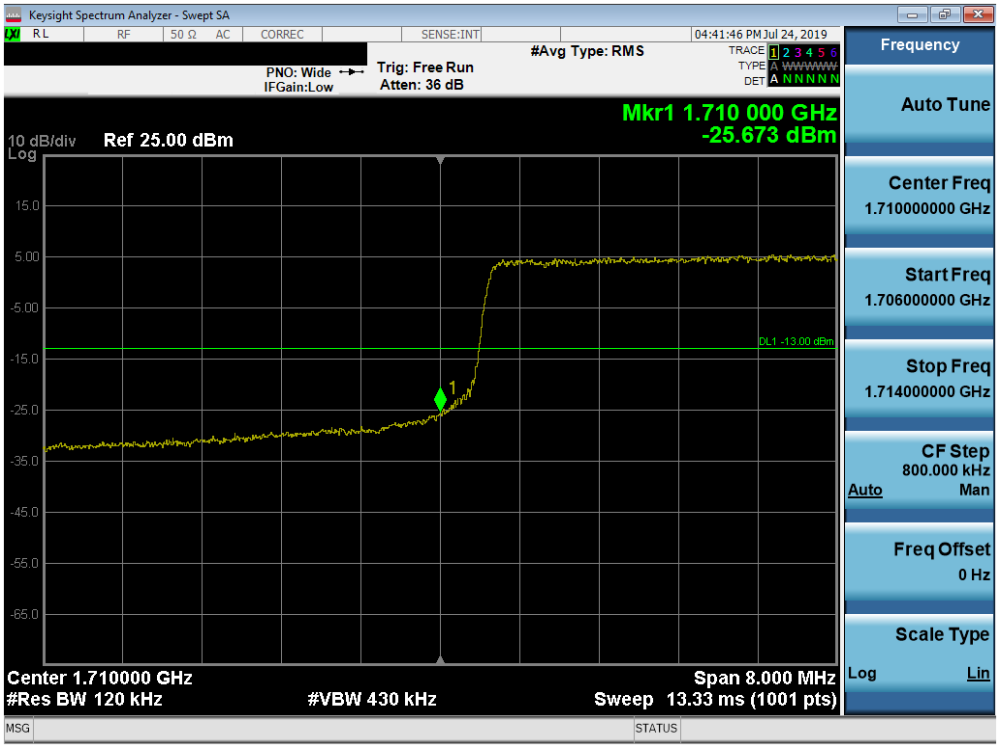
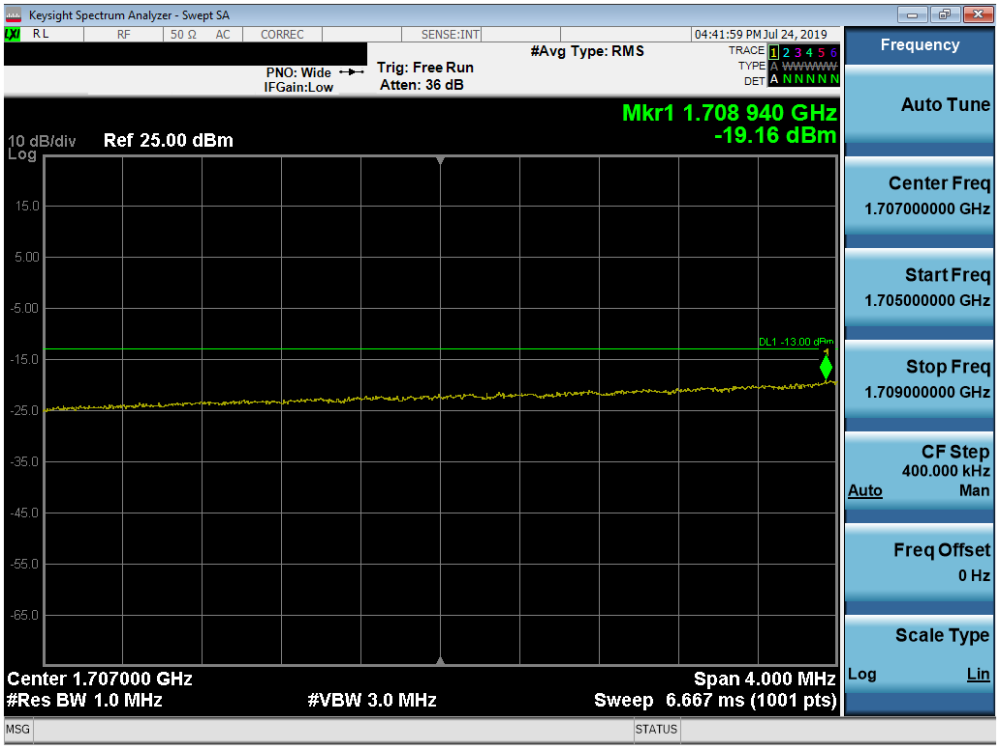
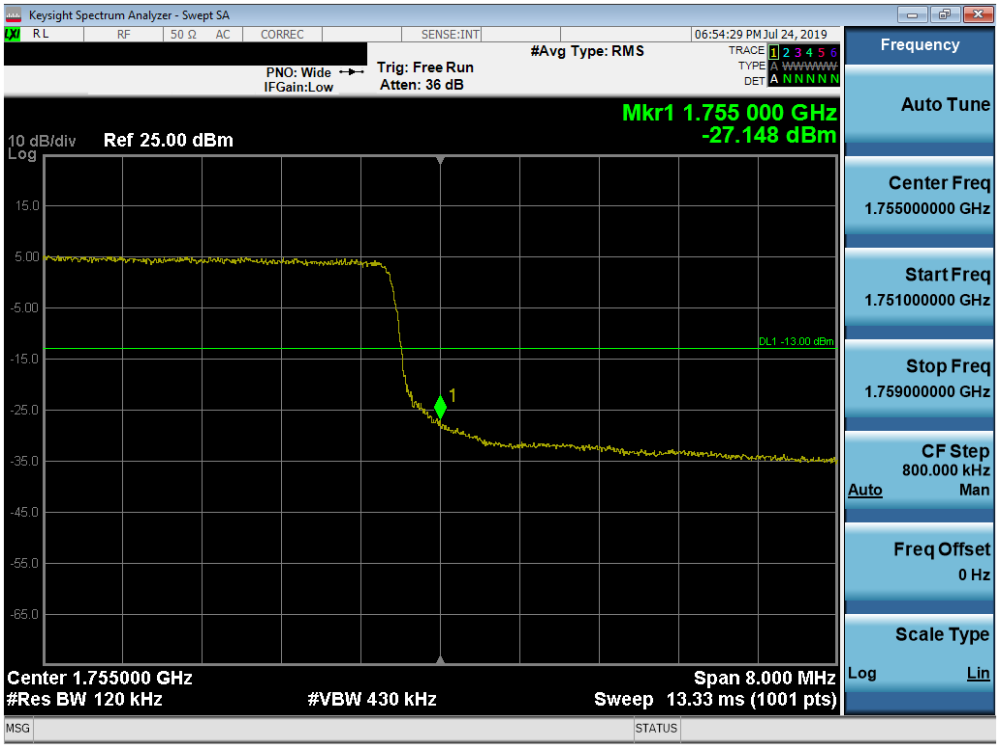


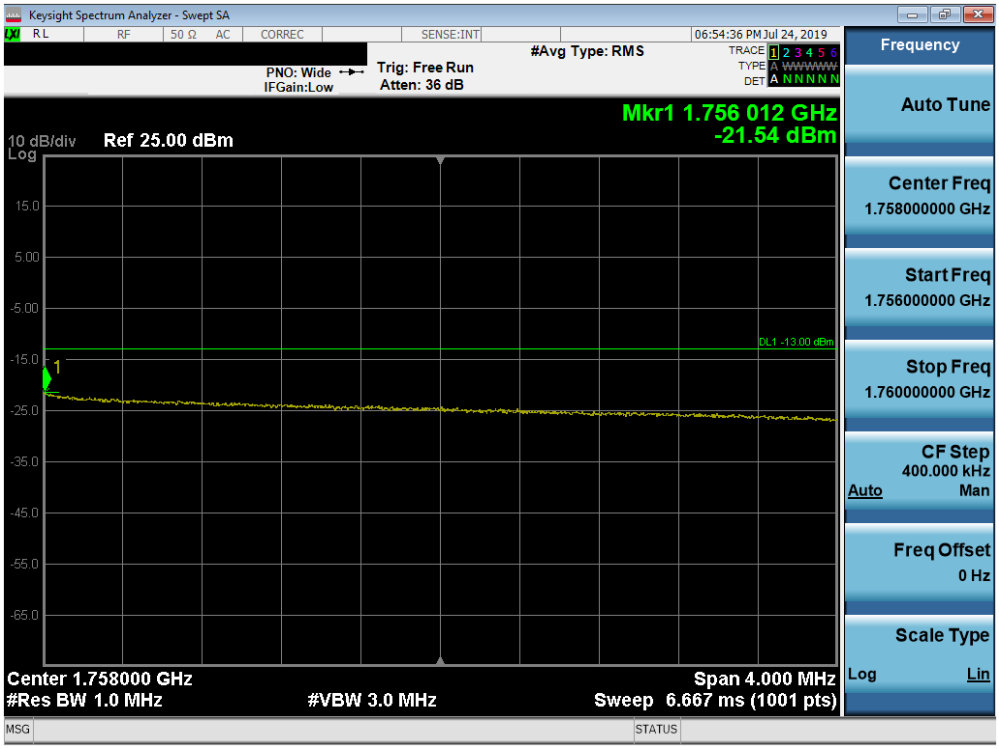
Plot 7-118. Lower Band Edge Plot (Band 66/4 - 10.0MHz QPSK - Full RB Configuration)



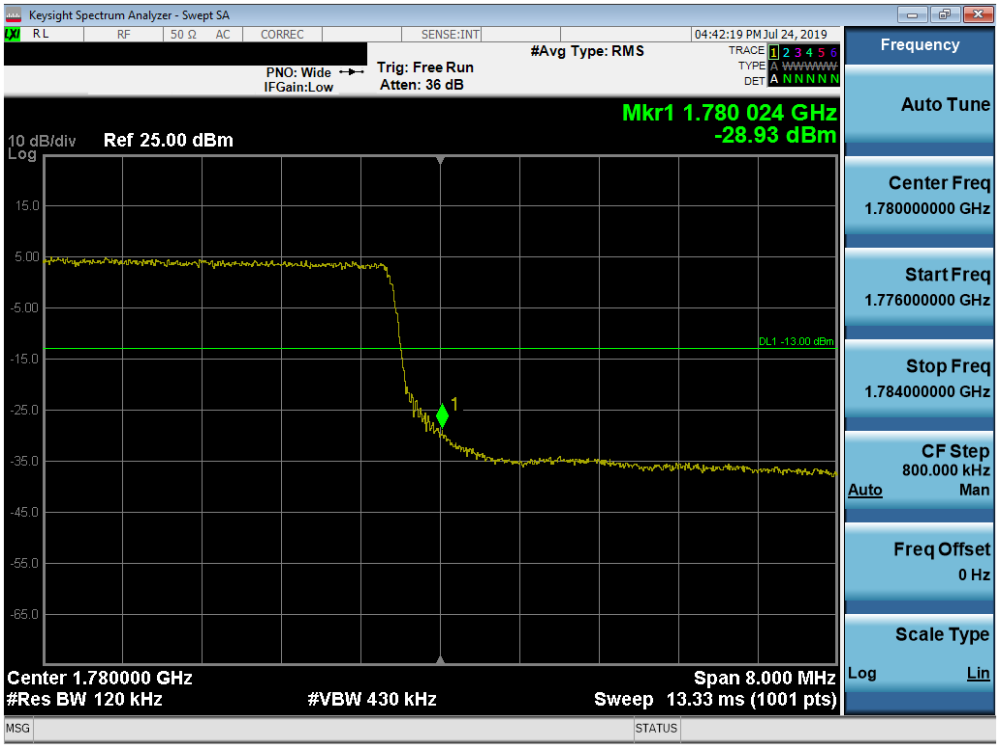
Plot 7-119. Lower Extended Band Edge Plot (Band 66/4 - 10.0MHz QPSK - Full RB Configuration)



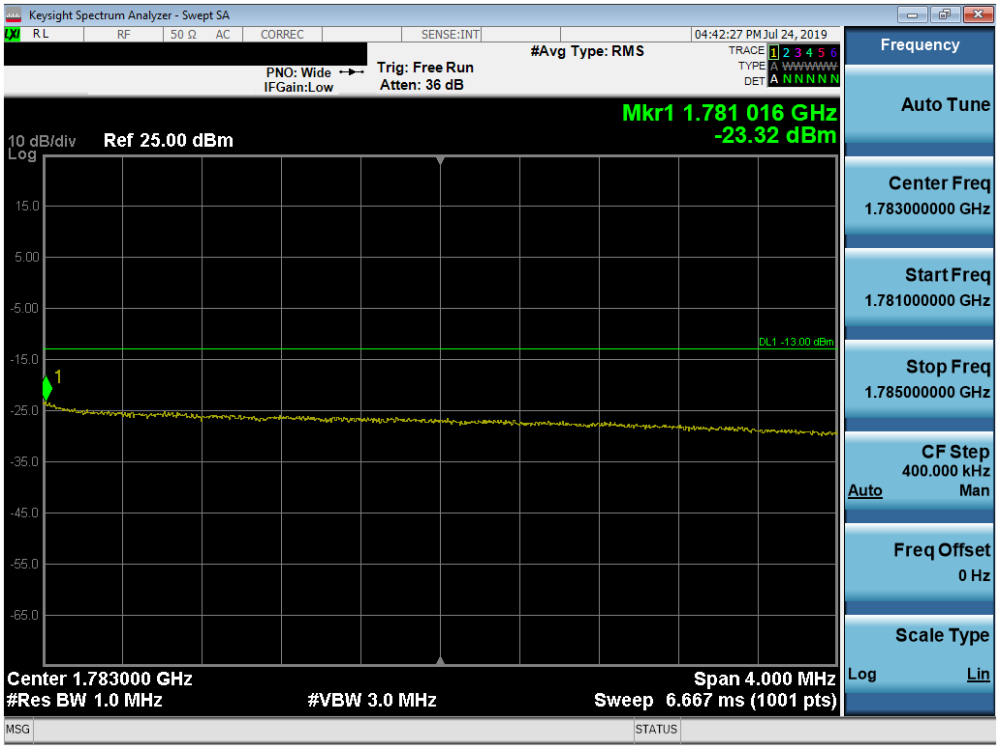
Plot 7-120. Upper Band Edge Plot (Band 4 - 10.0MHz QPSK - Full RB Configuration)



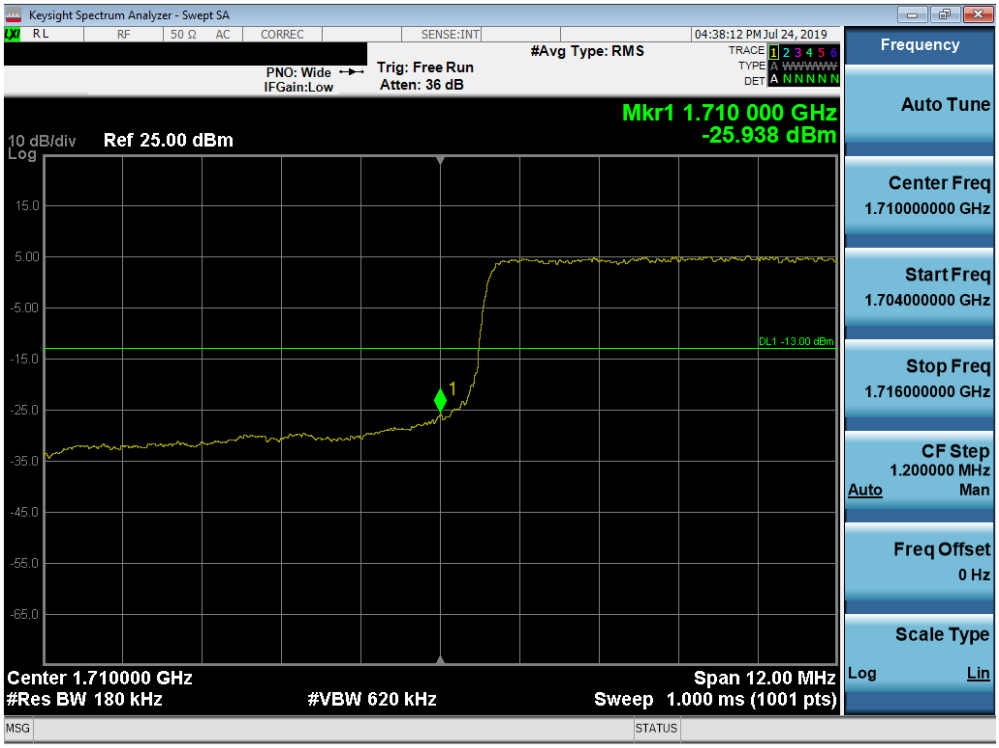
Plot 7-121. Upper Extended Band Edge Plot (Band 4 - 10.0MHz QPSK - Full RB Configuration)



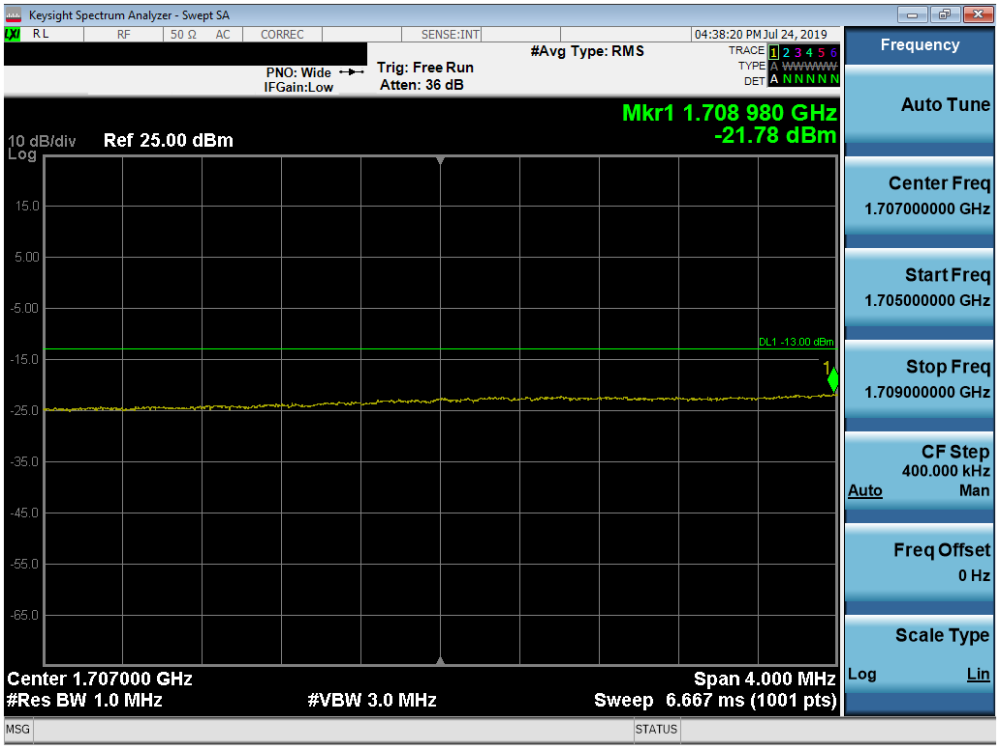
Plot 7-122. Upper Band Edge Plot (Band 66 - 10.0MHz QPSK - Full RB Configuration)



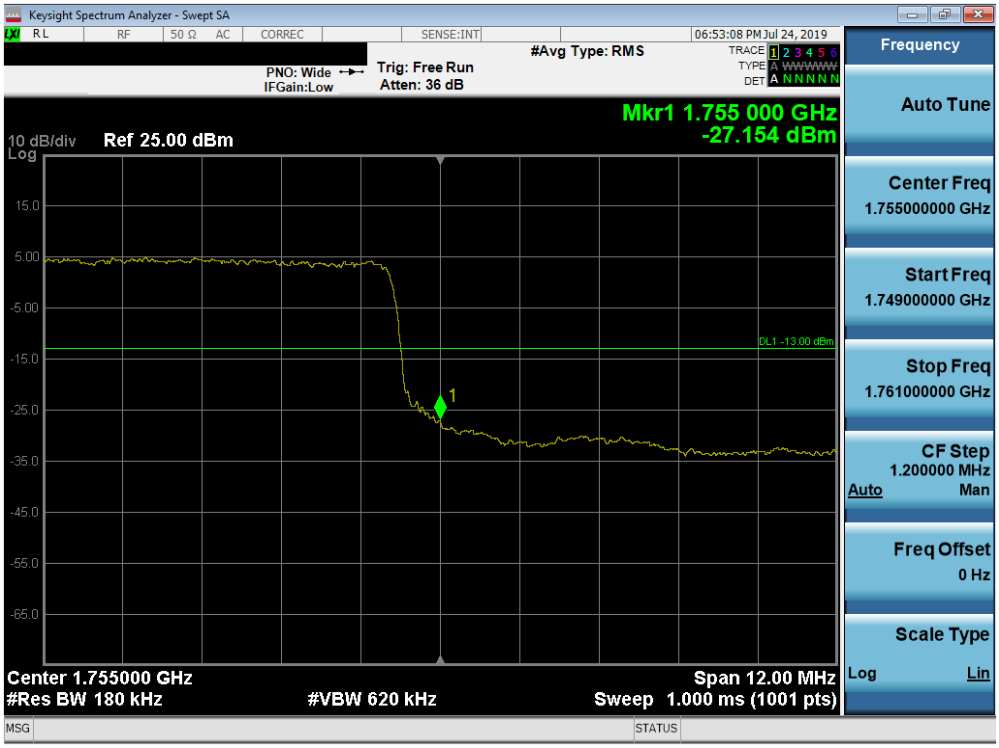
Plot 7-123. Upper Extended Band Edge Plot (Band 66 - 10.0MHz QPSK - Full RB Configuration)



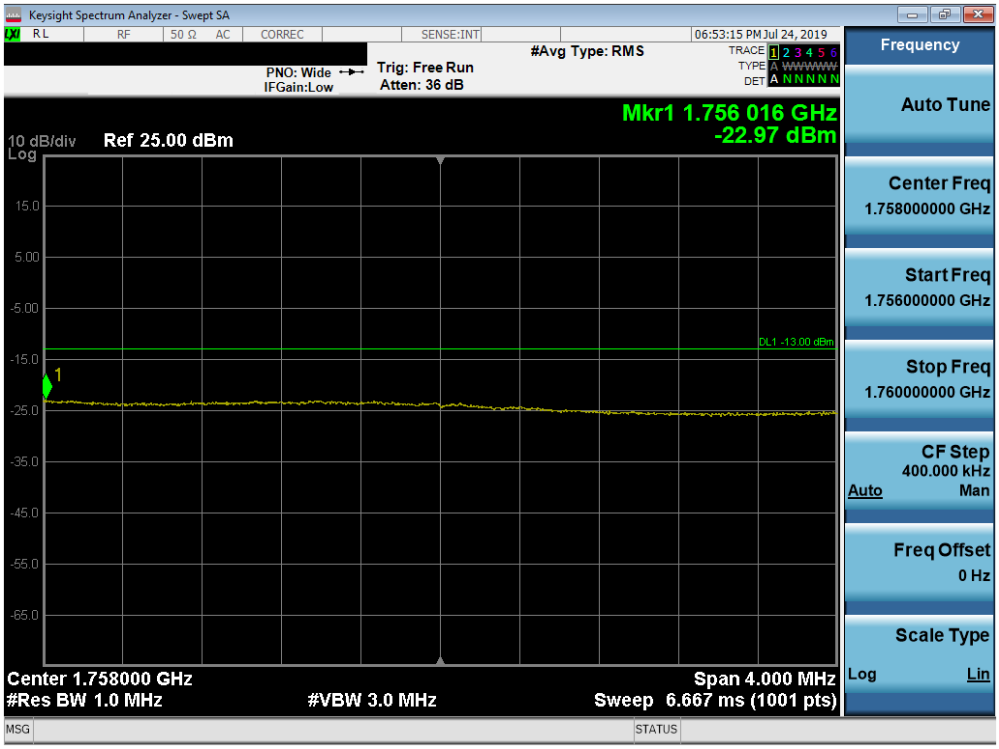
Plot 7-124. Lower Band Edge Plot (Band 66/4 - 15.0MHz QPSK - Full RB Configuration)



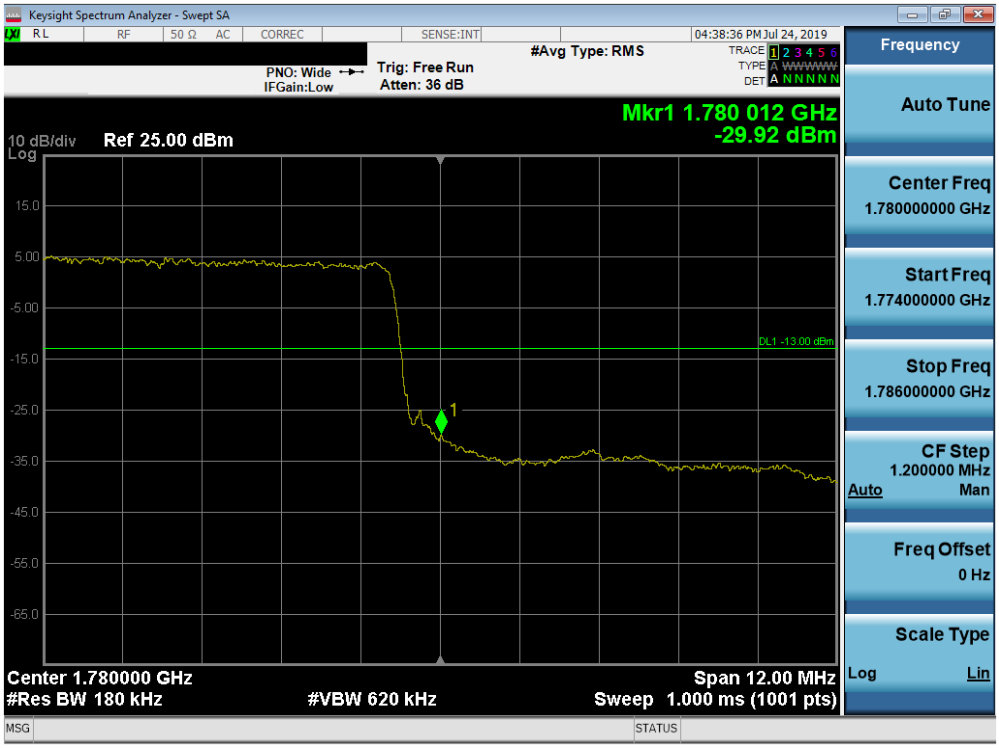
Plot 7-125. Lower Extended Band Edge Plot (Band 66/4 - 15.0MHz QPSK - Full RB Configuration)



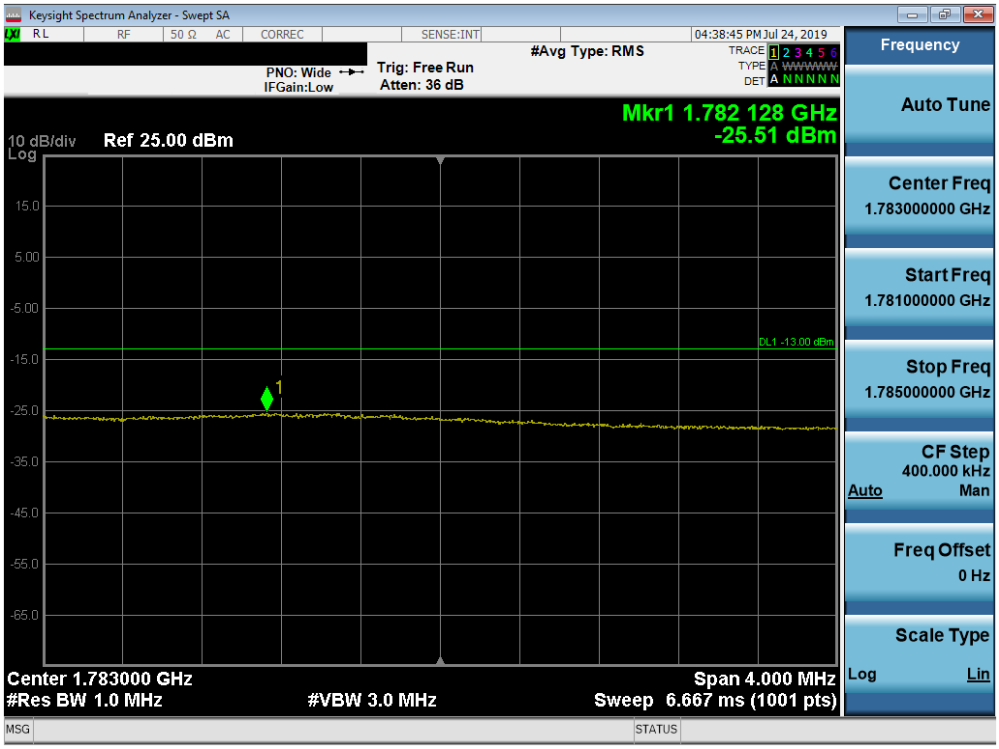
Plot 7-126. Upper Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)



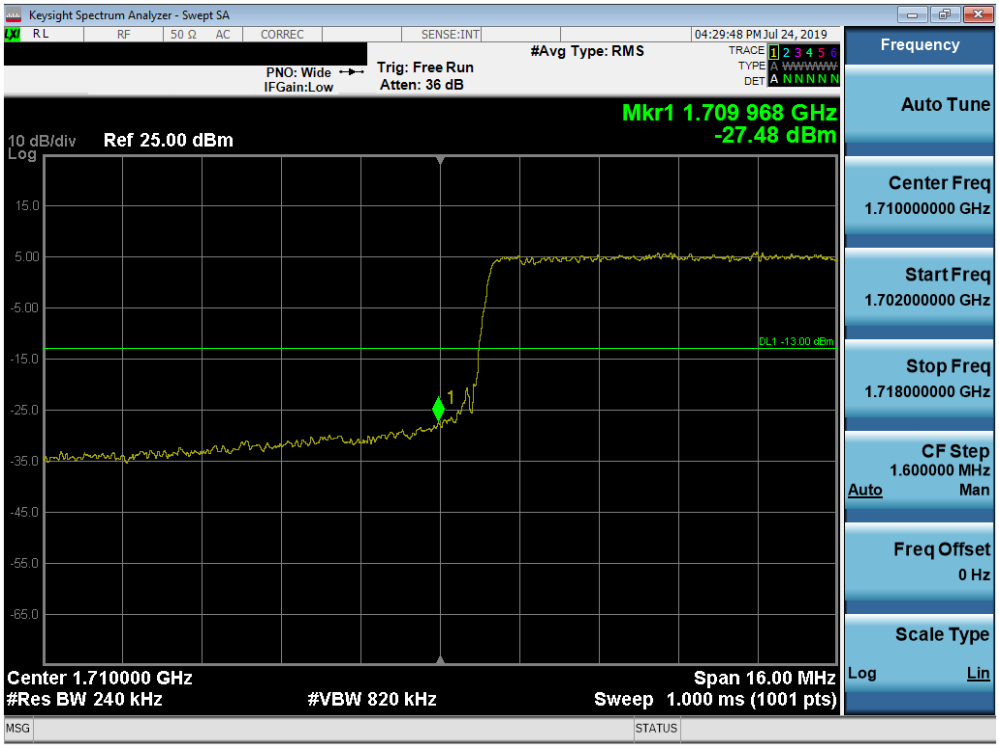
Plot 7-127. Upper Extended Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)



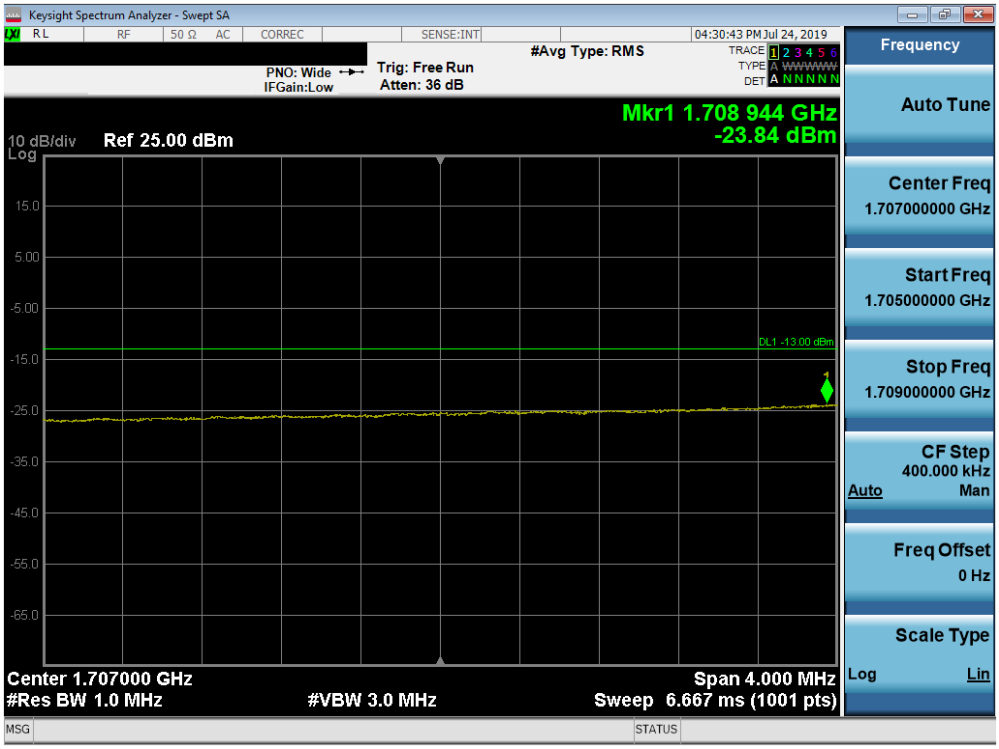
Plot 7-128. Upper Band Edge Plot (Band 66 - 15.0MHz QPSK - Full RB Configuration)



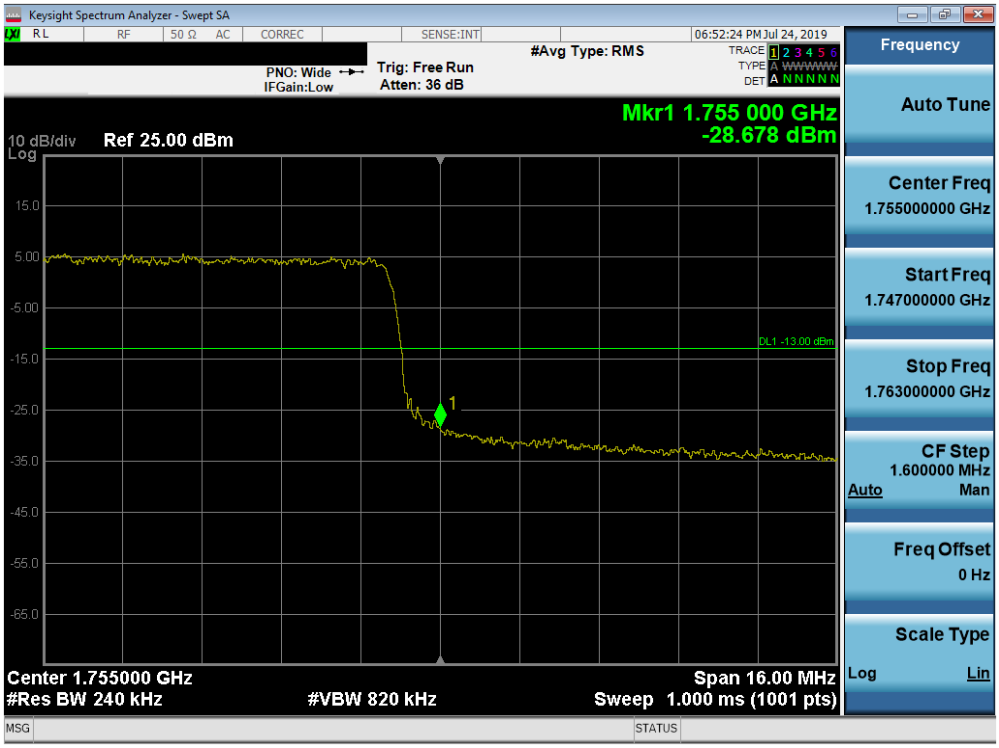
Plot 7-129. Upper Extended Band Edge Plot (Band 66 - 15.0MHz QPSK - Full RB Configuration)



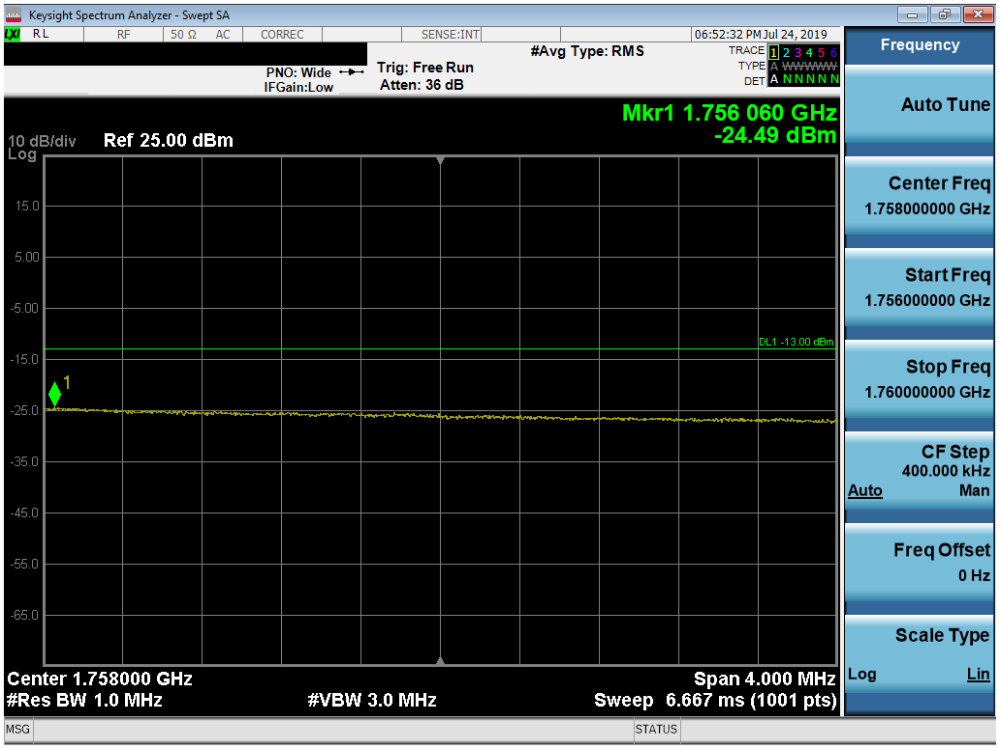
Plot 7-130. Lower Band Edge Plot (Band 66/4 - 20.0MHz QPSK - Full RB Configuration)



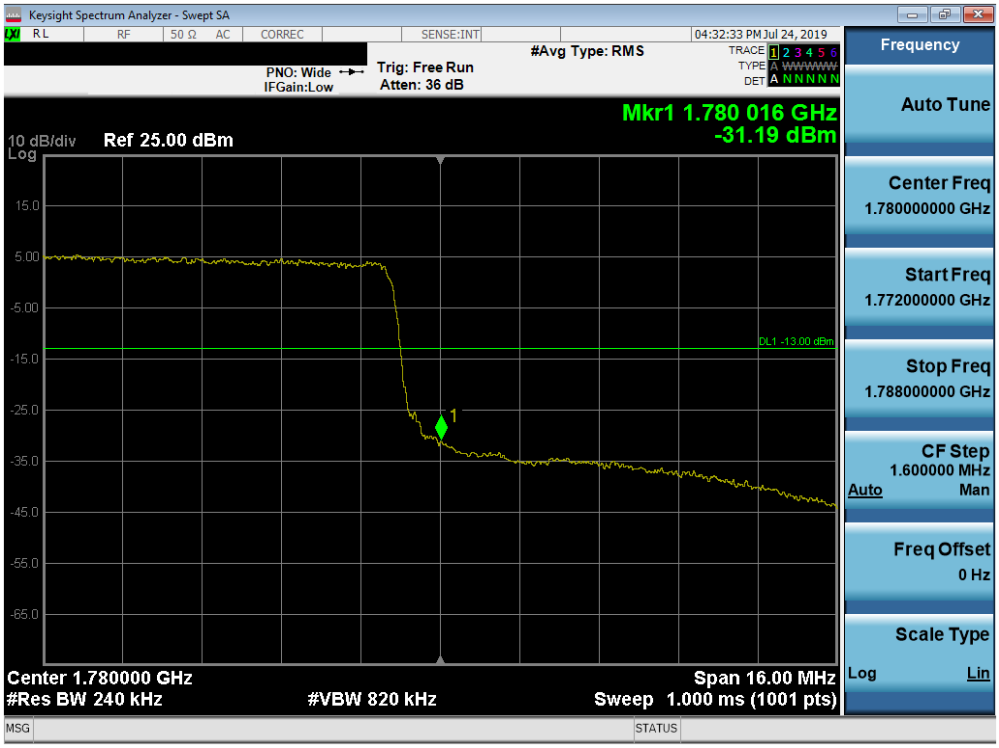
Plot 7-131. Lower Extended Band Edge Plot (Band 66/4 - 20.0MHz QPSK - Full RB Configuration)



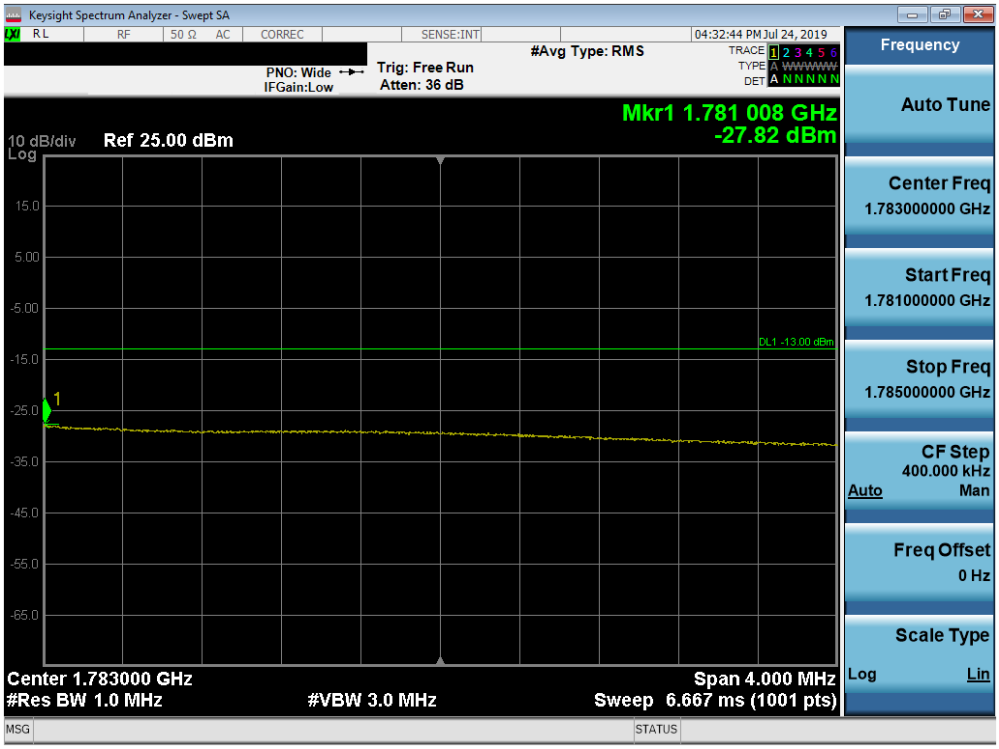
Plot 7-132. Upper Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)



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

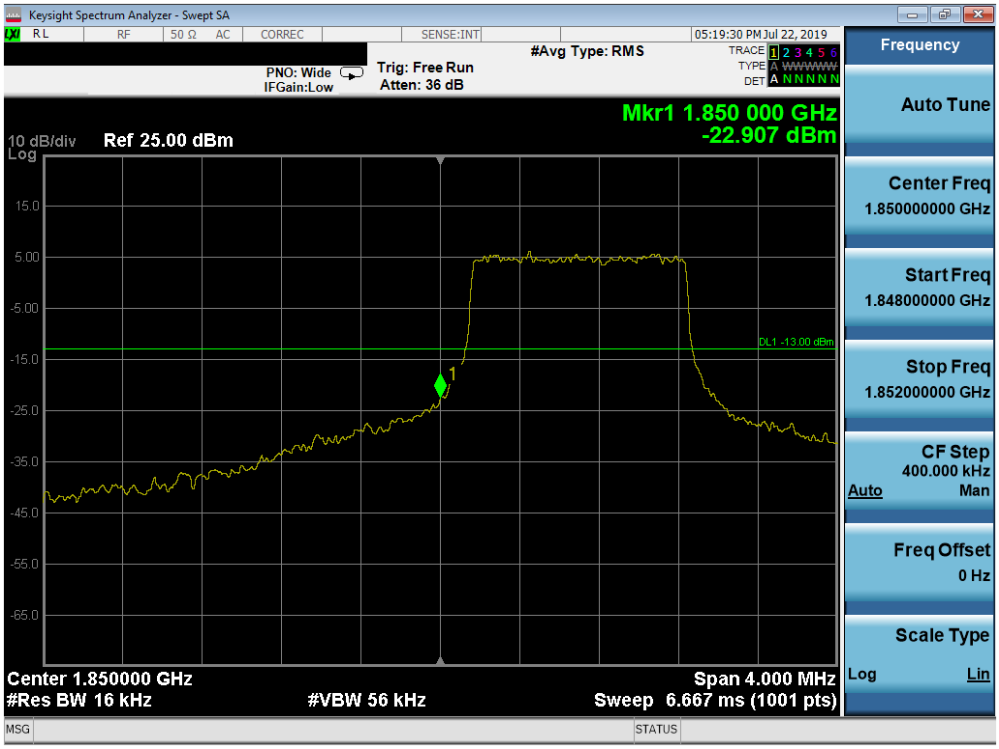


Plot 7-134. Upper Band Edge Plot (Band 66 - 20.0MHz QPSK - Full RB Configuration)

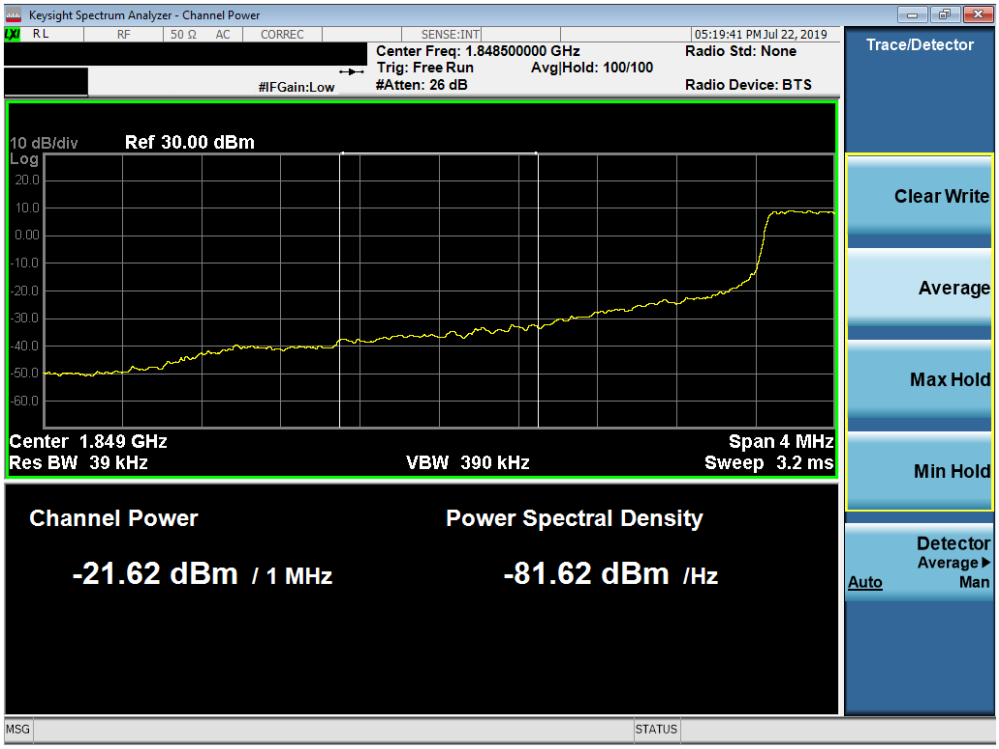


Plot 7-135. Upper Extended Band Edge Plot (Band 66 - 20.0MHz QPSK - Full RB Configuration)

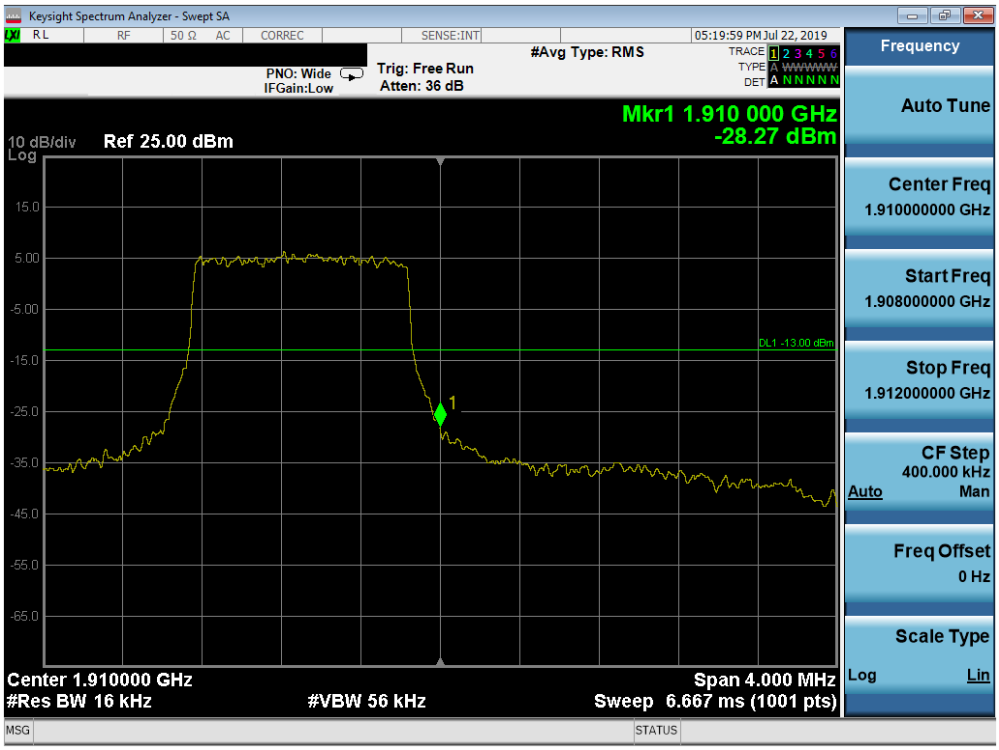
Band 2



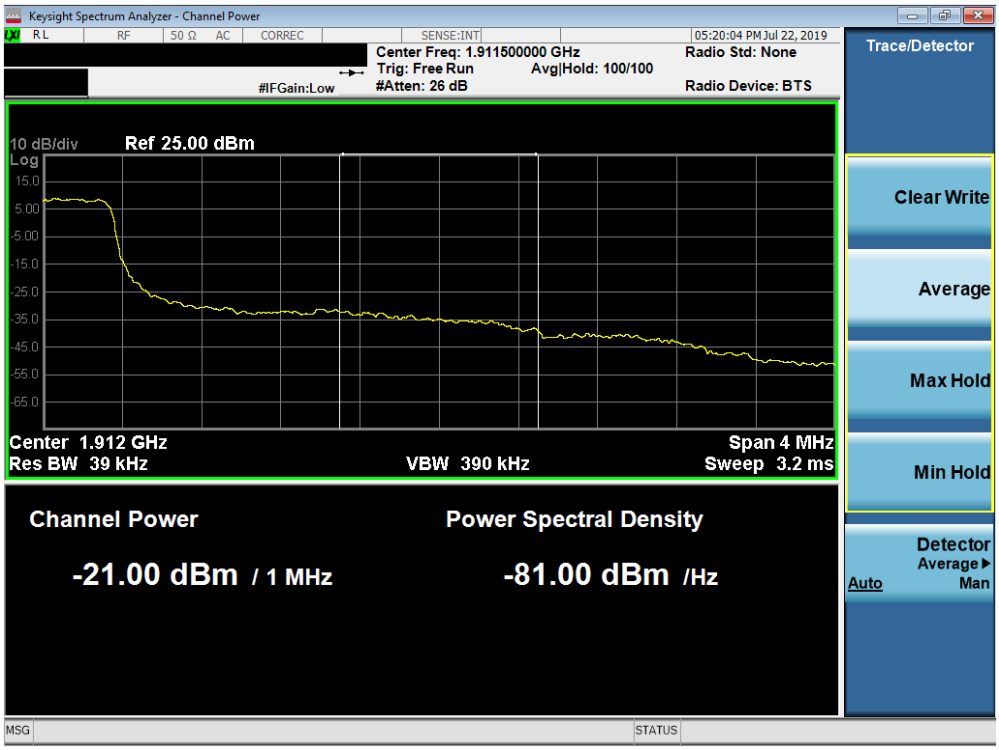
Plot 7-136. Lower Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



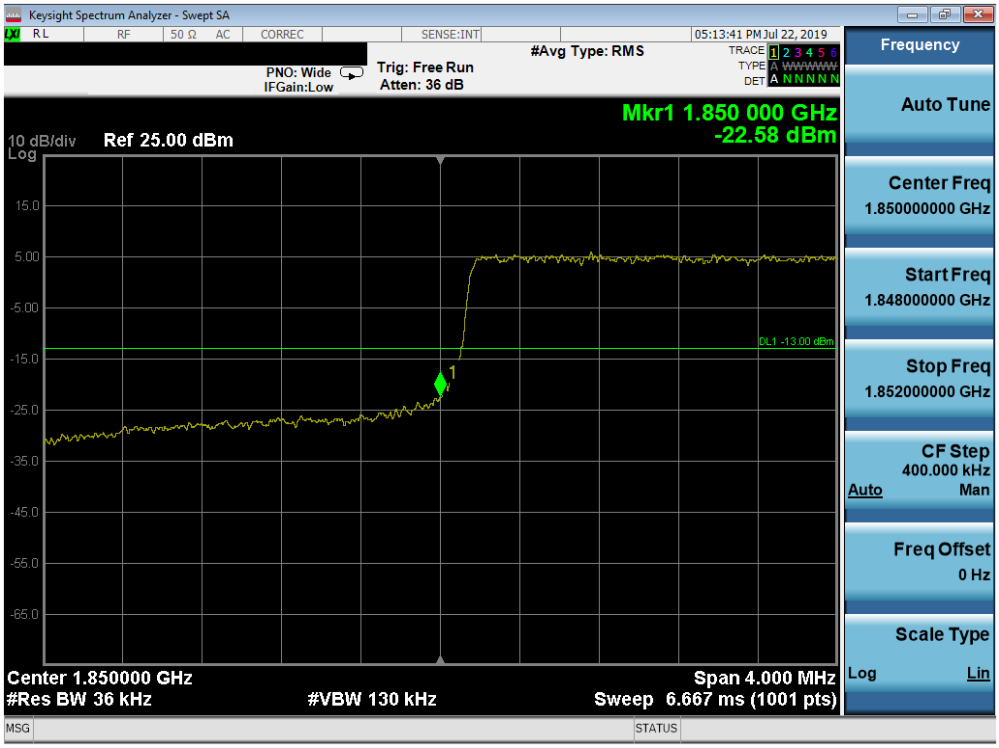
Plot 7-137. Lower Extended Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



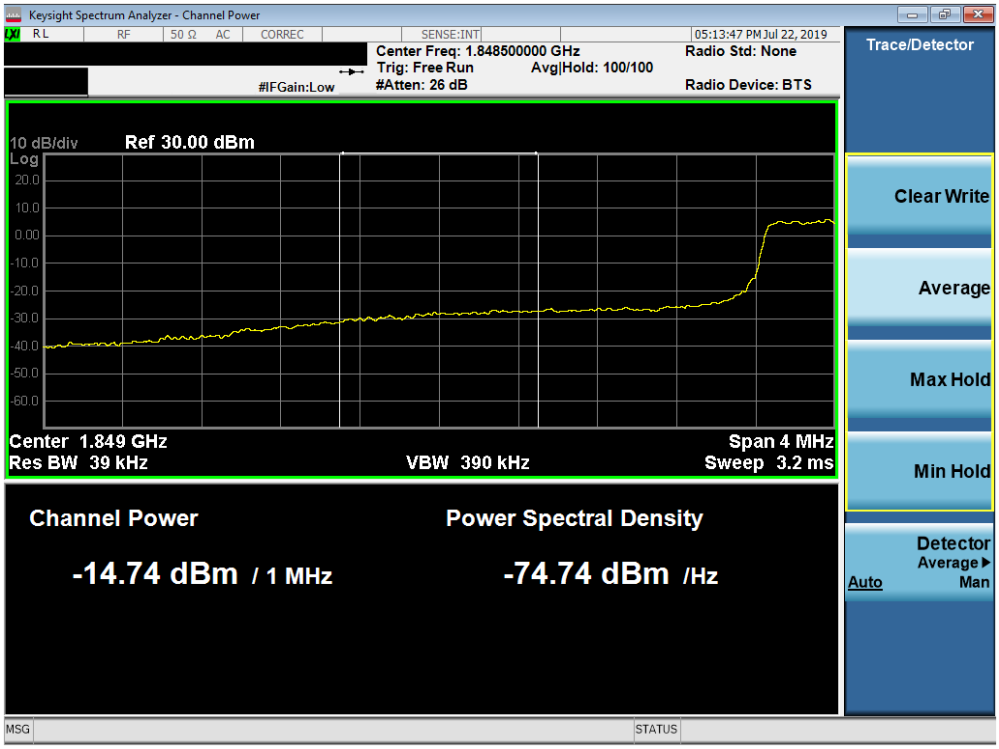
Plot 7-138. Upper Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



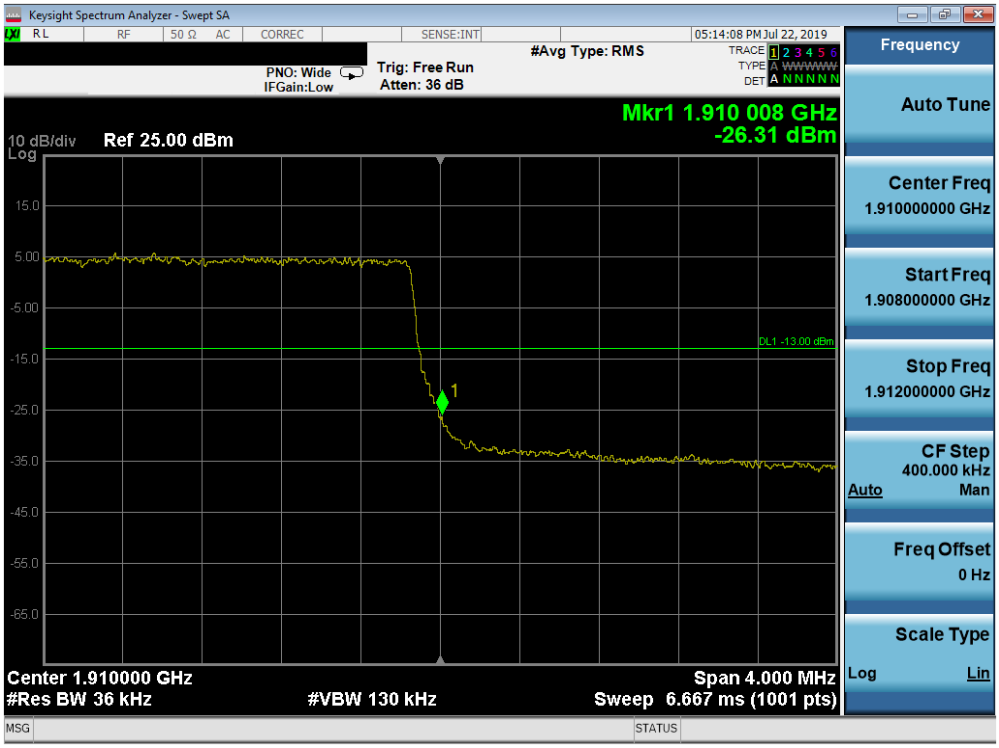
Plot 7-139. Upper Extended Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



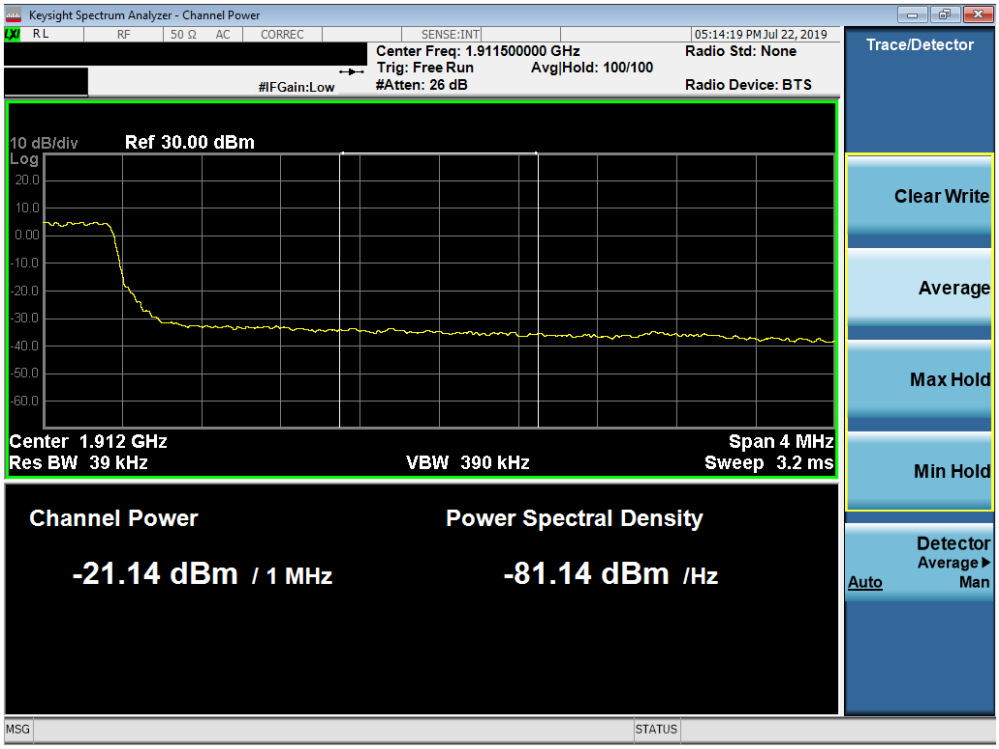
Plot 7-140. Lower Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



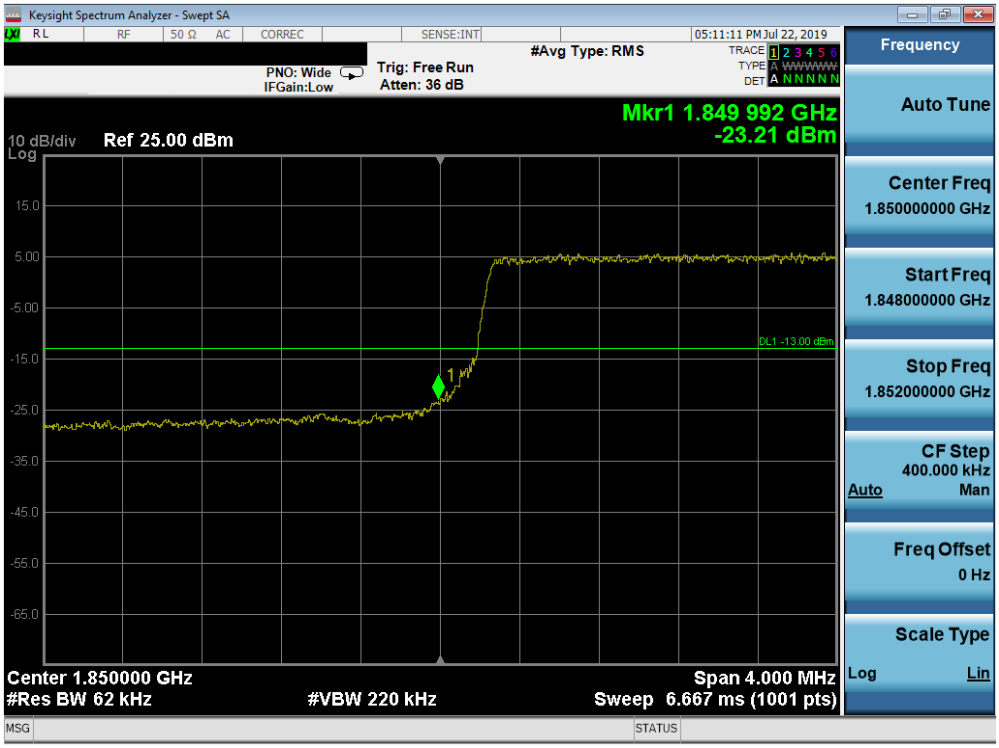
Plot 7-141. Lower Extended Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



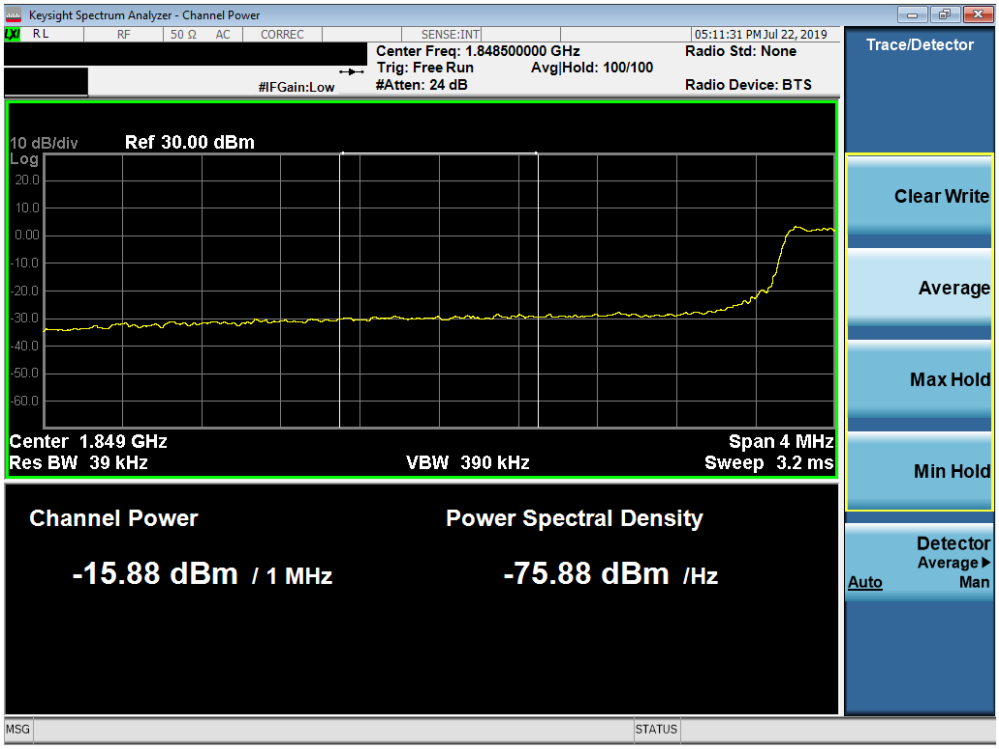
Plot 7-142. Upper Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



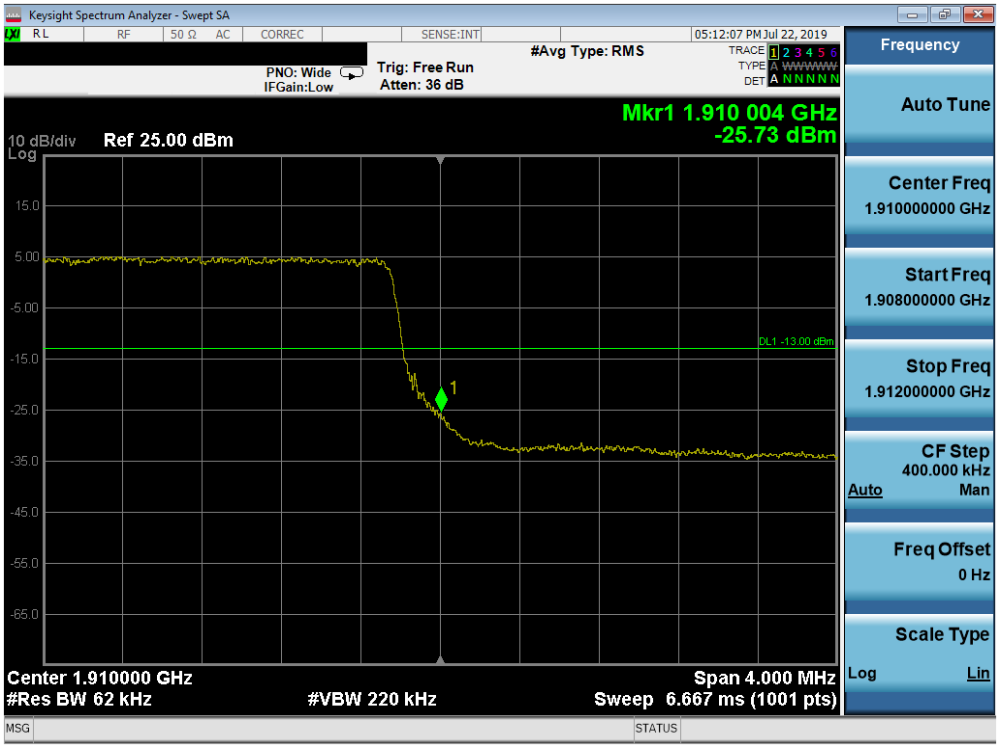
Plot 7-143. Upper Extended Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



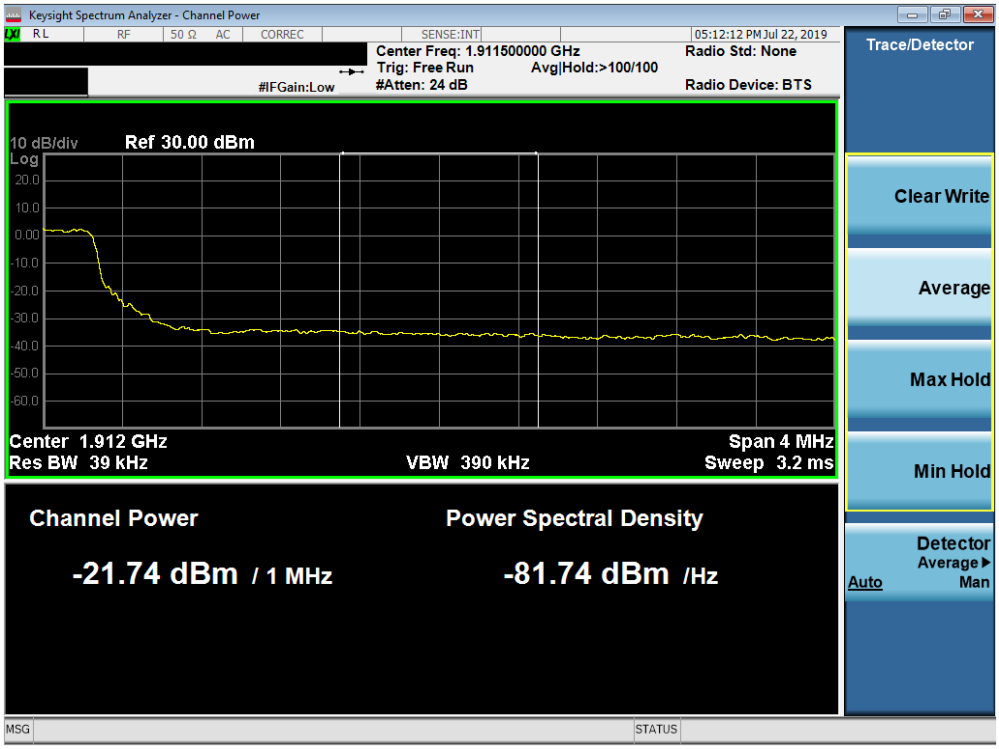
Plot 7-144. Lower Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



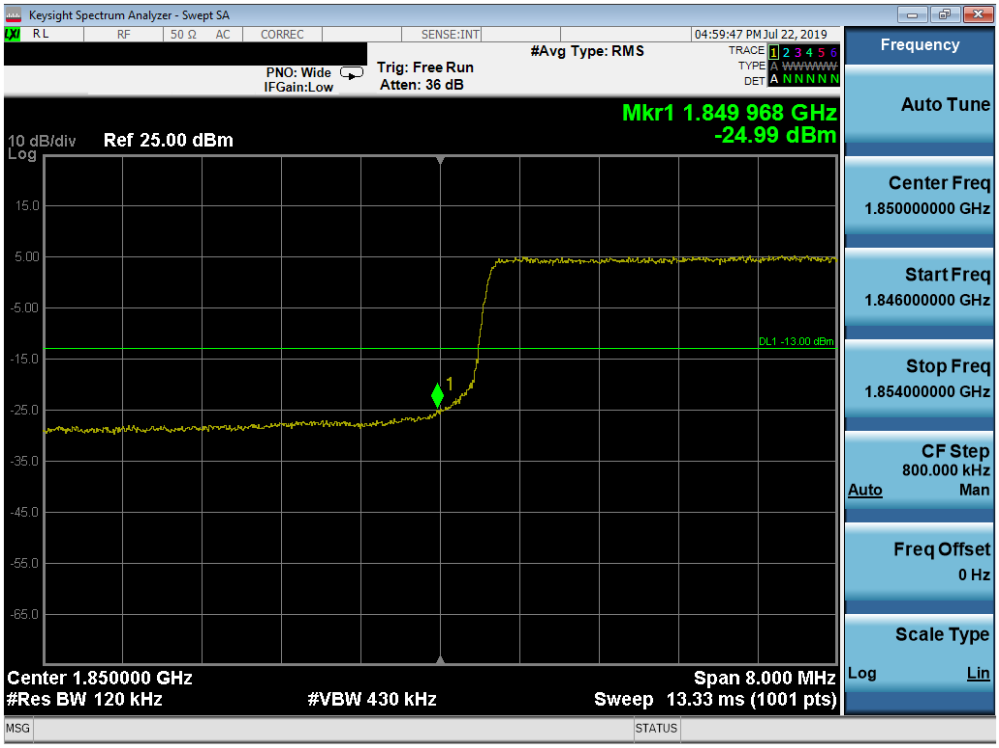
Plot 7-145. Lower Extended Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



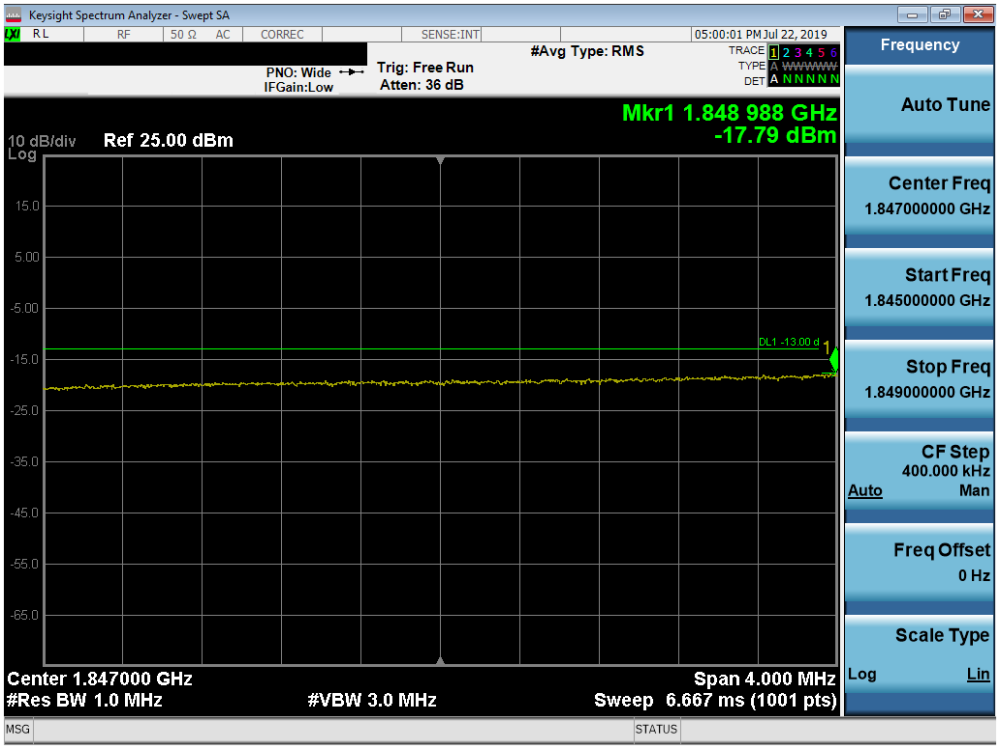
Plot 7-146. Upper Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



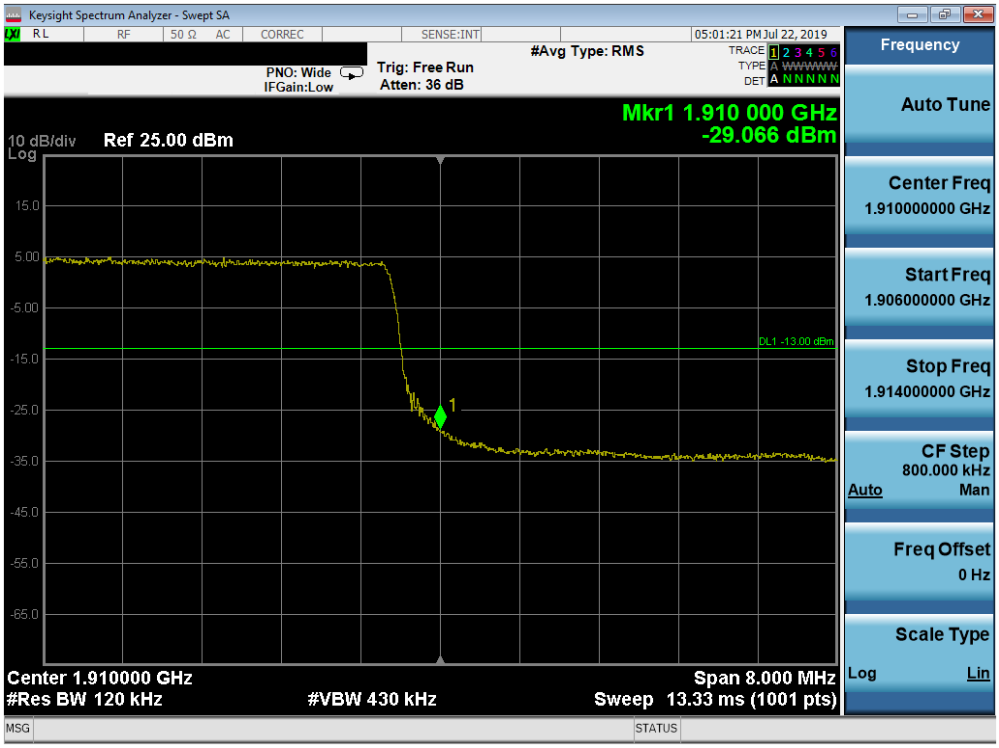
Plot 7-147. Upper Extended Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



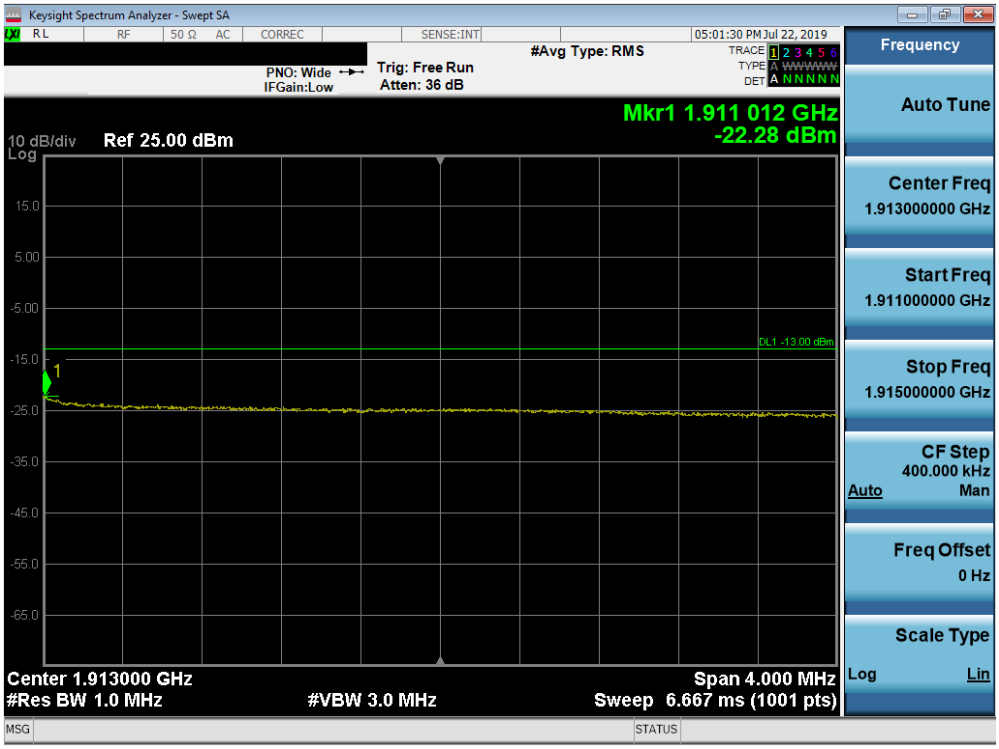
Plot 7-148. Lower Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



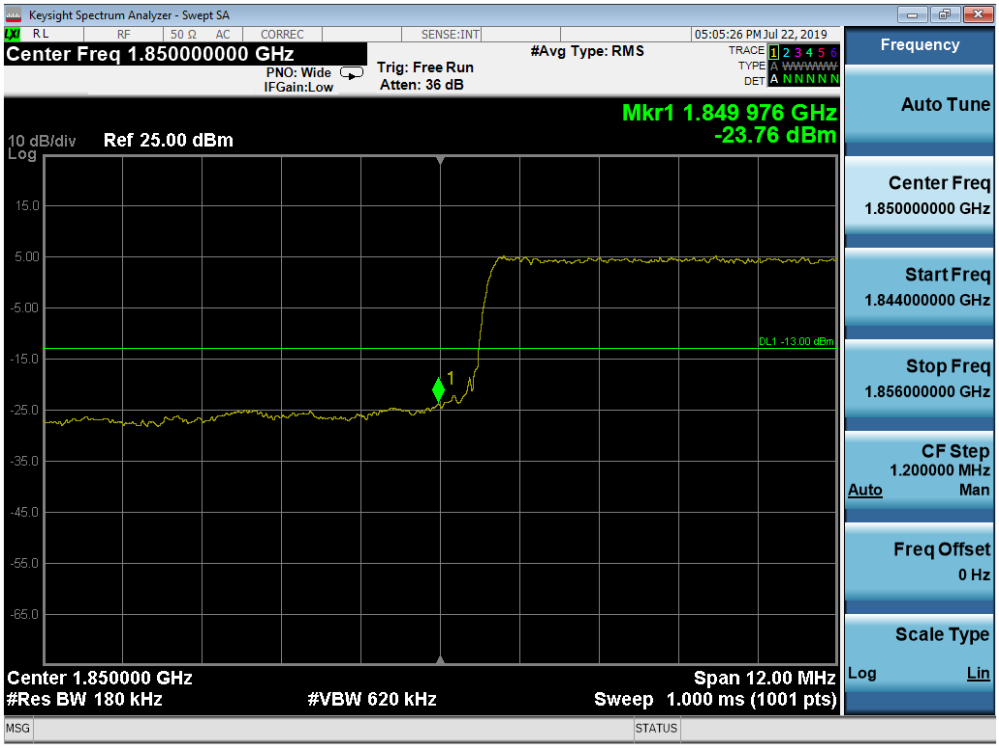
Plot 7-149. Lower Extended Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



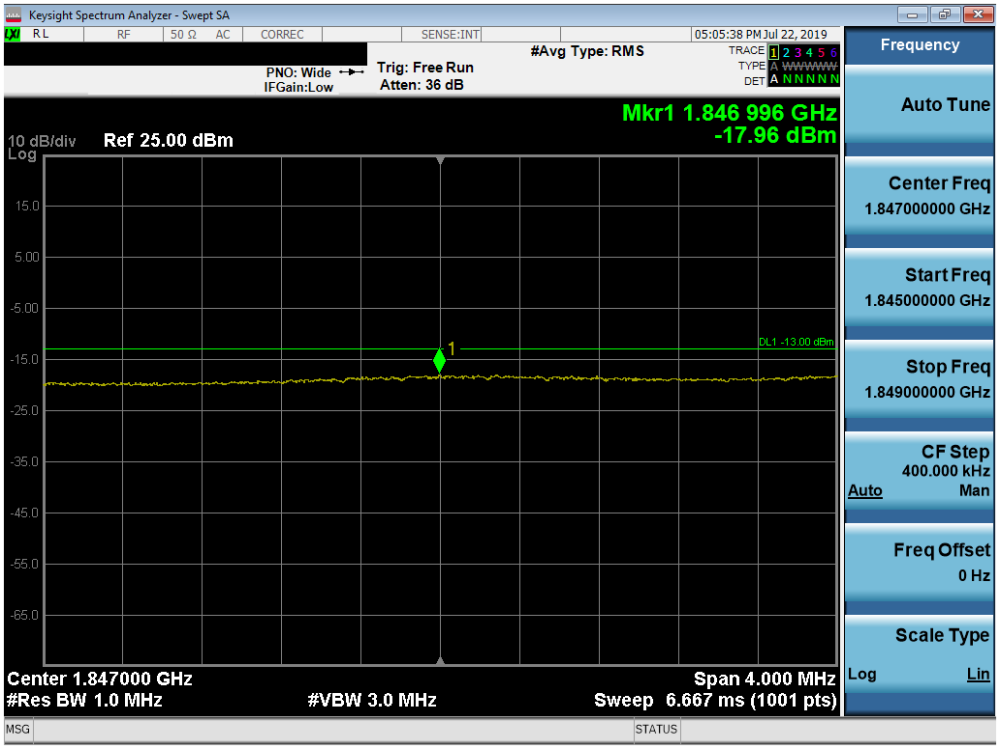
Plot 7-150. Upper Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



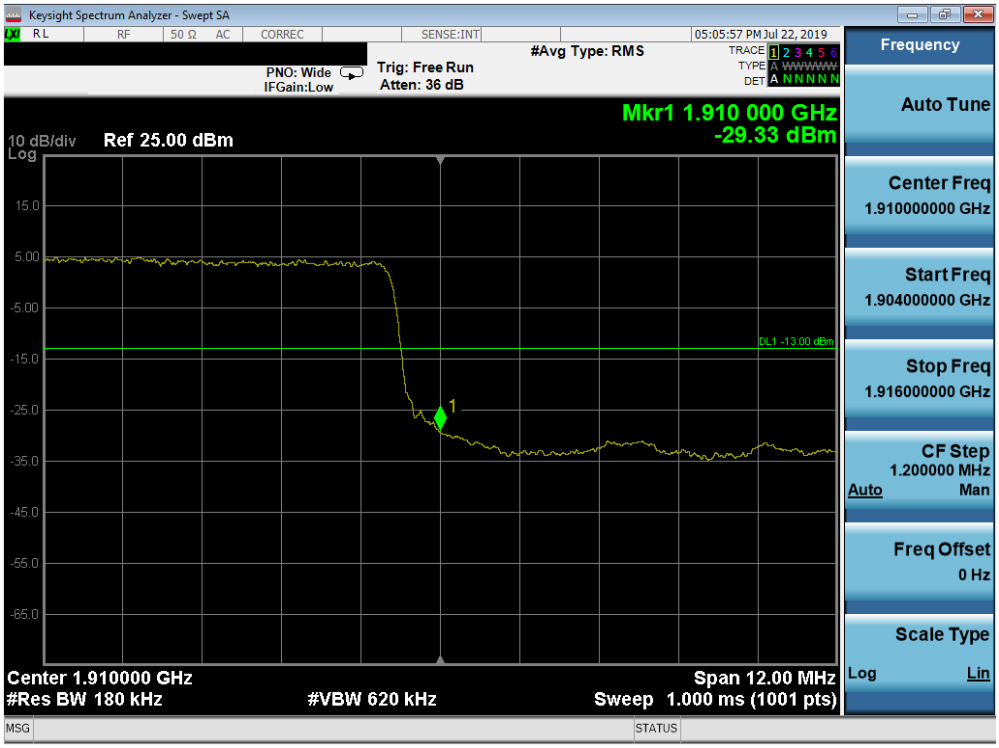
Plot 7-151. Upper Extended Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



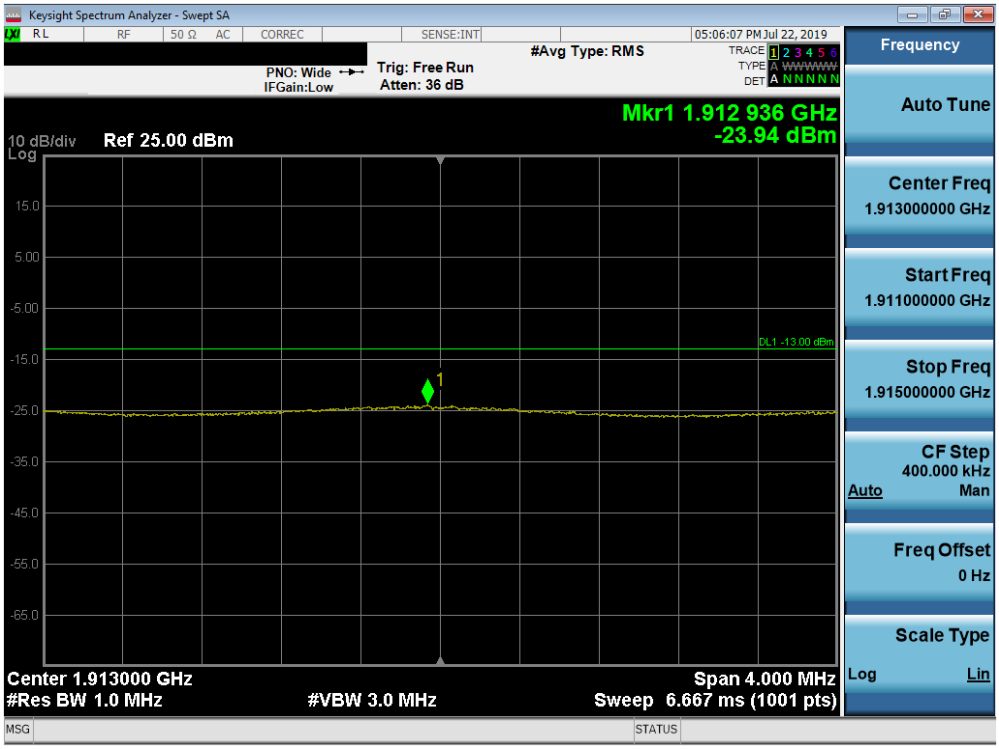
Plot 7-152. Lower Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



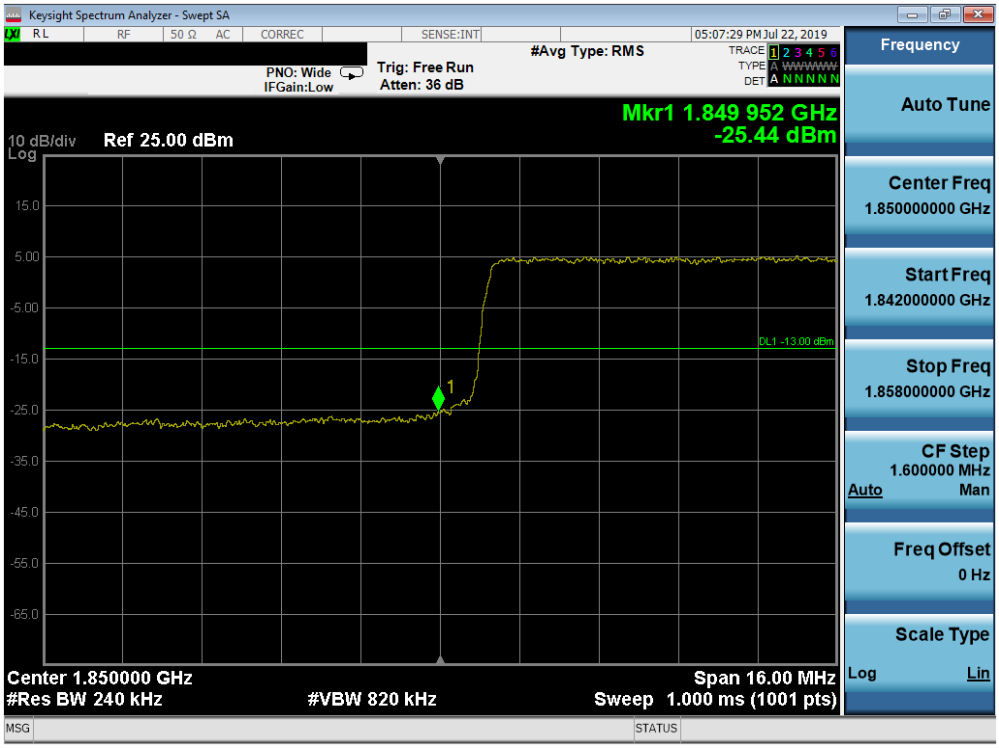
Plot 7-153. Lower Extended Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



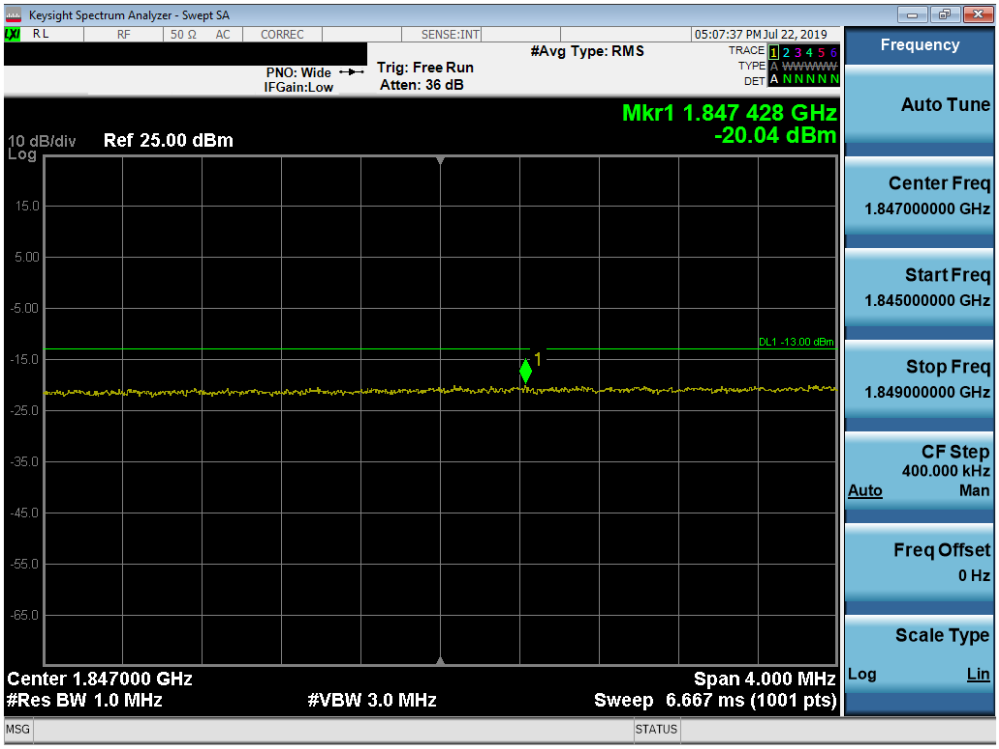
Plot 7-154. Upper Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



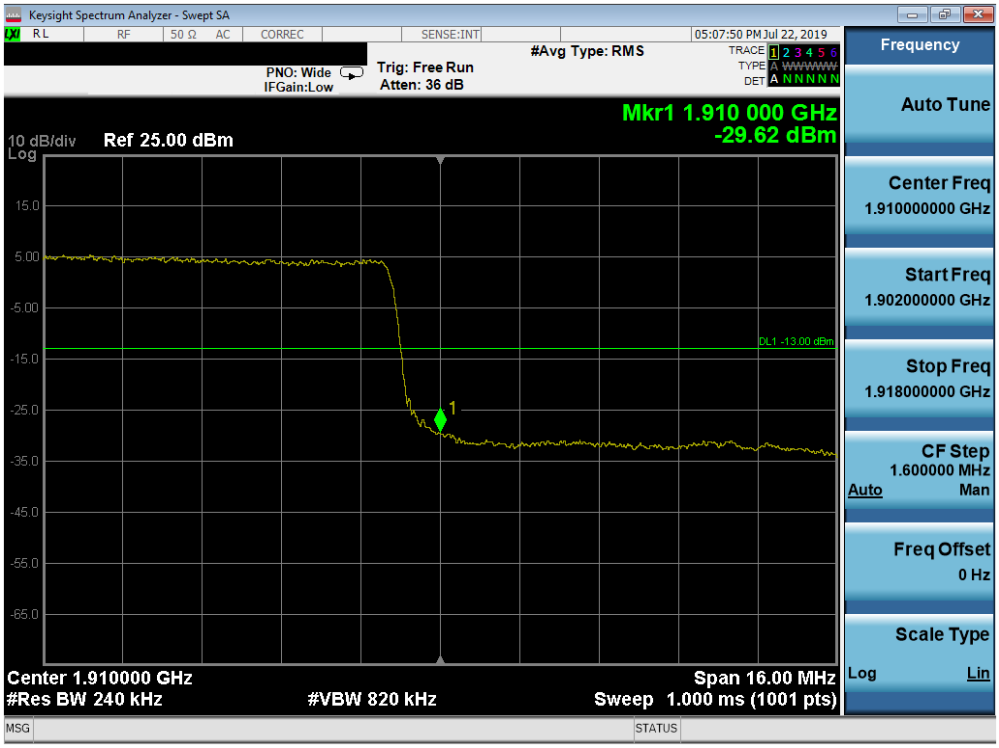
Plot 7-155. Upper Extended Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



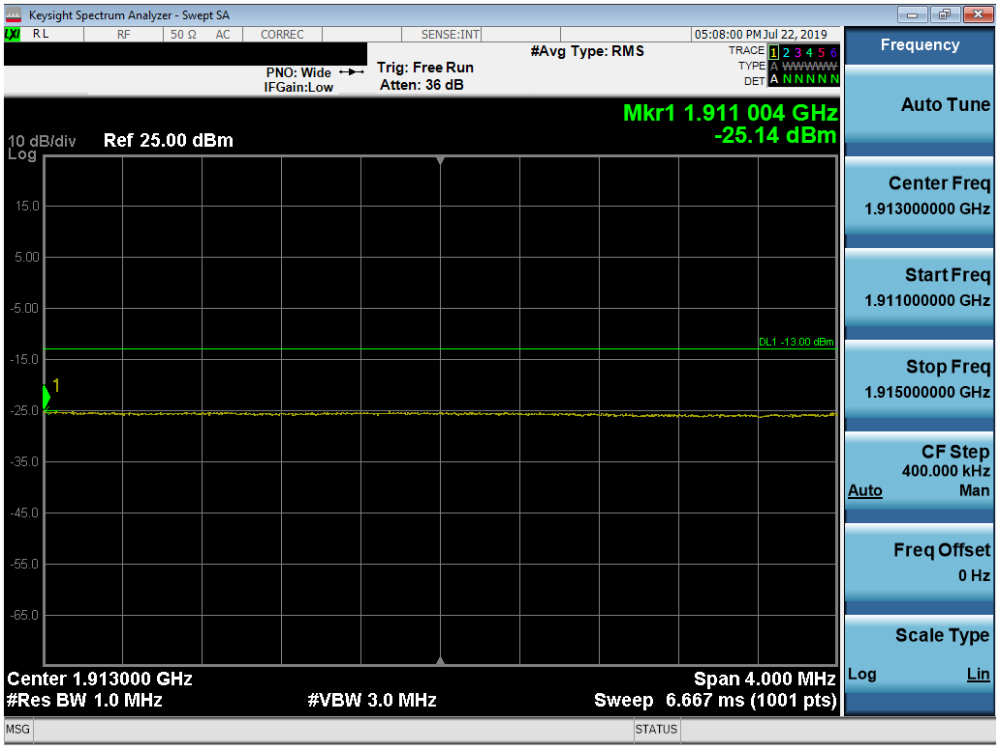
Plot 7-156. Lower Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



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

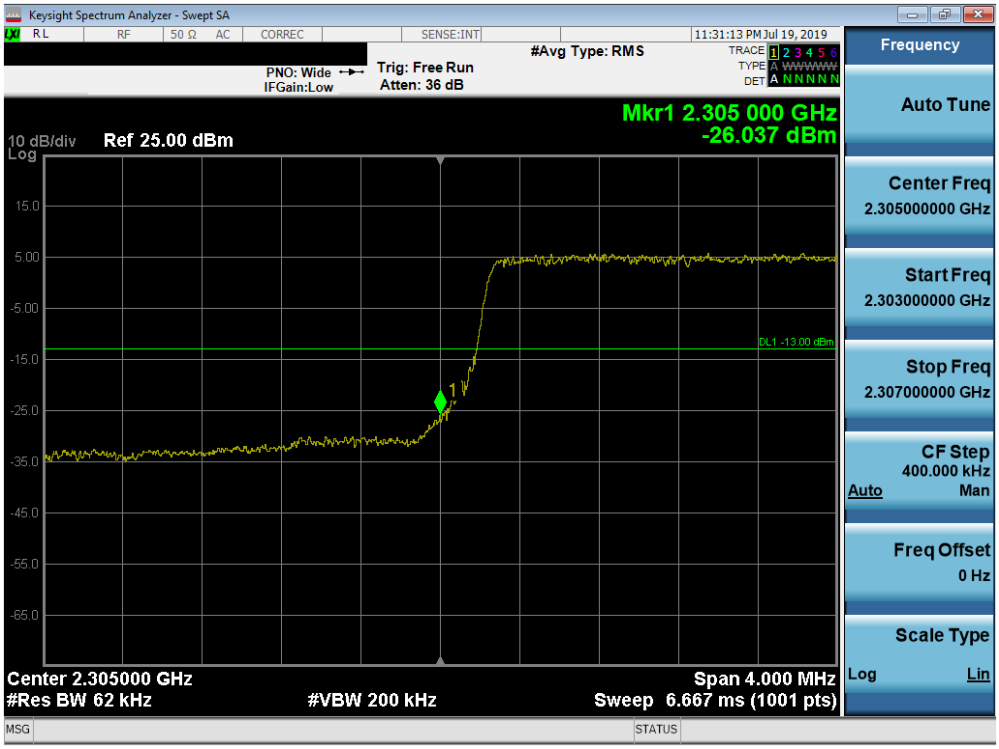


Plot 7-158. Upper Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



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

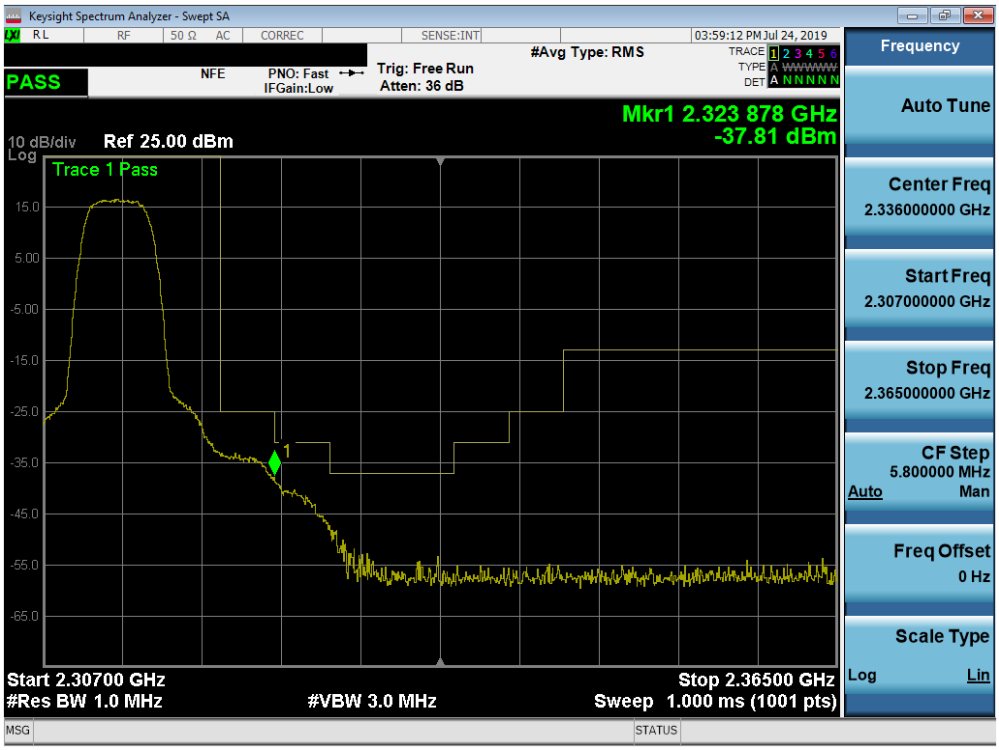
Band 30



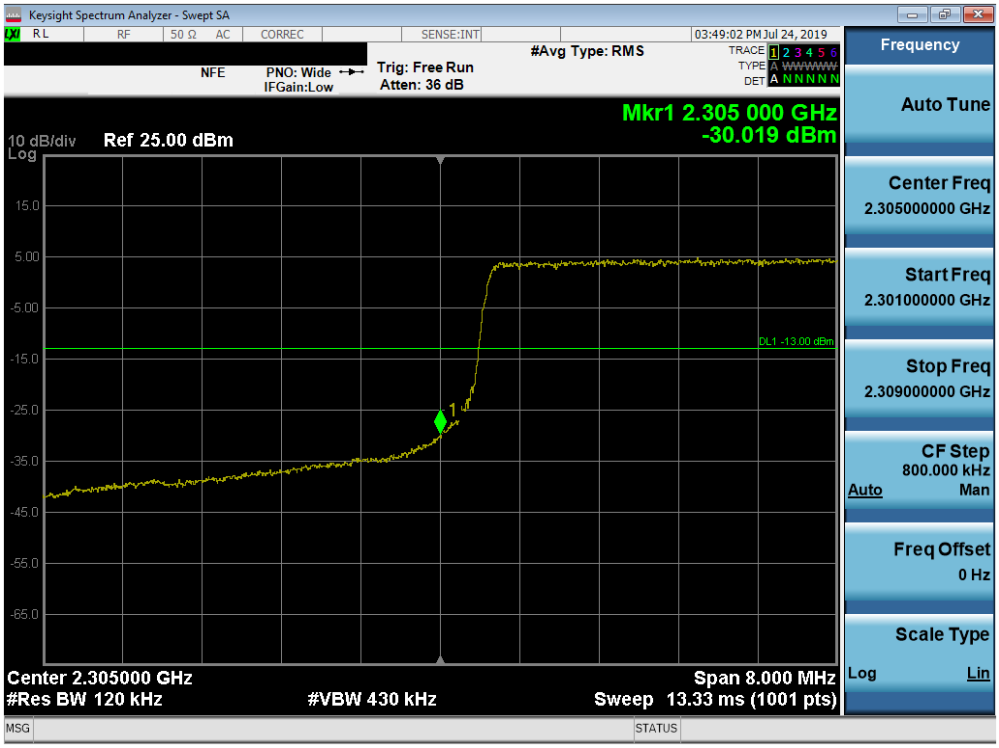
Plot 7-160. Lower Band Edge Plot (Band 30 - 5.0MHz QPSK - Full RB Configuration)

Plot 7-161. Lower Extended Band Edge Plot (Band 30 - 5.0MHz QPSK - Full RB Configuration)

Plot 7-162. Upper Band Edge Plot (Band 30 - 5.0MHz QPSK - Full RB Configuration)

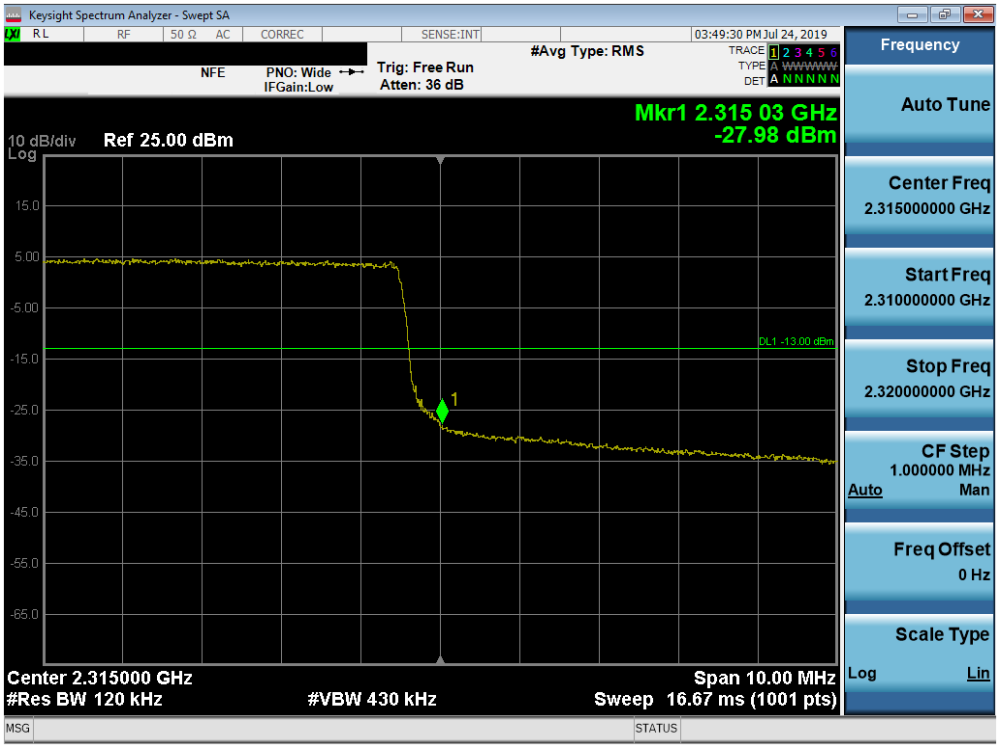


Plot 7-163. Upper Extended Band Edge Plot (Band 30 - 5.0MHz QPSK - Full RB Configuration)

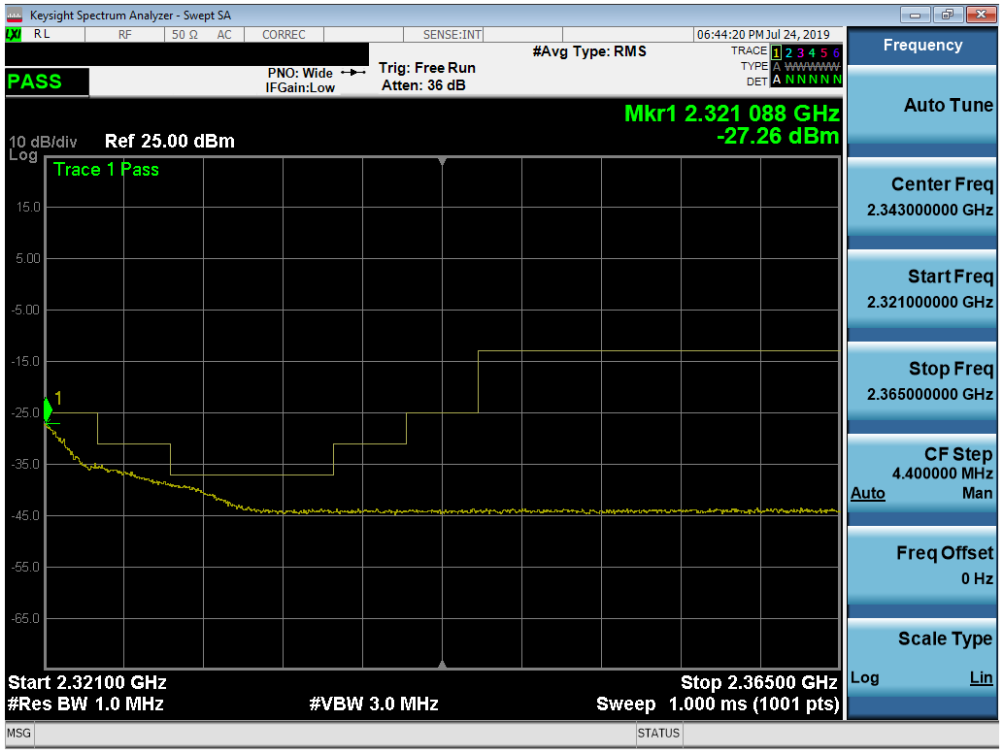


Plot 7-164. Lower Band Edge Plot (Band 30 - 10.0MHz QPSK - Full RB Configuration)

Plot 7-165. Lower Extended Band Edge Plot (Band 30 - 10.0MHz QPSK - Full RB Configuration)



Plot 7-166. Upper Band Edge Plot (Band 30 - 10.0MHz QPSK - Full RB Configuration)



Plot 7-167. Upper Extended Band Edge Plot (Band 30 - 10.0MHz 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.

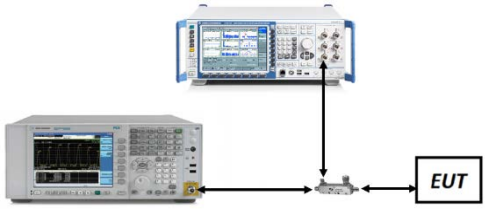
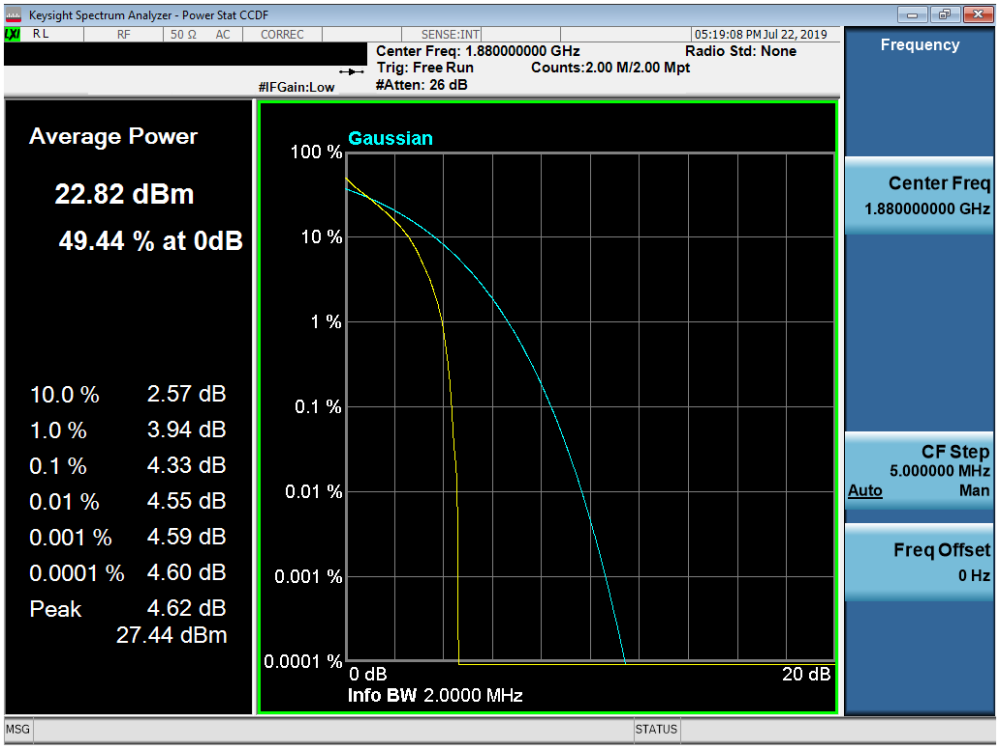


Figure 7-4. Test Instrument & Measurement Setup

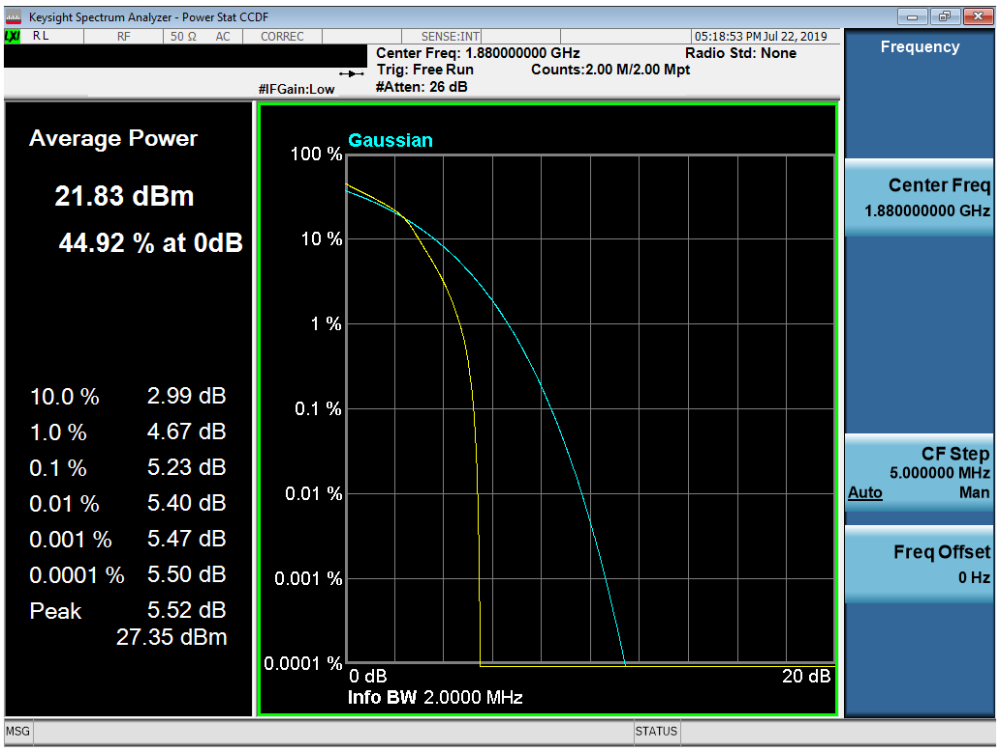
Test Notes

None.

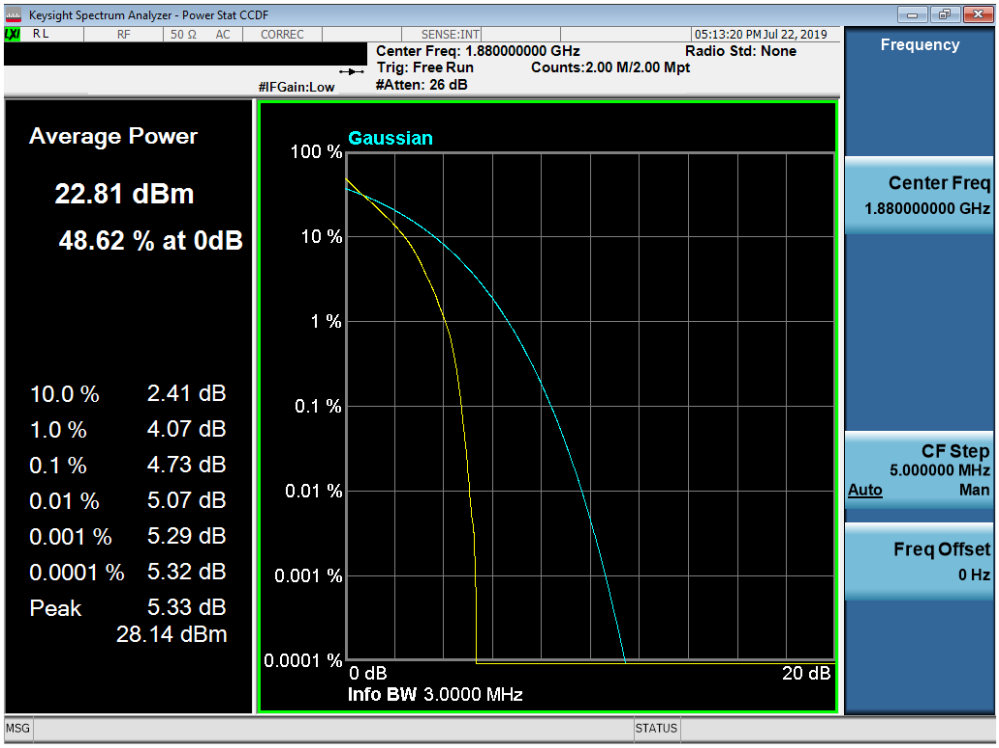
Band 2



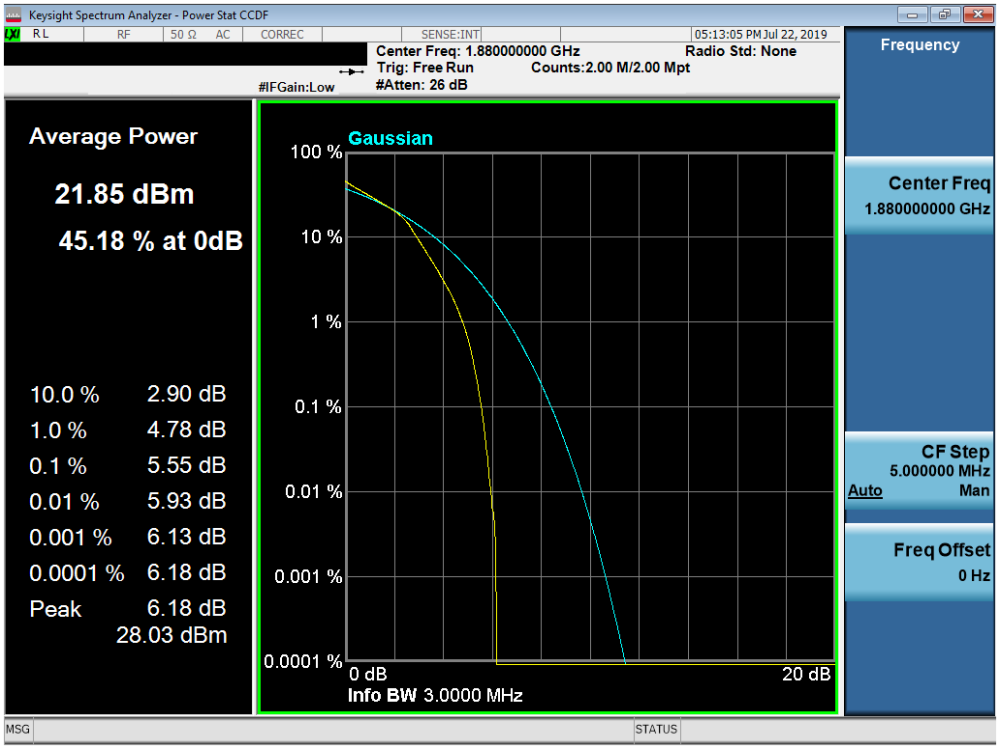
Plot 7-168. PAR Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



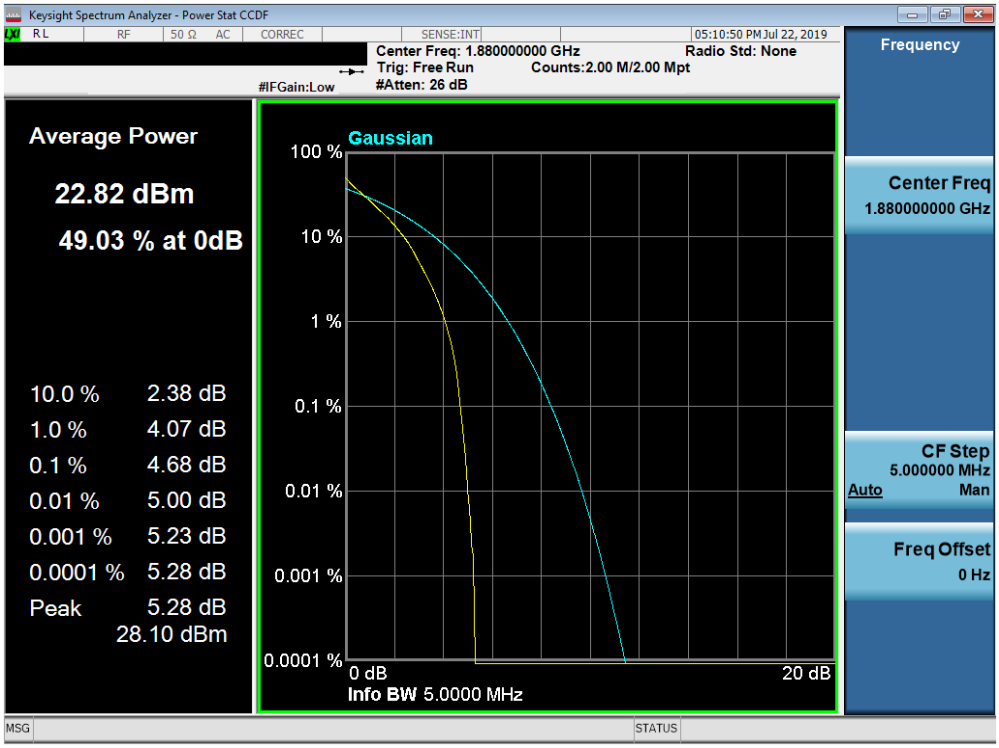
Plot 7-169. PAR Plot (Band 2 - 1.4MHz 16-QAM - Full RB Configuration)



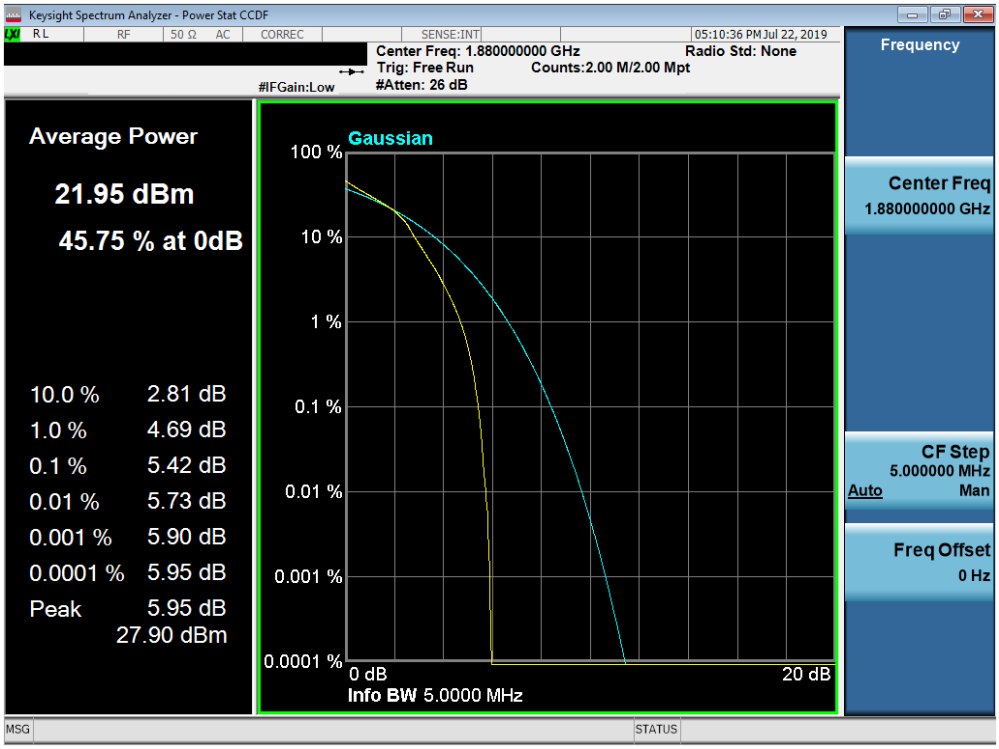
Plot 7-170. PAR Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



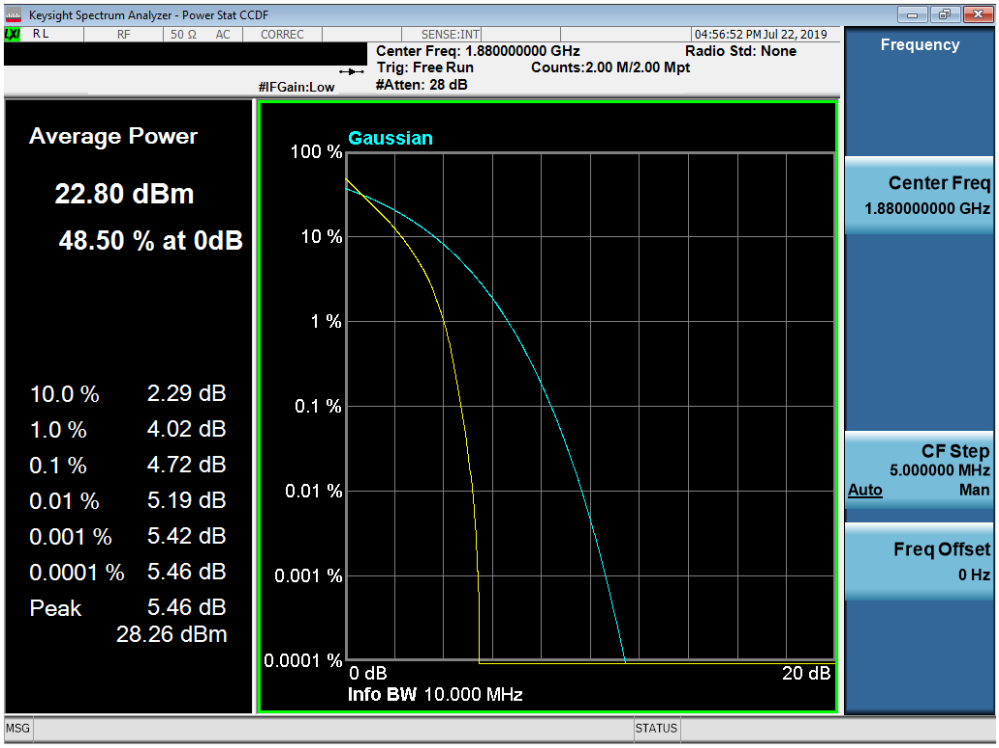
Plot 7-171. PAR Plot (Band 2 - 3.0MHz 16-QAM - Full RB Configuration)



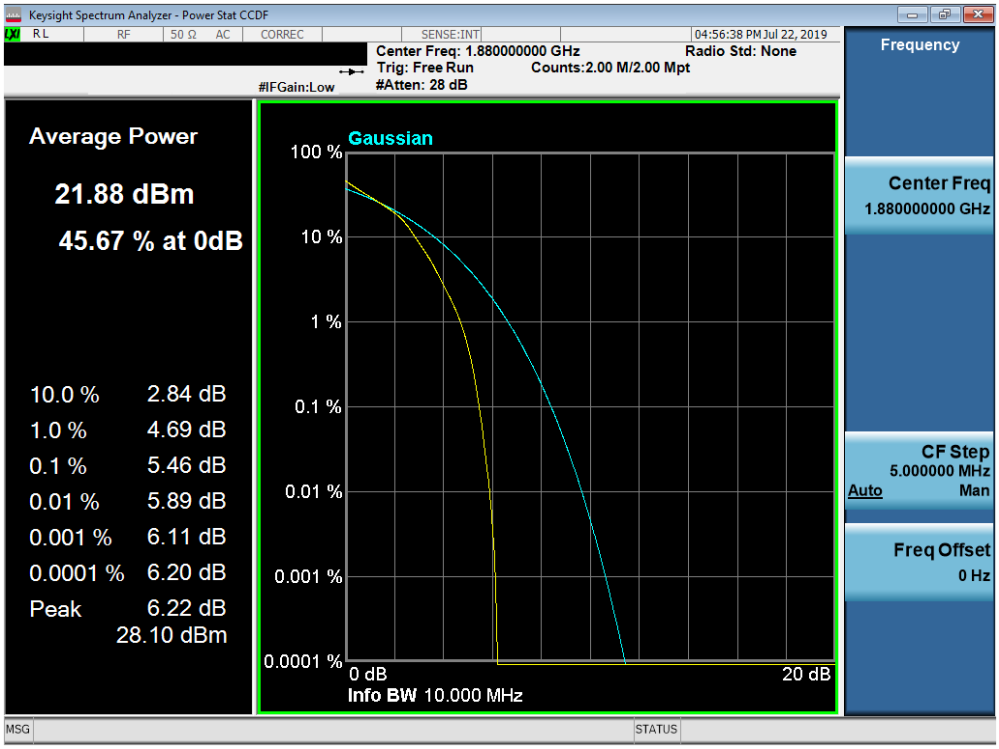
Plot 7-172. PAR Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



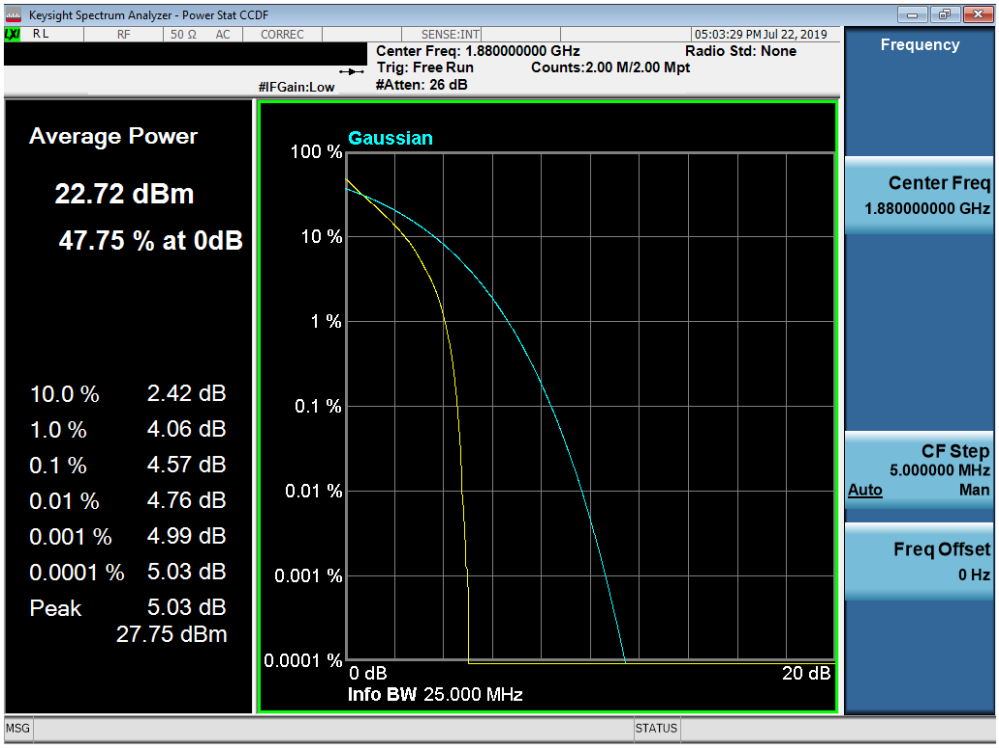
Plot 7-173. PAR Plot (Band 2 - 5.0MHz 16-QAM - Full RB Configuration)



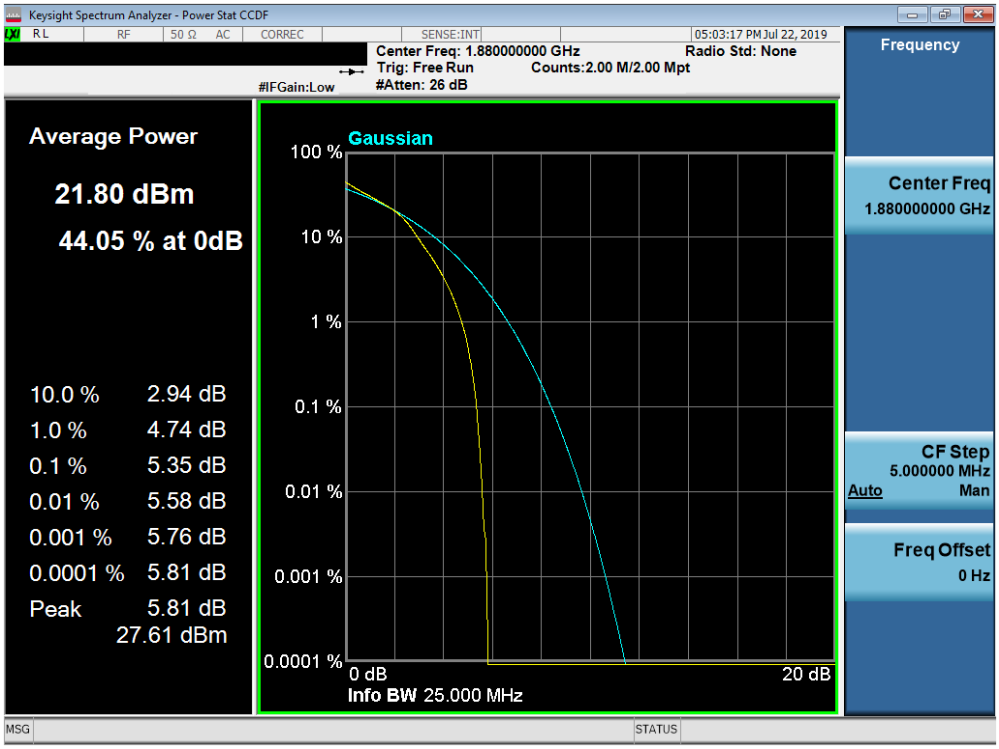
Plot 7-174. PAR Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



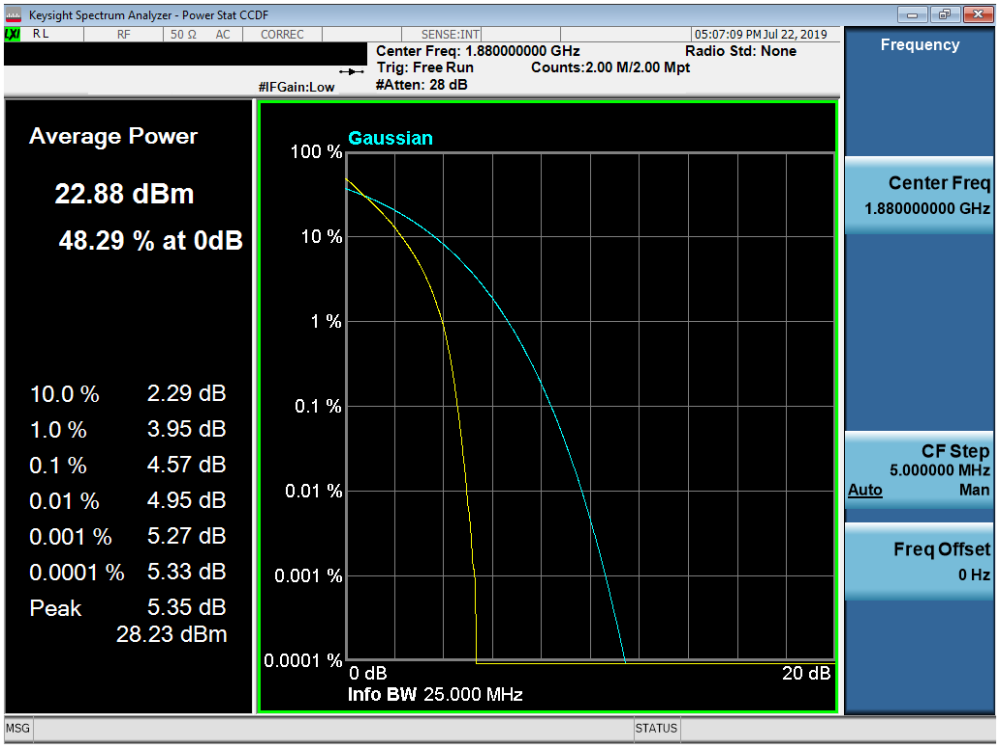
Plot 7-175. PAR Plot (Band 2 - 10.0MHz 16-QAM - Full RB Configuration)



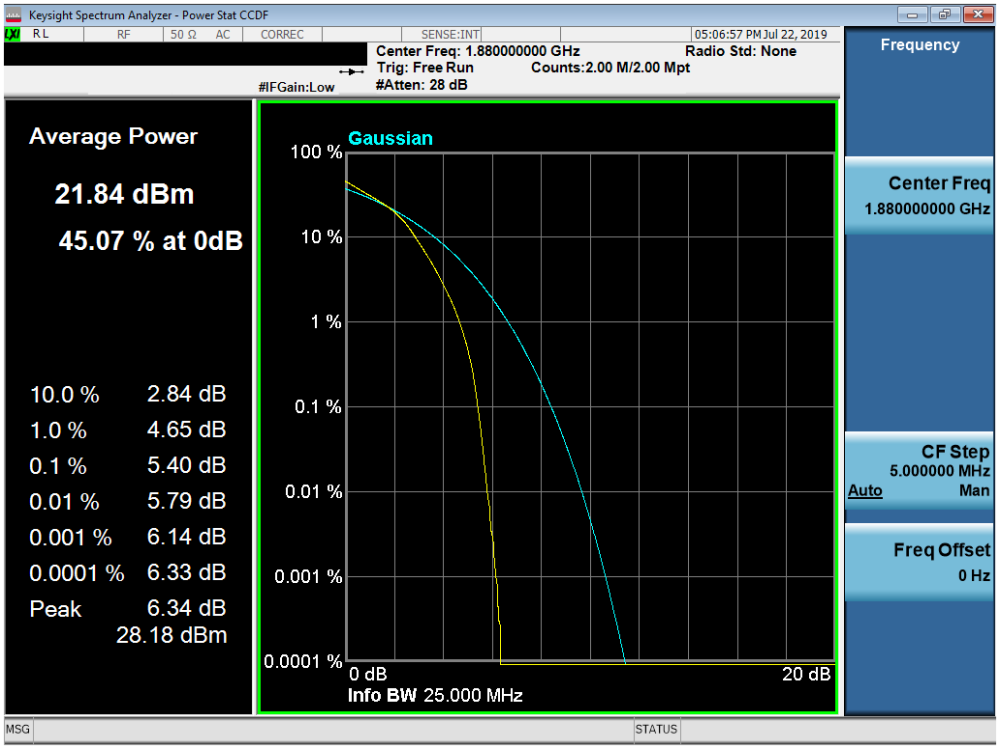
Plot 7-176. PAR Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-177. PAR Plot (Band 2 - 15.0MHz 16-QAM - Full RB Configuration)



Plot 7-178. PAR Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-179. PAR Plot (Band 2 - 20.0MHz 16-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.

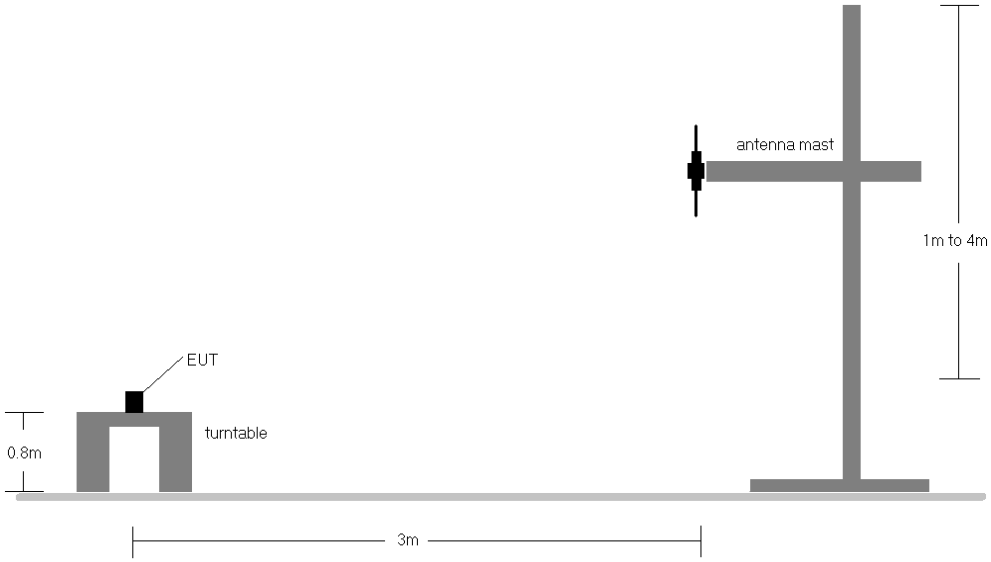


Figure 7-5. Radiated Test Setup <1GHz

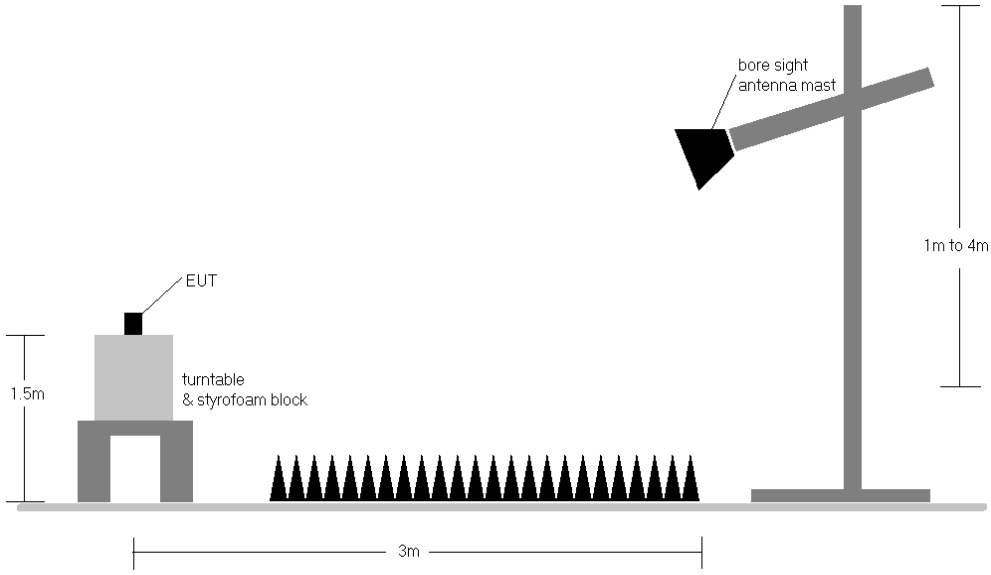


Figure 7-6. Radiated Test Setup >1GHz

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]
699.70	1.4	QPSK	V	100	240	1 / 5	15.40	4.50	17.75	0.060	34.77	-17.02
707.50	1.4	QPSK	V	100	244	1 / 5	15.43	4.60	17.88	0.061	34.77	-16.89
715.30	1.4	QPSK	V	101	243	1 / 5	15.66	4.63	**18.14**	**0.065**	34.77	-16.63
707.50	1.4	16-QAM	V	100	244	1 / 5	14.14	4.60	**16.59**	0.046	34.77	-18.18
700.50	3	QPSK	V	100	248	1 / 14	15.61	4.55	18.01	0.063	34.77	-16.76
707.50	3	QPSK	V	101	238	1 / 14	15.44	4.60	17.89	0.062	34.77	-16.88
714.50	3	QPSK	V	104	241	1 / 14	15.61	4.60	**18.06**	0.064	34.77	-16.71
707.50	3	16-QAM	V	101	238	1 / 14	14.21	4.60	**16.66**	0.046	34.77	-18.11
701.50	5	QPSK	V	100	246	1 / 24	15.50	4.60	**17.95**	0.062	34.77	-16.82
707.50	5	QPSK	V	103	240	1 / 24	15.43	4.60	17.88	0.061	34.77	-16.89
713.50	5	QPSK	V	100	247	1 / 24	15.48	4.60	17.93	0.062	34.77	-16.84
707.50	5	16-QAM	V	103	240	1 / 24	14.07	4.60	**16.52**	0.045	34.77	-18.25
704.00	10	QPSK	V	100	248	1 / 49	15.13	4.50	17.48	0.056	34.77	-17.29
707.50	10	QPSK	V	100	241	1 / 49	15.42	4.60	**17.87**	0.061	34.77	-16.90
711.00	10	QPSK	V	100	252	1 / 49	15.27	4.60	17.72	0.059	34.77	-17.05
707.50	10	16-QAM	V	100	241	1 / 49	13.98	4.60	**16.43**	0.044	34.77	-18.34
715.30	10	QPSK	H	190	182	1 / 49	14.59	3.65	16.09	0.041	34.77	-18.68

Table 7-3. ERP Data (Band 12)

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]
824.70	1.4	QPSK	V	139	262	1 / 5	13.22	6.70	17.77	0.060	38.45	-20.68
836.50	1.4	QPSK	V	143	260	1 / 5	13.08	6.70	17.63	0.058	38.45	-20.82
848.30	1.4	QPSK	V	140	253	1 / 5	13.28	6.70	**17.83**	0.061	38.45	-20.62
824.70	1.4	16-QAM	V	139	262	1 / 5	11.81	6.70	**16.36**	0.043	38.45	-22.09
825.50	3	QPSK	V	139	268	1 / 14	13.16	6.70	17.71	0.059	38.45	-20.74
836.50	3	QPSK	V	145	262	1 / 14	13.05	6.70	17.60	0.058	38.45	-20.85
847.50	3	QPSK	V	149	263	1 / 14	13.34	6.65	**17.84**	0.061	38.45	-20.61
825.50	3	16-QAM	V	139	268	1 / 14	11.77	6.70	**16.32**	0.043	38.45	-22.13
826.50	5	QPSK	V	137	267	1 / 24	13.23	6.70	**17.78**	0.060	38.45	-20.67
836.50	5	QPSK	V	147	263	1 / 24	13.08	6.70	17.63	0.058	38.45	-20.82
846.50	5	QPSK	V	148	253	1 / 24	13.31	6.60	17.76	0.060	38.45	-20.69
826.50	5	16-QAM	V	137	267	1 / 24	11.65	6.70	**16.20**	0.042	38.45	-22.25
829.00	10	QPSK	V	138	264	1 / 49	12.95	6.70	17.50	0.056	38.45	-20.95
836.50	10	QPSK	V	143	259	1 / 49	13.36	6.70	**17.91**	**0.062**	38.45	-20.54
844.00	10	QPSK	V	144	257	1 / 49	12.14	6.60	16.59	0.046	38.45	-21.86
829.00	10	16-QAM	V	138	264	1 / 49	11.81	6.70	**16.36**	0.043	38.45	-22.09
836.50	10	QPSK	H	212	263	1 / 49	12.66	6.70	17.21	0.053	38.45	-21.24

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	140	207	1 / 5	11.10	9.44	20.54	0.113	30.00	-9.46
1745.00	1.4	QPSK	V	130	331	1 / 5	13.46	9.23	**22.69**	0.186	30.00	-7.31
1779.30	1.4	QPSK	V	131	9	1 / 5	10.62	9.26	19.88	0.097	30.00	-10.12
1745.00	1.4	16-QAM	V	130	331	1 / 5	12.63	9.23	**21.86**	0.153	30.00	-8.14
1711.50	3	QPSK	V	142	201	1 / 14	11.11	9.44	20.55	0.113	30.00	-9.45
1745.00	3	QPSK	V	134	329	1 / 14	13.44	9.23	**22.67**	0.185	30.00	-7.33
1778.50	3	QPSK	V	132	11	1 / 14	10.61	9.26	19.87	0.097	30.00	-10.13
1745.00	3	16-QAM	V	134	329	1 / 14	12.71	9.23	**21.94**	0.156	30.00	-8.06
1712.50	5	QPSK	V	134	204	1 / 24	11.09	9.43	20.52	0.113	30.00	-9.48
1745.00	5	QPSK	V	131	328	1 / 24	13.65	9.23	**22.88**	0.194	30.00	-7.12
1777.50	5	QPSK	V	141	15	1 / 24	10.59	9.26	19.85	0.097	30.00	-10.15
1745.00	5	16-QAM	V	131	328	1 / 24	12.78	9.23	**22.01**	0.159	30.00	-7.99
1715.00	10	QPSK	V	138	210	1 / 49	11.11	9.42	20.53	0.113	30.00	-9.47
1745.00	10	QPSK	V	130	334	1 / 49	13.74	9.23	**22.97**	**0.198**	30.00	-7.03
1775.00	10	QPSK	V	132	7	1 / 49	10.74	9.25	19.99	0.100	30.00	-10.01
1745.00	10	16-QAM	V	130	334	1 / 49	13.17	9.23	**22.40**	0.174	30.00	-7.60
1717.50	15	QPSK	V	140	204	1 / 74	11.09	9.40	20.49	0.112	30.00	-9.51
1745.00	15	QPSK	V	132	340	1 / 74	13.74	9.23	**22.97**	**0.198**	30.00	-7.03
1772.50	15	QPSK	V	135	10	1 / 74	10.71	9.25	19.96	0.099	30.00	-10.04
1745.00	15	16-QAM	V	132	340	1 / 74	12.79	9.23	**22.02**	0.159	30.00	-7.98
1720.00	20	QPSK	V	146	208	1 / 99	11.03	9.38	20.41	0.110	30.00	-9.59
1745.00	20	QPSK	V	136	333	1 / 99	13.67	9.23	**22.90**	0.195	30.00	-7.10
1770.00	20	QPSK	V	138	4	1 / 99	10.74	9.24	19.98	0.100	30.00	-10.02
1745.00	20	16-QAM	V	136	333	1 / 99	12.63	9.23	**21.86**	0.153	30.00	-8.14
1745.00	20	QPSK	H	100	11	1 / 99	10.78	9.23	20.01	0.100	30.00	-9.99

Table 7-5. ERP 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	105	344	1 / 5	10.41	9.48	19.89	0.098	33.01	-13.12
1880.00	1.4	QPSK	H	102	350	1 / 5	11.24	9.90	**21.14**	0.130	33.01	-11.87
1909.30	1.4	QPSK	H	100	349	1 / 5	10.83	10.25	21.08	0.128	33.01	-11.93
1880.00	1.4	16-QAM	H	102	350	1 / 5	10.45	9.90	**20.35**	0.108	33.01	-12.66
1851.50	3	QPSK	H	104	348	1 / 14	10.26	9.50	19.76	0.095	33.01	-13.25
1880.00	3	QPSK	H	101	351	1 / 14	11.35	9.90	**21.25**	0.133	33.01	-11.76
1908.50	3	QPSK	H	100	357	1 / 14	10.66	10.25	20.91	0.123	33.01	-12.10
1880.00	3	16-QAM	H	101	351	1 / 14	10.61	9.90	**20.51**	0.112	33.01	-12.50
1852.50	5	QPSK	H	101	350	1 / 24	10.34	9.51	19.85	0.097	33.01	-13.16
1880.00	5	QPSK	H	103	355	1 / 24	11.46	9.90	**21.36**	0.137	33.01	-11.65
1907.50	5	QPSK	H	100	348	1 / 24	10.91	10.24	21.15	0.130	33.01	-11.86
1880.00	5	16-QAM	H	103	355	1 / 24	10.68	9.90	**20.58**	0.114	33.01	-12.43
1855.00	10	QPSK	H	100	352	1 / 49	10.25	9.55	19.80	0.095	33.01	-13.21
1880.00	10	QPSK	H	100	349	1 / 49	11.48	9.90	**21.38**	**0.137**	33.01	-11.63
1905.00	10	QPSK	H	101	351	1 / 49	10.58	10.22	20.80	0.120	33.01	-12.21
1880.00	10	16-QAM	H	100	349	1 / 49	10.63	9.90	**20.53**	0.113	33.01	-12.48
1857.50	15	QPSK	H	100	348	1 / 74	10.15	9.58	19.73	0.094	33.01	-13.28
1880.00	15	QPSK	H	102	351	1 / 74	10.92	9.90	**20.82**	0.121	33.01	-12.19
1902.50	15	QPSK	H	100	358	1 / 74	10.50	10.20	20.70	0.117	33.01	-12.31
1880.00	15	16-QAM	H	102	351	1 / 74	9.99	9.90	**19.89**	0.097	33.01	-13.12
1860.00	20	QPSK	H	100	359	1 / 99	10.41	9.62	20.03	0.101	33.01	-12.98
1880.00	20	QPSK	H	100	354	1 / 99	11.30	9.90	**21.20**	0.132	33.01	-11.81
1900.00	20	QPSK	H	100	354	1 / 99	10.67	10.18	20.85	0.122	33.01	-12.16
1900.00	20	16-QAM	H	100	354	1 / 99	10.91	10.18	**21.09**	0.129	33.01	-11.92
1880.00	20	QPSK	V	122	360	1 / 49	9.73	9.90	19.63	0.092	33.01	-13.38

Table 7-6. EIRP Data (Band 2)

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]
2307.50	5	QPSK	H	100	155	1 / 0	10.19	10.31	**20.50**	**0.112**	23.98	-3.48
2312.50	5	QPSK	H	110	157	1 / 24	9.98	10.31	20.29	0.107	23.98	-3.69
2312.50	5	16-QAM	H	110	157	1 / 24	9.37	10.31	**19.68**	0.093	23.98	-4.30
2310.00	10	QPSK	H	100	151	1 / 0	9.93	10.31	**20.24**	0.106	23.98	-3.74
2310.00	10	16-QAM	H	100	151	1 / 0	9.02	10.31	19.33	0.086	23.98	-4.65
2307.50	5	QPSK	V	102	262	1 / 0	9.54	10.23	19.77	0.095	23.98	-4.21

Table 7-7. EIRP Data (Band 30)

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.

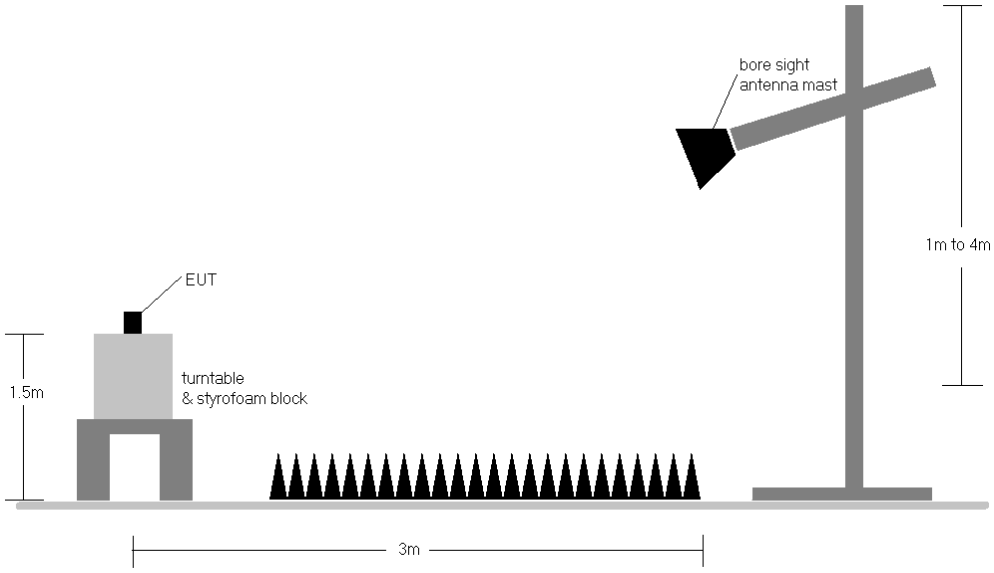


Figure 7-7. Test Instrument & Measurement Setup

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.

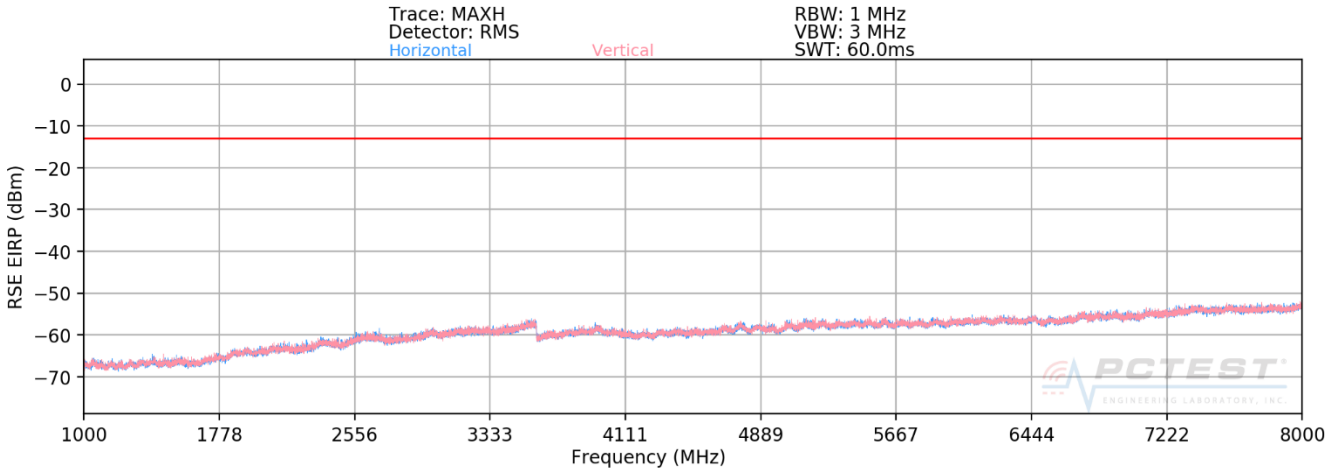
2) This unit was tested with its standard battery.

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 12



Plot 7-180. Radiated Spurious Plot above 1GHz (Band 12)

OPERATING FREQUENCY:	699.70	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	1.4	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]
1399.40	H	222	38	-67.87	2.63	-65.24	-52.2
2099.10	H	-	-	-67.77	3.56	-64.22	-51.2
2798.80	H	-	-	-67.42	4.92	-62.50	-49.5

Table 7-8. Radiated Spurious Data (Band 12 – Low Channel)

OPERATING FREQUENCY:	707.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	1.4	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]
1415.00	H	199	32	-66.50	2.80	-63.70	-50.7
2122.50	H	-	-	-67.37	3.57	-63.79	-50.8
2830.00	H	-	-	-67.63	5.02	-62.61	-49.6

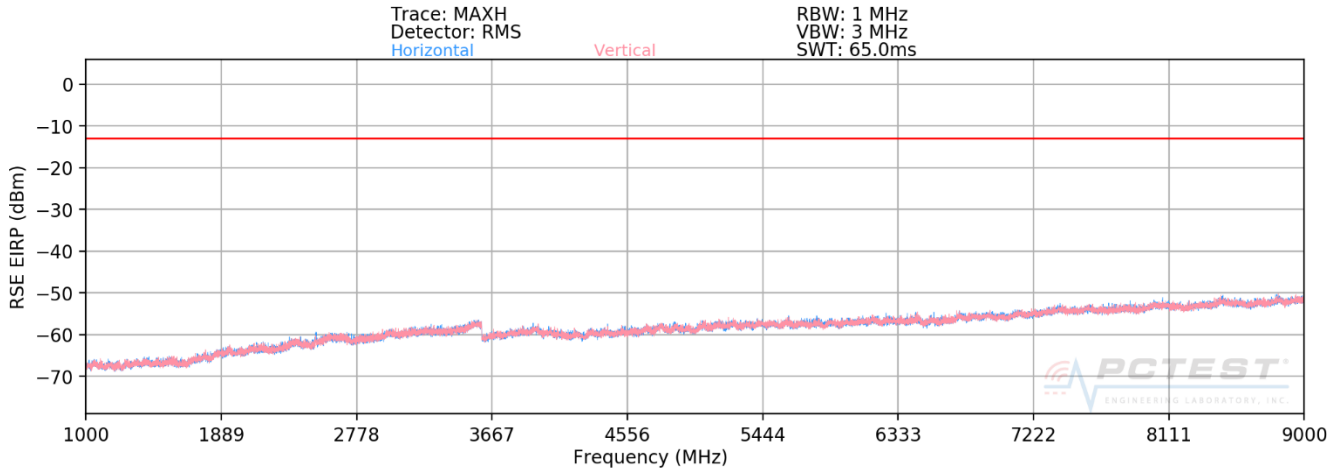
Table 7-9. Radiated Spurious Data (Band 12 – Mid Channel)

OPERATING FREQUENCY:	715.30	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	1.4	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]
1430.60	H	209	35	-67.24	2.98	-64.26	-51.3
2145.90	H	-	-	-67.66	3.59	-64.07	-51.1
2861.20	H	-	-	-68.00	5.12	-62.89	-49.9

Table 7-10. Radiated Spurious Data (Band 12 – High Channel)

Band 5



Plot 7-181. 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	283	47	-65.59	3.61	-61.98	-49.0
2487.00	V	-	-	-64.94	4.25	-60.69	-47.7
3316.00	V	-	-	-65.32	5.83	-59.49	-46.5

Table 7-11. 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	380	34	-64.10	3.62	-60.48	-47.5
2509.50	V	-	-	-65.07	4.33	-60.74	-47.7
3346.00	V	-	-	-65.26	5.92	-59.34	-46.3

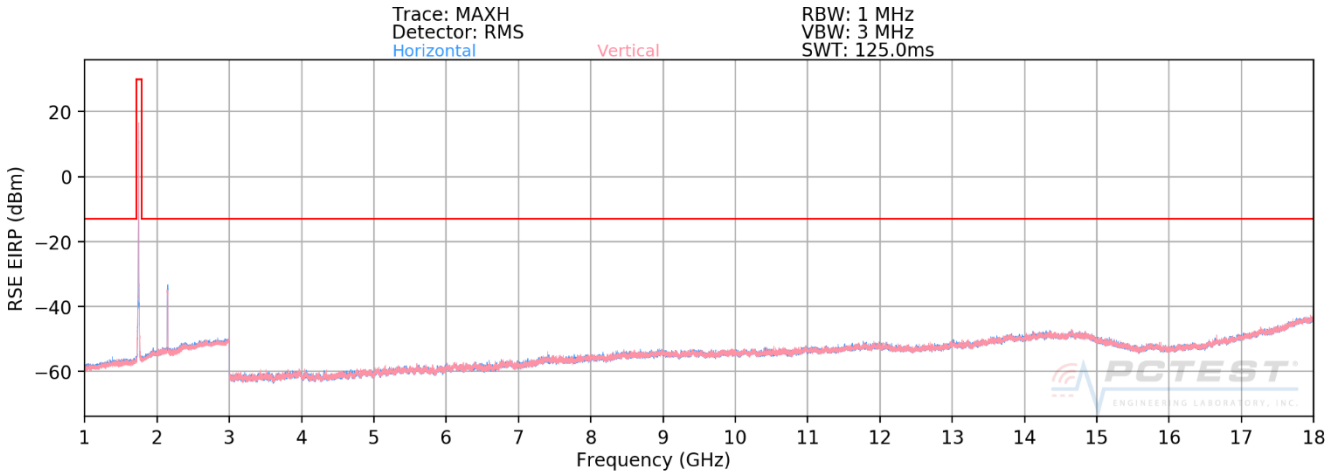
Table 7-12. Radiated Spurious Data (Band 5 – Mid Channel)

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	331	27	-64.67	3.63	-61.04	-48.0
2532.00	V	-	-	-65.42	4.47	-60.95	-48.0
3376.00	V	-	-	-65.10	6.05	-59.05	-46.0

Table 7-13. Radiated Spurious Data (Band 5 – High Channel)

Band 66/4



Plot 7-182. Radiated Spurious Plot above 1GHz (Band 66/4)

OPERATING FREQUENCY:	1715.00	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]
3430.00	V	122	360	-63.79	6.22	-57.57	-44.6
5145.00	V	-	-	-67.20	8.68	-58.53	-45.5
6860.00	V	-	-	-63.34	8.76	-54.59	-41.6

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

OPERATING FREQUENCY:	1745.00	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]
3490.00	V	395	18	-63.29	6.32	-56.96	-44.0
5235.00	V	-	-	-67.32	8.71	-58.60	-45.6
6980.00	V	-	-	-62.92	8.74	-54.18	-41.2
8725.00	V	-	-	-62.32	9.42	-52.91	-39.9

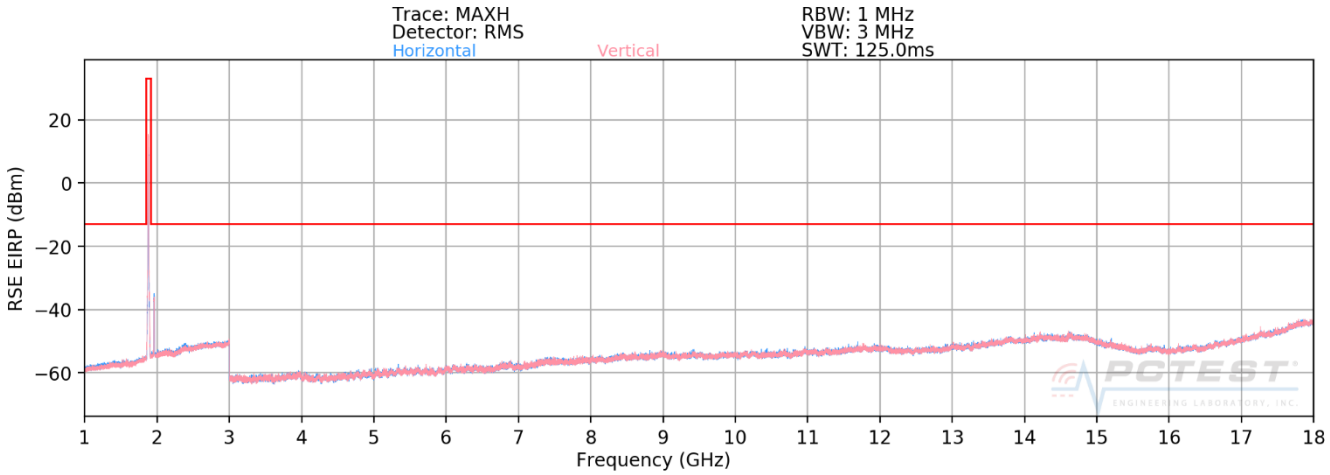
Table 7-15. Radiated Spurious Data (Band 66/4 – Mid Channel)

OPERATING FREQUENCY:	1775.00	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]
3550.00	V	152	350	-63.18	6.31	-56.87	-43.9
5325.00	V	-	-	-67.19	8.74	-58.46	-45.5
7100.00	V	-	-	-63.72	8.66	-55.06	-42.1

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

Band 2



Plot 7-183. Radiated Spurious Plot above 1GHz (Band 2)

OPERATING FREQUENCY:	1855.00	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]
3710.00	H	315	18	-67.06	6.57	-60.49	-47.5
5565.00	H	201	345	-67.59	8.73	-58.86	-45.9
7420.00	H	346	54	-56.62	8.41	-48.21	-35.2
9275.00	H	-	-	-65.11	9.40	-55.71	-42.7
11130.00	H	183	358	-58.57	9.32	-49.25	-36.3
12985.00	H	-	-	-60.19	8.99	-51.20	-38.2
14840.00	H	-	-	-58.61	8.62	-49.98	-37.0

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

OPERATING FREQUENCY:	1880.00	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]
3760.00	H	104	47	-65.21	6.67	-58.54	-45.5
5640.00	H	210	349	-68.40	8.81	-59.59	-46.6
7520.00	H	348	49	-58.28	8.48	-49.79	-36.8
9400.00	H	-	-	-64.72	9.32	-55.40	-42.4
11280.00	H	177	354	-57.67	9.24	-48.43	-35.4
13160.00	H	-	-	-60.31	9.07	-51.24	-38.2
15040.00	H	-	-	-58.15	8.77	-49.38	-36.4

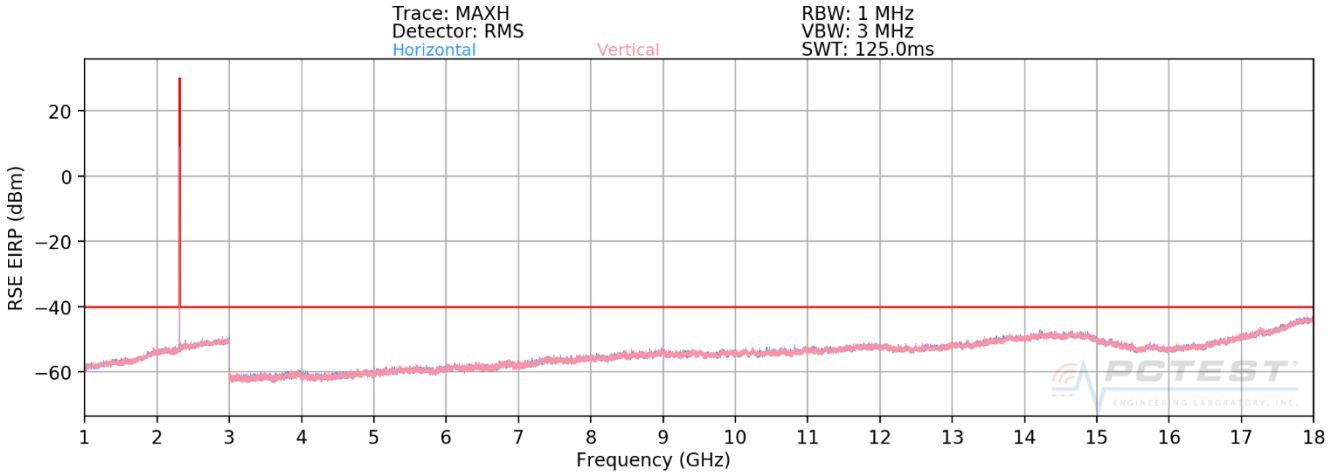
Table 7-18. Radiated Spurious Data (Band 2 – Mid Channel)

OPERATING FREQUENCY:	1905.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

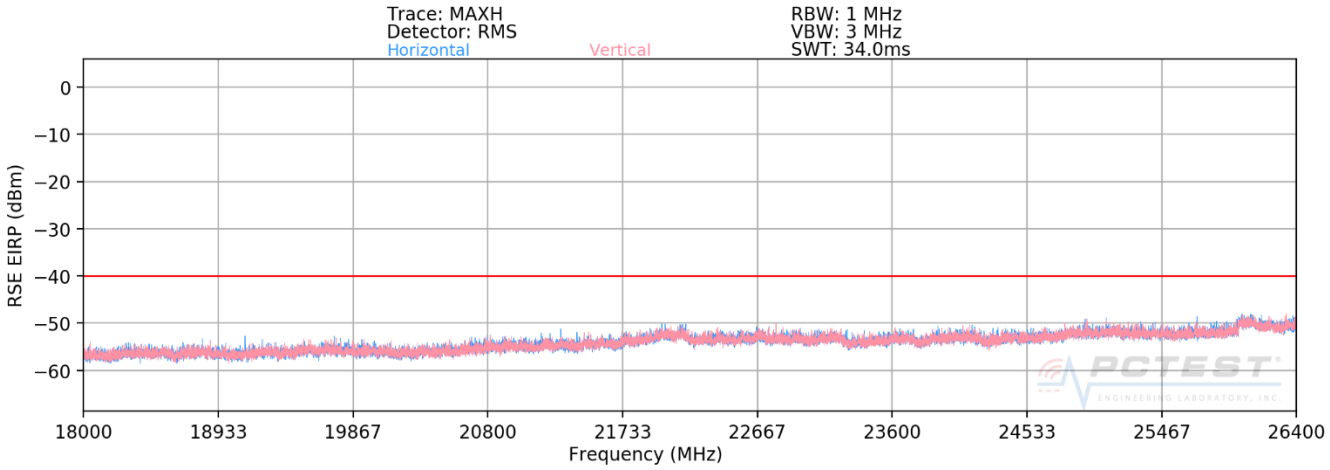
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3810.00	H	105	51	-62.58	6.94	-55.64	-42.6
5715.00	H	206	364	-67.57	8.77	-58.81	-45.8
7620.00	H	340	44	-59.00	8.51	-50.50	-37.5
9525.00	H	-	-	-65.48	9.40	-56.08	-43.1
11430.00	H	189	349	-57.93	9.19	-48.73	-35.7
13335.00	H	-	-	-59.89	8.91	-50.98	-38.0
15240.00	H	-	-	-57.43	8.41	-49.02	-36.0

Table 7-19. Radiated Spurious Data (Band 2 – High Channel)

Band 30



Plot 7-184. Radiated Spurious Plot above 1GHz (Band 30)



Plot 7-185. Radiated Spurious Plot 18GHz – 26.5GHz (Band 30)

OPERATING FREQUENCY:	2310.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-40	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]
4620.00	H	218	26	-62.32	8.25	-54.07	-14.1
6930.00	H	-	-	-66.98	8.72	-58.25	-18.3
9240.00	H	195	318	-60.07	9.52	-50.55	-10.5
11550.00	H	-	-	-62.28	9.19	-53.09	-13.1
13860.00	H	-	-	-60.27	9.00	-51.27	-11.3

Table 7-20. Radiated Spurious Data (Band 30 – Mid 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 2the 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 12 Frequency Stability Measurements

OPERATING FREQUENCY:	707,500,000	Hz
CHANNEL:	23790	
REFERENCE VOLTAGE:	4.37	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.37	- 30	707,500,036	36	0.0000051
100 %		- 20	707,499,922	-78	-0.0000110
100 %		- 10	707,499,931	-69	-0.0000098
100 %		0	707,499,893	-107	-0.0000151
100 %		+ 10	707,499,941	-59	-0.0000083
100 %		+ 20	707,499,813	-187	-0.0000264
100 %		+ 30	707,499,991	-9	-0.0000013
100 %		+ 40	707,500,077	77	0.0000109
100 %		+ 50	707,499,792	-208	-0.0000294
BATT. ENDPOINT	3.05	+ 20	707,500,129	129	0.0000182

Table 7-21. Frequency Stability Data (Band 12)

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 12 Frequency Stability Measurements

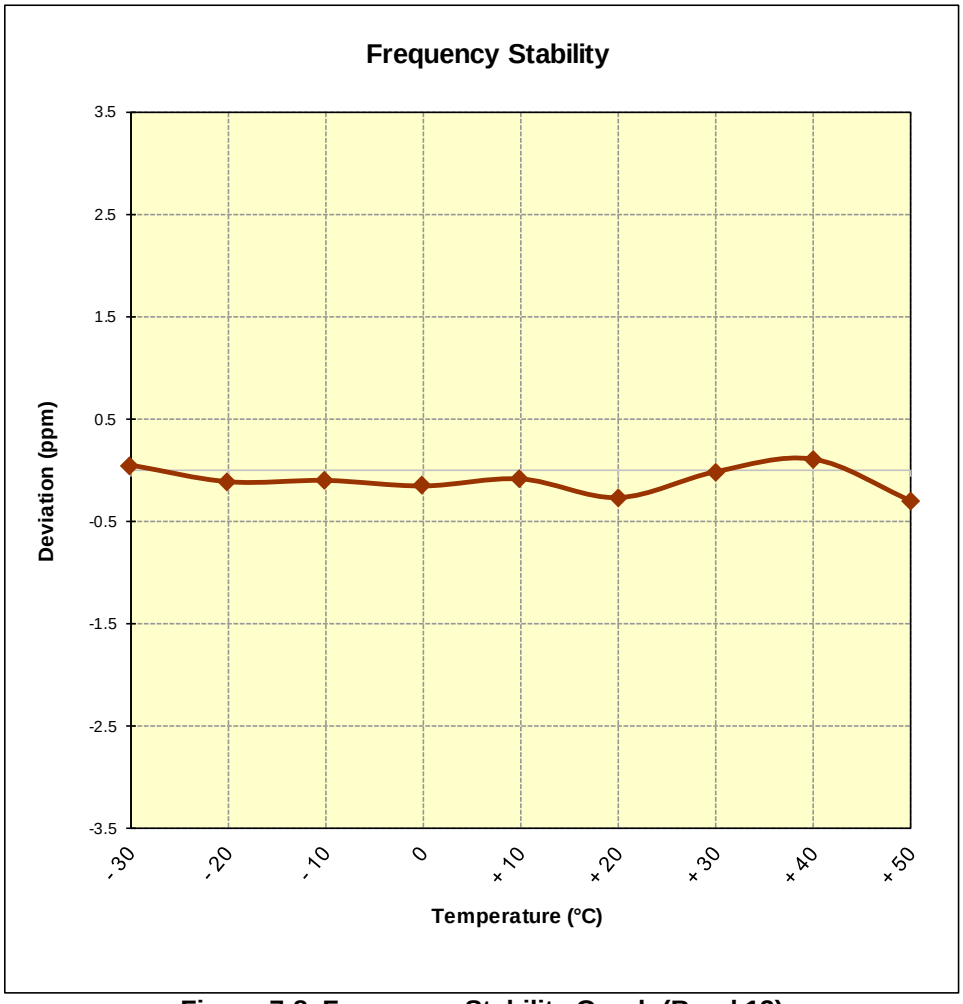


Figure 7-8. Frequency Stability Graph (Band 12)

Band 5 Frequency Stability Measurements

OPERATING FREQUENCY:	836,500,000	Hz
CHANNEL:	20525	
REFERENCE VOLTAGE:	4.37	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.37	- 30	836,500,465	465	0.0000556
100 %		- 20	836,500,046	46	0.0000055
100 %		- 10	836,500,120	120	0.0000143
100 %		0	836,499,973	-27	-0.0000032
100 %		+ 10	836,499,746	-254	-0.0000304
100 %		+ 20	836,500,218	218	0.0000261
100 %		+ 30	836,500,035	35	0.0000042
100 %		+ 40	836,500,131	131	0.0000157
100 %		+ 50	836,500,049	49	0.0000059
BATT. ENDPOINT	3.05	+ 20	836,500,015	15	0.0000018

Table 7-22. Frequency Stability Data (Band 5)

Band 5 Frequency Stability Measurements

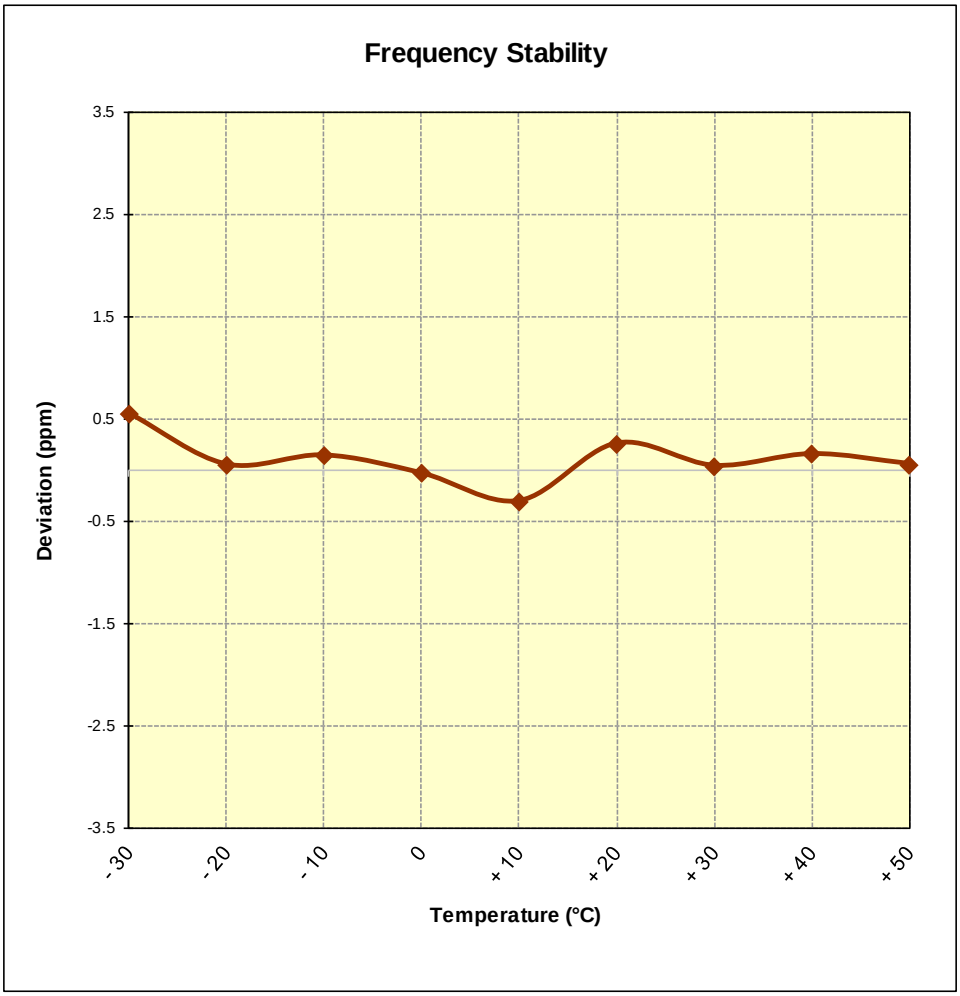


Figure 7-9. Frequency Stability Graph (Band 5)

Band 66/4 Frequency Stability Measurements

OPERATING FREQUENCY:	1,745,000,000	Hz
CHANNEL:	132322	
REFERENCE VOLTAGE:	4.37	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.37	- 30	1,745,000,011	11	0.0000006
100 %		- 20	1,745,000,157	157	0.0000090
100 %		- 10	1,744,999,697	-303	-0.0000174
100 %		0	1,744,999,690	-310	-0.0000178
100 %		+ 10	1,745,000,048	48	0.0000028
100 %		+ 20	1,744,999,962	-38	-0.0000022
100 %		+ 30	1,744,999,757	-243	-0.0000139
100 %		+ 40	1,744,999,904	-96	-0.0000055
100 %		+ 50	1,744,999,711	-289	-0.0000166
BATT. ENDPOINT	3.05	+ 20	1,745,000,008	8	0.0000005

Table 7-23. 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

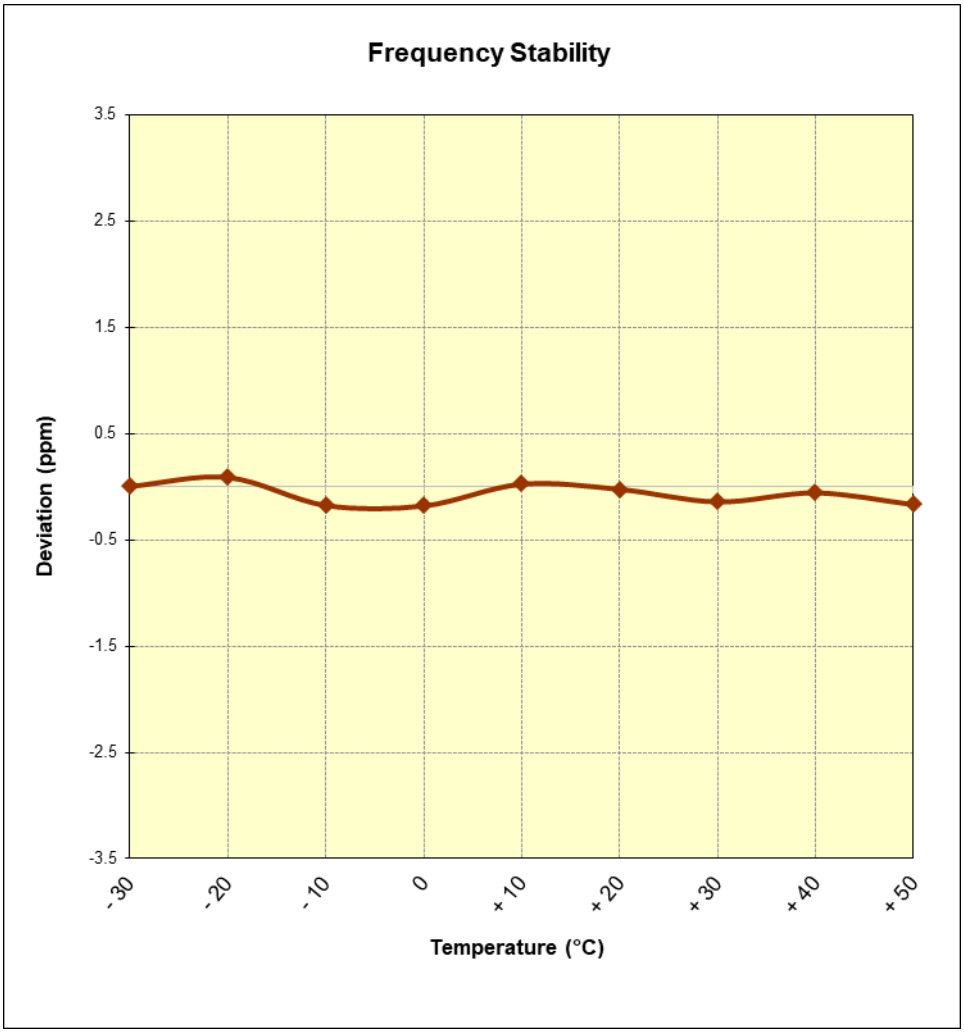


Figure 7-10. Frequency Stability Graph (Band 66/4)

Band 2 Frequency Stability Measurements

OPERATING FREQUENCY:	1,880,000,000	Hz
CHANNEL:	18900	
REFERENCE VOLTAGE:	4.37	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.37	- 30	1,880,000,119	119	0.0000063
100 %		- 20	1,879,999,753	-247	-0.0000131
100 %		- 10	1,879,999,840	-160	-0.0000085
100 %		0	1,880,000,404	404	0.0000215
100 %		+ 10	1,880,000,018	18	0.0000010
100 %		+ 20	1,879,999,825	-175	-0.0000093
100 %		+ 30	1,880,000,061	61	0.0000032
100 %		+ 40	1,879,999,647	-353	-0.0000188
100 %		+ 50	1,880,000,123	123	0.0000065
BATT. ENDPOINT	3.05	+ 20	1,879,999,947	-53	-0.0000028

Table 7-24. Frequency Stability Data (Band 2)

Band 2 Frequency Stability Measurements

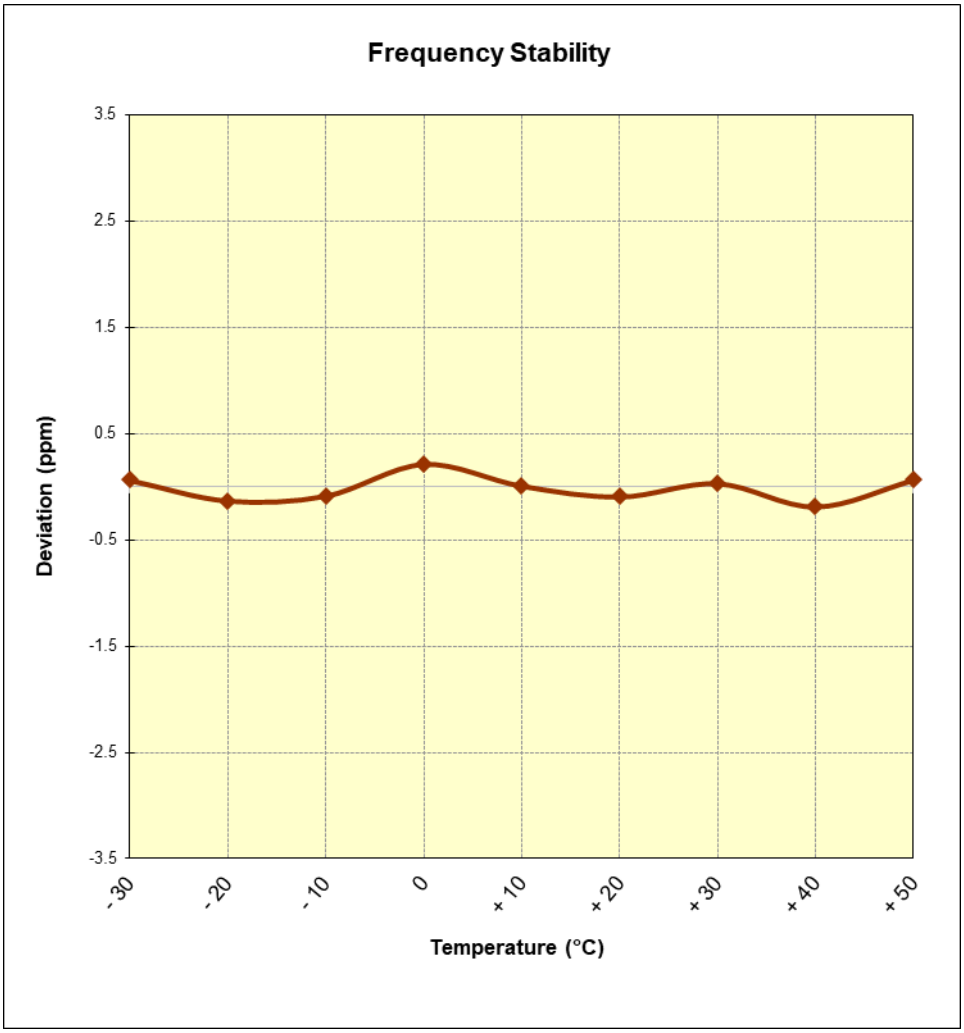


Figure 7-11. Frequency Stability Graph (Band 2)

Band 30 Frequency Stability Measurements

OPERATING FREQUENCY:	2,310,000,000	Hz
CHANNEL:	27710	
REFERENCE VOLTAGE:	4.37	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.37	- 30	2,310,000,136	136	0.0000059
100 %		- 20	2,310,000,080	80	0.0000035
100 %		- 10	2,309,999,956	-44	-0.0000019
100 %		0	2,309,999,997	-3	-0.0000001
100 %		+ 10	2,310,000,314	314	0.0000136
100 %		+ 20	2,309,999,816	-184	-0.0000080
100 %		+ 30	2,309,999,799	-201	-0.0000087
100 %		+ 40	2,309,999,827	-173	-0.0000075
100 %		+ 50	2,309,999,896	-104	-0.0000045
BATT. ENDPOINT	3.05	+ 20	2,309,999,831	-169	-0.0000073

Table 7-25. Frequency Stability Data (Band 30)

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 30 Frequency Stability Measurements

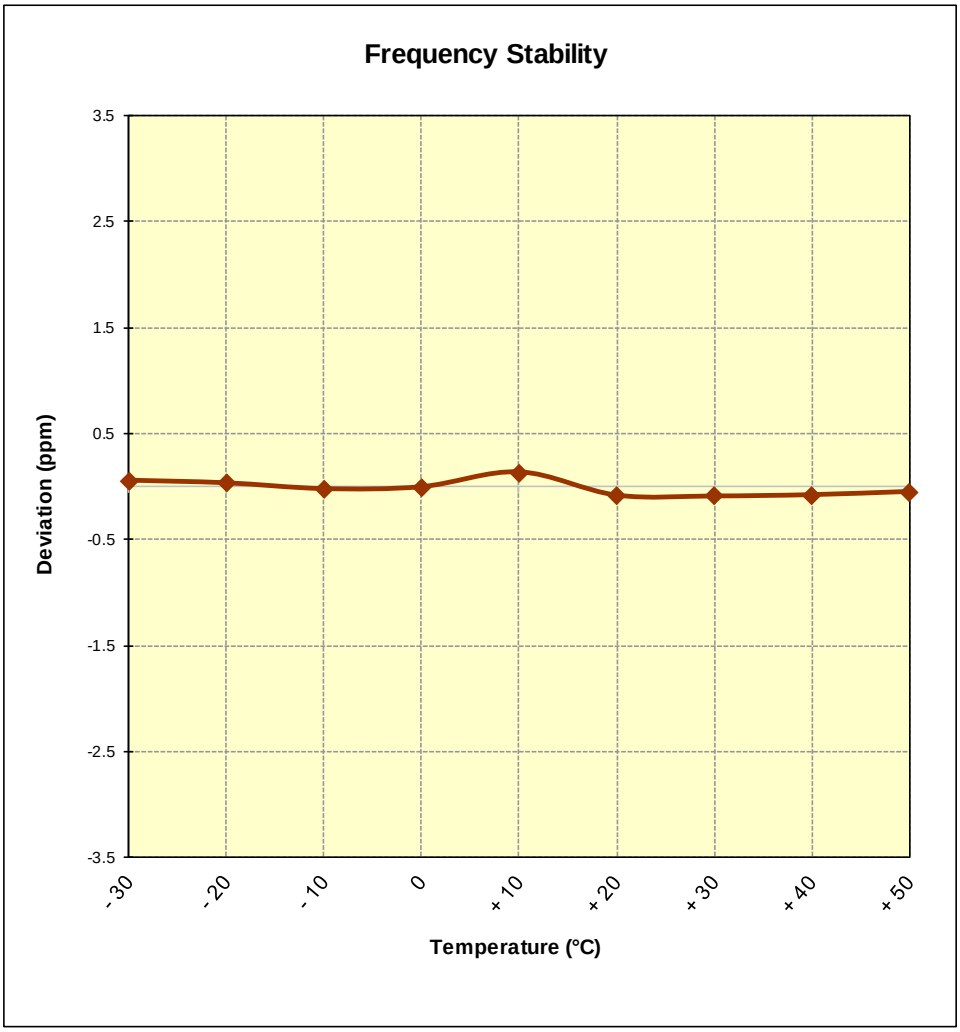


Figure 7-12. Frequency Stability Graph (Band 30)

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFQ720AM** complies with all the requirements of Part 22, 24, & 27 of the FCC Rules for LTE operation only.