7.4 Band Edge Emissions at Antenna Terminal

Test Overview

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

The minimum permissible attenuation level of any spurious emission is 43 + $\log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

The minimum permissible attenuation level for Band 7 is as noted in the Test Notes on the following page.

Test Procedure Used

KDB 971168 D01 v03 – Section 6.0

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW ≥ 1% of the emission bandwidth
4. VBW ≥ 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Setup

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

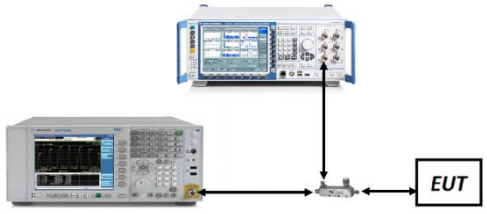


Figure 7-3. Test Instrument & Measurement Setup

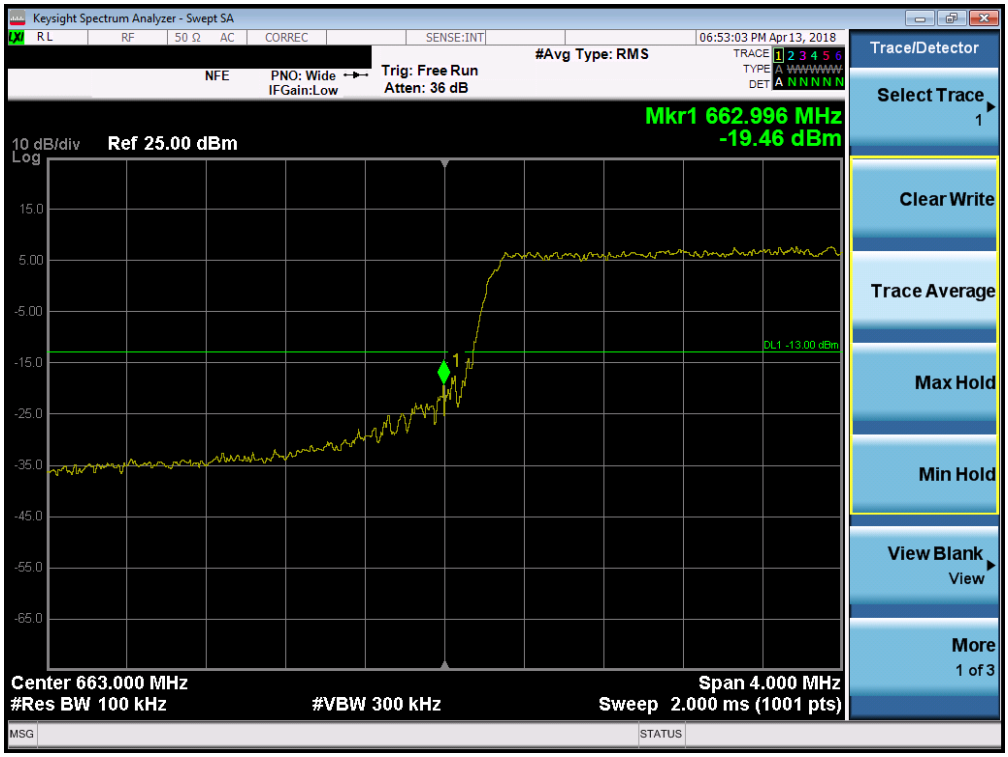
Test Notes

Per 22.917(b) 24.238(a) 27.53(h) in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

Per 27.53(g) for operations in the 698-746 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

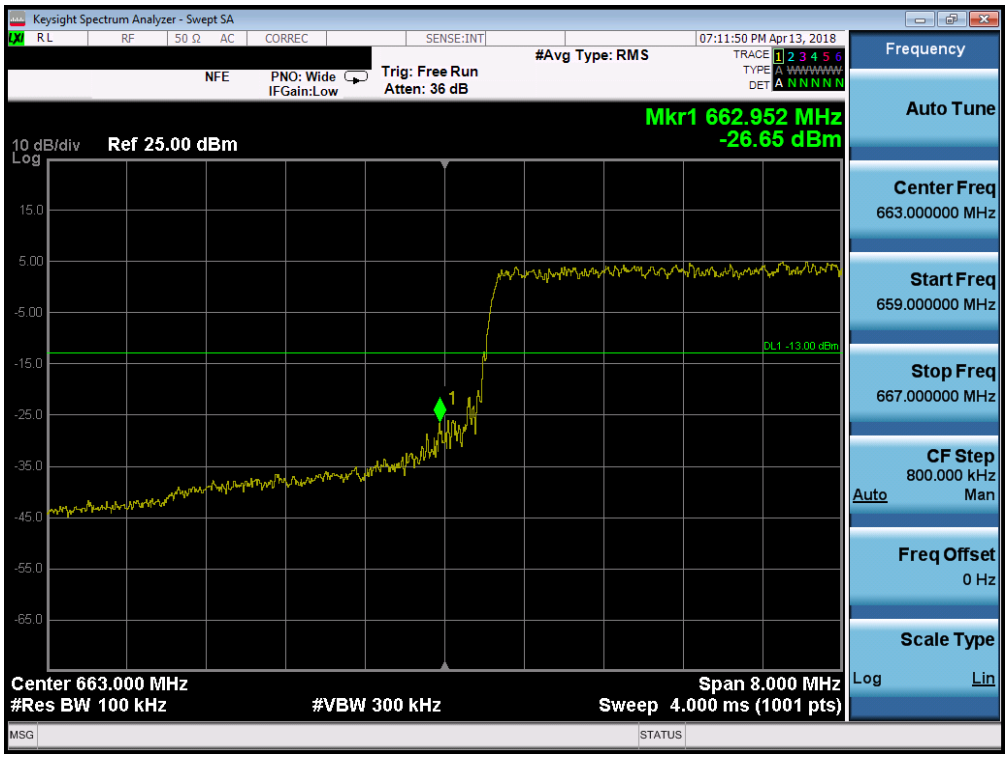
Per 27.53(m) for operations in the BRS/EBS bands, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz.

Band 71



Plot 7-111. Lower Band Edge Plot (Band 71 - 5.0MHz QPSK - Full RB Configuration)

Plot 7-112. Upper Band Edge Plot (Band 71 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-113. Lower Band Edge Plot (Band 71 - 10.0MHz QPSK - Full RB Configuration)

Plot 7-114. Upper Band Edge Plot (Band 71 - 10.0MHz QPSK - Full RB Configuration)

Plot 7-115. Lower Band Edge Plot (Band 71 - 15.0MHz QPSK - Full RB Configuration)

Plot 7-116. Upper Band Edge Plot (Band 71 - 15.0MHz QPSK - Full RB Configuration)

Plot 7-117. Lower Band Edge Plot (Band 71 - 20.0MHz QPSK - Full RB Configuration)

Plot 7-118. Upper Band Edge Plot (Band 71 - 20.0MHz QPSK - Full RB Configuration)

Plot 7-119. Lower Band Edge Plot (Band 12 - 1.4MHz QPSK - Full RB Configuration)

Plot 7-120. Upper Band Edge Plot (Band 12 - 1.4MHz QPSK - Full RB Configuration)

Plot 7-121. Lower Band Edge Plot (Band 12 - 3.0MHz QPSK - Full RB Configuration)

Plot 7-122. Upper Band Edge Plot (Band 12 - 3.0MHz QPSK - Full RB Configuration)

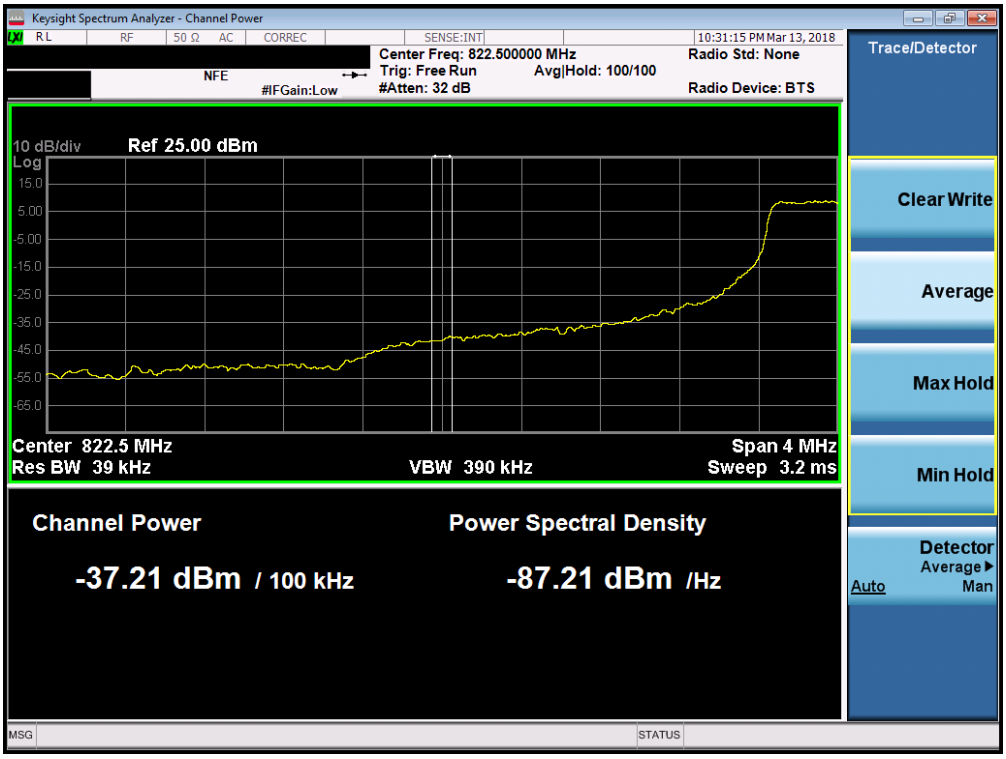
Plot 7-123. Lower Band Edge Plot (Band 12 - 5.0MHz QPSK - Full RB Configuration)

Plot 7-124. Upper Band Edge Plot (Band 12 - 5.0MHz QPSK - Full RB Configuration)

Plot 7-125. Lower Band Edge Plot (Band 12 - 10.0MHz QPSK - Full RB Configuration)

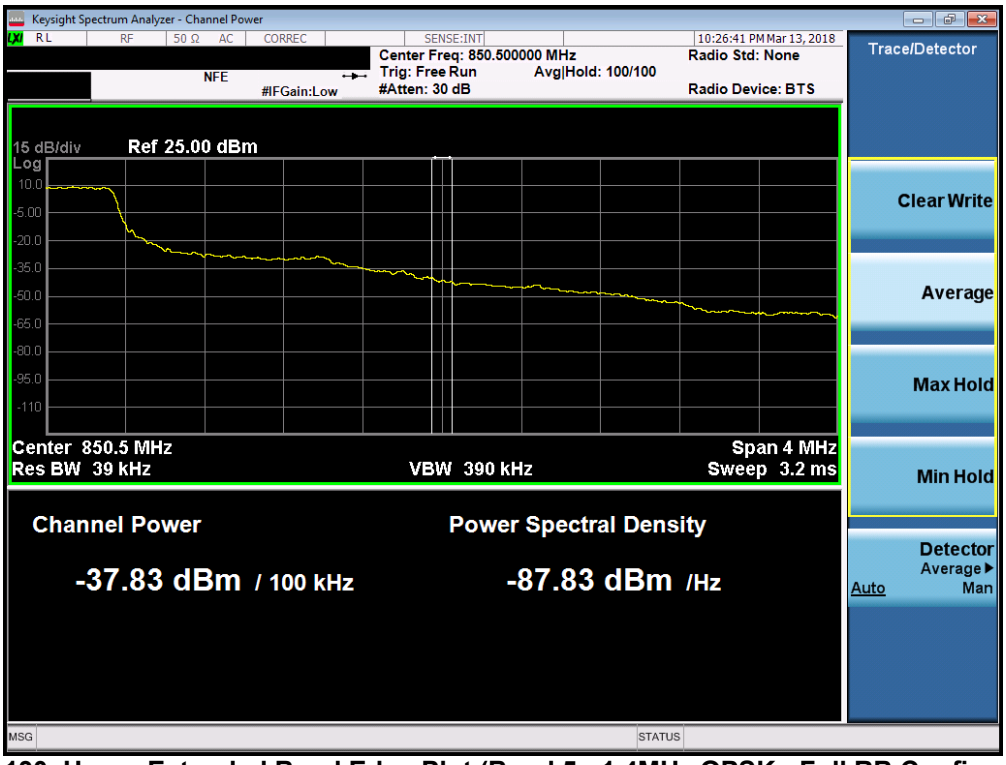
Plot 7-126. Upper Band Edge Plot (Band 12 - 10.0MHz QPSK - Full RB Configuration)

Plot 7-127. Lower Band Edge Plot (Band 5 - 1.4MHz QPSK - Full RB Configuration)



Plot 7-128. Lower Extended Band Edge Plot (Band 5 - 1.4MHz QPSK - Full RB Configuration)

Plot 7-129. Upper Band Edge Plot (Band 5 - 1.4MHz QPSK - Full RB Configuration)



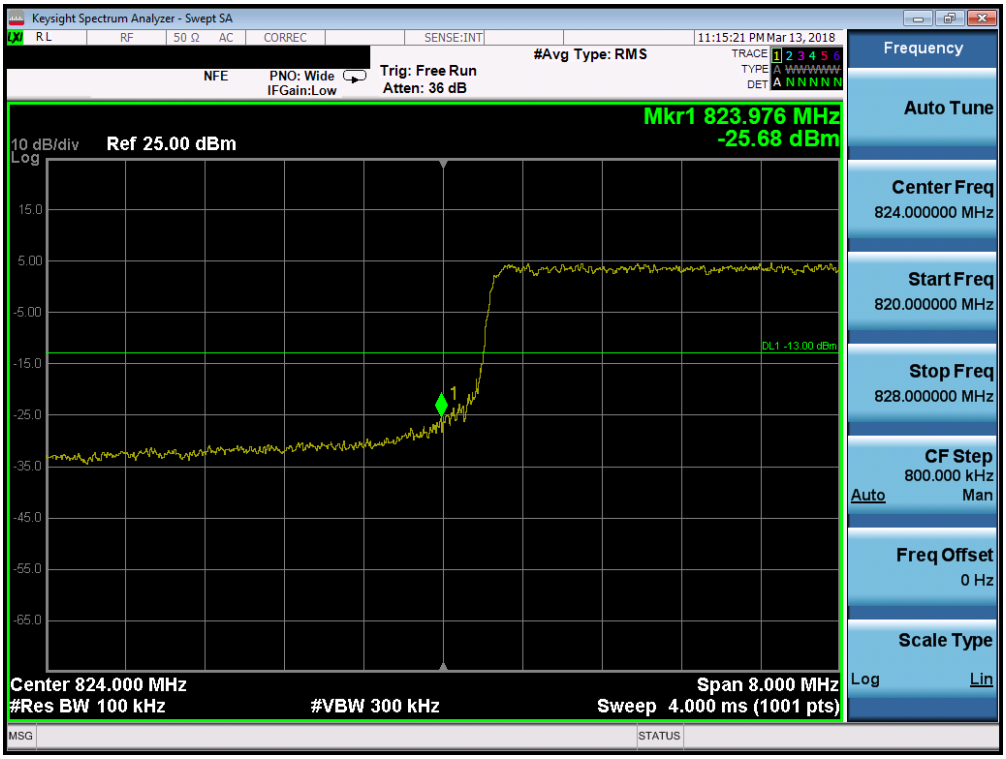
Plot 7-130. Upper Extended Band Edge Plot (Band 5 - 1.4MHz QPSK - Full RB Configuration)

Plot 7-131. Lower Band Edge Plot (Band 5 - 3.0MHz QPSK - Full RB Configuration)

Plot 7-132. Upper Band Edge Plot (Band 5 - 3.0MHz QPSK - Full RB Configuration)

Plot 7-133. Lower Band Edge Plot (Band 5 - 5.0MHz QPSK - Full RB Configuration)

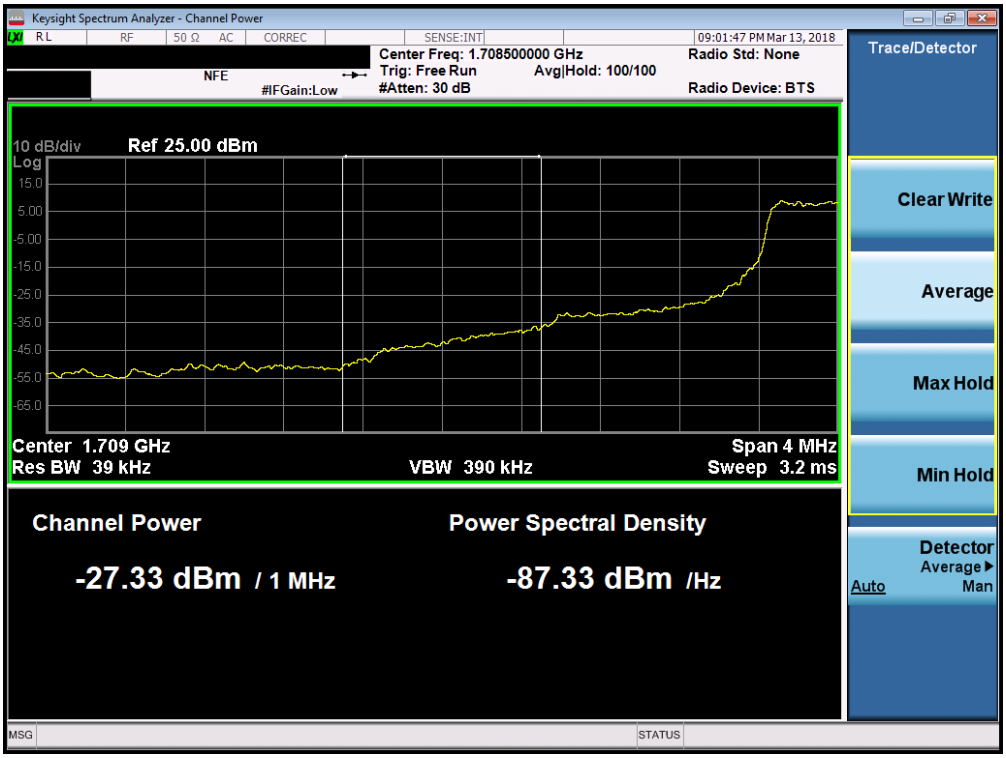
Plot 7-134. Upper Band Edge Plot (Band 5 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-135. Lower Band Edge Plot (Band 5 - 10.0MHz QPSK - Full RB Configuration)

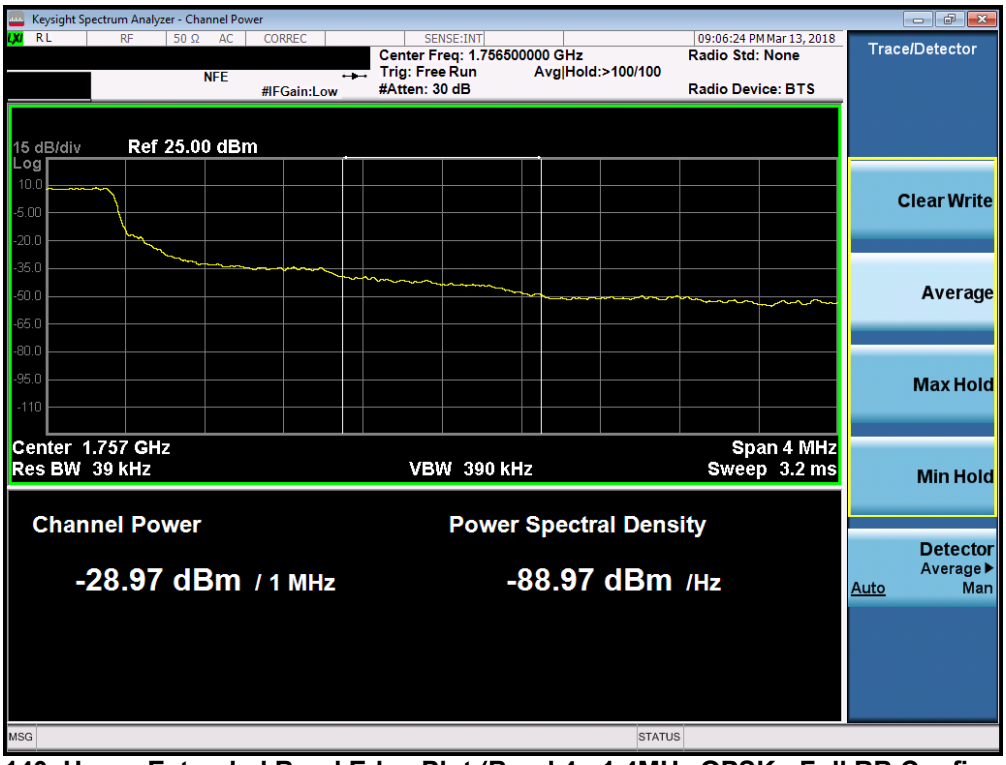
Plot 7-136. Upper Band Edge Plot (Band 5 - 10.0MHz QPSK - Full RB Configuration)

Plot 7-137. Lower Band Edge Plot (Band 66/4 - 1.4MHz QPSK - Full RB Configuration)

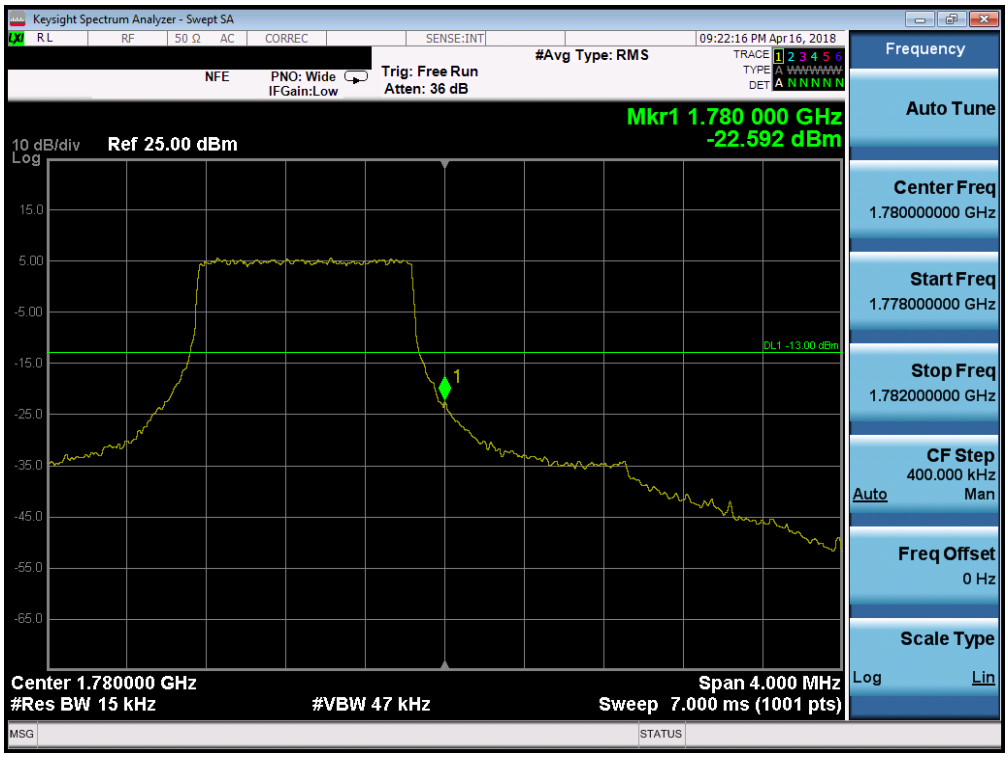


Plot 7-138. Lower Extended Band Edge Plot (Band 66/4 - 1.4MHz QPSK - Full RB Configuration)

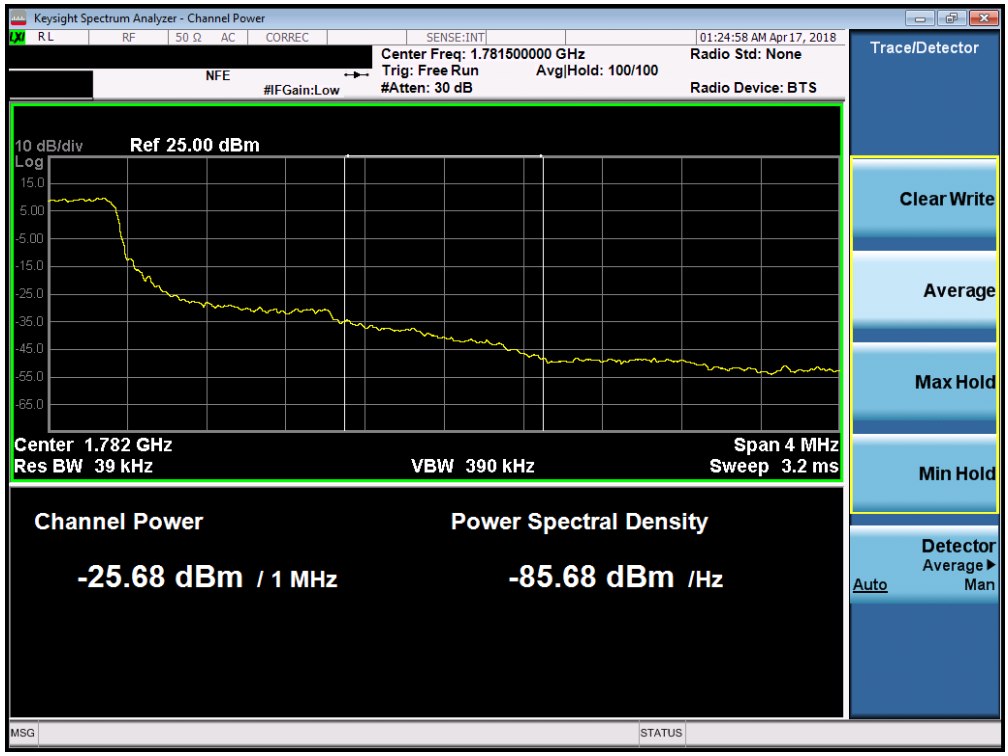
Plot 7-139. Upper Band Edge Plot (Band 4 - 1.4MHz QPSK - Full RB Configuration)



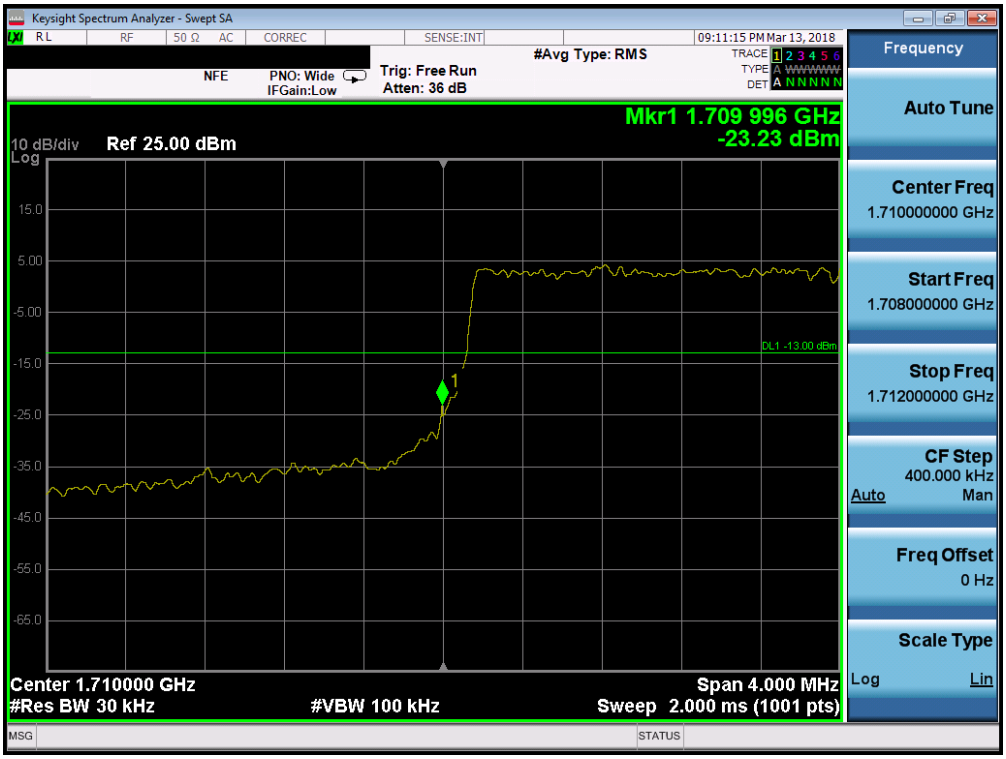
Plot 7-140. Upper Extended Band Edge Plot (Band 4 - 1.4MHz QPSK - Full RB Configuration)



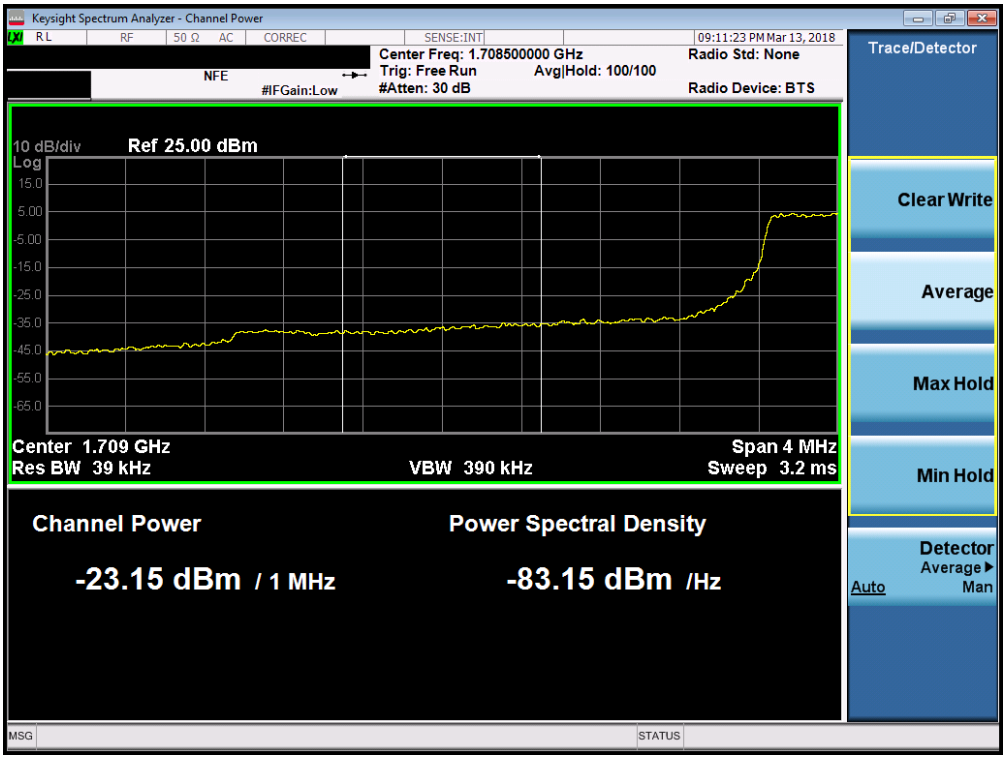
Plot 7-141. Upper Band Edge Plot (Band 66 - 1.4MHz QPSK - Full RB Configuration)



Plot 7-142. Upper Extended Band Edge Plot (Band 66 - 1.4MHz QPSK - Full RB Configuration)

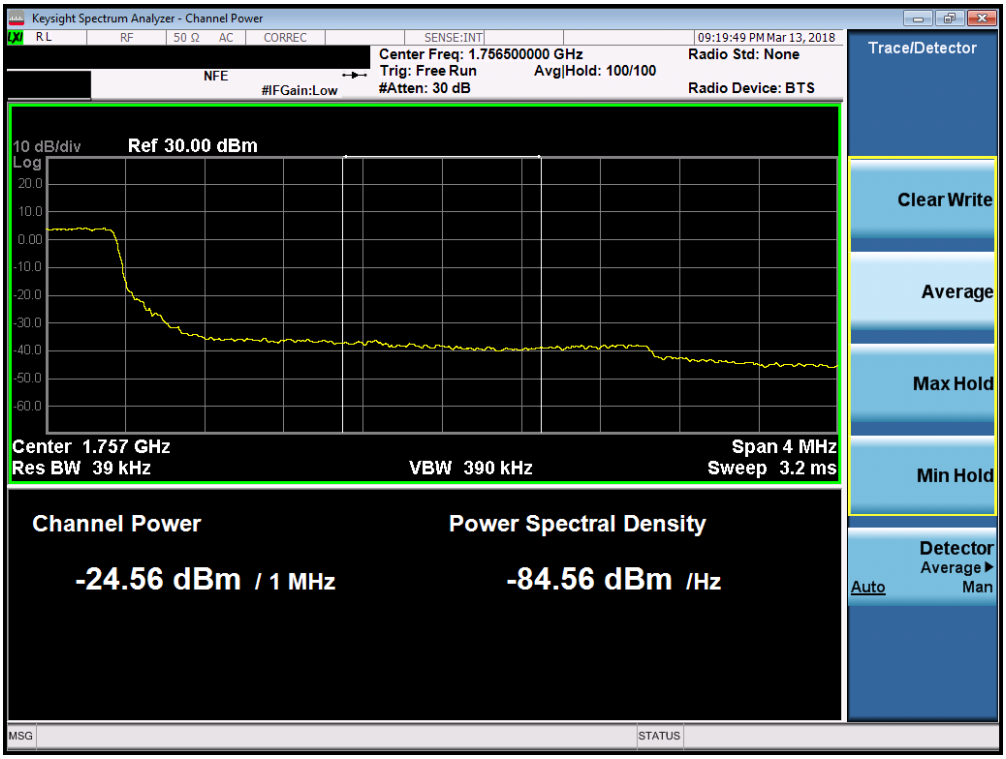


Plot 7-143. Lower Band Edge Plot (Band 66/4 - 3.0MHz QPSK - Full RB Configuration)

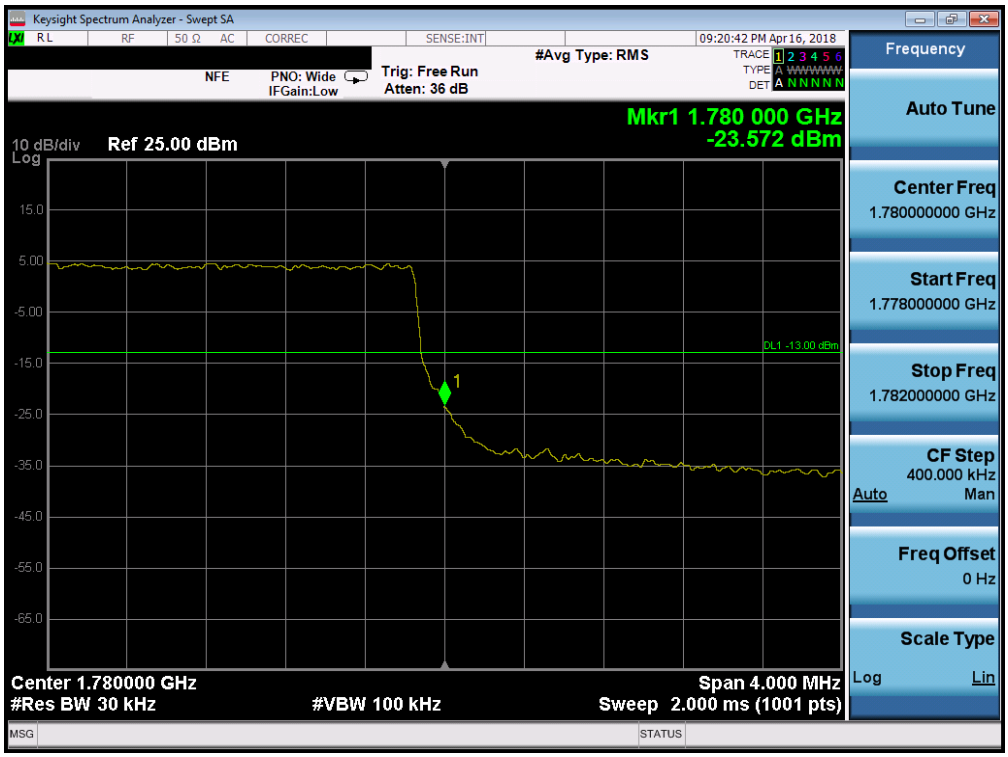


Plot 7-144. Lower Extended Band Edge Plot (Band 66/4 - 3.0MHz QPSK - Full RB Configuration)

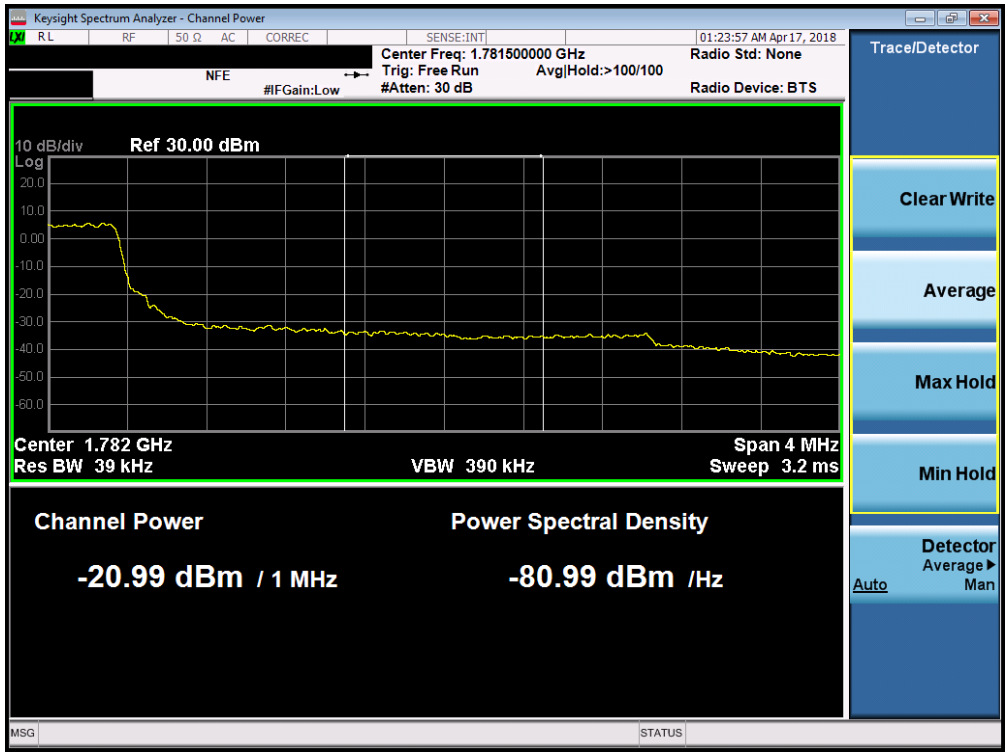
Plot 7-145. Upper Band Edge Plot (Band 4 - 3.0MHz QPSK - Full RB Configuration)



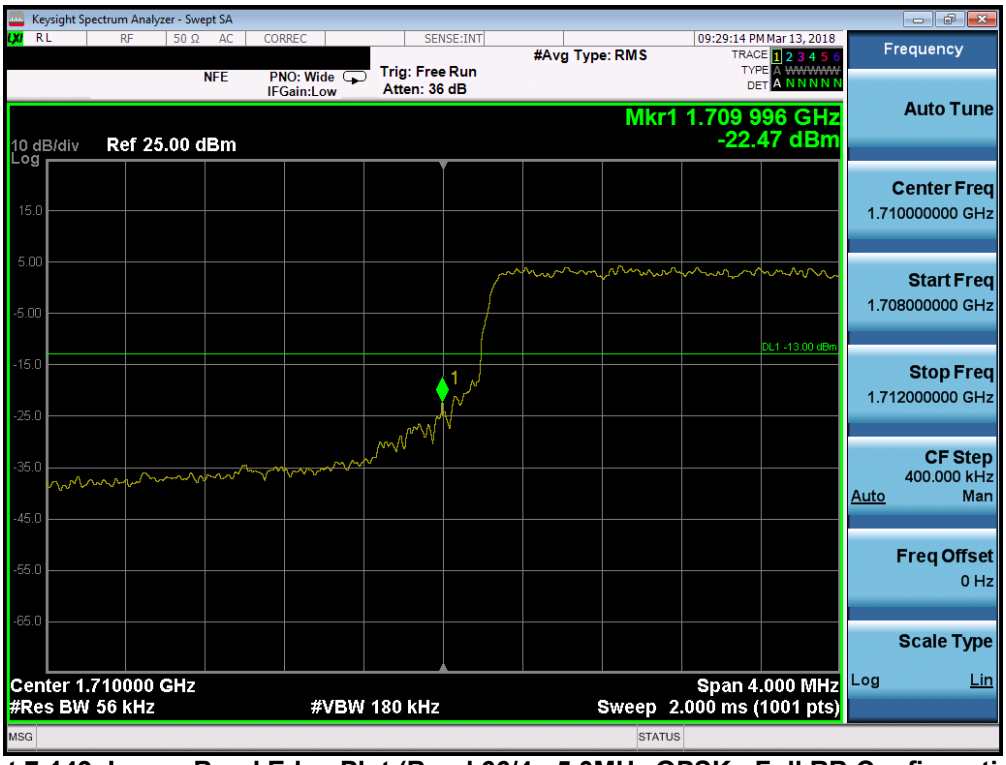
Plot 7-146. Upper Extended Band Edge Plot (Band 4 - 3.0MHz QPSK - Full RB Configuration)



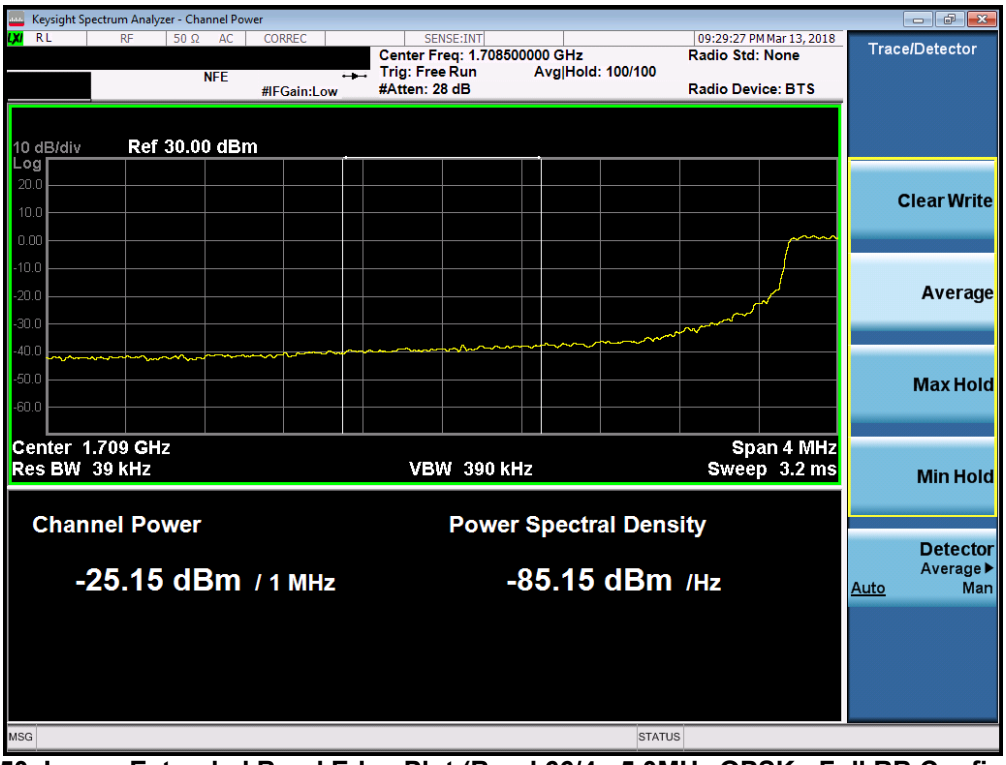
Plot 7-147. Upper Band Edge Plot (Band 66 - 3.0MHz QPSK - Full RB Configuration)



Plot 7-148. Upper Extended Band Edge Plot (Band 66 - 3.0MHz QPSK - Full RB Configuration)

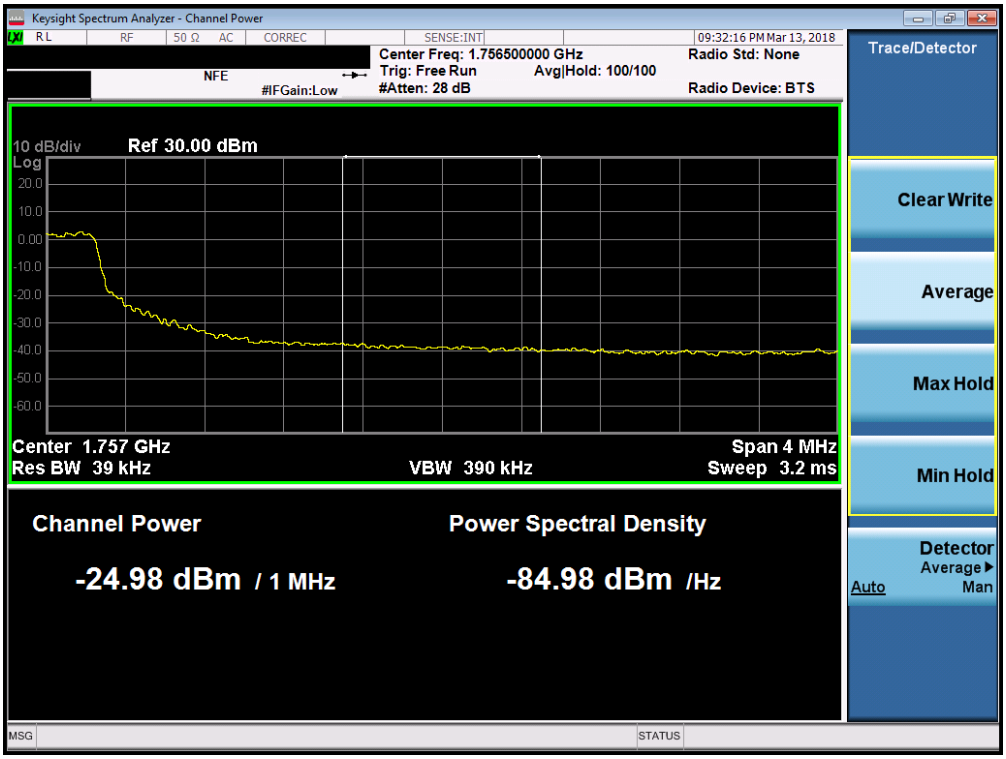


Plot 7-149. Lower Band Edge Plot (Band 66/4 - 5.0MHz QPSK - Full RB Configuration)

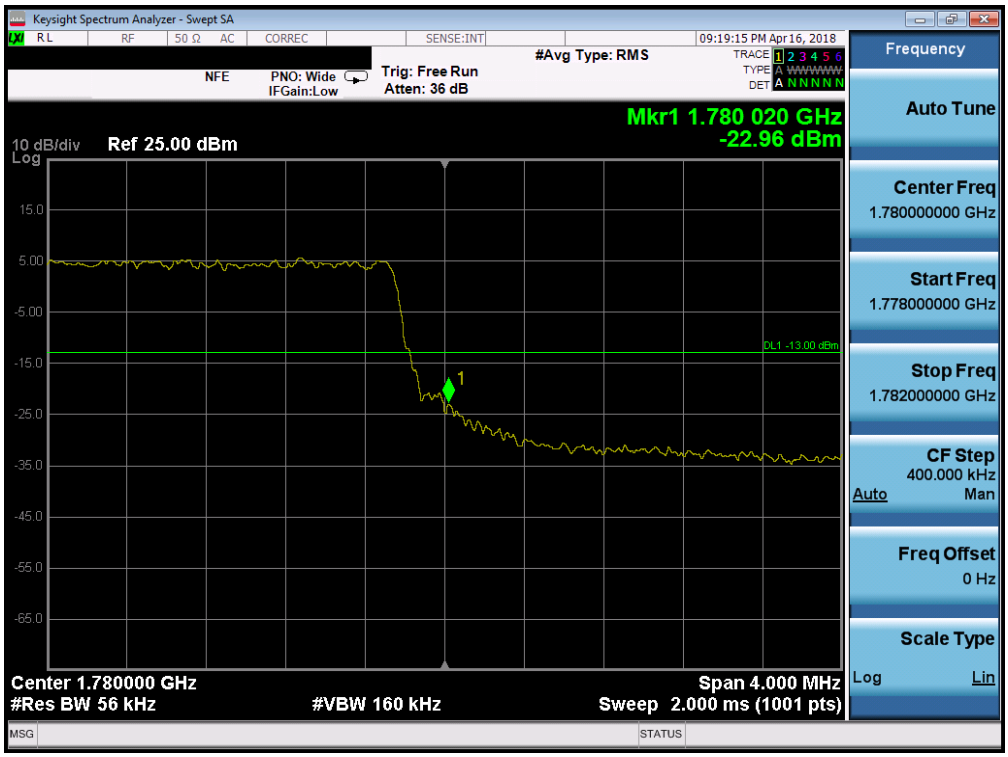


Plot 7-150. Lower Extended Band Edge Plot (Band 66/4 - 5.0MHz QPSK - Full RB Configuration)

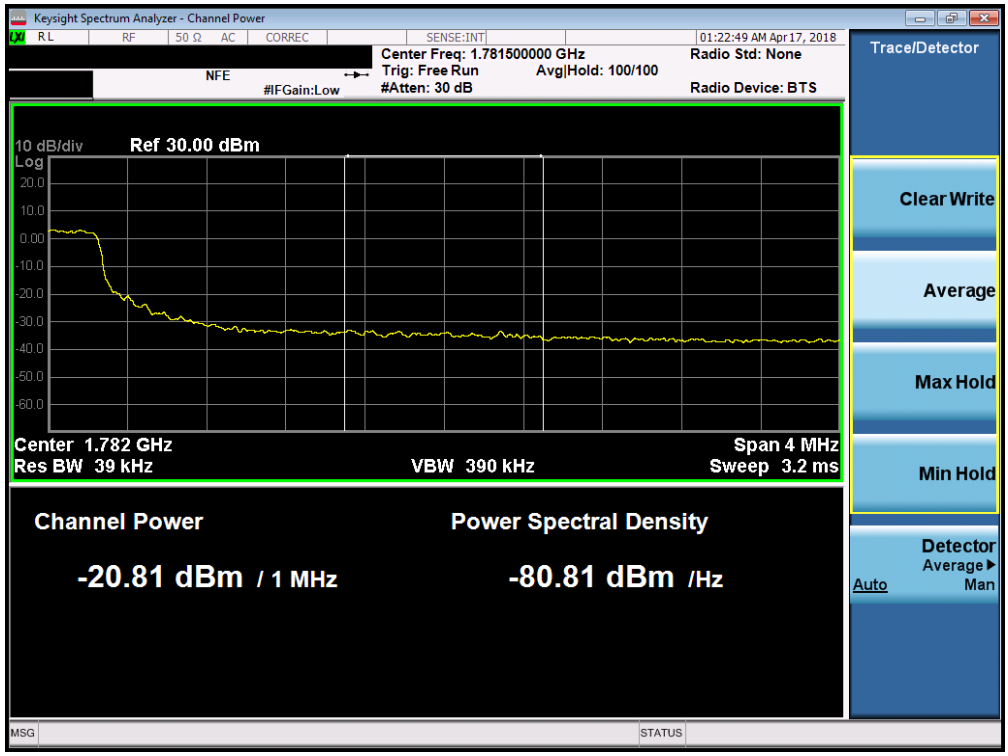
Plot 7-151. Upper Band Edge Plot (Band 4 - 5.0MHz QPSK - Full RB Configuration)



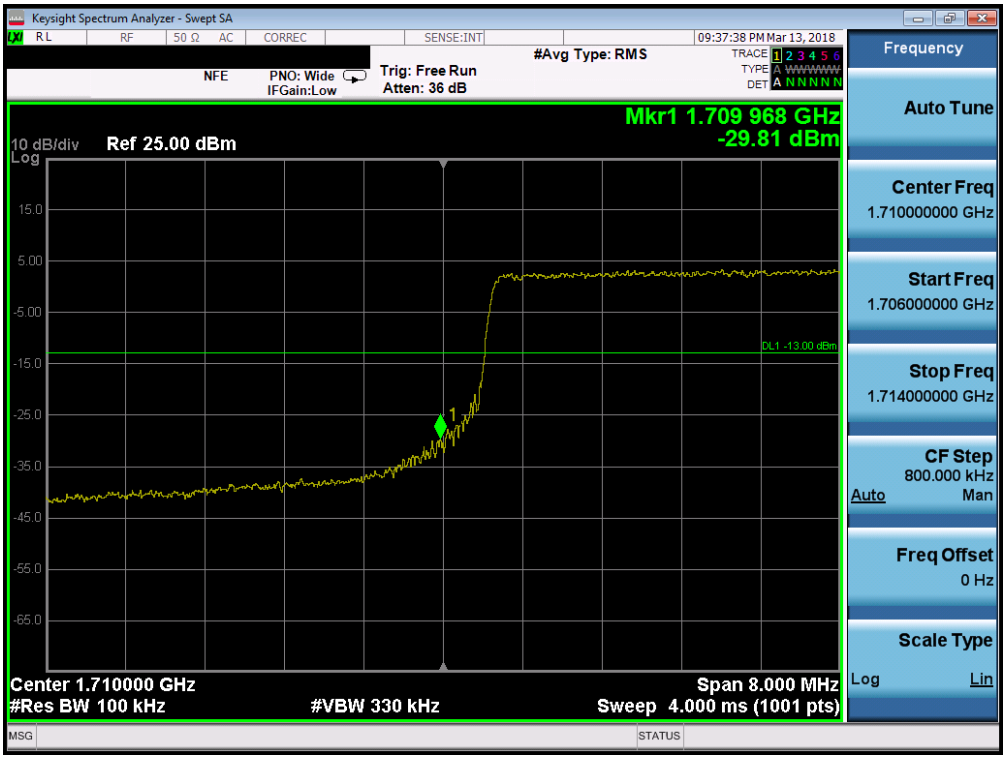
Plot 7-152. Upper Extended Band Edge Plot (Band 4 - 5.0MHz QPSK - Full RB Configuration)



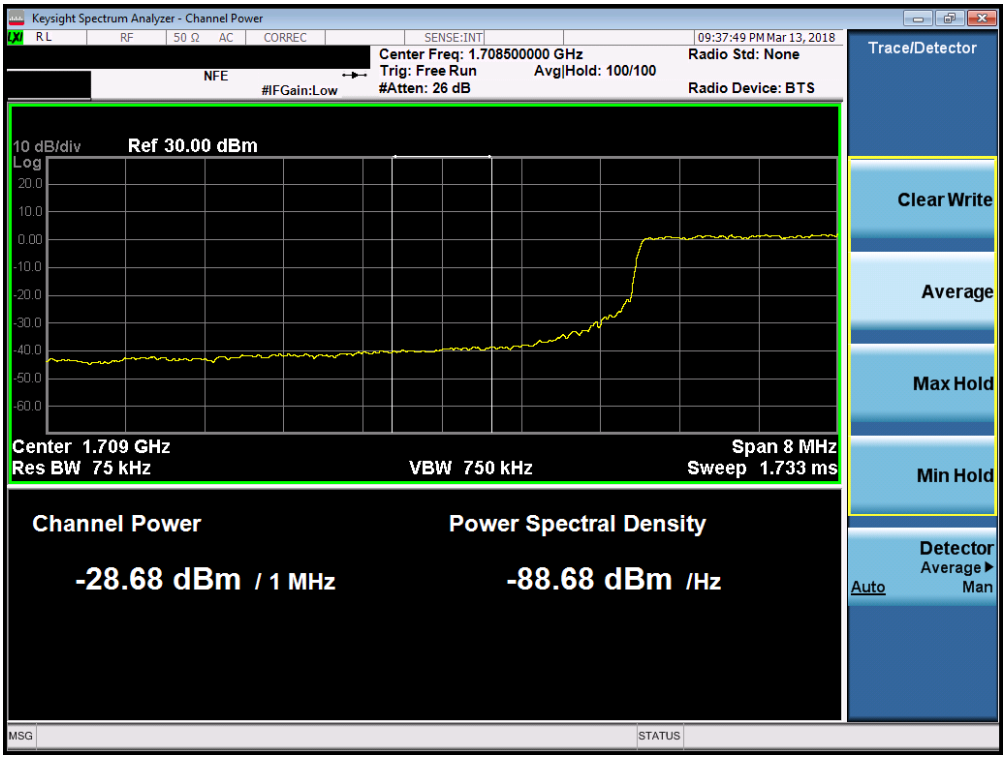
Plot 7-153. Upper Band Edge Plot (Band 66 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-154. Upper Extended Band Edge Plot (Band 66 - 5.0MHz QPSK - Full RB Configuration)

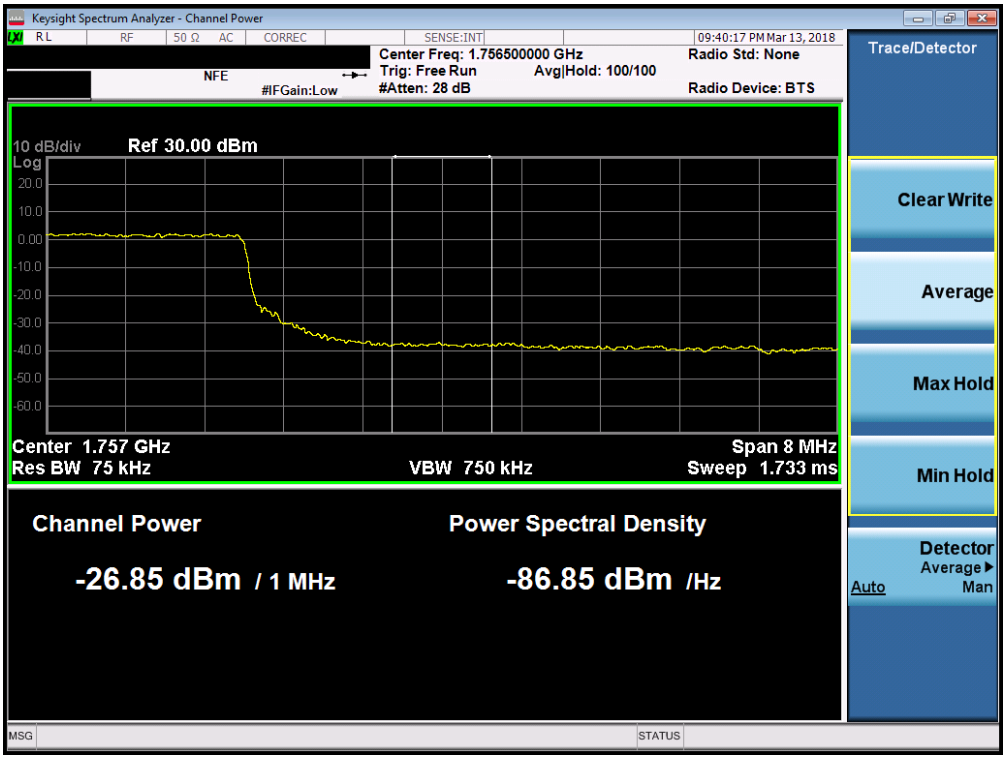


Plot 7-155. Lower Band Edge Plot (Band 66/4 - 10.0MHz QPSK - Full RB Configuration)

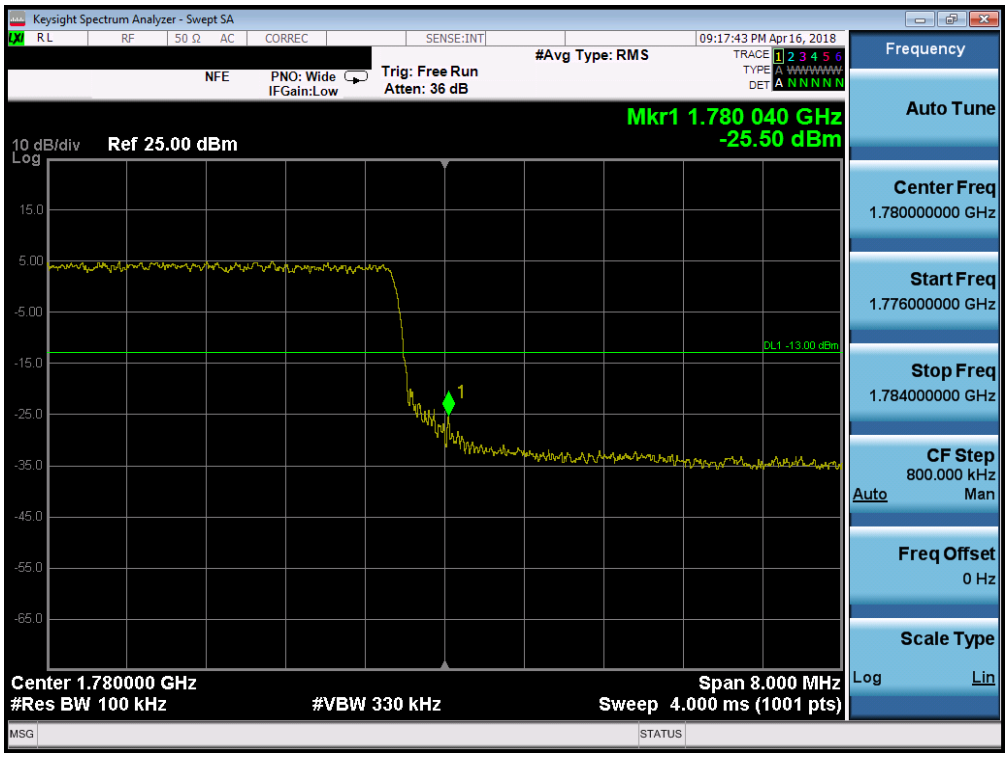


Plot 7-156. Lower Extended Band Edge Plot (Band 66/4 - 10.0MHz QPSK - Full RB Configuration)

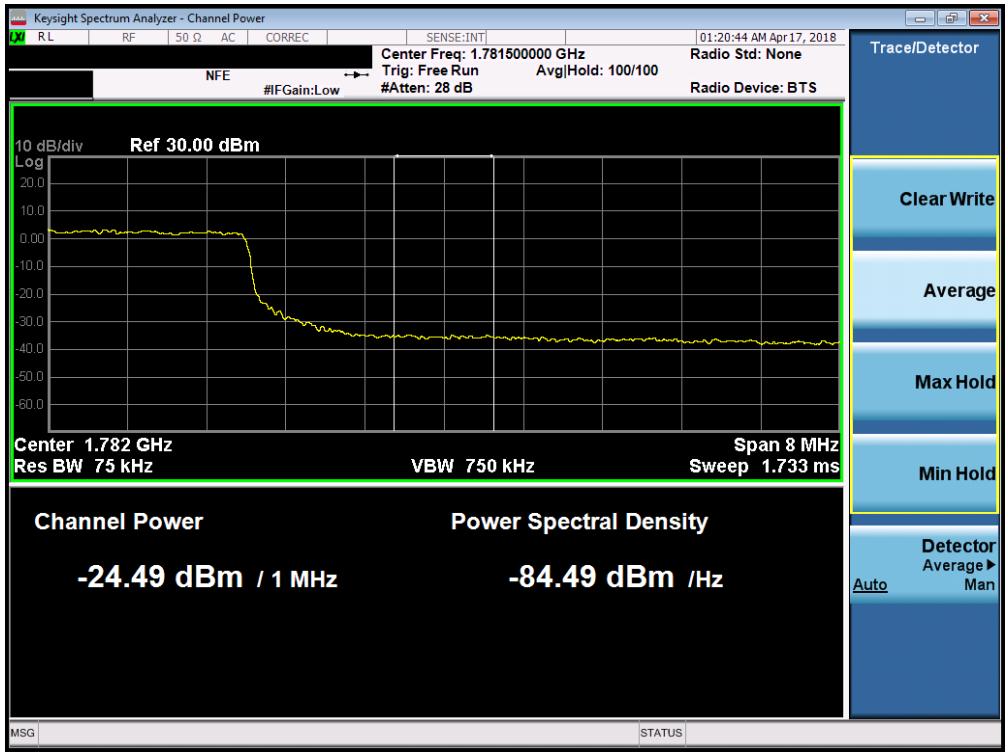
Plot 7-157. Upper Band Edge Plot (Band 4 - 10.0MHz QPSK - Full RB Configuration)



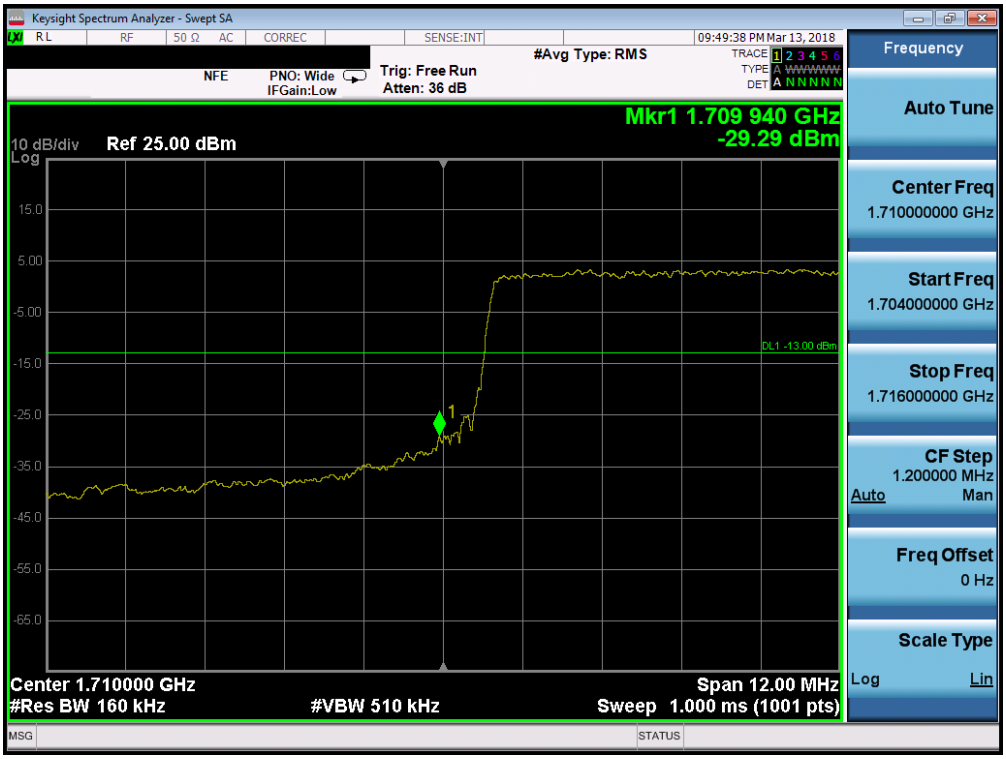
Plot 7-158. Upper Extended Band Edge Plot (Band 4 - 10.0MHz QPSK - Full RB Configuration)



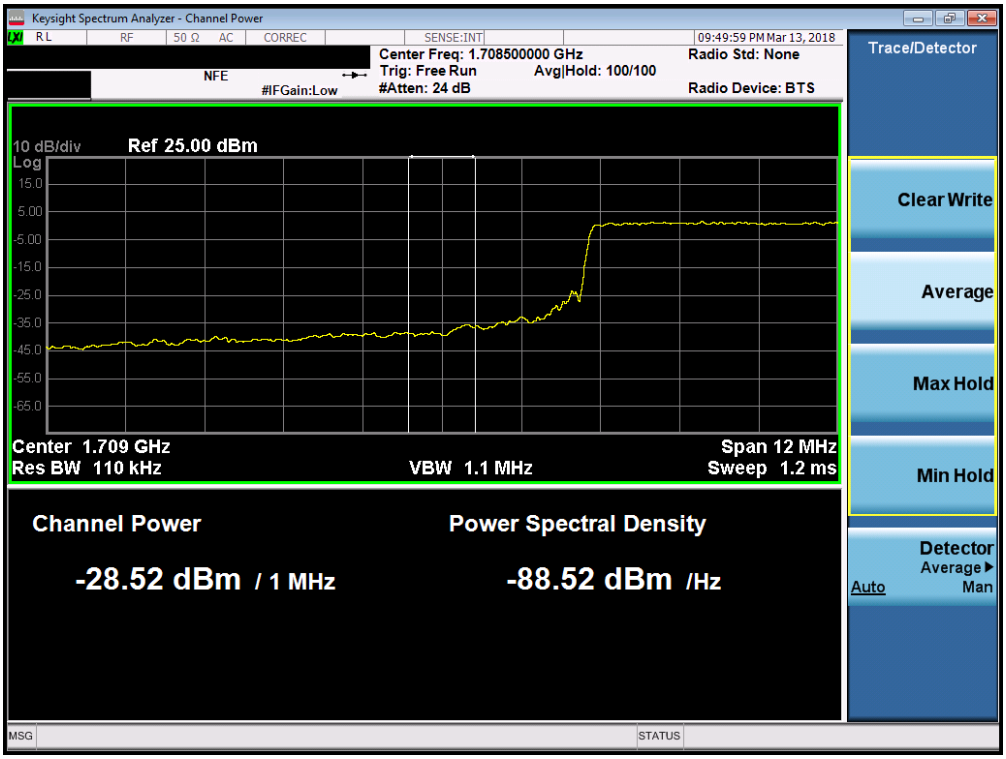
Plot 7-159. Upper Band Edge Plot (Band 66 - 10.0MHz QPSK - Full RB Configuration)



Plot 7-160. Upper Extended Band Edge Plot (Band 66 - 10.0MHz QPSK - Full RB Configuration)

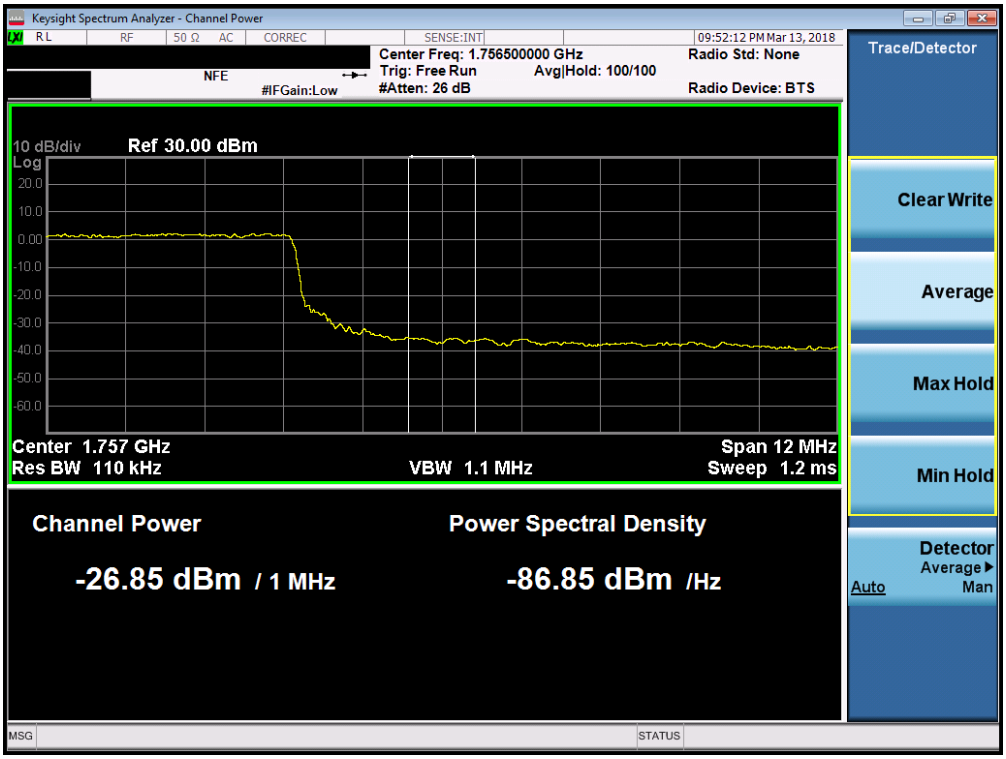


Plot 7-161. Lower Band Edge Plot (Band 66/4 - 15.0MHz QPSK - Full RB Configuration)



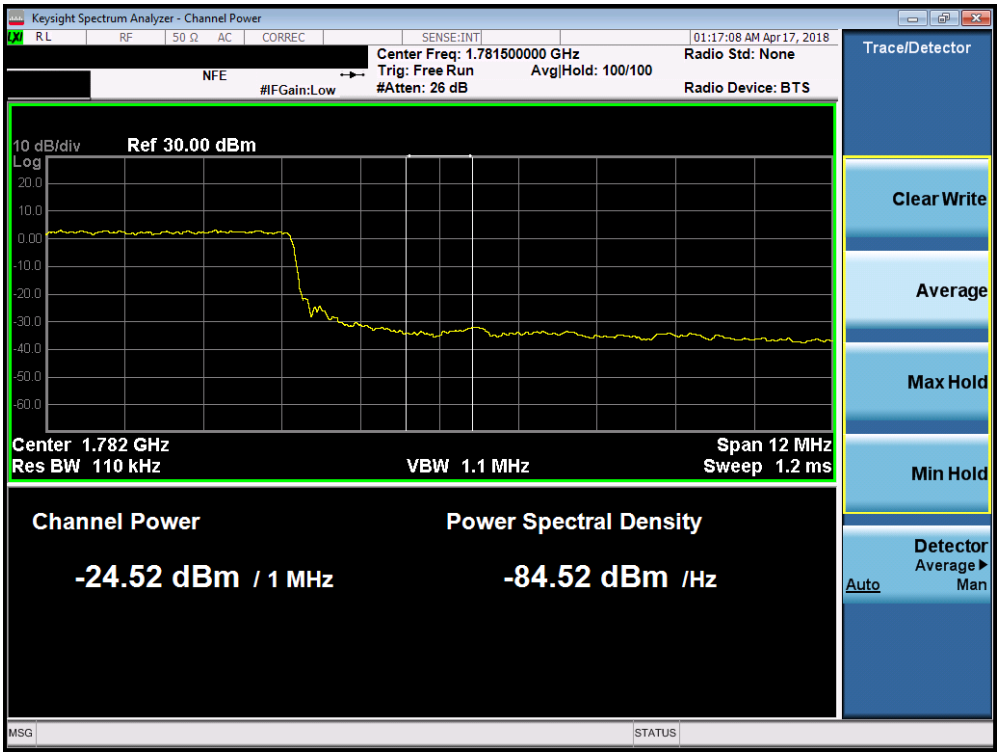
Plot 7-162. Lower Extended Band Edge Plot (Band 66/4 - 15.0MHz QPSK - Full RB Configuration)

Plot 7-163. Upper Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)



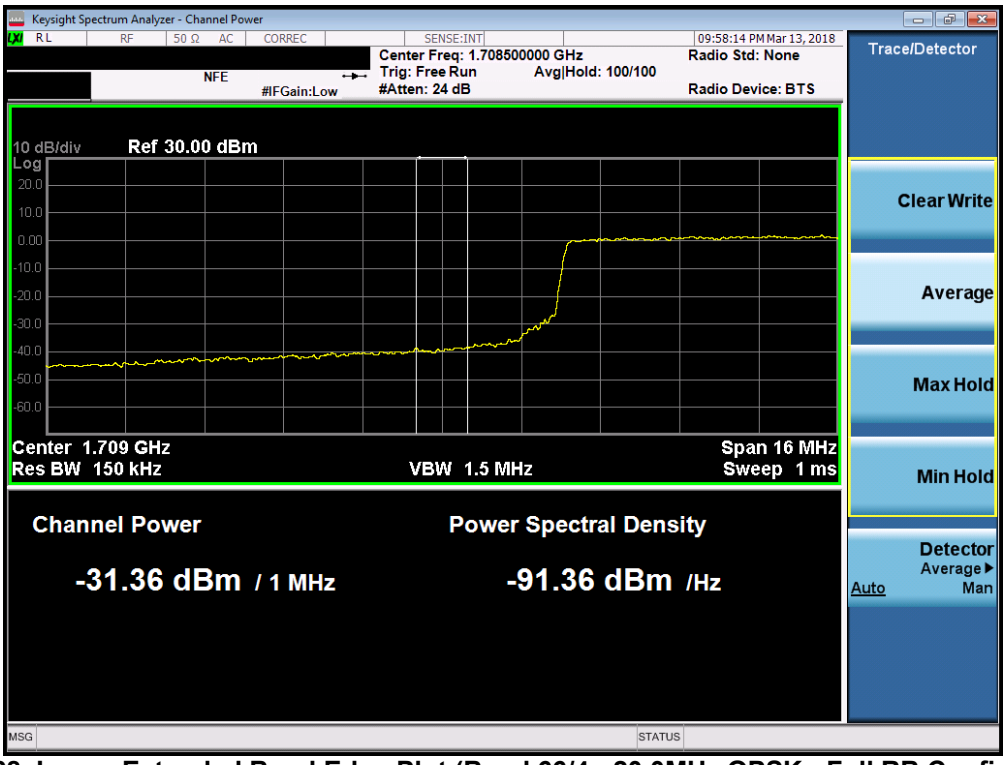
Plot 7-164. Upper Extended Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)

Plot 7-165. Upper Band Edge Plot (Band 66 - 15.0MHz QPSK - Full RB Configuration)

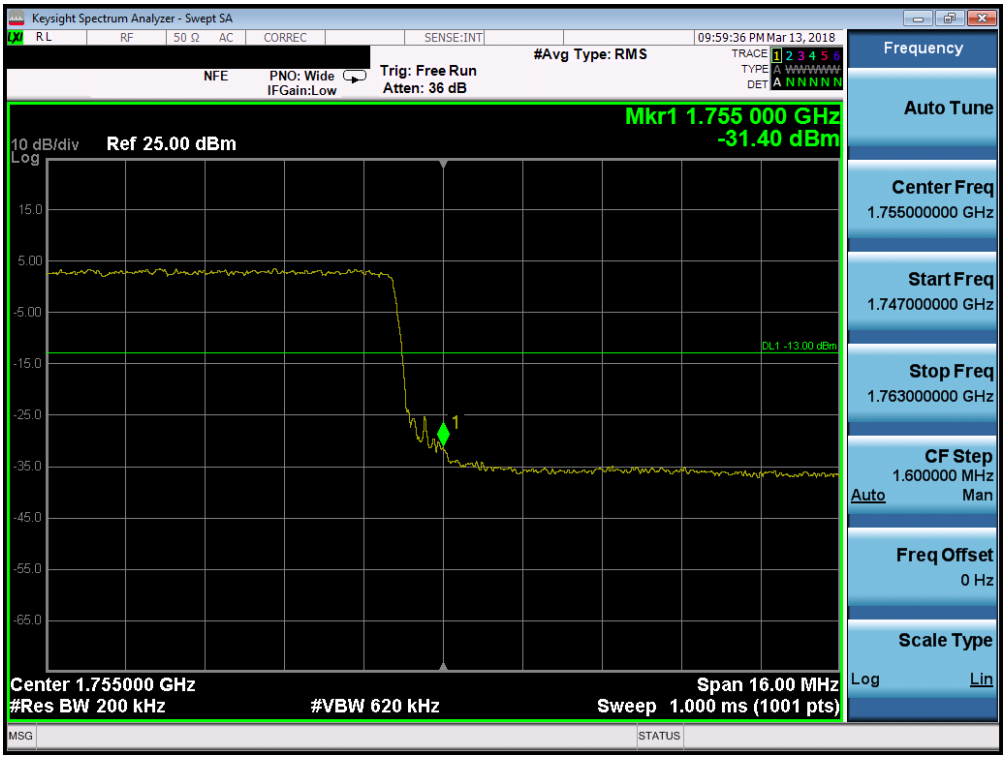


Plot 7-166. Upper Extended Band Edge Plot (Band 66 - 15.0MHz QPSK - Full RB Configuration)

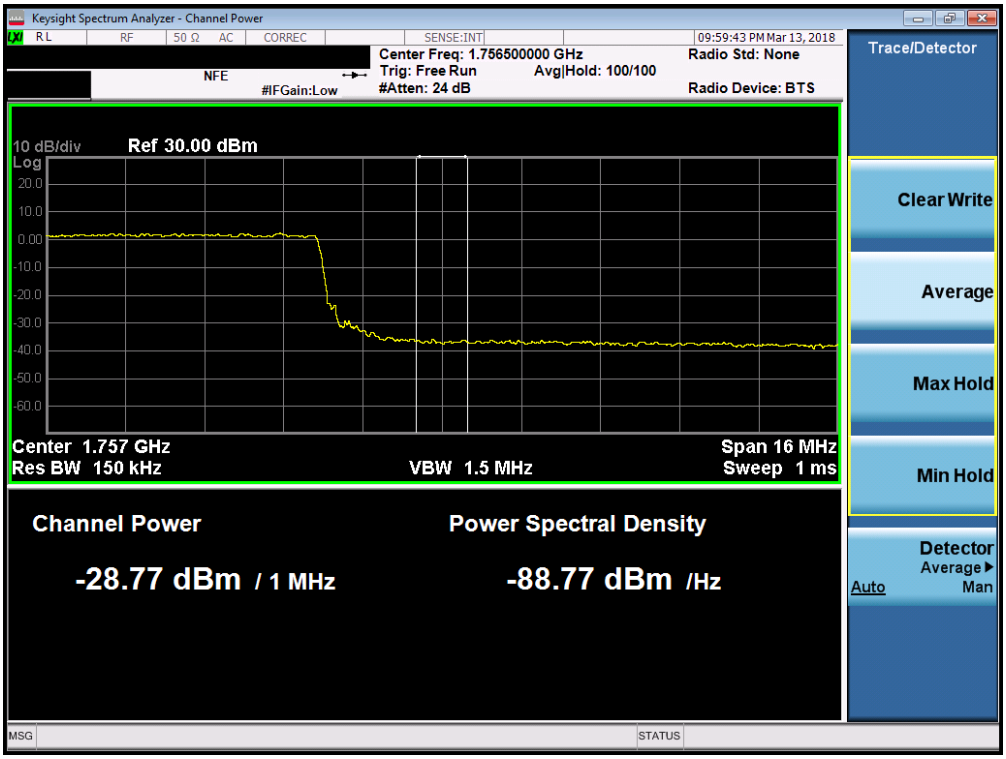
Plot 7-167. Lower Band Edge Plot (Band 66/4 - 20.0MHz QPSK - Full RB Configuration)



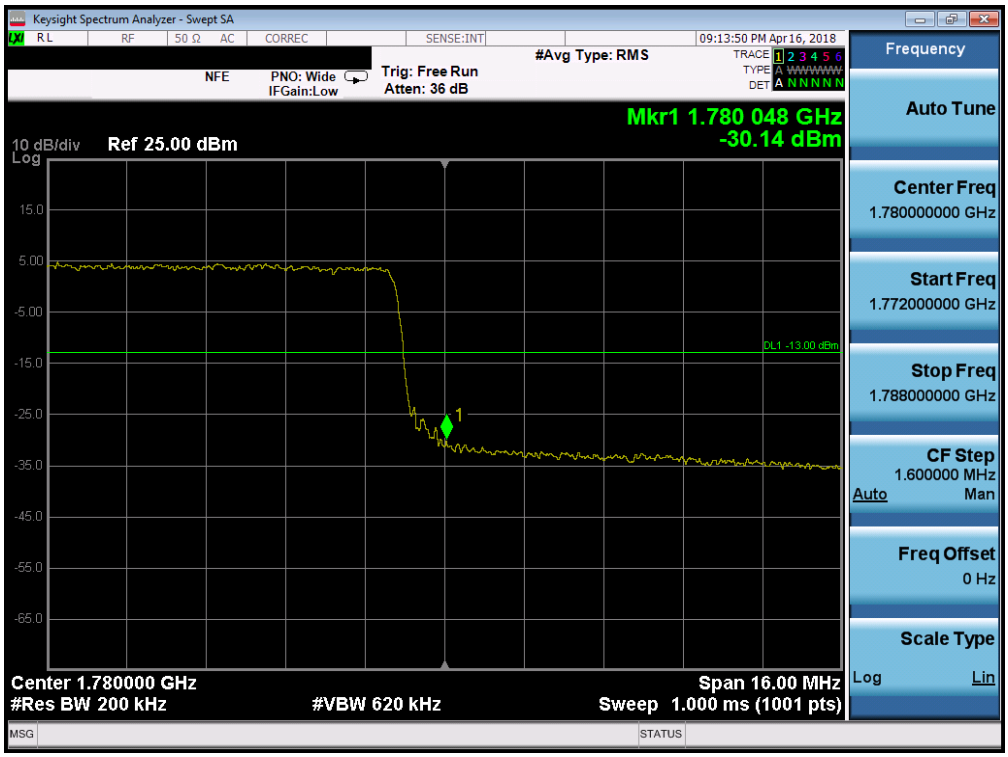
Plot 7-168. Lower Extended Band Edge Plot (Band 66/4 - 20.0MHz QPSK - Full RB Configuration)



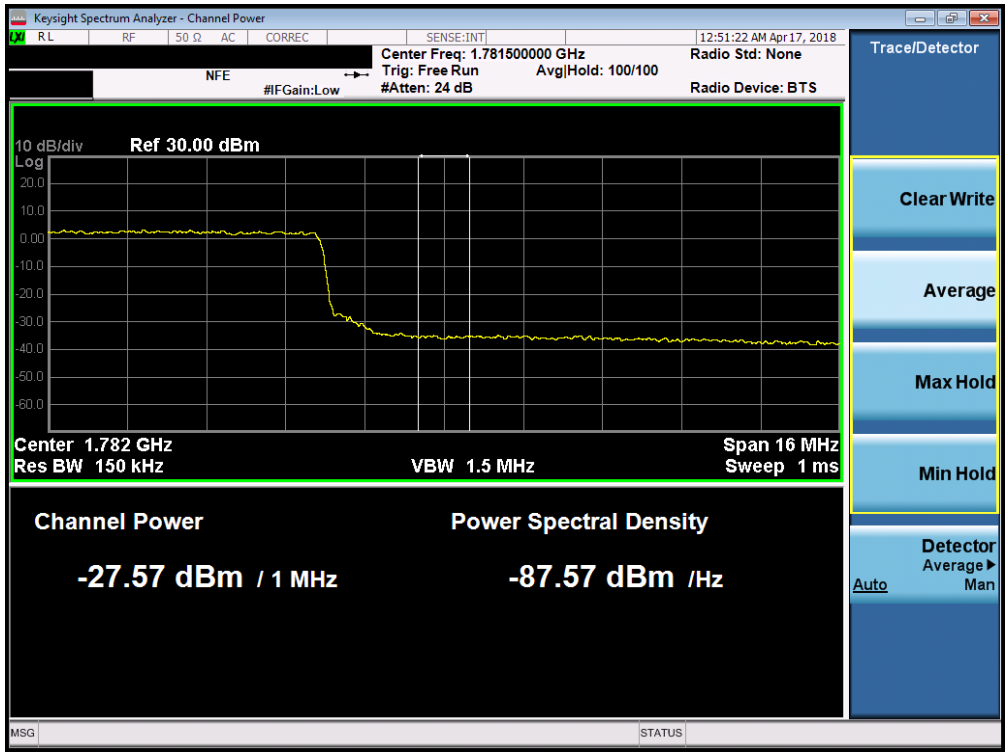
Plot 7-169. Upper Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-170. Upper Extended Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)



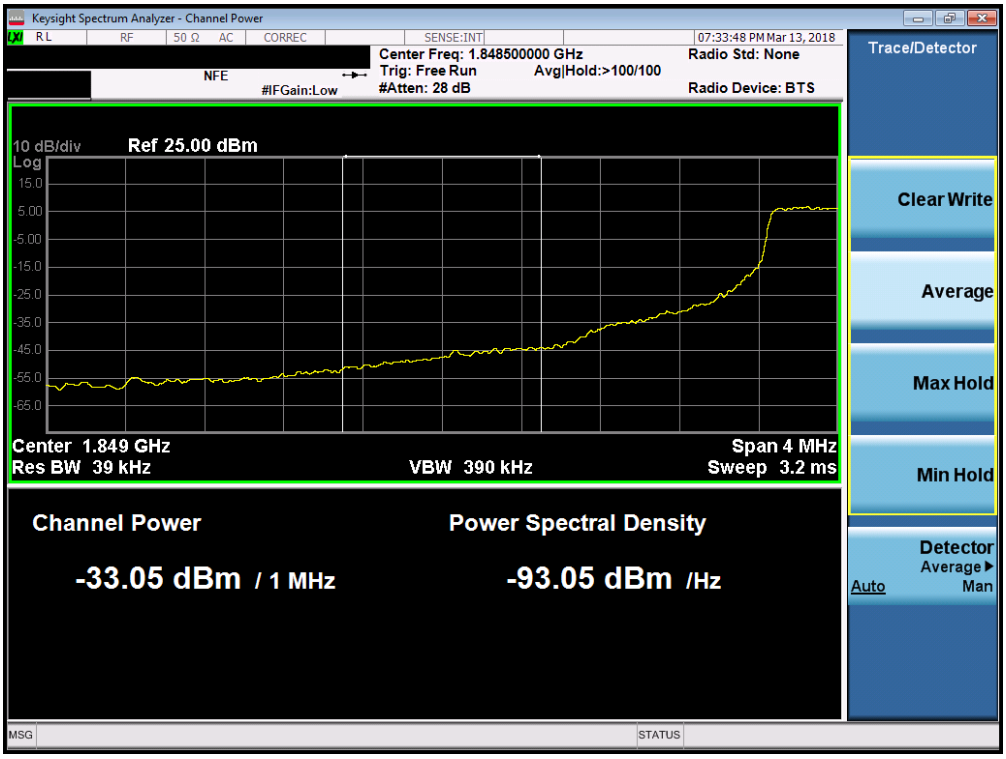
Plot 7-171. Upper Band Edge Plot (Band 66 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-172. Upper Extended Band Edge Plot (Band 66 - 20.0MHz QPSK - Full RB Configuration)

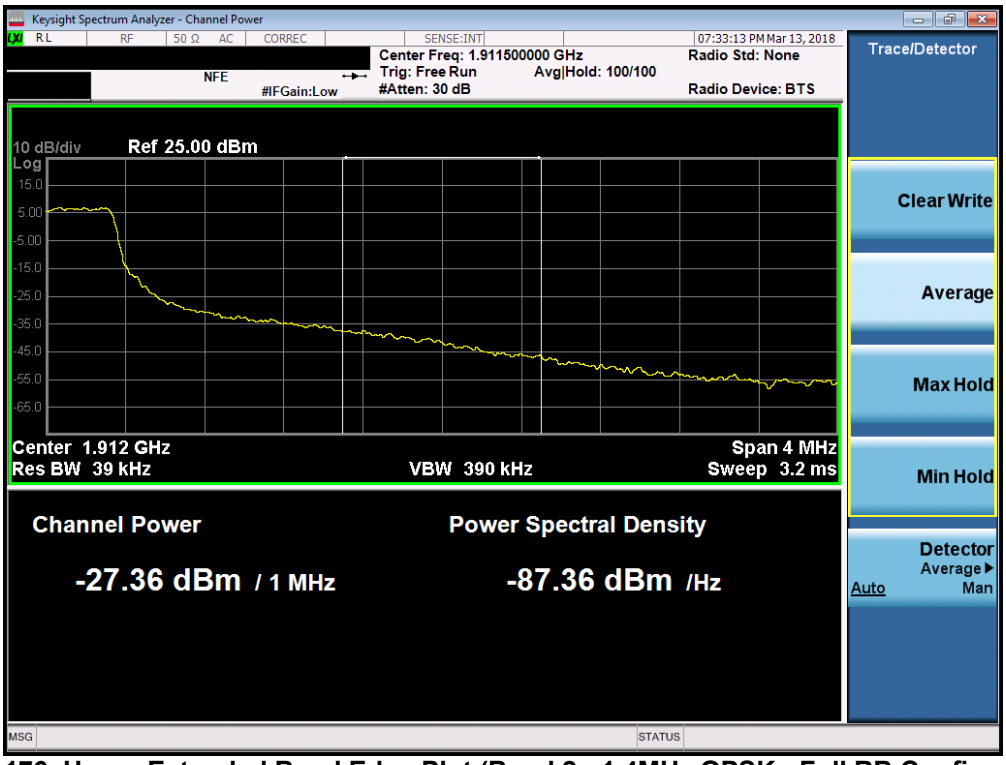
Band 2

Plot 7-173. Lower Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



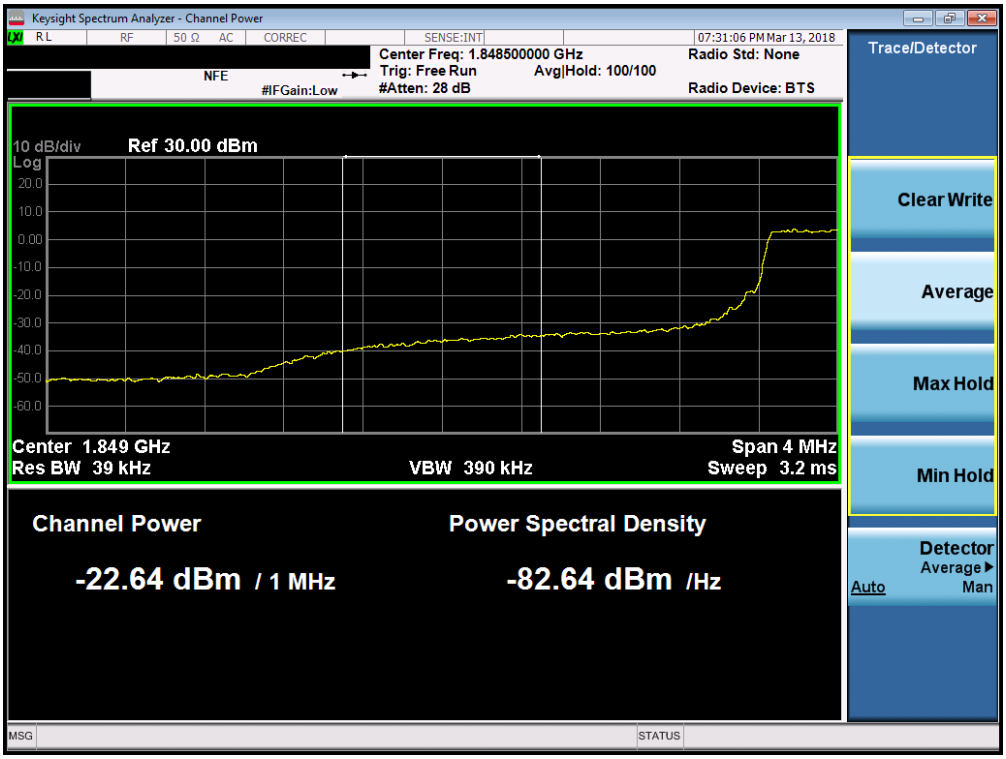
Plot 7-174. Lower Extended Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)

Plot 7-175. Upper Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



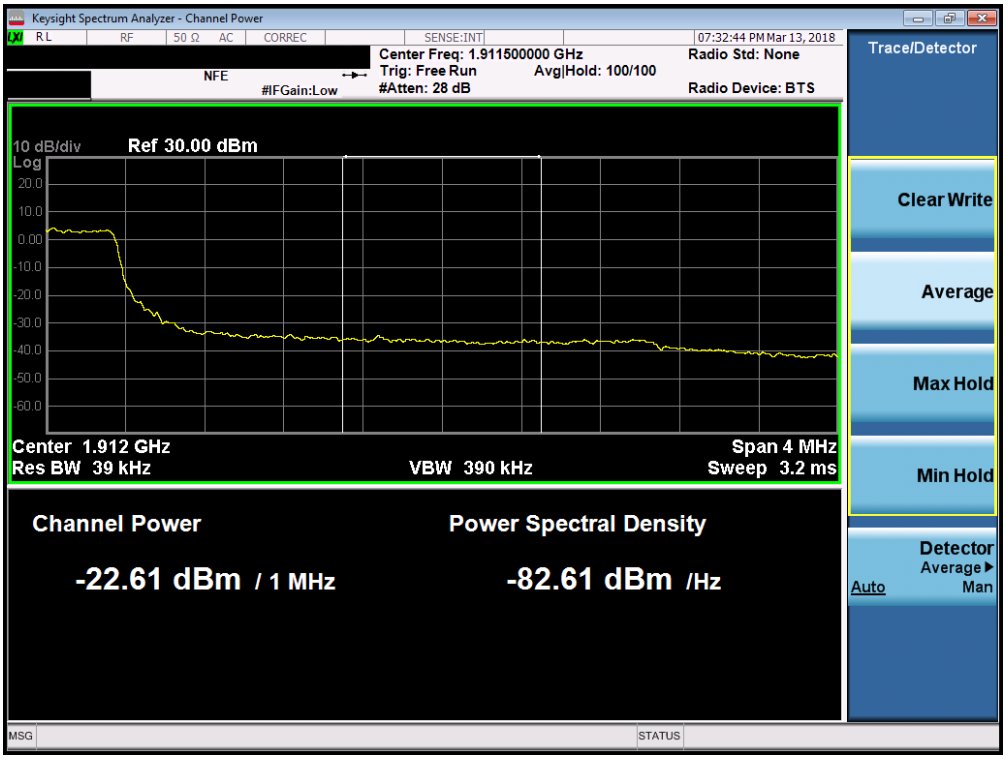
Plot 7-176. Upper Extended Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)

Plot 7-177. Lower Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)

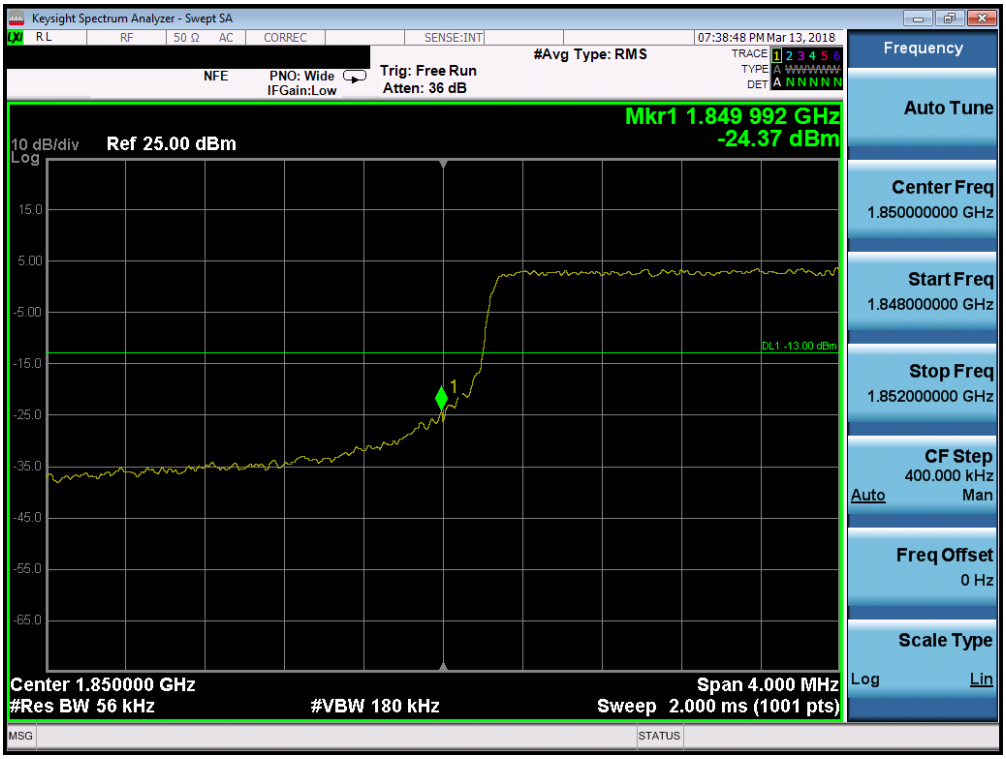


Plot 7-178. Lower Extended Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)

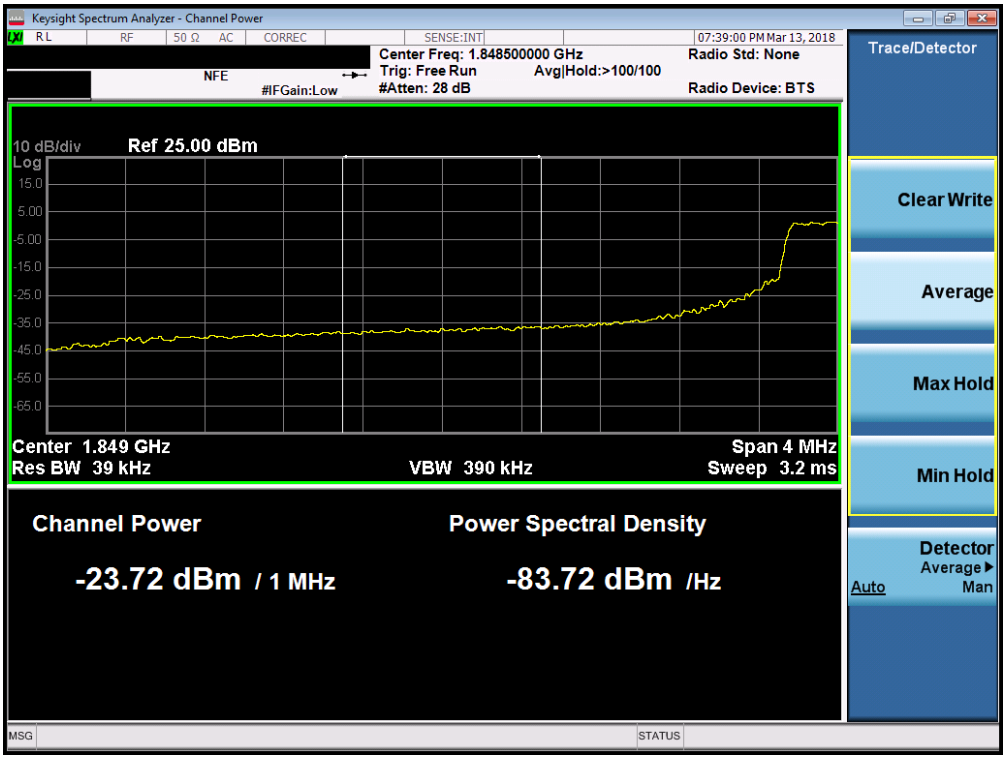
Plot 7-179. Upper Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



Plot 7-180. Upper Extended Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)

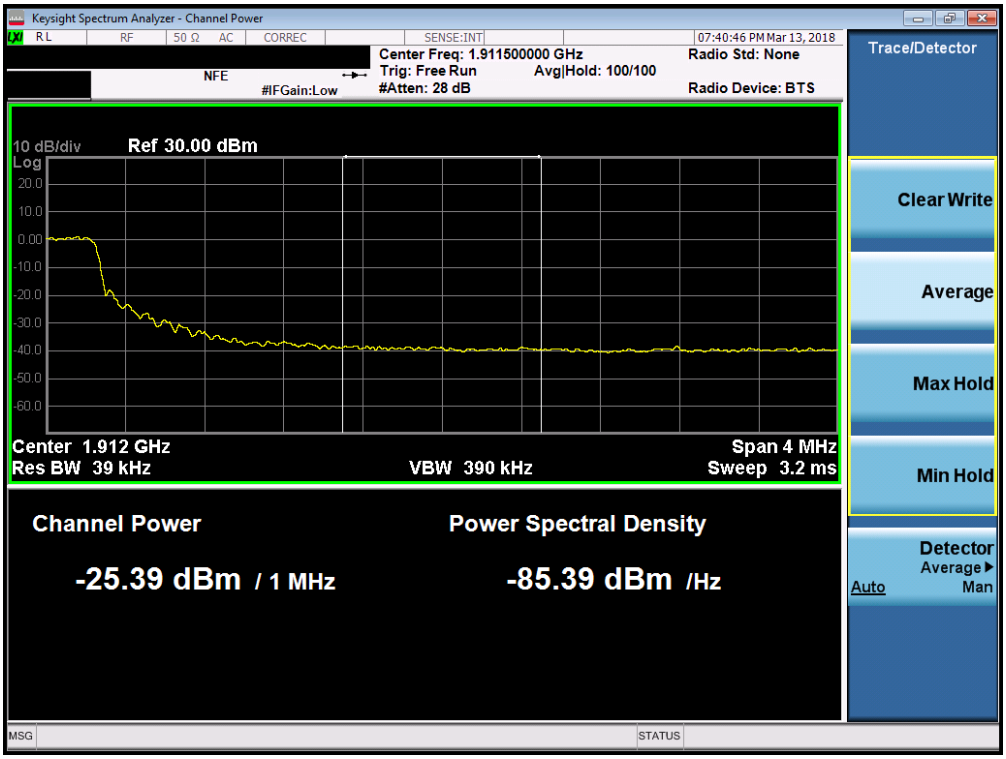


Plot 7-181. Lower Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)

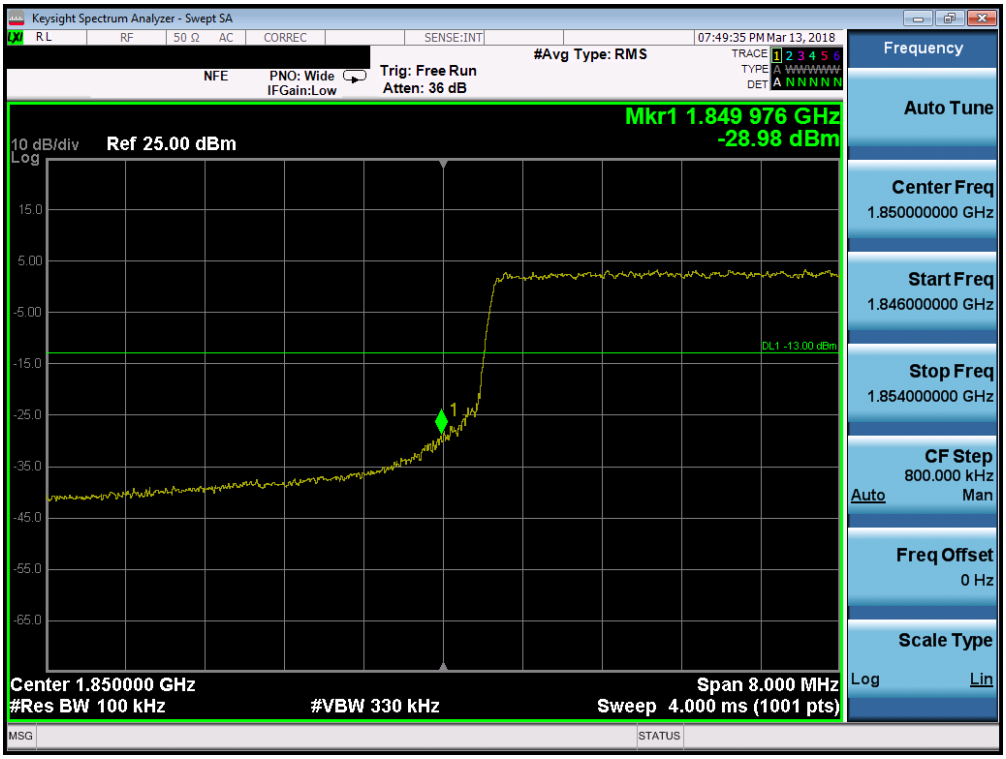


Plot 7-182. Lower Extended Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)

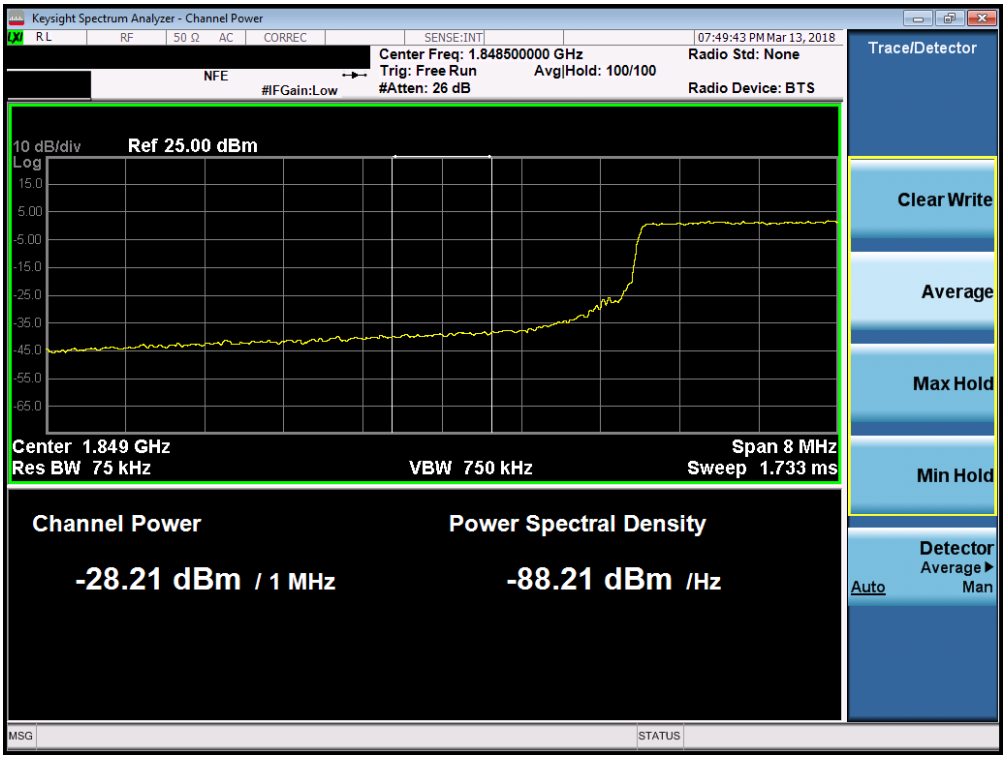
Plot 7-183. Upper Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



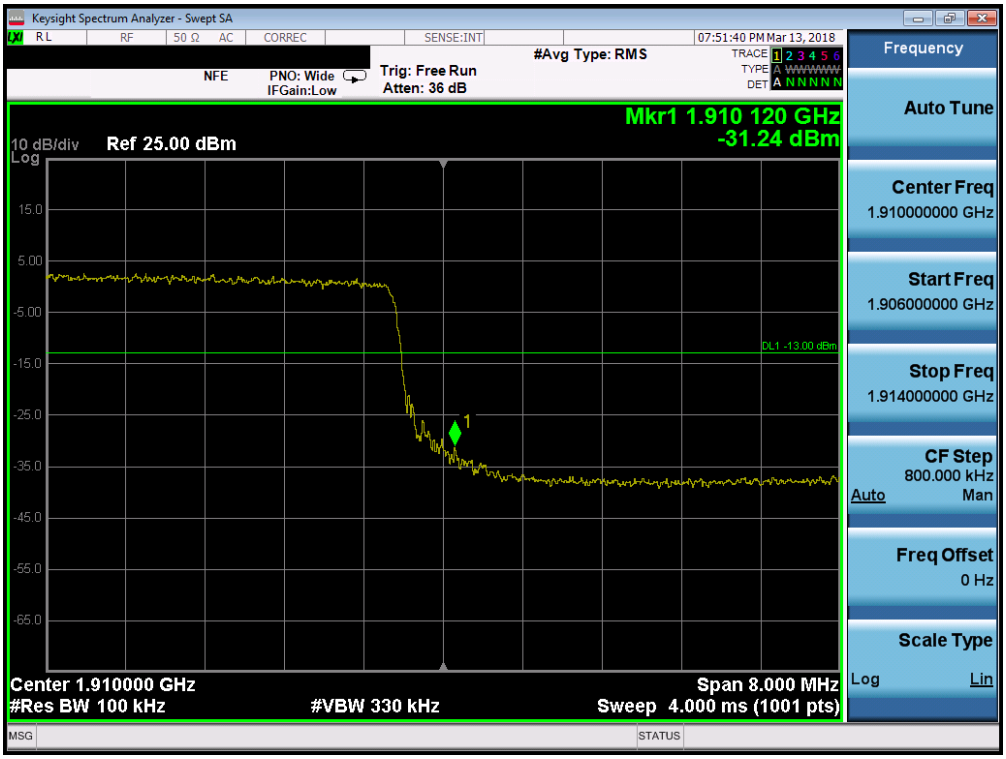
Plot 7-184. Upper Extended Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



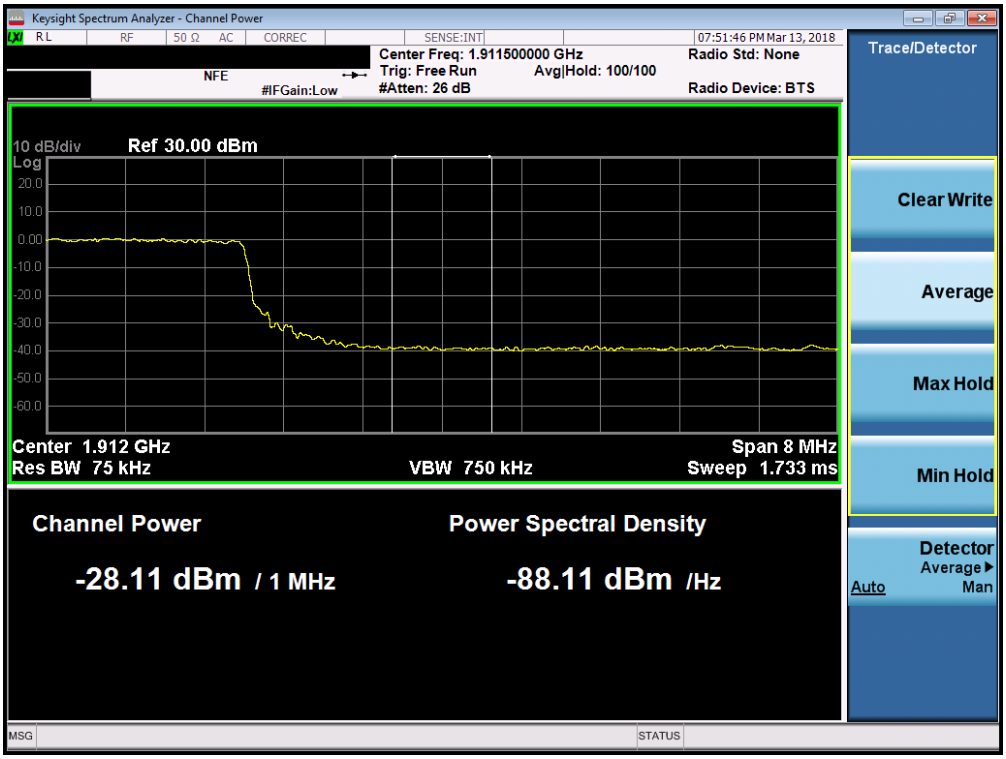
Plot 7-185. Lower Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



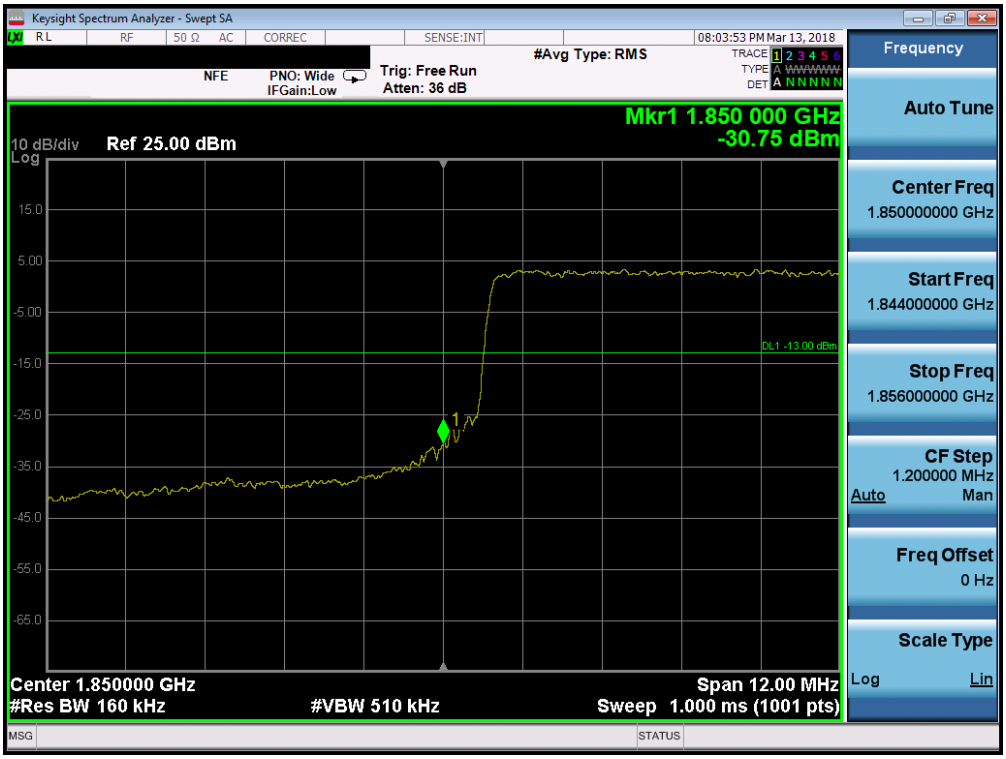
Plot 7-186. Lower Extended Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



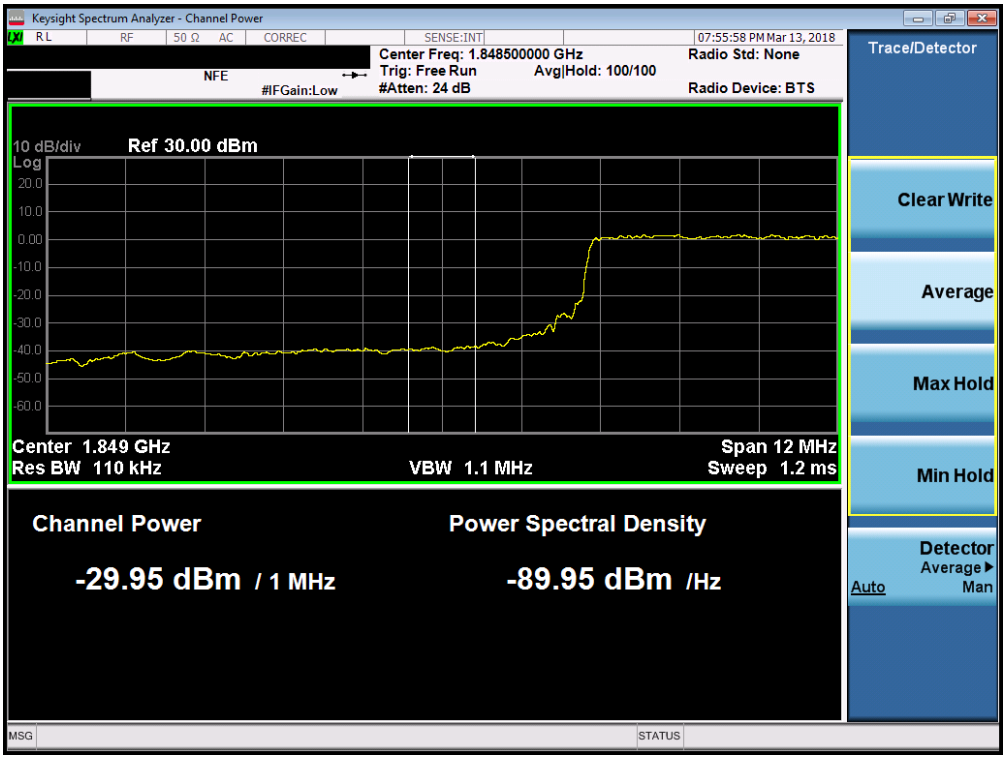
Plot 7-187. Upper Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



Plot 7-188. Upper Extended Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)

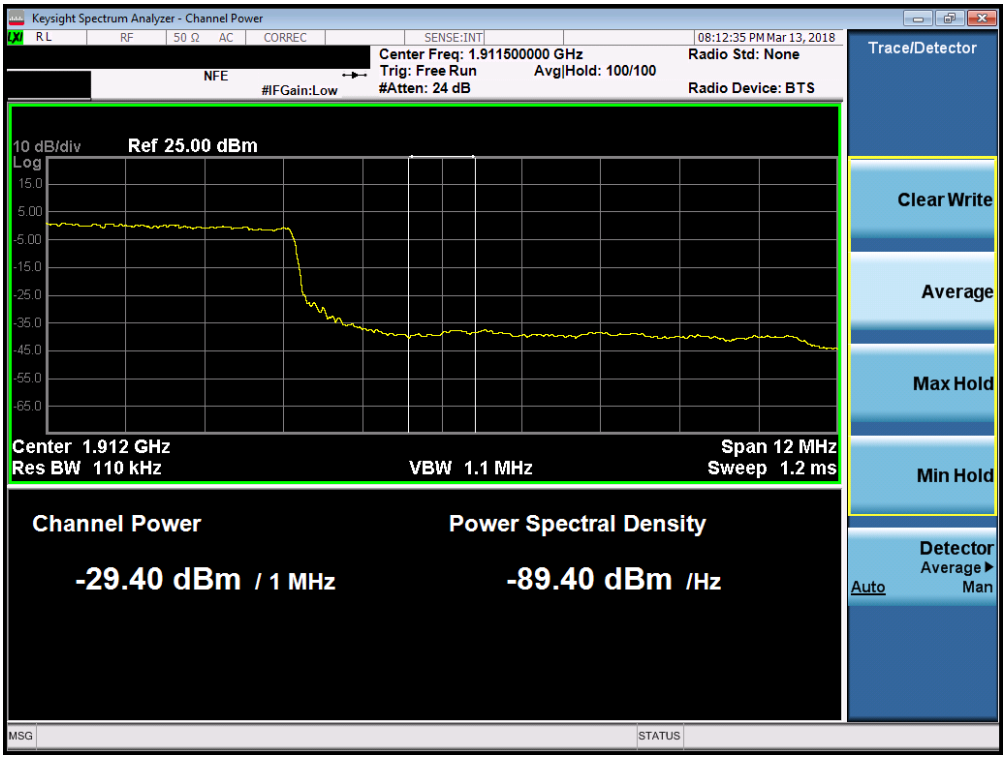


Plot 7-189. Lower Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)

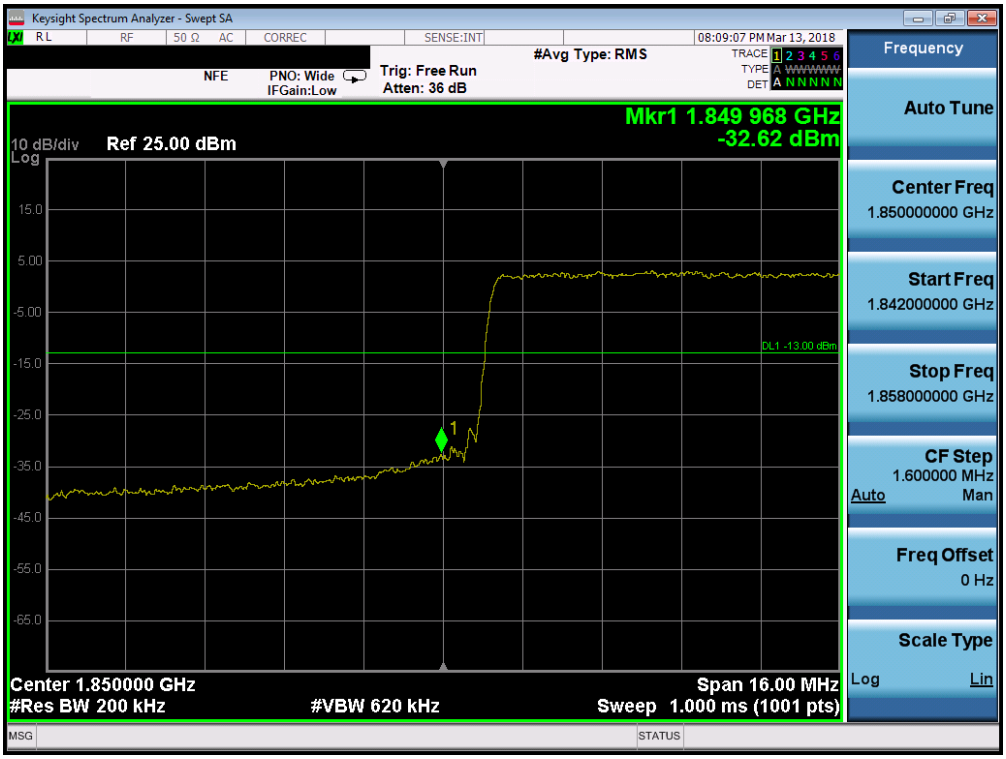


Plot 7-190. Lower Extended Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)

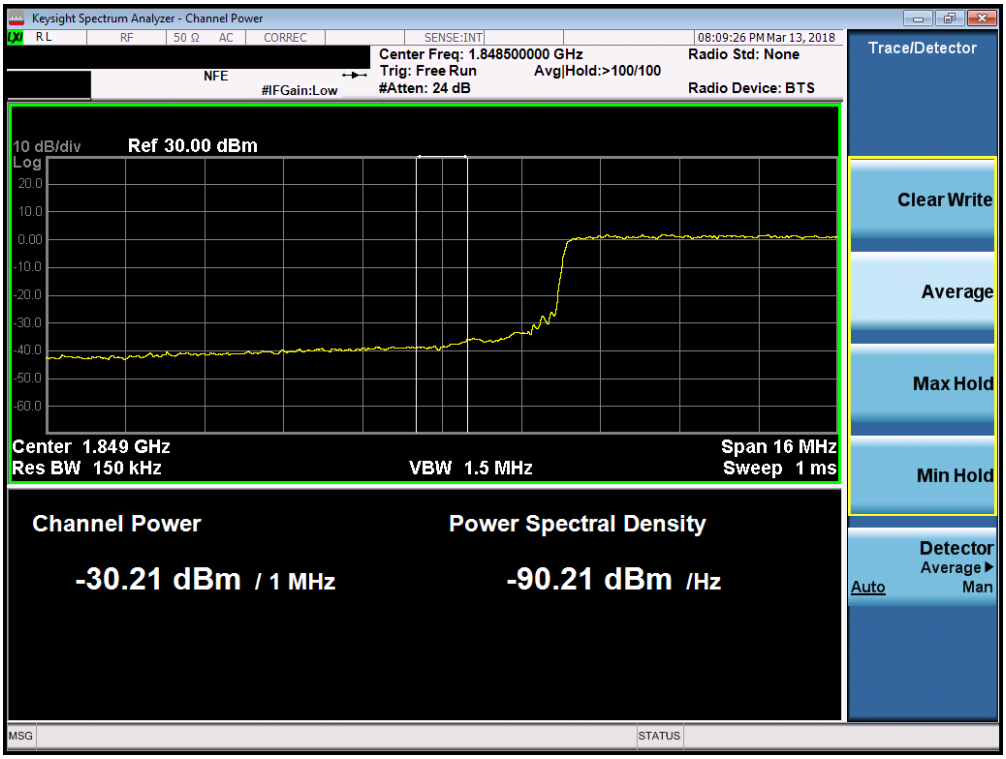
Plot 7-191. Upper Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-192. Upper Extended Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)

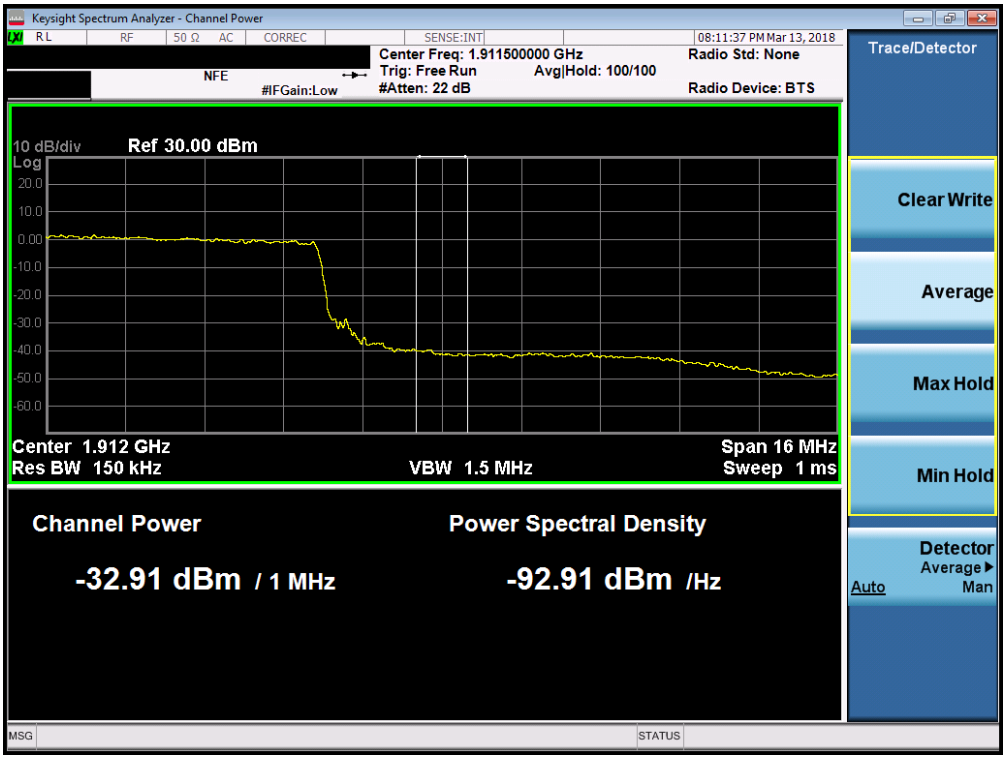


Plot 7-193. Lower Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



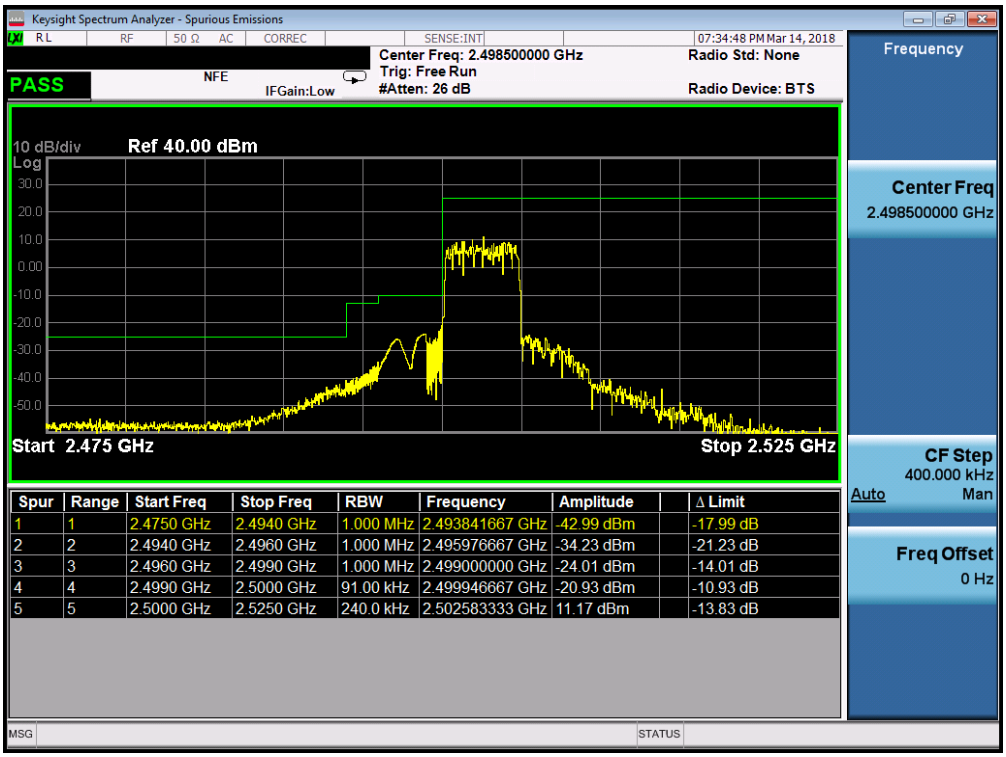
Plot 7-194. Lower Extended Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)

Plot 7-195. Upper Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



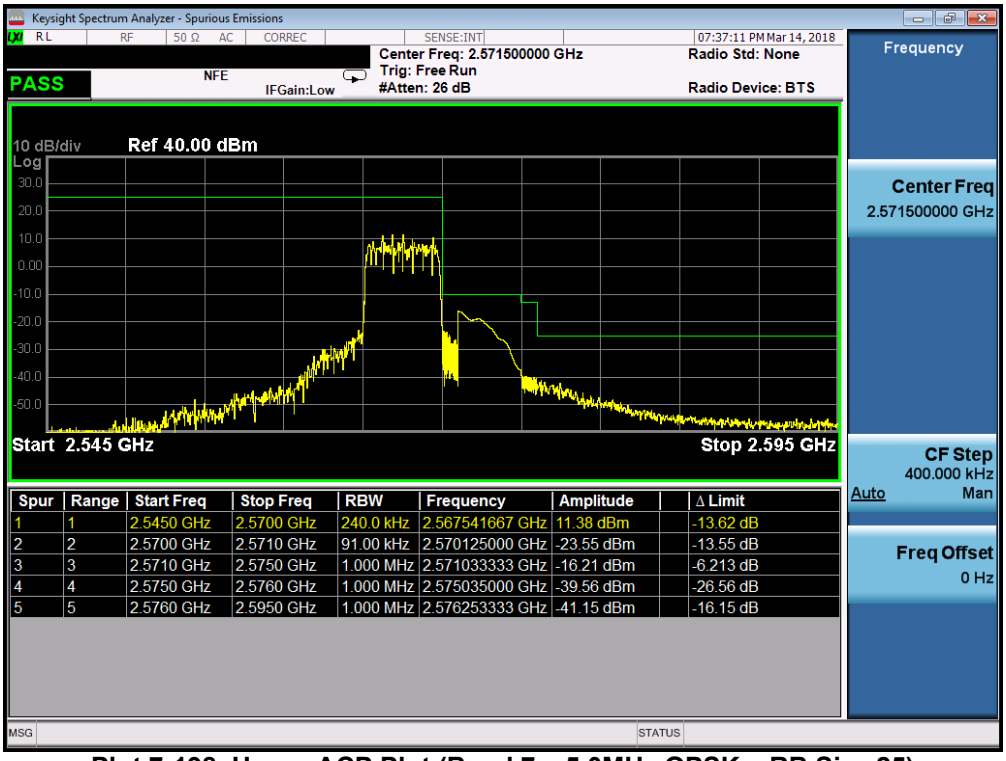
Plot 7-196. Upper Extended Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)

Band 7



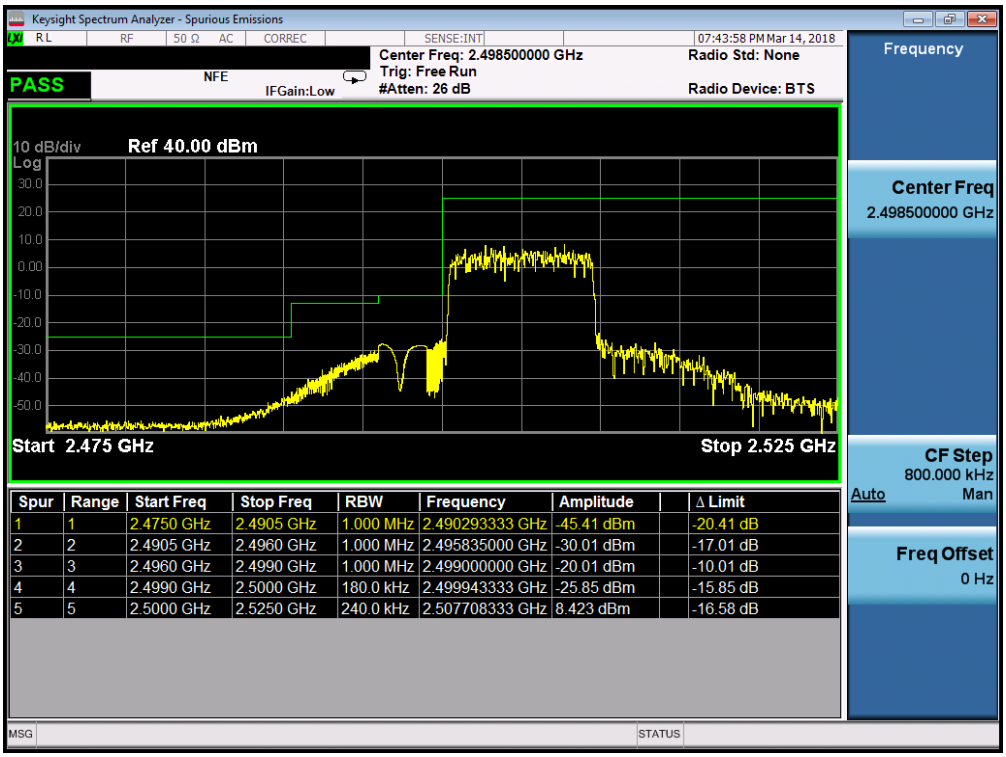
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4940 GHz	1.000 MHz	2.493841667 GHz	-42.99 dBm	-17.99 dB
2	2	2.4940 GHz	2.4960 GHz	1.000 MHz	2.495976667 GHz	-34.23 dBm	-21.23 dB
3	3	2.4960 GHz	2.4990 GHz	1.000 MHz	2.499000000 GHz	-24.01 dBm	-14.01 dB
4	4	2.4990 GHz	2.5000 GHz	91.00 kHz	2.499946667 GHz	-20.93 dBm	-10.93 dB
5	5	2.5000 GHz	2.5250 GHz	240.0 kHz	2.502583333 GHz	11.17 dBm	-13.83 dB

Plot 7-197. Lower ACP Plot (Band 7 – 5.0MHz QPSK – RB Size 25)

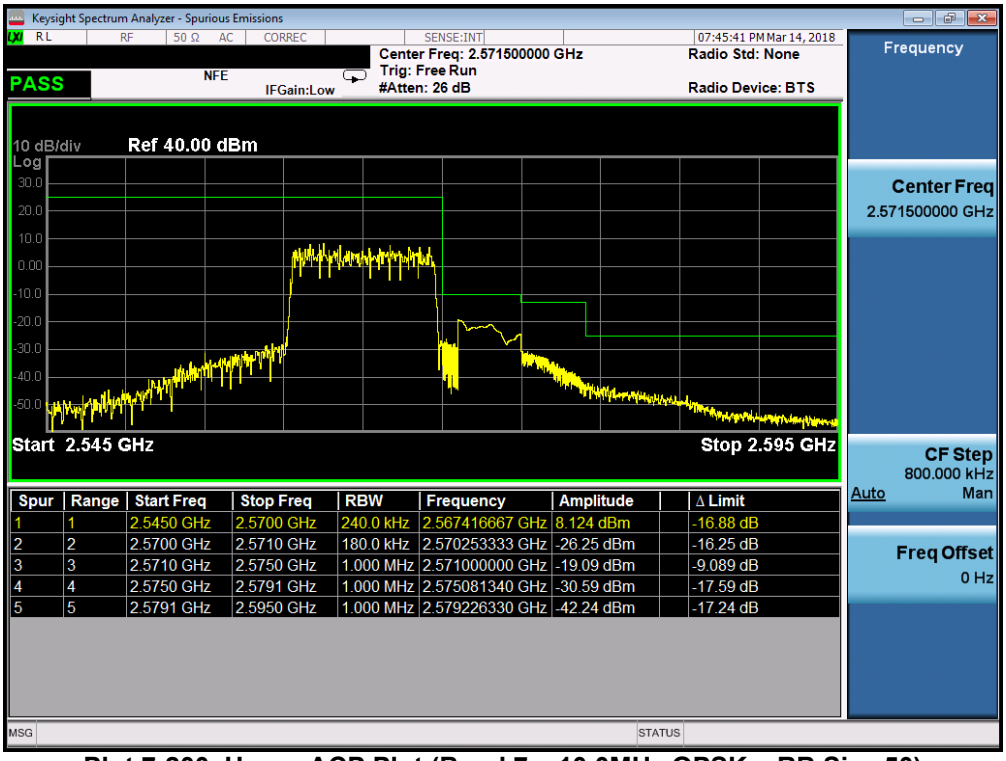


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.5450 GHz	2.5700 GHz	240.0 kHz	2.567541667 GHz	11.38 dBm	-13.62 dB
2	2	2.5700 GHz	2.5710 GHz	91.00 kHz	2.570125000 GHz	-23.55 dBm	-13.55 dB
3	3	2.5710 GHz	2.5750 GHz	1.000 MHz	2.571033333 GHz	-16.21 dBm	-6.213 dB
4	4	2.5750 GHz	2.5760 GHz	1.000 MHz	2.575035000 GHz	-39.56 dBm	-26.56 dB
5	5	2.5760 GHz	2.5950 GHz	1.000 MHz	2.576253333 GHz	-41.15 dBm	-16.15 dB

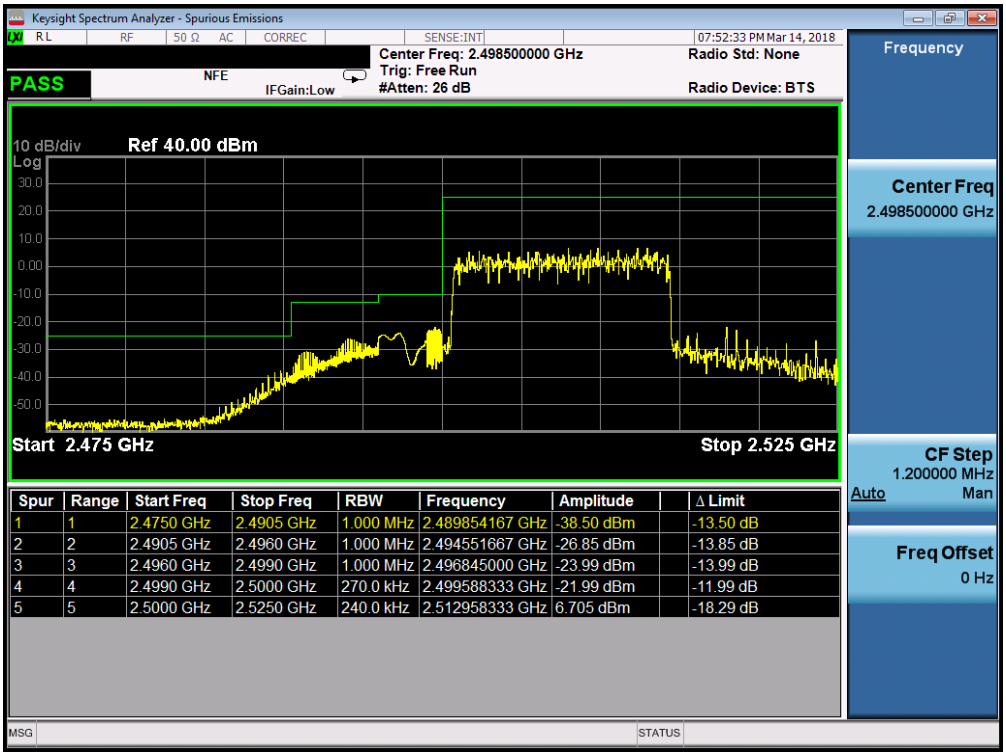
Plot 7-198. Upper ACP Plot (Band 7 – 5.0MHz QPSK – RB Size 25)



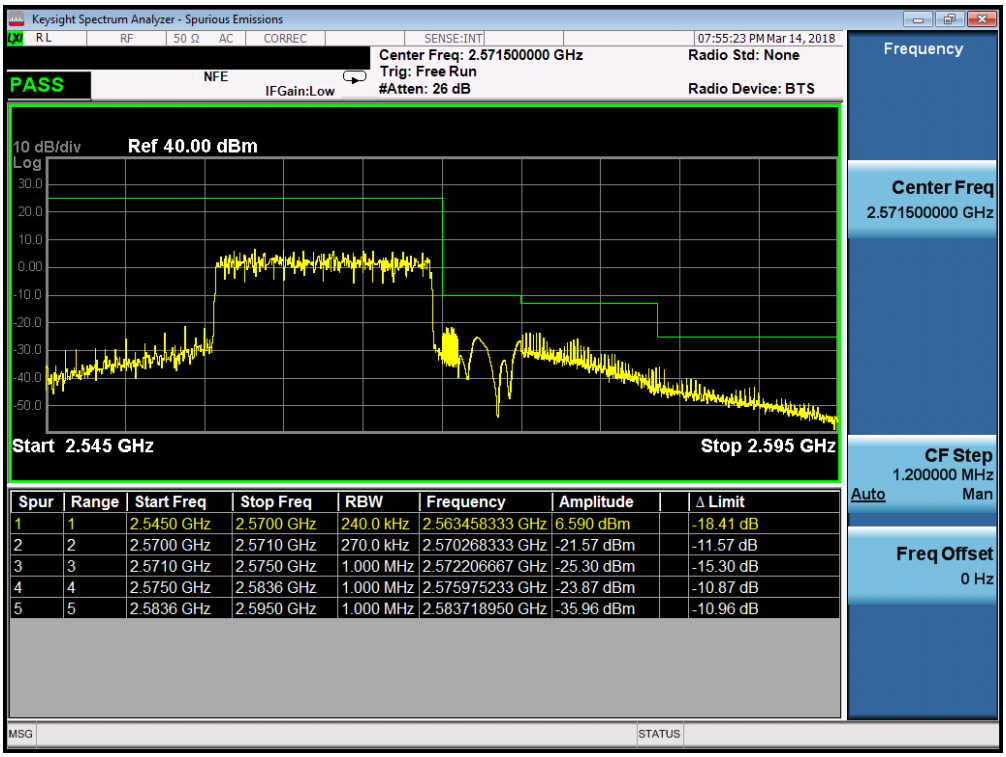
Plot 7-199. Lower ACP Plot (Band 7 – 10.0MHz QPSK – RB Size 50)



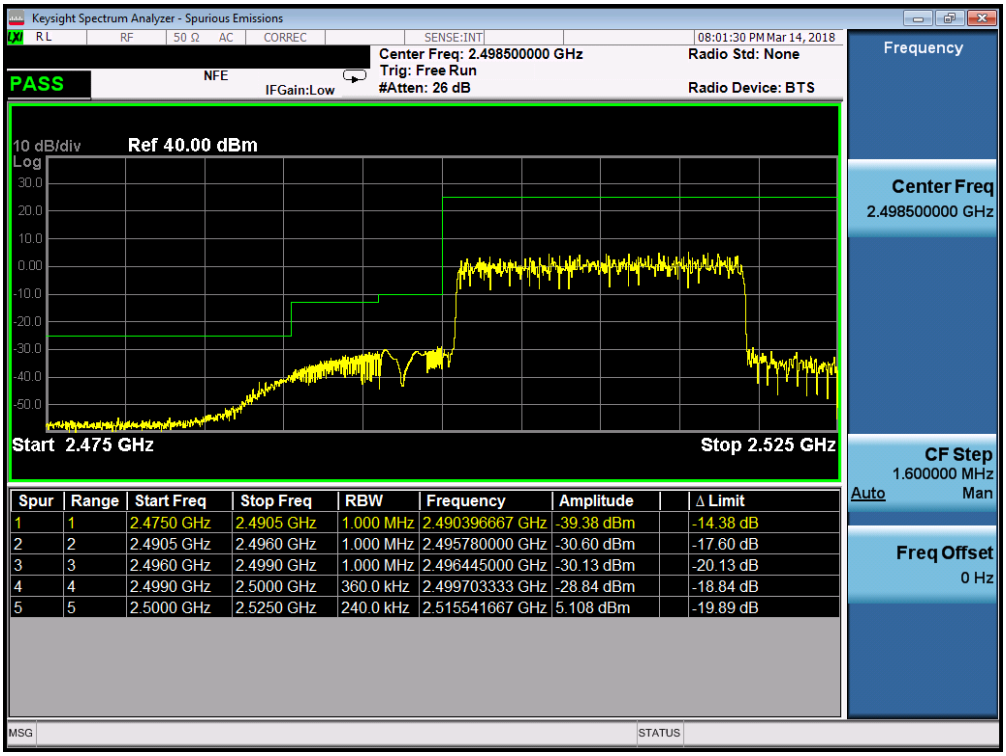
Plot 7-200. Upper ACP Plot (Band 7 – 10.0MHz QPSK – RB Size 50)



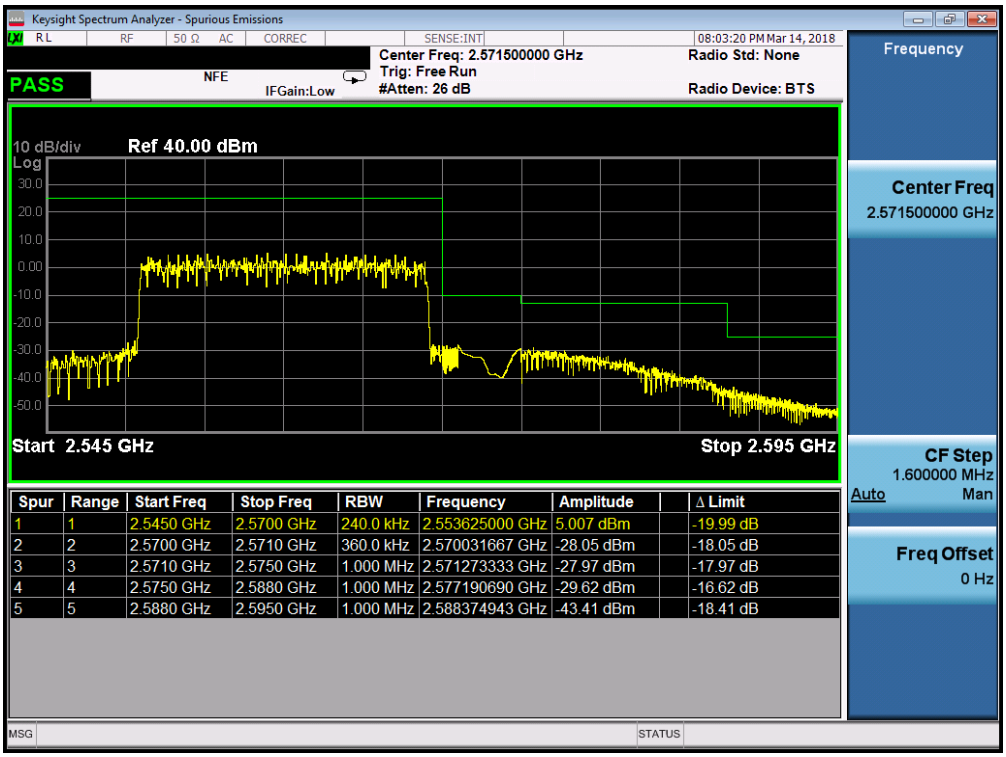
Plot 7-201. Lower ACP Plot (Band 7 – 15.0MHz QPSK – RB Size 75)



Plot 7-202. Upper ACP Plot (Band 7 – 15.0MHz QPSK – RB Size 75)



Plot 7-203. Lower ACP Plot (Band 7 – 20.0MHz QPSK – RB Size 100)



Plot 7-204. 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 v03 – 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.

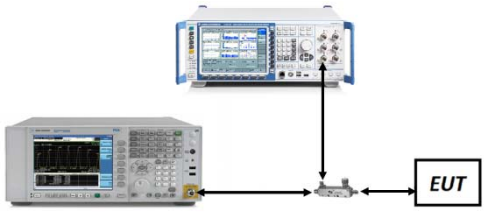
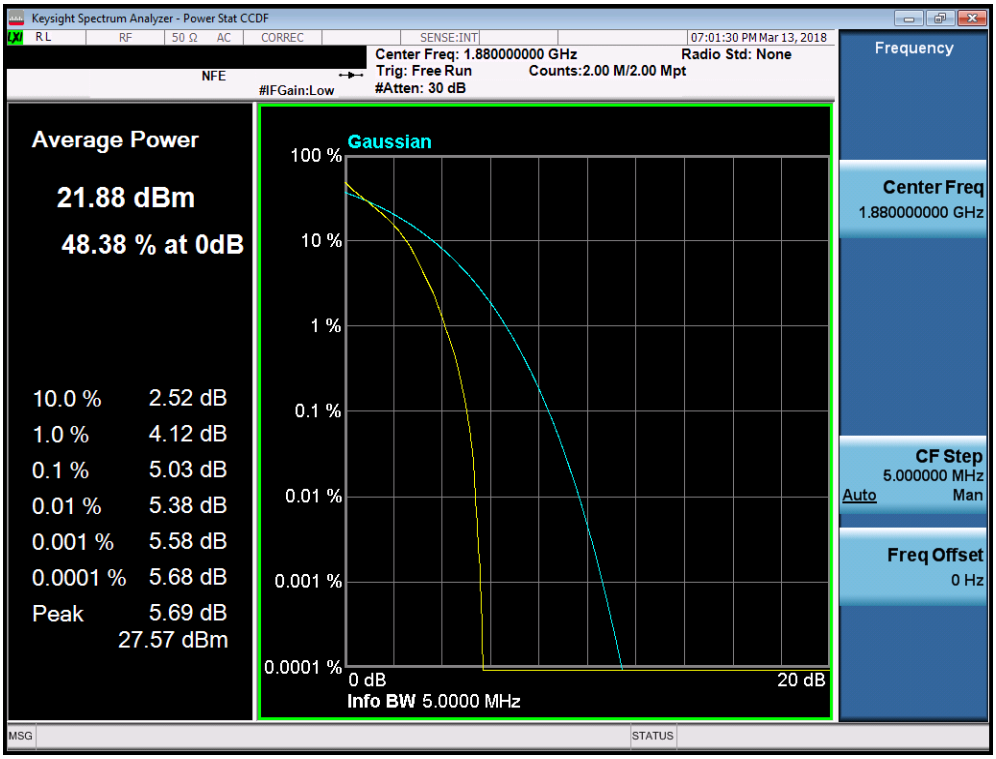


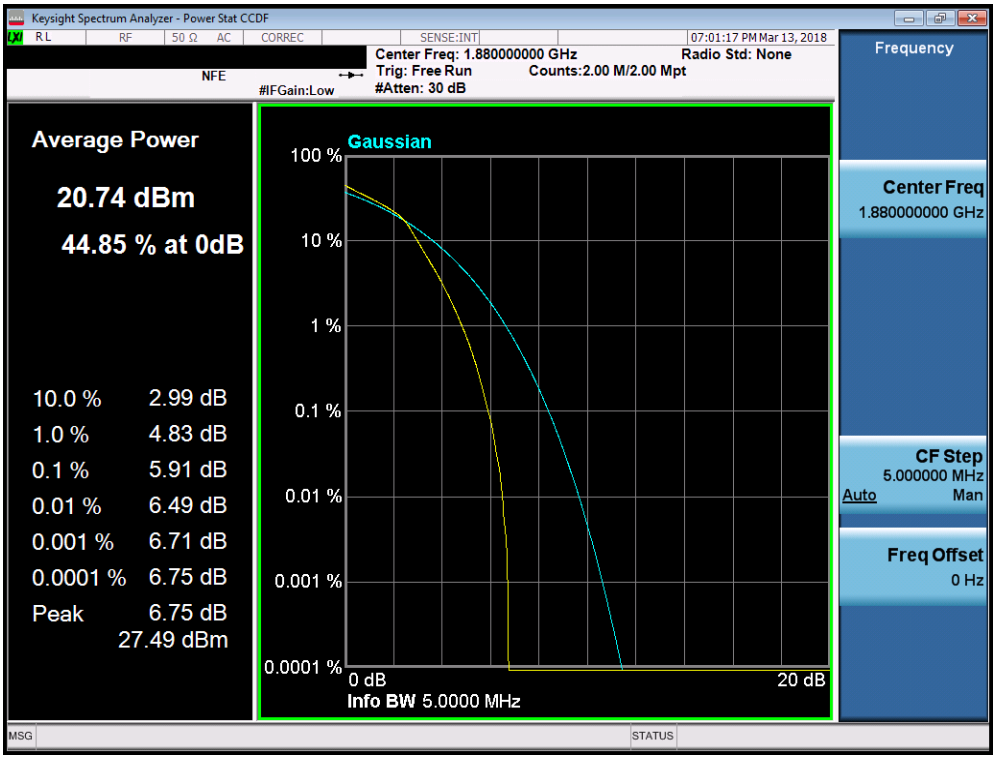
Figure 7-4. Test Instrument & Measurement Setup

Test Notes

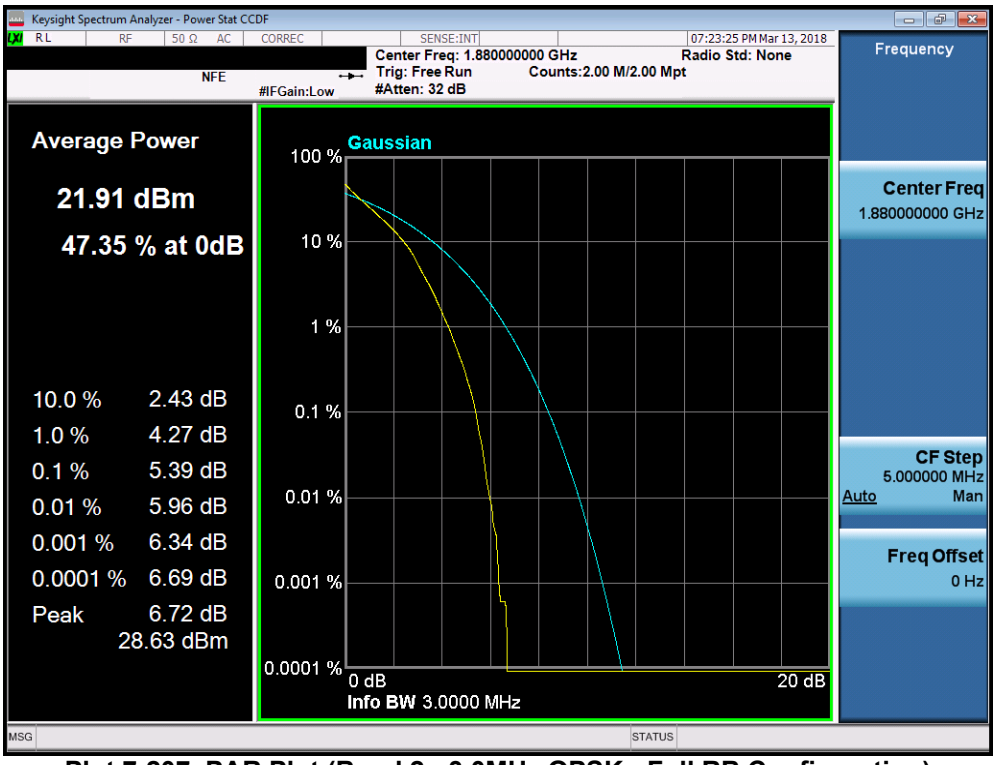
None.



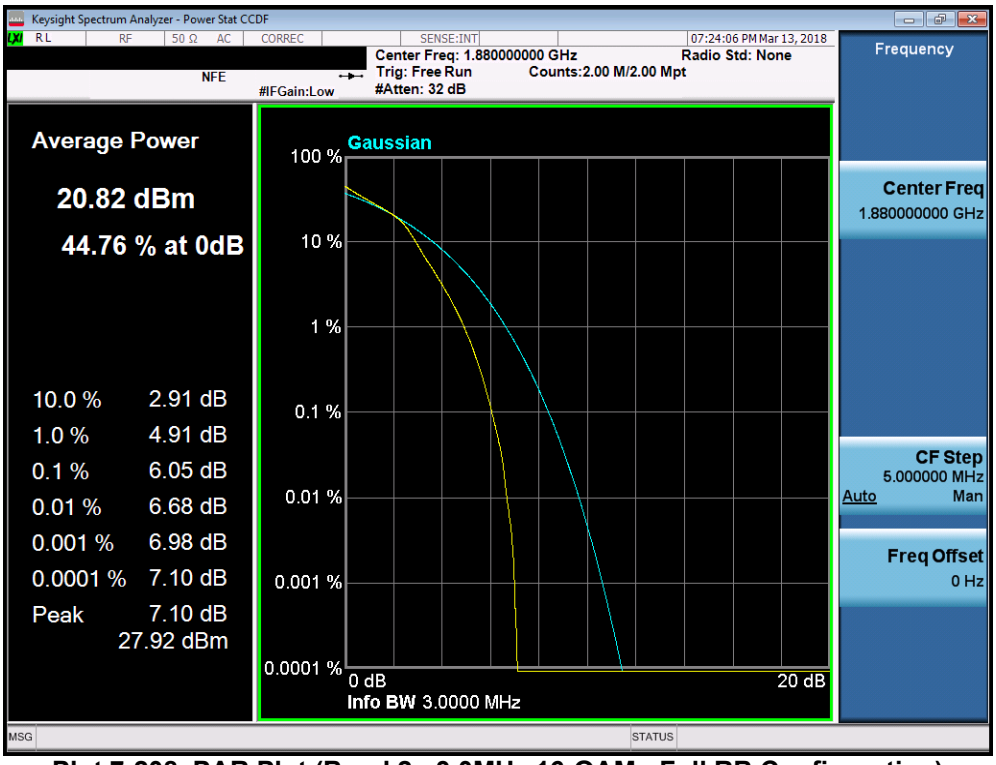
Plot 7-205. PAR Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



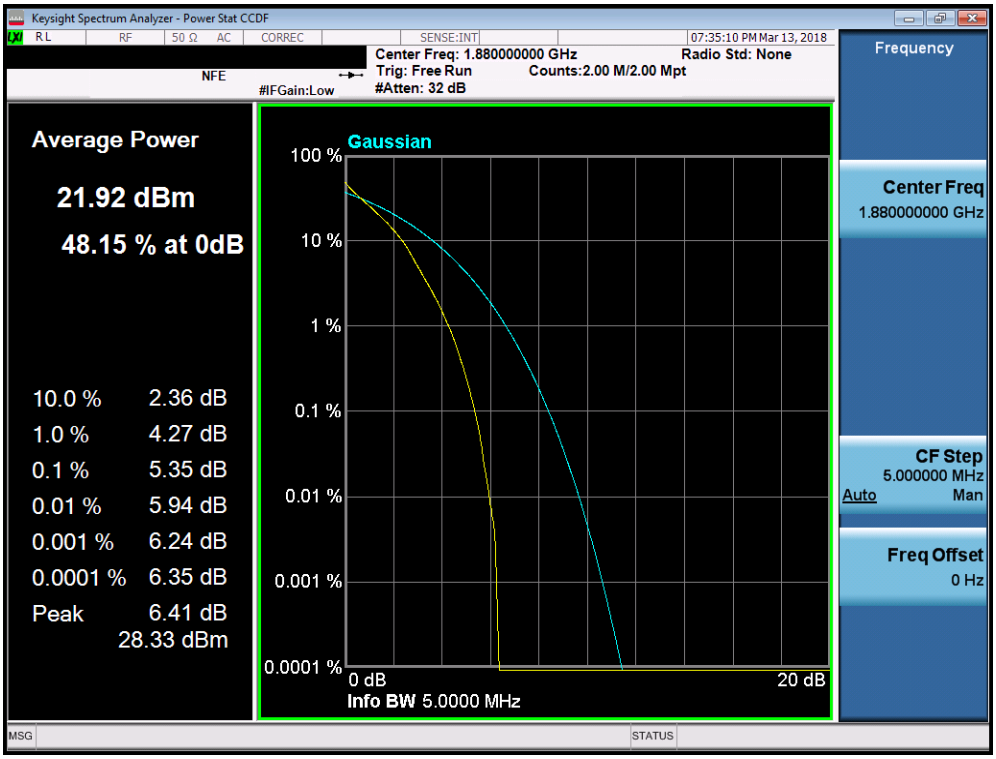
Plot 7-206. PAR Plot (Band 2 - 1.4MHz 16-QAM - Full RB Configuration)



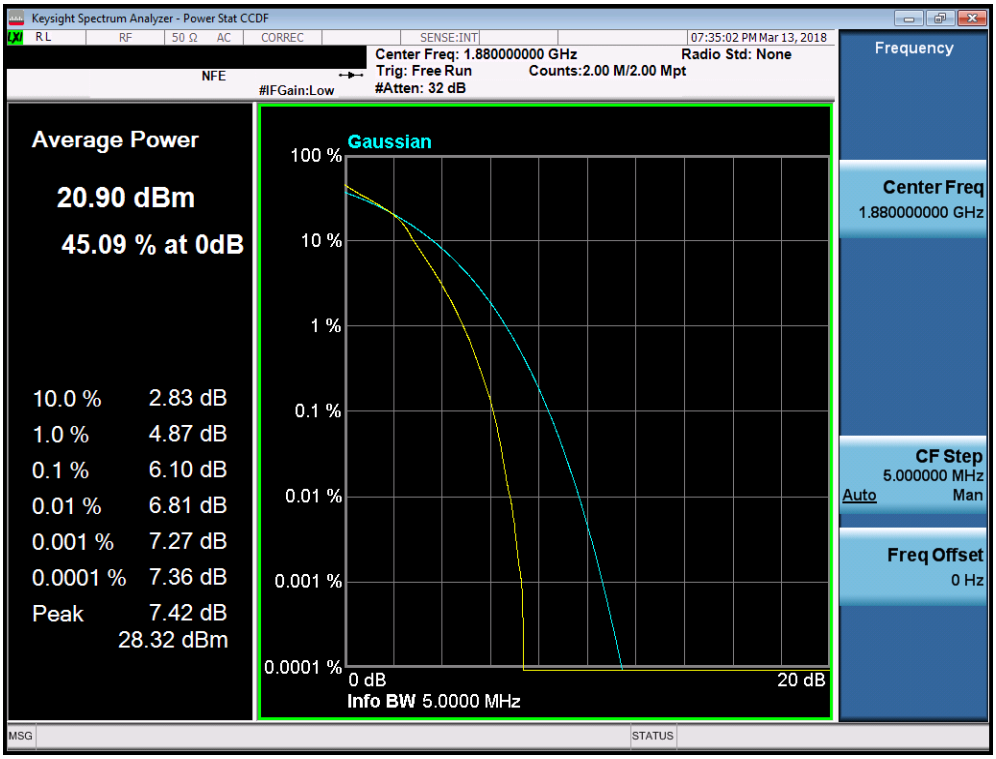
Plot 7-207. PAR Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



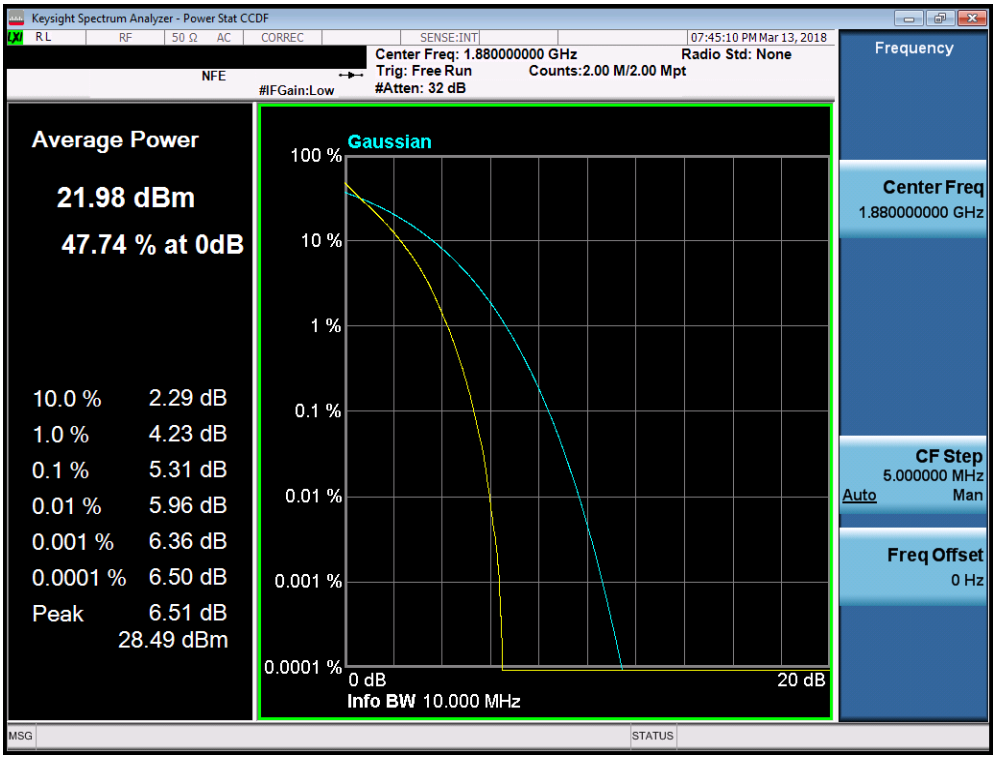
Plot 7-208. PAR Plot (Band 2 - 3.0MHz 16-QAM - Full RB Configuration)



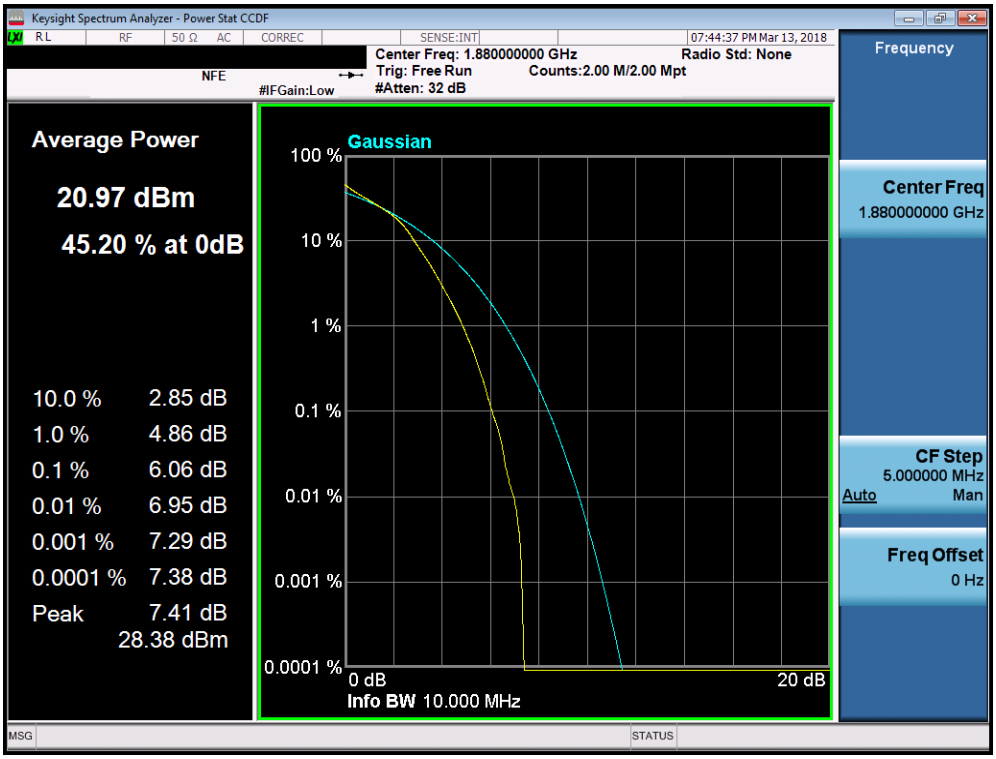
Plot 7-209. PAR Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



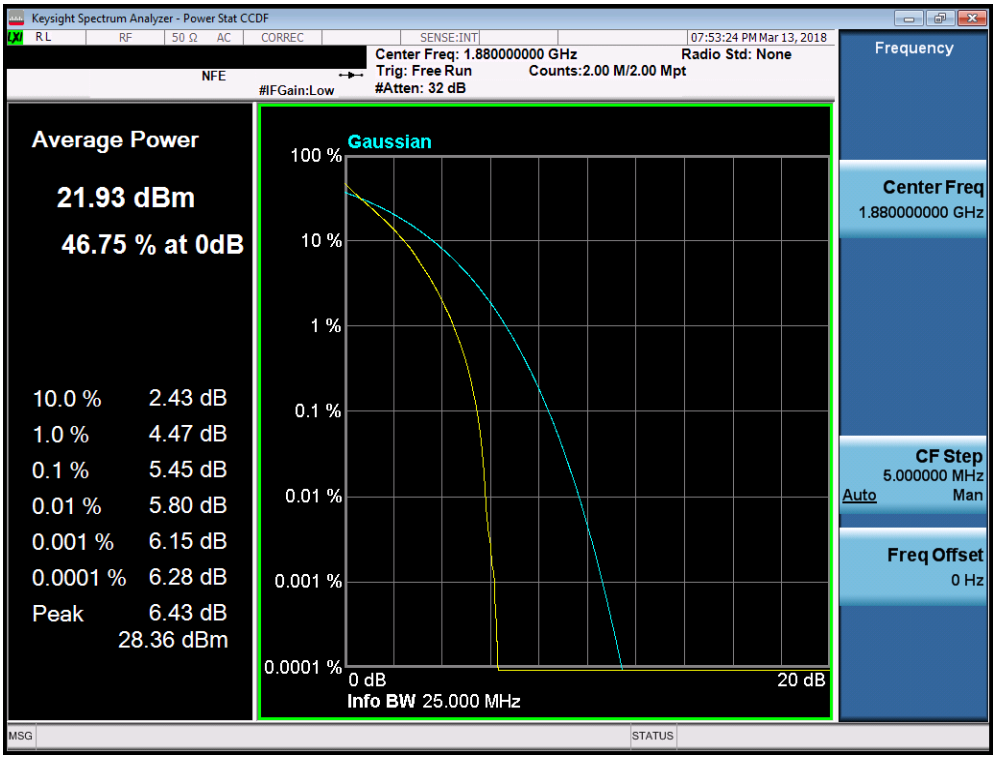
Plot 7-210. PAR Plot (Band 2 - 5.0MHz 16-QAM - Full RB Configuration)



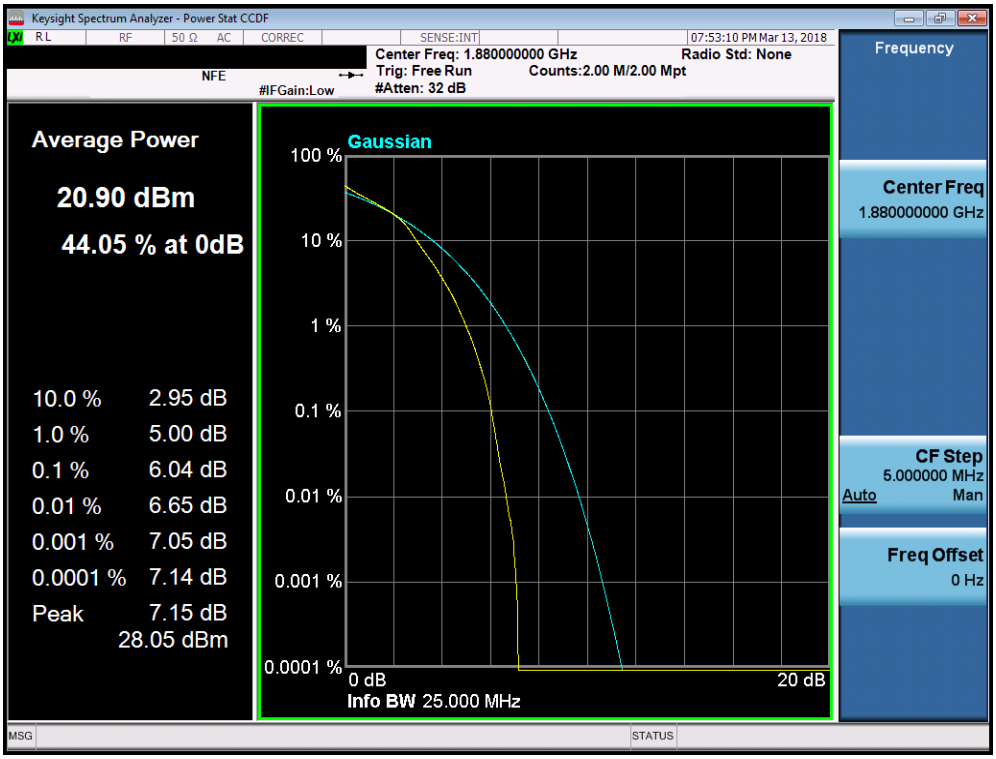
Plot 7-211. PAR Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



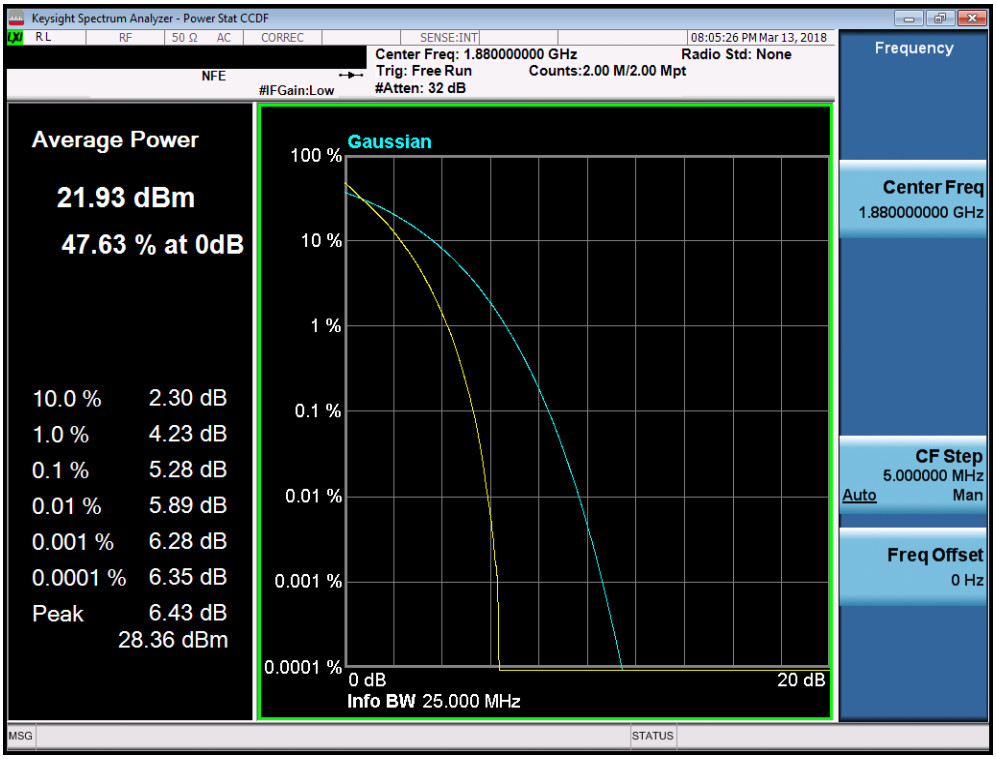
Plot 7-212. PAR Plot (Band 2 - 10.0MHz 16-QAM - Full RB Configuration)



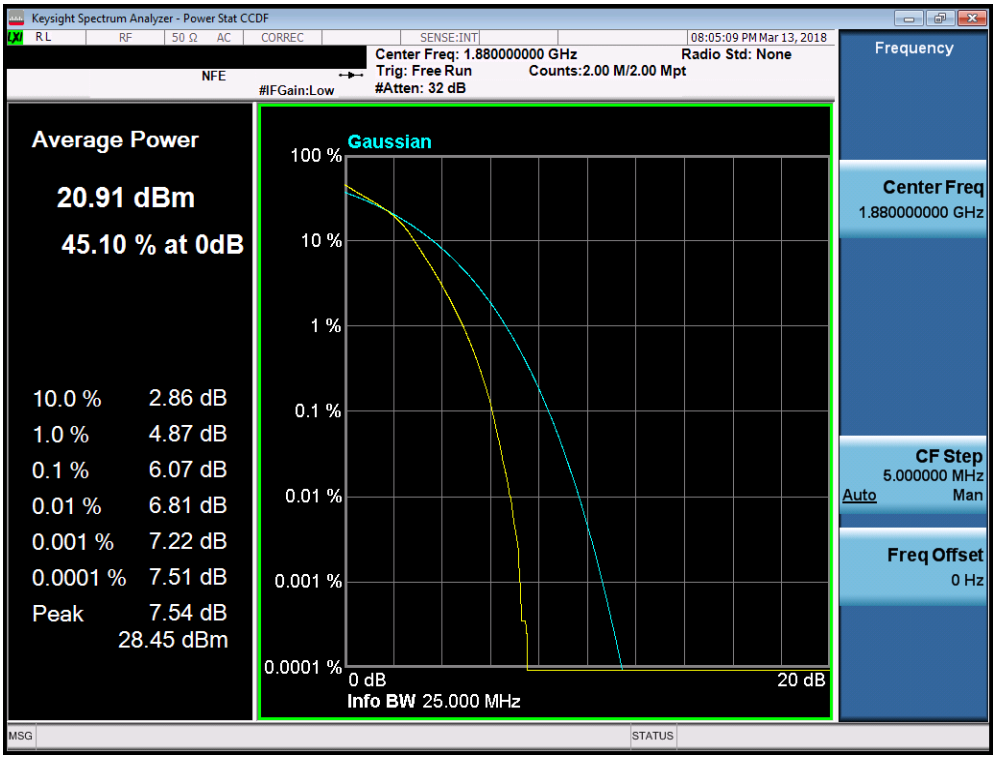
Plot 7-213. PAR Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-214. PAR Plot (Band 2 - 15.0MHz 16-QAM - Full RB Configuration)



Plot 7-215. PAR Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-216. 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 v03 – 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.

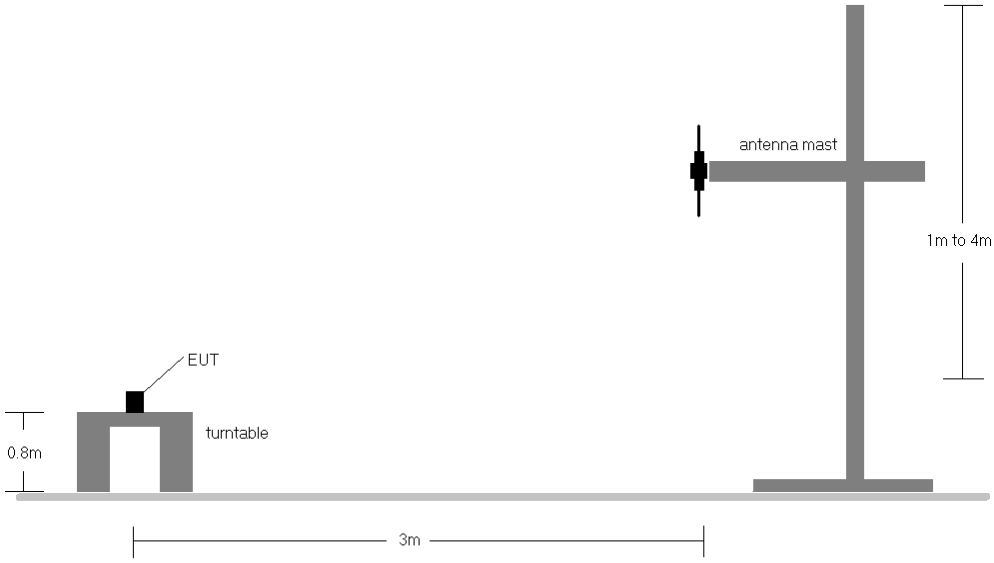


Figure 7-5. Radiated Test Setup <1GHz

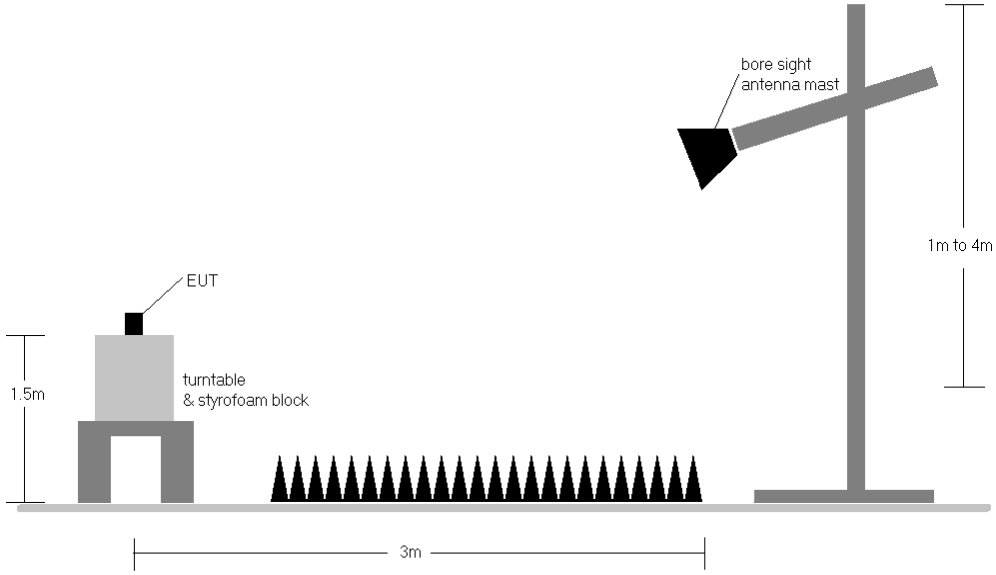


Figure 7-6. Radiated Test Setup >1GHz

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]
665.50	5	QPSK	H	150	200	1 / 24	17.00	1.10	15.95	0.039	34.77	-18.82
680.50	5	QPSK	H	150	200	1 / 24	18.51	1.10	17.46	0.056	34.77	-17.31
695.50	5	QPSK	H	150	200	1 / 24	18.73	1.10	**17.68**	0.059	34.77	-17.09
695.50	5	16-QAM	H	150	200	1 / 24	17.56	1.10	**16.51**	0.045	34.77	-18.26
668.00	10	QPSK	H	150	196	1 / 49	18.08	1.10	17.03	0.050	34.77	-17.74
680.50	10	QPSK	H	150	196	1 / 49	18.50	1.10	17.45	0.056	34.77	-17.32
693.00	10	QPSK	H	150	196	1 / 49	18.97	1.10	**17.92**	**0.062**	34.77	-16.85
693.00	10	16-QAM	H	150	196	1 / 49	17.77	1.10	**16.72**	0.047	34.77	-18.05
670.50	15	QPSK	H	150	195	1 / 74	18.40	1.10	17.35	0.054	34.77	-17.42
680.50	15	QPSK	H	150	195	1 / 74	18.42	1.10	17.37	0.055	34.77	-17.40
690.50	15	QPSK	H	150	195	1 / 74	18.79	1.10	**17.74**	0.059	34.77	-17.03
690.50	15	16-QAM	H	150	195	1 / 74	17.62	1.10	**16.57**	0.045	34.77	-18.20
673.00	20	QPSK	H	150	191	1 / 99	18.73	1.10	17.68	0.059	34.77	-17.09
680.50	20	QPSK	H	150	191	1 / 99	18.02	1.10	16.97	0.050	34.77	-17.80
688.00	20	QPSK	H	150	191	1 / 99	18.81	1.10	**17.76**	0.060	34.77	-17.01
688.00	20	16-QAM	H	150	191	1 / 99	17.72	1.10	**16.67**	0.046	34.77	-18.10
693.00	10	QPSK	V	150	341	1 / 99	18.59	1.10	17.54	0.057	34.77	-17.23

Table 7-3. ERP Data (Band 71)

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	150	13	3 / 2	20.32	1.10	19.27	0.085	34.77	-15.50	21.42	0.139	36.99	-15.57
707.50	1.4	QPSK	V	150	13	3 / 2	20.64	1.13	19.62	0.092	34.77	-15.15	21.77	0.150	36.99	-15.22
715.30	1.4	QPSK	V	150	13	3 / 2	20.78	1.16	**19.79**	0.095	34.77	-14.98	**21.94**	0.156	36.99	-15.05
715.30	1.4	16-QAM	V	150	13	3 / 2	20.07	1.16	**19.08**	0.081	34.77	-15.69	**21.23**	0.133	36.99	-15.76
700.50	3	QPSK	V	150	345	1 / 14	20.39	1.10	19.34	0.086	34.77	-15.43	21.49	0.141	36.99	-15.50
707.50	3	QPSK	V	150	345	1 / 14	20.75	1.13	19.73	0.094	34.77	-15.04	21.88	0.154	36.99	-15.11
714.50	3	QPSK	V	150	345	1 / 14	20.88	1.16	**19.89**	0.097	34.77	-14.88	**22.04**	0.160	36.99	-14.95
714.50	3	16-QAM	V	150	345	1 / 14	19.86	1.16	**18.87**	0.077	34.77	-15.90	**21.02**	0.126	36.99	-15.97
701.50	5	QPSK	V	150	357	1 / 24	20.42	1.11	19.38	0.087	34.77	-15.40	21.53	0.142	36.99	-15.46
707.50	5	QPSK	V	150	357	1 / 24	20.87	1.13	19.85	0.097	34.77	-14.92	22.00	0.159	36.99	-14.99
713.50	5	QPSK	V	150	357	1 / 24	20.85	1.15	**19.85**	0.097	34.77	-14.92	**22.00**	0.159	36.99	-14.99
713.50	5	16-QAM	V	150	357	1 / 24	19.94	1.15	**18.94**	0.078	34.77	-15.83	**21.09**	0.129	36.99	-15.90
704.00	10	QPSK	V	150	17	1 / 49	20.83	1.12	19.80	0.095	34.77	-14.97	21.95	0.157	36.99	-15.04
707.50	10	QPSK	V	150	17	1 / 49	20.97	1.13	**19.95**	**0.099**	34.77	-14.82	**22.10**	**0.162**	36.99	-14.89
711.00	10	QPSK	V	150	17	1 / 49	20.75	1.14	19.74	0.094	34.77	-15.03	21.89	0.155	36.99	-15.10
711.00	10	16-QAM	V	150	17	1 / 49	19.89	1.14	**18.88**	0.077	34.77	-15.89	**21.03**	0.127	36.99	-15.96
707.50	10	QPSK	H	150	341	1 / 49	19.14	1.13	18.12	0.065	34.77	-16.65	20.27	0.106	36.99	-16.72

Table 7-4. 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	H	150	11	1 / 0	20.11	1.50	19.46	0.088	38.45	-18.99	21.61	0.145	40.61	-19.00
836.50	1.4	QPSK	H	150	10	1 / 0	22.06	1.50	21.41	0.138	38.45	-17.04	23.56	0.227	40.61	-17.05
848.30	1.4	QPSK	H	150	10	1 / 0	22.93	1.50	**22.28**	**0.169**	38.45	-16.17	**24.43**	**0.277**	40.61	-16.18
848.30	1.4	16-QAM	H	150	10	1 / 0	21.72	1.50	**21.07**	0.128	38.45	-17.38	**23.22**	0.210	40.61	-17.39
825.50	3	QPSK	H	150	5	1 / 0	20.26	1.50	19.61	0.091	38.45	-18.84	21.76	0.150	40.61	-18.85
836.50	3	QPSK	H	150	5	1 / 0	21.96	1.50	21.31	0.135	38.45	-17.14	23.46	0.222	40.61	-17.15
847.50	3	QPSK	H	150	5	1 / 0	22.92	1.50	**22.27**	0.169	38.45	-16.18	**24.42**	0.277	40.61	-16.19
847.50	3	16-QAM	H	150	5	1 / 0	21.59	1.50	**20.94**	0.124	38.45	-17.51	**23.09**	0.204	40.61	-17.52
826.50	5	QPSK	H	150	3	1 / 0	19.99	1.50	19.34	0.086	38.45	-19.11	21.49	0.141	40.61	-19.12
836.50	5	QPSK	H	150	3	1 / 0	21.76	1.50	21.11	0.129	38.45	-17.34	23.26	0.212	40.61	-17.35
846.50	5	QPSK	H	15	3	1 / 0	22.45	1.50	**21.80**	0.151	38.45	-16.65	**23.95**	0.248	40.61	-16.66
846.50	5	16-QAM	H	15	3	1 / 0	21.09	1.50	**20.44**	0.111	38.45	-18.01	**22.59**	0.182	40.61	-18.02
829.00	10	QPSK	H	150	3	1 / 49	21.26	1.50	20.61	0.115	38.45	-17.84	22.76	0.189	40.61	-17.85
836.50	10	QPSK	H	150	3	1 / 49	21.84	1.50	21.19	0.132	38.45	-17.26	23.34	0.216	40.61	-17.27
844.00	10	QPSK	H	150	3	1 / 49	22.44	1.50	**21.79**	0.151	38.45	-16.66	**23.94**	0.248	40.61	-16.67
844.00	10	16-QAM	H	150	3	1 / 49	21.69	1.50	**21.04**	0.127	38.45	-17.41	**23.19**	0.208	40.61	-17.42
848.30	1.4	QPSK	V	150	359	1 / 0	19.87	1.50	19.22	0.084	38.45	-19.23	21.37	0.137	40.61	-19.24

Table 7-5. 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	92	1 / 0	19.28	5.56	24.84	0.305	30.00	-5.16
1745.00	1.4	QPSK	V	150	92	6 / 0	19.84	5.32	25.16	0.328	30.00	-4.84
1779.30	1.4	QPSK	V	150	89	1 / 0	20.56	5.09	**25.65**	0.367	30.00	-4.35
1779.30	1.4	16-QAM	V	150	89	1 / 0	20.40	5.09	**25.49**	0.354	30.00	-4.51
1711.50	3	QPSK	V	150	94	1 / 0	19.33	5.55	24.88	0.308	30.00	-5.12
1745.00	3	QPSK	V	150	94	1 / 0	20.05	5.32	25.37	0.345	30.00	-4.63
1778.50	3	QPSK	V	150	94	1 / 0	20.49	5.10	**25.59**	0.362	30.00	-4.41
1778.50	3	16-QAM	V	150	94	1 / 0	20.24	5.10	**25.34**	0.342	30.00	-4.66
1712.50	5	QPSK	V	150	85	1 / 0	18.75	5.55	24.30	0.269	30.00	-5.70
1745.00	5	QPSK	V	150	85	1 / 0	19.55	5.32	24.87	0.307	30.00	-5.13
1777.50	5	QPSK	V	150	85	1 / 0	20.38	5.10	**25.48**	0.354	30.00	-4.52
1777.50	5	16-QAM	V	150	85	1 / 0	20.01	5.10	**25.11**	0.325	30.00	-4.89
1715.00	10	QPSK	V	150	93	1 / 0	19.51	5.53	25.04	0.319	30.00	-4.96
1745.00	10	QPSK	V	150	93	1 / 0	20.10	5.32	**25.42**	0.349	30.00	-4.58
1775.00	10	QPSK	V	150	93	1 / 0	20.26	5.12	25.38	0.345	30.00	-4.62
1745.00	10	16-QAM	V	150	93	1 / 0	19.89	5.32	**25.21**	0.332	30.00	-4.79
1717.50	15	QPSK	V	150	91	1 / 0	19.37	5.51	24.88	0.308	30.00	-5.12
1745.00	15	QPSK	V	150	91	1 / 0	19.77	5.32	25.09	0.323	30.00	-4.91
1772.50	15	QPSK	V	150	91	1 / 0	20.19	5.14	**25.33**	0.341	30.00	-4.67
1772.50	15	16-QAM	V	150	91	1 / 0	19.98	5.14	**25.12**	0.325	30.00	-4.88
1720.00	20	QPSK	V	150	92	1 / 99	19.51	5.49	25.00	0.316	30.00	-5.00
1745.00	20	QPSK	V	150	92	1 / 99	19.93	5.32	25.25	0.335	30.00	-4.75
1770.00	20	QPSK	V	150	92	1 / 99	20.71	5.15	**25.86**	**0.386**	30.00	-4.14
1770.00	20	16-QAM	V	150	92	1 / 99	20.20	5.15	**25.35**	0.343	30.00	-4.65
1770.00	20	QPSK	H	150	100	100 / 0	20.69	5.15	25.84	0.384	30.00	-4.16

Table 7-6. 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	V	150	360	1 / 0	18.03	4.82	**22.85**	0.193	33.01	-10.16
1880.00	1.4	QPSK	V	150	360	1 / 0	18.00	4.74	22.74	0.188	33.01	-10.27
1909.30	1.4	QPSK	V	150	360	1 / 0	17.95	4.68	22.63	0.183	33.01	-10.38
1850.70	1.4	16-QAM	V	150	360	1 / 0	17.17	4.82	**21.99**	0.158	33.01	-11.02
1851.50	3	QPSK	V	150	359	1 / 0	18.17	4.82	**22.99**	0.199	33.01	-10.02
1880.00	3	QPSK	V	150	359	1 / 0	18.02	4.74	22.76	0.189	33.01	-10.25
1908.50	3	QPSK	V	150	359	1 / 0	18.12	4.68	22.80	0.191	33.01	-10.21
1851.50	3	16-QAM	V	150	359	1 / 0	17.28	4.82	**22.10**	0.162	33.01	-10.91
1852.50	5	QPSK	V	150	1	1 / 0	18.16	4.81	**22.97**	0.198	33.01	-10.04
1880.00	5	QPSK	V	150	1	1 / 0	18.08	4.74	22.82	0.191	33.01	-10.19
1907.50	5	QPSK	V	150	1	1 / 0	17.95	4.68	22.63	0.183	33.01	-10.38
1907.50	5	16-QAM	V	150	1	1 / 0	16.87	4.68	**21.55**	0.143	33.01	-11.46
1855.00	10	QPSK	V	150	352	1 / 0	18.28	4.81	**23.09**	0.204	33.01	-9.92
1880.00	10	QPSK	V	150	352	1 / 0	18.15	4.74	22.89	0.195	33.01	-10.12
1905.00	10	QPSK	V	150	352	1 / 0	17.98	4.68	22.66	0.185	33.01	-10.35
1855.00	10	16-QAM	V	150	352	1 / 0	17.00	4.81	**21.81**	0.152	33.01	-11.20
1857.50	15	QPSK	V	150	360	1 / 0	18.97	4.80	**23.77**	**0.238**	33.01	-9.24
1880.00	15	QPSK	V	150	360	1 / 0	18.52	4.74	23.26	0.212	33.01	-9.75
1902.50	15	QPSK	V	150	360	1 / 0	18.20	4.69	22.89	0.194	33.01	-10.12
1857.50	15	16-QAM	V	150	360	1 / 0	17.70	4.80	**22.50**	0.178	33.01	-10.51
1860.00	20	QPSK	V	150	355	1 / 0	18.48	4.79	**23.27**	0.212	33.01	-9.74
1880.00	20	QPSK	V	150	355	1 / 0	18.25	4.74	22.99	0.199	33.01	-10.02
1900.00	20	QPSK	V	150	355	1 / 0	17.83	4.69	22.52	0.179	33.01	-10.49
1860.00	20	16-QAM	V	150	355	1 / 0	17.32	4.79	**22.11**	0.163	33.01	-10.90
1857.50	15	QPSK	H	150	247	1 / 0	18.16	4.80	22.96	0.198	33.01	-10.05

Table 7-7. 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	341	1 / 24	17.40	5.74	23.14	0.206	33.01	-9.87
2535.00	5	QPSK	H	150	341	1 / 24	18.27	5.86	24.13	0.259	33.01	-8.88
2567.50	5	QPSK	H	150	341	1 / 24	18.42	5.98	**24.40**	0.275	33.01	-8.61
2567.50	5	16-QAM	H	150	341	1 / 24	17.37	5.98	**23.35**	0.216	33.01	-9.66
2505.00	10	QPSK	H	150	343	1 / 49	17.77	5.75	23.52	0.225	33.01	-9.49
2535.00	10	QPSK	H	150	343	1 / 0	18.34	5.86	24.20	0.263	33.01	-8.81
2565.00	10	QPSK	H	150	343	1 / 49	18.35	5.97	**24.32**	0.270	33.01	-8.69
2565.00	10	16-QAM	H	150	343	1 / 49	17.18	5.97	**23.15**	0.207	33.01	-9.86
2507.50	15	QPSK	H	150	341	1 / 74	17.78	5.76	23.54	0.226	33.01	-9.47
2535.00	15	QPSK	H	150	341	1 / 74	18.47	5.86	24.33	0.271	33.01	-8.68
2562.50	15	QPSK	H	150	341	1 / 74	18.61	5.96	**24.57**	0.287	33.01	-8.44
2562.50	15	16-QAM	H	150	341	1 / 74	17.16	5.96	**23.12**	0.205	33.01	-9.89
2510.00	20	QPSK	H	150	343	1 / 99	18.16	5.77	23.93	0.247	33.01	-9.08
2535.00	20	QPSK	H	150	343	1 / 99	18.63	5.86	24.49	0.281	33.01	-8.52
2560.00	20	QPSK	H	150	343	1 / 99	18.69	5.95	**24.64**	**0.291**	33.01	-8.37
2560.00	20	16-QAM	H	150	343	1 / 99	17.34	5.95	**23.29**	0.213	33.01	-9.72
2560.00	20	QPSK	V	150	58	1 / 0	13.92	5.95	19.87	0.097	33.01	-13.14

Table 7-8. 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 v03 – 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.

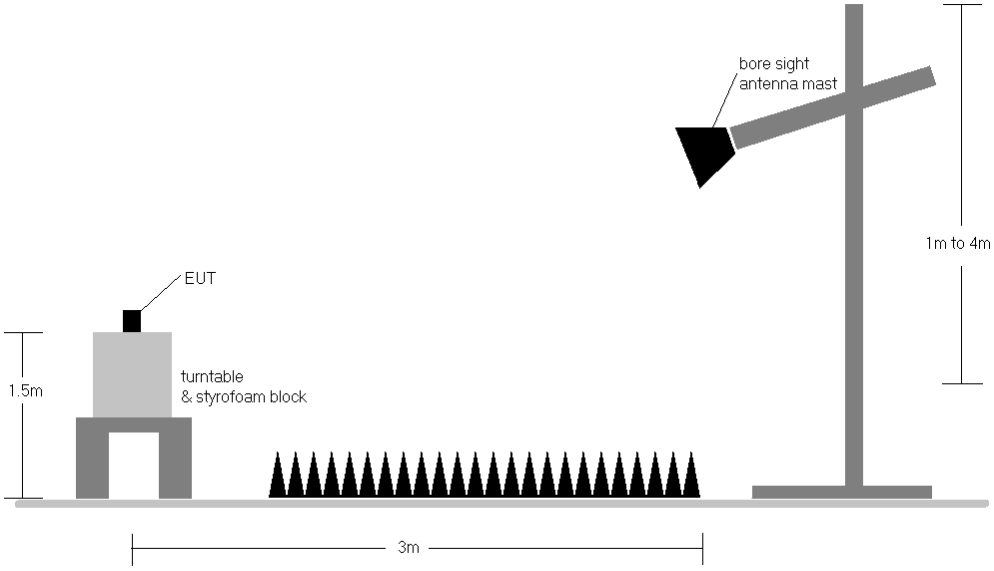


Figure 7-7. Test Instrument & Measurement Setup

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.

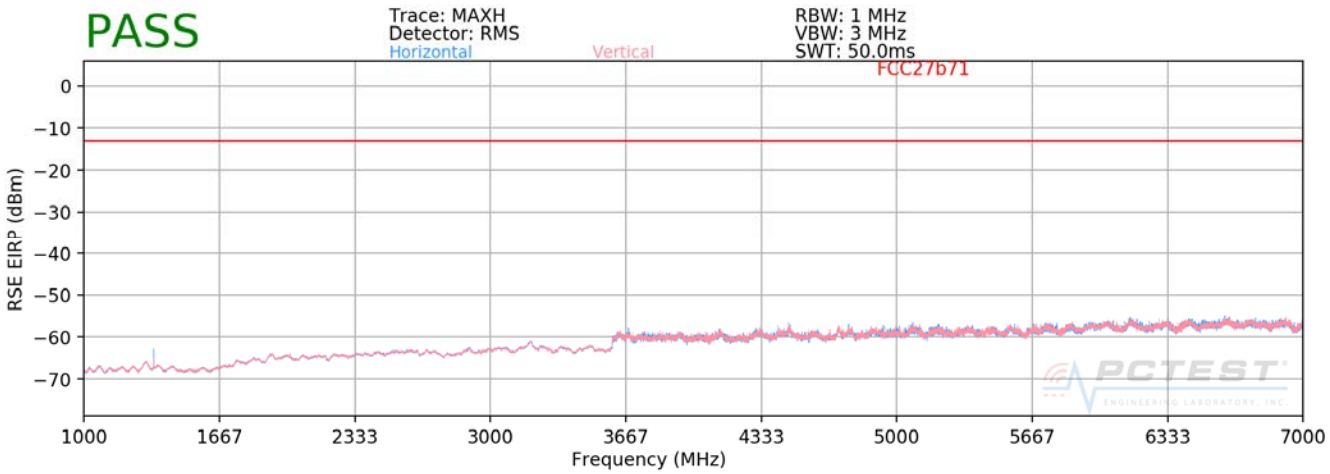
2) This unit was tested with its standard battery.

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 71



Plot 7-217. Radiated Spurious Plot above 1GHz (Band 71)

OPERATING FREQUENCY:	673.00	MHz
CHANNEL:	133222	
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]
1346.00	H	206	50	-63.70	3.87	-59.83	-46.8
2019.00	H	395	157	-69.17	4.74	-64.43	-51.4
2692.00	H	181	22	-69.63	6.50	-63.12	-50.1
3365.00	H	-	-	-71.54	7.93	-63.61	-50.6
4038.00	H	-	-	-71.95	9.07	-62.88	-49.9

Table 7-9. Radiated Spurious Data (Band 71 – Low Channel)

OPERATING FREQUENCY:	680.50	MHz
CHANNEL:	133297	
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]
1361.00	H	125	44	-64.76	4.00	-60.76	-47.8
2041.50	H	11	2	-68.95	4.89	-64.06	-51.1
2722.00	H	112	17	-70.42	6.64	-63.79	-50.8
3402.50	H	-	-	-71.06	7.99	-63.07	-50.1
4083.00	H	-	-	-72.03	9.05	-62.98	-50.0

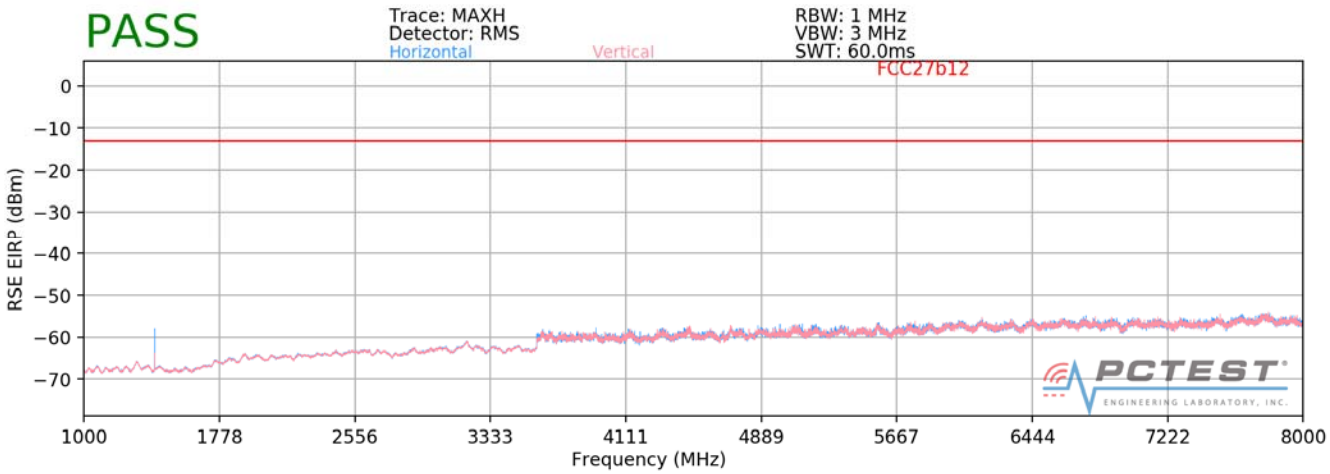
Table 7-10. Radiated Spurious Data (Band 71 – Mid Channel)

OPERATING FREQUENCY:	688.00	MHz
CHANNEL:	133372	
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]
1376.00	H	172	47	-67.99	8.00	-59.99	-47.0
2064.00	H	158	16	-69.69	8.75	-60.94	-47.9
2752.00	H	104	39	-75.83	9.73	-66.10	-53.1
3440.00	H	-	-	-74.06	9.48	-64.58	-51.6

Table 7-11. Radiated Spurious Data (Band 71 – High Channel)

Band 12



Plot 7-218. Radiated Spurious Plot above 1GHz (Band 12)

OPERATING FREQUENCY:	704.00	MHz
CHANNEL:	23060	
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	H	149	135	-62.30	8.00	-54.29	-41.3
2112.00	H	200	186	-73.96	8.89	-65.06	-52.1
2816.00	H	-	-	-77.82	10.10	-67.72	-54.7

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

OPERATING FREQUENCY:	707.50	MHz
CHANNEL:	23095	
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	H	153	132	-62.11	8.09	-54.02	-41.0
2122.50	H	104	221	-74.24	8.88	-65.36	-52.4
2830.00	H	173	211	-76.25	10.13	-66.12	-53.1
3537.50	H	-	-	-74.41	9.69	-64.71	-51.7

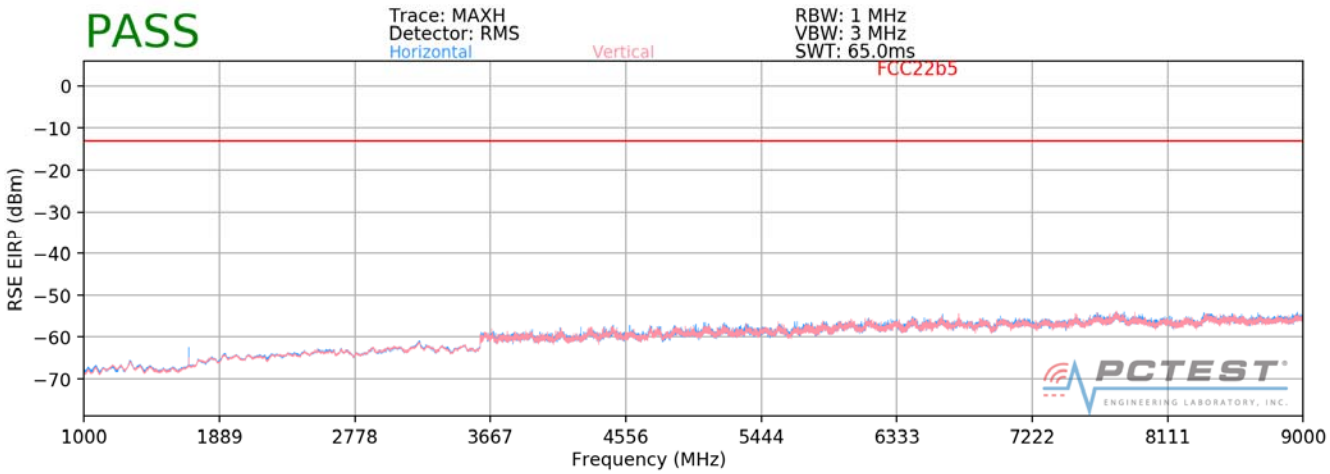
Table 7-13. Radiated Spurious Data (Band 12 – Mid Channel)

OPERATING FREQUENCY:	711.00	MHz
CHANNEL:	23130	
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	H	100	129	-60.87	8.17	-52.70	-39.7
2133.00	H	188	188	-72.73	8.87	-63.86	-50.9
2844.00	H	140	203	-75.97	10.16	-65.80	-52.8
3555.00	H	-	-	-74.62	9.71	-64.91	-51.9

Table 7-14. Radiated Spurious Data (Band 12 – High Channel)

Band 5



Plot 7-219. Radiated Spurious Plot above 1GHz (Band 5)

OPERATING FREQUENCY:	824.70	MHz
CHANNEL:	20407	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	1.4	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1649.40	H	120	41	-73.39	9.01	-64.38	-51.4
2474.10	H	113	50	-74.19	9.12	-65.07	-52.1
3298.80	H	-	-	-74.93	9.37	-65.56	-52.6

Table 7-15. Radiated Spurious Data (Band 5 – Low Channel)

OPERATING FREQUENCY:	836.50	MHz
CHANNEL:	20525	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	1.4	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1673.00	H	144	144	-73.57	8.85	-64.72	-51.7
2509.50	H	139	52	-75.98	9.17	-66.81	-53.8
3346.00	H	-	-	-75.24	9.36	-65.88	-52.9

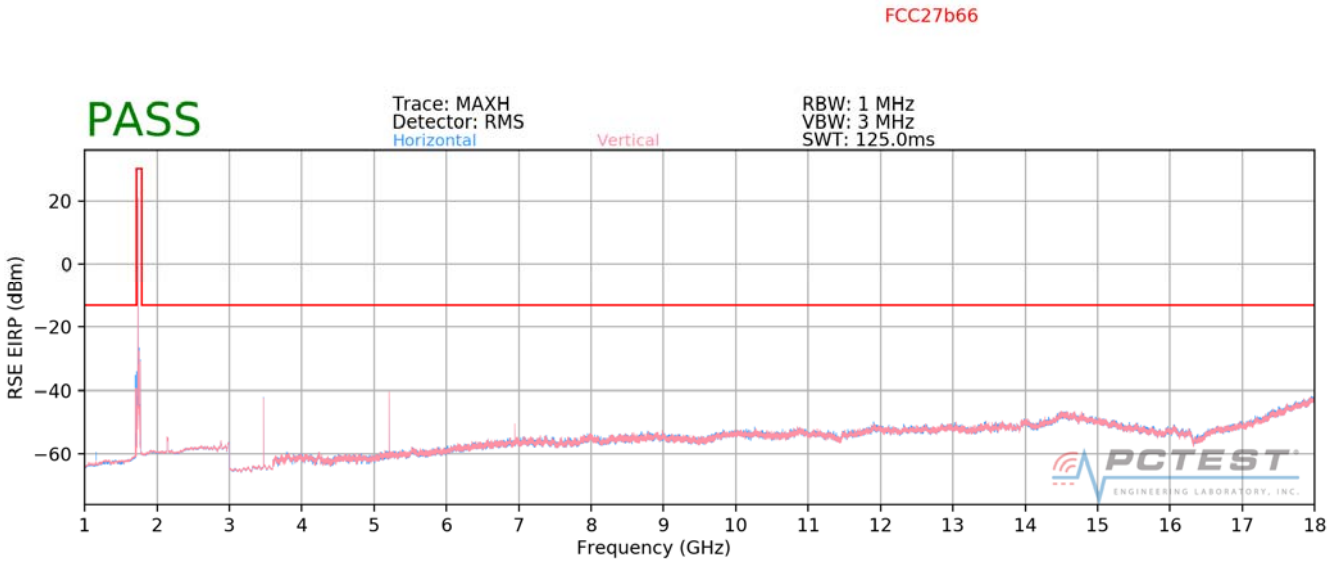
Table 7-16. Radiated Spurious Data (Band 5 – Mid Channel)

OPERATING FREQUENCY:	848.30	MHz
CHANNEL:	20643	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	1.4	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1696.60	H	177	147	-70.48	8.68	-61.80	-48.8
2544.90	H	149	49	-76.32	9.27	-67.05	-54.0
3393.20	H	-	-	-73.87	9.46	-64.41	-51.4

Table 7-17. Radiated Spurious Data (Band 5 – High Channel)

Band 66/4



Plot 7-220. Radiated Spurious Plot above 1GHz (Band 66/4)

OPERATING FREQUENCY:	1720.00	MHz
CHANNEL:	132072	
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	104	172	-45.52	9.54	-35.98	-23.0
5160.00	H	113	38	-55.41	10.79	-44.61	-31.6
6880.00	H	130	24	-57.45	10.86	-46.60	-33.6
8600.00	H	104	185	-68.99	11.69	-57.30	-44.3
10320.00	H	-	-	-68.38	12.49	-55.88	-42.9

Table 7-18. Radiated Spurious Data (Band 66/4 – Low Channel)

OPERATING FREQUENCY:	1745.00	MHz
CHANNEL:	132322	
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	131	172	-47.63	9.65	-37.98	-25.0
5235.00	H	100	188	-49.26	10.93	-38.33	-25.3
6980.00	H	100	22	-59.09	10.96	-48.13	-35.1
8725.00	H	-	-	-69.01	11.83	-57.18	-44.2

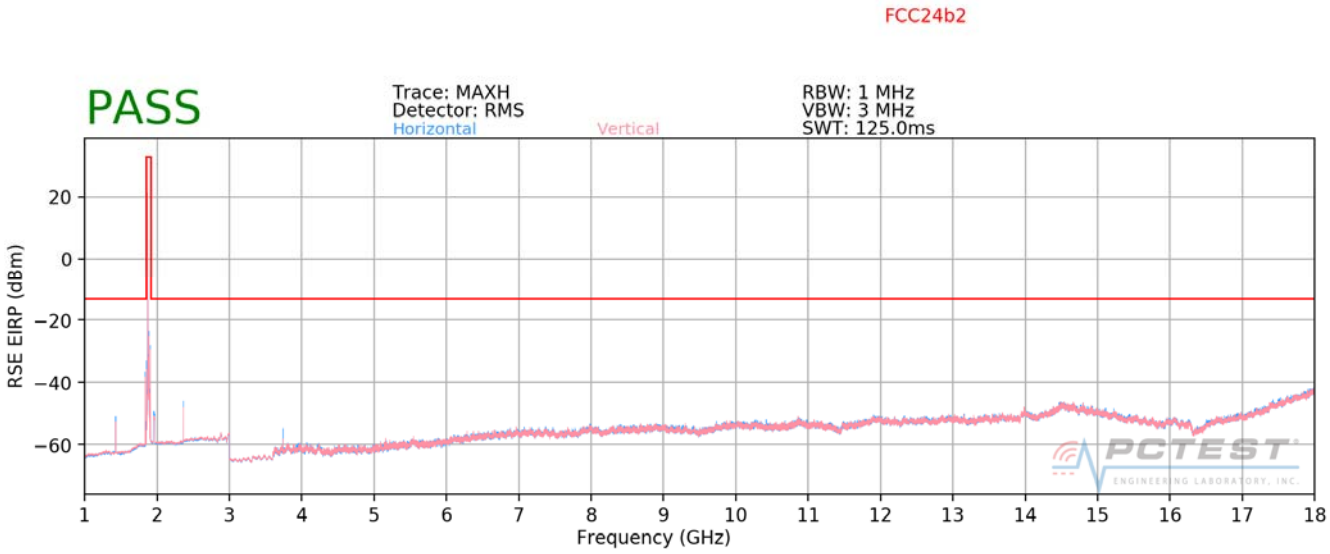
Table 7-19. Radiated Spurious Data (Band 66/4 – Mid Channel)

OPERATING FREQUENCY:	1770.00	MHz
CHANNEL:	132572	
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	130	173	-50.54	9.69	-40.84	-27.8
5310.00	H	100	182	-44.92	10.97	-33.96	-21.0
7080.00	H	104	312	-58.07	11.01	-47.06	-34.1
8850.00	H	-	-	-68.95	11.95	-57.00	-44.0

Table 7-20. Radiated Spurious Data (Band 66/4 – High Channel)

Band 2



Plot 7-221. 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	120	38	-56.77	9.68	-47.09	-34.1
5572.50	H	100	111	-66.68	11.02	-55.66	-42.7
7430.00	H	107	141	-67.38	10.84	-56.55	-43.5
9287.50	H	-	-	-69.76	12.29	-57.48	-44.5
11145.00	H	-	-	-68.58	12.97	-55.61	-42.6

Table 7-21. 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	104	38	-63.42	9.50	-53.92	-40.9
5640.00	H	104	106	-69.47	11.16	-58.31	-45.3
7520.00	H	256	155	-69.55	11.03	-58.52	-45.5
9400.00	H	-	-	-70.44	12.19	-58.25	-45.3
11280.00	H	-	-	-70.01	13.15	-56.86	-43.9

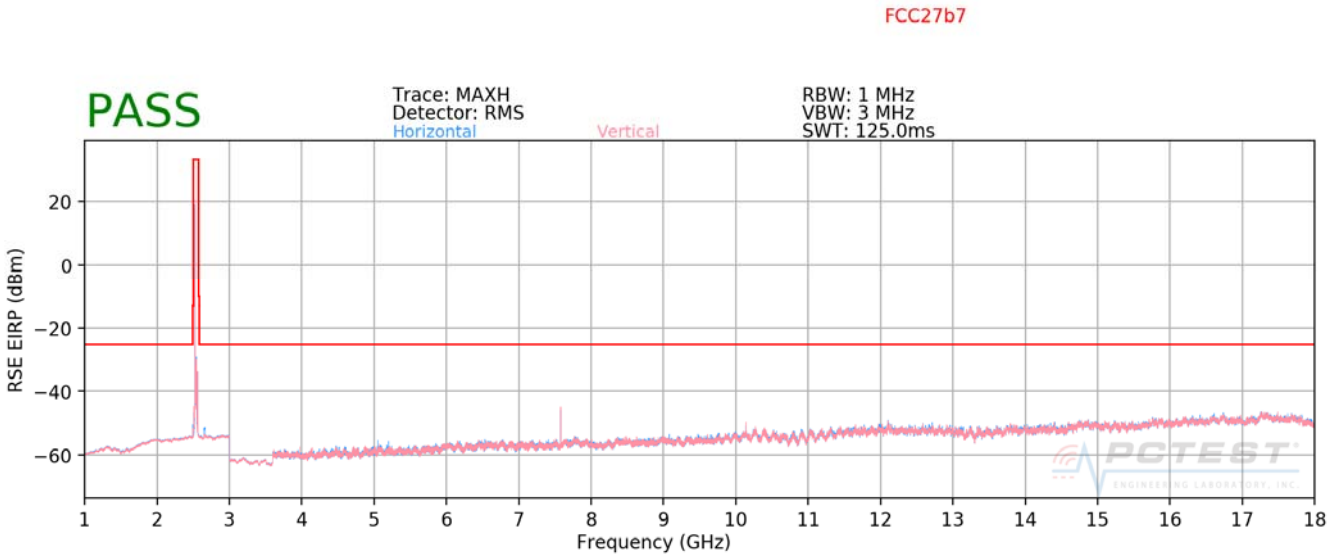
Table 7-22. Radiated Spurious Data (Band 2 – Mid Channel)

OPERATING FREQUENCY:	1902.50	MHz
CHANNEL:	19125	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	15.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

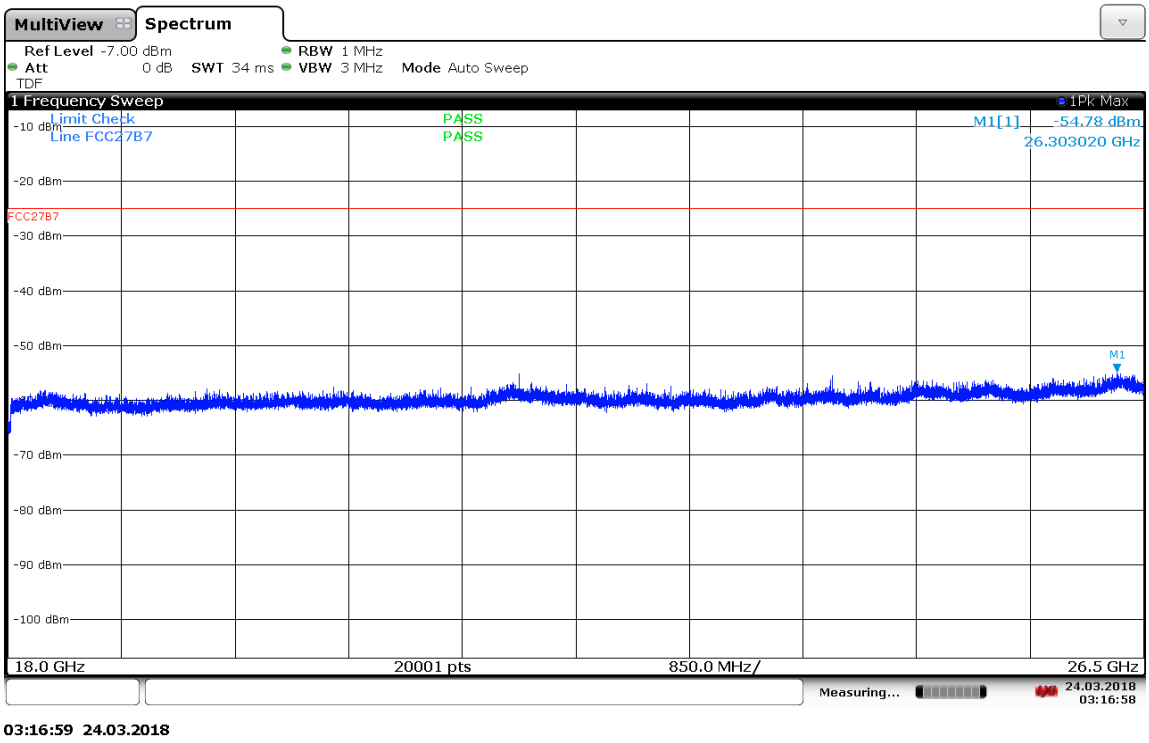
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3805.00	H	100	38	-59.94	9.33	-50.60	-37.6
5707.50	H	103	108	-72.00	11.31	-60.69	-47.7
7610.00	H	-	-	-69.68	11.23	-58.45	-45.5
9512.50	H	-	-	-69.64	12.21	-57.43	-44.4

Table 7-23. Radiated Spurious Data (Band 2 – High Channel)

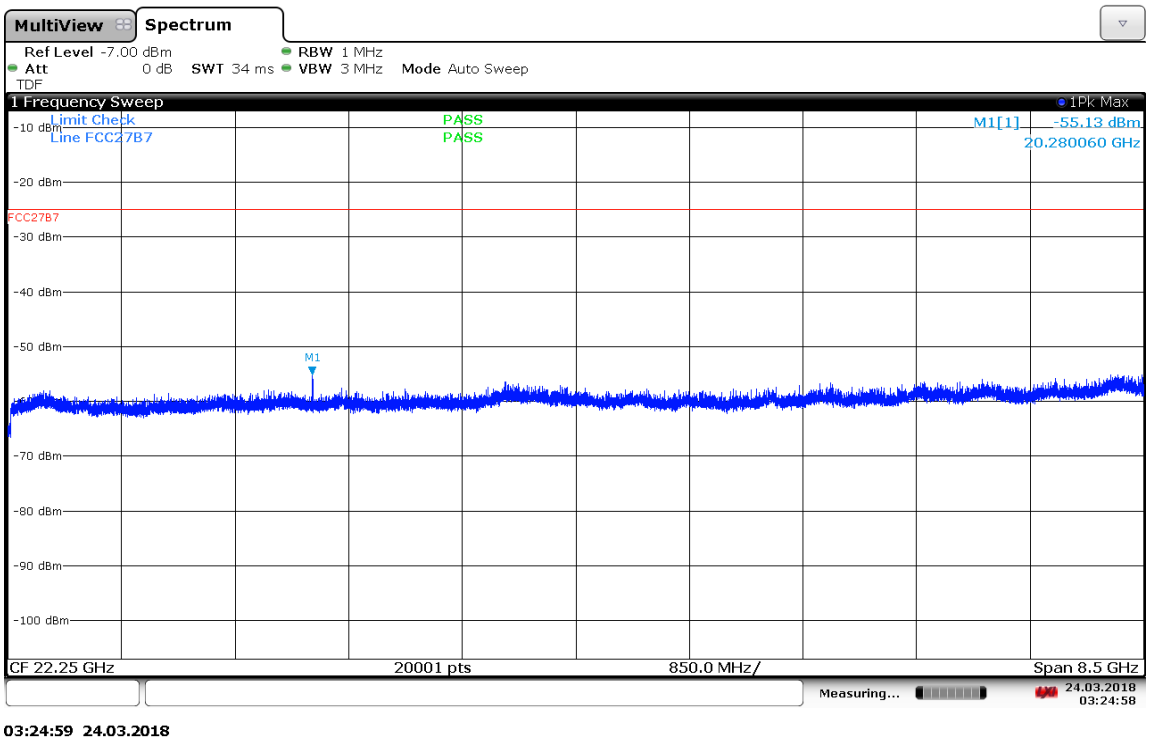
Band 7



Plot 7-222. Radiated Spurious Plot 1GHz - 18GHz (Band 7)



Plot 7-223. Radiated Spurious Plot 18GHz – 26.5GHz (Band 7) – Horizontal



Plot 7-224. Radiated Spurious Plot 18GHz – 26.5GHz (Band 7) – Vertical

OPERATING FREQUENCY:	2510.00	MHz
CHANNEL:	20850	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	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]
5020.00	V	115	355	-66.51	11.09	-55.42	-30.4
7530.00	V	100	318	-49.04	11.05	-37.99	-13.0
10040.00	V	394	7	-65.49	12.18	-53.31	-28.3
12550.00	V	-	-	-67.41	12.80	-54.61	-29.6

Table 7-24. Radiated Spurious Data (Band 7 – Low Channel)

OPERATING FREQUENCY:	2535.00	MHz
CHANNEL:	21100	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	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	V	117	173	-68.58	10.91	-57.67	-32.7
7605.00	V	100	319	-50.11	11.22	-38.89	-13.9
10140.00	V	261	52	-67.51	12.28	-55.23	-30.2
12675.00	V	-	-	-66.61	12.91	-53.70	-28.7

Table 7-25. Radiated Spurious Data (Band 7 – Mid Channel)

OPERATING FREQUENCY:	2560.00	MHz
CHANNEL:	21350	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	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]
5120.00	V	100	348	-71.32	10.84	-60.48	-35.5
7680.00	V	100	316	-53.11	11.34	-41.77	-16.8
10240.00	V	325	12	-65.78	12.42	-53.37	-28.4
12800.00	V	-	-	-66.90	12.91	-53.99	-29.0

Table 7-26. 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 71 Frequency Stability Measurements

OPERATING FREQUENCY:	680,500,000	Hz
CHANNEL:	133297	
REFERENCE VOLTAGE:	3.85	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	680,499,804	-196	-0.0000288
100 %		- 30	680,500,079	79	0.0000116
100 %		- 20	680,500,444	444	0.0000652
100 %		- 10	680,500,045	45	0.0000066
100 %		0	680,499,859	-141	-0.0000207
100 %		+ 10	680,499,892	-108	-0.0000159
100 %		+ 20	680,499,756	-244	-0.0000359
100 %		+ 30	680,500,165	165	0.0000242
100 %		+ 40	680,499,926	-74	-0.0000109
100 %		+ 50	680,499,898	-102	-0.0000150
BATT. ENDPOINT	3.45	+ 20	680,499,926	-74	-0.0000109

Table 7-27. Frequency Stability Data (Band 71)

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 71 Frequency Stability Measurements

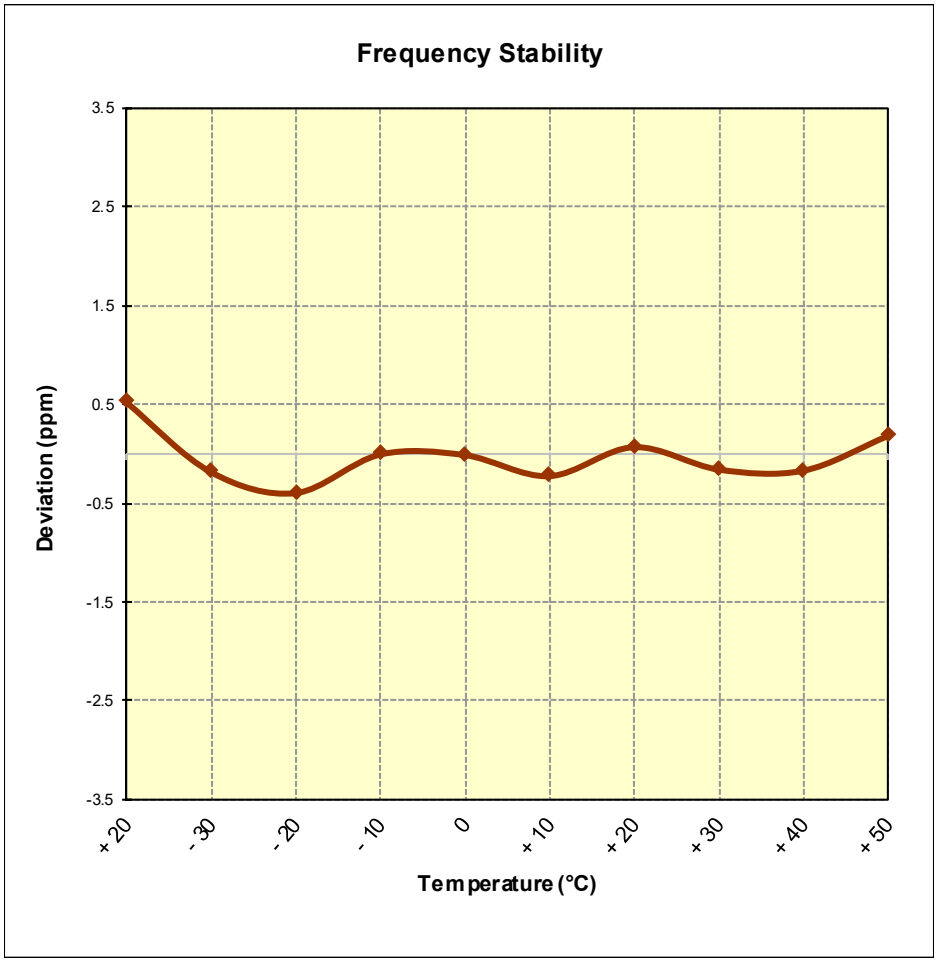


Figure 7-8. Frequency Stability Graph (Band 71)

Band 12 Frequency Stability Measurements

OPERATING FREQUENCY:	707,500,000	Hz
CHANNEL:	23790	
REFERENCE VOLTAGE:	3.85	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	707,500,373	373	0.0000527
100 %		- 30	707,499,873	-127	-0.0000180
100 %		- 20	707,499,723	-277	-0.0000392
100 %		- 10	707,499,998	-2	-0.0000003
100 %		0	707,499,994	-6	-0.0000008
100 %		+ 10	707,499,844	-156	-0.0000220
100 %		+ 20	707,500,051	51	0.0000072
100 %		+ 30	707,499,891	-109	-0.0000154
100 %		+ 40	707,499,883	-117	-0.0000165
100 %		+ 50	707,500,130	130	0.0000184
BATT. ENDPOINT	3.45	+ 20	707,500,080	80	0.0000113

Table 7-28. 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

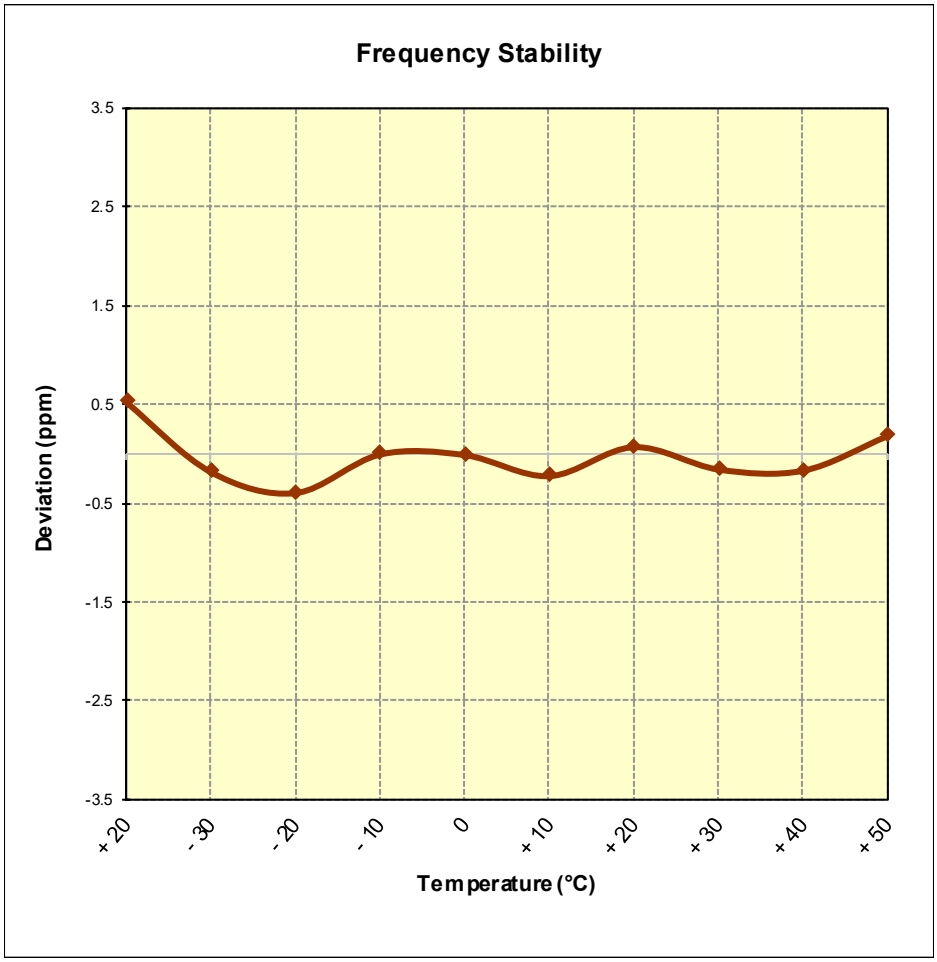


Figure 7-9. Frequency Stability Graph (Band 12)

Band 5 Frequency Stability Measurements

OPERATING FREQUENCY:	836,500,000	Hz
CHANNEL:	20525	
REFERENCE VOLTAGE:	3.85	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	836,499,733	-267	-0.0000319
100 %		- 30	836,499,871	-129	-0.0000154
100 %		- 20	836,500,316	316	0.0000378
100 %		- 10	836,500,164	164	0.0000196
100 %		0	836,499,898	-102	-0.0000122
100 %		+ 10	836,499,940	-60	-0.0000072
100 %		+ 20	836,499,957	-43	-0.0000051
100 %		+ 30	836,500,044	44	0.0000053
100 %		+ 40	836,500,371	371	0.0000444
100 %		+ 50	836,499,948	-52	-0.0000062
BATT. ENDPOINT	3.45	+ 20	836,500,177	177	0.0000212

Table 7-29. Frequency Stability Data (Band 5)

Band 5 Frequency Stability Measurements

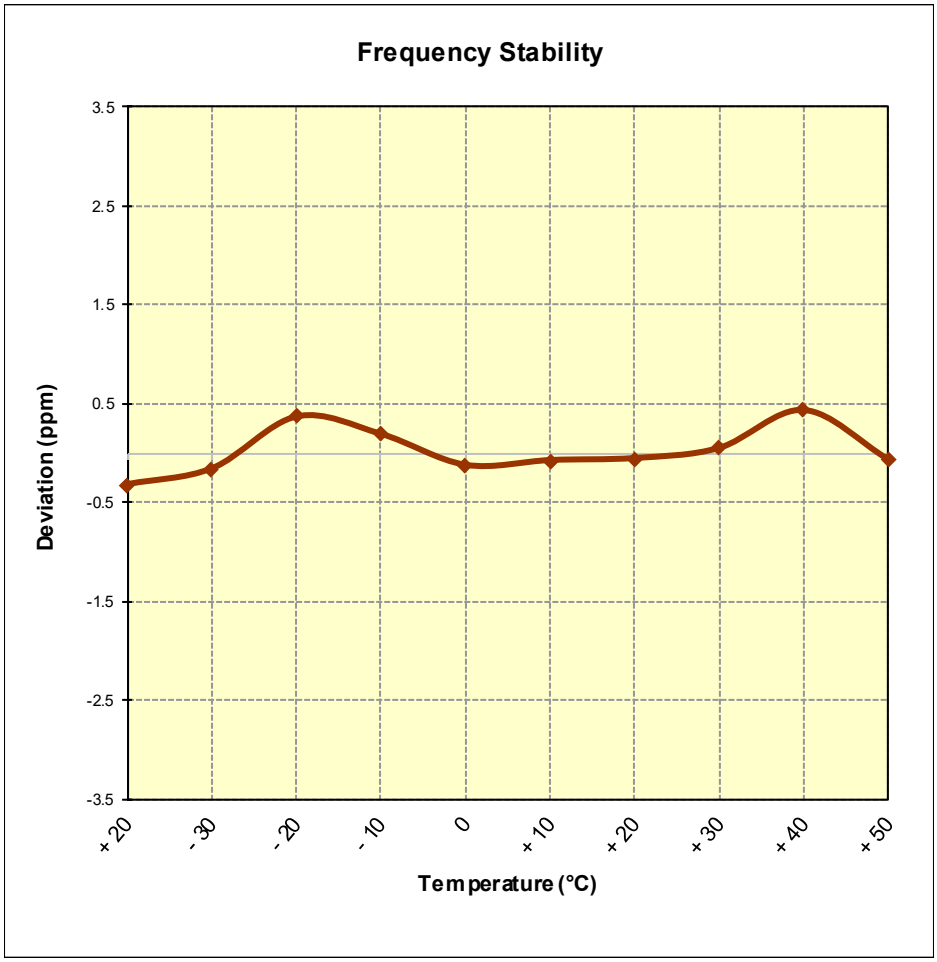


Figure 7-10. Frequency Stability Graph (Band 5)

Band 66/4Frequency Stability Measurements

OPERATING FREQUENCY:	1,745,000,000	Hz
CHANNEL:	132322	
REFERENCE VOLTAGE:	3.85	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	1,745,000,025	25	0.0000014
100 %		- 30	1,745,000,408	408	0.0000234
100 %		- 20	1,745,000,105	105	0.0000060
100 %		- 10	1,744,999,798	-202	-0.0000116
100 %		0	1,745,000,089	89	0.0000051
100 %		+ 10	1,745,000,407	407	0.0000233
100 %		+ 20	1,744,999,894	-106	-0.0000061
100 %		+ 30	1,744,999,867	-133	-0.0000076
100 %		+ 40	1,744,999,701	-299	-0.0000171
100 %		+ 50	1,744,999,711	-289	-0.0000166
BATT. ENDPOINT	3.45	+ 20	1,745,000,106	106	0.0000061

Table 7-30. 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 66/4Frequency Stability Measurements

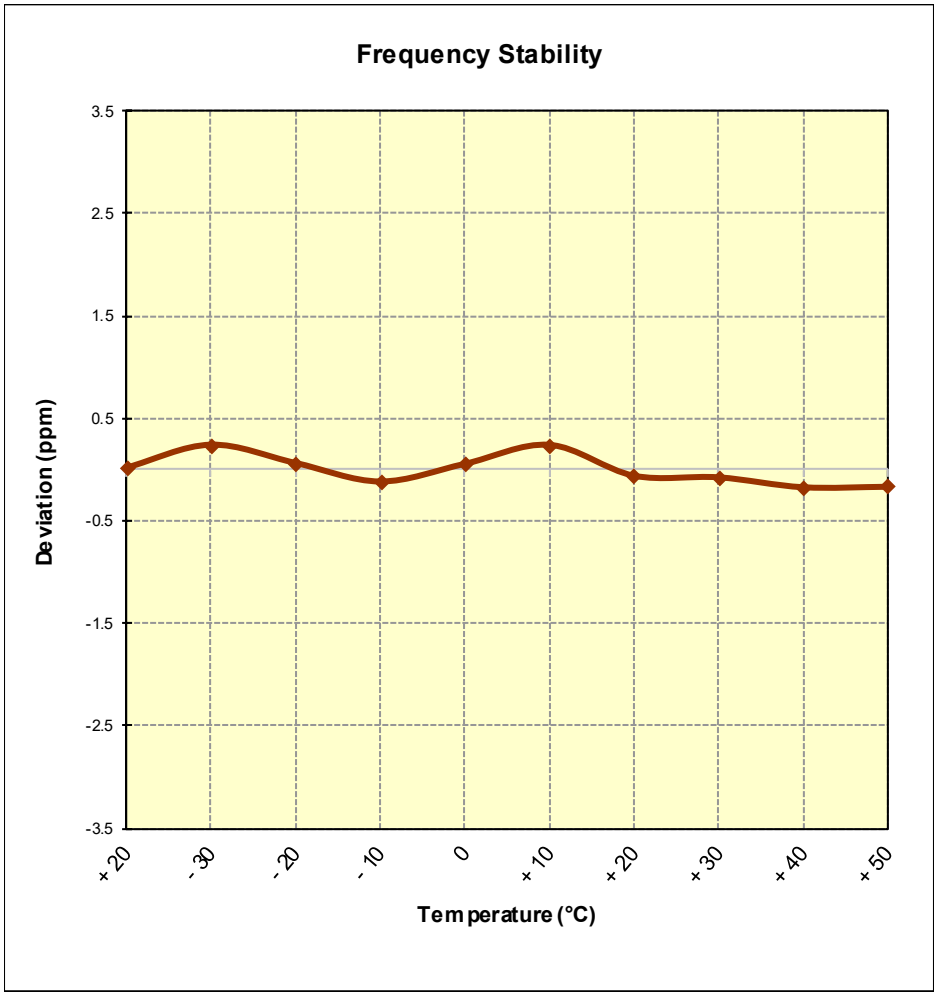


Figure 7-11. Frequency Stability Graph (Band 66/4)

Band 2 Frequency Stability Measurements

OPERATING FREQUENCY:	1,880,000,000	Hz
CHANNEL:	18900	
REFERENCE VOLTAGE:	3.85	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	1,879,999,921	-79	-0.0000042
100 %		- 30	1,879,999,934	-66	-0.0000035
100 %		- 20	1,879,999,949	-51	-0.0000027
100 %		- 10	1,879,999,972	-28	-0.0000015
100 %		0	1,879,999,999	-1	-0.0000001
100 %		+ 10	1,879,999,752	-248	-0.0000132
100 %		+ 20	1,880,000,409	409	0.0000218
100 %		+ 30	1,880,000,019	19	0.0000010
100 %		+ 40	1,880,000,310	310	0.0000165
100 %		+ 50	1,879,999,969	-31	-0.0000016
BATT. ENDPOINT	3.45	+ 20	1,880,000,076	76	0.0000040

Table 7-31. Frequency Stability Data (Band 2)

Band 2 Frequency Stability Measurements

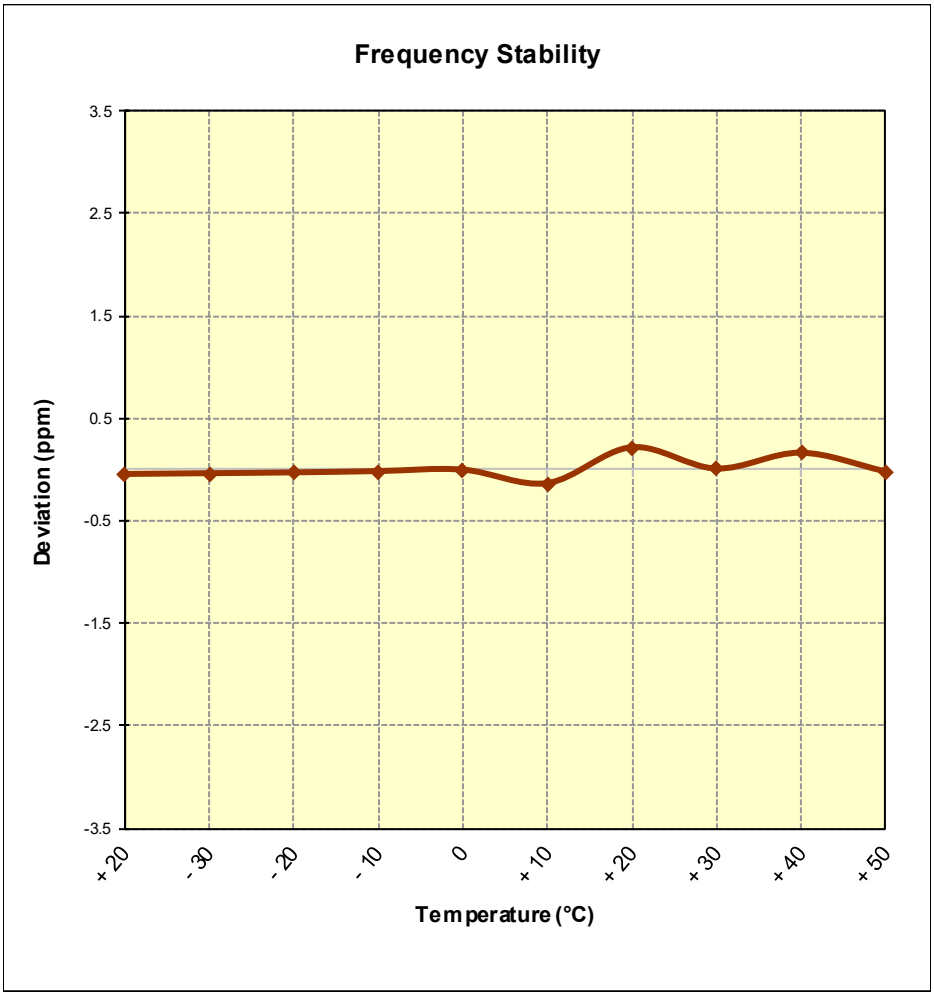


Figure 7-12. Frequency Stability Graph (Band 2)

Band 7 Frequency Stability Measurements

OPERATING FREQUENCY:	2,535,000,000	Hz
CHANNEL:	21100	
REFERENCE VOLTAGE:	3.85	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	2,535,000,059	59	0.0000023
100 %		- 30	2,534,999,895	-105	-0.0000041
100 %		- 20	2,534,999,975	-25	-0.0000010
100 %		- 10	2,535,000,069	69	0.0000027
100 %		0	2,534,999,812	-188	-0.0000074
100 %		+ 10	2,534,999,822	-178	-0.0000070
100 %		+ 20	2,534,999,624	-376	-0.0000148
100 %		+ 30	2,534,999,953	-47	-0.0000019
100 %		+ 40	2,534,999,900	-100	-0.0000039
100 %		+ 50	2,535,000,041	41	0.0000016
BATT. ENDPOINT	3.45	+ 20	2,535,000,049	49	0.0000019

Table 7-32. 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

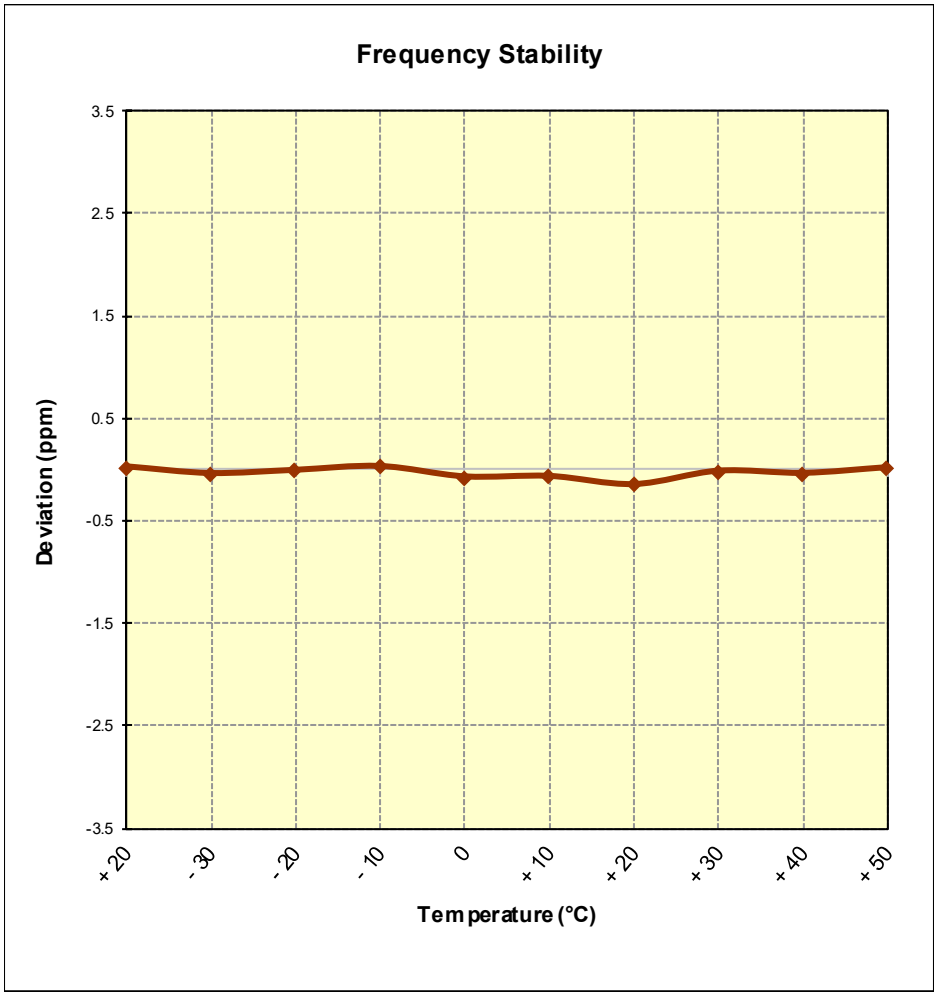


Figure 7-13. Frequency Stability Graph (Band 7)

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMJ737T** complies with all the requirements of Part 22, 24, & 27 of the FCC Rules for LTE operation only.