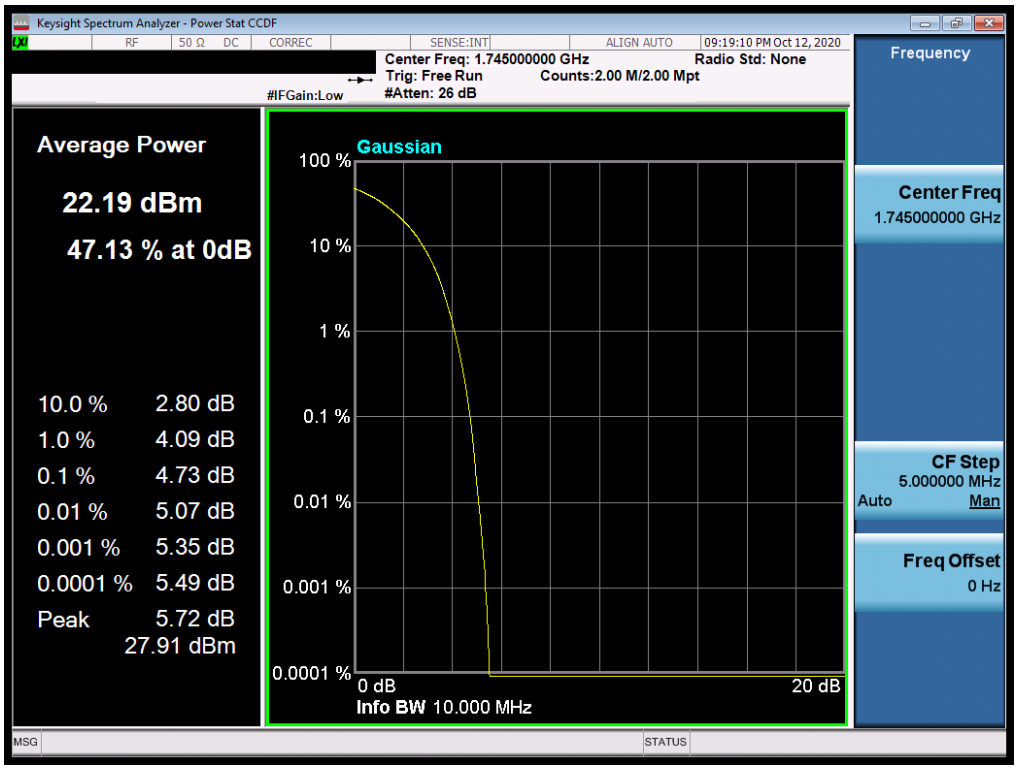
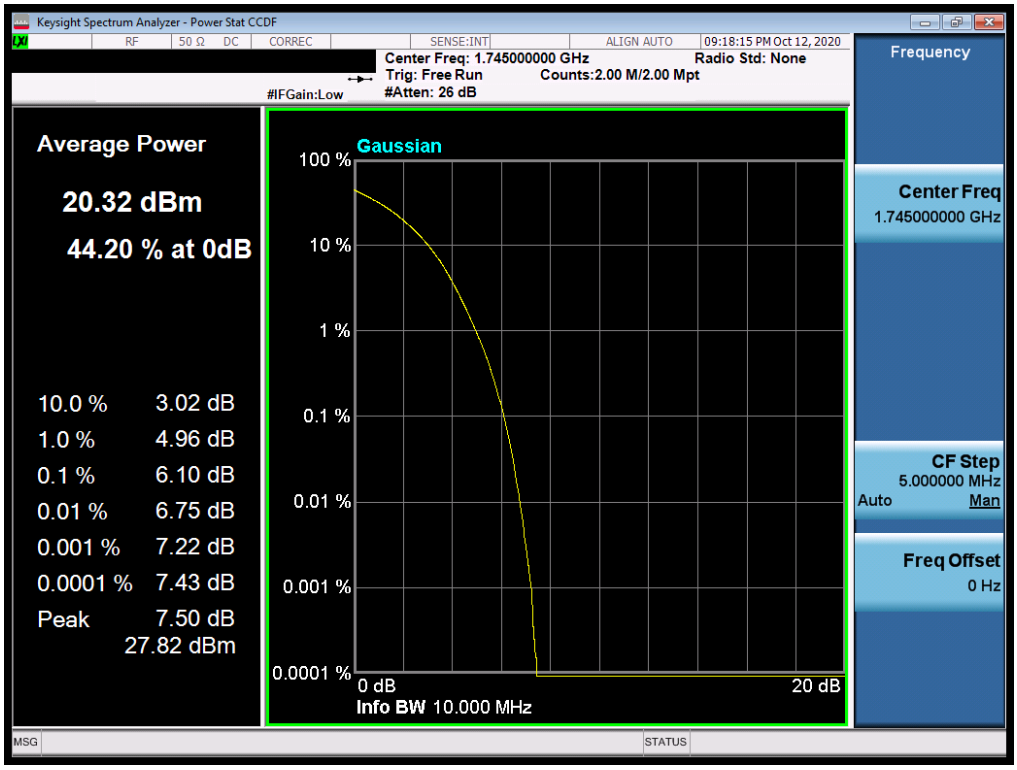
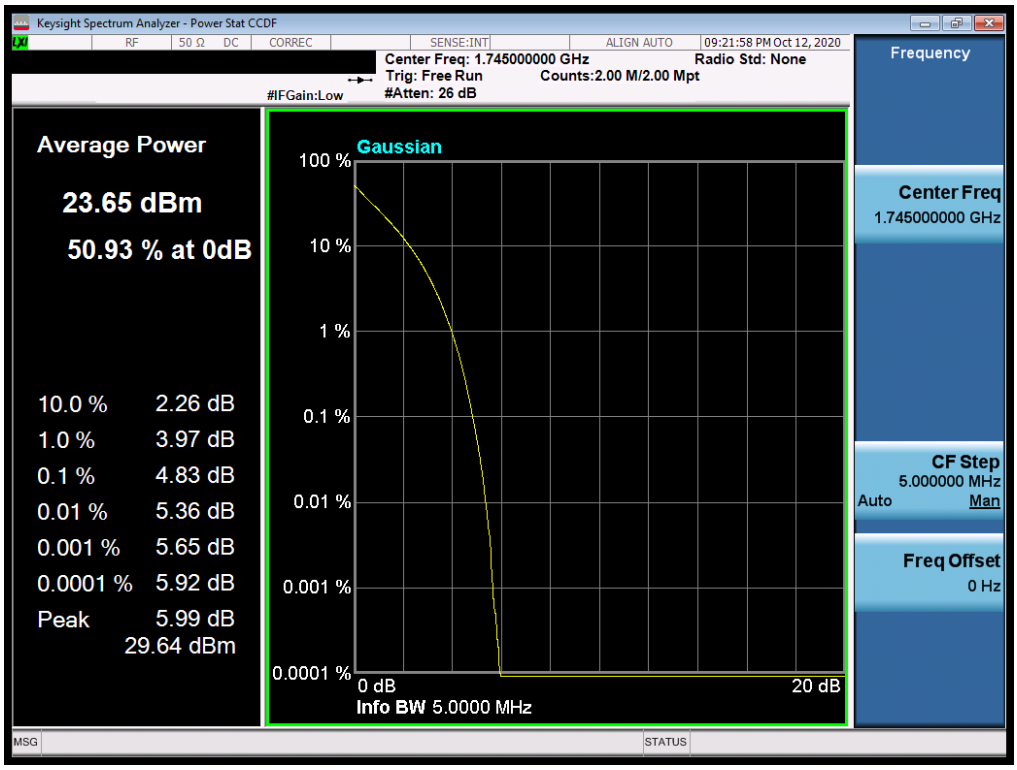


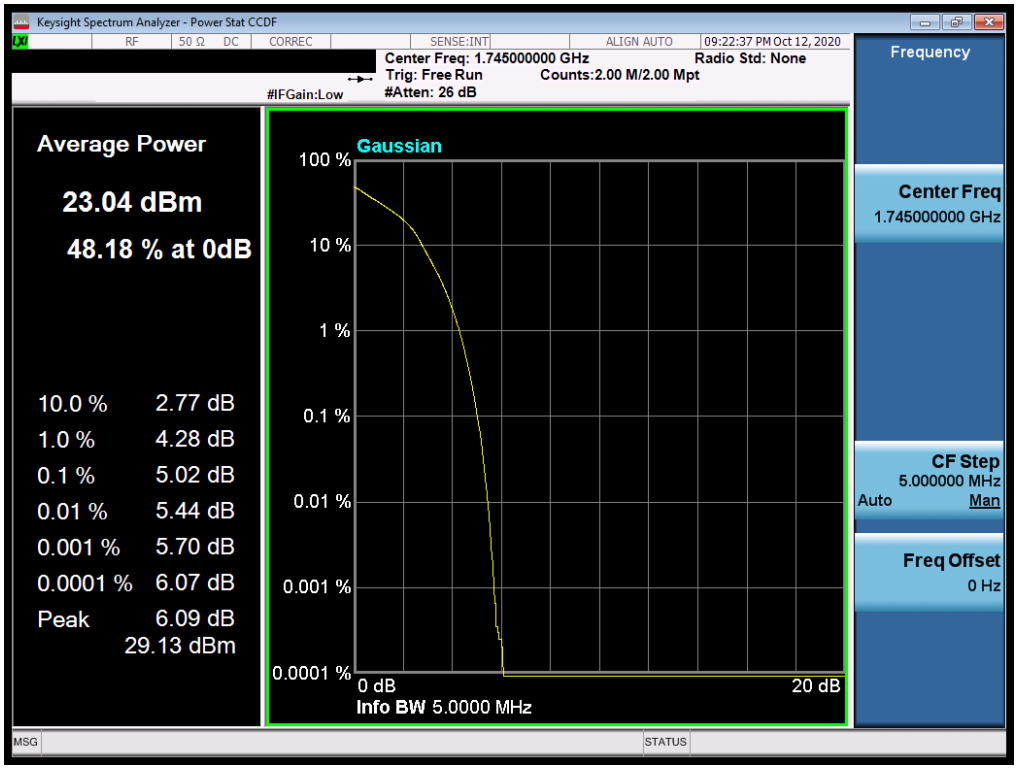
Plot 7-205. PAR Plot (LTE Band 66/4 - 10MHz 64-QAM - Full RB Configuration)



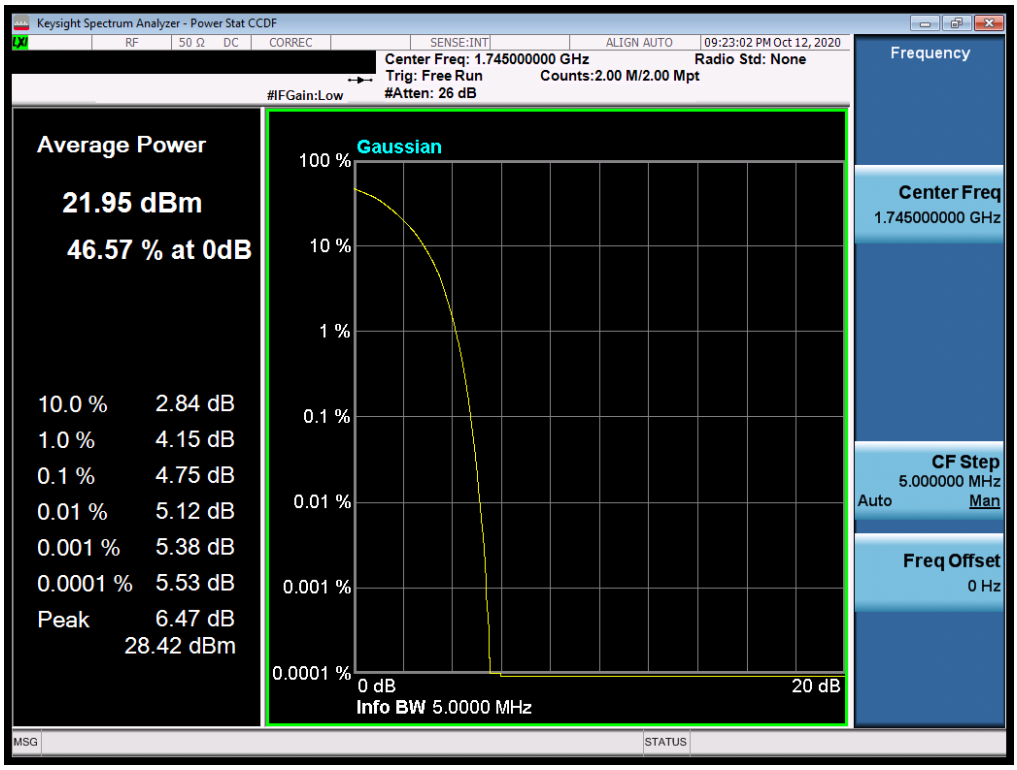
Plot 7-206. PAR Plot (LTE Band 66/4 - 10MHz 256-QAM - Full RB Configuration)



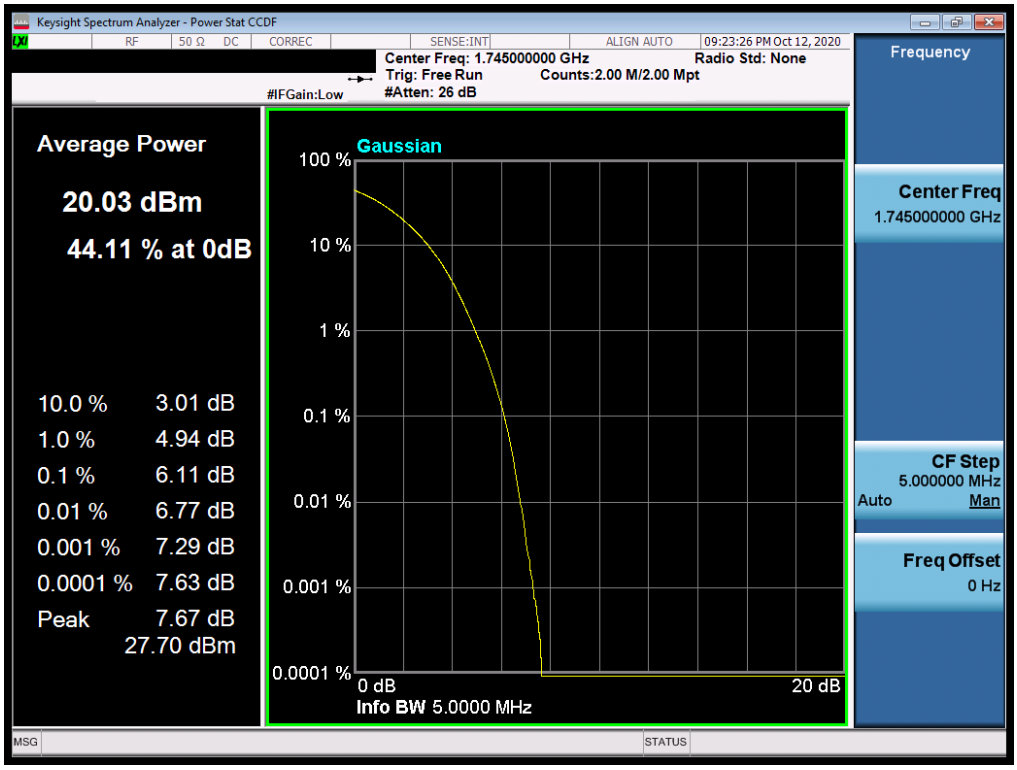
Plot 7-207. PAR Plot (LTE Band 66/4 - 5MHz QPSK - Full RB Configuration)



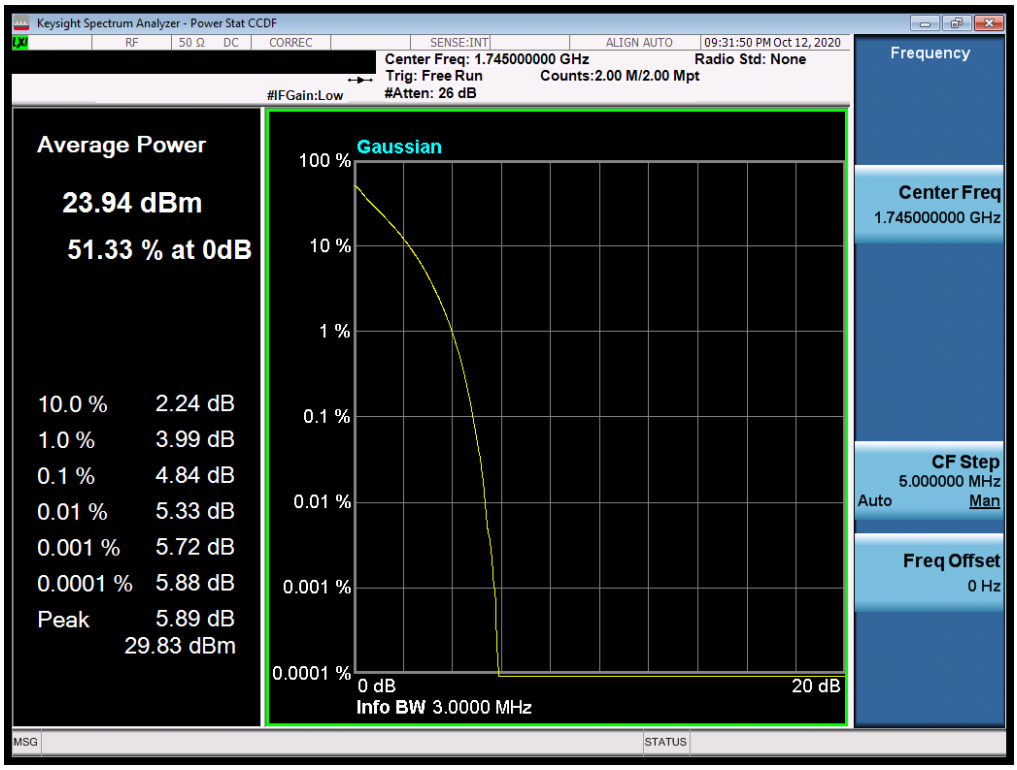
Plot 7-208. PAR Plot (LTE Band 66/4 - 5MHz 16-QAM - Full RB Configuration)



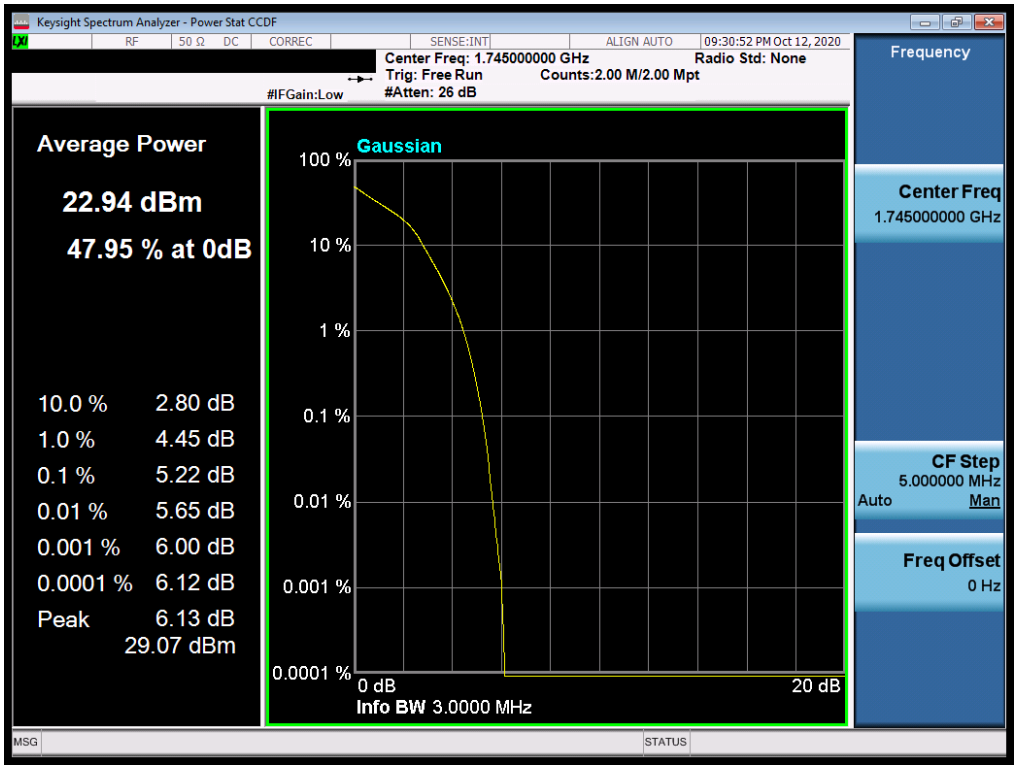
Plot 7-209. PAR Plot (LTE Band 66/4 - 5MHz 64-QAM - Full RB Configuration)



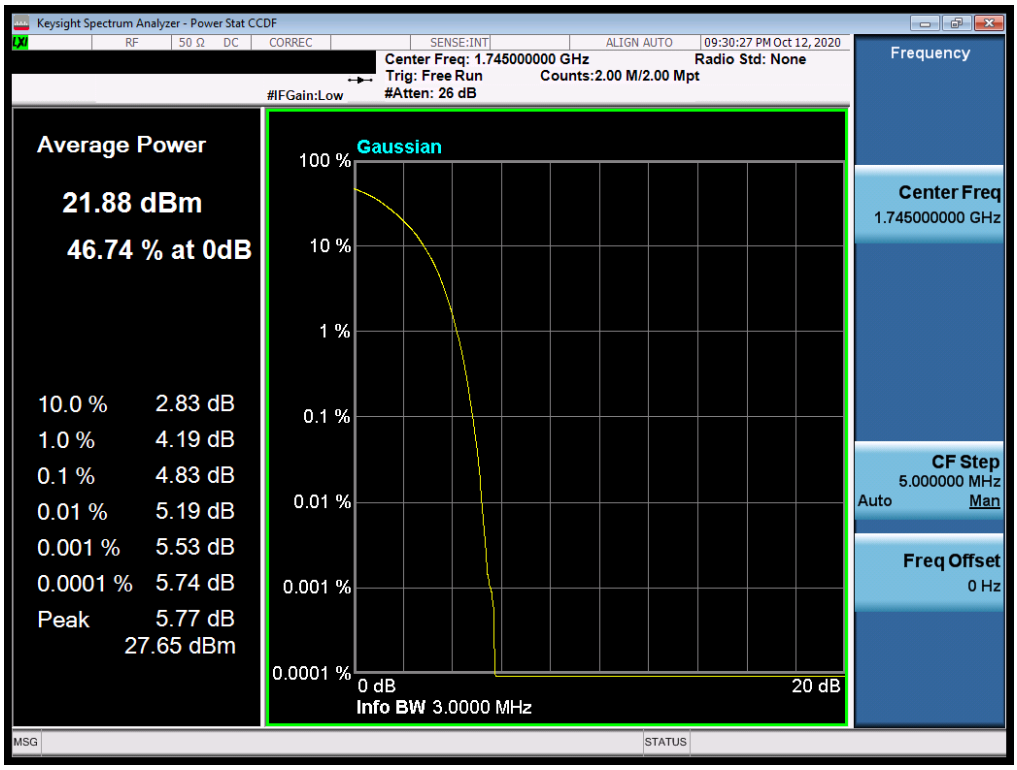
Plot 7-210. PAR Plot (LTE Band 66/4 - 5MHz 256-QAM - Full RB Configuration)



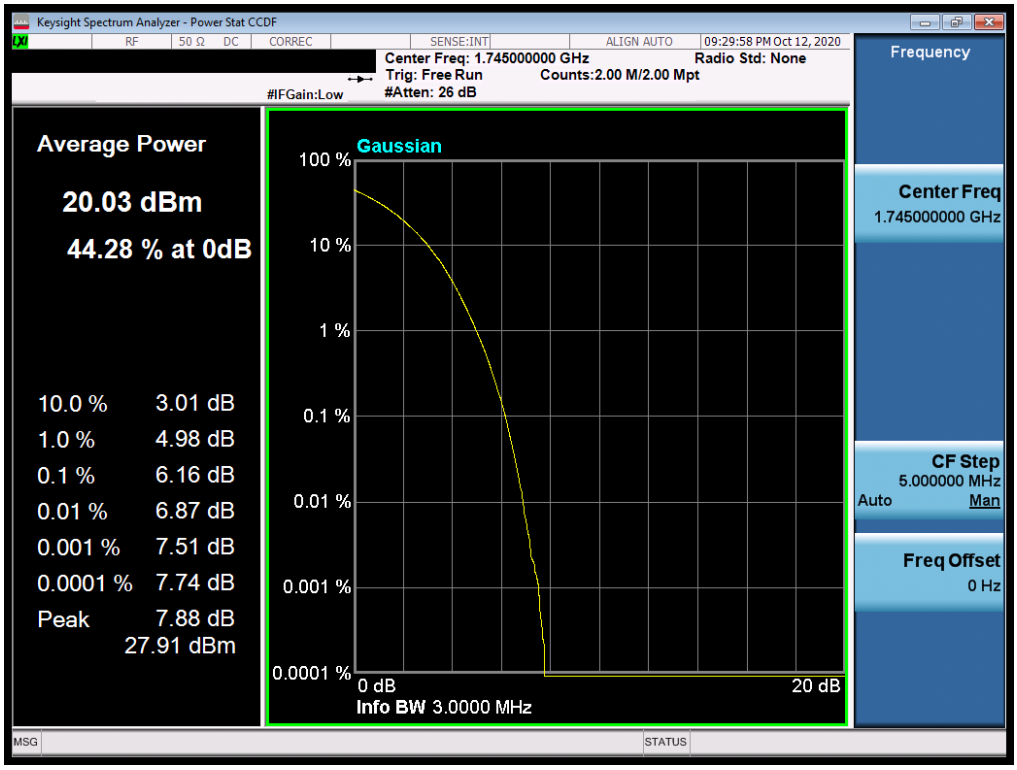
Plot 7-211. PAR Plot (LTE Band 66/4 - 3MHz QPSK - Full RB Configuration)



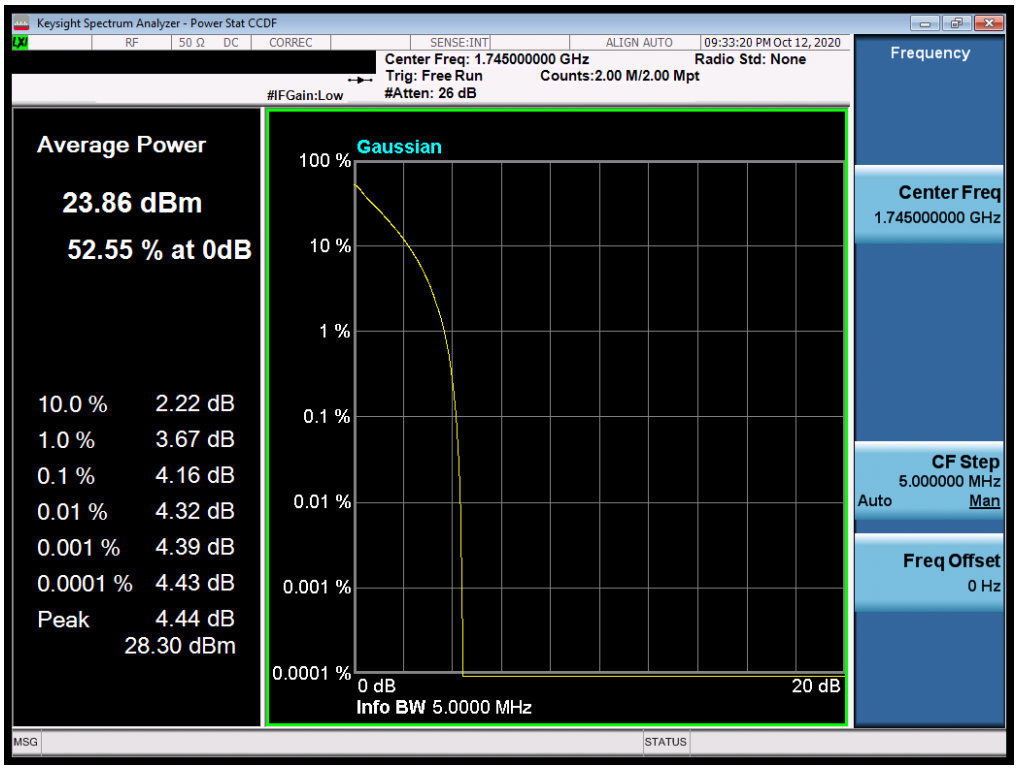
Plot 7-212. PAR Plot (LTE Band 66/4 - 3MHz 16-QAM - Full RB Configuration)



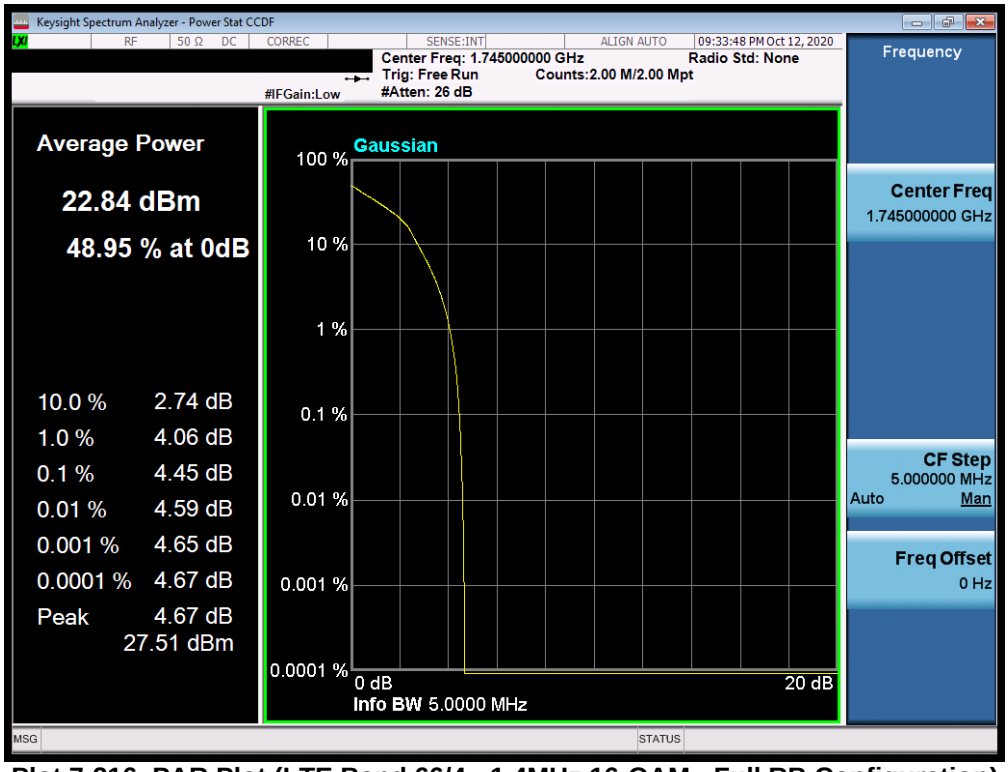
Plot 7-213. PAR Plot (LTE Band 66/4 - 3MHz 64-QAM - Full RB Configuration)



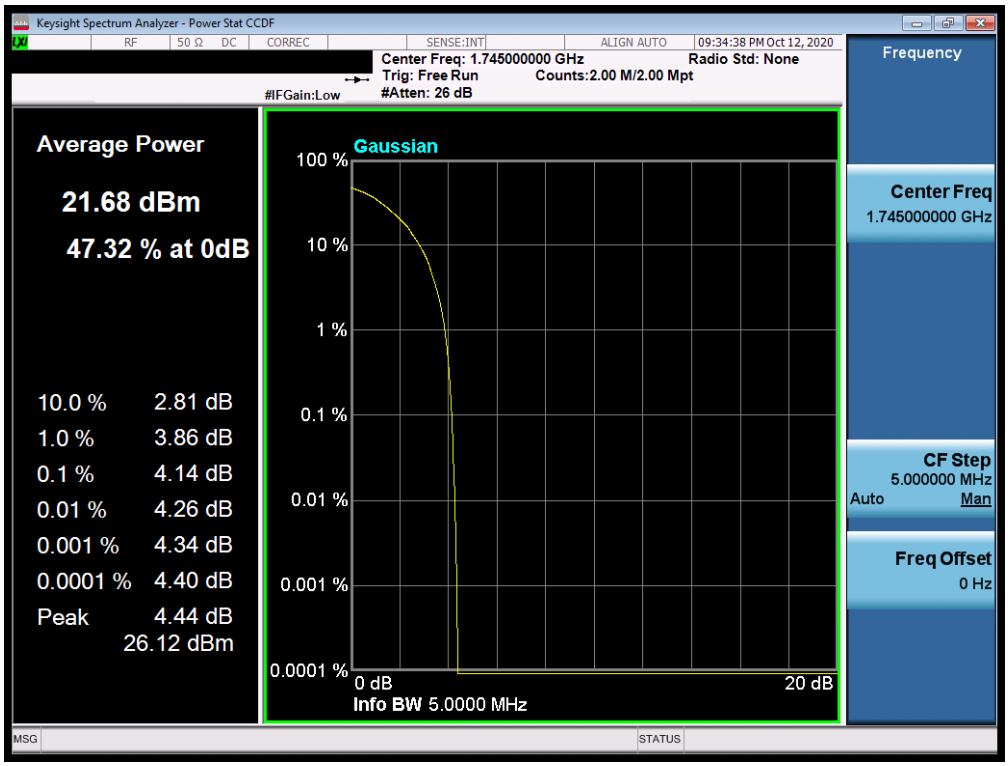
Plot 7-214. PAR Plot (LTE Band 66/4 - 3MHz 256-QAM - Full RB Configuration)



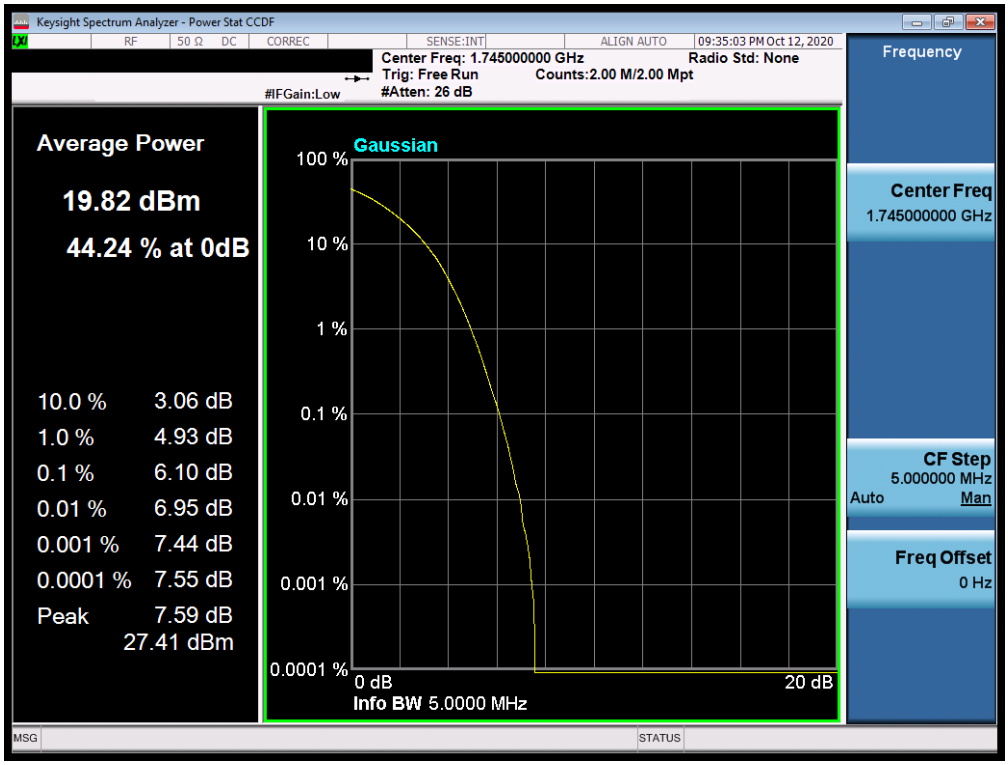
Plot 7-215. PAR Plot (LTE Band 66/4 - 1.4MHz QPSK - Full RB Configuration)



Plot 7-216. PAR Plot (LTE Band 66/4 - 1.4MHz 16-QAM - Full RB Configuration)

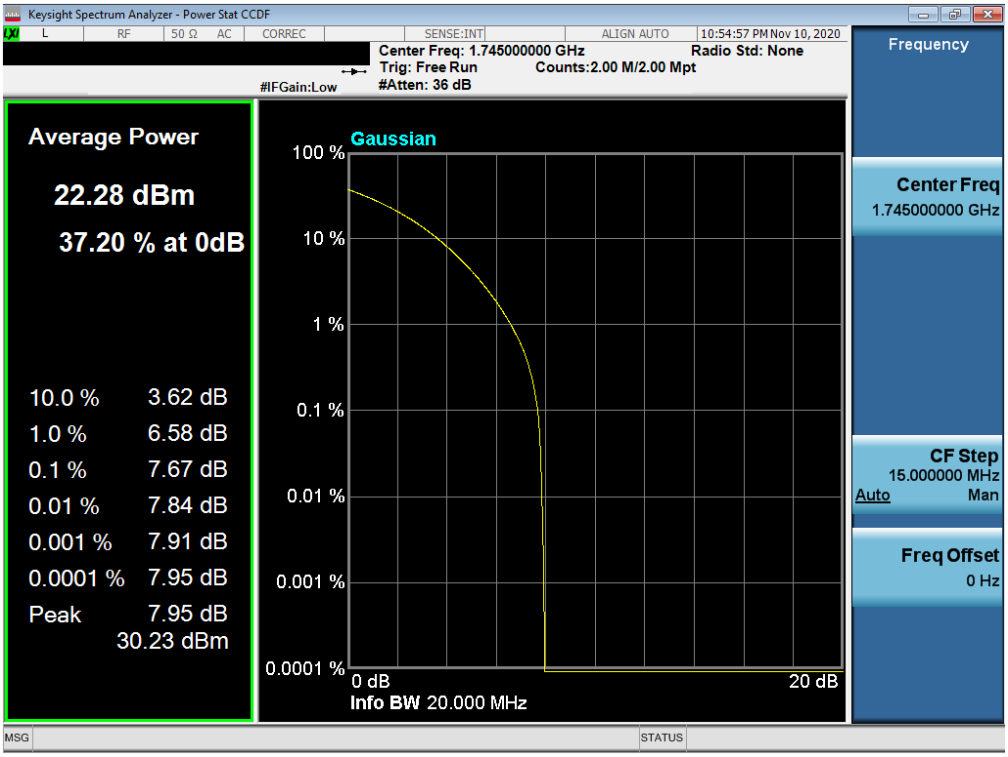


Plot 7-217. PAR Plot (LTE Band 66/4 - 1.4MHz 64-QAM - Full RB Configuration)

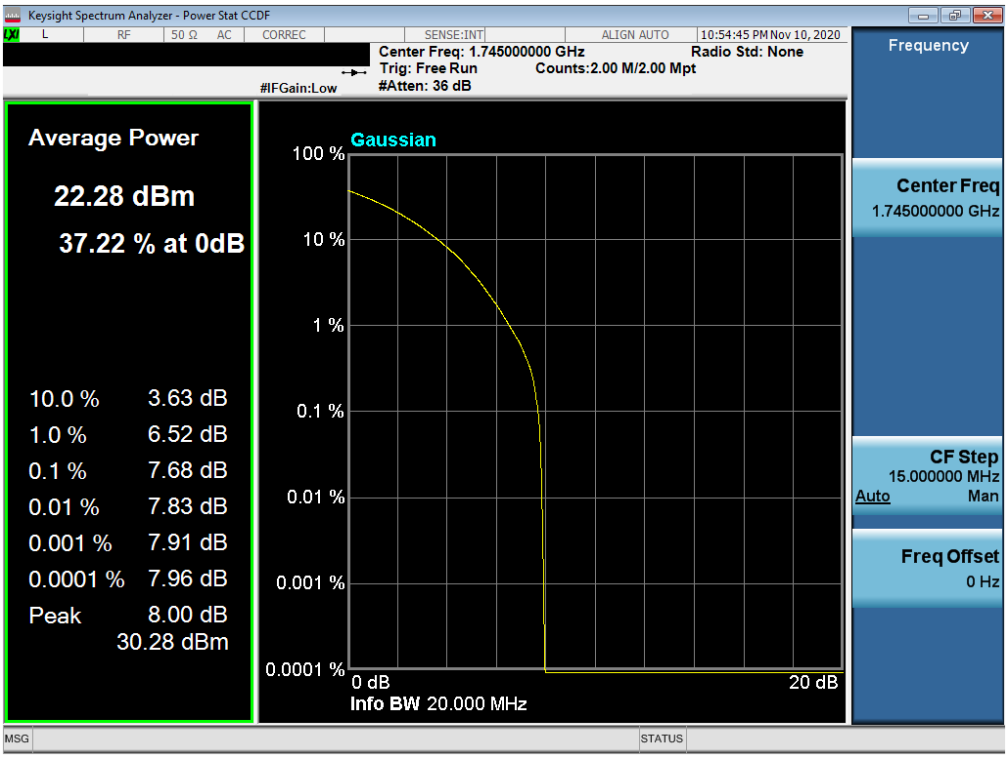


Plot 7-218. PAR Plot (LTE Band 66/4 - 1.4MHz 256-QAM - Full RB Configuration)

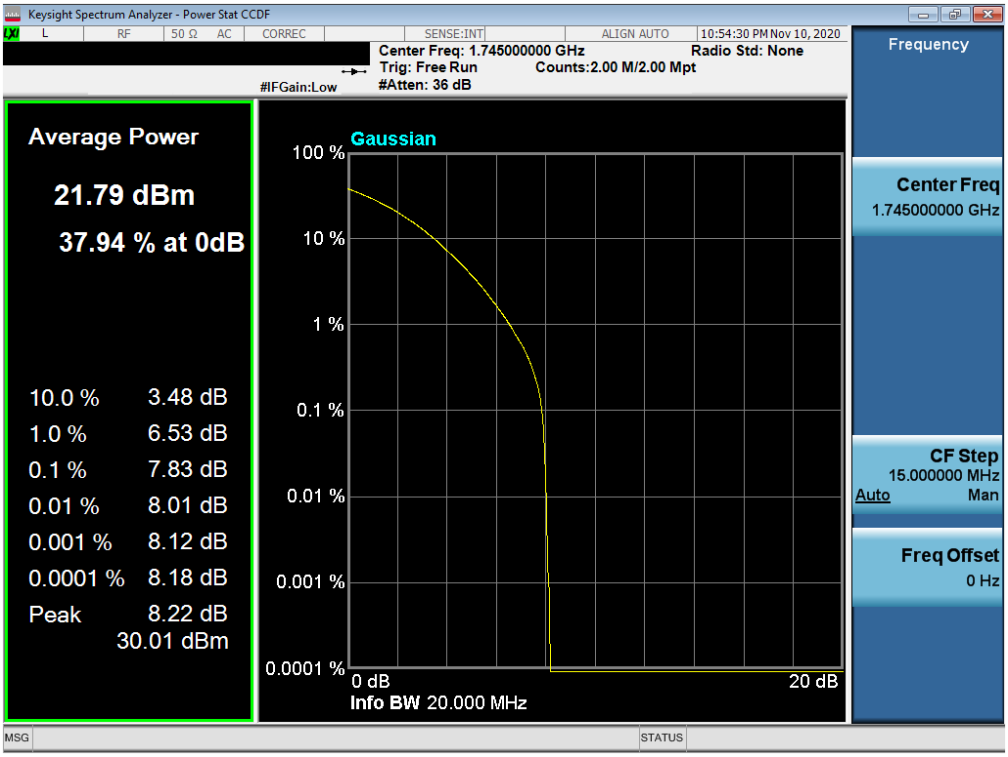
NR Band n66



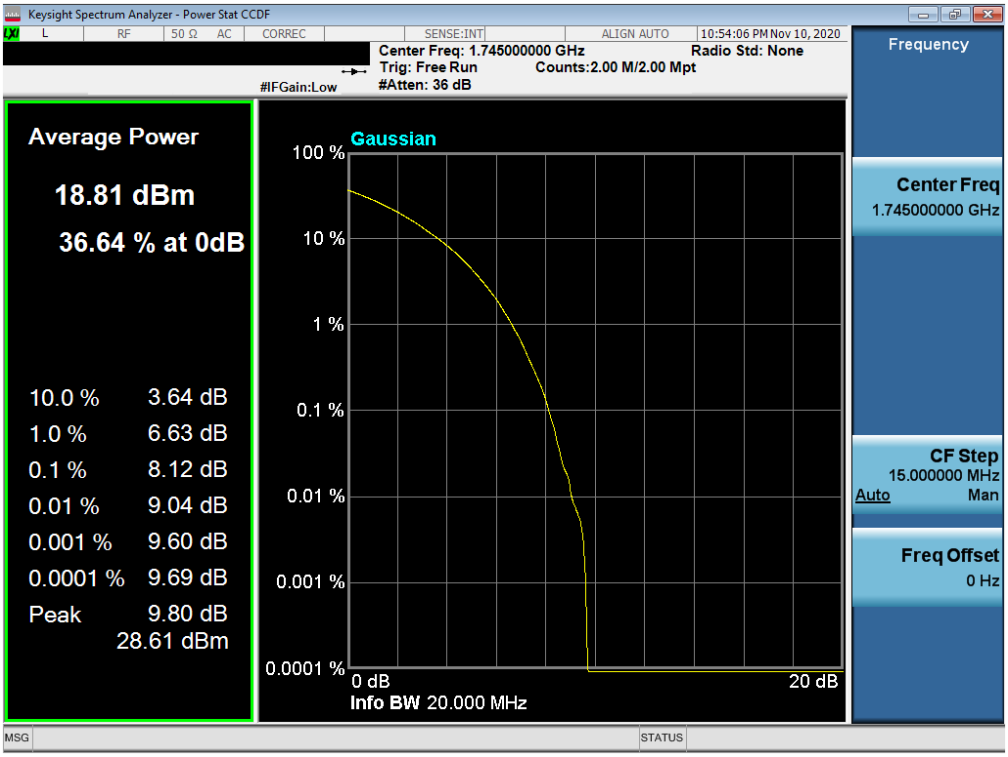
Plot 7-219. PAR Plot (NR Band n66 - 20.0MHz CP-OFDM QPSK - Full RB)



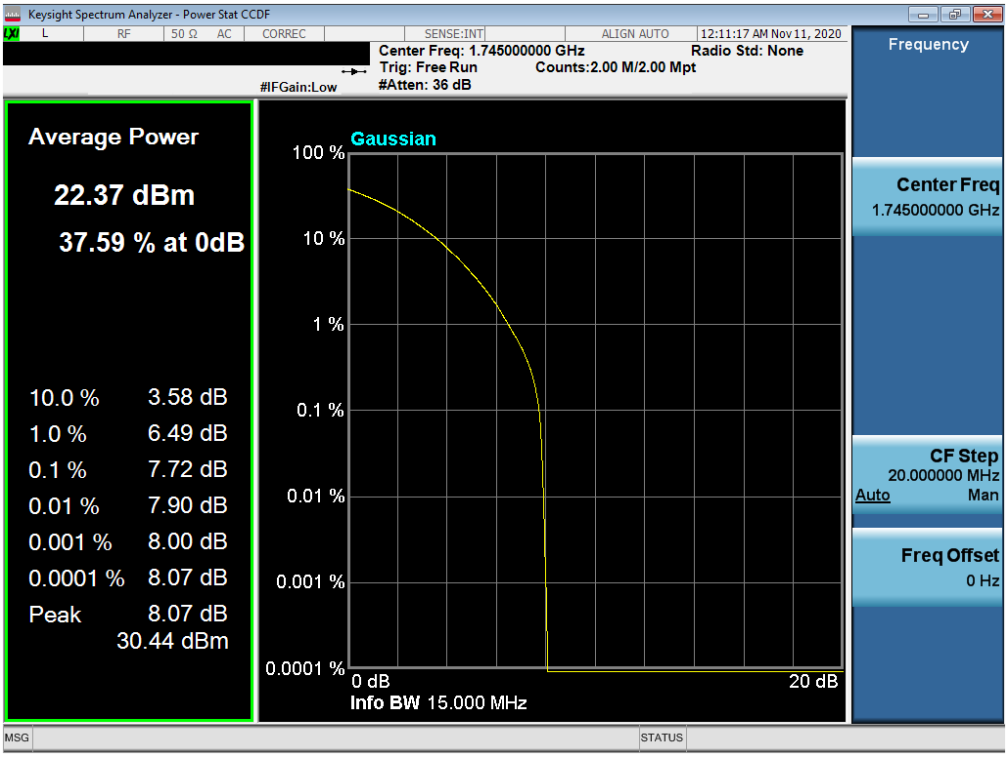
Plot 7-220. PAR Plot (NR Band n66 - 20.0MHz CP-OFDM 16-QAM - Full RB)



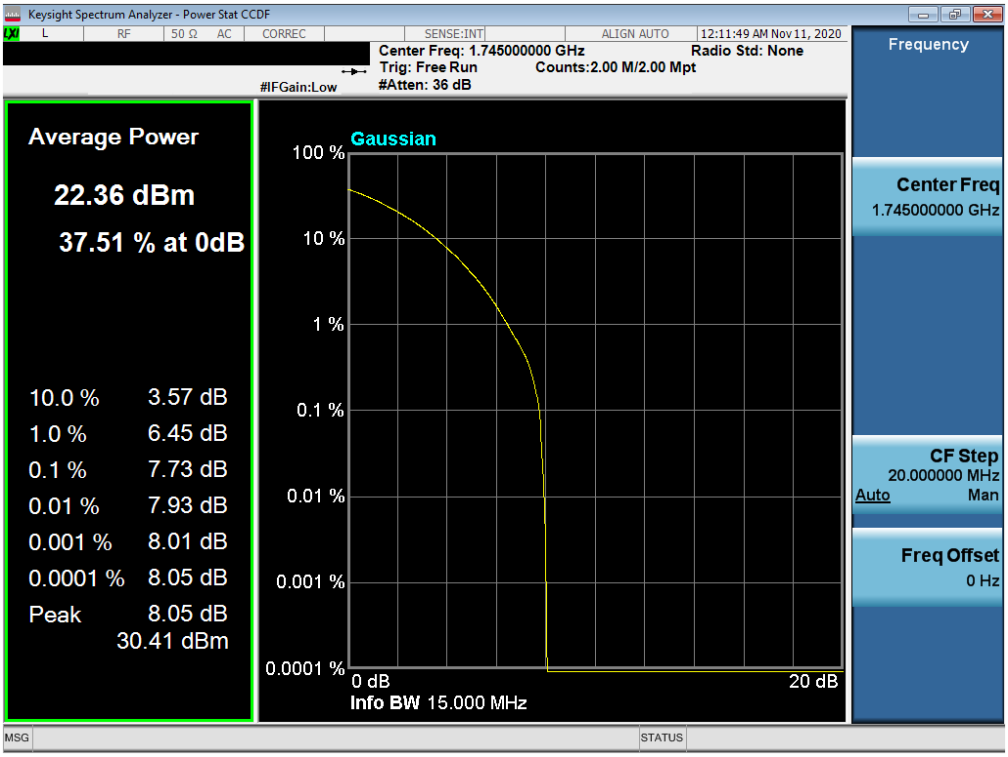
Plot 7-221. PAR Plot (NR Band n66 - 20.0MHz CP-OFDM 64-QAM - Full RB)



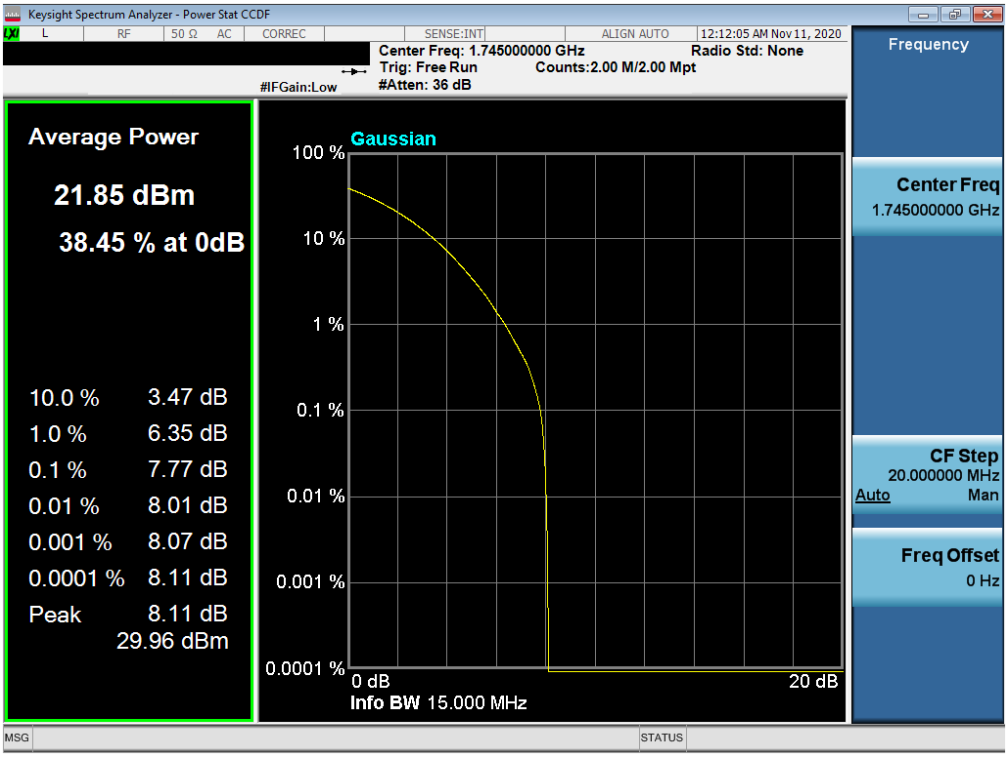
Plot 7-222. PAR Plot (NR Band n66 - 20.0MHz CP-OFDM 256-QAM - Full RB)



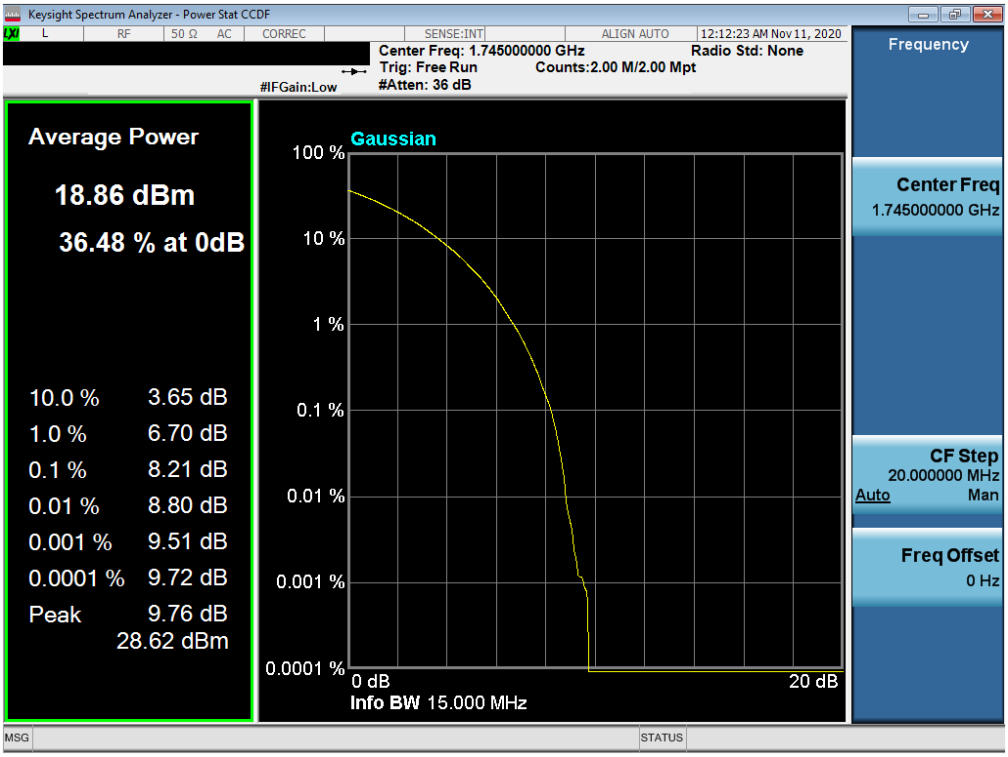
Plot 7-223. PAR Plot (NR Band n66 - 15.0MHz CP-OFDM QPSK - Full RB)



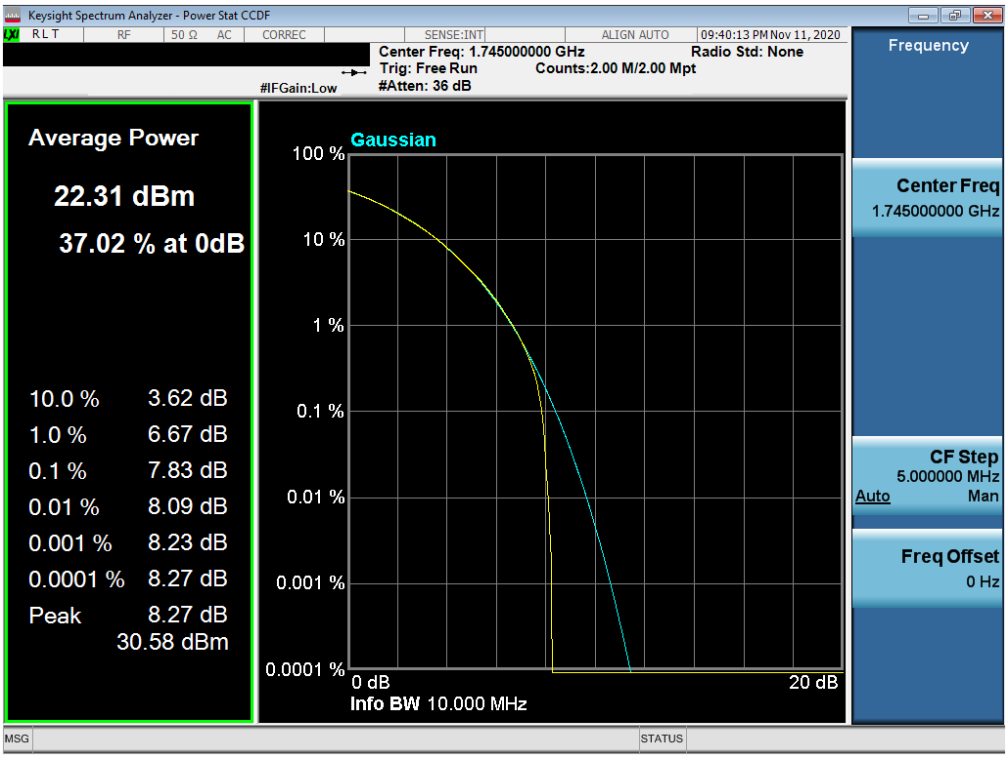
Plot 7-224. PAR Plot (NR Band n66 - 15.0MHz CP-OFDM 16-QAM - Full RB)



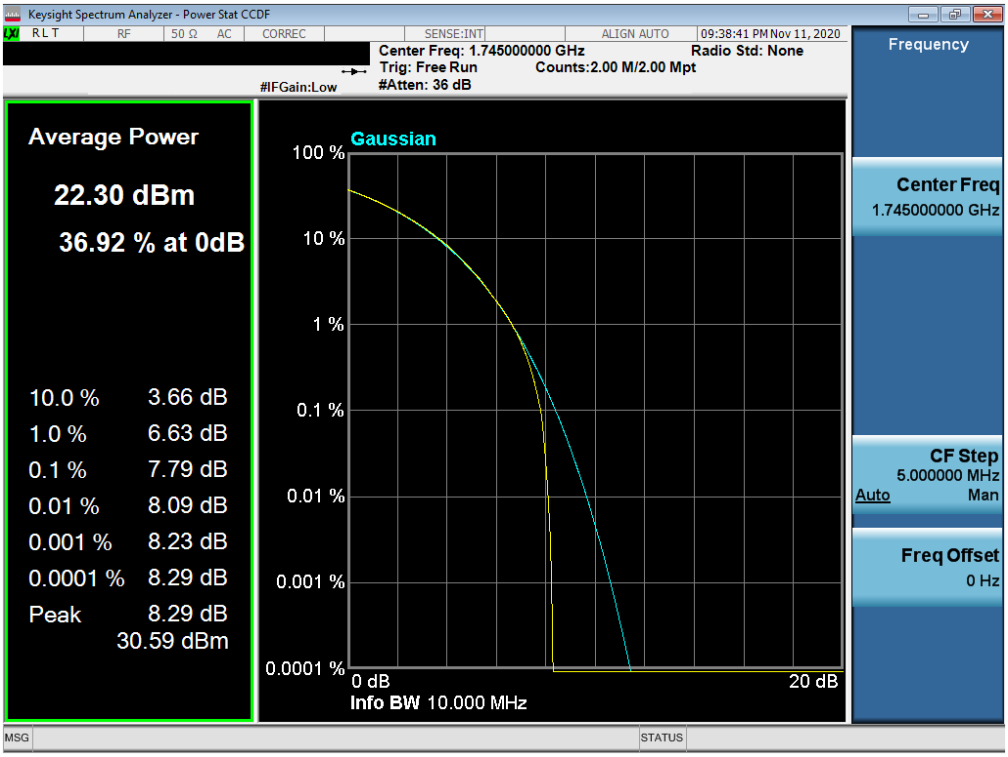
Plot 7-225. PAR Plot (NR Band n66 - 15.0MHz CP-OFDM 64-QAM - Full RB)



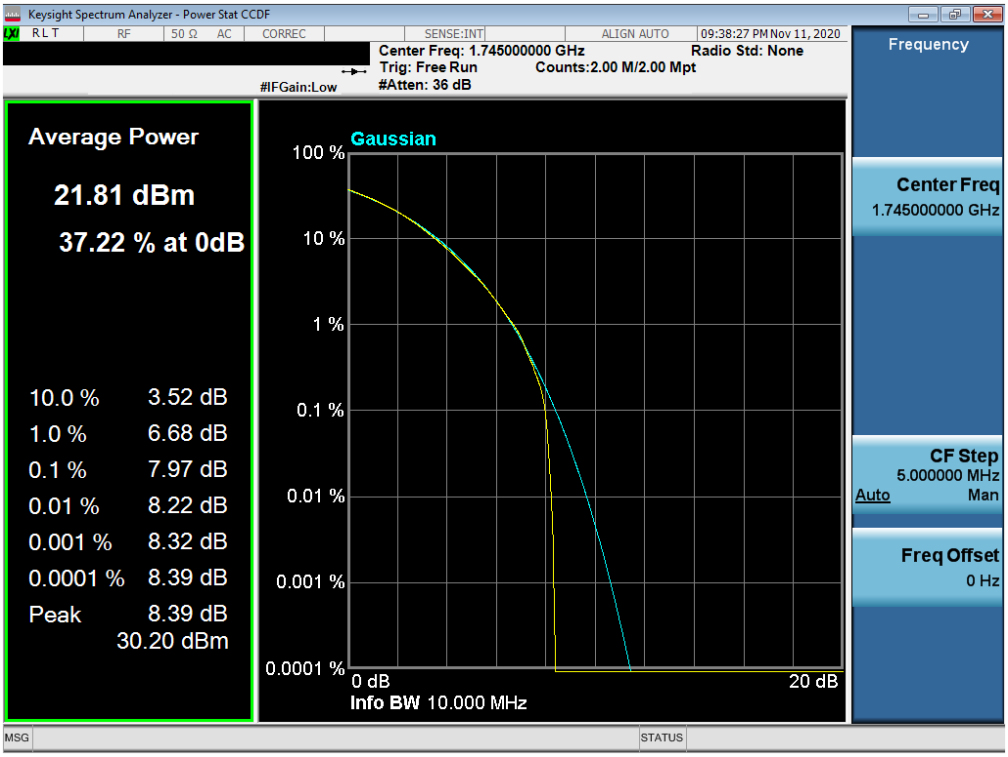
Plot 7-226. PAR Plot (NR Band n66 - 15.0MHz CP-OFDM 256-QAM - Full RB)



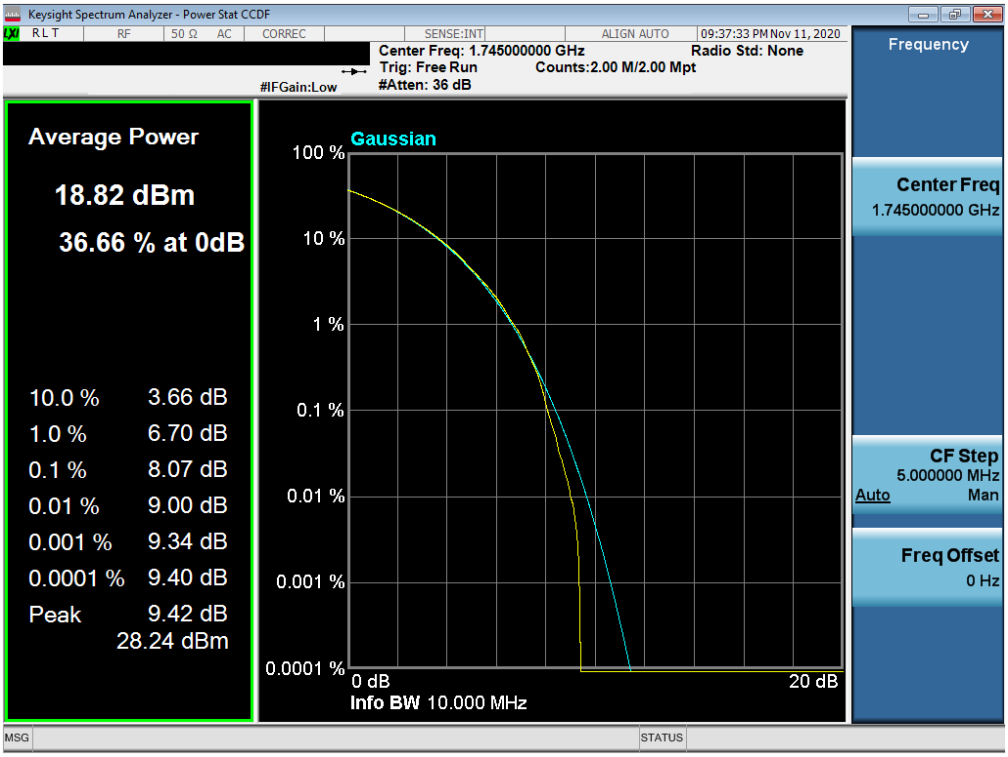
Plot 7-227. PAR Plot (NR Band n66 - 10.0MHz CP-OFDM QPSK - Full RB)



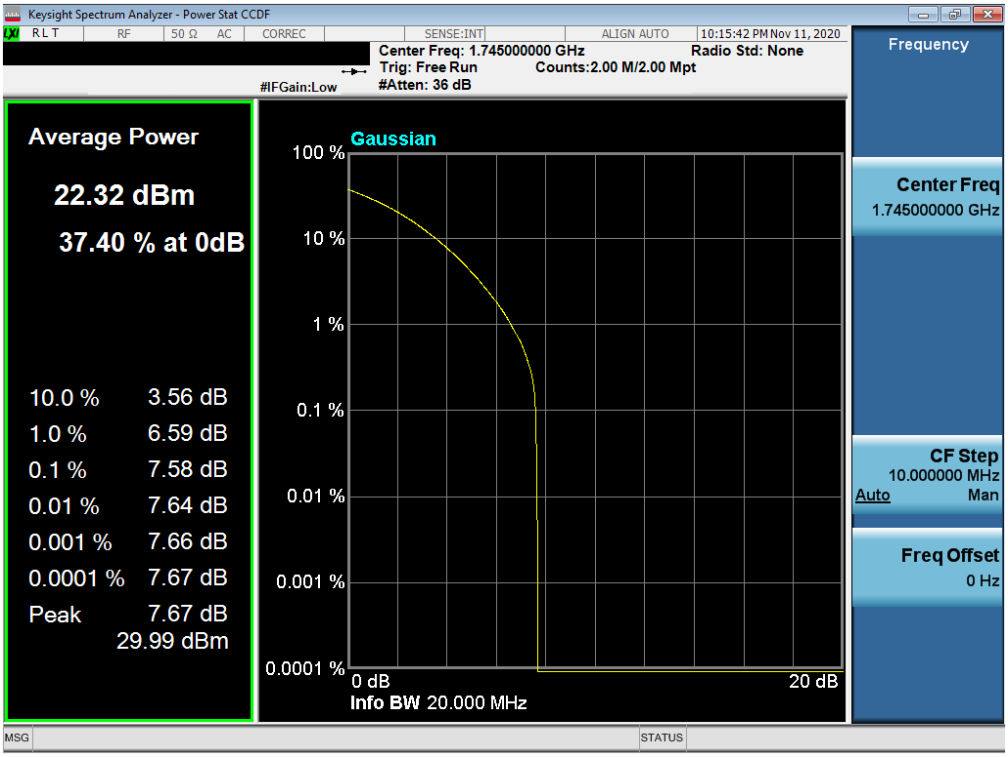
Plot 7-228. PAR Plot (NR Band n66 - 10.0MHz CP-OFDM 16-QAM - Full RB)



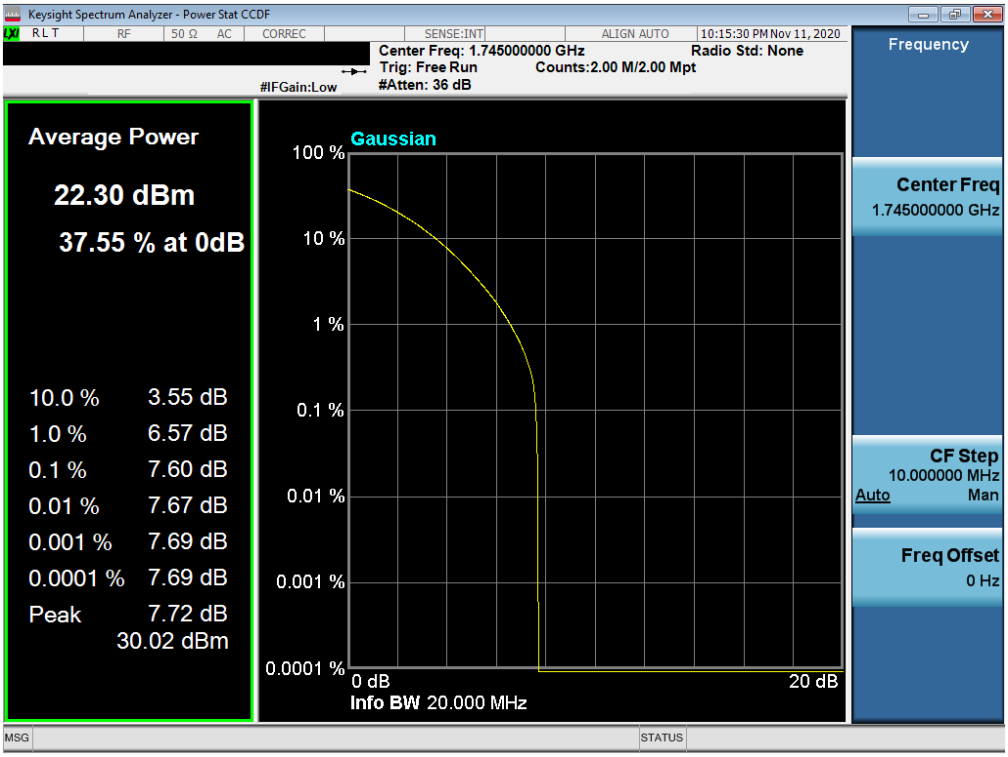
Plot 7-229. PAR Plot (NR Band n66 - 10.0MHz CP-OFDM 64-QAM - Full RB)



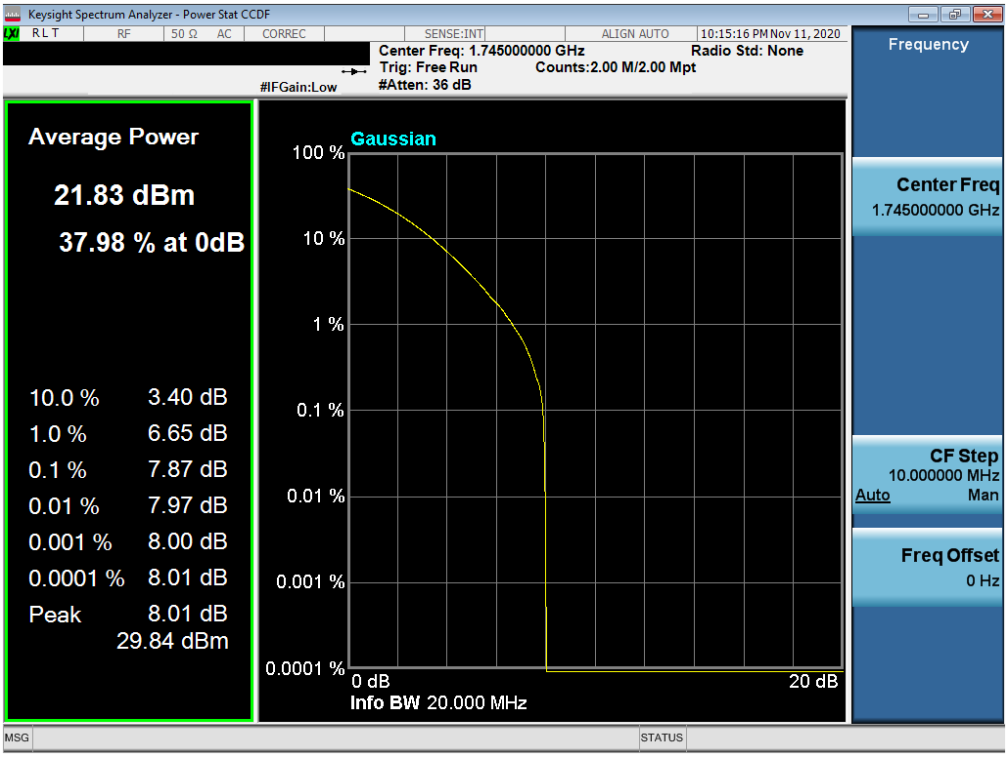
Plot 7-230. PAR Plot (NR Band n66 - 10.0MHz CP-OFDM 256-QAM - Full RB)



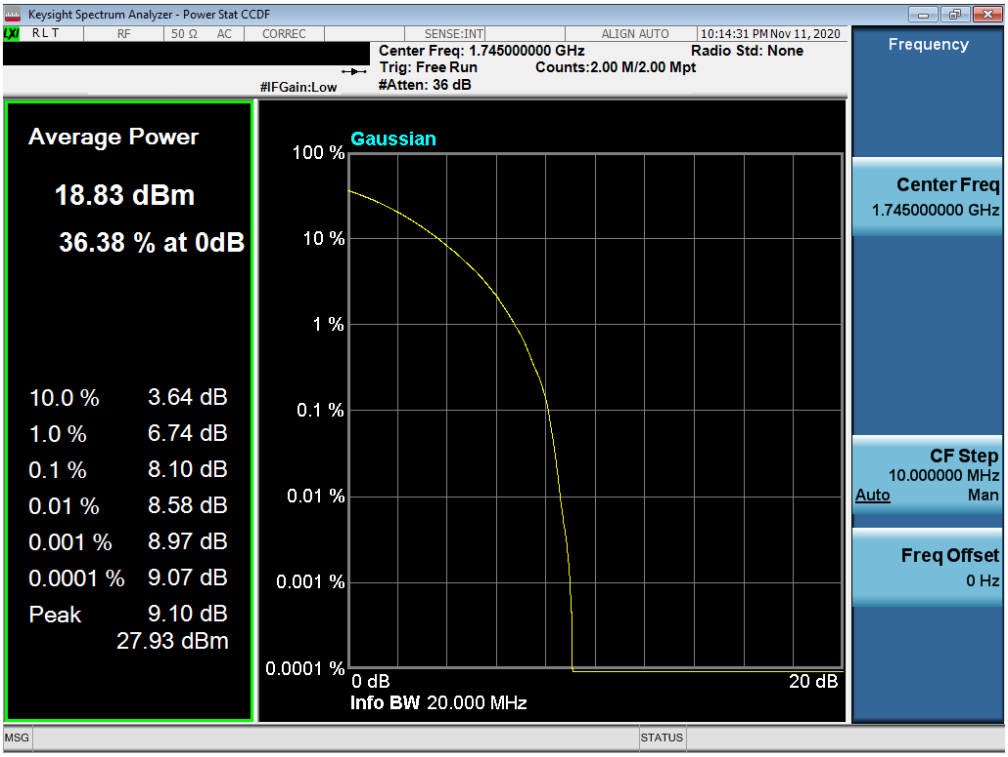
Plot 7-231. PAR Plot (NR Band n66 - 5.0MHz CP-OFDM QPSK - Full RB)



Plot 7-232. PAR Plot (NR Band n66 - 5.0MHz CP-OFDM 16-QAM - Full RB)



Plot 7-233. PAR Plot (NR Band n66 - 5.0MHz CP-OFDM 64-QAM - Full RB)



Plot 7-234. PAR Plot (NR Band n66 - 5.0MHz CP-OFDM 256-QAM - Full RB)

7.6 Radiated Power (EIRP)

Test Overview

Effective Radiated Power (ERP) measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. 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/TIA-603-E-2016 – Section 2.2.17

Test Settings

1. Radiated 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, not to exceed 1MHz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points ≥ 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

Test Setup

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

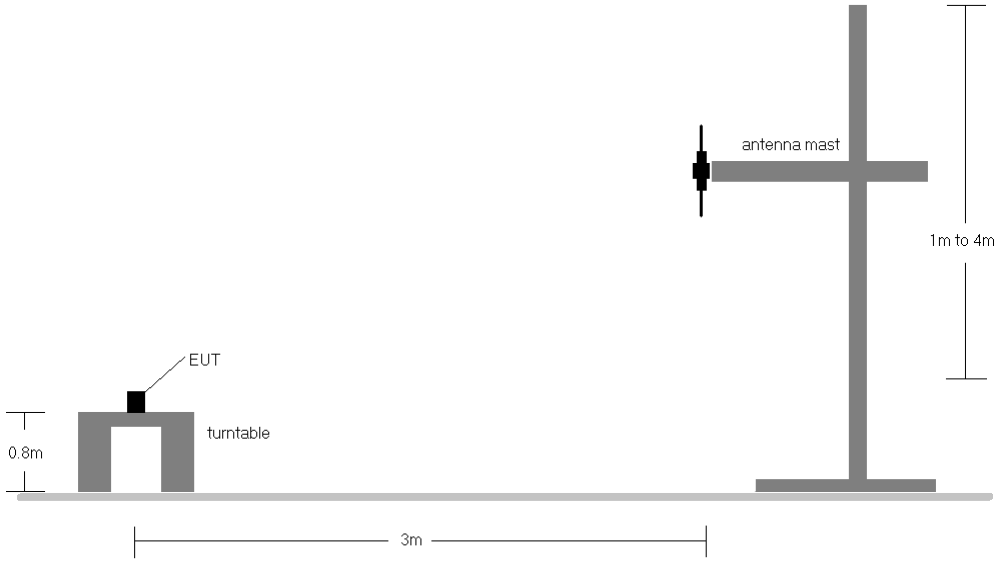


Figure 7-5. Radiated Test Setup <1GHz

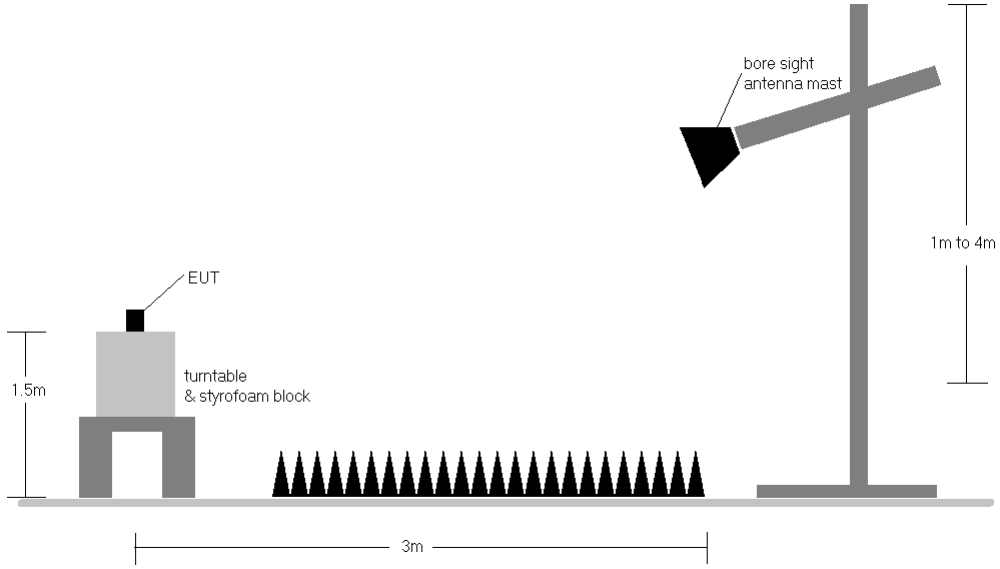


Figure 7-6. Radiated Test Setup >1GHz

Test Notes

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

2) This unit was tested with its standard battery.

3) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case setup is reported in the tables below.

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

5) This device employs UMTS technology with WCDMA (AMR/RMC) and HSDPA capabilities. The EUT was tested under all configurations and the highest power is reported in WCDMA mode with HSDPA Inactive at 12.2 kbps RMC and TPC bits all set to “1”.

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
10 MHz	QPSK	704.0	H	341.0	278.0	3.58	1 / 0	12.11	15.69	0.037	36.99	-21.30	13.54	0.023	34.77	-21.23
		707.5	H	341.0	278.0	4.62	1 / 0	13.76	**18.38**	0.069	36.99	-18.61	**16.23**	0.042	34.77	-18.54
		711.0	H	344.0	274.0	3.67	1 / 0	14.32	17.99	0.063	36.99	-19.00	15.84	0.038	34.77	-18.93
	16-QAM	707.5	H	341.0	278.0	4.62	1 / 0	12.84	**17.46**	0.056	36.99	-19.53	**15.31**	0.034	34.77	-19.46
	64-QAM	704.0	H	341.0	278.0	3.58	1 / 0	10.09	**13.67**	0.023	36.99	-23.32	**11.52**	0.014	34.77	-23.25
	256-QAM	707.5	H	341.0	278.0	4.62	1 / 0	6.78	**11.40**	0.014	36.99	-25.59	**9.25**	0.008	34.77	-25.52
5 MHz	QPSK	701.5	H	341.0	278.0	3.45	1 / 17	12.42	15.87	0.039	36.99	-21.12	13.72	0.024	34.77	-21.05
		707.5	H	341.0	278.0	3.72	1 / 17	14.66	**18.38**	0.069	36.99	-18.61	**16.23**	0.042	34.77	-18.54
		713.5	H	344.0	274.0	3.70	1 / 24	14.28	17.98	0.063	36.99	-19.01	15.83	0.038	34.77	-18.94
	16-QAM	707.5	H	341.0	278.0	3.72	1 / 17	13.86	**17.58**	0.057	36.99	-19.41	**15.43**	0.035	34.77	-19.34
	64-QAM	701.5	H	341.0	278.0	3.45	1 / 24	10.37	**13.82**	0.024	36.99	-23.17	**11.67**	0.015	34.77	-23.10
	256-QAM	707.5	H	341.0	278.0	3.72	1 / 17	7.60	**11.32**	0.014	36.99	-25.67	**9.17**	0.008	34.77	-25.60
3 MHz	QPSK	700.5	H	341.0	278.0	3.44	1 / 12	12.42	15.86	0.039	36.99	-21.13	13.71	0.023	34.77	-21.06
		707.5	H	341.0	278.0	3.72	1 / 14	14.57	**18.29**	0.067	36.99	-18.70	**16.14**	0.041	34.77	-18.63
		714.5	H	344.0	274.0	3.71	1 / 12	14.27	17.98	0.063	36.99	-19.01	15.83	0.038	34.77	-18.94
	16-QAM	707.5	H	341.0	278.0	3.72	1 / 12	13.61	**17.33**	0.054	36.99	-19.66	**15.18**	0.033	34.77	-19.59
	64-QAM	700.5	H	341.0	278.0	3.72	1 / 12	10.17	**13.89**	0.024	36.99	-23.10	**11.74**	0.015	34.77	-23.03
	256-QAM	714.5	H	344.0	274.0	3.72	1 / 14	7.85	**11.57**	0.014	36.99	-25.42	**9.42**	0.009	34.77	-25.35
1.4 MHz	QPSK	699.7	H	341.0	278.0	3.72	1 / 3	12.25	15.97	0.040	36.99	-21.02	13.82	0.024	34.77	-20.95
		707.5	H	341.0	278.0	3.72	1 / 3	14.67	**18.39**	0.069	36.99	-18.60	**16.24**	0.042	34.77	-18.53
		715.3	H	344.0	274.0	3.72	1 / 3	14.34	18.06	0.064	36.99	-18.93	15.91	0.039	34.77	-18.86
	16-QAM	707.5	H	341.0	278.0	3.72	1 / 5	13.61	**17.33**	0.054	36.99	-19.66	**15.18**	0.033	34.77	-19.59
	64-QAM	699.7	H	341.0	278.0	3.72	1 / 5	10.25	**13.97**	0.025	36.99	-23.02	**11.82**	0.015	34.77	-22.95
	256-QAM	707.5	H	341.0	278.0	3.72	1 / 0	7.65	**11.37**	0.014	36.99	-25.62	**9.22**	0.008	34.77	-25.55
	Opposite Pol.	707.5	V	186.0	315.0	4.62	1 / 0	12.83	17.45	0.056	36.99	-19.54	15.30	0.034	34.77	-19.47
	WCP	707.5	V	158.0	-8.0	4.62	1 / 0	9.01	13.63	0.023	36.99	-23.36	11.48	0.014	34.77	-23.29

Table 7-2. ERP Data (LTE Band 12/17)

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
10 MHz	QPSK	782.0	H	213.0	108.0	5.89	1 / 0	12.49	**18.38**	0.069	36.99	-18.61	**16.23**	0.042	34.77	-18.54
	16-QAM	782.0	H	213.0	108.0	5.89	1 / 49	10.44	**16.33**	0.043	36.99	-20.66	**14.18**	0.026	34.77	-20.59
	64-QAM	782.0	H	213.0	108.0	5.89	1 / 49	9.39	**15.28**	0.034	36.99	-21.71	**13.13**	0.021	34.77	-21.64
	256-QAM	782.0	H	213.0	108.0	5.89	1 / 25	7.18	**13.07**	0.020	36.99	-23.92	**10.92**	0.012	34.77	-23.85
5 MHz	QPSK	782.0	H	213.0	108.0	5.89	1 / 0	12.52	**18.41**	0.069	36.99	-18.58	**16.26**	0.042	34.77	-18.51
	16-QAM	782.0	H	213.0	108.0	5.89	1 / 0	10.95	**16.84**	0.048	36.99	-20.15	**14.69**	0.029	34.77	-20.08
	64-QAM	779.5	H	213.0	108.0	5.82	1 / 0	9.96	**15.78**	0.038	36.99	-21.21	**13.63**	0.023	34.77	-21.15
	256-QAM	782.0	H	213.0	108.0	5.89	1 / 0	4.73	**10.62**	0.012	36.99	-26.37	**8.47**	0.007	34.77	-26.30
	Opposite Pol.	782.0	V	102.0	292.0	5.79	1 / 0	9.18	14.97	0.031	36.99	-22.02	12.82	0.019	34.77	-21.95
	WCP	782.0	H	201.0	241.0	5.79	1 / 0	6.37	12.16	0.016	36.99	-24.83	10.01	0.010	34.77	-24.76

Table 7-3. ERP Data (LTE Band 13)

Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1712.40	WCDMA1700	V	127	329	11.44	9.37	**20.81**	**0.120**	30.00	-9.19
1732.60	WCDMA1700	V	112	343	10.25	9.22	19.47	0.089	30.00	-10.53
1752.60	WCDMA1700	V	113	321	7.93	9.11	17.04	0.051	30.00	-12.96
1712.40	WCDMA1700	H	112	258	4.03	9.22	13.25	0.021	30.00	-16.75
1712.40	WCDMA1700 (WCP)	V	131	300	8.18	9.22	17.40	0.055	30.00	-12.60

Table 7-4. EIRP Data (WCDMA AWS)

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
20 MHz	QPSK	1720.0	V	192.0	197.0	9.31	1 / 50	13.18	**22.49**	0.178	30.00	-7.51
		1745.0	V	205.0	195.0	9.14	1 / 50	12.28	21.42	0.139	30.00	-8.58
		1770.0	V	197.0	207.0	9.17	1 / 50	10.47	19.64	0.092	30.00	-10.36
	16-QAM	1720.0	V	192.0	197.0	9.31	1 / 50	12.64	**21.95**	0.157	30.00	-8.05
	64-QAM	1720.0	V	192.0	197.0	9.31	1 / 50	11.58	**20.89**	0.123	30.00	-9.11
	256-QAM	1720.0	V	192.0	197.0	9.31	1 / 50	8.57	**17.88**	0.061	30.00	-12.12
15 MHz	QPSK	1717.5	V	192.0	197.0	9.33	1 / 74	13.45	**22.78**	0.190	30.00	-7.22
		1745.0	V	205.0	195.0	9.14	1 / 0	12.74	21.88	0.154	30.00	-8.12
		1772.5	V	197.0	207.0	9.18	1 / 74	10.80	19.98	0.100	30.00	-10.02
	16-QAM	1717.5	V	192.0	197.0	9.33	1 / 74	12.98	**22.31**	0.170	30.00	-7.69
	64-QAM	1717.5	V	192.0	197.0	9.33	1 / 74	11.85	**21.18**	0.131	30.00	-8.82
	256-QAM	1717.5	V	192.0	197.0	9.33	1 / 74	8.88	**18.21**	0.066	30.00	-11.79
10 MHz	QPSK	1715.0	V	192.0	197.0	9.35	1 / 49	13.40	**22.75**	0.188	30.00	-7.25
		1745.0	V	205.0	195.0	9.14	1 / 0	12.64	21.78	0.151	30.00	-8.22
		1775.0	V	197.0	207.0	9.18	1 / 49	10.76	19.95	0.099	30.00	-10.05
	16-QAM	1715.0	V	192.0	197.0	9.35	1 / 49	13.04	**22.39**	0.173	30.00	-7.61
	64-QAM	1715.0	V	192.0	197.0	9.35	1 / 49	11.73	**21.08**	0.128	30.00	-8.92
	256-QAM	1715.0	V	192.0	197.0	9.35	1 / 49	8.79	**18.14**	0.065	30.00	-11.86
5 MHz	QPSK	1712.5	V	192.0	197.0	9.37	1 / 24	13.47	**22.83**	0.192	30.00	-7.17
		1745.0	V	205.0	195.0	9.14	1 / 0	12.73	21.87	0.154	30.00	-8.13
		1777.5	V	197.0	207.0	9.19	1 / 24	10.74	19.93	0.098	30.00	-10.07
	16-QAM	1712.5	V	192.0	197.0	9.37	1 / 0	13.15	**22.51**	0.178	30.00	-7.49
	64-QAM	1712.5	V	192.0	197.0	9.37	1 / 0	11.95	**21.31**	0.135	30.00	-8.69
	256-QAM	1712.5	V	192.0	197.0	9.37	1 / 24	8.92	**18.28**	0.067	30.00	-11.72
3 MHz	QPSK	1711.5	V	192.0	197.0	9.37	1 / 14	13.48	**22.85**	0.193	30.00	-7.15
		1745.0	V	205.0	195.0	9.14	1 / 14	12.69	21.83	0.152	30.00	-8.17
		1778.5	V	197.0	207.0	9.20	1 / 0	10.76	19.96	0.099	30.00	-10.04
	16-QAM	1711.5	V	192.0	197.0	9.37	1 / 0	12.91	**22.28**	0.169	30.00	-7.72
	64-QAM	1711.5	V	192.0	197.0	9.37	1 / 14	11.77	**21.14**	0.130	30.00	-8.86
	256-QAM	1711.5	V	192.0	197.0	9.37	1 / 0	8.92	**18.29**	0.067	30.00	-11.71
1.4 MHz	QPSK	1710.7	V	192.0	197.0	9.38	1 / 0	13.55	**22.93**	0.196	30.00	-7.07
		1745.0	V	205.0	195.0	9.14	1 / 0	12.80	21.94	0.156	30.00	-8.06
		1779.3	V	197.0	207.0	9.20	1 / 0	10.95	20.15	0.103	30.00	-9.85
	16-QAM	1710.7	V	192.0	197.0	9.38	1 / 5	13.13	**22.51**	0.178	30.00	-7.49
	64-QAM	1710.7	V	192.0	197.0	9.38	1 / 0	11.86	**21.24**	0.133	30.00	-8.76
	256-QAM	1710.7	V	192.0	197.0	9.38	1 / 5	8.91	**18.29**	0.067	30.00	-11.71
	Opposite Pol.	1720.0	H	100.0	37.0	9.31	1/50	7.58	16.89	0.049	30.00	-13.11
	WCP	1720.0	V	296.0	37.0	9.31	1/50	-0.48	8.83	0.008	30.00	-21.17

Table 7-5. EIRP Data (LTE Band 66/4)

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
20 MHz	QPSK	1720.0	V	142.0	326.0	9.31	1/79	13.39	**22.70**	0.186	30.00	-7.30
		1745.0	V	136.0	326.0	9.14	1/79	13.14	22.28	0.169	30.00	-7.72
		1770.0	V	126.0	343.0	9.17	1/53	12.88	22.05	0.160	30.00	-7.95
	16-QAM	1720.0	V	142.0	326.0	9.31	1/79	12.37	**21.68**	0.147	30.00	-8.32
	64-QAM	1720.0	V	142.0	326.0	9.31	1/53	11.08	**20.39**	0.109	30.00	-9.61
	256-QAM	1720.0	V	142.0	326.0	9.31	1/53	8.99	**18.30**	0.068	30.00	-11.70
15 MHz	QPSK	1717.5	V	142.0	326.0	9.33	1/39	13.35	**22.68**	0.185	30.00	-7.32
		1745.0	V	136.0	326.0	9.14	1/58	13.17	22.31	0.170	30.00	-7.69
		1772.5	V	126.0	343.0	9.18	1/39	12.91	22.08	0.162	30.00	-7.92
	16-QAM	1717.5	V	142.0	326.0	9.33	1/39	12.59	**21.92**	0.156	30.00	-8.08
	64-QAM	1717.5	V	142.0	326.0	9.33	1/39	11.23	**20.56**	0.114	30.00	-9.44
	256-QAM	1717.5	V	142.0	326.0	9.33	1/39	9.01	**18.34**	0.068	30.00	-11.66
10 MHz	QPSK	1715.0	V	142.0	326.0	9.35	1/26	13.47	**22.82**	0.191	30.00	-7.18
		1745.0	V	136.0	326.0	9.14	1/38	13.21	22.35	0.172	30.00	-7.65
		1775.0	V	126.0	343.0	9.18	1/38	12.91	22.10	0.162	30.00	-7.90
	16-QAM	1715.0	V	142.0	326.0	9.35	1/13	12.53	**21.87**	0.154	30.00	-8.13
	64-QAM	1715.0	V	142.0	326.0	9.35	1/38	10.97	**20.32**	0.108	30.00	-9.68
	256-QAM	1715.0	V	142.0	326.0	9.35	1/26	8.98	**18.33**	0.068	30.00	-11.67
5 MHz	QPSK	1712.5	V	142.0	326.0	9.37	1/12	13.49	**22.86**	0.193	30.00	-7.14
		1745.0	V	136.0	326.0	9.14	1/18	13.06	22.20	0.166	30.00	-7.80
		1777.5	V	126.0	343.0	9.19	1/12	12.96	22.15	0.164	30.00	-7.85
	16-QAM	1712.5	V	142.0	326.0	9.37	1/6	12.51	**21.88**	0.154	30.00	-8.12
	64-QAM	1712.5	V	142.0	326.0	9.37	1/12	11.20	**20.57**	0.114	30.00	-9.43
	256-QAM	1712.5	V	142.0	326.0	9.37	1/18	8.94	**18.30**	0.068	30.00	-11.70
	QPSK (CP-OFDM)	1730.0	V	142.0	326.0	9.31	1 / 161	11.84	**21.15**	0.130	30.00	-8.85
	QPSK (Opposite Pol.)	1730.0	H	170.0	167.0	9.41	1 / 161	12.00	21.41	0.138	30.00	-8.59
	QPSK (WCP)	1730.0	V	143.0	281.0	9.31	1 / 161	10.36	19.67	0.093	30.00	-10.33

Table 7-6. EIRP Data (NR Band n66)

7.7 Radiated Spurious Emissions Measurements

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using horizontally and vertically polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as peak measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.8

ANSI/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.

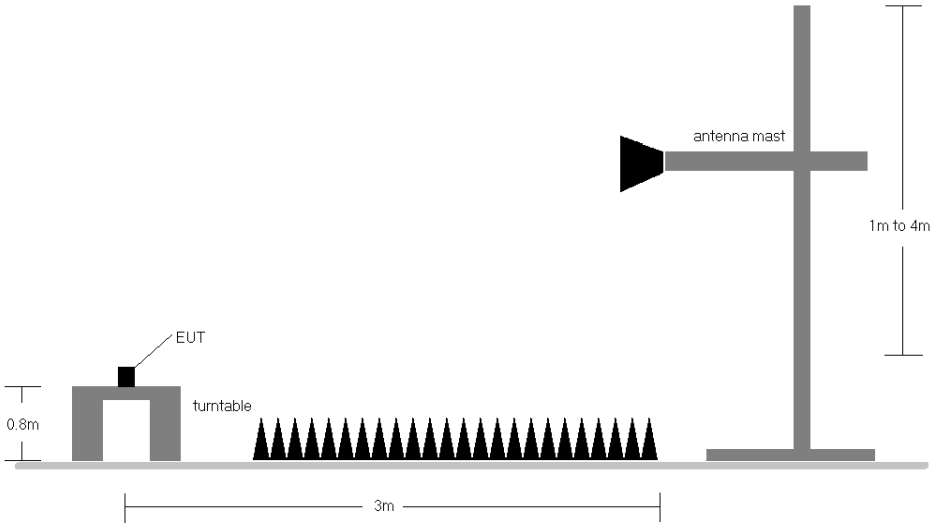


Figure 7-7. Test Instrument & Measurement Setup

Test Notes

1) Field strengths are calculated using the Measurement quantity conversions in KDB 971168 Section 5.8.4.
   b) E(dBµV/m) = Measured amplitude level (dBm) + 107 + Cable Loss (dB) + Antenna Factor (dB/m)
   d) 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 EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case setup is reported in the tables below.

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

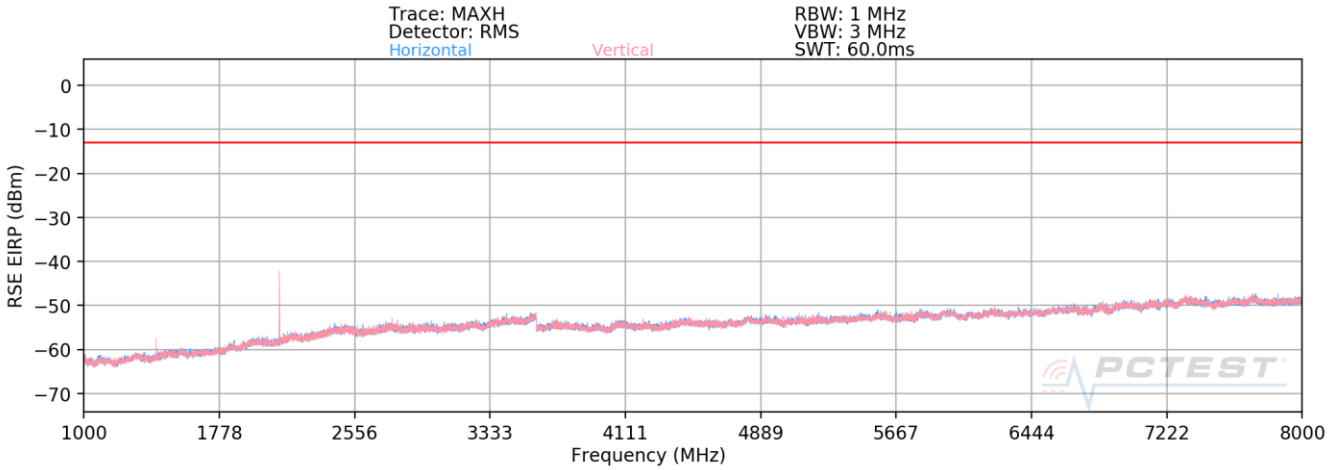
6) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.

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

8) 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.

9) Spurious emissions shown in this section are measured while operating in EN-DC mode with Sub 6GHz NR carrier as well as an LTE carrier (anchor). Spurious emissions from the NR carrier device, is subject to the rules under which the NR carrier operates. Spurious emission caused by the LTE carrier must meet the requirements of the rules under which the LTE carrier operates.

LTE Band 12/17



Plot 7-235. Radiated Spurious Plot (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]
1408.0	H	354	35	-75.12	-2.47	29.41	-65.85	-13.00	-52.85
2112.0	H	19	336	-58.27	0.89	49.62	-45.63	-13.00	-32.63
2816.0	H	-	-	-77.83	3.71	32.88	-62.38	-13.00	-49.38
3520.0	H	-	-	-77.74	4.45	33.71	-61.54	-13.00	-48.54
4224.0	H	-	-	-78.92	5.90	33.98	-61.28	-13.00	-48.28

Table 7-7. 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]
1415.0	H	357	35	-73.14	-2.42	31.44	-63.82	-13.00	-50.82
2122.5	H	272	333	-55.03	0.98	52.95	-42.30	-13.00	-29.30
2830.0	H	-	-	-77.93	3.51	32.58	-62.68	-13.00	-49.68
3537.5	H	-	-	-77.68	4.53	33.85	-61.41	-13.00	-48.41
4245.0	H	-	-	-78.70	5.88	34.18	-61.08	-13.00	-48.08

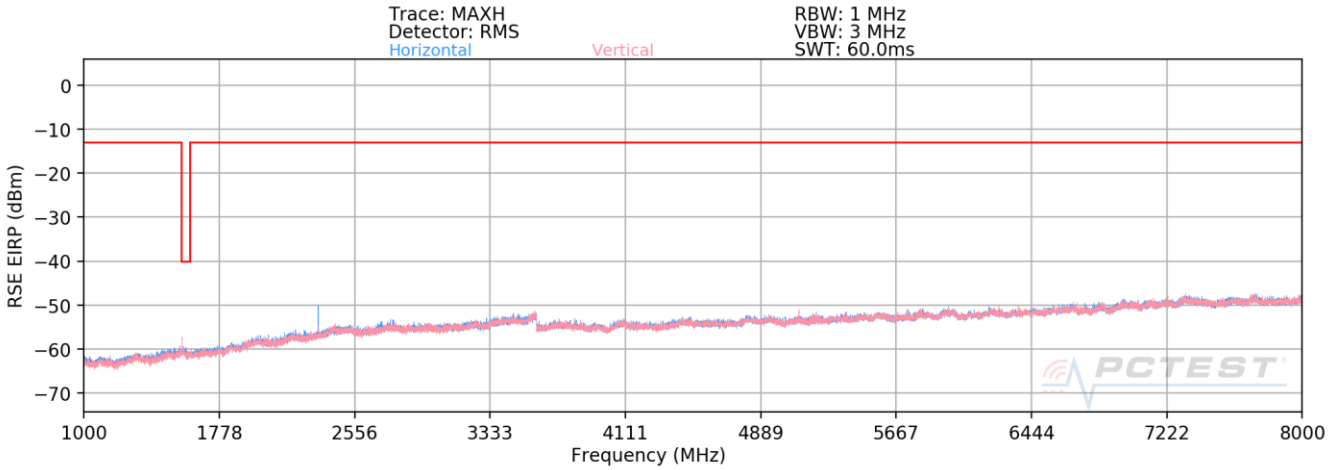
Table 7-8. Radiated Spurious Data (LTE Band 12/17 – Mid Channel)

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]
1422.0	H	346	179	-70.25	-2.48	34.27	-60.99	-13.00	-47.99
2133.0	H	306	340	-53.23	1.09	54.86	-40.39	-13.00	-27.39
2844.0	H	-	-	-77.94	3.46	32.52	-62.74	-13.00	-49.74
3555.0	H	-	-	-77.87	4.75	33.88	-61.38	-13.00	-48.38
4266.0	H	-	-	-78.30	5.56	34.26	-61.00	-13.00	-48.00

Table 7-9. Radiated Spurious Data (LTE Band 12/17 – High Channel)

LTE Band 13



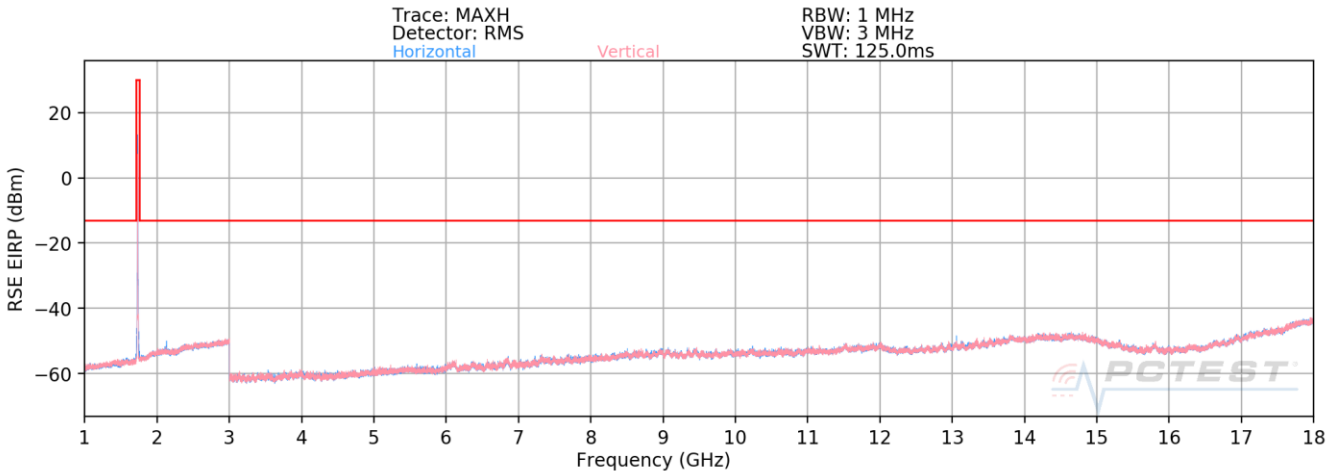
Plot 7-236. Radiated Spurious Plot (LTE Band 13)

Bandwidth (MHz):	10
Frequency (MHz):	782.0
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]
1564.0	H	213	48	-74.58	-0.89	31.53	-63.72	-40.00	-23.72
2346.0	H	101	135	-67.55	2.25	41.70	-53.56	-13.00	-40.56
3128.0	H	115	171	-74.97	4.00	36.03	-59.23	-13.00	-46.23
3910.0	H	-	-	-78.59	5.14	33.55	-61.71	-13.00	-48.71
4692.0	H	-	-	-78.91	6.50	34.59	-60.67	-13.00	-47.67
5474.0	H	-	-	-79.88	8.57	35.69	-59.56	-13.00	-46.56

Table 7-10. Radiated Spurious Data (LTE Band 13 – Mid Channel)

WCDMA AWS



Plot 7-237. Radiated Spurious Plot (WCDMA AWS)

Mode:	WCDMA RMC
Channel:	1312
Frequency (MHz):	1712.4

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]
3424.8	H	-	-	-78.24	1.94	30.70	-64.55	-13.00	-51.55
5137.2	H	-	-	-79.19	4.31	32.12	-63.14	-13.00	-50.14
6849.6	H	-	-	-80.32	8.64	35.32	-59.93	-13.00	-46.93

7-11. Radiated Spurious Data (WCDMA AWS – Low Channel)

Mode:	WCDMA RMC
Channel:	1413
Frequency (MHz):	1732.6

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]
3465.2	H	-	-	-77.12	1.07	30.95	-64.31	-13.00	-51.31
5197.8	H	-	-	-79.63	4.76	32.13	-63.13	-13.00	-50.13
6930.4	H	-	-	-79.84	7.43	34.59	-60.66	-13.00	-47.66

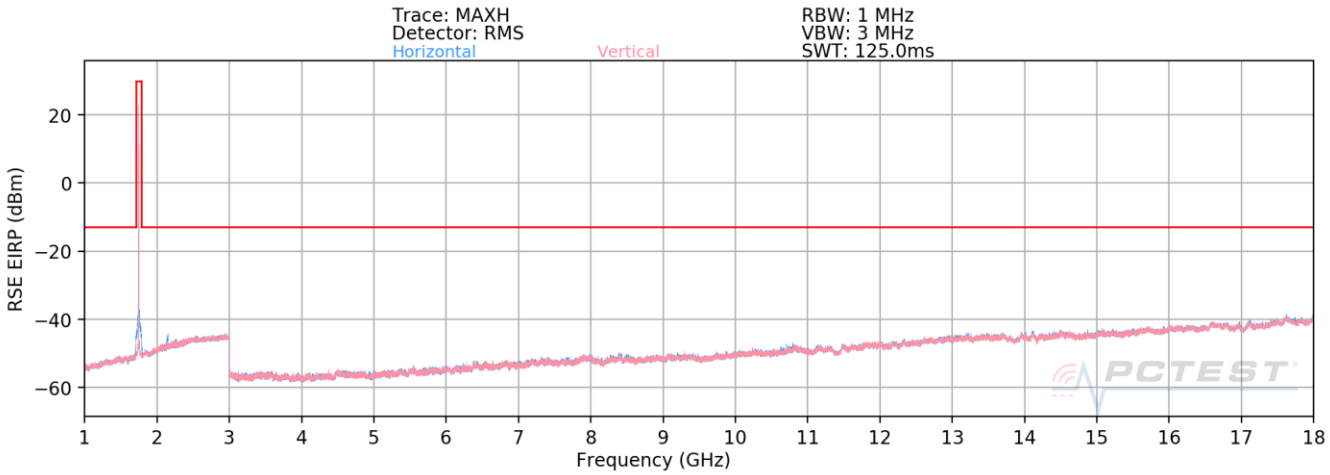
Table 7-12. Radiated Spurious Data (WCDMA AWS – Mid Channel)

Mode:	WCDMA RMC
Channel:	1513
Frequency (MHz):	1752.6

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]
3505.2	H	-	-	-77.85	1.46	30.61	-64.65	-13.00	-51.65
5257.8	H	-	-	-79.04	4.33	32.29	-62.96	-13.00	-49.96
7010.4	H	-	-	-79.66	6.87	34.21	-61.05	-13.00	-48.05

Table 7-13. Radiated Spurious Data (WCDMA AWS – High Channel)

LTE Band 66/4



Plot 7-238. Radiated Spurious Plot (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	H	-	-	-77.88	5.20	34.32	-60.94	-13.00	-47.94
5160.0	H	-	-	-79.83	7.89	35.06	-60.20	-13.00	-47.20
6880.0	H	-	-	-79.83	10.68	37.85	-57.41	-13.00	-44.41

Table 7-14. 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	H	-	-	-77.83	5.35	34.52	-60.74	-13.00	-47.74
5235.0	H	-	-	-79.61	7.37	34.76	-60.49	-13.00	-47.49
6980.0	H	-	-	-80.15	10.84	37.69	-57.57	-13.00	-44.57

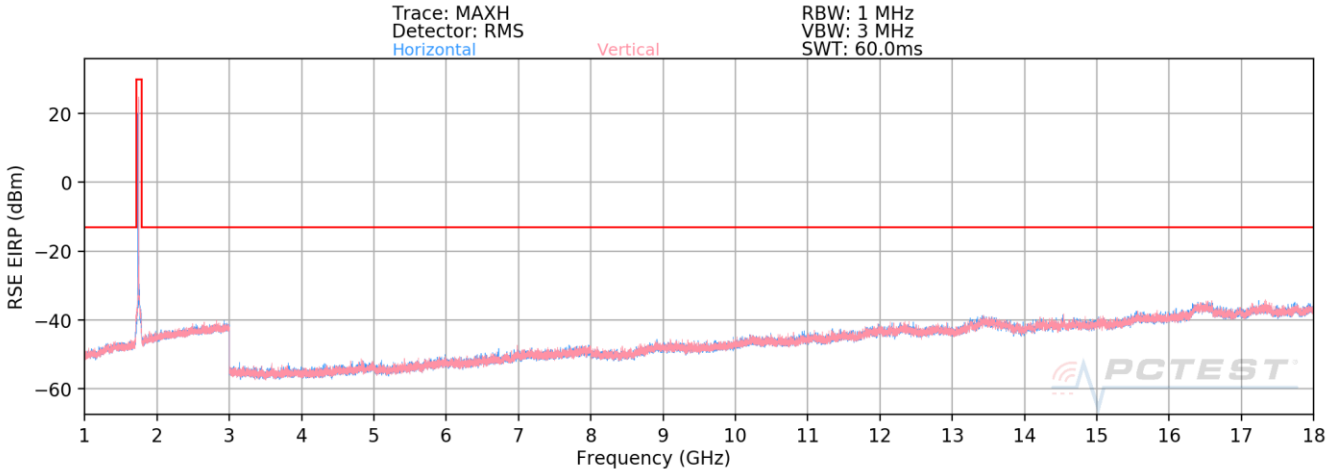
Table 7-15. Radiated Spurious Data (LTE Band 66/4 – Mid Channel)

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

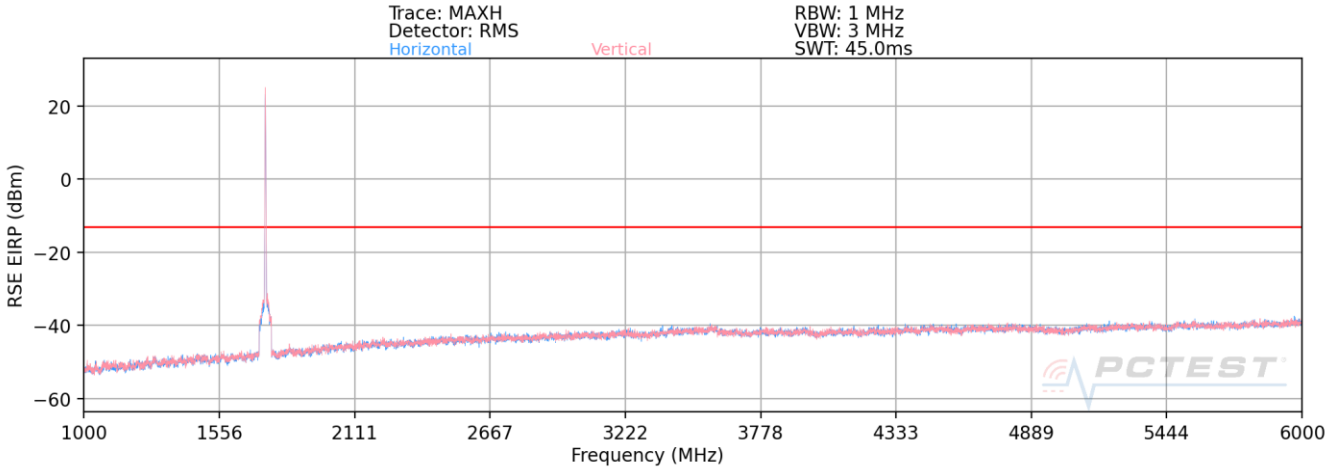
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3540.00	H	-	-	-77.76	5.30	34.54	-60.72	-13.00	-47.72
5310.00	H	-	-	-79.53	7.62	35.09	-60.17	-13.00	-47.17
7080.00	H	-	-	-80.49	10.94	37.45	-57.81	-13.00	-44.81

Table 7-16. Radiated Spurious Data (LTE Band 66/4 – High Channel)

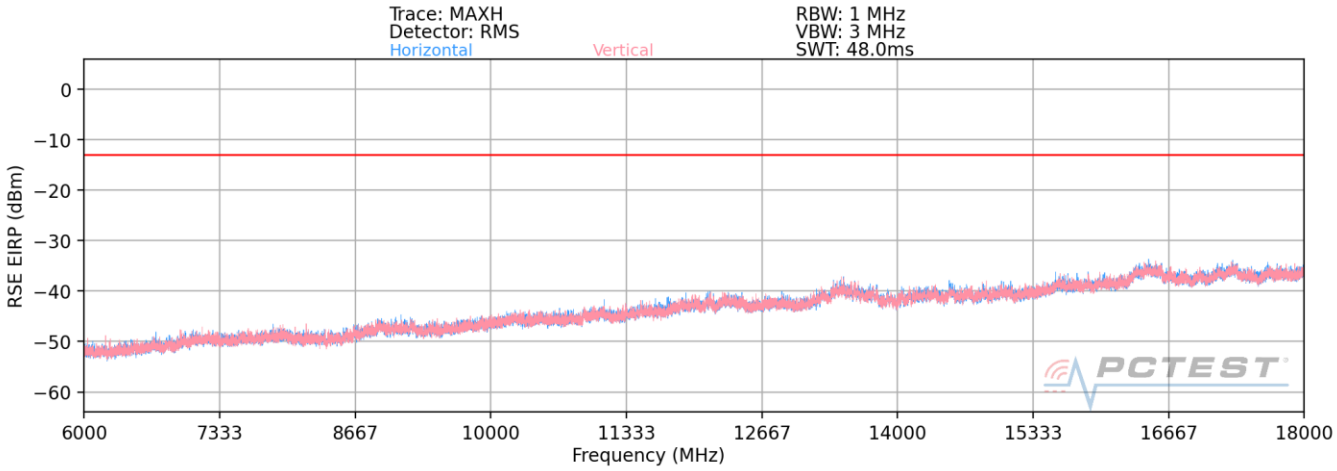
NR Band n66



Plot 7-239. Radiated Spurious Plot (NR Band n66)



Plot 7-240. Radiated Spurious Plot (NR Band n66) EN-DC Anchor B12 1-6GHz



Plot 7-241. Radiated Spurious Plot (NR Band n66) EN-DC Anchor B12 6-18GHz

Bandwidth (MHz):	20
Frequency (MHz):	1720.0
RB / Offset:	1 / 53
Mode:	DFT-s QPSK
Anchor Band:	LTE Band 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]
3440.0	H	-	-	-79.72	7.45	34.73	-60.53	-13.00	-47.53
5160.0	H	-	-	-81.24	10.05	35.81	-59.45	-13.00	-46.45

Table 7-17. Radiated Spurious Data (NR Band n66 – Low Channel)

Bandwidth (MHz):	20
Frequency (MHz):	1745.0
RB / Offset:	1 / 53
Mode:	DFT-s QPSK
Anchor Band:	LTE Band 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]
3490.0	H	-	-	-79.79	7.91	35.12	-60.14	-13.00	-47.14
5235.0	H	-	-	-81.09	10.76	36.67	-58.59	-13.00	-45.59

Table 7-18. Radiated Spurious Data (NR Band n66 – Mid Channel)

Bandwidth (MHz):	20
Frequency (MHz):	1770.0
RB / Offset:	1 / 53
Mode:	DFT-s QPSK
Anchor Band:	LTE Band 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]
3540.0	H	-	-	-79.96	8.51	35.55	-59.70	-13.00	-46.70
5310.0	H	-	-	-81.56	11.18	36.62	-58.64	-13.00	-45.64

Table 7-19. Radiated Spurious Data (NR Band n66 – High Channel

Bandwidth (MHz):	20
Frequency (MHz):	1745.0
RB / Offset:	1 / 53
Mode:	EN-DC
Anchor Band:	LTE Band 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]
1367.0	V	-	-	-76.69	7.57	37.88	-57.38	-13.00	-44.38
2405.0	V	-	-	-77.52	12.24	41.72	-53.54	-13.00	-40.54
2782.0	V	-	-	-77.79	13.32	42.53	-52.73	-13.00	-39.73

Table 7-20. Radiated Spurious Data (NR Band n66 – Mid Channel) EN-DC – B12 Anchor

7.8 Frequency Stability / Temperature Variation

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/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/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

The EUT was connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

Test Notes

None

Frequency Stability / Temperature Variation

LTE Band 12/17

Operating Frequency (Hz):	707,500,000
Ref. Voltage (VDC):	4.37
Deviation Limit:	± 0.00025% or 2.5 ppm

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.37	- 30	707,500,358	358	0.0000506
		- 20	707,500,028	28	0.0000040
		- 10	707,499,937	-63	-0.0000089
		0	707,499,976	-24	-0.0000034
		+ 10	707,499,831	-169	-0.0000239
		+ 20 (Ref)	707,500,329	329	0.0000465
		+ 30	707,499,940	-60	-0.0000085
		+ 40	707,500,082	82	0.0000116
		+ 50	707,499,770	-230	-0.0000325
Battery Endpoint	3.35	+ 20	707,500,099	99	0.0000140

Table 7-21. LTE Band 12/17 Frequency Stability Data

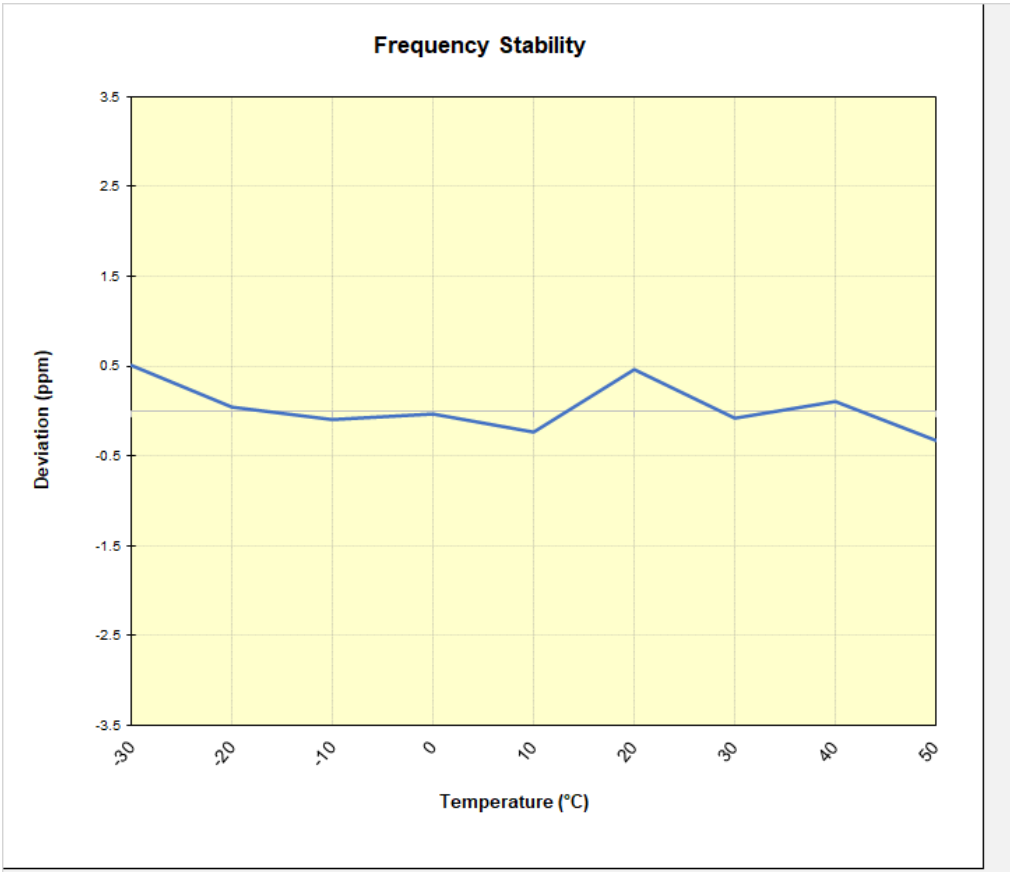


Table 7-22. LTE Band 12/17 Frequency Stability Chart

Frequency Stability / Temperature Variation

LTE Band 13

Operating Frequency (Hz):	782,000,000
Ref. Voltage (VDC):	4.37
Deviation Limit:	± 0.00025% or 2.5 ppm

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.37	- 30	781,999,872	-128	-0.0000164
		- 20	782,000,412	412	0.0000527
		- 10	782,000,045	45	0.0000058
		0	781,999,638	-362	-0.0000463
		+ 10	782,000,079	79	0.0000101
		+ 20 (Ref)	782,000,111	111	0.0000142
		+ 30	782,000,056	56	0.0000072
		+ 40	781,999,985	-15	-0.0000019
		+ 50	782,000,014	14	0.0000018
Battery Endpoint	3.35	+ 20	782,000,311	311	0.0000398

Table 7-23. LTE Band 13 Frequency Stability Data

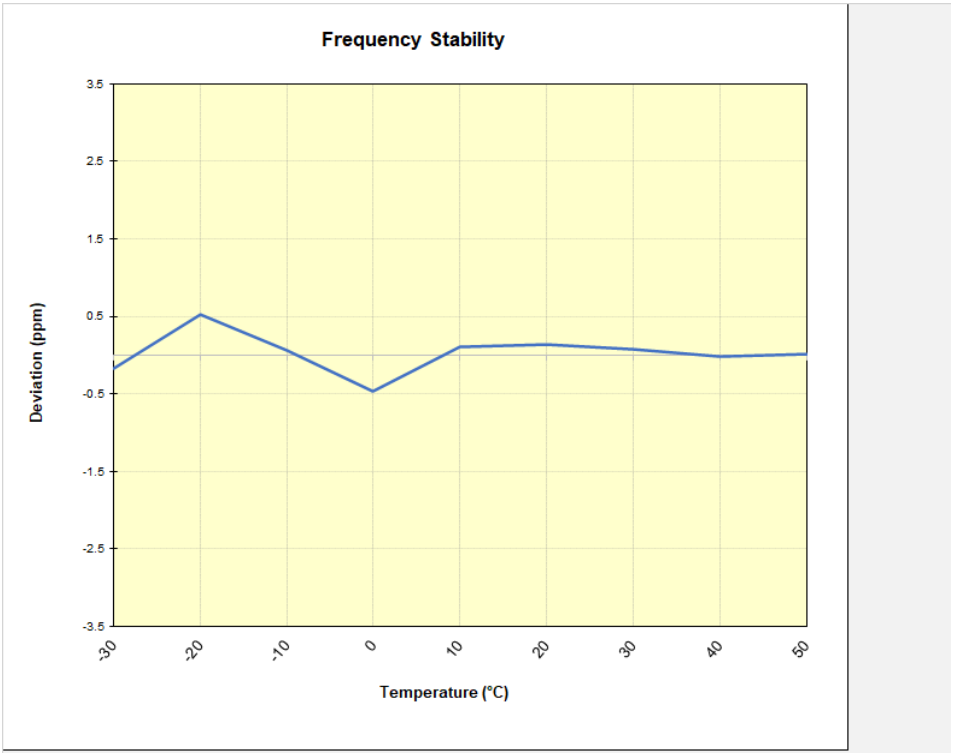


Table 7-24. LTE Band 13 Frequency Stability Chart

Frequency Stability / Temperature Variation

WCDMA AWS

Operating Frequency (Hz):	1,732,600,000
Ref. Voltage (VDC):	4.37
Deviation Limit:	± 0.00025% or 2.5 ppm

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.37	- 30	1,732,599,959	-41	-0.0000024
		- 20	1,732,600,378	378	0.0000218
		- 10	1,732,600,254	254	0.0000147
		0	1,732,599,902	-98	-0.0000057
		+ 10	1,732,599,997	-3	-0.0000002
		+ 20 (Ref)	1,732,599,876	-124	-0.0000072
		+ 30	1,732,600,055	55	0.0000032
		+ 40	1,732,600,088	88	0.0000051
		+ 50	1,732,599,815	-185	-0.0000107
Battery Endpoint	3.35	+ 20	1,732,599,917	-83	-0.0000048

Table 7-25. WCDMA AWS Frequency Stability Data

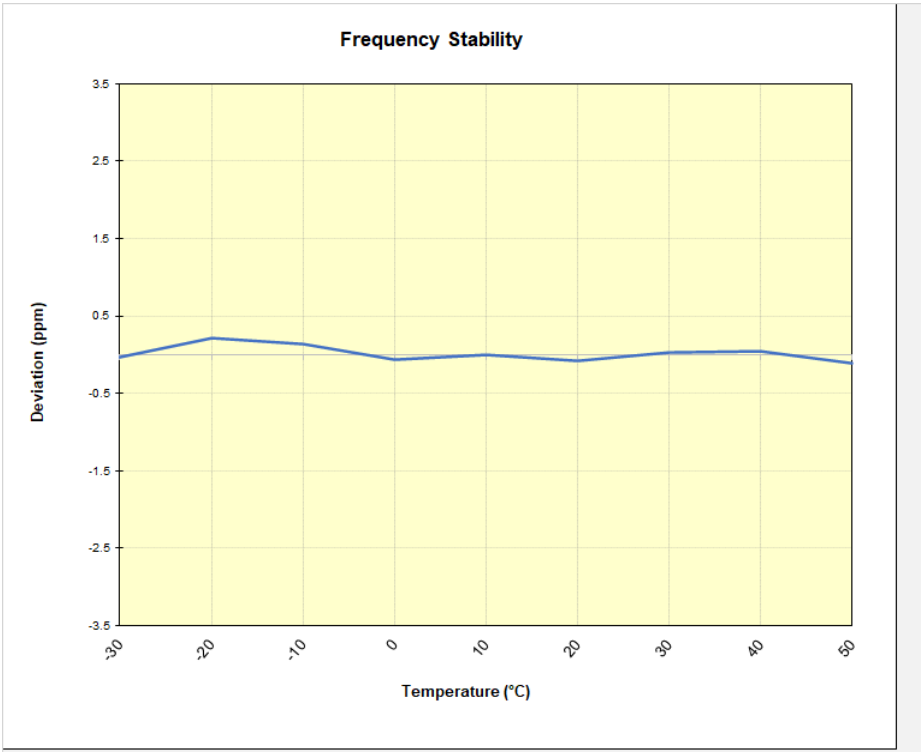


Table 7-26. WCDMA AWS Frequency Stability Chart

Frequency Stability / Temperature Variation

LTE Band 66/4

Operating Frequency (Hz):	1,745,000,000
Ref. Voltage (VDC):	4.37
Deviation Limit:	± 0.00025% or 2.5 ppm

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.37	- 30	1,744,999,995	-5	-0.0000003
		- 20	1,744,999,686	-314	-0.0000180
		- 10	1,745,000,101	101	0.0000058
		0	1,744,999,833	-167	-0.0000096
		+ 10	1,744,999,804	-196	-0.0000112
		+ 20 (Ref)	1,745,000,241	241	0.0000138
		+ 30	1,744,999,985	-15	-0.0000009
		+ 40	1,744,999,945	-55	-0.0000032
		+ 50	1,744,999,940	-60	-0.0000034
Battery Endpoint	3.35	+ 20	1,745,000,024	24	0.0000014

Table 7-27. LTE Band 66/4 Frequency Stability Data

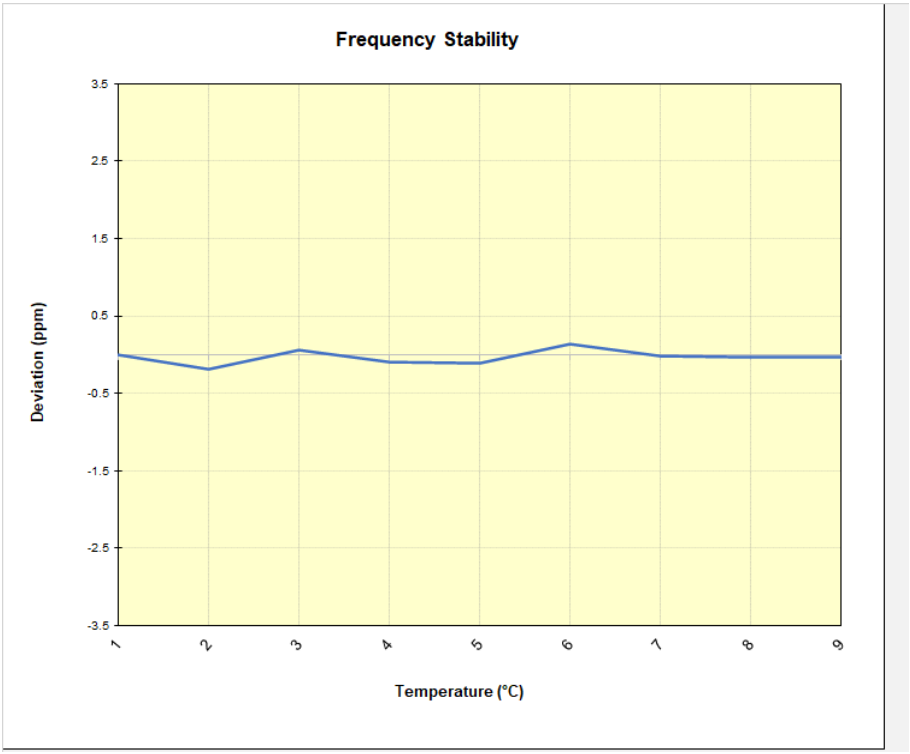


Table 7-28. LTE Band 66/4 Frequency Stability Chart

Frequency Stability / Temperature Variation

NR Band n66

Operating Frequency (Hz):	1,745,000,000
Ref. Voltage (VDC):	4.37

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.37	- 30	1,744,999,999	-1	-0.0000001
		- 20	1,744,999,749	-251	-0.0000144
		- 10	1,744,999,953	-47	-0.0000027
		0	1,745,000,067	67	0.0000038
		+ 10	1,744,999,703	-297	-0.0000170
		+ 20 (Ref)	1,745,000,104	104	0.0000060
		+ 30	1,745,000,162	162	0.0000093
		+ 40	1,745,000,092	92	0.0000053
		+ 50	1,744,999,906	-94	-0.0000054
Battery Endpoin	3.35	+ 20	1,745,000,369	369	0.0000211

Table 7-29. NR Band 66 Frequency Stability Data

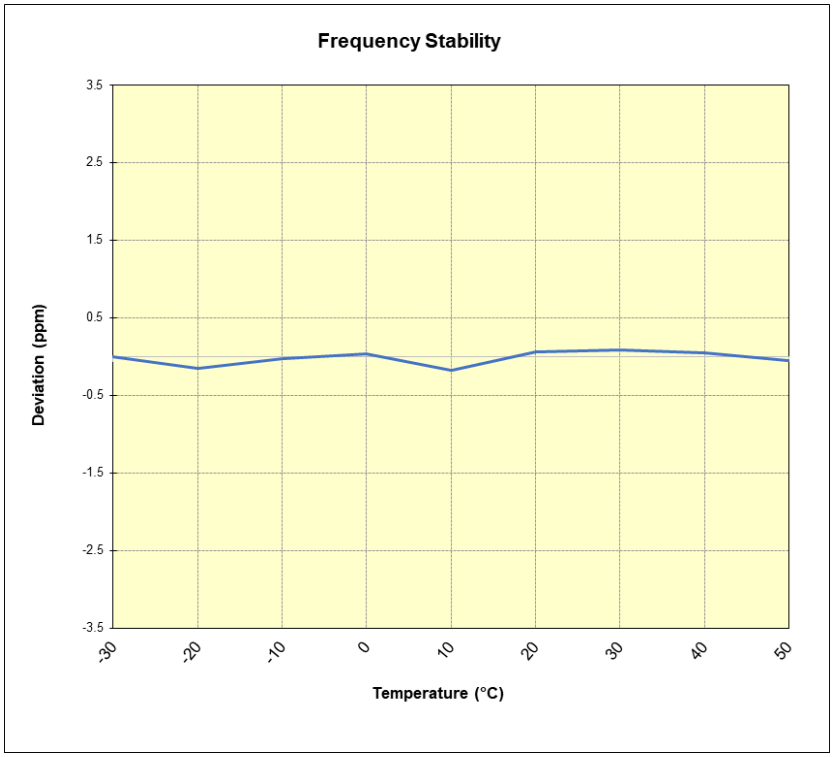


Table 7-30. NR Band 66 Frequency Stability Chart

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the Samsung **Portable Handset FCC ID: A3LSMG998B** complies with all the requirements of Part 27 of the FCC rules.