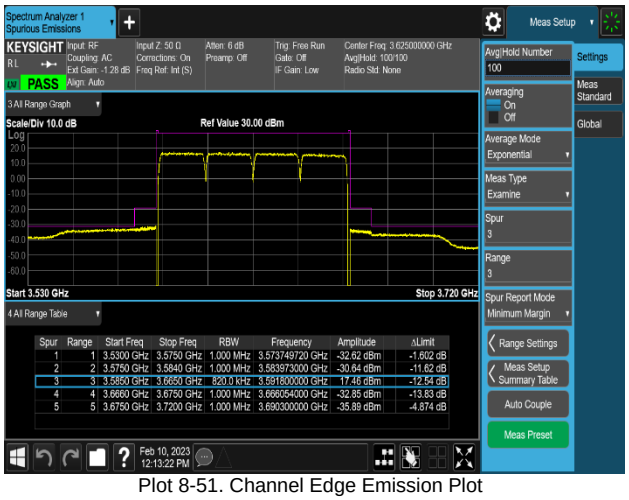
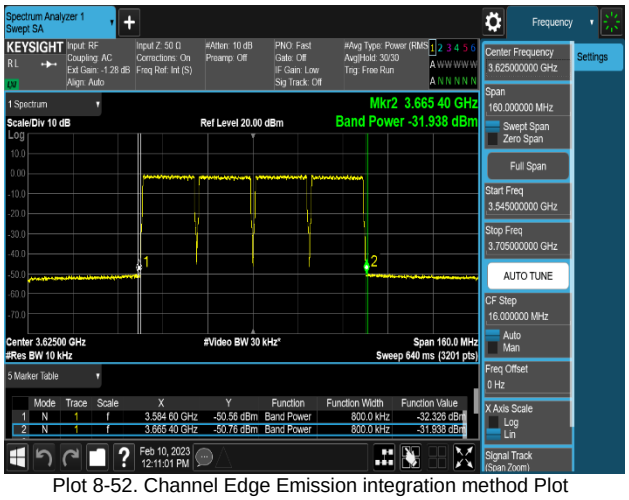
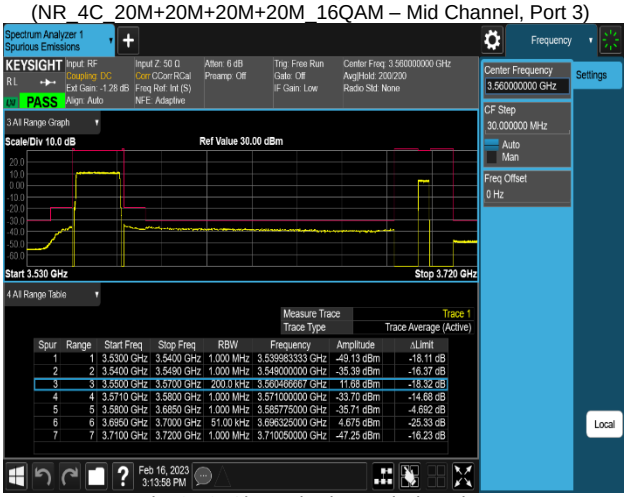


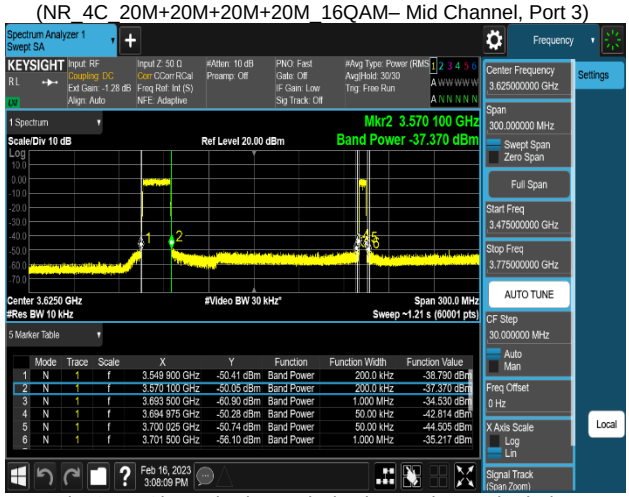
Plot 8-51. Channel Edge Emission Plot
(NR_4C_20M+20M+20M+20M_16QAM – Mid Channel, Port 3)



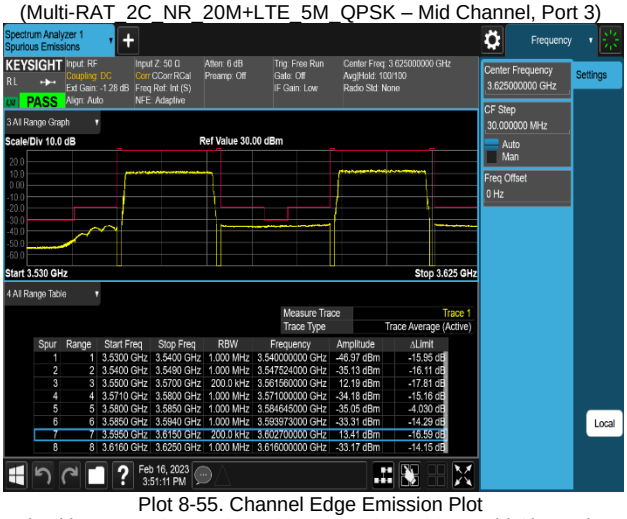
Plot 8-52. Channel Edge Emission integration method Plot
(NR_4C_20M+20M+20M+20M_16QAM– Mid Channel, Port 3)



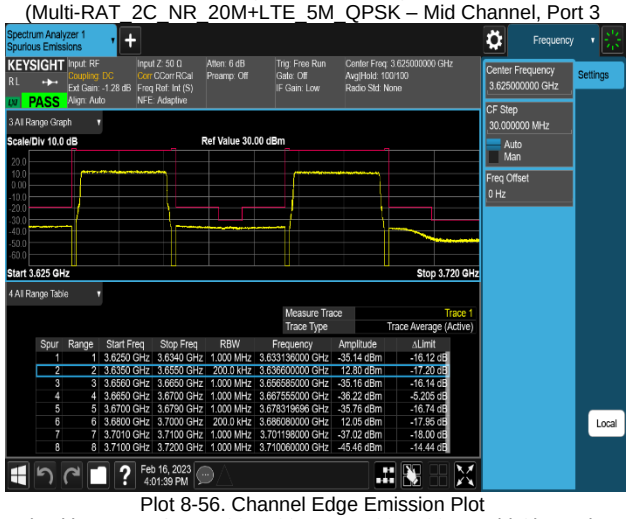
Plot 8-53. Channel Edge Emission Plot
(Multi-RAT_2C_NR_20M+LTE_5M_QPSK – Mid Channel, Port 3)



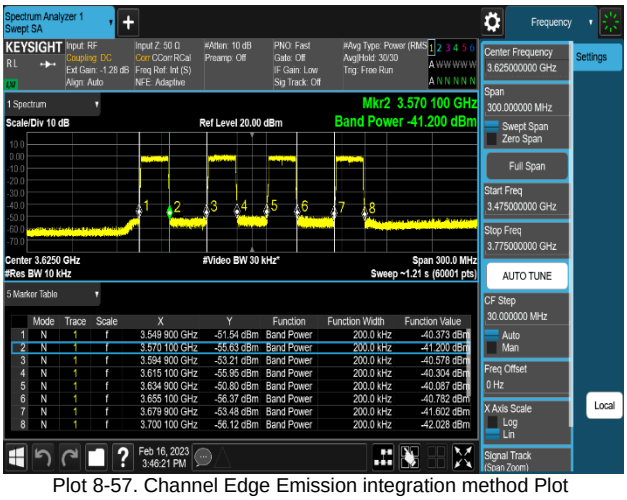
Plot 8-54. Channel Edge Emission integration method Plot
(Multi-RAT_2C_NR_20M+LTE_5M_QPSK – Mid Channel, Port 3



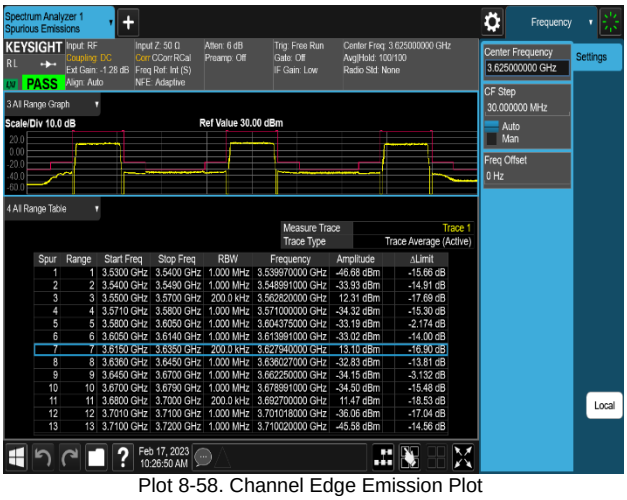
Plot 8-55. Channel Edge Emission Plot
(Multi-RAT_4NC_NR_20M+20M+LTE_20M+20M - Mid Channel, Port 3)



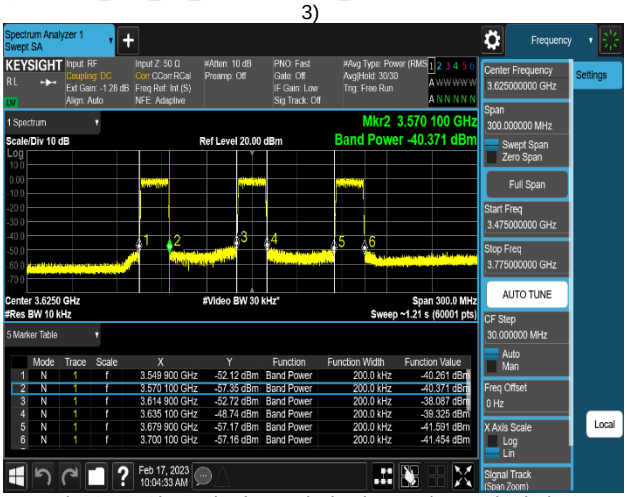
Plot 8-56. Channel Edge Emission Plot
(Multi-RAT_4NC_NR_20M+20M+LTE_20M+20M - Mid Channel, Port 3)



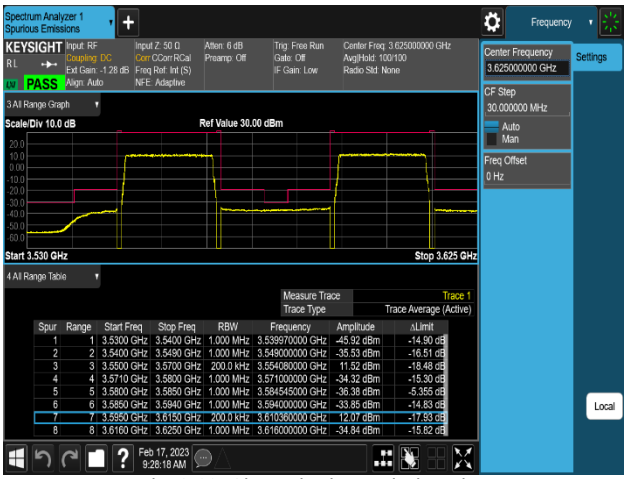
Plot 8-57. Channel Edge Emission integration method Plot
(Multi-RAT_4NC_NR_20M+20M+LTE_20M+20M - Mid Channel, Port 3)



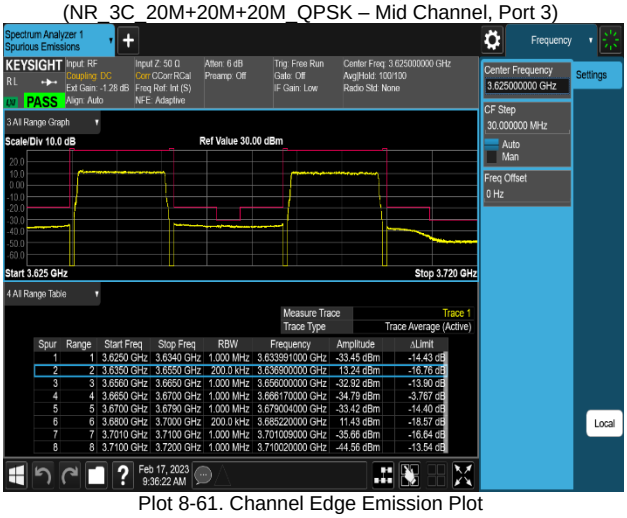
Plot 8-58. Channel Edge Emission Plot
(NR_3C_20M+20M+20M_QPSK – Mid Channel, Port 3)



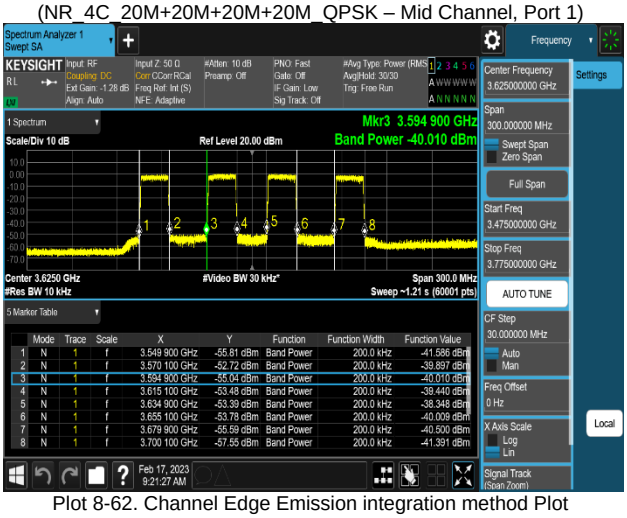
Plot 8-59. Channel Edge Emission integration method Plot
(NR_3C_20M+20M+20M_QPSK – Mid Channel, Port 3)



Plot 8-60. Channel Edge Emission Plot
(NR_4C_20M+20M+20M+20M_QPSK – Mid Channel, Port 1)



Plot 8-61. Channel Edge Emission Plot
(NR_4C_20M+20M+20M+20M_QPSK – Mid Channel, Port 1)



Plot 8-62. Channel Edge Emission integration method Plot
(NR_4C_20M+20M+20M+20M_QPSK – Mid Channel, Port 1)

8.7 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 equipm ent 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 its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

Test Procedure Used

ANSI C63.26 - Section 5.2.3.4.
KDB 971168 D01 v03r01 - Section 6
KDB 662911 D01 v02r01 - Section E)3)

Test Setting

1. Start frequency was set to 30 MHz and stop frequency was set to at least 10 * the fundamental frequency excluding the frequency range of the Channel Edge measurement.
2. RBW: 1 MHz
3. VBW ≥ 3 x RBW
4. Detector = RMS
5. Number of sweep points ≥ 2 x Span/RBW
6. Trace mode = trace average
7. Sweep time = auto couple
8. The trace was allowed to stabilize

Limit

- Any emission below 3530 MHz and above 3720 MHz ≤ −40 dBm/MHz

Test Setup

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

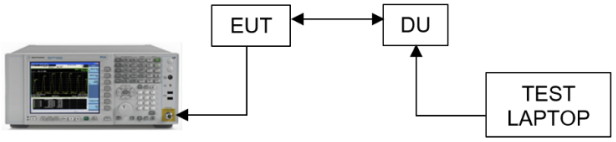


Figure 8-6. Test Instrument & Measurement Setup

Test Notes

1. All modes of operation were investigated and the worst configuration result plots are reported in each RF bandwidth.

2. When detected Emission, this value has been applied as reference offset in the spectrum analyzer.
   Duty cycle correction factor was added to spectrum analyzer.
   Duty cycle = transmit on-time / transmitter period = 3.72 ms / 5.00 ms = 0.74
   Duty cycle correction factor = 10*log (1/duty cycle) =10*log (1/0.74) = 1.28 dB

3. The limits were adjusted by a factor of [-10*log (n)] dB to account for the device operation as a n port MIMO transmitter, as per FCC KDB 622911. MIMO Factor calculation as below:

4. When the channel edge detect with a margin of under 1dB to Limit, That used to integration method was performed using the spectrum analyzer's band power functions. The spectrum analyzer marker was placed at one-half of the RBW away from the band edge. The integration value was set to a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter.

Frequency range	Basic Limit (dBm/MHz)	MIMO Factor (dB)	Adjusted limit (dBm)
		4T	4T
below 3530 MHz and above 3720 MHz	-40.00	6.02	- 46.02
Note: Adjusted limit (dBm/MHz) = Basic limit (dBm/1MHz) - MIMO Factor			

Channel	Port	Measurement Range	Level (dBm)	Limit (dBm)	Worst Margin (dB)
			QPSK		
Low	0	30 MHz to 3530 MHz	-67.10	-46.02	-21.08
		3.72 GHz to 6.2 GHz	-71.70	-46.02	-25.68
		6.2 GHz to 18 GHz	-55.38	-46.02	-9.36
		18 GHz to 40 GHz	-52.84	-46.02	-6.82
	1	30 MHz to 3530 MHz	-66.62	-46.02	-20.60
		3.72 GHz to 6.2 GHz	-71.25	-46.02	-25.23
		6.2 GHz to 18 GHz	-54.87	-46.02	-8.85
		18 GHz to 40 GHz	-52.90	-46.02	-6.88
	2	30 MHz to 3530 MHz	-67.41	-46.02	-21.39
		3.72 GHz to 6.2 GHz	-71.93	-46.02	-25.91
		6.2 GHz to 18 GHz	-55.03	-46.02	-9.01
		18 GHz to 40 GHz	-52.77	-46.02	-6.75
	3	30 MHz to 3530 MHz	-65.76	-46.02	-19.74
		3.72 GHz to 6.2 GHz	-70.09	-46.02	-24.07
		6.2 GHz to 18 GHz	-53.97	-46.02	-7.95
		18 GHz to 40 GHz	-53.13	-46.02	-7.11
Middle	0	30 MHz to 3530 MHz	-67.95	-46.02	-21.93
		3.72 GHz to 6.2 GHz	-71.73	-46.02	-25.71
		6.2 GHz to 18 GHz	-54.89	-46.02	-8.87
		18 GHz to 40 GHz	-52.69	-46.02	-6.67
	1	30 MHz to 3530 MHz	-67.26	-46.02	-21.24
		3.72 GHz to 6.2 GHz	-71.24	-46.02	-25.22
		6.2 GHz to 18 GHz	-55.80	-46.02	-9.78
		18 GHz to 40 GHz	-52.66	-46.02	-6.64
	2	30 MHz to 3530 MHz	-67.57	-46.02	-21.55
		3.72 GHz to 6.2 GHz	-72.00	-46.02	-25.98
		6.2 GHz to 18 GHz	-55.38	-46.02	-9.36
		18 GHz to 40 GHz	-53.21	-46.02	-7.19
	3	30 MHz to 3530 MHz	-66.10	-46.02	-20.08
		3.72 GHz to 6.2 GHz	-70.50	-46.02	-24.48
		6.2 GHz to 18 GHz	-51.99	-46.02	-5.97
		18 GHz to 40 GHz	-52.94	-46.02	-6.92
High	0	30 MHz to 3530 MHz	-67.37	-46.02	-21.35
		3.72 GHz to 6.2 GHz	-71.78	-46.02	-25.76
		6.2 GHz to 18 GHz	-55.43	-46.02	-9.41
		18 GHz to 40 GHz	-52.75	-46.02	-6.73
	1	30 MHz to 3530 MHz	-66.53	-46.02	-20.51
		3.72 GHz to 6.2 GHz	-70.95	-46.02	-24.93
		6.2 GHz to 18 GHz	-55.16	-46.02	-9.14
		18 GHz to 40 GHz	-52.11	-46.02	-6.09
	2	30 MHz to 3530 MHz	-67.31	-46.02	-21.29
		3.72 GHz to 6.2 GHz	-71.41	-46.02	-25.39
		6.2 GHz to 18 GHz	-55.64	-46.02	-9.62
		18 GHz to 40 GHz	-52.62	-46.02	-6.60
	3	30 MHz to 3530 MHz	-66.24	-46.02	-20.22
		3.72 GHz to 6.2 GHz	-70.32	-46.02	-24.30
		6.2 GHz to 18 GHz	-52.66	-46.02	-6.64
		18 GHz to 40 GHz	-52.70	-46.02	-6.68

Table 8-26. Conducted Spurious Emission Summary Data (Multi-RAT_2C_NR_20M+LTE_5M)

Channel	Port	Measurement Range	Level (dBm)	Limit (dBm)	Worst Margin (dB)
			QPSK		
Low	0	30 MHz to 3530 MHz	-67.56	-46.02	-21.54
		3.72 GHz to 6.2 GHz	-71.85	-46.02	-25.83
		6.2 GHz to 18 GHz	-56.06	-46.02	-10.04
		18 GHz to 40 GHz	-52.84	-46.02	-6.82
	1	30 MHz to 3530 MHz	-62.50	-46.02	-16.48
		3.72 GHz to 6.2 GHz	-71.36	-46.02	-25.34
		6.2 GHz to 18 GHz	-54.62	-46.02	-8.60
		18 GHz to 40 GHz	-53.19	-46.02	-7.17
	2	30 MHz to 3530 MHz	-66.88	-46.02	-20.86
		3.72 GHz to 6.2 GHz	-72.86	-46.02	-26.84
		6.2 GHz to 18 GHz	-56.37	-46.02	-10.35
		18 GHz to 40 GHz	-52.88	-46.02	-6.86
	3	30 MHz to 3530 MHz	-65.75	-46.02	-19.73
		3.72 GHz to 6.2 GHz	-70.68	-46.02	-24.66
		6.2 GHz to 18 GHz	-53.23	-46.02	-7.21
		18 GHz to 40 GHz	-52.36	-46.02	-6.34
Middle	0	30 MHz to 3530 MHz	-67.48	-46.02	-21.46
		3.72 GHz to 6.2 GHz	-72.17	-46.02	-26.15
		6.2 GHz to 18 GHz	-54.89	-46.02	-8.87
		18 GHz to 40 GHz	-52.65	-46.02	-6.63
	1	30 MHz to 3530 MHz	-66.92	-46.02	-20.90
		3.72 GHz to 6.2 GHz	-71.60	-46.02	-25.58
		6.2 GHz to 18 GHz	-55.28	-46.02	-9.26
		18 GHz to 40 GHz	-53.00	-46.02	-6.98
	2	30 MHz to 3530 MHz	-67.71	-46.02	-21.69
		3.72 GHz to 6.2 GHz	-72.61	-46.02	-26.59
		6.2 GHz to 18 GHz	-55.47	-46.02	-9.45
		18 GHz to 40 GHz	-52.86	-46.02	-6.84
	3	30 MHz to 3530 MHz	-66.24	-46.02	-20.22
		3.72 GHz to 6.2 GHz	-71.06	-46.02	-25.04
		6.2 GHz to 18 GHz	-53.99	-46.02	-7.97
		18 GHz to 40 GHz	-53.03	-46.02	-7.01
High	0	30 MHz to 3530 MHz	-68.10	-46.02	-22.08
		3.72 GHz to 6.2 GHz	-71.92	-46.02	-25.90
		6.2 GHz to 18 GHz	-56.32	-46.02	-10.30
		18 GHz to 40 GHz	-52.87	-46.02	-6.85
	1	30 MHz to 3530 MHz	-66.63	-46.02	-20.61
		3.72 GHz to 6.2 GHz	-71.25	-46.02	-25.23
		6.2 GHz to 18 GHz	-54.99	-46.02	-8.97
		18 GHz to 40 GHz	-52.47	-46.02	-6.45
	2	30 MHz to 3530 MHz	-67.13	-46.02	-21.11
		3.72 GHz to 6.2 GHz	-72.25	-46.02	-26.23
		6.2 GHz to 18 GHz	-56.42	-46.02	-10.40
		18 GHz to 40 GHz	-52.81	-46.02	-6.79
	3	30 MHz to 3530 MHz	-65.78	-46.02	-19.76
		3.72 GHz to 6.2 GHz	-70.55	-46.02	-24.53
		6.2 GHz to 18 GHz	-52.34	-46.02	-6.32
		18 GHz to 40 GHz	-53.21	-46.02	-7.19

Table 8-27. Conducted Spurious Emission Summary Data (Multi-RAT_4C_NR_20M+20M+LTE_20M+20M)

Channel	Port	Measurement Range	Level (dBm)	Limit (dBm)	Worst Margin (dB)
			QPSK		
Low	0	30 MHz to 3530 MHz	-51.71	-46.02	-5.69
		3.72 GHz to 6.2 GHz	-59.16	-46.02	-13.14
		6.2 GHz to 18 GHz	-55.78	-46.02	-9.76
		18 GHz to 40 GHz	-53.21	-46.02	-7.19
	1	30 MHz to 3530 MHz	-52.20	-46.02	-6.18
		3.72 GHz to 6.2 GHz	-58.45	-46.02	-12.43
		6.2 GHz to 18 GHz	-55.17	-46.02	-9.15
		18 GHz to 40 GHz	-52.90	-46.02	-6.88
	2	30 MHz to 3530 MHz	-51.04	-46.02	-5.02
		3.72 GHz to 6.2 GHz	-59.60	-46.02	-13.58
		6.2 GHz to 18 GHz	-56.38	-46.02	-10.36
		18 GHz to 40 GHz	-52.91	-46.02	-6.89
	3	30 MHz to 3530 MHz	-53.10	-46.02	-7.08
		3.72 GHz to 6.2 GHz	-57.37	-46.02	-11.35
		6.2 GHz to 18 GHz	-53.90	-46.02	-7.88
		18 GHz to 40 GHz	-52.99	-46.02	-6.97
Middle	0	30 MHz to 3530 MHz	-52.20	-46.02	-6.18
		3.72 GHz to 6.2 GHz	-59.60	-46.02	-13.58
		6.2 GHz to 18 GHz	-55.38	-46.02	-9.36
		18 GHz to 40 GHz	-52.78	-46.02	-6.76
	1	30 MHz to 3530 MHz	-52.02	-46.02	-6.00
		3.72 GHz to 6.2 GHz	-58.03	-46.02	-12.01
		6.2 GHz to 18 GHz	-54.58	-46.02	-8.56
		18 GHz to 40 GHz	-52.52	-46.02	-6.50
	2	30 MHz to 3530 MHz	-51.61	-46.02	-5.59
		3.72 GHz to 6.2 GHz	-59.82	-46.02	-13.80
		6.2 GHz to 18 GHz	-55.95	-46.02	-9.93
		18 GHz to 40 GHz	-52.94	-46.02	-6.92
	3	30 MHz to 3530 MHz	-52.78	-46.02	-6.76
		3.72 GHz to 6.2 GHz	-56.71	-46.02	-10.69
		6.2 GHz to 18 GHz	-53.42	-46.02	-7.40
		18 GHz to 40 GHz	-53.30	-46.02	-7.28
High	0	30 MHz to 3530 MHz	-51.51	-46.02	-5.49
		3.72 GHz to 6.2 GHz	-58.70	-46.02	-12.68
		6.2 GHz to 18 GHz	-55.25	-46.02	-9.23
		18 GHz to 40 GHz	-52.59	-46.02	-6.57
	1	30 MHz to 3530 MHz	-51.80	-46.02	-5.78
		3.72 GHz to 6.2 GHz	-57.65	-46.02	-11.63
		6.2 GHz to 18 GHz	-55.08	-46.02	-9.06
		18 GHz to 40 GHz	-52.45	-46.02	-6.43
	2	30 MHz to 3530 MHz	-50.79	-46.02	-4.77
		3.72 GHz to 6.2 GHz	-59.66	-46.02	-13.64
		6.2 GHz to 18 GHz	-55.83	-46.02	-9.81
		18 GHz to 40 GHz	-53.02	-46.02	-7.00
	3	30 MHz to 3530 MHz	-52.87	-46.02	-6.85
		3.72 GHz to 6.2 GHz	-57.63	-46.02	-11.61
		6.2 GHz to 18 GHz	-53.48	-46.02	-7.46
		18 GHz to 40 GHz	-52.74	-46.02	-6.72

Table 8-28. Conducted Spurious Emission Summary Data (NR_3C_20M+20M+20M)

Channel	Port	Measurement Range	Level (dBm)	Limit (dBm)	Worst Margin (dB)
			QPSK		
Low	0	30 MHz to 3530 MHz	**-48.92**	-46.02	**-2.90**
		3.72 GHz to 6.2 GHz	**-59.34**	-46.02	-13.32
		6.2 GHz to 18 GHz	**-56.00**	-46.02	-9.98
		18 GHz to 40 GHz	**-52.62**	-46.02	-6.60
	1	30 MHz to 3530 MHz	-50.28	-46.02	-4.26
		3.72 GHz to 6.2 GHz	-58.49	-46.02	-12.47
		6.2 GHz to 18 GHz	-55.35	-46.02	-9.33
		18 GHz to 40 GHz	-52.91	-46.02	-6.89
	2	30 MHz to 3530 MHz	-48.76	-46.02	-2.74
		3.72 GHz to 6.2 GHz	-58.98	-46.02	-12.96
		6.2 GHz to 18 GHz	-55.71	-46.02	-9.69
		18 GHz to 40 GHz	-53.08	-46.02	-7.06
	3	30 MHz to 3530 MHz	-50.66	-46.02	-4.64
		3.72 GHz to 6.2 GHz	-57.86	-46.02	-11.84
		6.2 GHz to 18 GHz	-53.50	-46.02	-7.48
		18 GHz to 40 GHz	-52.58	-46.02	-6.56
Middle	0	30 MHz to 3530 MHz	-49.38	-46.02	-3.36
		3.72 GHz to 6.2 GHz	-59.07	-46.02	-13.05
		6.2 GHz to 18 GHz	-55.62	-46.02	-9.60
		18 GHz to 40 GHz	-52.62	-46.02	-6.60
	1	30 MHz to 3530 MHz	-49.85	-46.02	-3.83
		3.72 GHz to 6.2 GHz	-57.62	-46.02	-11.60
		6.2 GHz to 18 GHz	-55.70	-46.02	-9.68
		18 GHz to 40 GHz	-52.86	-46.02	-6.84
	2	30 MHz to 3530 MHz	-48.96	-46.02	-2.94
		3.72 GHz to 6.2 GHz	-59.47	-46.02	-13.45
		6.2 GHz to 18 GHz	-56.75	-46.02	-10.73
		18 GHz to 40 GHz	-52.67	-46.02	-6.65
	3	30 MHz to 3530 MHz	-50.63	-46.02	-4.61
		3.72 GHz to 6.2 GHz	-56.98	-46.02	-10.96
		6.2 GHz to 18 GHz	-53.62	-46.02	-7.60
		18 GHz to 40 GHz	-52.71	-46.02	-6.69
High	0	30 MHz to 3530 MHz	-49.79	-46.02	-3.77
		3.72 GHz to 6.2 GHz	-58.90	-46.02	-12.88
		6.2 GHz to 18 GHz	-55.63	-46.02	-9.61
		18 GHz to 40 GHz	-52.38	-46.02	-6.36
	1	30 MHz to 3530 MHz	-50.07	-46.02	-4.05
		3.72 GHz to 6.2 GHz	-58.65	-46.02	-12.63
		6.2 GHz to 18 GHz	-55.53	-46.02	-9.51
		18 GHz to 40 GHz	-53.06	-46.02	-7.04
	2	30 MHz to 3530 MHz	-49.49	-46.02	-3.47
		3.72 GHz to 6.2 GHz	-59.14	-46.02	-13.12
		6.2 GHz to 18 GHz	-55.28	-46.02	-9.26
		18 GHz to 40 GHz	-52.66	-46.02	-6.64
	3	30 MHz to 3530 MHz	-50.80	-46.02	-4.78
		3.72 GHz to 6.2 GHz	-57.44	-46.02	-11.42
		6.2 GHz to 18 GHz	-54.33	-46.02	-8.31
		18 GHz to 40 GHz	-52.61	-46.02	-6.59

Table 8-29. Conducted Spurious Emission Summary Data (NR_4C_20M+20M+20M+20M)

Channel	Port	Measurement Range	Level (dBm)	Limit (dBm)	Worst Margin (dB)
			QPSK		
Middle	0	30 MHz to 3530 MHz	-67.38	-46.02	-21.36
		3.72 GHz to 6.2 GHz	-71.69	-46.02	-25.67
		6.2 GHz to 18 GHz	-55.28	-46.02	-9.26
		18 GHz to 40 GHz	-52.80	-46.02	-6.78
	1	30 MHz to 3530 MHz	-67.48	-46.02	-21.46
		3.72 GHz to 6.2 GHz	-71.15	-46.02	-25.13
		6.2 GHz to 18 GHz	-56.07	-46.02	-10.05
		18 GHz to 40 GHz	-52.47	-46.02	-6.45
	2	30 MHz to 3530 MHz	-67.28	-46.02	-21.26
		3.72 GHz to 6.2 GHz	-71.05	-46.02	-25.03
		6.2 GHz to 18 GHz	-56.36	-46.02	-10.34
		18 GHz to 40 GHz	-51.96	-46.02	-5.94
	3	30 MHz to 3530 MHz	-65.84	-46.02	-19.82
		3.72 GHz to 6.2 GHz	-70.42	-46.02	-24.40
		6.2 GHz to 18 GHz	-53.56	-46.02	-7.54
		18 GHz to 40 GHz	-53.03	-46.02	-7.01

Table 8-30. Conducted Spurious Emission Summary Data (Multi-RAT_2NC_NR_20M+LTE_5M)

Channel	Port	Measurement Range	Level (dBm)	Limit (dBm)	Worst Margin (dB)
			QPSK		
Middle	0	30 MHz to 3530 MHz	-67.94	-46.02	-21.92
		3.72 GHz to 6.2 GHz	-72.08	-46.02	-26.06
		6.2 GHz to 18 GHz	-54.92	-46.02	-8.90
		18 GHz to 40 GHz	-52.72	-46.02	-6.70
	1	30 MHz to 3530 MHz	-67.60	-46.02	-21.58
		3.72 GHz to 6.2 GHz	-71.79	-46.02	-25.77
		6.2 GHz to 18 GHz	-55.00	-46.02	-8.98
		18 GHz to 40 GHz	-52.64	-46.02	-6.62
	2	30 MHz to 3530 MHz	-67.07	-46.02	-21.05
		3.72 GHz to 6.2 GHz	-72.34	-46.02	-26.32
		6.2 GHz to 18 GHz	-56.42	-46.02	-10.40
		18 GHz to 40 GHz	-52.97	-46.02	-6.95
	3	30 MHz to 3530 MHz	-66.41	-46.02	-20.39
		3.72 GHz to 6.2 GHz	-70.98	-46.02	-24.96
		6.2 GHz to 18 GHz	-53.23	-46.02	-7.21
		18 GHz to 40 GHz	-53.05	-46.02	-7.03

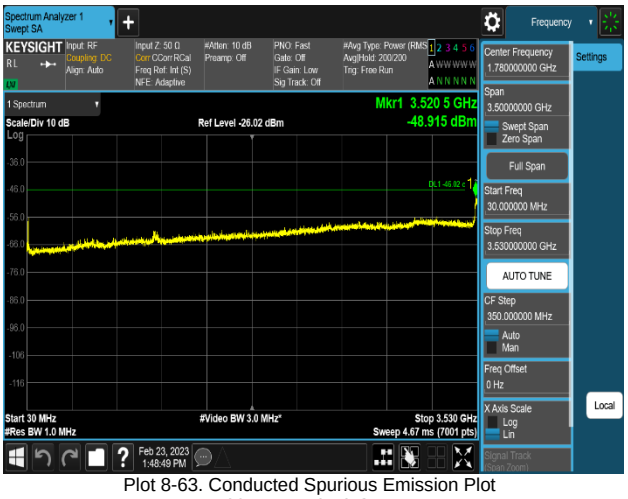
Table 8-31. Conducted Spurious Emission Summary Data (Multi-RAT_4NC_NR_20M+20M+LTE_20M+20M)

Channel	Port	Measurement Range	Level (dBm)	Limit (dBm)	Worst Margin (dB)
			QPSK		
Middle	0	30 MHz to 3530 MHz	**-51.59**	-46.02	**-5.57**
		3.72 GHz to 6.2 GHz	**-58.18**	-46.02	-12.16
		6.2 GHz to 18 GHz	**-54.40**	-46.02	-8.38
		18 GHz to 40 GHz	**-52.92**	-46.02	-6.90
	1	30 MHz to 3530 MHz	-51.81	-46.02	-5.79
		3.72 GHz to 6.2 GHz	-58.31	-46.02	-12.29
		6.2 GHz to 18 GHz	-55.48	-46.02	-9.46
		18 GHz to 40 GHz	-52.75	-46.02	-6.73
	2	30 MHz to 3530 MHz	-51.82	-46.02	-5.80
		3.72 GHz to 6.2 GHz	-59.47	-46.02	-13.45
		6.2 GHz to 18 GHz	-55.55	-46.02	-9.53
		18 GHz to 40 GHz	-52.73	-46.02	-6.71
	3	30 MHz to 3530 MHz	-52.91	-46.02	-6.89
		3.72 GHz to 6.2 GHz	-57.22	-46.02	-11.20
		6.2 GHz to 18 GHz	-53.45	-46.02	-7.43
		18 GHz to 40 GHz	-52.98	-46.02	-6.96

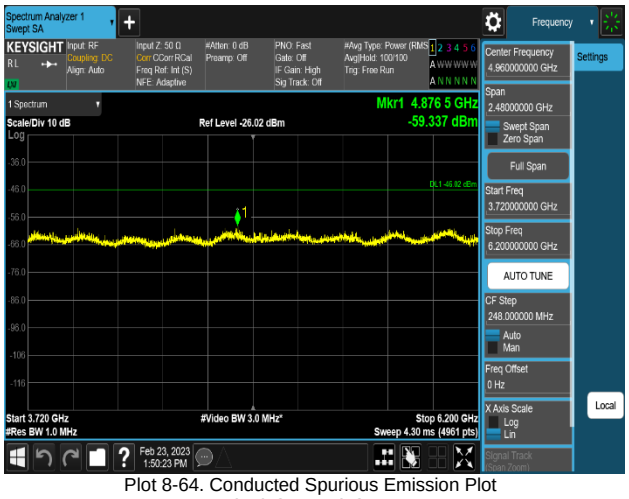
Table 8-32. Conducted Spurious Emission Summary Data (NR_3NC_20M+20M+20M)

Channel	Port	Measurement Range	Level (dBm)	Limit (dBm)	Worst Margin (dB)
			QPSK		
Middle	0	30 MHz to 3530 MHz	-53.57	-46.02	-7.55
		3.72 GHz to 6.2 GHz	-58.55	-46.02	-12.53
		6.2 GHz to 18 GHz	-55.35	-46.02	-9.33
		18 GHz to 40 GHz	-53.01	-46.02	-6.99
	1	30 MHz to 3530 MHz	-53.40	-46.02	-7.38
		3.72 GHz to 6.2 GHz	-58.83	-46.02	-12.81
		6.2 GHz to 18 GHz	-54.19	-46.02	-8.17
		18 GHz to 40 GHz	-52.94	-46.02	-6.92
	2	30 MHz to 3530 MHz	-52.24	-46.02	-6.22
		3.72 GHz to 6.2 GHz	-59.25	-46.02	-13.23
		6.2 GHz to 18 GHz	-55.38	-46.02	-9.36
		18 GHz to 40 GHz	-52.86	-46.02	-6.84
	3	30 MHz to 3530 MHz	-52.96	-46.02	-6.94
		3.72 GHz to 6.2 GHz	-57.80	-46.02	-11.78
		6.2 GHz to 18 GHz	-53.50	-46.02	-7.48
		18 GHz to 40 GHz	-52.81	-46.02	-6.79

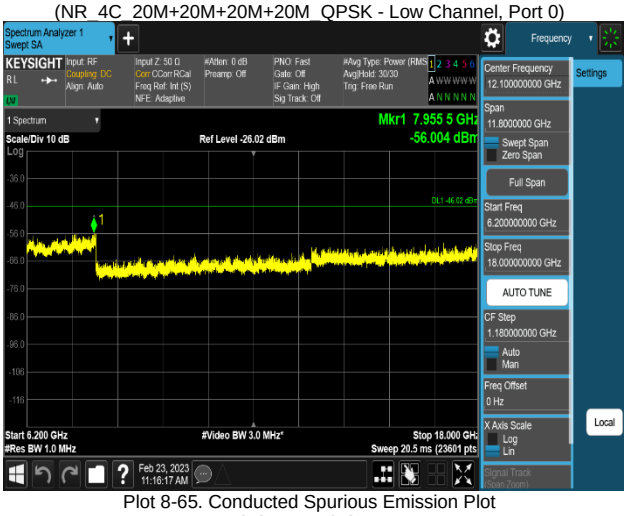
Table 8-33. Conducted Spurious Emission Summary Data (NR_4NC_20M+20M+20M+20M)



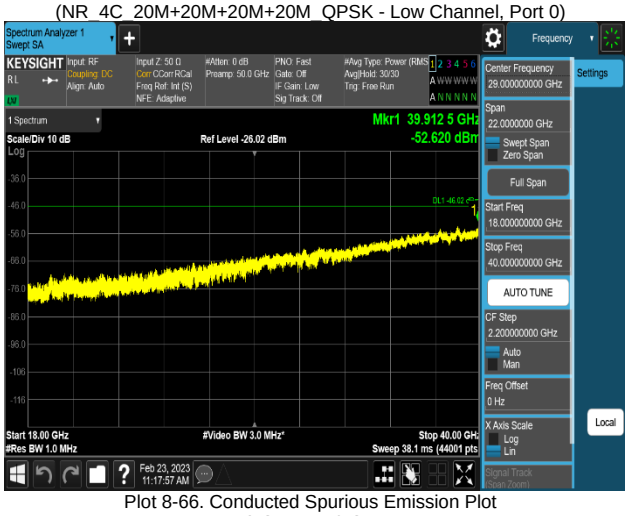
Plot 8-63. Conducted Spurious Emission Plot
30 MHz to 3.53 GHz
(NR_4C_20M+20M+20M+20M_QPSK - Low Channel, Port 0)



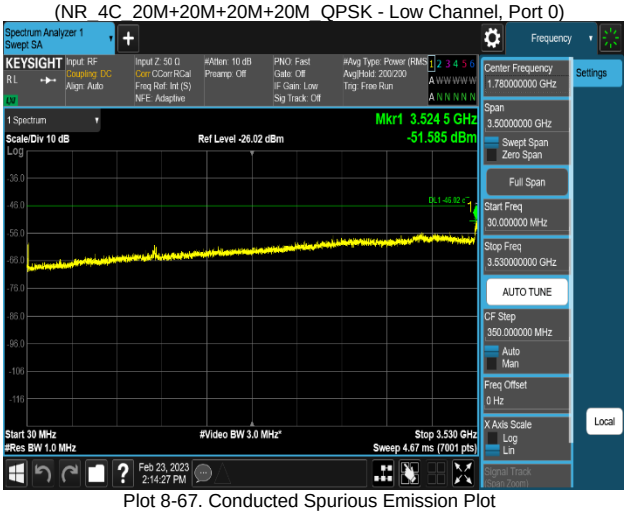
Plot 8-64. Conducted Spurious Emission Plot
3.72 GHz to 8 GHz
(NR_4C_20M+20M+20M+20M_QPSK - Low Channel, Port 0)



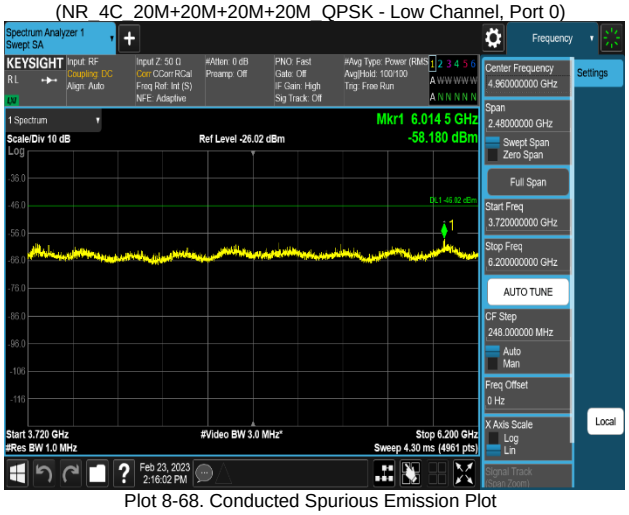
Plot 8-65. Conducted Spurious Emission Plot
8 GHz to 18 GHz
(NR_4C_20M+20M+20M+20M_QPSK - Low Channel, Port 0)



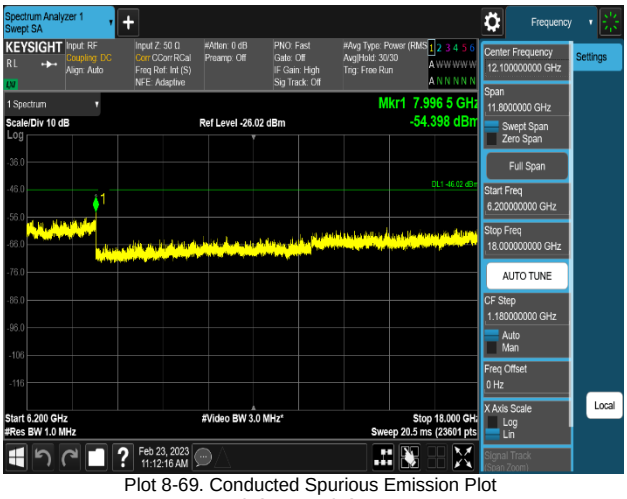
Plot 8-66. Conducted Spurious Emission Plot
18 GHz to 40 GHz
(NR_4C_20M+20M+20M+20M_QPSK - Low Channel, Port 0)



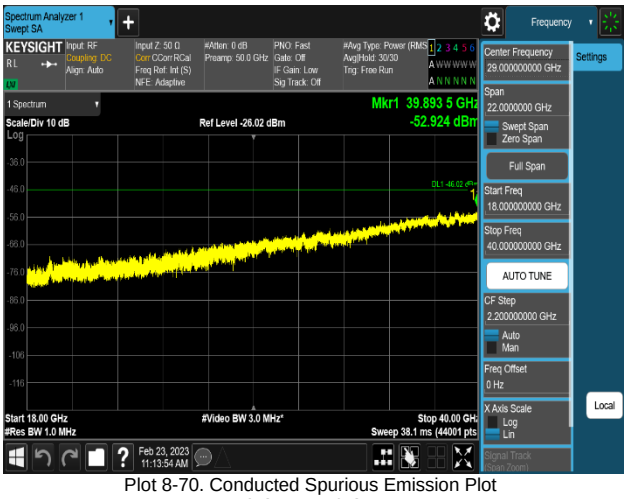
Plot 8-67. Conducted Spurious Emission Plot
30 MHz to 3.53 GHz
(NR_3NC_20M+20M+20M_QPSK - Mid Channel, Port 0)



Plot 8-68. Conducted Spurious Emission Plot
3.72 GHz to 8 GHz
(NR_3NC_20M+20M+20M_QPSK - Mid Channel, Port 0)



Plot 8-69. Conducted Spurious Emission Plot
8 GHz to 18 GHz
(NR_3NC_20M+20M+20M_QPSK - Mid Channel, Port 0)



Plot 8-70. Conducted Spurious Emission Plot
18 GHz to 40 GHz
(NR_3NC_20M+20M+20M_QPSK - Mid Channel, Port 0)

8.8 Radiated spurious emission

Test Overview

Radiated spurious emissions measurements are performed using the field strength method described in ANSI C63.26-2015 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized broadband tri-log antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas.

Test Procedure Used

ANSI C63.26 - Section 5.5.4
KDB 971168 D01 v03r01 - Section 7

Test Setting

1. Start frequency was set to 30 MHz and stop frequency was set to at least 10 * the fundamental frequency
2. RBW = 1 MHz
3. VBW ≥ 3 x RBW
4. No. of sweep points ≥ 2 x span / RBW
5. Detector = RMS
6. Trace mode = Max Hold (In cases where the level is within 2 dB of the limit, the final measurement is taken using triggering/gating and trace averaging.)
7. The trace was allowed to stabilize.

Limit

- Any emission below 3530 MHz and above 3720 MHz ≤ −40 dBm/MHz

Test Setup

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

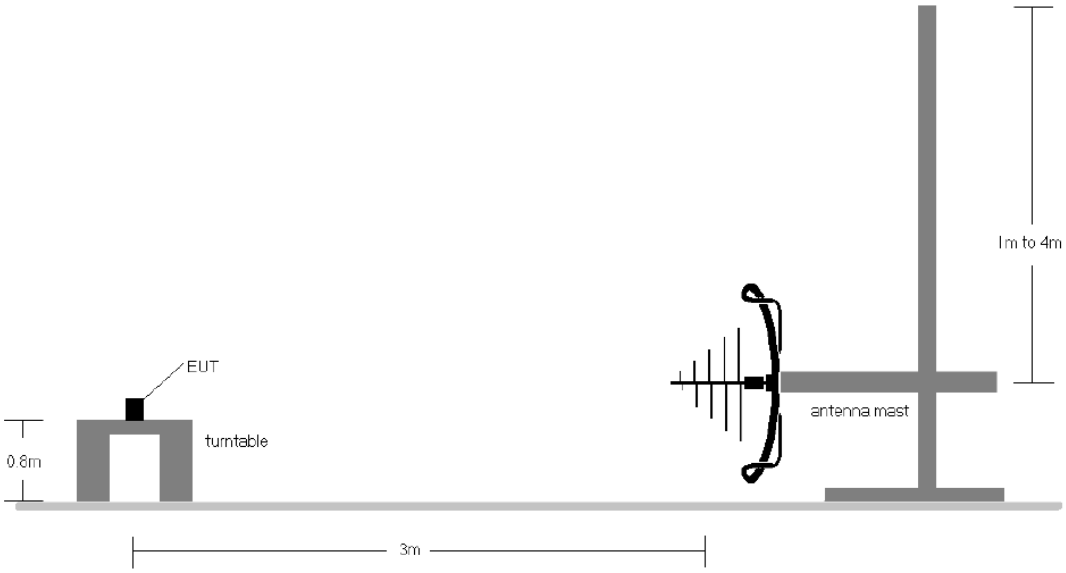


Figure 8-7. Test Instrument & Measurement Setup < 1GHz

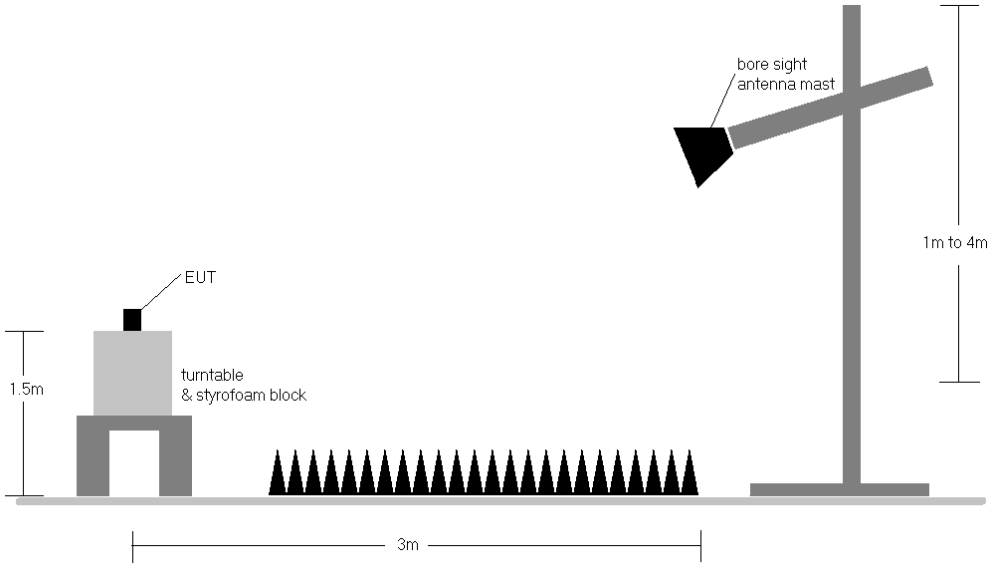


Figure 8-8. Test Instrument & Measurement Setup > 1GHz

Test Notes

1. The average EIRP reported below is calculated per 5.2.7 of ANSI C63.26-2015 which states:

   The measured e.i.r.p is converted to E-field in V/m. Then the distance correction is applied before converted back to calculated e.i.r.p.as explained in KDB 971168 D01 D01 v03r01.

Effective Isotropic Radiated Power Sample Calculation

Field Strength [dBµV/m] = Measured Value [dBm] + AFCL [dB/m] + 107

= -72.35 dBm + 13.48 dBm + 107 = 48.23 dBµV/m

e.i.r.p. [dBm] = E[dB μV/m] + 20 $\log_{10}$(d[m]) - 104.8

= 48.23 + (20*log (3)) - 104.8

= - 47.03 dBm e.i.r.p.

*AFCL (dB/m) contains measurement antenna factor(dB/m) and cable loss(dB) as below:

Frequency [MHz]	Antenna Factor (dB/m)	Chamber measurement cable loss + amplifier [dB]	AFCL (dB/m)
992.58	29.19	-26.33	2.85
12778.69	39.21	-25.74	13.48

Table 8-34. Adopted AFCL value in the calculation

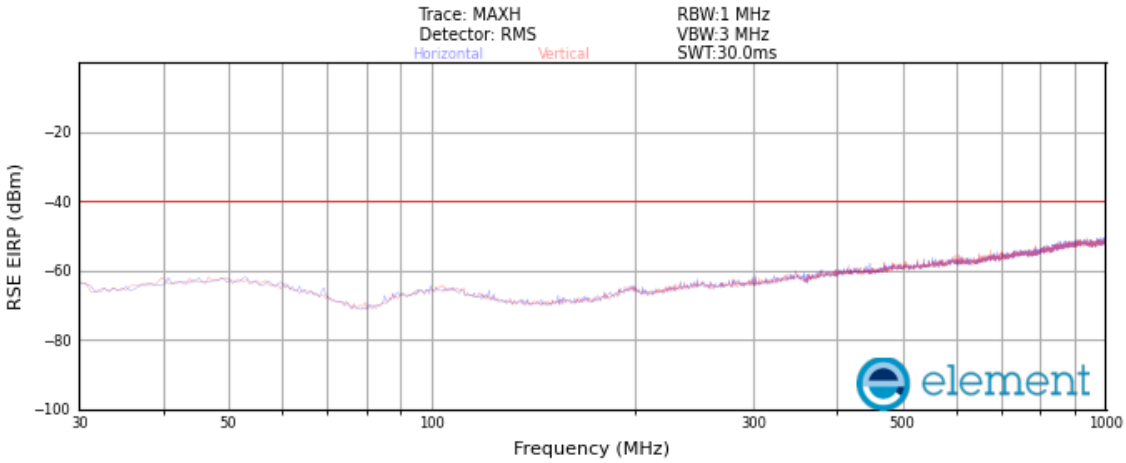
2. The EUT was tested in both horizontal and vertical antenna polarizations and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, channel bandwidth configurations shown in the tables below.

3. The spectrum is measured from 30 MHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.

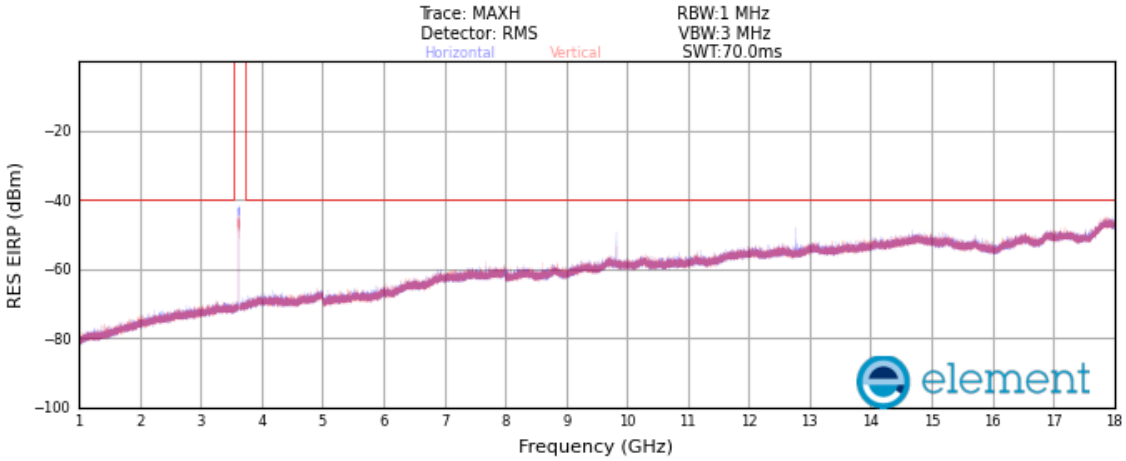
4. All emissions were measured at a 3-meter test distance.

5. Spurious emissions were measured with all EUT antennas transmitting simultaneously and all antenna ports terminated.

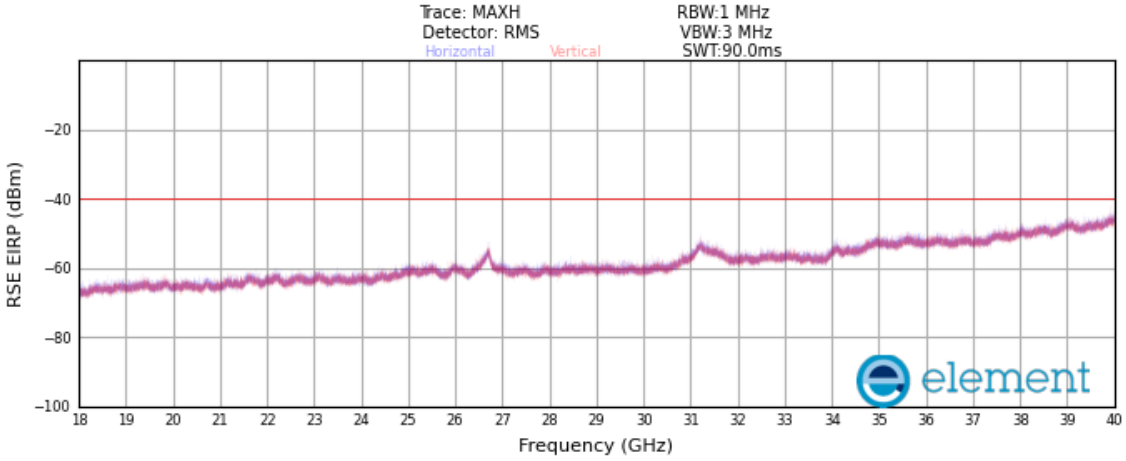
6. The "-" shown in the following RSE tables are used to denote a noise floor measurement.



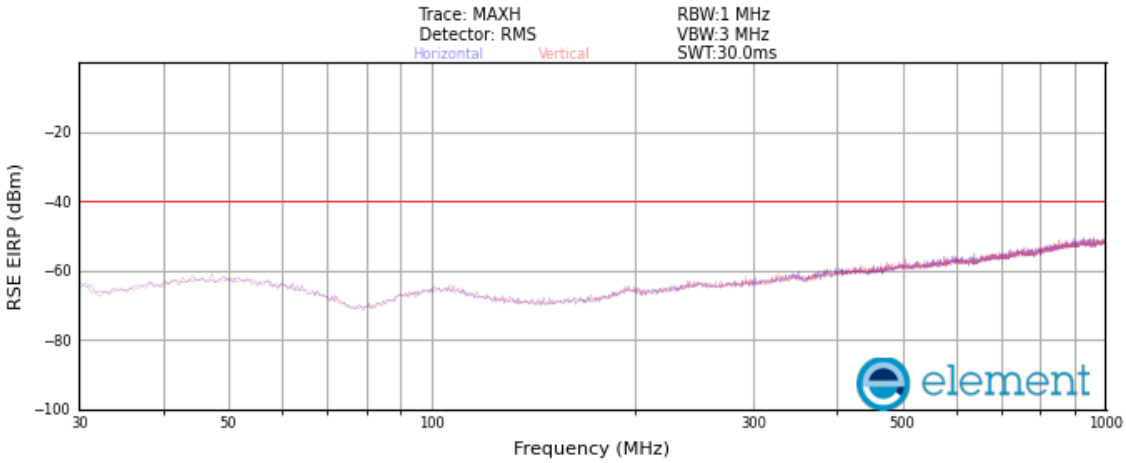
Plot 8-71. Radiated spurious emission Plot_30 MHz to 1000 MHz
(Multi-RAT_2C_NR_20M+ LTE_5M_QPSK - Mid Channel)



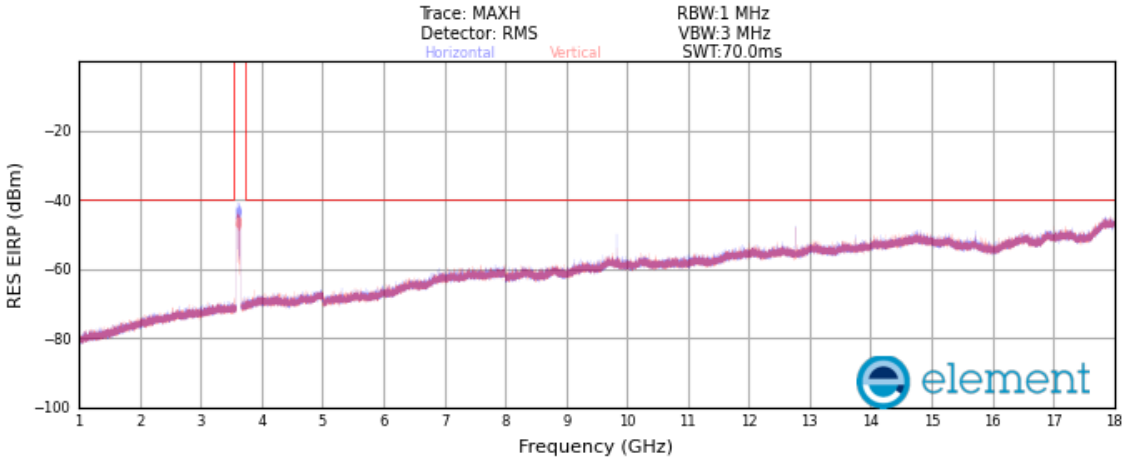
Plot 8-72. Radiated spurious emission Plot_1 GHz to 18 GHz
(Multi-RAT_2C_NR_20M+ LTE_5M_QPSK - Mid Channel)



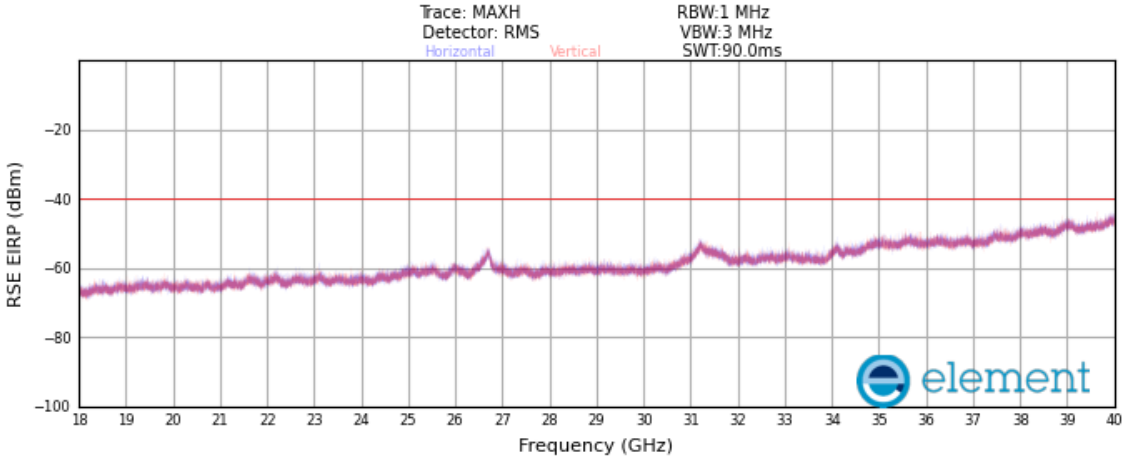
Plot 8-73. Radiated spurious emission Plot_18 GHz to 40 GHz
(Multi-RAT_2C_NR_20M+ LTE_5M_QPSK - Mid Channel)



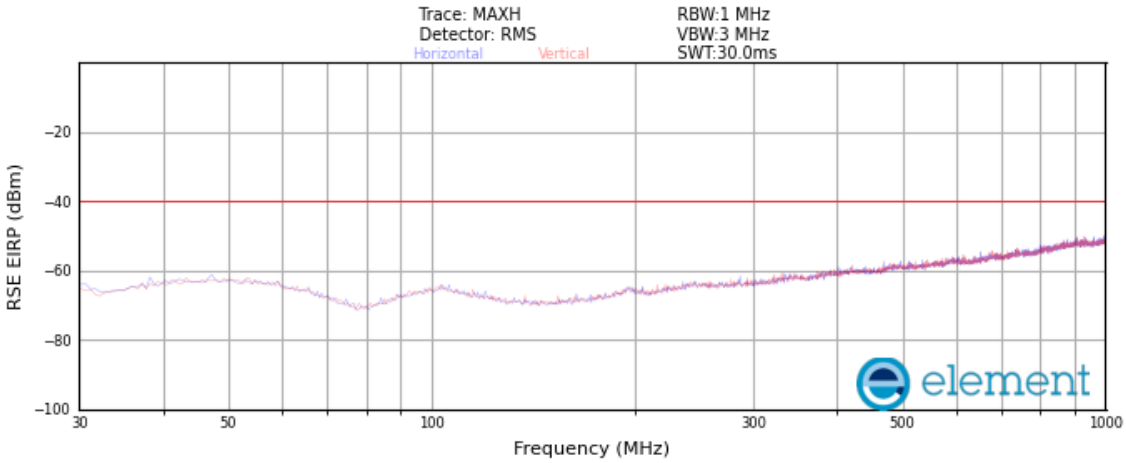
Plot 8-74. Radiated spurious emission Plot_30 MHz to 1000 MHz
(Multi-RAT_4C NR_20M+20M+LTE_20M+20M_QPSK - Mid Channel)



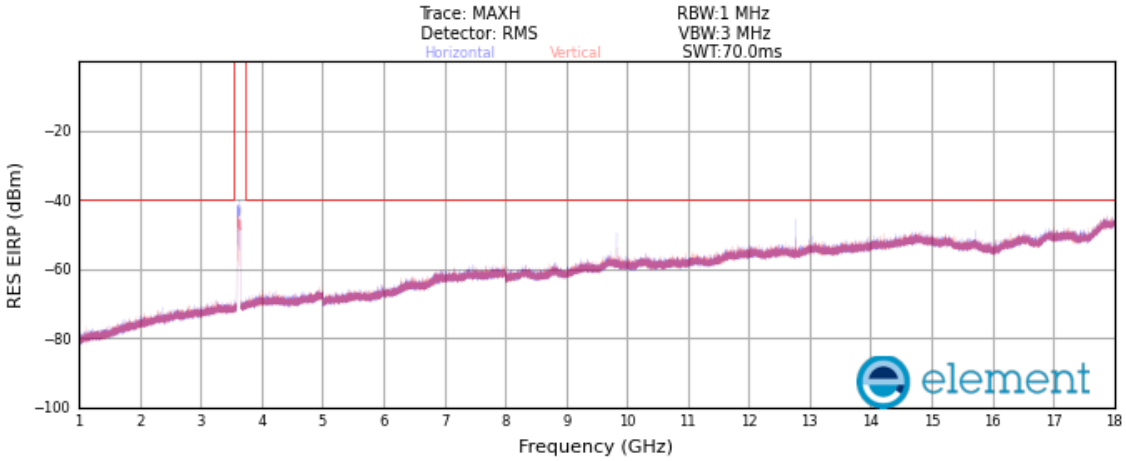
Plot 8-75. Radiated spurious emission Plot_1 GHz to 18 GHz
(Multi-RAT_4C NR_20M+20M+LTE_20M+20M_QPSK - Mid Channel)



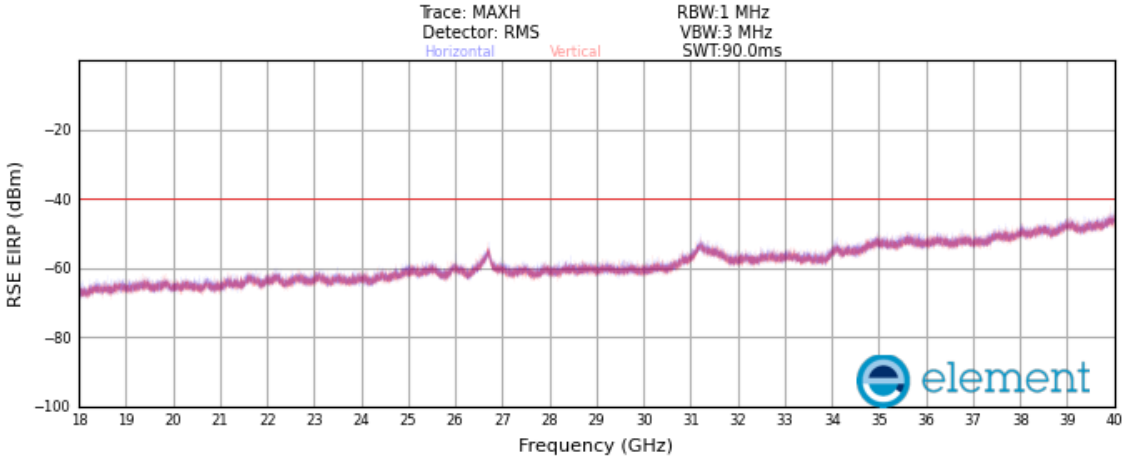
Plot 8-76. Radiated spurious emission Plot_18 GHz to 40 GHz
(Multi-RAT_4C NR_20M+20M+LTE_20M+20M_QPSK - Mid Channel)



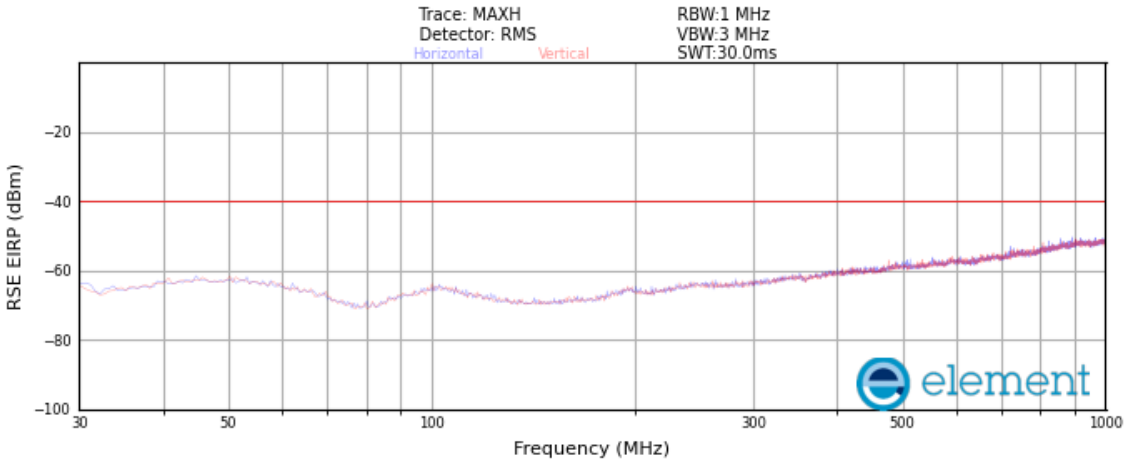
Plot 8-77. Radiated spurious emission Plot_30 MHz to 1000 MHz
(NR_3C_20M+20M+20M_QPSK - Mid Channel)



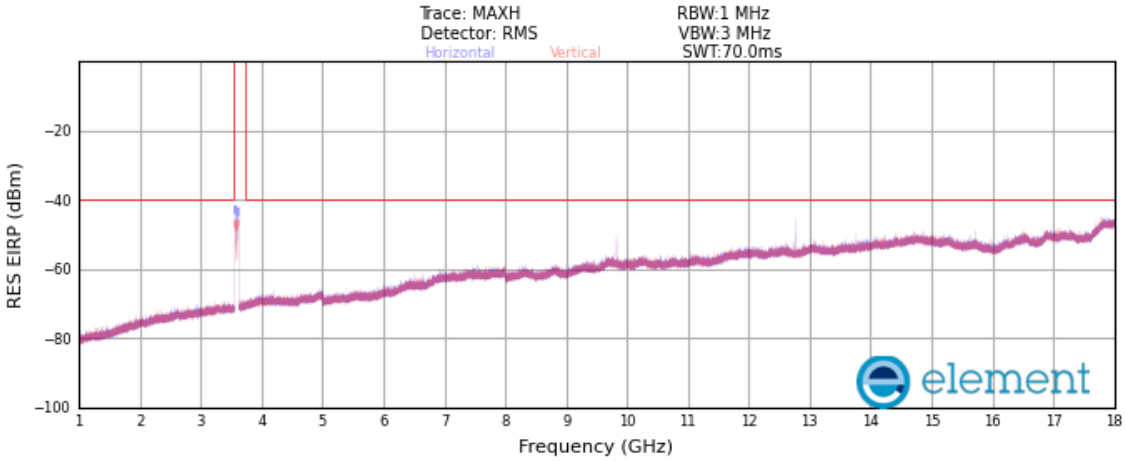
Plot 8-78. Radiated spurious emission Plot_1 GHz to 18 GHz
(NR_3C_20M+20M+20M_QPSK - Mid Channel)



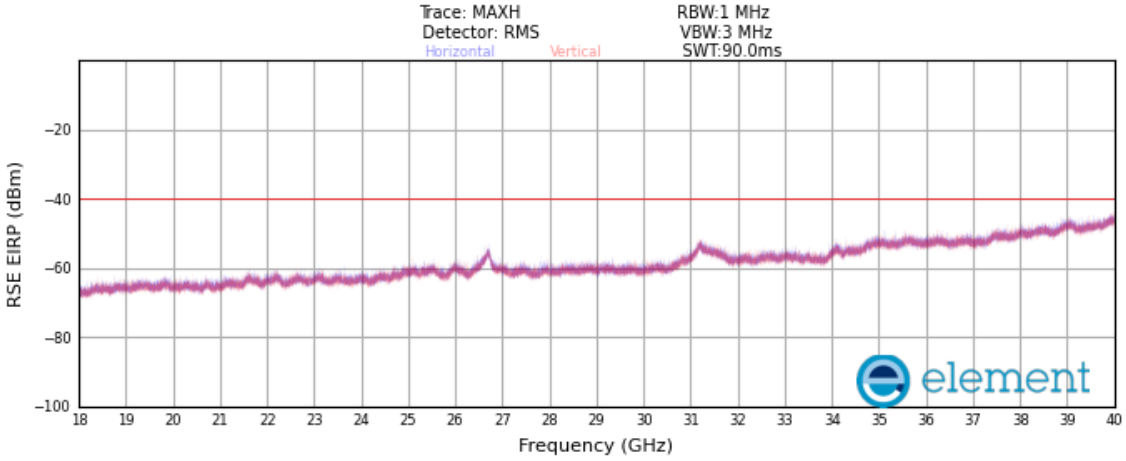
Plot 8-79. Radiated spurious emission Plot_18 GHz to 40 GHz
(NR_3C_20M+20M+20M_QPSK - Mid Channel)



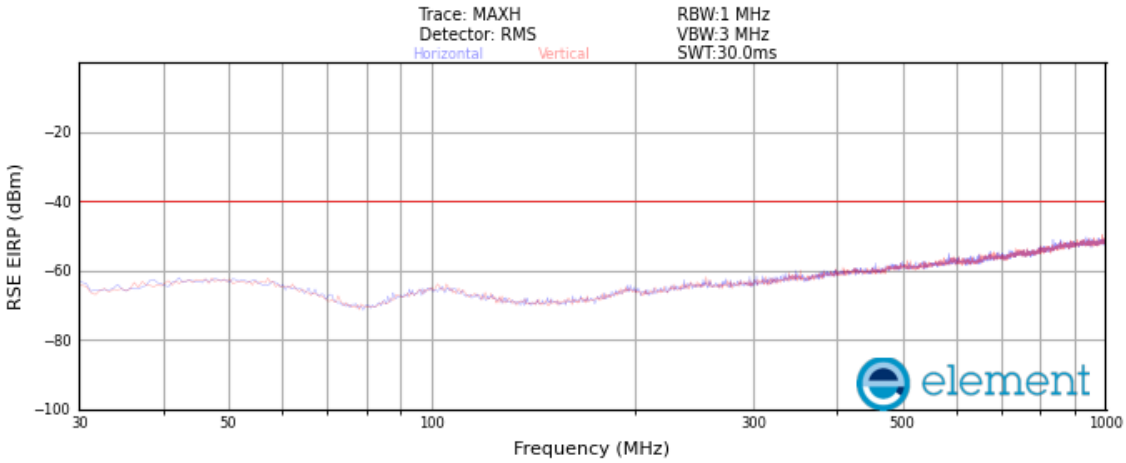
Plot 8-80. Radiated spurious emission Plot_30 MHz to 1000 MHz (NR_4C_20M+20M+20M+20M_QPSK - Low Channel)



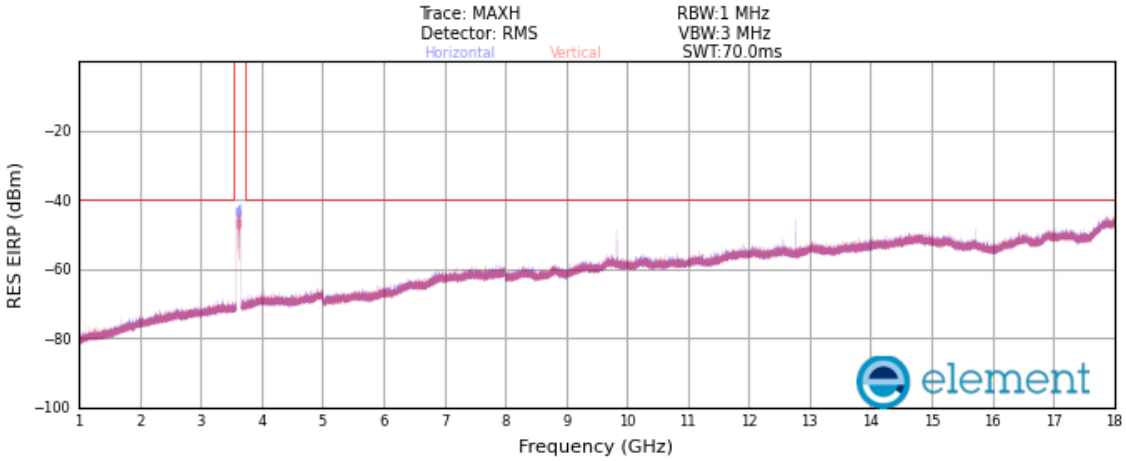
Plot 8-81. Radiated spurious emission Plot_1 GHz to 18 GHz (NR_4C_20M+20M+20M+20M_QPSK - Low Channel)



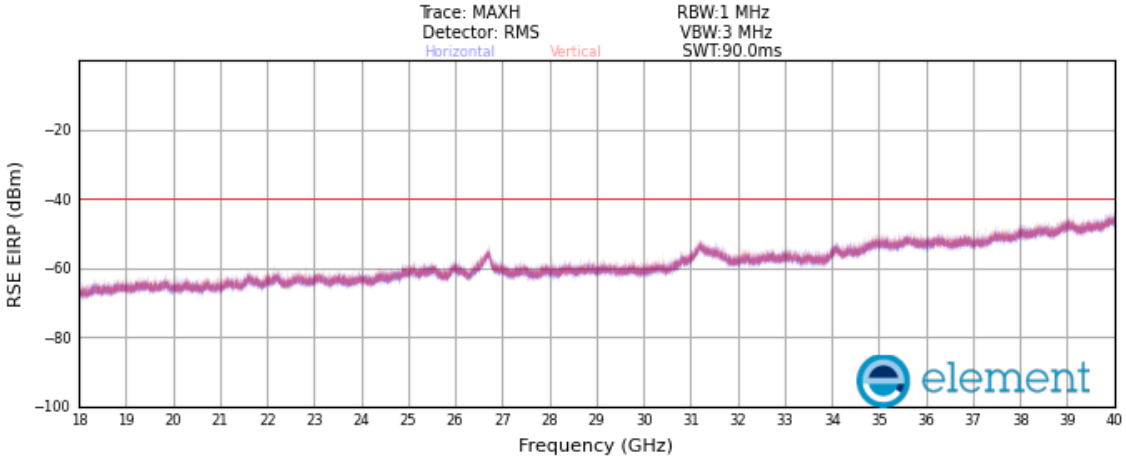
Plot 8-82. Radiated spurious emission Plot_18 GHz to 40 GHz (NR_4C_20M+20M+20M+20M_QPSK - Low Channel)



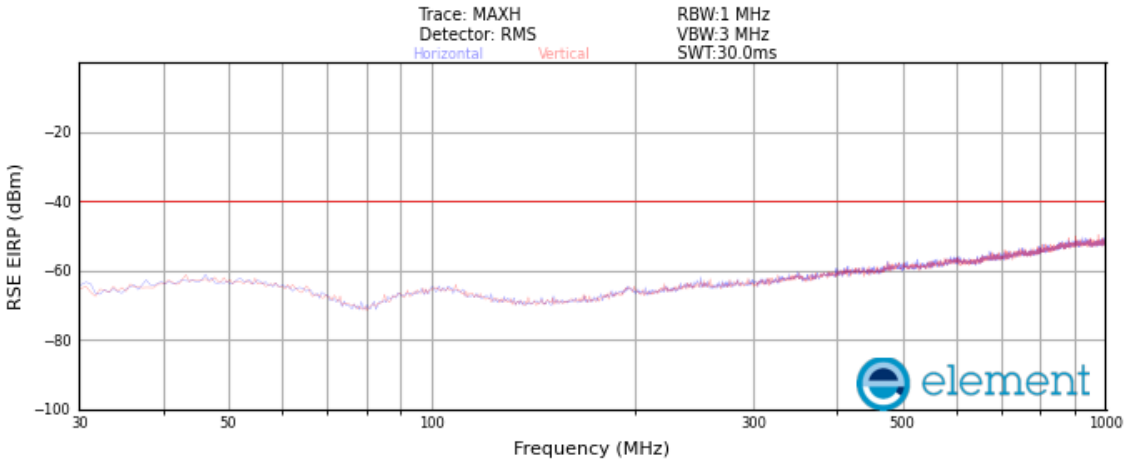
Plot 8-83. Radiated spurious emission Plot_30 MHz to 1000 MHz
(NR_4C_20M+20M+20M+20M_QPSK - Mid Channel)



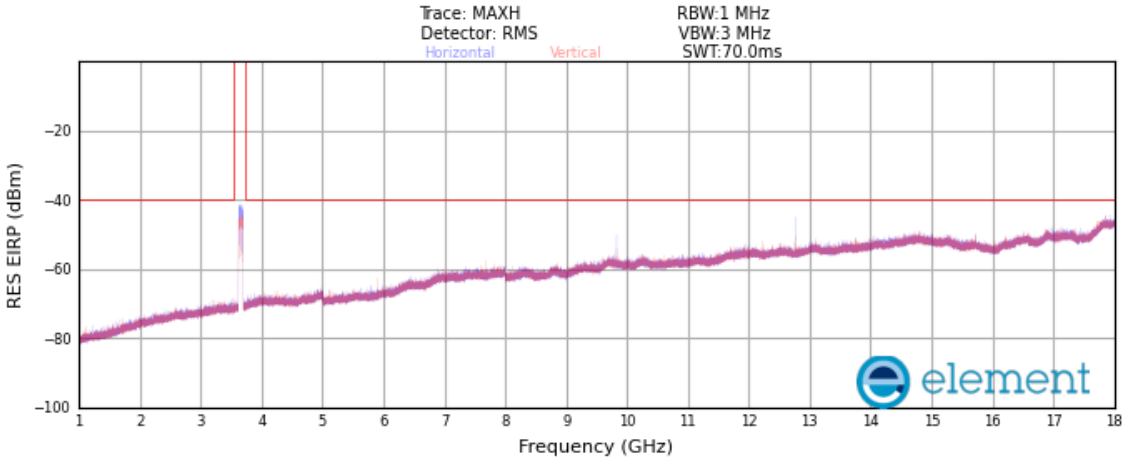
Plot 8-84. Radiated spurious emission Plot_1 GHz to 18 GHz
(NR_4C_20M+20M+20M+20M_QPSK - Mid Channel)



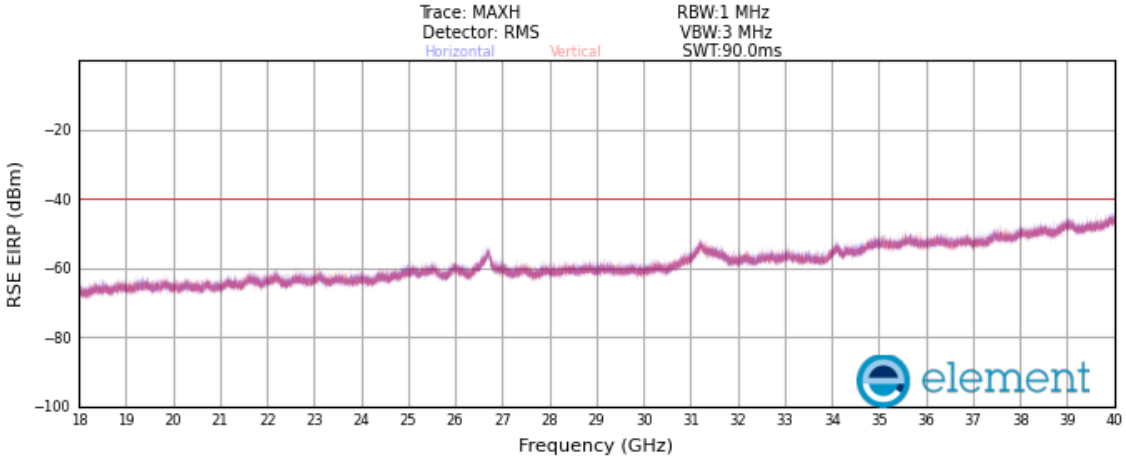
Plot 8-85. Radiated spurious emission Plot_18 GHz to 40 GHz
(NR_4C_20M+20M+20M+20M_QPSK - Mid Channel)



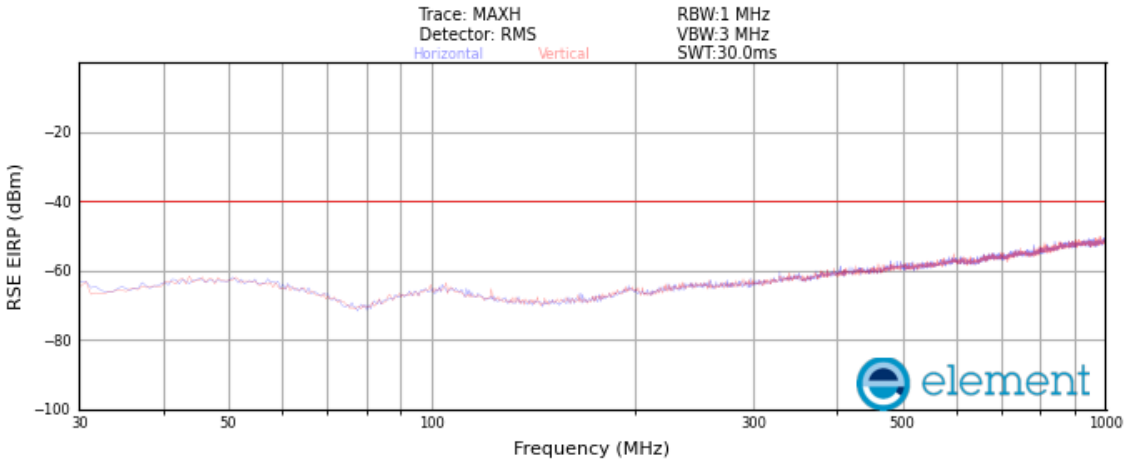
Plot 8-86. Radiated spurious emission Plot_30 MHz to 1000 MHz
(NR_4C_20M+20M+20M+20M_QPSK - High Channel)



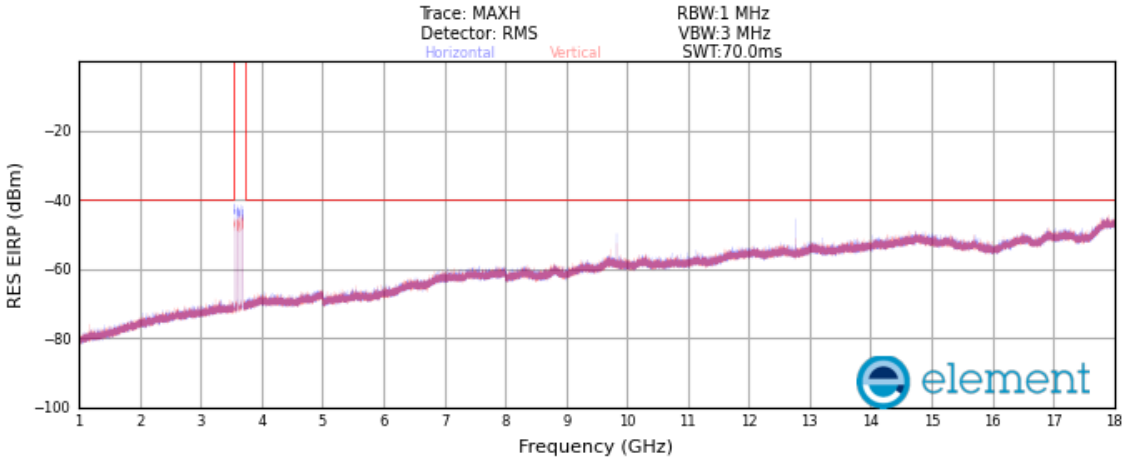
Plot 8-87. Radiated spurious emission Plot_1 GHz to 18 GHz
(NR_4C_20M+20M+20M+20M_QPSK - High Channel)



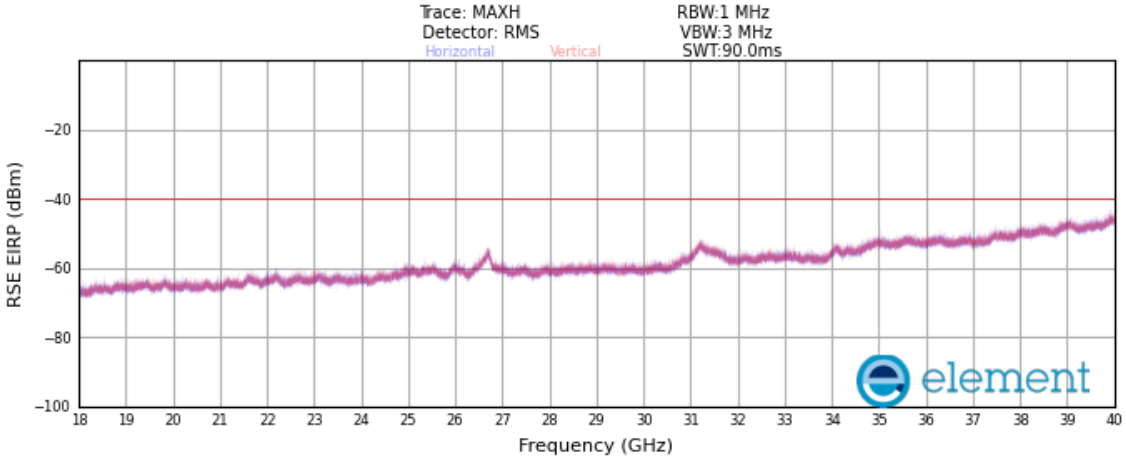
Plot 8-88. Radiated spurious emission Plot_18 GHz to 40 GHz
(NR_4C_20M+20M+20M+20M_QPSK - High Channel)



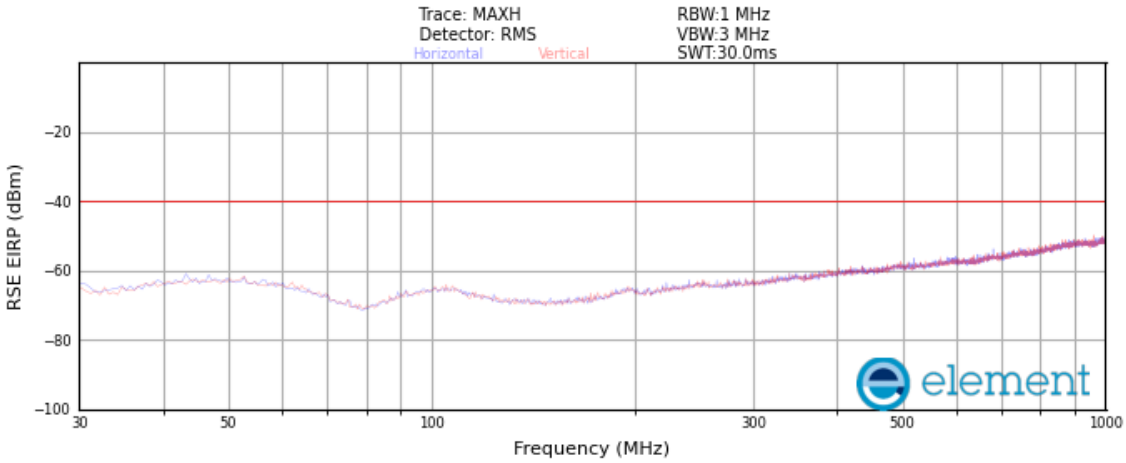
Plot 8-89. Radiated spurious emission Plot_30 MHz to 1000 MHz
(NR_4NC_20M+20M+20M+20M_QPSK - Mid Channel)



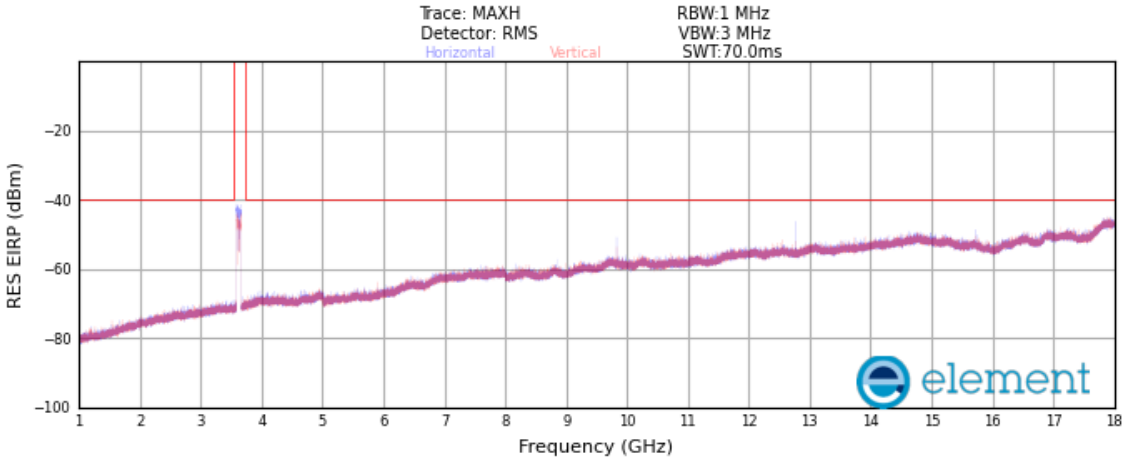
Plot 8-90. Radiated spurious emission Plot_1 GHz to 18 GHz
(NR_4NC_20M+20M+20M+20M_QPSK - Mid Channel)



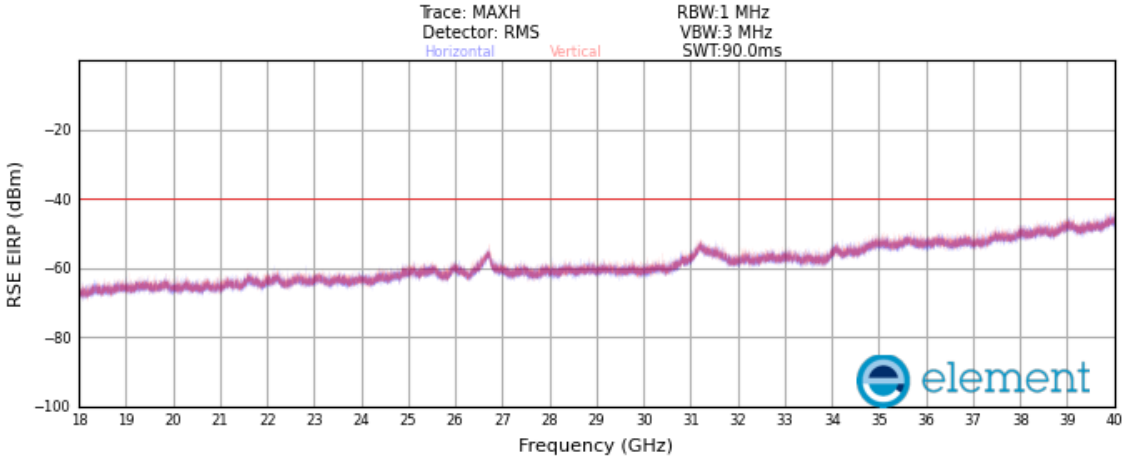
Plot 8-91. Radiated spurious emission Plot_18 GHz to 40 GHz
(NR_4NC_20M+20M+20M+20M_QPSK - Mid Channel)



Plot 8-92. Radiated spurious emission Plot_30 MHz to 1000 MHz
(Multi-RAT_4C_NR_20M+20M+LTE_20M+20M_QPSK - Mid Channel_AC_Adpator)



Plot 8-93. Radiated spurious emission Plot_1 GHz to 18 GHz
(Multi-RAT_4C_NR_20M+20M+LTE_20M+20M_QPSK - Mid Channel_AC Adpator)



Plot 8-94. Radiated spurious emission Plot_18 GHz to 40 GHz
(Multi-RAT_4C_NR_20M+20M+LTE_20M+20M_QPSK - Mid Channel_AC Adpator)

Bandwidth (MHz):	NR_4NC_20M+20M+20M+20M
Frequency (MHz):	3560.0 + 3605.0 + 3645.0 + 3690.0
Modulation Signal:	QPSK

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Heigh [cm]	Turntable azimuth [degree]	Analyzer Level [dBm/MHz]	AFCL [dBm]	Field Strength [dBμV/m]	RSE EIRP [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
992.58	H	100	20	-68.25	2.85	41.60	-53.65	-40.00	-13.65
989.37	V	150	100	-69.28	2.79	40.51	-54.75	-40.00	-14.75
12778.69	H	150	100	-72.25	13.48	48.23	-47.03	-40.00	-7.03
12776.54	V	150	80	-73.28	13.49	47.20	-48.06	-40.00	-8.06

Table 8-35. Radiated spurious emission Worst mode Summary Data
(NR_4NC_20M+20M+20M+20M_QPSK - Mid Channel)

9.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Electronics Co., Ltd. CBSD FCC ID: A3LRT4401-48A** complies with all of the requirements of Part 96 of the FCC Rules.

10.0 APPENDIX. A

10.1 Conducted Average Output Power

Test Overview

A transmitter port of EUT is connected to the input of a signal analyzer. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Description

KDB 971168 D01 v03r01 – Section 5
KDB 662911 D01 v02r01 – Section E)1) In-Band Power Measurements
ANSI C63.26-2015 – Section 5.2.4.4.1

The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The spectrum analyzer settings were as follows:

1. Conducted power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 ~ 5% of the expected OBW
3. VBW ≥ 3 x RBW
4. Span = 2 ~ 3 x OBW
5. No. of sweep points ≥ 2 x span / RBW
6. Detector = RMS
7. Trigger Settings is set to "RF Power" for signals with non-continuous operation with the sweep times set to "auto". Refer test note 3 for details.
8. Trace mode = Trace-Averaging (RMS) set to average over 100 sweeps
9. The trace was allowed to stabilize

Test Setup

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

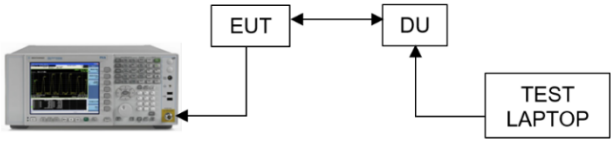


Figure 10-1. Test Instrument & Measurement Setup

Note

1. Result for reference maximum output power of Grant of Authorization is under section 10.1.

2. Periodic trigger was used with gating ON. Gate sweeptime, Gate delay and gate length were set accordingly to capture ON time of the transmission.

3. MIMO Calculations are done considering output channel power for all ports and respective margins are calculated according to procedures in section 6.4 of ANSI C63.26 and section D of KDB 971168 D01 v03r01.

4. Consider the following factors for MIMO Power:
   Conducted power for each port is measured in dBm.
   Powers are summed up in linear using the measure-and-sum technique defined in KDB 971168 D01 v03r01- Section D.
   Conducted power per port (dBm) is converted to a linear value (mW). A summation of linear powers for all ports gives us the total MIMO conducted power in milliWatts (mW).

5. Antenna Gains (dBi) control value provided by the client.

6. The EUT have multiple antennas transmitting correlated signals with the equal antenna gains and two outputs driving a cross-polarized antennas with N_{ANT}=2.
   Directional gain is to be computed as follows;
   * Directional gain = G_{ANT} + 10 log(N_{ANT}) dBi

7. Worst e.i.r.p Case Scenario gain antenna was selected to perform all RF testing that can get maximum power setting. And high gain antenna power setting will be reduced according to difference value of antenna gain declared by applicant.

8. Applied antenna gain as below:

Bandwidth	Antenna gain (dBi)	Directional gain (dBi)
All Bandwidth	9.0	12.0

9. Sample Calculation:
   Let us assume the following numbers:
   a) Total MIMO Conducted Power as 5745.78mW
   b) Antenna Gain = 12.00 dBi

Factors		Value	Unit
Summed MIMO Conducted Power (linear sum)		5745.78	mW
Summed MIMO Conducted Power (dBm)	= 10 * log (5745.78) =	37.59	dBm
Antenna Gain		12.00	dBi
Total MIMO EIRP		49.59	dBm

Channel	Port	QPSK	16QAM
Low	0	31.52	31.20
	1	31.59	31.53
	2	31.52	31.60
	3	31.66	31.84
	Total Conducted Power (mW)	5745.78	5713.59
	Total Conducted Power(dBm)	37.59	37.57
	Ant. Gain (dBi)	12.00	12.00
	e.i.r.p (dBm)	49.59	49.57
Middle	0	32.04	31.43
	1	32.11	31.41
	2	32.09	31.13
	3	32.13	31.24
	Total Conducted Power (mW)	6476.24	5401.15
	Total Conducted Power(dBm)	38.11	37.32
	Ant. Gain (dBi)	12.00	12.00
	e.i.r.p (dBm)	50.11	49.32
High	0	30.58	30.76
	1	30.72	30.80
	2	30.50	30.78
	3	30.42	31.05
	Total Conducted Power (mW)	4546.76	4863.75
	Total Conducted Power(dBm)	36.58	36.87
	Ant. Gain (dBi)	12.00	12.00
	e.i.r.p (dBm)	48.58	48.87

Table 10-1. Conducted Average Output Power Table (Multi-RAT_2C_NR_20M+LTE_5M)

Channel	Port	QPSK	16QAM
Low	0	36.57	36.63
	1	36.72	36.59
	2	36.59	36.54
	3	36.70	36.64
	Total Conducted Power (mW)	18476.08	18284.28
	Total Conducted Power(dBm)	42.67	42.62
	Ant. Gain (dBi)	12.00	12.00
	e.i.r.p (dBm)	54.67	54.62
Middle	0	36.43	36.61
	1	36.66	36.67
	2	36.70	36.40
	3	36.74	36.52
	Total Conducted Power (mW)	18427.87	18079.18
	Total Conducted Power(dBm)	42.65	42.57
	Ant. Gain (dBi)	12.00	12.00
	e.i.r.p (dBm)	54.65	54.57
High	0	36.39	36.28
	1	36.38	36.46
	2	36.37	36.48
	3	36.42	36.45
	Total Conducted Power (mW)	17420.64	17534.10
	Total Conducted Power(dBm)	42.41	42.44
	Ant. Gain (dBi)	12.00	12.00
	e.i.r.p (dBm)	54.41	54.44

Table 10-2. Conducted Average Output Power Table (Multi-RAT_4C NR_20M+20M+LTE_20M+20M)

Channel	Port	QPSK	16QAM
Low	0	35.17	34.77
	1	34.67	35.06
	2	34.70	35.11
	3	34.97	35.10
	Total Conducted Power (mW)	12311.13	12684.76
	Total Conducted Power(dBm)	40.90	41.03
	Ant. Gain (dBi)	12.00	12.00
	e.i.r.p (dBm)	52.90	53.03
Middle	0	34.87	34.99
	1	34.78	34.89
	2	34.57	35.15
	3	34.47	34.86
	Total Conducted Power (mW)	11738.26	12573.56
	Total Conducted Power(dBm)	40.70	40.99
	Ant. Gain (dBi)	12.00	12.00
	e.i.r.p (dBm)	52.70	52.99
High	0	34.83	35.00
	1	34.72	35.07
	2	34.89	35.22
	3	35.07	35.34
	Total Conducted Power (mW)	12302.56	13122.33
	Total Conducted Power(dBm)	40.90	41.18
	Ant. Gain (dBi)	12.00	12.00
	e.i.r.p (dBm)	52.90	53.18

Table 10-3. Conducted Average Output Power Table (NR_3C_20M+20M+20M)

Channel	Port	QPSK	16QAM
Low	0	36.38	36.52
	1	36.48	36.64
	2	36.43	36.64
	3	36.59	36.67
	Total Conducted Power (mW)	17747.20	18358.96
	Total Conducted Power(dBm)	42.49	42.64
	Ant. Gain (dBi)	12.00	12.00
	e.i.r.p (dBm)	54.49	54.64
Middle	0	36.39	36.60
	1	36.54	36.65
	2	36.61	36.51
	3	36.57	36.66
	Total Conducted Power (mW)	17984.12	18306.29
	Total Conducted Power(dBm)	42.55	42.63
	Ant. Gain (dBi)	12.00	12.00
	e.i.r.p (dBm)	54.55	54.63
High	0	36.18	36.47
	1	36.25	36.51
	2	36.37	36.51
	3	36.56	36.74
	Total Conducted Power (mW)	17230.59	18110.98
	Total Conducted Power(dBm)	42.36	42.58
	Ant. Gain (dBi)	12.00	12.00
	e.i.r.p (dBm)	54.36	54.58

Table 10-4. Conducted Average Output Power Table (NR_4C_20M+20M+20M+20M)