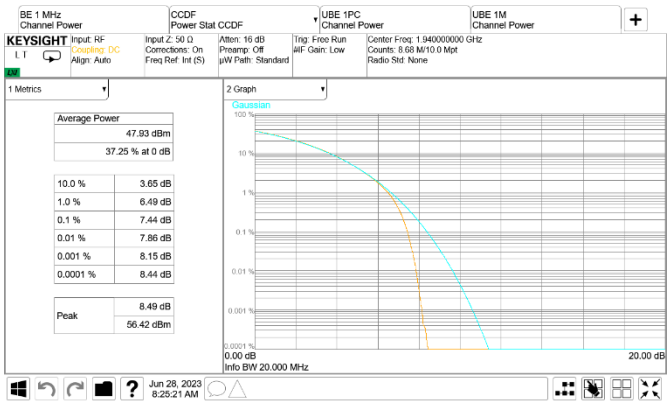

Figure 8.2-33: *CCDF sample plot, LTE*

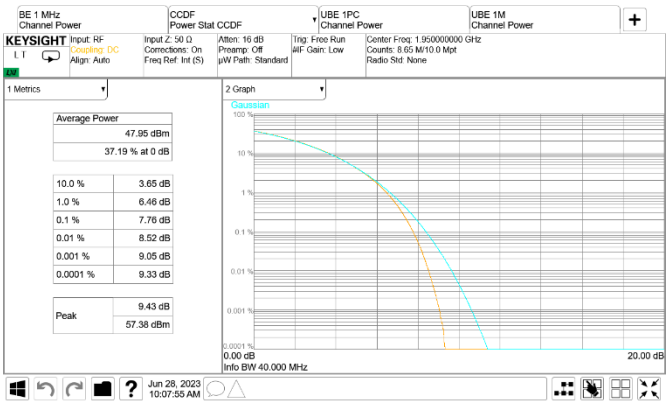

Figure 8.2-34: *CCDF sample plot, NR*

8.3 Spurious emissions at RF antenna connector (Band 66)

8.3.1 Definitions and limits

FCC §27.53:
(h) AWS emission limits
(1) General protection levels. Except as otherwise specified below, for operations in the 1695–1710 MHz, 1710–1755 MHz, 1755–1780 MHz, 1915–1920 MHz, 1995–2000 MHz, 2000–2020 MHz, 2110–2155 MHz, 2155–2180 MHz, and 2180–2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}$ (P) dB.

(3) Measurement procedure.

(i) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1-megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. 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 emissions are attenuated at least 26 dB below the transmitter power.
(ii) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.
(iii) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

RSS-139, Section 5.6:
Unwanted emissions shall be measured in terms of average values.

For all equipment, the TRP or total conducted power (sum of conducted power across all antenna connectors) of the unwanted emissions outside the frequency block or frequency block group shall not exceed the limits shown in table below:

Table 8.3-1: *Unwanted emissions limits*

Offset from the edge of the frequency block or frequency group	Unwanted emission limits
1 MHz	-13 dBm/(1% of OB*)
> 1 MHz	-13 dBm/MHz

Notes: *OB is the occupied bandwidth

In addition to complying with the above limits, equipment operating in the band 2180-2200 MHz may require additional filtering (see SRSP-519).

8.3.2 Test summary

Test date	June 26 and 27, 2023
Test engineer	Nimish Kapoor

8.3.3 Observations, settings and special notes

- The spectrum was searched from 30 MHz to the 10th harmonic.
- All measurements were performed using an average (RMS) detector per ANSI C63.26 Paragraph 5.7.2 method.
- Limit line ($43 + 10 \log_{10}$ (P) or −13 dBm) was adjusted for MIMO operation by 6 dB*: −13 dBm – 6 dB = −19 dBm
  *MIMO correction factor for 4 antenna ports: $10 \times \text{Log}_{10}(4) = 6$ dB
- RBW 1 MHz, VBW was wider than RBW.

8.3.4 Test data

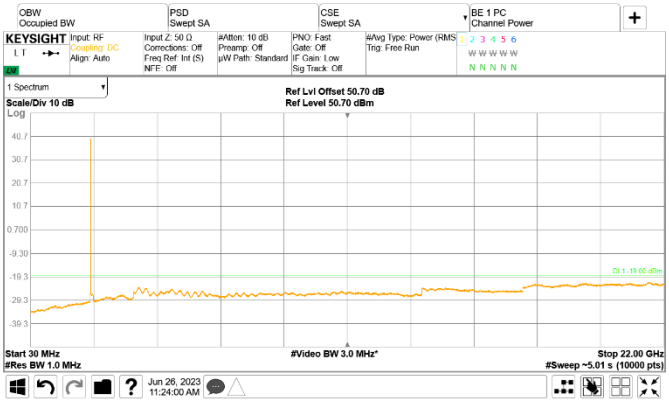

Figure 8.3-1: *Conducted spurious emissions of LTE 5 MHz low channel, single carrier operation*

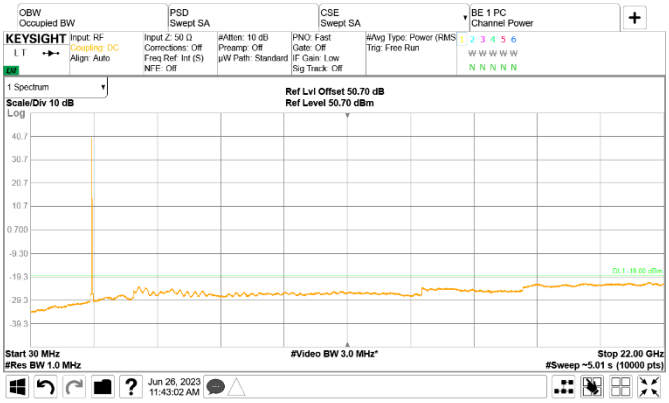

Figure 8.3-2: *Conducted spurious emissions of LTE 5 MHz mid channel, single carrier operation*

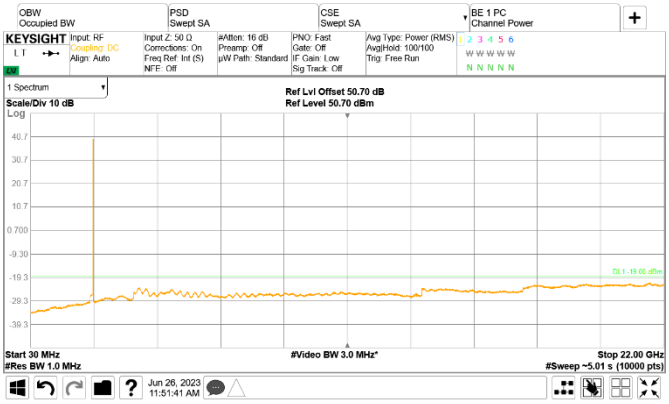

Figure 8.3-3: *Conducted spurious emissions of LTE 5 MHz top channel, single carrier operation*

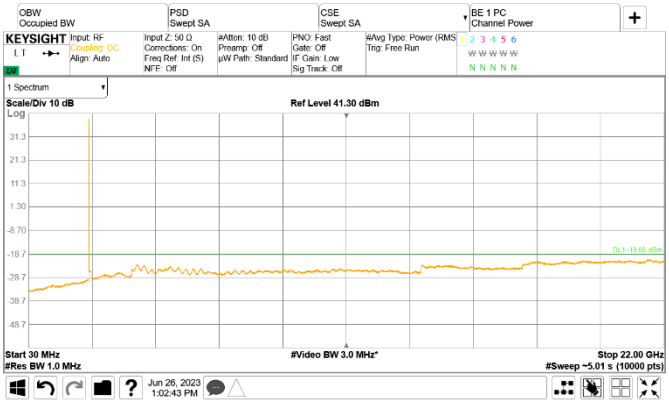

Figure 8.3-4: *Conducted spurious emissions of LTE 10 MHz low channel, single carrier operation*

Test data, continued

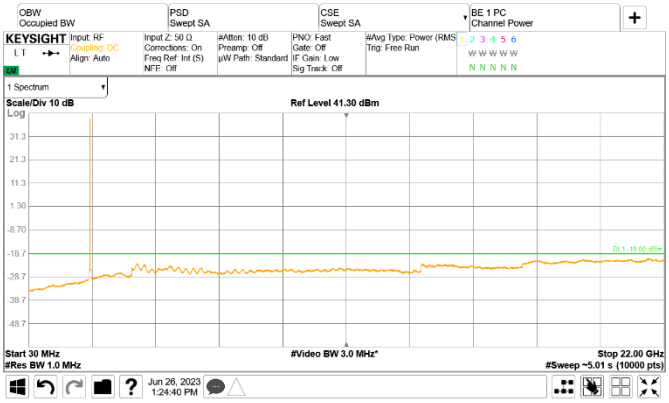

Figure 8.3-5: *Conducted spurious emissions of LTE 10 MHz mid channel, single carrier operation*

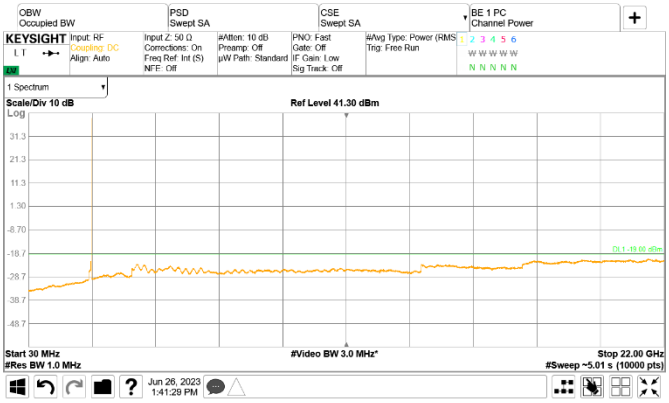

Figure 8.3-6: *Conducted spurious emissions of LTE 10 MHz top channel, single carrier operation*

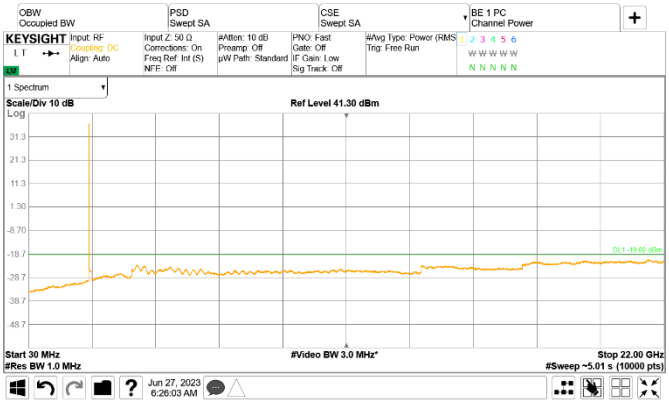

Figure 8.3-7: *Conducted spurious emissions of LTE 15 MHz low channel, single carrier operation*

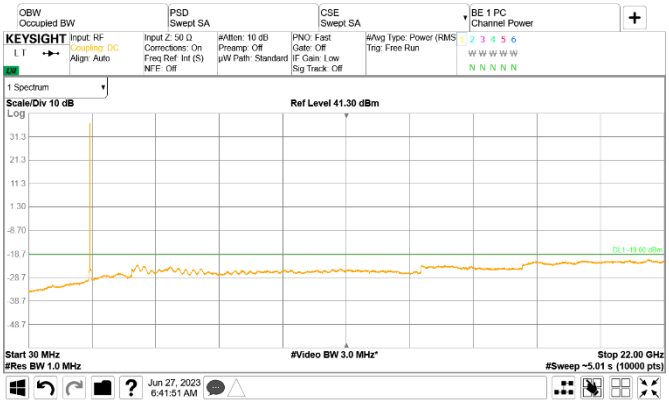

Figure 8.3-8: *Conducted spurious emissions of LTE 15 MHz mid channel, single carrier operation*

Test data, continued

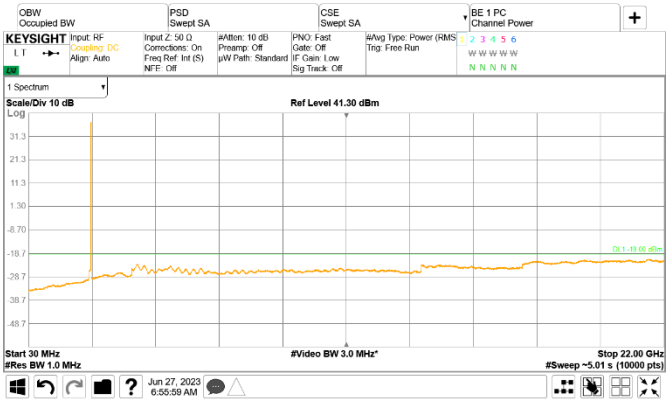

Figure 8.3-9: *Conducted spurious emissions of LTE 15 MHz top channel, single carrier operation*

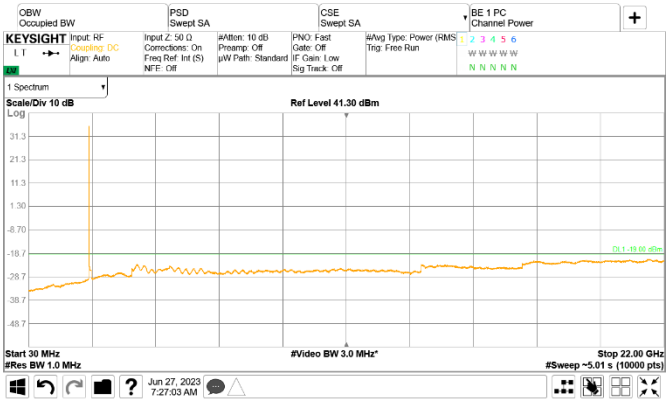

Figure 8.3-10: *Conducted spurious emissions of LTE 20 MHz low channel, single carrier*

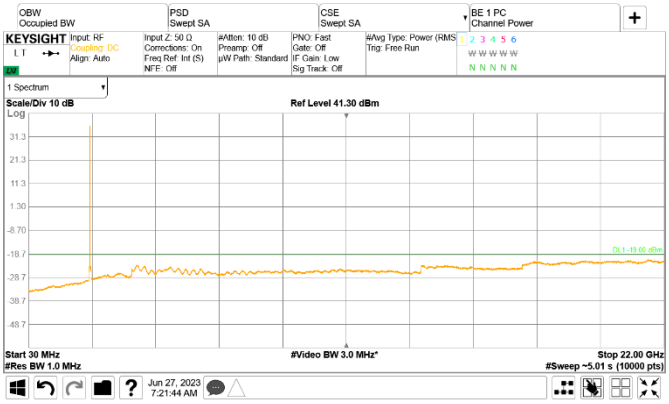

Figure 8.3-11: *Conducted spurious emissions of LTE 20 MHz mid channel, single carrier operation*

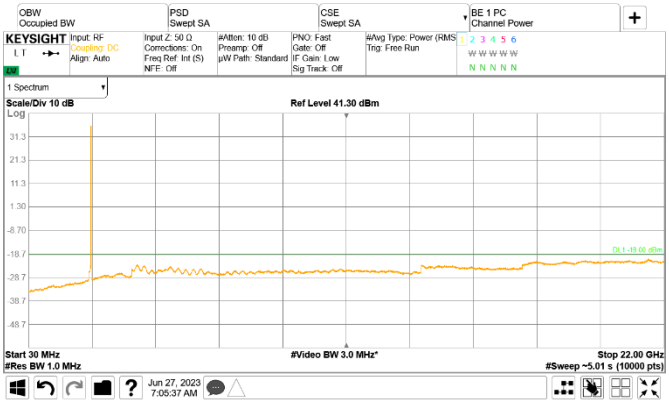

Figure 8.3-12: *Conducted spurious emissions of LTE 20 MHz top channel, single carrier operation*

Test data, continued

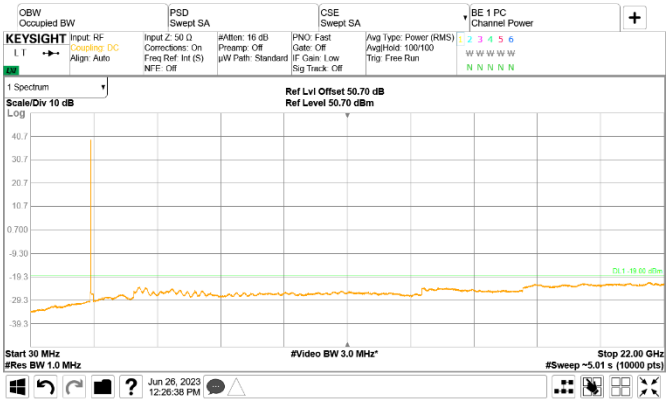

Figure 8.3-13: *Conducted spurious emissions of LTE with IoT1 5 MHz low channel, single carrier operation*

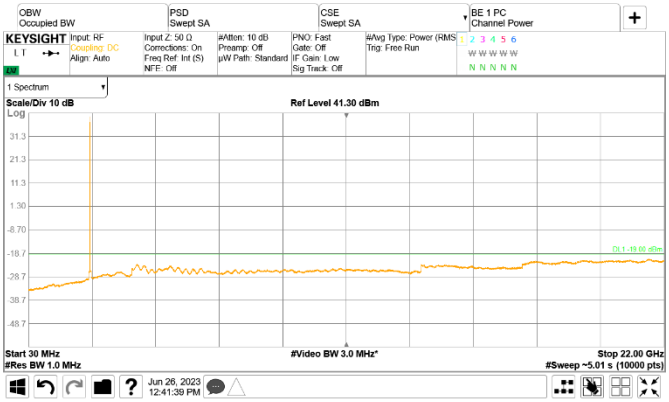

Figure 8.3-14: *Conducted spurious emissions of LTE with IoT1 5 MHz mid channel, single carrier operation*

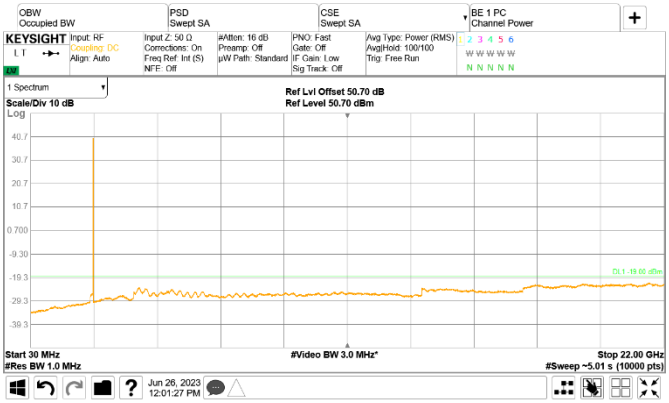

Figure 8.3-15: *Conducted spurious emissions of LTE with IoT1 5 MHz top channel, single carrier operation*

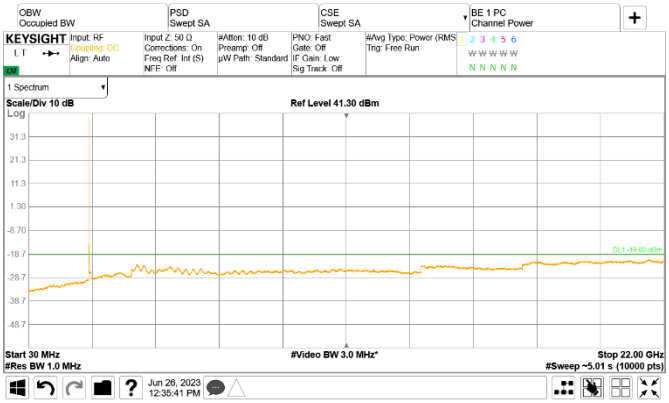

Figure 8.3-16: *Conducted spurious emissions of LTE with IoT2 5 MHz low channel, single carrier operation*

Test data, continued

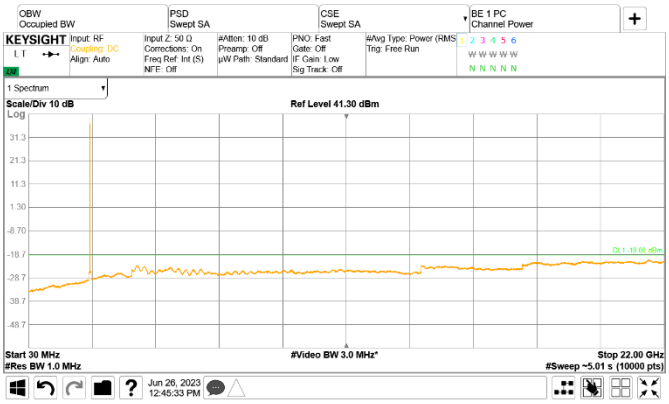

Figure 8.3-17: *Conducted spurious emissions of LTE with IoT2 5 MHz mid channel, single carrier operation*

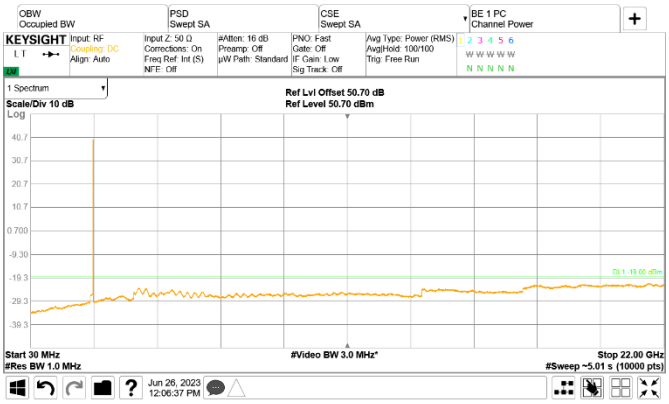

Figure 8.3-18: *Conducted spurious emissions of LTE with IoT2 5 MHz top channel, single carrier operation*

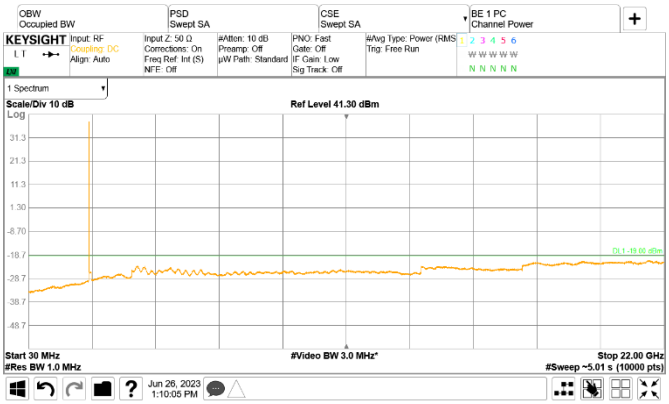

Figure 8.3-19: *Conducted spurious emissions of LTE with GB 10 MHz low channel, single carrier operation*

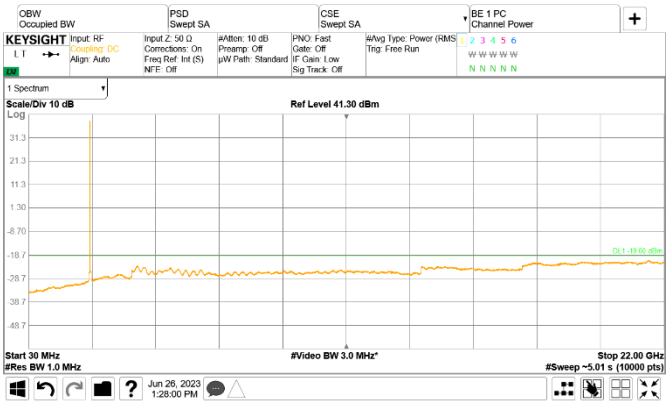

Figure 8.3-20: *Conducted spurious emissions of LTE with GB 10 MHz mid channel, single carrier operation*

Test data, continued

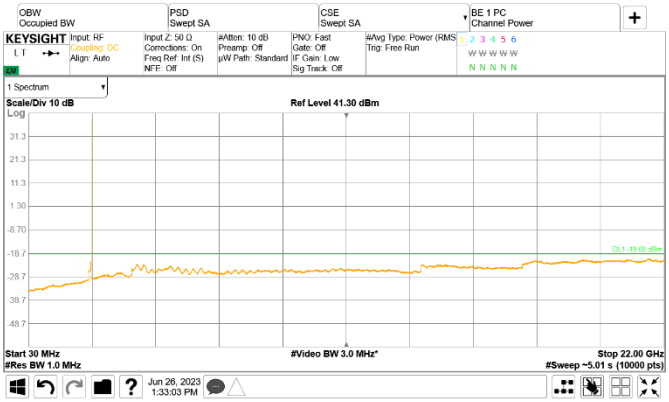

Figure 8.3-21: *Conducted spurious emissions of LTE with GB 10 MHz top channel, single carrier operation*

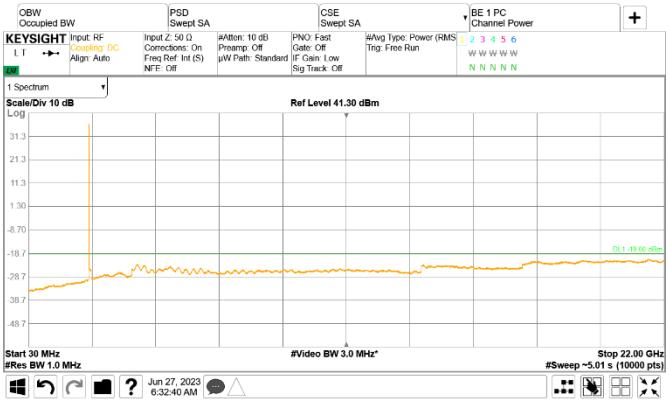

Figure 8.3-22: *Conducted spurious emissions of LTE with GB 15 MHz low channel, single carrier operation*

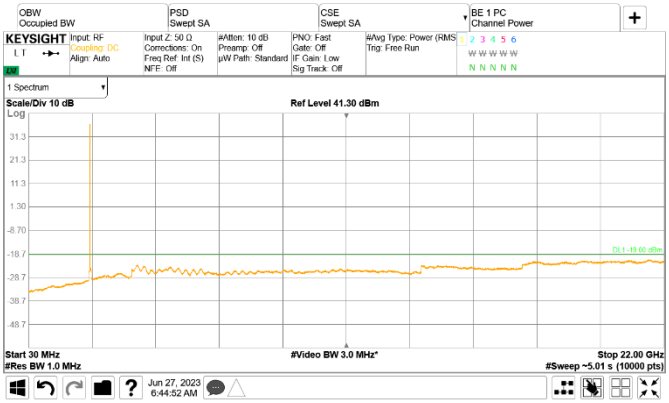

Figure 8.3-23: *Conducted spurious emissions of LTE with GB 15 MHz mid channel, single carrier operation*

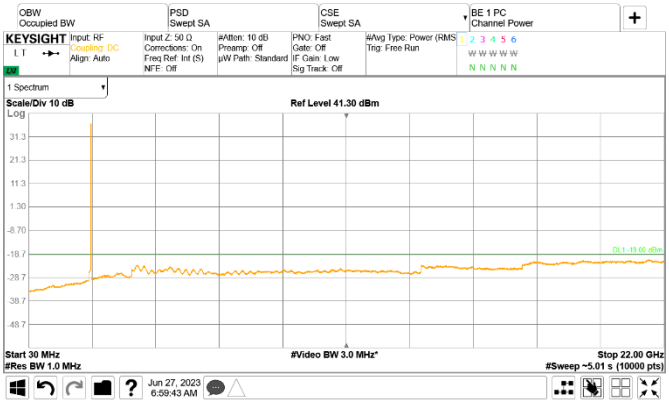

Figure 8.3-24: *Conducted spurious emissions of LTE with GB 15 MHz top channel, single carrier*

Test data, continued

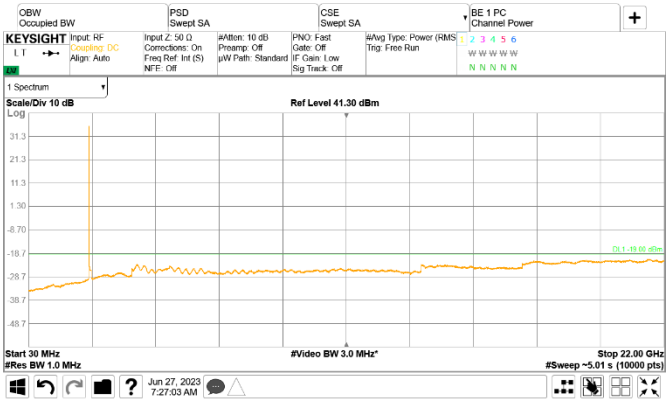

Figure 8.3-25: *Conducted spurious emissions of LTE with GB 20 MHz low channel, single carrier operation*

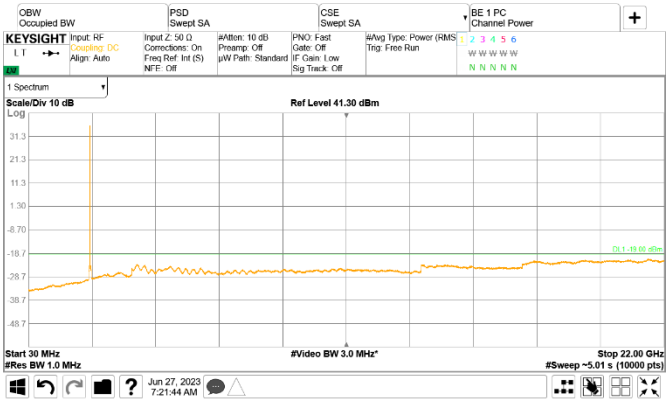

Figure 8.3-26: *Conducted spurious emissions of LTE with GB 20 MHz mid channel, single carrier operation*

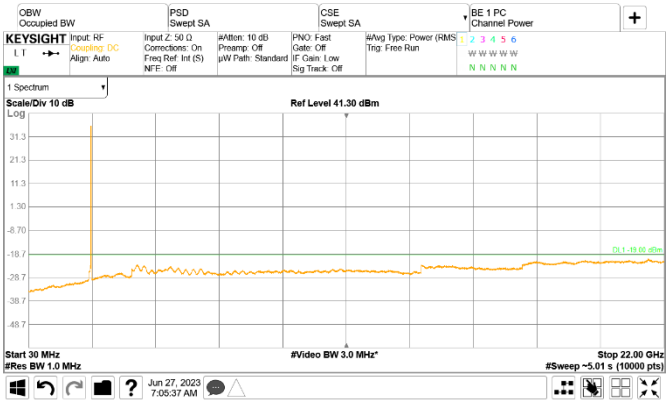

Figure 8.3-27: *Conducted spurious emissions of LTE with GB 20 MHz top channel, single carrier operation*

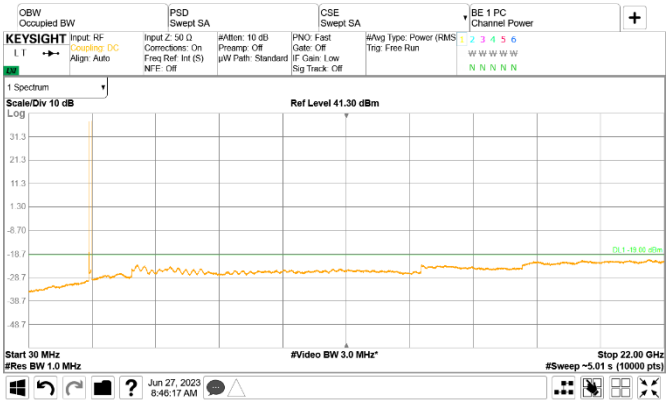

Figure 8.3-28: *Conducted spurious emissions of LTE 5 MHz two non-contiguous channels, two-carrier operation*

Test data, continued

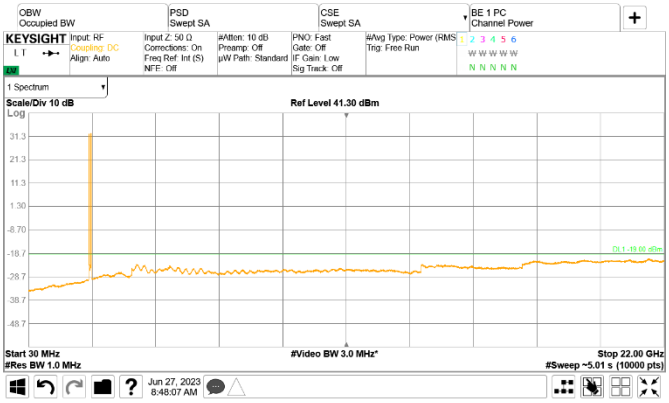

Figure 8.3-29: *Conducted spurious emissions of LTE 20 MHz two non-contiguous channels, two-carrier operation*

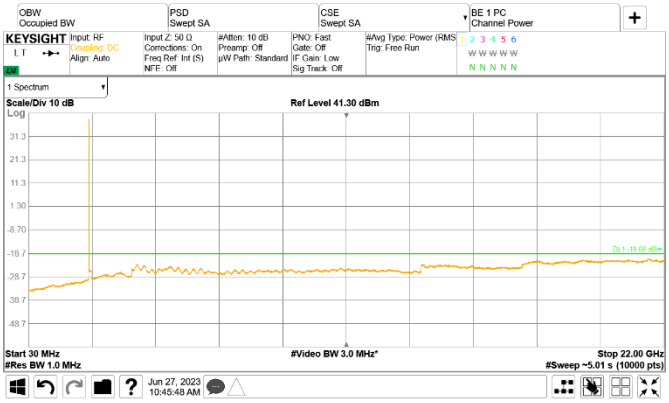

Figure 8.3-30: *Conducted spurious emissions of LTE 5 MHz two contiguous low channels, two-carrier operation*

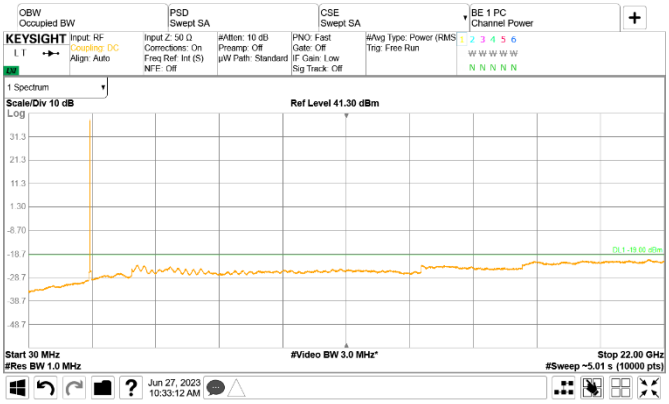

Figure 8.3-31: *Conducted spurious emissions of LTE 5 MHz two contiguous mid channels, two-carrier operation*

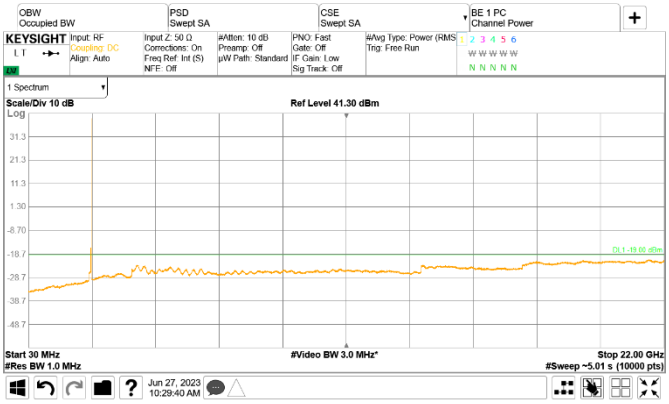

Figure 8.3-32: *Conducted spurious emissions of LTE 5 MHz two contiguous top channels, two-carrier operation*

Test data, continued

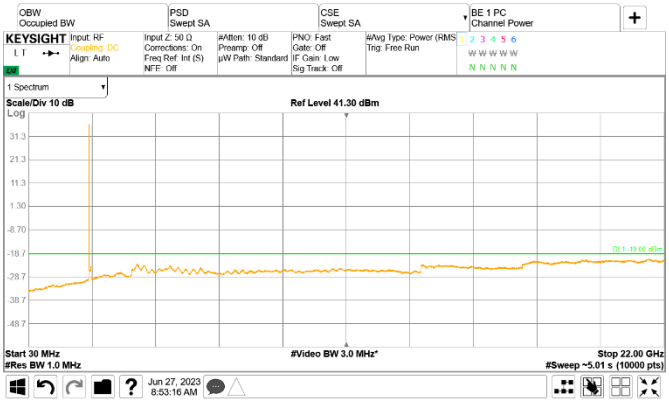

Figure 8.3-33: *Conducted spurious emissions of LTE 5 MHz three non-contiguous channels, three-carrier operation*

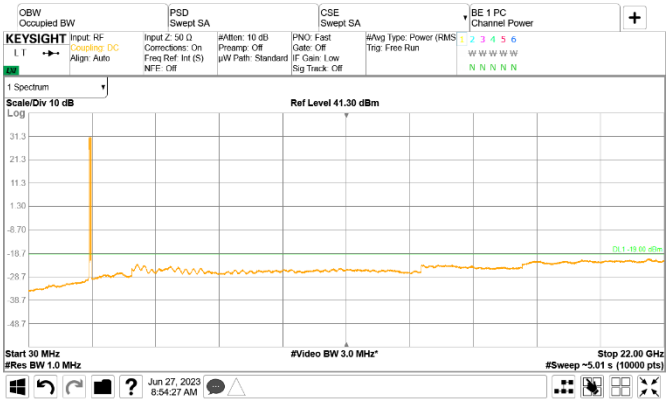

Figure 8.3-34: *Conducted spurious emissions of LTE 20 MHz three non-contiguous channels, three-carrier operation*

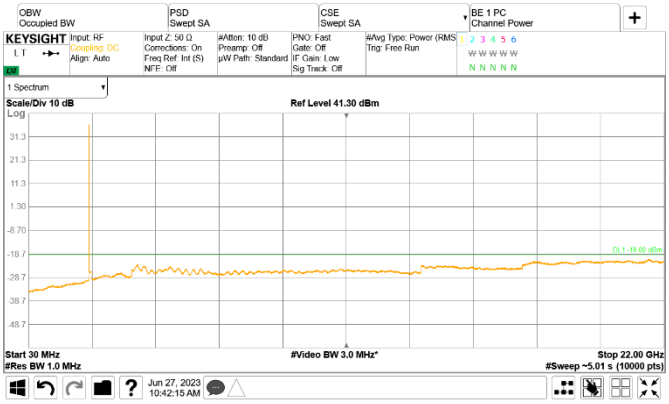

Figure 8.3-35: *Conducted spurious emissions of LTE 5 MHz three contiguous low channels, three-carrier operation*

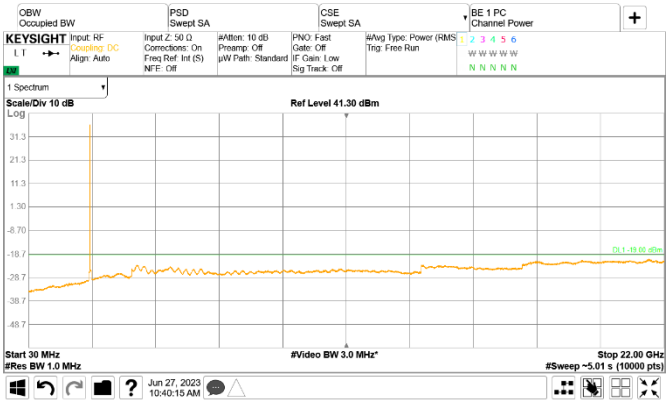

Figure 8.3-36: *Conducted spurious emissions of LTE 5 MHz three contiguous mid channels, three-carrier operation*

Test data, continued

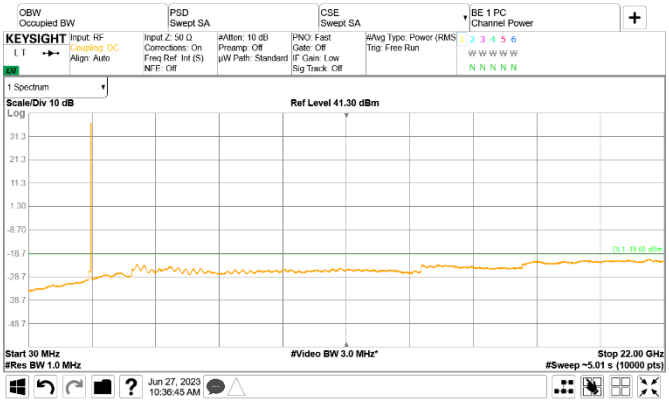

Figure 8.3-37: *Conducted spurious emissions of LTE 5 MHz three contiguous top channels, three-carrier operation*

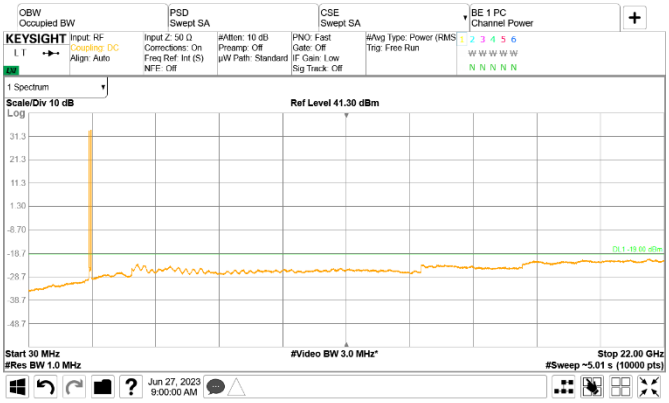

Figure 8.3-38: *Conducted spurious emissions of LTE 5 MHz six non-contiguous channels, six-carrier operation*

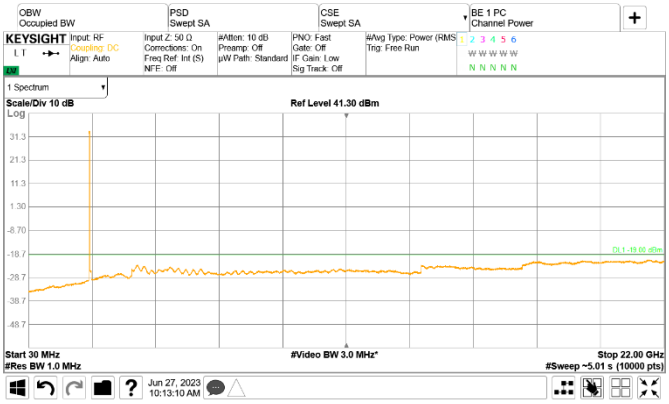

Figure 8.3-39: *Conducted spurious emissions of LTE 5 MHz six contiguous low channels, six-carrier operation*

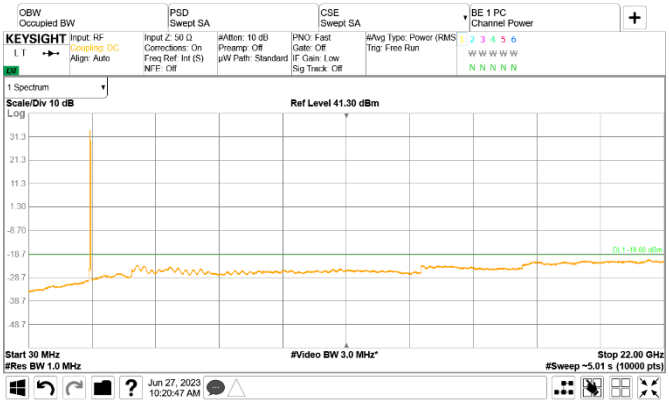

Figure 8.3-40: *Conducted spurious emissions of LTE 5 MHz six contiguous mid channels, six-carrier operation*

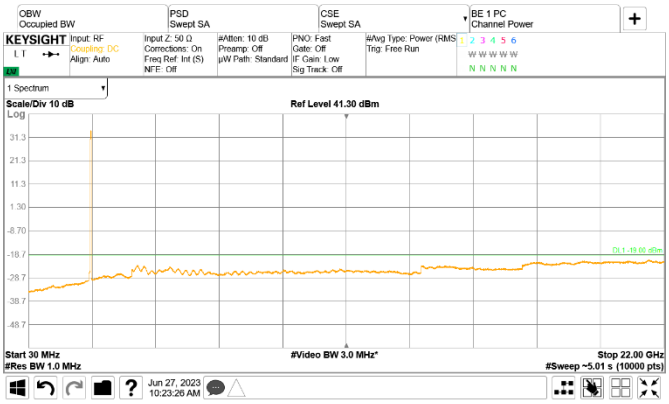

Figure 8.3-41: *Conducted spurious emissions of LTE 5 MHz six contiguous top channels, six-carrier operation*

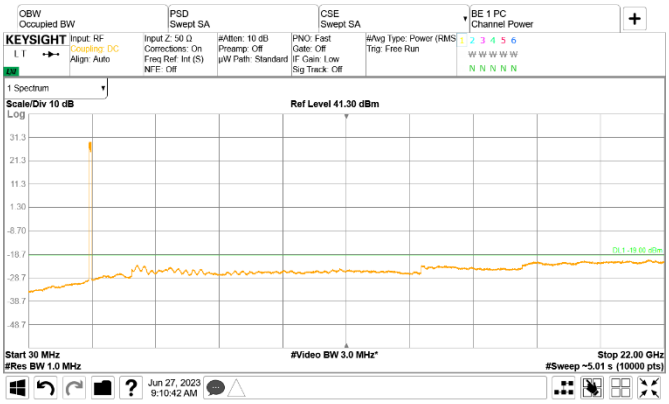

Figure 8.3-42: *Conducted spurious emissions of LTE 15 MHz six contiguous channels, six-carrier operation*

Test data, continued

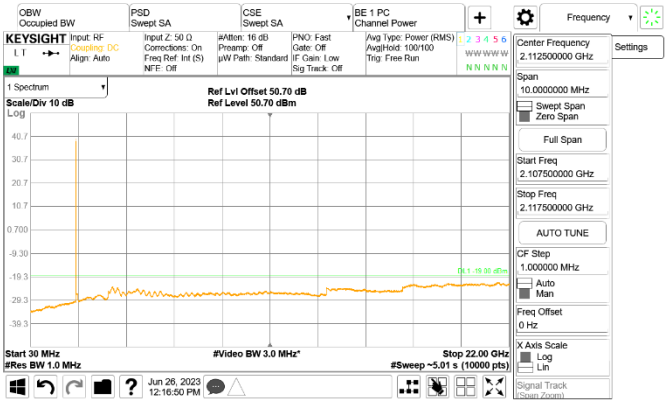

Figure 8.3-43: *Conducted spurious emissions of NR 5 MHz low channel, single-carrier operation*

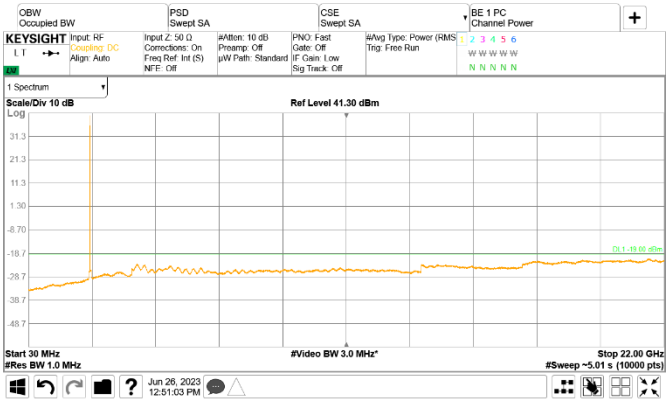

Figure 8.3-44: *Conducted spurious emissions of NR 5 MHz mid channel, single-carrier operation*

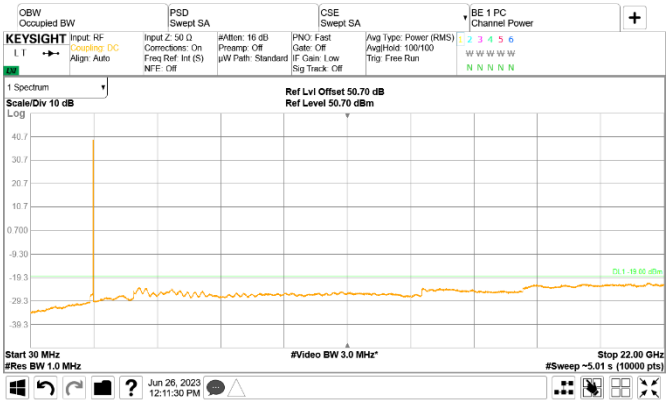

Figure 8.3-45: *Conducted spurious emissions of NR 5 MHz top channel, single-carrier operation*

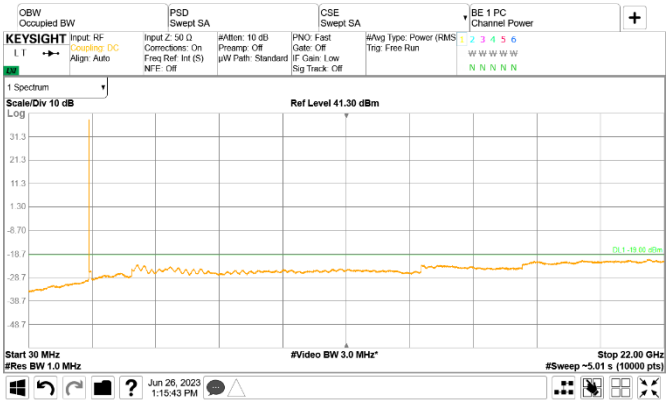

Figure 8.3-46: *Conducted spurious emissions of NR 10 MHz low channel, single-carrier operation*

Test data, continued

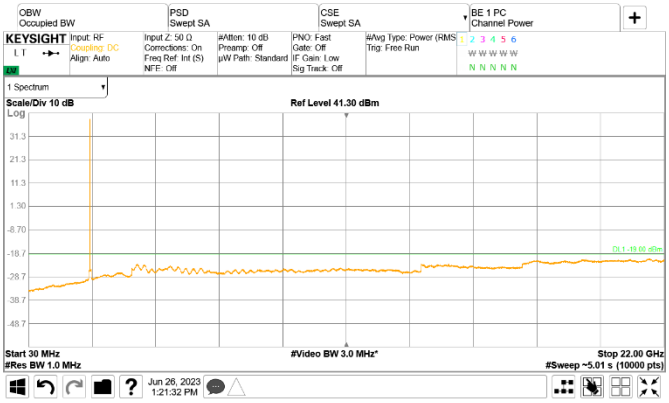

Figure 8.3-47: *Conducted spurious emissions of NR 10 MHz mid channel, single-carrier operation*

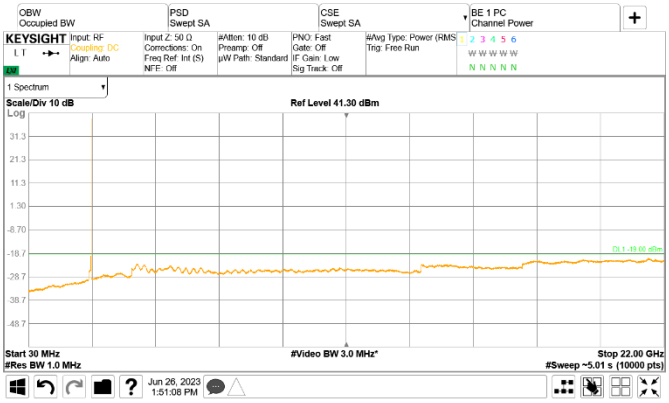

Figure 8.3-48: *Conducted spurious emissions of NR 10 MHz top channel, single-carrier operation*

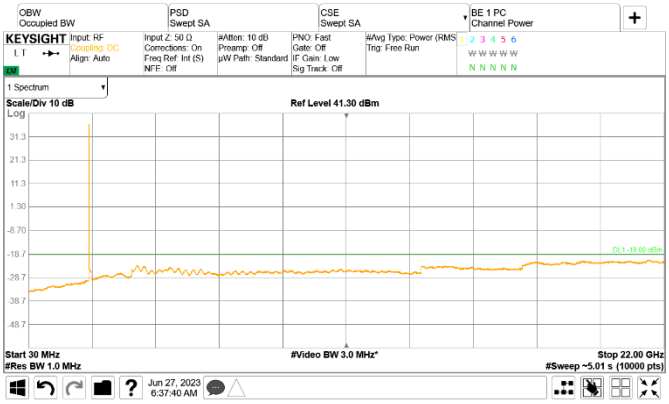

Figure 8.3-49: *Conducted spurious emissions of NR 15 MHz low channel, single-carrier operation*

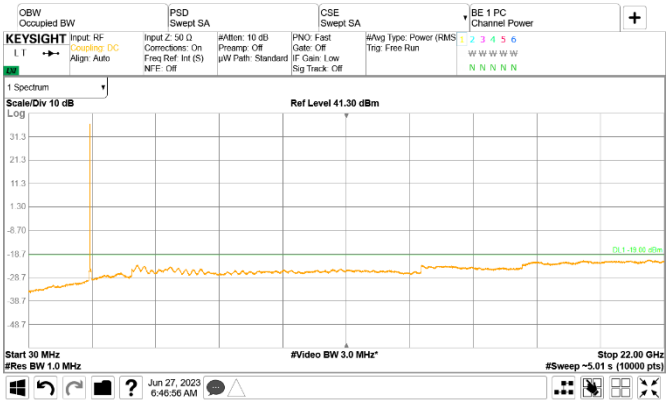

Figure 8.3-50: *Conducted spurious emissions of NR 15 MHz mid channel, single-carrier operation*

Test data, continued

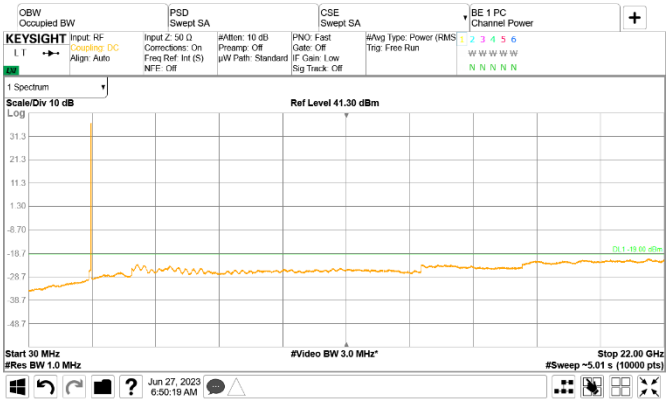

Figure 8.3-51: *Conducted spurious emissions of NR 15 MHz top channel, single-carrier operation*

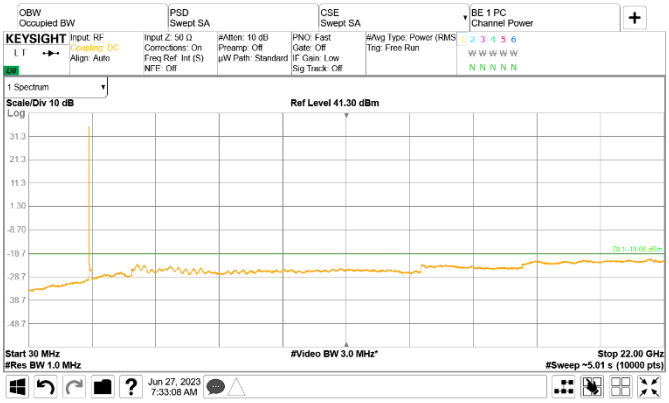

Figure 8.3-52: *Conducted spurious emissions of NR 20 MHz low channel, single-carrier operation*

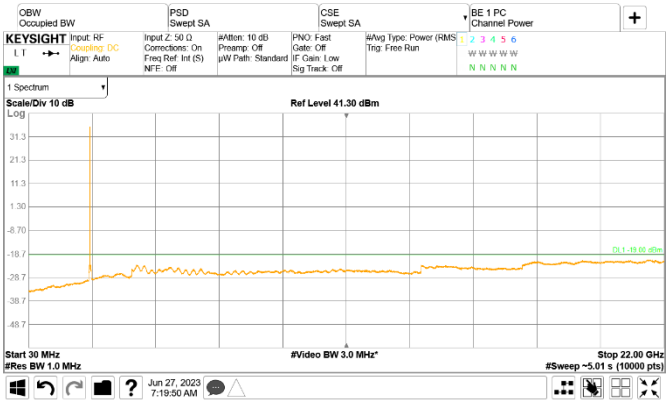

Figure 8.3-53: *Conducted spurious emissions of NR 20 MHz mid channel, single-carrier operation*

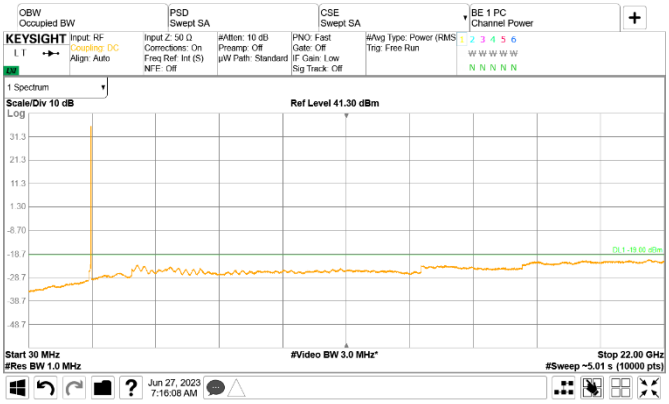

Figure 8.3-54: *Conducted spurious emissions of NR 20 MHz top channel, single-carrier operation*

Test data, continued

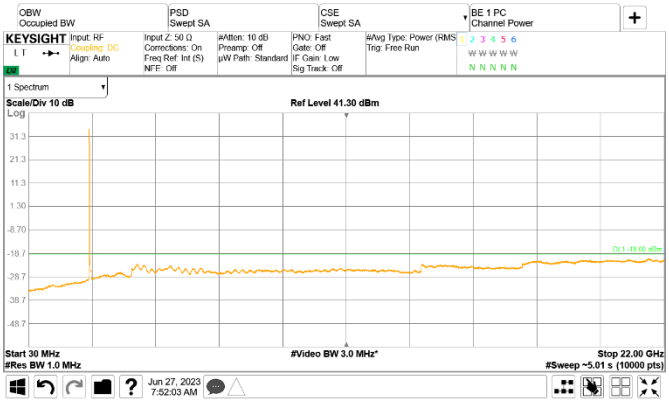

Figure 8.3-55: *Conducted spurious emissions of NR 25 MHz low channel, single-carrier operation*

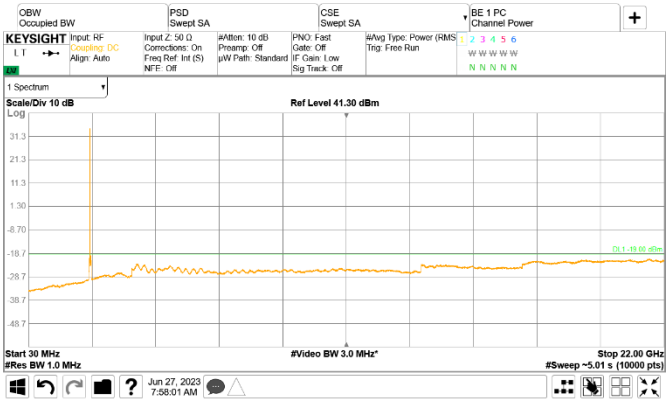

Figure 8.3-56: *Conducted spurious emissions of NR 25 MHz mid channel, single-carrier operation*

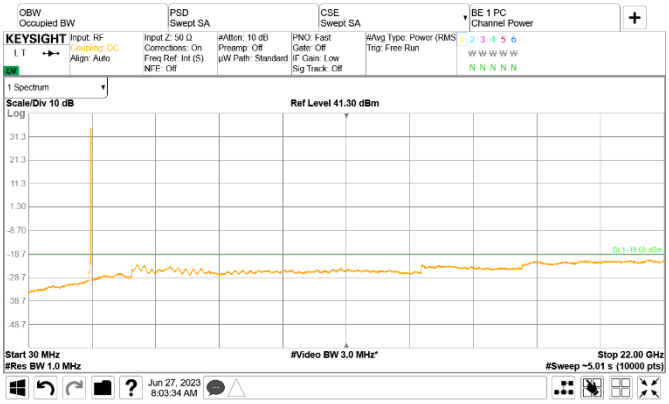

Figure 8.3-57: *Conducted spurious emissions of NR 25 MHz top channel, single-carrier operation*

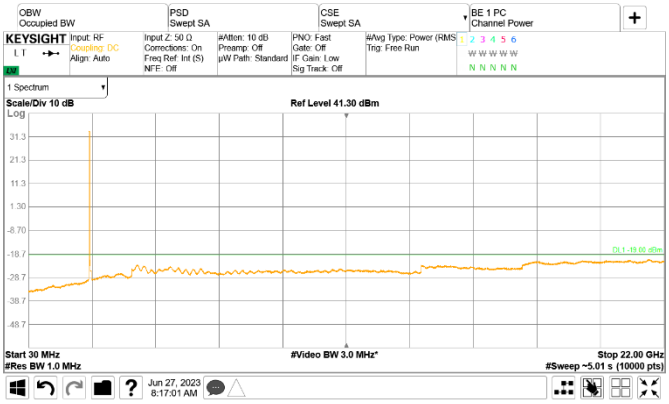

Figure 8.3-58: *Conducted spurious emissions of NR 30 MHz low channel, single-carrier operation*

Test data, continued

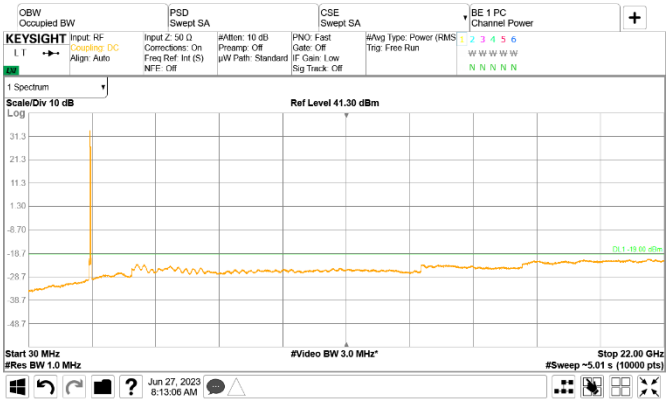

Figure 8.3-59: *Conducted spurious emissions of NR 30 MHz mid channel, single-carrier operation*

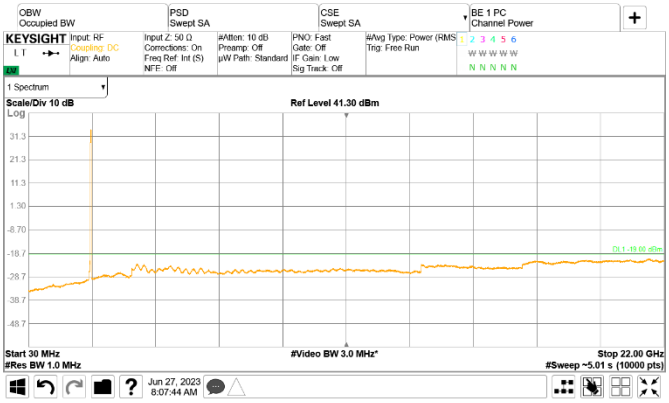

Figure 8.3-60: *Conducted spurious emissions of NR 30 MHz top channel, single-carrier operation*

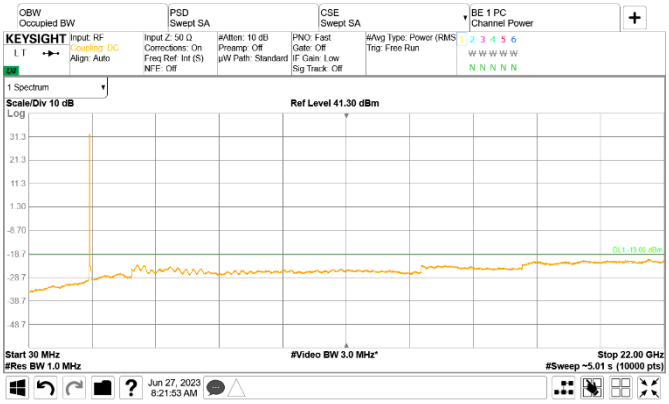

Figure 8.3-61: *Conducted spurious emissions of NR 40 MHz low channel, single-carrier operation*

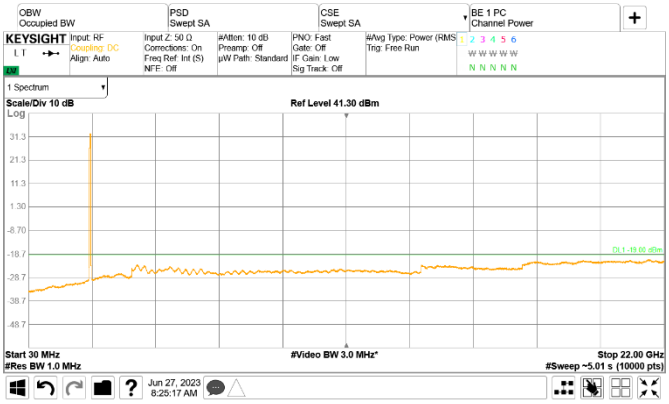

Figure 8.3-62: *Conducted spurious emissions of NR 40 MHz mid channel, single-carrier operation*

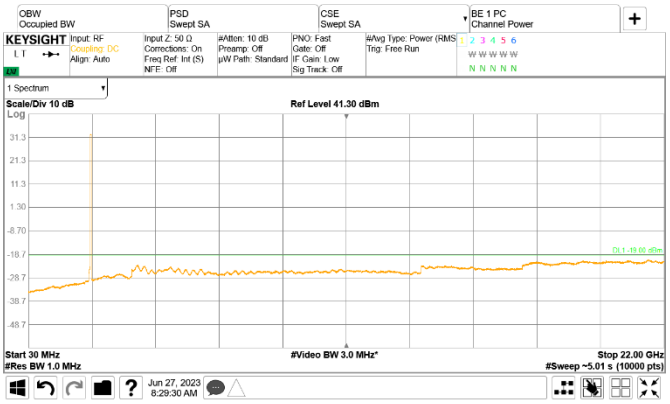

Figure 8.3-63: *Conducted spurious emissions of NR 40 MHz top channel, single-carrier operation*

Test data, continued

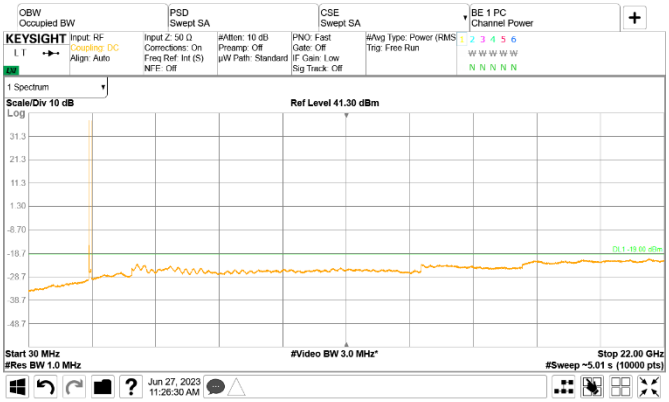

Figure 8.3-64: *Conducted spurious emissions of NR 5 MHz two non-contiguous channels, two-carrier operation*

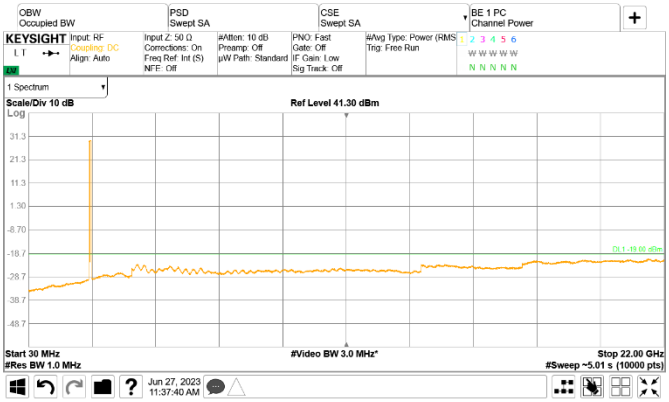

Figure 8.3-65: *Conducted spurious emissions of NR 40 MHz two non-contiguous channels, two-carrier operation*

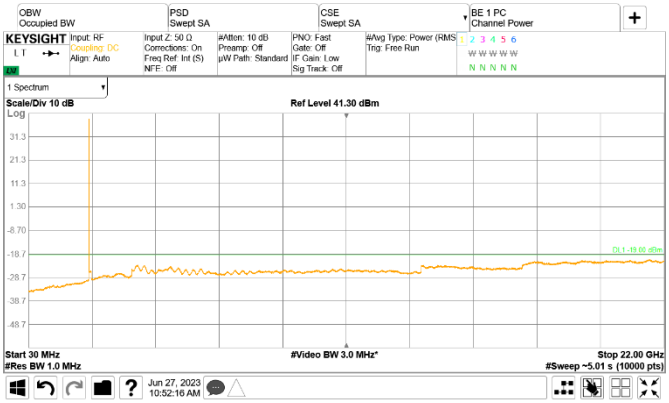

Figure 8.3-66: *Conducted spurious emissions of NR 5 MHz two contiguous low channels, two-carrier operation*

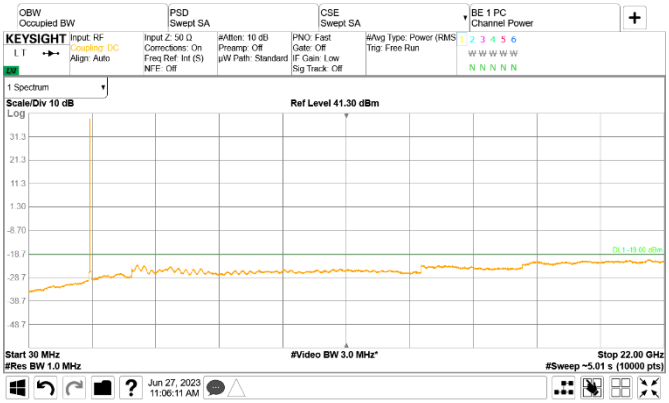

Figure 8.3-67: *Conducted spurious emissions of NR 5 MHz two contiguous mid channels, two-carrier operation*

Test data, continued

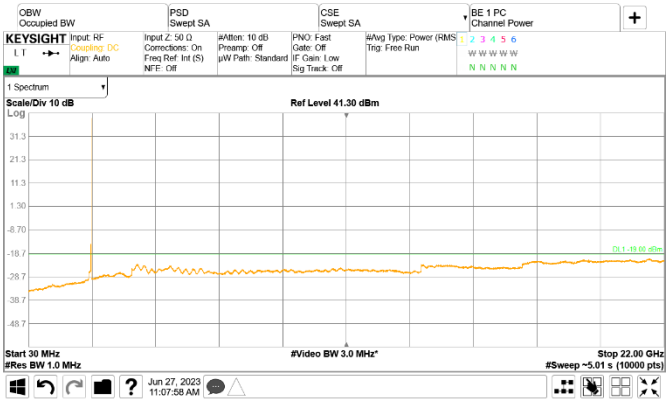

Figure 8.3-68: *Conducted spurious emissions of NR 5 MHz two contiguous top channels, two-carrier operation*

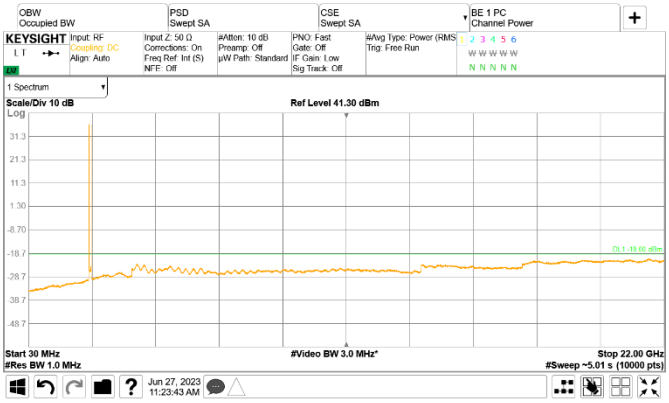

Figure 8.3-69: *Conducted spurious emissions of NR 5 MHz three non-contiguous channels, three-carrier operation*

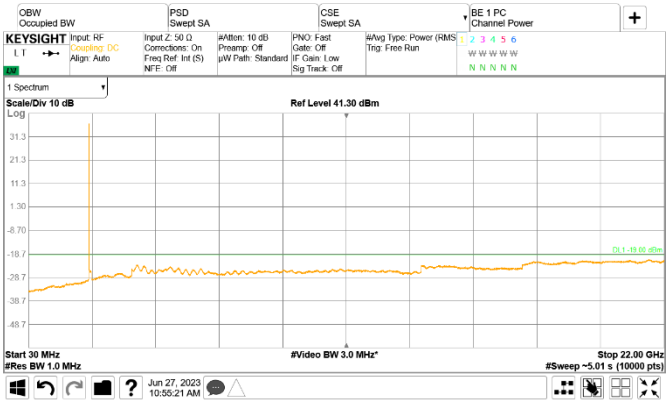

Figure 8.3-70: *Conducted spurious emissions of NR 5 MHz three contiguous low channels, three-carrier operation*

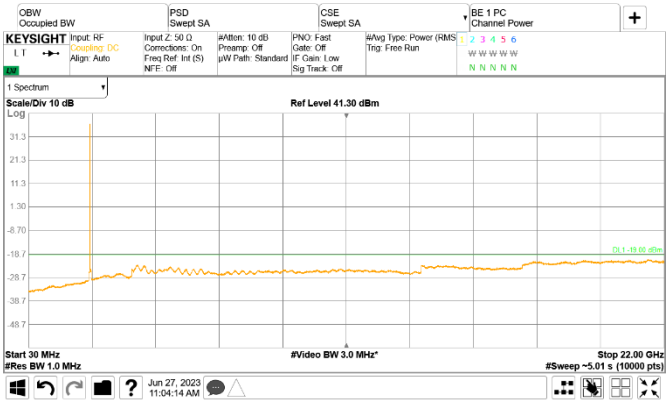

Figure 8.3-71: *Conducted spurious emissions of NR 5 MHz three contiguous mid channels, three-carrier operation*

Test data, continued

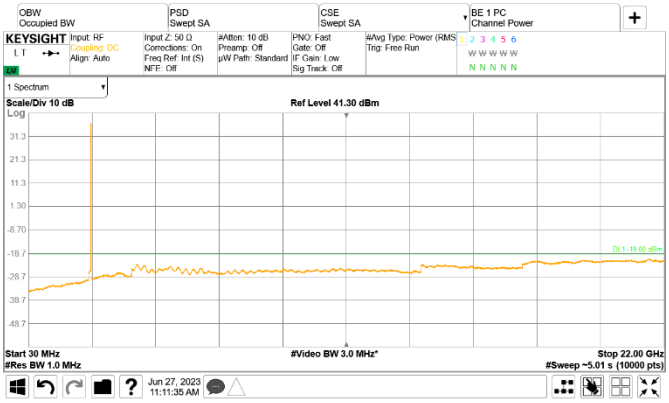

Figure 8.3-72: *Conducted spurious emissions of NR 5 MHz three contiguous top channels, three-carrier operation*

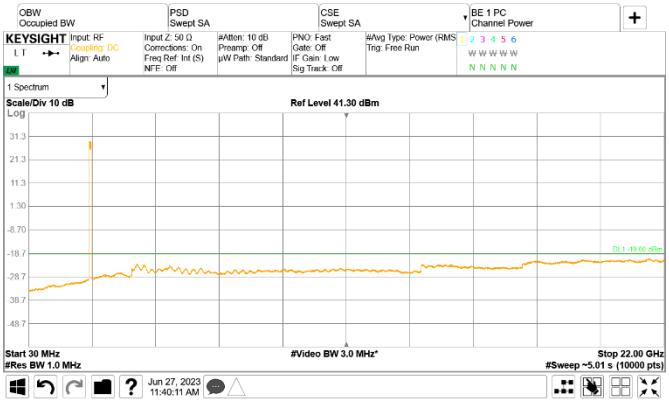

Figure 8.3-73: *Conducted spurious emissions of NR 30 MHz three contiguous channels, three-carrier operation*

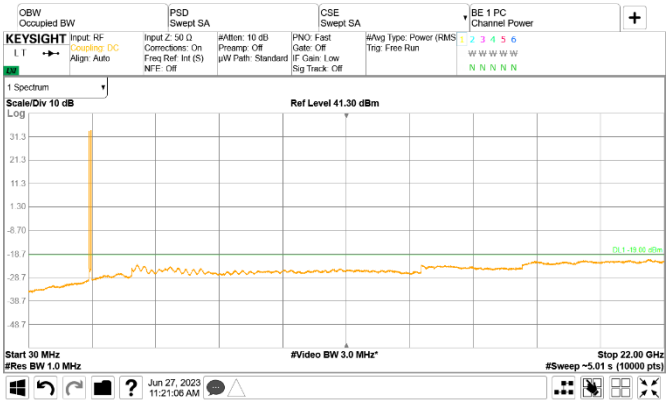

Figure 8.3-74: *Conducted spurious emissions of NR 5 MHz six non-contiguous channels, six-carrier operation*

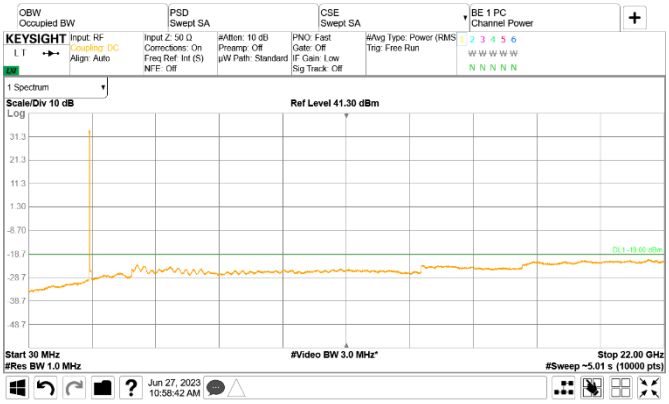

Figure 8.3-75: *Conducted spurious emissions of NR 5 MHz six contiguous low channels, six-carrier operation*

Test data, continued

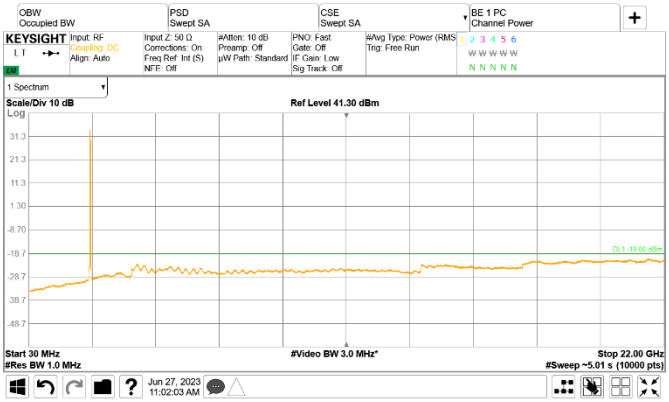

Figure 8.3-76: *Conducted spurious emissions of NR 5 MHz six contiguous mid channels, six-carrier operation*

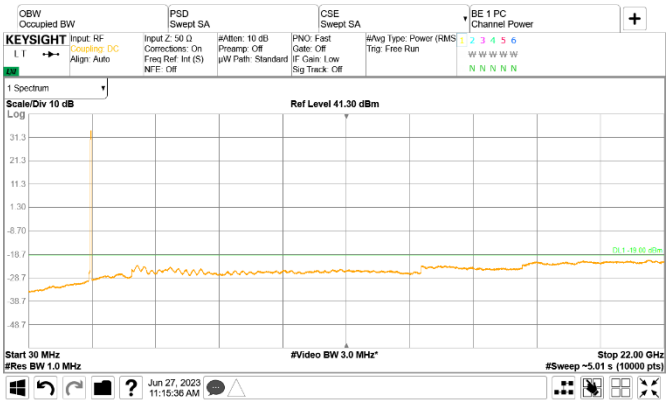

Figure 8.3-77: *Conducted spurious emissions of NR 5 MHz six contiguous top channels, six-carrier operation*

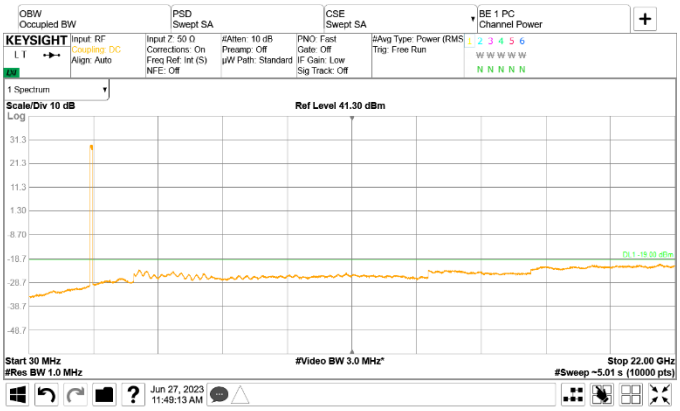

Figure 8.3-78: *Conducted spurious emissions of NR 15 MHz six contiguous channels, six-carrier operation*

Test data, continued

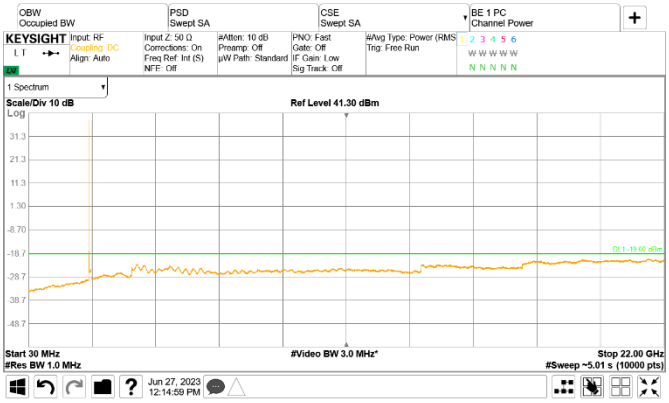

Figure 8.3-79: *Conducted spurious emissions of multi-RAT operation, NR 5 MHz and LTE with IoT1 5 MHz*

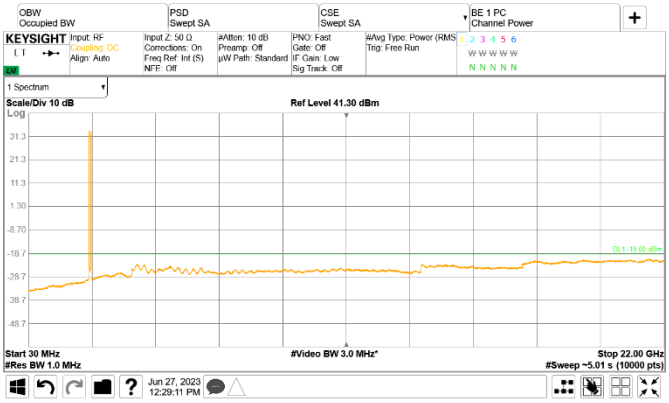

Figure 8.3-80: *Conducted spurious emissions of multi-RAT operation, 3 × NR 5 MHz and 3 × LTE with IoT1 5 MHz*

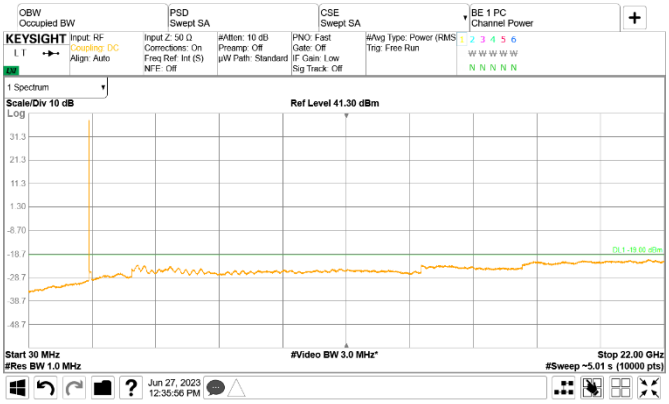

Figure 8.3-81: *Conducted spurious emissions of multi-RAT operation, NR 5 MHz + LTE 5 MHz, Low Channel*

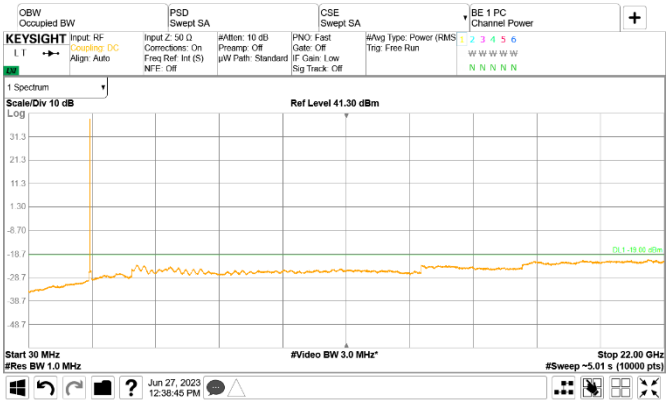

Figure 8.3-82: *Conducted spurious emissions of multi-RAT operation, NR 5 MHz + LTE 5 MHz, Mid Channel*

Note: “and”: non-contiguous channels; “+”: contiguous channels

Test data, continued

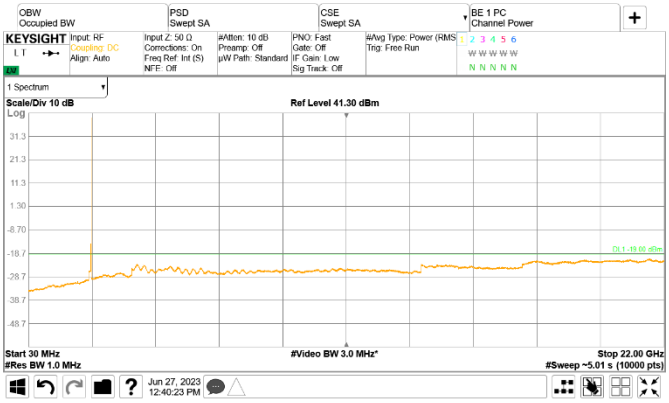

Figure 8.3-83: *Conducted spurious emissions of multi-RAT operation, NR 5 MHz + LTE 5 MHz, Top Channel*

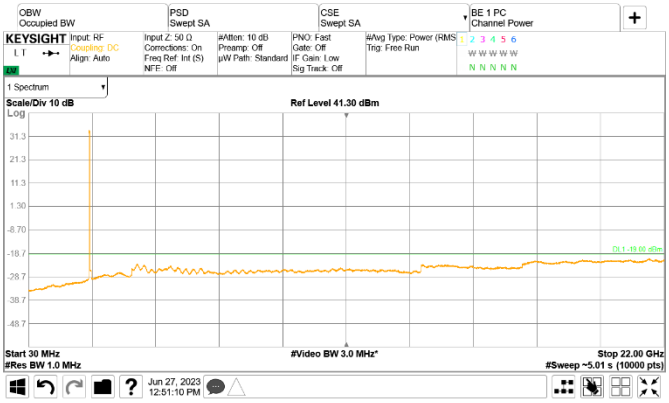

Figure 8.3-84: *Conducted spurious emissions of multi-RAT operation, 3 × NR 5 MHz + 3 × LTE 5 MHz, Low Channel*

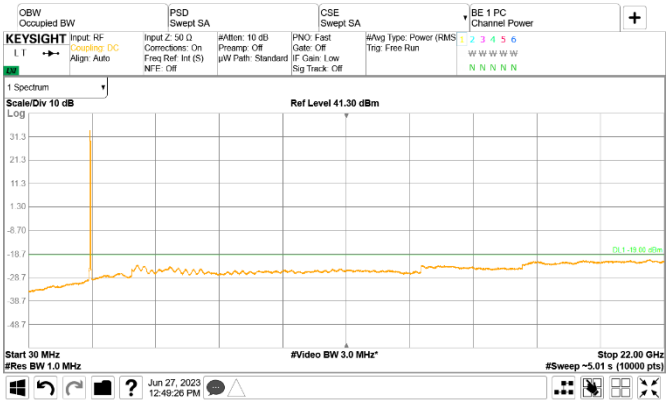

Figure 8.3-85: *Conducted spurious emissions of multi-RAT operation, 3 × NR 5 MHz + 3 × LTE 5 MHz, Mid Channel*

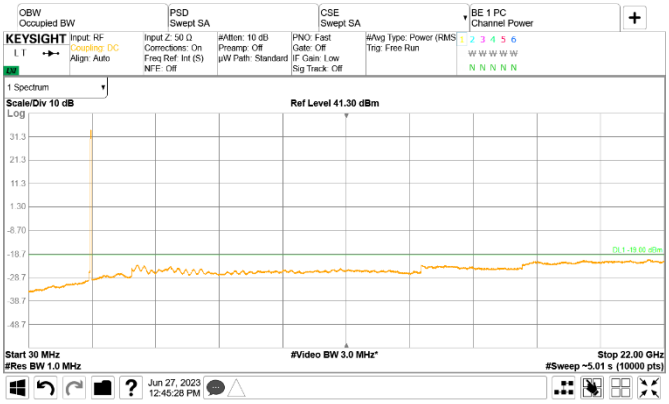

Figure 8.3-86: *Conducted spurious emissions of multi-RAT operation, 3 × NR 5 MHz + 3 × LTE 5 MHz, Top Channel*

Note: “and”: non-contiguous channels; “+”: contiguous channels

Test data, continued

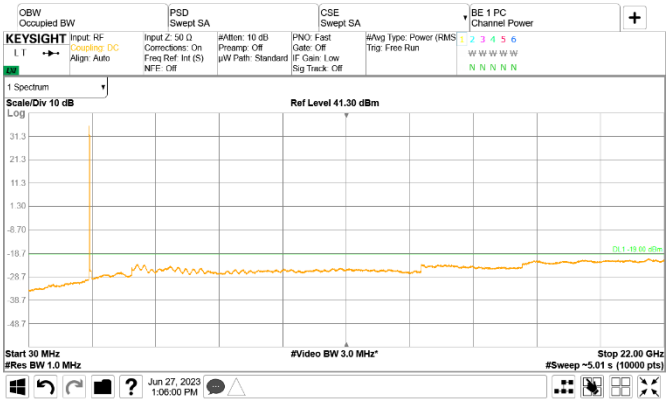

Figure 8.3-87: *Conducted spurious emissions of multi-RAT operation, LTE 10 MHz + 3 × NR 5 MHz, Low Channel*

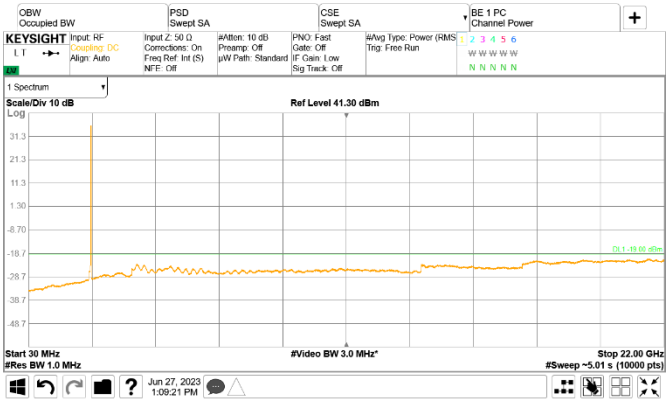

Figure 8.3-88: *Conducted spurious emissions of multi-RAT operation, LTE 10 MHz + 3 × NR 5 MHz, Top Channel*

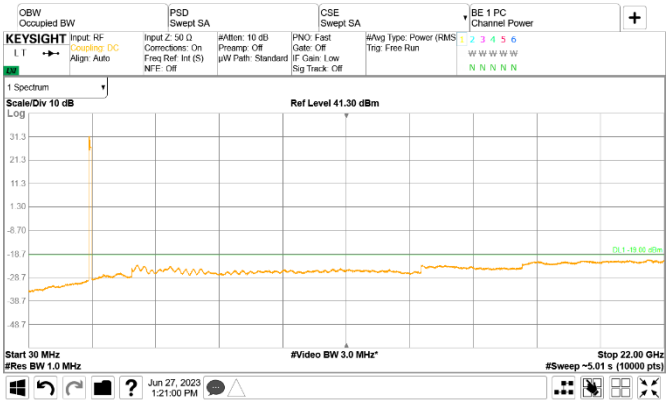

Figure 8.3-89: *Conducted spurious emissions of multi-RAT operation, NR 10 MHz + 3 × LTE 15 MHz + NR 30 MHz, Low Channel*

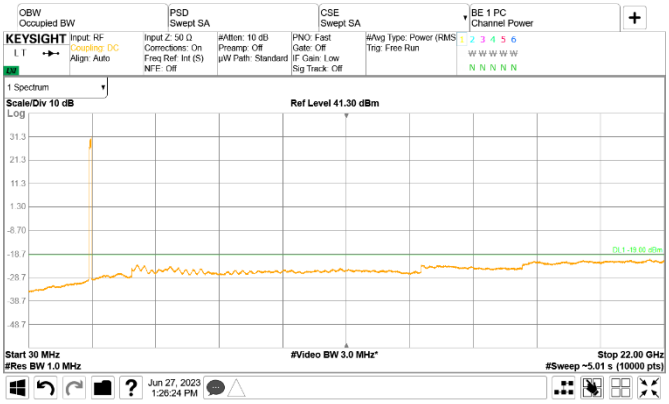

Figure 8.3-90: *Conducted spurious emissions of multi-RAT operation, NR 10 MHz + 3 × LTE 15 MHz + NR 30 MHz, Top Channel*

Note: “and”: non-contiguous channels; “+”: contiguous channels

Test data, continued

On the plots below the measured *Channel Power* value in the "*Total Channel Power*" column must be −19 dBm and lower.

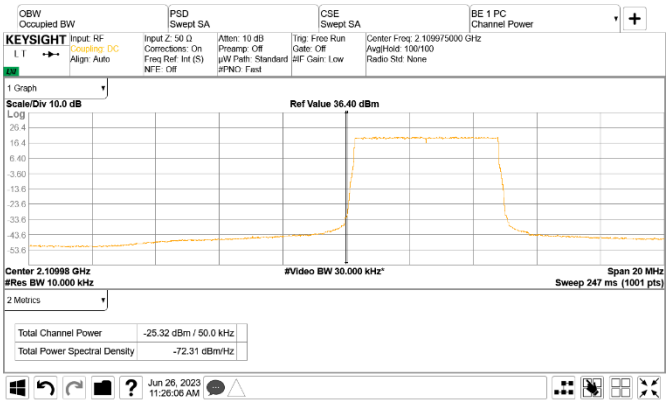

Figure 8.3-91: *Conducted emission at the lower band edge*

Frequency:	*2110 MHz*	*Mode:*	*Single-carrier operation*
Meas. BW:	*1% of EBW*	*Tech.:*	*LTE 5 MHz*
Limit:	*−19 dBm/50 kHz*	*Notes:*	*None*

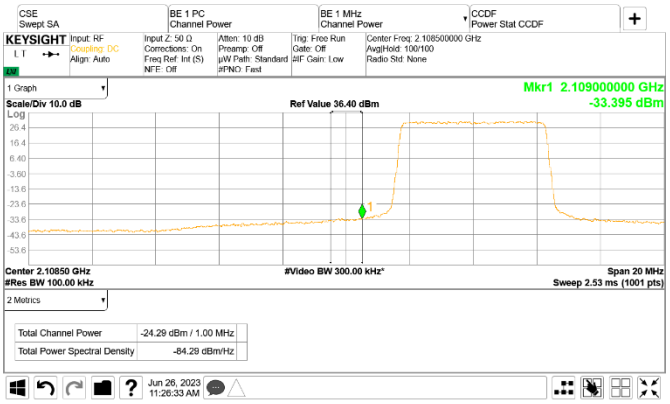

Figure 8.3-92: *Conducted emission 1 MHz away from the lower band edge*

Frequency:	*2109 MHz*	*Mode:*	*Single-carrier operation*
Meas. BW:	*1 MHz*	*Tech.:*	*LTE 5 MHz*
Limit:	*−19 dBm/MHz*	*Notes:*	*None*

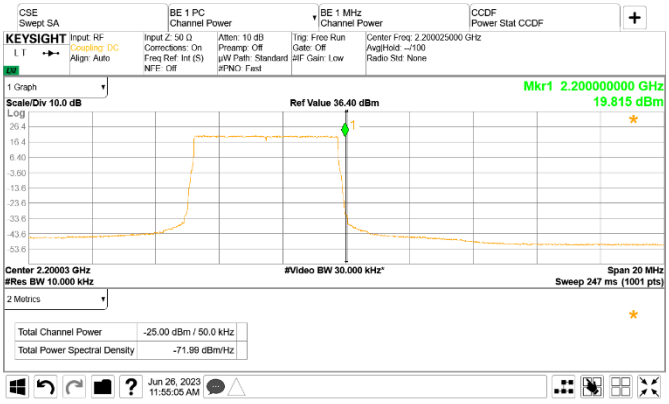

Figure 8.3-93: *Conducted emission at the upper band edge*

Frequency:	*2200 MHz*	*Mode:*	*Single-carrier operation*
Meas. BW:	*1% of EBW*	*Tech.:*	*LTE 5 MHz*
Limit:	*−19 dBm/50 kHz*	*Notes:*	*None*

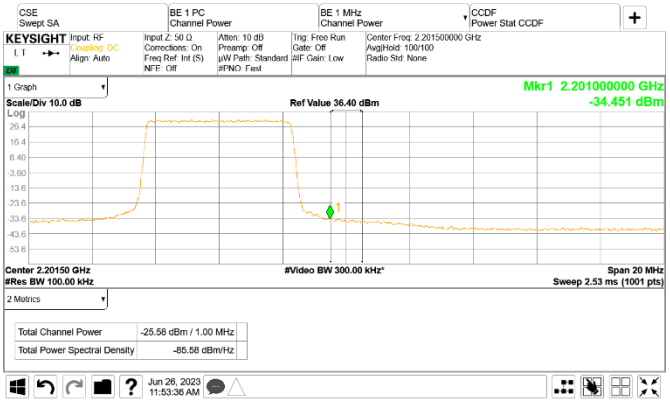

Figure 8.3-94: *Conducted emission 1 MHz away from the upper band edge*

Frequency:	*2201 MHz*	*Mode:*	*Single-carrier operation*
Meas. BW:	*1 MHz*	*Tech.:*	*LTE 5 MHz*
Limit:	*−19 dBm/MHz*	*Notes:*	*None*