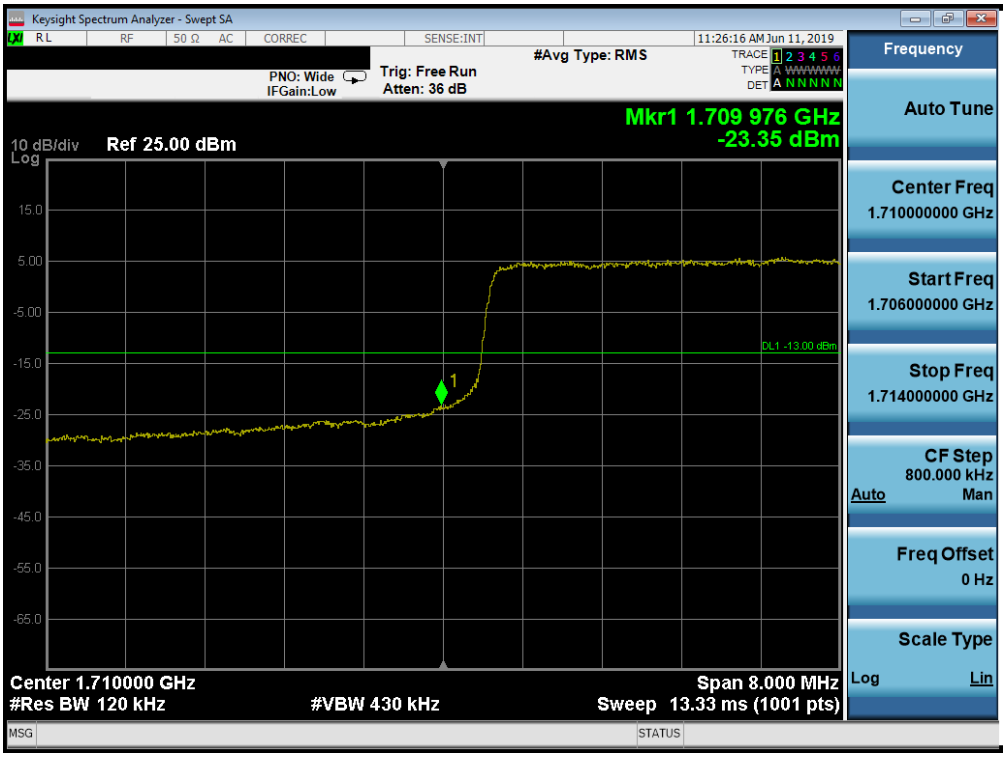
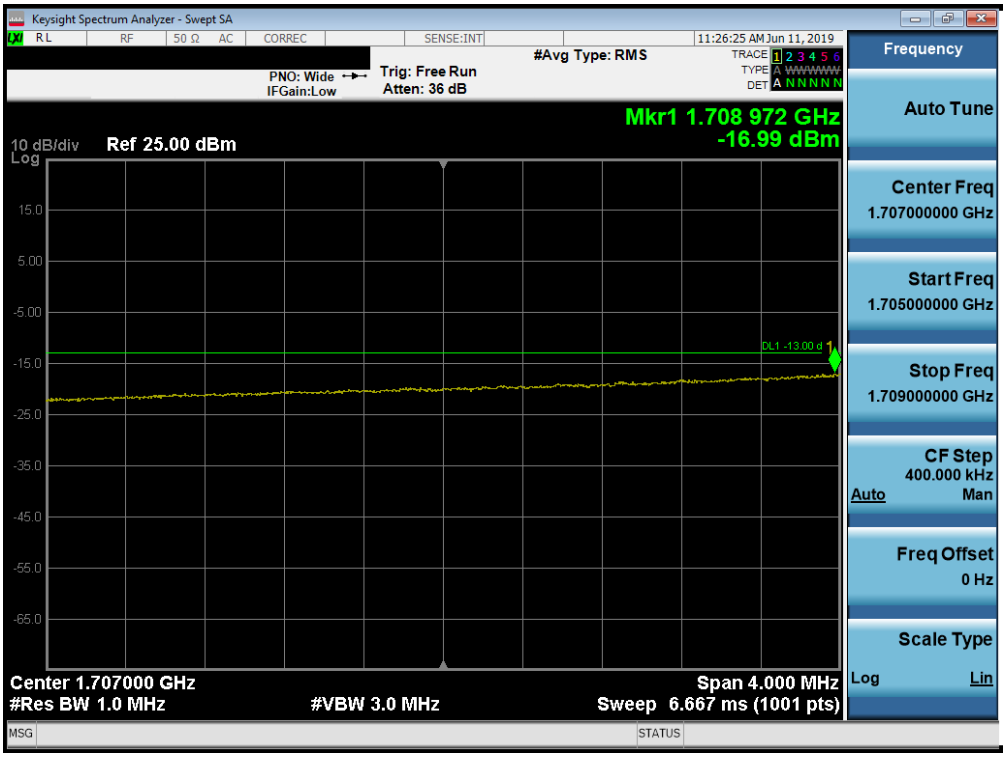
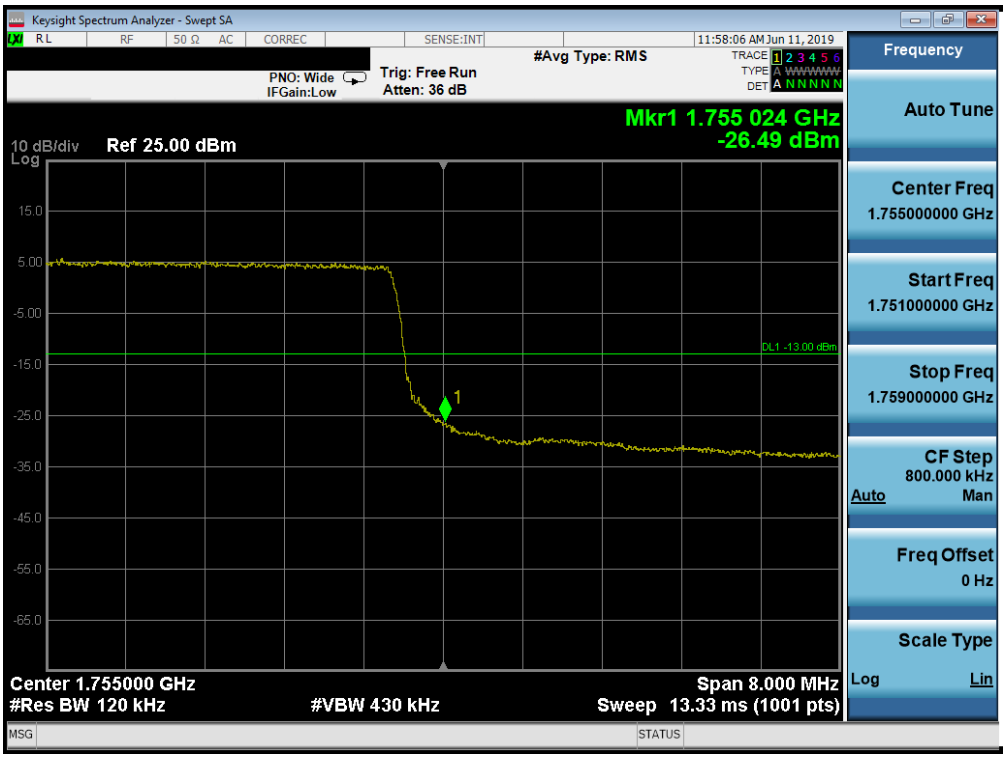


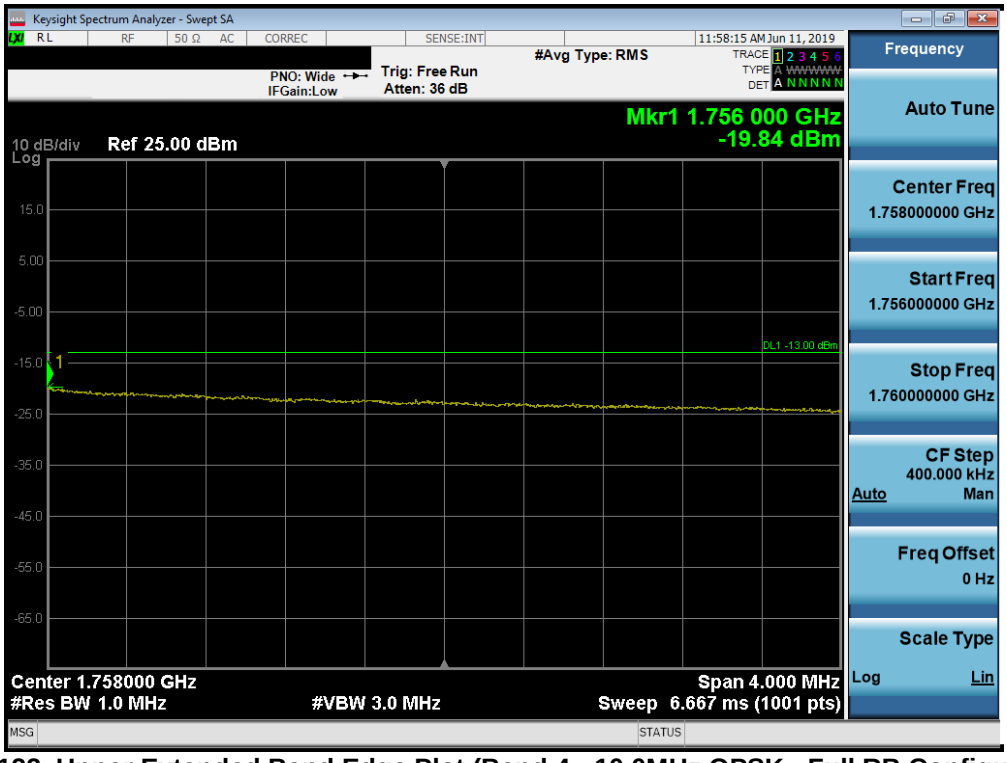
Plot 7-119. Lower Band Edge Plot (Band 66/4 - 10.0MHz QPSK - Full RB Configuration)



Plot 7-120. Lower Extended Band Edge Plot (Band 66/4 - 10.0MHz QPSK - Full RB Configuration)

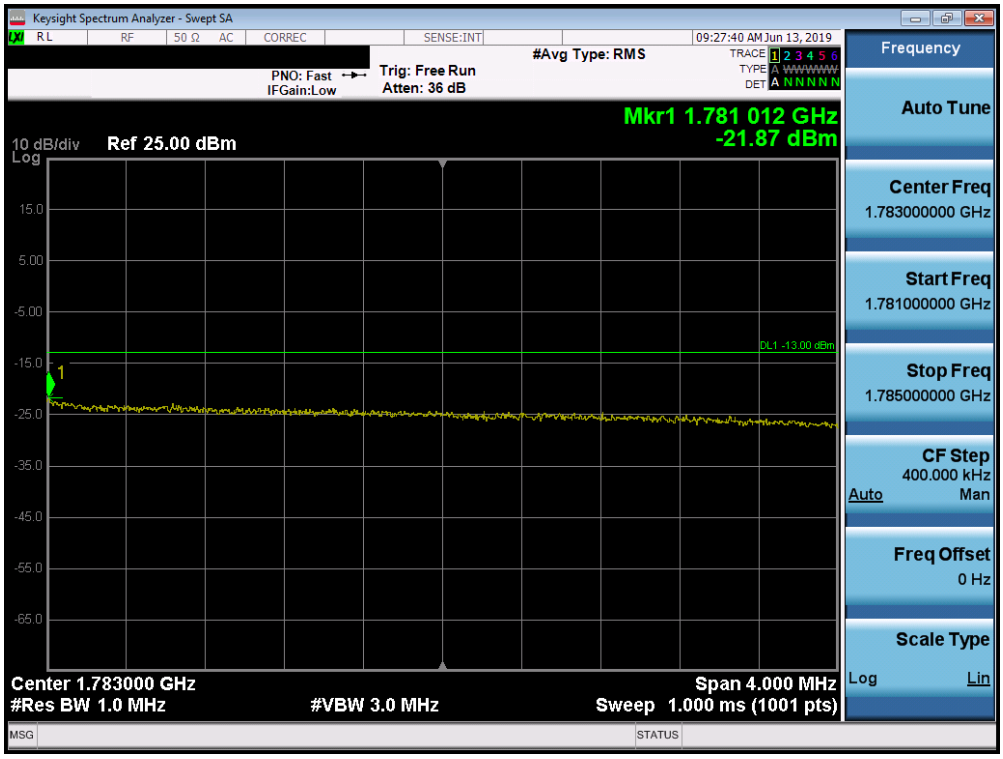


Plot 7-121. Upper Band Edge Plot (Band 4 - 10.0MHz QPSK - Full RB Configuration)

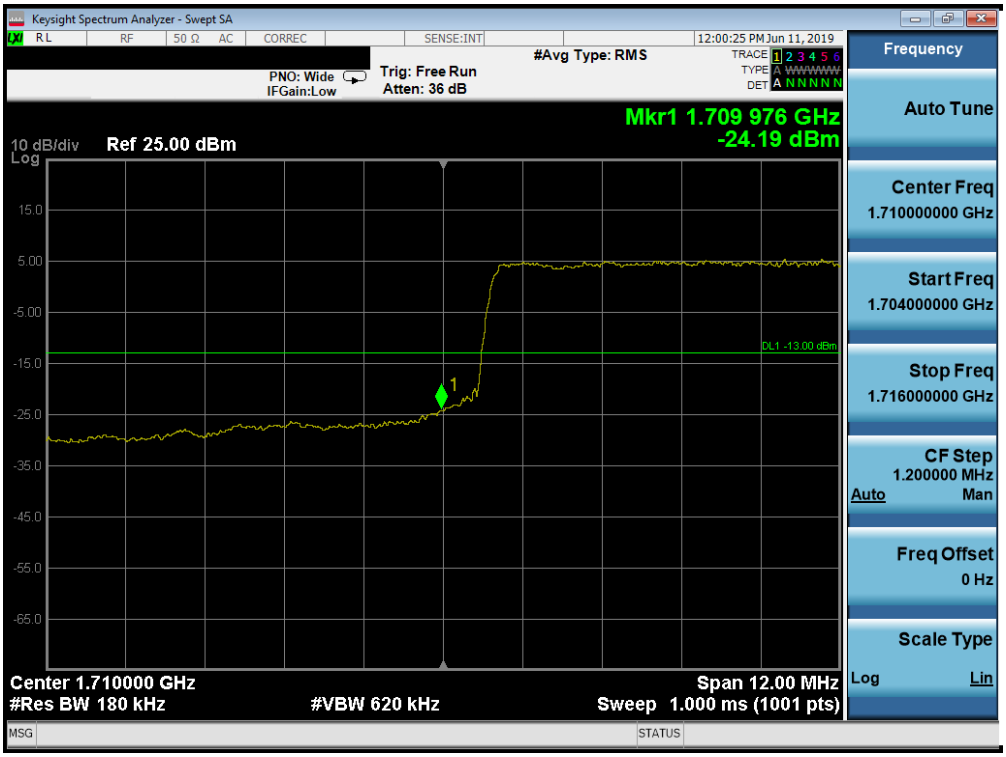


Plot 7-122. Upper Extended Band Edge Plot (Band 4 - 10.0MHz QPSK - Full RB Configuration)

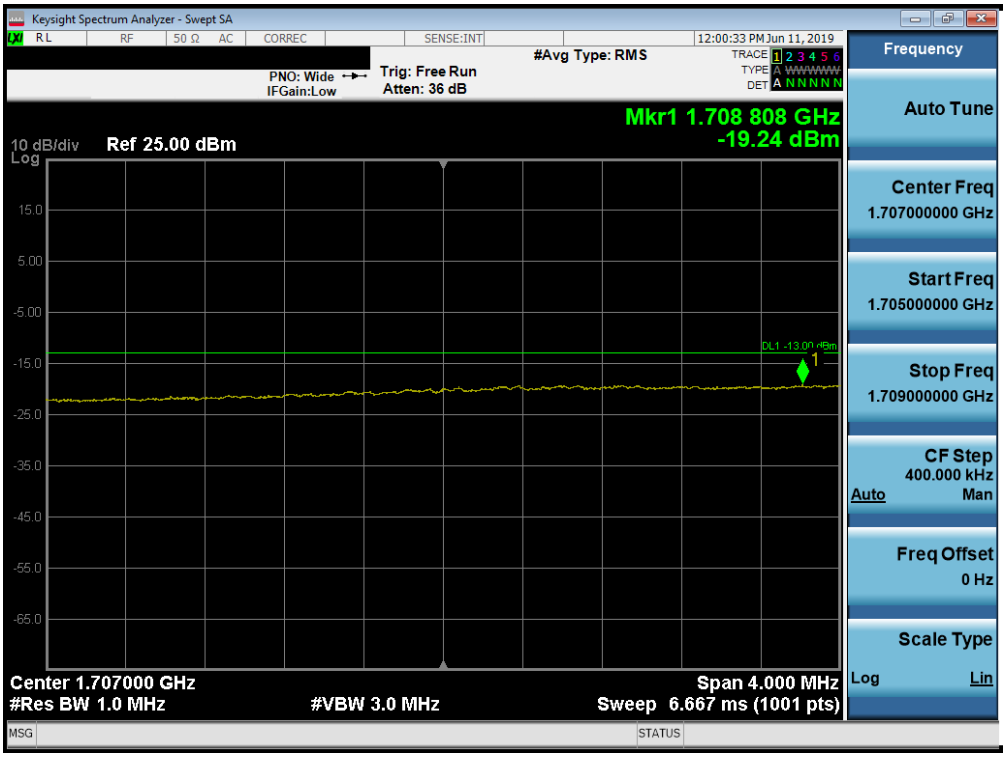
Plot 7-123. Upper Band Edge Plot (Band 66 - 10.0MHz QPSK - Full RB Configuration)



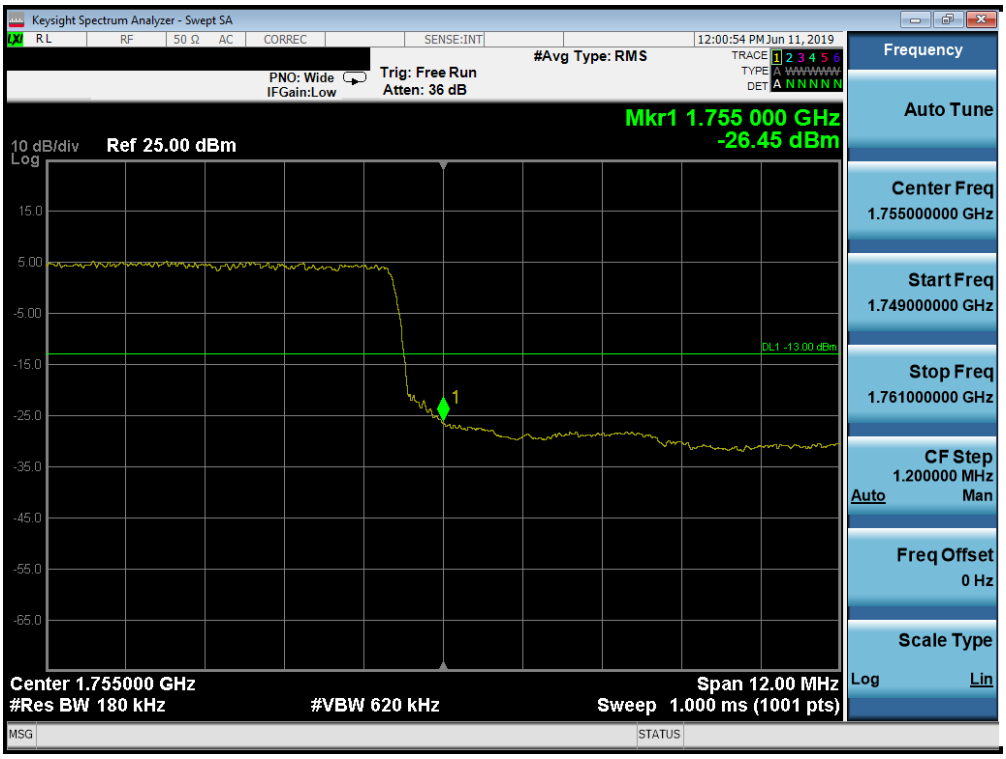
Plot 7-124. Upper Extended Band Edge Plot (Band 66 - 10.0MHz QPSK - Full RB Configuration)



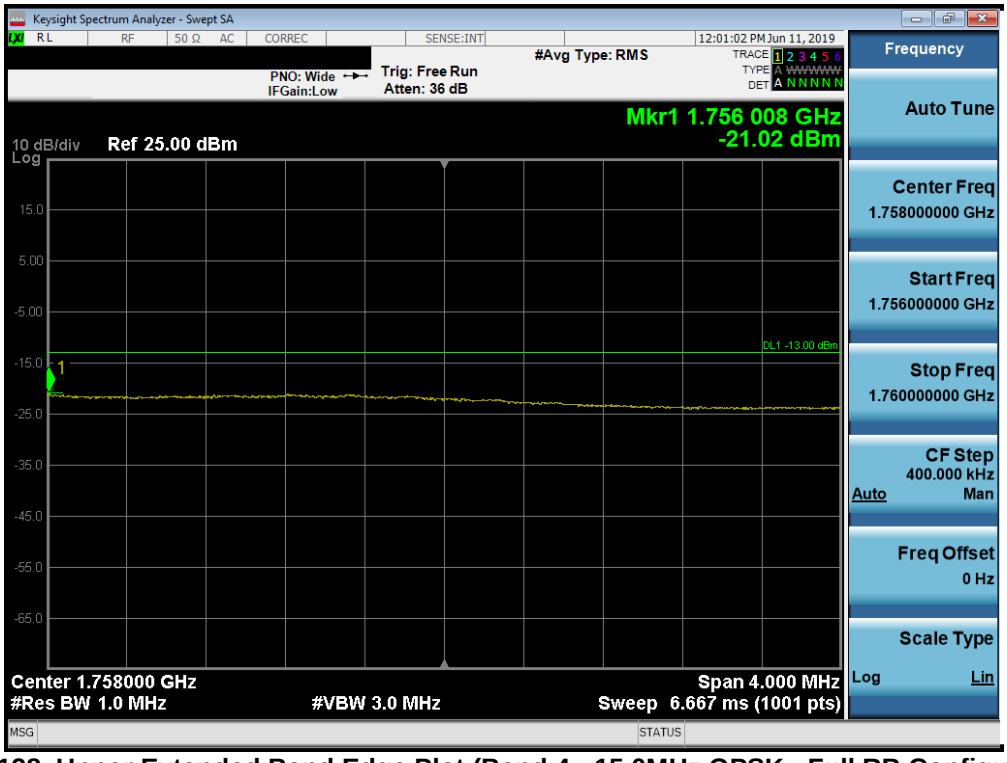
Plot 7-125. Lower Band Edge Plot (Band 66/4 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-126. Lower Extended Band Edge Plot (Band 66/4 - 15.0MHz QPSK - Full RB Configuration)

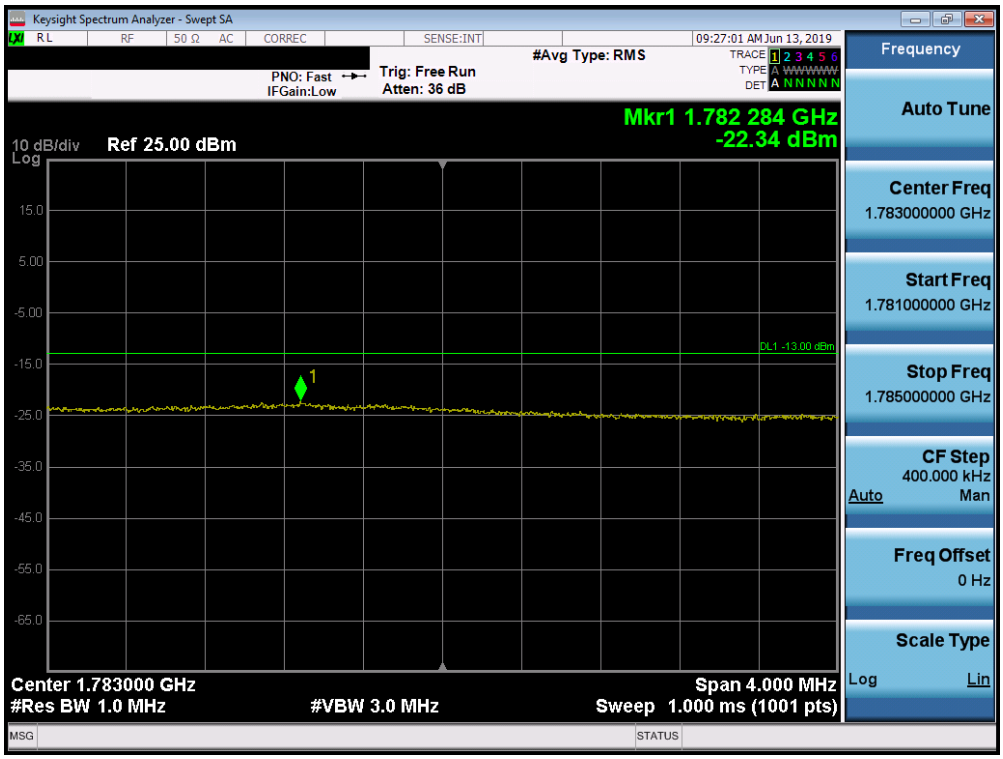


Plot 7-127. Upper Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)

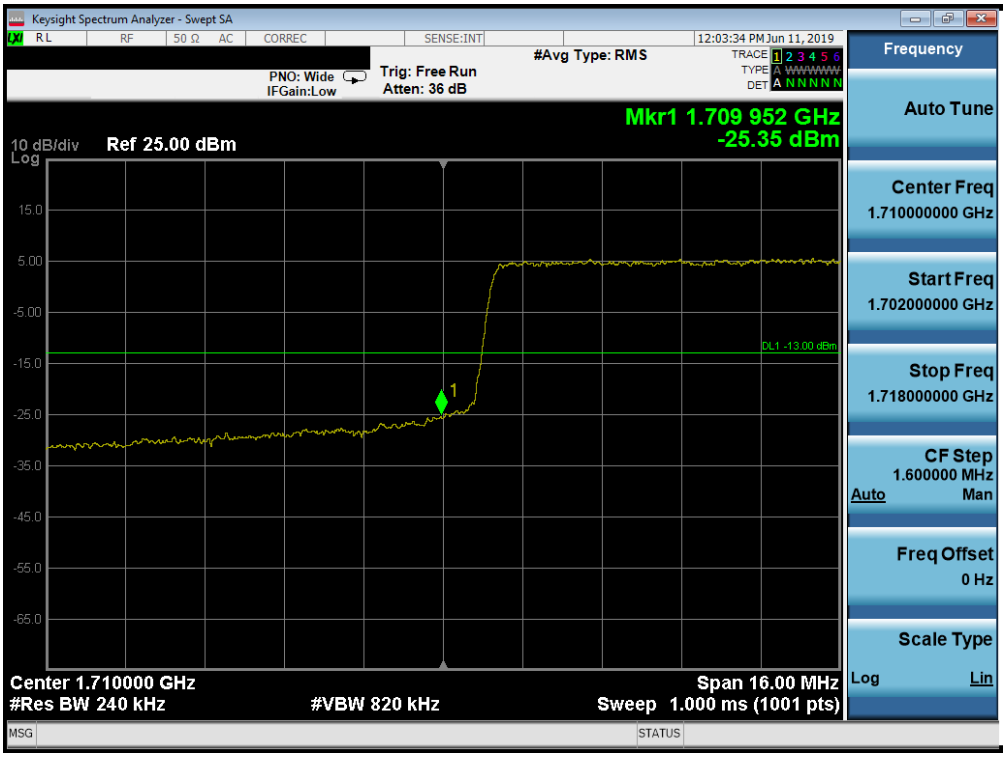


Plot 7-128. Upper Extended Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)

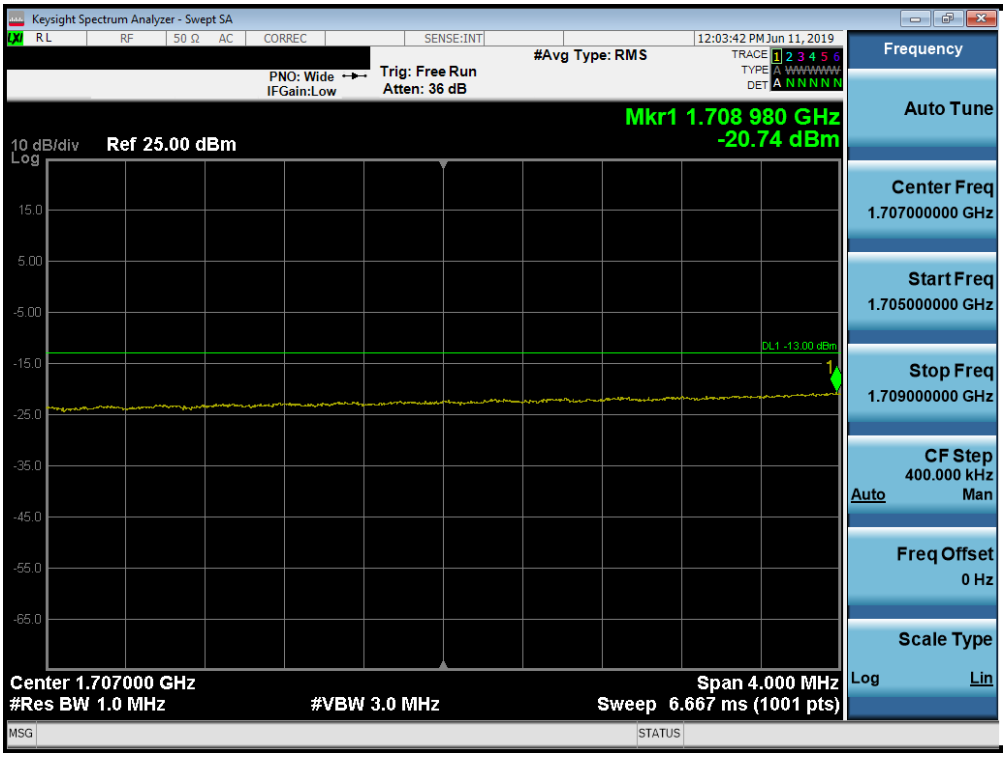
Plot 7-129. Upper Band Edge Plot (Band 66 - 15.0MHz QPSK - Full RB Configuration)



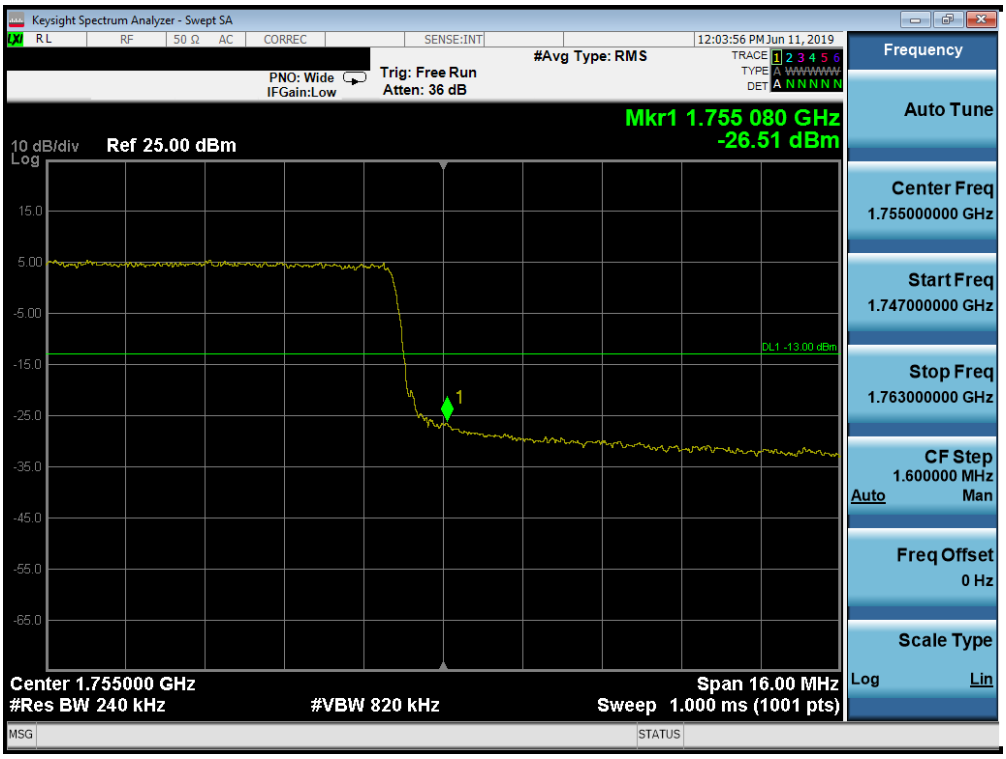
Plot 7-130. Upper Extended Band Edge Plot (Band 66 - 15.0MHz QPSK - Full RB Configuration)



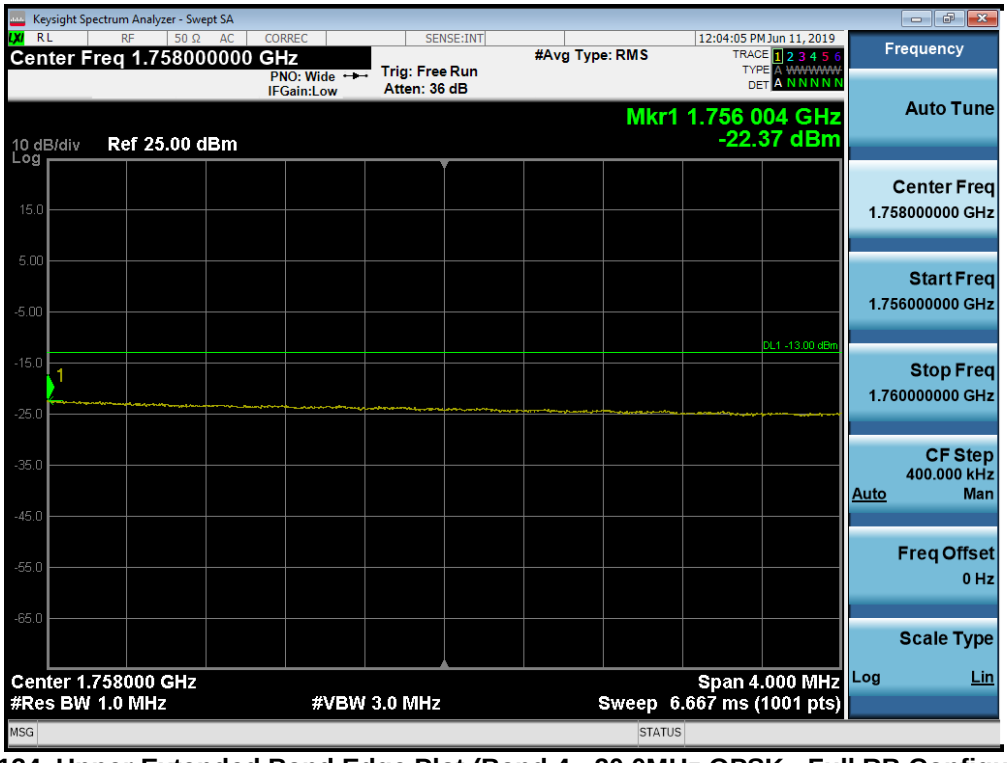
Plot 7-131. Lower Band Edge Plot (Band 66/4 - 20.0MHz QPSK - Full RB Configuration)



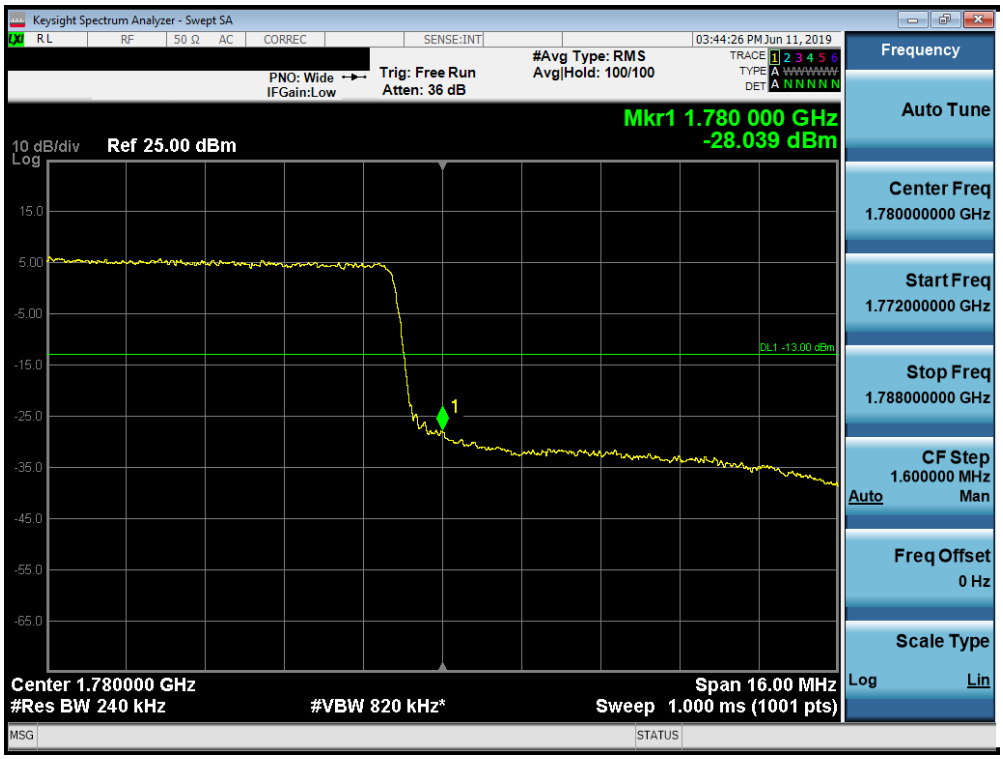
Plot 7-132. Lower Extended Band Edge Plot (Band 66/4 - 20.0MHz QPSK - Full RB Configuration)



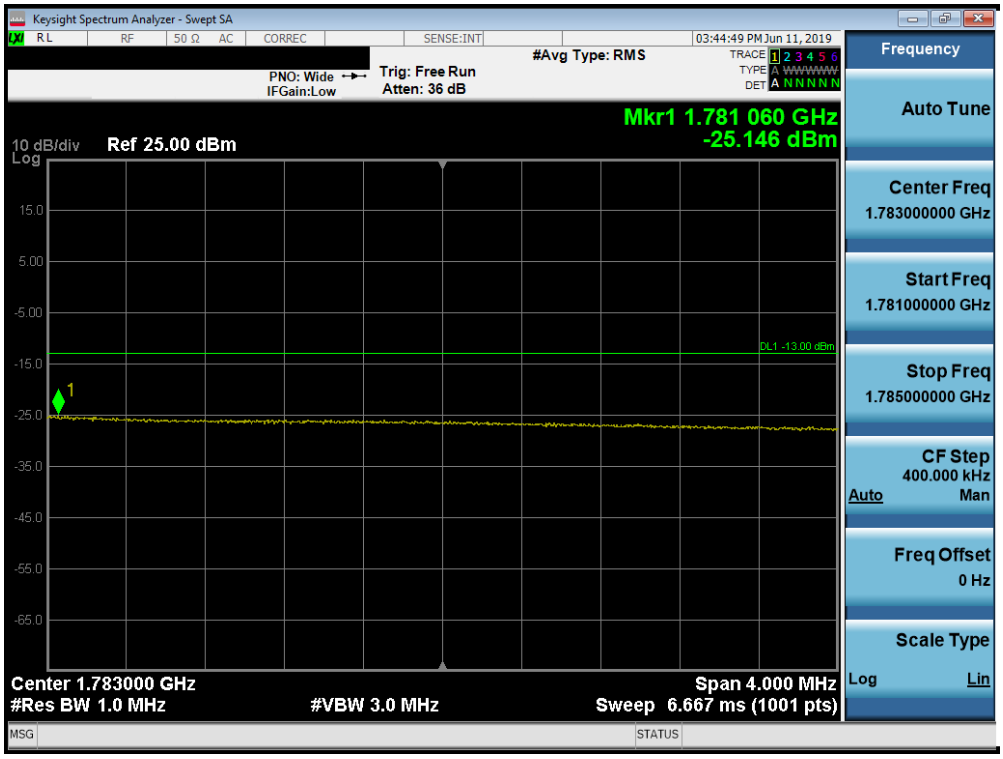
Plot 7-133. Upper Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-134. Upper Extended Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)

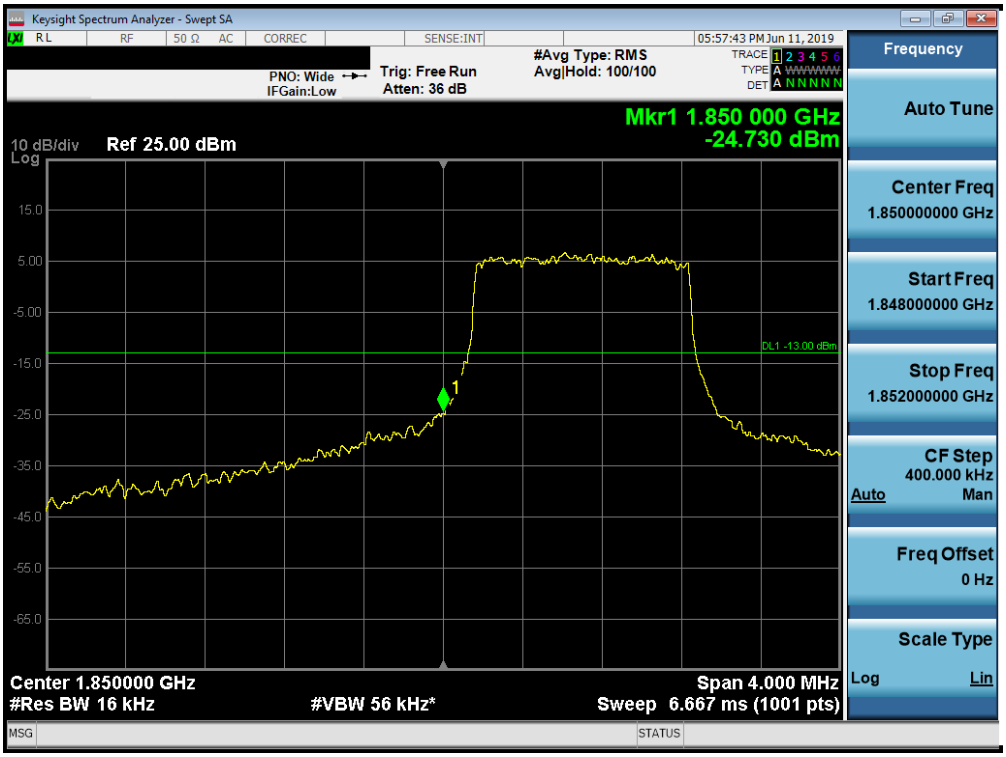


Plot 7-135. Upper Band Edge Plot (Band 66 - 20.0MHz QPSK - Full RB Configuration)

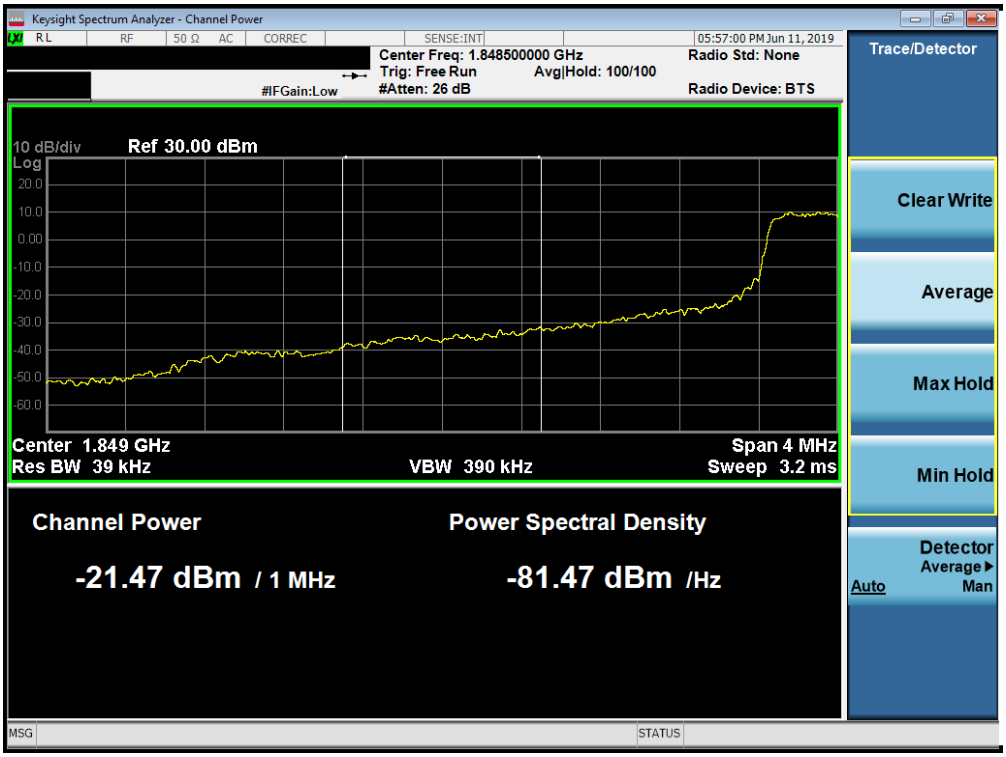


Plot 7-136. Upper Extended Band Edge Plot (Band 66 - 20.0MHz QPSK - Full RB Configuration)

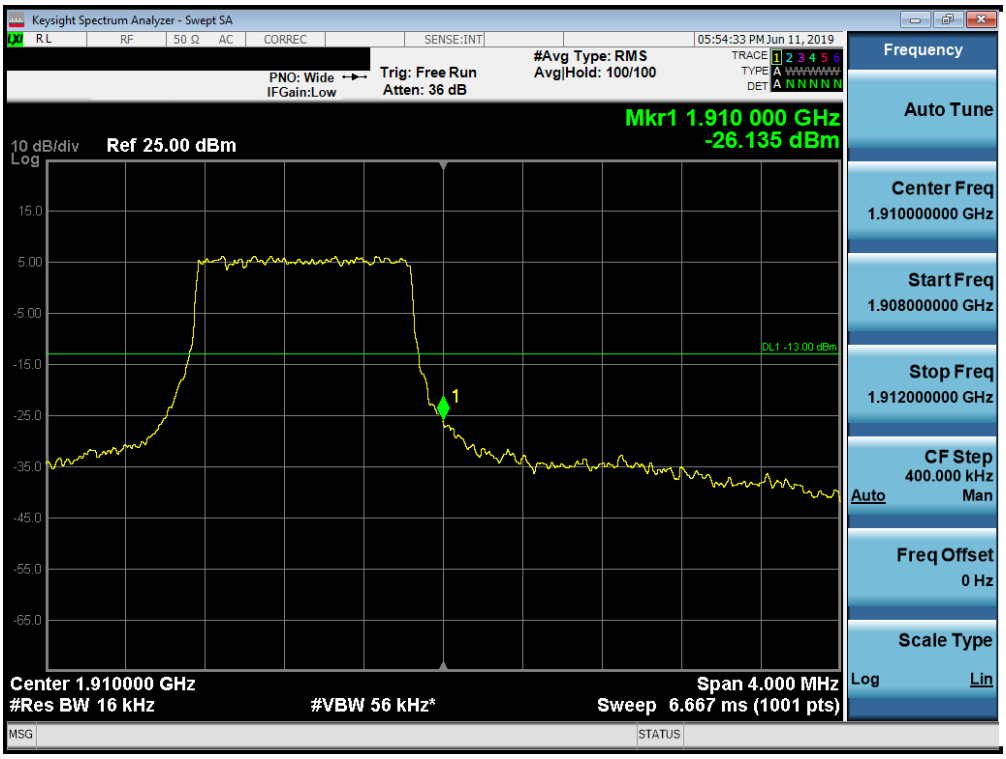
Band 2



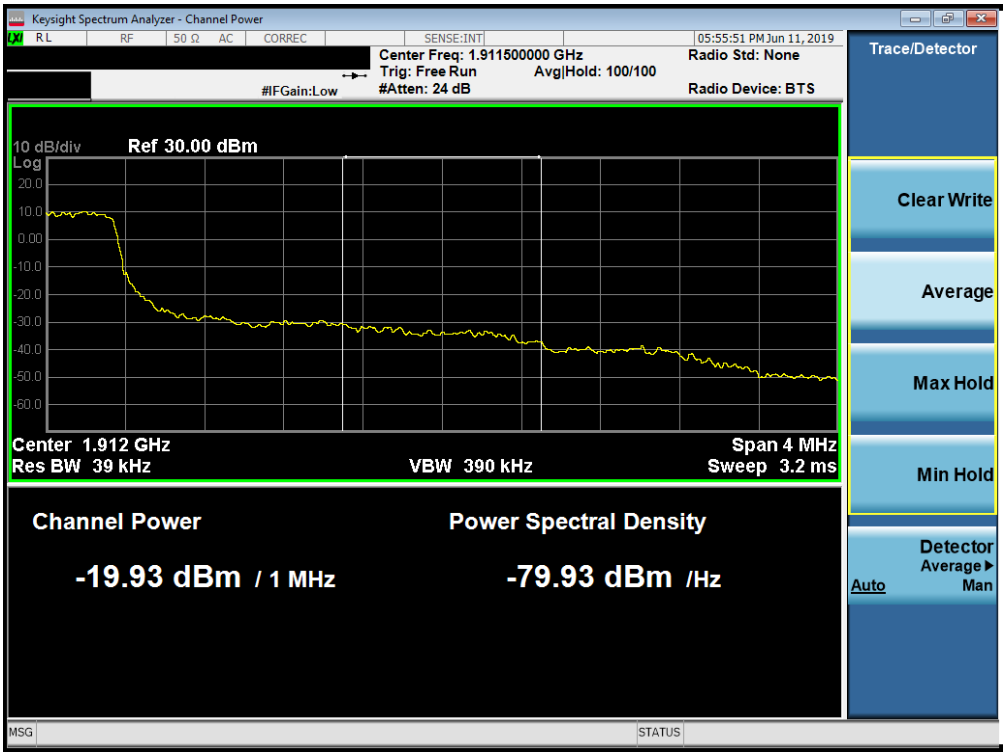
Plot 7-137. Lower Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



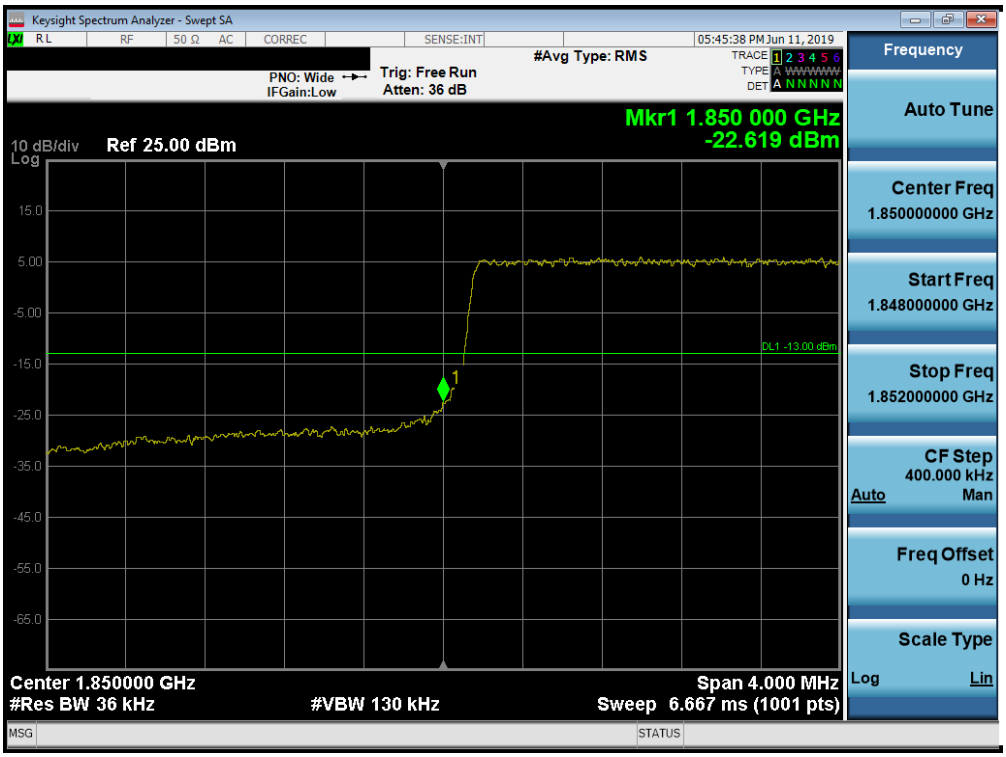
Plot 7-138. Lower Extended Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



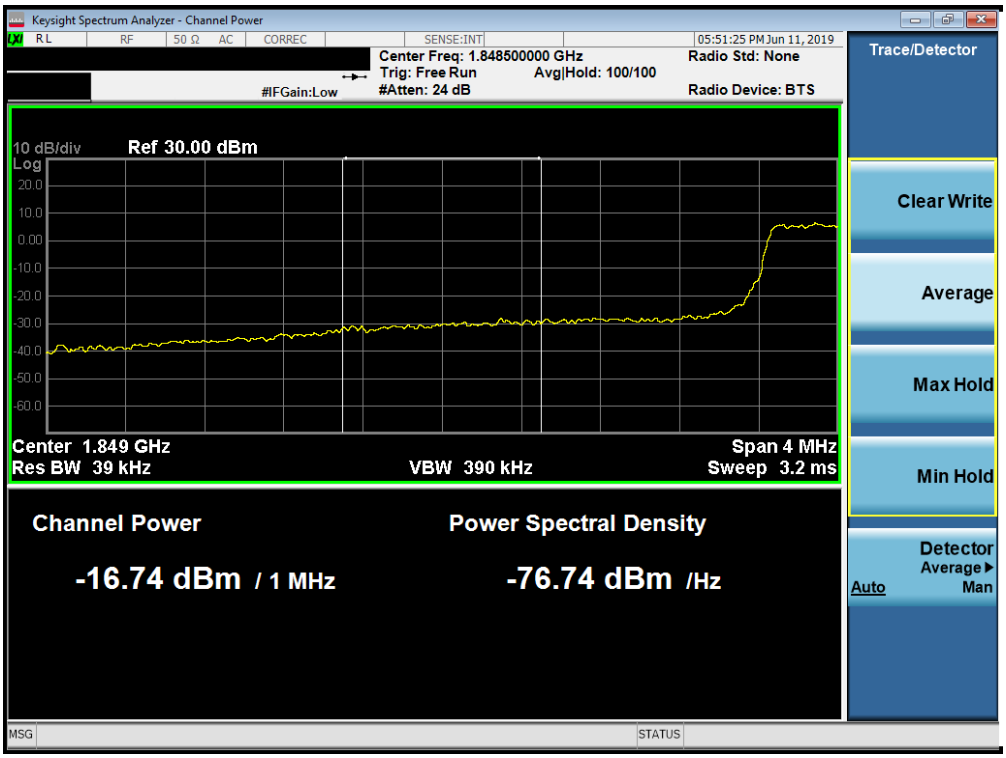
Plot 7-139. Upper Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



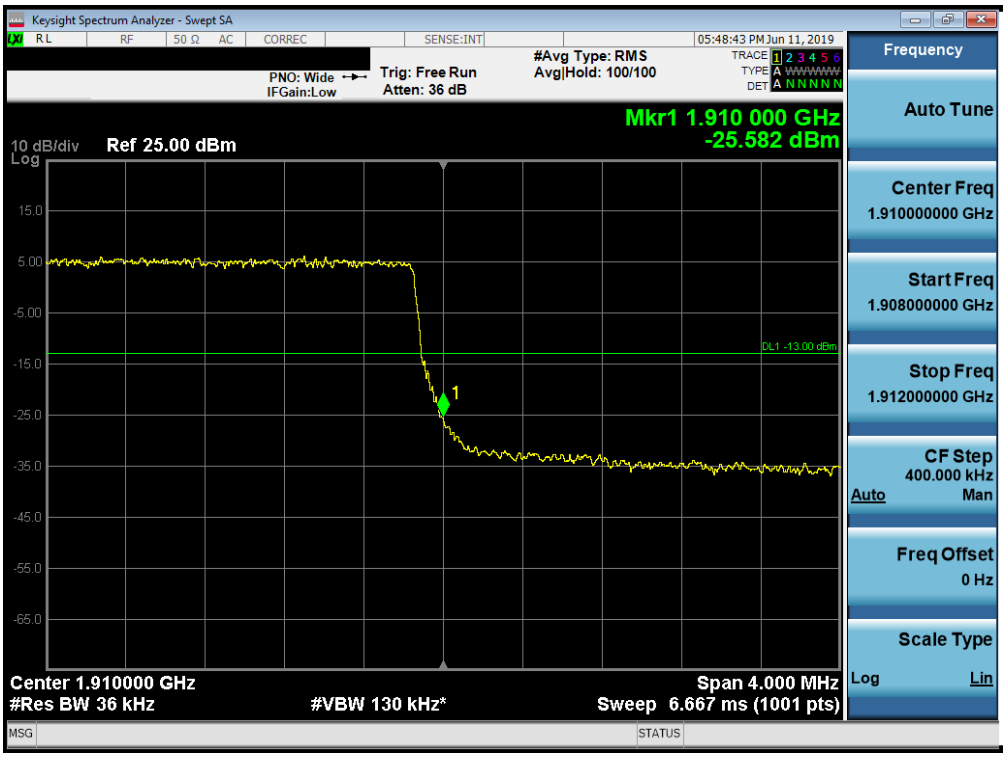
Plot 7-140. Upper Extended Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



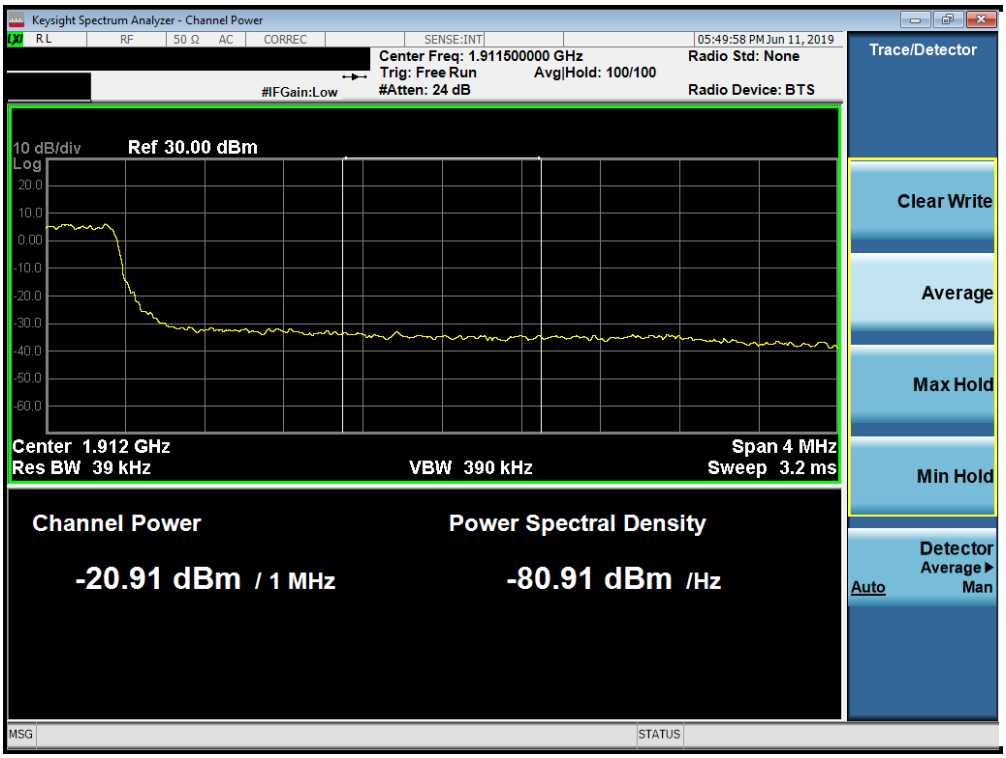
Plot 7-141. Lower Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



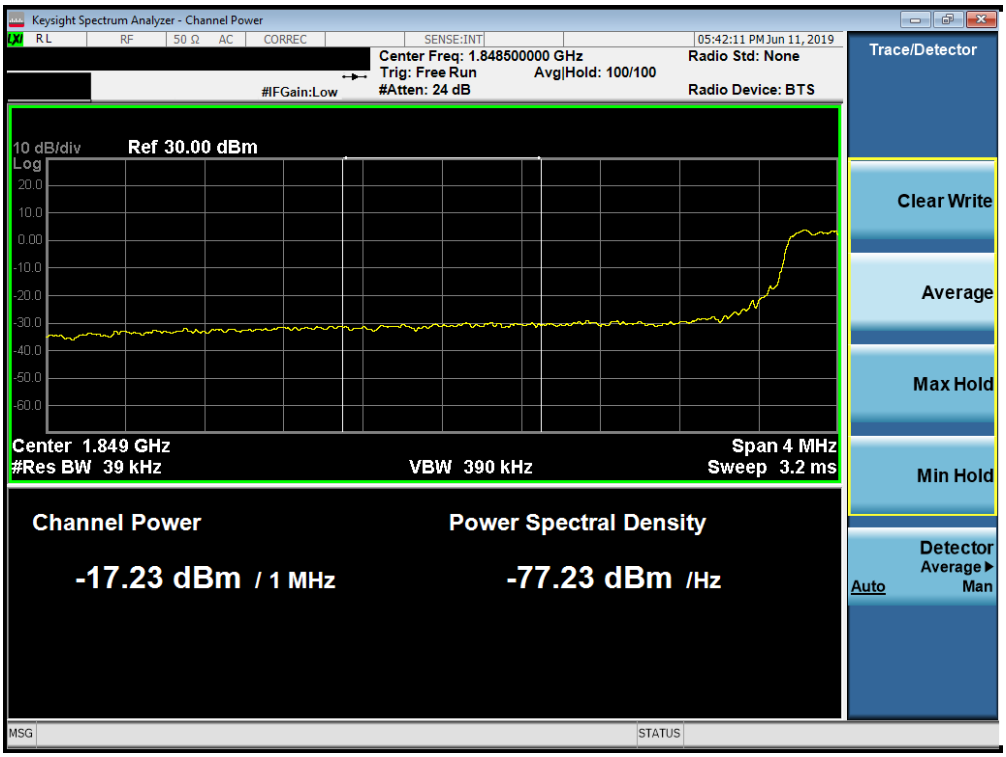
Plot 7-142. Lower Extended Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



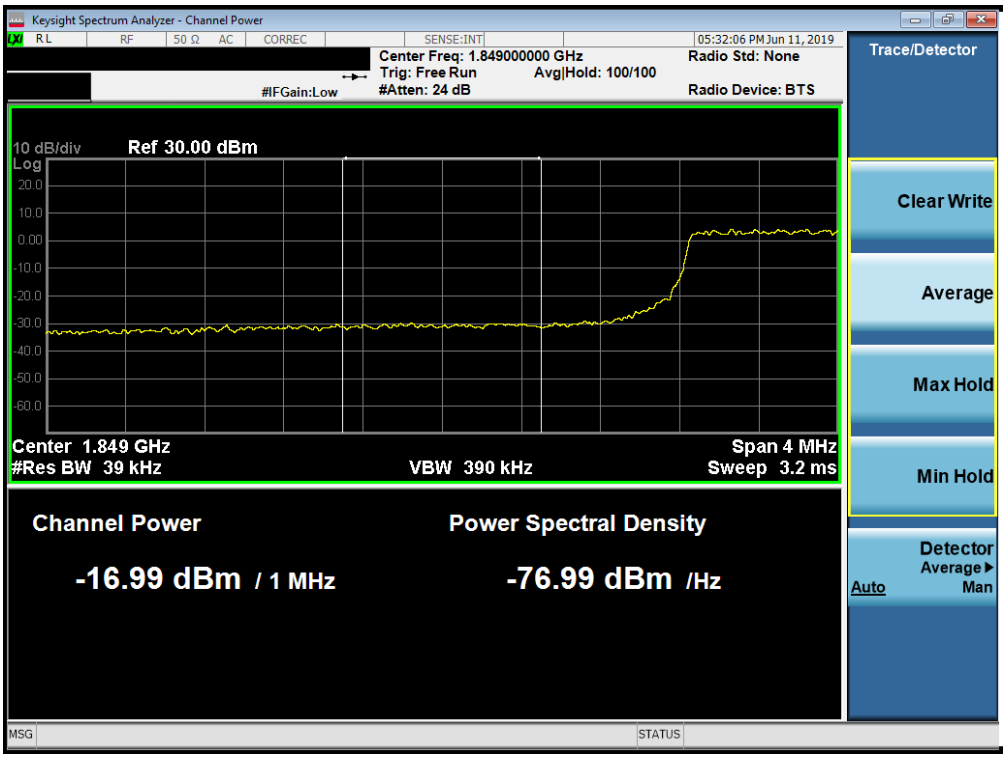
Plot 7-143. Upper Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



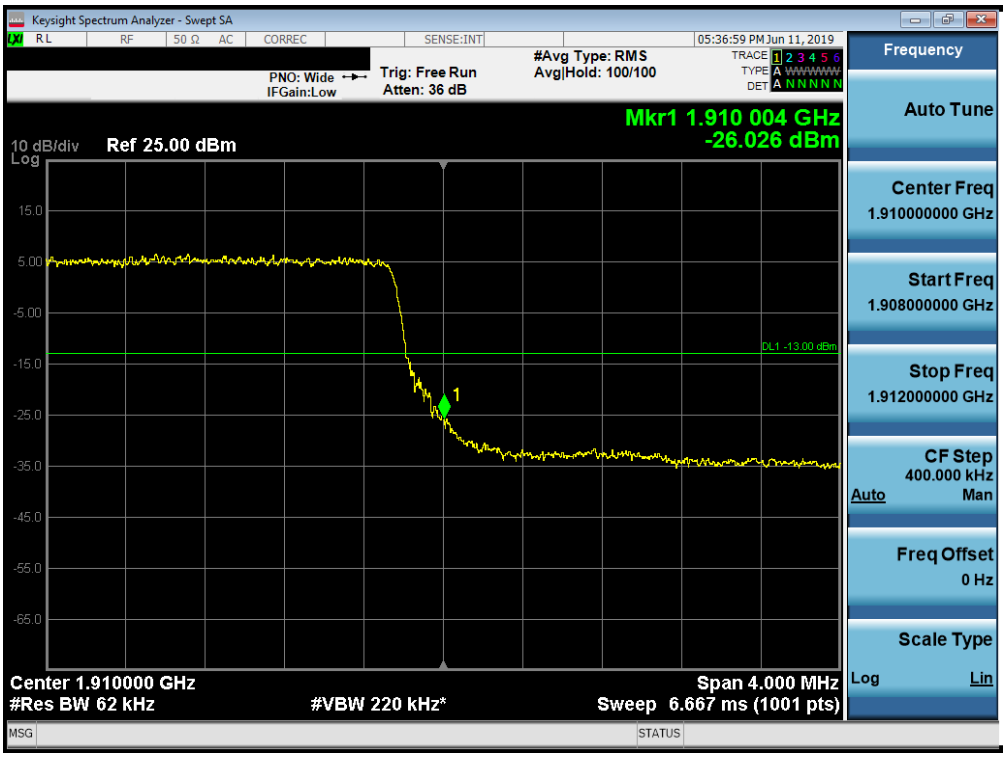
Plot 7-144. Upper Extended Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



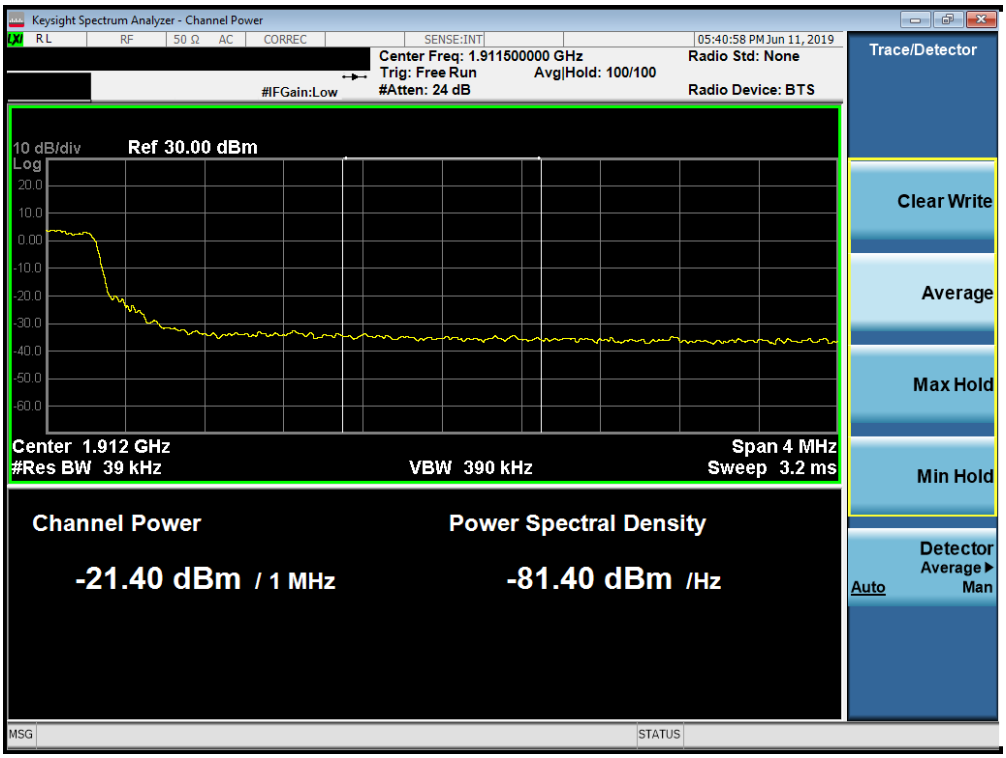
Plot 7-145. Lower Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



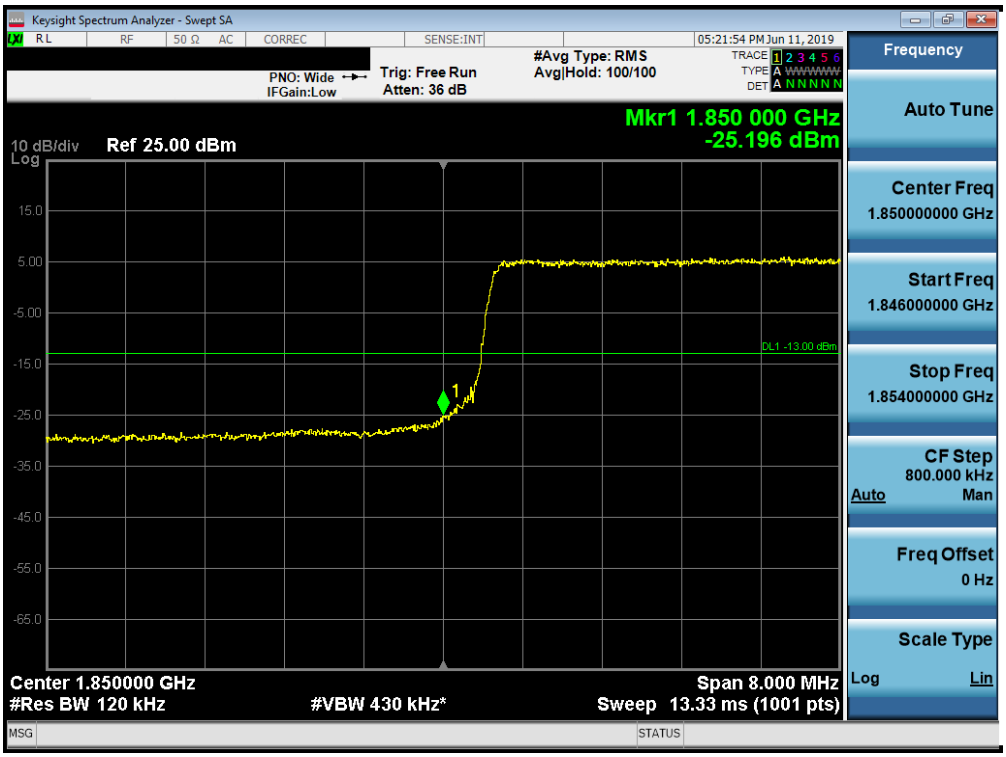
Plot 7-146. Lower Extended Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



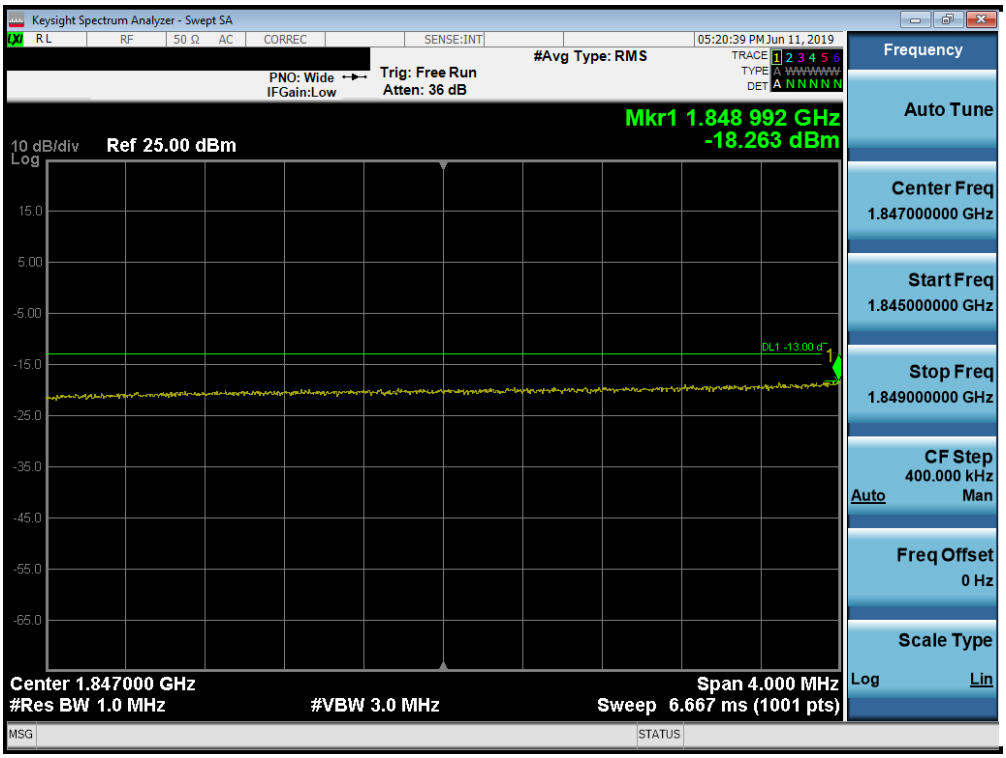
Plot 7-147. Upper Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



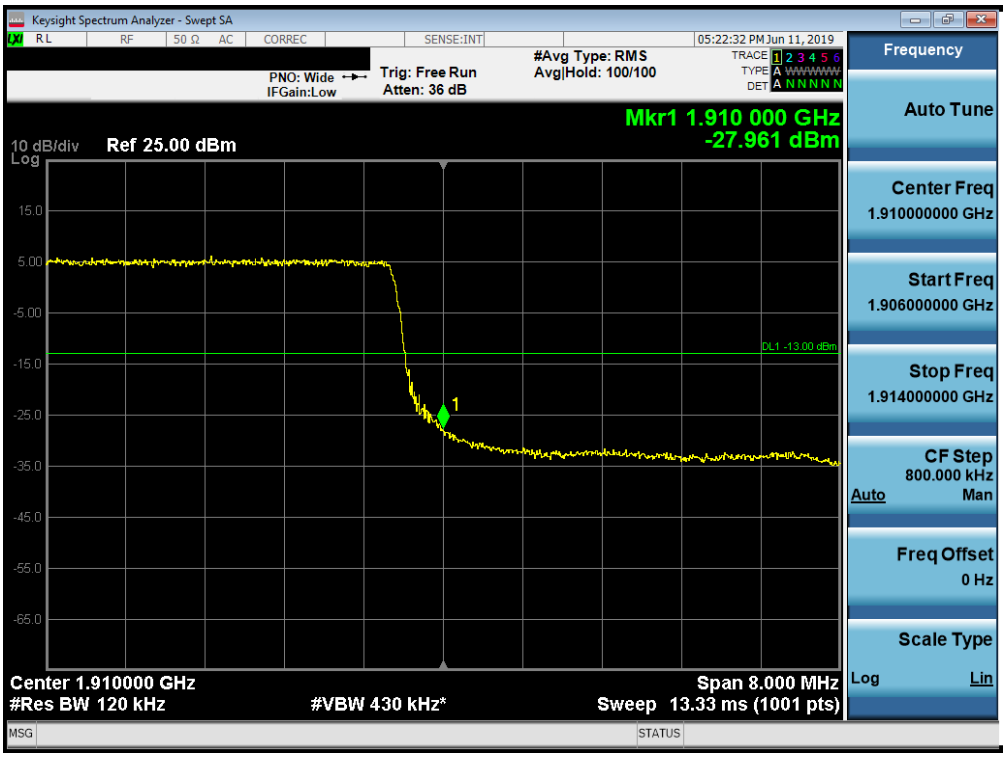
Plot 7-148. Upper Extended Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



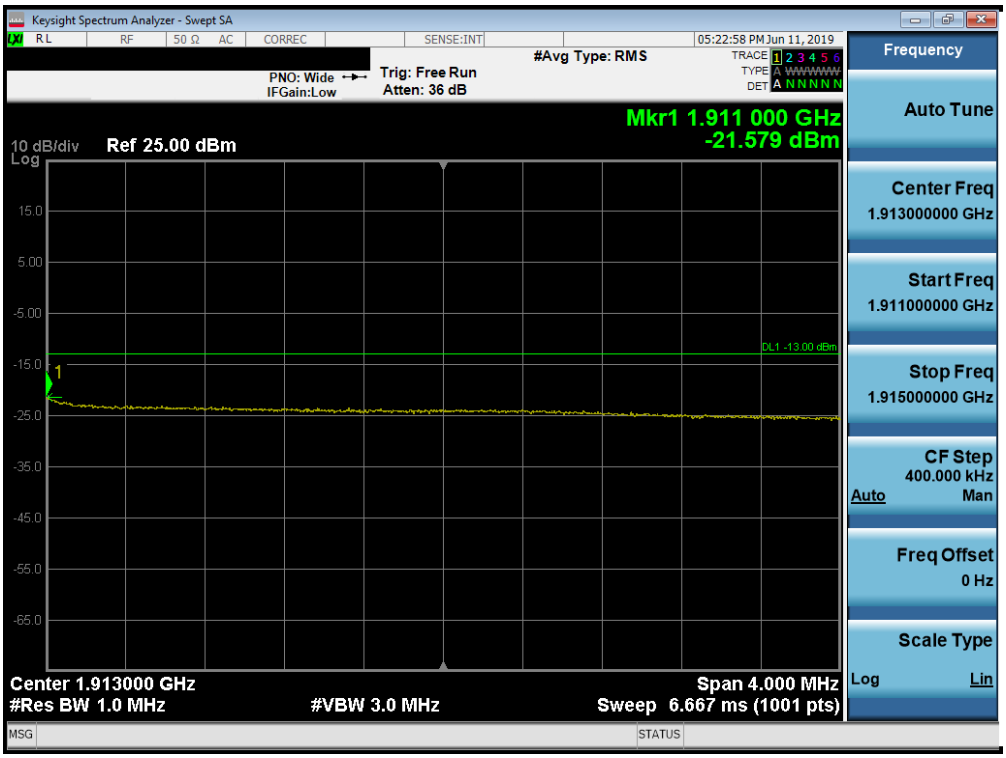
Plot 7-149. Lower Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



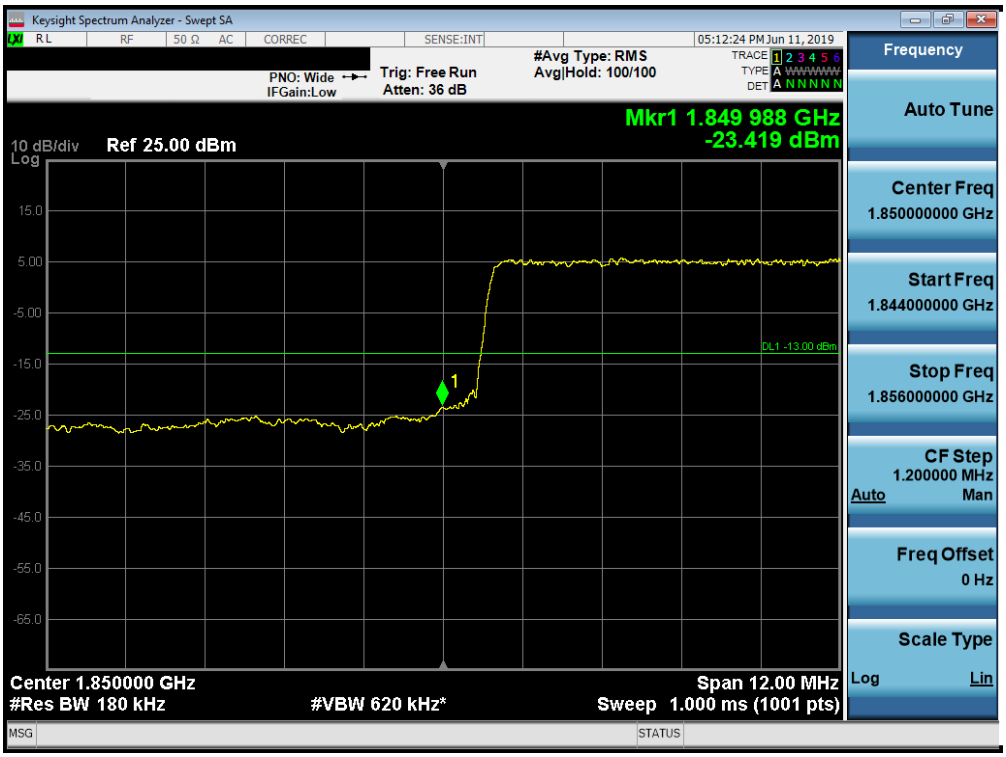
Plot 7-150. Lower Extended Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



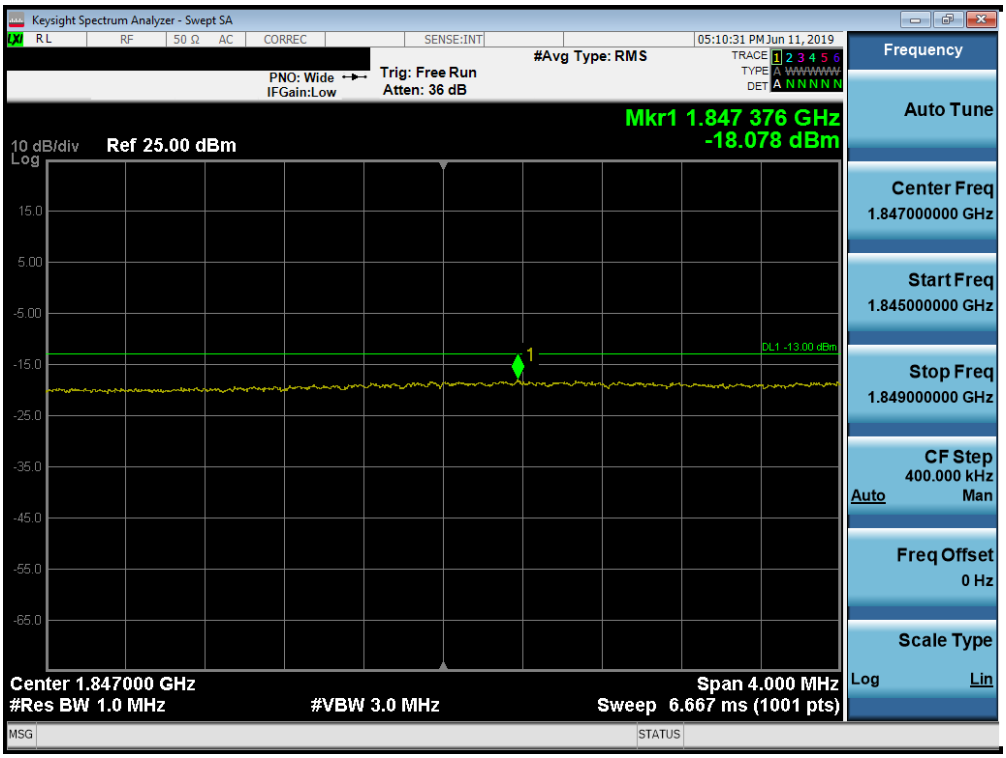
Plot 7-151. Upper Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



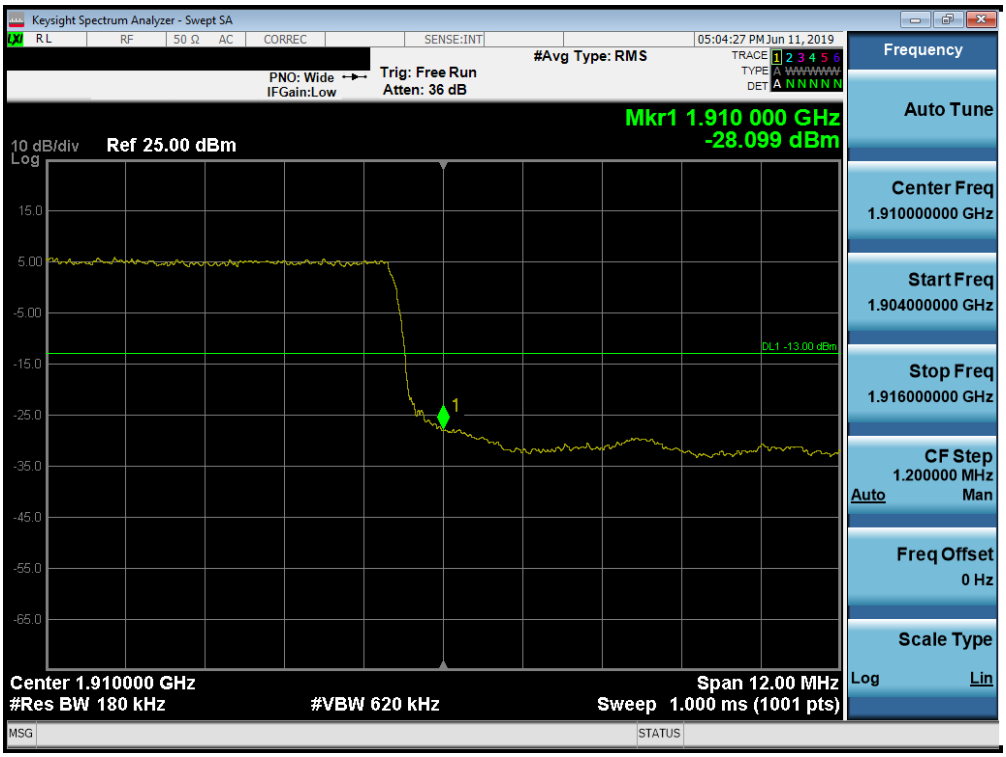
Plot 7-152. Upper Extended Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



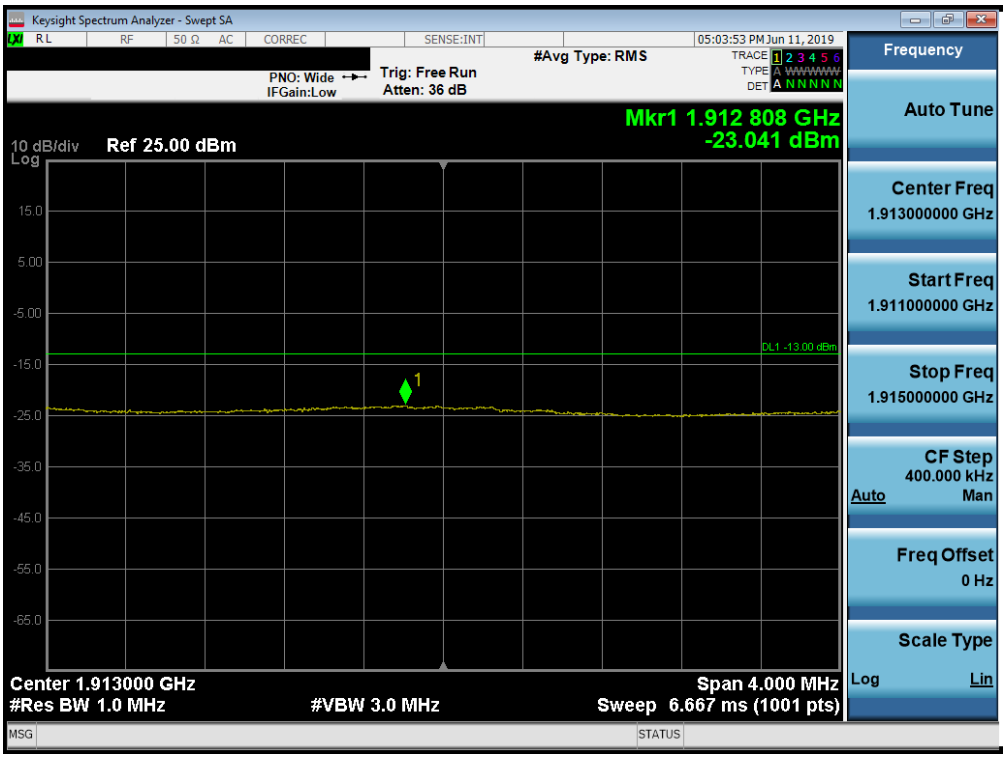
Plot 7-153. Lower Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



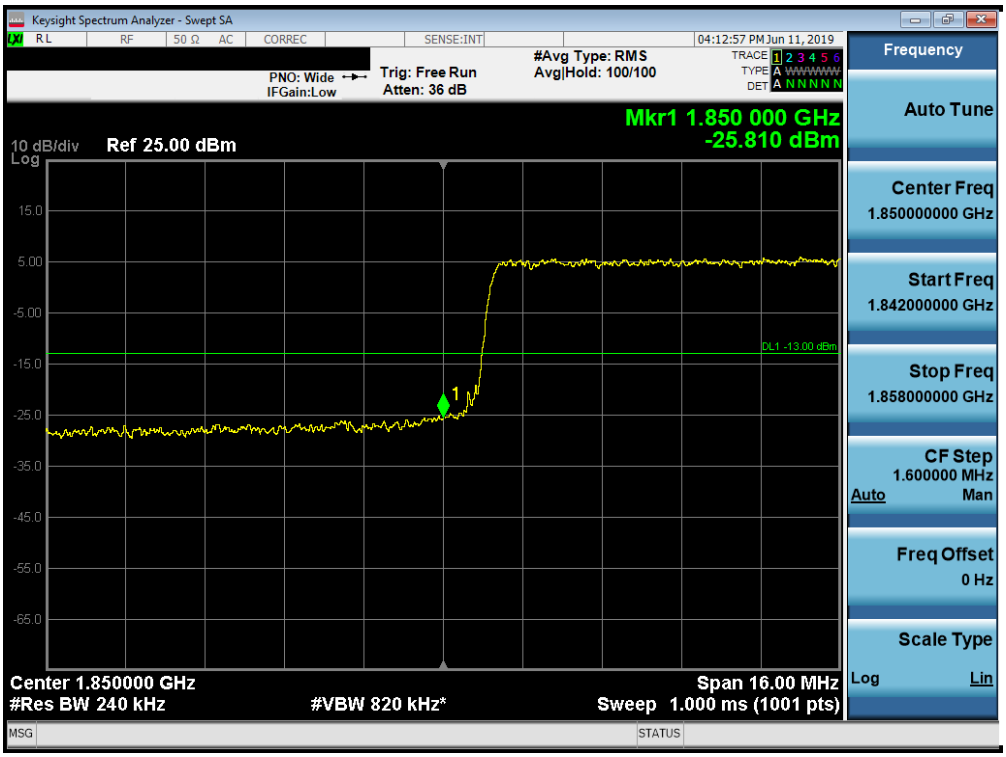
Plot 7-154. Lower Extended Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



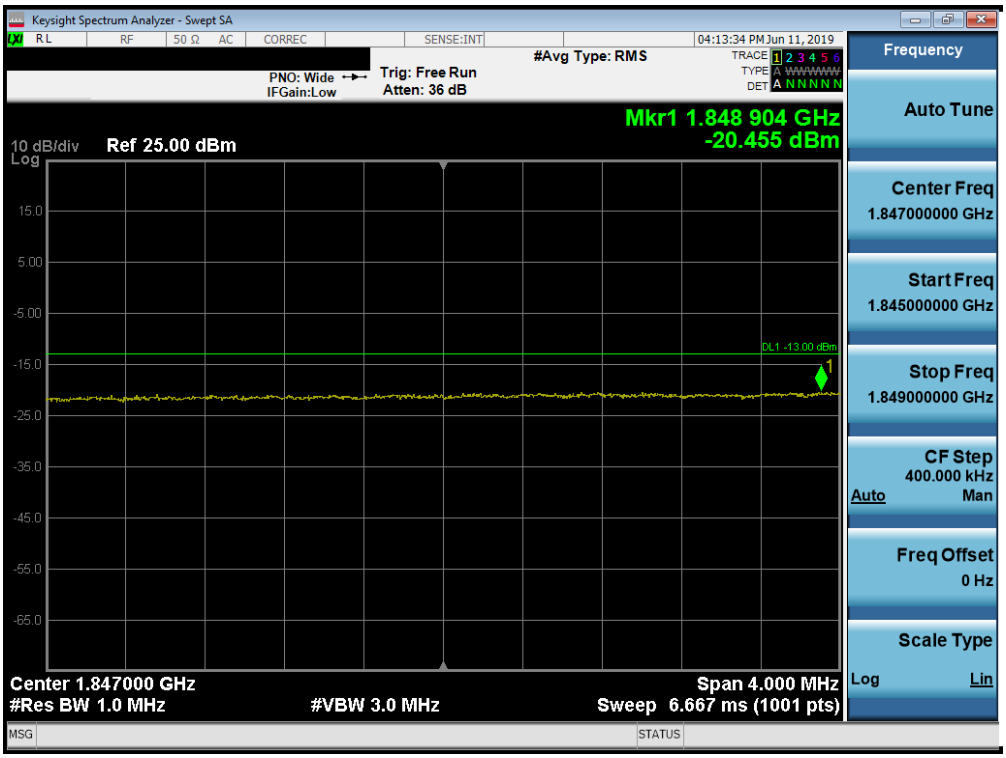
Plot 7-155. Upper Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



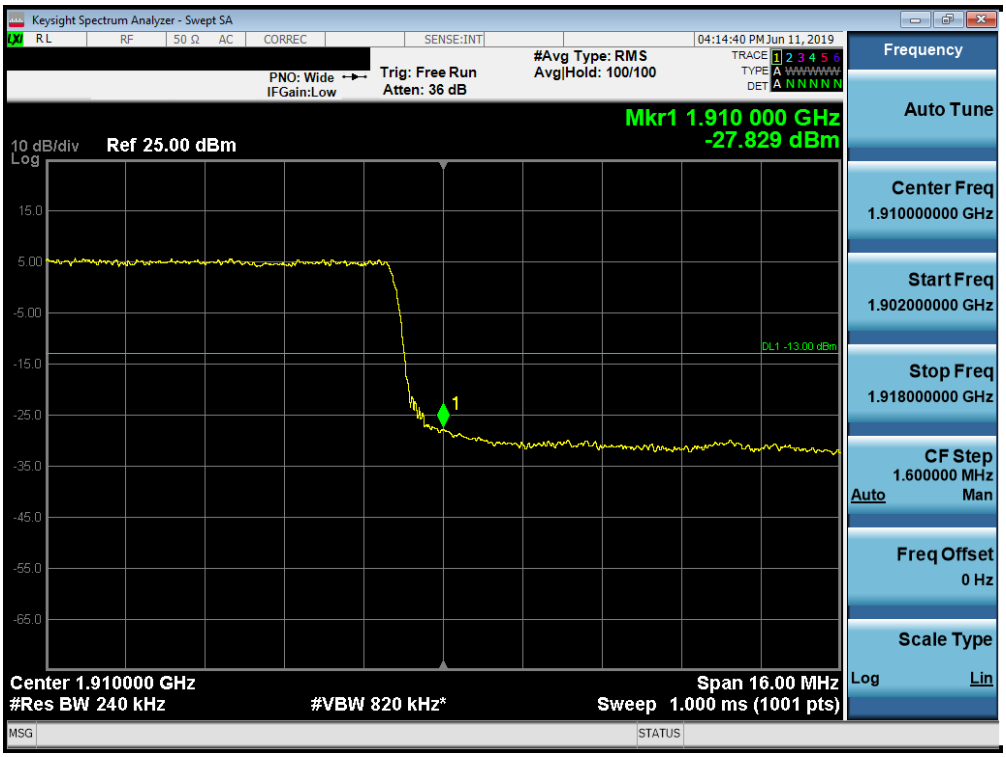
Plot 7-156. Upper Extended Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



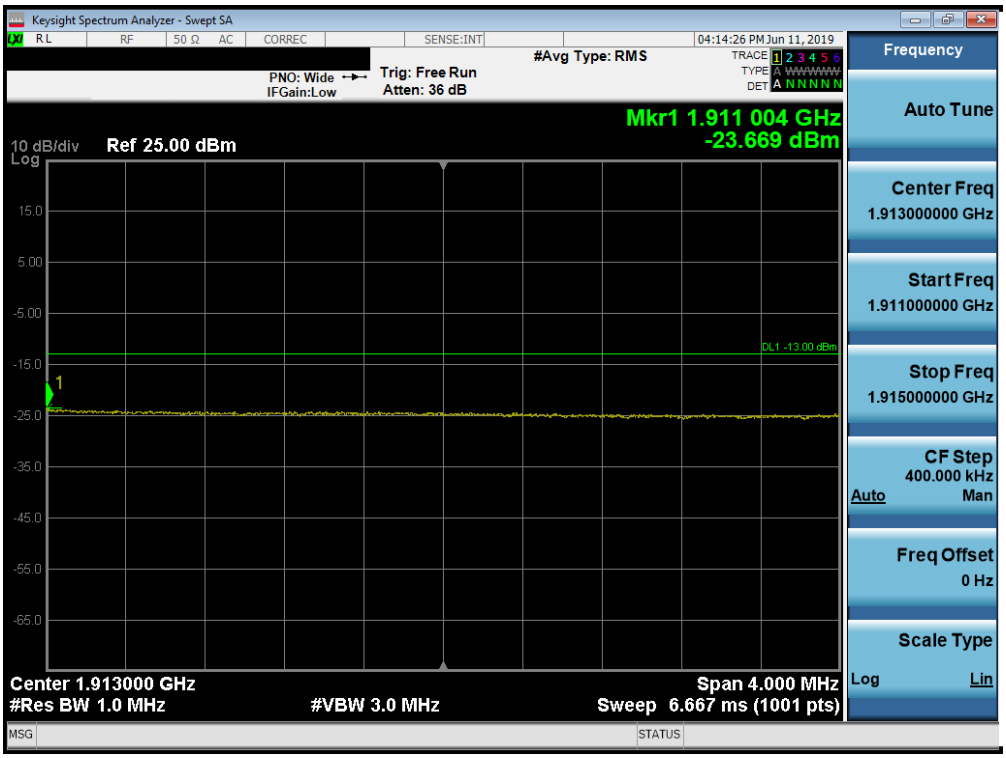
Plot 7-157. Lower Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-158. Lower Extended Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-159. Upper Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-160. Upper Extended Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)

7.5 Peak-Average Ratio

Test Overview

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

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.

Test Setup

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

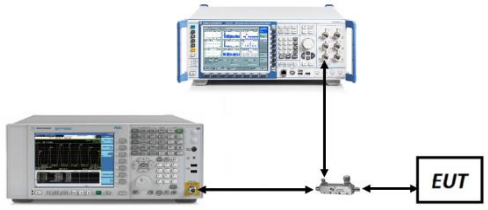
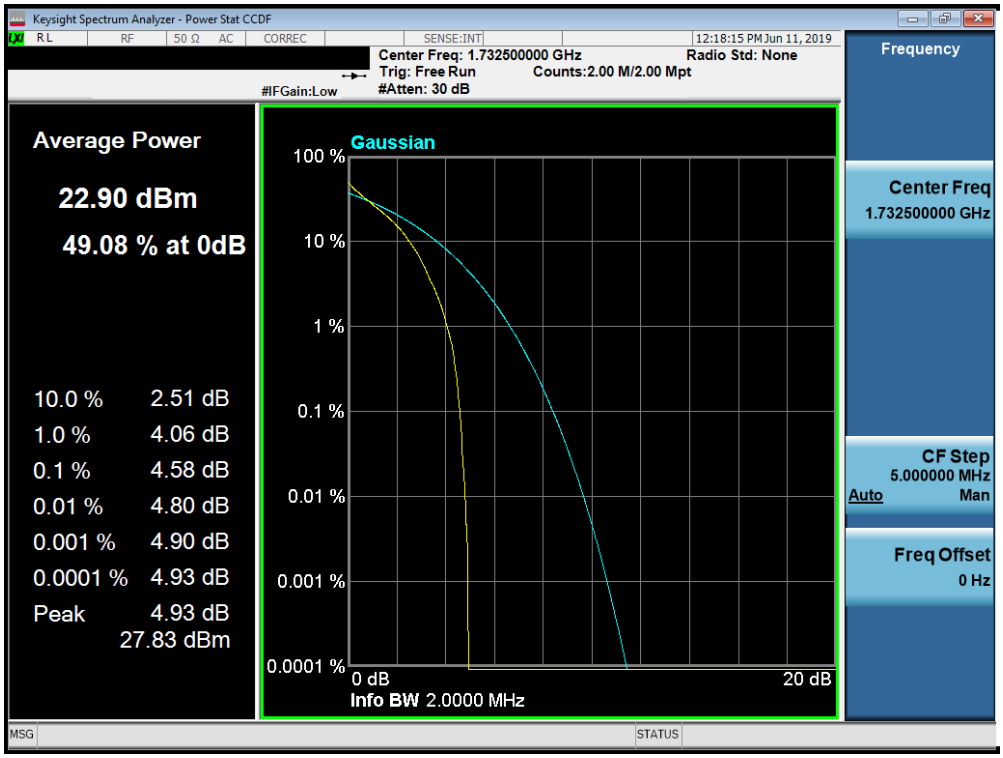


Figure 7-4. Test Instrument & Measurement Setup

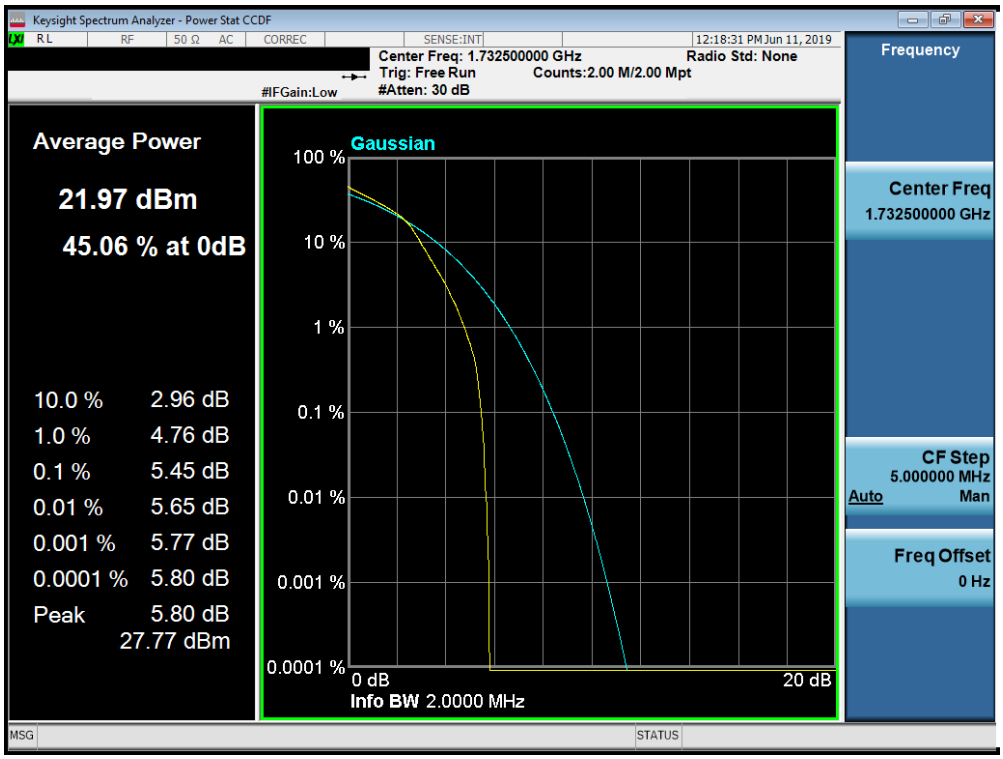
Test Notes

None.

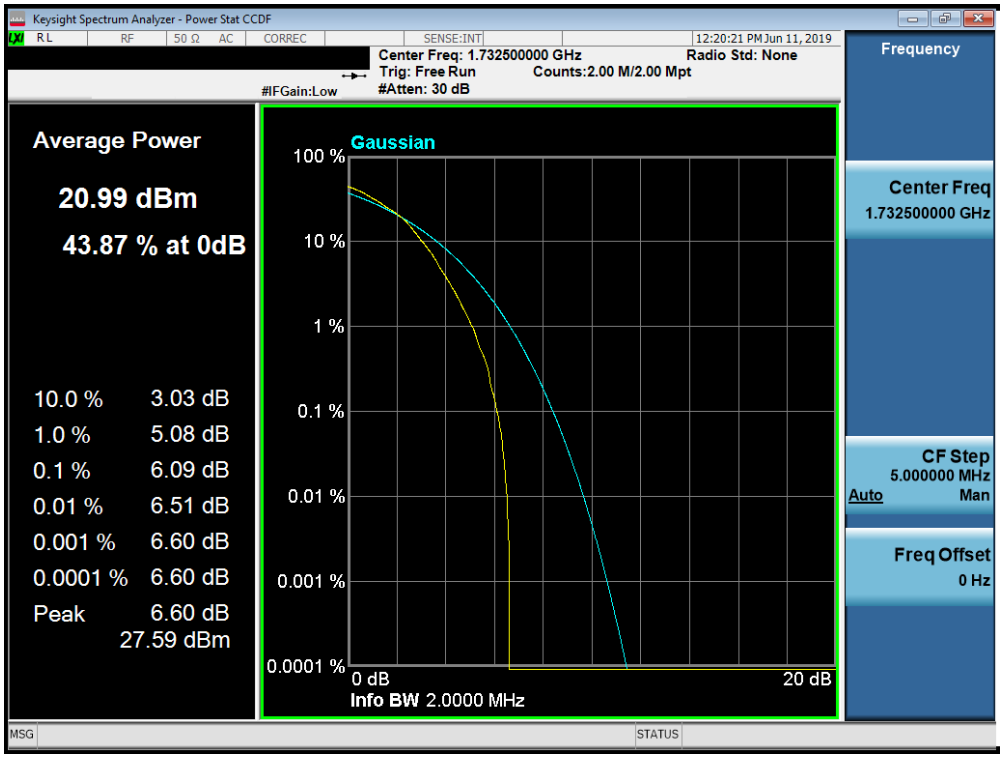
Band 66/4



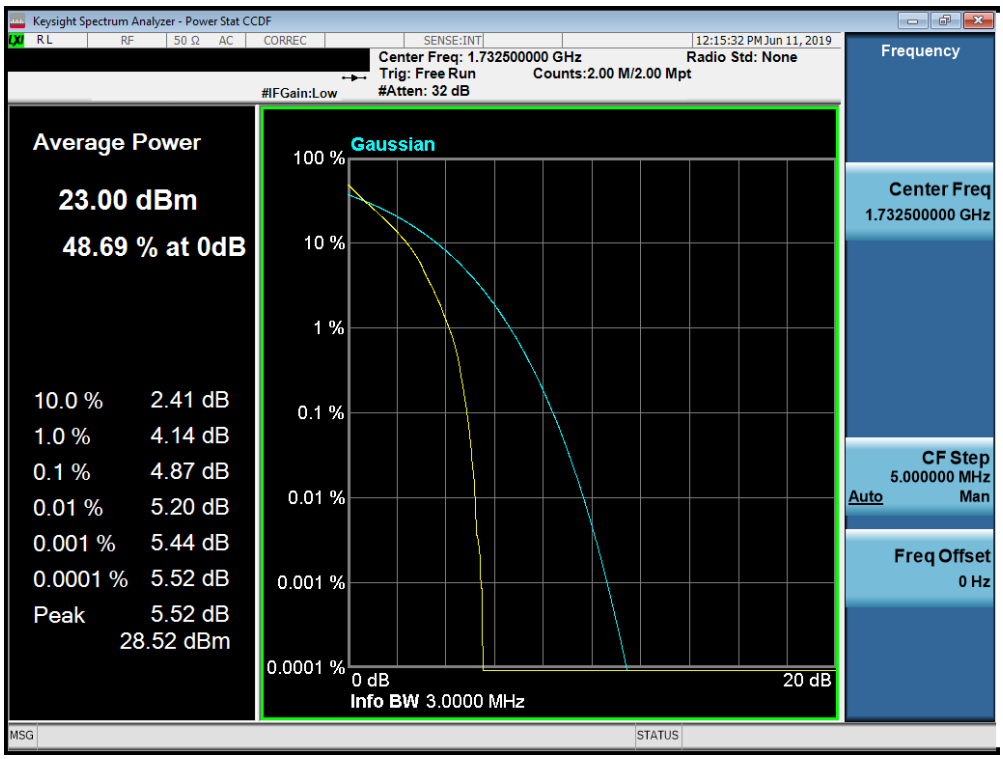
Plot 7-161. PAR Plot (Band 66/4 - 1.4MHz QPSK - Full RB Configuration)



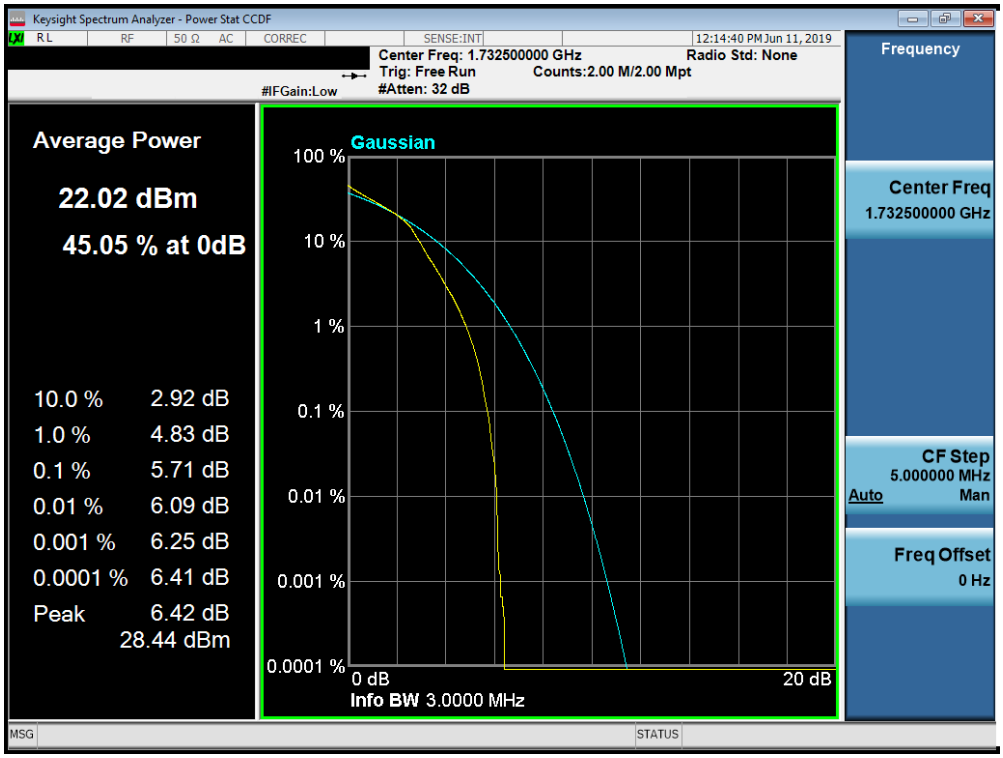
Plot 7-162. PAR Plot (Band 66/4 - 1.4MHz 16-QAM - Full RB Configuration)



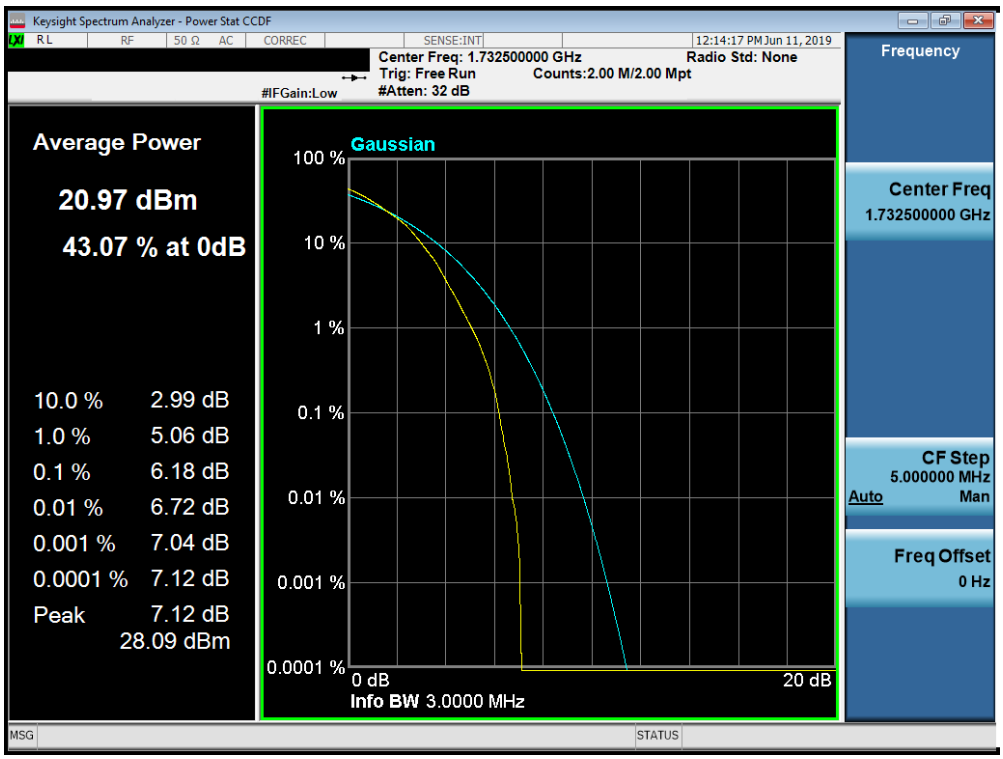
Plot 7-163. PAR Plot (Band 66/4 - 1.4MHz 64-QAM - Full RB Configuration)



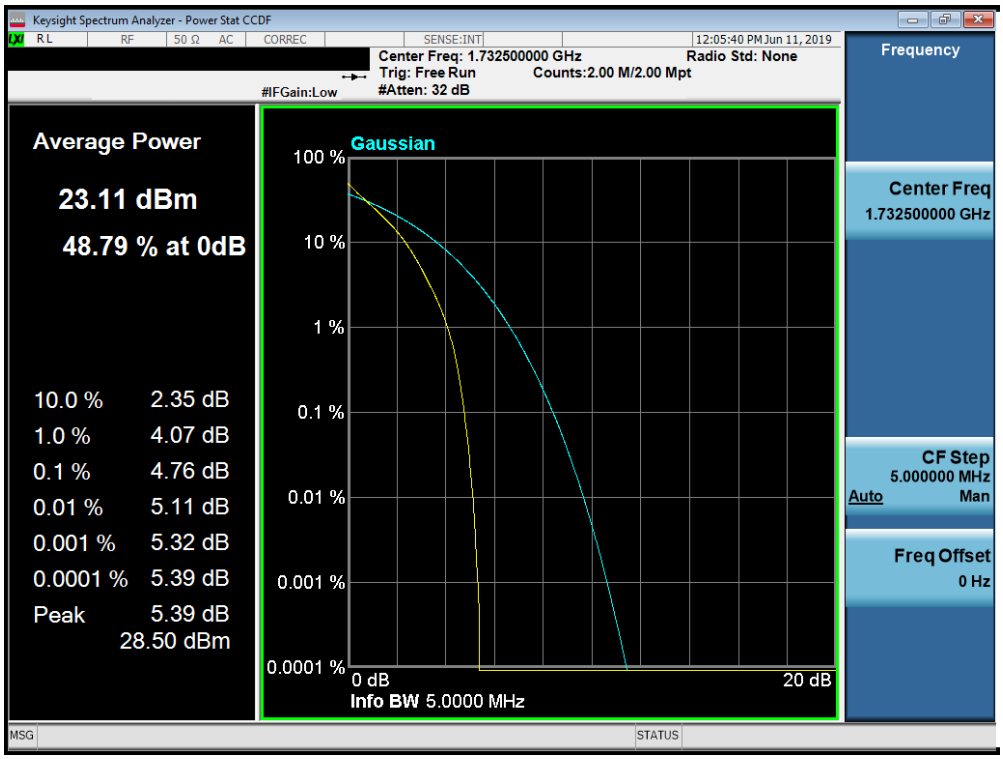
Plot 7-164. PAR Plot (Band 66/4 - 3.0MHz QPSK - Full RB Configuration)



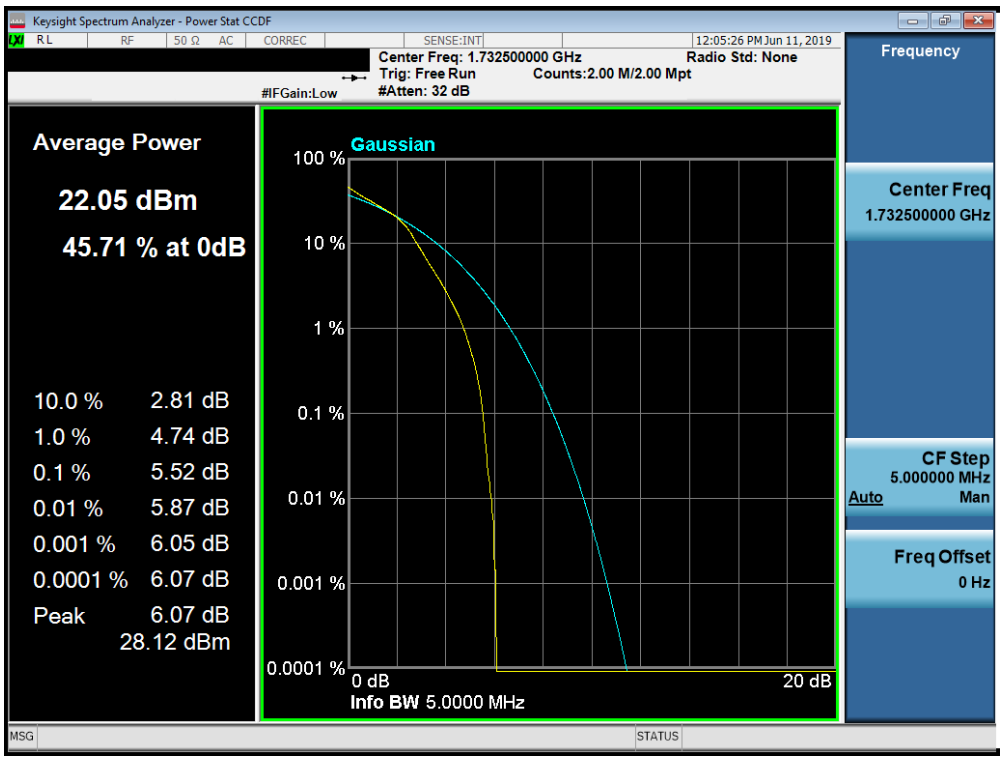
Plot 7-165. PAR Plot (Band 66/4 - 3.0MHz 16-QAM - Full RB Configuration)



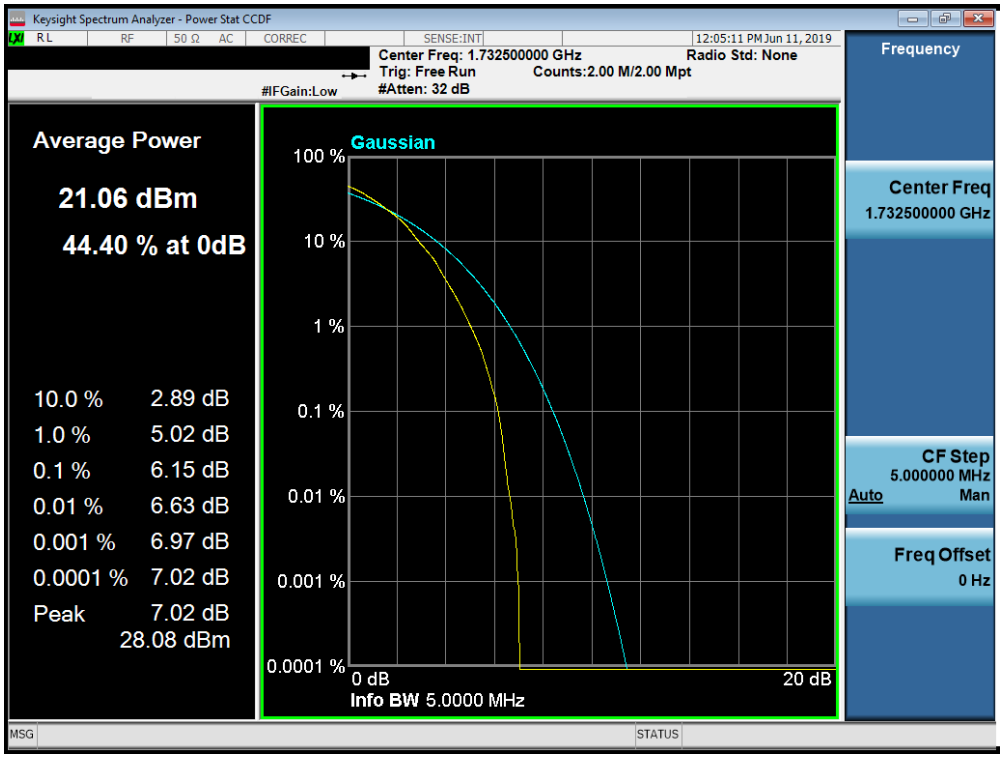
Plot 7-166. PAR Plot (Band 66/4 - 3.0MHz 64-QAM - Full RB Configuration)



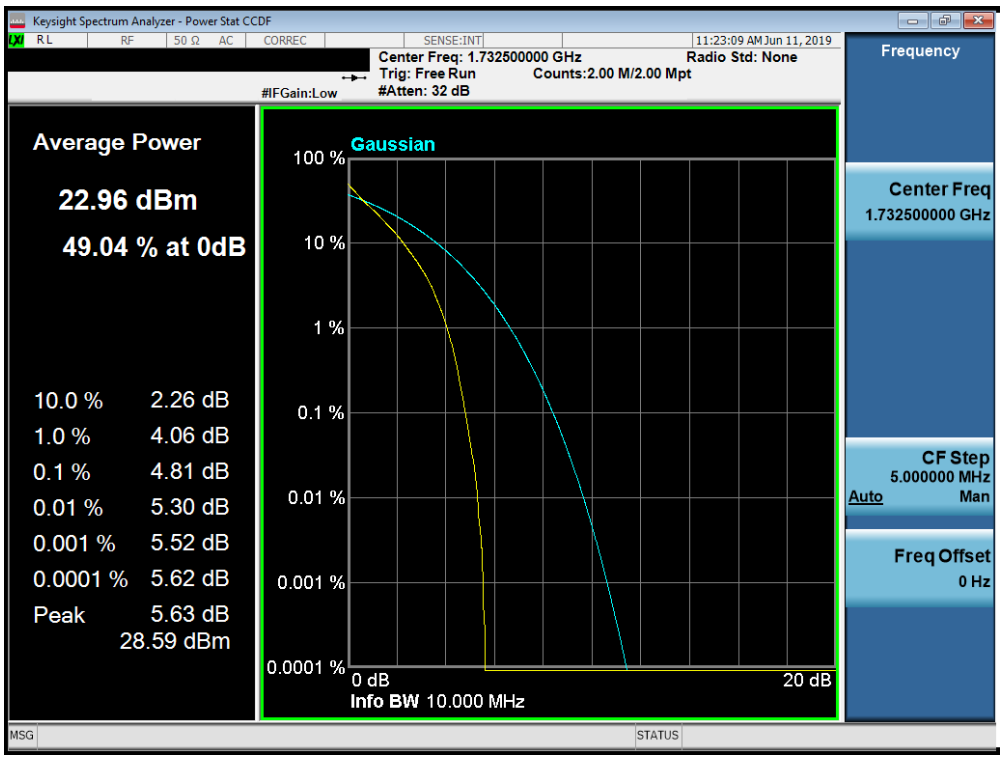
Plot 7-167. PAR Plot (Band 66/4 - 5.0MHz QPSK - Full RB Configuration)



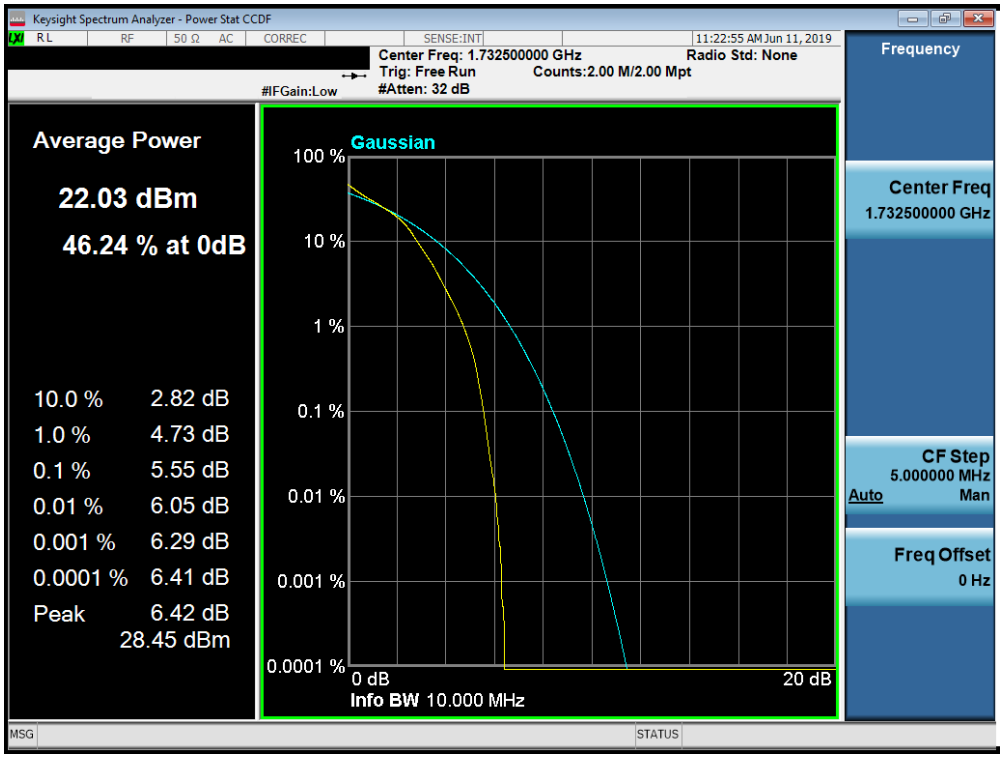
Plot 7-168. PAR Plot (Band 66/4 - 5.0MHz 16-QAM - Full RB Configuration)



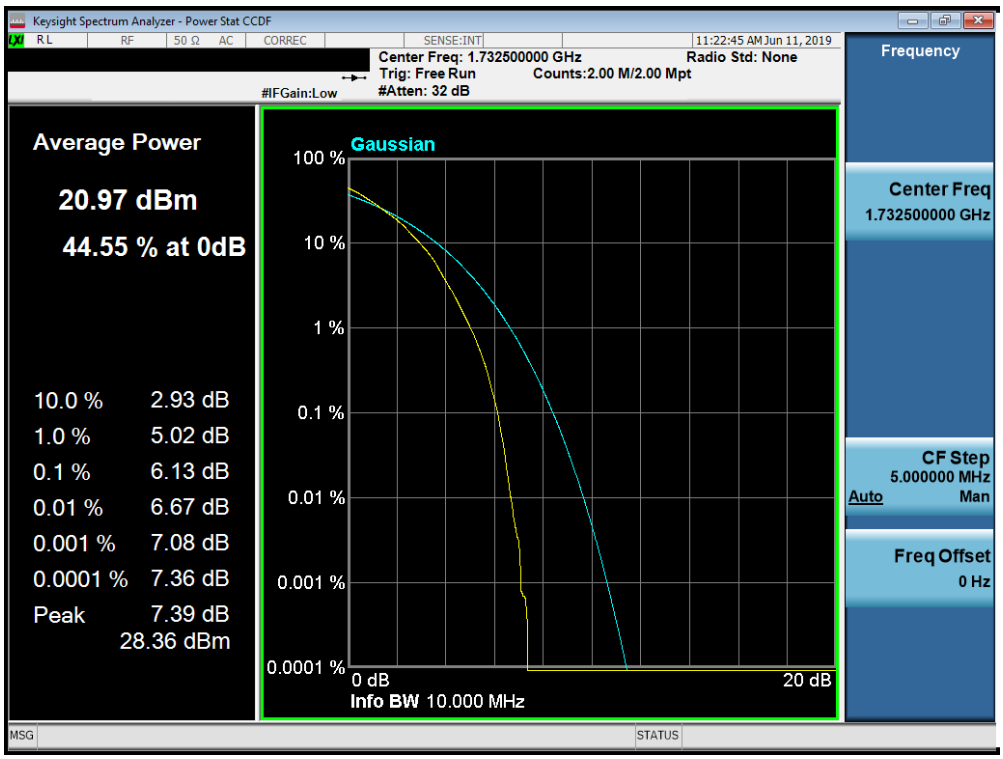
Plot 7-169. PAR Plot (Band 66/4 - 5.0MHz 64-QAM - Full RB Configuration)



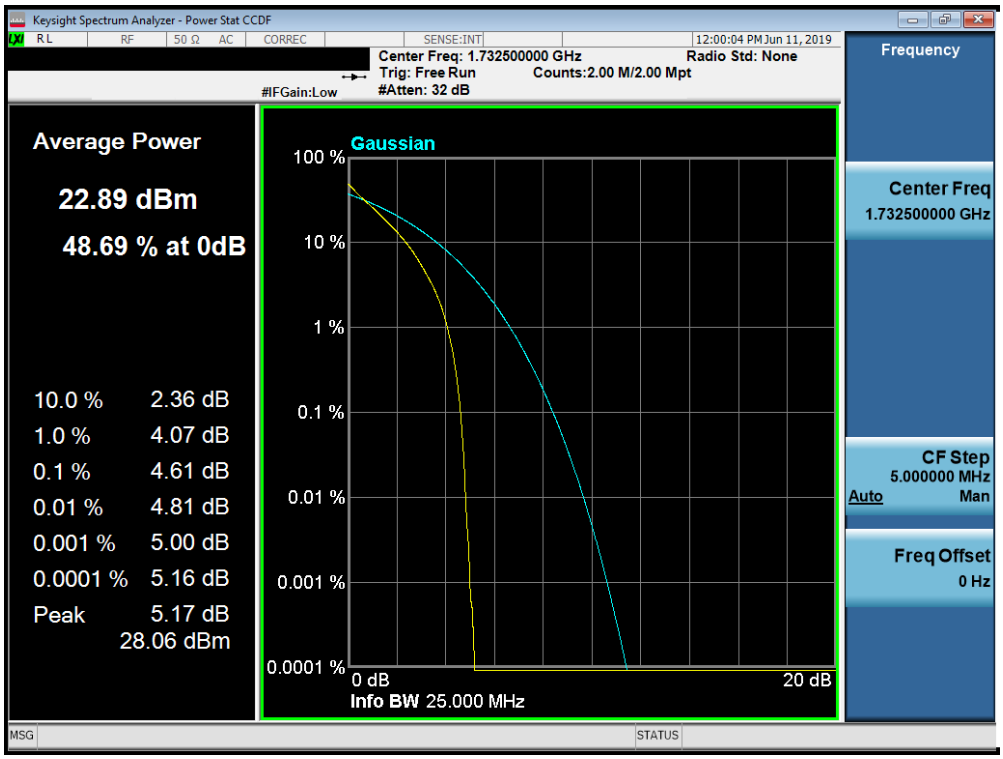
Plot 7-170. PAR Plot (Band 66/4 - 10.0MHz QPSK - Full RB Configuration)



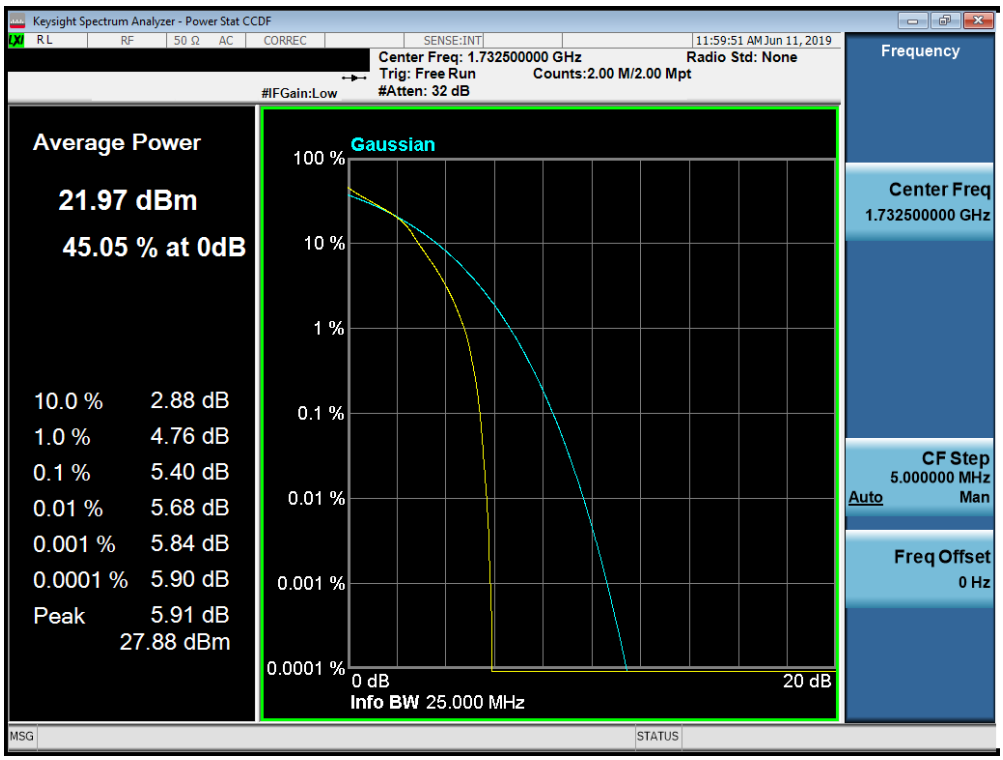
Plot 7-171. PAR Plot (Band 66/4 - 10.0MHz 16-QAM - Full RB Configuration)



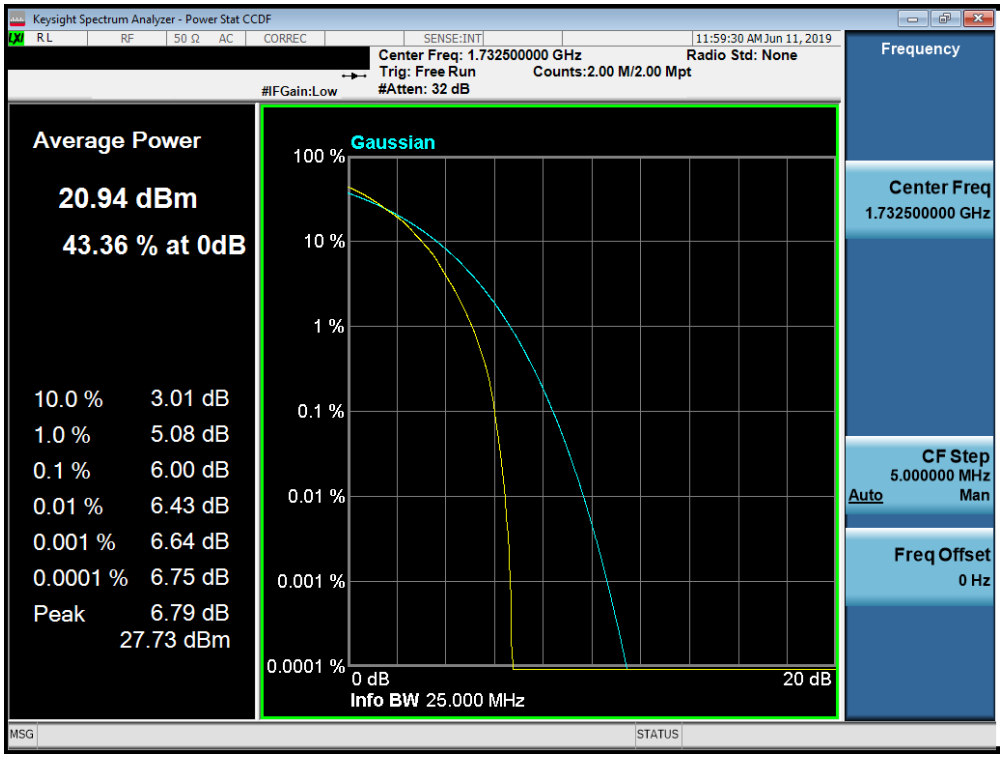
Plot 7-172. PAR Plot (Band 66/4 - 10.0MHz 64-QAM - Full RB Configuration)



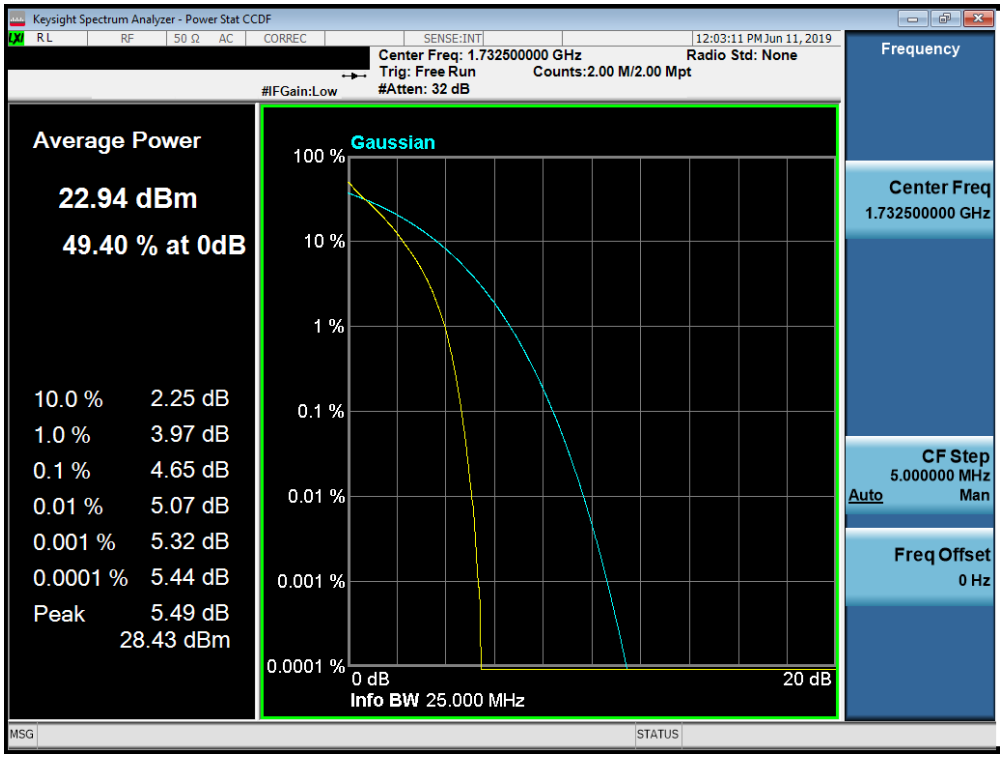
Plot 7-173. PAR Plot (Band 66/4 - 15.0MHz QPSK - Full RB Configuration)



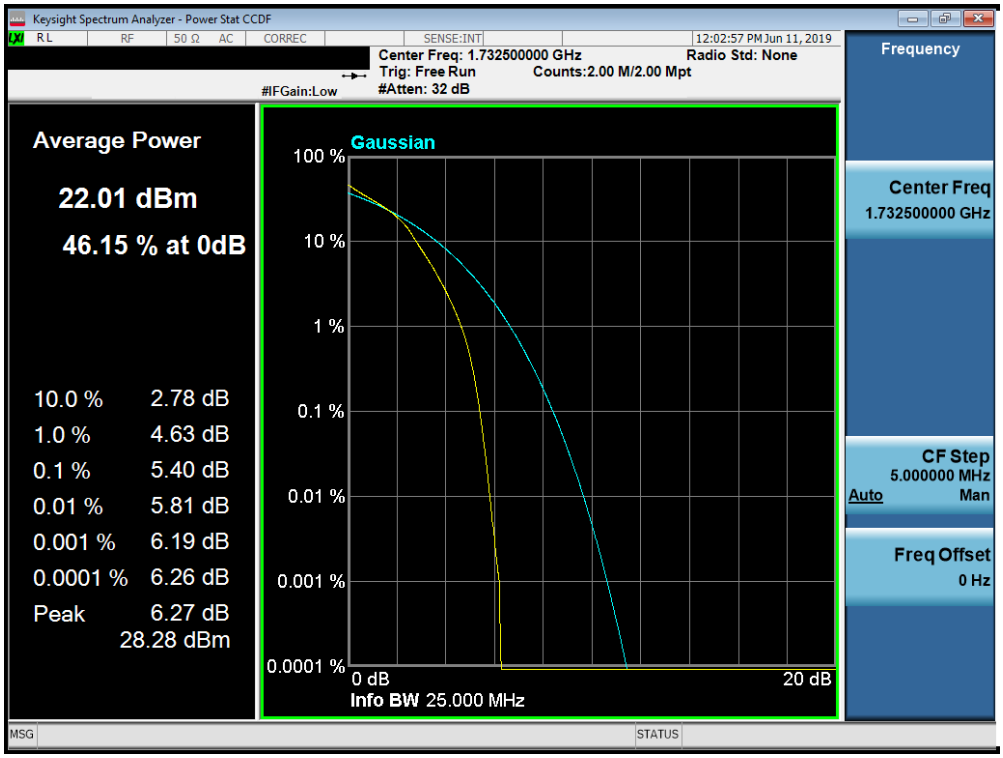
Plot 7-174. PAR Plot (Band 66/4 - 15.0MHz 16-QAM - Full RB Configuration)



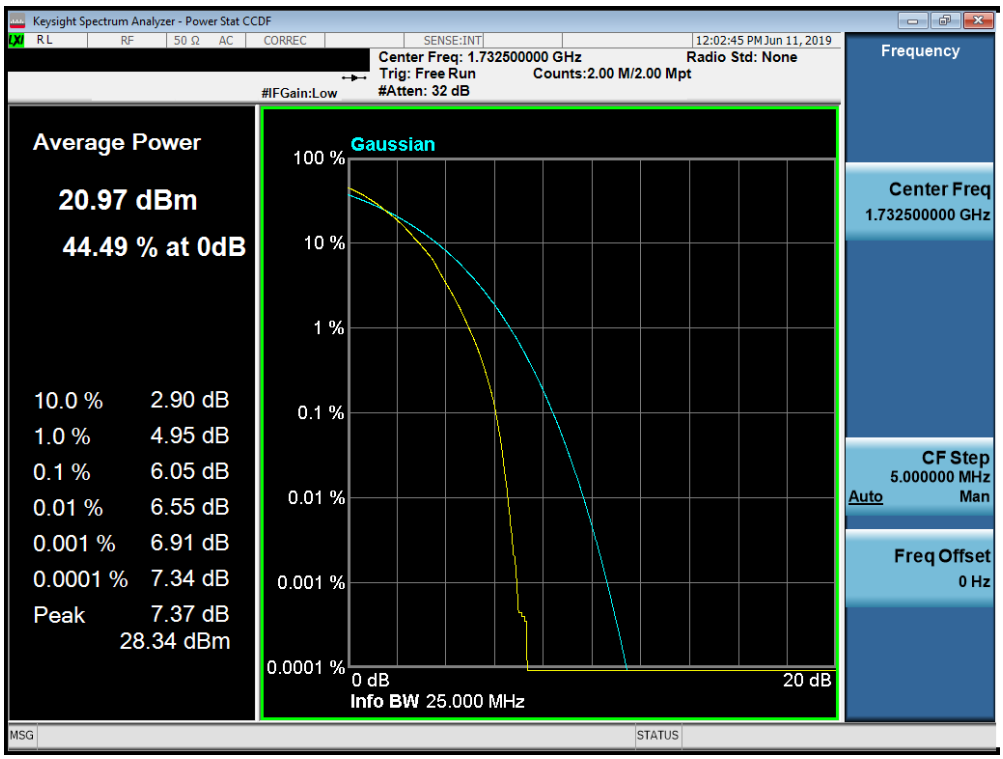
Plot 7-175. PAR Plot (Band 66/4 - 15.0MHz 64-QAM - Full RB Configuration)



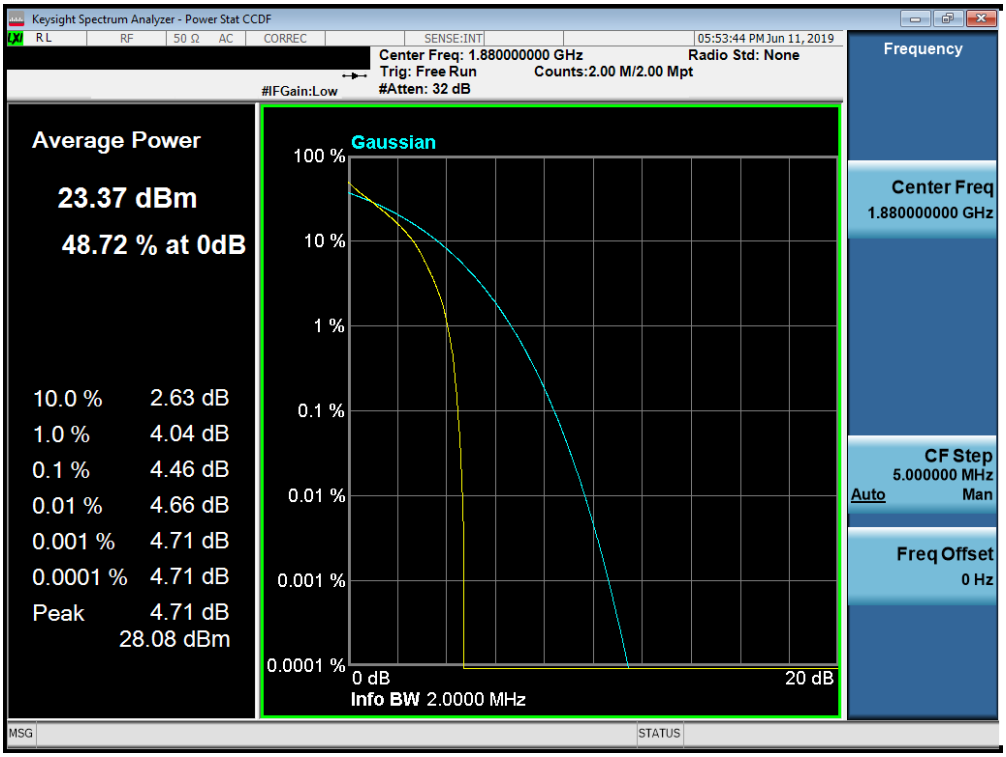
Plot 7-176. PAR Plot (Band 66/4 - 20.0MHz QPSK - Full RB Configuration)



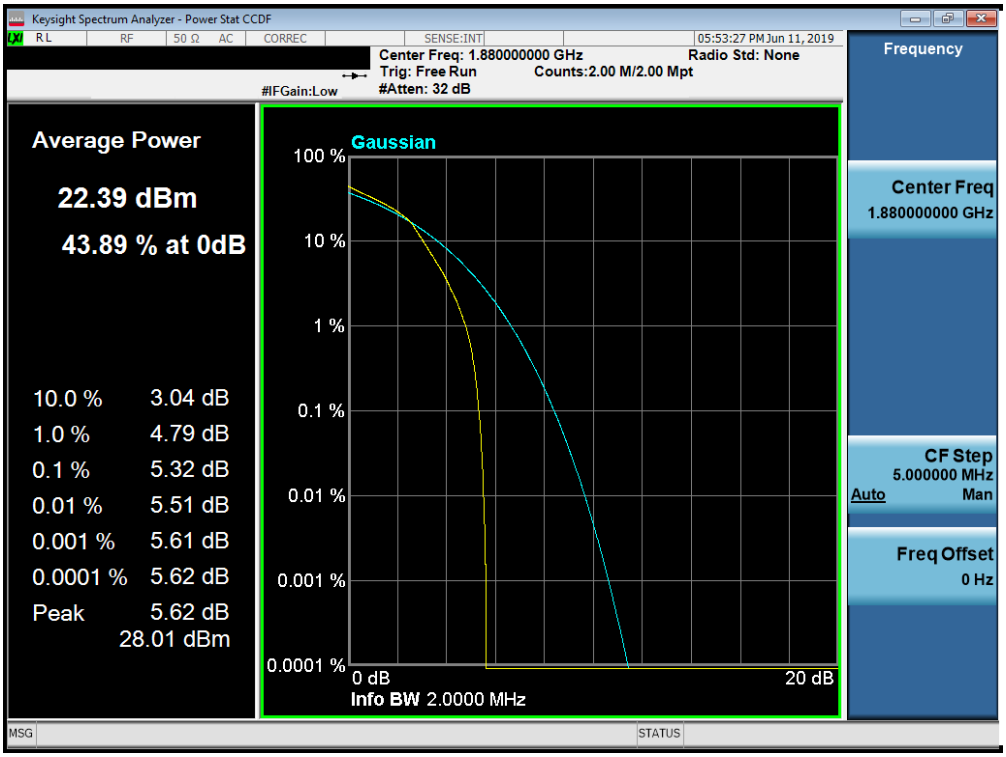
Plot 7-177. PAR Plot (Band 66/4 - 20.0MHz 16-QAM - Full RB Configuration)



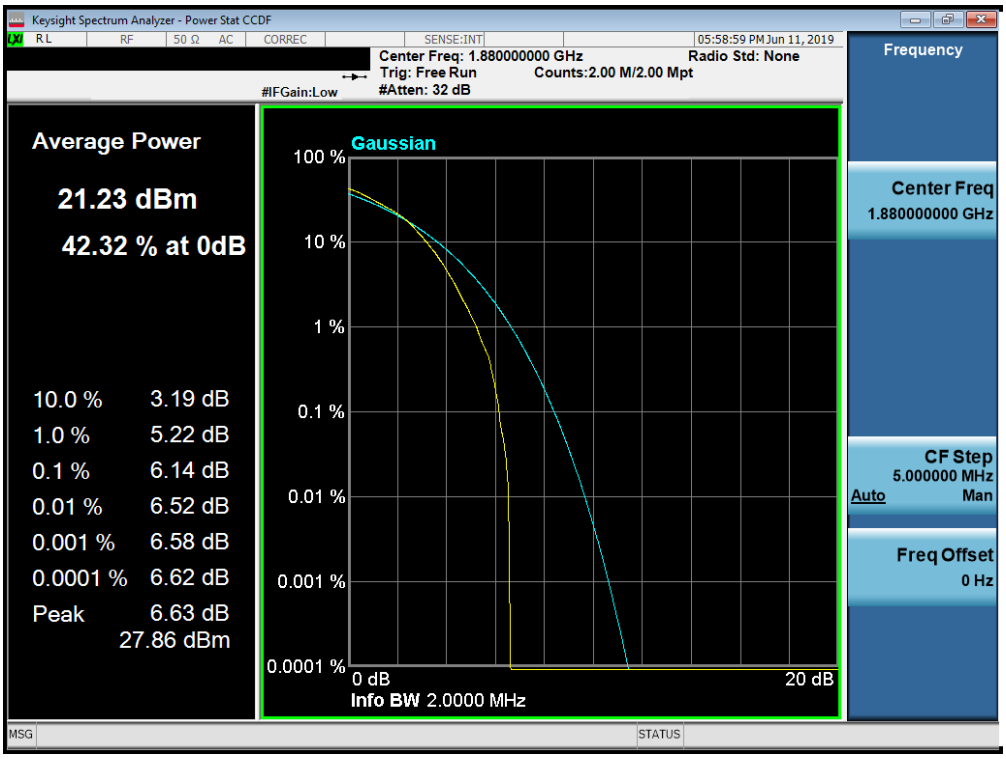
Plot 7-178. PAR Plot (Band 66/4 - 20.0MHz 64-QAM - Full RB Configuration)



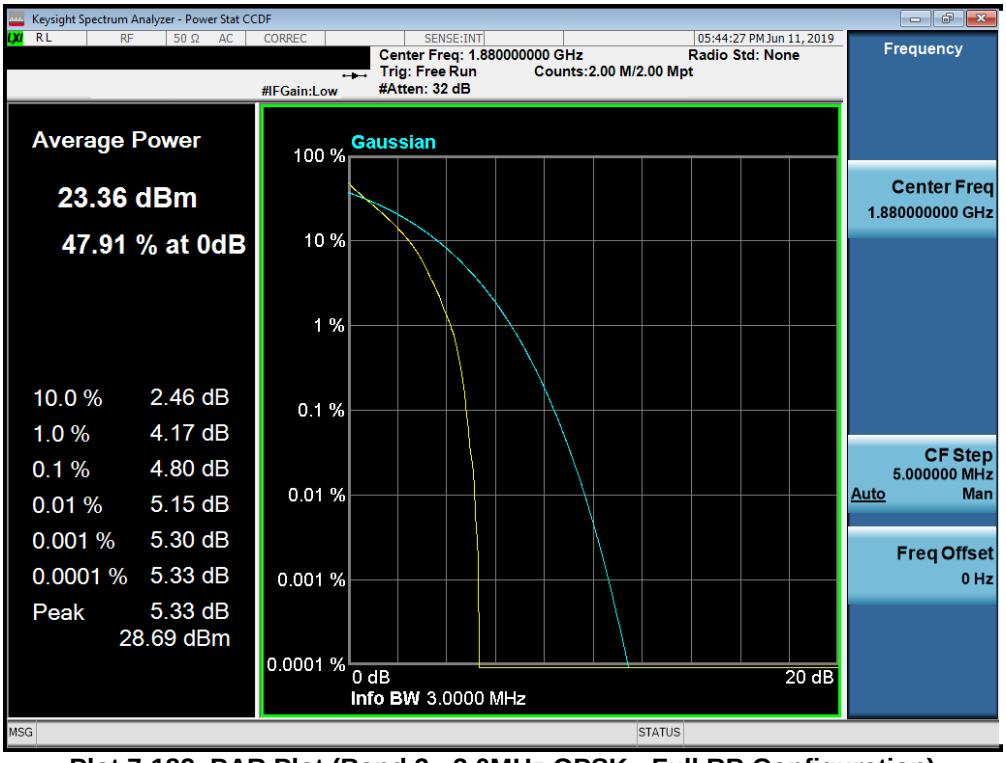
Plot 7-179. PAR Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



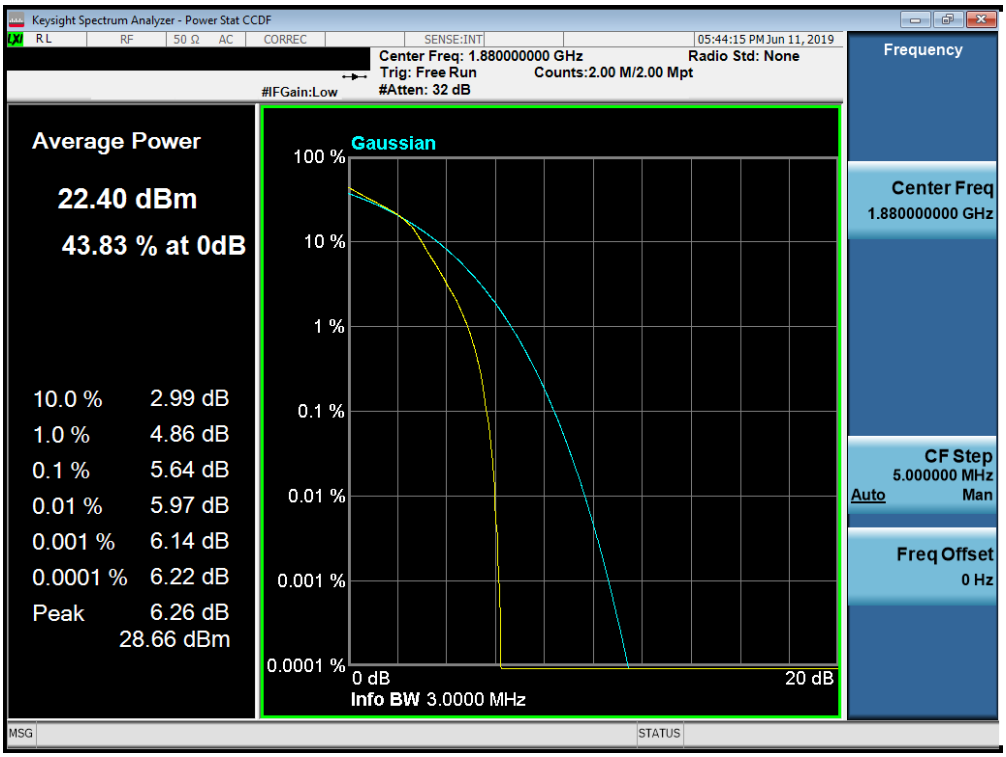
Plot 7-180. PAR Plot (Band 2 - 1.4MHz 16-QAM - Full RB Configuration)



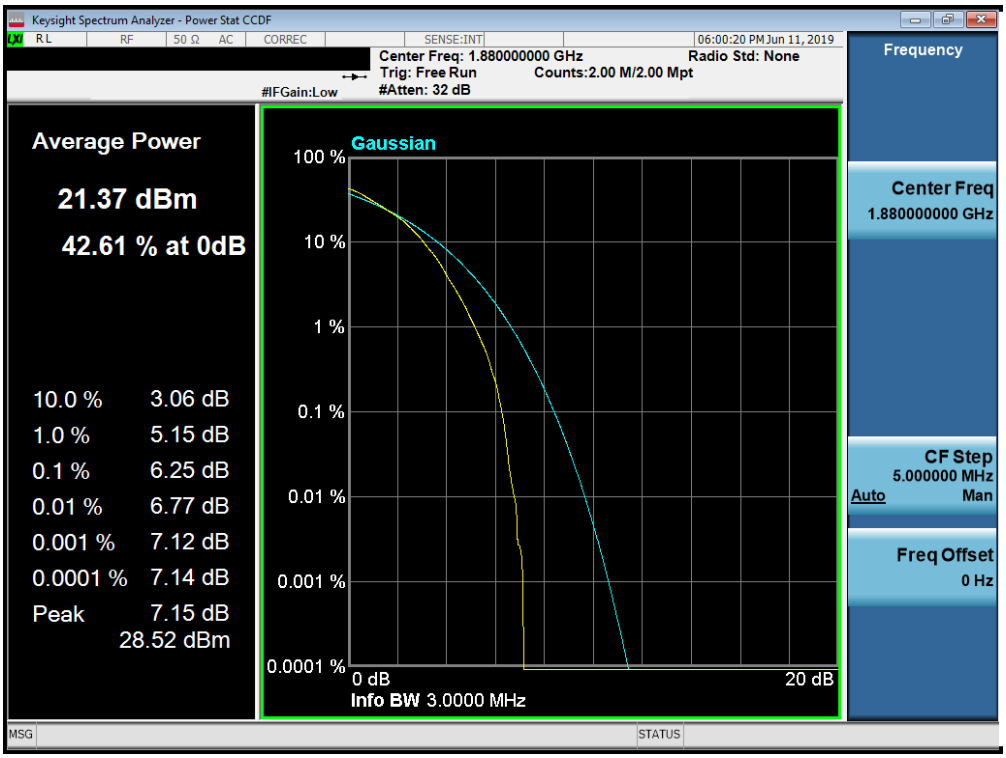
Plot 7-181. PAR Plot (Band 2 - 1.4MHz 64-QAM - Full RB Configuration)



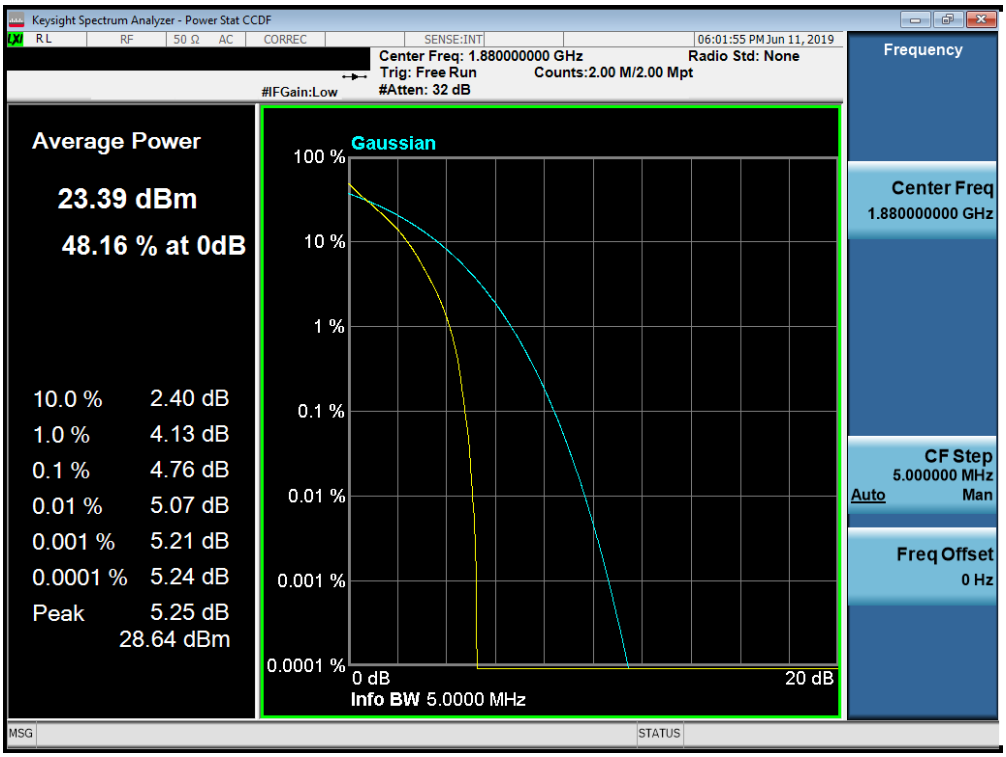
Plot 7-182. PAR Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



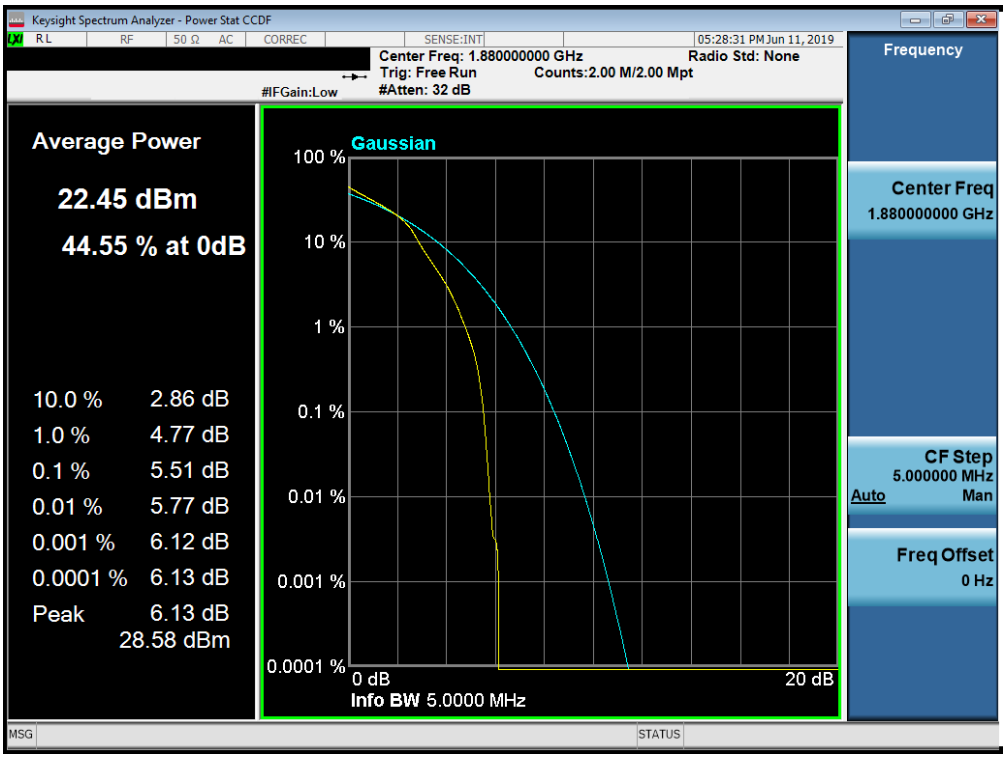
Plot 7-183. PAR Plot (Band 2 - 3.0MHz 16-QAM - Full RB Configuration)



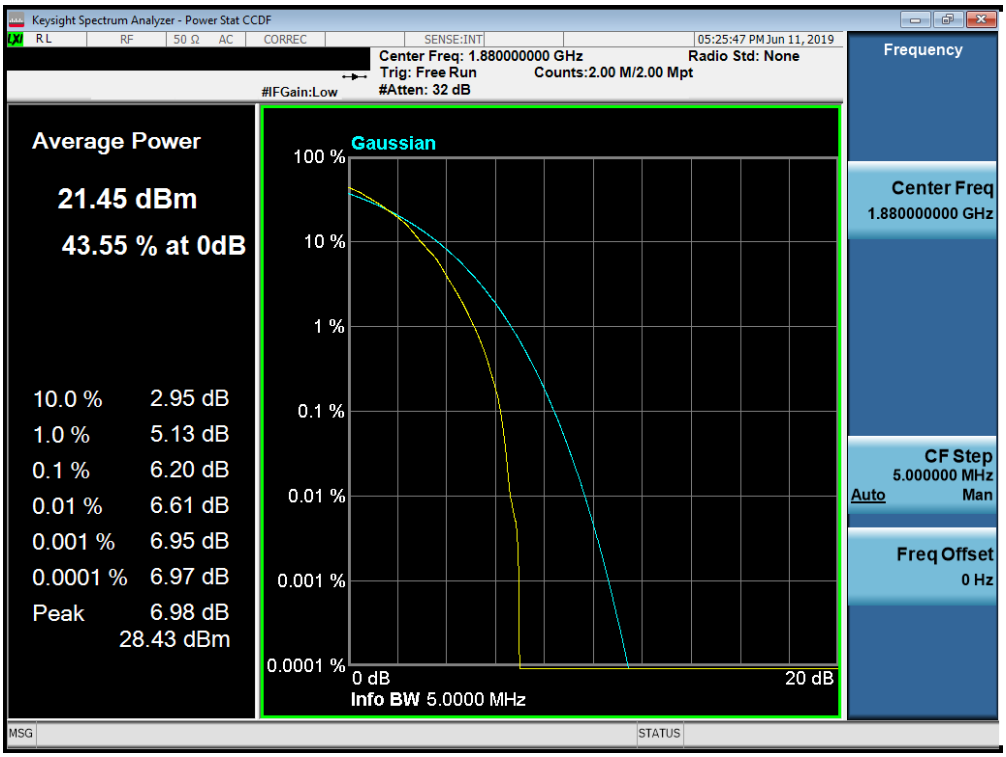
Plot 7-184. PAR Plot (Band 2 - 3.0MHz 64-QAM - Full RB Configuration)



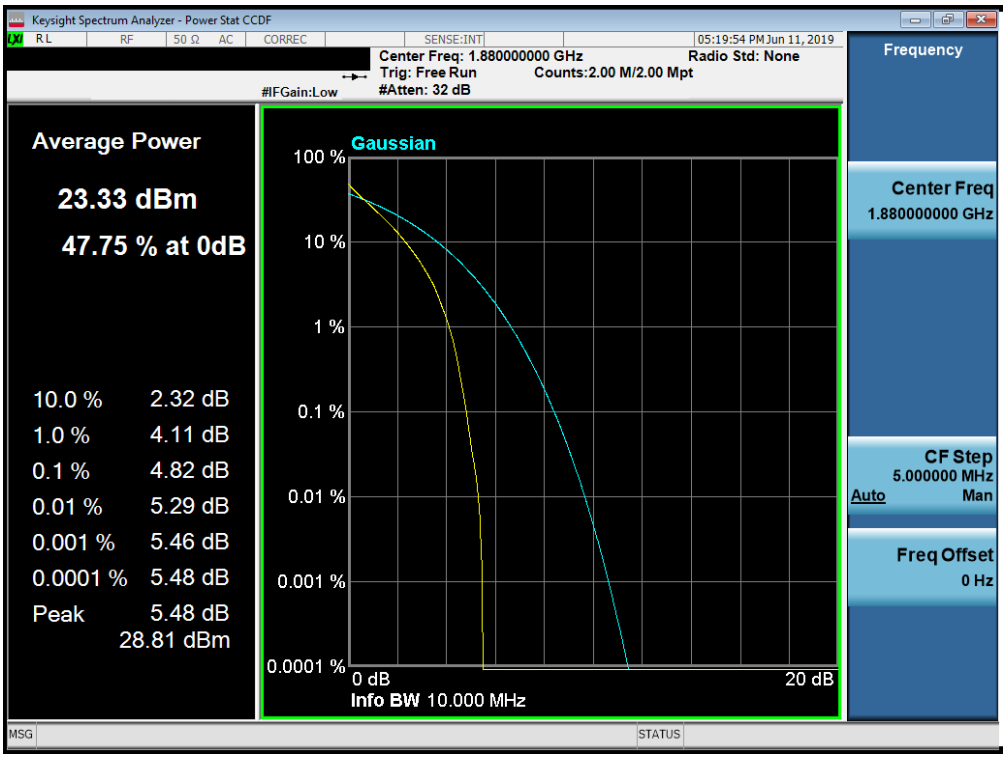
Plot 7-185. PAR Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



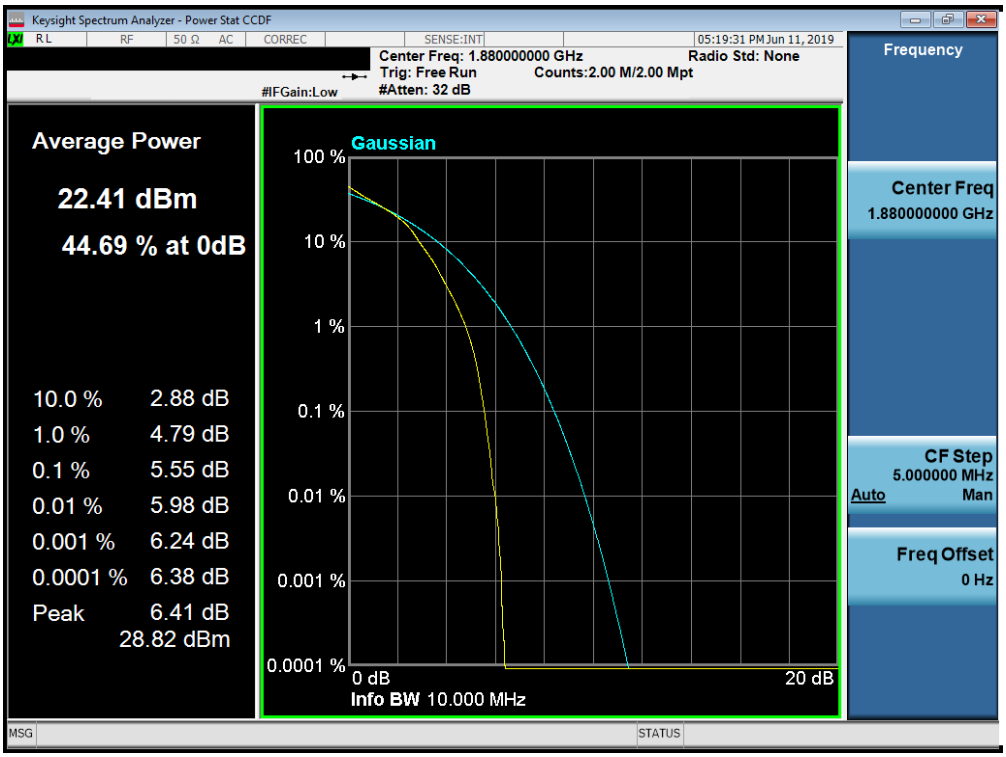
Plot 7-186. PAR Plot (Band 2 - 5.0MHz 16-QAM - Full RB Configuration)



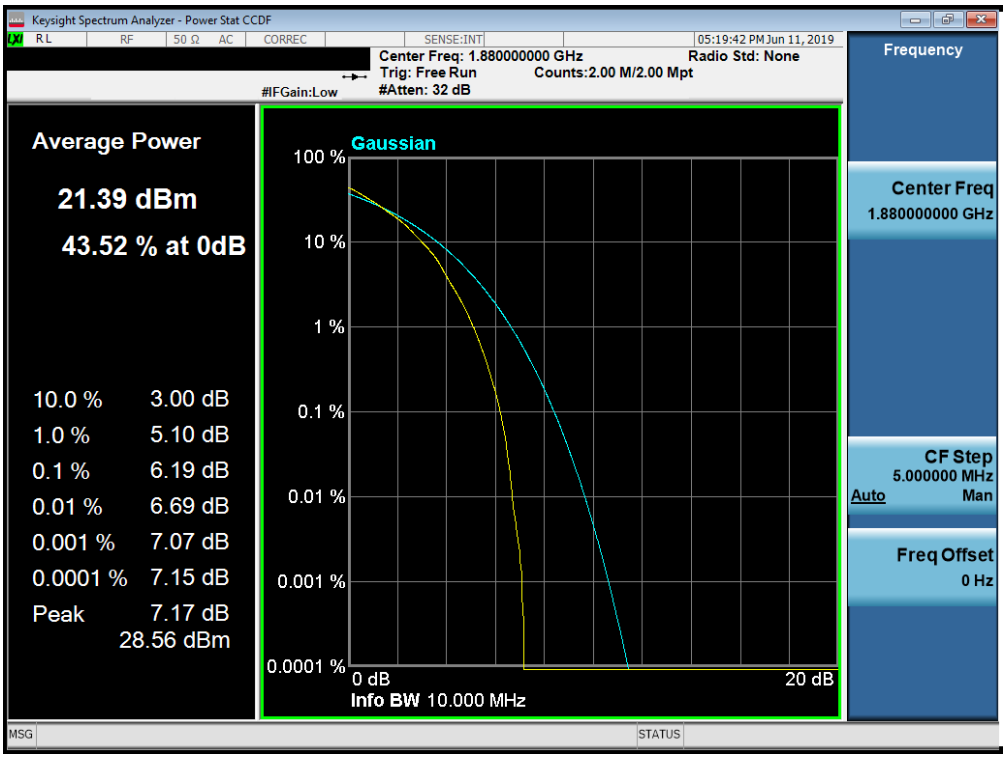
Plot 7-187. PAR Plot (Band 2 - 5.0MHz 64-QAM - Full RB Configuration)



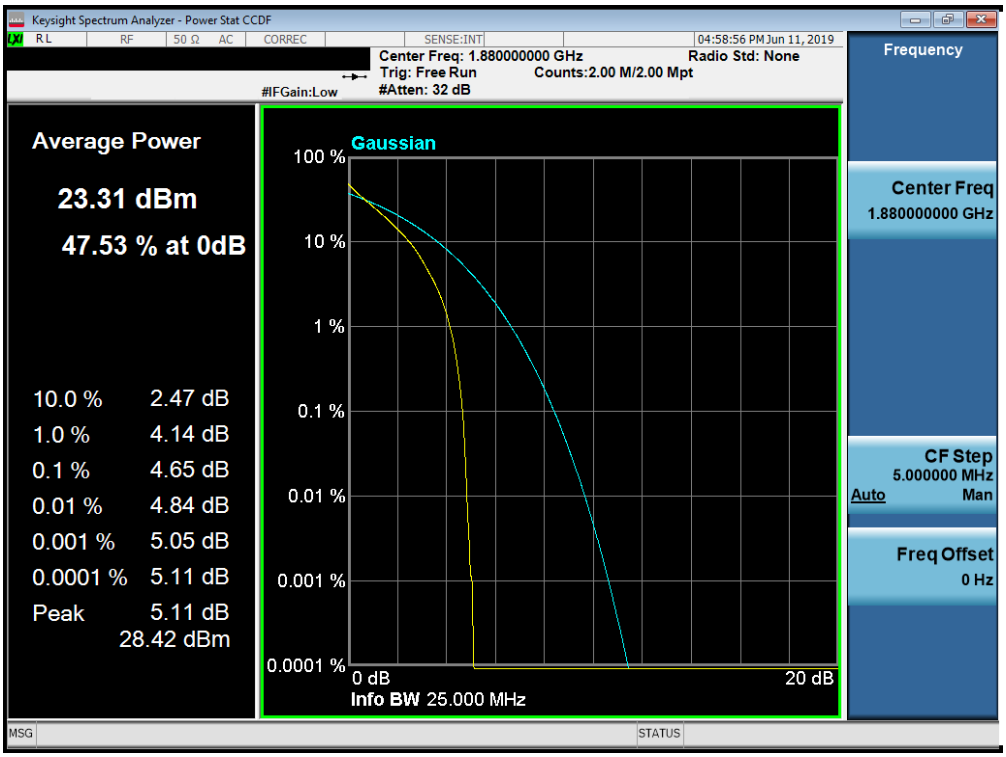
Plot 7-188. PAR Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



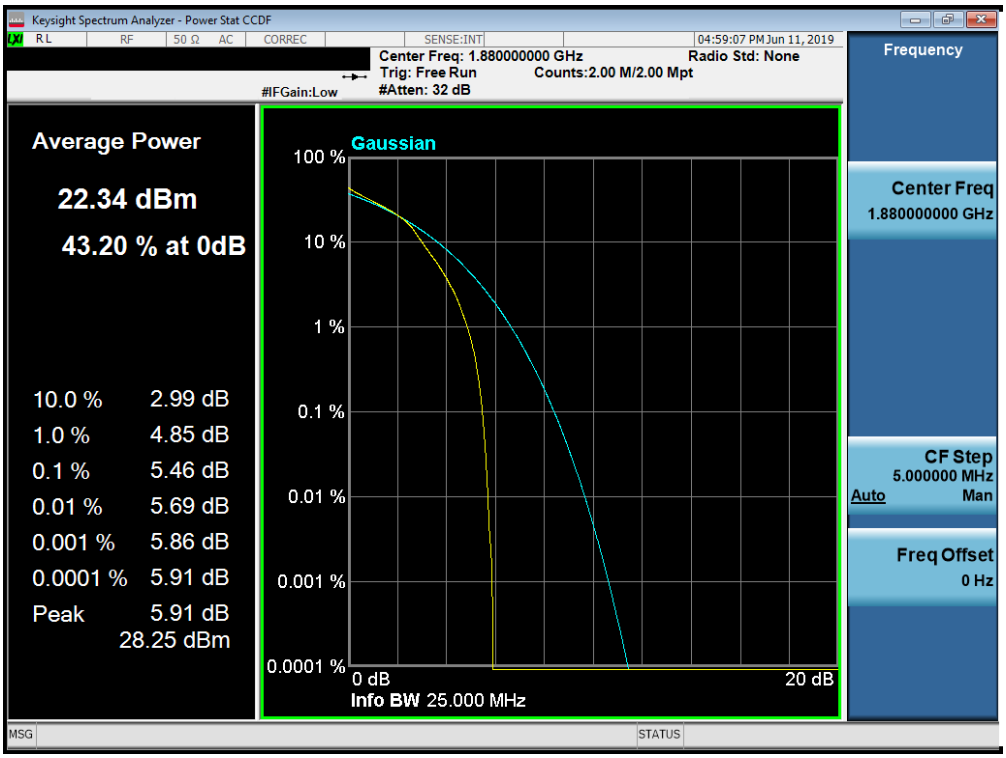
Plot 7-189. PAR Plot (Band 2 - 10.0MHz 16-QAM - Full RB Configuration)



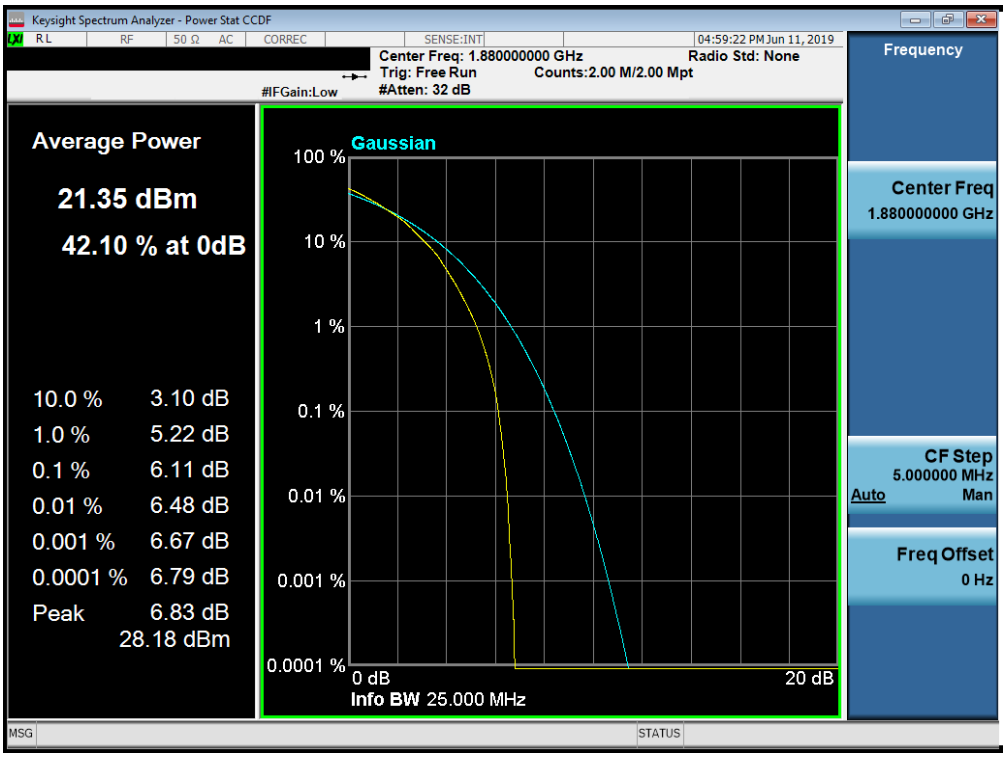
Plot 7-190. PAR Plot (Band 2 - 10.0MHz 64-QAM - Full RB Configuration)



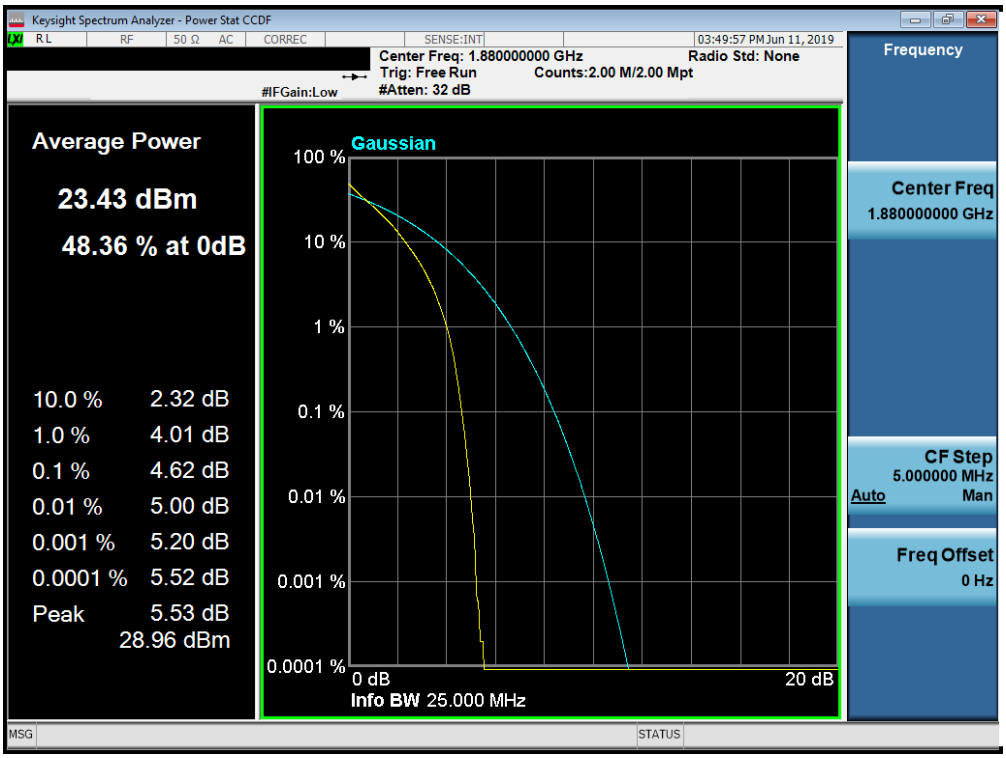
Plot 7-191. PAR Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



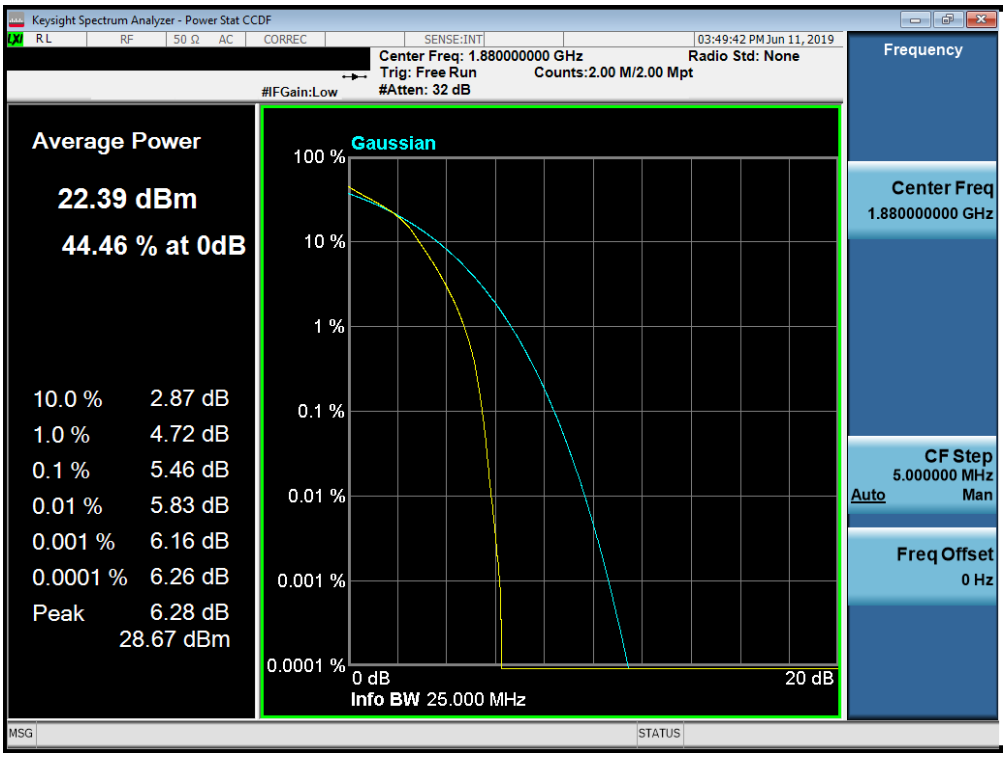
Plot 7-192. PAR Plot (Band 2 - 15.0MHz 16-QAM - Full RB Configuration)



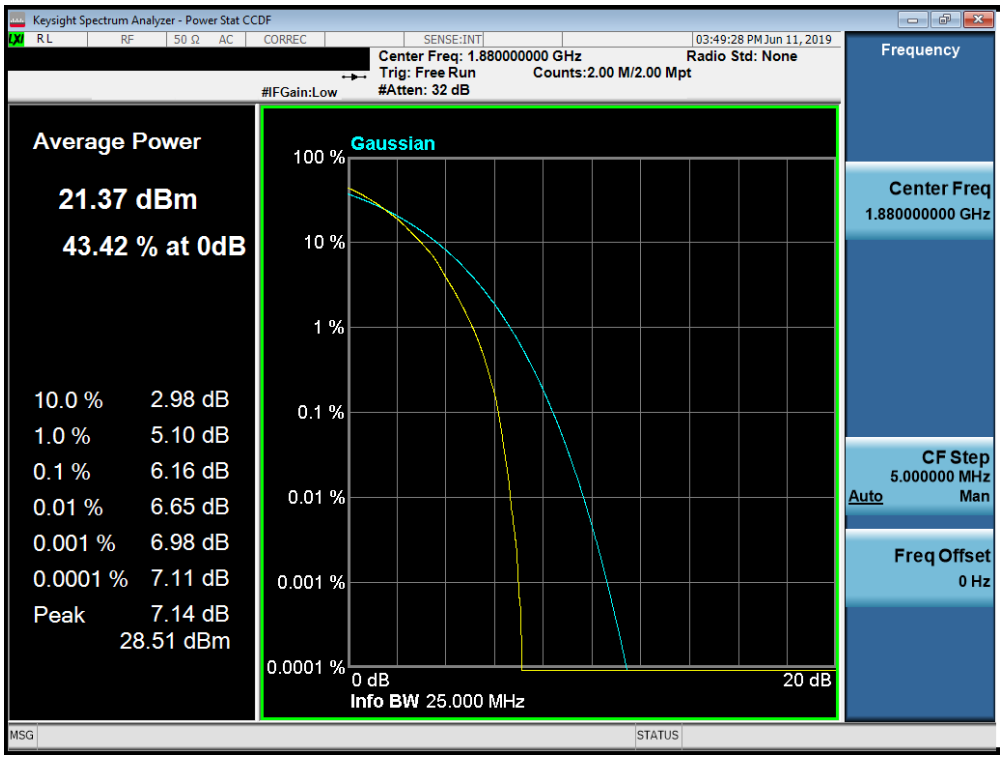
Plot 7-193. PAR Plot (Band 2 - 15.0MHz 64-QAM - Full RB Configuration)



Plot 7-194. PAR Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-195. PAR Plot (Band 2 - 20.0MHz 16-QAM - Full RB Configuration)



Plot 7-196. PAR Plot (Band 2 - 20.0MHz 64-QAM - Full RB Configuration)

7.6 Radiated Power (ERP/EIRP)

Test Overview

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) 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. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn 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.

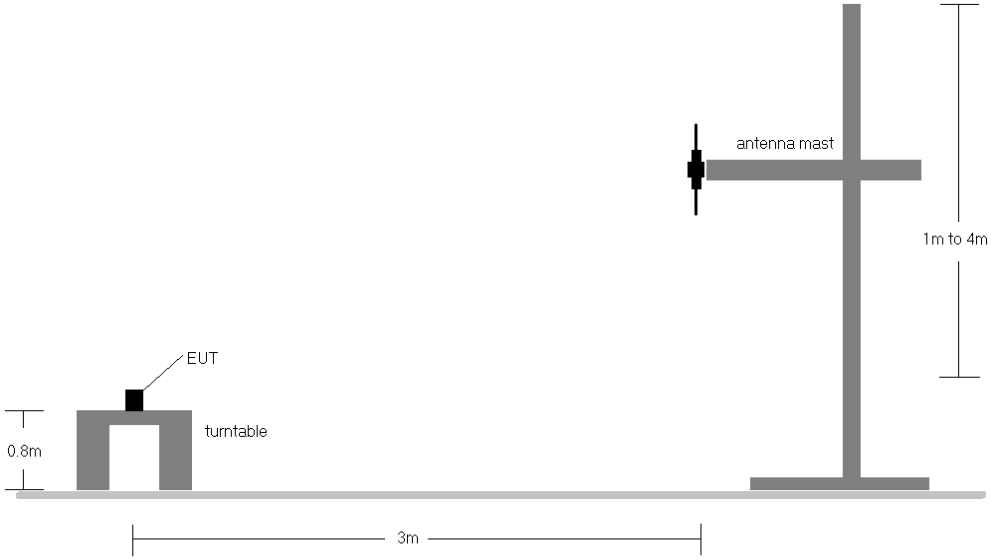


Figure 7-5. Radiated Test Setup <1GHz

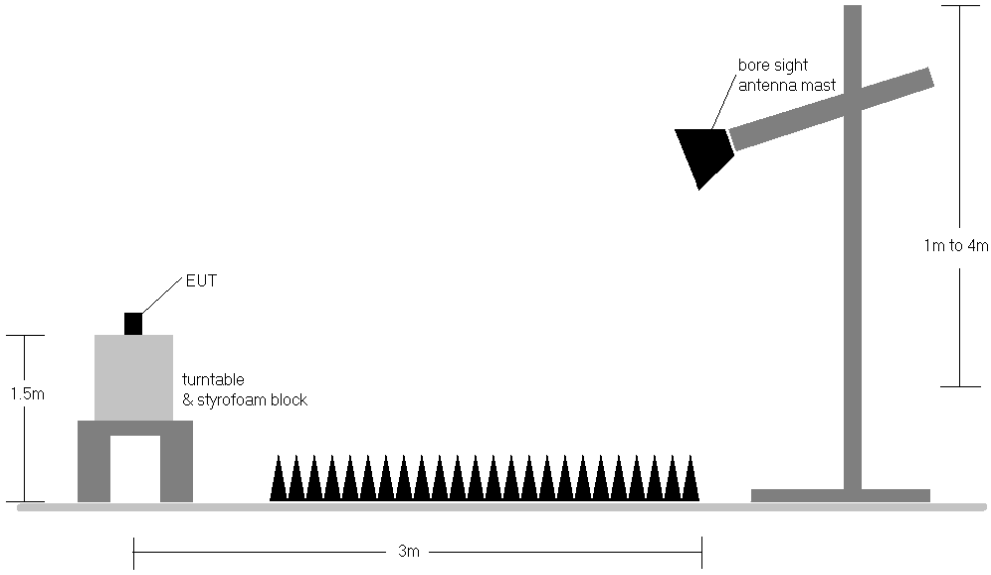


Figure 7-6. Radiated Test Setup >1GHz

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.

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
779.50	5	QPSK	V	285	254	1 / 0	17.10	5.80	20.75	0.119	34.77	-14.02
782.00	5	QPSK	V	285	254	1 / 0	17.52	5.80	**21.17**	0.131	34.77	-13.60
784.50	5	QPSK	V	285	254	1 / 0	16.00	5.90	19.75	0.094	34.77	-15.02
782.00	5	16-QAM	V	285	254	1 / 0	16.10	5.80	**19.75**	0.094	34.77	-15.02
782.00	5	64-QAM	V	285	254	1 / 0	15.40	5.80	**19.05**	0.080	34.77	-15.72
782.00	10	QPSK	V	285	254	1 / 0	17.71	5.80	**21.36**	**0.137**	34.77	-13.41
782.00	10	16-QAM	V	285	254	1 / 0	15.44	5.80	**19.09**	0.081	34.77	-15.68
782.00	10	64-QAM	V	285	254	1 / 0	14.56	5.80	**18.21**	0.066	34.77	-16.56
782.00	10	QPSK	H	156	282	1 / 0	14.34	5.80	17.99	0.063	34.77	-16.78

Table 7-3. ERP Data (Band 13)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
824.70	1.4	QPSK	V	143	252	1 / 5	14.94	6.70	19.49	0.089	38.45	-18.96	21.64	0.146	40.61	-18.97
836.50	1.4	QPSK	V	144	247	1 / 5	15.54	6.70	**20.09**	0.102	38.45	-18.36	**22.24**	0.167	40.61	-18.37
848.30	1.4	QPSK	V	155	248	1 / 5	13.91	6.70	18.46	0.070	38.45	-19.99	20.61	0.115	40.61	-20.00
836.50	1.4	16-QAM	V	144	247	1 / 5	14.94	6.70	**19.49**	0.089	38.45	-18.96	**21.64**	0.146	40.61	-18.97
836.50	1.4	64-QAM	V	144	247	1 / 5	13.84	6.70	**18.39**	0.069	38.45	-20.06	**20.54**	0.113	40.61	-20.07
825.50	3	QPSK	V	143	252	1 / 14	14.94	6.70	19.49	0.089	38.45	-18.96	21.64	0.146	40.61	-18.97
836.50	3	QPSK	V	144	247	1 / 14	15.44	6.70	**19.99**	0.100	38.45	-18.46	**22.14**	0.164	40.61	-18.47
847.50	3	QPSK	V	155	248	1 / 14	13.84	6.65	18.34	0.068	38.45	-20.11	20.49	0.112	40.61	-20.12
836.50	3	16-QAM	V	144	247	1 / 14	14.94	6.70	**19.49**	0.089	38.45	-18.96	**21.64**	0.146	40.61	-18.97
836.50	3	64-QAM	V	144	247	1 / 14	13.54	6.70	**18.09**	0.064	38.45	-20.36	**20.24**	0.106	40.61	-20.37
826.50	5	QPSK	V	143	252	1 / 24	15.34	6.70	19.89	0.097	38.45	-18.56	22.04	0.160	40.61	-18.57
836.50	5	QPSK	V	144	247	1 / 24	15.74	6.70	**20.29**	0.107	38.45	-18.16	**22.44**	0.175	40.61	-18.17
846.50	5	QPSK	V	155	248	1 / 24	14.44	6.60	18.89	0.077	38.45	-19.56	21.04	0.127	40.61	-19.57
836.50	5	16-QAM	V	144	247	1 / 24	14.24	6.70	**18.79**	0.076	38.45	-19.66	**20.94**	0.124	40.61	-19.67
836.50	5	64-QAM	V	144	247	1 / 24	13.29	6.70	**17.84**	0.061	38.45	-20.61	**19.99**	0.100	40.61	-20.62
829.00	10	QPSK	V	143	252	1 / 49	15.55	6.70	20.10	0.102	38.45	-18.35	22.25	0.168	40.61	-18.36
836.50	10	QPSK	V	144	247	1 / 49	15.98	6.70	**20.53**	**0.113**	38.45	-17.92	**22.68**	**0.185**	40.61	-17.93
844.00	10	QPSK	V	155	248	1 / 49	14.71	6.60	19.16	0.082	38.45	-19.29	21.31	0.135	40.61	-19.30
836.50	10	16-QAM	V	144	247	1 / 49	14.09	6.70	18.64	0.073	38.45	-19.81	20.79	0.120	40.61	-19.82
836.50	10	64-QAM	V	144	247	1 / 49	12.96	6.70	17.51	0.056	38.45	-20.94	19.66	0.092	40.61	-20.95
836.50	10	QPSK	H	140	255	1 / 49	12.60	6.70	17.15	0.052	38.45	-21.30	19.30	0.085	40.61	-21.31

Table 7-4. ERP Data (Band 5)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1710.70	1.4	QPSK	V	146	16	1 / 0	10.17	9.44	19.61	0.091	30.00	-10.39
1745.00	1.4	QPSK	V	144	1	1 / 0	11.57	9.23	**20.80**	0.120	30.00	-9.20
1779.30	1.4	QPSK	V	152	12	1 / 0	8.97	9.26	18.23	0.067	30.00	-11.77
1745.00	1.4	16-QAM	V	144	1	1 / 0	11.17	9.23	**20.40**	0.110	30.00	-9.60
1745.00	1.4	64-QAM	V	144	1	1 / 0	10.37	9.23	**19.60**	0.091	30.00	-10.40
1711.50	3	QPSK	V	146	16	1 / 0	10.47	9.44	19.91	0.098	30.00	-10.09
1745.00	3	QPSK	V	144	1	1 / 0	11.51	9.23	**20.74**	0.119	30.00	-9.26
1778.50	3	QPSK	V	152	12	1 / 0	9.37	9.26	18.63	0.073	30.00	-11.37
1745.00	3	16-QAM	V	144	1	1 / 0	11.07	9.23	**20.30**	0.107	30.00	-9.70
1745.00	3	64-QAM	V	144	1	1 / 0	9.97	9.23	**19.20**	0.083	30.00	-10.80
1712.50	5	QPSK	V	146	16	1 / 0	10.27	9.43	19.70	0.093	30.00	-10.30
1745.00	5	QPSK	V	144	1	1 / 0	11.77	9.23	**21.00**	**0.126**	30.00	-9.00
1777.50	5	QPSK	V	152	12	1 / 0	9.07	9.26	18.33	0.068	30.00	-11.67
1745.00	5	16-QAM	V	144	1	1 / 0	11.47	9.23	**20.70**	0.118	30.00	-9.30
1745.00	5	64-QAM	V	144	1	1 / 0	10.47	9.23	**19.70**	0.093	30.00	-10.30
1715.00	10	QPSK	V	146	16	1 / 0	9.97	9.42	19.39	0.087	30.00	-10.61
1745.00	10	QPSK	V	144	1	1 / 0	11.52	9.23	**20.75**	0.119	30.00	-9.25
1775.00	10	QPSK	V	152	12	1 / 0	9.22	9.25	18.47	0.070	30.00	-11.53
1745.00	10	16-QAM	V	144	1	1 / 0	11.17	9.23	**20.40**	0.110	30.00	-9.60
1745.00	10	64-QAM	V	144	1	1 / 0	10.42	9.23	**19.65**	0.092	30.00	-10.35
1717.50	15	QPSK	V	146	16	1 / 0	9.77	9.40	19.17	0.083	30.00	-10.83
1745.00	15	QPSK	V	144	1	1 / 0	11.07	9.23	**20.30**	0.107	30.00	-9.70
1772.50	15	QPSK	V	152	12	1 / 0	8.87	9.25	18.12	0.065	30.00	-11.88
1745.00	15	16-QAM	V	144	1	1 / 0	10.77	9.23	**20.00**	0.100	30.00	-10.00
1745.00	15	64-QAM	V	144	1	1 / 0	9.67	9.23	**18.90**	0.078	30.00	-11.10
1720.00	20	QPSK	V	146	16	1 / 0	9.92	9.38	19.30	0.085	30.00	-10.70
1745.00	20	QPSK	V	144	1	1 / 0	11.61	9.23	**20.84**	0.121	30.00	-9.16
1770.00	20	QPSK	V	152	12	1 / 0	9.47	9.24	18.71	0.074	30.00	-11.29
1745.00	20	16-QAM	V	144	1	1 / 0	11.35	9.23	**20.58**	0.114	30.00	-9.42
1745.00	20	64-QAM	V	144	1	1 / 0	10.30	9.23	**19.53**	0.090	30.00	-10.47
1745.00	20	QPSK	H	184	358	1 / 0	10.69	9.23	19.92	0.098	30.00	-10.08

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

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1850.70	1.4	QPSK	H	153	135	1 / 0	8.96	9.48	18.44	0.070	33.01	-14.57
1880.00	1.4	QPSK	H	153	122	1 / 0	10.27	9.90	20.17	0.104	33.01	-12.84
1909.30	1.4	QPSK	H	151	164	1 / 0	10.31	10.25	**20.56**	0.114	33.01	-12.45
1909.30	1.4	16-QAM	H	151	164	1 / 0	9.51	10.25	**19.76**	0.095	33.01	-13.25
1909.30	1.4	64-QAM	H	151	164	1 / 0	8.71	10.25	**18.96**	0.079	33.01	-14.05
1851.50	3	QPSK	H	153	135	1 / 0	9.21	9.50	18.71	0.074	33.01	-14.30
1880.00	3	QPSK	H	153	122	1 / 0	10.76	9.90	20.66	0.116	33.01	-12.35
1908.50	3	QPSK	H	151	164	1 / 0	11.06	10.25	**21.31**	**0.135**	33.01	-11.70
1908.50	3	16-QAM	H	151	164	1 / 0	10.26	10.25	**20.51**	0.112	33.01	-12.50
1908.50	3	64-QAM	H	151	164	1 / 0	9.56	10.25	**19.81**	0.096	33.01	-13.20
1852.50	5	QPSK	H	153	135	1 / 0	8.86	9.51	18.37	0.069	33.01	-14.64
1880.00	5	QPSK	H	153	122	1 / 0	10.26	9.90	20.16	0.104	33.01	-12.85
1907.50	5	QPSK	H	151	164	1 / 0	9.96	10.24	**20.20**	0.105	33.01	-12.81
1907.50	5	16-QAM	H	151	164	1 / 0	9.26	10.24	**19.50**	0.089	33.01	-13.51
1907.50	5	64-QAM	H	151	164	1 / 0	8.56	10.24	**18.80**	0.076	33.01	-14.21
1855.00	10	QPSK	H	153	135	1 / 0	8.76	9.55	18.31	0.068	33.01	-14.70
1880.00	10	QPSK	H	153	122	1 / 0	10.16	9.90	20.06	0.101	33.01	-12.95
1905.00	10	QPSK	H	151	164	1 / 0	10.26	10.22	**20.48**	0.112	33.01	-12.53
1905.00	10	16-QAM	H	151	164	1 / 0	9.56	10.22	**19.78**	0.095	33.01	-13.23
1905.00	10	64-QAM	H	151	164	1 / 0	8.76	10.22	**18.98**	0.079	33.01	-14.03
1857.50	15	QPSK	H	153	135	1 / 0	8.61	9.58	18.19	0.066	33.01	-14.82
1880.00	15	QPSK	H	153	122	1 / 0	10.16	9.90	20.06	0.101	33.01	-12.95
1902.50	15	QPSK	H	151	164	1 / 0	10.06	10.20	**20.26**	0.106	33.01	-12.75
1902.50	15	16-QAM	H	151	164	1 / 0	9.26	10.20	**19.46**	0.088	33.01	-13.55
1902.50	15	64-QAM	H	151	164	1 / 0	8.51	10.20	**18.71**	0.074	33.01	-14.30
1860.00	20	QPSK	H	153	135	1 / 0	9.04	9.62	18.66	0.073	33.01	-14.35
1880.00	20	QPSK	H	153	122	1 / 0	10.28	9.90	20.18	0.104	33.01	-12.83
1900.00	20	QPSK	H	151	164	1 / 0	10.49	10.18	**20.67**	0.117	33.01	-12.34
1900.00	20	16-QAM	H	151	164	1 / 0	9.66	10.18	**19.84**	0.096	33.01	-13.17
1900.00	20	64-QAM	H	151	164	1 / 0	8.94	10.18	**19.12**	0.082	33.01	-13.89
1880.00	20	QPSK	V	134	317	1 / 0	11.05	9.90	20.95	0.124	33.01	-12.06

Table 7-6. EIRP Data (Band 2)

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 vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas.

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.

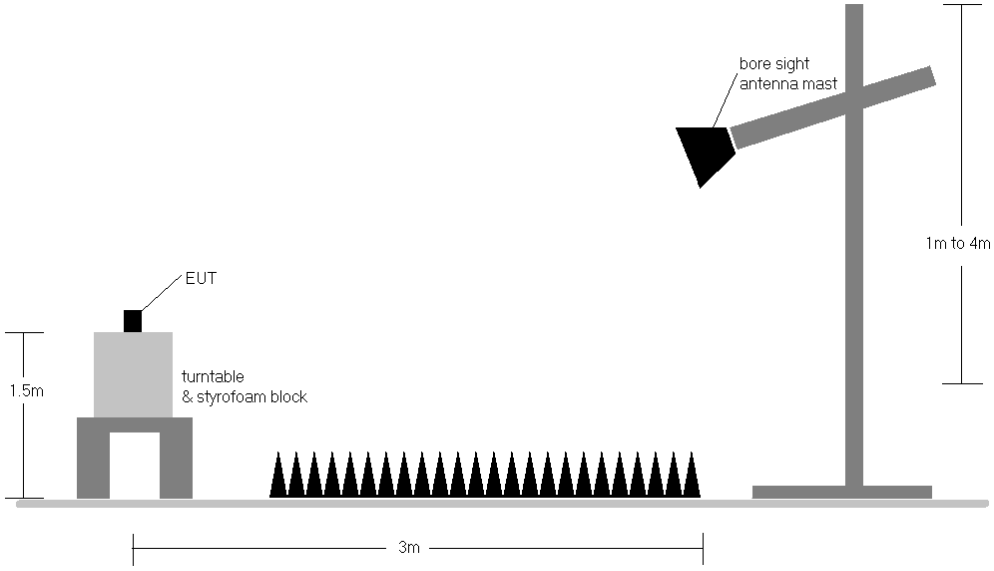


Figure 7-7. Test Instrument & Measurement Setup

Test Notes

1) 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.

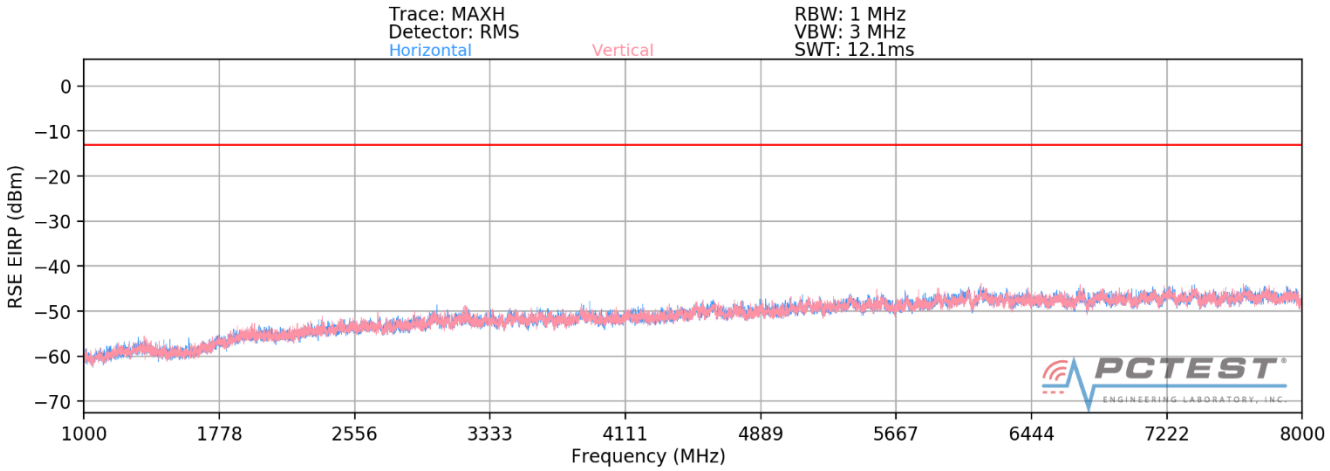
2) This unit was tested with its standard battery.

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

4) 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.

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

Band 13



Plot 7-197. Radiated Spurious Plot above 1GHz (Band 13)

OPERATING FREQUENCY:	782.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
2346.00	V	120	155	-59.07	9.43	-49.64	-36.6
3128.00	V	-	-	-67.92	9.34	-58.58	-45.6

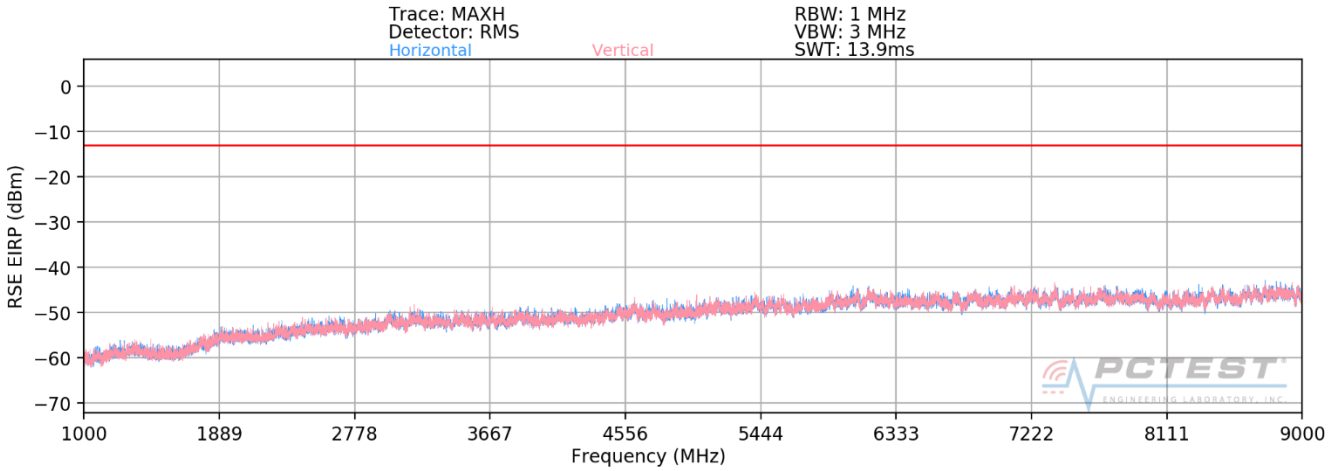
Table 7-7. Radiated Spurious Data (Band 13 – Mid Channel)

MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.00	MHz
DISTANCE:	3	meters
NARROWBAND EMISSION LIMIT:	-50	dBm
WIDEBAND EMISSION LIMIT:	-40	dBm/MHz

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1564.00	V	116	244	-67.21	8.53	-58.68	-18.7

Table 7-8. Radiated Spurious Data (Band 13 – 1559-1610MHz Band)

Band 5



Plot 7-198. Radiated Spurious Plot above 1GHz (Band 5)

OPERATING FREQUENCY:	829.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1658.00	V	120	225	-77.97	8.95	-69.02	-56.0
2487.00	V	135	200	-70.04	9.70	-60.33	-47.3
3316.00	V	-	-	-73.62	9.59	-64.03	-51.0

Table 7-9. Radiated Spurious Data (Band 5 – Low Channel)

OPERATING FREQUENCY:	836.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1673.00	V	141	244	-78.66	8.95	-69.71	-56.7
2509.50	V	135	235	-68.79	9.75	-59.04	-46.0
3346.00	V	-	-	-73.36	9.60	-63.76	-50.8

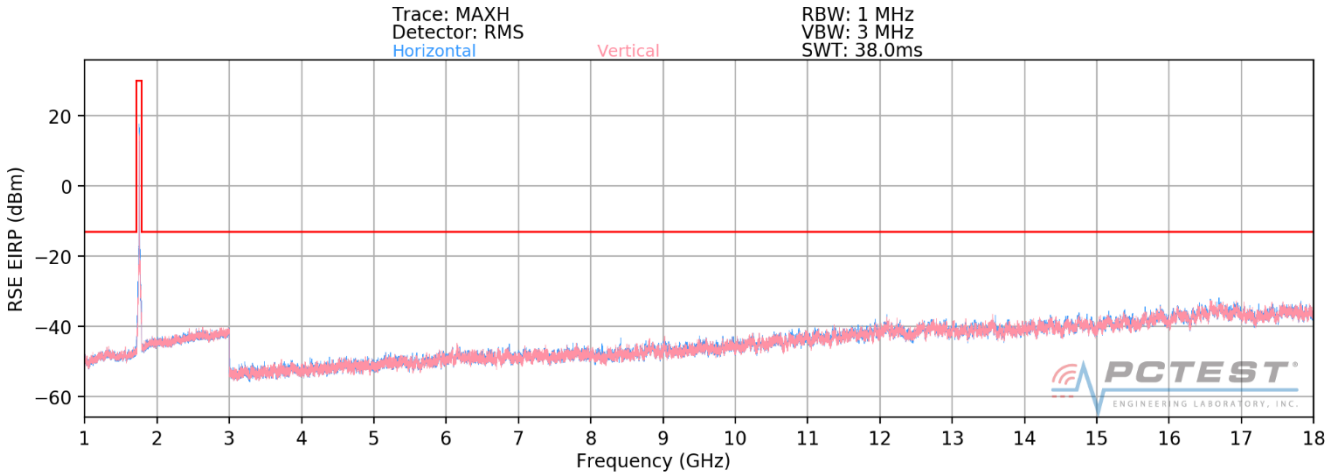
Table 7-10. Radiated Spurious Data (Band 5 – Mid Channel)

OPERATING FREQUENCY:	844.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1688.00	V	126	277	-78.97	8.95	-70.02	-57.0
2532.00	V	127	256	-65.79	9.75	-56.04	-43.0
3376.00	V	-	-	-73.86	9.71	-64.15	-51.2

Table 7-11. Radiated Spurious Data (Band 5 – High Channel)

Band 66/4



Plot 7-199. Radiated Spurious Plot above 1GHz (Band 66/4)

OPERATING FREQUENCY:	1712.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3425.00	H	112	37	-72.05	9.83	-62.23	-49.2
5137.50	H	-	-	-72.01	10.69	-61.32	-48.3

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

OPERATING FREQUENCY:	1745.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3490.00	H	309	181	-72.21	9.91	-62.30	-49.3
5235.00	H	-	-	-72.21	10.73	-61.47	-48.5

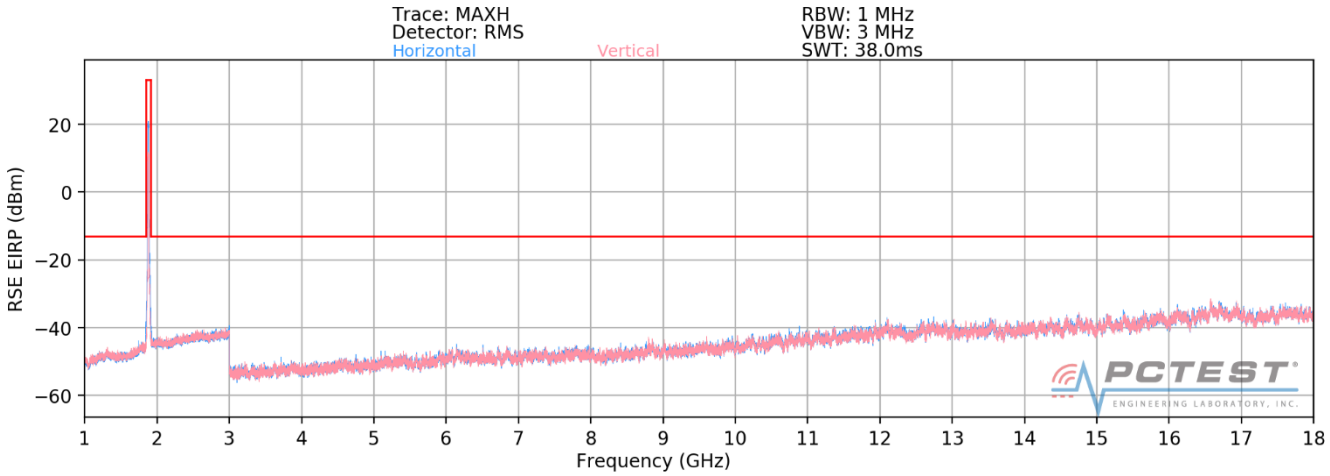
Table 7-13. Radiated Spurious Data (Band 66/4 – Mid Channel)

OPERATING FREQUENCY:	1777.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3555.00	H	337	188	-72.18	9.89	-62.29	-49.3
5332.50	H	-	-	-72.17	10.70	-61.48	-48.5

Table 7-14. Radiated Spurious Data (Band 66/4 – High Channel)

Band 2



Plot 7-200. Radiated Spurious Plot above 1GHz (Band 2)

OPERATING FREQUENCY:	1851.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	3.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3703.00	H	239	162	-69.92	9.57	-60.35	-47.3
5554.50	H	-	-	-68.63	10.95	-57.68	-44.7

Table 7-15. Radiated Spurious Data (Band 2 – Low Channel)

OPERATING FREQUENCY:	1880.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	3.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3760.00	H	-	-	-69.77	9.37	-60.41	-47.4
5640.00	H	-	-	-69.19	11.17	-58.02	-45.0

Table 7-16. Radiated Spurious Data (Band 2 – Mid Channel)

OPERATING FREQUENCY:	1908.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	3.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3817.00	H	115	119	-67.27	9.30	-57.97	-45.0
5725.50	H	-	-	-69.15	11.38	-57.77	-44.8

Table 7-17. Radiated Spurious Data (Band 2 – High Channel)

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 22, the frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency. For Part 24, 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

Band 13 Frequency Stability Measurements

OPERATING FREQUENCY:	782,000,000	Hz
CHANNEL:	23230	
REFERENCE VOLTAGE:	4.38	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.38	- 30	782,000,120	120	0.0000153
100 %		- 20	782,000,013	13	0.0000017
100 %		- 10	782,000,266	266	0.0000340
100 %		0	781,999,938	-62	-0.0000079
100 %		+ 10	782,000,127	127	0.0000162
100 %		+ 20	781,999,869	-131	-0.0000168
100 %		+ 30	781,999,690	-310	-0.0000396
100 %		+ 40	781,999,748	-252	-0.0000322
100 %		+ 50	782,000,441	441	0.0000564
BATT. ENDPOINT	3.59	+ 20	782,000,079	79	0.0000101

Table 7-18. Frequency Stability Data (Band 13)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

Band 13 Frequency Stability Measurements

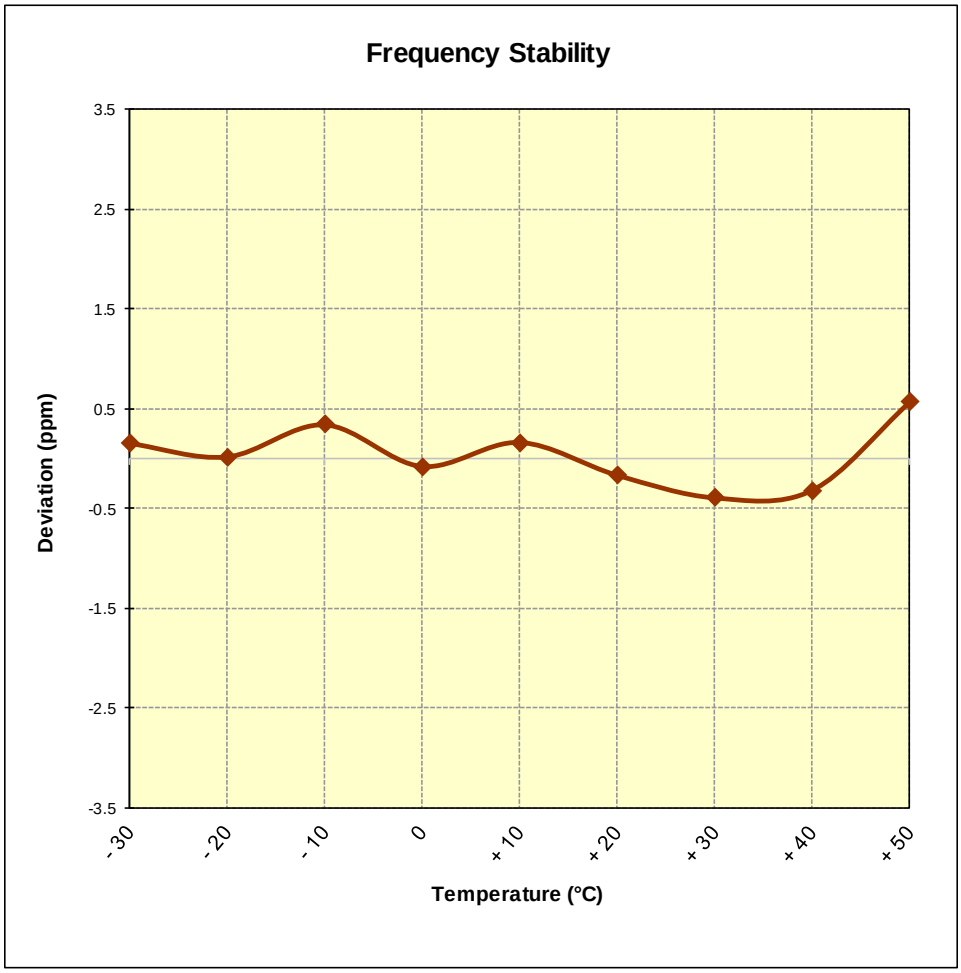


Figure 7-8. Frequency Stability Graph (Band 13)

Band 5 Frequency Stability Measurements

OPERATING FREQUENCY:	836,500,000	Hz
CHANNEL:	20525	
REFERENCE VOLTAGE:	4.38	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.38	- 30	836,500,326	326	0.0000390
100 %		- 20	836,500,062	62	0.0000074
100 %		- 10	836,499,651	-349	-0.0000417
100 %		0	836,500,211	211	0.0000252
100 %		+ 10	836,499,868	-132	-0.0000158
100 %		+ 20	836,499,943	-57	-0.0000068
100 %		+ 30	836,500,198	198	0.0000237
100 %		+ 40	836,499,933	-67	-0.0000080
100 %		+ 50	836,500,153	153	0.0000183
BATT. ENDPOINT	3.59	+ 20	836,499,950	-50	-0.0000060

Table 7-19. Frequency Stability Data (Band 5)

Band 5 Frequency Stability Measurements

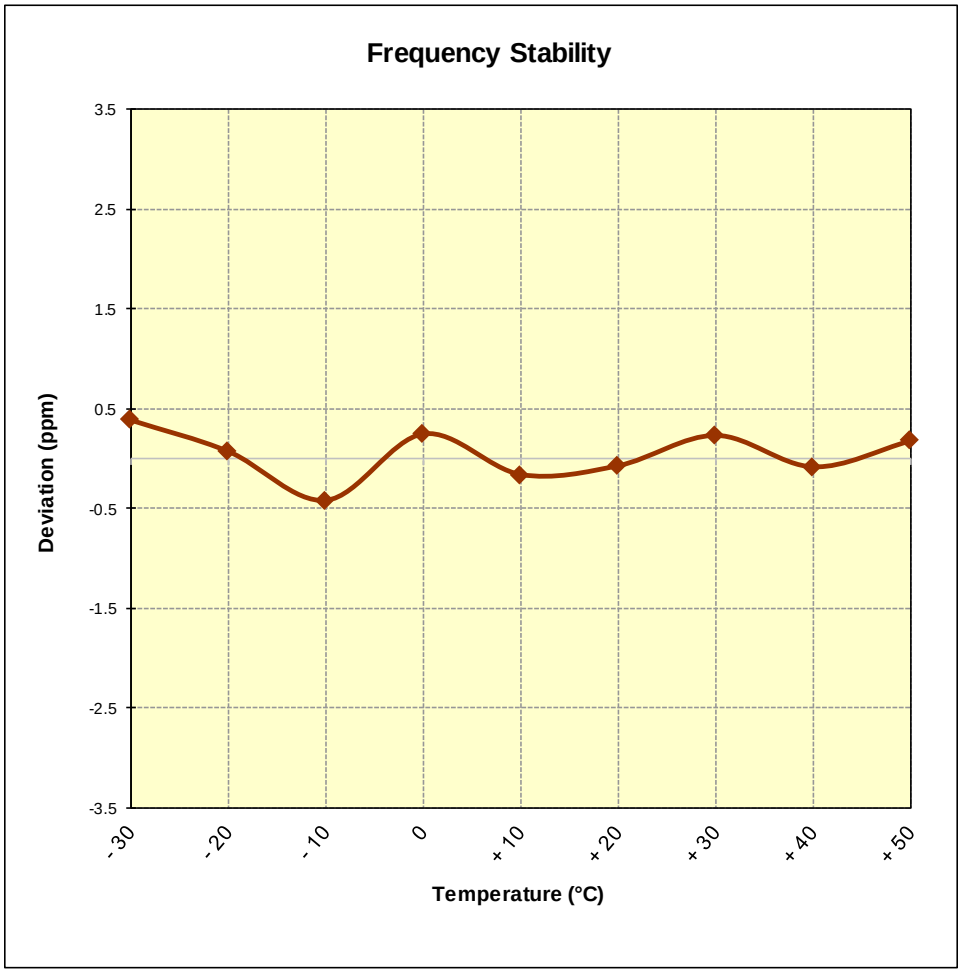


Figure 7-9. Frequency Stability Graph (Band 5)

Band 66/4 Frequency Stability Measurements

OPERATING FREQUENCY:	1,745,000,000	Hz
CHANNEL:	132322	
REFERENCE VOLTAGE:	4.38	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.38	- 30	1,745,000,051	51	0.0000029
100 %		- 20	1,744,999,997	-3	-0.0000002
100 %		- 10	1,745,000,146	146	0.0000084
100 %		0	1,745,000,057	57	0.0000033
100 %		+ 10	1,745,000,085	85	0.0000049
100 %		+ 20	1,744,999,919	-81	-0.0000046
100 %		+ 30	1,745,000,379	379	0.0000217
100 %		+ 40	1,744,999,943	-57	-0.0000033
100 %		+ 50	1,744,999,787	-213	-0.0000122
BATT. ENDPOINT	3.59	+ 20	1,745,000,192	192	0.0000110

Table 7-20. Frequency Stability Data (Band 66/4)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

Band 66/4 Frequency Stability Measurements

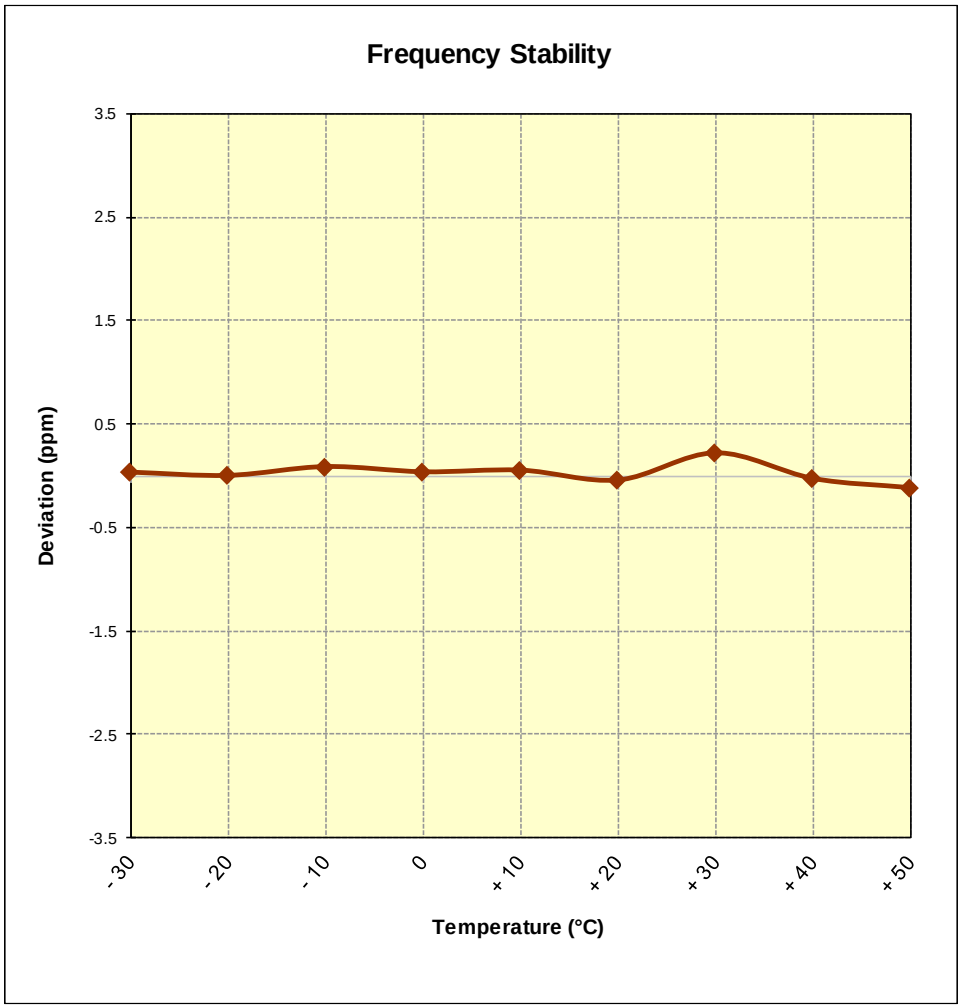


Figure 7-10. Frequency Stability Graph (Band 66/4)

Band 2 Frequency Stability Measurements

OPERATING FREQUENCY:	1,880,000,000	Hz
CHANNEL:	18900	
REFERENCE VOLTAGE:	4.38	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.38	- 30	1,880,000,400	400	0.0000213
100 %		- 20	1,879,999,838	-162	-0.0000086
100 %		- 10	1,880,000,042	42	0.0000022
100 %		0	1,879,999,814	-186	-0.0000099
100 %		+ 10	1,880,000,071	71	0.0000038
100 %		+ 20	1,880,000,080	80	0.0000043
100 %		+ 30	1,879,999,824	-176	-0.0000094
100 %		+ 40	1,880,000,159	159	0.0000085
100 %		+ 50	1,880,000,218	218	0.0000116
BATT. ENDPOINT	3.59	+ 20	1,879,999,588	-412	-0.0000219

Table 7-21. Frequency Stability Data (Band 2)

Band 2 Frequency Stability Measurements

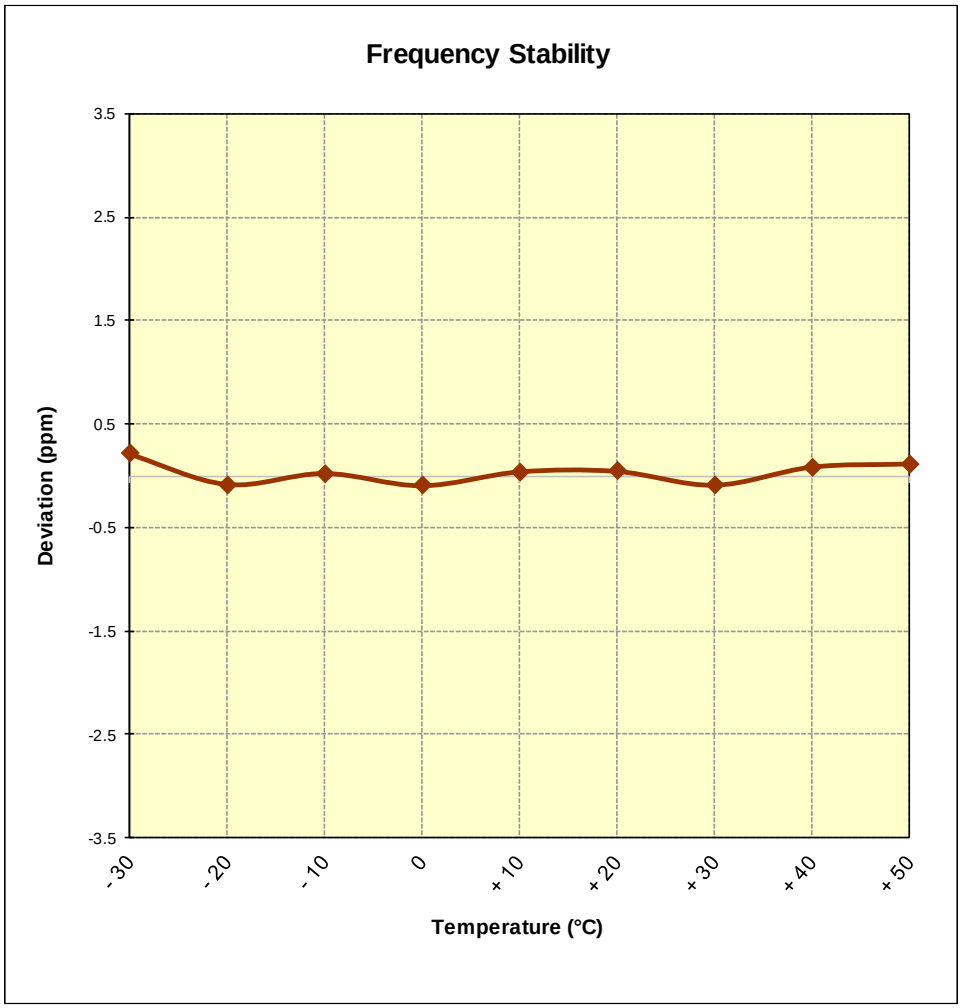


Figure 7-11. Frequency Stability Graph (Band 2)

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFQ720VS** complies with all the requirements of Part 22, 24, & 27 of the FCC Rules for LTE operation only.