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.

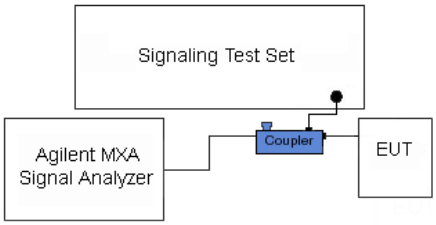

Figure 7-3. Test Instrument & Measurement Setup

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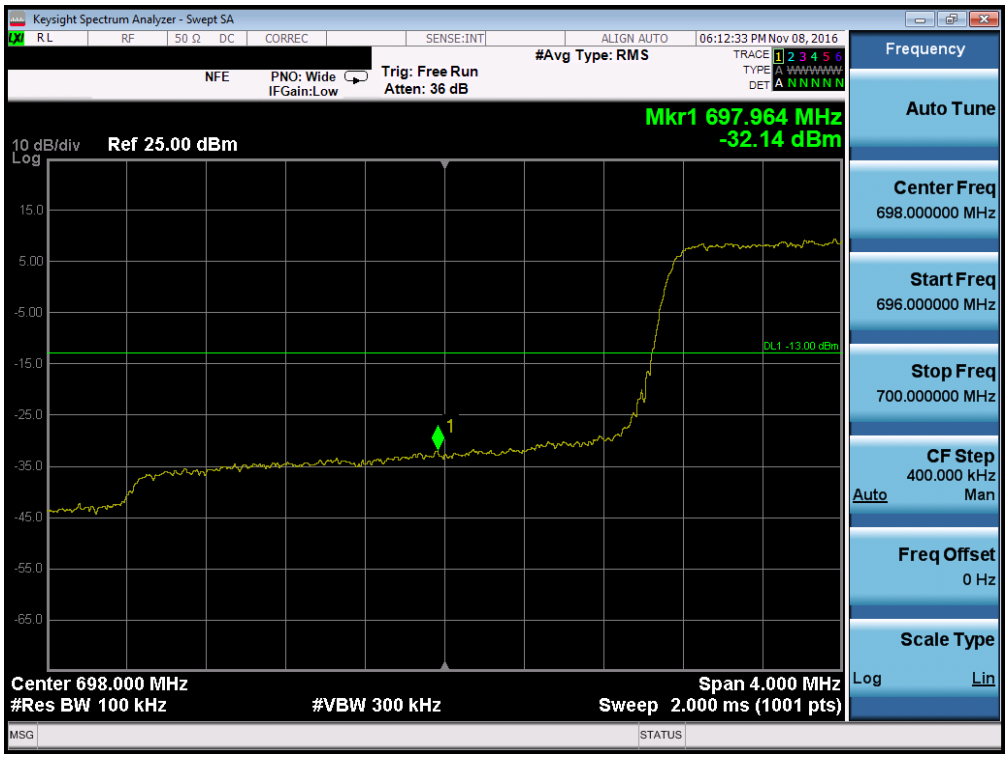
Plot 7-97. Upper Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)



Plot 7-98. Lower Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

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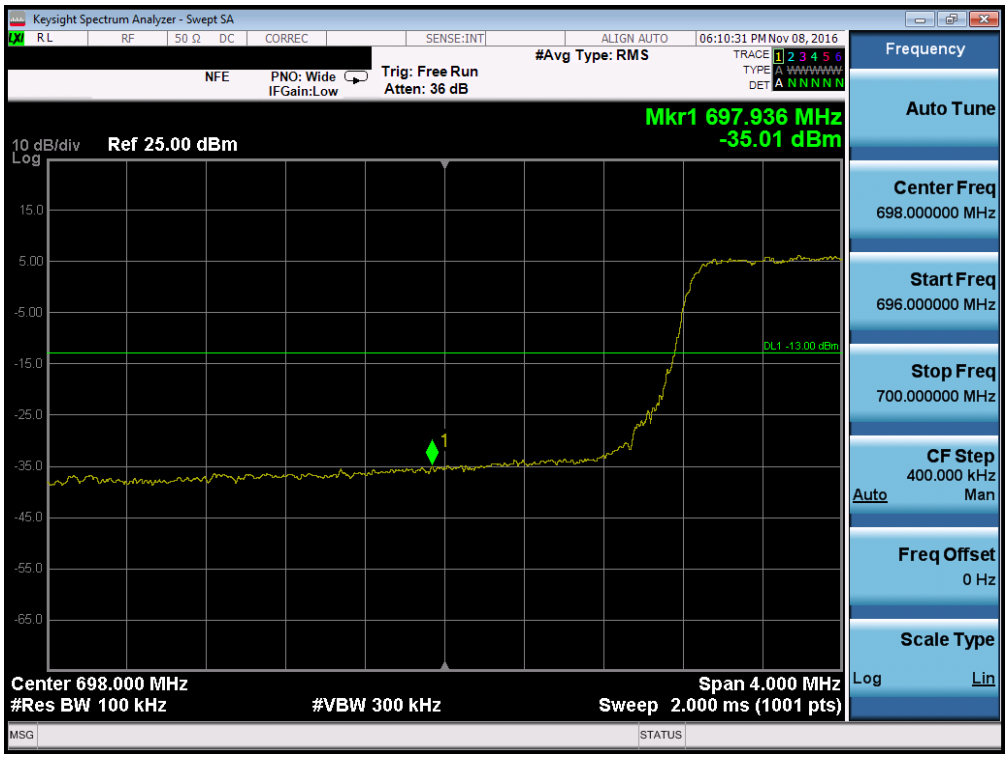
Plot 7-99. Upper Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)



Plot 7-100. Lower Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)

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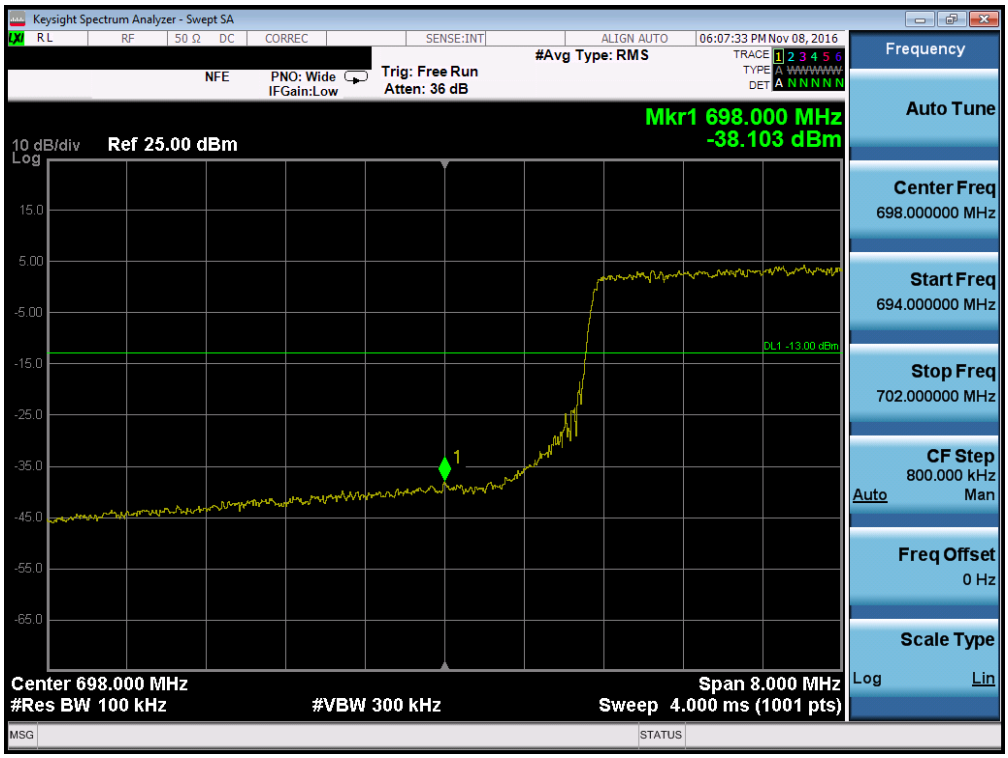
Plot 7-101. Upper Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)



Plot 7-102. Lower Band Edge Plot (Band 12 – 10.0MHz QPSK – RB Size 50)

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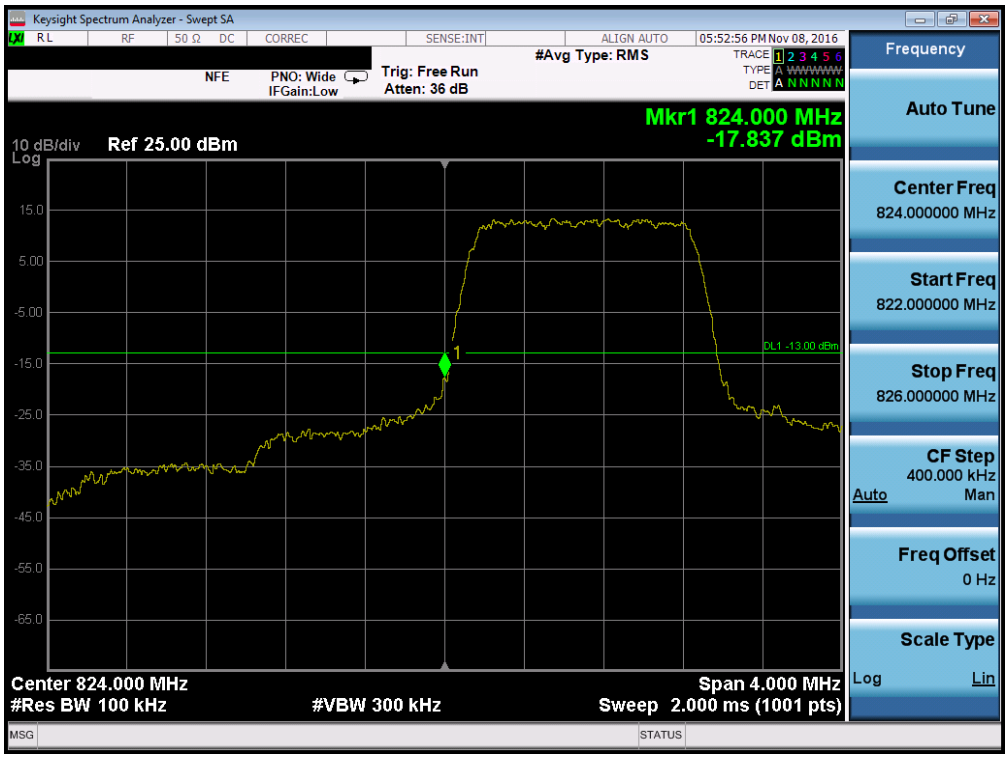
Plot 7-103. Upper Band Edge Plot (Band 12 – 10.0MHz QPSK – RB Size 50)



Plot 7-104. Lower Band Edge Plot (Band 26/5 – 1.4MHz QPSK – RB Size 6)

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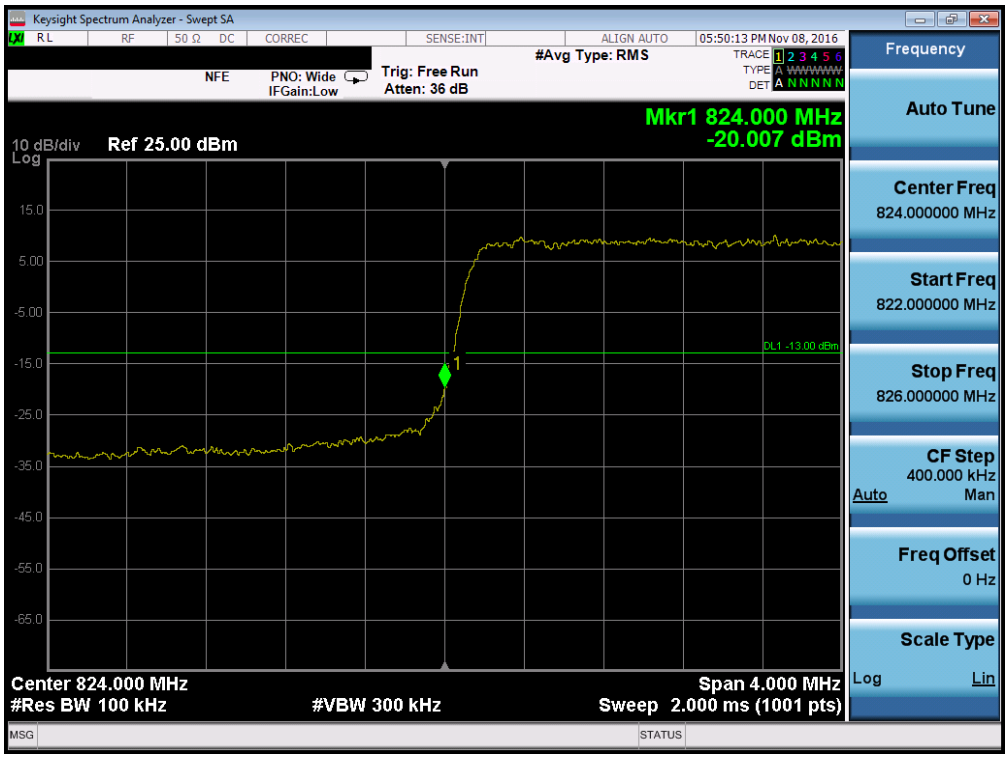
Plot 7-105. Upper Band Edge Plot (Band 26/5 – 1.4MHz QPSK – RB Size 6)



Plot 7-106. Lower Band Edge Plot (Band 26/5 – 3.0MHz QPSK – RB Size 15)

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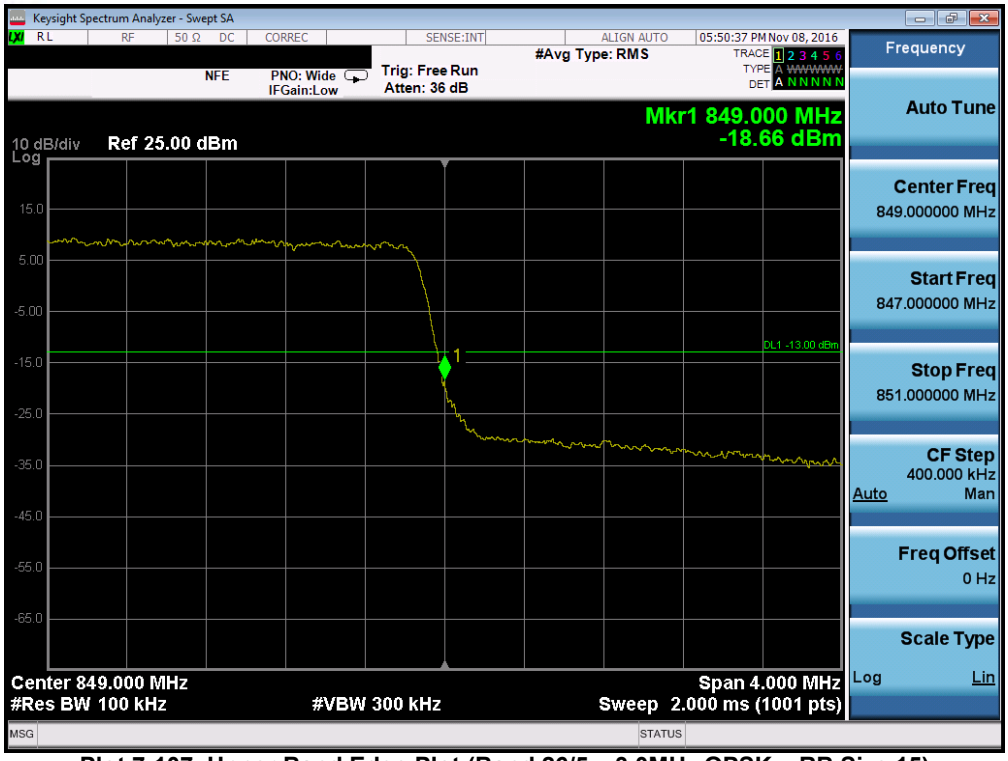
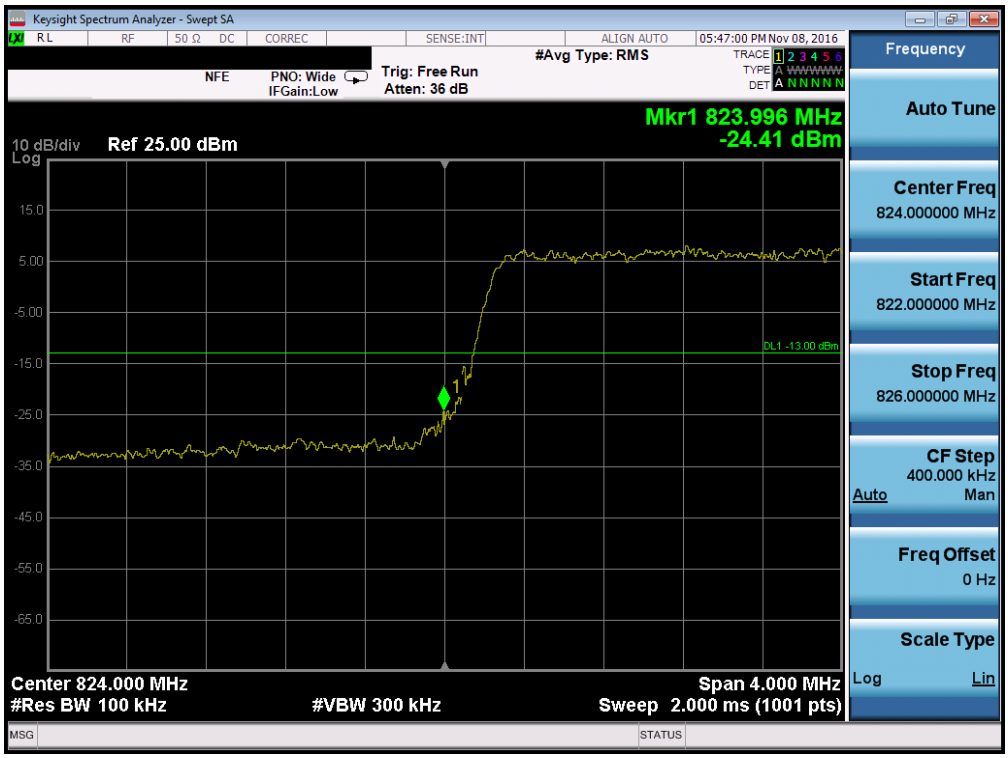


Plot 7-107. Upper Band Edge Plot (Band 26/5 – 3.0MHz QPSK – RB Size 15)



Plot 7-108. Lower Band Edge Plot (Band 26/5 – 5.0MHz QPSK – RB Size 25)

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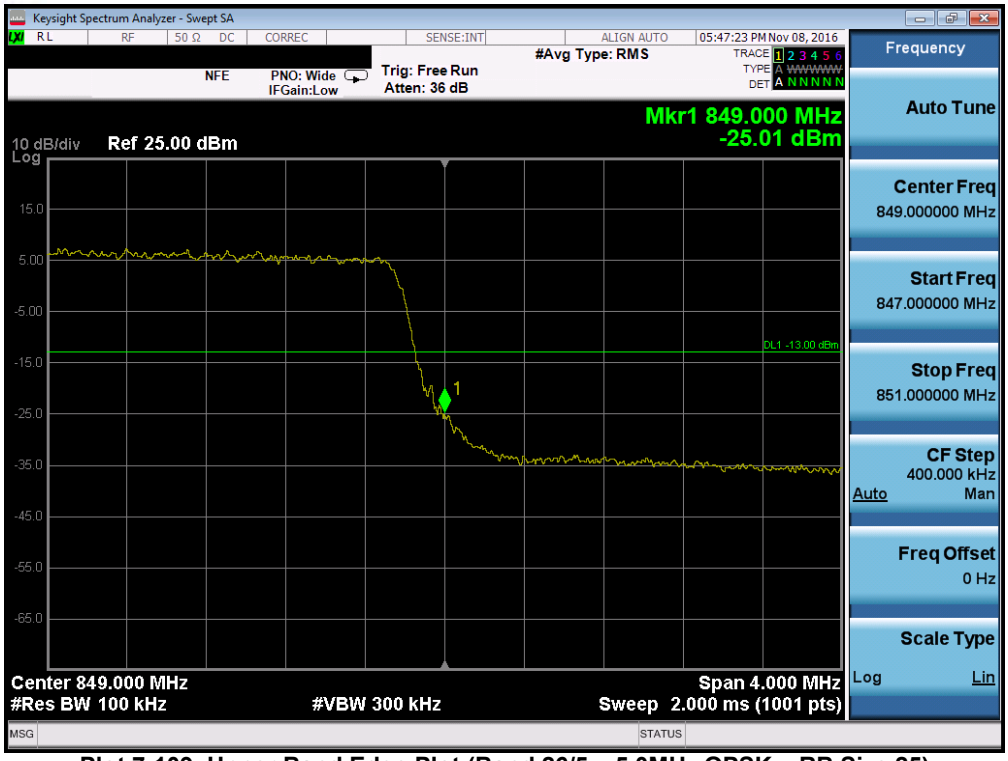
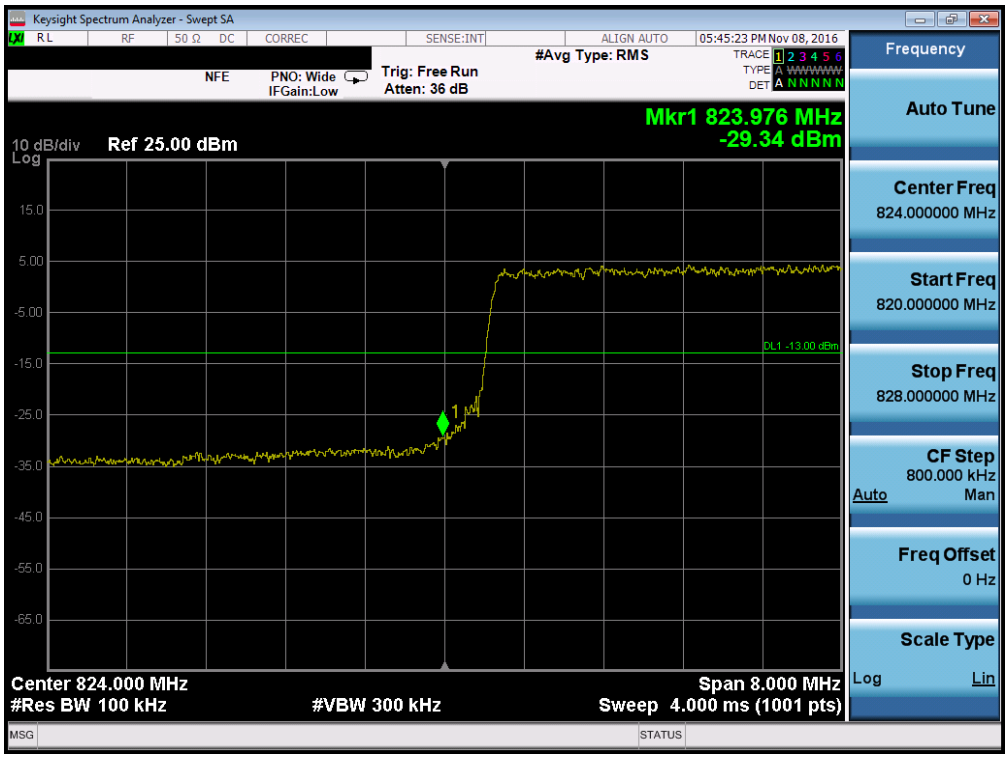


Plot 7-109. Upper Band Edge Plot (Band 26/5 – 5.0MHz QPSK – RB Size 25)



Plot 7-110. Lower Band Edge Plot (Band 26/5 – 10.0MHz QPSK – RB Size 50)

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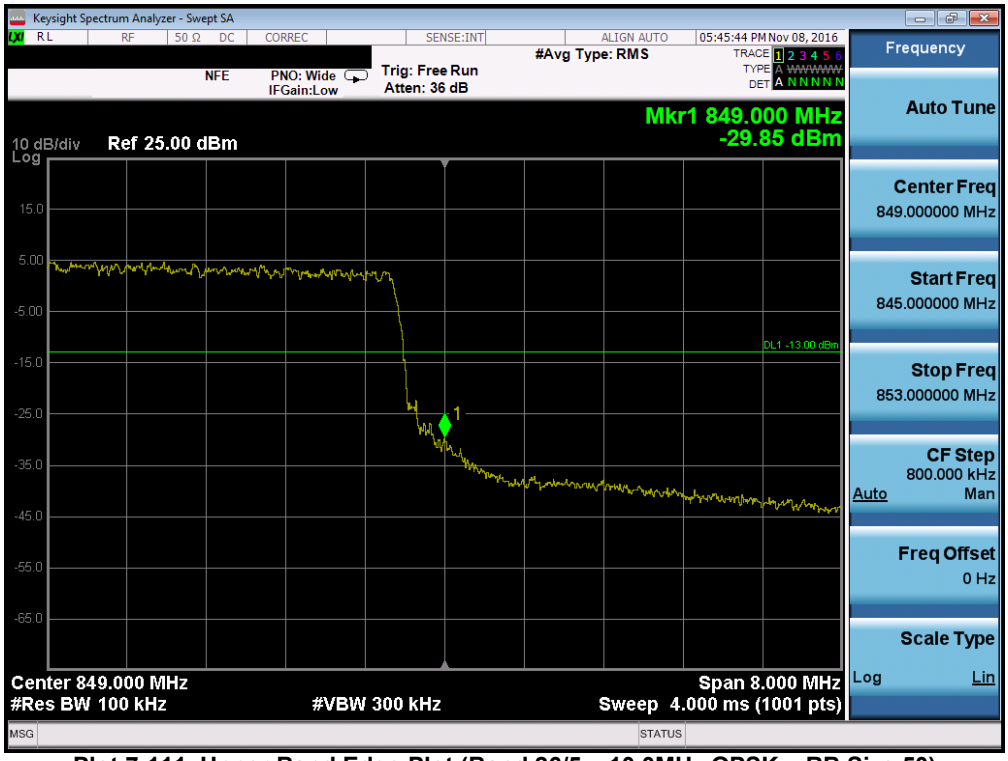
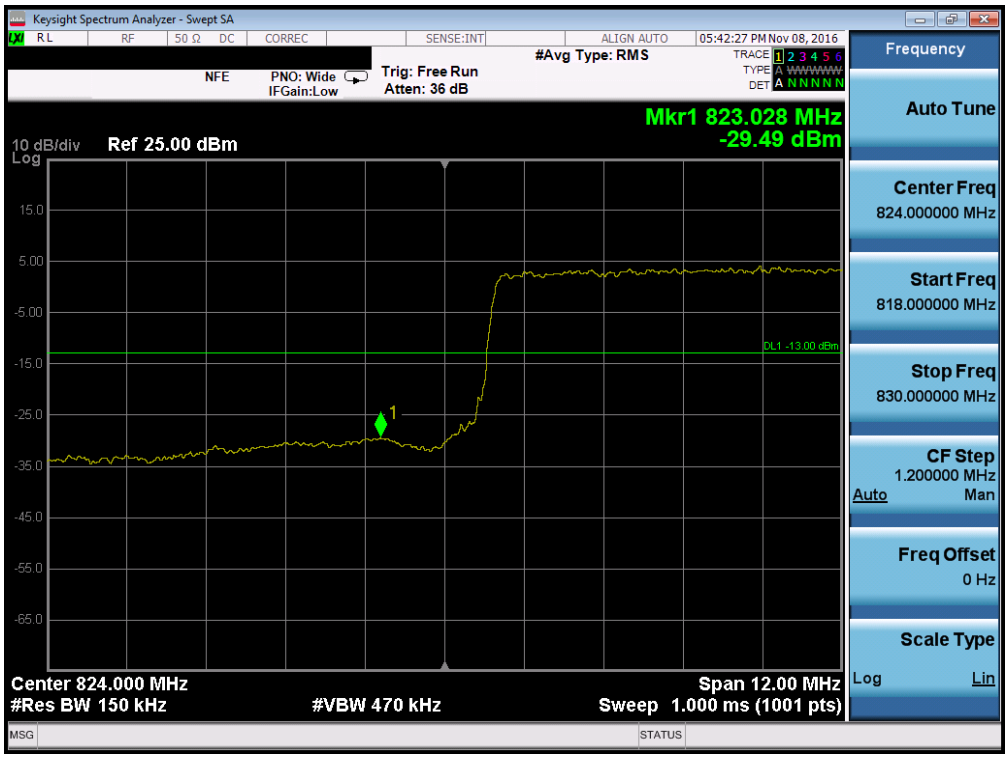


Plot 7-111. Upper Band Edge Plot (Band 26/5 – 10.0MHz QPSK – RB Size 50)



Plot 7-112. Lower Band Edge Plot (Band 26 – 15.0MHz QPSK – RB Size 75)

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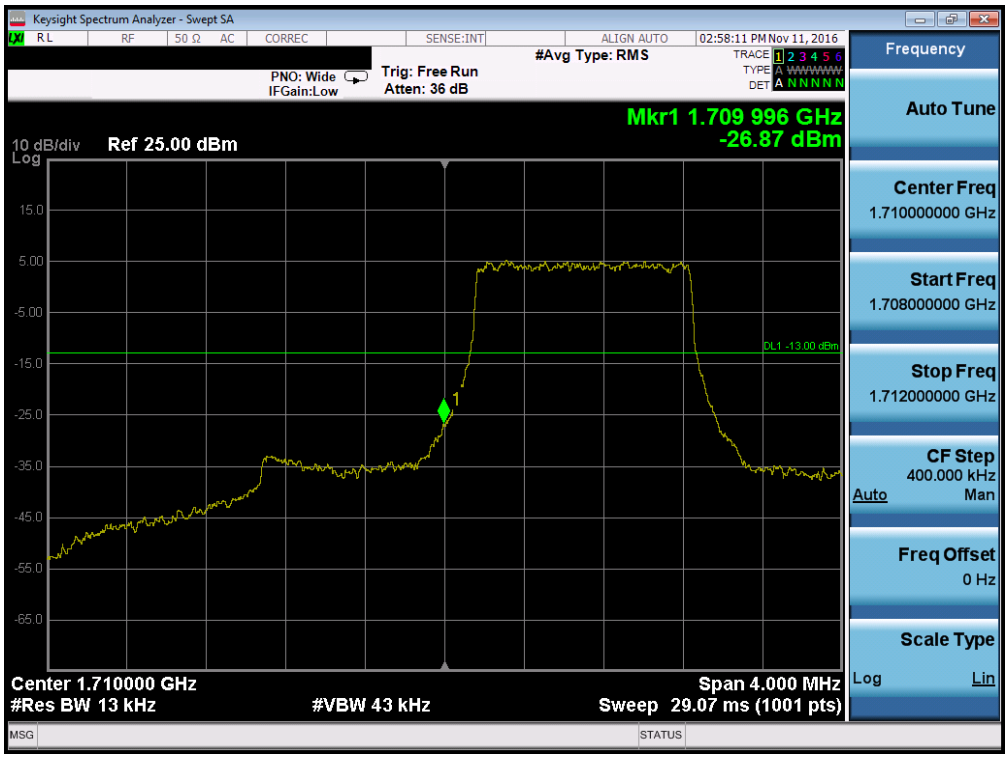
Plot 7-113. Upper Band Edge Plot (Band 26 – 15.0MHz QPSK – RB Size 75)



Plot 7-114. Lower Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

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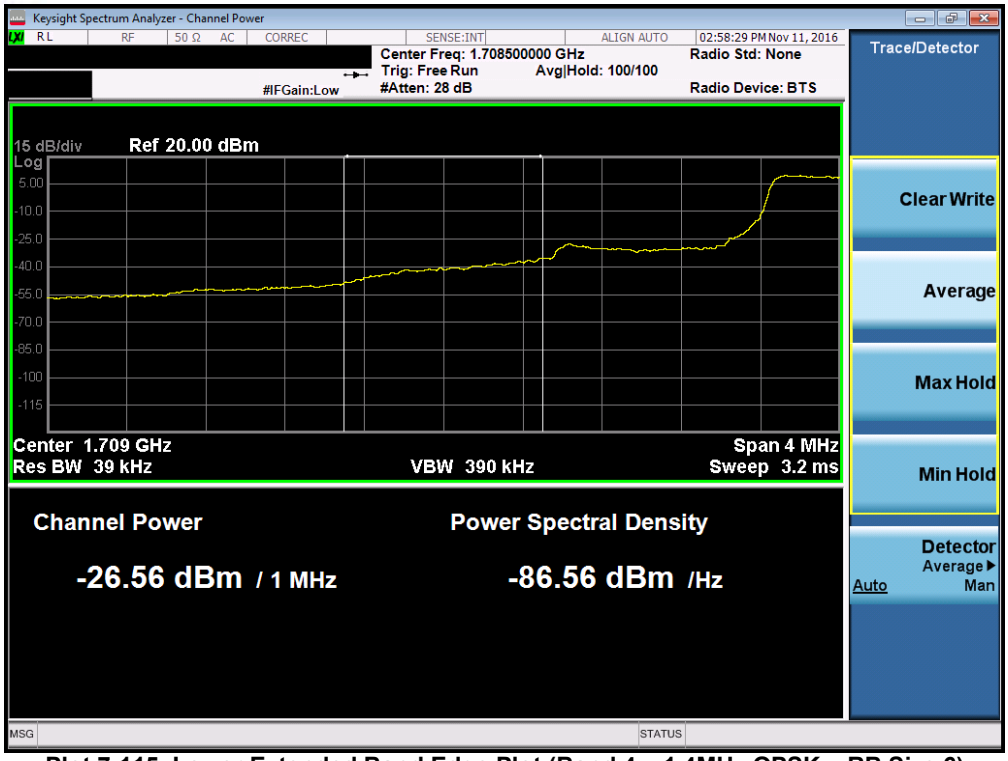
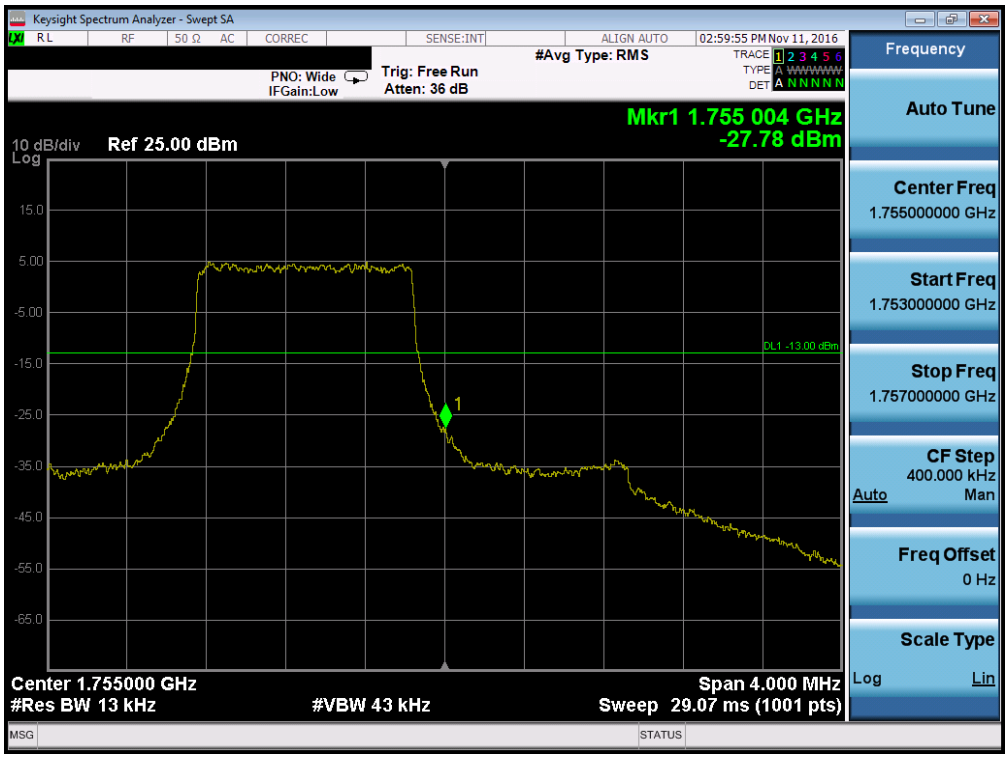


Plot 7-115. Lower Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



Plot 7-116. Upper Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

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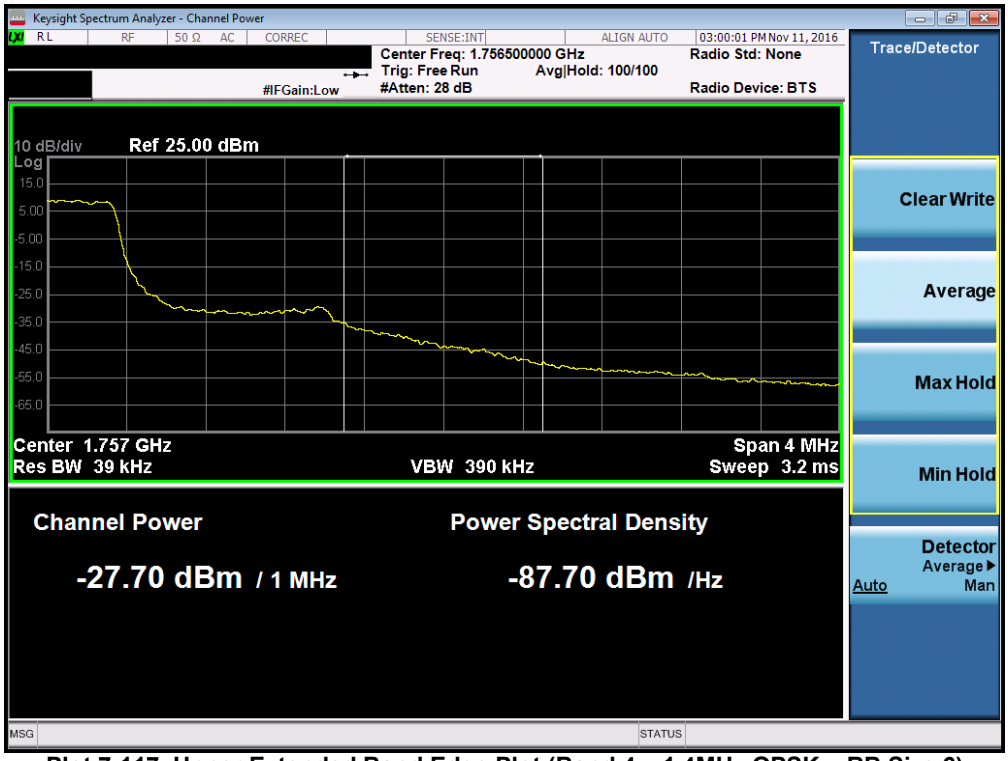
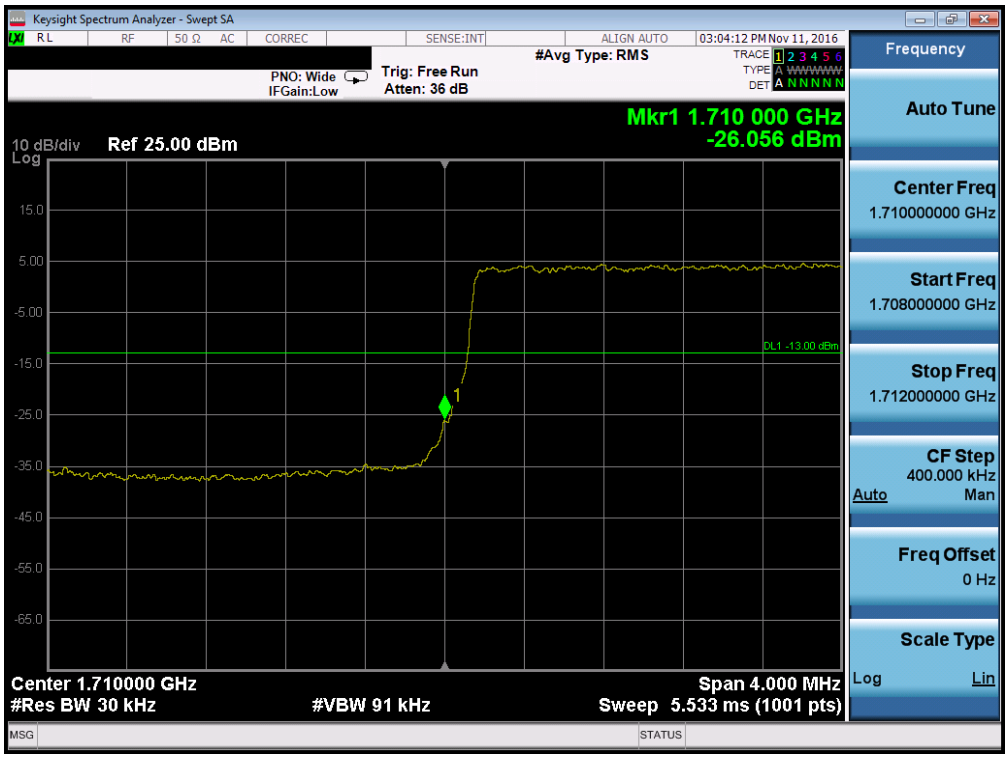


Plot 7-117. Upper Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



Plot 7-118. Lower Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

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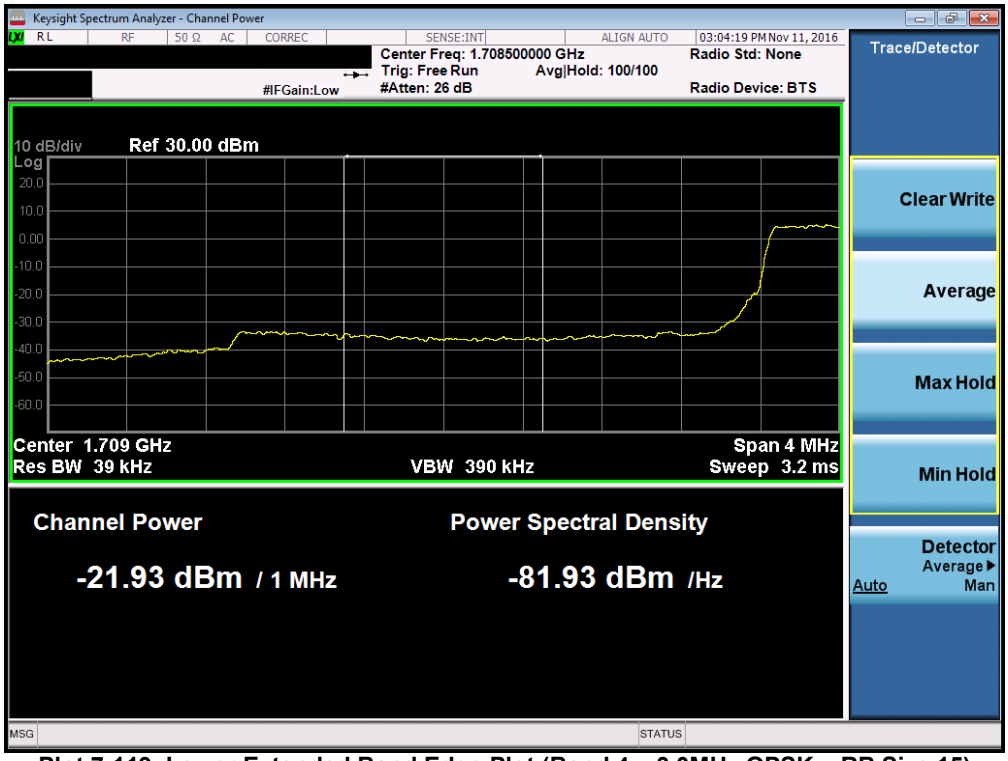
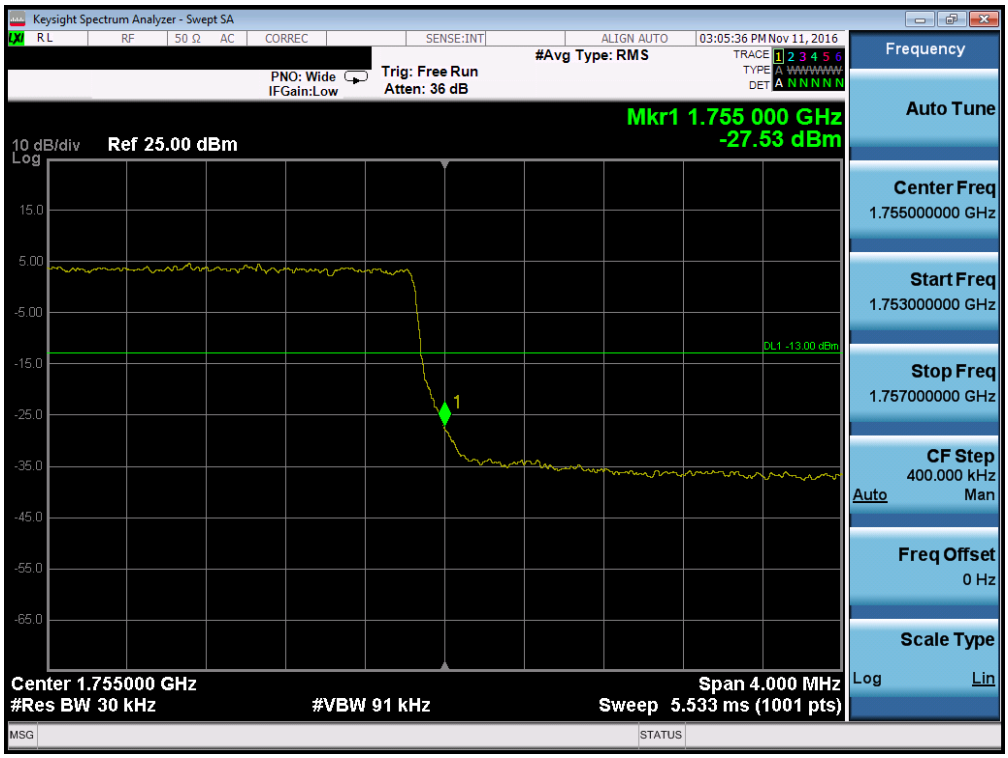


Plot 7-119. Lower Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



Plot 7-120. Upper Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

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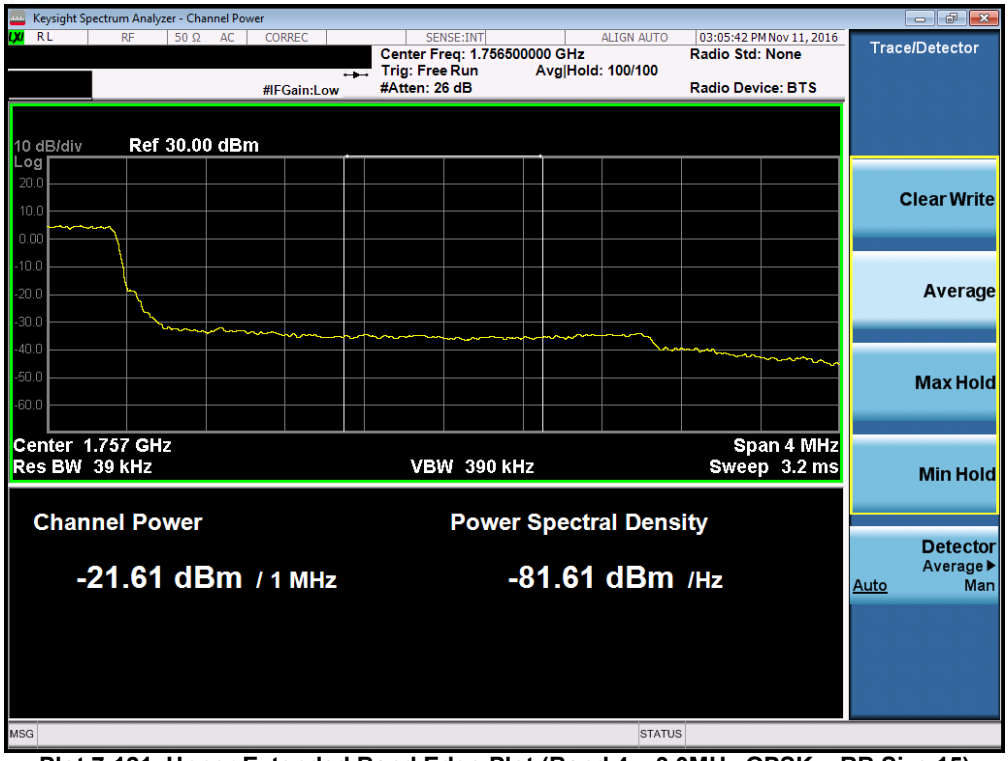
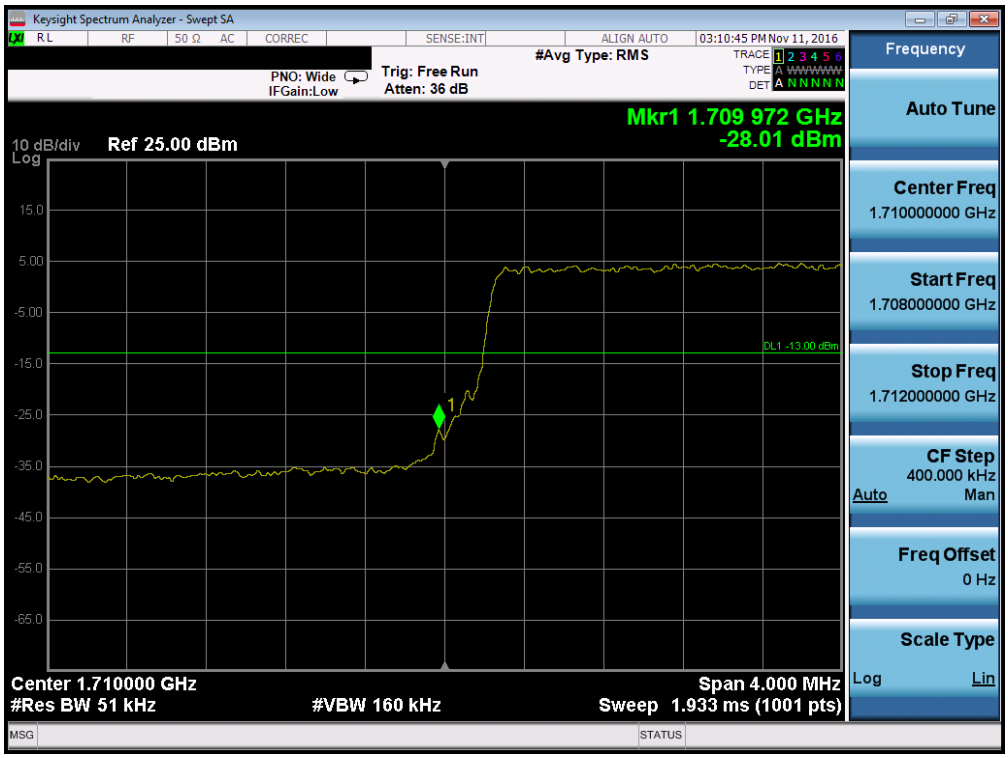


Plot 7-121. Upper Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



Plot 7-122. Lower Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

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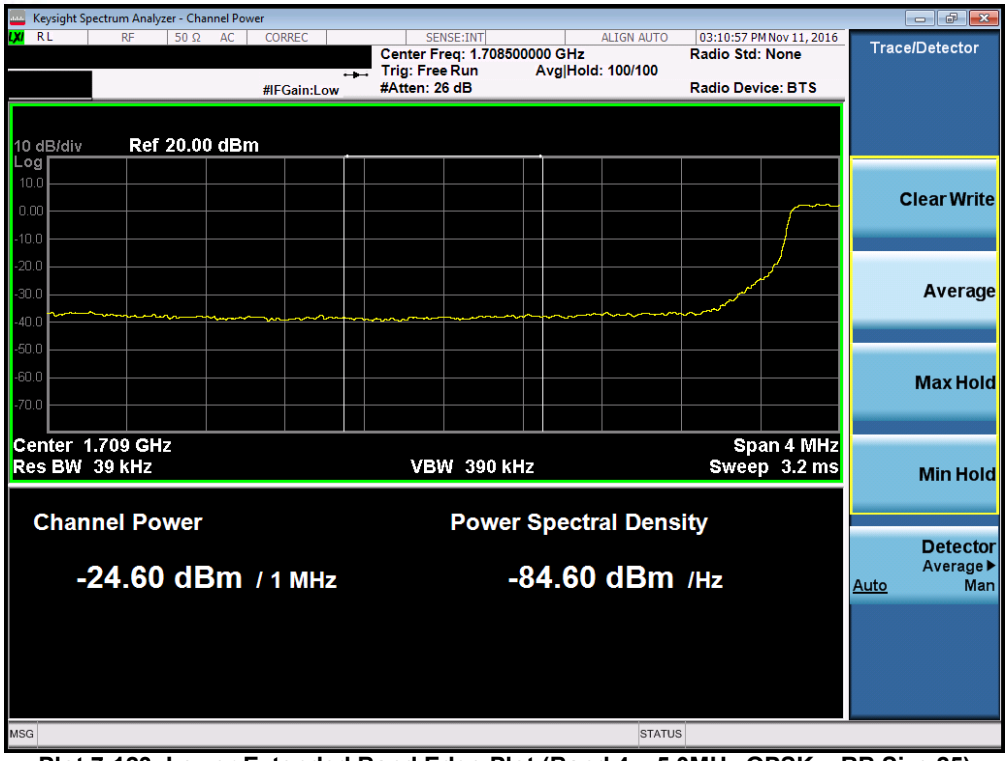
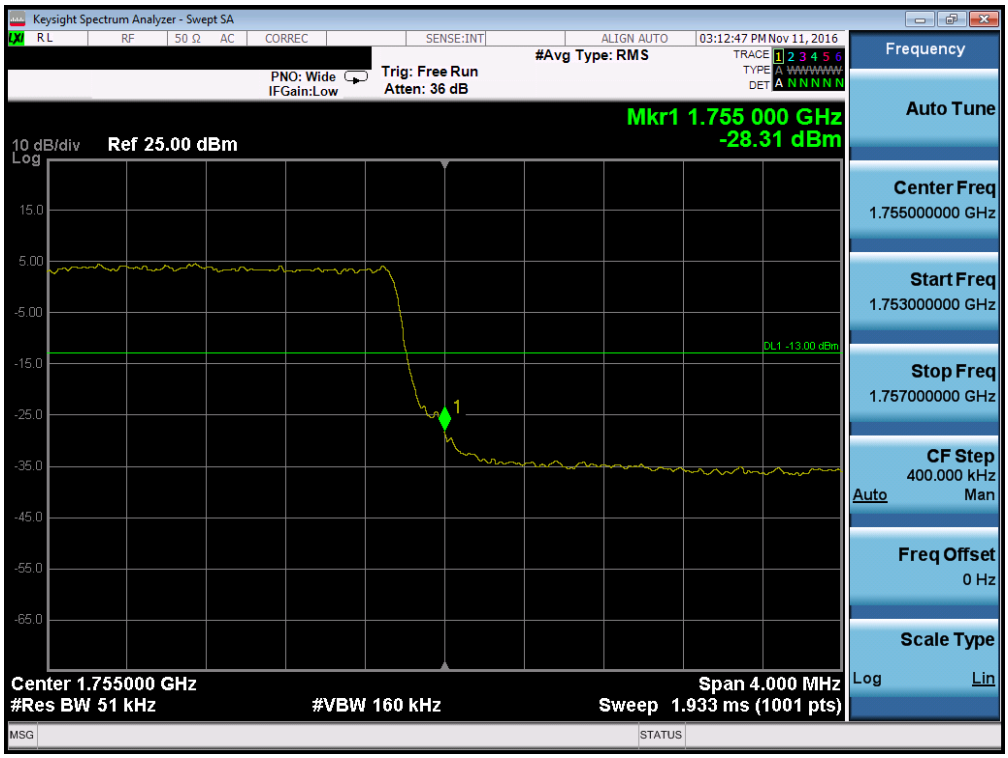


Plot 7-123. Lower Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



Plot 7-124. Upper Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

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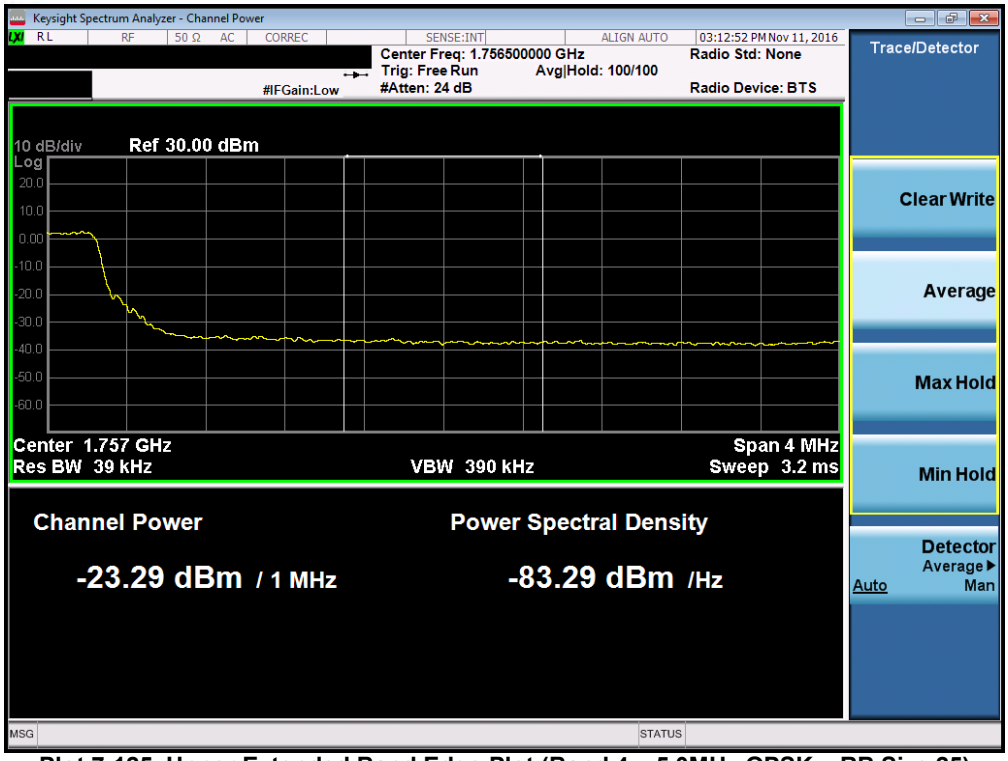
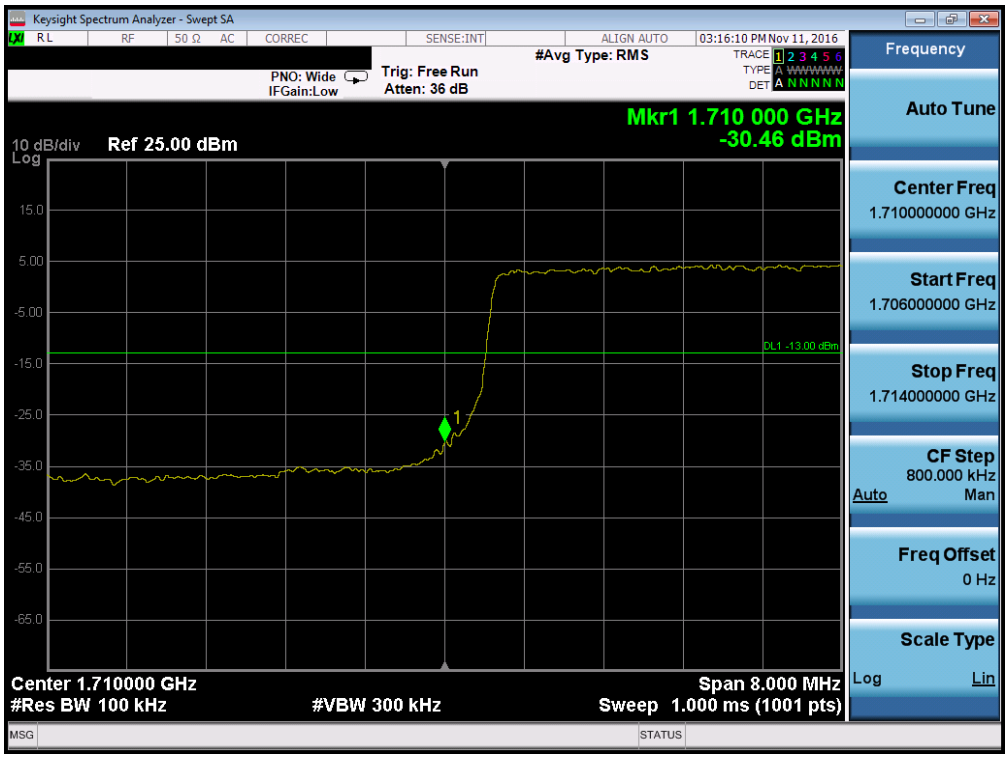


Plot 7-125. Upper Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



Plot 7-126. Lower Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

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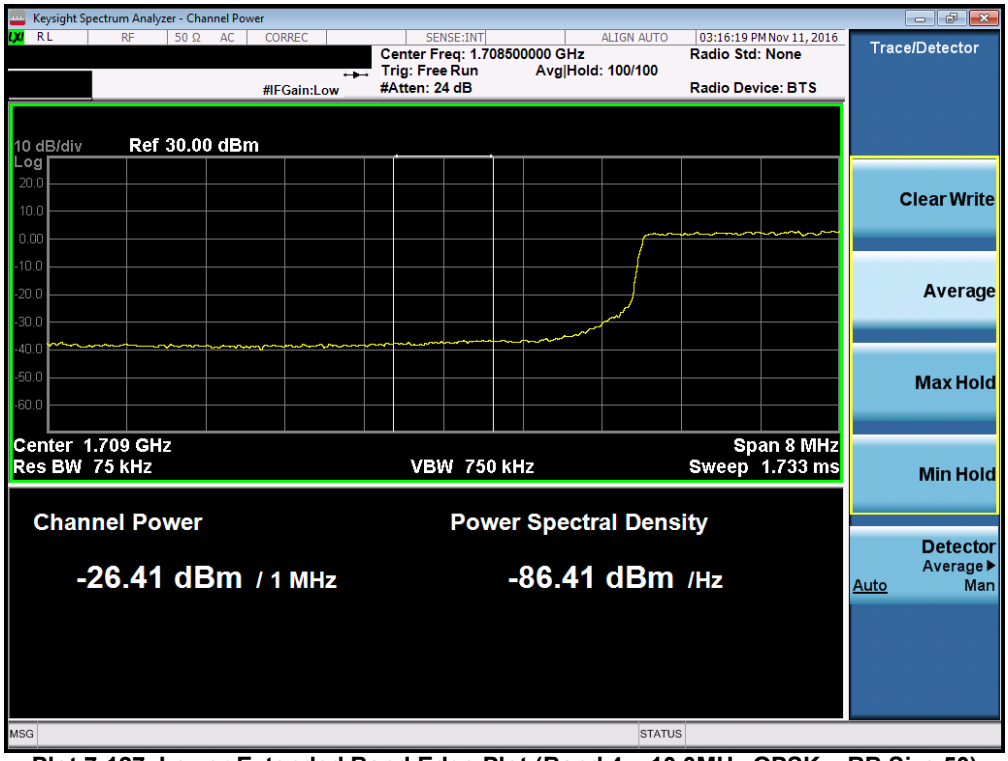
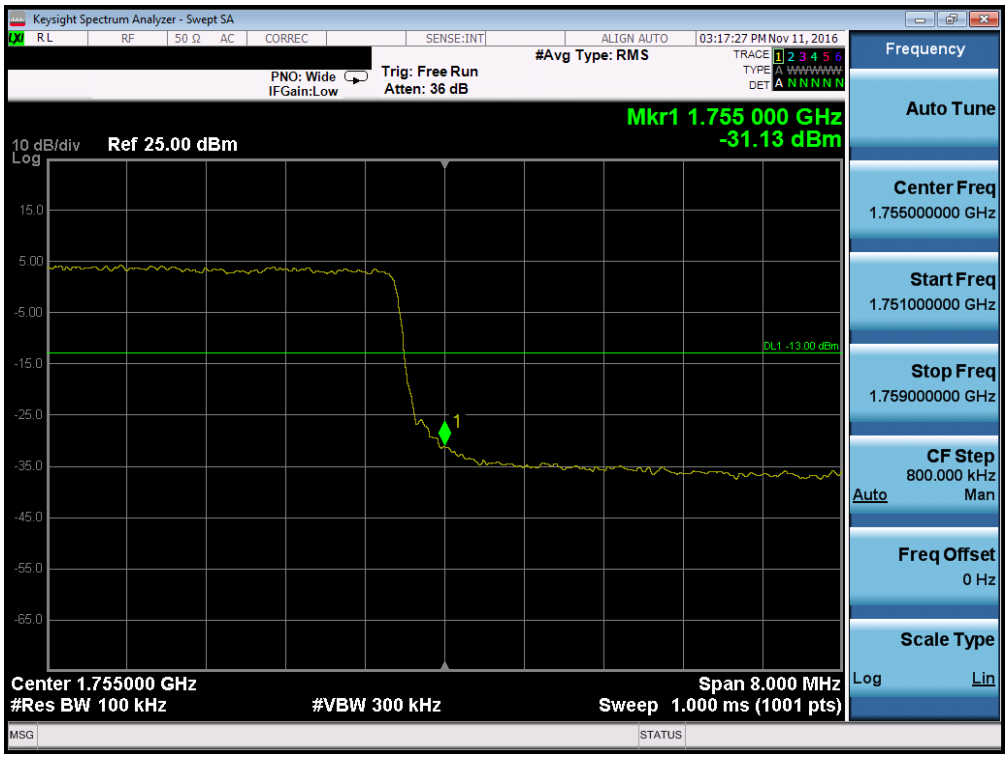


Plot 7-127. Lower Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)



Plot 7-128. Upper Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

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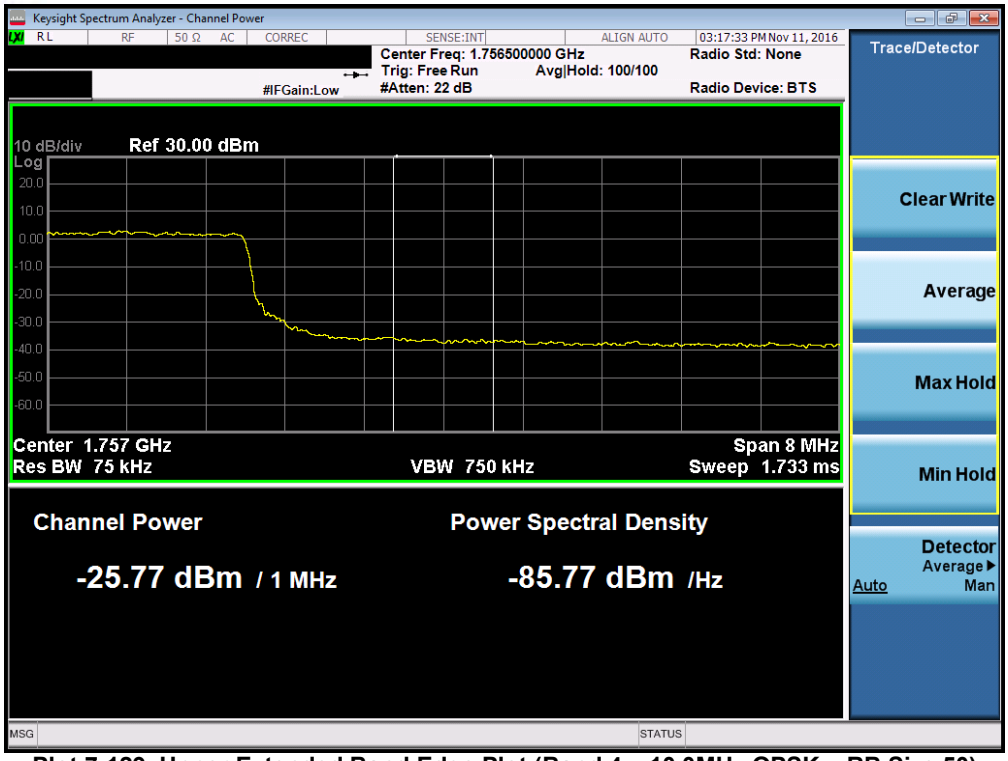
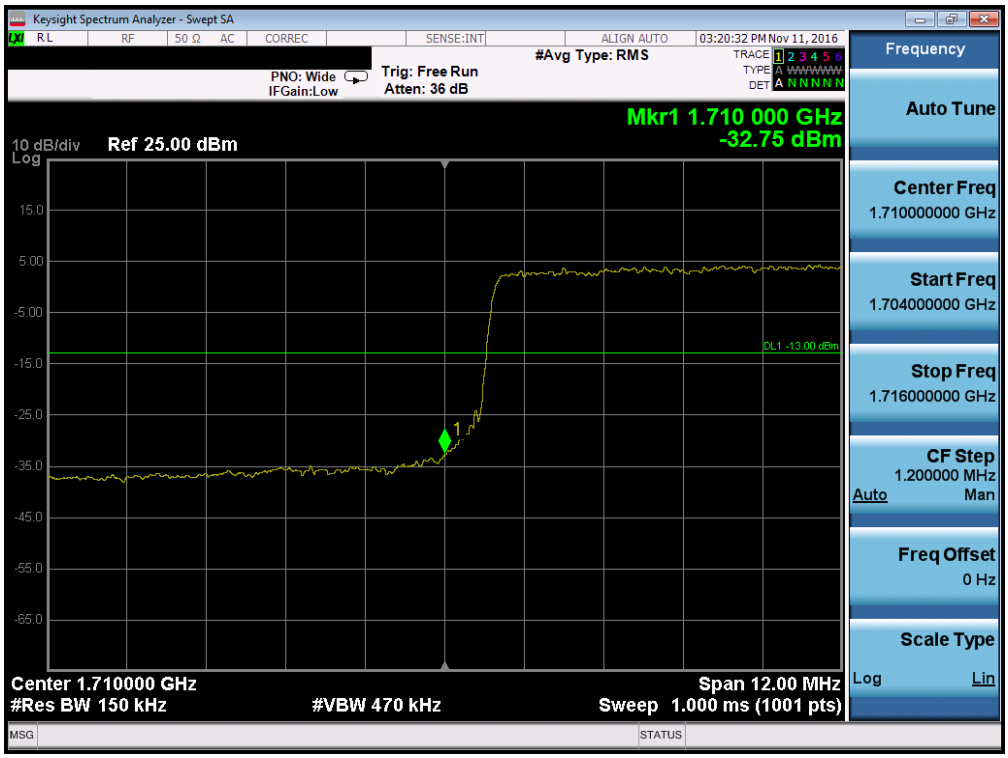


Plot 7-129. Upper Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)



Plot 7-130. Lower Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

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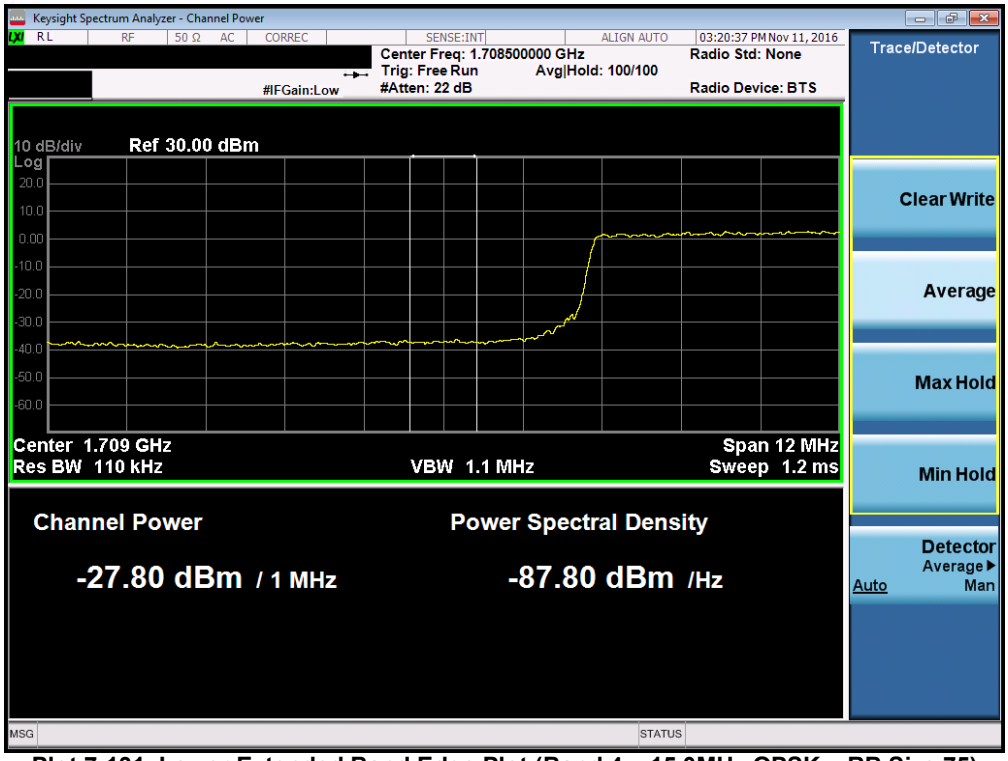
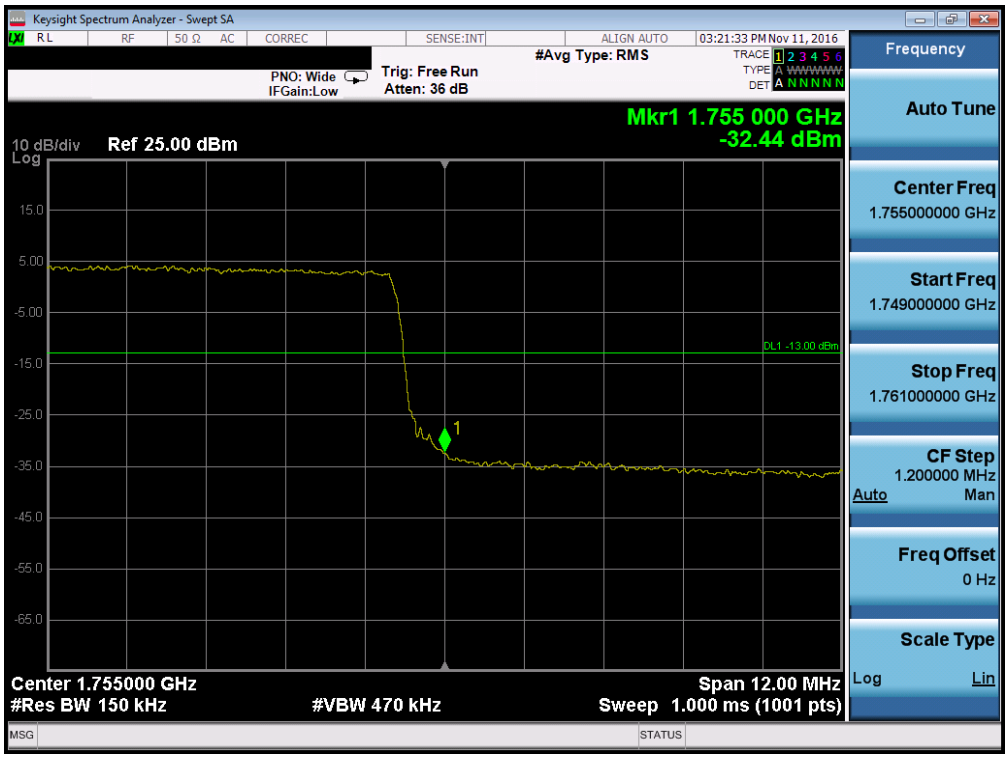


Plot 7-131. Lower Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)



Plot 7-132. Upper Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

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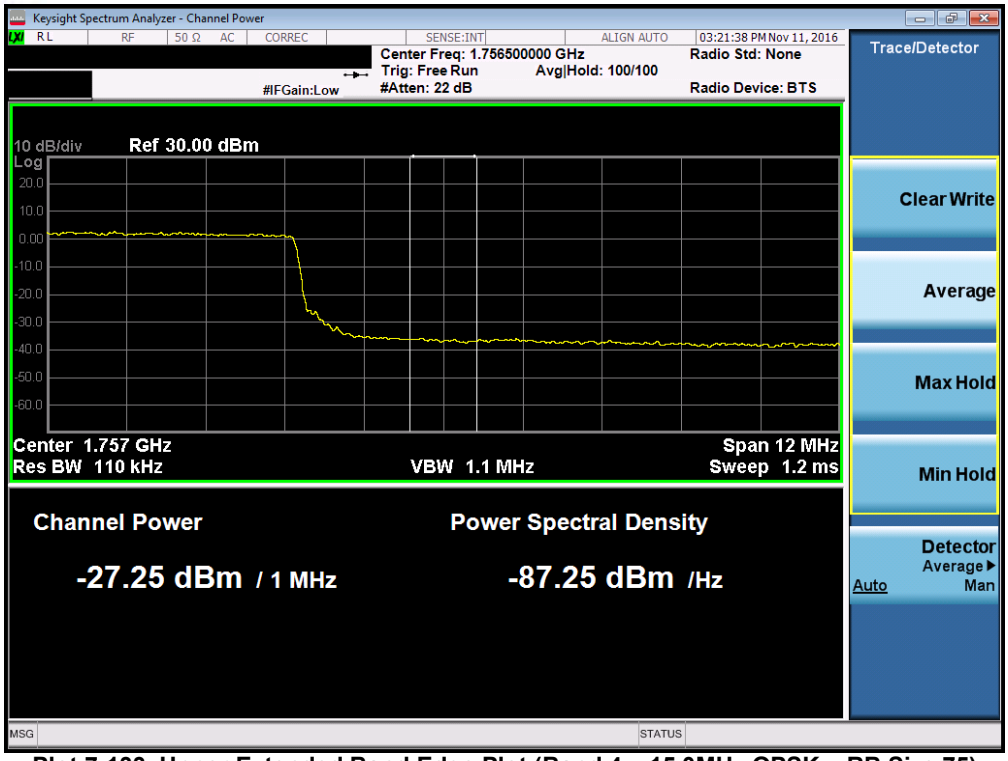
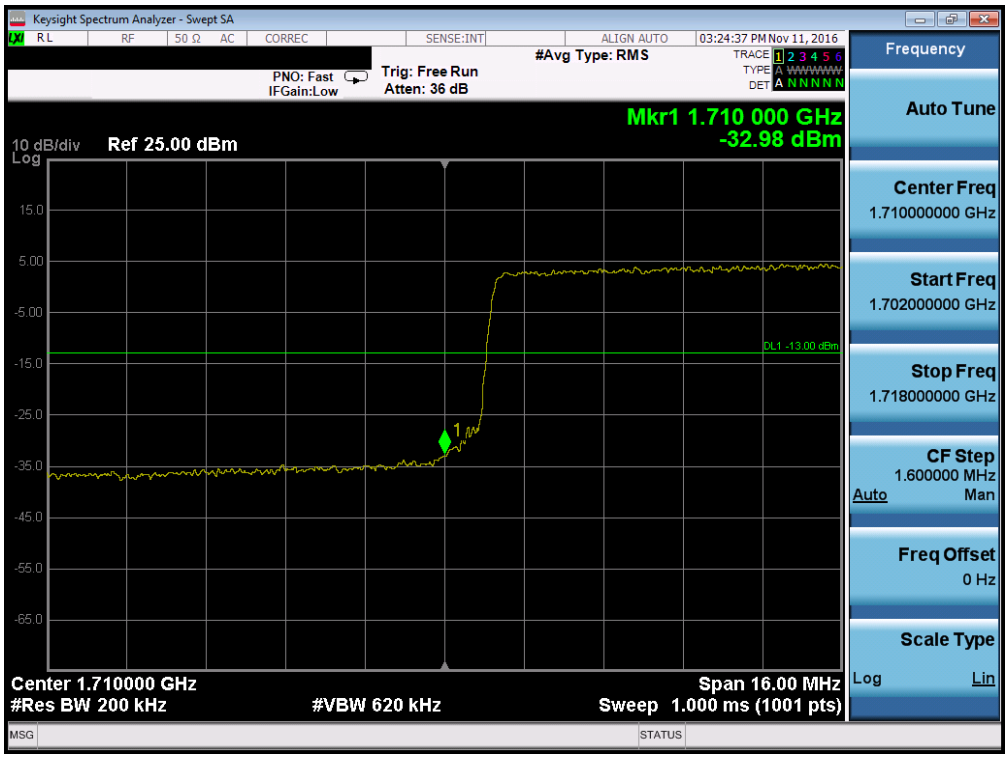


Plot 7-133. Upper Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)



Plot 7-134. Lower Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

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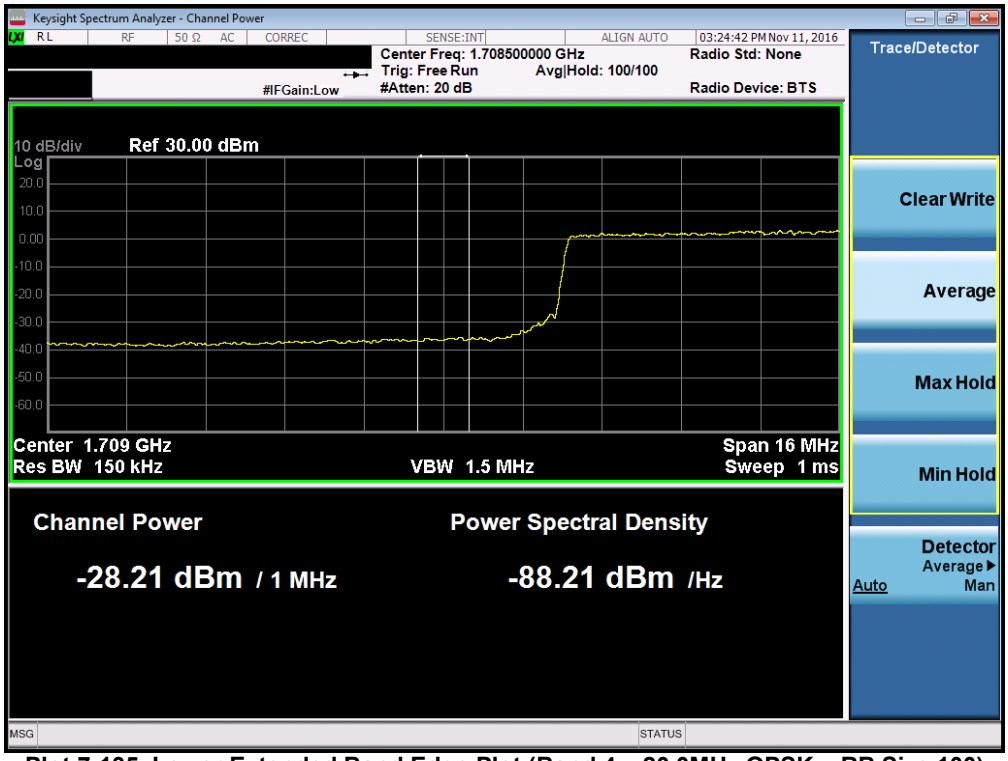
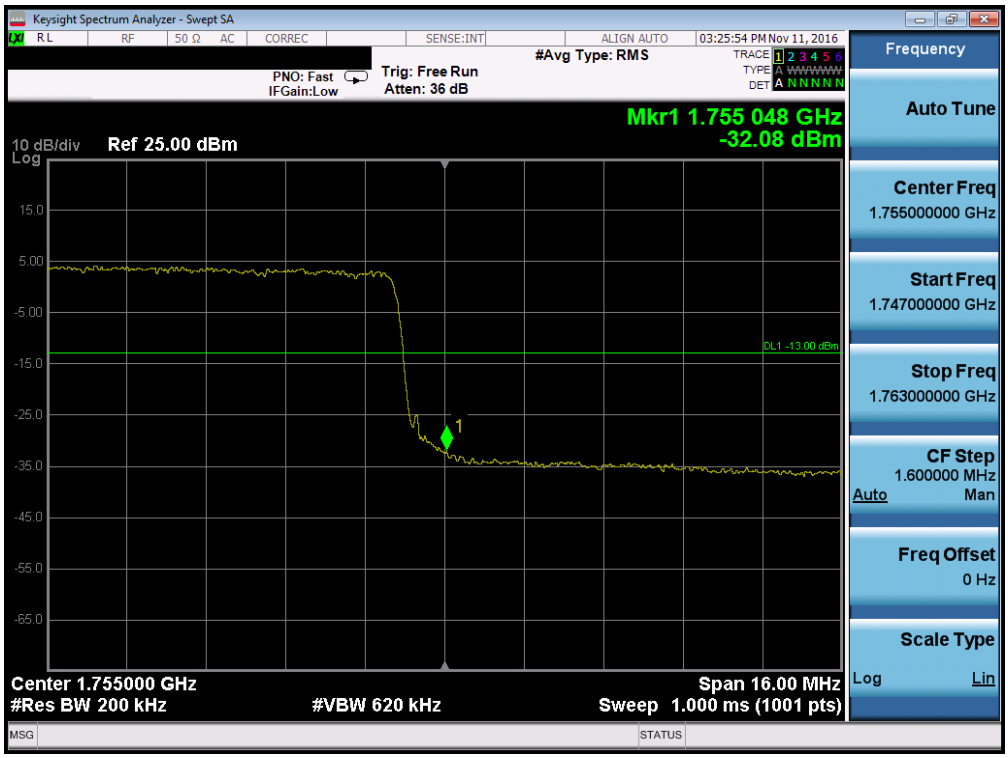


Plot 7-135. Lower Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



Plot 7-136. Upper Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

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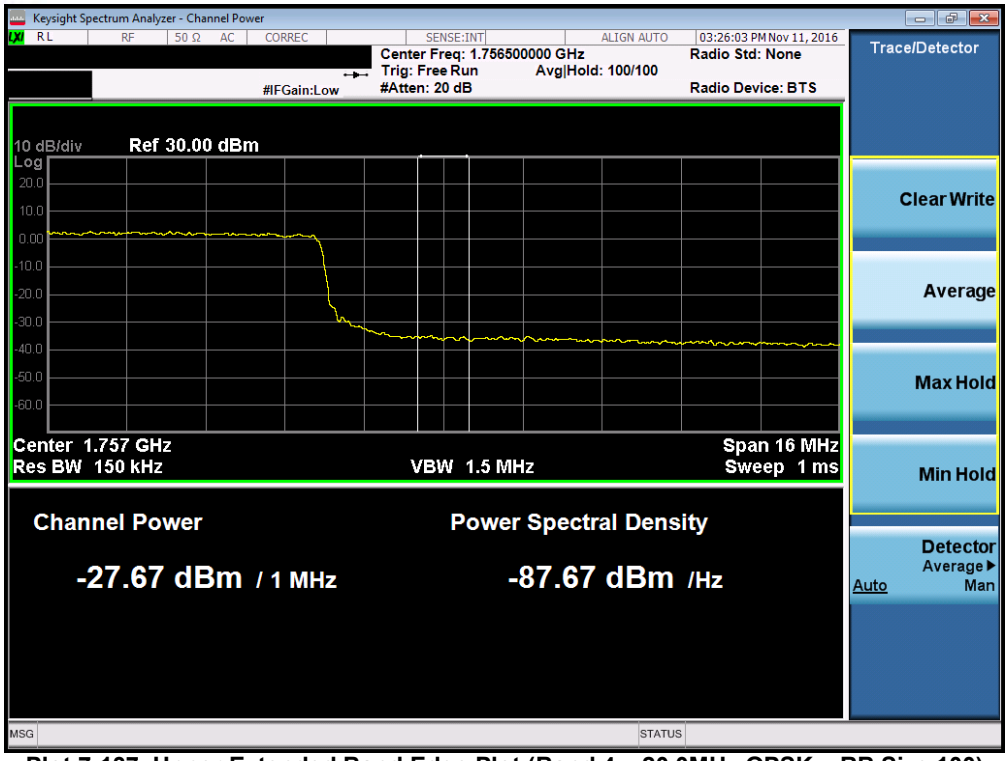
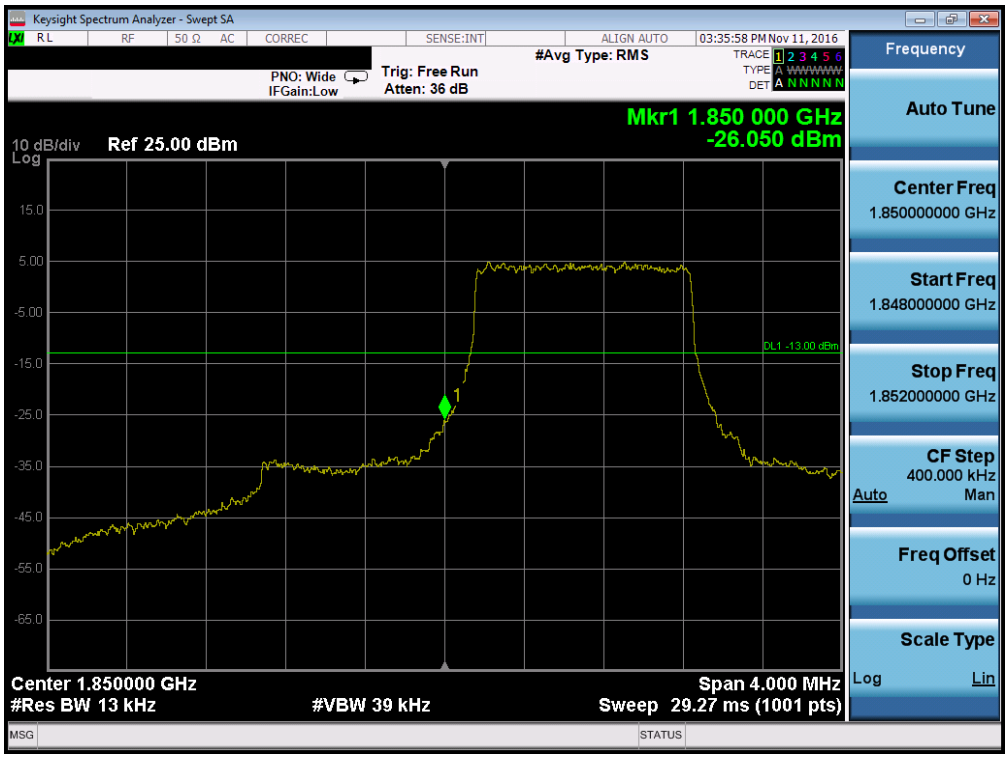


Plot 7-137. Upper Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



Plot 7-138. Lower Band Edge Plot (Band 25/2 – 1.4MHz QPSK – RB Size 6)

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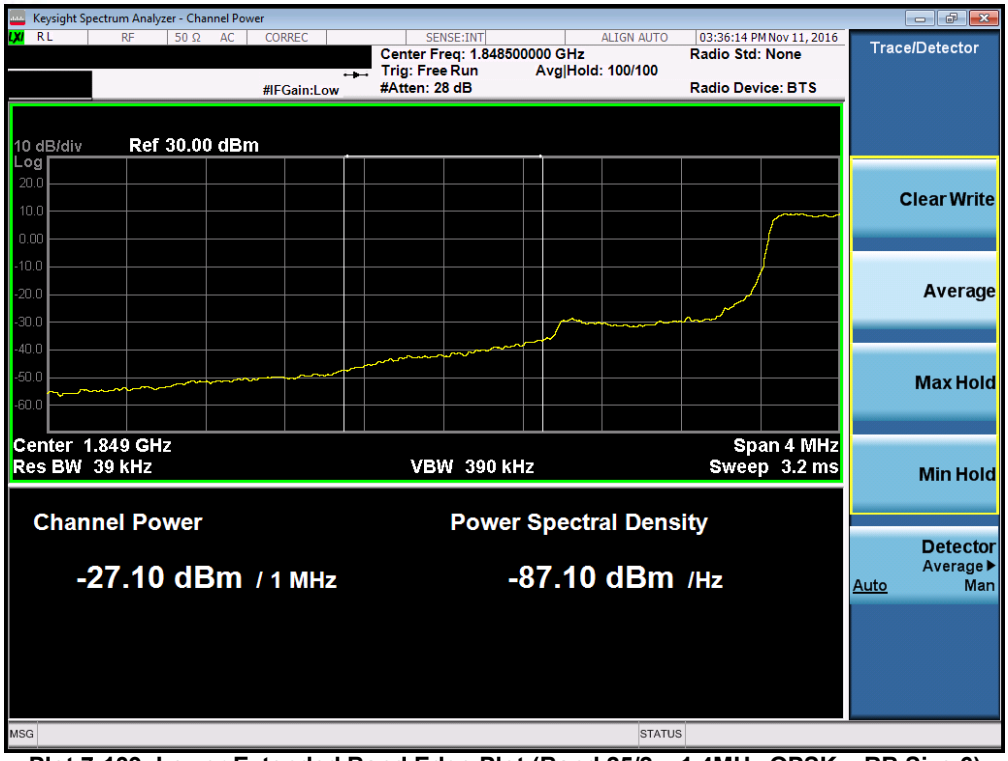
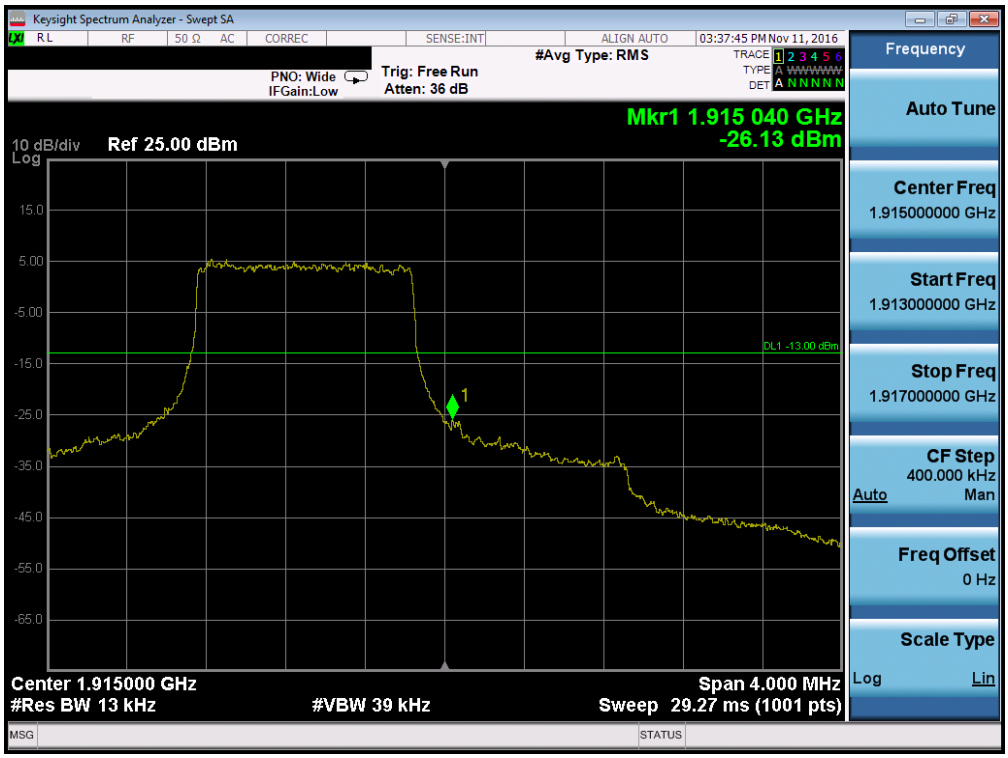


Plot 7-139. Lower Extended Band Edge Plot (Band 25/2 – 1.4MHz QPSK – RB Size 6)



Plot 7-140. Upper Band Edge Plot (Band 25/2 – 1.4MHz QPSK – RB Size 6)

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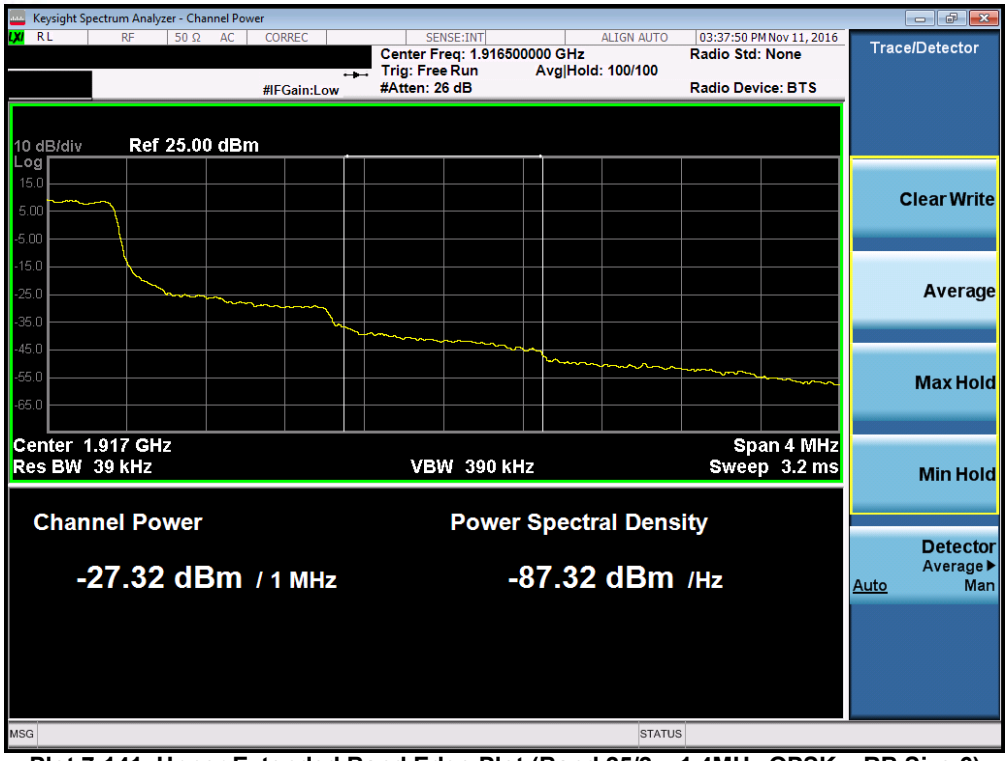
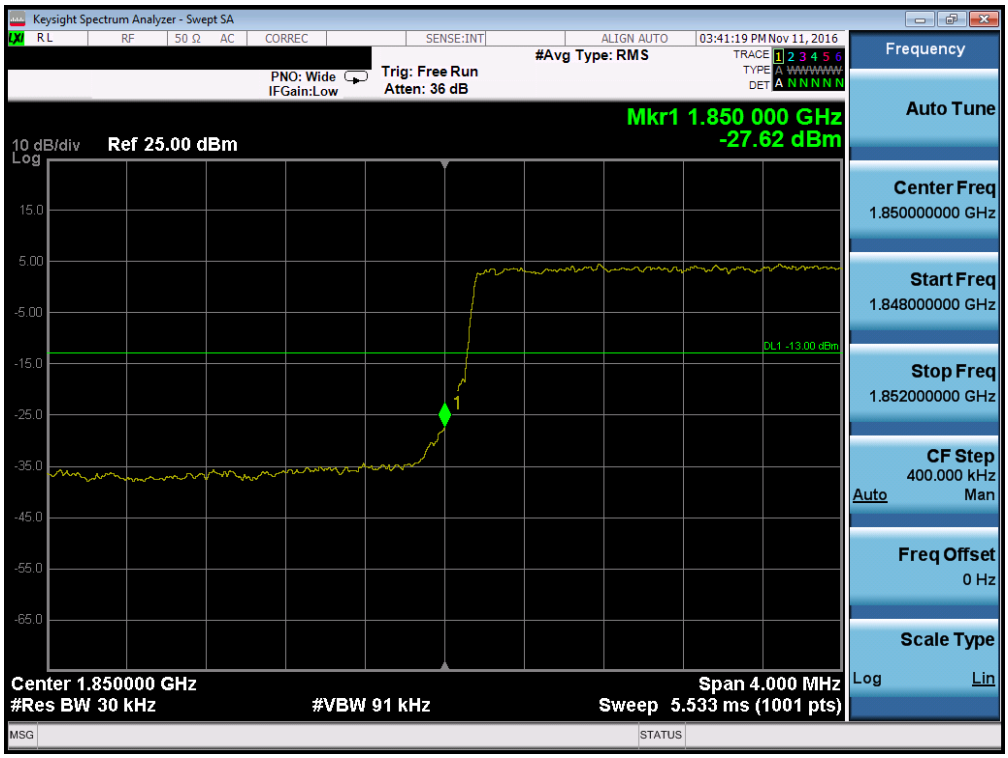


Plot 7-141. Upper Extended Band Edge Plot (Band 25/2 – 1.4MHz QPSK – RB Size 6)



Plot 7-142. Lower Band Edge Plot (Band 25/2 – 3.0MHz QPSK – RB Size 15)

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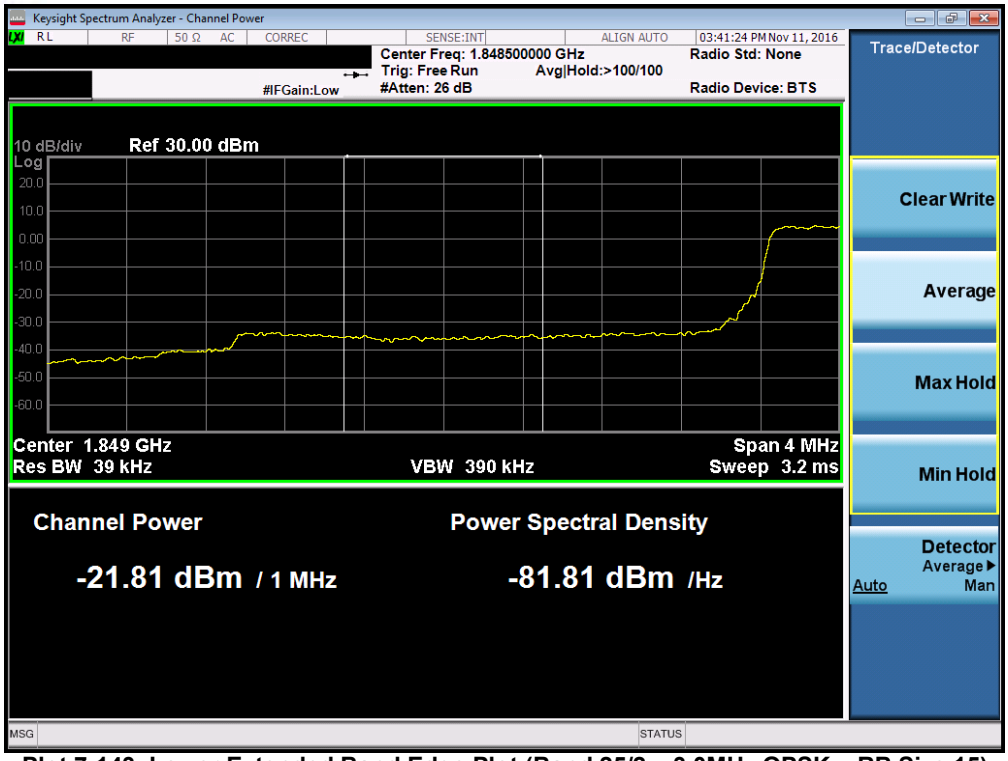
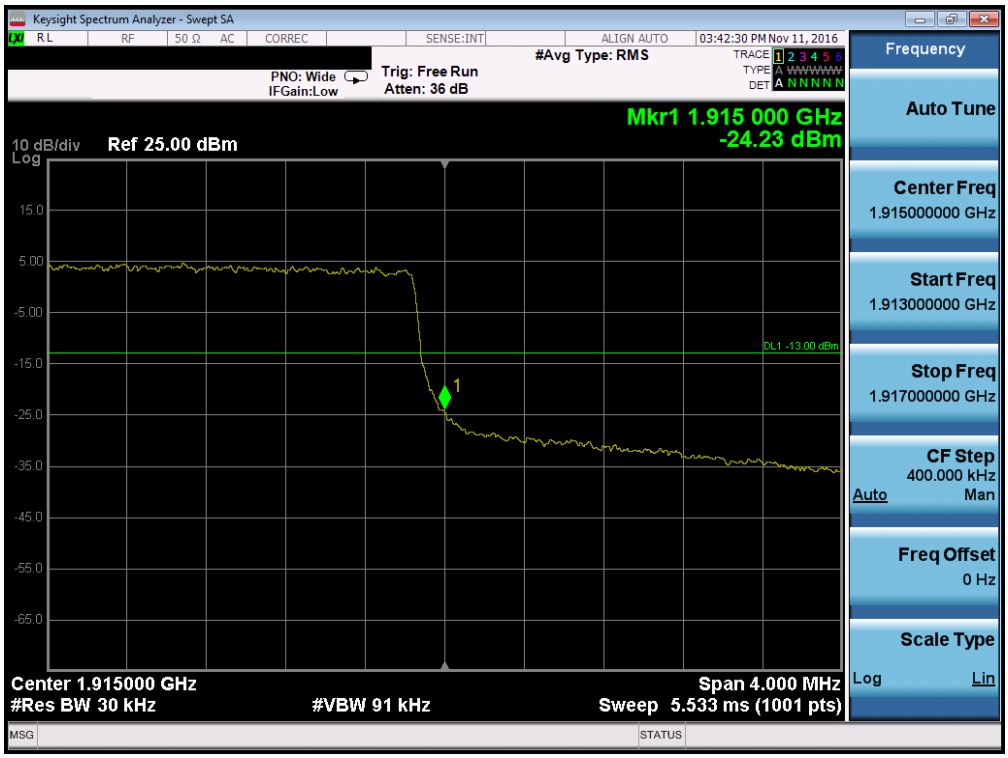


Plot 7-143. Lower Extended Band Edge Plot (Band 25/2 – 3.0MHz QPSK – RB Size 15)



Plot 7-144. Upper Band Edge Plot (Band 25/2 – 3.0MHz QPSK – RB Size 15)

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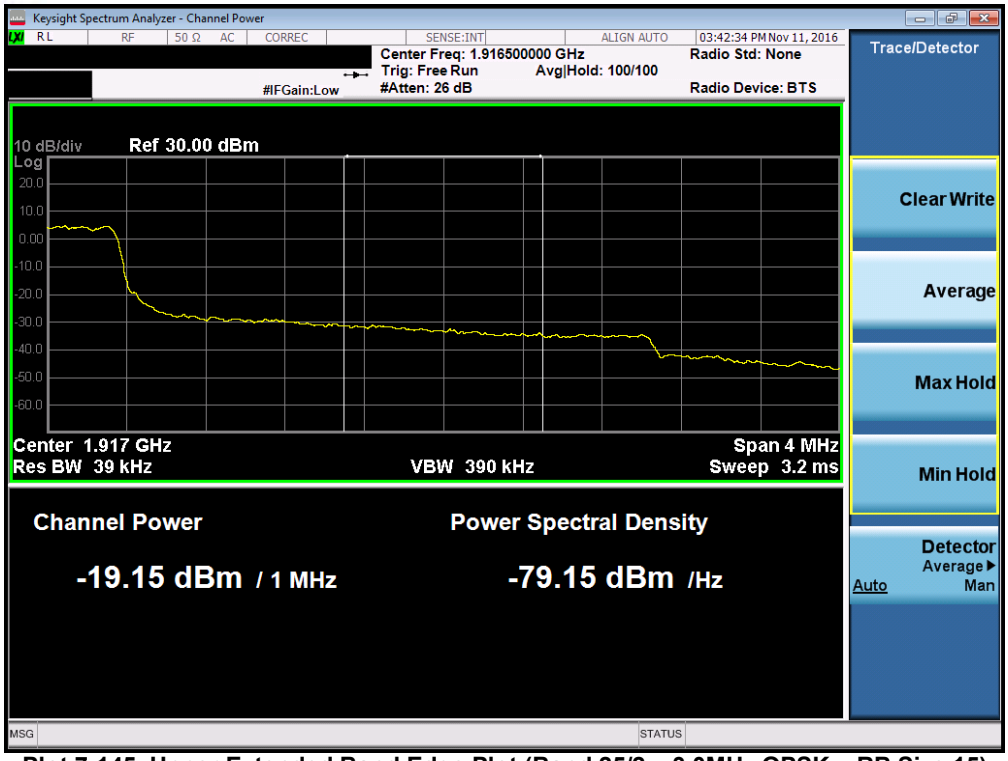
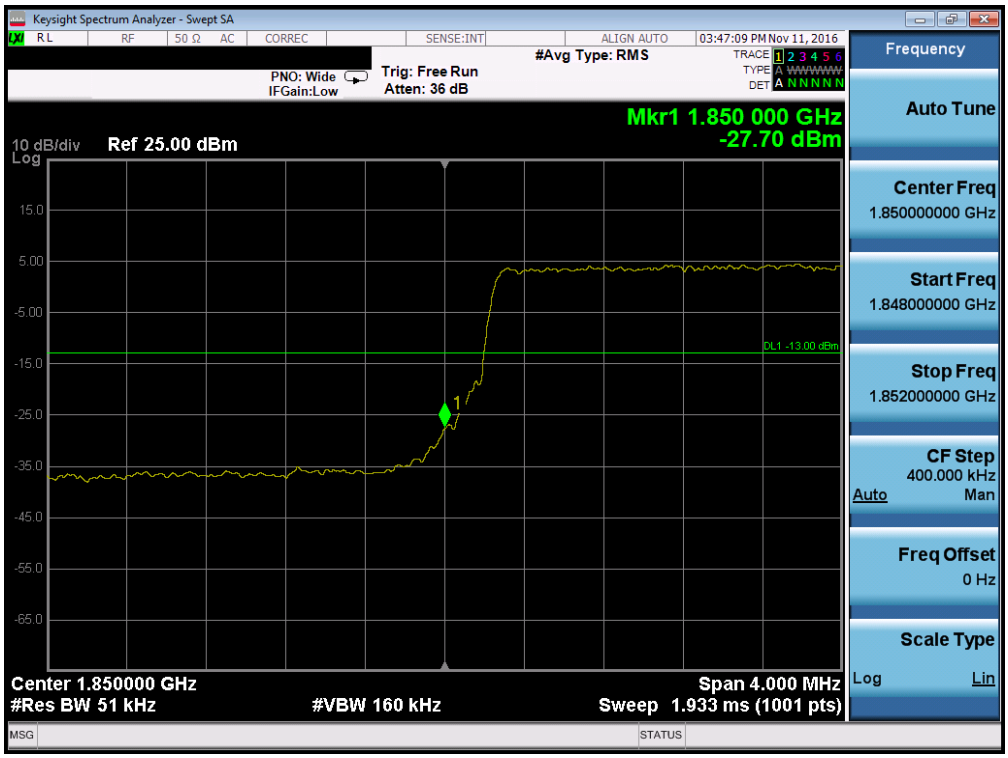


Plot 7-145. Upper Extended Band Edge Plot (Band 25/2 – 3.0MHz QPSK – RB Size 15)



Plot 7-146. Lower Band Edge Plot (Band 25/2 – 5.0MHz QPSK – RB Size 25)

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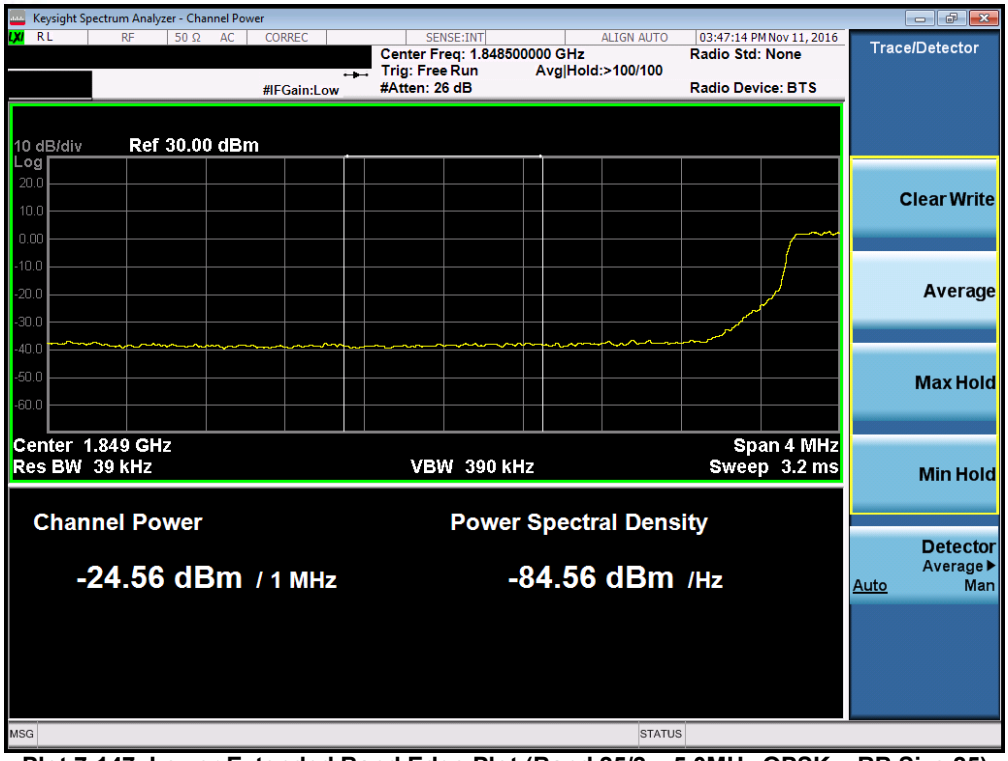
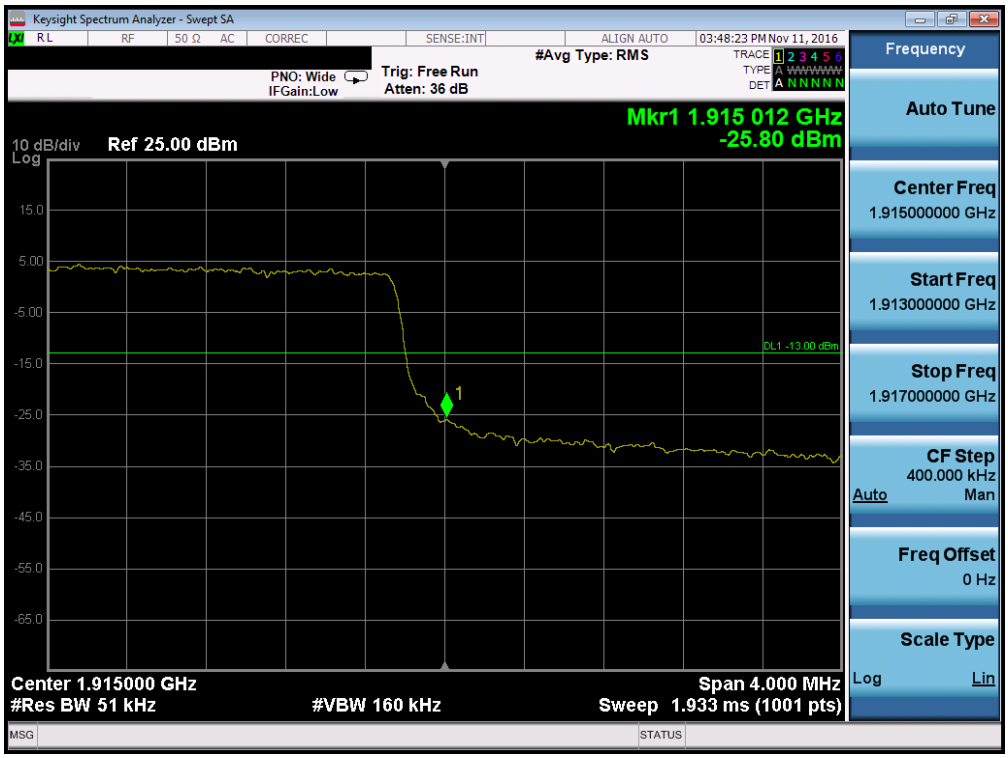


Plot 7-147. Lower Extended Band Edge Plot (Band 25/2 – 5.0MHz QPSK – RB Size 25)



Plot 7-148. Upper Band Edge Plot (Band 25/2 – 5.0MHz QPSK – RB Size 25)

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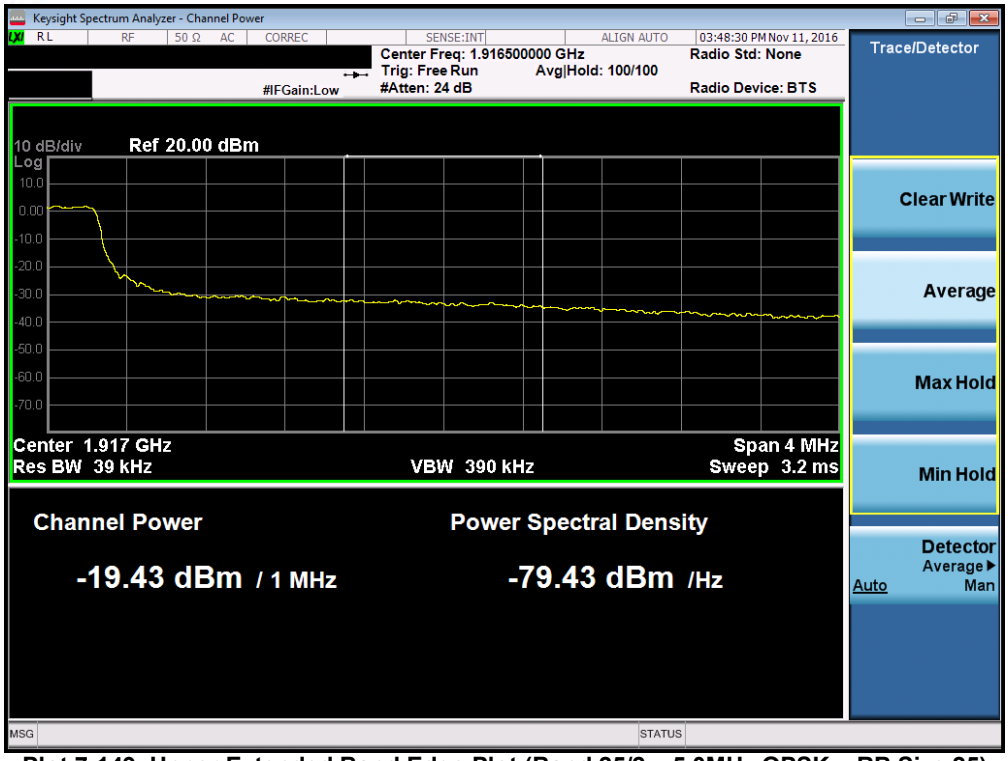
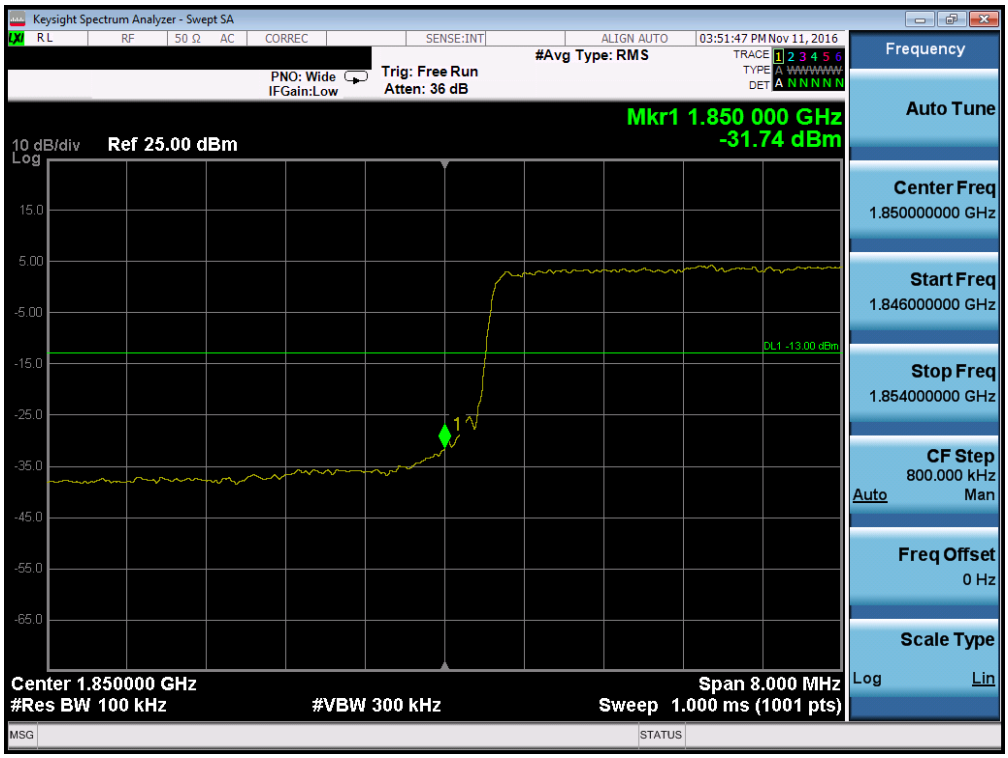


Plot 7-149. Upper Extended Band Edge Plot (Band 25/2 – 5.0MHz QPSK – RB Size 25)



Plot 7-150. Lower Band Edge Plot (Band 25/2 – 10.0MHz QPSK – RB Size 50)

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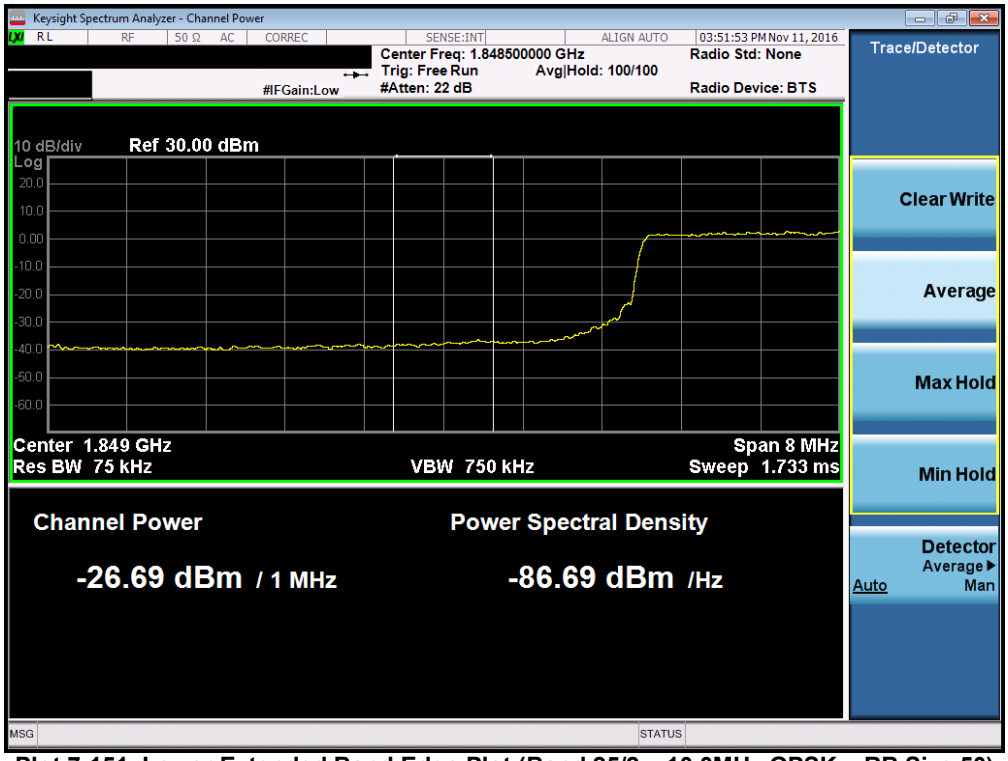
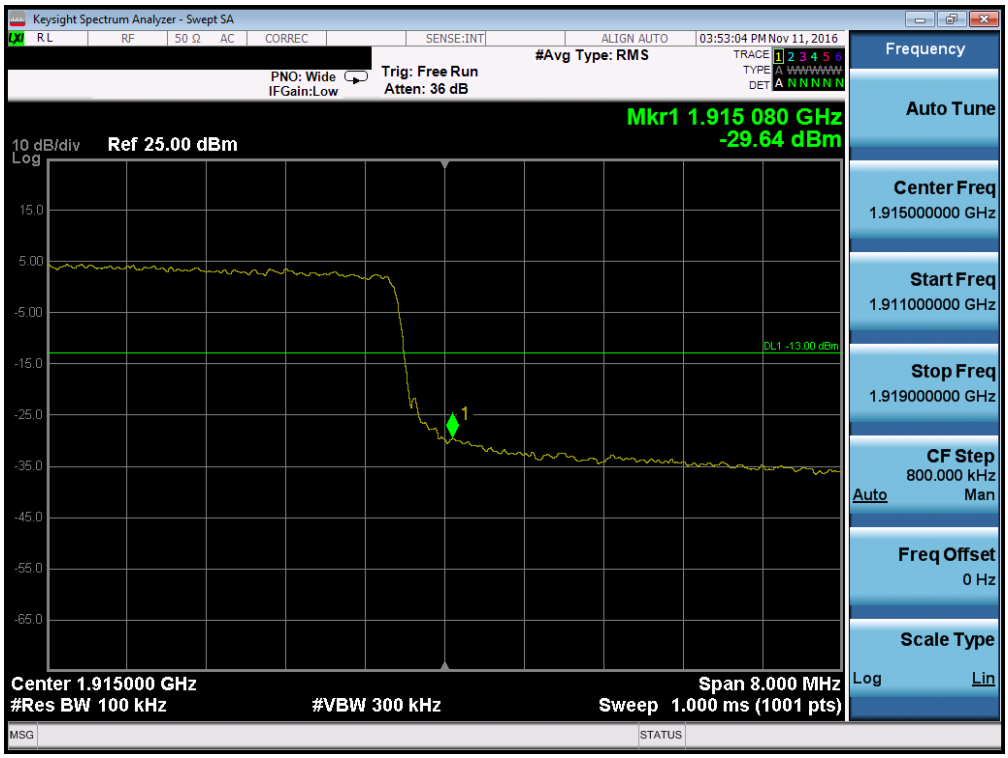


Plot 7-151. Lower Extended Band Edge Plot (Band 25/2 – 10.0MHz QPSK – RB Size 50)



Plot 7-152. Upper Band Edge Plot (Band 25/2 – 10.0MHz QPSK – RB Size 50)

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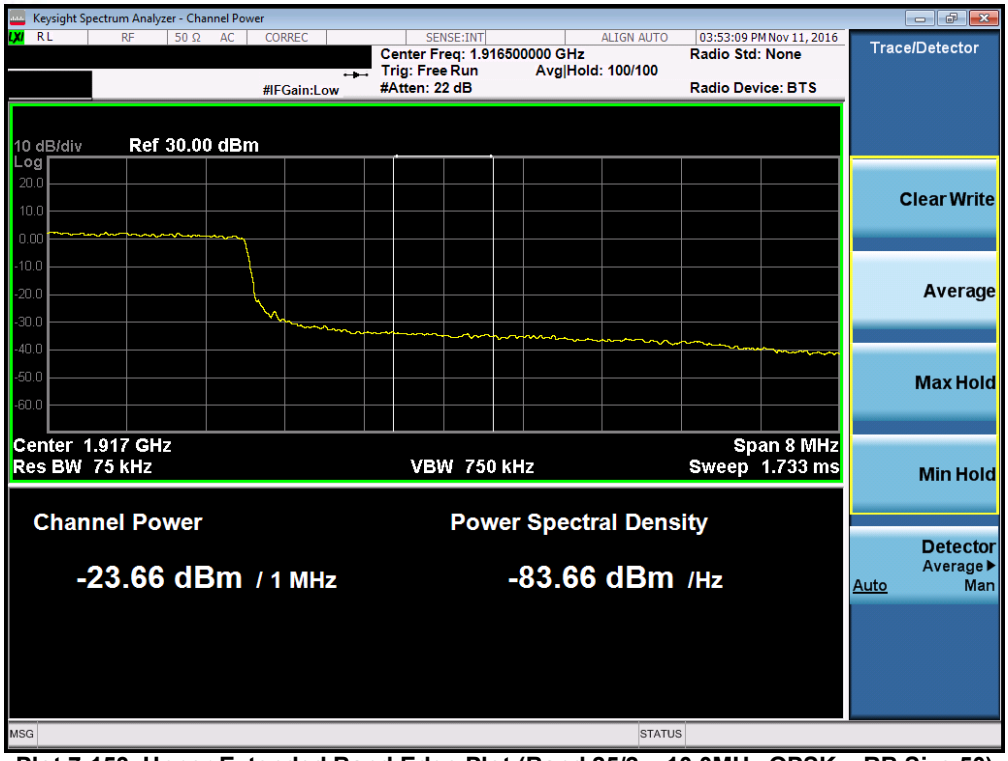
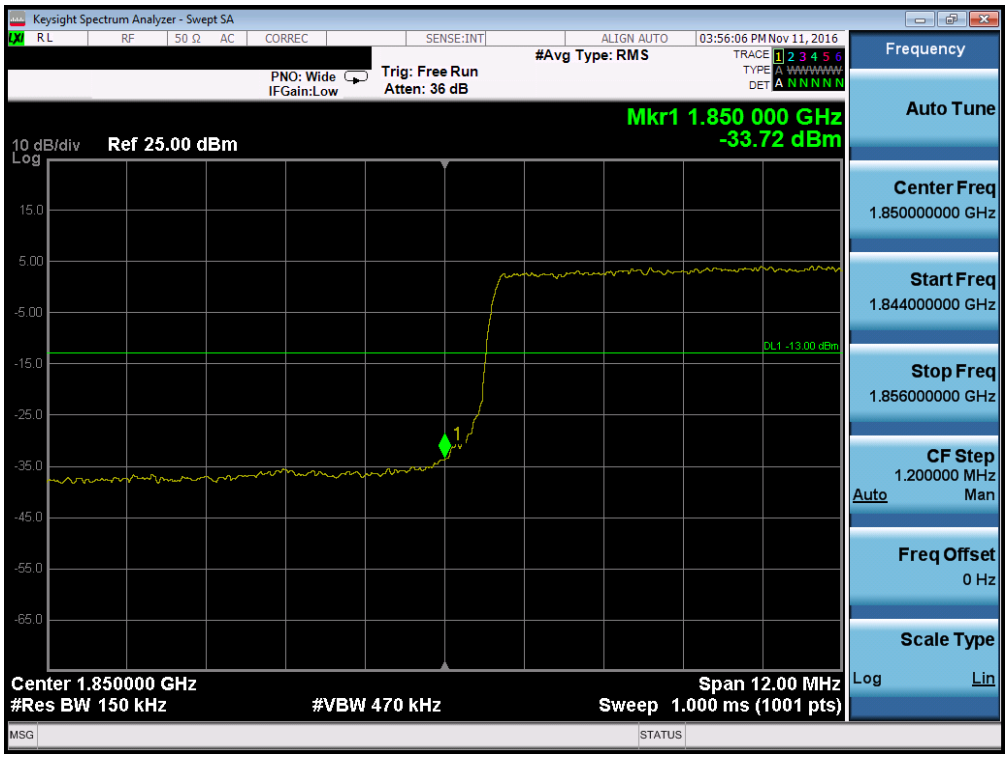


Plot 7-153. Upper Extended Band Edge Plot (Band 25/2 – 10.0MHz QPSK – RB Size 50)



Plot 7-154. Lower Band Edge Plot (Band 25/2 – 15.0MHz QPSK – RB Size 75)

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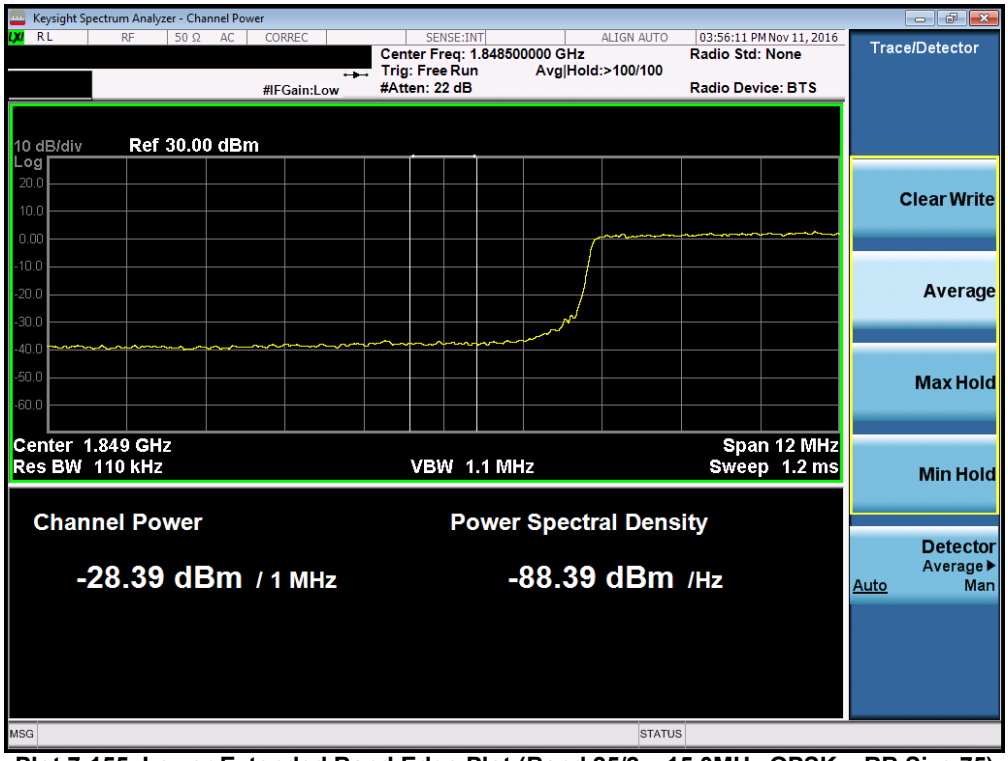
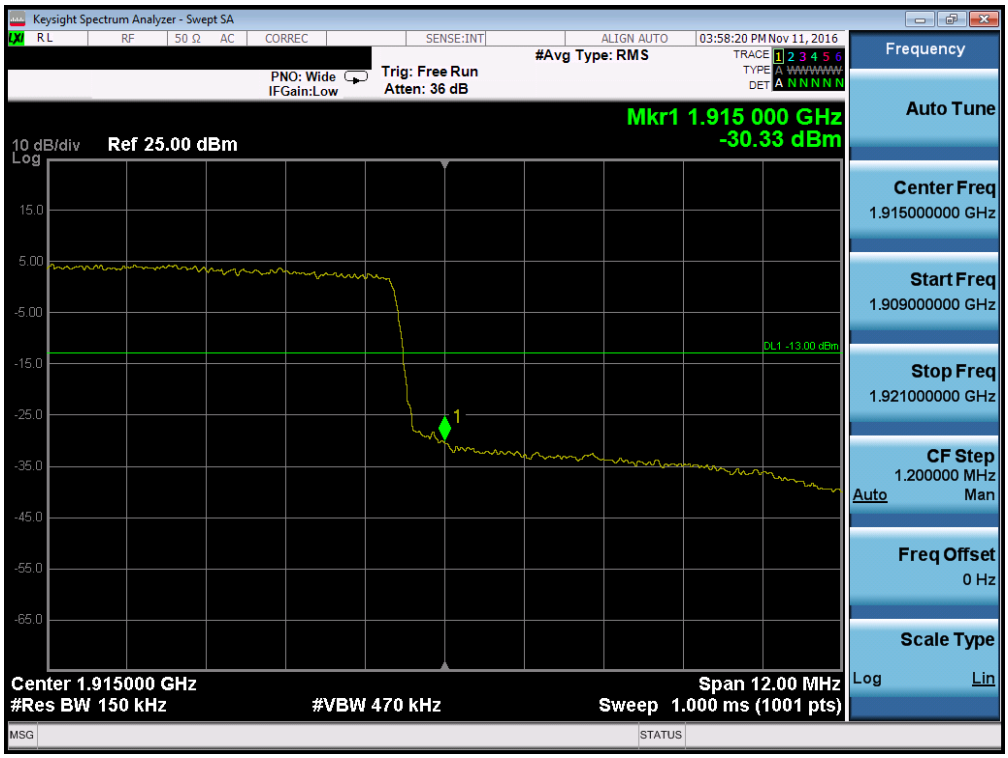


Plot 7-155. Lower Extended Band Edge Plot (Band 25/2 – 15.0MHz QPSK – RB Size 75)



Plot 7-156. Upper Band Edge Plot (Band 25/2 – 15.0MHz QPSK – RB Size 75)

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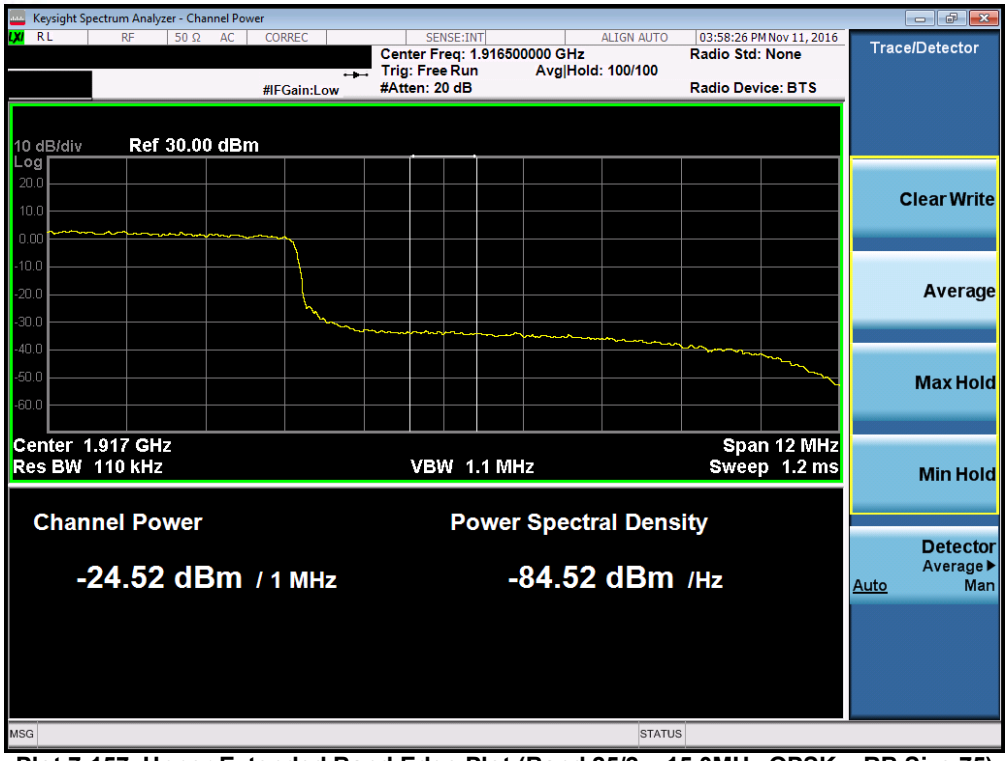
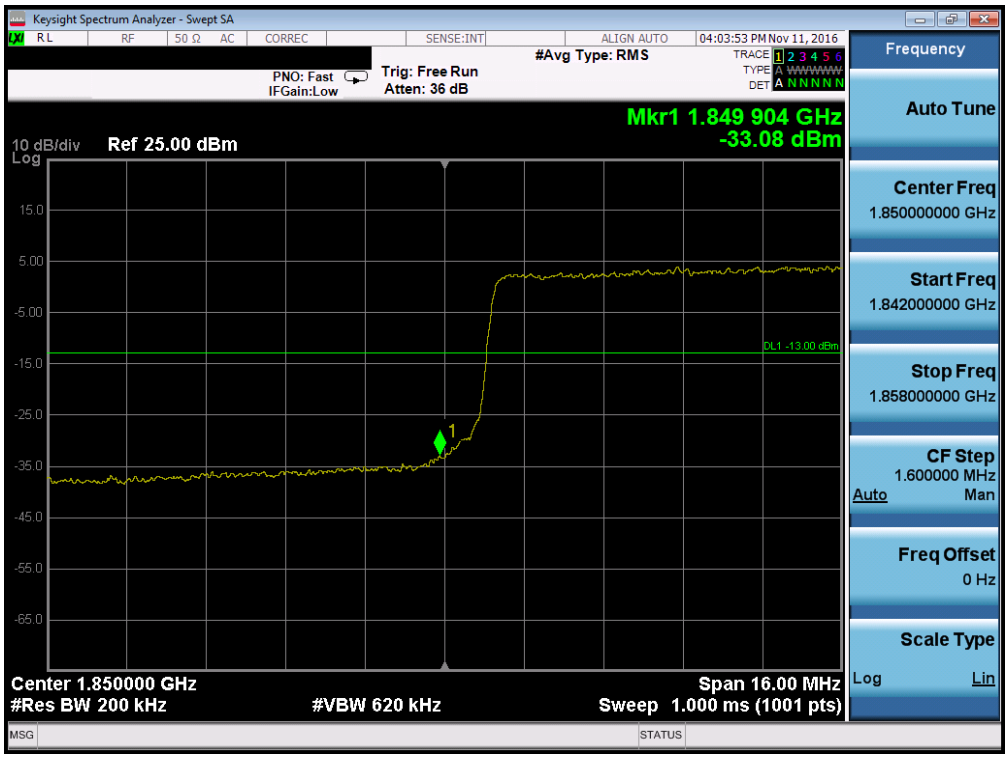


Plot 7-157. Upper Extended Band Edge Plot (Band 25/2 – 15.0MHz QPSK – RB Size 75)



Plot 7-158. Lower Band Edge Plot (Band 25/2 – 20.0MHz QPSK – RB Size 100)

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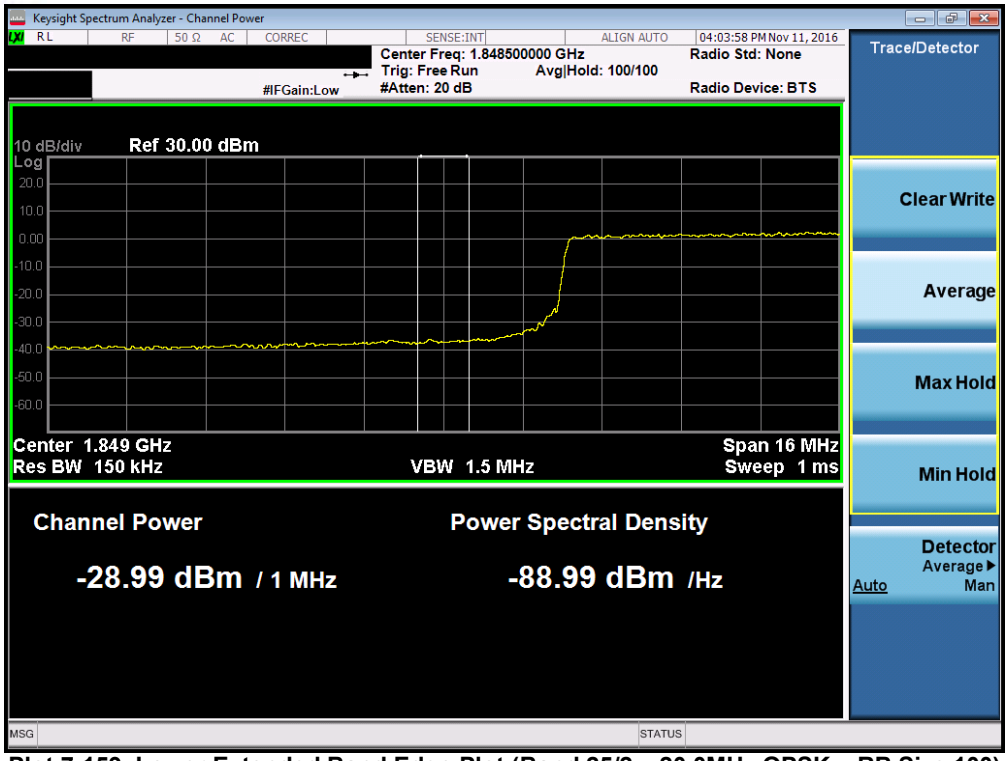
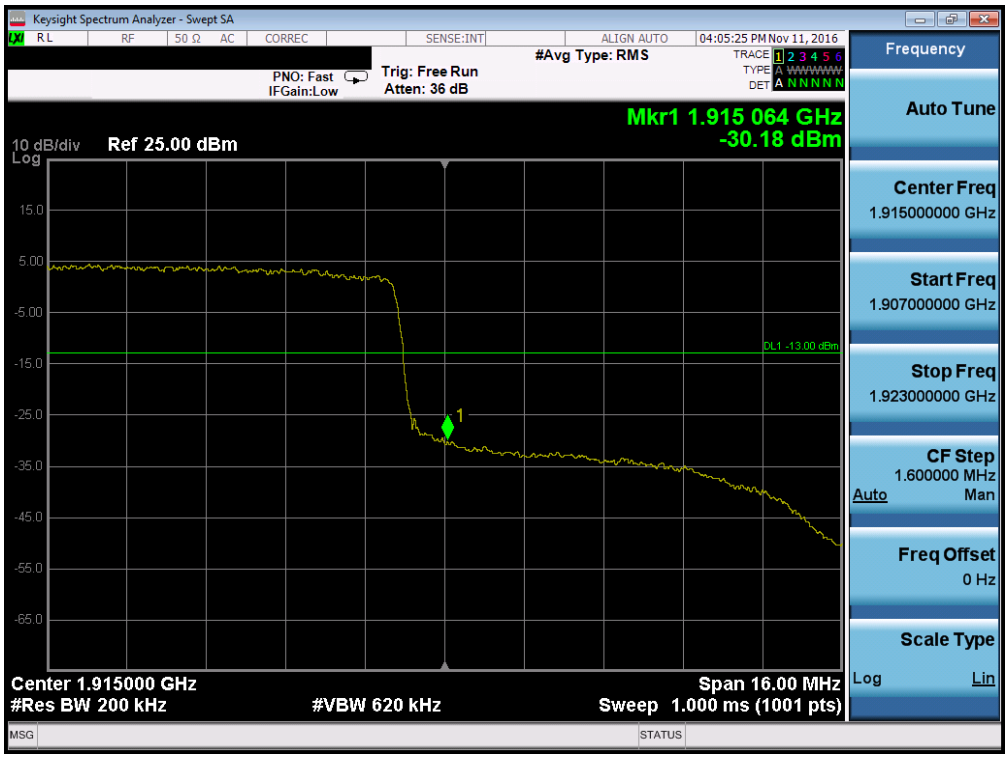


Plot 7-159. Lower Extended Band Edge Plot (Band 25/2 – 20.0MHz QPSK – RB Size 100)



Plot 7-160. Upper Band Edge Plot (Band 25/2 – 20.0MHz QPSK – RB Size 100)

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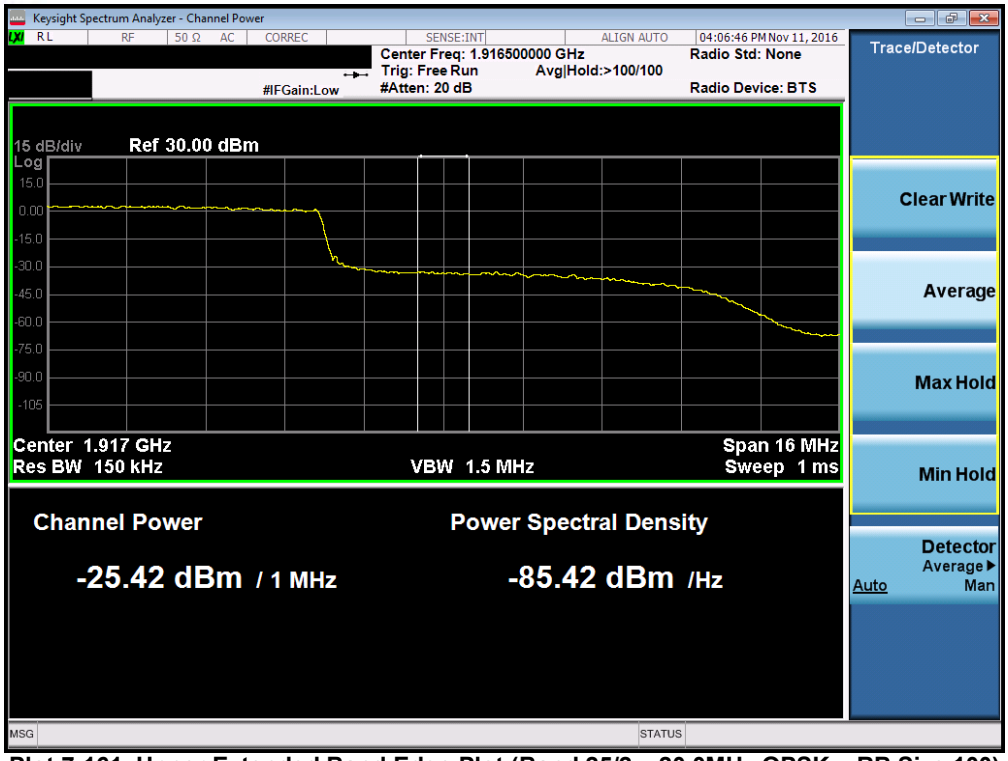
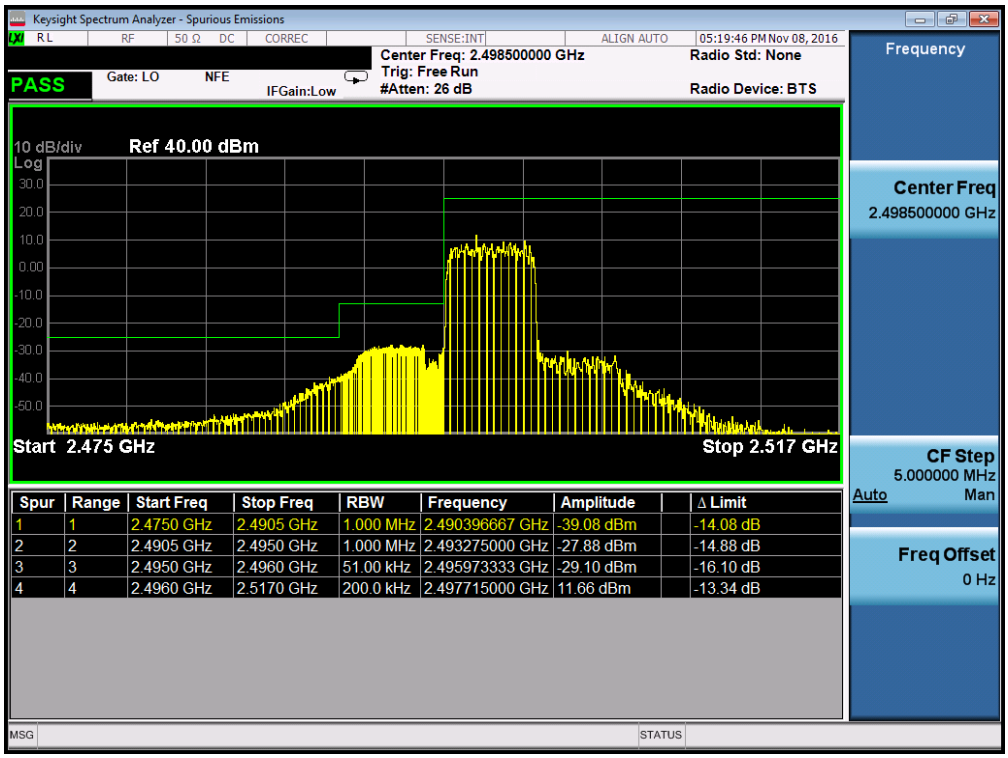


Plot 7-161. Upper Extended Band Edge Plot (Band 25/2 – 20.0MHz QPSK – RB Size 100)



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude		Δ Limit
1	1	2.4750 GHz	2.4905 GHz	1.000 MHz	2.490396667 GHz	-39.08 dBm		-14.08 dB
2	2	2.4905 GHz	2.4950 GHz	1.000 MHz	2.493275000 GHz	-27.88 dBm		-14.88 dB
3	3	2.4950 GHz	2.4960 GHz	51.00 kHz	2.495973333 GHz	-29.10 dBm		-16.10 dB
4	4	2.4960 GHz	2.5170 GHz	200.0 kHz	2.497715000 GHz	11.66 dBm		-13.34 dB

Plot 7-162. Lower ACP Plot (Band 41 – 5.0MHz QPSK – RB Size 25)

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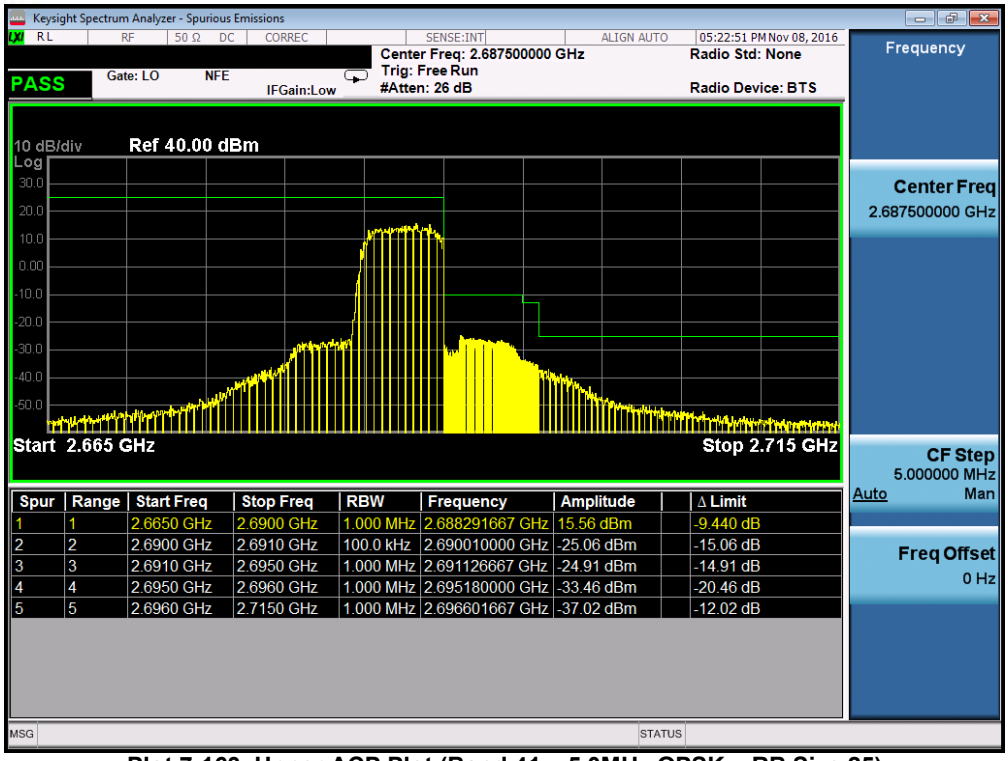
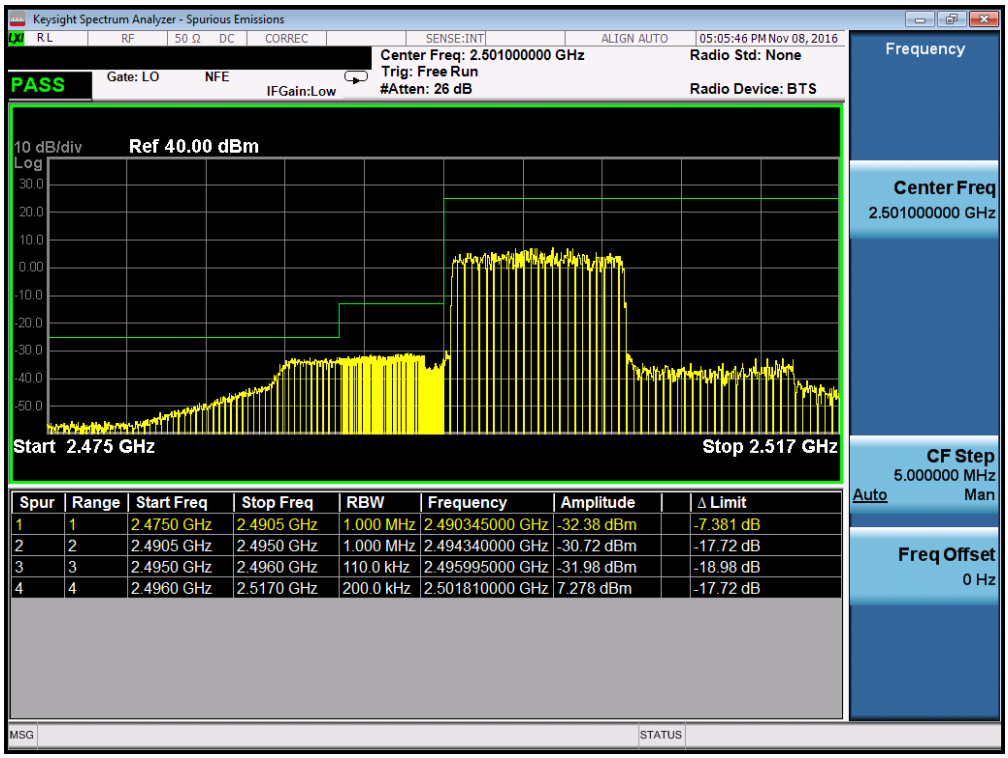


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.6650 GHz	2.6900 GHz	1.000 MHz	2.688291667 GHz	15.56 dBm	-9.440 dB
2	2	2.6900 GHz	2.6910 GHz	100.0 kHz	2.690010000 GHz	-25.06 dBm	-15.06 dB
3	3	2.6910 GHz	2.6950 GHz	1.000 MHz	2.691126667 GHz	-24.91 dBm	-14.91 dB
4	4	2.6950 GHz	2.6960 GHz	1.000 MHz	2.695180000 GHz	-33.46 dBm	-20.46 dB
5	5	2.6960 GHz	2.7150 GHz	1.000 MHz	2.696601667 GHz	-37.02 dBm	-12.02 dB

Plot 7-163. 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	2.490345000 GHz	-32.38 dBm	-7.381 dB
2	2	2.4905 GHz	2.4950 GHz	1.000 MHz	2.494340000 GHz	-30.72 dBm	-17.72 dB
3	3	2.4950 GHz	2.4960 GHz	110.0 kHz	2.495995000 GHz	-31.98 dBm	-18.98 dB
4	4	2.4960 GHz	2.5170 GHz	200.0 kHz	2.501810000 GHz	7.278 dBm	-17.72 dB

Plot 7-164. Lower ACP Plot (Band 41 – 10.0MHz QPSK – RB Size 50)

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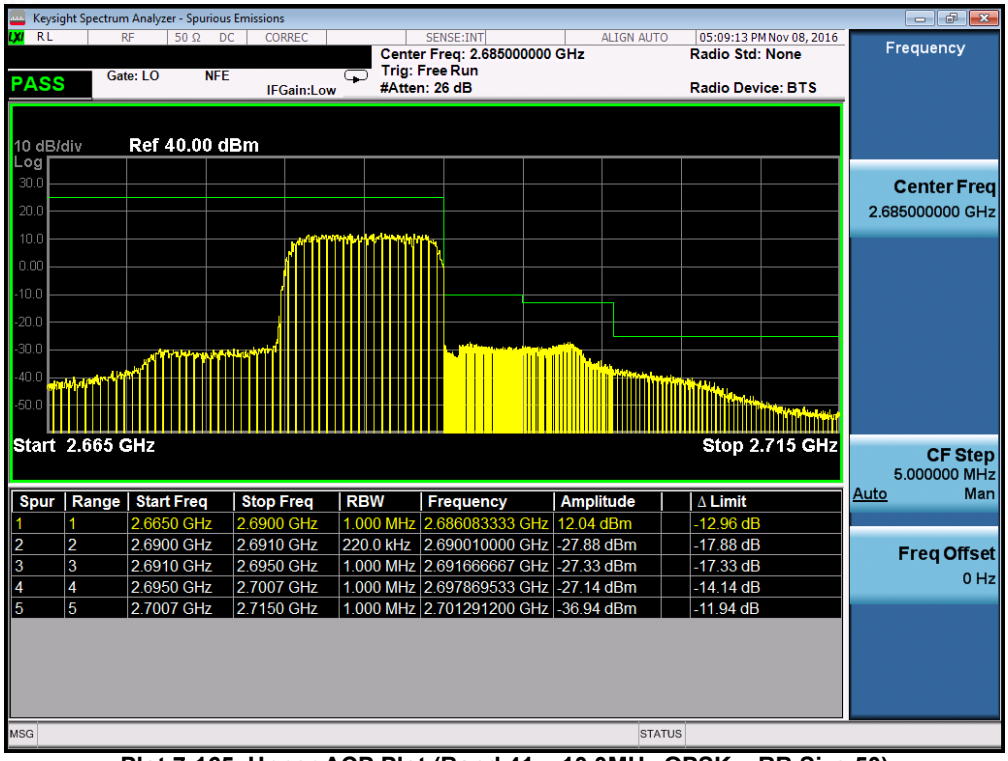
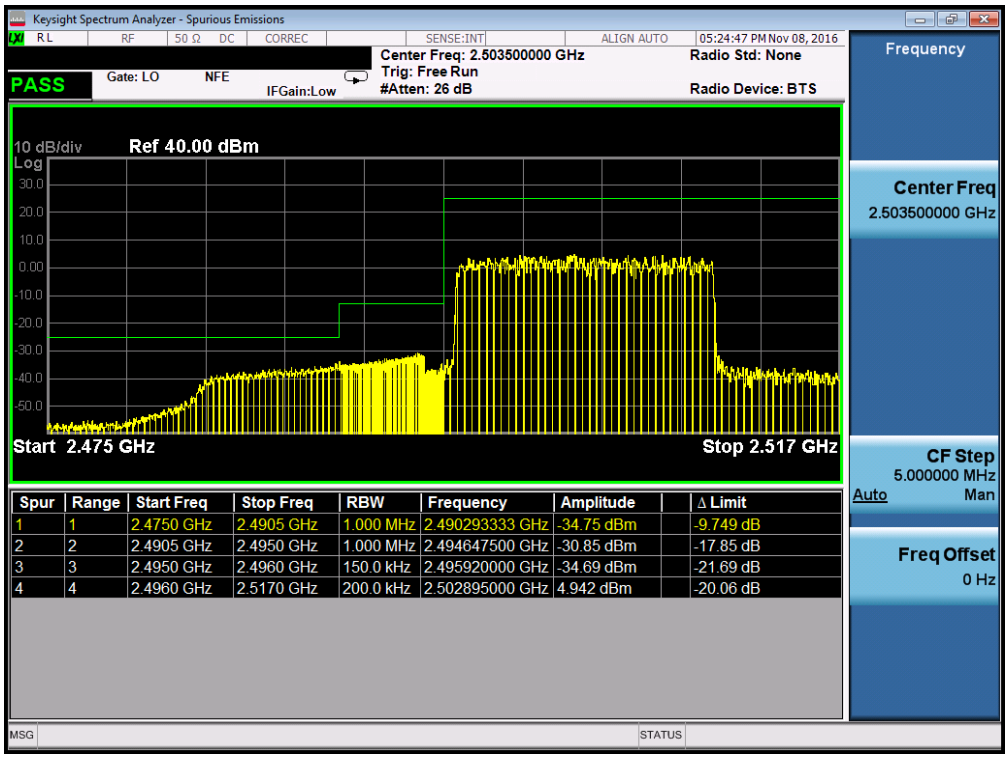


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude		Δ Limit
1	1	2.6650 GHz	2.6900 GHz	1.000 MHz	2.686083333 GHz	12.04 dBm		-12.96 dB
2	2	2.6900 GHz	2.6910 GHz	220.0 kHz	2.690010000 GHz	-27.88 dBm		-17.88 dB
3	3	2.6910 GHz	2.6950 GHz	1.000 MHz	2.691666667 GHz	-27.33 dBm		-17.33 dB
4	4	2.6950 GHz	2.7007 GHz	1.000 MHz	2.697869533 GHz	-27.14 dBm		-14.14 dB
5	5	2.7007 GHz	2.7150 GHz	1.000 MHz	2.701291200 GHz	-36.94 dBm		-11.94 dB

Plot 7-165. 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	2.490293333 GHz	-34.75 dBm		-9.749 dB
2	2	2.4905 GHz	2.4950 GHz	1.000 MHz	2.494647500 GHz	-30.85 dBm		-17.85 dB
3	3	2.4950 GHz	2.4960 GHz	150.0 kHz	2.495920000 GHz	-34.69 dBm		-21.69 dB
4	4	2.4960 GHz	2.5170 GHz	200.0 kHz	2.502895000 GHz	4.942 dBm		-20.06 dB

Plot 7-166. Lower ACP Plot (Band 41 – 15.0MHz QPSK – RB Size 75)

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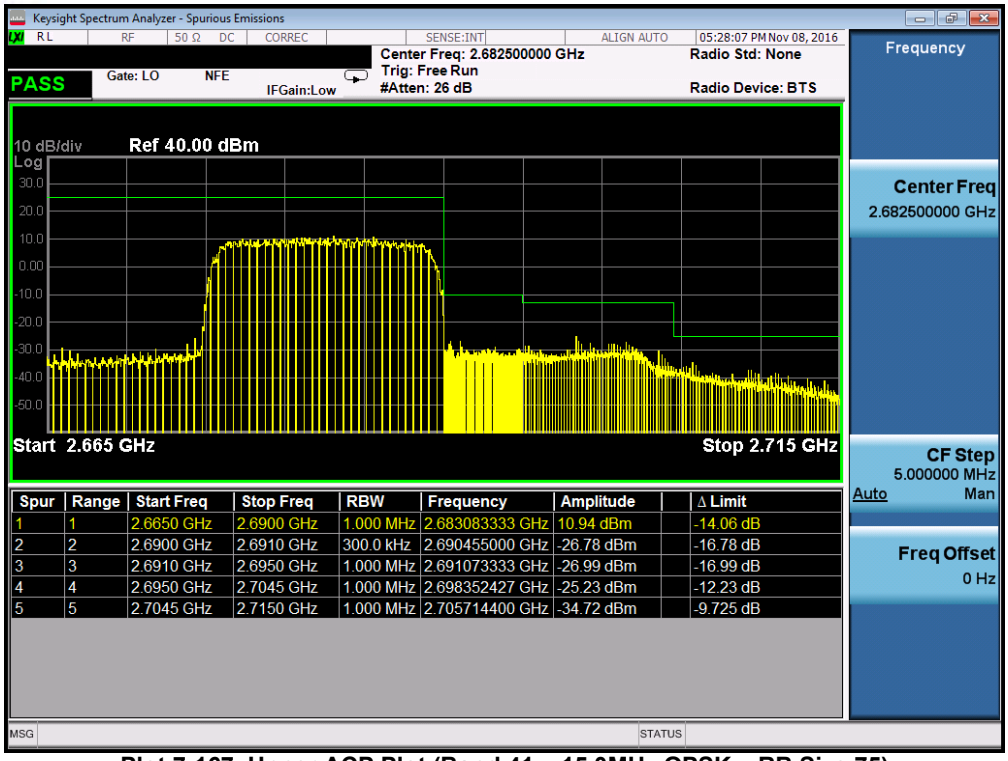
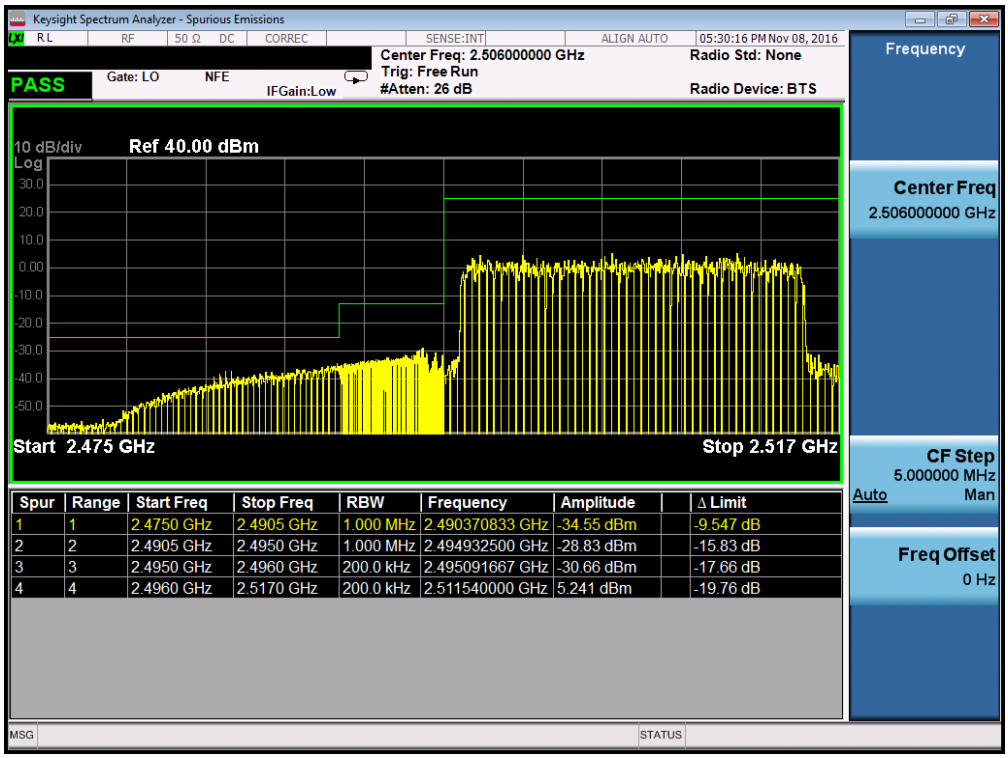


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude		Δ Limit
1	1	2.6650 GHz	2.6900 GHz	1.000 MHz	2.683083333 GHz	10.94 dBm		-14.06 dB
2	2	2.6900 GHz	2.6910 GHz	300.0 kHz	2.690455000 GHz	-26.78 dBm		-16.78 dB
3	3	2.6910 GHz	2.6950 GHz	1.000 MHz	2.691073333 GHz	-26.99 dBm		-16.99 dB
4	4	2.6950 GHz	2.7045 GHz	1.000 MHz	2.698352427 GHz	-25.23 dBm		-12.23 dB
5	5	2.7045 GHz	2.7150 GHz	1.000 MHz	2.705714400 GHz	-34.72 dBm		-9.725 dB

Plot 7-167. 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	2.490370833 GHz	-34.55 dBm		-9.547 dB
2	2	2.4905 GHz	2.4950 GHz	1.000 MHz	2.494932500 GHz	-28.83 dBm		-15.83 dB
3	3	2.4950 GHz	2.4960 GHz	200.0 kHz	2.495091667 GHz	-30.66 dBm		-17.66 dB
4	4	2.4960 GHz	2.5170 GHz	200.0 kHz	2.511540000 GHz	5.241 dBm		-19.76 dB

Plot 7-168. 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	2.675958333 GHz	9.940 dBm		-15.06 dB
2	2	2.6900 GHz	2.6910 GHz	390.0 kHz	2.690013333 GHz	-31.89 dBm		-21.89 dB
3	3	2.6910 GHz	2.6950 GHz	1.000 MHz	2.693980000 GHz	-30.63 dBm		-20.63 dB
4	4	2.6950 GHz	2.7096 GHz	1.000 MHz	2.705367560 GHz	-30.28 dBm		-17.28 dB
5	5	2.7096 GHz	2.7150 GHz	1.000 MHz	2.709694747 GHz	-38.61 dBm		-13.61 dB

Plot 7-169. 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.

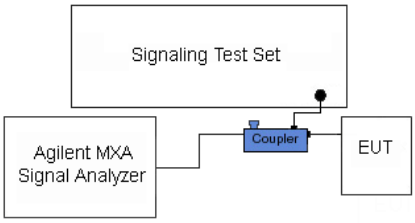

Figure 7-4. Test Instrument & Measurement Setup

Test Notes

None.

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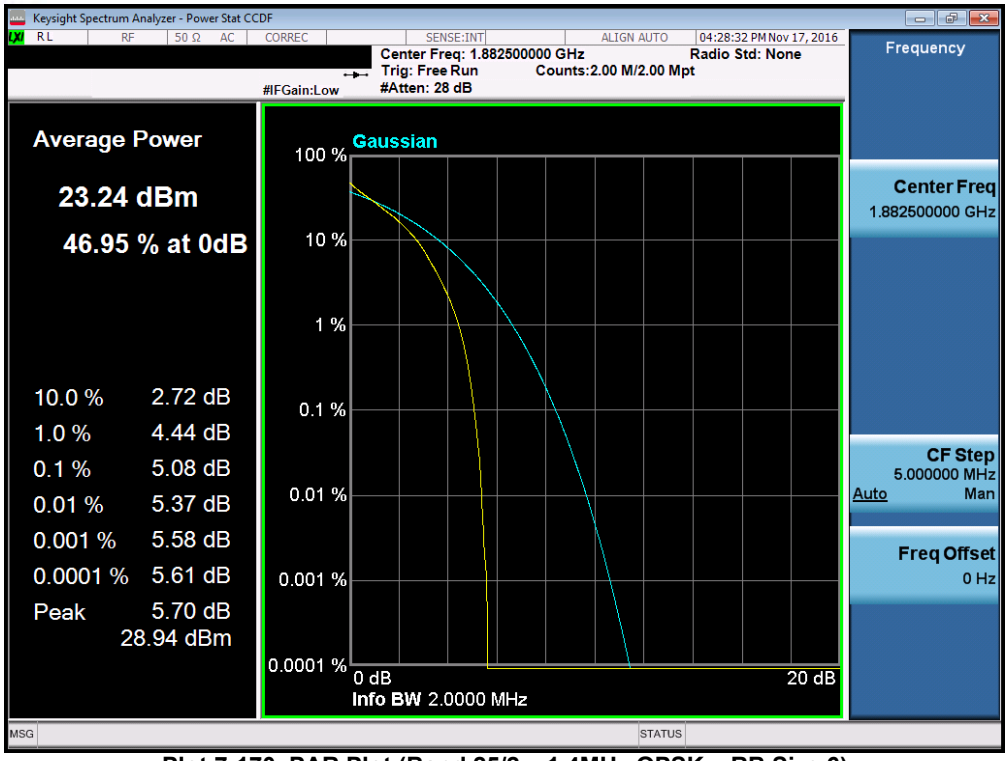
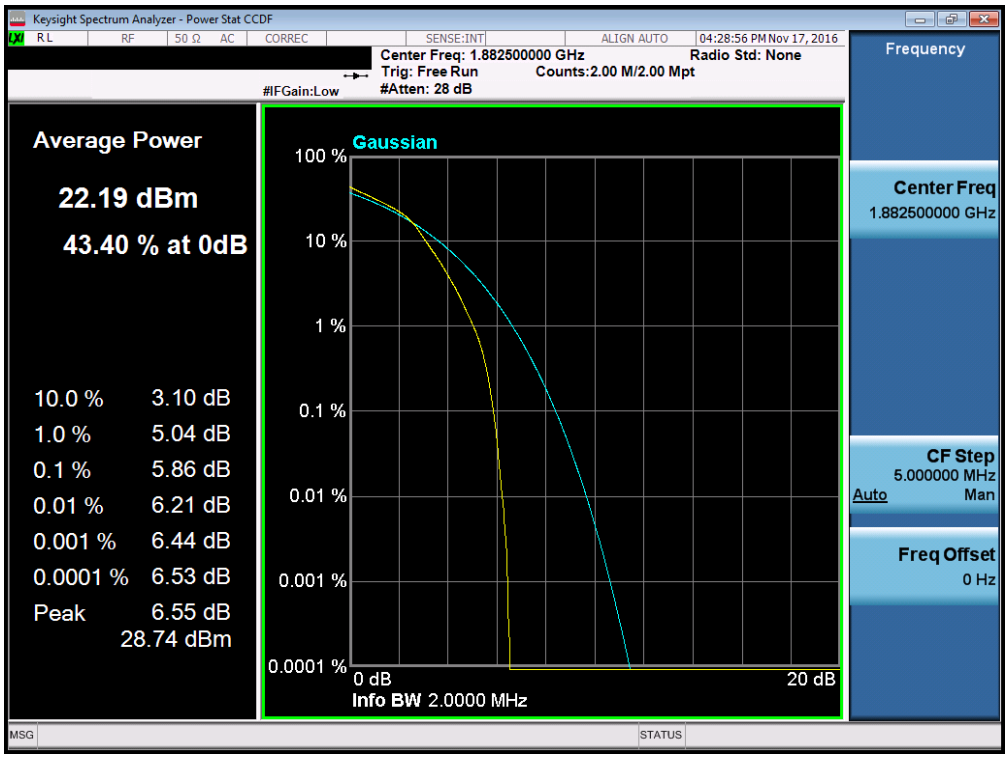


Plot 7-170. PAR Plot (Band 25/2 – 1.4MHz QPSK – RB Size 6)



Plot 7-171. PAR Plot (Band 25/2 – 1.4MHz 16-QAM – RB Size 6)

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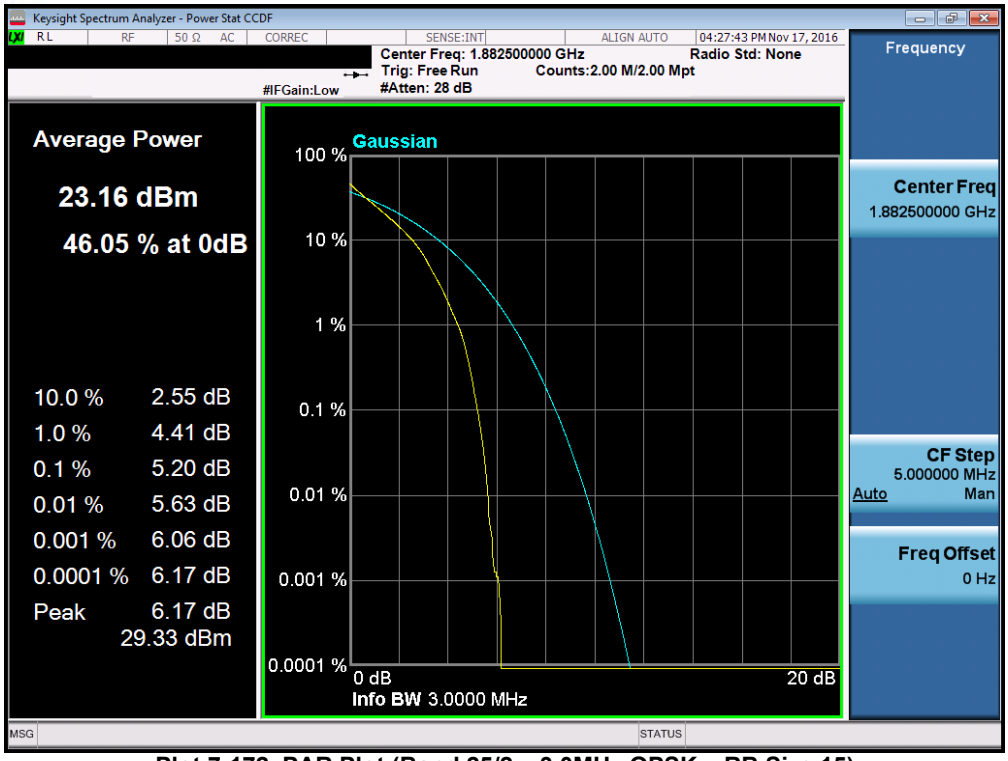
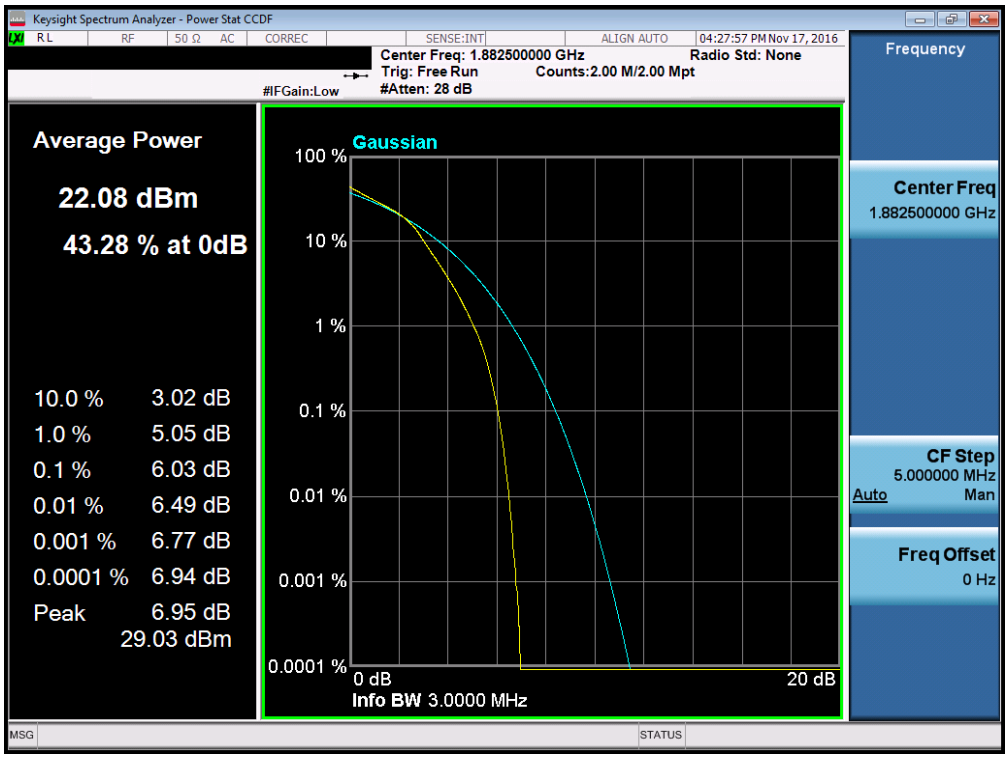


Plot 7-172. PAR Plot (Band 25/2 – 3.0MHz QPSK – RB Size 15)



Plot 7-173. PAR Plot (Band 25/2 – 3.0MHz 16-QAM – RB Size 15)

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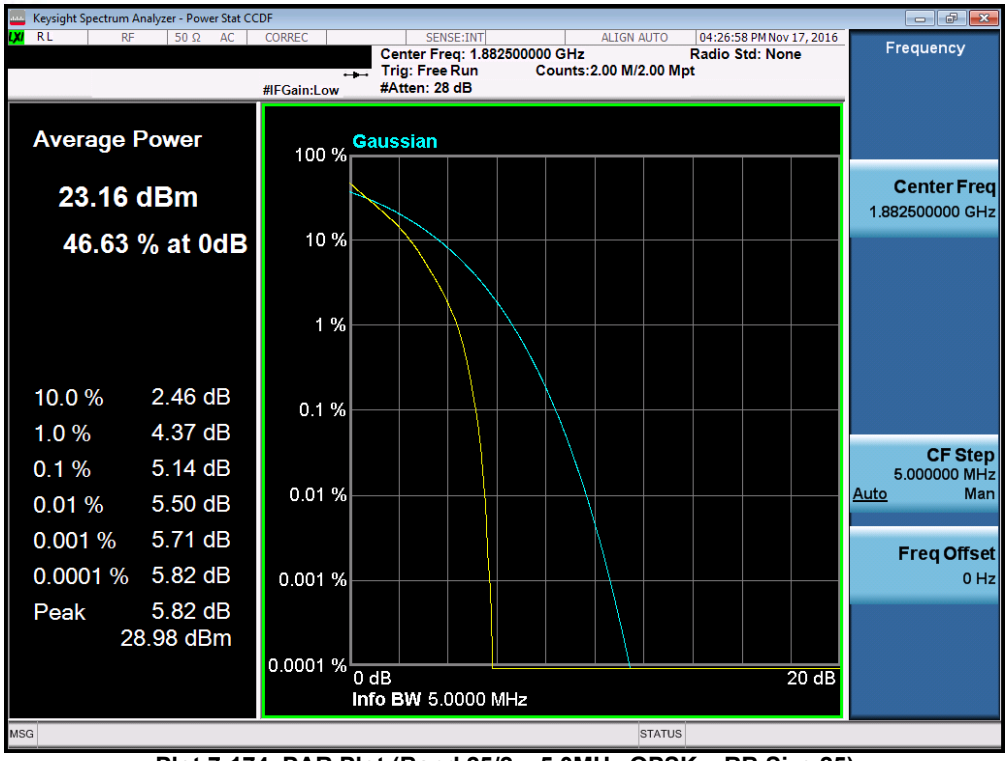
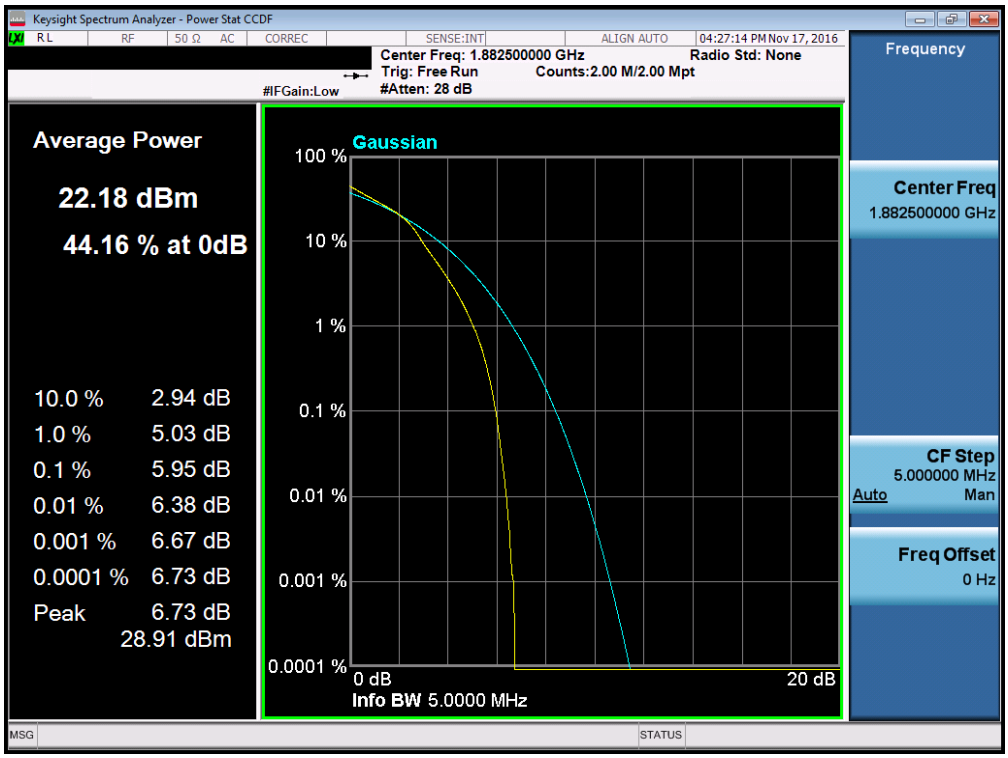


Plot 7-174. PAR Plot (Band 25/2 – 5.0MHz QPSK – RB Size 25)



Plot 7-175. PAR Plot (Band 25/2 – 5.0MHz 16-QAM – RB Size 25)

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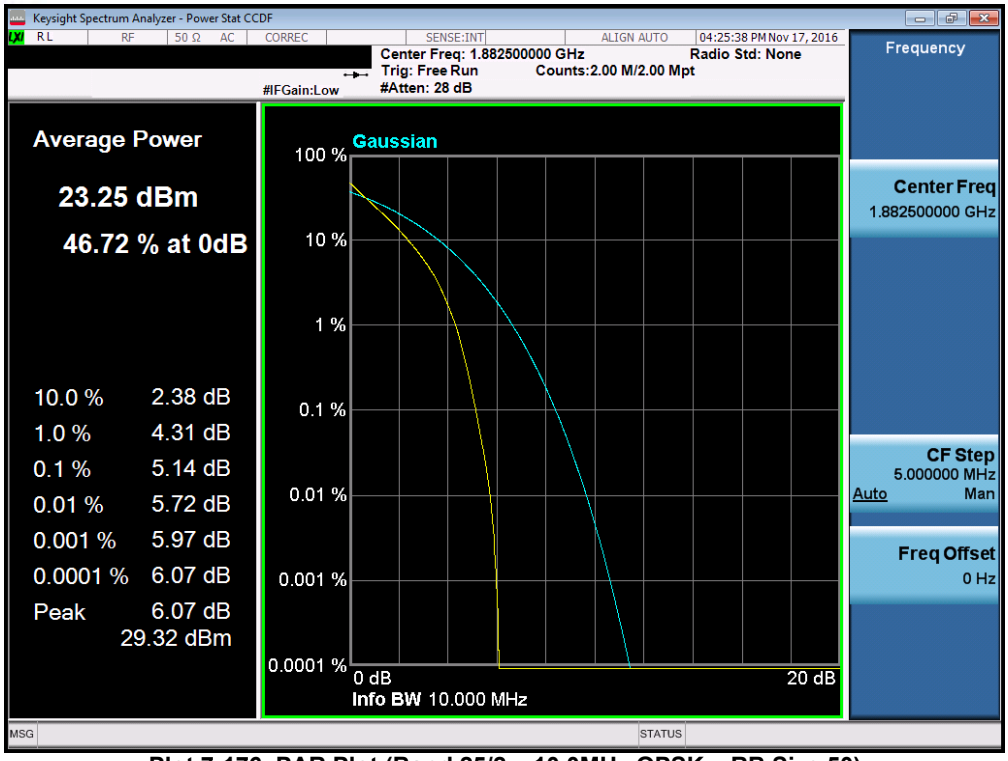
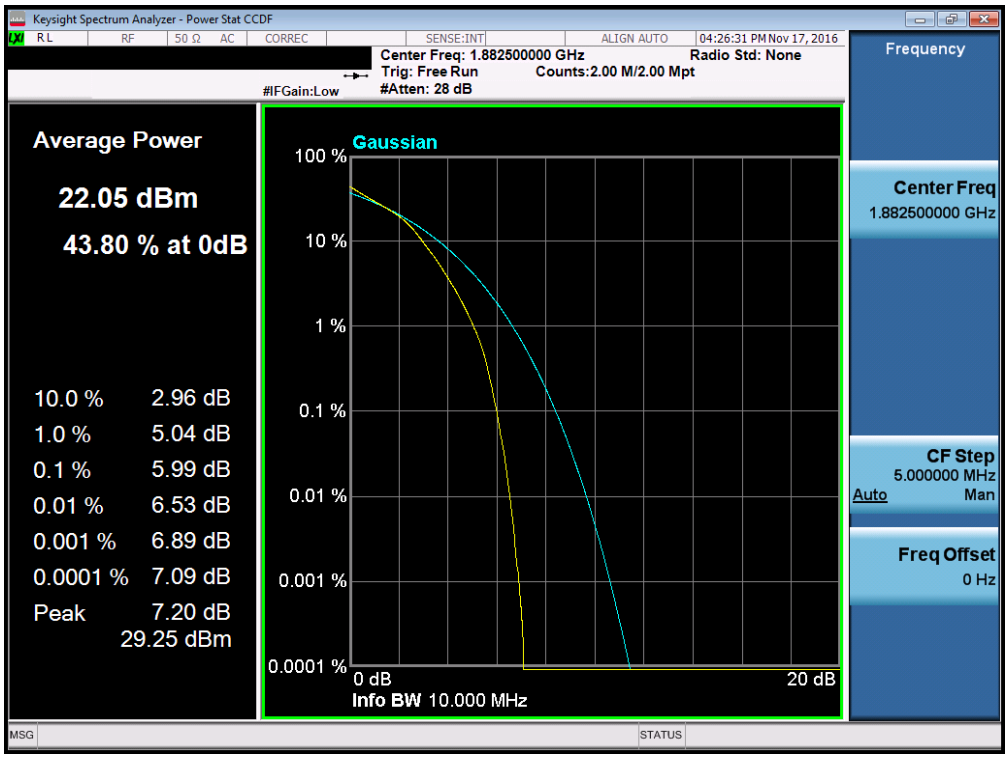


Plot 7-176. PAR Plot (Band 25/2 – 10.0MHz QPSK – RB Size 50)



Plot 7-177. PAR Plot (Band 25/2 – 10.0MHz 16-QAM – RB Size 50)

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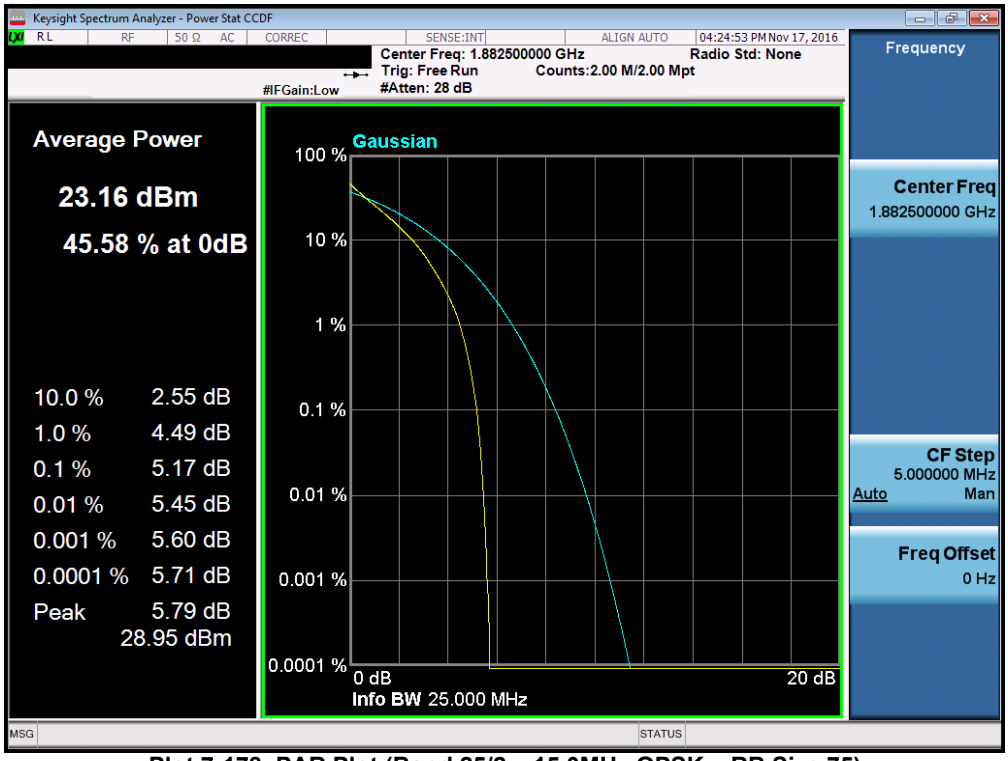
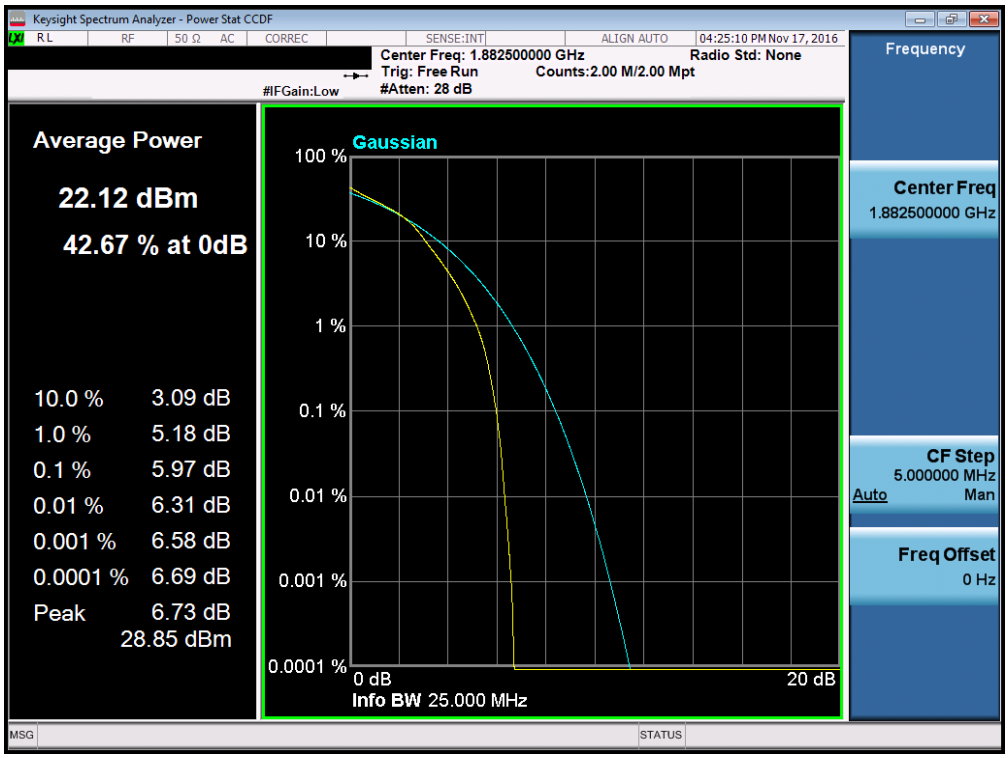


Plot 7-178. PAR Plot (Band 25/2 – 15.0MHz QPSK – RB Size 75)



Plot 7-179. PAR Plot (Band 25/2 – 15.0MHz 16-QAM – RB Size 75)

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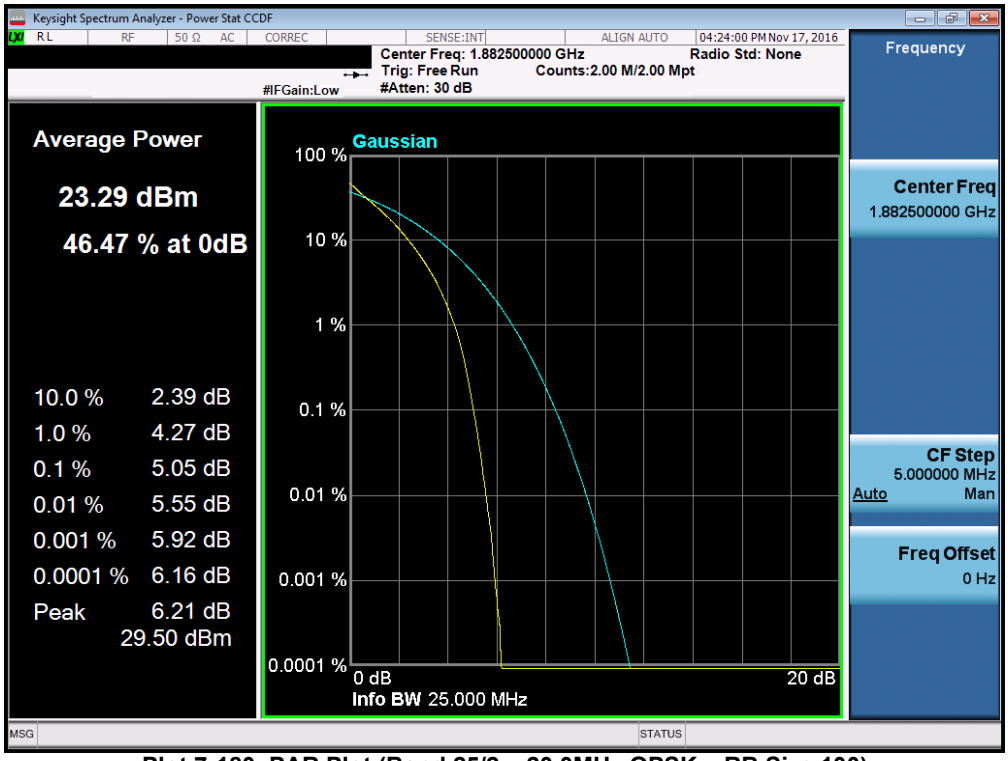
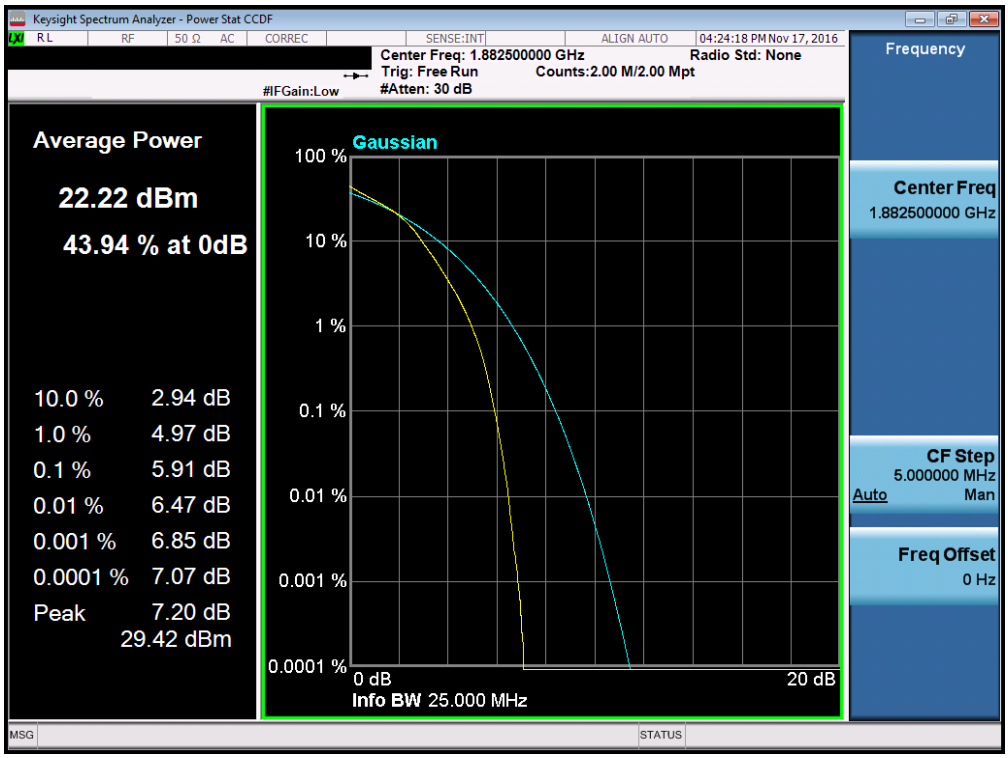


Plot 7-180. PAR Plot (Band 25/2 – 20.0MHz QPSK – RB Size 100)



Plot 7-181. PAR Plot (Band 25/2 – 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-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

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Test Setup

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

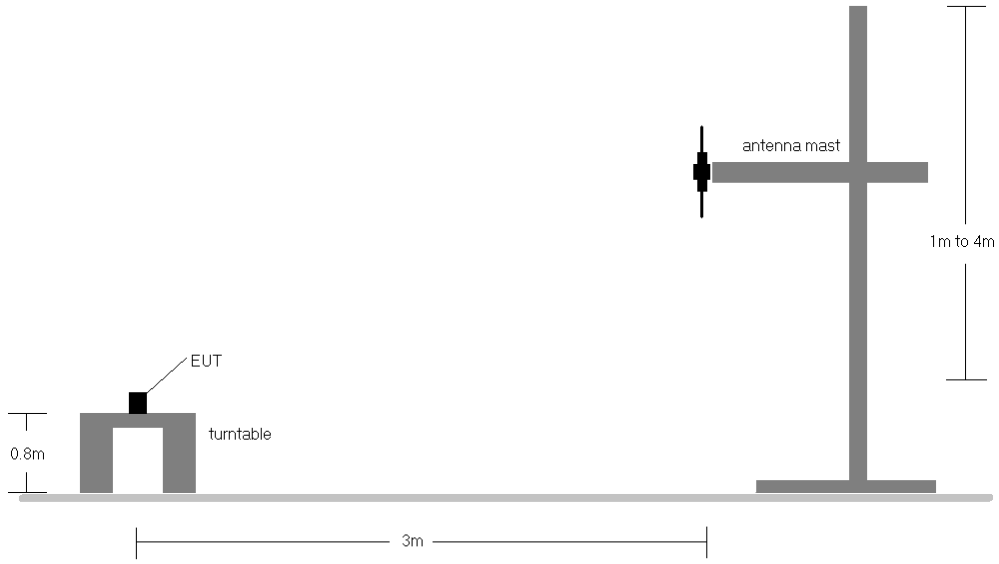

Figure 7-5. Radiated Test Setup <1GHz

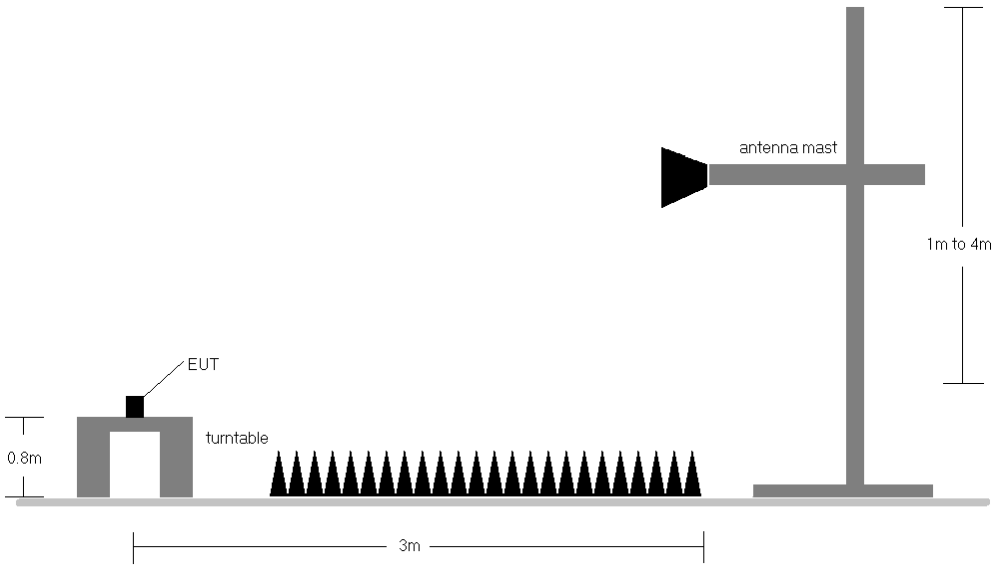

Figure 7-6. Radiated Test Setup >1GHz

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 [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	H	307	26	1 / 0	17.64	2.12	19.76	34.77	-15.01
707.50	1.4	QPSK	H	284	26	1 / 0	17.24	2.31	19.55	34.77	-15.22
715.30	1.4	QPSK	H	284	26	1 / 0	17.21	2.52	19.73	34.77	-15.04
699.70	1.4	16-QAM	H	307	26	1 / 0	16.26	2.12	18.38	34.77	-16.39
707.50	1.4	16-QAM	H	284	26	1 / 0	16.00	2.31	18.31	34.77	-16.46
715.30	1.4	16-QAM	H	284	26	1 / 0	16.17	2.52	18.69	34.77	-16.08
700.50	3	QPSK	H	281	25	1 / 14	17.30	2.12	19.42	34.77	-15.35
707.50	3	QPSK	H	284	28	1 / 14	17.57	2.31	19.88	34.77	-14.89
714.50	3	QPSK	H	288	15	1 / 0	17.95	2.50	20.45	34.77	-14.32
700.50	3	16-QAM	H	281	25	1 / 14	16.19	2.12	18.31	34.77	-16.46
707.50	3	16-QAM	H	284	28	1 / 14	16.48	2.31	18.79	34.77	-15.98
714.50	3	16-QAM	H	288	15	1 / 0	16.81	2.50	19.31	34.77	-15.46
701.50	5	QPSK	H	307	10	1 / 0	17.97	2.15	20.12	34.77	-14.65
707.50	5	QPSK	H	284	4	1 / 0	17.64	2.31	19.95	34.77	-14.82
713.50	5	QPSK	H	290	15	1 / 24	17.83	2.48	20.31	34.77	-14.47
701.50	5	16-QAM	H	307	10	1 / 0	17.10	2.15	19.25	34.77	-15.52
707.50	5	16-QAM	H	284	4	1 / 0	16.53	2.31	18.84	34.77	-15.93
713.50	5	16-QAM	H	290	15	1 / 24	16.89	2.48	19.37	34.77	-15.41
704.00	10	QPSK	H	311	16	1 / 0	17.30	2.22	19.52	34.77	-15.26
707.50	10	QPSK	H	311	20	1 / 0	17.70	2.31	20.01	34.77	-14.76
711.00	10	QPSK	H	287	12	1 / 49	17.56	2.41	19.97	34.77	-14.80
704.00	10	16-QAM	H	311	16	1 / 0	16.35	2.22	18.57	34.77	-16.21
707.50	10	16-QAM	H	311	20	1 / 0	16.83	2.31	19.14	34.77	-15.63
711.00	10	16-QAM	H	287	12	1 / 49	16.45	2.41	18.86	34.77	-15.91
714.50	3	QPSK	V	103	6	1 / 74	16.01	3.04	19.05	34.77	-15.72

Table 7-2. ERP Data (Band 12)

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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	194	165	1 / 0	14.56	5.01	19.57	38.45	-18.88
836.50	1.4	QPSK	H	208	159	3 / 2	14.67	5.16	19.83	38.45	-18.62
848.30	1.4	QPSK	H	187	158	3 / 2	13.67	5.30	18.97	38.45	-19.48
824.70	1.4	16-QAM	H	194	165	3 / 2	13.38	5.01	18.39	38.45	-20.06
836.50	1.4	16-QAM	H	208	159	3 / 2	13.77	5.16	18.93	38.45	-19.52
848.30	1.4	16-QAM	H	187	158	3 / 2	12.58	5.30	17.88	38.45	-20.57
825.50	3	QPSK	H	221	20	1 / 14	16.34	5.02	21.36	38.45	-17.09
836.50	3	QPSK	H	196	24	1 / 14	16.56	5.16	21.72	38.45	-16.73
847.50	3	QPSK	H	211	39	1 / 14	15.96	5.29	21.25	38.45	-17.20
825.50	3	16-QAM	H	221	20	1 / 14	15.24	5.02	20.26	38.45	-18.19
836.50	3	16-QAM	H	196	24	1 / 14	15.41	5.16	20.57	38.45	-17.88
847.50	3	16-QAM	H	211	39	1 / 14	14.98	5.29	20.27	38.45	-18.18
826.50	5	QPSK	H	193	200	1 / 24	16.47	5.03	21.50	38.45	-16.95
836.50	5	QPSK	H	202	216	1 / 24	16.81	5.16	21.97	38.45	-16.48
846.50	5	QPSK	H	209	213	1 / 24	16.30	5.28	21.58	38.45	-16.87
826.50	5	16-QAM	H	193	200	1 / 24	14.99	5.03	20.02	38.45	-18.43
836.50	5	16-QAM	H	202	216	1 / 24	15.60	5.16	20.76	38.45	-17.69
846.50	5	16-QAM	H	209	213	1 / 24	15.42	5.28	20.70	38.45	-17.75
829.00	10	QPSK	H	220	29	1 / 0	16.13	5.06	21.19	38.45	-17.26
836.50	10	QPSK	H	220	32	1 / 0	16.48	5.16	21.64	38.45	-16.81
844.00	10	QPSK	H	198	38	1 / 0	16.06	5.25	21.31	38.45	-17.14
829.00	10	16-QAM	H	220	29	1 / 0	14.80	5.06	19.86	38.45	-18.59
836.50	10	16-QAM	H	220	32	1 / 0	15.43	5.16	20.59	38.45	-17.86
844.00	10	16-QAM	H	198	38	1 / 0	14.94	5.25	20.19	38.45	-18.26
836.50	5	QPSK	V	147	213	1 / 0	15.17	5.00	20.17	38.45	-18.28

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

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
831.50	15	QPSK	H	198	19	1 / 74	15.99	5.10	21.09	38.45	-17.37
836.50	15	QPSK	H	198	37	1 / 0	15.94	5.16	21.10	38.45	-17.35
841.50	15	QPSK	H	198	37	1 / 0	15.44	5.22	20.66	38.45	-17.79
831.50	15	16-QAM	H	198	19	1 / 74	15.18	5.10	20.28	38.45	-18.18
836.50	15	16-QAM	H	198	37	1 / 0	15.13	5.16	20.29	38.45	-18.16
841.50	15	16-QAM	H	198	37	1 / 0	14.62	5.22	19.84	38.45	-18.61

Table 7-4. ERP Data (Band 26)

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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	245	293	3 / 2	14.50	9.66	24.16	30.00	-5.84
1732.50	1.4	QPSK	H	230	284	1 / 5	14.43	9.61	24.04	30.00	-5.96
1754.30	1.4	QPSK	H	235	280	3 / 2	14.60	9.57	24.17	30.00	-5.83
1710.70	1.4	16-QAM	H	245	293	3 / 2	13.79	9.66	23.45	30.00	-6.55
1732.50	1.4	16-QAM	H	230	284	1 / 5	13.10	9.61	22.71	30.00	-7.29
1754.30	1.4	16-QAM	H	235	280	3 / 2	13.18	9.57	22.75	30.00	-7.25
1711.50	3	QPSK	H	248	292	1 / 0	13.10	9.65	22.75	30.00	-7.25
1732.50	3	QPSK	H	238	279	1 / 14	14.53	9.61	24.14	30.00	-5.86
1753.50	3	QPSK	H	233	282	1 / 0	14.56	9.57	24.13	30.00	-5.87
1711.50	3	16-QAM	H	248	292	1 / 0	12.00	9.65	21.65	30.00	-8.35
1732.50	3	16-QAM	H	238	279	1 / 14	13.55	9.61	23.16	30.00	-6.84
1753.50	3	16-QAM	H	233	282	1 / 0	13.56	9.57	23.13	30.00	-6.87
1712.50	5	QPSK	H	106	131	1 / 0	13.81	9.65	23.46	30.00	-6.54
1732.50	5	QPSK	H	150	127	1 / 24	14.79	9.61	24.40	30.00	-5.60
1752.50	5	QPSK	H	104	133	1 / 24	14.82	9.57	24.39	30.00	-5.61
1712.50	5	16-QAM	H	106	131	1 / 24	12.66	9.65	22.31	30.00	-7.69
1732.50	5	16-QAM	H	150	127	1 / 24	13.83	9.61	23.44	30.00	-6.56
1752.50	5	16-QAM	H	104	133	1 / 24	13.88	9.57	23.45	30.00	-6.55
1715.00	10	QPSK	H	101	130	1 / 0	14.90	9.65	24.55	30.00	-5.45
1732.50	10	QPSK	H	101	132	1 / 0	14.88	9.61	24.49	30.00	-5.51
1750.00	10	QPSK	H	100	131	1 / 49	14.38	9.58	23.96	30.00	-6.04
1715.00	10	16-QAM	H	101	130	1 / 0	13.67	9.65	23.32	30.00	-6.68
1732.50	10	16-QAM	H	101	132	1 / 0	13.58	9.61	23.19	30.00	-6.81
1750.00	10	16-QAM	H	100	131	1 / 49	13.40	9.58	22.98	30.00	-7.02
1717.50	15	QPSK	H	101	129	1 / 0	14.06	9.64	23.70	30.00	-6.30
1732.50	15	QPSK	H	100	137	1 / 74	13.00	9.61	22.61	30.00	-7.39
1747.50	15	QPSK	H	106	137	1 / 0	14.85	9.58	24.43	30.00	-5.57
1717.50	15	16-QAM	H	101	129	1 / 0	13.23	9.64	22.87	30.00	-7.13
1732.50	15	16-QAM	H	100	137	1 / 74	12.96	9.61	22.57	30.00	-7.43
1747.50	15	16-QAM	H	106	137	1 / 0	13.83	9.58	23.41	30.00	-6.59
1720.00	20	QPSK	H	106	128	1 / 0	14.44	9.64	24.08	30.00	-5.92
1732.50	20	QPSK	H	100	130	1 / 0	14.06	9.61	23.67	30.00	-6.33
1745.00	20	QPSK	H	111	133	1 / 0	14.53	9.59	24.12	30.00	-5.88
1720.00	20	16-QAM	H	106	128	1 / 0	13.20	9.64	22.84	30.00	-7.16
1732.50	20	16-QAM	H	100	130	1 / 0	13.26	9.61	22.87	30.00	-7.13
1745.00	20	16-QAM	H	111	133	1 / 0	13.44	9.59	23.03	30.00	-6.97
1715.00	10.0	QPSK	V	100	240	1 / 99	14.30	9.64	23.94	30.00	-6.06

Table 7-5. EIRP Data (Band 4)

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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	103	284	1 / 0	14.49	9.35	23.84	33.01	-9.17
1882.50	1.4	QPSK	H	101	284	3 / 2	15.54	9.27	24.81	33.01	-8.20
1914.30	1.4	QPSK	H	100	271	3 / 2	14.64	9.26	23.90	33.01	-9.11
1850.70	1.4	16-QAM	H	103	284	1 / 0	13.41	9.35	22.76	33.01	-10.25
1882.50	1.4	16-QAM	H	101	284	3 / 2	14.55	9.27	23.82	33.01	-9.19
1914.30	1.4	16-QAM	H	100	271	3 / 2	13.35	9.26	22.61	33.01	-10.40
1851.50	3	QPSK	H	105	284	1 / 0	15.27	9.35	24.62	33.01	-8.39
1882.50	3	QPSK	H	107	204	1 / 14	15.64	9.27	24.91	33.01	-8.10
1913.50	3	QPSK	H	100	273	1 / 14	15.30	9.26	24.56	33.01	-8.45
1851.50	3	16-QAM	H	105	284	1 / 0	14.21	9.35	23.56	33.01	-9.45
1882.50	3	16-QAM	H	107	204	1 / 14	14.21	9.27	23.48	33.01	-9.53
1913.50	3	16-QAM	H	100	273	1 / 14	14.12	9.26	23.38	33.01	-9.63
1852.50	5	QPSK	H	106	285	1 / 0	15.08	9.34	24.42	33.01	-8.59
1882.50	5	QPSK	H	101	278	1 / 24	16.09	9.27	25.36	33.01	-7.65
1912.50	5	QPSK	H	100	274	1 / 24	15.11	9.26	24.37	33.01	-8.64
1852.50	5	16-QAM	H	106	285	1 / 0	14.08	9.34	23.42	33.01	-9.59
1882.50	5	16-QAM	H	101	278	1 / 24	14.73	9.27	24.00	33.01	-9.01
1912.50	5	16-QAM	H	100	274	1 / 24	14.06	9.26	23.32	33.01	-9.69
1855.00	10	QPSK	H	106	281	1 / 0	15.13	9.34	24.47	33.01	-8.54
1882.50	10	QPSK	H	107	279	1 / 49	15.78	9.27	25.05	33.01	-7.96
1910.00	10	QPSK	H	100	271	1 / 49	14.58	9.25	23.83	33.01	-9.18
1855.00	10	16-QAM	H	106	281	1 / 0	13.94	9.34	23.28	33.01	-9.73
1882.50	10	16-QAM	H	107	279	1 / 49	14.66	9.27	23.93	33.01	-9.08
1910.00	10	16-QAM	H	100	271	1 / 49	13.56	9.25	22.81	33.01	-10.20
1857.50	15	QPSK	H	108	282	1 / 74	14.21	9.33	23.54	33.01	-9.47
1882.50	15	QPSK	H	101	277	1 / 0	14.60	9.27	23.87	33.01	-9.14
1907.50	15	QPSK	H	100	272	1 / 0	13.78	9.24	23.02	33.01	-9.99
1857.50	15	16-QAM	H	108	282	1 / 74	12.85	9.33	22.18	33.01	-10.83
1882.50	15	16-QAM	H	101	277	1 / 0	13.62	9.27	22.89	33.01	-10.12
1907.50	15	16-QAM	H	100	272	1 / 0	12.69	9.24	21.93	33.01	-11.08
1860.00	20	QPSK	H	110	281	1 / 99	14.16	9.32	23.48	33.01	-9.53
1882.50	20	QPSK	H	105	280	1 / 99	15.06	9.27	24.33	33.01	-8.68
1905.00	20	QPSK	H	100	275	1 / 99	15.19	9.24	24.43	33.01	-8.58
1860.00	20	16-QAM	H	110	281	1 / 99	13.18	9.32	22.50	33.01	-10.51
1882.50	20	16-QAM	H	105	280	1 / 99	13.80	9.27	23.07	33.01	-9.94
1905.00	20	16-QAM	H	100	275	1 / 99	13.64	9.24	22.88	33.01	-10.13
1882.50	5	QPSK	V	100	251	1 / 0	13.84	9.28	23.12	33.01	-9.89

Table 7-6. EIRP Data (Band 25/2)

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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	295	267	1 / 24	15.78	8.60	24.38	33.01	-8.63
2593.00	5	QPSK	H	282	255	1 / 0	16.39	8.53	24.92	33.01	-8.09
2687.50	5	QPSK	H	216	242	1 / 24	14.61	8.79	23.40	33.01	-9.61
2498.50	5	16-QAM	H	295	267	1 / 24	14.03	8.60	22.63	33.01	-10.38
2593.00	5	16-QAM	H	282	255	1 / 0	15.77	8.53	24.30	33.01	-8.71
2687.50	5	16-QAM	H	216	242	1 / 24	13.43	8.79	22.22	33.01	-10.79
2501.00	10	QPSK	H	245	269	1 / 49	16.19	8.60	24.79	33.01	-8.22
2593.00	10	QPSK	H	233	270	1 / 0	16.48	8.53	25.01	33.01	-8.00
2685.00	10	QPSK	H	264	251	1 / 0	12.94	8.78	21.72	33.01	-11.29
2501.00	10	16-QAM	H	245	269	1 / 49	14.22	8.60	22.82	33.01	-10.19
2593.00	10	16-QAM	H	233	270	1 / 0	16.23	8.53	24.76	33.01	-8.25
2685.00	10	16-QAM	H	264	251	1 / 0	11.75	8.78	20.53	33.01	-12.48
2503.50	15	QPSK	H	275	260	1 / 0	14.88	8.59	23.47	33.01	-9.54
2593.00	15	QPSK	H	275	261	1 / 0	15.13	8.53	23.66	33.01	-9.35
2682.50	15	QPSK	H	263	255	1 / 0	13.70	8.77	22.47	33.01	-10.54
2503.50	15	16-QAM	H	275	260	1 / 0	11.98	8.59	20.57	33.01	-12.44
2593.00	15	16-QAM	H	275	261	1 / 0	14.89	8.53	23.42	33.01	-9.59
2682.50	15	16-QAM	H	263	255	1 / 0	11.62	8.77	20.39	33.01	-12.62
2506.00	20	QPSK	H	275	258	1 / 0	15.17	8.59	23.76	33.01	-9.25
2593.00	20	QPSK	H	275	259	1 / 0	15.56	8.53	24.09	33.01	-8.92
2680.00	20	QPSK	H	285	79	1 / 0	11.54	8.77	20.31	33.01	-12.70
2506.00	20	16-QAM	H	275	258	1 / 0	13.25	8.59	21.84	33.01	-11.17
2593.00	20	16-QAM	H	275	259	1 / 0	13.77	8.53	22.30	33.01	-10.71
2680.00	20	16-QAM	H	285	79	1 / 0	9.64	8.77	18.41	33.01	-14.60
2593.00	10	QPSK	V	101	334	1 / 99	14.80	8.93	23.73	33.01	-9.28

Table 7-7. 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-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 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-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

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Test Setup

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

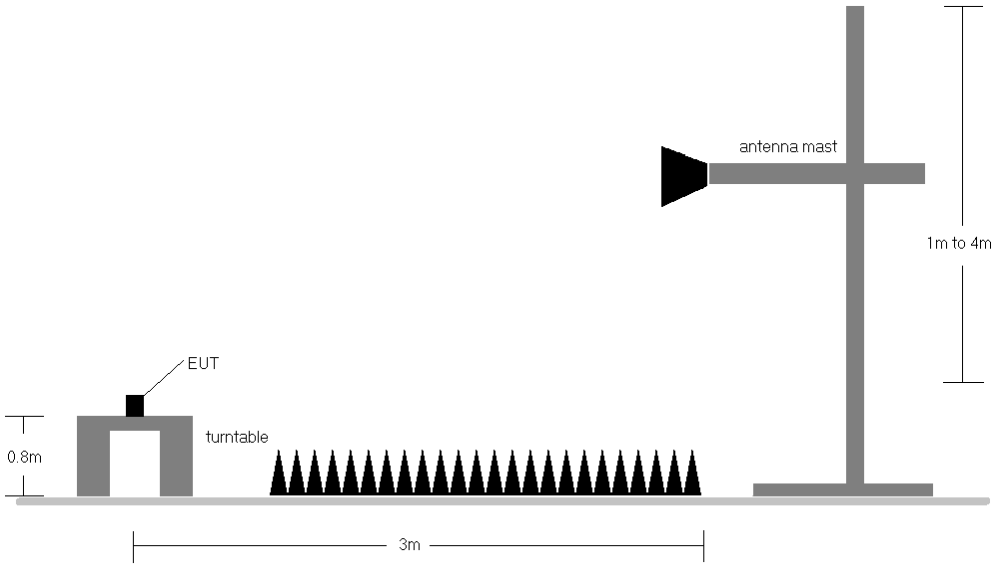

Figure 7-7. Test Instrument & Measurement Setup

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:	700.50	MHz		
CHANNEL:	23025			
MEASURED OUTPUT POWER:	19.42	dBm	=	0.087 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	32.42	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]
1401.00	H	100	95	-66.46	2.36	-64.10	83.5
2101.50	H	119	217	-52.99	3.46	-49.52	68.9
2802.00	H	-	-	-66.19	4.74	-61.44	80.9

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

OPERATING FREQUENCY:	707.50	MHz		
CHANNEL:	23095			
MEASURED OUTPUT POWER:	19.88	dBm	=	0.097 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	32.88	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]
1415.00	H	154	263	-69.02	2.54	-66.48	86.4
2122.50	H	117	224	-50.76	3.42	-47.34	67.2
2830.00	H	-	-	-66.11	4.85	-61.26	81.1

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

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OPERATING FREQUENCY:	714.50	MHz		
CHANNEL:	23165			
MEASURED OUTPUT POWER:	20.45	dBm	=	0.111 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	33.45	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]
1429.00	H	149	263	-64.39	2.72	-61.67	82.1
2143.50	H	272	290	-66.56	3.37	-63.19	83.6
2858.00	H	-	-	-66.16	4.96	-61.19	81.6

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

OPERATING FREQUENCY:	826.50	MHz		
CHANNEL:	26815			
MEASURED OUTPUT POWER:	21.50	dBm	=	0.141 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	34.50	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]
1653.00	H	-	-	-71.84	3.62	-68.22	89.7
2479.50	H	240	300	-67.36	3.56	-63.80	85.3
3306.00	H	-	-	-67.87	5.83	-62.05	83.6

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

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OPERATING FREQUENCY:	836.50	MHz		
CHANNEL:	26915			
MEASURED OUTPUT POWER:	21.97	dBm	=	0.157 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	34.97	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	-	-	-71.82	3.52	-68.30	90.3
2509.50	H	247	69	-64.71	3.59	-61.12	83.1
3346.00	H	-	-	-67.80	5.87	-61.93	83.9

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

OPERATING FREQUENCY:	846.50	MHz		
CHANNEL:	27015			
MEASURED OUTPUT POWER:	21.58	dBm	=	0.144 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	34.58	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]
1693.00	H	-	-	-71.53	3.42	-68.11	89.7
2539.50	H	242	1	-64.18	3.72	-60.46	82.0
3386.00	H	-	-	-67.68	5.91	-61.77	83.3

Table 7-13. Radiated Spurious Data (Band 26/5 – High Channel)

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OPERATING FREQUENCY: 1715.00 MHz
CHANNEL: 20000
MEASURED OUTPUT POWER: 24.55 dBm = 0.285 W
MODULATION SIGNAL: QPSK
BANDWIDTH: 10.0 MHz
DISTANCE: 3 meters
LIMIT: 43 + 10 $\log_{10}$ (W) = 37.55 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]
3430.00	H	100	175	-59.54	8.16	-51.38	75.9
5145.00	H	-	-	-65.80	10.37	-55.42	80.0

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

OPERATING FREQUENCY: 1732.50 MHz
CHANNEL: 20175
MEASURED OUTPUT POWER: 24.49 dBm = 0.281 W
MODULATION SIGNAL: QPSK
BANDWIDTH: 10.0 MHz
DISTANCE: 3 meters
LIMIT: 43 + 10 $\log_{10}$ (W) = 37.49 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	230	202	-62.46	8.26	-54.20	78.7
5197.50	H	-	-	-66.09	10.41	-55.67	80.2

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

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OPERATING FREQUENCY: 1750.00 MHz
CHANNEL: 20350
MEASURED OUTPUT POWER: 23.96 dBm = 0.249 W
MODULATION SIGNAL: QPSK
BANDWIDTH: 10.0 MHz
DISTANCE: 3 meters
LIMIT: 43 + 10 $\log_{10}$ (W) = 36.96 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]
3500.00	H	100	260	-61.53	8.35	-53.17	77.1
5250.00	H	-	-	-65.47	10.36	-55.11	79.1

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

OPERATING FREQUENCY: 1852.50 MHz
CHANNEL: 26065
MEASURED OUTPUT POWER: 24.42 dBm = 0.277 W
MODULATION SIGNAL: QPSK
BANDWIDTH: 5.0 MHz
DISTANCE: 3 meters
LIMIT: 43 + 10 $\log_{10}$ (W) = 37.42 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]
3705.00	H	-	-	-66.39	8.42	-57.97	82.4
5557.50	H	-	-	-65.39	10.52	-54.87	79.3
7410.00	H	-	-	-63.99	12.01	-51.98	76.4

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

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OPERATING FREQUENCY:	1882.50	MHz		
CHANNEL:	26365			
MEASURED OUTPUT POWER:	25.36	dBm	=	0.343 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	38.36	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	-	-	-66.56	8.66	-57.90	83.3
5647.50	H	-	-	-65.29	10.62	-54.66	80.0
7530.00	H	-	-	-63.81	12.06	-51.75	77.1

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

OPERATING FREQUENCY:	1912.50	MHz		
CHANNEL:	26665			
MEASURED OUTPUT POWER:	24.37	dBm	=	0.273 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	37.37	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]
3825.00	H	-	-	-66.53	8.76	-57.78	82.1
5737.50	H	-	-	-65.31	10.72	-54.59	79.0
7650.00	H	-	-	-64.39	12.18	-52.22	76.6

Table 7-19. Radiated Spurious Data (Band 25/2 – High Channel)

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OPERATING FREQUENCY:	2501.00	MHz		
CHANNEL:	39700			
MEASURED OUTPUT POWER:	24.79	dBm	=	0.301 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	10.0	MHz		
DISTANCE:	3	meters		
LIMIT:	55 + 10 log10 (W)	49.79	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]
5002.00	H	-	-	-64.39	10.14	-54.24	79.0
7503.00	H	-	-	-63.30	12.02	-51.28	76.1
10004.00	H	-	-	-60.52	13.00	-47.52	72.3

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

OPERATING FREQUENCY:	2593.00	MHz		
CHANNEL:	40620			
MEASURED OUTPUT POWER:	25.01	dBm	=	0.317 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	10.0	MHz		
DISTANCE:	3	meters		
LIMIT:	55 + 10 log10 (W)	50.01	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	230	157	-53.97	10.40	-43.57	68.6
7779.00	H	119	189	-61.68	12.24	-49.44	74.5
10372.00	H	-	-	-60.32	13.13	-47.19	72.2

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

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OPERATING FREQUENCY:	2685.00	MHz		
CHANNEL:	41540			
MEASURED OUTPUT POWER:	21.72	dBm	=	0.149 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	10.0	MHz		
DISTANCE:	3	meters		
LIMIT:	55 + 10 log10 (W)	46.72	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	107	228	-47.72	10.37	-37.35	59.1
8055.00	H	107	42	-51.38	12.54	-38.83	60.6
10740.00	H	-	-	-58.76	13.00	-45.77	67.5

Table 7-22. 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-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

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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 (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	707,500,262	262	0.0000370
100 %		- 30	707,500,075	75	0.0000106
100 %		- 20	707,500,155	155	0.0000219
100 %		- 10	707,499,818	-182	-0.0000257
100 %		0	707,499,693	-307	-0.0000434
100 %		+ 10	707,500,037	37	0.0000052
100 %		+ 20	707,500,043	43	0.0000061
100 %		+ 30	707,499,701	-299	-0.0000423
100 %		+ 40	707,500,018	18	0.0000025
100 %		+ 50	707,500,055	55	0.0000078
BATT. ENDPOINT	3.45	+ 20	707,499,563	-437	-0.0000618

Table 7-23. 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

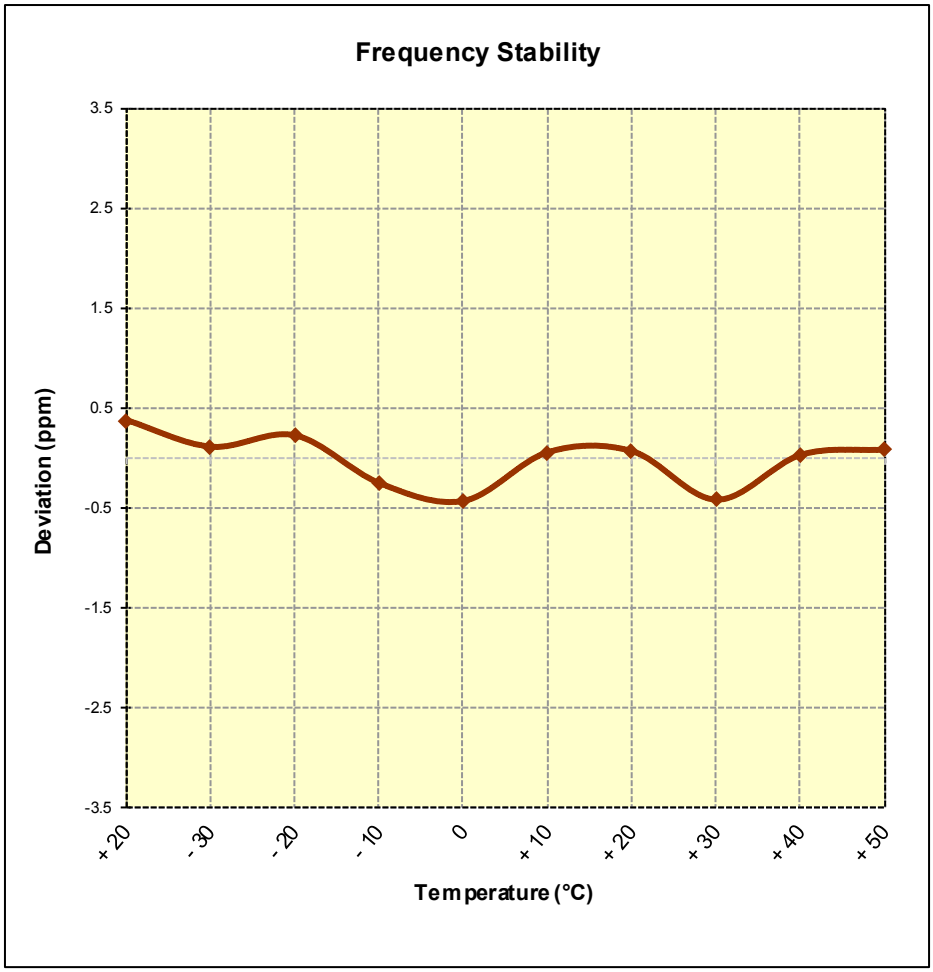

Figure 7-8. Frequency Stability Graph (Band 12)

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Band 26/5 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)	831,499,962	-38	-0.0000046
100 %		- 30	831,499,986	-14	-0.0000017
100 %		- 20	831,500,287	287	0.0000345
100 %		- 10	831,499,630	-370	-0.0000445
100 %		0	831,500,030	30	0.0000036
100 %		+ 10	831,499,964	-36	-0.0000043
100 %		+ 20	831,500,217	217	0.0000261
100 %		+ 30	831,500,004	4	0.0000005
100 %		+ 40	831,500,008	8	0.0000010
100 %		+ 50	831,499,846	-154	-0.0000185
BATT. ENDPOINT	3.45	+ 20	831,500,127	127	0.0000153

Table 7-24. Frequency Stability Data (Band 26/5)

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 26/5 Frequency Stability Measurements

§2.1055 §22.355

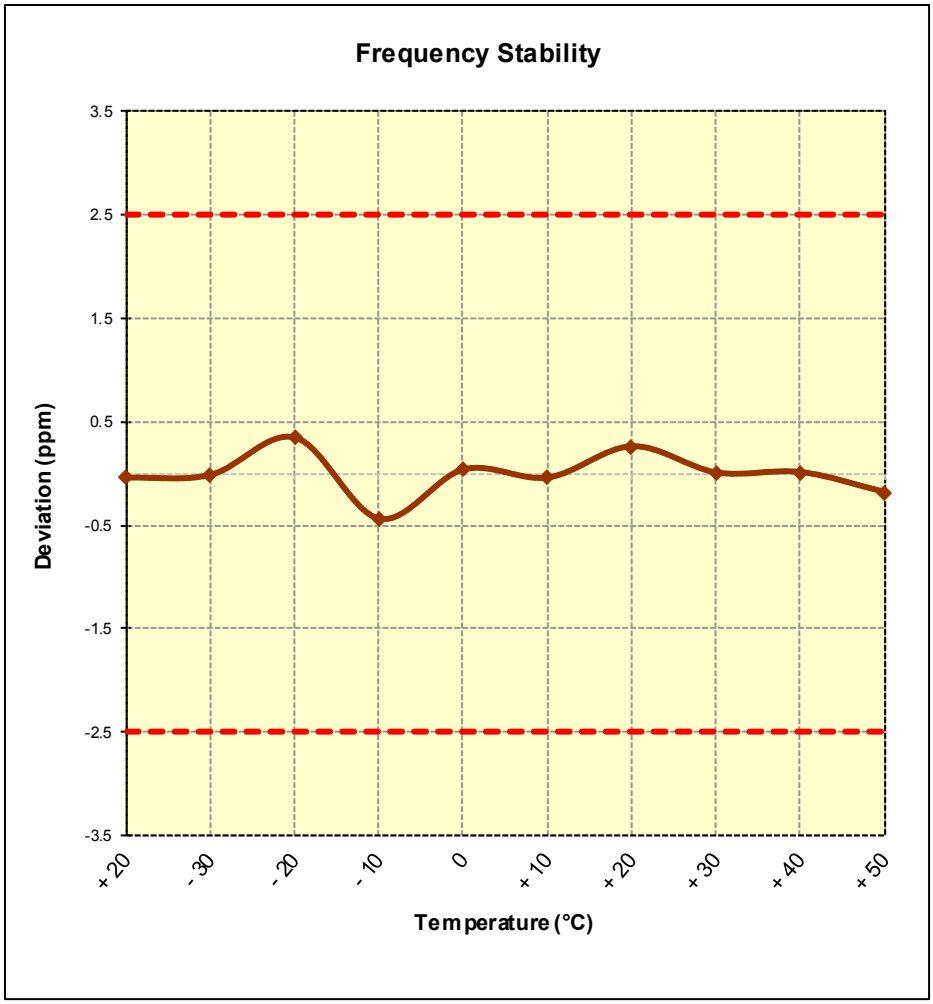

Figure 7-9. Frequency Stability Graph (Band 26/5)

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Band 4 Frequency Stability Measurements

§2.1055 §§27.54

OPERATING FREQUENCY: 1,732,500,000 Hz

CHANNEL: 20175

REFERENCE VOLTAGE: 3.85 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	1,732,500,398	398	0.0000230
100 %		- 30	1,732,500,104	104	0.0000060
100 %		- 20	1,732,500,035	35	0.0000020
100 %		- 10	1,732,500,147	147	0.0000085
100 %		0	1,732,500,307	307	0.0000177
100 %		+ 10	1,732,499,605	-395	-0.0000228
100 %		+ 20	1,732,499,991	-9	-0.0000005
100 %		+ 30	1,732,499,955	-45	-0.0000026
100 %		+ 40	1,732,500,116	116	0.0000067
100 %		+ 50	1,732,499,957	-43	-0.0000025
BATT. ENDPOINT	3.45	+ 20	1,732,499,918	-82	-0.0000047

Table 7-25. 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

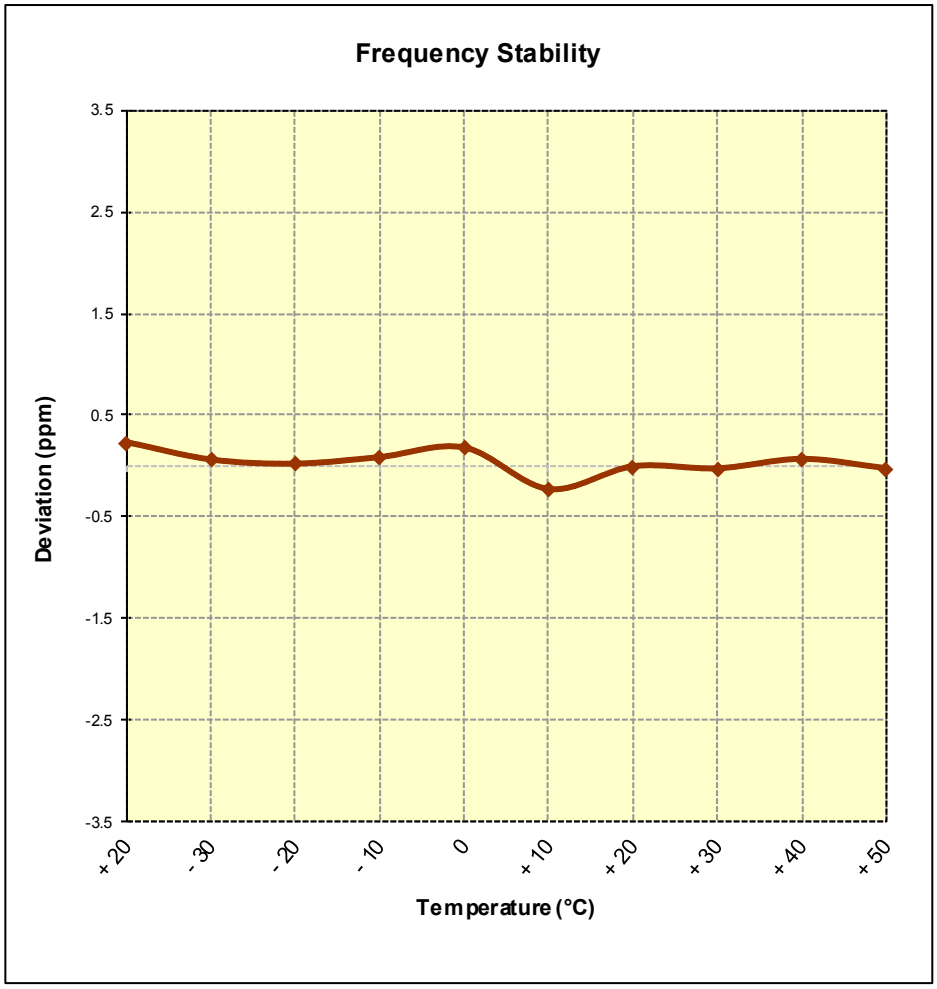

Figure 7-10. Frequency Stability Graph (Band 4)

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Band 25/2 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)	1,882,499,864	-136	-0.0000072
100 %		- 30	1,882,500,152	152	0.0000081
100 %		- 20	1,882,499,810	-190	-0.0000101
100 %		- 10	1,882,499,953	-47	-0.0000025
100 %		0	1,882,499,915	-85	-0.0000045
100 %		+ 10	1,882,500,398	398	0.0000211
100 %		+ 20	1,882,499,781	-219	-0.0000116
100 %		+ 30	1,882,500,098	98	0.0000052
100 %		+ 40	1,882,500,062	62	0.0000033
100 %		+ 50	1,882,499,835	-165	-0.0000088
BATT. ENDPOINT	3.45	+ 20	1,882,499,939	-61	-0.0000032

Table 7-26. Frequency Stability Data (Band 25/2)

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 25/2 Frequency Stability Measurements

§2.1055 §24.235

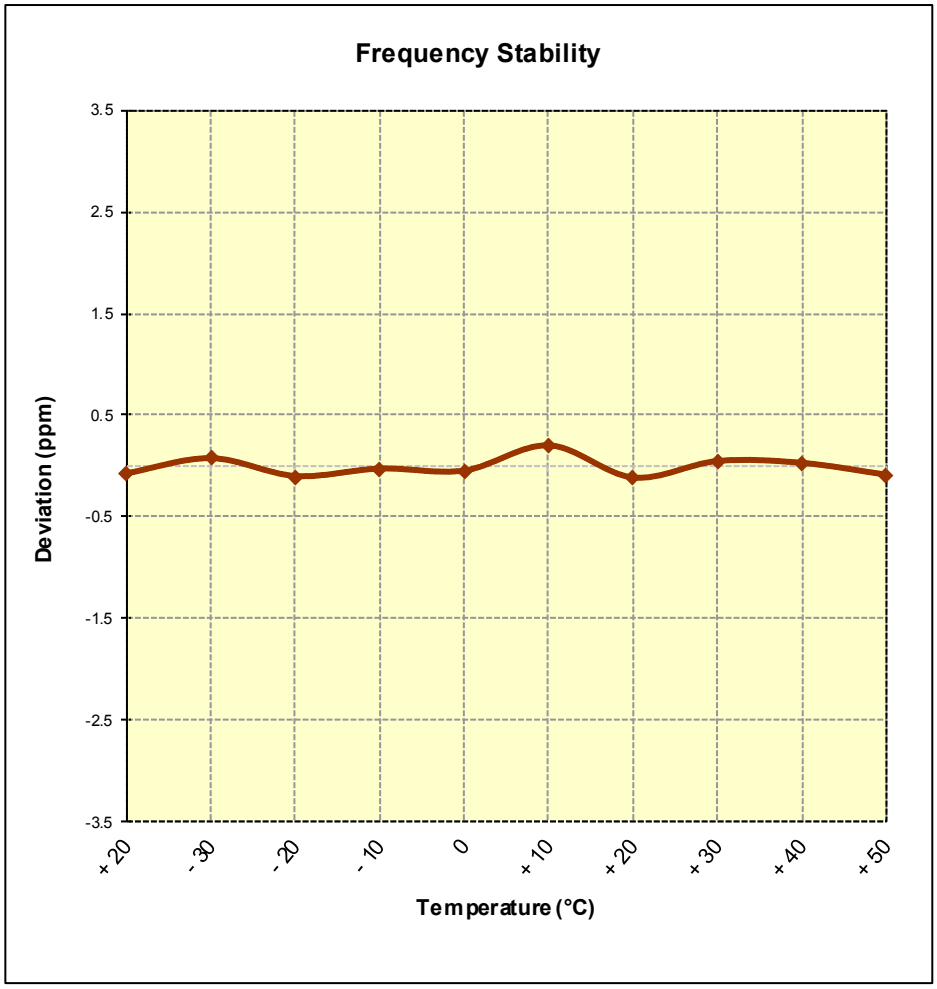

Figure 7-11. Frequency Stability Graph (Band 25/2)

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Band 41 Frequency Stability Measurements

§2.1055 §27.54

OPERATING FREQUENCY: 2,593,000,000 Hz

CHANNEL: 40620

REFERENCE VOLTAGE: 3.85 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	2,592,999,821	-179	-0.0000069
100 %		- 30	2,593,000,077	77	0.0000030
100 %		- 20	2,593,000,231	231	0.0000089
100 %		- 10	2,592,999,707	-293	-0.0000113
100 %		0	2,593,000,120	120	0.0000046
100 %		+ 10	2,592,999,842	-158	-0.0000061
100 %		+ 20	2,593,000,018	18	0.0000007
100 %		+ 30	2,592,999,995	-5	-0.0000002
100 %		+ 40	2,593,000,198	198	0.0000076
100 %		+ 50	2,593,000,063	63	0.0000024
BATT. ENDPOINT	3.45	+ 20	2,592,999,854	-146	-0.0000056

Table 7-27. 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

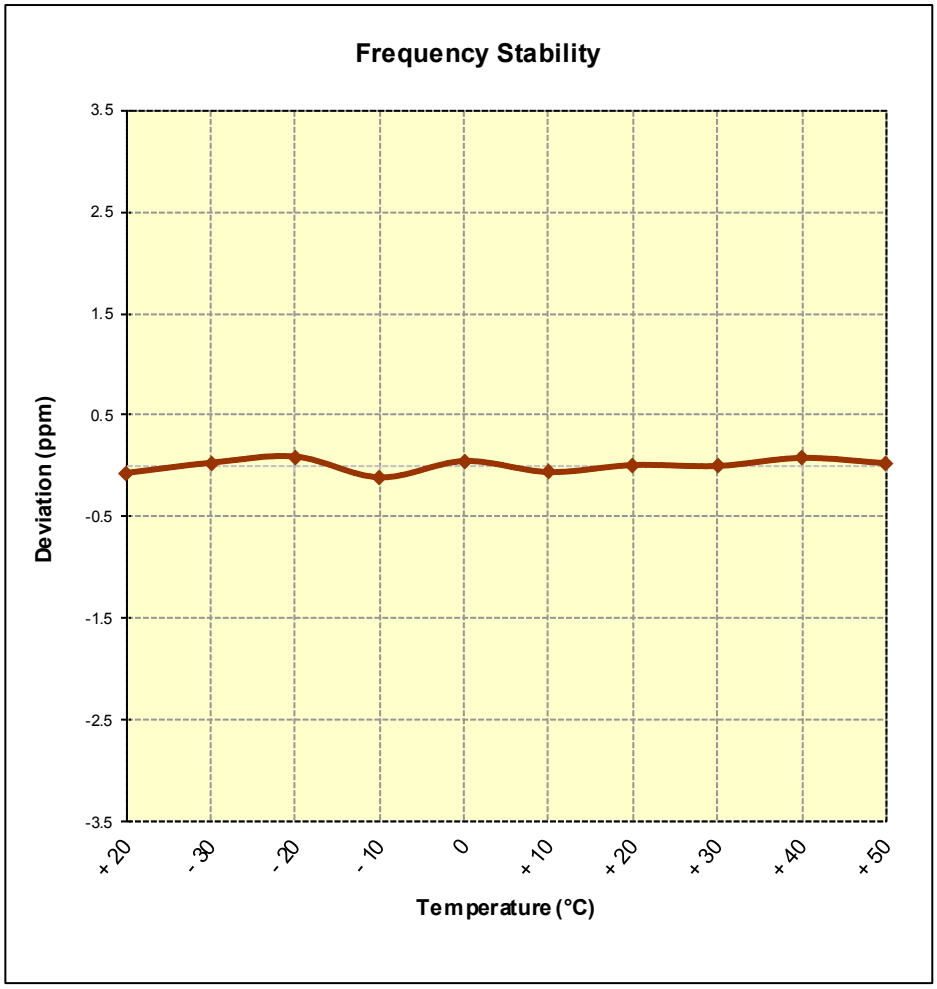

Figure 7-12. Frequency Stability Graph (Band 41)

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset** **FCC ID: ZNFLS777** complies with all the requirements of Parts 22, 24, & 27 of the FCC rules for LTE operation only.

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