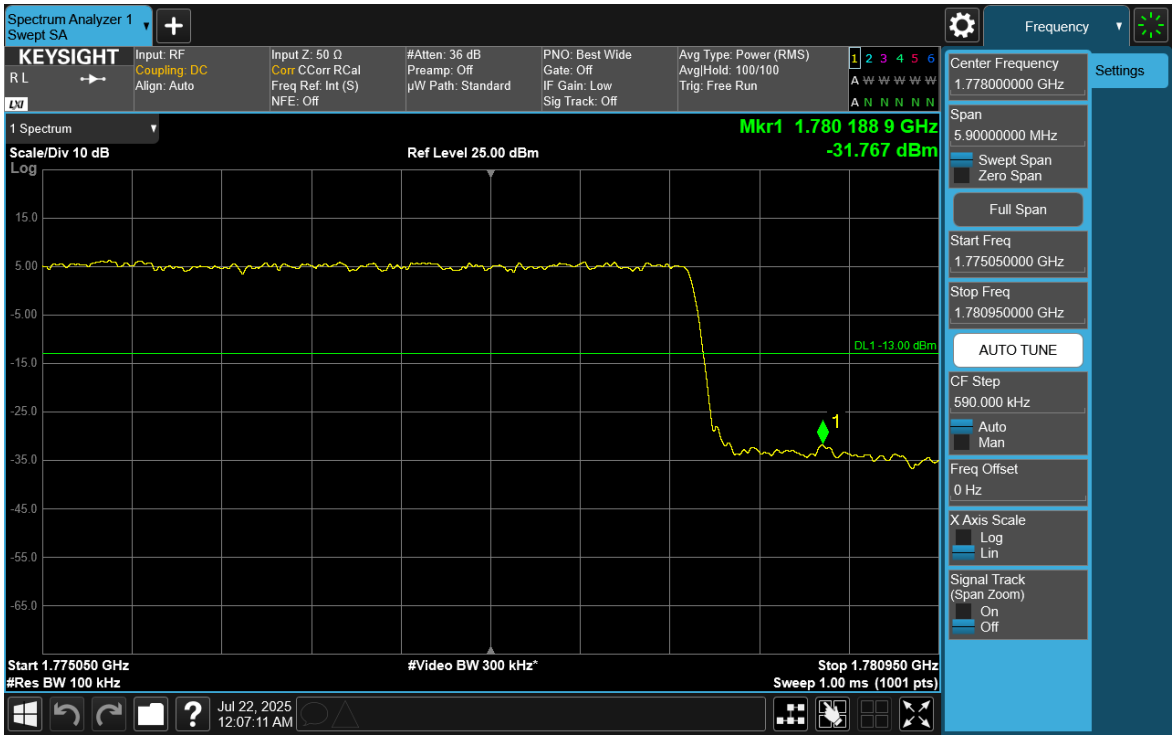
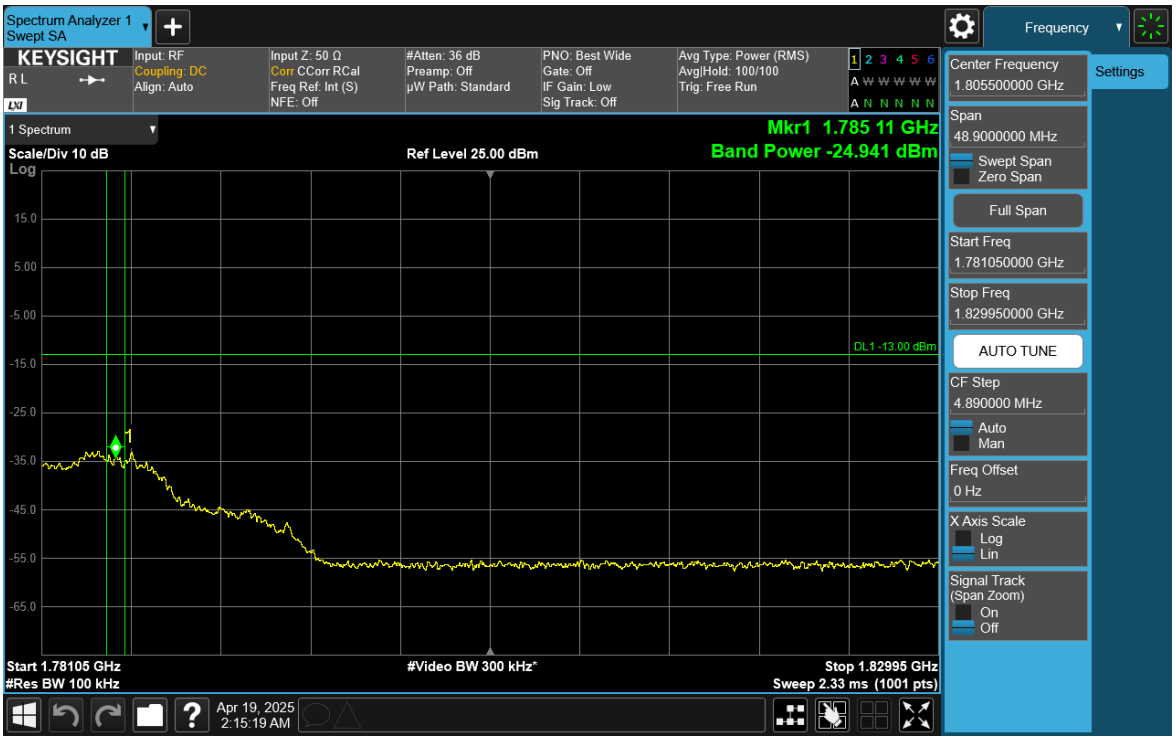
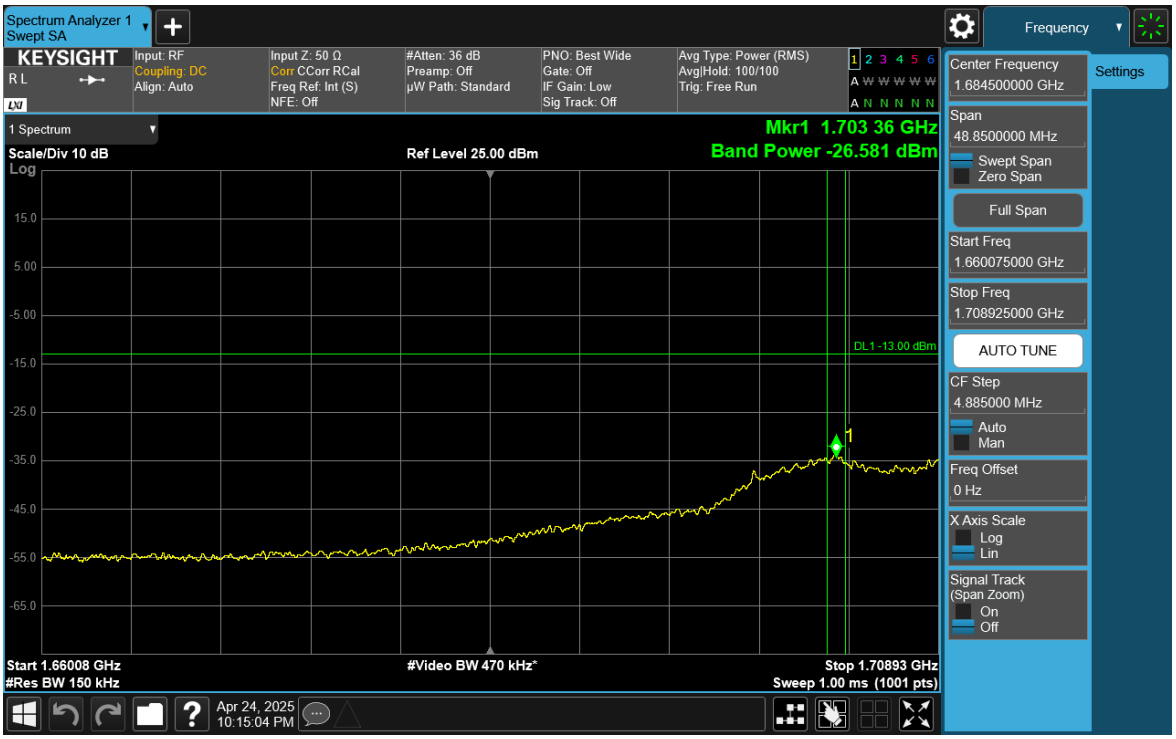


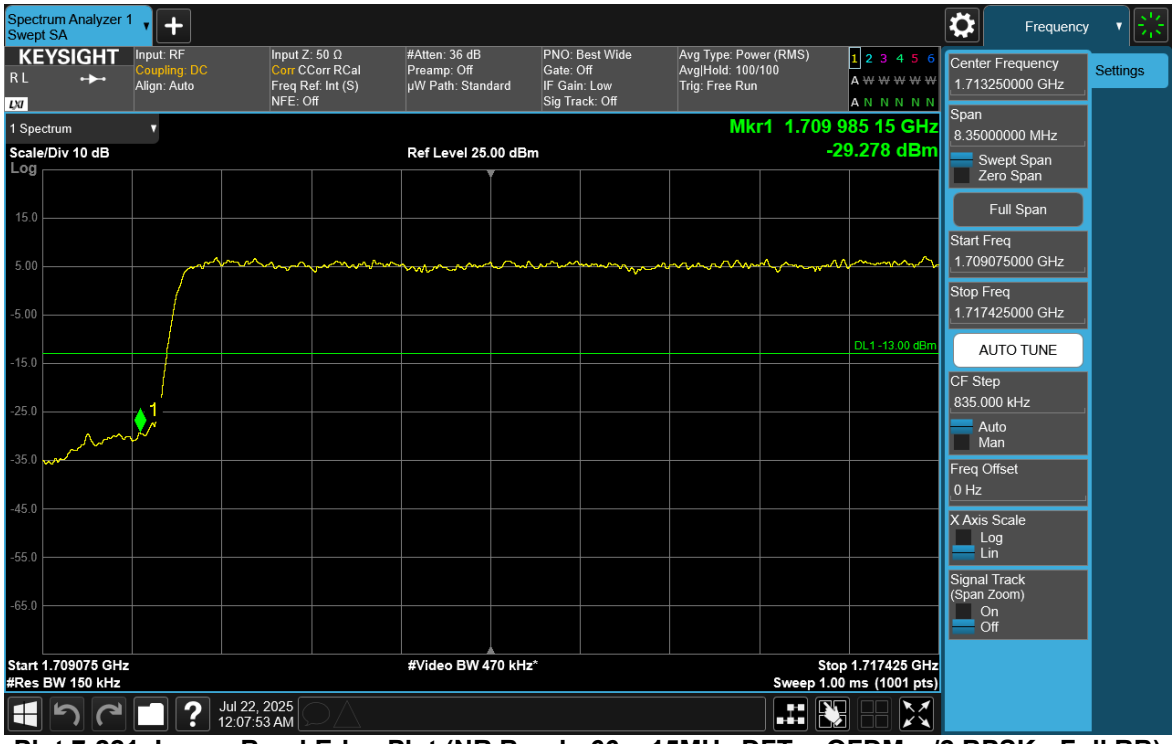
Plot 7-218. Upper Band Edge Plot (NR Band n66 – 10MHz DFT-s-OFDM π/2 BPSK - Full RB)



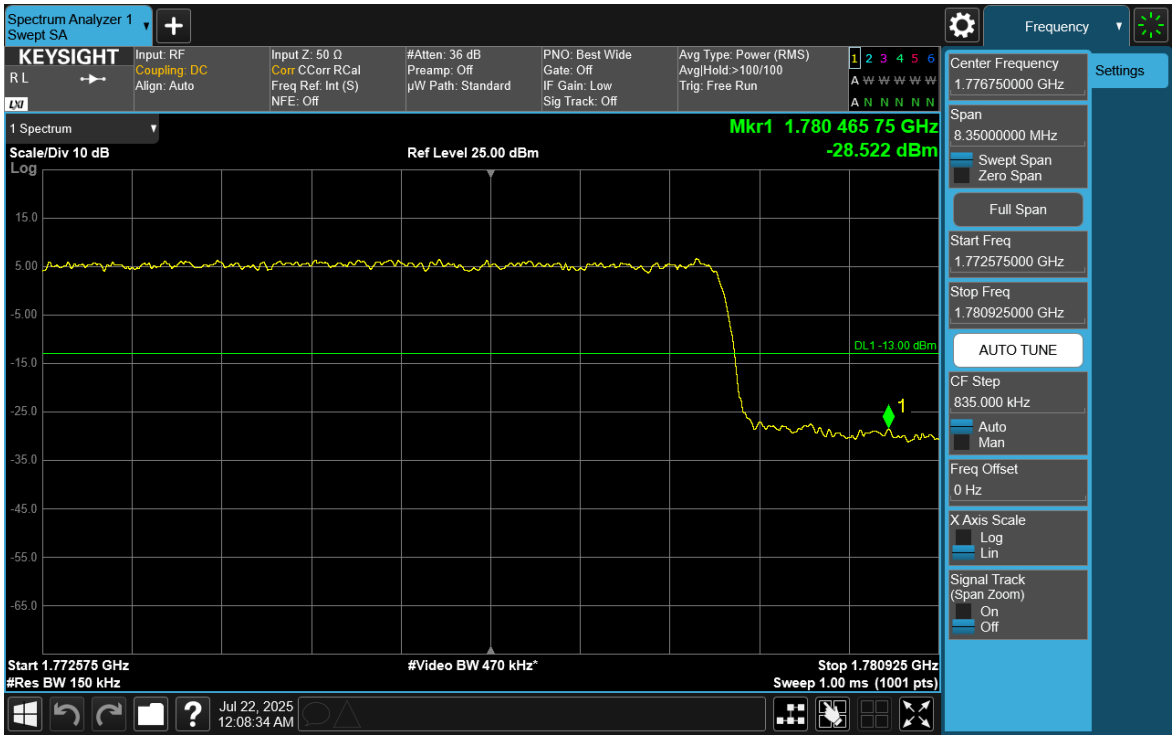
Plot 7-219. Upper Extended Band Edge Plot (NR Band n66 – 10MHz DFT-s-OFDM π/2 BPSK - Full RB)



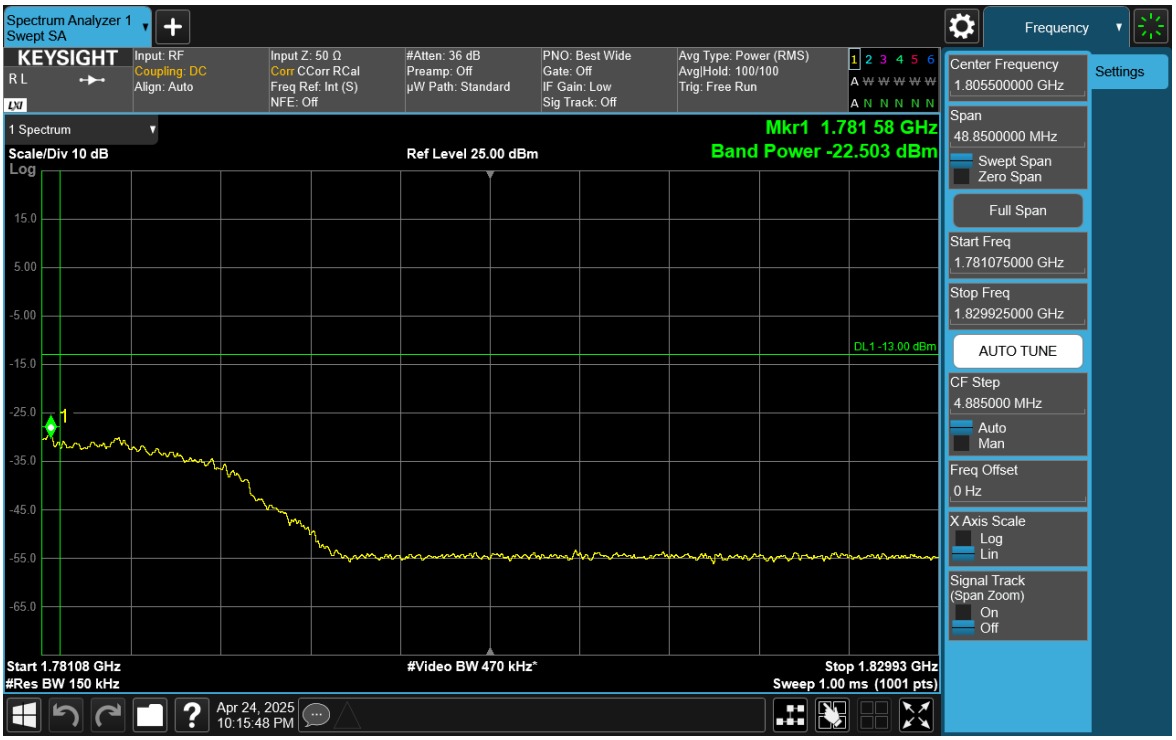
Plot 7-220. Lower Extended Band Edge Plot (NR Band n66 – 15MHz DFT-s-OFDM π/2 BPSK - Full RB)



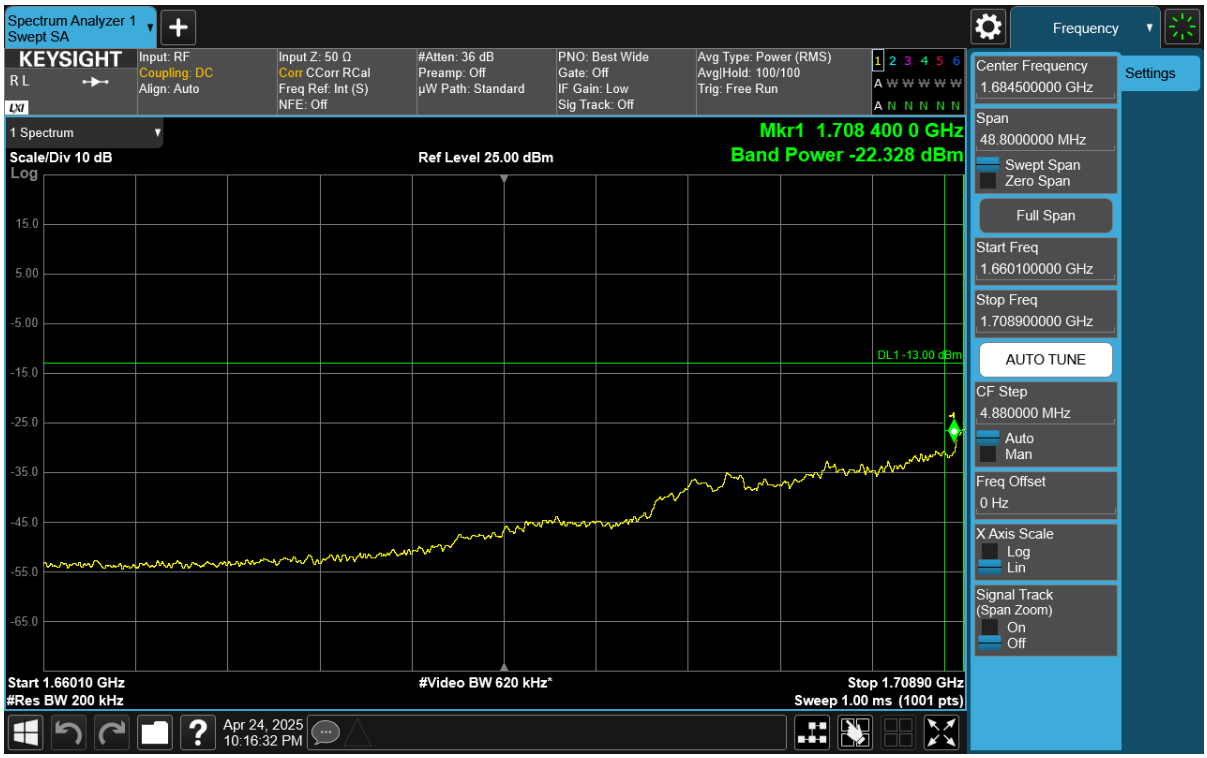
Plot 7-221. Lower Band Edge Plot (NR Band n66 – 15MHz DFT-s-OFDM π/2 BPSK - Full RB)



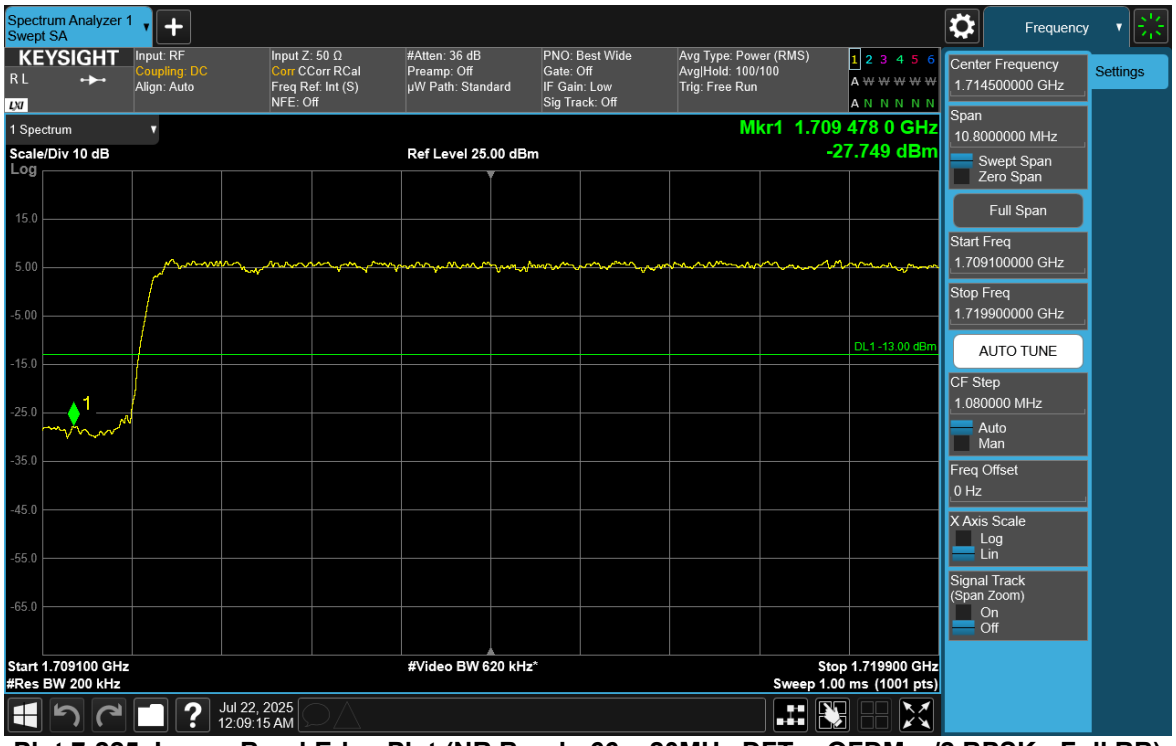
Plot 7-222. Upper Band Edge Plot (NR Band n66 – 15MHz DFT -OFDM π/2 BPSK - Full RB)



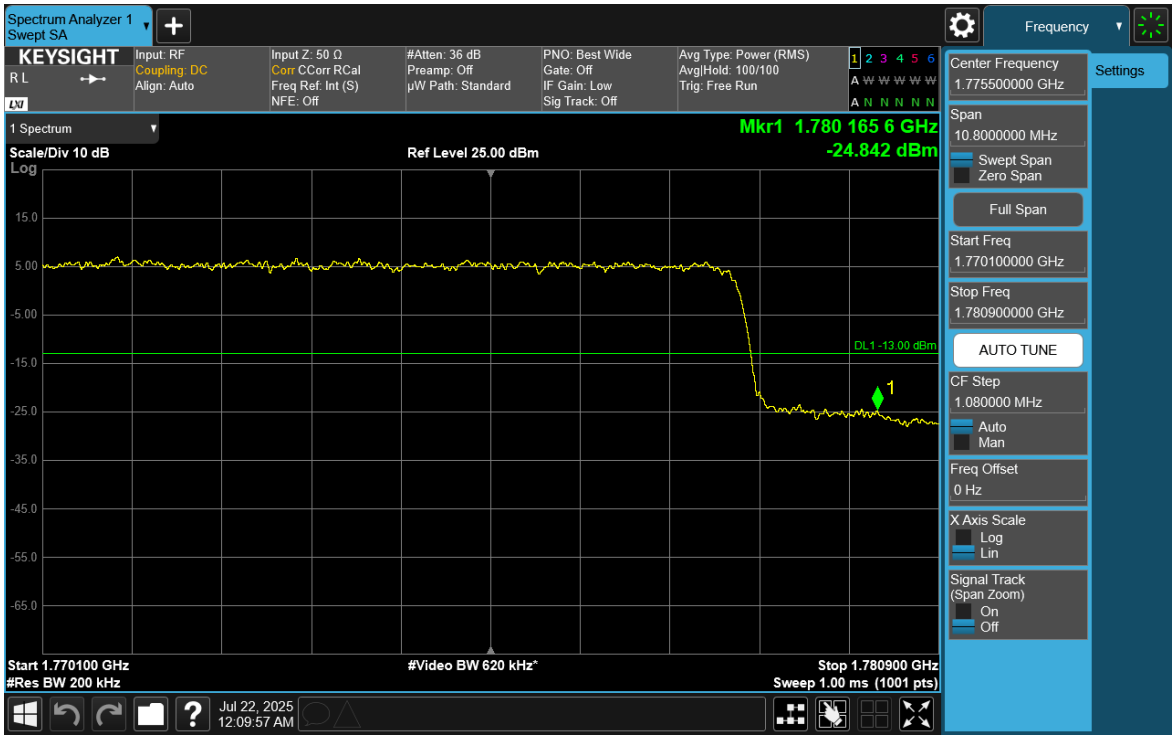
Plot 7-223. Upper Extended Band Edge Plot (NR Band n66 – 15MHz DFT-s-OFDM π/2 BPSK - Full RB)



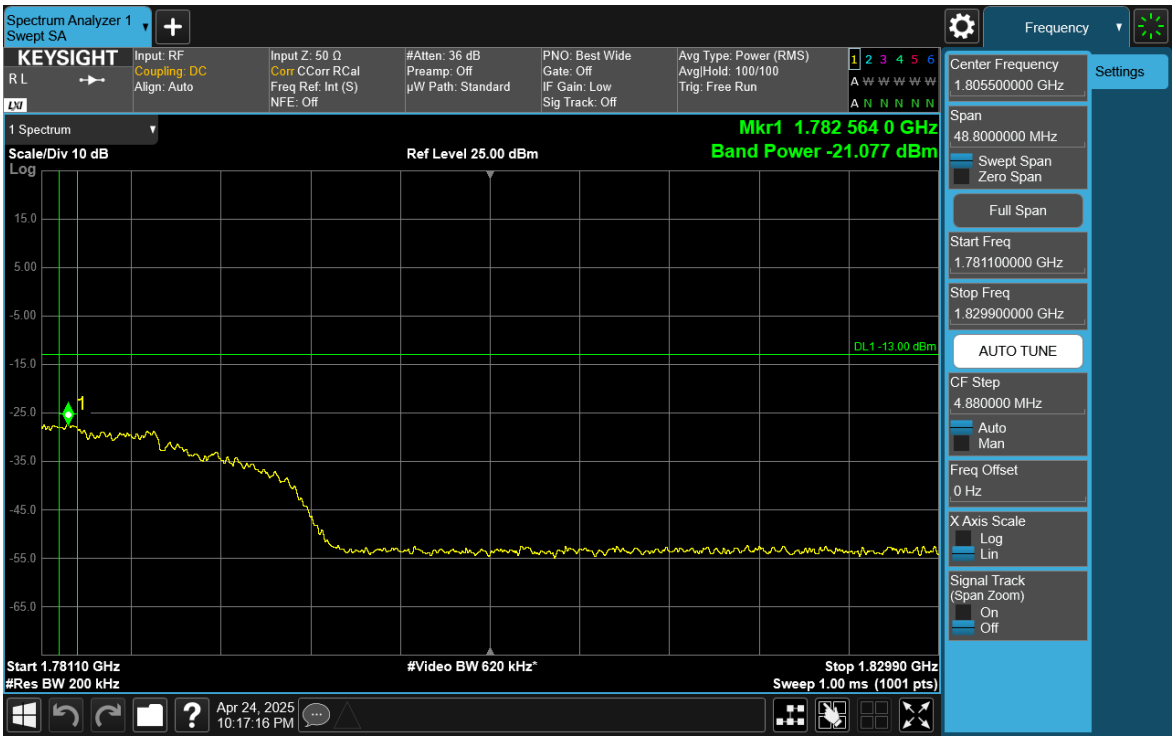
Plot 7-224. Lower Extended Band Edge Plot (NR Band n66 – 20MHz DFT-s-OFDM π/2 BPSK - Full RB)



Plot 7-225. Lower Band Edge Plot (NR Band n66 – 20MHz DFT-s-OFDM π/2 BPSK - Full RB)

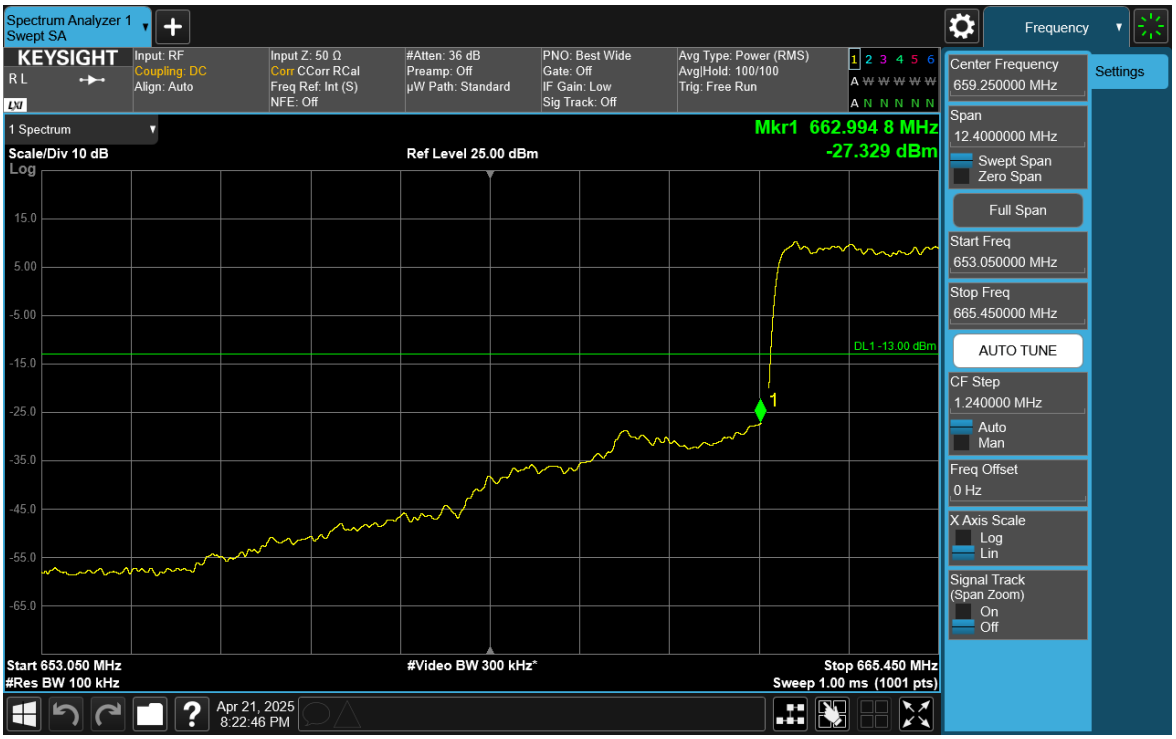


Plot 7-226. Upper Band Edge Plot (NR Band n66 – 20MHz DFT-s-OFDM π/2 BPSK - Full RB)



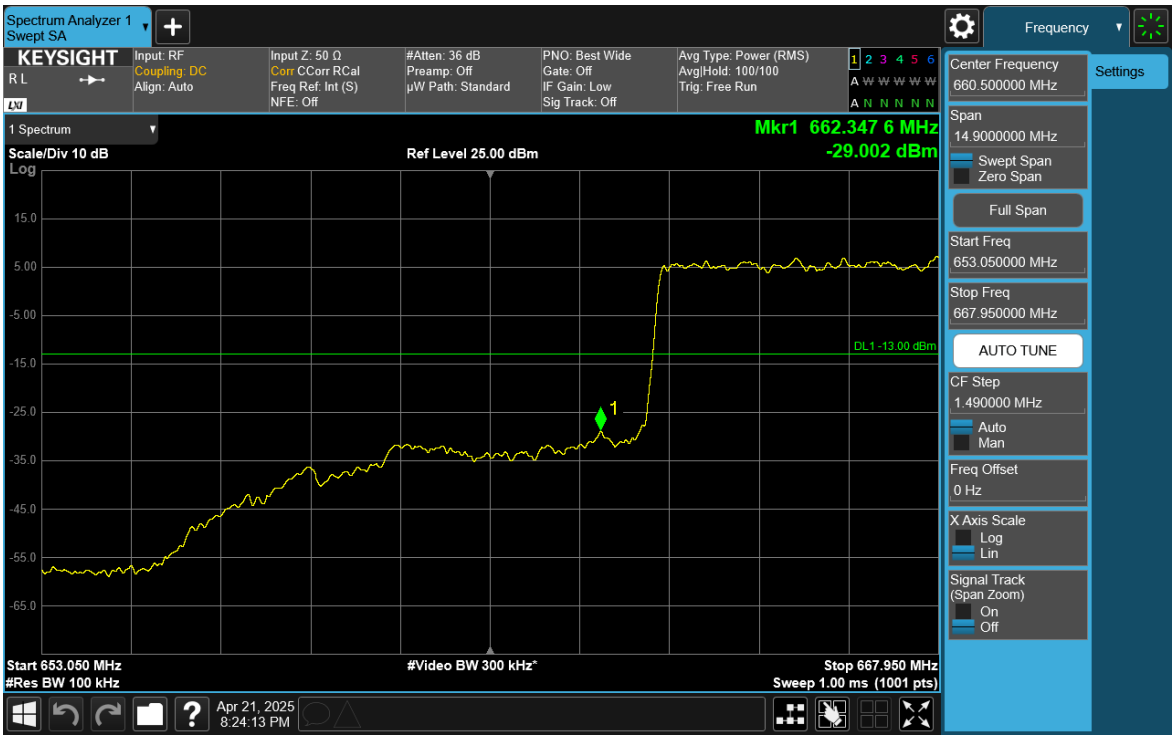
Plot 7-227. Upper Extended Band Edge Plot (NR Band n66 – 20MHz DFT-s-OFDM π/2 BPSK - Full RB)

NR Band n71

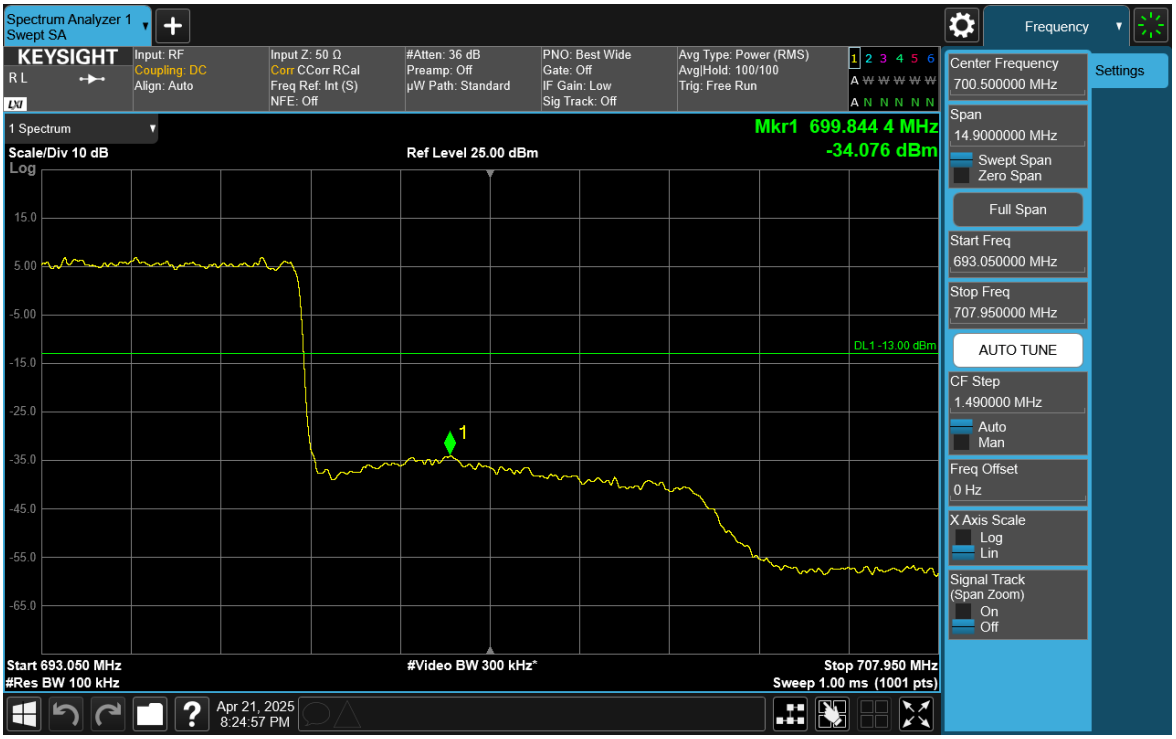


Plot 7-228. Lower Band Edge Plot (NR Band n71 – 5MHz DFT-s-OFDM π/2 BPSK - Full RB)

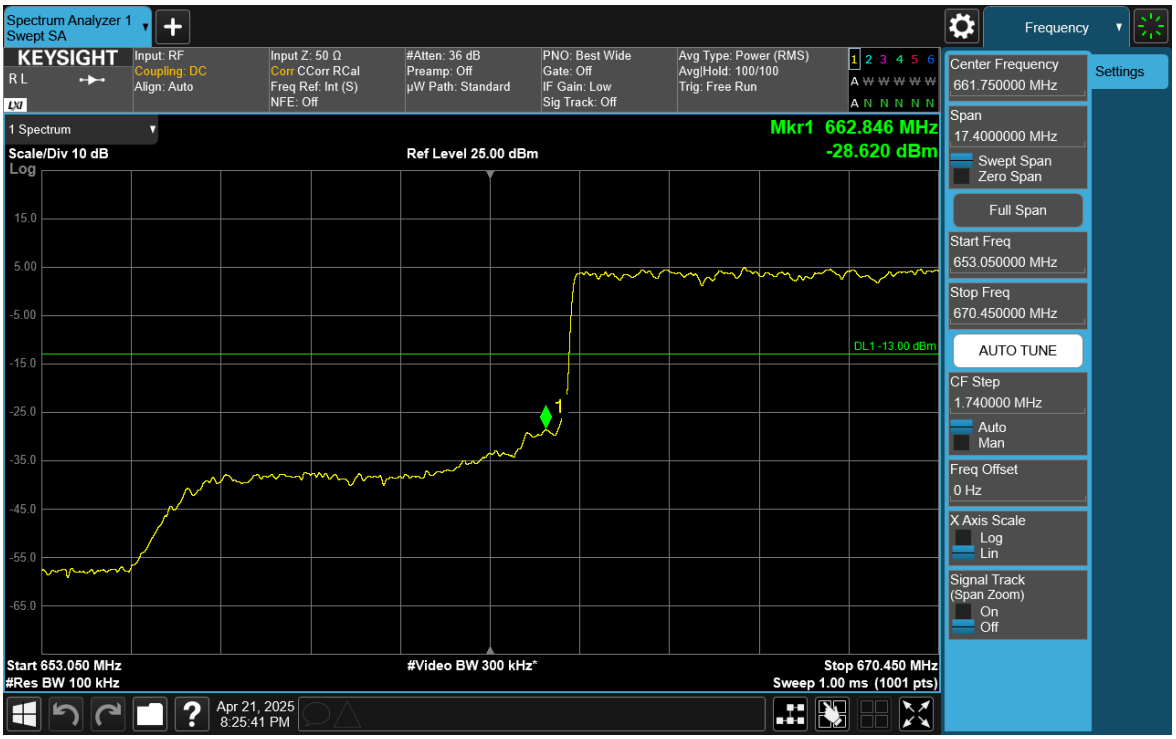
Plot 7-229. Upper Band Edge Plot (NR Band n71 – 5MHz DFT-s-OFDM π/2 BPSK - Full RB)



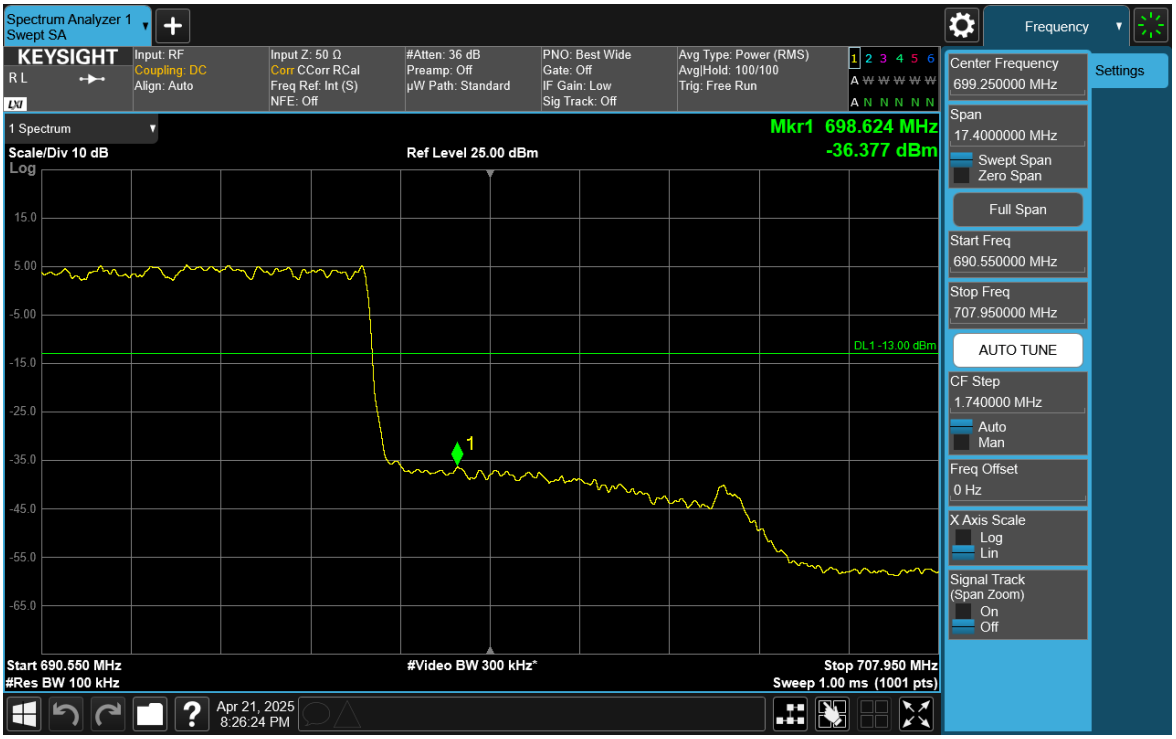
Plot 7-230. Lower Band Edge Plot (NR Band n71 – 10MHz DFT-s-OFDM π/2 BPSK - Full RB)



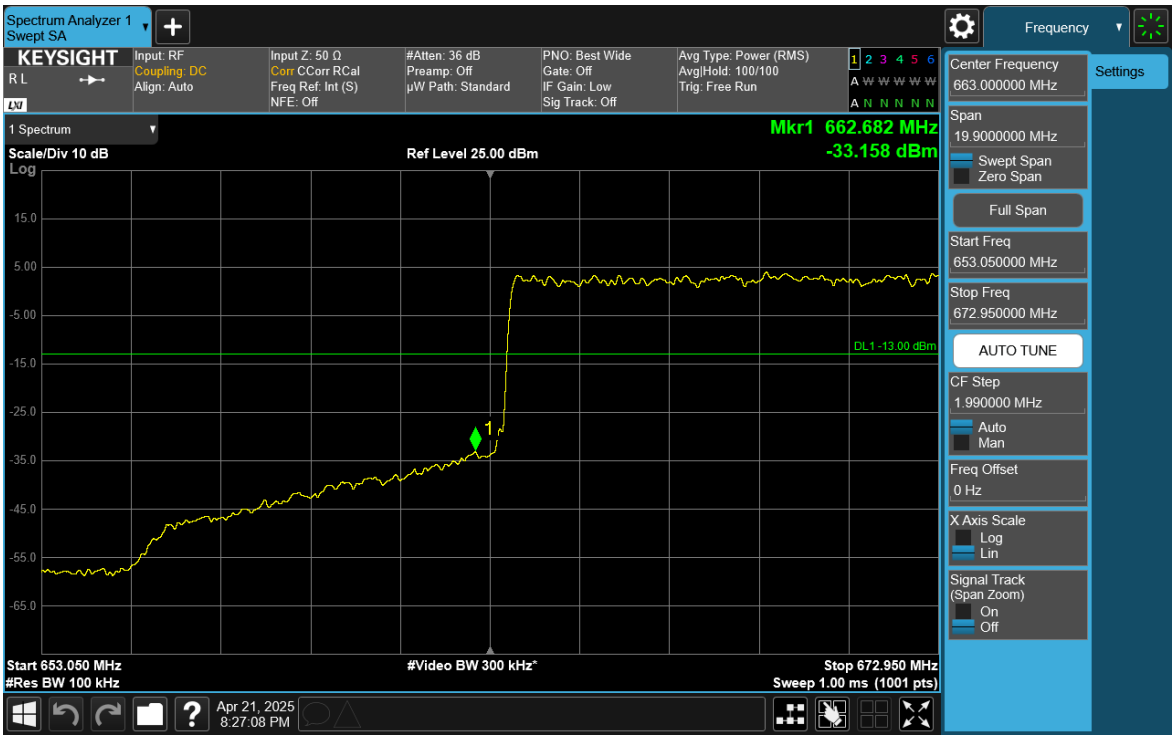
Plot 7-231. Upper Band Edge Plot (NR Band n71 – 10MHz DFT-s-OFDM π/2 BPSK - Full RB)



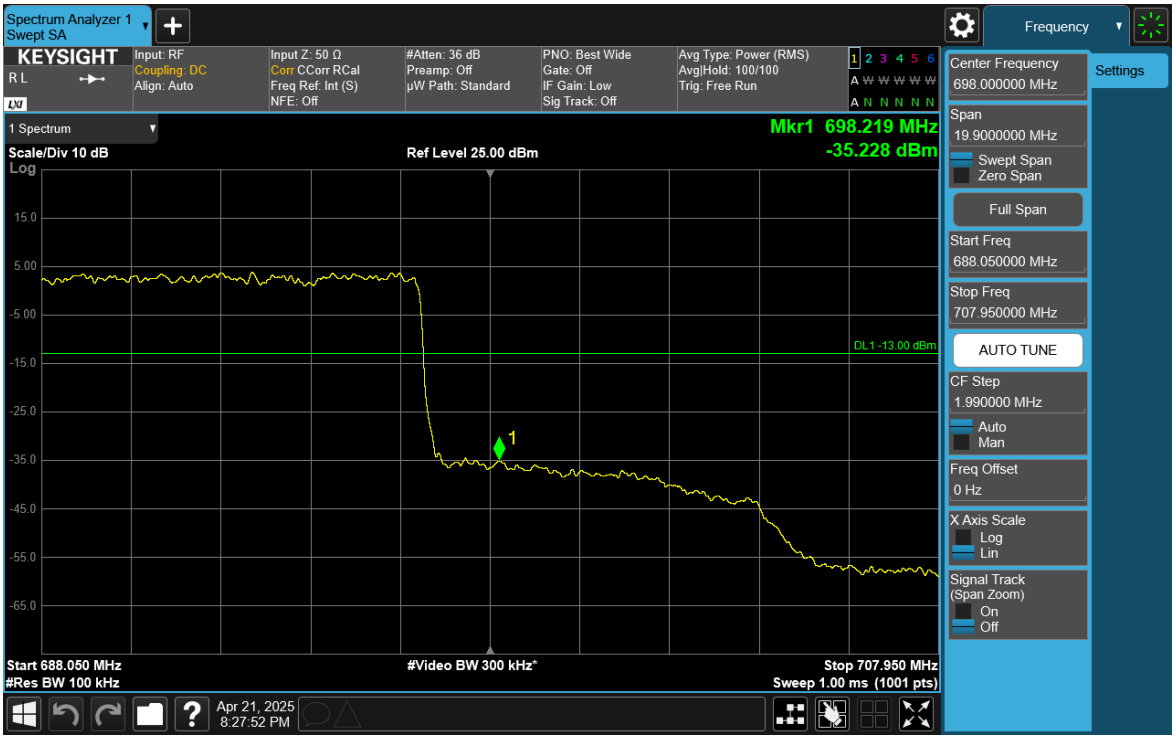
Plot 7-232. Lower Band Edge Plot (NR Band n71 – 15MHz DFT-s-OFDM π/2 BPSK - Full RB)



Plot 7-233. Upper Band Edge Plot (NR Band n71 – 15MHz DFT-s-OFDM π/2 BPSK - Full RB)

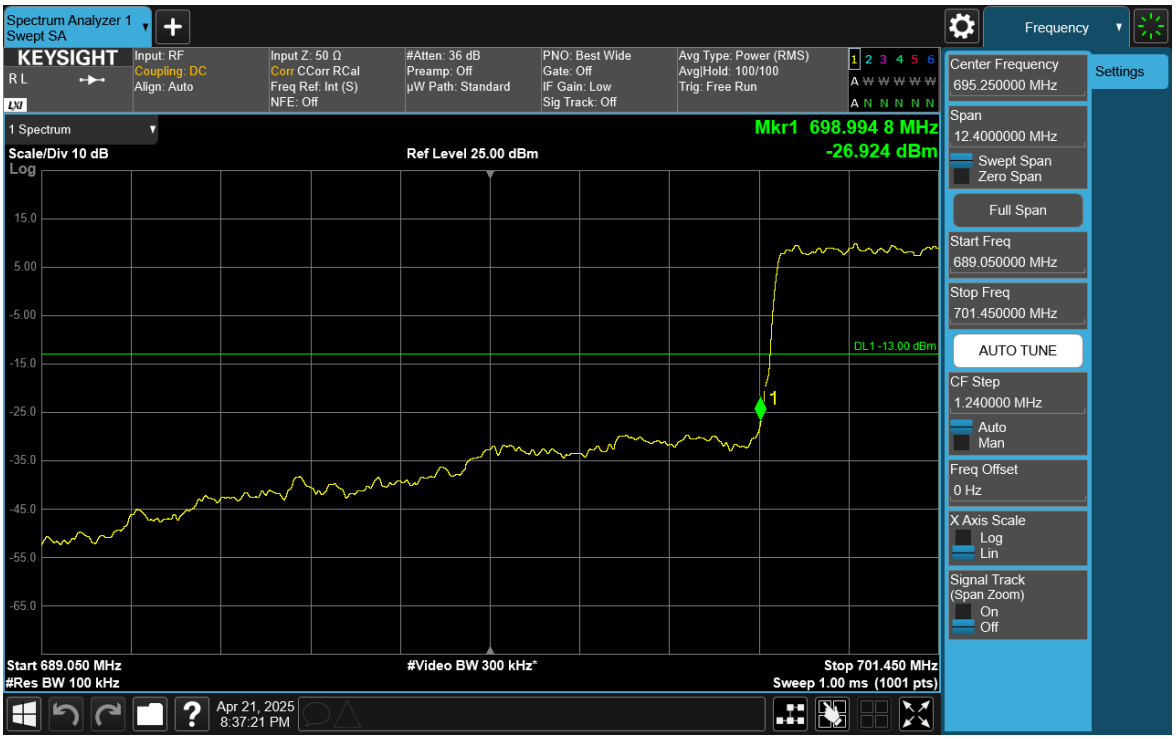


Plot 7-234. Lower Band Edge Plot (NR Band n71 – 20MHz DFT-s-OFDM π/2 BPSK - Full RB)



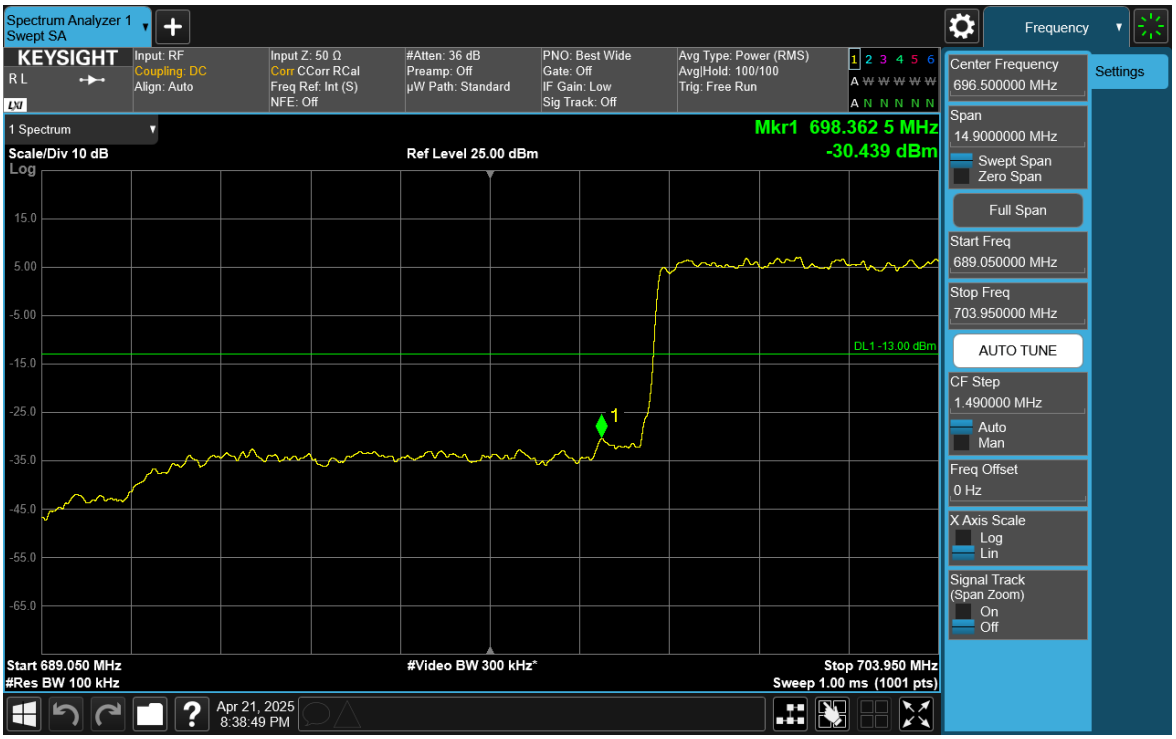
Plot 7-235. Upper Band Edge Plot (NR Band n71 – 20MHz DFT-s-OFDM π/2 BPSK - Full RB)

NR Band n12

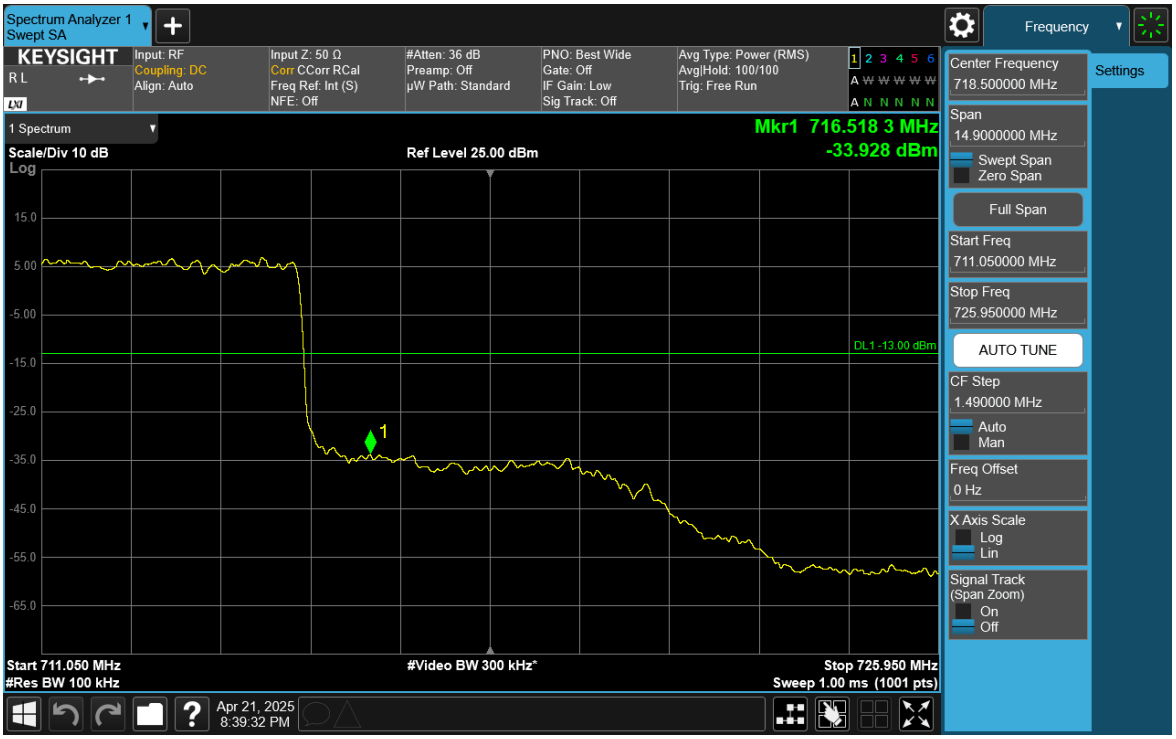


Plot 7-236. Lower Band Edge Plot (NR Band n12 – 5MHz DFT-s-OFDM π/2 BPSK - Full RB)

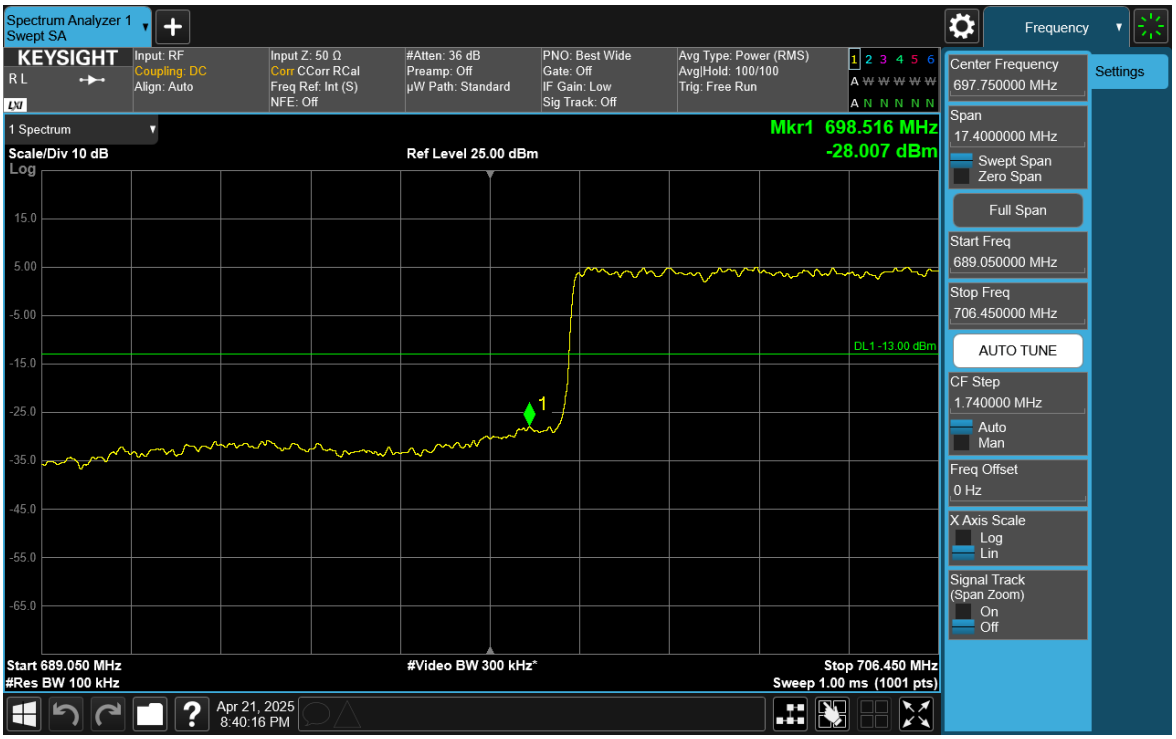
Plot 7-237. Upper Band Edge Plot (NR Band n12 – 5MHz DFT-s-OFDM π/2 BPSK - Full RB)



Plot 7-238. Lower Band Edge Plot (NR Band n12 – 10MHz DFT-s-OFDM π/2 BPSK - Full RB)



Plot 7-239. Upper Band Edge Plot (NR Band n12 – 10MHz DFT-s-OFDM π/2 BPSK - Full RB)



Plot 7-240. Lower Band Edge Plot (NR Band n12 – 15MHz DFT-s-OFDM π/2 BPSK - Full RB)

Plot 7-241. Upper Band Edge Plot (NR Band n12 – 15MHz DFT-s-OFDM π/2 BPSK - Full RB)

7.5 Peak-Average Ratio

§27.50(d)(5)

Test Overview

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

Test Procedure Used

KDB 971168 D01 v03r01 – Section 5.7.1

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.

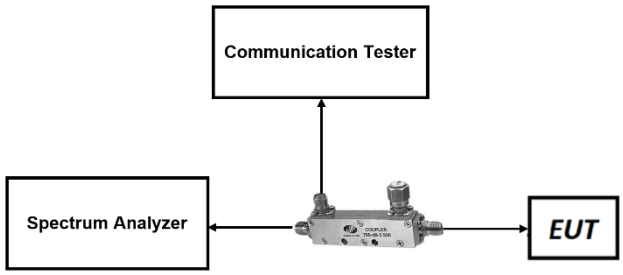


Figure 7-7. LTE Test Instrument & Measurement Setup

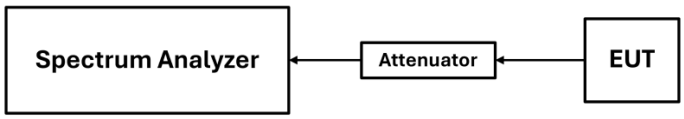
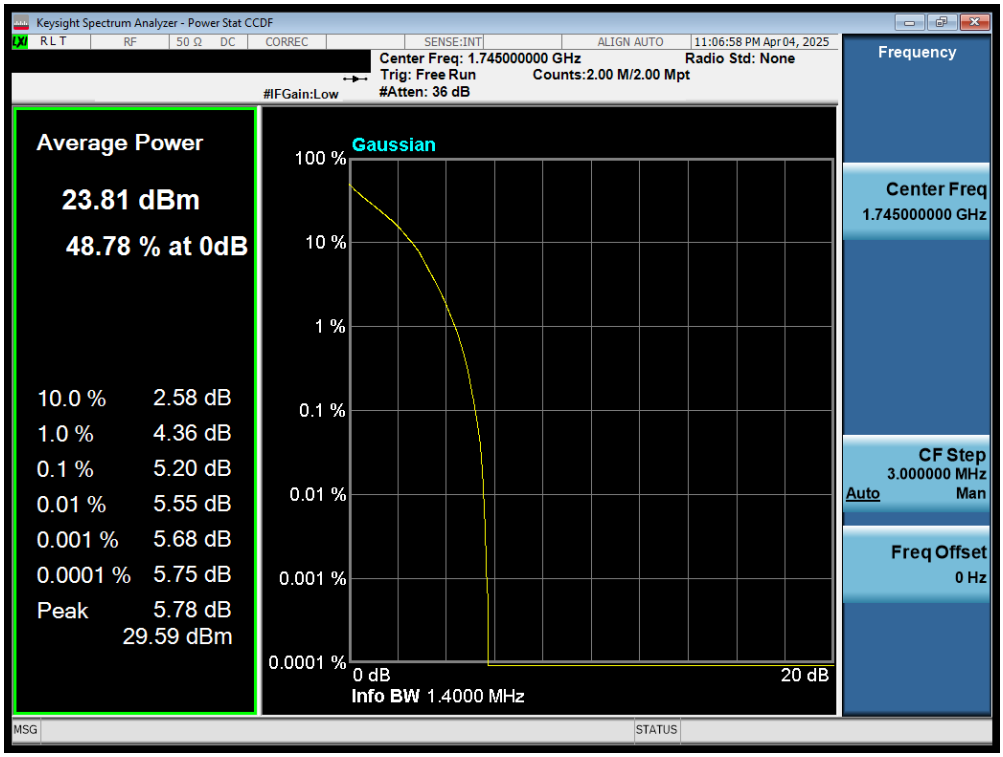


Figure 7-8. FR1 Test Instrument & Measurement Setup

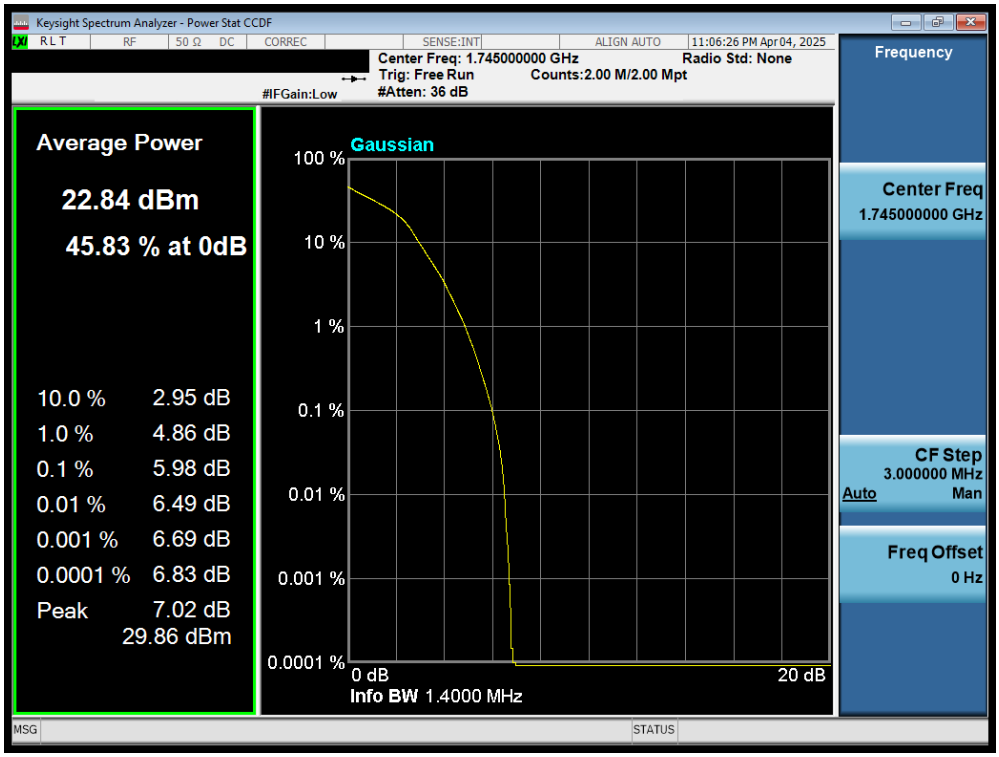
Test Notes

None.

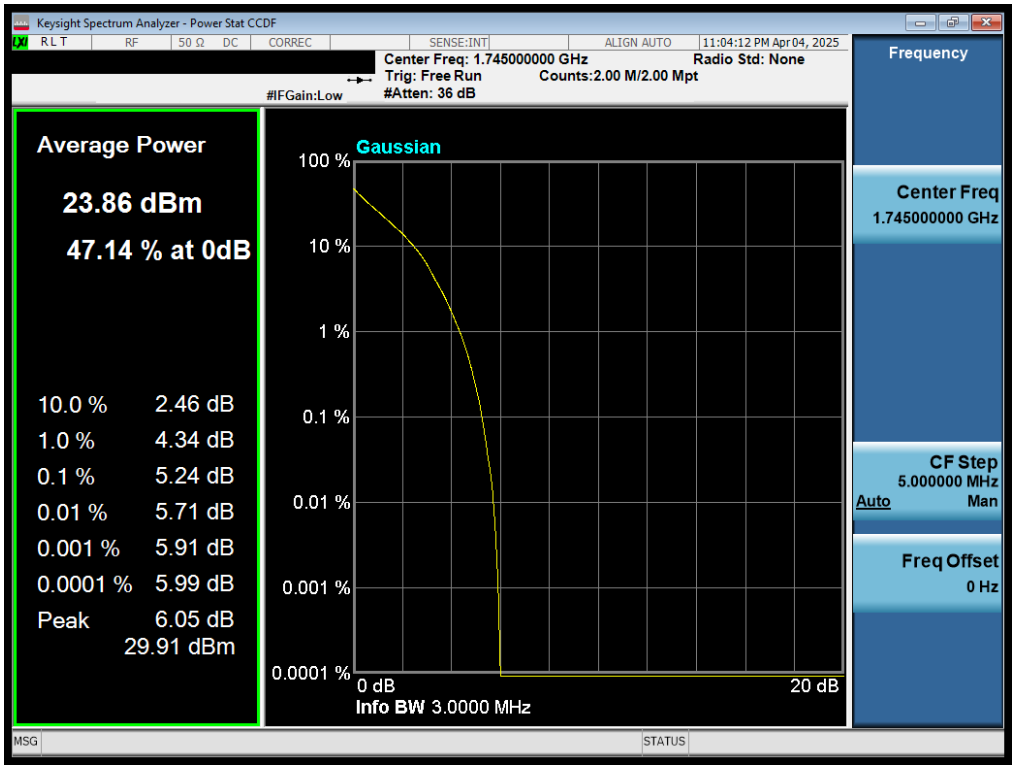
LTE Band 66



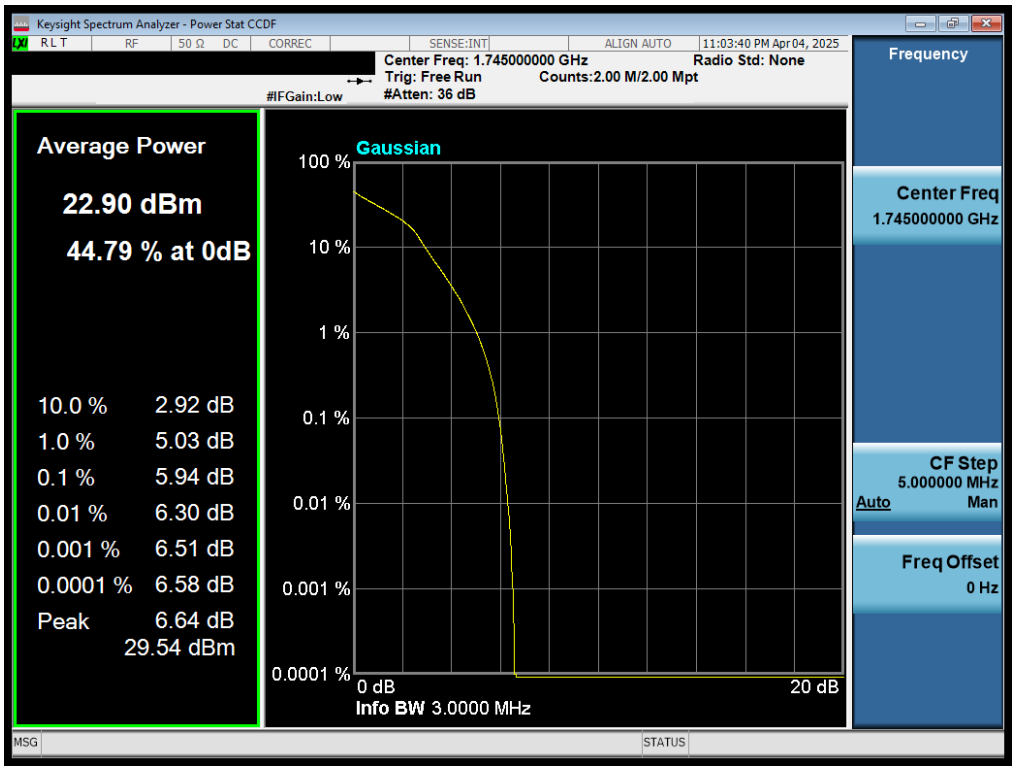
Plot 7-242. PAR Plot (LTE Band 66 - 1.4MHz QPSK - Full RB)



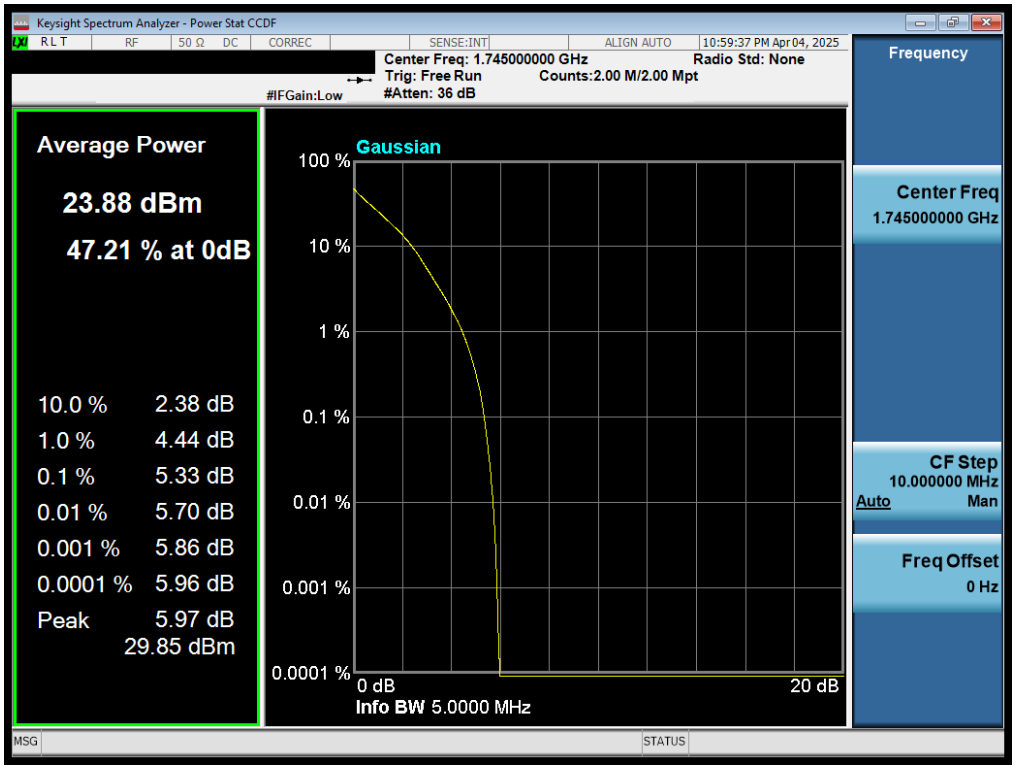
Plot 7-243. PAR Plot (LTE Band 66 - 1.4MHz 16-QAM - Full RB)



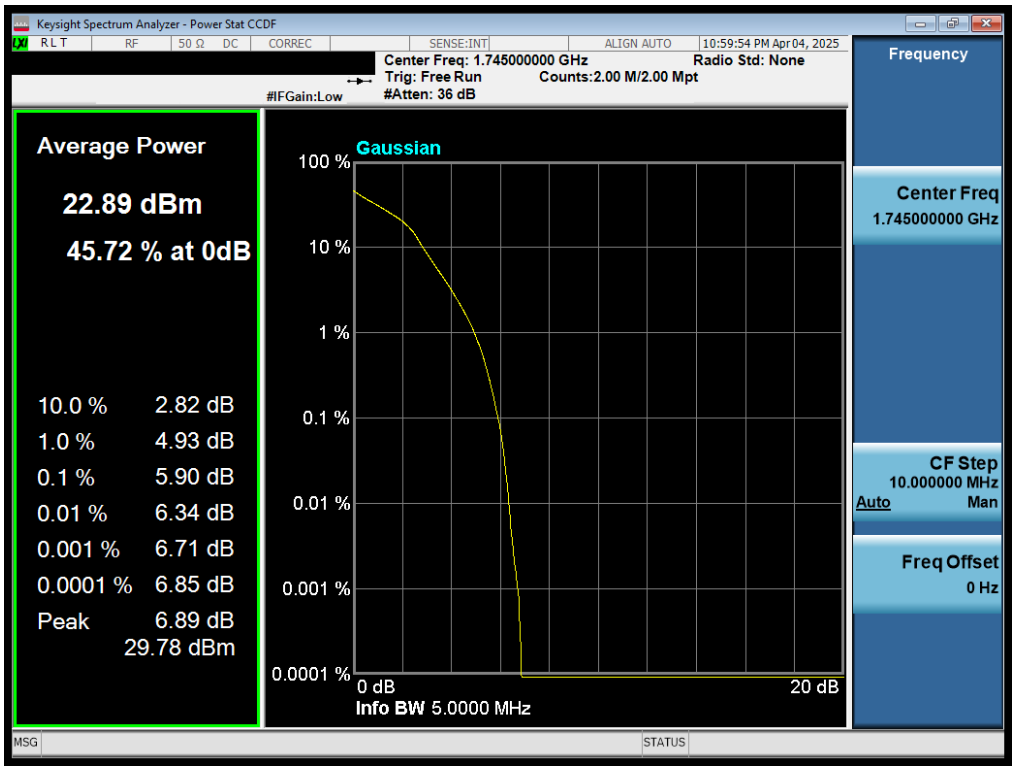
Plot 7-244. PAR Plot (LTE Band 66 - 3MHz QPSK - Full RB)



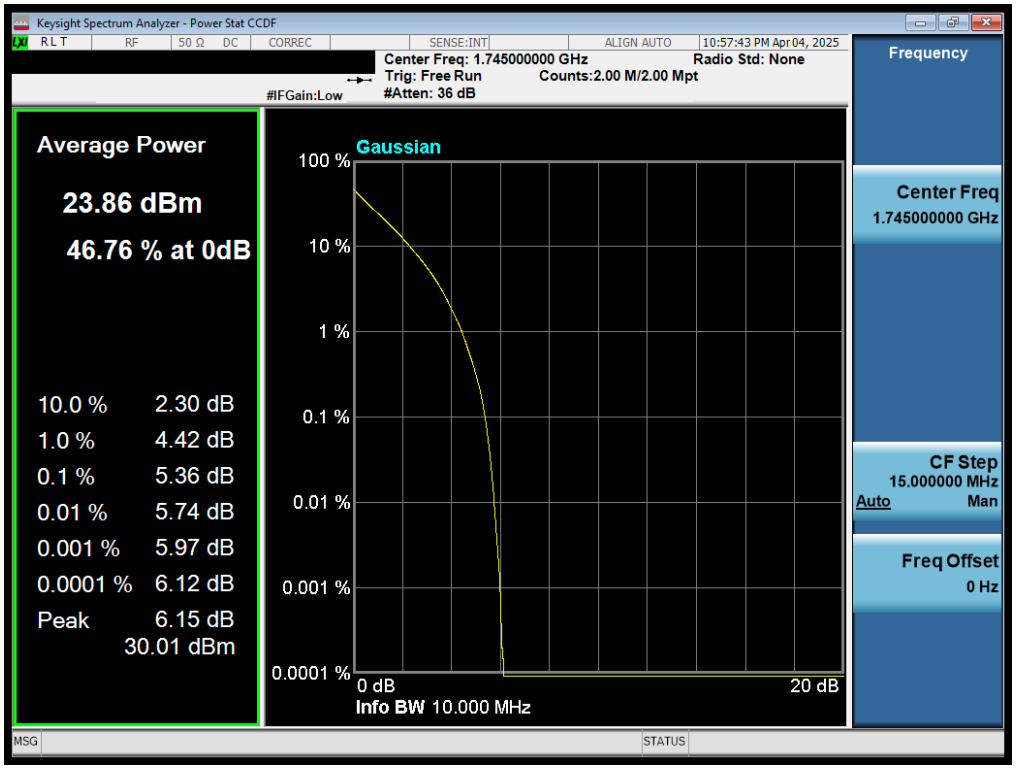
Plot 7-245. PAR Plot (LTE Band 66 - 3MHz 16-QAM - Full RB)



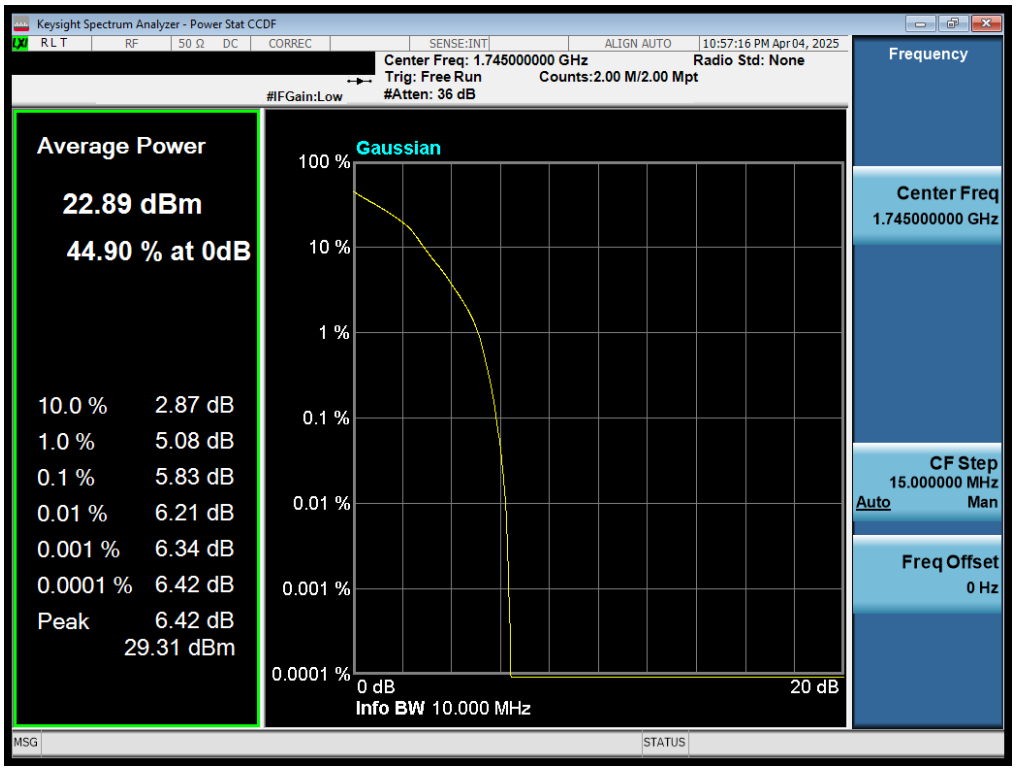
Plot 7-246. PAR Plot (LTE Band 66 - 5MHz QPSK - Full RB)



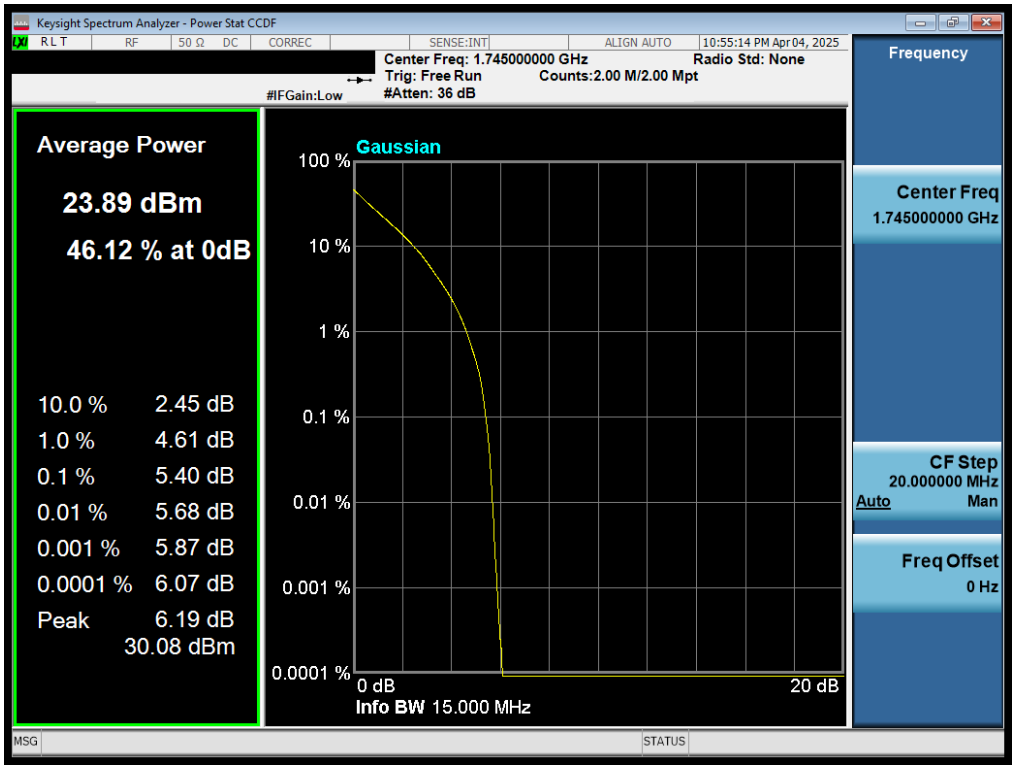
Plot 7-247. PAR Plot (LTE Band 66 - 5MHz 16-QAM - Full RB)



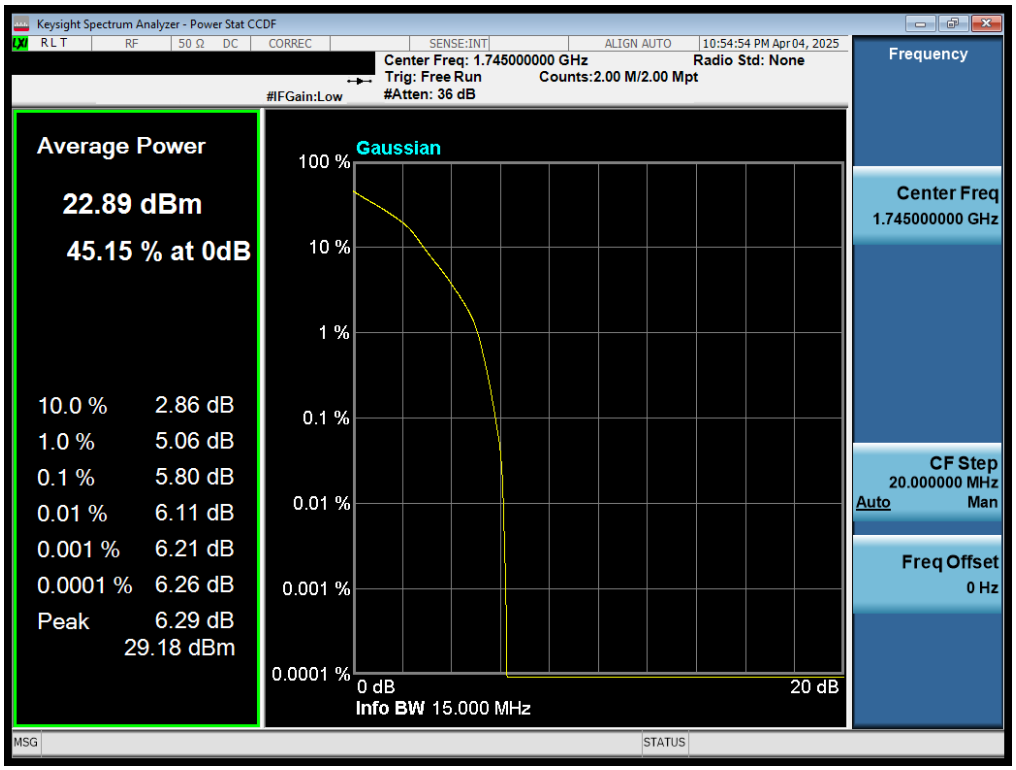
Plot 7-248. PAR Plot (LTE Band 66 - 10MHz QPSK - Full RB)



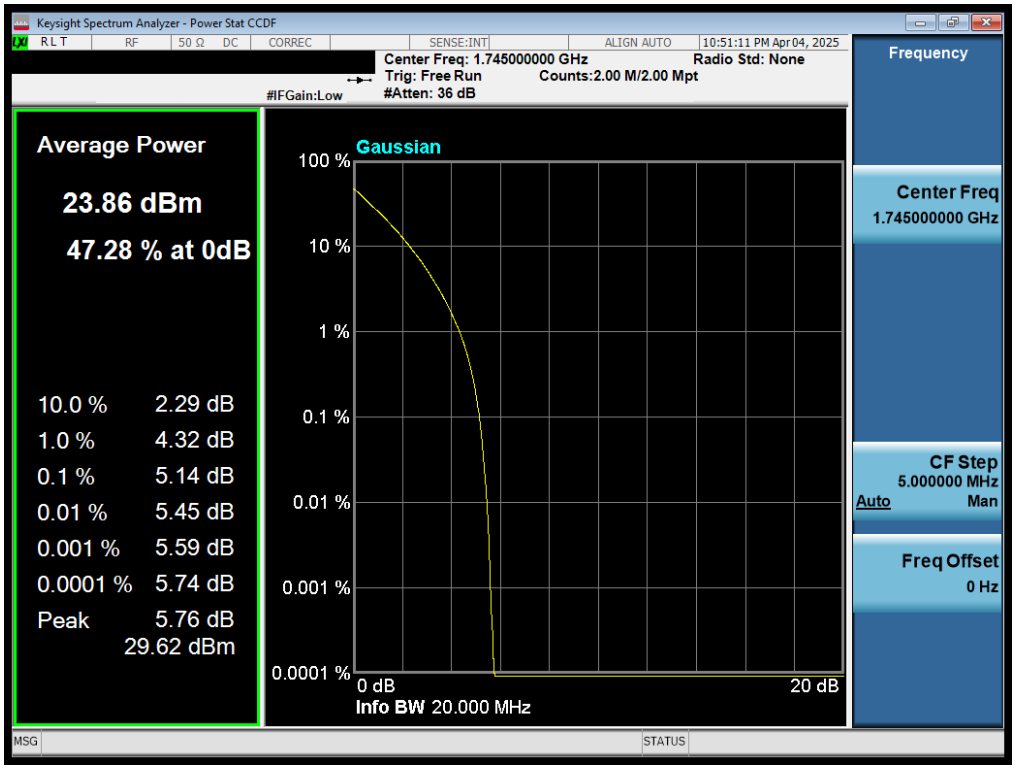
Plot 7-249. PAR Plot (LTE Band 66 - 10MHz 16-QAM - Full RB)



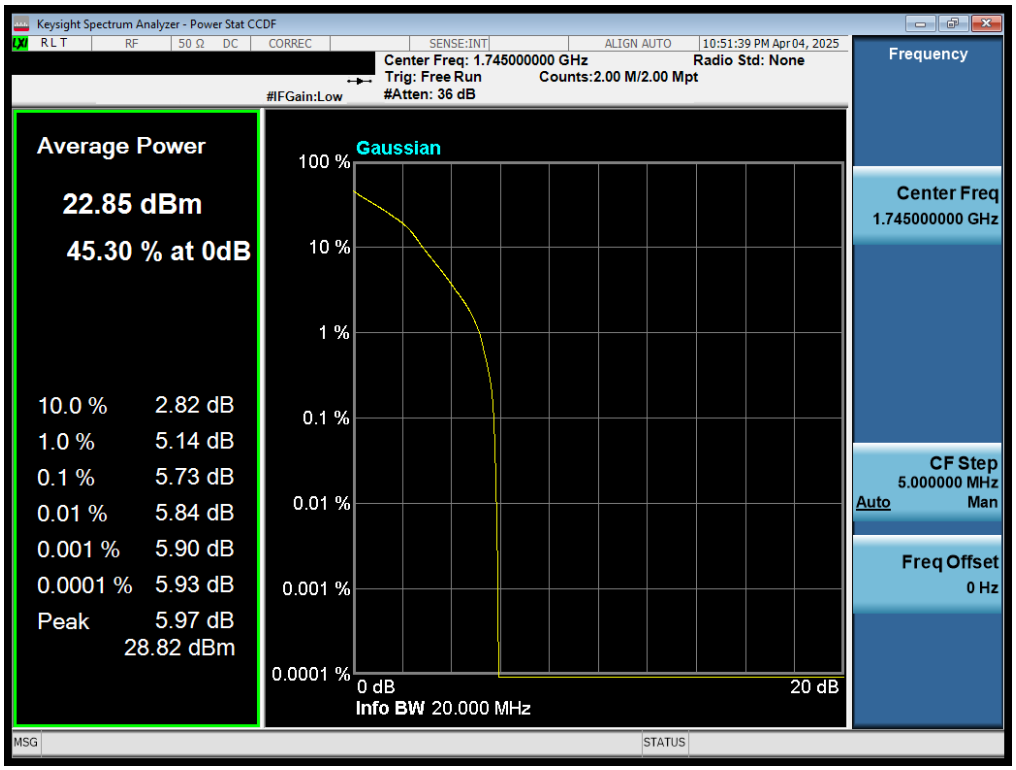
Plot 7-250. PAR Plot (LTE Band 66 - 15MHz QPSK - Full RB)



Plot 7-251. PAR Plot (LTE Band 66 - 15MHz 16-QAM - Full RB)

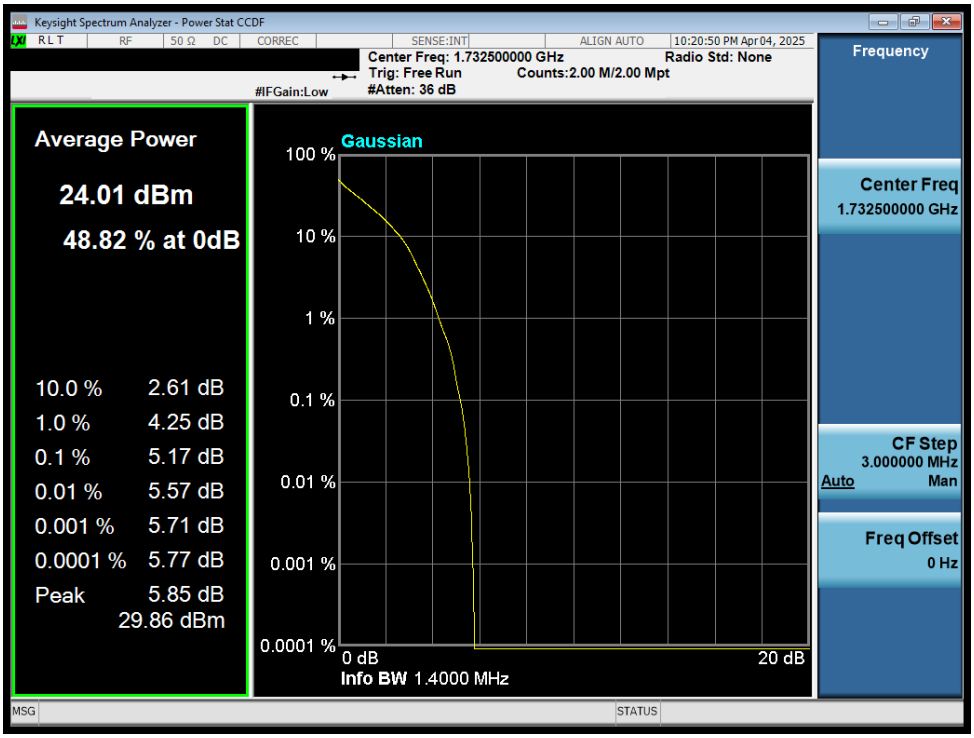


Plot 7-252. PAR Plot (LTE Band 66 - 20MHz QPSK - Full RB)

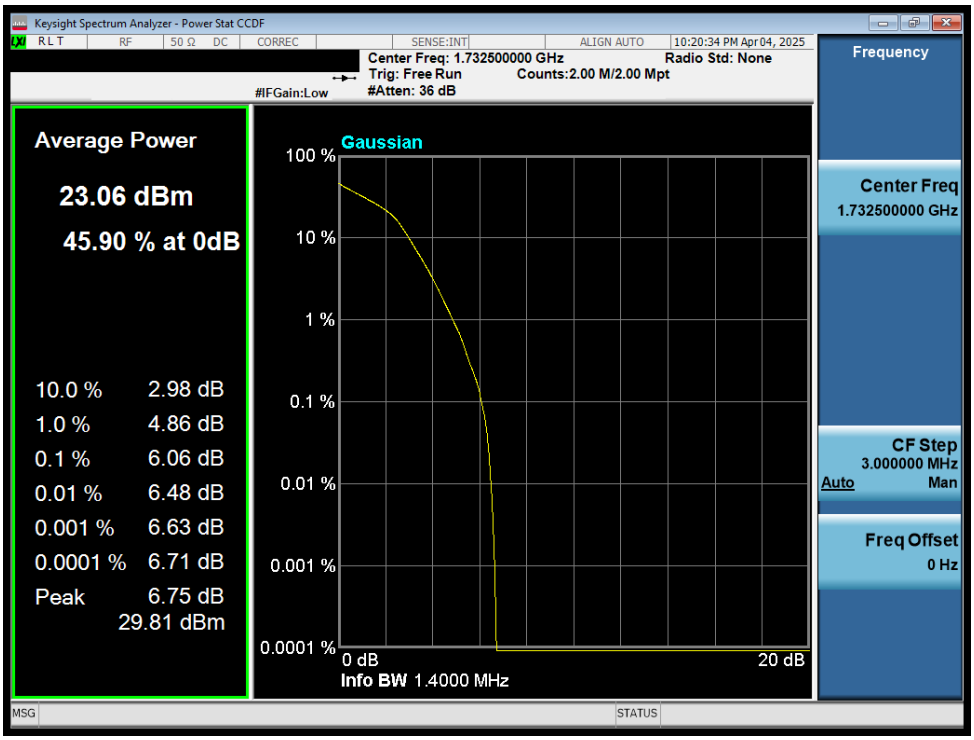


Plot 7-253. PAR Plot (LTE Band 66 - 20MHz 16-QAM - Full RB)

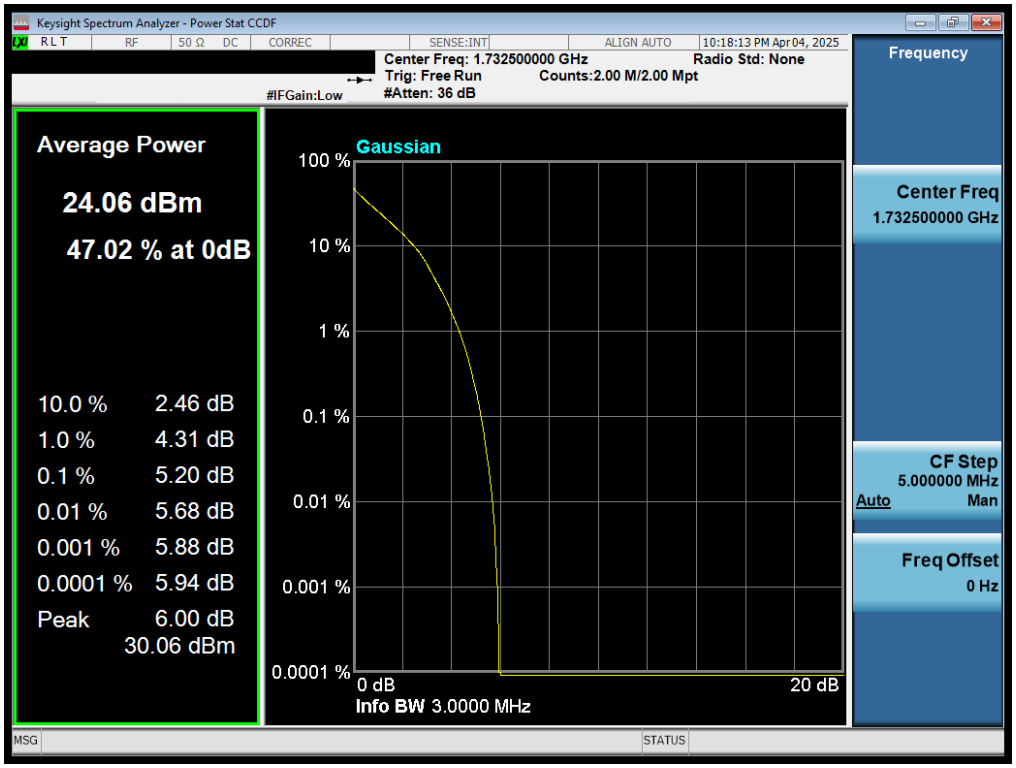
LTE Band 4



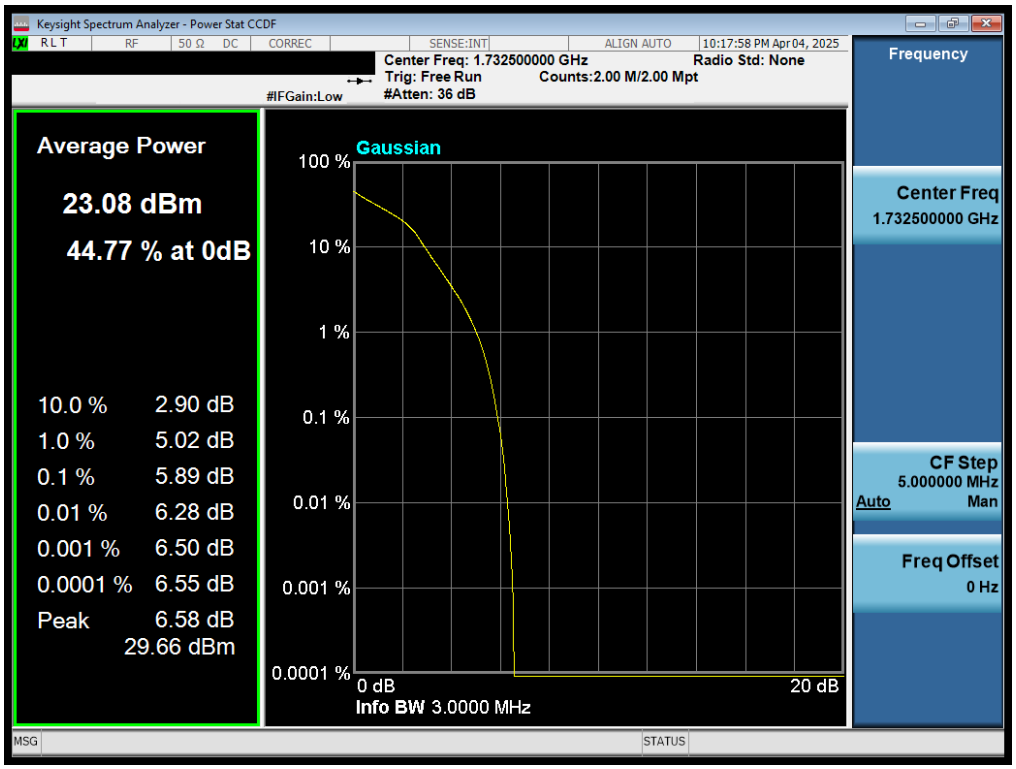
Plot 7-254. PAR Plot (LTE Band 4 - 1.4MHz QPSK - Full RB)



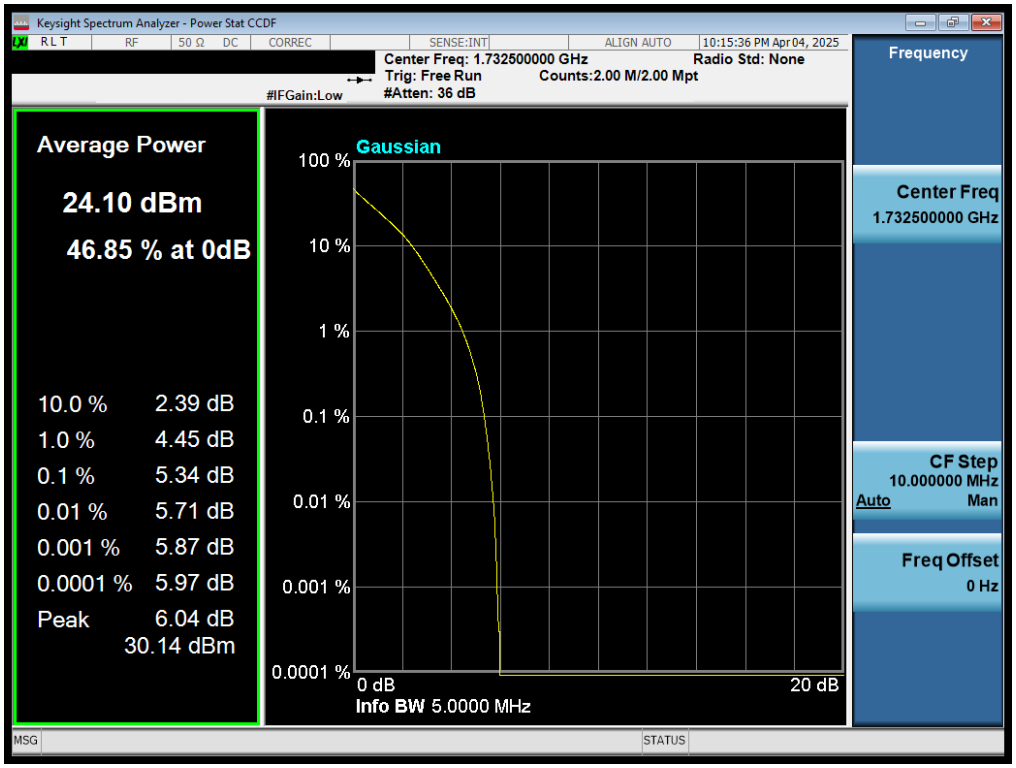
Plot 7-255. PAR Plot (LTE Band 4 - 1.4MHz 16-QAM - Full RB)



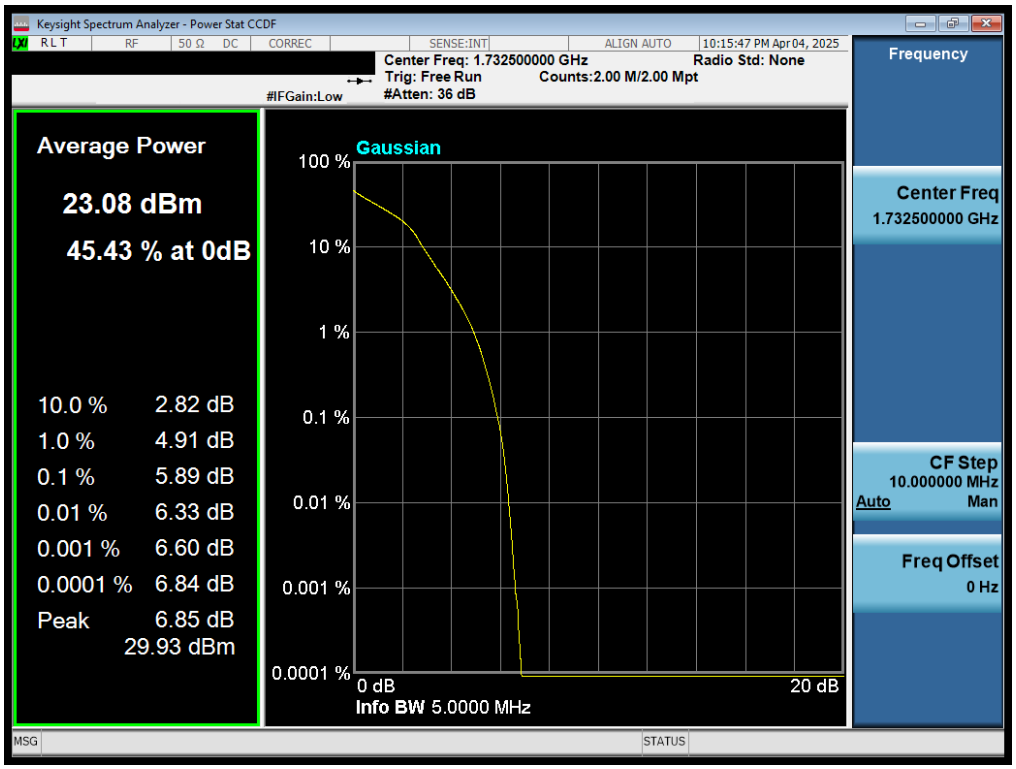
Plot 7-256. PAR Plot (LTE Band 4 - 3MHz QPSK - Full RB)



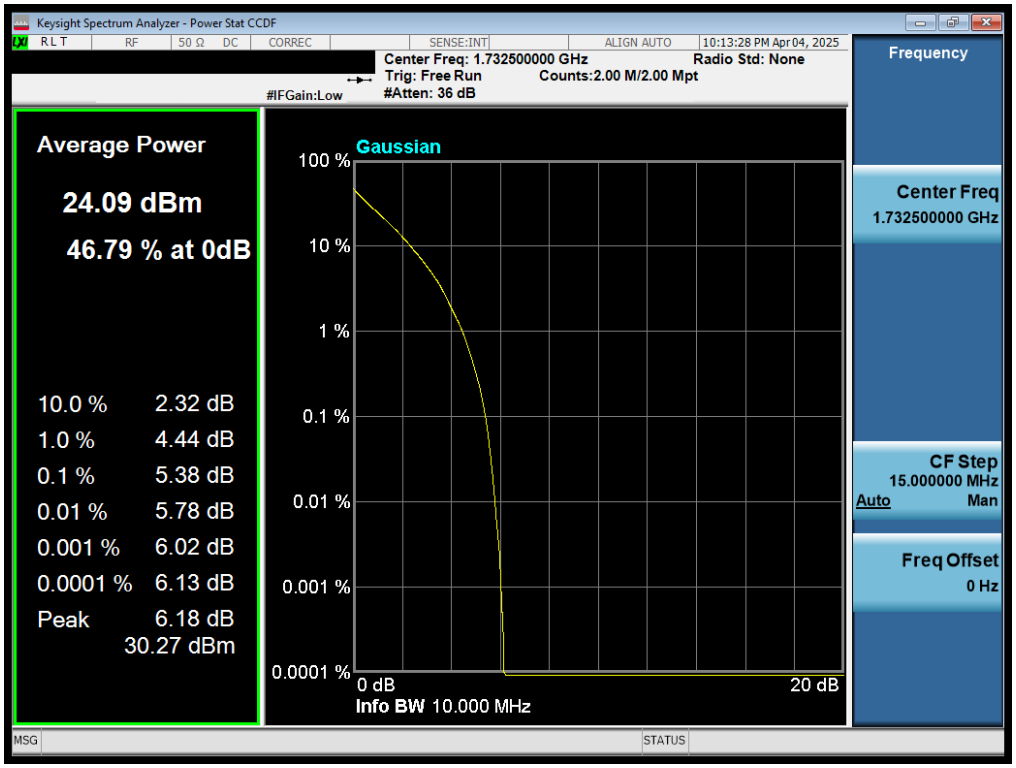
Plot 7-257. PAR Plot (LTE Band 4 - 3MHz 16-QAM - Full RB)



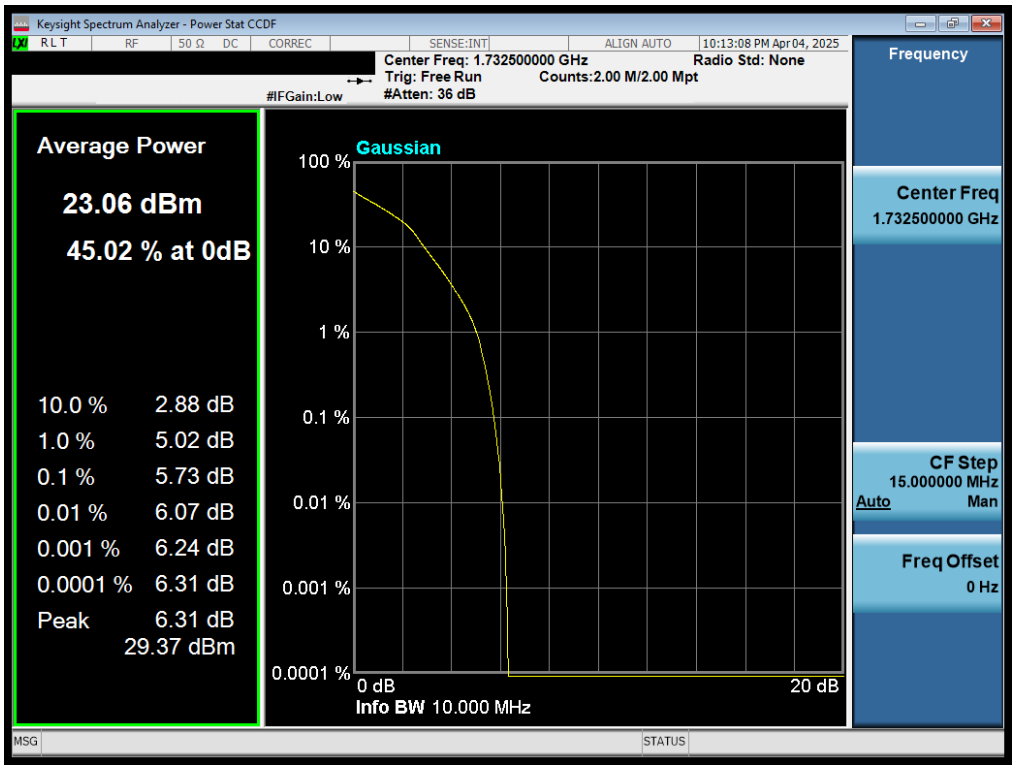
Plot 7-258. PAR Plot (LTE Band 4 - 5MHz QPSK - Full RB)



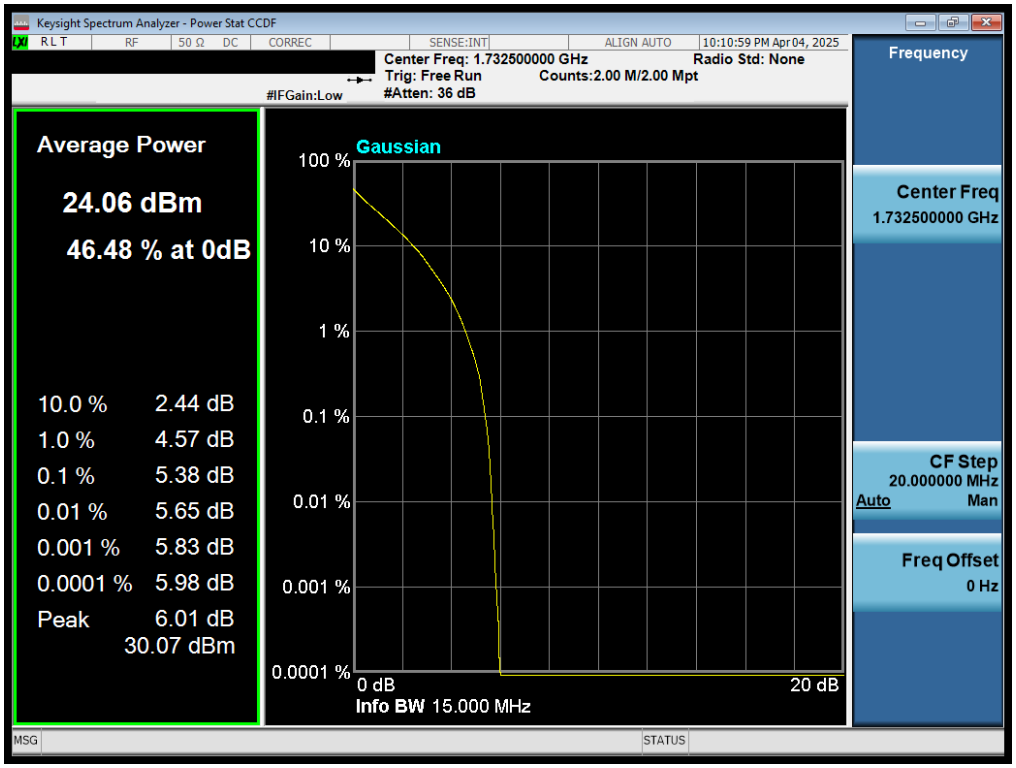
Plot 7-259. PAR Plot (LTE Band 4 - 5MHz 16-QAM - Full RB)



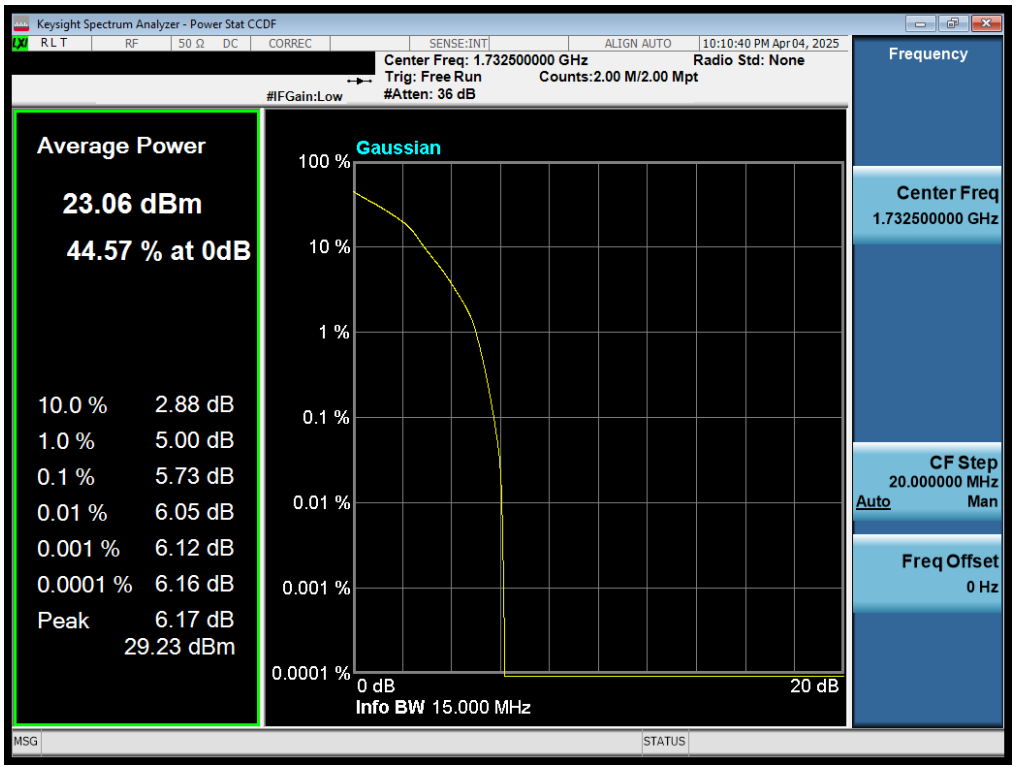
Plot 7-260. PAR Plot (LTE Band 4 - 10MHz QPSK - Full RB)



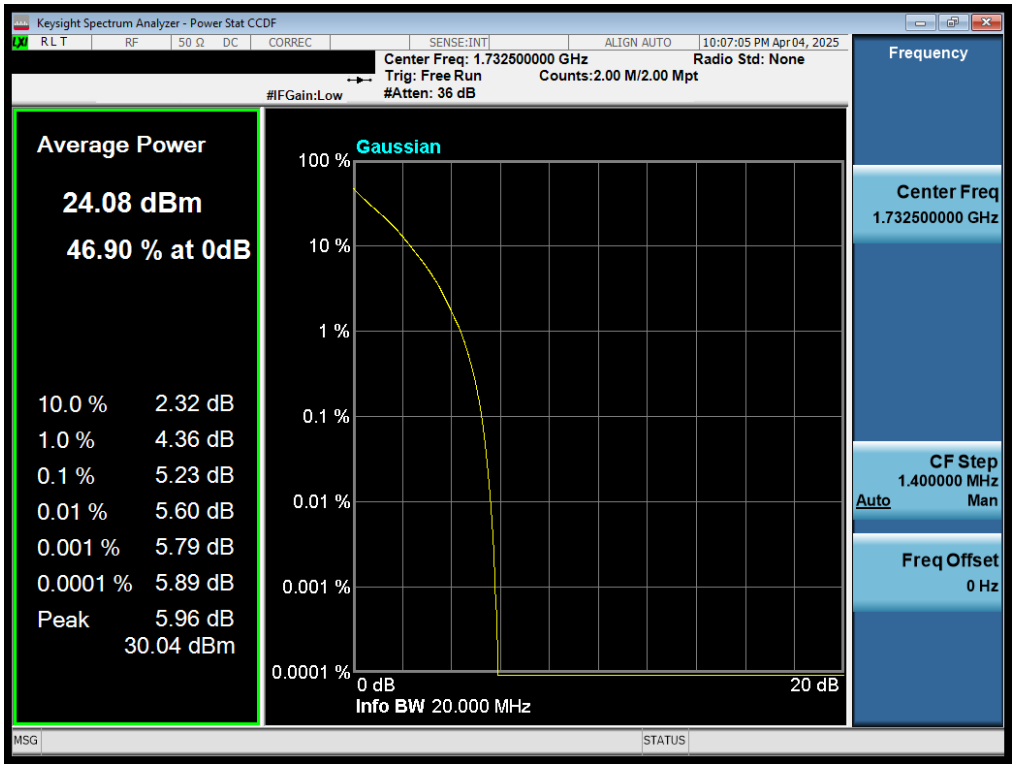
Plot 7-261. PAR Plot (LTE Band 4 - 10MHz 16-QAM - Full RB)



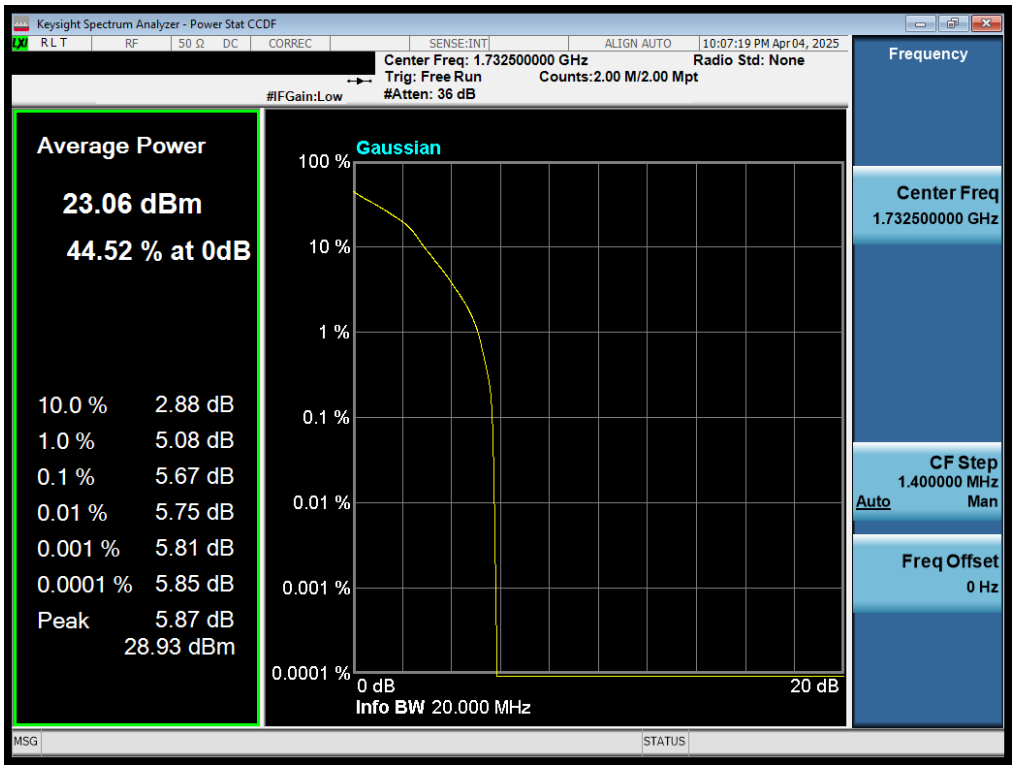
Plot 7-262. PAR Plot (LTE Band 4 - 15MHz QPSK - Full RB)



Plot 7-263. PAR Plot (LTE Band 4 - 15MHz 16-QAM - Full RB)

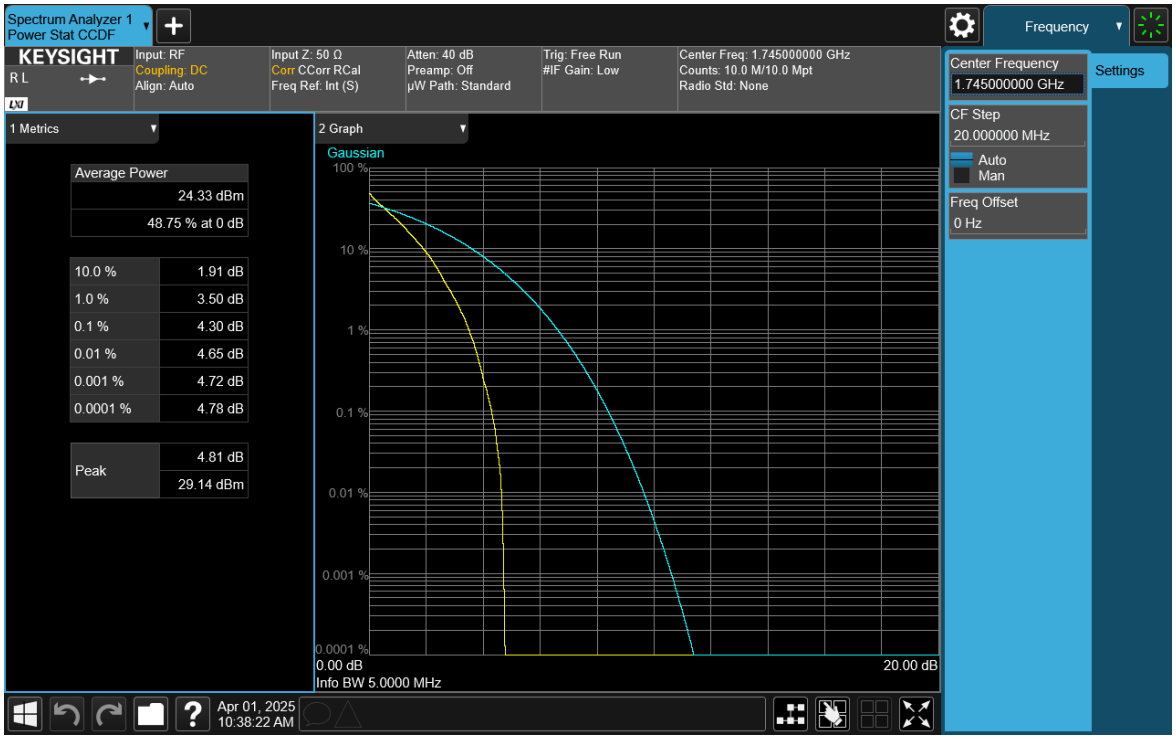


Plot 7-264. PAR Plot (LTE Band 4 - 20MHz QPSK - Full RB)

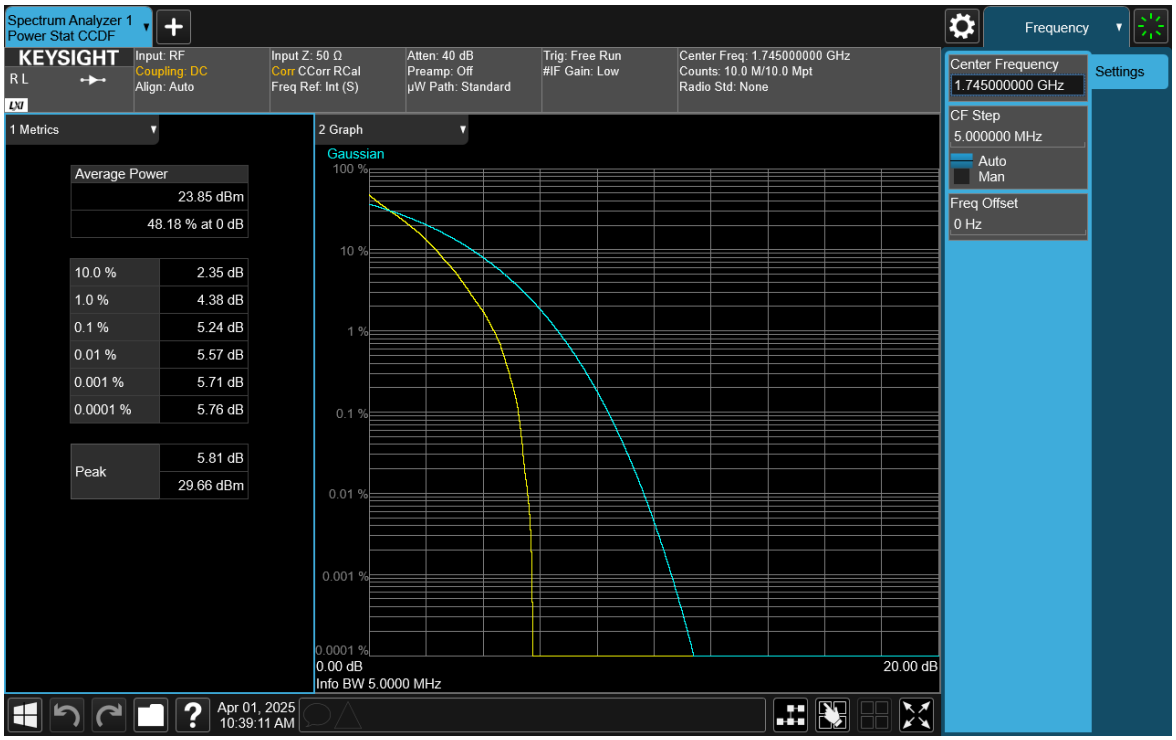


Plot 7-265. PAR Plot (LTE Band 4 - 20MHz 16-QAM - Full RB)

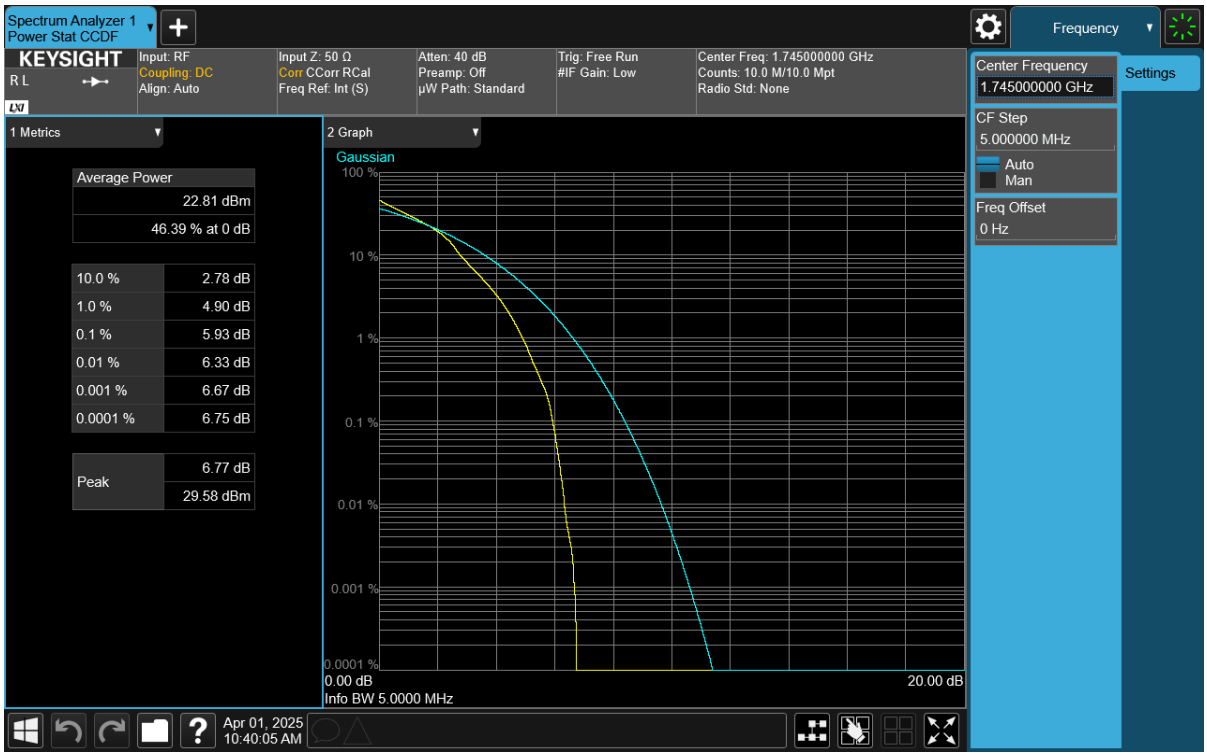
NR Band n66



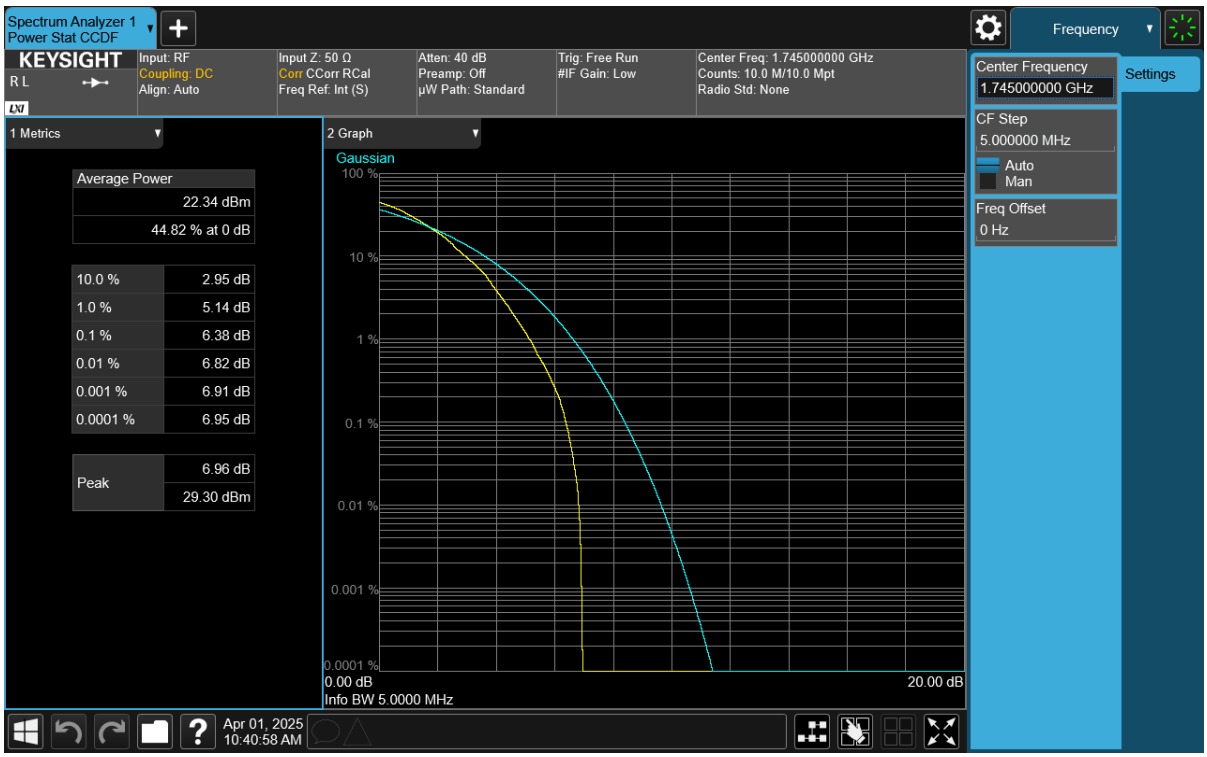
Plot 7-266. PAR Plot (NR Band n66 - 5MHz DFT-s-OFDM π/2 BPSK - Full RB)



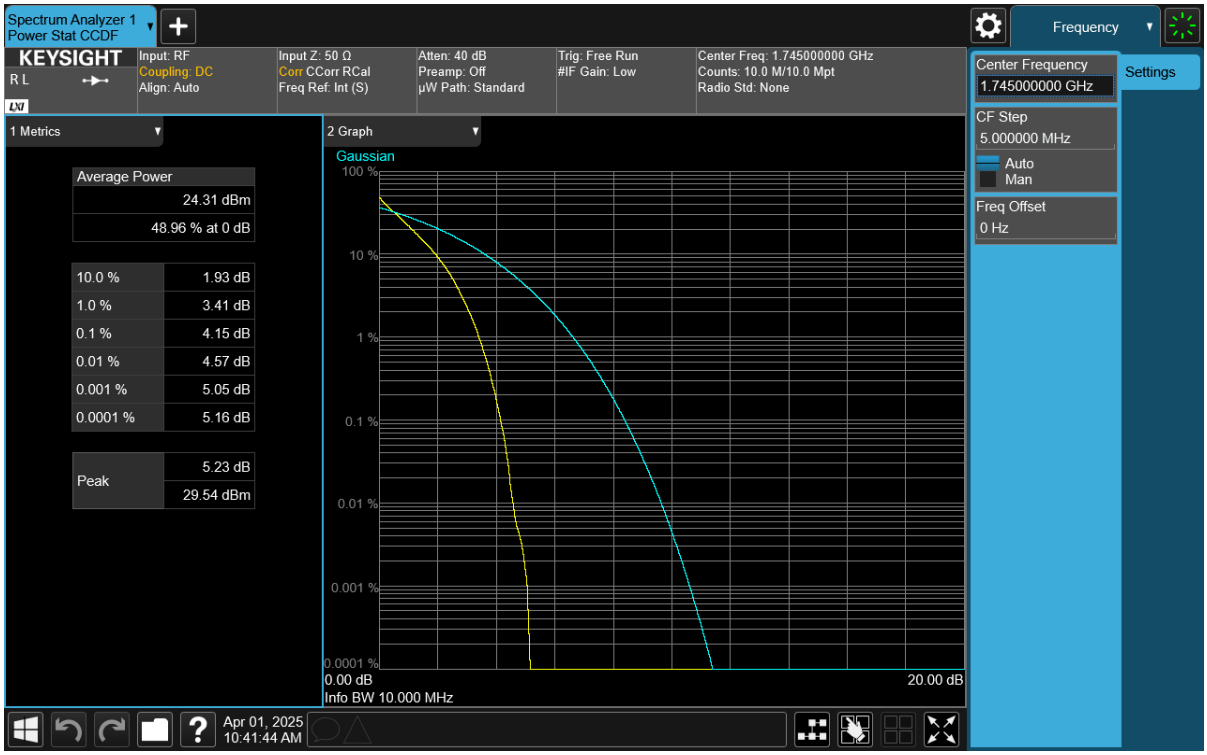
Plot 7-267. PAR Plot (NR Band n66 - 5MHz DFT-s-OFDM QPSK - Full RB)



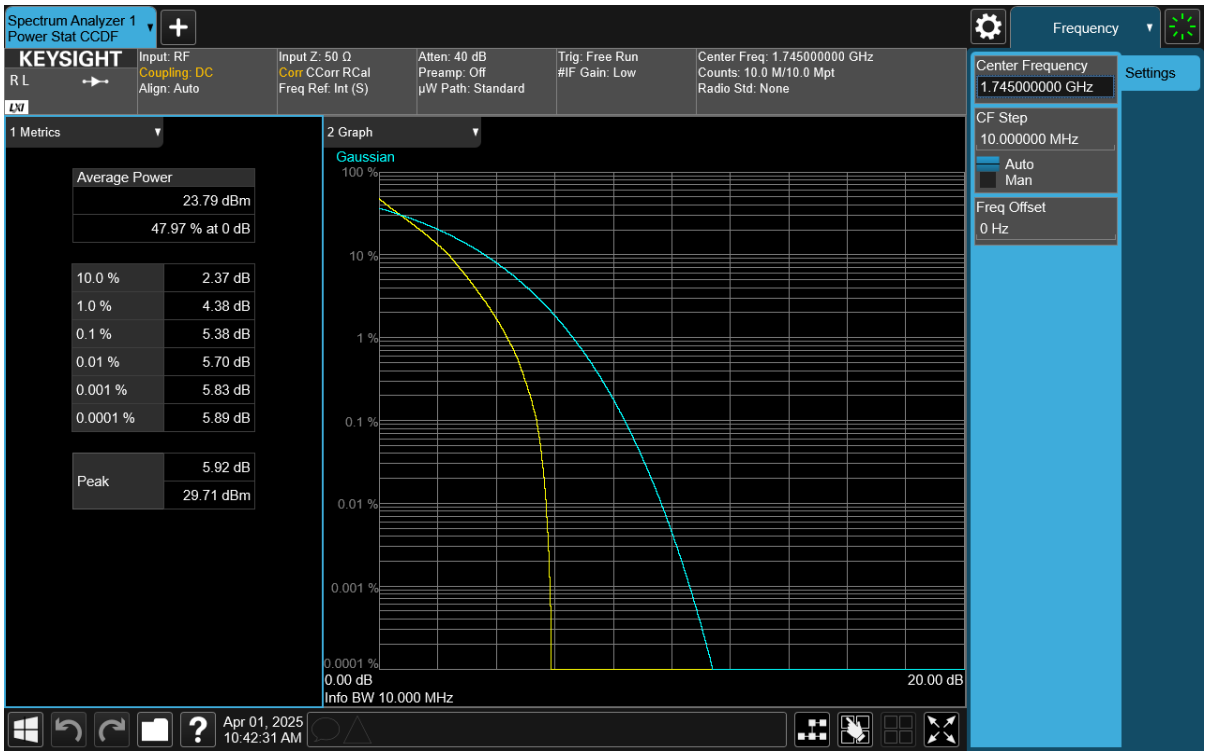
Plot 7-268. PAR Plot (NR Band n66 - 5MHz DFT-s-OFDM 16-QAM - Full RB)



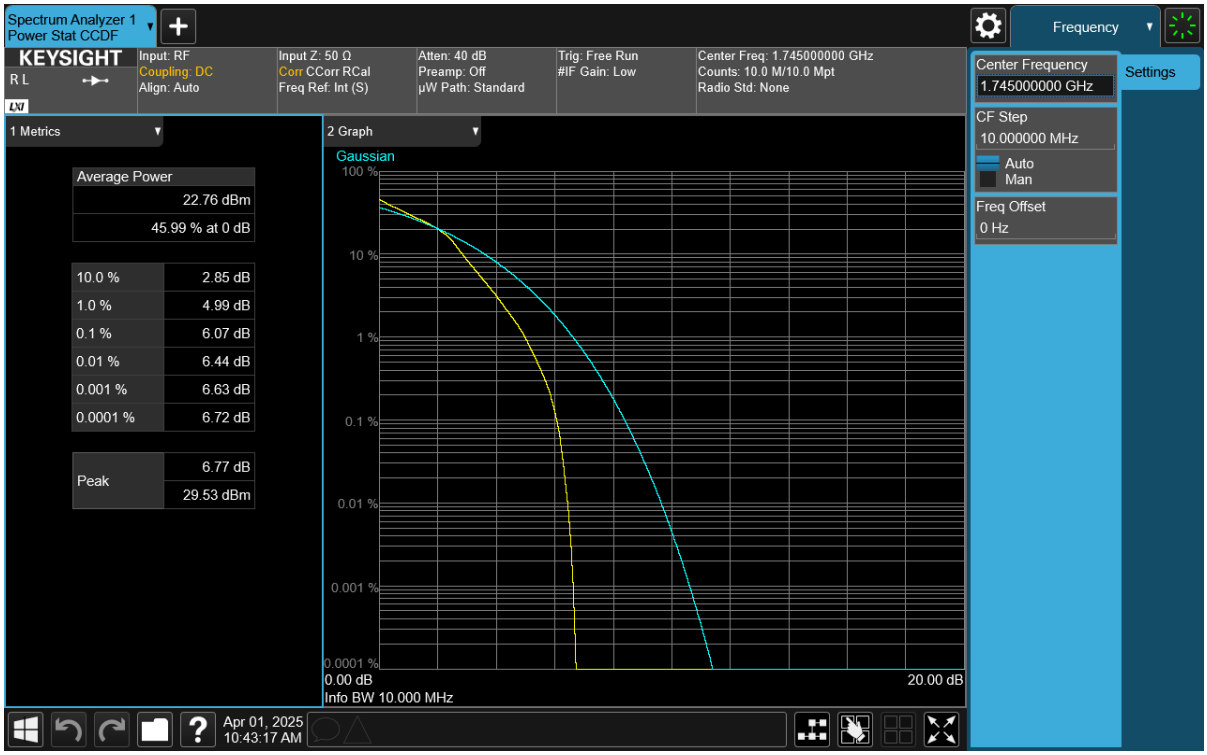
Plot 7-269. PAR Plot (NR Band n66 - 5MHz DFT-s-OFDM 64-QAM - Full RB)



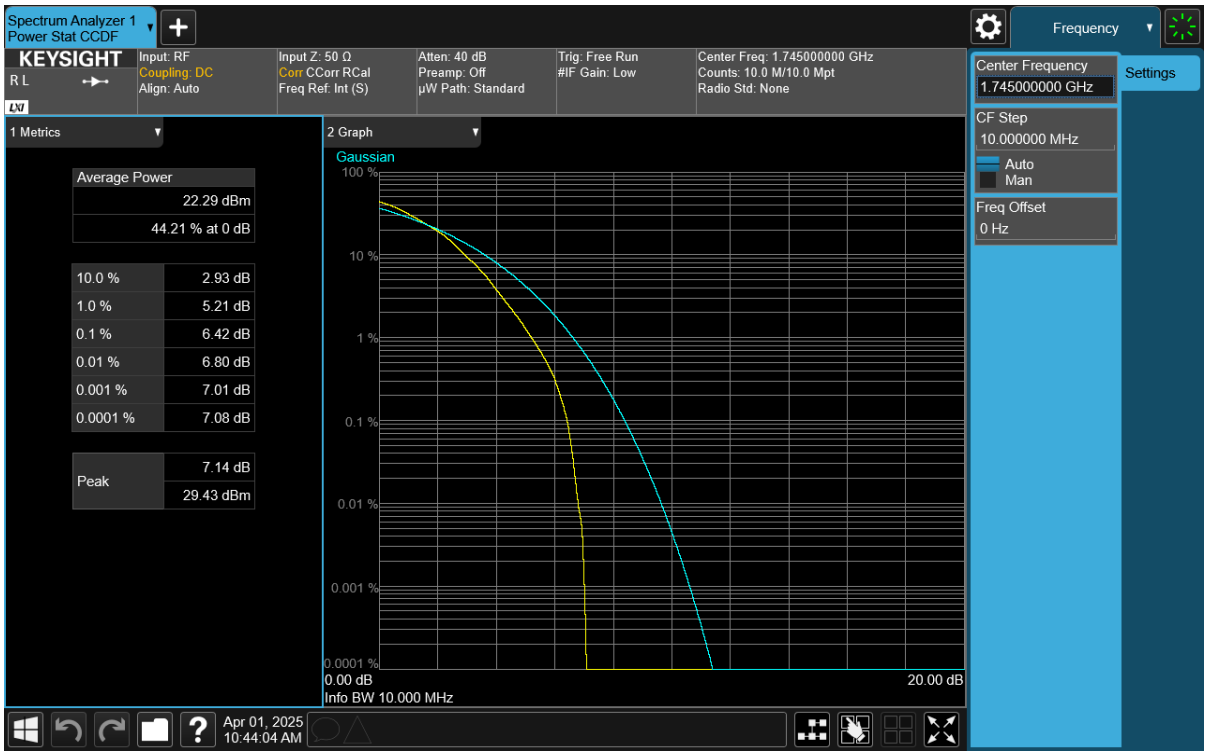
Plot 7-270. PAR Plot (NR Band n66 - 10MHz DFT-s-OFDM π/2 BPSK - Full RB)



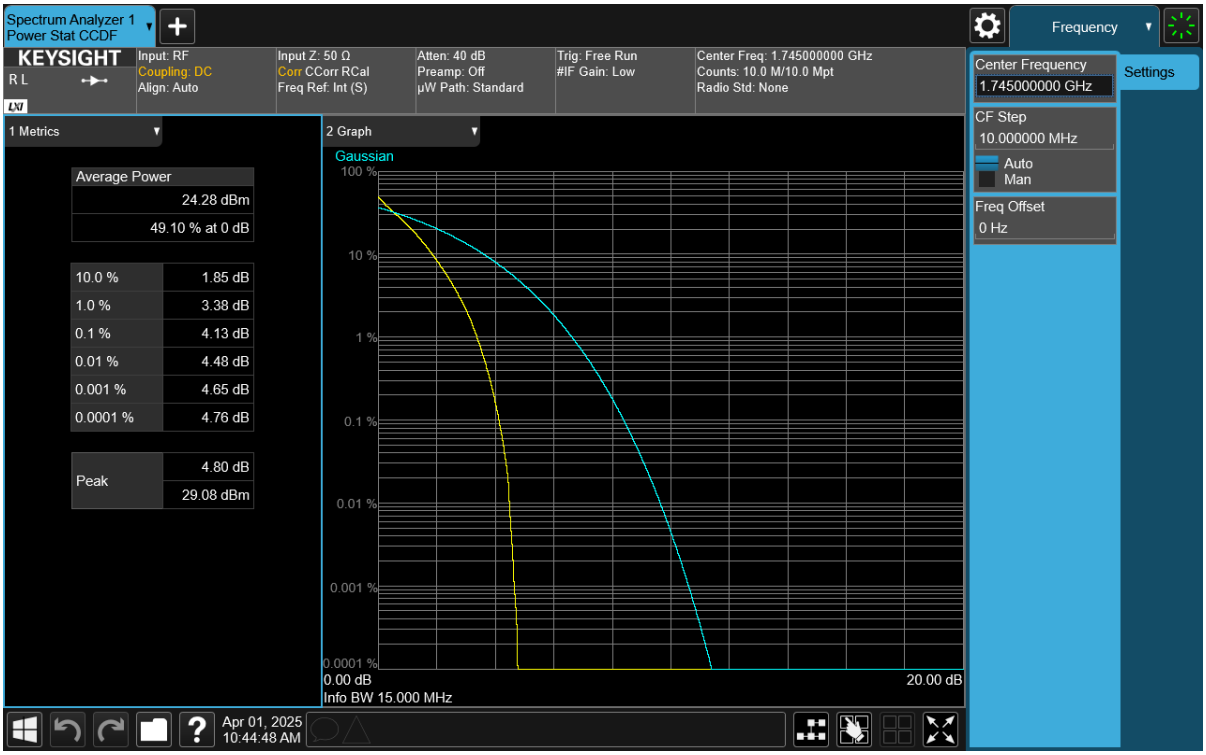
Plot 7-271. PAR Plot (NR Band n66 - 10MHz DFT-s-OFDM QPSK - Full RB)



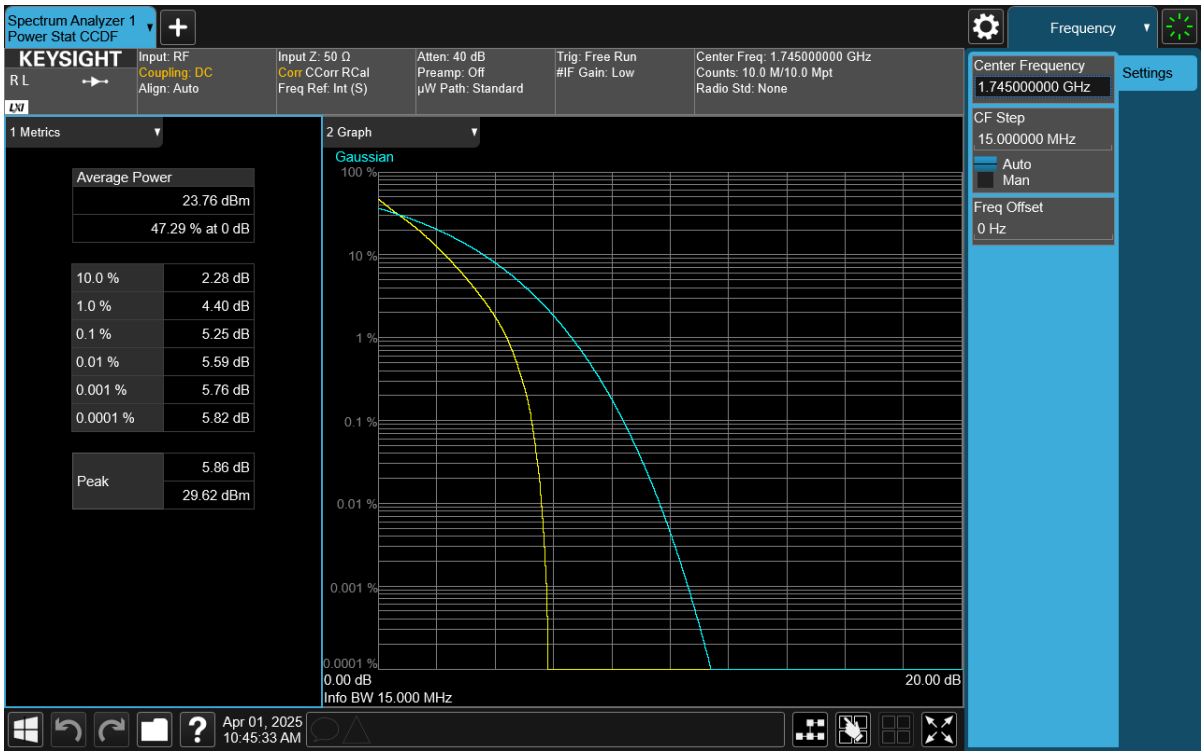
Plot 7-272. PAR Plot (NR Band n66 - 10MHz DFT-s-OFDM 16-QAM - Full RB)



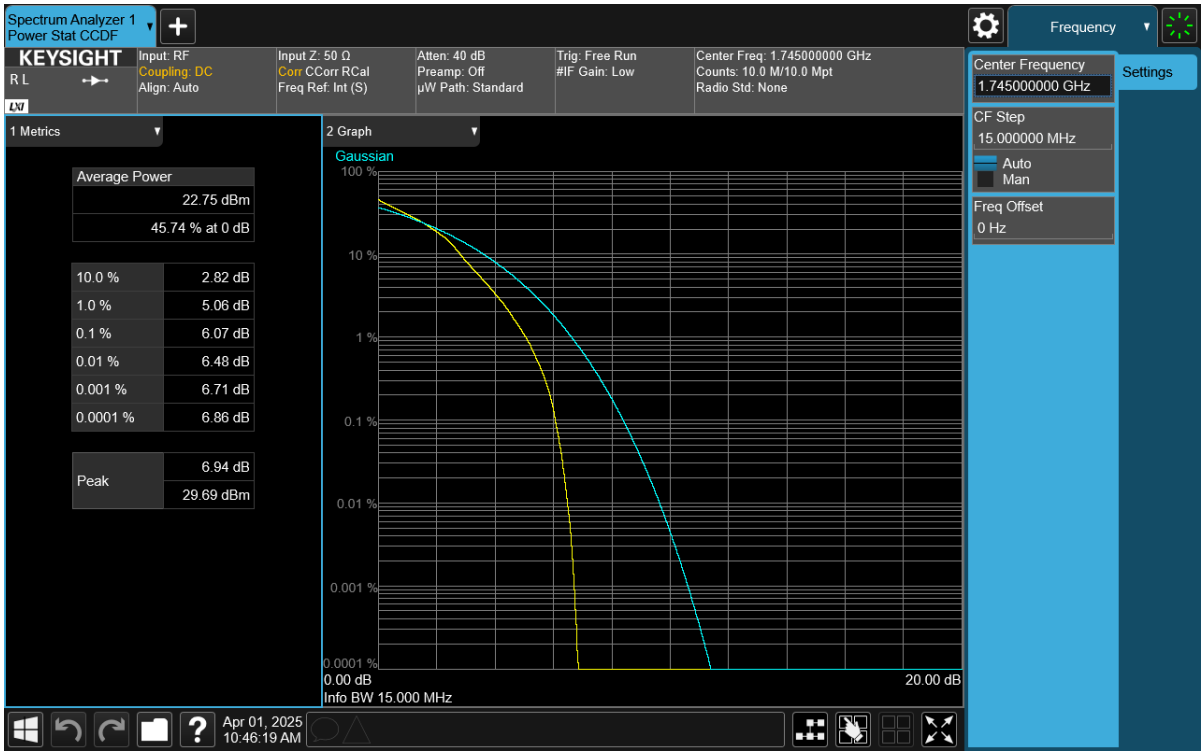
Plot 7-273. PAR Plot (NR Band n66 - 10MHz DFT-s-OFDM 64-QAM - Full RB)



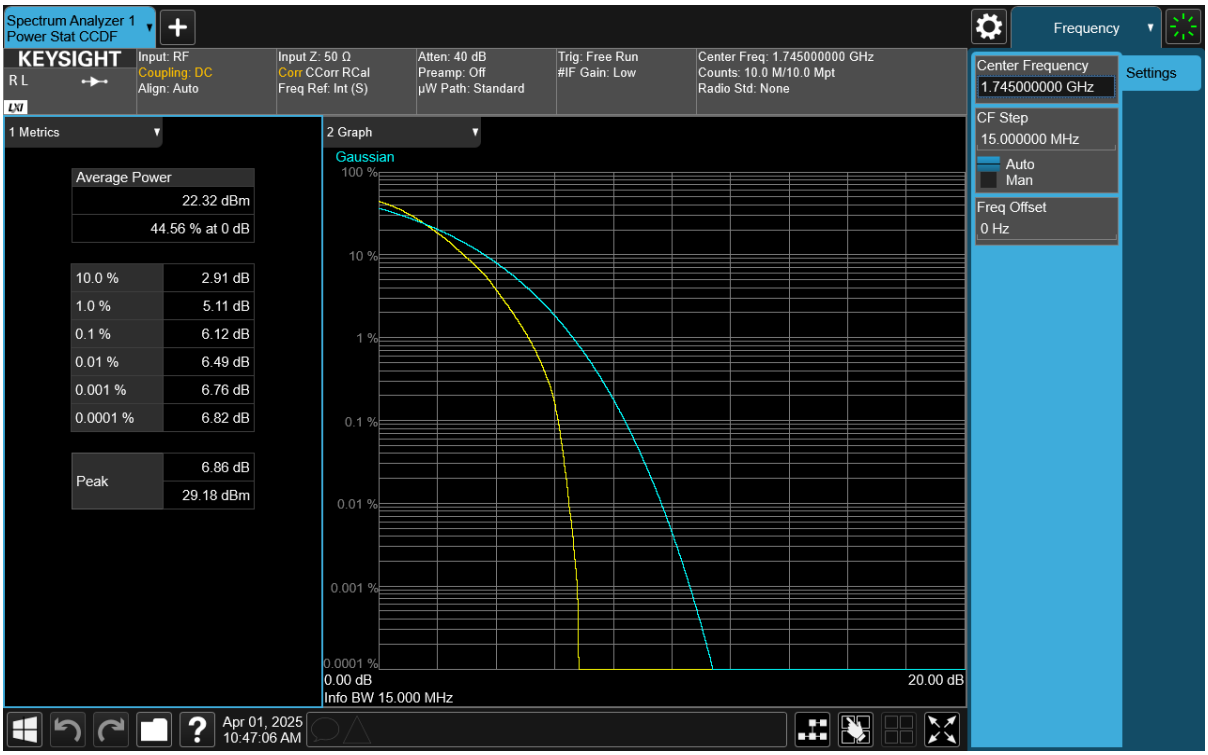
Plot 7-274. PAR Plot (NR Band n66 - 15MHz DFT-s-OFDM π/2 BPSK - Full RB)



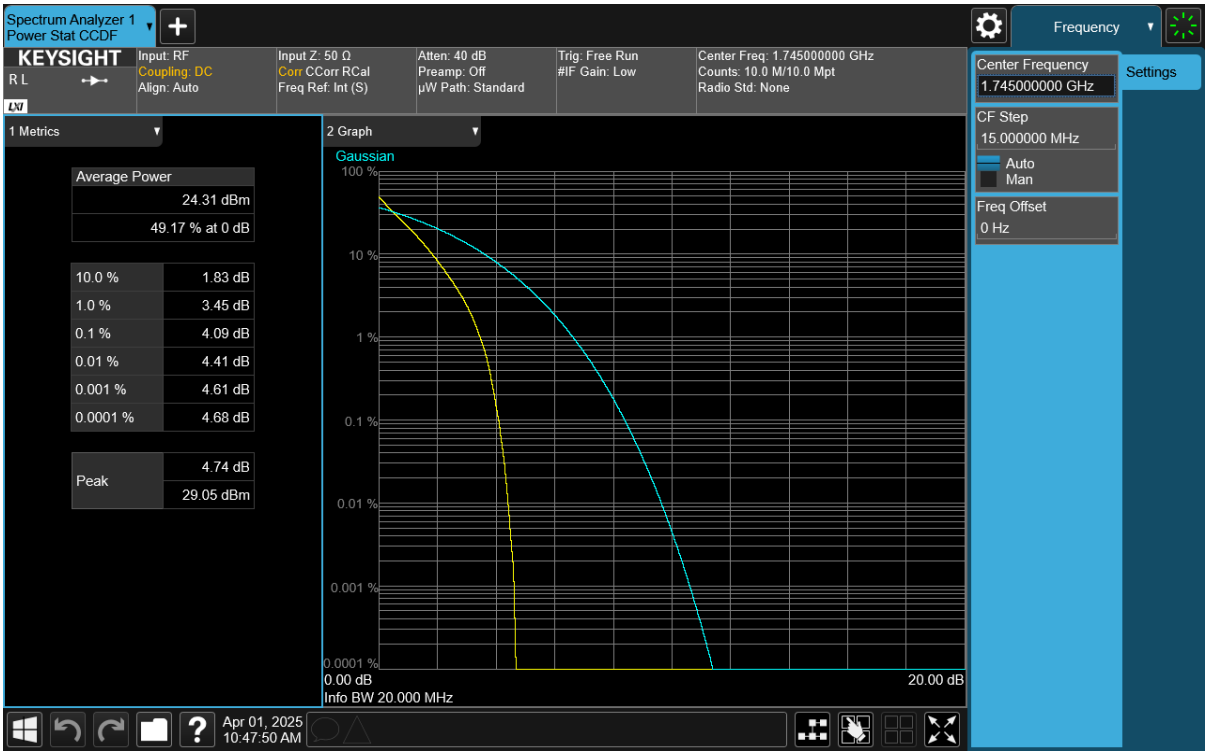
Plot 7-275. PAR Plot (NR Band n66 - 15MHz DFT-s-OFDM QPSK - Full RB)



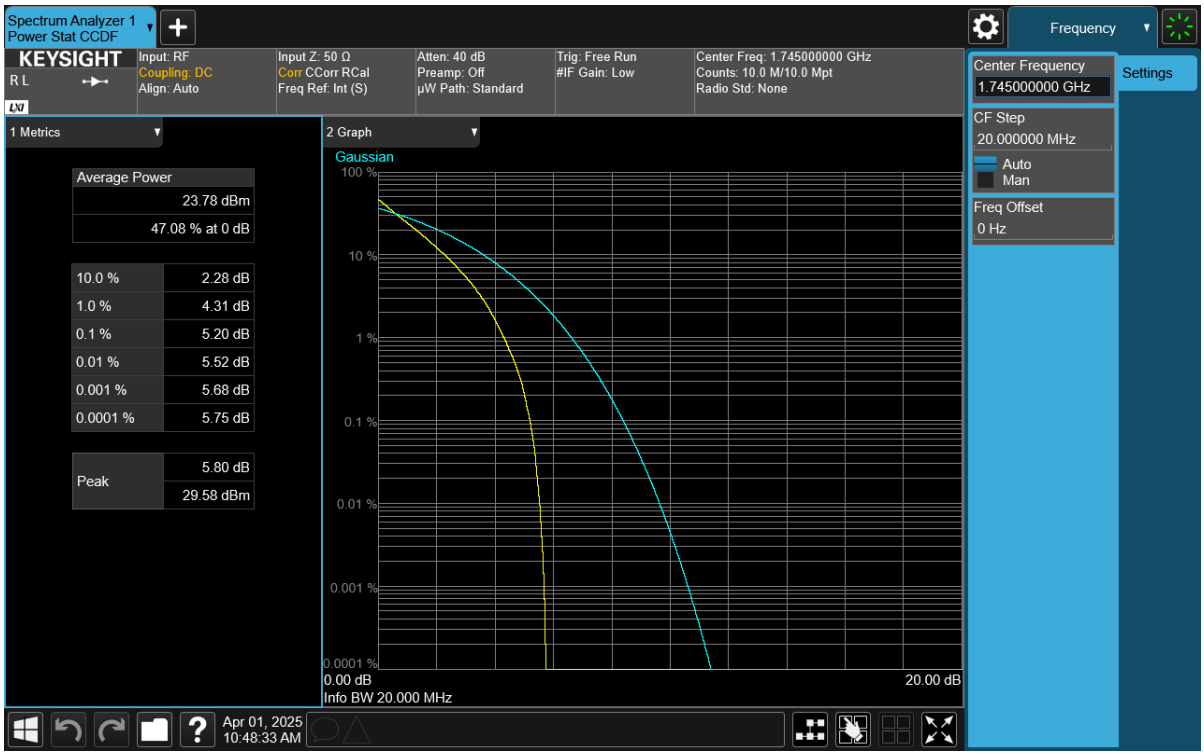
Plot 7-276. PAR Plot (NR Band n66 - 15MHz DFT-s-OFDM 16-QAM - Full RB)



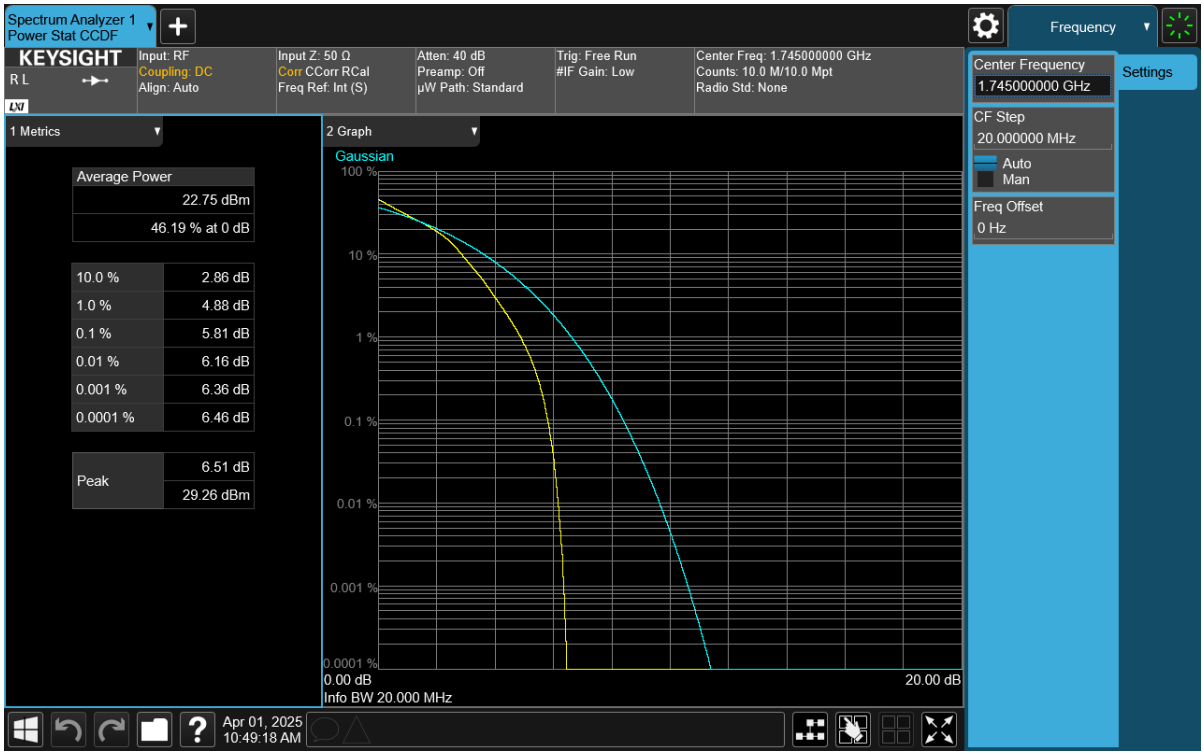
Plot 7-277. PAR Plot (NR Band n66 - 15MHz DFT-s-OFDM 64-QAM - Full RB)



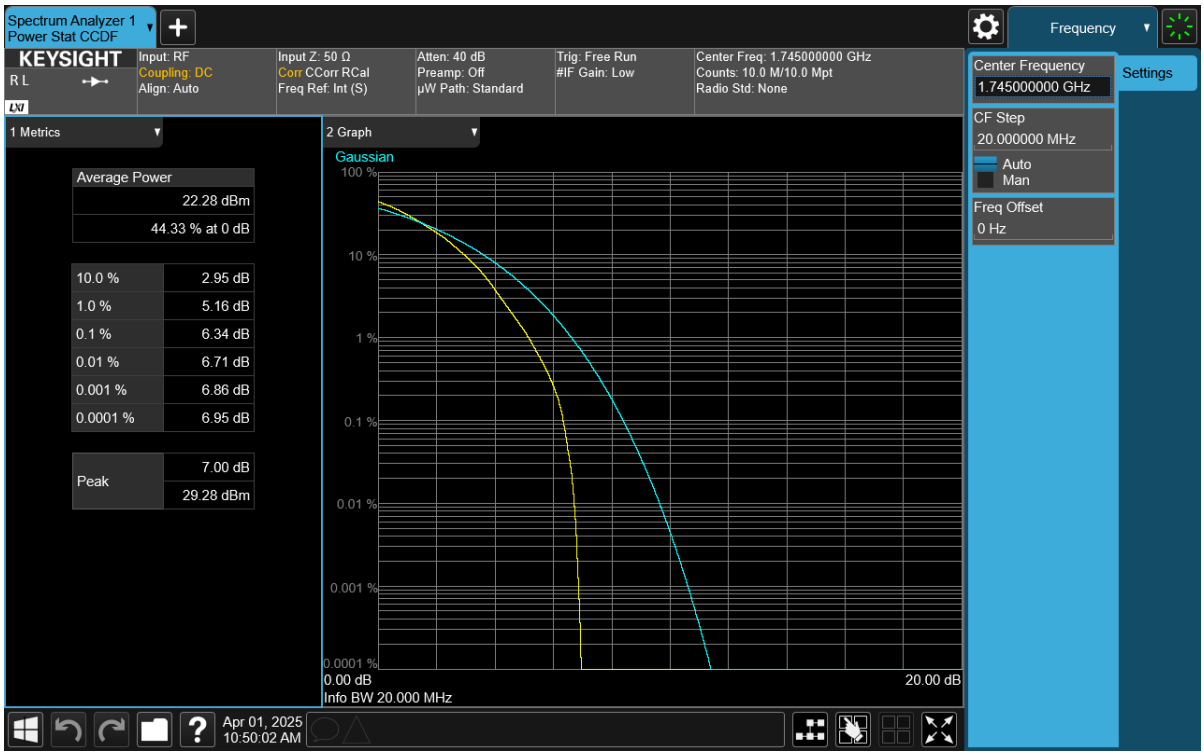
Plot 7-278. PAR Plot (NR Band n66 - 20MHz DFT-s-OFDM π/2 BPSK - Full RB)



Plot 7-279. PAR Plot (NR Band n66 - 20MHz DFT-s-OFDM QPSK - Full RB)



Plot 7-280. PAR Plot (NR Band n66 - 20MHz DFT-s-OFDM 16-QAM - Full RB)



Plot 7-281. PAR Plot (NR Band n66 - 20MHz DFT-s-OFDM 64-QAM - Full RB)

7.6 Radiated Power (ERP/EIRP)

§27.50(b)(10), §27.50(c)(10), §27.50(d)(4)

Test Overview

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements are calculated by adding highest antenna gain to maximum measured conducted output power. 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 Procedures Used

KDB 971168 D01 v03r01 – Section 5.2.1
ANSI C63.26-2015 – Section 5.2.5.5

Test Settings

The relevant equation for determining the ERP or EIRP from the conducted RF output power measured is:

ERP/EIRP = PMeas – LC + GT

Where:

ERP/EIRP = Effective or Equivalent Isotropic Radiated Power, respectively (expressed in the same units as PMeas, typically dBW or dBm)

PMeas = measured transmitter output power or PSD, in dBW or dBm

LC = signal attenuation in the connecting cable between the transmitter and antenna in dB

GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

Test Setup

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

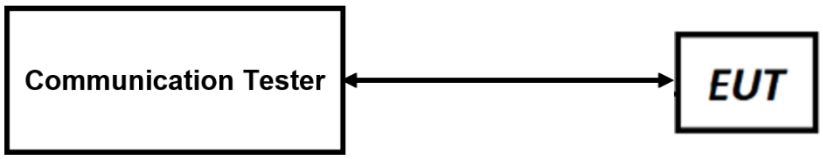


Figure 7-9. LTE ERP/EIRP Measurement Setup

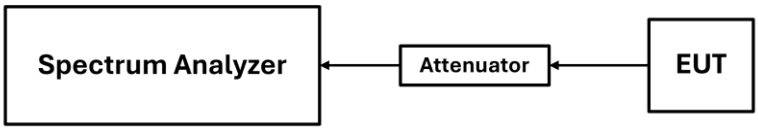


Figure 7-10. FR1 ERP/EIRP Measurement Setup

Test Notes

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

2. This unit was tested with its standard battery.

3. The Level (dBm) readings in the table were taken with a correction table loaded into the base station simulator. The correction table was used to account for the signal attenuation in the connecting cable between the transmitter and antenna.

4. The Ant. Gains (GT) are listed in dBi.

5. 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.

7.6.1 EIRP/ERP

LTE Band 66

Bandwidth	Modulation	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	EIRP [dBm]	EIRP [mW]	EIRP Limit [dBm]	Margin [dB]
1.4 MHz	QPSK	1710.7	-11.10	1 / 0	24.92	13.82	24.099	30.00	-16.18
		1745.0	-11.10	1 / 3	25.02	13.92	24.660	30.00	-16.08
		1779.3	-11.10	1 / 3	25.20	**14.10**	25.704	30.00	-15.90
	16-QAM	1779.3	-11.10	1 / 0	24.21	13.11	20.464	30.00	-16.89
3 MHz	QPSK	1711.5	-11.10	1 / 0	25.02	13.92	24.660	30.00	-16.08
		1745.0	-11.10	1 / 0	25.08	13.98	25.003	30.00	-16.02
		1778.5	-11.10	1 / 7	25.09	**13.99**	25.061	30.00	-16.01
	16-QAM	1711.5	-11.10	1 / 7	24.19	13.09	20.370	30.00	-16.91
5 MHz	QPSK	1712.5	-11.10	1 / 12	25.19	**14.09**	25.645	30.00	-15.91
		1745.0	-11.10	1 / 12	25.00	13.90	24.547	30.00	-16.10
		1777.5	-11.10	1 / 0	25.16	14.06	25.468	30.00	-15.94
	16-QAM	1745.0	-11.10	1 / 0	24.11	13.01	19.999	30.00	-16.99
10 MHz	QPSK	1715.0	-11.10	1 / 25	25.19	**14.09**	25.645	30.00	-15.91
		1745.0	-11.10	1 / 25	24.90	13.80	23.988	30.00	-16.20
		1775.0	-11.10	1 / 25	25.12	14.02	25.235	30.00	-15.98
	16-QAM	1715.0	-11.10	1 / 49	24.19	13.09	20.370	30.00	-16.91
15 MHz	QPSK	1717.5	-11.10	1 / 0	25.18	**14.08**	25.586	30.00	-15.92
		1745.0	-11.10	1 / 0	25.15	14.05	25.410	30.00	-15.95
		1772.5	-11.10	1 / 0	25.13	14.03	25.293	30.00	-15.97
	16-QAM	1717.5	-11.10	1 / 37	24.17	13.07	20.277	30.00	-16.93
20 MHz	QPSK	1720.0	-11.10	1 / 50	25.17	**14.07**	25.527	30.00	-15.93
		1745.0	-11.10	1 / 0	25.12	14.02	25.235	30.00	-15.98
		1770.0	-11.10	1 / 50	25.17	**14.07**	25.527	30.00	-15.93
	16-QAM	1745.0	-11.10	1 / 99	24.31	13.21	20.941	30.00	-16.79

Table 7-2. Antenna FCM EIRP Data LTE Band 66

LTE Band 4

Bandwidth	Modulation	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	EIRP [dBm]	EIRP [mW]	EIRP Limit [dBm]	Margin [dB]
1.4 MHz	QPSK	1710.7	-11.10	1 / 3	25.09	13.99	25.061	30.00	-16.01
		1732.5	-11.10	1 / 3	24.95	13.85	24.266	30.00	-16.15
		1754.3	-11.10	1 / 0	25.20	**14.10**	25.704	30.00	-15.90
	16-QAM	1732.5	-11.10	1 / 5	24.20	13.10	20.417	30.00	-16.90
3 MHz	QPSK	1711.5	-11.10	1 / 0	25.14	14.04	25.351	30.00	-15.96
		1732.5	-11.10	1 / 14	25.03	13.93	24.717	30.00	-16.07
		1753.5	-11.10	1 / 0	25.20	**14.10**	25.704	30.00	-15.90
	16-QAM	1732.5	-11.10	1 / 7	24.22	13.12	20.512	30.00	-16.88
5 MHz	QPSK	1712.5	-11.10	1 / 0	25.20	**14.10**	25.704	30.00	-15.90
		1732.5	-11.10	1 / 0	25.09	13.99	25.061	30.00	-16.01
		1752.5	-11.10	1 / 24	24.97	13.87	24.378	30.00	-16.13
	16-QAM	1732.5	-11.10	1 / 0	24.22	13.12	20.512	30.00	-16.88
10 MHz	QPSK	1715.0	-11.10	1 / 25	25.20	**14.10**	25.704	30.00	-15.90
		1732.5	-11.10	1 / 49	25.20	**14.10**	25.704	30.00	-15.90
		1750.0	-11.10	1 / 49	25.19	14.09	25.645	30.00	-15.91
	16-QAM	1732.5	-11.10	1 / 0	24.19	13.09	20.370	30.00	-16.91
15 MHz	QPSK	1717.5	-11.10	1 / 74	24.78	13.68	23.335	30.00	-16.32
		1732.5	-11.10	1 / 0	25.20	**14.10**	25.704	30.00	-15.90
		1747.5	-11.10	1 / 0	24.99	13.89	24.491	30.00	-16.11
	16-QAM	1747.5	-11.10	1 / 74	24.21	13.11	20.464	30.00	-16.89
20 MHz	QPSK	1720.0	-11.10	1 / 50	25.16	14.06	25.468	30.00	-15.94
		1732.5	-11.10	1 / 0	25.17	**14.07**	25.527	30.00	-15.93
		1745.0	-11.10	1 / 99	25.02	13.92	24.660	30.00	-16.08
	16-QAM	1720.0	-11.10	1 / 50	24.15	13.05	20.184	30.00	-16.95

Table 7-3. Antenna FCM EIRP Data LTE Band 4

LTE Band 71

Bandwidth	Modulation	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	ERP [dBm]	ERP [mW]	ERP Limit [dBm]	Margin [dB]
5 MHz	QPSK	665.5	-31.00	1 / 12	25.70	**-7.45**	0.180	34.77	-42.22
		680.5	-31.00	1 / 12	25.70	**-7.45**	0.180	34.77	-42.22
		695.5	-31.00	1 / 24	25.51	-7.64	0.172	34.77	-42.41
	16-QAM	680.5	-31.00	1 / 12	24.93	-8.22	0.151	34.77	-42.99
10 MHz	QPSK	668.0	-31.00	1 / 0	25.67	-7.48	0.179	34.77	-42.25
		680.5	-31.00	1 / 25	25.66	-7.49	0.178	34.77	-42.26
		693.0	-31.00	1 / 49	25.55	-7.60	0.174	34.77	-42.37
	16-QAM	680.5	-31.00	1 / 25	24.66	-8.49	0.142	34.77	-43.26
15 MHz	QPSK	670.5	-31.00	1 / 0	25.70	**-7.45**	0.180	34.77	-42.22
		680.5	-31.00	1 / 0	25.70	**-7.45**	0.180	34.77	-42.22
		690.5	-31.00	1 / 0	25.57	-7.58	0.175	34.77	-42.35
	16-QAM	670.5	-31.00	1 / 74	24.74	-8.41	0.144	34.77	-43.18
20 MHz	QPSK	673.0	-31.00	1 / 0	25.70	**-7.45**	0.180	34.77	-42.22
		680.5	-31.00	1 / 50	25.54	-7.61	0.173	34.77	-42.38
		688.0	-31.00	1 / 0	25.70	**-7.45**	0.180	34.77	-42.22
	16-QAM	673.0	-31.00	1 / 50	24.96	-8.19	0.152	34.77	-42.96

Table 7-4. Antenna BCM ERP Data LTE Band 71

LTE Band 12

Bandwidth	Modulation	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	ERP [dBm]	ERP [mW]	ERP Limit [dBm]	Margin [dB]
1.4 MHz	QPSK	699.7	-30.70	1 / 5	25.55	**-7.30**	0.186	34.77	-42.07
		707.5	-30.70	1 / 5	25.65	-7.20	0.191	34.77	-41.97
		715.3	-30.70	1 / 0	25.70	**-7.15**	0.193	34.77	-41.92
	16-QAM	707.5	-30.70	1 / 0	25.08	-7.77	0.167	34.77	-42.54
3 MHz	QPSK	700.5	-30.70	1 / 0	25.62	-7.23	0.189	34.77	-42.00
		707.5	-30.70	1 / 14	25.70	**-7.15**	0.193	34.77	-41.92
		714.5	-30.70	1 / 0	25.57	-7.28	0.187	34.77	-42.05
	16-QAM	707.5	-30.70	1 / 14	25.12	-7.73	0.169	34.77	-42.50
5 MHz	QPSK	701.5	-30.70	1 / 24	25.70	**-7.15**	0.193	34.77	-41.92
		707.5	-30.70	1 / 0	25.70	**-7.15**	0.193	34.77	-41.92
		713.5	-30.70	1 / 0	25.56	-7.29	0.187	34.77	-42.06
	16-QAM	707.5	-30.70	1 / 24	25.29	-7.56	0.175	34.77	-42.33
10 MHz	QPSK	704.0	-30.70	1 / 49	25.59	-7.26	0.188	34.77	-42.03
		707.5	-30.70	1 / 0	25.64	**-7.21**	0.190	34.77	-41.98
		711.0	-30.70	1 / 0	25.59	-7.26	0.188	34.77	-42.03
	16-QAM	707.5	-30.70	1 / 0	25.00	-7.85	0.164	34.77	-42.62

Table 7-5. Antenna BCM ERP Data LTE Band 12

LTE Band 17

Bandwidth	Modulation	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	ERP [dBm]	ERP [mW]	ERP Limit [dBm]	Margin [dB]
5 MHz	QPSK	706.5	-30.70	1 / 0	25.70	**-7.15**	0.193	34.77	-41.92
		710.0	-30.70	1 / 0	25.70	**-7.15**	0.193	34.77	-41.92
		713.5	-30.70	1 / 12	25.57	-7.28	0.187	34.77	-42.05
	16-QAM	713.5	-30.70	1 / 0	24.70	-8.15	0.153	34.77	-42.92
10 MHz	QPSK	709.0	-30.70	1 / 0	25.63	**-7.22**	0.190	34.77	-41.99
		710.0	-30.70	1 / 49	25.63	**-7.22**	0.190	34.77	-41.99
		711.0	-30.70	1 / 0	25.60	-7.25	0.188	34.77	-42.02
	16-QAM	710.0	-30.70	1 / 49	24.78	-8.07	0.156	34.77	-42.84

Table 7-6. Antenna BCM ERP Data LTE Band 17

LTE Band 13

Bandwidth	Modulation	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	ERP [dBm]	ERP [mW]	ERP Limit [dBm]	Margin [dB]
5 MHz	QPSK	779.5	-28.20	1 / 24	25.70	**-4.65**	0.343	34.77	-39.42
		782.0	-28.20	1 / 12	25.70	**-4.65**	0.343	34.77	-39.42
		784.5	-28.20	1 / 0	25.54	-4.81	0.330	34.77	-39.58
	16-QAM	782.0	-28.20	1 / 12	24.81	-5.54	0.279	34.77	-40.31
10 MHz	QPSK	782.0	-28.20	1 / 0	25.58	**-4.77**	0.333	34.77	-39.54
	16-QAM	782.0	-28.20	1 / 25	24.59	-5.76	0.265	34.77	-40.53

Table 7-7. Antenna BCM ERP Data LTE Band 13

NR Band n66

Bandwidth	Modulation	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	EIRP [dBm]	EIRP [mW]	EIRP Limit [dBm]	Margin [dB]
5 MHz	π/2 BPSK	1712.5	-11.10	1 / 12	25.19	14.09	25.645	30.00	-15.91
		1745.0	-11.10	1 / 0	25.10	14.00	25.119	30.00	-16.00
		1777.5	-11.10	1 / 12	25.13	14.03	25.293	30.00	-15.97
	QPSK	1712.5	-11.10	1 / 24	25.00	13.90	24.547	30.00	-16.10
		1745.0	-11.10	1 / 0	24.99	13.89	24.491	30.00	-16.11
		1777.5	-11.10	1 / 0	25.20	**14.10**	25.704	30.00	-15.90
	16-QAM	1712.5	-11.10	1 / 24	24.16	13.06	20.230	30.00	-16.94
	64-QAM	1777.5	-11.10	1 / 0	23.19	12.09	16.181	30.00	-17.91
10 MHz	π/2 BPSK	1715.0	-11.10	1 / 49	25.18	14.08	25.586	30.00	-15.92
		1745.0	-11.10	1 / 0	25.17	14.07	25.527	30.00	-15.93
		1775.0	-11.10	1 / 49	25.16	14.06	25.468	30.00	-15.94
	QPSK	1715.0	-11.10	1 / 25	25.20	**14.10**	25.704	30.00	-15.90
		1745.0	-11.10	1 / 49	25.02	13.92	24.660	30.00	-16.08
		1775.0	-11.10	1 / 25	25.20	**14.10**	25.704	30.00	-15.90
	16-QAM	1715.0	-11.10	1 / 0	24.18	13.08	20.324	30.00	-16.92
	64-QAM	1745.0	-11.10	1 / 49	23.13	12.03	15.959	30.00	-17.97
15 MHz	π/2 BPSK	1717.5	-11.10	1 / 74	25.12	14.02	25.235	30.00	-15.98
		1745.0	-11.10	1 / 0	25.10	14.00	25.119	30.00	-16.00
		1772.5	-11.10	1 / 0	25.20	**14.10**	25.704	30.00	-15.90
	QPSK	1717.5	-11.10	1 / 0	25.03	13.93	24.717	30.00	-16.07
		1745.0	-11.10	1 / 74	25.13	14.03	25.293	30.00	-15.97
		1772.5	-11.10	1 / 0	25.03	13.93	24.717	30.00	-16.07
	16-QAM	1772.5	-11.10	1 / 0	24.20	13.10	20.417	30.00	-16.90
	64-QAM	1772.5	-11.10	1 / 0	23.25	12.15	16.406	30.00	-17.85
20 MHz	π/2 BPSK	1720.0	-11.10	1 / 0	25.15	14.05	25.410	30.00	-15.95
		1745.0	-11.10	1 / 0	25.09	13.99	25.061	30.00	-16.01
		1770.0	-11.10	1 / 99	25.13	14.03	25.293	30.00	-15.97
	QPSK	1720.0	-11.10	1 / 99	25.09	13.99	25.061	30.00	-16.01
		1745.0	-11.10	1 / 0	25.20	**14.10**	25.704	30.00	-15.90
		1770.0	-11.10	1 / 99	25.07	13.97	24.946	30.00	-16.03
	16-QAM	1745.0	-11.10	1 / 99	24.16	13.06	20.230	30.00	-16.94
	64-QAM	1770.0	-11.10	1 / 0	23.20	12.10	16.218	30.00	-17.90

Table 7-8. Antenna FCM EIRP Data NR Band n66

NR Band n71

Bandwidth	Modulation	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	ERP [dBm]	ERP [mW]	ERP Limit [dBm]	Margin [dB]
5 MHz	π/2 BPSK	665.5	-31.00	1 / 0	25.42	**-7.73**	0.169	34.77	-42.50
		680.5	-31.00	1 / 24	25.65	-7.50	0.178	34.77	-42.27
		695.5	-31.00	1 / 12	25.63	-7.52	0.177	34.77	-42.29
	QPSK	665.5	-31.00	1 / 12	25.50	-7.65	0.172	34.77	-42.42
		680.5	-31.00	1 / 24	25.47	-7.68	0.171	34.77	-42.45
		695.5	-31.00	1 / 24	25.70	**-7.45**	0.180	34.77	-42.22
	16-QAM	665.5	-31.00	1 / 12	24.70	-8.45	0.143	34.77	-43.22
	64-QAM	665.5	-31.00	1 / 0	23.69	-9.46	0.113	34.77	-44.23
10 MHz	π/2 BPSK	668.0	-31.00	1 / 0	25.61	-7.54	0.176	34.77	-42.31
		680.5	-31.00	1 / 49	25.70	**-7.45**	0.180	34.77	-42.22
		693.0	-31.00	1 / 25	25.60	-7.55	0.176	34.77	-42.32
	QPSK	668.0	-31.00	1 / 0	25.58	-7.57	0.175	34.77	-42.34
		680.5	-31.00	1 / 0	25.68	-7.47	0.179	34.77	-42.24
		693.0	-31.00	1 / 25	25.49	-7.66	0.171	34.77	-42.43
	16-QAM	680.5	-31.00	1 / 0	24.63	-8.52	0.141	34.77	-43.29
	64-QAM	668.0	-31.00	1 / 25	23.70	-9.45	0.114	34.77	-44.22
15 MHz	π/2 BPSK	670.5	-31.00	1 / 37	25.68	-7.47	0.179	34.77	-42.24
		680.5	-31.00	1 / 0	25.62	-7.53	0.177	34.77	-42.30
		690.5	-31.00	1 / 74	25.70	**-7.45**	0.180	34.77	-42.22
	QPSK	670.5	-31.00	1 / 37	25.67	-7.48	0.179	34.77	-42.25
		680.5	-31.00	1 / 0	25.46	-7.69	0.170	34.77	-42.46
		690.5	-31.00	1 / 74	25.65	-7.50	0.178	34.77	-42.27
	16-QAM	680.5	-31.00	1 / 0	24.62	-8.53	0.140	34.77	-43.30
	64-QAM	680.5	-31.00	1 / 0	23.64	-9.51	0.112	34.77	-44.28
20 MHz	π/2 BPSK	673.0	-31.00	1 / 0	25.70	**-7.45**	0.180	34.77	-42.22
		680.5	-31.00	1 / 50	25.43	-7.72	0.169	34.77	-42.49
		688.0	-31.00	1 / 50	25.51	-7.64	0.172	34.77	-42.41
	QPSK	673.0	-31.00	1 / 0	25.66	-7.49	0.178	34.77	-42.26
		680.5	-31.00	1 / 99	25.57	-7.58	0.175	34.77	-42.35
		688.0	-31.00	1 / 0	25.68	-7.47	0.179	34.77	-42.24
	16-QAM	673.0	-31.00	1 / 50	24.71	-8.44	0.143	34.77	-43.21
	64-QAM	673.0	-31.00	1 / 99	23.72	-9.43	0.114	34.77	-44.20

Table 7-9. Antenna BCM ERP Data NR Band n71

NR Band n12

Bandwidth	Modulation	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	ERP [dBm]	ERP [mW]	ERP Limit [dBm]	Margin [dB]
5 MHz	π/2 BPSK	701.5	-30.70	1 / 1	25.68	**-7.17**	0.192	34.77	-41.94
		707.5	-30.70	1 / 1	25.68	-7.17	0.192	34.77	-41.94
		713.5	-30.70	1 / 23	25.70	**-7.15**	0.193	34.77	-41.92
	QPSK	701.5	-30.70	1 / 12	25.65	-7.20	0.191	34.77	-41.97
		707.5	-30.70	1 / 12	25.65	-7.20	0.191	34.77	-41.97
		713.5	-30.70	1 / 23	25.69	-7.16	0.192	34.77	-41.93
	16-QAM	701.5	-30.70	1 / 12	24.75	-8.10	0.155	34.77	-42.87
	64-QAM	707.5	-30.70	1 / 23	23.75	-9.10	0.123	34.77	-43.87
10 MHz	π/2 BPSK	704.0	-30.70	1 / 50	25.57	-7.28	0.187	34.77	-42.05
		707.5	-30.70	1 / 26	25.49	-7.36	0.184	34.77	-42.13
		711.0	-30.70	1 / 26	25.70	**-7.15**	0.193	34.77	-41.92
	QPSK	704.0	-30.70	1 / 1	25.32	-7.53	0.177	34.77	-42.30
		707.5	-30.70	1 / 1	25.68	-7.17	0.192	34.77	-41.94
		711.0	-30.70	1 / 50	25.49	-7.36	0.184	34.77	-42.13
	16-QAM	707.5	-30.70	1 / 1	24.57	-8.28	0.149	34.77	-43.05
	64-QAM	704.0	-30.70	1 / 26	23.68	-9.17	0.121	34.77	-43.94
15 MHz	π/2 BPSK	706.5	-30.70	1 / 39	25.58	**-7.27**	0.187	34.77	-42.04
		707.5	-30.70	1 / 1	25.65	-7.20	0.191	34.77	-41.97
		708.5	-30.70	1 / 39	25.70	**-7.15**	0.193	34.77	-41.92
	QPSK	706.5	-30.70	1 / 39	25.38	-7.47	0.179	34.77	-42.24
		707.5	-30.70	1 / 1	25.55	-7.30	0.186	34.77	-42.07
		708.5	-30.70	1 / 39	25.47	-7.38	0.183	34.77	-42.15
	16-QAM	706.5	-30.70	1 / 39	24.65	-8.20	0.151	34.77	-42.97
	64-QAM	707.5	-30.70	1 / 77	23.71	-9.14	0.122	34.77	-43.91

Table 7-10. Antenna BCM ERP Data NR Band n12

7.7 Radiated Spurious Emissions

§2.1053, §27.53(f)

Test Overview

Radiated spurious emissions measurements are performed using the field strength conversion method described in KDB 971168 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using horizontally and vertically polarized broadband hybrid antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed while the EUT is operating at maximum power and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.8

ANSI C63.26 2015, TIA-603-E-2016 – Section 2.2.12

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.

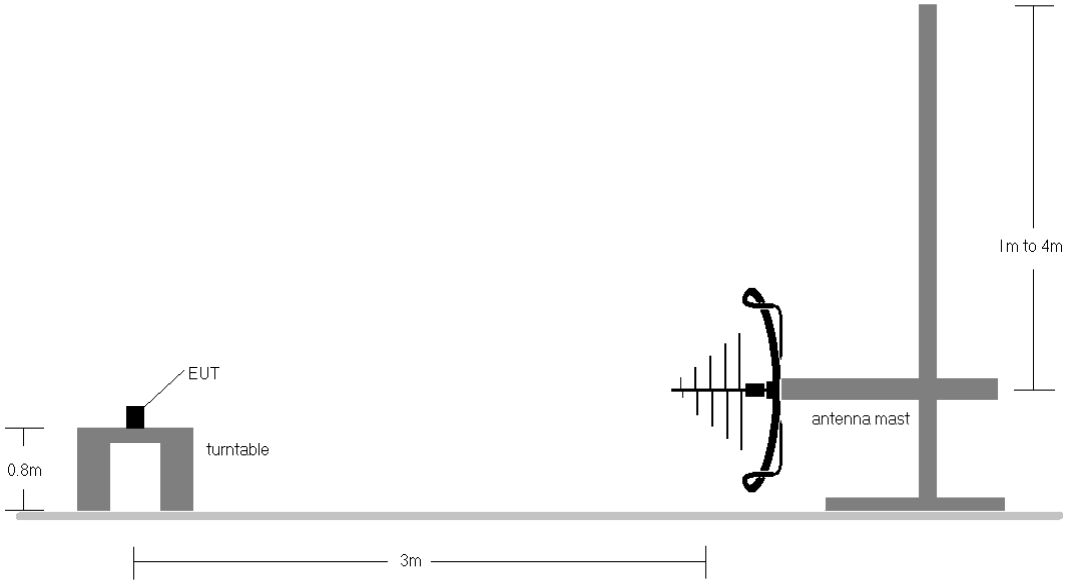


Figure 7-11. Test Instrument & Measurement Setup < 1GHz

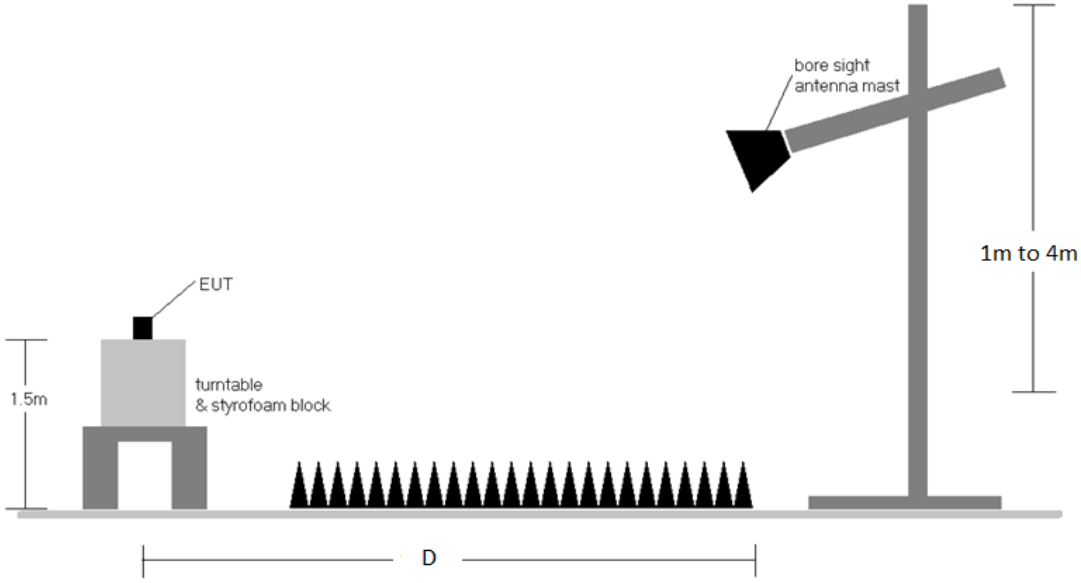


Figure 7-12. Test Instrument & Measurement Setup > 1GHz

Test Notes

1. Field strengths are calculated using the Measurement quantity conversions in KDB 971168 v03r01 Section 5.8.4.
    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.

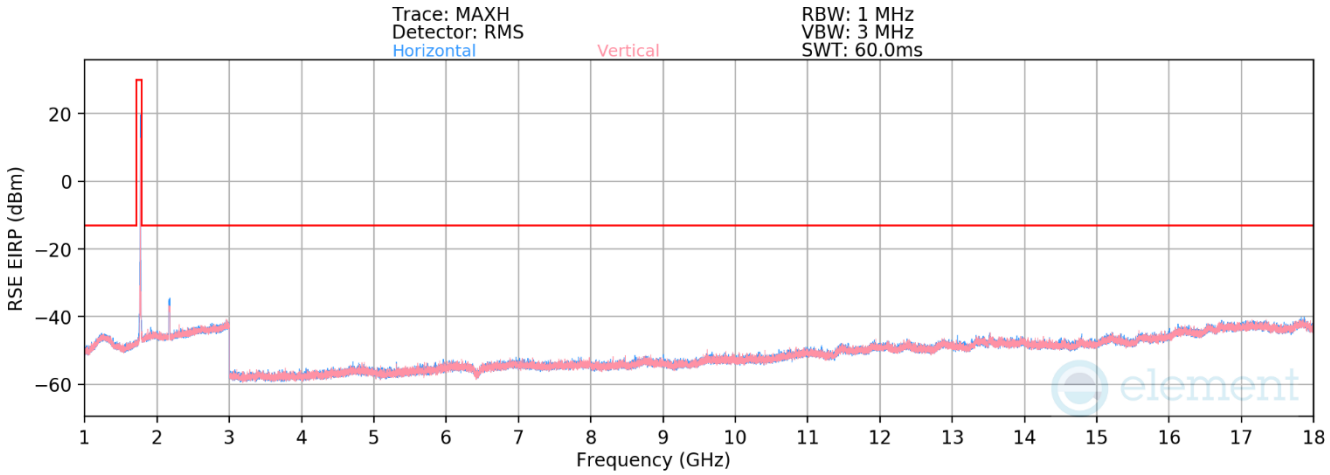
5. Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.

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.

7.7.1 Antenna FCM Radiated Spurious Emission Measurements

LTE Band 66/4



Plot 7-282. Antenna FCM Radiated Spurious Emission above 1GHz (LTE Band 66/4)

Bandwidth (MHz):	20
Frequency (MHz):	1720.0
RB / Offset:	1 / 50

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]
3440.0	V	-	-	-78.13	3.85	32.72	-62.54	-13.00	-49.54
5160.0	V	293	206	-77.52	5.93	35.41	-59.84	-13.00	-46.84
6880.0	H	-	-	-80.48	8.77	35.29	-59.97	-13.00	-46.97
8600.0	V	-	-	-79.60	8.61	36.01	-59.25	-13.00	-46.25
10320.0	H	-	-	-81.48	12.29	37.80	-57.45	-13.00	-44.45

Table 7-11. Radiated Spurious Data (LTE Band 66/4 – Low Channel)

Bandwidth (MHz):	20
Frequency (MHz):	1745.0
RB / Offset:	1 / 50

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]
3490.0	V	111	192	-76.10	3.37	34.27	-60.99	-13.00	-47.99
5235.0	V	159	215	-77.19	5.85	35.66	-59.60	-13.00	-46.60
6980.0	V	-	-	-80.00	8.34	35.34	-59.92	-13.00	-46.92
8725.0	V	-	-	-80.55	10.11	36.56	-58.70	-13.00	-45.70
10470.0	V	-	-	-81.79	12.08	37.29	-57.97	-13.00	-44.97

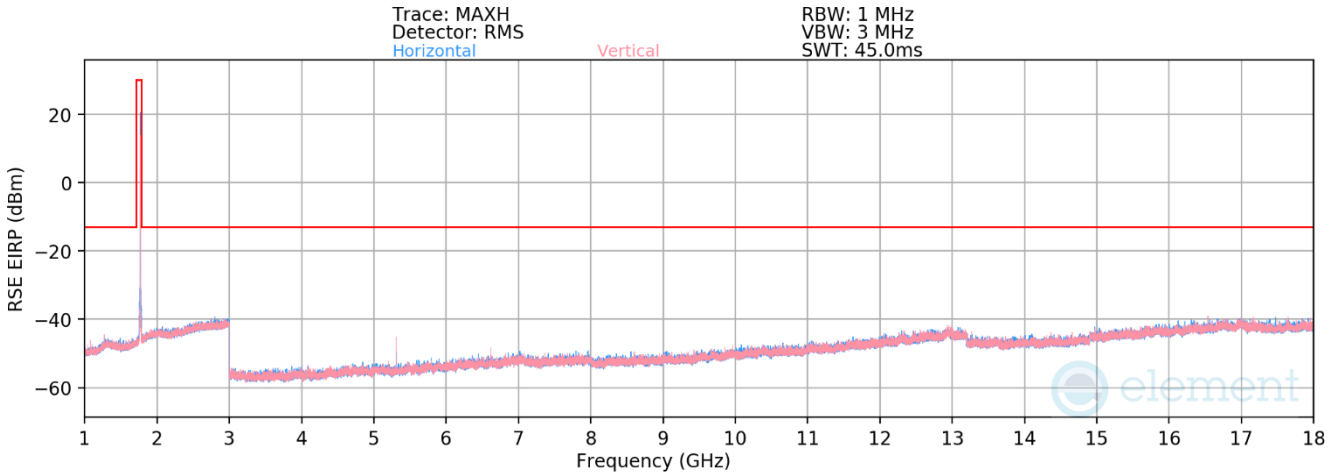
Table 7-12. Radiated Spurious Data (LTE Band 66/4 – Mid Channel)

Bandwidth (MHz):	20
Frequency (MHz):	1770.0
RB / Offset:	1 / 50

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]
3540.0	V	100	162	-76.74	2.93	33.19	-62.06	-13.00	-49.06
5310.0	V	321	198	-75.59	5.85	37.26	-58.00	-13.00	-45.00
7080.0	V	-	-	-80.17	8.75	35.58	-59.68	-13.00	-46.68
8850.0	H	-	-	-79.68	9.07	36.39	-58.87	-13.00	-45.87
10620.0	V	-	-	-81.54	12.38	37.84	-57.42	-13.00	-44.42

Table 7-13. Radiated Spurious Data (LTE Band 66/4 – High Channel)

NR Band n66



Plot 7-283. Antenna FCM Radiated Spurious Emission above 1GHz (NR Band n66)

Bandwidth (MHz):	20
Frequency (MHz):	1720.0
RB / Offset:	1 / 50

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]
3433.9	H	-	-	-79.55	5.22	32.68	-62.58	-13.00	-49.58
5151.9	V	-	-	-81.08	8.23	34.14	-61.11	-13.00	-48.11
6896.7	H	-	-	-81.34	11.06	36.73	-58.53	-13.00	-45.53

Table 7-14. Radiated Spurious Data (NR Band n66 – Low Channel)

Bandwidth (MHz):	20
Frequency (MHz):	1745.0
RB / Offset:	1 / 50

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]
3509.9	H	-	-	-79.16	5.42	33.26	-62.00	-13.00	-49.00
5233.5	H	100	137	-73.28	8.59	42.31	-52.95	-13.00	-39.95
6962.5	H	-	-	-81.68	11.14	36.46	-58.80	-13.00	-45.80
8700.8	H	-	-	-81.71	11.89	37.18	-58.08	-13.00	-45.08
10446.3	H	-	-	-82.55	14.88	39.33	-55.93	-13.00	-42.93

Table 7-15. Radiated Spurious Data (NR Band n66 – Mid Channel)

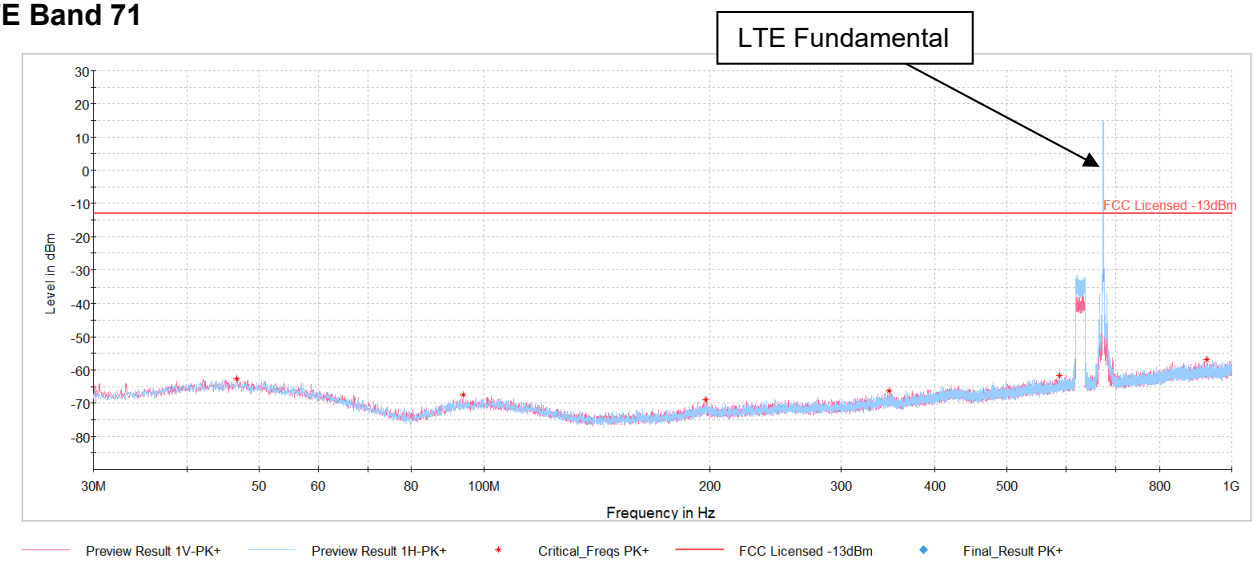
Bandwidth (MHz):	20
Frequency (MHz):	1770.0
RB / Offset:	1 / 50

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]
3517.1	H	-	-	-79.52	5.36	32.84	-62.41	-13.00	-49.41
5308.5	V	300	347	-69.41	8.69	46.27	-48.98	-13.00	-35.98
7060.0	V	-	-	-81.82	11.33	36.51	-58.74	-13.00	-45.74
8870.0	H	-	-	-81.42	11.74	37.32	-57.94	-13.00	-44.94
10605.6	V	-	-	-82.49	15.13	39.65	-55.61	-13.00	-42.61

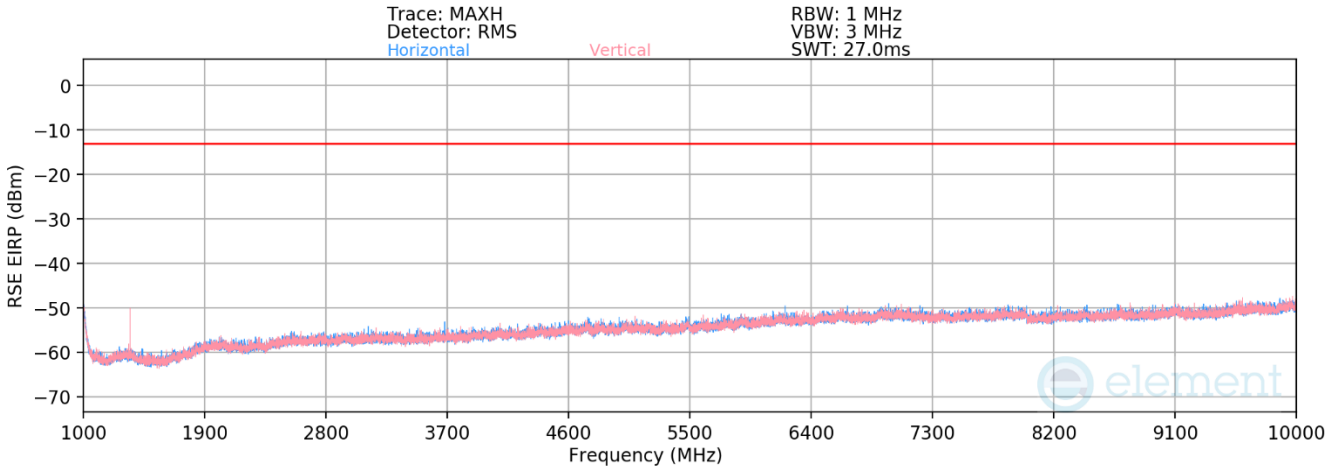
Table 7-16. Radiated Spurious Data (NR Band n66 – High Channel)

7.7.2 Antenna BCM Radiated Spurious Emission Measurements

LTE Band 71



Plot 7-284. Antenna BCM Radiated Spurious Emission below 1GHz (LTE Band 71)



Plot 7-285. Antenna BCM Radiated Spurious Emission above 1GHz (LTE Band 71)

Bandwidth (MHz):	20
Frequency (MHz):	673.0
RB / Offset:	1 / 50

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]
1346.0	V	104	41	-66.50	-1.07	39.44	-55.82	-13.00	-42.82
2019.0	H	-	-	-77.81	1.83	31.03	-64.23	-13.00	-51.23
2692.0	V	-	-	-78.32	3.27	31.96	-63.30	-13.00	-50.30
3365.0	H	-	-	-79.31	4.64	32.33	-62.93	-13.00	-49.93

Table 7-17. Radiated Spurious Data (LTE Band 71 – Low Channel)

Bandwidth (MHz):	20
Frequency (MHz):	680.5
RB / Offset:	1 / 50

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]
1361.0	V	100	352	-66.95	-1.25	38.80	-56.46	-13.00	-43.46
2041.5	V	189	353	-76.78	1.83	32.05	-63.21	-13.00	-50.21
2722.0	V	-	-	-78.36	3.20	31.84	-63.42	-13.00	-50.42
3402.5	V	-	-	-78.81	4.31	32.50	-62.76	-13.00	-49.76

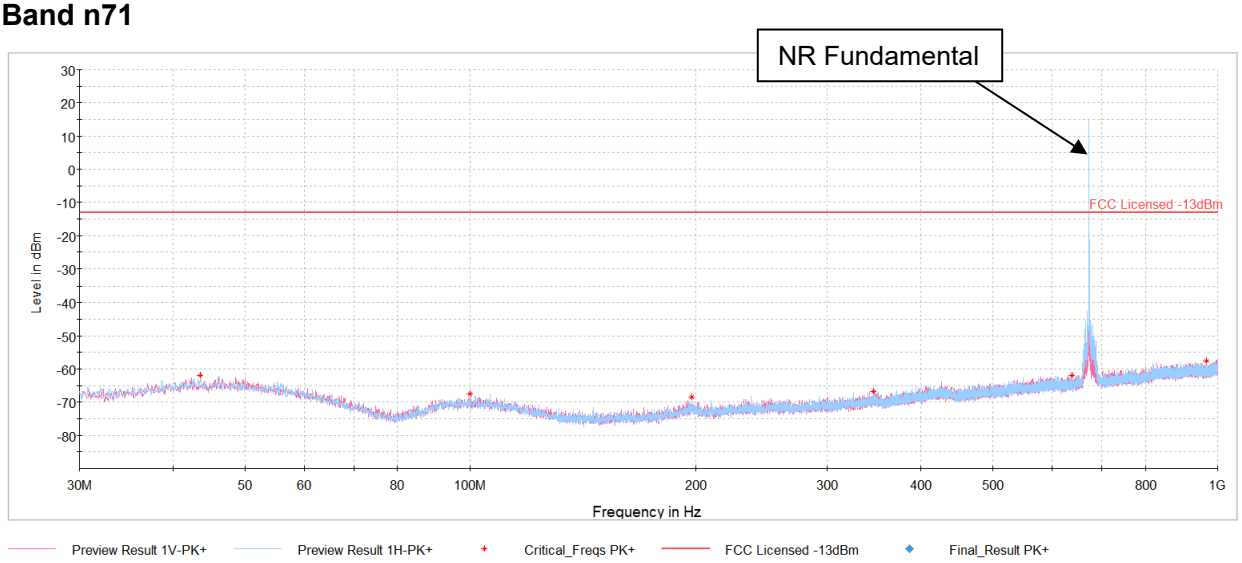
Table 7-18. Radiated Spurious Data (LTE Band 71 – Mid Channel)

Bandwidth (MHz):	20
Frequency (MHz):	688.0
RB / Offset:	1 / 50

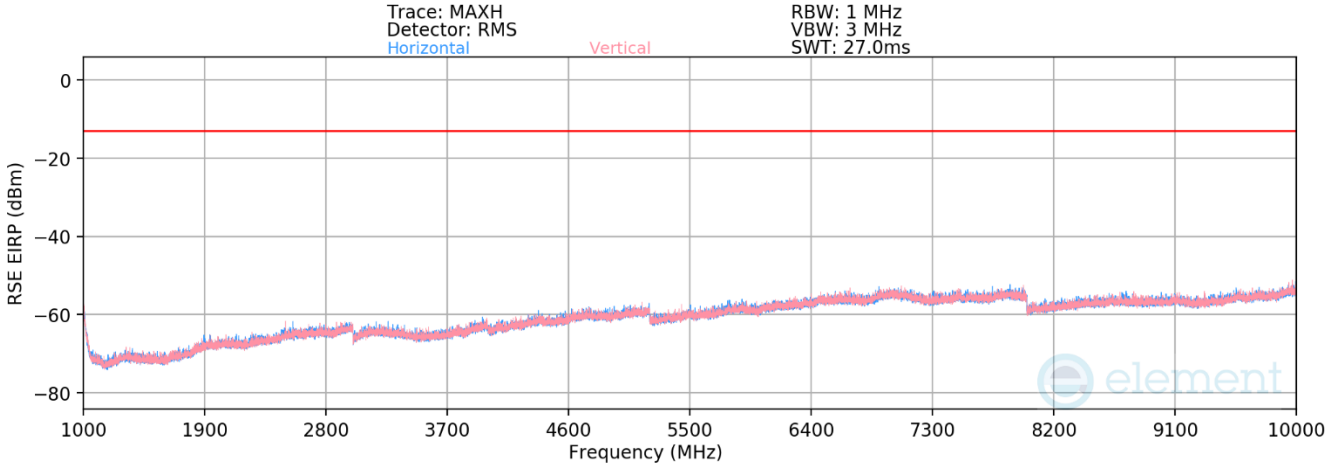
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1376.0	V	112	324	-67.35	-1.23	38.42	-56.83	-13.00	-43.83
2064.0	H	-	-	-77.83	1.83	31.00	-64.26	-13.00	-51.26
2752.0	H	-	-	-78.43	3.38	31.95	-63.31	-13.00	-50.31
3440.0	V	-	-	-79.23	4.58	32.35	-62.91	-13.00	-49.91

Table 7-19. Radiated Spurious Data (LTE Band 71 – High Channel)

NR Band n71



Plot 7-286. Antenna BCM Radiated Spurious Emission below 1GHz (NR Band n71)



Plot 7-287. Antenna BCM Radiated Spurious Emission above 1GHz (NR Band n71)

Bandwidth (MHz):	20
Frequency (MHz):	673.0
RB / Offset:	1 / 50

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]
1356.2	H	-	-	-88.05	-1.31	17.64	-77.62	-13.00	-64.62
2042.6	V	-	-	-87.77	1.83	21.07	-74.19	-13.00	-61.19
2680.9	H	-	-	-86.69	3.14	23.44	-71.82	-13.00	-58.82

Table 7-20. Radiated Spurious Data (NR Band n71 – Low Channel)

Bandwidth (MHz):	20
Frequency (MHz):	680.5
RB / Offset:	1 / 50

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]
1356.4	H	-	-	-87.86	-1.31	17.82	-77.43	-13.00	-64.43
2061.8	H	-	-	-87.45	1.65	21.20	-74.06	-13.00	-61.06
2697.8	V	-	-	-87.11	3.27	23.16	-72.10	-13.00	-59.10

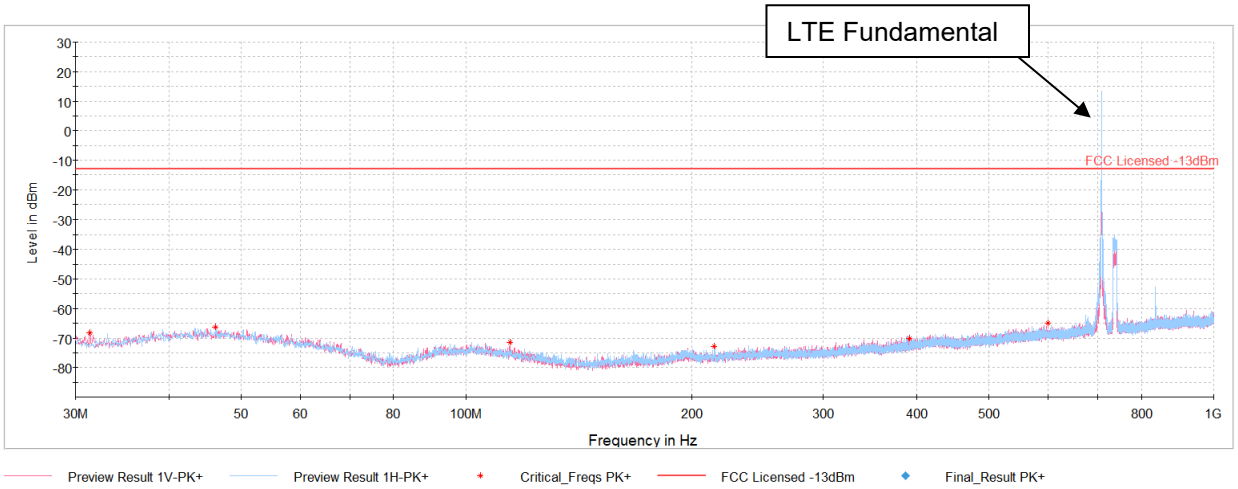
Table 7-21. Radiated Spurious Data (NR Band n71 – Mid Channel)

Bandwidth (MHz):	20
Frequency (MHz):	688.0
RB / Offset:	1 / 50

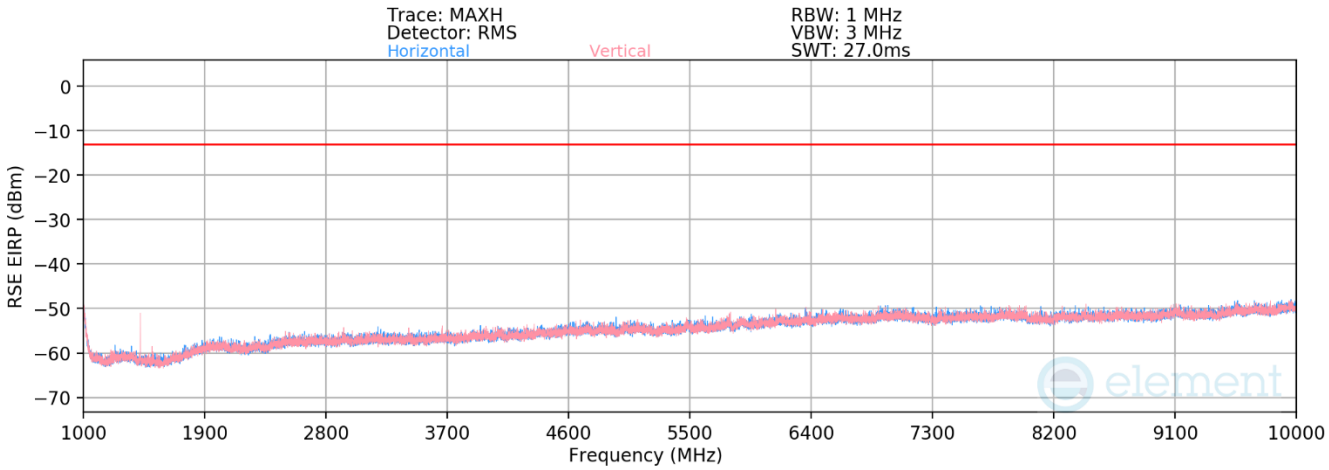
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1362.1	V	-	-	-88.24	-1.25	17.51	-77.75	-13.00	-64.75
2051.2	H	-	-	-87.30	1.70	21.40	-73.86	-13.00	-60.86
2747.6	H	-	-	-86.92	3.17	23.24	-72.01	-13.00	-59.01

Table 7-22. Radiated Spurious Data (NR Band n71 – High Channel)

LTE Band 12/17



Plot 7-288. Antenna BCM Radiated Spurious Emission below 1GHz (LTE Band 12/17)



Plot 7-289. Antenna BCM Radiated Spurious Emission above 1GHz (LTE Band 12/17)

Bandwidth (MHz):	10
Frequency (MHz):	704.0
RB / Offset:	1 / 25

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]
1408.3	V	106	360	-68.65	-1.98	36.37	-58.89	-13.00	-45.89
2127.1	H	-	-	-77.80	1.42	30.62	-64.64	-13.00	-51.64
2825.8	H	-	-	-78.63	3.27	31.64	-63.62	-13.00	-50.62
3502.6	V	-	-	-78.96	4.81	32.85	-62.41	-13.00	-49.41

Table 7-23. Radiated Spurious Data (LTE Band 12/17 – Low Channel)

Bandwidth (MHz):	10
Frequency (MHz):	707.5
RB / Offset:	1 / 25

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]
1415.2	V	279	344	-69.35	-1.98	35.67	-59.59	-13.00	-46.59
2122.8	H	-	-	-77.80	1.42	30.62	-64.64	-13.00	-51.64
2839.6	V	-	-	-78.48	3.25	31.78	-63.48	-13.00	-50.48
3513.6	H	-	-	-79.26	4.81	32.55	-62.71	-13.00	-49.71

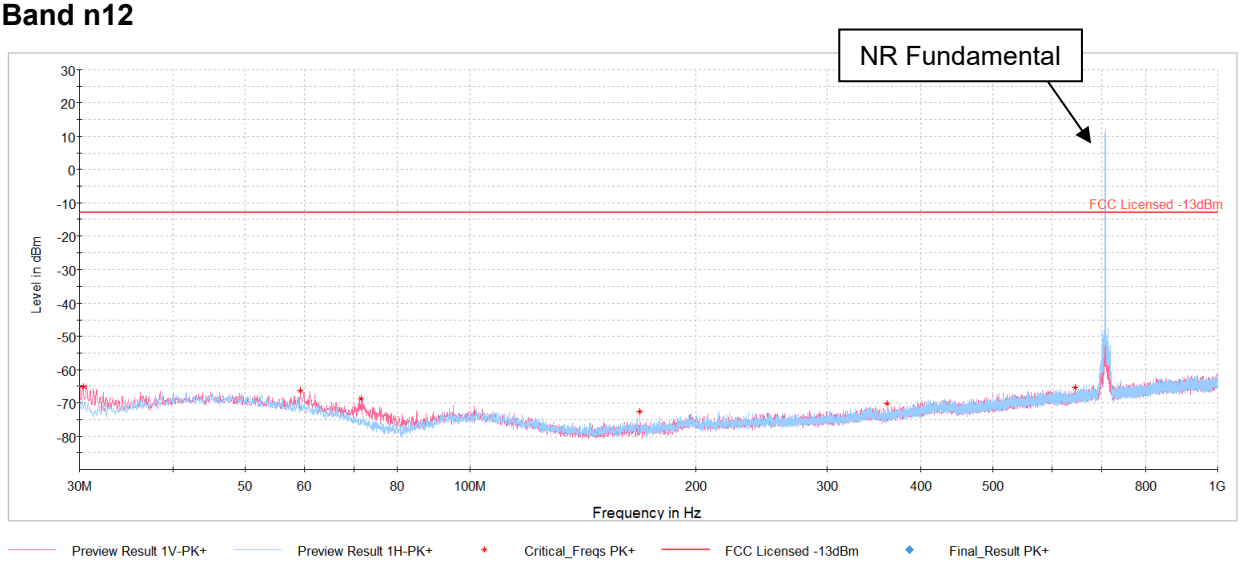
Table 7-24. Radiated Spurious Data (LTE Band 12/17 – Mid Channel)

Bandwidth (MHz):	10
Frequency (MHz):	711.0
RB / Offset:	1 / 25

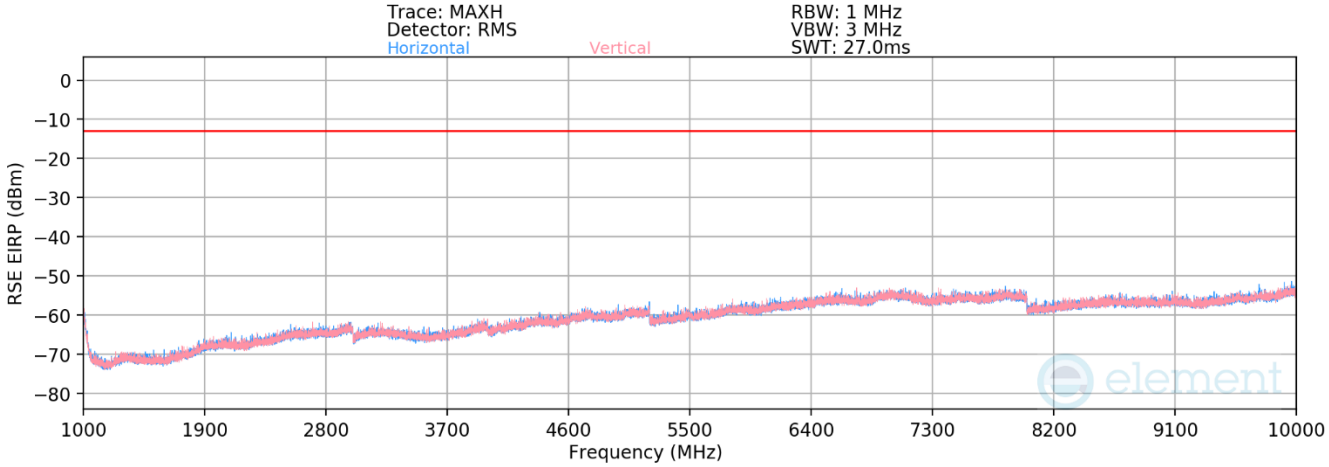
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1422.2	V	158	342	-66.38	-1.98	38.64	-56.62	-13.00	-43.62
2154.4	H	-	-	-77.78	1.24	30.46	-64.80	-13.00	-51.80
2837.1	V	-	-	-78.52	3.25	31.74	-63.52	-13.00	-50.52
3573.4	H	-	-	-79.26	4.73	32.47	-62.79	-13.00	-49.79

Table 7-25. Radiated Spurious Data (LTE Band 12/17 – High Channel)

NR Band n12



Plot 7-290. Antenna BCM Radiated Spurious Emission below 1GHz (NR Band n12)



Plot 7-291. Antenna BCM Radiated Spurious Emission above 1GHz (NR Band n12)

Bandwidth (MHz):	15
Frequency (MHz):	706.5
RB / Offset:	1 / 37

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]
1427.3	H	-	-	-87.83	-1.98	17.19	-78.07	-13.00	-65.07
2128.4	H	-	-	-87.38	1.42	21.03	-74.23	-13.00	-61.23
2813.4	V	-	-	-87.12	3.26	23.14	-72.12	-13.00	-59.12

Table 7-26. Radiated Spurious Data (NR Band n12 – Low Channel)

Bandwidth (MHz):	15
Frequency (MHz):	707.5
RB / Offset:	1 / 37

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]
1434.5	H	-	-	-87.92	-1.98	17.10	-78.16	-13.00	-65.16
2112.5	V	-	-	-87.44	1.45	21.01	-74.25	-13.00	-61.25
2852.0	H	-	-	-86.84	3.09	23.25	-72.01	-13.00	-59.01

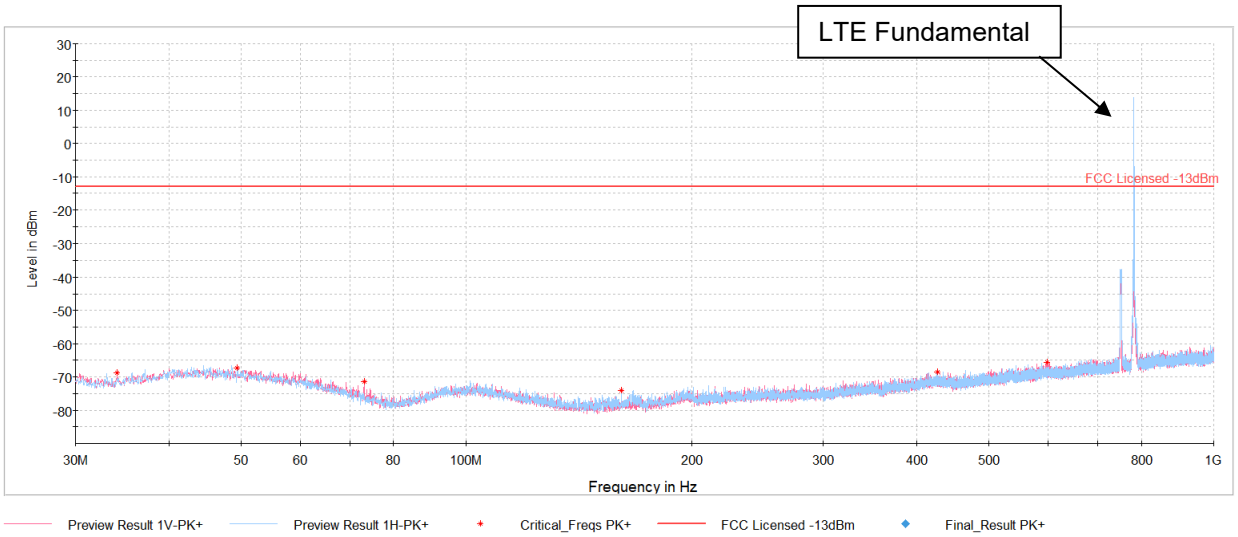
Table 7-27. Radiated Spurious Data (NR Band n12 – Mid Channel)

Bandwidth (MHz):	15
Frequency (MHz):	708.5
RB / Offset:	1 / 37

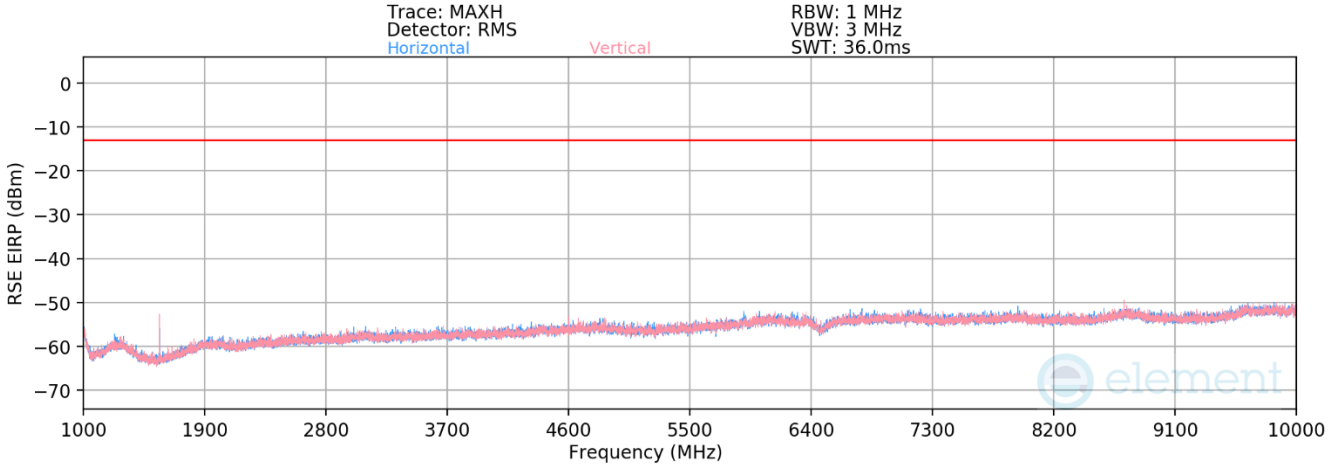
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1436.0	H	-	-	-87.85	-1.98	17.17	-78.09	-13.00	-65.09
2111.1	V	-	-	-87.28	1.45	21.17	-74.09	-13.00	-61.09
2852.0	H	-	-	-87.15	3.09	22.94	-72.32	-13.00	-59.32

Table 7-28. Radiated Spurious Data (NR Band n12 – High Channel)

LTE Band 13



Plot 7-292. Antenna BCM Radiated Spurious Emission below 1GHz (LTE Band 13)



Plot 7-293. Antenna BCM Radiated Spurious Emission above 1GHz (LTE Band 13)

Bandwidth (MHz):	5
Frequency (MHz):	779.5
RB / Offset:	1 / 12

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]
1559.0	V	158	58	-69.95	-3.19	33.86	-61.40	-40.00	-21.40
2338.5	V	-	-	-76.84	0.57	30.72	-64.53	-13.00	-51.53
3118.0	H	-	-	-77.28	2.40	32.12	-63.14	-13.00	-50.14
3897.5	V	-	-	-77.94	3.52	32.58	-62.67	-13.00	-49.67

Table 7-29. Radiated Spurious Data (LTE Band 13 – Low Channel)

Bandwidth (MHz):	5
Frequency (MHz):	782.0
RB / Offset:	1 / 12

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]
1564.0	V	188	40	-66.89	-3.03	37.08	-58.18	-40.00	-18.18
2346.0	H	-	-	-76.89	0.71	30.82	-64.44	-13.00	-51.44
3128.0	H	-	-	-77.56	2.48	31.91	-63.35	-13.00	-50.35
3910.0	H	-	-	-78.10	3.45	32.35	-62.90	-13.00	-49.90

Table 7-30. Radiated Spurious Data (LTE Band 13 – Mid Channel)

Bandwidth (MHz):	5
Frequency (MHz):	784.5
RB / Offset:	1 / 12

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]
1569.0	V	190	18	-67.18	-3.03	36.79	-58.47	-40.00	-18.47
2353.5	H	-	-	-76.85	0.53	30.67	-64.58	-13.00	-51.58
3138.0	V	-	-	-77.49	2.36	31.87	-63.39	-13.00	-50.39
3922.5	H	-	-	-77.97	3.45	32.49	-62.77	-13.00	-49.77

Table 7-31. Radiated Spurious Data (LTE Band 13 – High Channel)

7.8 Frequency Stability / Temperature Variation

§2.1053, §27.53

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015 and TIA-603-E-2016. The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

For Part 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure Used

ANSI C63.26-2015

TIA-603-E-2016

Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a "standby" condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Test Setup

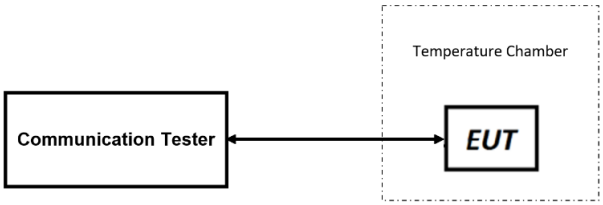


Figure 7-13. LTE Test Instrument & Measurement Setup

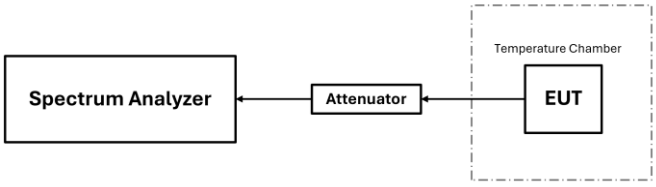


Figure 7-14. FR1 Test Instrument & Measurement Setup

Test Notes

N/A

Frequency Stability / Temperature Variation

LTE Band 66/4

Operating Band Lower Boundary (GHz)	1.710
Ref. Voltage (VDC):	3.80

Voltage (%)	Power (VDC)	Temp (°C)	Measured Freq. (GHz)	Freq. Delta from Operating Range (GHz)
100 %	3.80	- 30	1.71023147	-0.00023147
		- 20	1.71089463	-0.00089463
		- 10	1.71030826	-0.00030826
		0	1.71076532	-0.00076532
		+ 10	1.71012658	-0.00012658
		+ 20 (Ref)	1.71068317	-0.00068317
		+ 30	1.71053291	-0.00053291
		+ 40	1.71091540	-0.00091540
		+ 50	1.71047862	-0.00047862
Battery Endpoint	3.40	+ 20	1.71015973	-0.00015973

Table 7-32. LTE Band 66/4 Lower Boundary Frequency Stability Data

LTE Band 66/4

Operating Band Upper Boundary (GHz)	1.780
Ref. Voltage (VDC):	3.80

Voltage (%)	Power (VDC)	Temp (°C)	Measured Freq. (GHz)	Freq. Delta from Operating Range (GHz)
100 %	3.80	- 30	1.77974213	-0.00025787
		- 20	1.77918642	-0.00081358
		- 10	1.77982357	-0.00017643
		0	1.77939184	-0.00060816
		+ 10	1.77951426	-0.00048574
		+ 20 (Ref)	1.77966317	-0.00033683
		+ 30	1.77917493	-0.00082507
		+ 40	1.77973855	-0.00026145
		+ 50	1.77928467	-0.00071533
Battery Endpoint	3.40	+ 20	1.77980594	-0.00019406

Table 7-33. LTE Band 66/4 Upper Boundary Frequency Stability Data

Frequency Stability / Temperature Variation

LTE Band 71				
	Operating Band Lower Boundary (GHz)		0.663	
	Ref. Voltage (VDC):		3.80	
Voltage (%)	**Power (VDC)**	**Temp (°C)**	**Measured Freq. (GHz)**	**Freq. Delta from Operating Range (GHz)**
100 %	3.80	- 30	0.66317429	-0.00017429
		- 20	0.66339186	-0.00039186
		- 10	0.66352547	-0.00052547
		0	0.66374328	-0.00074328
		+ 10	0.66306853	-0.00006853
		+ 20 (Ref)	0.66365874	-0.00065874
		+ 30	0.66348291	-0.00048291
		+ 40	0.66322038	-0.00022038
		+ 50	0.66313574	-0.00013574
Battery Endpoint	3.40	+ 20	0.66370015	-0.00070015

Table 7-34. LTE Band 71 Lower Boundary Frequency Stability Data

LTE Band 71				
	Operating Band Upper Boundary (GHz)		0.698	
	Ref. Voltage (VDC):		3.80	
Voltage (%)	**Power (VDC)**	**Temp (°C)**	**Measured Freq. (GHz)**	**Freq. Delta from Operating Range (GHz)**
100 %	3.80	- 30	0.69784219	-0.00015781
		- 20	0.69717364	-0.00082636
		- 10	0.69759830	-0.00040170
		0	0.69701452	-0.00098548
		+ 10	0.69748691	-0.00051309
		+ 20 (Ref)	0.69792145	-0.00007855
		+ 30	0.69731286	-0.00068714
		+ 40	0.69770538	-0.00029462
		+ 50	0.69723814	-0.00076186
Battery Endpoint	3.40	+ 20	0.69739025	-0.00060975

Table 7-35. LTE Band 71 Upper Boundary Frequency Stability Data

Frequency Stability / Temperature Variation

LTE Band 12/17

Operating Band Lower Boundary (GHz)	0.699
Ref. Voltage (VDC):	3.80

Voltage (%)	Power (VDC)	Temp (°C)	Measured Freq. (GHz)	Freq. Delta from Operating Range (GHz)
100 %	3.80	- 30	0.69950980	-0.00050980
		- 20	0.69953510	-0.00053510
		- 10	0.69952370	-0.00052370
		0	0.69950760	-0.00050760
		+ 10	0.69954430	-0.00054430
		+ 20 (Ref)	0.69953180	-0.00053180
		+ 30	0.69951420	-0.00051420
		+ 40	0.69955000	-0.00055000
		+ 50	0.69950910	-0.00050910
Battery Endpoint	3.40	+ 20	0.69952160	-0.00052160

Table 7-36. LTE Band 12/17 Lower Boundary Frequency Stability Data

LTE Band 12/17

Operating Band Upper Boundary (GHz)	0.716
Ref. Voltage (VDC):	3.80

Voltage (%)	Power (VDC)	Temp (°C)	Measured Freq. (GHz)	Freq. Delta from Operating Range (GHz)
100 %	3.80	- 30	0.71532846	-0.00067154
		- 20	0.71567713	-0.00032287
		- 10	0.71552288	-0.00047712
		0	0.71530519	-0.00069481
		+ 10	0.71573142	-0.00026858
		+ 20 (Ref)	0.71518637	-0.00081363
		+ 30	0.71540195	-0.00059805
		+ 40	0.71549763	-0.00050237
		+ 50	0.71566084	-0.00033916
Battery Endpoint	3.40	+ 20	0.71534278	-0.00065722

Table 7-37. LTE Band 12/17 Upper Boundary Frequency Stability Data

Frequency Stability / Temperature Variation

LTE Band 13				
	Operating Band Lower Boundary (GHz)		0.777	
	Ref. Voltage (VDC):		3.80	
Voltage (%)	**Power (VDC)**	**Temp (°C)**	**Measured Freq. (GHz)**	**Freq. Delta from Operating Range (GHz)**
100 %	3.80	- 30	0.77714367	-0.00014367
		- 20	0.77769125	-0.00069125
		- 10	0.77758213	-0.00058213
		0	0.77720189	-0.00020189
		+ 10	0.77775844	-0.00075844
		+ 20 (Ref)	0.77748056	-0.00048056
		+ 30	0.77709231	-0.00009231
		+ 40	0.77773590	-0.00073590
		+ 50	0.77765784	-0.00065784
Battery Endpoint	3.40	+ 20	0.77710542	-0.00010542

Table 7-38. LTE Band 13 Lower Boundary Frequency Stability Data

LTE Band 13				
	Operating Band Upper Boundary (GHz)		0.787	
	Ref. Voltage (VDC):		3.80	
Voltage (%)	**Power (VDC)**	**Temp (°C)**	**Measured Freq. (GHz)**	**Freq. Delta from Operating Range (GHz)**
100 %	3.80	- 30	0.78632457	-0.00067543
		- 20	0.78688316	-0.00011684
		- 10	0.78647632	-0.00052368
		0	0.78615983	-0.00084017
		+ 10	0.78673895	-0.00026105
		+ 20 (Ref)	0.78620541	-0.00079459
		+ 30	0.78662879	-0.00037121
		+ 40	0.78691106	-0.00008894
		+ 50	0.78651428	-0.00048572
Battery Endpoint	3.40	+ 20	0.78639367	-0.00060633

Table 7-39. LTE Band 13 Upper Boundary Frequency Stability Data

Frequency Stability / Temperature Variation

NR Band n66

Operating Band Lower Boundary (GHz)	1.710
Ref. Voltage (VDC):	3.80

Voltage (%)	Power (VDC)	Temp (°C)	Measured Freq. (GHz)	Freq. Delta from Operating Range (GHz)
100 %	3.80	- 30	1.71084615	-0.00084615
		- 20	1.71070398	-0.00070398
		- 10	1.71032246	-0.00032246
		0	1.71061357	-0.00061357
		+ 10	1.71017834	-0.00017834
		+ 20 (Ref)	1.71075944	-0.00075944
		+ 30	1.71049236	-0.00049236
		+ 40	1.71068729	-0.00068729
		+ 50	1.71038015	-0.00038015
Battery Endpoint	3.40	+ 20	1.71056821	-0.00056821

Table 7-40. NR Band n66 Lower Boundary Frequency Stability Data

NR Band n66

Operating Band Upper Boundary (GHz)	1.780
Ref. Voltage (VDC):	3.80

Voltage (%)	Power (VDC)	Temp (°C)	Measured Freq. (GHz)	Freq. Delta from Operating Range (GHz)
100 %	3.80	- 30	1.77933428	-0.00066572
		- 20	1.77964973	-0.00035027
		- 10	1.77971249	-0.00028751
		0	1.77958136	-0.00041864
		+ 10	1.77921984	-0.00078016
		+ 20 (Ref)	1.77976512	-0.00023488
		+ 30	1.77947895	-0.00052105
		+ 40	1.77987463	-0.00012537
		+ 50	1.77942618	-0.00057382
Battery Endpoint	3.40	+ 20	1.77935407	-0.00064593

Table 7-41. NR Band n66 Upper Boundary Frequency Stability Data

Frequency Stability / Temperature Variation

NR Band n71

Operating Band Lower Boundary (GHz)	0.663
Ref. Voltage (VDC):	3.80

Voltage (%)	Power (VDC)	Temp (°C)	Measured Freq. (GHz)	Freq. Delta from Operating Range (GHz)
100 %	3.80	- 30	0.66357193	-0.00057193
		- 20	0.66329461	-0.00029461
		- 10	0.66362387	-0.00062387
		0	0.66310824	-0.00010824
		+ 10	0.66335972	-0.00035972
		+ 20 (Ref)	0.66378946	-0.00078946
		+ 30	0.66327483	-0.00027483
		+ 40	0.66367812	-0.00067812
		+ 50	0.66318059	-0.00018059
Battery Endpoint	3.40	+ 20	0.66349102	-0.00049102

Table 7-42. NR Band n71 Lower Boundary Frequency Stability Data

NR Band n71

Operating Band Upper Boundary (GHz)	0.698
Ref. Voltage (VDC):	3.80

Voltage (%)	Power (VDC)	Temp (°C)	Measured Freq. (GHz)	Freq. Delta from Operating Range (GHz)
100 %	3.80	- 30	0.69764471	-0.00035529
		- 20	0.69705984	-0.00094016
		- 10	0.69789926	-0.00010074
		0	0.69752763	-0.00047237
		+ 10	0.69718857	-0.00081143
		+ 20 (Ref)	0.69773190	-0.00026810
		+ 30	0.69708142	-0.00091858
		+ 40	0.69735019	-0.00064981
		+ 50	0.69747653	-0.00052347
Battery Endpoint	3.40	+ 20	0.69785806	-0.00014194

Table 7-43. NR Band n71 Upper Boundary Frequency Stability Data

Frequency Stability / Temperature Variation

NR Band n12

Operating Band Lower Boundary (GHz)	0.699
Ref. Voltage (VDC):	3.80

Voltage (%)	Power (VDC)	Temp (°C)	Measured Freq. (GHz)	Freq. Delta from Operating Range (GHz)
100 %	3.80	- 30	0.69912453	-0.00012453
		- 20	0.69967214	-0.00067214
		- 10	0.69931508	-0.00031508
		0	0.69952167	-0.00052167
		+ 10	0.69904823	-0.00004823
		+ 20 (Ref)	0.69968945	-0.00068945
		+ 30	0.69921376	-0.00021376
		+ 40	0.69937819	-0.00037819
		+ 50	0.69960287	-0.00060287
Battery Endpoint	3.40	+ 20	0.69945132	-0.00045132

Table 7-44. NR Band n12 Lower Boundary Frequency Stability Data

NR Band n12

Operating Band Upper Boundary (GHz)	0.716
Ref. Voltage (VDC):	3.80

Voltage (%)	Power (VDC)	Temp (°C)	Measured Freq. (GHz)	Freq. Delta from Operating Range (GHz)
100 %	3.80	- 30	0.71513257	-0.00086743
		- 20	0.71574319	-0.00025681
		- 10	0.71528563	-0.00071437
		0	0.71561428	-0.00038572
		+ 10	0.71538945	-0.00061055
		+ 20 (Ref)	0.71570106	-0.00029894
		+ 30	0.71515384	-0.00084616
		+ 40	0.71557892	-0.00042108
		+ 50	0.71544721	-0.00055279
Battery Endpoint	3.40	+ 20	0.71526973	-0.00073027

Table 7-45. NR Band n12 Upper Boundary Frequency Stability Data

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Apple Watch FCC ID: BCG-A3326** complies with all the requirements of Part 27 of the FCC rules.