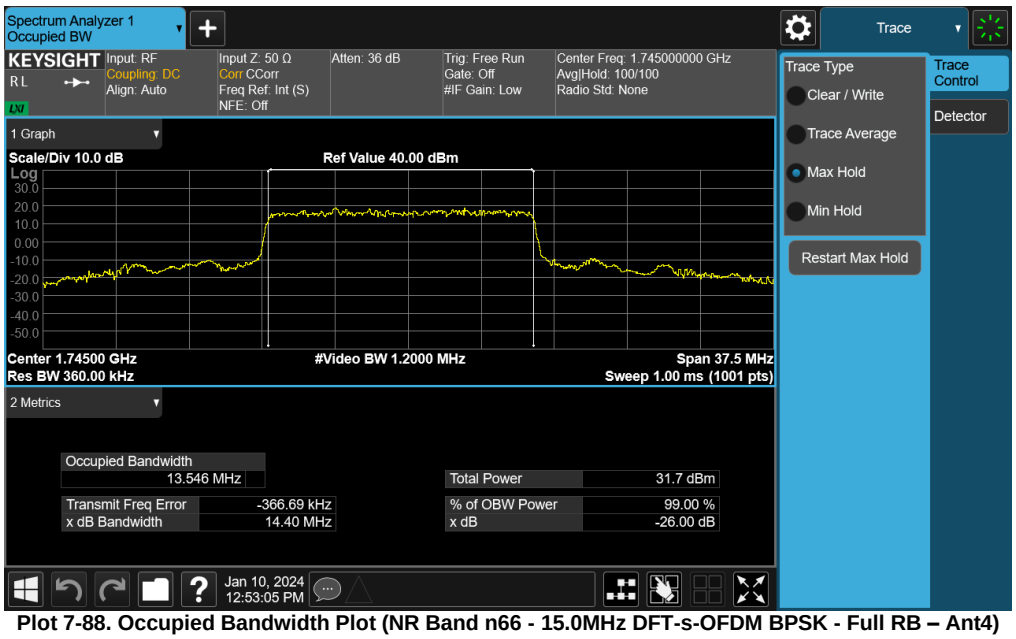
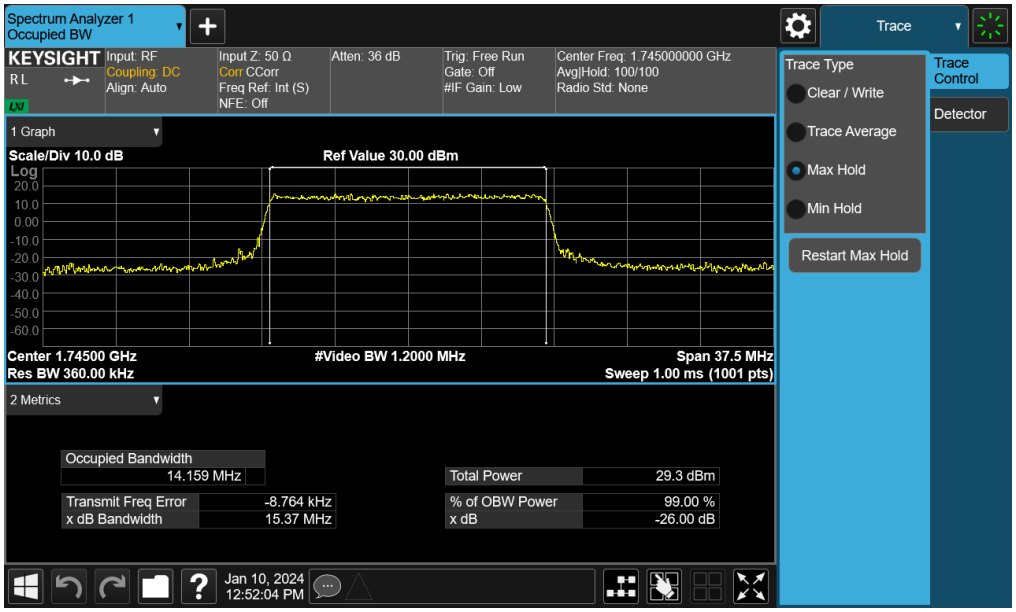
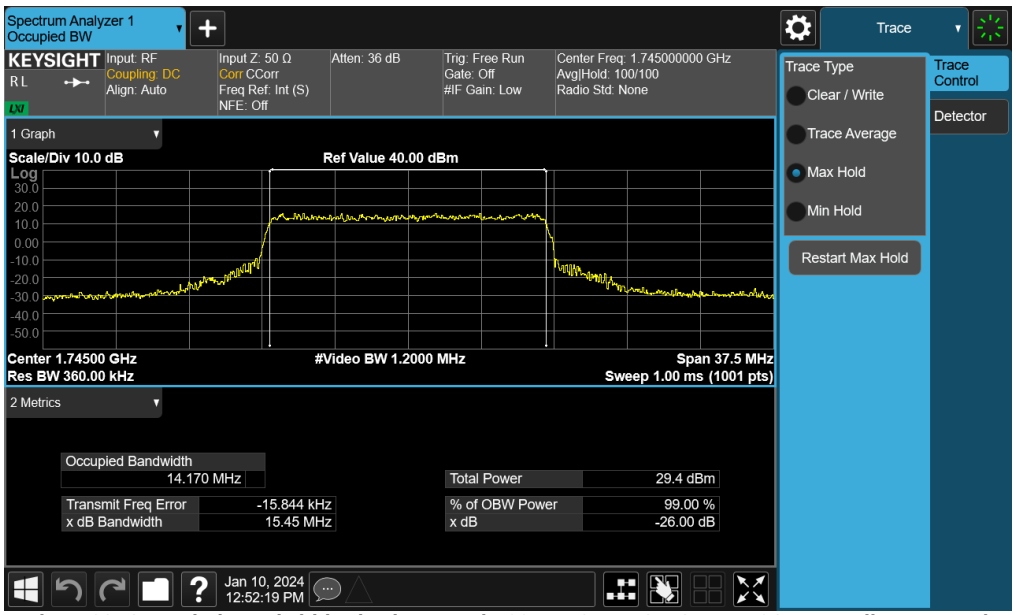


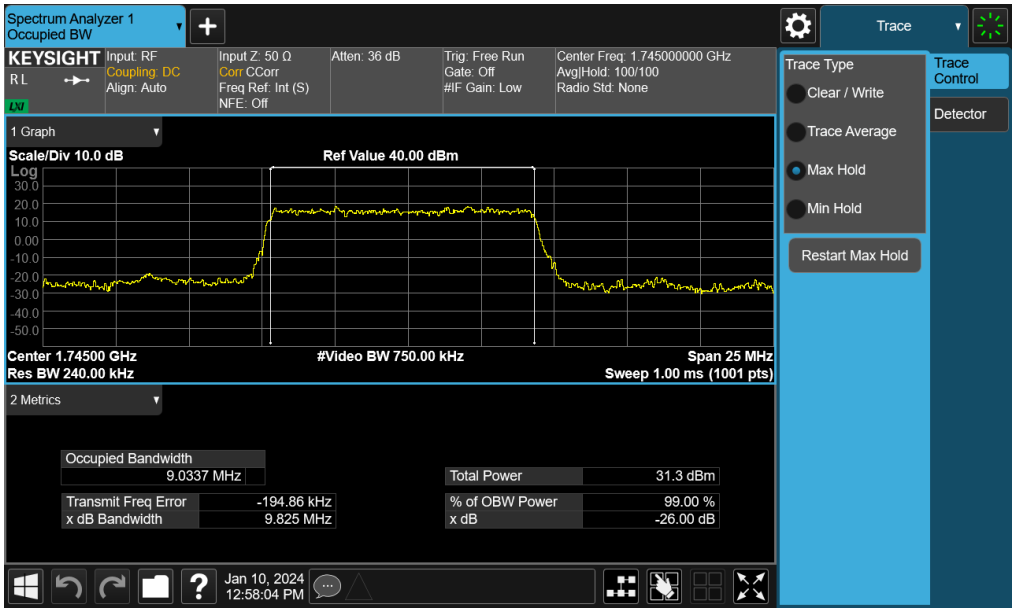
Plot 7-88. Occupied Bandwidth Plot (NR Band n66 - 15.0MHz DFT-s-OFDM BPSK - Full RB – Ant4)



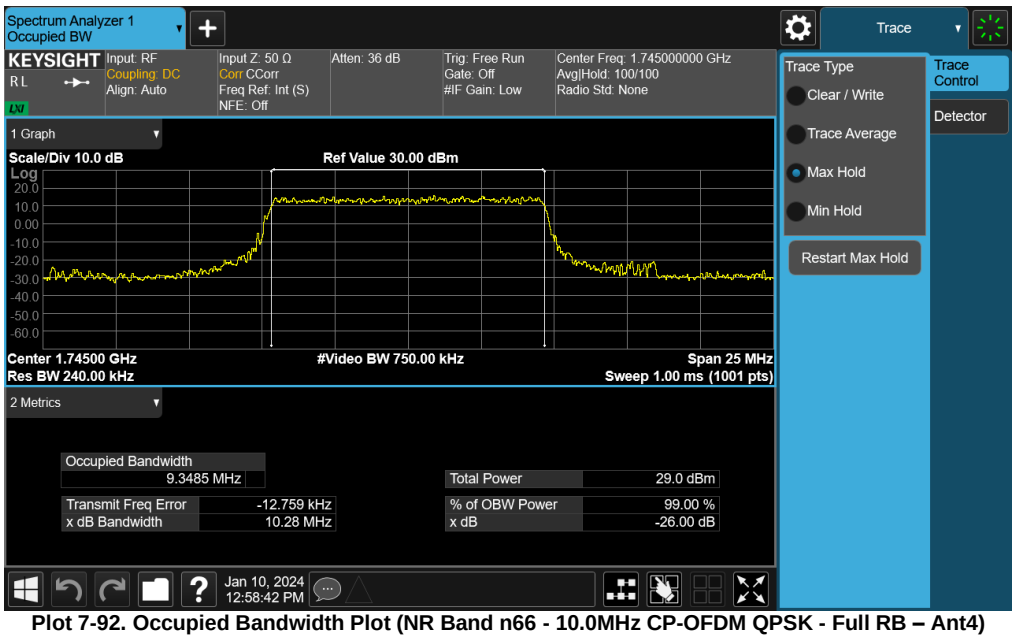
Plot 7-89. Occupied Bandwidth Plot (NR Band n66 - 15.0MHz CP-OFDM QPSK - Full RB – Ant4)



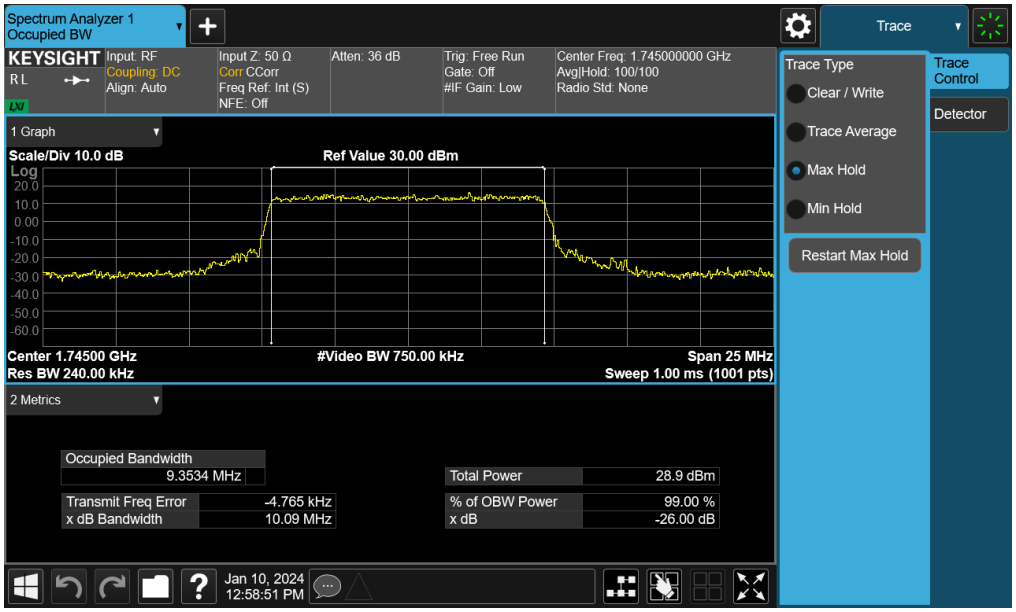
Plot 7-90. Occupied Bandwidth Plot (NR Band n66 - 15.0MHz CP-OFDM 16QAM - Full RB – Ant4)



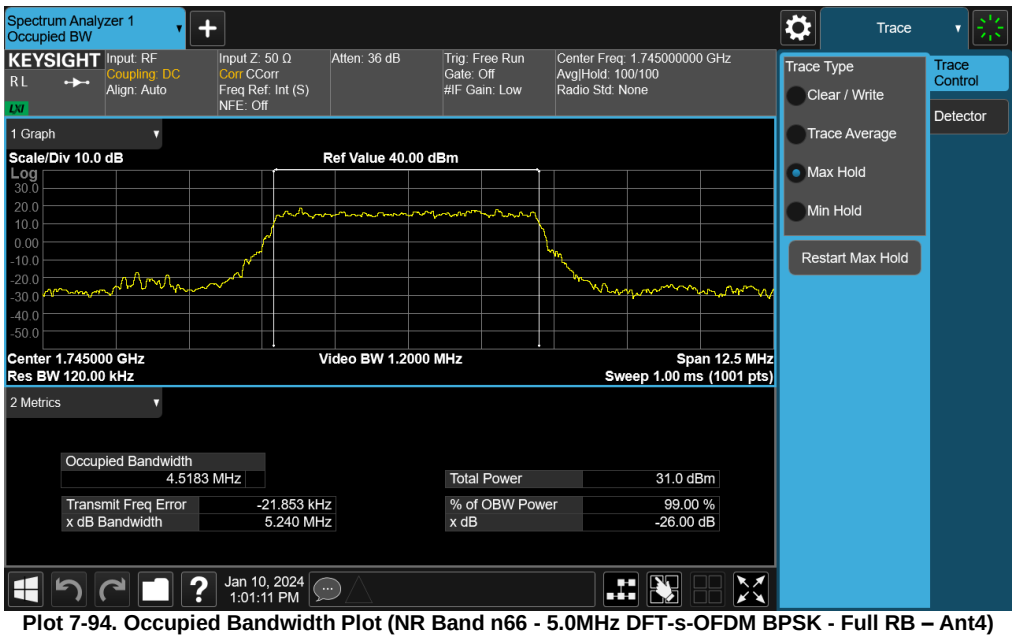
Plot 7-91. Occupied Bandwidth Plot (NR Band n66 - 10.0MHz DFT-s-OFDM BPSK - Full RB – Ant4)



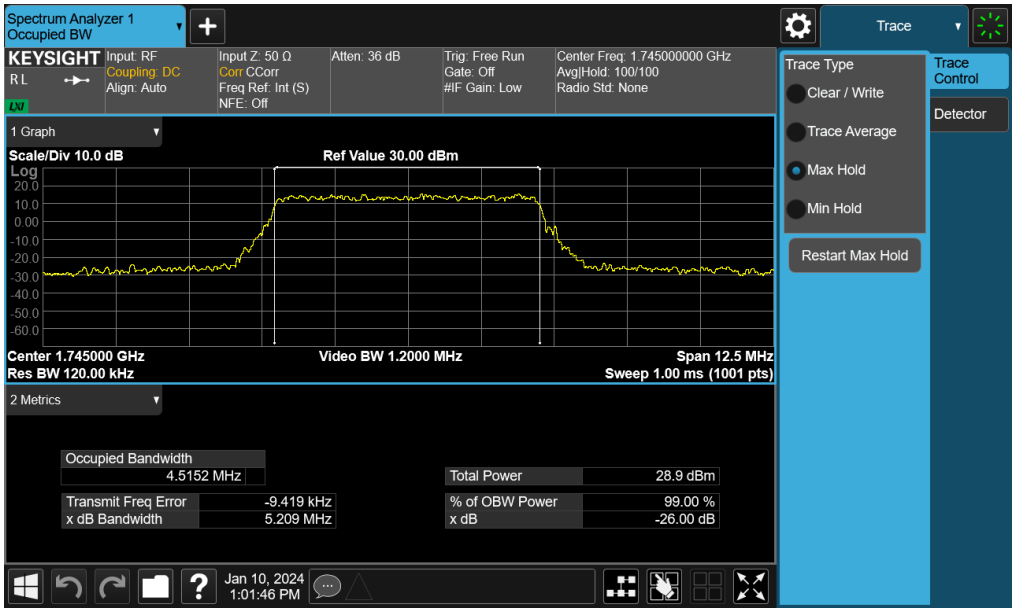
Plot 7-92. Occupied Bandwidth Plot (NR Band n66 - 10.0MHz CP-OFDM QPSK - Full RB – Ant4)



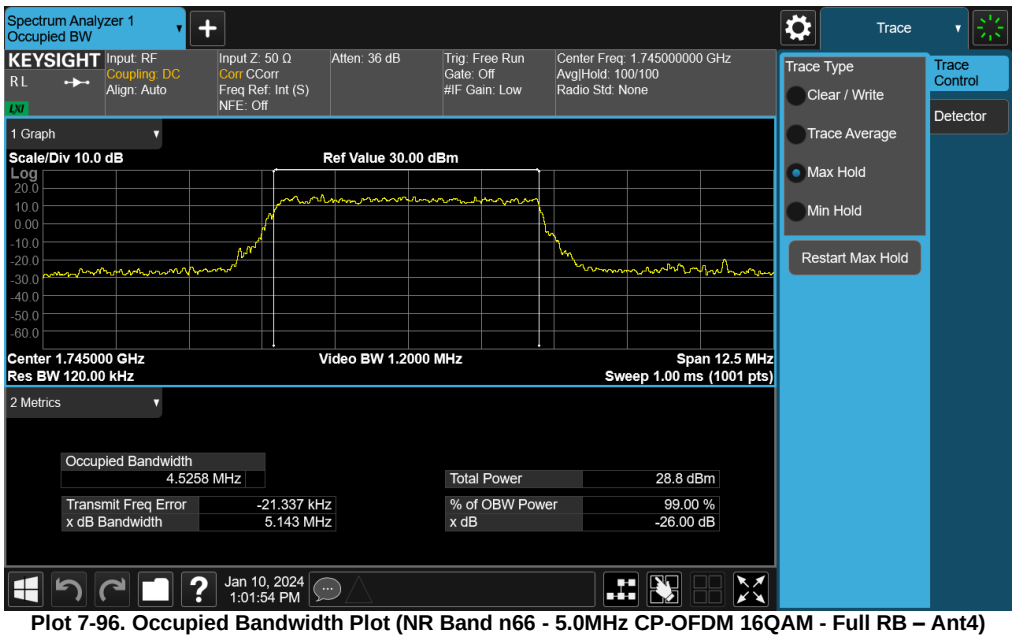
Plot 7-93. Occupied Bandwidth Plot (NR Band n66 - 10.0MHz CP-OFDM 16QAM - Full RB – Ant4)



Plot 7-94. Occupied Bandwidth Plot (NR Band n66 - 5.0MHz DFT-s-OFDM BPSK - Full RB – Ant4)



Plot 7-95. Occupied Bandwidth Plot (NR Band n66 - 5.0MHz CP-OFDM QPSK - Full RB – Ant4)



Plot 7-96. Occupied Bandwidth Plot (NR Band n66 - 5.0MHz CP-OFDM 16QAM - Full RB – Ant4)

7.4 Spurious and Harmonic Emissions at Antenna Terminal

Test Overview

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

The minimum permissible attenuation level of any spurious emission is 43 + 10 $log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

Test Procedure Used

ANSI C63.26-2015 – Section 5.7.4

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 18GHz (separated into at least two plots per channel)
2. RBW ≥ 100kHz
3. VBW ≥ 3 x RBW
4. Detector = RMS
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

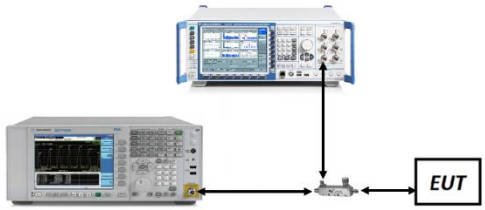


Figure 7-3. Test Instrument & Measurement Setup

Test Notes

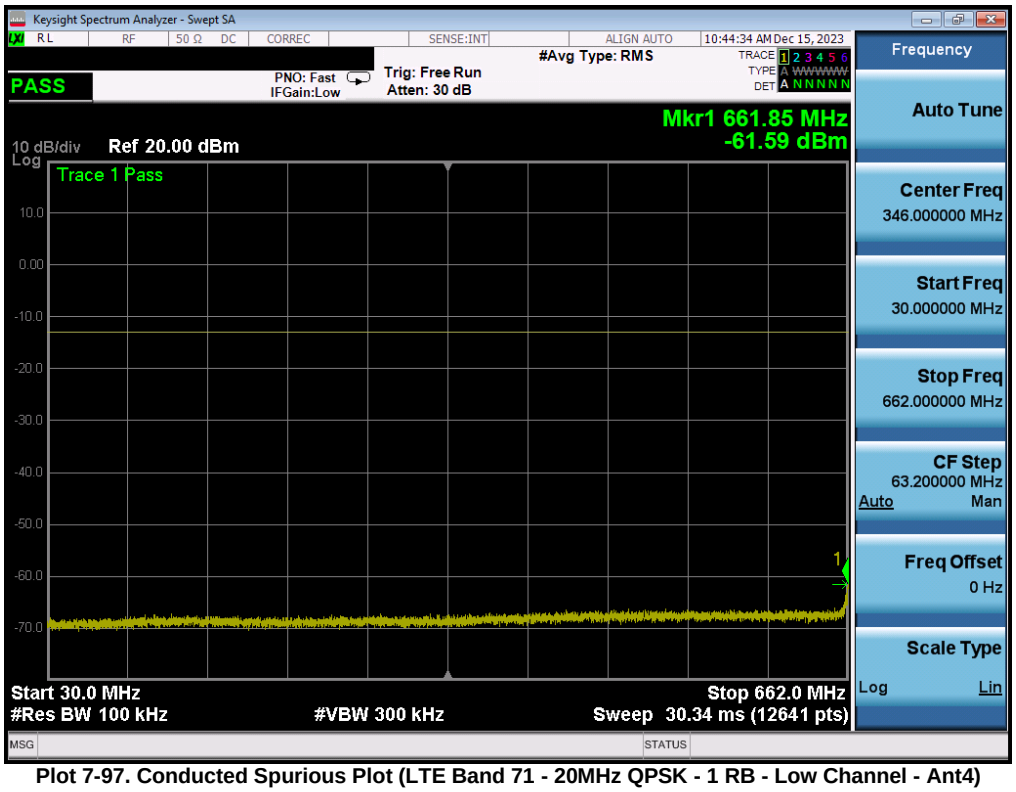
1. Per Part 27 and RSS-139, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth 100 kHz or greater for measurements below 1GHz.

2. For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

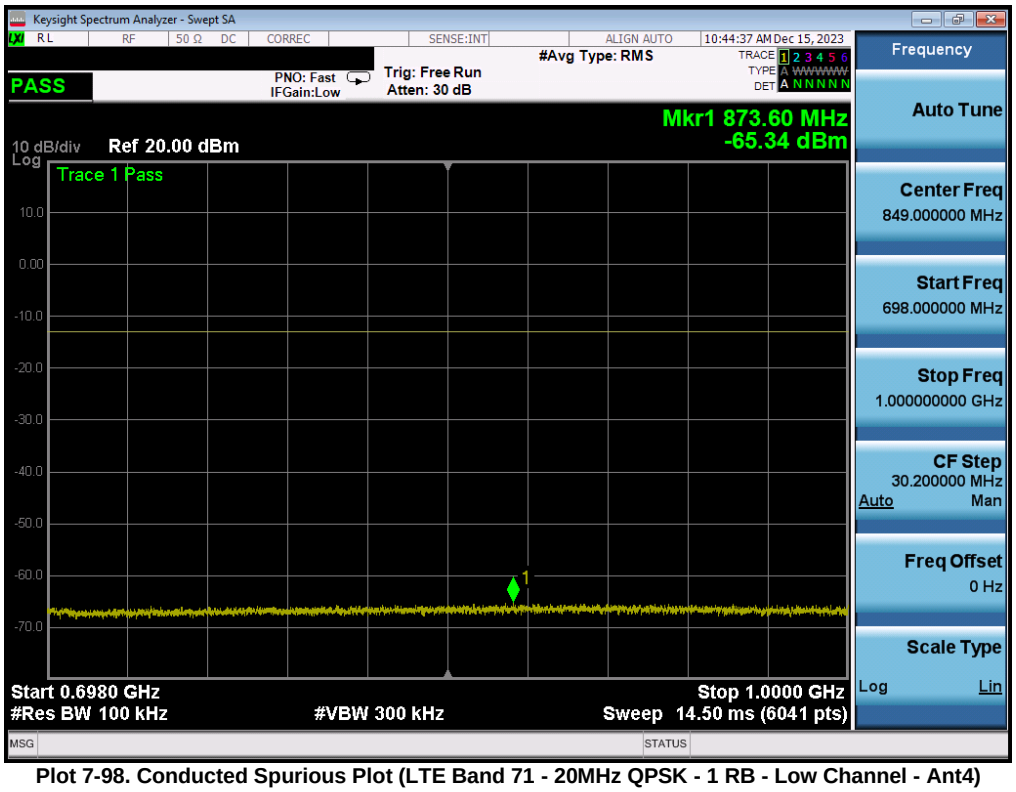
Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
LTE Band 71	20 MHz	Low	30.0 - 662.0	-61.59	-13	-48.59
		Low	698.0 - 1000.0	-65.34	-13	-52.34
		Low	1000.0 - 10000.0	-44.71	-13	-31.71
		Mid	30.0 - 663.0	-65.79	-13	-52.79
		Mid	698.0 - 1000.0	-65.17	-13	-52.17
		Mid	1000.0 - 10000.0	-46.12	-13	-33.12
		High	30.0 - 663.0	-65.80	-13	-52.80
		High	699.0 - 1000.0	-61.96	-13	-48.96
		High	1000.0 - 10000.0	-45.48	-13	-32.48
LTE Band 12	10 MHz	Low	30.0 - 697.9	-60.21	-13	-47.21
		Low	716.0 - 1000.0	-65.06	-13	-52.06
		Low	1000.0 - 10000.0	-44.08	-13	-31.08
		Mid	30.0 - 698.0	-64.97	-13	-51.97
		Mid	716.0 - 1000.0	-64.32	-13	-51.32
		Mid	1000.0 - 10000.0	-44.39	-13	-31.39
		High	30.0 - 697.9	-65.11	-13	-52.11
		High	716.1 - 1000.0	-57.14	-13	-44.14
		High	1000.0 - 10000.0	-46.36	-13	-33.36
LTE Band 13	10 MHz	Mid	30.0 - 777.0	-65.16	-35	-30.16
		Mid	787.0 - 1000.0	-66.48	-13	-53.48
		Mid	1000.0 - 20000.0	-46.13	-13	-33.13
NR Band n71	20 MHz	Low	30.0 - 663.0	-51.51	-13	-38.51
		Low	698.0 - 1000.0	-61.68	-13	-48.68
		Low	1000.0 - 10000.0	-42.75	-13	-29.75
		Mid	30.0 - 663.0	-60.14	-13	-47.14
		Mid	698.0 - 1000.0	-61.85	-13	-48.85
		Mid	1000.0 - 10000.0	-43.30	-13	-30.30
		High	30.0 - 663.0	-61.50	-13	-48.50
		High	698.0 - 1000.0	-61.33	-13	-48.33
		High	1000.0 - 10000.0	-42.97	-13	-29.97
NR Band n12	15 MHz	Low	30.0 - 698.0	-54.90	-13	-41.90
		Low	716.0 - 1000.0	-60.02	-13	-47.02
		Low	1000.0 - 10000.0	-43.18	-13	-30.18
		Mid	30.0 - 698.0	-52.24	-13	-39.24
		Mid	716.0 - 1000.0	-59.13	-13	-46.13
		Mid	1000.0 - 10000.0	-43.27	-13	-30.27
		High	30.0 - 698.0	-56.97	-13	-43.97
		High	716.0 - 1000.0	-60.38	-13	-47.38
		High	1000.0 - 10000.0	-43.26	-13	-30.26

Table 7-6. Conducted Spurious Test Results – Ant4

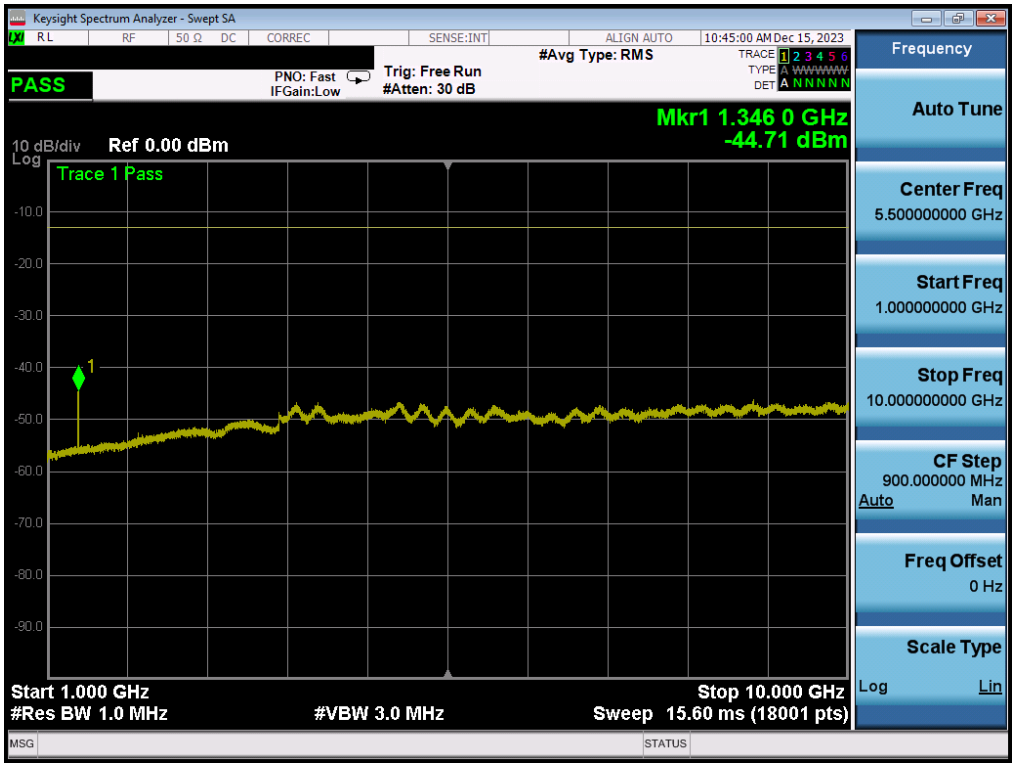
LTE Band 71 – Ant4



Plot 7-97. Conducted Spurious Plot (LTE Band 71 - 20MHz QPSK - 1 RB - Low Channel - Ant4)

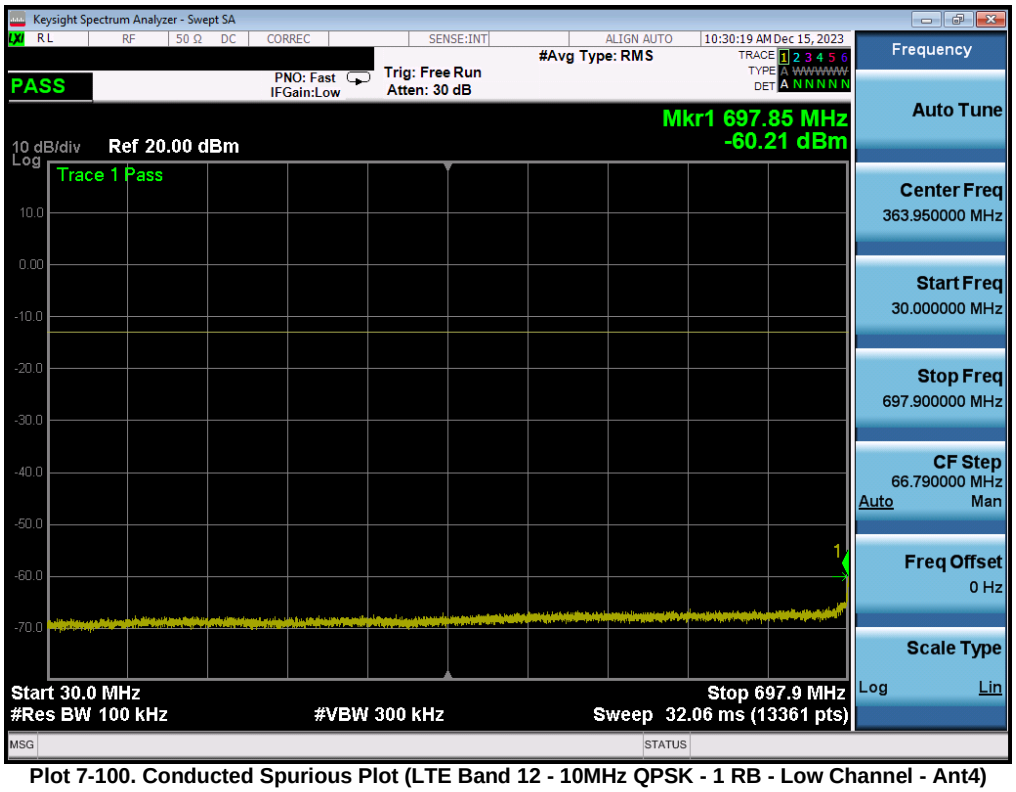


Plot 7-98. Conducted Spurious Plot (LTE Band 71 - 20MHz QPSK - 1 RB - Low Channel - Ant4)

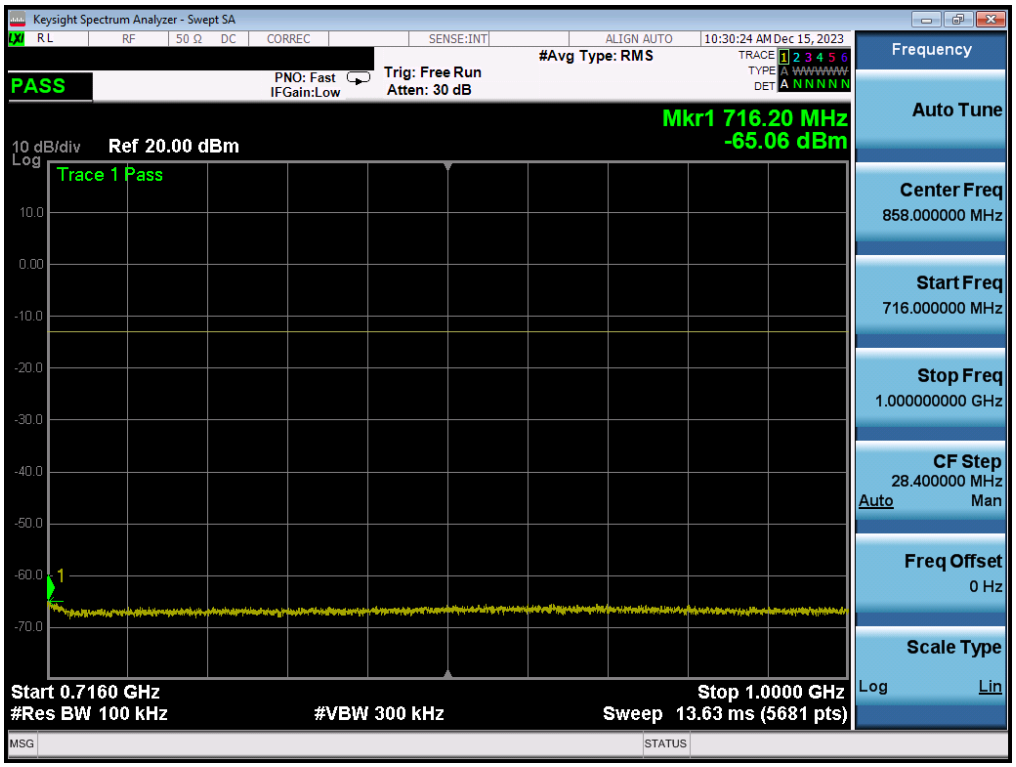


Plot 7-99. Conducted Spurious Plot (LTE Band 71 - 20MHz QPSK - 1 RB - Low Channel - Ant4)

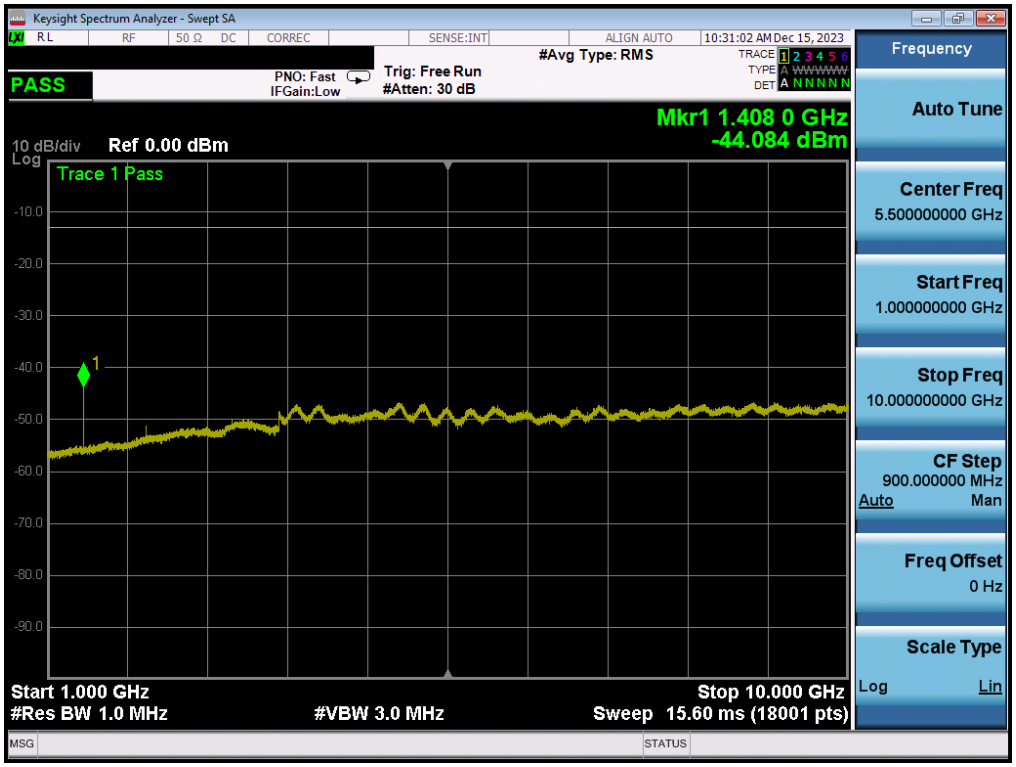
LTE Band 12 – Ant4



Plot 7-100. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - 1 RB - Low Channel - Ant4)

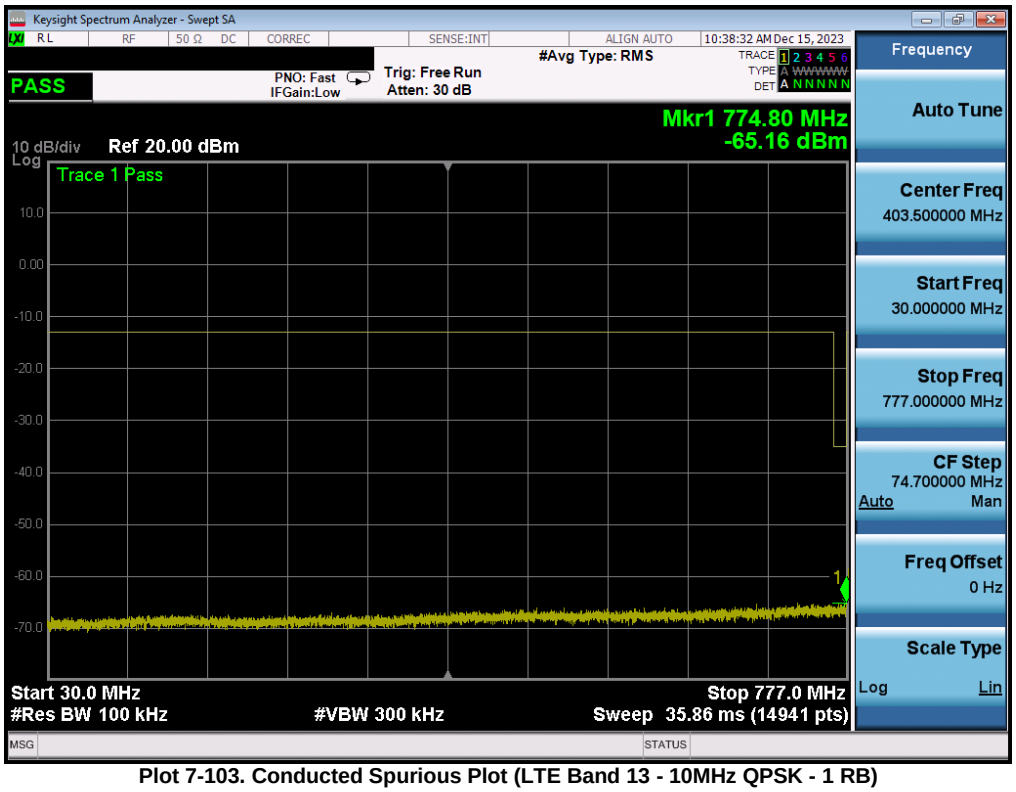


Plot 7-101. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - 1 RB - Low Channel - Ant4)

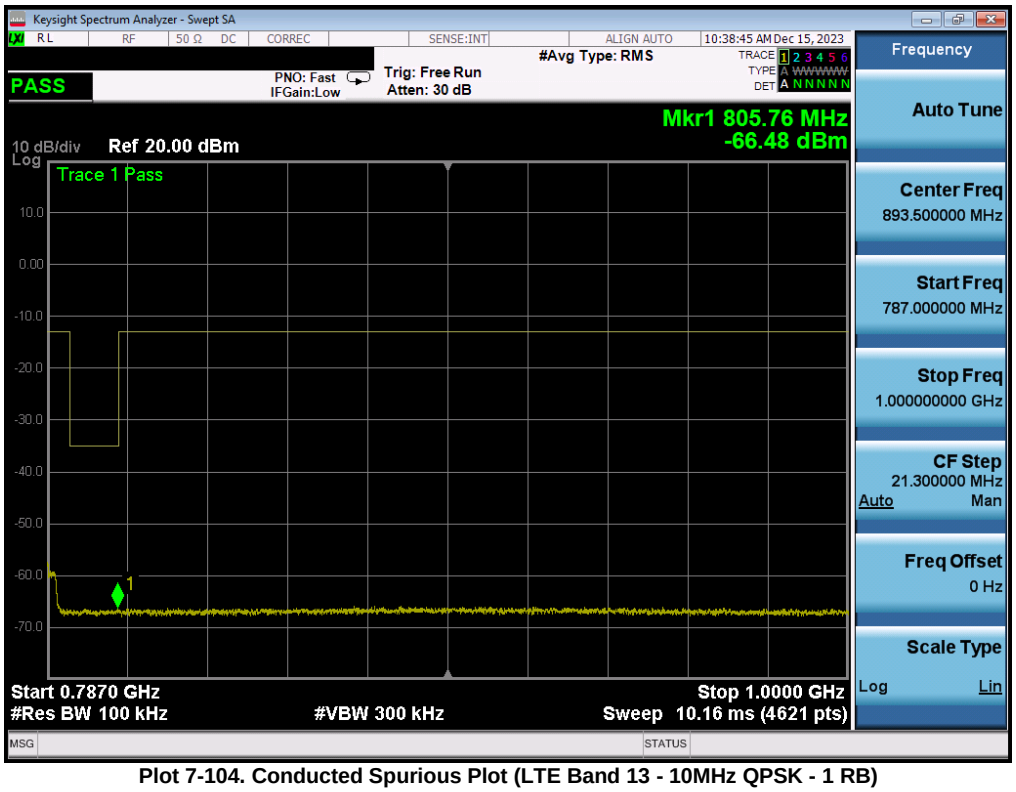


Plot 7-102. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - 1 RB - Low Channel - Ant4)

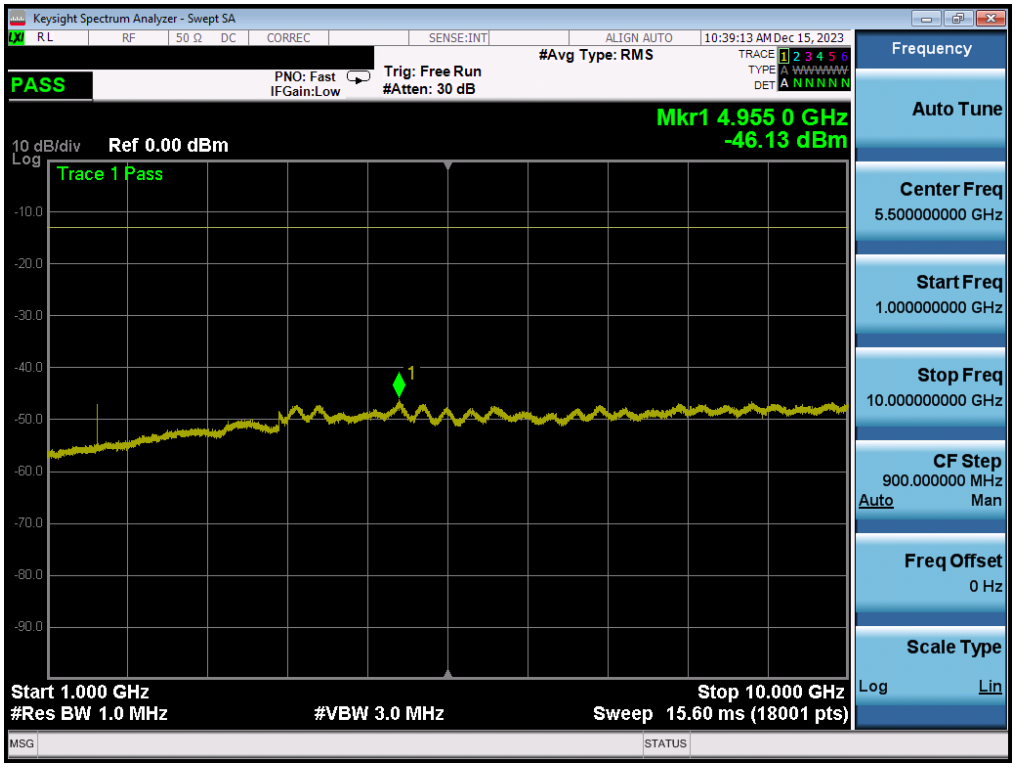
LTE Band 13 – Ant4



Plot 7-103. Conducted Spurious Plot (LTE Band 13 - 10MHz QPSK - 1 RB)

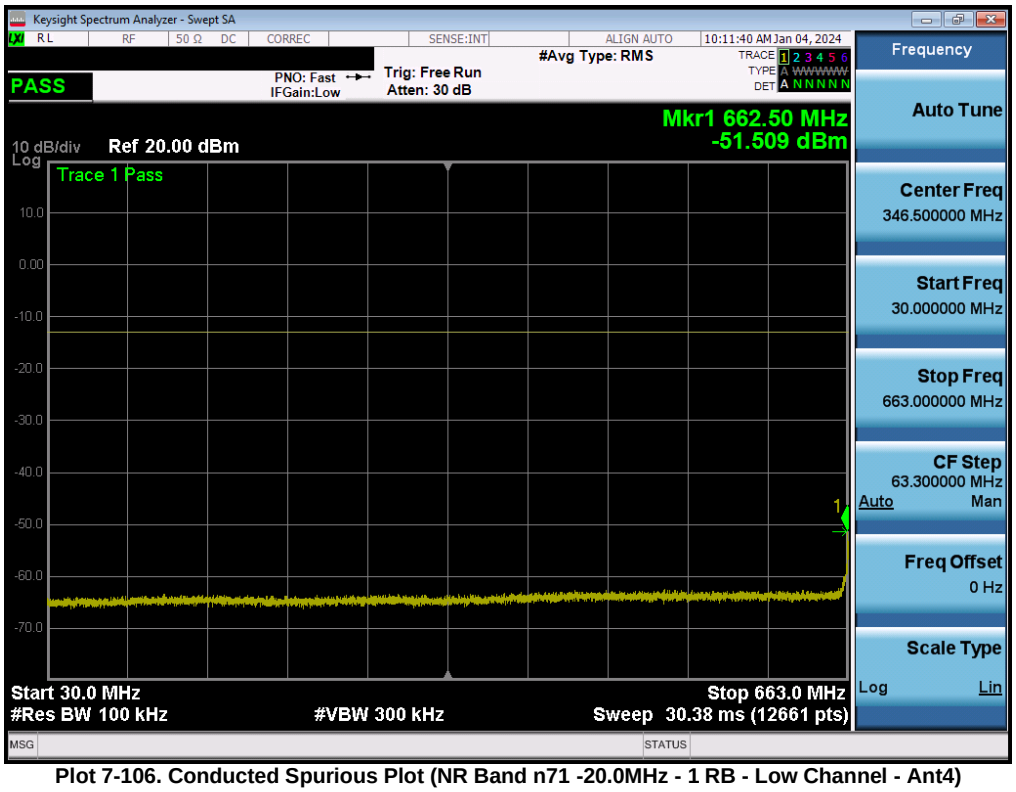


Plot 7-104. Conducted Spurious Plot (LTE Band 13 - 10MHz QPSK - 1 RB)

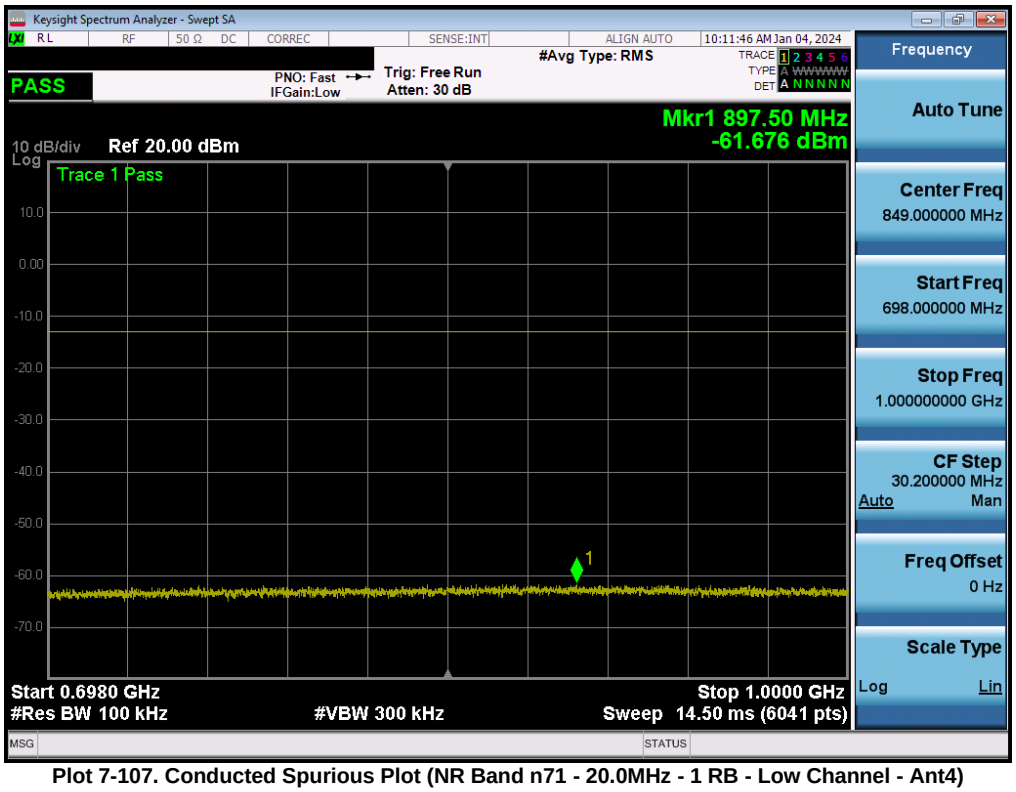


Plot 7-105. Conducted Spurious Plot (LTE Band 13 - 10MHz QPSK - 1 RB)

NR Band n71 – Ant4



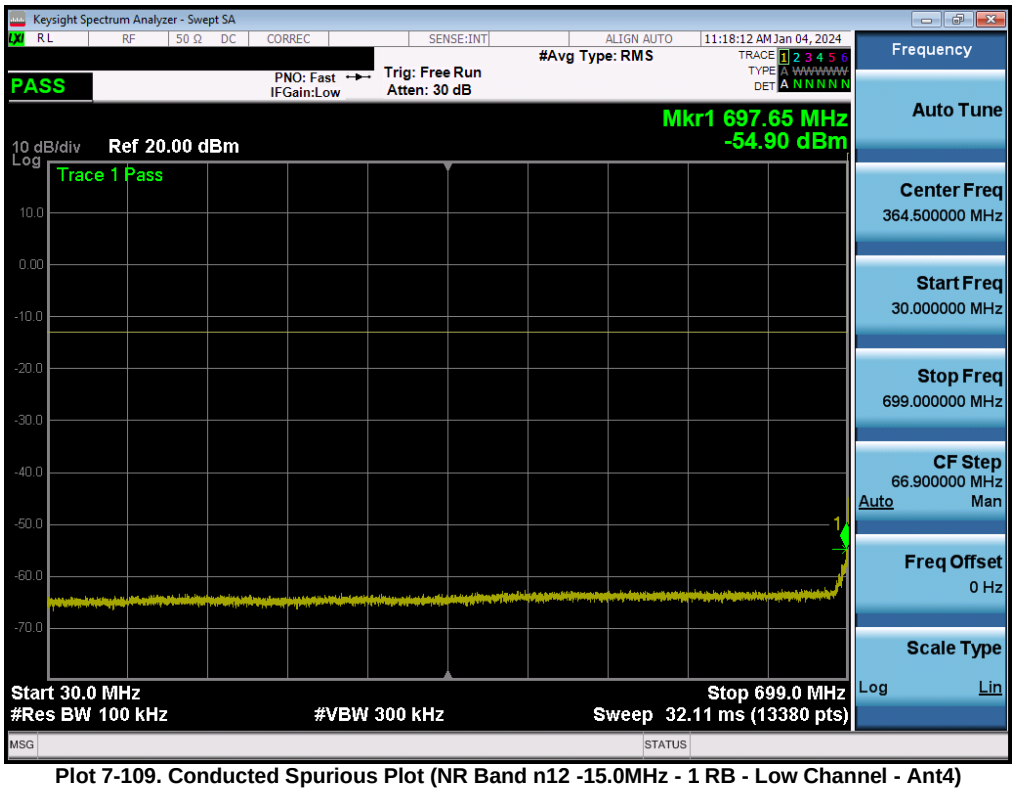
Plot 7-106. Conducted Spurious Plot (NR Band n71 -20.0MHz - 1 RB - Low Channel - Ant4)



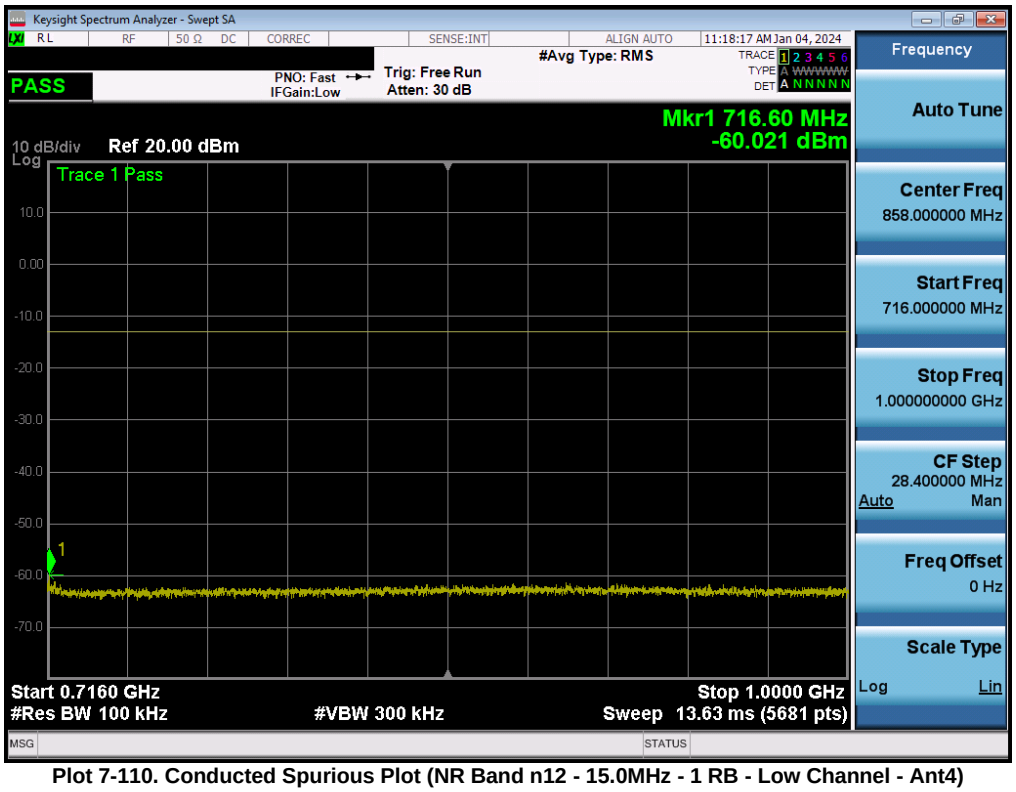
Plot 7-107. Conducted Spurious Plot (NR Band n71 - 20.0MHz - 1 RB - Low Channel - Ant4)

Plot 7-108. Conducted Spurious Plot (NR Band n71 - 20.0MHz - 1 RB - Low Channel - Ant4)

NR Band n12 – Ant4



Plot 7-109. Conducted Spurious Plot (NR Band n12 -15.0MHz - 1 RB - Low Channel - Ant4)



Plot 7-110. Conducted Spurious Plot (NR Band n12 - 15.0MHz - 1 RB - Low Channel - Ant4)

Plot 7-111. Conducted Spurious Plot (NR Band n12 - 15.0MHz - 1 RB - Low Channel - Ant4)

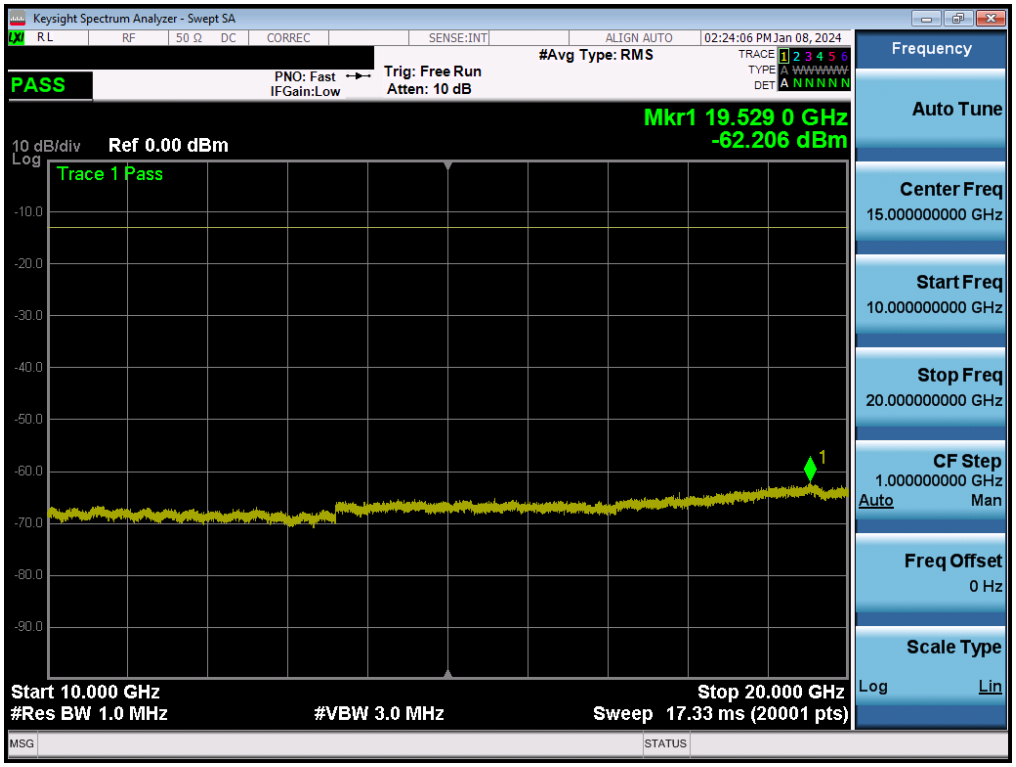
Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
WCDMA1700	N/A	Low	30.0 - 1705.0	-34.76	-13	-21.76
		Low	1755.0 - 10000.0	-46.77	-13	-33.77
		Low	10000.0 - 20000.0	-62.21	-13	-49.21
		Mid	30.0 - 1710.0	-51.56	-13	-38.56
		Mid	1755.0 - 10000.0	-46.92	-13	-33.92
		Mid	10000.0 - 20000.0	-61.92	-13	-48.92
		High	30.0 - 1710.0	-53.12	-13	-40.12
		High	1760.0 - 10000.0	-37.01	-13	-24.01
		High	10000.0 - 20000.0	-62.43	-13	-49.43
LTE-B66-4	20 MHz	Low	30.0 - 663.0	-49.17	-13	-36.17
		Low	698.0 - 1000.0	-46.18	-13	-33.18
		Low	1000.0 - 10000.0	-61.68	-13	-48.68
		Mid	30.0 - 663.0	-53.55	-13	-40.55
		Mid	698.0 - 1000.0	-46.56	-13	-33.56
		Mid	1000.0 - 10000.0	-61.87	-13	-48.87
		High	30.0 - 663.0	-53.30	-13	-40.30
		High	698.0 - 1000.0	-46.14	-13	-33.14
		High	1000.0 - 10000.0	-61.75	-13	-48.75
NR Band n66	40 MHz	Low	30.0 - 1710.0	-37.28	-13	-24.28
		Low	1780.0 - 10000.0	-43.48	-13	-30.48
		Low	10000.0 - 20000.0	-59.34	-13	-46.34
		Mid	30.0 - 1710.0	-49.52	-13	-36.52
		Mid	1780.0 - 10000.0	-43.44	-13	-30.44
		Mid	10000.0 - 20000.0	-59.25	-13	-46.25
		High	30.0 - 1710.0	-50.10	-13	-37.10
		High	1780.0 - 10000.0	-43.29	-13	-30.29
		High	10000.0 - 20000.0	-59.28	-13	-46.28
LTE Band 66B/C ULCA	40 MHz	Low	30.0 - 1709.0	-50.19	-13	-37.19
		Low	1710.0 - 1780.0	13.85	-	-
		Low	1780.0 - 10000.0	-46.99	-13	-33.99
		Low	10000.0 - 20000.0	-62.34	-13	-49.34
		Mid	30.0 - 1710.0	-53.00	-13	-40.00
		Mid	1710.0 - 1780.0	13.81	-	-
		Mid	1780.0 - 10000.0	-46.98	-13	-33.98
		Mid	10000.0 - 20000.0	-62.37	-13	-49.37
		High	30.0 - 1710.0	-52.77	-13	-39.77
		High	1710.0 - 1780.0	13.65	-	-
		High	1781.0 - 10000.0	-46.91	-13	-33.91
		High	10000.0 - 20000.0	-62.46	-13	-49.46

Table 7-7. Conducted Spurious Test Results – Ant1

WCDMA AWS – Ant1

Plot 7-112. Conducted Spurious Plot (WCDMA Ch. 1312- Low Channel - Ant1)

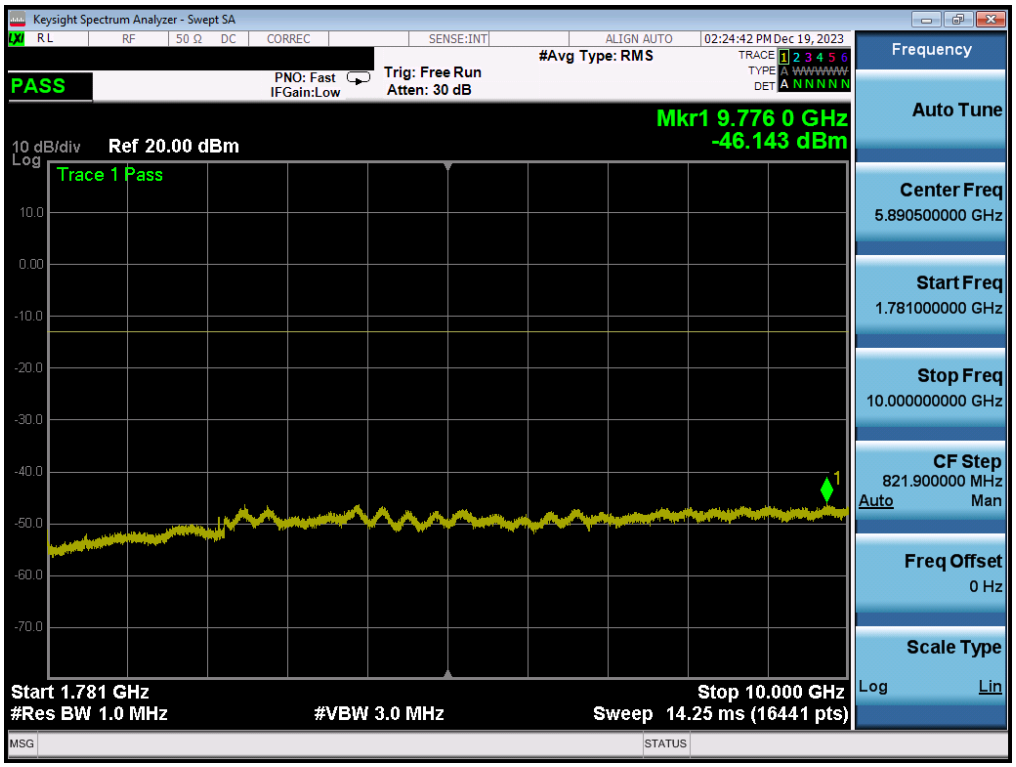
Plot 7-113. Conducted Spurious Plot (WCDMA Ch. 1312- Low Channel - Ant1)



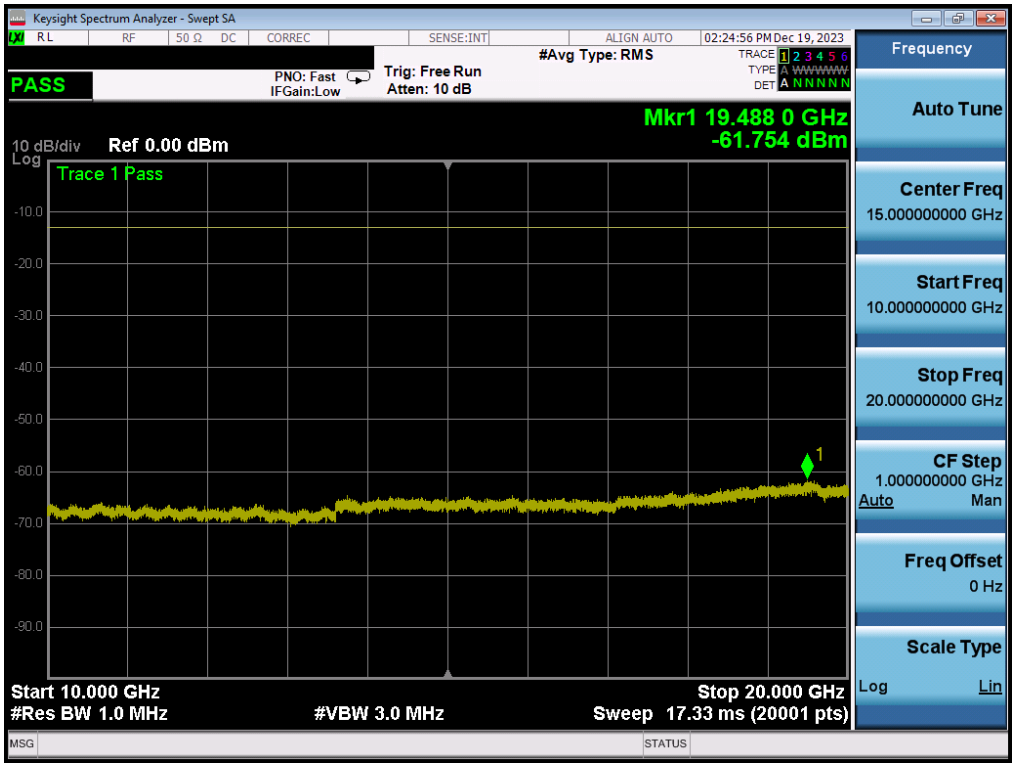
Plot 7-114. Conducted Spurious Plot (WCDMA Ch. 1312- Low Channel - Ant1)

LTE Band 66/4 – Ant1

Plot 7-115. Conducted Spurious Plot (LTE Band 66/4 - 20MHz QPSK - 1 RB - High Channel – Ant1)

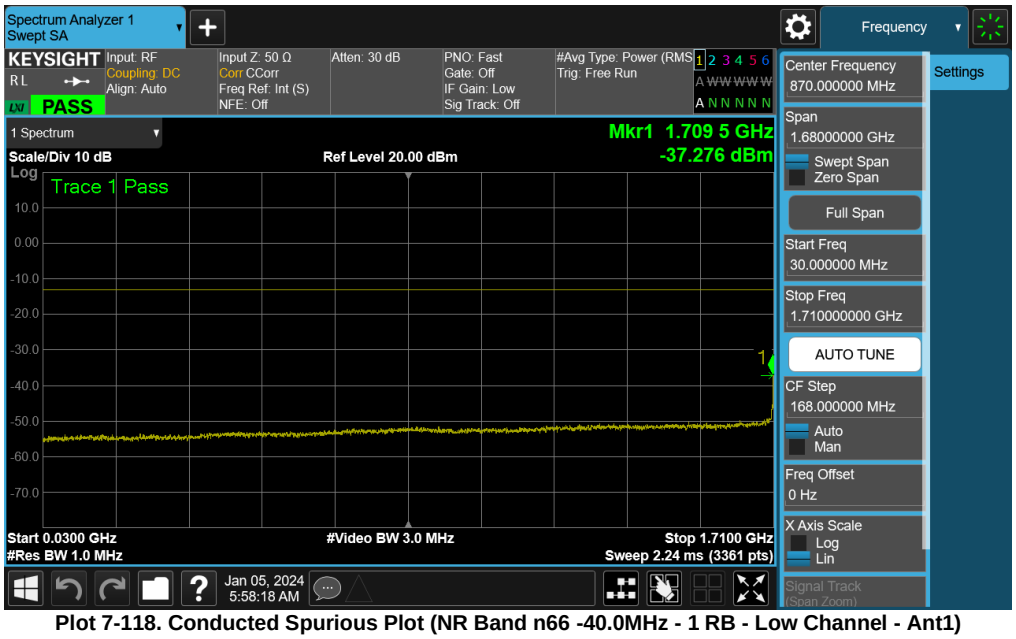


Plot 7-116. Conducted Spurious Plot (LTE Band 66/4 - 20MHz QPSK - 1 RB - High Channel – Ant1)

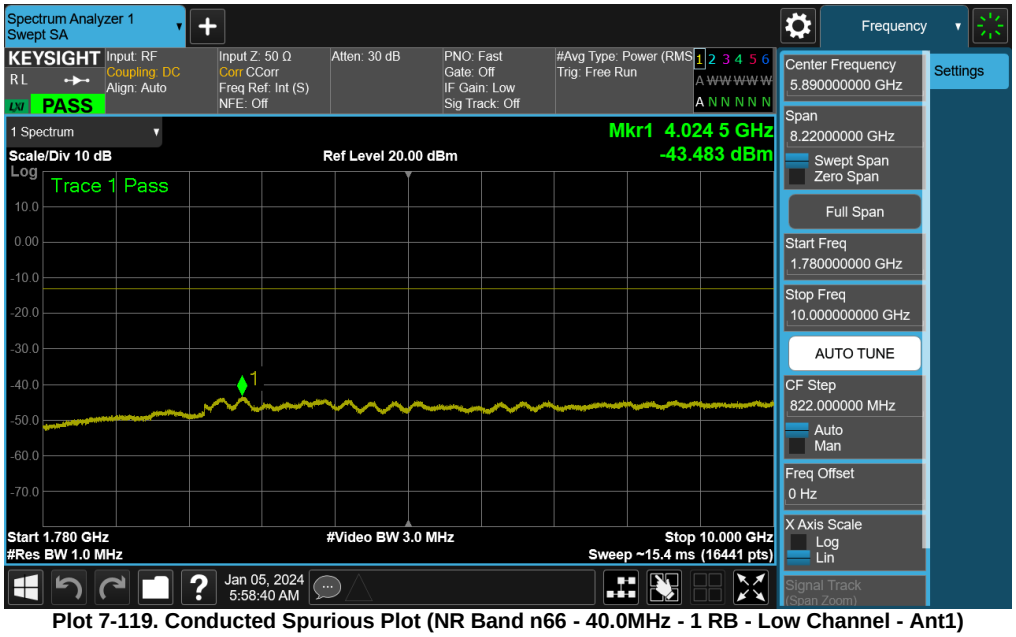


Plot 7-117. Conducted Spurious Plot (LTE Band 66/4 - 20MHz QPSK - 1 RB - High Channel – Ant1)

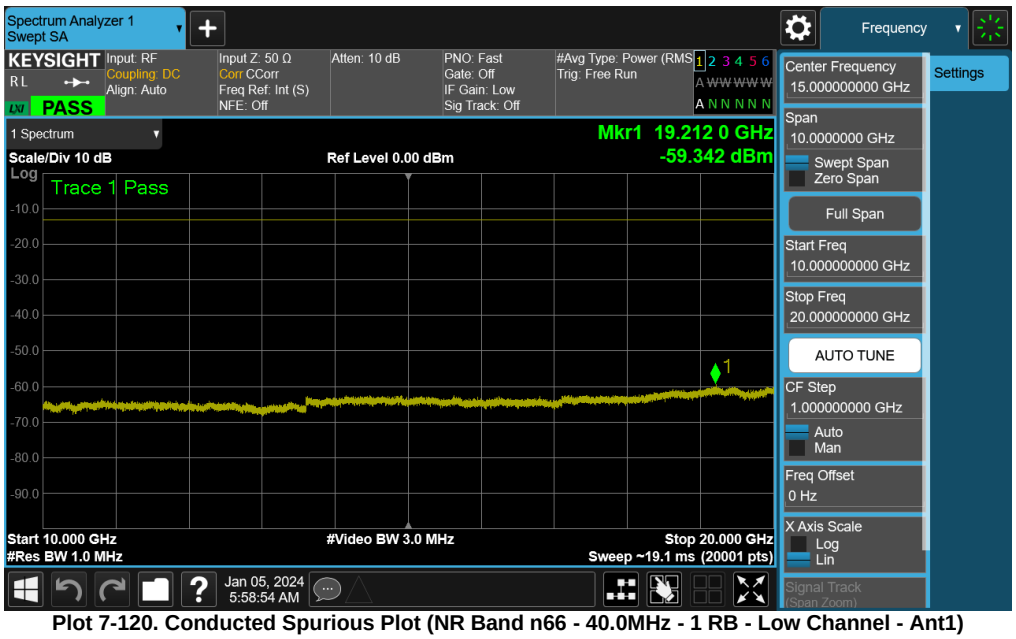
NR Band n66 – Ant1



Plot 7-118. Conducted Spurious Plot (NR Band n66 -40.0MHz - 1 RB - Low Channel - Ant1)

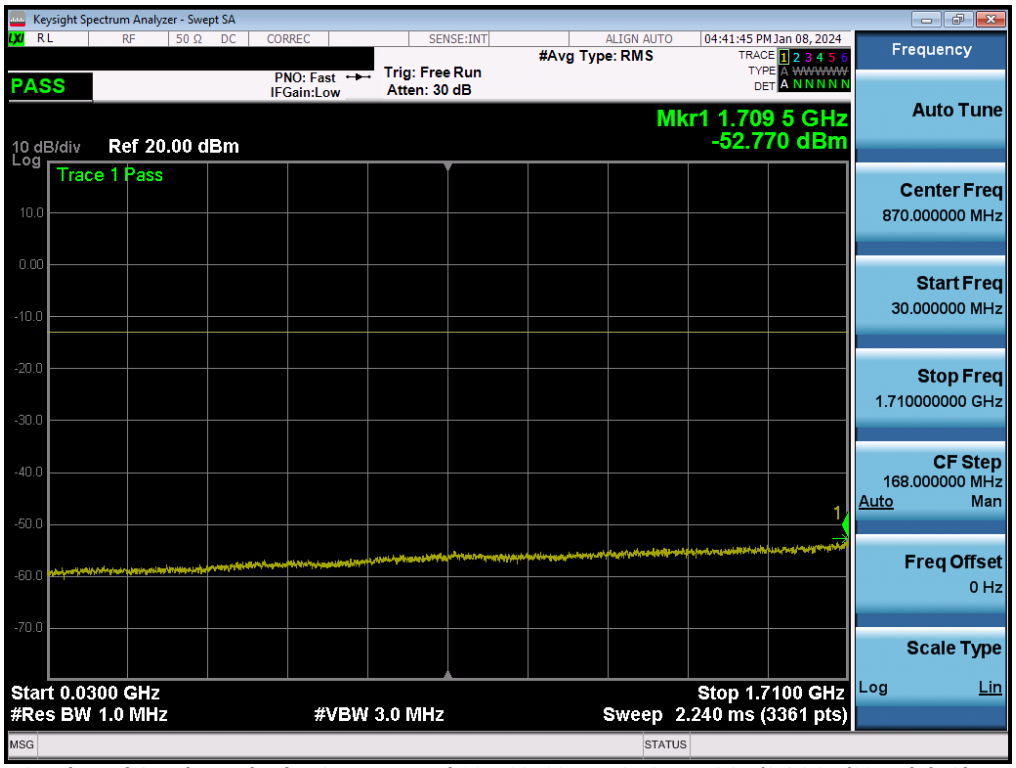


Plot 7-119. Conducted Spurious Plot (NR Band n66 - 40.0MHz - 1 RB - Low Channel - Ant1)

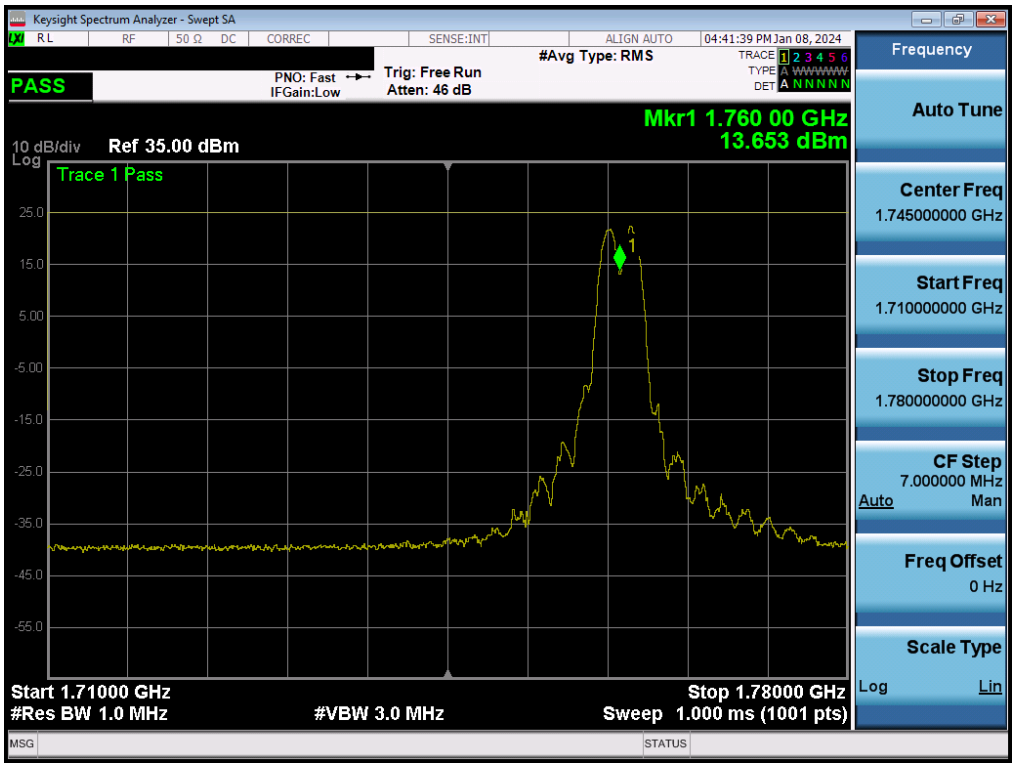


Plot 7-120. Conducted Spurious Plot (NR Band n66 - 40.0MHz - 1 RB - Low Channel - Ant1)

ULCA LTE Band 66 – Ant1

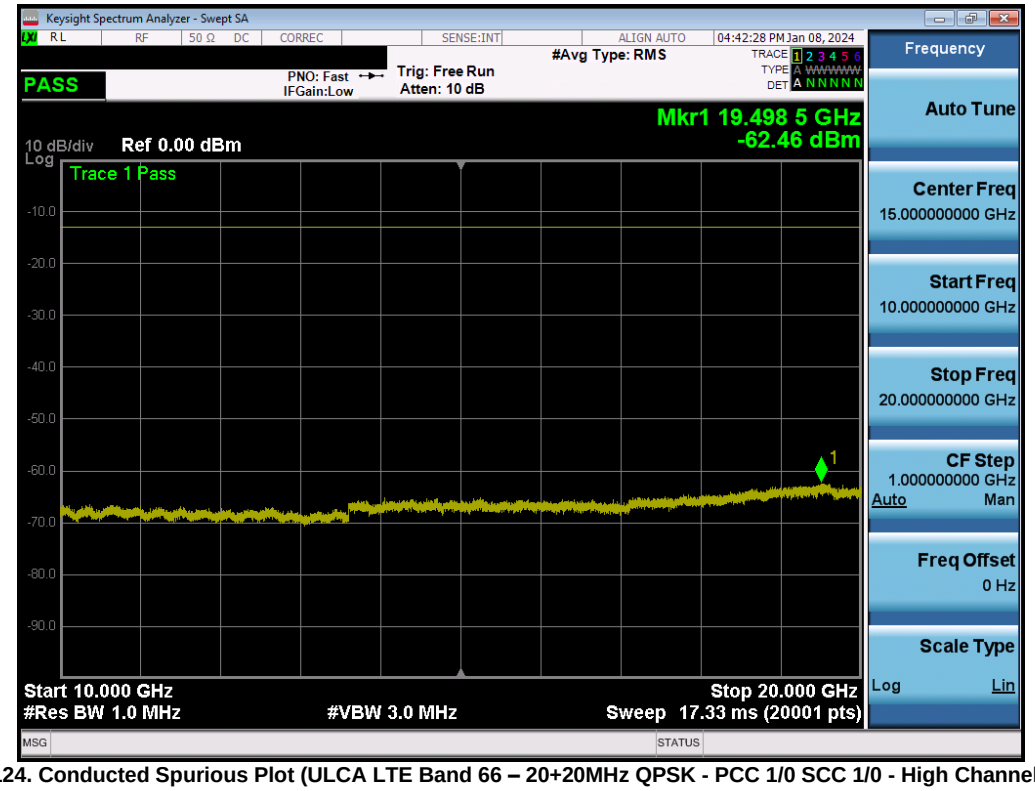


Plot 7-121. Conducted Spurious Plot (ULCA LTE Band 66 – 20+20MHz QPSK - PCC 1/0 SCC 1/99 - High Channel – Ant1)



Plot 7-122. Conducted Spurious Plot (ULCA LTE Band 66 – 20+20MHz QPSK - PCC 1/0 SCC 1/0 - High Channel – Ant1)

Plot 7-123. Conducted Spurious Plot (ULCA LTE Band 66 – 20+20MHz QPSK - PCC 1/0 SCC 1/0 - High Channel – Ant1)

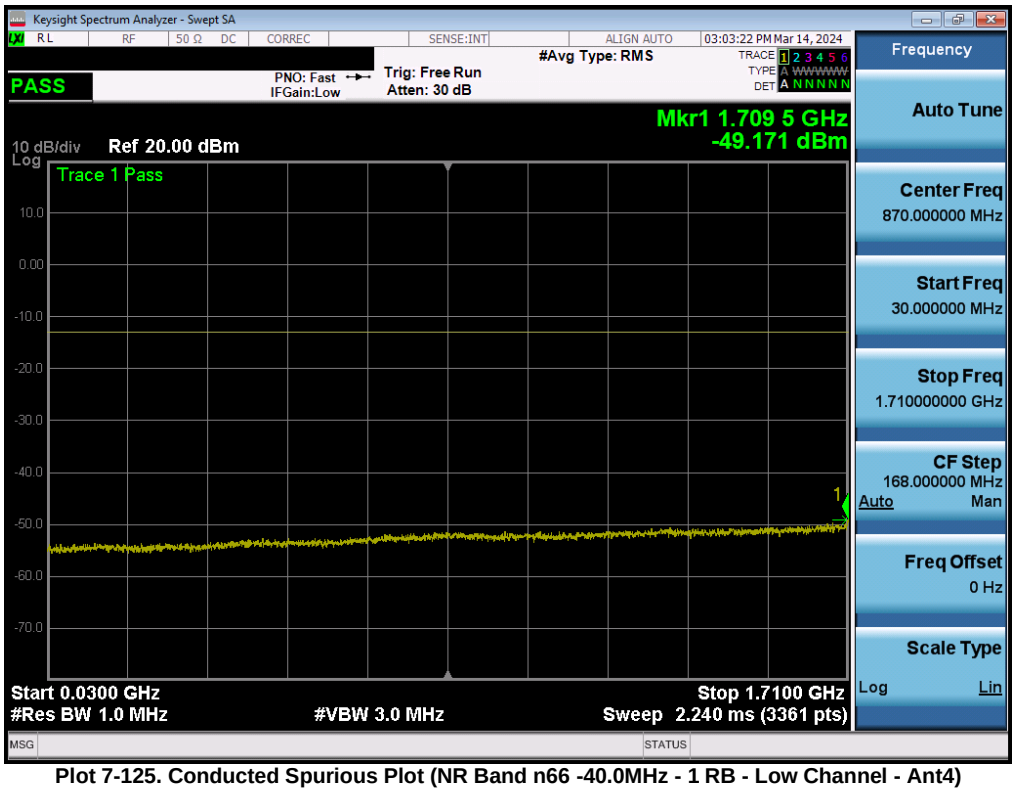


Plot 7-124. Conducted Spurious Plot (ULCA LTE Band 66 – 20+20MHz QPSK - PCC 1/0 SCC 1/0 - High Channel – Ant1)

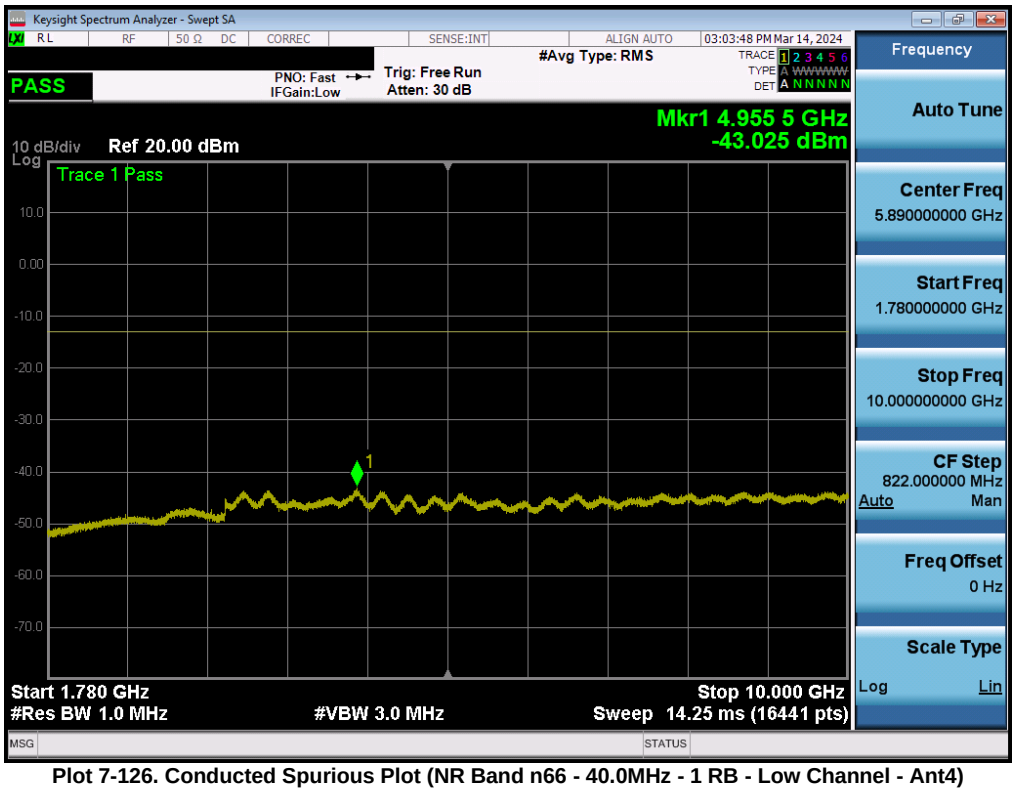
Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
NR Band n66	40 MHz	Low	30.0 - 1710.0	-49.17	-13	-36.17
		Low	1780.0 - 10000.0	-43.03	-13	-30.03
		Low	10000.0 - 20000.0	-59.70	-13	-46.70
		Mid	30.0 - 1710.0	-49.64	-13	-36.64
		Mid	1780.0 - 10000.0	-43.18	-13	-30.18
		Mid	10000.0 - 20000.0	-59.71	-13	-46.71
		High	30.0 - 1710.0	-49.86	-13	-36.86
		High	1780.0 - 10000.0	-43.43	-13	-30.43
		High	10000.0 - 20000.0	-59.54	-13	-46.54

Table 7-8. Conducted Spurious Test Results – Ant4

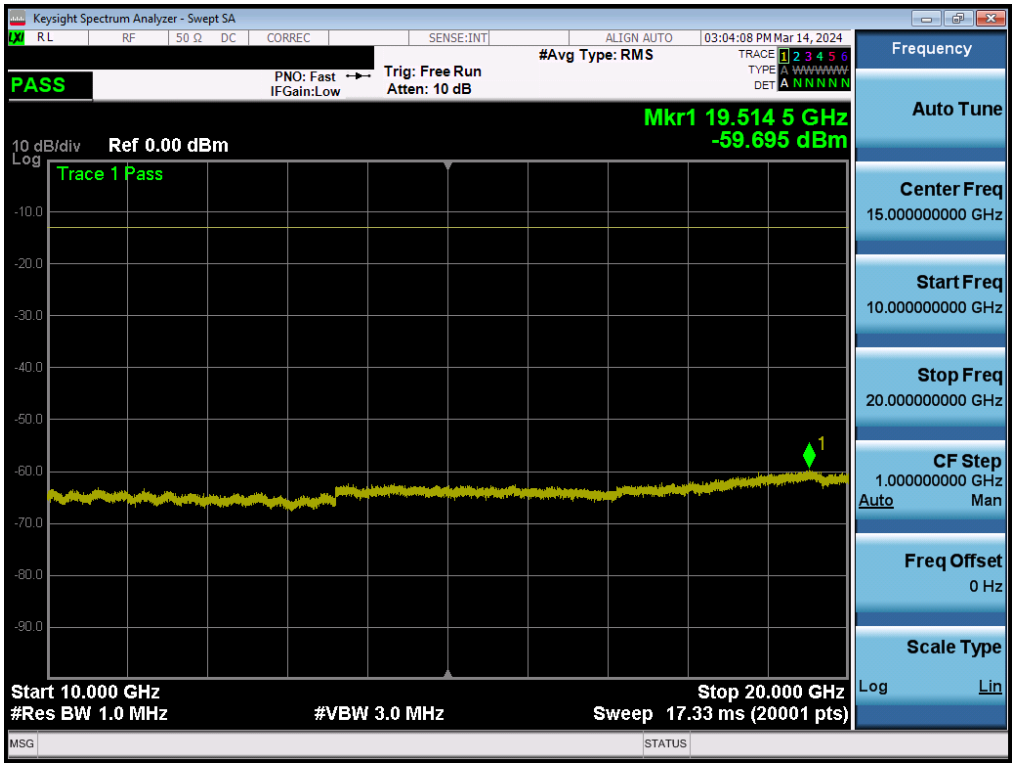
NR Band n66 – Ant4



Plot 7-125. Conducted Spurious Plot (NR Band n66 -40.0MHz - 1 RB - Low Channel - Ant4)



Plot 7-126. Conducted Spurious Plot (NR Band n66 - 40.0MHz - 1 RB - Low Channel - Ant4)



Plot 7-127. Conducted Spurious Plot (NR Band n66 - 40.0MHz - 1 RB - Low Channel - Ant4)

7.5 Band Edge Emissions at Antenna Terminal

Test Overview

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

The minimum permissible attenuation level of any spurious emission is 43 + 10 $log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

Test Procedure Used

ANSI C63.26-2015 – Section 5.7.3

Test Settings

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

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

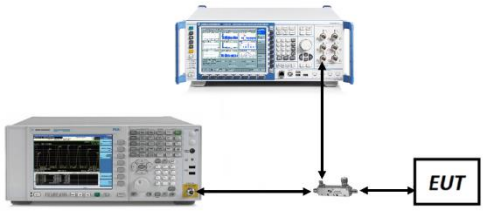


Figure 7-4. Test Instrument & Measurement Setup

Test Notes

1. Per 27.53(h) for AWS band operation, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

2. Per 27.53(g) for operations in the 663 - 698 MHz and 698 – 746MHz bands, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

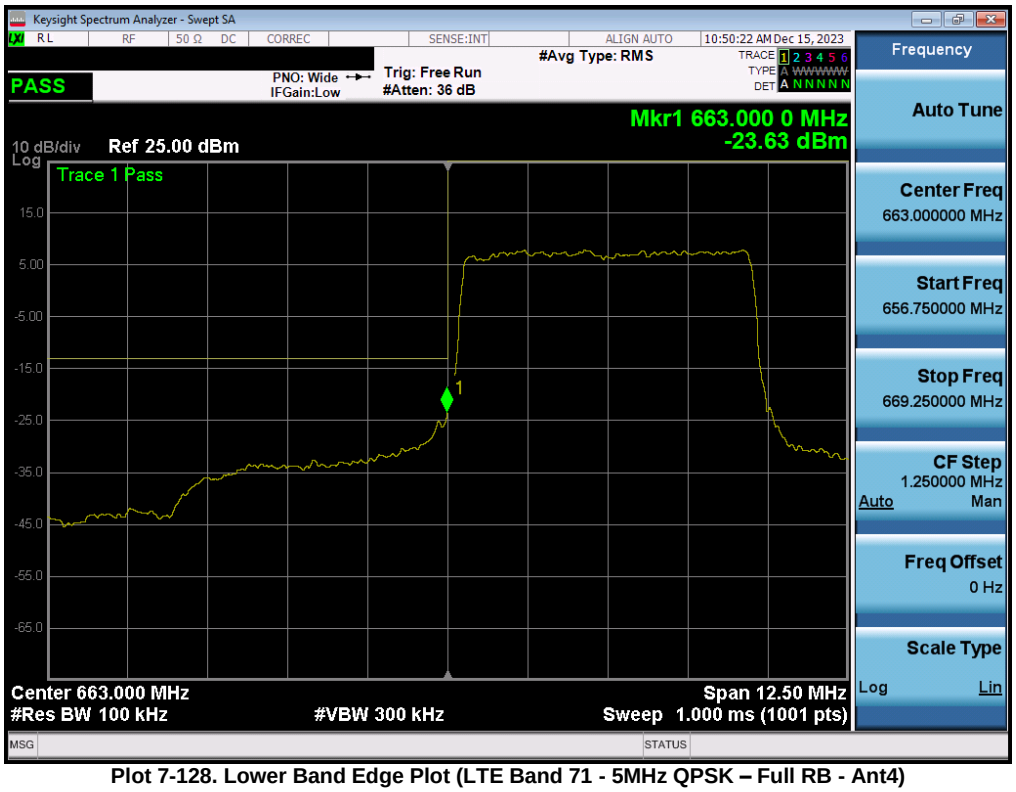
3. Per 27.53(c)(5) for operations in the 776-788 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

4. For all plots showing emissions in the 763 – 775MHz and 793 – 805MHz band, the FCC limit per 27.53(c)(4) is $65 + 10 \log_{10}(P) = -35$dBm in a 6.25kHz bandwidth.

Mode	Bandwidth	Channel	Test Case	Level [dBm]	Limit [dBm]	Margin [dB]
LTE Band 71	20 MHz	Low	Band Edge	-29.94	-13	-16.94
		High	Band Edge	-27.77	-13	-14.77
	15 MHz	Low	Band Edge	-29.66	-13	-16.66
		High	Band Edge	-27.61	-13	-14.61
	10 MHz	Low	Band Edge	-29.60	-13	-16.60
		High	Band Edge	-29.72	-13	-16.72
	5 MHz	Low	Band Edge	-23.63	-13	-10.63
		High	Band Edge	-21.91	-13	-8.91
LTE Band 12	10 MHz	Low	Band Edge	-27.91	-13	-14.91
		High	Band Edge	-30.43	-13	-17.43
	5 MHz	Low	Band Edge	-22.53	-13	-9.53
		High	Band Edge	-22.09	-13	-9.09
	3 MHz	Low	Band Edge	-16.86	-13	-3.86
		High	Band Edge	-17.17	-13	-4.17
	1.4 MHz	Low	Band Edge	-15.14	-13	-2.14
		High	Band Edge	-16.73	-13	-3.73
LTE Band 13	10 MHz	Low	Band Edge	-25.24	-13	-12.24
		Low	Emission Mask	-56.75	-13	-43.75
		High	Band Edge	-23.84	-13	-10.84
		High	Emission Mask	-62.42	-13	-49.42
	5 MHz	Low	Band Edge	-22.36	-13	-9.36
		Low	Emission Mask	-59.05	-13	-46.05
		High	Band Edge	-21.29	-13	-8.29
		High	EmMask	-72.68	-13	-59.68
NR Band n71	20 MHz	Low	Band Edge	-27.48	-13	-14.48
		High	Band Edge	-28.55	-13	-15.55
	15 MHz	Low	Band Edge	-27.42	-13	-14.42
		High	Band Edge	-30.33	-13	-17.33
	10 MHz	Low	Band Edge	-23.16	-13	-10.16
		High	Band Edge	-28.96	-13	-15.96
	5 MHz	Low	Band Edge	-20.84	-13	-7.84
		High	Band Edge	-18.32	-13	-5.32
NR Band n12	15 MHz	Low	Band Edge	-23.45	-13	-10.45
		High	Band Edge	-27.81	-13	-14.81
	10 MHz	Low	Band Edge	-24.84	-13	-11.84
		High	Band Edge	-25.21	-13	-12.21
	5 MHz	Low	Band Edge	-22.24	-13	-9.24
		High	Band Edge	-22.88	-13	-9.88

Table 7-9. Conducted Band Edge Test Results – Ant4

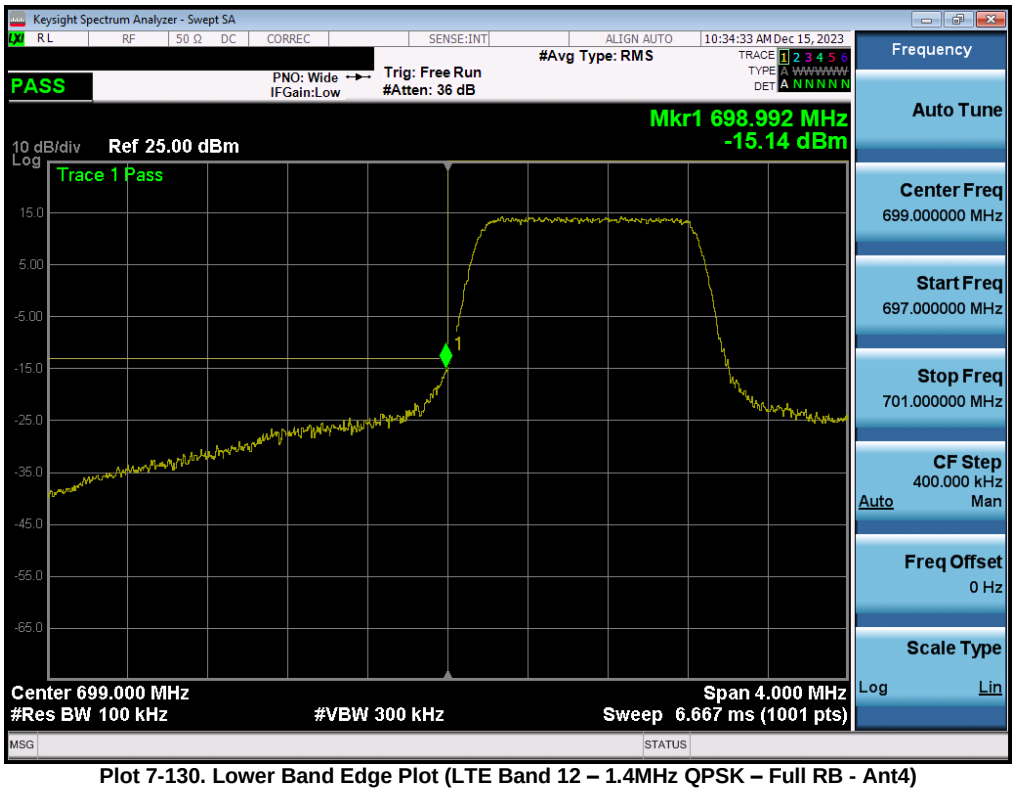
LTE Band 71 – Ant4



Plot 7-128. Lower Band Edge Plot (LTE Band 71 - 5MHz QPSK – Full RB - Ant4)

Plot 7-129. Upper Band Edge Plot (LTE Band 71 - 5MHz QPSK – Full RB - Ant4)

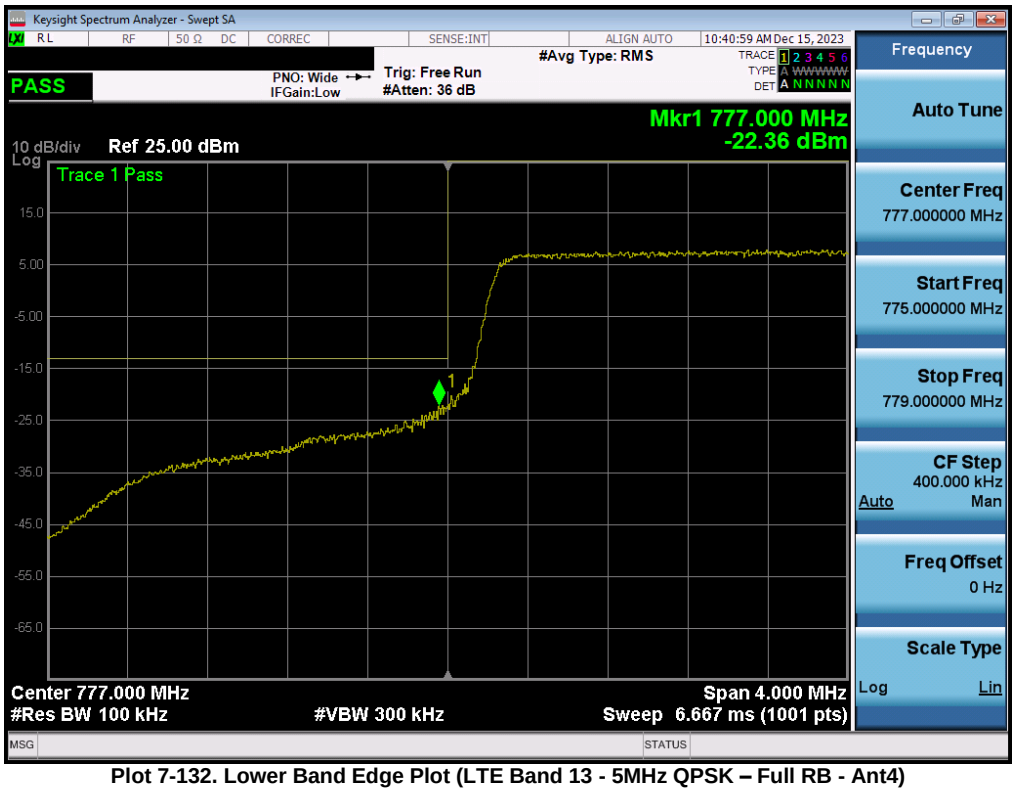
LTE Band 12 – Ant4



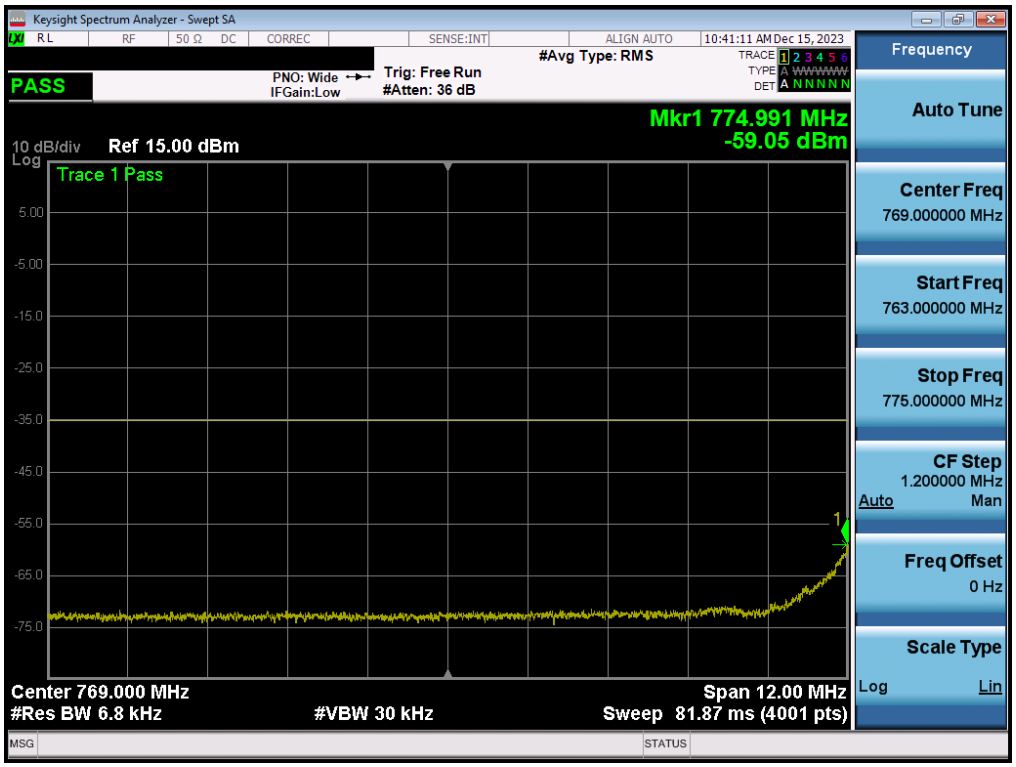
Plot 7-130. Lower Band Edge Plot (LTE Band 12 – 1.4MHz QPSK – Full RB - Ant4)

Plot 7-131. Upper Band Edge Plot (LTE Band 12 – 1.4MHz QPSK – Full RB - Ant4)

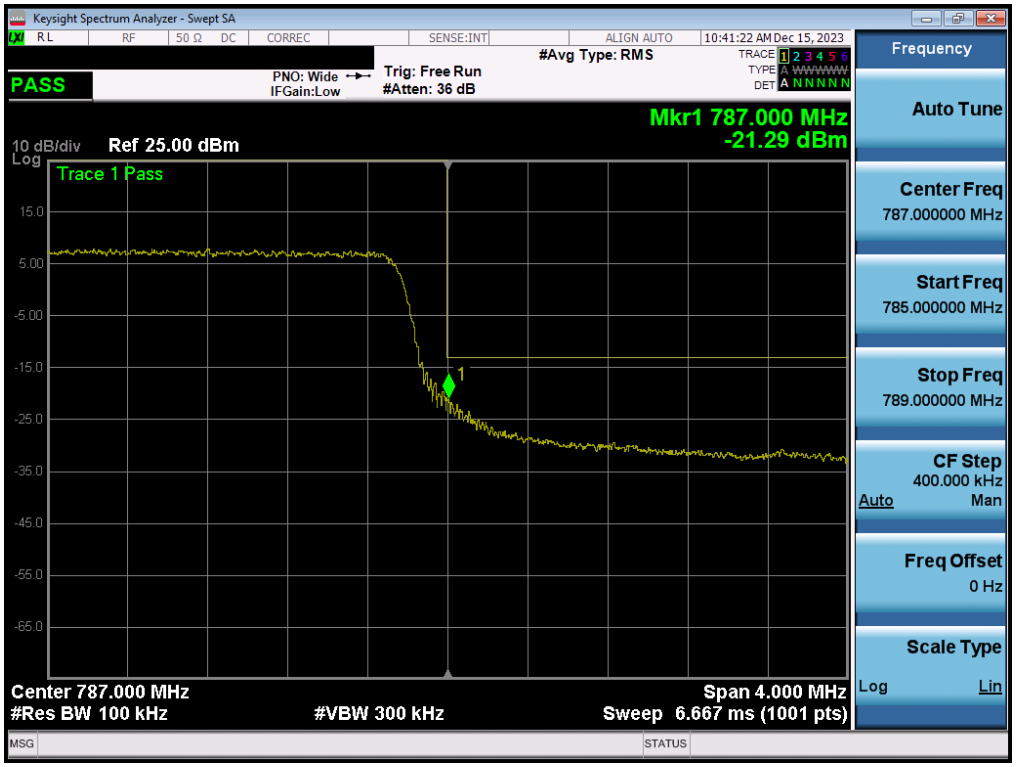
LTE Band 13 – Ant4



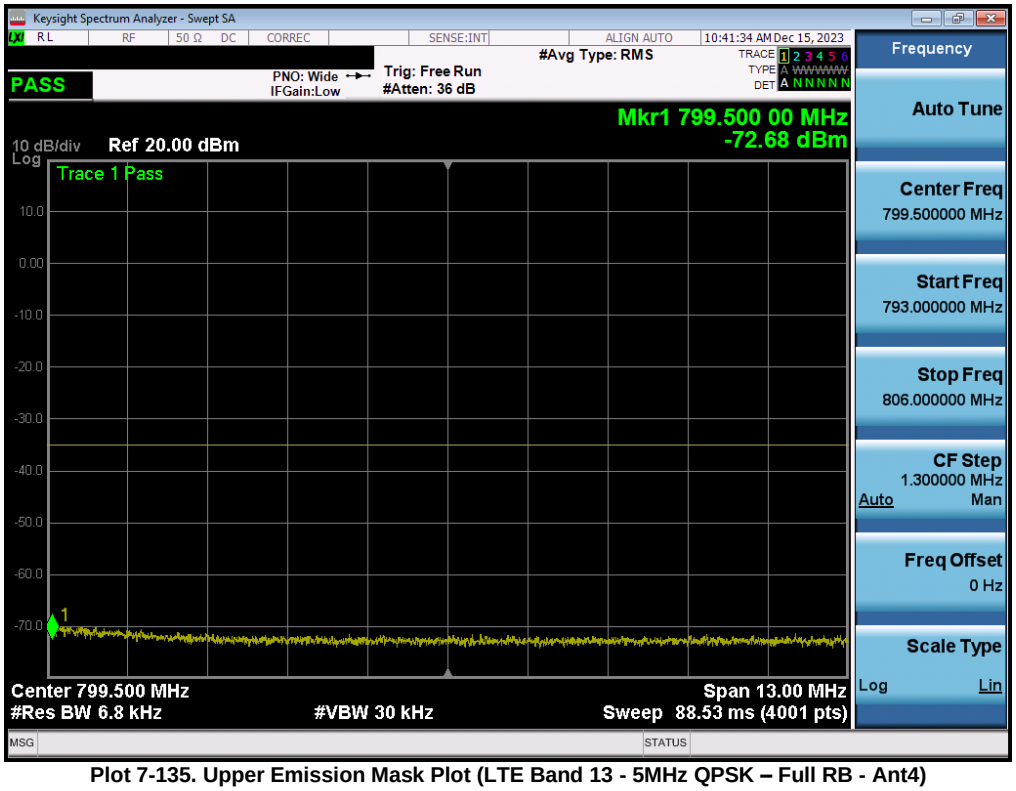
Plot 7-132. Lower Band Edge Plot (LTE Band 13 - 5MHz QPSK – Full RB - Ant4)



Plot 7-133. Lower Emission Mask Plot (LTE Band 13 - 5MHz QPSK – Full RB - Ant4)



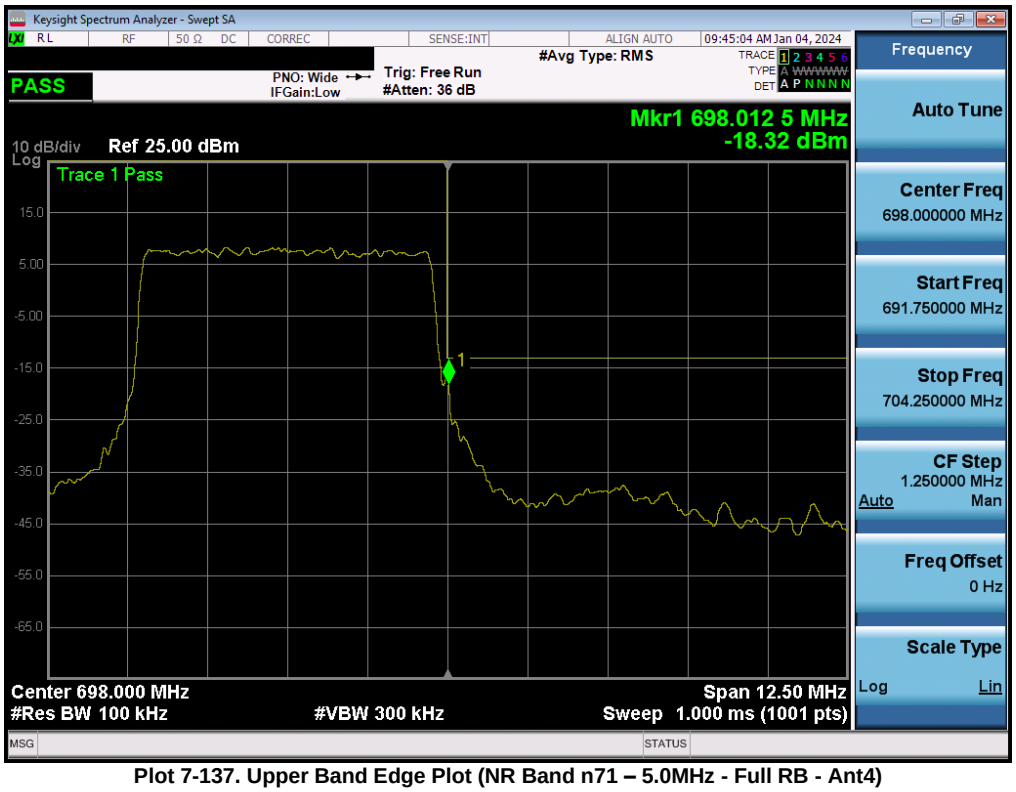
Plot 7-134. Upper Band Edge Plot (LTE Band 13 - 5MHz QPSK – Full RB - Ant4)



Plot 7-135. Upper Emission Mask Plot (LTE Band 13 - 5MHz QPSK – Full RB - Ant4)

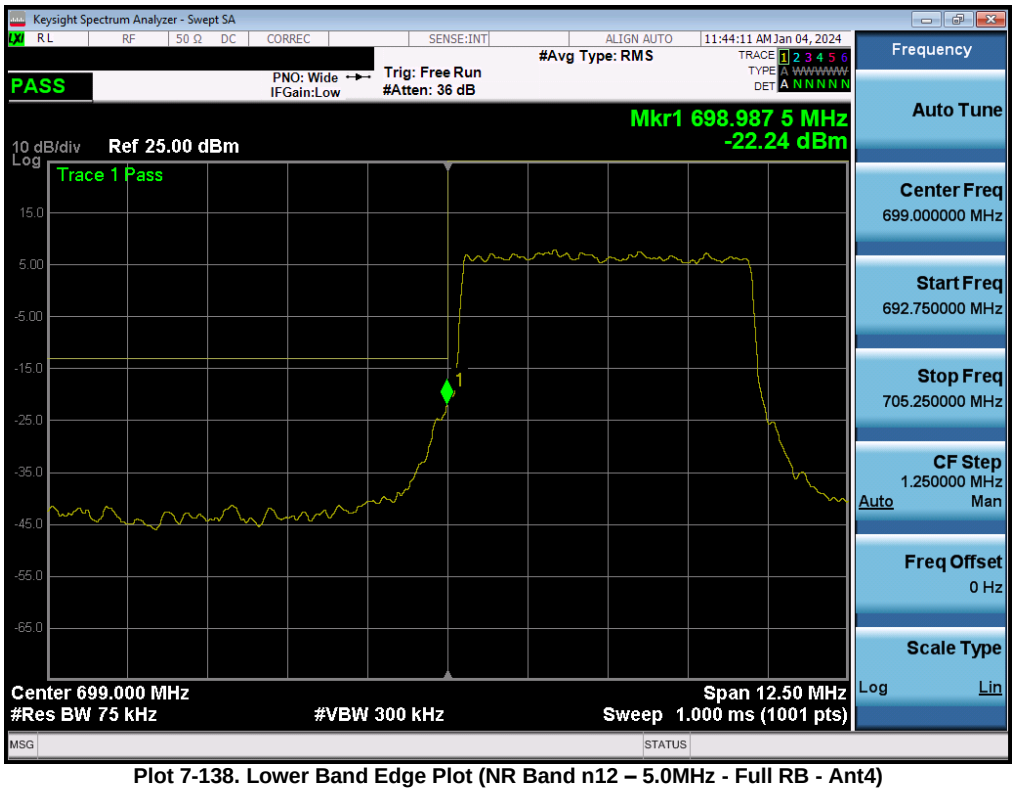
NR Band n71 – Ant4

Plot 7-136. Lower Band Edge Plot (NR Band n71 – 5.0MHz - Full RB - Ant4)



Plot 7-137. Upper Band Edge Plot (NR Band n71 – 5.0MHz - Full RB - Ant4)

NR Band n12 – Ant4



Plot 7-138. Lower Band Edge Plot (NR Band n12 – 5.0MHz - Full RB - Ant4)

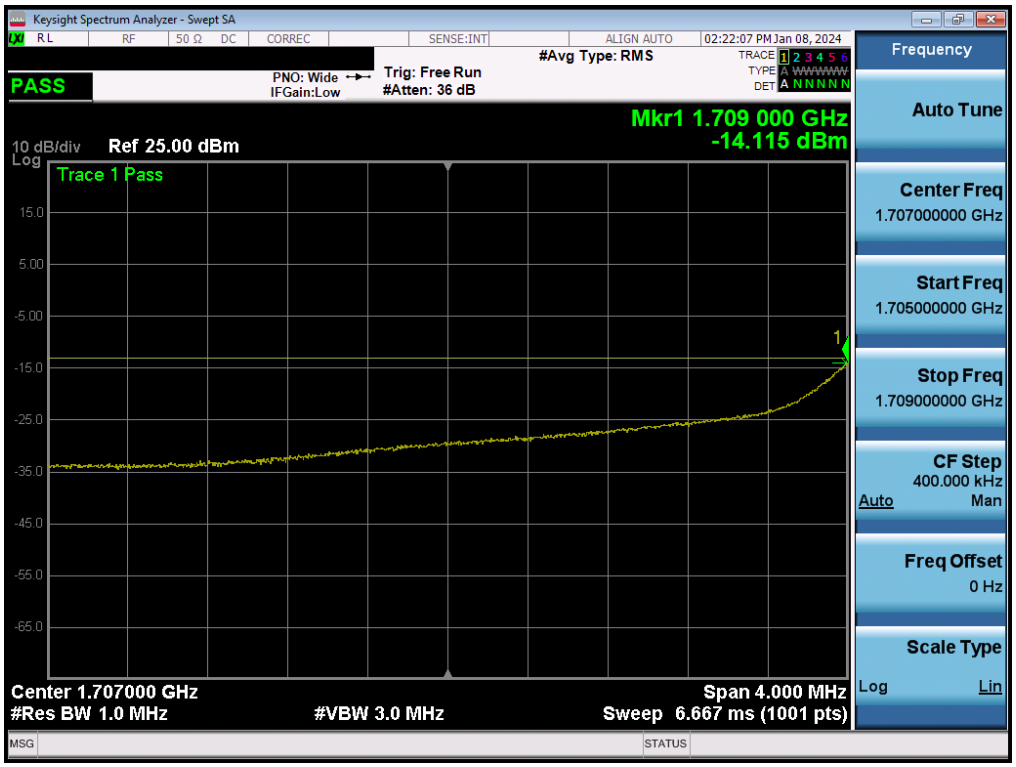
Plot 7-139. Upper Band Edge Plot (NR Band n12 – 5.0MHz - Full RB - Ant4)

Mode	Bandwidth	Channel	Test Case	Level [dBm]	Limit [dBm]	Margin [dB]
WCDMA1700	N/A	Low	Band Edge	-21.89	-13	-8.89
		Low	Extended	-14.12	-13	-1.12
		High	Band Edge	-25.23	-13	-12.23
		High	Extended	-17.85	-13	-4.85
LTE Band 66/4	20MHz	Low	Band Edge	-22.44	-13	-9.44
		Low	Extended	-20.43	-13	-7.43
		High (B4)	Band Edge	-28.05	-13	-15.05
		High (B4)	Extended	-26.04	-13	-13.04
		High (B66)	Band Edge	-24.25	-13	-11.25
		High (B66)	Extended	-21.70	-13	-8.70
	15MHz	Low	Band Edge	-23.37	-13	-10.37
		Low	Extended	-20.79	-13	-7.79
		High (B4)	Band Edge	-23.79	-13	-10.79
		High (B4)	Extended	-22.61	-13	-9.61
		High (B66)	Band Edge	-22.68	-13	-9.68
		High (B66)	Extended	-19.49	-13	-6.49
	10MHz	Low	Band Edge	-22.20	-13	-9.20
		Low	Extended	-19.64	-13	-6.64
		High (B4)	Band Edge	-24.66	-13	-11.66
		High (B4)	Extended	-21.02	-13	-8.02
		High (B66)	Band Edge	-20.57	-13	-7.57
		High (B66)	Extended	-18.83	-13	-5.83
	5MHz	Low	Band Edge	-20.28	-13	-7.28
		Low	Extended	-22.25	-13	-9.25
		High (B4)	Band Edge	-21.13	-13	-8.13
		High (B4)	Extended	-24.15	-13	-11.15
		High (B66)	Band Edge	-21.91	-13	-8.91
		High (B66)	Extended	-21.03	-13	-8.03
	3MHz	Low	Band Edge	-19.68	-13	-6.68
		Low	Extended	-25.00	-13	-12.00
		High (B4)	Band Edge	-17.97	-13	-4.97
		High (B4)	Extended	-29.65	-13	-16.65
		High (B66)	Band Edge	-19.29	-13	-6.29
		High (B66)	Extended	-23.16	-13	-10.16
	1.4MHz	Low	Band Edge	-21.45	-13	-8.45
		Low	Extended	-22.43	-13	-9.43
		High (B4)	Band Edge	-22.68	-13	-9.68
		High (B4)	Extended	-23.48	-13	-10.48
		High (B66)	Band Edge	-21.33	-13	-8.33
		High (B66)	Extended	-22.92	-13	-9.92

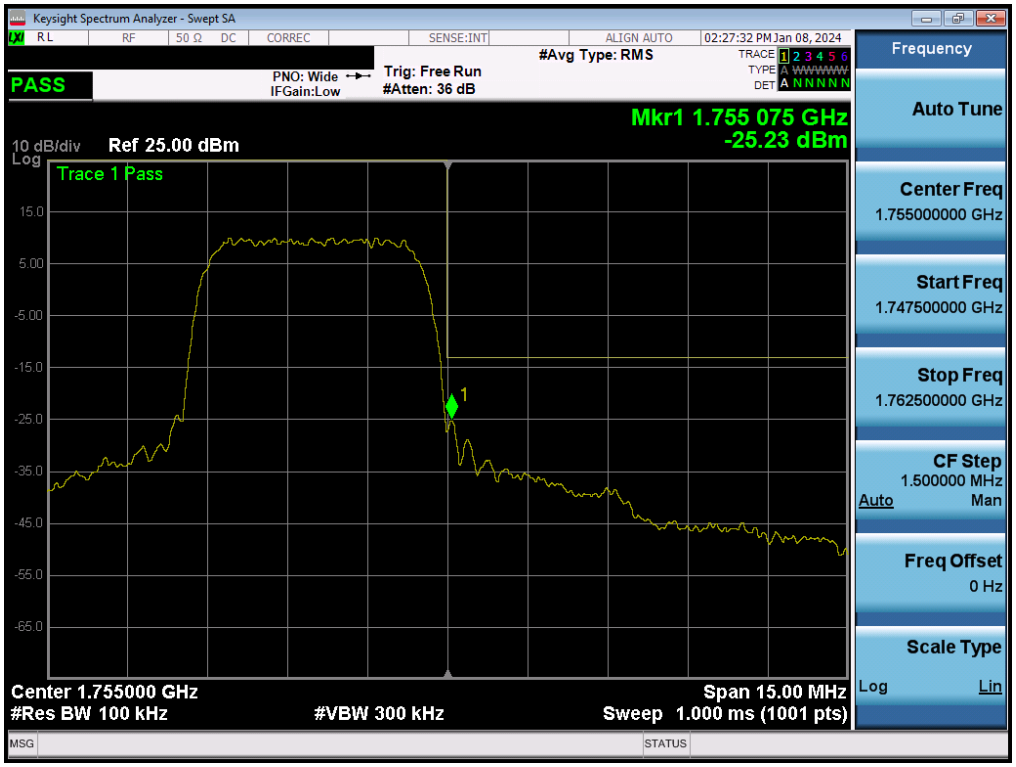
Table 7-10. Conducted Band Edge Test Results – Ant1

WCDMA AWS – Ant1

Plot 7-140. Lower Band Edge Plot (WCDMA AWS – Ch. 1312 – Ant4)



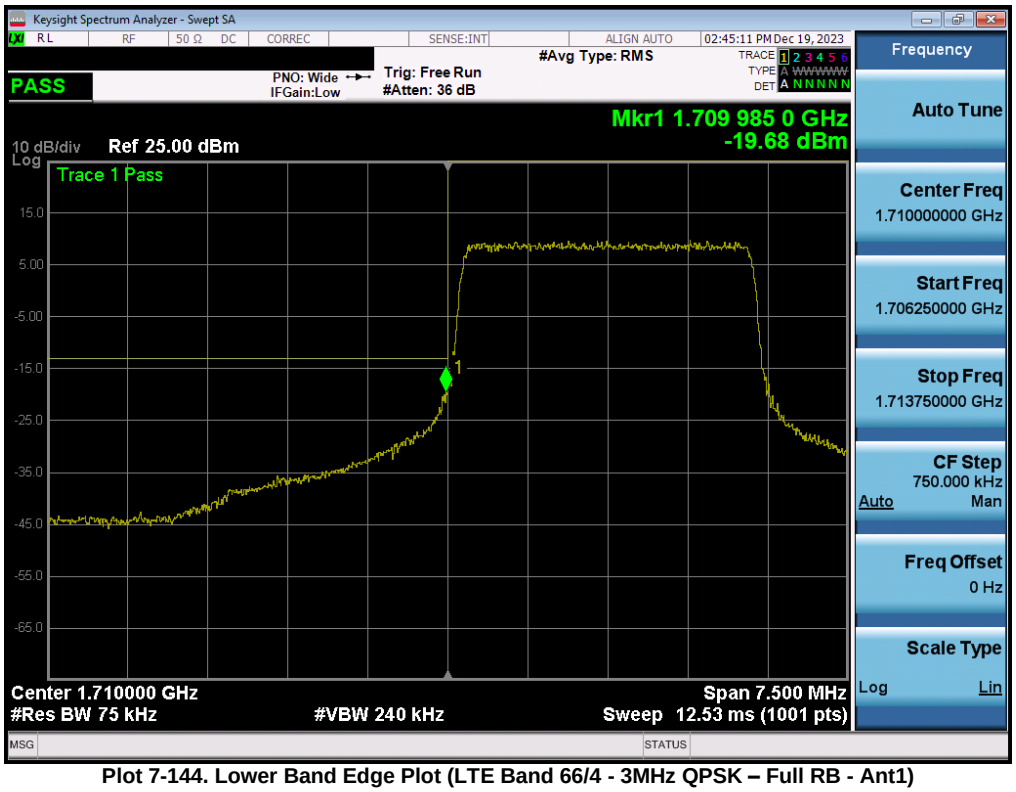
Plot 7-141. Lower Extended Band Edge Plot (WCDMA AWS – Ch. 1312 – Ant4)



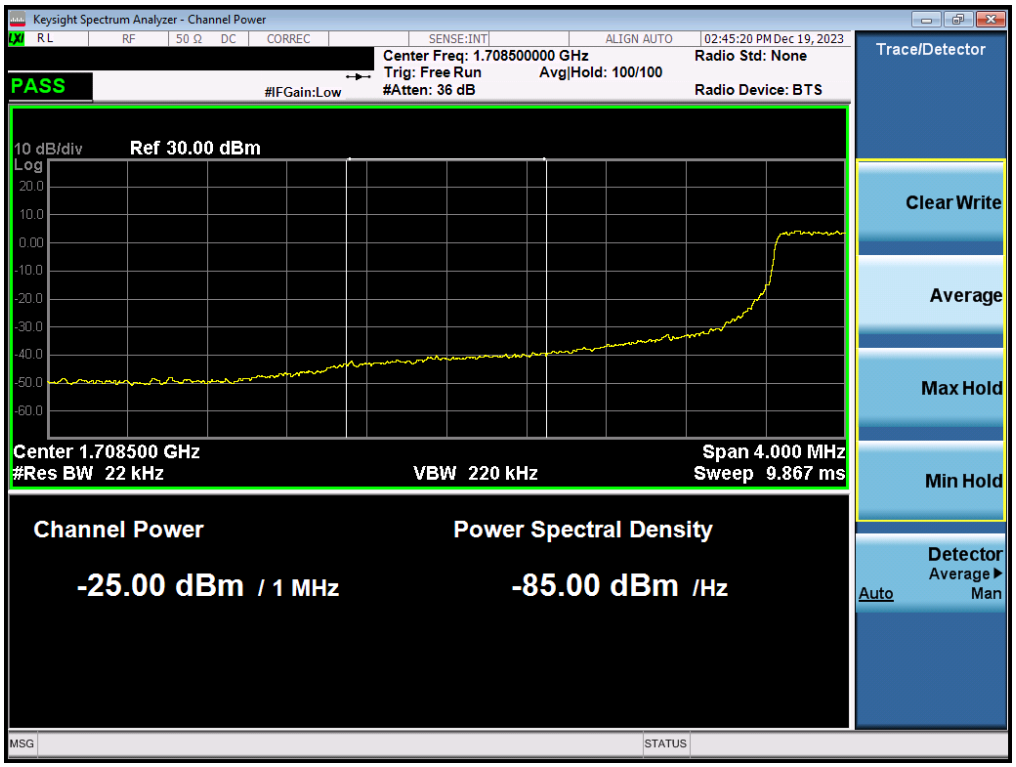
Plot 7-142. Upper Band Edge Plot (WCDMA AWS – Ch. 1312 – Ant4)

Plot 7-143. Upper Extended Band Edge Plot (WCDMA AWS – Ch. 1312 – Ant4)

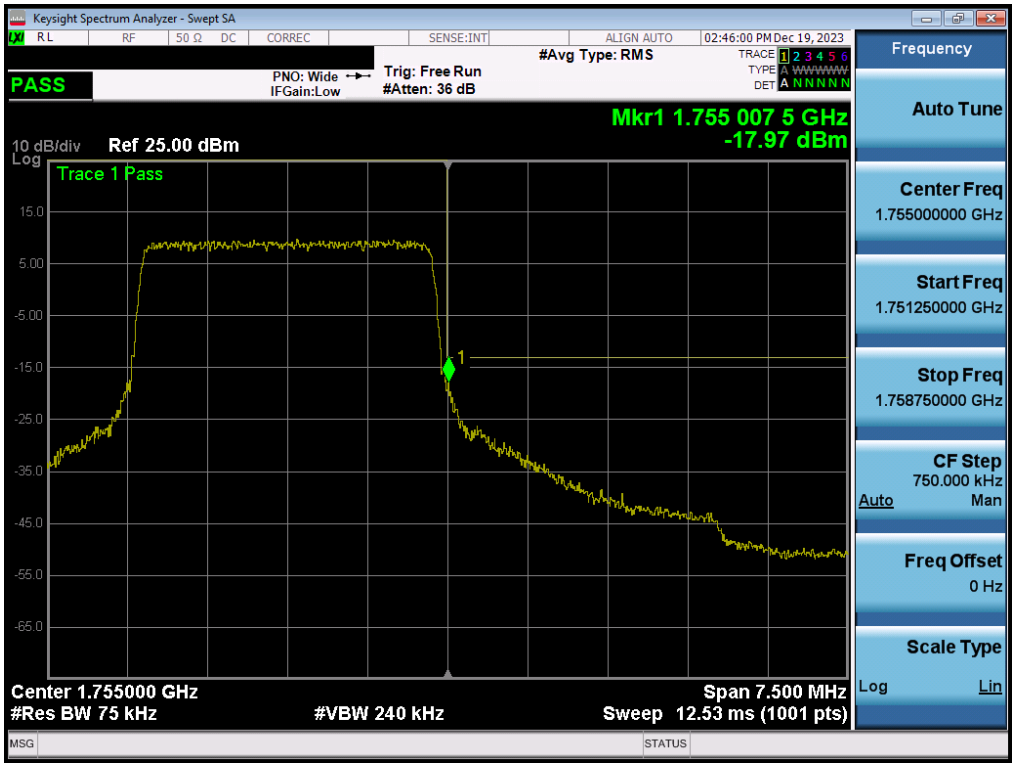
LTE Band 66/4 – Ant1



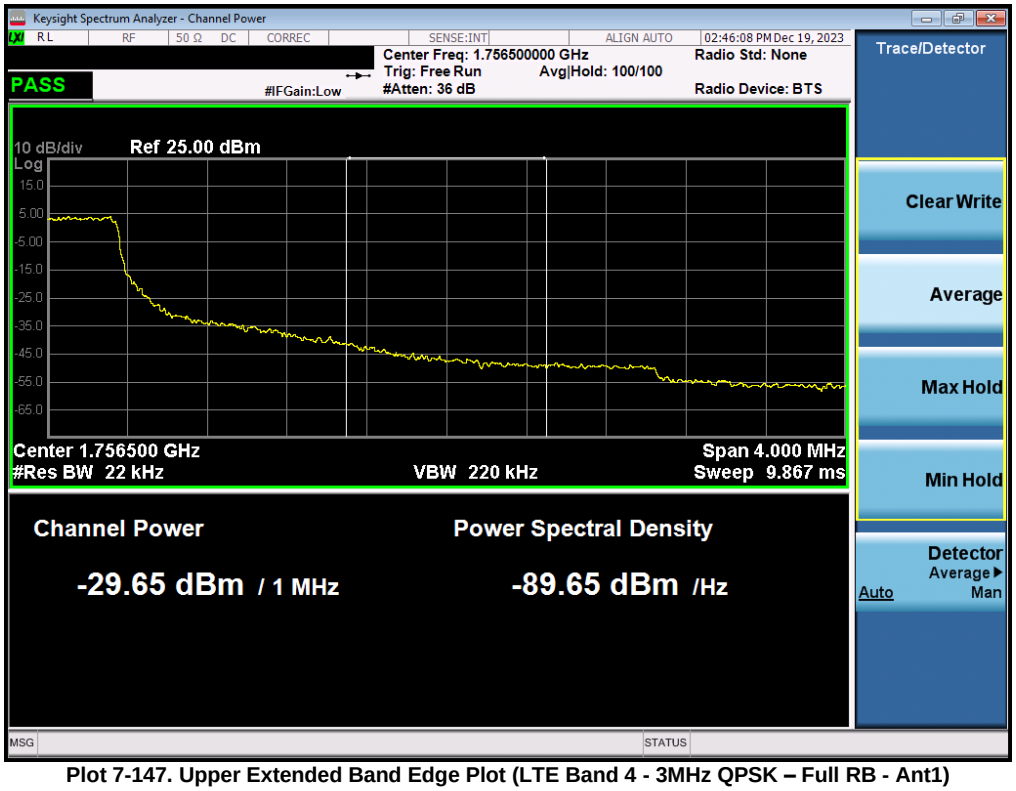
Plot 7-144. Lower Band Edge Plot (LTE Band 66/4 - 3MHz QPSK – Full RB - Ant1)



Plot 7-145. Lower Extended Band Edge Plot (LTE Band 66/4 - 3MHz QPSK – Full RB - Ant1)

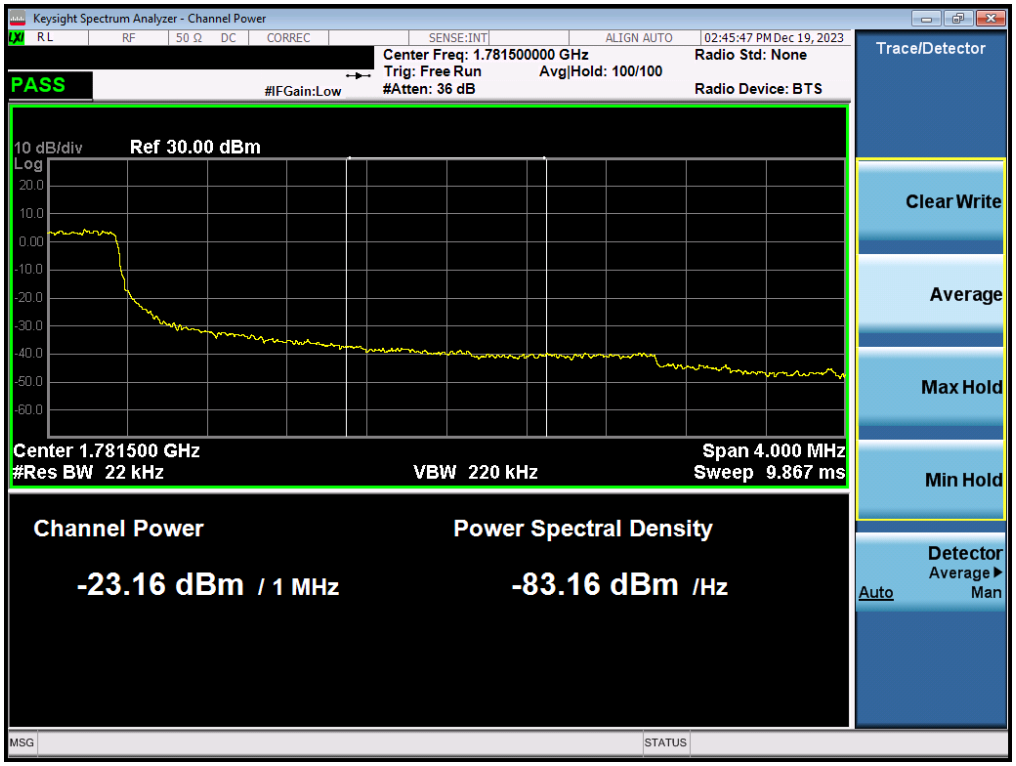


Plot 7-146. Upper Band Edge Plot (LTE Band 4 - 3MHz QPSK – Full RB - Ant1)



Plot 7-147. Upper Extended Band Edge Plot (LTE Band 4 - 3MHz QPSK – Full RB - Ant1)

Plot 7-148. Upper Band Edge Plot (LTE Band 66 - 3MHz QPSK – Full RB - Ant1)

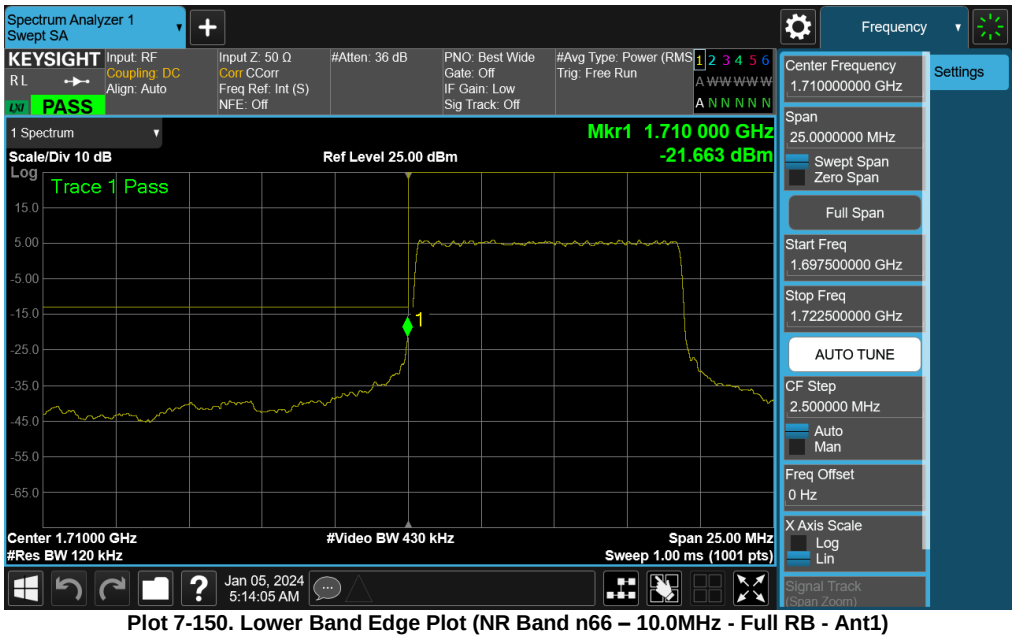


Plot 7-149. Upper Extended Band Edge Plot (LTE Band 66 - 3MHz QPSK – Full RB - Ant1)

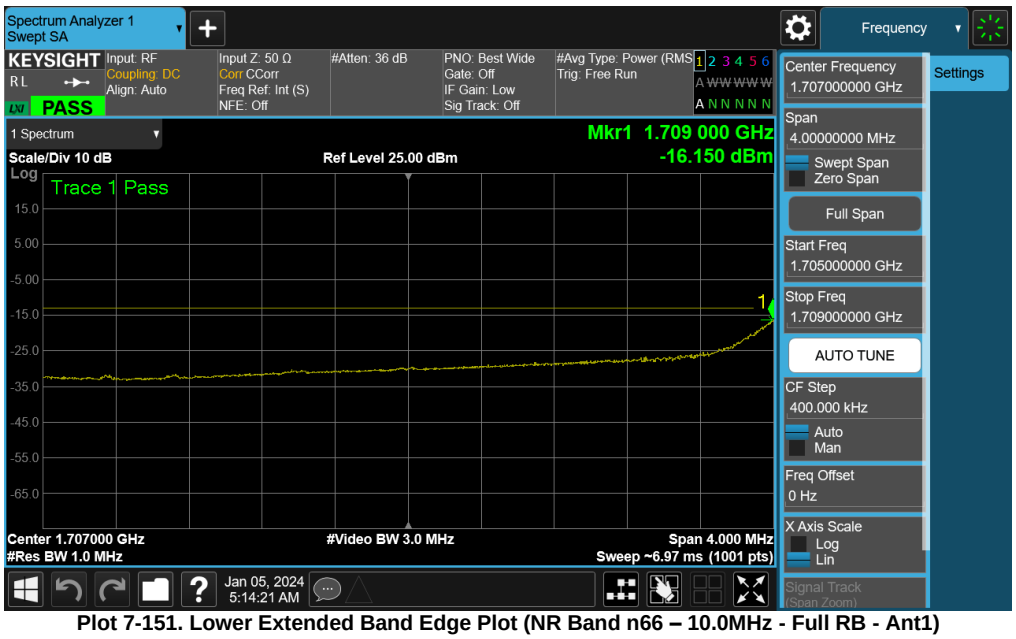
Mode	Bandwidth	Channel	Test Case	Level [dBm]	Limit [dBm]	Margin [dB]
NR Band n66	40 MHz	Low	Band Edge	-26.73	-13	-13.73
		Low	Extended	-28.05	-13	-15.05
		High	Band Edge	-23.84	-13	-10.84
		High	Extended	-28.54	-13	-15.54
	30 MHz	Low	Band Edge	-25.14	-13	-12.14
		Low	Extended	-24.46	-13	-11.46
		High	Band Edge	-22.95	-13	-9.95
		High	Extended	-24.14	-13	-11.14
	25 MHz	Low	Band Edge	-21.21	-13	-8.21
		Low	Extended	-21.21	-13	-8.21
		High	Band Edge	-22.08	-13	-9.08
		High	Extended	-22.08	-13	-9.08
	20 MHz	Low	Band Edge	-25.89	-13	-12.89
		Low	Extended	-22.06	-13	-9.06
		High	Band Edge	-26.49	-13	-13.49
		High	Extended	-21.71	-13	-8.71
	15 MHz	Low	Band Edge	-28.70	-13	-15.70
		Low	Extended	-22.44	-13	-9.44
		High	Band Edge	-28.47	-13	-15.47
		High	Extended	-23.86	-13	-10.86
	10 MHz	Low	Band Edge	-21.66	-13	-8.66
		Low	Extended	-16.15	-13	-3.15
		High	Band Edge	-24.89	-13	-11.89
		High	Extended	-17.73	-13	-4.73
	5 MHz	Low	Band Edge	-25.06	-13	-12.06
		Low	Extended	-29.14	-13	-16.14
		High	Band Edge	-23.15	-13	-10.15
		High	Extended	-30.49	-13	-17.49
LTE Band 66B/C ULCA	40 MHz	Low	Band Edge	-16.77	-13	-3.77
		Low	Extended	-28.86	-13	-15.86
		High	Band Edge	-15.54	-13	-2.54
		High	Extended	-24.31	-13	-11.31

Table 7-11. Conducted Band Edge Test Results – Ant1

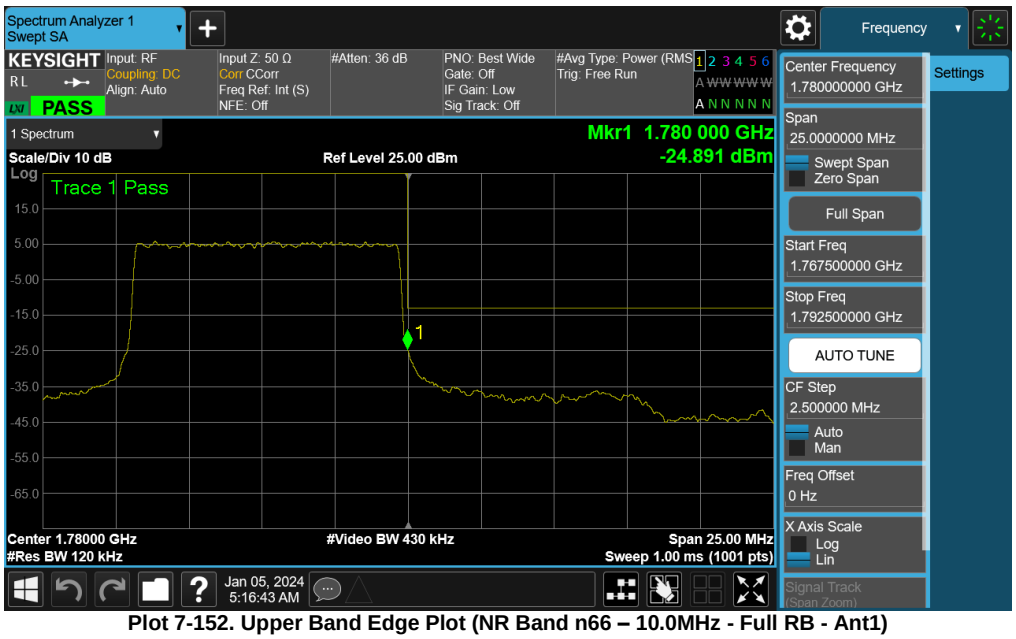
NR Band n66 – Ant1



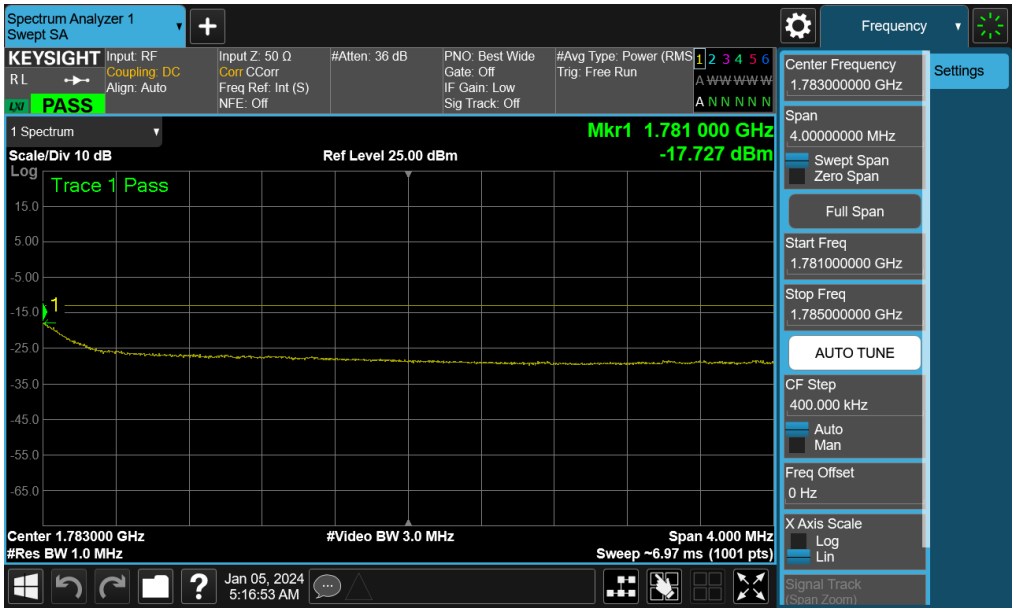
Plot 7-150. Lower Band Edge Plot (NR Band n66 – 10.0MHz - Full RB - Ant1)



Plot 7-151. Lower Extended Band Edge Plot (NR Band n66 – 10.0MHz - Full RB - Ant1)

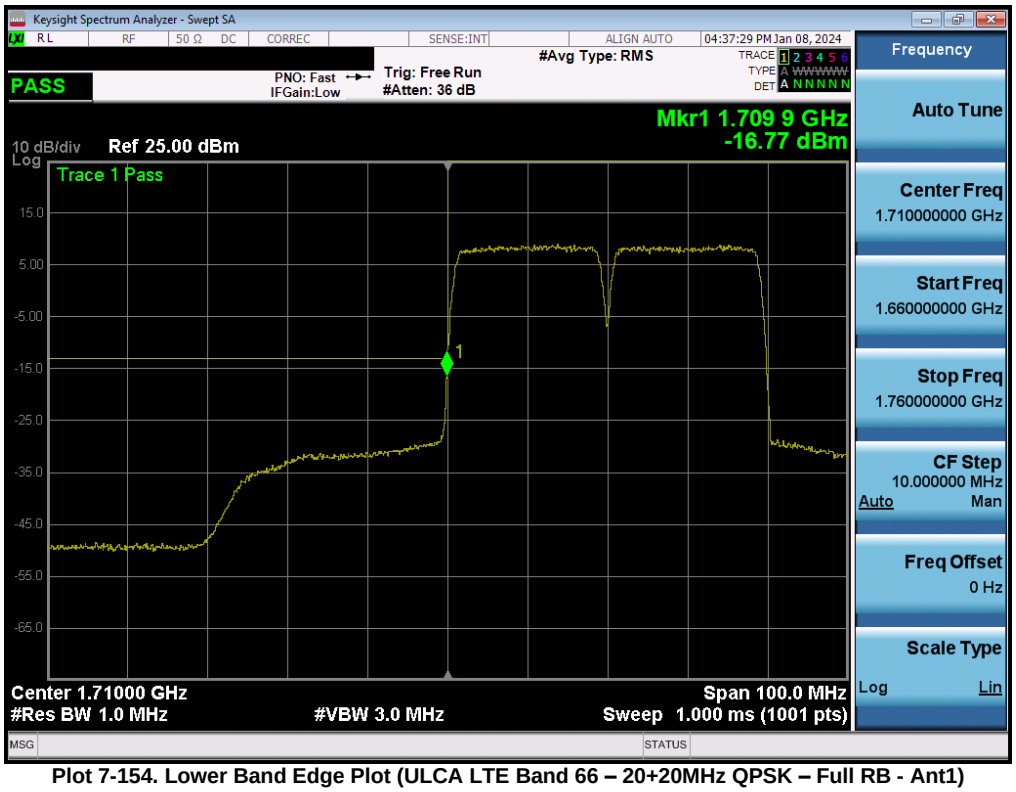


Plot 7-152. Upper Band Edge Plot (NR Band n66 – 10.0MHz - Full RB - Ant1)

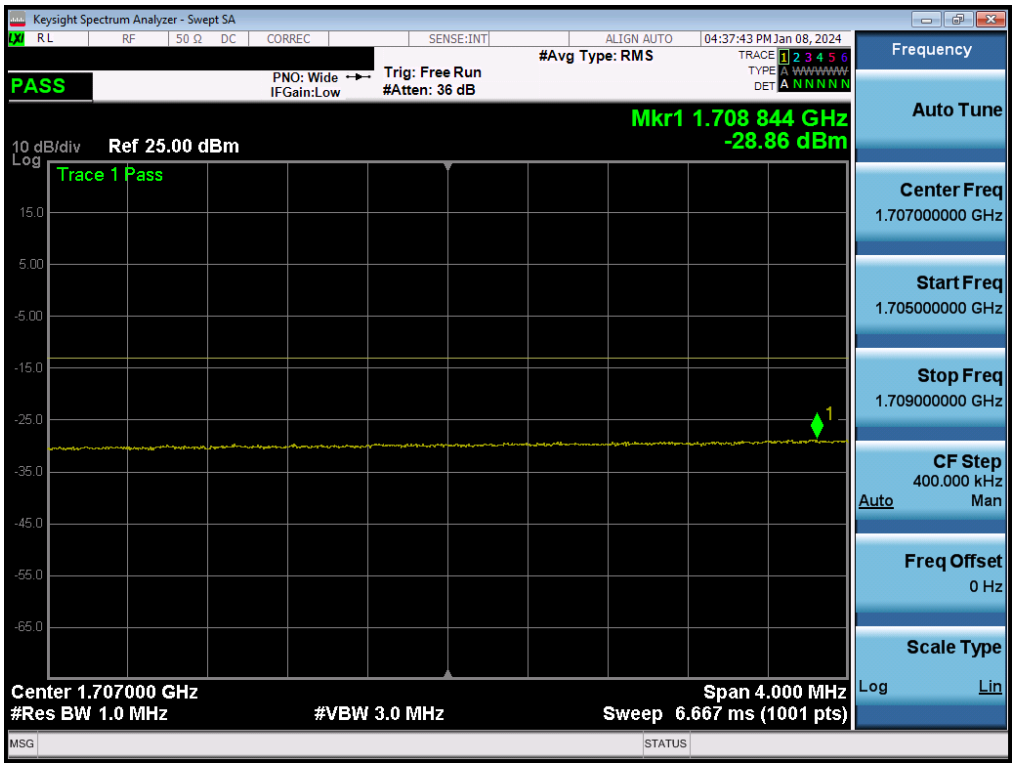


Plot 7-153. Upper Extended Band Edge Plot (NR Band n66 – 10.0MHz - Full RB - Ant1)

ULCA LTE Band 66 – Ant1



Plot 7-154. Lower Band Edge Plot (ULCA LTE Band 66 – 20+20MHz QPSK – Full RB - Ant1)



Plot 7-155. Lower Extended Band Edge Plot (ULCA LTE Band 66 – 20+20MHz QPSK – Full RB - Ant1)

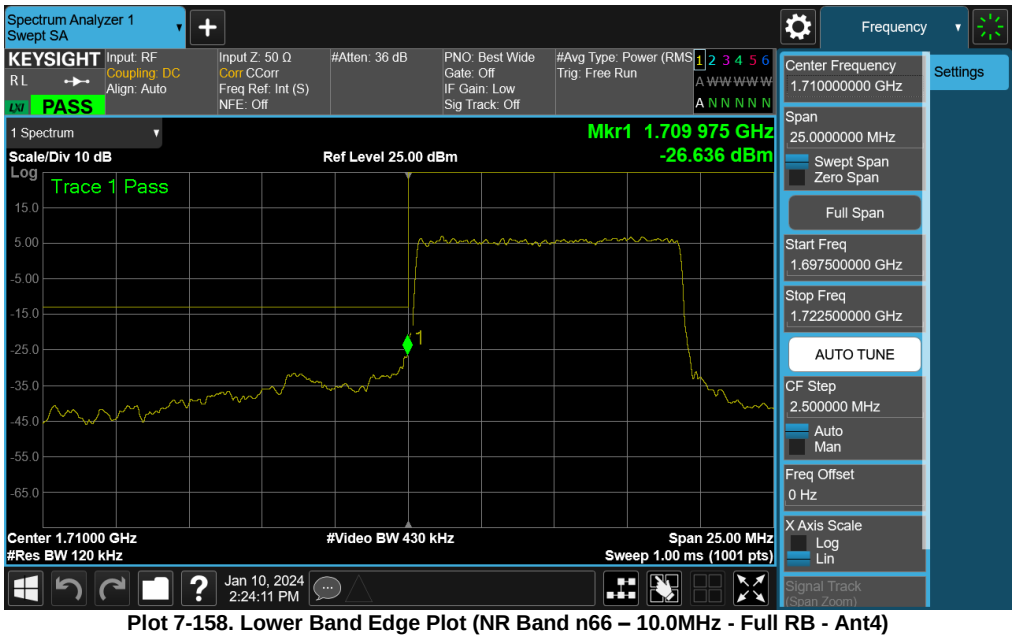
Plot 7-156. Upper Band Edge Plot (ULCA LTE Band 66 – 20+20MHz QPSK – Full RB - Ant1)

Plot 7-157. Upper Extended Band Edge Plot (ULCA LTE Band 66 – 20+20MHz QPSK – Full RB - Ant1)

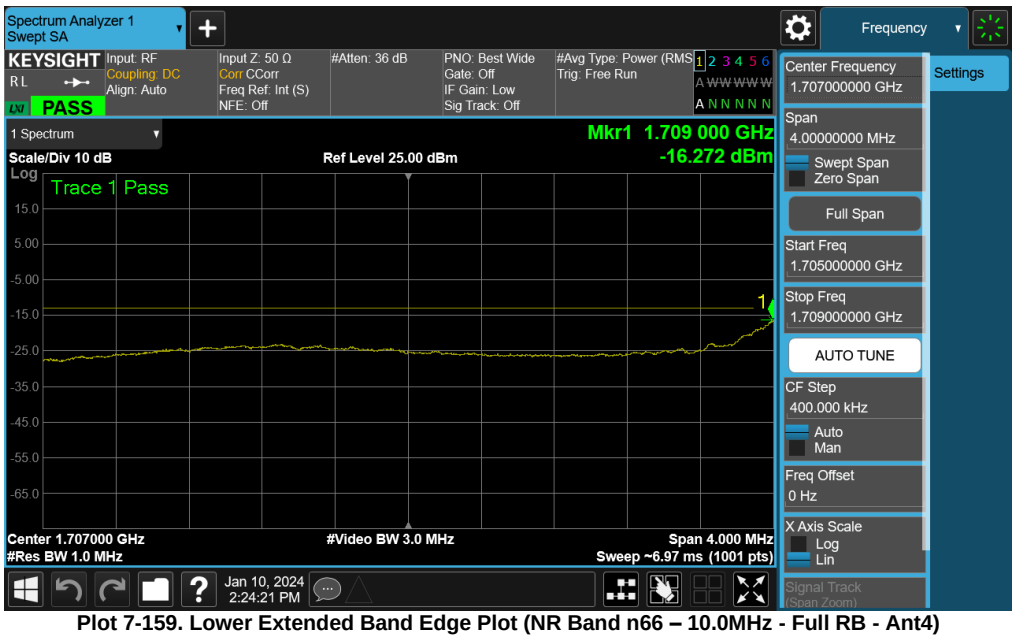
Mode	Bandwidth	Channel	Test Case	Level [dBm]	Limit [dBm]	Margin [dB]
NR Band n66	40 MHz	Low	Band Edge	-25.36	-13	-12.36
		Low	Extended	-24.86	-13	-11.86
		High	Band Edge	-22.83	-13	-9.83
		High	Extended	-27.00	-13	-14.00
	30 MHz	Low	Band Edge	-24.41	-13	-11.41
		Low	Extended	-24.77	-13	-11.77
		High	Band Edge	-23.73	-13	-10.73
		High	Extended	-22.61	-13	-9.61
	25 MHz	Low	Band Edge	-29.84	-13	-16.84
		Low	Extended	-29.84	-13	-16.84
		High	Band Edge	-29.27	-13	-16.27
		High	Extended	-29.27	-13	-16.27
	20 MHz	Low	Band Edge	-24.61	-13	-11.61
		Low	Extended	-19.65	-13	-6.65
		High	Band Edge	-26.59	-13	-13.59
		High	Extended	-22.32	-13	-9.32
	15 MHz	Low	Band Edge	-26.74	-13	-13.74
		Low	Extended	-19.81	-13	-6.81
		High	Band Edge	-27.16	-13	-14.16
		High	Extended	-22.29	-13	-9.29
	10 MHz	Low	Band Edge	-26.64	-13	-13.64
		Low	Extended	-16.27	-13	-3.27
		High	Band Edge	-28.58	-13	-15.58
		High	Extended	-19.00	-13	-6.00
	5 MHz	Low	Band Edge	-22.98	-13	-9.98
		Low	Extended	-25.43	-13	-12.43
		High	Band Edge	-22.50	-13	-9.50
		High	Extended	-25.15	-13	-12.15

Table 7-12. Conducted Band Edge Test Results – Ant4

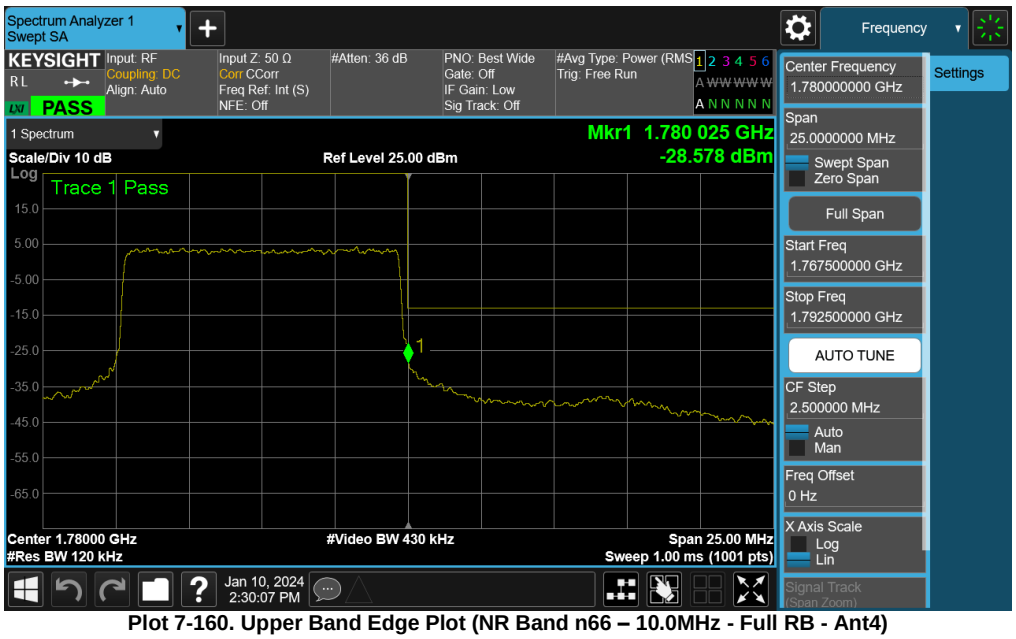
NR Band n66 – Ant4



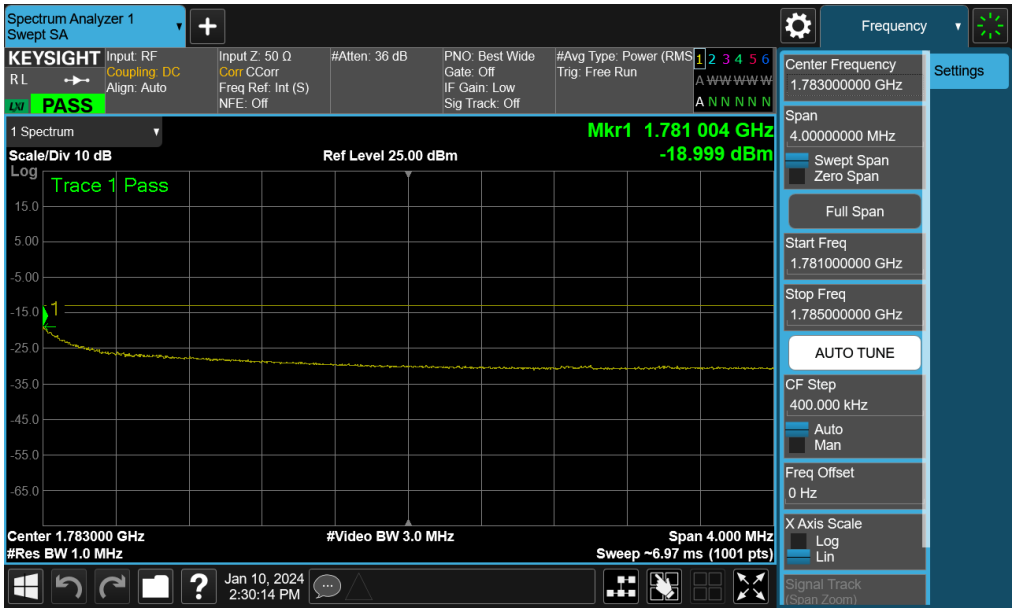
Plot 7-158. Lower Band Edge Plot (NR Band n66 – 10.0MHz - Full RB - Ant4)



Plot 7-159. Lower Extended Band Edge Plot (NR Band n66 – 10.0MHz - Full RB - Ant4)



Plot 7-160. Upper Band Edge Plot (NR Band n66 – 10.0MHz - Full RB - Ant4)



Plot 7-161. Upper Extended Band Edge Plot (NR Band n66 – 10.0MHz - Full RB - Ant4)

7.6 Peak-Average Ratio

Test Overview

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

Test Procedure Used

ANSI C63.26-2015 – Section 5.2.3.4

Test Settings

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW ≥ OBW or specified reference bandwidth
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

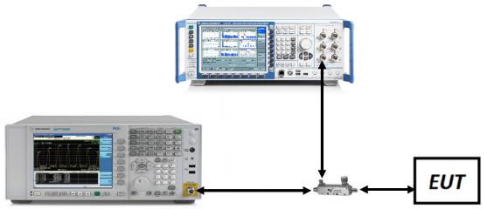


Figure 7-5. Test Instrument & Measurement Setup

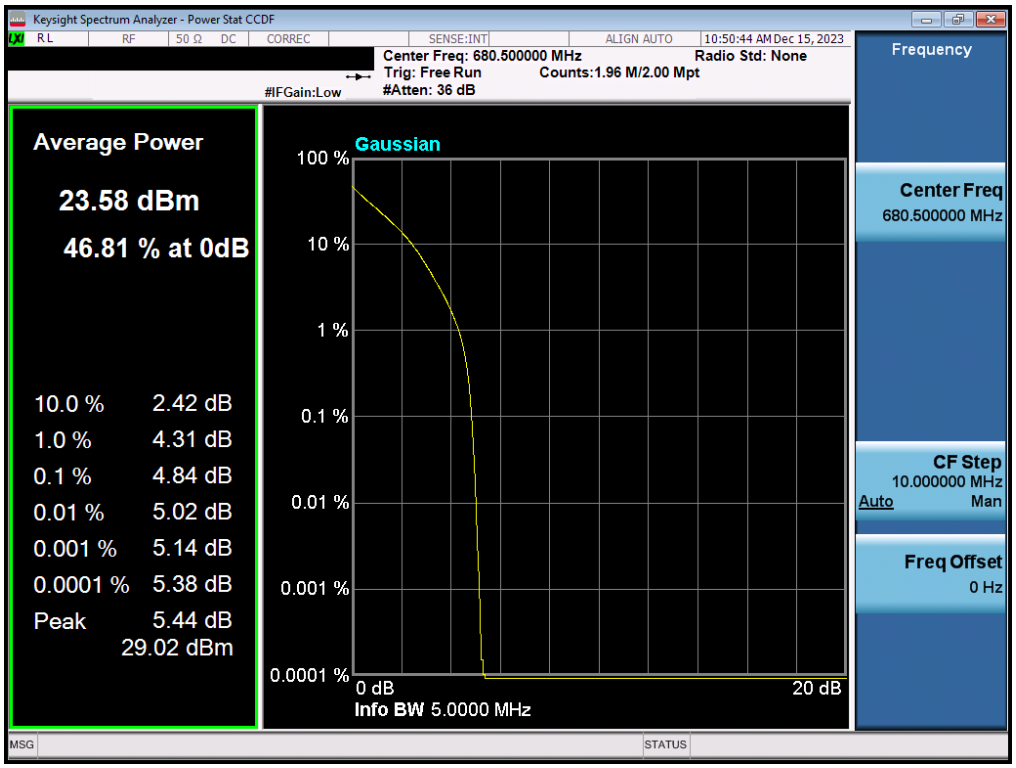
Test Notes

For the QAM modulations, 256QAM was found to have the worst-case peak-to-average ratio so it is the only QAM measurement included in this section.

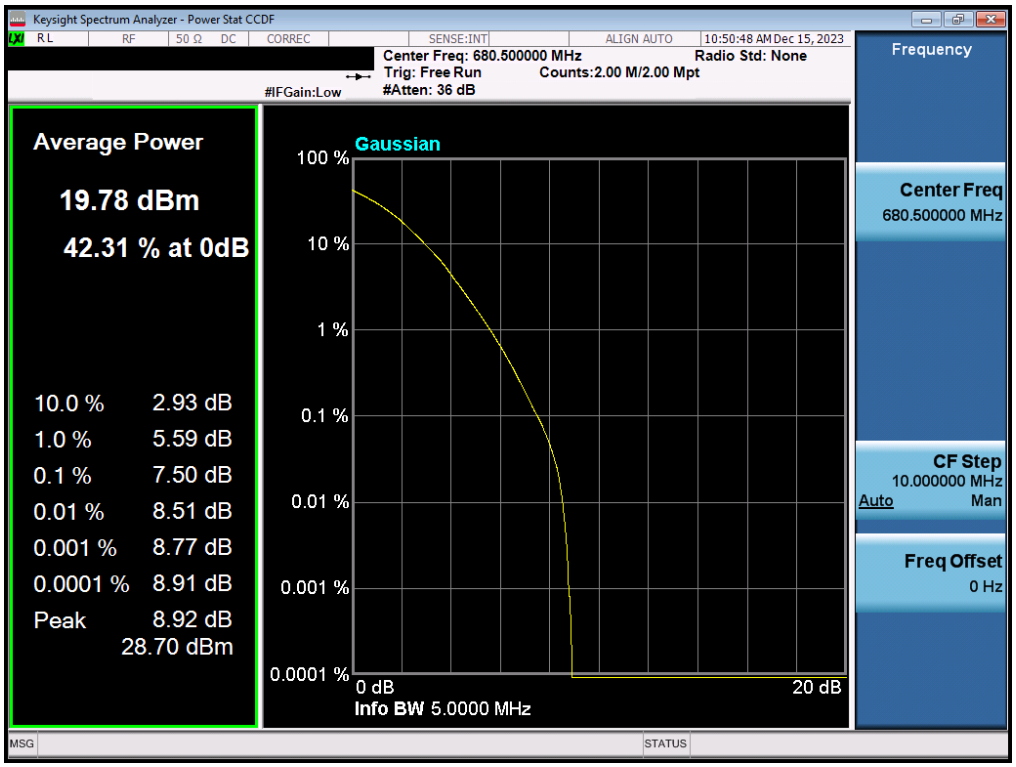
Mode	Bandwidth	Modulation	Average Power [dBm]	PAR at 0.1% [dB]	PAR Limit [dB]	Margin [dB]
LTE-B71	20MHz	QPSK	23.39	4.63	13	-8.37
		256QAM	19.37	6.58	13	-6.42
	15MHz	QPSK	23.39	4.80	13	-8.20
		256QAM	19.40	6.66	13	-6.34
	10MHz	QPSK	22.56	4.80	13	-8.20
		256QAM	19.57	6.70	13	-6.30
	5MHz	QPSK	23.58	4.83	13	-8.17
		256QAM	19.78	7.50	13	-5.50
LTE-B12	10MHz	QPSK	23.85	4.74	13	-8.26
		256QAM	19.95	6.65	13	-6.35
	5MHz	QPSK	23.86	4.74	13	-8.26
		256QAM	19.93	6.71	13	-6.29
	3MHz	QPSK	23.84	4.62	13	-8.38
		256QAM	20.24	7.54	13	-5.46
	1.4MHz	QPSK	23.78	5.02	13	-7.98
		256QAM	20.05	7.34	13	-5.66
LTE-B13	10MHz	QPSK	23.54	4.77	13	-8.23
		256QAM	19.59	6.63	13	-6.37
	5MHz	QPSK	23.55	4.74	13	-8.26
		256QAM	19.60	6.67	13	-6.33
NR-n71	20MHz	π/2 BPSK	23.93	3.74	13	-9.26
		QPSK	21.48	6.50	13	-6.50
		256QAM	17.97	8.45	13	-4.55
	15MHz	π/2 BPSK	23.89	3.86	13	-9.14
		QPSK	21.49	6.45	13	-6.55
		256QAM	17.94	8.35	13	-4.65
	10MHz	π/2 BPSK	23.81	3.87	13	-9.13
		QPSK	21.31	6.58	13	-6.42
		256QAM	17.85	8.53	13	-4.47
	5MHz	π/2 BPSK	23.77	4.07	13	-8.93
		QPSK	21.52	6.43	13	-6.57
		256QAM	17.86	8.17	13	-4.83
NR-n12	15MHz	π/2 BPSK	24.36	3.99	13	-9.01
		QPSK	21.92	6.58	13	-6.42
		256QAM	18.39	8.42	13	-4.58
	10MHz	π/2 BPSK	24.18	3.89	13	-9.11
		QPSK	21.62	6.64	13	-6.36
		256QAM	18.13	8.22	13	-4.78
	5MHz	π/2 BPSK	24.23	3.85	13	-9.15
		QPSK	21.77	6.41	13	-6.59
		256QAM	18.25	7.86	13	-5.14

Table 7-13. Peak-Average Ratio Test Results – Ant4

LTE Band 71 – Ant4

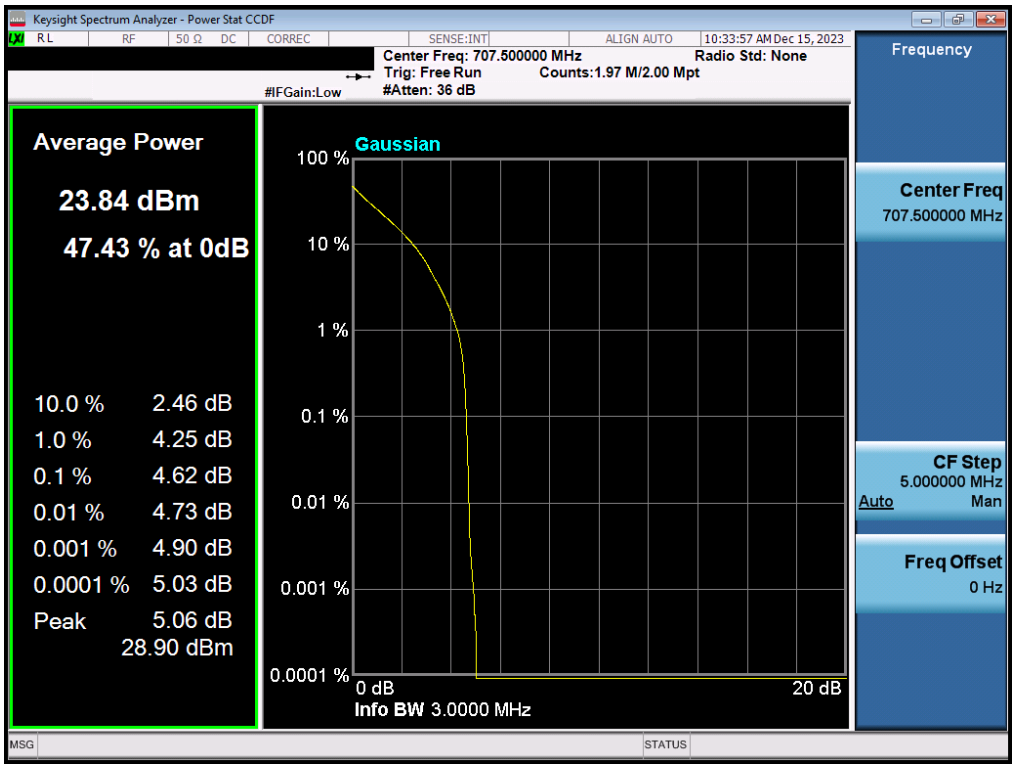


Plot 7-162. PAR Plot (LTE Band 71 - 5MHz QPSK - Full RB - Ant4)

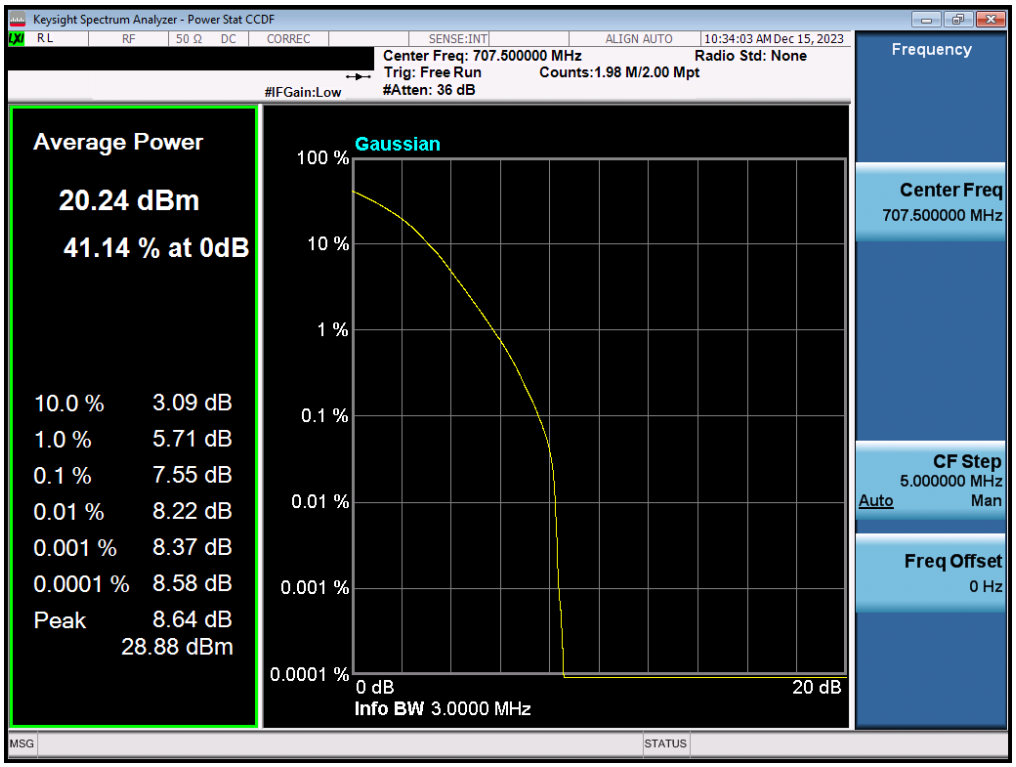


Plot 7-163. PAR Plot (LTE Band 71 - 5MHz 256-QAM - Full RB - Ant4)

LTE Band 12 – Ant4

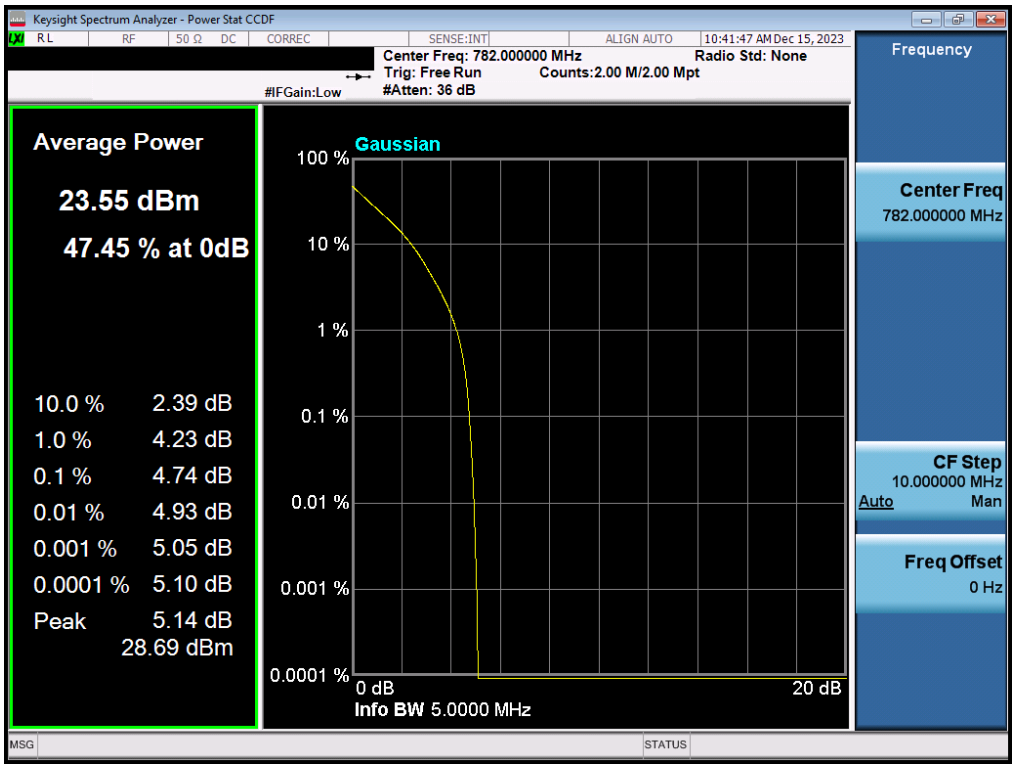


Plot 7-164. PAR Plot (LTE Band 12 - 3MHz QPSK - Full RB - Ant4)

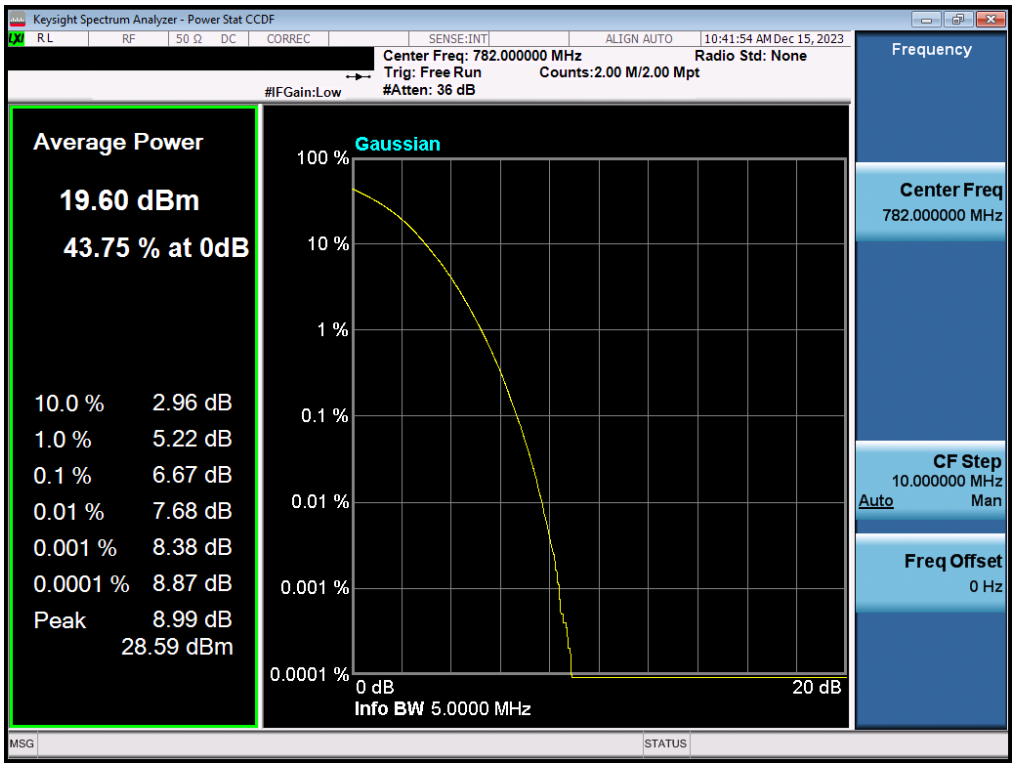


Plot 7-165. PAR Plot (LTE Band 12 - 3MHz 256-QAM - Full RB - Ant4)

LTE Band 13 – Ant4

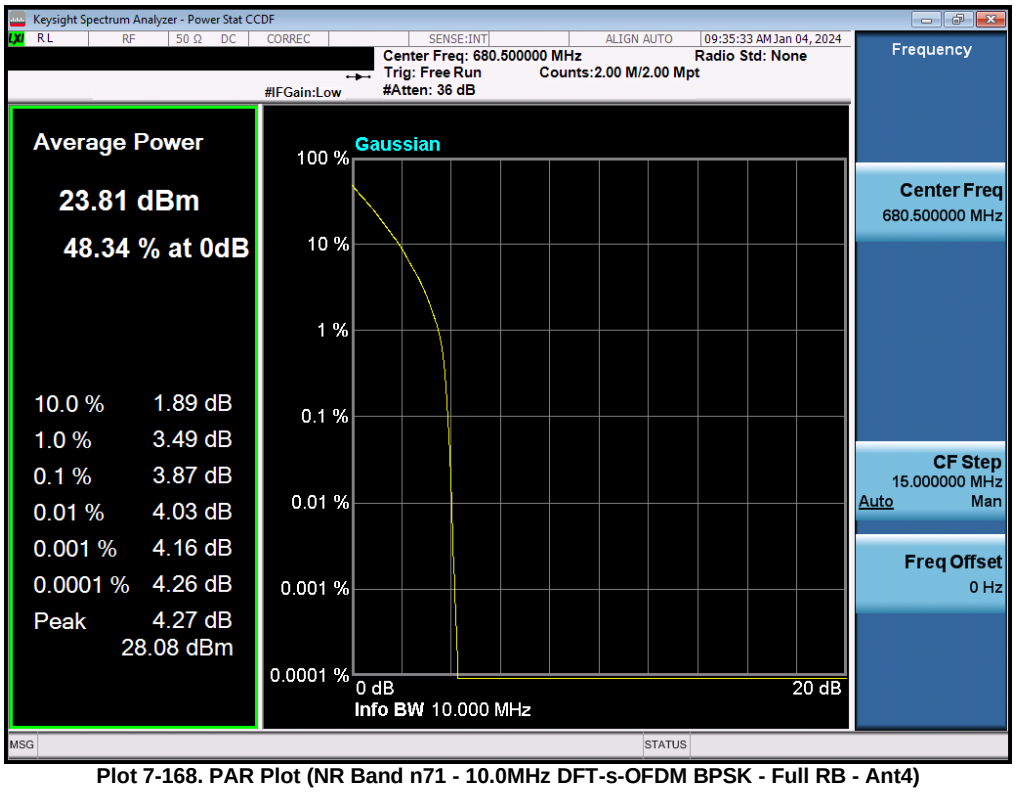


Plot 7-166. PAR Plot (LTE Band 13 - 5MHz QPSK - Full RB - Ant4)

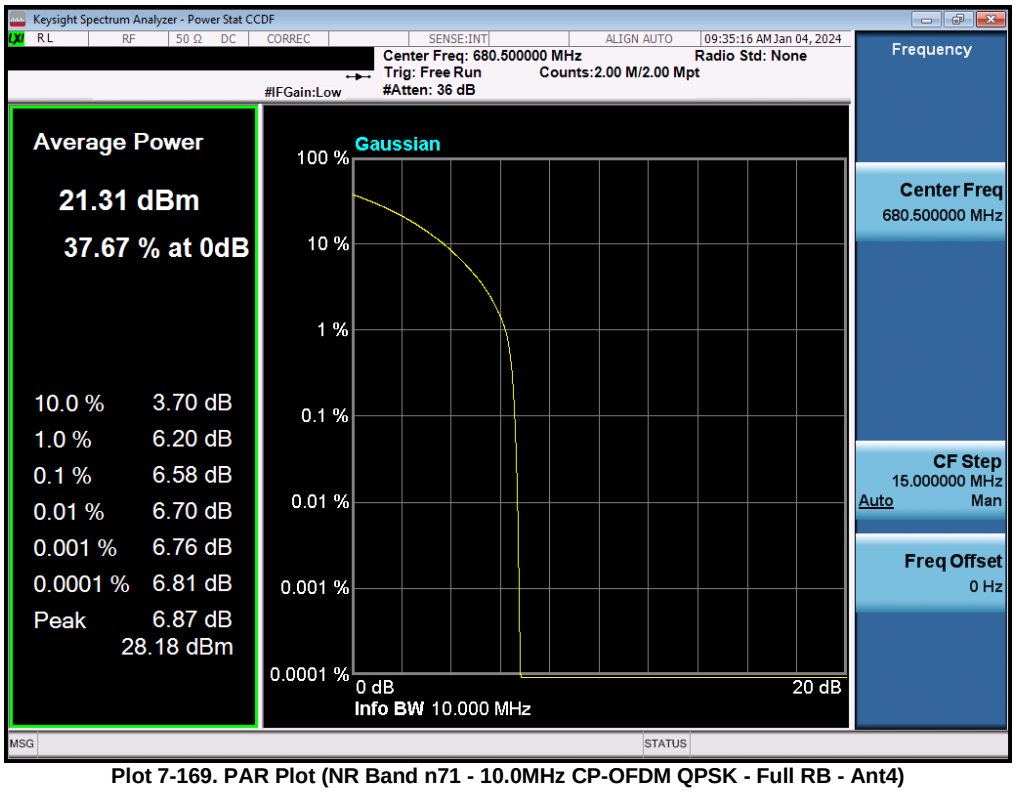


Plot 7-167. PAR Plot (LTE Band 13 - 5MHz 256-QAM - Full RB - Ant4)

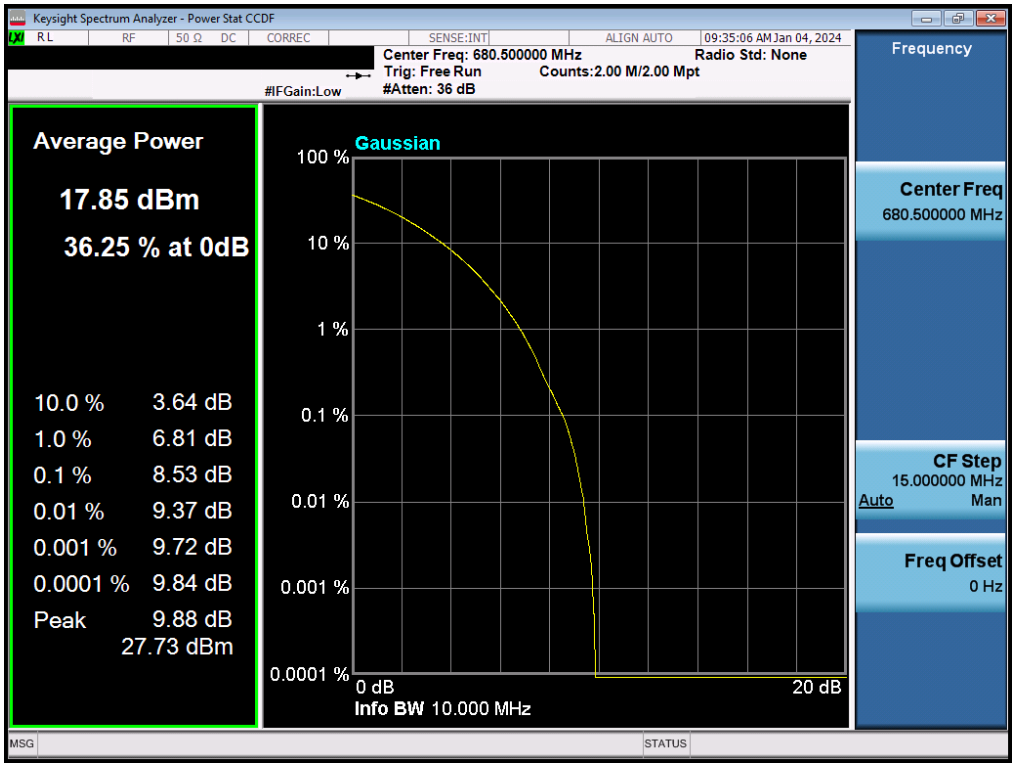
NR Band n71 – Ant4



Plot 7-168. PAR Plot (NR Band n71 - 10.0MHz DFT-s-OFDM BPSK - Full RB - Ant4)

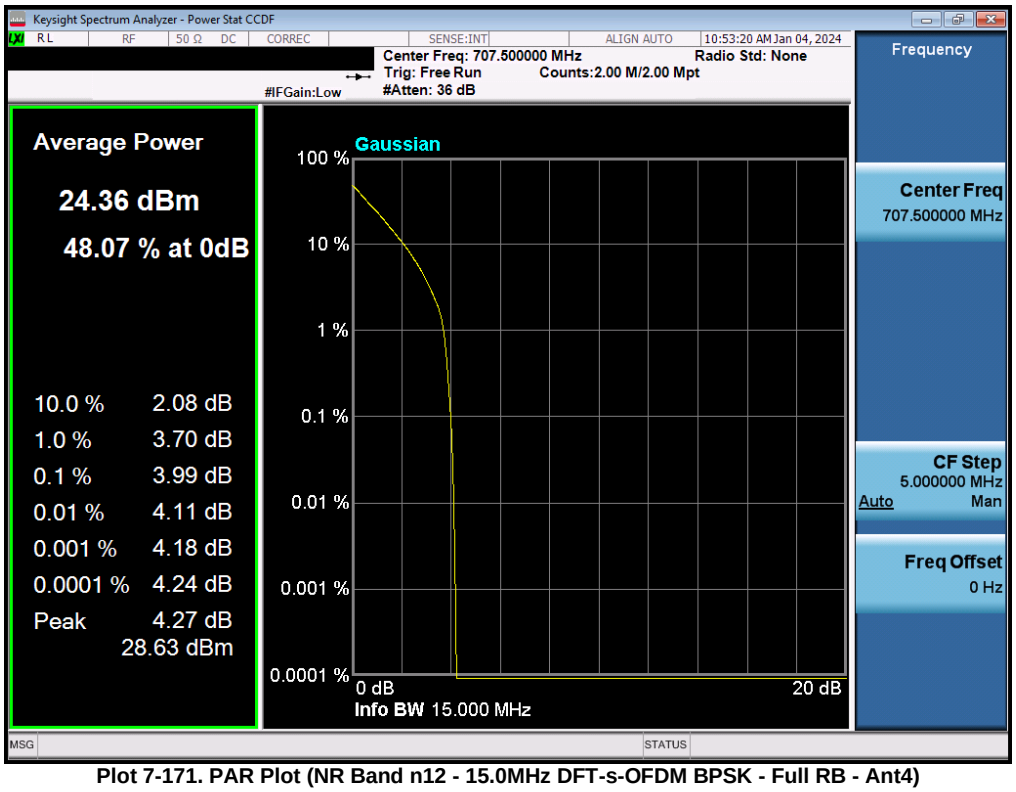


Plot 7-169. PAR Plot (NR Band n71 - 10.0MHz CP-OFDM QPSK - Full RB - Ant4)

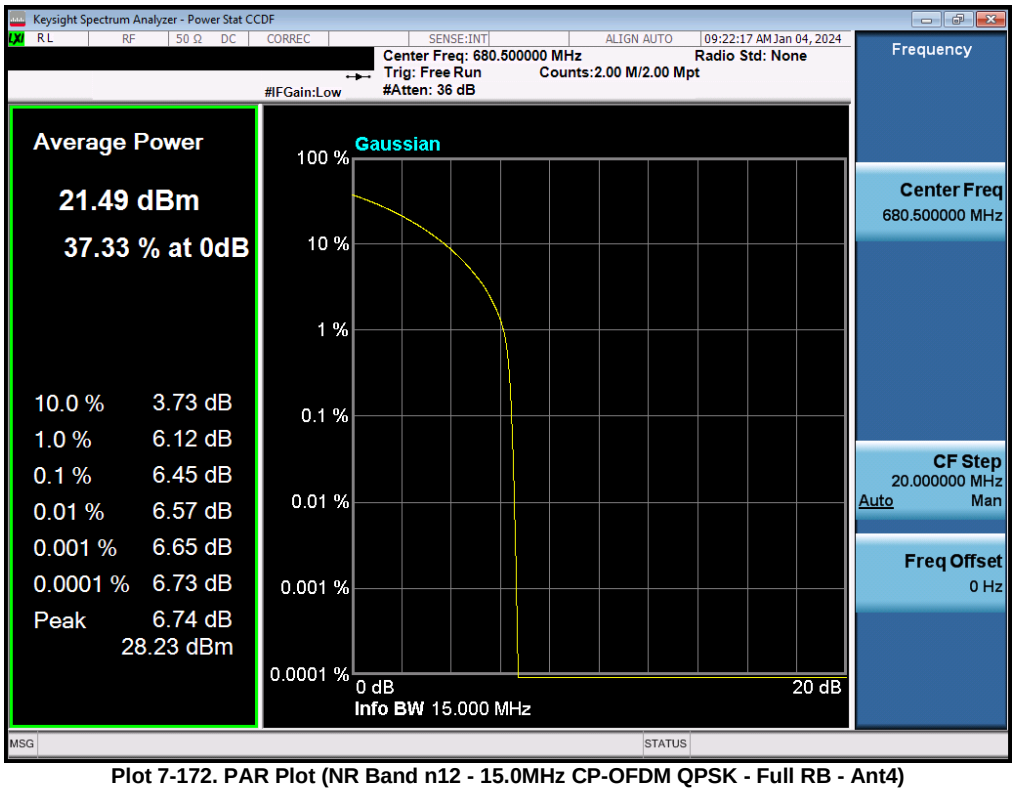


Plot 7-170. PAR Plot (NR Band n71 - 10.0MHz CP-OFDM 256-QAM - Full RB - Ant4)

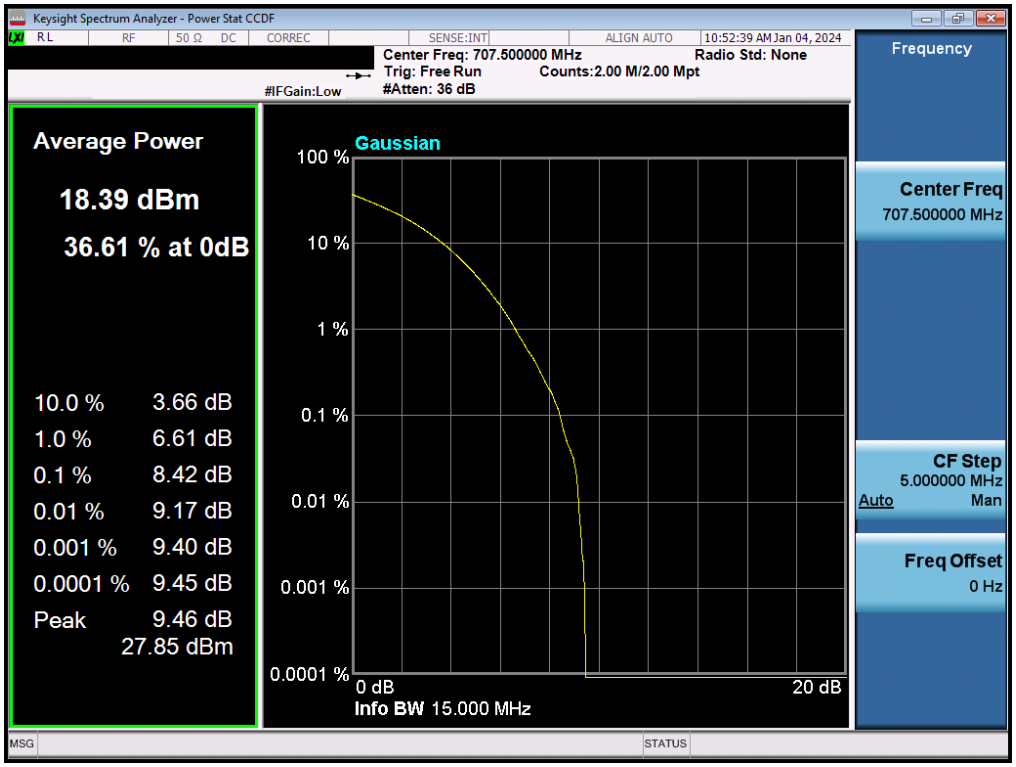
NR Band n12 – Ant4



Plot 7-171. PAR Plot (NR Band n12 - 15.0MHz DFT-s-OFDM BPSK - Full RB - Ant4)



Plot 7-172. PAR Plot (NR Band n12 - 15.0MHz CP-OFDM QPSK - Full RB - Ant4)

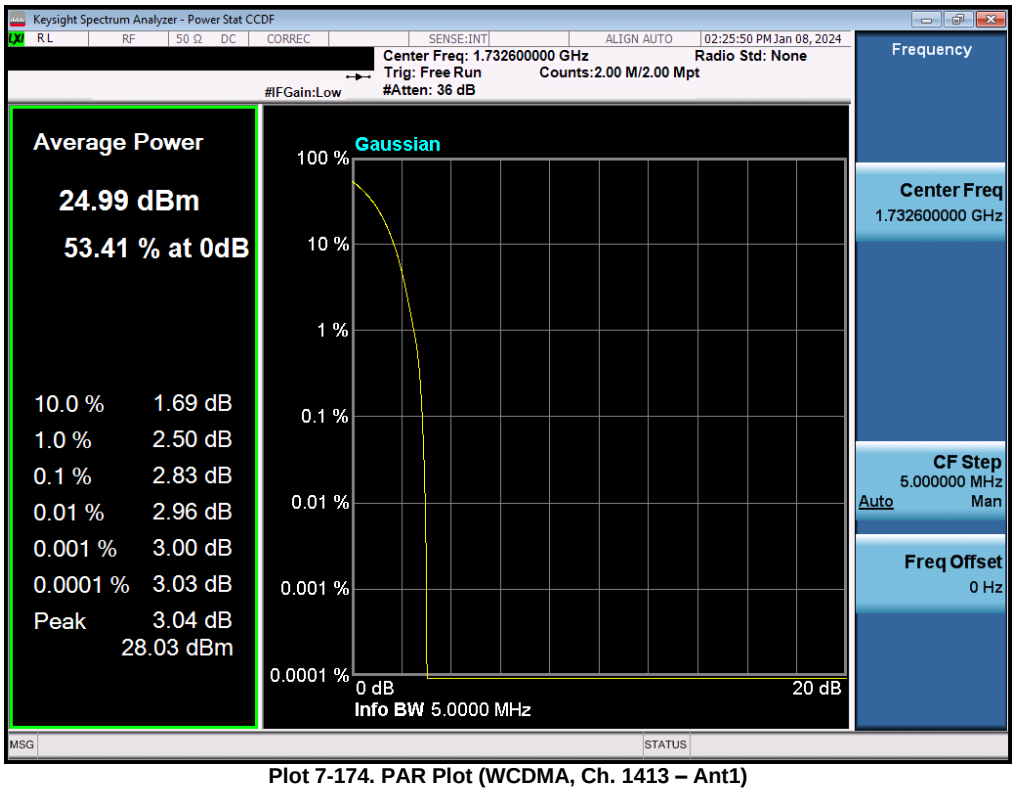


Plot 7-173. PAR Plot (NR Band n12 - 15.0MHz CP-OFDM 256-QAM - Full RB - Ant4)

Mode	Bandwidth	Modulation	Average Power [dBm]	PAR at 0.1% [dB]	PAR Limit [dB]	Margin [dB]
WCDMA-AWS	5MHz	GMSK	24.99	2.83	13	-10.17
LTE-B66-4	20MHz	QPSK	23.87	4.87	13	-8.13
		256QAM	19.86	6.69	13	-6.31
	15MHz	QPSK	24.01	4.96	13	-8.04
		256QAM	20.03	6.82	13	-6.18
	10MHz	QPSK	24.12	4.41	13	-8.59
		256QAM	20.16	6.82	13	-6.18
	5MHz	QPSK	24.11	4.85	13	-8.15
		256QAM	20.14	6.78	13	-6.22
	3MHz	QPSK	24.07	4.38	13	-8.62
		256QAM	20.13	6.85	13	-6.15
	1.4MHz	QPSK	24.15	4.98	13	-8.02
		256QAM	20.21	6.71	13	-6.29
NR-n66	40MHz	π/2 BPSK	24.32	4.05	13	-8.95
		QPSK	21.79	6.53	13	-6.47
		256QAM	18.30	8.44	13	-4.56
	30MHz	π/2 BPSK	24.33	3.98	13	-9.02
		QPSK	21.79	6.56	13	-6.44
		256QAM	18.26	8.62	13	-4.38
	25MHz	π/2 BPSK	24.27	4.15	13	-8.85
		QPSK	21.79	6.68	13	-6.32
		256QAM	18.24	8.37	13	-4.63
	20MHz	π/2 BPSK	24.27	3.88	13	-9.12
		QPSK	21.71	6.57	13	-6.43
		256QAM	18.21	8.32	13	-4.68
	15MHz	π/2 BPSK	24.19	4.00	13	-9.00
		QPSK	21.72	6.54	13	-6.46
		256QAM	18.21	8.37	13	-4.63
	10MHz	π/2 BPSK	24.11	3.95	13	-9.05
		QPSK	21.59	6.67	13	-6.33
		256QAM	18.12	8.43	13	-4.57
	5MHz	π/2 BPSK	24.05	3.80	13	-9.20
		QPSK	21.53	6.39	13	-6.61
		256QAM	18.02	8.06	13	-4.94

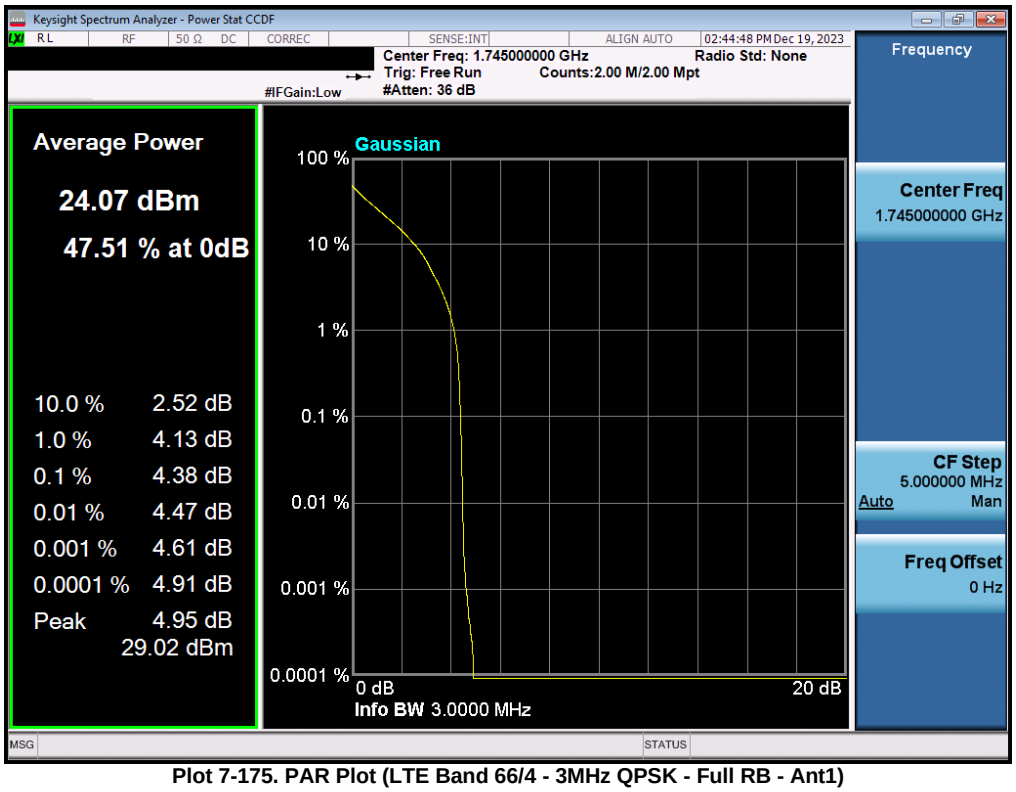
Table 7-14. Peak-Average Ratio Test Results – Ant1

WCDMA AWS – Ant1

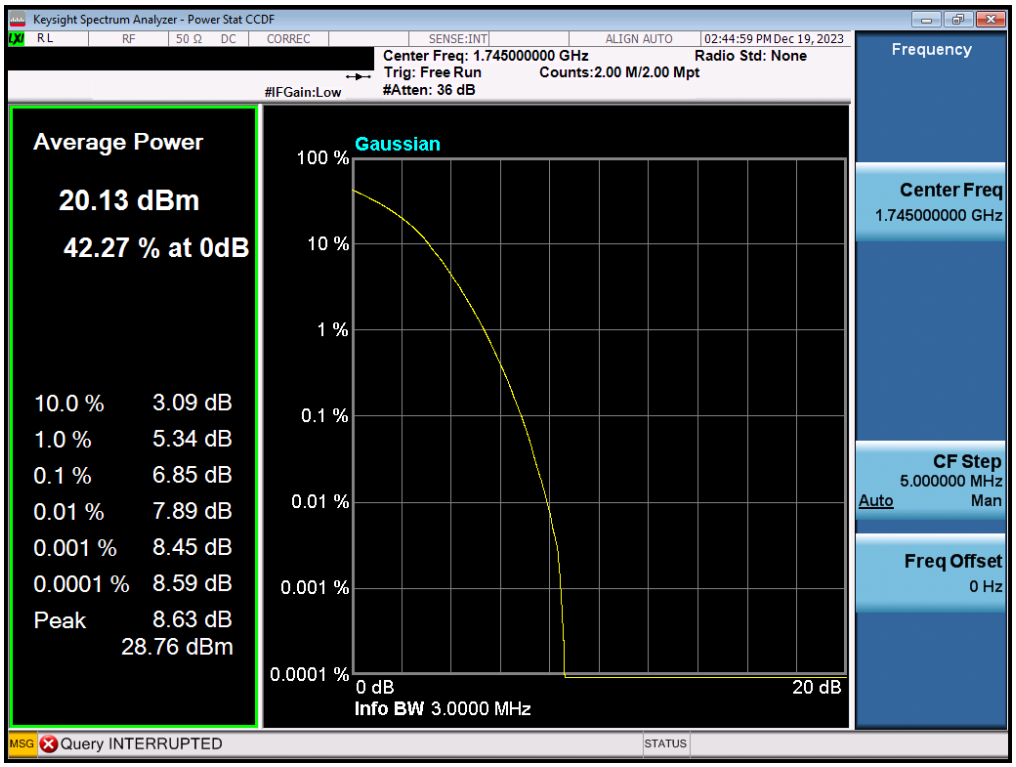


Plot 7-174. PAR Plot (WCDMA, Ch. 1413 – Ant1)

LTE Band 66/4 – Ant1



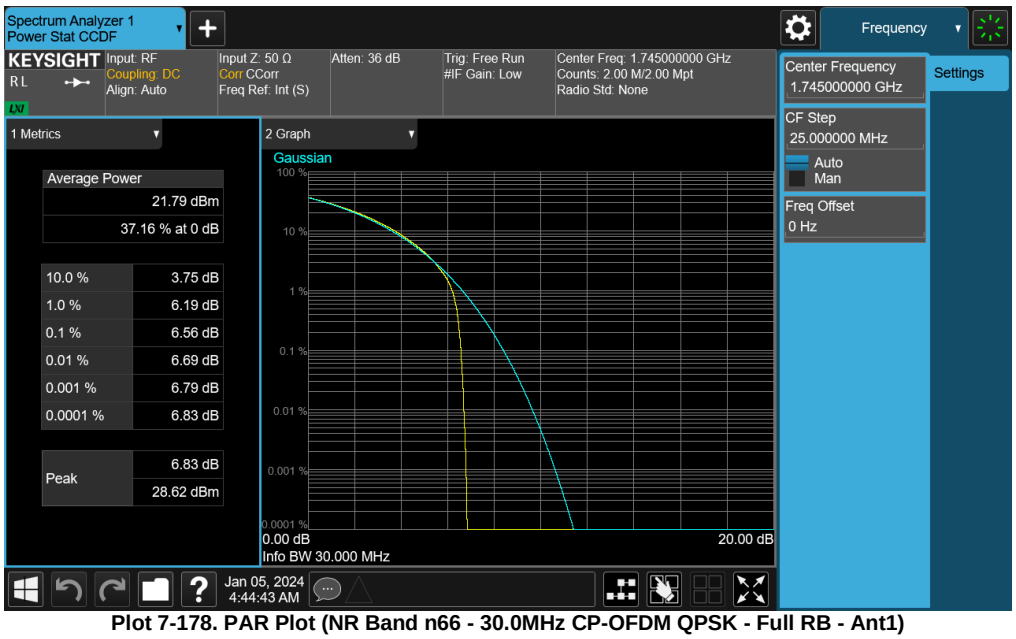
Plot 7-175. PAR Plot (LTE Band 66/4 - 3MHz QPSK - Full RB - Ant1)



Plot 7-176. PAR Plot (LTE Band 66/4 - 3MHz 256-QAM - Full RB - Ant1)

NR Band n66 – Ant1

Plot 7-177. PAR Plot (NR Band n66 - 30.0MHz DFT-s-OFDM BPSK - Full RB - Ant1)



Plot 7-178. PAR Plot (NR Band n66 - 30.0MHz CP-OFDM QPSK - Full RB - Ant1)

Plot 7-179. PAR Plot (NR Band n66 - 30.0MHz CP-OFDM 256-QAM - Full RB - Ant1)

Mode	Bandwidth	Modulation	Average Power [dBm]	PAR at 0.1% [dB]	PAR Limit [dB]	Margin [dB]
NR-n66	40MHz	π/2 BPSK	24.34	4.00	13	-9.00
		QPSK	21.88	6.50	13	-6.50
		256QAM	18.34	8.24	13	-4.76
	30MHz	π/2 BPSK	24.36	3.91	13	-9.09
		QPSK	21.83	6.57	13	-6.43
		256QAM	18.36	8.16	13	-4.84
	25MHz	π/2 BPSK	24.39	4.09	13	-8.91
		QPSK	21.87	6.68	13	-6.32
		256QAM	18.36	8.16	13	-4.84
	20MHz	π/2 BPSK	24.34	3.93	13	-9.07
		QPSK	21.82	6.43	13	-6.57
		256QAM	18.28	8.00	13	-5.00
	15MHz	π/2 BPSK	24.32	4.12	13	-8.88
		QPSK	21.83	6.50	13	-6.50
		256QAM	18.31	8.07	13	-4.93
	10MHz	π/2 BPSK	24.27	3.96	13	-9.04
		QPSK	21.70	6.59	13	-6.41
		256QAM	18.11	8.15	13	-4.85
	5MHz	π/2 BPSK	24.21	4.00	13	-9.00
		QPSK	21.80	6.35	13	-6.65
		256QAM	18.19	8.15	13	-4.85

Table 7-15. Peak-Average Ratio Test Results – Ant4