7.4 Band Edge Emissions at Antenna Terminal

§2.1051 §22.917(a) §24.238(a) §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 ≥ 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.

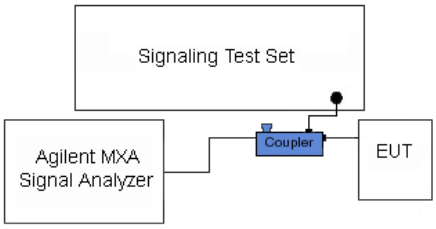

Figure 7-3. Test Instrument & Measurement Setup

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.

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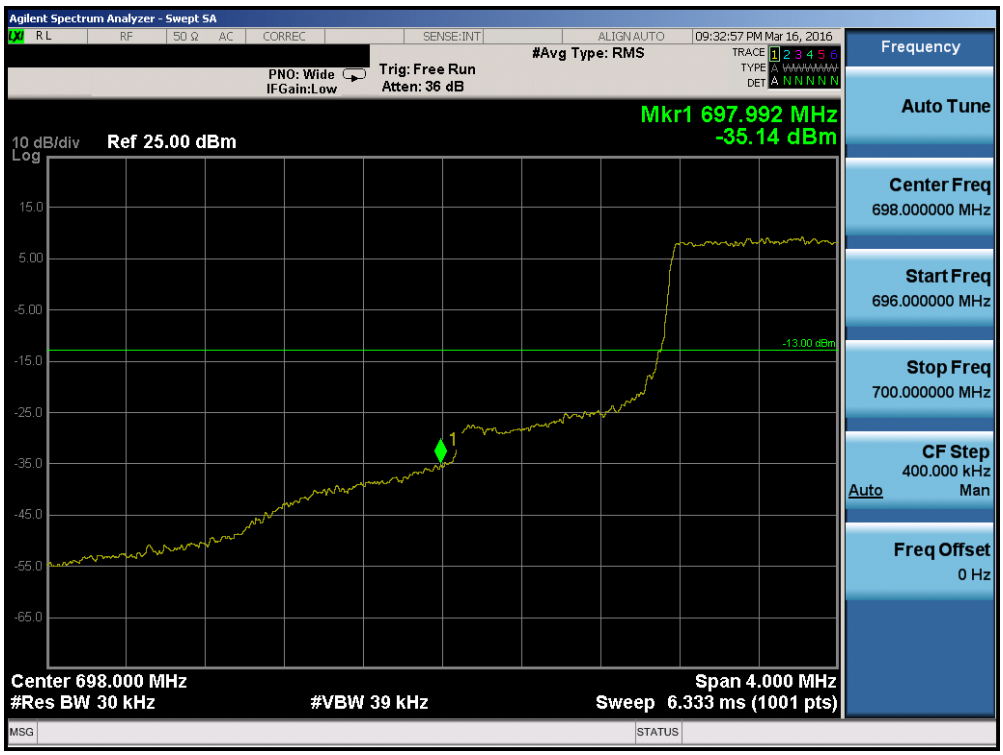
Per 27.53(g) for operations in the 698-746 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

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.



Plot 7-96. Lower Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)

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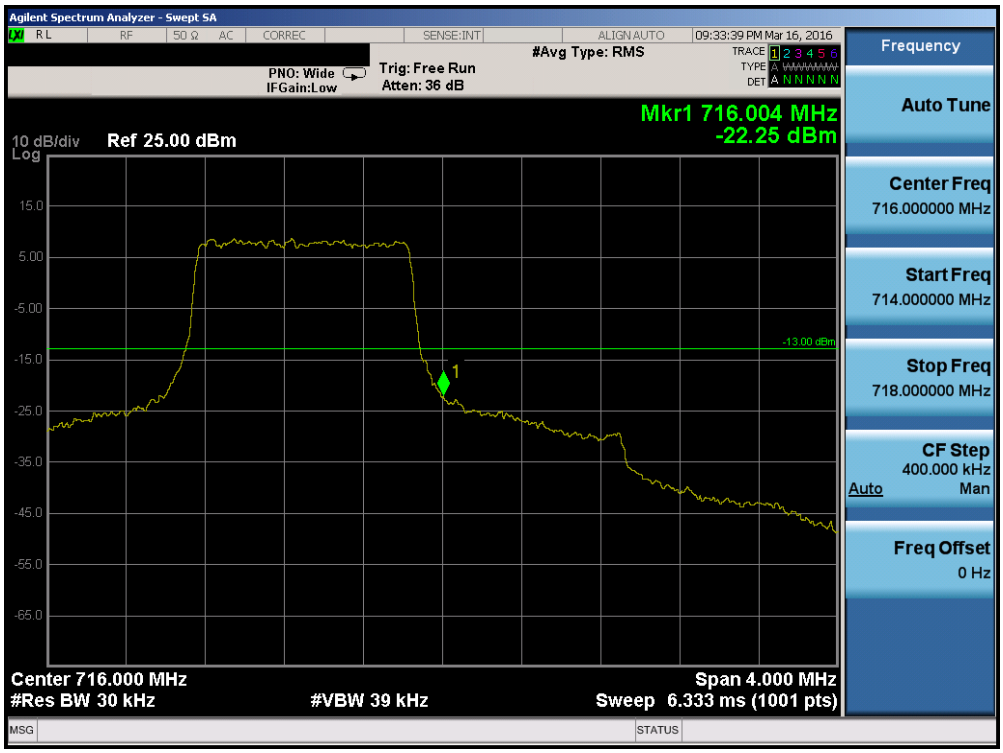
Plot 7-97. Lower Extended Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)



Plot 7-98. Upper Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)

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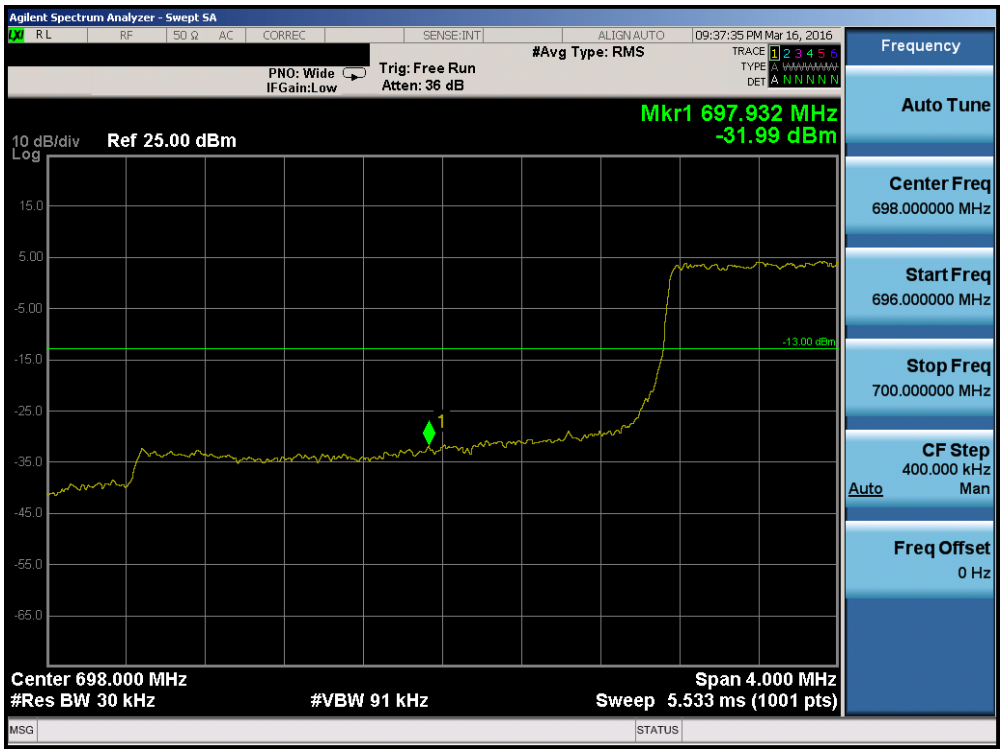
Plot 7-99. Upper Extended Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)



Plot 7-100. Lower Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

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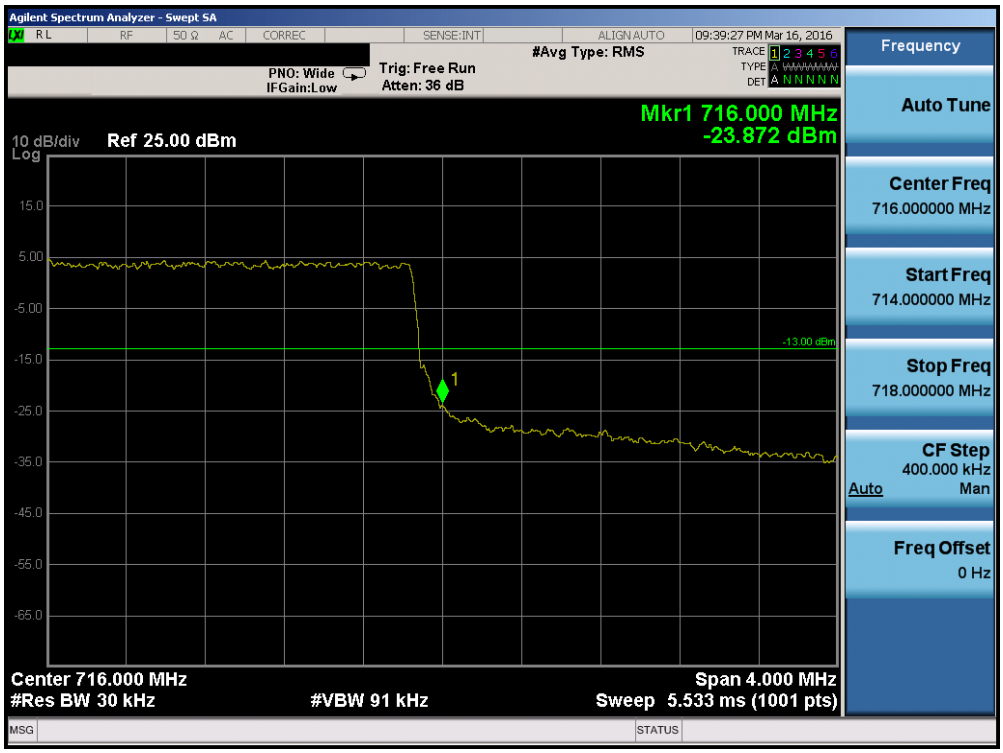
Plot 7-101. Lower Extended Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)



Plot 7-102. Upper Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

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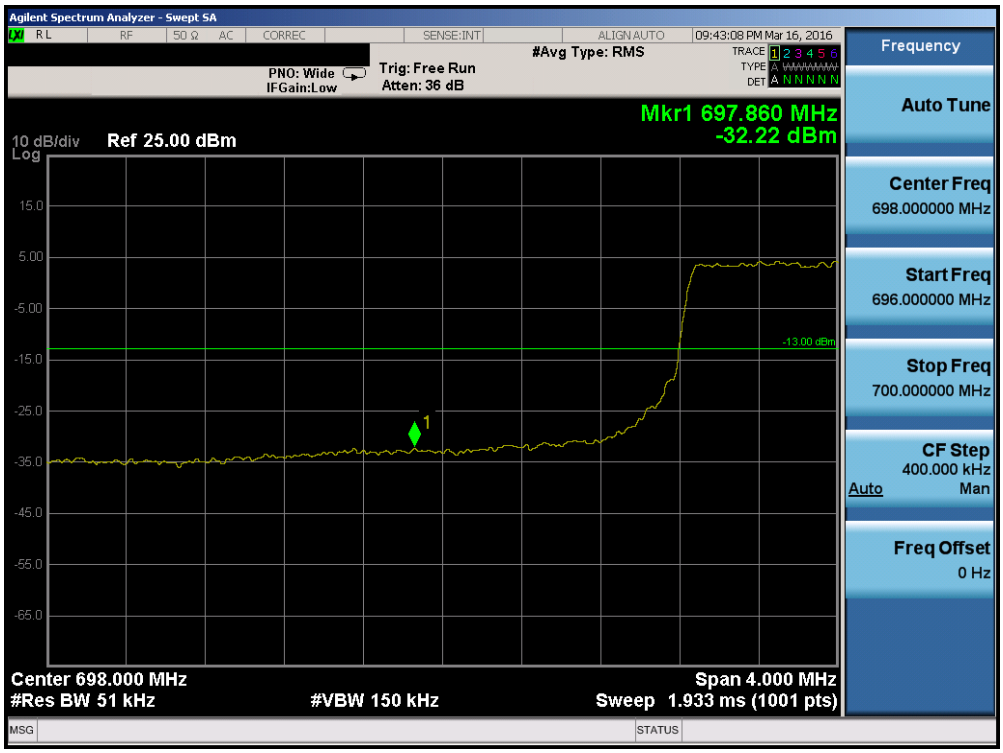
Plot 7-103. Upper Extended Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)



Plot 7-104. Lower Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)

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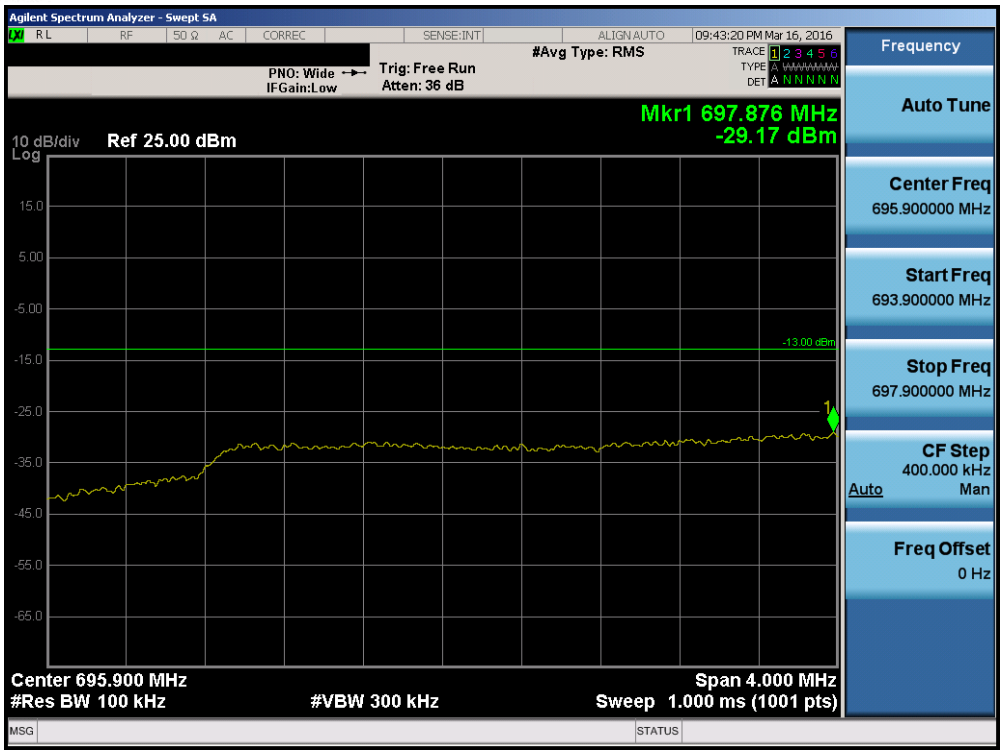

Plot 7-105. Lower Extended Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)

Plot 7-106. Upper Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)

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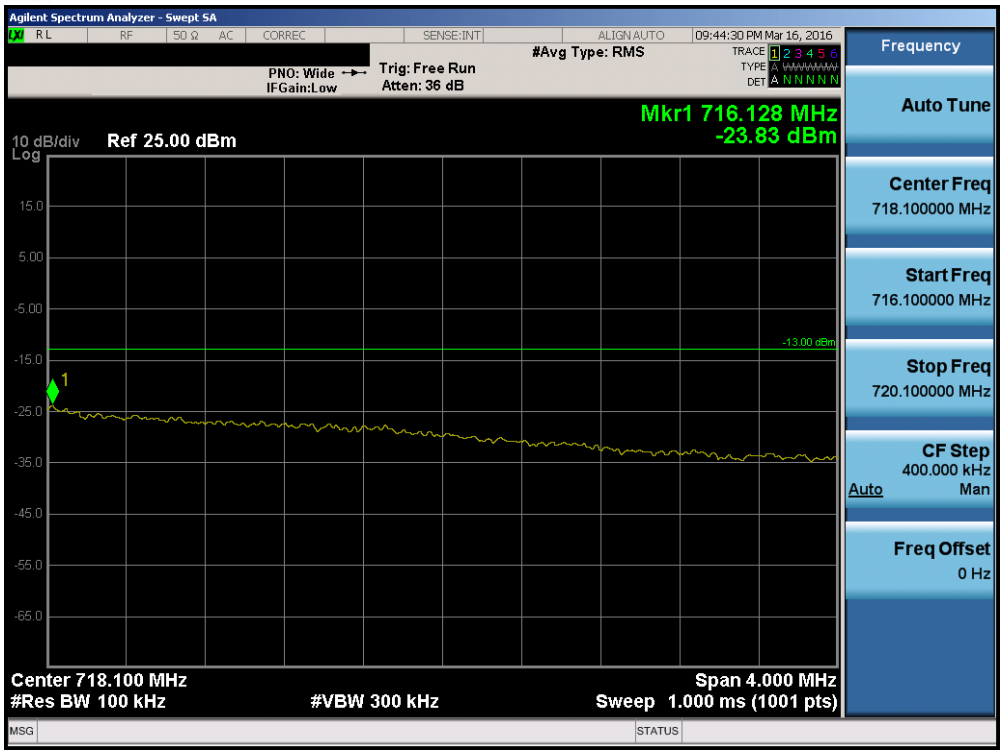
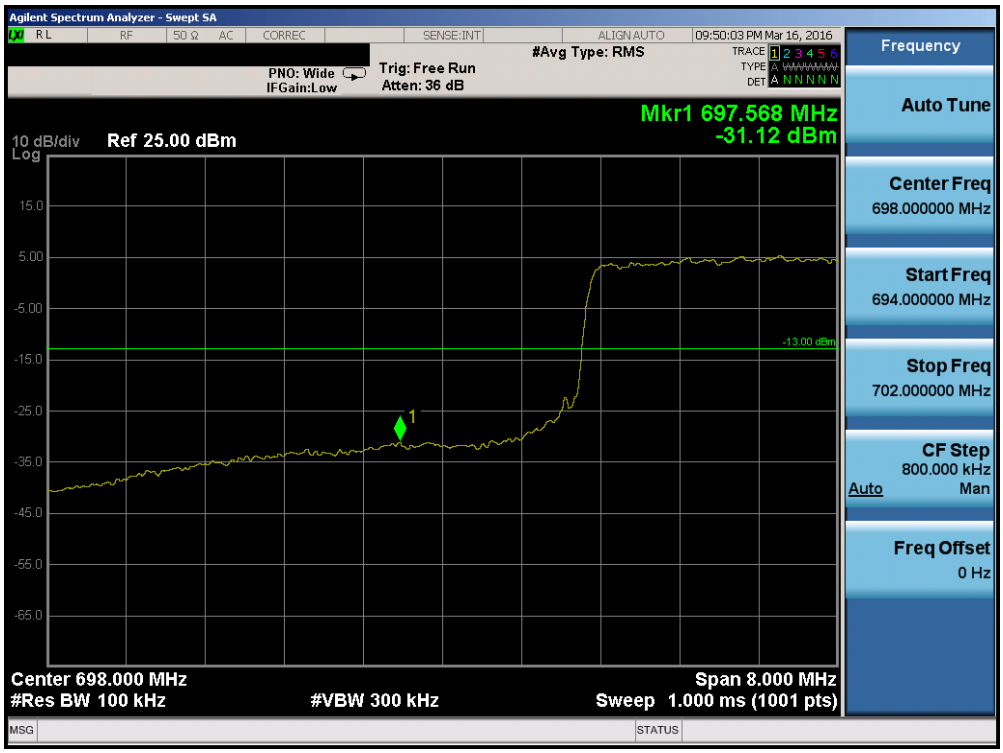


Plot 7-107. Upper Extended Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)



Plot 7-108. Lower Band Edge Plot (Band 12 – 10.0MHz QPSK – RB Size 50)

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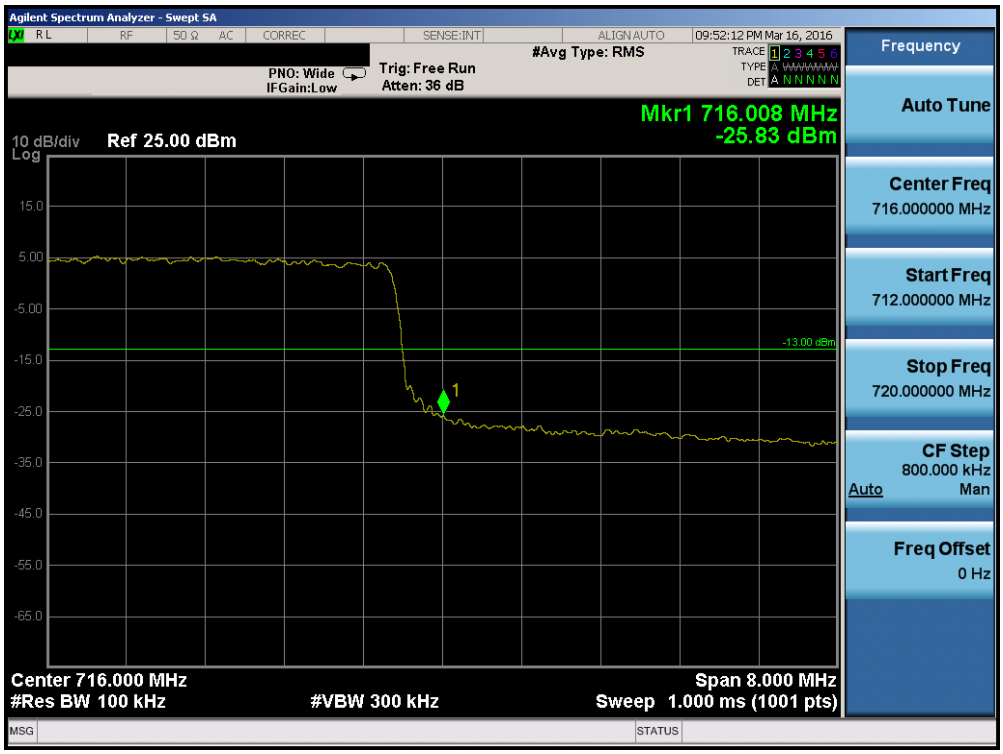
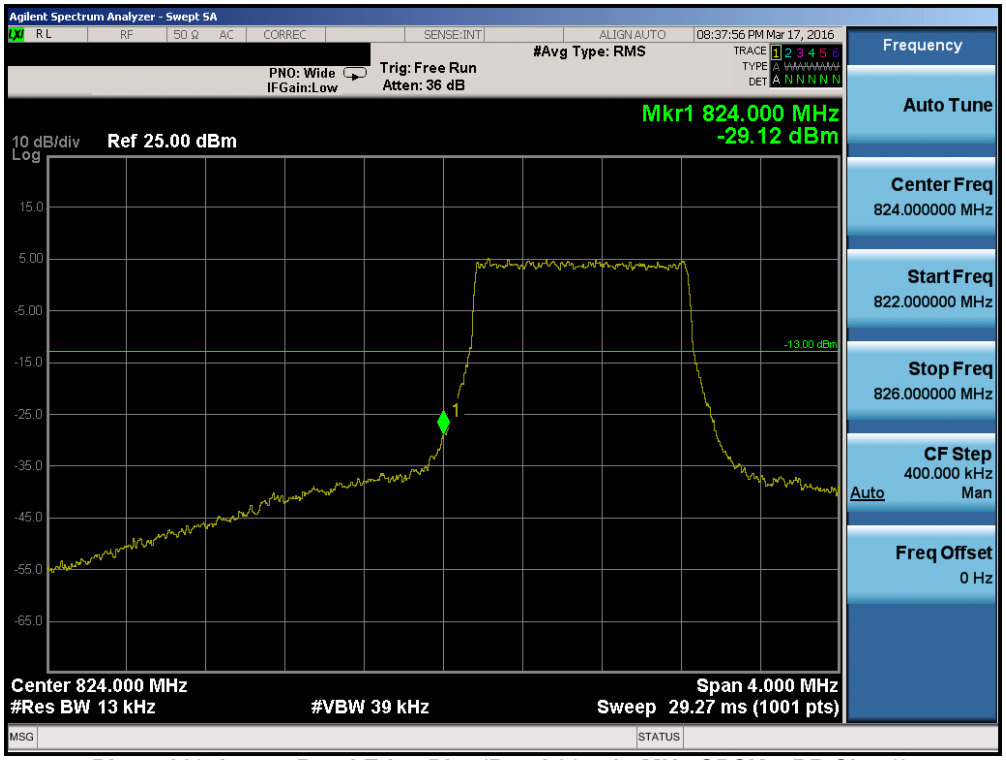


Plot 7-109. Upper Band Edge Plot (Band 12 – 10.0MHz QPSK – RB Size 50)



Plot 7-110. Lower Band Edge Plot (Band 26 – 1.4MHz QPSK – RB Size 6)

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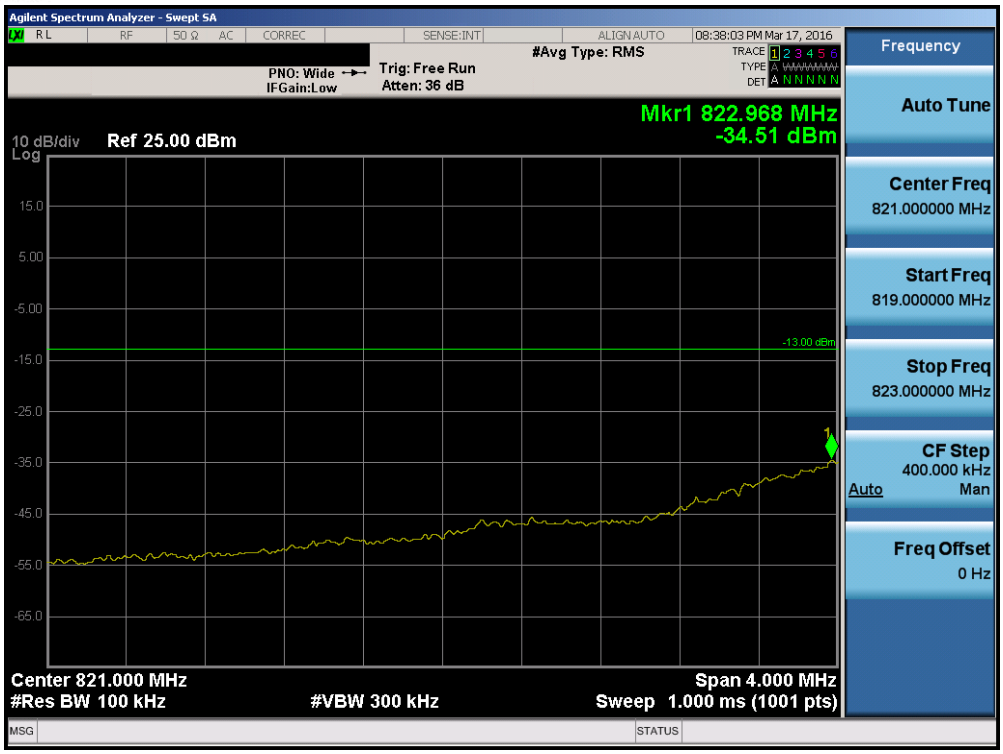
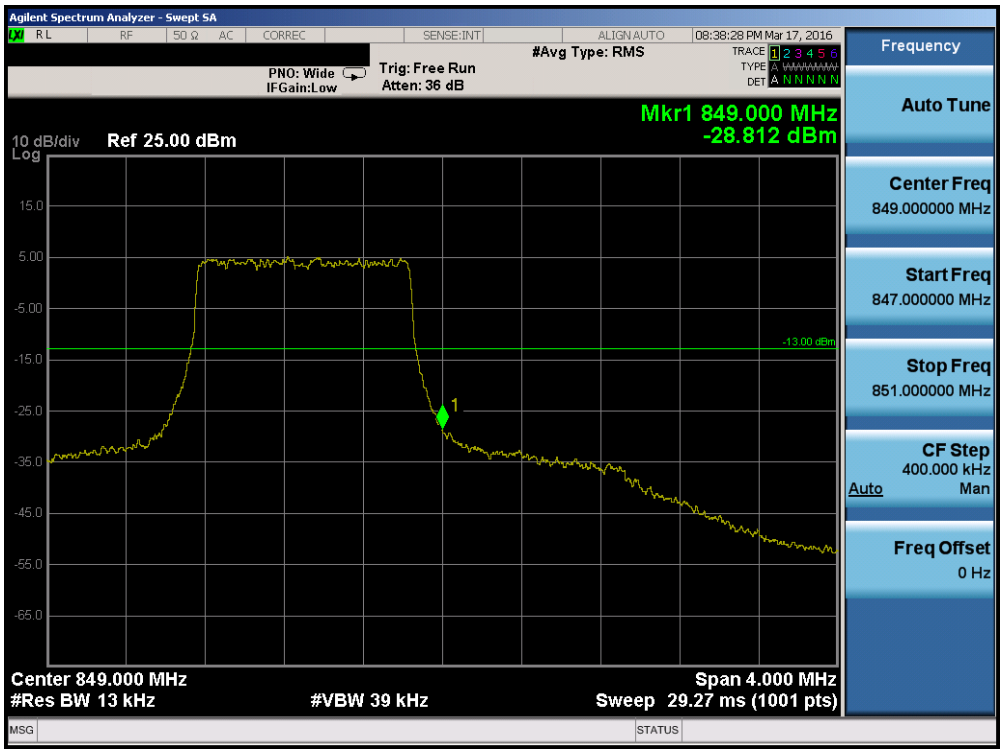


Plot 7-111. Lower Extended Band Edge Plot (Band 26 – 1.4MHz QPSK – RB Size 6)



Plot 7-112. Upper Band Edge Plot (Band 26 – 1.4MHz QPSK – RB Size 6)

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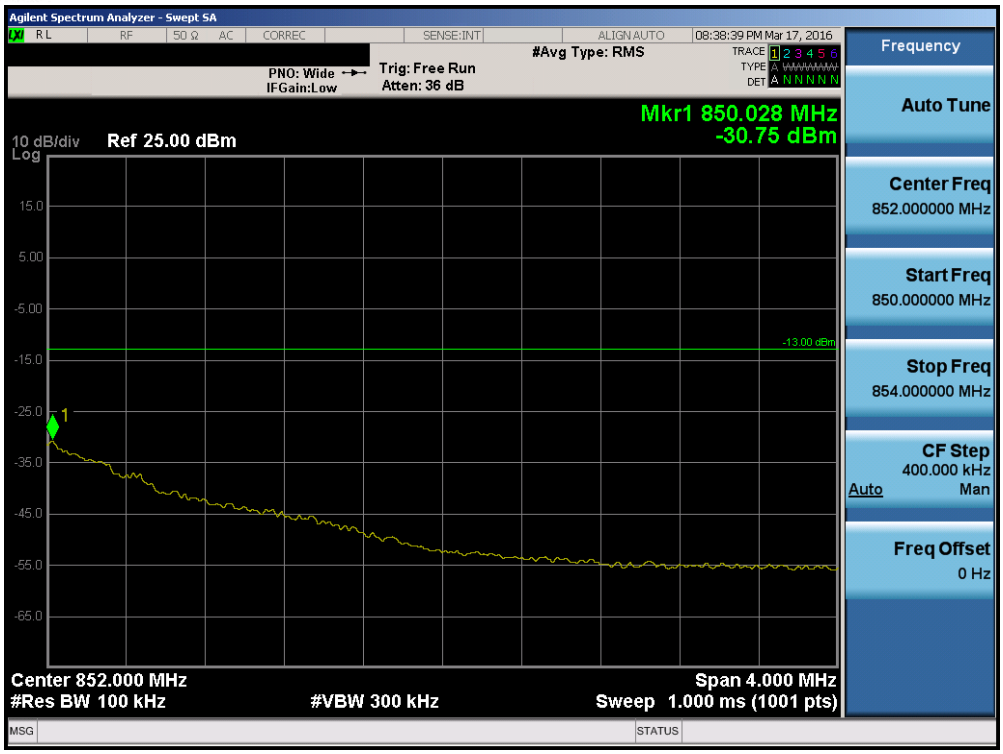
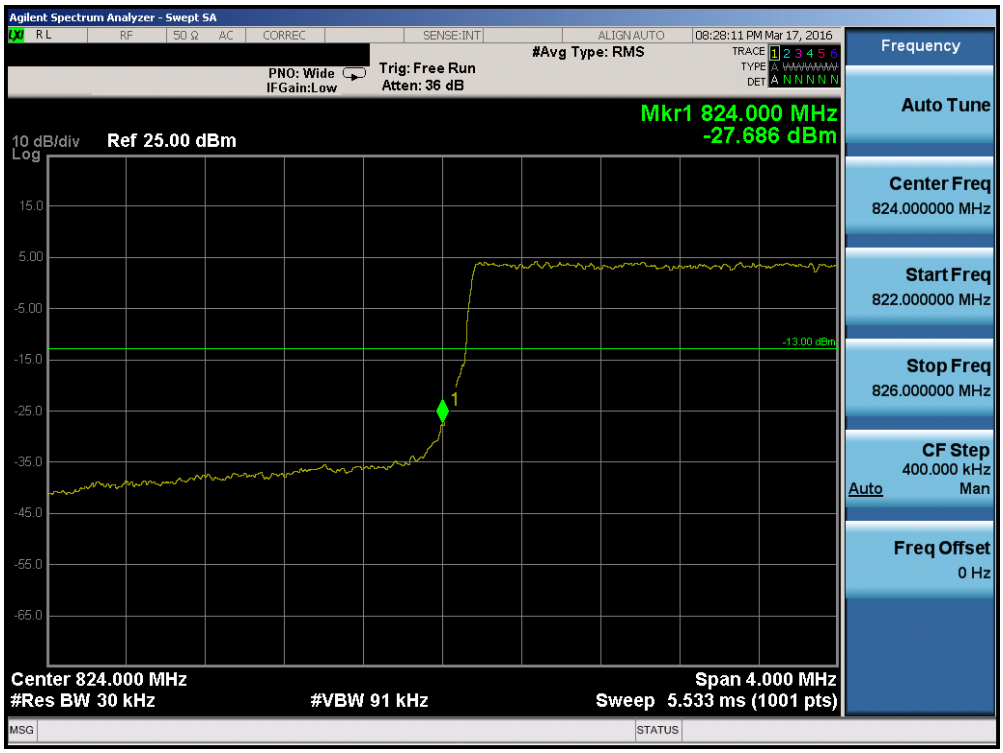


Plot 7-113. Upper Extended Band Edge Plot (Band 26 – 1.4MHz QPSK – RB Size 6)



Plot 7-114. Lower Band Edge Plot (Band 26 – 3.0MHz QPSK – RB Size 15)

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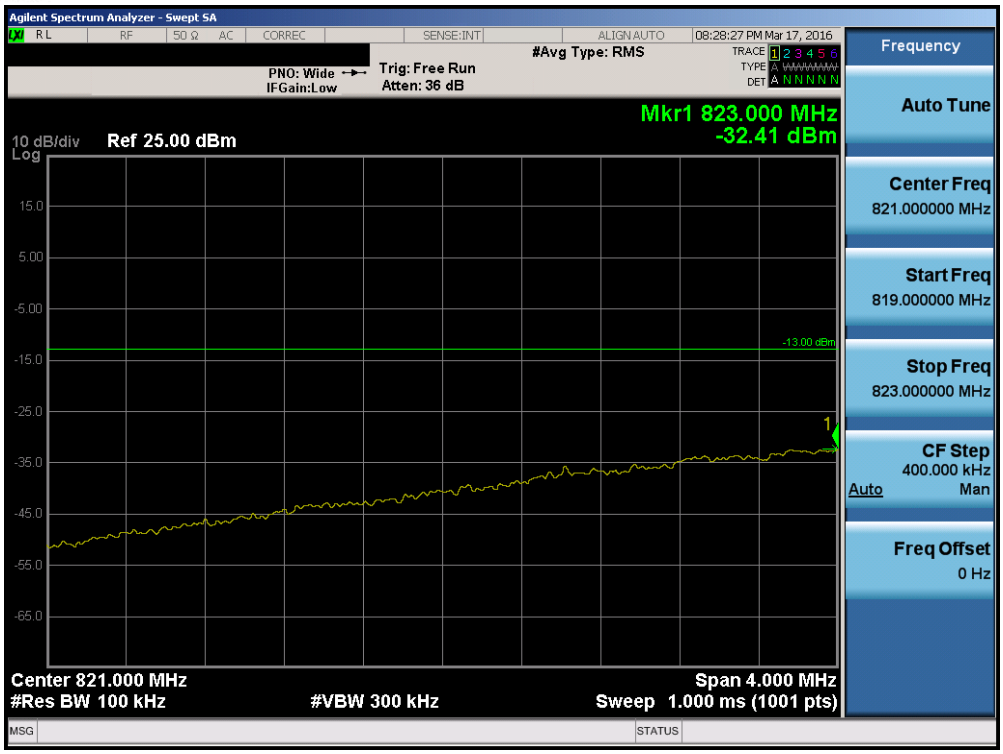
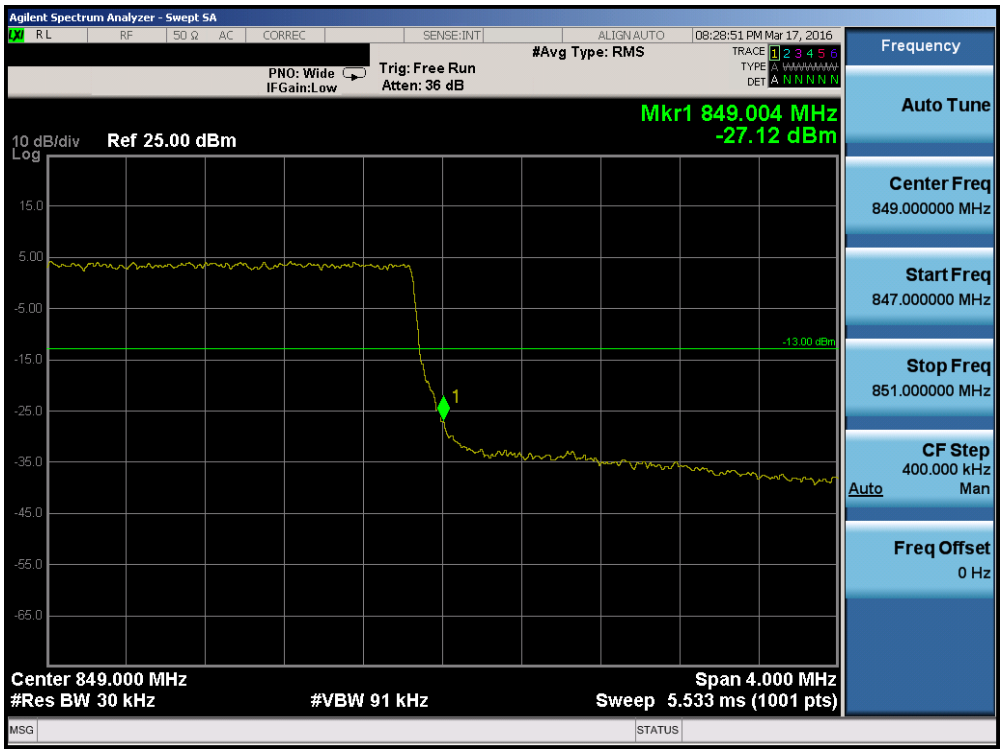


Plot 7-115. Lower Extended Band Edge Plot (Band 26 – 3.0MHz QPSK – RB Size 15)



Plot 7-116. Upper Band Edge Plot (Band 26 – 3.0MHz QPSK – RB Size 15)

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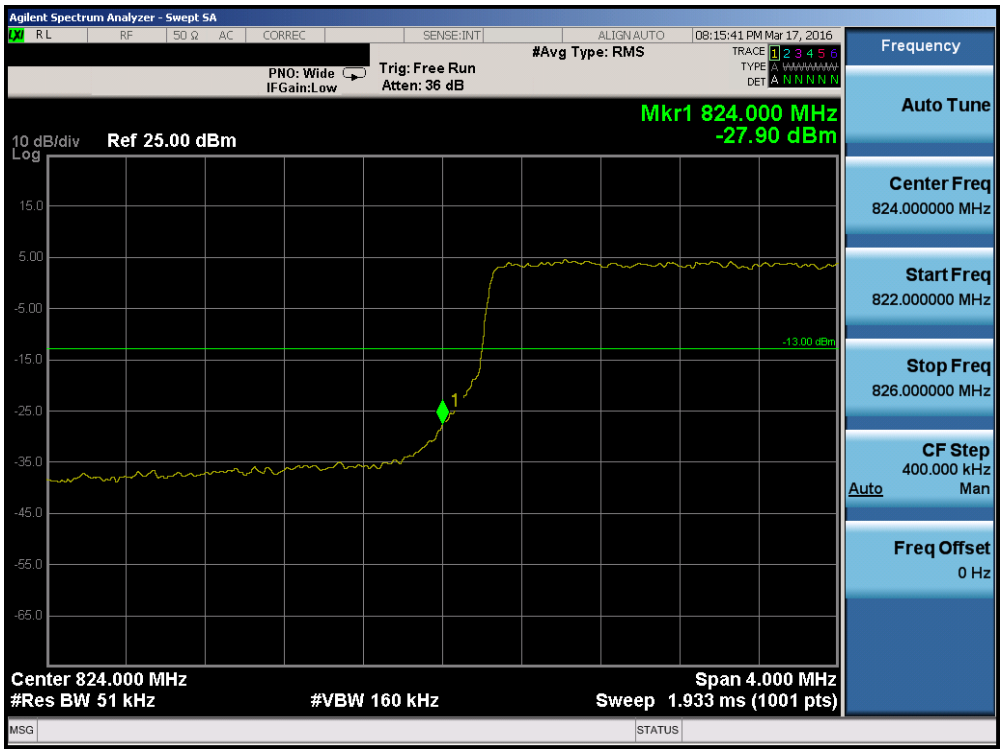
Plot 7-117. Upper Extended Band Edge Plot (Band 26 – 3.0MHz QPSK – RB Size 15)



Plot 7-118. Lower Band Edge Plot (Band 26 – 5.0MHz QPSK – RB Size 25)

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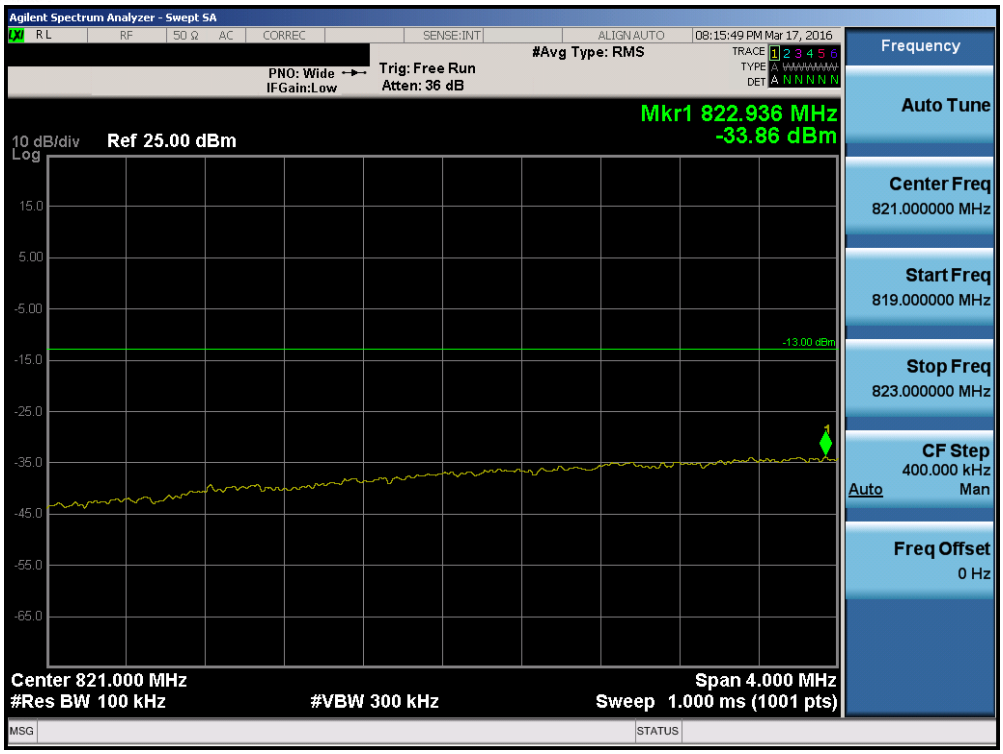
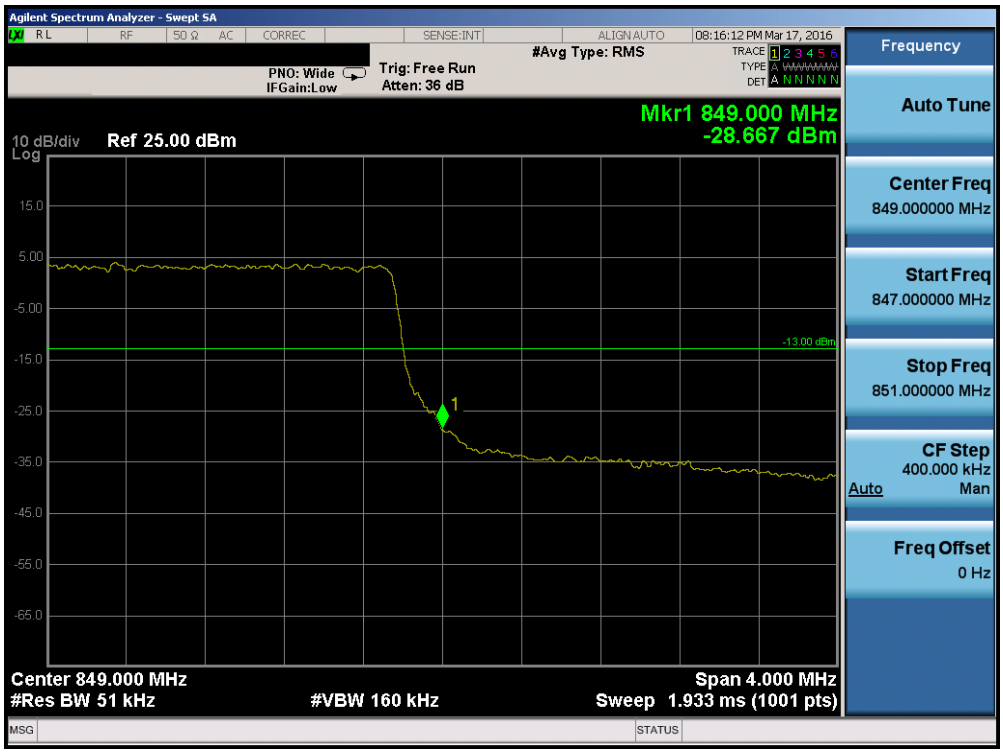


Plot 7-119. Lower Extended Band Edge Plot (Band 26 – 5.0MHz QPSK – RB Size 25)



Plot 7-120. Upper Band Edge Plot (Band 26 – 5.0MHz QPSK – RB Size 25)

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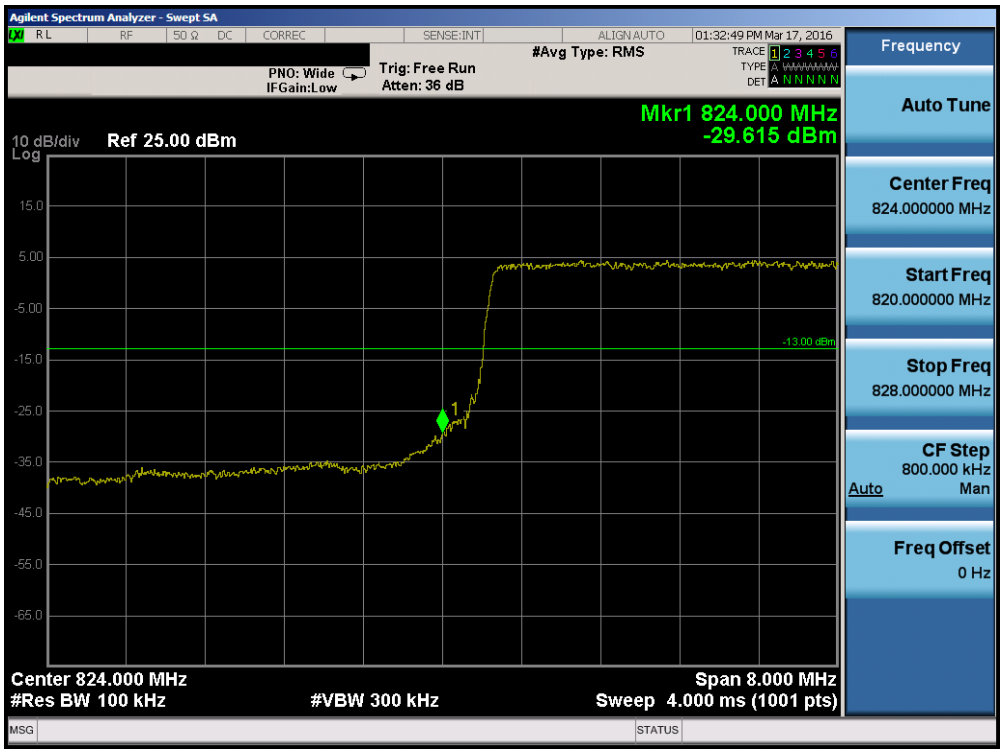
Plot 7-121. Upper Extended Band Edge Plot (Band 26 – 5.0MHz QPSK – RB Size 25)



Plot 7-122. Lower Band Edge Plot (Band 26 – 10.0MHz QPSK – RB Size 50)

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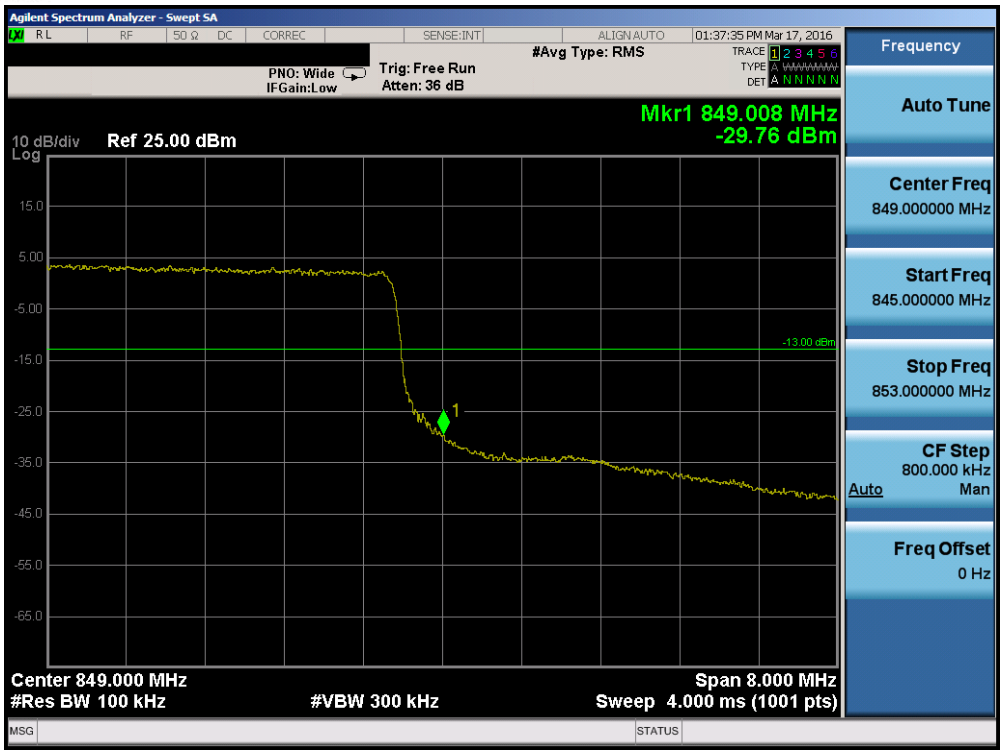
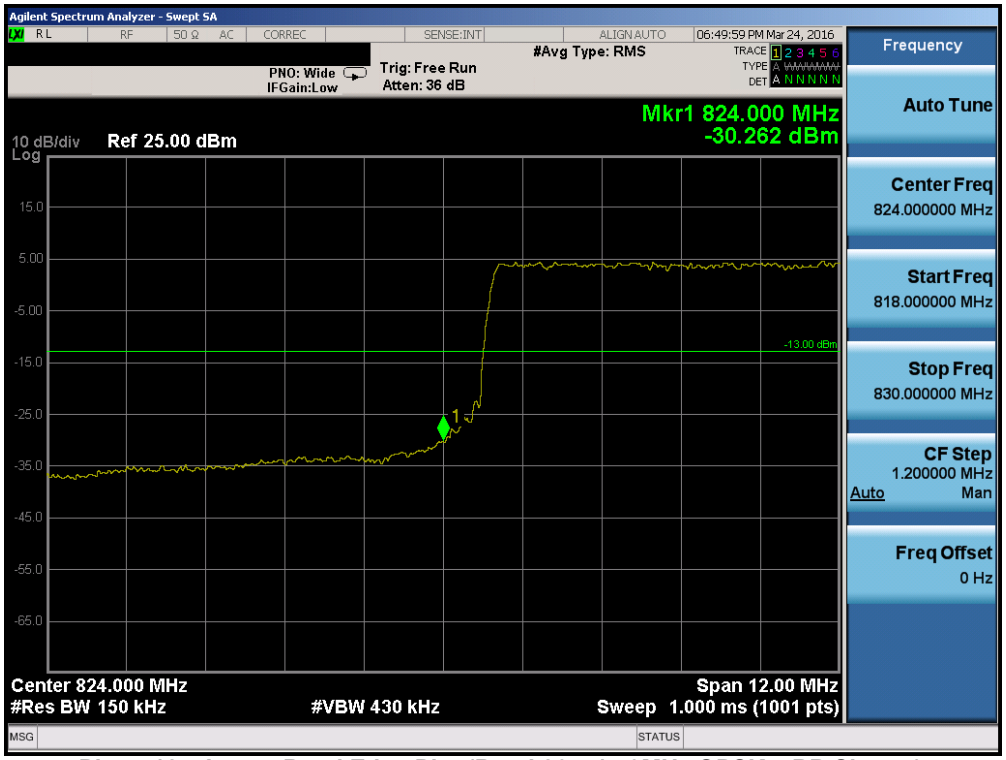


Plot 7-123. Upper Band Edge Plot (Band 26 – 10.0MHz QPSK – RB Size 50)



Plot 7-124. Lower Band Edge Plot (Band 26 – 15.0MHz QPSK – RB Size 75)

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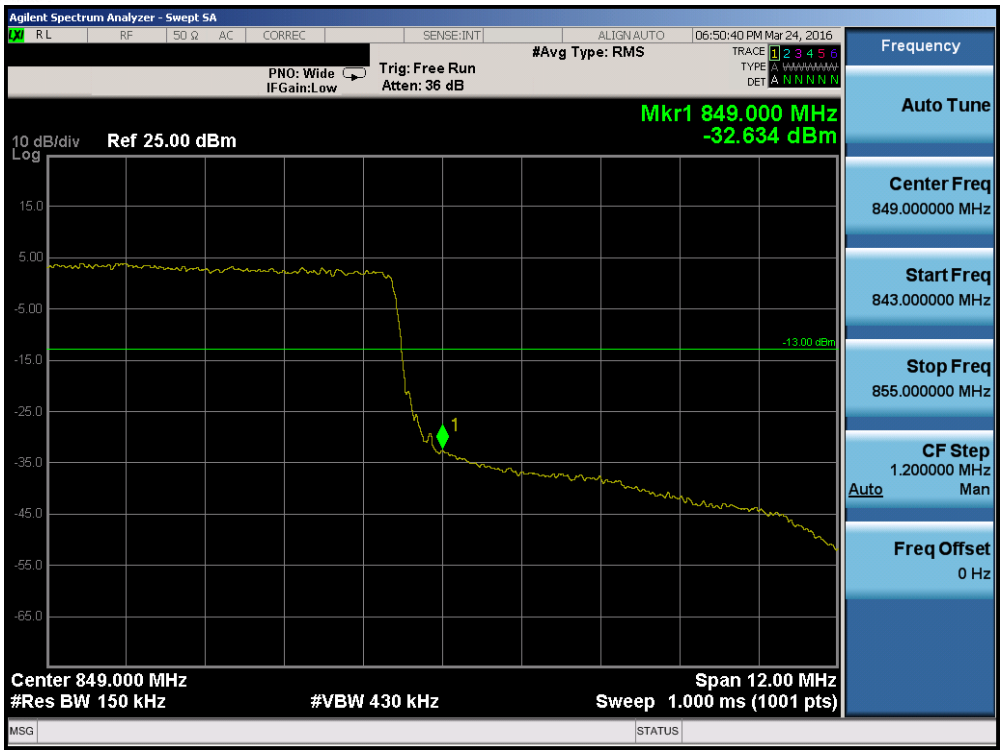
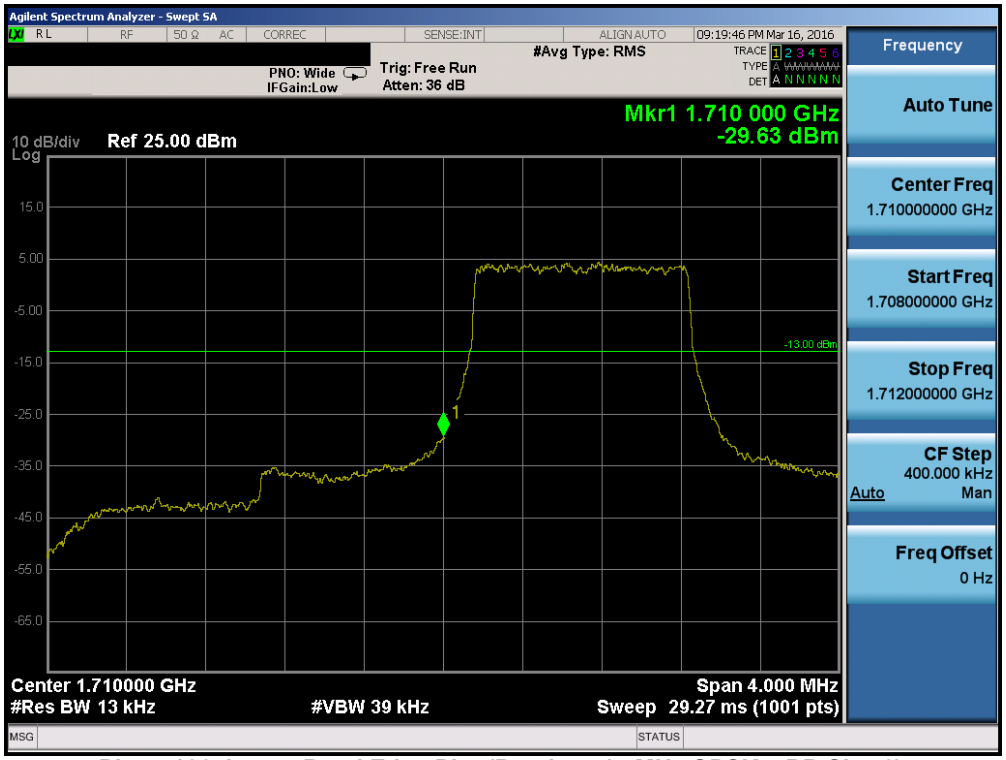


Plot 7-125. Upper Band Edge Plot (Band 26 – 15.0MHz QPSK – RB Size 75)



Plot 7-126. Lower Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

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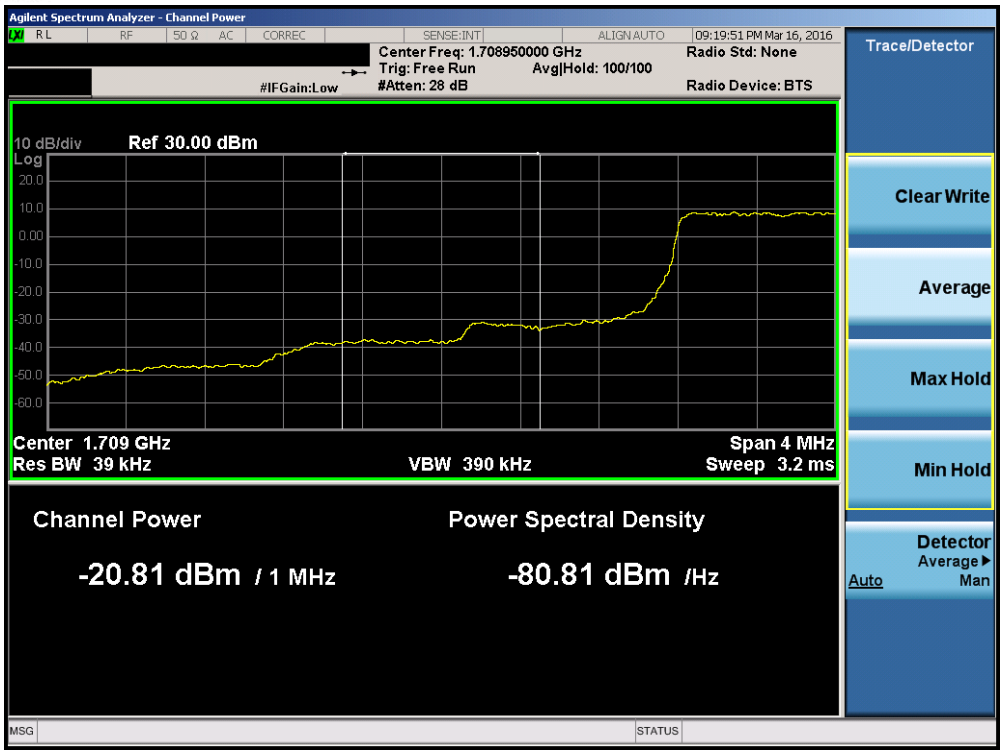
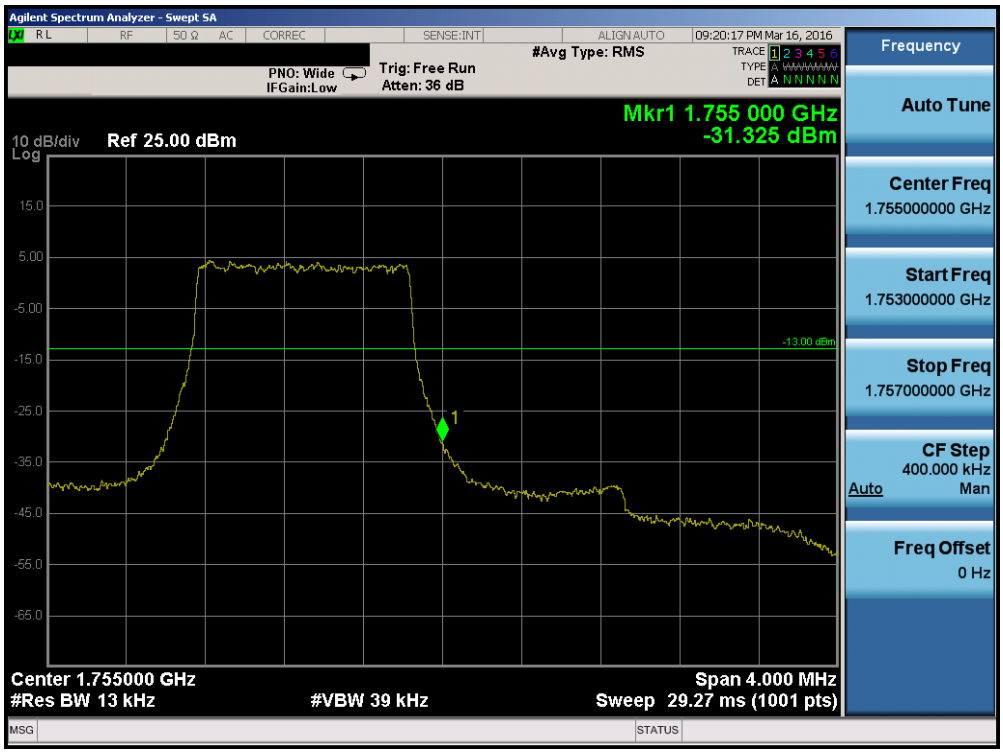


Plot 7-127. Lower Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



Plot 7-128. Upper Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

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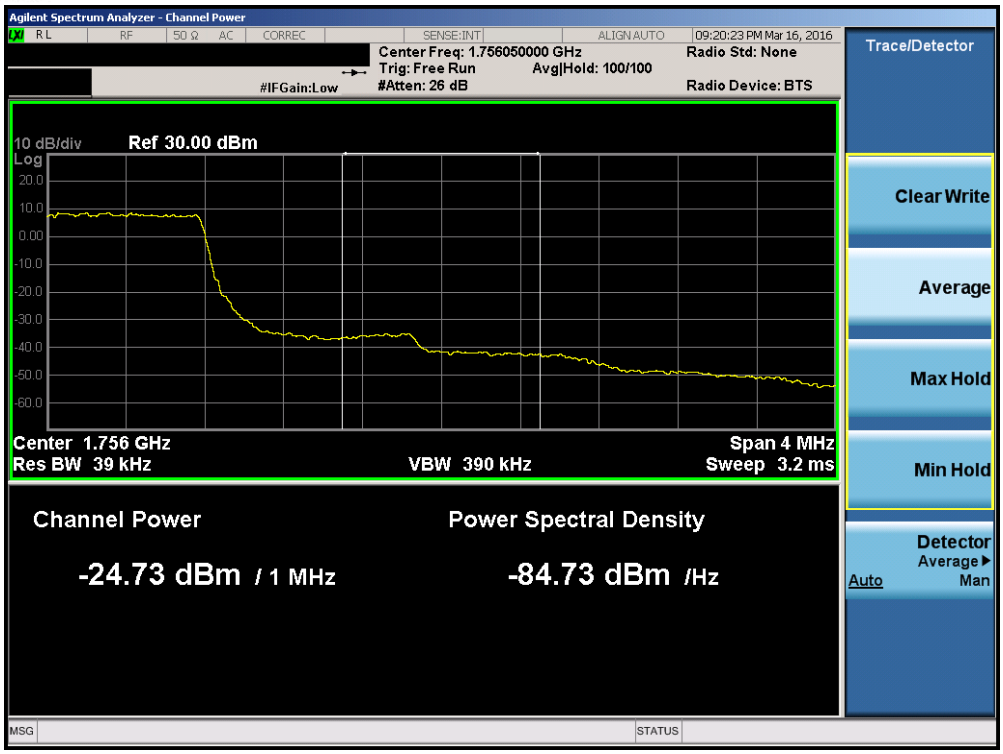
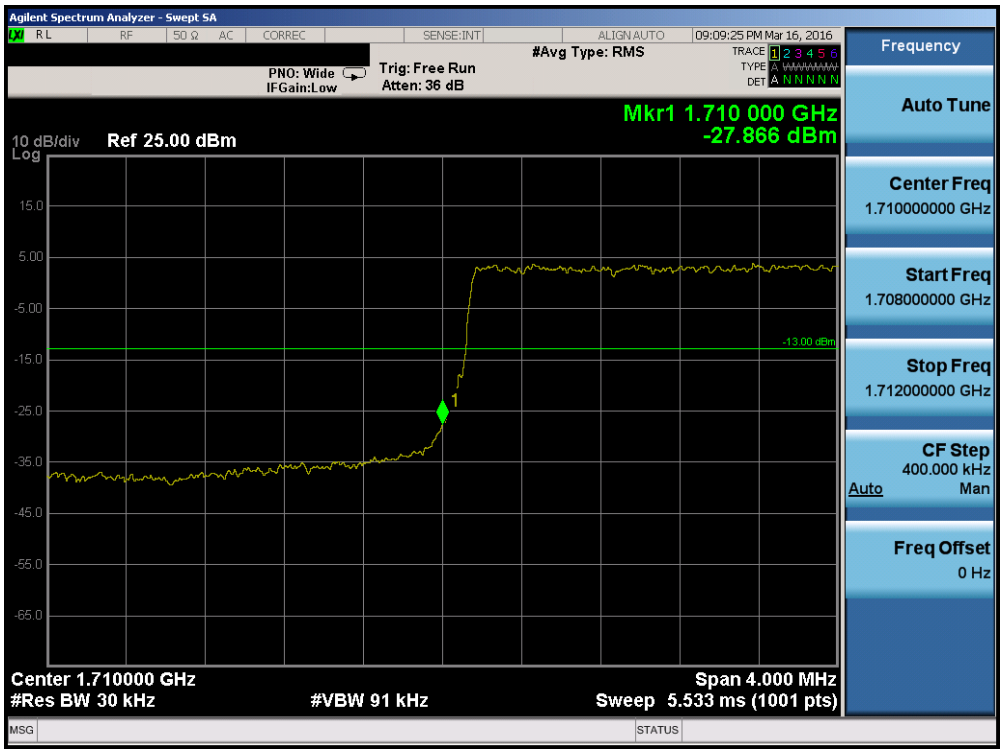


Plot 7-129. Upper Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



Plot 7-130. Lower Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

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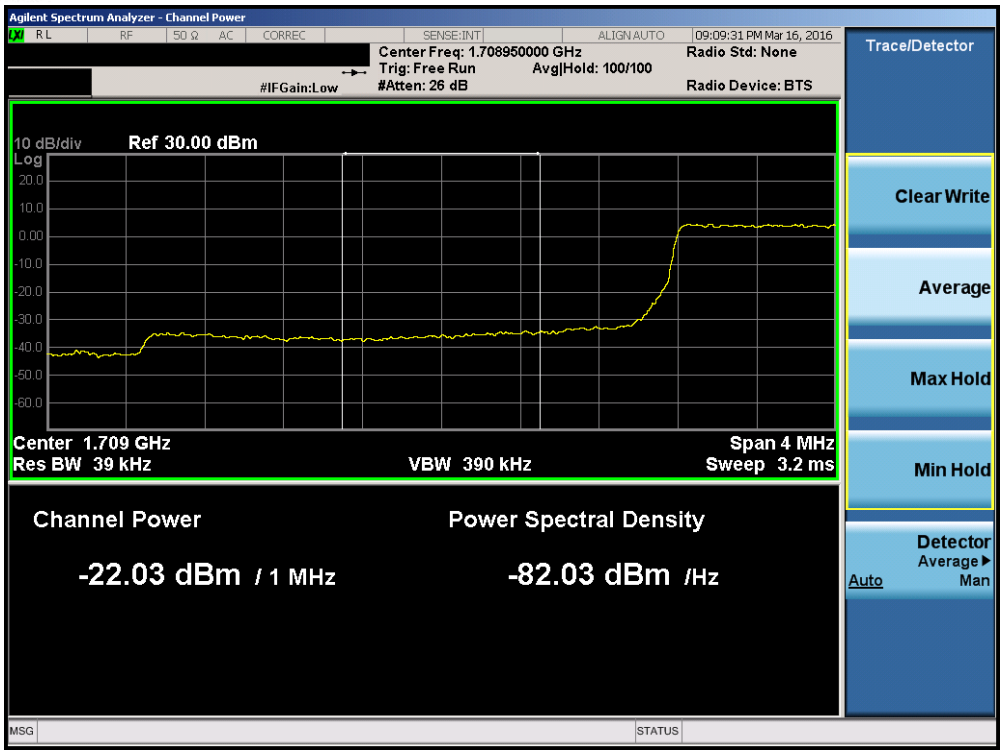
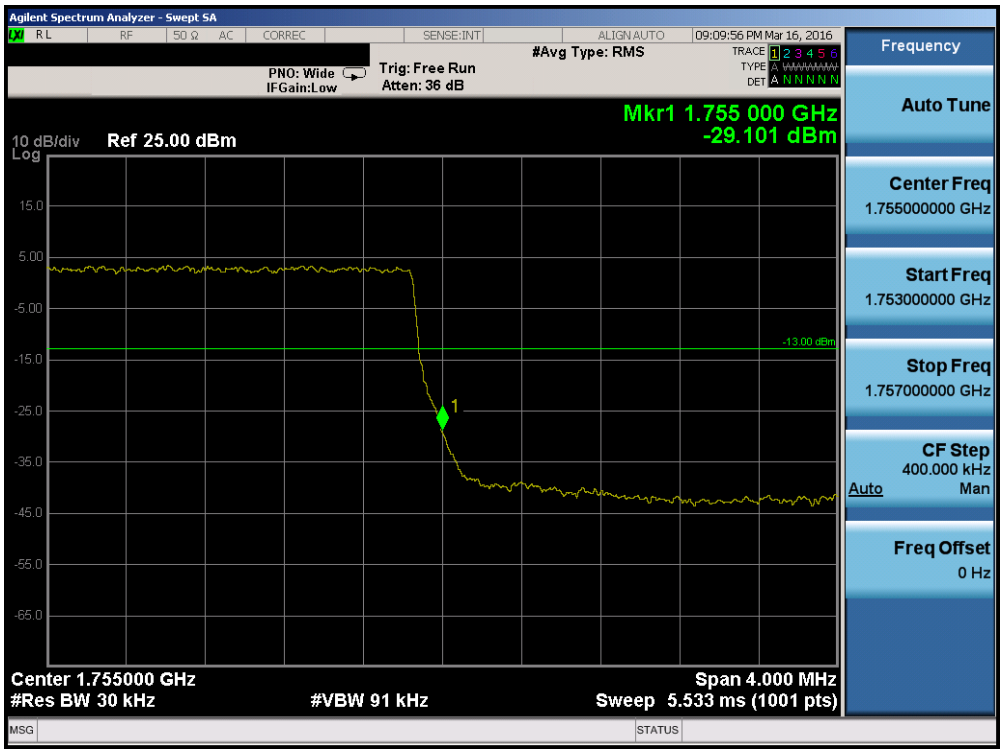


Plot 7-131. Lower Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



Plot 7-132. Upper Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

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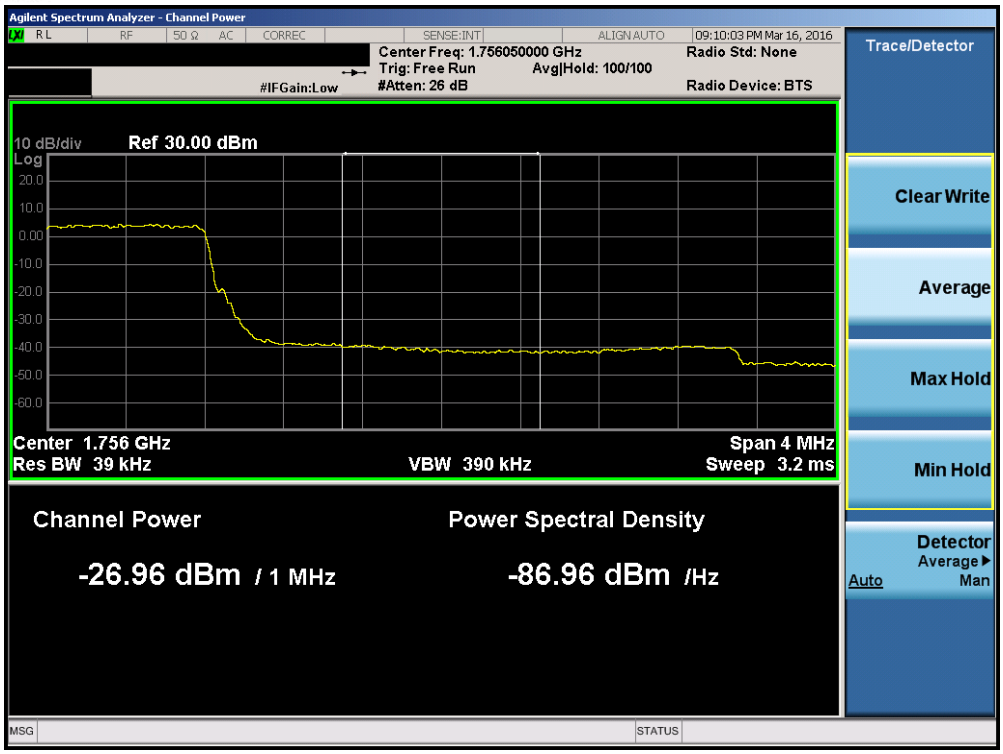
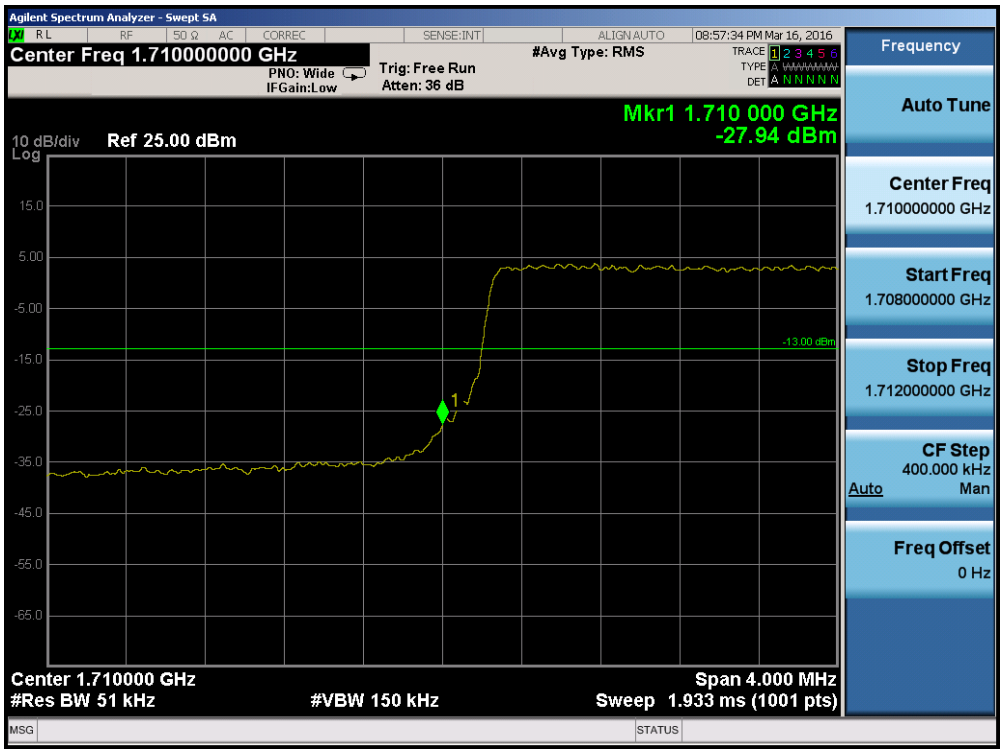


Plot 7-133. Upper Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



Plot 7-134. Lower Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

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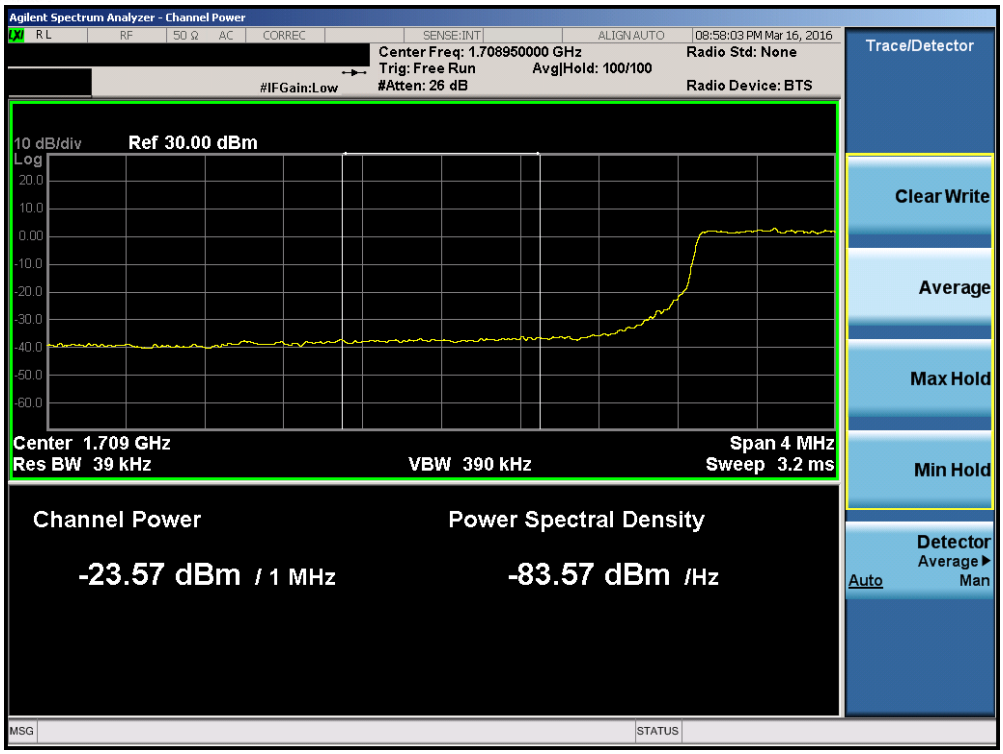
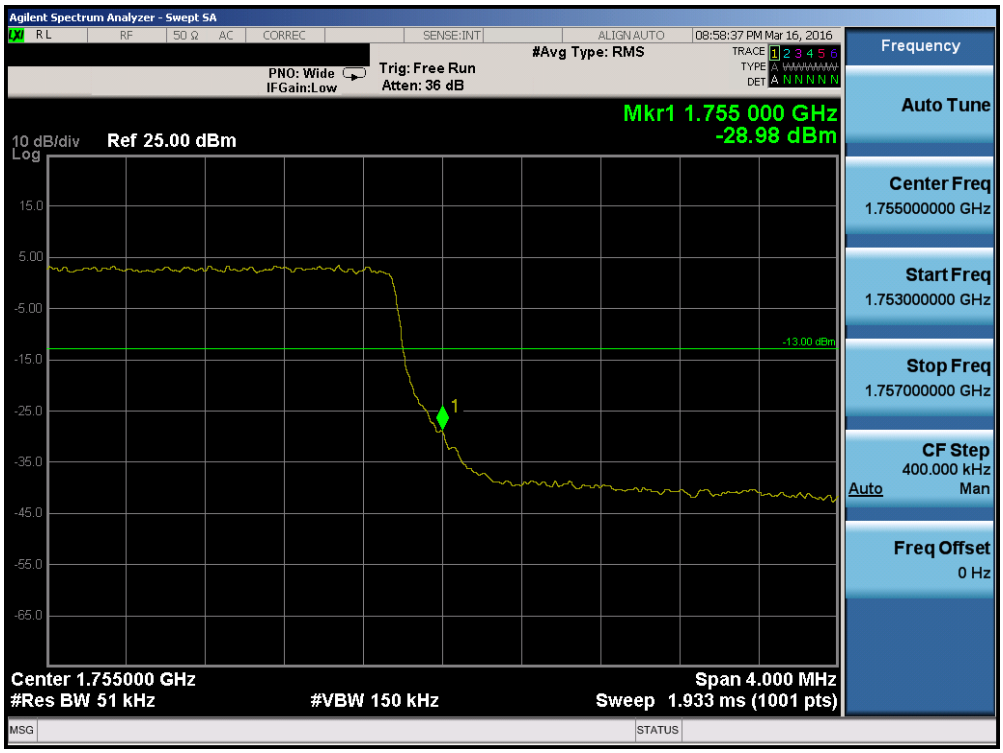


Plot 7-135. Lower Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



Plot 7-136. Upper Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

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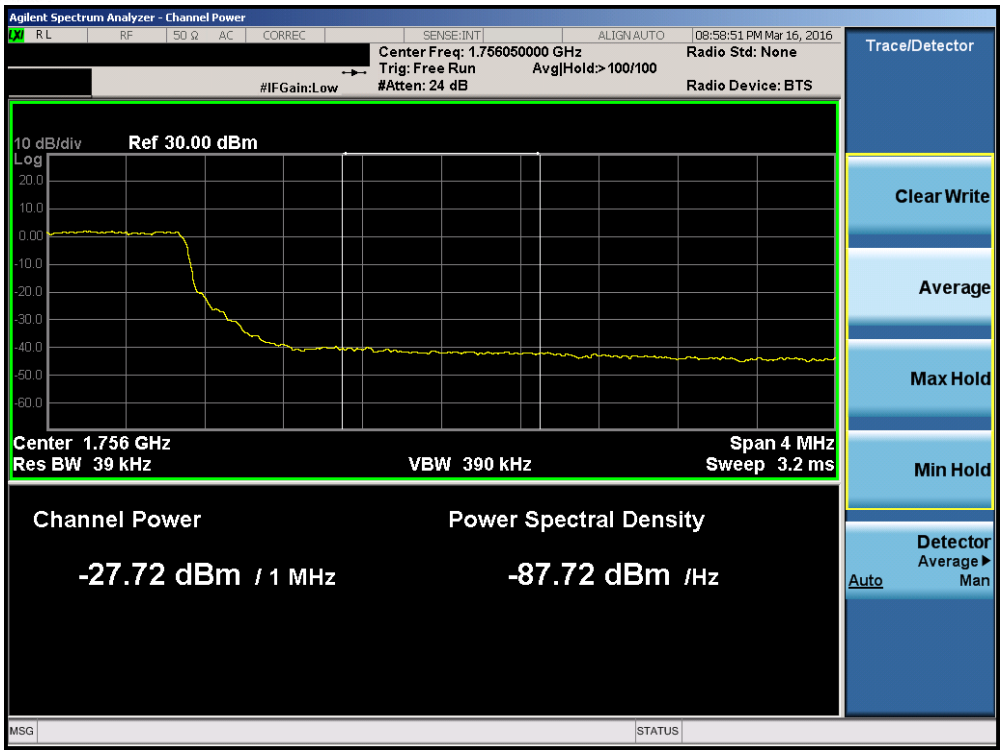
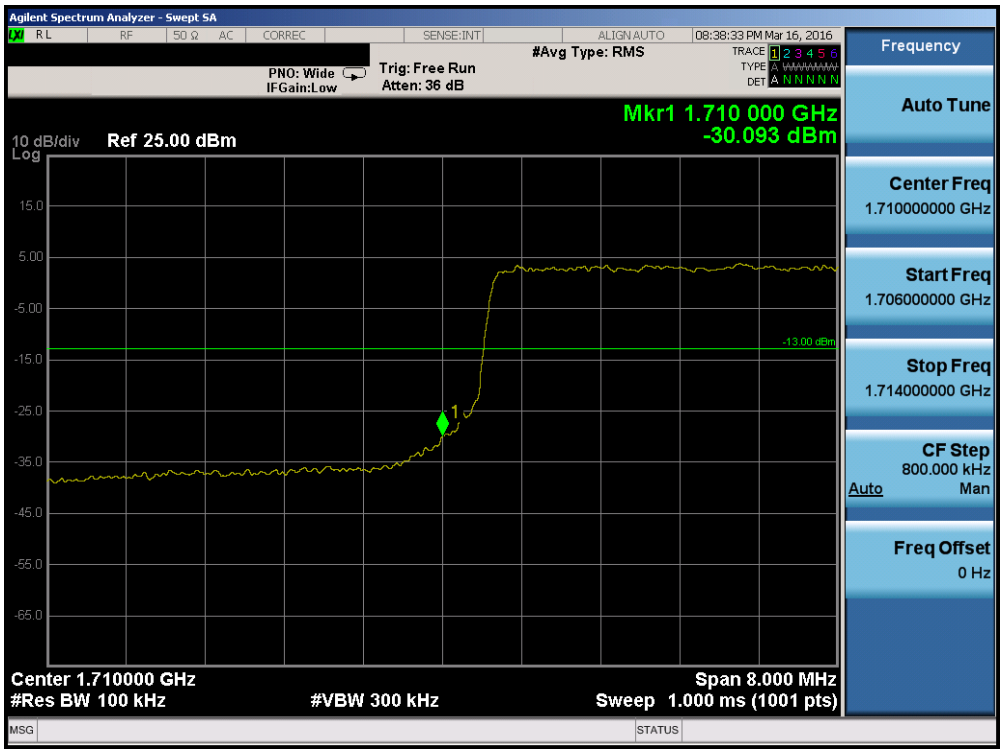


Plot 7-137. Upper Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



Plot 7-138. Lower Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

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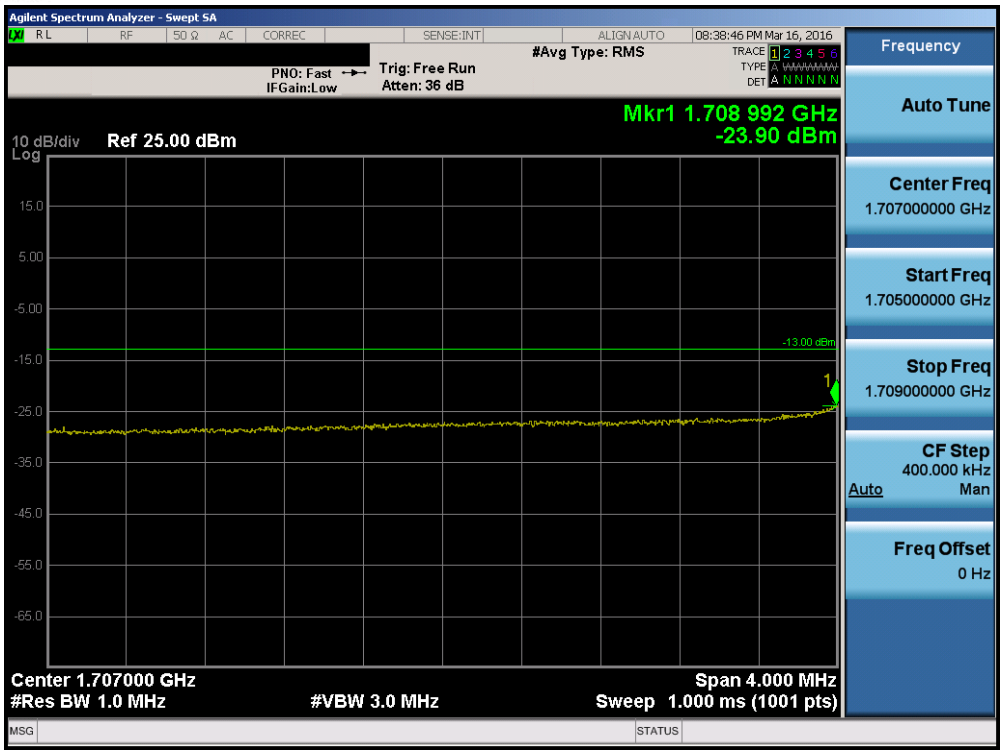

Plot 7-139. Lower Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

Plot 7-140. Upper Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

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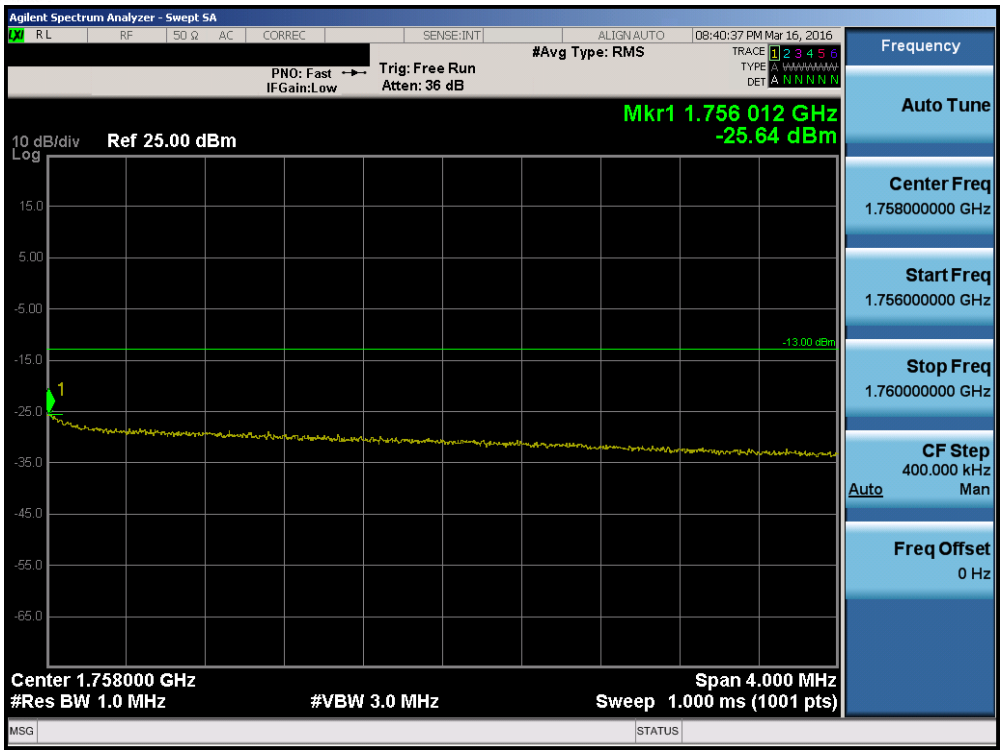
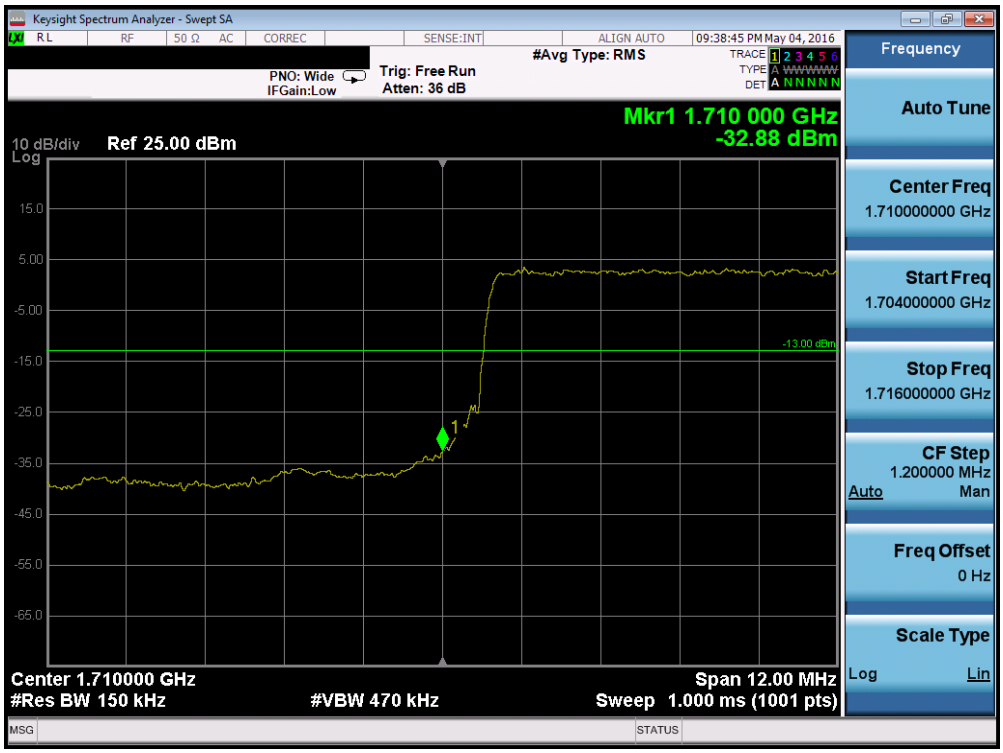


Plot 7-141. Upper Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)



Plot 7-142. Lower Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

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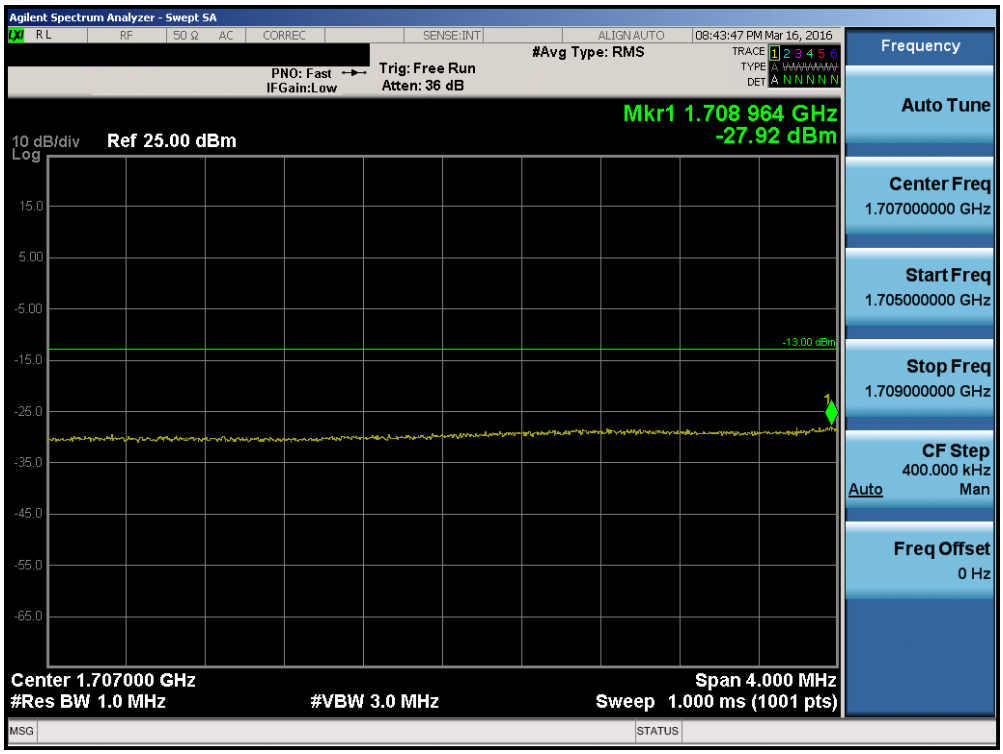

Plot 7-143. Lower Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

Plot 7-144. Upper Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

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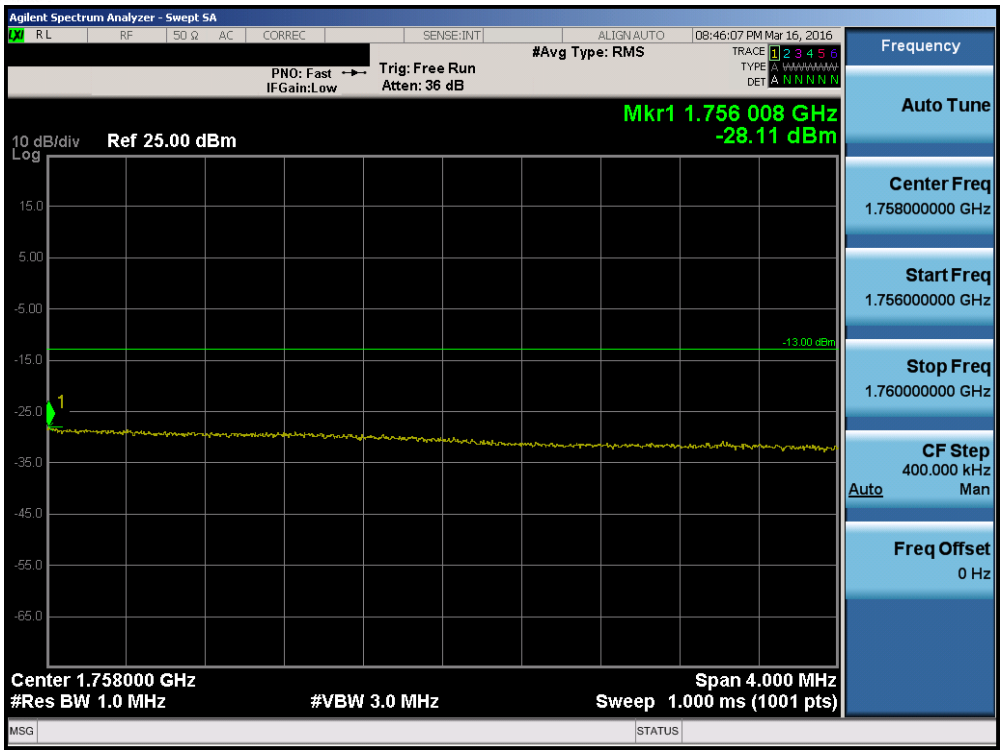
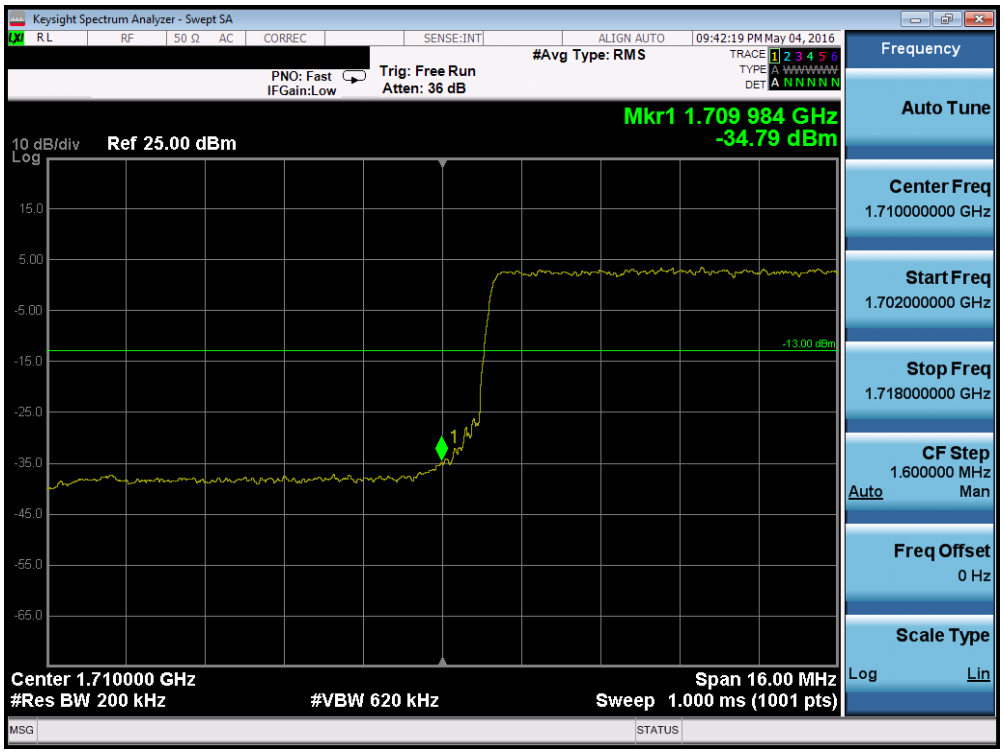


Plot 7-145. Upper Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)



Plot 7-146. Lower Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

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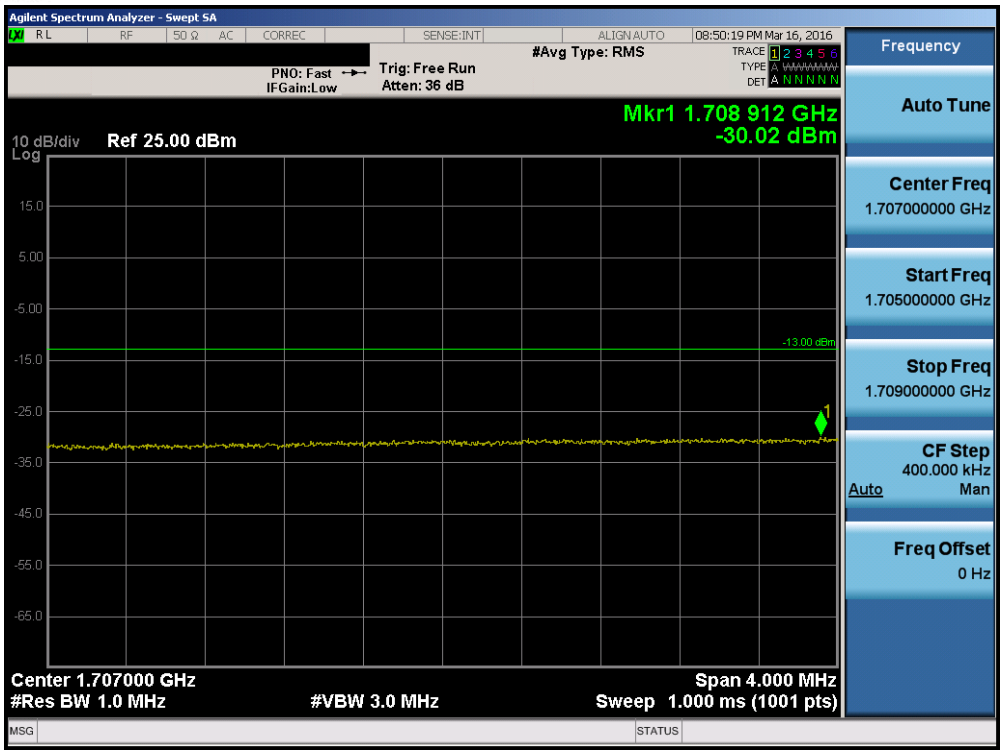
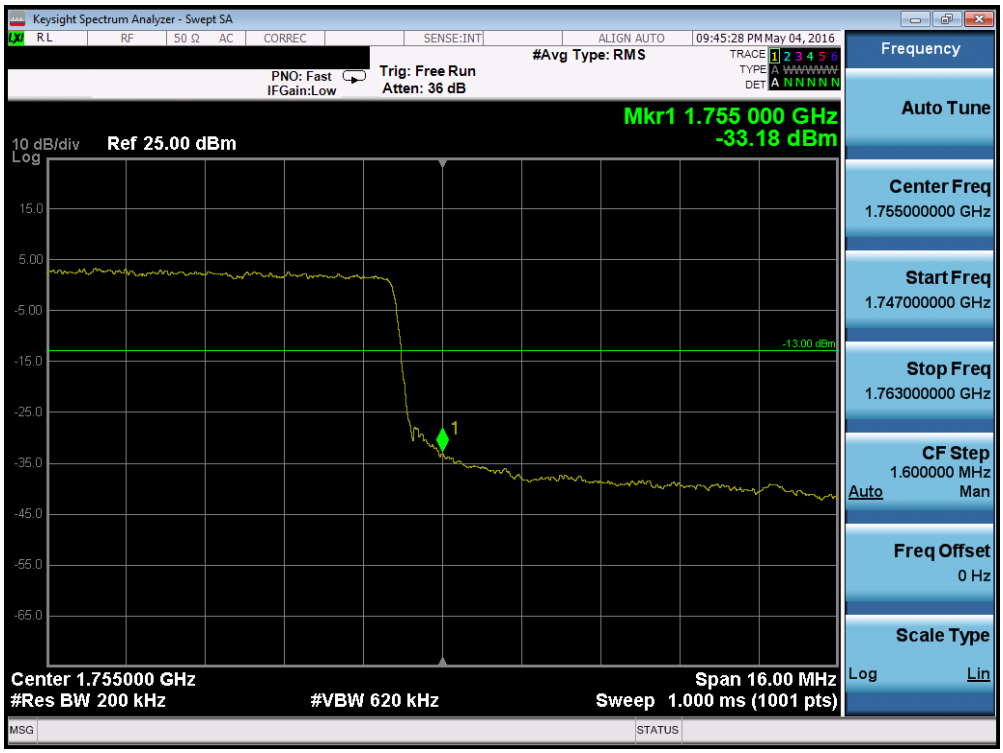


Plot 7-147. Lower Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



Plot 7-148. Upper Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

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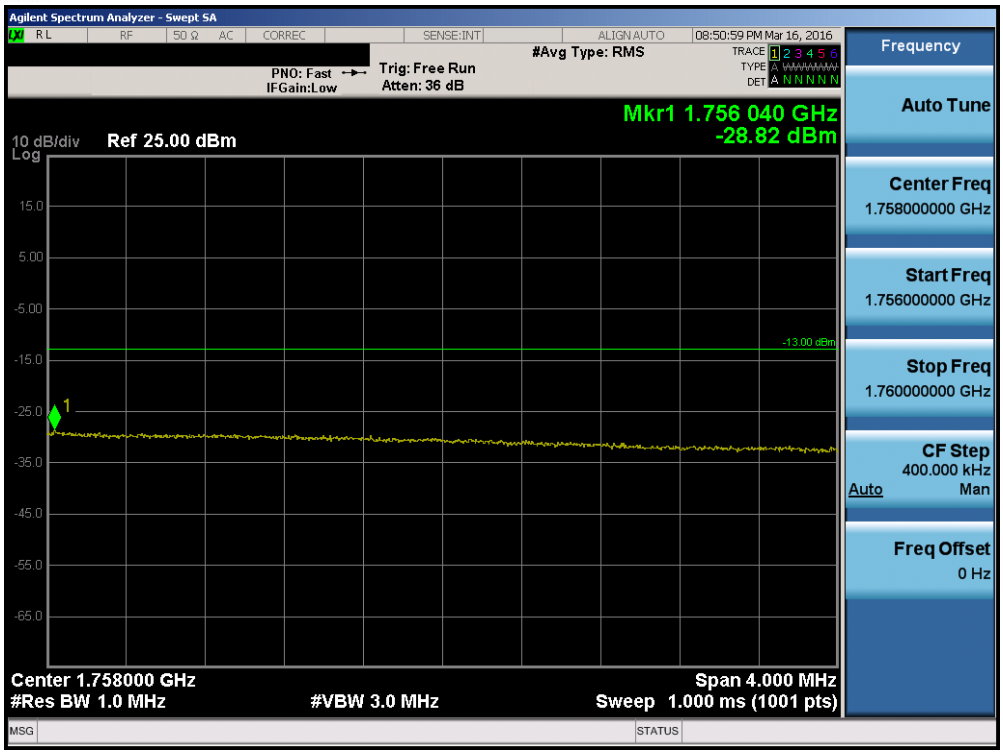
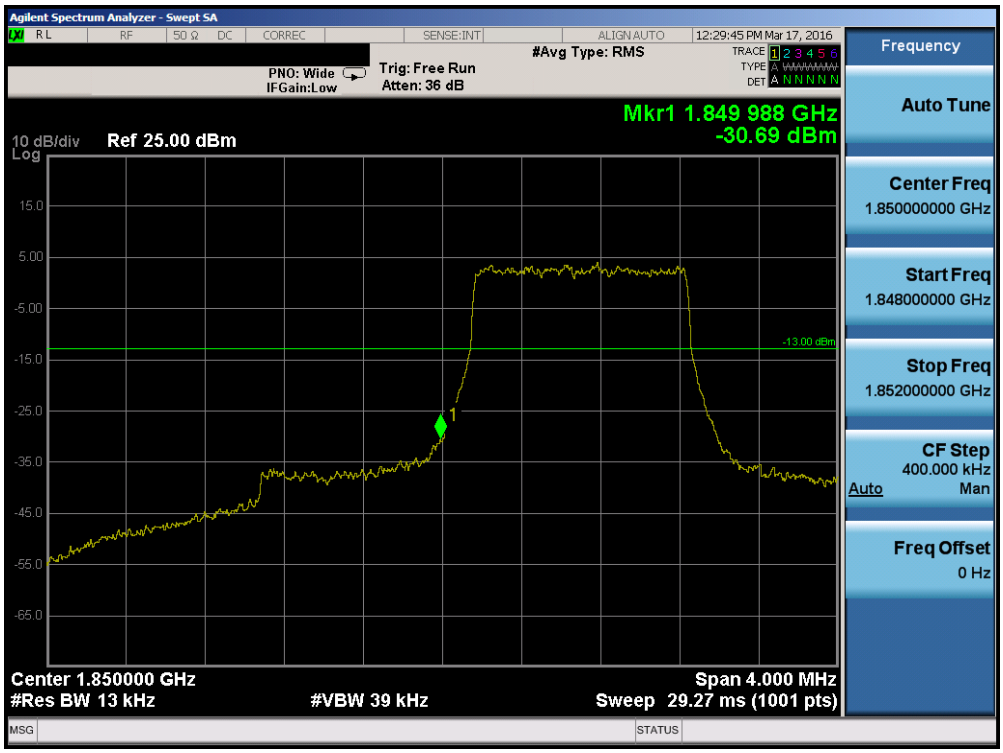


Plot 7-149. Upper Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



Plot 7-150. Lower Band Edge Plot (Band 25 – 1.4MHz QPSK – RB Size 6)

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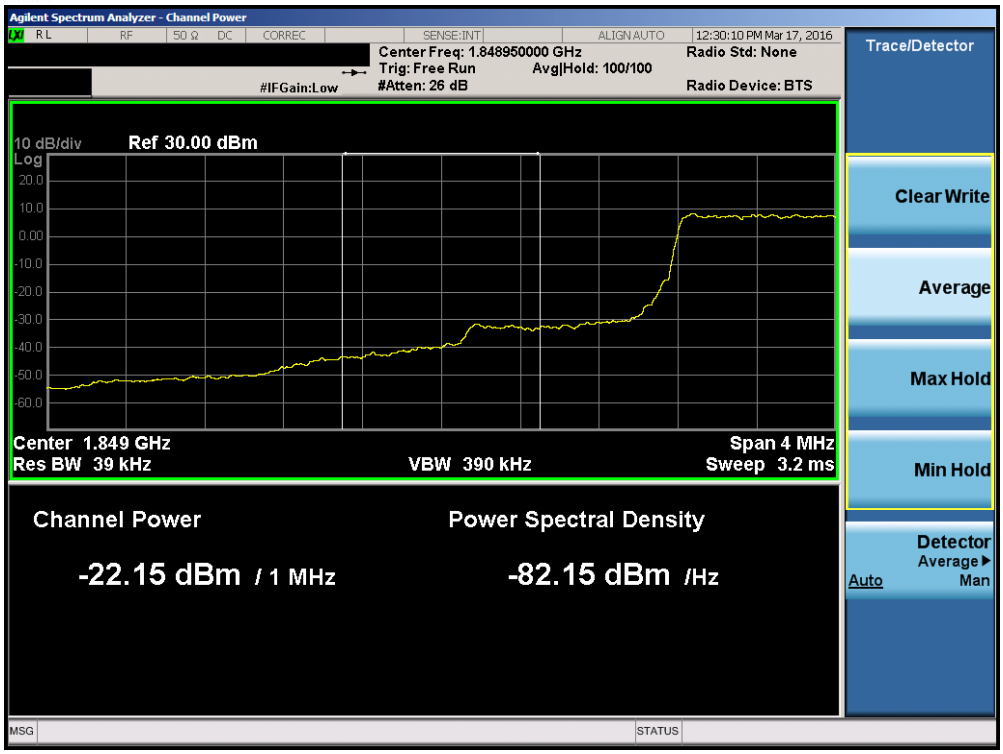
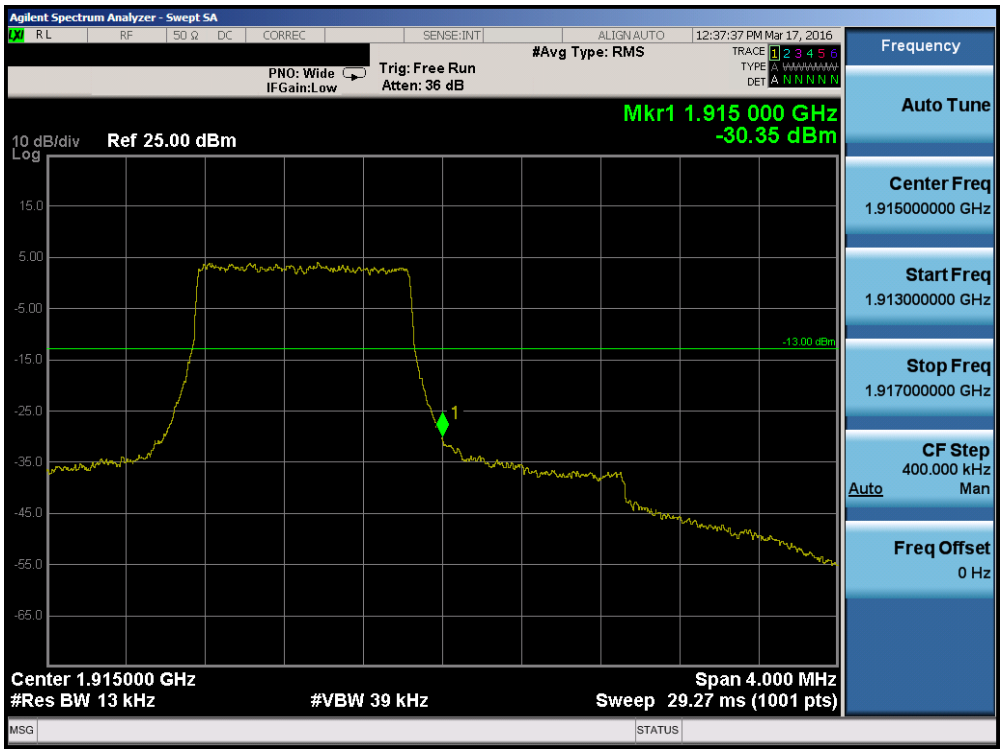


Plot 7-151. Lower Extended Band Edge Plot (Band 25 – 1.4MHz QPSK – RB Size 6)



Plot 7-152. Upper Band Edge Plot (Band 25 – 1.4MHz QPSK – RB Size 6)

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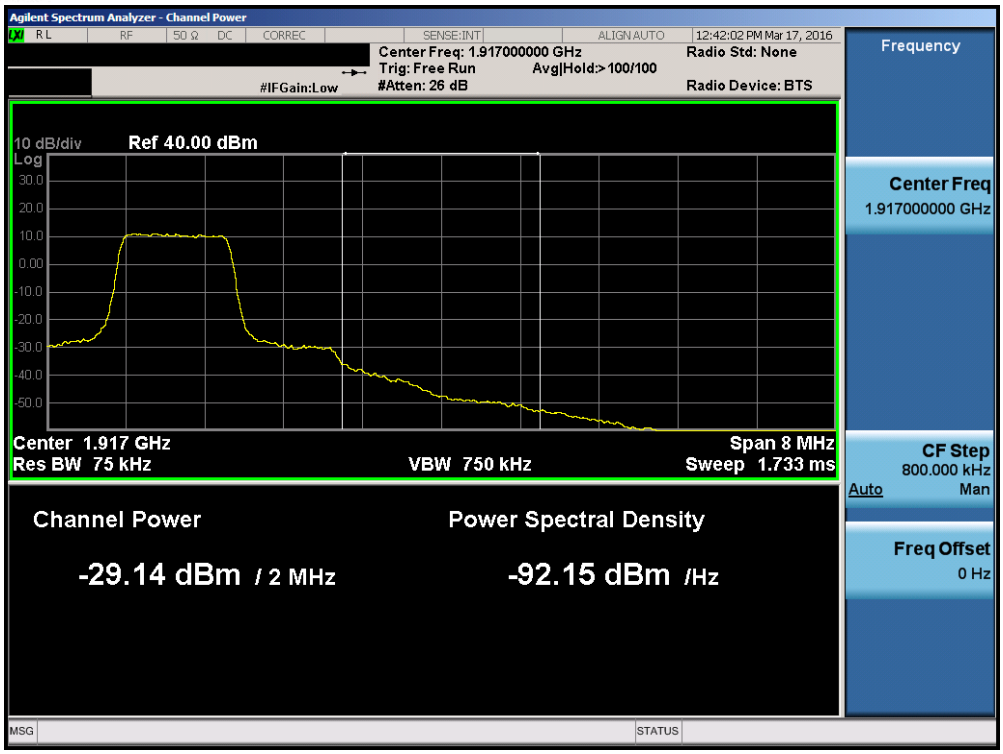
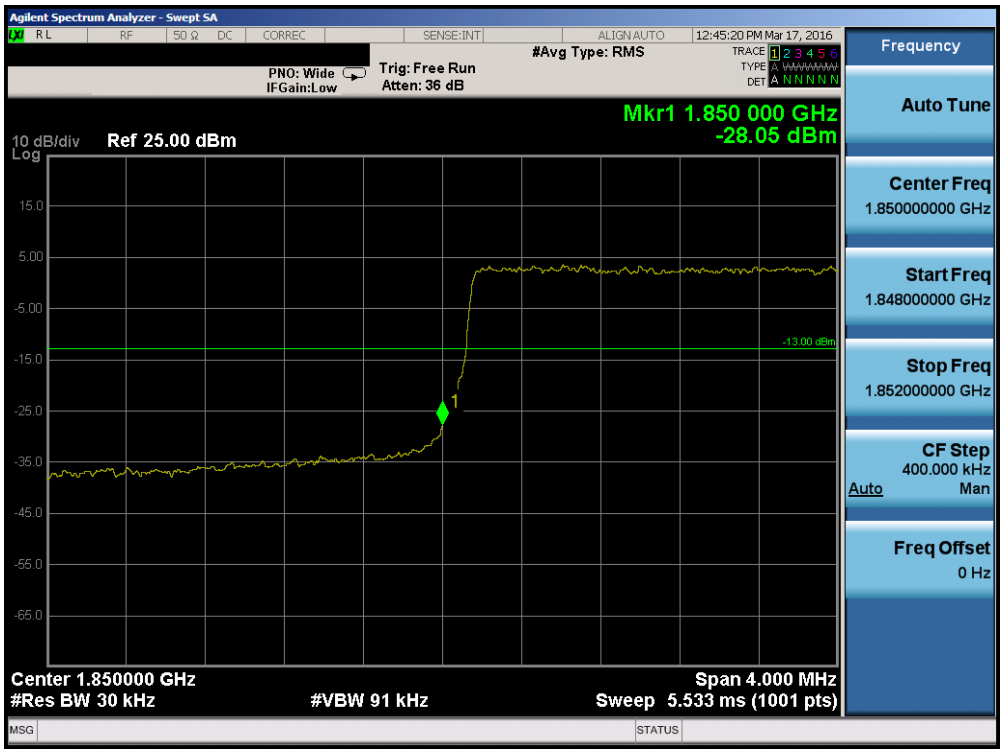


Plot 7-153. Upper Extended Band Edge Plot (Band 25 – 1.4MHz QPSK – RB Size 6)



Plot 7-154. Lower Band Edge Plot (Band 25 – 3.0MHz QPSK – RB Size 15)

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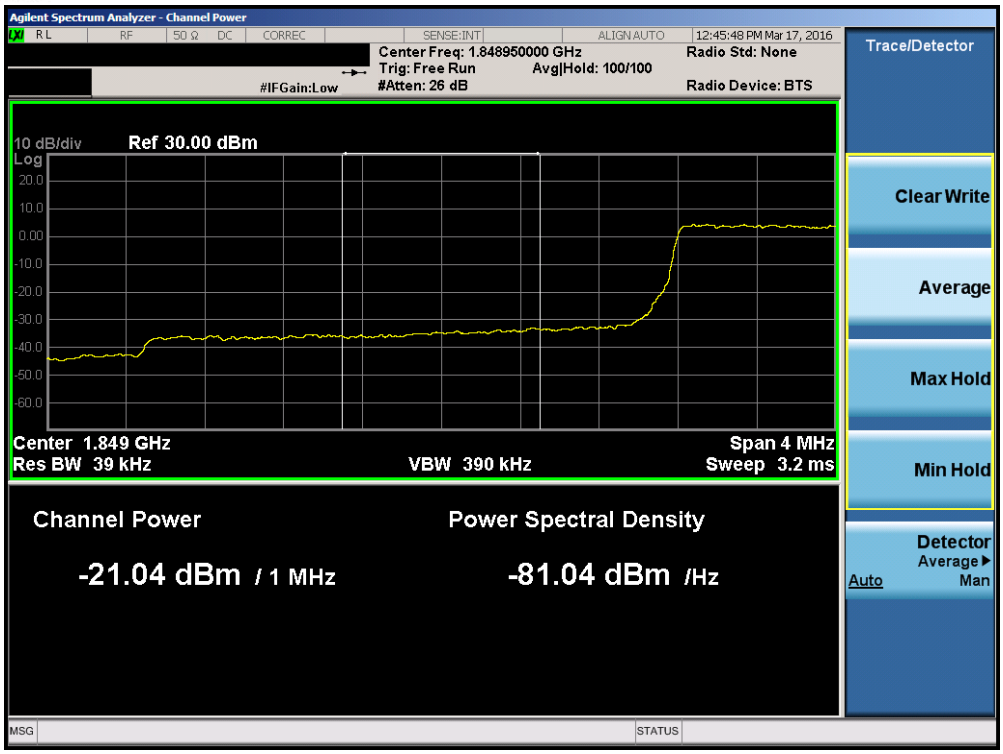
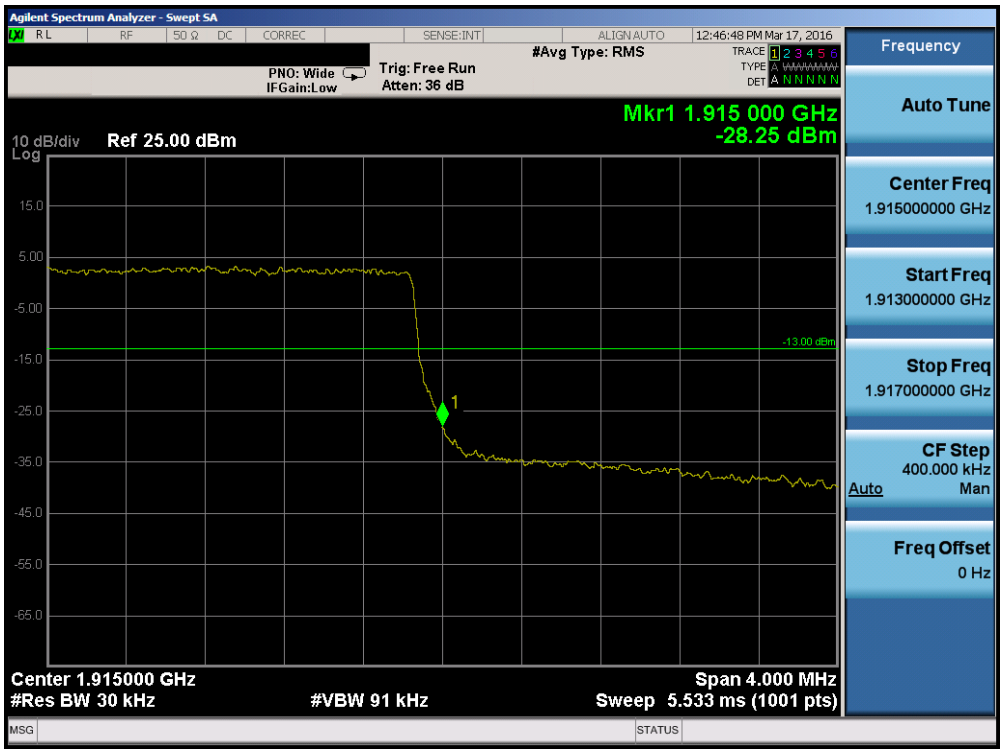


Plot 7-155. Lower Extended Band Edge Plot (Band 25 – 3.0MHz QPSK – RB Size 15)



Plot 7-156. Upper Band Edge Plot (Band 25 – 3.0MHz QPSK – RB Size 15)

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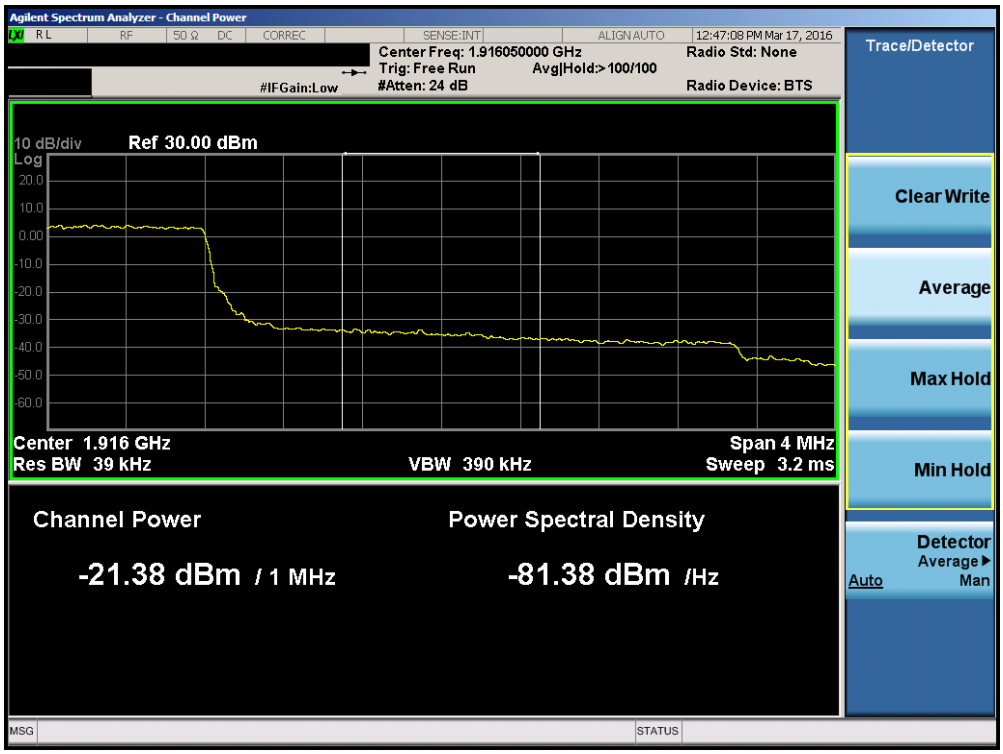
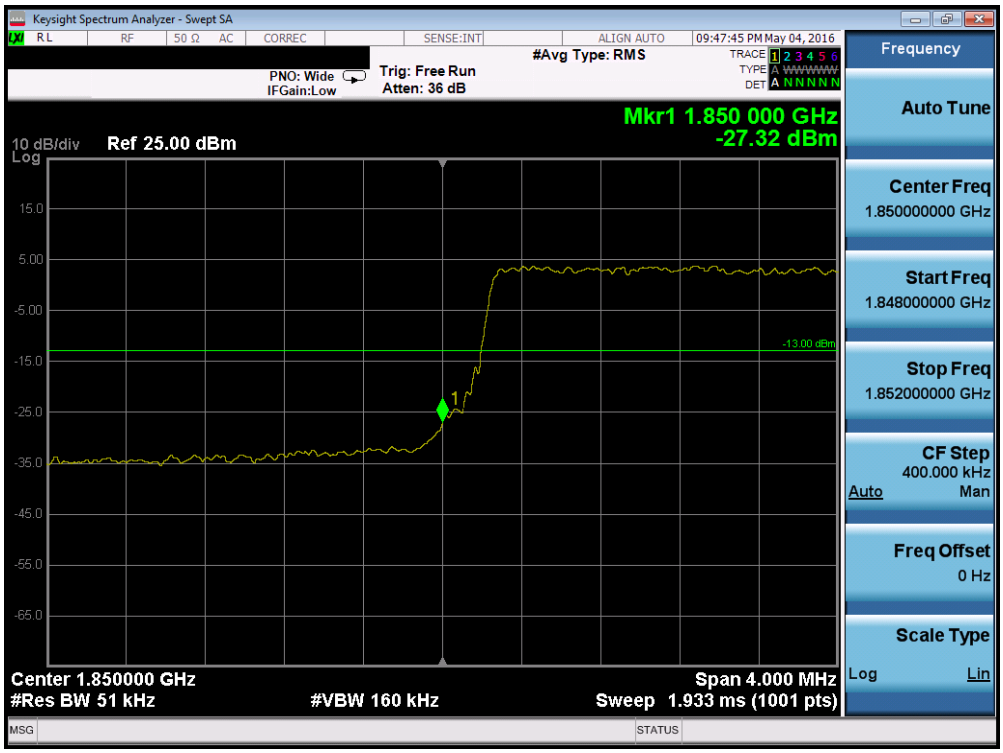


Plot 7-157. Upper Extended Band Edge Plot (Band 25 – 3.0MHz QPSK – RB Size 15)



Plot 7-158. Lower Band Edge Plot (Band 25 – 5.0MHz QPSK – RB Size 25)

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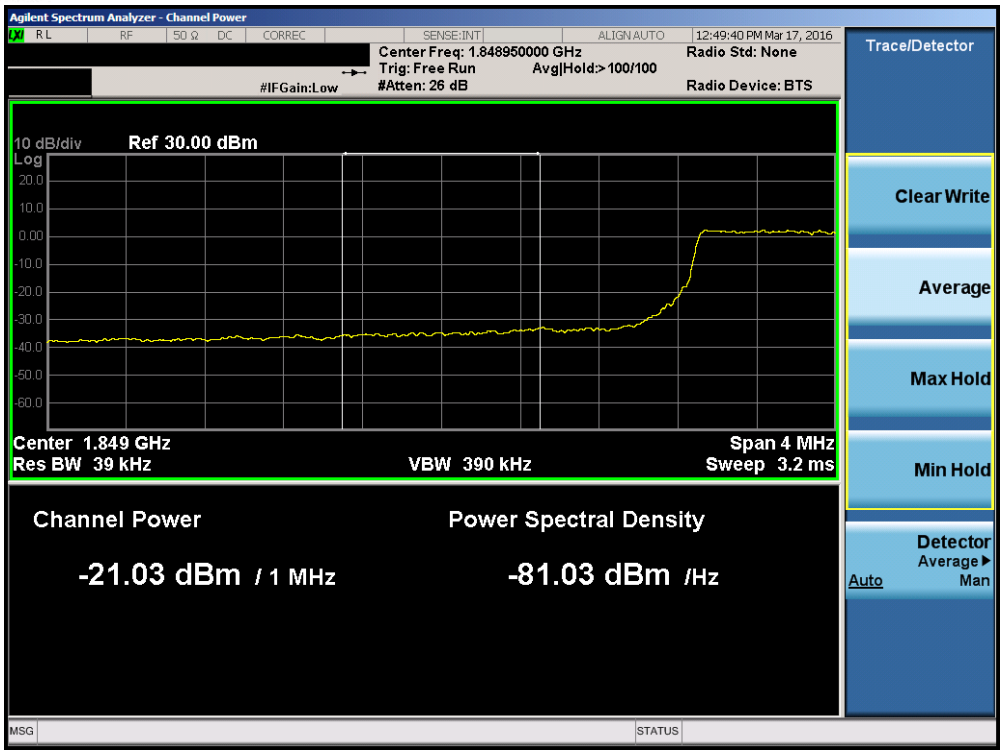
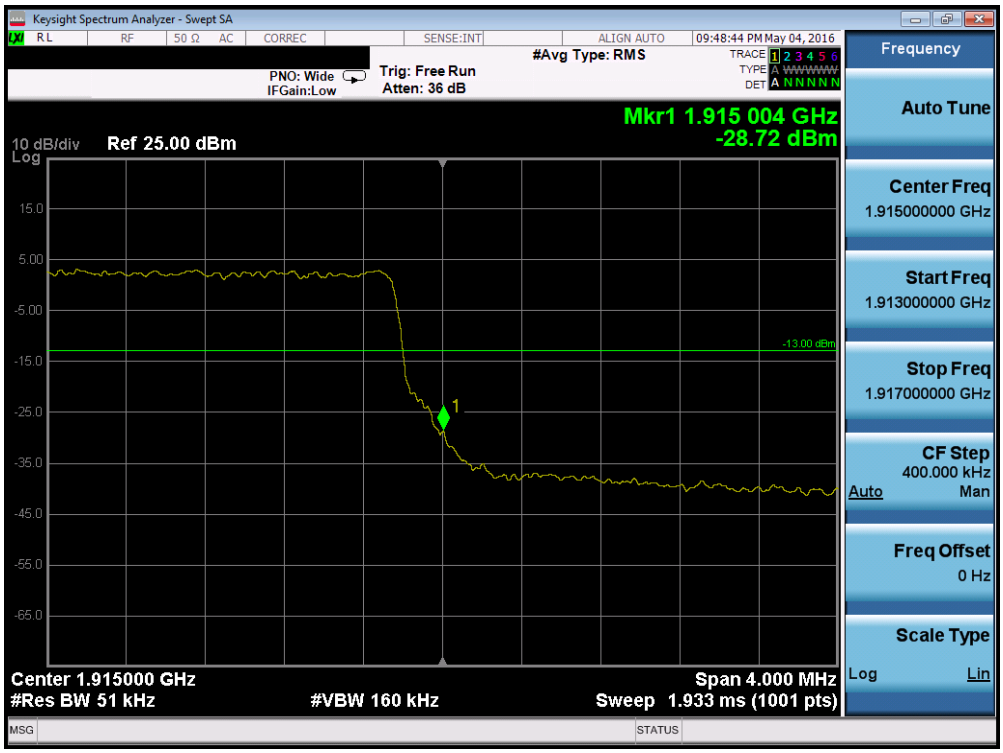


Plot 7-159. Lower Extended Band Edge Plot (Band 25 – 5.0MHz QPSK – RB Size 25)



Plot 7-160. Upper Band Edge Plot (Band 25 – 5.0MHz QPSK – RB Size 25)

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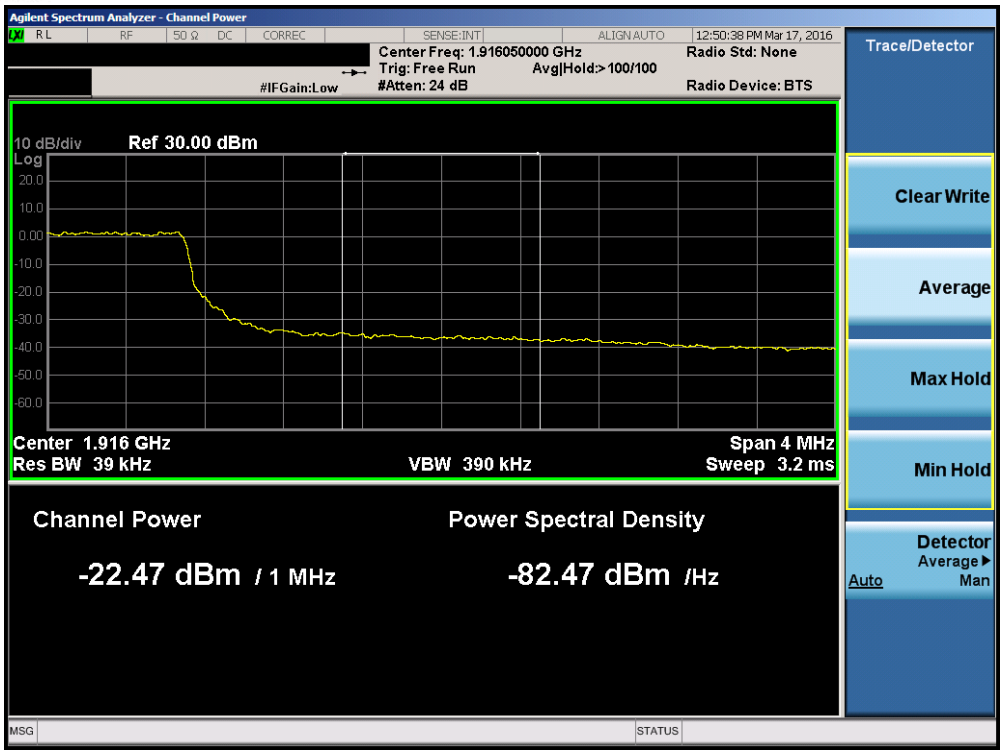
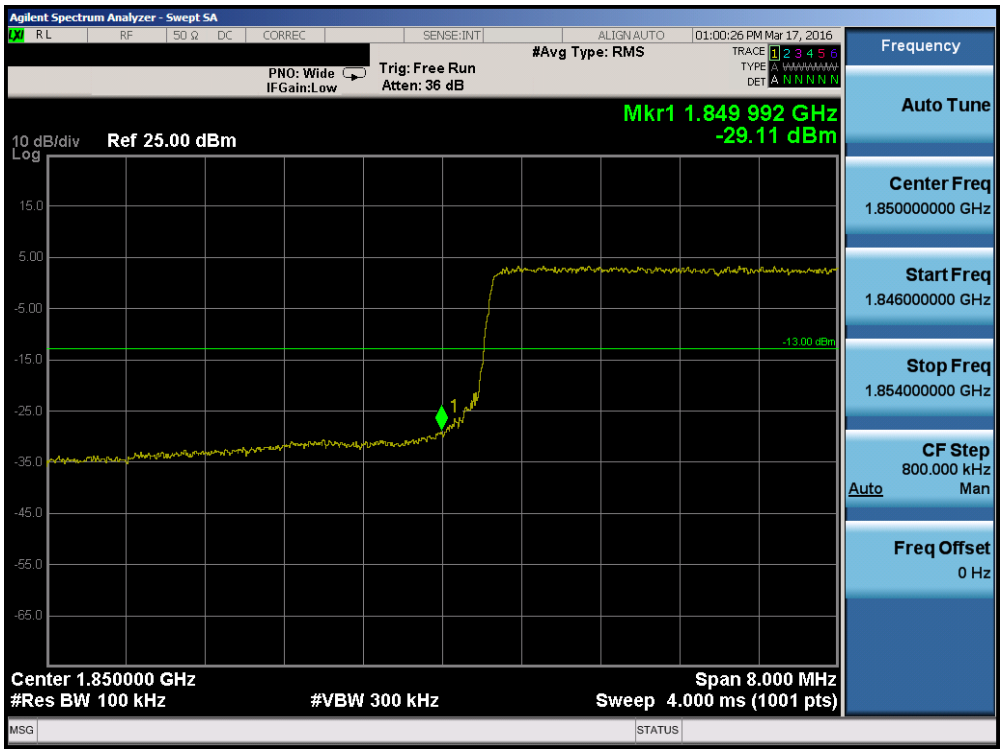


Plot 7-161. Upper Extended Band Edge Plot (Band 25 – 5.0MHz QPSK – RB Size 25)



Plot 7-162. Lower Band Edge Plot (Band 25 – 10.0MHz QPSK – RB Size 50)

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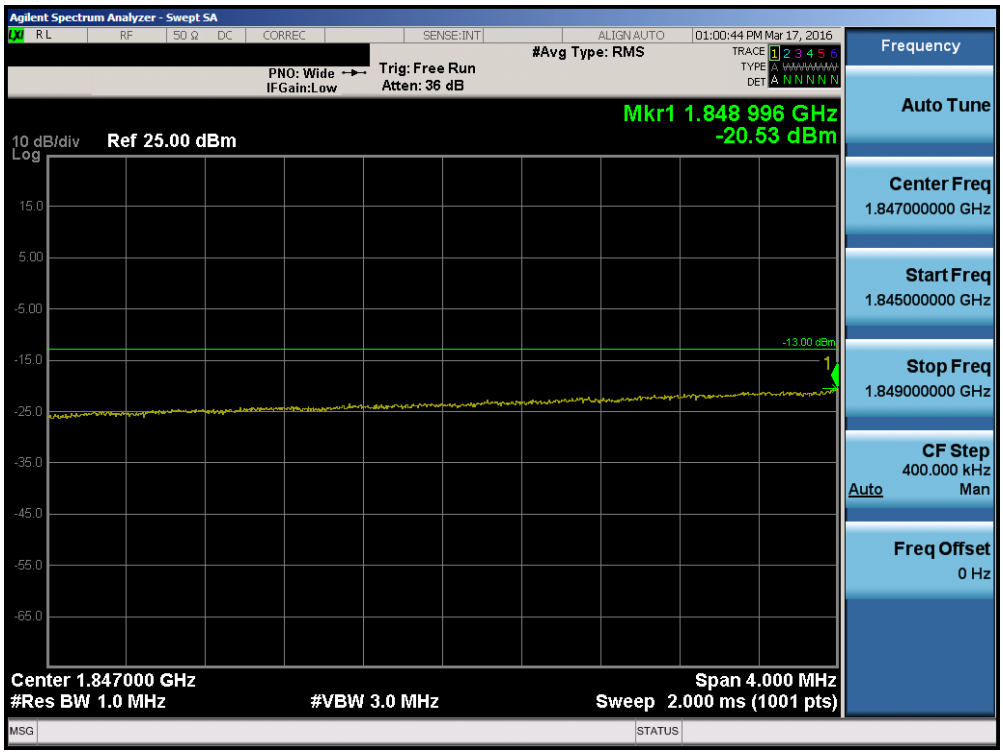
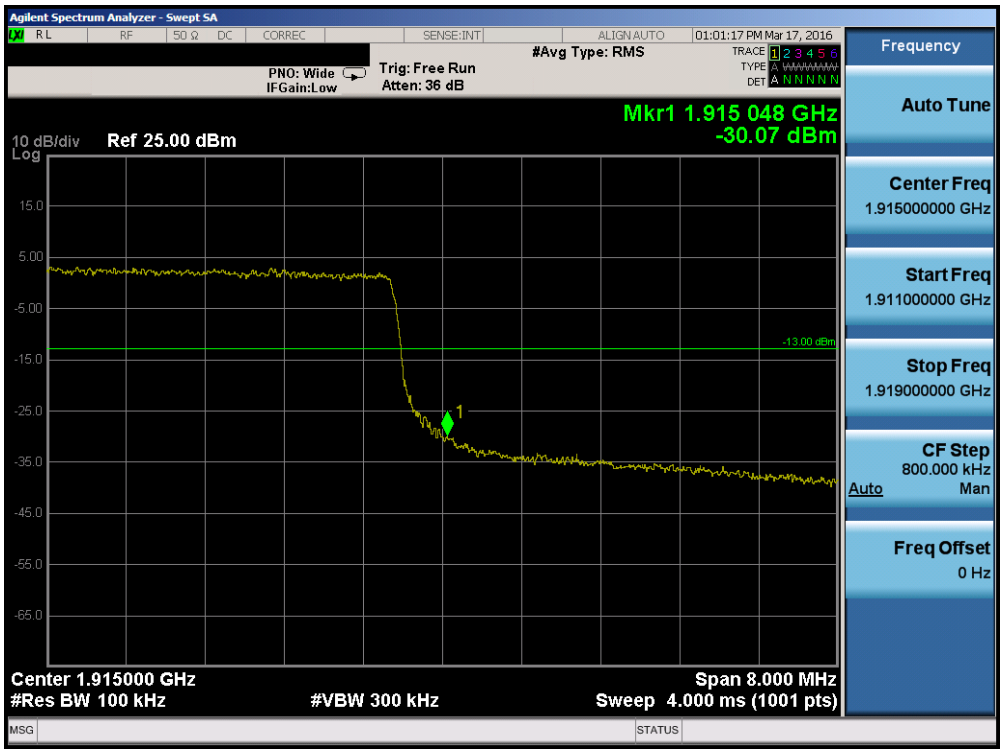


Plot 7-163. Lower Extended Band Edge Plot (Band 25 – 10.0MHz QPSK – RB Size 50)



Plot 7-164. Upper Band Edge Plot (Band 25 – 10.0MHz QPSK – RB Size 50)

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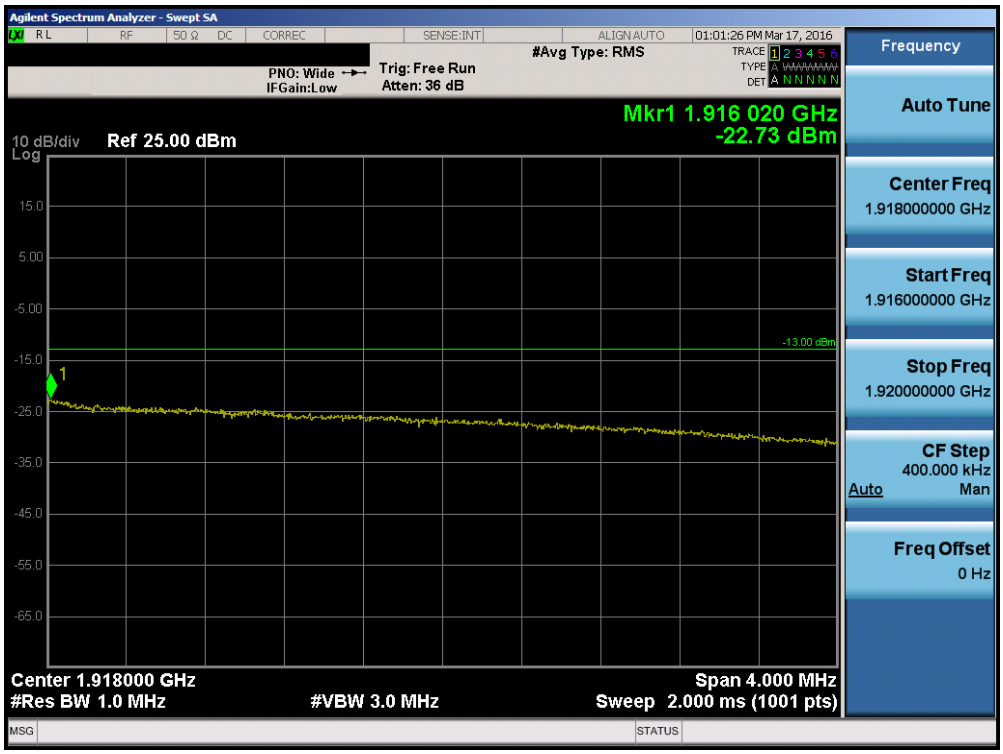
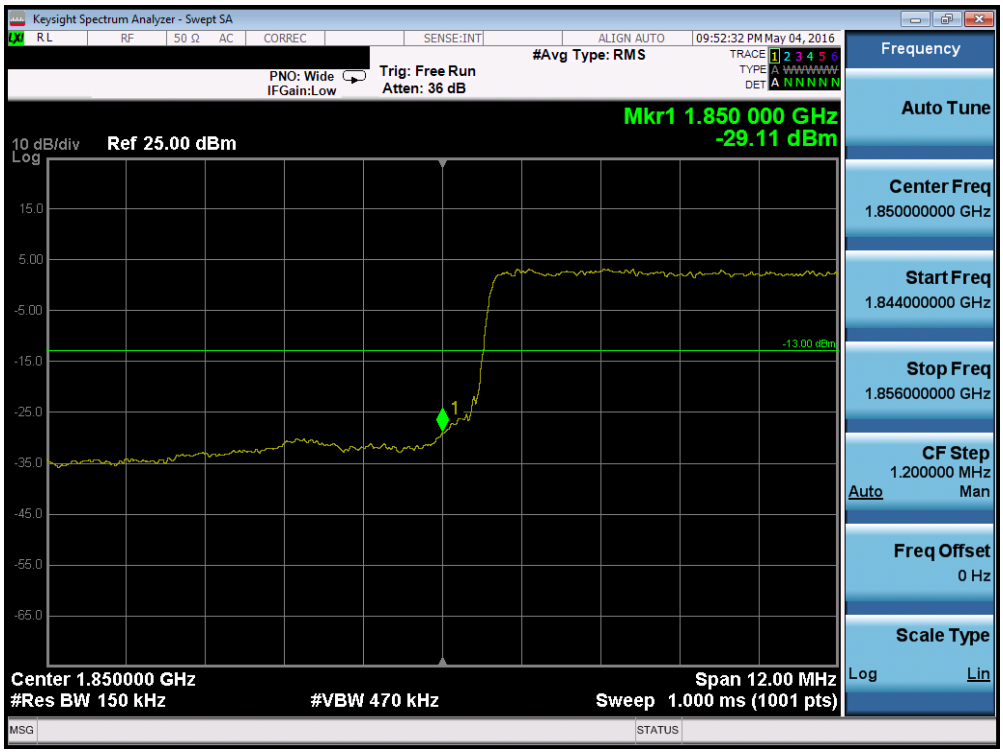


Plot 7-165. Upper Extended Band Edge Plot (Band 25 – 10.0MHz QPSK – RB Size 50)



Plot 7-166. Lower Band Edge Plot (Band 25 – 15.0MHz QPSK – RB Size 75)

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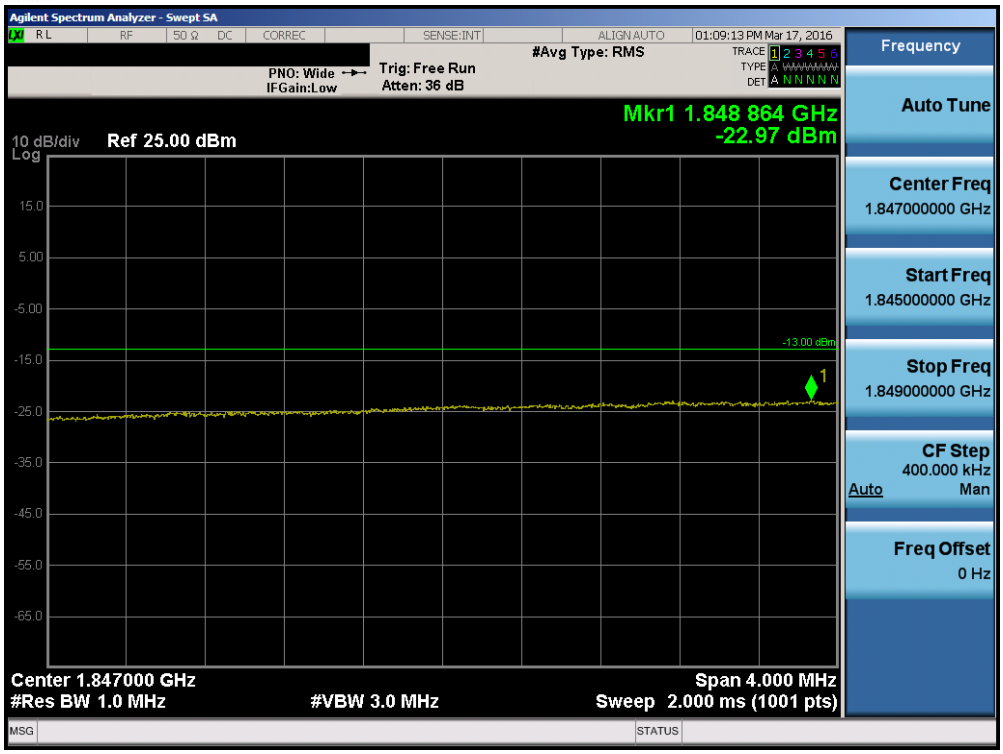

Plot 7-167. Lower Extended Band Edge Plot (Band 25 – 15.0MHz QPSK – RB Size 75)

Plot 7-168. Upper Band Edge Plot (Band 25 – 15.0MHz QPSK – RB Size 75)

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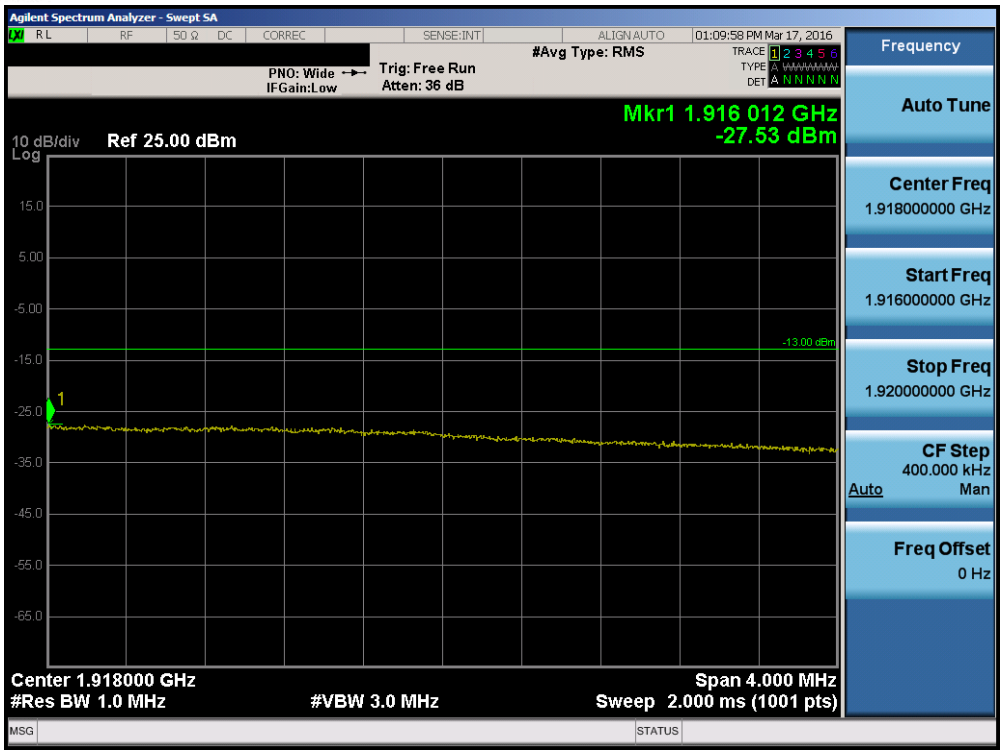
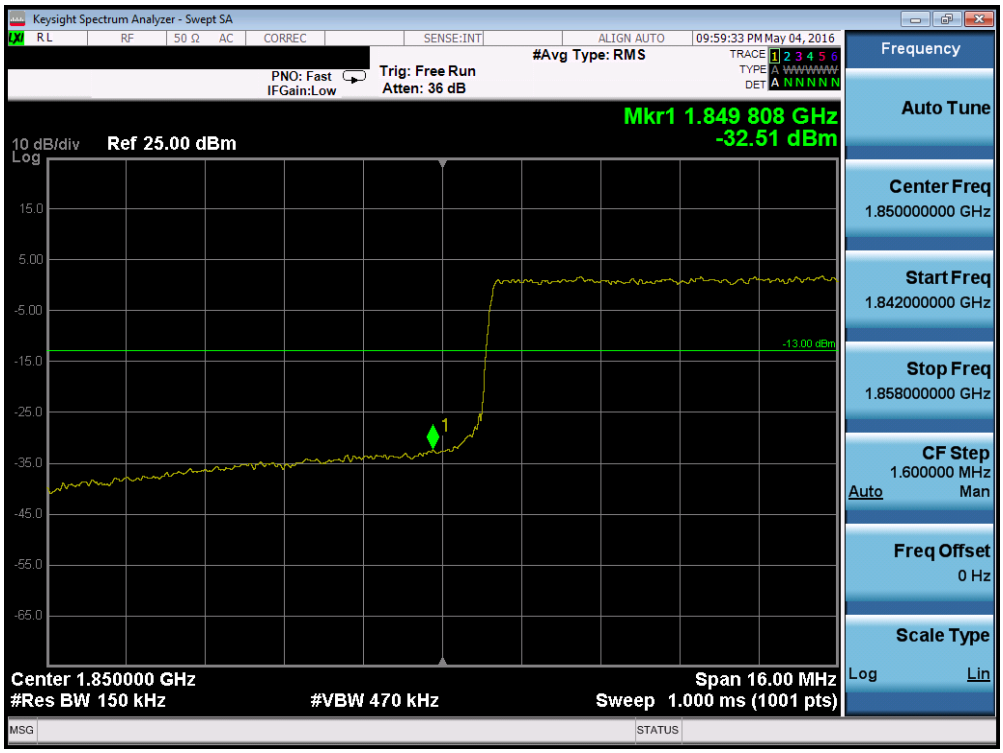


Plot 7-169. Upper Extended Band Edge Plot (Band 25 – 15.0MHz QPSK – RB Size 75)



Plot 7-170. Lower Band Edge Plot (Band 25 – 20.0MHz QPSK – RB Size 100)

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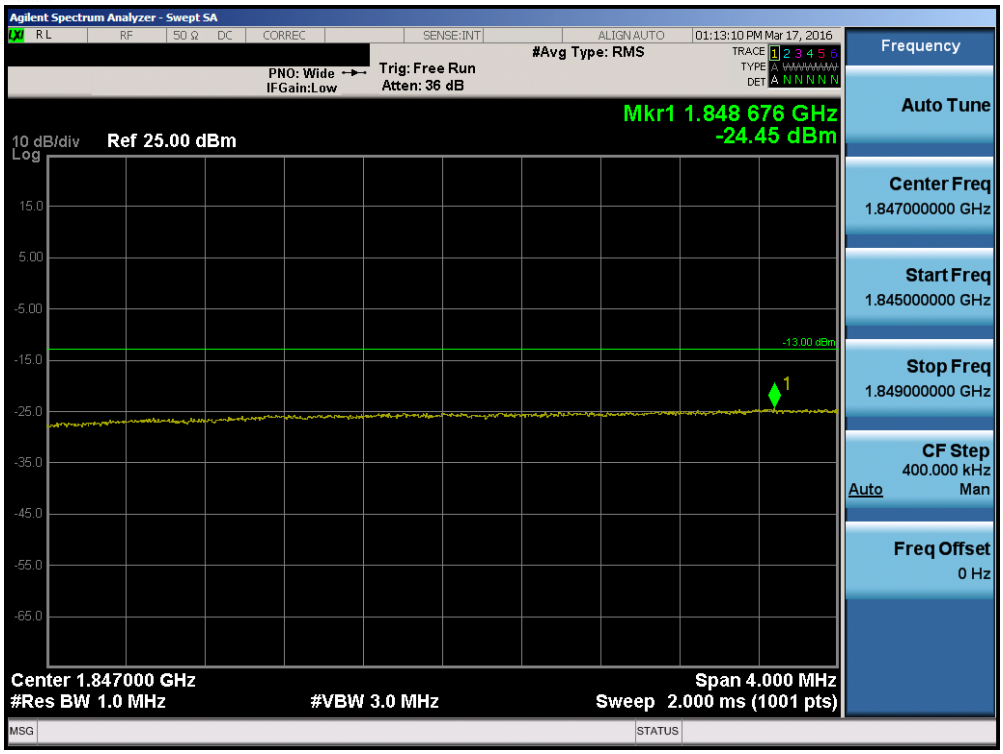
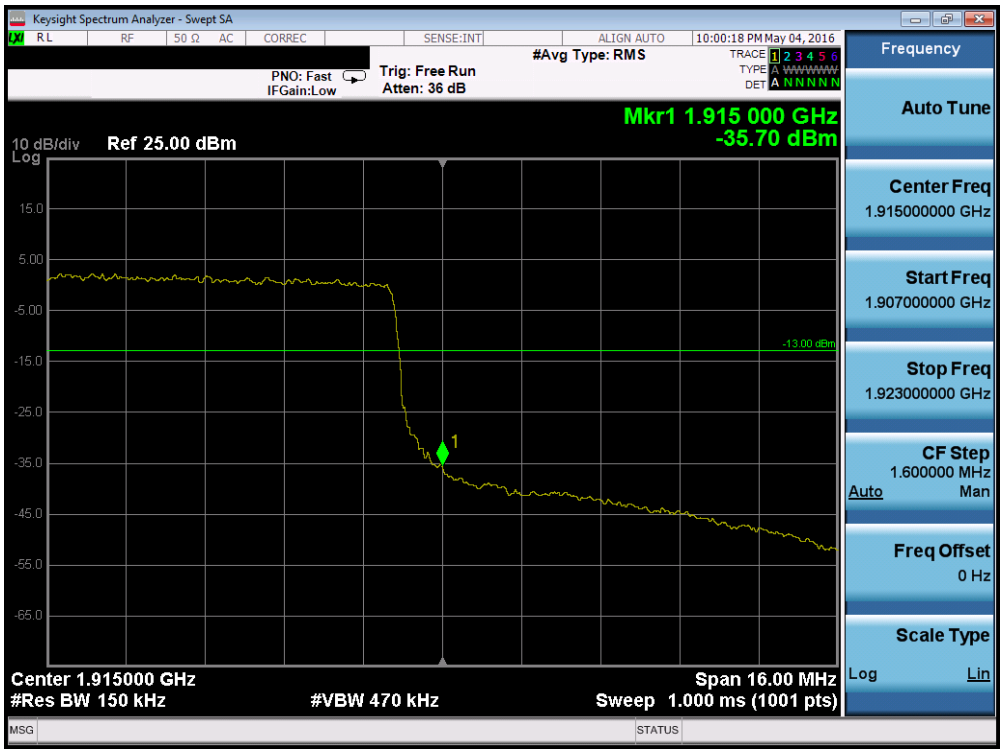


Plot 7-171. Lower Extended Band Edge Plot (Band 25 – 20.0MHz QPSK – RB Size 100)



Plot 7-172. Upper Band Edge Plot (Band 25 – 20.0MHz QPSK – RB Size 100)

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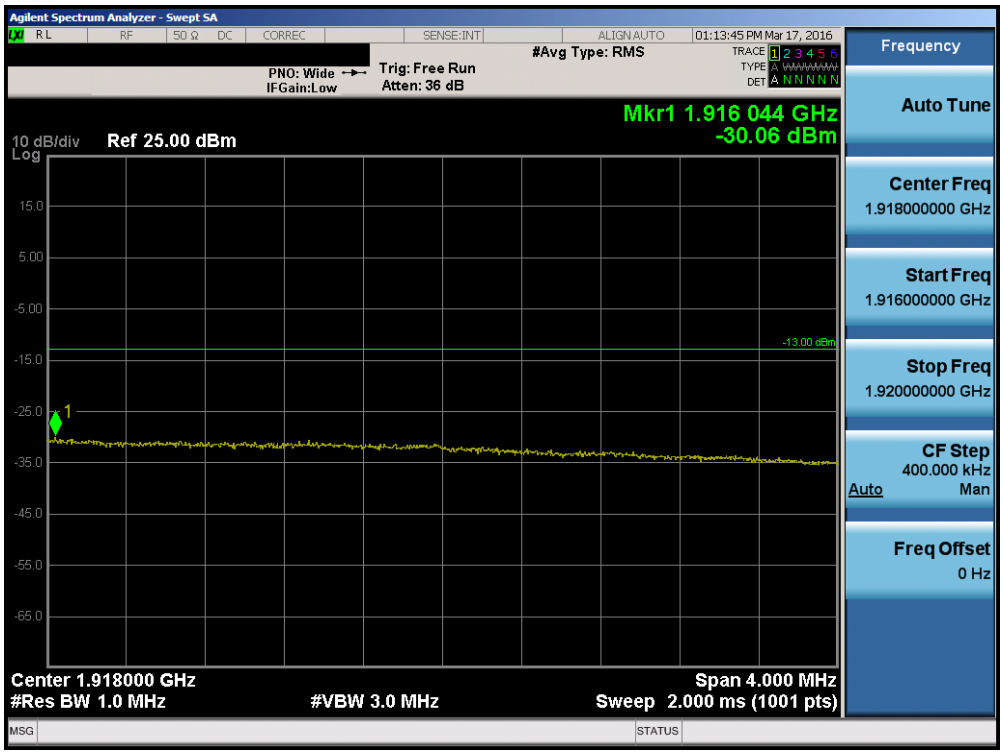
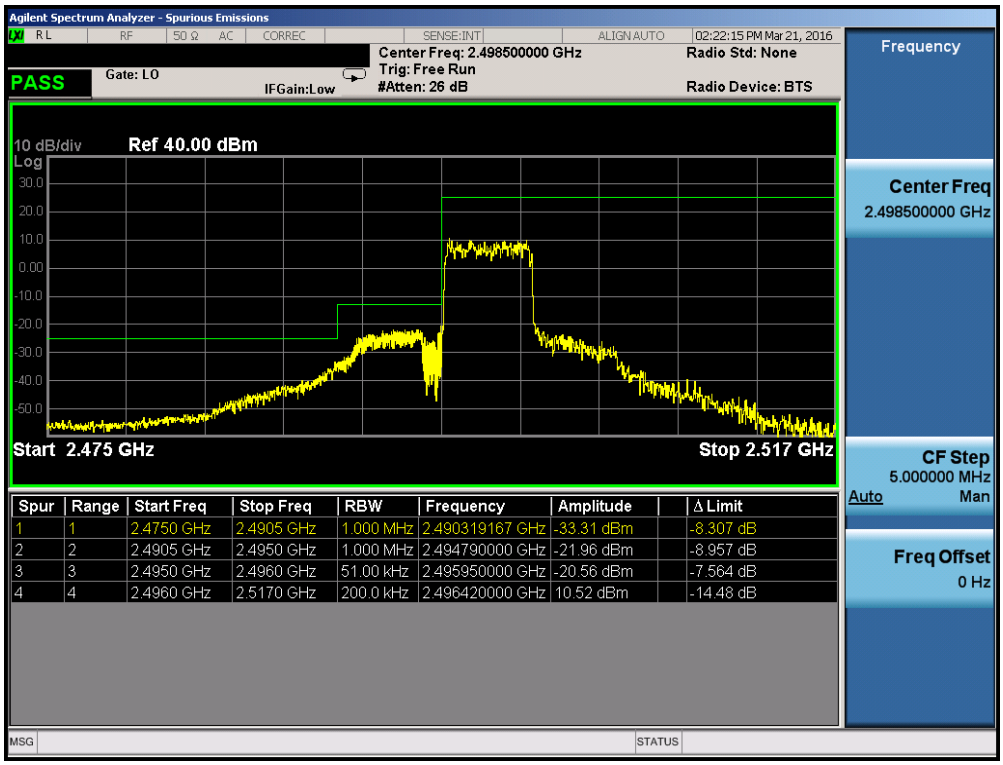


Plot 7-173. Upper Extended Band Edge Plot (Band 25 – 20.0MHz QPSK – RB Size 100)



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude		Δ Limit
1	1	2.4750 GHz	2.4905 GHz	1.000 MHz	2.490319167 GHz	-33.31 dBm		-8.307 dB
2	2	2.4905 GHz	2.4950 GHz	1.000 MHz	2.494790000 GHz	-21.96 dBm		-8.957 dB
3	3	2.4950 GHz	2.4960 GHz	51.00 kHz	2.495950000 GHz	-20.56 dBm		-7.564 dB
4	4	2.4960 GHz	2.5170 GHz	200.0 kHz	2.496420000 GHz	10.52 dBm		-14.48 dB

Plot 7-174. Lower ACP Plot (Band 41 – 5.0MHz QPSK – RB Size 25)

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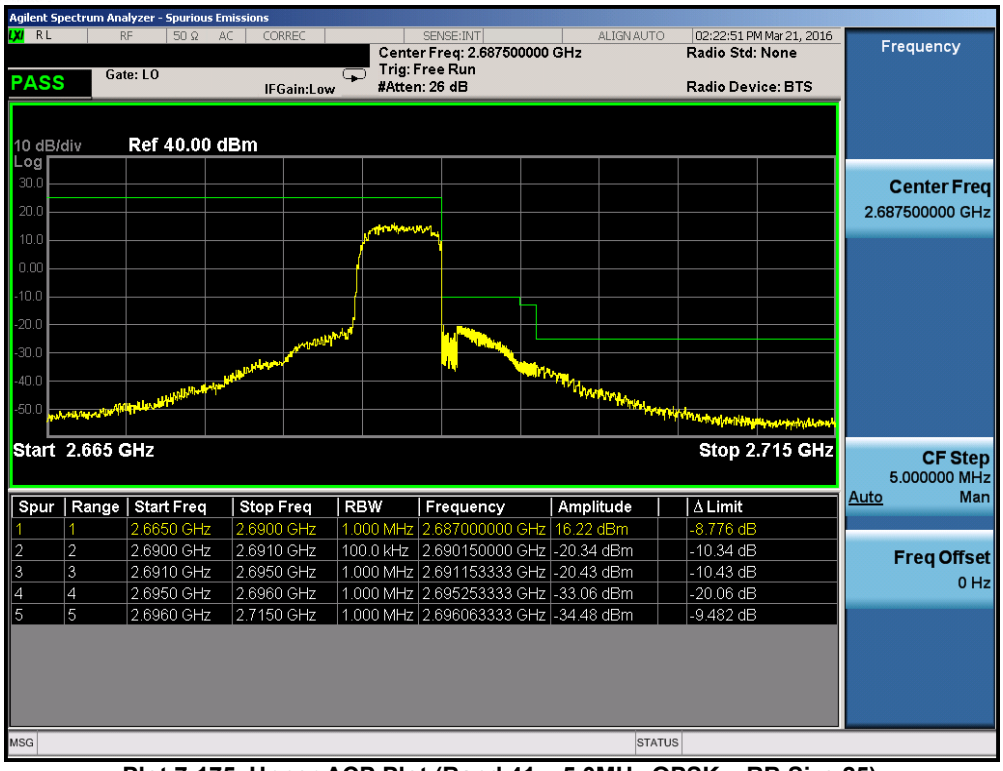
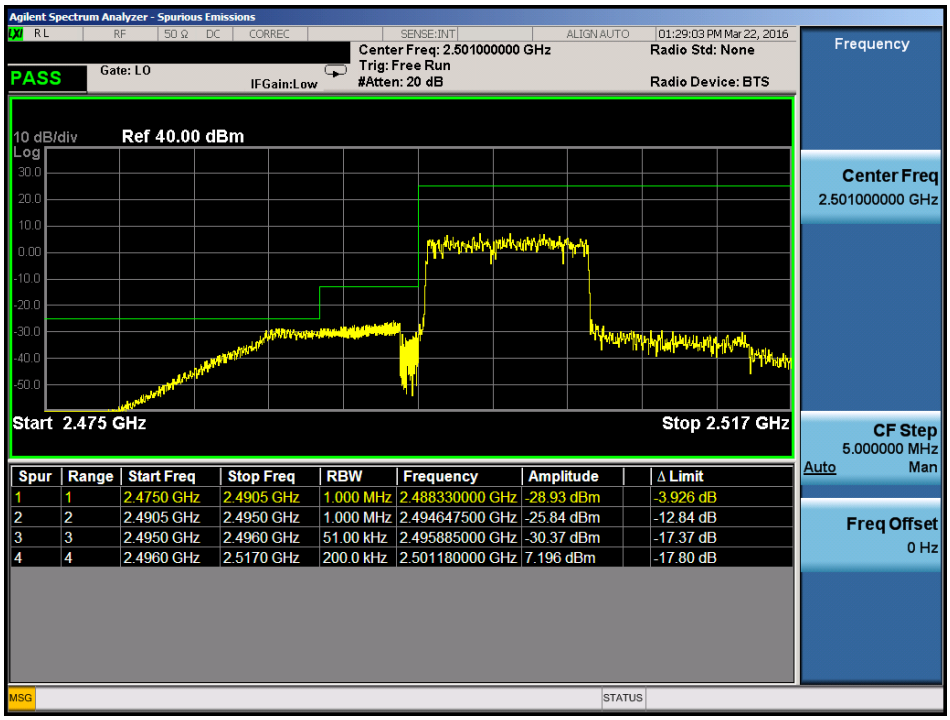


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.6650 GHz	2.6900 GHz	1.000 MHz	2.687000000 GHz	16.22 dBm	-8.776 dB
2	2	2.6900 GHz	2.6910 GHz	100.0 kHz	2.690150000 GHz	-20.34 dBm	-10.34 dB
3	3	2.6910 GHz	2.6950 GHz	1.000 MHz	2.691153333 GHz	-20.43 dBm	-10.43 dB
4	4	2.6950 GHz	2.6960 GHz	1.000 MHz	2.695253333 GHz	-33.06 dBm	-20.06 dB
5	5	2.6960 GHz	2.7150 GHz	1.000 MHz	2.696063333 GHz	-34.48 dBm	-9.482 dB

Plot 7-175. 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	2.488330000 GHz	-28.93 dBm	-3.926 dB
2	2	2.4905 GHz	2.4950 GHz	1.000 MHz	2.494647500 GHz	-25.84 dBm	-12.84 dB
3	3	2.4950 GHz	2.4960 GHz	51.00 kHz	2.495885000 GHz	-30.37 dBm	-17.37 dB
4	4	2.4960 GHz	2.5170 GHz	200.0 kHz	2.501180000 GHz	7.196 dBm	-17.80 dB

Plot 7-176. Lower ACP Plot (Band 41 – 10.0MHz QPSK – RB Size 50)

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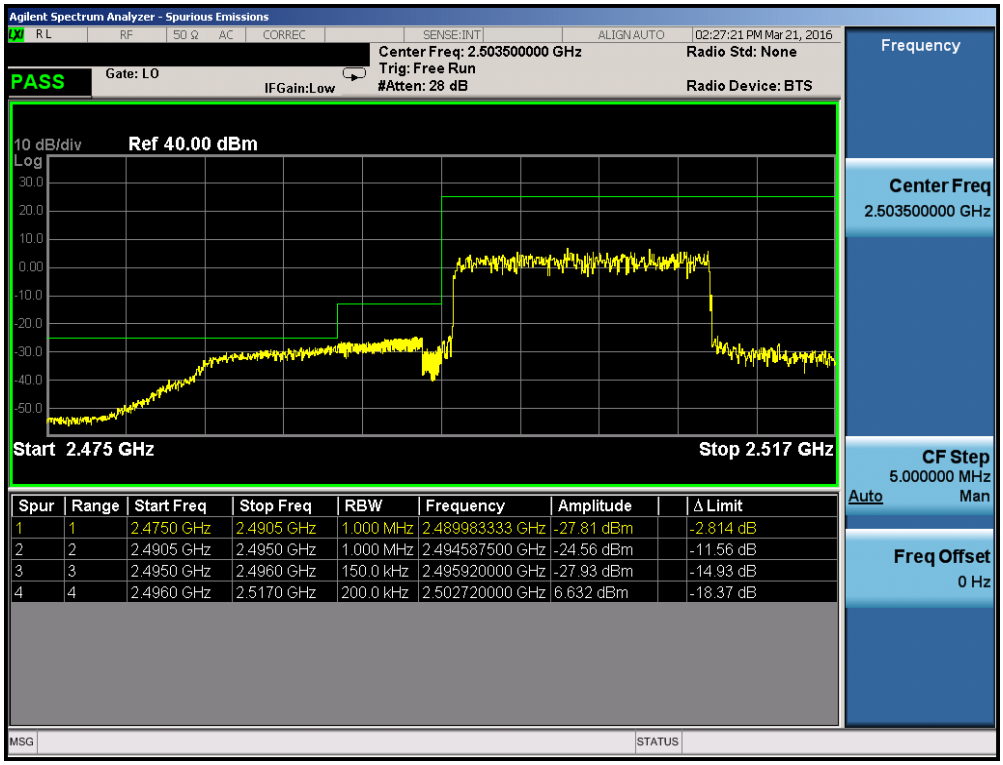
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.6650 GHz	2.6900 GHz	1.000 MHz	2.682958333 GHz	13.32 dBm	-11.68 dB
2	2	2.6900 GHz	2.6910 GHz	200.0 kHz	2.690178333 GHz	-21.15 dBm	-11.15 dB
3	3	2.6910 GHz	2.6950 GHz	1.000 MHz	2.691933333 GHz	-20.69 dBm	-10.69 dB
4	4	2.6950 GHz	2.6999 GHz	1.000 MHz	2.695250583 GHz	-25.47 dBm	-12.47 dB
5	5	2.6999 GHz	2.7150 GHz	1.000 MHz	2.701289250 GHz	-37.46 dBm	-12.46 dB

Plot 7-177. Upper ACP Plot (Band 41 – 10.0MHz QPSK – RB Size 50)



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4905 GHz	1.000 MHz	2.489983333 GHz	-27.81 dBm	-2.814 dB
2	2	2.4905 GHz	2.4950 GHz	1.000 MHz	2.494587500 GHz	-24.56 dBm	-11.56 dB
3	3	2.4950 GHz	2.4960 GHz	150.0 kHz	2.495920000 GHz	-27.93 dBm	-14.93 dB
4	4	2.4960 GHz	2.5170 GHz	200.0 kHz	2.502720000 GHz	6.632 dBm	-18.37 dB

Plot 7-178. Lower ACP Plot (Band 41 – 15.0MHz QPSK – RB Size 75)

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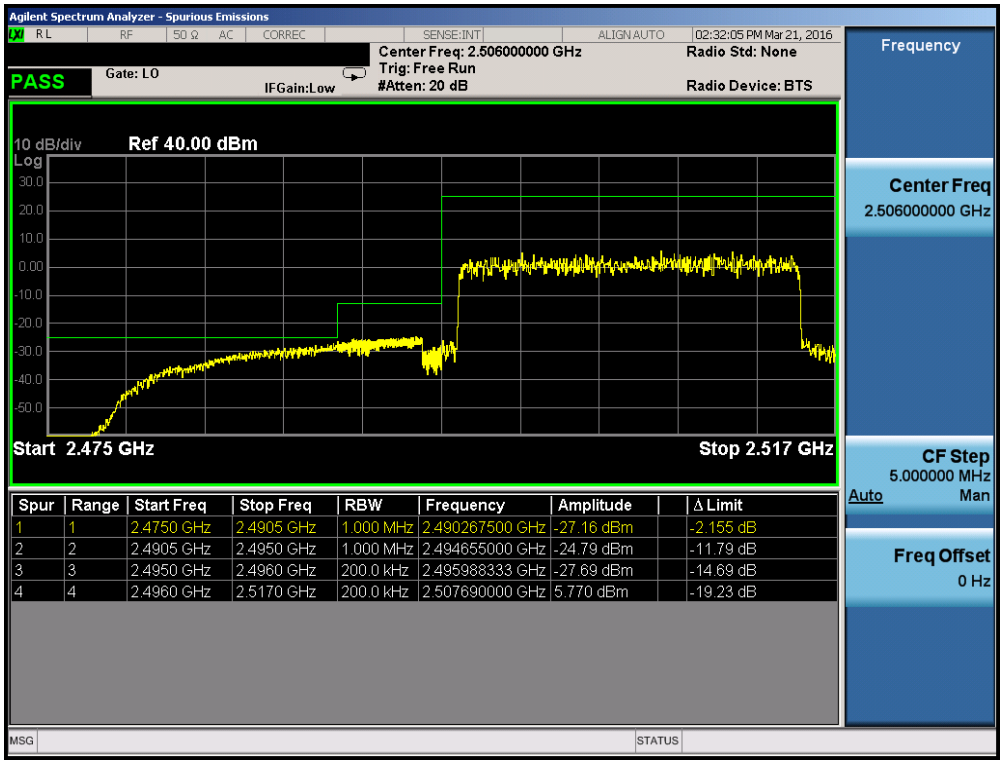
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.6650 GHz	2.6900 GHz	1.000 MHz	2.683041667 GHz	11.31 dBm	-13.69 dB
2	2	2.6900 GHz	2.6910 GHz	300.0 kHz	2.690078333 GHz	-21.79 dBm	-11.79 dB
3	3	2.6910 GHz	2.6950 GHz	1.000 MHz	2.691006667 GHz	-20.56 dBm	-10.56 dB
4	4	2.6950 GHz	2.7047 GHz	1.000 MHz	2.695194120 GHz	-23.51 dBm	-10.51 dB
5	5	2.7047 GHz	2.7150 GHz	1.000 MHz	2.704826097 GHz	-40.46 dBm	-15.46 dB

Plot 7-179. Upper ACP Plot (Band 41 – 15.0MHz QPSK – RB Size 75)



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4905 GHz	1.000 MHz	2.490267500 GHz	-27.16 dBm	-2.155 dB
2	2	2.4905 GHz	2.4950 GHz	1.000 MHz	2.494655000 GHz	-24.79 dBm	-11.79 dB
3	3	2.4950 GHz	2.4960 GHz	200.0 kHz	2.495988333 GHz	-27.69 dBm	-14.69 dB
4	4	2.4960 GHz	2.5170 GHz	200.0 kHz	2.507690000 GHz	5.770 dBm	-19.23 dB

Plot 7-180. Lower ACP Plot (Band 41 – 20.0MHz QPSK – RB Size 100)

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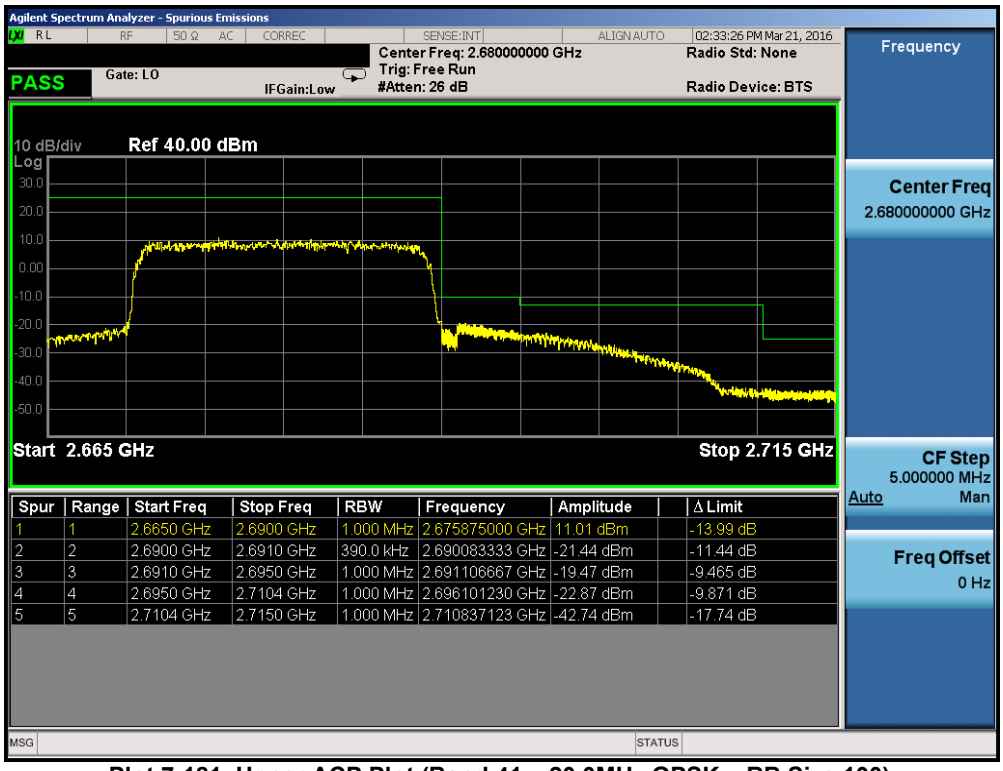

Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude		Δ Limit
1	1	2.6650 GHz	2.6900 GHz	1.000 MHz	2.675875000 GHz	11.01 dBm		-13.99 dB
2	2	2.6900 GHz	2.6910 GHz	390.0 kHz	2.690083333 GHz	-21.44 dBm		-11.44 dB
3	3	2.6910 GHz	2.6950 GHz	1.000 MHz	2.691106667 GHz	-19.47 dBm		-9.465 dB
4	4	2.6950 GHz	2.7104 GHz	1.000 MHz	2.696101230 GHz	-22.87 dBm		-9.871 dB
5	5	2.7104 GHz	2.7150 GHz	1.000 MHz	2.710837123 GHz	-42.74 dBm		-17.74 dB

Plot 7-181. Upper ACP Plot (Band 41 – 20.0MHz QPSK – RB Size 100)

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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.

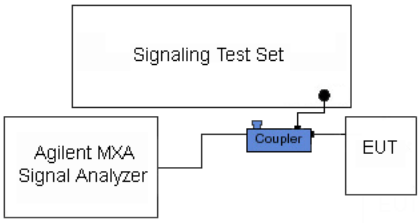

Figure 7-4. Test Instrument & Measurement Setup

Test Notes

None.

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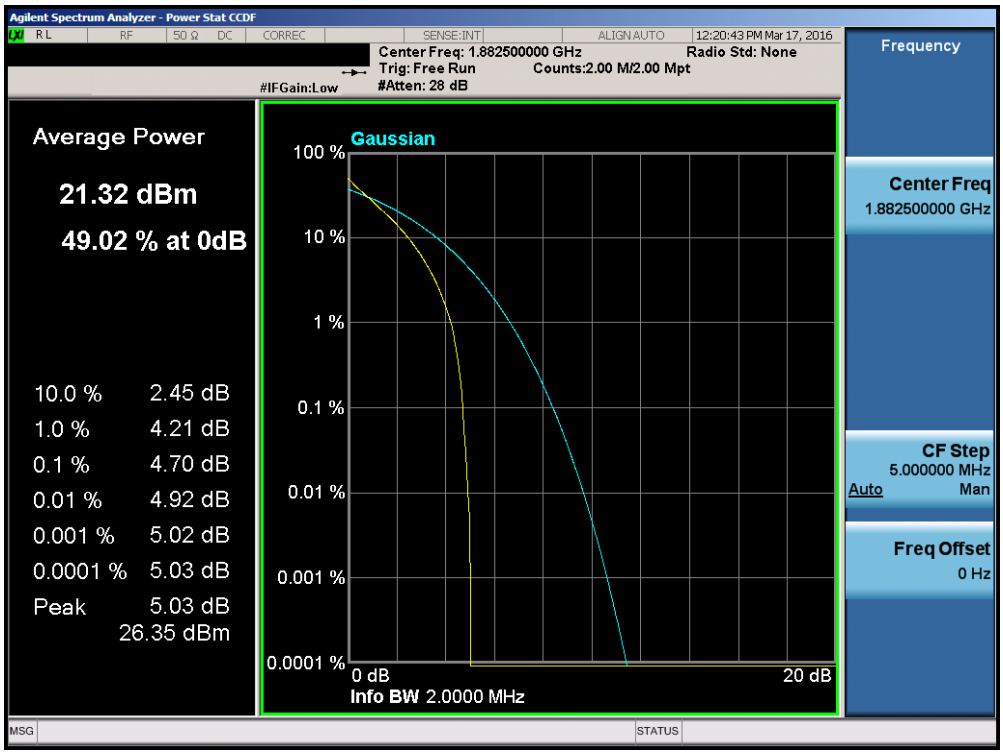
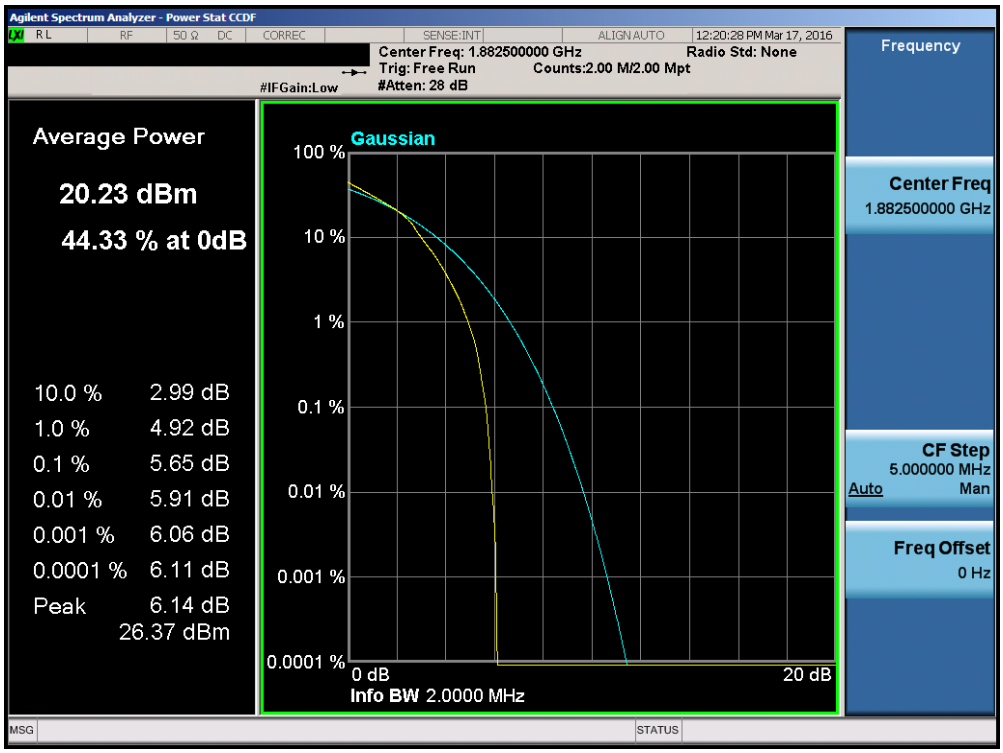


Plot 7-182. PAR Plot (Band 25 – 1.4MHz QPSK – RB Size 6)



Plot 7-183. PAR Plot (Band 25 – 1.4MHz 16-QAM – RB Size 6)

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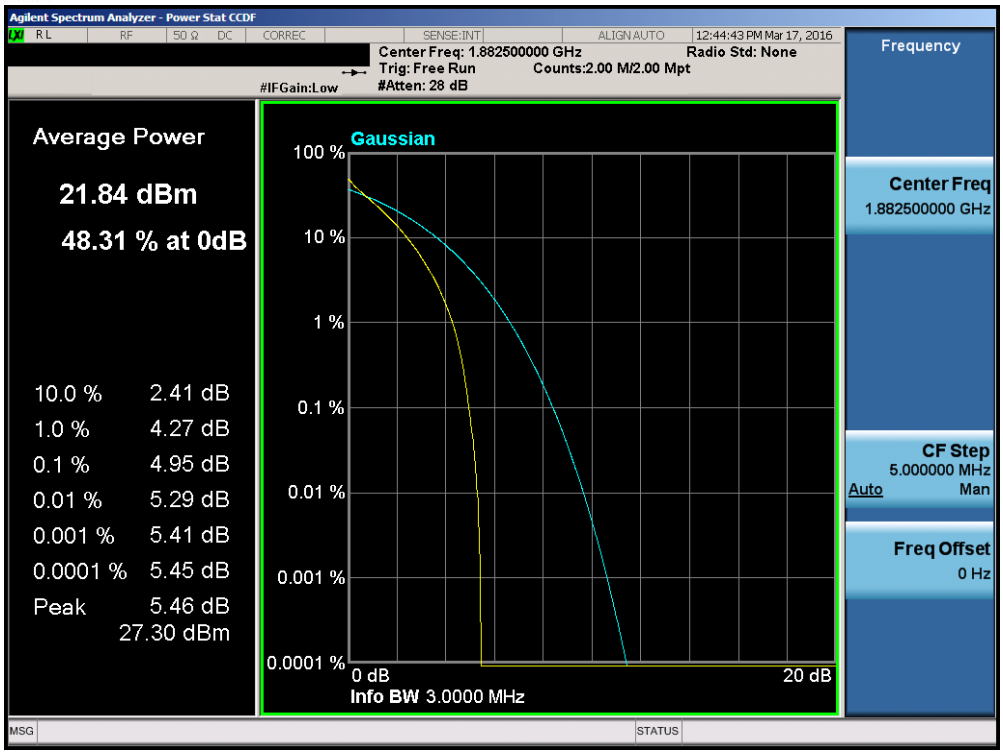
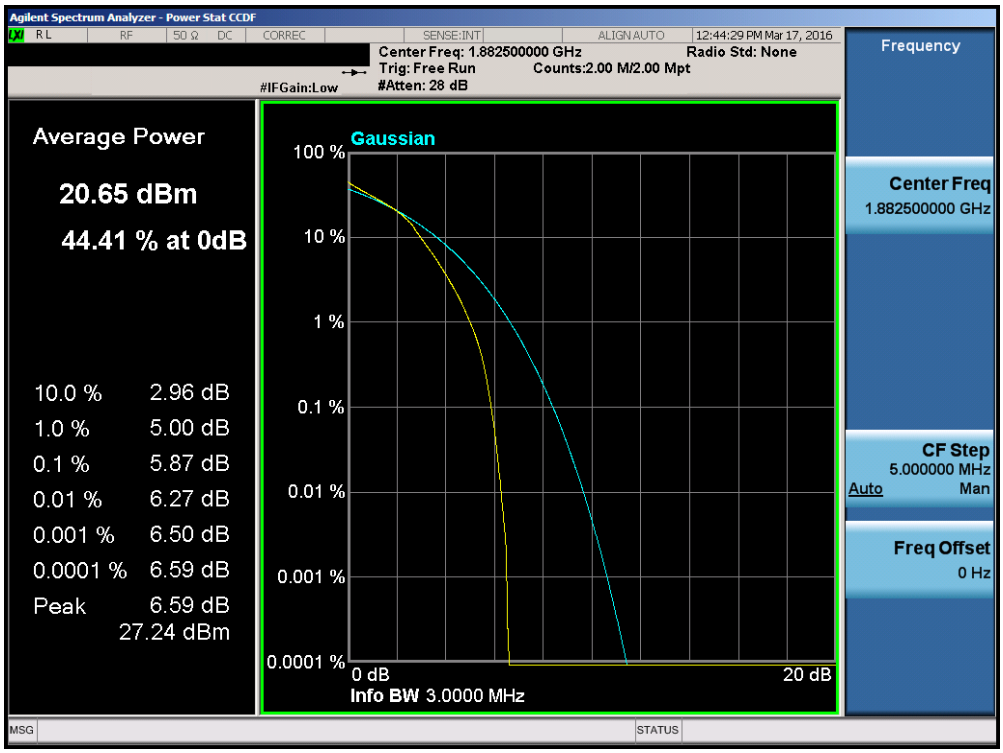


Plot 7-184. PAR Plot (Band 25 – 3.0MHz QPSK – RB Size 15)



Plot 7-185. PAR Plot (Band 25 – 3.0MHz 16-QAM – RB Size 15)

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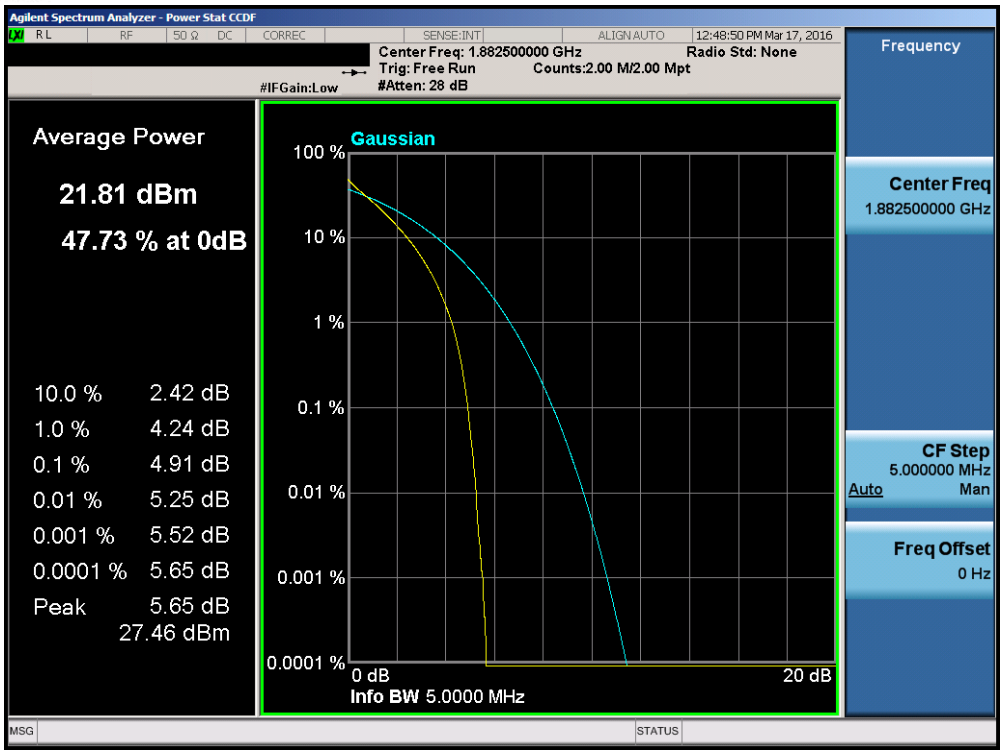
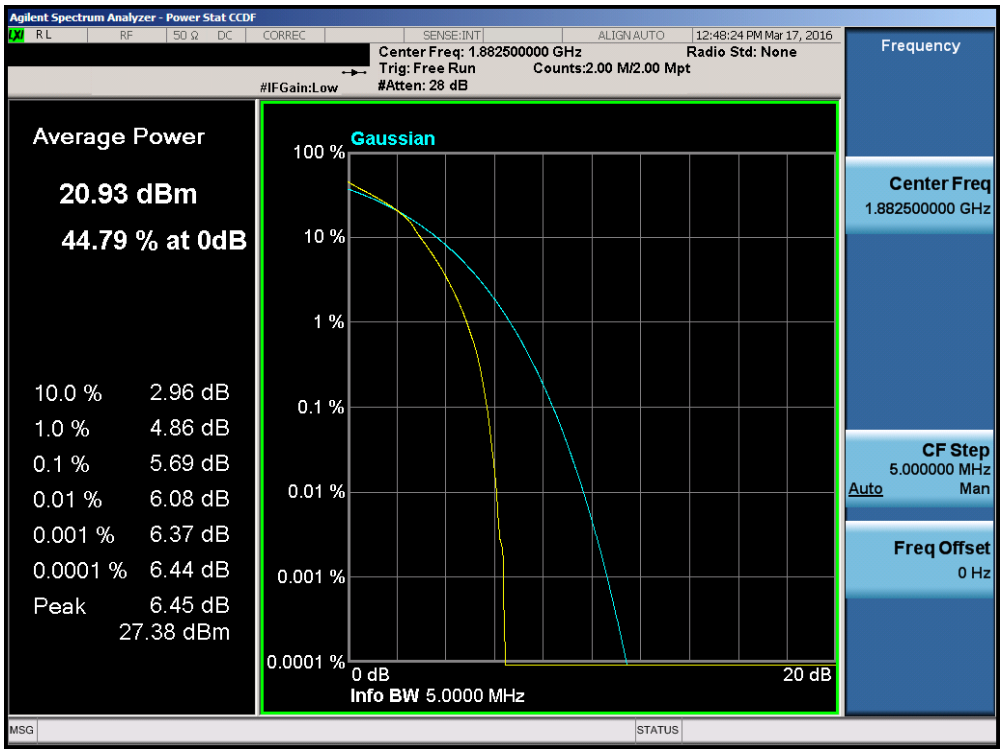


Plot 7-186. PAR Plot (Band 25 – 5.0MHz QPSK – RB Size 25)



Plot 7-187. PAR Plot (Band 25 – 5.0MHz 16-QAM – RB Size 25)

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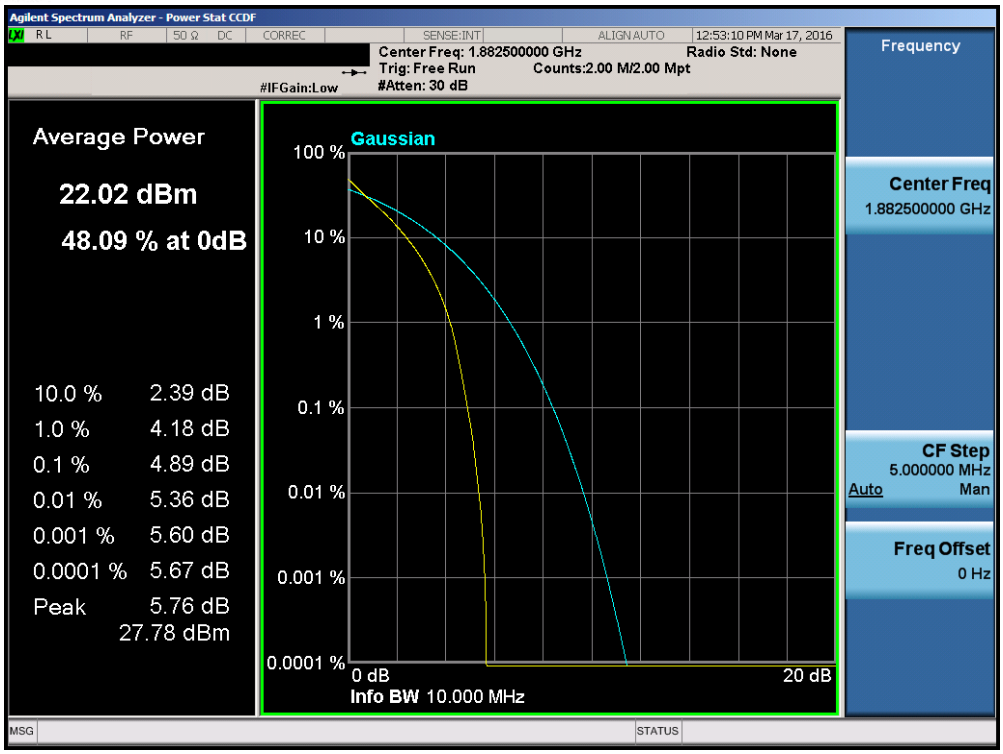
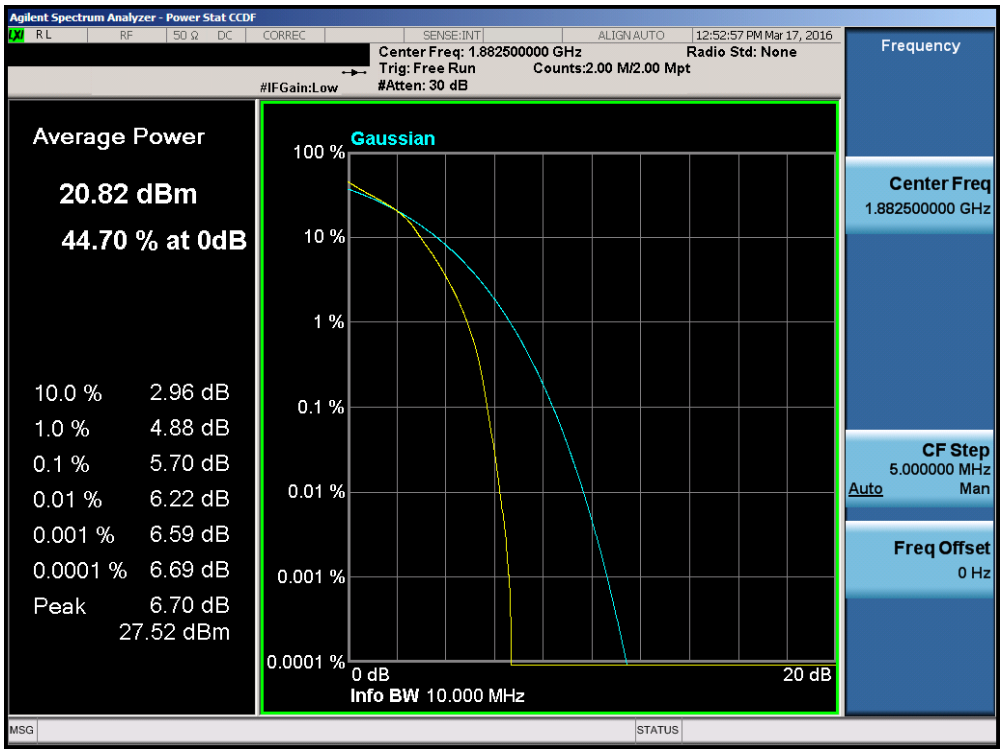


Plot 7-188. PAR Plot (Band 25 – 10.0MHz QPSK – RB Size 50)



Plot 7-189. PAR Plot (Band 25 – 10.0MHz 16-QAM – RB Size 50)

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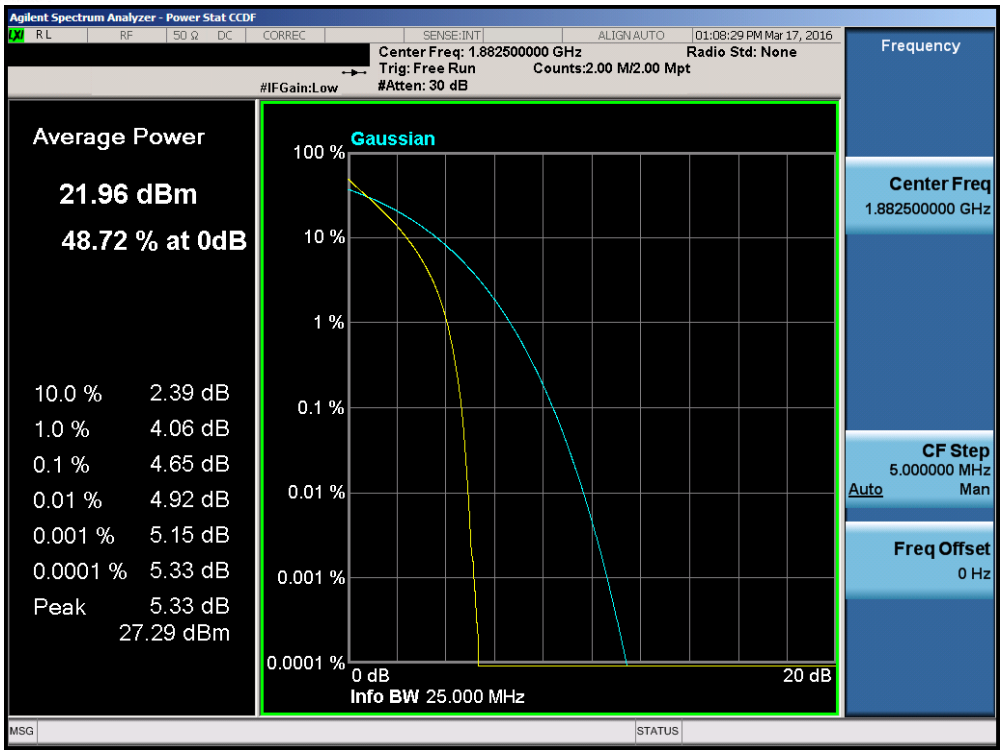
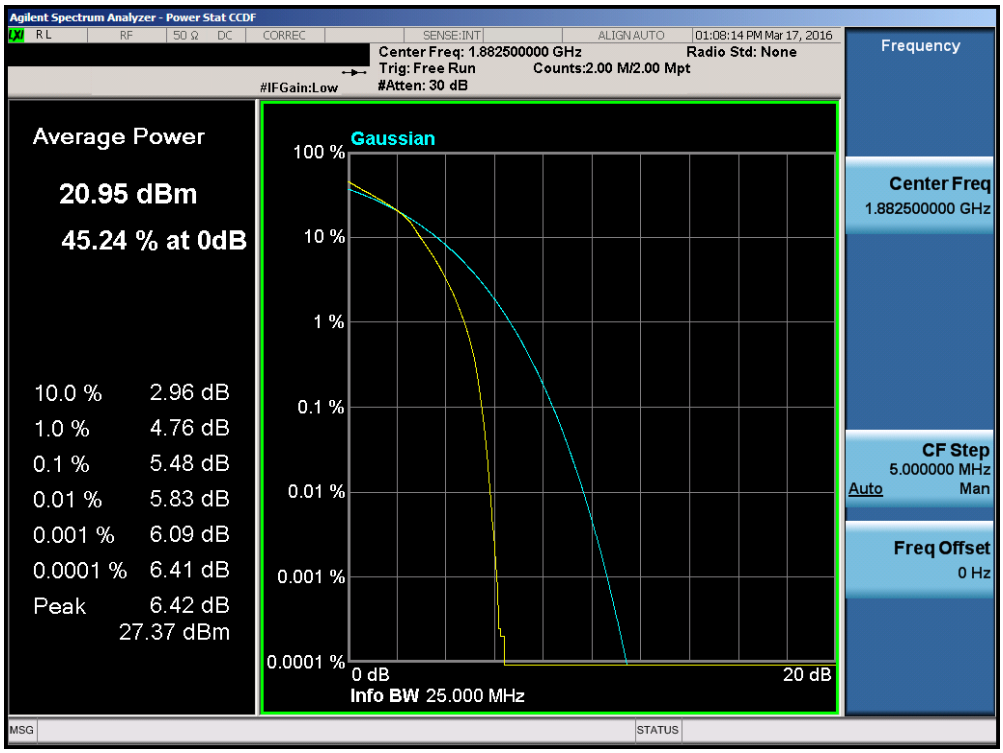


Plot 7-190. PAR Plot (Band 25 – 15.0MHz QPSK – RB Size 75)



Plot 7-191. PAR Plot (Band 25 – 15.0MHz 16-QAM – RB Size 75)

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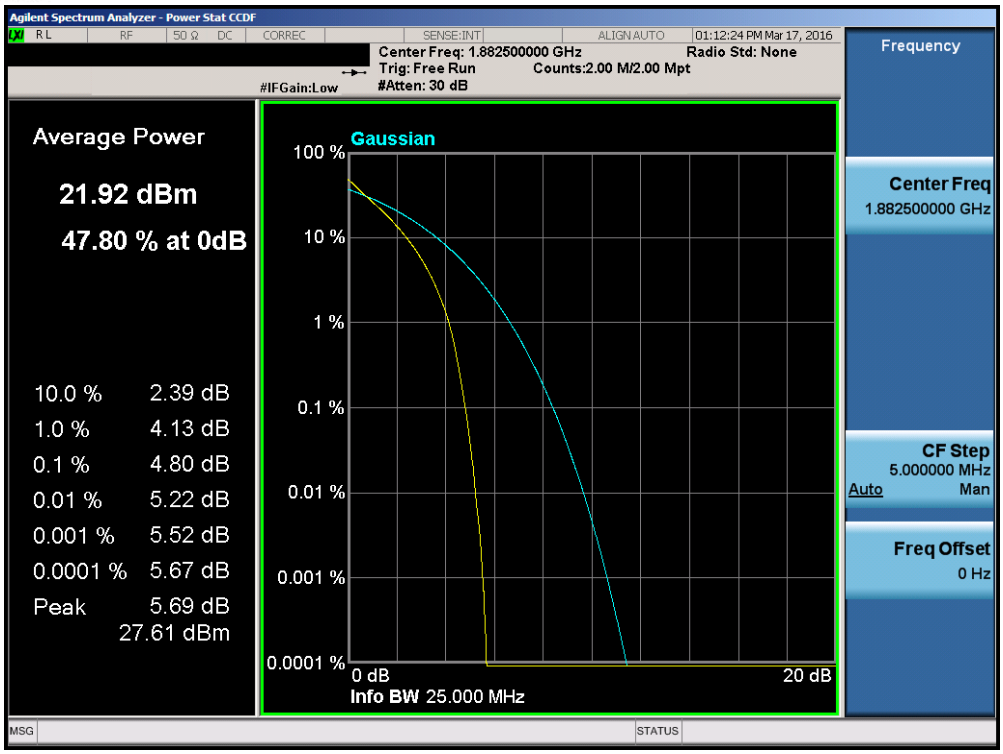
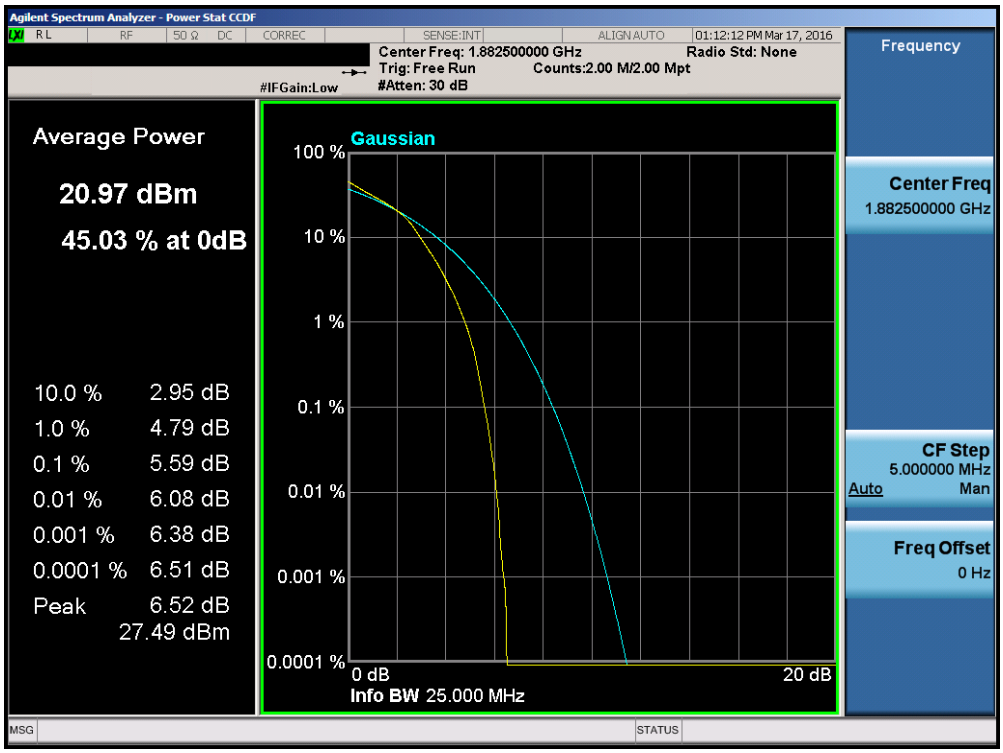


Plot 7-192. PAR Plot (Band 25 – 20.0MHz QPSK – RB Size 100)



Plot 7-193. PAR Plot (Band 25 – 20.0MHz 16-QAM – RB Size 100)

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7.6 Radiated Power (ERP/EIRP)

§22.913(a.2) §24.232(c.2) §27.50(h.2) §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-C-2004 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using horizontally and vertically polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using horizontally and vertically 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-C-2004 – 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

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Test Setup

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

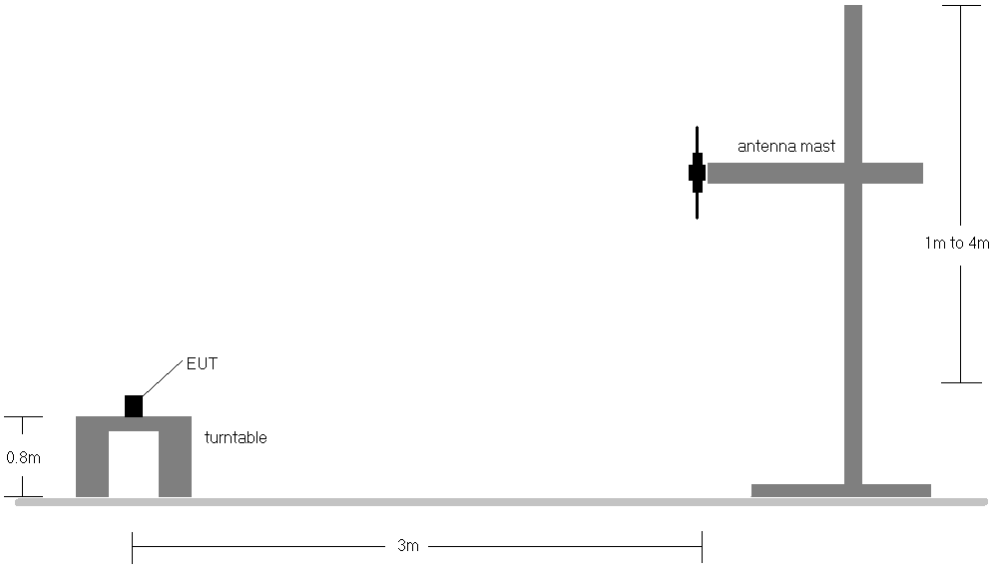

Figure 7-5. Radiated Test Setup <1GHz

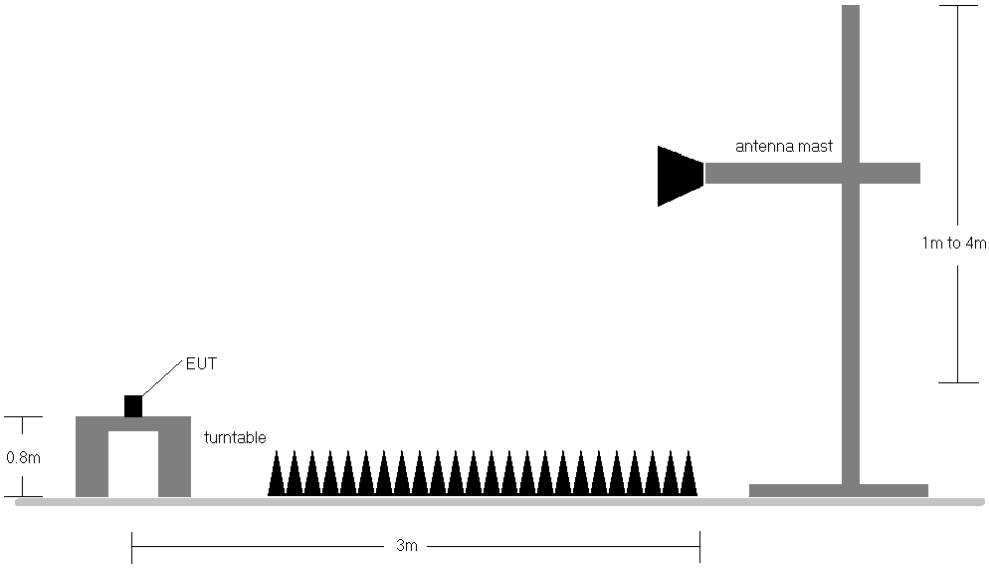

Figure 7-6. Radiated Test Setup >1GHz

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.

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Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
699.70	1.4	QPSK	H	2.82	186	3 / 2	14.52	2.72	17.24	34.77	-17.53
707.50	1.4	QPSK	H	2.68	201	3 / 2	14.88	2.88	17.76	34.77	-17.01
715.30	1.4	QPSK	H	2.60	198	1 / 5	14.57	3.06	17.63	34.77	-17.14
699.70	1.4	16-QAM	H	2.82	186	3 / 2	13.61	2.72	16.33	34.77	-18.44
707.50	1.4	16-QAM	H	2.68	201	3 / 2	13.78	2.88	16.66	34.77	-18.11
715.30	1.4	16-QAM	H	2.60	198	1 / 5	13.73	3.06	16.79	34.77	-17.98
700.50	3	QPSK	H	2.80	194	1 / 0	14.56	2.72	17.28	34.77	-17.49
707.50	3	QPSK	H	2.85	201	1 / 0	14.88	2.88	17.76	34.77	-17.01
714.50	3	QPSK	H	2.64	188	1 / 14	14.58	3.04	17.62	34.77	-17.15
700.50	3	16-QAM	H	2.80	194	1 / 0	13.91	2.72	16.63	34.77	-18.14
707.50	3	16-QAM	H	2.85	201	1 / 0	14.00	2.88	16.88	34.77	-17.89
714.50	3	16-QAM	H	2.64	188	1 / 14	13.74	3.04	16.78	34.77	-17.99
701.50	5	QPSK	H	2.83	195	1 / 24	15.15	2.75	17.90	34.77	-16.87
707.50	5	QPSK	H	2.87	187	1 / 0	15.36	2.88	18.24	34.77	-16.53
713.50	5	QPSK	H	2.62	195	1 / 24	15.01	3.02	18.03	34.77	-16.74
701.50	5	16-QAM	H	2.83	195	1 / 24	14.32	2.75	17.07	34.77	-17.70
707.50	5	16-QAM	H	2.87	187	1 / 0	14.44	2.88	17.32	34.77	-17.45
713.50	5	16-QAM	H	2.62	195	1 / 24	14.26	3.02	17.28	34.77	-17.49
704.00	10	QPSK	H	2.82	198	1 / 0	14.58	2.80	17.38	34.77	-17.39
707.50	10	QPSK	H	2.87	196	1 / 0	14.52	2.88	17.40	34.77	-17.37
711.00	10	QPSK	H	2.76	191	1 / 0	14.35	2.96	17.31	34.77	-17.46
704.00	10	16-QAM	H	2.82	198	1 / 0	13.75	2.80	16.55	34.77	-18.22
707.50	10	16-QAM	H	2.87	196	1 / 0	13.50	2.88	16.38	34.77	-18.39
711.00	10	16-QAM	H	2.76	191	1 / 0	13.42	2.96	16.38	34.77	-18.39

Table 7-2. ERP Data (Band 12)

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Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	ERP [dBm]	EIRP Limit [dBm]	Margin [dB]
824.70	1.4	QPSK	H	2.27	356	3 / 2	14.28	4.95	19.23	38.45	-19.23
836.50	1.4	QPSK	H	2.26	2	3 / 2	15.09	5.00	20.09	38.45	-18.36
848.30	1.4	QPSK	H	2.15	359	1 / 0	14.50	5.05	19.55	38.45	-18.90
824.70	1.4	16-QAM	H	2.27	356	3 / 2	14.12	4.95	19.07	38.45	-19.39
836.50	1.4	16-QAM	H	2.26	2	3 / 2	14.16	5.00	19.16	38.45	-19.29
848.30	1.4	16-QAM	H	2.15	359	1 / 0	13.61	5.05	18.66	38.45	-19.79
825.50	3	QPSK	H	2.15	347	1 / 14	14.49	4.95	19.44	38.45	-19.01
836.50	3	QPSK	H	2.21	353	1 / 0	14.90	5.00	19.90	38.45	-18.55
847.50	3	QPSK	H	2.17	358	1 / 0	14.56	5.05	19.61	38.45	-18.84
825.50	3	16-QAM	H	2.15	347	1 / 14	13.49	4.95	18.44	38.45	-20.01
836.50	3	16-QAM	H	2.21	353	1 / 0	13.84	5.00	18.84	38.45	-19.61
847.50	3	16-QAM	H	2.17	358	1 / 0	13.50	5.05	18.55	38.45	-19.90
826.50	5	QPSK	H	2.27	6	1 / 24	15.16	4.95	20.11	38.45	-18.34
836.50	5	QPSK	H	2.27	4	1 / 24	15.44	5.00	20.44	38.45	-18.01
846.50	5	QPSK	H	2.34	357	1 / 0	14.62	5.04	19.66	38.45	-18.79
826.50	5	16-QAM	H	2.27	6	1 / 24	14.24	4.95	19.19	38.45	-19.26
836.50	5	16-QAM	H	2.27	4	1 / 24	14.48	5.00	19.48	38.45	-18.97
846.50	5	16-QAM	H	2.34	357	1 / 0	13.63	5.04	18.67	38.45	-19.78
829.00	10	QPSK	H	2.37	351	1 / 0	15.22	4.96	20.18	38.45	-18.27
836.50	10	QPSK	H	2.21	355	1 / 0	15.30	5.00	20.30	38.45	-18.15
844.00	10	QPSK	H	2.25	355	1 / 0	15.11	5.03	20.14	38.45	-18.31
829.00	10	16-QAM	H	2.37	351	1 / 0	14.21	4.96	19.17	38.45	-19.28
836.50	10	16-QAM	H	2.21	355	1 / 0	14.37	5.00	19.37	38.45	-19.08
844.00	10	16-QAM	H	2.25	355	1 / 0	14.05	5.03	19.08	38.45	-19.37
831.50	15	QPSK	H	2.31	6	1 / 74	14.91	4.98	19.89	38.45	-18.57
836.50	15	QPSK	H	2.36	259	1 / 0	15.34	5.00	20.34	38.45	-18.11
841.50	15	QPSK	H	2.27	3	1 / 0	14.89	5.02	19.91	38.45	-18.54
831.50	15	16-QAM	H	2.31	6	1 / 74	13.97	4.98	18.95	38.45	-19.51
836.50	15	16-QAM	H	2.36	259	1 / 0	14.48	5.00	19.48	38.45	-18.97
841.50	15	16-QAM	H	2.27	3	1 / 0	14.04	5.02	19.06	38.45	-19.39

Table 7-3. ERP Data (Band 5/26)

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Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [m]	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	2.91	297	1 / 0	11.96	9.67	21.63	30.00	-8.37
1732.50	1.4	QPSK	H	2.91	297	1 / 0	14.13	9.53	23.66	30.00	-6.34
1754.30	1.4	QPSK	H	2.91	297	1 / 0	11.98	9.39	21.37	30.00	-8.63
1710.70	1.4	16-QAM	H	2.91	297	1 / 5	11.26	9.67	20.93	30.00	-9.07
1732.50	1.4	16-QAM	H	2.91	297	1 / 0	13.01	9.53	22.54	30.00	-7.46
1754.30	1.4	16-QAM	H	2.91	297	1 / 0	10.84	9.39	20.23	30.00	-9.77
1711.50	3	QPSK	H	2.94	297	1 / 14	12.19	9.67	21.86	30.00	-8.14
1732.50	3	QPSK	H	2.94	297	1 / 14	14.06	9.53	23.59	30.00	-6.41
1753.50	3	QPSK	H	2.94	297	1 / 0	12.53	9.40	21.93	30.00	-8.07
1711.50	3	16-QAM	H	2.94	297	1 / 14	11.34	9.67	21.01	30.00	-8.99
1732.50	3	16-QAM	H	2.94	297	1 / 0	13.20	9.53	22.73	30.00	-7.27
1753.50	3	16-QAM	H	2.94	297	1 / 0	11.71	9.40	21.11	30.00	-8.89
1712.50	5	QPSK	H	2.28	282	1 / 0	13.46	9.66	23.12	30.00	-6.88
1732.50	5	QPSK	H	2.28	282	1 / 24	13.53	9.53	23.06	30.00	-6.94
1752.50	5	QPSK	H	2.28	282	1 / 0	12.92	9.40	22.32	30.00	-7.68
1712.50	5	16-QAM	H	2.28	282	1 / 0	13.23	9.66	22.89	30.00	-7.11
1732.50	5	16-QAM	H	2.28	282	1 / 24	12.70	9.53	22.23	30.00	-7.77
1752.50	5	16-QAM	H	2.28	282	1 / 0	11.82	9.40	21.22	30.00	-8.78
1715.00	10	QPSK	H	2.28	282	1 / 0	13.09	9.64	22.73	30.00	-7.27
1732.50	10	QPSK	H	2.28	282	1 / 49	13.29	9.53	22.82	30.00	-7.18
1750.00	10	QPSK	H	2.28	282	1 / 0	12.93	9.42	22.35	30.00	-7.65
1715.00	10	16-QAM	H	2.28	282	1 / 0	12.67	9.64	22.31	30.00	-7.69
1732.50	10	16-QAM	H	2.28	282	1 / 49	12.43	9.53	21.96	30.00	-8.04
1750.00	10	16-QAM	H	2.28	282	1 / 0	12.23	9.42	21.65	30.00	-8.35
1717.50	15	QPSK	H	3.02	280	1 / 74	13.09	9.63	22.72	30.00	-7.28
1732.50	15	QPSK	H	3.02	280	1 / 0	13.43	9.53	22.96	30.00	-7.04
1747.50	15	QPSK	H	3.02	280	1 / 0	12.87	9.43	22.30	30.00	-7.70
1717.50	15	16-QAM	H	3.02	280	1 / 74	12.13	9.63	21.76	30.00	-8.24
1732.50	15	16-QAM	H	3.02	280	1 / 0	12.50	9.53	22.03	30.00	-7.97
1747.50	15	16-QAM	H	3.02	280	1 / 0	11.80	9.43	21.23	30.00	-8.77
1720.00	20	QPSK	H	3.02	280	1 / 99	13.33	9.61	22.94	30.00	-7.06
1732.50	20	QPSK	H	3.02	280	1 / 0	13.03	9.53	22.56	30.00	-7.44
1745.00	20	QPSK	H	3.02	280	1 / 0	13.04	9.45	22.49	30.00	-7.51
1720.00	20	16-QAM	H	3.02	280	1 / 99	12.54	9.61	22.15	30.00	-7.85
1732.50	20	16-QAM	H	3.02	280	1 / 0	12.18	9.53	21.71	30.00	-8.29
1745.00	20	16-QAM	H	3.02	280	1 / 0	12.05	9.45	21.50	30.00	-8.50

Table 7-4. EIRP Data (Band 4)

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Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [m]	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	1.08	293	1 / 0	13.18	9.21	22.39	33.01	-10.62
1882.50	1.4	QPSK	H	1.08	293	3 / 2	15.35	9.27	24.62	33.01	-8.39
1914.30	1.4	QPSK	H	1.08	293	1 / 5	13.21	9.36	22.57	33.01	-10.44
1850.70	1.4	16-QAM	H	1.08	293	1 / 5	12.07	9.21	21.28	33.01	-11.73
1882.50	1.4	16-QAM	H	1.08	293	1 / 5	14.24	9.27	23.51	33.01	-9.50
1914.30	1.4	16-QAM	H	1.08	293	1 / 5	12.46	9.36	21.82	33.01	-11.19
1851.50	3	QPSK	H	1.08	293	1 / 14	13.28	9.21	22.49	33.01	-10.52
1882.50	3	QPSK	H	1.08	293	1 / 14	15.14	9.27	24.41	33.01	-8.60
1913.50	3	QPSK	H	1.08	293	1 / 14	13.05	9.36	22.41	33.01	-10.60
1851.50	3	16-QAM	H	1.08	293	1 / 0	12.68	9.21	21.89	33.01	-11.12
1882.50	3	16-QAM	H	1.08	293	1 / 14	14.49	9.27	23.76	33.01	-9.25
1913.50	3	16-QAM	H	1.08	293	1 / 14	12.57	9.36	21.93	33.01	-11.08
1852.50	5	QPSK	H	1.08	293	1 / 24	14.31	9.22	23.53	33.01	-9.48
1882.50	5	QPSK	H	1.08	293	1 / 24	15.28	9.27	24.55	33.01	-8.46
1912.50	5	QPSK	H	1.08	293	1 / 24	14.26	9.35	23.61	33.01	-9.40
1852.50	5	16-QAM	H	1.08	293	1 / 24	13.58	9.22	22.80	33.01	-10.21
1882.50	5	16-QAM	H	1.08	293	1 / 0	14.26	9.27	23.53	33.01	-9.48
1912.50	5	16-QAM	H	1.08	293	1 / 24	13.32	9.35	22.67	33.01	-10.34
1855.00	10	QPSK	H	1.08	293	1 / 49	13.89	9.22	23.11	33.01	-9.90
1882.50	10	QPSK	H	1.08	293	1 / 0	15.24	9.27	24.51	33.01	-8.50
1910.00	10	QPSK	H	1.08	293	1 / 0	14.26	9.34	23.60	33.01	-9.41
1855.00	10	16-QAM	H	1.08	293	1 / 49	13.12	9.22	22.34	33.01	-10.67
1882.50	10	16-QAM	H	1.08	293	1 / 0	14.58	9.27	23.85	33.01	-9.16
1910.00	10	16-QAM	H	1.08	293	1 / 0	13.64	9.34	22.98	33.01	-10.03
1857.50	15	QPSK	H	1.08	293	1 / 74	13.75	9.23	22.98	33.01	-10.03
1882.50	15	QPSK	H	1.08	293	1 / 0	13.64	9.27	22.91	33.01	-10.10
1907.50	15	QPSK	H	1.08	293	1 / 74	13.31	9.33	22.64	33.01	-10.37
1857.50	15	16-QAM	H	1.08	293	1 / 74	12.87	9.23	22.10	33.01	-10.91
1882.50	15	16-QAM	H	1.08	293	1 / 0	12.88	9.27	22.15	33.01	-10.86
1907.50	15	16-QAM	H	1.08	293	1 / 0	11.90	9.33	21.23	33.01	-11.78
1860.00	20	QPSK	H	1.08	293	1 / 99	13.32	9.23	22.55	33.01	-10.46
1882.50	20	QPSK	H	1.08	293	1 / 0	13.41	9.27	22.68	33.01	-10.33
1905.00	20	QPSK	H	1.08	293	1 / 0	12.87	9.31	22.18	33.01	-10.83
1860.00	20	16-QAM	H	1.08	293	1 / 99	12.55	9.23	21.78	33.01	-11.23
1882.50	20	16-QAM	H	1.08	293	1 / 0	12.72	9.27	21.99	33.01	-11.02
1905.00	20	16-QAM	H	1.08	293	1 / 0	12.14	9.31	21.45	33.01	-11.56

Table 7-5. EIRP Data (Band 25)

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Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
2498.50	5	QPSK	H	1.00	337	1 / 0	10.95	8.51	19.46	33.01	-13.55
2593.00	5	QPSK	H	1.00	339	1 / 0	10.76	8.78	19.54	33.01	-13.47
2687.50	5	QPSK	H	1.00	343	1 / 0	9.53	8.93	18.46	33.01	-14.55
2498.50	5	16-QAM	H	1.00	337	1 / 0	9.22	8.51	17.73	33.01	-15.28
2593.00	5	16-QAM	H	1.00	339	1 / 0	9.27	8.78	18.05	33.01	-14.96
2687.50	5	16-QAM	H	1.00	343	1 / 0	9.05	8.93	17.98	33.01	-15.03
2501.00	10	QPSK	H	2.51	113	1 / 49	11.87	8.50	20.37	33.01	-12.64
2593.00	10	QPSK	H	2.44	88	1 / 0	17.53	8.78	26.31	33.01	-6.70
2685.00	10	QPSK	H	2.32	107	1 / 0	10.49	8.93	19.42	33.01	-13.59
2501.00	10	16-QAM	H	2.51	113	1 / 49	11.44	8.50	19.94	33.01	-13.07
2593.00	10	16-QAM	H	2.44	88	1 / 0	16.74	8.78	25.52	33.01	-7.49
2503.50	15	QPSK	H	2.63	335	1 / 0	11.97	8.51	20.48	33.01	-12.53
2593.00	15	QPSK	H	2.49	327	1 / 74	9.39	8.78	18.17	33.01	-14.84
2682.50	15	QPSK	H	2.38	331	1 / 0	11.12	8.92	20.04	33.01	-12.97
2503.50	15	16-QAM	H	2.63	335	1 / 0	10.76	8.51	19.27	33.01	-13.74
2593.00	15	16-QAM	H	2.49	327	1 / 0	8.35	8.78	17.13	33.01	-15.88
2682.50	15	16-QAM	H	2.38	331	1 / 0	10.50	8.92	19.42	33.01	-13.59
2506.00	20	QPSK	H	1.00	332	1 / 99	11.78	8.52	20.30	33.01	-12.71
2593.00	20	QPSK	H	2.51	332	1 / 0	9.51	8.78	18.29	33.01	-14.72
2680.00	20	QPSK	H	2.37	333	1 / 0	11.52	8.92	20.44	33.01	-12.57
2506.00	20	16-QAM	H	1.00	332	1 / 99	10.98	8.52	19.50	33.01	-13.51
2593.00	20	16-QAM	H	2.51	332	1 / 0	8.52	8.78	17.30	33.01	-15.71
2680.00	20	16-QAM	H	2.37	333	1 / 0	10.24	8.92	19.16	33.01	-13.85

Table 7-6. EIRP Data (Band 41)

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7.7 Radiated Spurious Emissions Measurements

§2.1053 §22.917(a) §24.238(a) §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-C-2004 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 peak 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 5.8

ANSI/TIA-603-C-2004 – 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 = Peak
6. Trace mode = max hold
7. The trace was allowed to stabilize

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Test Setup

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

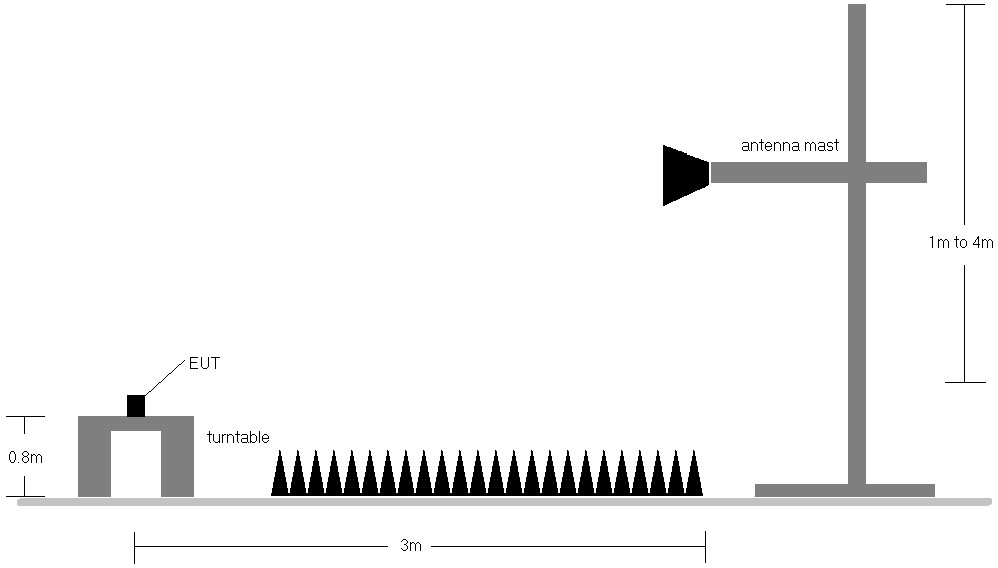

Figure 7-7. Test Instrument & Measurement Setup

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.

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OPERATING FREQUENCY:	701.50	MHz		
CHANNEL:	23035			
MEASURED OUTPUT POWER:	17.90	dBm	=	0.062 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	30.90	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1403.00	H	1.21	239	-63.87	5.60	-58.27	76.2
2104.50	H	-	-	-58.85	6.67	-52.17	70.1
2806.00	H	-	-	-61.28	7.92	-53.36	71.3

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

OPERATING FREQUENCY:	707.50	MHz		
CHANNEL:	23095			
MEASURED OUTPUT POWER:	18.24	dBm	=	0.067 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	31.24	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1415.00	H	1.17	274	-65.45	5.69	-59.75	78.0
2122.50	H	-	-	-58.48	6.75	-51.73	70.0
2830.00	H	-	-	-61.45	7.90	-53.56	71.8

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

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OPERATING FREQUENCY:	713.50	MHz		
CHANNEL:	23155			
MEASURED OUTPUT POWER:	18.03	dBm	=	0.063 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	31.03	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1427.00	H	1.21	239	-63.07	5.79	-57.28	75.3
2140.50	H	1.45	156	-48.36	6.82	-41.54	59.6
2854.00	H	-	-	-60.56	7.88	-52.68	70.7

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

OPERATING FREQUENCY:	826.50	MHz		
CHANNEL:	26815			
MEASURED OUTPUT POWER:	20.11	dBm	=	0.103 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	33.11	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
1653.00	H	1.25	157	-62.33	6.70	-55.64	75.7
2479.50	H	-	-	-62.10	7.54	-54.56	74.7

Table 7-10. Radiated Spurious Data (Band 5/26 – Low Channel)

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OPERATING FREQUENCY:	836.50	MHz		
CHANNEL:	26915			
MEASURED OUTPUT POWER:	20.44	dBm	=	0.111 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	33.44	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1673.00	H	1.13	146	-62.64	6.70	-55.94	76.4
2509.50	H	-	-	-62.49	7.63	-54.87	75.3

Table 7-11. Radiated Spurious Data (Band 5/26 – Mid Channel)

OPERATING FREQUENCY:	846.50	MHz		
CHANNEL:	27015			
MEASURED OUTPUT POWER:	19.66	dBm	=	0.093 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	32.66	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1693.00	H	1.10	131	-60.65	6.70	-53.95	73.6
2539.50	H	-	-	-62.19	7.60	-54.59	74.2

Table 7-12. Radiated Spurious Data (Band 5/26 – High Channel)

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OPERATING FREQUENCY:	1710.70	MHz		
CHANNEL:	19957			
MEASURED OUTPUT POWER:	21.63	dBm	=	0.146 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	1.4	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	34.63	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3421.40	H	1.00	140	-44.69	8.14	-36.55	58.2
5132.10	H	1.00	24	-51.25	10.26	-40.99	62.6
6842.80	H	1.48	100	-46.74	11.38	-35.36	57.0
8553.50	H	1.50	290	-52.72	13.02	-39.71	61.3
10264.20	H	-	-	-53.16	13.27	-39.89	61.5
11974.90	H	-	-	-49.24	13.15	-36.09	57.7

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

OPERATING FREQUENCY:	1732.50	MHz		
CHANNEL:	20175			
MEASURED OUTPUT POWER:	23.66	dBm	=	0.232 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	1.4	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	36.66	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3465.00	H	2.43	0	-42.60	8.29	-34.31	58.0
5197.50	H	1.00	0	-52.56	10.35	-42.21	65.9
6930.00	H	1.00	0	-51.39	11.49	-39.90	63.6
8662.50	H	1.00	38	-52.70	13.02	-39.68	63.3
10395.00	H	-	-	-52.52	13.16	-39.36	63.0
12127.50	H	-	-	-50.83	13.10	-37.73	61.4

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

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OPERATING FREQUENCY:	1754.30	MHz		
CHANNEL:	20393			
MEASURED OUTPUT POWER:	21.37	dBm	=	0.137 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	1.4	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	34.37	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3508.60	H	2.29	120	-46.13	8.41	-37.72	59.1
5262.90	H	1.71	316	-54.88	10.36	-44.52	65.9
7017.20	H	1.38	98	-44.81	11.57	-33.24	54.6
8771.50	H	1.34	300	-51.34	13.03	-38.31	59.7
10525.80	H	-	-	-51.75	13.01	-38.74	60.1
12280.10	H	-	-	-50.49	13.16	-37.33	58.7

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

OPERATING FREQUENCY:	1850.70	MHz		
CHANNEL:	26047			
MEASURED OUTPUT POWER:	22.39	dBm	=	0.173 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	1.4	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	35.39	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3701.40	H	2.89	270	-52.17	8.40	-43.77	66.2
5552.10	H	1.56	37	-52.67	10.56	-42.12	64.5
7402.80	H	1.73	295	-49.87	12.05	-37.81	60.2
9253.50	H	-	-	-55.26	13.22	-42.04	64.4
11104.20	H	-	-	-51.45	13.25	-38.20	60.6

Table 7-16. Radiated Spurious Data (Band 2/25 – Low Channel)

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OPERATING FREQUENCY:	1882.50	MHz		
CHANNEL:	26365			
MEASURED OUTPUT POWER:	24.62	dBm	=	0.290 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	1.4	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	37.62	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3765.00	H	2.10	140	-49.56	8.38	-41.17	65.8
5647.50	H	1.58	40	-52.11	10.70	-41.41	66.0
7530.00	H	1.22	200	-49.70	12.10	-37.60	62.2
9412.50	H	-	-	-59.85	13.19	-46.66	71.3
11295.00	H	-	-	-51.98	13.31	-38.66	63.3

Table 7-17. Radiated Spurious Data (Band 2/25 – Mid Channel)

OPERATING FREQUENCY:	1914.30	MHz		
CHANNEL:	26683			
MEASURED OUTPUT POWER:	22.57	dBm	=	0.181 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	1.4	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	35.57	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3828.60	H	1.71	97	-47.57	8.40	-39.17	61.7
5742.90	H	1.44	100	-52.98	10.76	-42.22	64.8
7657.20	H	1.46	110	-47.96	12.22	-35.75	58.3
9571.50	H	-	-	-54.33	13.18	-41.15	63.7
11485.80	H	-	-	-50.99	13.33	-37.66	60.2

Table 7-18. Radiated Spurious Data (Band 2/25 – High Channel)

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OPERATING FREQUENCY:	2501.00	MHz		
CHANNEL:	39700			
MEASURED OUTPUT POWER:	20.37	dBm	=	0.109 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	10.0	MHz		
DISTANCE:	3	meters		
LIMIT:	55 + 10 log10 (W)	45.37	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
5002.00	H	1.00	277	-51.47	10.14	-41.33	61.7
7503.00	H	1.00	306	-50.52	12.09	-38.44	58.8
10004.00	H	1.00	262	-46.20	13.25	-32.95	53.3
12505.00	H	-	-	-50.72	13.19	-37.53	57.9

Table 7-19. Radiated Spurious Data (Band 41 – Low Channel)

OPERATING FREQUENCY:	2593.00	MHz		
CHANNEL:	40620			
MEASURED OUTPUT POWER:	26.31	dBm	=	0.427 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	10.0	MHz		
DISTANCE:	3	meters		
LIMIT:	55 + 10 log10 (W)	51.31	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
5186.00	H	2.49	265	-50.42	10.33	-40.09	66.4
7779.00	H	1.49	241	-47.00	12.32	-34.68	61.0
10372.00	H	1.46	107	-45.45	13.18	-32.26	58.6
12965.00	H	-	-	-50.24	13.43	-36.81	63.1

Table 7-20. Radiated Spurious Data (Band 41 – Mid Channel)

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OPERATING FREQUENCY:	2685.00	MHz		
CHANNEL:	41540			
MEASURED OUTPUT POWER:	19.42	dBm	=	0.087 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	10.0	MHz		
DISTANCE:	3	meters		
LIMIT:	55 + 10 log10 (W)	44.42	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
5370.00	H	2.33	324	-49.91	10.37	-39.55	59.0
8055.00	H	1.00	295	-45.05	12.60	-32.45	51.9
10740.00	H	1.00	316	-48.39	12.94	-35.45	54.9
13425.00	H	-	-	-49.52	13.69	-35.84	55.3

Table 7-21. Radiated Spurious Data (Band 41 – High Channel)

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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-C-2004. 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-C-2004

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

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Band 12 Frequency Stability Measurements

§2.1055 §27.54

OPERATING FREQUENCY:	707,500,000	Hz
CHANNEL:	23790	
REFERENCE VOLTAGE:	3.80	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	707,499,979	-21	-0.0000029
100 %		- 30	707,499,926	-74	-0.0000104
100 %		- 20	707,499,850	-150	-0.0000212
100 %		- 10	707,499,862	-138	-0.0000195
100 %		0	707,499,891	-109	-0.0000154
100 %		+ 10	707,499,840	-160	-0.0000226
100 %		+ 20	707,499,861	-139	-0.0000196
100 %		+ 30	707,499,940	-60	-0.0000085
100 %		+ 40	707,499,866	-134	-0.0000189
100 %		+ 50	707,499,986	-14	-0.0000020
BATT. ENDPOINT	3.40	+ 20	707,499,850	-150	-0.0000212

Table 7-22. 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.

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Band 12 Frequency Stability Measurements

§2.1055 §27.54

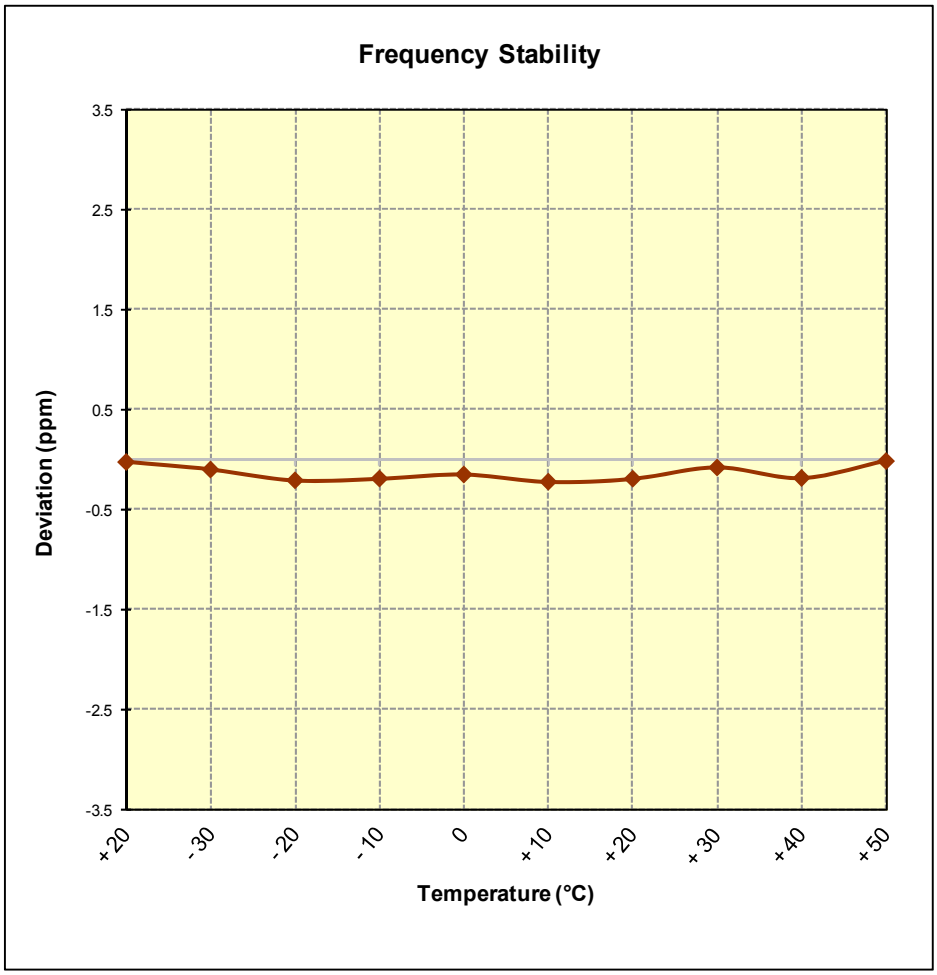

Figure 7-8. Frequency Stability Graph (Band 12)

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Band 26 Frequency Stability Measurements

§2.1055 §22.355

OPERATING FREQUENCY:	831,500,000	Hz
CHANNEL:	26865	
REFERENCE VOLTAGE:	3.80	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	831,499,916	-84	-0.0000101
100 %		- 30	831,499,894	-106	-0.0000128
100 %		- 20	831,499,903	-97	-0.0000116
100 %		- 10	831,499,983	-17	-0.0000021
100 %		0	831,499,944	-56	-0.0000067
100 %		+ 10	831,499,995	-5	-0.0000007
100 %		+ 20	831,499,945	-55	-0.0000066
100 %		+ 30	831,499,824	-176	-0.0000212
100 %		+ 40	831,499,994	-6	-0.0000007
100 %		+ 50	831,499,937	-63	-0.0000075
BATT. ENDPOINT	3.40	+ 20	831,499,813	-187	-0.0000225

Table 7-23. Frequency Stability Data (Band 26)

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Band 26 Frequency Stability Measurements

§2.1055 §22.355

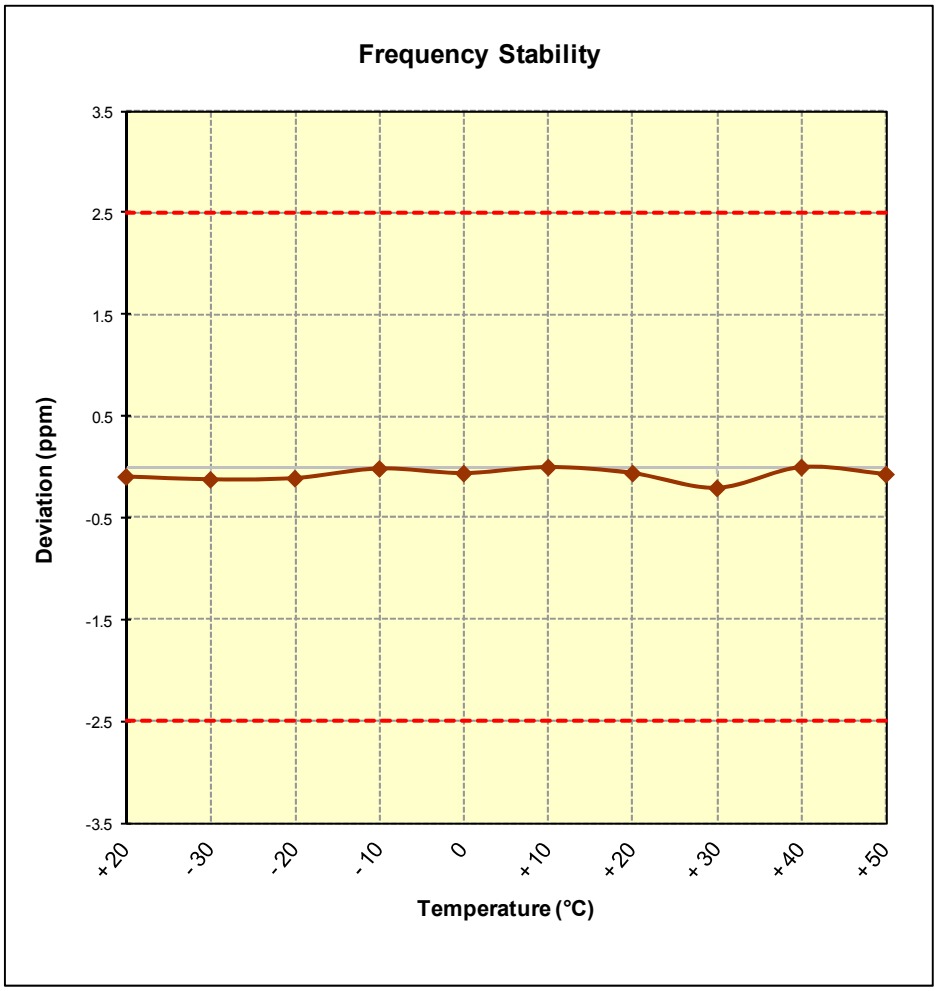

Figure 7-9. Frequency Stability Graph (Band 26)

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Band 4 Frequency Stability Measurements

§2.1055 §§27.54

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

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	1,732,499,910	-90	-0.0000052
100 %		- 30	1,732,499,990	-10	-0.0000006
100 %		- 20	1,732,499,982	-18	-0.0000010
100 %		- 10	1,732,499,848	-152	-0.0000088
100 %		0	1,732,499,849	-151	-0.0000087
100 %		+ 10	1,732,499,854	-146	-0.0000084
100 %		+ 20	1,732,499,985	-15	-0.0000009
100 %		+ 30	1,732,499,840	-160	-0.0000093
100 %		+ 40	1,732,499,814	-186	-0.0000107
100 %		+ 50	1,732,499,866	-134	-0.0000077
BATT. ENDPOINT	3.40	+ 20	1,732,499,801	-199	-0.0000115

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

Note:

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

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Band 4 Frequency Stability Measurements

§2.1055 §§27.54

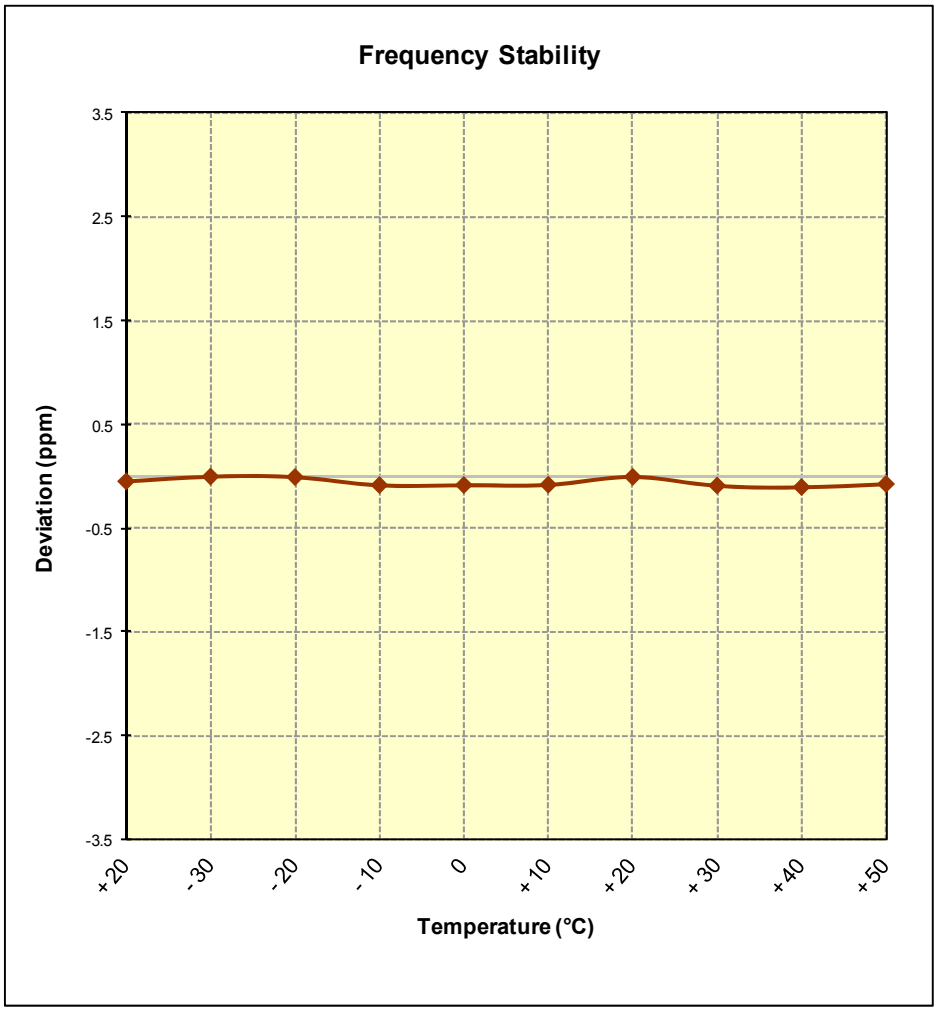

Figure 7-10. Frequency Stability Graph (Band 4)

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Band 25 Frequency Stability Measurements

§2.1055 §24.235

OPERATING FREQUENCY:	1,882,500,000	Hz
CHANNEL:	26365	
REFERENCE VOLTAGE:	3.80	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	1,882,499,828	-172	-0.0000092
100 %		- 30	1,882,499,960	-40	-0.0000021
100 %		- 20	1,882,499,950	-50	-0.0000027
100 %		- 10	1,882,499,944	-56	-0.0000030
100 %		0	1,882,499,878	-122	-0.0000065
100 %		+ 10	1,882,499,852	-148	-0.0000079
100 %		+ 20	1,882,499,936	-64	-0.0000034
100 %		+ 30	1,882,499,859	-141	-0.0000075
100 %		+ 40	1,882,499,967	-33	-0.0000018
100 %		+ 50	1,882,499,816	-184	-0.0000097
BATT. ENDPOINT	3.40	+ 20	1,882,499,923	-77	-0.0000041

Table 7-25. Frequency Stability Data (Band 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.

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Band 25 Frequency Stability Measurements

§2.1055 §24.235

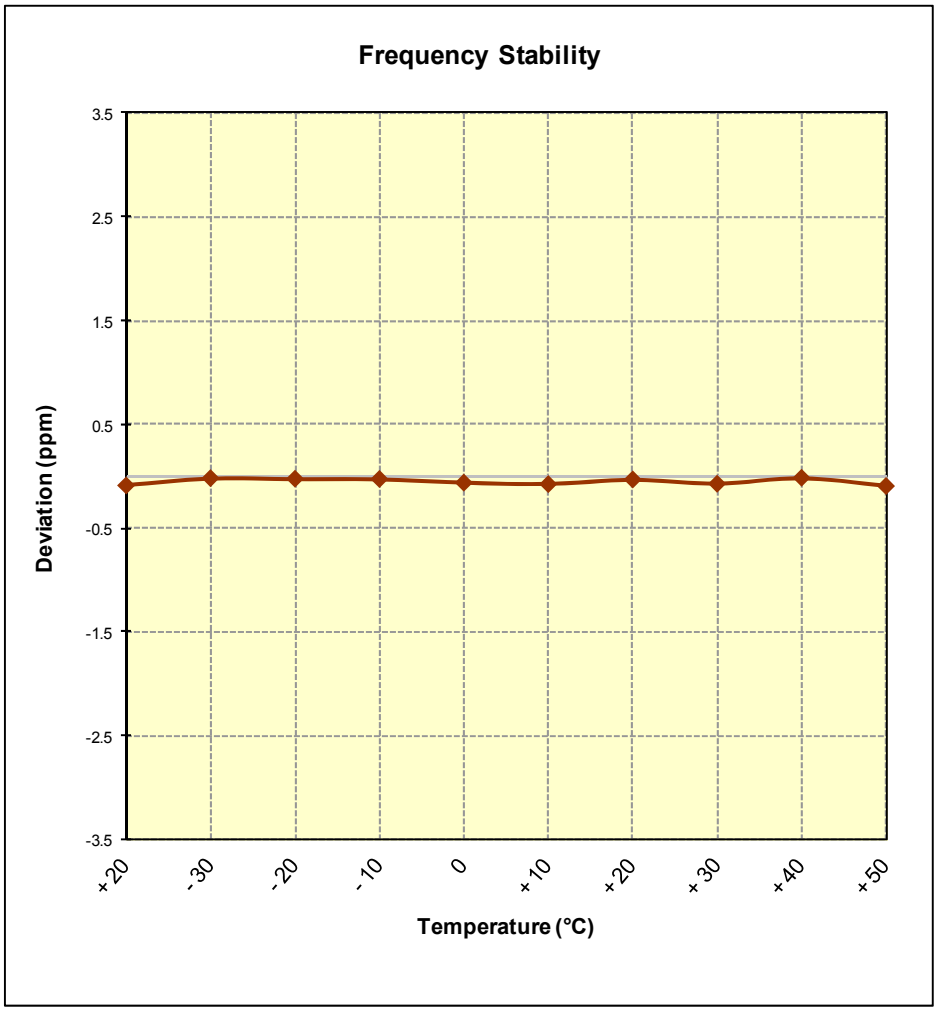

Figure 7-11. Frequency Stability Graph (Band 25)

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Band 41 Frequency Stability Measurements

§2.1055 §27.54

OPERATING FREQUENCY:	2,593,000,000	Hz
CHANNEL:	40620	
REFERENCE VOLTAGE:	3.80	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	2,592,999,986	-14	-0.0000005
100 %		- 30	2,592,999,960	-40	-0.0000015
100 %		- 20	2,592,999,938	-62	-0.0000024
100 %		- 10	2,592,999,967	-33	-0.0000013
100 %		0	2,592,999,862	-138	-0.0000053
100 %		+ 10	2,592,999,919	-81	-0.0000031
100 %		+ 20	2,592,999,936	-64	-0.0000025
100 %		+ 30	2,592,999,873	-127	-0.0000049
100 %		+ 40	2,592,999,921	-79	-0.0000031
100 %		+ 50	2,592,999,827	-173	-0.0000067
BATT. ENDPOINT	3.40	+ 20	2,592,999,862	-138	-0.0000053

Table 7-26. 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.

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Band 41 Frequency Stability Measurements

§2.1055 §27.54

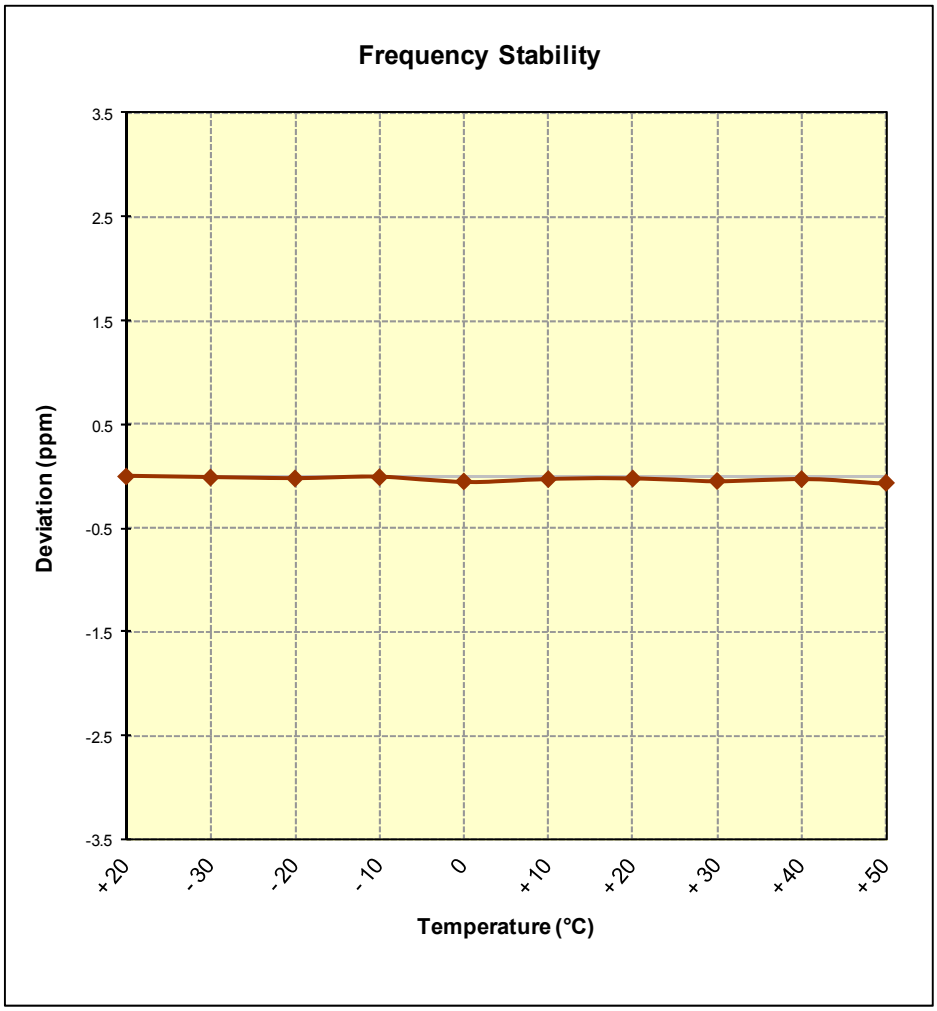

Figure 7-12. Frequency Stability Graph (Band 41)

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LGE Portable Handset FCC ID: ZNFLS450** complies with all the requirements of Parts 22, 24, & 27 of the FCC rules for LTE operation only.

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