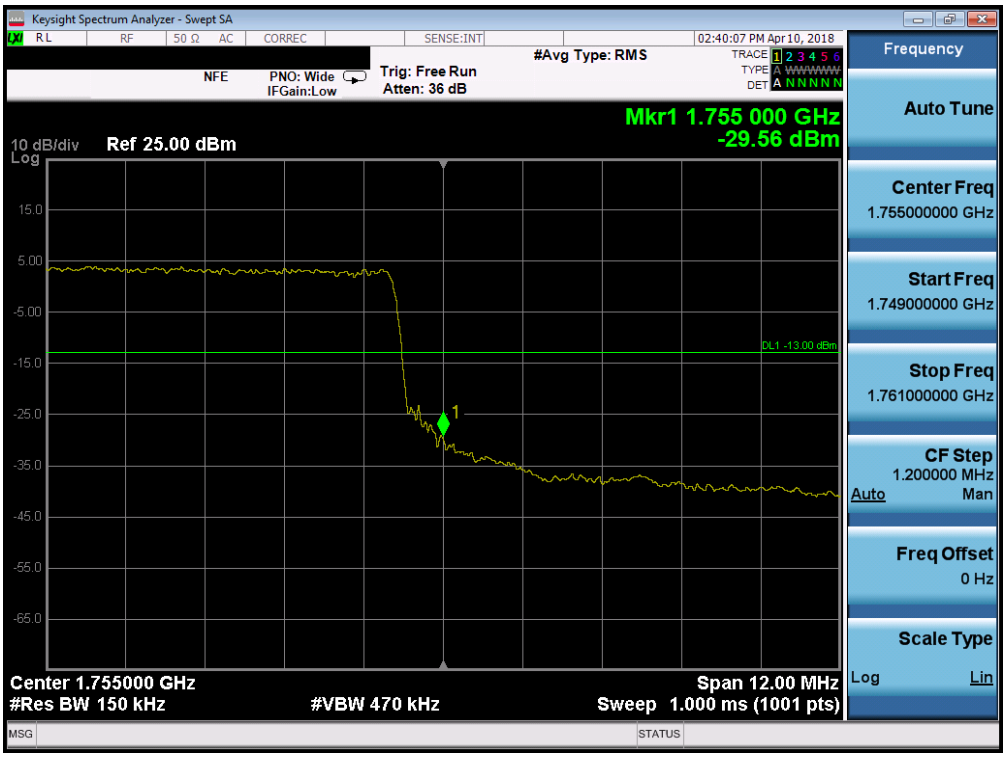
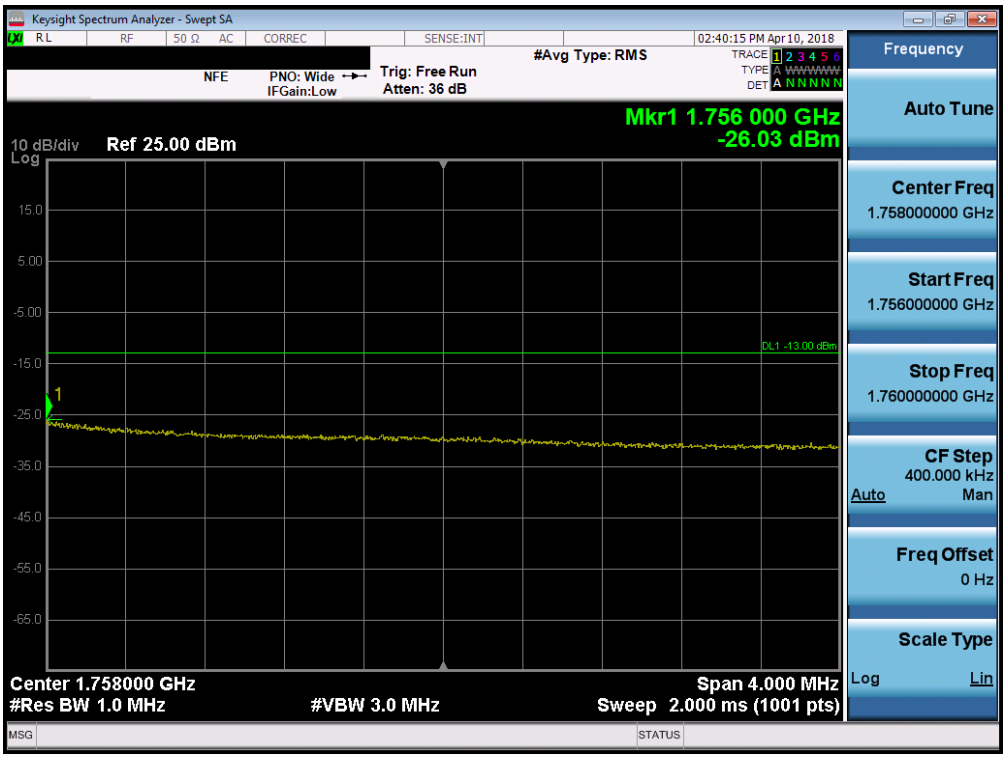
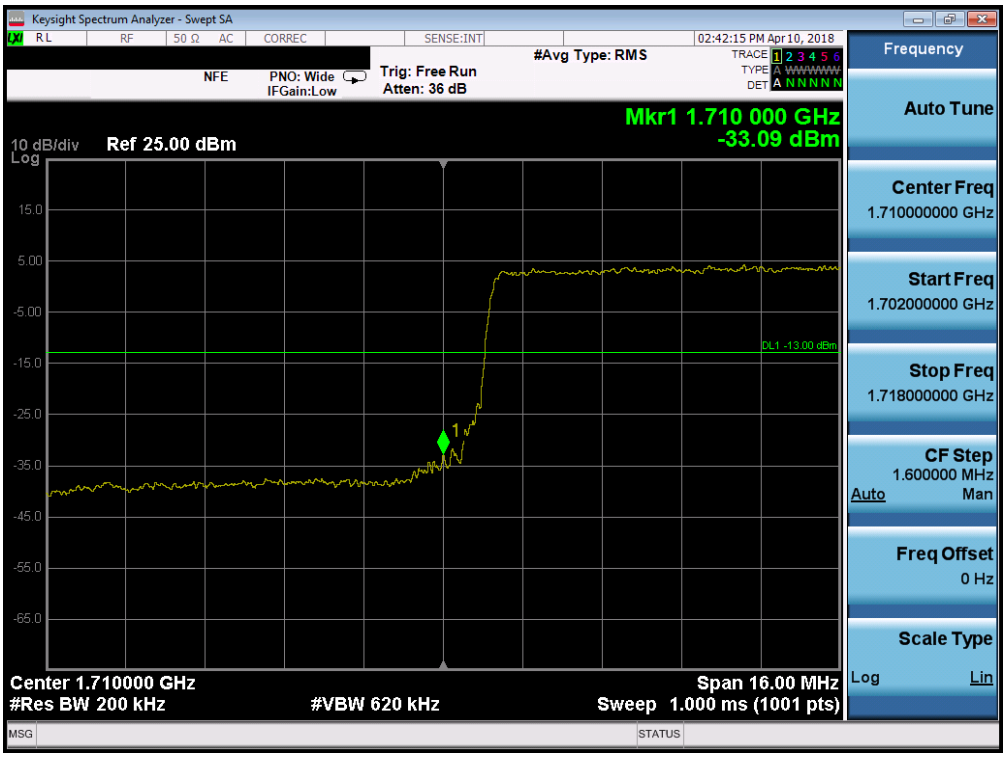


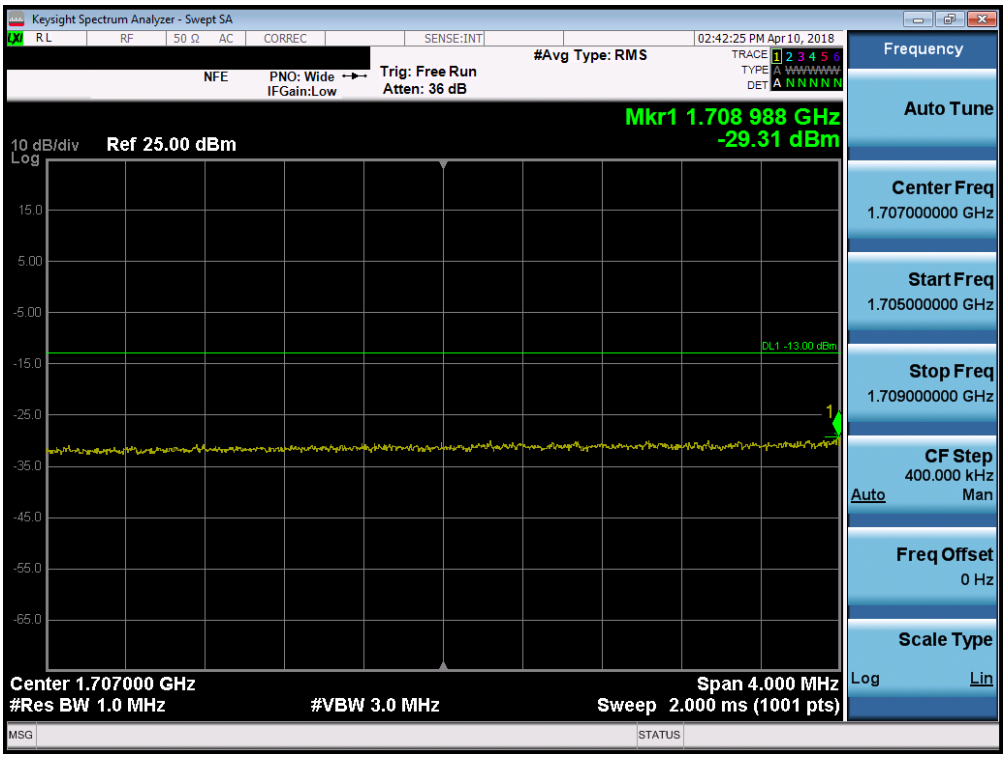
Plot 7-118. Upper Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)



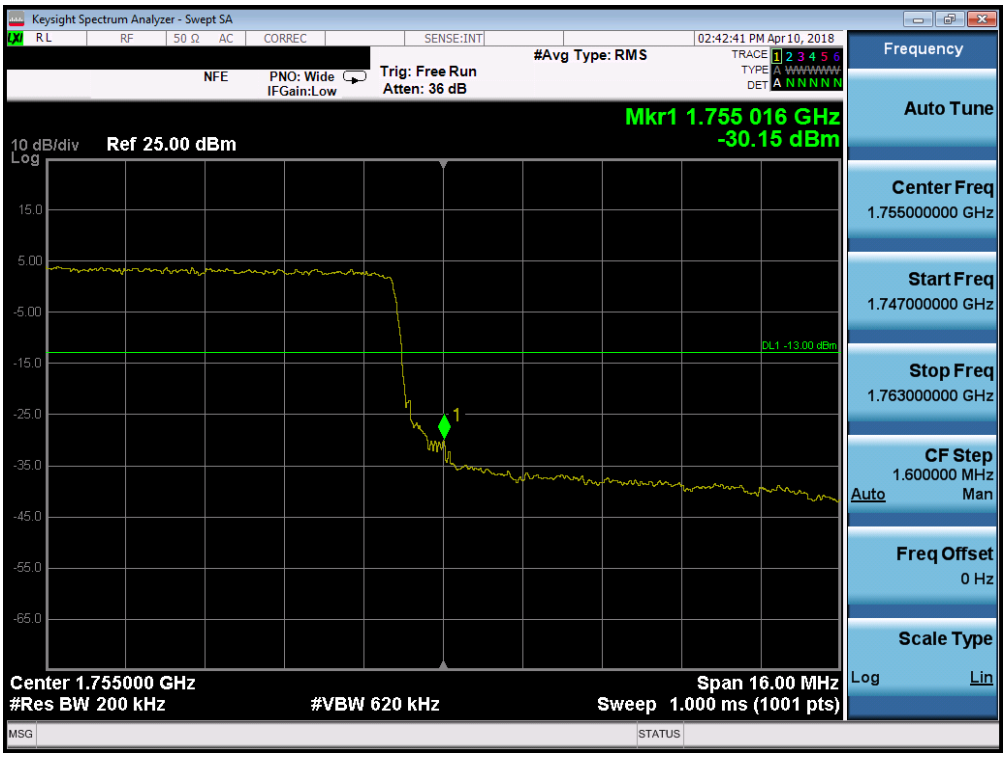
Plot 7-119. Upper Extended Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)



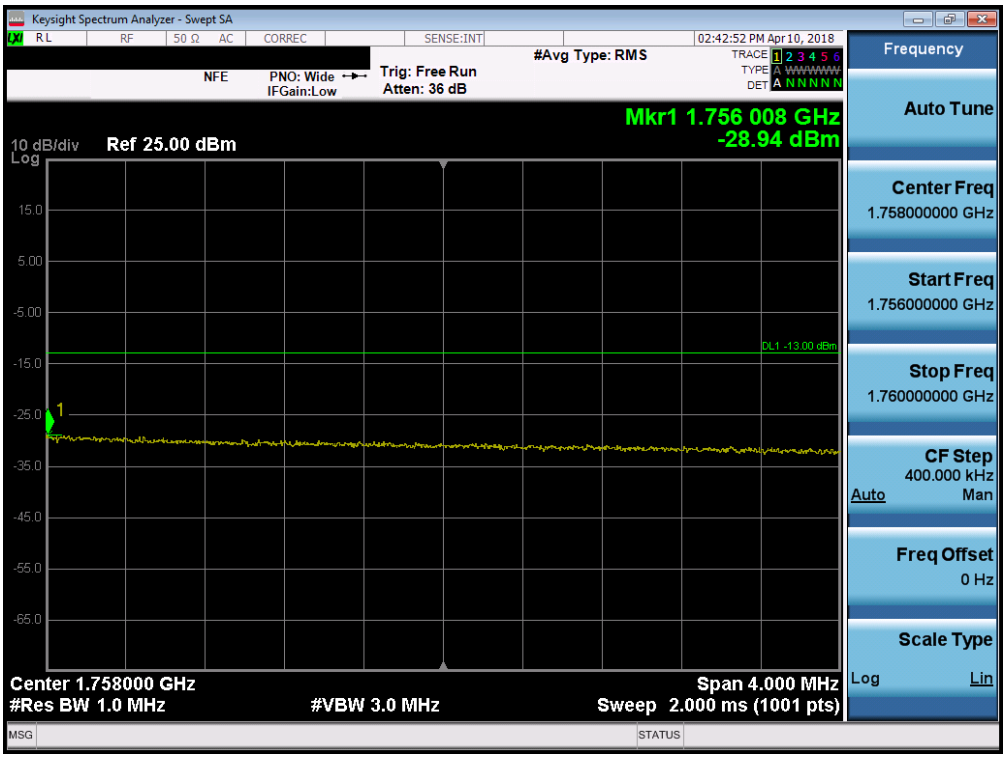
Plot 7-120. Lower Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-121. Lower Extended Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)

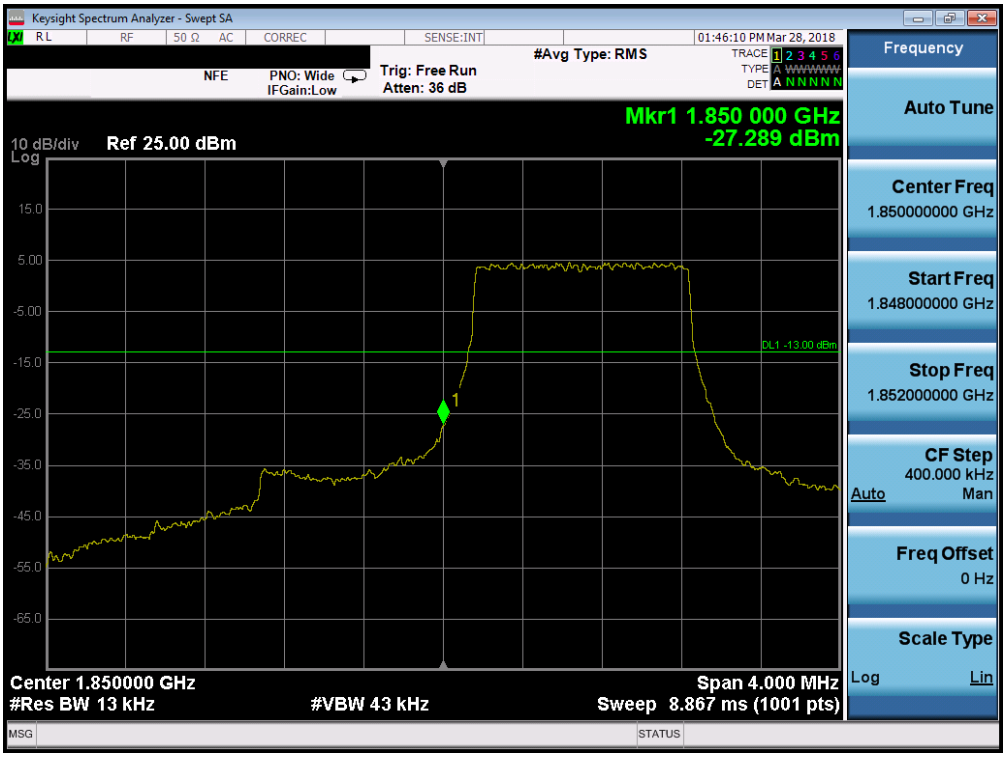


Plot 7-122. Upper Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)

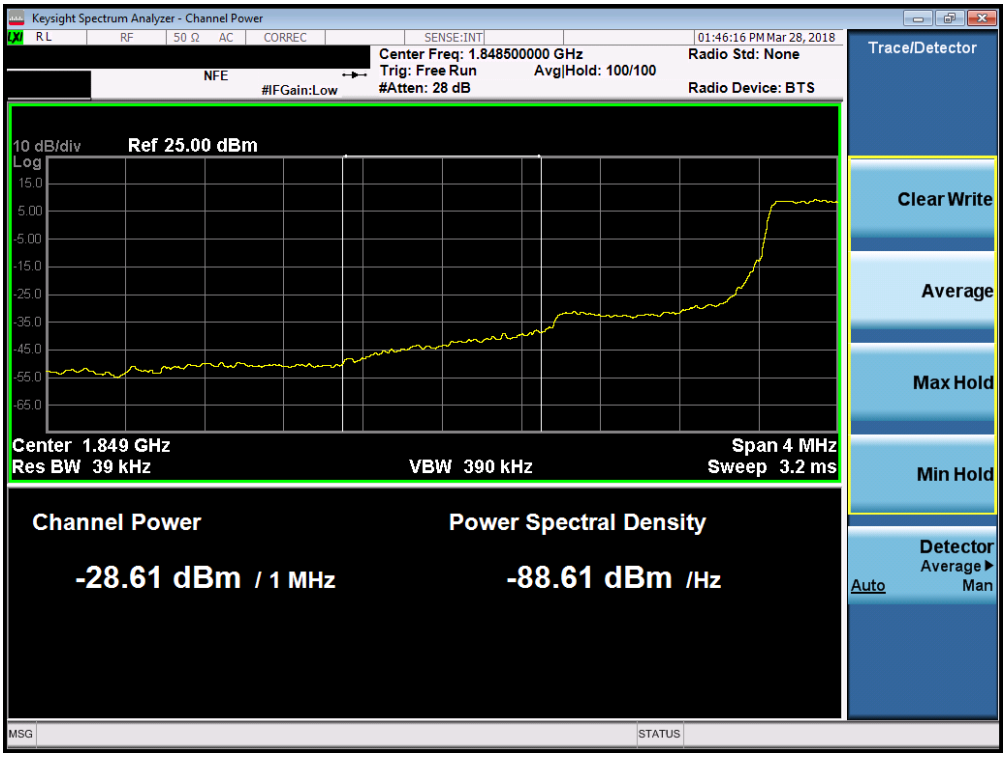


Plot 7-123. Upper Extended Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)

Band 2

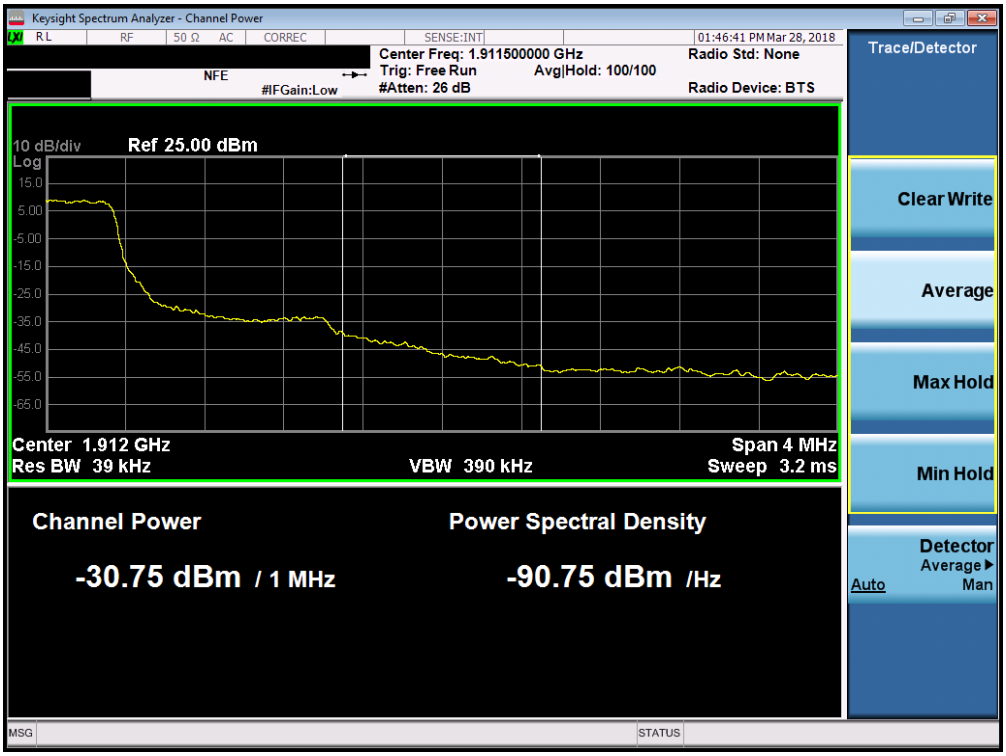


Plot 7-124. Lower Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)

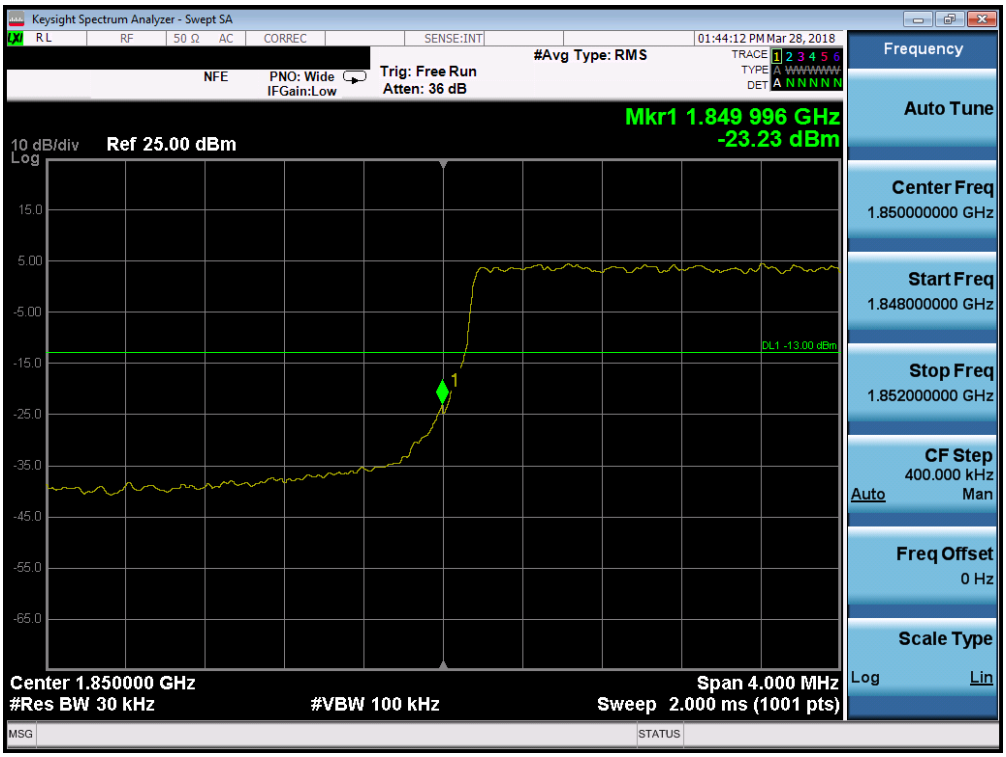


Plot 7-125. Lower Extended Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)

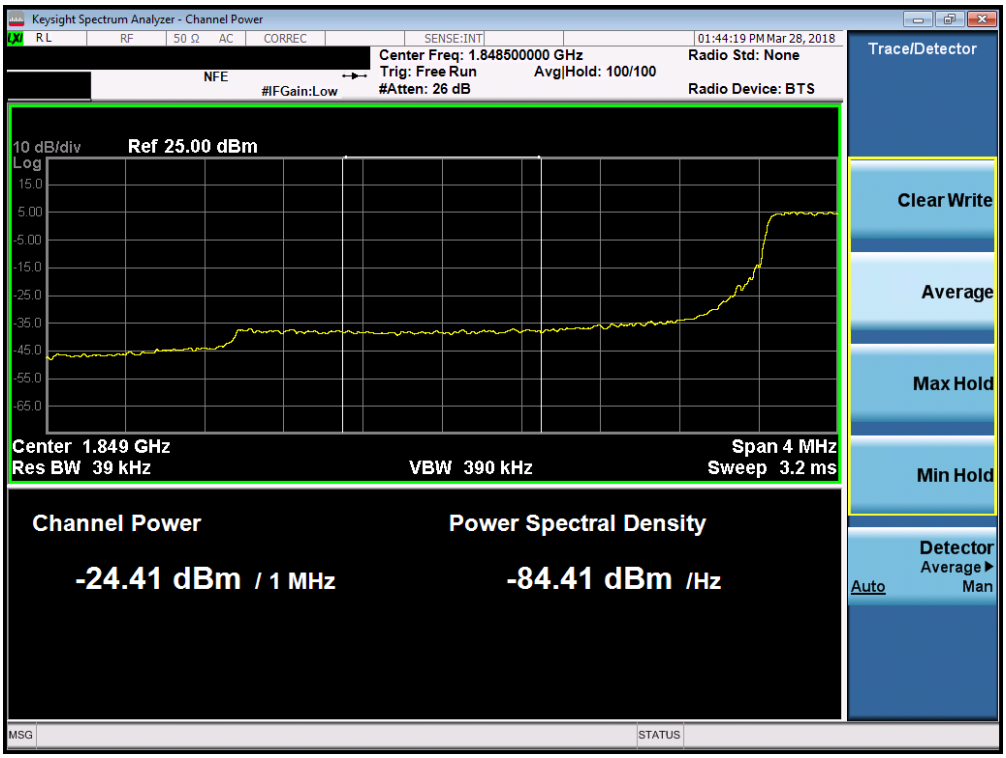
Plot 7-126. Upper Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



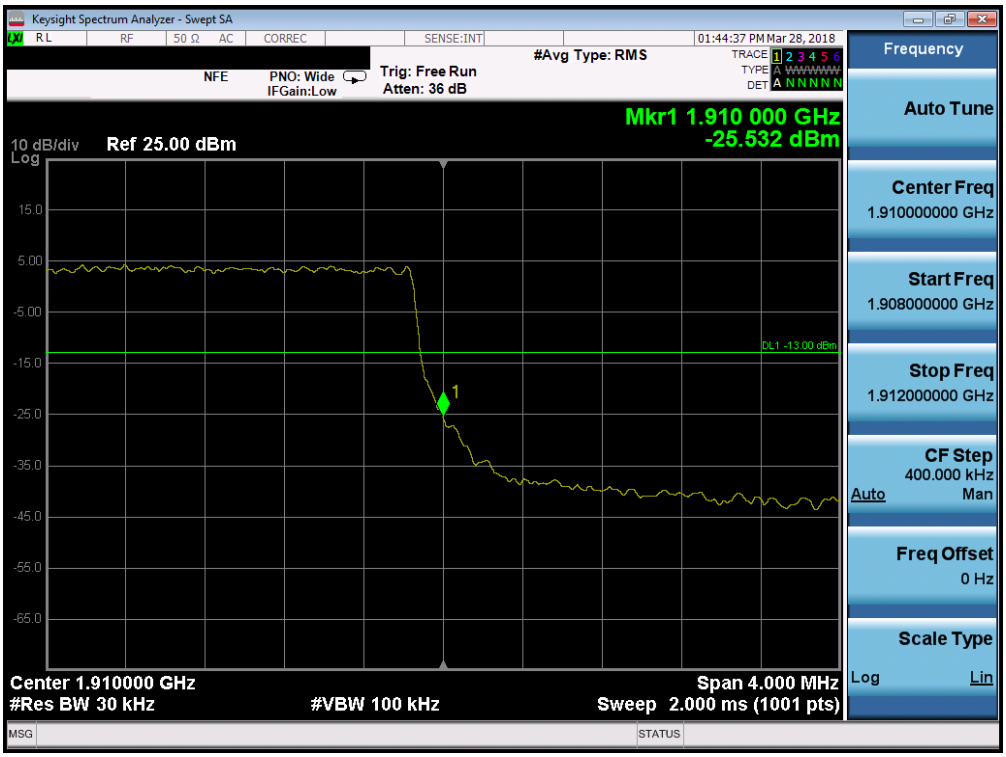
Plot 7-127. Upper Extended Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



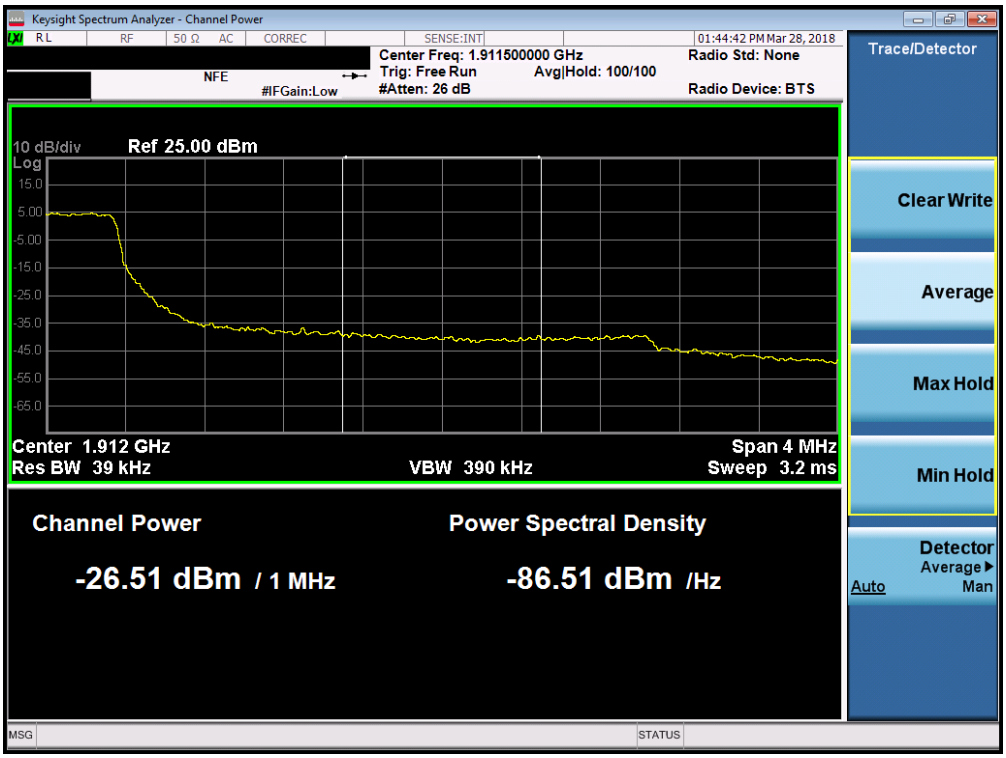
Plot 7-128. Lower Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



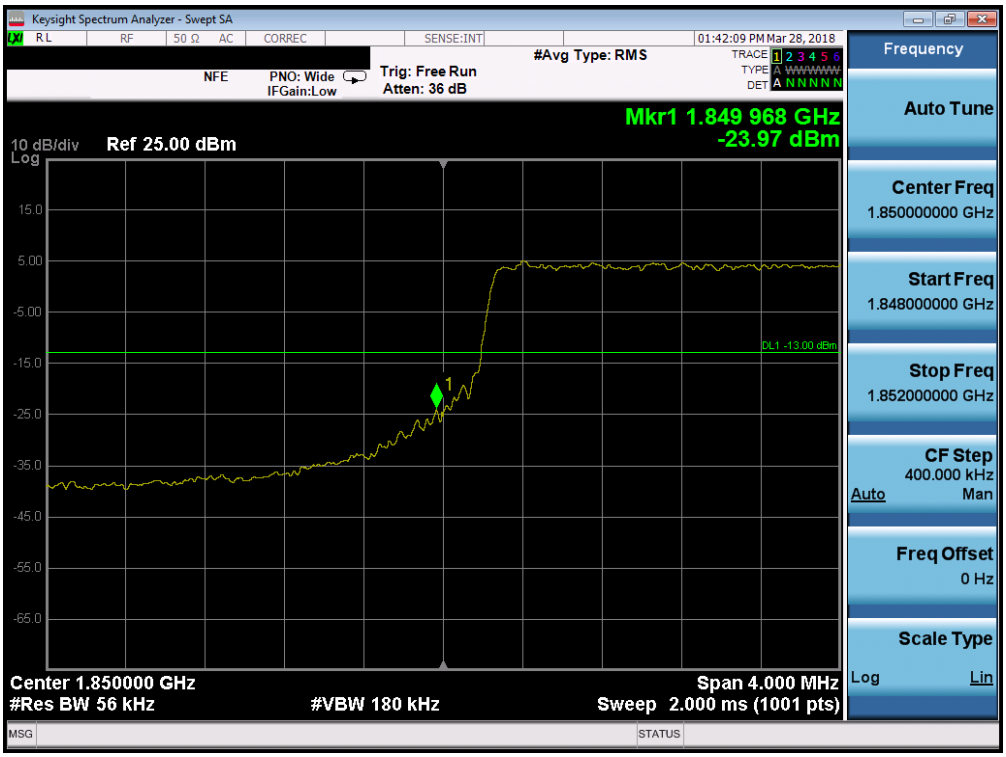
Plot 7-129. Lower Extended Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



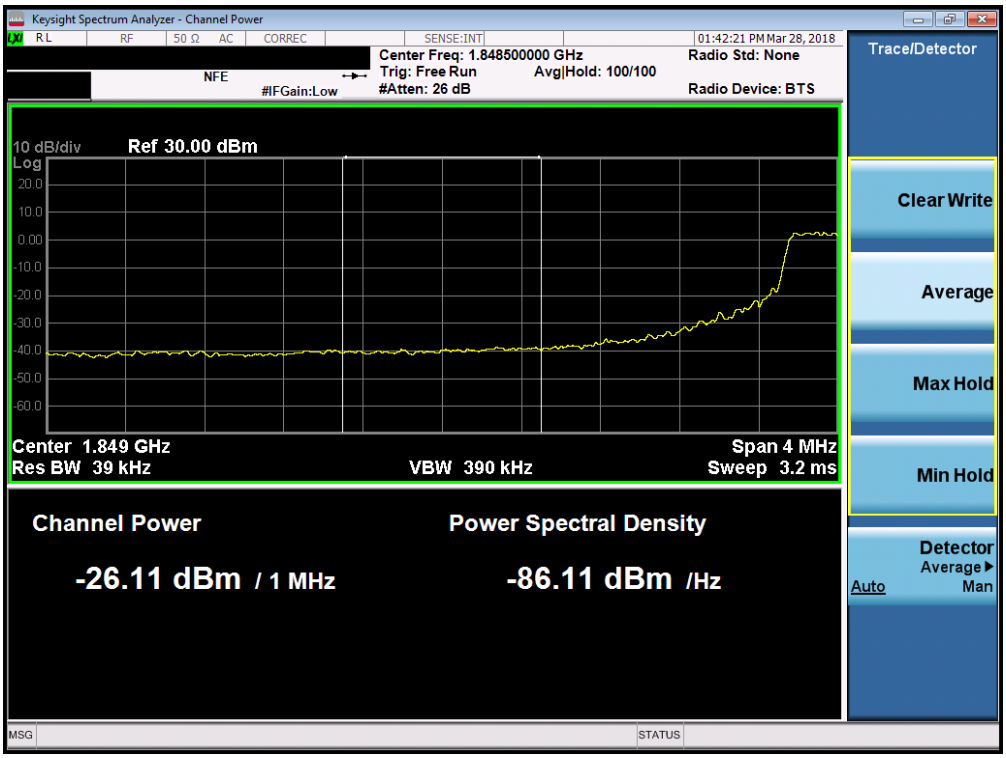
Plot 7-130. Upper Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



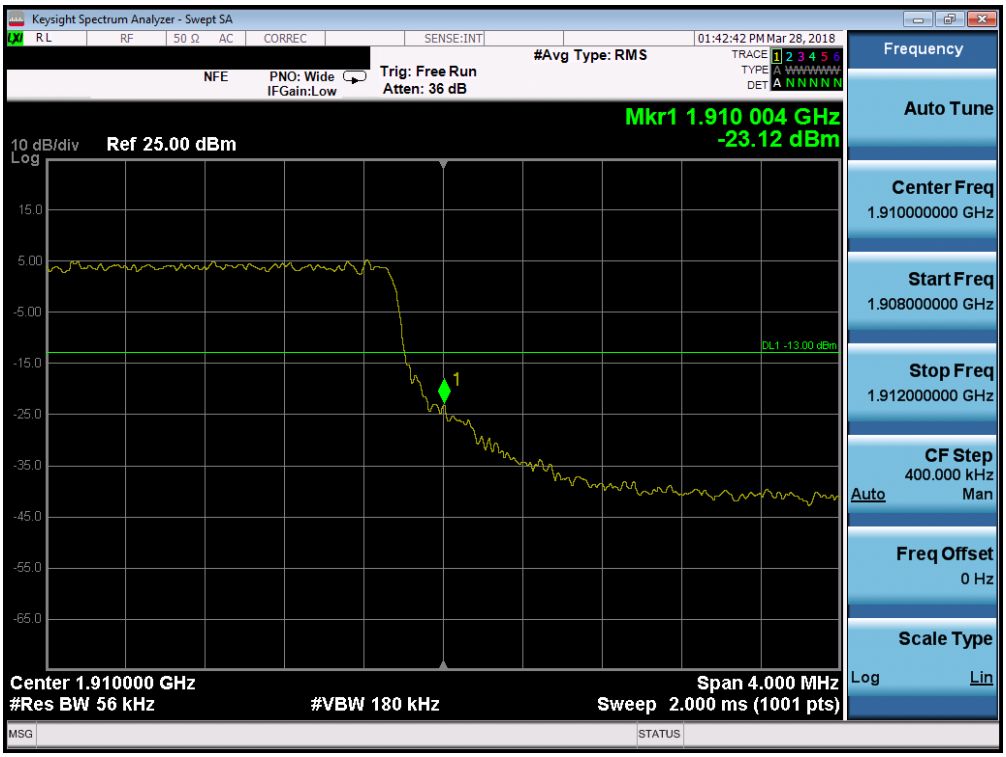
Plot 7-131. Upper Extended Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



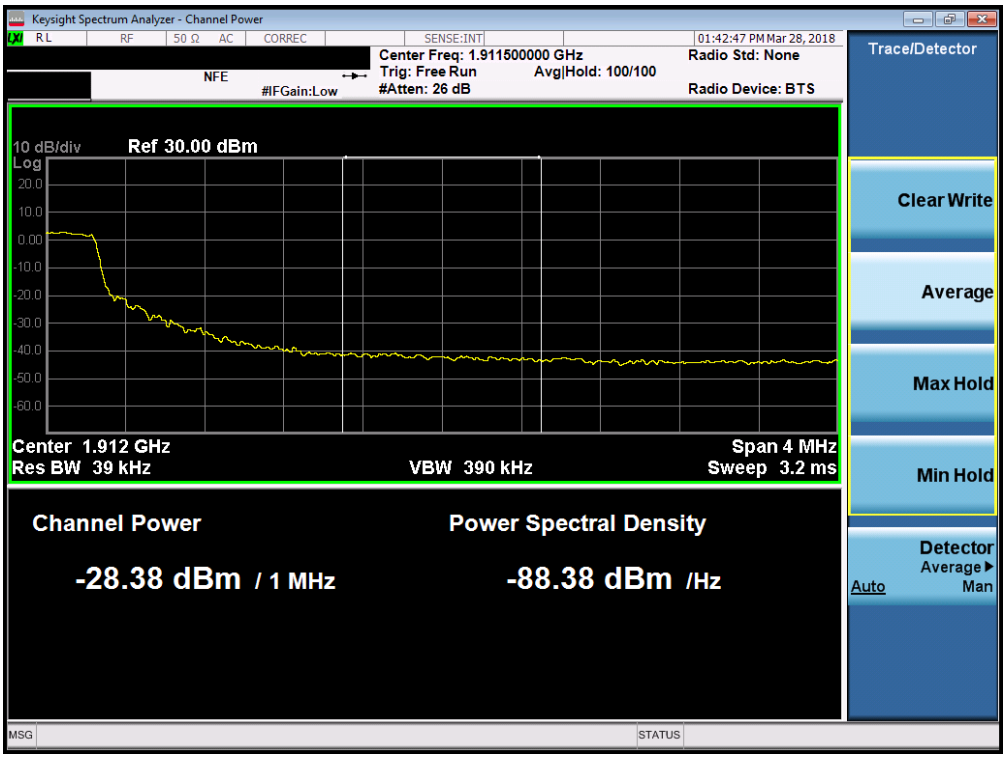
Plot 7-132. Lower Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



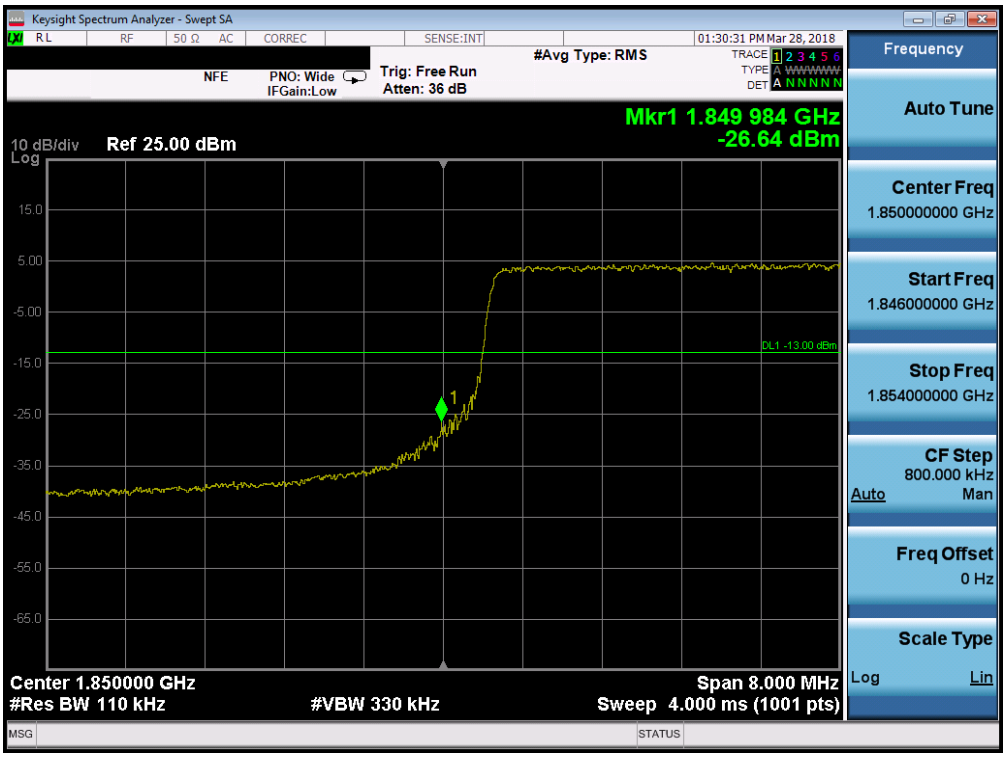
Plot 7-133. Lower Extended Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



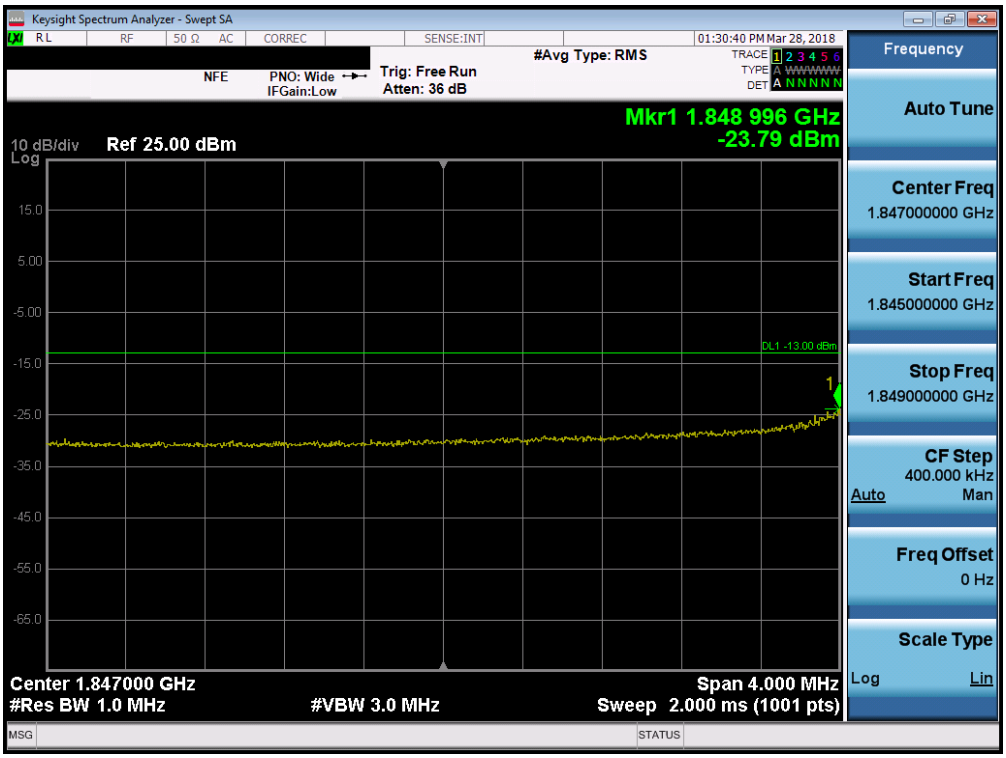
Plot 7-134. Upper Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



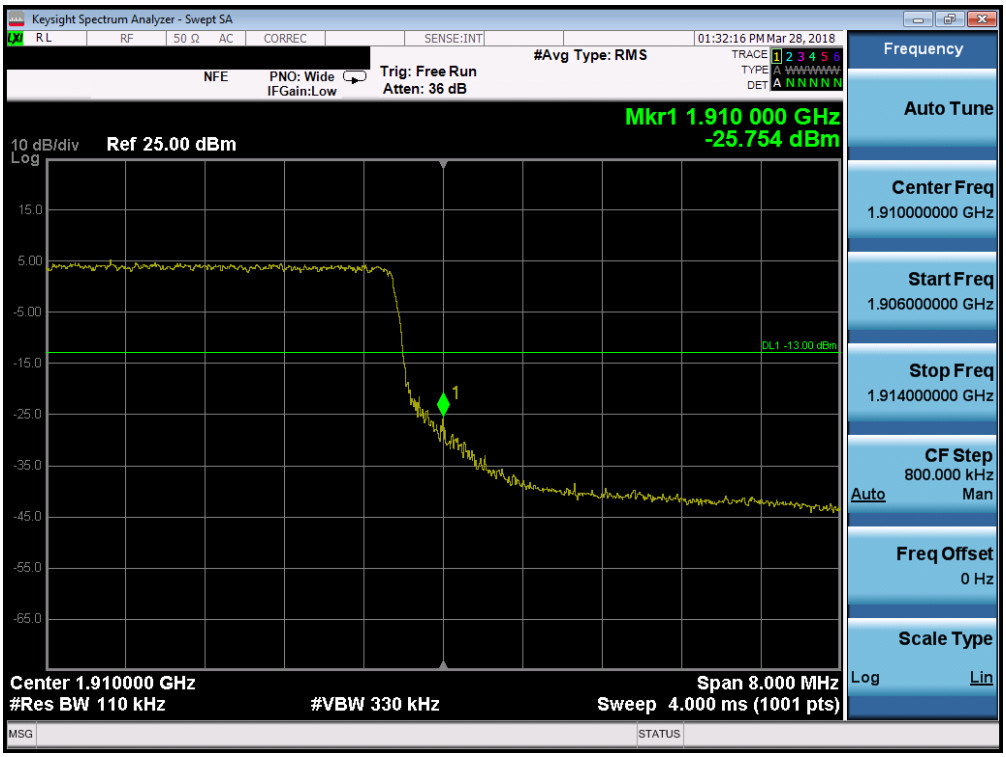
Plot 7-135. Upper Extended Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



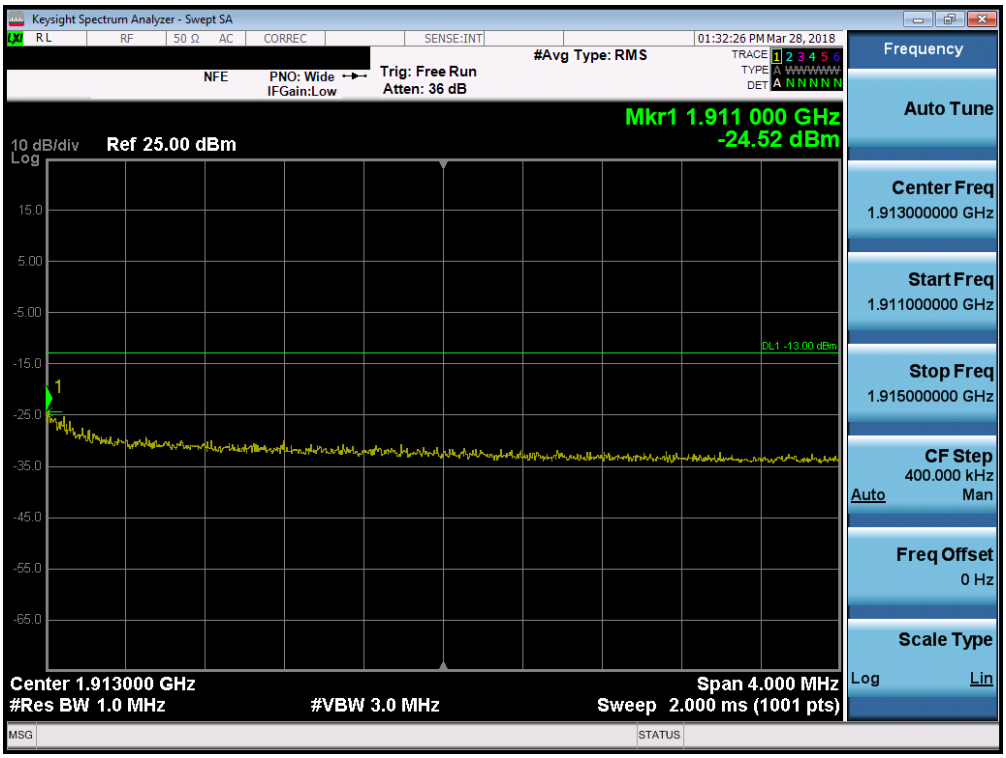
Plot 7-136. Lower Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



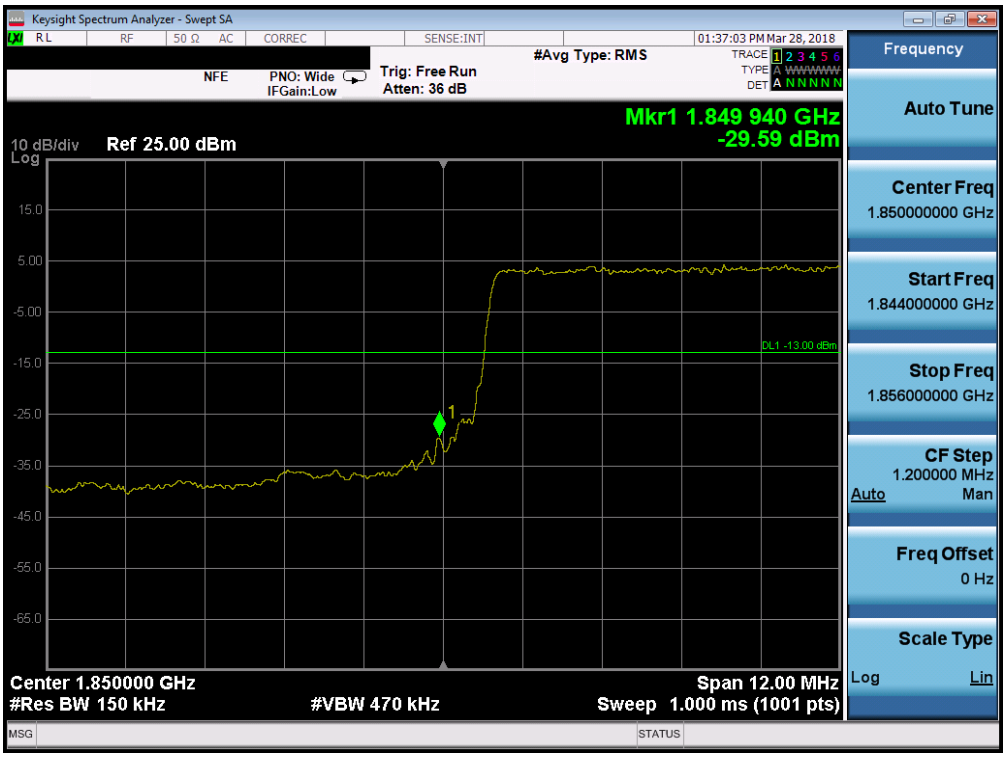
Plot 7-137. Lower Extended Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



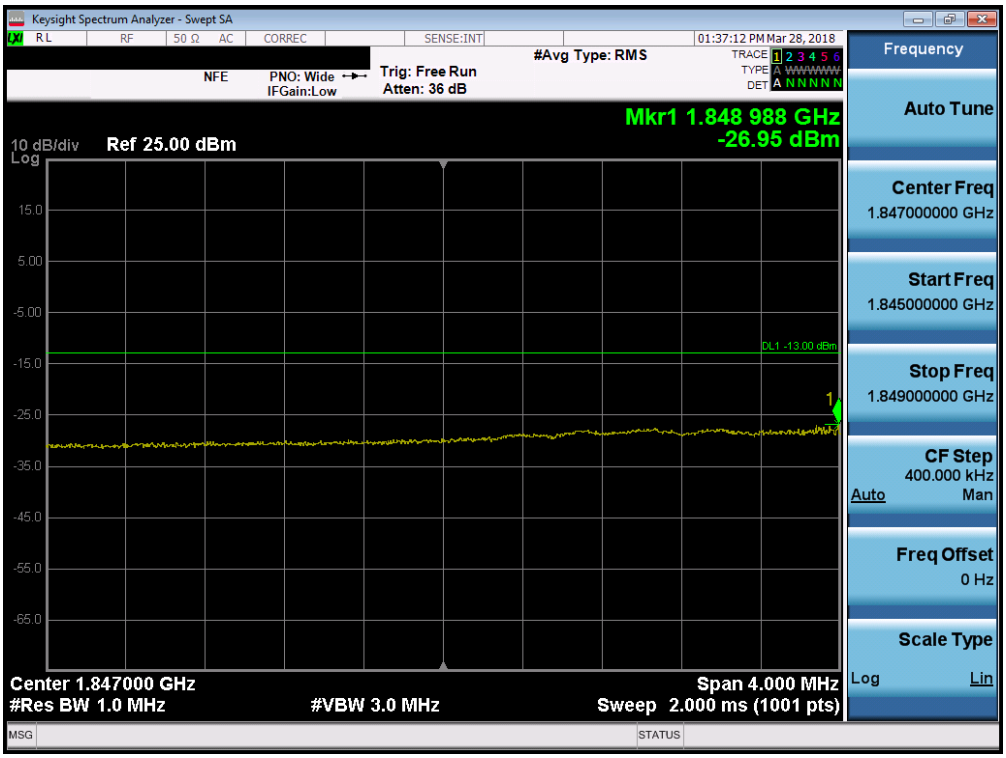
Plot 7-138. Upper Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



Plot 7-139. Upper Extended Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)

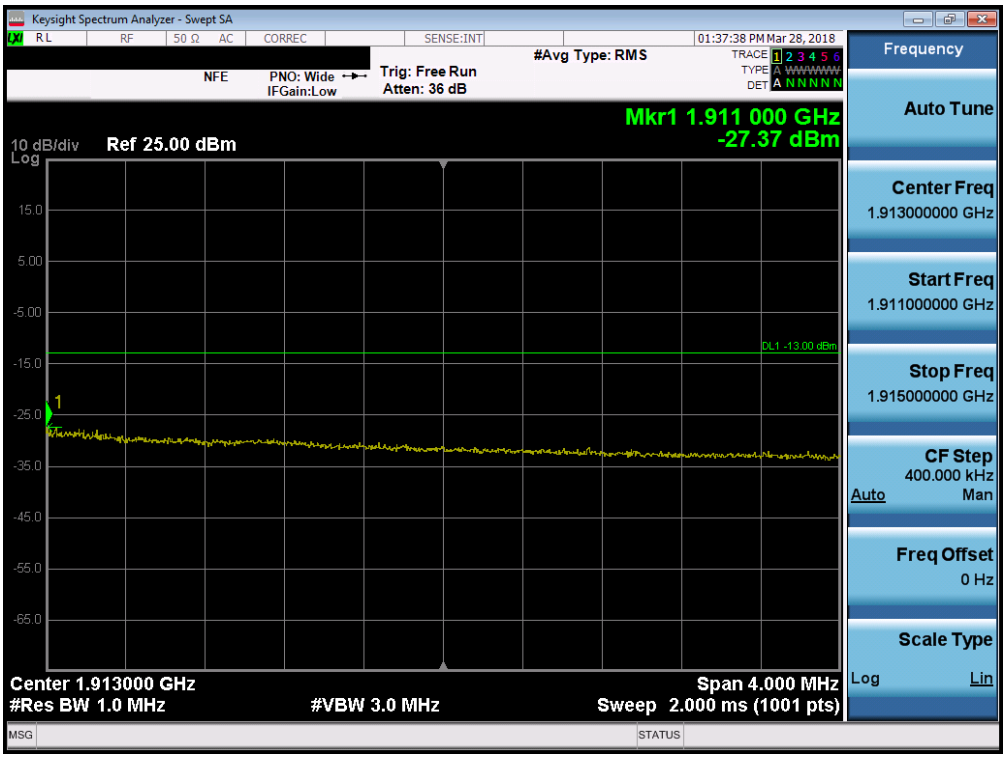


Plot 7-140. Lower Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)

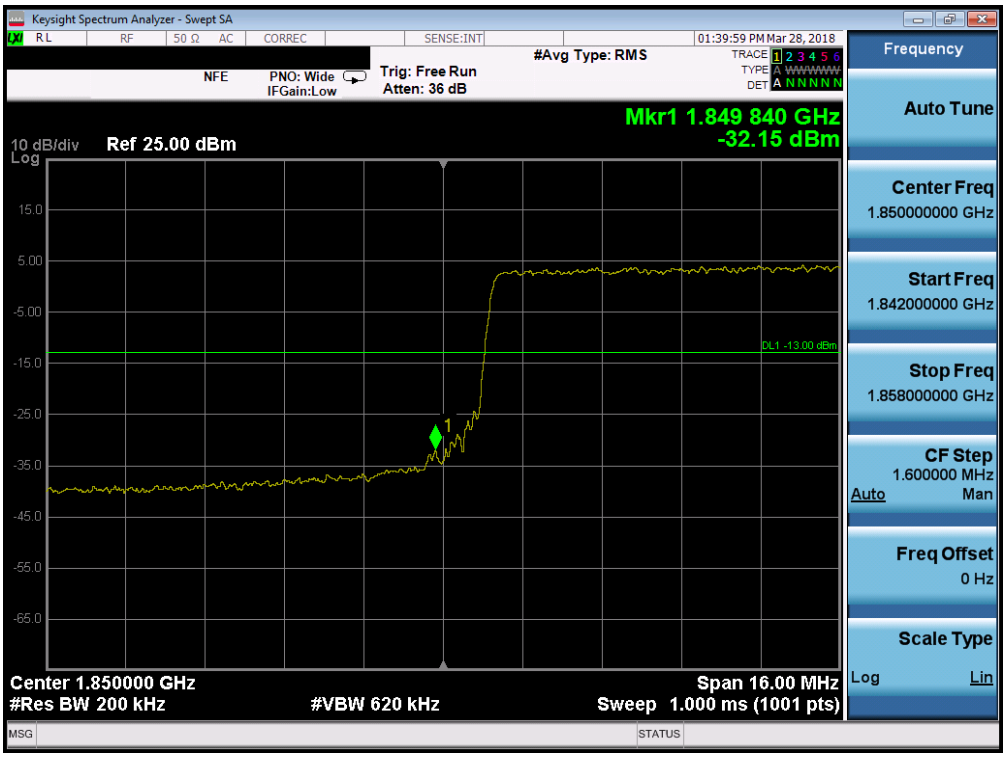


Plot 7-141. Lower Extended Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)

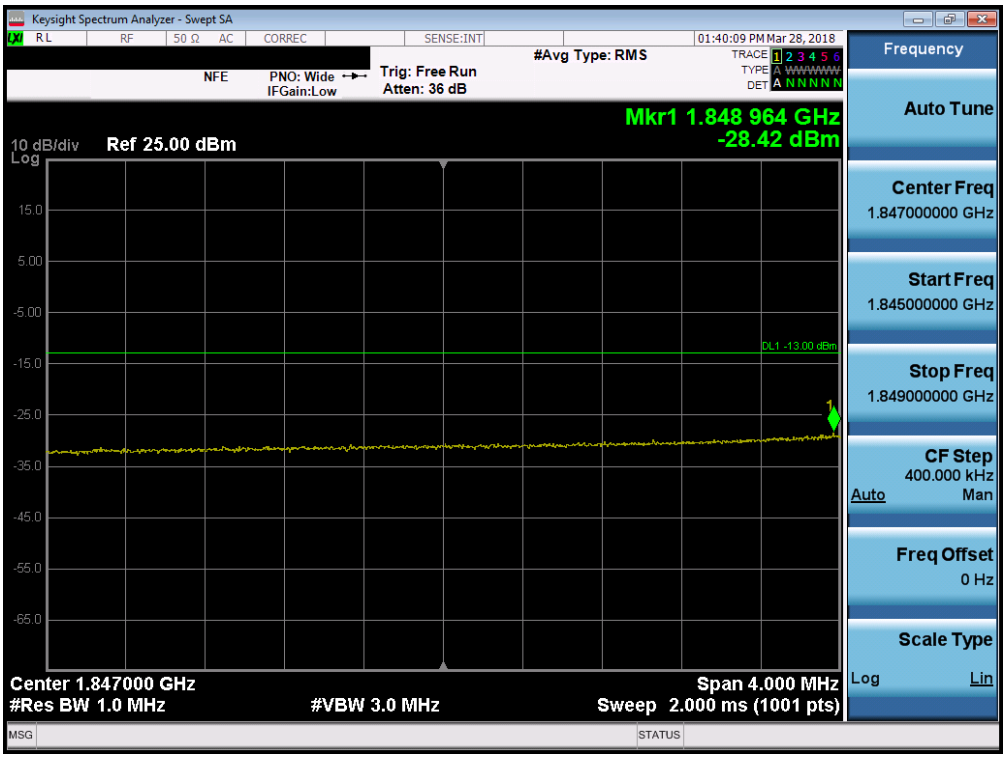
Plot 7-142. Upper Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



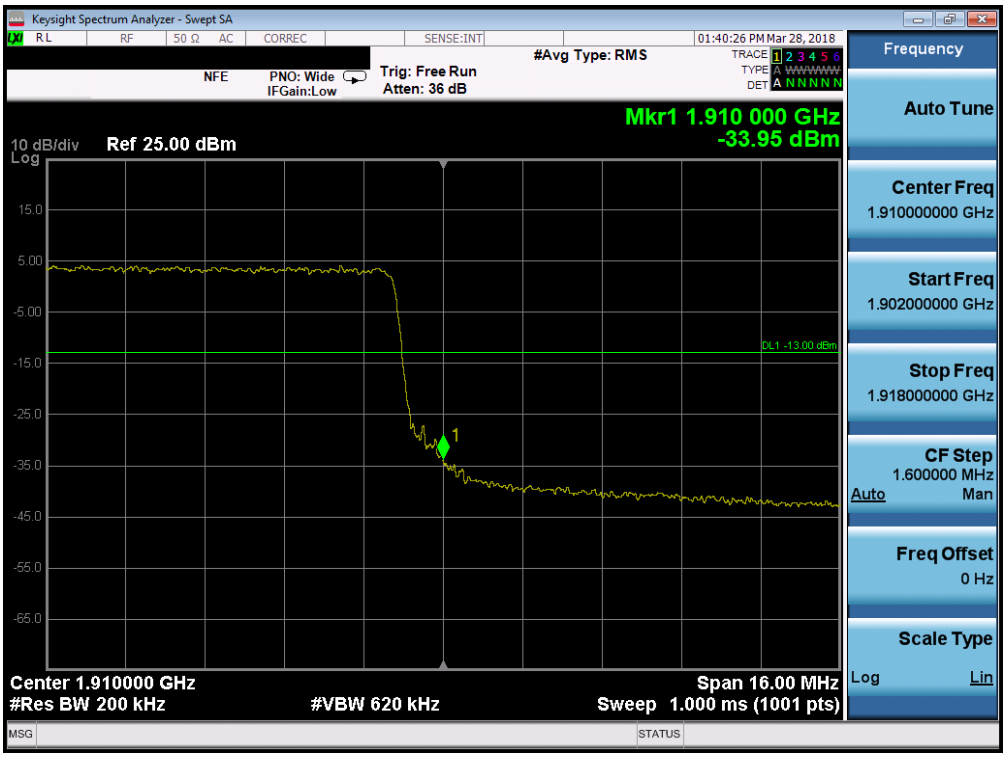
Plot 7-143. Upper Extended Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



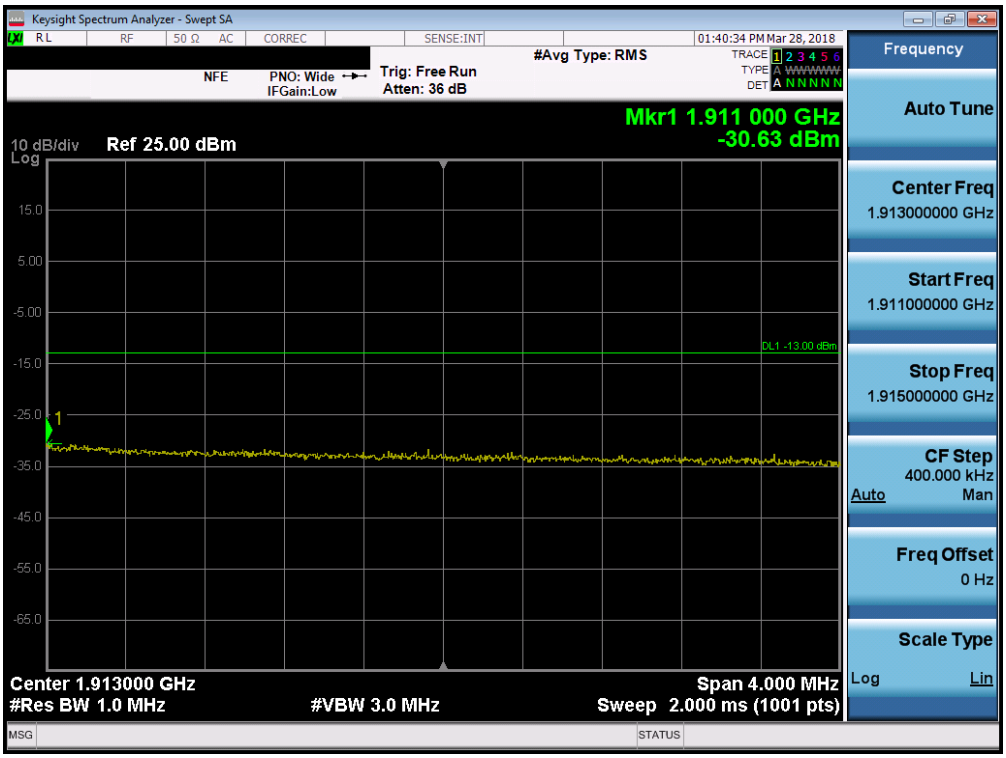
Plot 7-144. Lower Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-145. Lower Extended Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)

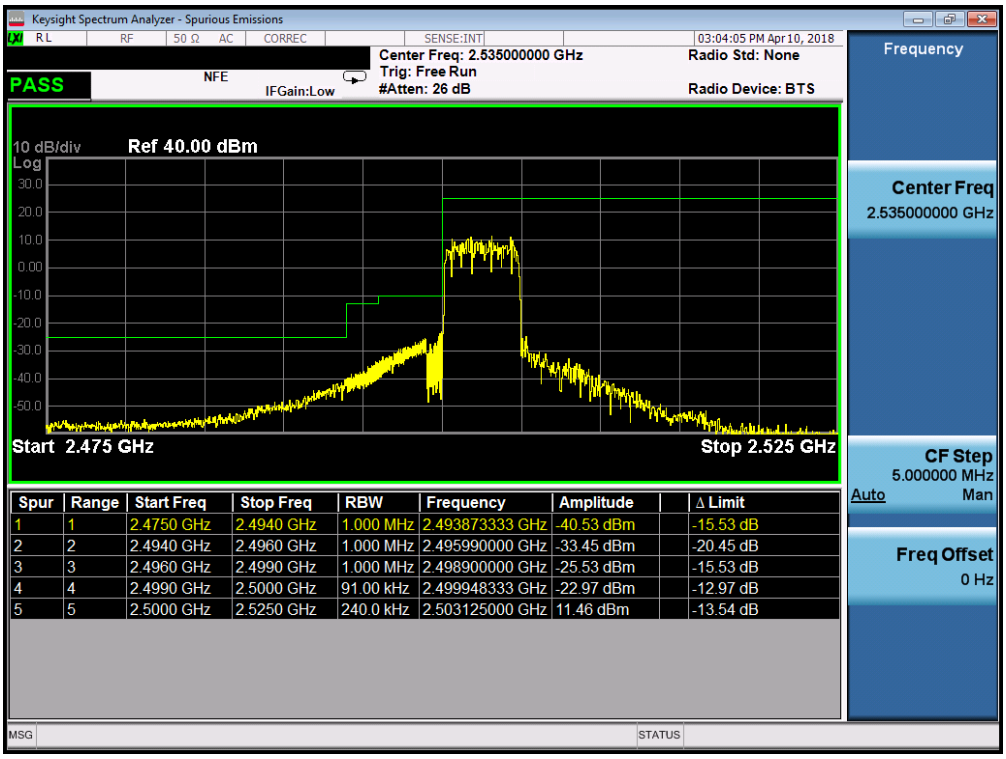


Plot 7-146. Upper Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



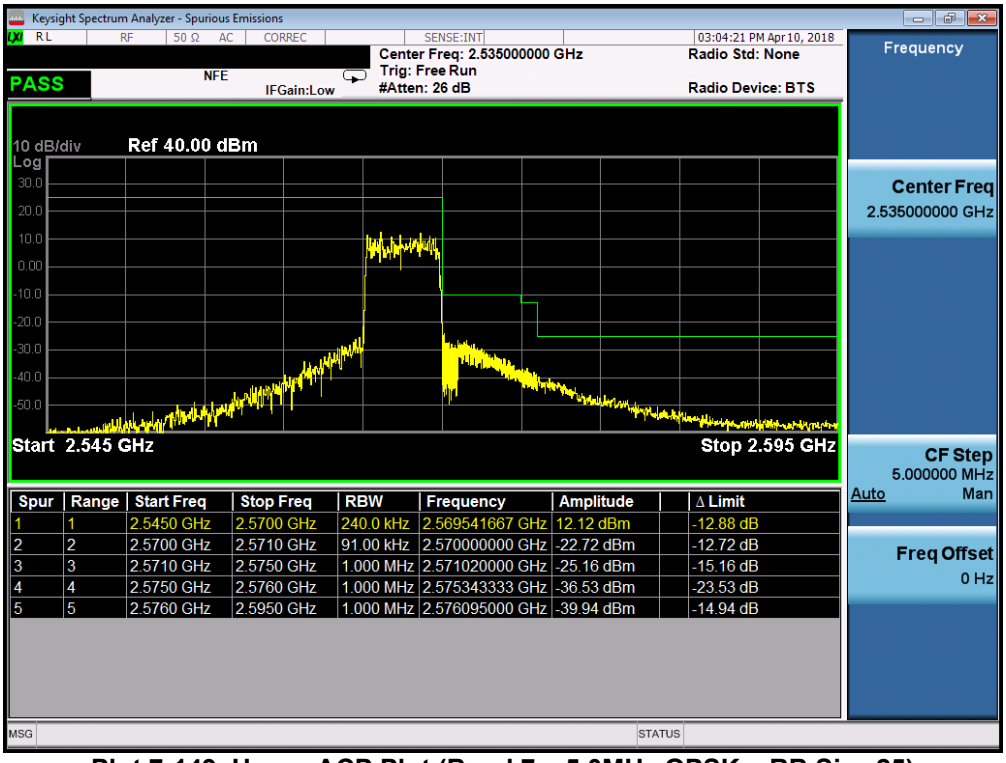
Plot 7-147. Upper Extended Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)

Band 7



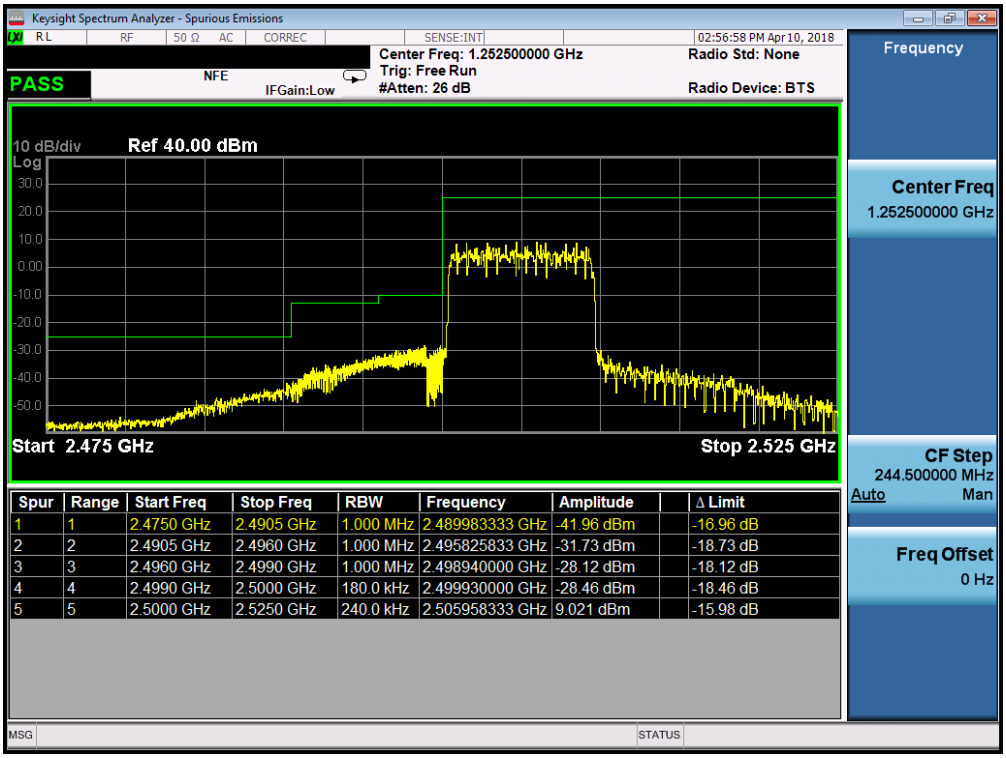
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4940 GHz	1.000 MHz	2.493873333 GHz	-40.53 dBm	-15.53 dB
2	2	2.4940 GHz	2.4960 GHz	1.000 MHz	2.495990000 GHz	-33.45 dBm	-20.45 dB
3	3	2.4960 GHz	2.4990 GHz	1.000 MHz	2.498900000 GHz	-25.53 dBm	-15.53 dB
4	4	2.4990 GHz	2.5000 GHz	91.00 kHz	2.499948333 GHz	-22.97 dBm	-12.97 dB
5	5	2.5000 GHz	2.5250 GHz	240.0 kHz	2.503125000 GHz	11.46 dBm	-13.54 dB

Plot 7-148. Lower ACP Plot (Band 7 – 5.0MHz QPSK – RB Size 25)

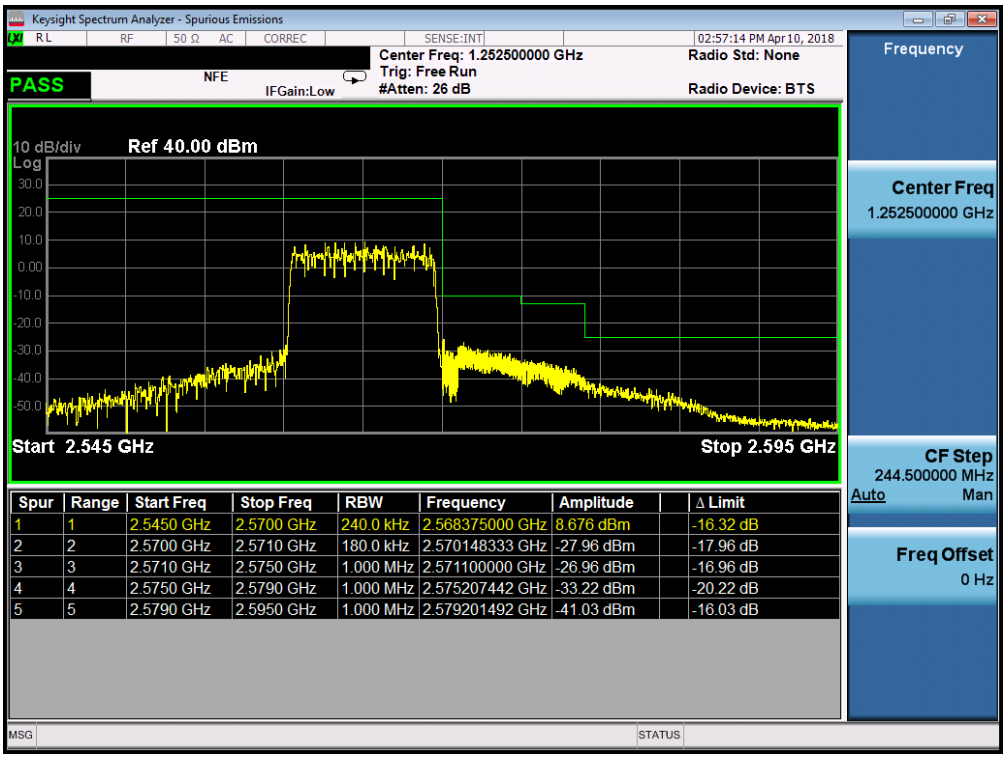


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.5450 GHz	2.5700 GHz	240.0 kHz	2.569541667 GHz	12.12 dBm	-12.88 dB
2	2	2.5700 GHz	2.5710 GHz	91.00 kHz	2.570000000 GHz	-22.72 dBm	-12.72 dB
3	3	2.5710 GHz	2.5750 GHz	1.000 MHz	2.571020000 GHz	-25.16 dBm	-15.16 dB
4	4	2.5750 GHz	2.5760 GHz	1.000 MHz	2.575343333 GHz	-36.53 dBm	-23.53 dB
5	5	2.5760 GHz	2.5950 GHz	1.000 MHz	2.576095000 GHz	-39.94 dBm	-14.94 dB

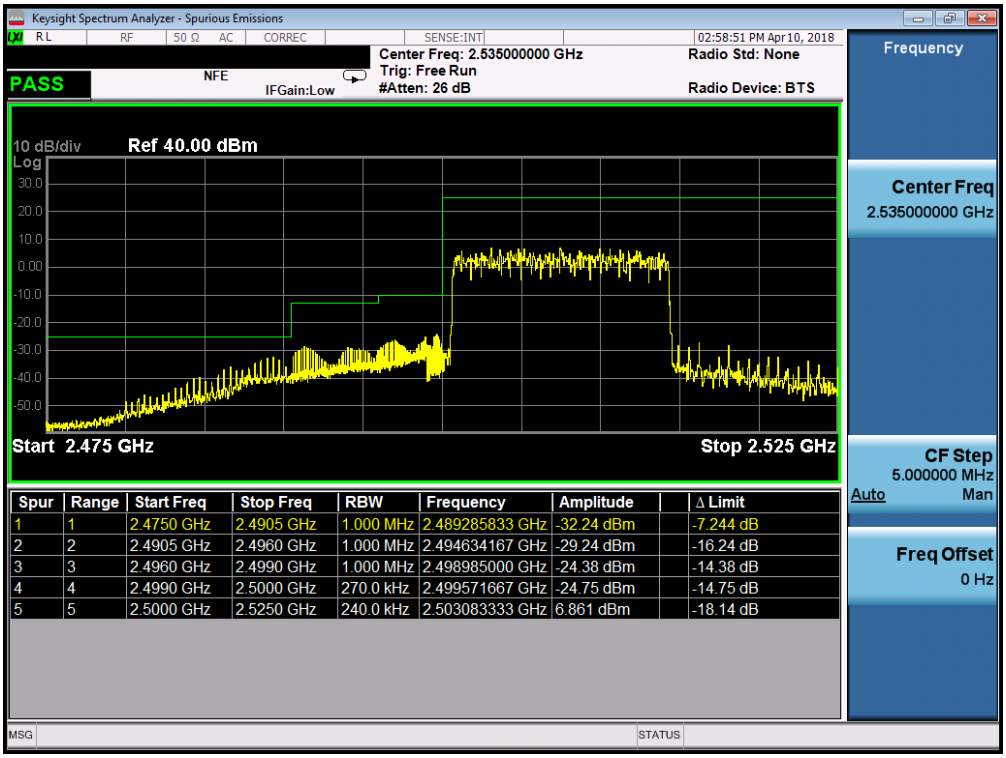
Plot 7-149. Upper ACP Plot (Band 7 – 5.0MHz QPSK – RB Size 25)



Plot 7-150. Lower ACP Plot (Band 7 – 10.0MHz QPSK – RB Size 50)

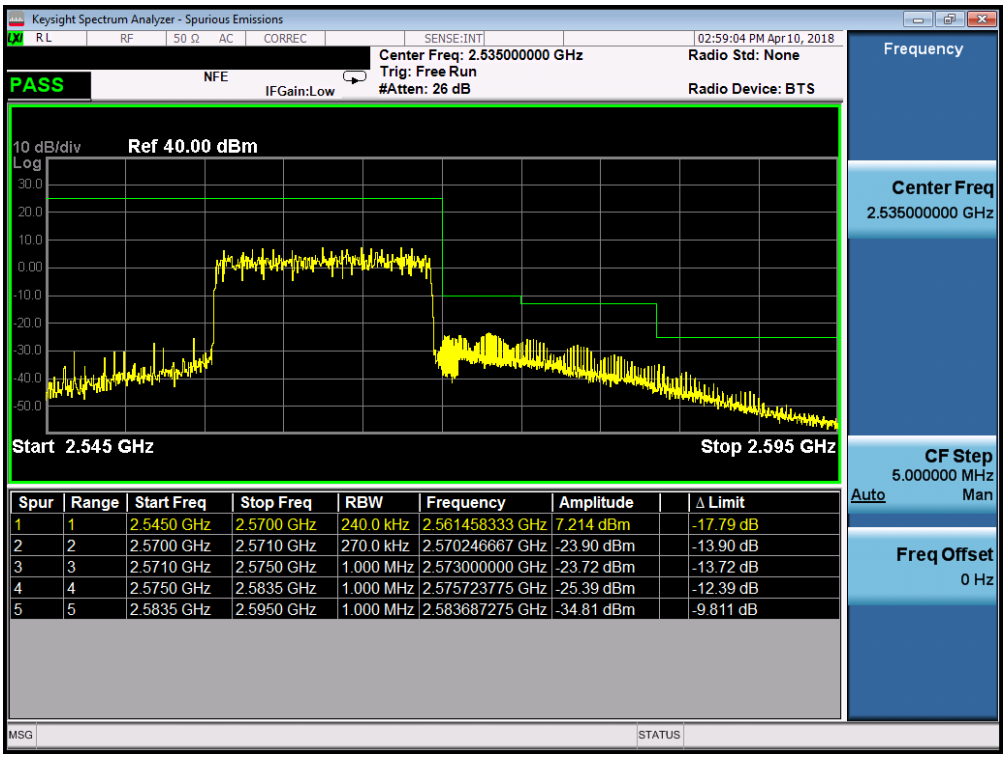


Plot 7-151. Upper ACP Plot (Band 7 – 10.0MHz QPSK – RB Size 50)



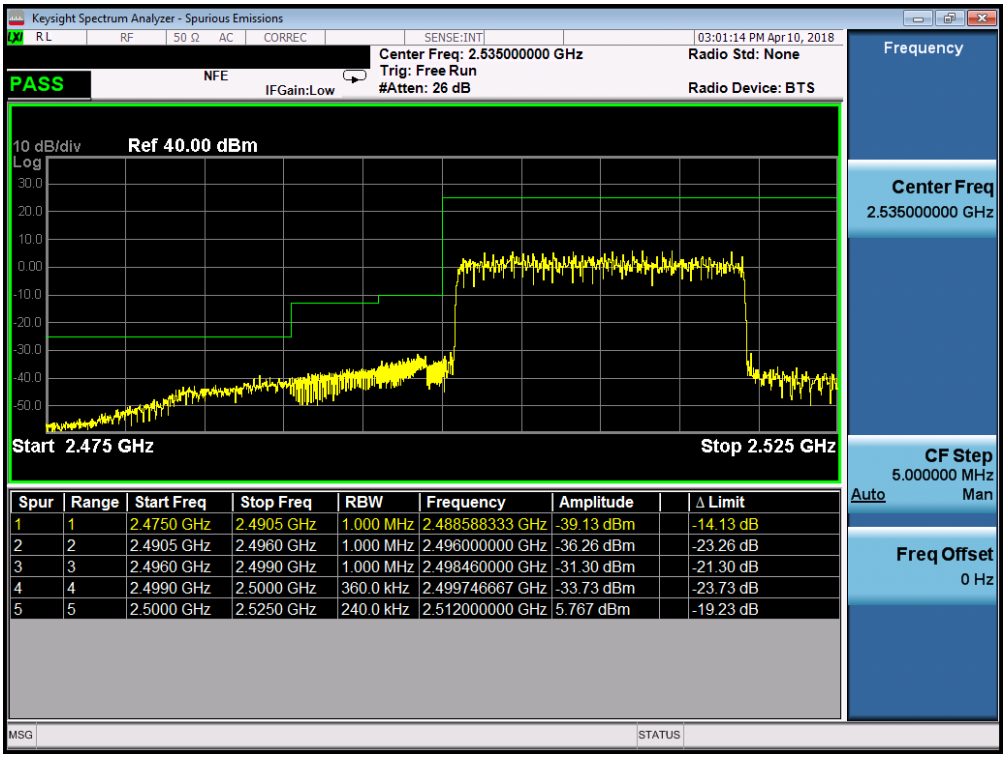
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4905 GHz	1.000 MHz	2.489285833 GHz	-32.24 dBm	-7.244 dB
2	2	2.4905 GHz	2.4960 GHz	1.000 MHz	2.494634167 GHz	-29.24 dBm	-16.24 dB
3	3	2.4960 GHz	2.4990 GHz	1.000 MHz	2.498985000 GHz	-24.38 dBm	-14.38 dB
4	4	2.4990 GHz	2.5000 GHz	270.0 kHz	2.499571667 GHz	-24.75 dBm	-14.75 dB
5	5	2.5000 GHz	2.5250 GHz	240.0 kHz	2.503083333 GHz	6.861 dBm	-18.14 dB

Plot 7-152. Lower ACP Plot (Band 7 – 15.0MHz QPSK – RB Size 75)

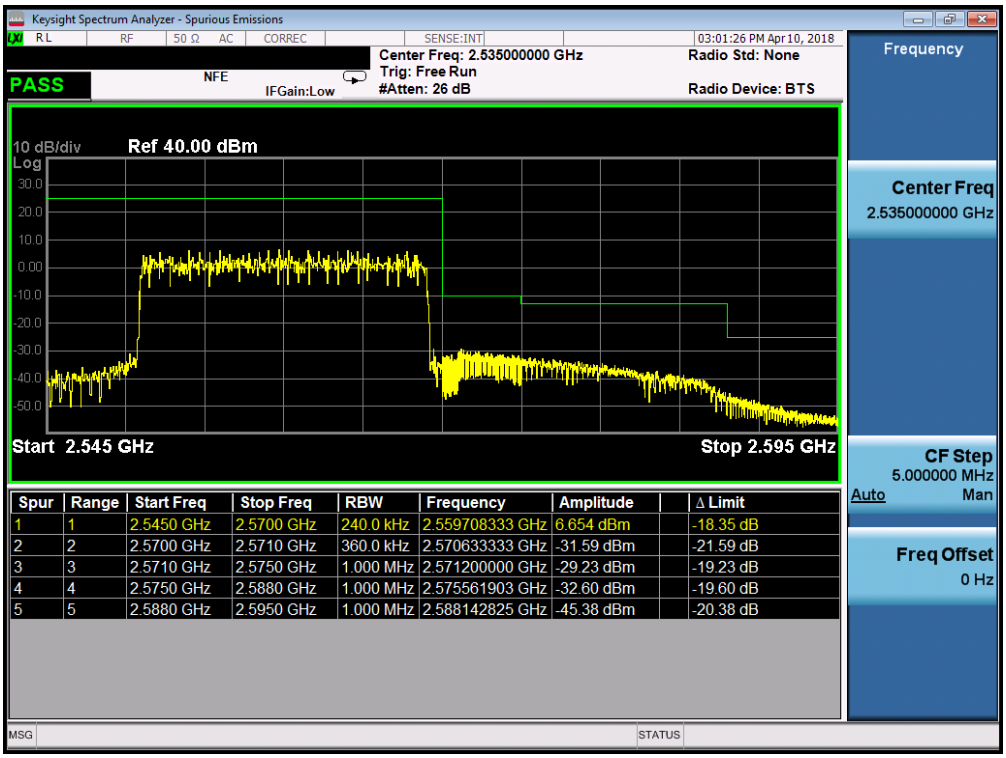


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.5450 GHz	2.5700 GHz	240.0 kHz	2.561458333 GHz	7.214 dBm	-17.79 dB
2	2	2.5700 GHz	2.5710 GHz	270.0 kHz	2.570246667 GHz	-23.90 dBm	-13.90 dB
3	3	2.5710 GHz	2.5750 GHz	1.000 MHz	2.573000000 GHz	-23.72 dBm	-13.72 dB
4	4	2.5750 GHz	2.5835 GHz	1.000 MHz	2.575723775 GHz	-25.39 dBm	-12.39 dB
5	5	2.5835 GHz	2.5950 GHz	1.000 MHz	2.583687275 GHz	-34.81 dBm	-9.811 dB

Plot 7-153. Upper ACP Plot (Band 7 – 15.0MHz QPSK – RB Size 75)



Plot 7-154. Lower ACP Plot (Band 7 – 20.0MHz QPSK – RB Size 100)



Plot 7-155. Upper ACP Plot (Band 7 – 20.0MHz QPSK – RB Size 100)

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 > Emission bandwidth of signal
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.

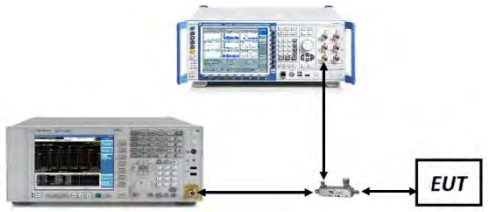
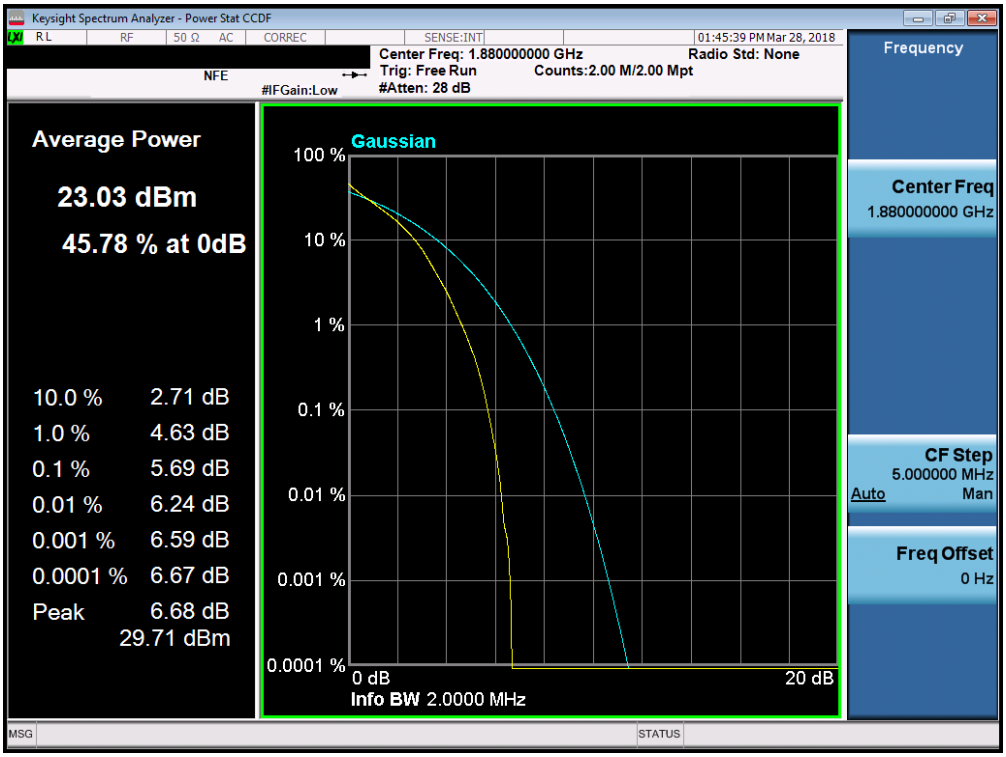


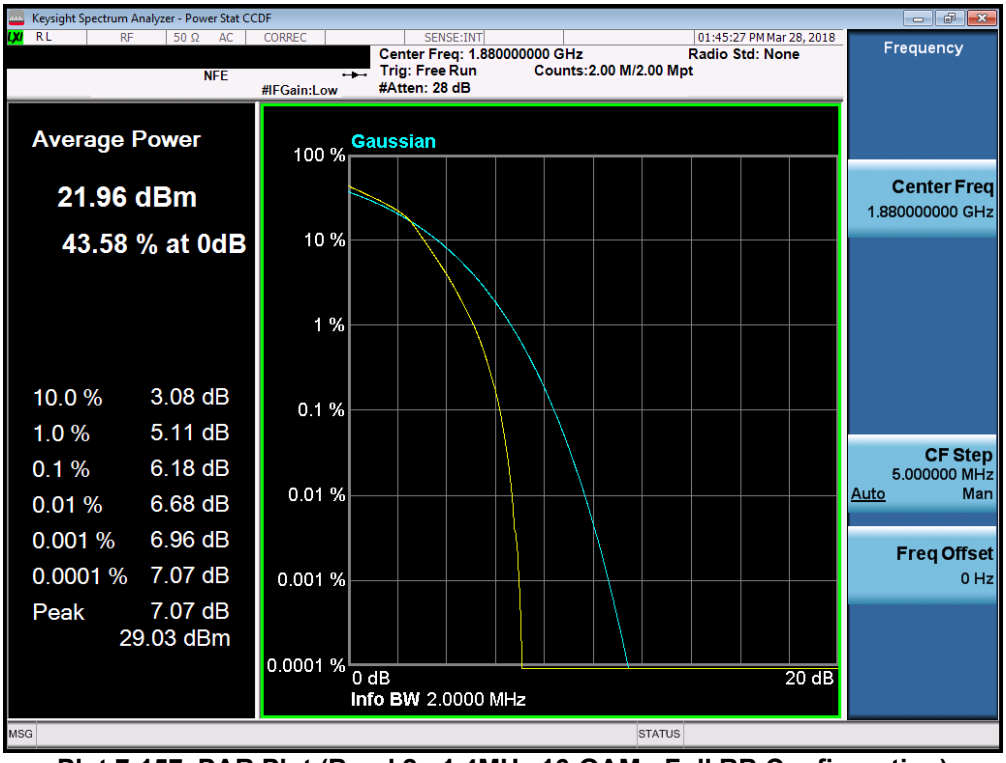
Figure 7-4. Test Instrument & Measurement Setup

Test Notes

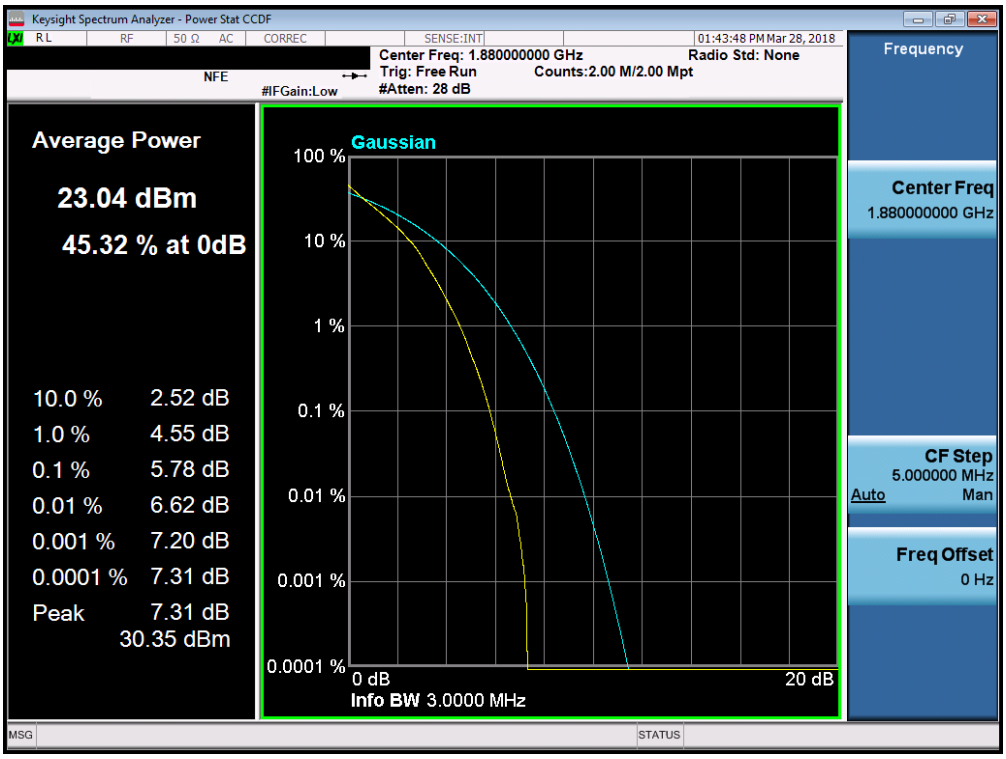
None.



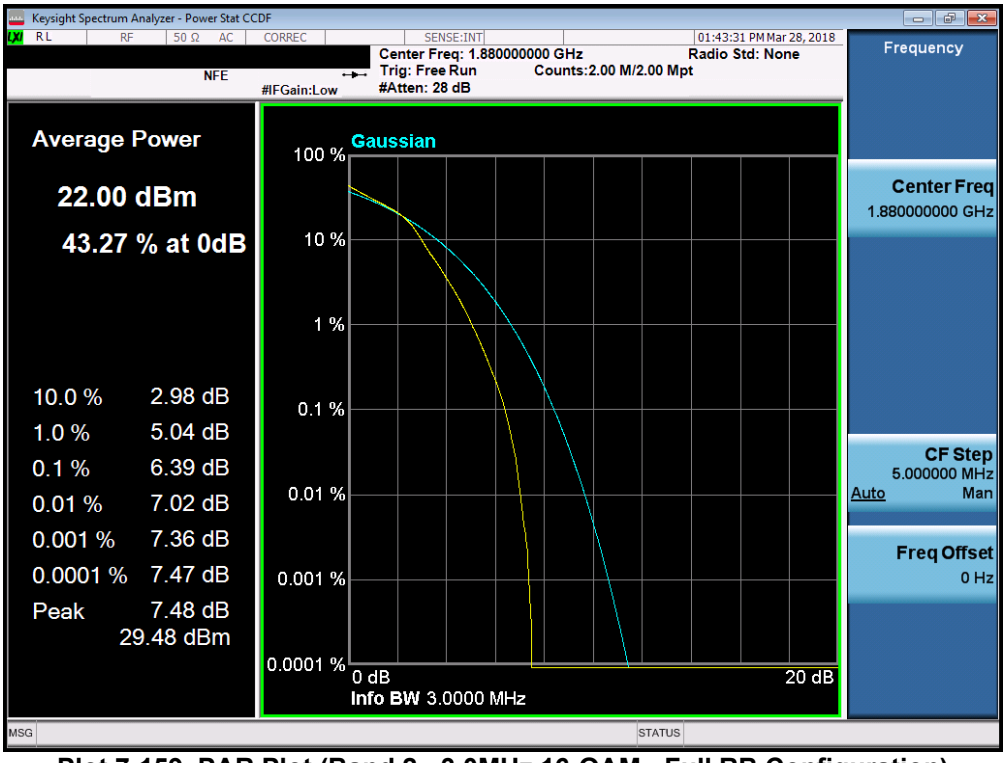
Plot 7-156. PAR Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



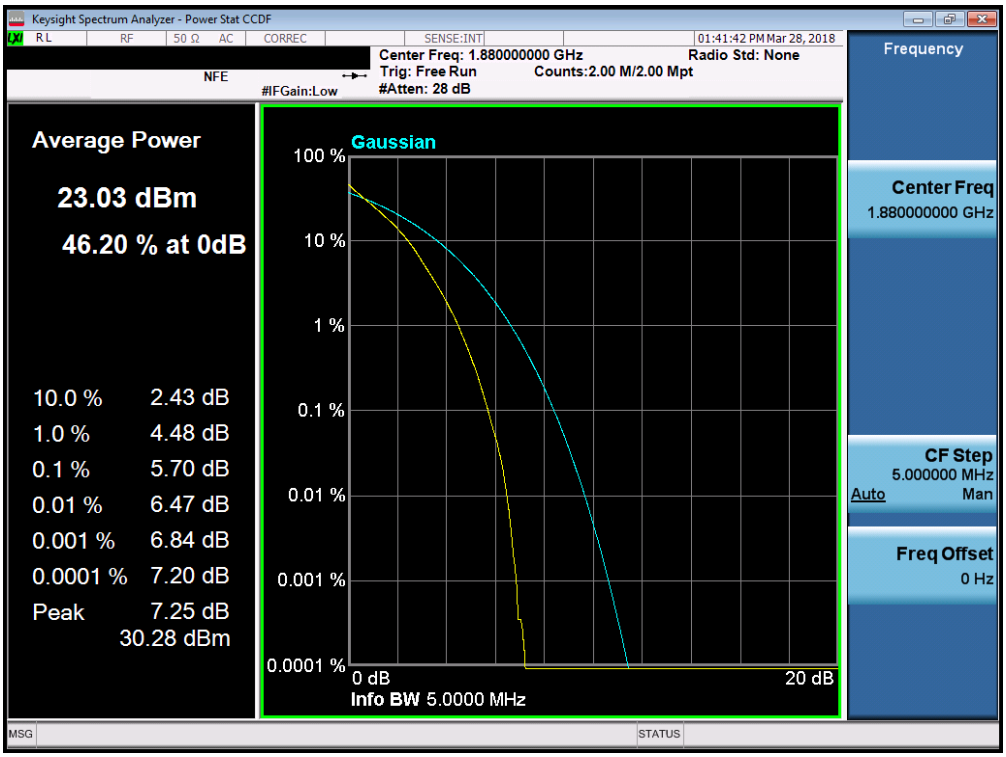
Plot 7-157. PAR Plot (Band 2 - 1.4MHz 16-QAM - Full RB Configuration)



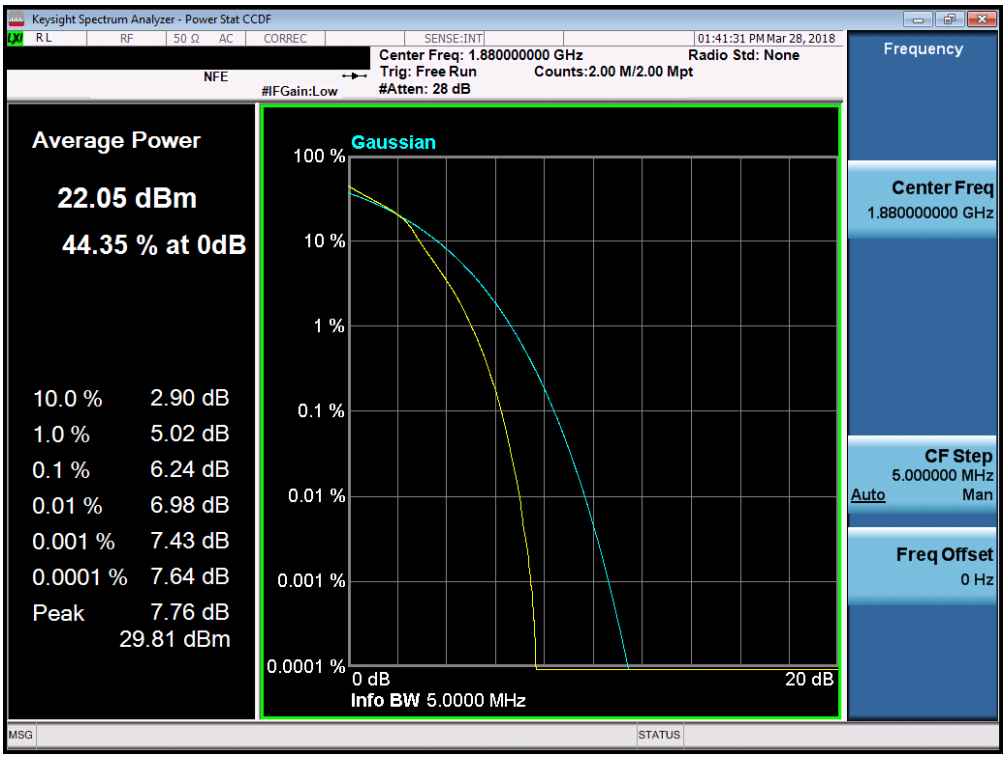
Plot 7-158. PAR Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



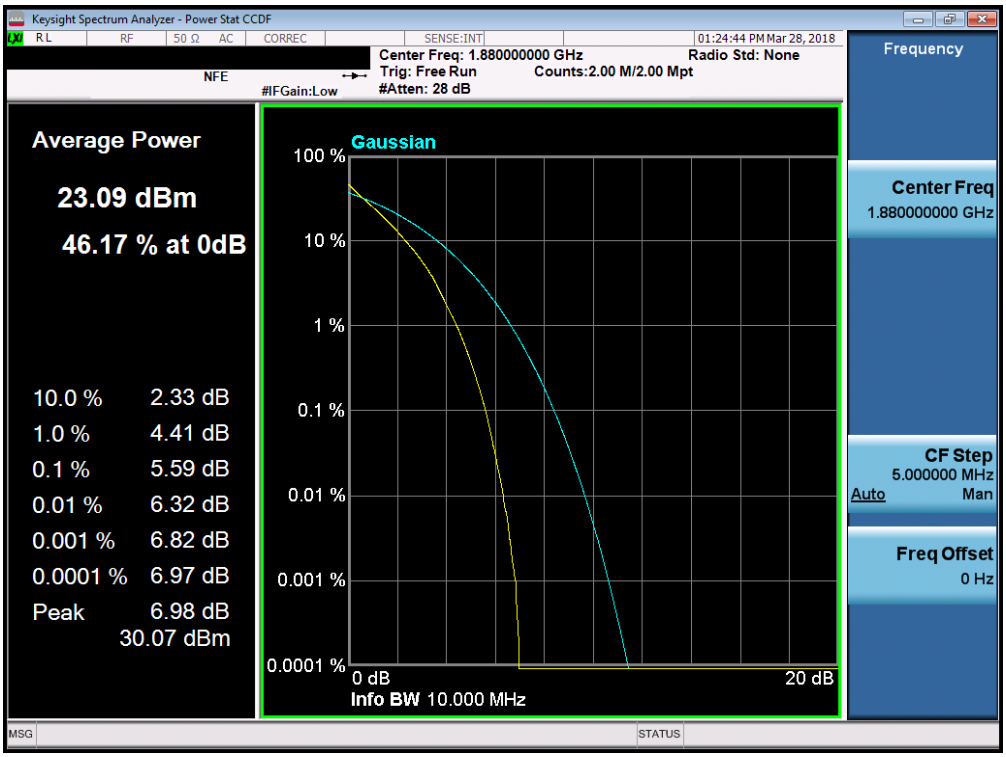
Plot 7-159. PAR Plot (Band 2 - 3.0MHz 16-QAM - Full RB Configuration)



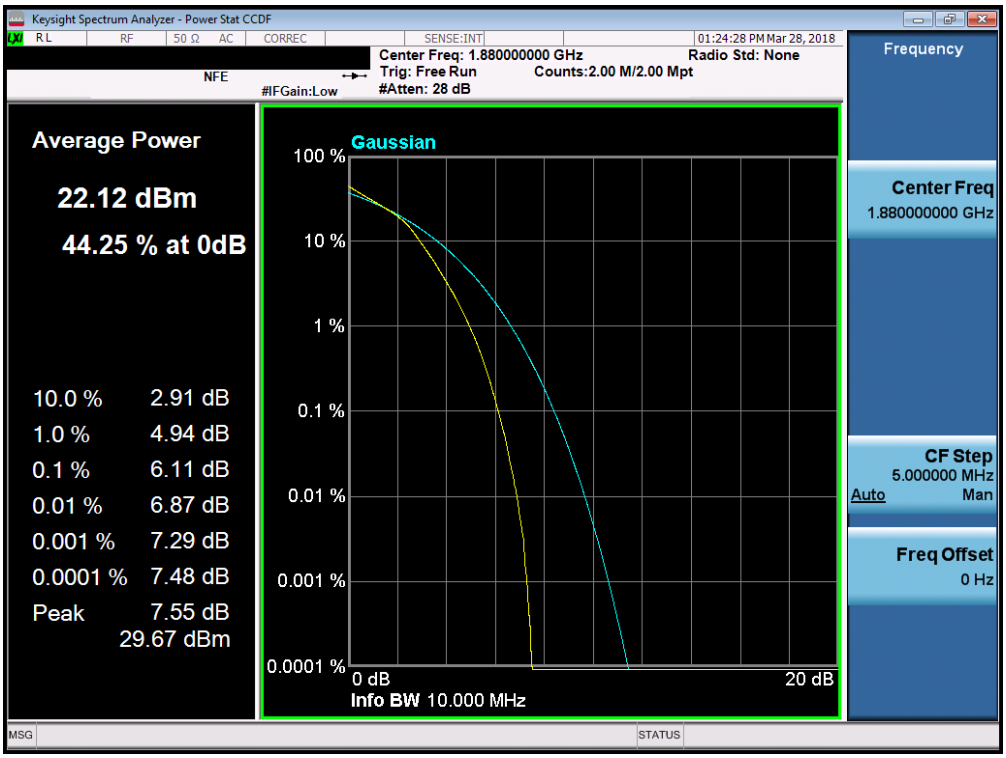
Plot 7-160. PAR Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



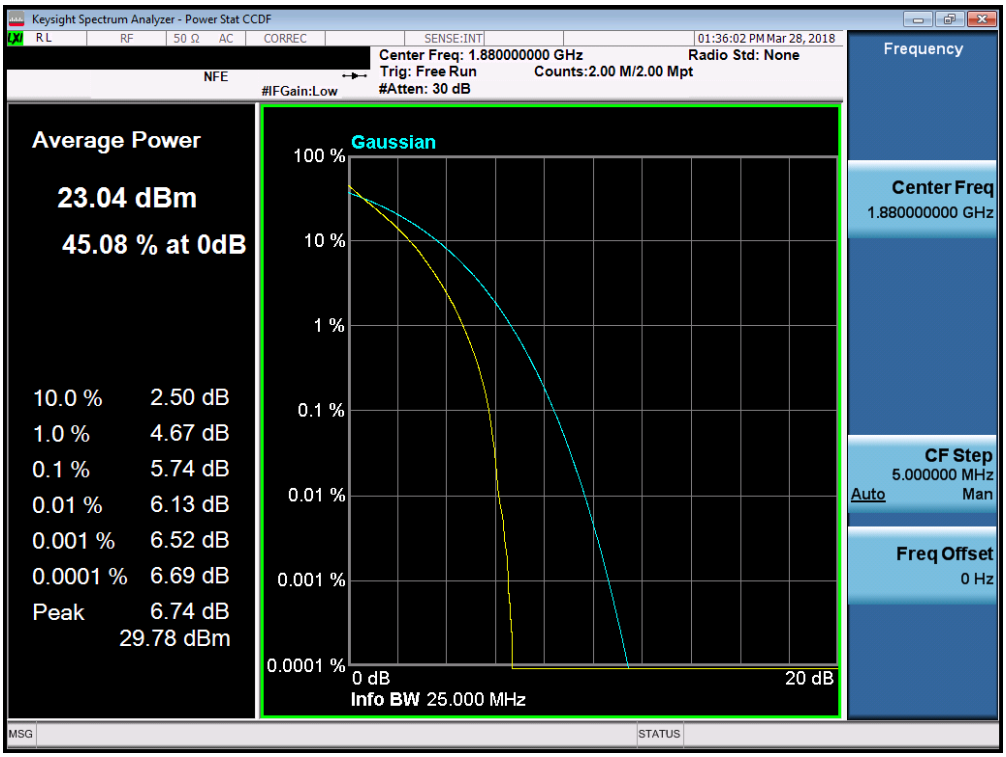
Plot 7-161. PAR Plot (Band 2 - 5.0MHz 16-QAM - Full RB Configuration)



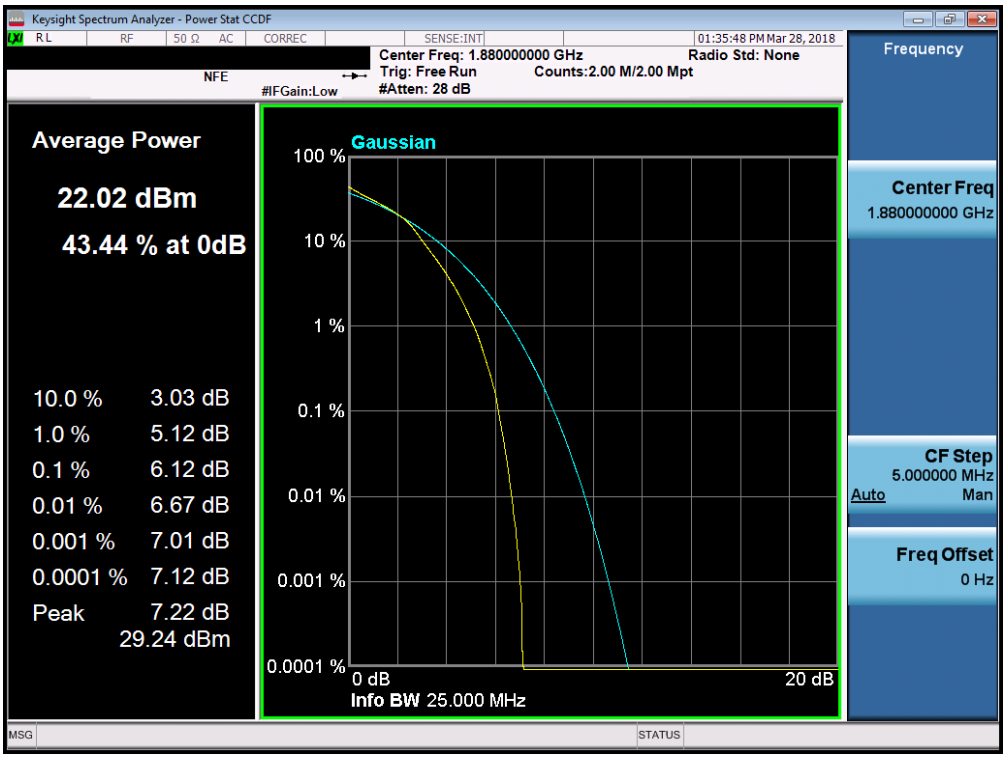
Plot 7-162. PAR Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



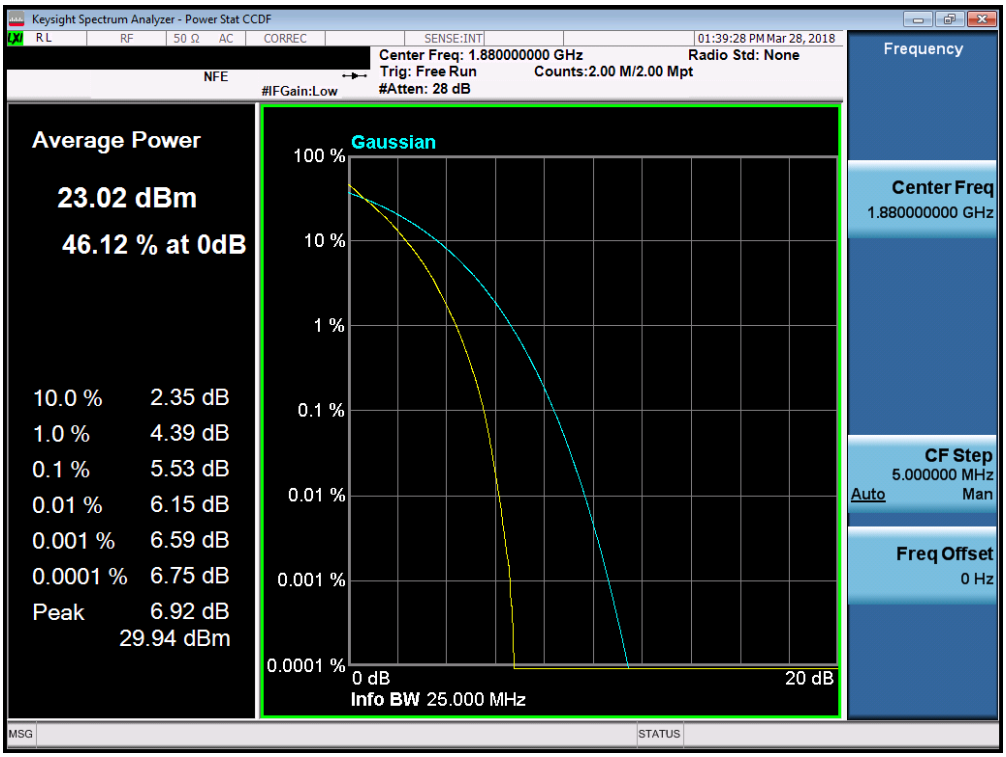
Plot 7-163. PAR Plot (Band 2 - 10.0MHz 16-QAM - Full RB Configuration)



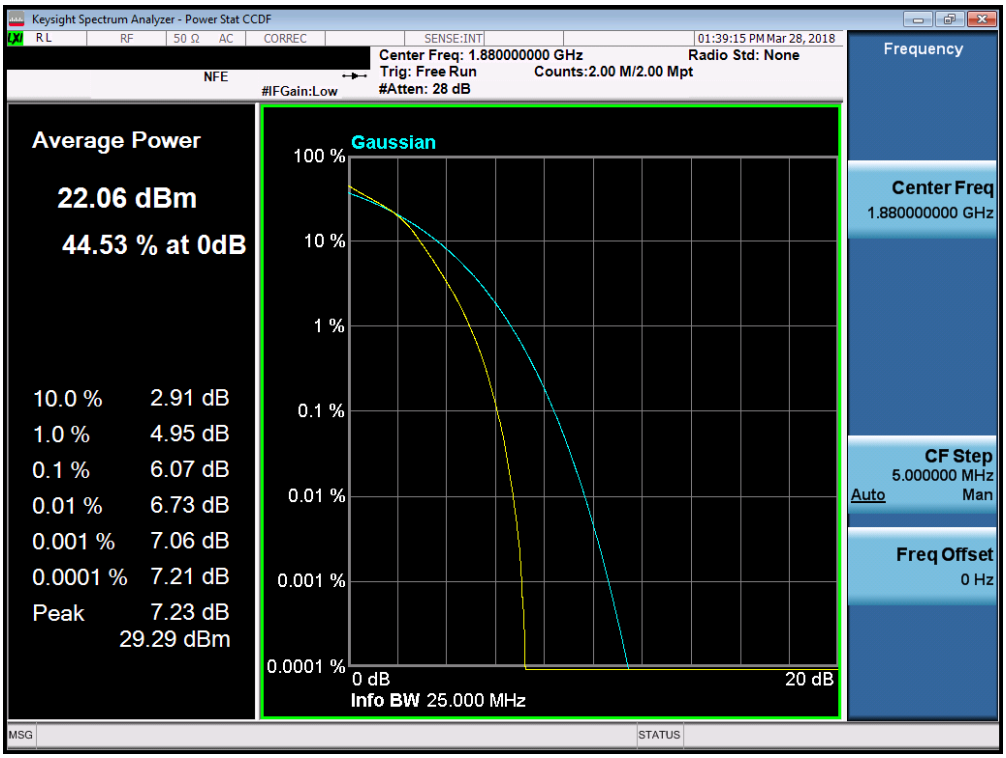
Plot 7-164. PAR Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-165. PAR Plot (Band 2 - 15.0MHz 16-QAM - Full RB Configuration)



Plot 7-166. PAR Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-167. 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.

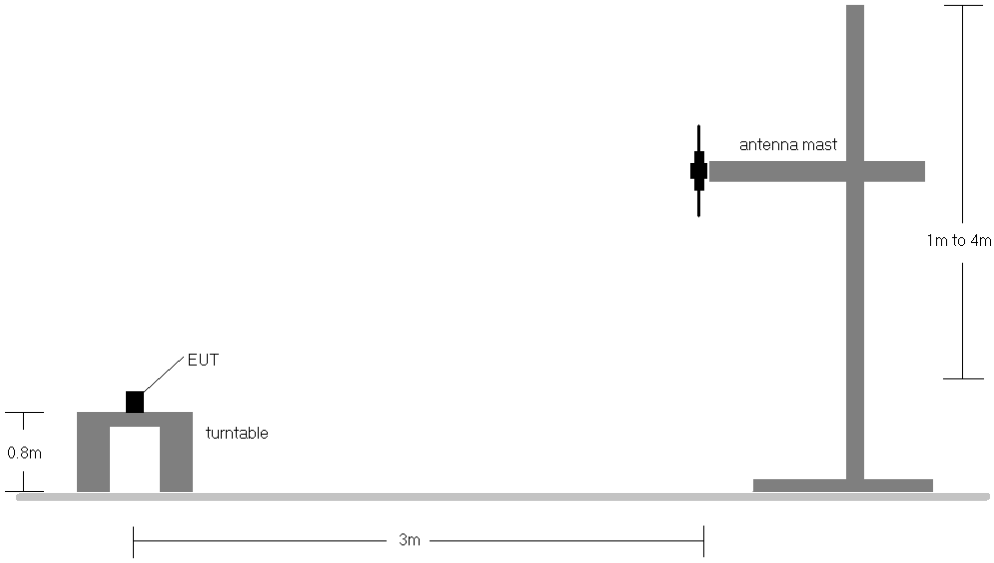


Figure 7-5. Radiated Test Setup <1GHz

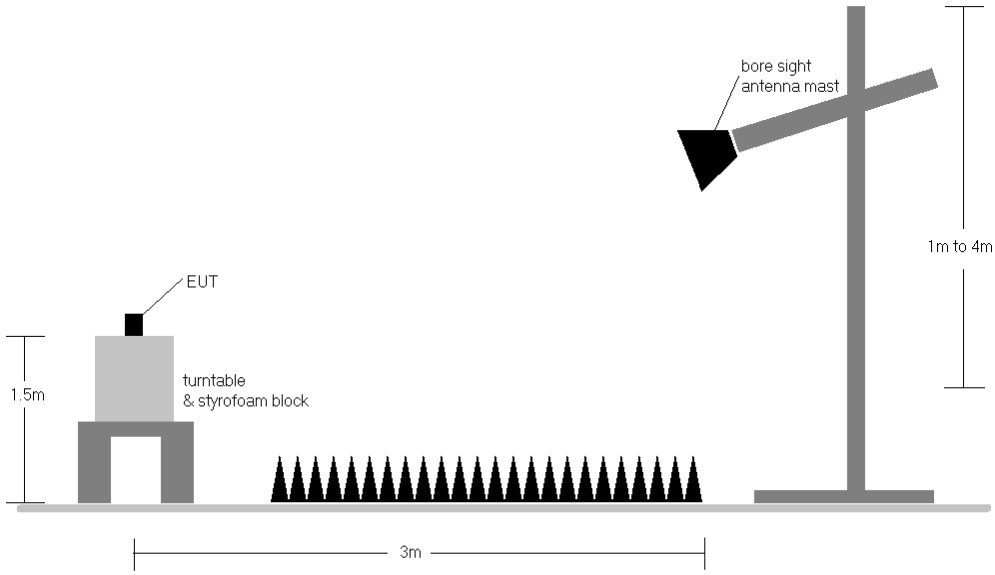


Figure 7-6. Radiated Test Setup >1GHz

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]
779.50	5	QPSK	H	150	350	1 / 24	17.87	1.32	17.04	0.051	34.77	-17.73	19.19	0.083	36.99	-17.80
782.00	5	QPSK	H	150	350	1 / 0	18.02	1.33	17.20	0.052	34.77	-17.57	19.35	0.086	36.99	-17.64
784.50	5	QPSK	H	150	350	1 / 24	18.52	1.34	**17.71**	0.059	34.77	-17.06	**19.86**	0.097	36.99	-17.13
782.00	5	16-QAM	H	150	350	1 / 24	17.94	1.33	**17.12**	0.052	34.77	-17.65	**19.27**	0.084	36.99	-17.72
782.00	10	QPSK	H	150	356	1 / 49	18.61	1.33	**17.79**	**0.060**	34.77	-16.98	**19.94**	**0.099**	36.99	-17.05
782.00	10	16-QAM	H	150	356	1 / 49	17.91	1.33	**17.09**	0.051	34.77	-17.68	**19.24**	0.084	36.99	-17.75
782.00	10	QPSK	V	150	8	1 / 74	17.22	1.33	16.40	0.044	34.77	-18.37	18.55	0.072	36.99	-18.44

Table 7-3. ERP Data (Band 13)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
824.70	1.4	QPSK	V	150	348	1 / 5	19.87	1.50	19.22	0.084	38.45	-19.23	21.37	0.137	40.61	-19.24
836.50	1.4	QPSK	V	150	348	1 / 0	22.33	1.50	**21.68**	0.147	38.45	-16.77	**23.83**	0.242	40.61	-16.78
848.30	1.4	QPSK	V	150	348	1 / 0	22.11	1.50	21.46	0.140	38.45	-16.99	23.61	0.230	40.61	-17.00
836.50	1.4	16-QAM	V	150	348	1 / 0	21.59	1.50	**20.94**	0.124	38.45	-17.51	**23.09**	0.204	40.61	-17.52
825.50	3	QPSK	V	150	349	1 / 0	19.85	1.50	19.20	0.083	38.45	-19.25	21.35	0.136	40.61	-19.26
836.50	3	QPSK	V	150	349	1 / 0	22.53	1.50	**21.88**	0.154	38.45	-16.57	**24.03**	0.253	40.61	-16.58
847.50	3	QPSK	V	150	349	1 / 0	22.14	1.50	21.49	0.141	38.45	-16.96	23.64	0.231	40.61	-16.97
836.50	3	16-QAM	V	150	349	1 / 0	22.01	1.50	**21.36**	0.137	38.45	-17.09	**23.51**	0.224	40.61	-17.10
826.50	5	QPSK	V	150	350	1 / 0	19.89	1.50	19.24	0.084	38.45	-19.21	21.39	0.138	40.61	-19.22
836.50	5	QPSK	V	150	350	1 / 0	22.62	1.50	**21.97**	**0.157**	38.45	-16.48	**24.12**	**0.258**	40.61	-16.49
846.50	5	QPSK	V	150	350	1 / 0	21.94	1.50	21.29	0.135	38.45	-17.16	23.44	0.221	40.61	-17.17
836.50	5	16-QAM	V	150	350	1 / 0	21.92	1.50	**21.27**	0.134	38.45	-17.18	**23.42**	0.220	40.61	-17.19
829.00	10	QPSK	V	150	348	1 / 0	19.70	1.50	19.05	0.080	38.45	-19.40	21.20	0.132	40.61	-19.41
836.50	10	QPSK	V	150	348	1 / 0	22.25	1.50	**21.60**	0.145	38.45	-16.85	**23.75**	0.237	40.61	-16.86
844.00	10	QPSK	V	150	348	1 / 0	21.57	1.50	20.92	0.124	38.45	-17.53	23.07	0.203	40.61	-17.54
836.50	10	16-QAM	V	150	348	1 / 0	21.50	1.50	**20.85**	0.122	38.45	-17.60	**23.00**	0.200	40.61	-17.61
836.50	5	QPSK	H	150	163	1 / 0	21.93	1.50	21.28	0.134	38.45	-17.17	23.43	0.220	40.61	-17.18

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	150	108	3 / 2	16.03	5.65	21.68	0.147	30.00	-8.32
1732.50	1.4	QPSK	V	150	108	3 / 2	16.64	5.41	**22.05**	0.160	30.00	-7.95
1754.30	1.4	QPSK	V	150	108	3 / 2	16.55	5.17	21.72	0.149	30.00	-8.28
1732.50	1.4	16-QAM	V	150	108	3 / 2	15.78	5.41	**21.19**	0.131	30.00	-8.81
1711.50	3	QPSK	V	150	278	1 / 0	16.42	5.64	**22.06**	0.161	30.00	-7.94
1732.50	3	QPSK	V	150	278	1 / 14	16.65	5.41	22.06	0.161	30.00	-7.94
1753.50	3	QPSK	V	150	278	1 / 0	16.23	5.18	21.41	0.138	30.00	-8.59
1711.50	3	16-QAM	V	150	278	1 / 0	15.46	5.64	**21.10**	0.129	30.00	-8.90
1712.50	5	QPSK	V	150	286	1 / 0	16.18	5.63	21.81	0.152	30.00	-8.19
1732.50	5	QPSK	V	150	286	1 / 24	16.48	5.41	**21.89**	0.154	30.00	-8.11
1752.50	5	QPSK	V	150	286	1 / 0	16.32	5.19	21.51	0.142	30.00	-8.49
1732.50	5	16-QAM	V	150	286	1 / 0	15.59	5.41	**21.00**	0.126	30.00	-9.00
1715.00	10	QPSK	V	150	284	1 / 0	16.53	5.60	22.13	0.163	30.00	-7.87
1732.50	10	QPSK	V	150	284	1 / 0	16.74	5.41	**22.15**	**0.164**	30.00	-7.85
1750.00	10	QPSK	V	150	284	1 / 0	16.02	5.22	21.24	0.133	30.00	-8.76
1732.50	10	16-QAM	V	150	284	1 / 0	15.93	5.41	**21.34**	0.136	30.00	-8.66
1717.50	15	QPSK	V	150	285	1 / 0	16.54	5.57	**22.11**	0.163	30.00	-7.89
1732.50	15	QPSK	V	150	285	1 / 0	16.40	5.41	21.81	0.152	30.00	-8.19
1747.50	15	QPSK	V	150	285	1 / 0	16.23	5.24	21.47	0.140	30.00	-8.53
1717.50	15	16-QAM	V	150	285	1 / 0	15.67	5.57	**21.24**	0.133	30.00	-8.76
1720.00	20	QPSK	V	150	279	1 / 0	16.37	5.54	21.91	0.155	30.00	-8.09
1732.50	20	QPSK	V	150	279	1 / 0	16.60	5.41	**22.01**	0.159	30.00	-7.99
1745.00	20	QPSK	V	150	279	1 / 0	16.65	5.27	21.92	0.156	30.00	-8.08
1732.50	20	16-QAM	V	150	279	1 / 0	15.78	5.41	**21.19**	0.131	30.00	-8.81
1732.50	10	QPSK	H	150	10	1 / 99	15.14	5.41	20.55	0.113	30.00	-9.45

Table 7-5. EIRP Data (Band 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	150	17	3 / 2	18.31	4.82	**23.13**	0.205	33.01	-9.88
1880.00	1.4	QPSK	H	150	17	3 / 2	17.86	4.74	22.60	0.182	33.01	-10.41
1909.30	1.4	QPSK	H	150	17	3 / 2	17.72	4.68	22.40	0.174	33.01	-10.61
1880.00	1.4	16-QAM	H	150	17	3 / 2	17.88	4.74	**22.62**	0.183	33.01	-10.39
1851.50	3	QPSK	H	150	16	1 / 0	18.37	4.82	**23.19**	0.208	33.01	-9.82
1880.00	3	QPSK	H	150	16	1 / 0	17.78	4.74	22.52	0.179	33.01	-10.49
1908.50	3	QPSK	H	150	16	1 / 0	17.90	4.68	22.58	0.181	33.01	-10.43
1851.50	3	16-QAM	H	150	16	1 / 0	17.52	4.82	**22.34**	0.171	33.01	-10.67
1852.50	5	QPSK	H	150	15	1 / 0	18.20	4.81	**23.01**	0.200	33.01	-10.00
1880.00	5	QPSK	H	150	15	1 / 0	17.68	4.74	22.42	0.175	33.01	-10.59
1907.50	5	QPSK	H	150	15	1 / 0	17.79	4.68	22.47	0.177	33.01	-10.54
1852.50	5	16-QAM	H	150	15	1 / 0	17.15	4.81	**21.96**	0.157	33.01	-11.05
1855.00	10	QPSK	H	150	18	1 / 0	18.16	4.81	**22.97**	0.198	33.01	-10.04
1880.00	10	QPSK	H	150	16	1 / 0	17.94	4.74	22.68	0.185	33.01	-10.33
1905.00	10	QPSK	H	150	18	1 / 0	17.74	4.68	22.42	0.175	33.01	-10.59
1855.00	10	16-QAM	H	150	18	1 / 0	17.33	4.81	**22.14**	0.164	33.01	-10.87
1857.50	15	QPSK	H	150	18	1 / 0	18.43	4.80	**23.23**	**0.210**	33.01	-9.78
1880.00	15	QPSK	H	150	18	1 / 0	17.92	4.74	22.66	0.185	33.01	-10.35
1902.50	15	QPSK	H	150	18	1 / 0	17.77	4.69	22.46	0.176	33.01	-10.55
1857.50	15	16-QAM	H	150	18	1 / 0	17.46	4.80	**22.26**	0.168	33.01	-10.75
1860.00	20	QPSK	H	150	16	1 / 0	18.30	4.79	**23.09**	0.204	33.01	-9.92
1880.00	20	QPSK	H	150	16	1 / 0	17.93	4.74	22.67	0.185	33.01	-10.34
1900.00	20	QPSK	H	150	16	1 / 0	17.65	4.69	22.34	0.171	33.01	-10.67
1860.00	20	16-QAM	H	150	16	1 / 0	17.37	4.79	**22.16**	0.165	33.01	-10.85
1857.50	15	QPSK	V	150	337	1 / 99	13.89	3.68	17.57	0.057	33.01	-15.44

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]
2502.50	5	QPSK	H	150	41	1 / 24	16.58	5.74	22.32	0.171	33.01	-10.69
2535.00	5	QPSK	H	150	41	1 / 24	18.97	5.86	**24.83**	**0.304**	33.01	-8.18
2567.50	5	QPSK	H	150	41	1 / 0	17.87	5.98	23.85	0.243	33.01	-9.16
2535.00	5	16-QAM	H	150	41	1 / 24	18.22	5.86	**24.08**	0.256	33.01	-8.93
2505.00	10	QPSK	H	150	46	1 / 49	16.87	5.75	22.62	0.183	33.01	-10.39
2535.00	10	QPSK	H	150	41	1 / 49	18.64	5.86	**24.50**	0.282	33.01	-8.51
2565.00	10	QPSK	H	150	46	1 / 49	17.30	5.97	23.27	0.212	33.01	-9.74
2535.00	10	16-QAM	H	150	41	1 / 49	18.12	5.86	**23.98**	0.250	33.01	-9.03
2507.50	15	QPSK	H	150	40	1 / 74	16.58	5.76	22.34	0.171	33.01	-10.67
2535.00	15	QPSK	H	150	40	1 / 74	18.65	5.86	**24.51**	0.283	33.01	-8.50
2562.50	15	QPSK	H	150	40	1 / 74	17.78	5.96	23.74	0.237	33.01	-9.27
2535.00	15	16-QAM	H	150	40	1 / 74	18.07	5.86	**23.93**	0.247	33.01	-9.08
2510.00	20	QPSK	H	150	38	1 / 99	16.12	5.77	21.89	0.154	33.01	-11.12
2535.00	20	QPSK	H	150	38	1 / 99	18.05	5.86	**23.91**	0.246	33.01	-9.10
2560.00	20	QPSK	H	150	38	1 / 0	17.25	5.95	23.20	0.209	33.01	-9.81
2535.00	20	16-QAM	H	150	38	1 / 99	17.41	5.86	**23.27**	0.212	33.01	-9.74
2535.00	5	QPSK	V	150	154	1 / 0	15.43	5.85	21.28	0.134	33.01	-11.73

Table 7-7. EIRP Data (Band 7)

7.7 Radiated Spurious Emissions Measurements

Test Overview

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

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.8

ANSI/TIA-603-E-2016 – Section 2.2.12

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW ≥ 3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points ≥ 2 x span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

Test Setup

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

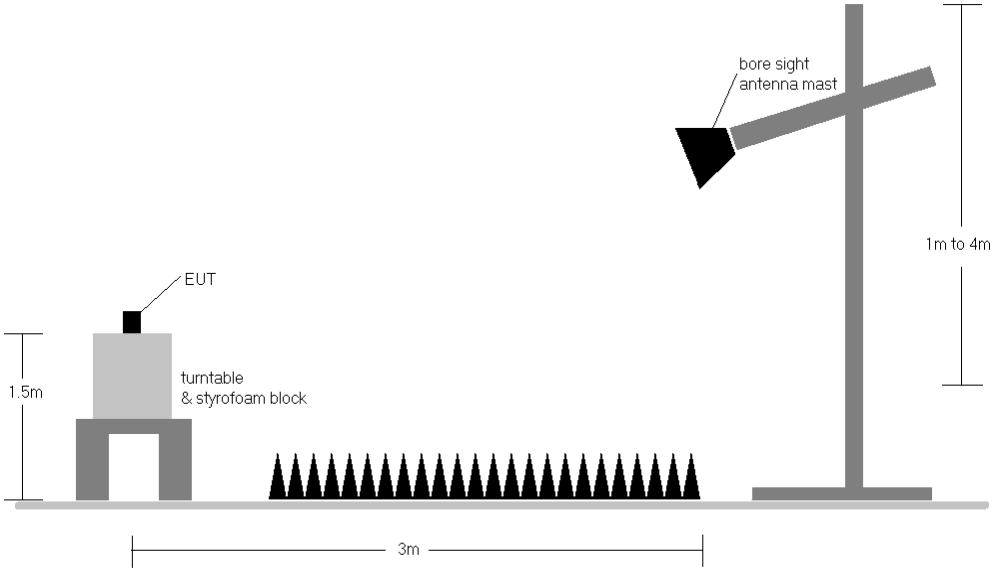


Figure 7-7. Test Instrument & Measurement Setup

Test Notes

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

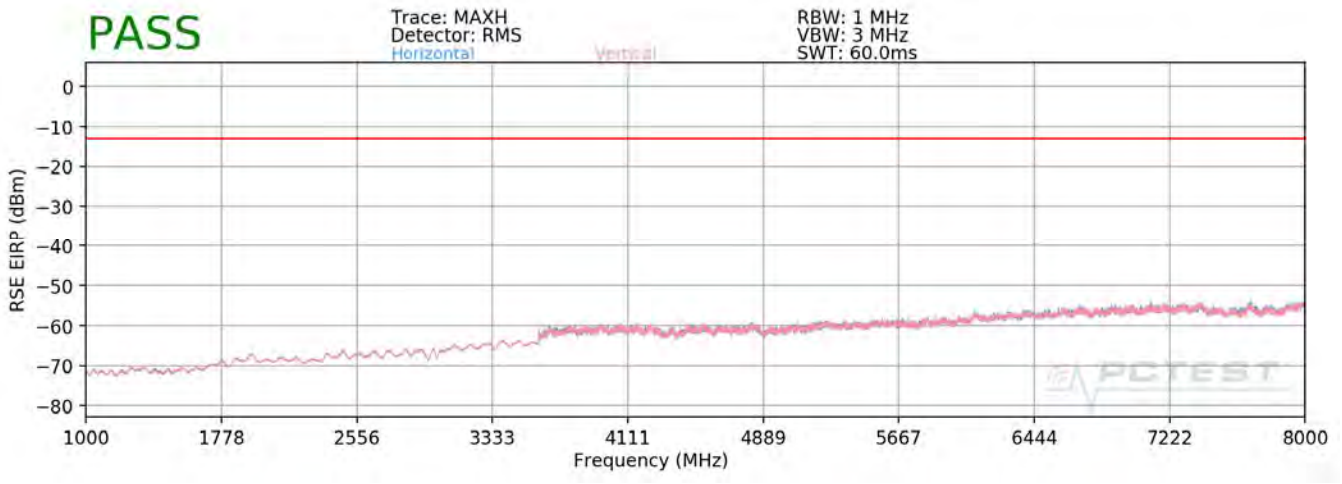
2) This unit was tested with its standard battery.

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

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

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

Band 13



Plot 7-168. Radiated Spurious Plot above 1GHz (Band 13)

OPERATING FREQUENCY:	782.00	MHz
CHANNEL:	23230	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
2346.00	H	-	-	-68.02	4.88	-63.14	-50.1

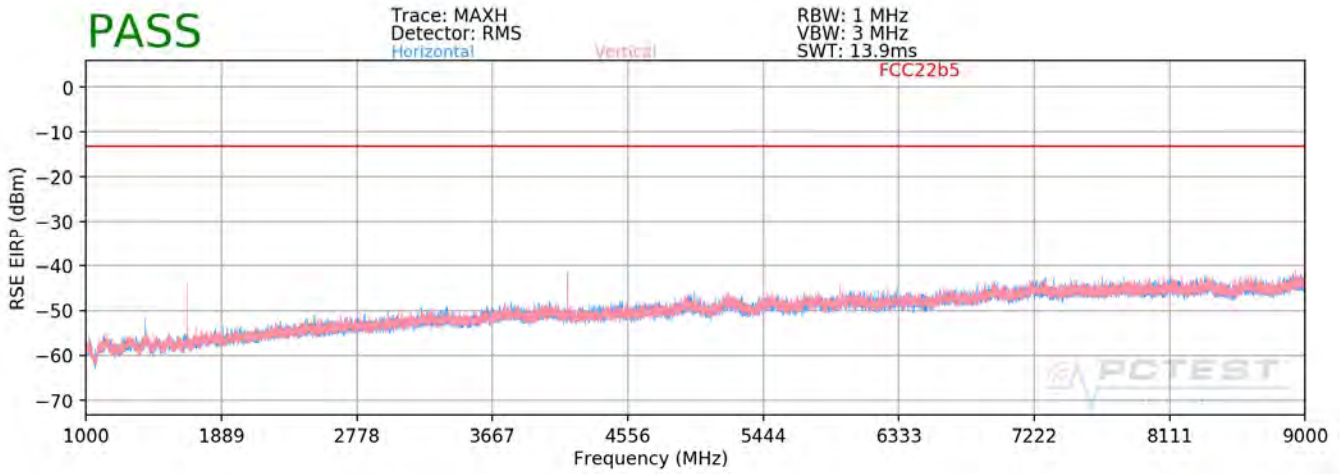
Table 7-8. Radiated Spurious Data (Band 13 – Mid Channel)

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

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1564.00	H	-	-	-71.45	4.50	-66.95	-26.9

Table 7-9. Radiated Spurious Data (Band 13 – 1559-1610MHz Band)

Band 5



Plot 7-169. Radiated Spurious Plot above 1GHz (Band 5)

OPERATING FREQUENCY:	826.50	MHz
CHANNEL:	20425	
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	150	285	-53.86	4.82	-49.04	-36.0
2479.50	V	-	-	-66.29	5.01	-61.28	-48.3

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

OPERATING FREQUENCY:	836.50	MHz
CHANNEL:	20525	
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	150	73	-55.12	4.86	-50.26	-37.3
2509.50	V	-	-	-66.37	5.10	-61.27	-48.3

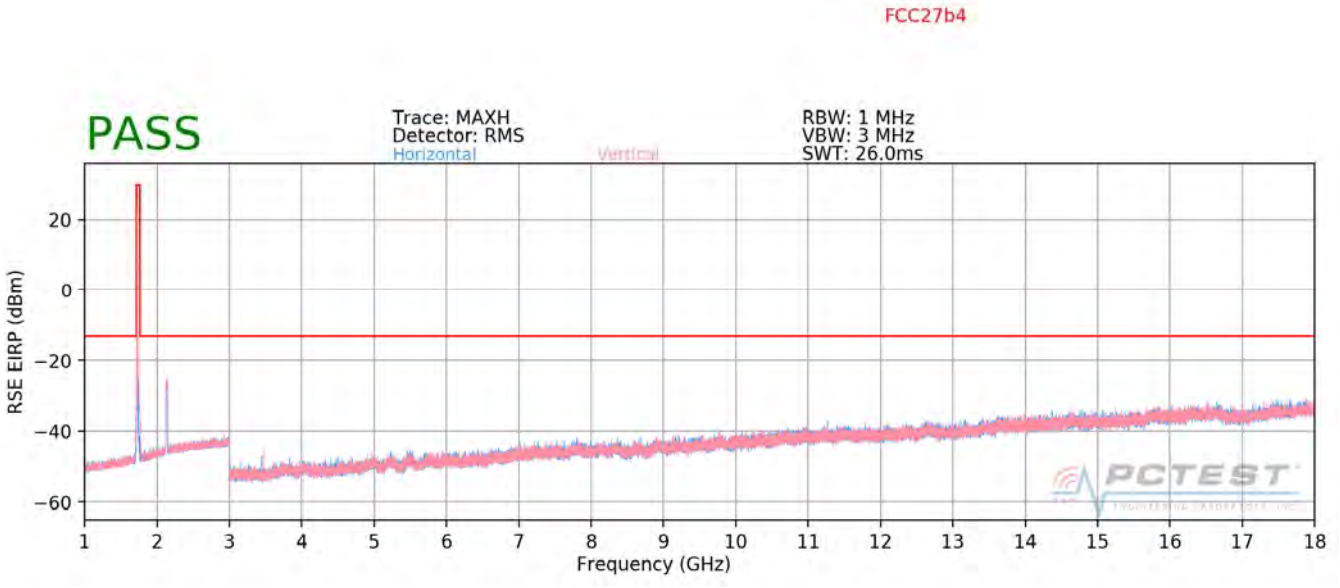
Table 7-11. Radiated Spurious Data (Band 5 – Mid Channel)

OPERATING FREQUENCY:	846.50	MHz
CHANNEL:	20625	
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	150	259	-56.90	4.90	-52.00	-39.0
2539.50	V	-	-	-66.65	5.25	-61.40	-48.4

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

Band 4



Plot 7-170. Radiated Spurious Plot above 1GHz (Band 4)

OPERATING FREQUENCY:	1715.00	MHz
CHANNEL:	20000	
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	150	185	-56.73	6.49	-50.24	-37.2
5145.00	V	-	-	-66.21	8.43	-57.78	-44.8

Table 7-13. Radiated Spurious Data (Band 4 – Low Channel)

OPERATING FREQUENCY:	1732.50	MHz
CHANNEL:	20175	
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]
3465.00	V	150	167	-56.98	6.56	-50.42	-37.4
5197.50	V	-	-	-65.88	8.45	-57.43	-44.4

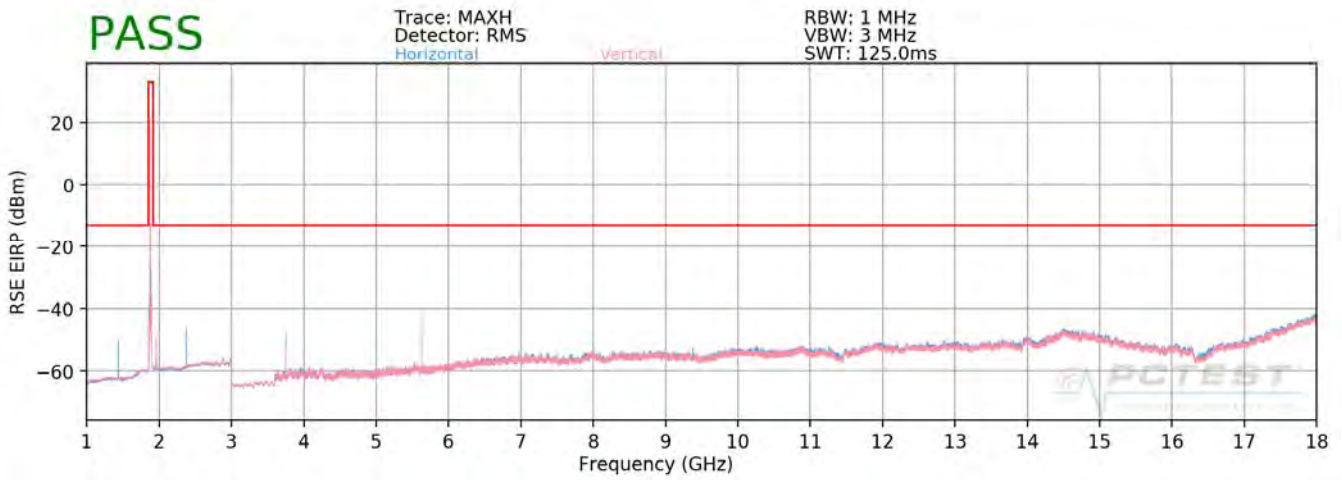
Table 7-14. Radiated Spurious Data (Band 4 – Mid Channel)

OPERATING FREQUENCY:	1750.00	MHz
CHANNEL:	20350	
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]
3500.00	V	150	261	-58.51	6.60	-51.91	-38.9
5250.00	V	-	-	-65.40	8.41	-56.99	-44.0

Table 7-15. Radiated Spurious Data (Band 4 – High Channel)

Band 2



Plot 7-171. Radiated Spurious Plot above 1GHz (Band 2)

OPERATING FREQUENCY:	1857.50	MHz
CHANNEL:	18675	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	15.0	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]
3715.00	H	150	259	-56.36	8.34	-48.02	-35.0
5572.50	H	150	236	-53.17	10.56	-42.60	-29.6
7430.00	H	-	-	-66.15	11.96	-54.19	-41.2

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

OPERATING FREQUENCY:	1880.00	MHz
CHANNEL:	18900	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	15.0	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	150	248	-58.20	8.46	-49.74	-36.7
5640.00	H	150	21	-48.46	10.60	-37.86	-24.9
7520.00	H	-	-	-65.67	12.11	-53.56	-40.6

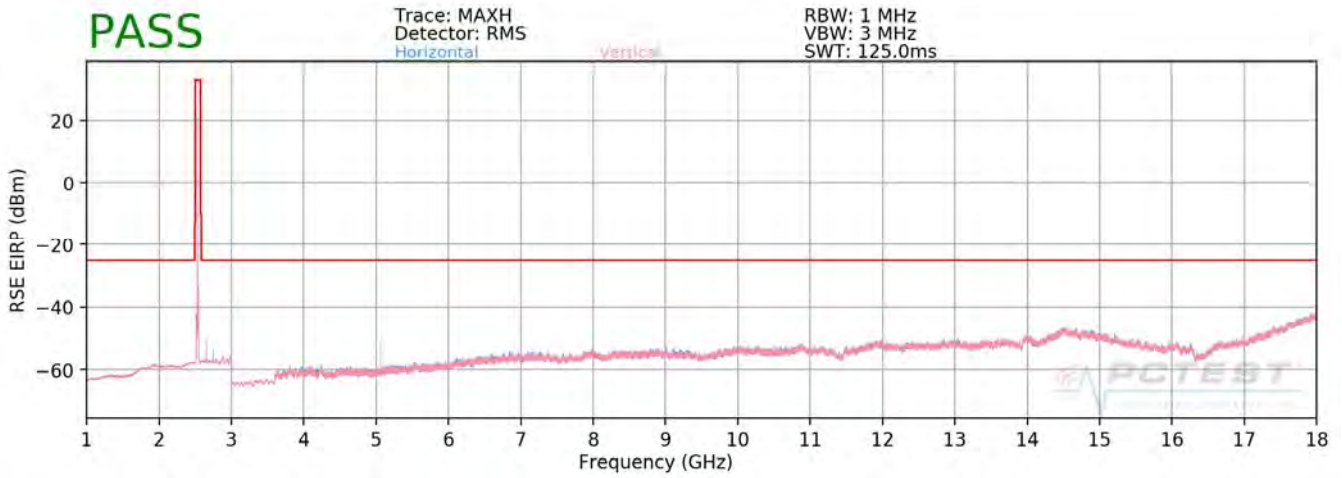
Table 7-17. Radiated Spurious Data (Band 2 – Mid Channel)

OPERATING FREQUENCY:	1902.50	MHz
CHANNEL:	19125	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	15.0	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]
3805.00	H	150	253	-57.57	8.56	-49.01	-36.0
5707.50	H	150	21	-48.04	10.60	-37.44	-24.4
7610.00	H	-	-	-63.01	12.15	-50.85	-37.9

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

Band 7



Plot 7-172. Radiated Spurious Plot 1GHz - 18GHz (Band 7)

OPERATING FREQUENCY:	2502.50	MHz
CHANNEL:	20775	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-25	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]
5005.00	H	150	230	-54.29	8.33	-45.95	-21.0
7507.50	H	-	-	-62.81	8.43	-54.38	-29.4

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

OPERATING FREQUENCY:	2535.00	MHz
CHANNEL:	21100	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-25	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]
5070.00	H	-	-	-66.61	8.39	-58.22	-33.2

Table 7-20. Radiated Spurious Data (Band 7 – Mid Channel)

OPERATING FREQUENCY:	2567.50	MHz
CHANNEL:	21425	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-25	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]
5135.00	H	150	233	-54.36	8.43	-45.94	-20.9
7702.50	H	-	-	-61.89	8.67	-53.22	-28.2

Table 7-21. Radiated Spurious Data (Band 7 – High Channel)

7.8 Frequency Stability / Temperature Variation

Test Overview and Limit

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

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

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

For Part 22, the frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency. For Part 24, Part 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure Used

ANSI/TIA-603-E-2016

Test Settings

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

Test Setup

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

Test Notes

None

Band 13 Frequency Stability Measurements

OPERATING FREQUENCY:	782,000,000	Hz
CHANNEL:	23230	
REFERENCE VOLTAGE:	3.80	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	781,999,965	-35	-0.0000045
100 %		- 30	781,999,956	-44	-0.0000057
100 %		- 20	781,999,861	-139	-0.0000178
100 %		- 10	781,999,993	-7	-0.0000009
100 %		0	781,999,982	-18	-0.0000023
100 %		+ 10	781,999,972	-28	-0.0000036
100 %		+ 20	781,999,823	-177	-0.0000226
100 %		+ 30	781,999,902	-98	-0.0000126
100 %		+ 40	781,999,913	-87	-0.0000111
100 %		+ 50	781,999,817	-183	-0.0000234
BATT. ENDPOINT	3.40	+ 20	781,999,947	-53	-0.0000068

Table 7-22. Frequency Stability Data (Band 13)

Note:

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

Band 13 Frequency Stability Measurements

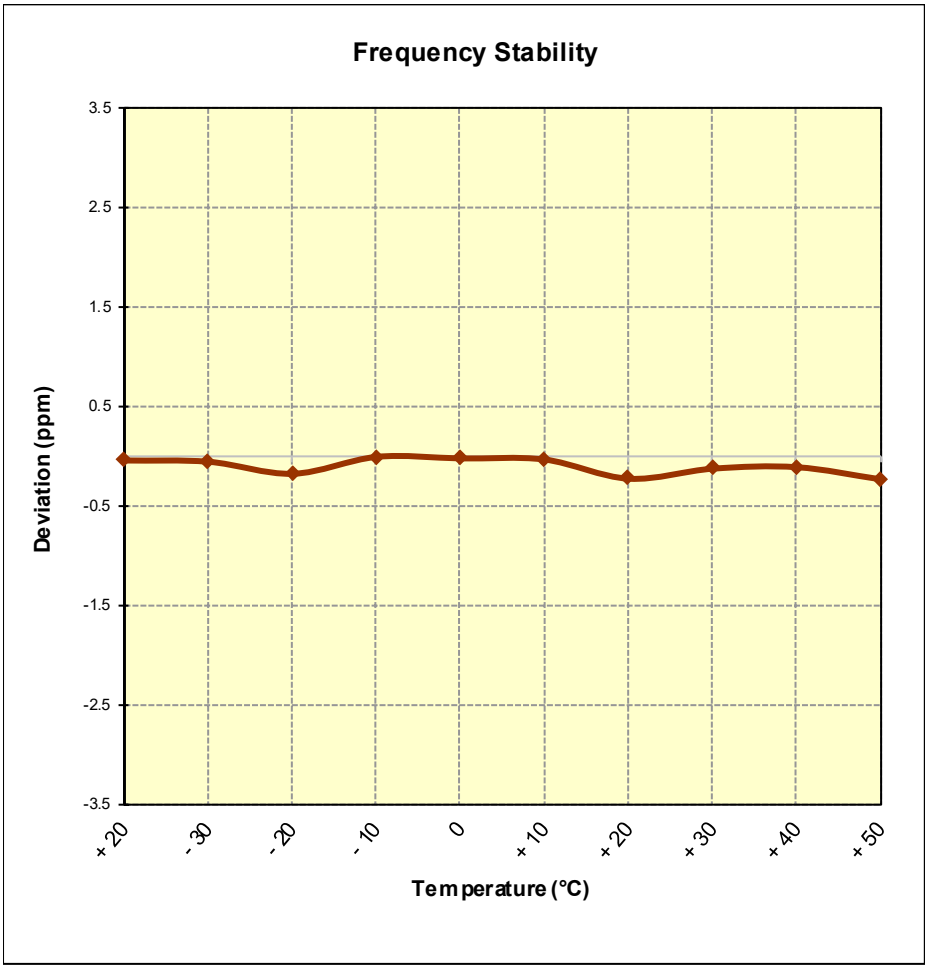


Figure 7-8. Frequency Stability Graph (Band 13)

Band 5 Frequency Stability Measurements

OPERATING FREQUENCY:	836,500,000	Hz
CHANNEL:	20525	
REFERENCE VOLTAGE:	3.80	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	836,499,966	-34	-0.0000041
100 %		- 30	836,499,937	-63	-0.0000076
100 %		- 20	836,499,879	-121	-0.0000145
100 %		- 10	836,499,912	-88	-0.0000105
100 %		0	836,499,914	-86	-0.0000102
100 %		+ 10	836,499,922	-78	-0.0000093
100 %		+ 20	836,499,942	-58	-0.0000070
100 %		+ 30	836,499,952	-48	-0.0000058
100 %		+ 40	836,499,883	-117	-0.0000140
100 %		+ 50	836,499,871	-129	-0.0000154
BATT. ENDPOINT	3.40	+ 20	836,499,840	-160	-0.0000191

Table 7-23. Frequency Stability Data (Band 5)

Band 5 Frequency Stability Measurements

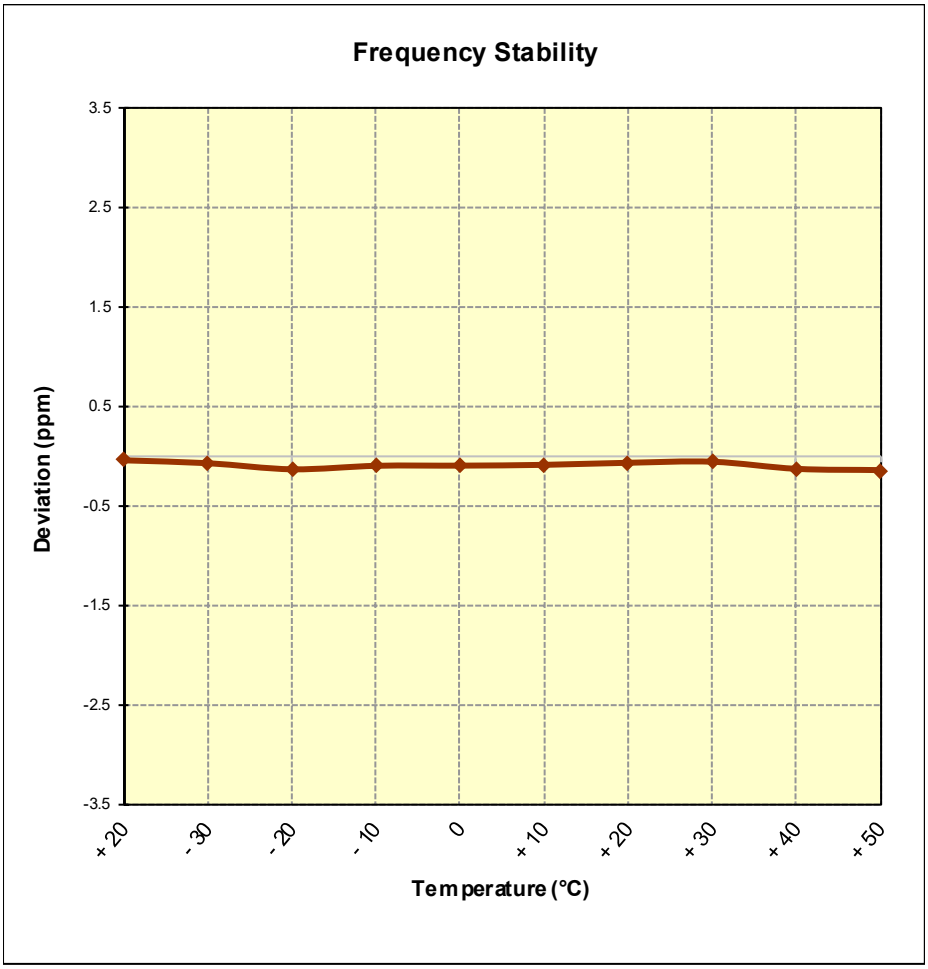


Figure 7-9. Frequency Stability Graph (Band 5)

Band 4 Frequency Stability Measurements

OPERATING FREQUENCY:	1,732,500,000	Hz
CHANNEL:	20175	
REFERENCE VOLTAGE:	3.80	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	1,732,499,903	-97	-0.0000056
100 %		- 30	1,732,499,976	-24	-0.0000014
100 %		- 20	1,732,499,826	-174	-0.0000100
100 %		- 10	1,732,499,938	-62	-0.0000036
100 %		0	1,732,499,998	-2	-0.0000001
100 %		+ 10	1,732,499,874	-126	-0.0000073
100 %		+ 20	1,732,499,836	-164	-0.0000095
100 %		+ 30	1,732,499,962	-38	-0.0000022
100 %		+ 40	1,732,499,838	-162	-0.0000094
100 %		+ 50	1,732,499,889	-111	-0.0000064
BATT. ENDPOINT	3.40	+ 20	1,732,499,931	-69	-0.0000040

Table 7-24. Frequency Stability Data (Band 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 4 Frequency Stability Measurements

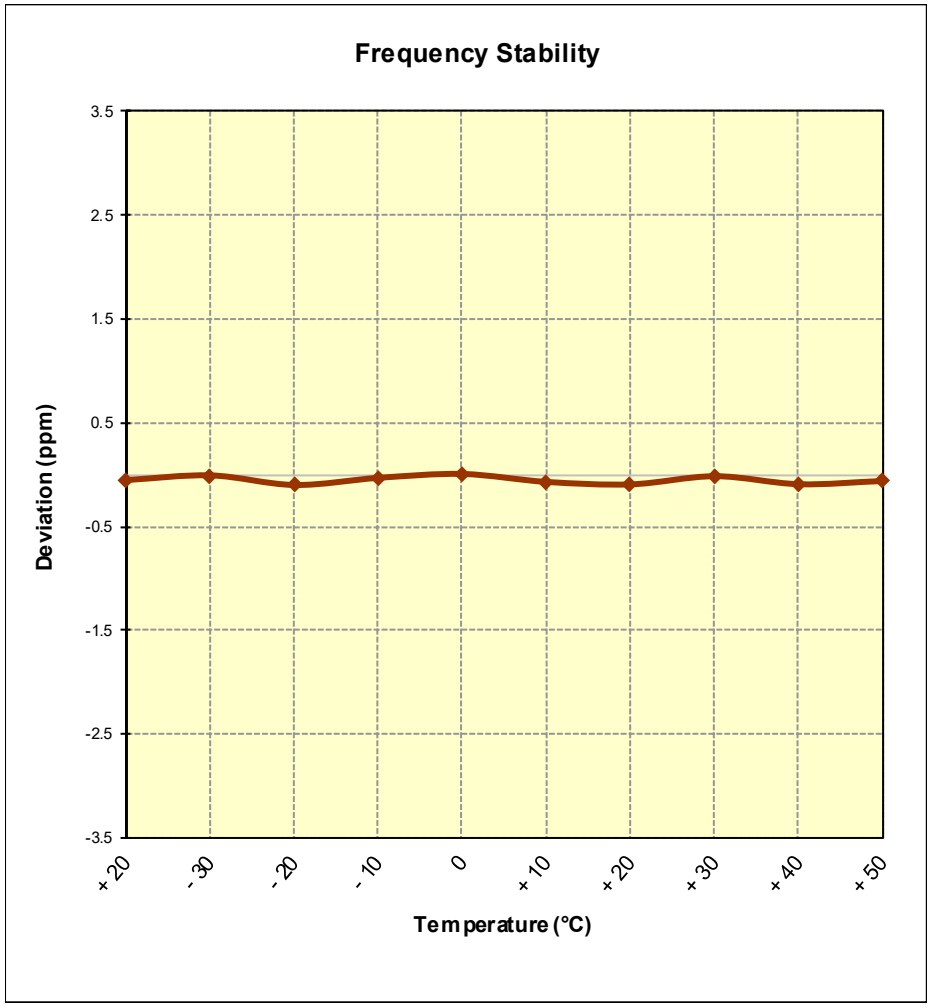


Figure 7-10. Frequency Stability Graph (Band 4)

Band 2 Frequency Stability Measurements

OPERATING FREQUENCY:	1,880,000,000	Hz
CHANNEL:	18900	
REFERENCE VOLTAGE:	3.80	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	1,879,999,966	-34	-0.0000018
100 %		- 30	1,879,999,992	-8	-0.0000004
100 %		- 20	1,879,999,902	-98	-0.0000052
100 %		- 10	1,879,999,925	-75	-0.0000040
100 %		0	1,879,999,808	-192	-0.0000102
100 %		+ 10	1,879,999,844	-156	-0.0000083
100 %		+ 20	1,879,999,964	-36	-0.0000019
100 %		+ 30	1,879,999,918	-82	-0.0000044
100 %		+ 40	1,879,999,884	-116	-0.0000062
100 %		+ 50	1,879,999,898	-102	-0.0000054
BATT. ENDPOINT	3.40	+ 20	1,879,999,950	-50	-0.0000026

Table 7-25. Frequency Stability Data (Band 2)

Band 2 Frequency Stability Measurements

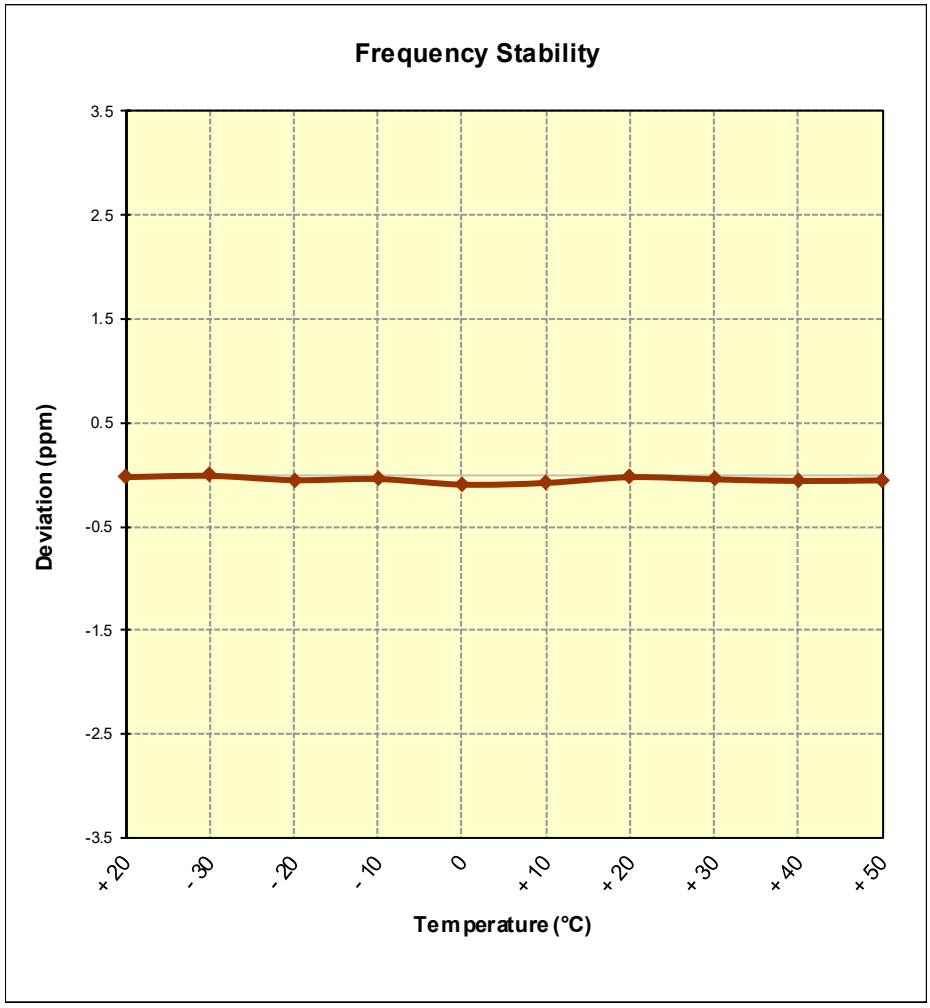


Figure 7-11. Frequency Stability Graph (Band 2)

Band 7 Frequency Stability Measurements

OPERATING FREQUENCY:	2,535,000,000	Hz
CHANNEL:	21100	
REFERENCE VOLTAGE:	3.80	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	2,534,999,912	-88	-0.0000035
100 %		- 30	2,534,999,815	-185	-0.0000073
100 %		- 20	2,534,999,809	-191	-0.0000075
100 %		- 10	2,534,999,857	-143	-0.0000056
100 %		0	2,534,999,817	-183	-0.0000072
100 %		+ 10	2,534,999,989	-11	-0.0000004
100 %		+ 20	2,534,999,911	-89	-0.0000035
100 %		+ 30	2,534,999,870	-130	-0.0000051
100 %		+ 40	2,534,999,843	-157	-0.0000062
100 %		+ 50	2,534,999,934	-66	-0.0000026
BATT. ENDPOINT	3.40	+ 20	2,534,999,833	-167	-0.0000066

Table 7-26. Frequency Stability Data (Band 7)

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 7 Frequency Stability Measurements

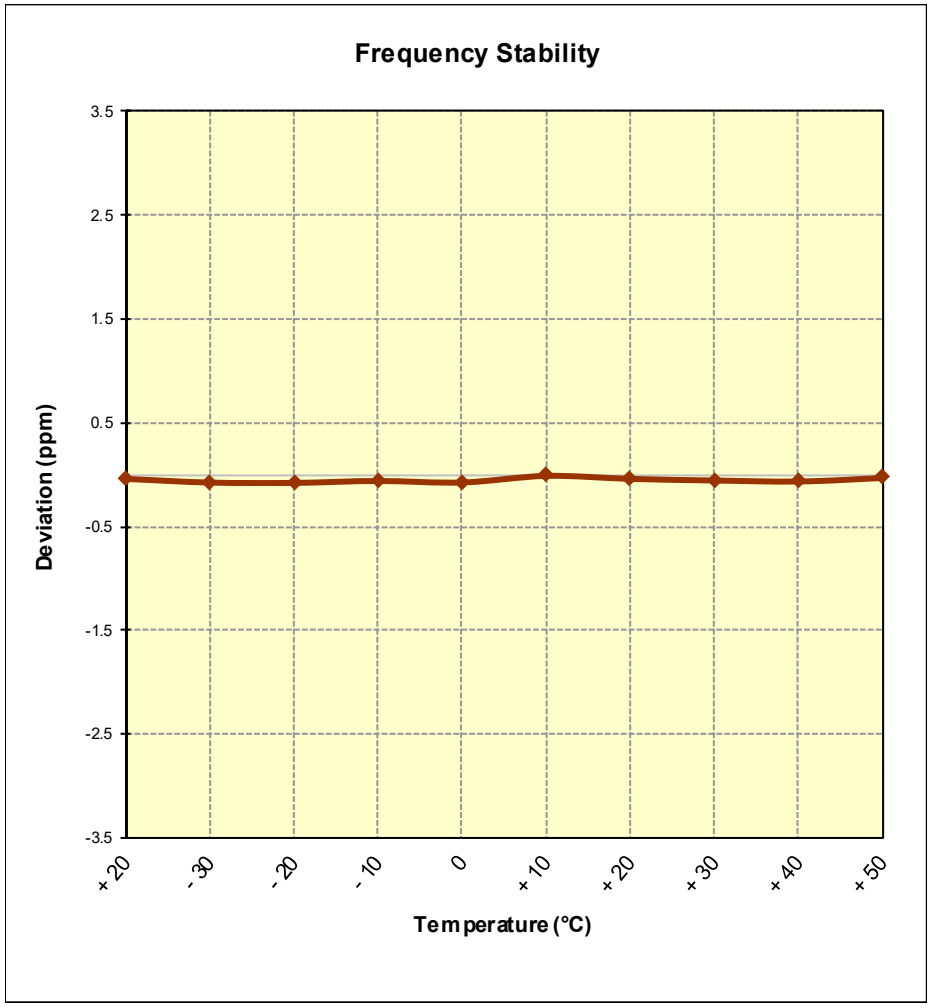


Figure 7-12. Frequency Stability Graph (Band 7)

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMJ337V** complies with all the requirements of Part 22, 24, & 27 of the FCC Rules for LTE operation only.