7.4 Band Edge Emissions at Antenna Terminal

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

Test Overview

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

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

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
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.

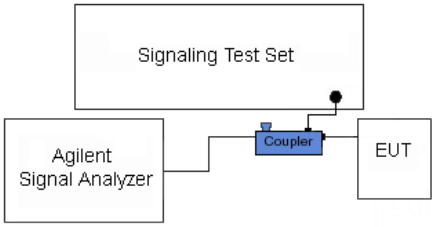

Figure 7-3. Test Instrument & Measurement Setup

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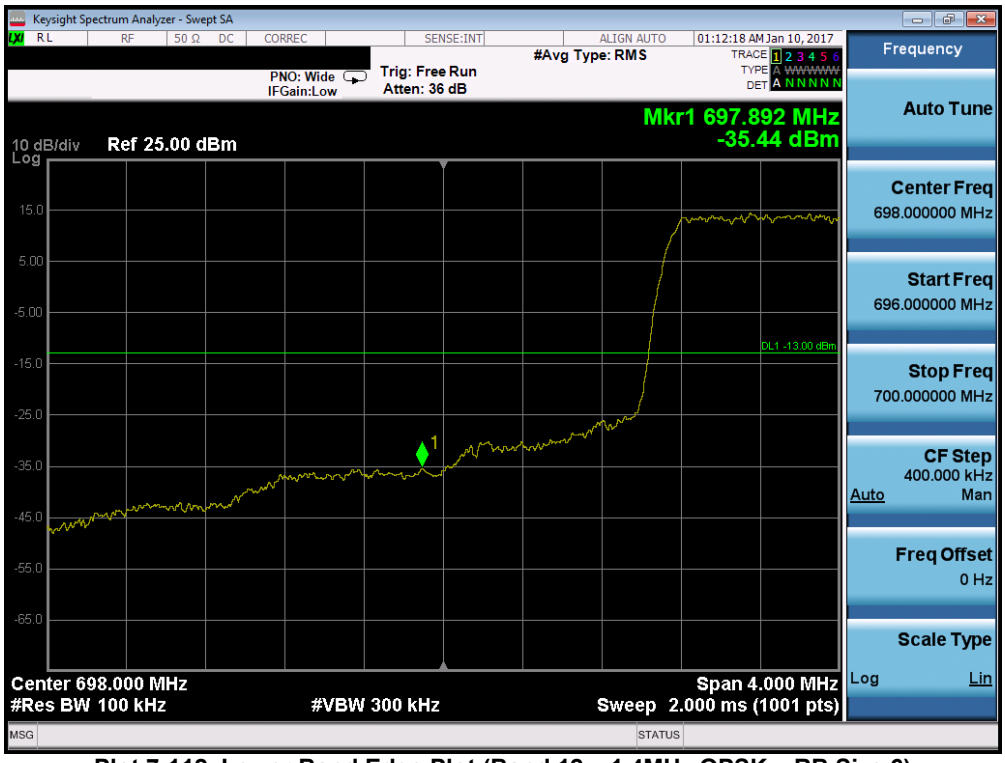
Test Notes

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

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

Per 27.53(c.5) for operations in the 776-788 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

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



Plot 7-112. Lower Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)

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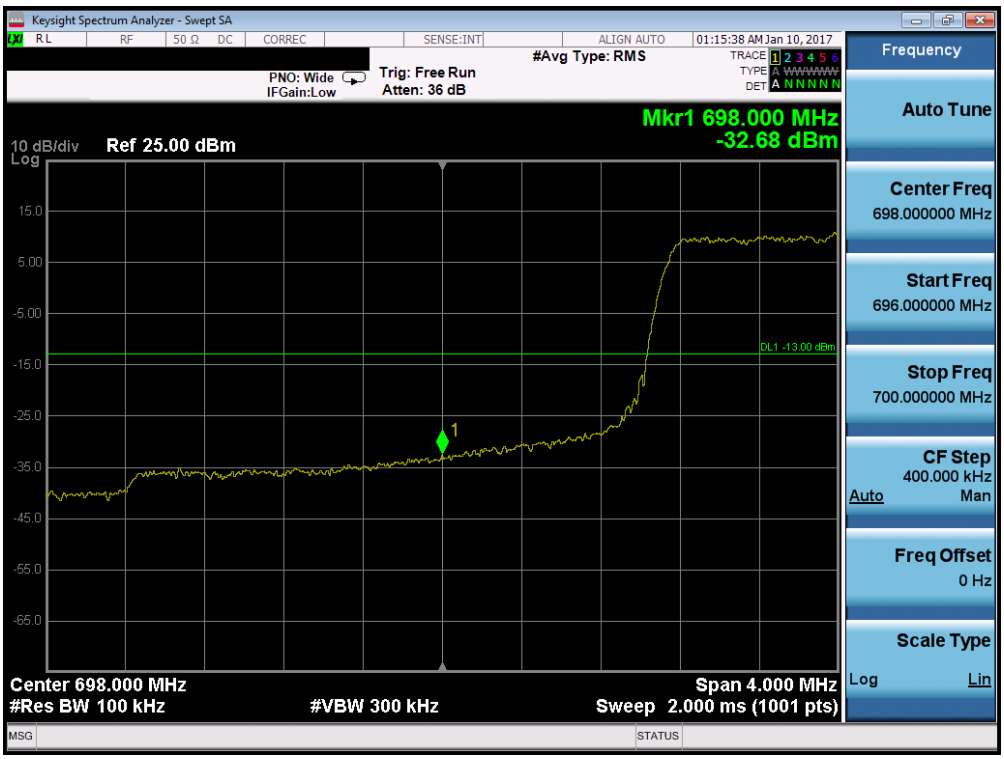
Plot 7-113. Upper Band Edge Plot (Band 12– 1.4MHz QPSK – RB Size 6)



Plot 7-114. Lower Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

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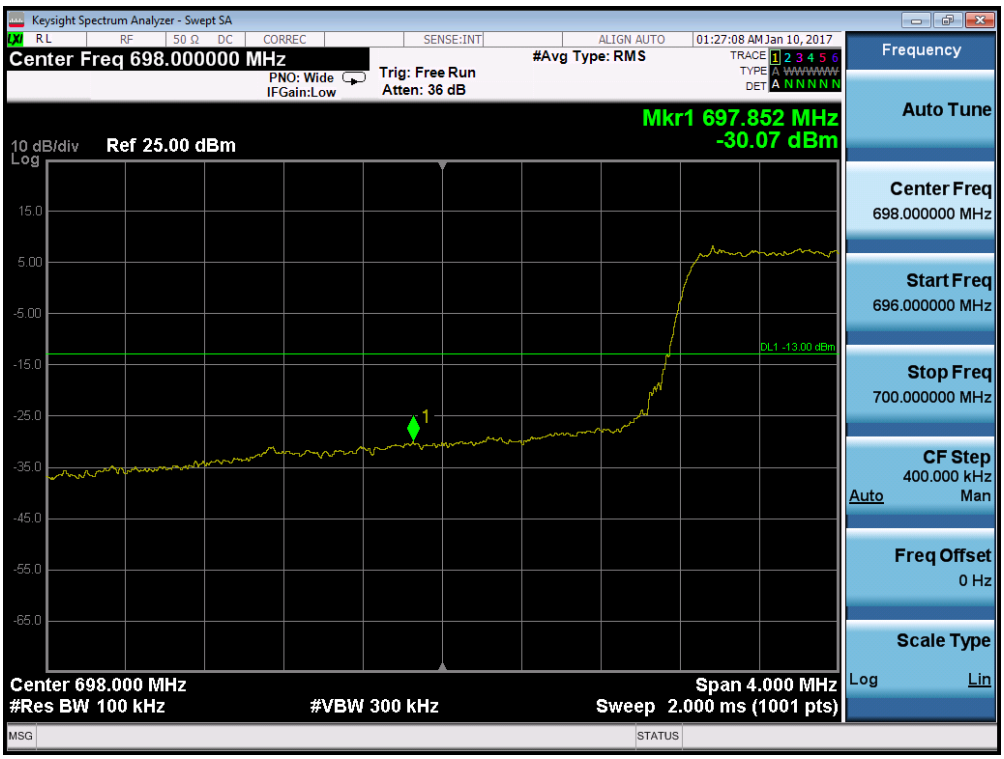
Plot 7-115. Upper Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)



Plot 7-116. Lower Band Edge Plot (Band 12/17 – 5.0MHz QPSK – RB Size 25)

)

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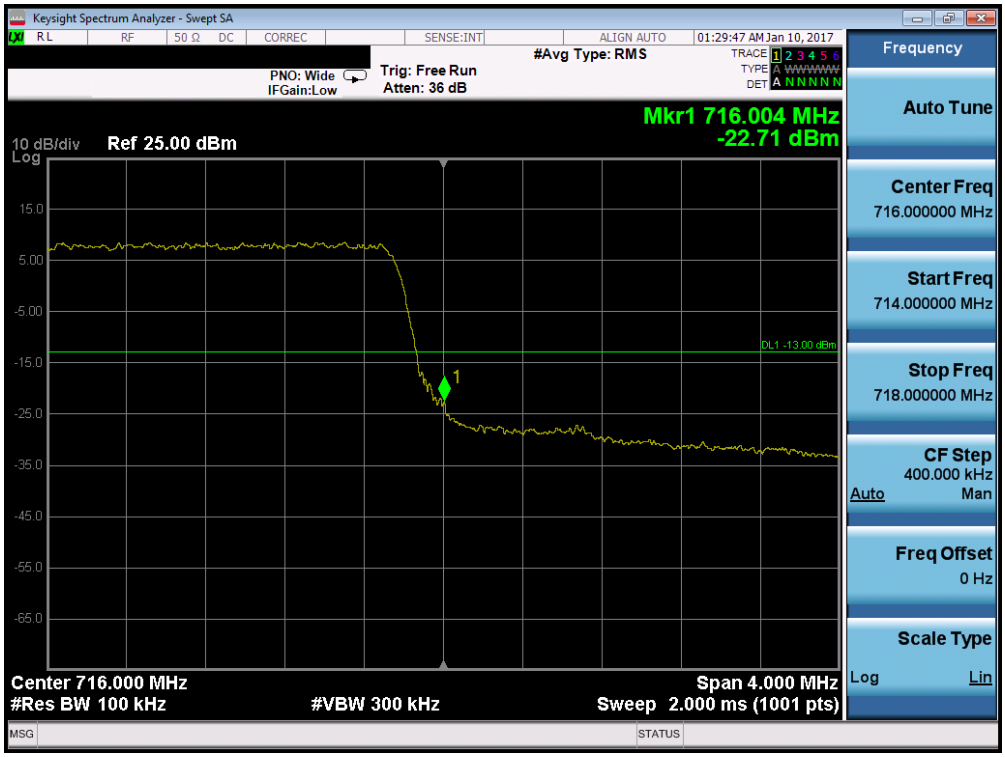
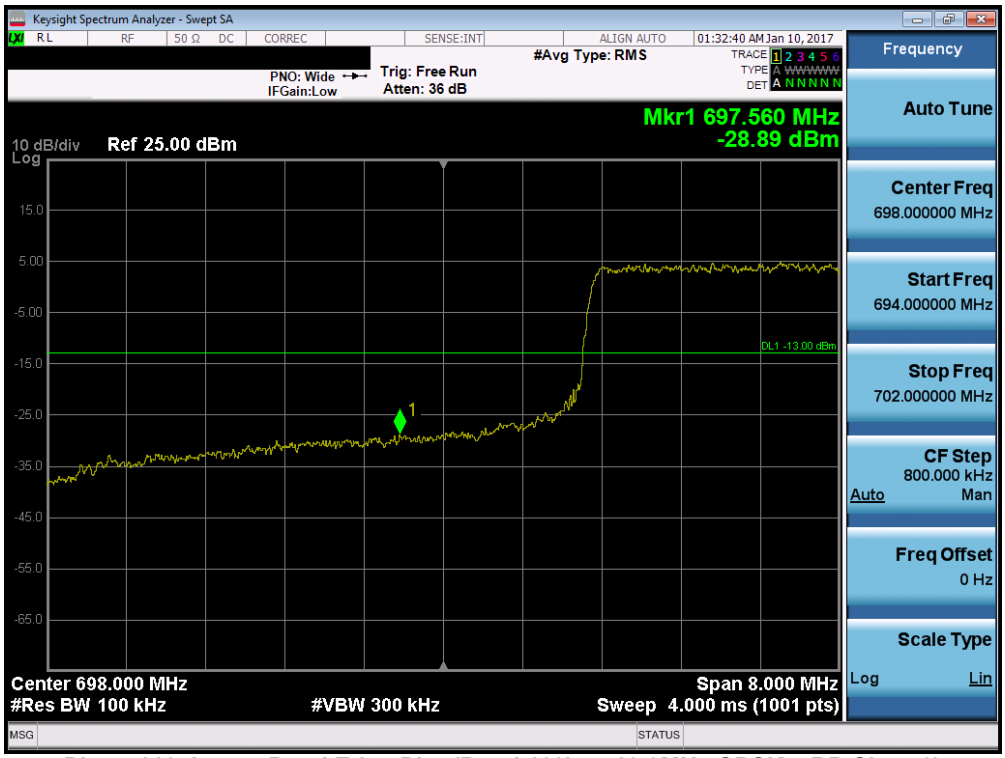


Plot 7-117. Upper Band Edge Plot (Band 12/17 – 5.0MHz QPSK – RB Size 25)



Plot 7-118. Lower Band Edge Plot (Band 12/17 – 10.0MHz QPSK – RB Size 50)

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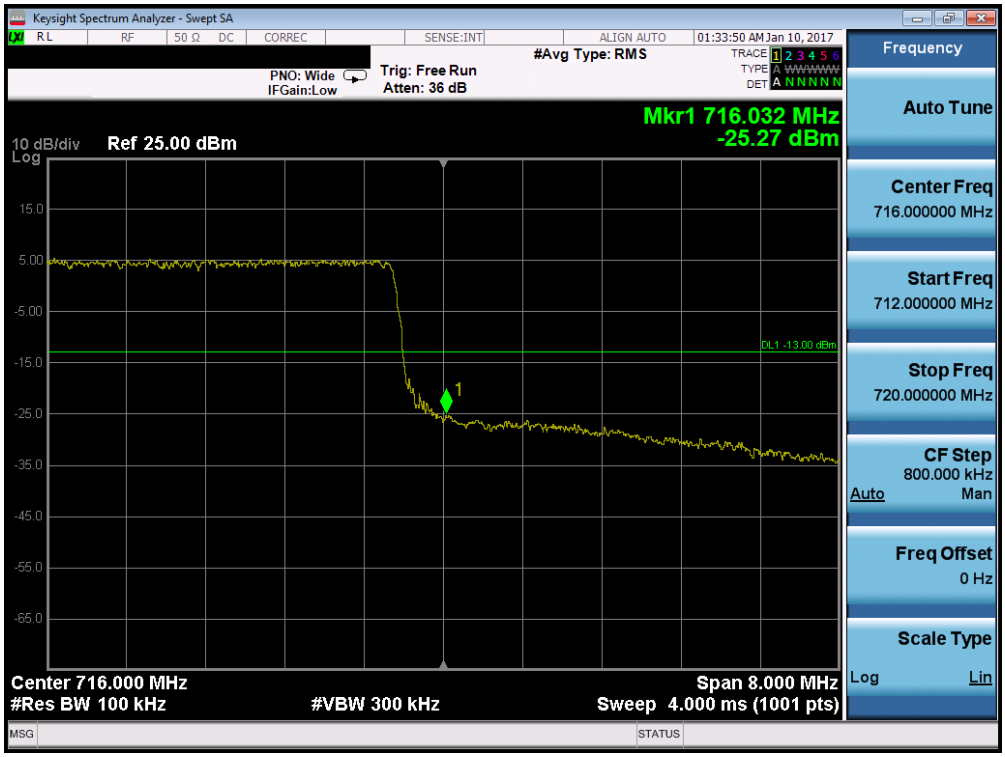
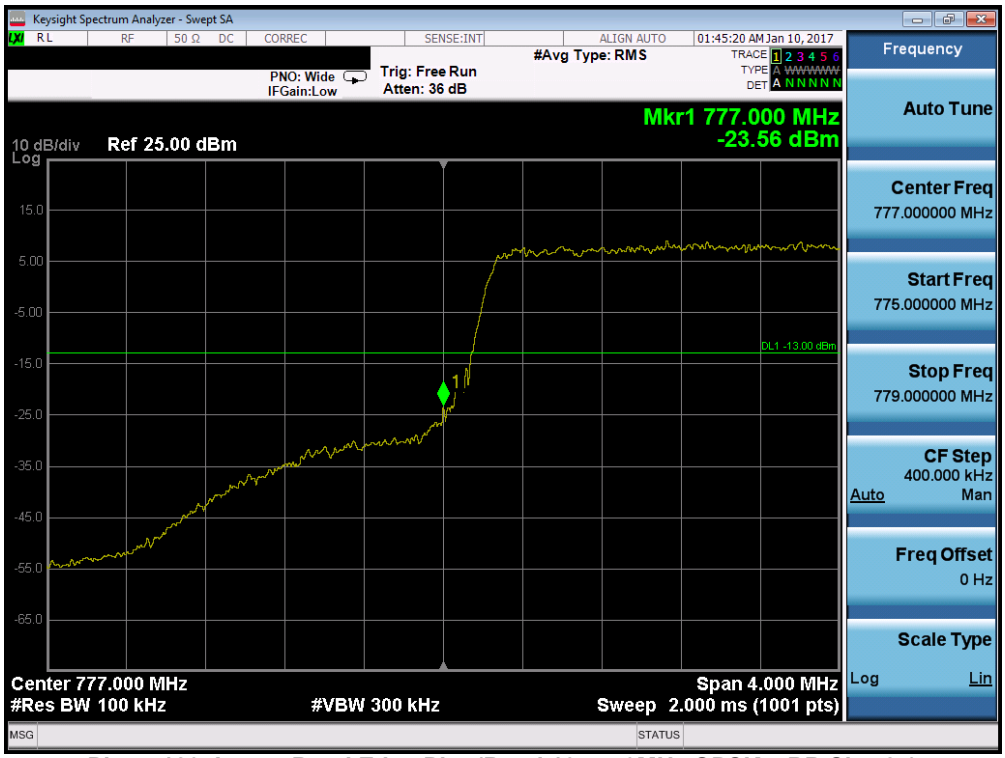


Plot 7-119. Upper Band Edge Plot (Band 12/17 – 10.0MHz QPSK – RB Size 50)



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

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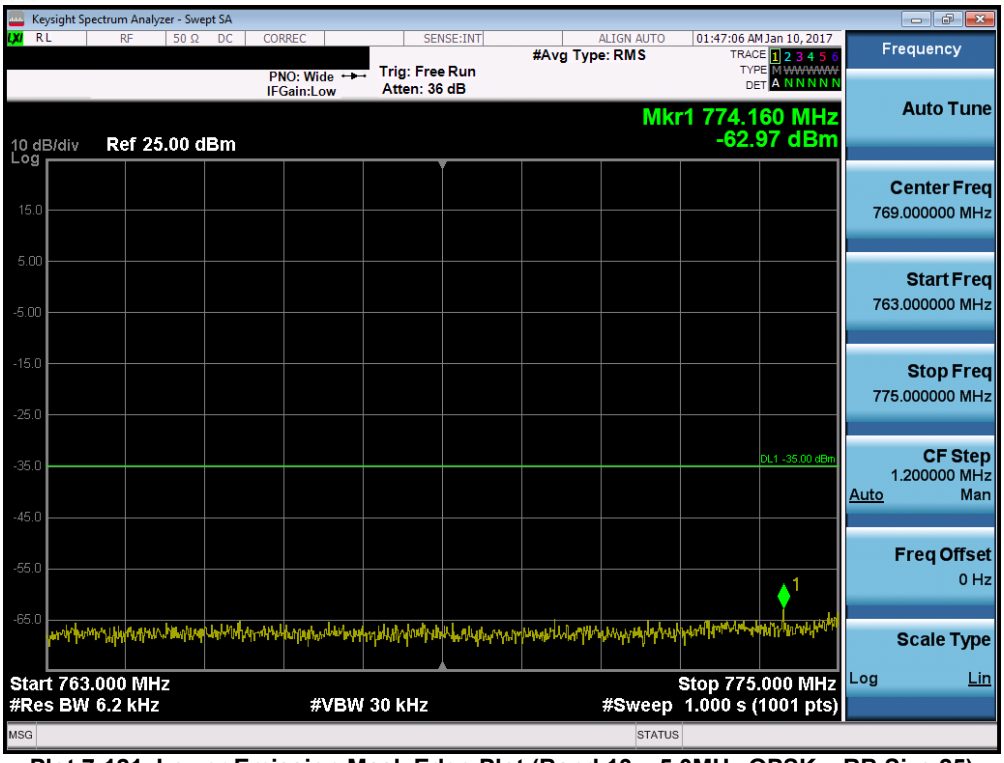

Plot 7-121. Lower Emission Mask Edge Plot (Band 13 – 5.0MHz QPSK – RB Size 25)

Plot 7-122. Upper Band Edge Plot (Band 13 – 5.0MHz QPSK – RB Size 25)

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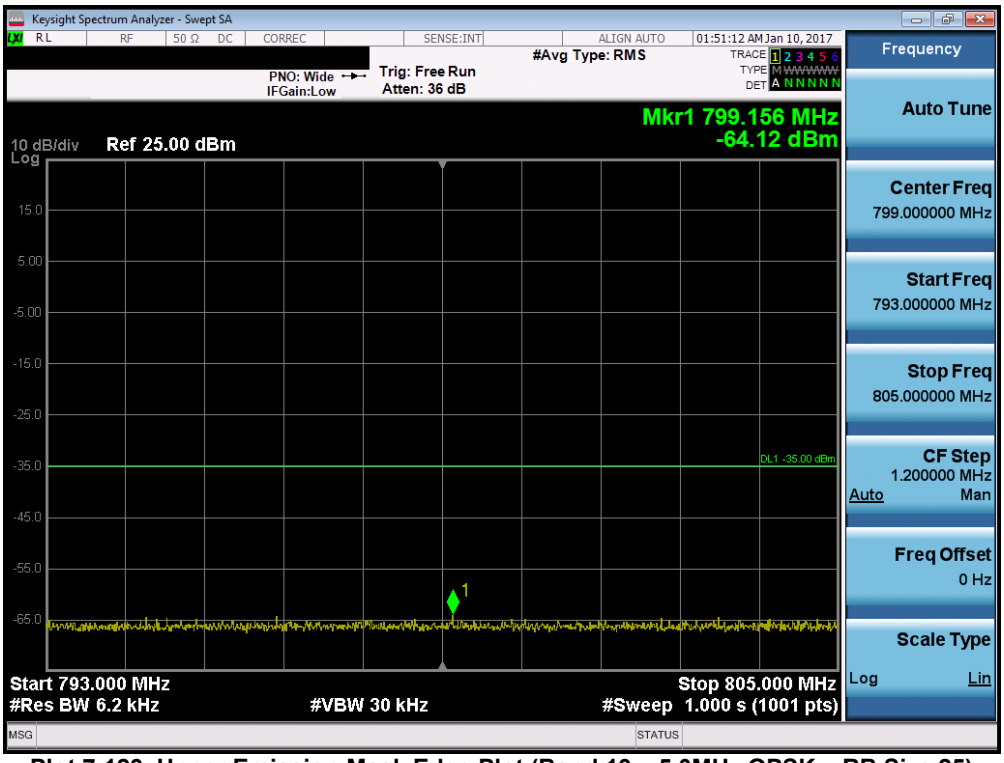
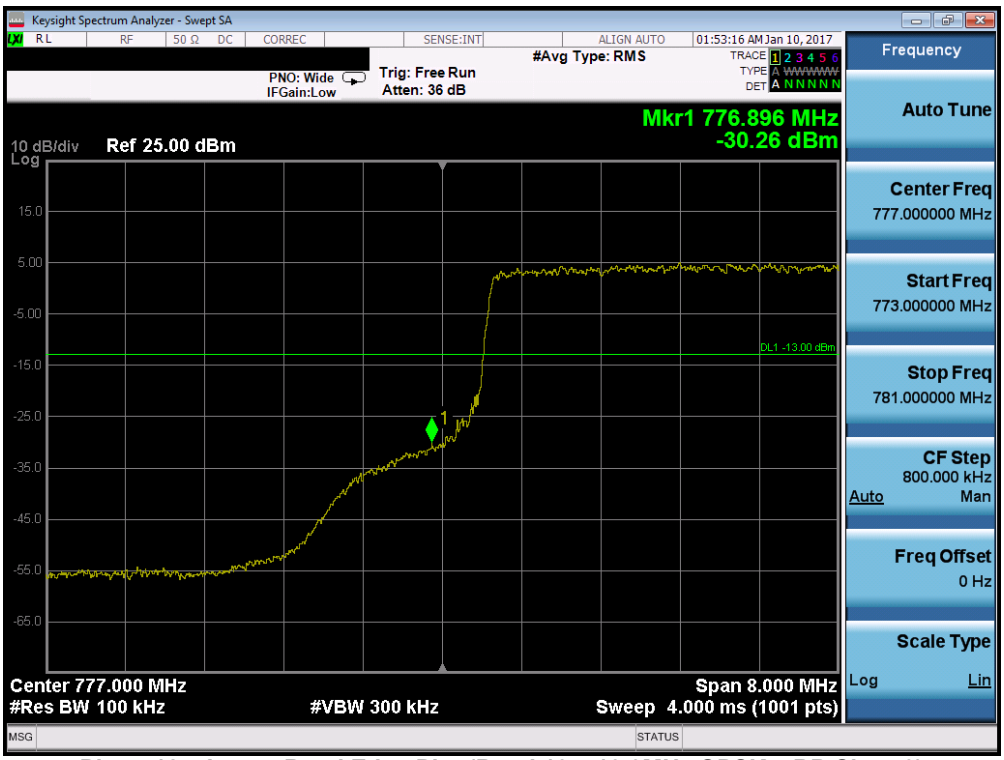


Plot 7-123. Upper Emission Mask Edge Plot (Band 13 – 5.0MHz QPSK – RB Size 25)



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

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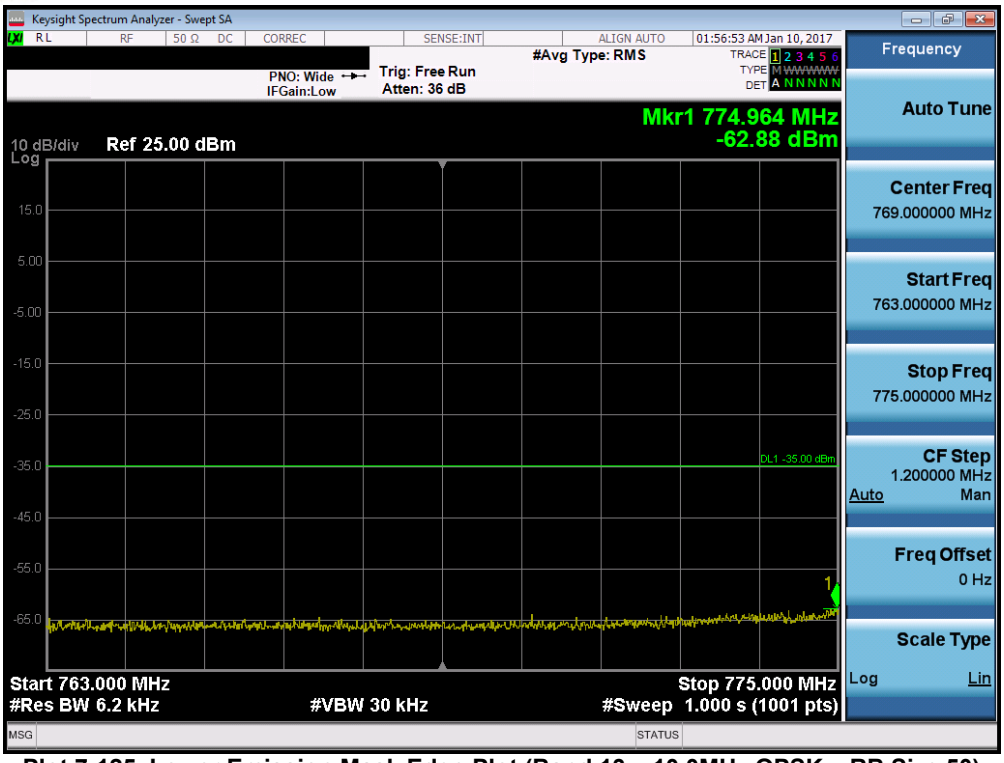

Plot 7-125. Lower Emission Mask Edge Plot (Band 13 – 10.0MHz QPSK – RB Size 50)

Plot 7-126. Upper Band Edge Plot (Band 13 – 10.0MHz QPSK – RB Size 50)

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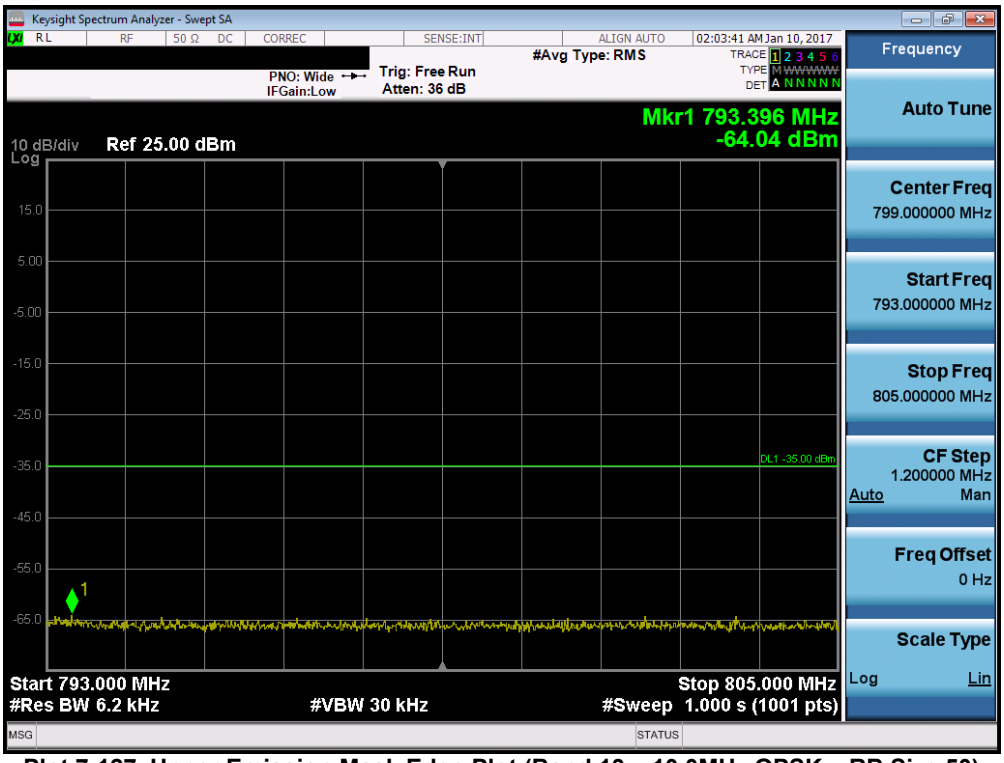

Plot 7-127. Upper Emission Mask Edge Plot (Band 13 – 10.0MHz QPSK – RB Size 50)

Plot 7-128. Lower Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

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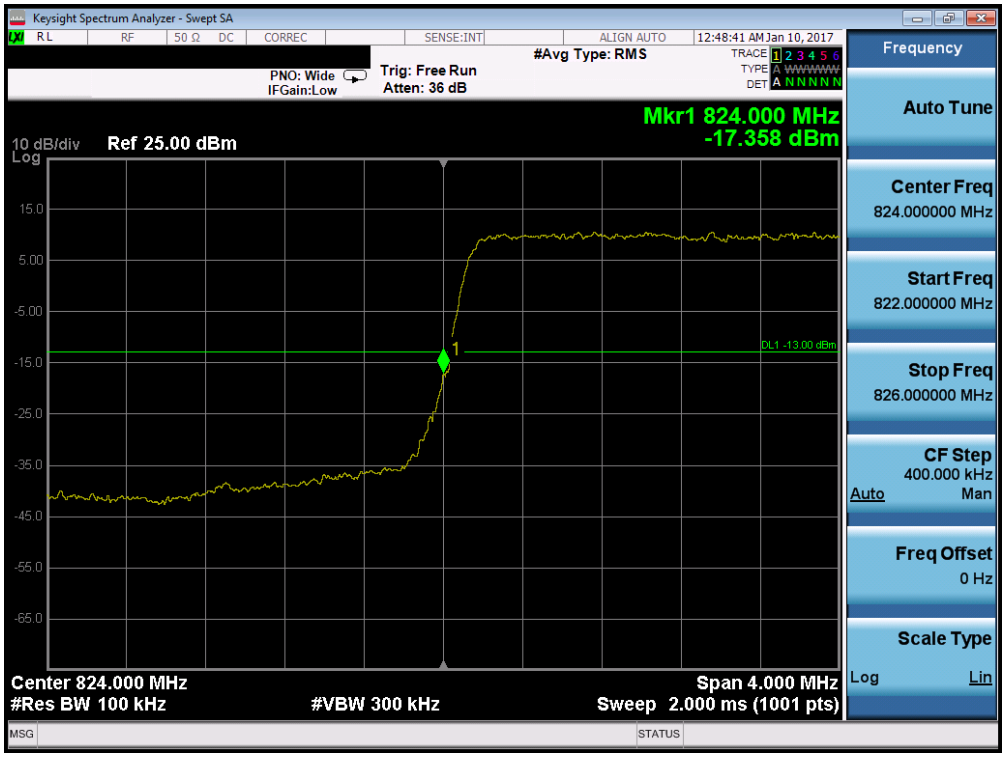
Plot 7-129. Upper Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)



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

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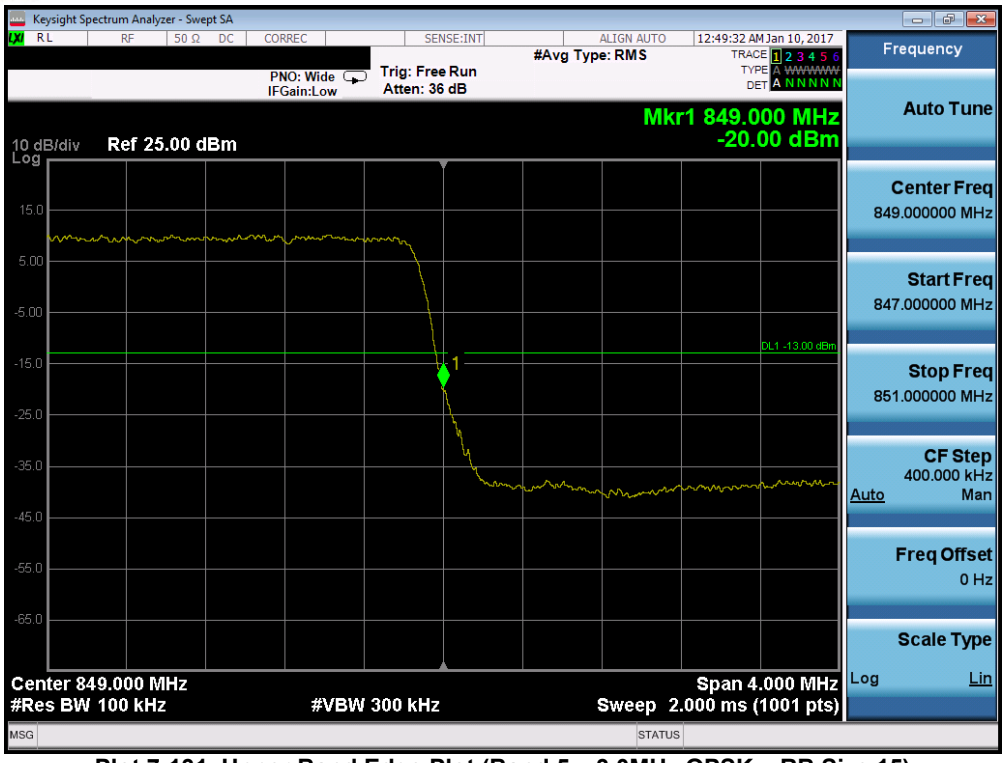
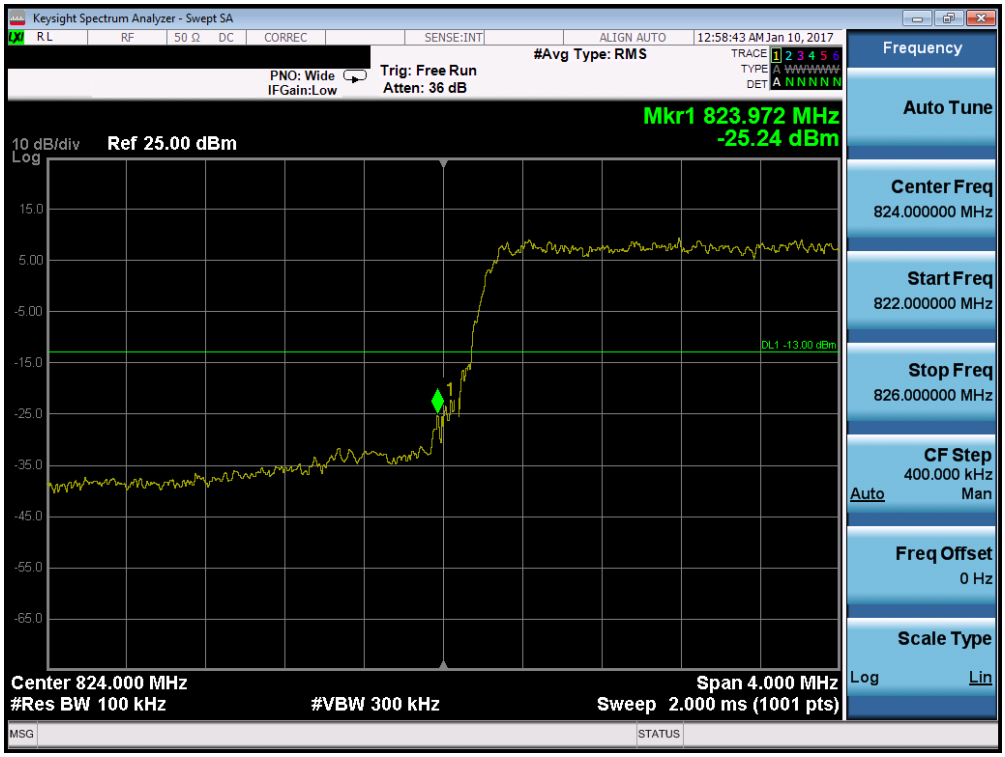


Plot 7-131. Upper Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)



Plot 7-132. Lower Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

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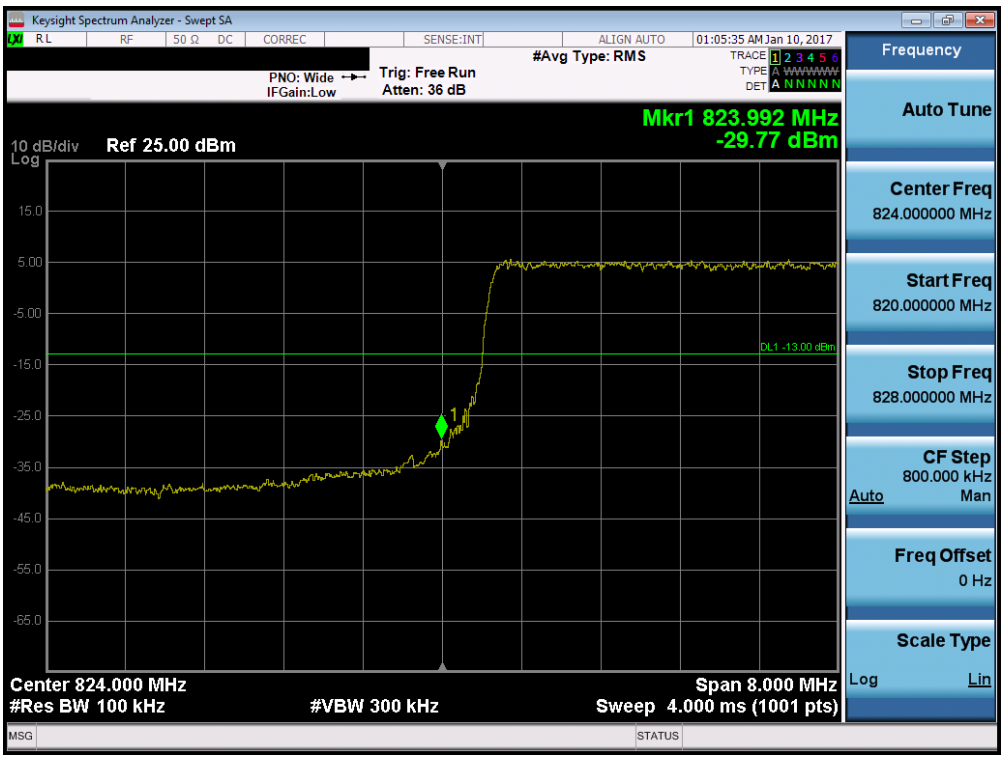
Plot 7-133. Upper Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)



Plot 7-134. Lower Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)

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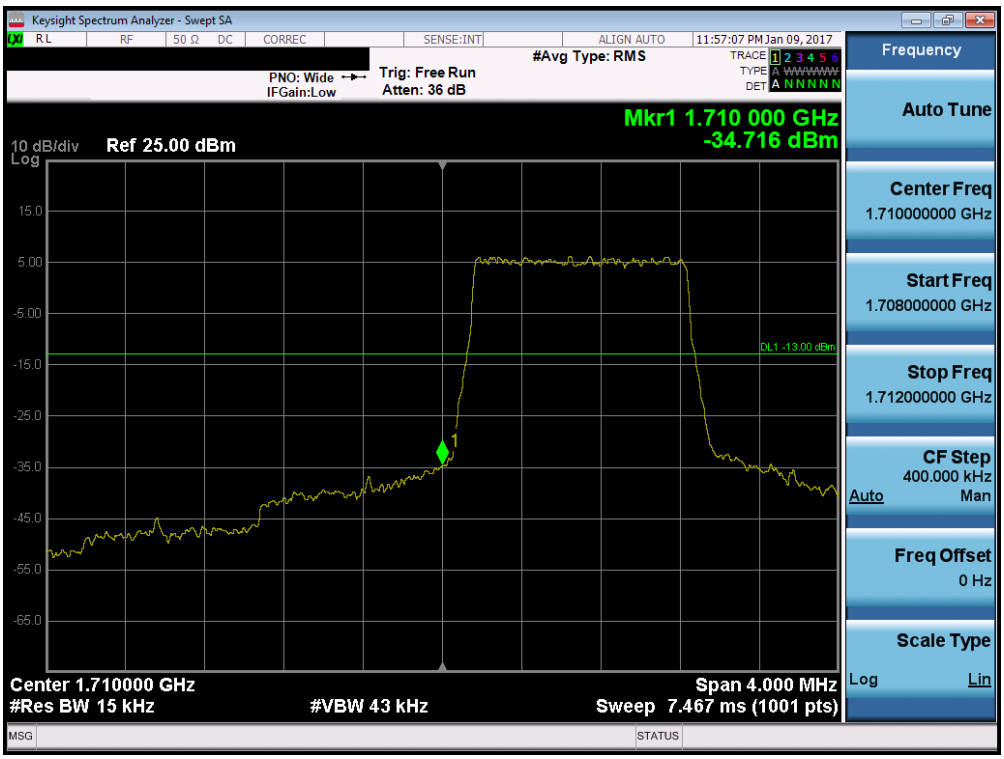
Plot 7-135. Upper Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)



Plot 7-136. Lower Band Edge Plot (Band 4/66 – 1.4MHz QPSK – RB Size 6)

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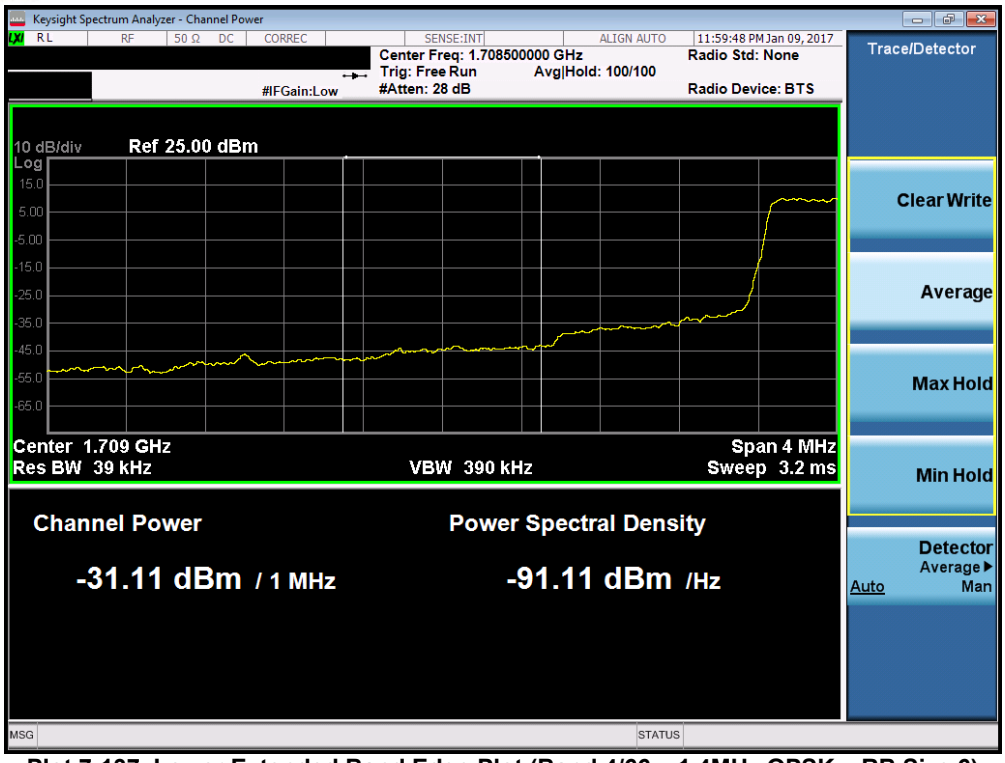
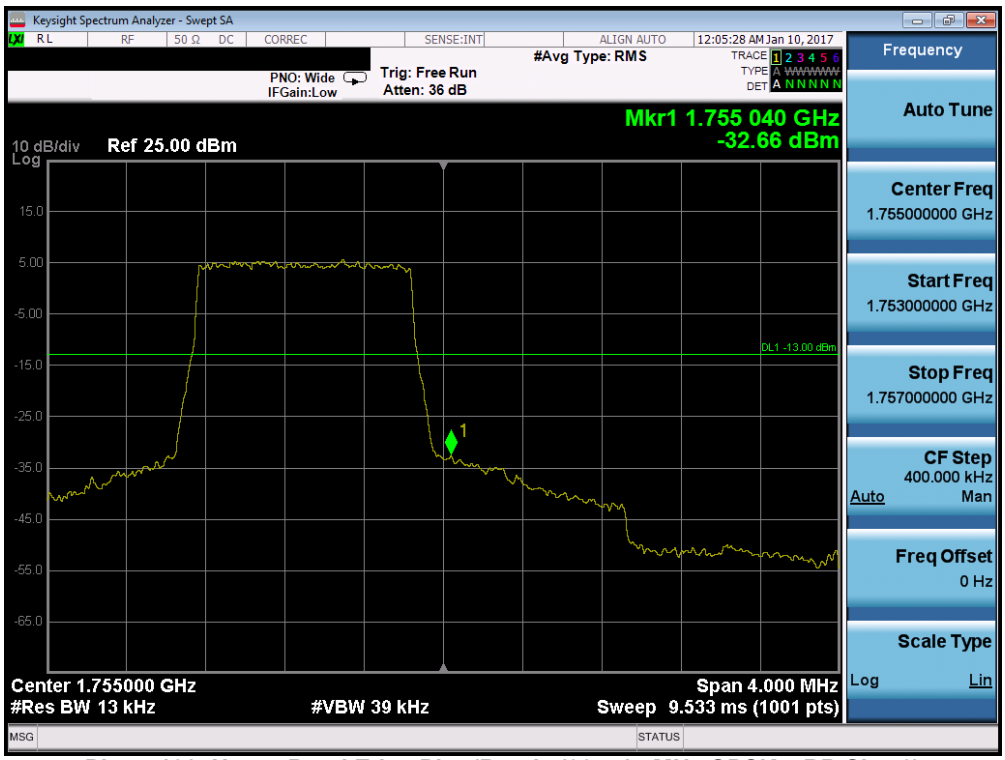


Plot 7-137. Lower Extended Band Edge Plot (Band 4/66 – 1.4MHz QPSK – RB Size 6)



Plot 7-138. Upper Band Edge Plot (Band 4/66 – 1.4MHz QPSK – RB Size 6)

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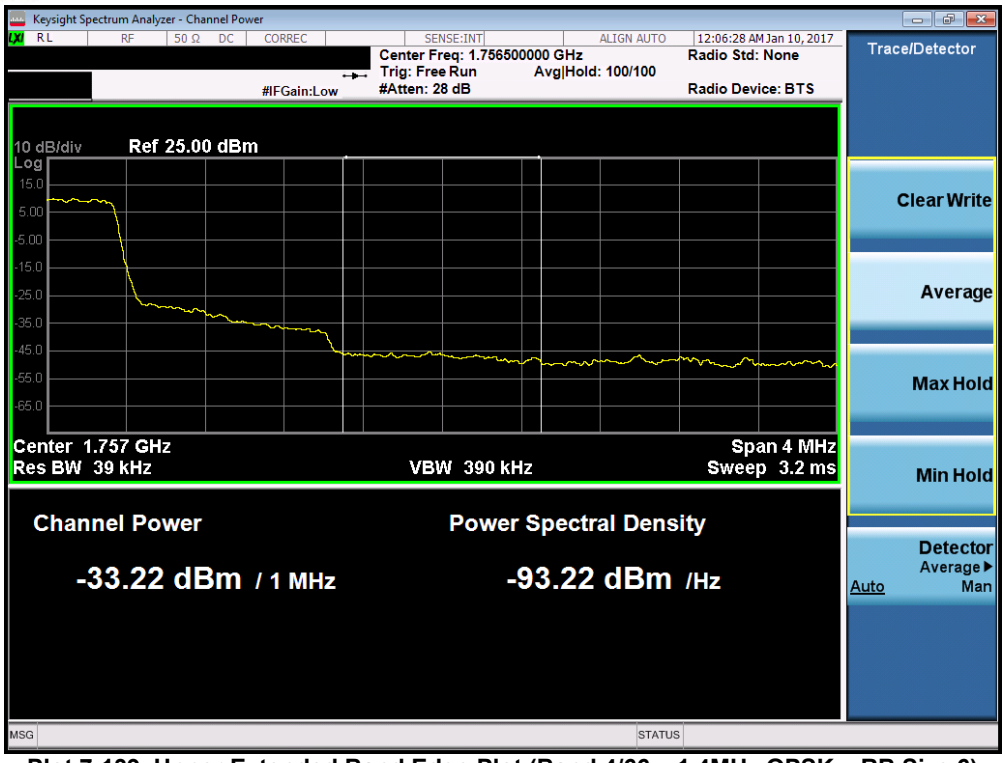
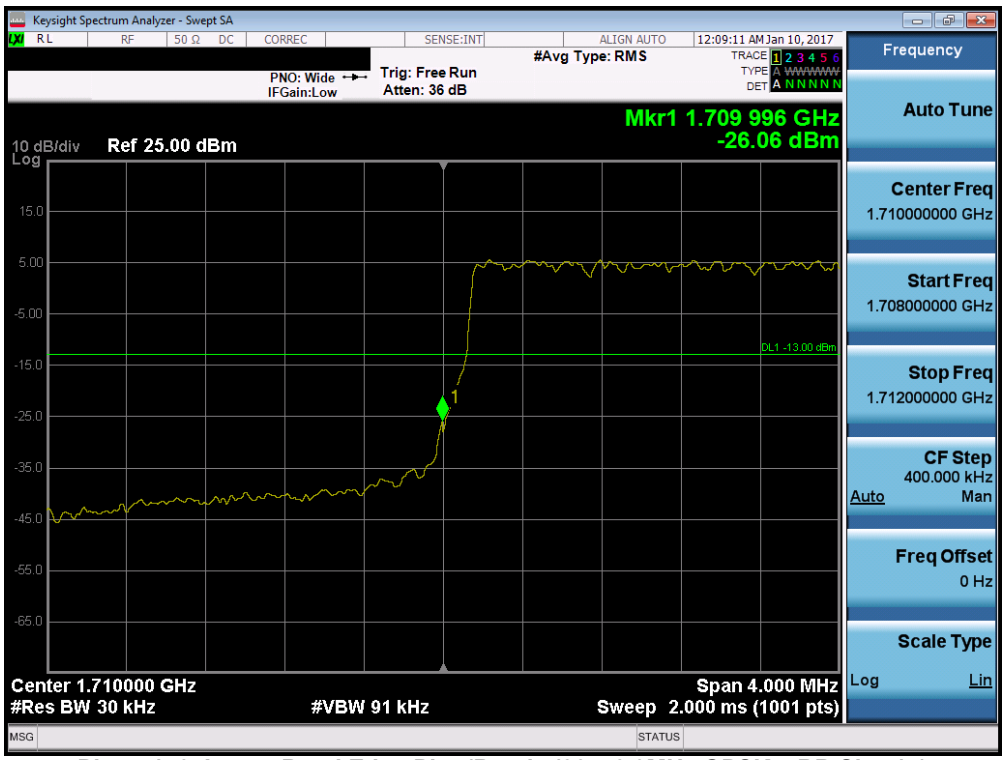


Plot 7-139. Upper Extended Band Edge Plot (Band 4/66 – 1.4MHz QPSK – RB Size 6)



Plot 7-140. Lower Band Edge Plot (Band 4/66 – 3.0MHz QPSK – RB Size 15)

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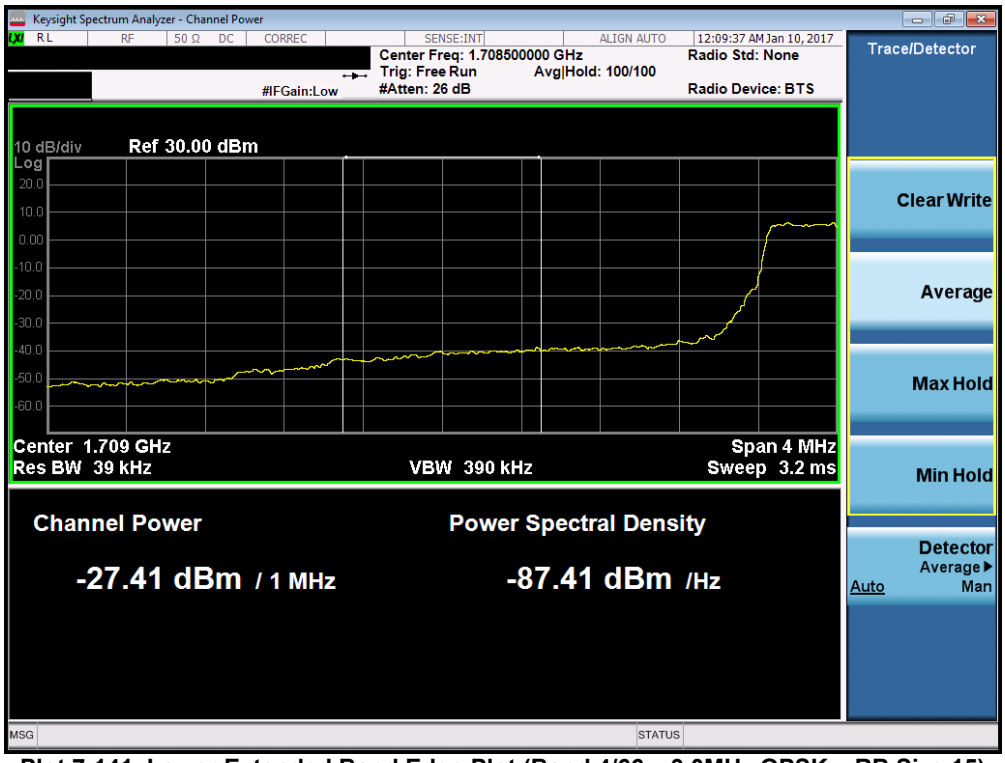
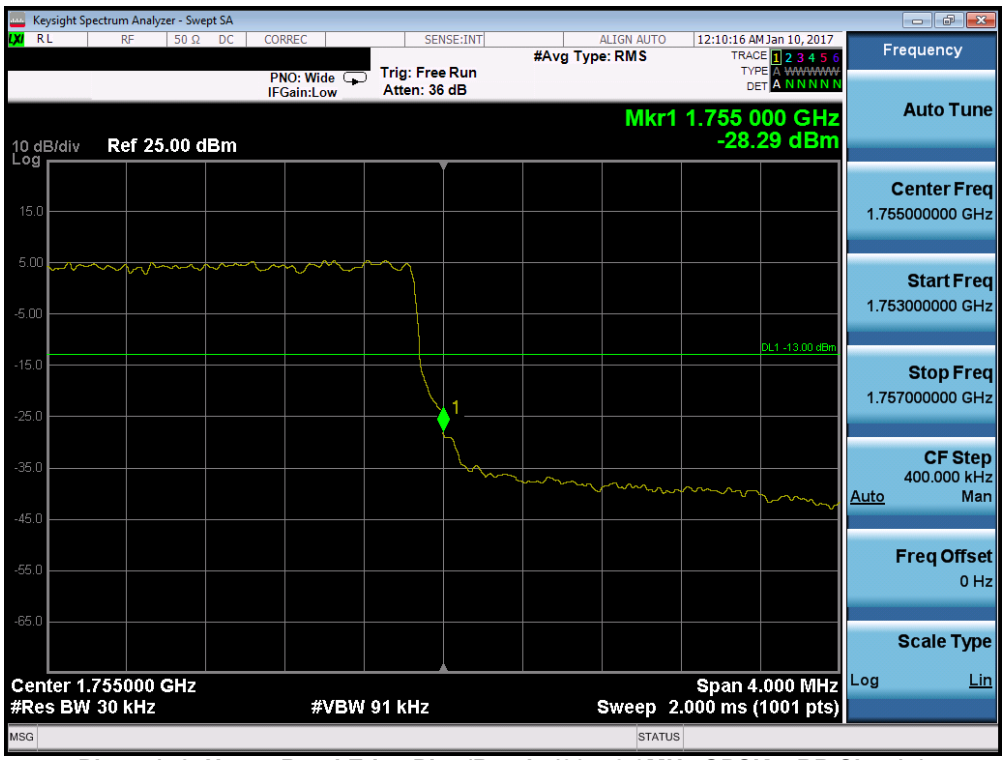


Plot 7-141. Lower Extended Band Edge Plot (Band 4/66 – 3.0MHz QPSK – RB Size 15)



Plot 7-142. Upper Band Edge Plot (Band 4/66 – 3.0MHz QPSK – RB Size 15)

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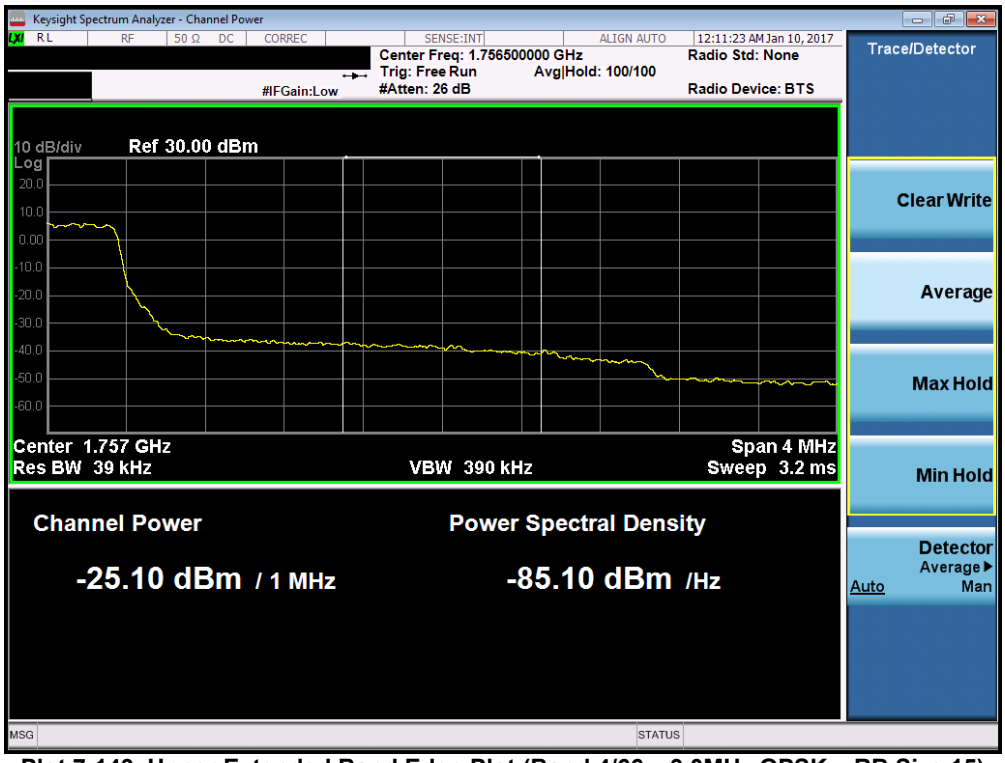

Plot 7-143. Upper Extended Band Edge Plot (Band 4/66 – 3.0MHz QPSK – RB Size 15)

Plot 7-144. Lower Band Edge Plot (Band 4/66 – 5.0MHz QPSK – RB Size 25)

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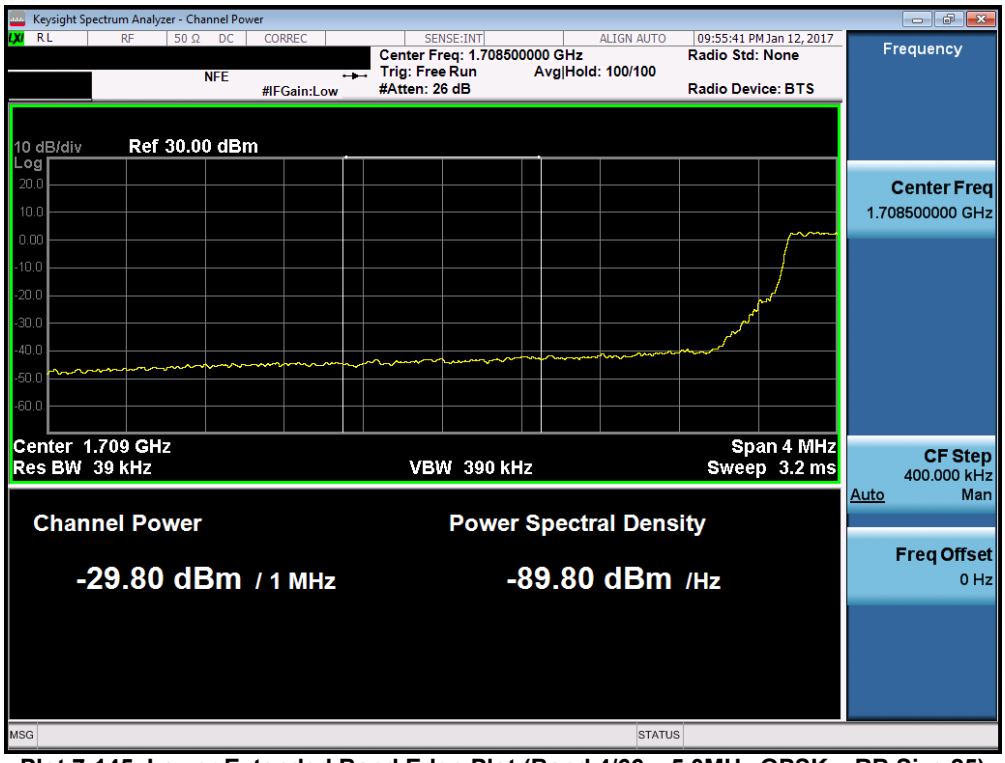

Plot 7-145. Lower Extended Band Edge Plot (Band 4/66 – 5.0MHz QPSK – RB Size 25)

Plot 7-146. Upper Band Edge Plot (Band 4/66 – 5.0MHz QPSK – RB Size 25)

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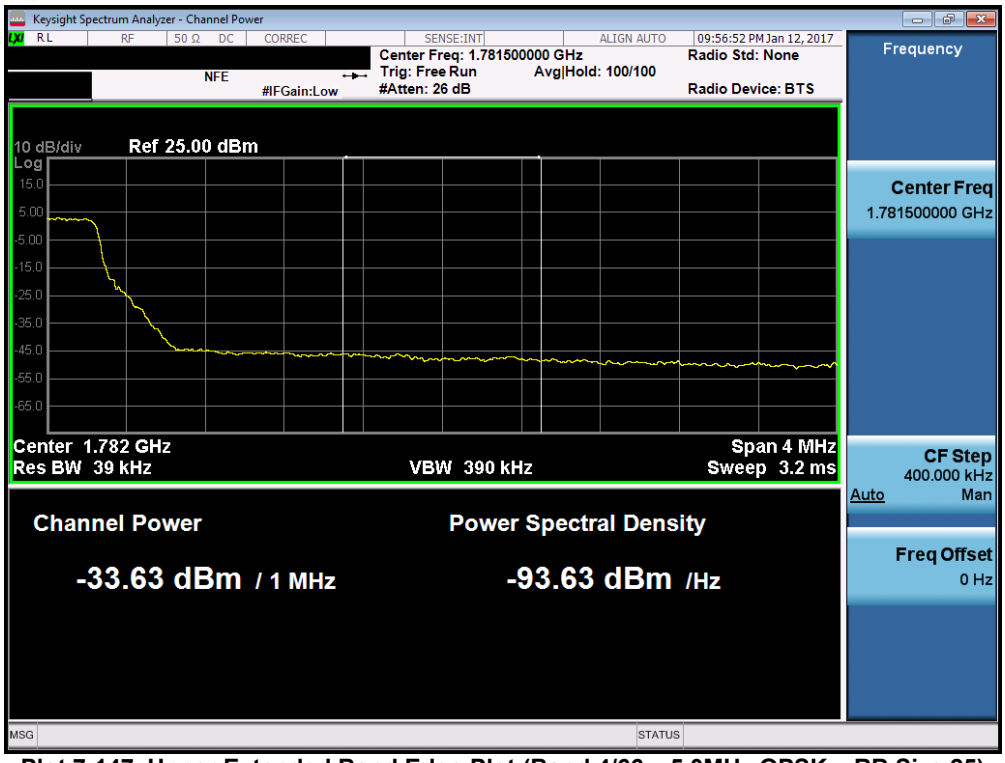
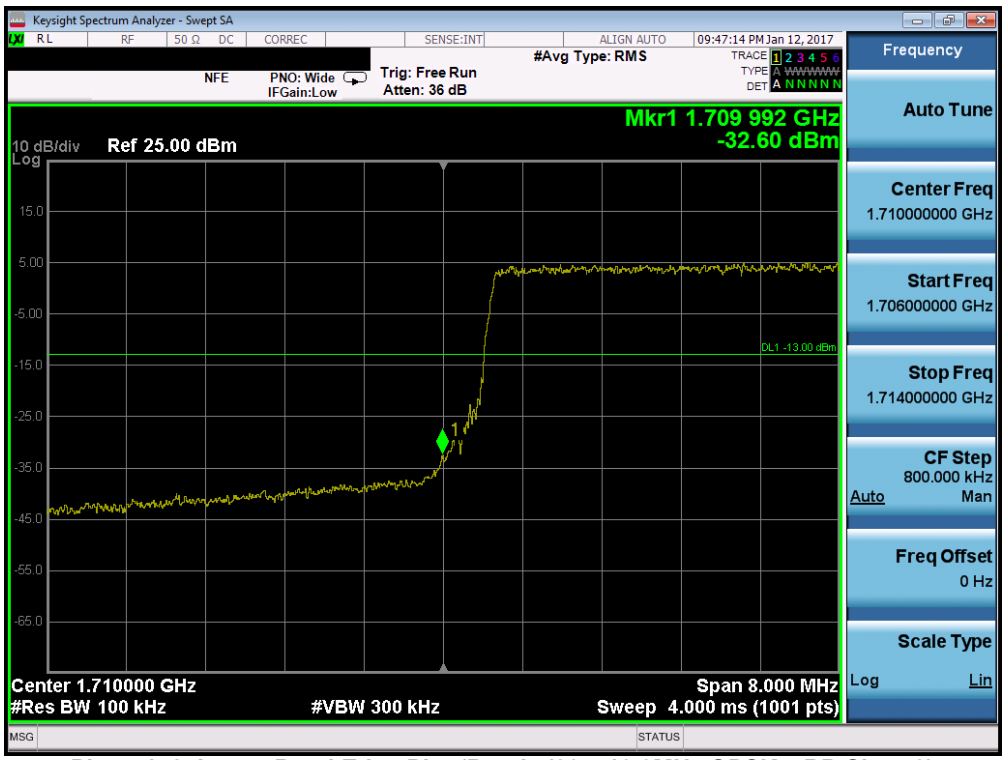


Plot 7-147. Upper Extended Band Edge Plot (Band 4/66 – 5.0MHz QPSK – RB Size 25)



Plot 7-148. Lower Band Edge Plot (Band 4/66 – 10.0MHz QPSK – RB Size 50)

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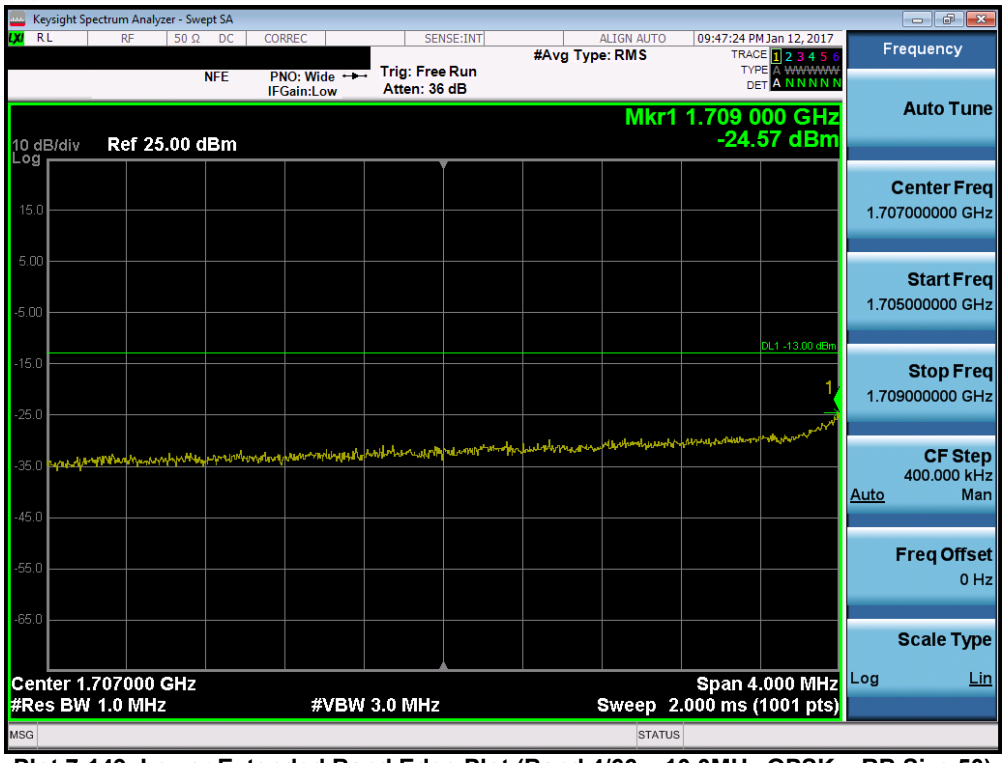
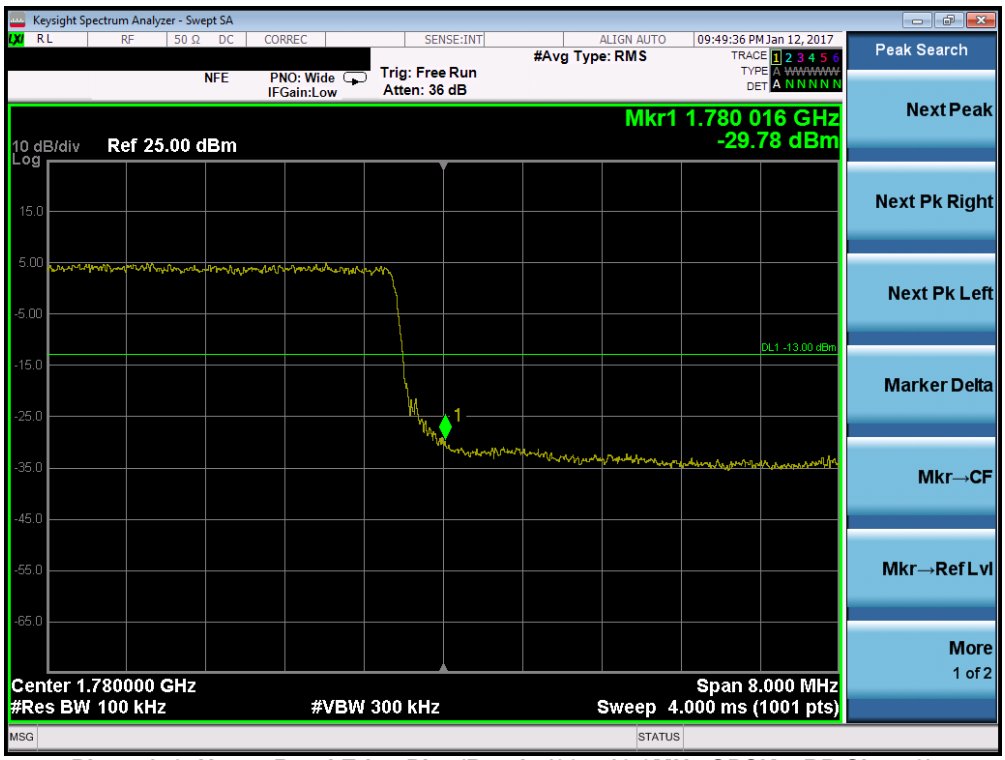


Plot 7-149. Lower Extended Band Edge Plot (Band 4/66 – 10.0MHz QPSK – RB Size 50)



Plot 7-150. Upper Band Edge Plot (Band 4/66 – 10.0MHz QPSK – RB Size 50)

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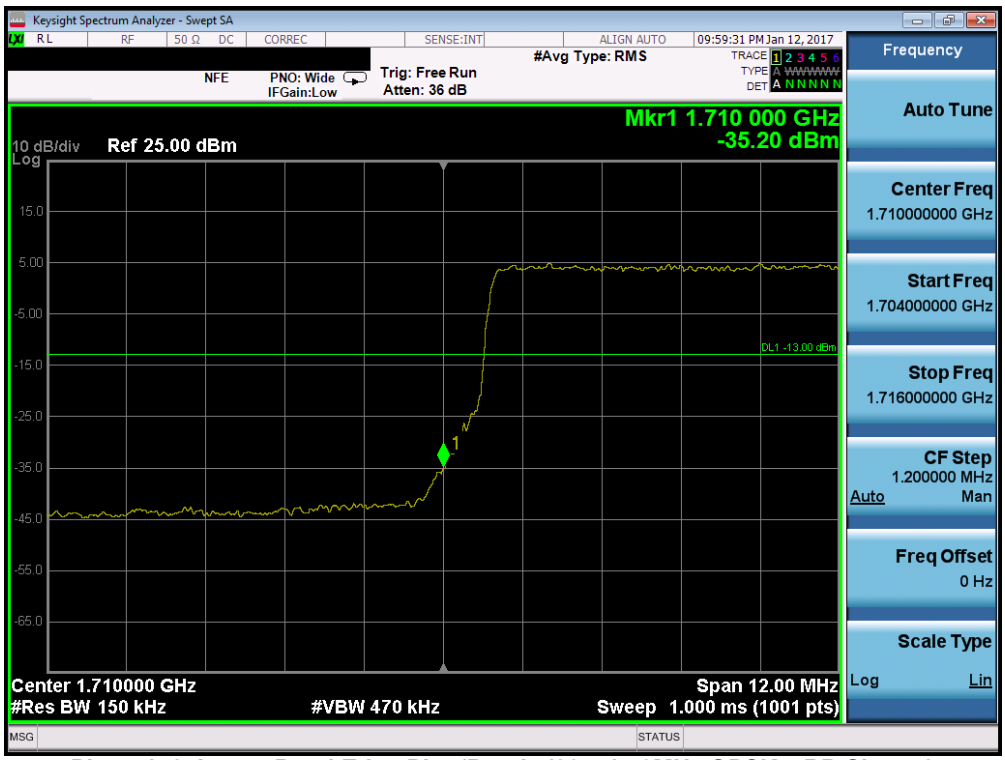
Plot 7-151. Upper Extended Band Edge Plot (Band 4/66 – 10.0MHz QPSK – RB Size 50)



Plot 7-152. Lower Band Edge Plot (Band 4/66 – 15.0MHz QPSK – RB Size 75)

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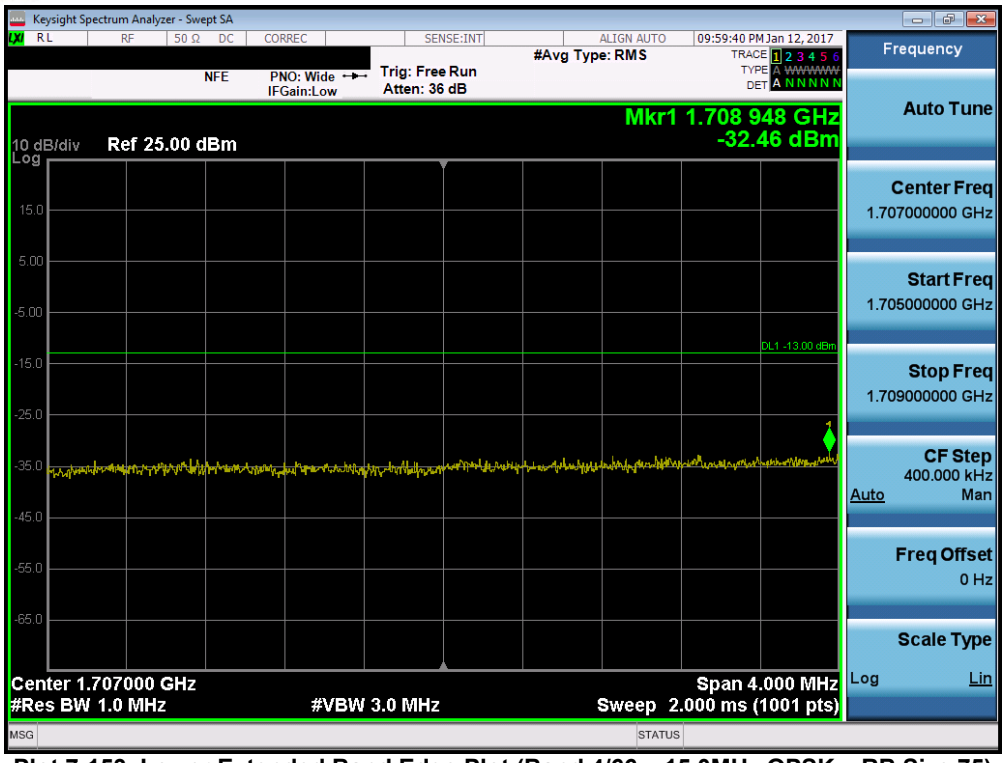

Plot 7-153. Lower Extended Band Edge Plot (Band 4/66 – 15.0MHz QPSK – RB Size 75)

Plot 7-154. Upper Band Edge Plot (Band 4/66 – 15.0MHz QPSK – RB Size 75)

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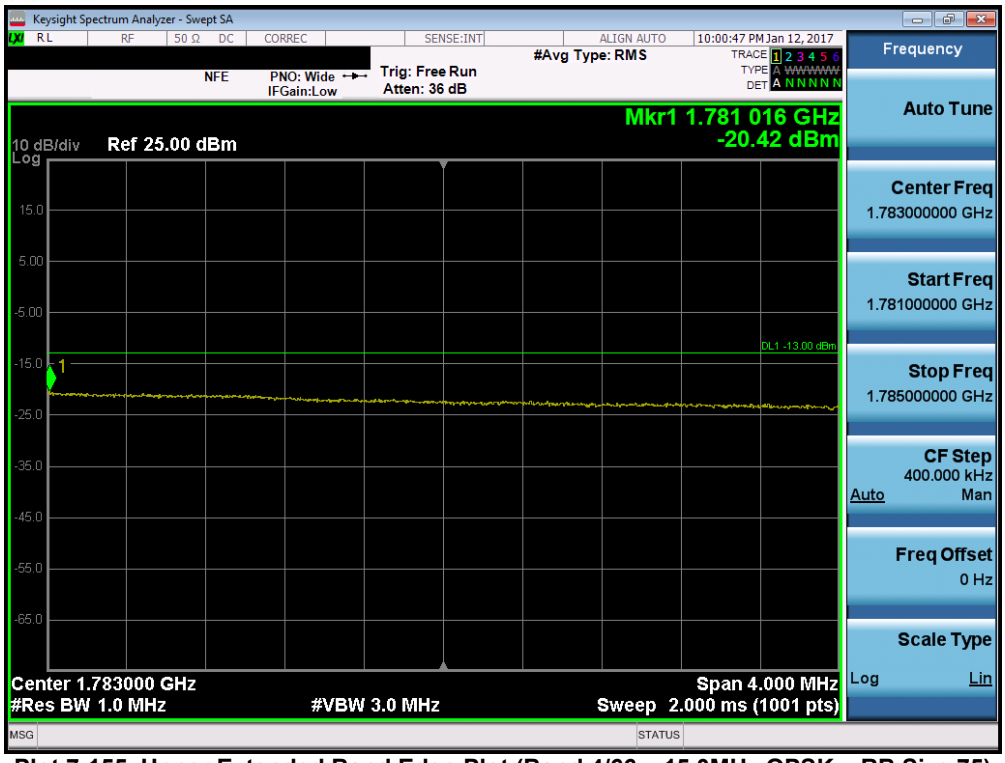
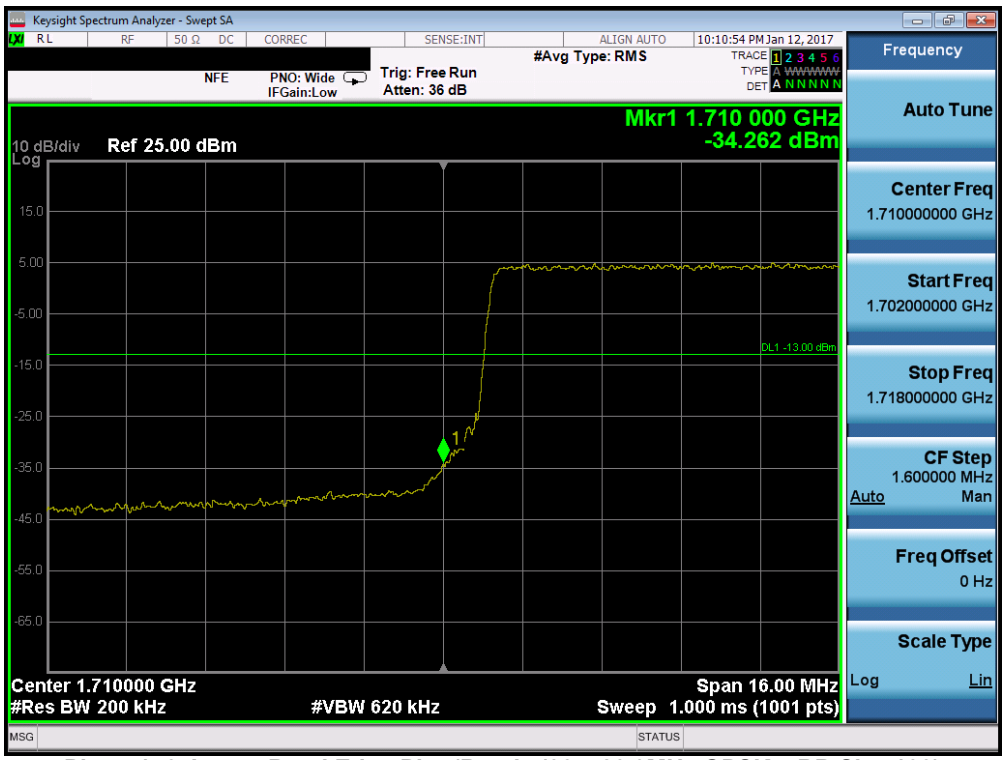


Plot 7-155. Upper Extended Band Edge Plot (Band 4/66 – 15.0MHz QPSK – RB Size 75)



Plot 7-156. Lower Band Edge Plot (Band 4/66 – 20.0MHz QPSK – RB Size 100)

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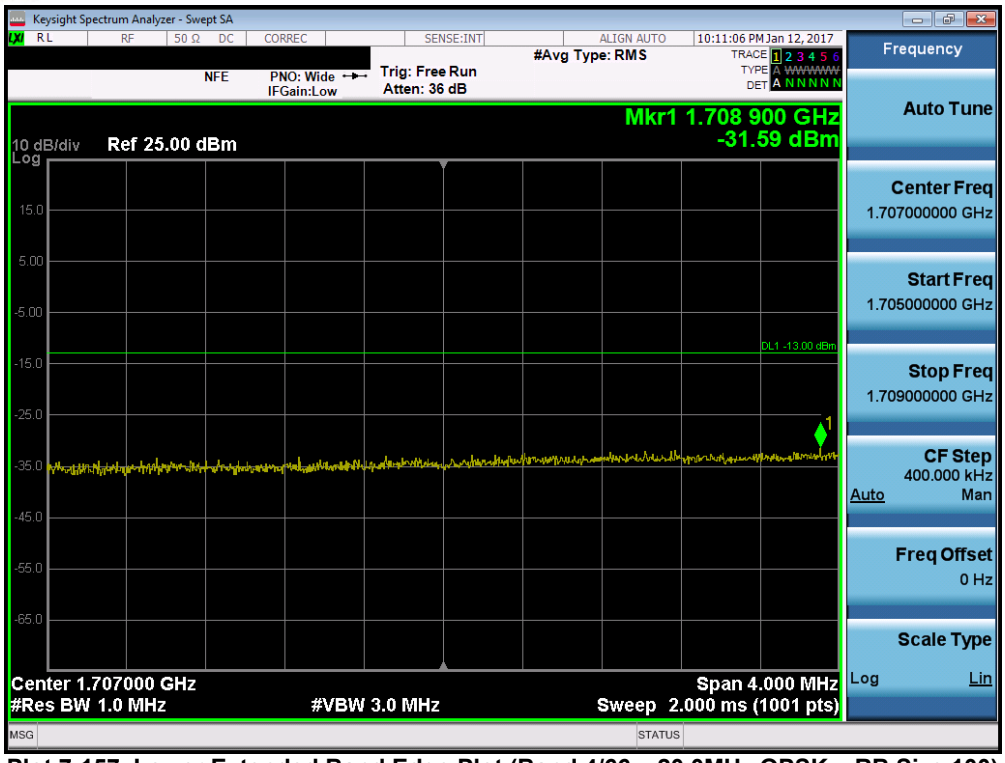

Plot 7-157. Lower Extended Band Edge Plot (Band 4/66 – 20.0MHz QPSK – RB Size 100)

Plot 7-158. Upper Band Edge Plot (Band 4/66 – 20.0MHz QPSK – RB Size 100)

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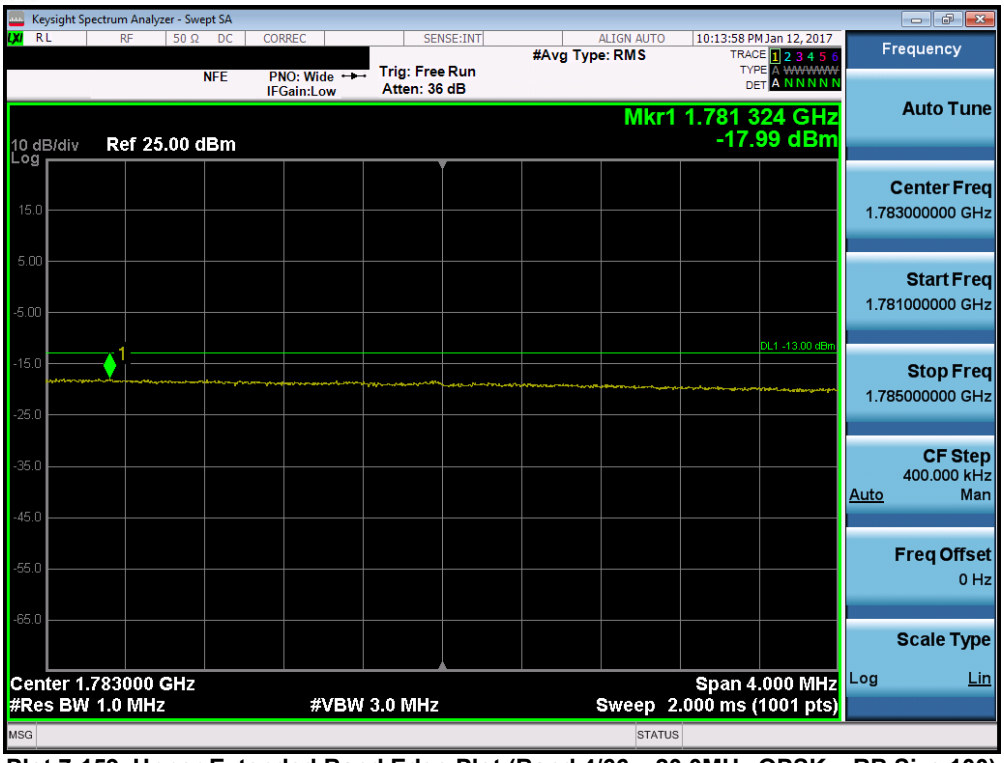
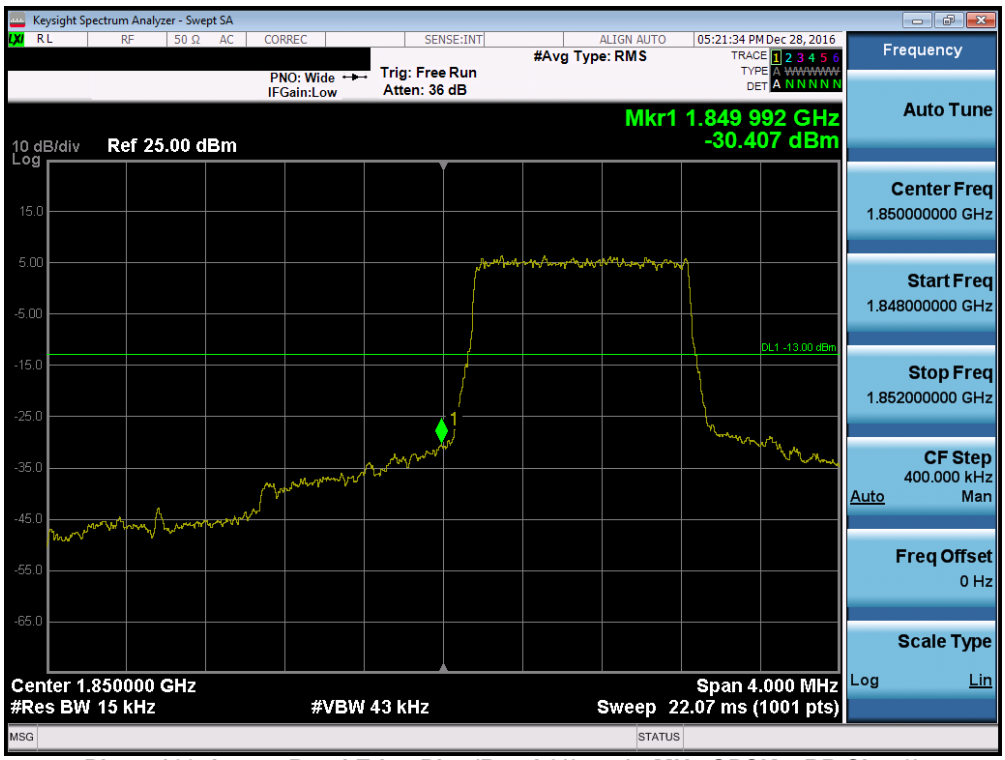


Plot 7-159. Upper Extended Band Edge Plot (Band 4/66 – 20.0MHz QPSK – RB Size 100)



Plot 7-160. Lower Band Edge Plot (Band 2/25 – 1.4MHz QPSK – RB Size 6)

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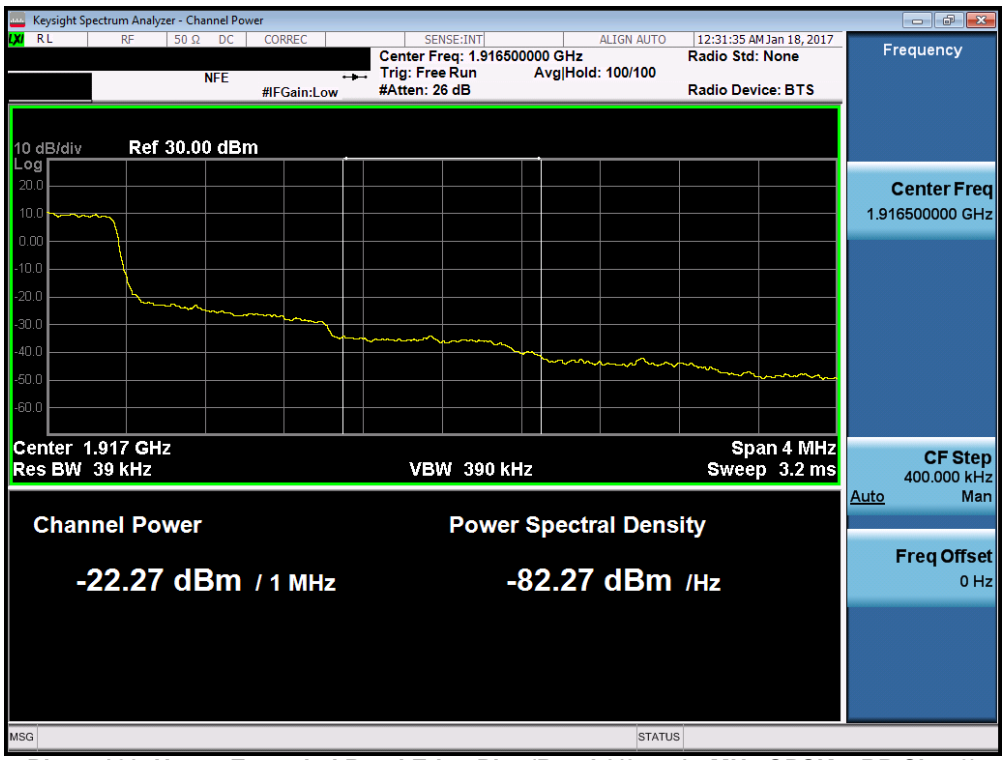
Plot 7-161. Upper Band Edge Plot (Band 2/25 – 1.4MHz QPSK – RB Size 6)



Plot 7-162. Upper Extended Band Edge Plot (Band 2/25 – 1.4MHz QPSK – RB Size 6)

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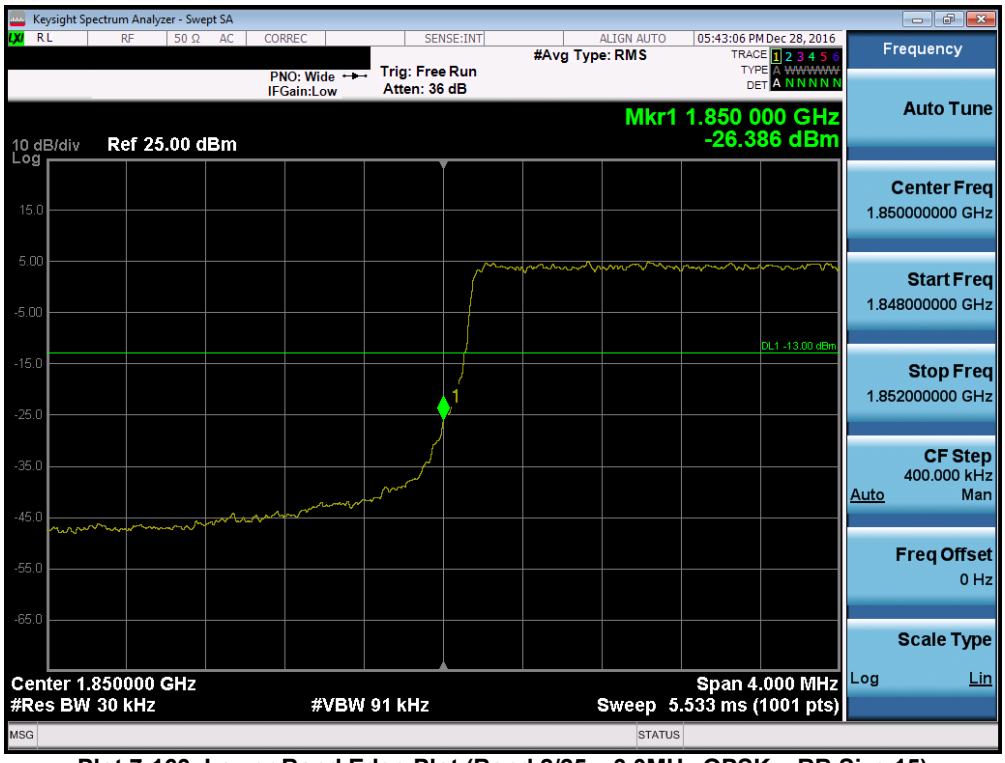
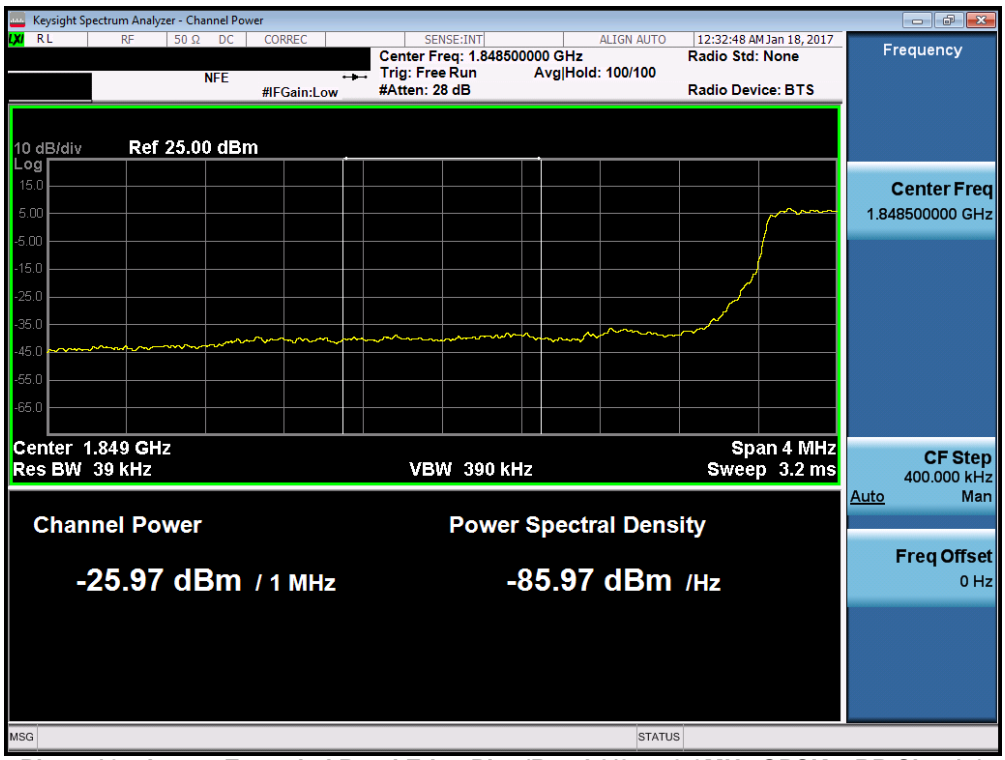


Plot 7-163. Lower Band Edge Plot (Band 2/25 – 3.0MHz QPSK – RB Size 15)



Plot 7-164. Lower Extended Band Edge Plot (Band 2/25 – 3.0MHz QPSK – RB Size 15)

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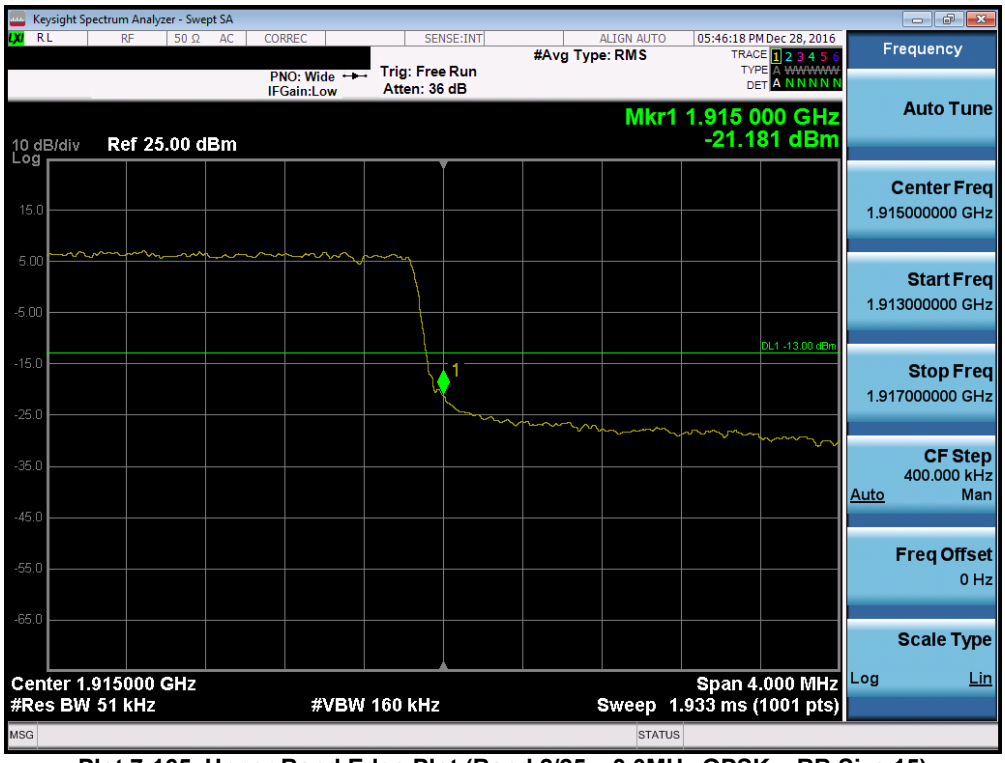
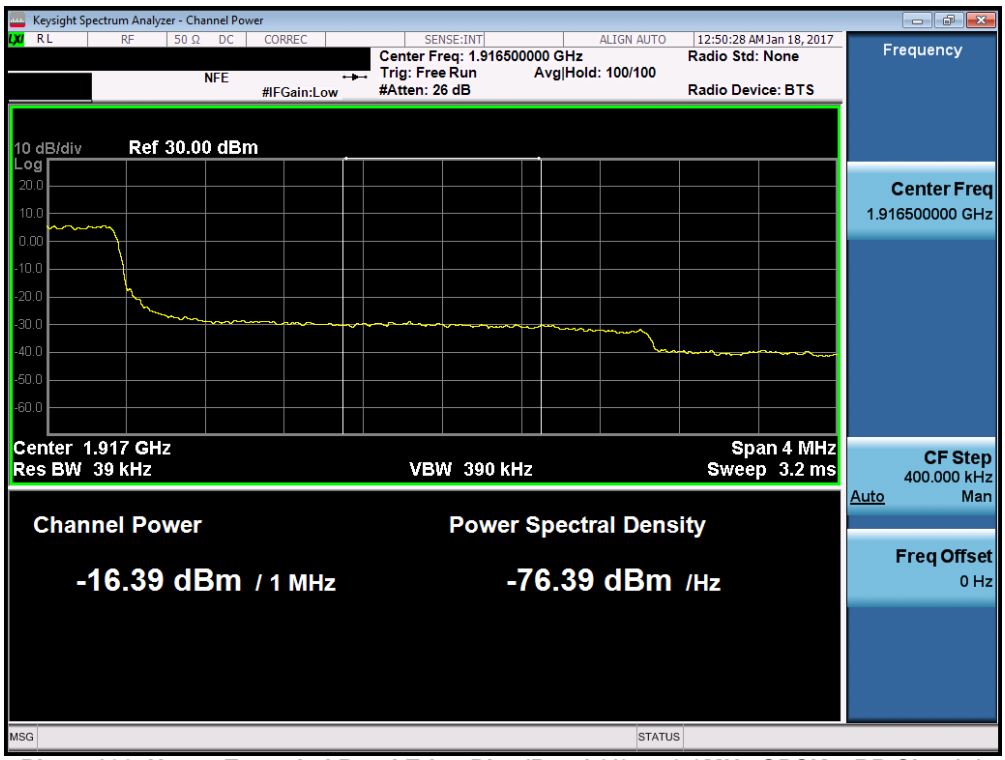


Plot 7-165. Upper Band Edge Plot (Band 2/25 – 3.0MHz QPSK – RB Size 15)



Plot 7-166. Upper Extended Band Edge Plot (Band 2/25 – 3.0MHz QPSK – RB Size 15)

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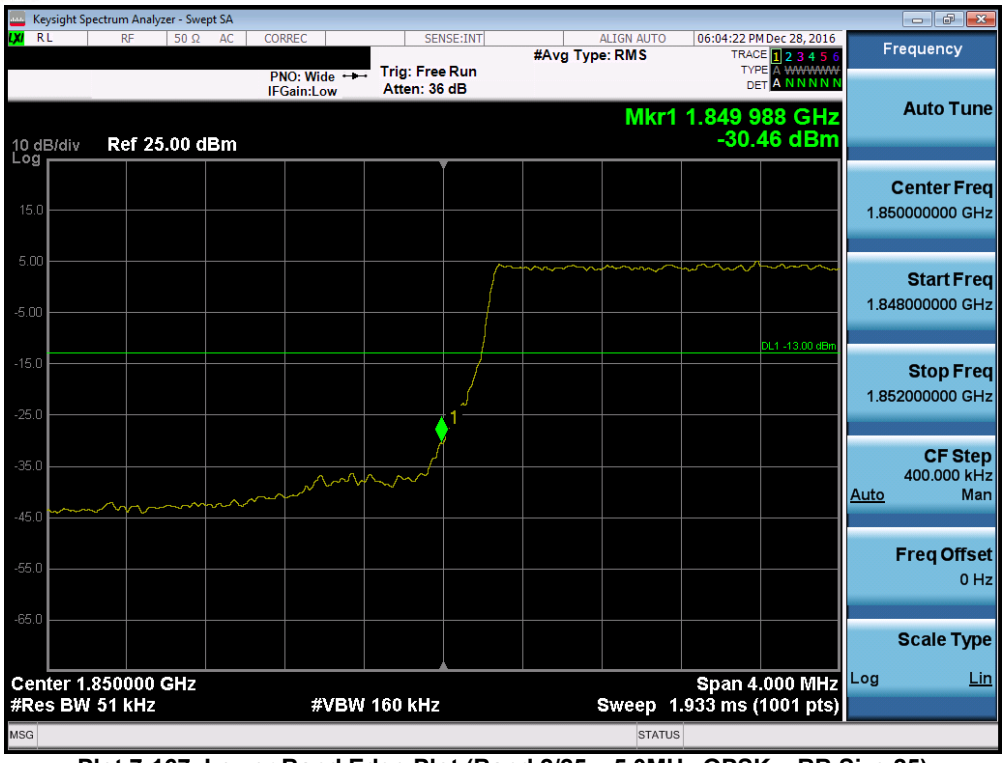
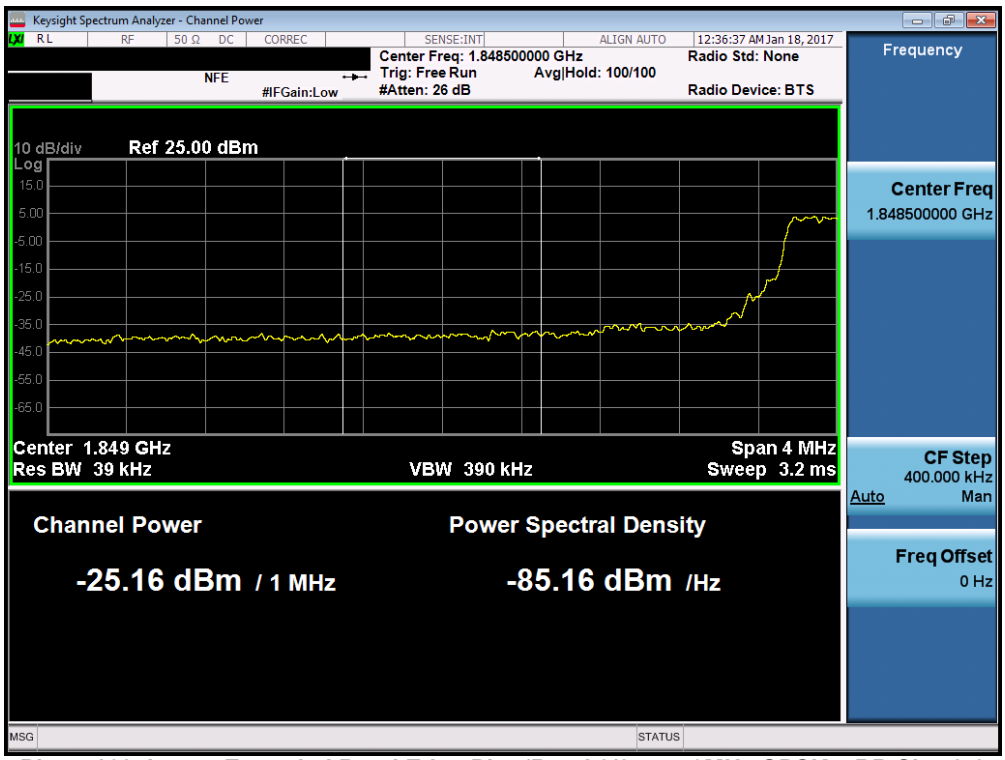


Plot 7-167. Lower Band Edge Plot (Band 2/25 – 5.0MHz QPSK – RB Size 25)



Plot 7-168. Lower Extended Band Edge Plot (Band 2/25 – 5.0MHz QPSK – RB Size 25)

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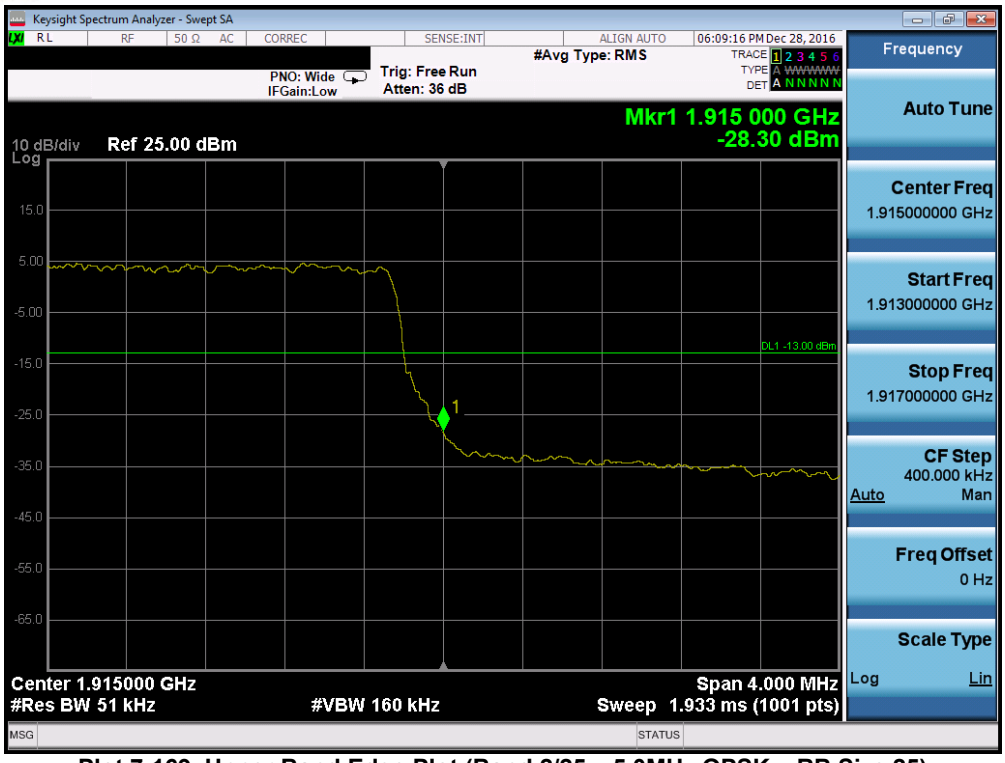
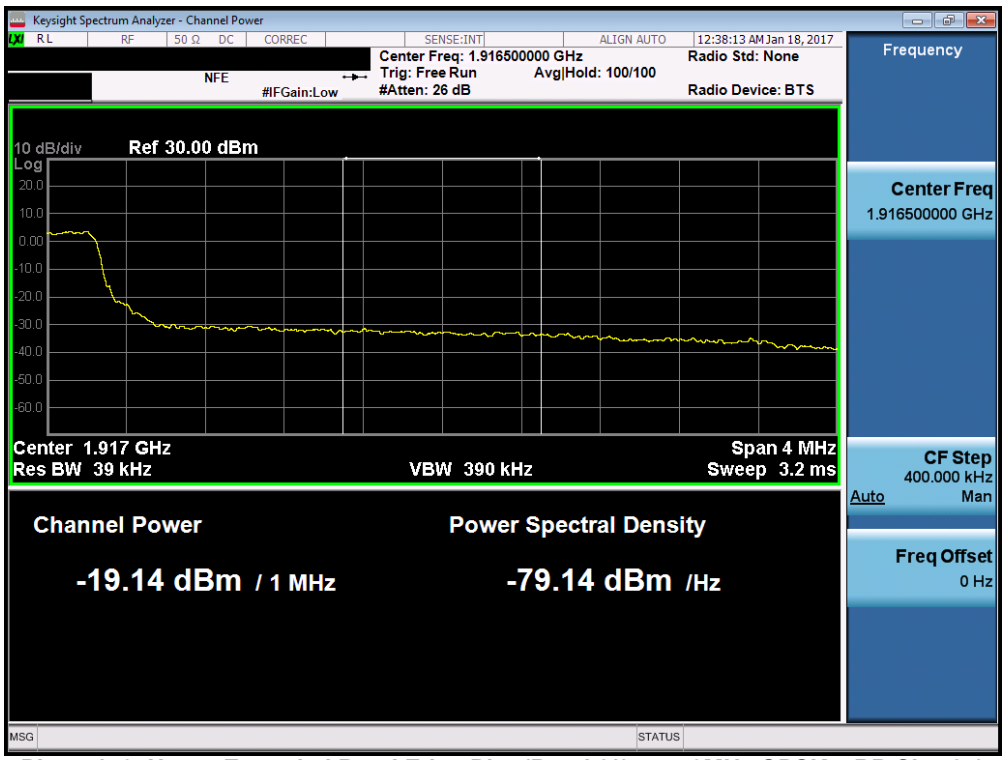


Plot 7-169. Upper Band Edge Plot (Band 2/25 – 5.0MHz QPSK – RB Size 25)



Plot 7-170. Upper Extended Band Edge Plot (Band 2/25 – 5.0MHz QPSK – RB Size 25)

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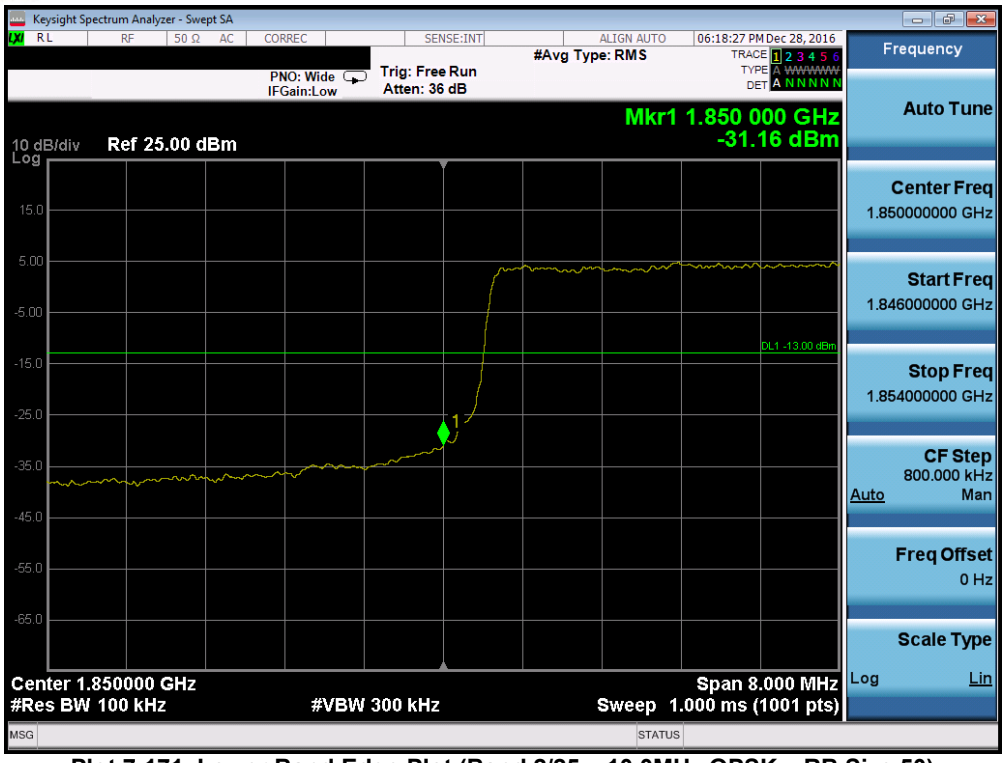
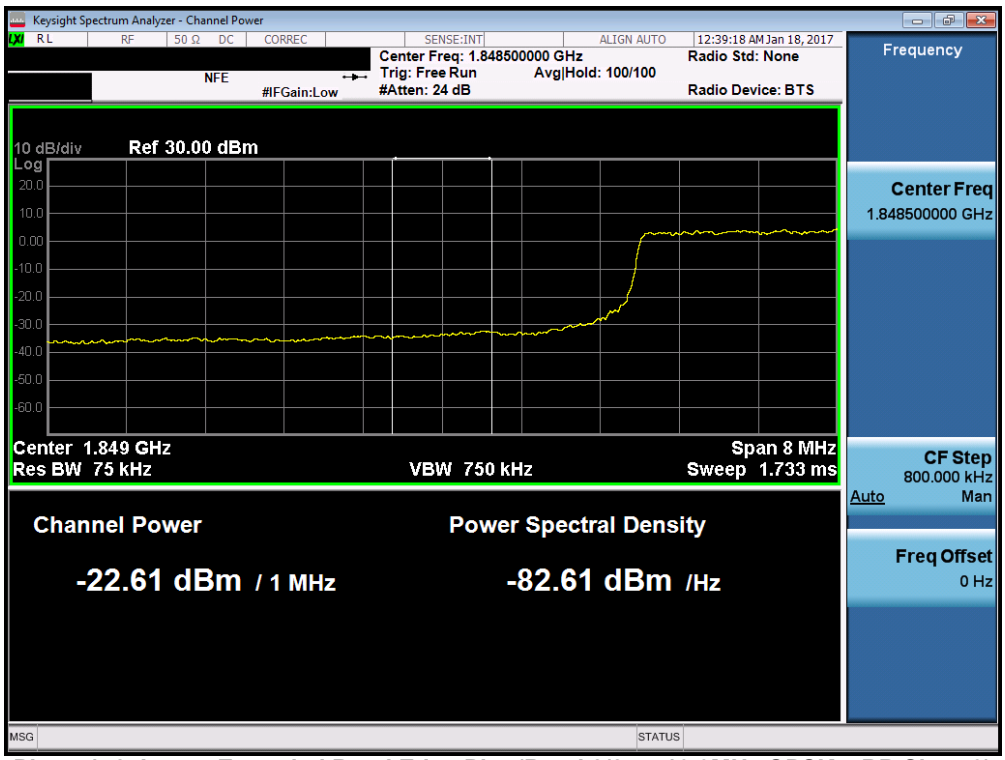


Plot 7-171. Lower Band Edge Plot (Band 2/25 – 10.0MHz QPSK – RB Size 50)



Plot 7-172. Lower Extended Band Edge Plot (Band 2/25 – 10.0MHz QPSK – RB Size 50)

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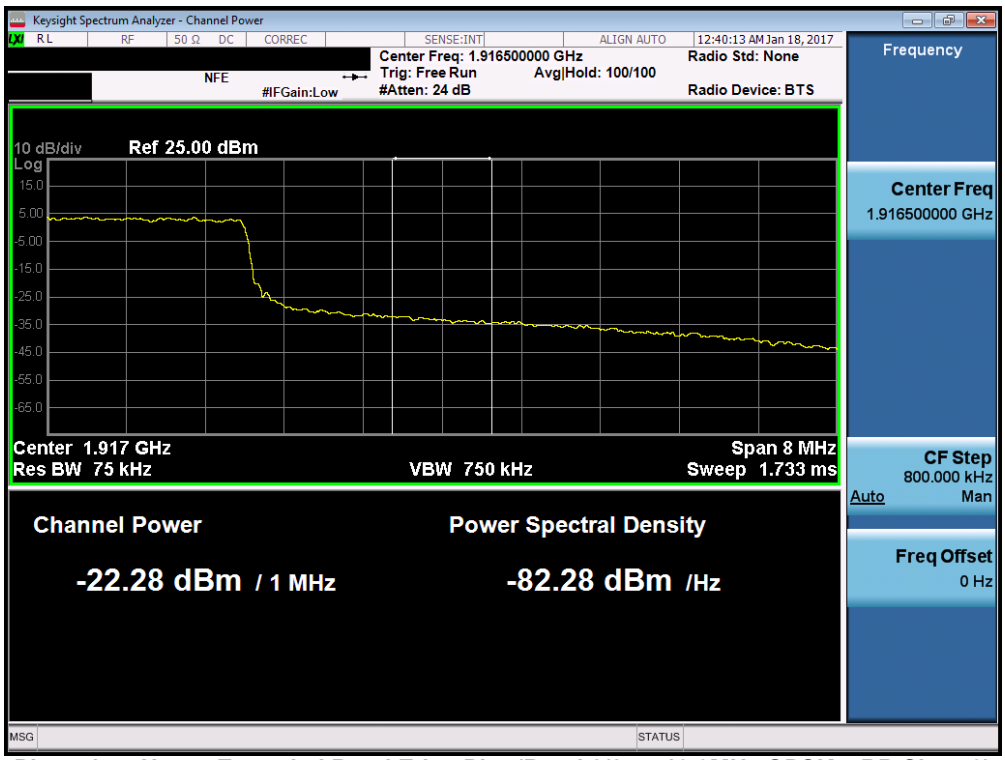
Plot 7-173. Upper Band Edge Plot (Band 2/25 – 10.0MHz QPSK – RB Size 50)



Plot 7-174. Upper Extended Band Edge Plot (Band 2/25 – 10.0MHz QPSK – RB Size 50)

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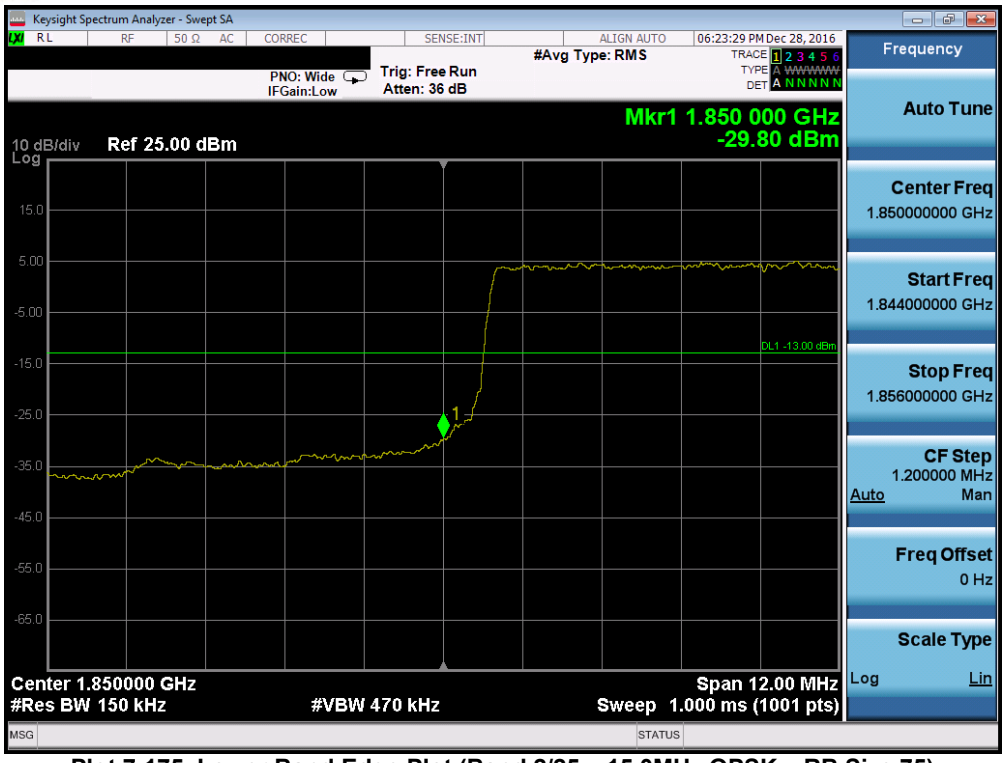
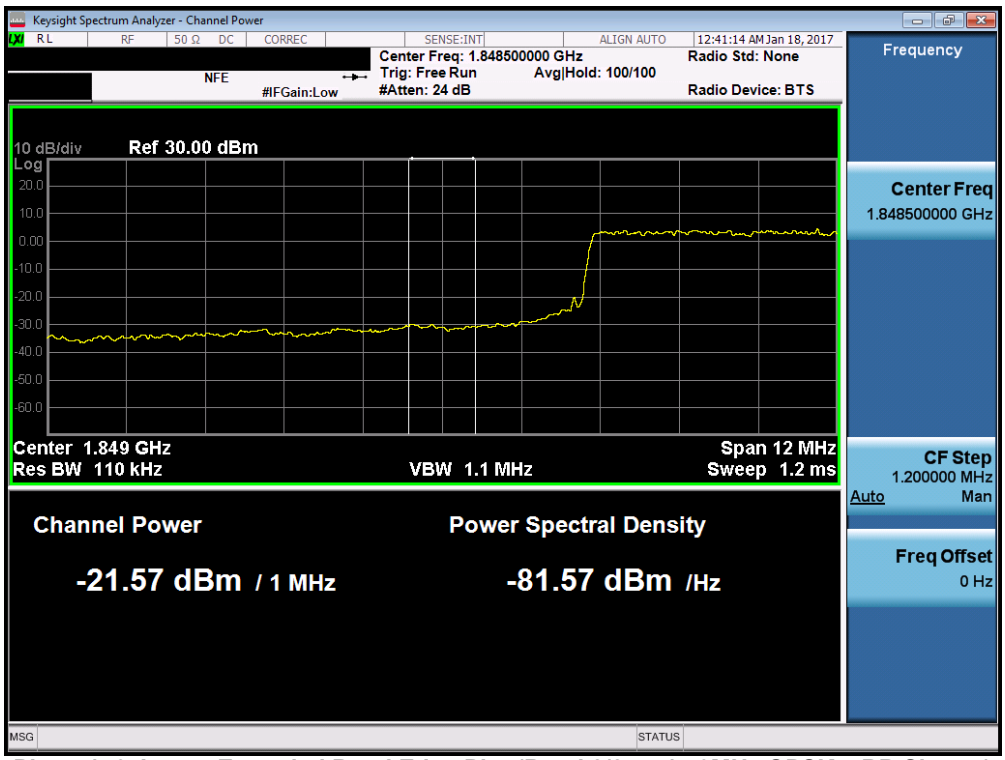


Plot 7-175. Lower Band Edge Plot (Band 2/25 – 15.0MHz QPSK – RB Size 75)



Plot 7-176. Lower Extended Band Edge Plot (Band 2/25 – 15.0MHz QPSK – RB Size 75)

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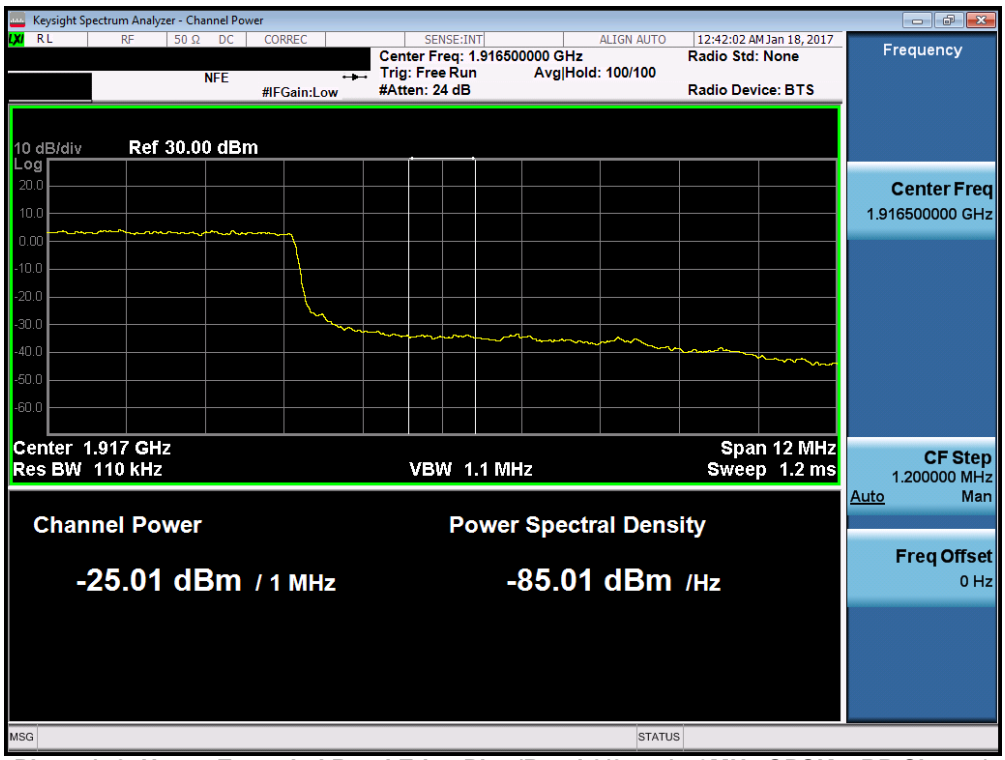
Plot 7-177. Upper Band Edge Plot (Band 2/25 – 15.0MHz QPSK – RB Size 75)



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

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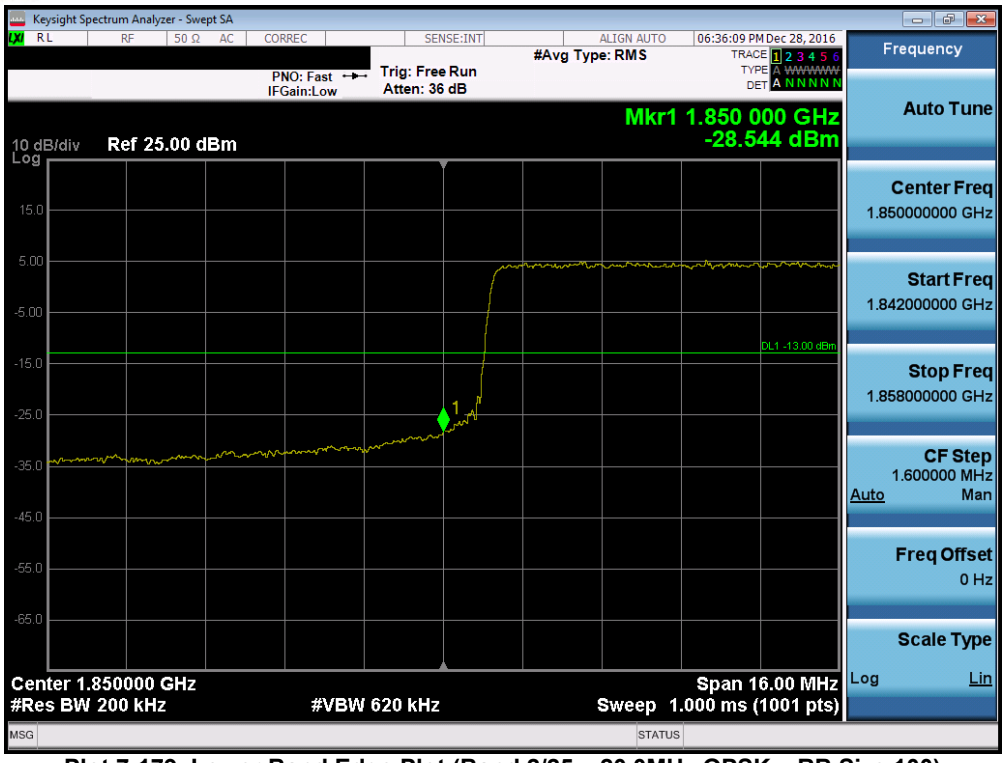
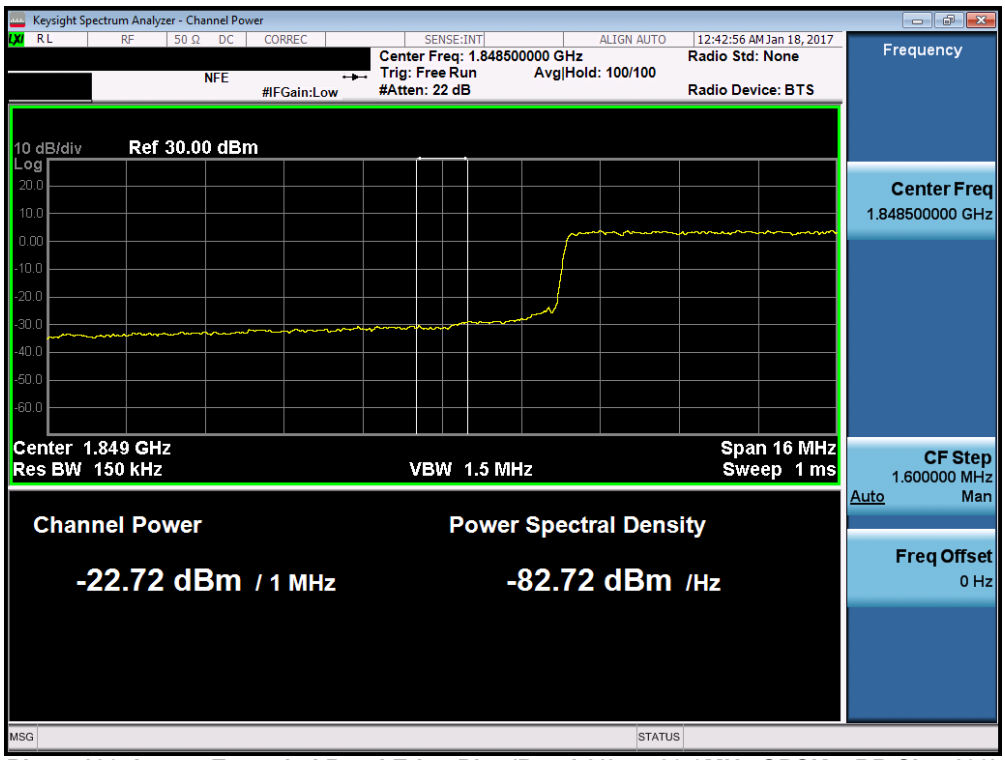


Plot 7-179. Lower Band Edge Plot (Band 2/25 – 20.0MHz QPSK – RB Size 100)



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

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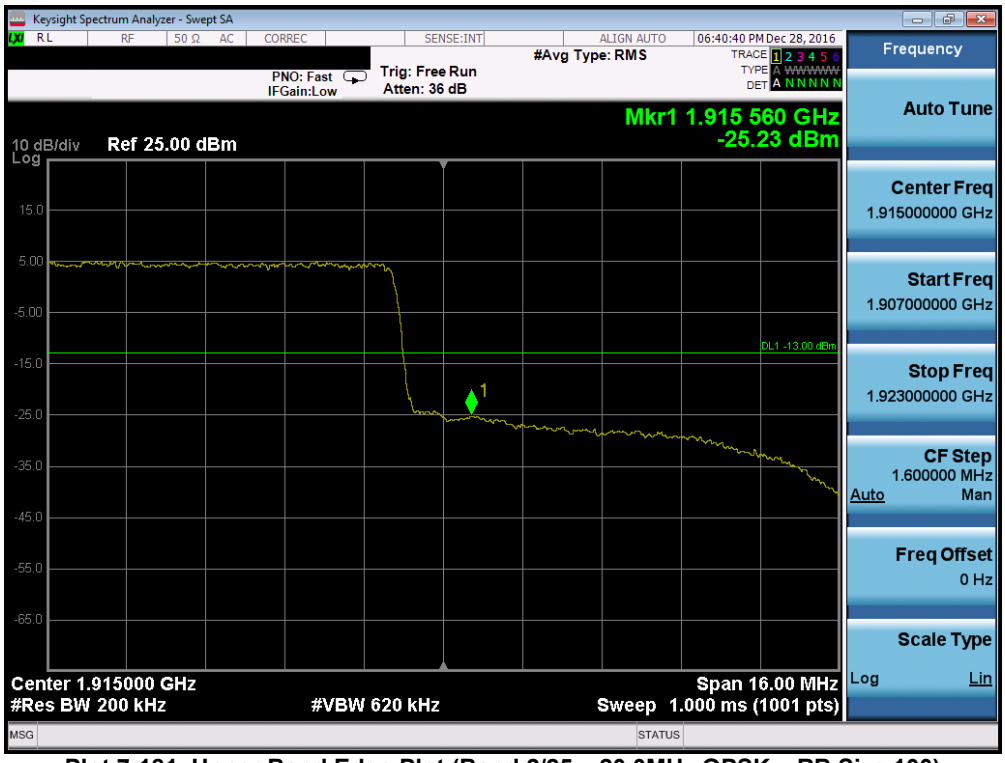
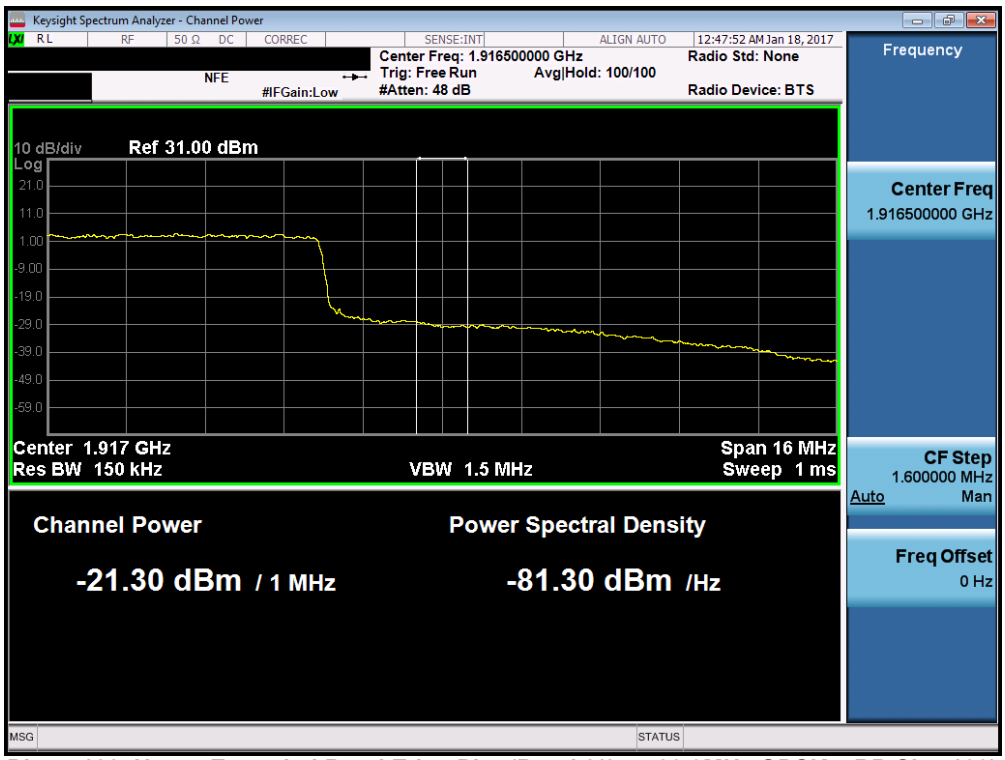


Plot 7-181. Upper Band Edge Plot (Band 2/25 – 20.0MHz QPSK – RB Size 100)



Plot 7-182. Upper Extended Band Edge Plot (Band 2/25 – 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.

Test Setup

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

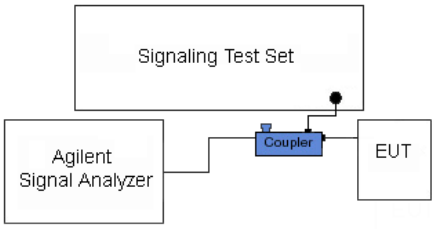

Figure 7-4. Test Instrument & Measurement Setup

Test Notes

None.

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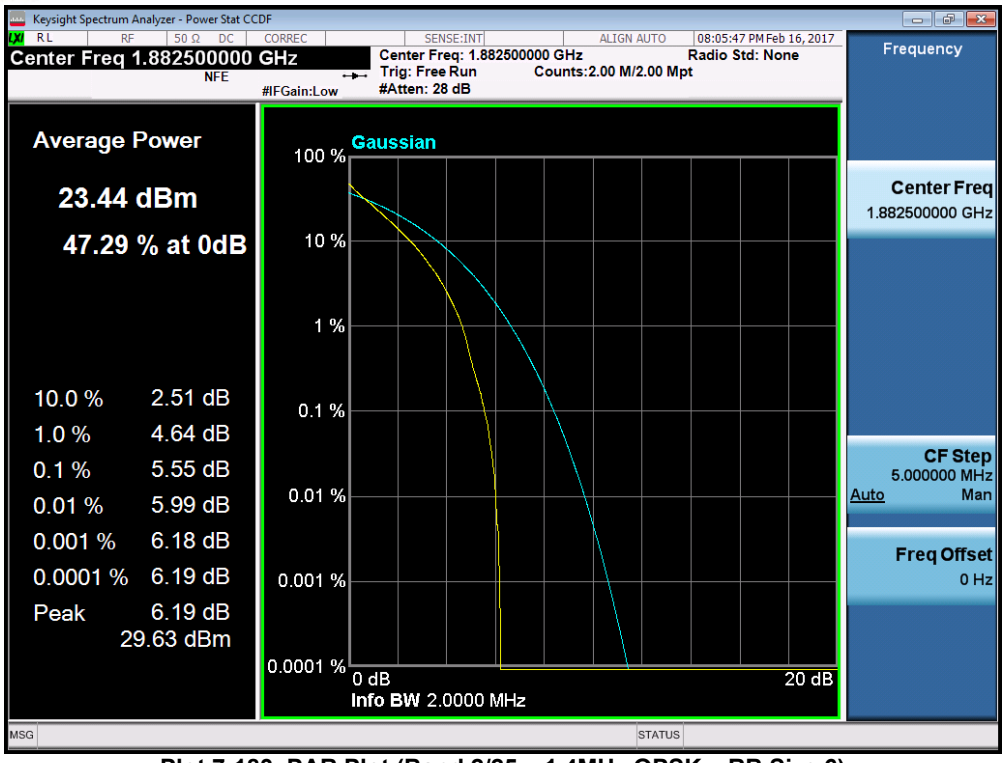
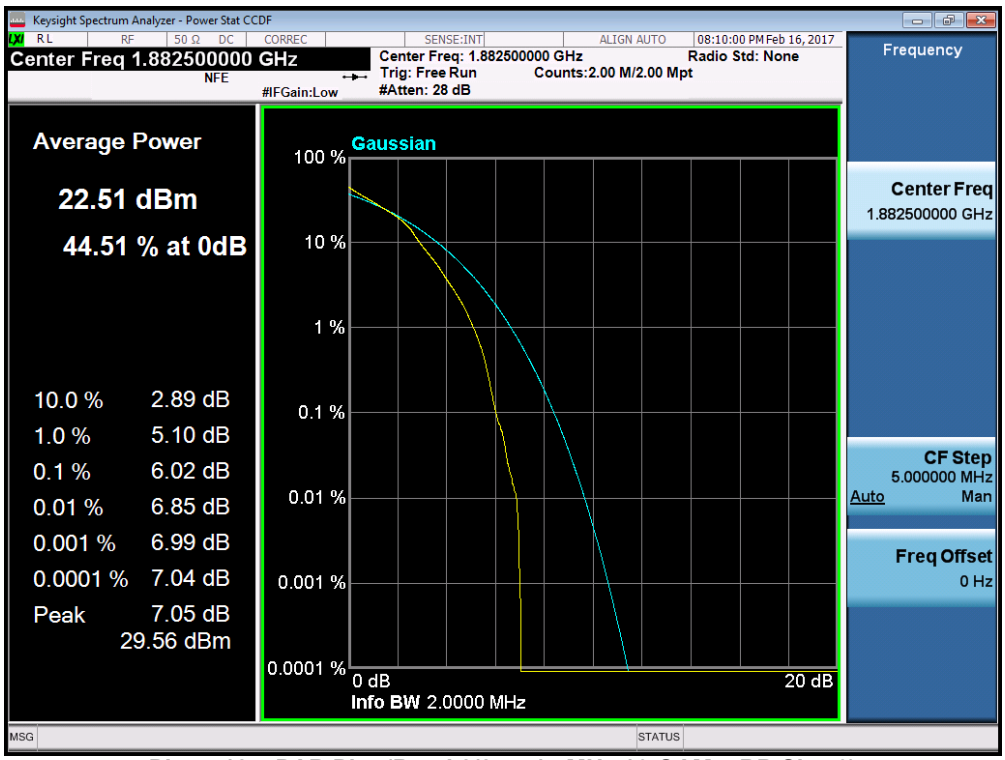


Plot 7-183. PAR Plot (Band 2/25 – 1.4MHz QPSK – RB Size 6)



Plot 7-184. PAR Plot (Band 2/25 – 1.4MHz 16-QAM – RB Size 6)

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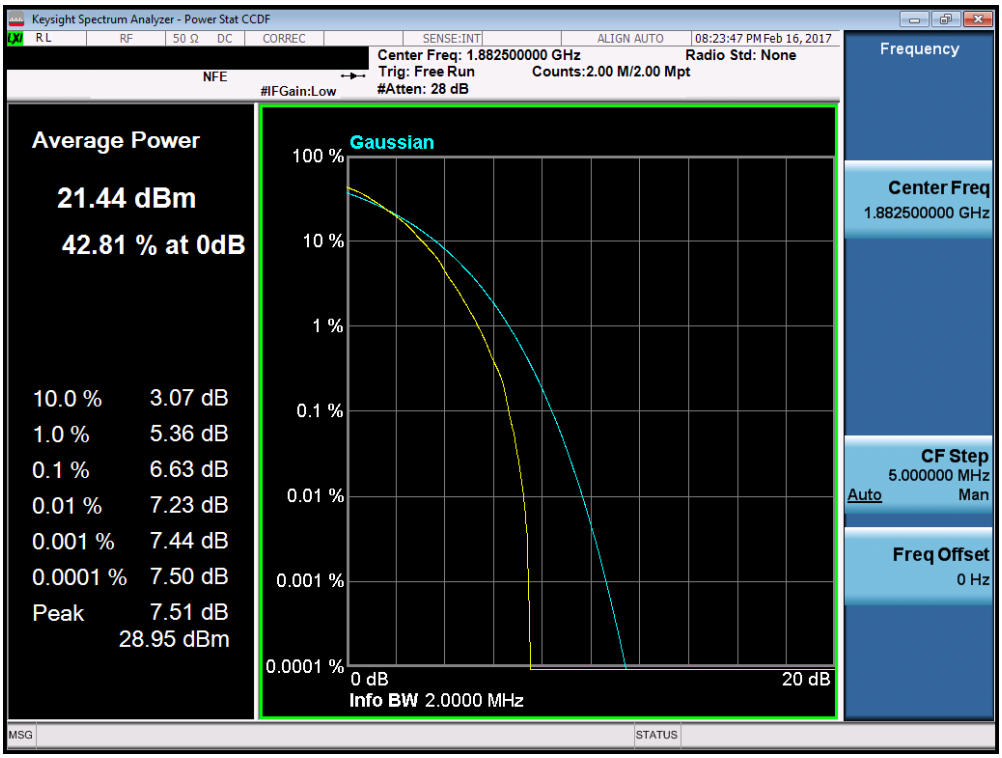
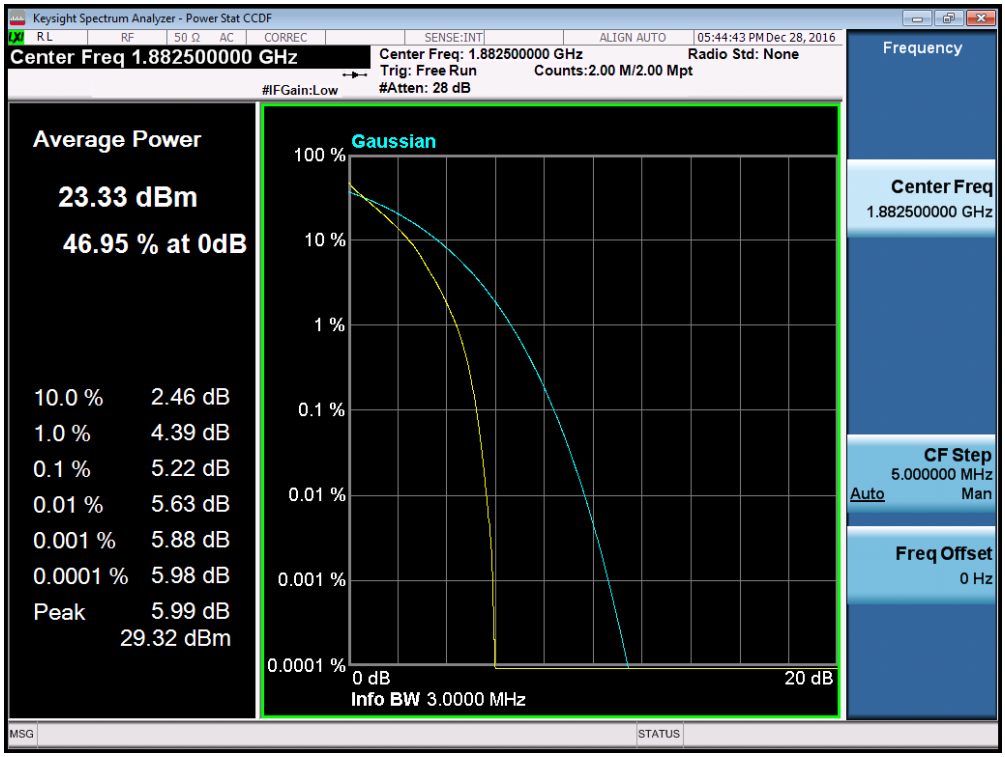


Plot 7-185. PAR Plot (Band 2/25 – 1.4MHz 64-QAM – RB Size 6)



Plot 7-186. PAR Plot (Band 2/25 – 3.0MHz QPSK – RB Size 15)

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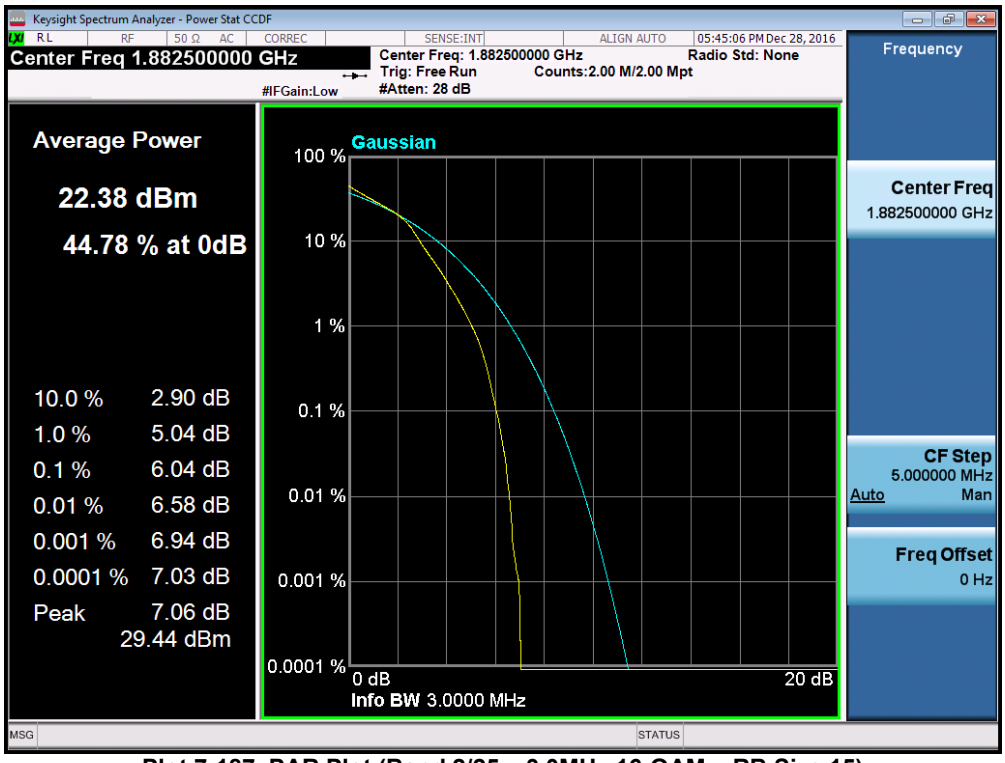
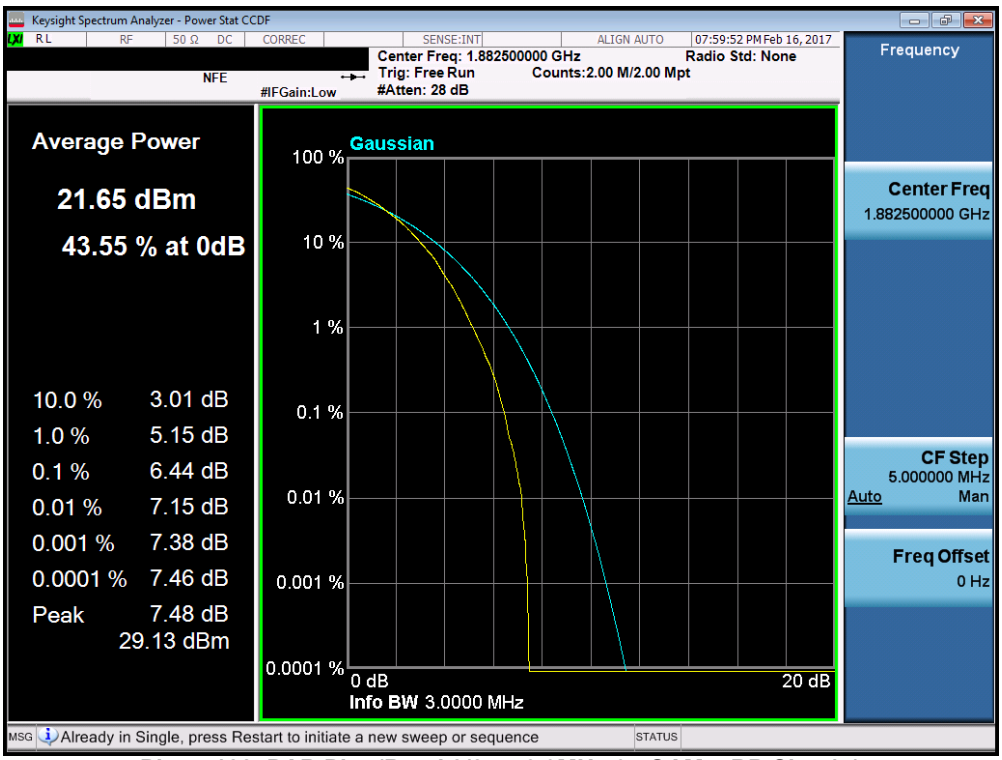


Plot 7-187. PAR Plot (Band 2/25 – 3.0MHz 16-QAM – RB Size 15)



Plot 7-188. PAR Plot (Band 2/25 – 3.0MHz 64-QAM – RB Size 15)

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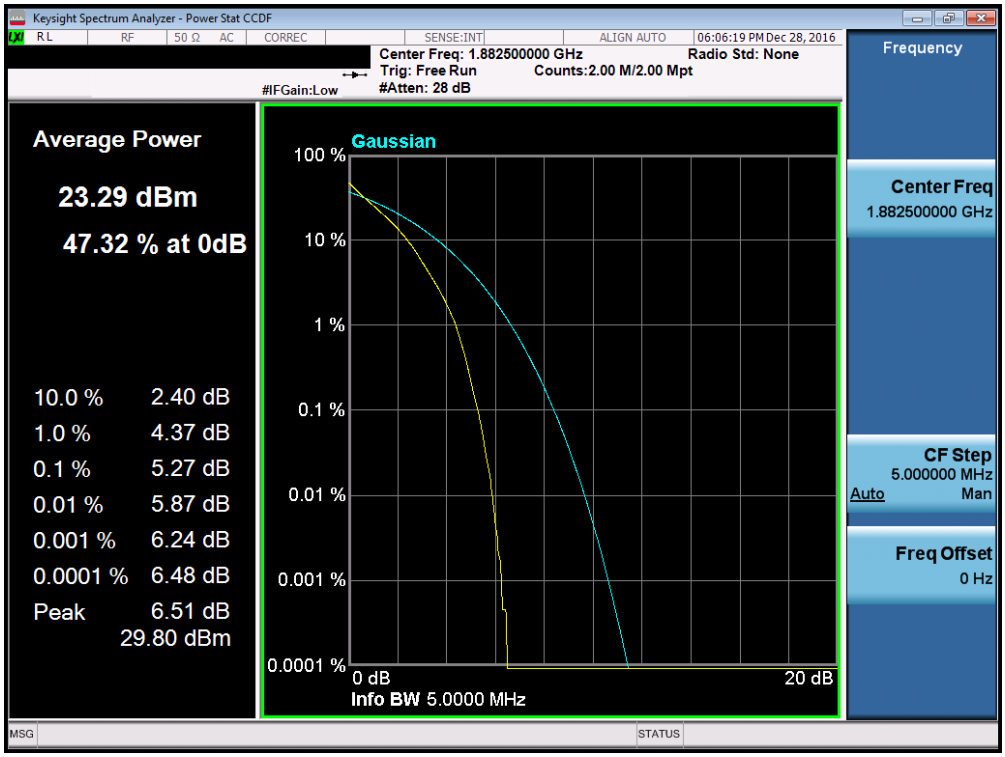
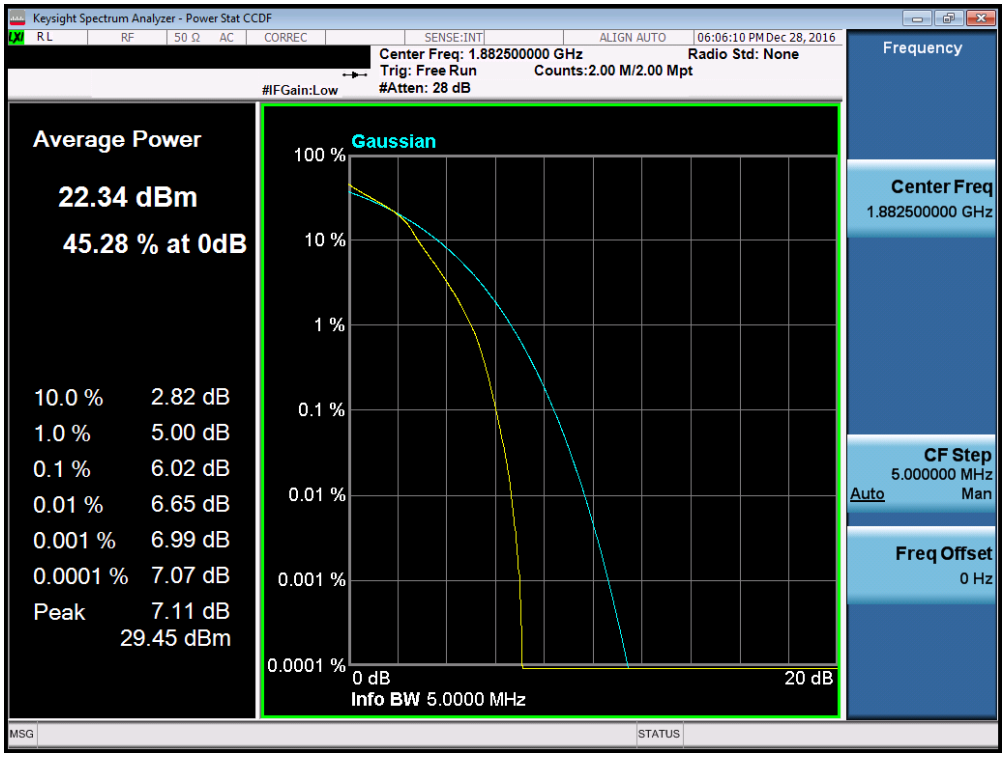


Plot 7-189. PAR Plot (Band 2/25 – 5.0MHz QPSK – RB Size 25)



Plot 7-190. PAR Plot (Band 2/25 – 5.0MHz 16-QAM – RB Size 25)

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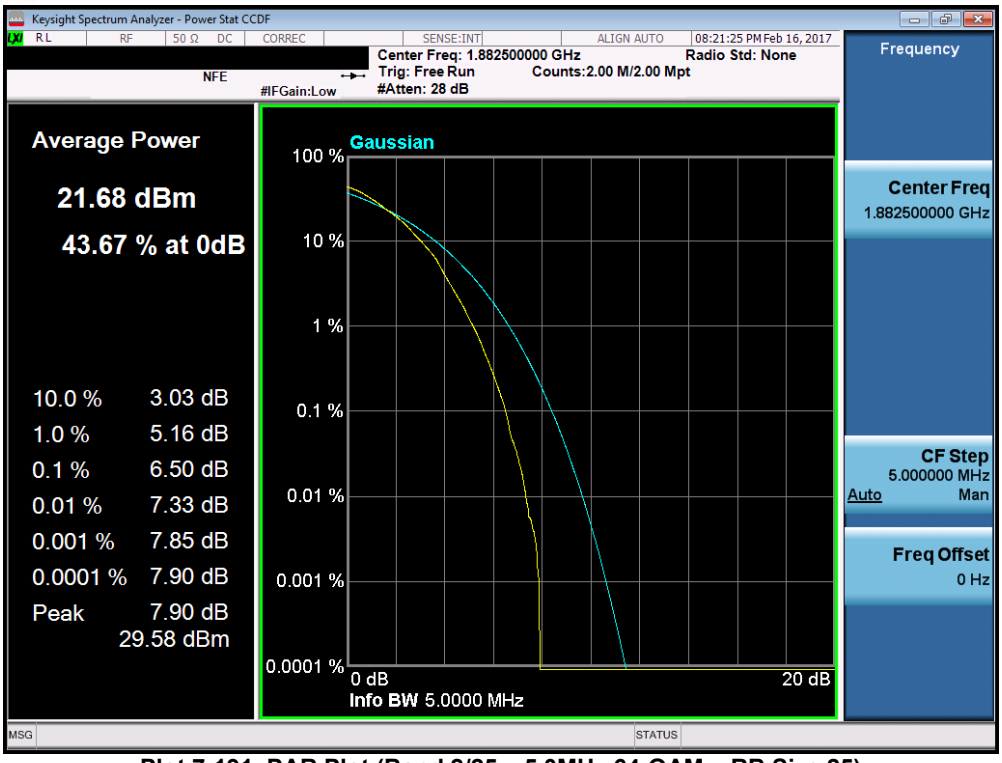
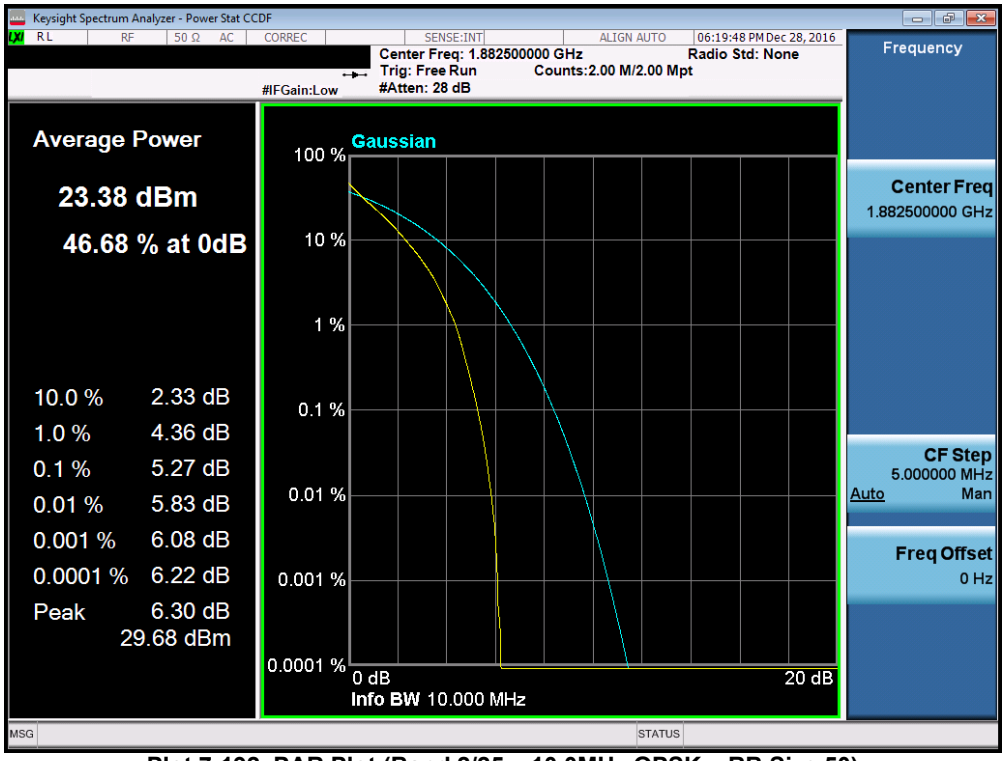


Plot 7-191. PAR Plot (Band 2/25 – 5.0MHz 64-QAM – RB Size 25)



Plot 7-192. PAR Plot (Band 2/25 – 10.0MHz QPSK – RB Size 50)

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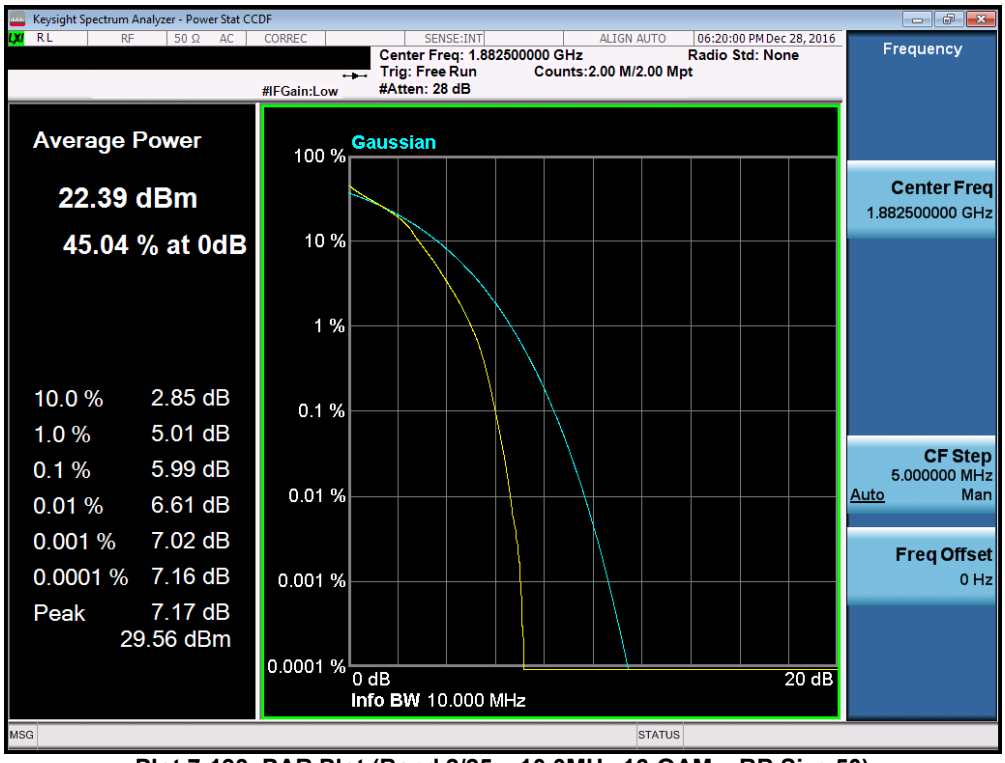
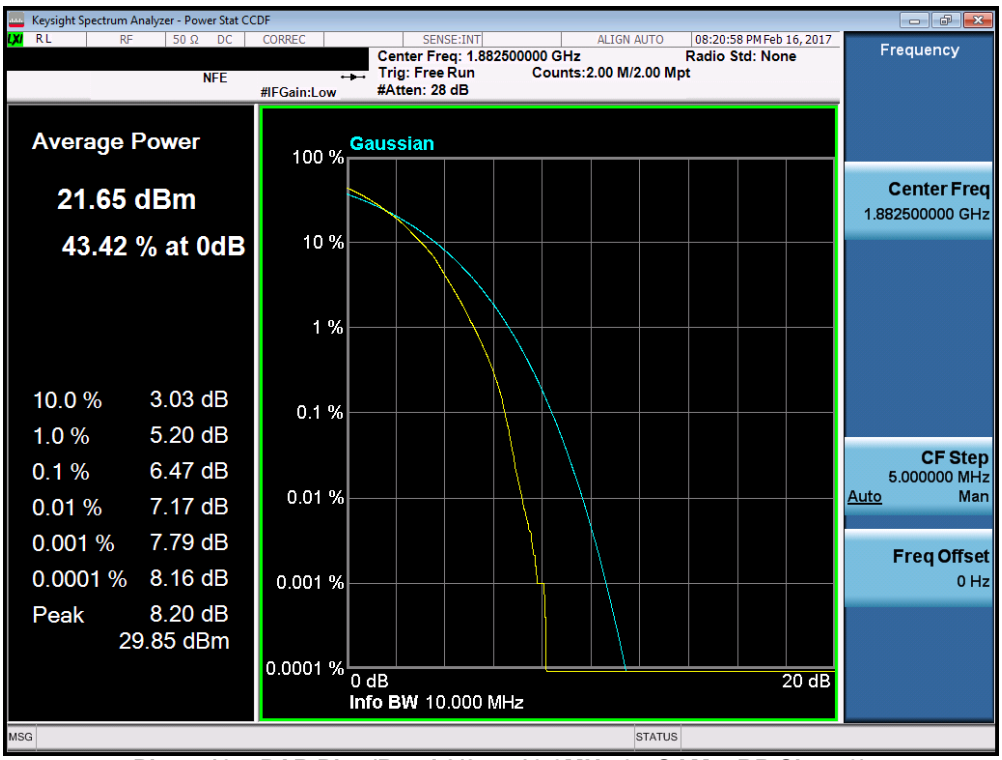


Plot 7-193. PAR Plot (Band 2/25 – 10.0MHz 16-QAM – RB Size 50)



Plot 7-194. PAR Plot (Band 2/25 – 10.0MHz 64-QAM – RB Size 50)

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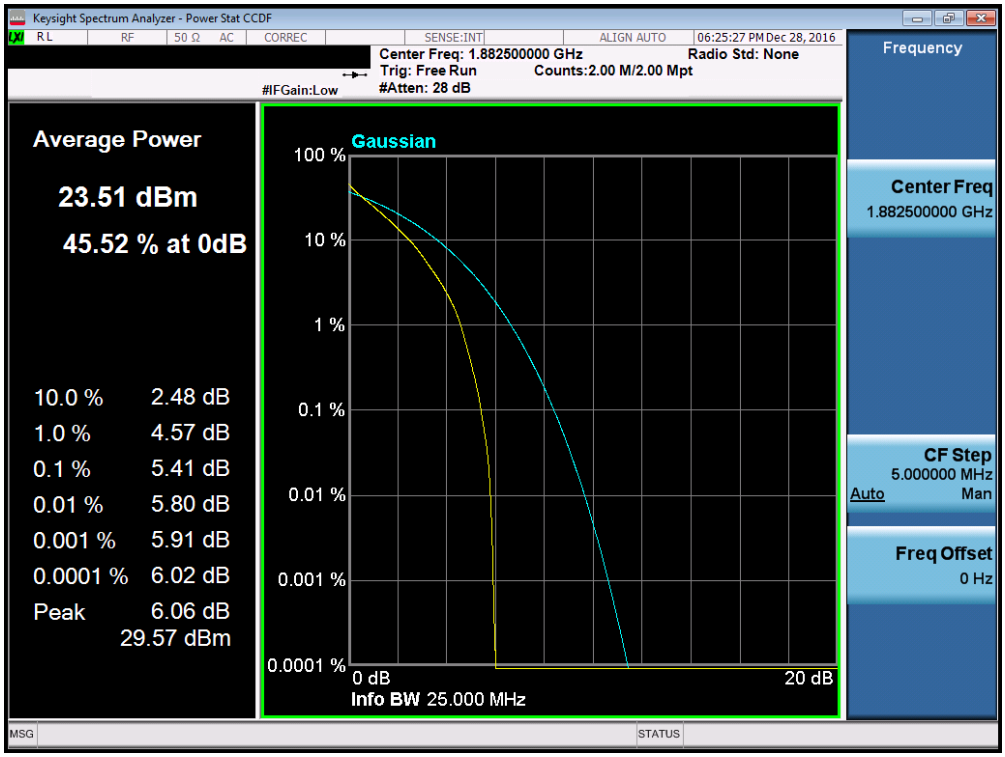
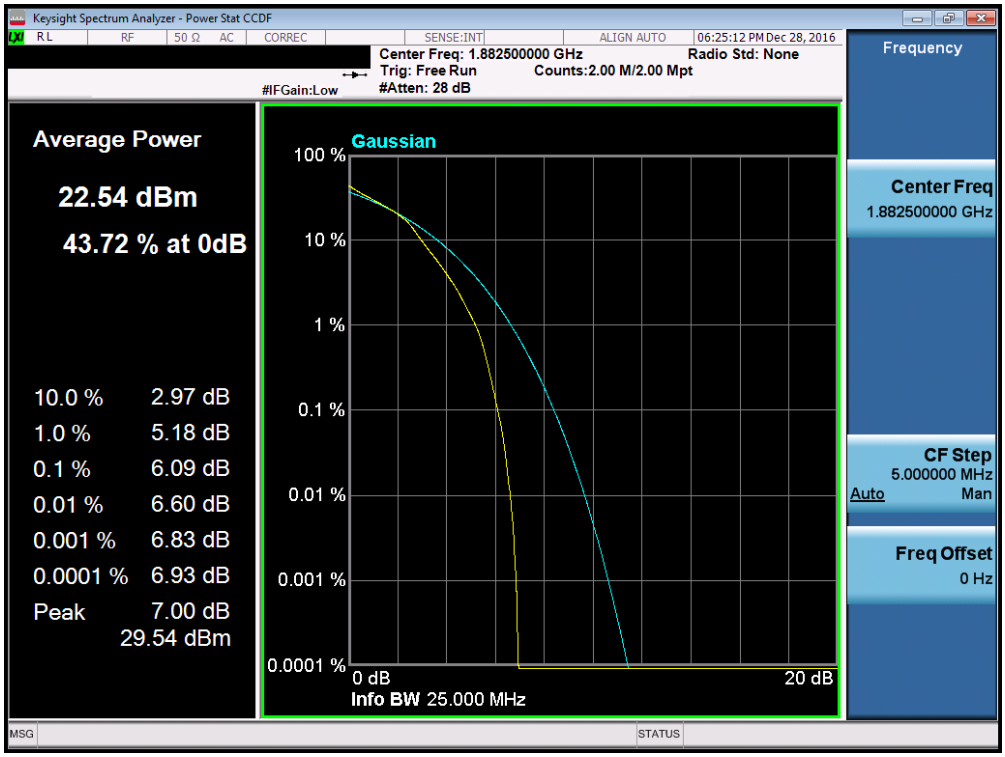


Plot 7-195. PAR Plot (Band 2/25 – 15.0MHz QPSK – RB Size 75)



Plot 7-196. PAR Plot (Band 2/25 – 15.0MHz 16-QAM – RB Size 75)

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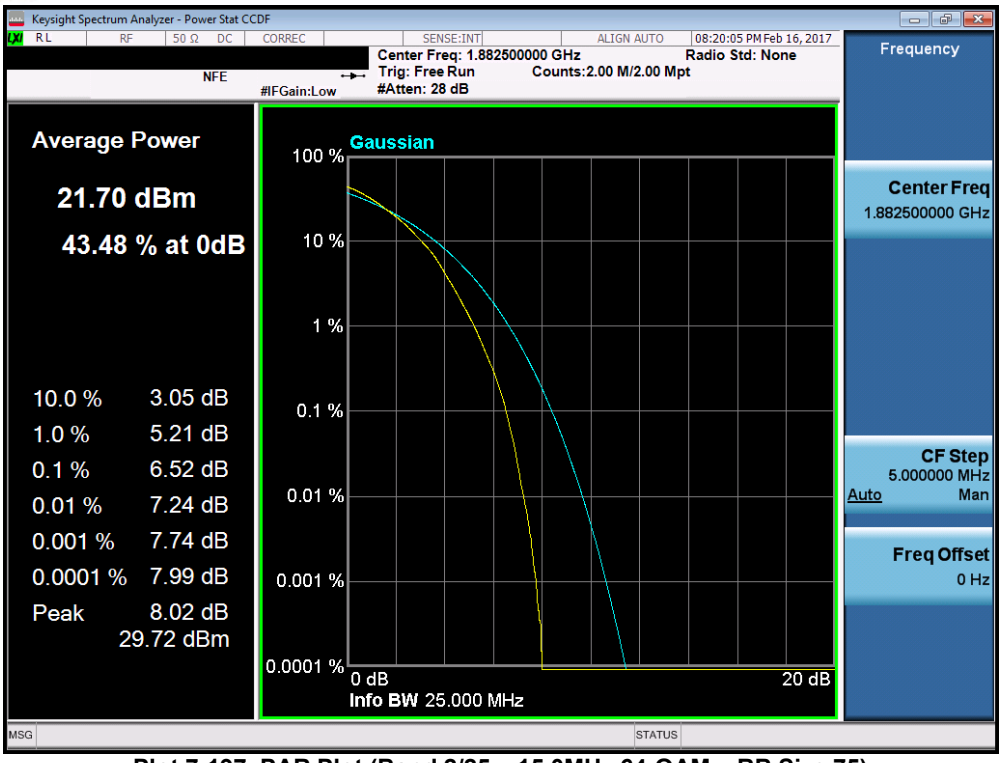
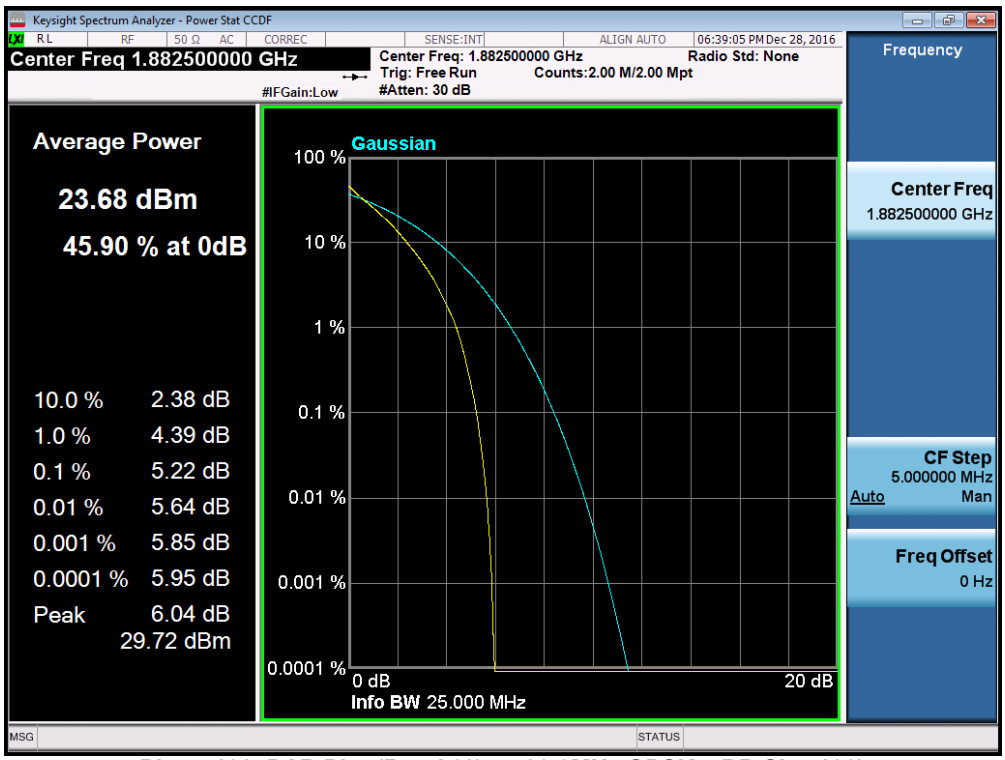


Plot 7-197. PAR Plot (Band 2/25 – 15.0MHz 64-QAM – RB Size 75)



Plot 7-198. PAR Plot (Band 2/25 – 20.0MHz QPSK – RB Size 100)

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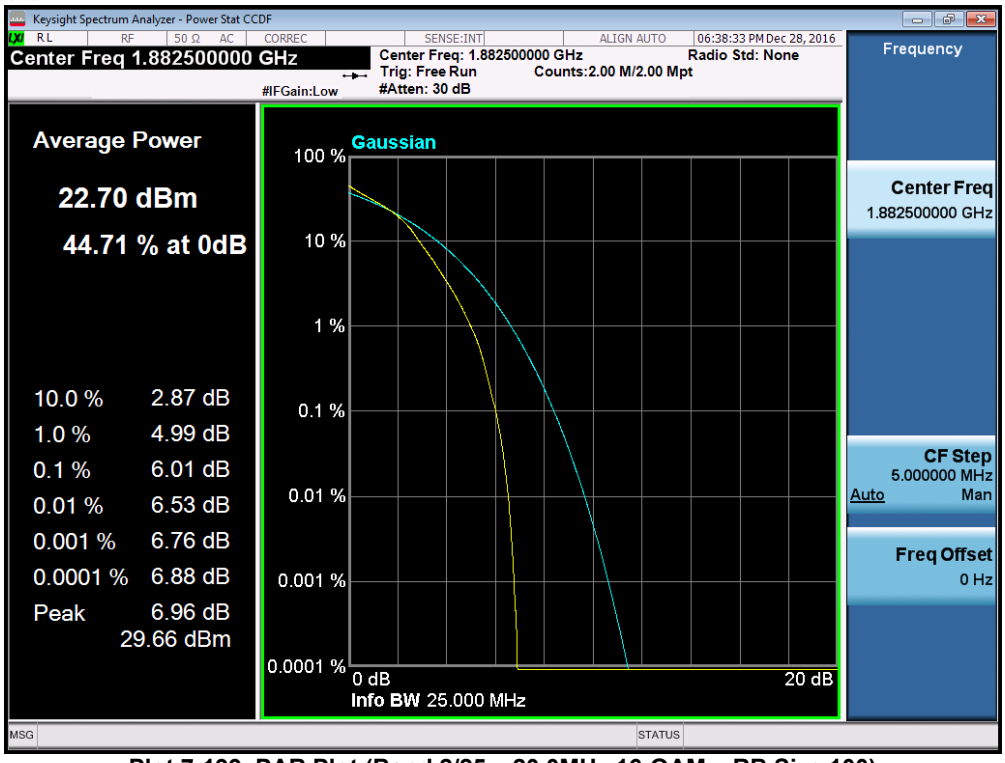
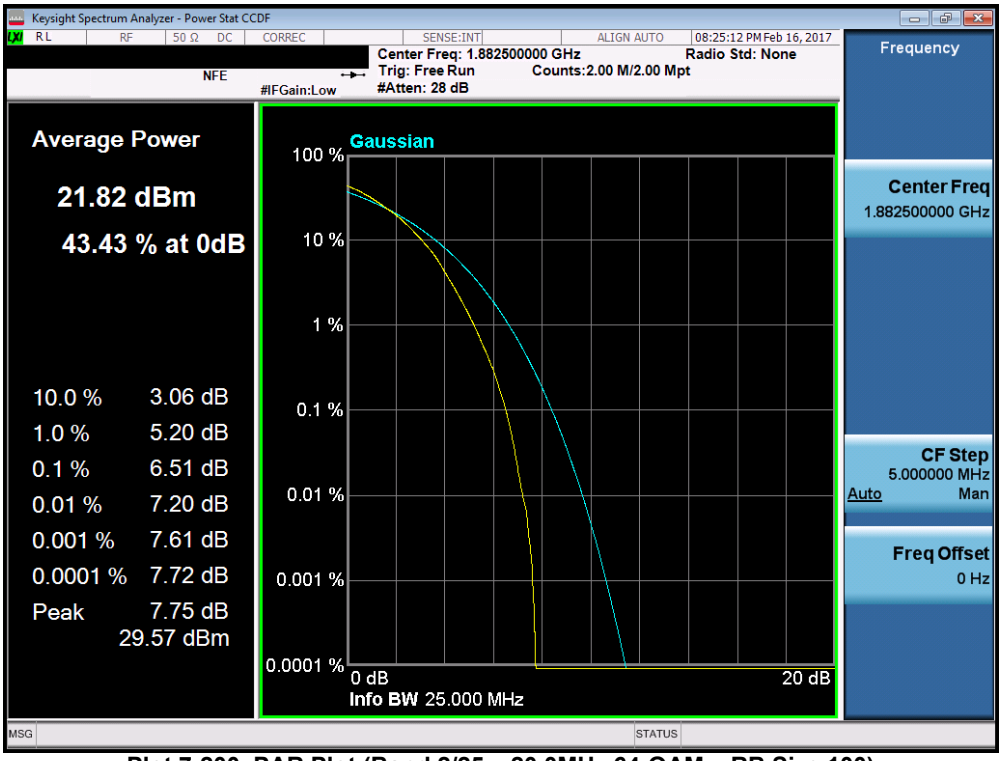


Plot 7-199. PAR Plot (Band 2/25 – 20.0MHz 16-QAM – RB Size 100)



Plot 7-200. PAR Plot (Band 2/25 – 20.0MHz 64-QAM – RB Size 100)

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7.6 Radiated Power (ERP/EIRP)

§22.913(a.2) §24.232(c.2) §27.50(b.10) §27.50(c.10) §27.50(d.4)

Test Overview

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/TIA-603-D-2010 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v02r02 – Section 5.2.1

ANSI/TIA-603-D-2010 – Section 2.2.17

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points ≥ 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

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Test Setup

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

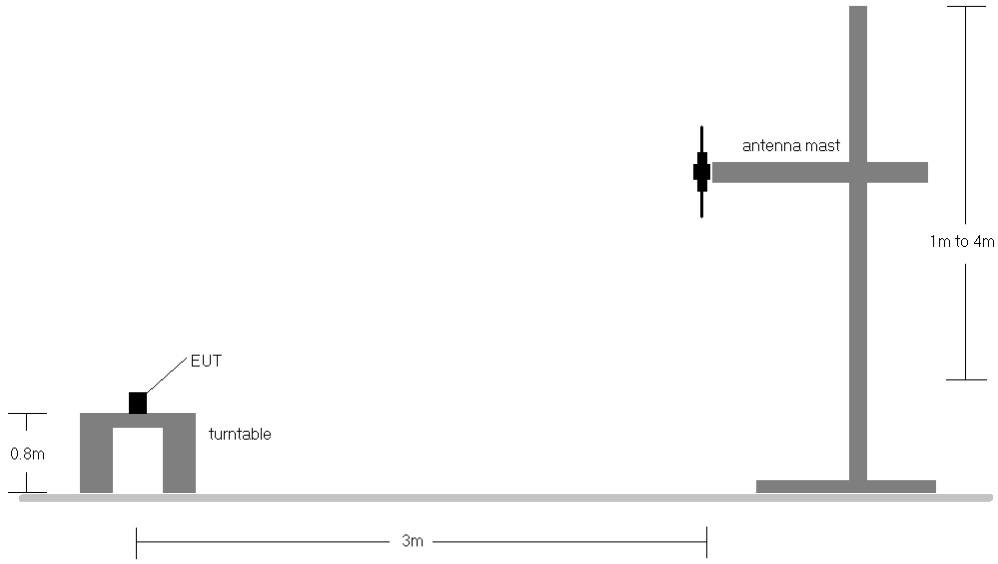

Figure 7-5. Radiated Test Setup <1GHz

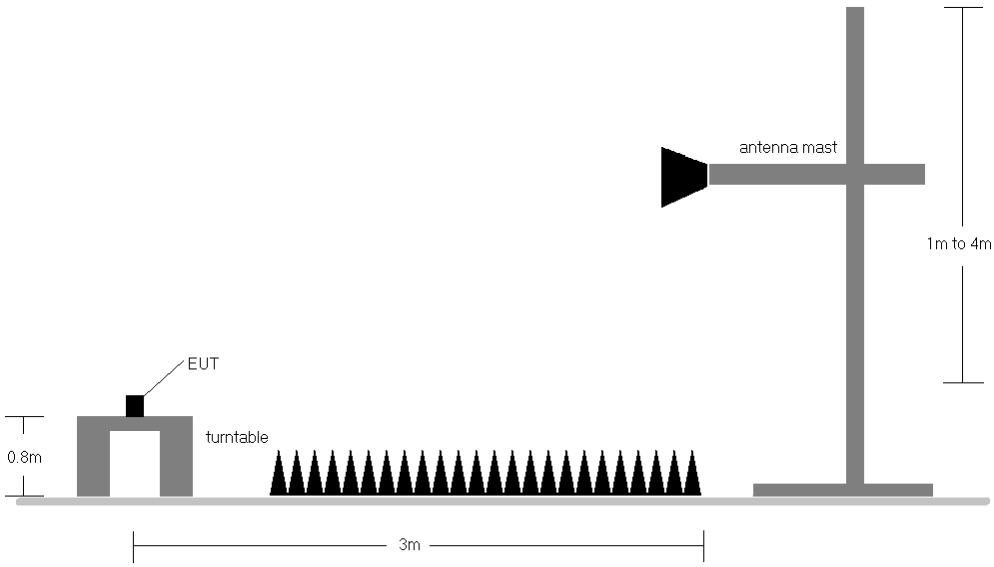

Figure 7-6. Radiated Test Setup >1GHz

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.

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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	289	187	1 / 5	12.70	2.48	15.18	34.77	-19.59
707.50	1.4	QPSK	H	284	206	1 / 5	13.77	2.56	16.33	34.77	-18.44
715.30	1.4	QPSK	H	265	198	1 / 5	13.82	2.60	16.42	34.77	-18.36
715.30	1.4	16-QAM	H	265	198	1 / 5	12.71	2.60	15.31	34.77	-19.47
715.30	1.4	64-QAM	H	265	198	1 / 5	12.77	2.60	15.37	34.77	-19.41
700.50	3	QPSK	H	289	172	1 / 14	14.06	2.48	16.54	34.77	-18.23
707.50	3	QPSK	H	288	191	1 / 0	14.70	2.56	17.26	34.77	-17.51
714.50	3	QPSK	H	266	205	1 / 0	13.80	2.60	16.40	34.77	-18.37
707.50	3	16-QAM	H	288	191	1 / 0	13.68	2.56	16.24	34.77	-18.53
707.50	3	64-QAM	H	288	191	1 / 0	13.66	2.56	16.22	34.77	-18.55
701.50	5	QPSK	H	283	203	1 / 24	14.96	2.49	17.45	34.77	-17.32
707.50	5	QPSK	H	292	182	1 / 24	15.59	2.56	18.15	34.77	-16.62
713.50	5	QPSK	H	263	194	1 / 0	15.16	2.60	17.76	34.77	-17.01
707.50	5	16-QAM	H	292	182	1 / 24	14.63	2.56	17.19	34.77	-17.58
707.50	5	64-QAM	H	292	182	1 / 24	14.56	2.56	17.12	34.77	-17.65
704.00	10	QPSK	H	283	184	1 / 0	15.30	2.51	17.81	34.77	-16.96
707.50	10	QPSK	H	292	183	1 / 49	15.39	2.56	17.95	34.77	-16.82
711.00	10	QPSK	H	284	190	1 / 0	14.89	2.60	17.49	34.77	-17.29
704.00	10	16-QAM	H	283	184	1 / 0	14.61	2.51	17.12	34.77	-17.65
704.00	10	64-QAM	H	283	184	1 / 0	14.22	2.94	17.16	34.77	-17.62
707.50	5	QPSK	V	190	201	1 / 0	14.12	2.99	17.11	34.77	-17.66
707.50	5 (WCP)	QPSK	H	293	186	1 / 24	15.36	2.56	17.92	34.77	-16.85

Table 7-2. ERP Data (Band 12/17)

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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]
779.50	5	QPSK	V	150	129	1 / 24	18.48	-0.83	17.65	34.77	-17.12
782.00	5	QPSK	V	150	129	1 / 0	18.49	-0.82	17.67	34.77	-17.10
784.50	5	QPSK	V	150	129	1 / 0	18.57	-0.81	17.76	34.77	-17.01
784.50	5	16-QAM	V	150	129	1 / 0	17.75	-0.81	16.94	34.77	-17.83
784.50	5	64-QAM	V	150	129	1 / 0	16.54	-0.81	15.73	34.77	-19.04
782.00	10	QPSK	V	150	134	1 / 49	18.68	-0.82	17.86	34.77	-16.91
782.00	10	16-QAM	V	150	134	1 / 49	17.81	-0.82	16.99	34.77	-17.78
782.00	10	64-QAM	V	150	134	1 / 49	16.63	-0.82	15.81	34.77	-18.96
782.00	10	QPSK	H	150	38	1 / 0	17.34	-0.82	16.52	34.77	-18.25
782.00	10 (WCP)	QPSK	H	150	48	1 / 0	16.85	-0.82	16.03	34.77	-18.74

Table 7-3. ERP Data (Band 13)

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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	V	100	255	1 / 0	12.67	5.36	18.03	38.45	-20.42
836.50	1.4	QPSK	V	100	260	1 / 5	13.25	5.15	18.40	38.45	-20.05
848.30	1.4	QPSK	V	100	288	1 / 5	13.36	5.16	18.52	38.45	-19.93
848.30	1.4	16-QAM	V	100	288	1 / 5	12.37	5.16	17.53	38.45	-20.92
848.30	1.4	64-QAM	V	100	288	1 / 5	11.21	5.16	16.37	38.45	-22.08
825.50	3	QPSK	V	100	252	1 / 14	12.78	5.35	18.13	38.45	-20.32
836.50	3	QPSK	V	100	287	1 / 14	12.44	5.15	17.59	38.45	-20.86
847.50	3	QPSK	V	100	299	1 / 14	13.02	5.14	18.16	38.45	-20.29
847.50	3	16-QAM	V	100	299	1 / 14	12.13	5.14	17.27	38.45	-21.18
847.50	3	64-QAM	V	100	299	1 / 14	10.99	5.14	16.13	38.45	-22.32
826.50	5	QPSK	V	100	263	1 / 24	13.75	5.34	19.09	38.45	-19.36
836.50	5	QPSK	V	100	290	1 / 0	13.52	5.15	18.67	38.45	-19.78
846.50	5	QPSK	V	100	295	1 / 24	13.75	5.13	18.88	38.45	-19.57
836.50	5	16-QAM	V	100	290	1 / 0	12.60	5.15	17.75	38.45	-20.70
836.50	5	64-QAM	V	100	290	1 / 0	11.44	5.15	16.59	38.45	-21.86
829.00	10	QPSK	V	100	291	1 / 49	13.65	5.30	18.95	38.45	-19.50
836.50	10	QPSK	V	100	299	1 / 0	13.61	5.15	18.76	38.45	-19.69
844.00	10	QPSK	V	100	286	1 / 0	13.76	5.11	18.87	38.45	-19.58
829.00	10	16-QAM	V	100	291	1 / 49	12.73	5.30	18.03	38.45	-20.42
829.00	10	64-QAM	V	100	291	1 / 49	11.61	5.30	16.91	38.45	-21.54
826.50	5	QPSK	H	153	243	1 / 24	11.58	5.51	17.09	38.45	-21.36
826.50	5 (WCP)	QPSK	H	199	354	1 / 24	11.50	5.34	16.84	38.45	-21.61

Table 7-4. ERP Data (Band 5)

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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	V	108	24	1 / 0	17.93	5.65	23.58	30.00	-6.42
1745.00	1.4	QPSK	V	111	298	1 / 0	17.00	5.27	22.27	30.00	-7.73
1779.30	1.4	QPSK	V	108	280	1 / 0	17.61	4.90	22.51	30.00	-7.49
1710.70	1.4	16-QAM	V	108	24	1 / 0	17.11	5.65	22.76	30.00	-7.24
1710.70	1.4	64-QAM	V	108	24	1 / 0	15.83	5.65	21.48	30.00	-8.52
1711.50	3	QPSK	V	111	283	1 / 0	18.35	5.64	23.99	30.00	-6.01
1745.00	3	QPSK	V	107	285	1 / 0	18.20	5.27	23.47	30.00	-6.53
1778.50	3	QPSK	V	110	288	1 / 0	18.13	4.91	23.04	30.00	-6.96
1711.50	3	16-QAM	V	111	283	1 / 0	17.48	5.64	23.12	30.00	-6.88
1711.50	3	64-QAM	V	111	283	1 / 0	16.37	5.64	22.01	30.00	-7.99
1712.50	5	QPSK	V	111	282	1 / 0	19.25	5.63	24.88	30.00	-5.12
1745.00	5	QPSK	V	111	287	1 / 0	19.15	5.27	24.42	30.00	-5.58
1777.50	5	QPSK	V	105	282	1 / 0	19.07	4.92	23.99	30.00	-6.01
1712.50	5	16-QAM	V	111	282	1 / 0	18.42	5.63	24.05	30.00	-5.95
1712.50	5	64-QAM	V	111	282	1 / 0	17.21	5.63	22.84	30.00	-7.16
1715.00	10	QPSK	V	105	281	1 / 0	19.41	5.60	25.01	30.00	-4.99
1745.00	10	QPSK	V	105	285	1 / 49	19.25	5.27	24.52	30.00	-5.48
1775.00	10	QPSK	V	109	283	1 / 0	19.26	4.95	24.21	30.00	-5.79
1715.00	10	16-QAM	V	105	281	1 / 0	18.34	5.60	23.94	30.00	-6.06
1715.00	10	64-QAM	V	105	281	1 / 0	17.39	5.60	22.99	30.00	-7.01
1717.50	15	QPSK	V	110	289	1 / 0	19.80	5.57	25.37	30.00	-4.63
1745.00	15	QPSK	V	109	290	1 / 0	19.59	5.27	24.86	30.00	-5.14
1772.50	15	QPSK	V	107	292	1 / 74	19.31	4.97	24.28	30.00	-5.72
1717.50	15	16-QAM	V	110	289	1 / 0	18.70	5.57	24.27	30.00	-5.73
1717.50	15	64-QAM	V	110	289	1 / 0	17.78	5.57	23.35	30.00	-6.65
1720.00	20	QPSK	V	105	288	1 / 0	20.00	5.54	25.54	30.00	-4.46
1745.00	20	QPSK	V	106	283	1 / 0	19.97	5.27	25.24	30.00	-4.76
1770.00	20	QPSK	V	110	278	1 / 0	19.78	5.00	24.78	30.00	-5.22
1720.00	20	16-QAM	V	105	288	1 / 0	18.95	5.54	24.49	30.00	-5.51
1720.00	20	64-QAM	V	105	288	1 / 0	18.04	5.54	23.58	30.00	-6.42
1720.00	20	QPSK	H	100	135	1 / 0	17.52	5.49	23.01	30.00	-6.99
1720.00	20 (WCP)	QPSK	H	100	117	1 / 0	16.85	5.49	22.34	30.00	-7.66

Table 7-5. EIRP Data (Band 4/66)

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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	V	150	311	1 / 0	17.57	4.79	22.36	33.01	-10.65
1882.50	1.4	QPSK	V	150	319	1 / 0	17.29	4.84	22.13	33.01	-10.88
1914.30	1.4	QPSK	V	150	323	1 / 5	16.74	4.86	21.60	33.01	-11.41
1914.30	1.4	16-QAM	V	150	323	1 / 5	16.74	4.86	21.60	33.01	-11.41
1914.30	1.4	64-QAM	V	150	323	1 / 0	14.67	4.86	19.53	33.01	-13.48
1851.50	3	QPSK	V	150	340	1 / 0	18.68	4.79	23.47	33.01	-9.54
1882.50	3	QPSK	V	150	312	1 / 0	18.29	4.84	23.13	33.01	-9.88
1913.50	3	QPSK	V	150	301	1 / 0	17.41	4.86	22.27	33.01	-10.74
1851.50	3	16-QAM	V	150	340	1 / 0	17.67	4.79	22.46	33.01	-10.55
1851.50	3	64-QAM	V	150	340	1 / 0	16.68	4.79	21.47	33.01	-11.54
1852.50	5	QPSK	V	150	310	1 / 0	19.76	4.79	24.55	33.01	-8.46
1882.50	5	QPSK	V	150	305	1 / 0	19.36	4.84	24.20	33.01	-8.81
1912.50	5	QPSK	V	150	312	1 / 0	18.72	4.87	23.59	33.01	-9.42
1852.50	5	16-QAM	V	150	310	1 / 0	18.81	4.79	23.60	33.01	-9.41
1852.50	5	64-QAM	V	150	310	1 / 0	17.78	4.79	22.57	33.01	-10.44
1855.00	10	QPSK	V	150	311	1 / 0	19.47	4.80	24.27	33.01	-8.74
1882.50	10	QPSK	V	150	309	1 / 0	19.35	4.84	24.19	33.01	-8.82
1910.00	10	QPSK	V	150	317	1 / 0	18.71	4.87	23.58	33.01	-9.43
1855.00	10	16-QAM	V	150	311	1 / 0	18.33	4.80	23.13	33.01	-9.88
1855.00	10	64-QAM	V	150	311	1 / 0	17.45	4.80	22.25	33.01	-10.76
1857.50	15	QPSK	V	150	295	1 / 0	19.44	4.80	24.24	33.01	-8.77
1882.50	15	QPSK	V	150	309	1 / 0	19.45	4.84	24.29	33.01	-8.72
1907.50	15	QPSK	V	150	304	1 / 0	18.66	4.88	23.54	33.01	-9.47
1882.50	15	16-QAM	V	150	309	1 / 0	18.48	4.84	23.32	33.01	-9.69
1882.50	15	64-QAM	V	150	309	1 / 0	17.46	4.84	22.30	33.01	-10.71
1860.00	20	QPSK	V	150	301	1 / 0	20.09	4.81	24.90	33.01	-8.12
1882.50	20	QPSK	V	150	304	1 / 0	19.73	4.84	24.57	33.01	-8.44
1905.00	20	QPSK	V	150	207	1 / 0	19.24	4.88	24.12	33.01	-8.89
1860.00	20	16-QAM	V	150	301	1 / 0	19.04	4.81	23.85	33.01	-9.17
1860.00	20	64-QAM	V	150	301	1 / 0	18.08	4.81	22.89	33.01	-10.12
1860.00	20	QPSK	H	150	48	1 / 0	19.44	4.87	24.31	33.01	-8.70
1860.00	20 (WCP)	QPSK	H	150	52	1 / 0	18.37	4.87	23.24	33.01	-9.77

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

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7.7 Radiated Spurious Emissions Measurements

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

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.

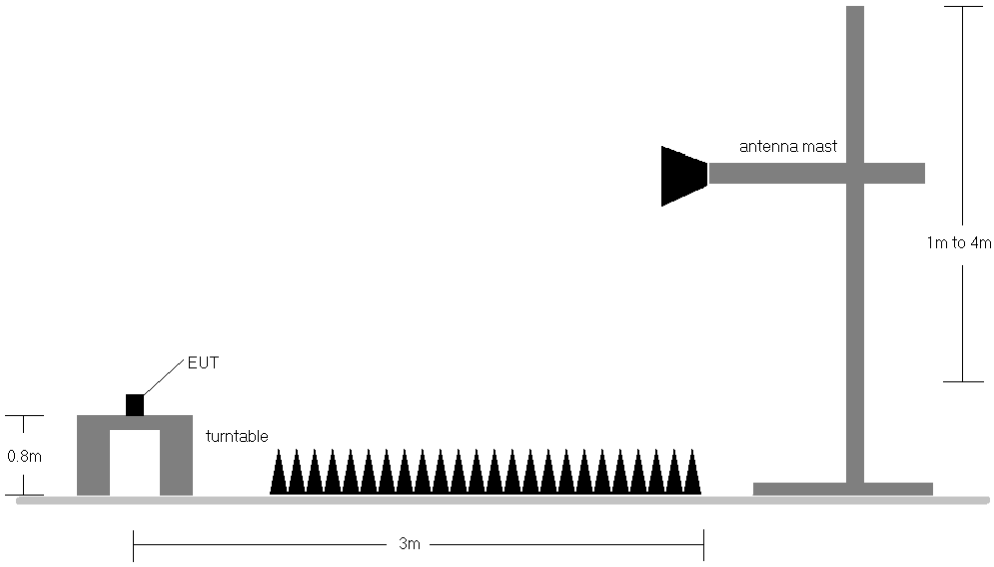

Figure 7-7. Test Instrument & Measurement Setup

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:	701.50	MHz		
CHANNEL:	23035			
MEASURED OUTPUT POWER:	17.45	dBm	=	0.056 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	30.45	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]
1403.00	H	100	189	-58.21	5.92	-52.29	69.7
2104.50	H	100	268	-59.33	6.80	-52.53	70.0
2806.00	H	-	-	-66.93	8.12	-58.81	76.3
3507.50	H	-	-	-62.85	7.74	-55.11	72.6

Table 7-7. Radiated Spurious Data (Band 12/17 – Low Channel)

OPERATING FREQUENCY:	707.50	MHz		
CHANNEL:	23095			
MEASURED OUTPUT POWER:	18.15	dBm	=	0.065 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	31.15	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	100	185	-57.08	5.96	-51.11	69.3
2122.50	H	100	273	-57.59	6.84	-50.75	68.9
2830.00	H	-	-	-66.56	8.13	-58.42	76.6
3537.50	H	-	-	-63.73	7.79	-55.94	74.1

Table 7-8. Radiated Spurious Data (Band 12/17 – Mid Channel)

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OPERATING FREQUENCY:	713.50	MHz		
CHANNEL:	23155			
MEASURED OUTPUT POWER:	17.76	dBm	=	0.060 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	30.76	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1427.00	H	100	85	-56.45	6.01	-50.45	68.2
2140.50	H	100	136	-58.23	6.89	-51.34	69.1
2854.00	H	-	-	-67.28	8.15	-59.13	76.9
3567.50	H	-	-	-62.57	7.84	-54.73	72.5

Table 7-9. Radiated Spurious Data (Band 12/17 – High Channel)

OPERATING FREQUENCY:	707.50	MHz		
CHANNEL:	23095			
MEASURED OUTPUT POWER:	17.92	dBm	=	0.062 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	30.92	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	100	93	-57.64	5.96	-51.67	69.6
2122.50	H	100	8	-61.31	6.84	-54.47	72.4
2830.00	H	-	-	-68.70	8.13	-60.56	78.5
3537.50	H	-	-	-64.14	7.79	-56.35	74.3

Table 7-10. Radiated Spurious Data with WCP (Band 12/17 – Mid Channel)

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OPERATING FREQUENCY:	782.00	MHz		
CHANNEL:	23230			
MEASURED OUTPUT POWER:	17.86	dBm	=	0.061 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	10.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	30.86	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
2346.00	V	100	341	-56.56	7.00	-49.55	67.4
3128.00	V	-	-	-63.79	7.26	-56.53	74.4

Table 7-11. Radiated Spurious Data (Band 13 – Mid Channel)

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

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Margin [dB]
1564.00	V	100	339	-62.23	6.37	-55.86	-15.9

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

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OPERATING FREQUENCY:	782.00	MHz		
CHANNEL:	23230			
MEASURED OUTPUT POWER:	16.03	dBm	=	0.040 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	10.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	29.03	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
2346.00	H	100	155	-56.36	7.00	-49.36	65.4
3128.00	H	-	-	-65.69	7.21	-58.48	74.5

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

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

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Margin [dB]
1564.00	H	110	264	-61.85	6.41	-55.44	-15.4

Table 7-14. Radiated Spurious Data with WCP (Band 13 – Wide Band)

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OPERATING FREQUENCY:	826.50	MHz		
CHANNEL:	20425			
MEASURED OUTPUT POWER:	19.09	dBm	=	0.081 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	32.09	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1653.00	V	100	354	-56.43	6.28	-50.15	69.2
2479.50	V	100	326	-53.69	6.89	-46.80	65.9
3306.00	V	-	-	-62.25	7.09	-55.16	74.2

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

OPERATING FREQUENCY:	836.50	MHz		
CHANNEL:	20525			
MEASURED OUTPUT POWER:	18.67	dBm	=	0.074 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	31.67	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1673.00	V	100	351	-53.57	6.21	-47.36	66.0
2509.50	V	100	31	-52.98	6.90	-46.08	64.8
3346.00	V	-	-	-62.45	7.26	-55.19	73.9

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

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OPERATING FREQUENCY:	846.50	MHz		
CHANNEL:	20625			
MEASURED OUTPUT POWER:	18.88	dBm	=	0.077 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	31.88	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]
1693.00	V	100	355	-52.41	6.14	-46.27	65.1
2539.50	V	100	31	-54.06	7.02	-47.04	65.9
3386.00	V	-	-	-62.77	7.43	-55.34	74.2

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

OPERATING FREQUENCY:	826.50	MHz		
CHANNEL:	20425			
MEASURED OUTPUT POWER:	16.84	dBm	=	0.048 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	29.84	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1653.00	H	100	115	-55.21	6.30	-48.91	65.7
2479.50	H	100	322	-55.33	6.85	-48.48	65.3
3306.00	H	-	-	-63.10	7.12	-55.98	72.8

Table 7-18. Radiated Spurious Data with WCP (Band 5 – Low Channel)

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OPERATING FREQUENCY:	1720.00	MHz		
CHANNEL:	132072			
MEASURED OUTPUT POWER:	25.54	dBm	=	0.358 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	20.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	38.54	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]
3440.00	V	100	321	-62.72	9.73	-52.99	78.5
5160.00	V	100	16	-55.09	10.89	-44.20	69.7
6880.00	V	-	-	-57.63	10.85	-46.78	72.3
8600.00	V	-	-	-56.17	11.73	-44.45	70.0

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

OPERATING FREQUENCY:	1745.00	MHz		
CHANNEL:	132322			
MEASURED OUTPUT POWER:	25.24	dBm	=	0.334 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	20.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	38.24	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]
3490.00	V	104	344	-62.18	9.89	-52.28	77.5
5235.00	V	100	18	-55.53	10.88	-44.66	69.9
6980.00	V	-	-	-57.69	11.05	-46.64	71.9
8725.00	V	-	-	-56.31	11.97	-44.34	69.6

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

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OPERATING FREQUENCY:	1770.00	MHz		
CHANNEL:	132572			
MEASURED OUTPUT POWER:	24.78	dBm	=	0.301 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	20.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	37.78	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]
3540.00	V	100	34	-63.44	9.99	-53.44	78.2
5310.00	V	100	13	-52.80	11.02	-41.78	66.6
7080.00	V	-	-	-57.63	11.13	-46.50	71.3
8850.00	V	-	-	-56.39	12.18	-44.21	69.0

Table 7-21. Radiated Spurious Data (Band 4/66 – High Channel)

OPERATING FREQUENCY:	1720.00	MHz		
CHANNEL:	132072			
MEASURED OUTPUT POWER:	22.34	dBm	=	0.171 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	20.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	35.34	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3440.00	H	100	325	-63.03	9.73	-53.30	75.6
5160.00	H	100	326	-63.04	10.89	-52.15	74.5
6880.00	H	-	-	-57.30	10.85	-46.45	68.8

Table 7-22. Radiated Spurious Data with WCP (Band 4/66 – Mid Channel)

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OPERATING FREQUENCY:	1860.00	MHz		
CHANNEL:	26140			
MEASURED OUTPUT POWER:	24.90	dBm	=	0.309 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	20.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	37.90	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]
3720.00	V	100	180	-63.57	9.99	-53.57	78.5
5580.00	V	100	300	-58.12	11.27	-46.84	71.7
7440.00	V	100	340	-54.94	10.98	-43.95	68.8
9300.00	V	-	-	-57.24	12.33	-44.91	69.8

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

OPERATING FREQUENCY:	1882.50	MHz		
CHANNEL:	26365			
MEASURED OUTPUT POWER:	24.57	dBm	=	0.287 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	20.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	37.57	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	V	100	191	-61.56	9.78	-51.79	76.4
5647.50	V	100	301	-57.53	11.38	-46.15	70.7
7530.00	V	100	329	-56.13	11.27	-44.87	69.4
9412.50	V	-	-	-56.23	12.35	-43.88	68.5

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

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OPERATING FREQUENCY:	1905.00	MHz		
CHANNEL:	26590			
MEASURED OUTPUT POWER:	24.12	dBm	=	0.258 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	20.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	37.12	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]
3810.00	V	100	211	-61.40	9.58	-51.82	75.9
5715.00	V	100	316	-52.87	11.45	-41.42	65.5
7620.00	V	100	294	-55.10	11.50	-43.61	67.7
9525.00	V	-	-	-56.26	12.38	-43.88	68.0

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

OPERATING FREQUENCY:	1860.00	MHz		
CHANNEL:	26140			
MEASURED OUTPUT POWER:	23.24	dBm	=	0.211 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	20.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	36.24	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]
3720.00	H	100	216	-62.33	9.99	-52.34	75.6
5580.00	H	100	325	-58.13	11.27	-46.86	70.1
7440.00	H	-	-	-57.28	10.98	-46.30	69.5

Table 7-26. Radiated Spurious Data with WCP (Band 2/25 –Low 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 12/17 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)	707,500,009	9	0.0000013
100 %		- 30	707,500,122	122	0.0000172
100 %		- 20	707,500,290	290	0.0000410
100 %		- 10	707,500,006	6	0.0000008
100 %		0	707,500,078	78	0.0000110
100 %		+ 10	707,500,124	124	0.0000175
100 %		+ 20	707,499,869	-131	-0.0000185
100 %		+ 30	707,499,885	-115	-0.0000163
100 %		+ 40	707,500,073	73	0.0000103
100 %		+ 50	707,499,881	-119	-0.0000168
BATT. ENDPOINT	3.40	+ 20	707,499,907	-93	-0.0000131

Table 7-27. Frequency Stability Data (Band 12/17)

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Band 12/17 Frequency Stability Measurements

§2.1055 §27.54

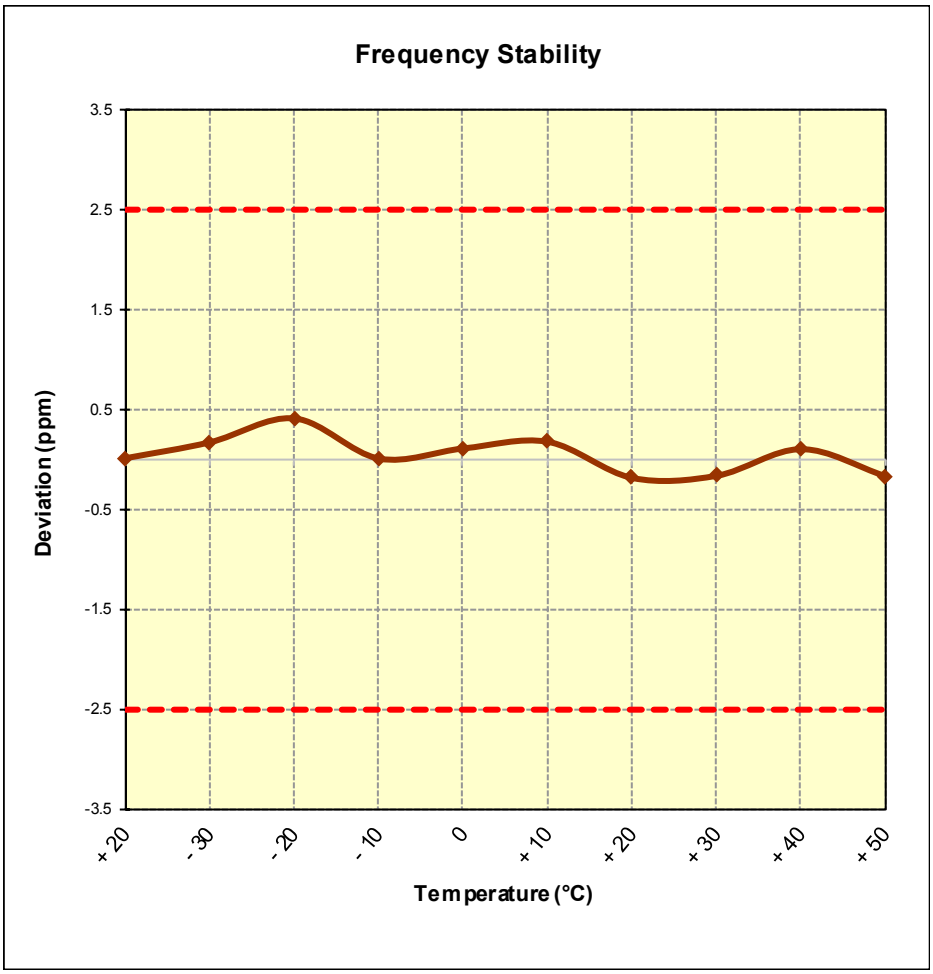

Figure 7-8. Frequency Stability Graph (Band 12/17)

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Band 13 Frequency Stability Measurements

§2.1055 §27.54

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

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	781,999,769	-231	-0.0000295
100 %		- 30	782,000,117	117	0.0000150
100 %		- 20	782,000,016	16	0.0000020
100 %		- 10	782,000,001	1	0.0000001
100 %		0	781,999,954	-46	-0.0000059
100 %		+ 10	781,999,808	-192	-0.0000246
100 %		+ 20	782,000,309	309	0.0000395
100 %		+ 30	782,000,120	120	0.0000153
100 %		+ 40	782,000,000	0	0.0000000
100 %		+ 50	781,999,744	-256	-0.0000327
BATT. ENDPOINT	3.40	+ 20	782,000,221	221	0.0000283

Table 7-28. Frequency Stability Data (Band 13)

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Band 13 Frequency Stability Measurements

§2.1055 §27.54

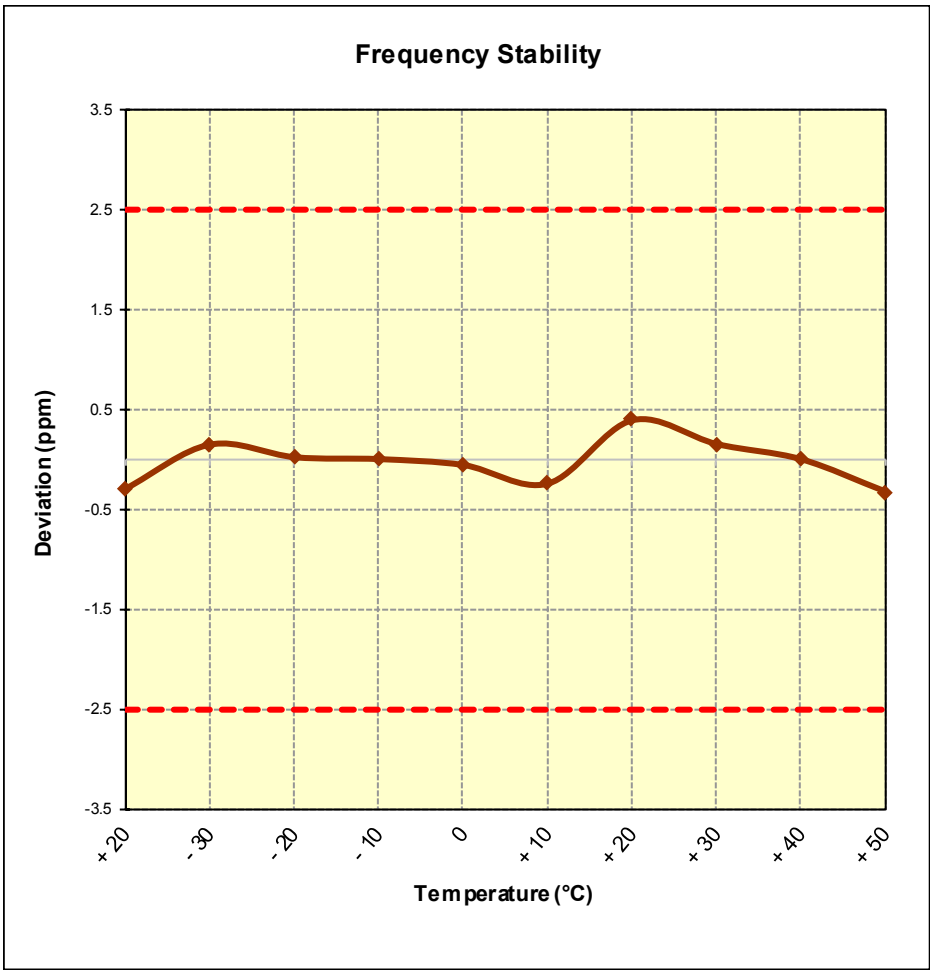

Figure 7-9. Frequency Stability Graph (Band 13)

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Band 5 Frequency Stability Measurements

§2.1055 §22.355

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

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	836,499,723	-277	-0.0000331
100 %		- 30	836,499,841	-159	-0.0000190
100 %		- 20	836,500,127	127	0.0000152
100 %		- 10	836,500,054	54	0.0000065
100 %		0	836,499,690	-310	-0.0000371
100 %		+ 10	836,499,686	-314	-0.0000375
100 %		+ 20	836,500,287	287	0.0000343
100 %		+ 30	836,500,083	83	0.0000099
100 %		+ 40	836,500,057	57	0.0000068
100 %		+ 50	836,499,934	-66	-0.0000079
BATT. ENDPOINT	3.40	+ 20	836,499,942	-58	-0.0000069

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

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Band 5 Frequency Stability Measurements

§2.1055 §22.355

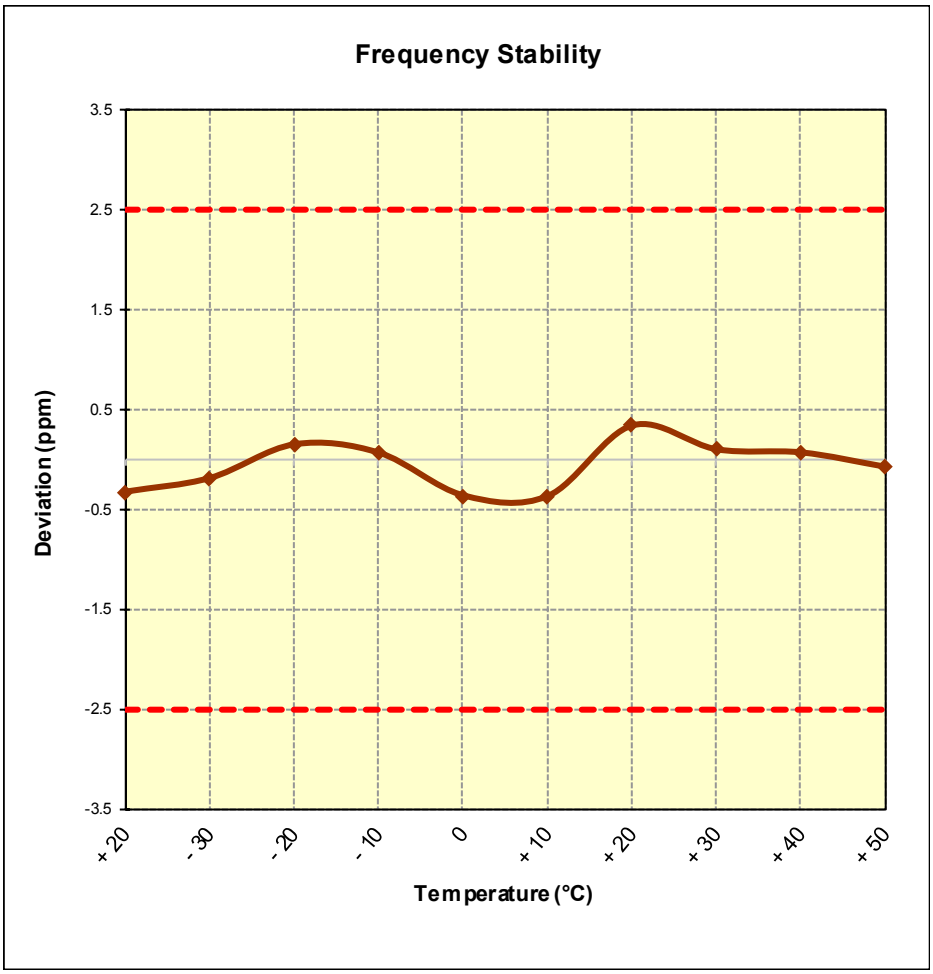

Figure 7-10. Frequency Stability Graph (Band 5)

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Band 4/66 Frequency Stability Measurements

§2.1055 §§27.54

OPERATING FREQUENCY:	1,745,000,000	Hz
CHANNEL:	132322	
REFERENCE VOLTAGE:	3.80	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	1,744,999,975	-25	-0.0000014
100 %		- 30	1,745,000,340	340	0.0000195
100 %		- 20	1,744,999,939	-61	-0.0000035
100 %		- 10	1,744,999,814	-186	-0.0000107
100 %		0	1,745,000,012	12	0.0000007
100 %		+ 10	1,745,000,396	396	0.0000227
100 %		+ 20	1,744,999,732	-268	-0.0000154
100 %		+ 30	1,745,000,063	63	0.0000036
100 %		+ 40	1,744,999,915	-85	-0.0000049
100 %		+ 50	1,744,999,758	-242	-0.0000139
BATT. ENDPOINT	3.40	+ 20	1,745,000,066	66	0.0000038

Table 7-30. Frequency Stability Data (Band 4/66)

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 4/66 Frequency Stability Measurements

§2.1055 §§27.54

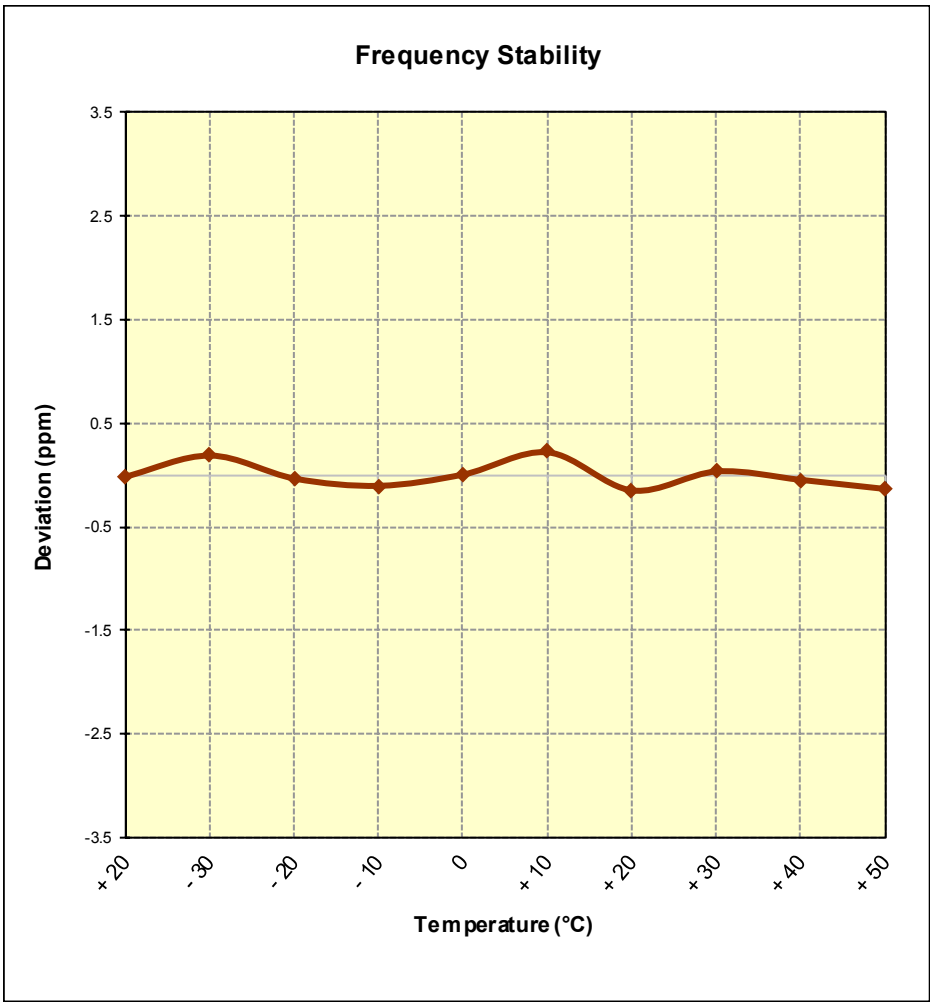

Figure 7-11. Frequency Stability Graph (Band 4/66)

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Band 2/25 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)	1,882,500,182	182	0.0000097
100 %		- 30	1,882,500,008	8	0.0000004
100 %		- 20	1,882,500,309	309	0.0000164
100 %		- 10	1,882,499,796	-204	-0.0000108
100 %		0	1,882,500,294	294	0.0000156
100 %		+ 10	1,882,499,859	-141	-0.0000075
100 %		+ 20	1,882,500,056	56	0.0000030
100 %		+ 30	1,882,499,948	-52	-0.0000028
100 %		+ 40	1,882,500,359	359	0.0000191
100 %		+ 50	1,882,500,297	297	0.0000158
BATT. ENDPOINT	3.40	+ 20	1,882,499,709	-291	-0.0000155

Table 7-31. Frequency Stability Data (Band 2/25)

Note:

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

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Band 2/25 Frequency Stability Measurements

§2.1055 §24.235

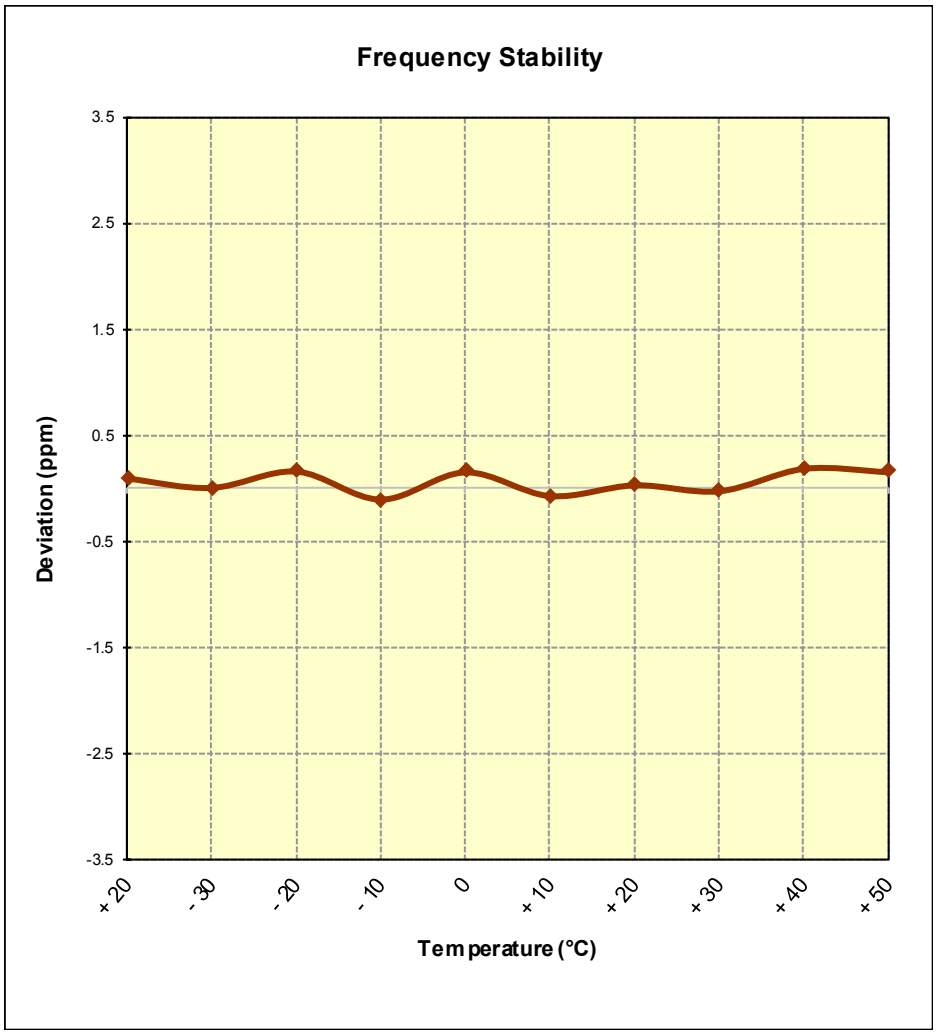

Figure 7-12. Frequency Stability Graph (Band 2/25)

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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: ZNFVS988** complies with all the requirements of Parts 22, 24, & 27 of the FCC rules for LTE operation only.

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