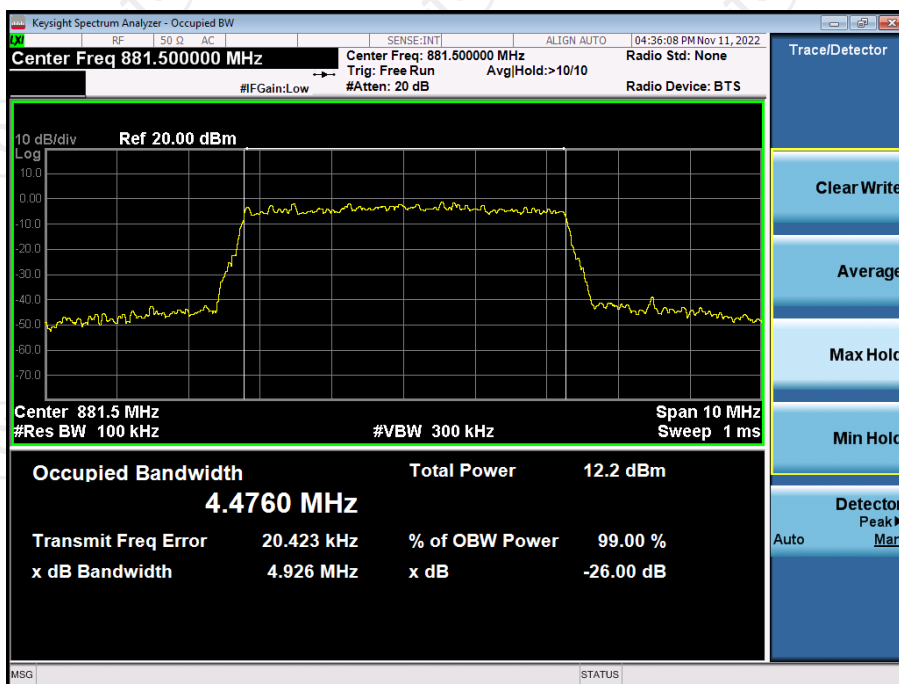
## Cellular LTE UL output



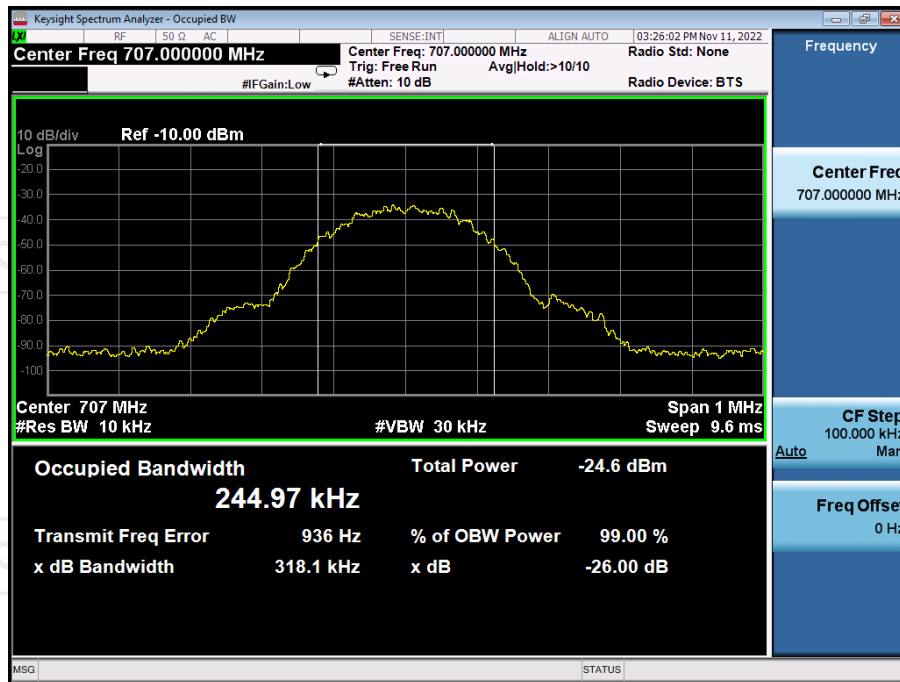
## Cellular LTE DL Input



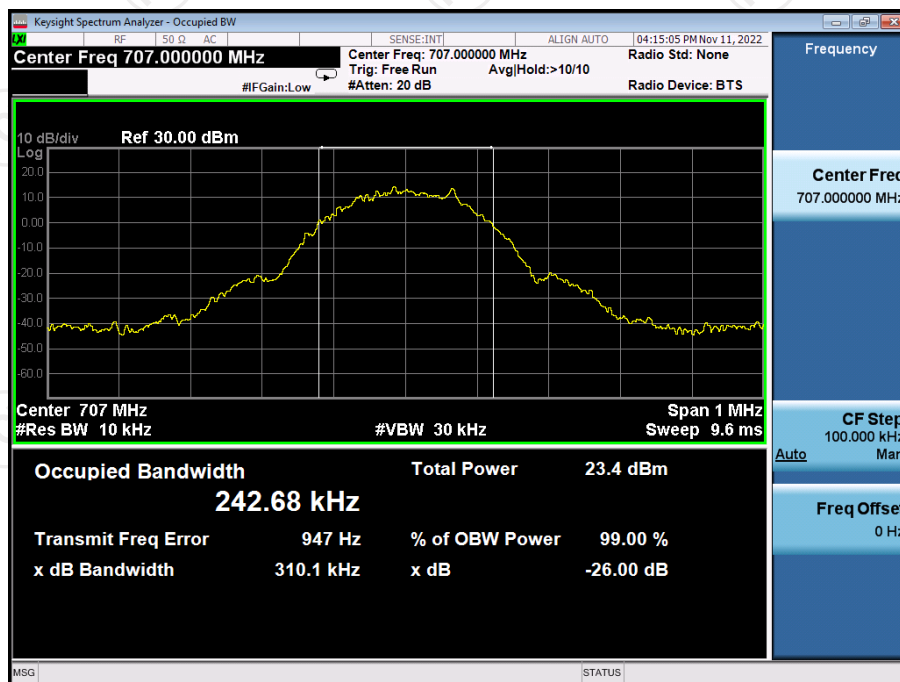
## Cellular LTE DL Output



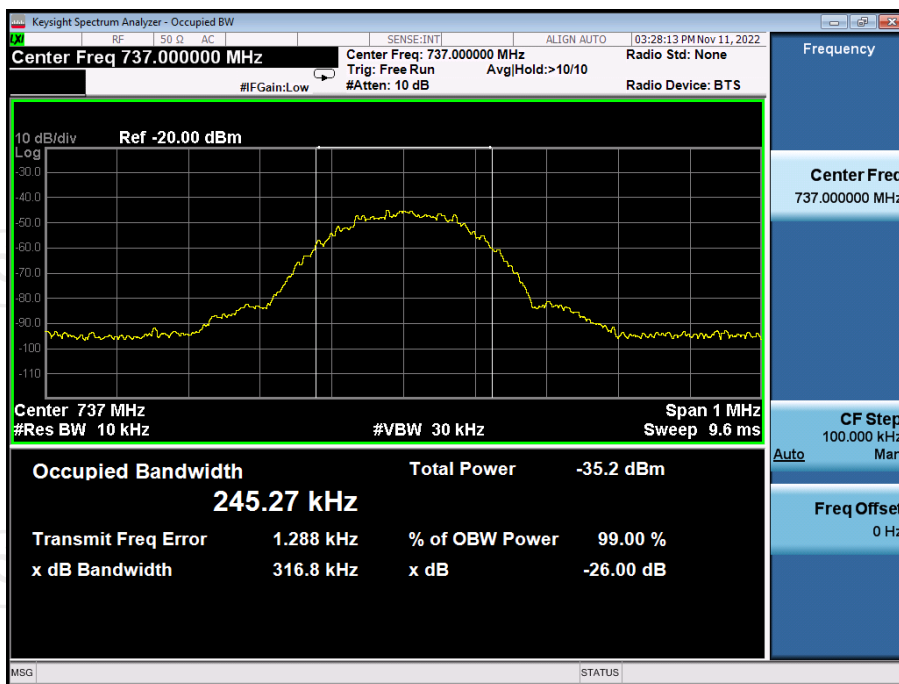
## Lower700MHz GSM UL Input



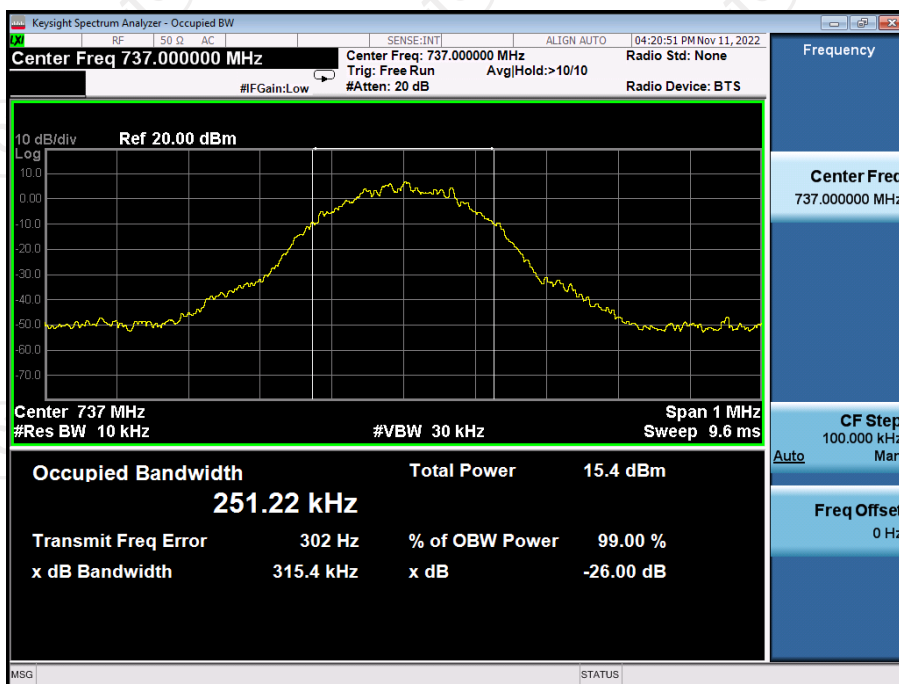
## Lower700MHz GSM UL output



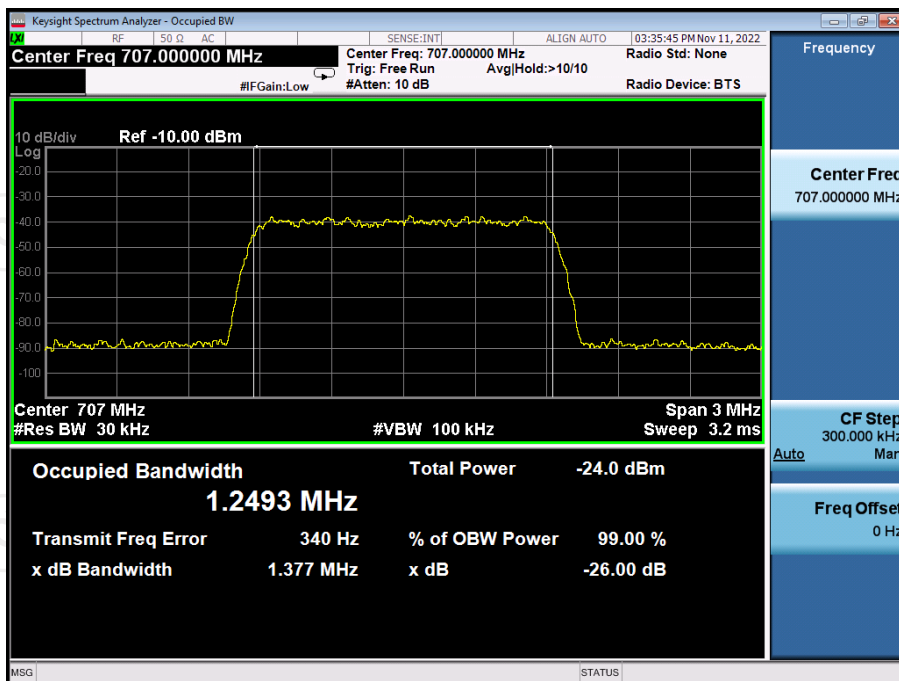
## Lower700MHz GSM DL Input



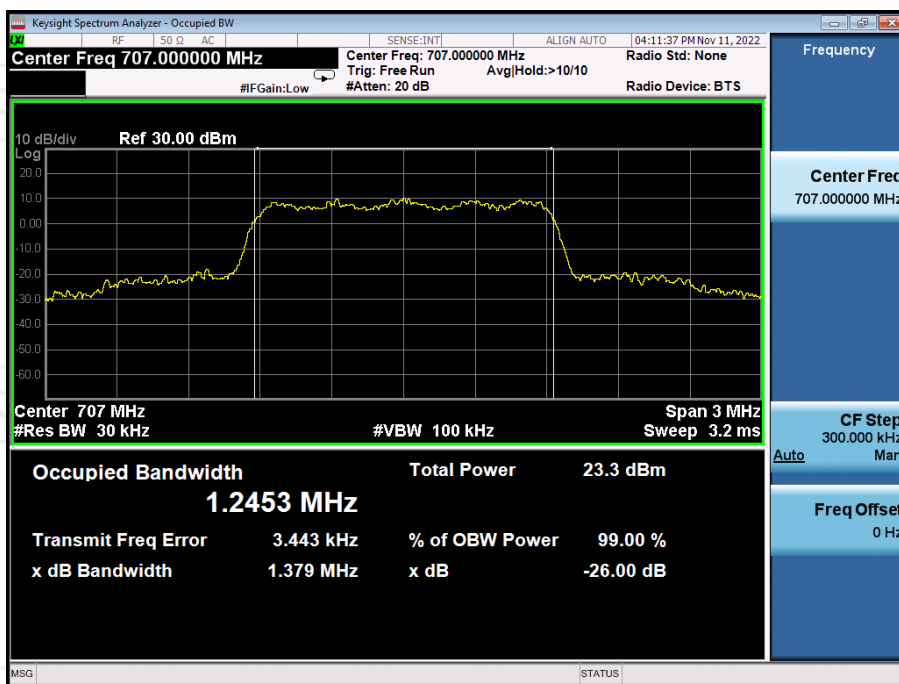
## Lower700MHz GSM DL Output



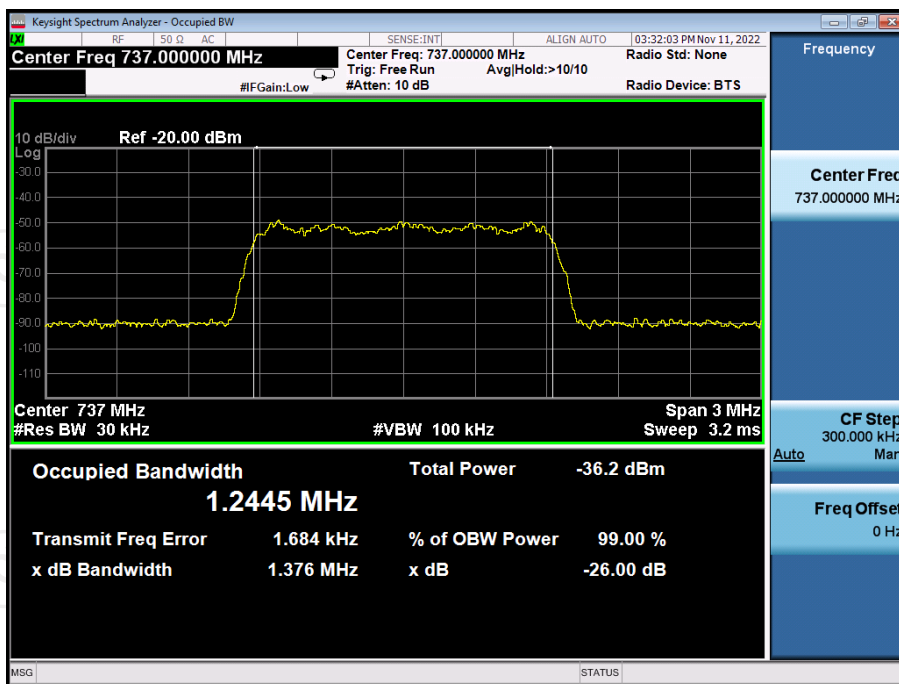
## Lower700MHz CDMA UL Input



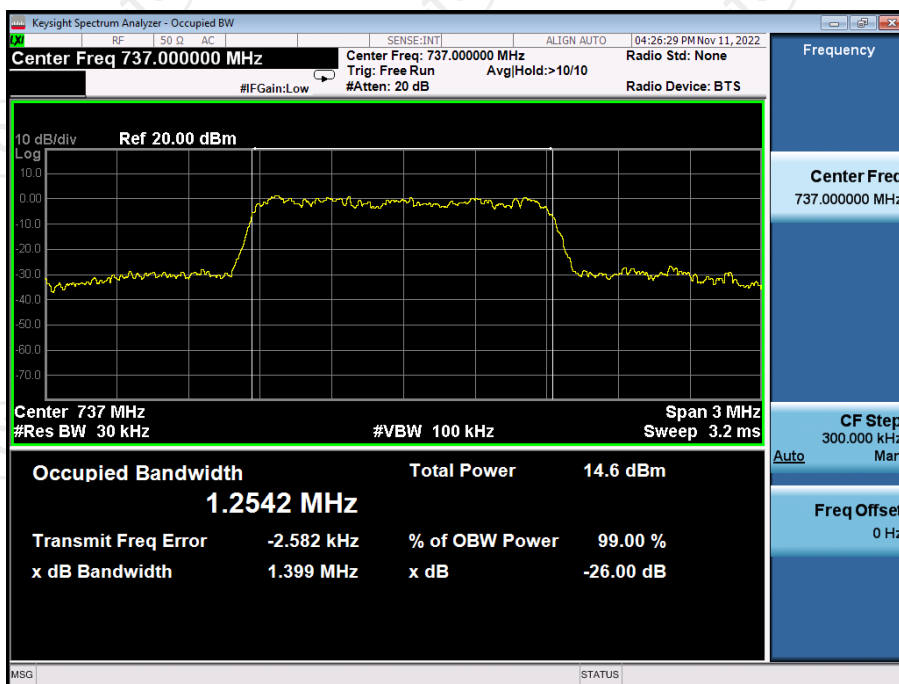
## Lower700MHz CDMA UL output



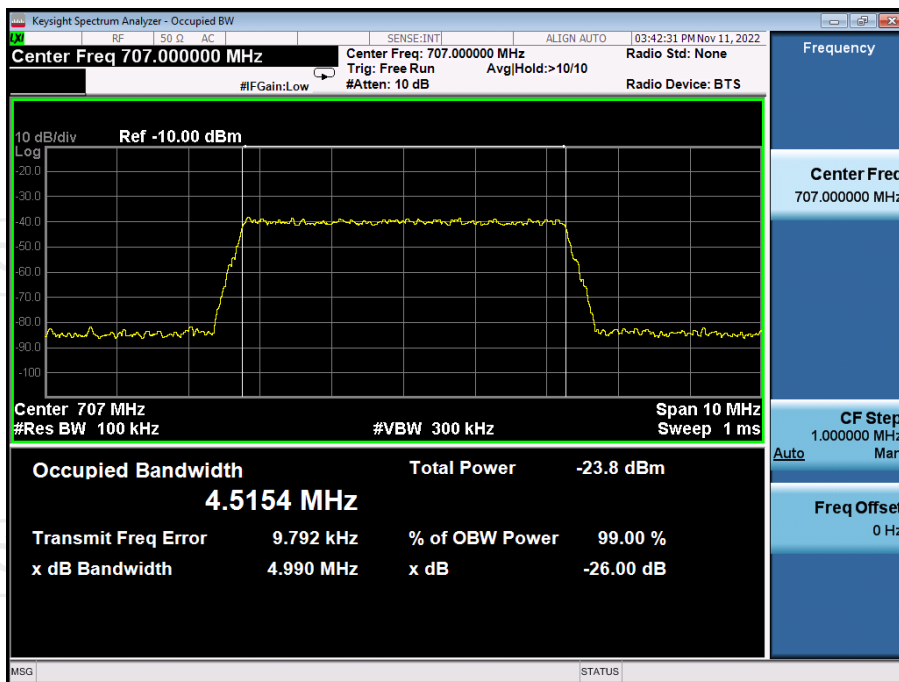
## Lower700MHz CDMA DL Input



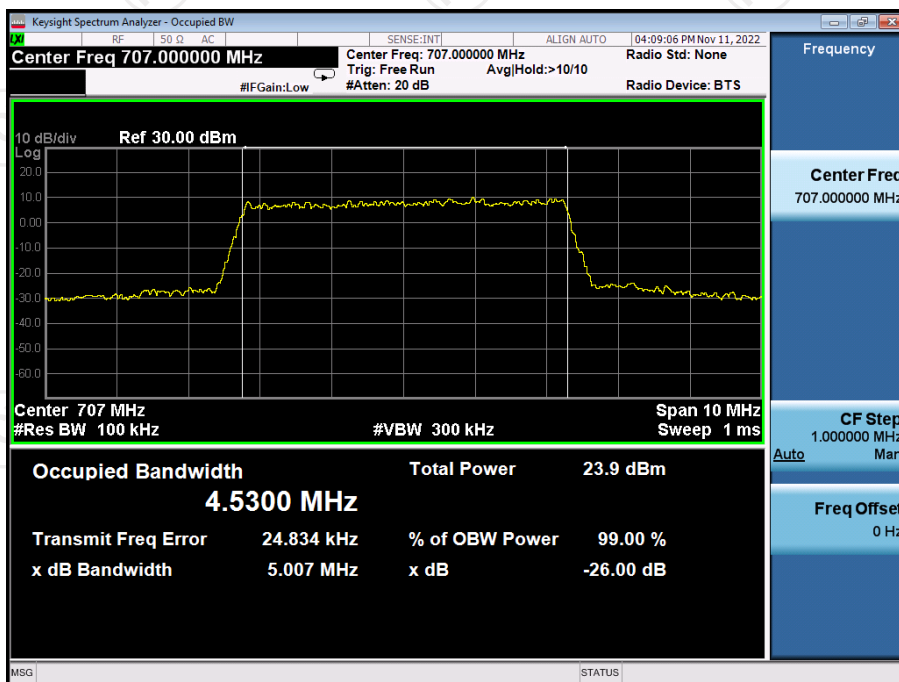
## Lower700MHz CDMA DL Output



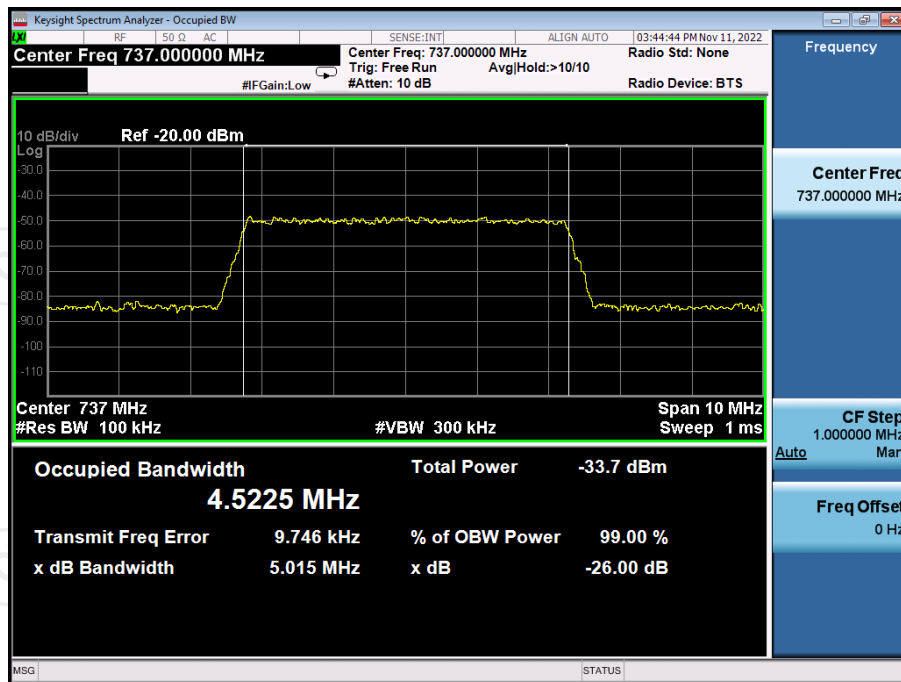
## Lower700MHz LTE UL Input



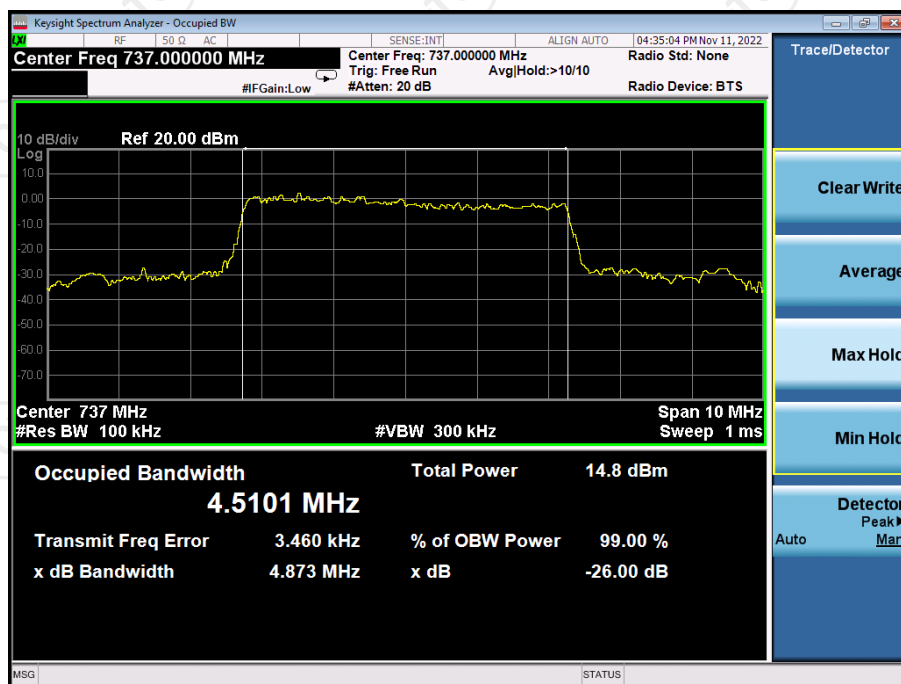
## Lower700MHz LTE UL output



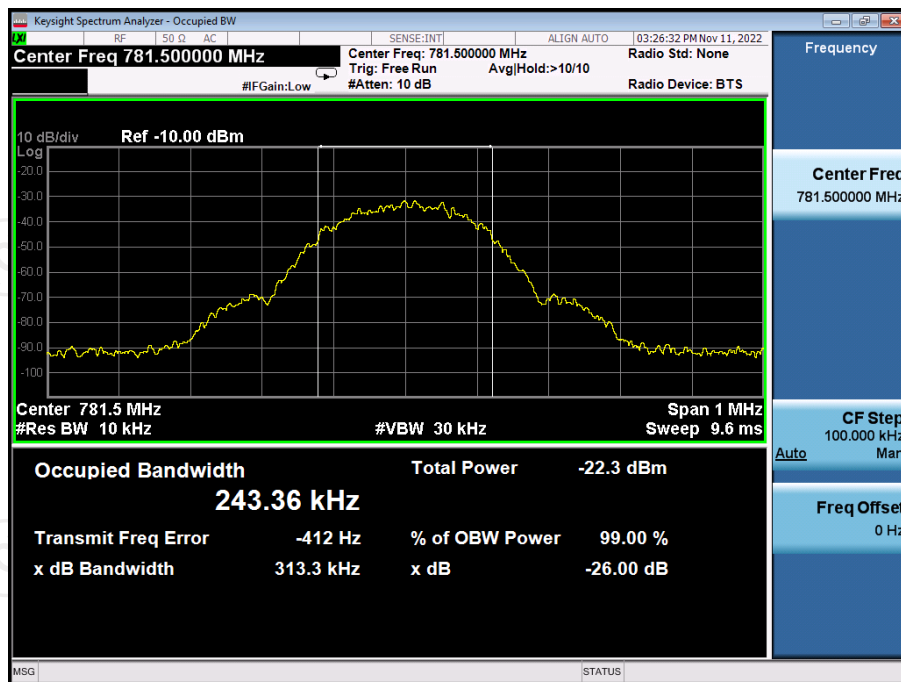
## Lower700MHz LTE DL Input



## Lower700MHz LTE DL Output



## Upper700MHz GSM UL Input



## Upper700MHz GSM UL output

