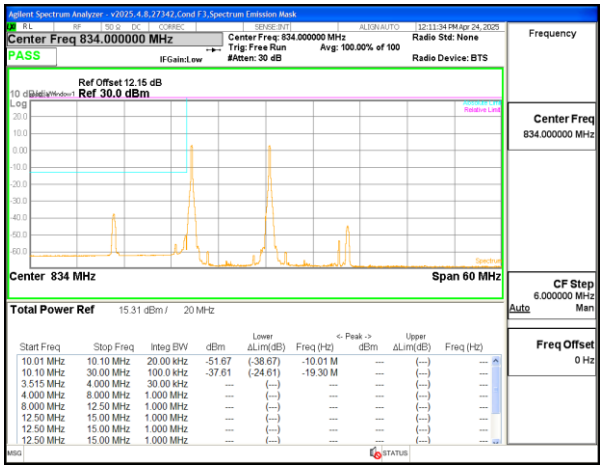
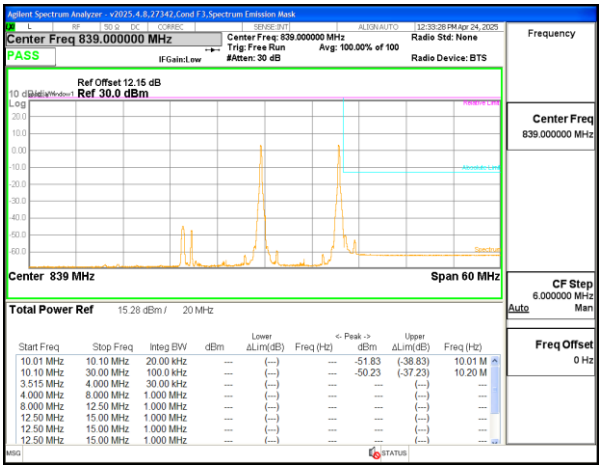
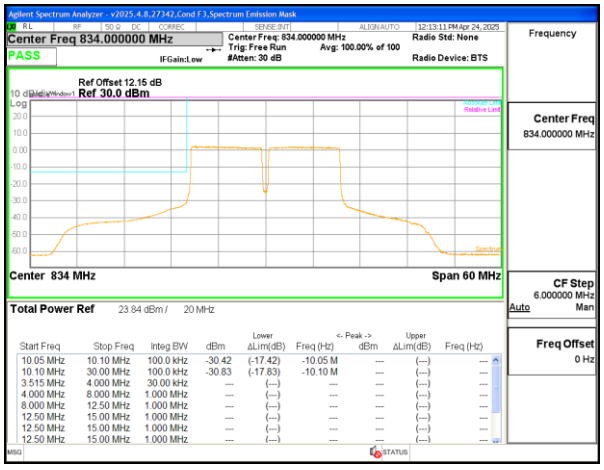
## 9.2.3. ULCA LTE BAND 5



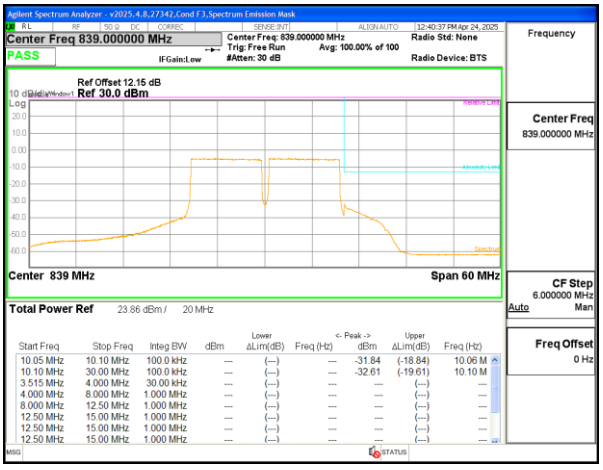

ULCA LTE B5 10MHz + 10MHz QPSK Low Ch RB1-0 + RB1-0



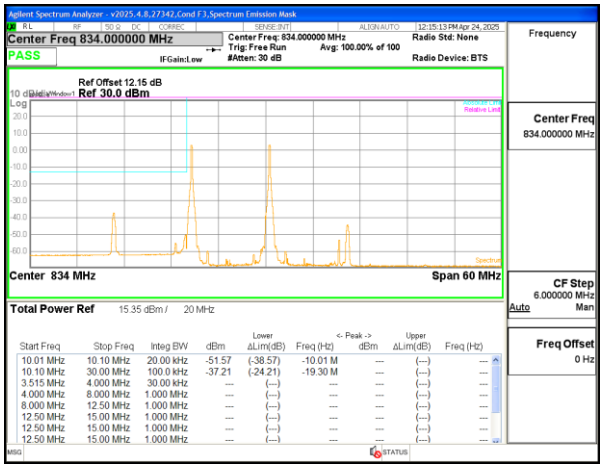

ULCA LTE B5 10MHz + 10MHz QPSK High Ch RB1-49 + RB1-49



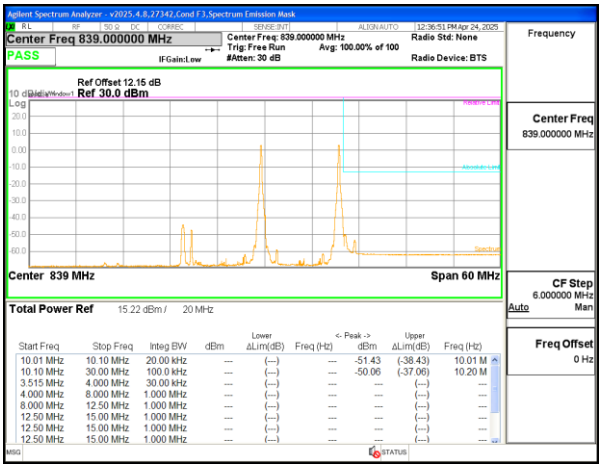

ULCA LTE B5 10MHz + 10MHz QPSK Low Ch RB50-0 + RB50-0




ULCA LTE B5 10MHz + 10MHz QPSK High Ch RB50-0 + RB50-0




ULCA LTE B5 10MHz + 10MHz 16QAM Low Ch RB1-0 + RB1-0

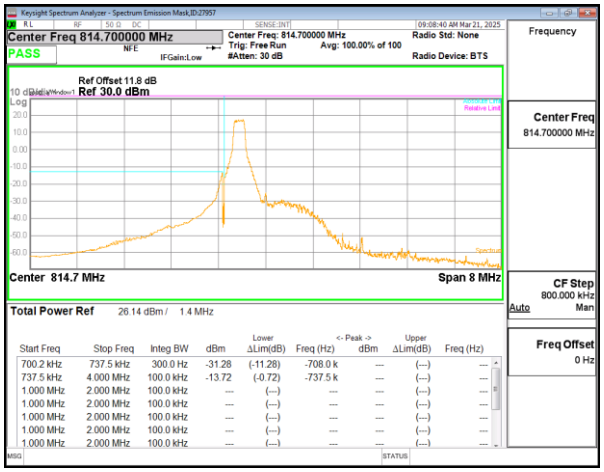



ULCA LTE B5 10MHz + 10MHz 16QAM High Ch RB1-49 + RB1-49

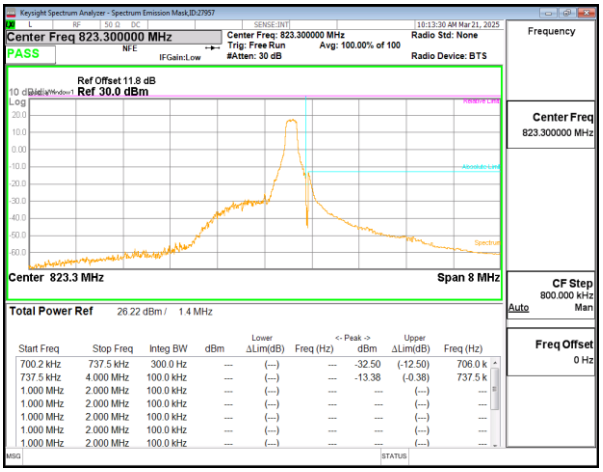

ULCA LTE B5 10MHz + 10MHz 16QAM Low Ch RB50-0 + RB50-0


ULCA LTE B5 10MHz + 10MHz 16QAM High Ch RB50-0 + RB50-0

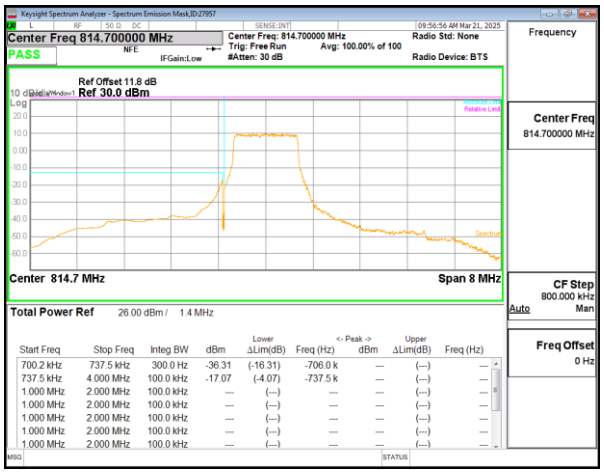
## 9.2.4. LTE BAND 26 (FCC PART 90S)



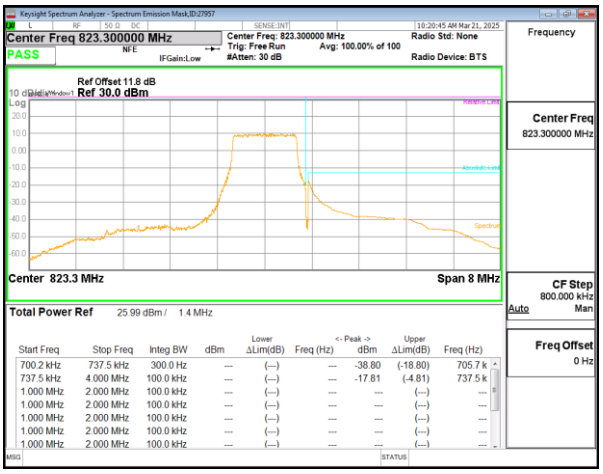

LTE B26 1.4MHz QPSK Low Channel RB1-0



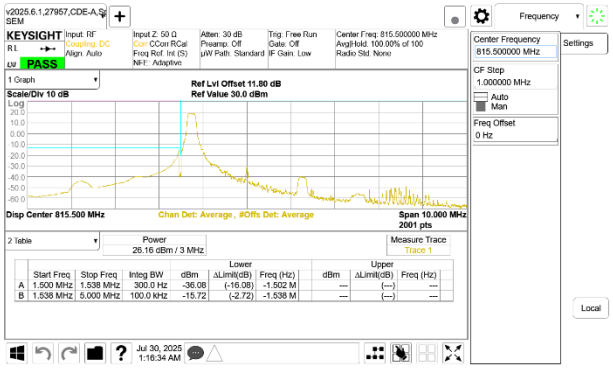

LTE B26 1.4MHz QPSK High Channel RB1-5



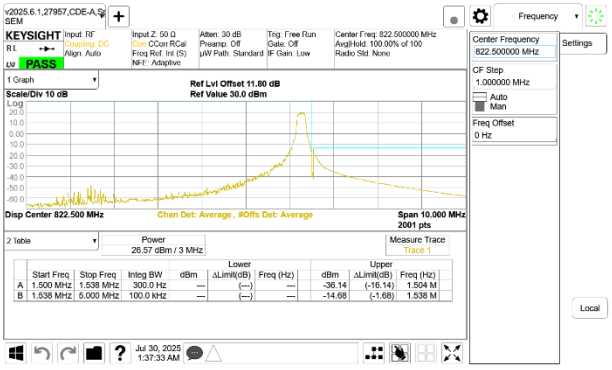

LTE B26 1.4MHz QPSK Low Channel RB6-0



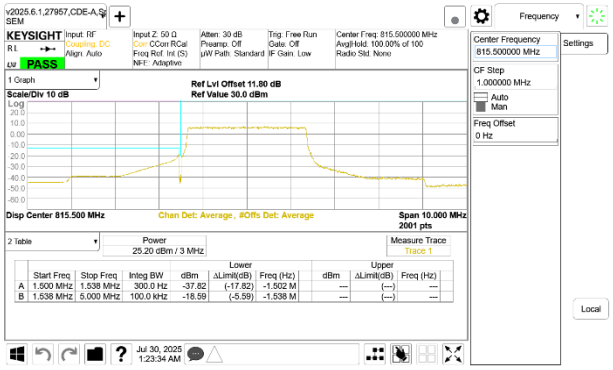

LTE B26 1.4MHz QPSK High Channel RB6-0



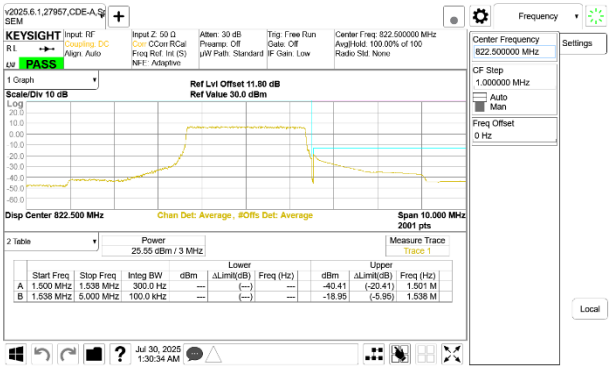

LTE B26 3MHz QPSK Low Channel RB1-0



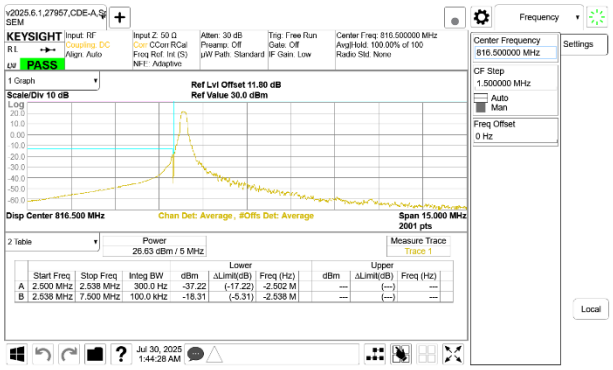

LTE B26 3MHz QPSK High Channel RB1-14



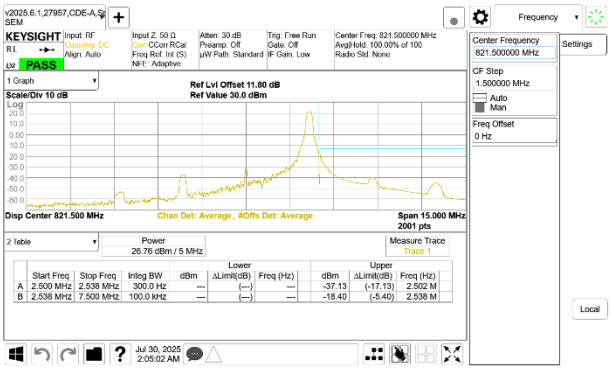

LTE B26 3MHz QPSK Low Channel RB15-0



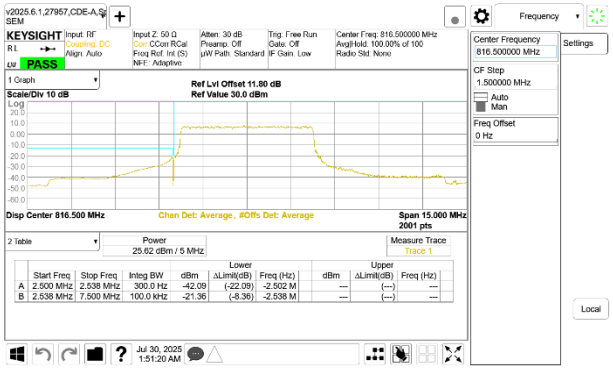

LTE B26 3MHz QPSK High Channel RB15-0



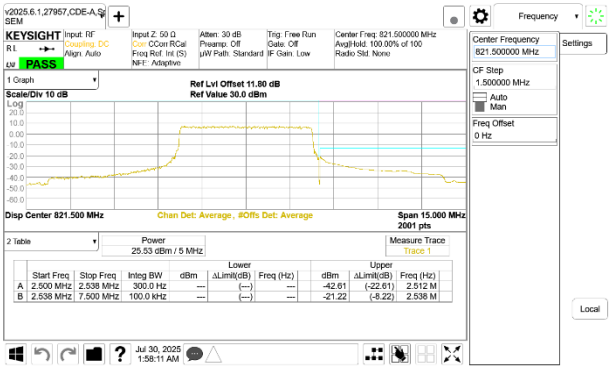

LTE B26 5MHz QPSK Low Channel RB1-0



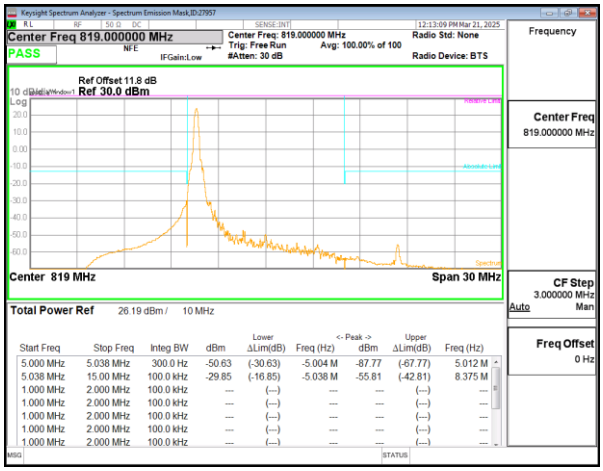

LTE B26 5MHz QPSK High Channel RB1-24



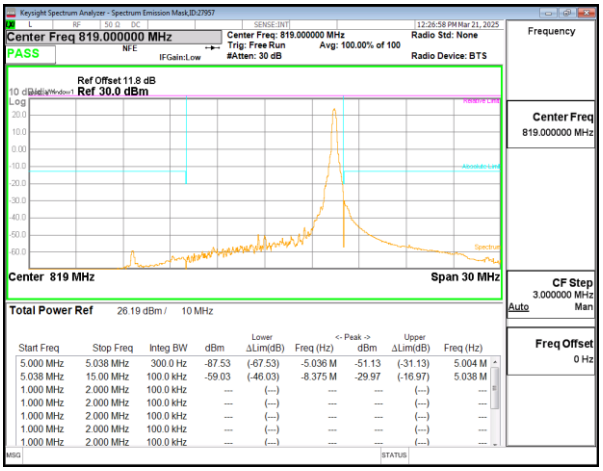

LTE B26 5MHz QPSK Low Channel RB25-0



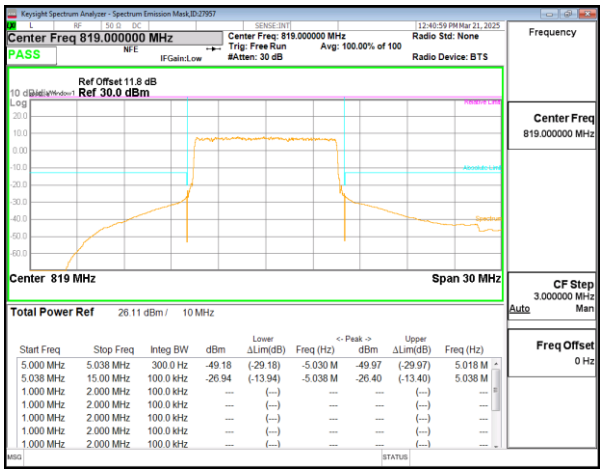

LTE B26 5MHz QPSK High Channel RB25-0




LTE B26 10MHz QPSK Middle Channel RB1-0



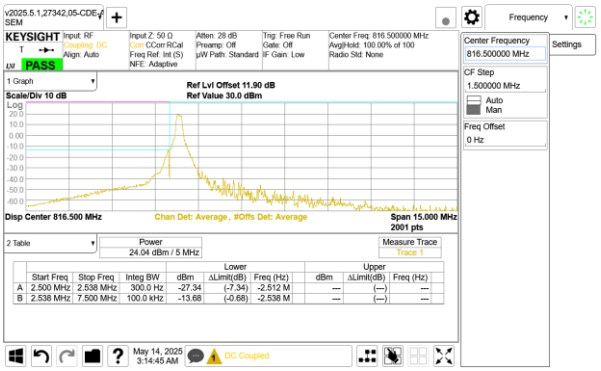

LTE B26 10MHz QPSK Middle Channel RB1-49



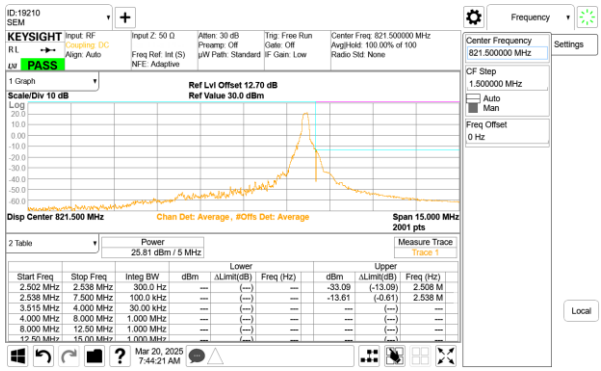

LTE B26 10MHz QPSK Middle Channel RB50-0

Intentionally Blank

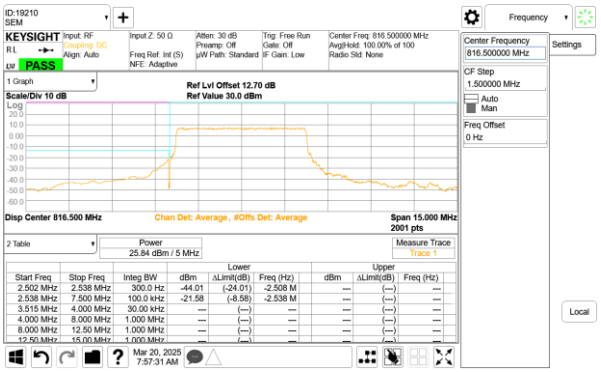
## 9.2.5. 5G NR n26 (FCC PART 90S)



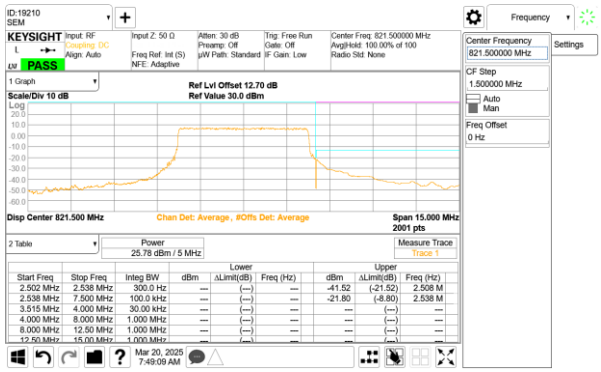

5G NR n26 5MHz BPSK Low Channel RB1-0



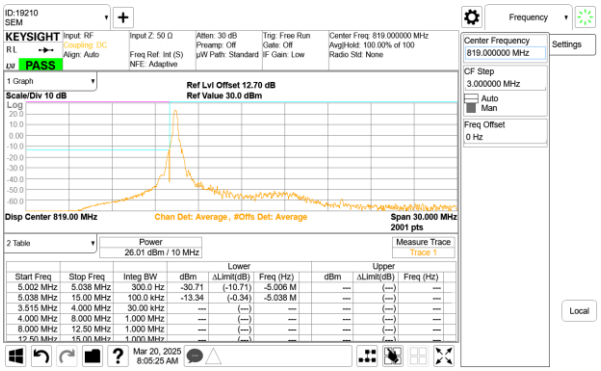

5G NR n26 5MHzz BPSK High Channel RB1-24



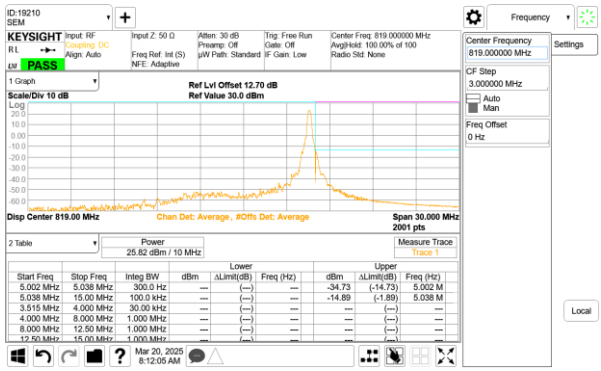

5G NR n26 5MHz BPSK Low Channel RB25-0



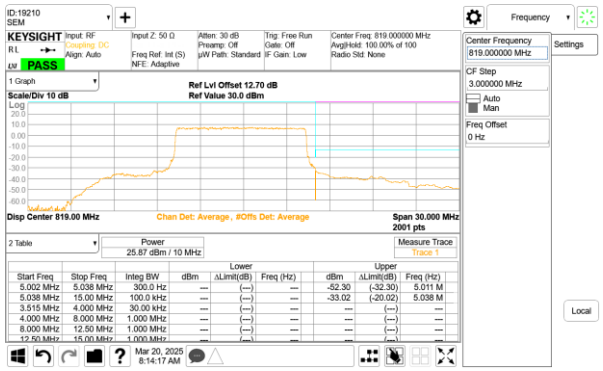

5G NR n26 5MHz BPSK High Channel RB25-0




5G NR n26 10MHz BPSK Middle Channel RB1-0



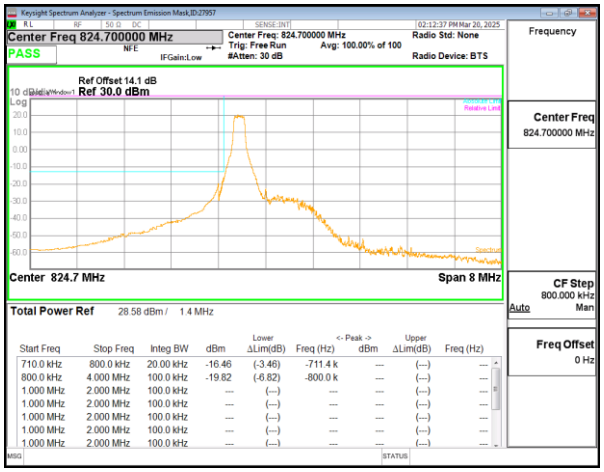

5G NR n26 10MHz BPSK Middle Channel RB1-51



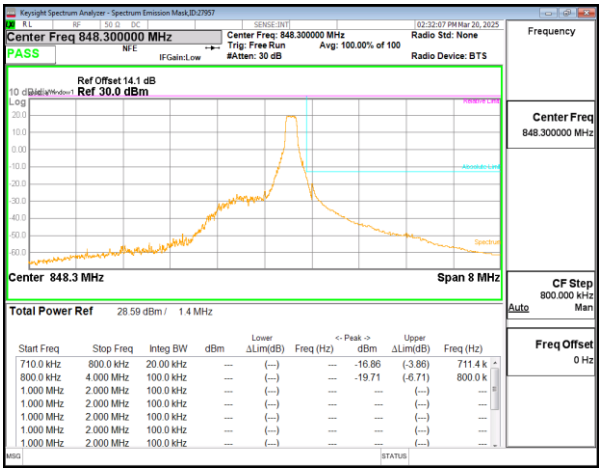

5G NR n26 10MHz BPSK Middle Channel RB50-0

Intentionally Blank

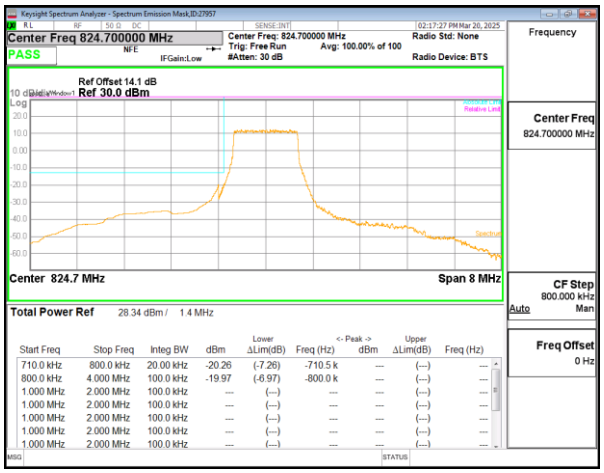
## 9.2.6. LTE BAND 26 (FCC PART 22)



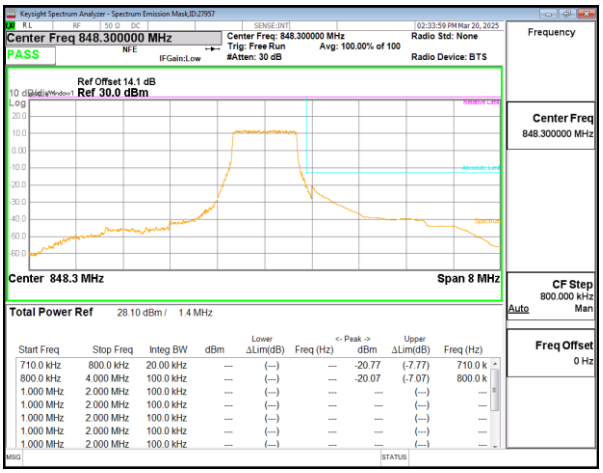

LTE B26 1.4MHz QPSK Low Channel RB1-0



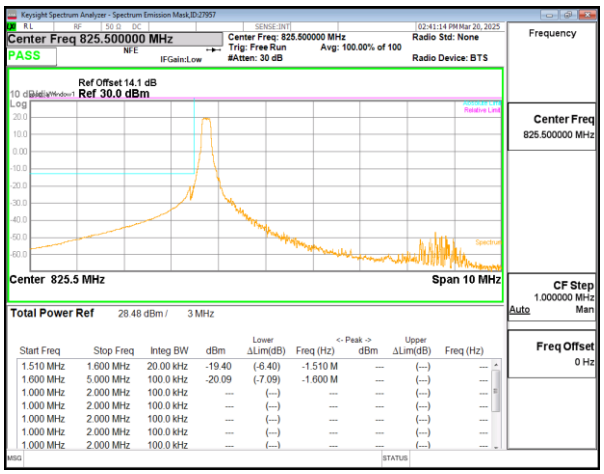

LTE B26 1.4MHz QPSK High Channel RB1-5



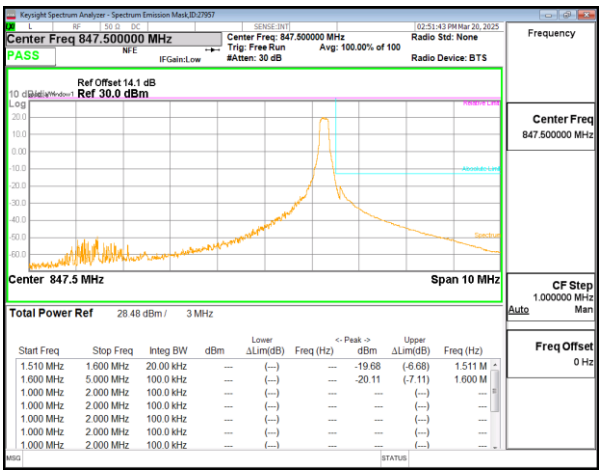

LTE B26 1.4MHz QPSK Low Channel RB6-0



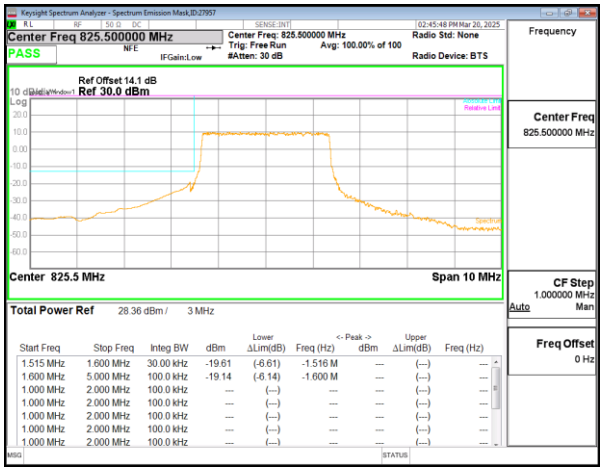

LTE B26 1.4MHz QPSK High Channel RB6-0



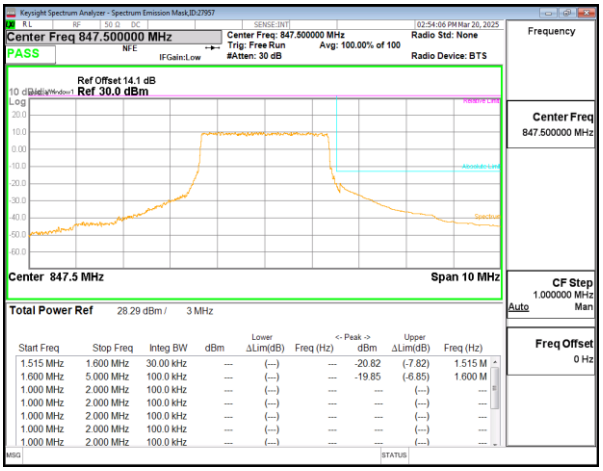

LTE B26 3MHz QPSK Low Channel RB1-0



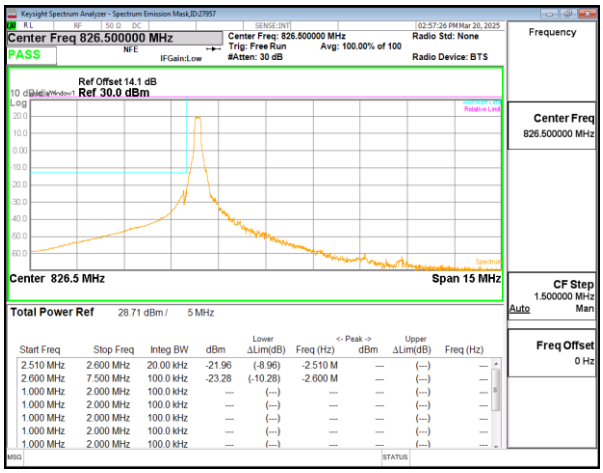

LTE B26 3MHz QPSK High Channel RB1-14



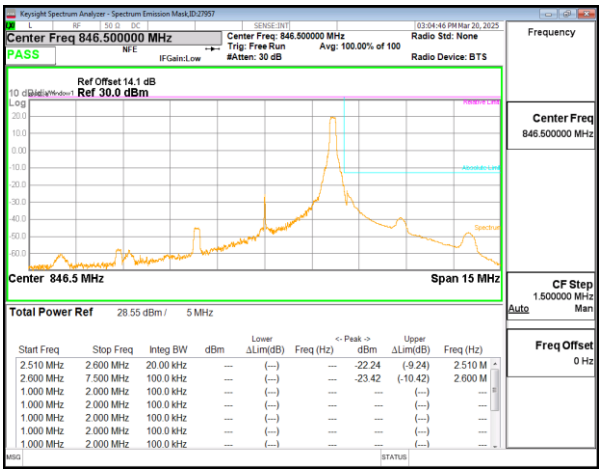

LTE B26 3MHz QPSK Low Channel RB15-0



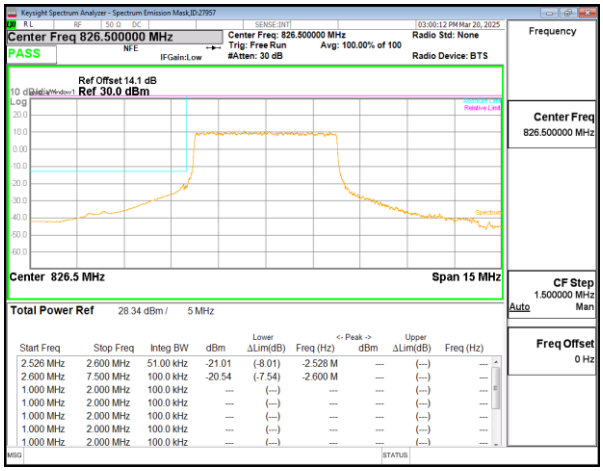

LTE B26 3MHz QPSK High Channel RB15-0



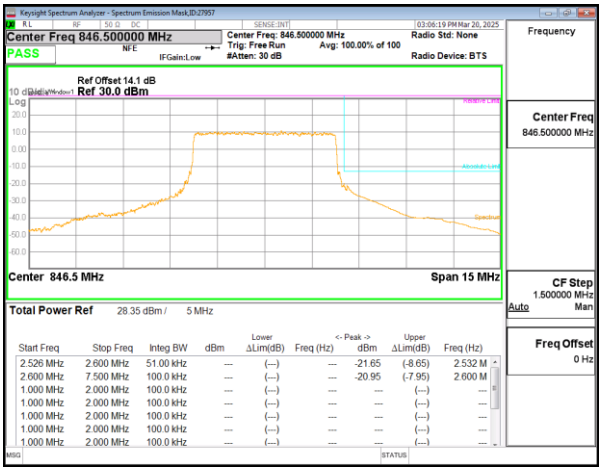

LTE B26 5MHz QPSK Low Channel RB1-0



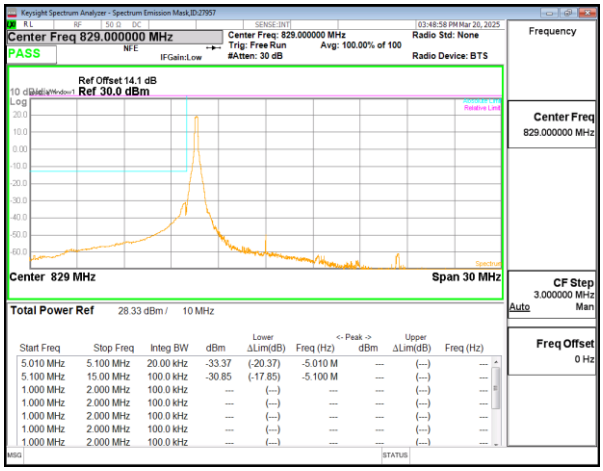

LTE B26 5MHz QPSK High Channel RB1-24



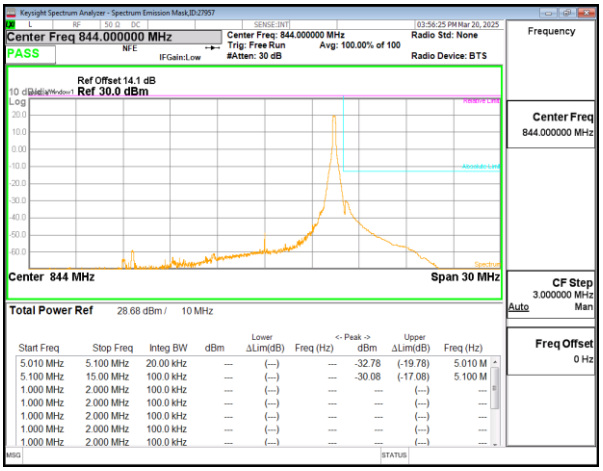

LTE B26 5MHz QPSK Low Channel RB25-0



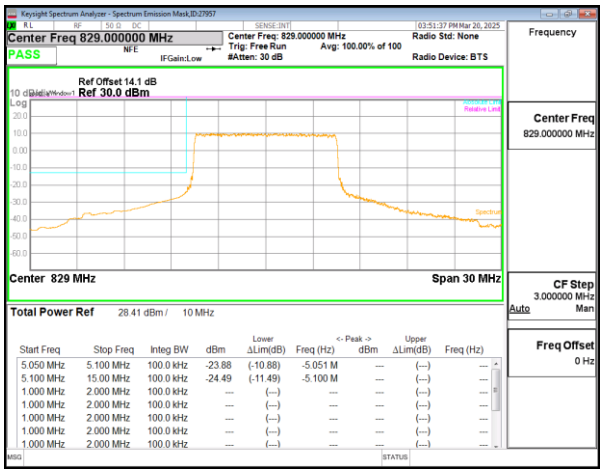

LTE B26 5MHz QPSK High Channel RB25-0



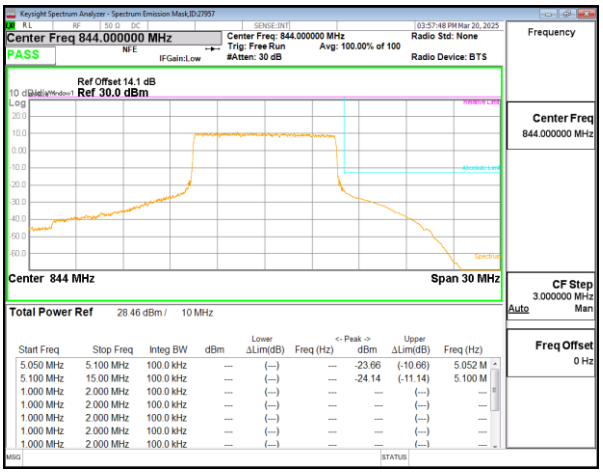

LTE B26 10MHz QPSK Low Channel RB1-0




LTE B26 10MHz QPSK High Channel RB1-49

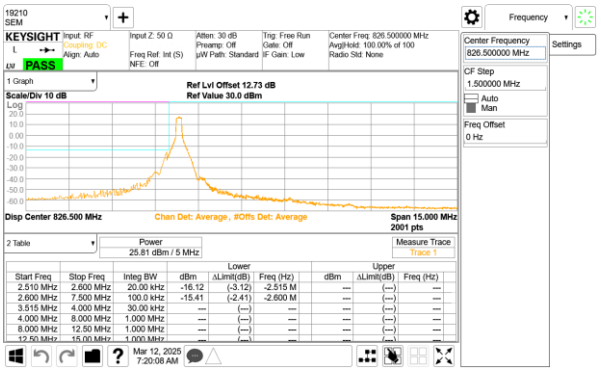



LTE B26 10MHz QPSK Low Channel RB50-0

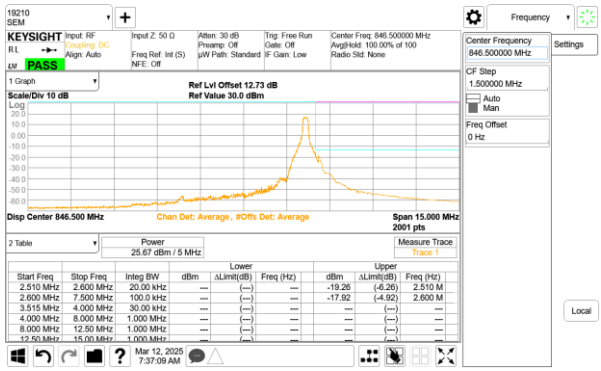



LTE B26 10MHz QPSK High Channel RB50-0

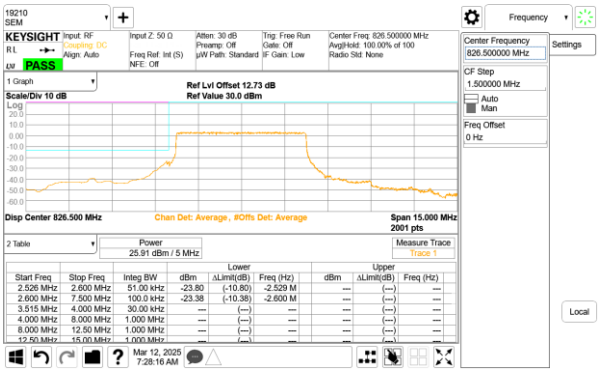
## 9.2.7. 5G NR n26 (FCC PART 22)



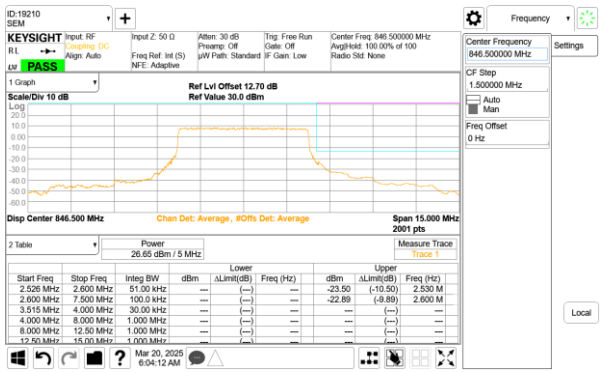

5G NR n26 5MHz BPSK Low Channel RB1-0



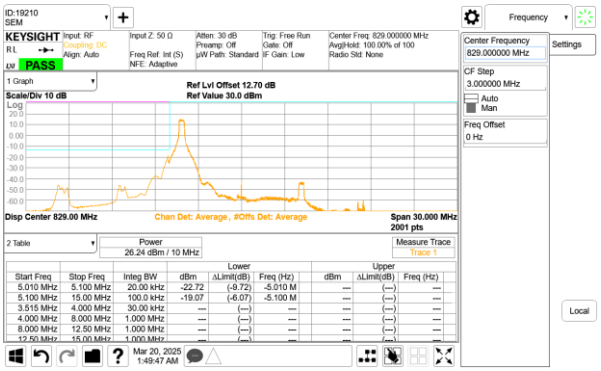

5G NR n26 5MHzz BPSK High Channel RB1-24



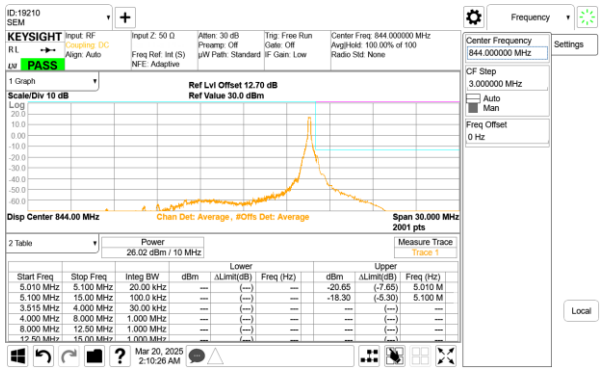

5G NR n26 5MHz BPSK Low Channel RB25-0



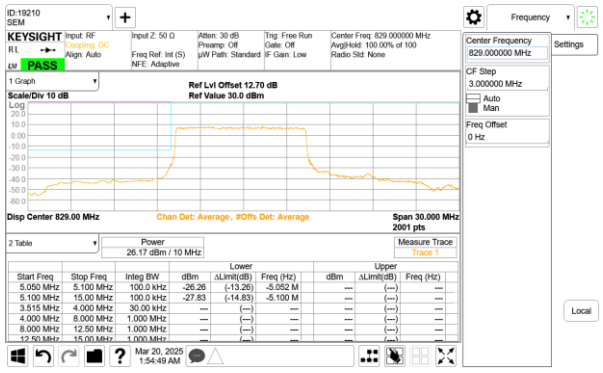

5G NR n26 5MHz BPSK High Channel RB25-0



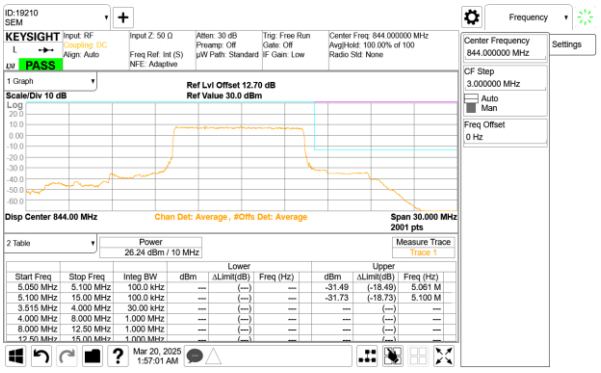

5G NR n26 10MHz BPSK Low Channel RB1-0



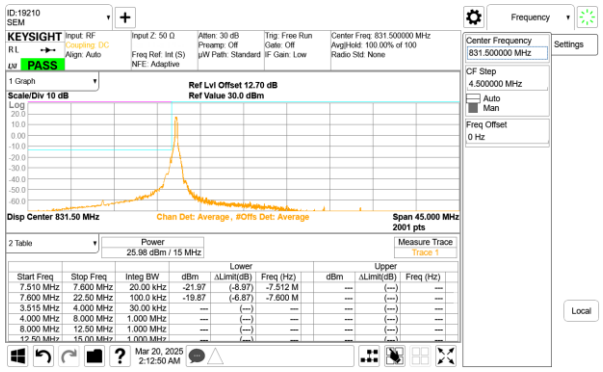

5G NR n26 10MHz BPSK High Channel RB1-51



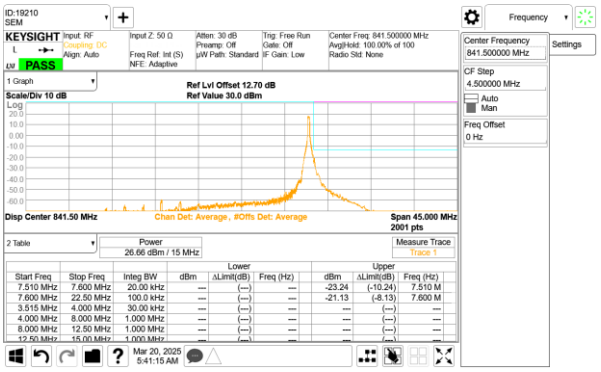

5G NR n26 10MHz BPSK Low Channel RB50-0



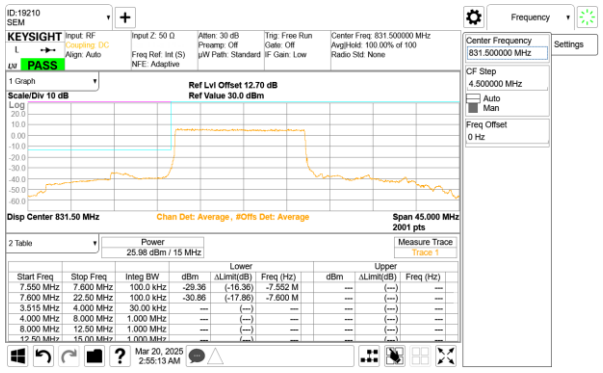

5G NR n26 10MHz BPSK High Channel RB50-0



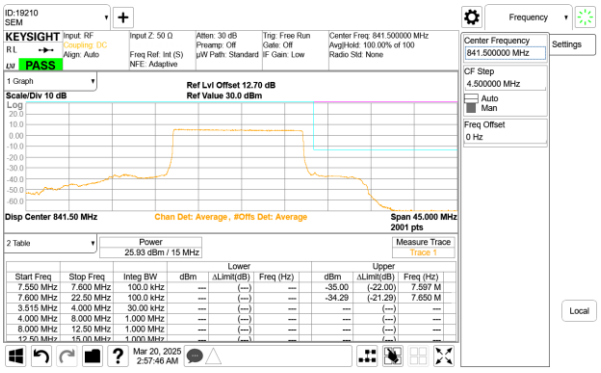

5G NR n26 15MHz BPSK Low Channel RB1-0



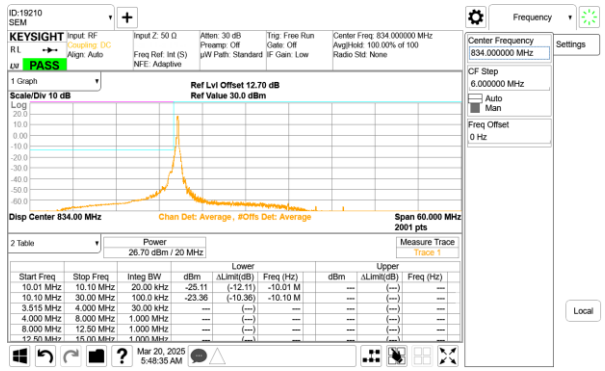

5G NR n26 15MHzz BPSK High Channel RB1-78



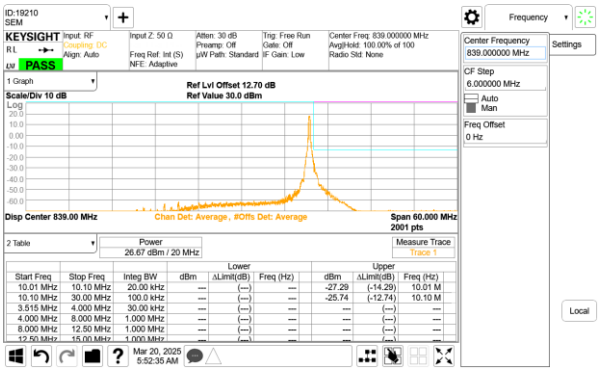

5G NR n26 15MHz BPSK Low Channel RB75-0



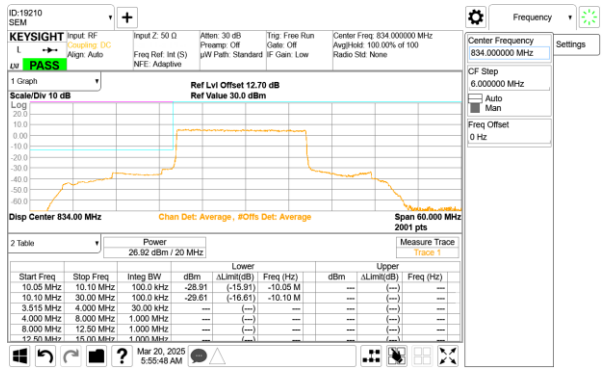

5G NR n26 15MHz BPSK High Channel RB75-0



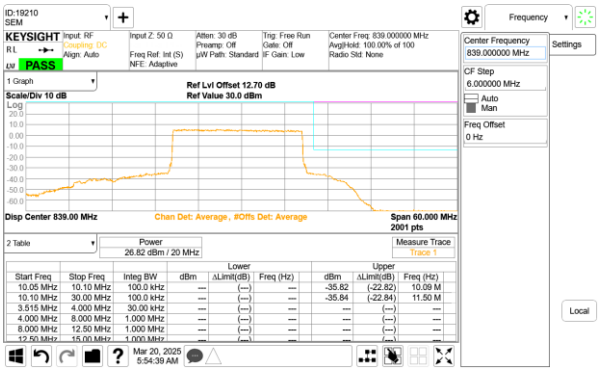

5G NR n26 20MHz BPSK Low Channel RB1-0




5G NR n26 20MHzz BPSK High Channel RB1-105




5G NR n26 20MHz BPSK Low Channel RB100-0




5G NR n26 20MHzz BPSK High Channel RB100-0

## 9.3. OUT OF BAND EMISSIONS

**LIMITS**

FCC: §22.917
The minimum permissible attenuation level of any spurious emissions is 43 + 10 log (P) dB where transmitting power (P) in Watts.

FCC: §90.691
The minimum permissible attenuation level of any spurious emissions is 43 + 10 log (P) dB where transmitting power (P) in Watts.

RSS132§5.5
The minimum permissible attenuation level of any spurious emissions is 43 + 10 log (P) dB where transmitting power (P) in Watts.

**TEST PROCEDURE**

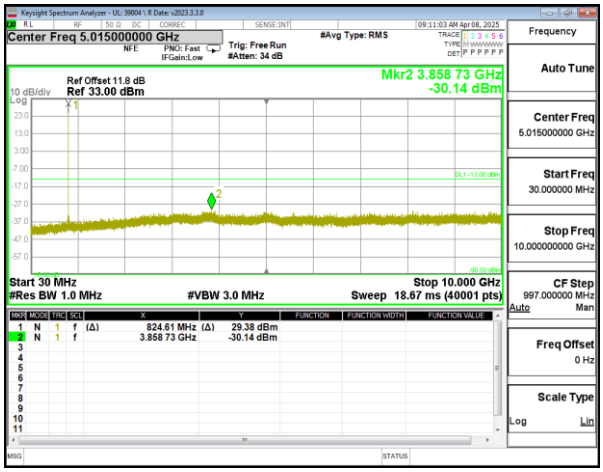
The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

For each out of band emissions measurement:

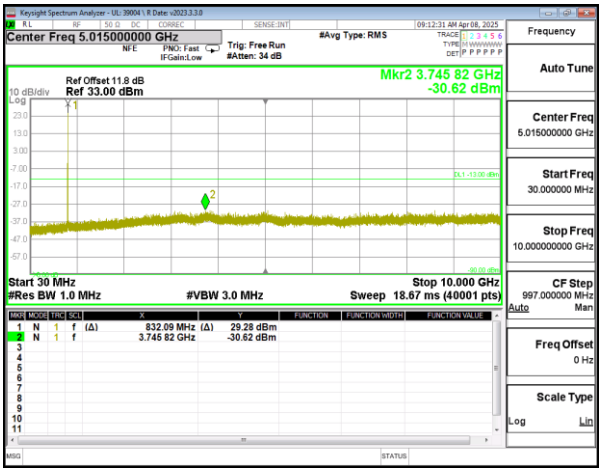
- Set display line at -13 dBm
- Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz. (NOTE: Worst case set RBW/VBW to 1MHz/3MHz)

**RESULTS**

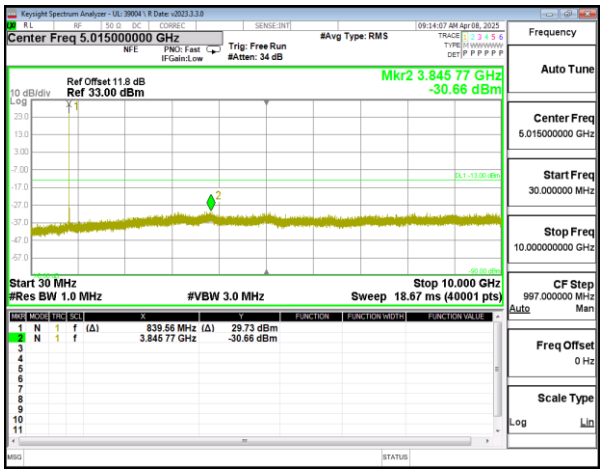
## 9.3.1. LTE BAND 5




LTE B5 10MHz QPSK Low Channel RB1-0



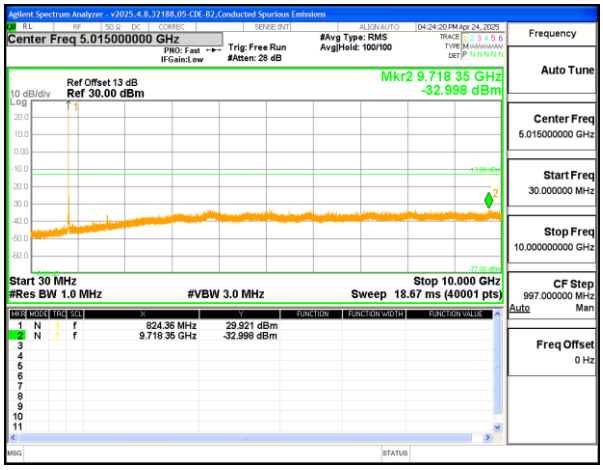

LTE B5 10MHz QPSK Middle Channel RB1-0



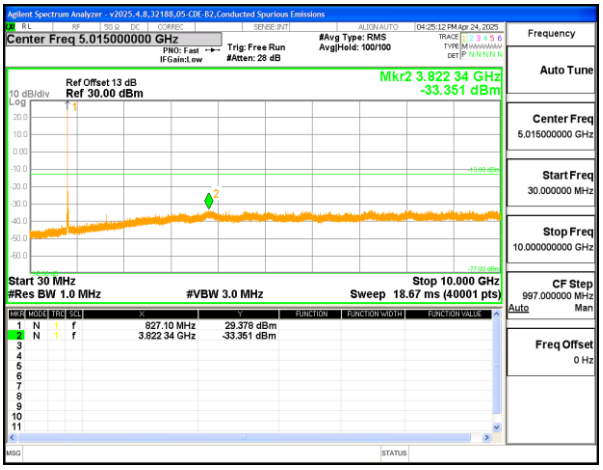

LTE B5 10MHz QPSK High Channel RB1-0

Intentionally Blank

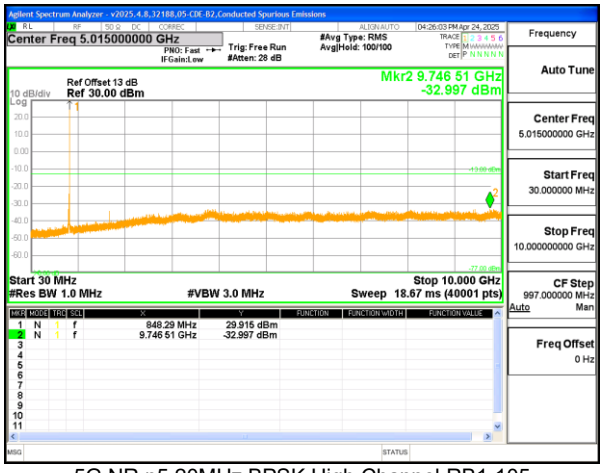
## 9.3.2. 5G NR n5




5G NR n5 20MHz BPSK Low Channel RB1-0



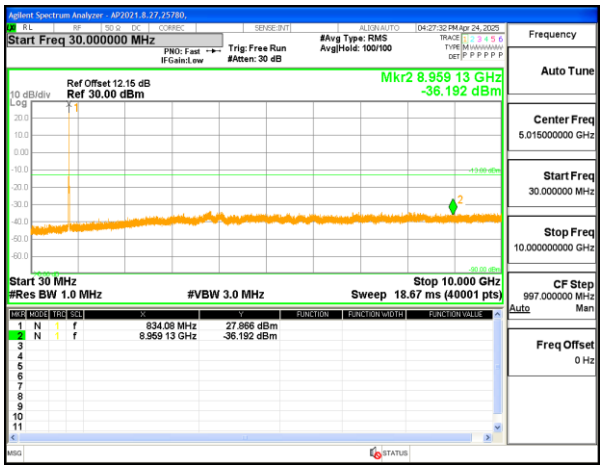

5G NR n5 20MHz BPSK Middel Channel RB1-1



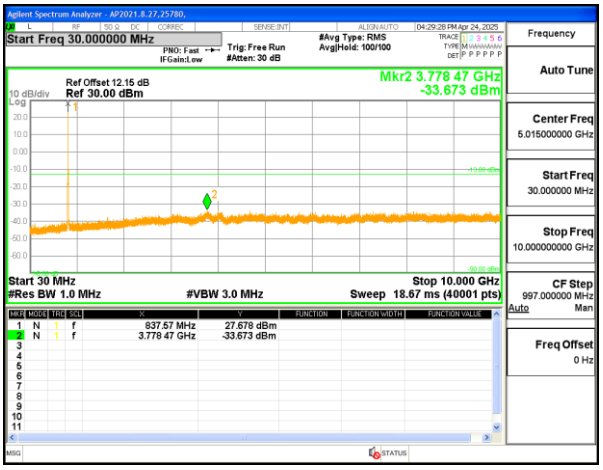

5G NR n5 20MHz BPSK High Channel RB1-105

Intentionally Blank

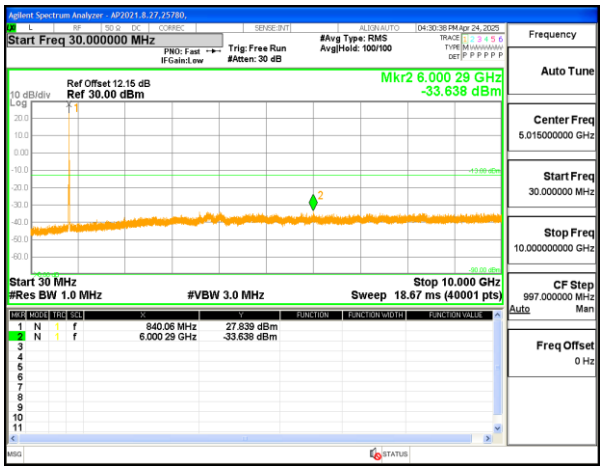
## 9.3.3. ULCA LTE BAND 5




ULCA LTE B5 10MHz + 10MHz QPSK Low Ch RB1-49 + RB1-0



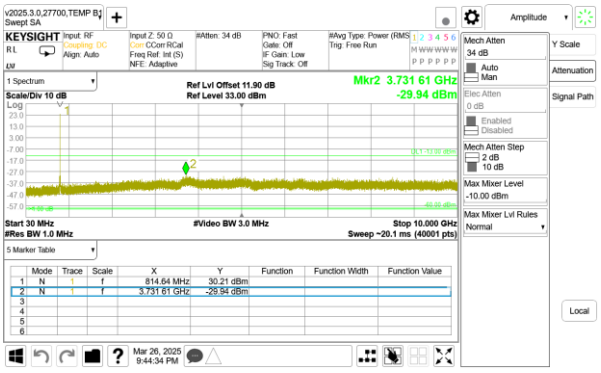

ULCA LTE B5 10MHz + 10MHz QPSK Middle Ch RB1-49 + RB1-0




ULCA LTE B5 10MHz + 10MHz QPSK High Ch RB1-49 + RB1-0

Intentionally Blank

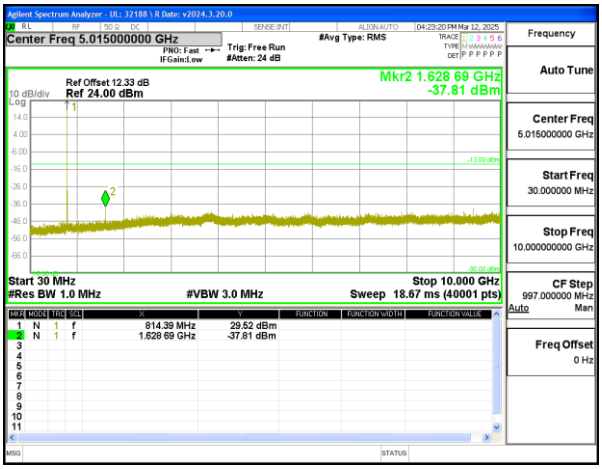
## 9.3.4. LTE BAND 26 (FCC PART 90S)




LTE B26 10MHz QPSK Middle Channel RB1-0

Intentionally Blank

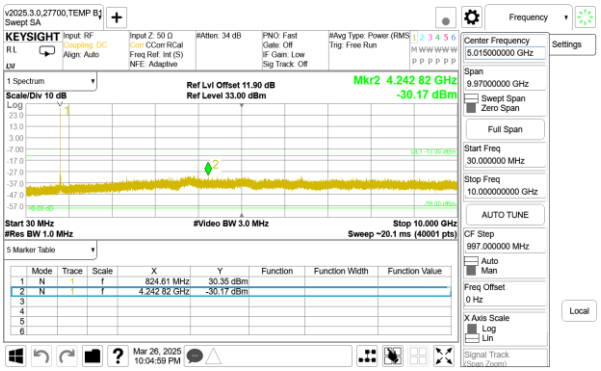
## 9.3.5. 5G NR n26 (FCC PART 90S)



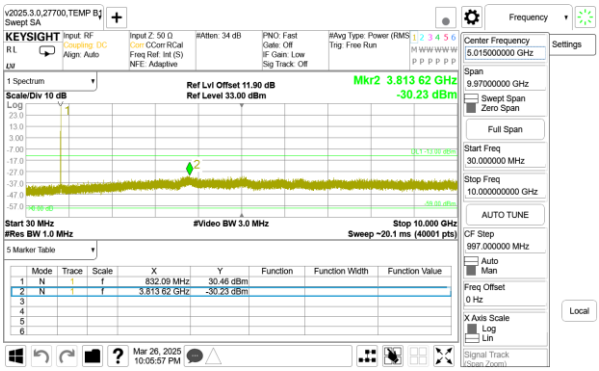

5G NR n26 10MHz BPSK Middle Channel RB1-0

Intentionally Blank

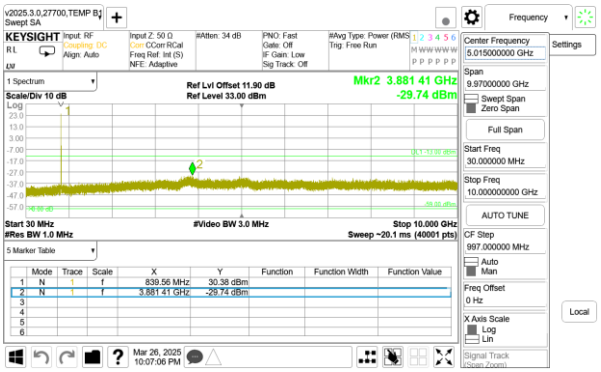
## 9.3.6. LTE BAND 26 (FCC PART 22)




LTE B26 10MHz QPSK Low Channel RB1-0



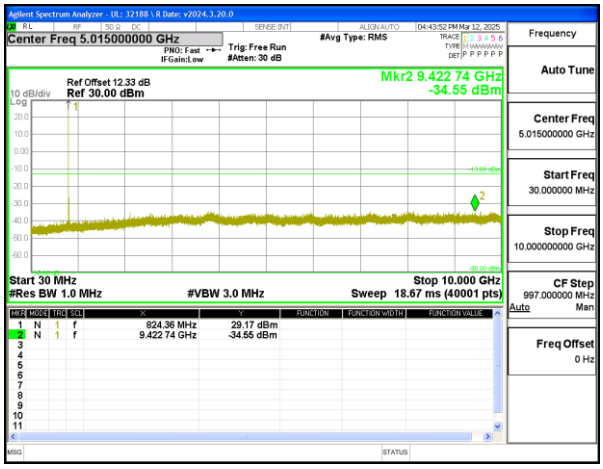

LTE B26 10MHz QPSK Middle Channel RB1-0



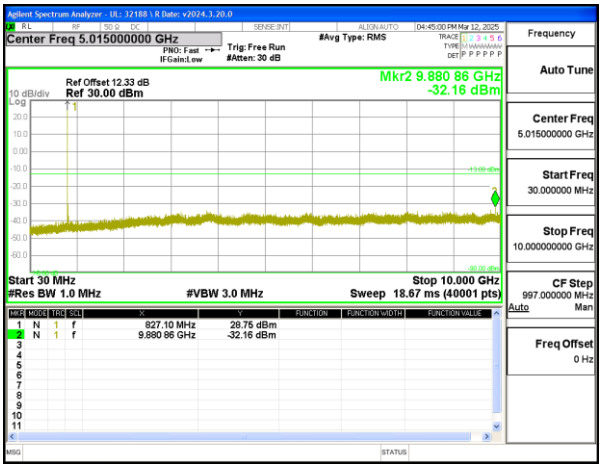

LTE B26 10MHz QPSK High Channel RB1-0

Intentionally Blank

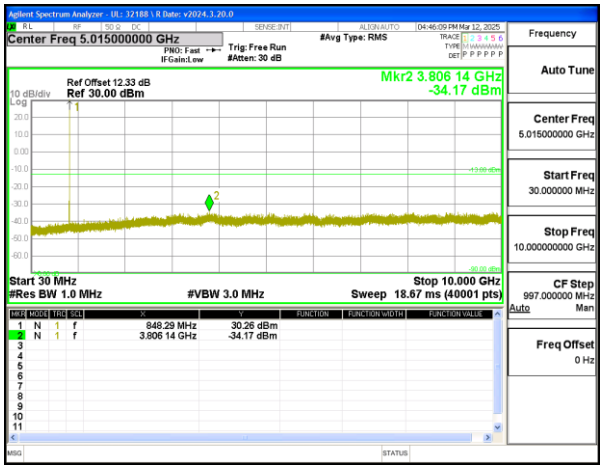
## 9.3.7. 5G NR n26




5G NR n26 20MHz BPSK Low Channel RB1-0




5G NR n26 20MHz BPSK Middle Channel RB1-1




5G NR n26 20MHz BPSK High Channel RB1-105

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## 9.4. FREQUENCY STABILITY

**LIMITS**

FCC: §22.355
The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.

FCC: §90.213
The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.

ISED: RSS132§5.3
The frequency stability shall be sufficient to ensure that the occupied bandwidth stays within each of the sub-bands when tested at the temperature and supply voltage variations specified in RSS-Gen.

**TEST PROCEDURE**

Use base station simulator with Frequency Error measurement capability.

- Temp. = −30°C to +50°C
- Voltage = (85% - 115%)

  Low voltage, 3.23VDC, Normal, 3.8VDC and High voltage, 4.37VDC.
  End Voltage, 3.2VDC.

**Frequency Stability vs Temperature:**
The EUT is place inside a temperature chamber. The temperature is set to 20ºC and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until +50ºC is reached.

**Frequency Stability vs Voltage:**
The peak frequency error is recorded (worst-case).

**RESULTS**

See the following pages.



UL VERIFICATION SERVICES INC.
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 319-4000 FAX: (510) 661-0888

## 9.4.1. LTE BAND 5 (QPSK 10MHz BANDWIDTH)

| Test Engineer ID: | 27700 | Test Date: | 2025-04-04 |
|---|---|---|---|

| Band | 5 | Frequency Range | | Frequency Error Reading (Hz) | Limit | |
|---|---|---|---|---|---|---|
| Condition | | 824 | 849 | | 2.5 | |
| Temperature | Voltage | Freq Reading @ Low End (MHz) | Freq Reading @ High End (MHz) | | Frequency Stability (ppm) | Within Authorized Frequency Block (Hz) |
| Normal (20°C) | Normal | 824.2522 | 848.5313 | | | |
| Extreme (50°C) | | 824.2522 | 848.5313 | 1.3 | 0.002 | Yes |
| Extreme (40°C) | | 824.2522 | 848.5313 | 3.6 | 0.004 | Yes |
| Extreme (30°C) | | 824.2522 | 848.5313 | -0.8 | -0.001 | Yes |
| Extreme (10°C) | | 824.2522 | 848.5313 | -1.9 | -0.002 | Yes |
| Extreme (0°C) | | 824.2522 | 848.5313 | -2.3 | -0.003 | Yes |
| Extreme (-10°C) | | 824.2522 | 848.5313 | -0.6 | -0.001 | Yes |
| Extreme (-20°C) | | 824.2522 | 848.5313 | 1.0 | 0.001 | Yes |
| Extreme (-30°C) | | 824.2522 | 848.5313 | -1.8 | -0.002 | Yes |
| | | | | | | |
| 20°C | 15% | 824.2522 | 848.5313 | 2.9 | 0.003 | Yes |
| | -15% | 824.2522 | 848.5313 | 0.5 | 0.001 | Yes |
| | End Point Voltage | 824.2522 | 848.5313 | -1.6 | -0.002 | Yes |

## 9.4.2. 5G NR n5 (BPSK 20MHz BANDWIDTH)

| Test Engineer ID: | 27700 | Test Date: | 2025-04-09 |
|---|---|---|---|

| Band | 5 | Frequency Range | | Frequency Error Reading (Hz) | Limit | |
|---|---|---|---|---|---|---|
| Condition | | 824 | 849 | | 2.5 | |
| Temperature | Voltage | Freq Reading @ Low End (MHz) | Freq Reading @ High End (MHz) | | Frequency Stability (ppm) | Within Authorized Frequency Block (Hz) |
| Normal (20°C) | Normal | 824.5029 | 847.3916 | | | |
| Extreme (50°C) | | 824.5029 | 847.3916 | -0.97 | -0.001 | Yes |
| Extreme (40°C) | | 824.5029 | 847.3916 | -0.74 | -0.001 | Yes |
| Extreme (30°C) | | 824.5029 | 847.3916 | 0.71 | 0.001 | Yes |
| Extreme (10°C) | | 824.5029 | 847.3916 | 0.42 | 0.001 | Yes |
| Extreme (0°C) | | 824.5029 | 847.3916 | 0.45 | 0.001 | Yes |
| Extreme (-10°C) | | 824.5029 | 847.3916 | 0.49 | 0.001 | Yes |
| Extreme (-20°C) | | 824.5029 | 847.3916 | 0.43 | 0.001 | Yes |
| Extreme (-30°C) | | 824.5029 | 847.3916 | -0.34 | 0.000 | Yes |
| | | | | | | |
| 20°C | 15% | 824.5029 | 847.3916 | 0.23 | 0.000 | Yes |
| | -15% | 824.5029 | 847.3916 | -0.2 | 0.000 | Yes |
| | End Point Voltage | 824.5029 | 847.3916 | 1.12 | 0.001 | Yes |

## 9.4.3. ULCA LTE BAND 5 (QPSK 10MHz + 10MHz BANDWIDTH)

| Test Engineer ID: | 27700 | Test Date: | 2025-04-09 |
|---|---|---|---|

| Band | 5 | Frequency Range | | Frequency Error Reading (Hz) | Limit | |
|---|---|---|---|---|---|---|
| Condition | | 824 | 849 | | 2.5 | |
| Temperature | Voltage | Freq Reading @ Low End (MHz) | Freq Reading @ High End (MHz) | | Frequency Stability (ppm) | Within Authorized Frequency Block (Hz) |
| Normal (20°C) | Normal | 824.5076 | 848.4800 | | | |
| Extreme (50°C) | | 824.5076 | 848.4800 | 43.2 | 0.052 | Yes |
| Extreme (40°C) | | 824.5076 | 848.4800 | 43.1 | 0.051 | Yes |
| Extreme (30°C) | | 824.5076 | 848.4800 | 36.8 | 0.044 | Yes |
| Extreme (10°C) | | 824.5076 | 848.4800 | -0.7 | -0.001 | Yes |
| Extreme (0°C) | | 824.5076 | 848.4800 | -7.8 | -0.009 | Yes |
| Extreme (-10°C) | | 824.5076 | 848.4800 | -13.9 | -0.017 | Yes |
| Extreme (-20°C) | | 824.5076 | 848.4800 | -19.5 | -0.023 | Yes |
| Extreme (-30°C) | | 824.5076 | 848.4800 | -18.4 | -0.022 | Yes |
| | | | | | | |
| 20°C | 15% | 824.5076 | 848.4800 | 22.0 | 0.026 | Yes |
| | -15% | 824.5076 | 848.4800 | 23.0 | 0.027 | Yes |
| | End Point Voltage | 824.5076 | 848.4800 | 26.0 | 0.031 | Yes |

## 9.4.4. LTE BAND 26 (QPSK 10MHz BANDWIDTH, FCC PART 90S)

| Test Engineer ID: | 27700 | Test Date: | 2025-03-03 |
|---|---|---|---|

| Band | 26 | Frequency Range | | Frequency Error Reading (Hz) | Limit | |
|---|---|---|---|---|---|---|
| Condition | | 814 | 824 | | 2.5 | |
| Temperature | Voltage | Freq Reading @ Low End (MHz) | Freq Reading @ High End (MHz) | | Frequency Stability (ppm) | Within Authorized Frequency Block (Hz) |
| Normal (20°C) | Normal | 814.5070 | 823.4907 | | | |
| Extreme (50°C) | | 814.5070 | 823.4907 | 2.9 | 0.004 | Yes |
| Extreme (40°C) | | 814.5070 | 823.4907 | 0.1 | 0.000 | Yes |
| Extreme (30°C) | | 814.5070 | 823.4907 | 0.3 | 0.000 | Yes |
| Extreme (10°C) | | 814.5070 | 823.4907 | 1.7 | 0.002 | Yes |
| Extreme (0°C) | | 814.5070 | 823.4907 | 0.3 | 0.000 | Yes |
| Extreme (-10°C) | | 814.5070 | 823.4907 | 0.7 | 0.001 | Yes |
| Extreme (-20°C) | | 814.5070 | 823.4907 | 3.9 | 0.005 | Yes |
| Extreme (-30°C) | | 814.5070 | 823.4907 | 4.1 | 0.005 | Yes |
| | | | | | | |
| 20°C | 15% | 814.5070 | 823.4907 | 2.3 | 0.003 | Yes |
| | -15% | 814.5070 | 823.4907 | -0.6 | -0.001 | Yes |
| | End Point Voltage | 814.5070 | 823.4907 | 0.2 | 0.000 | Yes |

## 9.4.5. 5G NR n26 (BPSK 10MHz BANDWIDTH, FCC PART 90S)

| Test Engineer ID: | 27700 | Test Date: | 2025-04-10 |
|---|---|---|---|

| Band | 26 | Frequency Range | | Frequency Error Reading (Hz) | Limit | |
|---|---|---|---|---|---|---|
| Condition | | 814 | 824 | | 2.5 | |
| | | Freq Reading @ Low End (MHz) | Freq Reading @ High End (MHz) | | Frequency Stability (ppm) | Within Authorized Frequency Block (Hz) |
| Temperature | Voltage | | | | | |
| Normal (20°C) | Normal | 814.0850 | 823.5439 | | | |
| Extreme (50°C) | | 814.0850 | 823.5439 | -4.66 | -0.006 | Yes |
| Extreme (40°C) | | 814.0850 | 823.5439 | -2.49 | -0.003 | Yes |
| Extreme (30°C) | | 814.0850 | 823.5439 | -3.26 | -0.004 | Yes |
| Extreme (10°C) | | 814.0850 | 823.5439 | -4.22 | -0.005 | Yes |
| Extreme (0°C) | | 814.0850 | 823.5439 | -3.99 | -0.005 | Yes |
| Extreme (-10°C) | | 814.0850 | 823.5439 | -2.49 | -0.003 | Yes |
| Extreme (-20°C) | | 814.0850 | 823.5439 | -4.91 | -0.006 | Yes |
| Extreme (-30°C) | | 814.0850 | 823.5439 | -3.15 | -0.004 | Yes |
| | | | | | | |
| 20°C | 15% | 814.0850 | 823.5439 | -3.33 | -0.004 | Yes |
| | -15% | 814.0850 | 823.5439 | -4.89 | -0.006 | Yes |
| | End Point Voltage | 814.0850 | 823.5439 | -2.23 | -0.003 | Yes |

## 9.4.6. LTE BAND 26 (QPSK 10MHz BANDWIDTH, FCC PART 22)

| Test Engineer ID: | 27700 | Test Date: | 2025-03-03 |
|---|---|---|---|

| Band | 26 | Frequency Range | | Frequency Error Reading (Hz) | Limit | |
|---|---|---|---|---|---|---|
| Condition | | 824 | 849 | | 2.5 | |
| | | Freq Reading @ Low End (MHz) | Freq Reading @ High End (MHz) | | Frequency Stability (ppm) | Within Authorized Frequency Block (Hz) |
| Temperature | Voltage | | | | | |
| Normal (20°C) | Normal | 824.7776 | 848.2184 | | | |
| Extreme (50°C) | | 824.7776 | 848.2184 | -1.3 | -0.002 | Yes |
| Extreme (40°C) | | 824.7776 | 848.2184 | 0.2 | 0.000 | Yes |
| Extreme (30°C) | | 824.7776 | 848.2184 | -1.1 | -0.001 | Yes |
| Extreme (10°C) | | 824.7776 | 848.2184 | 0.1 | 0.000 | Yes |
| Extreme (0°C) | | 824.7776 | 848.2184 | 0.3 | 0.000 | Yes |
| Extreme (-10°C) | | 824.7776 | 848.2184 | -0.5 | -0.001 | Yes |
| Extreme (-20°C) | | 824.7776 | 848.2184 | 2.1 | 0.003 | Yes |
| Extreme (-30°C) | | 824.7776 | 848.2184 | 2.7 | 0.003 | Yes |
| | | | | | | |
| 20°C | 15% | 824.7776 | 848.2184 | -0.9 | -0.001 | Yes |
| | -15% | 824.7776 | 848.2184 | -1.6 | -0.002 | Yes |
| | End Point Voltage | 824.7776 | 848.2184 | -1.1 | -0.001 | Yes |