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.

For operations in the 3700 – 3980MHz band and the 3450 – 3550MHz band, the maximum permissible conducted power level of any spurious emission is -13dBm/MHz.

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 the tenth harmonic of the highest transmit frequency (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

Test Setup

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

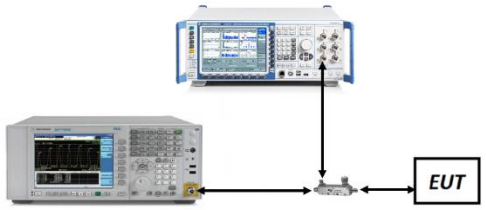


Figure 7-3. Test Instrument & Measurement Setup

Test Notes

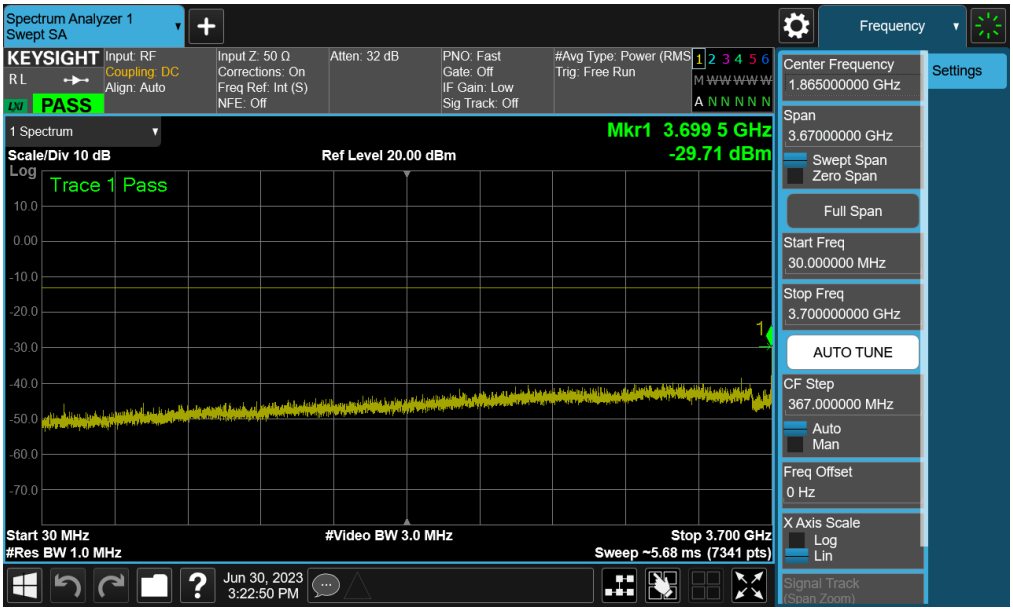
1. Per Part 27.53(k) and Part 27.53(l), compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz.

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.

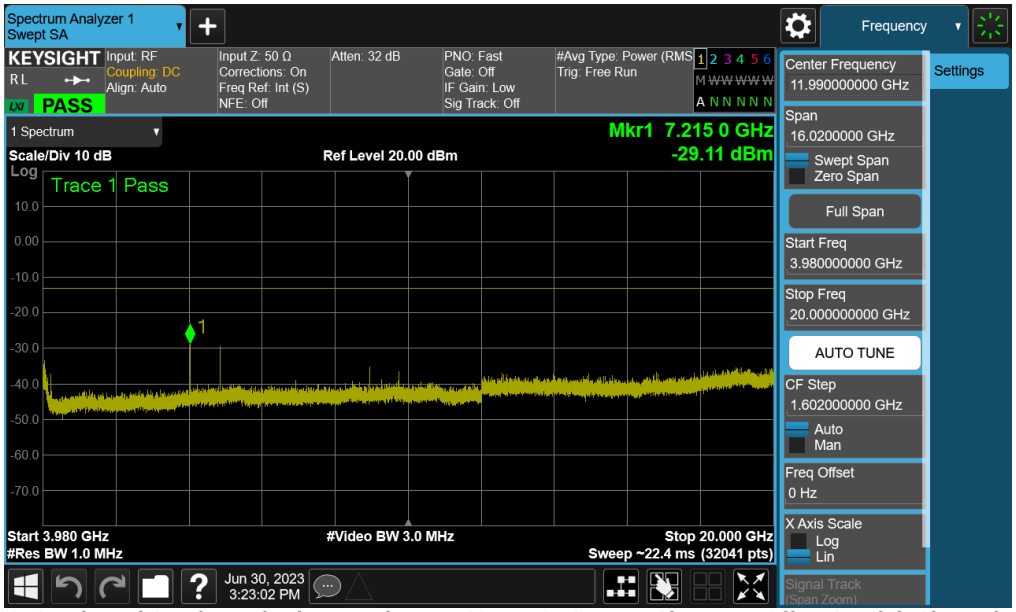
Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
NR-n77PC3-R1	100MHz	Mid	30.0 - 3450.0	-32.39	-13	-19.39
		Mid	3550.0 - 20000.0	-27.70	-13	-14.70
		Mid	20000.0 - 40000.0	-24.46	-13	-11.46
NR-n77PC3	100MHz	Low	30.0 - 3700.0	-31.14	-13	-18.14
		Low	3930.0 - 20000.0	-30.46	-13	-17.46
		Low	20000.0 - 40000.0	-25.75	-13	-12.75
		Mid	30.0 - 3700.0	-27.98	-13	-14.98
		Mid	3930.0 - 20000.0	-30.17	-13	-17.17
		Mid	20000.0 - 40000.0	-24.94	-13	-11.94
		High	30.0 - 3700.0	-29.71	-13	-16.71
		High	3930.0 - 20000.0	-29.11	-13	-16.11
		High	20000.0 - 40000.0	-24.78	-13	-11.78

Figure 7-4. Conducted Emission Test Results – Ant F

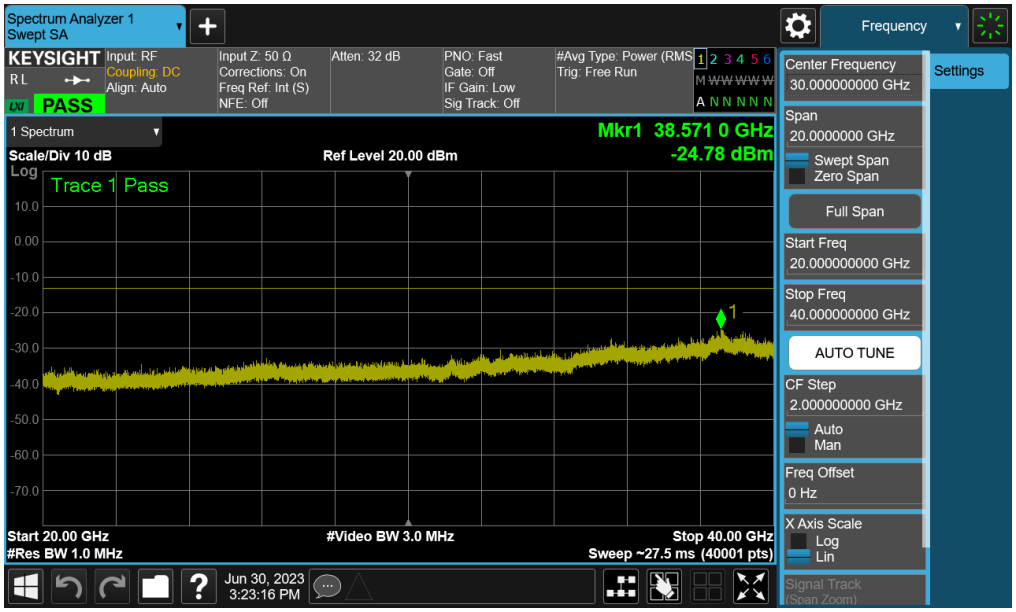
NR Band n77 – Ant F



Plot 7-67. Conducted Spurious Plot (NR Band n77 - 100MHz QPSK - RB Size 1, RB Offset 0 - High Channel – Ant F)

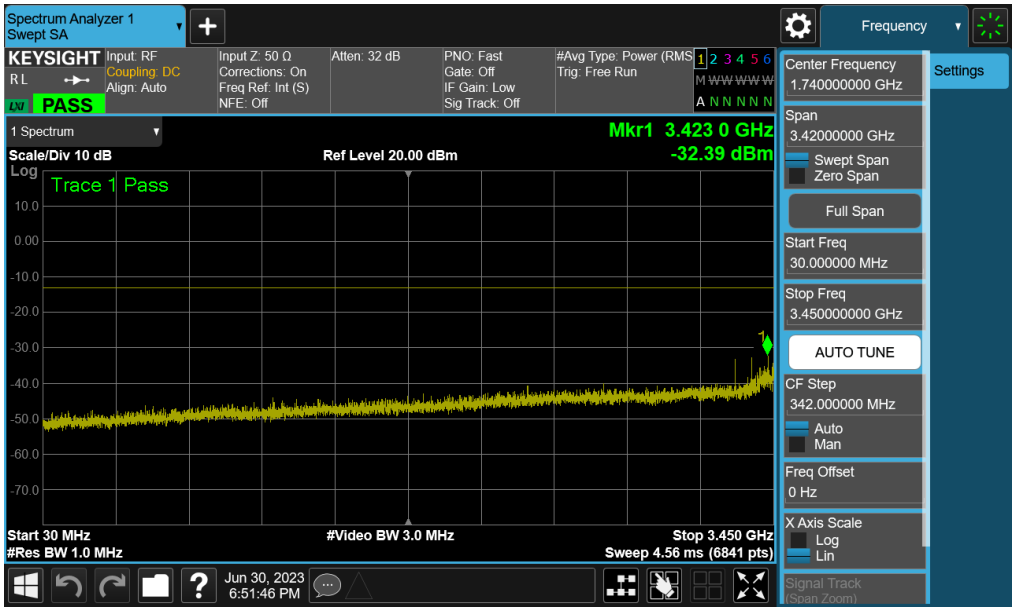


Plot 7-68. Conducted Spurious Plot (NR Band n77 - 100MHz QPSK - RB Size 1, RB Offset 0 - High Channel – Ant F)

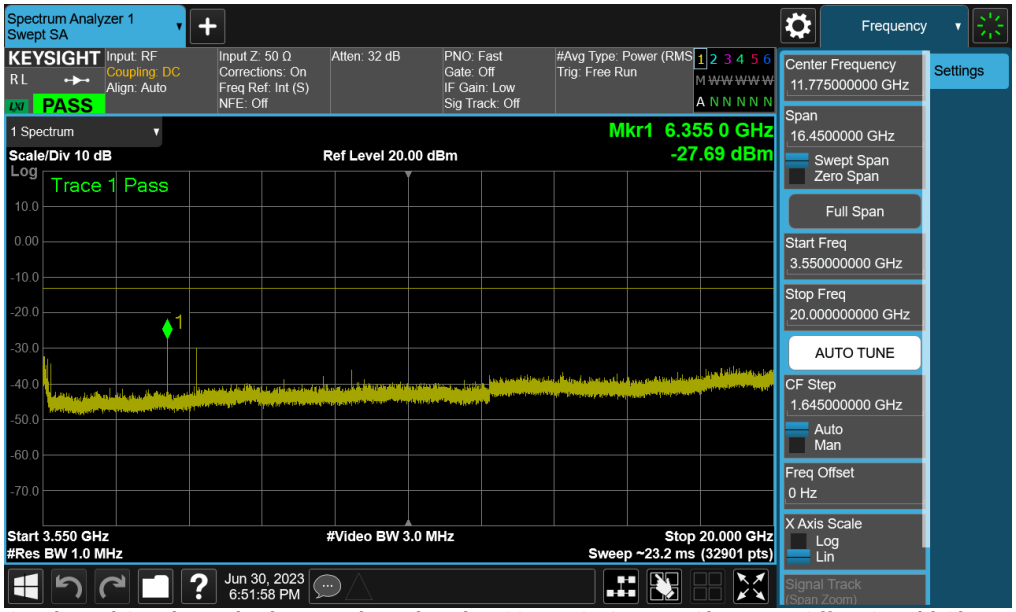


Plot 7-69. Conducted Spurious Plot (NR Band n77 - 100MHz QPSK - RB Size 1, RB Offset 0 - High Channel – Ant F)

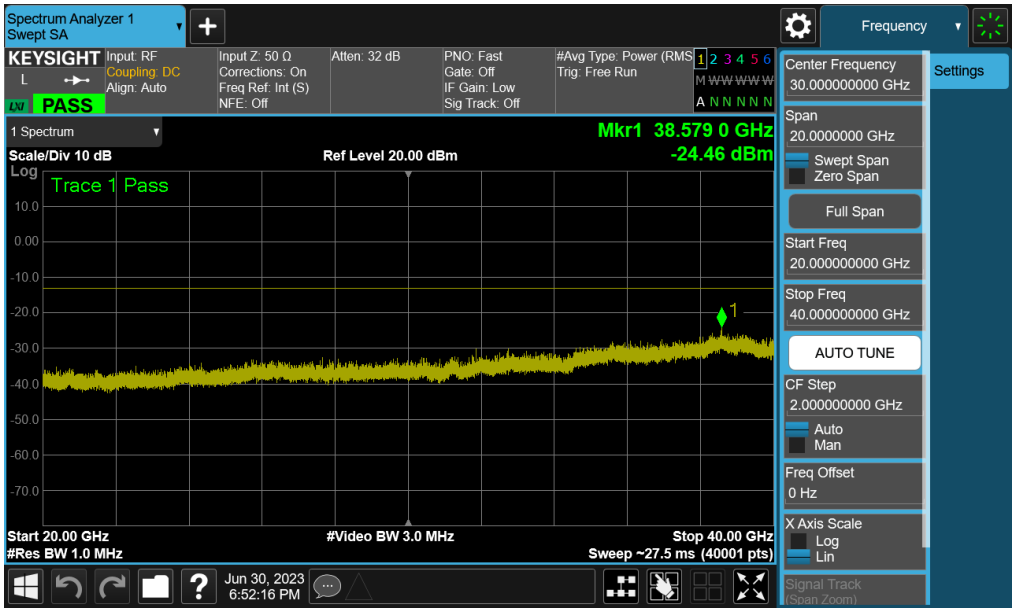
NR Band n77 (DoD Band) – Ant F



Plot 7-70. Conducted Spurious Plot (NR Band n77 (DoD) - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel – Ant F)



Plot 7-71. Conducted Spurious Plot (NR Band n77 (DoD) - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel – Ant F)

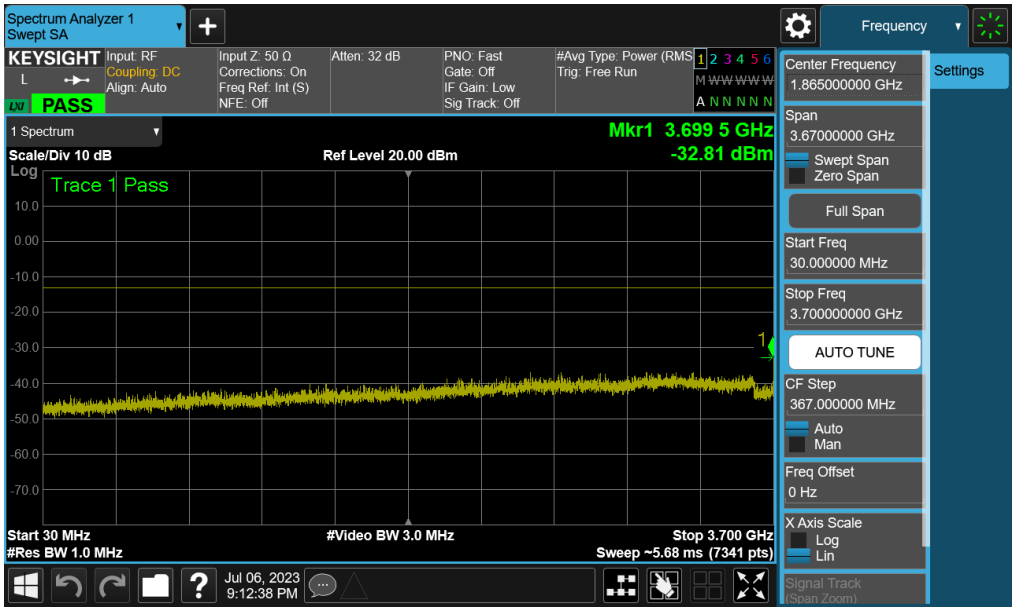


Plot 7-72. Conducted Spurious Plot (NR Band n77 (DoD) - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel – Ant F)

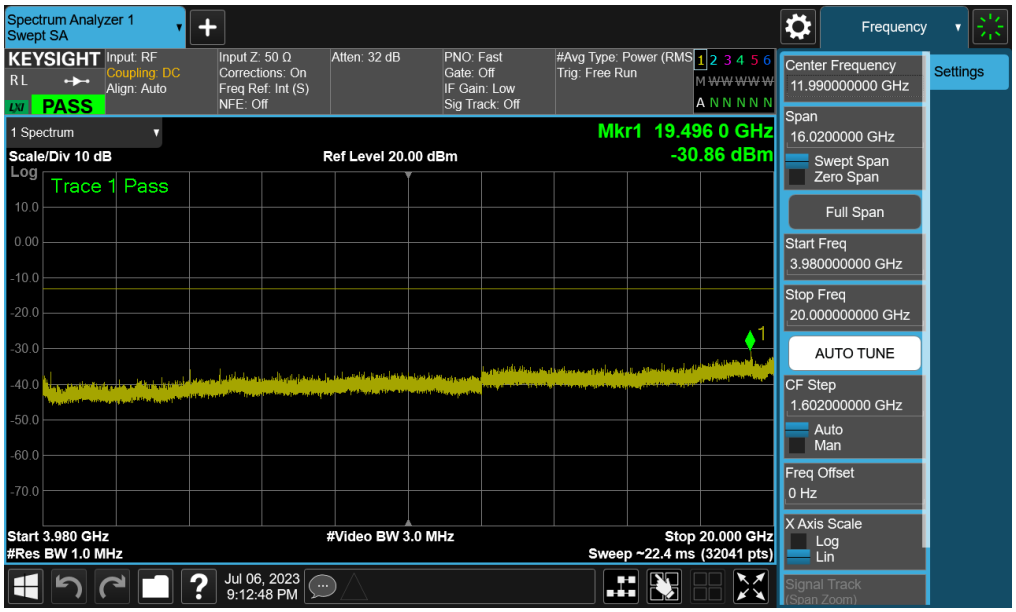
Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
NR-n77PC3 DoD Band	100MHz	Mid	30.0 - 3450.0	-32.79	-13	-19.79
		Mid	3550.0 - 20000.0	-33.04	-13	-20.04
		Mid	20000.0 - 40000.0	-34.34	-13	-21.34
NR-n77PC3 C-Band	100MHz	Low	30.0 - 3700.0	-31.64	-13	-18.64
		Low	3930.0 - 20000.0	-32.06	-13	-19.06
		Low	20000.0 - 40000.0	-35.06	-13	-22.06
		Mid	30.0 - 3700.0	-31.50	-13	-18.50
		Mid	3930.0 - 20000.0	-32.17	-13	-19.17
		Mid	20000.0 - 40000.0	-34.88	-13	-21.88
		High	30.0 - 3700.0	-32.81	-13	-19.81
		High	3930.0 - 20000.0	-30.86	-13	-17.86
		High	20000.0 - 40000.0	-35.00	-13	-22.00

Figure 7-6. Conducted Emission Test Results – Ant C

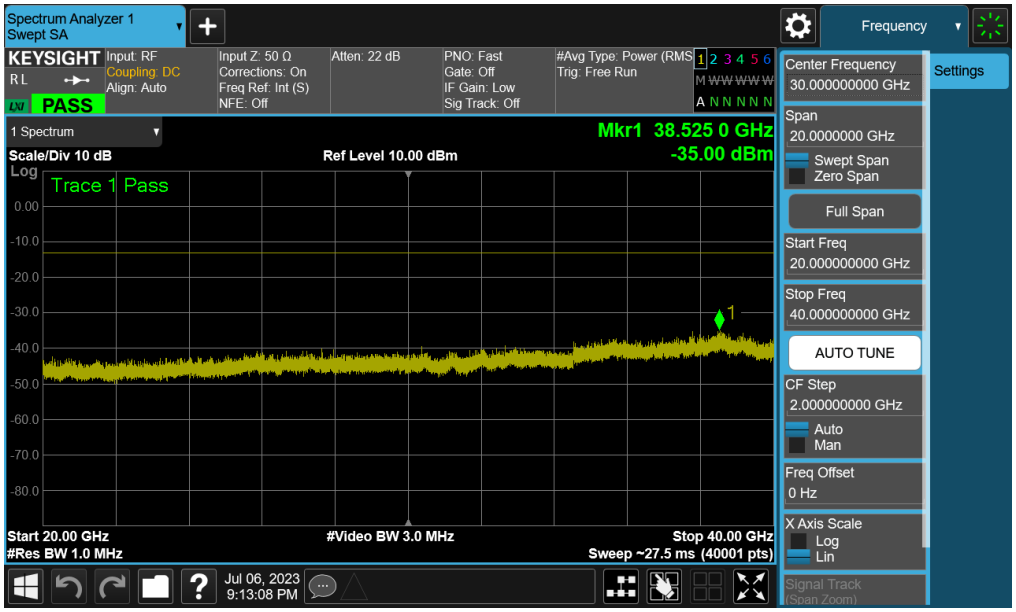
NR Band n77 – Ant C



Plot 7-73. Conducted Spurious Plot (NR Band n77 - 100MHz QPSK - RB Size 1, RB Offset 0 - High Channel – Ant C)

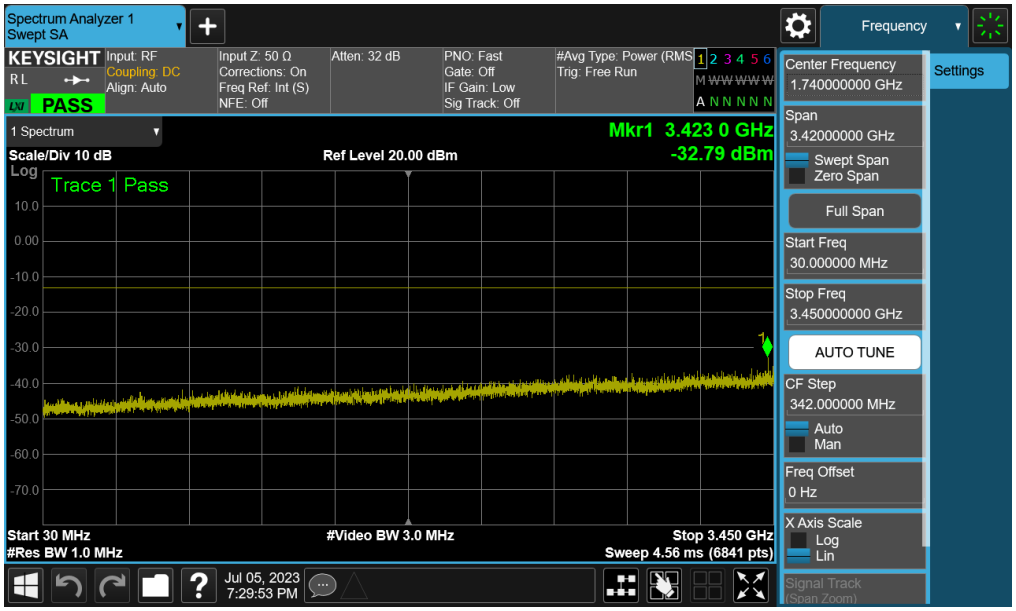


Plot 7-74. Conducted Spurious Plot (NR Band n77 - 100MHz QPSK - RB Size 1, RB Offset 0 - High Channel – Ant C)

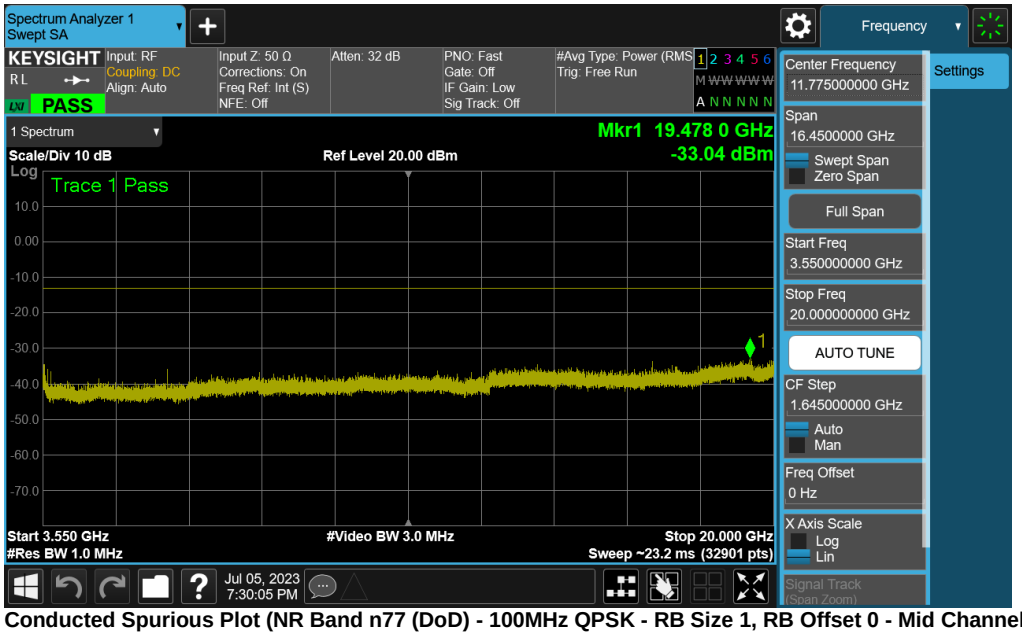


Plot 7-75. Conducted Spurious Plot (NR Band n77 - 100MHz QPSK - RB Size 1, RB Offset 0 - High Channel – Ant C)

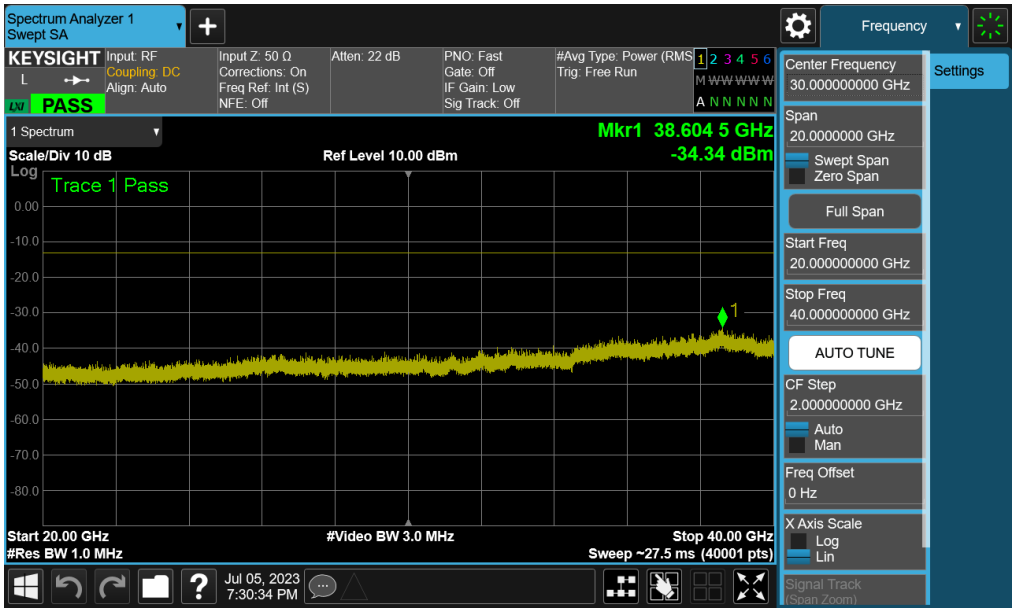
NR Band n77 (DoD Band) – Ant C



Plot 7-76. Conducted Spurious Plot (NR Band n77 (DoD) - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel – Ant C)



Plot 7-77. Conducted Spurious Plot (NR Band n77 (DoD) - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel – Ant C)

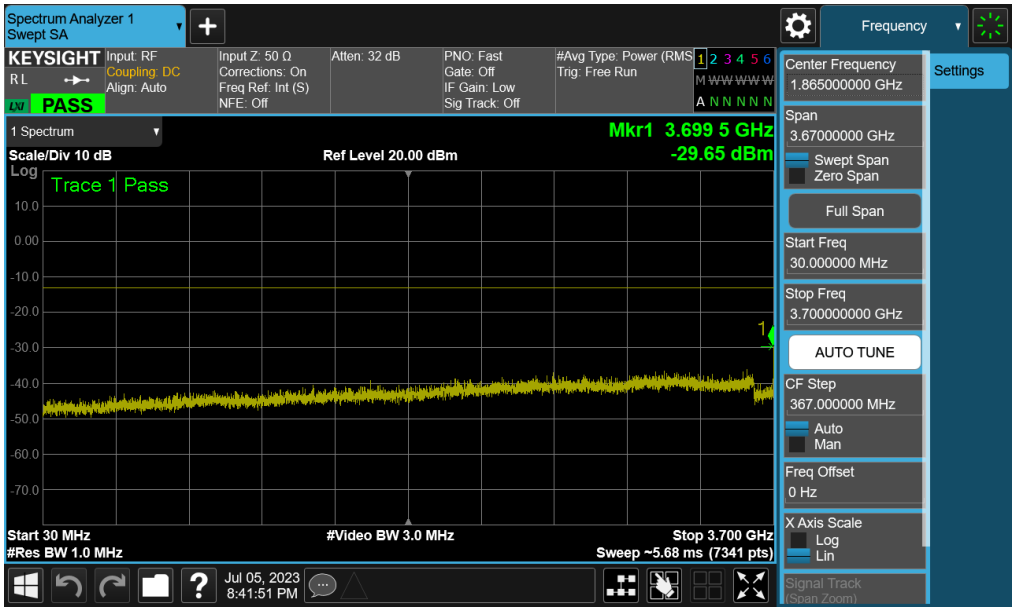


Plot 7-78. Conducted Spurious Plot (NR Band n77 (DoD) - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel – Ant C)

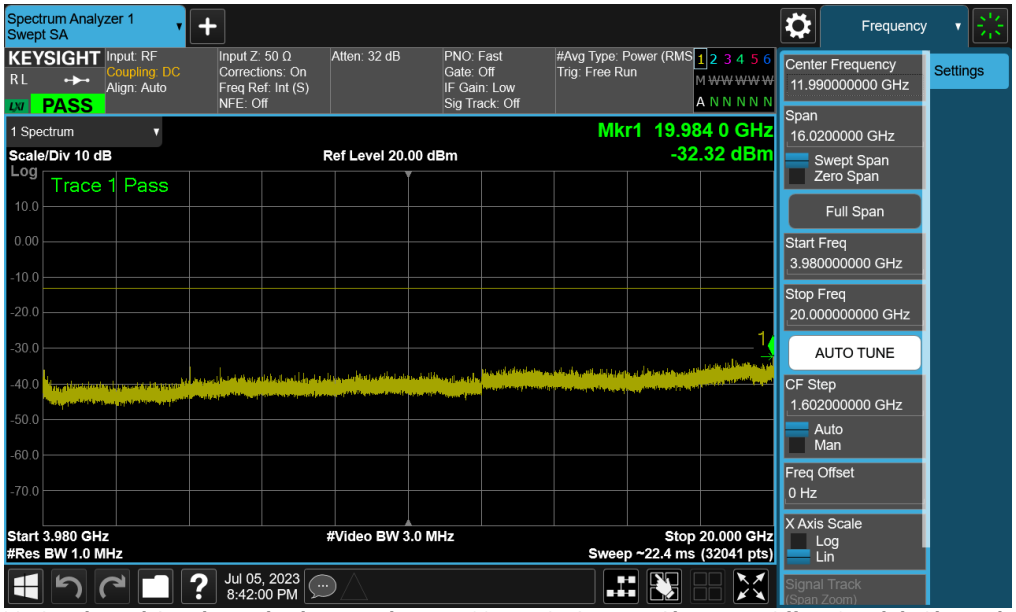
Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
NR-n77PC3 DoD Band	100MHz	Mid	30.0 - 3450.0	-30.18	-13	-17.18
		Mid	3550.0 - 20000.0	-30.35	-13	-17.35
		Mid	20000.0 - 40000.0	-34.95	-13	-21.95
NR-n77PC3 C-Band	100MHz	Low	30.0 - 3700.0	-30.39	-13	-17.39
		Low	3930.0 - 20000.0	-32.75	-13	-19.75
		Low	20000.0 - 40000.0	-34.81	-13	-21.81
		Mid	30.0 - 3700.0	-31.09	-13	-18.09
		Mid	3930.0 - 20000.0	-32.63	-13	-19.63
		Mid	20000.0 - 40000.0	-35.08	-13	-22.08
		High	30.0 - 3700.0	-29.65	-13	-16.65
		High	3930.0 - 20000.0	-32.32	-13	-19.32
		High	20000.0 - 40000.0	-34.36	-13	-21.36

Figure 7-7. Conducted Emission Test Results – Ant I

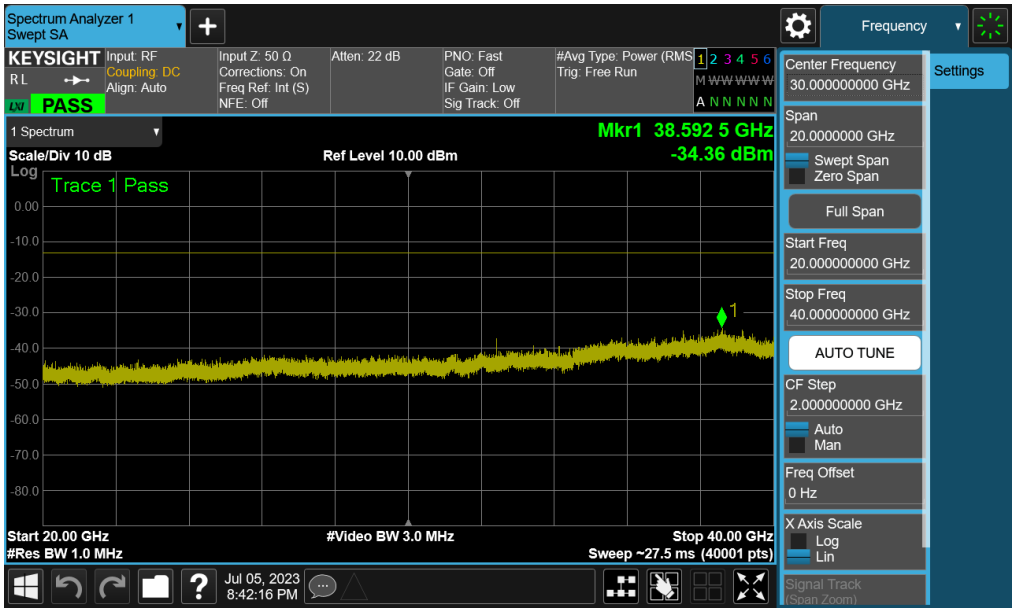
NR Band n77 – Ant I



Plot 7-79. Conducted Spurious Plot (NR Band n77 - 100MHz QPSK - RB Size 1, RB Offset 0 - High Channel – Ant I)

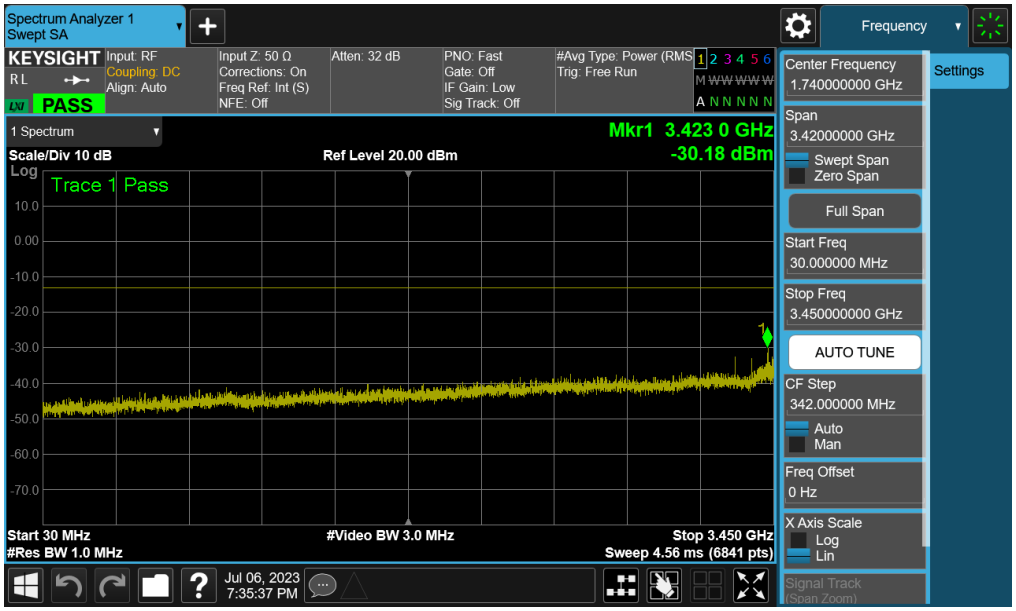


Plot 7-80. Conducted Spurious Plot (NR Band n77 - 100MHz QPSK - RB Size 1, RB Offset 0 - High Channel – Ant I)

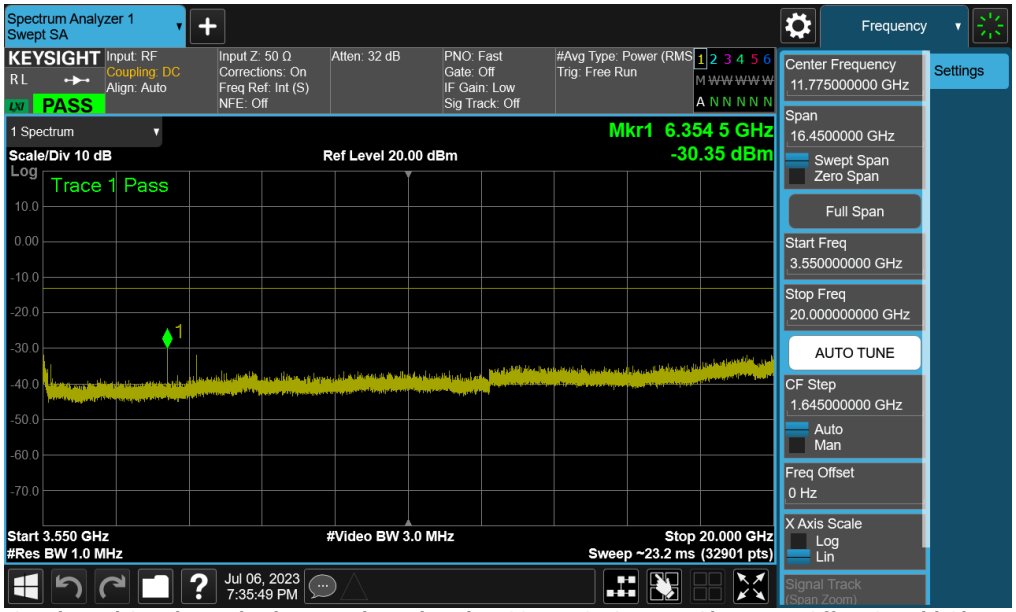


Plot 7-81. Conducted Spurious Plot (NR Band n77 - 100MHz QPSK - RB Size 1, RB Offset 0 - High Channel – Ant I)

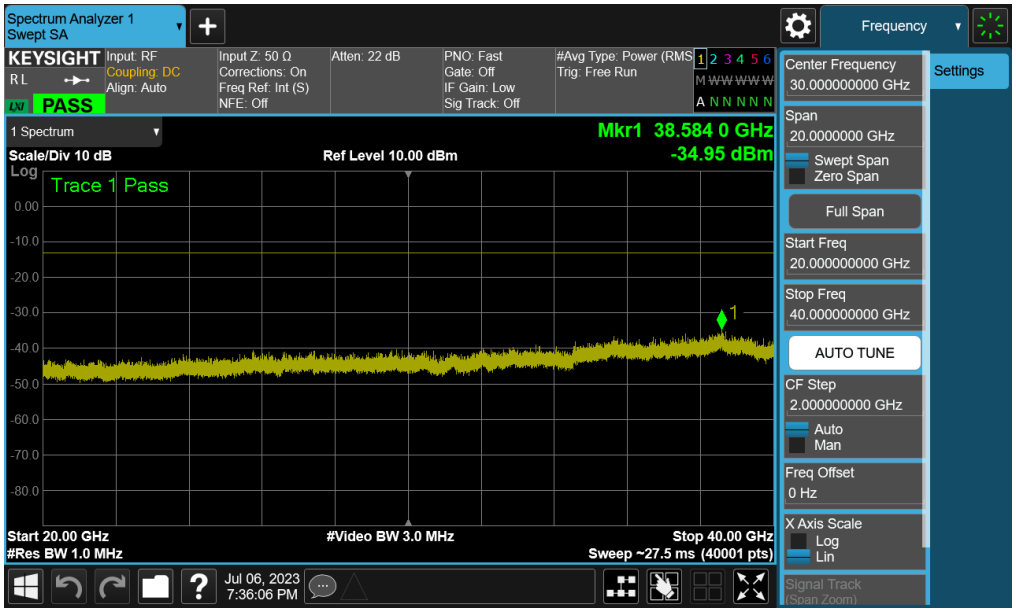
NR Band n77 (DoD Band) – Ant I



Plot 7-82. Conducted Spurious Plot (NR Band n77 (DoD) - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel – Ant I)



Plot 7-83. Conducted Spurious Plot (NR Band n77 (DoD) - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel – Ant I)

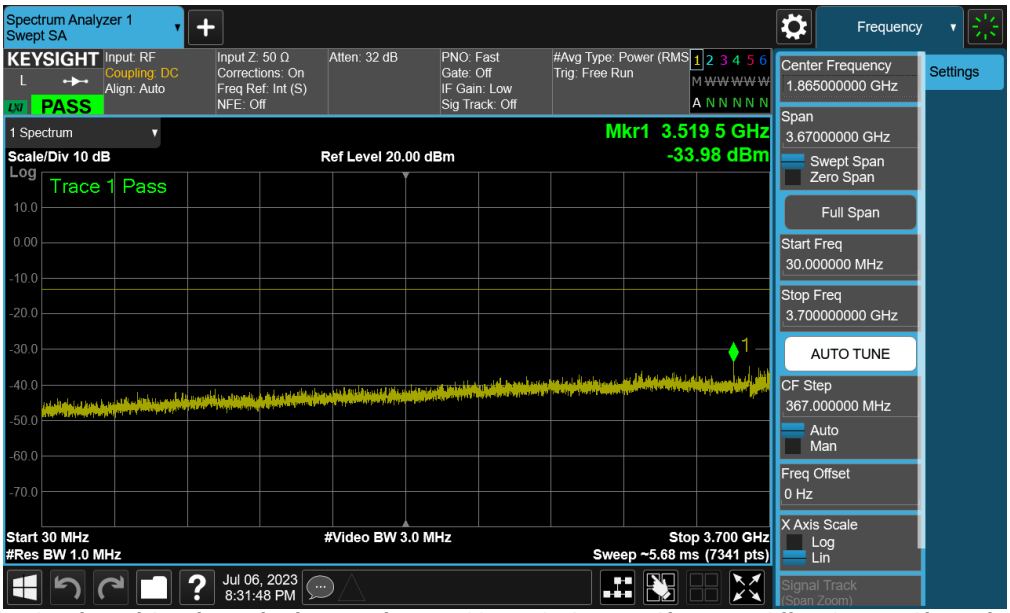


Plot 7-84. Conducted Spurious Plot (NR Band n77 (DoD) - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel – Ant I)

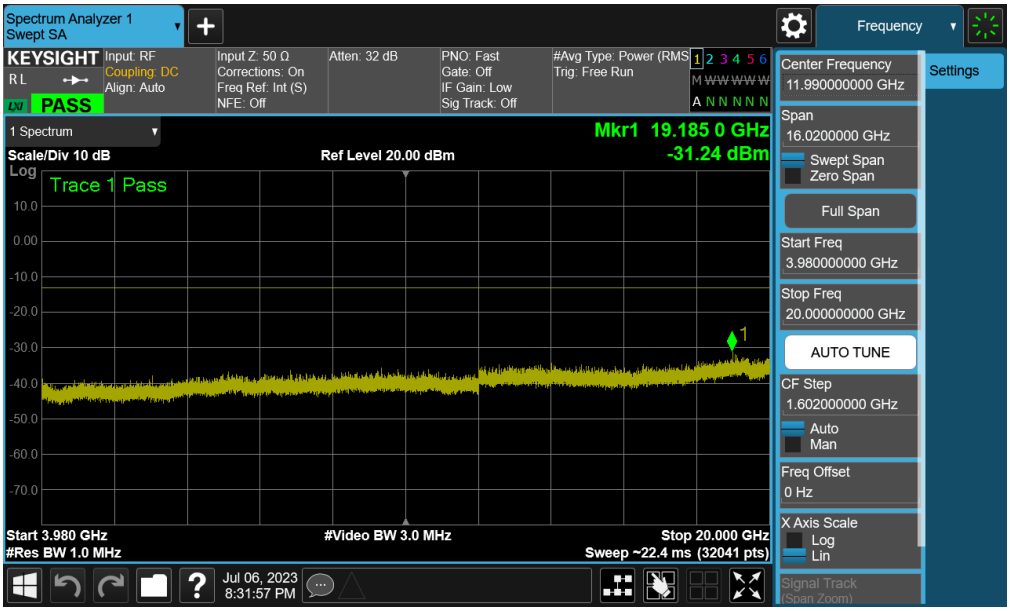
Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
NR-n77PC3 DoD Band	100MHz	Mid	30.0 - 3450.0	-37.91	-13	-24.91
		Mid	3550.0 - 20000.0	-32.71	-13	-19.71
		Mid	20000.0 - 40000.0	-42.65	-13	-29.65
NR-n77PC3 C-Band	100MHz	Low	30.0 - 3700.0	-33.98	-13	-20.98
		Low	3930.0 - 20000.0	-31.24	-13	-18.24
		Low	20000.0 - 40000.0	-34.94	-13	-21.94
		Mid	30.0 - 3700.0	-34.00	-13	-21.00
		Mid	3930.0 - 20000.0	-32.48	-13	-19.48
		Mid	20000.0 - 40000.0	-35.55	-13	-22.55
		High	30.0 - 3700.0	-35.37	-13	-22.37
		High	3930.0 - 20000.0	-31.52	-13	-18.52
		High	20000.0 - 40000.0	-34.85	-13	-21.85

Figure 7-8. Conducted Emission Test Results – Ant D

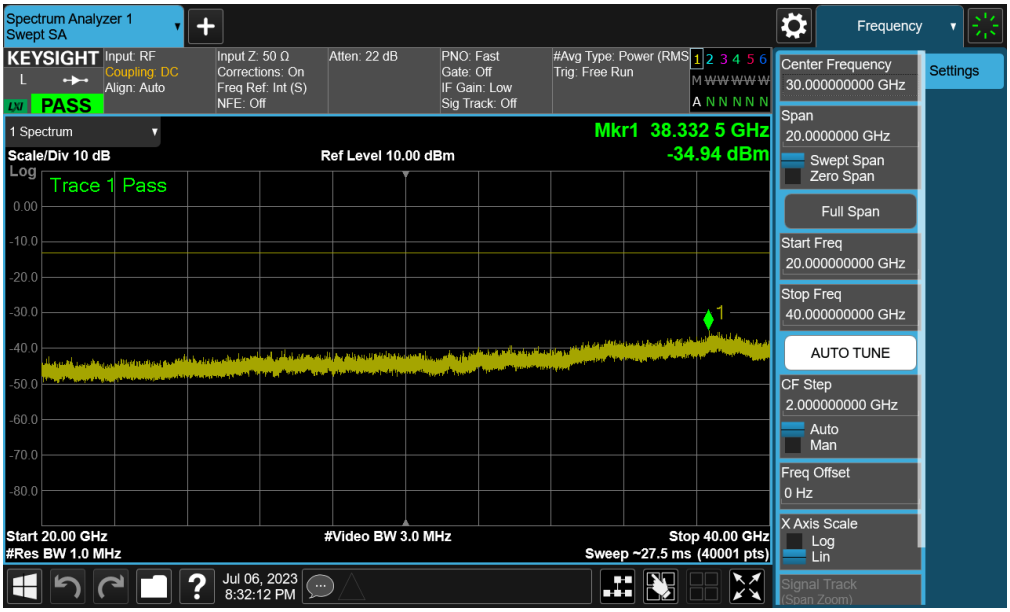
NR Band n77 – Ant D



Plot 7-85. Conducted Spurious Plot (NR Band n77 - 100MHz QPSK - RB Size 1, RB Offset 0 - Low Channel – Ant D)

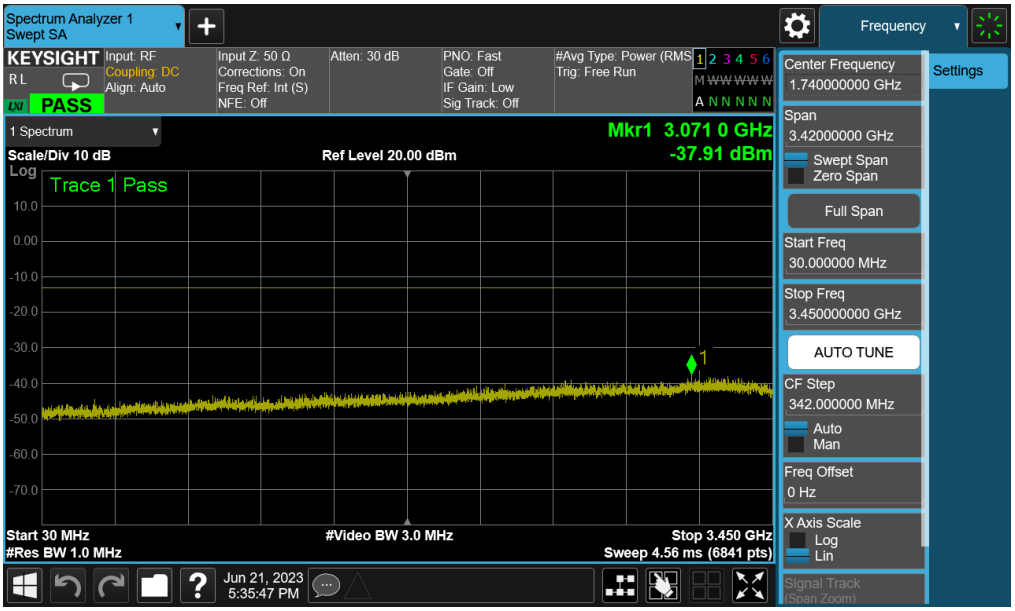


Plot 7-86. Conducted Spurious Plot (NR Band n77 - 100MHz QPSK - RB Size 1, RB Offset 0 - Low Channel – Ant D)

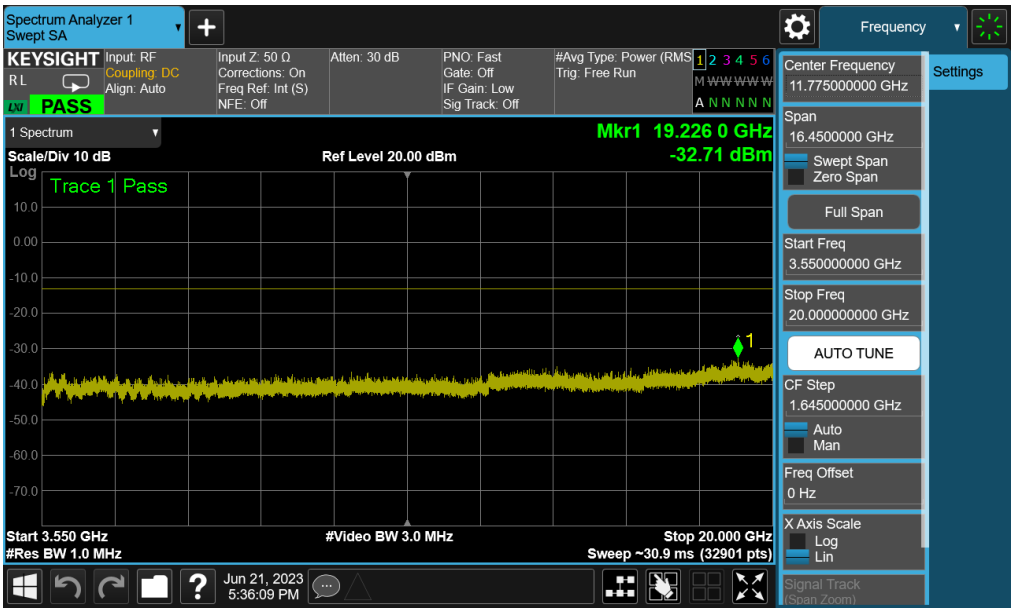


Plot 7-87. Conducted Spurious Plot (NR Band n77 - 100MHz QPSK - RB Size 1, RB Offset 0 - Low Channel – Ant D)

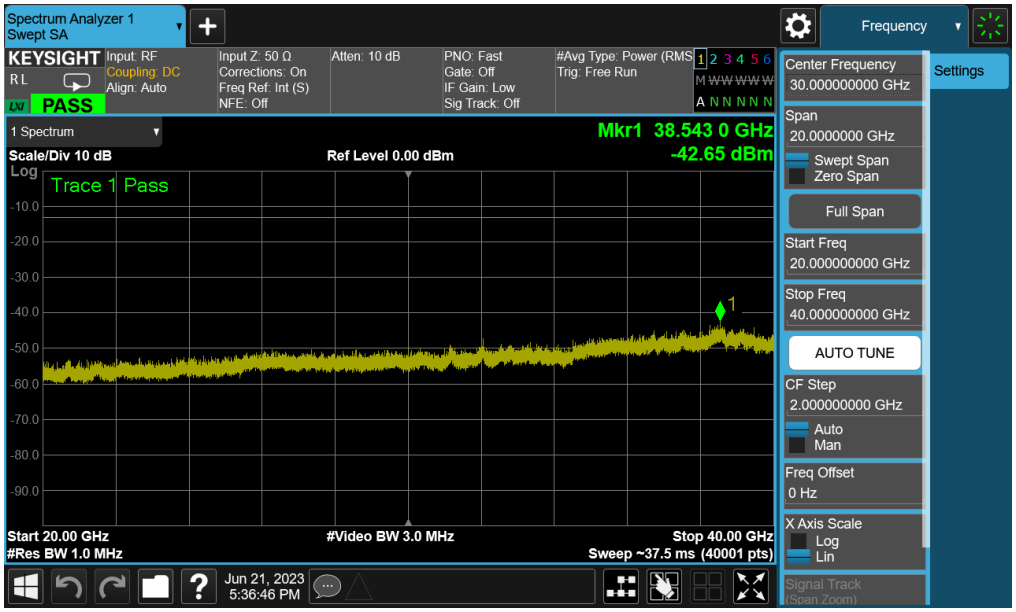
NR Band n77 (DoD Band) – Ant D



Plot 7-88. Conducted Spurious Plot (NR Band n77 (DoD) - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel – Ant D)



Plot 7-89. Conducted Spurious Plot (NR Band n77 (DoD) - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel – Ant D)



Plot 7-90. Conducted Spurious Plot (NR Band n77 (DoD) - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel – Ant D)

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 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.

For operations in the 3700 – 3980MHz band and the 3450 – 3550MHz band, the maximum permissible conducted power level of any out-of-band emission is -13dBm/MHz.

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.

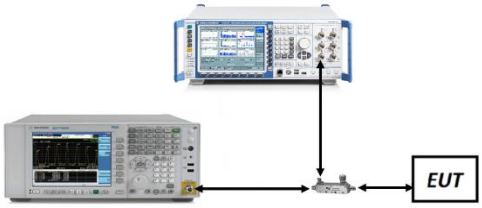


Figure 7-4. Test Instrument & Measurement Setup

Test Notes

1. Per Part 27.53(l), compliance with the -13dBm/MHz conducted power limit for out-of-band emissions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be either one percent of the emission bandwidth of the fundamental emission of the transmitter or 350 kHz. In the bands between 1 and 5 MHz removed from the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be 500 kHz.

2. Per Part 27.53(n), compliance with the -13dBm/MHz conducted power limit for out-of-band emissions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz 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, but limited to a maximum of 200 kHz. In the bands between 1 and 5 MHz removed from the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be 500 kHz.

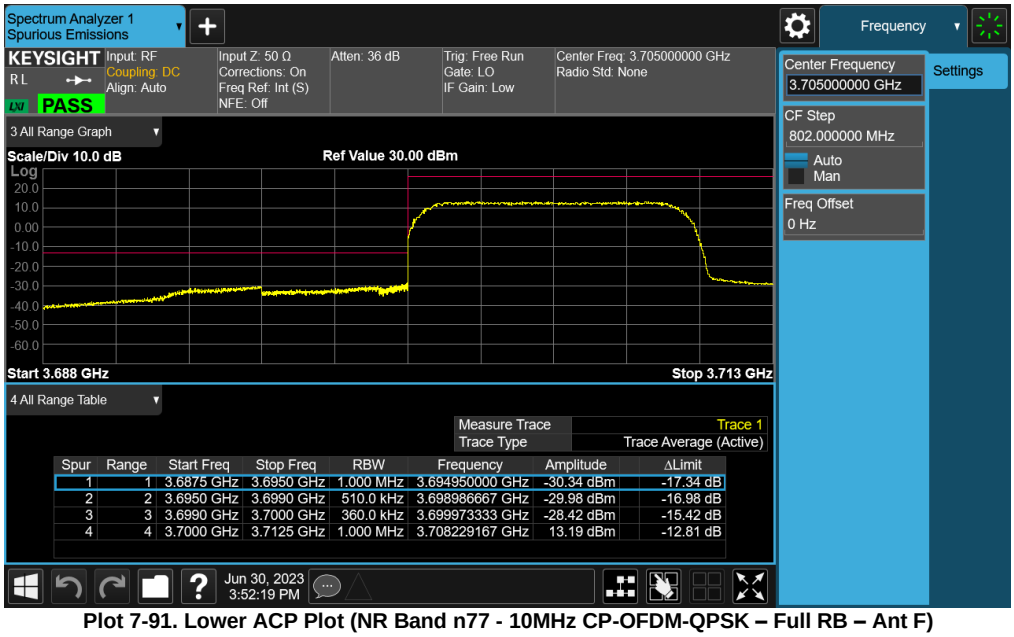
3. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

4. 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.

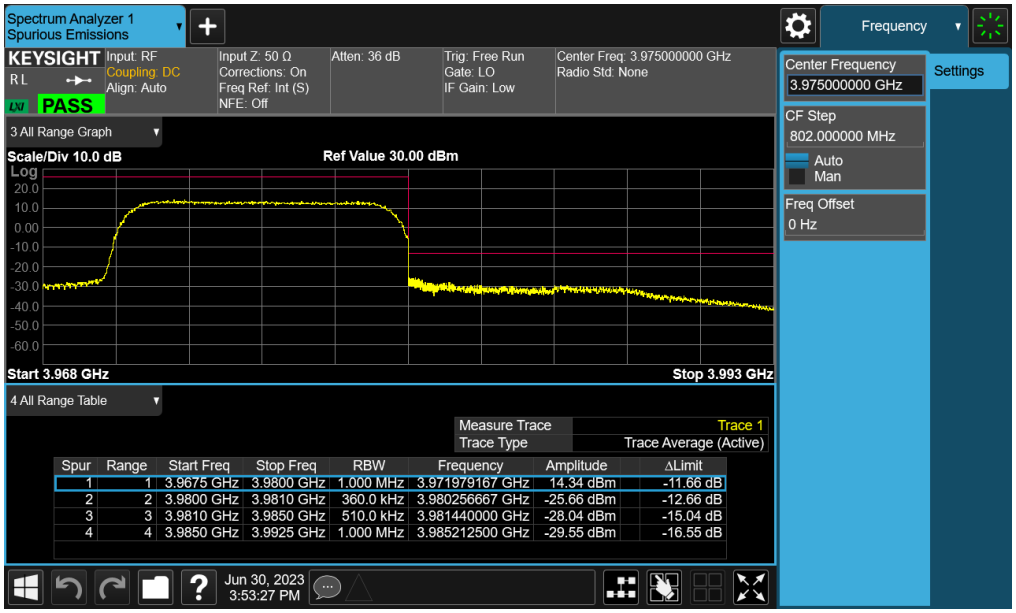
Mode	Bandwidth	Channel	Test Case	Level [dBm]	Limit [dBm]	Margin [dB]
NR-n77PC3 C Band	100MHz	Low	Band Edge	-33.99	-13	-20.99
		High	Band Edge	-28.74	-13	-15.74
	90MHz	Low	Band Edge	-34.26	-13	-21.26
		High	Band Edge	-30.18	-13	-17.18
	80MHz	Low	Band Edge	-33.66	-13	-20.66
		High	Band Edge	-30.19	-13	-17.19
	70MHz	Low	Band Edge	-33.64	-13	-20.64
		High	Band Edge	-30.85	-13	-17.85
	60MHz	Low	Band Edge	-33.40	-13	-20.40
		High	Band Edge	-28.84	-13	-15.84
	50MHz	Low	Band Edge	-32.05	-13	-19.05
		High	Band Edge	-28.16	-13	-15.16
	40MHz	Low	Band Edge	-32.09	-13	-19.09
		High	Band Edge	-28.48	-13	-15.48
	30MHz	Low	Band Edge	-31.66	-13	-18.66
		High	Band Edge	-27.90	-13	-14.90
	20MHz	Low	Band Edge	-30.84	-13	-17.84
		High	Band Edge	-27.58	-13	-14.58
	15MHz	Low	Band Edge	-29.06	-13	-16.06
		High	Band Edge	-26.41	-13	-13.41
	10MHz	Low	Band Edge	-28.42	-13	-15.42
		High	Band Edge	-25.66	-13	-12.66

Table 7-11. Conducted Band Edge Test Results – Ant F – C Band

NR Band n77 – Ant F



Plot 7-91. Lower ACP Plot (NR Band n77 - 10MHz CP-OFDM-QPSK – Full RB – Ant F)

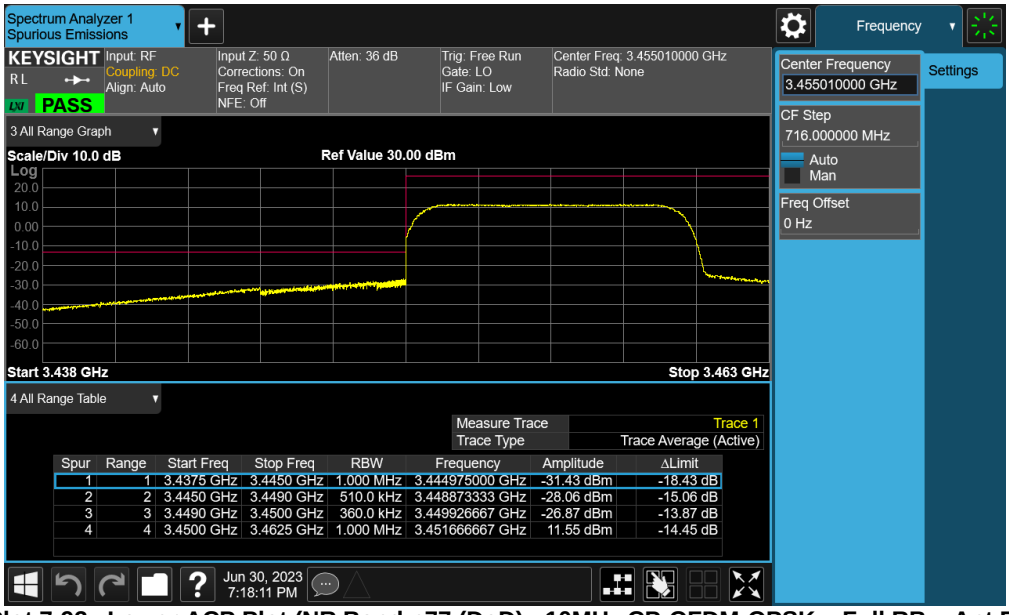


Plot 7-92. Upper ACP Plot (NR Band n77 - 10MHz CP-OFDM-QPSK – Full RB – Ant F)

Mode	Bandwidth	Channel	Test Case	Level [dBm]	Limit [dBm]	Margin [dB]
NR-n77PC3 DoD Band	100MHz	Low	Band Edge	-36.05	-13	-23.05
		High	Band Edge	-33.56	-13	-20.56
	90MHz	Low	Band Edge	-35.13	-13	-22.13
		High	Band Edge	-33.79	-13	-20.79
	80MHz	Low	Band Edge	-34.91	-13	-21.91
		High	Band Edge	-33.79	-13	-20.79
	70MHz	Low	Band Edge	-34.30	-13	-21.30
		High	Band Edge	-34.69	-13	-21.69
	60MHz	Low	Band Edge	-32.41	-13	-19.41
		High	Band Edge	-34.22	-13	-21.22
	50MHz	Low	Band Edge	-31.97	-13	-18.97
		High	Band Edge	-34.69	-13	-21.69
	40MHz	Low	Band Edge	-30.59	-13	-17.59
		High	Band Edge	-33.37	-13	-20.37
	30MHz	Low	Band Edge	-30.03	-13	-17.03
		High	Band Edge	-37.60	-13	-24.60
	20MHz	Low	Band Edge	-29.33	-13	-16.33
		High	Band Edge	-32.48	-13	-19.48
	15MHz	Low	Band Edge	-28.05	-13	-15.05
		High	Band Edge	-33.47	-13	-20.47
	10MHz	Low	Band Edge	-26.87	-13	-13.87
		High	Band Edge	-29.85	-13	-16.85

Table 7-12. Conducted Band Edge Test Results – Ant F – DoD Band

NR Band n77 (DoD Band) – Ant F



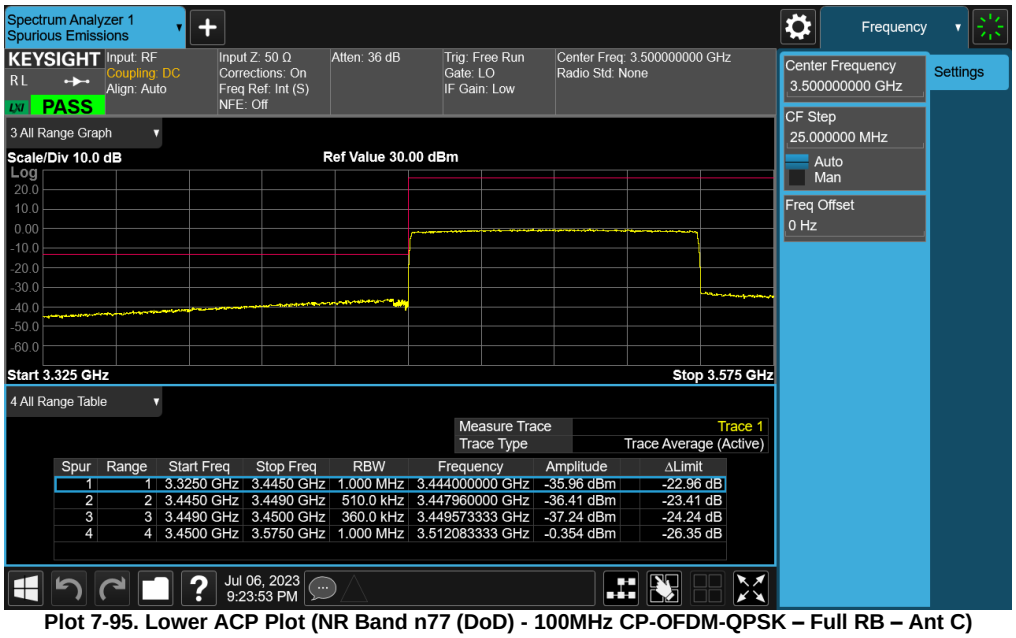
Plot 7-93. Lower ACP Plot (NR Band n77 (DoD) - 10MHz CP-OFDM-QPSK – Full RB – Ant F)

Plot 7-94. Upper ACP Plot (NR Band n77 (DoD) - 10MHz CP-OFDM-QPSK – Full RB – Ant F)

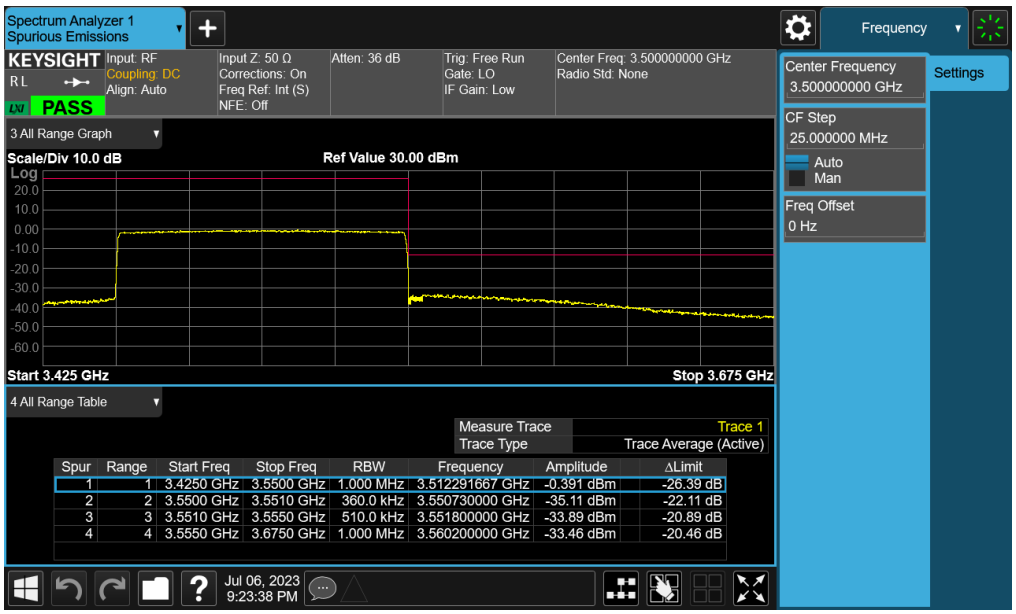
Mode	Bandwidth	Channel	Test Case	Level [dBm]	Limit [dBm]	Margin [dB]
NR-n77PC3 DoD Band	100MHz	Low	Band Edge	-35.96	-13	-22.96
		High	Band Edge	-33.46	-13	-20.46
Mode	**Bandwidth**	**Channel**	**Test Case**	**Level [dBm]**	**Limit [dBm]**	**Margin [dB]**
NR-n77PC3 C Band	100MHz	Low	Band Edge	-28.59	-13	-15.59
		High	Band Edge	-20.26	-13	-7.26

Table 7-13. Conducted Band Edge Test Results – Ant C

NR Band n77 (DoD Band) – Ant C

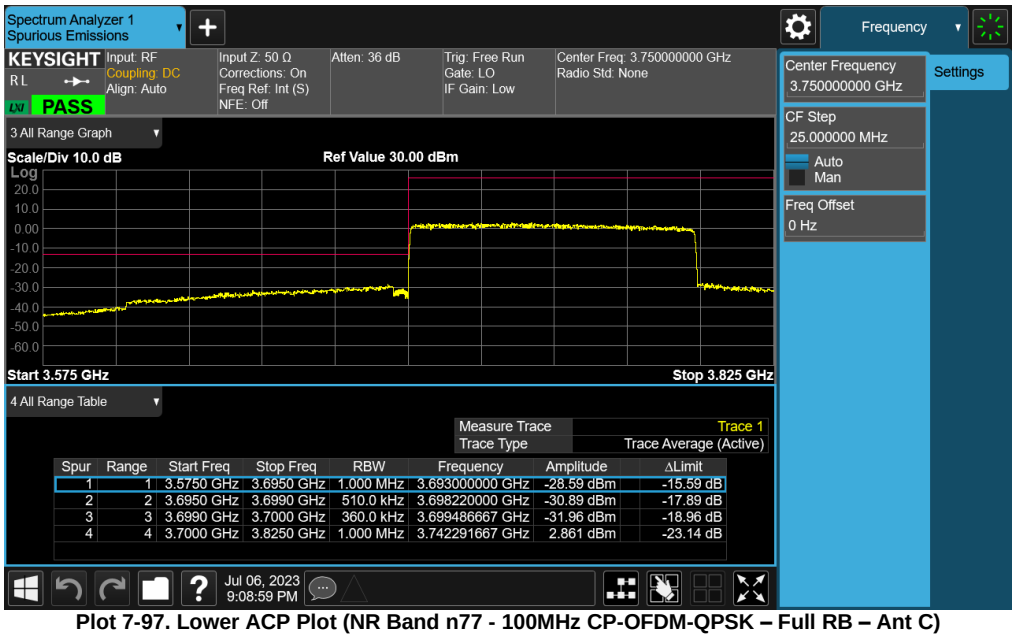


Plot 7-95. Lower ACP Plot (NR Band n77 (DoD) - 100MHz CP-OFDM-QPSK – Full RB – Ant C)

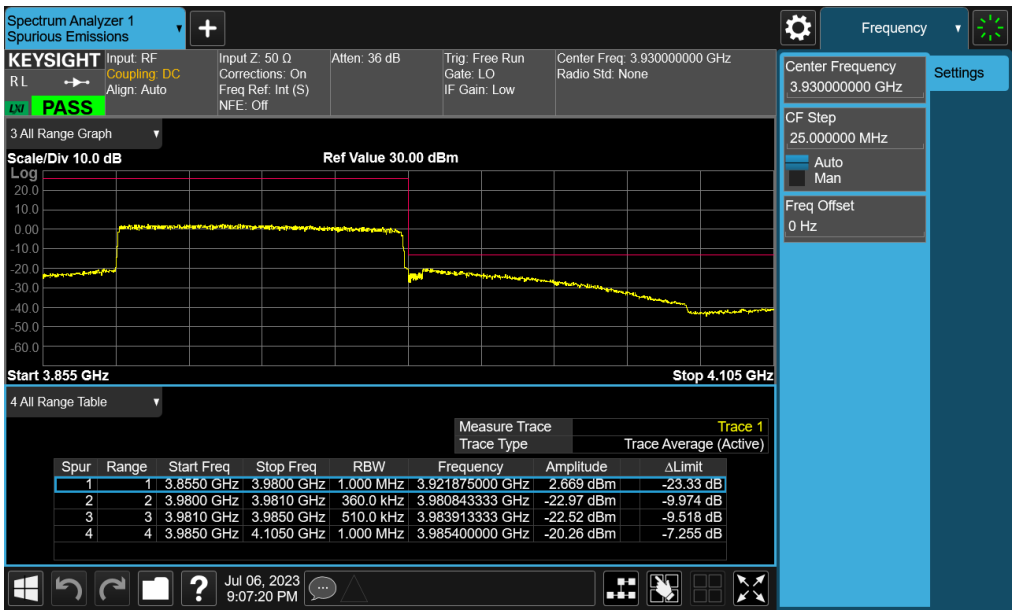


Plot 7-96. Upper ACP Plot (NR Band n77 (DoD) - 100MHz CP-OFDM-QPSK – Full RB – Ant C)

NR Band n77 – Ant C



Plot 7-97. Lower ACP Plot (NR Band n77 - 100MHz CP-OFDM-QPSK – Full RB – Ant C)

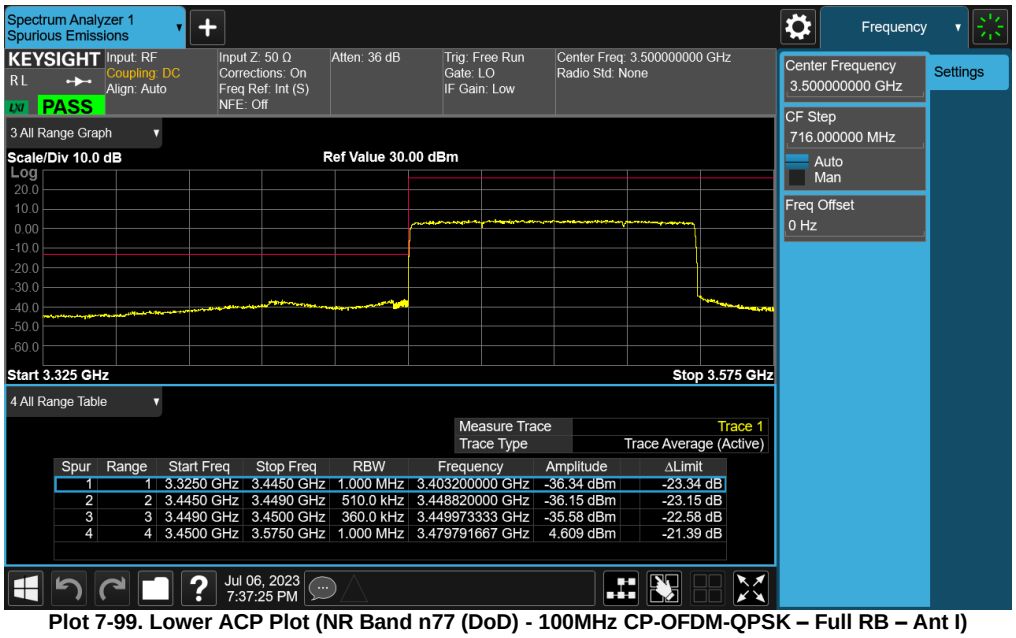


Plot 7-98. Upper ACP Plot (NR Band n77 - 100MHz CP-OFDM-QPSK – Full RB – Ant C)

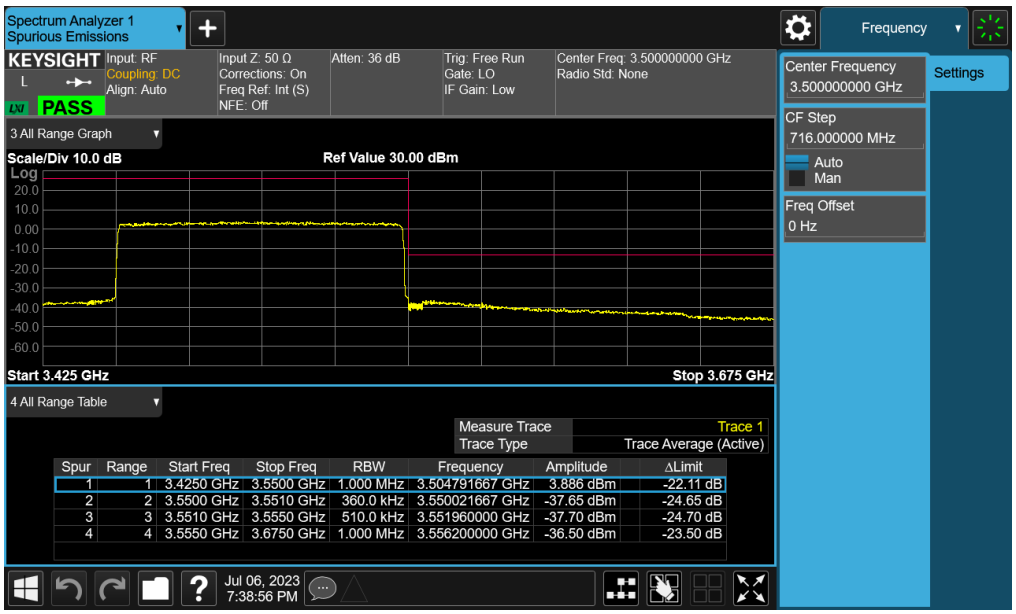
Mode	Bandwidth	Channel	Test Case	Level [dBm]	Limit [dBm]	Margin [dB]
NR-n77PC3 DoD Band	100MHz	Low	Band Edge	-35.58	-13	-22.58
		High	Band Edge	-36.50	-13	-23.50
Mode	**Bandwidth**	**Channel**	**Test Case**	**Level [dBm]**	**Limit [dBm]**	**Margin [dB]**
NR-n77PC3 C Band	100MHz	Low	Band Edge	-35.08	-13	-22.08
		High	Band Edge	-32.56	-13	-19.56

Table 7-14. Conducted Band Edge Test Results – Ant I

NR Band n77 (DoD Band) – Ant I

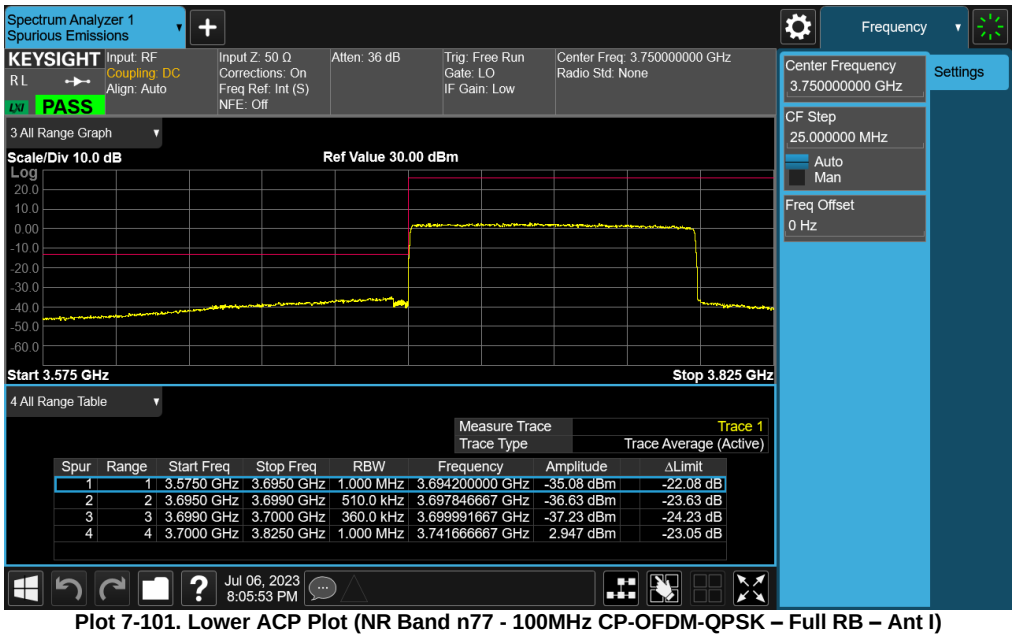


Plot 7-99. Lower ACP Plot (NR Band n77 (DoD) - 100MHz CP-OFDM-QPSK – Full RB – Ant I)

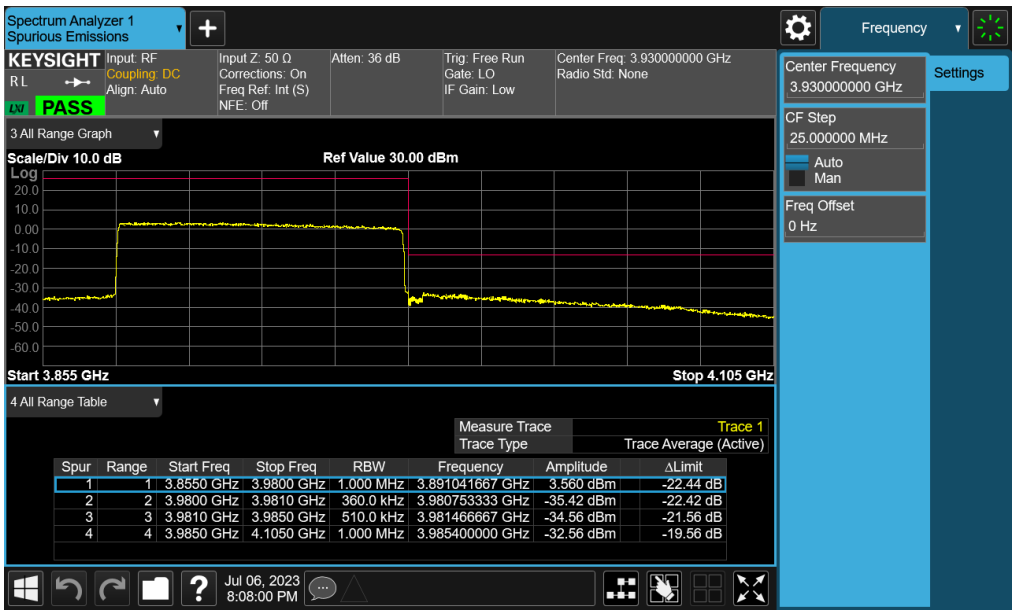


Plot 7-100. Upper ACP Plot (NR Band n77 (DoD) - 100MHz CP-OFDM-QPSK – Full RB – Ant I)

NR Band n77 – Ant I



Plot 7-101. Lower ACP Plot (NR Band n77 - 100MHz CP-OFDM-QPSK – Full RB – Ant I)

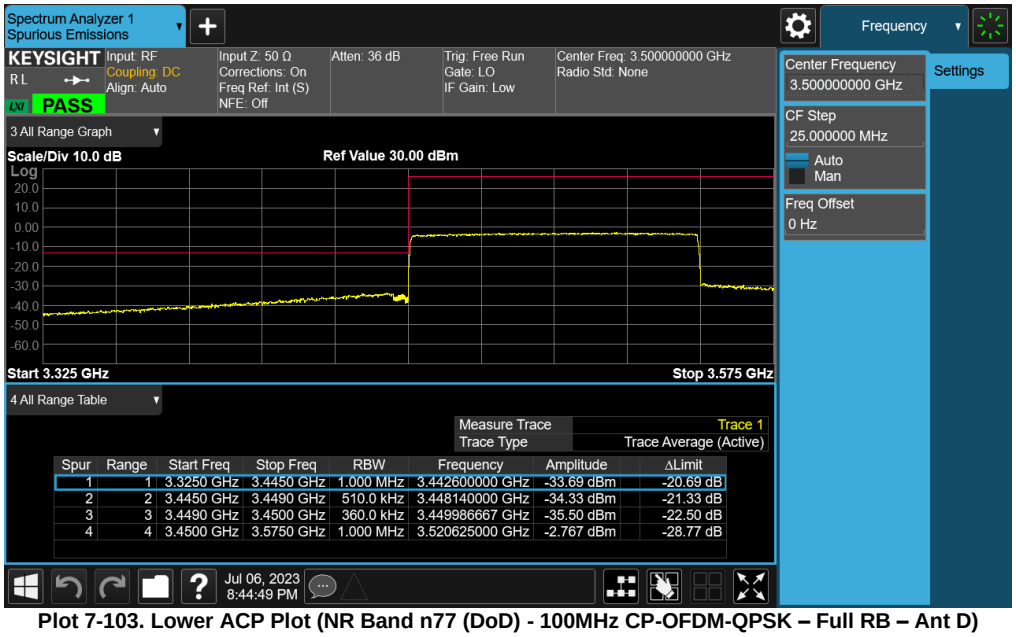


Plot 7-102. Upper ACP Plot (NR Band n77 - 100MHz CP-OFDM-QPSK – Full RB – Ant I)

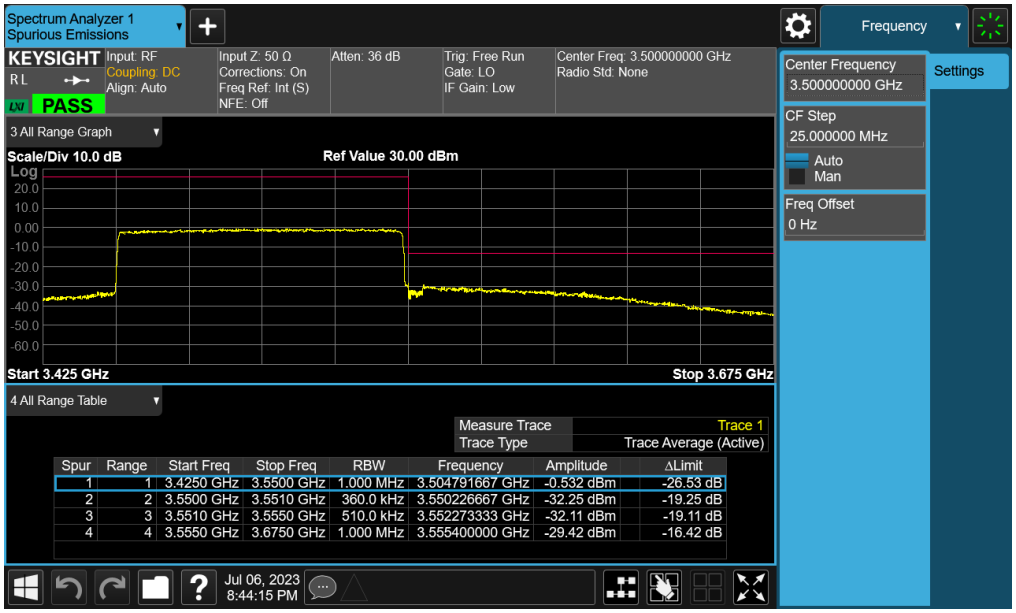
Mode	Bandwidth	Channel	Test Case	Level [dBm]	Limit [dBm]	Margin [dB]
NR-n77PC3 DoD Band	100MHz	Low	Band Edge	-33.69	-13	-20.69
		High	Band Edge	-29.42	-13	-16.42
Mode	**Bandwidth**	**Channel**	**Test Case**	**Level [dBm]**	**Limit [dBm]**	**Margin [dB]**
NR-n77PC3 C Band	100MHz	Low	Band Edge	-31.84	-13	-18.84
		High	Band Edge	-19.94	-13	-6.94

Table 7-15. Conducted Band Edge Test Results – Ant D

NR Band n77 (DoD Band) – Ant D

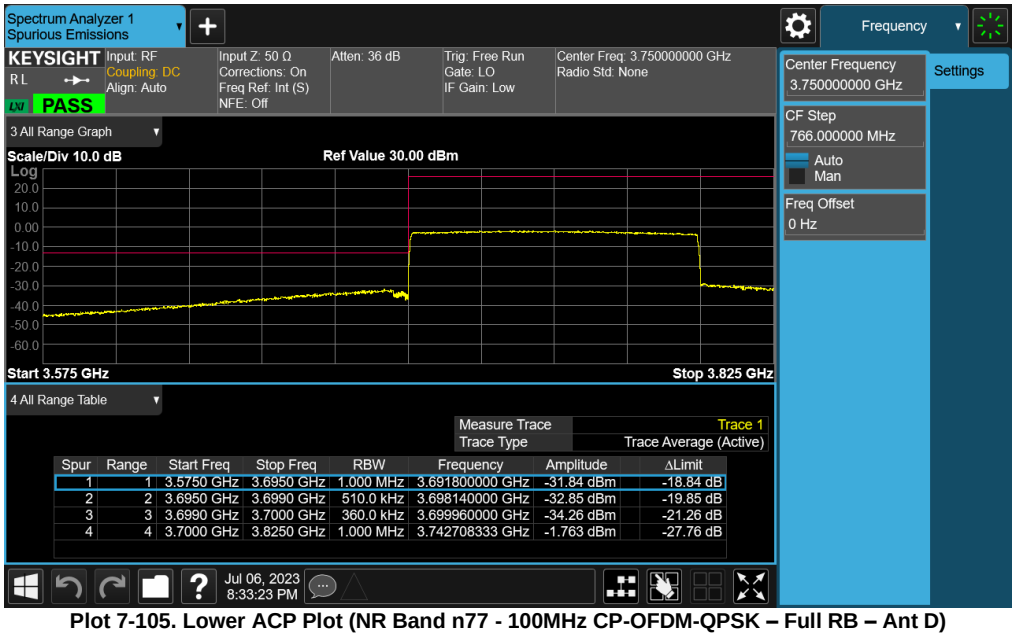


Plot 7-103. Lower ACP Plot (NR Band n77 (DoD) - 100MHz CP-OFDM-QPSK – Full RB – Ant D)

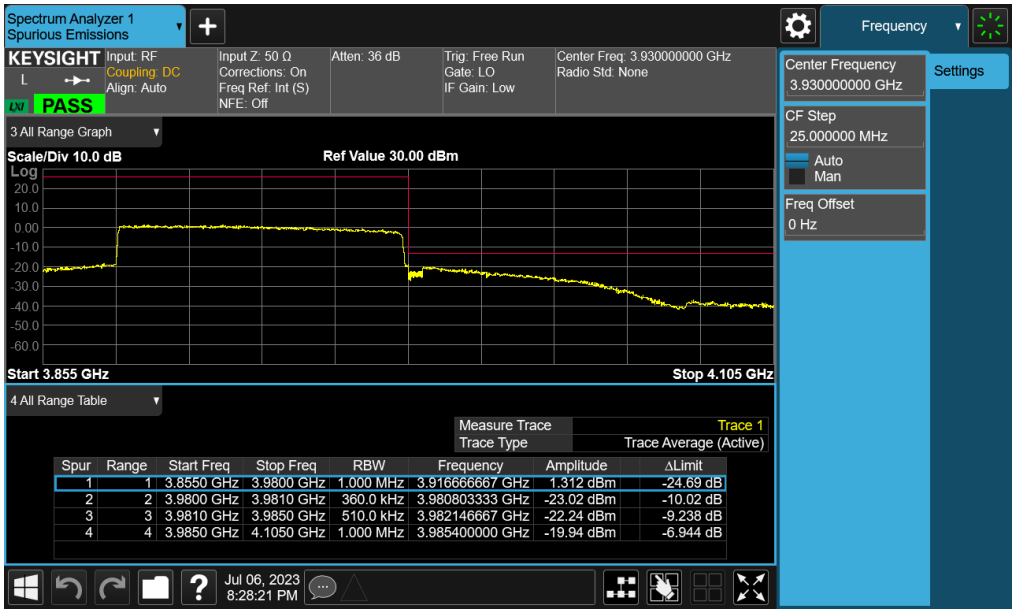


Plot 7-104. Upper ACP Plot (NR Band n77 (DoD) - 100MHz CP-OFDM-QPSK – Full RB – Ant D)

NR Band n77 – Ant D



Plot 7-105. Lower ACP Plot (NR Band n77 - 100MHz CP-OFDM-QPSK – Full RB – Ant D)



Plot 7-106. Upper ACP Plot (NR Band n77 - 100MHz CP-OFDM-QPSK – Full RB – Ant D)

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.

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB.

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.

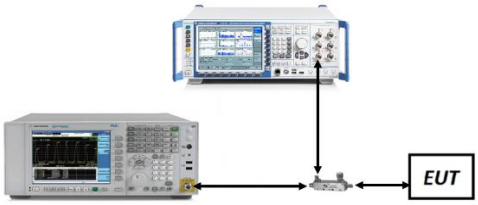


Figure 7-5. Test Instrument & Measurement Setup

Test Notes

The Peak to Average Ratio was only measured on the main antenna SRS 0 (Ant F).

Mode	Bandwidth	Modulation	Average Power [dBm]	PAR at 0.1% [dB]	PAR Limit [dB]	Margin [dB]
NR-n77PC3 C Band	100MHz	π/2 BPSK	25.10	4.34	13	-8.66
		QPSK	22.61	7.10	13	-5.90
		256QAM	19.14	7.88	13	-5.12
	90MHz	π/2 BPSK	25.09	3.88	13	-9.12
		QPSK	22.55	7.14	13	-5.86
		256QAM	19.09	7.85	13	-5.15
	80MHz	π/2 BPSK	25.06	4.32	13	-8.68
		QPSK	22.54	7.16	13	-5.84
		256QAM	19.07	7.91	13	-5.09
	70MHz	π/2 BPSK	25.06	4.02	13	-8.98
		QPSK	22.53	7.16	13	-5.84
		256QAM	19.05	7.92	13	-5.08
	60MHz	π/2 BPSK	25.06	3.70	13	-9.30
		QPSK	22.55	7.16	13	-5.84
		256QAM	19.06	7.80	13	-5.20
	50MHz	π/2 BPSK	25.03	4.05	13	-8.95
		QPSK	22.53	7.18	13	-5.82
		256QAM	19.06	7.84	13	-5.16
	40MHz	π/2 BPSK	25.02	3.96	13	-9.04
		QPSK	22.52	7.20	13	-5.80
		256QAM	19.05	7.81	13	-5.19
	30MHz	π/2 BPSK	25.01	3.93	13	-9.07
		QPSK	22.52	7.21	13	-5.79
		256QAM	19.03	7.81	13	-5.19
	20MHz	π/2 BPSK	24.66	4.19	13	-8.81
		QPSK	22.33	7.30	13	-5.70
		256QAM	18.99	7.95	13	-5.05
	15MHz	π/2 BPSK	24.56	4.22	13	-8.78
		QPSK	22.42	7.18	13	-5.82
		256QAM	18.97	7.78	13	-5.22
	10MHz	π/2 BPSK	24.75	4.12	13	-8.88
		QPSK	22.44	7.15	13	-5.85
		256QAM	18.96	7.63	13	-5.37

Table 7-16. PAR Test Results – Ant F – C Band

NR Band n77 – Ant F

Plot 7-107. PAR Plot (NR Band n77 - 100MHz DFT-s-OFDM BPSK - Full RB – Ant F)

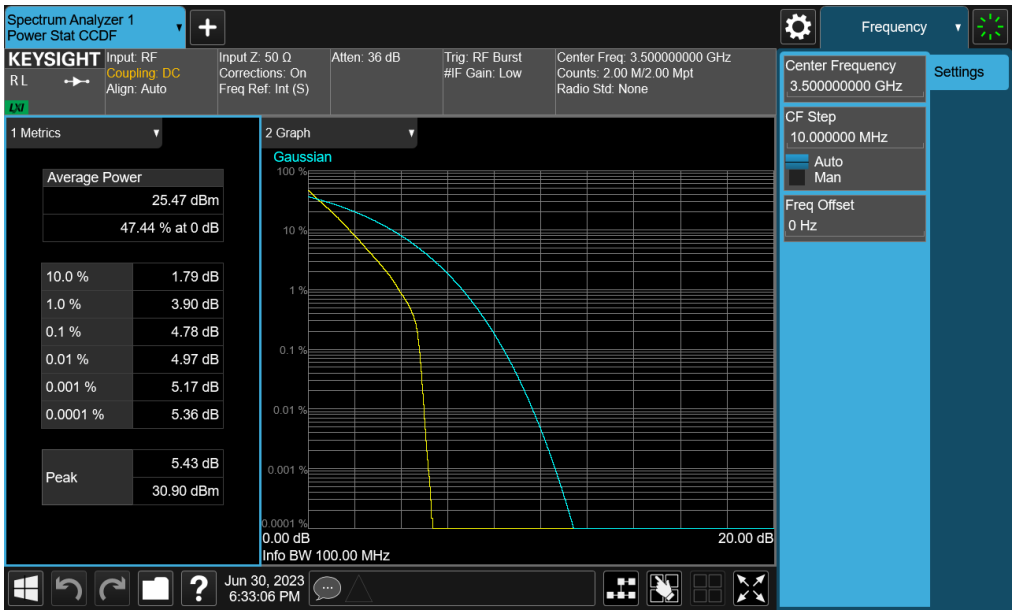
Plot 7-108. PAR Plot (NR Band n77 - 100MHz CP-OFDM QPSK - Full RB – Ant F)

Plot 7-109. PAR Plot (NR Band n77 - 100MHz CP-OFDM 256-QAM - Full RB – Ant F)

Mode	Bandwidth	Modulation	Average Power [dBm]	PAR at 0.1% [dB]	PAR Limit [dB]	Margin [dB]
NR-n77PC3 DoD Band	100MHz	π/2 BPSK	25.47	4.78	13	-8.22
		QPSK	23.01	7.66	13	-5.34
		256QAM	19.57	8.59	13	-4.41
	90MHz	π/2 BPSK	25.42	4.18	13	-8.82
		QPSK	22.99	7.67	13	-5.33
		256QAM	19.45	8.54	13	-4.46
	80MHz	π/2 BPSK	25.39	4.75	13	-8.25
		QPSK	22.89	7.69	13	-5.31
		256QAM	19.40	8.60	13	-4.40
	70MHz	π/2 BPSK	25.40	4.33	13	-8.67
		QPSK	22.88	7.67	13	-5.33
		256QAM	19.42	8.19	13	-4.81
	60MHz	π/2 BPSK	25.35	4.22	13	-8.78
		QPSK	22.83	7.65	13	-5.35
		256QAM	19.40	8.16	13	-4.84
	50MHz	π/2 BPSK	25.34	4.53	13	-8.47
		QPSK	22.82	7.64	13	-5.36
		256QAM	19.39	8.16	13	-4.84
	40MHz	π/2 BPSK	25.29	4.41	13	-8.59
		QPSK	22.80	7.63	13	-5.37
		256QAM	19.36	8.56	13	-4.44
	30MHz	π/2 BPSK	25.31	4.37	13	-8.63
		QPSK	22.77	7.65	13	-5.35
		256QAM	19.34	8.50	13	-4.50
	20MHz	π/2 BPSK	24.26	5.23	13	-7.77
		QPSK	22.59	7.70	13	-5.30
		256QAM	19.20	8.83	13	-4.17
	15MHz	π/2 BPSK	24.70	4.73	13	-8.27
		QPSK	22.52	7.72	13	-5.28
		256QAM	19.21	8.57	13	-4.43
	10MHz	π/2 BPSK	25.12	4.47	13	-8.53
		QPSK	22.43	7.86	13	-5.14
		256QAM	19.16	8.55	13	-4.45

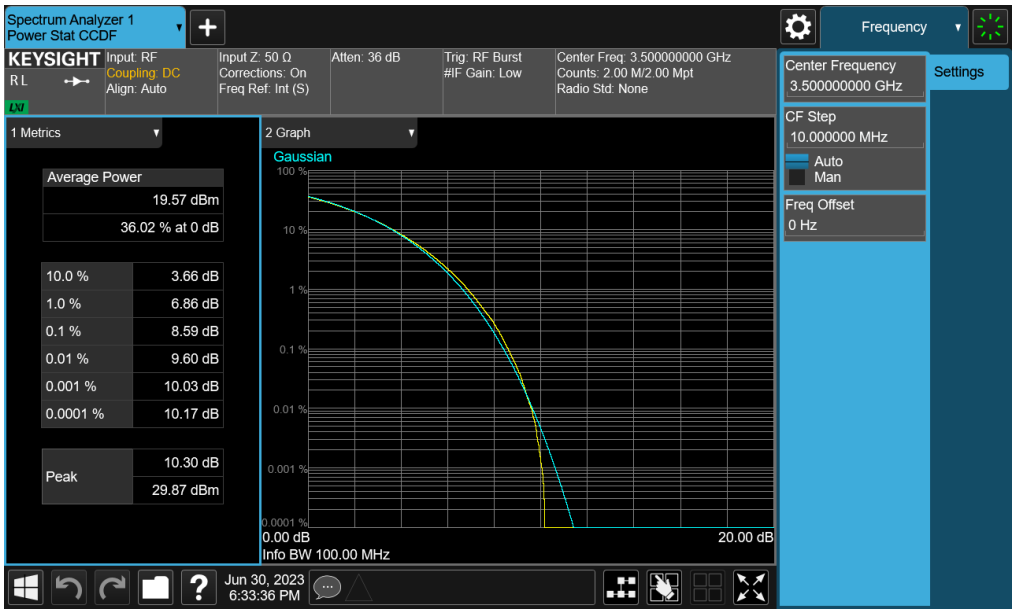
Table 7-17. PAR Test Results – AntF – DoD Band

NR Band n77 (DoD Band) – Ant F



Plot 7-110. PAR Plot (NR Band n77 (DoD) - 100MHz DFT-s-OFDM BPSK - Full RB – Ant F)

Plot 7-111. PAR Plot (NR Band n77 (DoD) - 100MHz CP-OFDM QPSK - Full RB – Ant F)



Plot 7-112. PAR Plot (NR Band n77 (DoD) - 100MHz CP-OFDM 256-QAM - Full RB – Ant F)

7.7 Radiated Power (EIRP)

Test Overview

Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI C63.26-2015 with the EUT transmitting into an integral antenna. Measurements are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

Test Procedures Used

ANSI C63.26-2015 – Section 5.2.4.4

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation. For signals with burst transmission, the signal analyzer's "time domain power" measurement capability is used
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points ≥ 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto". Trigger is set to enable triggering only on full power bursts with the sweep time set less than or equal to the transmission burst duration.
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation. For signals with burst transmission, the "gating" function was enabled to ensure that measurements are performed during times in which the transmitter is operating at its maximum power.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize.

Test Setup

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

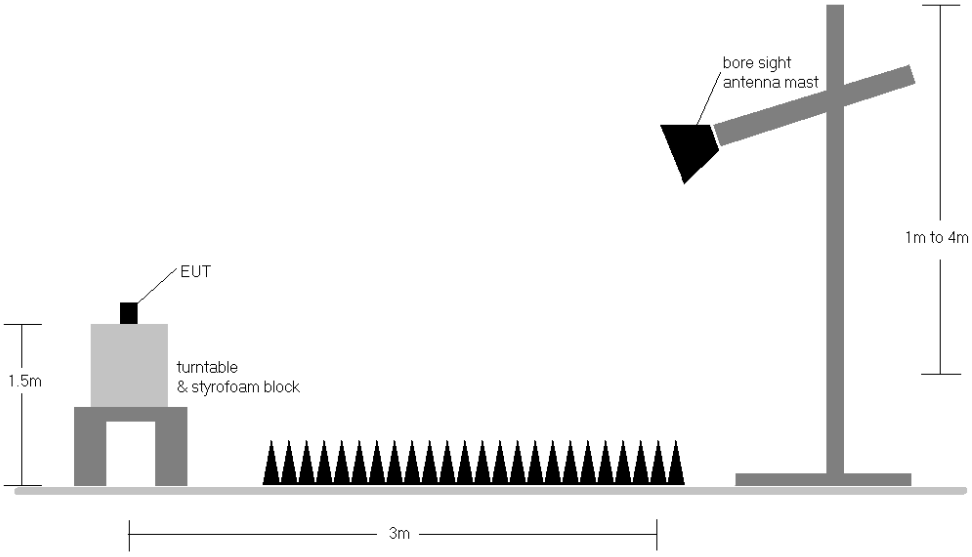


Figure 7-6. Radiated Test Setup >1GHz

Test Notes

1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst-case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.

2) This unit was tested with its standard battery.

3) 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.

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
100 MHz	π/2 BPSK	3750.00	H	103	303	7.03	1 / 136	15.87	22.90	0.195	33.01	-10.11
	π/2 BPSK	3840.00	H	102	303	7.13	1 / 136	15.56	22.69	0.186	33.01	-10.32
	π/2 BPSK	3930.00	H	111	298	7.39	1 / 136	15.88	**23.27**	0.213	33.01	-9.74
	QPSK	3750.00	H	103	303	7.03	1 / 136	15.71	22.74	0.188	33.01	-10.27
	QPSK	3840.00	H	102	303	7.13	1 / 136	15.44	22.57	0.181	33.01	-10.44
	QPSK	3930.00	H	111	298	7.39	1 / 136	15.71	23.10	0.204	33.01	-9.91
	16-QAM	3930.00	H	111	298	7.39	1 / 136	15.40	22.79	0.190	33.01	-10.22
90 MHz	π/2 BPSK	3745.02	H	103	303	7.03	1 / 61	15.81	22.84	0.192	33.01	-10.17
	π/2 BPSK	3840.00	H	102	303	7.13	1 / 122	15.66	22.79	0.190	33.01	-10.22
	π/2 BPSK	3934.98	H	111	298	7.40	1 / 122	16.00	**23.40**	0.219	33.01	-9.61
	QPSK	3745.02	H	103	303	7.03	1 / 61	15.62	22.65	0.184	33.01	-10.36
	QPSK	3840.00	H	102	303	7.13	1 / 122	15.44	22.57	0.181	33.01	-10.44
	QPSK	3934.98	H	111	298	7.40	1 / 122	15.77	23.17	0.208	33.01	-9.84
	16-QAM	3840.00	H	102	303	7.13	1 / 122	15.76	22.89	0.194	33.01	-10.12
80 MHz	π/2 BPSK	3740.01	H	103	303	7.03	1 / 108	15.71	22.74	0.188	33.01	-10.27
	π/2 BPSK	3840.00	H	102	303	7.13	1 / 108	15.64	22.77	0.189	33.01	-10.24
	π/2 BPSK	3939.99	H	111	298	7.41	1 / 108	15.92	**23.32**	0.215	33.01	-9.69
	QPSK	3740.01	H	103	303	7.03	1 / 108	15.55	22.58	0.181	33.01	-10.43
	QPSK	3840.00	H	102	303	7.13	1 / 108	15.45	22.58	0.181	33.01	-10.43
	QPSK	3939.99	H	111	298	7.41	1 / 108	15.61	23.01	0.200	33.01	-10.00
	16-QAM	3939.99	H	111	298	7.41	1 / 108	15.37	22.77	0.189	33.01	-10.24
70 MHz	π/2 BPSK	3735.00	H	103	303	7.03	1 / 47	16.40	23.43	0.220	33.01	-9.58
	π/2 BPSK	3840.00	H	102	303	7.13	1 / 47	16.06	23.19	0.208	33.01	-9.82
	π/2 BPSK	3945.00	H	111	298	7.41	1 / 47	16.15	**23.56**	0.227	33.01	-9.45
	QPSK	3735.00	H	103	303	7.03	1 / 47	16.20	23.23	0.211	33.01	-9.78
	QPSK	3840.00	H	102	303	7.13	1 / 47	15.88	23.01	0.200	33.01	-10.00
	QPSK	3945.00	H	111	298	7.41	1 / 47	15.97	23.38	0.218	33.01	-9.63
	16-QAM	3840.00	H	102	303	7.13	1 / 47	16.14	23.27	0.212	33.01	-9.74
60 MHz	π/2 BPSK	3730.02	H	103	303	7.03	1 / 40	16.29	23.32	0.215	33.01	-9.69
	π/2 BPSK	3840.00	H	102	303	7.13	1 / 40	16.08	23.21	0.209	33.01	-9.80
	π/2 BPSK	3949.98	H	111	298	7.42	1 / 40	16.22	**23.63**	0.231	33.01	-9.38
	QPSK	3730.02	H	103	303	7.03	1 / 40	16.12	23.15	0.207	33.01	-9.86
	QPSK	3840.00	H	102	303	7.13	1 / 40	15.86	22.99	0.199	33.01	-10.02
	QPSK	3949.98	H	111	298	7.42	1 / 40	16.06	23.47	0.223	33.01	-9.54
	16-QAM	3840.00	H	102	303	7.13	1 / 40	16.16	23.29	0.213	33.01	-9.72
50 MHz	π/2 BPSK	3725.01	H	103	303	7.03	1 / 33	16.19	23.22	0.210	33.01	-9.79
	π/2 BPSK	3840.00	H	102	303	7.13	1 / 33	15.93	23.06	0.202	33.01	-9.95
	π/2 BPSK	3954.99	H	111	298	7.43	1 / 33	16.07	**23.49**	0.224	33.01	-9.52
	QPSK	3725.01	H	103	303	7.03	1 / 33	16.00	23.03	0.201	33.01	-9.98
	QPSK	3840.00	H	102	303	7.13	1 / 33	15.77	22.90	0.195	33.01	-10.11
	QPSK	3954.99	H	111	298	7.43	1 / 33	15.92	23.34	0.216	33.01	-9.67
	16-QAM	3954.99	H	111	298	7.43	1 / 33	15.69	23.11	0.205	33.01	-9.90
40 MHz	π/2 BPSK	3720.00	H	103	303	7.03	1 / 26	16.15	23.18	0.208	33.01	-9.83
	π/2 BPSK	3840.00	H	102	303	7.13	1 / 26	15.94	23.07	0.203	33.01	-9.94
	π/2 BPSK	3960.00	H	111	298	7.44	1 / 26	15.93	**23.36**	0.217	33.01	-9.65
	QPSK	3720.00	H	103	303	7.03	1 / 26	15.96	22.99	0.199	33.01	-10.02
	QPSK	3840.00	H	102	303	7.13	1 / 26	15.76	22.89	0.194	33.01	-10.12
	QPSK	3960.00	H	111	298	7.44	1 / 53	15.75	23.18	0.208	33.01	-9.83
	16-QAM	3840.00	H	102	303	7.13	1 / 26	15.96	23.09	0.204	33.01	-9.92
30 MHz	π/2 BPSK	3715.02	H	103	303	7.03	1 / 19	15.54	22.57	0.181	33.01	-10.44
	π/2 BPSK	3840.00	H	102	303	7.13	1 / 19	15.83	22.96	0.198	33.01	-10.05
	π/2 BPSK	3964.98	H	111	298	7.45	1 / 19	16.06	**23.50**	0.224	33.01	-9.51
	QPSK	3715.02	H	103	303	7.03	1 / 19	15.89	22.92	0.196	33.01	-10.09
	QPSK	3840.00	H	102	303	7.13	1 / 19	15.67	22.80	0.191	33.01	-10.21
	QPSK	3964.98	H	111	298	7.45	1 / 19	15.85	23.29	0.214	33.01	-9.72
	16-QAM	3840.00	H	102	303	7.13	1 / 19	15.96	23.09	0.204	33.01	-9.92
20 MHz	π/2 BPSK	3710.01	H	103	303	7.03	1 / 25	16.02	23.05	0.202	33.01	-9.96
	π/2 BPSK	3840.00	H	102	303	7.13	1 / 37	15.82	22.95	0.197	33.01	-10.06
	π/2 BPSK	3969.99	H	111	298	7.46	1 / 13	15.94	**23.39**	0.218	33.01	-9.62
	QPSK	3710.01	H	103	303	7.03	1 / 13	15.87	22.90	0.195	33.01	-10.11
	QPSK	3840.00	H	102	303	7.13	1 / 37	15.64	22.77	0.189	33.01	-10.24
	QPSK	3969.99	H	111	298	7.46	1 / 13	15.78	23.23	0.211	33.01	-9.78
	16-QAM	3840.00	H	102	303	7.13	1 / 37	15.86	22.99	0.199	33.01	-10.02
15 MHz	π/2 BPSK	3707.51	H	103	303	7.03	1 / 9	16.00	23.03	0.201	33.01	-9.98
	π/2 BPSK	3840.00	H	102	303	7.13	1 / 19	15.79	22.92	0.196	33.01	-10.09
	π/2 BPSK	3972.50	H	111	298	7.46	1 / 9	15.88	**23.34**	0.216	33.01	-9.67
	QPSK	3707.51	H	103	303	7.03	1 / 9	15.84	22.87	0.194	33.01	-10.14
	QPSK	3840.00	H	102	303	7.13	1 / 28	15.64	22.77	0.189	33.01	-10.24
	QPSK	3972.50	H	111	298	7.46	1 / 9	15.73	23.19	0.209	33.01	-9.82
	16-QAM	3840.00	H	102	303	7.13	1 / 28	15.86	22.99	0.199	33.01	-10.02
10 MHz	π/2 BPSK	3705.00	H	103	303	7.03	1 / 12	15.95	22.98	0.199	33.01	-10.03
	π/2 BPSK	3840.00	H	102	303	7.13	1 / 17	15.72	22.85	0.193	33.01	-10.16
	π/2 BPSK	3975.00	H	111	298	7.47	1 / 6	15.77	**23.23**	0.211	33.01	-9.78
	QPSK	3705.00	H	103	303	7.03	1 / 12	15.81	22.84	0.192	33.01	-10.17
	QPSK	3840.00	H	102	303	7.13	1 / 6	15.51	22.64	0.184	33.01	-10.37
	QPSK	3975.00	H	111	298	7.47	1 / 6	15.44	22.90	0.195	33.01	-10.11
	16-QAM	3840.00	H	102	303	7.13	1 / 17	15.71	22.84	0.192	33.01	-10.17
100 MHz	QPSK (CP-OFDM)	3930.0	H	110	298	7.39	1 / 68	14.85	22.24	0.168	33.01	-10.77
	QPSK (WCP)	3930.0	H	169	314	7.39	1 / 136	9.33	16.72	0.047	33.01	-16.29

Table 7-12. EIRP Data (NR Band n77 – Ant F)

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
100 MHz	π/2 BPSK	3750.00	H	102	40	7.01	1 / 136	14.67	**21.68**	0.147	33.01	-11.33
	π/2 BPSK	3840.00	H	101	40	7.15	1 / 136	12.01	19.16	0.082	33.01	-13.85
	π/2 BPSK	3930.00	H	100	40	7.39	1 / 136	12.79	20.18	0.104	33.01	-12.83
	QPSK	3750.00	H	102	40	7.01	1 / 136	14.55	21.56	0.143	33.01	-11.45
	QPSK	3840.00	H	101	40	7.15	1 / 136	12.69	19.84	0.096	33.01	-13.17
	QPSK	3930.00	H	100	40	7.39	1 / 136	12.64	20.03	0.101	33.01	-12.98
	16-QAM	3750.00	H	102	40	7.01	1 / 136	12.48	19.49	0.089	33.01	-13.52
100 MHz	QPSK (CP-OFDM)	3750.0	H	100	40	7.01	1/136	11.12	18.13	0.065	33.01	-14.88

Table 7-13. EIRP Data (NR Band n77 – Ant C)

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
100 MHz	π/2 BPSK	3750.00	H	204	323	7.01	1/1	8.63	15.64	0.037	33.01	-17.37
	π/2 BPSK	3840.00	H	202	315	7.15	1/1	8.50	15.65	0.037	33.01	-17.36
	π/2 BPSK	3930.00	H	192	338	7.39	1/1	6.95	14.34	0.027	33.01	-18.67
	QPSK	3750.00	H	204	323	7.01	1/1	7.60	14.61	0.029	33.01	-18.40
	QPSK	3840.00	H	202	315	7.15	1/1	9.69	**16.84**	0.048	33.01	-16.17
	QPSK	3930.00	H	192	338	7.39	1/1	7.23	14.62	0.029	33.01	-18.39
	16-QAM	3840.00	H	202	315	7.15	1/1	5.54	12.69	0.019	33.01	-20.32
100 MHz	QPSK (CP-OFDM)	3840.0	H	202	315	7.15	1/1	6.43	13.58	0.023	33.01	-19.43

Table 7-14. EIRP Data (NR Band n77 – Ant I)

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
100 MHz	π/2 BPSK	3750.00	H	110	19	7.01	1 / 136	9.86	16.87	0.049	33.01	-16.14
	π/2 BPSK	3840.00	H	112	17	7.15	1 / 136	9.44	16.59	0.046	33.01	-16.42
	π/2 BPSK	3930.00	H	124	20	7.39	1 / 136	11.83	**19.22**	0.084	33.01	-13.79
	QPSK	3750.00	H	110	19	7.01	1 / 136	9.15	16.16	0.041	33.01	-16.85
	QPSK	3840.00	H	112	17	7.15	1 / 136	8.14	15.29	0.034	33.01	-17.72
	QPSK	3930.00	H	124	20	7.39	1 / 136	11.48	18.87	0.077	33.01	-14.14
	16-QAM	3930.00	H	124	20	7.39	1 / 136	10.46	17.85	0.061	33.01	-15.16
100 MHz	QPSK (CP-OFDM)	3930	H	124	20	7.39	1 / 136	10.13	17.52	0.057	33.01	-15.49

Table 7-15. EIRP Data (NR Band n77 – Ant D)

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
100 MHz	π/2 BPSK	3500.01	H	122	340	6.46	1 / 136	15.06	**21.52**	0.142	33.01	-11.49
	QPSK	3500.01	H	122	340	6.46	1 / 136	14.88	21.34	0.136	33.01	-11.67
	16-QAM	3500.01	H	122	340	6.46	1 / 136	13.77	20.23	0.106	33.01	-12.78
90 MHz	π/2 BPSK	3495.00	H	122	340	6.46	1 / 122	15.18	21.64	0.146	33.01	-11.37
	π/2 BPSK	3500.01	H	122	340	6.46	1 / 122	15.12	21.58	0.144	33.01	-11.43
	π/2 BPSK	3504.99	H	122	340	6.46	1 / 122	15.12	21.58	0.144	33.01	-11.43
	QPSK	3495.00	H	122	340	6.46	1 / 122	14.97	21.43	0.139	33.01	-11.58
	QPSK	3500.01	H	122	340	6.46	1 / 122	14.95	21.41	0.139	33.01	-11.60
	QPSK	3504.99	H	122	340	6.46	1 / 61	15.61	**22.07**	0.161	33.01	-10.94
	16-QAM	3504.99	H	122	340	6.46	1 / 122	13.71	20.17	0.104	33.01	-12.84
80 MHz	π/2 BPSK	3490.02	H	122	340	6.46	1 / 108	15.10	21.56	0.143	33.01	-11.45
	π/2 BPSK	3500.01	H	122	340	6.46	1 / 108	15.07	21.53	0.142	33.01	-11.48
	π/2 BPSK	3510.00	H	122	340	6.46	1 / 108	15.05	21.51	0.142	33.01	-11.50
	QPSK	3490.02	H	122	340	6.46	1 / 162	15.31	**21.77**	0.150	33.01	-11.24
	QPSK	3500.01	H	122	340	6.46	1 / 54	14.59	21.05	0.127	33.01	-11.96
	QPSK	3510.00	H	122	340	6.46	1 / 108	14.87	21.33	0.136	33.01	-11.68
	16-QAM	3490.02	H	122	340	6.46	1 / 108	13.63	20.09	0.102	33.01	-12.92
70 MHz	π/2 BPSK	3485.01	H	122	340	6.46	1 / 47	15.38	21.84	0.153	33.01	-11.17
	π/2 BPSK	3500.01	H	122	340	6.46	1 / 47	15.42	**21.88**	0.154	33.01	-11.13
	π/2 BPSK	3514.98	H	122	340	6.46	1 / 47	15.41	21.87	0.154	33.01	-11.14
	QPSK	3485.01	H	122	340	6.46	1 / 47	15.23	21.69	0.148	33.01	-11.32
	QPSK	3500.01	H	122	340	6.46	1 / 47	15.24	21.70	0.148	33.01	-11.31
	QPSK	3514.98	H	122	340	6.46	1 / 47	15.24	21.70	0.148	33.01	-11.31
	16-QAM	3500.01	H	122	340	6.46	1 / 47	14.24	20.70	0.118	33.01	-12.31
60 MHz	π/2 BPSK	3480.00	H	122	340	6.46	1 / 40	15.35	21.81	0.152	33.01	-11.20
	π/2 BPSK	3500.01	H	122	340	6.46	1 / 40	15.42	**21.88**	0.154	33.01	-11.13
	π/2 BPSK	3519.99	H	122	340	6.46	1 / 40	15.37	21.83	0.153	33.01	-11.18
	QPSK	3480.00	H	122	340	6.46	1 / 40	15.15	21.61	0.145	33.01	-11.40
	QPSK	3500.01	H	122	340	6.46	1 / 40	15.22	21.68	0.147	33.01	-11.33
	QPSK	3519.99	H	122	340	6.46	1 / 40	15.18	21.64	0.146	33.01	-11.37
	16-QAM	3500.01	H	122	340	6.46	1 / 40	13.97	20.43	0.111	33.01	-12.58
50 MHz	π/2 BPSK	3475.02	H	122	340	6.46	1 / 33	15.25	21.71	0.148	33.01	-11.30
	π/2 BPSK	3500.01	H	122	340	6.46	1 / 33	15.41	**21.87**	0.154	33.01	-11.14
	π/2 BPSK	3525.00	H	122	340	6.46	1 / 33	15.35	21.81	0.152	33.01	-11.20
	QPSK	3475.02	H	122	340	6.46	1 / 33	15.05	21.51	0.142	33.01	-11.50
	QPSK	3500.01	H	122	340	6.46	1 / 33	15.21	21.67	0.147	33.01	-11.34
	QPSK	3525.00	H	122	340	6.46	1 / 33	15.15	21.61	0.145	33.01	-11.40
	16-QAM	3500.01	H	122	340	6.46	1 / 33	13.96	20.42	0.110	33.01	-12.59
40 MHz	π/2 BPSK	3470.01	H	122	340	6.46	1 / 26	15.16	21.62	0.145	33.01	-11.39
	π/2 BPSK	3500.01	H	122	340	6.46	1 / 26	15.32	**21.78**	0.151	33.01	-11.23
	π/2 BPSK	3529.98	H	122	340	6.46	1 / 26	15.18	21.64	0.146	33.01	-11.37
	QPSK	3470.01	H	122	340	6.46	1 / 53	15.20	21.66	0.147	33.01	-11.35
	QPSK	3500.01	H	122	340	6.46	1 / 26	15.10	21.56	0.143	33.01	-11.45
	QPSK	3529.98	H	122	340	6.46	1 / 26	15.05	21.51	0.142	33.01	-11.50
	16-QAM	3470.01	H	122	340	6.46	1 / 53	13.93	20.39	0.110	33.01	-12.62
30 MHz	π/2 BPSK	3465.00	H	122	340	6.46	1 / 39	15.26	**21.72**	0.149	33.01	-11.29
	π/2 BPSK	3500.01	H	122	340	6.46	1 / 19	15.22	21.68	0.147	33.01	-11.33
	π/2 BPSK	3534.99	H	122	340	6.46	1 / 19	15.00	21.46	0.140	33.01	-11.55
	QPSK	3465.00	H	122	340	6.46	1 / 39	15.11	21.57	0.144	33.01	-11.44
	QPSK	3500.01	H	122	340	6.46	1 / 19	15.03	21.49	0.141	33.01	-11.52
	QPSK	3534.99	H	122	340	6.46	1 / 19	14.78	21.24	0.133	33.01	-11.77
	16-QAM	3500.01	H	122	340	6.46	1 / 19	13.78	20.24	0.106	33.01	-12.77
20 MHz	π/2 BPSK	3460.02	H	122	340	6.46	1 / 37	15.27	**21.73**	0.149	33.01	-11.28
	π/2 BPSK	3500.01	H	122	340	6.46	1 / 13	15.15	21.61	0.145	33.01	-11.40
	π/2 BPSK	3540.00	H	122	340	6.46	1 / 13	14.82	21.28	0.134	33.01	-11.73
	QPSK	3460.02	H	122	340	6.46	1 / 37	15.09	21.55	0.143	33.01	-11.46
	QPSK	3500.01	H	122	340	6.46	1 / 13	14.99	21.45	0.140	33.01	-11.56
	QPSK	3540.00	H	122	340	6.46	1 / 13	14.65	21.11	0.129	33.01	-11.90
	16-QAM	3460.02	H	122	340	6.46	1 / 37	13.75	20.21	0.105	33.01	-12.80
15 MHz	π/2 BPSK	3457.50	H	122	340	6.46	1 / 28	15.17	**21.63**	0.146	33.01	-11.38
	π/2 BPSK	3500.01	H	122	340	6.46	1 / 19	15.17	**21.63**	0.146	33.01	-11.38
	π/2 BPSK	3542.49	H	122	340	6.46	1 / 9	14.81	21.27	0.134	33.01	-11.74
	QPSK	3457.50	H	122	340	6.46	1 / 28	14.95	21.41	0.139	33.01	-11.60
	QPSK	3500.01	H	122	340	6.46	1 / 19	14.96	21.42	0.139	33.01	-11.59
	QPSK	3542.49	H	122	340	6.46	1 / 9	14.63	21.09	0.129	33.01	-11.92
	16-QAM	3500.01	H	122	340	6.46	1 / 19	13.61	20.07	0.102	33.01	-12.94
10 MHz	π/2 BPSK	3455.01	H	122	340	6.46	1 / 12	15.04	21.50	0.141	33.01	-11.51
	π/2 BPSK	3500.01	H	122	340	6.46	1 / 12	15.15	**21.61**	0.145	33.01	-11.40
	π/2 BPSK	3544.98	H	122	340	6.46	1 / 6	14.83	21.29	0.135	33.01	-11.72
	QPSK	3455.01	H	122	340	6.46	1 / 6	14.87	21.33	0.136	33.01	-11.68
	QPSK	3500.01	H	122	340	6.46	1 / 12	15.03	21.49	0.141	33.01	-11.52
	QPSK	3544.98	H	122	340	6.46	1 / 6	14.67	21.13	0.130	33.01	-11.88
	16-QAM	3500.01	H	122	340	6.46	1 / 12	13.69	20.15	0.104	33.01	-12.86
100 MHz	QPSK (CP-OFDM)	3500.0	H	120	341	6.46	1 / 204	13.07	19.53	0.090	33.01	-13.48
	QPSK (WCP)	3500.0	H	176	340	6.46	1 / 136	15.00	21.46	0.140	33.01	-11.55

Table 7-16. EIRP Data (NR Band n77 (DoD) – Ant F)

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
100 MH	π/2 BPSK	3500.01	H	101	44	6.46	1/1	14.12	**20.58**	0.114	33.01	-12.43
	QPSK	3500.01	H	101	44	6.46	1/1	13.63	20.09	0.102	33.01	-12.92
	16-QAM	3500.01	H	101	44	6.46	1/1	10.43	16.89	0.049	33.01	-16.12
100 MHz	QPSK (CP-OFDM)	3500.0	H	101	44	6.46	1/1	8.83	15.29	0.034	33.01	-17.72

Table 7-17. EIRP Data (NR Band n77 (DoD) – Ant C)

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
100 MH	π/2 BPSK	3500.01	H	196	320	6.46	1 / 136	15.41	21.87	0.154	33.01	-11.14
	QPSK	3500.01	H	196	320	6.46	1 / 136	16.17	**22.63**	0.183	33.01	-10.38
	16-QAM	3500.01	H	196	320	6.46	1 / 136	13.15	19.61	0.092	33.01	-13.40
100 MHz	QPSK (CP-OFDM)	3500.0	H	196	320	6.46	1/136	12.18	18.64	0.073	33.01	-14.37

Table 7-18. EIRP Data (NR Band n77 (DoD) – Ant I)

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
100 MH	π/2 BPSK	3500.01	H	110	8	6.46	1 / 136	10.64	17.10	0.051	33.01	-15.91
	QPSK	3500.01	H	110	8	6.46	1 / 136	11.40	**17.86**	0.061	33.01	-15.15
	16-QAM	3500.01	H	110	8	6.46	1 / 136	9.21	15.67	0.037	33.01	-17.34
100 MHz	QPSK (CP-OFDM)	3500.0	H	110	8	6.46	1 / 136	7.61	14.07	0.026	33.01	-18.94

Table 7-19. EIRP Data (NR Band n77 (DoD) – Ant D)

7.8 Radiated Spurious Emissions Measurements

Test Overview

Radiated spurious emissions measurements are performed using the field strength conversion method described in ANSI C63.26-2015 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using hybrid (biconical/log) antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

Test Procedures Used

ANSI C63.26-2015 – Section 5.5.4

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW ≥ 3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points ≥ 2 x span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

Test Setup

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

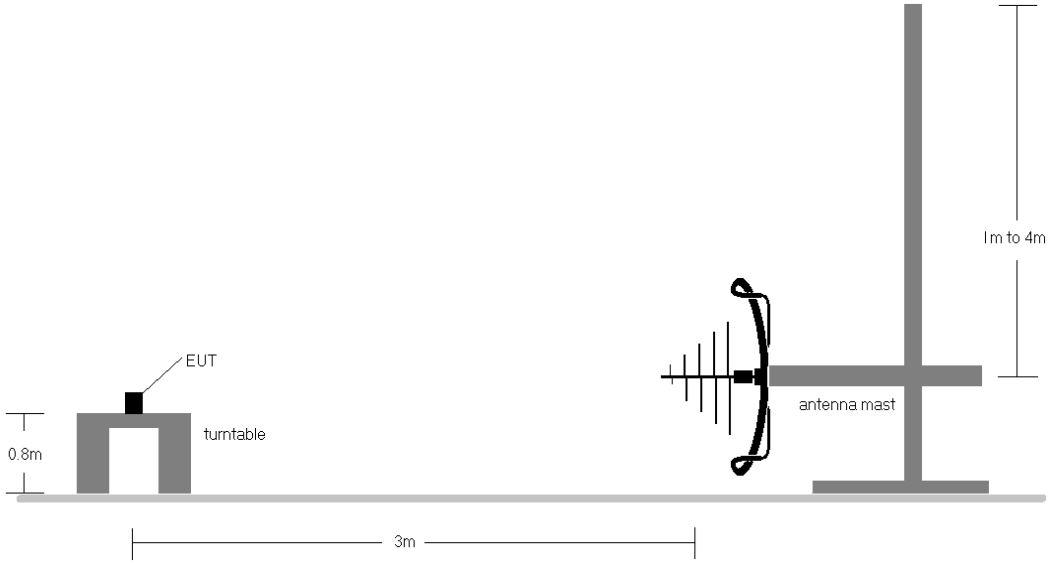


Figure 7-7. Test Instrument & Measurement Setup < 1GHz

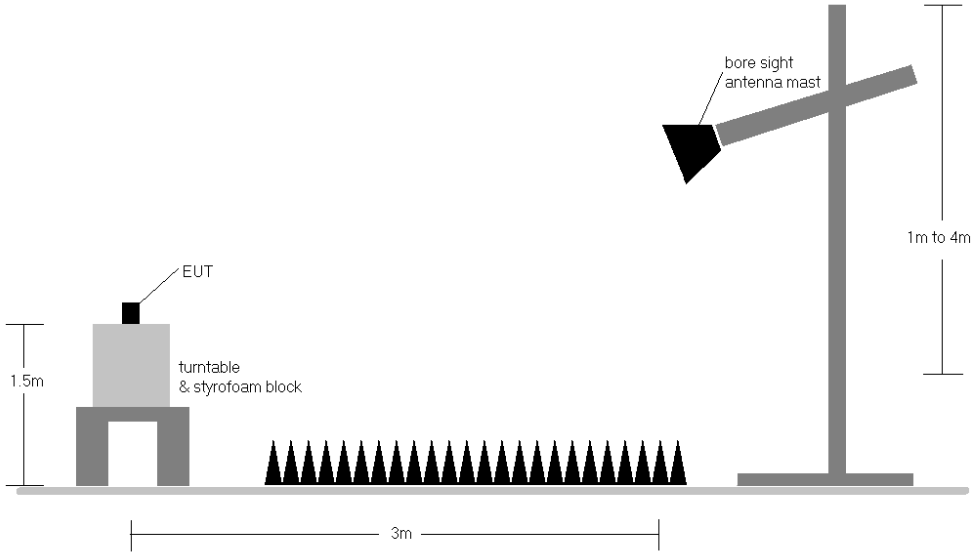


Figure 7-8. Test Instrument & Measurement Setup >1 GHz

Test Notes

1) Field strengths are calculated using the Measurement quantity conversions in ANSI C63.26-2015 Section 5.2.7:
   a) E(dBµV/m) = Measured amplitude level (dBm) + 107 + Cable Loss (dB) + Antenna Factor (dB/m)
   b) EIRP (dBm) = E(dBµV/m) + 20logD – 104.8; where D is the measurement distance in meters.

2) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.

3) This unit was tested with its standard battery.

4) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.

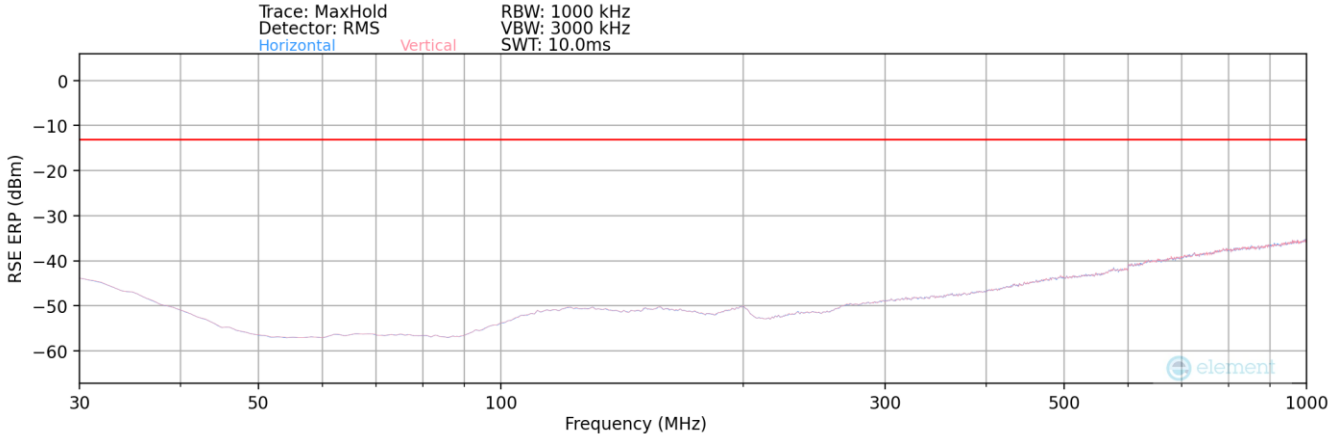
5) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.

6) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

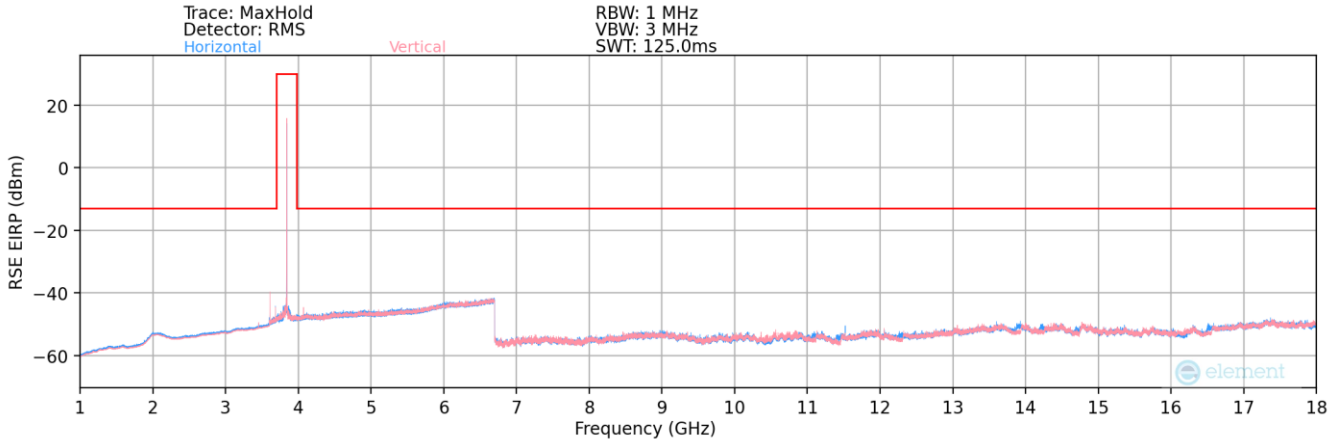
7) For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst-case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

8) Spurious emission in EN-DC Operating mode with Sub 6GHz NR carrier as well as an LTE carrier (anchor) has been checked and was found to not to be the worst case.

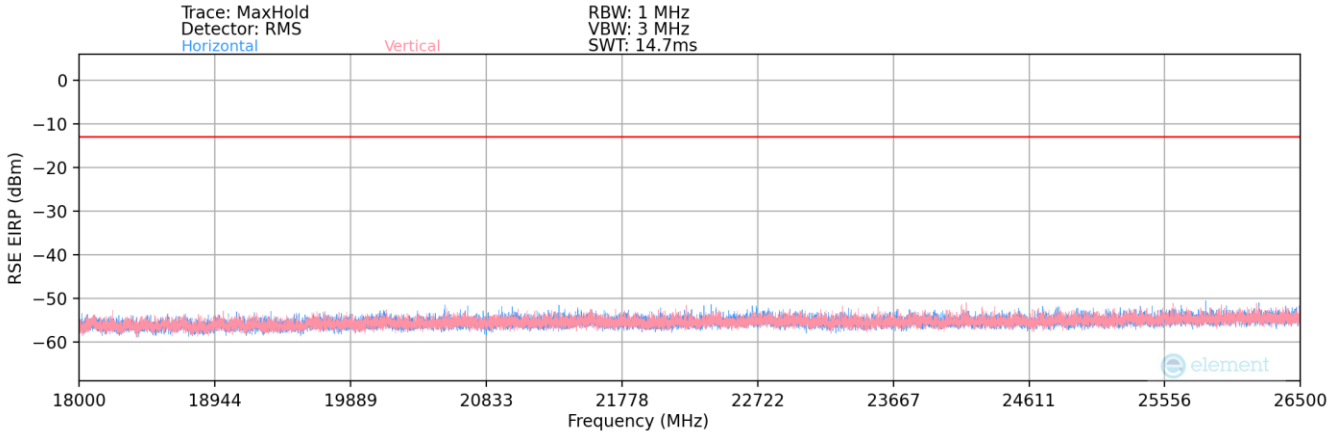
NR Band n77 – Ant F



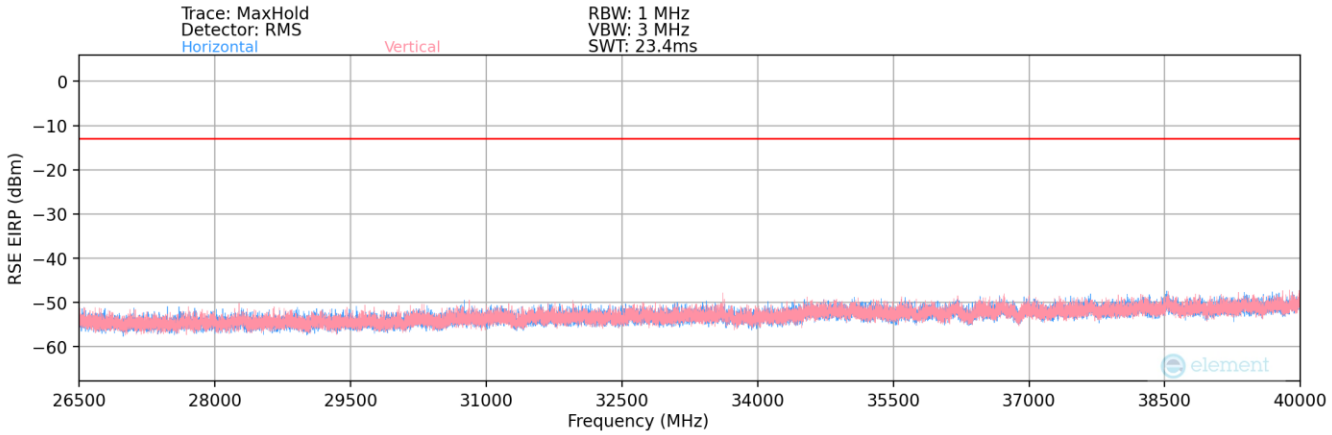
Plot 7-113. Radiated Spurious Plot (NR Band n77 – Ant F)



Plot 7-114. Radiated Spurious Plot (NR Band n77 – Ant F)



Plot 7-115. Radiated Spurious Plot (NR Band n77 – Ant F)



Plot 7-116. Radiated Spurious Plot (NR Band n77 – Ant F)

Bandwidth (MHz):	100
Frequency (MHz):	3930.00
RB / Offset:	1 / 136
Mode:	Stand Alone

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
783.00	H	-	-	-96.96	29.78	39.82	-55.44	-13.00	-42.44

Table 7-20. Radiated Spurious Data (NR Band n77 – Below 1GHz – Ant F)

Bandwidth (MHz):	100
Frequency (MHz):	3750.00
RB / Offset:	1 / 136
Mode:	Stand Alone

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
7500.00	H	158	346	-73.98	9.72	42.74	-52.52	-13.00	-39.52
11250.00	H	127	341	-70.77	12.07	48.30	-46.96	-13.00	-33.96
15000.00	H	317	47	-72.22	14.86	49.64	-45.61	-13.00	-32.61
18750.00	H	-	-	-65.15	1.87	43.72	-61.08	-13.00	-48.08
22500.00	H	-	-	-66.78	3.97	44.19	-60.61	-13.00	-47.61
26250.00	H	-	-	-66.48	4.35	44.86	-59.94	-13.00	-46.94
30000.00	H	-	-	-67.43	6.18	45.75	-59.05	-13.00	-46.05
33750.00	H	-	-	-67.48	7.89	47.41	-57.39	-13.00	-44.39

Table 7-21. Radiated Spurious Data (NR Band n77 – Low Channel – Ant F)

Bandwidth (MHz):	100
Frequency (MHz):	3840.00
RB / Offset:	1 / 136
Mode:	Stand Alone

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
7680.00	H	293	306	-71.39	8.49	44.10	-51.16	-13.00	-38.16
11520.00	H	270	8	-68.62	12.59	50.97	-44.29	-13.00	-31.29
15360.00	H	133	317	-71.72	14.87	50.15	-45.11	-13.00	-32.11
19200.00	H	-	-	-66.14	2.25	43.12	-61.68	-13.00	-48.68
23040.00	H	-	-	-66.77	3.99	44.21	-60.59	-13.00	-47.59
26880.00	H	-	-	-67.27	4.75	44.48	-60.32	-13.00	-47.32
30720.00	H	-	-	-67.08	6.80	46.72	-58.08	-13.00	-45.08
34560.00	H	-	-	-66.48	7.79	48.31	-56.49	-13.00	-43.49

Table 7-22. Radiated Spurious Data (NR Band n77 – Mid Channel – Ant F)

Bandwidth (MHz):	100
Frequency (MHz):	3930.00
RB / Offset:	1 / 136
Mode:	Stand Alone

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
7860.00	H	178	315	-69.13	8.96	46.83	-48.43	-13.00	-35.43
11790.00	H	275	3	-66.96	13.13	53.17	-42.09	-13.00	-29.09
15720.00	H	111	352	-64.60	15.19	57.59	-37.67	-13.00	-24.67
19650.00	H	-	-	-66.33	2.78	43.45	-61.35	-13.00	-48.35
23580.00	H	-	-	-66.73	4.00	44.27	-60.53	-13.00	-47.53
27510.00	H	-	-	-66.71	4.62	44.91	-59.89	-13.00	-46.89
31440.00	H	-	-	-67.26	6.99	46.73	-58.07	-13.00	-45.07
35370.00	H	-	-	-67.03	8.89	48.87	-55.93	-13.00	-42.93

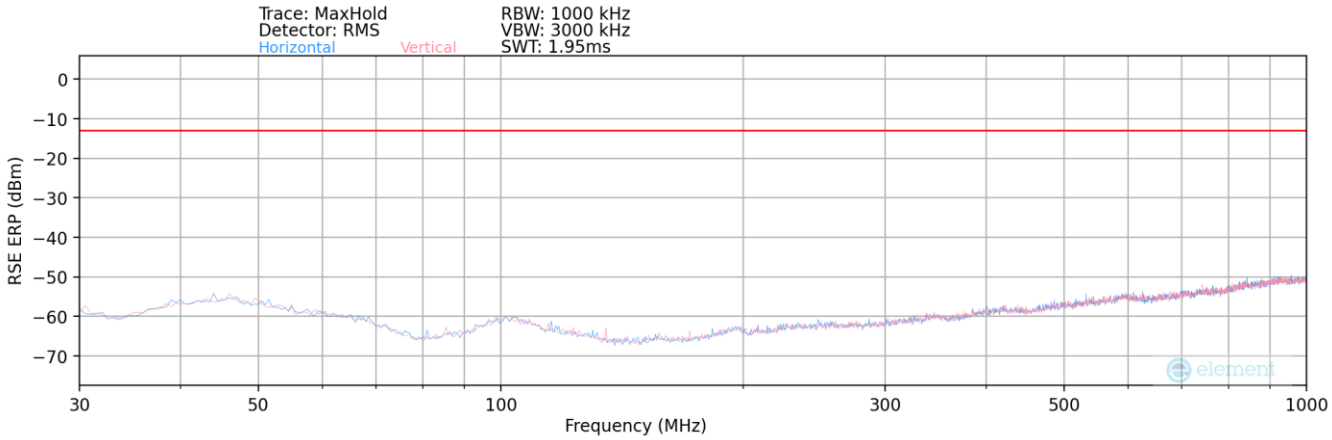
Table 7-23. Radiated Spurious Data (NR Band n77 – High Channel – Ant F)

Case:	w/ Wireless Charging Pad
Bandwidth (MHz):	100
Frequency (MHz):	3930.00
RB / Offset:	1 / 136
Mode:	Stand Alone

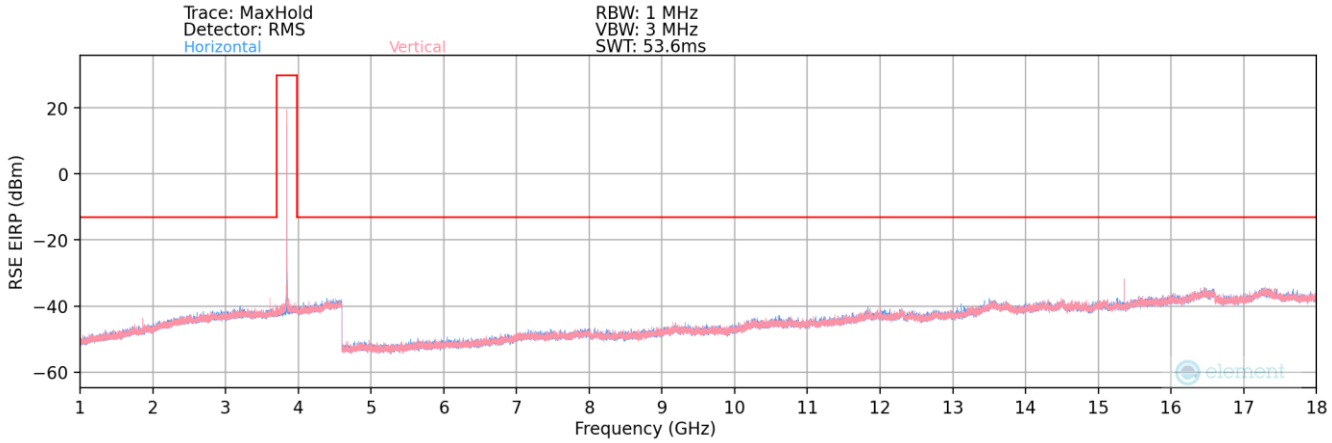
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
7860.00	H	259	96	-71.80	8.96	44.16	-51.10	-13.00	-38.10
11790.00	H	110	81	-74.61	13.13	45.52	-49.74	-13.00	-36.74
15720.00	H	121	347	-67.44	15.19	54.75	-40.51	-13.00	-27.51
19650.00	H	-	-	-66.72	2.78	43.06	-61.74	-13.00	-48.74
23580.00	H	-	-	-67.43	4.00	43.58	-61.22	-13.00	-48.22
27510.00	H	-	-	-66.23	4.62	45.39	-59.41	-13.00	-46.41
31440.00	H	-	-	-67.58	6.99	46.42	-58.38	-13.00	-45.38
35370.00	H	-	-	-67.66	8.89	48.24	-56.56	-13.00	-43.56

Table 7-24. Radiated Spurious Data with WCP (NR Band n77 – Ant F)

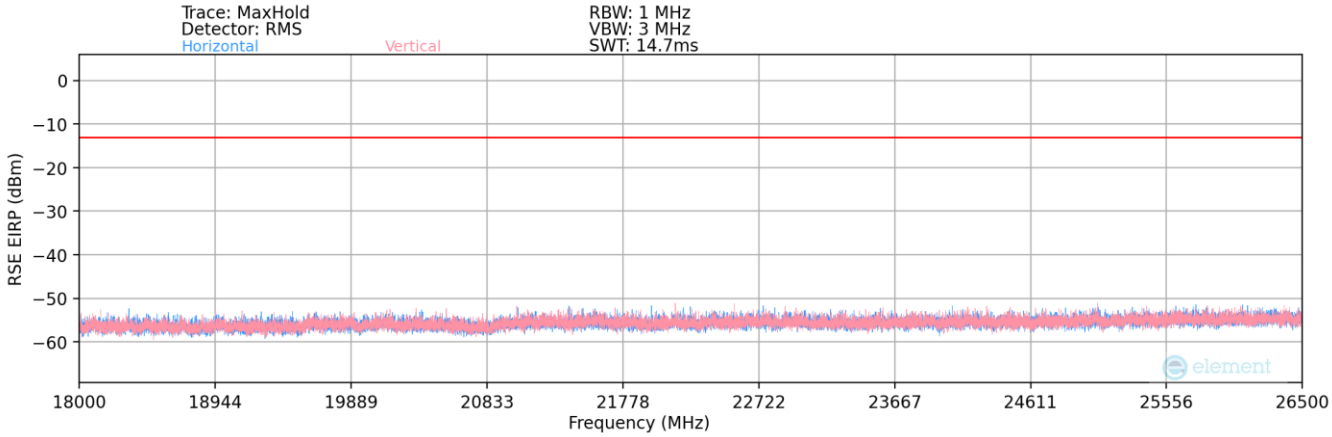
NR Band n77 – Ant C



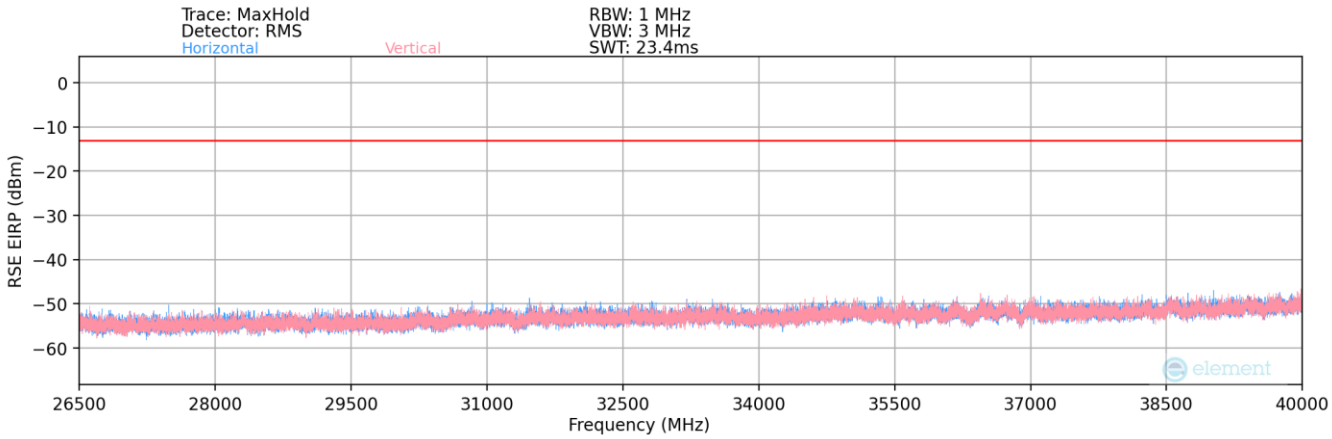
Plot 7-117. Radiated Spurious Plot (NR Band n77 – Ant C)



Plot 7-118. Radiated Spurious Plot (NR Band n77 – Ant C)



Plot 7-119. Radiated Spurious Plot (NR Band n77 – Ant C)



Plot 7-120. Radiated Spurious Plot (NR Band n77 – Ant C)

Bandwidth (MHz):	100
Frequency (MHz):	3840.00
RB / Offset:	1/136
Mode:	Stand Alone

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
538.00	H	-	-	-67.18	-3.49	36.33	-58.93	-13.00	-45.93

Table 7-25. Radiated Spurious Data (NR Band n77 – Below 1GHz – Ant C)

Bandwidth (MHz):	100
Frequency (MHz):	3750.00
RB / Offset:	1/136
Mode:	Stand Alone

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
7500.00	H	-	-	-74.74	15.93	48.19	-47.07	-13.00	-34.07
11250.00	H	-	-	-76.17	21.35	52.18	-43.07	-13.00	-30.07
15000.00	H	149.00	55.00	-69.45	26.20	63.75	-31.51	-13.00	-18.51
18750.00	H	-	-	-58.67	1.87	50.20	-54.60	-13.00	-41.60
22500.00	H	-	-	-58.47	3.97	52.50	-52.30	-13.00	-39.30
26250.00	H	-	-	-59.09	4.35	52.26	-52.54	-13.00	-39.54

Table 7-26. Radiated Spurious Data (NR Band n77 – Low Channel – Ant C)

Bandwidth (MHz):	100
Frequency (MHz):	3840.00
RB / Offset:	1/136
Mode:	Stand Alone

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
7680.00	H	100.00	21.00	-73.16	15.91	49.75	-45.51	-13.00	-32.51
11520.00	H	-	-	-76.28	22.28	53.00	-42.26	-13.00	-29.26
15360.00	H	125.00	324.00	-65.57	27.28	68.71	-26.54	-13.00	-13.54
19200.00	H	-	-	-58.77	2.25	50.49	-54.31	-13.00	-41.31
23040.00	H	-	-	-57.54	3.99	53.45	-51.35	-13.00	-38.35
26880.00	H	-	-	-59.77	4.75	51.98	-52.82	-13.00	-39.82

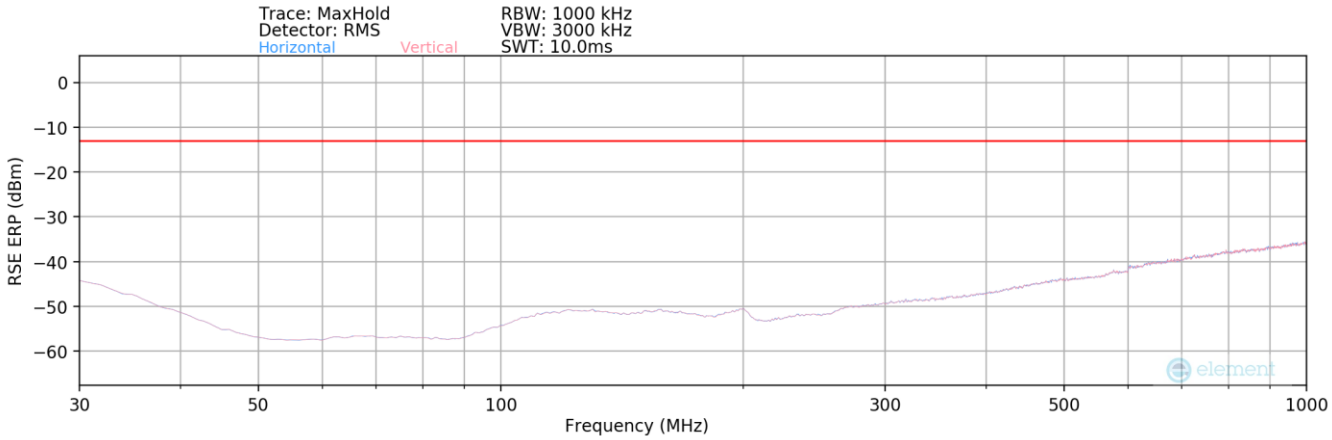
Table 7-27. Radiated Spurious Data (NR Band n77 – Mid Channel – Ant C)

Bandwidth (MHz):	100
Frequency (MHz):	3930.00
RB / Offset:	1/136
Mode:	Stand Alone

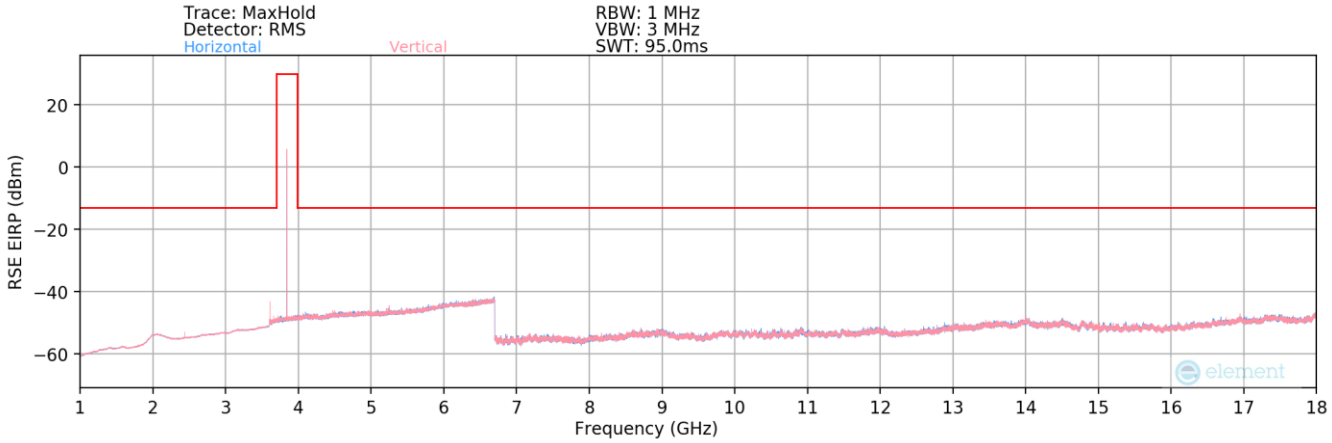
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
7860.00	H	-	-	-74.46	15.90	48.44	-46.82	-13.00	-33.82
11790.00	H	-	-	-75.45	21.45	53.00	-42.26	-13.00	-29.26
15720.00	H	340.00	13.00	-71.64	28.22	63.58	-31.67	-13.00	-18.67
19650.00	H	-	-	-59.39	2.78	50.39	-54.41	-13.00	-41.41
23580.00	H	-	-	-59.21	4.00	51.79	-53.01	-13.00	-40.01
27510.00	H	-	-	-58.55	4.62	53.07	-51.73	-13.00	-38.73

Table 7-28. Radiated Spurious Data (NR Band n77 – High Channel – Ant C)

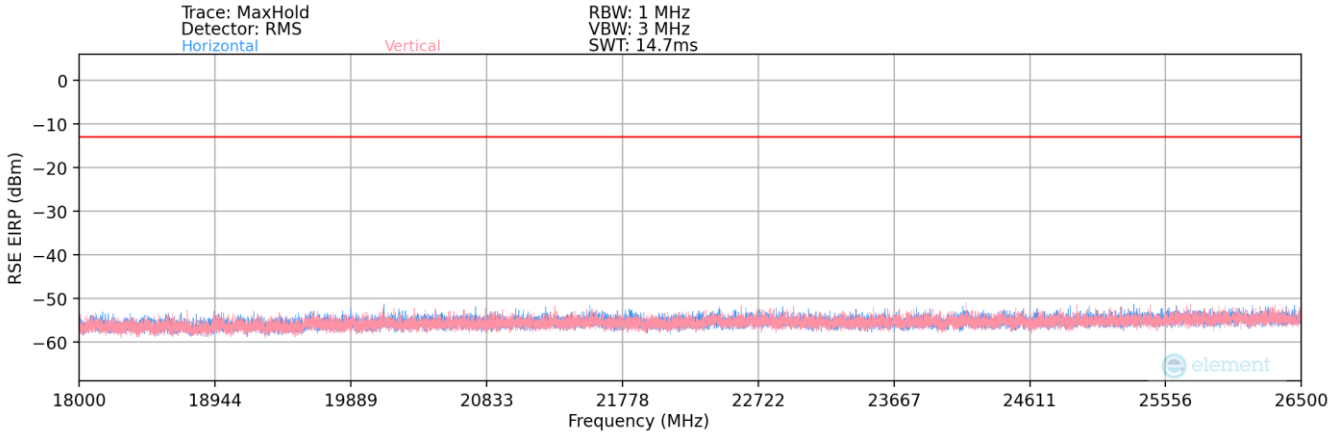
NR Band n77 – Ant I



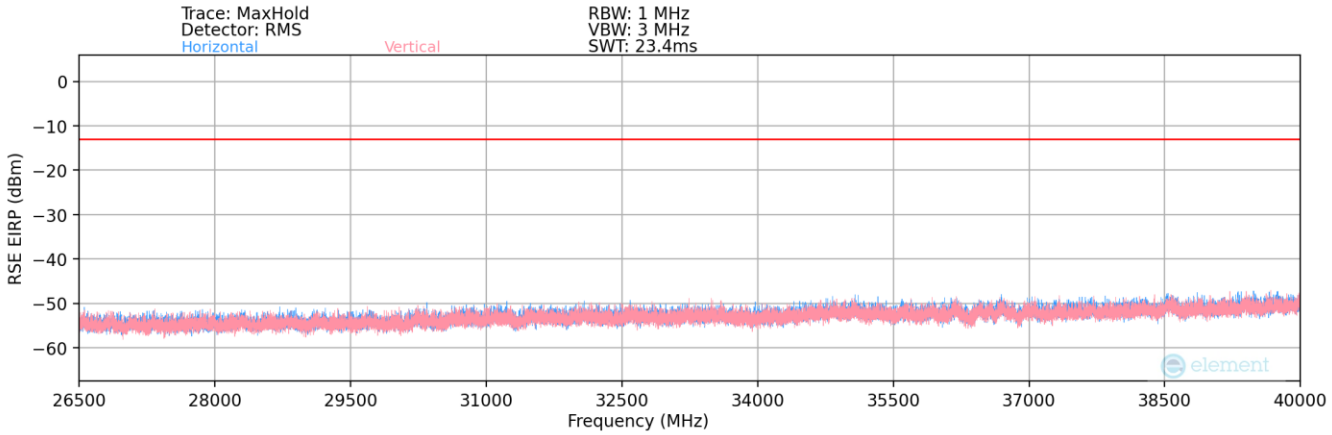
Plot 7-121. Radiated Spurious Plot (NR Band n77 – Ant I)



Plot 7-122. Radiated Spurious Plot (NR Band n77 – Ant I)



Plot 7-123. Radiated Spurious Plot (NR Band n77 – Ant I)



Plot 7-124. Radiated Spurious Plot (NR Band n77 – Ant I)

Bandwidth (MHz):	100
Frequency (MHz):	3840.00
RB / Offset:	1/136
Mode:	Stand Alone

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
312.00	V	-	-	-84.75	21.50	43.75	-51.51	-13.00	-38.51

Table 7-29. Radiated Spurious Data (NR Band n77 – Below 1GHz – Ant I)

Bandwidth (MHz):	100
Frequency (MHz):	3750.00
RB / Offset:	1/136
Mode:	Stand Alone

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
7500.00	V	-	-	-78.04	9.72	38.68	-56.58	-13.00	-43.58
11250.00	V	-	-	-79.43	12.07	39.64	-55.62	-13.00	-42.62
15000.00	V	-	-	-80.18	14.86	41.68	-53.57	-13.00	-40.57

Table 7-30. Radiated Spurious Data (NR Band n77 – Low Channel – Ant I)

Bandwidth (MHz):	100
Frequency (MHz):	3840.00
RB / Offset:	1/136
Mode:	Stand Alone

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
7680.00	V	-	-	-77.38	8.49	38.11	-57.15	-13.00	-44.15
11520.00	V	-	-	-80.03	12.59	39.56	-55.70	-13.00	-42.70
15360.00	V	-	-	-79.84	14.87	42.03	-53.23	-13.00	-40.23

Table 7-31. Radiated Spurious Data (NR Band n77 – Mid Channel – Ant I)

Bandwidth (MHz):	100
Frequency (MHz):	3930.00
RB / Offset:	1/136
Mode:	Stand Alone

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
7860.00	V	-	-	-77.70	8.96	38.26	-57.00	-13.00	-44.00
11790.00	V	-	-	-80.05	13.13	40.08	-55.18	-13.00	-42.18
15720.00	V	-	-	-79.77	15.19	42.42	-52.84	-13.00	-39.84

Table 7-32. Radiated Spurious Data (NR Band n77 – High Channel – Ant I)