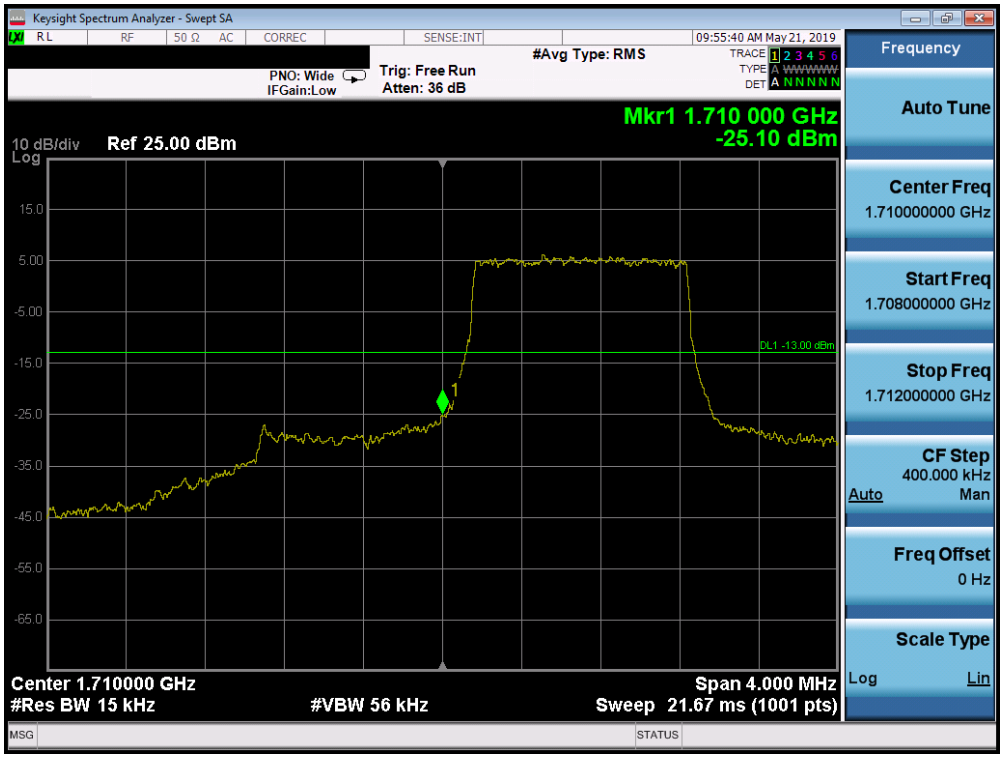
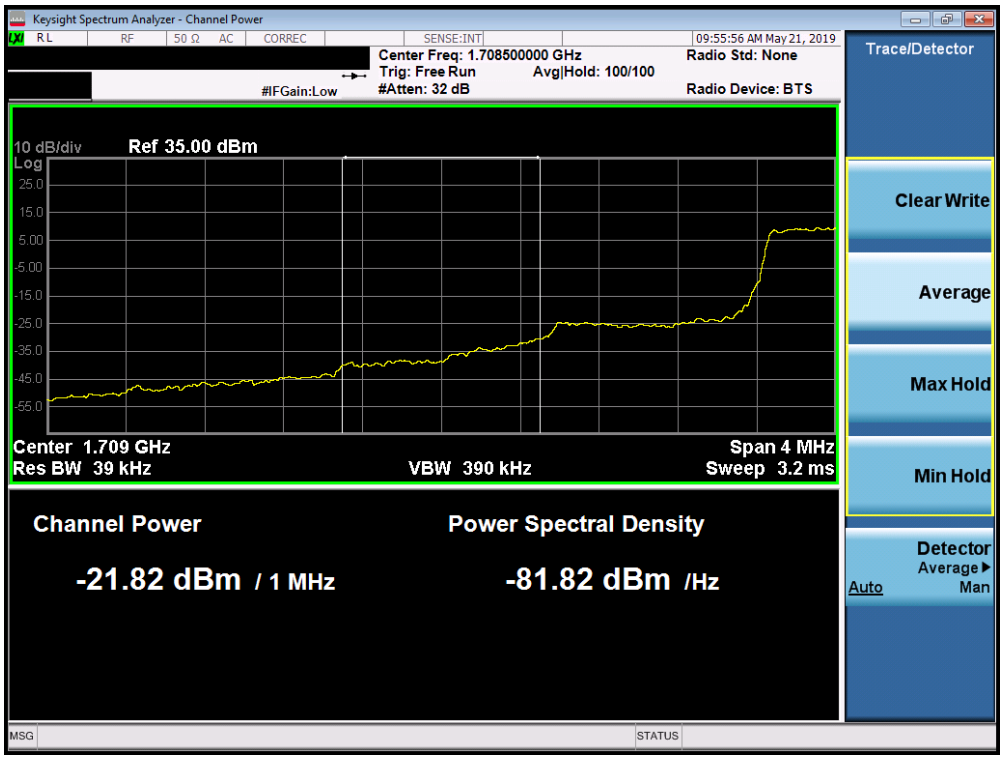
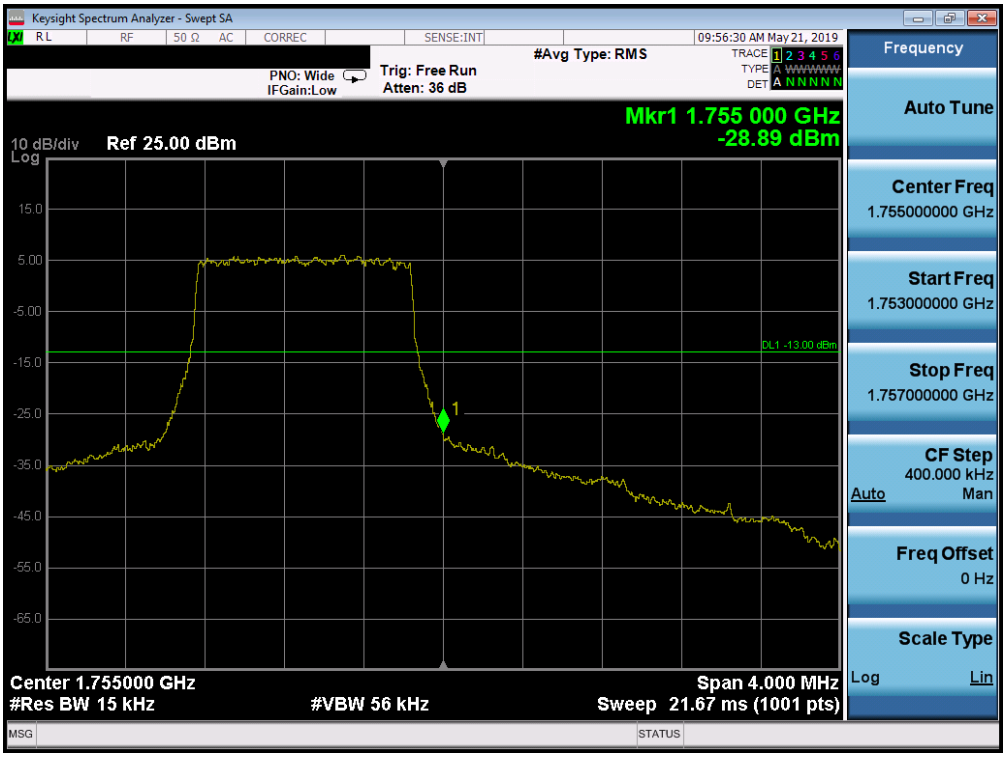


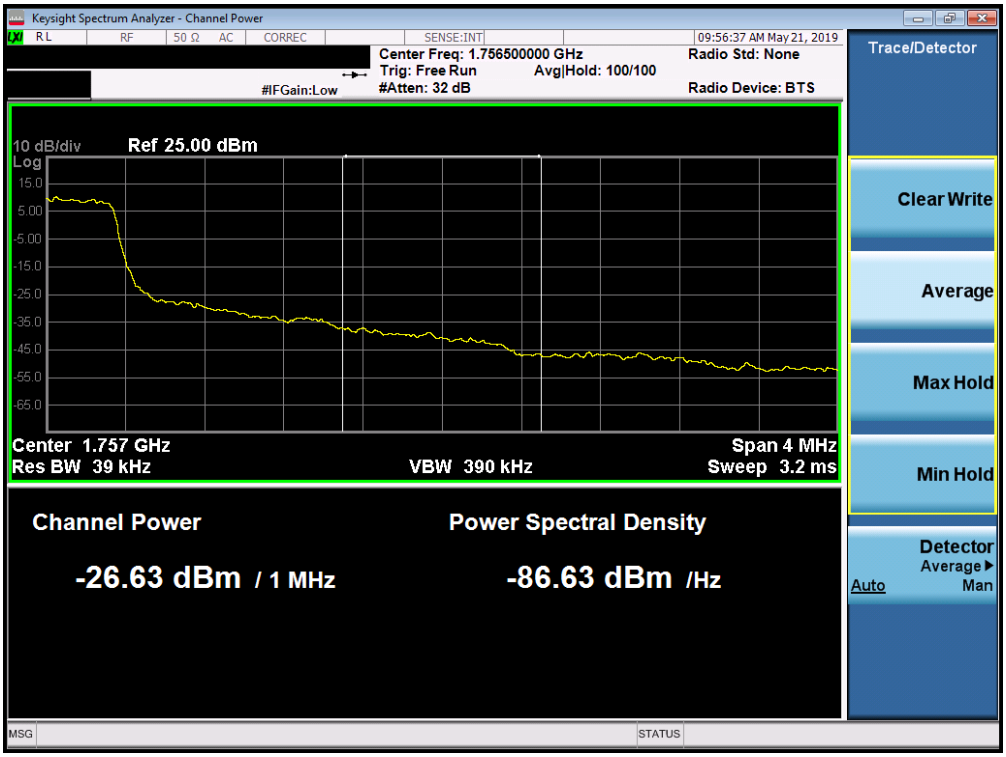
Plot 7-100. Lower Band Edge Plot (Band 66/4 - 1.4MHz QPSK - Full RB Configuration)



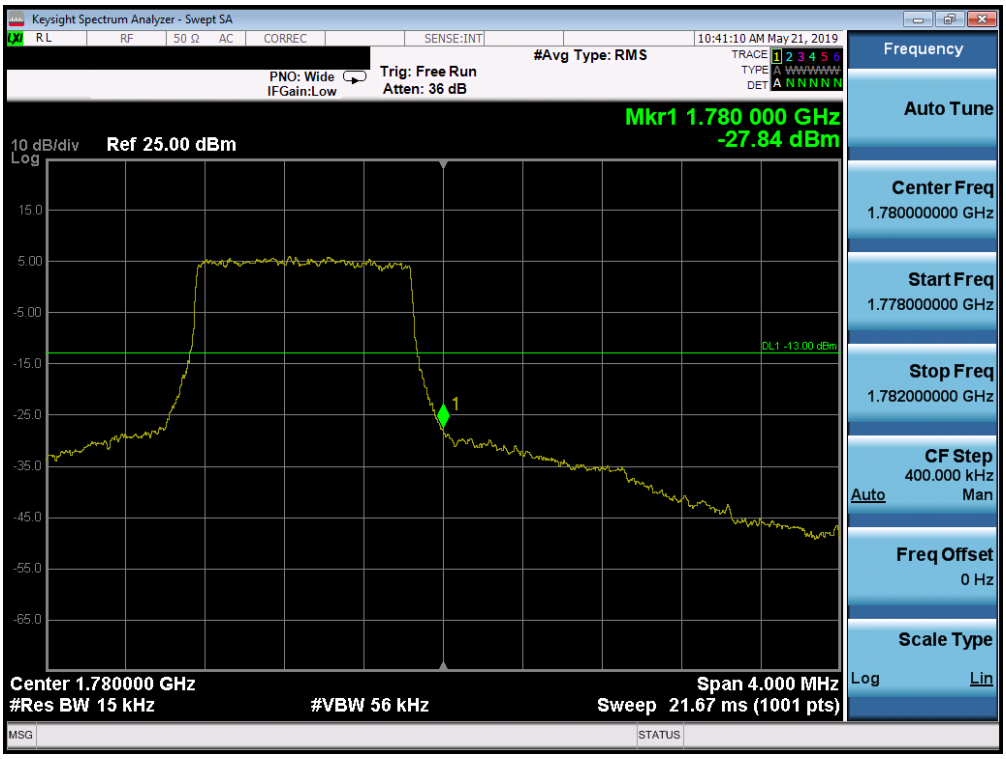
Plot 7-101. Lower Extended Band Edge Plot (Band 66/4 - 1.4MHz QPSK - Full RB Configuration)



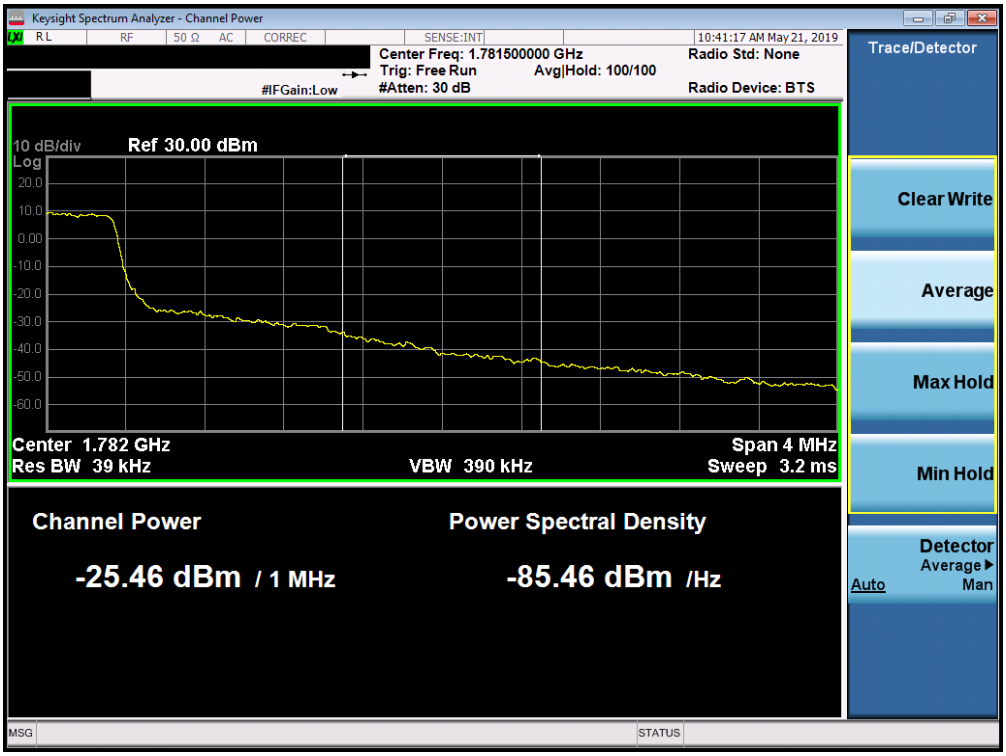
Plot 7-102. Upper Band Edge Plot (Band 4 - 1.4MHz QPSK - Full RB Configuration)



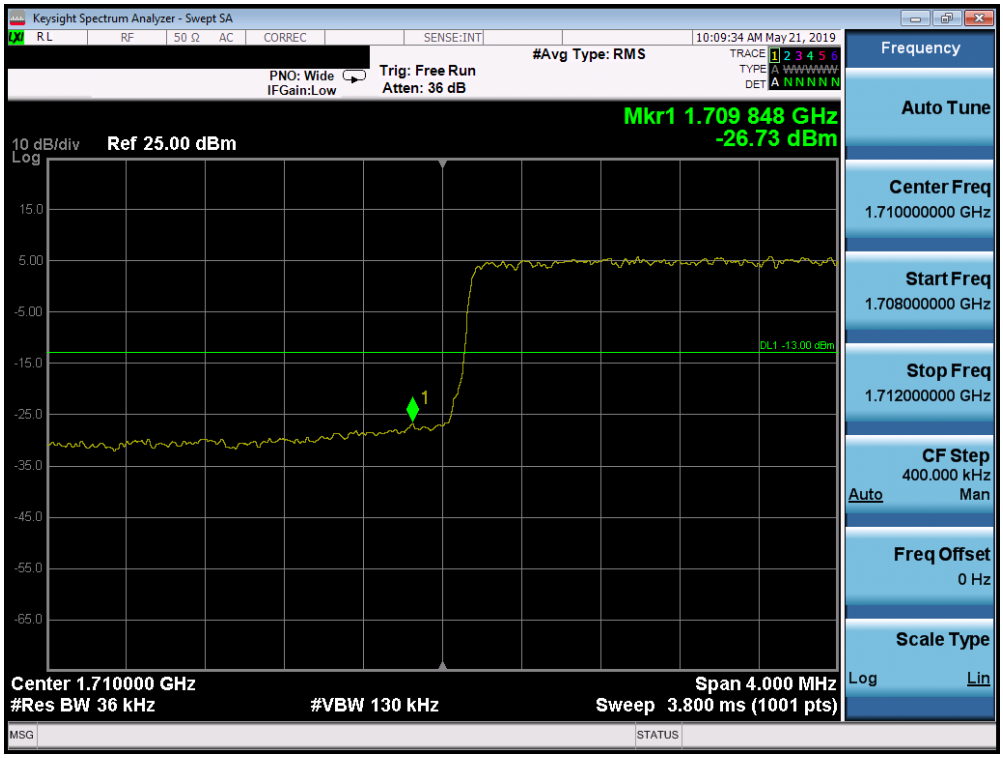
Plot 7-103. Upper Extended Band Edge Plot (Band 4 - 1.4MHz QPSK - Full RB Configuration)



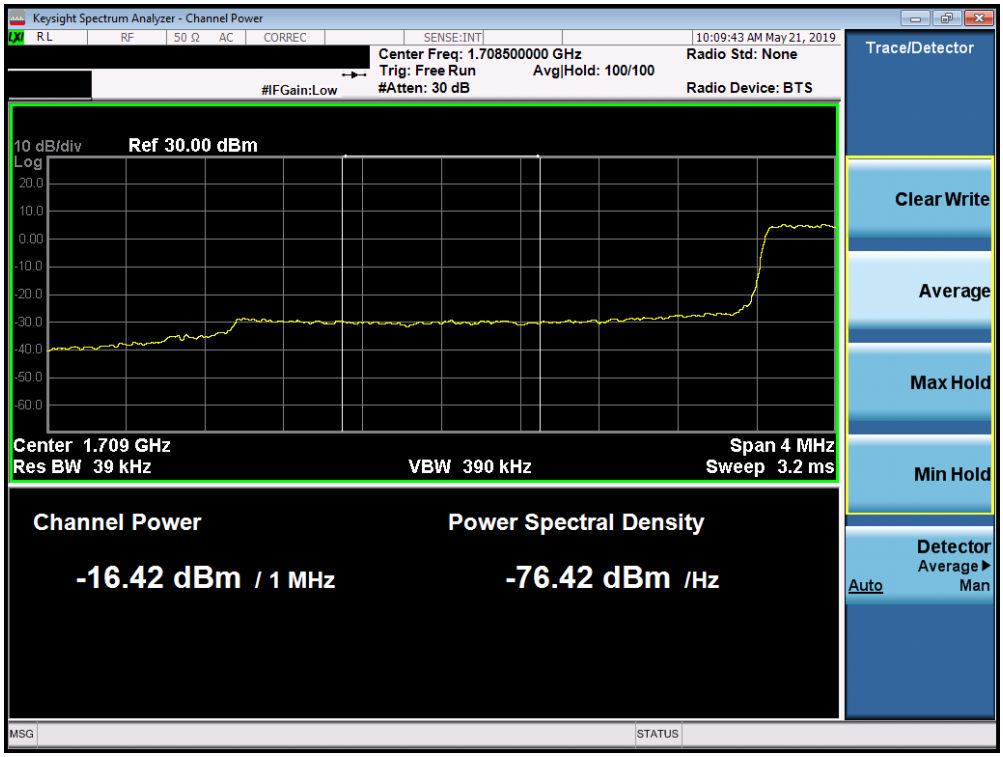
Plot 7-104. Upper Band Edge Plot (Band 66 - 1.4MHz QPSK - Full RB Configuration)



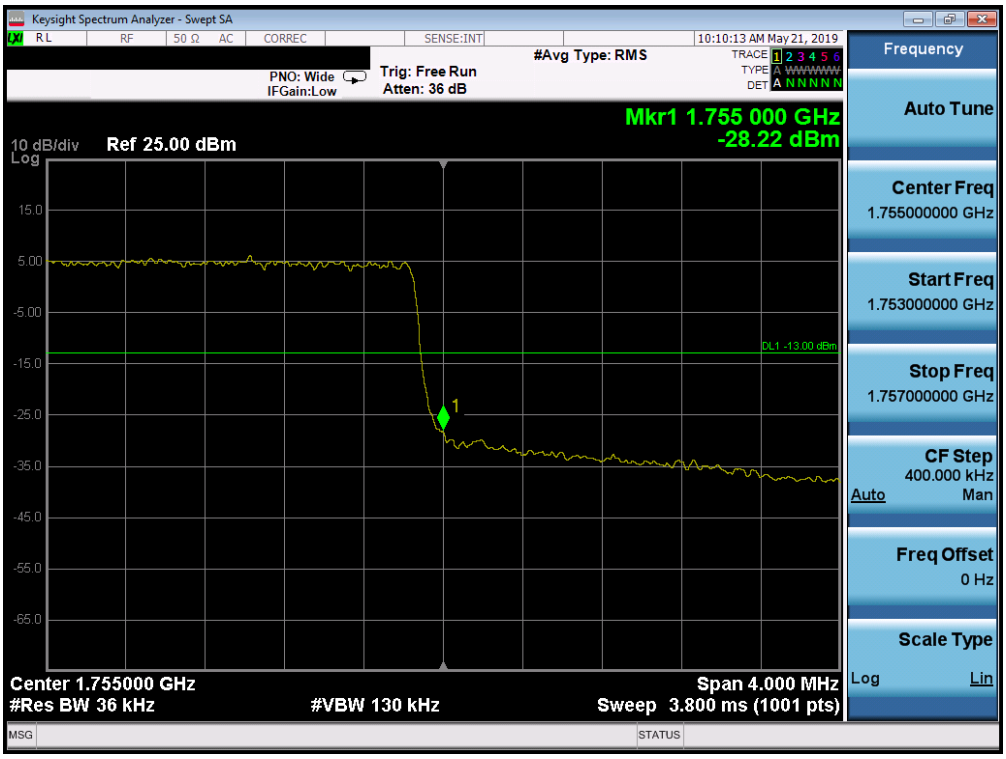
Plot 7-105. Upper Extended Band Edge Plot (Band 66 - 1.4MHz QPSK - Full RB Configuration)



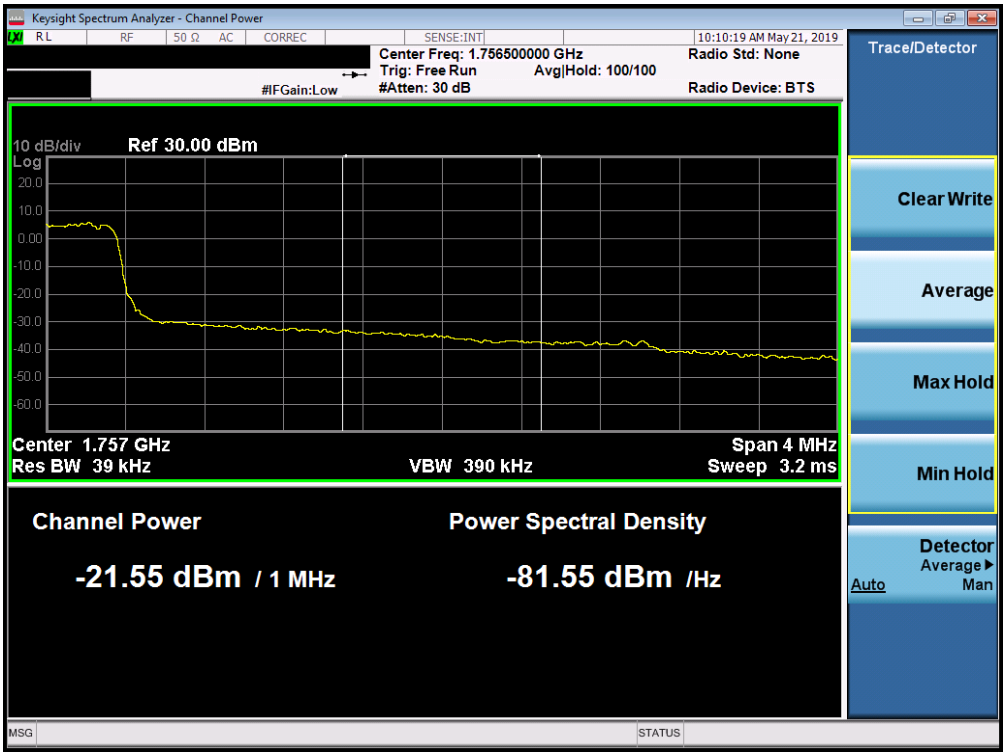
Plot 7-106. Lower Band Edge Plot (Band 66/4 - 3.0MHz QPSK - Full RB Configuration)



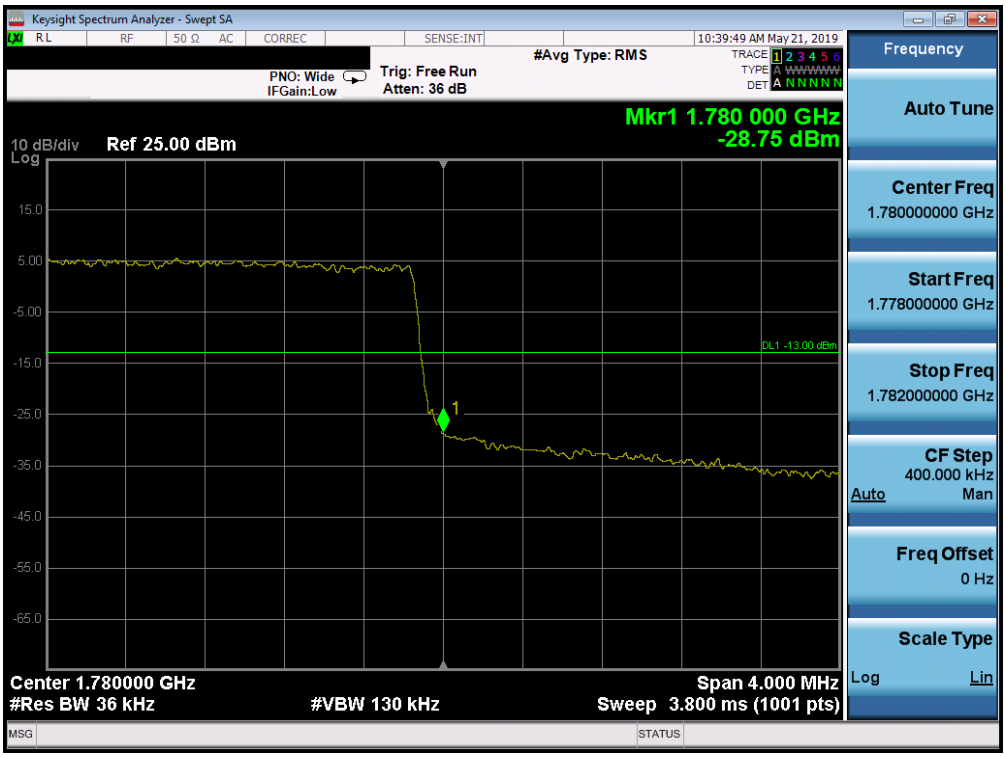
Plot 7-107. Lower Extended Band Edge Plot (Band 66/4 - 3.0MHz QPSK - Full RB Configuration)



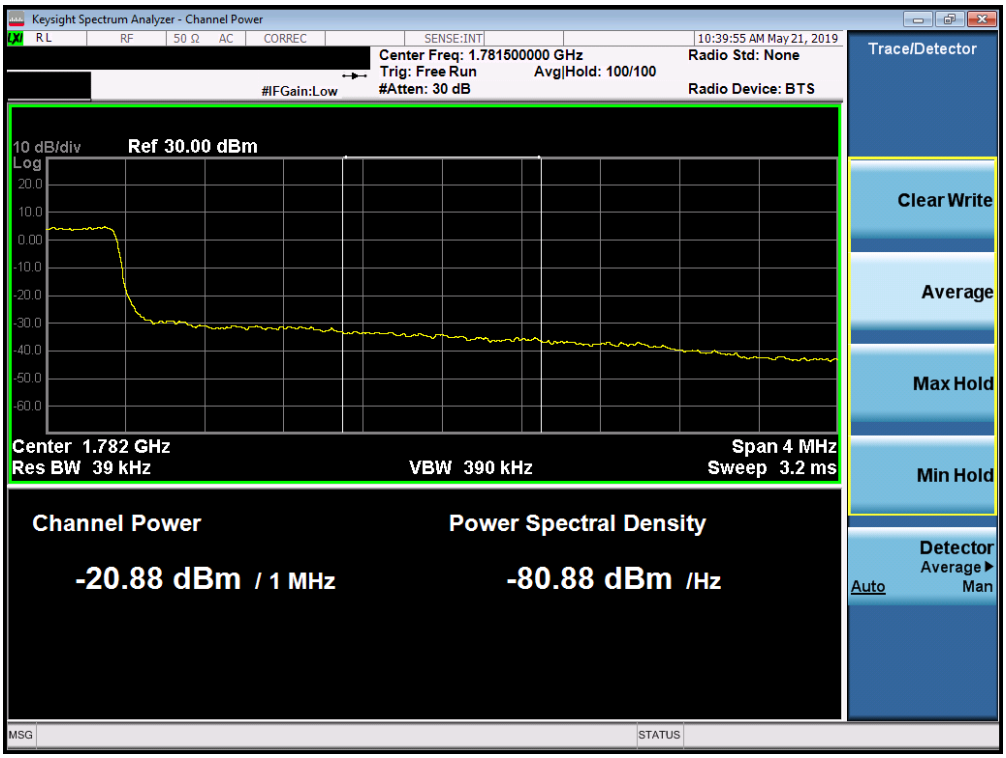
Plot 7-108. Upper Band Edge Plot (Band 4 - 3.0MHz QPSK - Full RB Configuration)



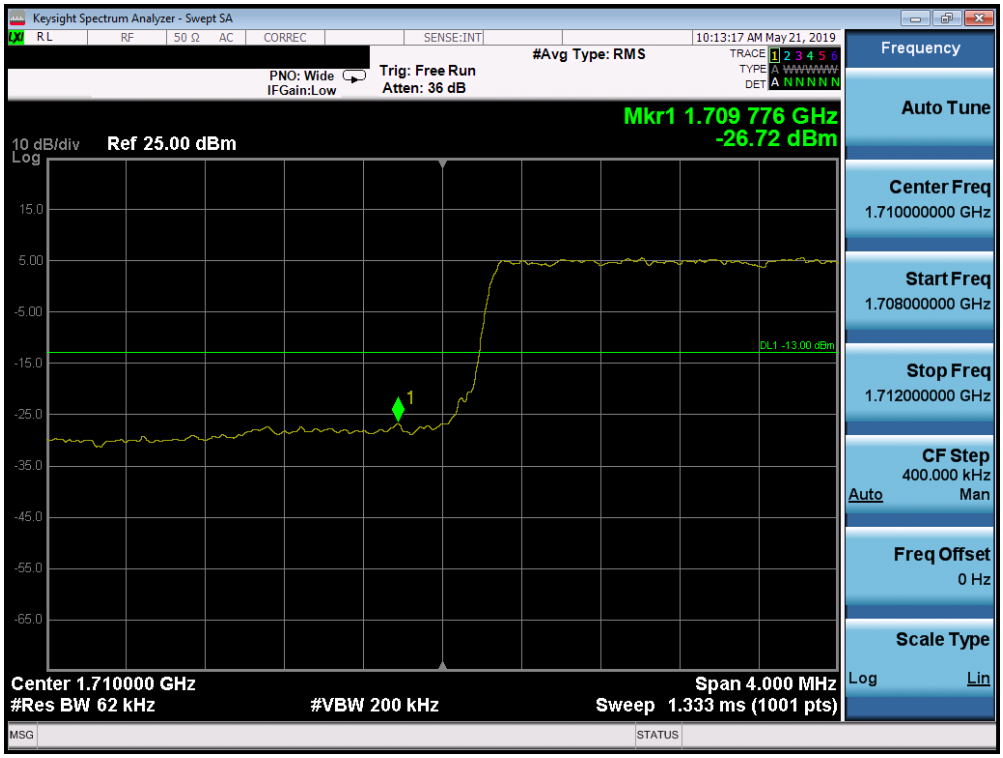
Plot 7-109. Upper Extended Band Edge Plot (Band 4 - 3.0MHz QPSK - Full RB Configuration)



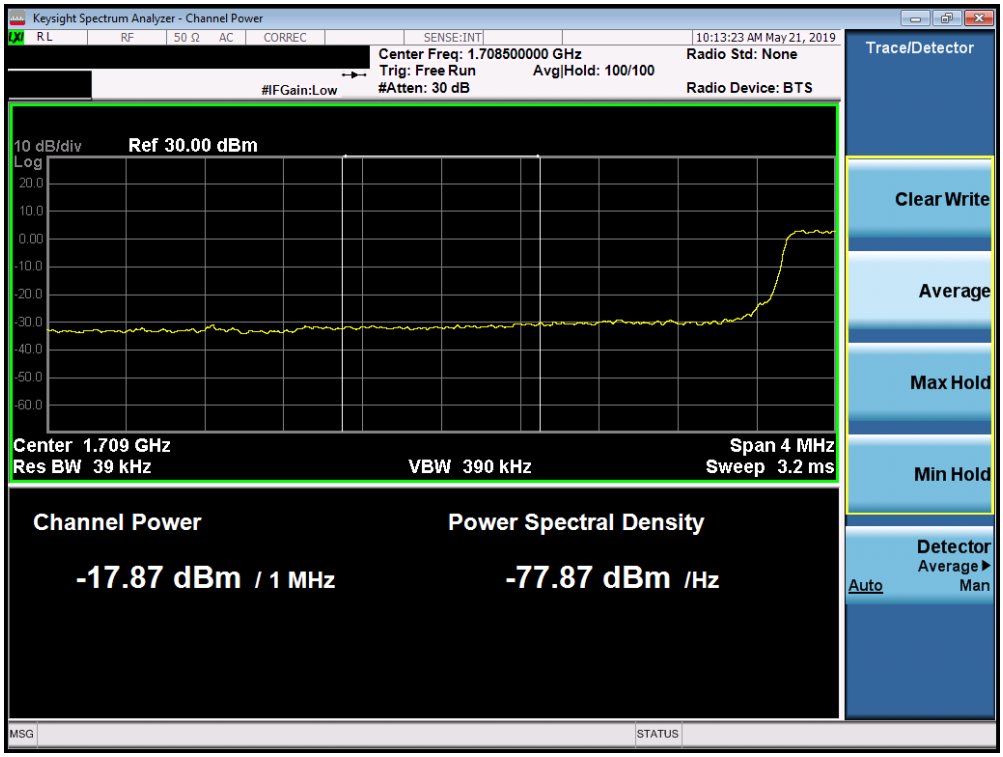
Plot 7-110. Upper Band Edge Plot (Band 66 - 3.0MHz QPSK - Full RB Configuration)



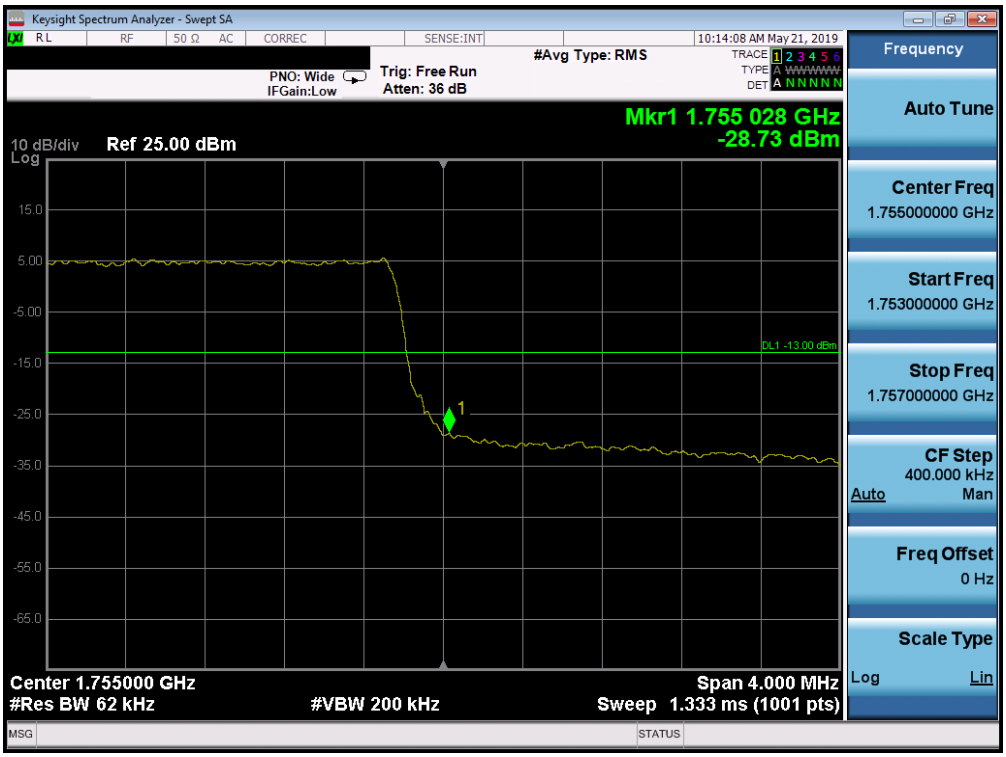
Plot 7-111. Upper Extended Band Edge Plot (Band 66 - 3.0MHz QPSK - Full RB Configuration)



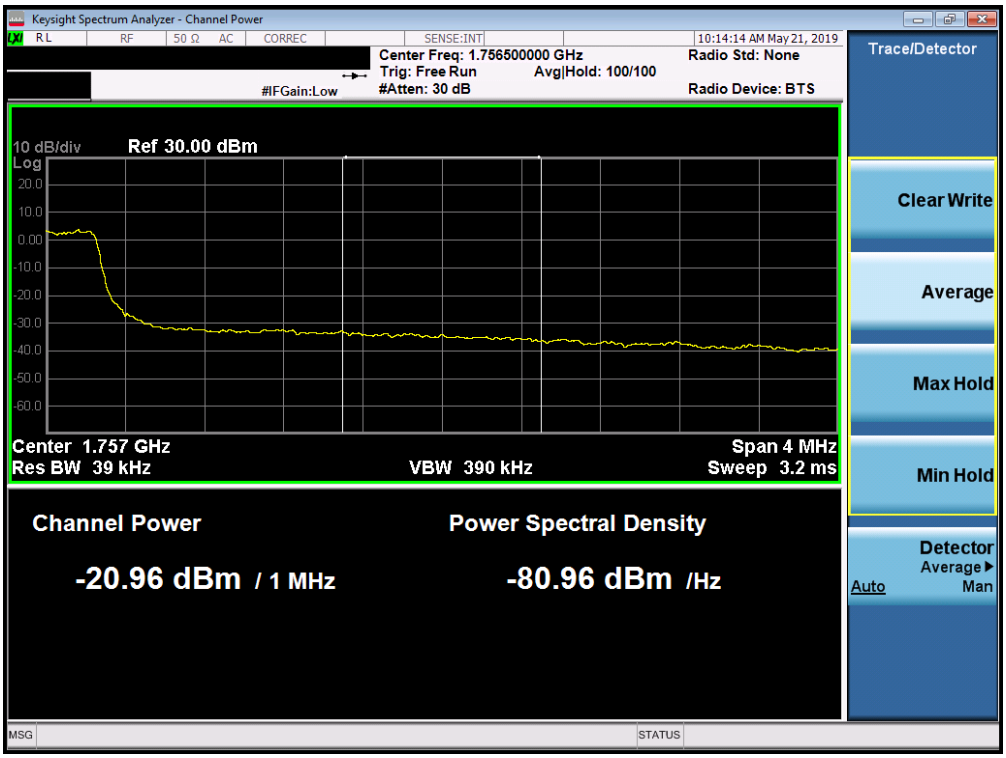
Plot 7-112. Lower Band Edge Plot (Band 66/4 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-113. Lower Extended Band Edge Plot (Band 66/4 - 5.0MHz QPSK - Full RB Configuration)

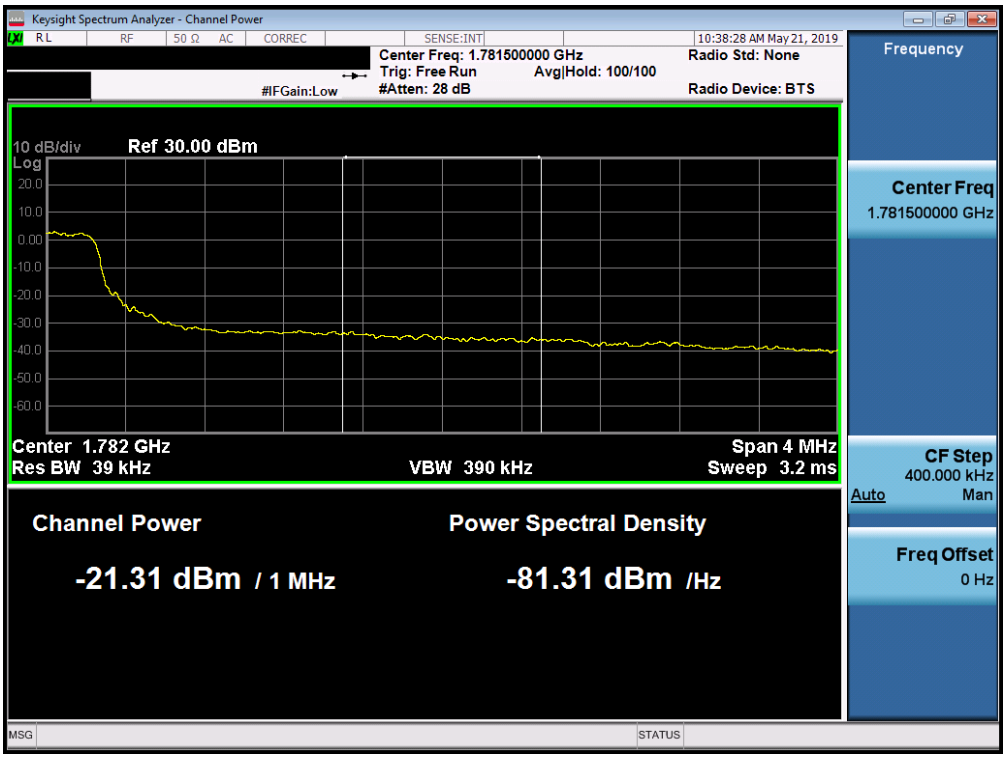


Plot 7-114. Upper Band Edge Plot (Band 4 - 5.0MHz QPSK - Full RB Configuration)

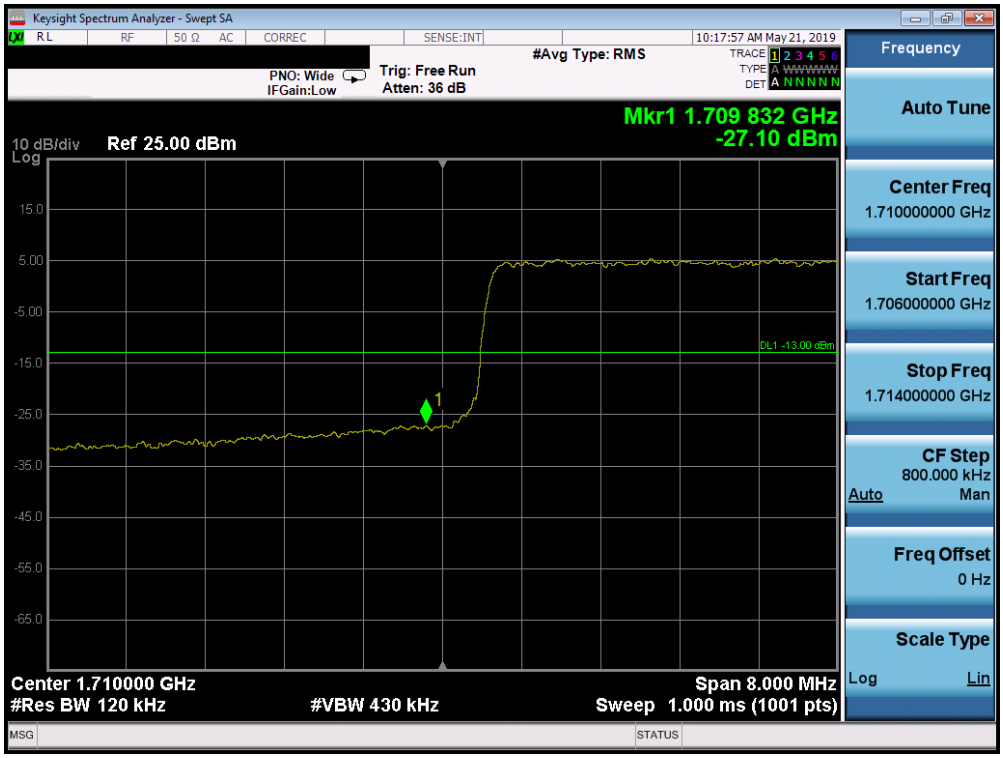


Plot 7-115. Upper Extended Band Edge Plot (Band 4 - 5.0MHz QPSK - Full RB Configuration)

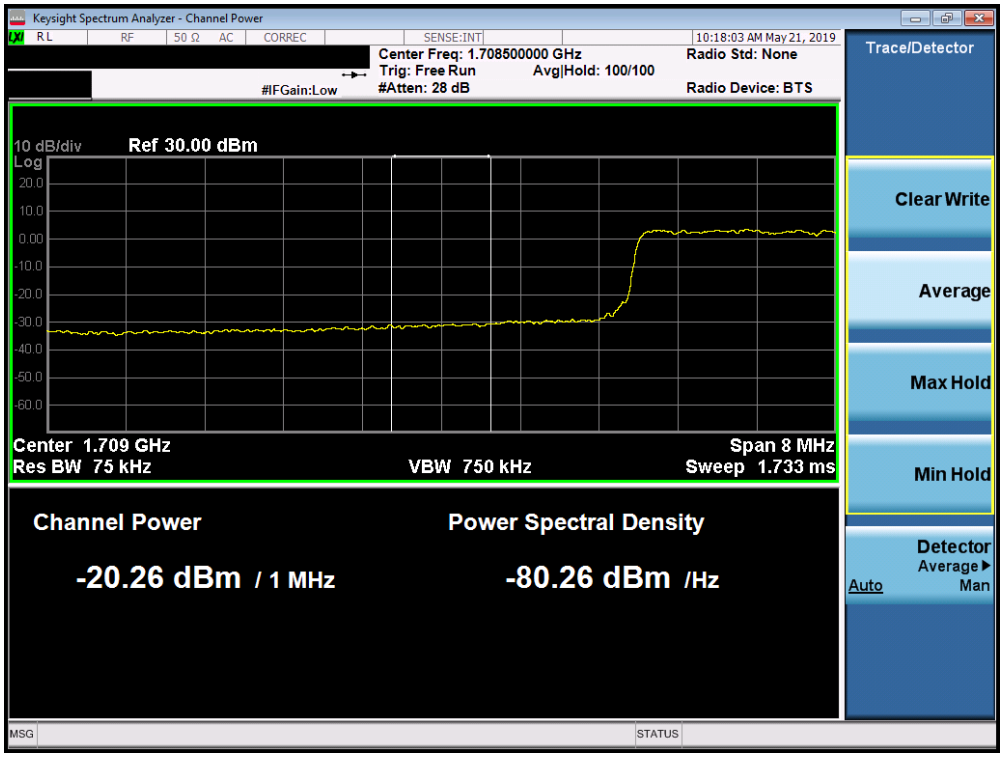
Plot 7-116. Upper Band Edge Plot (Band 66 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-117. Upper Extended Band Edge Plot (Band 66 - 5.0MHz QPSK - Full RB Configuration)

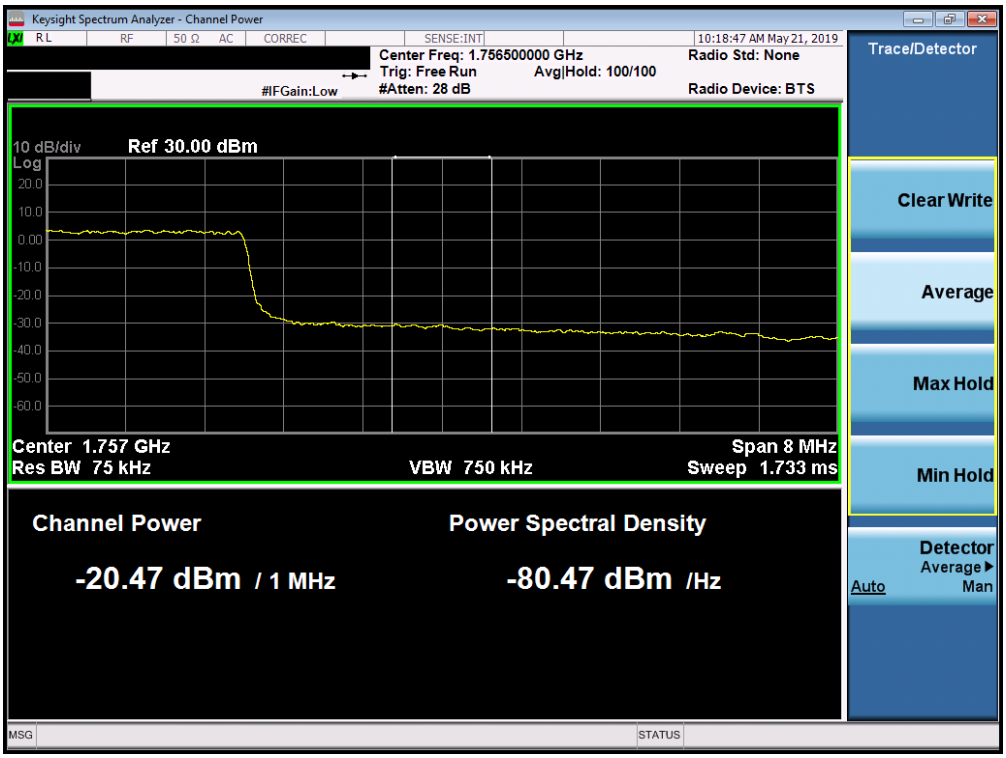


Plot 7-118. Lower Band Edge Plot (Band 66/4 - 10.0MHz QPSK - Full RB Configuration)



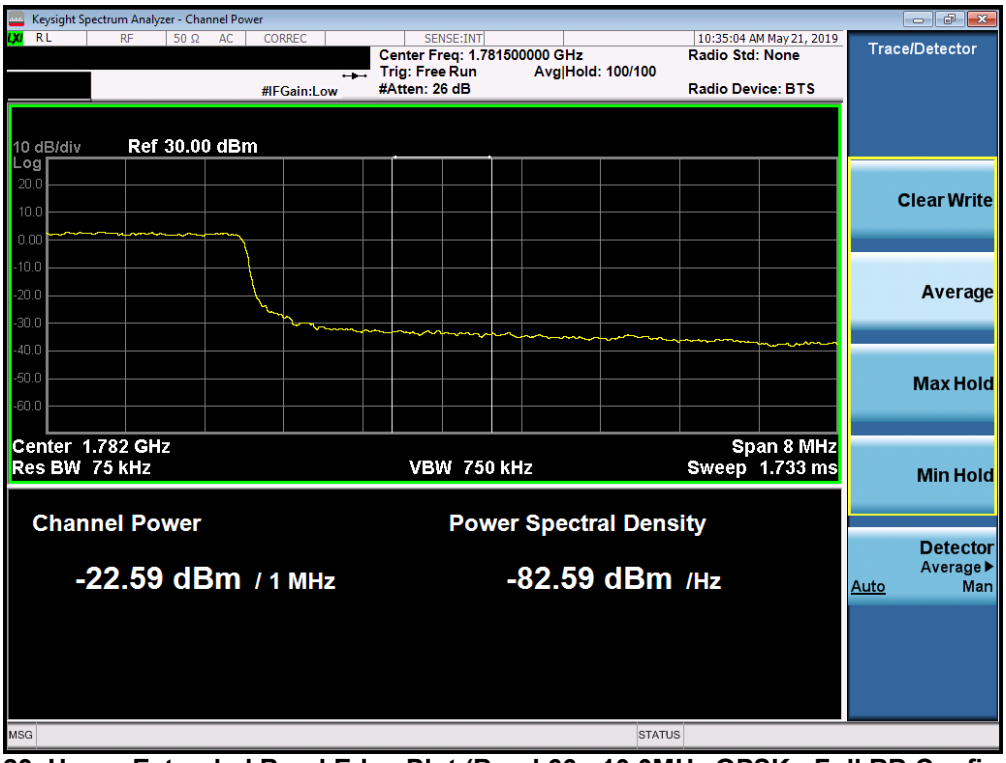
Plot 7-119. Lower Extended Band Edge Plot (Band 66/4 - 10.0MHz QPSK - Full RB Configuration)

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

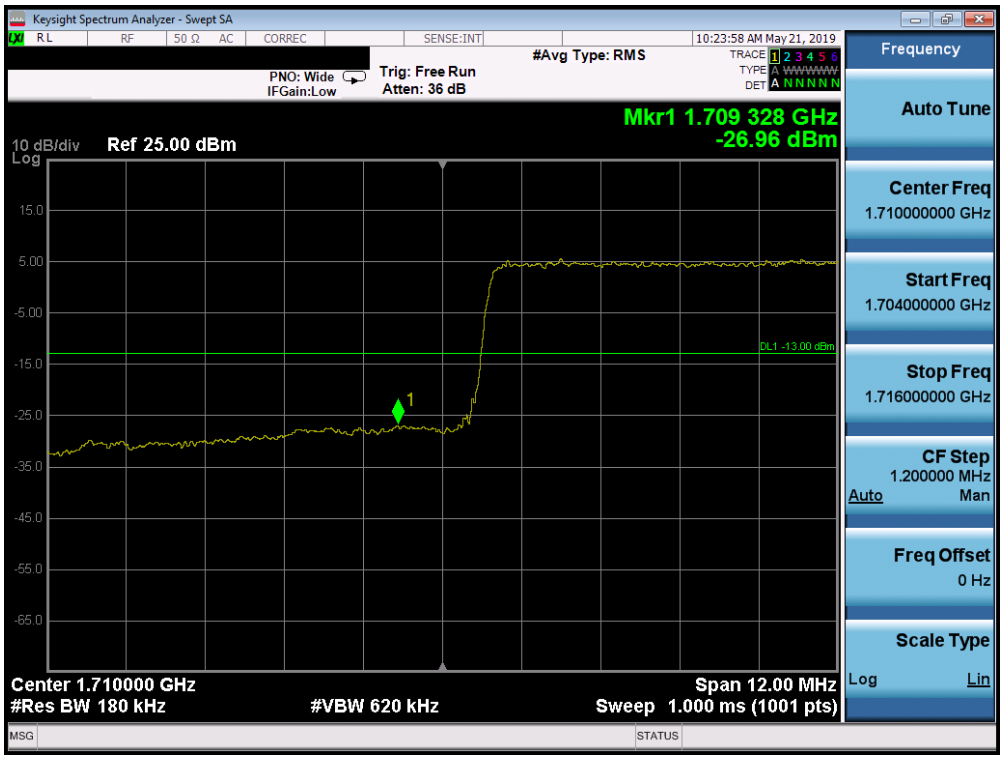


Plot 7-121. Upper Extended Band Edge Plot (Band 4 - 10.0MHz QPSK - Full RB Configuration)

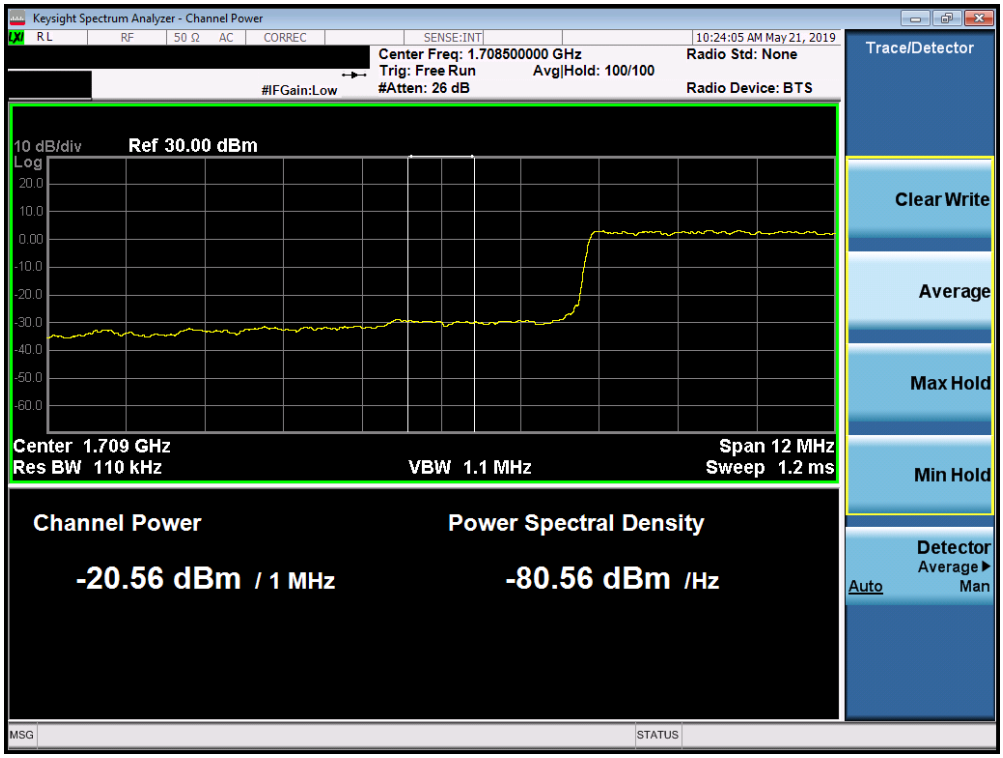
Plot 7-122. Upper Band Edge Plot (Band 66 - 10.0MHz QPSK - Full RB Configuration)



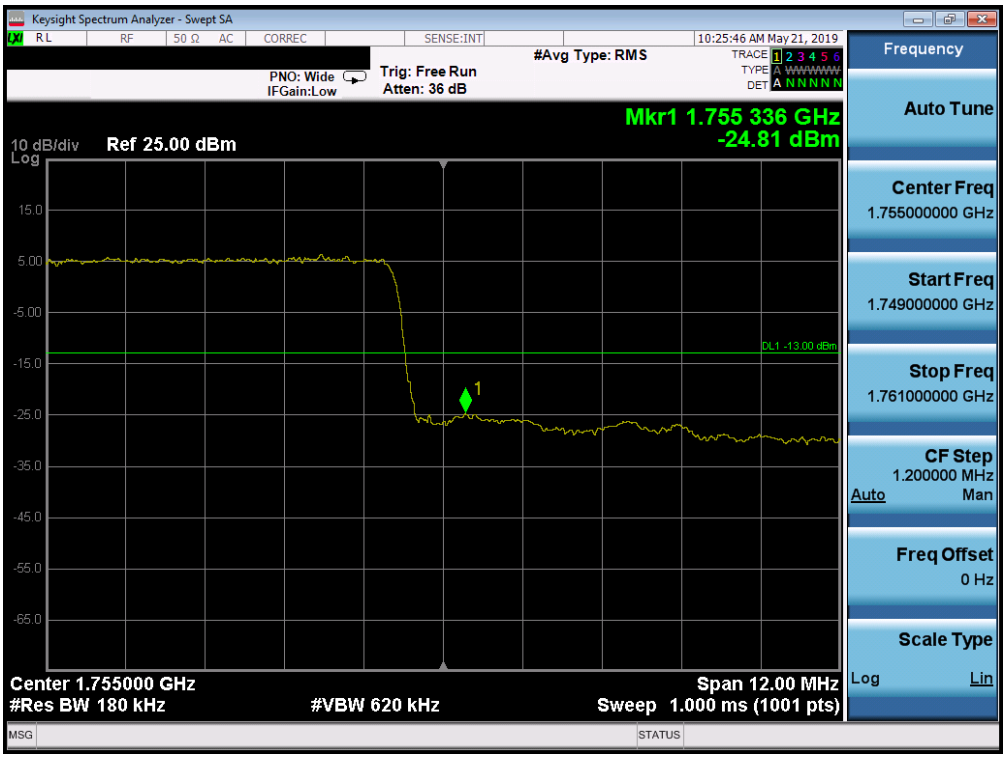
Plot 7-123. Upper Extended Band Edge Plot (Band 66 - 10.0MHz QPSK - Full RB Configuration)



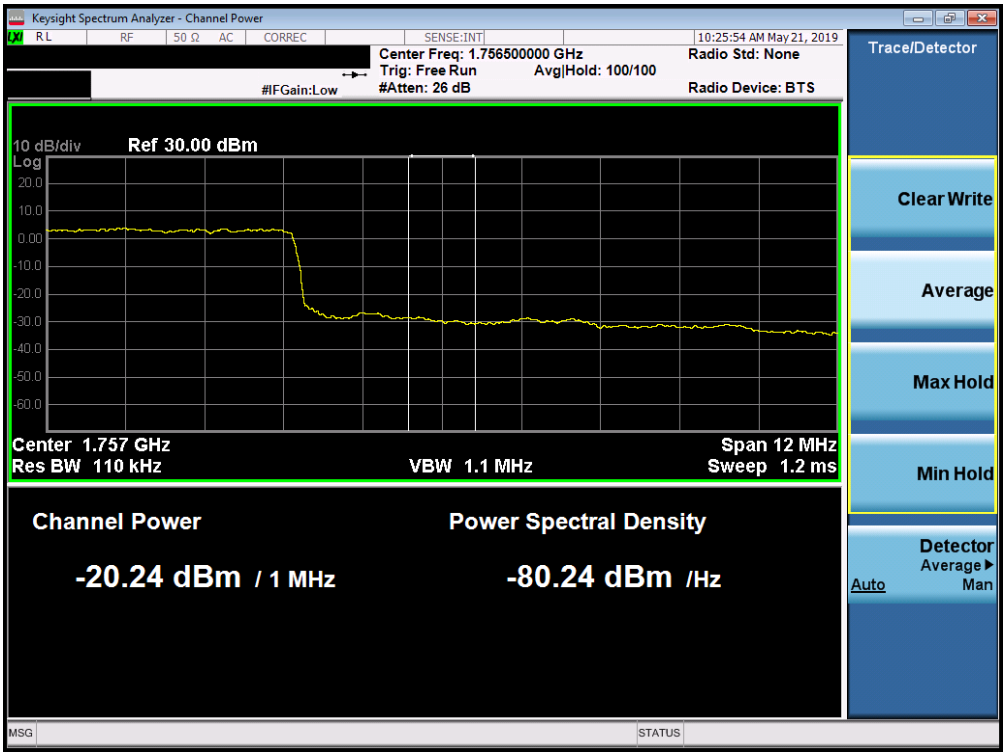
Plot 7-124. Lower Band Edge Plot (Band 66/4 - 15.0MHz QPSK - Full RB Configuration)



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

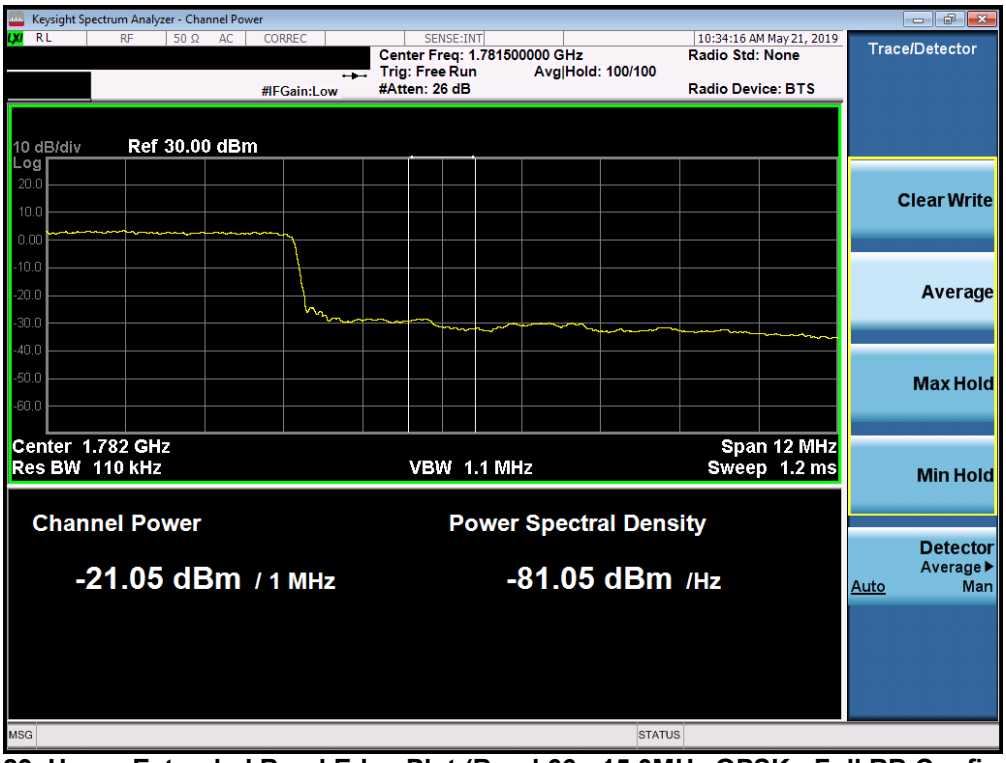


Plot 7-126. Upper Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)

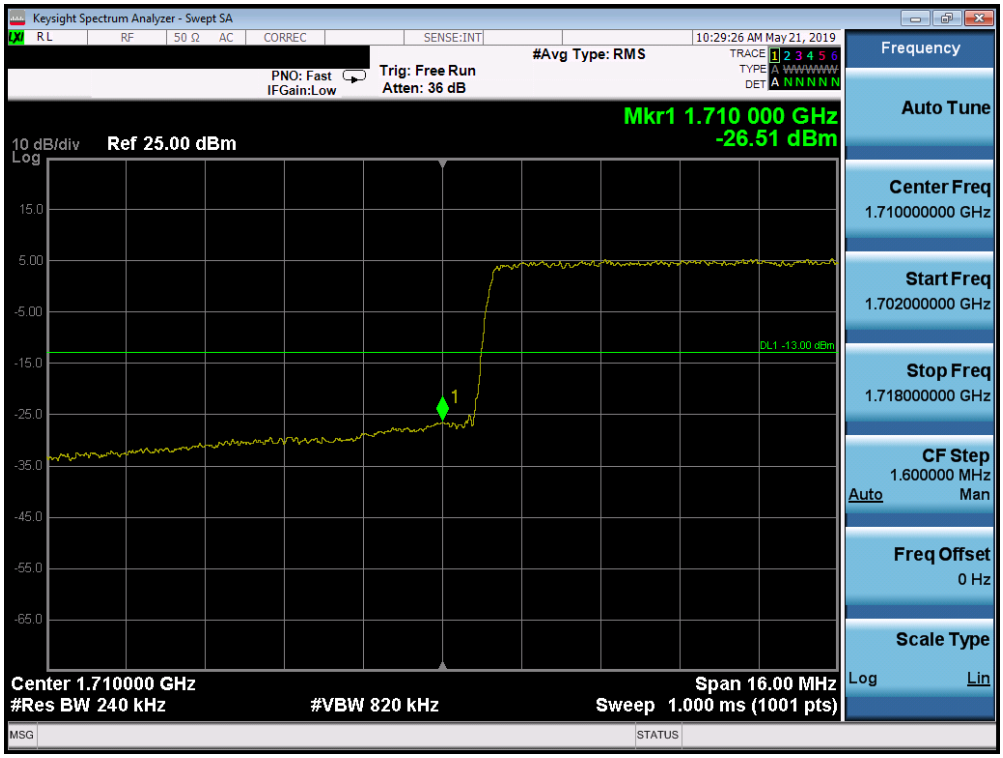


Plot 7-127. Upper Extended Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)

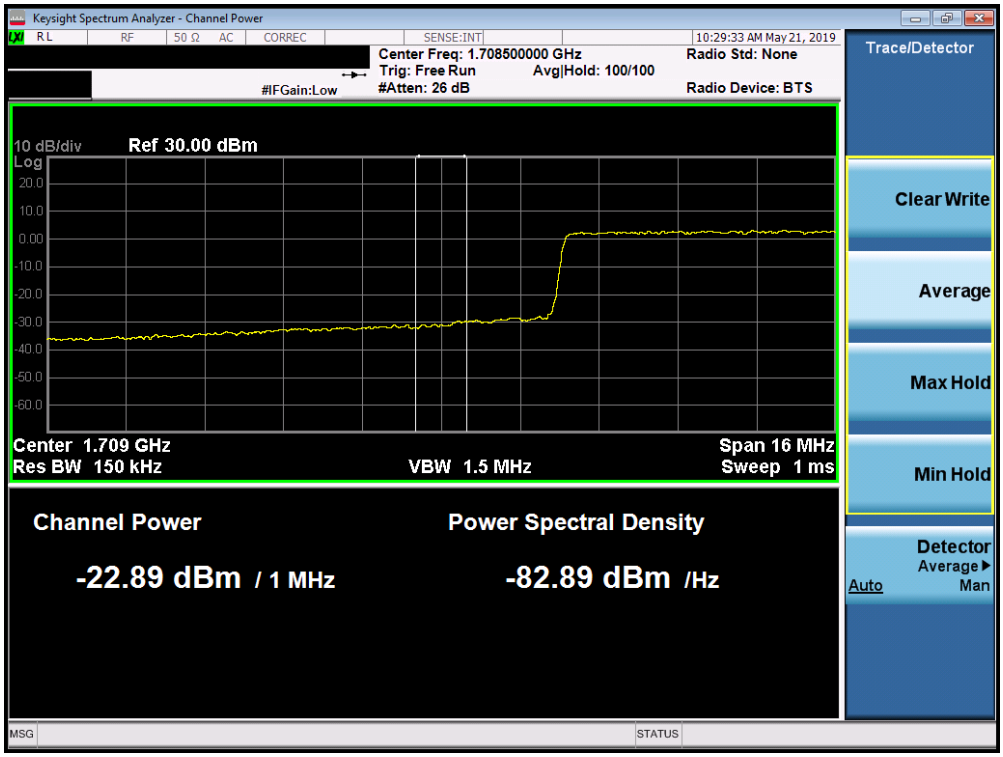
Plot 7-128. Upper Band Edge Plot (Band 66 - 15.0MHz QPSK - Full RB Configuration)



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

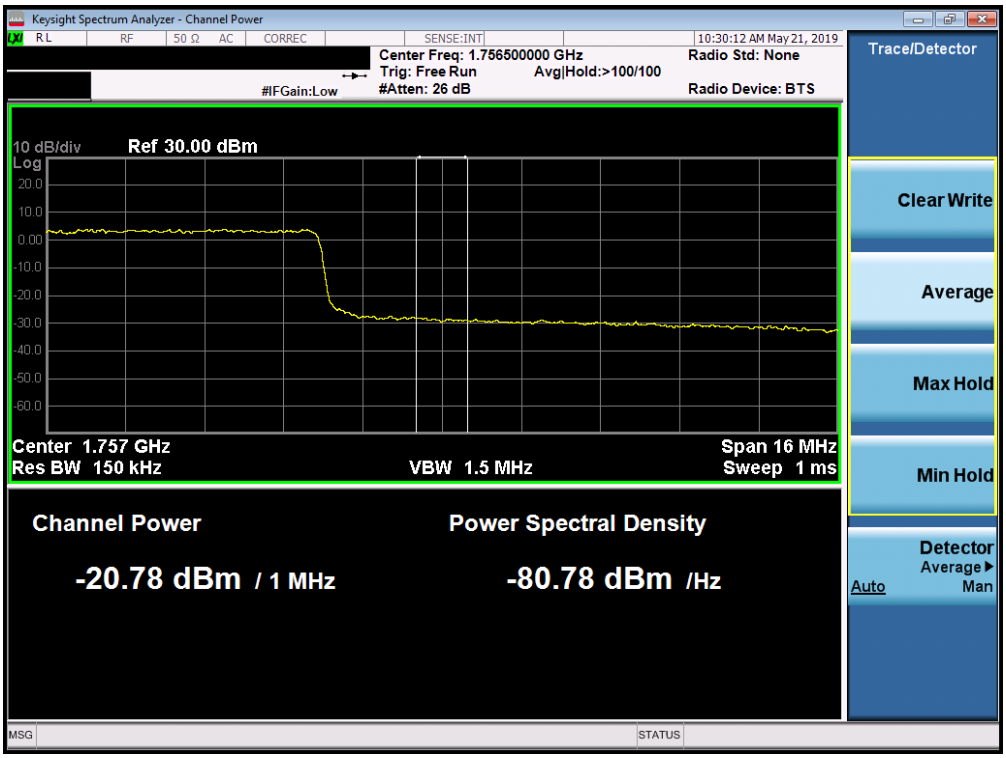


Plot 7-130. Lower Band Edge Plot (Band 66/4 - 20.0MHz QPSK - Full RB Configuration)

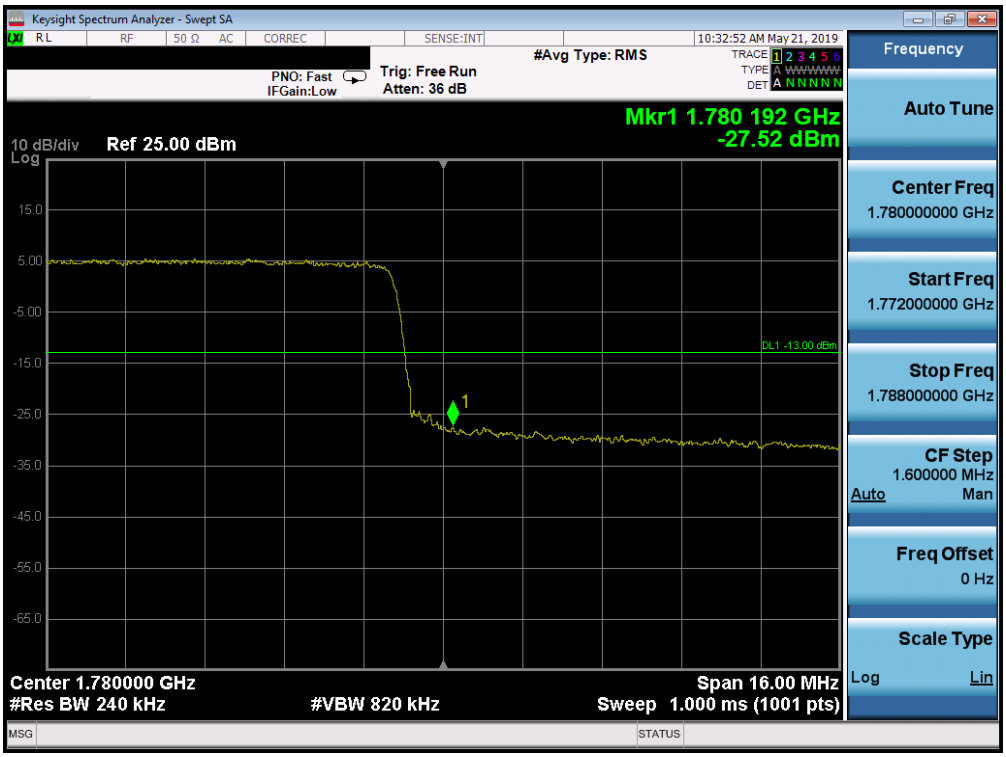


Plot 7-131. Lower Extended Band Edge Plot (Band 66/4 - 20.0MHz QPSK - Full RB Configuration)

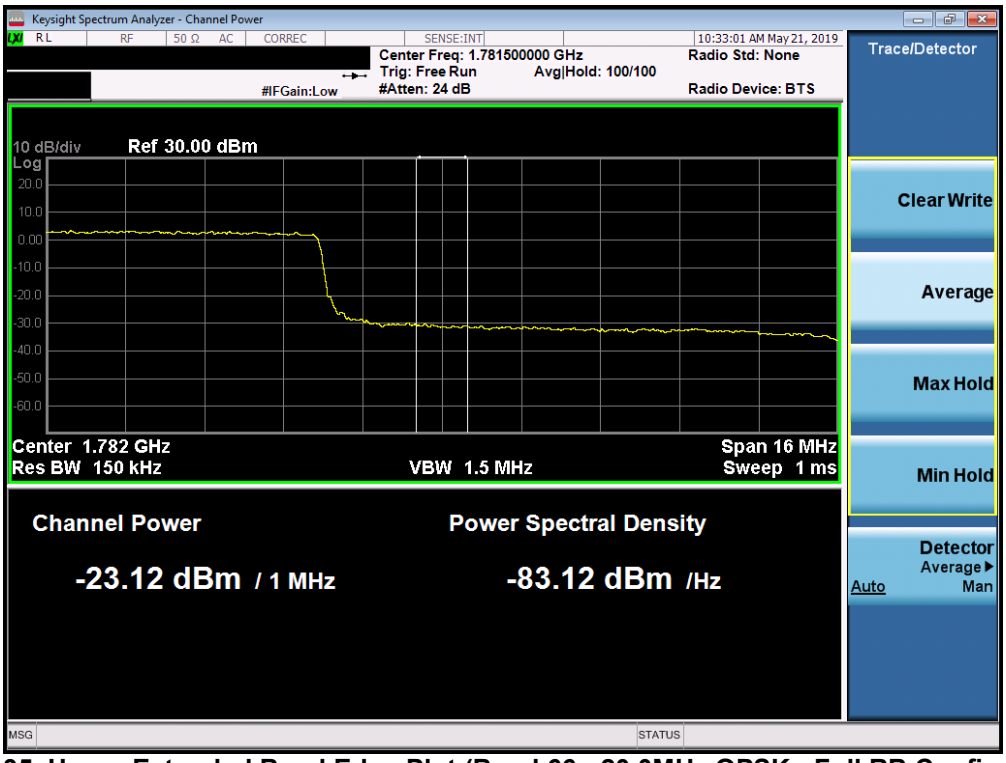
Plot 7-132. Upper Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)



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

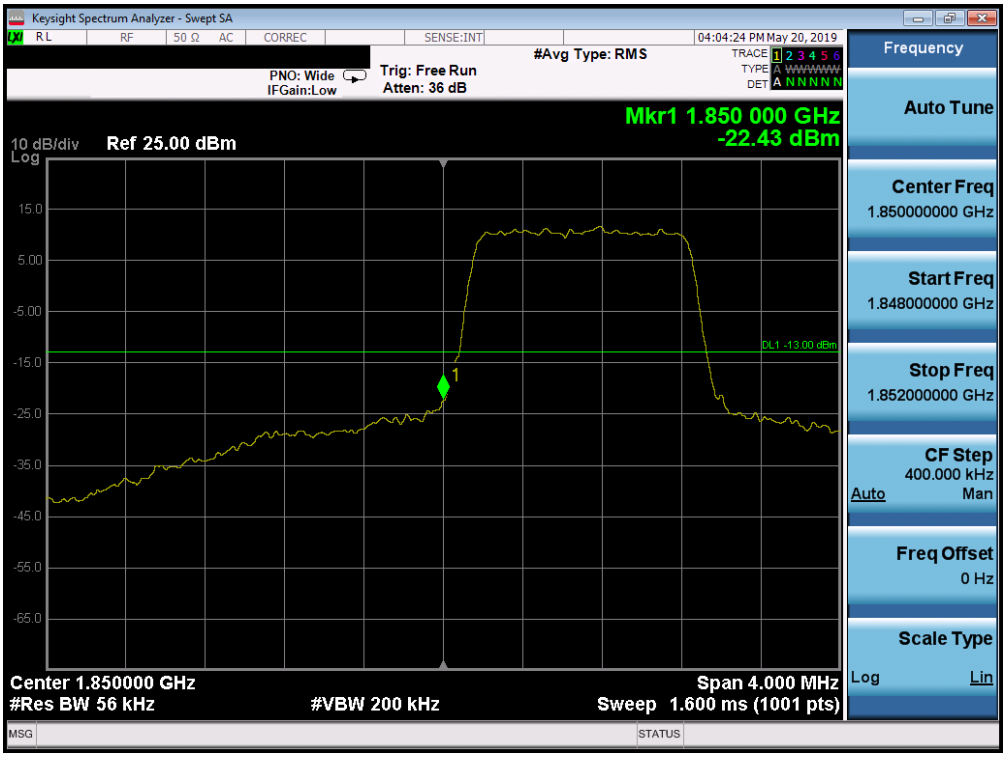


Plot 7-134. Upper Band Edge Plot (Band 66 - 20.0MHz QPSK - Full RB Configuration)

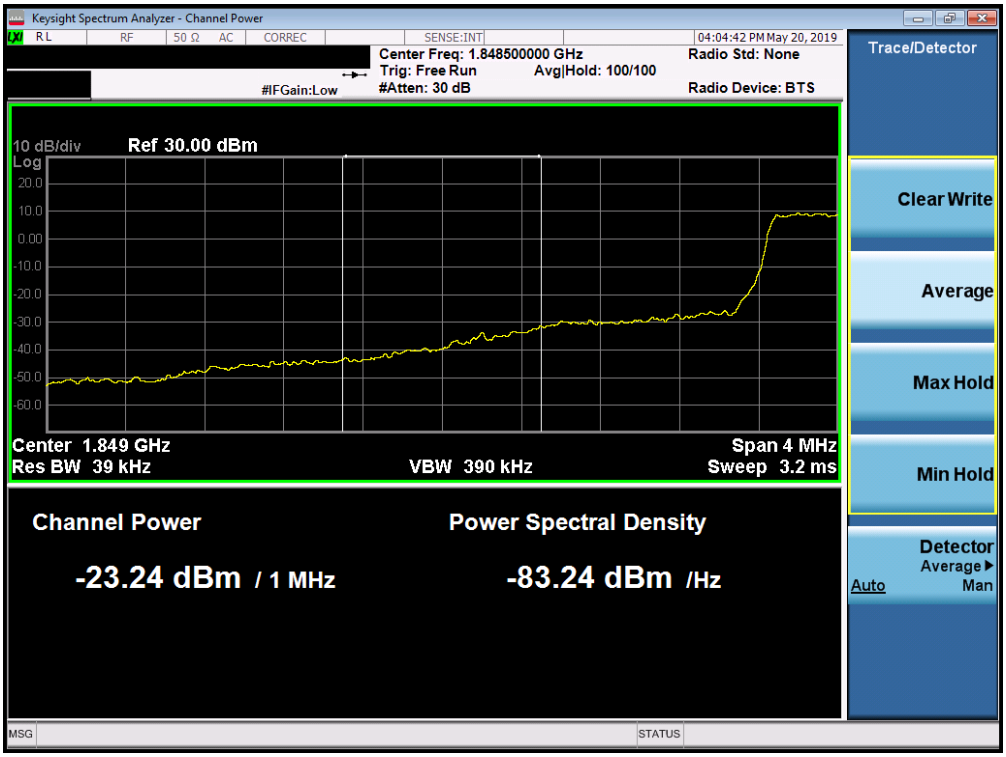


Plot 7-135. Upper Extended Band Edge Plot (Band 66 - 20.0MHz QPSK - Full RB Configuration)

Band 2

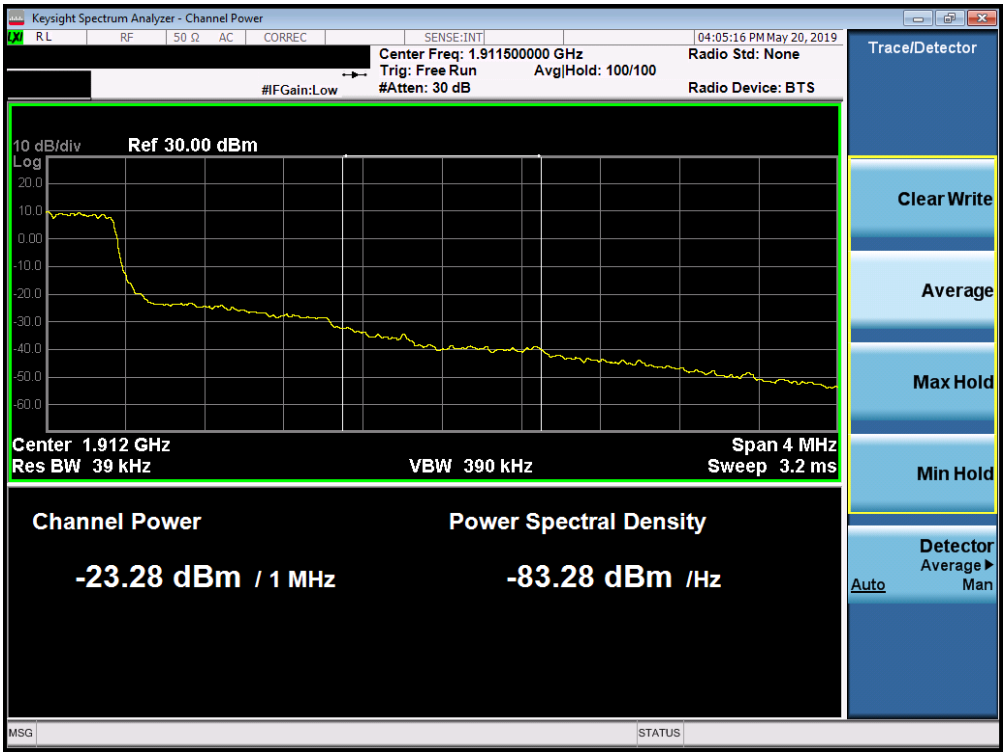


Plot 7-136. Lower Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)

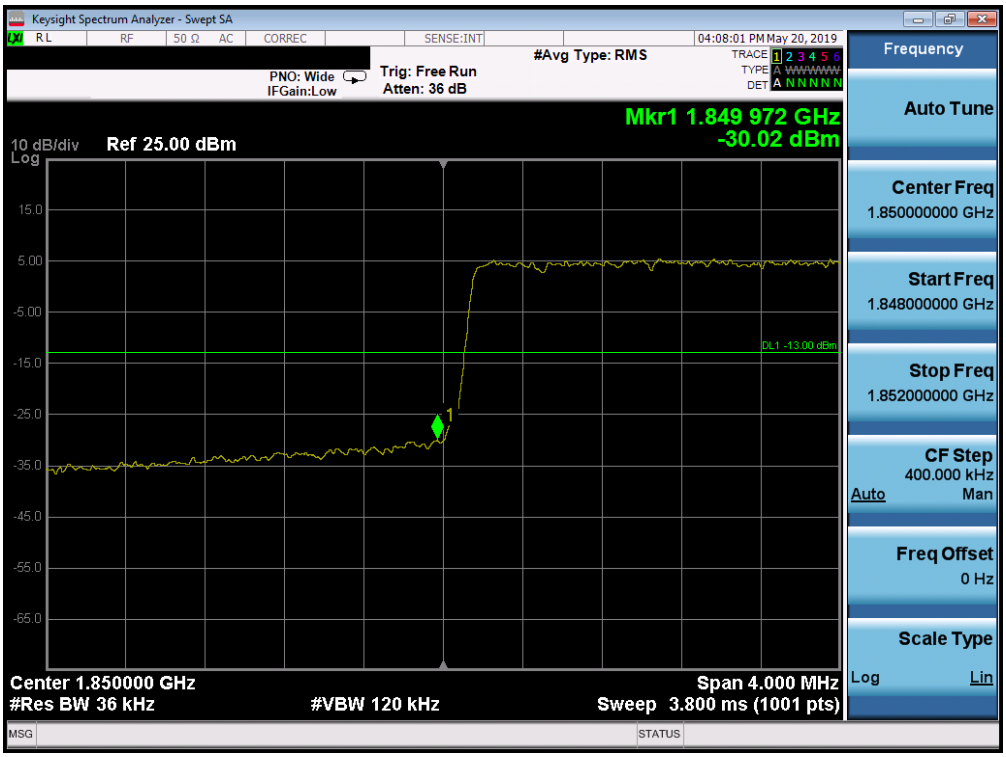


Plot 7-137. Lower Extended Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)

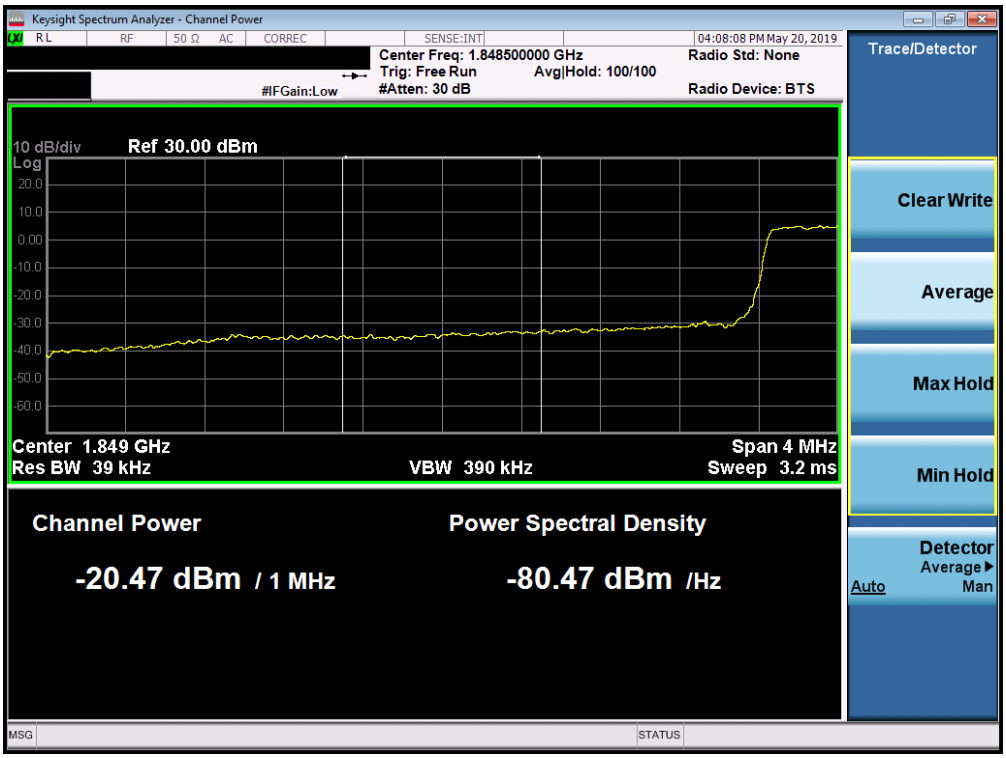
Plot 7-138. Upper Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



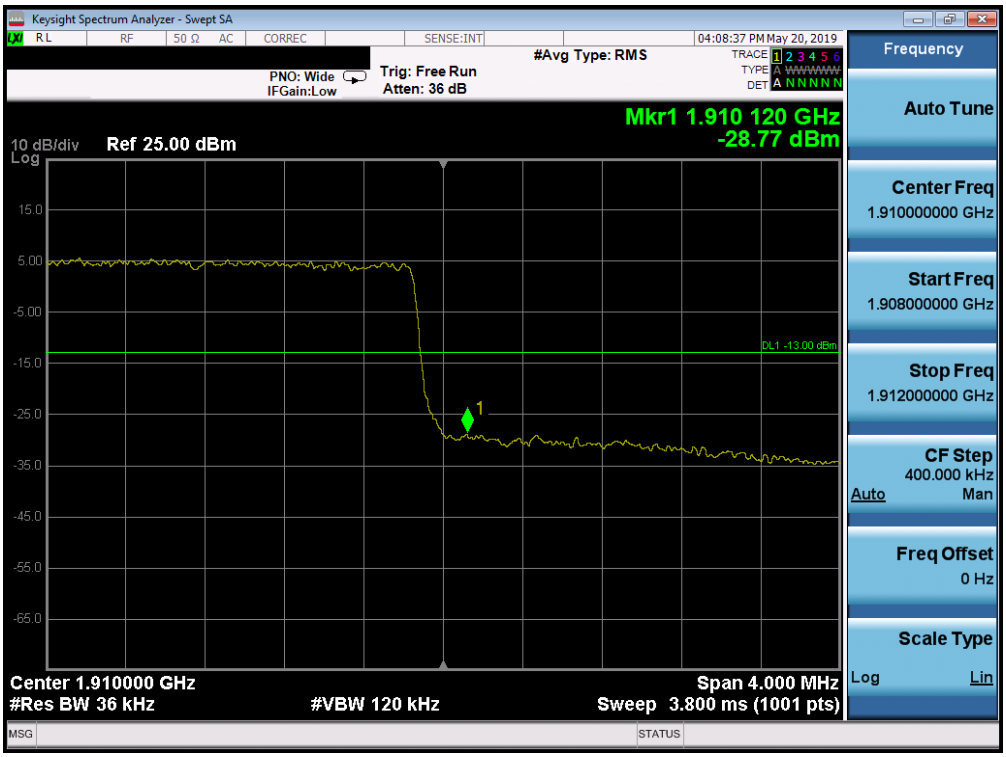
Plot 7-139. Upper Extended Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



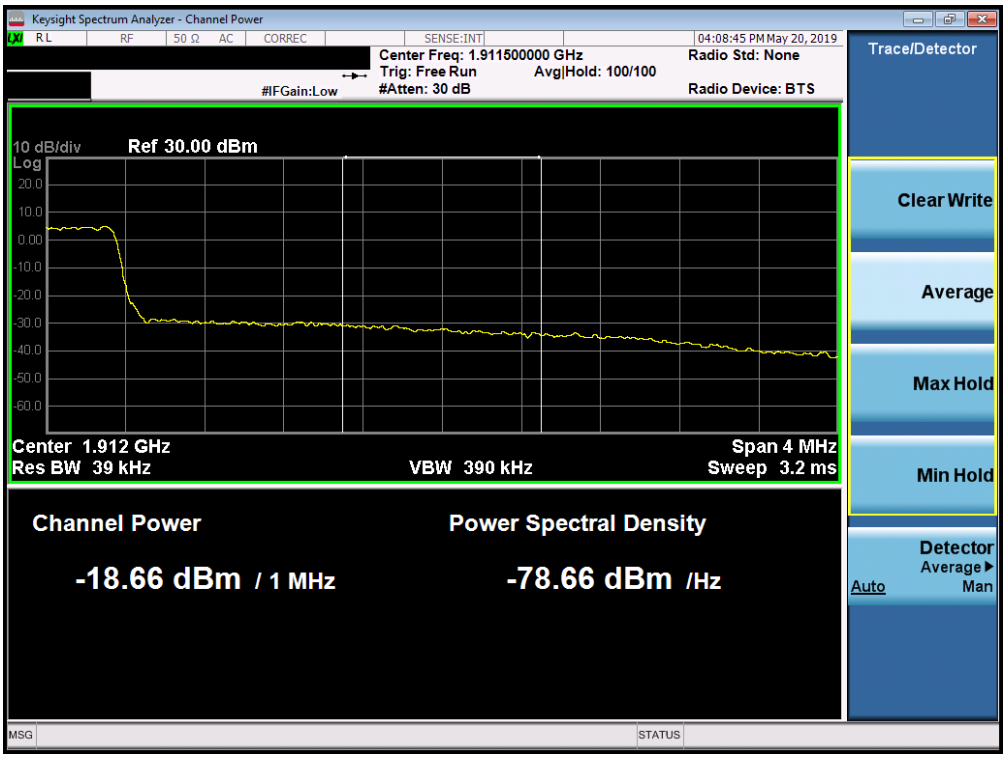
Plot 7-140. Lower Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



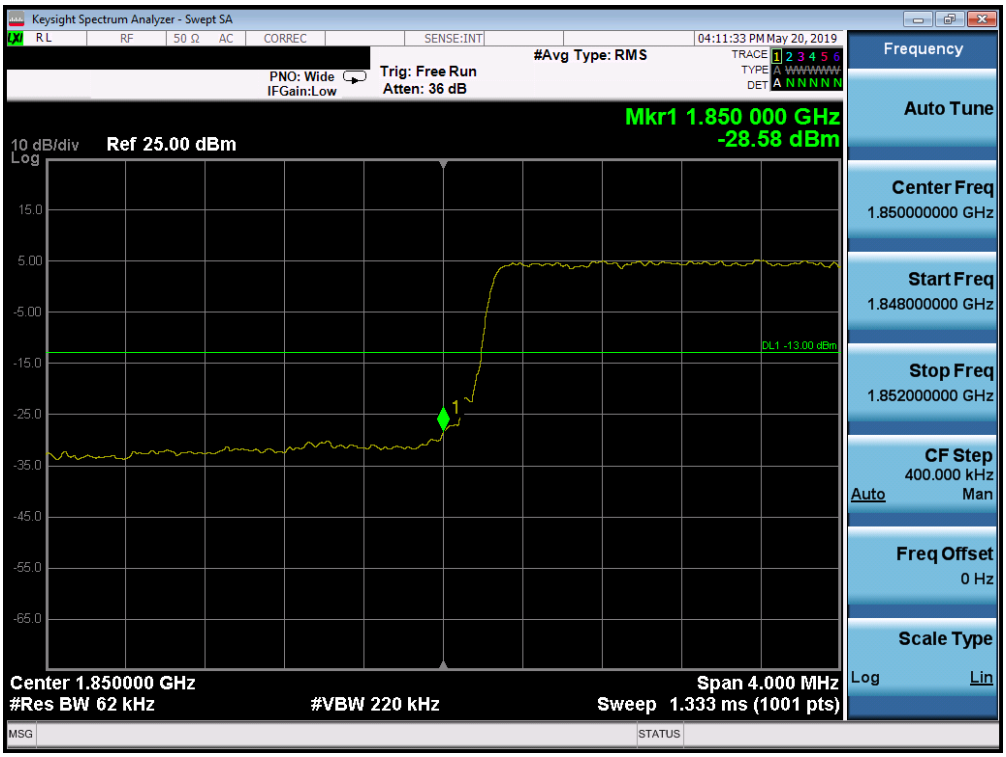
Plot 7-141. Lower Extended Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



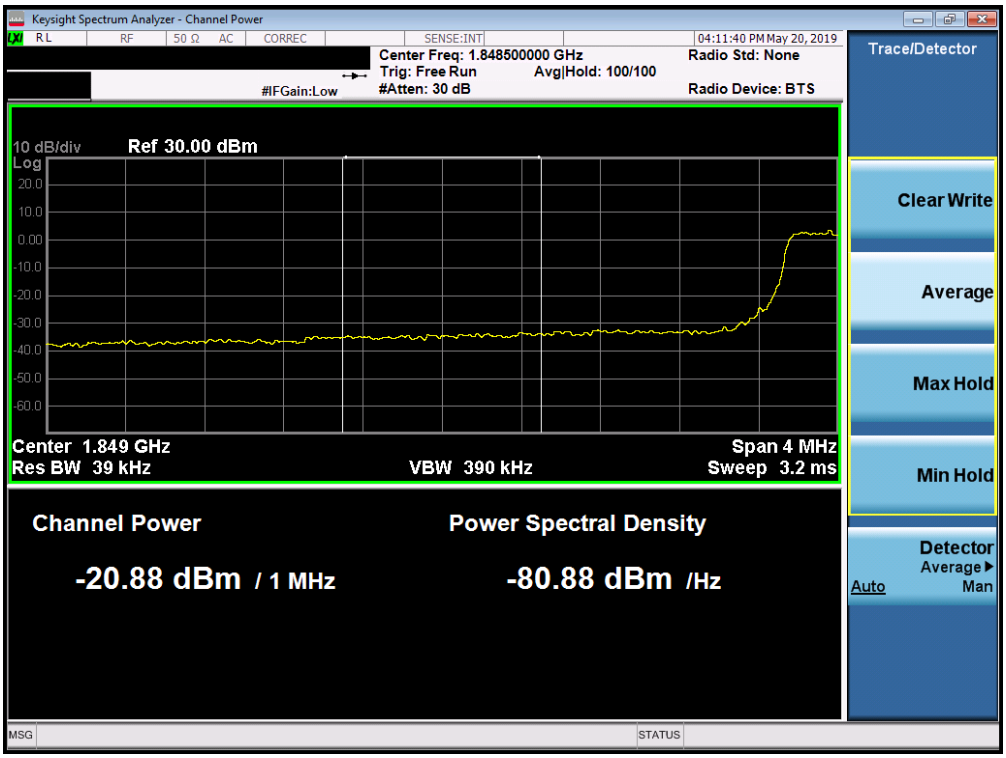
Plot 7-142. Upper Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



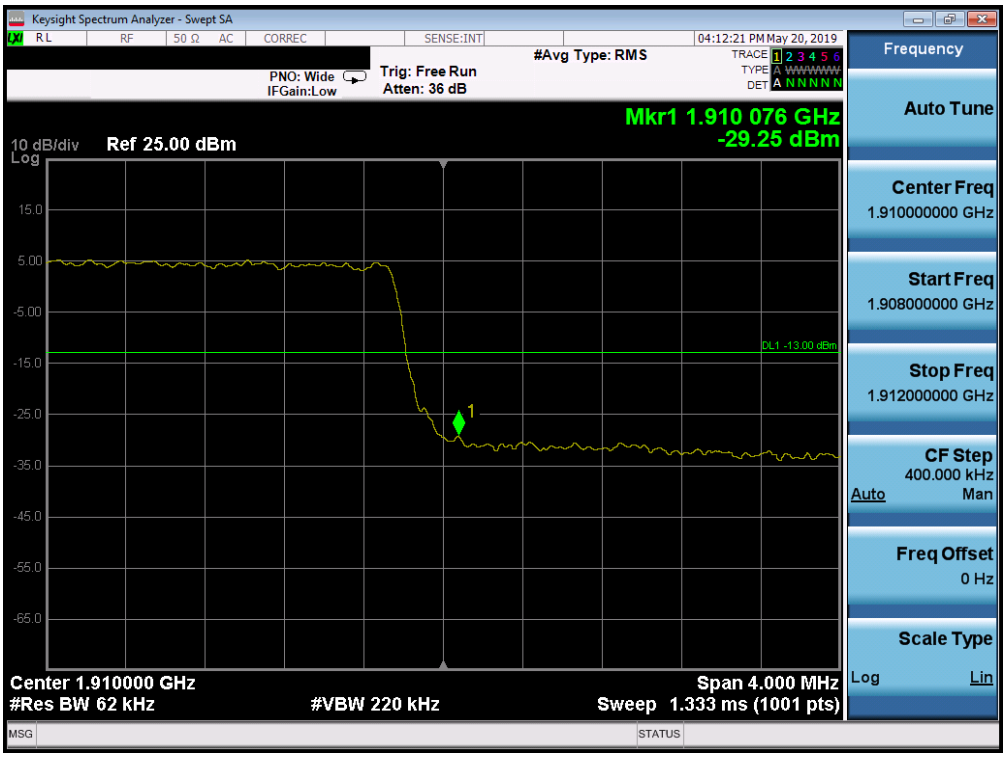
Plot 7-143. Upper Extended Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



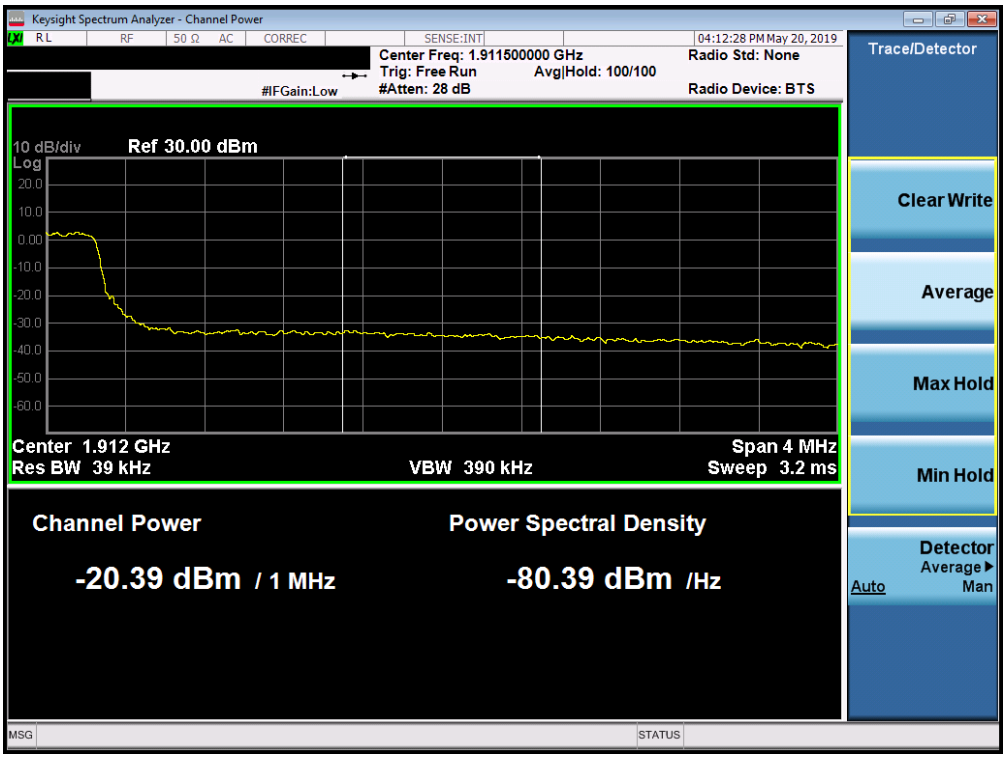
Plot 7-144. Lower Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



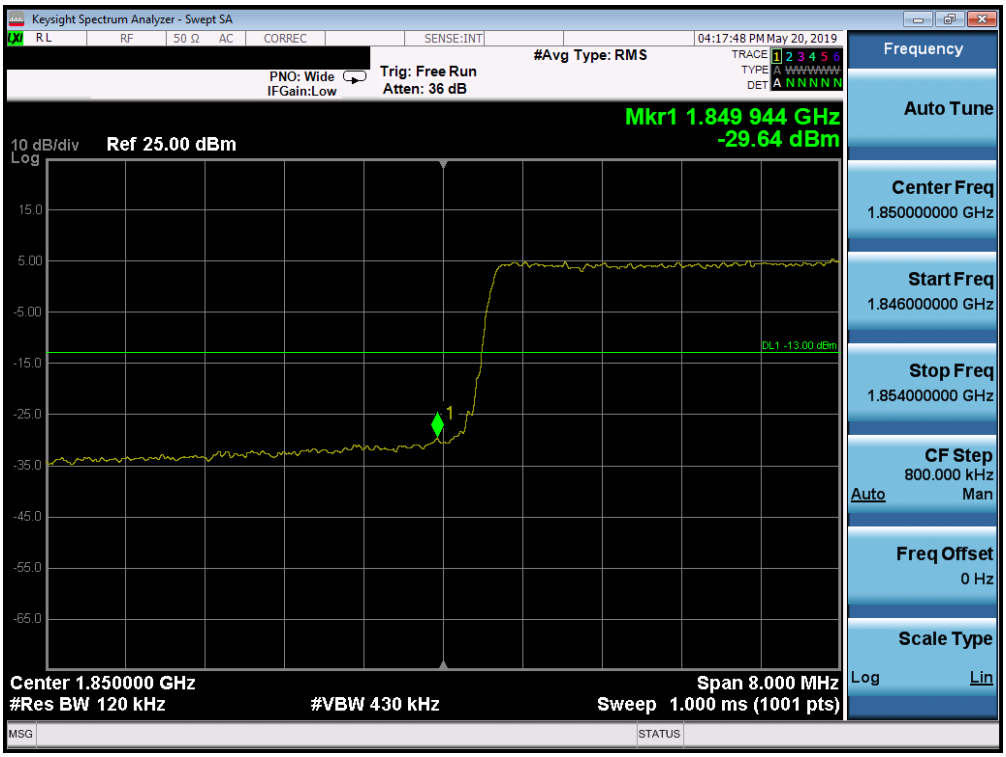
Plot 7-145. Lower Extended Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



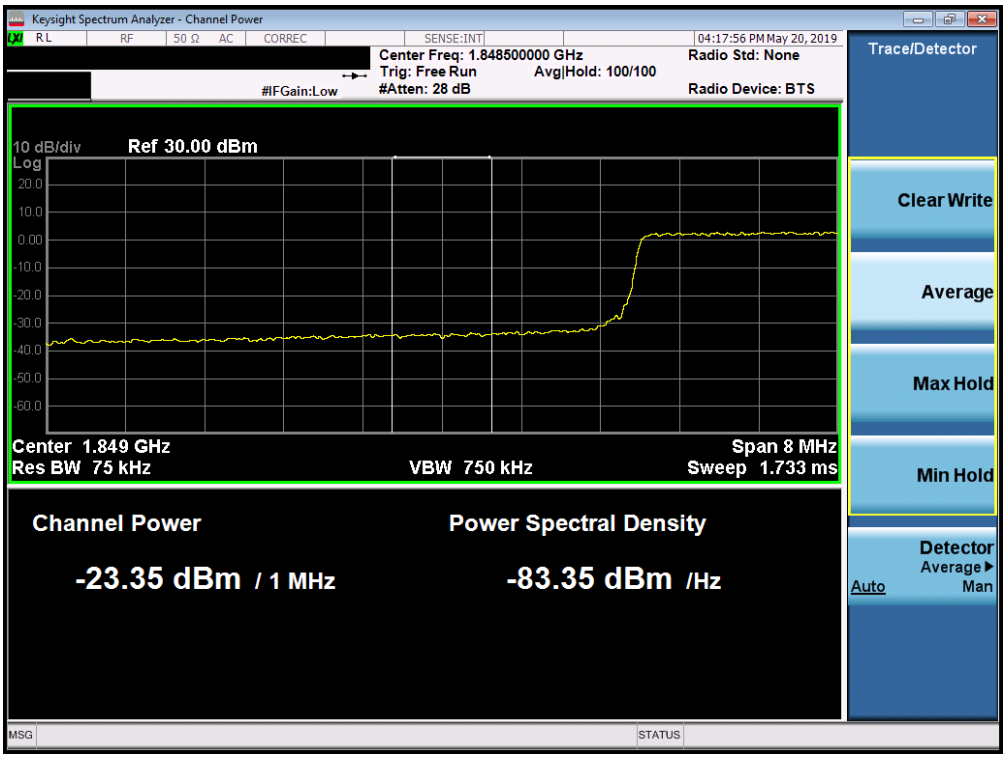
Plot 7-146. Upper Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



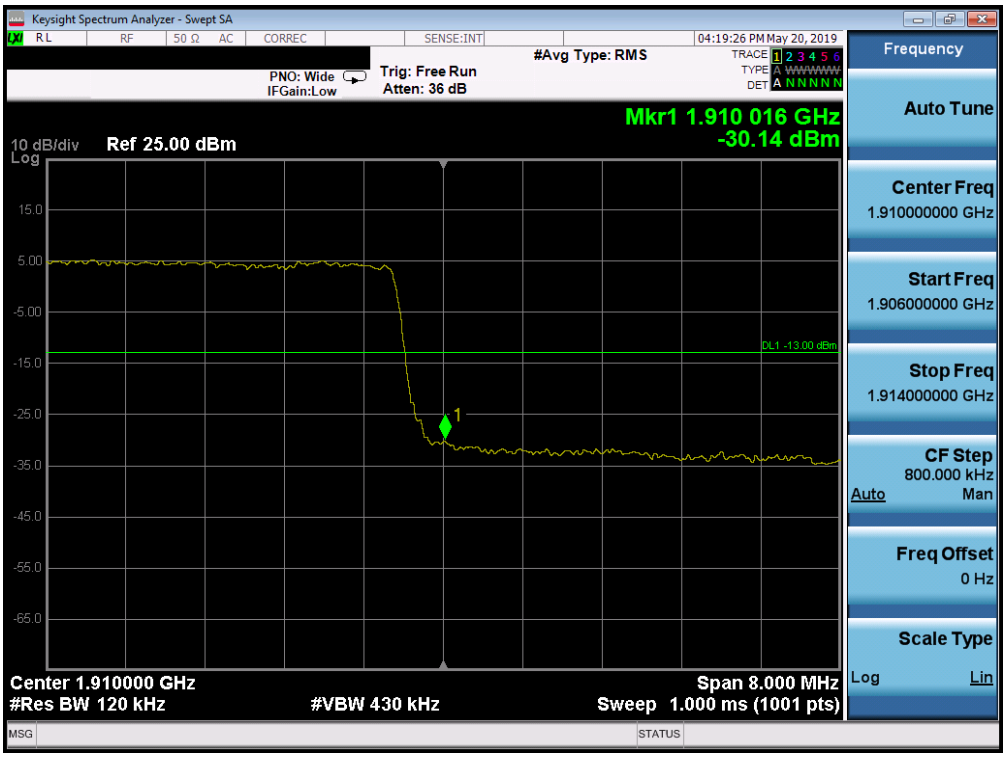
Plot 7-147. Upper Extended Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



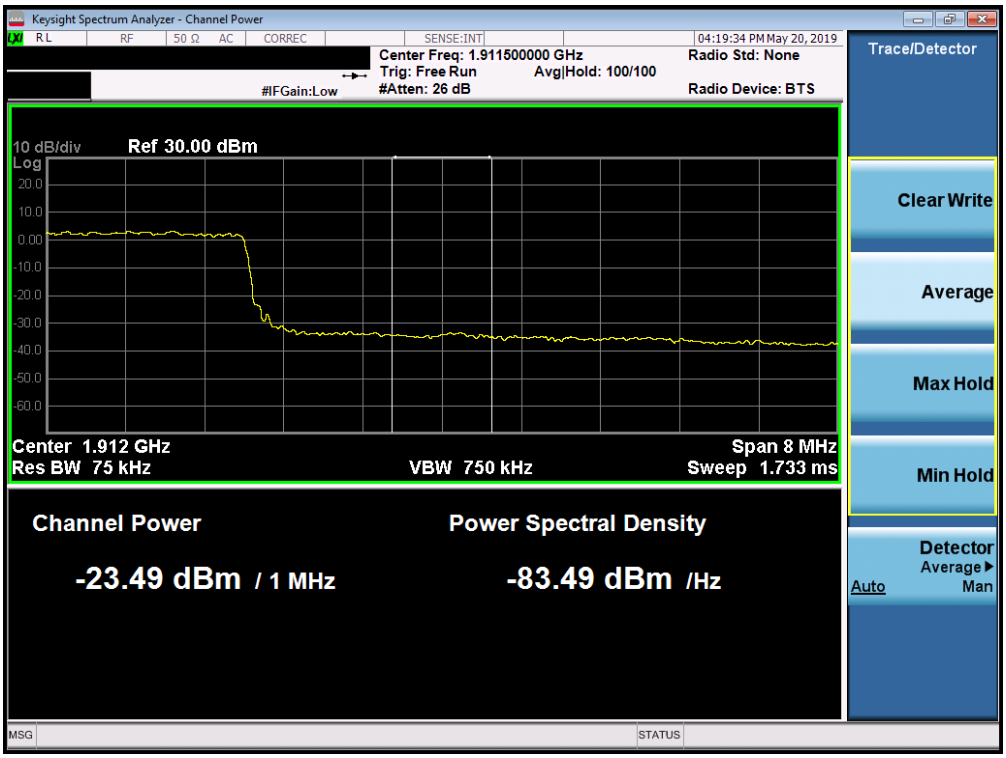
Plot 7-148. Lower Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



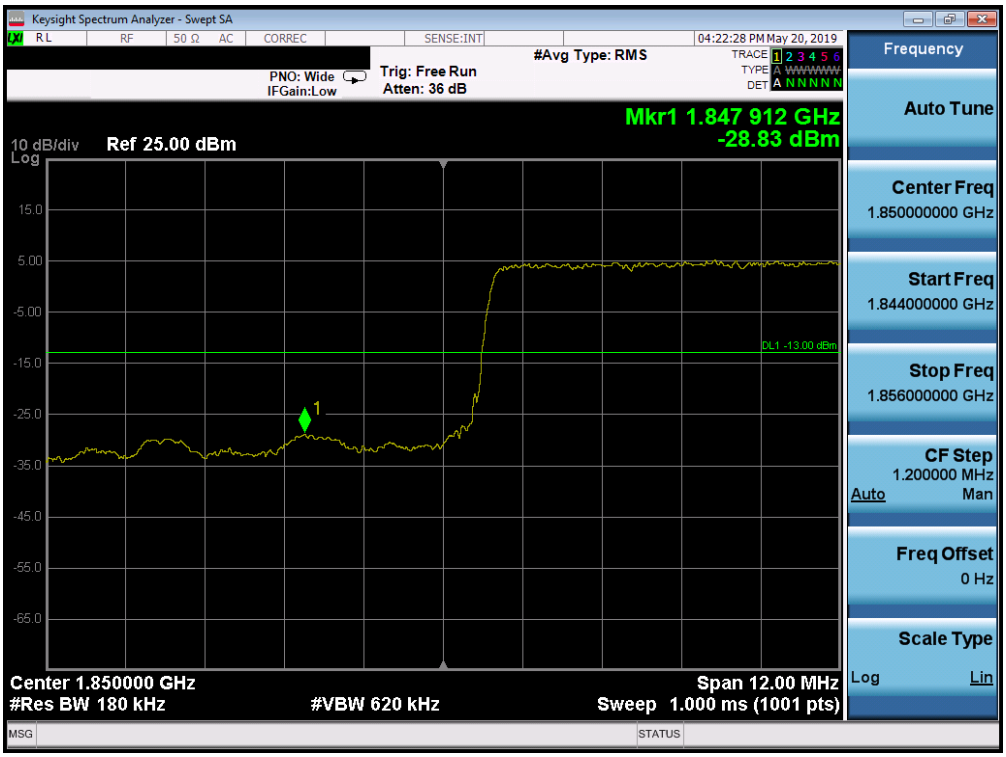
Plot 7-149. Lower Extended Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



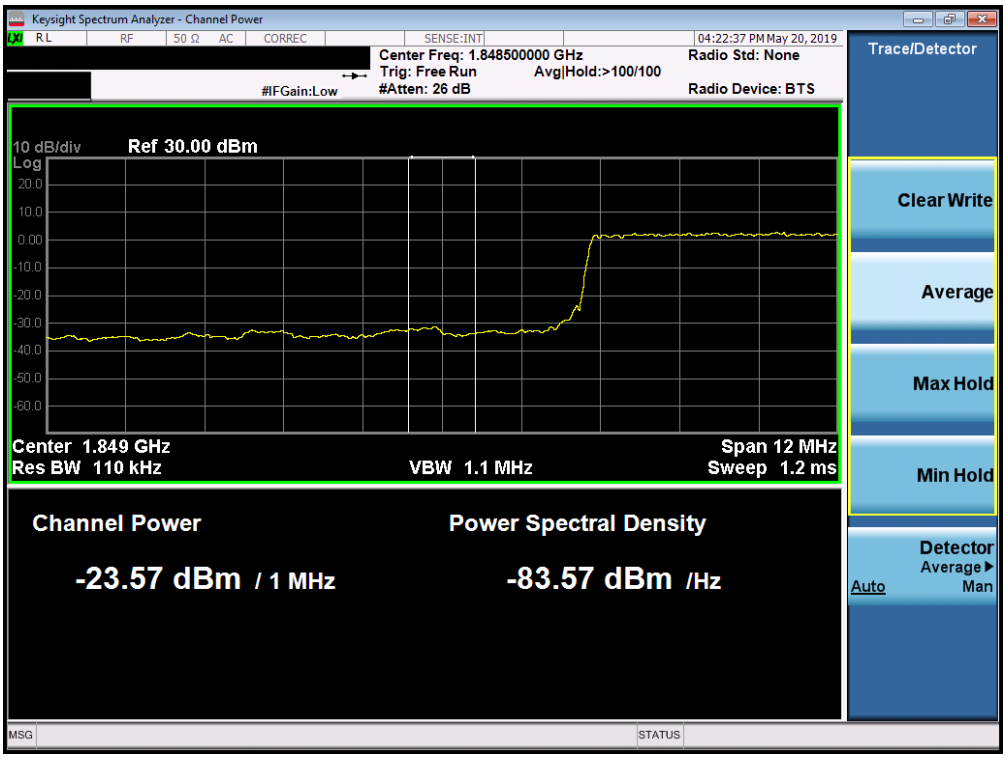
Plot 7-150. Upper Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



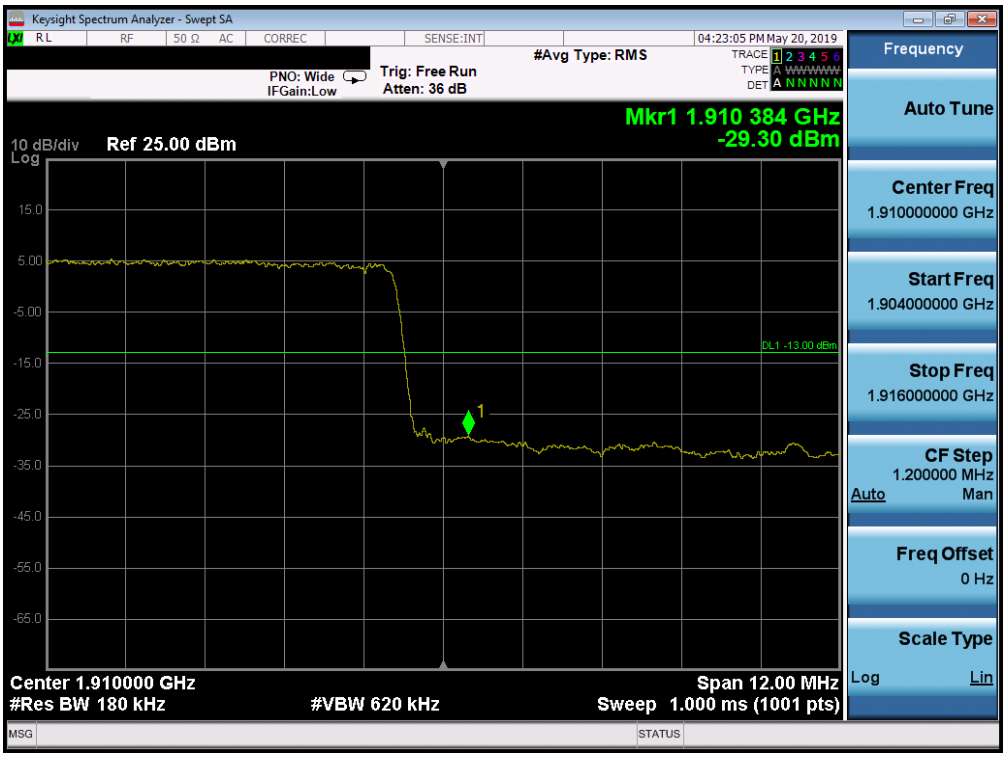
Plot 7-151. Upper Extended Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



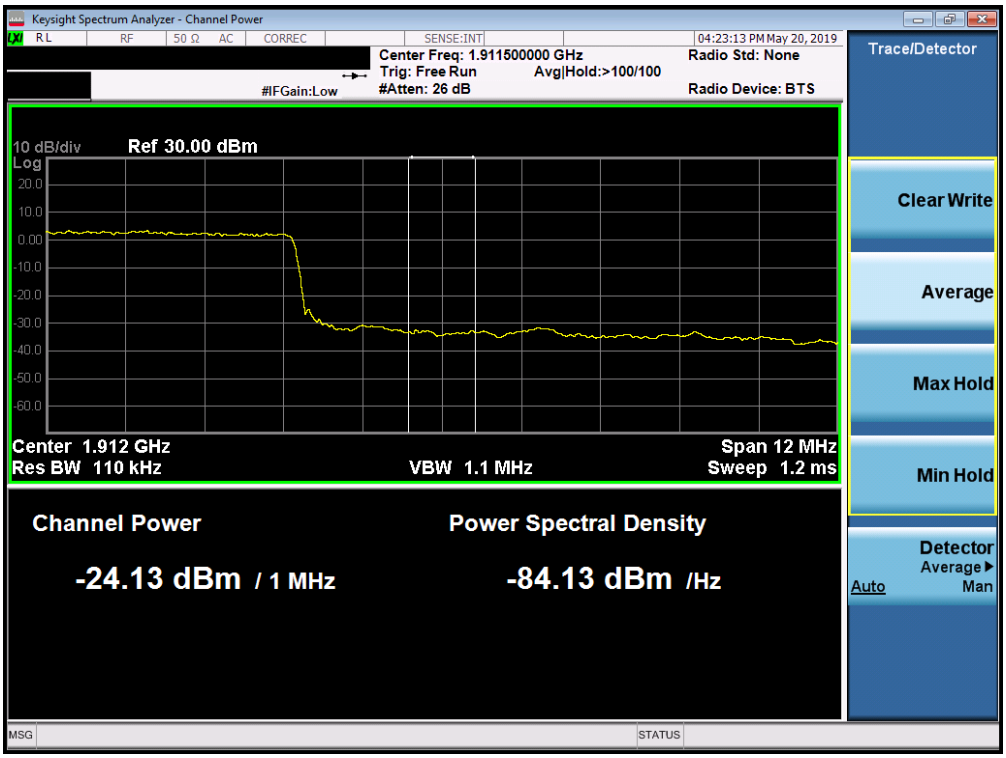
Plot 7-152. Lower Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



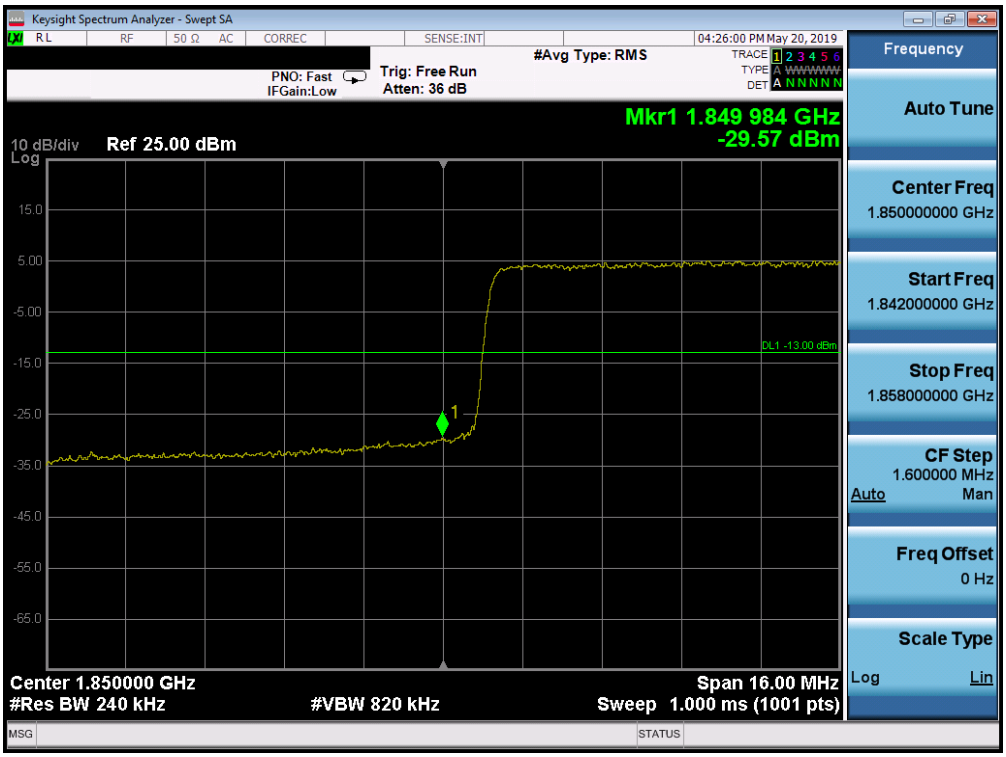
Plot 7-153. Lower Extended Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



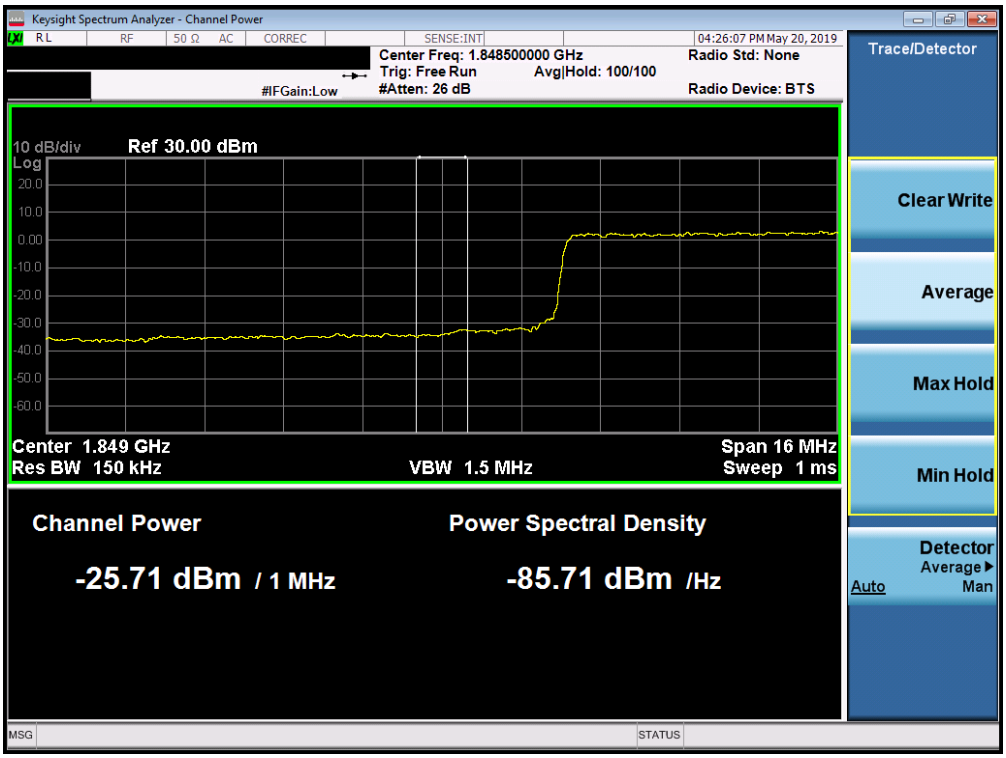
Plot 7-154. Upper Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



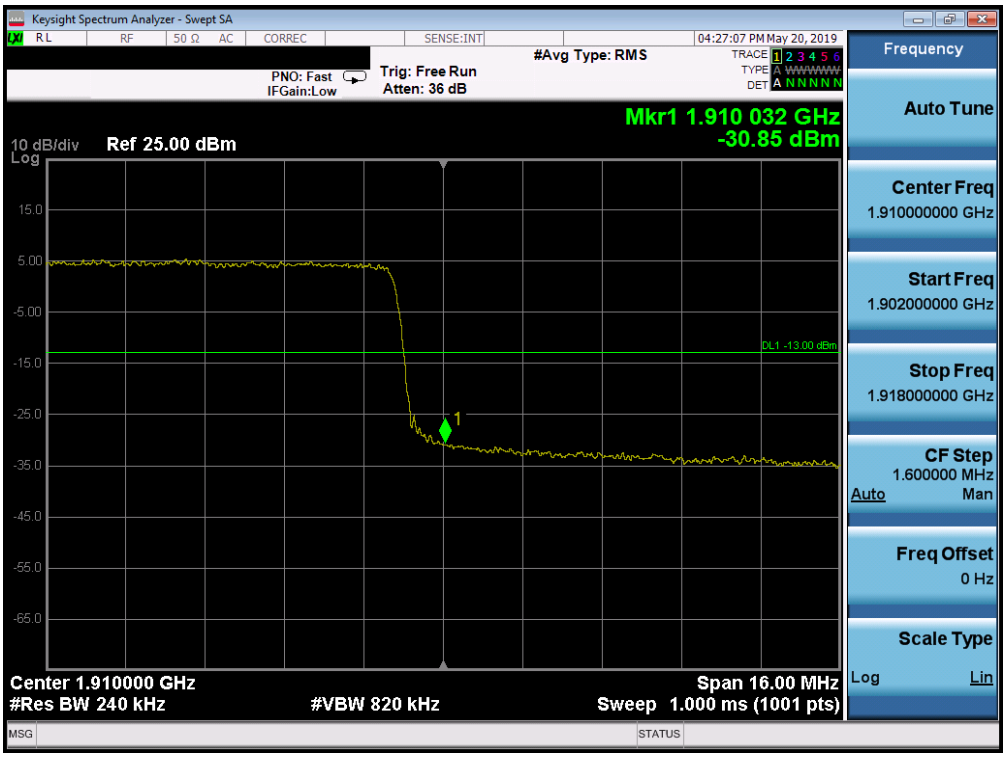
Plot 7-155. Upper Extended Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



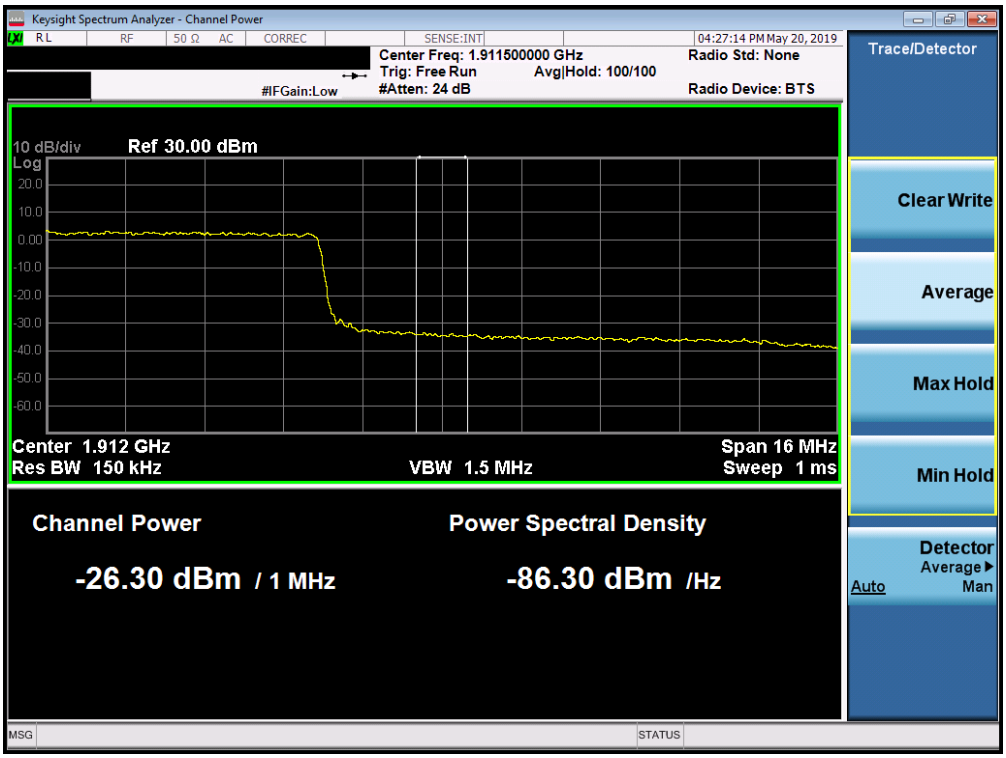
Plot 7-156. Lower Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



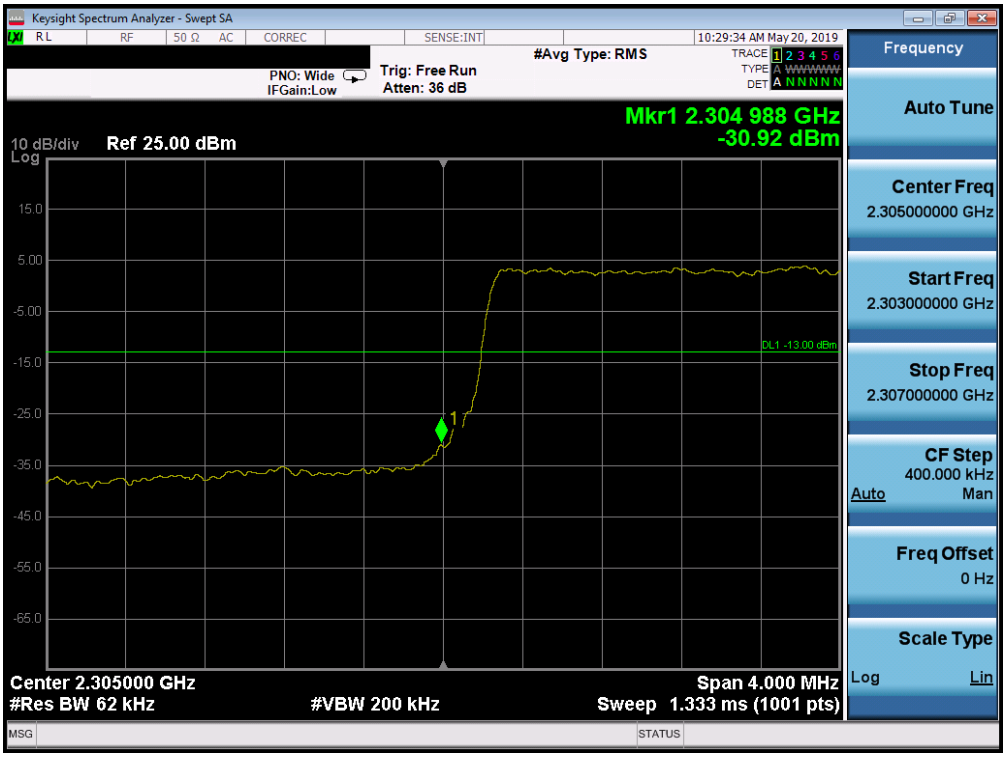
Plot 7-157. Lower Extended Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



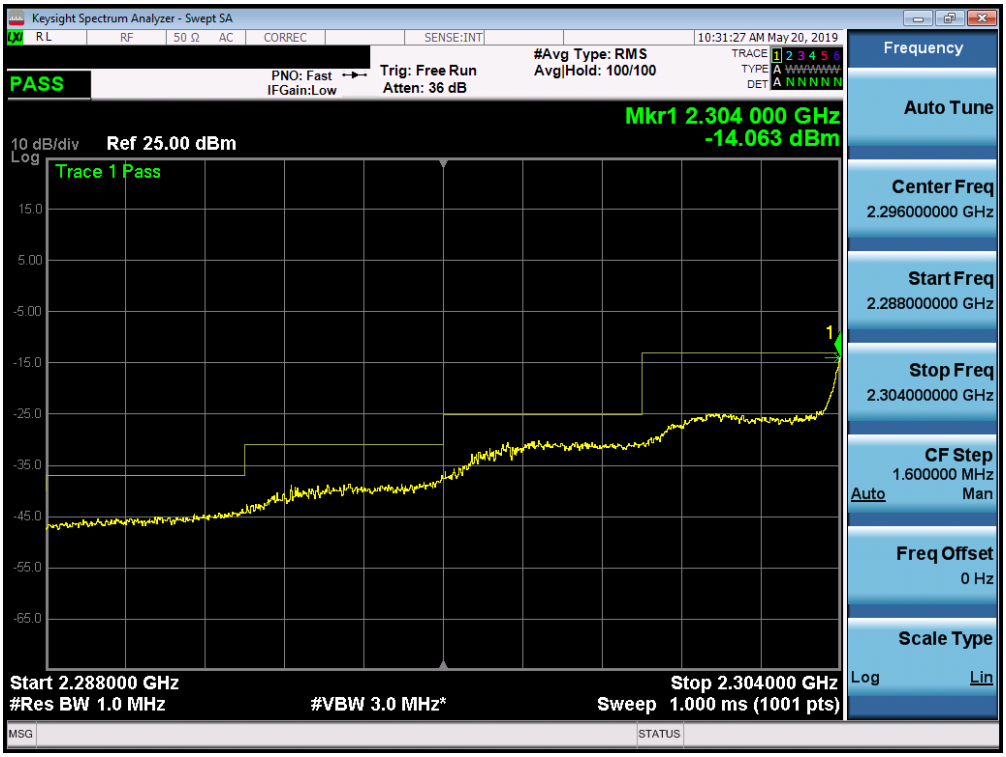
Plot 7-158. Upper Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



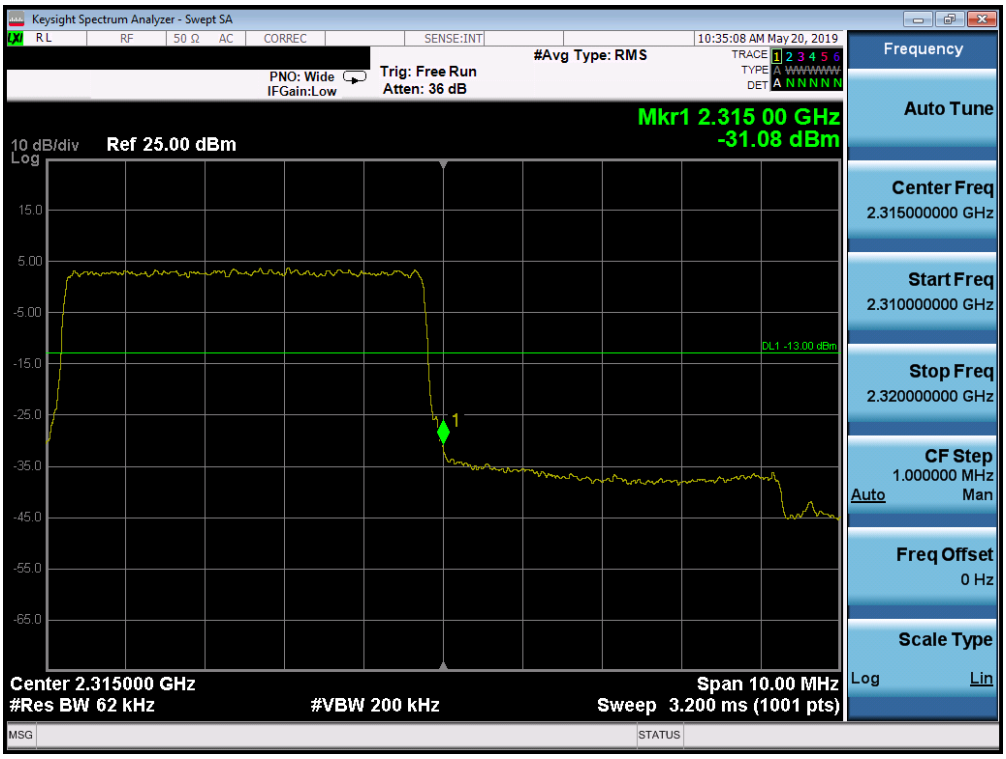
Plot 7-159. Upper Extended Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



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

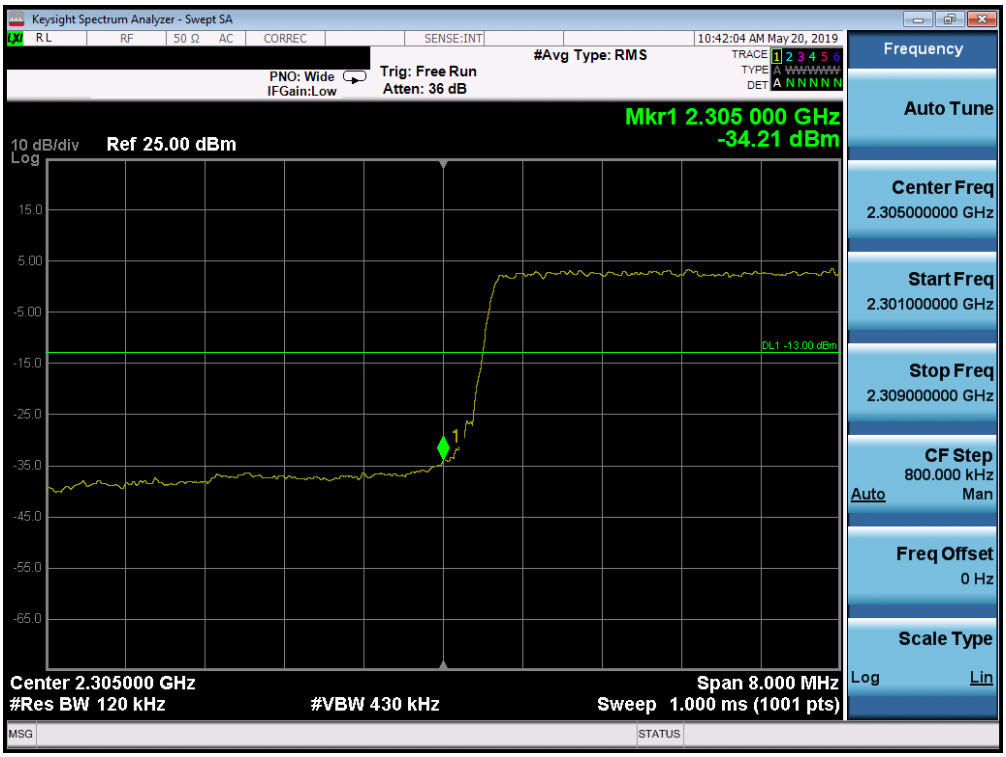


Plot 7-161. Lower Extended Band Edge Plot (Band 30 - 5.0MHz QPSK - Full RB Configuration)



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 (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.

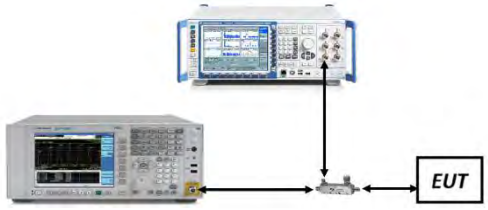
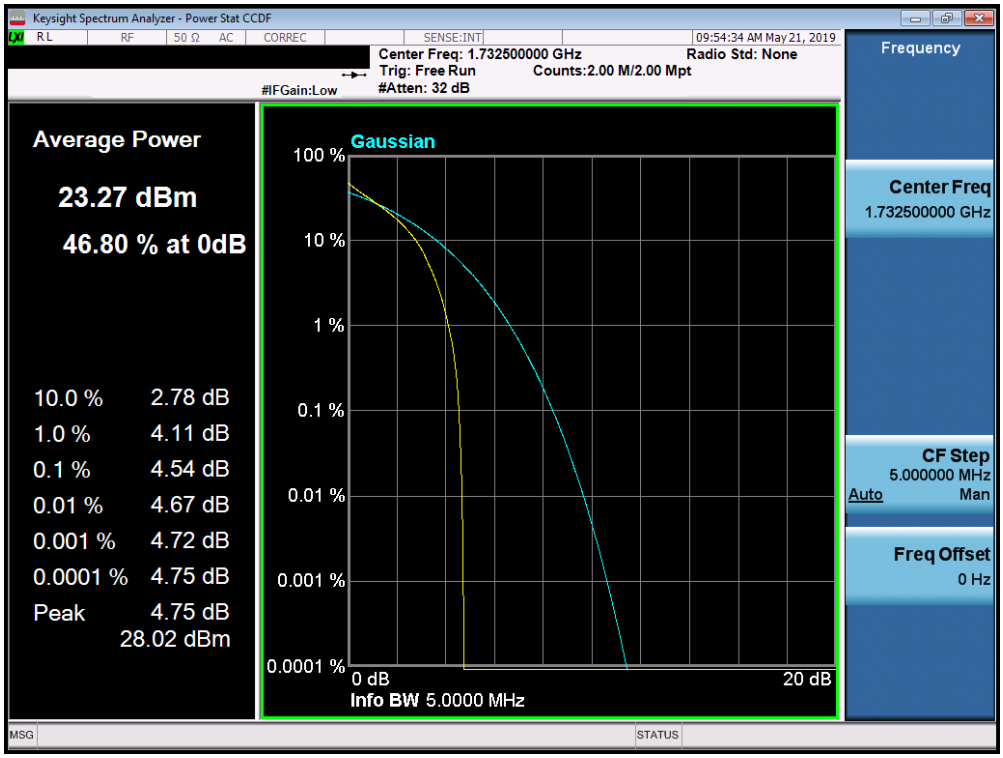


Figure 7-4. Test Instrument & Measurement Setup

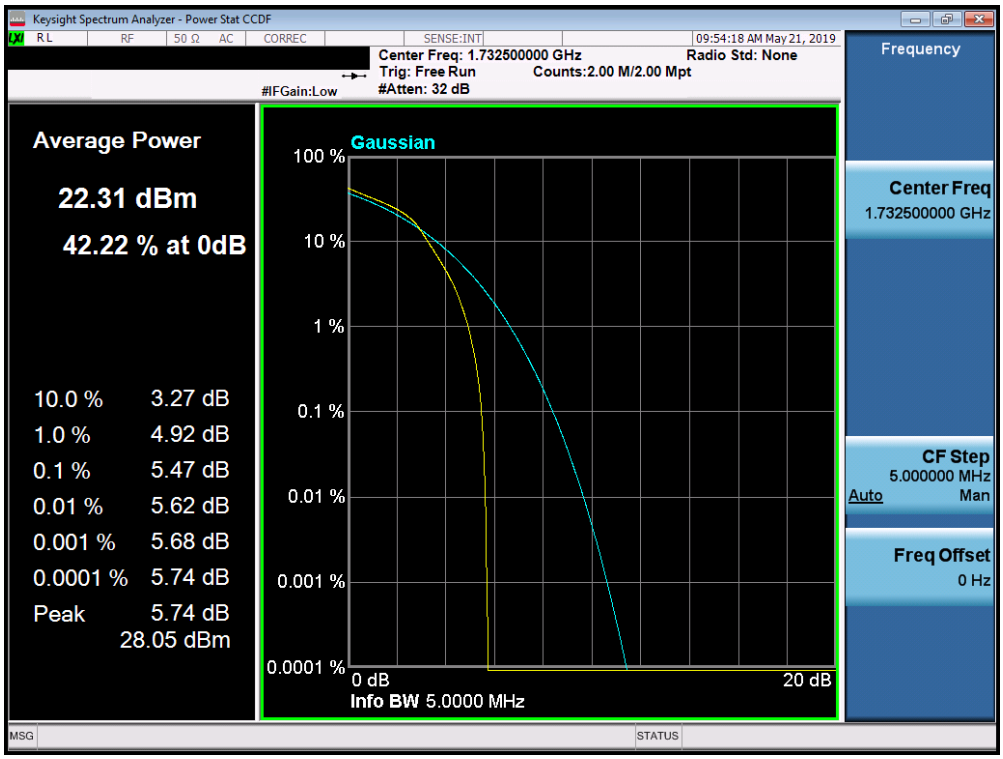
Test Notes

None.

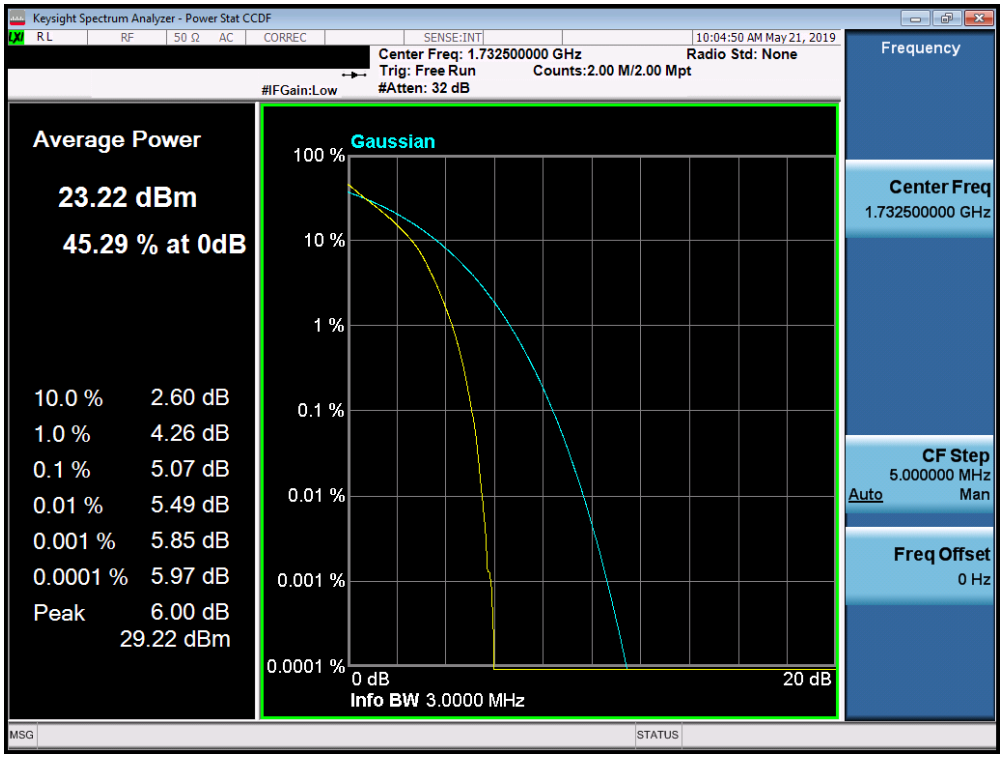
Band 66/4



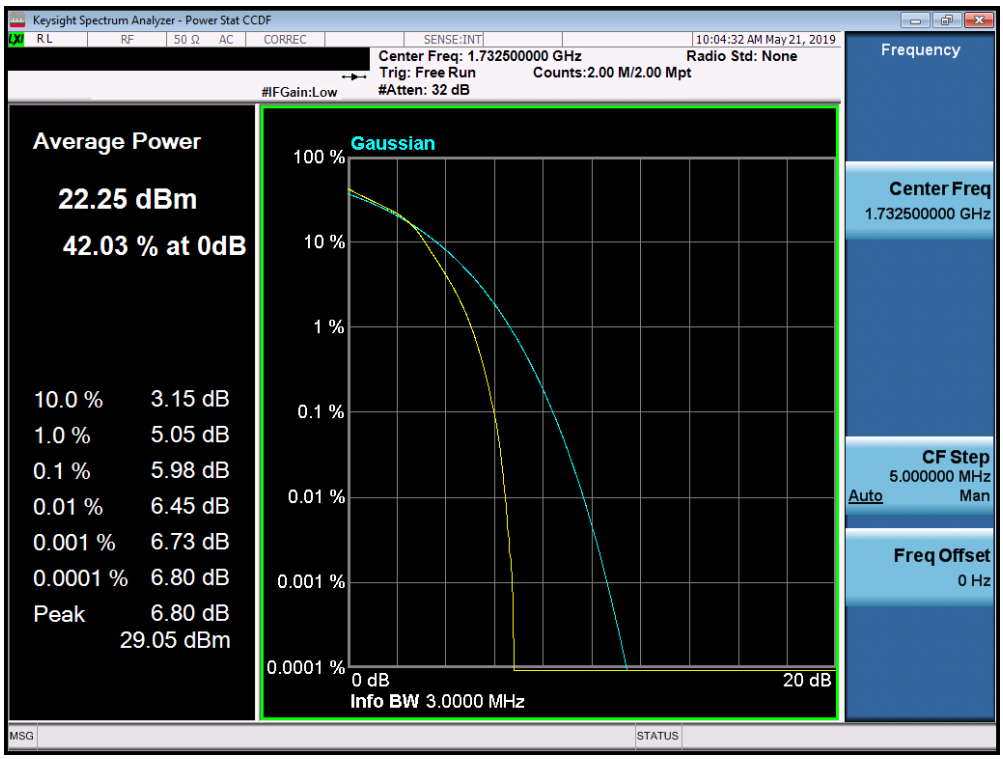
Plot 7-168. PAR Plot (Band 66/4 - 1.4MHz QPSK - Full RB Configuration)



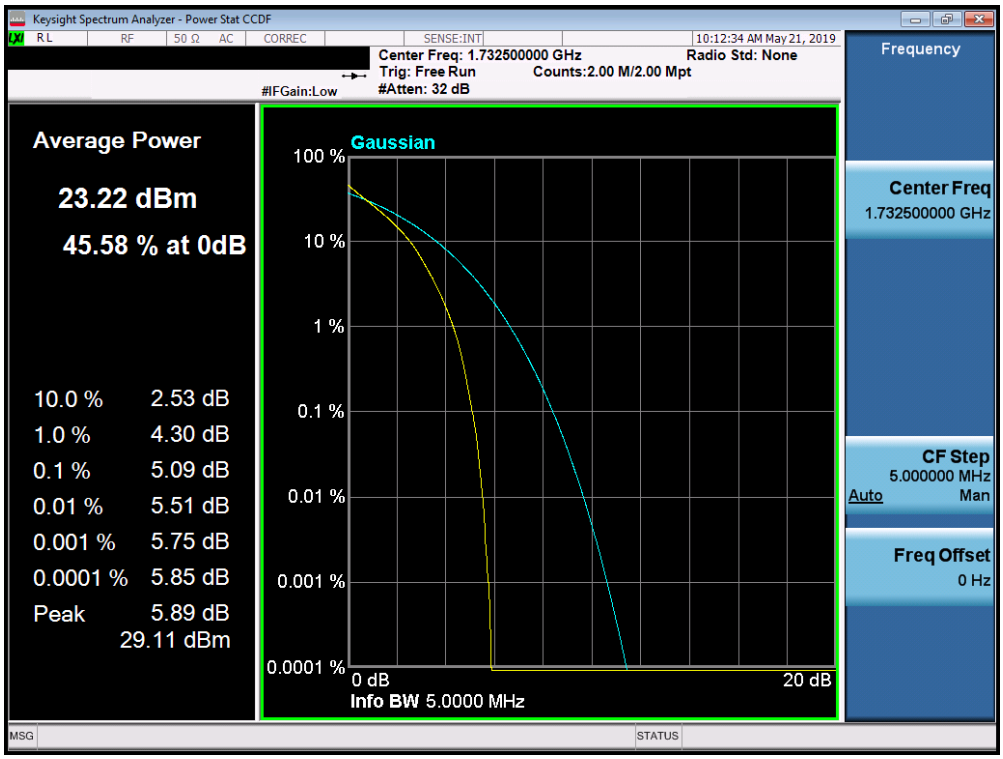
Plot 7-169. PAR Plot (Band 66/4 - 1.4MHz 16-QAM - Full RB Configuration)



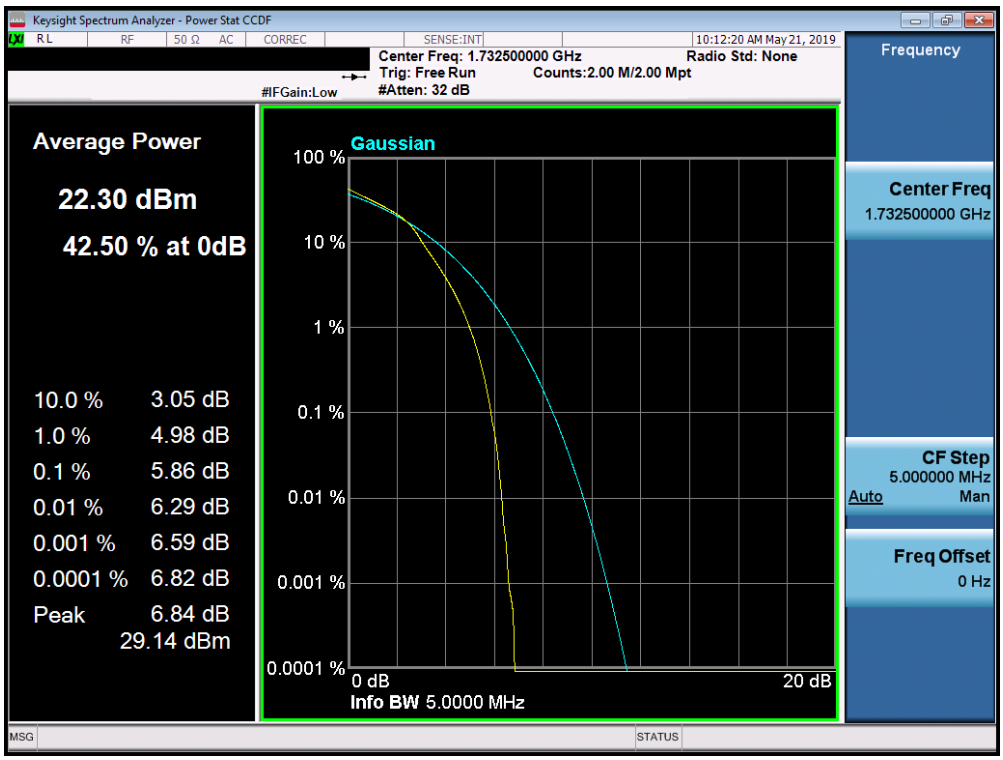
Plot 7-170. PAR Plot (Band 66/4 - 3.0MHz QPSK - Full RB Configuration)



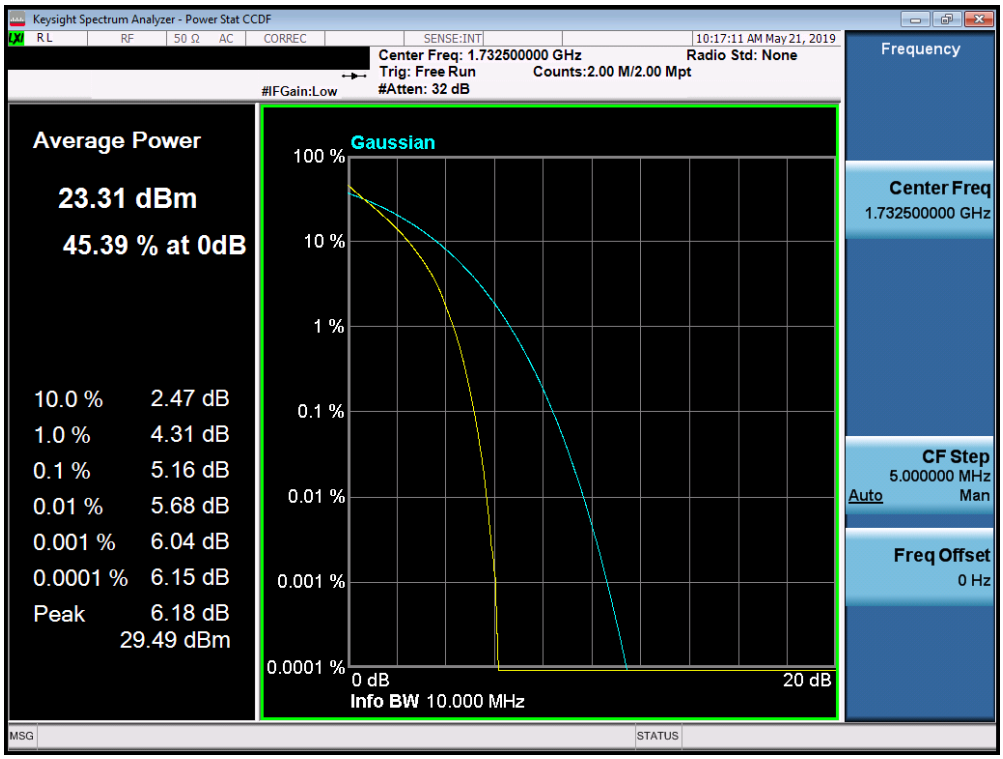
Plot 7-171. PAR Plot (Band 66/4 - 3.0MHz 16-QAM - Full RB Configuration)



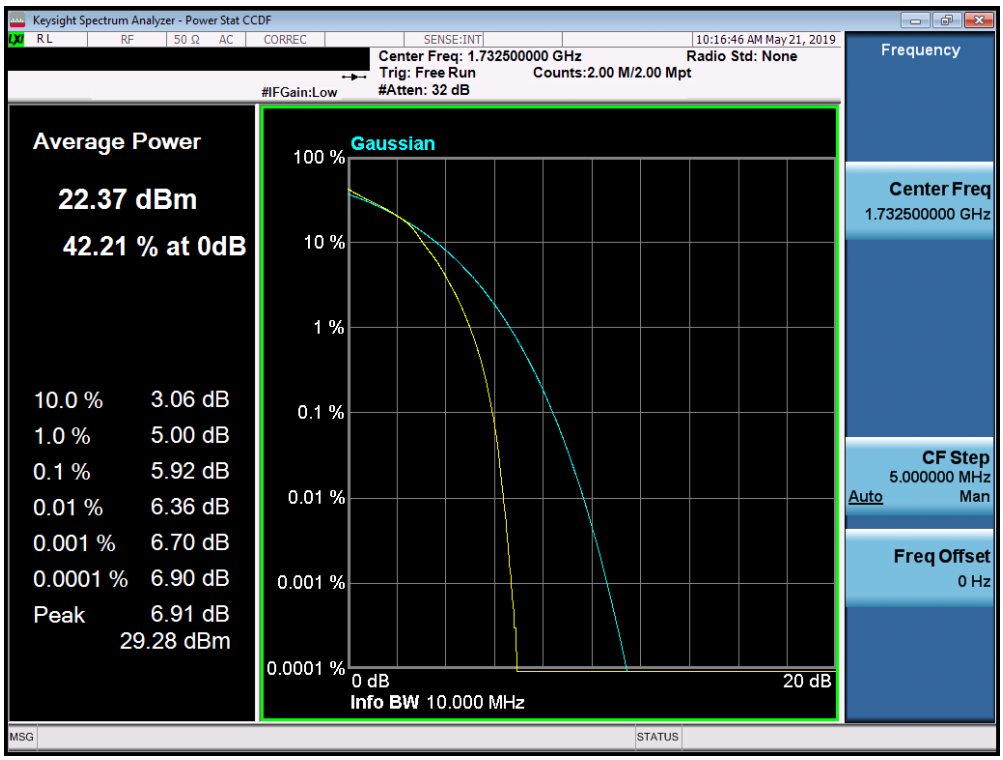
Plot 7-172. PAR Plot (Band 66/4 - 5.0MHz QPSK - Full RB Configuration)



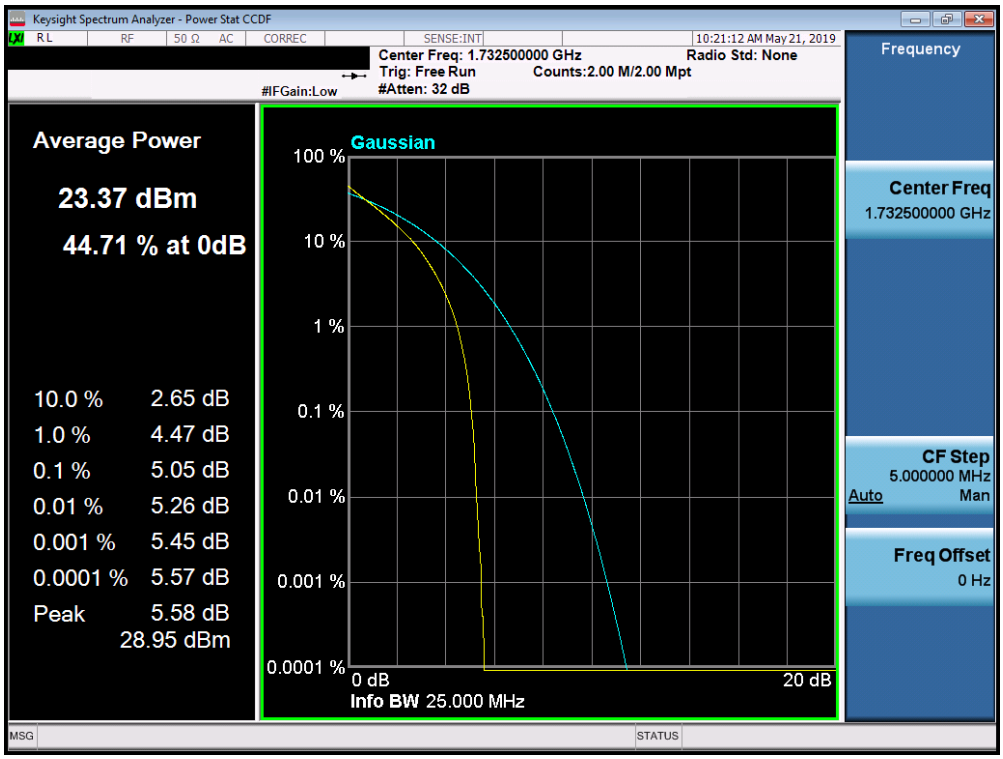
Plot 7-173. PAR Plot (Band 66/4 - 5.0MHz 16-QAM - Full RB Configuration)



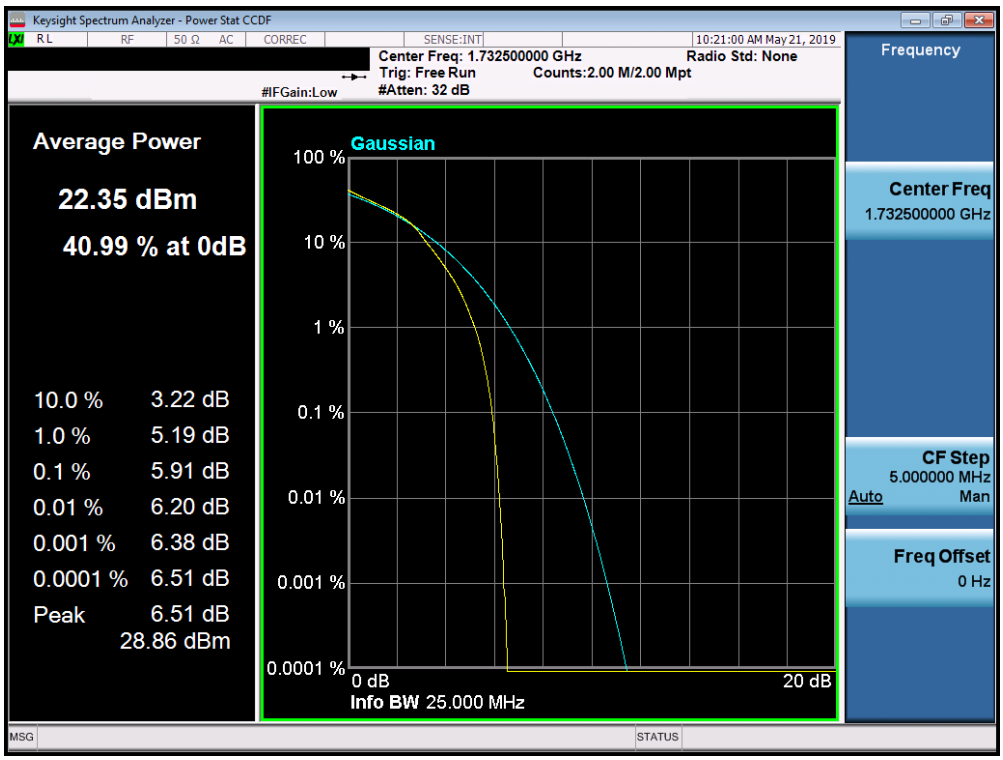
Plot 7-174. PAR Plot (Band 66/4 - 10.0MHz QPSK - Full RB Configuration)



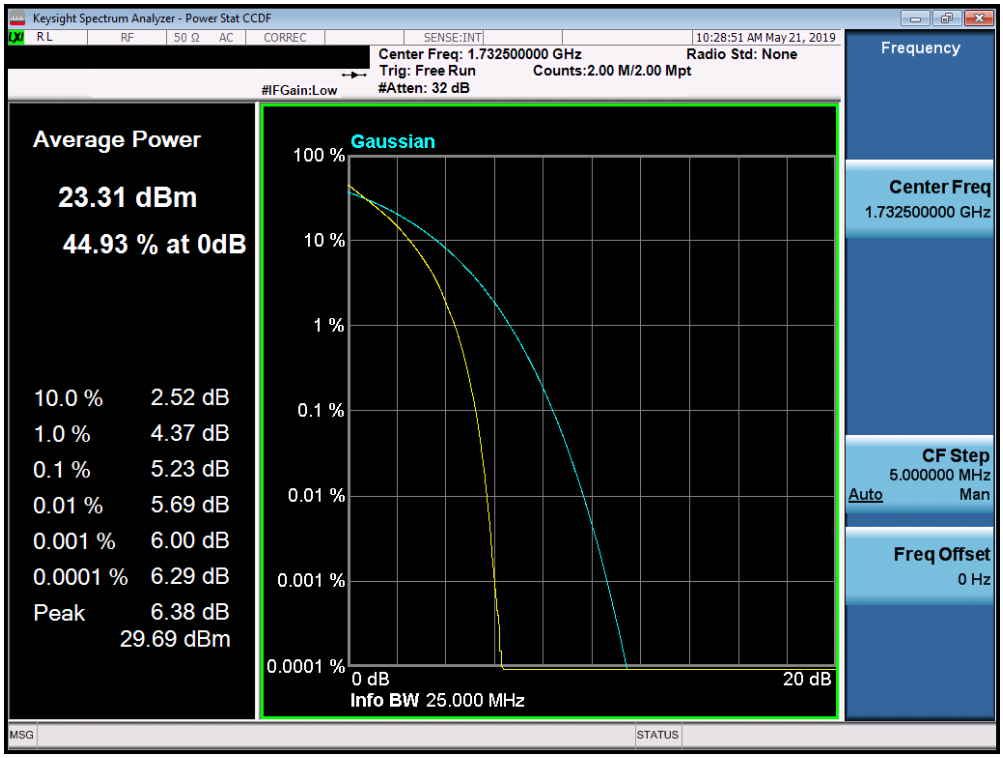
Plot 7-175. PAR Plot (Band 66/4 - 10.0MHz 16-QAM - Full RB Configuration)



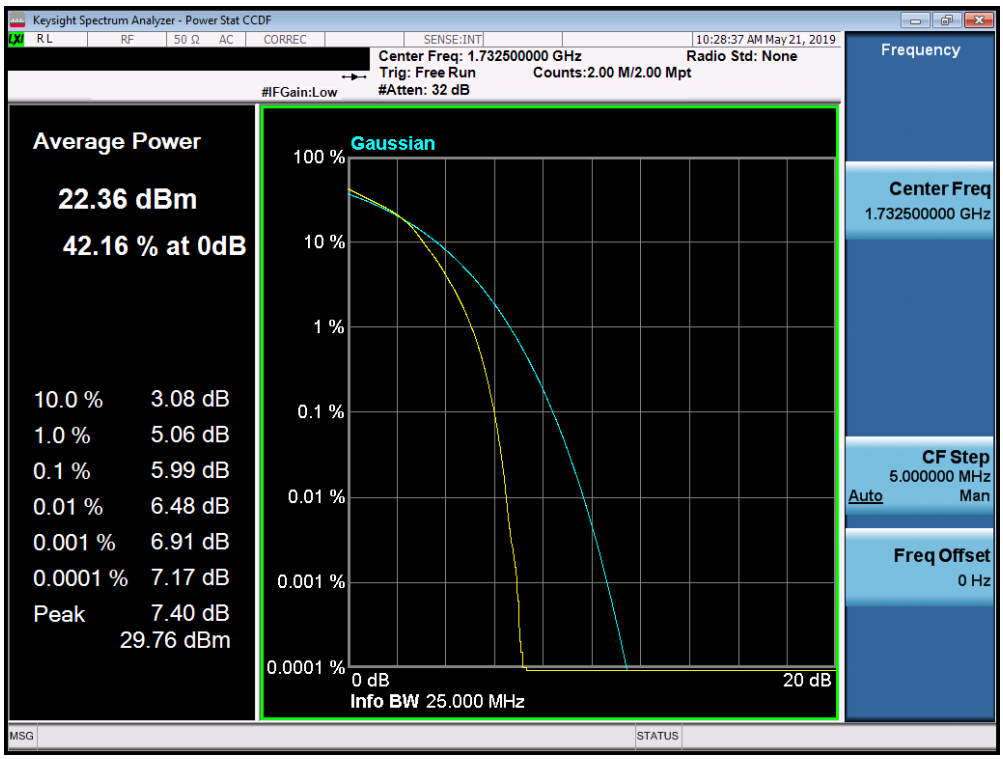
Plot 7-176. PAR Plot (Band 66/4 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-177. PAR Plot (Band 66/4 - 15.0MHz 16-QAM - Full RB Configuration)

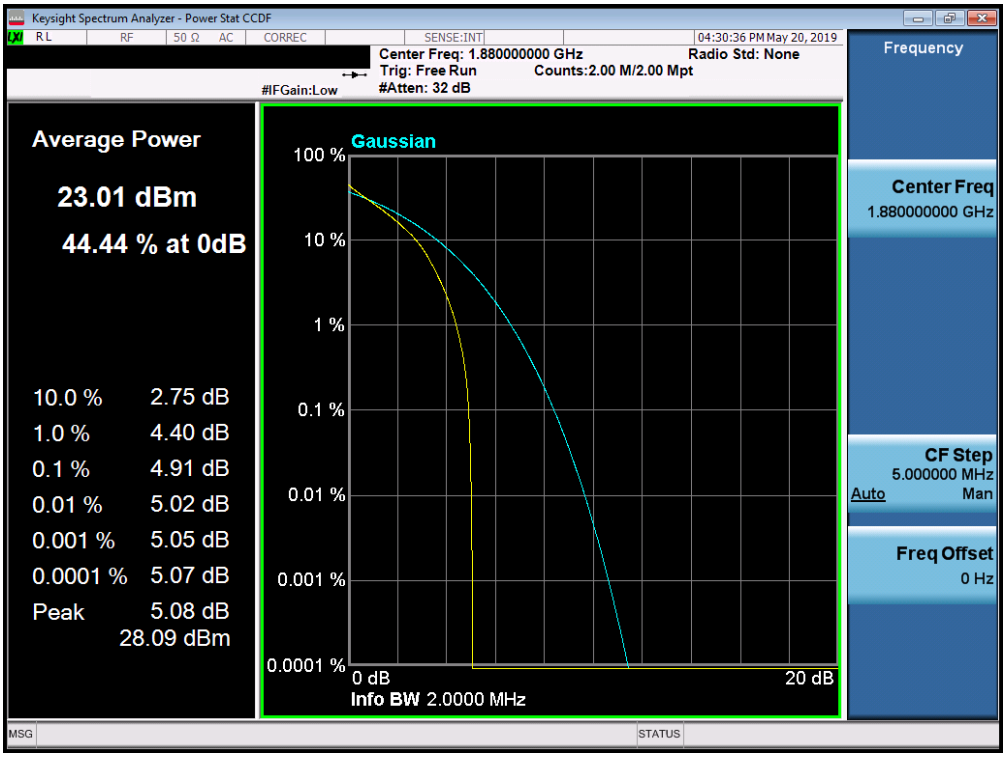


Plot 7-178. PAR Plot (Band 66/4 - 20.0MHz QPSK - Full RB Configuration)

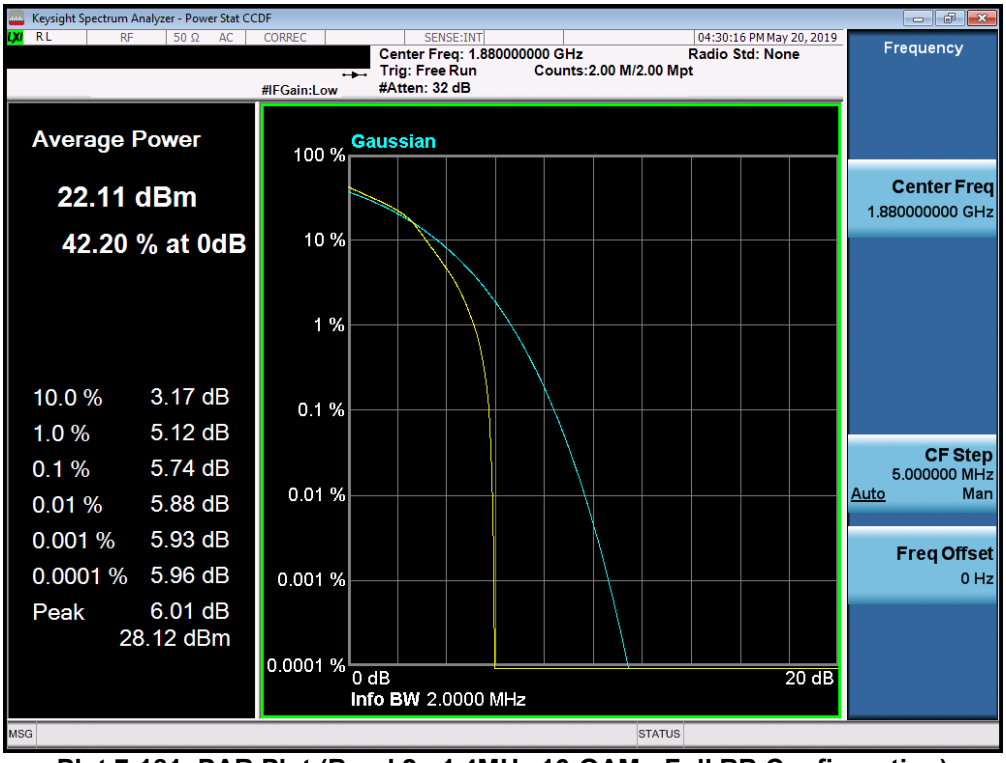


Plot 7-179. PAR Plot (Band 66/4 - 20.0MHz 16-QAM - Full RB Configuration)

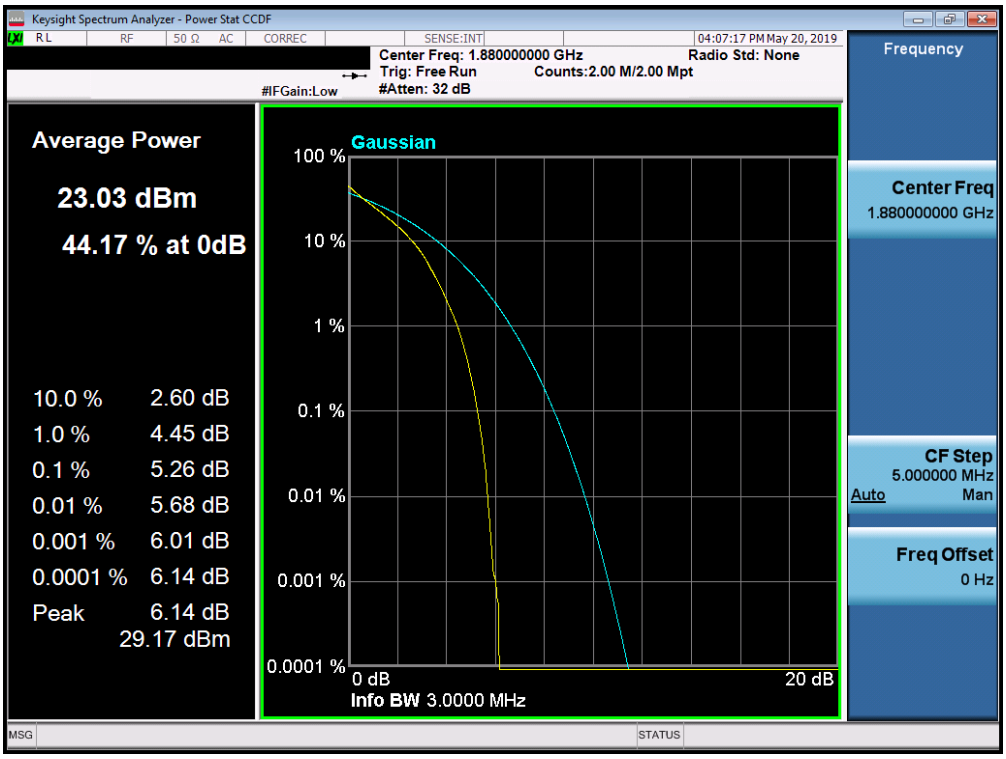
Band 2



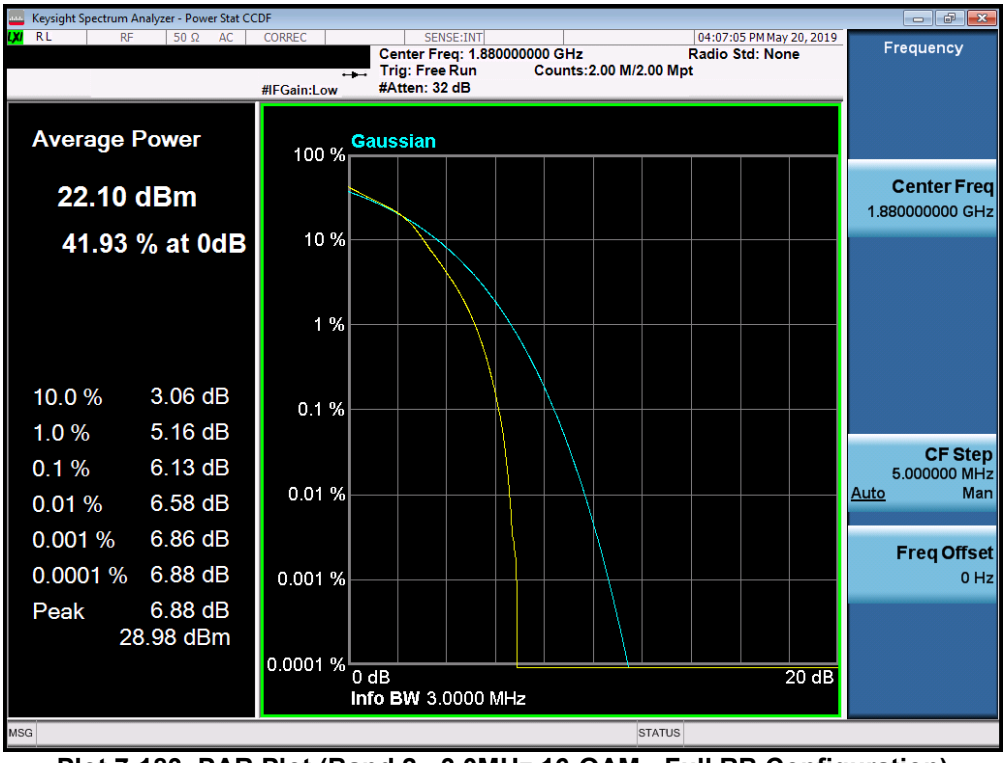
Plot 7-180. PAR Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



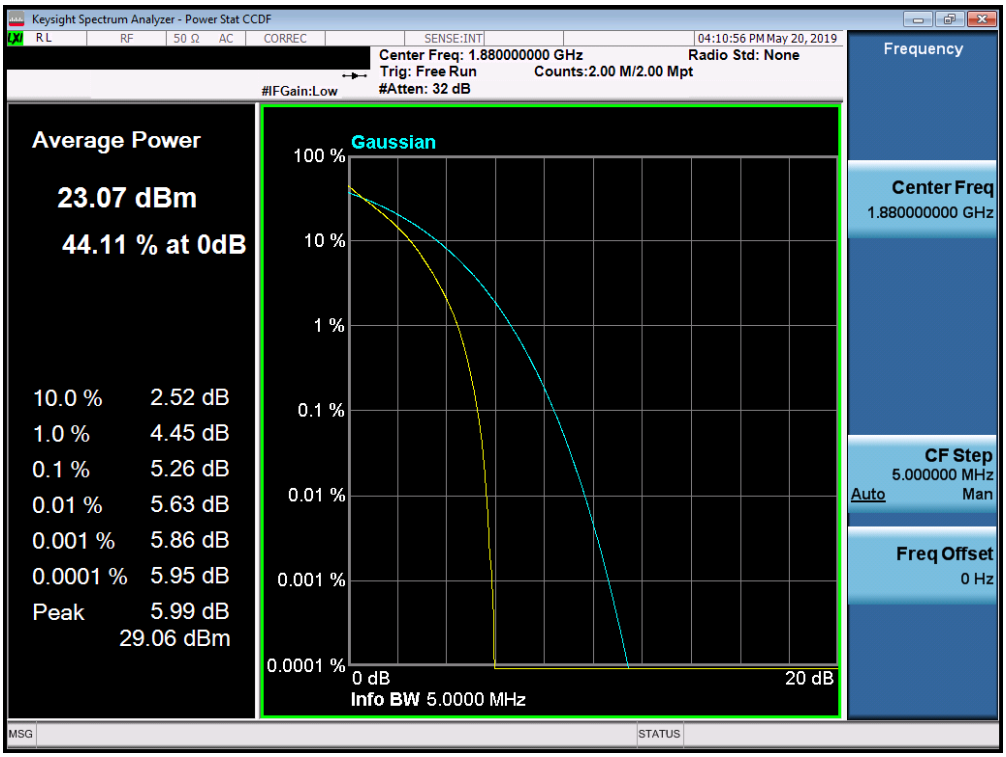
Plot 7-181. PAR Plot (Band 2 - 1.4MHz 16-QAM - Full RB Configuration)



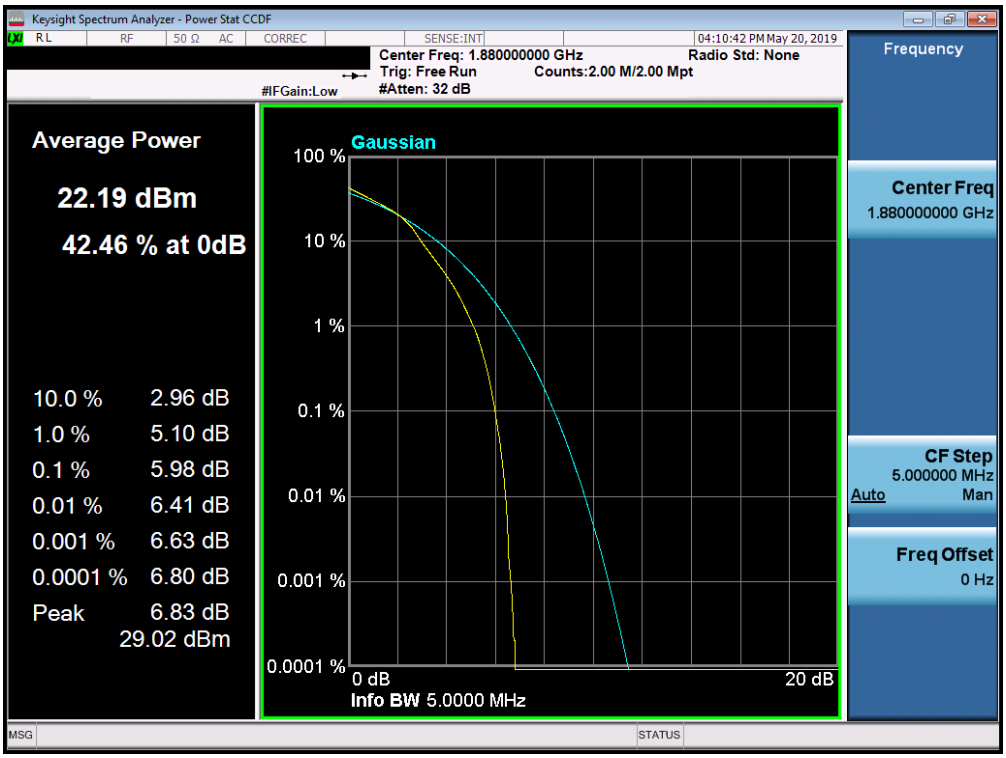
Plot 7-182. PAR Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



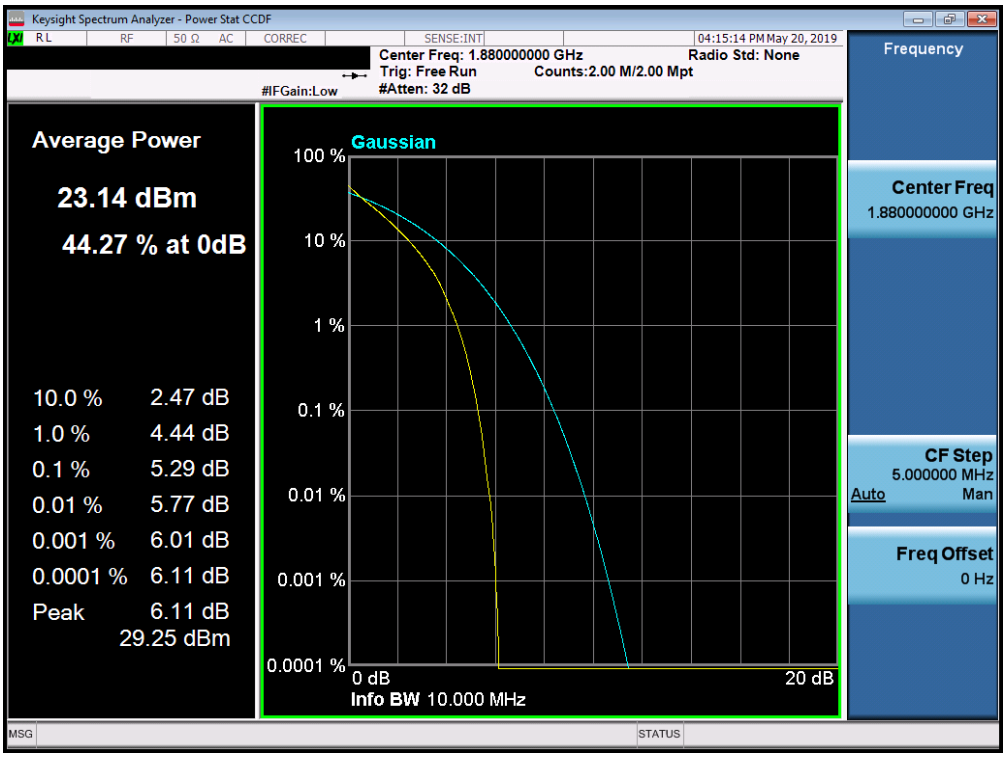
Plot 7-183. PAR Plot (Band 2 - 3.0MHz 16-QAM - Full RB Configuration)



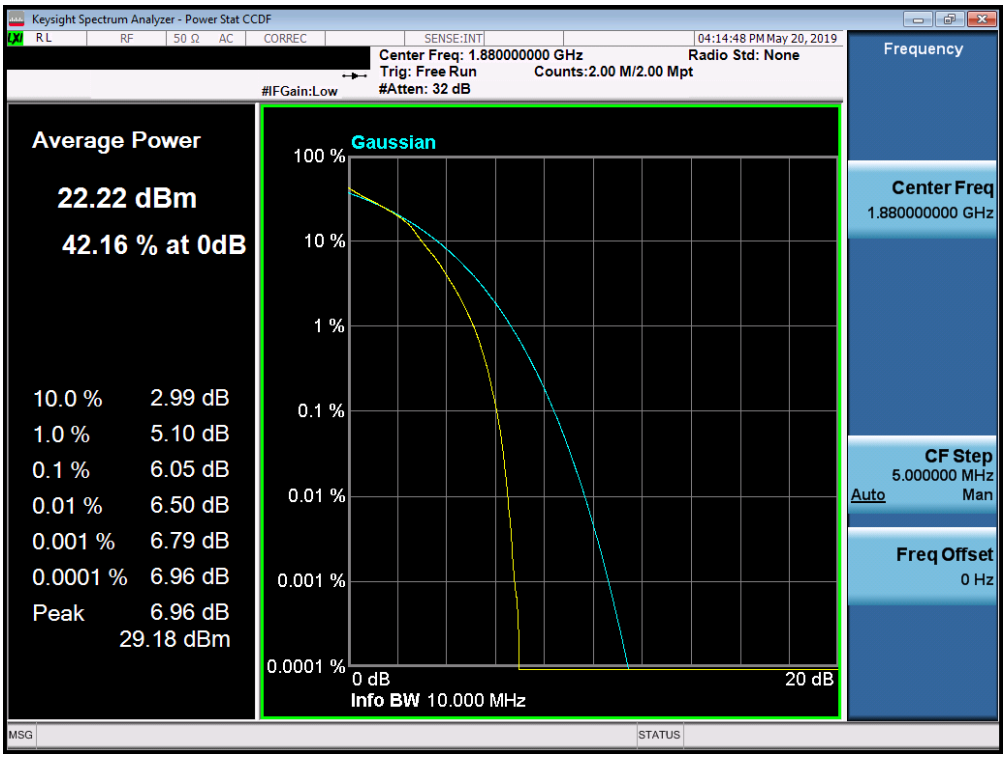
Plot 7-184. PAR Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



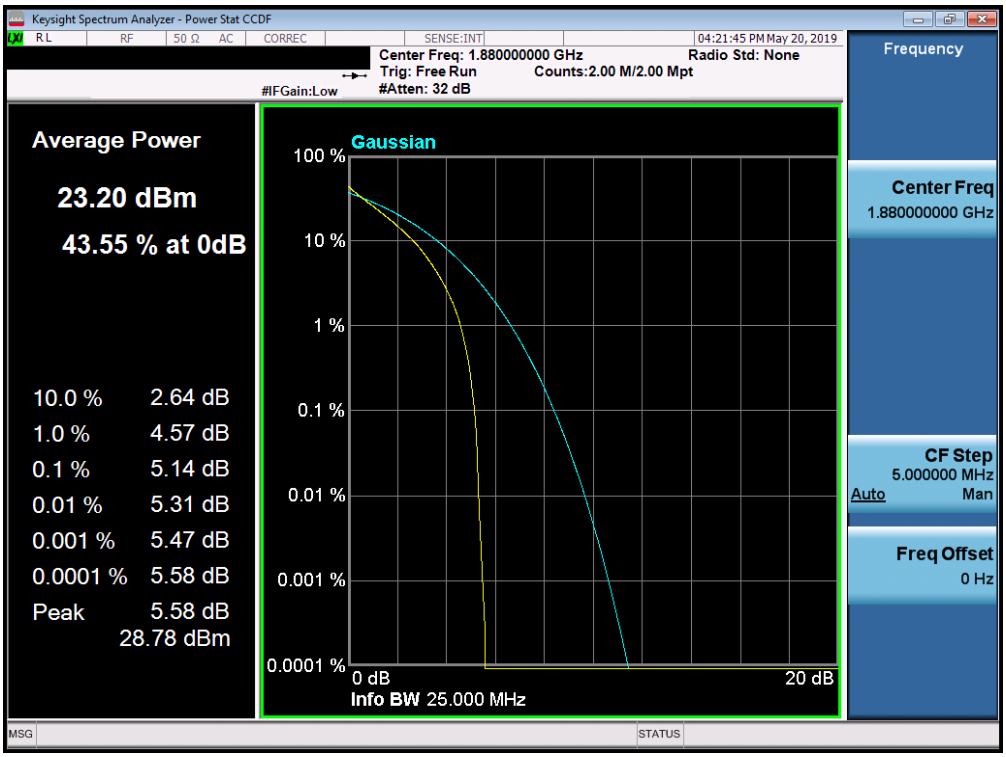
Plot 7-185. PAR Plot (Band 2 - 5.0MHz 16-QAM - Full RB Configuration)



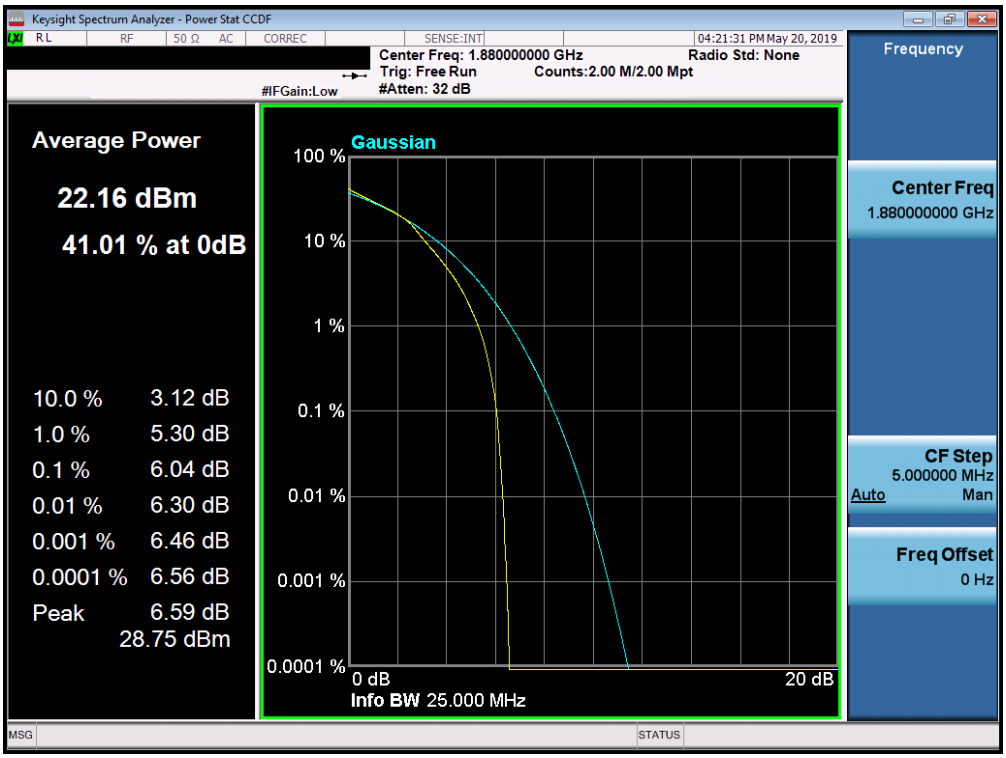
Plot 7-186. PAR Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



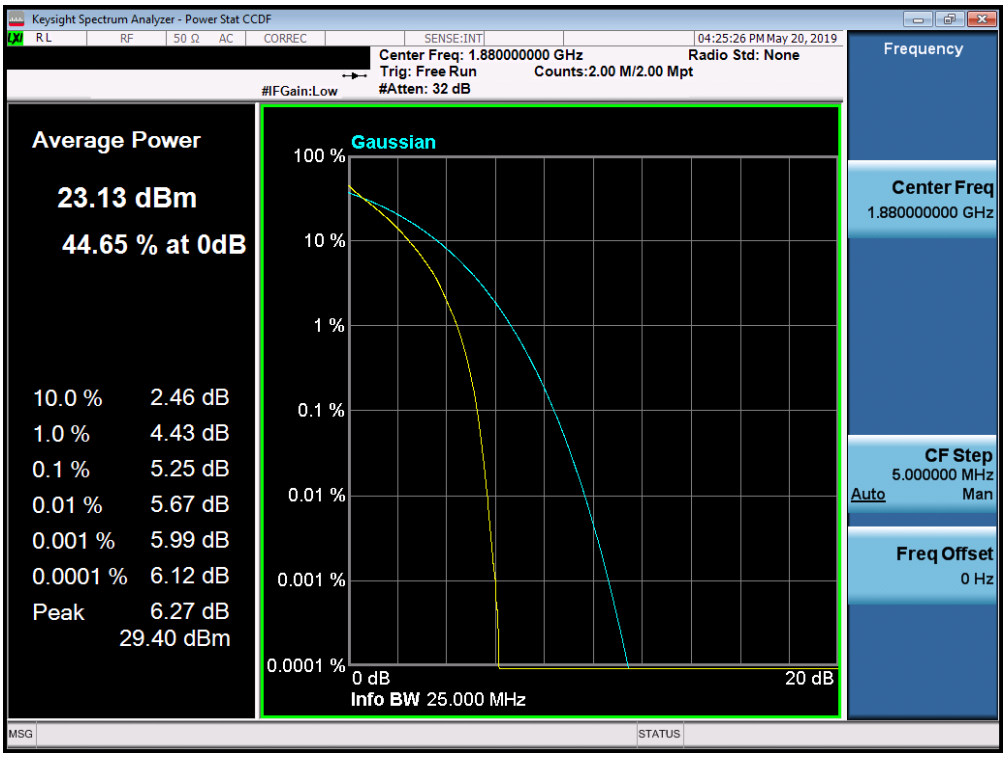
Plot 7-187. PAR Plot (Band 2 - 10.0MHz 16-QAM - Full RB Configuration)



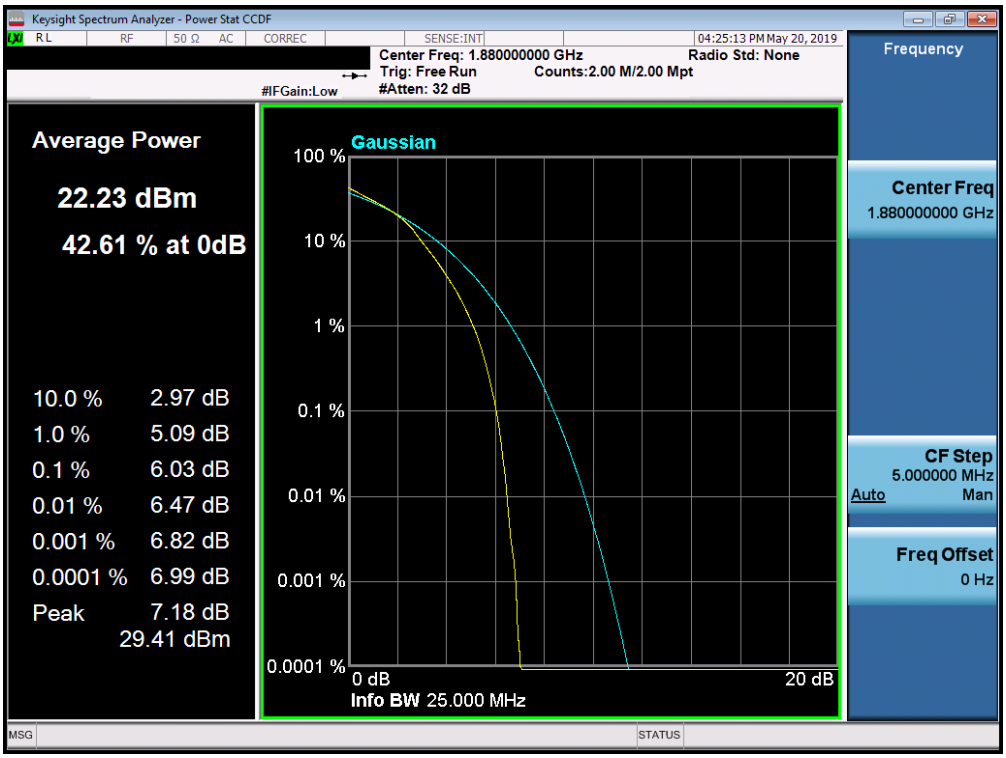
Plot 7-188. PAR Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-189. PAR Plot (Band 2 - 15.0MHz 16-QAM - Full RB Configuration)



Plot 7-190. PAR Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-191. 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.

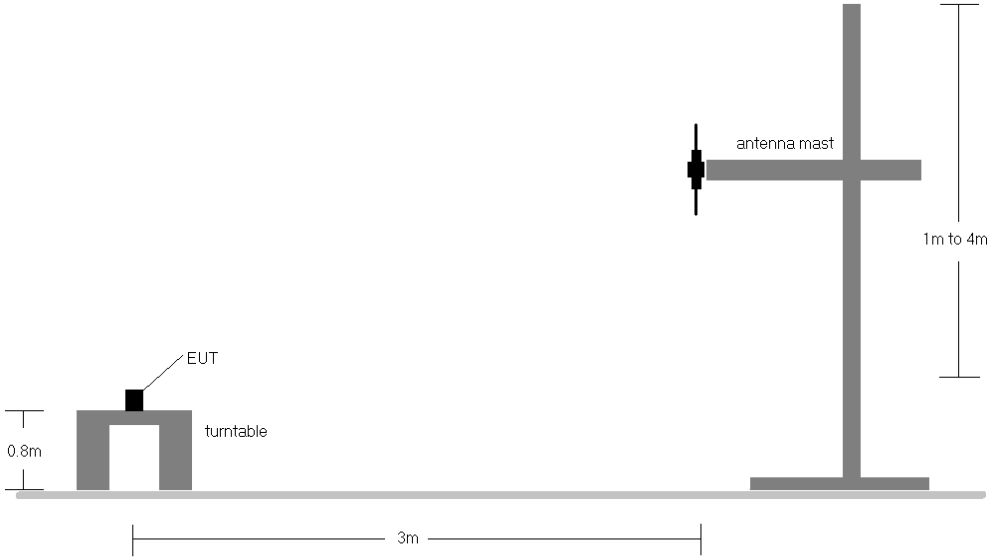


Figure 7-5. Radiated Test Setup <1GHz

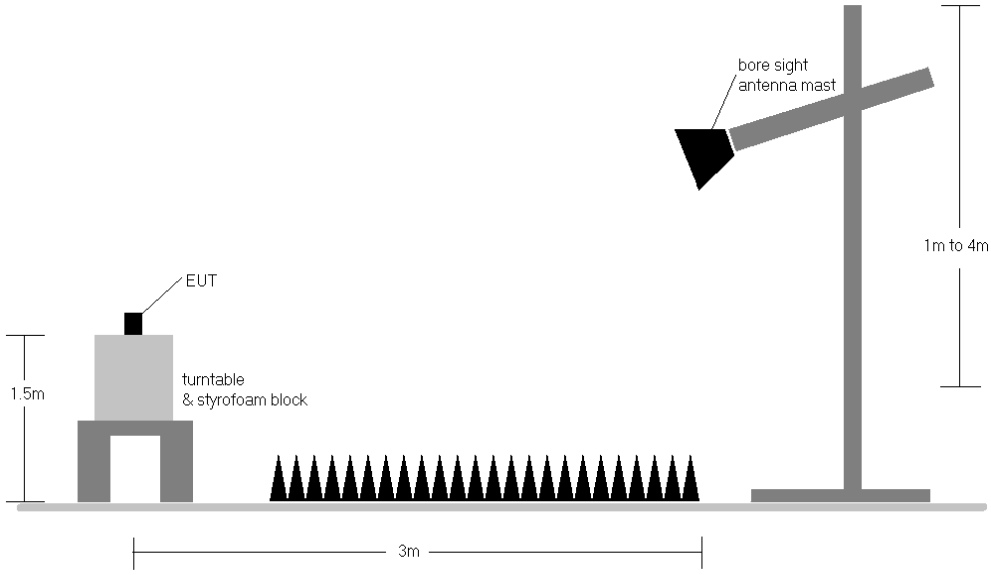


Figure 7-6. Radiated Test Setup >1GHz

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]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
699.70	1.4	QPSK	V	161	216	1 / 5	18.25	3.40	19.50	0.089	34.77	-15.27	21.65	0.146	36.99	-15.34
707.50	1.4	QPSK	V	176	215	1 / 5	18.55	3.65	20.05	0.101	34.77	-14.72	22.20	0.166	36.99	-14.79
715.30	1.4	QPSK	V	169	225	1 / 5	19.05	3.70	**20.60**	0.115	34.77	-14.17	**22.75**	0.188	36.99	-14.24
715.30	1.4	16-QAM	V	169	225	1 / 5	18.05	3.70	**19.60**	0.091	34.77	-15.17	**21.75**	0.150	36.99	-15.24
700.50	3	QPSK	V	161	216	1 / 14	18.35	3.40	19.60	0.091	34.77	-15.17	21.75	0.150	36.99	-15.24
707.50	3	QPSK	V	176	215	1 / 14	18.63	3.65	20.13	0.103	34.77	-14.64	22.28	0.169	36.99	-14.71
714.50	3	QPSK	V	169	225	1 / 14	19.25	3.70	**20.80**	**0.120**	34.77	-13.97	**22.95**	**0.197**	36.99	-14.04
714.50	3	16-QAM	V	169	225	1 / 14	18.13	3.70	**19.68**	0.093	34.77	-15.09	**21.83**	0.152	36.99	-15.16
701.50	5	QPSK	V	161	216	1 / 24	18.25	3.40	19.50	0.089	34.77	-15.27	21.65	0.146	36.99	-15.34
707.50	5	QPSK	V	176	215	1 / 24	18.53	3.65	20.03	0.101	34.77	-14.74	22.18	0.165	36.99	-14.81
713.50	5	QPSK	V	169	225	1 / 24	19.10	3.70	**20.65**	0.116	34.77	-14.12	**22.80**	0.191	36.99	-14.19
713.50	5	16-QAM	V	169	225	1 / 24	18.05	3.70	**19.60**	0.091	34.77	-15.17	**21.75**	0.150	36.99	-15.24
704.00	10	QPSK	V	161	216	1 / 49	18.35	3.50	19.70	0.093	34.77	-15.07	21.85	0.153	36.99	-15.14
707.50	10	QPSK	V	176	215	1 / 49	18.65	3.65	20.15	0.104	34.77	-14.62	22.30	0.170	36.99	-14.69
711.00	10	QPSK	V	169	225	1 / 49	19.20	3.70	**20.75**	0.119	34.77	-14.02	**22.90**	0.195	36.99	-14.09
711.00	10	16-QAM	V	169	225	1 / 49	18.28	3.70	**19.83**	0.096	34.77	-14.94	**21.98**	0.158	36.99	-15.01
711.00	10	QPSK	H	296	275	1 / 14	18.59	3.70	20.14	0.103	34.77	-14.63	22.29	0.169	36.99	-14.70

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]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
824.70	1.4	QPSK	V	239	234	1 / 5	16.29	6.70	20.84	0.121	38.45	-17.61	22.99	0.199	40.61	-17.62
836.50	1.4	QPSK	V	231	233	1 / 5	16.78	6.70	21.33	0.136	38.45	-17.12	23.48	0.223	40.61	-17.13
848.30	1.4	QPSK	V	230	239	1 / 5	17.24	6.70	**21.79**	0.151	38.45	-16.66	**23.94**	0.248	40.61	-16.67
848.30	1.4	16-QAM	V	230	239	1 / 5	16.29	6.70	**20.84**	0.121	38.45	-17.61	**22.99**	0.199	40.61	-17.62
825.50	3	QPSK	V	239	234	1 / 14	16.44	6.70	20.99	0.126	38.45	-17.46	23.14	0.206	40.61	-17.47
836.50	3	QPSK	V	231	233	1 / 14	16.79	6.70	21.34	0.136	38.45	-17.11	23.49	0.223	40.61	-17.12
847.50	3	QPSK	V	230	239	1 / 14	17.19	6.65	**21.69**	0.148	38.45	-16.76	**23.84**	0.242	40.61	-16.77
847.50	3	16-QAM	V	230	239	1 / 14	16.27	6.65	**20.77**	0.119	38.45	-17.68	**22.92**	0.196	40.61	-17.69
826.50	5	QPSK	V	239	234	1 / 24	16.34	6.70	20.89	0.123	38.45	-17.56	23.04	0.201	40.61	-17.57
836.50	5	QPSK	V	231	233	1 / 24	16.89	6.70	21.44	0.139	38.45	-17.01	23.59	0.229	40.61	-17.02
846.50	5	QPSK	V	230	239	1 / 24	17.39	6.60	**21.84**	**0.153**	38.45	-16.61	**23.99**	**0.251**	40.61	-16.62
846.50	5	16-QAM	V	230	239	1 / 24	16.59	6.60	**21.04**	0.127	38.45	-17.41	**23.19**	0.208	40.61	-17.42
829.00	10	QPSK	V	239	234	1 / 49	16.38	6.70	20.93	0.124	38.45	-17.52	23.08	0.203	40.61	-17.53
836.50	10	QPSK	V	231	233	1 / 49	16.96	6.70	21.51	0.142	38.45	-16.94	23.66	0.232	40.61	-16.95
844.00	10	QPSK	V	230	239	1 / 49	17.38	6.60	**21.83**	0.152	38.45	-16.62	**23.98**	0.250	40.61	-16.63
844.00	10	16-QAM	V	230	239	1 / 49	16.34	6.60	**20.79**	0.120	38.45	-17.66	**22.94**	0.197	40.61	-17.67
844.00	10	QPSK	H	140	29	1 / 24	15.37	6.60	19.82	0.096	38.45	-18.63	21.97	0.157	40.61	-18.64

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	H	186	26	1 / 0	14.47	9.44	23.91	0.246	30.00	-6.09
1745.00	1.4	QPSK	H	236	23	1 / 0	14.97	9.23	**24.20**	**0.263**	30.00	-5.80
1779.30	1.4	QPSK	H	171	20	1 / 0	13.27	9.26	22.53	0.179	30.00	-7.47
1745.00	1.4	16-QAM	H	236	23	1 / 0	14.07	9.23	**23.30**	0.214	30.00	-6.70
1711.50	3	QPSK	H	186	26	1 / 0	14.27	9.44	23.71	0.235	30.00	-6.29
1745.00	3	QPSK	H	236	23	1 / 0	14.72	9.23	**23.95**	0.248	30.00	-6.05
1778.50	3	QPSK	H	171	20	1 / 0	13.07	9.26	22.33	0.171	30.00	-7.67
1745.00	3	16-QAM	H	236	23	1 / 0	13.97	9.23	**23.20**	0.209	30.00	-6.80
1712.50	5	QPSK	H	186	26	1 / 0	14.47	9.43	23.90	0.246	30.00	-6.10
1745.00	5	QPSK	H	236	23	1 / 0	14.82	9.23	**24.05**	0.254	30.00	-5.95
1777.50	5	QPSK	H	171	20	1 / 0	13.37	9.26	22.63	0.183	30.00	-7.37
1745.00	5	16-QAM	H	236	23	1 / 0	13.87	9.23	**23.10**	0.204	30.00	-6.90
1715.00	10	QPSK	H	186	26	1 / 0	14.47	9.42	23.89	0.245	30.00	-6.11
1745.00	10	QPSK	H	236	23	1 / 0	14.77	9.23	**24.00**	0.251	30.00	-6.00
1775.00	10	QPSK	H	171	20	1 / 0	13.37	9.25	22.62	0.183	30.00	-7.38
1745.00	10	16-QAM	H	236	23	1 / 0	13.87	9.23	**23.10**	0.204	30.00	-6.90
1717.50	15	QPSK	H	186	26	1 / 0	14.47	9.40	23.87	0.244	30.00	-6.13
1745.00	15	QPSK	H	236	23	1 / 0	14.72	9.23	**23.95**	0.248	30.00	-6.05
1772.50	15	QPSK	H	171	20	1 / 0	13.37	9.25	22.62	0.183	30.00	-7.38
1745.00	15	16-QAM	H	236	23	1 / 0	13.87	9.23	**23.10**	0.204	30.00	-6.90
1720.00	20	QPSK	H	186	26	1 / 0	14.39	9.38	23.77	0.239	30.00	-6.23
1745.00	20	QPSK	H	236	23	1 / 0	14.64	9.23	**23.87**	0.244	30.00	-6.13
1770.00	20	QPSK	H	171	20	1 / 0	13.28	9.24	22.52	0.179	30.00	-7.48
1745.00	20	16-QAM	H	236	23	1 / 0	13.84	9.23	**23.07**	0.203	30.00	-6.93
1745.00	20	QPSK	V	100	92	1 / 0	14.57	9.23	23.80	0.240	30.00	-6.20

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	295	12	1 / 5	14.51	9.48	23.99	0.251	33.01	-9.02
1880.00	1.4	QPSK	H	113	28	1 / 5	14.46	9.90	**24.36**	**0.273**	33.01	-8.65
1909.30	1.4	QPSK	H	150	20	1 / 5	13.84	10.25	24.09	0.257	33.01	-8.92
1880.00	1.4	16-QAM	H	113	28	1 / 5	13.80	9.90	**23.70**	0.234	33.01	-9.31
1851.50	3	QPSK	H	295	12	1 / 14	14.50	9.50	24.00	0.251	33.01	-9.01
1880.00	3	QPSK	H	113	28	1 / 14	14.38	9.90	**24.28**	0.268	33.01	-8.73
1908.50	3	QPSK	H	150	20	1 / 14	13.68	10.25	23.93	0.247	33.01	-9.08
1880.00	3	16-QAM	H	113	28	1 / 14	13.58	9.90	**23.48**	0.223	33.01	-9.53
1852.50	5	QPSK	H	295	12	1 / 24	14.30	9.51	23.81	0.240	33.01	-9.20
1880.00	5	QPSK	H	113	28	1 / 24	14.30	9.90	**24.20**	0.263	33.01	-8.81
1907.50	5	QPSK	H	150	20	1 / 24	13.72	10.24	23.96	0.249	33.01	-9.05
1880.00	5	16-QAM	H	113	28	1 / 24	13.75	9.90	**23.65**	0.232	33.01	-9.36
1855.00	10	QPSK	H	295	12	1 / 49	14.20	9.55	23.75	0.237	33.01	-9.26
1880.00	10	QPSK	H	113	28	1 / 49	14.30	9.90	**24.20**	0.263	33.01	-8.81
1905.00	10	QPSK	H	150	20	1 / 49	13.69	10.22	23.91	0.246	33.01	-9.10
1880.00	10	16-QAM	H	113	28	1 / 49	13.70	9.90	**23.60**	0.229	33.01	-9.41
1857.50	15	QPSK	H	295	12	1 / 74	14.20	9.58	23.78	0.239	33.01	-9.23
1880.00	15	QPSK	H	113	28	1 / 74	14.38	9.90	**24.28**	0.268	33.01	-8.73
1902.50	15	QPSK	H	150	20	1 / 74	13.70	10.20	23.90	0.245	33.01	-9.11
1880.00	15	16-QAM	H	113	28	1 / 74	13.70	9.90	**23.60**	0.229	33.01	-9.41
1860.00	20	QPSK	H	295	12	1 / 99	14.34	9.62	23.96	0.249	33.01	-9.05
1880.00	20	QPSK	H	113	28	1 / 99	14.32	9.90	**24.22**	0.264	33.01	-8.79
1900.00	20	QPSK	H	150	20	1 / 99	13.75	10.18	23.93	0.247	33.01	-9.08
1880.00	20	16-QAM	H	113	28	1 / 99	13.72	9.90	**23.62**	0.230	33.01	-9.39
1900.00	20	QPSK	V	140	41	1 / 5	14.30	9.90	24.20	0.263	33.01	-8.81

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	117	343	1 / 0	12.03	10.31	22.34	0.171	23.98	-1.64
2312.50	5	QPSK	H	117	343	1 / 0	12.05	10.31	**22.36**	0.172	23.98	-1.62
2312.50	5	16-QAM	H	117	343	1 / 0	11.10	10.31	**21.41**	0.138	23.98	-2.57
2310.00	10	QPSK	H	117	343	1 / 0	12.16	10.31	**22.47**	**0.177**	23.98	-1.51
2310.00	10	16-QAM	H	117	343	1 / 0	11.15	10.31	21.46	0.140	23.98	-2.52
2310.00	10	QPSK	V	295	274	1 / 0	10.26	10.31	20.57	0.114	23.98	-3.41

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.

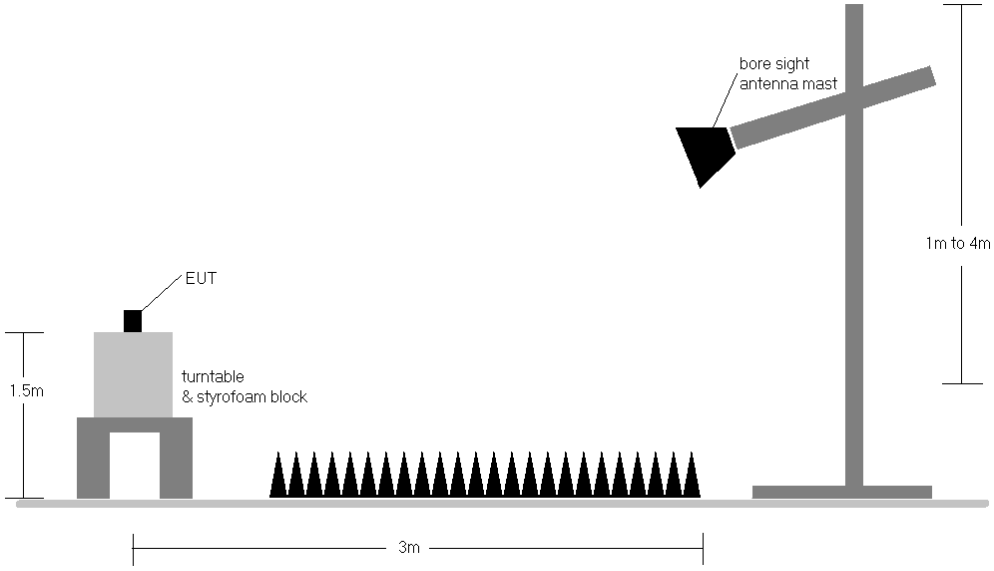


Figure 7-7. Test Instrument & Measurement Setup

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.

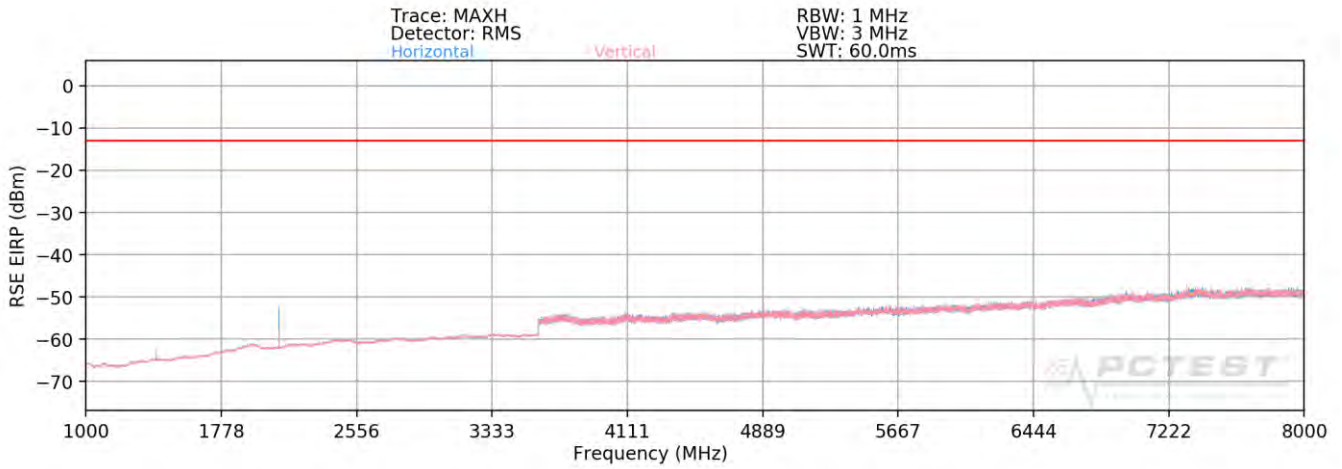
2) This unit was tested with its standard battery.

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 7-192. Radiated Spurious Plot above 1GHz (Band 12)

OPERATING FREQUENCY:	704.00	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]
1408.00	V	112	180	-71.96	7.54	-64.42	-51.4
2112.00	V	120	155	-75.48	8.85	-66.63	-53.6
2816.00	V	-	-	-76.58	10.12	-66.46	-53.5

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

OPERATING FREQUENCY:	707.50	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]
1415.00	V	329	220	-76.03	7.63	-68.39	-55.4
2122.50	V	-	-	-77.10	8.86	-68.24	-55.2

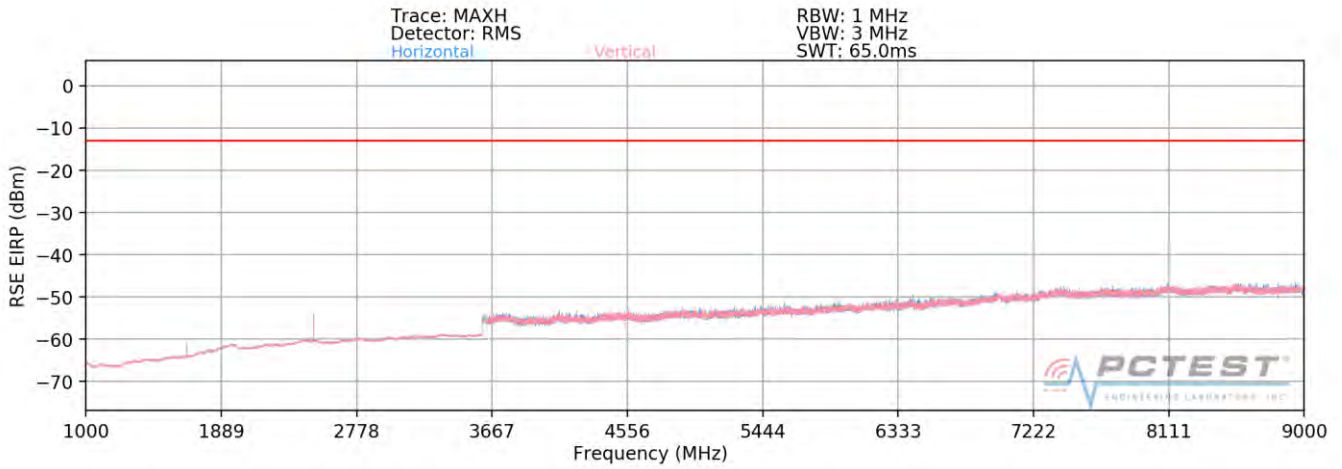
Table 7-9. Radiated Spurious Data (Band 12 – Mid Channel)

OPERATING FREQUENCY:	711.00	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]
1422.00	V	112	183	-72.32	7.72	-64.60	-51.6
2133.00	V	145	200	-74.96	8.87	-66.09	-53.1
2844.00	V	-	-	-76.67	10.07	-66.60	-53.6

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

Band 5



Plot 7-193. Radiated Spurious Plot above 1GHz (Band 5)

OPERATING FREQUENCY:	826.50	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]
1653.00	V	18	116	-76.02	8.95	-67.07	-54.1
2479.50	V	-	-	-74.98	9.67	-65.31	-52.3
3306.00	V	-	-	-73.74	9.58	-64.16	-51.2

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

OPERATING FREQUENCY:	836.50	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]
1673.00	V	18	113	-75.31	8.95	-66.36	-53.4
2509.50	V	-	-	-76.46	9.75	-66.71	-53.7
3346.00	V	-	-	-73.90	9.60	-64.29	-51.3

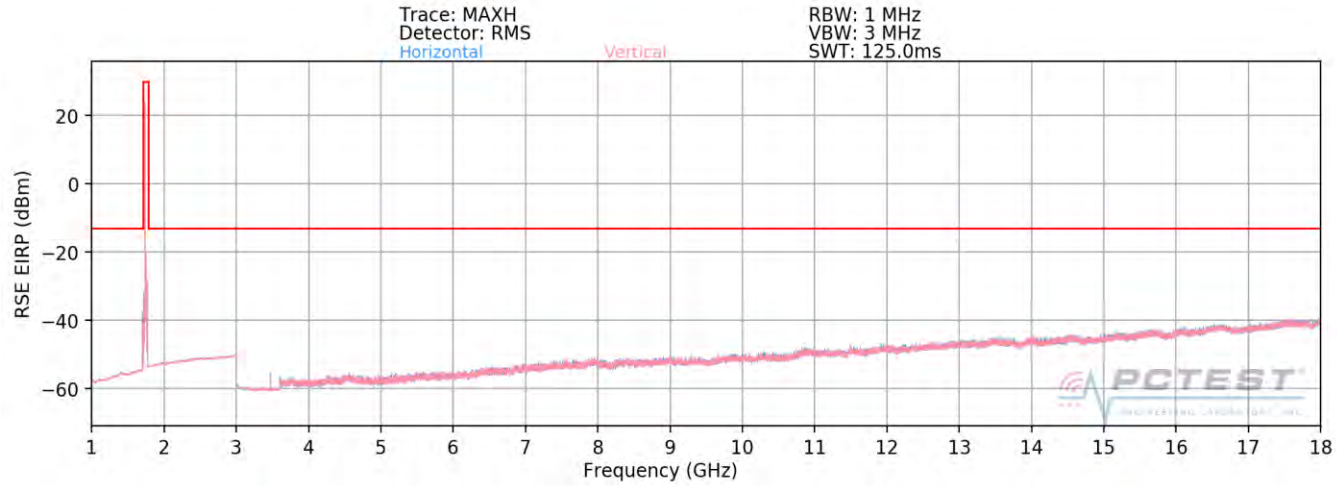
Table 7-12. Radiated Spurious Data (Band 5 – Mid Channel)

OPERATING FREQUENCY:	846.50	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]
1693.00	V	112	387	-75.25	8.95	-66.29	-53.3
2539.50	V	-	-	-76.15	9.74	-66.41	-53.4

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

Band 66/4



Plot 7-194. Radiated Spurious Plot above 1GHz (Band 66/4)

OPERATING FREQUENCY:	1720.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	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]
3440.00	H	115	200	-64.44	9.84	-54.60	-41.6
5160.00	H	127	255	-71.85	10.71	-61.14	-48.1
6880.00	H	-	-	-70.72	11.68	-59.04	-46.0

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

OPERATING FREQUENCY:	1745.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	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	144	187	-67.17	9.91	-57.26	-44.3
5235.00	H	155	210	-72.05	10.73	-61.31	-48.3
6980.00	H	-	-	-71.79	11.82	-59.96	-47.0

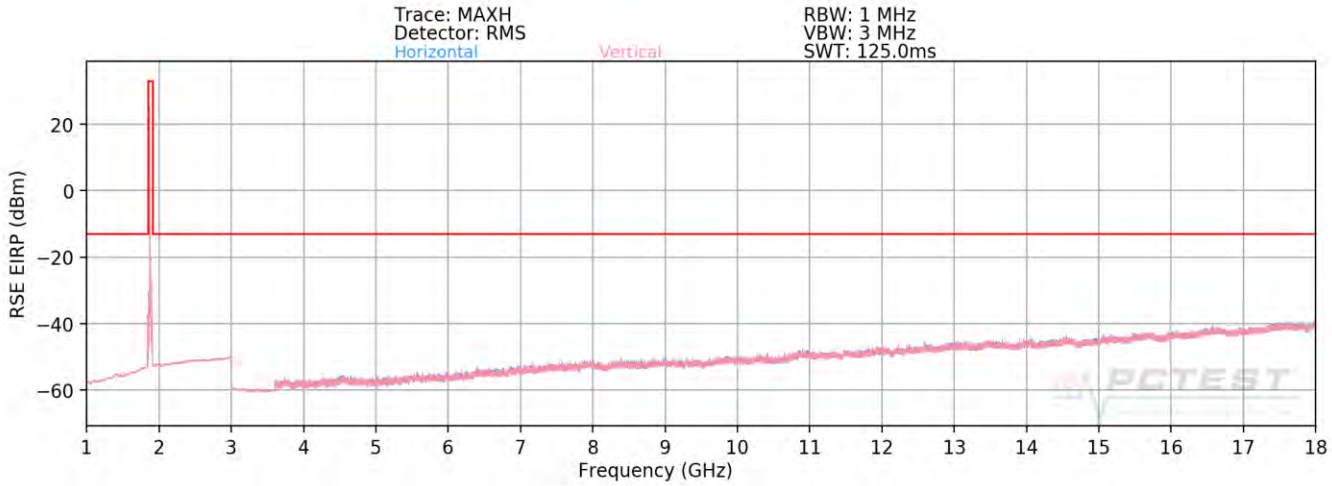
Table 7-15. Radiated Spurious Data (Band 66/4 – Mid Channel)

OPERATING FREQUENCY:	1770.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	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]
3540.00	H	155	272	-66.84	9.89	-56.95	-43.9
5310.00	H	-	-	-71.97	10.69	-61.28	-48.3

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

Band 2



Plot 7-195. Radiated Spurious Plot above 1GHz (Band 2)

OPERATING FREQUENCY:	1860.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	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]
3720.00	H	114	187	-65.44	9.51	-55.93	-42.9
5580.00	H	-	-	-72.51	10.99	-61.53	-48.5

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

OPERATING FREQUENCY:	1880.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	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	128	182	-66.98	9.37	-57.61	-44.6
5640.00	H	-	-	-72.49	11.17	-61.33	-48.3

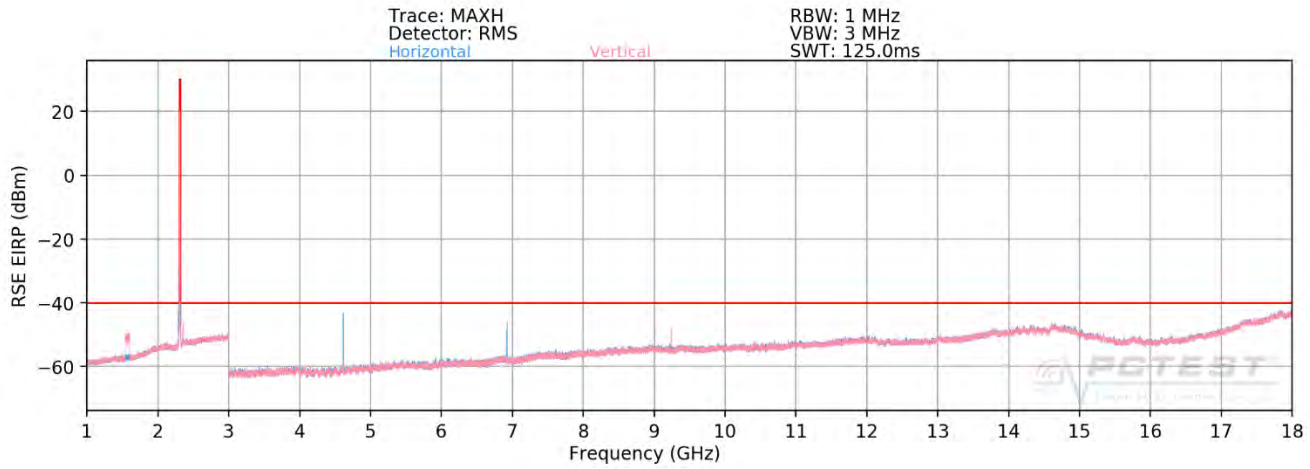
Table 7-18. Radiated Spurious Data (Band 2 – Mid Channel)

OPERATING FREQUENCY:	1900.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

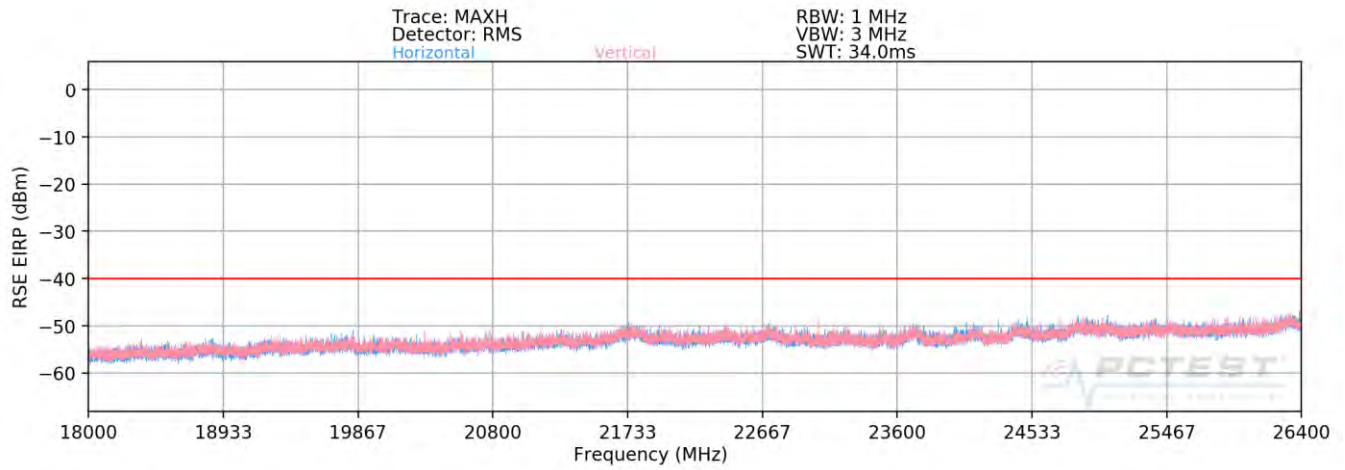
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3800.00	H	112	37	-67.00	9.28	-57.72	-44.7
5700.00	H	-	-	-72.11	11.31	-60.80	-47.8

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

Band 30



Plot 7-196. Radiated Spurious Plot 1GHz - 18GHz (Band 30)



Plot 7-197. 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	121	54	-57.28	10.92	-46.37	-6.4
6930.00	H	135	7	-65.29	11.74	-53.55	-13.6
9240.00	H	113	176	-66.59	11.62	-54.97	-15.0
11550.00	H	-	-	-66.09	12.72	-53.37	-13.4

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 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 12 Frequency Stability Measurements

OPERATING FREQUENCY:	707,500,000	Hz
CHANNEL:	23790	
REFERENCE VOLTAGE:	4.26	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.26	- 30	707,500,259	259	0.0000366
100 %		- 20	707,499,997	-3	-0.0000004
100 %		- 10	707,499,561	-439	-0.0000620
100 %		0	707,499,797	-203	-0.0000287
100 %		+ 10	707,500,434	434	0.0000613
100 %		+ 20	707,499,918	-82	-0.0000116
100 %		+ 30	707,499,741	-259	-0.0000366
100 %		+ 40	707,499,985	-15	-0.0000021
100 %		+ 50	707,500,055	55	0.0000078
BATT. ENDPOINT	3.44	+ 20	707,499,621	-379	-0.0000536

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

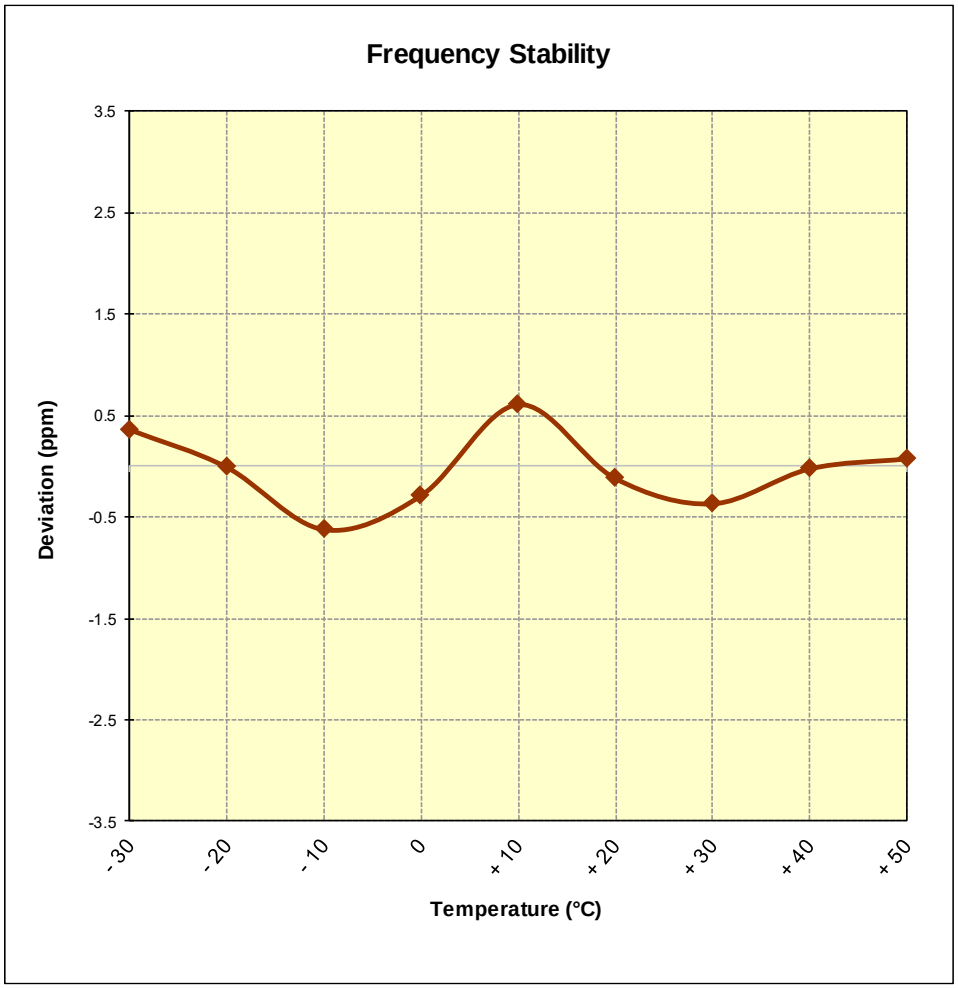


Figure 7-8. Frequency Stability Graph (Band 12)

Band 5 Frequency Stability Measurements

OPERATING FREQUENCY:	836,500,000	Hz
CHANNEL:	20525	
REFERENCE VOLTAGE:	4.26	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.26	- 30	836,500,170	170	0.0000203
100 %		- 20	836,499,891	-109	-0.0000130
100 %		- 10	836,499,919	-81	-0.0000097
100 %		0	836,499,902	-98	-0.0000117
100 %		+ 10	836,500,367	367	0.0000439
100 %		+ 20	836,500,239	239	0.0000286
100 %		+ 30	836,500,098	98	0.0000117
100 %		+ 40	836,499,773	-227	-0.0000271
100 %		+ 50	836,499,967	-33	-0.0000039
BATT. ENDPOINT	3.44	+ 20	836,500,067	67	0.0000080

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

Band 5 Frequency Stability Measurements

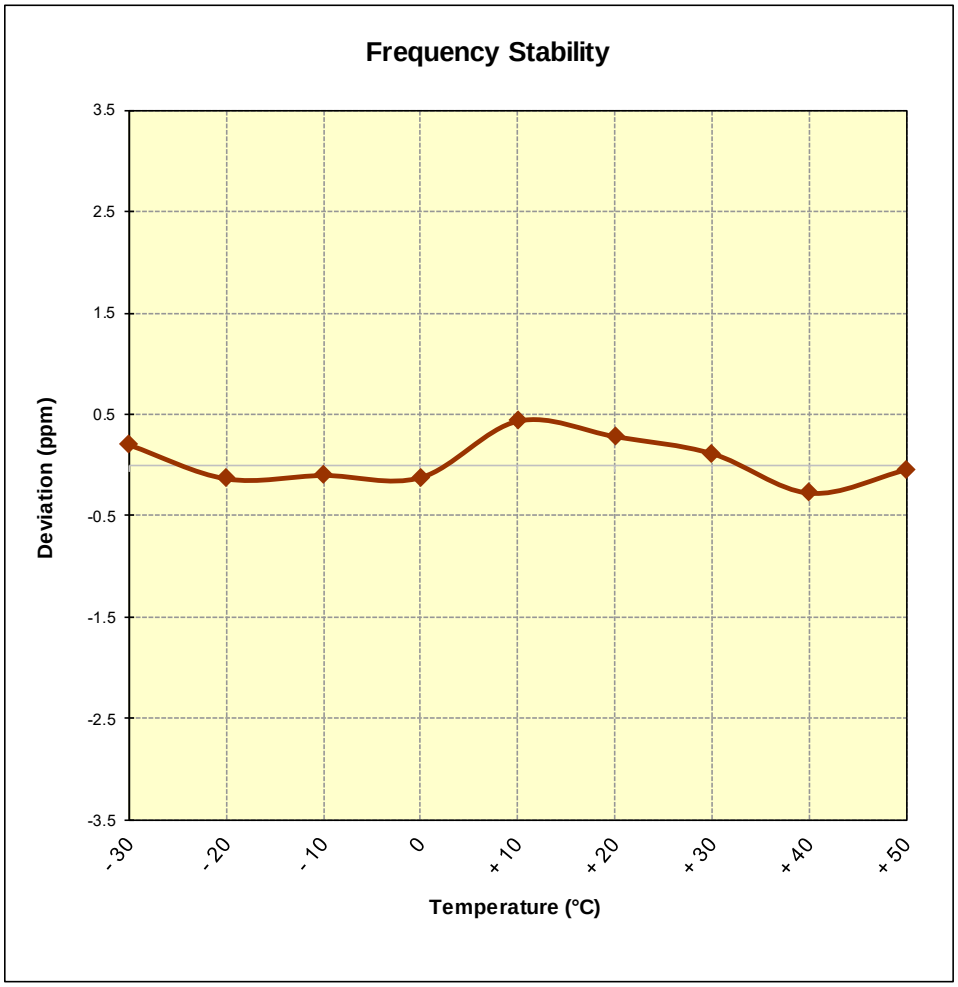


Figure 7-9. Frequency Stability Graph (Band 5)

Band 66/4 Frequency Stability Measurements

OPERATING FREQUENCY:	1,745,000,000	Hz
CHANNEL:	132322	
REFERENCE VOLTAGE:	4.26	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.26	- 30	1,744,999,750	-250	-0.0000143
100 %		- 20	1,745,000,406	406	0.0000233
100 %		- 10	1,745,000,255	255	0.0000146
100 %		0	1,745,000,078	78	0.0000045
100 %		+ 10	1,744,999,957	-43	-0.0000025
100 %		+ 20	1,744,999,638	-362	-0.0000207
100 %		+ 30	1,744,999,609	-391	-0.0000224
100 %		+ 40	1,744,999,913	-87	-0.0000050
100 %		+ 50	1,745,000,119	119	0.0000068
BATT. ENDPOINT	3.44	+ 20	1,745,000,261	261	0.0000150

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

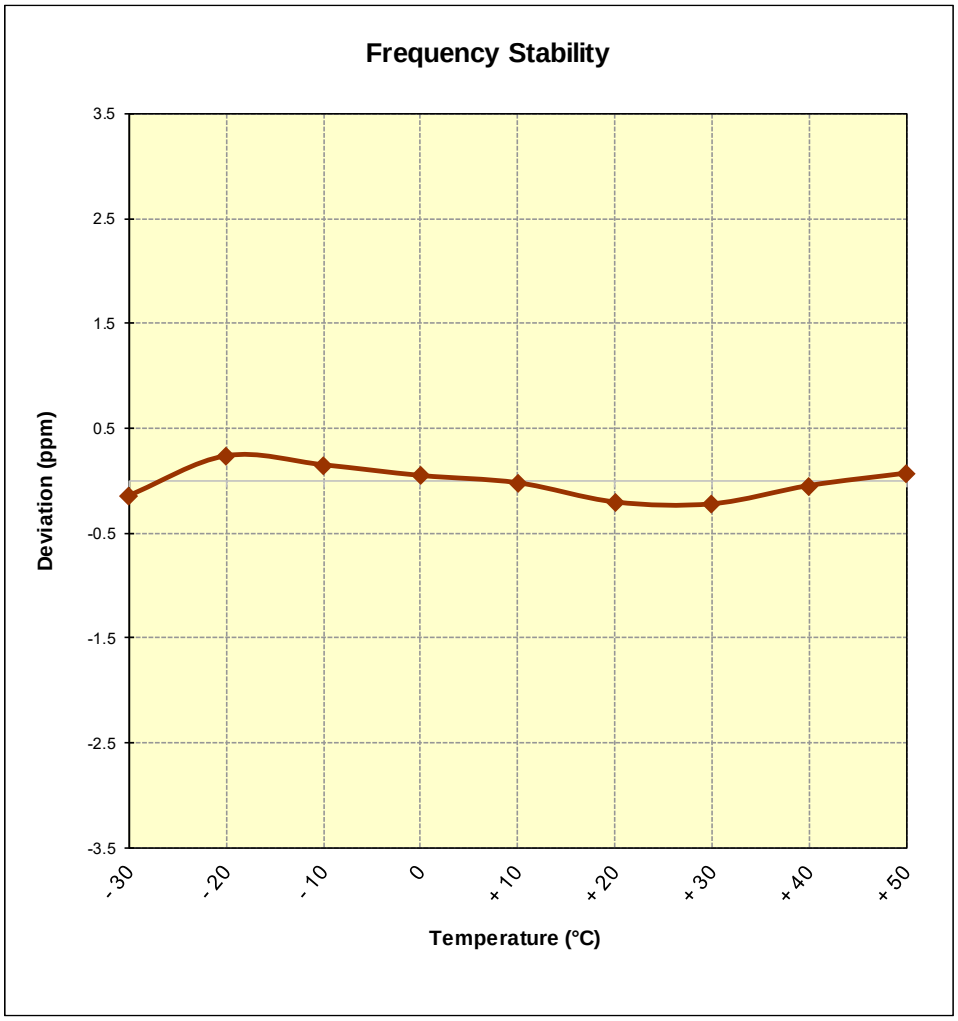


Figure 7-10. Frequency Stability Graph (Band 66/4)

Band 2 Frequency Stability Measurements

OPERATING FREQUENCY:	1,880,000,000	Hz
CHANNEL:	18900	
REFERENCE VOLTAGE:	4.26	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.26	- 30	1,880,000,186	186	0.0000099
100 %		- 20	1,879,999,847	-153	-0.0000081
100 %		- 10	1,879,999,941	-59	-0.0000031
100 %		0	1,880,000,066	66	0.0000035
100 %		+ 10	1,879,999,929	-71	-0.0000038
100 %		+ 20	1,879,999,732	-268	-0.0000143
100 %		+ 30	1,879,999,729	-271	-0.0000144
100 %		+ 40	1,880,000,284	284	0.0000151
100 %		+ 50	1,879,999,801	-199	-0.0000106
BATT. ENDPOINT	3.44	+ 20	1,879,999,936	-64	-0.0000034

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

Band 2 Frequency Stability Measurements

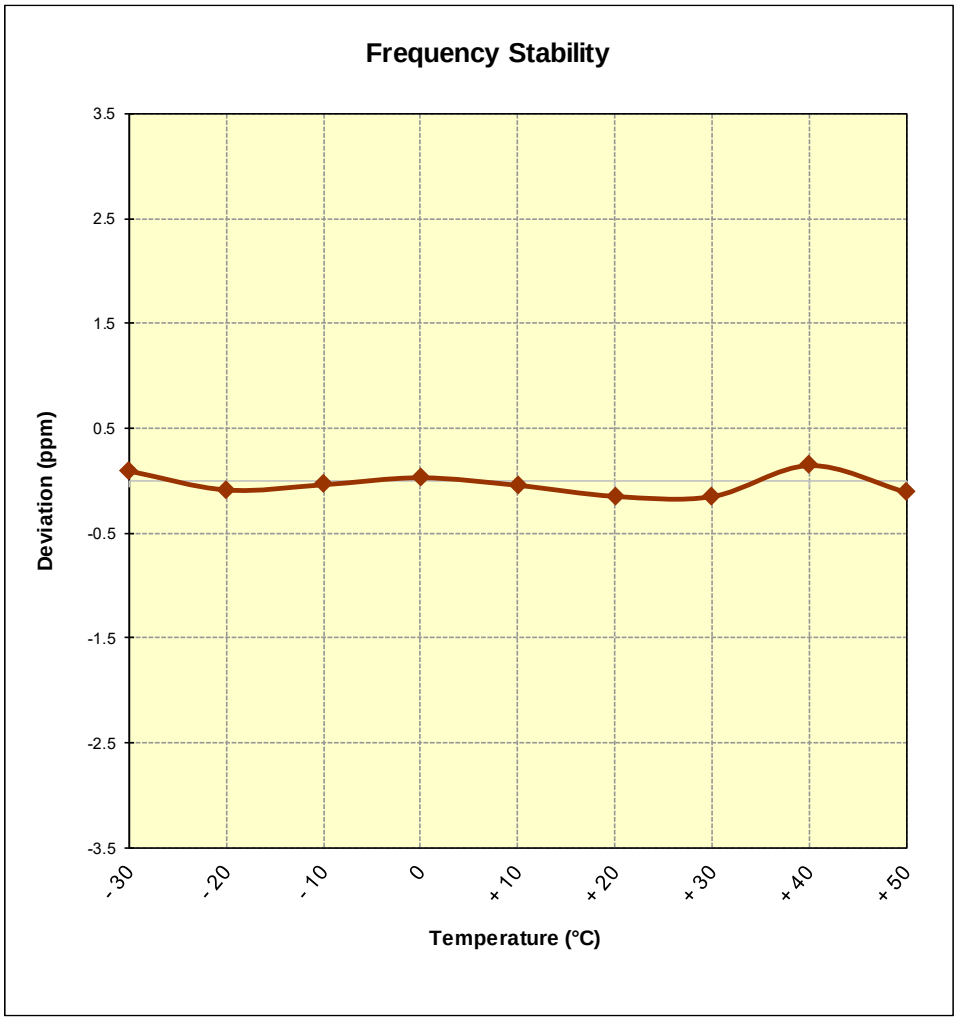


Figure 7-11. Frequency Stability Graph (Band 2)

Band 30 Frequency Stability Measurements

OPERATING FREQUENCY:	2,310,000,000	Hz
CHANNEL:	27710	
REFERENCE VOLTAGE:	4.26	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.26	- 30	2,309,999,950	-50	-0.0000022
100 %		- 20	2,310,000,097	97	0.0000042
100 %		- 10	2,310,000,384	384	0.0000166
100 %		0	2,309,999,736	-264	-0.0000114
100 %		+ 10	2,310,000,088	88	0.0000038
100 %		+ 20	2,309,999,949	-51	-0.0000022
100 %		+ 30	2,310,000,273	273	0.0000118
100 %		+ 40	2,310,000,051	51	0.0000022
100 %		+ 50	2,310,000,009	9	0.0000004
BATT. ENDPOINT	3.44	+ 20	2,310,000,003	3	0.0000001

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

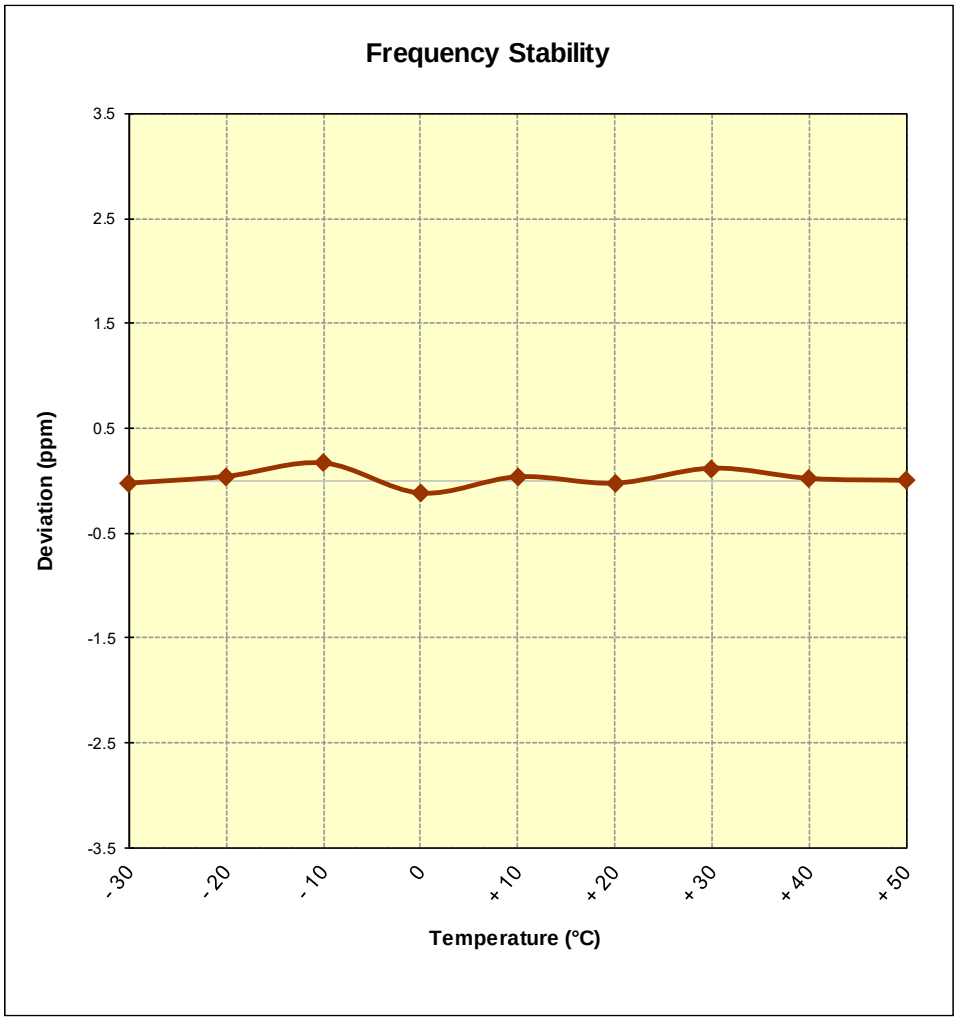


Figure 7-12. Frequency Stability Graph (Band 30)

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFX420AS** complies with all the requirements of Part 22, 24, & 27 of the FCC Rules for LTE operation only.