7.4 Band Edge Emissions at Antenna Terminal

§2.1051 §22.917(a) §24.238(a) §27.53(c) §27.53(g) §27.53(h) §27.53(m)

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 for Band 41 is as noted in the Test Notes on the following page.

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

Test Procedure Used

KDB 971168 D01 v02r02 – 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 $\geq$ 1% of the emission bandwidth
4. VBW $\geq$ 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.

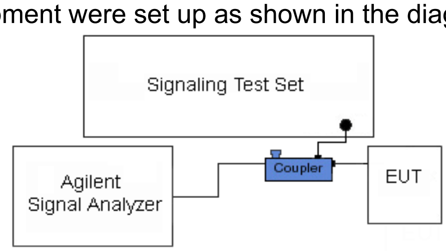


Figure 7-3. Test Instrument & Measurement Setup

Test Notes

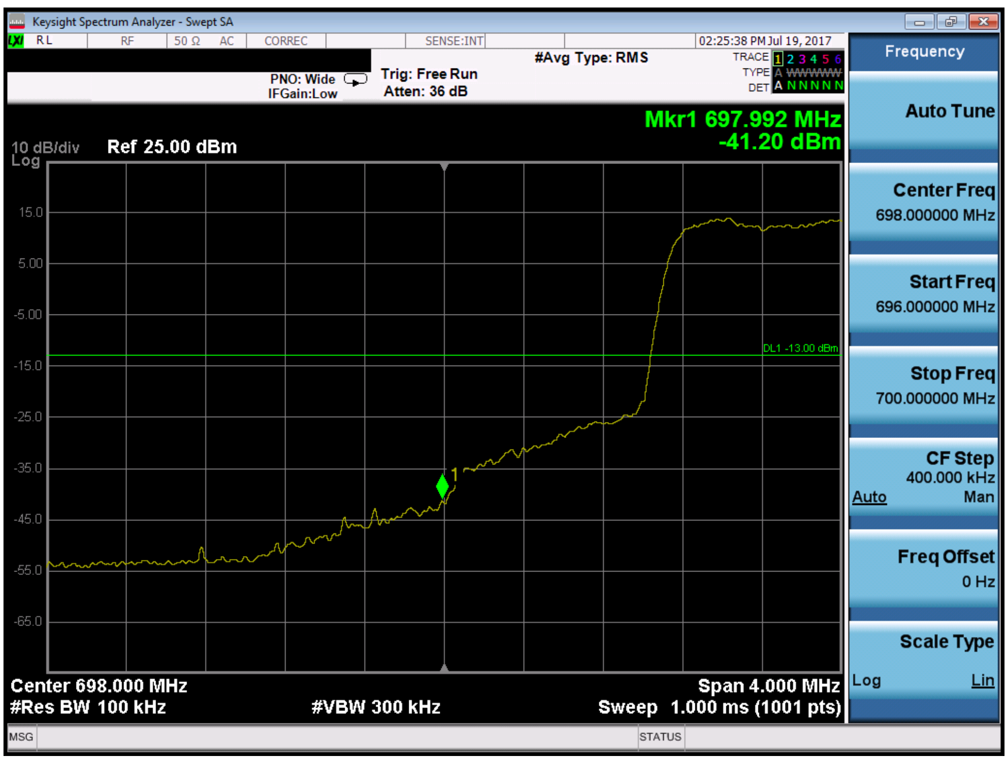
Per 22.917(b) 24.238(a) 27.53(h) in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions 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(c.5) for operations in the 776-788 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.

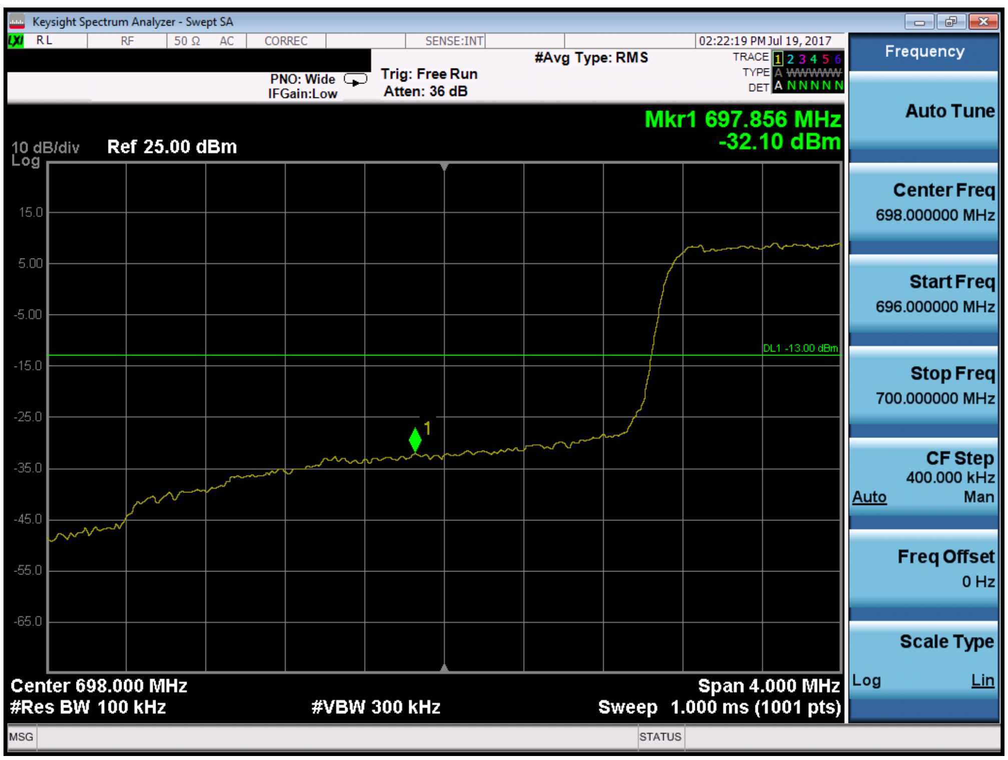
For all plots showing emissions in the 763 – 775MHz and 793 – 805MHz band, the FCC limit per 27.53(c.4) is 65 + $10\log_{10}(P)$ = -35dBm in a 6.25kHz bandwidth.

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.



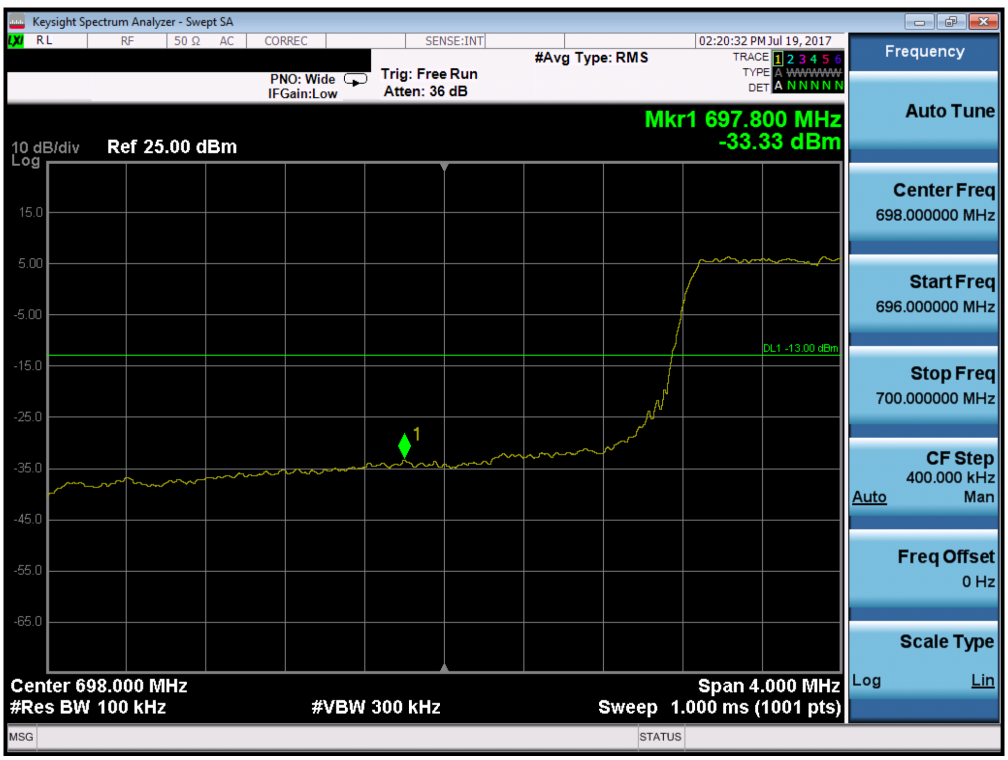
Plot 7-109. Lower Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)

Plot 7-110. Upper Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)



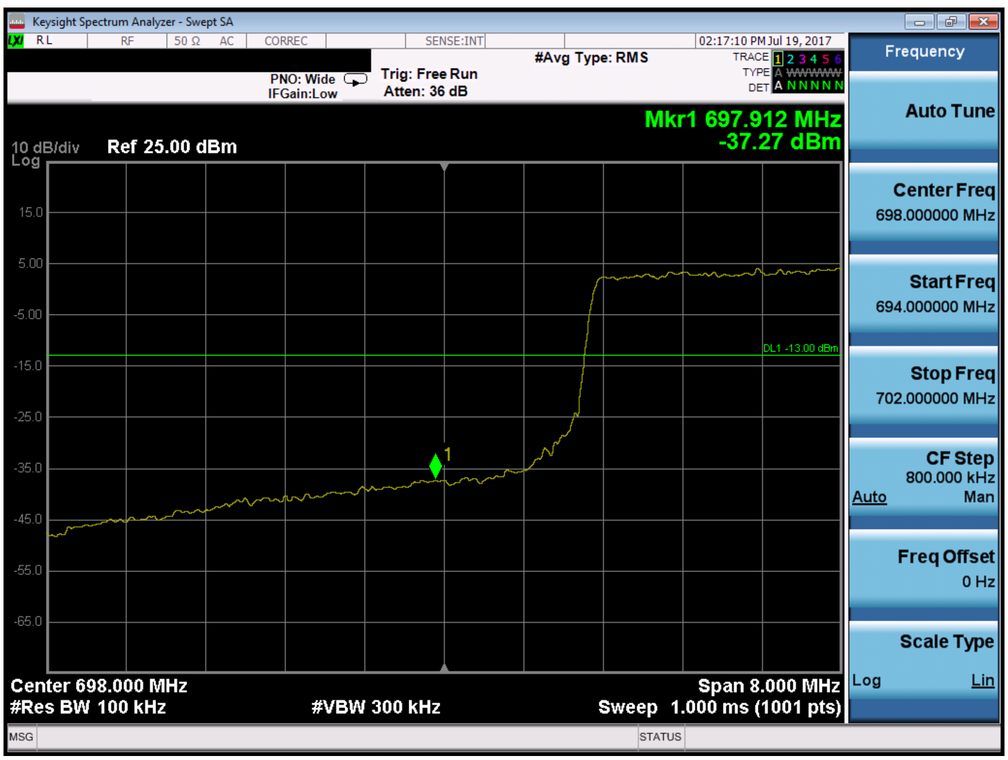
Plot 7-111. Lower Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

Plot 7-112. Upper Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

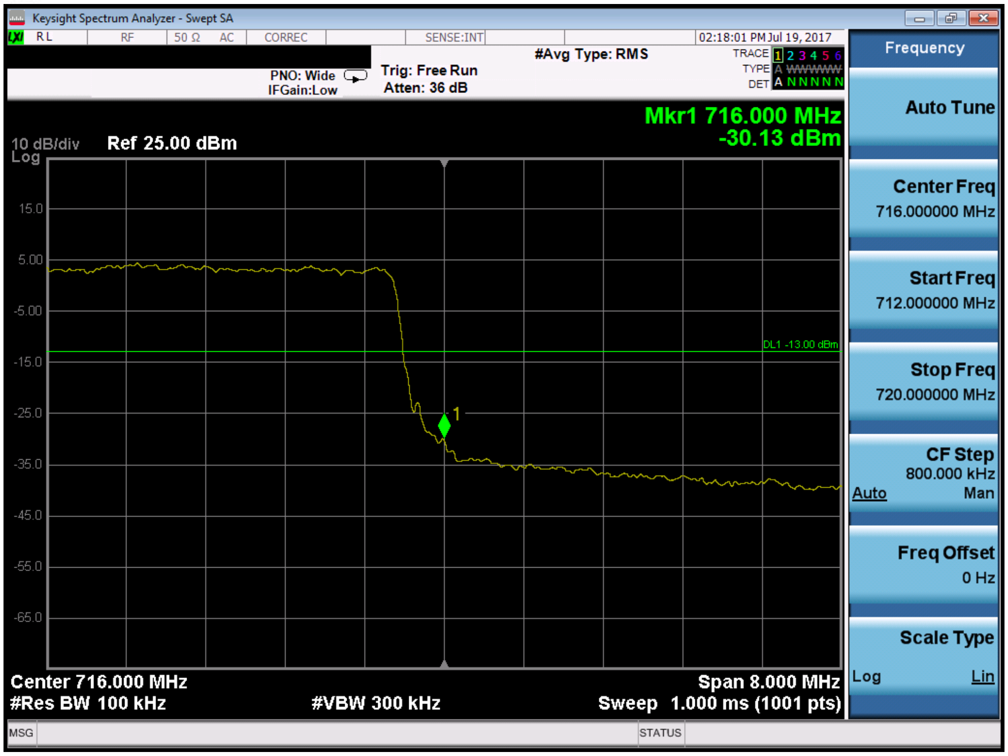


Plot 7-113. Lower Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)

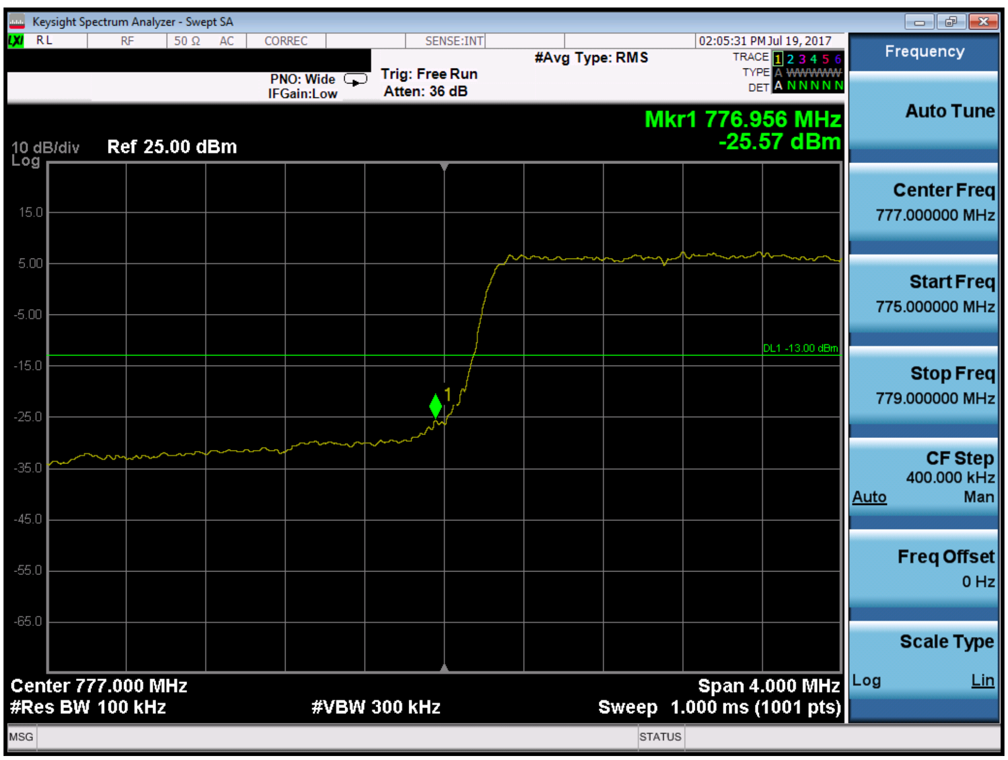
Plot 7-114. Upper Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)



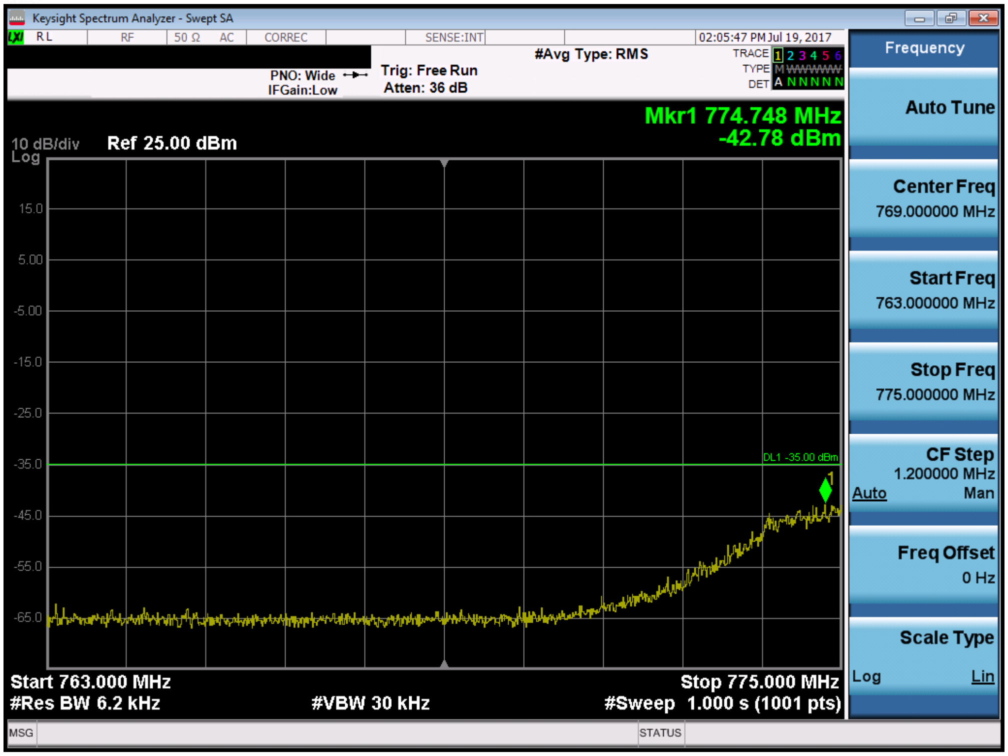
Plot 7-115. Lower Band Edge Plot (Band 12 – 10.0MHz QPSK – RB Size 50)



Plot 7-116. Upper Band Edge Plot (Band 12 – 10.0MHz QPSK – RB Size 50)

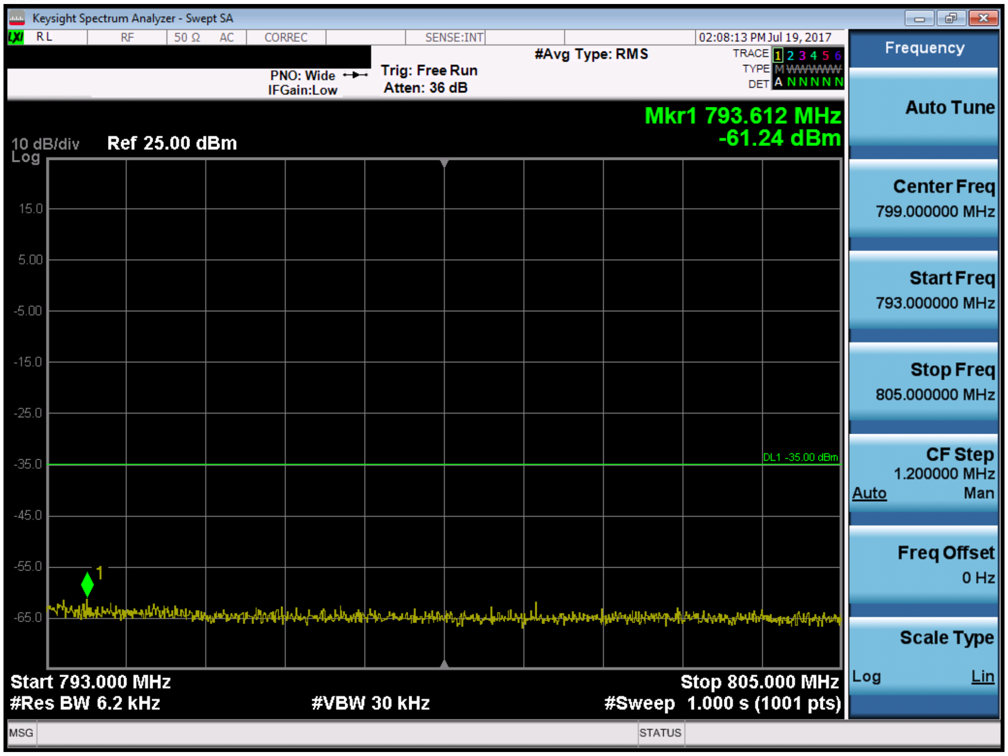


Plot 7-117. Lower Band Edge Plot (Band 13 – 5.0MHz QPSK – RB Size 25)

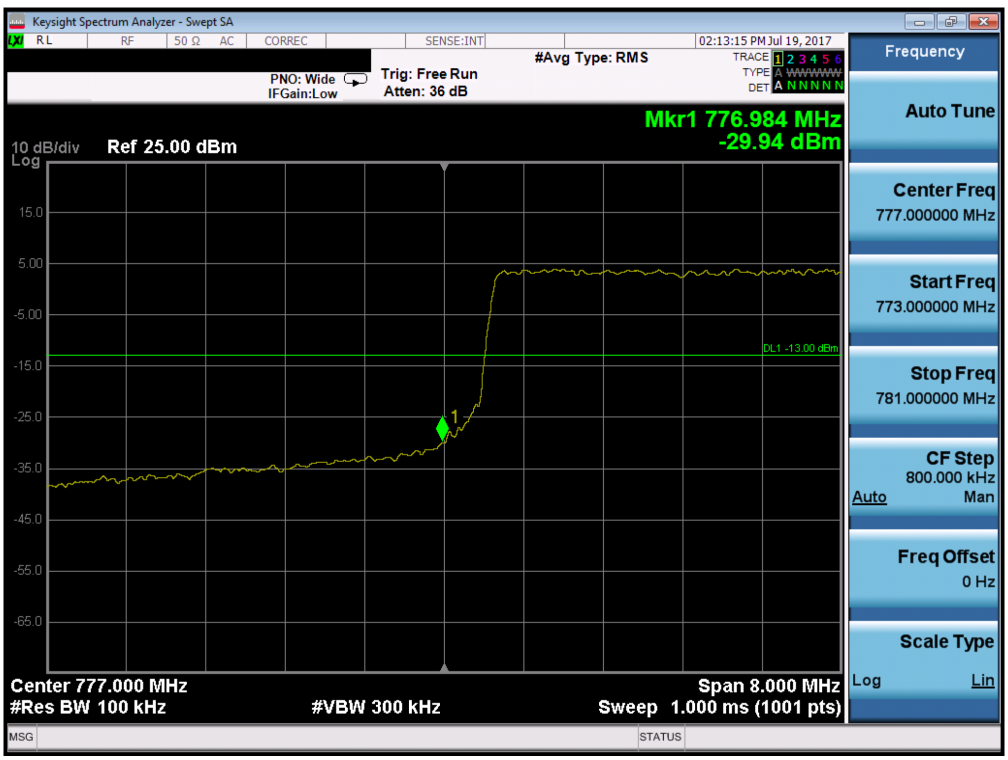


Plot 7-118. Lower Emission Mask Edge Plot (Band 13 – 5.0MHz QPSK – RB Size 25)

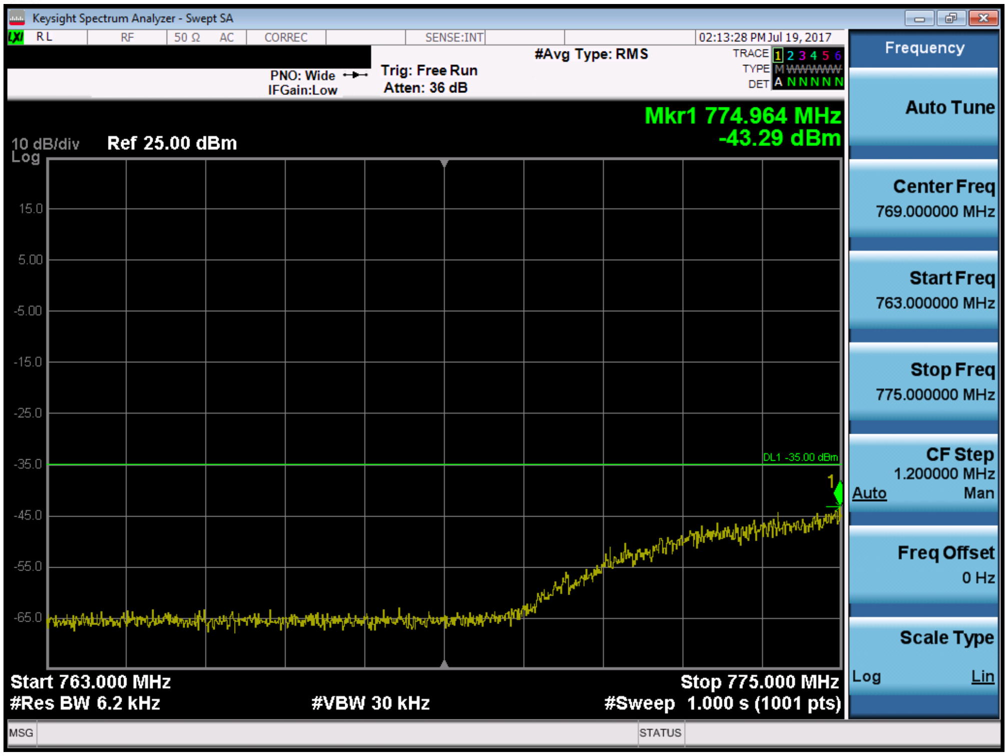
Plot 7-119. Upper Band Edge Plot (Band 13 – 5.0MHz QPSK – RB Size 25)



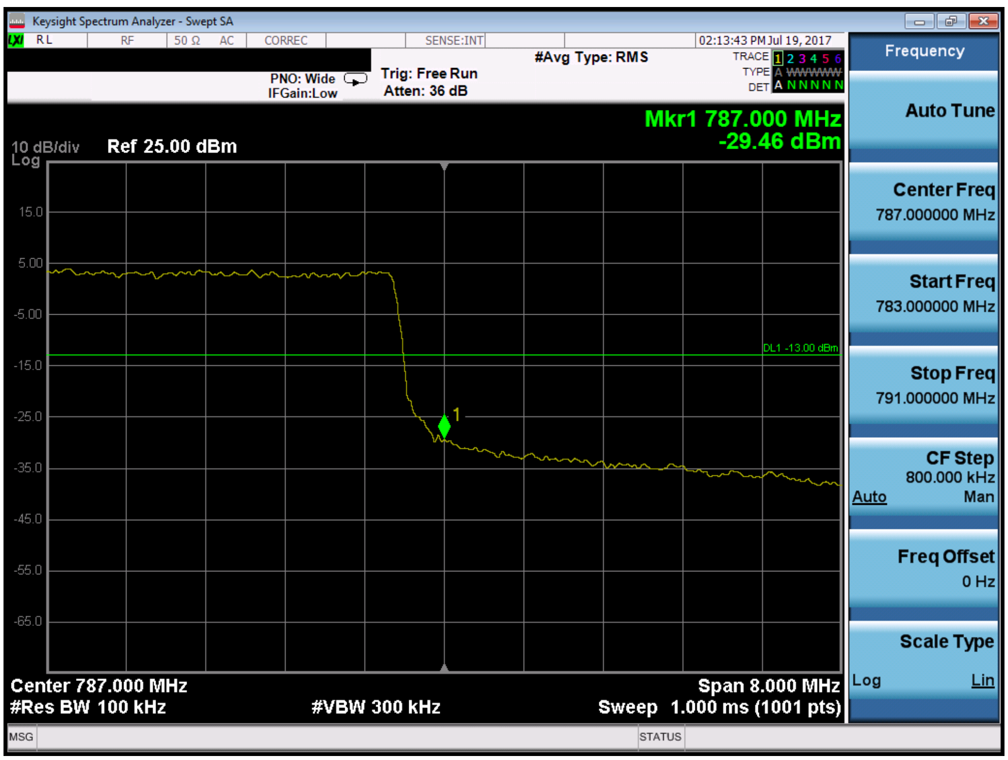
Plot 7-120. Upper Emission Mask Edge Plot (Band 13 – 5.0MHz QPSK – RB Size 25)



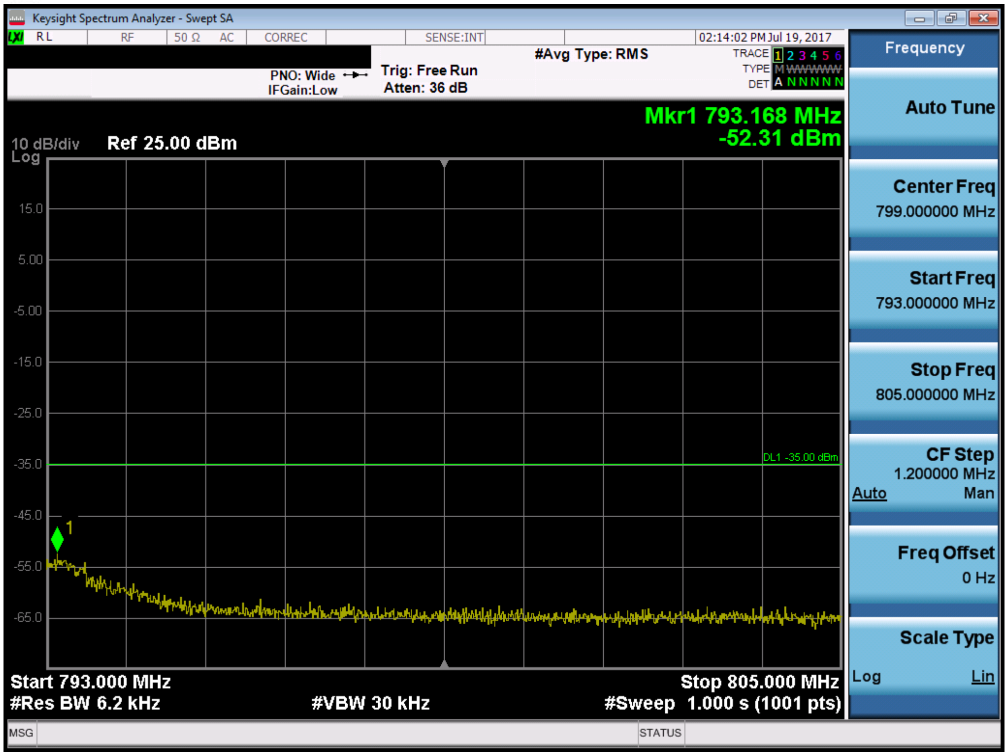
Plot 7-121. Lower Band Edge Plot (Band 13 – 10.0MHz QPSK – RB Size 50)



Plot 7-122. Lower Emission Mask Edge Plot (Band 13 – 10.0MHz QPSK – RB Size 50)



Plot 7-123. Upper Band Edge Plot (Band 13 – 10.0MHz QPSK – RB Size 50)

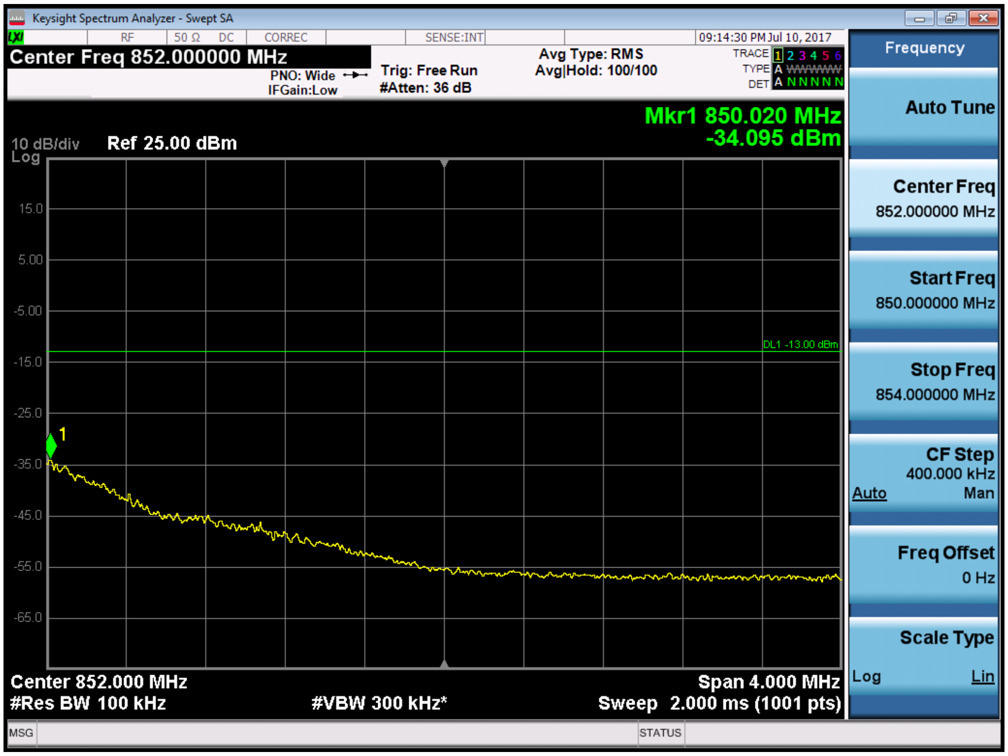


Plot 7-124. Upper Emission Mask Edge Plot (Band 13 – 10.0MHz QPSK – RB Size 50)

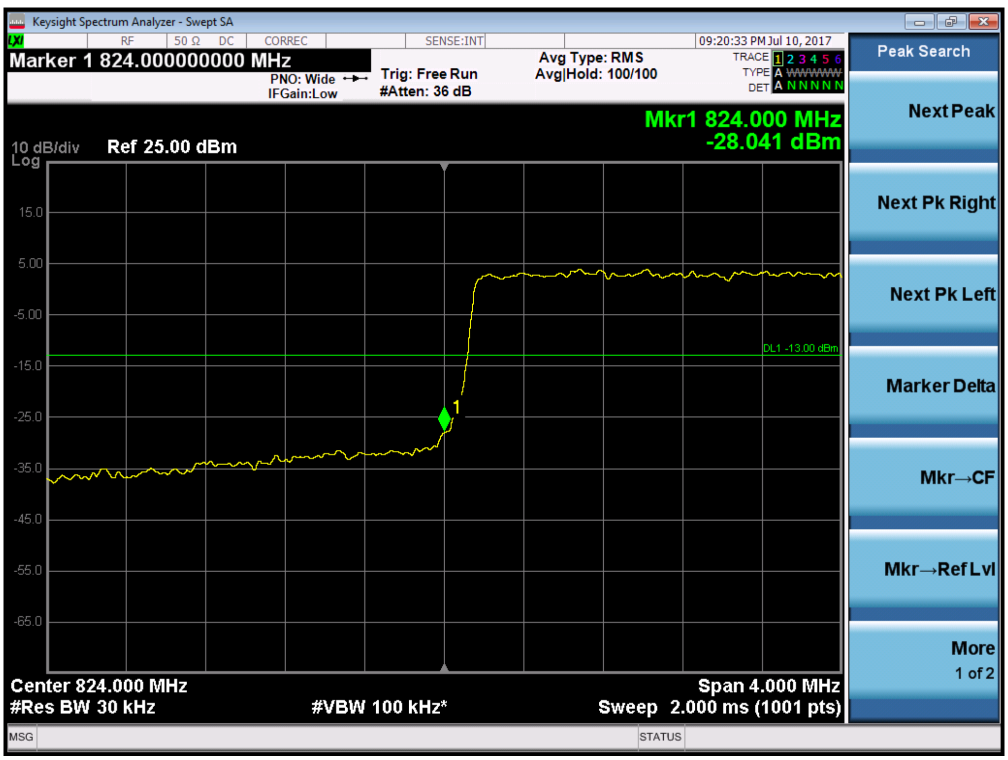
Plot 7-125. Lower Band Edge Plot (Band 26 – 1.4MHz QPSK – RB Size 6)

Plot 7-126. Lower Extended Band Edge Plot (Band 5/26 – 1.4MHz QPSK – RB Size 6)

Plot 7-127. Upper Band Edge Plot (Band 5/26 – 1.4MHz QPSK – RB Size 6)



Plot 7-128. Upper Extended Band Edge Plot (Band 5/26 – 1.4MHz QPSK – RB Size 6)

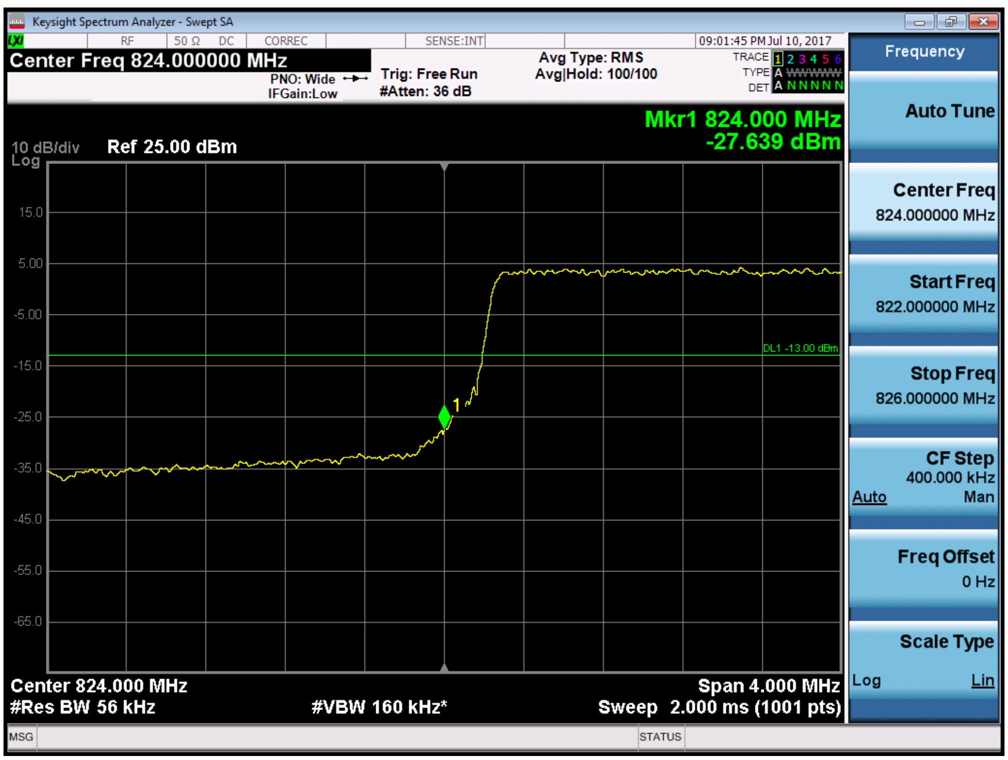


Plot 7-129. Lower Band Edge Plot (Band 5/26 – 3.0MHz QPSK – RB Size 15)

Plot 7-130. Lower Extended Band Edge Plot (Band 5/26 – 3.0MHz QPSK – RB Size 15)

Plot 7-131. Upper Band Edge Plot (Band 5/26 – 3.0MHz QPSK – RB Size 15)

Plot 7-132. Upper Extended Band Edge Plot (Band 5/26 – Band 5 – 3.0MHz QPSK – RB Size 15)

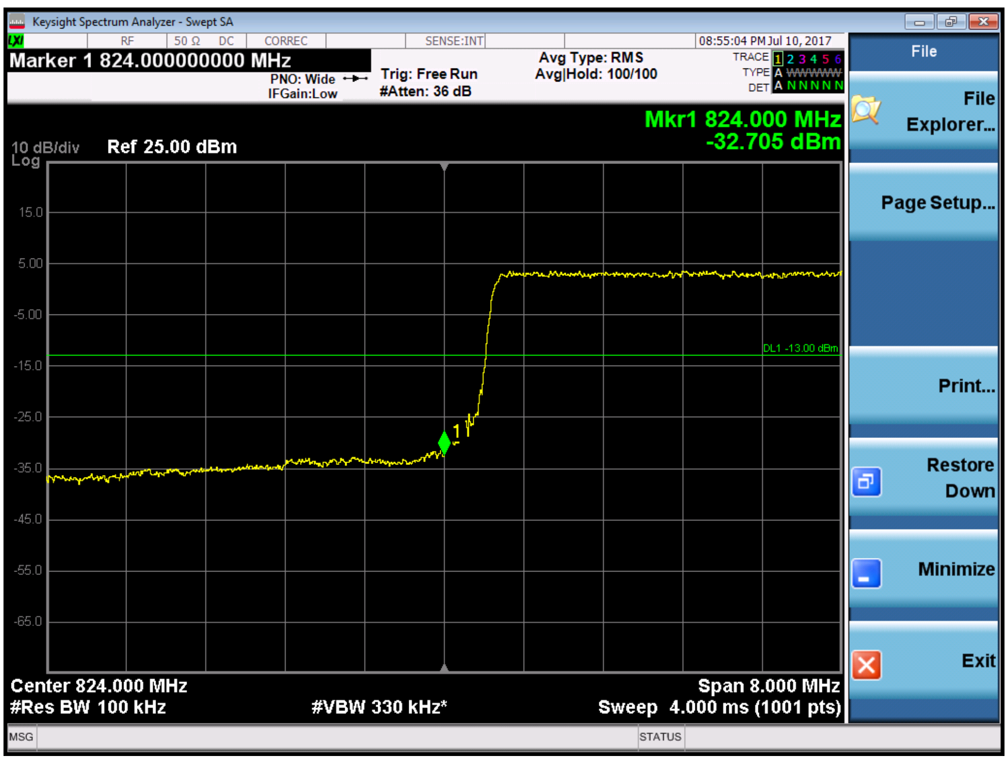


Plot 7-133. Lower Band Edge Plot (Band 5/26 – 5.0MHz QPSK – RB Size 25)

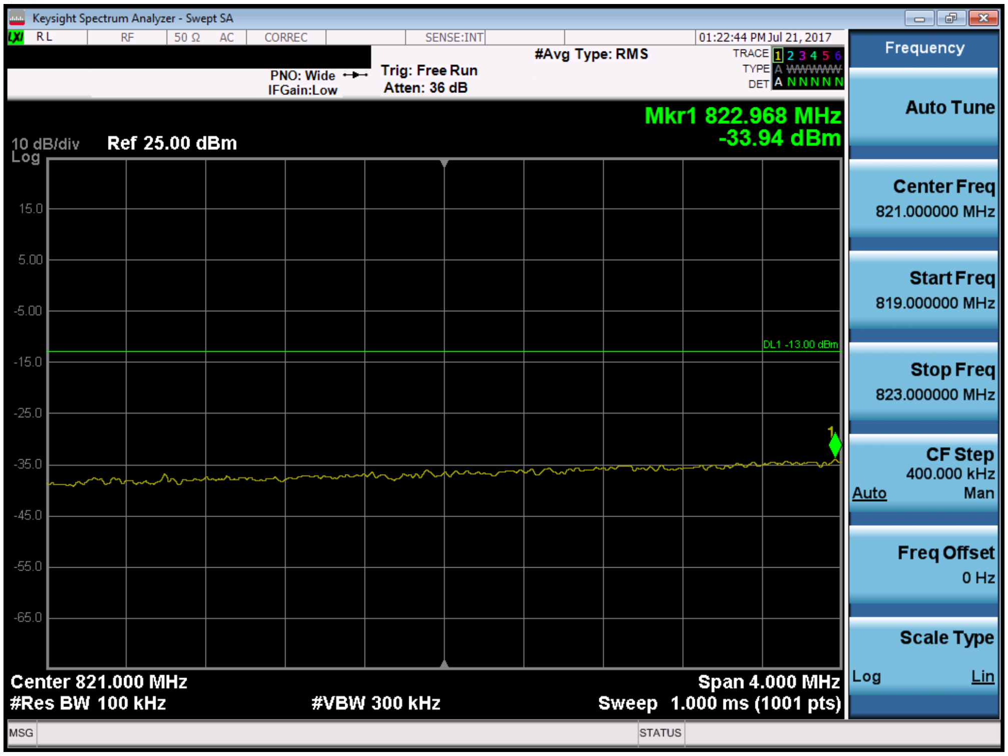
Plot 7-134. Lower Extended Band Edge Plot (Band 5/26 – 5.0MHz QPSK – RB Size 25)

Plot 7-135. Upper Band Edge Plot (Band 5/26 – 5.0MHz QPSK – RB Size 25)

Plot 7-136. Upper Extended Band Edge Plot (Band 5/26 – 5.0MHz QPSK – RB Size 25)

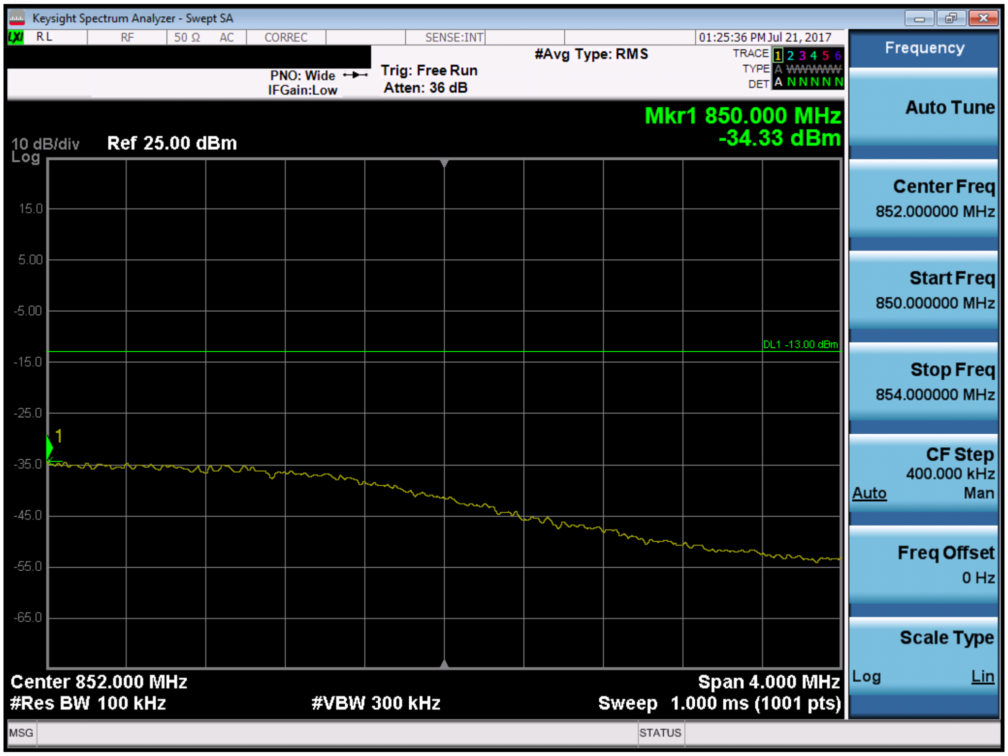


Plot 7-137. Lower Band Edge Plot (Band 5/26 – 10.0MHz QPSK – RB Size 50)

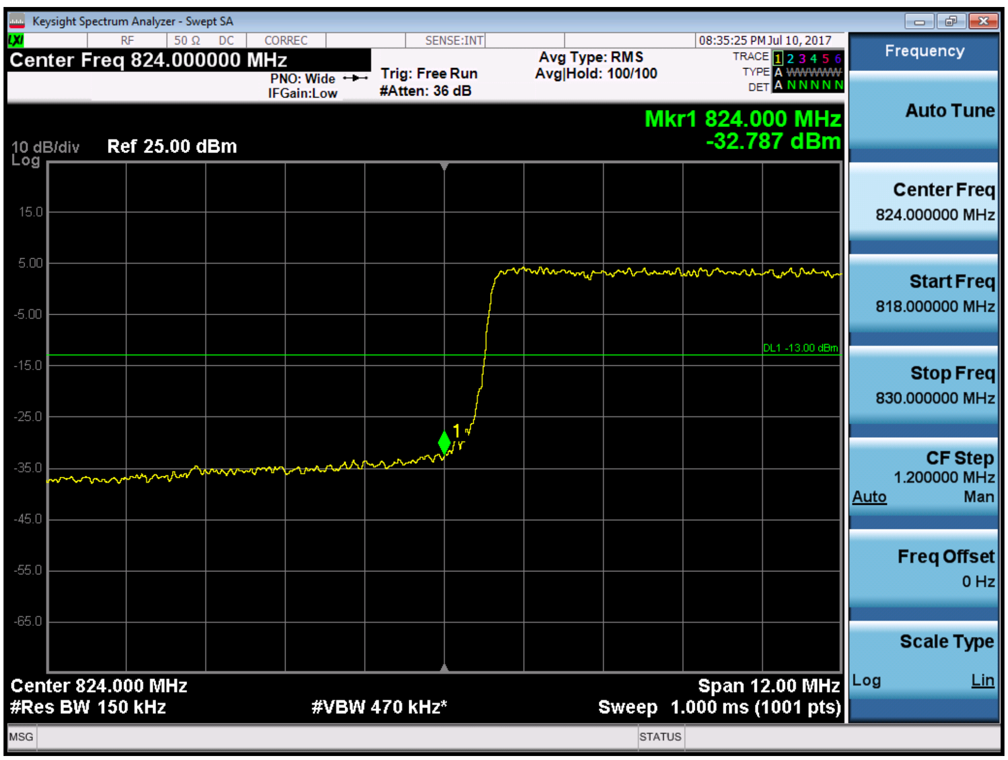


Plot 7-138. Lower Extended Band Edge Plot (Band 5/26 – 10.0MHz QPSK – RB Size 50)

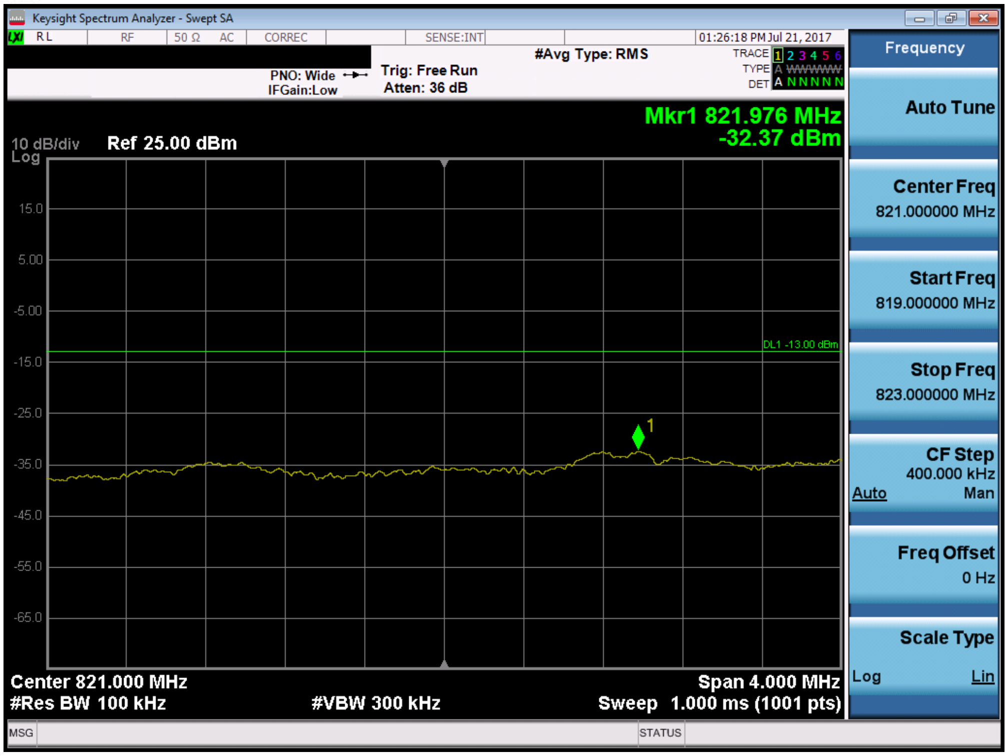
Plot 7-139. Upper Band Edge Plot (Band 5/26 – 10.0MHz QPSK – RB Size 50)



Plot 7-140. Upper Extended Band Edge Plot (Band 5/26 – 10.0MHz QPSK – RB Size 50)



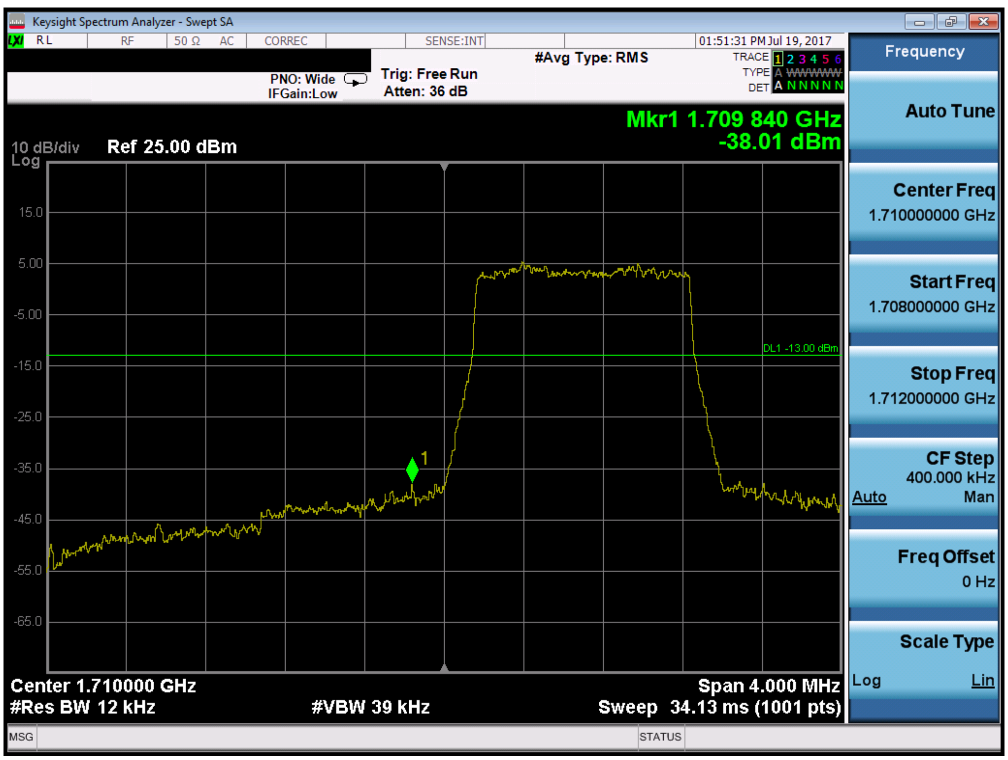
Plot 7-141. Lower Band Edge Plot (Band 26 – 15.0MHz QPSK – RB Size 75)



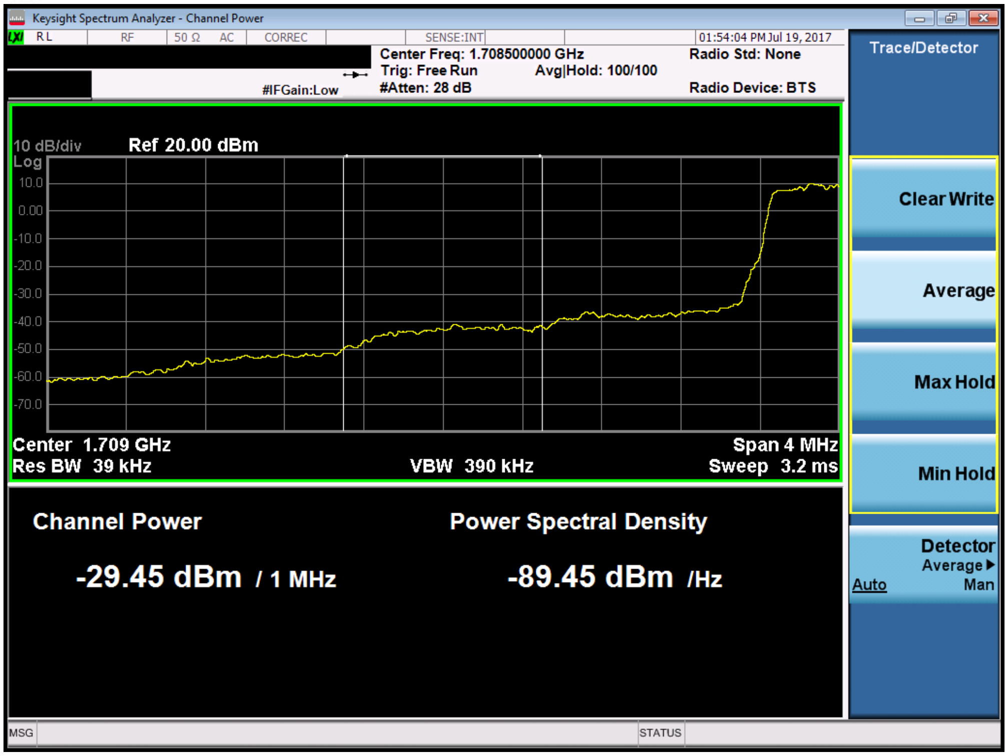
Plot 7-142. Lower Extended Band Edge Plot (Band 26 – 15.0MHz QPSK – RB Size 75)

Plot 7-143. Upper Band Edge Plot (Band 26 – 15.0MHz QPSK – RB Size 75)

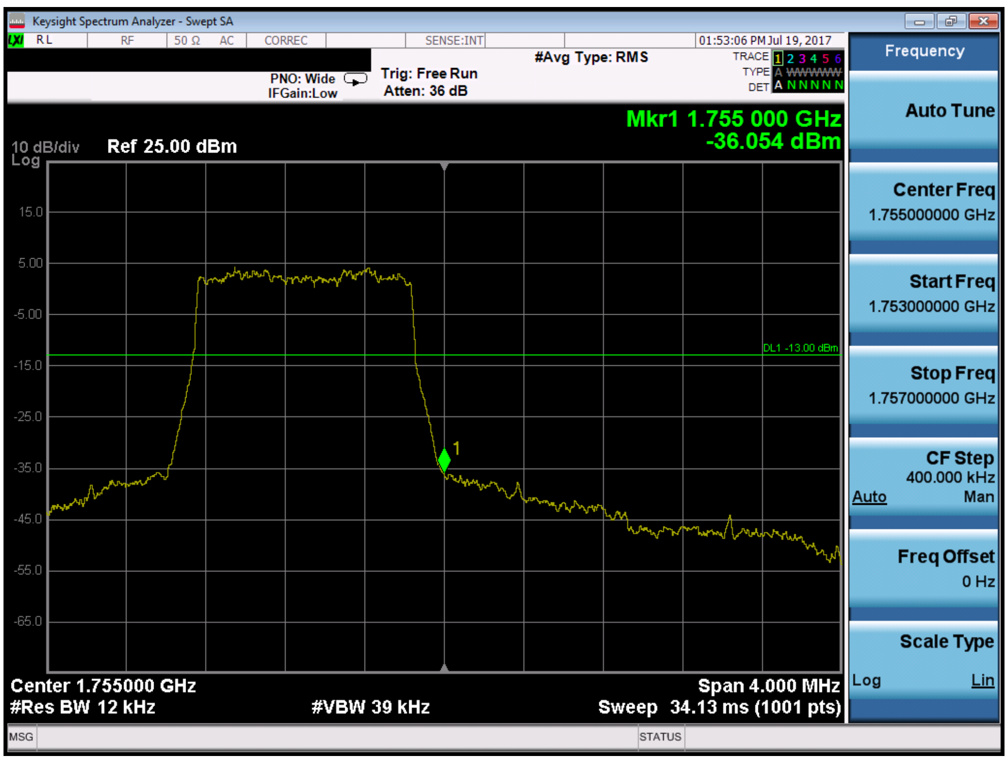
Plot 7-144. Upper Extended Band Edge Plot (Band 26 – 15.0MHz QPSK – RB Size 75)



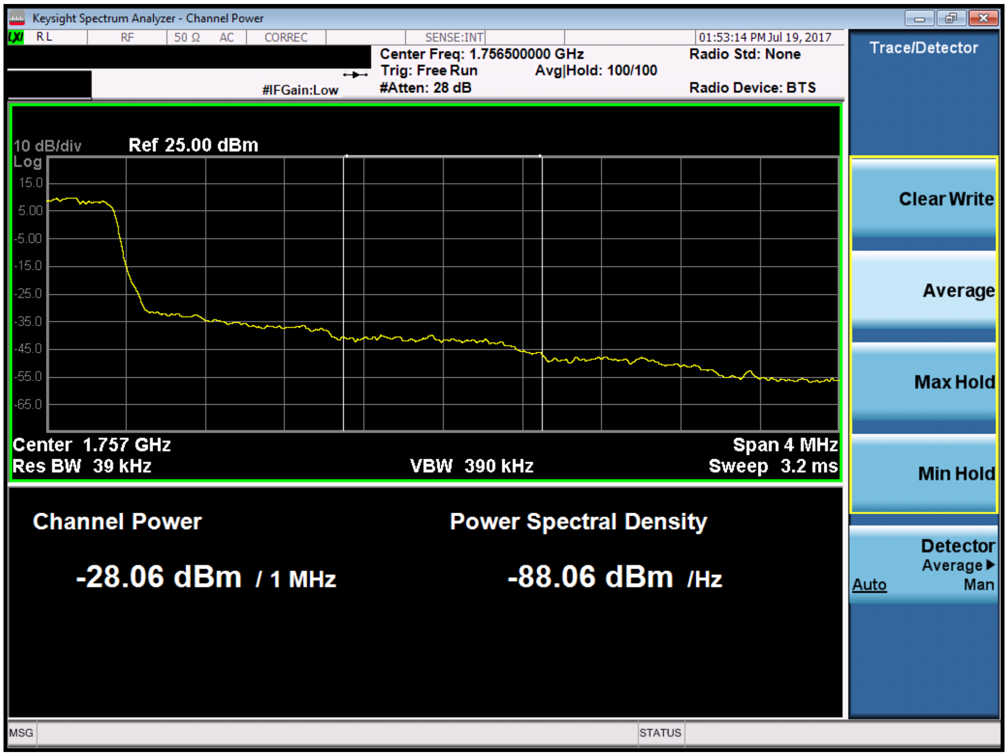
Plot 7-145. Lower Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



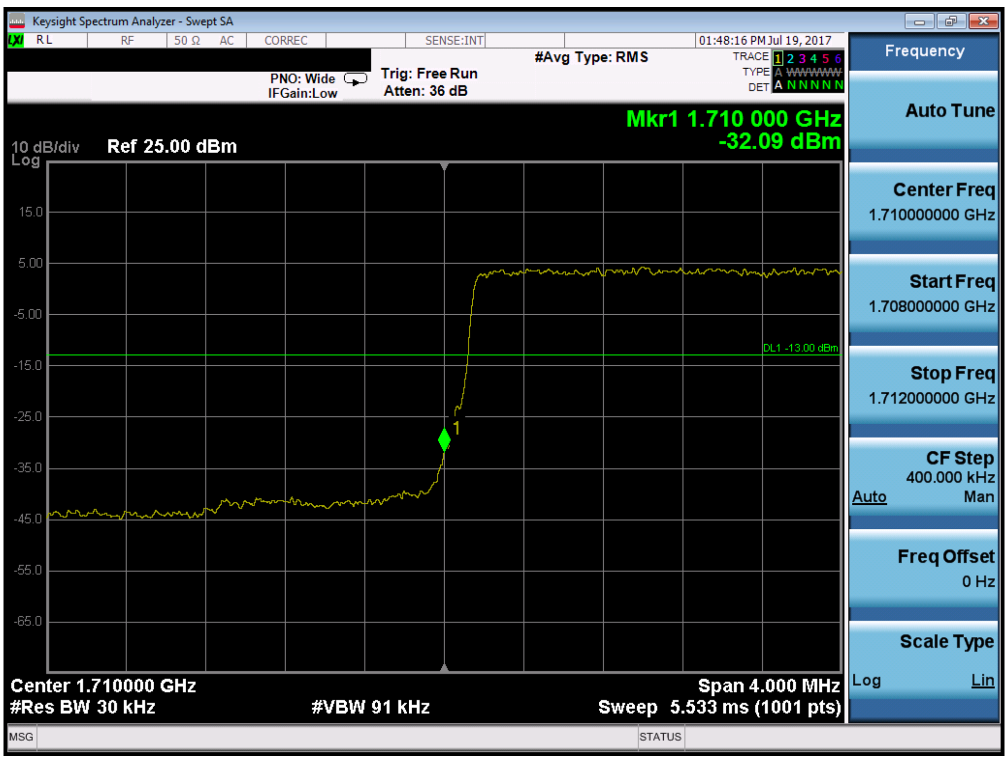
Plot 7-146. Lower Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



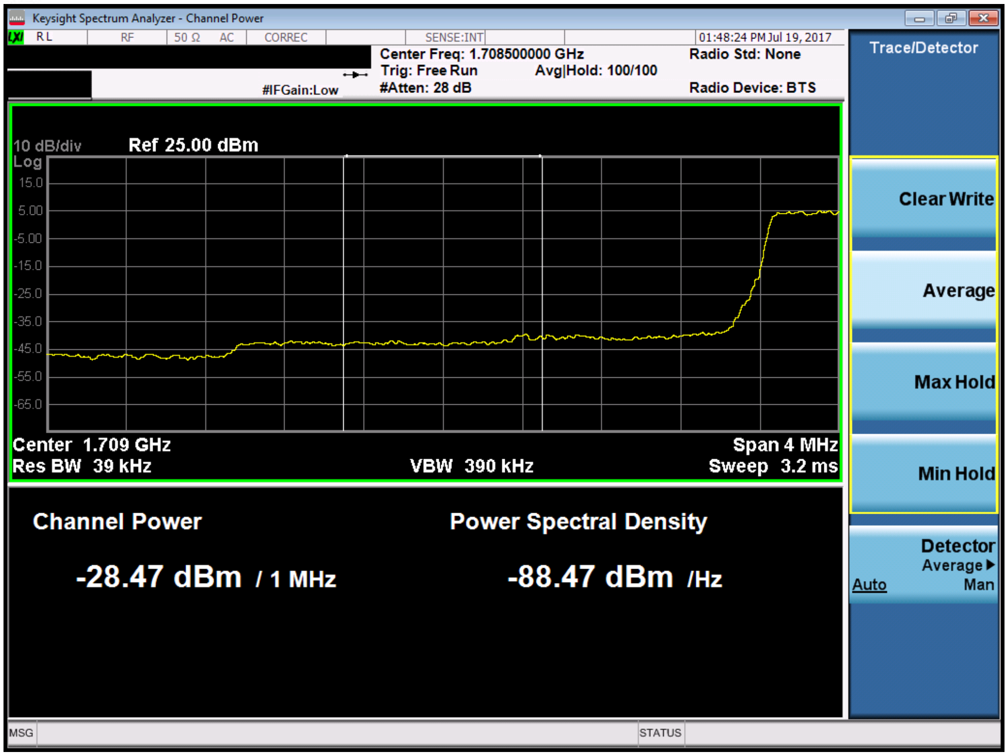
Plot 7-147. Upper Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



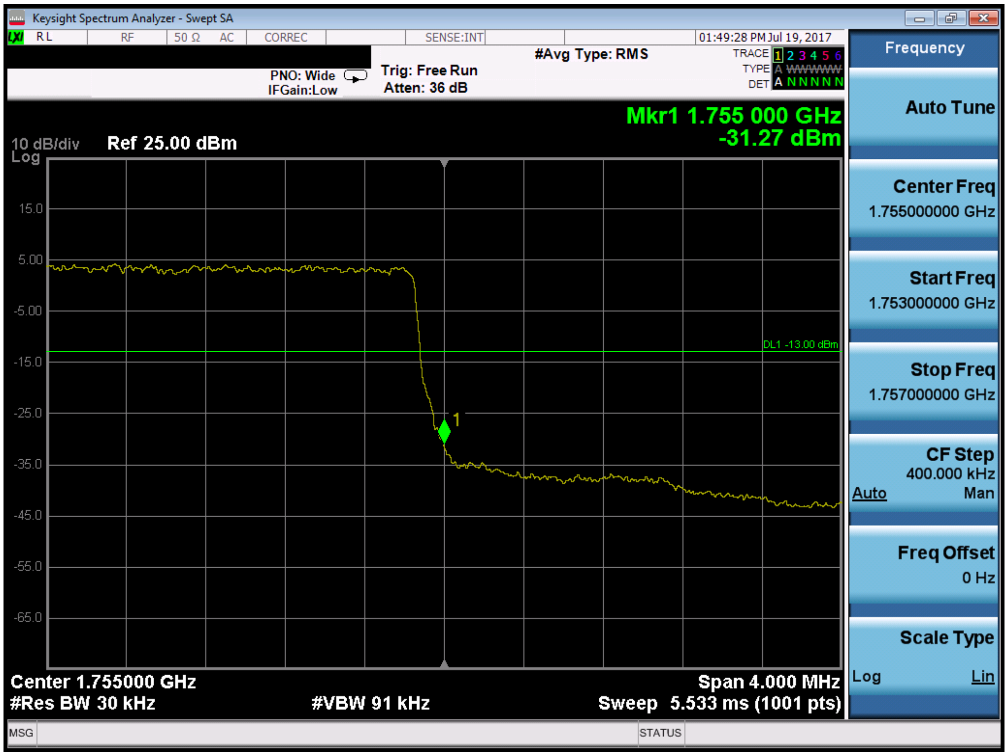
Plot 7-148. Upper Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



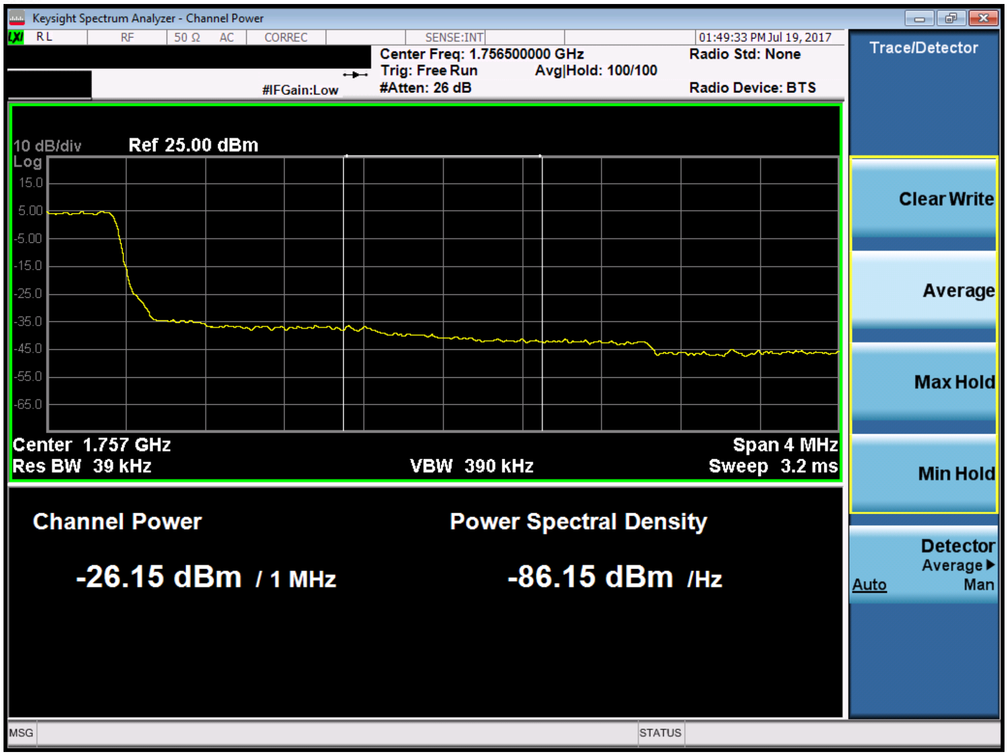
Plot 7-149. Lower Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



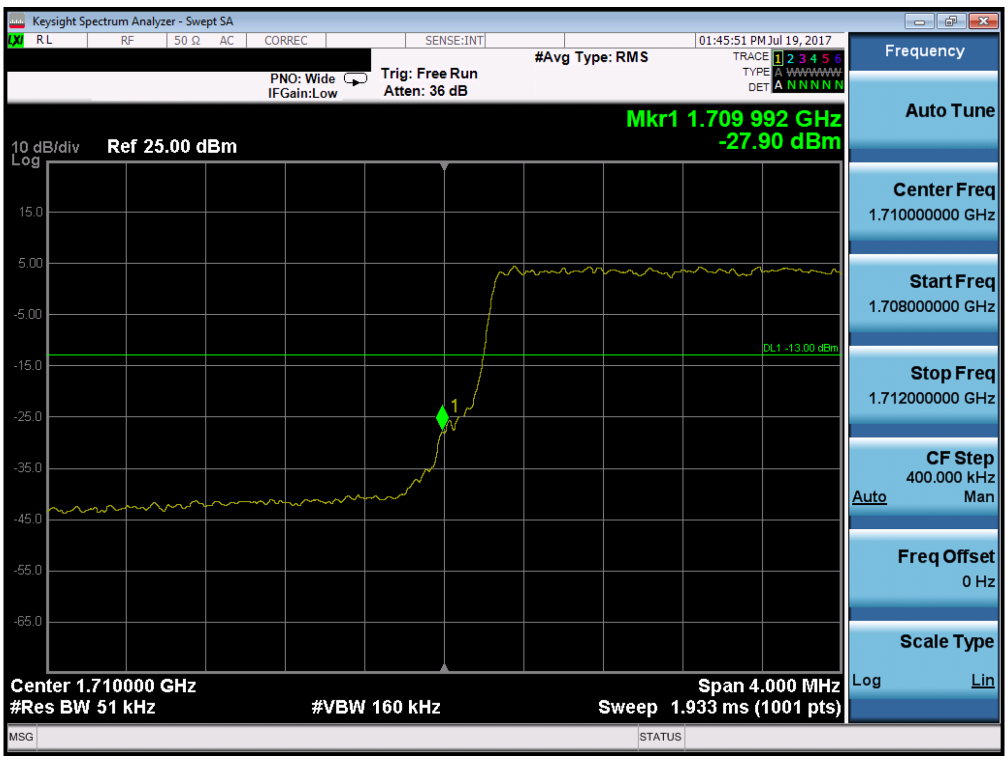
Plot 7-150. Lower Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



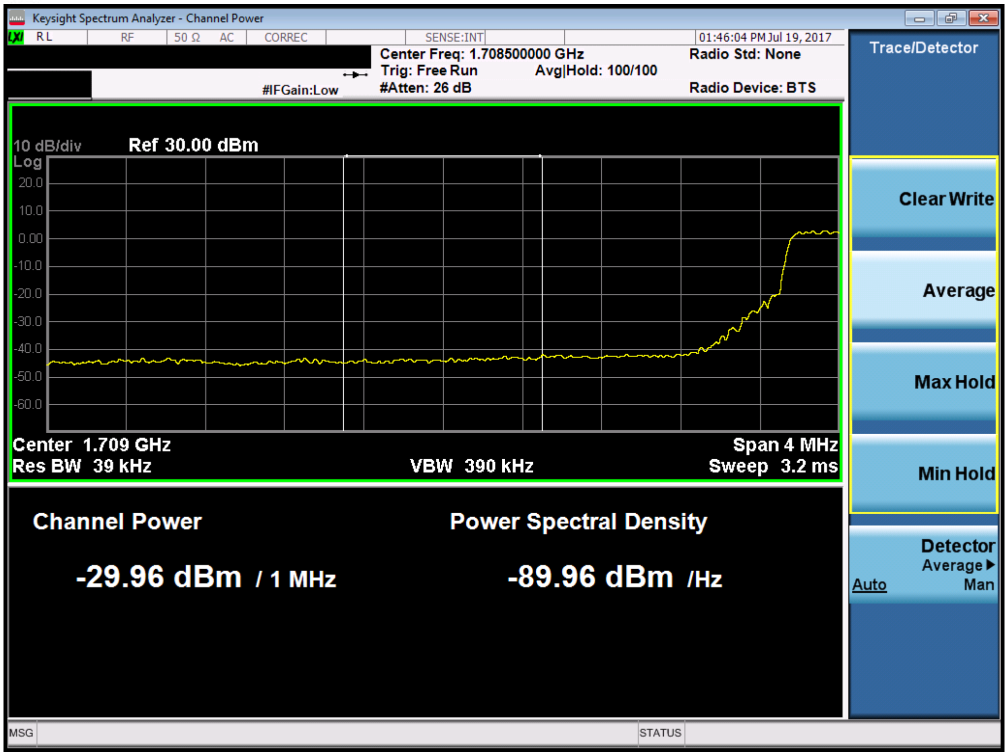
Plot 7-151. Upper Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



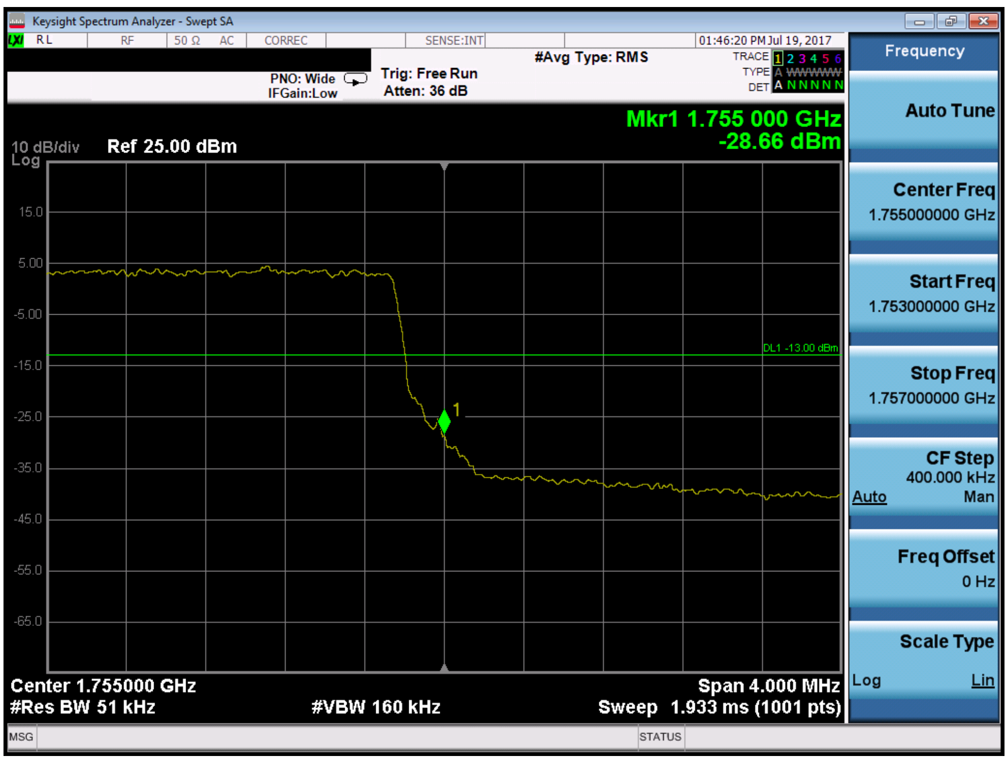
Plot 7-152. Upper Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



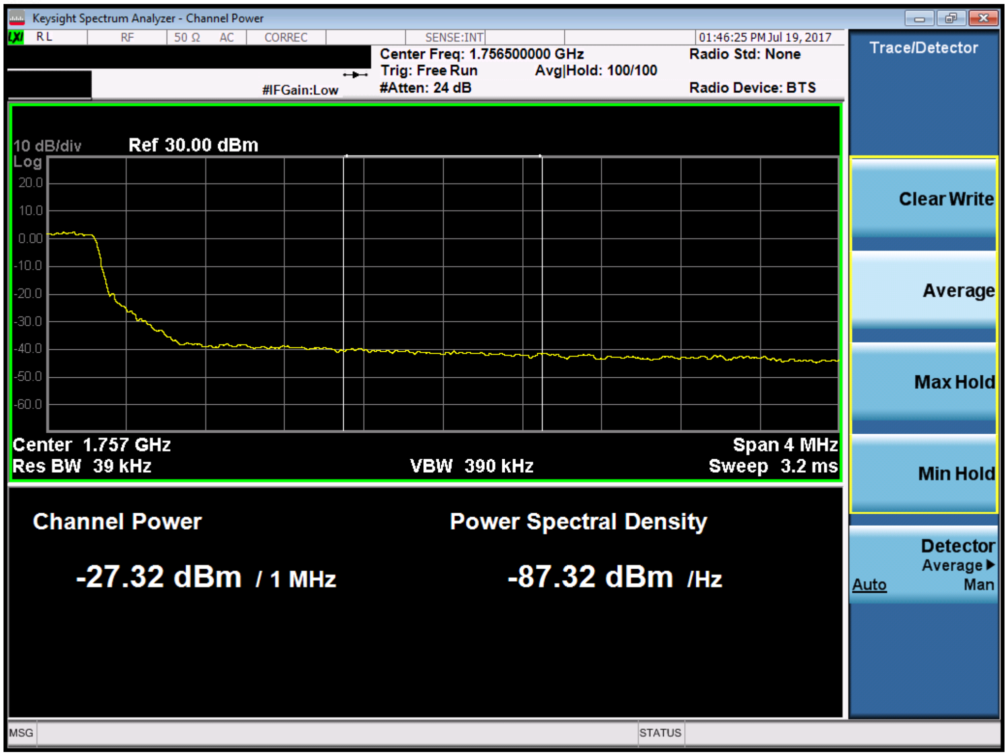
Plot 7-153. Lower Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



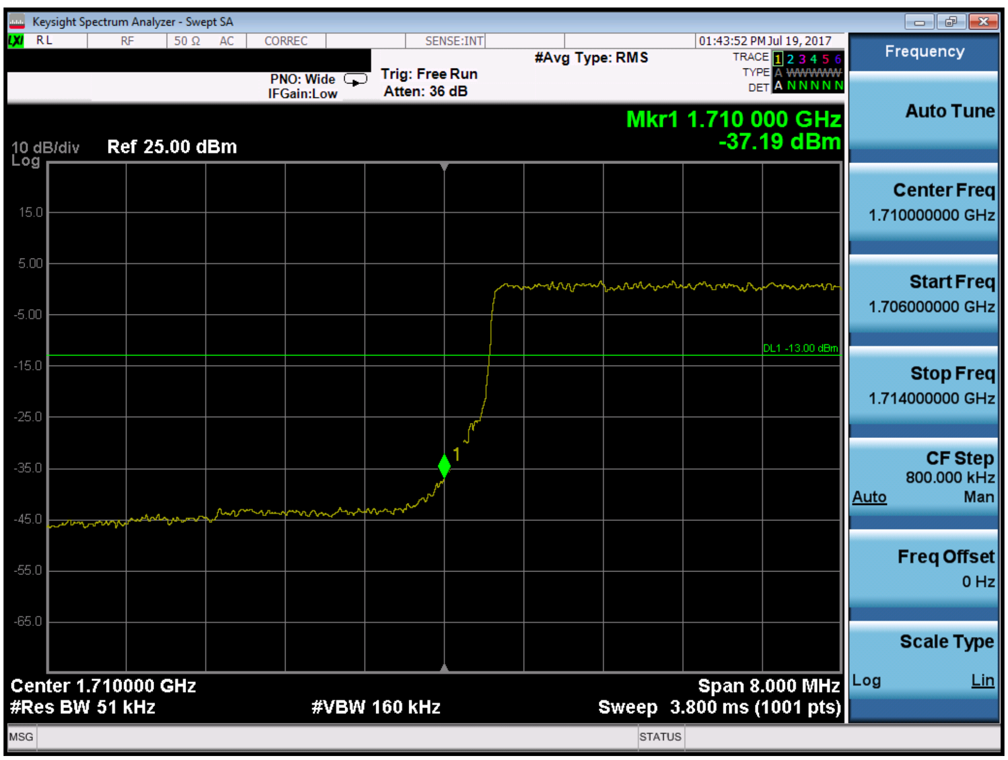
Plot 7-154. Lower Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



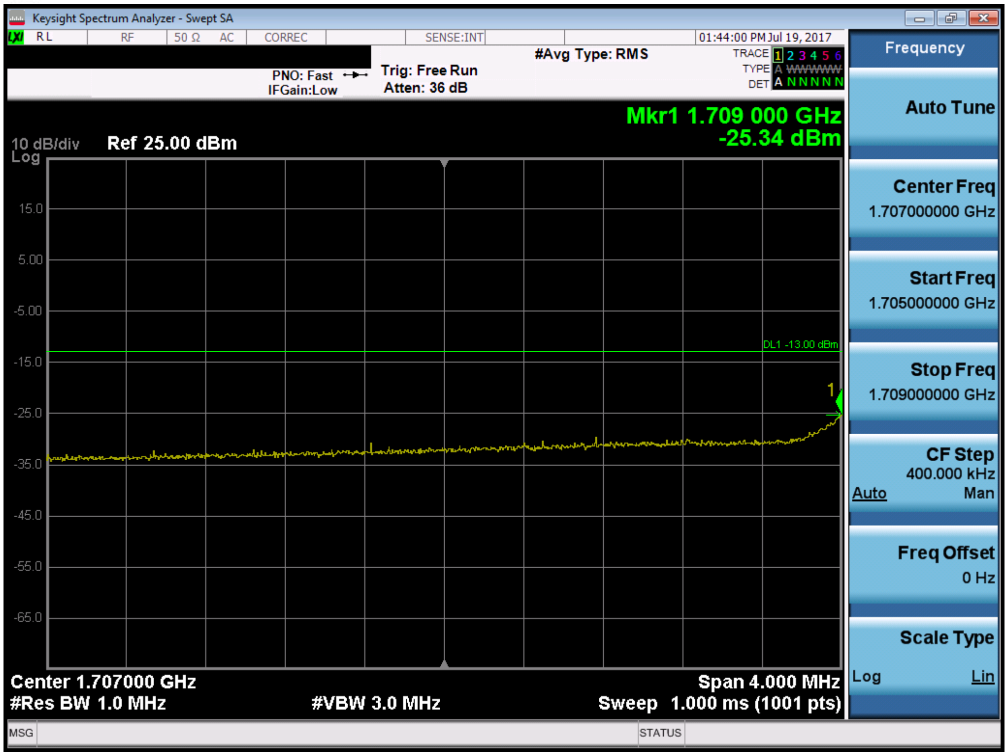
Plot 7-155. Upper Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



Plot 7-156. Upper Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

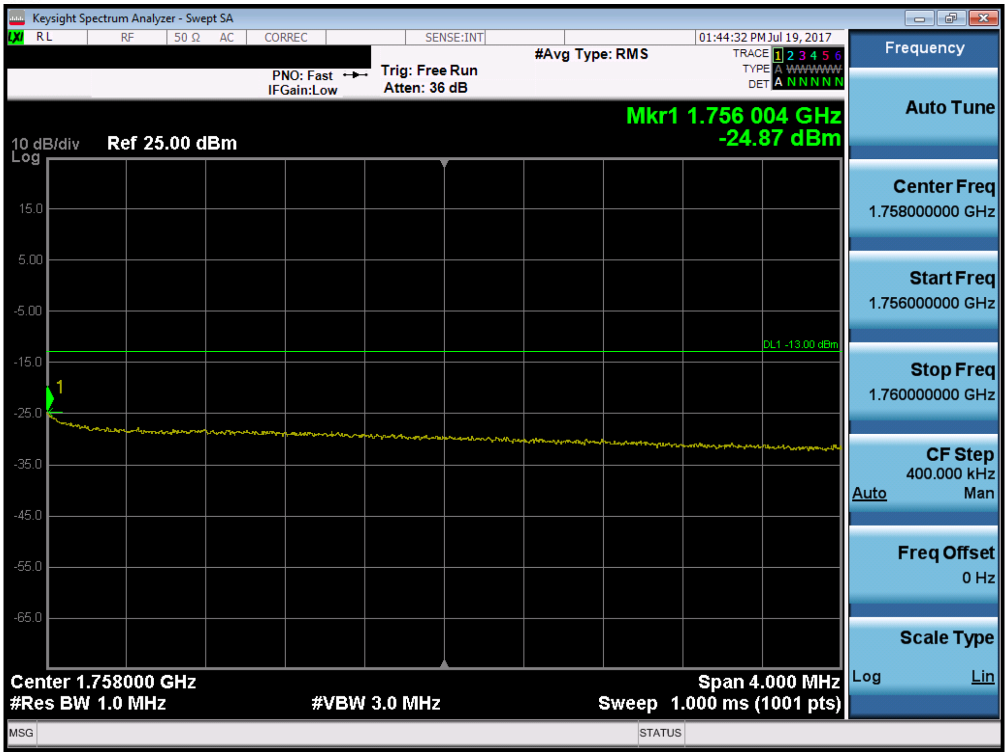


Plot 7-157. Lower Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

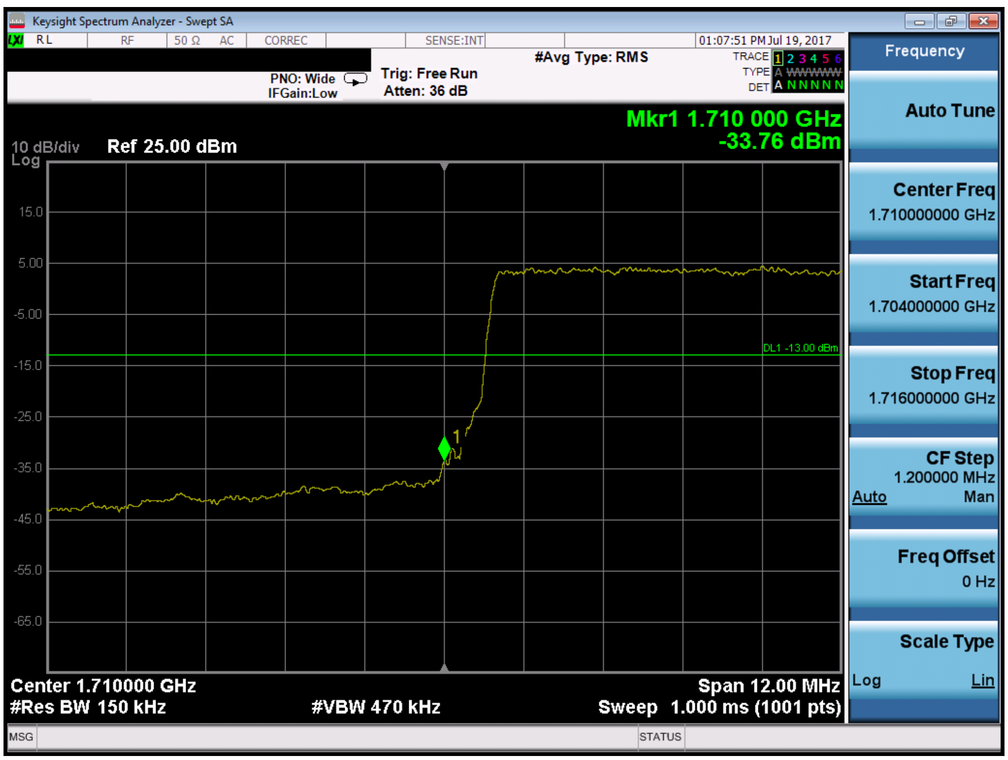


Plot 7-158. Lower Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

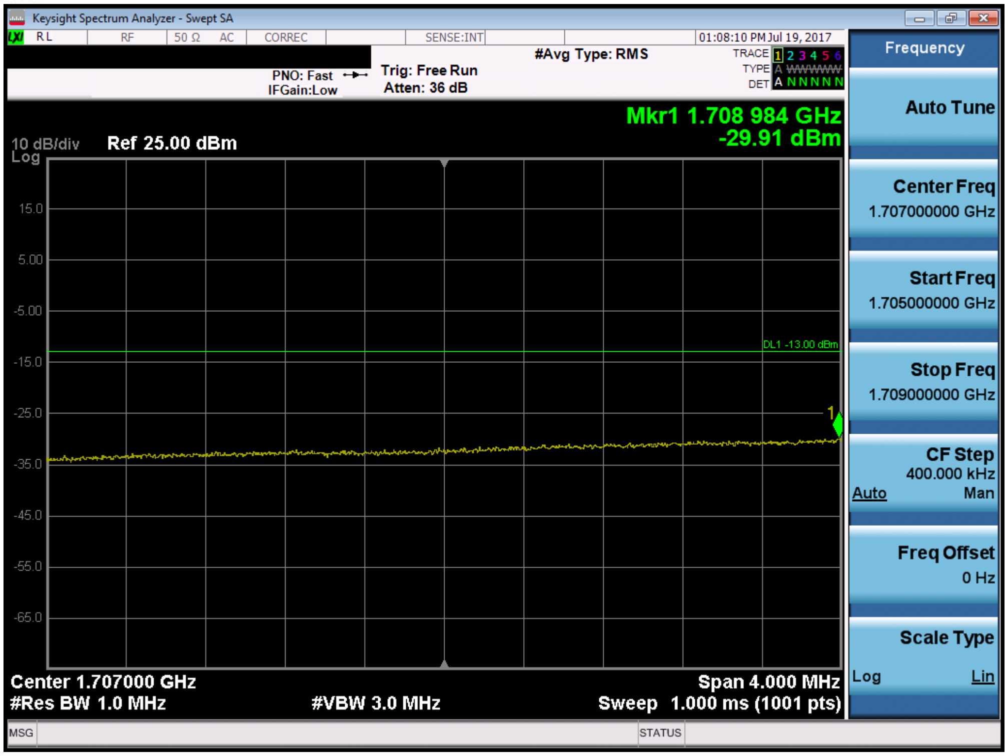
Plot 7-159. Upper Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)



Plot 7-160. Upper Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

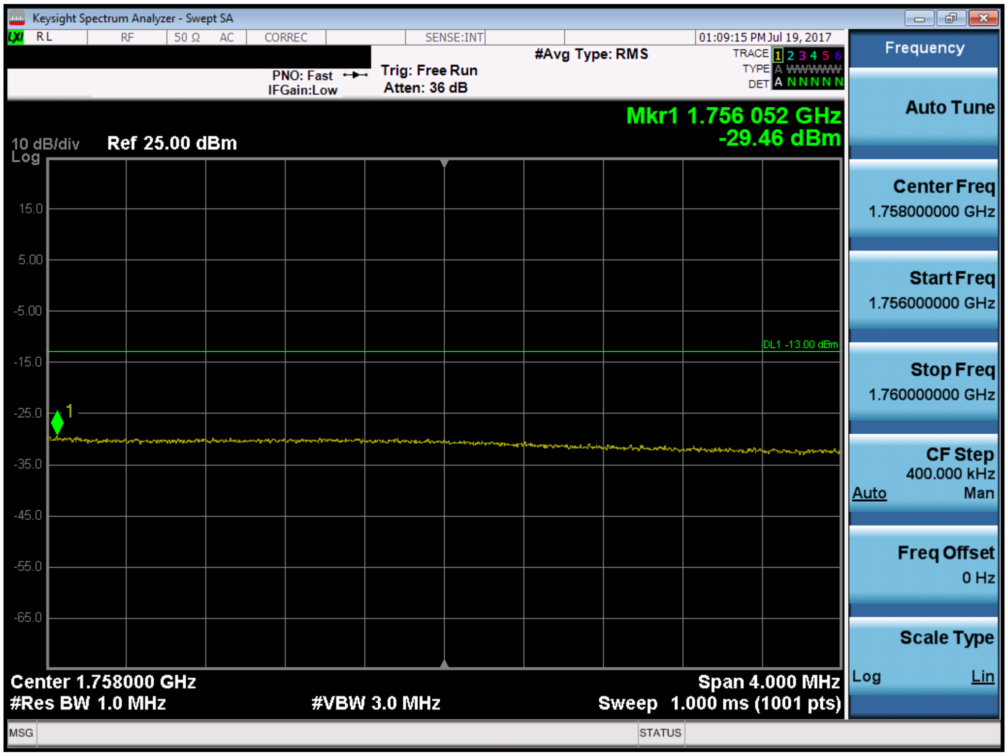


Plot 7-161. Lower Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

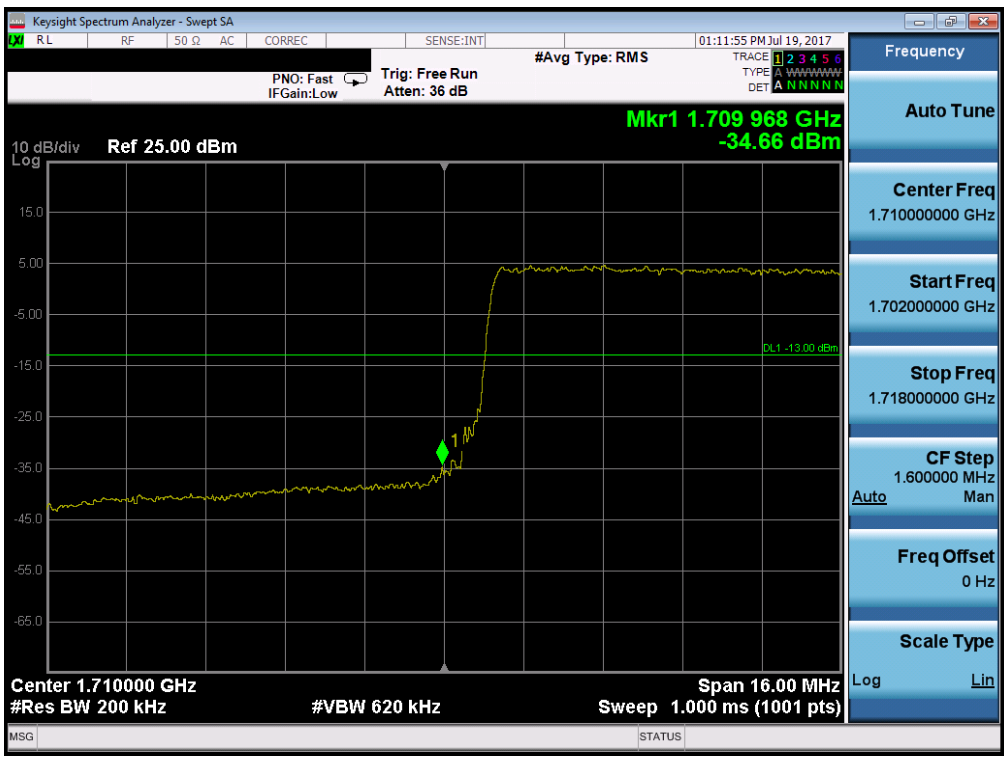


Plot 7-162. Lower Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

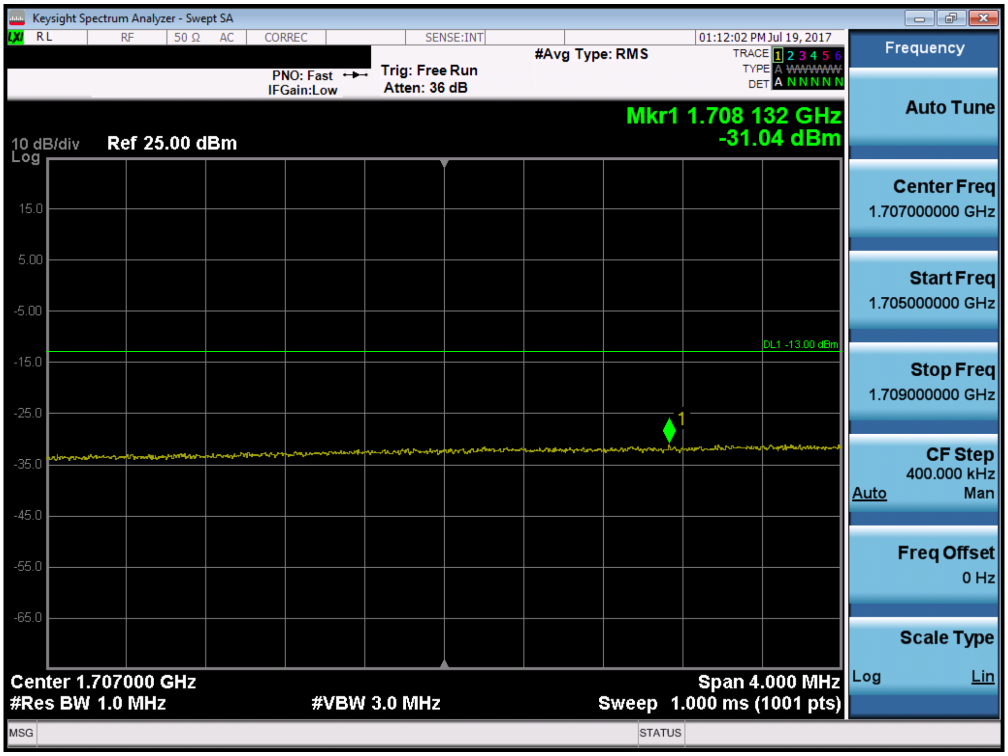
Plot 7-163. Upper Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)



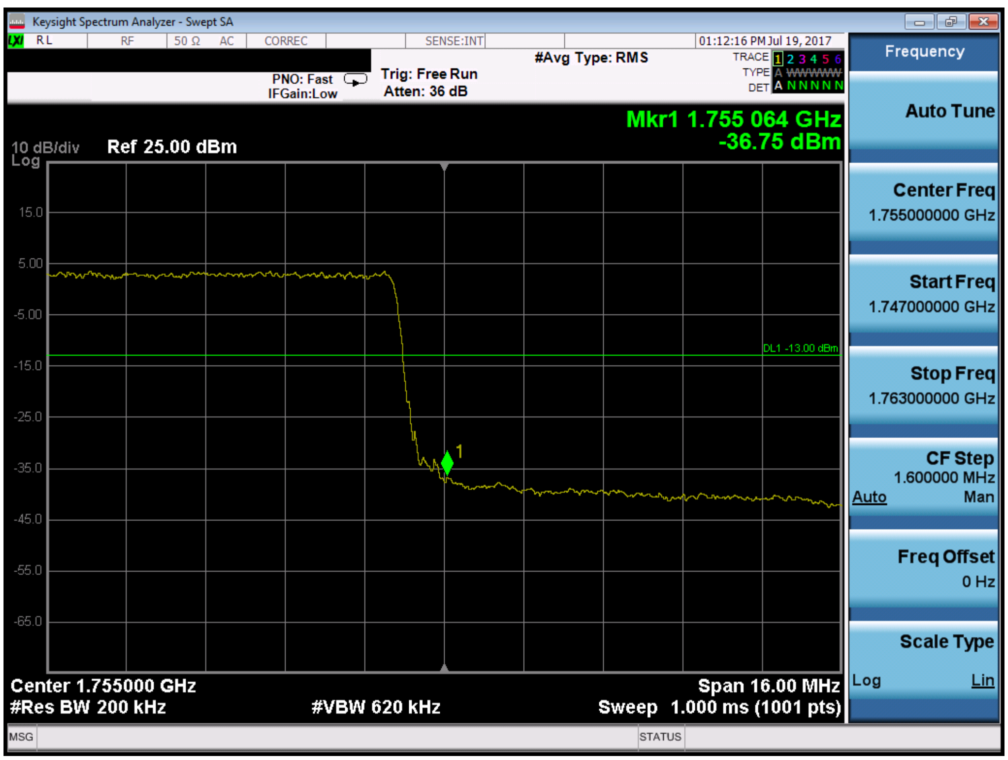
Plot 7-164. Upper Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)



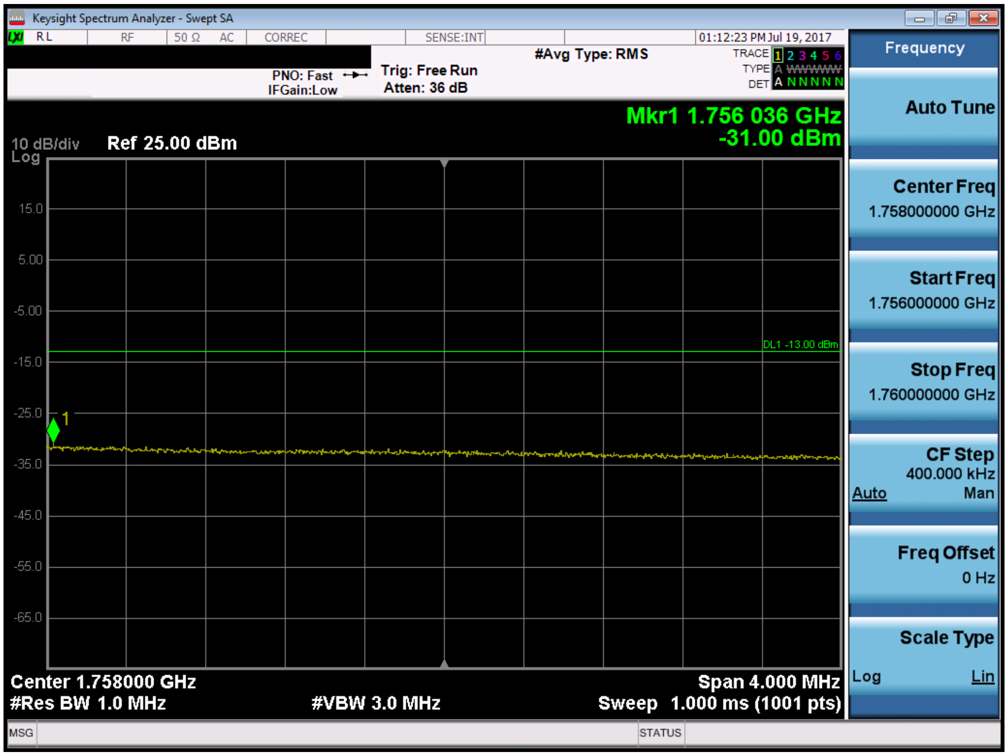
Plot 7-165. Lower Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



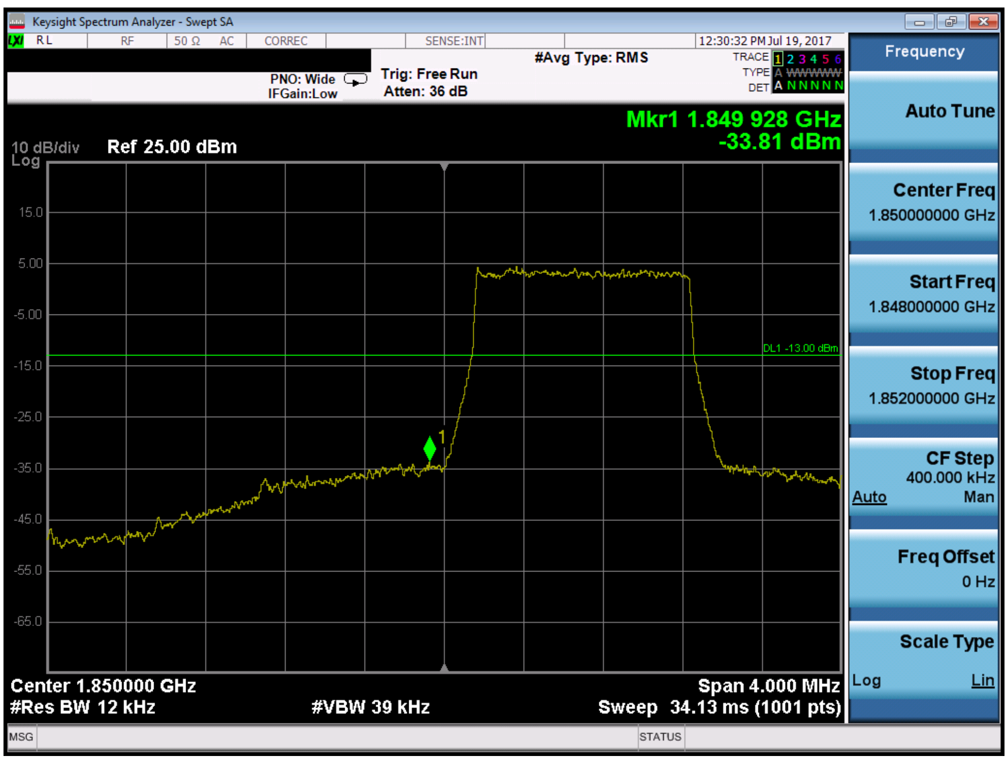
Plot 7-166. Lower Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



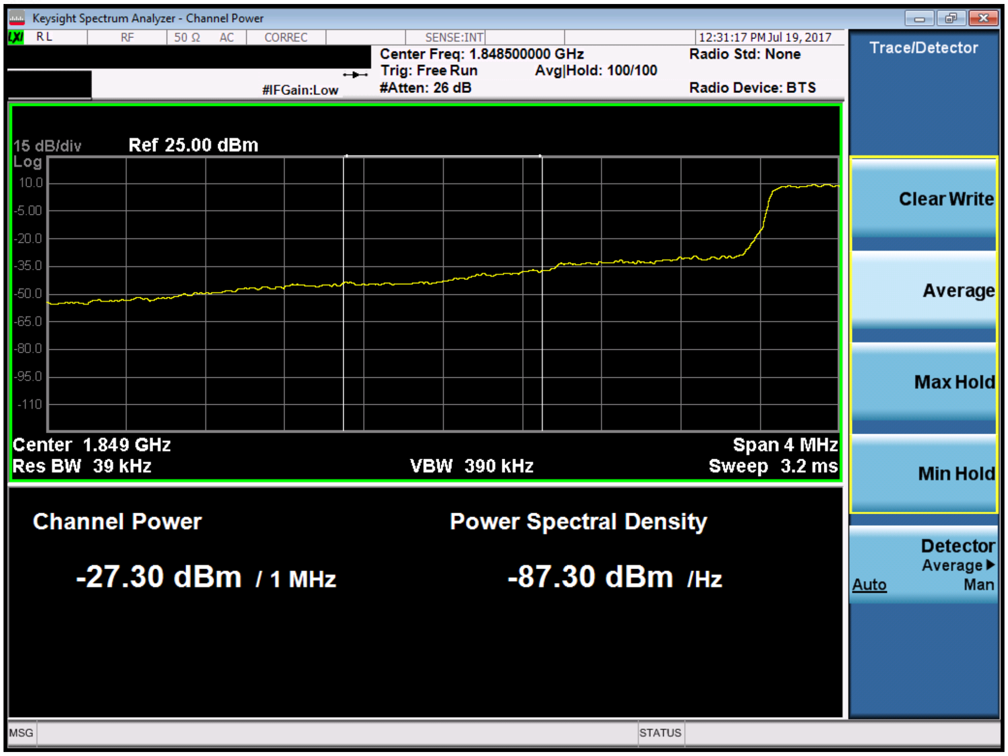
Plot 7-167. Upper Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



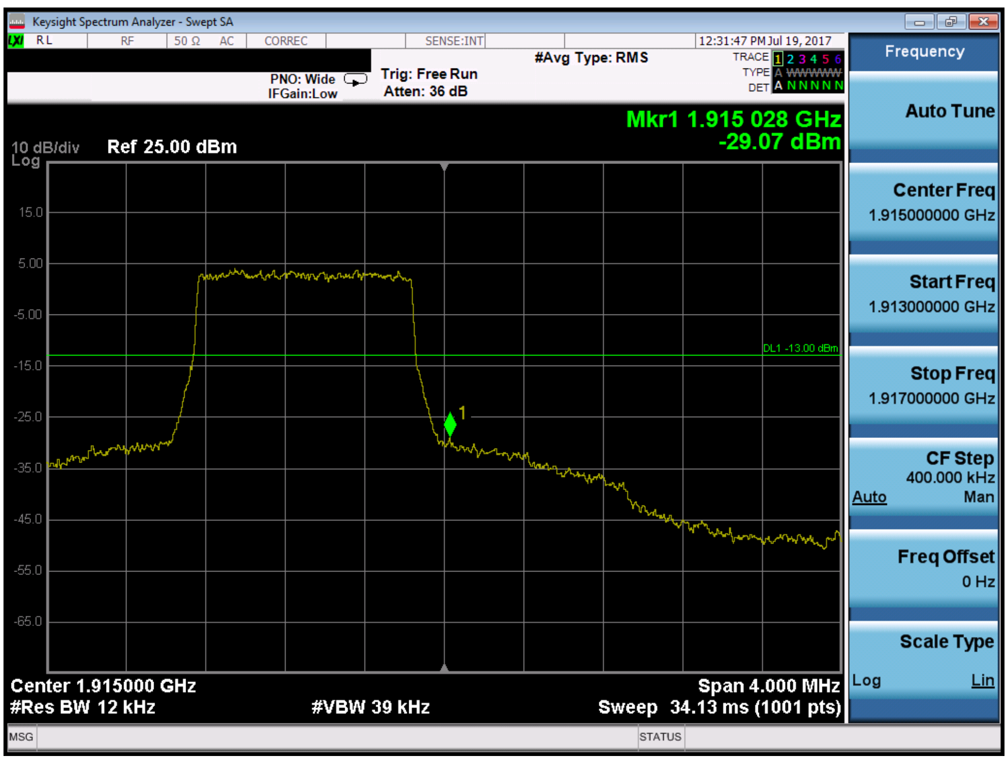
Plot 7-168. Upper Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



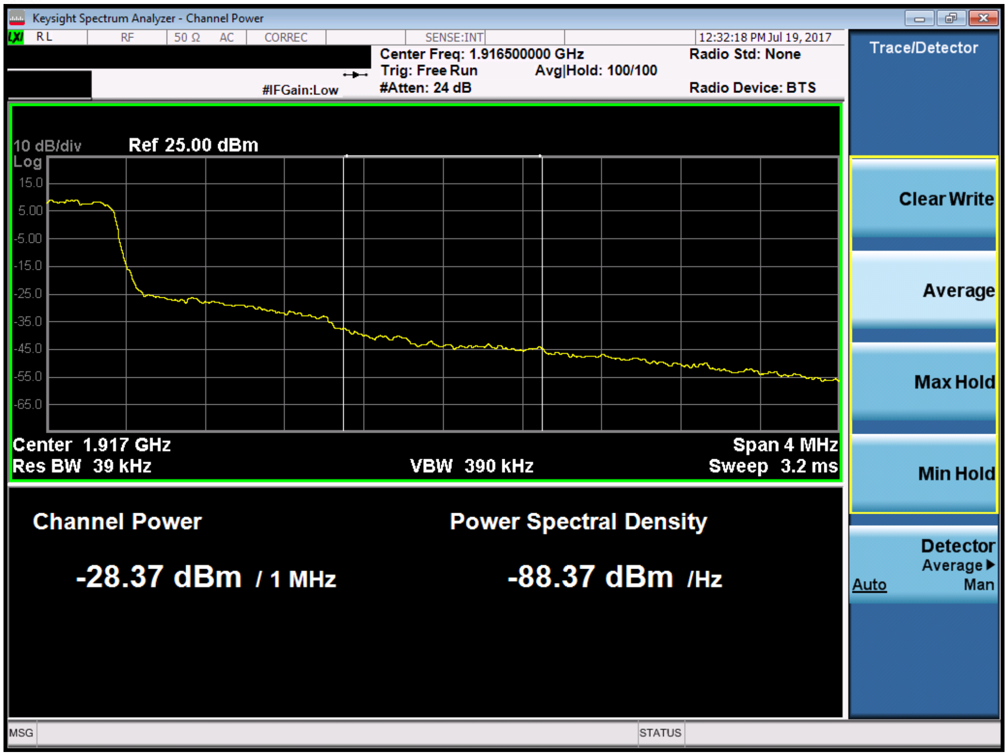
Plot 7-169. Lower Band Edge Plot (Band 2/25 – 1.4MHz QPSK – RB Size 6)



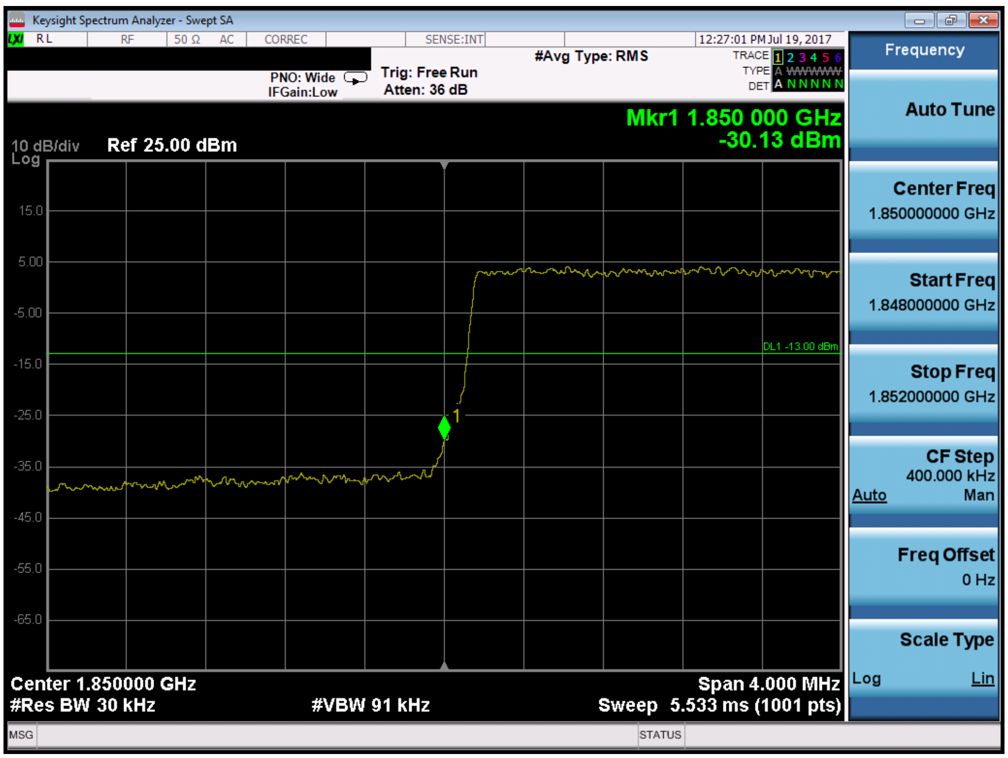
Plot 7-170. Lower Extended Band Edge Plot (Band 2/25 – 1.4MHz QPSK – RB Size 6)



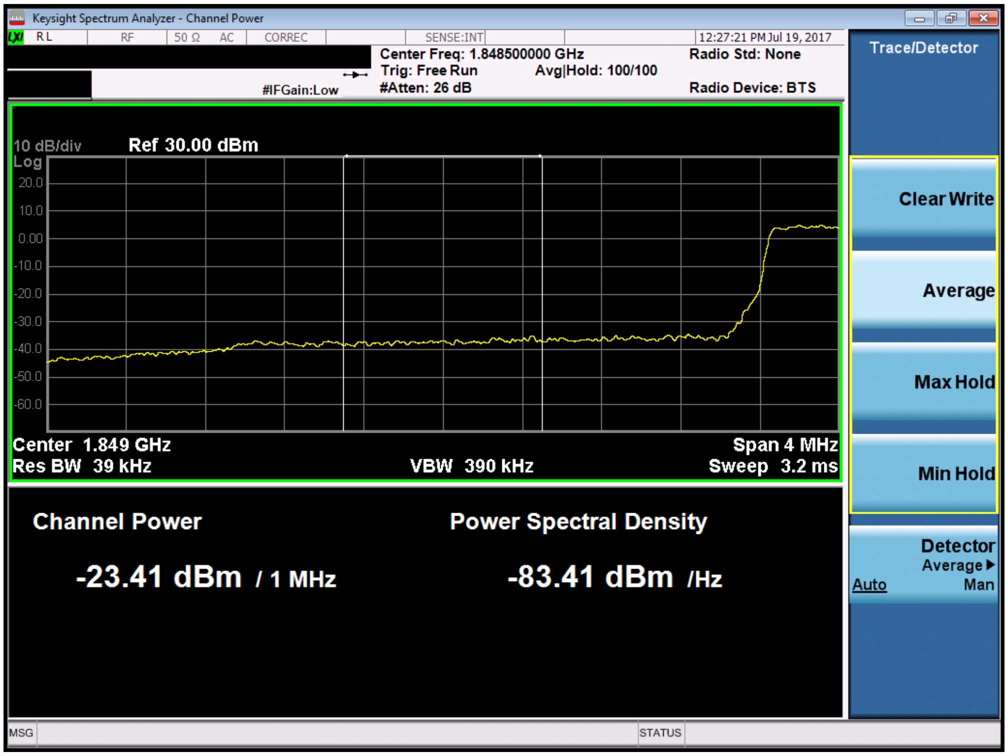
Plot 7-171. Upper Band Edge Plot (Band 25 – 1.4MHz QPSK – RB Size 6)



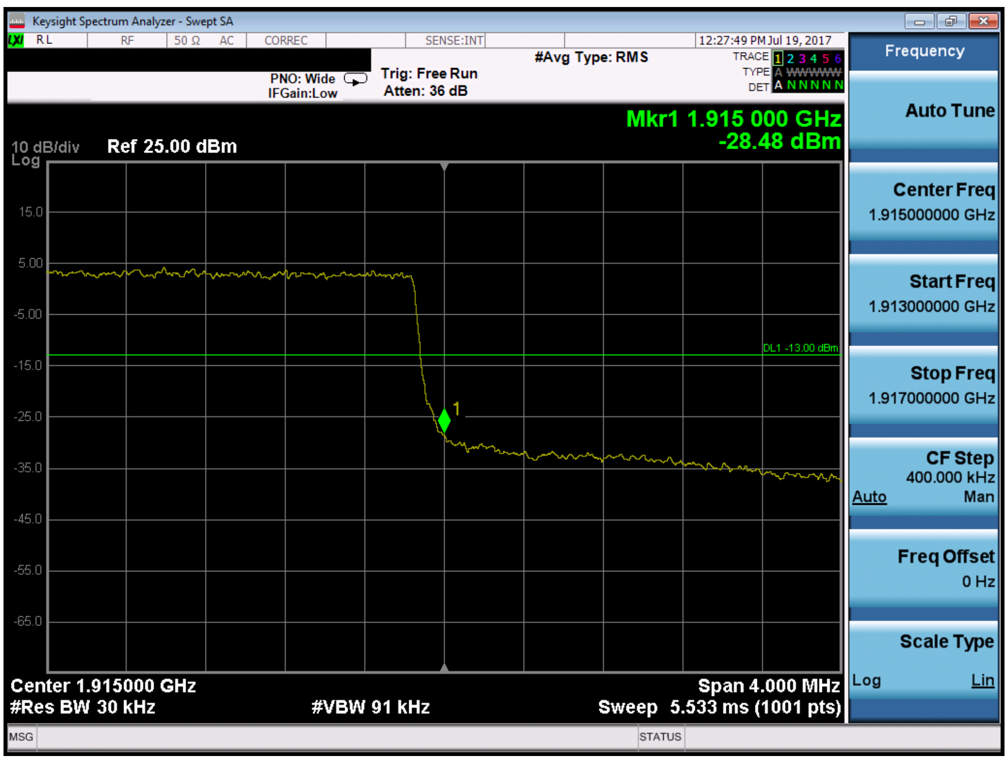
Plot 7-172. Upper Extended Band Edge Plot (Band 25 – 1.4MHz QPSK – RB Size 6)



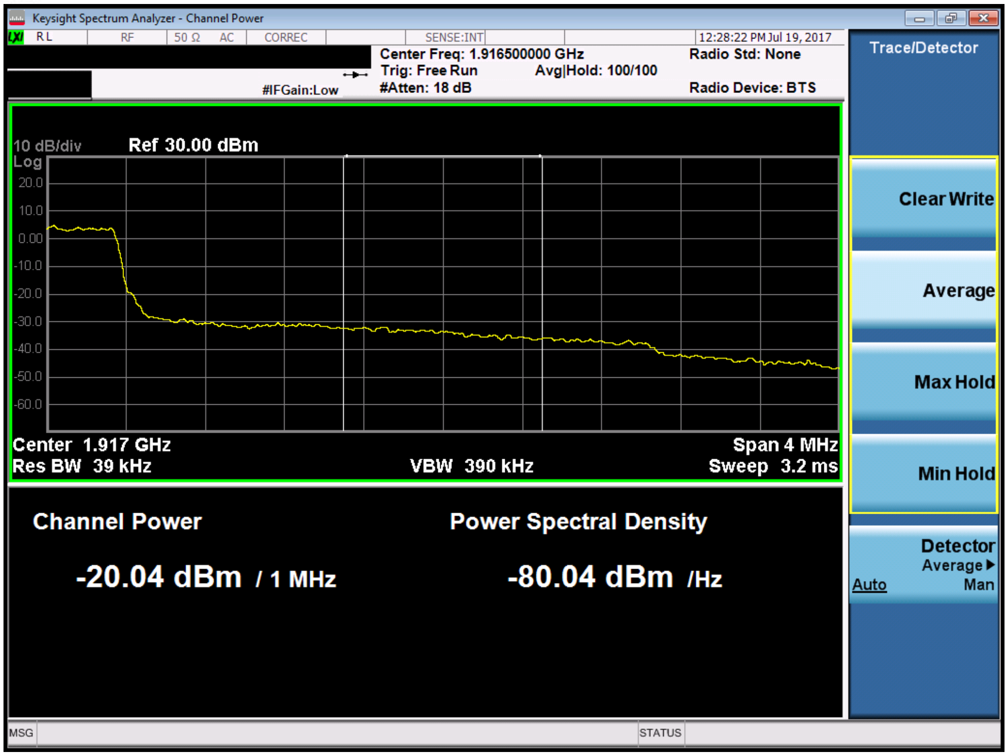
Plot 7-173. Lower Band Edge Plot (Band 2/25 – 3.0MHz QPSK – RB Size 15)



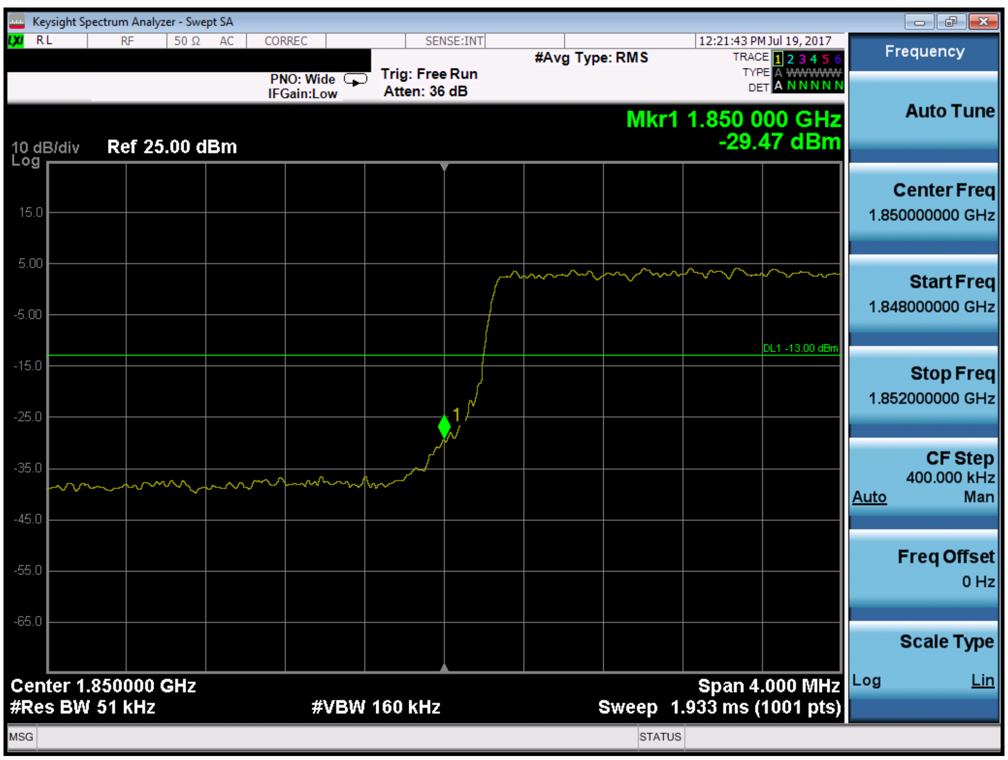
Plot 7-174. Lower Extended Band Edge Plot (Band 2/25 – 3.0MHz QPSK – RB Size 15)



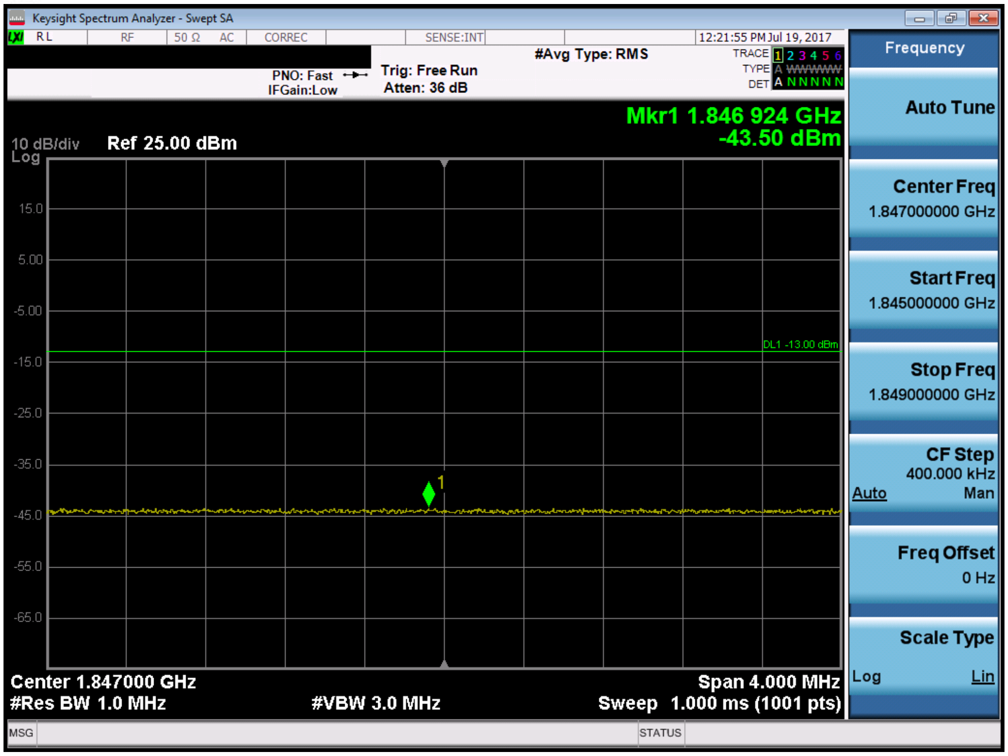
Plot 7-175. Upper Band Edge Plot (Band 25 – 3.0MHz QPSK – RB Size 15)



Plot 7-176. Upper Extended Band Edge Plot (Band 25 – 3.0MHz QPSK – RB Size 15)

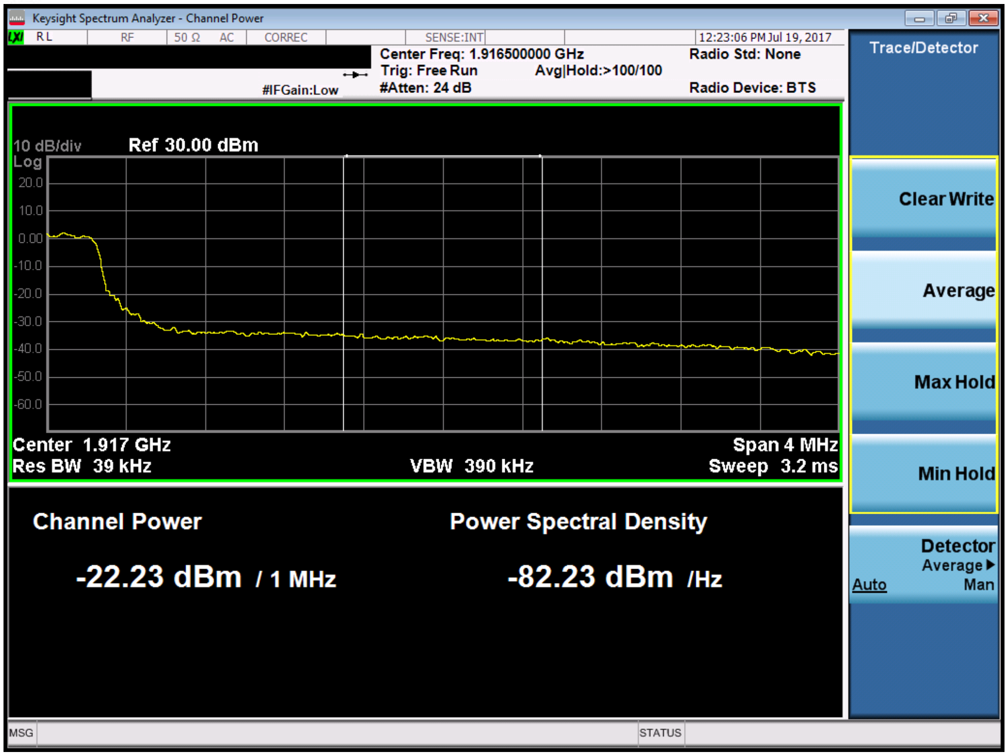


Plot 7-177. Lower Band Edge Plot (Band 2/25 – 5.0MHz QPSK – RB Size 25)

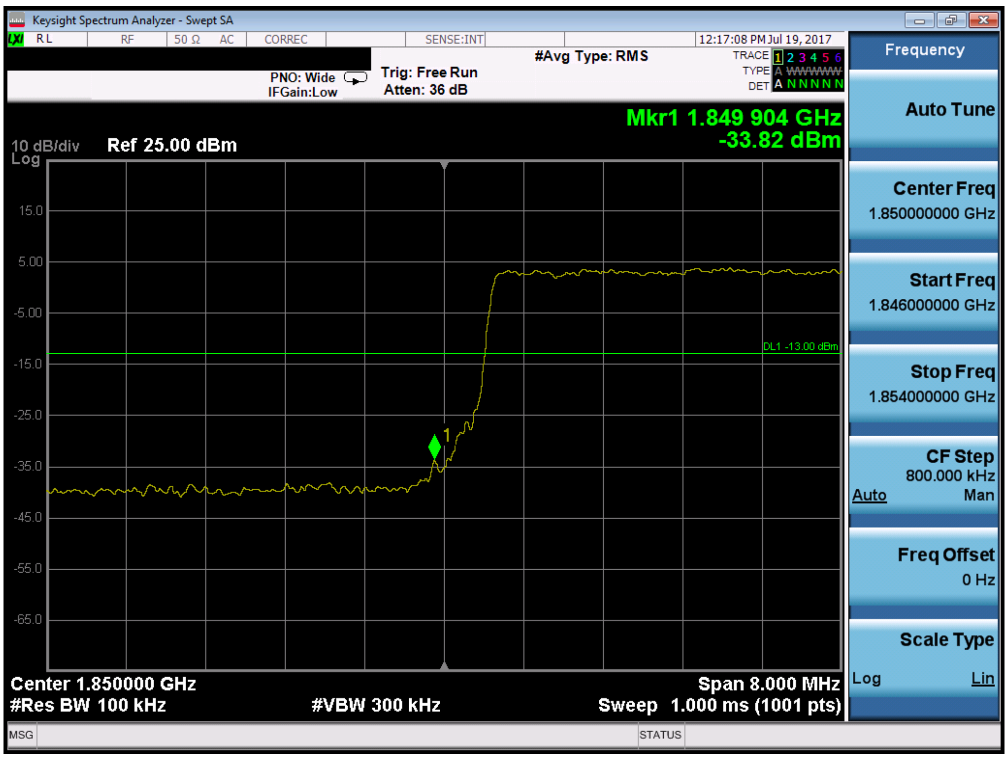


Plot 7-178. Lower Extended Band Edge Plot (Band 2/25 – 5.0MHz QPSK – RB Size 25)

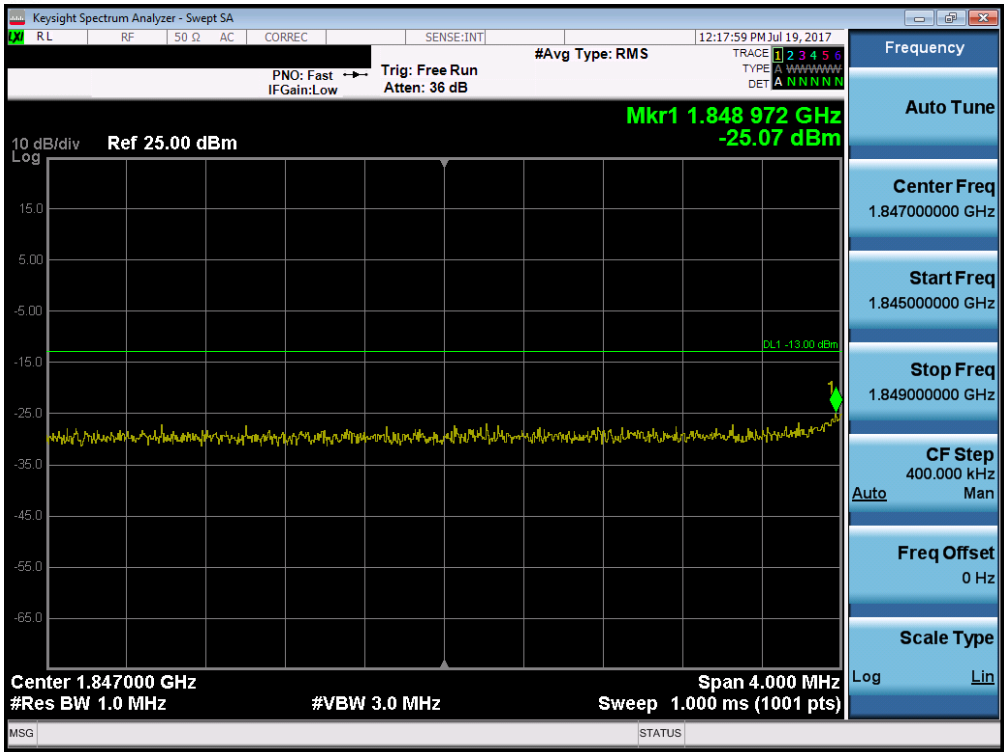
Plot 7-179. Upper Band Edge Plot (Band 25 – 5.0MHz QPSK – RB Size 25)



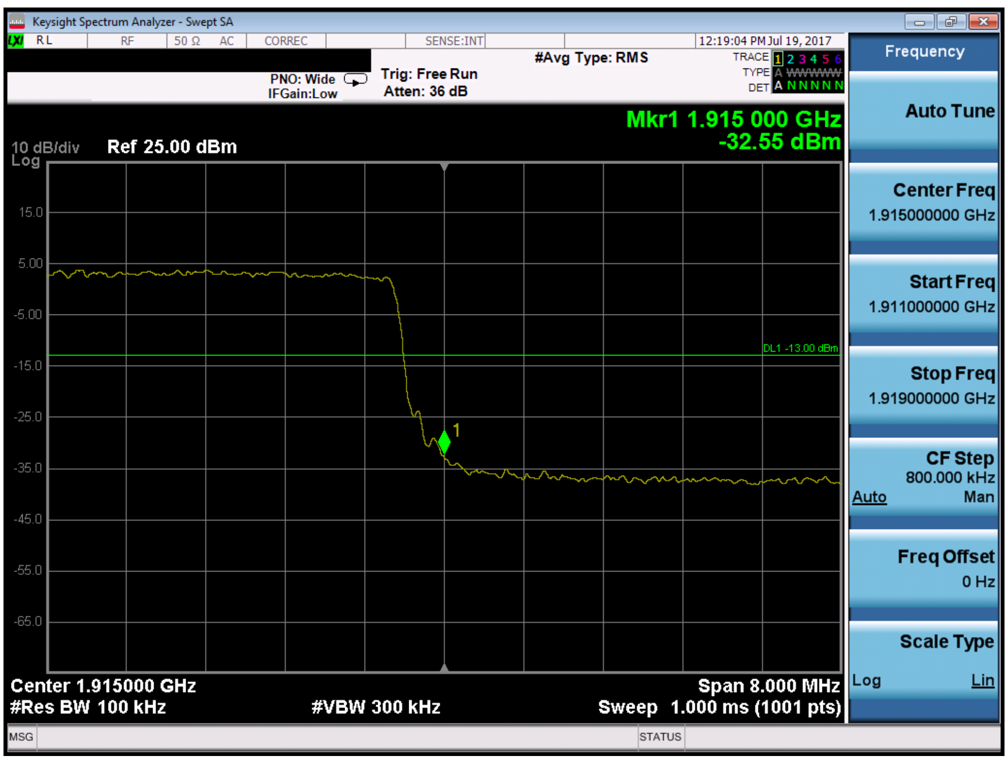
Plot 7-180. Upper Extended Band Edge Plot (Band 25 – 5.0MHz QPSK – RB Size 25)



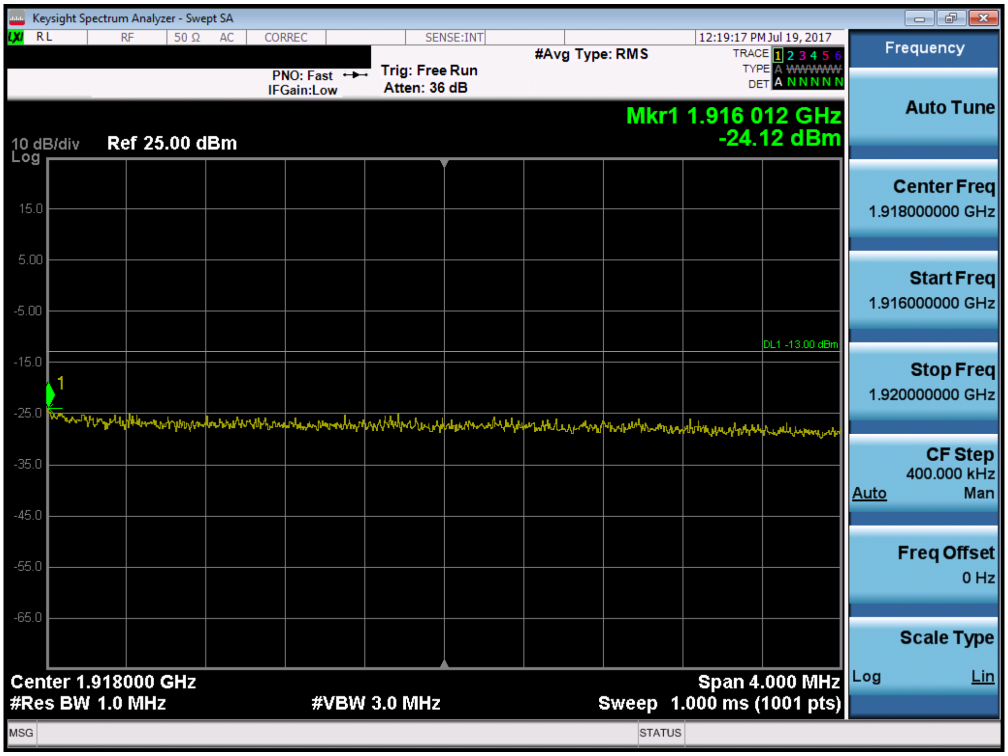
Plot 7-181. Lower Band Edge Plot (Band 2/25 – 10.0MHz QPSK – RB Size 50)



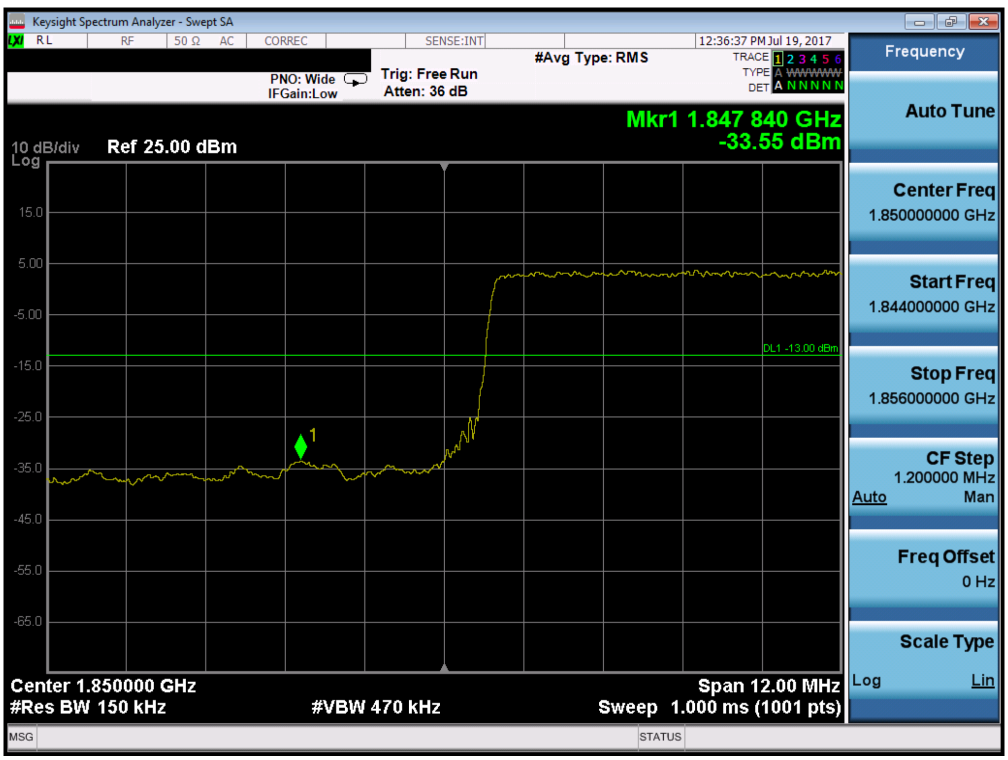
Plot 7-182. Lower Extended Band Edge Plot (Band 2/25 – 10.0MHz QPSK – RB Size 50)



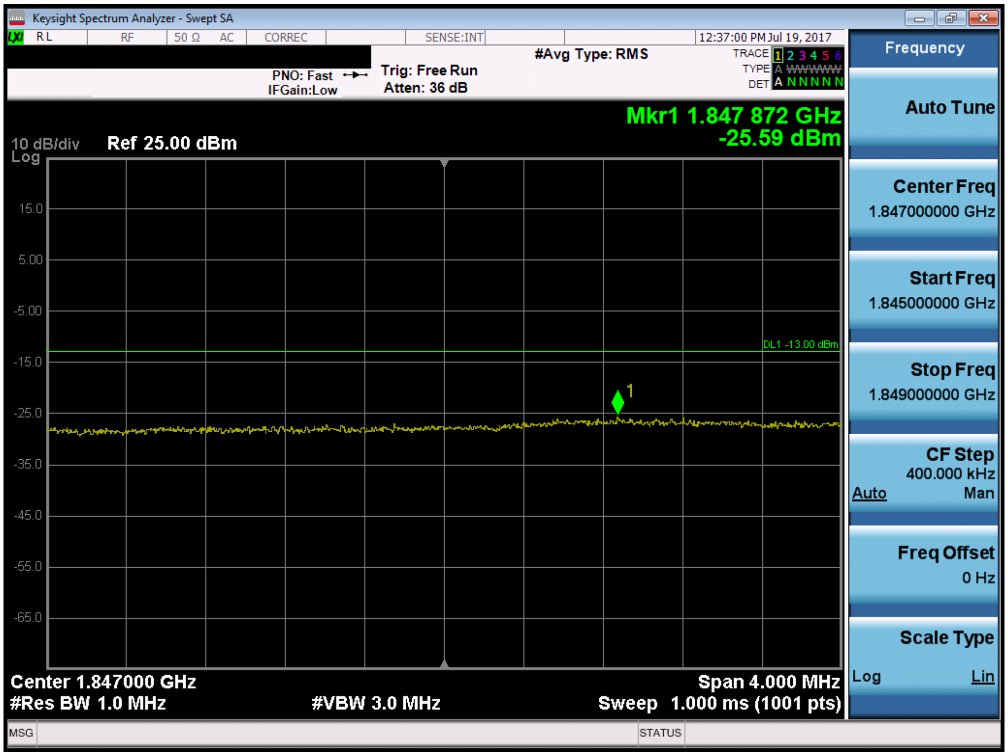
Plot 7-183. Upper Band Edge Plot (Band 25 – 10.0MHz QPSK – RB Size 50)



Plot 7-184. Upper Extended Band Edge Plot (Band 25 – 10.0MHz QPSK – RB Size 50)



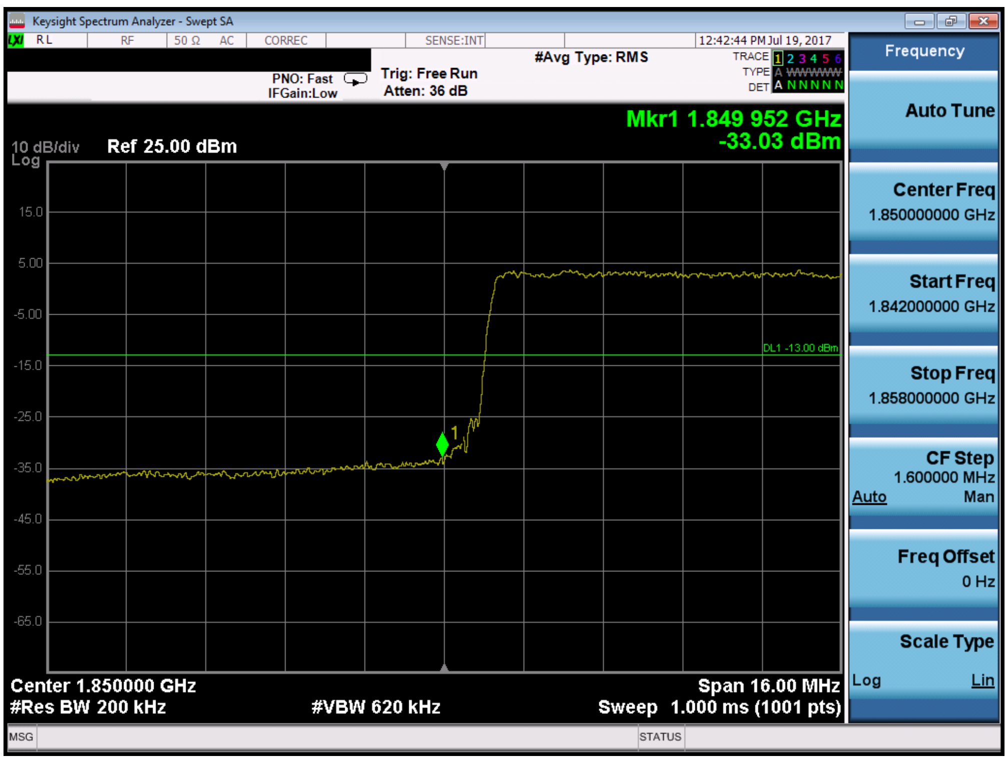
Plot 7-185. Lower Band Edge Plot (Band 2/25 – 15.0MHz QPSK – RB Size 75)



Plot 7-186. Lower Extended Band Edge Plot (Band 2/25 – 15.0MHz QPSK – RB Size 75)

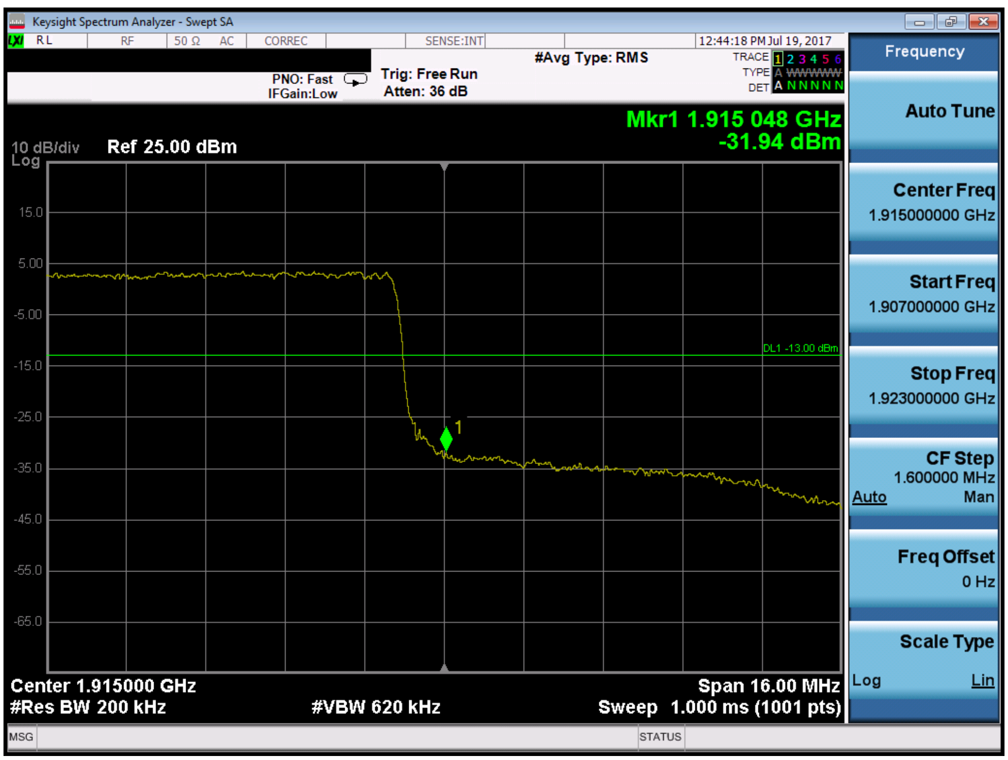
Plot 7-187. Upper Band Edge Plot (Band 25 – 15.0MHz QPSK – RB Size 75)

Plot 7-188. Upper Extended Band Edge Plot (Band 25 – 15.0MHz QPSK – RB Size 75)

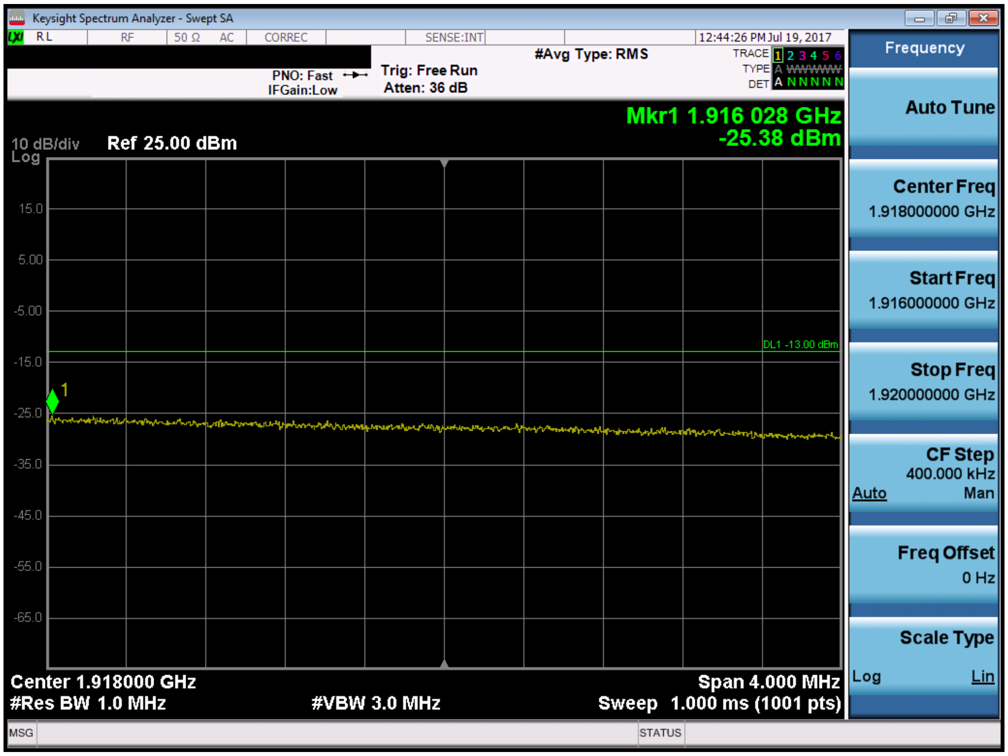


Plot 7-189. Lower Band Edge Plot (Band 2/25 – 20.0MHz QPSK – RB Size 100)

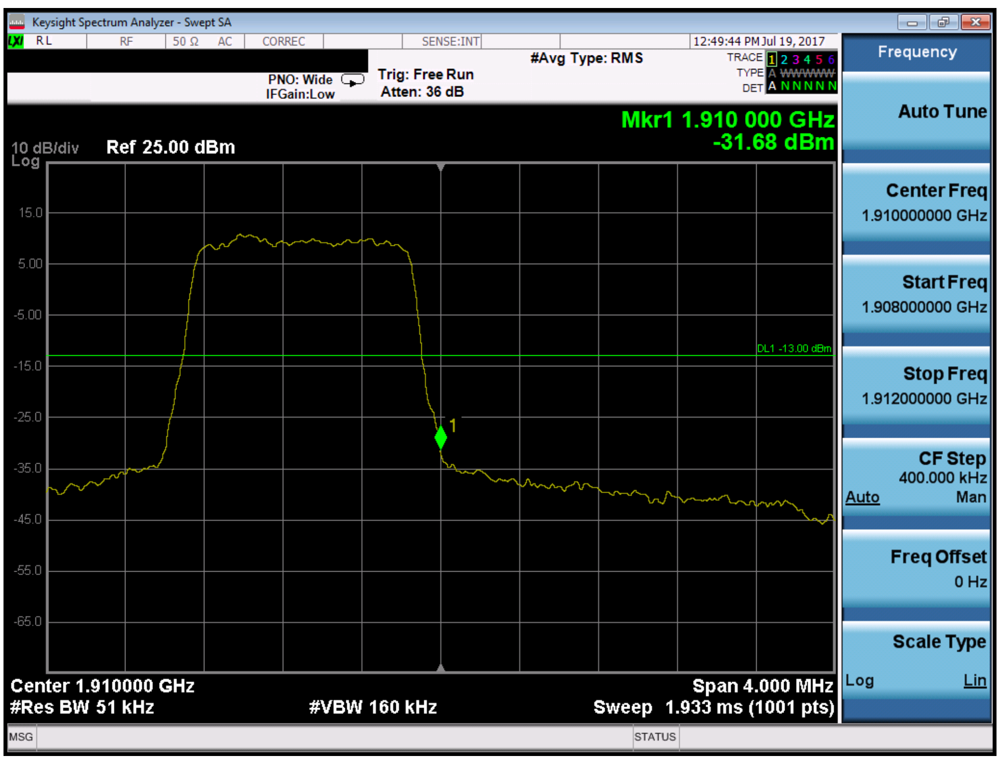
Plot 7-190. Lower Extended Band Edge Plot (Band 2/25 – 20.0MHz QPSK – RB Size 100)



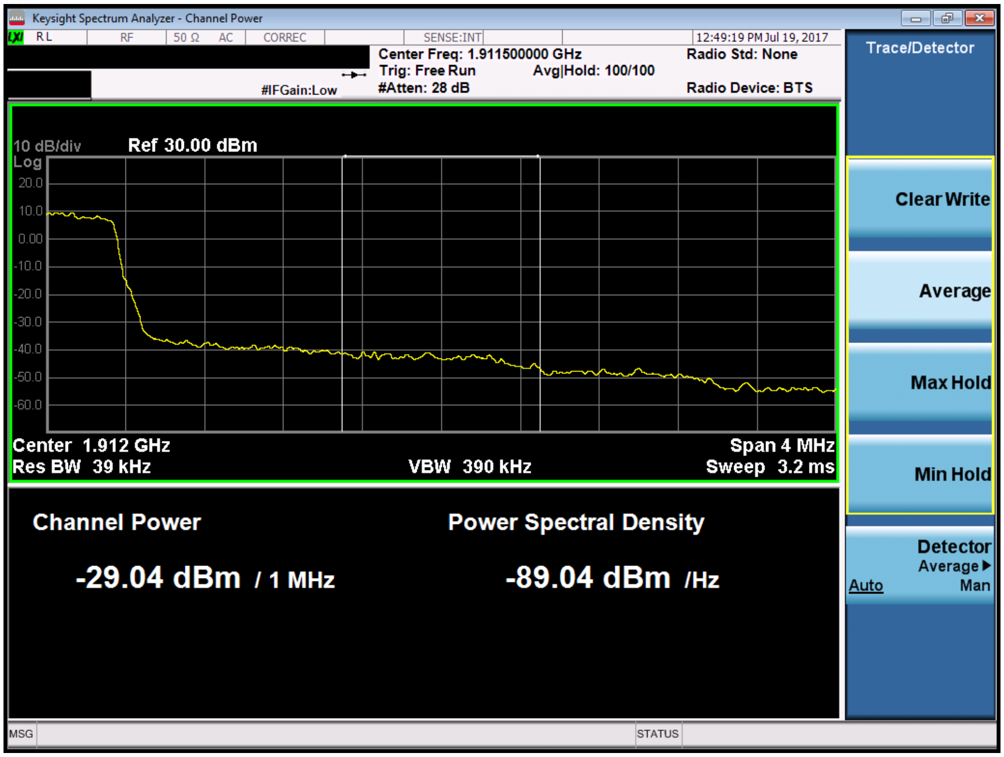
Plot 7-191. Upper Band Edge Plot (Band 25 – 20.0MHz QPSK – RB Size 100)



Plot 7-192. Upper Extended Band Edge Plot (Band 25 – 20.0MHz QPSK – RB Size 100)

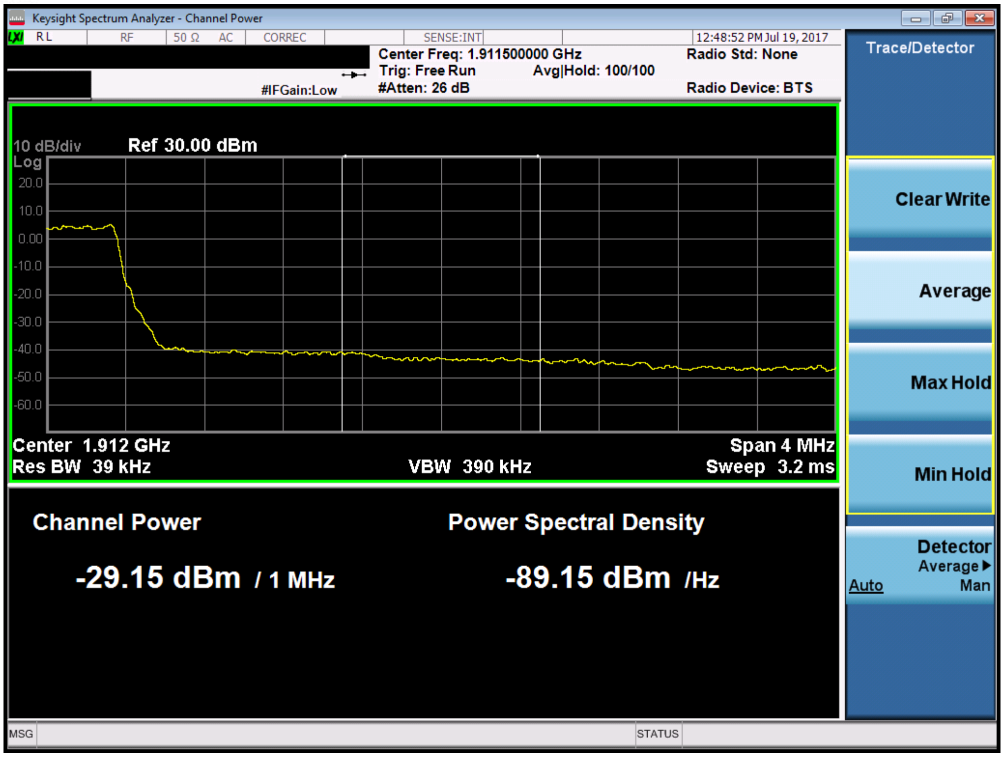


Plot 7-193. Upper Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)



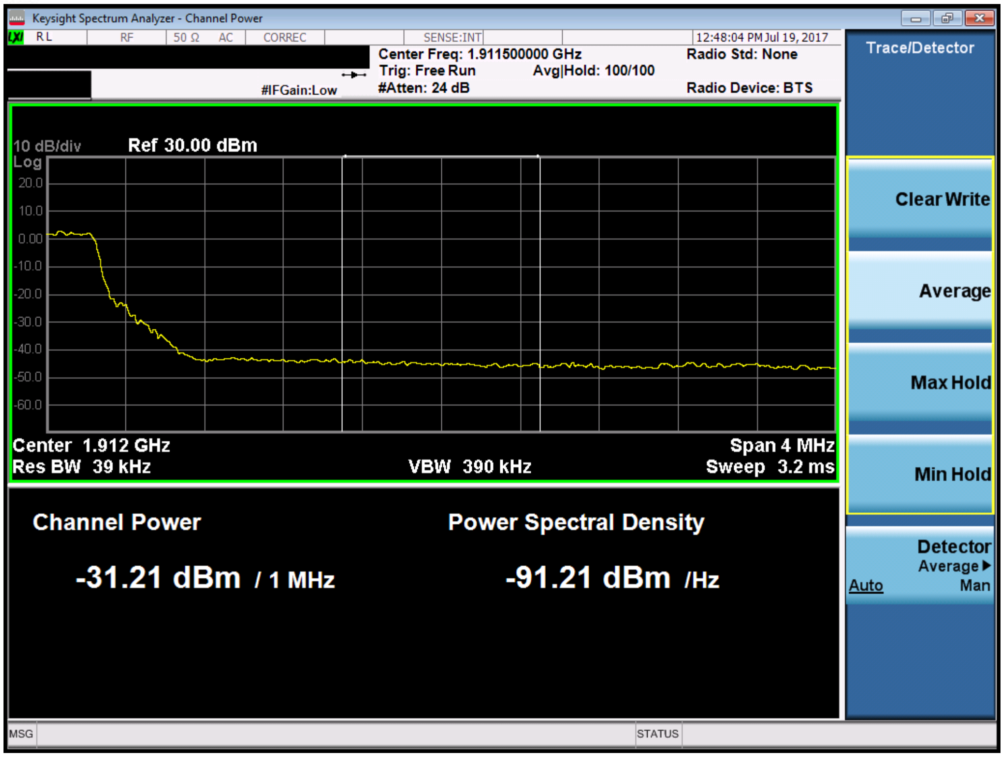
Plot 7-194. Upper Extended Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

Plot 7-195. Upper Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)



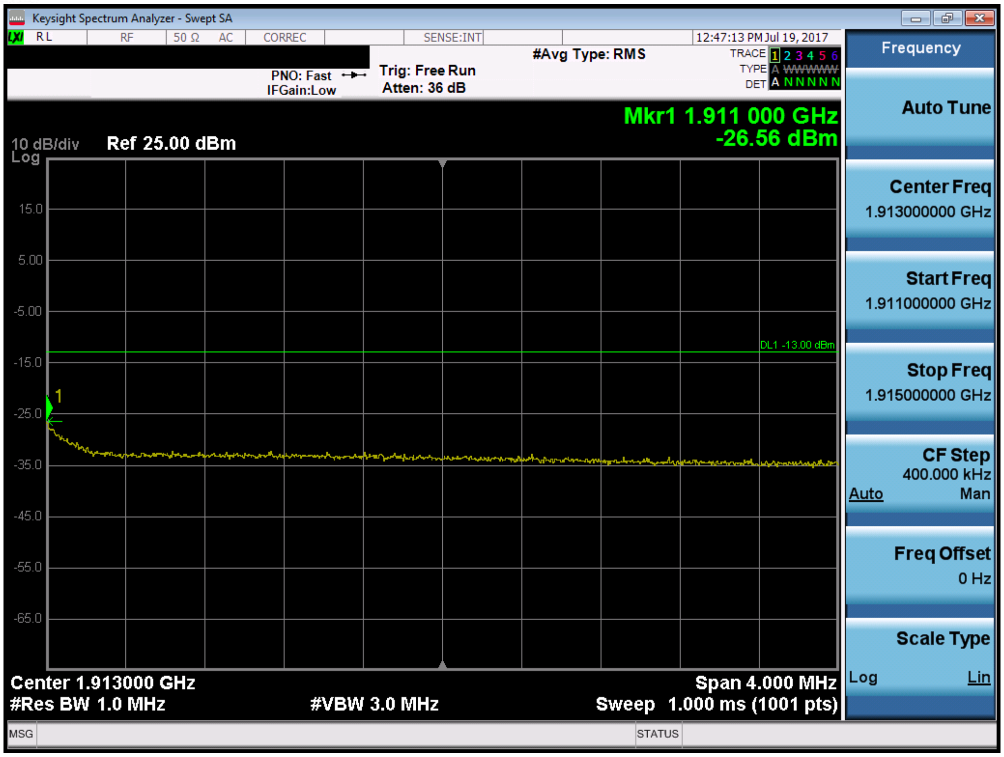
Plot 7-196. Upper Extended Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

Plot 7-197. Upper Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

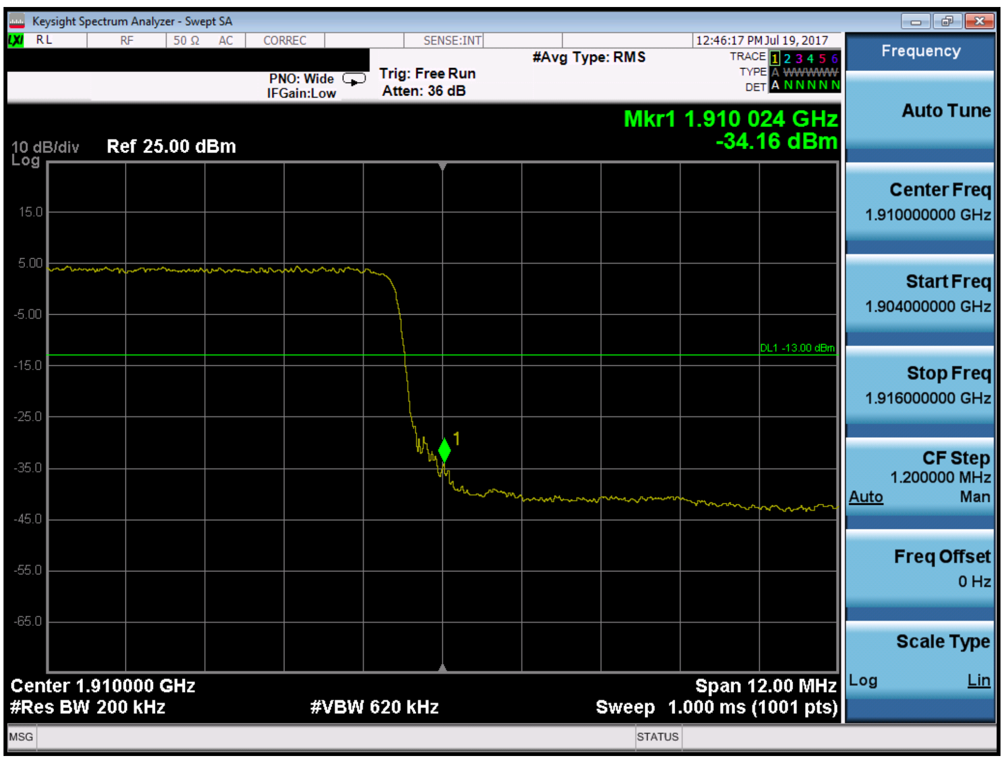


Plot 7-198. Upper Extended Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

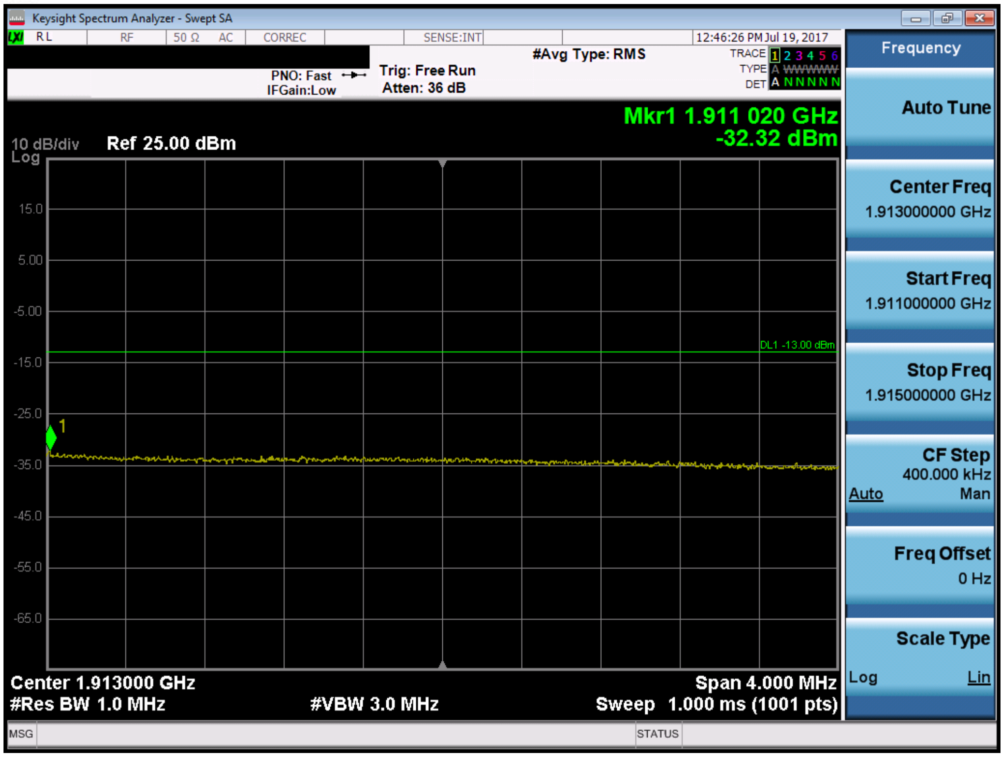
Plot 7-199. Upper Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)



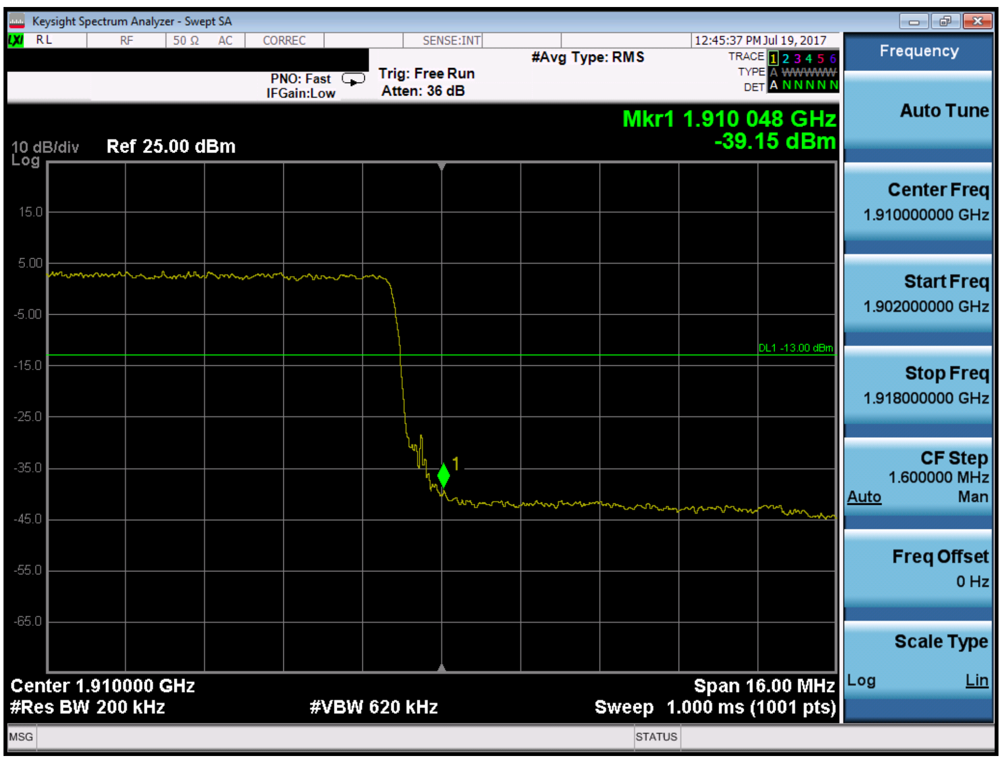
Plot 7-200. Upper Extended Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)



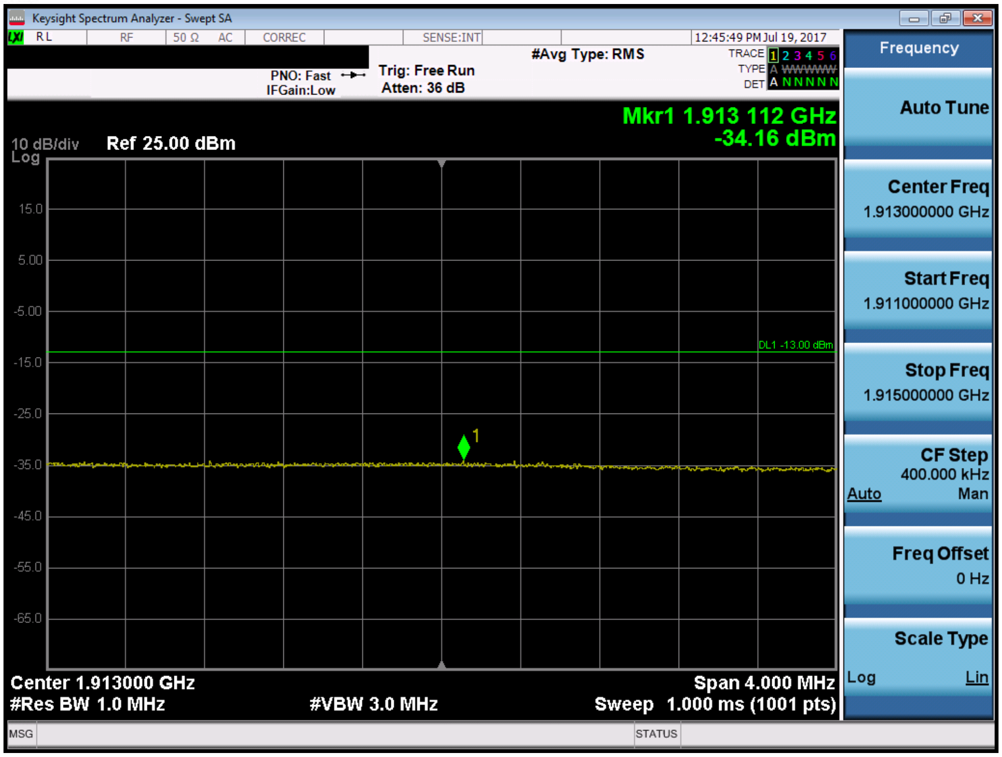
Plot 7-201. Upper Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)



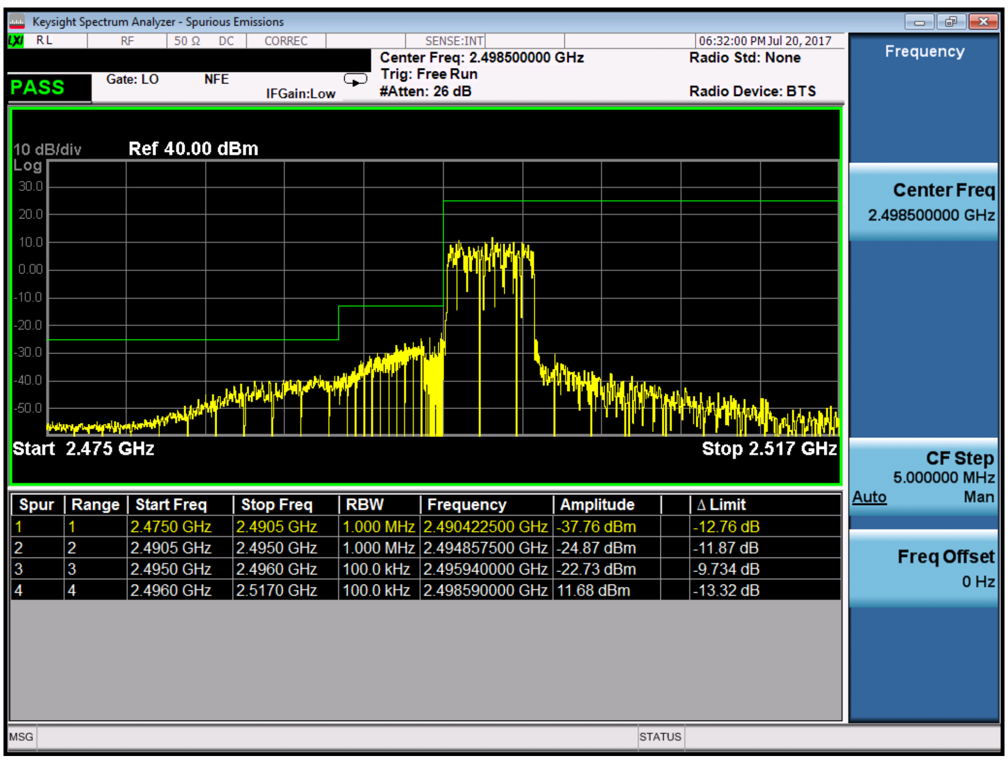
Plot 7-202. Upper Extended Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)



Plot 7-203. Upper Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)

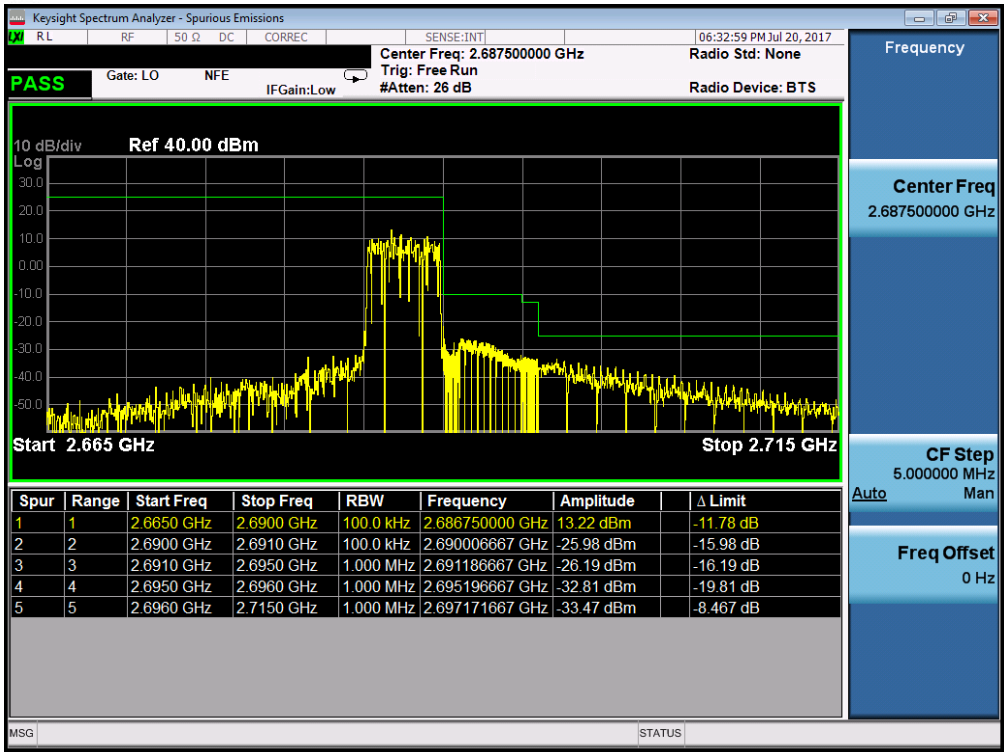


Plot 7-204. Upper Extended Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



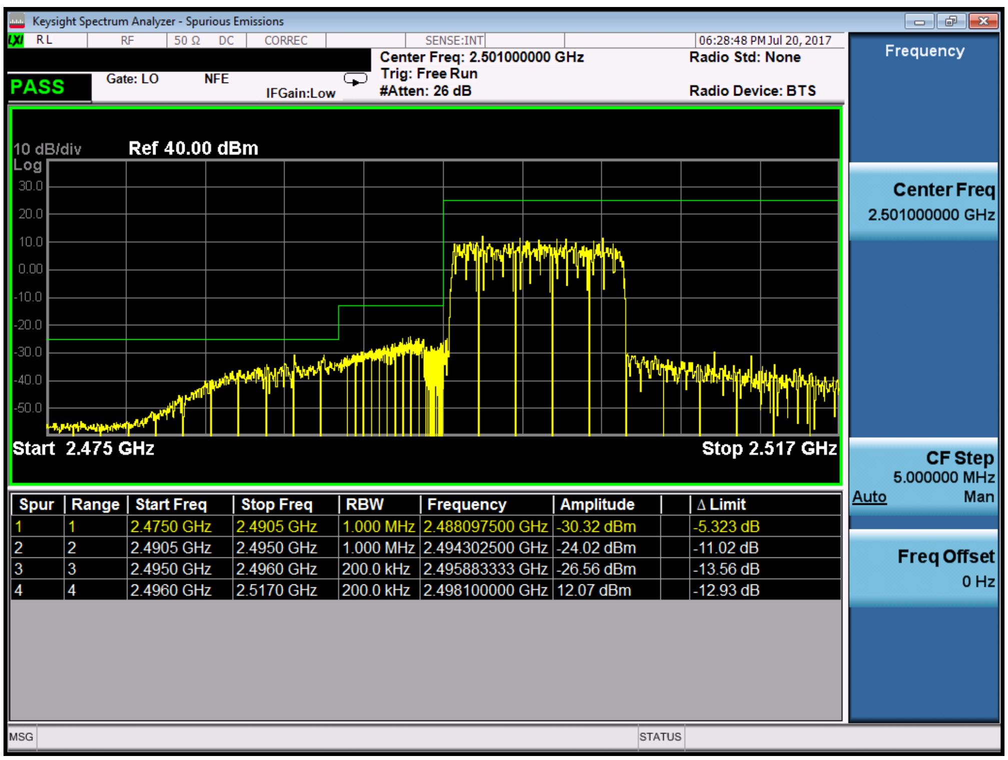
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4905 GHz	1.000 MHz	2.490422500 GHz	-37.76 dBm	-12.76 dB
2	2	2.4905 GHz	2.4950 GHz	1.000 MHz	2.494857500 GHz	-24.87 dBm	-11.87 dB
3	3	2.4950 GHz	2.4960 GHz	100.0 kHz	2.495940000 GHz	-22.73 dBm	-9.734 dB
4	4	2.4960 GHz	2.5170 GHz	100.0 kHz	2.498590000 GHz	11.68 dBm	-13.32 dB

Plot 7-205. Lower ACP Plot (Band 41 – 5.0MHz QPSK – RB Size 25)



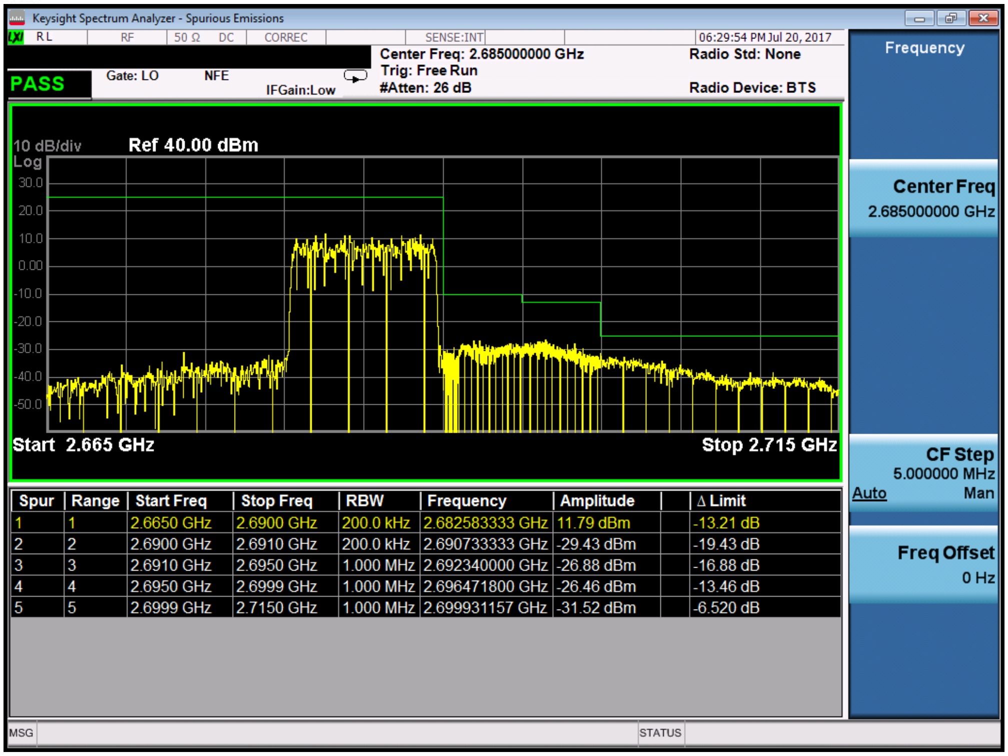
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.6650 GHz	2.6900 GHz	100.0 kHz	2.686750000 GHz	13.22 dBm	-11.78 dB
2	2	2.6900 GHz	2.6910 GHz	100.0 kHz	2.690006667 GHz	-25.98 dBm	-15.98 dB
3	3	2.6910 GHz	2.6950 GHz	1.000 MHz	2.691186667 GHz	-26.19 dBm	-16.19 dB
4	4	2.6950 GHz	2.6960 GHz	1.000 MHz	2.695196667 GHz	-32.81 dBm	-19.81 dB
5	5	2.6960 GHz	2.7150 GHz	1.000 MHz	2.697171667 GHz	-33.47 dBm	-8.467 dB

Plot 7-206. Upper ACP Plot (Band 41 – 5.0MHz QPSK – RB Size 25)

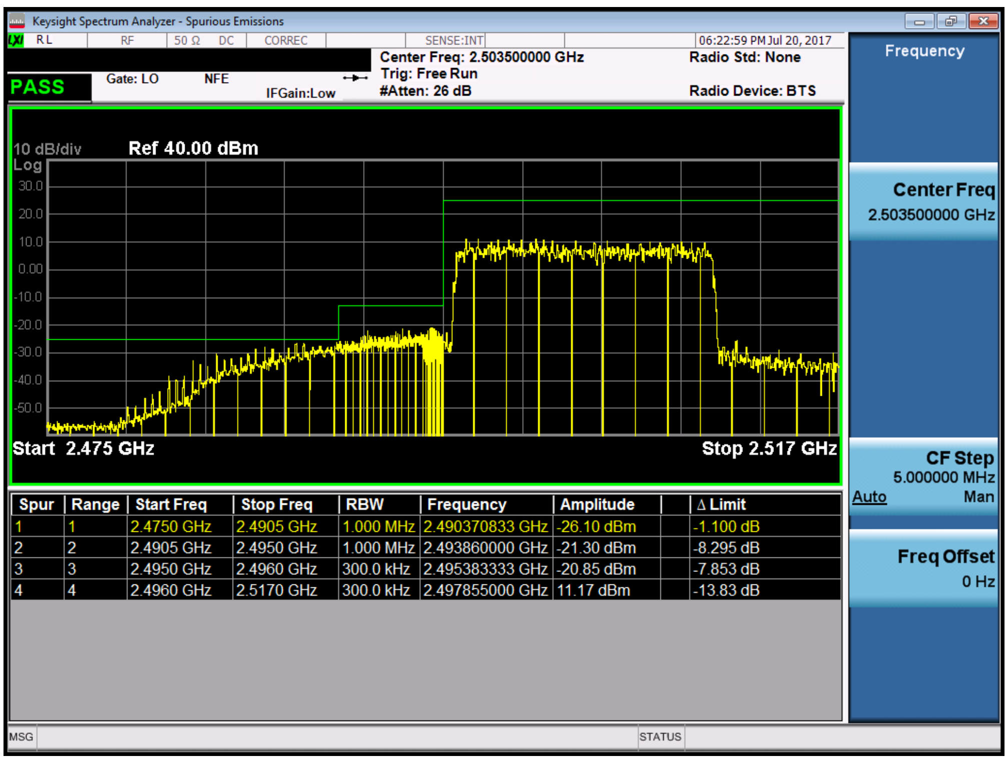


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4905 GHz	1.000 MHz	2.488097500 GHz	-30.32 dBm	-5.323 dB
2	2	2.4905 GHz	2.4950 GHz	1.000 MHz	2.494302500 GHz	-24.02 dBm	-11.02 dB
3	3	2.4950 GHz	2.4960 GHz	200.0 kHz	2.495883333 GHz	-26.56 dBm	-13.56 dB
4	4	2.4960 GHz	2.5170 GHz	200.0 kHz	2.498100000 GHz	12.07 dBm	-12.93 dB

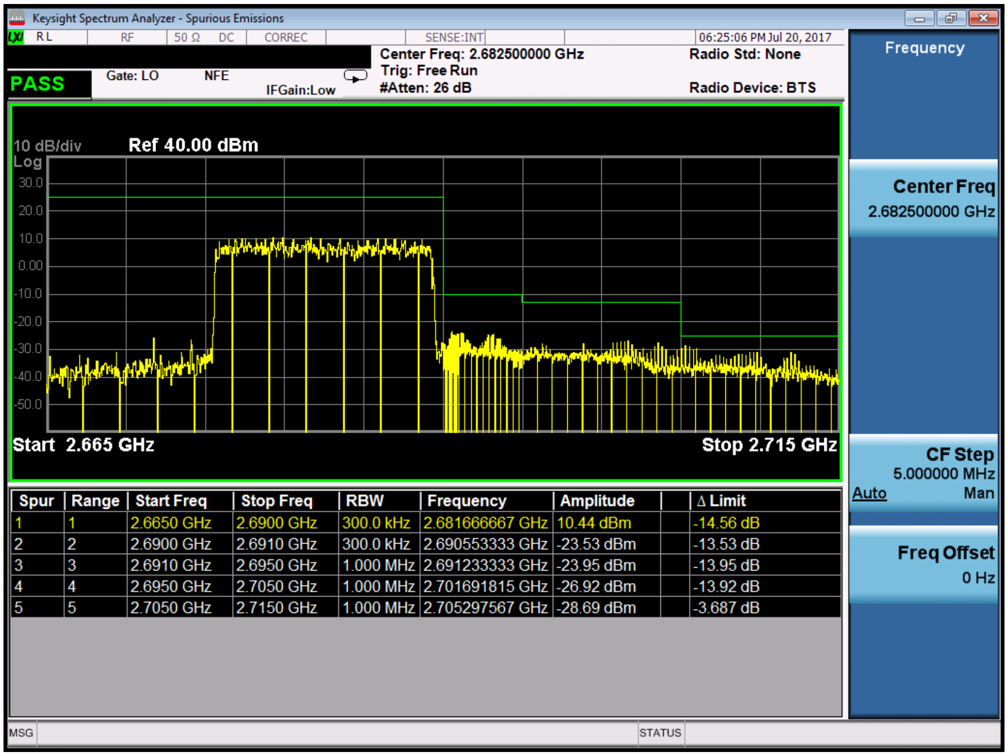
Plot 7-207. Lower ACP Plot (Band 41 – 10.0MHz QPSK – RB Size 50)



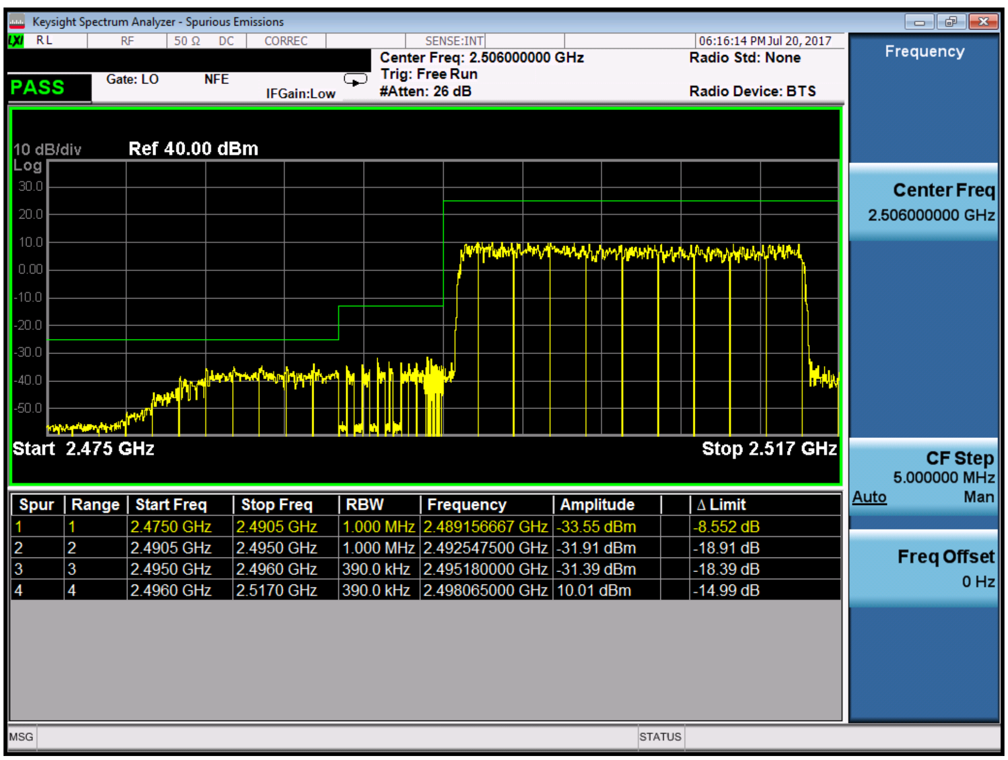
Plot 7-208. Upper ACP Plot (Band 41 – 10.0MHz QPSK – RB Size 50)



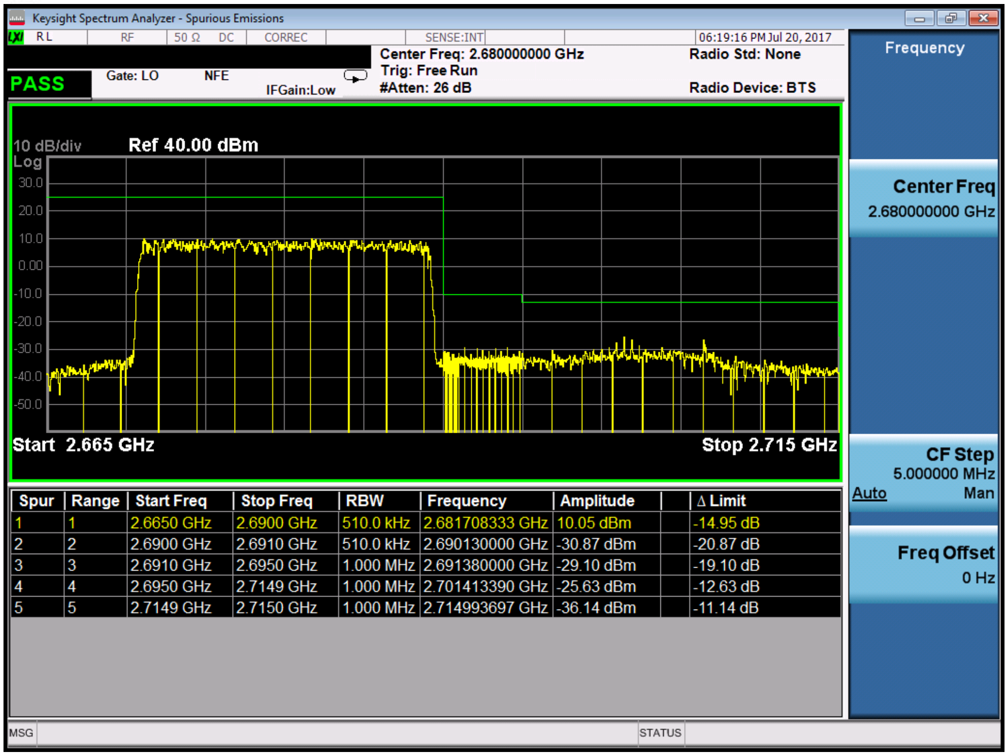
Plot 7-209. Lower ACP Plot (Band 41 – 15.0MHz QPSK – RB Size 75)



Plot 7-210. Upper ACP Plot (Band 41 – 15.0MHz QPSK – RB Size 75)



Plot 7-211. Lower ACP Plot (Band 41 – 20.0MHz QPSK – RB Size 100)



Plot 7-212. Upper ACP Plot (Band 41 – 20.0MHz QPSK – RB Size 100)

7.5 Peak-Average Ratio

§24.232(d)

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 v02r02 – 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. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

Test Setup

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

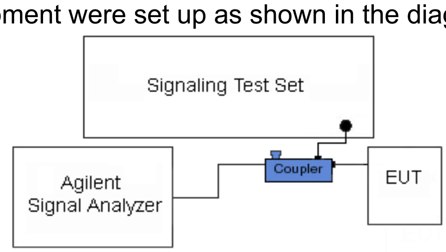
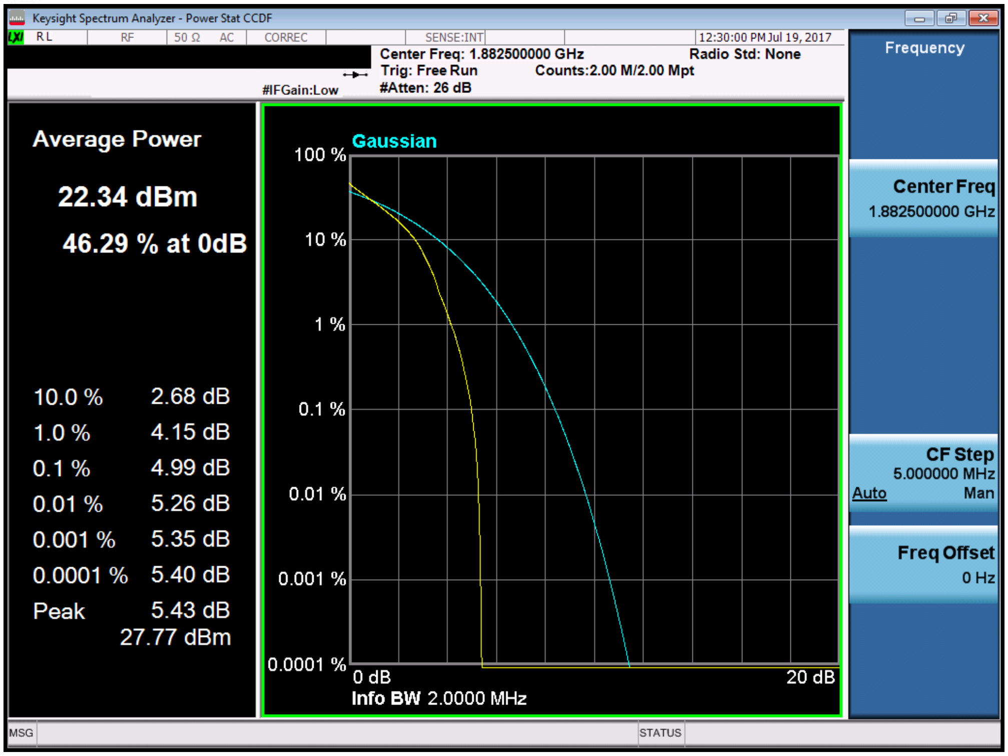


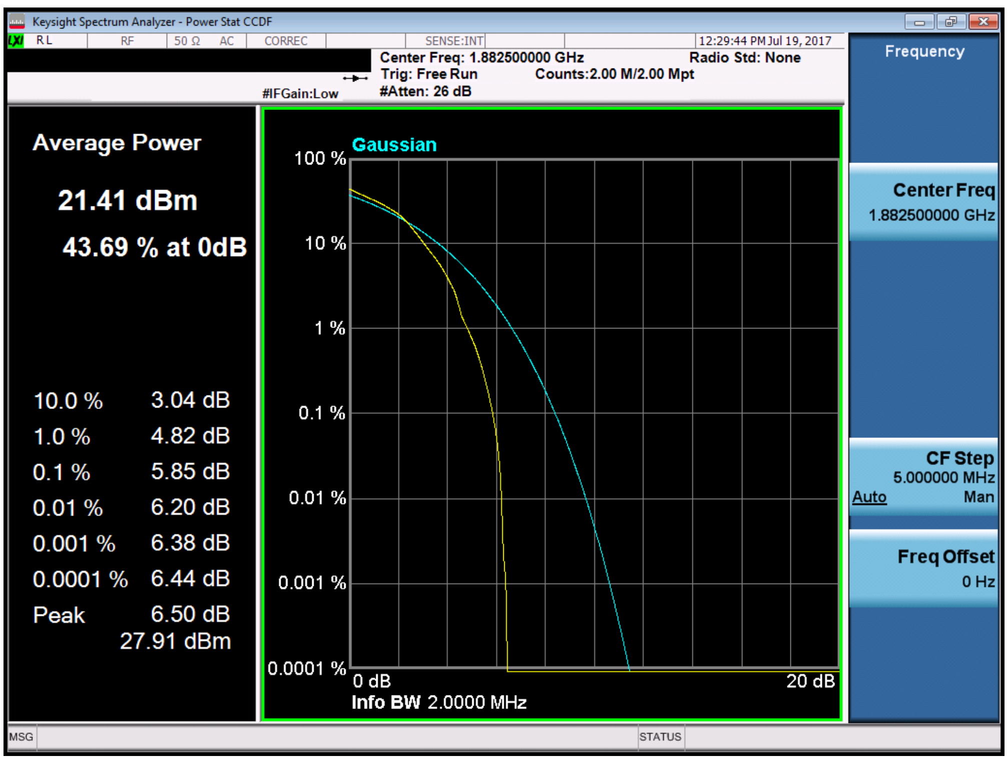
Figure 7-4. Test Instrument & Measurement Setup

Test Notes

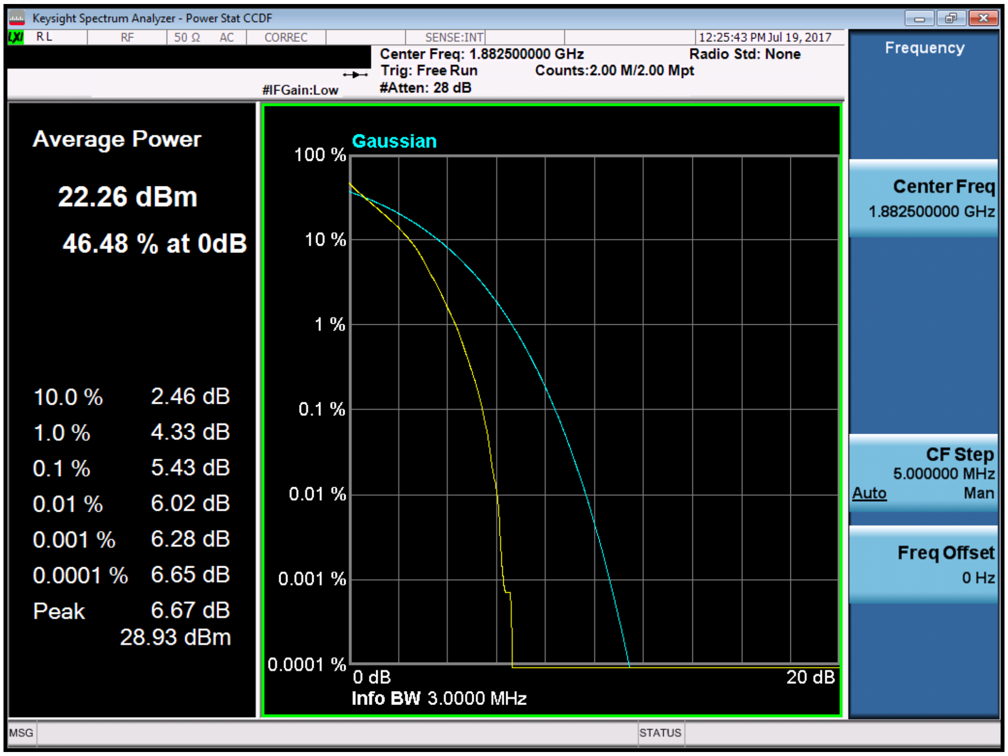
None.



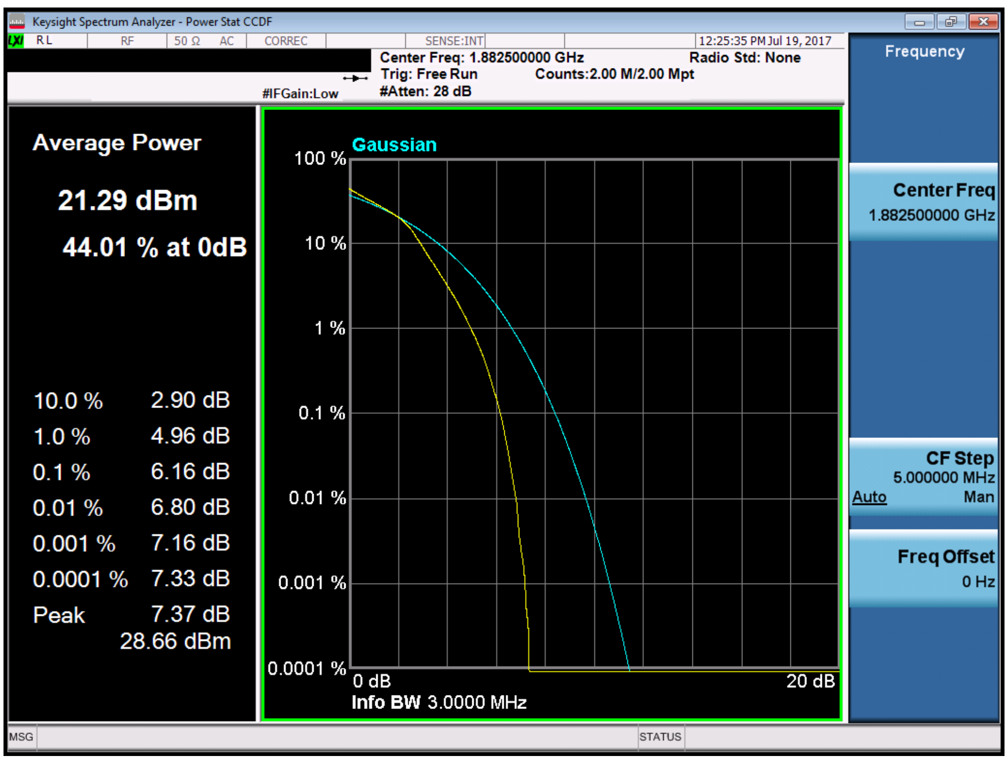
Plot 7-213. PAR Plot (Band 2/25 – 1.4MHz QPSK – RB Size 6)



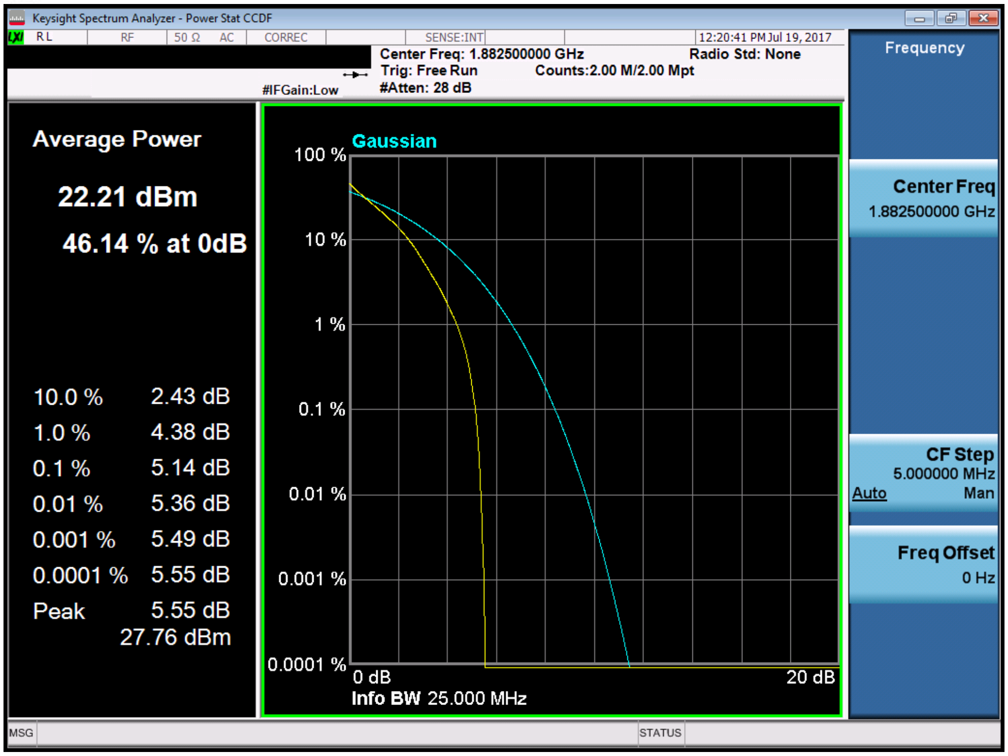
Plot 7-214. PAR Plot (Band 2/25 – 1.4MHz 16-QAM – RB Size 6)



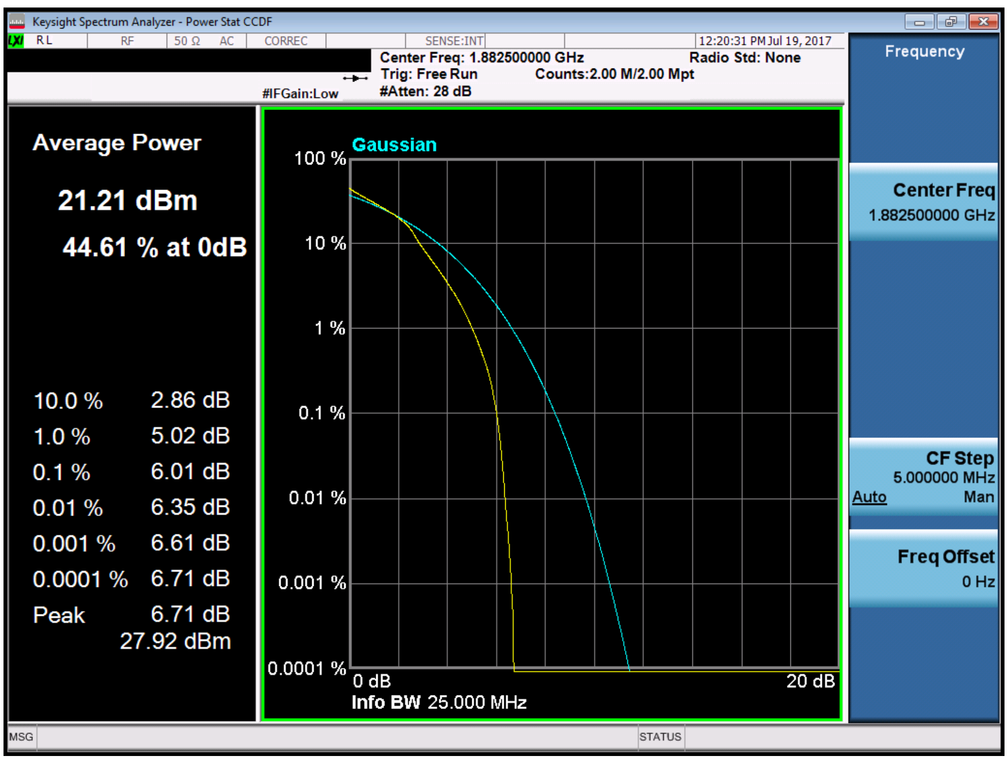
Plot 7-215. PAR Plot (Band 2/25 – 3.0MHz QPSK – RB Size 15)



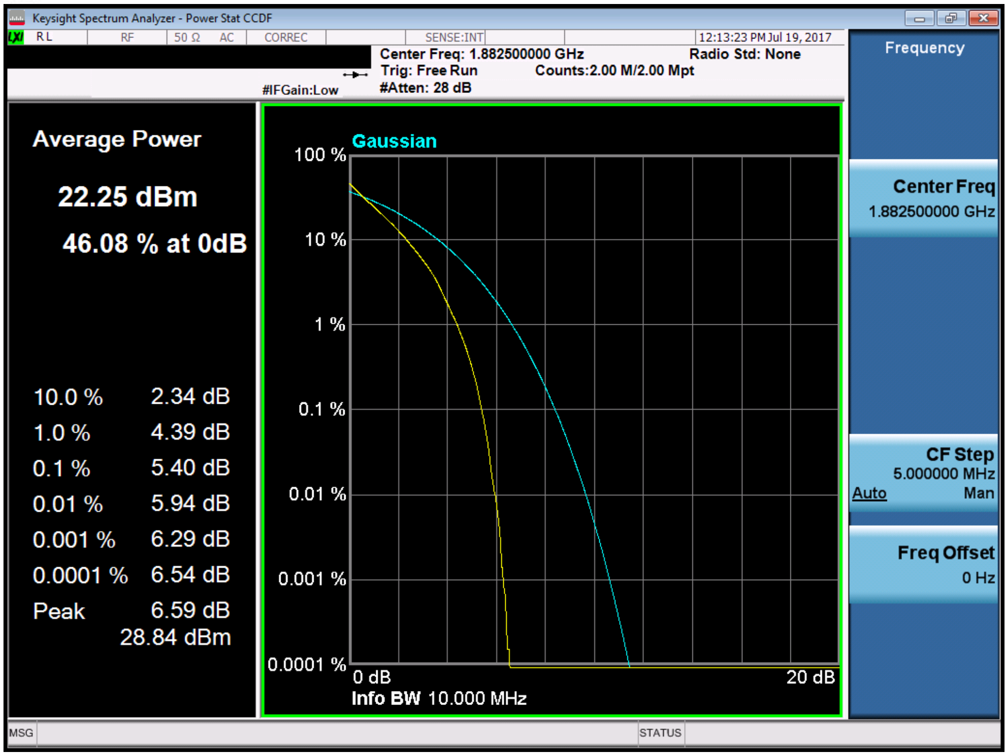
Plot 7-216. PAR Plot (Band 2/25 – 3.0MHz 16-QAM – RB Size 15)



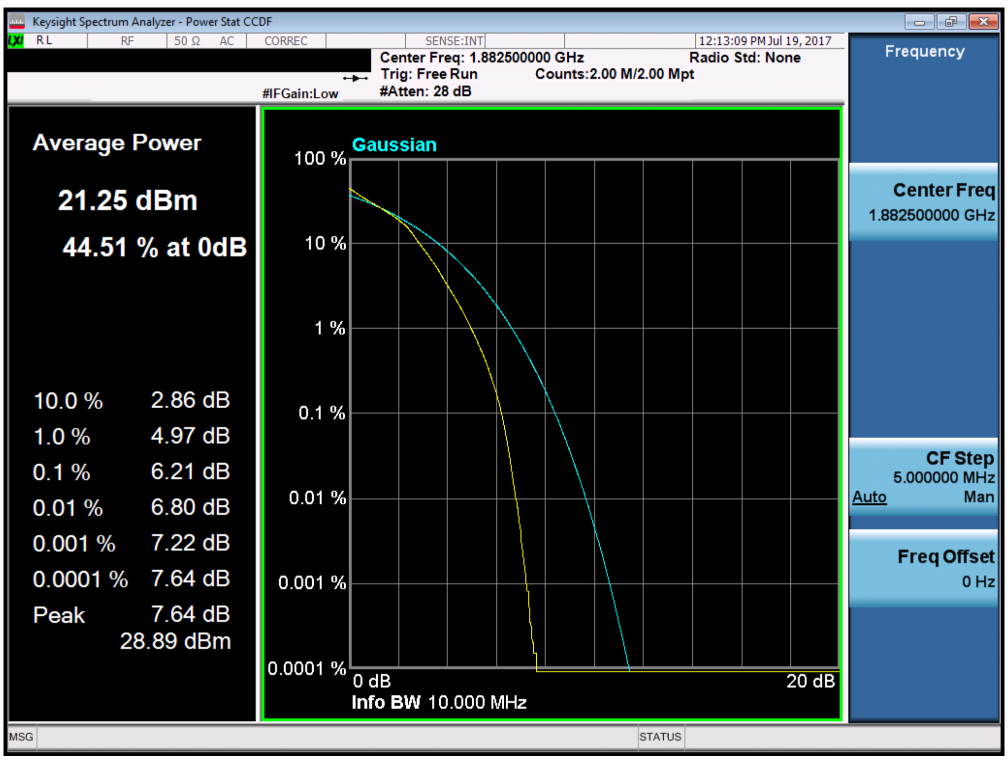
Plot 7-217. PAR Plot (Band 2/25 – 5.0MHz QPSK – RB Size 25)



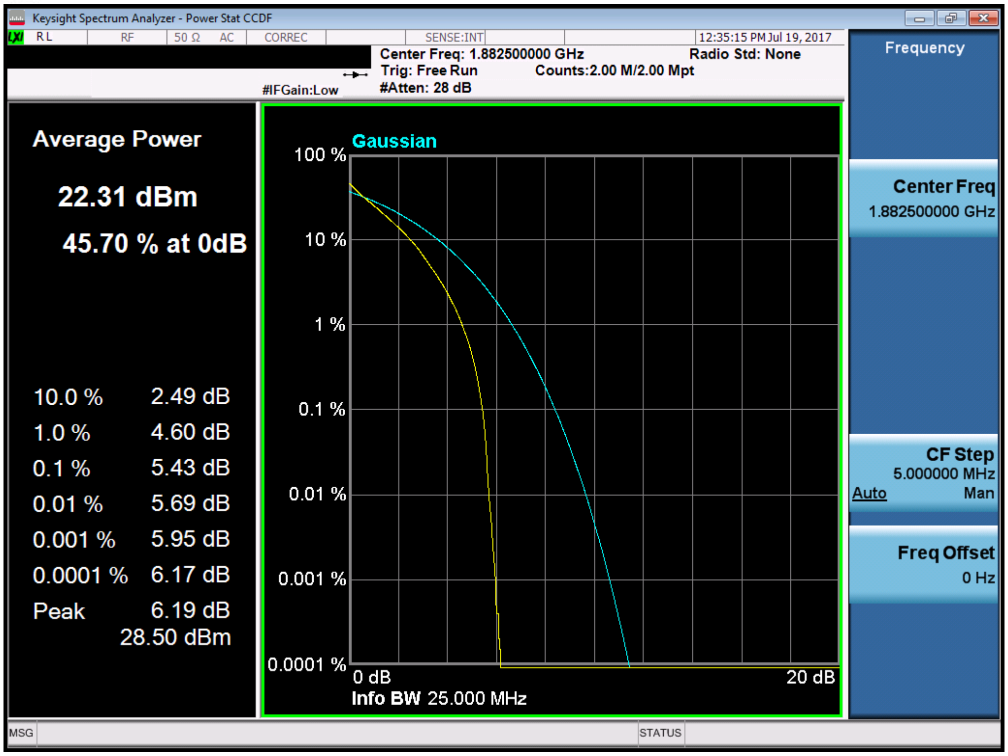
Plot 7-218. PAR Plot (Band 2/25 – 5.0MHz 16-QAM – RB Size 25)



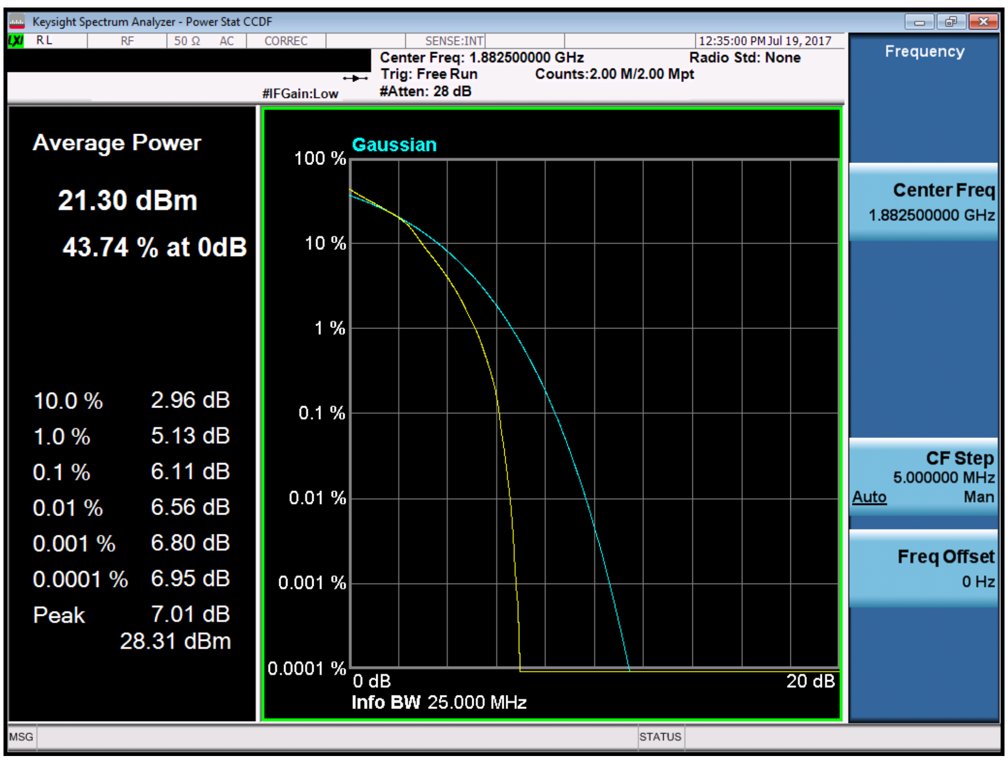
Plot 7-219. PAR Plot (Band 2/25 – 10.0MHz QPSK – RB Size 50)



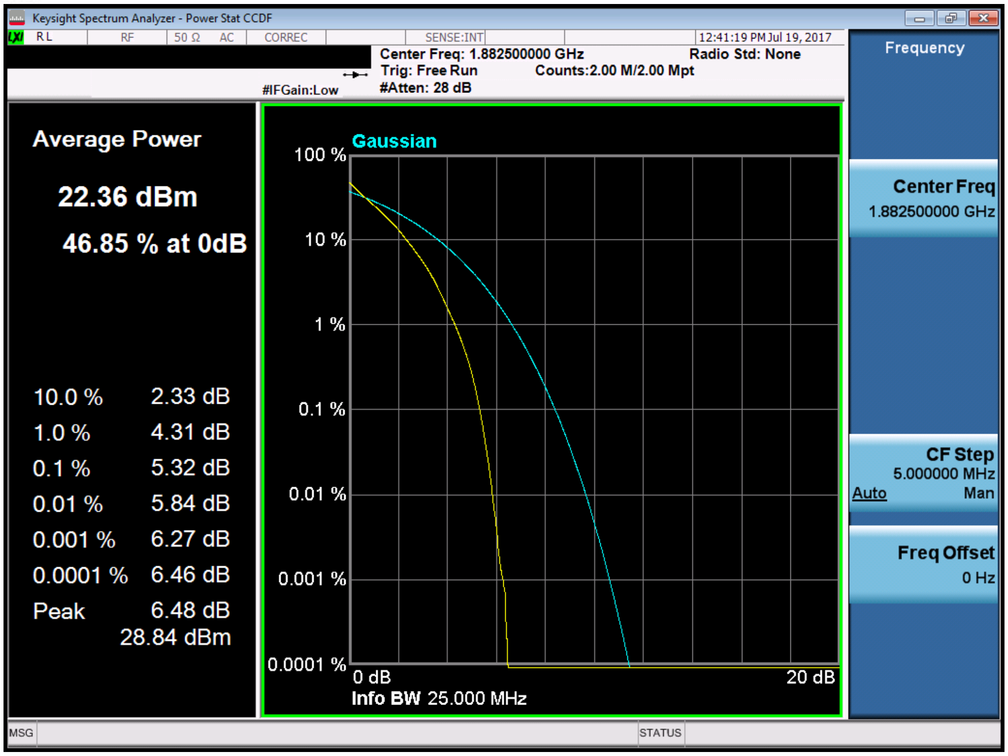
Plot 7-220. PAR Plot (Band 2/25 – 10.0MHz 16-QAM – RB Size 50)



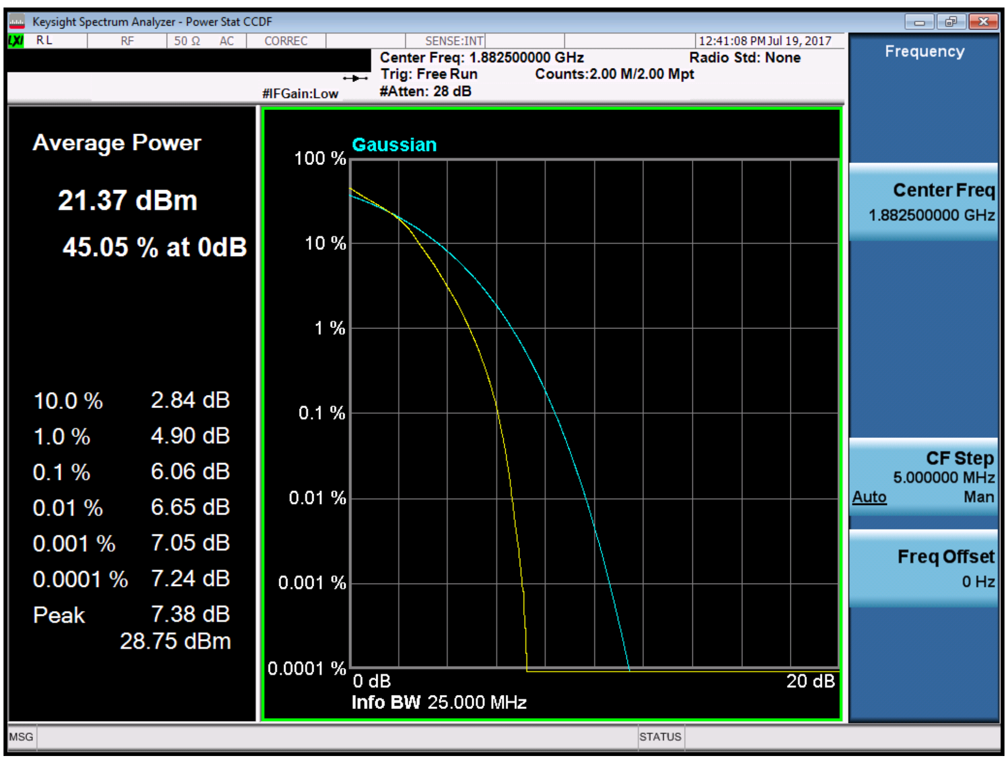
Plot 7-221. PAR Plot (Band 2/25 – 15.0MHz QPSK – RB Size 75)



Plot 7-222. PAR Plot (Band 2/25 – 15.0MHz 16-QAM – RB Size 75)



Plot 7-223. PAR Plot (Band 2/25 – 20.0MHz QPSK – RB Size 100)



Plot 7-224. PAR Plot (Band 2/25 – 20.0MHz 16-QAM – RB Size 100)

7.6 Radiated Power (ERP/EIRP)
§22.913(a.2) §24.232(c.2) §27.50(h.2) §27.50(b.10) §27.50(c.10) §27.50(d.4)

Test Overview

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/TIA-603-D-2010 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 v02r02 – Section 5.2.1

ANSI/TIA-603-D-2010 – 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. For signals with burst transmission, the signal analyzer's "time domain power" measurement capability is used
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". Trigger is set to enable triggering only on full power bursts with the sweep time set less than or equal to the transmission burst duration
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation. For signals with burst transmission, the "gating" function was enabled to ensure that measurements are performed during times in which the transmitter is operating at its maximum power
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.

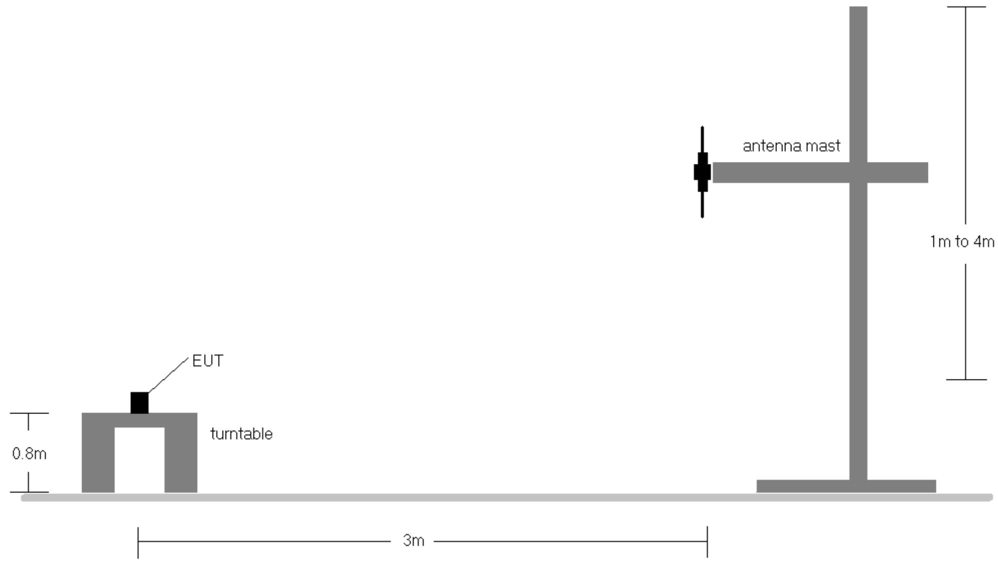


Figure 7-5. Radiated Test Setup <1GHz

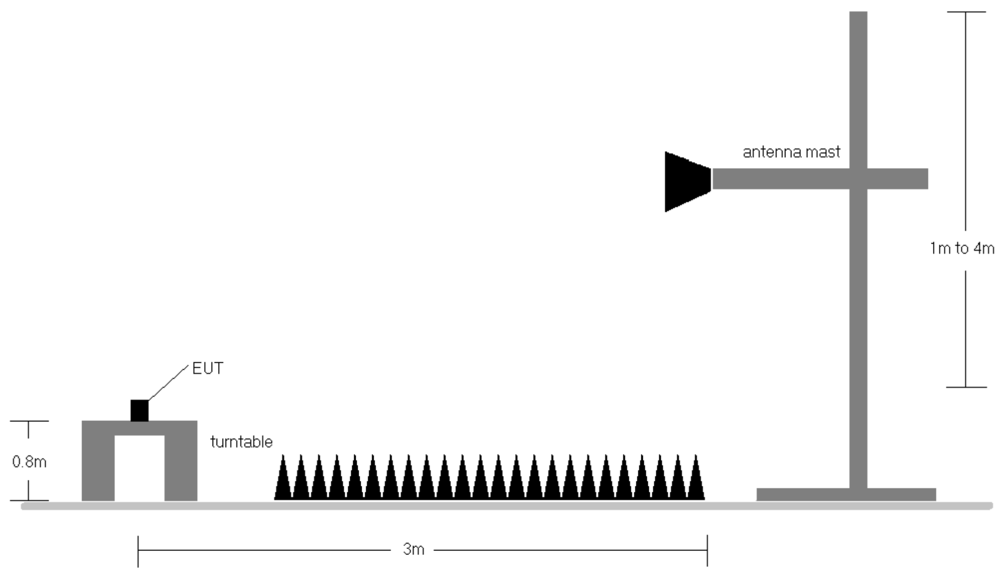


Figure 7-6. Radiated Test Setup >1GHz

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 [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
699.70	1.4	QPSK	V	142	34	1 / 5	12.62	2.84	15.46	34.77	-19.31
707.50	1.4	QPSK	V	144	123	1 / 0	13.68	2.99	16.67	34.77	-18.10
715.30	1.4	QPSK	V	147	38	3 / 2	14.55	3.06	17.61	34.77	-17.16
715.30	1.4	16-QAM	V	147	38	3 / 2	13.26	3.06	16.32	34.77	-18.45
700.50	3	QPSK	V	147	343	1 / 14	13.22	2.85	16.07	34.77	-18.70
707.50	3	QPSK	V	155	10	1 / 0	13.52	2.99	16.51	34.77	-18.26
714.50	3	QPSK	V	147	28	1 / 7	15.53	3.05	18.58	34.77	-16.19
714.50	3	16-QAM	V	147	28	1 / 7	14.14	3.05	17.19	34.77	-17.58
701.50	5	QPSK	V	147	21	1 / 24	16.30	2.88	19.18	34.77	-15.60
707.50	5	QPSK	V	154	29	1 / 0	16.14	2.99	19.13	34.77	-15.64
713.50	5	QPSK	V	141	14	1 / 12	16.70	3.04	19.74	34.77	-15.03
713.50	5	16-QAM	V	141	14	1 / 12	15.47	3.04	18.51	34.77	-16.26
704.00	10	QPSK	V	140	39	1 / 25	16.05	2.94	18.99	34.77	-15.79
707.50	10	QPSK	V	144	35	1 / 49	15.83	2.99	18.82	34.77	-15.95
711.00	10	QPSK	V	154	35	1 / 49	15.90	3.02	18.92	34.77	-15.85
704.00	10	16-QAM	V	140	39	1 / 25	14.63	2.94	17.57	34.77	-17.21
713.50	5	QPSK	H	127	287	1 / 0	14.21	2.60	16.81	34.77	-17.96

Table 7-2. 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 [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
779.50	5	QPSK	V	144	53	1 / 0	17.17	3.85	21.02	34.77	-13.75
782.00	5	QPSK	V	132	45	1 / 12	16.66	3.92	20.58	34.77	-14.19
784.50	5	QPSK	V	144	25	1 / 12	16.52	4.02	20.54	34.77	-14.23
779.50	5	16-QAM	V	144	53	1 / 0	15.43	3.85	19.28	34.77	-15.49
782.00	10	QPSK	V	138	158	1 / 25	15.94	3.92	19.86	34.77	-14.91
782.00	10	16-QAM	V	138	158	1 / 25	14.55	3.92	18.47	34.77	-16.30
779.50	5	QPSK	H	100	309	1 / 12	17.82	2.47	20.29	34.77	-14.48

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 [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
824.70	1.4	QPSK	H	150	353	1 / 0	21.74	-0.65	21.09	38.45	-17.36
836.50	1.4	QPSK	H	150	358	3 / 2	21.27	-0.65	20.62	38.45	-17.83
848.30	1.4	QPSK	H	150	352	3 / 2	21.34	-0.65	20.69	38.45	-17.76
824.70	1.4	16-QAM	H	150	353	1 / 0	20.83	-0.65	20.18	38.45	-18.27
825.50	3	QPSK	H	150	356	1 / 14	21.87	-0.65	21.22	38.45	-17.23
836.50	3	QPSK	H	150	356	1 / 14	21.52	-0.65	20.87	38.45	-17.58
847.50	3	QPSK	H	150	352	1 / 0	21.34	-0.65	20.69	38.45	-17.76
825.50	3	16-QAM	H	150	356	1 / 14	20.94	-0.65	20.29	38.45	-18.16
826.50	5	QPSK	H	150	346	1 / 0	21.53	-0.65	20.88	38.45	-17.57
836.50	5	QPSK	H	150	1	1 / 0	21.24	-0.65	20.59	38.45	-17.86
846.50	5	QPSK	H	150	357	1 / 0	21.32	-0.65	20.67	38.45	-17.78
826.50	5	16-QAM	H	150	346	1 / 0	20.74	-0.65	20.09	38.45	-18.36
829.00	10	QPSK	H	150	0	1 / 0	21.74	-0.65	21.09	38.45	-17.36
836.50	10	QPSK	H	150	5	1 / 49	21.49	-0.65	20.84	38.45	-17.61
844.00	10	QPSK	H	150	8	1 / 49	21.57	-0.65	20.92	38.45	-17.53
829.00	10	16-QAM	H	150	0	1 / 0	20.67	-0.65	20.02	38.45	-18.43
825.50	3	QPSK	V	150	175	1 / 0	19.80	-0.65	19.15	38.45	-19.30

Table 7-4. ERP Data (Band 5/26)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
831.50	15	QPSK	H	150	355	1 / 74	22.01	-0.65	21.36	38.45	-17.09
836.50	15	QPSK	H	150	0	1 / 0	22.00	-0.65	21.35	38.45	-17.10
841.50	15	QPSK	H	150	348	1 / 0	21.97	-0.65	21.32	38.45	-17.13
831.50	15	16-QAM	H	150	355	1 / 74	21.00	-0.65	20.35	38.45	-18.10

Table 7-5. ERP Data (Band 26)

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 Limit [dBm]	Margin [dB]
1710.70	1.4	QPSK	H	150	359	1 / 0	18.27	5.56	23.83	30.00	-6.17
1732.50	1.4	QPSK	H	150	354	1 / 0	19.08	5.41	24.49	30.00	-5.51
1754.30	1.4	QPSK	H	15	354	1 / 5	19.64	5.26	24.90	30.00	-5.10
1754.30	1.4	16-QAM	H	150	354	1 / 5	18.84	5.26	24.10	30.00	-5.90
1711.50	3	QPSK	H	150	359	1 / 0	18.45	5.55	24.00	30.00	-6.00
1732.50	3	QPSK	H	150	357	1 / 14	18.93	5.41	24.34	30.00	-5.66
1753.50	3	QPSK	H	150	354	1 / 14	19.70	5.26	24.96	30.00	-5.04
1753.50	3	16-QAM	H	150	354	1 / 14	18.64	5.26	23.90	30.00	-6.10
1712.50	5	QPSK	H	150	358	1 / 24	18.29	5.55	23.84	30.00	-6.16
1732.50	5	QPSK	H	150	355	1 / 24	19.06	5.41	24.47	30.00	-5.53
1752.50	5	QPSK	H	150	356	1 / 24	19.57	5.27	24.84	30.00	-5.16
1752.50	5	16-QAM	H	150	356	1 / 24	18.89	5.27	24.16	30.00	-5.84
1715.00	10	QPSK	H	150	359	1 / 49	18.37	5.53	23.90	30.00	-6.10
1732.50	10	QPSK	H	150	352	1 / 49	18.99	5.41	24.40	30.00	-5.60
1750.00	10	QPSK	H	150	355	1 / 0	19.63	5.29	24.92	30.00	-5.08
1750.00	10	16-QAM	H	150	355	1 / 0	18.97	5.29	24.26	30.00	-5.74
1717.50	15	QPSK	H	150	356	1 / 74	19.02	5.51	24.53	30.00	-5.47
1732.50	15	QPSK	H	150	355	1 / 74	19.32	5.41	24.73	30.00	-5.27
1747.50	15	QPSK	H	150	356	1 / 74	19.64	5.31	24.95	30.00	-5.05
1747.50	15	16-QAM	H	150	356	1 / 74	19.07	5.31	24.38	30.00	-5.62
1720.00	20	QPSK	H	150	353	1 / 99	19.24	5.49	24.73	30.00	-5.27
1732.50	20	QPSK	H	150	354	1 / 99	19.50	5.41	24.91	30.00	-5.09
1745.00	20	QPSK	H	150	351	1 / 99	19.58	5.32	24.90	30.00	-5.10
1732.50	20	16-QAM	H	150	354	1 / 99	18.77	5.41	24.18	30.00	-5.82
1753.50	3	QPSK	V	150	14	1 / 0	17.76	5.26	23.02	30.00	-6.98

Table 7-6. 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 Limit [dBm]	Margin [dB]
1850.70	1.4	QPSK	H	100	286	1 / 0	16.92	9.52	26.44	33.01	-6.57
1882.50	1.4	QPSK	H	100	283	3 / 2	16.20	9.52	25.72	33.01	-7.29
1914.30	1.4	QPSK	H	100	283	1 / 0	15.00	9.56	24.56	33.01	-8.45
1850.70	1.4	16-QAM	H	100	286	1 / 0	16.07	9.52	25.59	33.01	-7.42
1851.50	3	QPSK	H	100	288	1 / 0	17.14	9.52	26.66	33.01	-6.35
1882.50	3	QPSK	H	100	280	1 / 14	16.54	9.52	26.06	33.01	-6.95
1913.50	3	QPSK	H	100	294	1 / 0	15.67	9.55	25.22	33.01	-7.79
1851.50	3	16-QAM	H	100	288	1 / 0	16.18	9.52	25.70	33.01	-7.31
1852.50	5	QPSK	H	100	284	1 / 0	17.04	9.52	26.56	33.01	-6.45
1882.50	5	QPSK	H	100	284	1 / 24	16.52	9.52	26.04	33.01	-6.97
1912.50	5	QPSK	H	100	285	1 / 0	16.10	9.55	25.65	33.01	-7.36
1882.50	5	16-QAM	H	100	284	1 / 24	15.77	9.52	25.29	33.01	-7.72
1855.00	10	QPSK	H	108	282	1 / 49	15.76	9.52	25.28	33.01	-7.73
1882.50	10	QPSK	H	106	277	1 / 49	15.71	9.52	25.23	33.01	-7.78
1910.00	10	QPSK	H	100	278	1 / 0	15.77	9.55	25.32	33.01	-7.69
1910.00	10	16-QAM	H	100	278	1 / 0	14.95	9.55	24.50	33.01	-8.51
1857.50	15	QPSK	H	100	289	1 / 0	16.09	9.52	25.61	33.01	-7.40
1882.50	15	QPSK	H	100	288	1 / 0	15.87	9.52	25.39	33.01	-7.62
1907.50	15	QPSK	H	100	288	1 / 0	15.78	9.54	25.32	33.01	-7.69
1857.50	15	16-QAM	H	100	289	1 / 0	15.43	9.52	24.95	33.01	-8.06
1860.00	20	QPSK	H	100	284	1 / 0	16.83	9.52	26.35	33.01	-6.66
1882.50	20	QPSK	H	100	285	1 / 0	15.98	9.52	25.50	33.01	-7.51
1905.00	20	QPSK	H	100	279	1 / 0	16.06	9.54	25.60	33.01	-7.41
1860.00	20	16-QAM	H	100	284	1 / 0	15.92	9.52	25.44	33.01	-7.57
1851.50	3	QPSK	V	103	311	1 / 0	14.48	9.46	23.94	33.01	-9.07

Table 7-7. EIRP Data (Band 2/25)

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 Limit [dBm]	Margin [dB]
2498.50	5	QPSK	H	100	80	1 / 24	15.51	8.42	23.93	33.01	-9.08
2593.00	5	QPSK	H	100	270	1 / 24	16.30	8.65	24.95	33.01	-8.06
2687.50	5	QPSK	H	104	337	1 / 0	17.38	8.44	25.82	33.01	-7.19
2687.50	5	16-QAM	H	104	337	1 / 0	16.40	8.44	24.84	33.01	-8.17
2501.00	10	QPSK	H	100	83	1 / 49	15.09	8.41	23.50	33.01	-9.51
2593.00	10	QPSK	H	103	262	1 / 0	16.58	8.65	25.23	33.01	-7.78
2685.00	10	QPSK	H	104	337	1 / 0	17.14	8.45	25.59	33.01	-7.42
2685.00	10	16-QAM	H	104	337	1 / 0	15.78	8.45	24.23	33.01	-8.78
2503.50	15	QPSK	H	112	64	1 / 74	15.48	8.42	23.90	33.01	-9.11
2593.00	15	QPSK	H	103	283	1 / 74	16.42	8.65	25.07	33.01	-7.94
2682.50	15	QPSK	H	103	337	1 / 0	17.09	8.46	25.55	33.01	-7.46
2682.50	15	16-QAM	H	103	337	1 / 0	16.30	8.46	24.76	33.01	-8.25
2506.00	20	QPSK	H	100	67	1 / 99	16.24	8.42	24.66	33.01	-8.35
2593.00	20	QPSK	H	105	337	1 / 99	15.82	8.65	24.47	33.01	-8.54
2680.00	20	QPSK	H	106	339	1 / 0	16.95	8.46	25.41	33.01	-7.60
2680.00	20	16-QAM	H	106	339	1 / 0	16.08	8.46	24.54	33.01	-8.47
2687.50	5	QPSK	V	100	270	1 / 99	15.60	8.73	24.33	33.01	-8.68
2685.00	10	QPSK (PC3)	V	100	308	1 / 0	15.48	8.73	24.21	33.01	-8.80

Table 7-8. EIRP Data (Band 41)

7.7 Radiated Spurious Emissions Measurements

§2.1053 §22.917(a) §24.238(a) §27.53(c) §27.53(f) §27.53(g) §27.53(h) §27.53(m)

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-D-2010 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 v02r02 – Section 5.8

ANSI/TIA-603-D-2010 – 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.

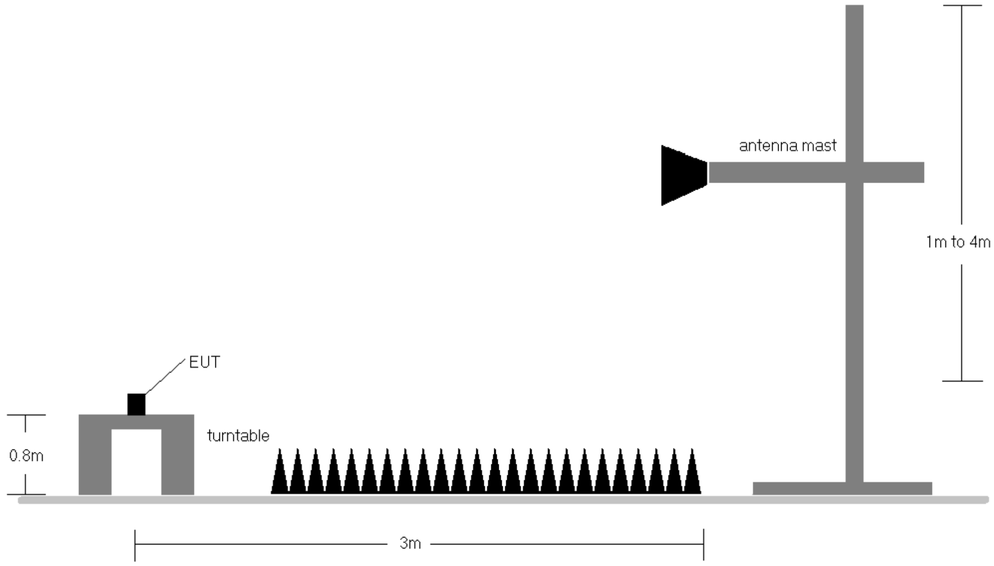


Figure 7-7. Test Instrument & Measurement Setup

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.

OPERATING FREQUENCY:	701.50	MHz		
CHANNEL:	23035			
MEASURED OUTPUT POWER:	19.18	dBm =	0.083	W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	$43 + 10 \log_{10}(W) =$	32.18	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1403.00	V	139	80	-71.77	5.91	-65.86	85.0
2104.50	V	144	87	-71.39	6.82	-64.56	83.7
2806.00	V	-	-	-72.39	8.13	-64.26	83.4

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

OPERATING FREQUENCY:	707.50	MHz		
CHANNEL:	23095			
MEASURED OUTPUT POWER:	19.13	dBm =	0.082	W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	$43 + 10 \log_{10}(W) =$	32.13	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1415.00	V	141	277	-74.22	5.95	-68.27	87.4
2122.50	V	147	108	-71.65	6.87	-64.78	83.9
2830.00	V	-	-	-72.07	8.14	-63.93	83.1

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

OPERATING FREQUENCY:	713.50			MHz
CHANNEL:	23155			
MEASURED OUTPUT POWER:	19.74	dBm =	0.094	W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	$43 + 10 \log_{10}(W) =$	32.74	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1427.00	V	142	80	-66.83	5.99	-60.83	80.6
2140.50	V	141	270	-71.80	6.92	-64.88	84.6
2854.00	V	-	-	-72.09	8.15	-63.95	83.7

Table 7-11. Radiated Spurious Data (Band 12 – High Channel)

OPERATING FREQUENCY:	779.50			MHz
CHANNEL:	23205			
MEASURED OUTPUT POWER:	21.02	dBm =	0.126	W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	$43 + 10 \log_{10}(W) =$	34.02	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
2338.50	V	-	-	-76.07	7.01	-69.06	90.1
3118.00	V	167	62	-72.92	7.28	-65.64	86.7
3897.50	V	-	-	-70.38	7.18	-63.19	84.2

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

OPERATING FREQUENCY:	782.00			MHz
CHANNEL:	23230			
MEASURED OUTPUT POWER:	20.58	dBm =	0.114	W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	$43 + 10 \log_{10}(W) =$	33.58	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
2346.00	V	-	-	-73.60	7.00	-66.59	87.2
3128.00	V	219	279	-70.96	7.26	-63.70	84.3
3910.00	V	-	-	-67.89	7.18	-60.71	81.3

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

OPERATING FREQUENCY:	784.50			MHz
CHANNEL:	23255			
MEASURED OUTPUT POWER:	20.54	dBm =	0.113	W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	$43 + 10 \log_{10}(W) =$	33.54	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
2353.50	V	-	-	-73.49	6.99	-66.50	87.0
3138.00	V	117	98	-70.20	7.25	-62.96	83.5
3922.50	V	-	-	-67.55	7.19	-60.36	80.9

Table 7-14. Radiated Spurious Data (Band 13 – High Channel)

MODULATION SIGNAL: QPSK

BANDWIDTH: 5.00 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 [dBd]	Spurious Emission Level [dBm]	Margin [dB]
1559.00	V	154	180	-72.67	6.36	-66.31	-26.3
1564.00	V	159	206	-70.82	6.37	-64.45	-24.4
1569.00	V	164	183	-70.73	6.38	-64.35	-24.4

Table 7-15. Radiated Spurious Data (Band 13 – 1559-1610MHz Band)

OPERATING FREQUENCY: 826.50 MHz

CHANNEL: 26815

MEASURED OUTPUT POWER: 20.88 dBm = 0.122 W

MODULATION SIGNAL: QPSK

BANDWIDTH: 5.0 MHz

DISTANCE: 3 meters

LIMIT: $43 + 10 \log_{10}(W) =$ 33.88 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1653.00	H	123	45	-68.94	6.28	-62.66	83.5
2479.50	H	-	-	-73.22	6.84	-66.37	87.3

Table 7-16. Radiated Spurious Data (Band 5/26 – Low Channel)

OPERATING FREQUENCY:	836.50	MHz		
CHANNEL:	26915			
MEASURED OUTPUT POWER:	20.59	dBm =	0.115	W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	$43 + 10 \log_{10}(W) =$	33.59	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1673.00	H	112	41	-68.92	6.21	-62.71	83.3
2509.50	H	101	123	-71.97	6.86	-65.11	85.7
3346.00	H	-	-	-70.40	7.26	-63.13	83.7

Table 7-17. Radiated Spurious Data (Band 5/26 – Mid Channel)

OPERATING FREQUENCY:	846.50	MHz		
CHANNEL:	27015			
MEASURED OUTPUT POWER:	20.67	dBm =	0.117	W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	$43 + 10 \log_{10}(W) =$	33.67	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1693.00	H	108	42	-66.92	6.14	-60.78	81.5
2539.50	H	100	134	-69.62	6.95	-62.67	83.3
3386.00	H	215	51	-70.47	7.38	-63.09	83.8
4232.50	H	-	-	-70.54	8.34	-62.21	82.9

Table 7-18. Radiated Spurious Data (Band 5/26 – High Channel)

OPERATING FREQUENCY:	1711.50	MHz		
CHANNEL:	19965			
MEASURED OUTPUT POWER:	24.00	dBm =	0.251	W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	37.00	dBc	

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]	[dBc]
3423.00	H	156	312	-67.82	9.65	-58.18	82.2
5134.50	H	138	334	-64.16	10.92	-53.24	77.2
6846.00	H	145	12	-57.64	10.78	-46.86	70.9
8557.50	H	145	47	-52.30	11.67	-40.63	64.6
10269.00	H	-	-	-59.71	12.75	-46.96	71.0

Table 7-19. Radiated Spurious Data (Band 4 – Low Channel)

OPERATING FREQUENCY:	1732.50	MHz		
CHANNEL:	20175			
MEASURED OUTPUT POWER:	24.34	dBm =	0.272	W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	37.34	dBc	

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]	[dBc]
3465.00	H	189	10	-69.58	9.77	-59.80	84.1
5197.50	H	294	13	-66.09	10.81	-55.28	79.6
6930.00	H	100	2	-57.33	10.89	-46.45	70.8
8662.50	H	152	225	-54.48	11.86	-42.62	67.0
10395.00	H	-	-	-59.43	12.73	-46.69	71.0

Table 7-20. Radiated Spurious Data (Band 4 – Mid Channel)

OPERATING FREQUENCY:	1753.50	MHz		
CHANNEL:	20385			
MEASURED OUTPUT POWER:	24.96	dBm =	0.314	W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	$43 + 10 \log_{10}(W) =$	37.96	dBc	

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]	[dBc]
3507.00	H	100	325	-67.56	9.89	-57.67	82.6
5260.50	H	130	312	-61.52	10.93	-50.59	75.6
7014.00	H	123	352	-58.56	11.06	-47.49	72.5
8767.50	H	162	68	-46.06	12.03	-34.03	59.0
10521.00	H	-	-	-59.43	12.70	-46.73	71.7

Table 7-21. Radiated Spurious Data (Band 4 – High Channel)

OPERATING FREQUENCY:	1851.50	MHz		
CHANNEL:	26055			
MEASURED OUTPUT POWER:	26.66	dBm =	0.463	W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	$43 + 10 \log_{10}(W) =$	39.66	dBc	

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]	[dBc]
3703.00	H	175	79	-64.74	10.02	-54.72	81.4
5554.50	H	141	75	-65.35	11.19	-54.16	80.8
7406.00	H	128	44	-57.24	10.87	-46.37	73.0
9257.50	H	106	119	-57.10	12.36	-44.74	71.4
11109.00	H	-	-	-59.53	13.32	-46.22	72.9

Table 7-22. Radiated Spurious Data (Band 2/25 – Low Channel)

OPERATING FREQUENCY: 1882.50 MHz

CHANNEL: 26365

MEASURED OUTPUT POWER: 26.06 dBm = 0.404 W

MODULATION SIGNAL: QPSK

BANDWIDTH: 3.0 MHz

DISTANCE: 3 meters

LIMIT: 43 + 10 $\log_{10}$ (W) = 39.06 dBc

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]	[dBc]
3765.00	H	141	169	-61.11	9.76	-51.34	77.4
5647.50	H	139	295	-62.44	11.36	-51.08	77.1
7530.00	H	114	85	-56.53	11.25	-45.28	71.3
9412.50	H	151	114	-57.31	12.31	-45.00	71.1
11295.00	H	-	-	-58.35	13.25	-45.10	71.2

Table 7-23. Radiated Spurious Data (Band 2/25 – Mid Channel)

OPERATING FREQUENCY: 1913.50 MHz

CHANNEL: 26675

MEASURED OUTPUT POWER: 25.22 dBm = 0.333 W

MODULATION SIGNAL: QPSK

BANDWIDTH: 3.0 MHz

DISTANCE: 3 meters

LIMIT: 43 + 10 $\log_{10}$ (W) = 38.22 dBc

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]	[dBc]
3827.00	H	159	124	-55.16	9.53	-45.63	70.8
5740.50	H	222	0	-65.48	11.44	-54.04	79.3
7654.00	H	171	83	-57.00	11.52	-45.49	70.7
9567.50	H	143	109	-56.99	12.40	-44.59	69.8
11481.00	H	-	-	-57.64	13.35	-44.30	69.5

Table 7-24. Radiated Spurious Data (Band 2/25 – High Channel)

OPERATING FREQUENCY:	2498.50			MHz
CHANNEL:	39675			
MEASURED OUTPUT POWER:	23.93	dBm =	0.247	W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	55 + 10 log10 (W)	48.93	dBc	

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]	[dBc]
4997.00	H	145	256	-65.01	11.18	-53.82	77.8
7498.00	H	160	354	-58.33	11.16	-47.17	71.1
9999.00	H	132	302	-54.46	12.55	-41.90	65.8
12500.00	H	-	-	-55.01	12.97	-42.04	66.0

Table 7-25. Radiated Spurious Data (Band 41 – Low Channel)

OPERATING FREQUENCY:	2593.00			MHz
CHANNEL:	40620			
MEASURED OUTPUT POWER:	24.95	dBm =	0.313	W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	55 + 10 log10 (W)	49.95	dBc	

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]	[dBc]
5186.00	H	132	15	-62.14	11.18	-50.95	75.9
7779.00	H	136	17	-51.81	11.16	-40.65	65.6
10372.00	H	125	120	-47.19	12.55	-34.63	59.6
12965.00	H	151	342	-53.93	12.97	-40.96	65.9
15558.00	H	-	-	-49.23	11.71	-37.52	62.5

Table 7-26. Radiated Spurious Data (Band 41 – Mid Channel)

OPERATING FREQUENCY:	2687.50	MHz		
CHANNEL:	41565			
MEASURED OUTPUT POWER:	25.82	dBm =	0.382	W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	55 + 10 log10 (W)	50.82	dBc	

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]	[dBc]
5375.00	H	130	345	-59.87	11.09	-48.78	74.6
8060.00	H	149	287	-52.07	11.55	-40.52	66.3
10745.00	H	130	66	-49.58	13.01	-36.57	62.4
13430.00	H	-	-	-53.69	12.99	-40.71	66.5

Table 7-27. Radiated Spurious Data (Band 41 – High Channel)

OPERATING FREQUENCY:	2685.00	MHz		
CHANNEL:	41540			
MEASURED OUTPUT POWER:	24.21	dBm =	0.264	W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	10.0	MHz		
DISTANCE:	3	meters		
LIMIT:	55 + 10 log10 (W)	49.21	dBc	

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]	[dBc]
5370.00	H	143	344	-59.64	11.09	-48.55	72.8
8055.00	H	149	291	-51.51	11.55	-39.96	64.2
10740.00	H	159	352	-54.63	13.01	-41.62	65.8
13425.00	H	-	-	-53.35	12.99	-40.37	64.6

Table 7-28. Radiated Spurious Data (Band 41 – High Channel) (PC3)

7.8 Frequency Stability / Temperature Variation

§2.1055 §22.355 §24.235 §27.54

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-D-2010. 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 and 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-D-2010

Test Settings

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

Test Setup

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

Test Notes

None

Band 12 Frequency Stability Measurements

§2.1055 §27.54

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

VOLTAGE (%)	POWER (VDC)	TEMP (^oC)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	707,499,905	-95	-0.0000134
100 %		- 30	707,500,038	38	0.0000054
100 %		- 20	707,500,003	3	0.0000004
100 %		- 10	707,500,074	74	0.0000105
100 %		0	707,500,120	120	0.0000170
100 %		+ 10	707,500,335	335	0.0000473
100 %		+ 20	707,499,815	-185	-0.0000261
100 %		+ 30	707,499,816	-184	-0.0000260
100 %		+ 40	707,499,808	-192	-0.0000271
100 %		+ 50	707,500,397	397	0.0000561
BATT. ENDPOINT	3.45	+ 20	707,500,083	83	0.0000117

Table 7-29. 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
§2.1055 §27.54

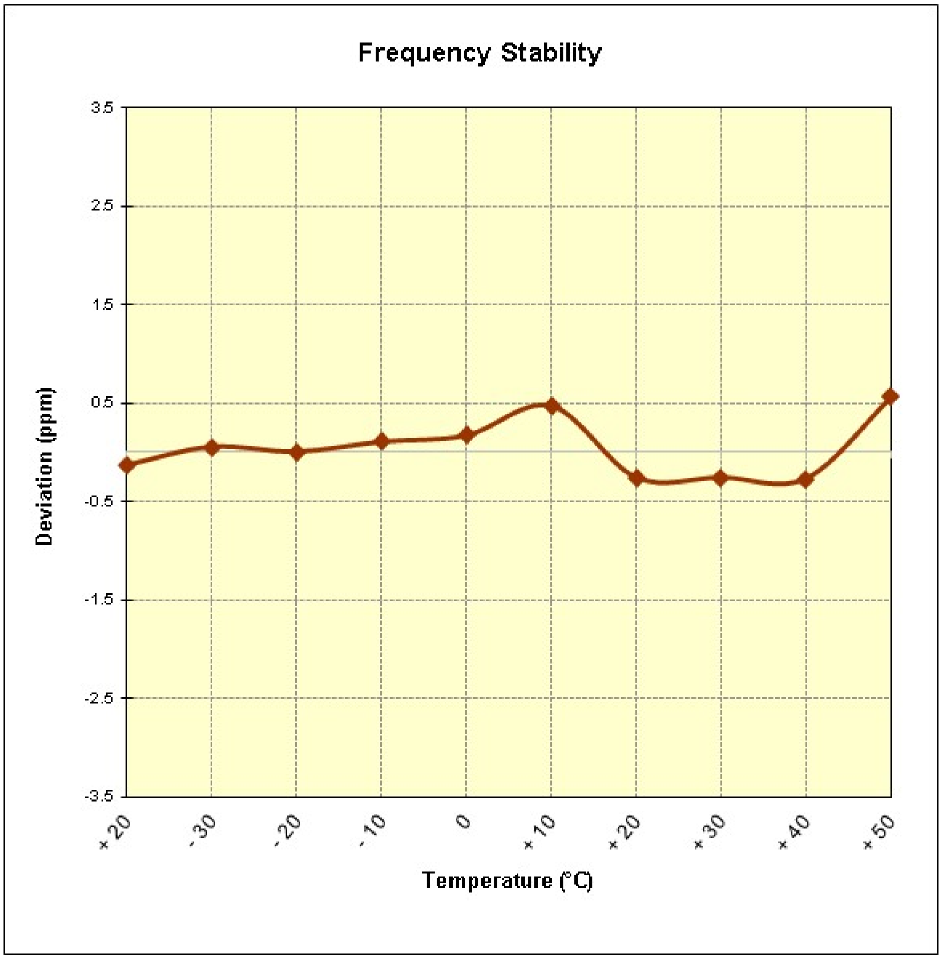


Figure 7-8. Frequency Stability Graph (Band 12)

Band 13 Frequency Stability Measurements
§2.1055 §27.54

OPERATING FREQUENCY:	782,000,000	Hz
CHANNEL:	23230	
REFERENCE VOLTAGE:	3.85	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	781,999,963	-37	-0.0000047
100 %		- 30	782,000,051	51	0.0000065
100 %		- 20	781,999,921	-79	-0.0000101
100 %		- 10	781,999,796	-204	-0.0000261
100 %		0	782,000,050	50	0.0000064
100 %		+ 10	782,000,001	1	0.0000001
100 %		+ 20	781,999,900	-100	-0.0000128
100 %		+ 30	782,000,060	60	0.0000077
100 %		+ 40	782,000,387	387	0.0000495
100 %		+ 50	782,000,193	193	0.0000247
BATT. ENDPOINT	3.45	+ 20	781,999,735	-265	-0.0000339

Table 7-30. 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

§2.1055 §27.54

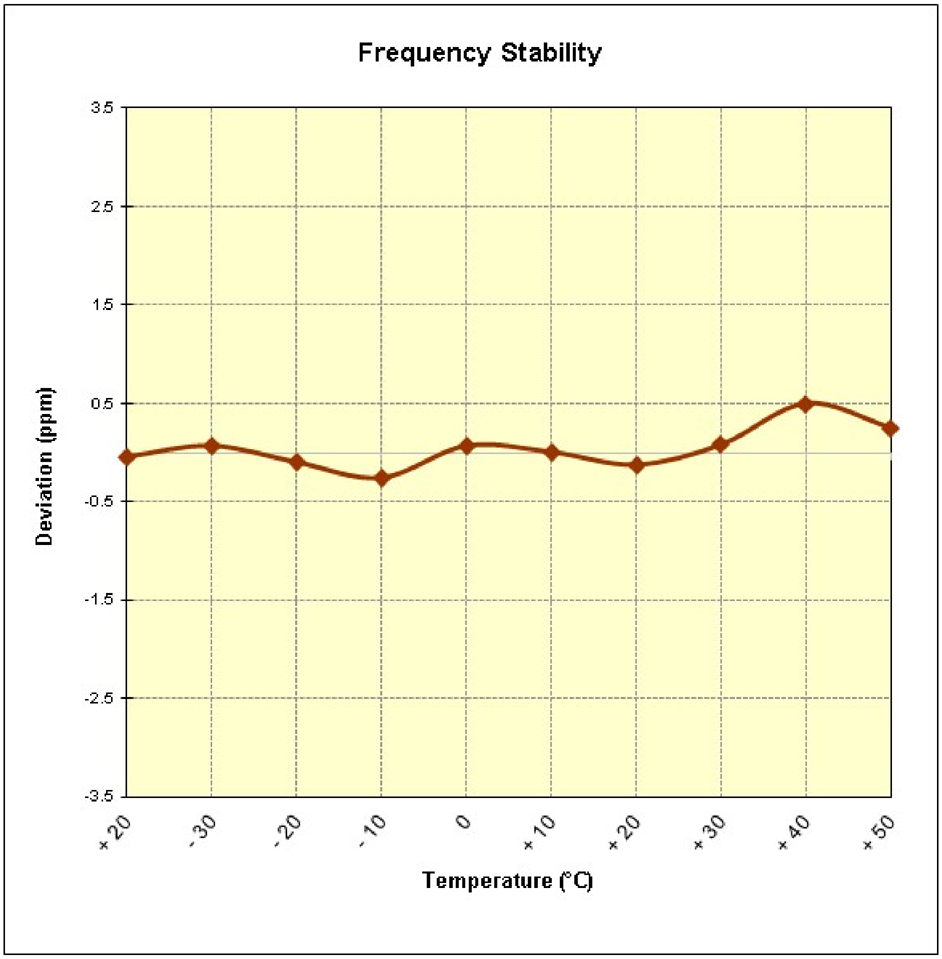


Figure 7-9. Frequency Stability Graph (Band 13)

Band 5/26 Frequency Stability Measurements

§2.1055 §22.355

OPERATING FREQUENCY:	831,500,000	Hz
CHANNEL:	26865	
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)	831,499,879	-121	-0.0000146
100 %		- 30	831,500,312	312	0.0000375
100 %		- 20	831,499,734	-266	-0.0000320
100 %		- 10	831,500,321	321	0.0000386
100 %		0	831,499,664	-336	-0.0000404
100 %		+ 10	831,500,035	35	0.0000042
100 %		+ 20	831,499,999	-1	-0.0000001
100 %		+ 30	831,499,829	-171	-0.0000206
100 %		+ 40	831,499,561	-439	-0.0000528
100 %		+ 50	831,499,959	-41	-0.0000049
BATT. ENDPOINT	3.45	+ 20	831,500,095	95	0.0000114

Table 7-31. Frequency Stability Data (Band 5/26)

Band 5/26 Frequency Stability Measurements

§2.1055 §22.355

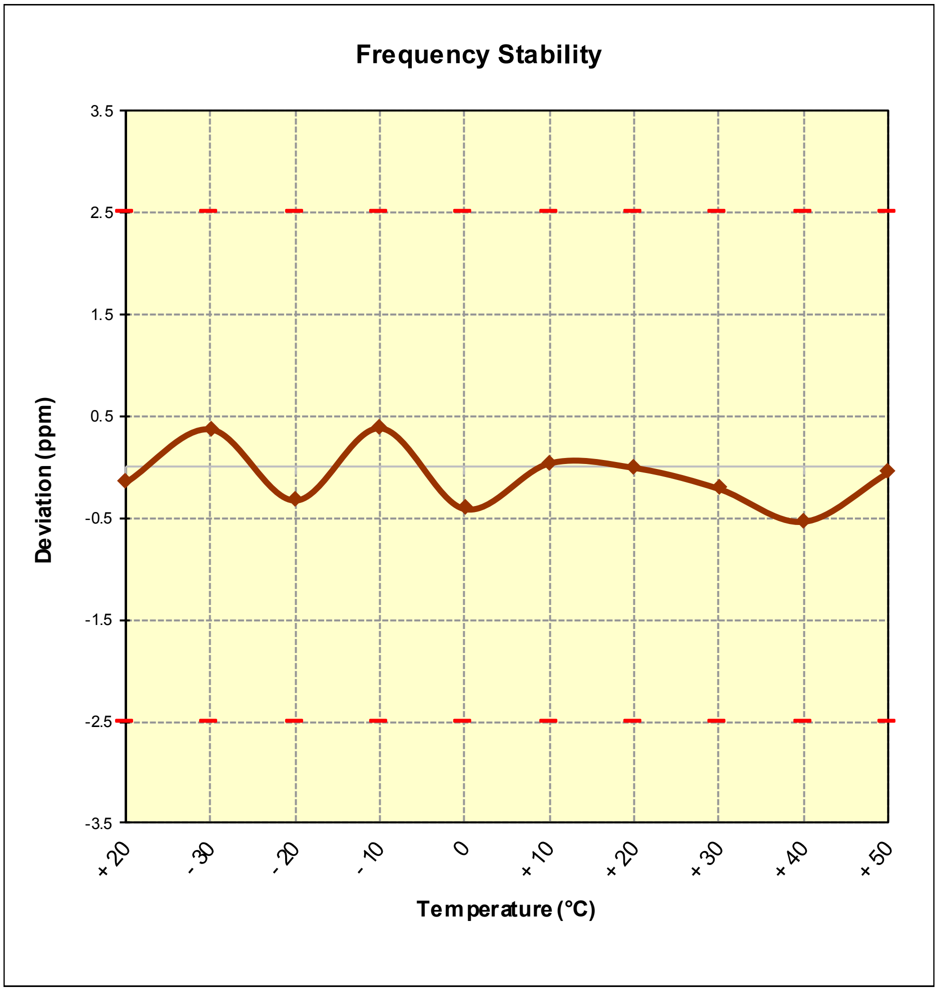


Figure 7-10. Frequency Stability Graph (Band 5/26)

Band 4 Frequency Stability Measurements

§2.1055 §§27.54

OPERATING FREQUENCY:	1,732,500,000	Hz
CHANNEL:	20175	
REFERENCE VOLTAGE:	3.85	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	1,732,500,020	20	0.0000012
100 %		- 30	1,732,499,916	-84	-0.0000048
100 %		- 20	1,732,500,101	101	0.0000058
100 %		- 10	1,732,499,674	-326	-0.0000188
100 %		0	1,732,499,769	-231	-0.0000133
100 %		+ 10	1,732,499,979	-21	-0.0000012
100 %		+ 20	1,732,500,099	99	0.0000057
100 %		+ 30	1,732,499,903	-97	-0.0000056
100 %		+ 40	1,732,499,990	-10	-0.0000006
100 %		+ 50	1,732,499,972	-28	-0.0000016
BATT. ENDPOINT	3.45	+ 20	1,732,499,642	-358	-0.0000207

Table 7-32. 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

§2.1055 §§27.54

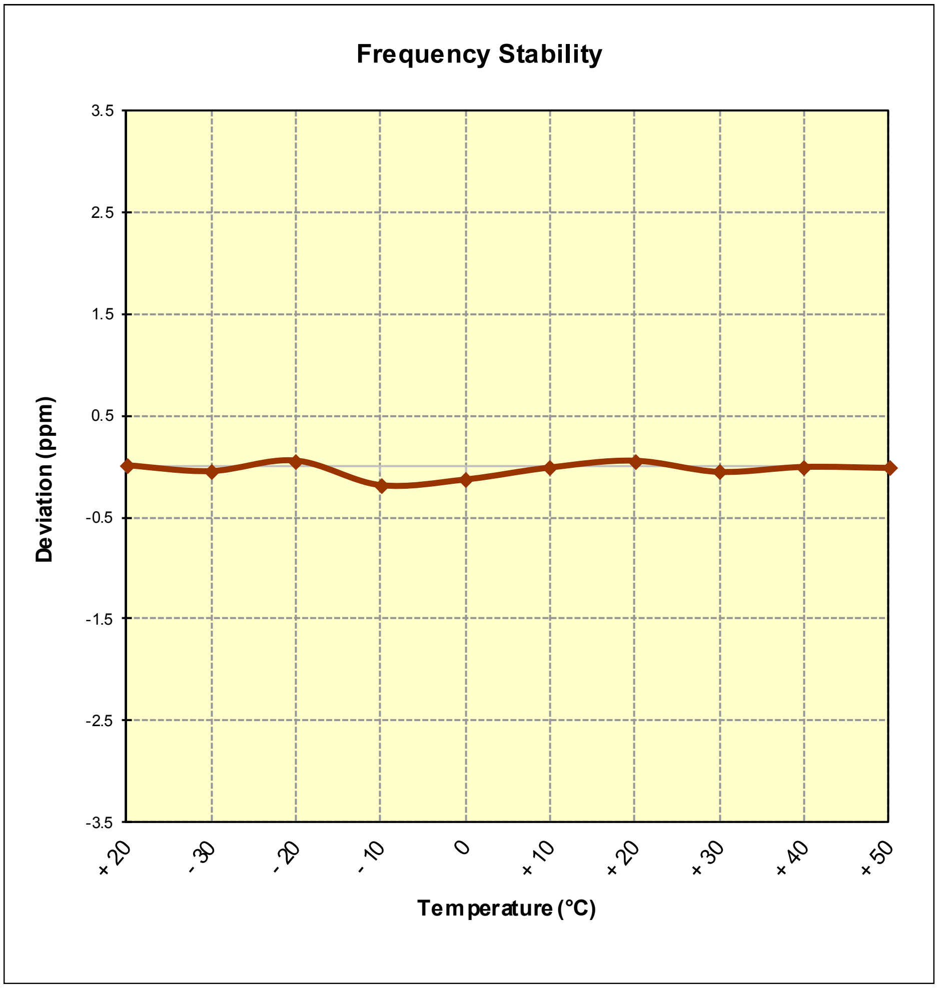


Figure 7-11. Frequency Stability Graph (Band 4)

Band 2/25 Frequency Stability Measurements

§2.1055 §24.235

OPERATING FREQUENCY:	1,882,500,000	Hz
CHANNEL:	26365	
REFERENCE VOLTAGE:	3.85	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	1,882,500,347	347	0.0000184
100 %		- 30	1,882,500,132	132	0.0000070
100 %		- 20	1,882,500,218	218	0.0000116
100 %		- 10	1,882,500,089	89	0.0000047
100 %		0	1,882,500,126	126	0.0000067
100 %		+ 10	1,882,500,389	389	0.0000207
100 %		+ 20	1,882,500,164	164	0.0000087
100 %		+ 30	1,882,499,917	-83	-0.0000044
100 %		+ 40	1,882,499,965	-35	-0.0000019
100 %		+ 50	1,882,500,036	36	0.0000019
BATT. ENDPOINT	3.45	+ 20	1,882,500,169	169	0.0000090

Table 7-33. Frequency Stability Data (Band 2/25)

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 2/25 Frequency Stability Measurements

§2.1055 §24.235

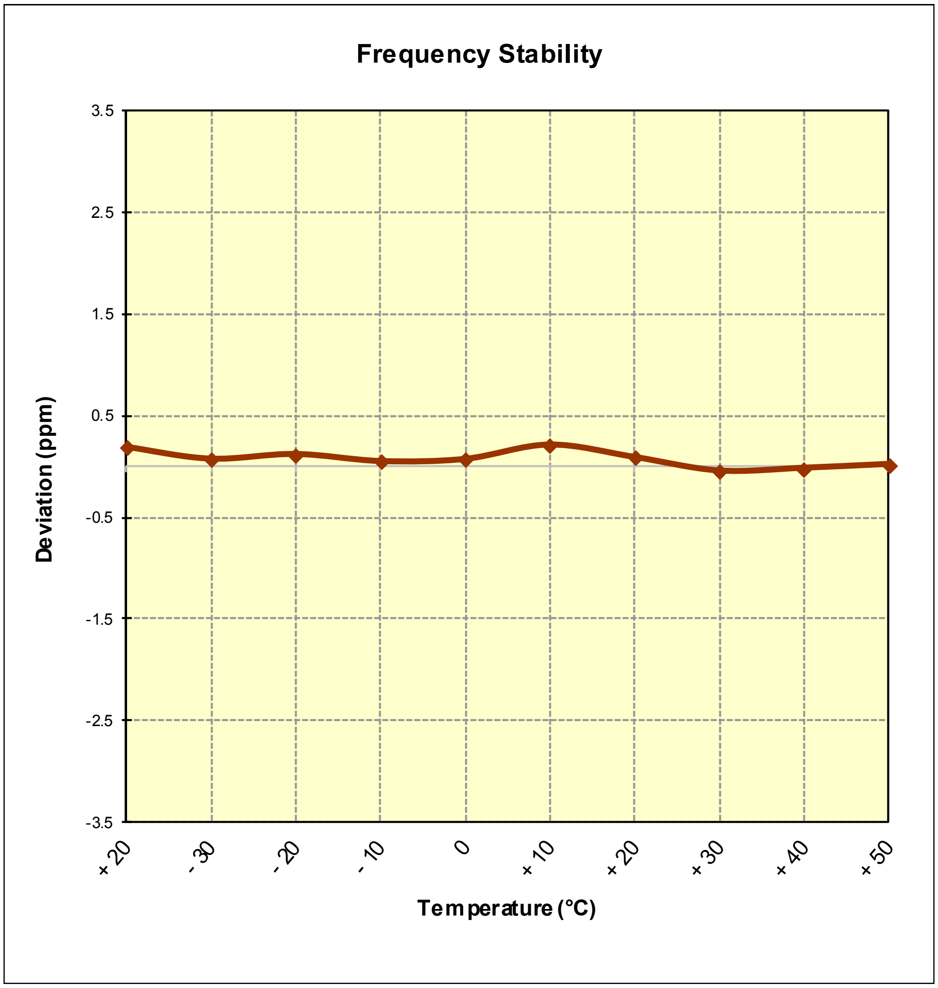


Figure 7-12. Frequency Stability Graph (Band 2/25)

Band 41 Frequency Stability Measurements

§2.1055 §27.54

OPERATING FREQUENCY:	2,593,000,000	Hz
CHANNEL:	40620	
REFERENCE VOLTAGE:	3.85	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	2,592,999,811	-189	-0.0000073
100 %		- 30	2,592,999,600	-400	-0.0000154
100 %		- 20	2,593,000,028	28	0.0000011
100 %		- 10	2,593,000,138	138	0.0000053
100 %		0	2,593,000,029	29	0.0000011
100 %		+ 10	2,592,999,977	-23	-0.0000009
100 %		+ 20	2,592,999,835	-165	-0.0000064
100 %		+ 30	2,593,000,455	455	0.0000175
100 %		+ 40	2,593,000,398	398	0.0000153
100 %		+ 50	2,592,999,634	-366	-0.0000141
BATT. ENDPOINT	3.45	+ 20	2,593,000,206	206	0.0000079

Table 7-34. Frequency Stability Data (Band 41)

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 41 Frequency Stability Measurements

§2.1055 §27.54

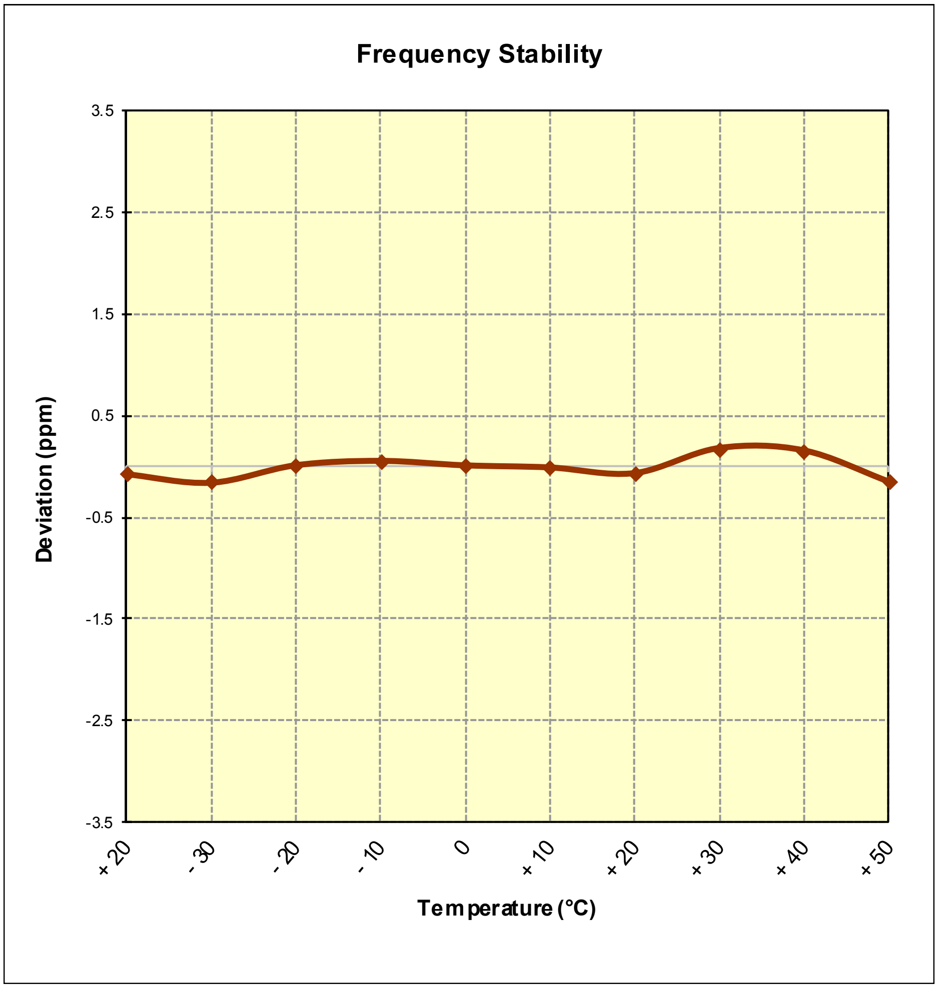


Figure 7-13. Frequency Stability Graph (Band 41)

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFSP320** complies with all the requirements of Parts 22, 24, & 27 of the FCC rules for LTE operation only.