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.

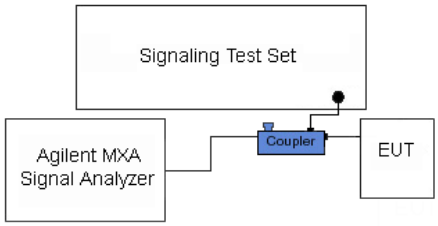

Figure 7-3. Test Instrument & Measurement Setup

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.

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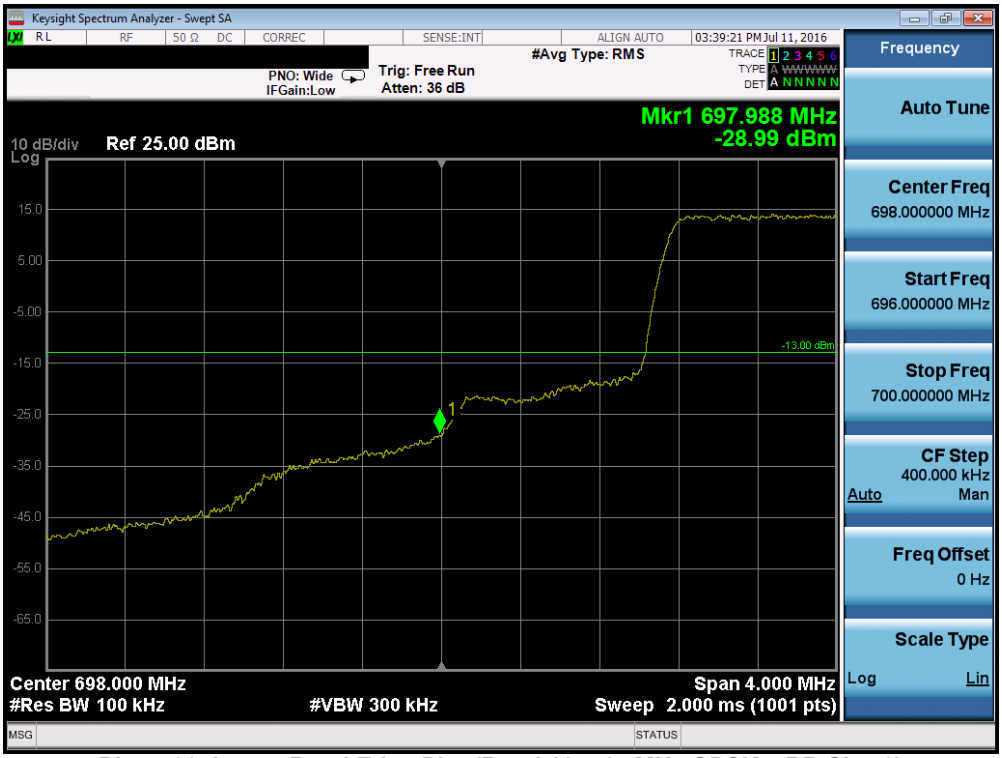
Per 27.53(c.5) for operations in the 776-788 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

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



Plot 7-90. Lower Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)

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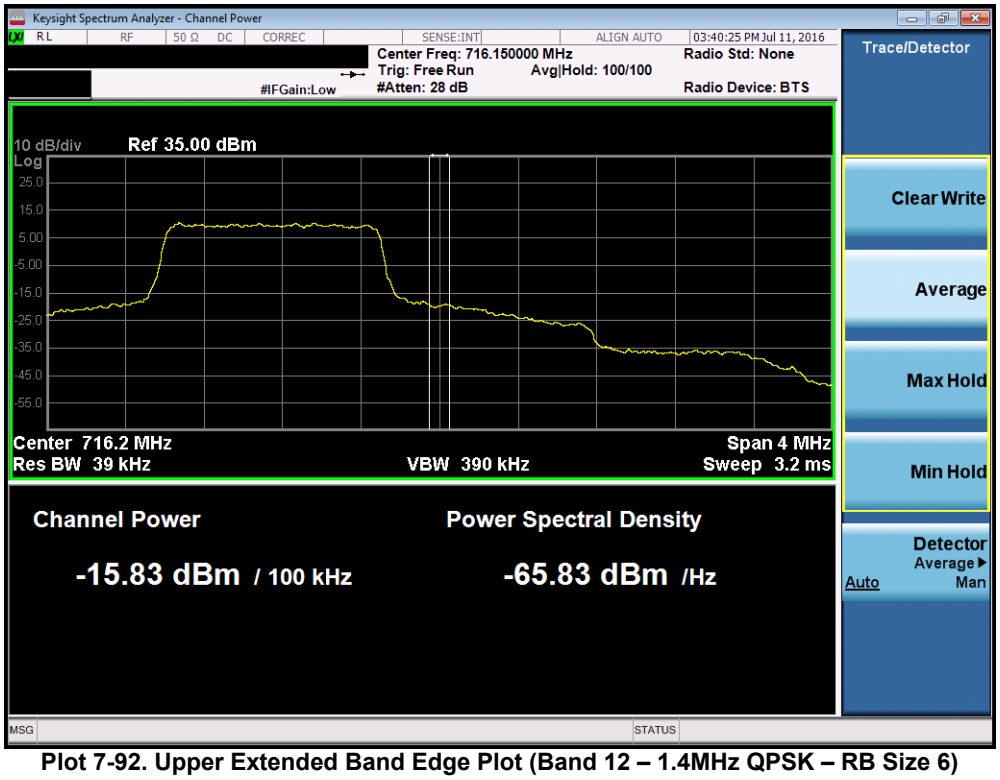
Plot 7-91. Upper Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)



Plot 7-92. Upper Extended Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)

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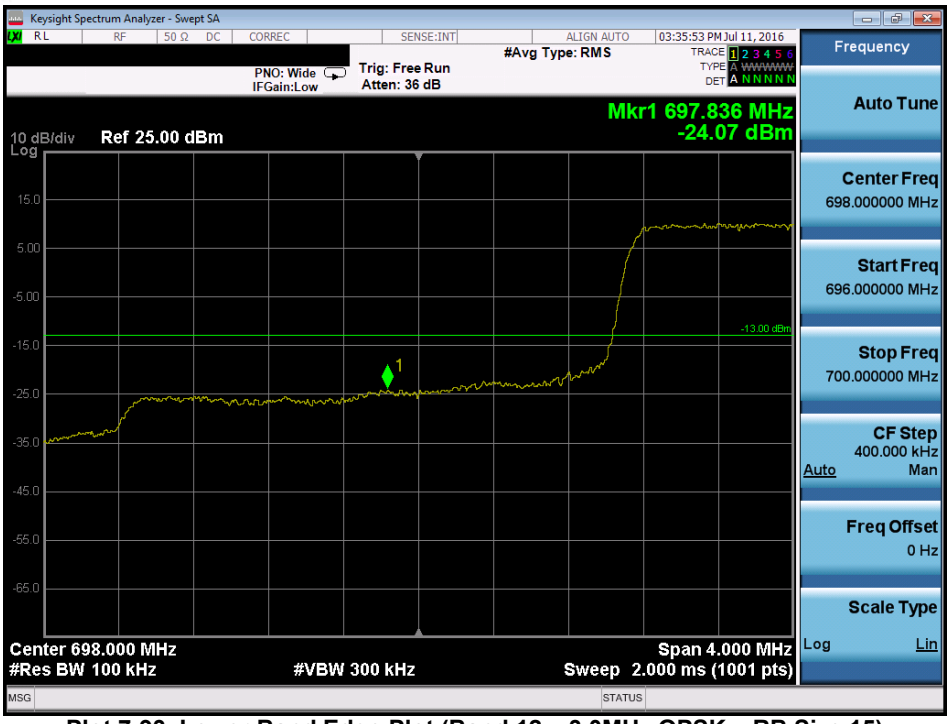
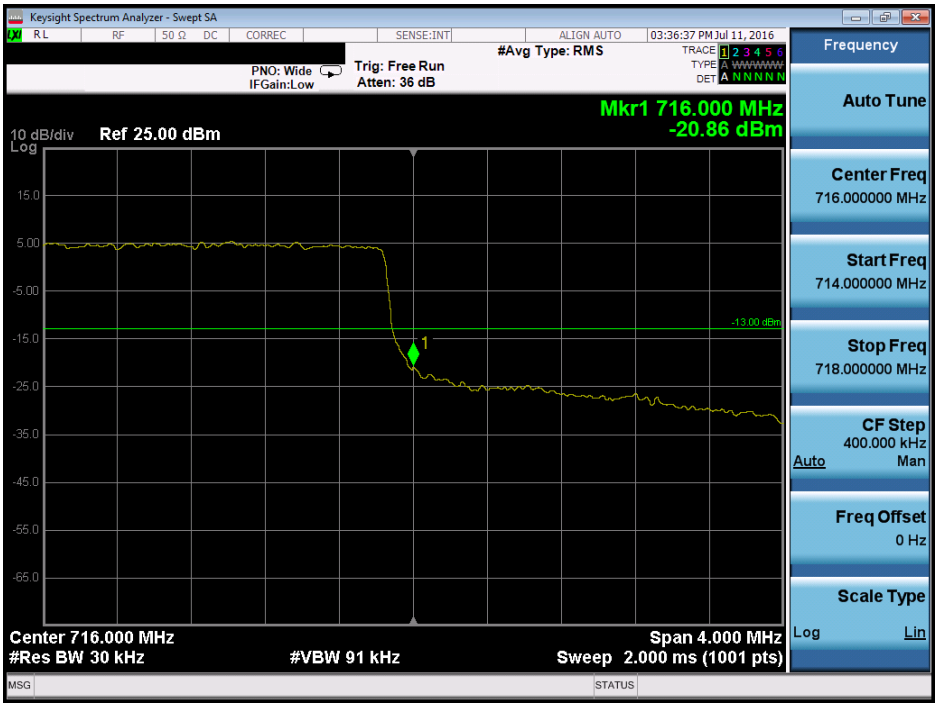


Plot 7-93. Lower Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)



Plot 7-94. Upper Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

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Plot 7-95. Upper Extended Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

Plot 7-96. Lower Band Edge Plot (Band 12/17 – 5.0MHz QPSK – RB Size 25)

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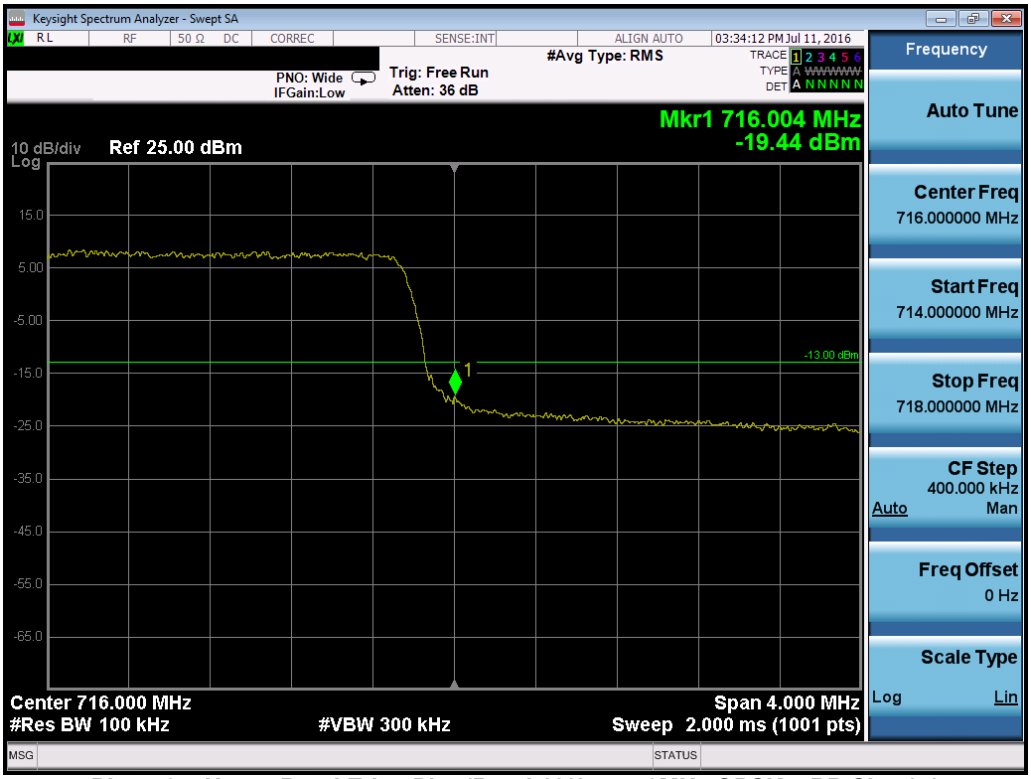
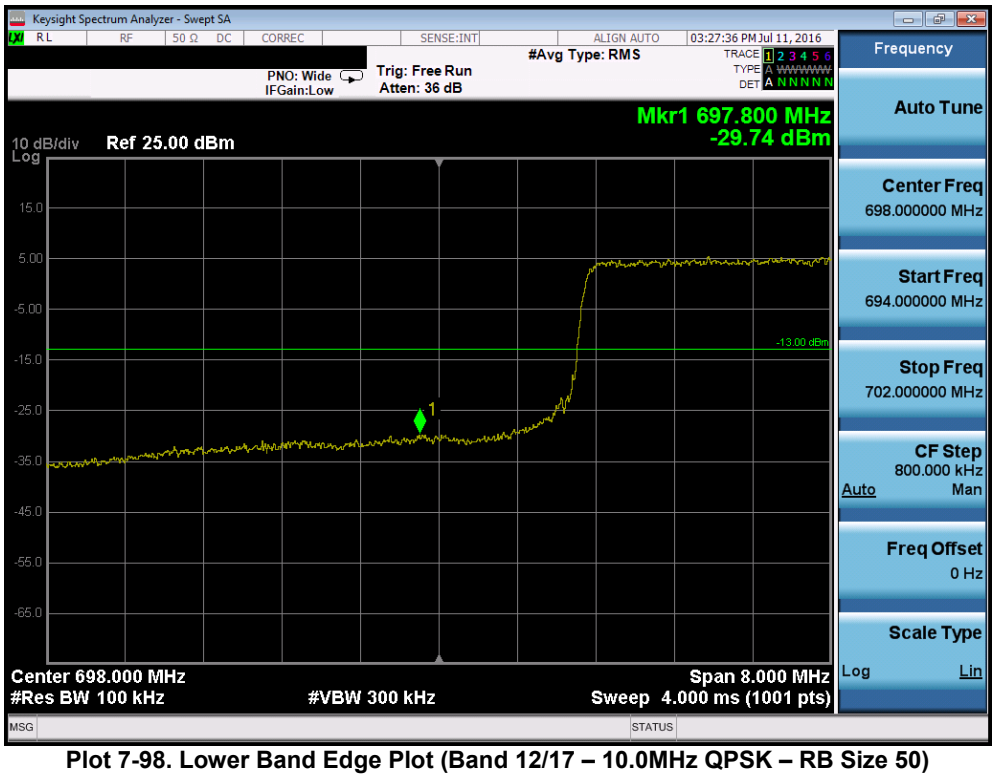


Plot 7-97. Upper Band Edge Plot (Band 12/17 – 5.0MHz QPSK – RB Size 25)



Plot 7-98. Lower Band Edge Plot (Band 12/17 – 10.0MHz QPSK – RB Size 50)

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Plot 7-99. Upper Band Edge Plot (Band 12/17 – 10.0MHz QPSK – RB Size 50)

Plot 7-100. Lower Emission Mask Plot (Band 13 – 5.0MHz QPSK – RB Size 25)

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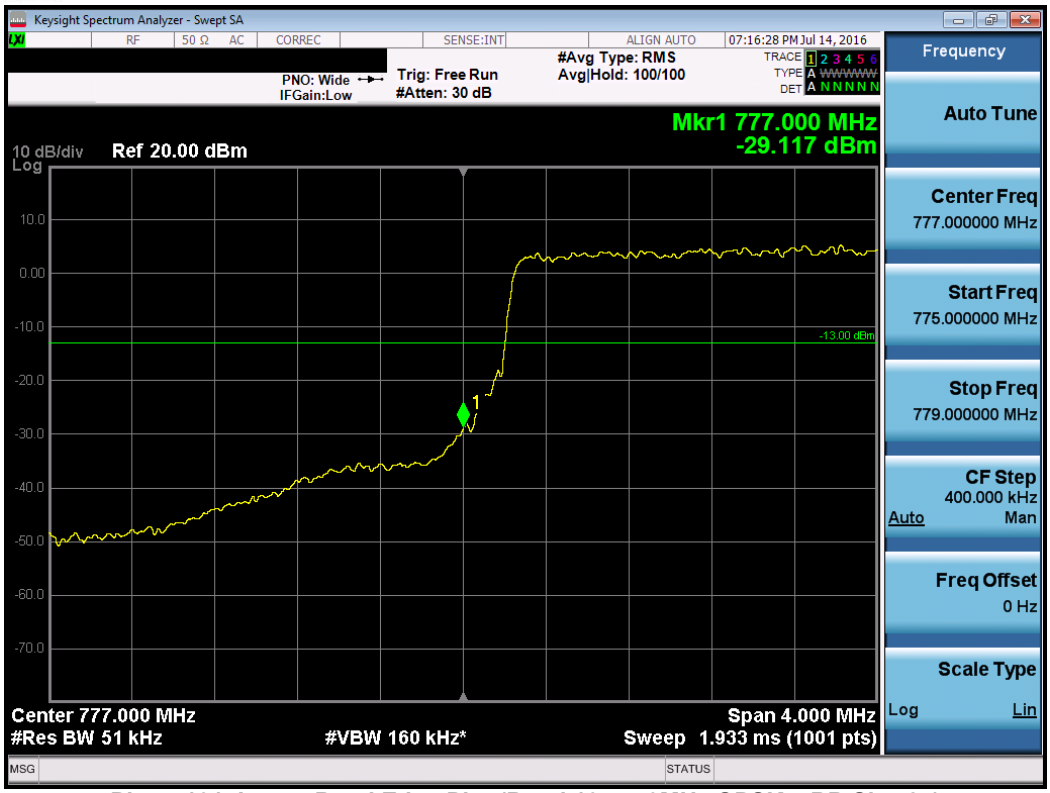
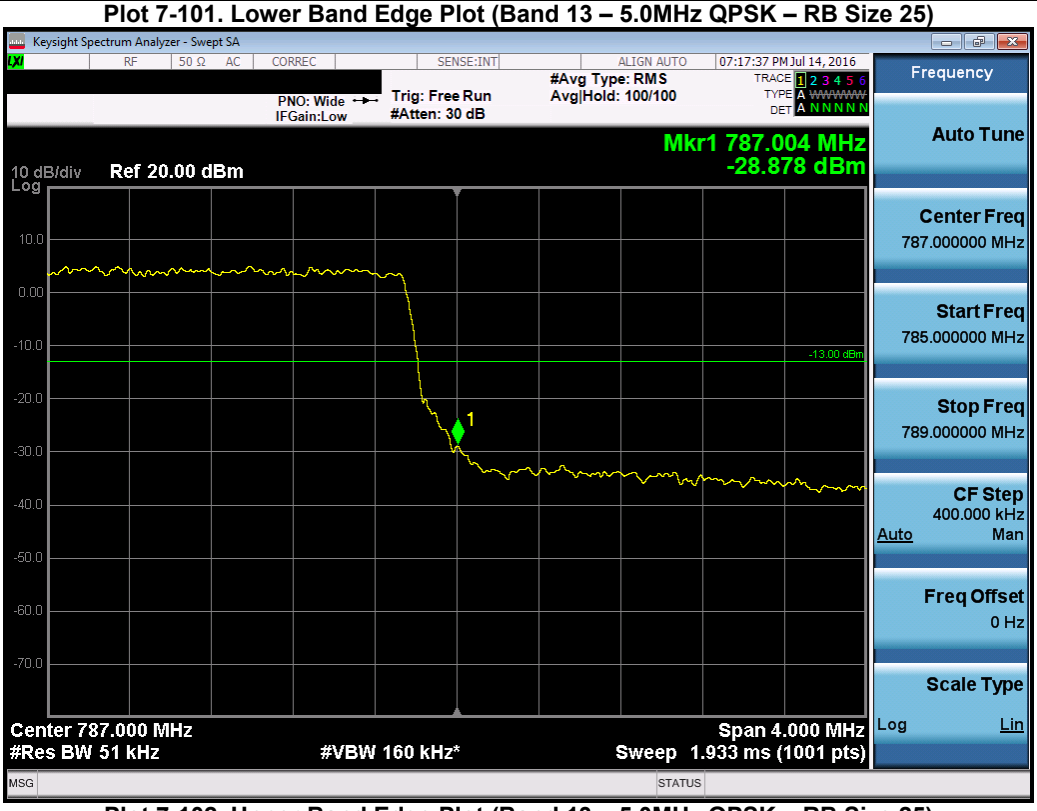


Plot 7-101. Lower Band Edge Plot (Band 13 – 5.0MHz QPSK – RB Size 25)



Plot 7-102. Upper Band Edge Plot (Band 13 – 5.0MHz QPSK – RB Size 25)

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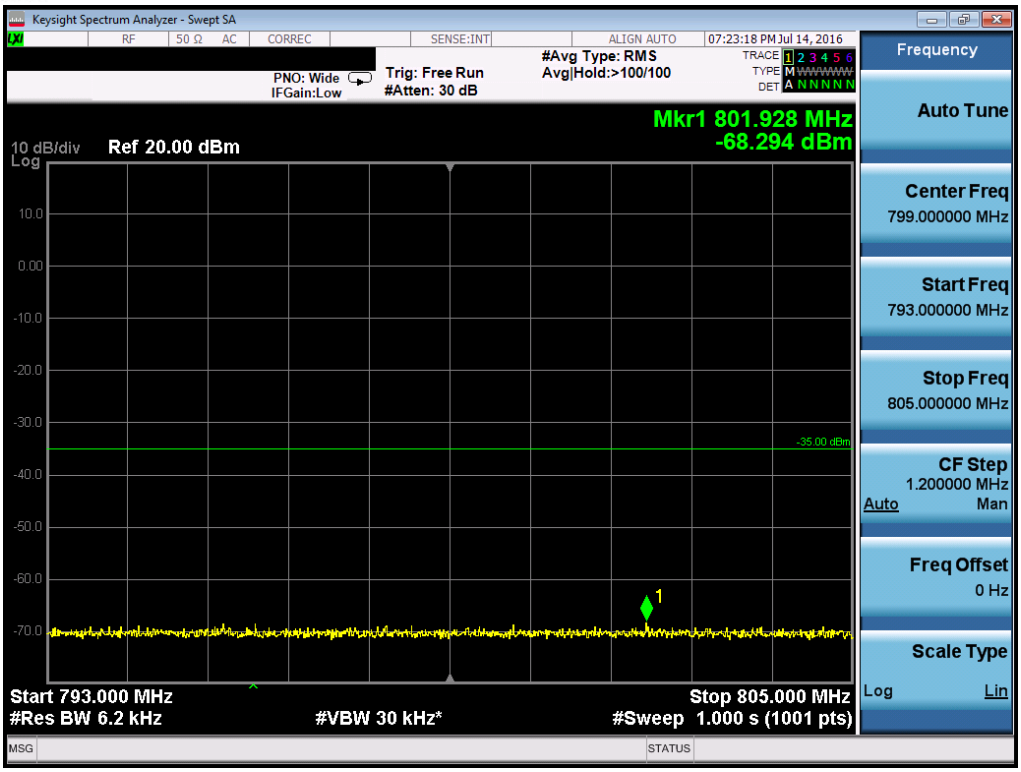
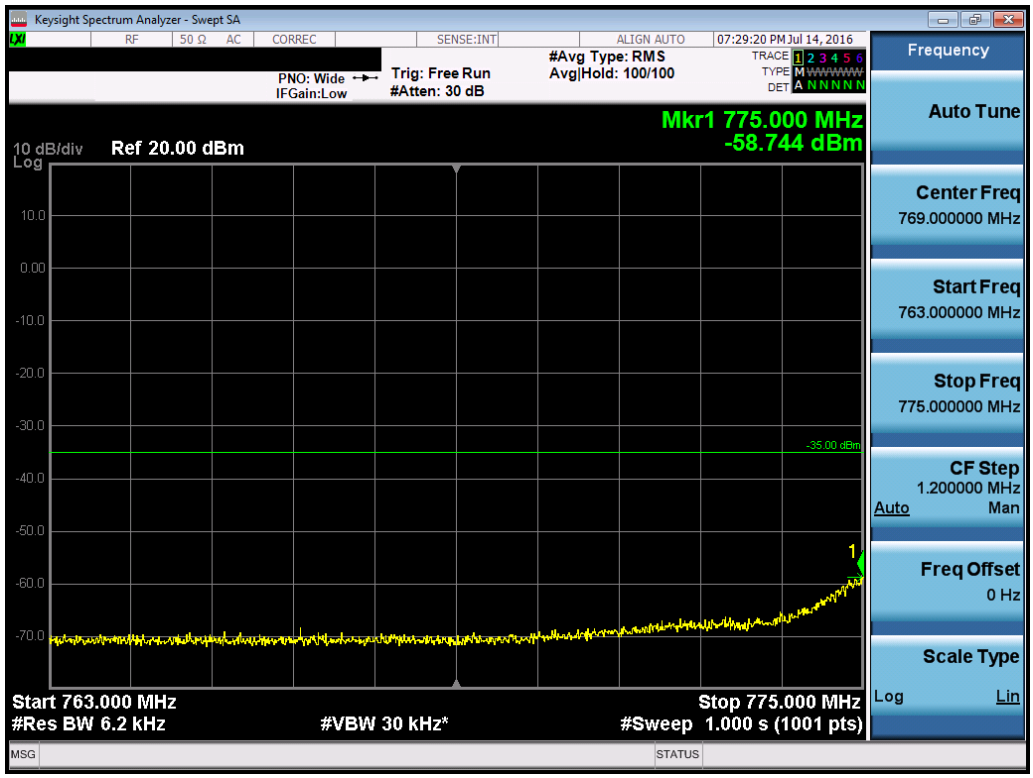


Plot 7-103. Upper Emission Mask Plot (Band 13 – 5.0MHz QPSK – RB Size 25)



Plot 7-104. Lower Emission Mask Plot (Band 13 – 10.0MHz QPSK – RB Size 50)

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Plot 7-105. Lower Band Edge Plot (Band 13 – 10.0MHz QPSK – RB Size 50)

Plot 7-106. Upper Band Edge Plot (Band 13 – 10.0MHz QPSK – RB Size 50)

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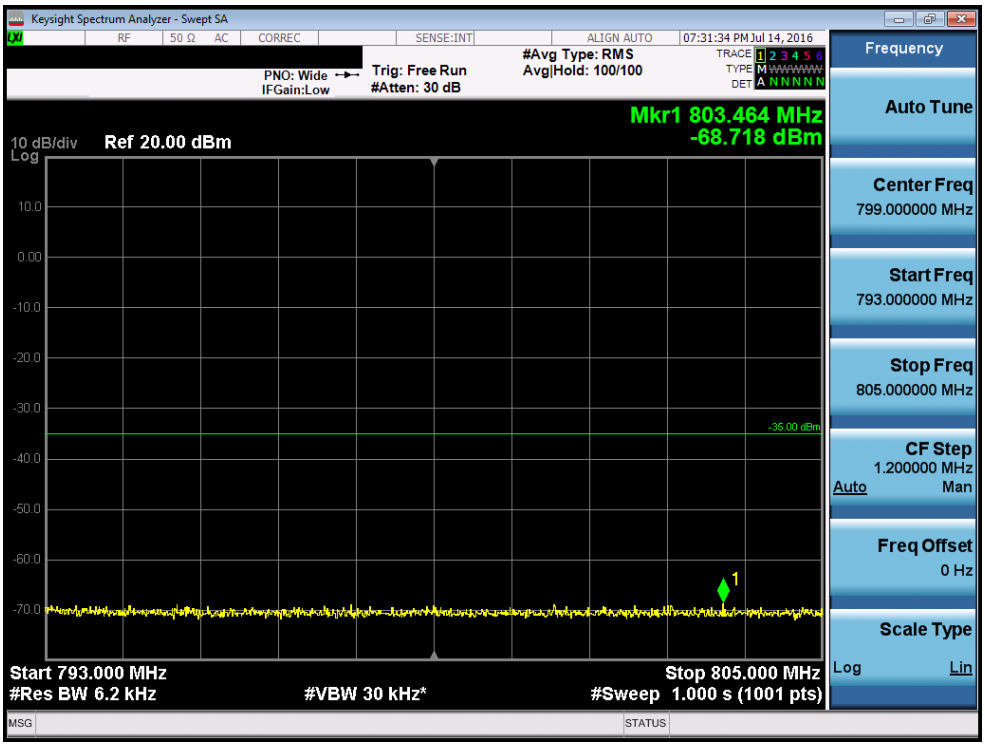
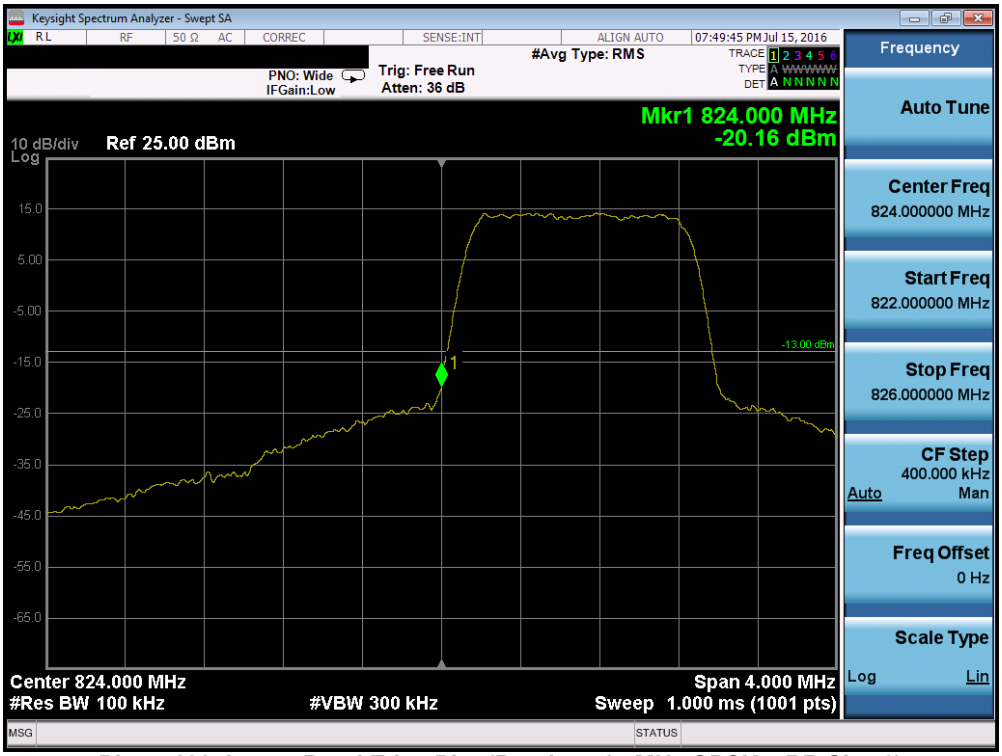


Plot 7-107. Upper Emission Mask Plot (Band 13 – 10.0MHz QPSK – RB Size 50)



Plot 7-108. Lower Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

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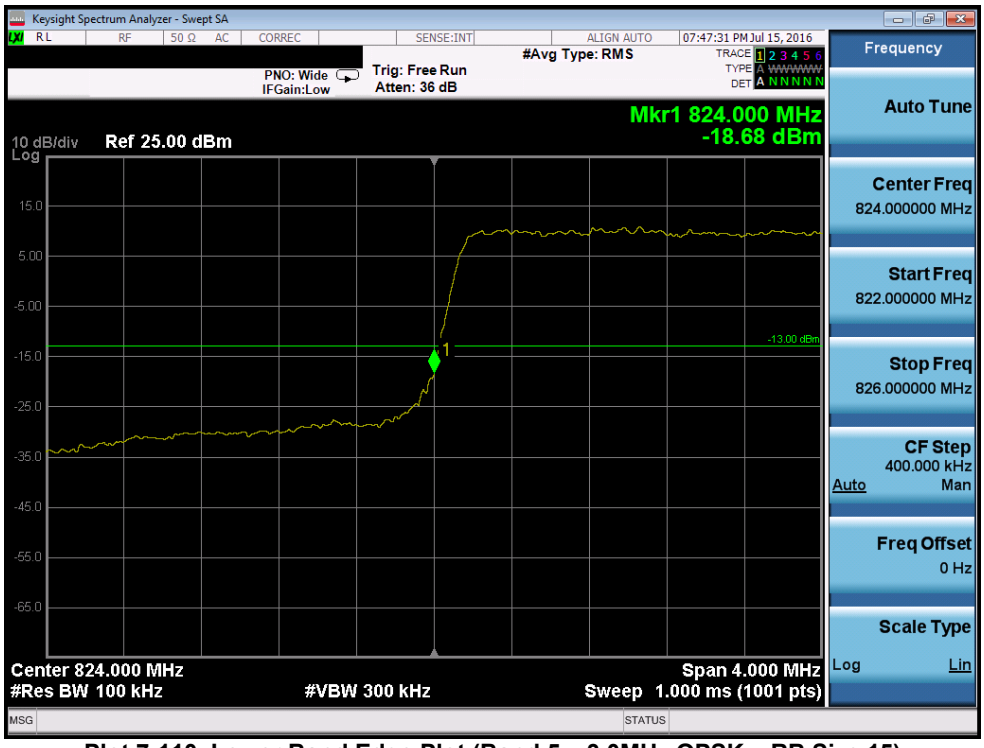
Plot 7-109. Upper Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)



Plot 7-110. Lower Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)

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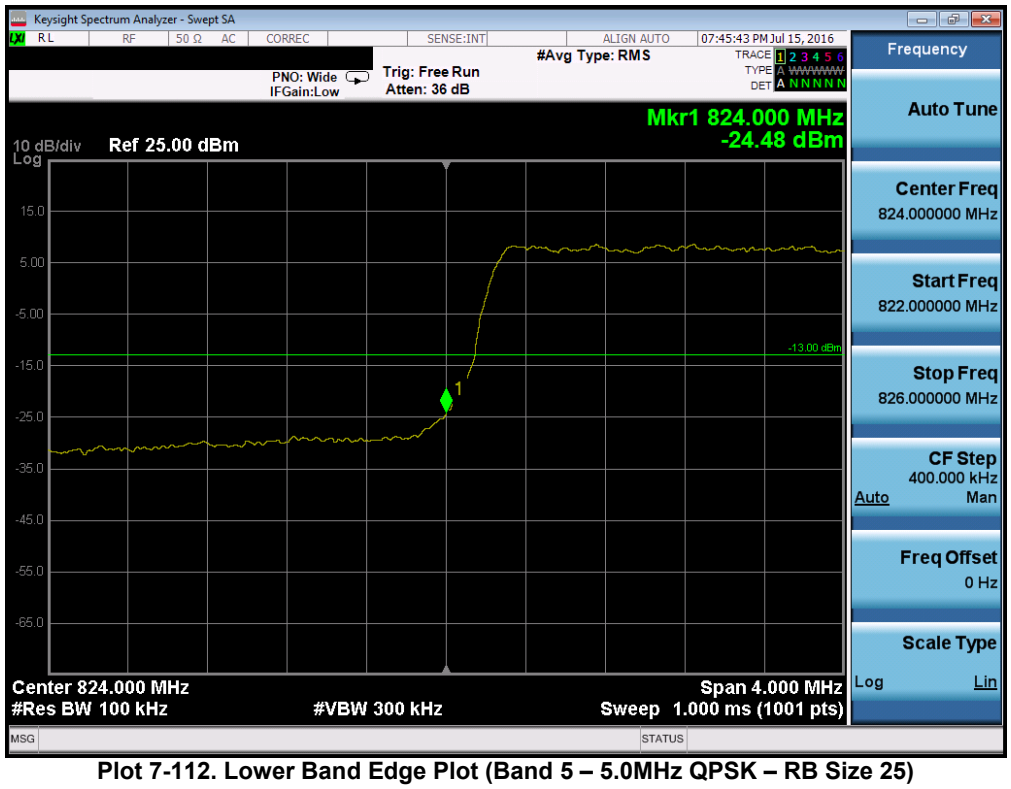
Plot 7-111. Upper Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)



Plot 7-112. Lower Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

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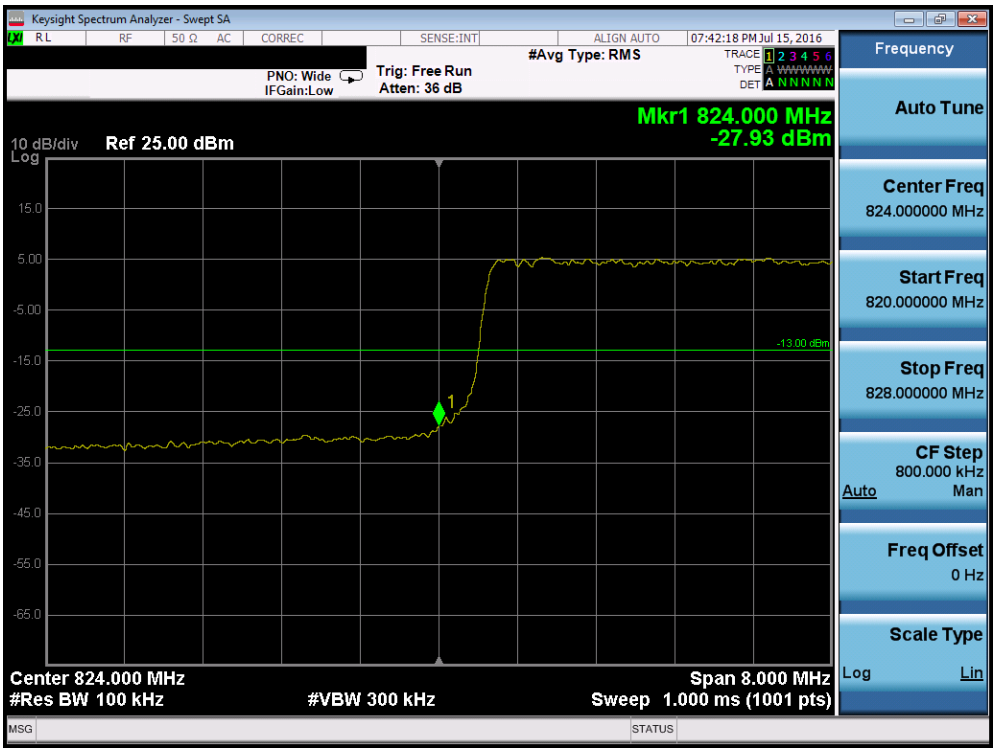
Plot 7-113. Upper Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)



Plot 7-114. Lower Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)

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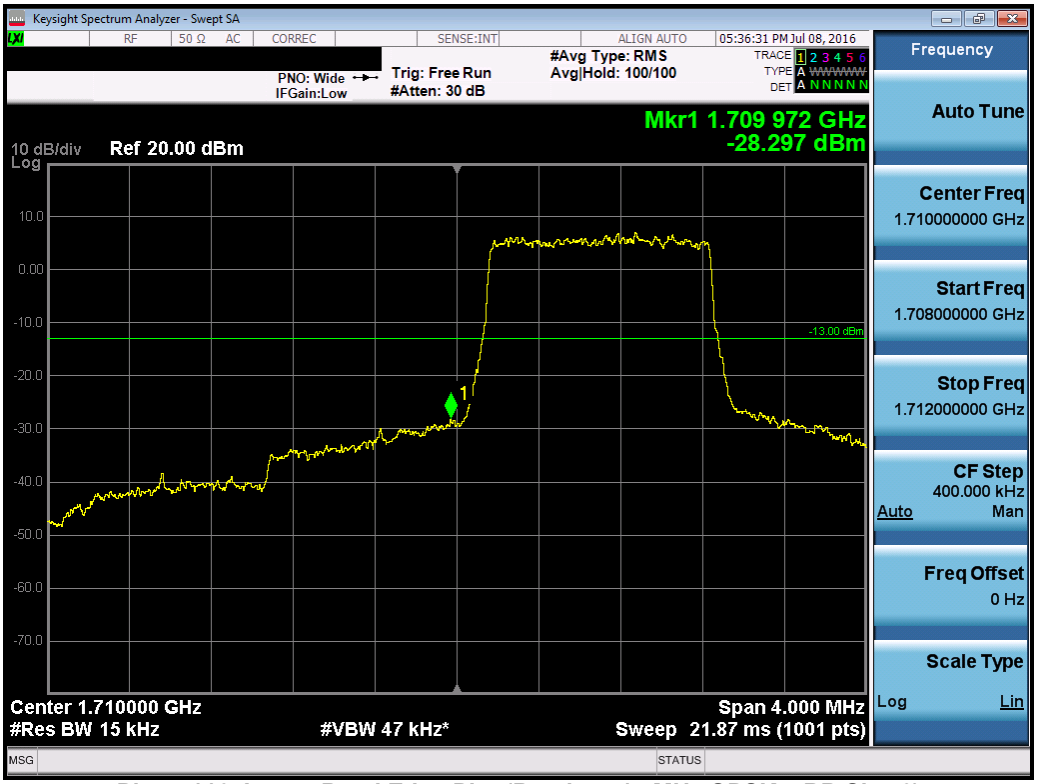
Plot 7-115. Upper Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)



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

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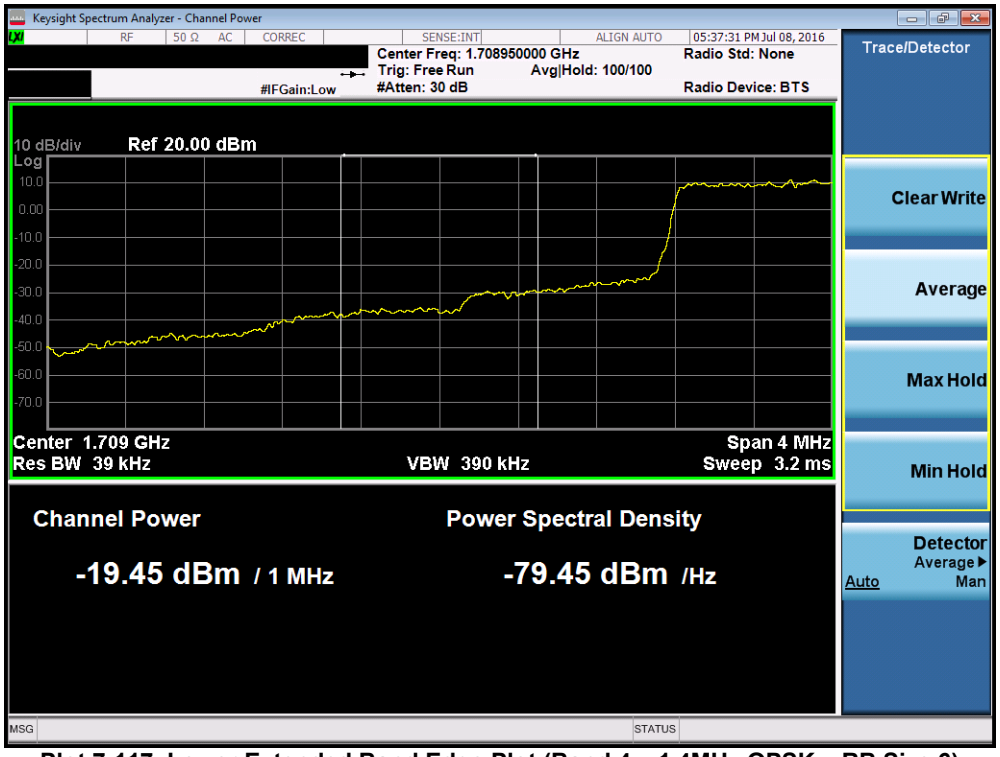

Plot 7-117. Lower Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

Plot 7-118. Upper Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

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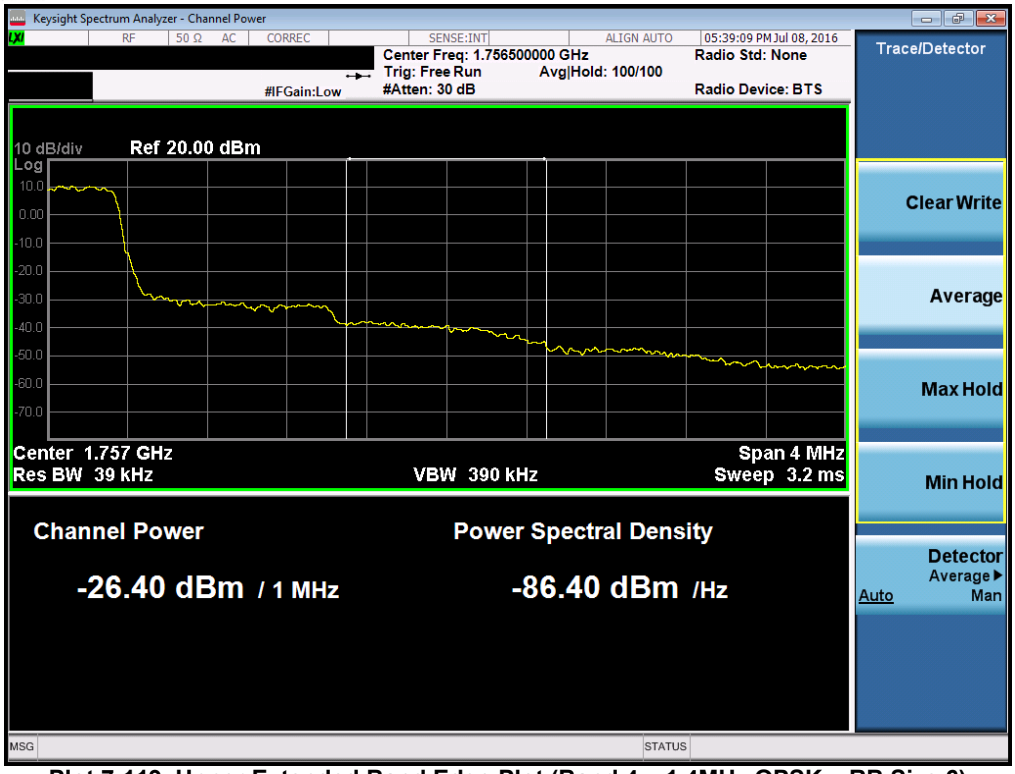
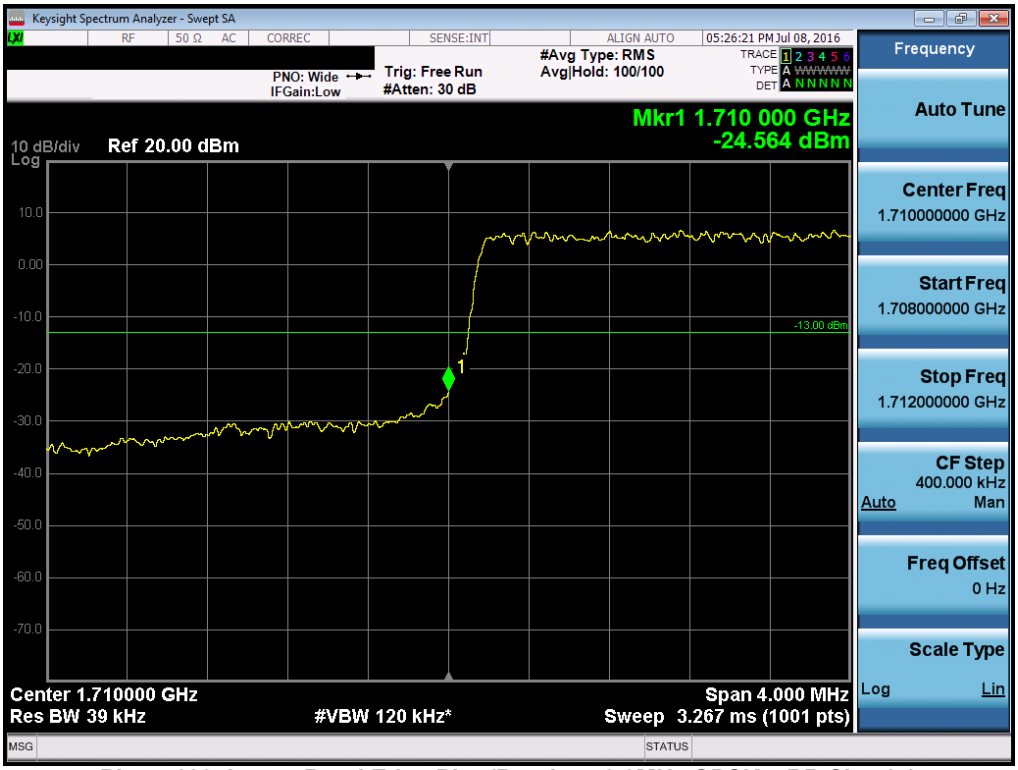


Plot 7-119. Upper Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



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

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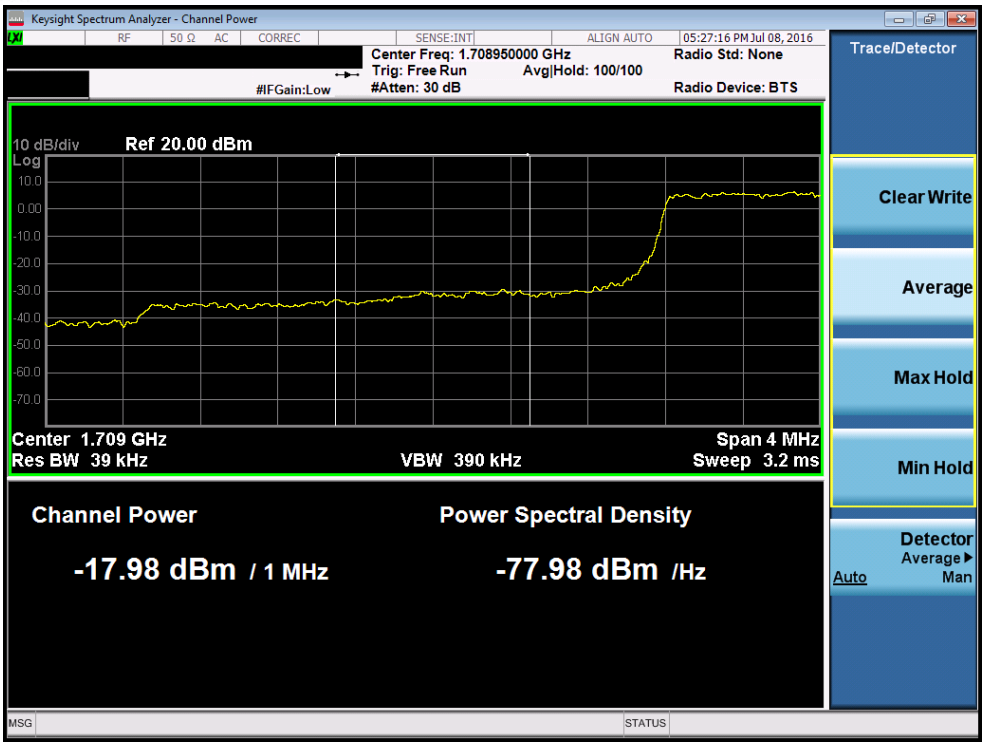

Plot 7-121. Lower Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

Plot 7-122. Upper Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

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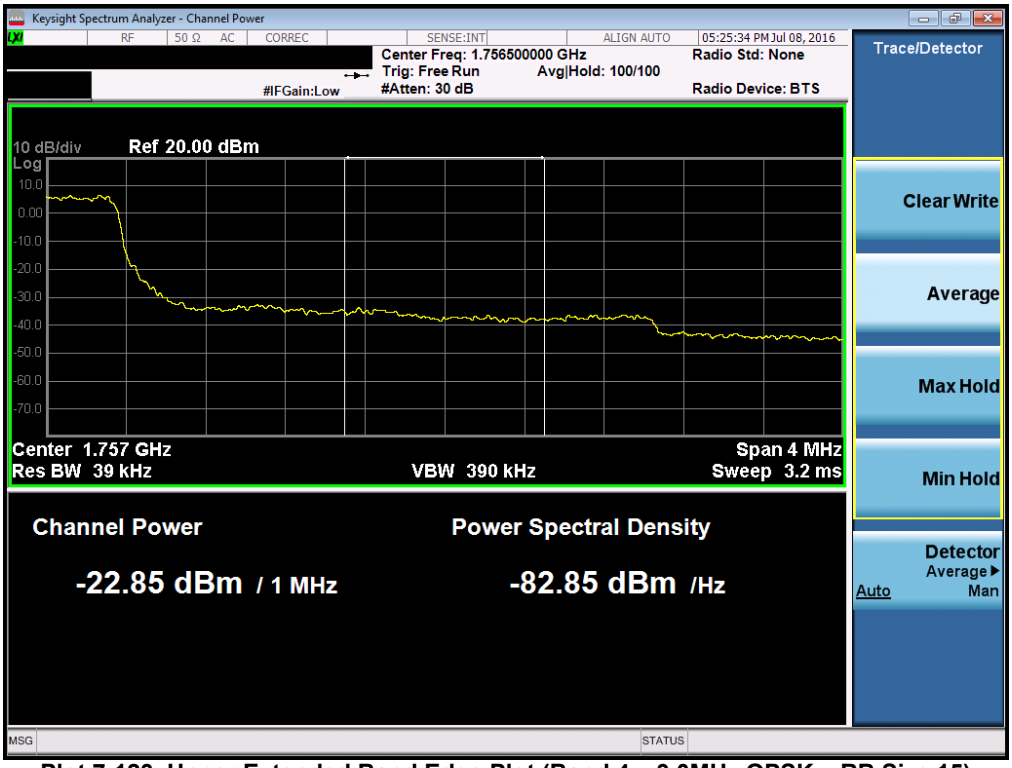
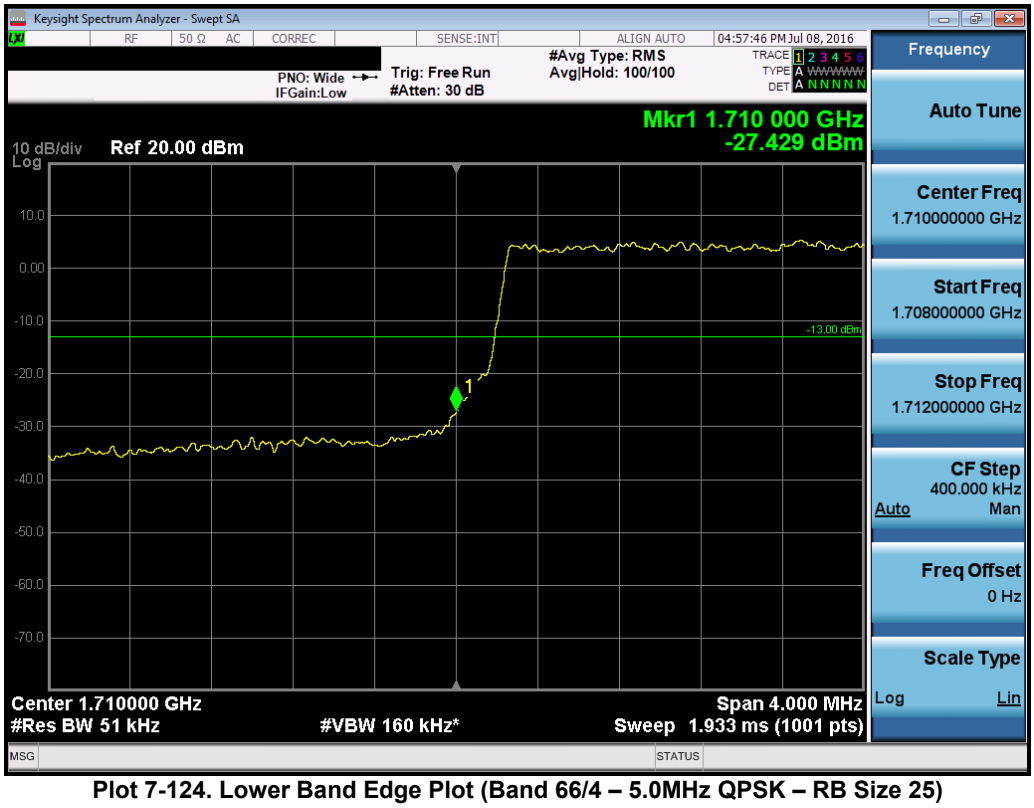


Plot 7-123. Upper Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



Plot 7-124. Lower Band Edge Plot (Band 66/4 – 5.0MHz QPSK – RB Size 25)

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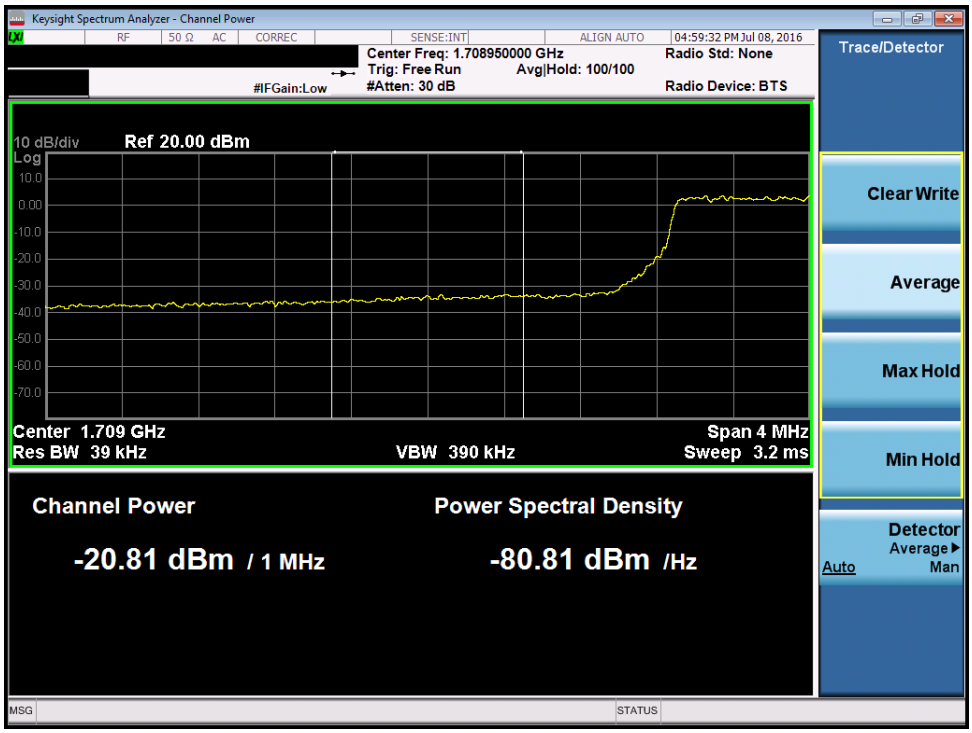

Plot 7-125. Lower Extended Band Edge Plot (Band 66/4 – 5.0MHz QPSK – RB Size 25)

Plot 7-126. Upper Band Edge Plot (Band 66 – 5.0MHz QPSK – RB Size 25)

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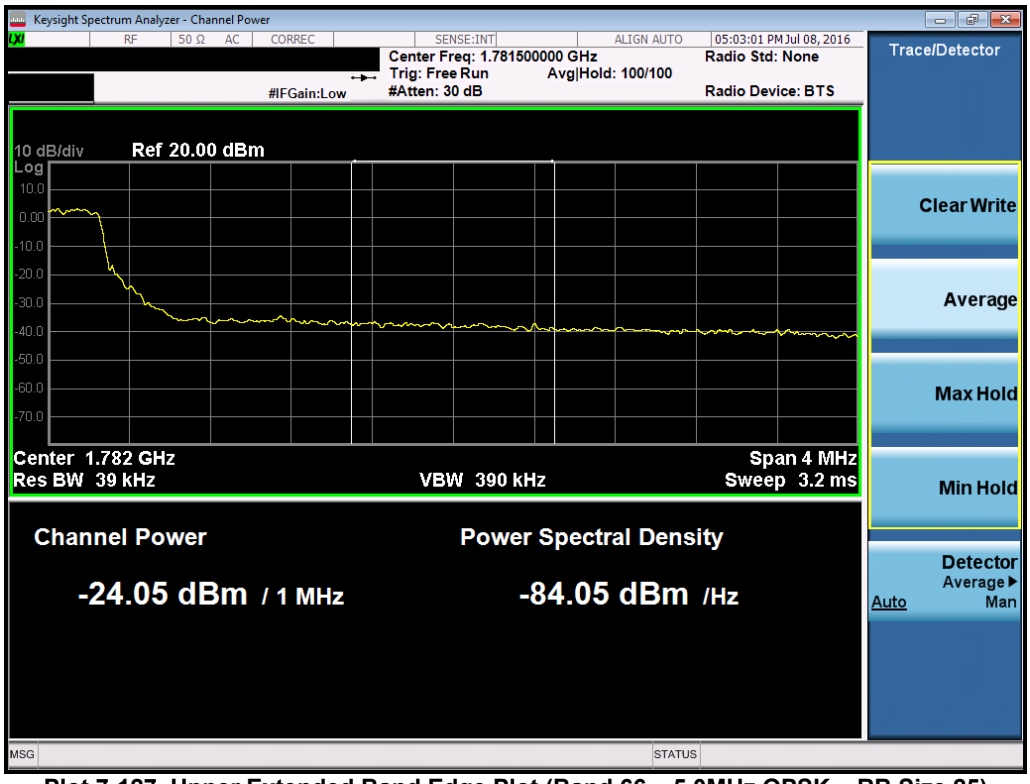
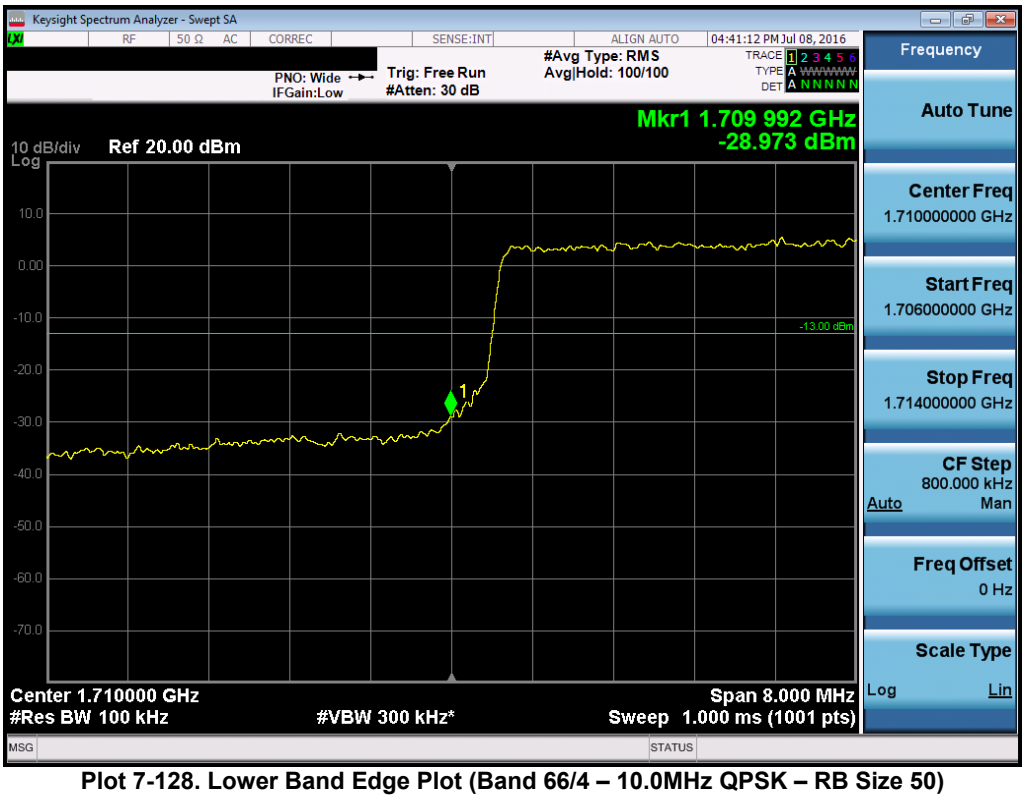


Plot 7-127. Upper Extended Band Edge Plot (Band 66 – 5.0MHz QPSK – RB Size 25)



Plot 7-128. Lower Band Edge Plot (Band 66/4 – 10.0MHz QPSK – RB Size 50)

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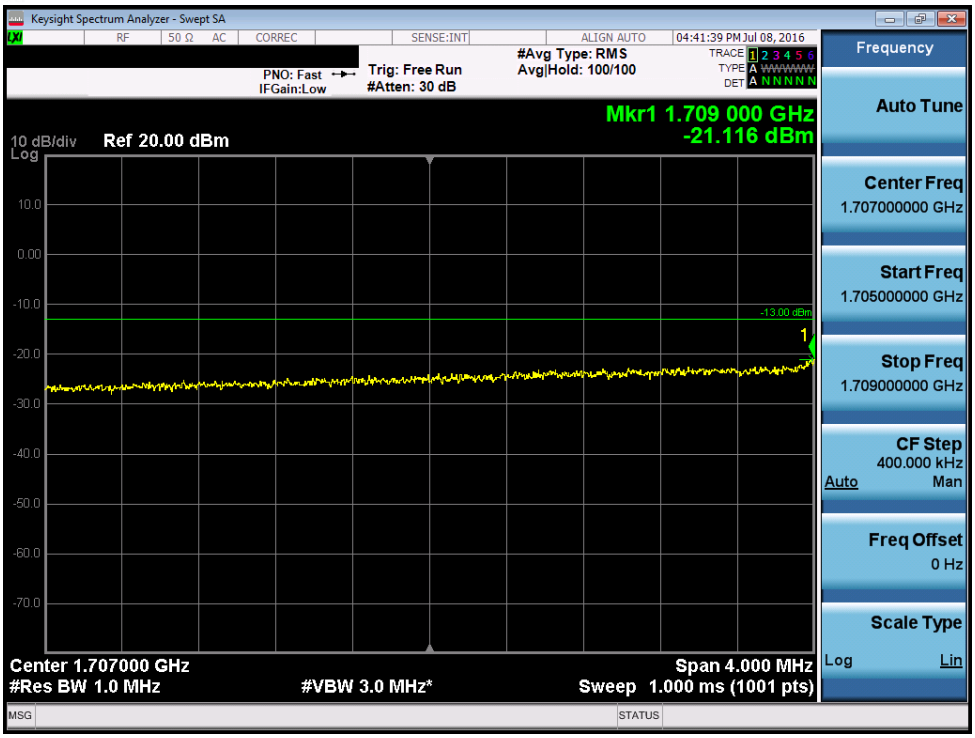

Plot 7-129. Lower Extended Band Edge Plot (Band 66/4 - 10MHz QPSK – RB Size 50)

Plot 7-130. Upper Band Edge Plot (Band 66 – 10.0MHz QPSK – RB Size 50)

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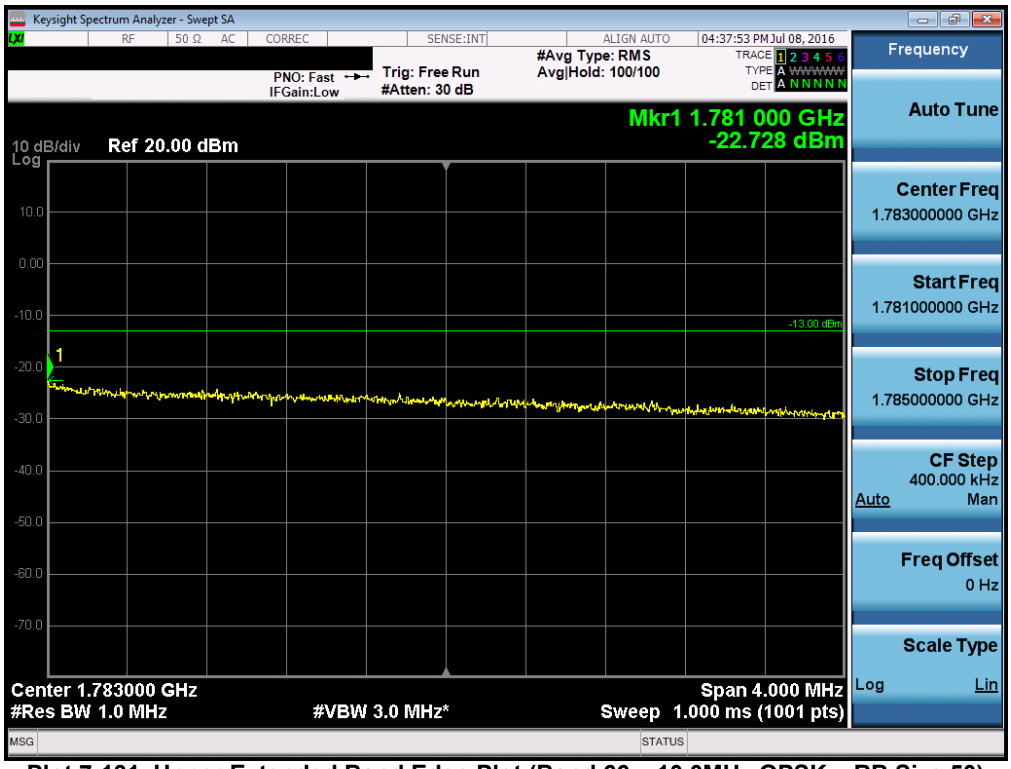
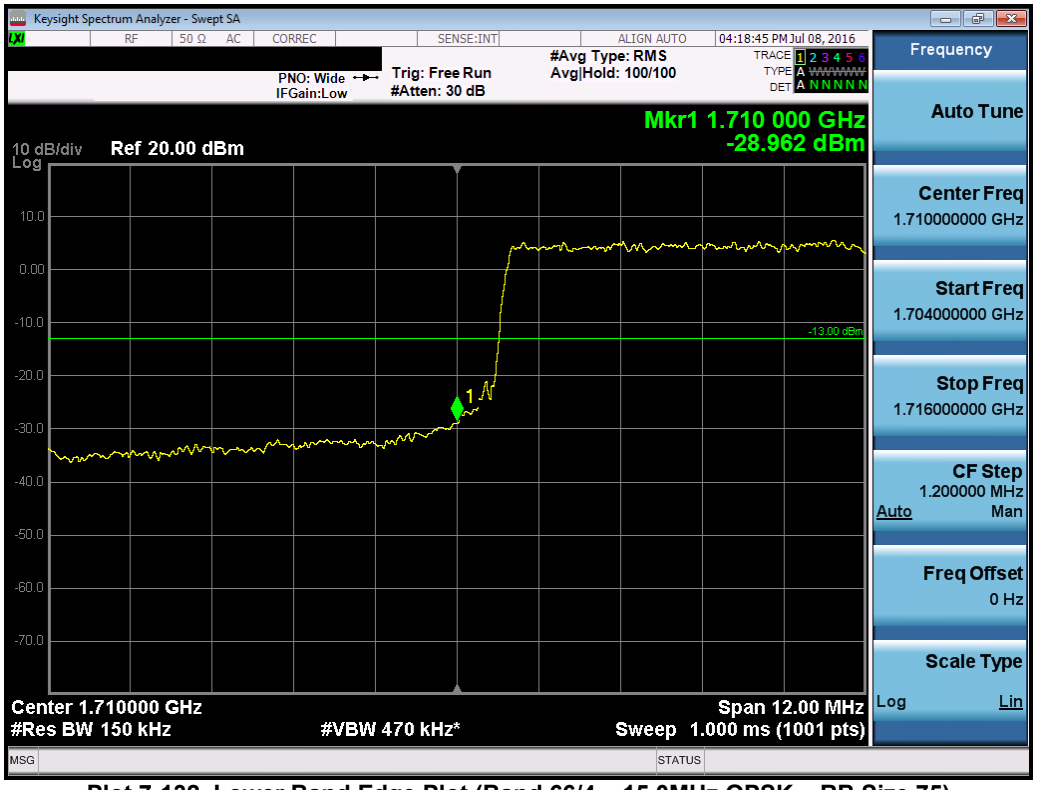


Plot 7-131. Upper Extended Band Edge Plot (Band 66 – 10.0MHz QPSK – RB Size 50)



Plot 7-132. Lower Band Edge Plot (Band 66/4 – 15.0MHz QPSK – RB Size 75)

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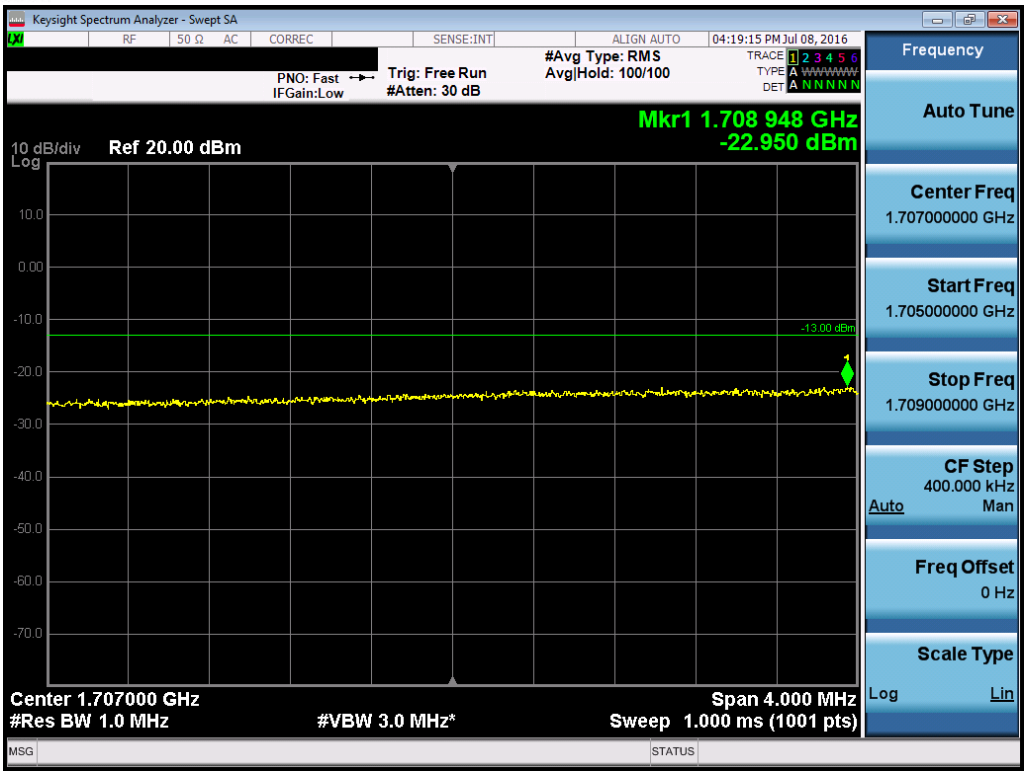

Plot 7-133. Lower Extended Band Edge Plot (Band 66/4 - 15MHz QPSK – RB Size 75)

Plot 7-134. Upper Band Edge Plot (Band 66 – 15.0MHz QPSK – RB Size 75)

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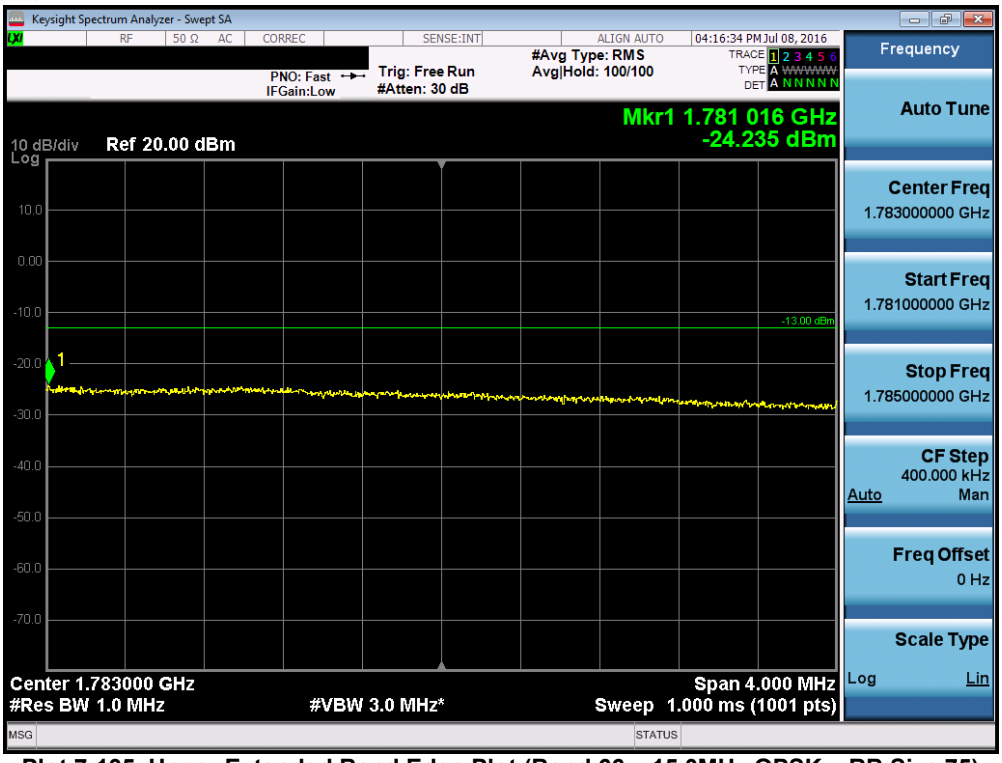
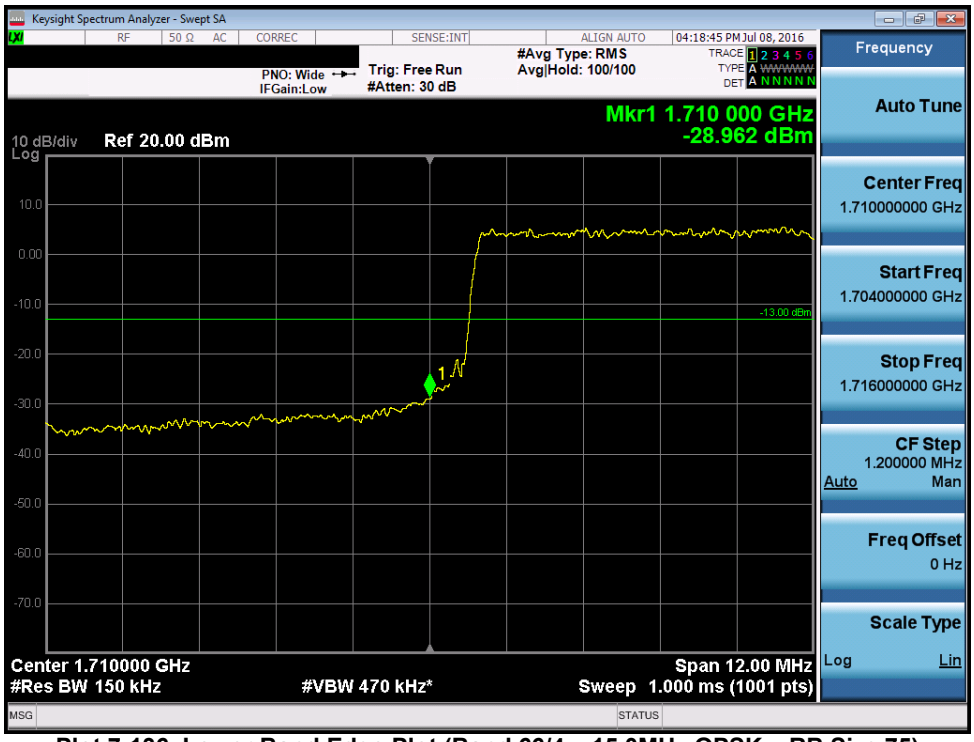


Plot 7-135. Upper Extended Band Edge Plot (Band 66 – 15.0MHz QPSK – RB Size 75)



Plot 7-136. Lower Band Edge Plot (Band 66/4 – 15.0MHz QPSK – RB Size 75)

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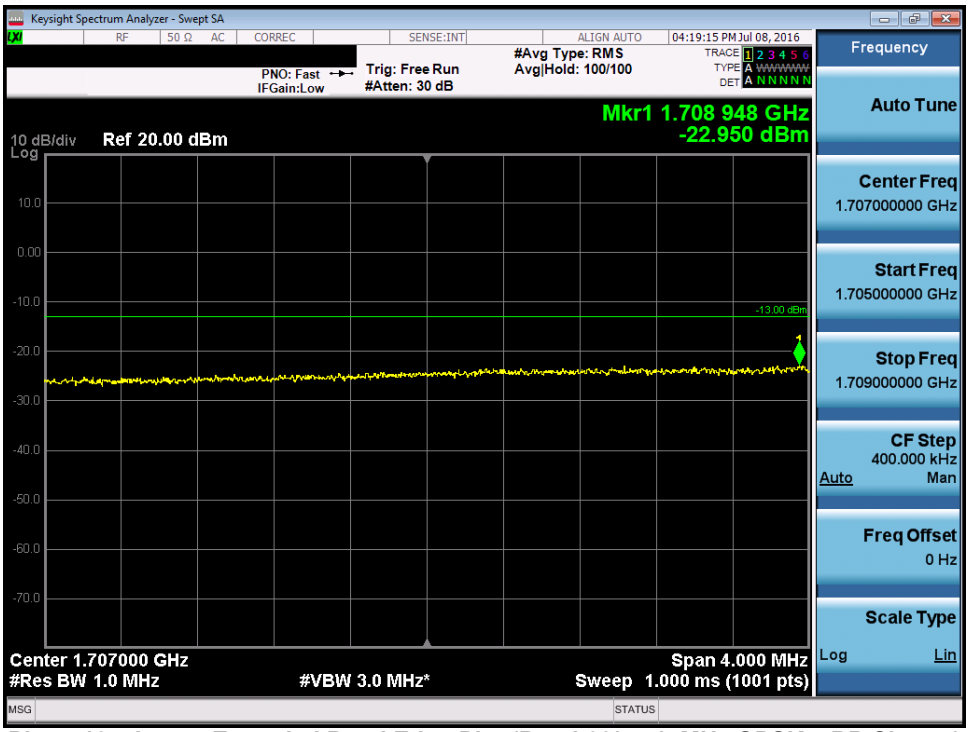

Plot 7-137. Lower Extended Band Edge Plot (Band 66/4 - 15MHz QPSK – RB Size 75)

Plot 7-138. Upper Band Edge Plot (Band 66 – 15.0MHz QPSK – RB Size 75)

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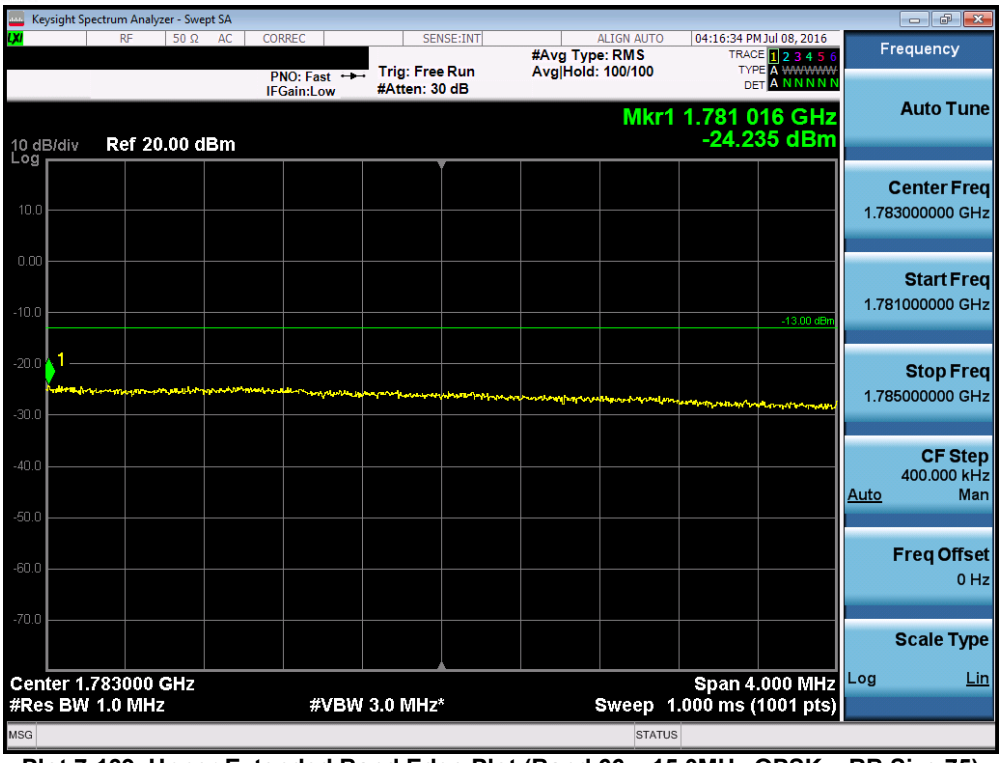
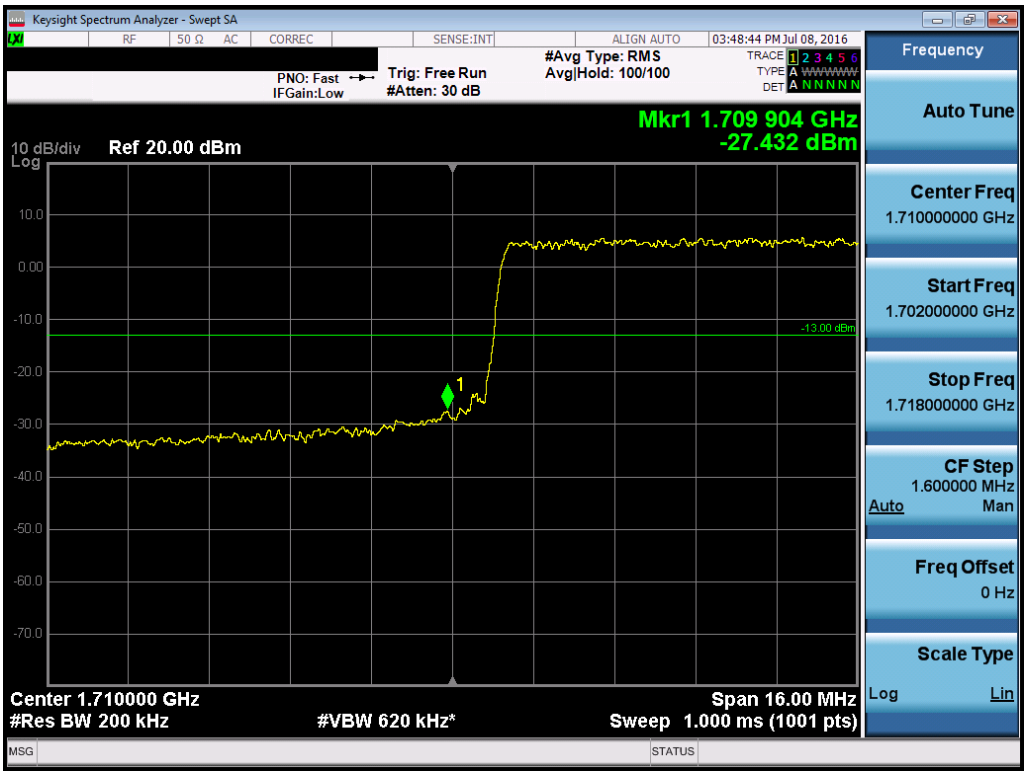


Plot 7-139. Upper Extended Band Edge Plot (Band 66 – 15.0MHz QPSK – RB Size 75)



Plot 7-140. Lower Band Edge Plot (Band 66/4 – 20.0MHz QPSK – RB Size 100)

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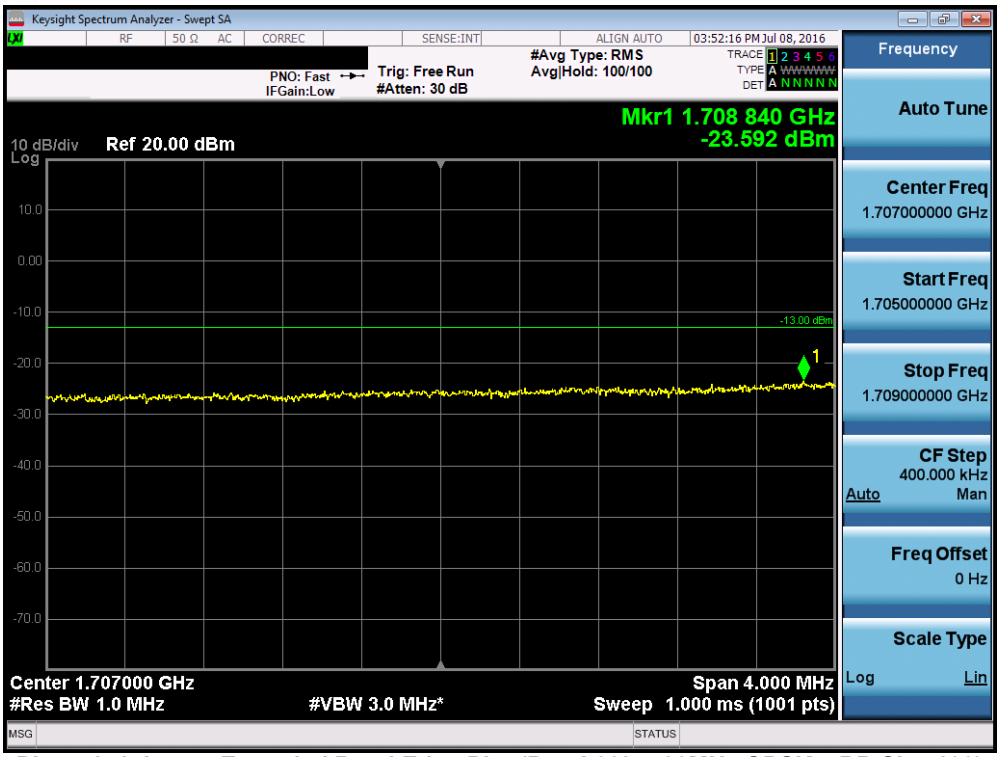
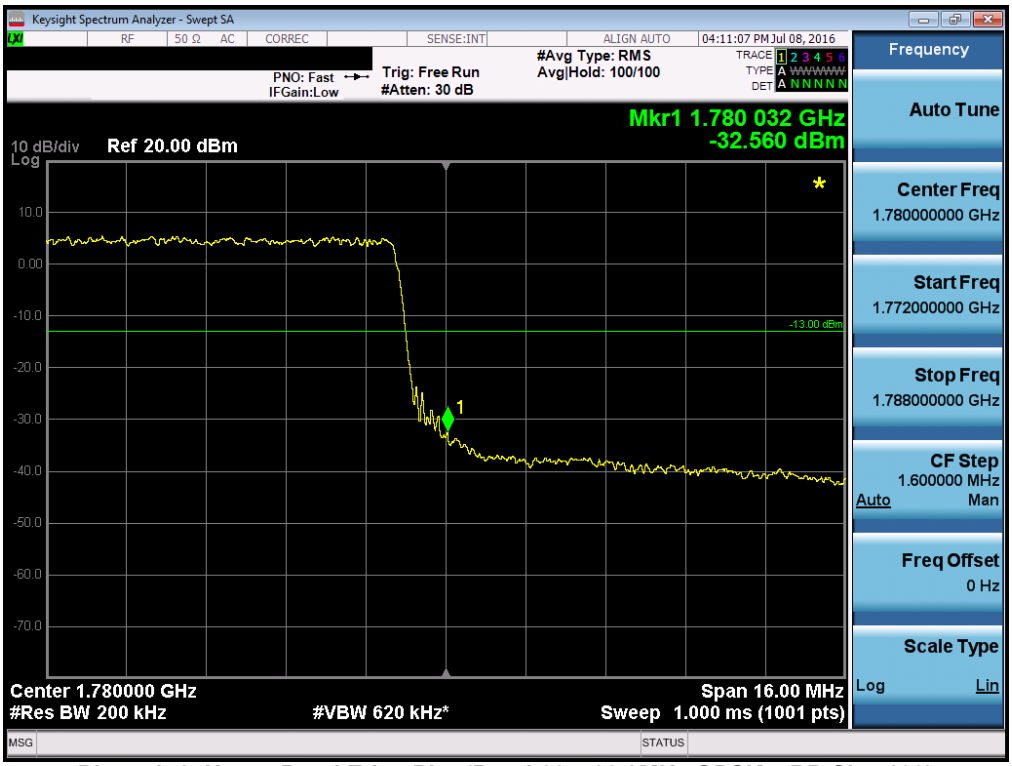


Plot 7-141. Lower Extended Band Edge Plot (Band 66/4 - 20MHz QPSK – RB Size 100)



Plot 7-142. Upper Band Edge Plot (Band 66 – 20.0MHz QPSK – RB Size 100)

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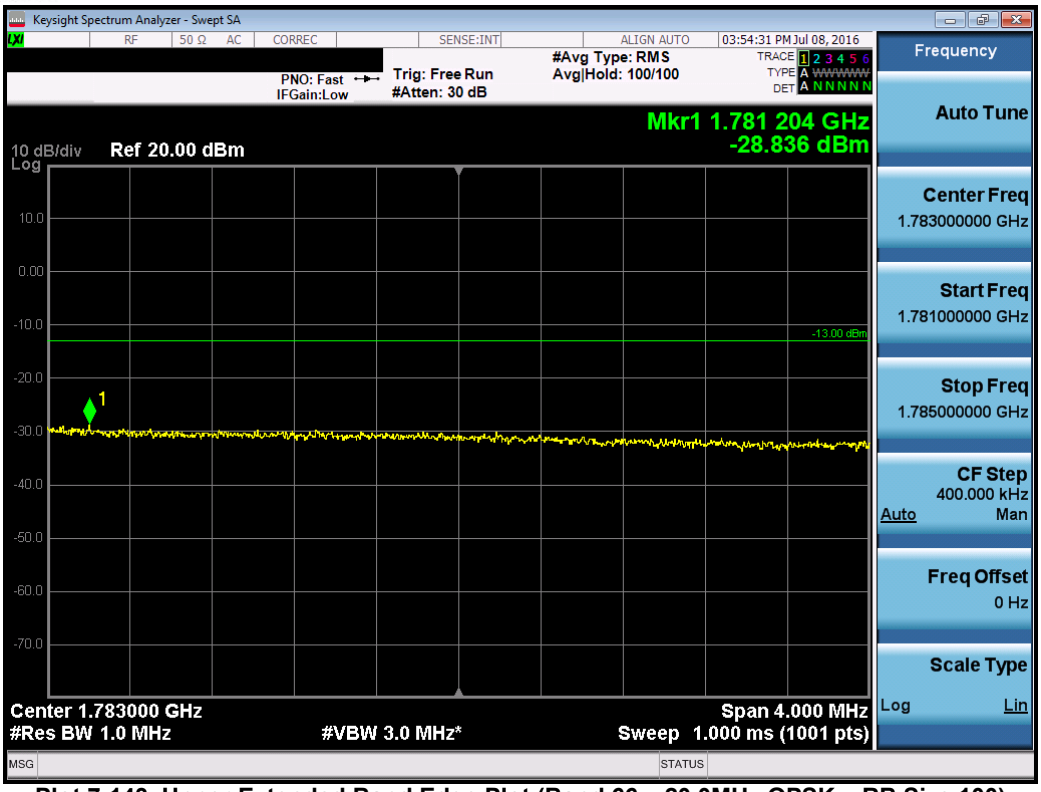
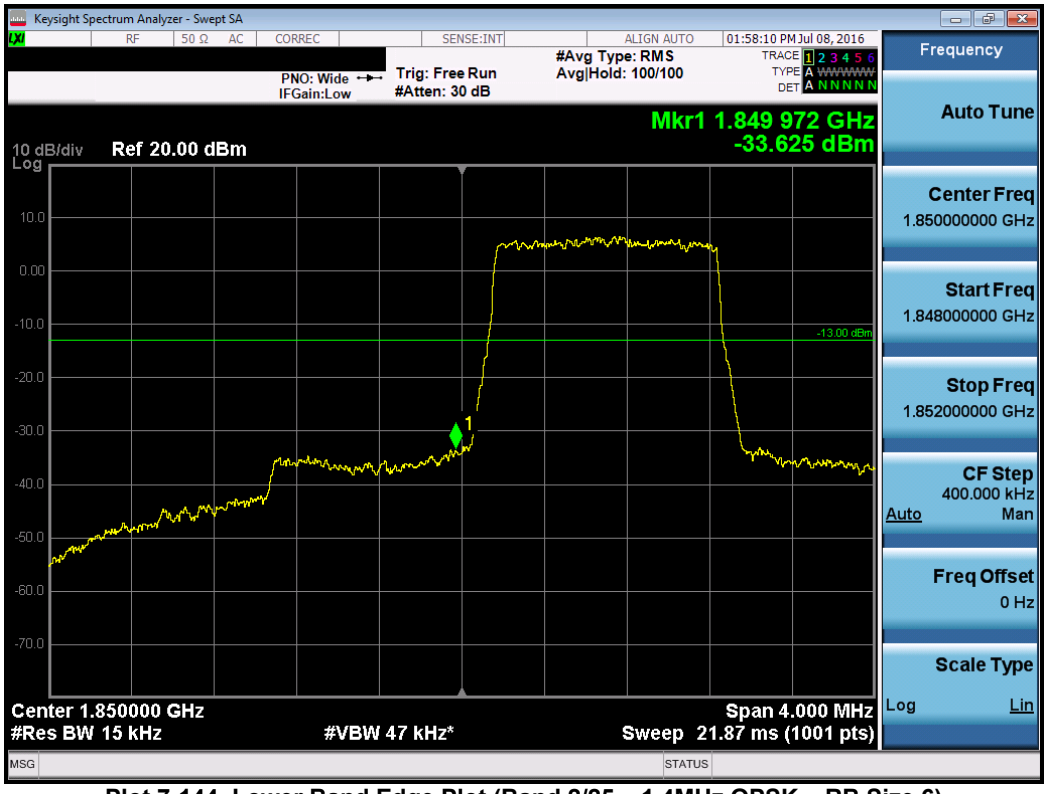


Plot 7-143. Upper Extended Band Edge Plot (Band 66 – 20.0MHz QPSK – RB Size 100)



Plot 7-144. Lower Band Edge Plot (Band 2/25 – 1.4MHz QPSK – RB Size 6)

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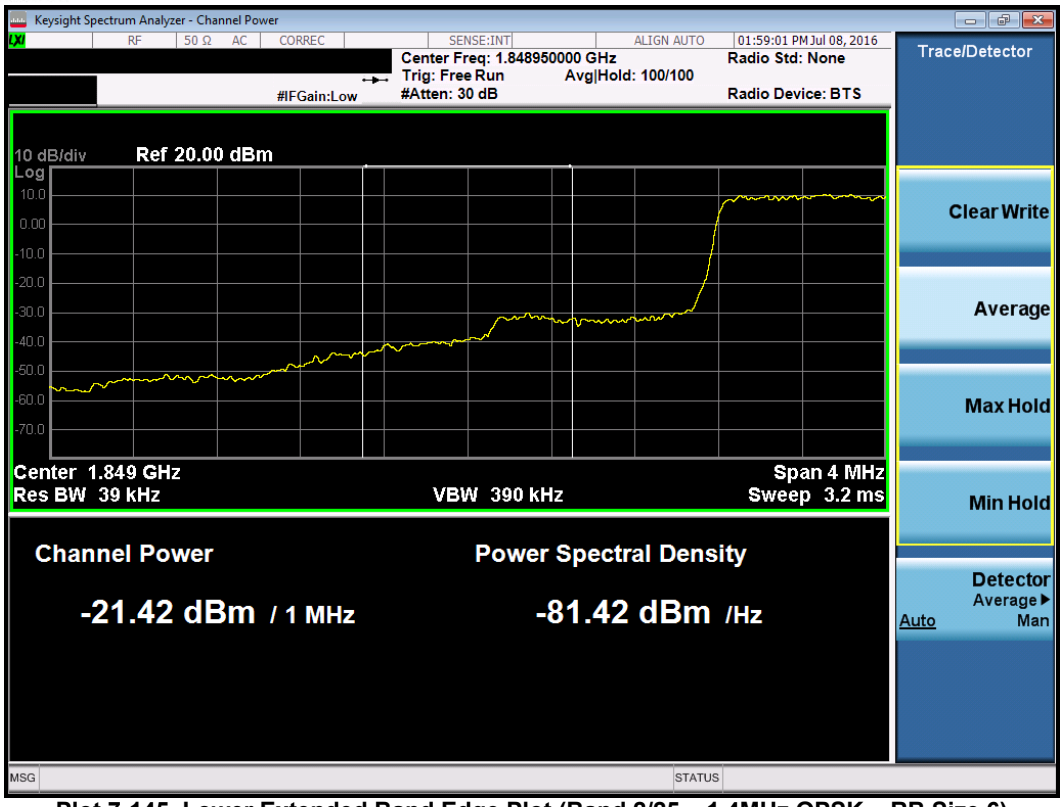

Plot 7-145. Lower Extended Band Edge Plot (Band 2/25 – 1.4MHz QPSK – RB Size 6)

Plot 7-146. Upper Band Edge Plot (Band 2/25 – 1.4MHz QPSK – RB Size 6)

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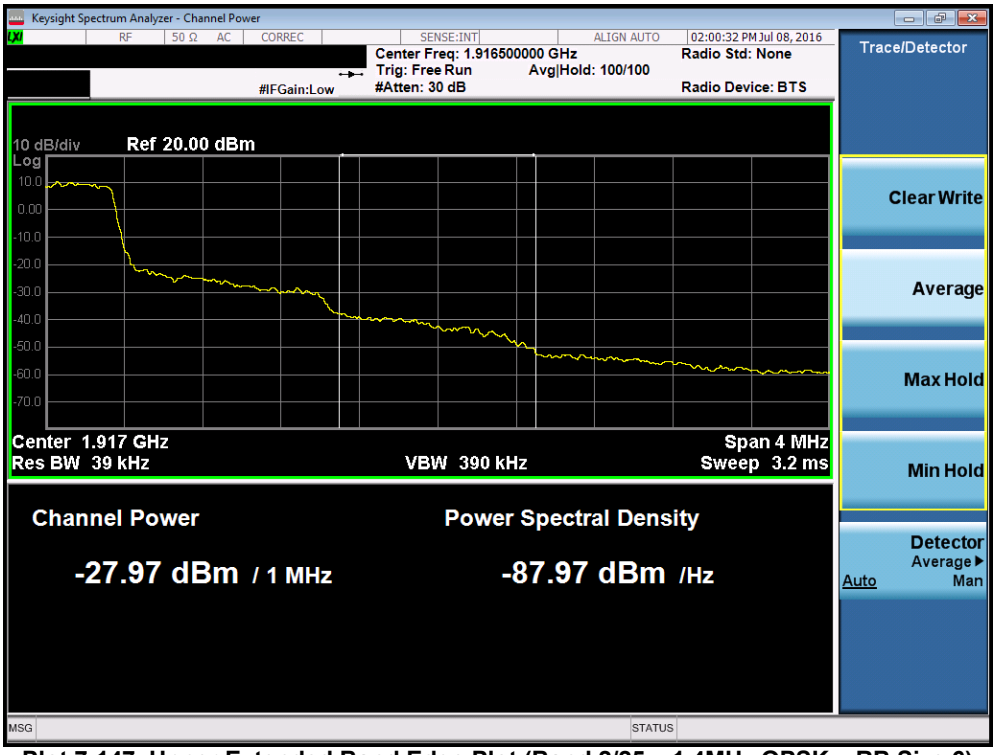
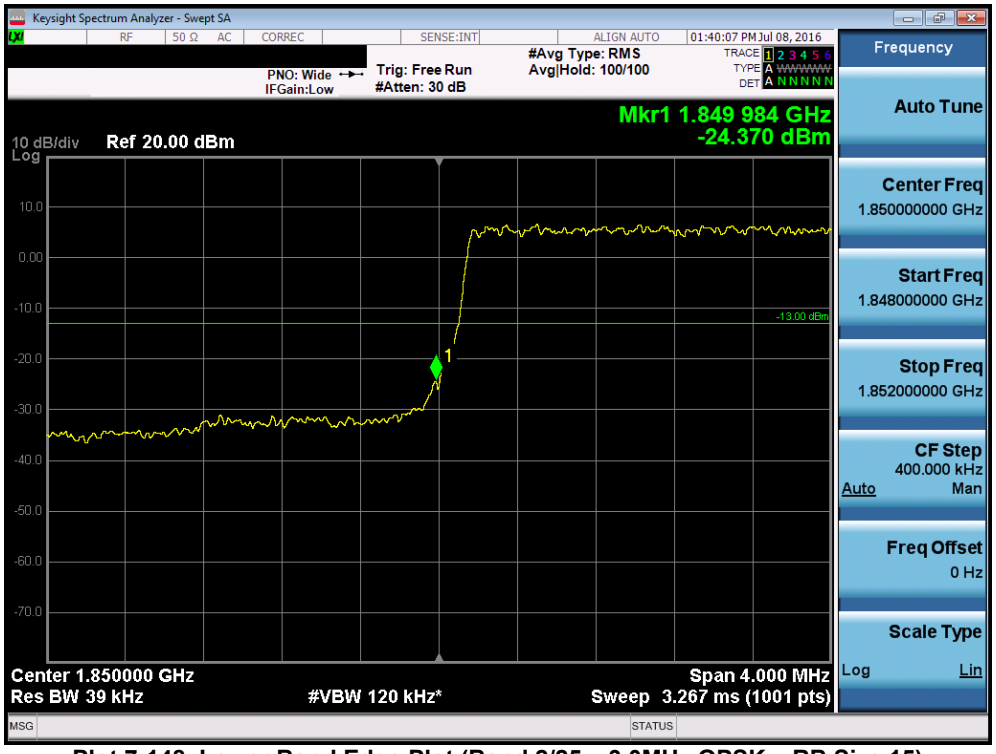


Plot 7-147. Upper Extended Band Edge Plot (Band 2/25 – 1.4MHz QPSK – RB Size 6)



Plot 7-148. Lower Band Edge Plot (Band 2/25 – 3.0MHz QPSK – RB Size 15)

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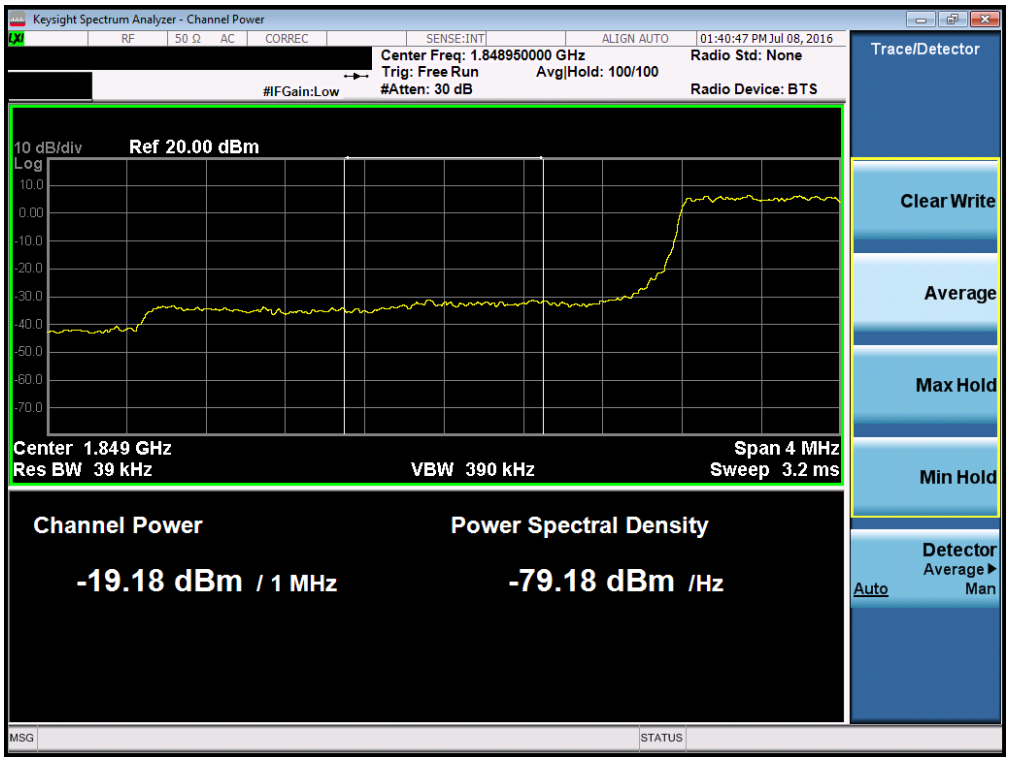

Plot 7-149. Lower Extended Band Edge Plot (Band 2/25 – 3.0MHz QPSK – RB Size 15)

Plot 7-150. Upper Band Edge Plot (Band 2/25 – 3.0MHz QPSK – RB Size 15)

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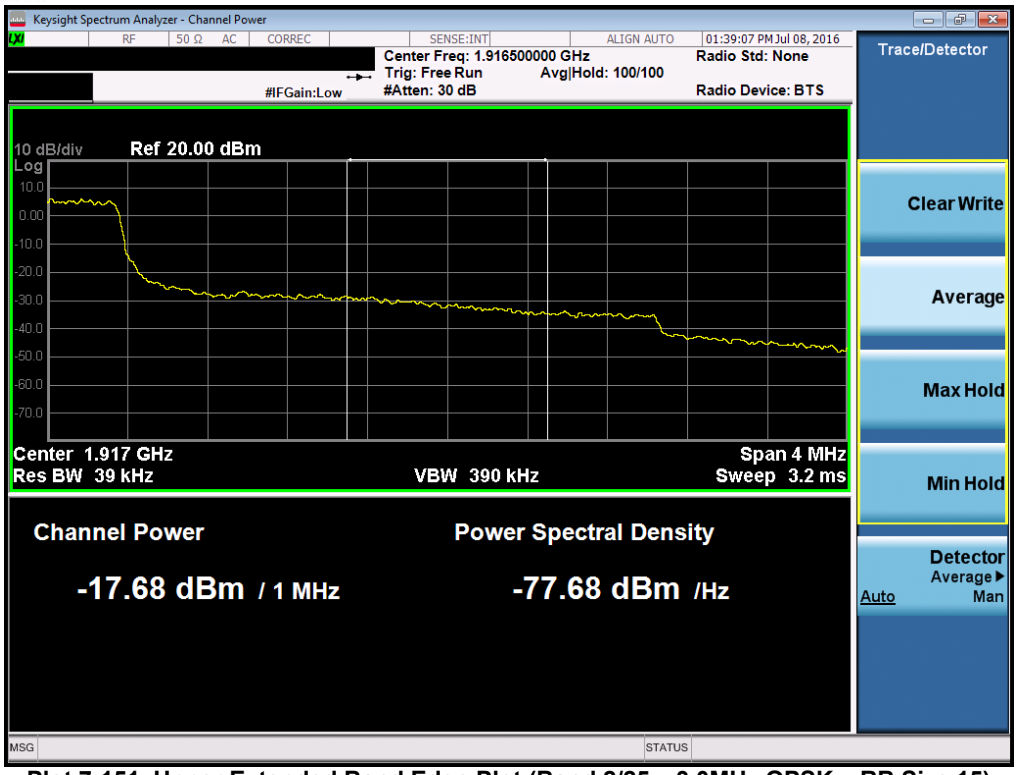
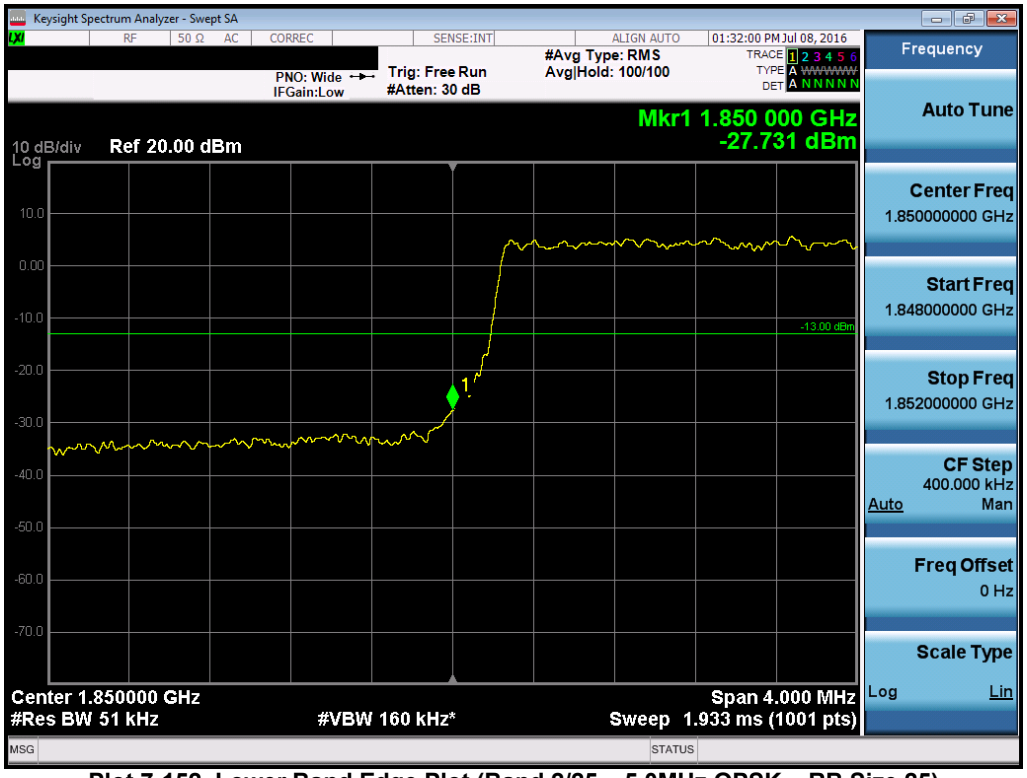


Plot 7-151. Upper Extended Band Edge Plot (Band 2/25 – 3.0MHz QPSK – RB Size 15)



Plot 7-152. Lower Band Edge Plot (Band 2/25 – 5.0MHz QPSK – RB Size 25)

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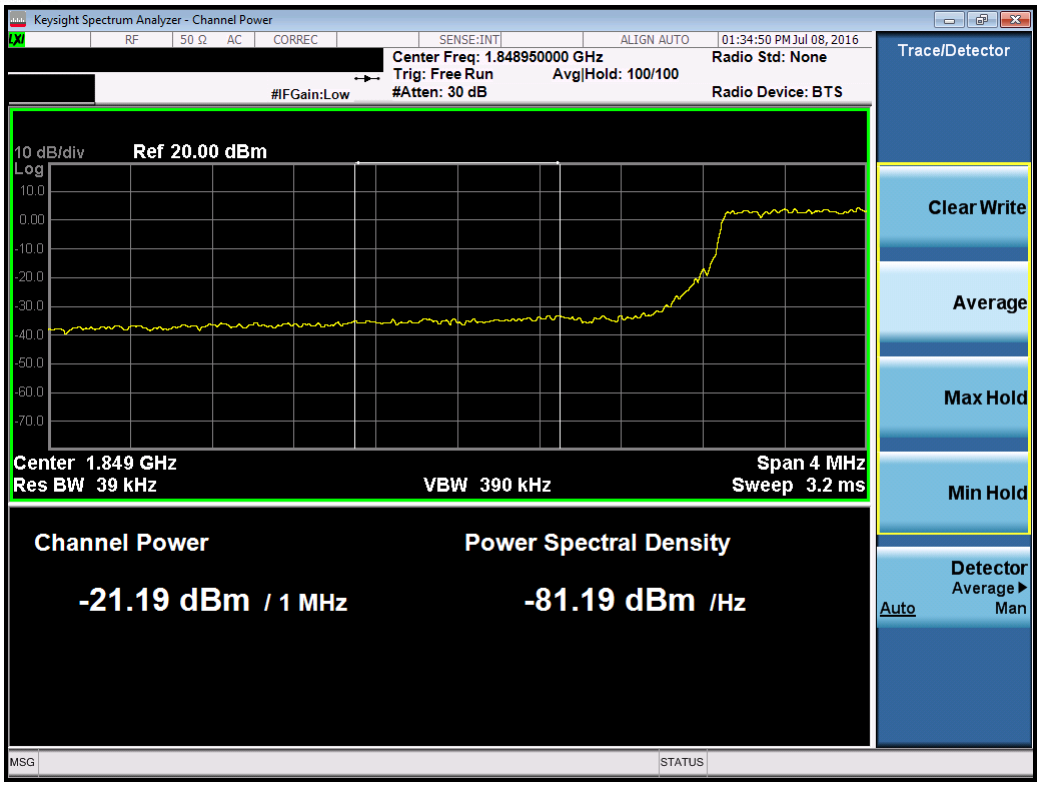

Plot 7-153. Lower Extended Band Edge Plot (Band 2/25 – 5.0MHz QPSK – RB Size 25)

Plot 7-154. Upper Band Edge Plot (Band 2/25 – 5.0MHz QPSK – RB Size 25)

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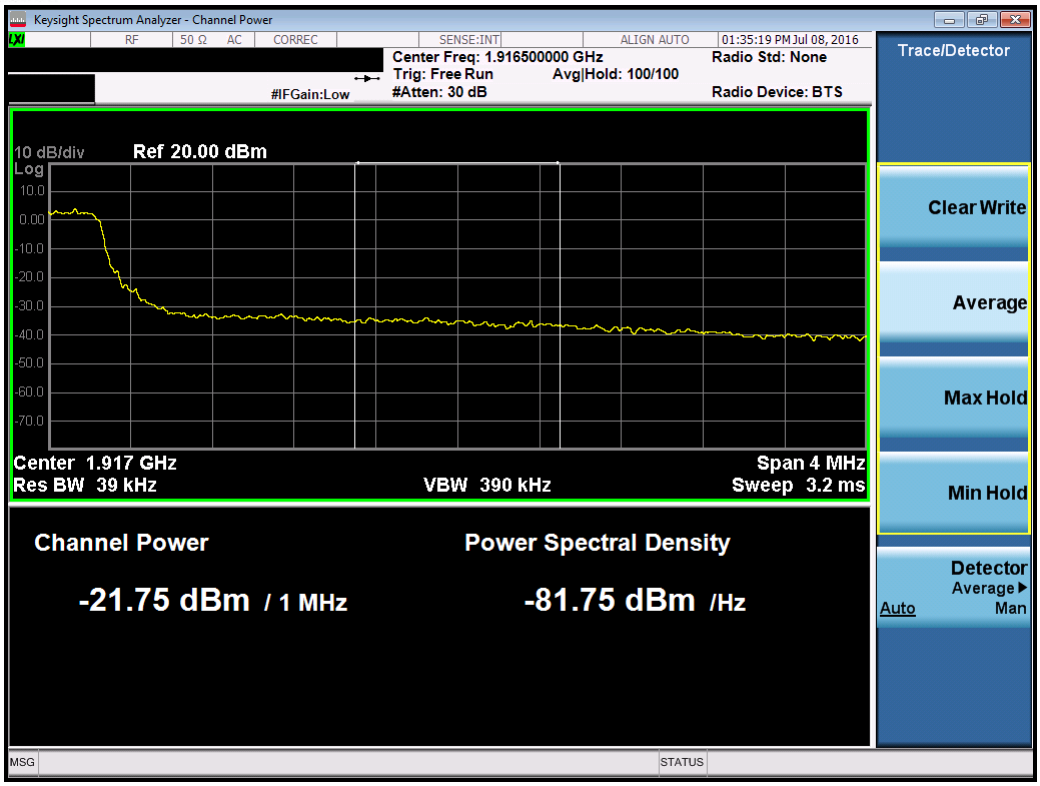
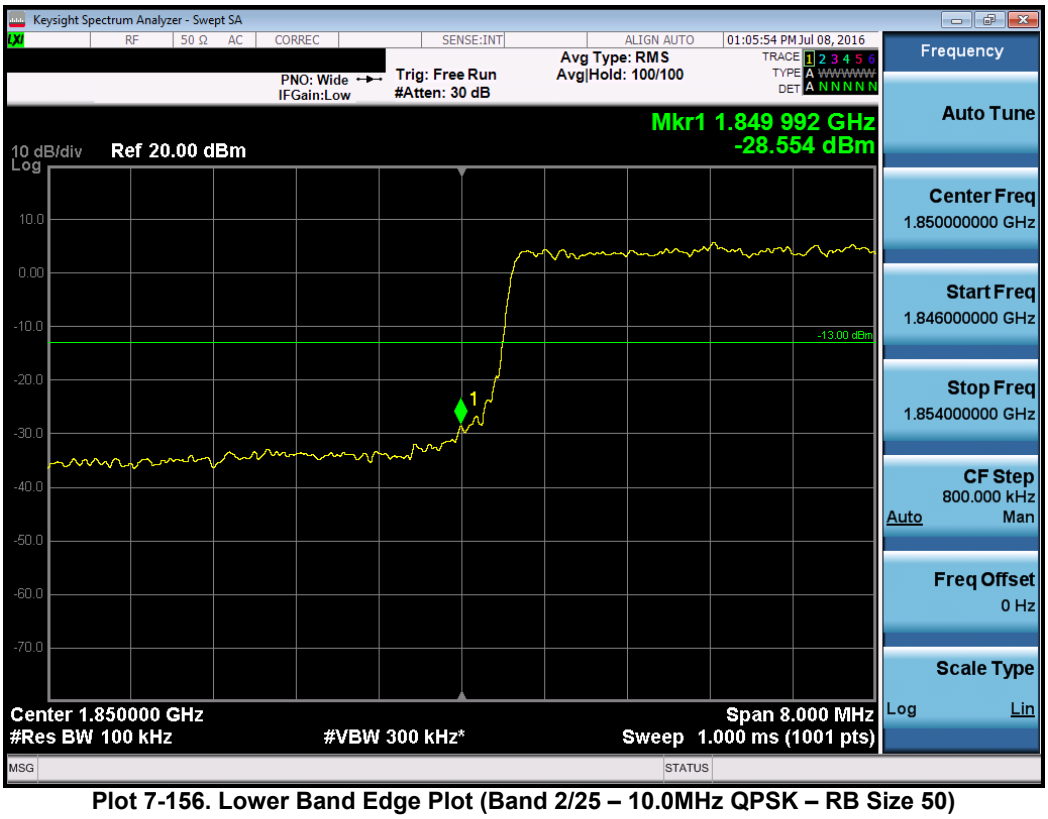


Plot 7-155. Upper Extended Band Edge Plot (Band 2/25 – 5.0MHz QPSK – RB Size 25)



Plot 7-156. Lower Band Edge Plot (Band 2/25 – 10.0MHz QPSK – RB Size 50)

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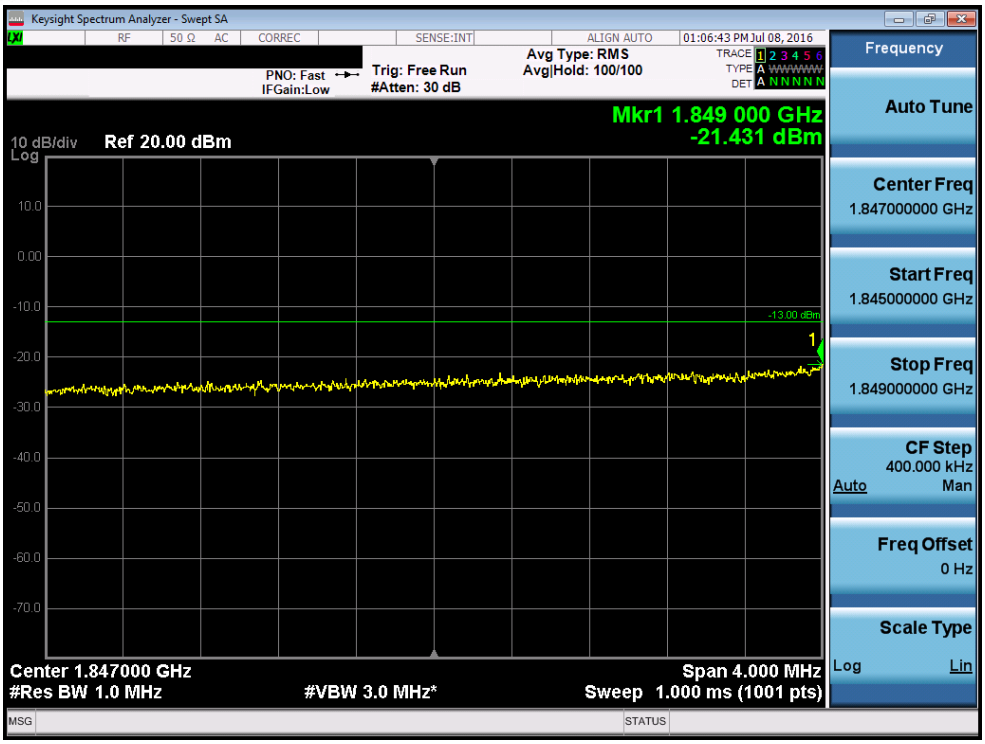
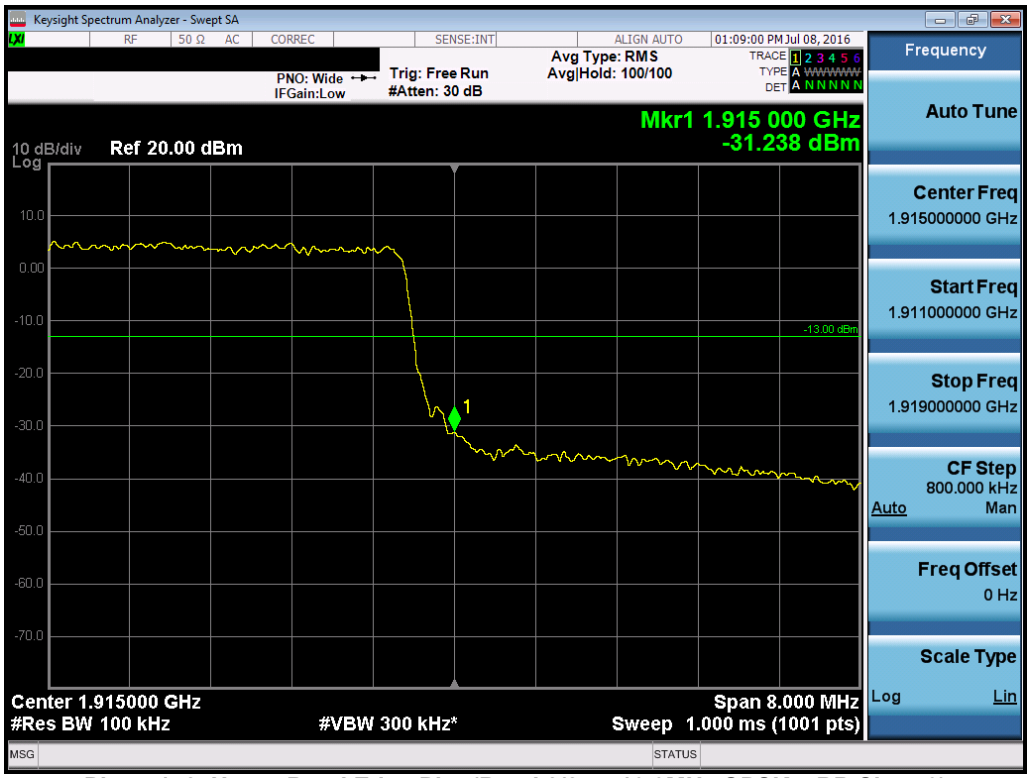


Plot 7-157. Lower Extended Band Edge Plot (Band 2/25 – 10.0MHz QPSK – RB Size 50)



Plot 7-158. Upper Band Edge Plot (Band 2/25 – 10.0MHz QPSK – RB Size 50)

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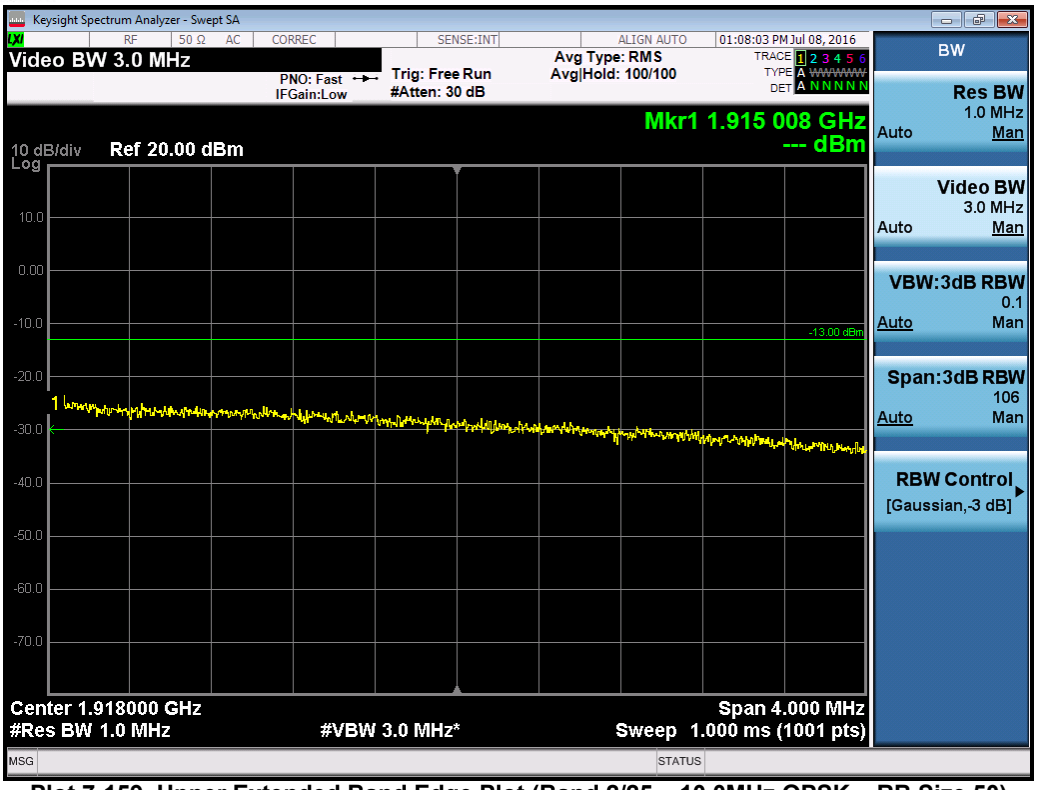
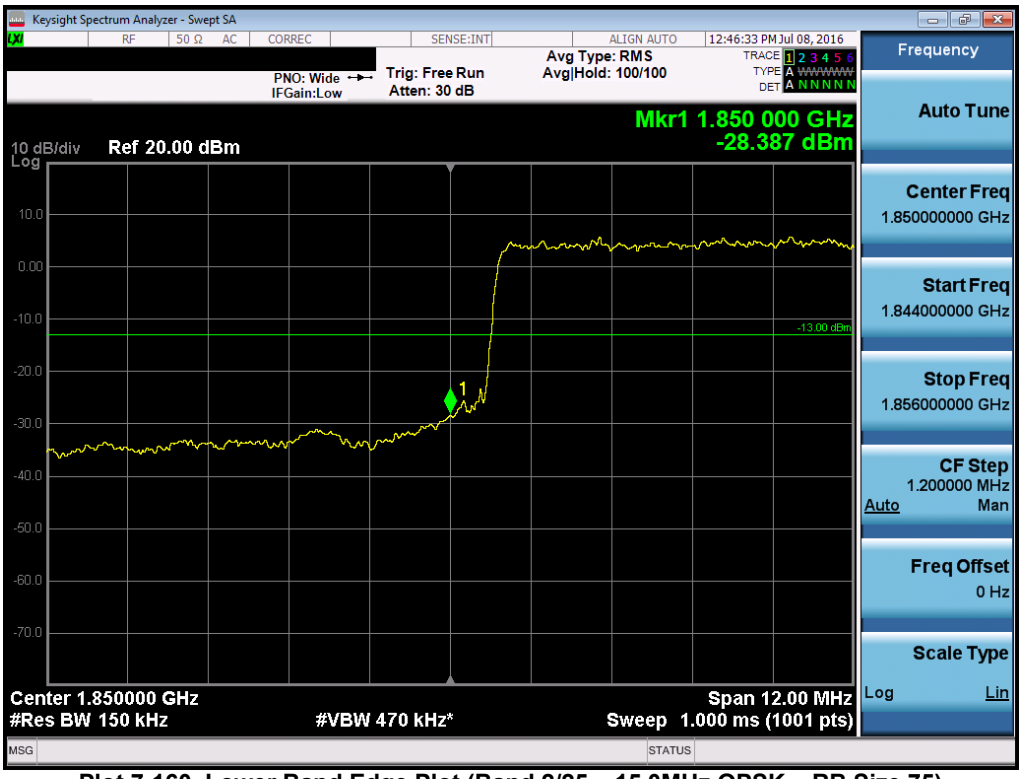


Plot 7-159. Upper Extended Band Edge Plot (Band 2/25 – 10.0MHz QPSK – RB Size 50)



Plot 7-160. Lower Band Edge Plot (Band 2/25 – 15.0MHz QPSK – RB Size 75)

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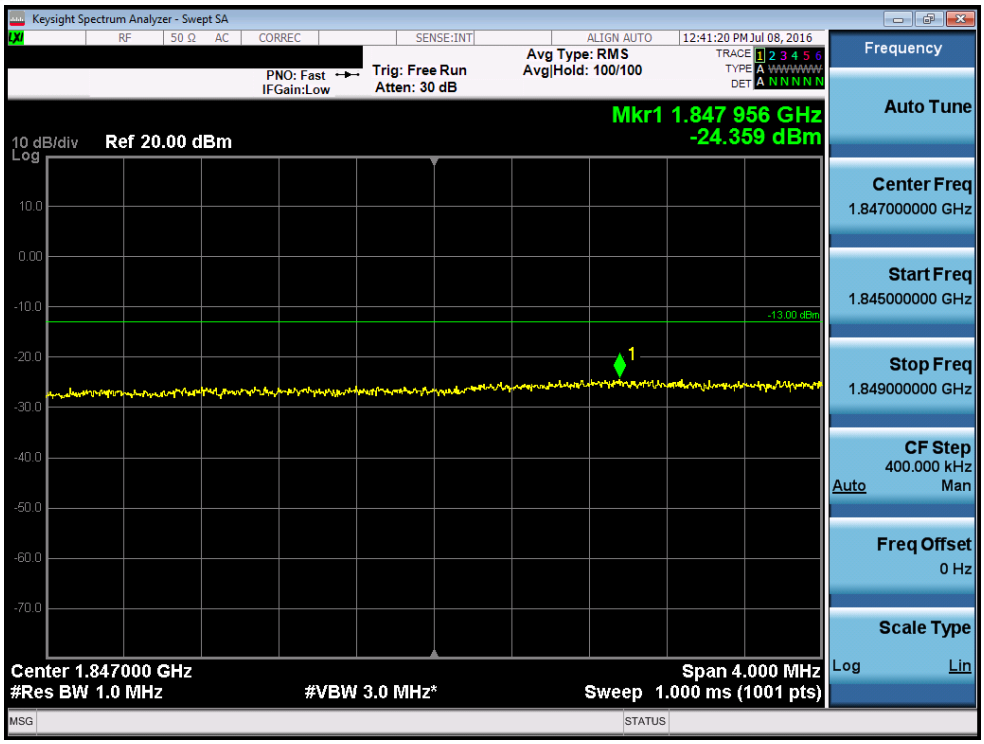

Plot 7-161. Lower Extended Band Edge Plot (Band 2/25 – 15.0MHz QPSK – RB Size 75)

Plot 7-162. Upper Band Edge Plot (Band 2/25 – 15.0MHz QPSK – RB Size 75)

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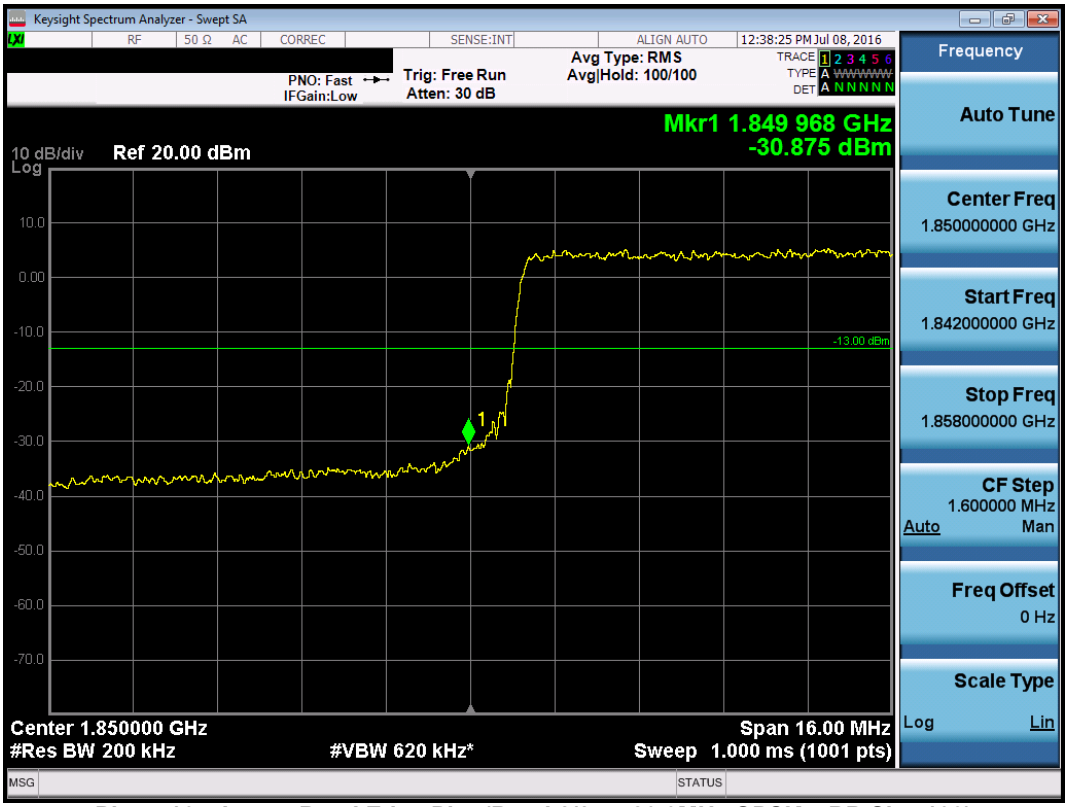
Plot 7-163. Upper Extended Band Edge Plot (Band 2/25 – 15.0MHz QPSK – RB Size 75)



Plot 7-164. Lower Band Edge Plot (Band 2/25 – 20.0MHz QPSK – RB Size 100)

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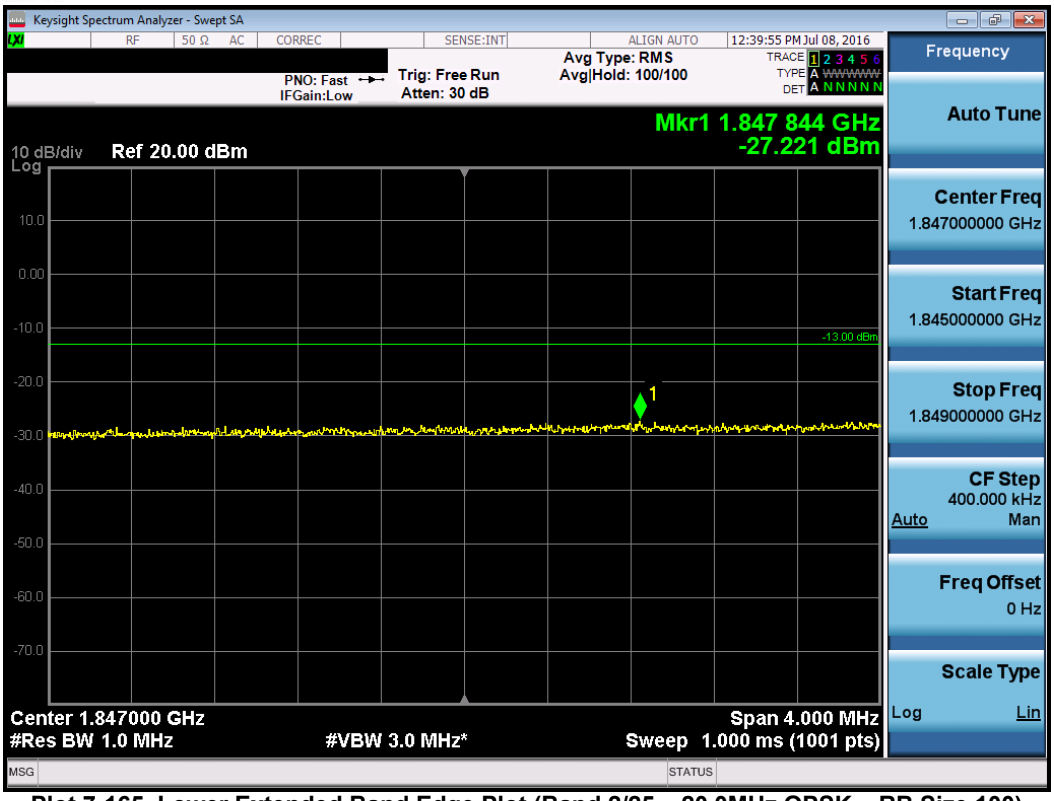

Plot 7-165. Lower Extended Band Edge Plot (Band 2/25 – 20.0MHz QPSK – RB Size 100)

Plot 7-166. Upper Band Edge Plot (Band 2/25 – 20.0MHz QPSK – RB Size 100)

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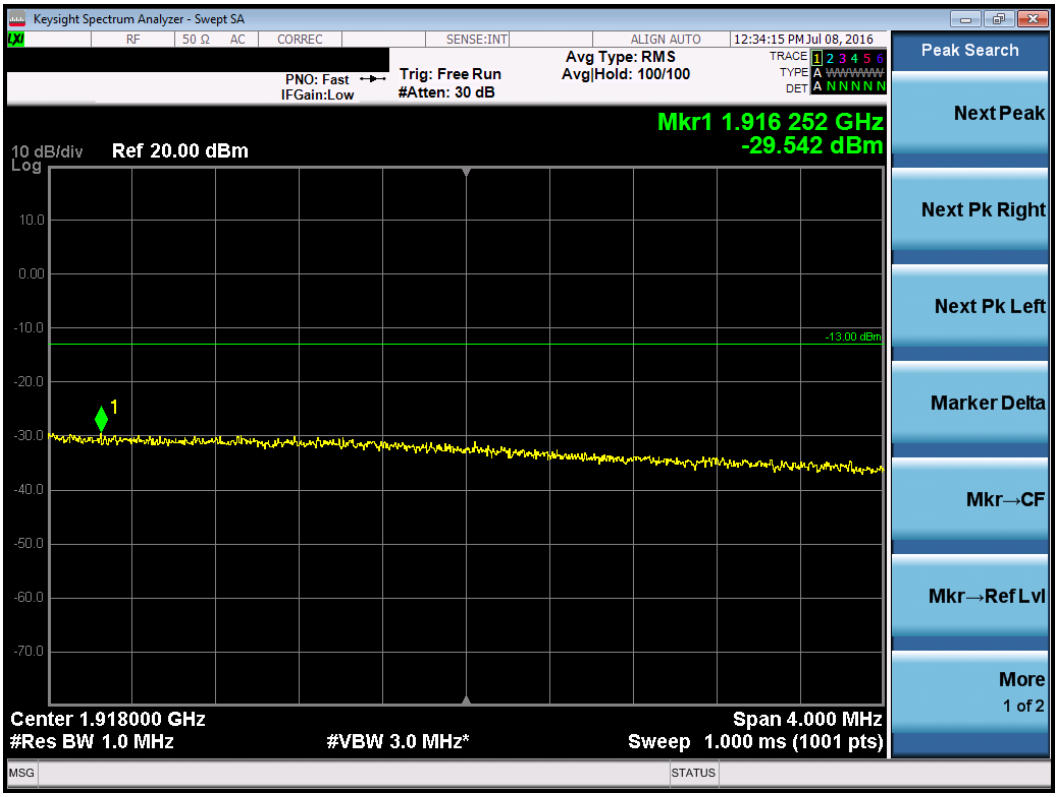

Plot 7-167. Upper Extended Band Edge Plot (Band 2/25 – 20.0MHz QPSK – RB Size 100)

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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.

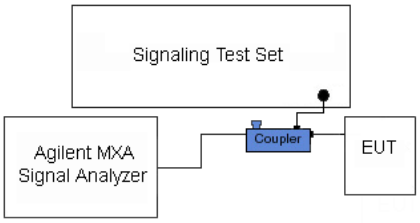

Figure 7-4. Test Instrument & Measurement Setup

Test Notes

None.

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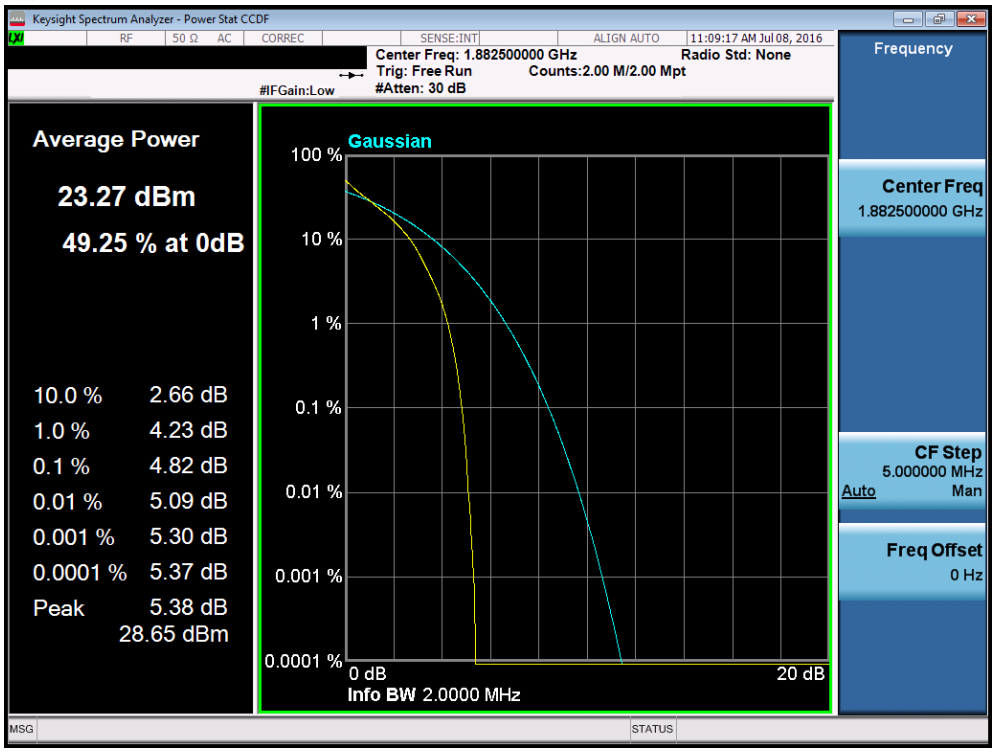
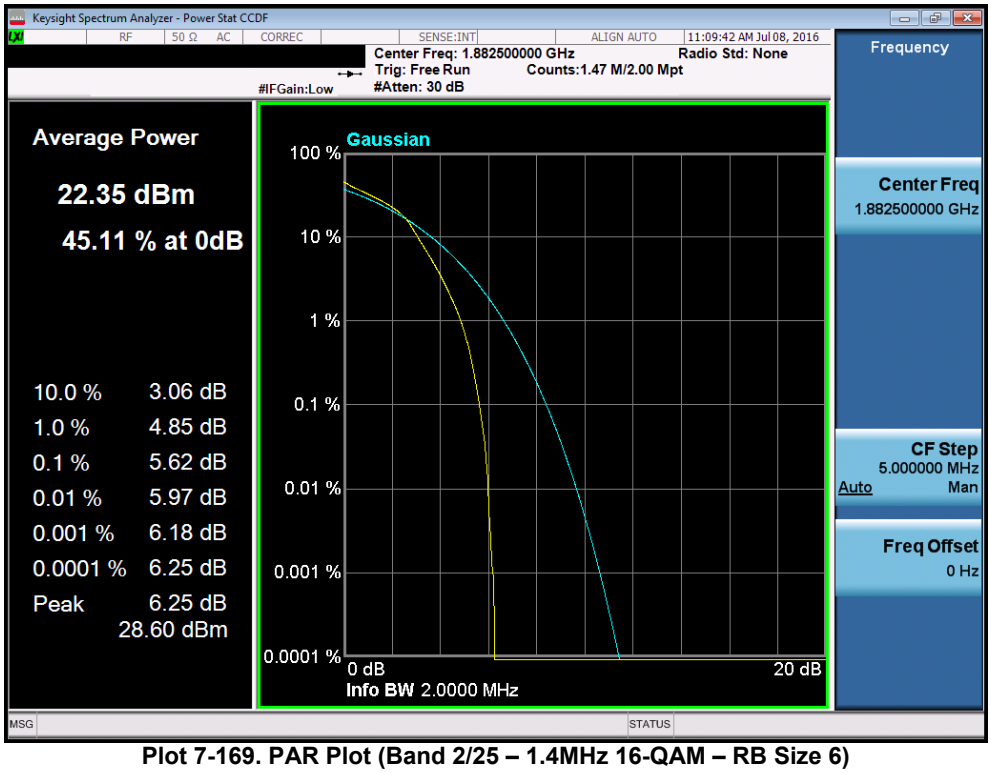


Plot 7-168. PAR Plot (Band 2/25 – 1.4MHz QPSK – RB Size 6)



Plot 7-169. PAR Plot (Band 2/25 – 1.4MHz 16-QAM – RB Size 6)

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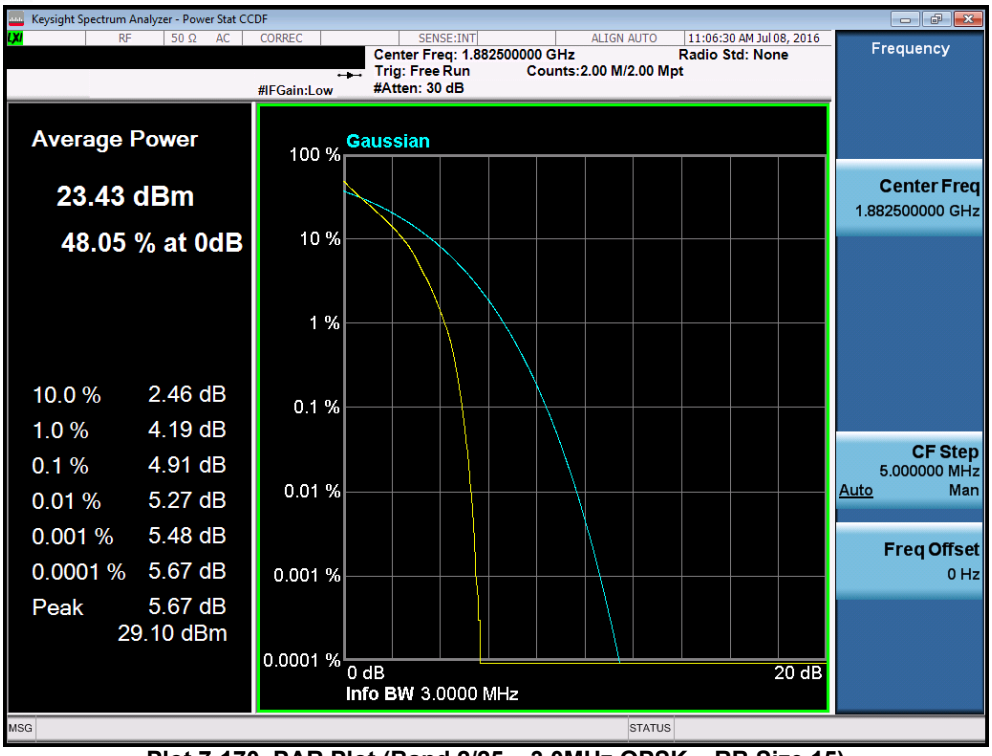
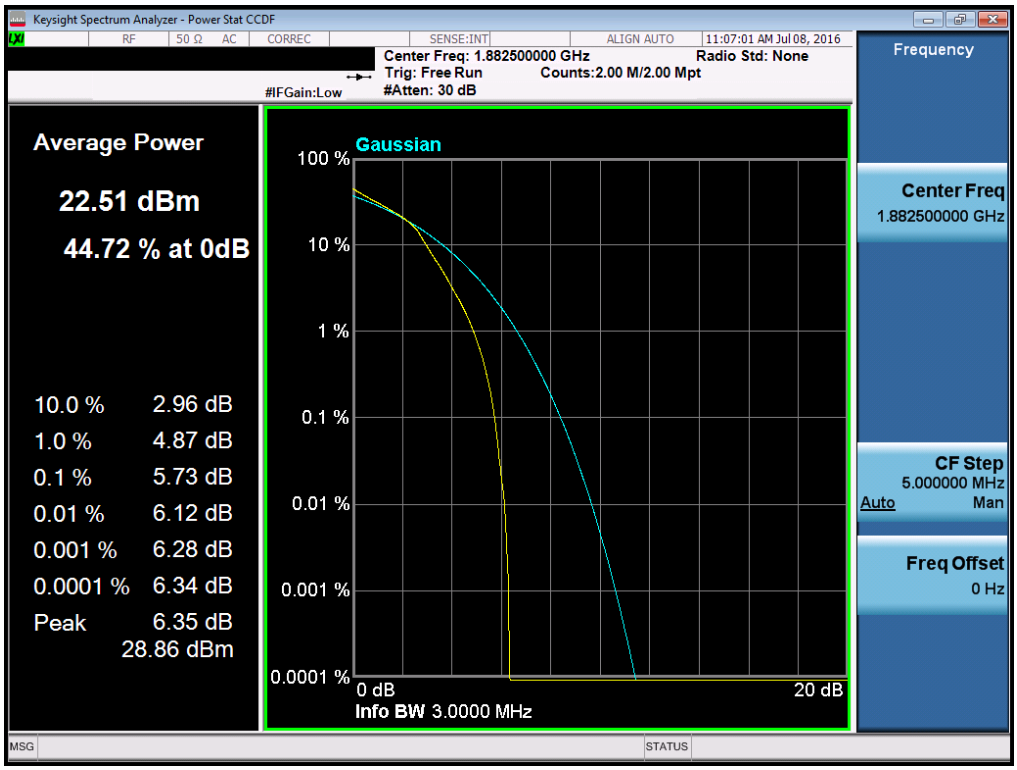


Plot 7-170. PAR Plot (Band 2/25 – 3.0MHz QPSK – RB Size 15)



Plot 7-171. PAR Plot (Band 2/25 – 3.0MHz 16-QAM – RB Size 15)

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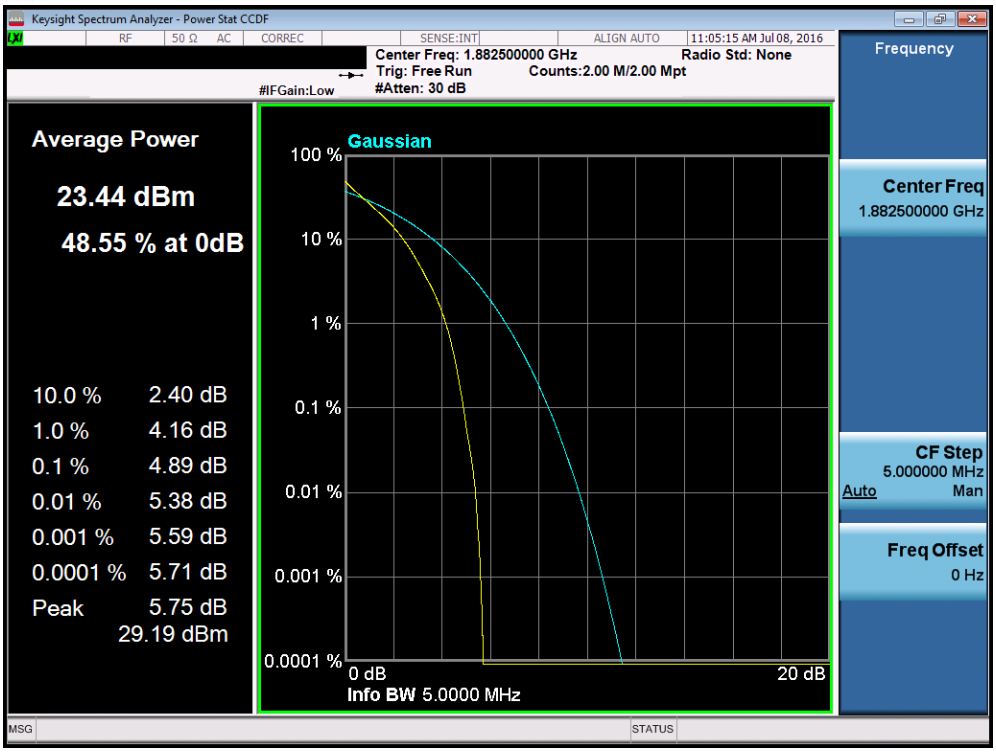
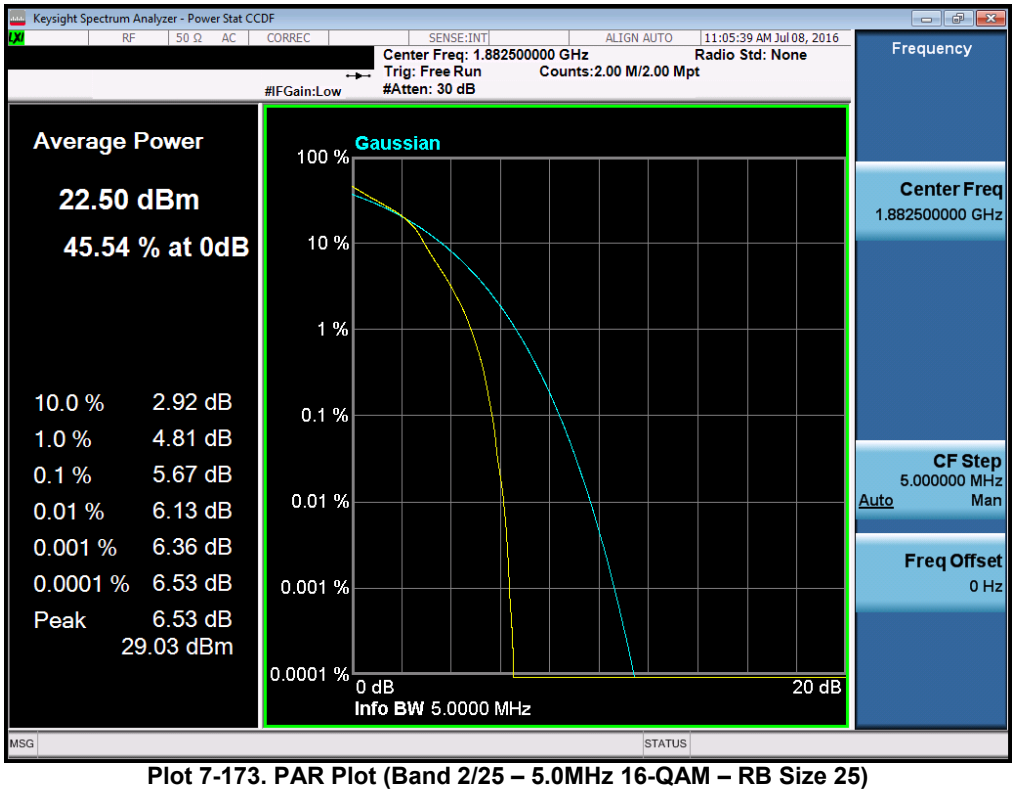


Plot 7-172. PAR Plot (Band 2/25 – 5.0MHz QPSK – RB Size 25)



Plot 7-173. PAR Plot (Band 2/25 – 5.0MHz 16-QAM – RB Size 25)

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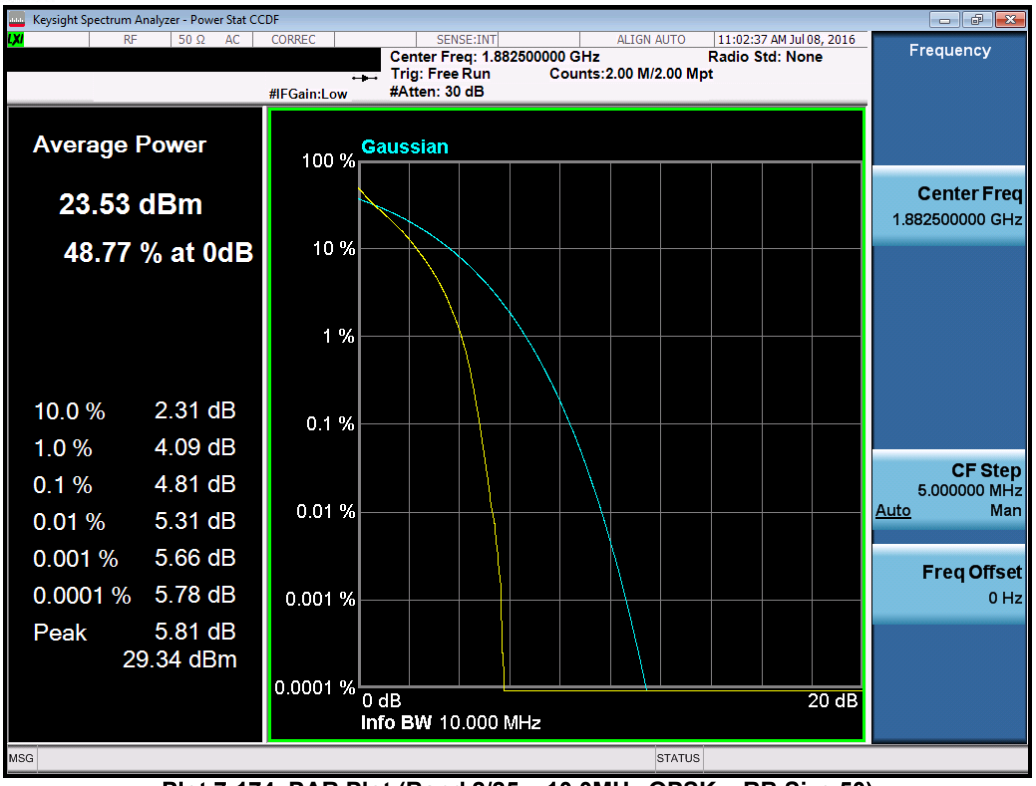
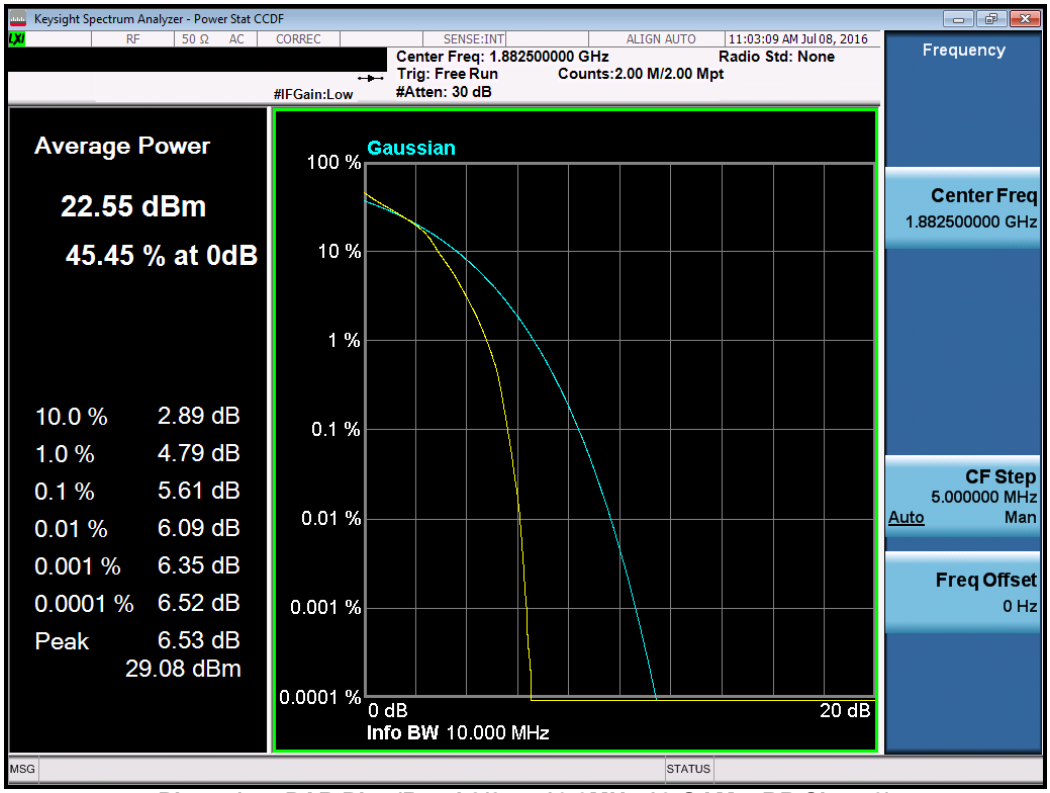


Plot 7-174. PAR Plot (Band 2/25 – 10.0MHz QPSK – RB Size 50)



Plot 7-175. PAR Plot (Band 2/25 – 10.0MHz 16-QAM – RB Size 50)

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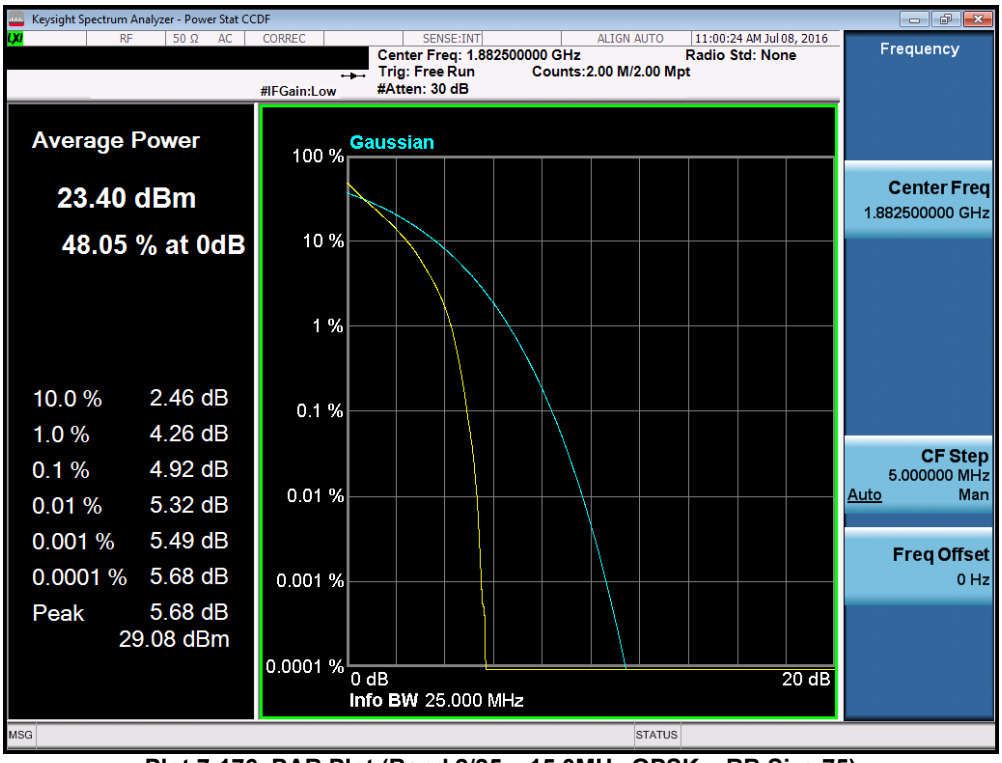
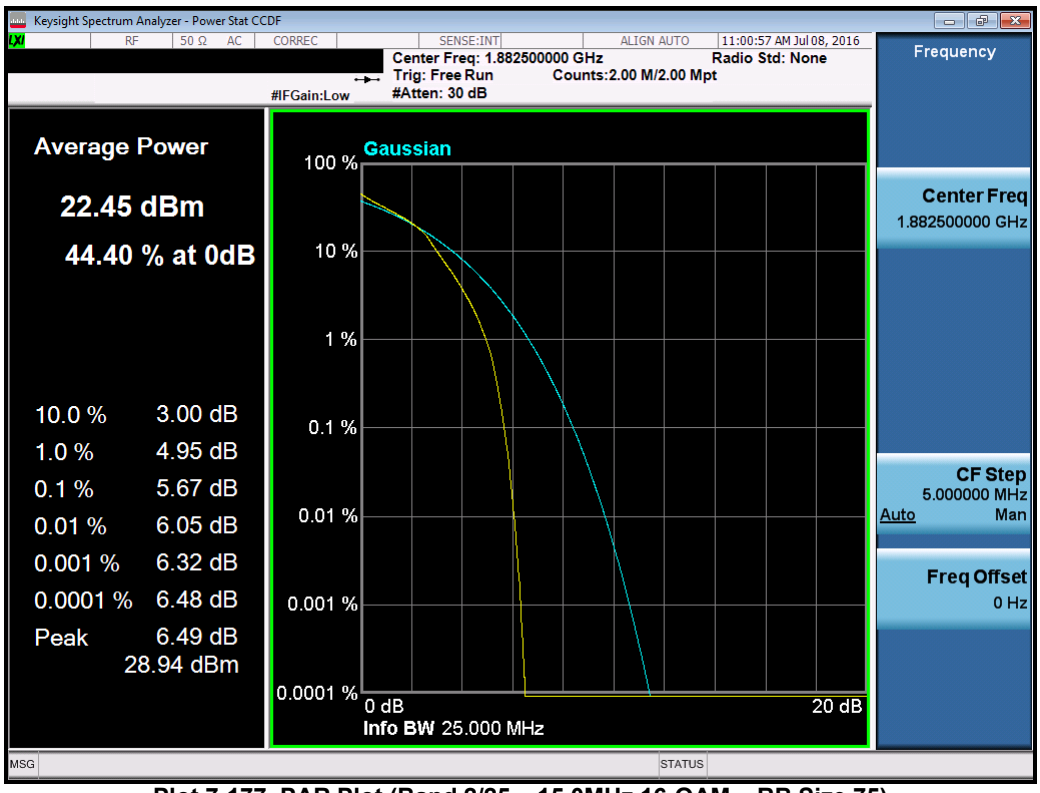


Plot 7-176. PAR Plot (Band 2/25 – 15.0MHz QPSK – RB Size 75)



Plot 7-177. PAR Plot (Band 2/25 – 15.0MHz 16-QAM – RB Size 75)

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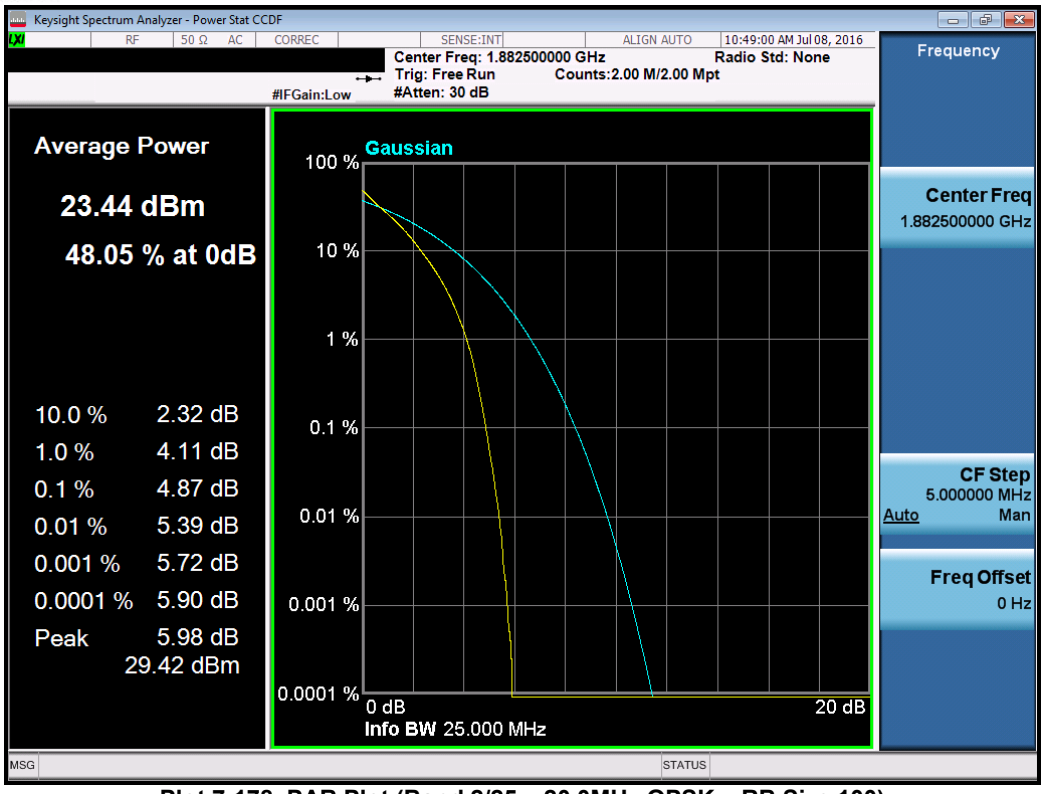
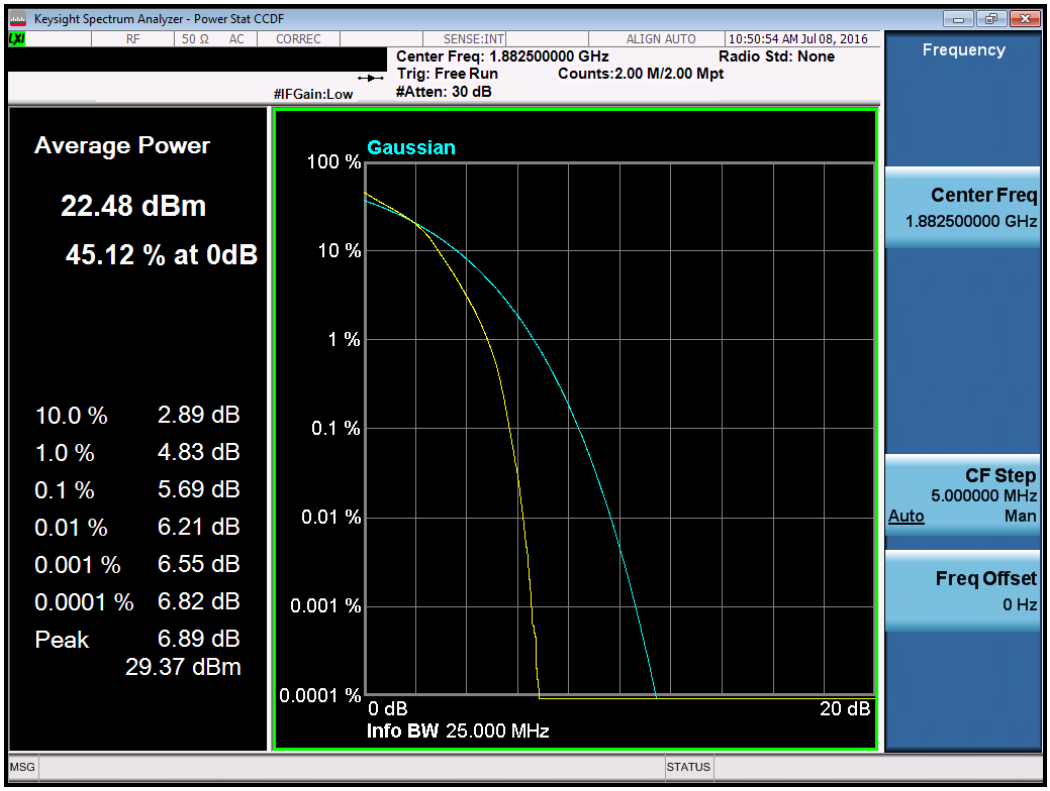


Plot 7-178. PAR Plot (Band 2/25 – 20.0MHz QPSK – RB Size 100)



Plot 7-179. PAR Plot (Band 2/25 – 20.0MHz 16-QAM – RB Size 100)

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7.6 Radiated Power (ERP/EIRP)

§22.913(a.2) §24.232(c.2) §27.50(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.

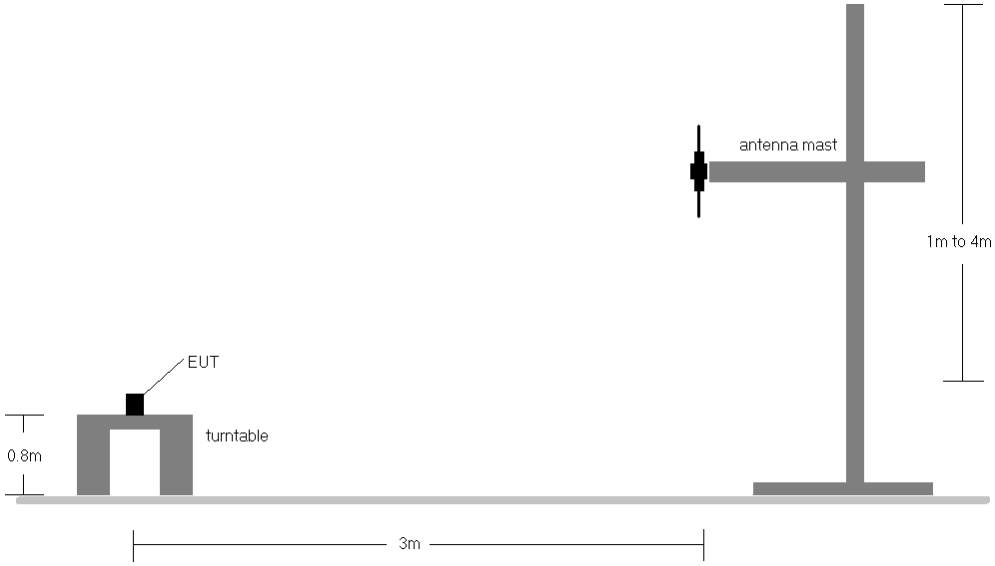

Figure 7-5. Radiated Test Setup <1GHz

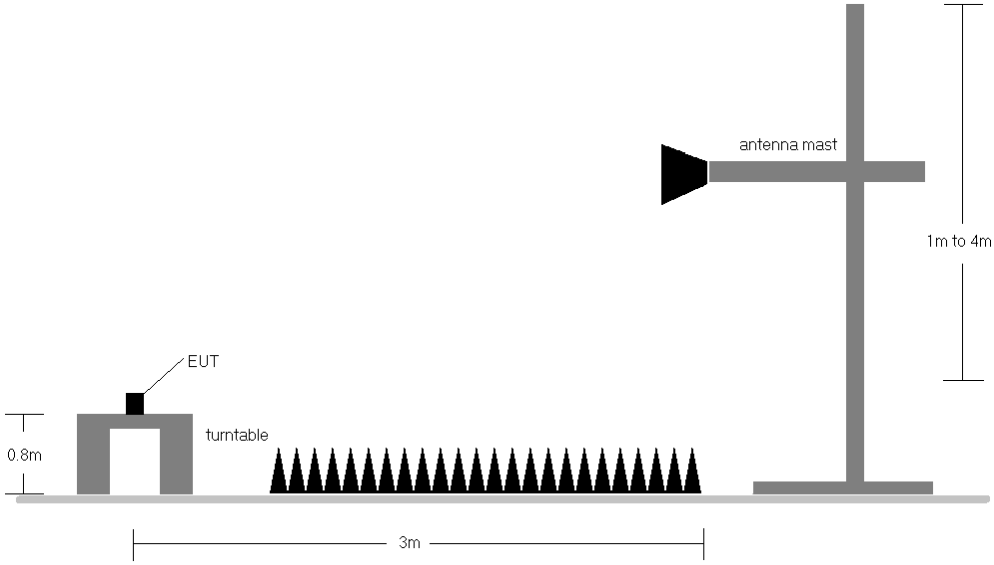

Figure 7-6. Radiated Test Setup >1GHz

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.

2) This unit was tested with its standard battery.

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7.6.1 Antenna-1 Radiated Power (ERP/EIRP)

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	271	3	3 / 2	15.45	2.12	17.57	34.77	-17.20
707.50	1.4	QPSK	H	255	0	3 / 2	16.27	2.31	18.58	34.77	-16.19
715.30	1.4	QPSK	H	259	0	3 / 2	16.76	2.52	19.28	34.77	-15.49
699.70	1.4	16-QAM	H	271	3	3 / 2	14.33	2.12	16.45	34.77	-18.32
707.50	1.4	16-QAM	H	255	0	3 / 2	15.20	2.31	17.51	34.77	-17.26
715.30	1.4	16-QAM	H	259	0	3 / 2	15.67	2.52	18.19	34.77	-16.58
700.50	3	QPSK	H	274	3	1 / 14	16.47	2.12	18.59	34.77	-16.18
707.50	3	QPSK	H	256	350	1 / 14	16.80	2.31	19.11	34.77	-15.66
714.50	3	QPSK	H	255	3	1 / 0	17.23	2.50	19.73	34.77	-15.04
700.50	3	16-QAM	H	274	3	1 / 14	15.52	2.12	17.64	34.77	-17.13
707.50	3	16-QAM	H	256	350	1 / 14	15.86	2.31	18.17	34.77	-16.60
714.50	3	16-QAM	H	255	3	1 / 0	16.37	2.50	18.87	34.77	-15.90
701.50	5	QPSK	H	275	4	1 / 24	16.59	2.15	18.74	34.77	-16.03
707.50	5	QPSK	H	282	0	1 / 0	16.77	2.31	19.08	34.77	-15.69
713.50	5	QPSK	H	259	0	1 / 0	17.48	2.48	19.96	34.77	-14.82
701.50	5	16-QAM	H	275	4	1 / 24	15.72	2.15	17.87	34.77	-16.90
707.50	5	16-QAM	H	282	0	1 / 0	15.96	2.31	18.27	34.77	-16.50
713.50	5	16-QAM	H	259	0	1 / 0	16.56	2.48	19.04	34.77	-15.74
704.00	10	QPSK	H	284	182	1 / 49	16.42	2.22	18.64	34.77	-16.14
707.50	10	QPSK	H	279	178	1 / 0	17.01	2.31	19.32	34.77	-15.45
711.00	10	QPSK	H	256	192	1 / 49	16.24	2.41	18.65	34.77	-16.12
704.00	10	16-QAM	H	284	182	1 / 49	15.49	2.22	17.71	34.77	-17.07
707.50	10	16-QAM	H	279	178	1 / 0	16.09	2.31	18.40	34.77	-16.37
711.00	10	16-QAM	H	256	192	1 / 49	15.43	2.41	17.84	34.77	-16.93
713.50	5	QPSK	V	100	0	1 / 0	16.55	2.48	19.03	34.77	-15.75

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	H	235	317	1 / 0	15.46	4.19	19.65	34.77	-15.12
782.00	5	QPSK	H	242	307	1 / 0	15.48	4.25	19.73	34.77	-15.04
784.50	5	QPSK	H	218	310	1 / 24	15.53	4.32	19.85	34.77	-14.92
779.50	5	16QAM	H	235	317	1 / 0	14.54	4.19	18.73	34.77	-16.04
782.00	5	16QAM	H	242	307	1 / 0	14.74	4.25	18.99	34.77	-15.78
784.50	5	16QAM	H	218	310	1 / 24	14.60	4.32	18.92	34.77	-15.85
782.00	10	QPSK	H	238	312	1 / 0	15.16	4.25	19.41	34.77	-15.36
782.00	10	16QAM	H	238	312	1 / 0	14.43	4.25	18.68	34.77	-16.09
784.50	5	QPSK	V	117	135	1 / 0	14.15	4.32	18.47	34.77	-16.30

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	H	226	313	3 / 2	14.69	5.01	19.70	38.45	-18.75
836.50	1.4	QPSK	H	358	313	3 / 2	14.36	5.16	19.52	38.45	-18.93
848.30	1.4	QPSK	H	206	311	3 / 2	13.76	5.30	19.06	38.45	-19.39
824.70	1.4	16-QAM	H	226	313	3 / 2	13.68	5.01	18.69	38.45	-19.76
836.50	1.4	16-QAM	H	358	313	3 / 2	13.30	5.16	18.46	38.45	-19.99
848.30	1.4	16-QAM	H	206	311	3 / 2	12.52	5.30	17.82	38.45	-20.63
825.50	3	QPSK	H	223	319	1 / 14	14.92	5.02	19.94	38.45	-18.51
836.50	3	QPSK	H	186	356	1 / 14	14.24	5.16	19.40	38.45	-19.05
847.50	3	QPSK	H	358	189	1 / 0	13.99	5.29	19.28	38.45	-19.17
825.50	3	16-QAM	H	223	319	1 / 14	13.96	5.02	18.98	38.45	-19.47
836.50	3	16-QAM	H	186	356	1 / 14	13.20	5.16	18.36	38.45	-20.09
847.50	3	16-QAM	H	358	189	1 / 0	13.07	5.29	18.36	38.45	-20.09
826.50	5	QPSK	H	221	316	1 / 0	14.41	5.03	19.44	38.45	-19.01
836.50	5	QPSK	H	356	180	1 / 24	13.32	5.16	18.48	38.45	-19.97
846.50	5	QPSK	H	358	183	1 / 0	13.41	5.28	18.69	38.45	-19.76
826.50	5	16-QAM	H	221	316	1 / 0	13.49	5.03	18.52	38.45	-19.93
836.50	5	16-QAM	H	356	180	1 / 24	12.41	5.16	17.57	38.45	-20.88
846.50	5	16-QAM	H	358	183	1 / 0	12.54	5.28	17.82	38.45	-20.63
829.00	10	QPSK	H	186	184	1 / 0	14.64	5.06	19.70	38.45	-18.75
836.50	10	QPSK	H	188	181	1 / 0	14.29	5.16	19.45	38.45	-19.00
844.00	10	QPSK	H	188	179	1 / 0	13.30	5.25	18.55	38.45	-19.90
829.00	10	16-QAM	H	186	184	1 / 0	13.76	5.06	18.82	38.45	-19.63
836.50	10	16-QAM	H	188	181	1 / 0	13.36	5.16	18.52	38.45	-19.93
844.00	10	16-QAM	H	188	179	1 / 0	12.37	5.25	17.62	38.45	-20.83
825.50	3	QPSK	V	149	346	1 / 74	13.03	5.02	18.05	38.45	-20.40

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	H	188	214	1 / 3	13.75	9.66	23.41	30.00	-6.59
1732.50	1.4	QPSK	H	222	225	1 / 3	12.20	9.61	21.81	30.00	-8.19
1754.30	1.4	QPSK	H	176	217	1 / 3	13.79	9.57	23.36	30.00	-6.64
1710.70	1.4	16-QAM	H	188	214	1 / 3	12.07	9.66	21.73	30.00	-8.27
1732.50	1.4	16-QAM	H	222	225	1 / 3	10.80	9.61	20.41	30.00	-9.59
1754.30	1.4	16-QAM	H	176	217	1 / 3	12.64	9.57	22.21	30.00	-7.79
1711.50	3	QPSK	H	190	211	1 / 0	13.65	9.65	23.30	30.00	-6.70
1732.50	3	QPSK	H	109	206	1 / 7	12.85	9.61	22.46	30.00	-7.54
1753.50	3	QPSK	H	180	218	1 / 7	13.79	9.57	23.36	30.00	-6.64
1711.50	3	16-QAM	H	190	211	1 / 0	12.30	9.65	21.95	30.00	-8.05
1732.50	3	16-QAM	H	109	206	1 / 7	11.65	9.61	21.26	30.00	-8.74
1753.50	3	16-QAM	H	180	218	1 / 7	12.29	9.57	21.86	30.00	-8.14
1712.50	5	QPSK	H	255	321	1 / 0	11.55	9.65	21.20	30.00	-8.80
1745.00	5	QPSK	H	176	325	1 / 0	12.92	9.59	22.51	30.00	-7.49
1777.50	5	QPSK	H	100	212	1 / 0	13.02	9.53	22.55	30.00	-7.45
1712.50	5	16-QAM	H	255	321	1 / 0	10.48	9.65	20.13	30.00	-9.87
1745.00	5	16-QAM	H	176	325	1 / 0	11.69	9.59	21.28	30.00	-8.72
1777.50	5	16-QAM	H	100	212	1 / 0	11.74	9.53	21.27	30.00	-8.73
1715.00	10	QPSK	H	113	230	1 / 0	12.23	9.65	21.88	30.00	-8.12
1745.00	10	QPSK	H	174	212	1 / 49	13.62	9.59	23.21	30.00	-6.79
1775.00	10	QPSK	H	100	214	1 / 0	13.18	9.53	22.71	30.00	-7.29
1715.00	10	16-QAM	H	113	230	1 / 0	10.98	9.65	20.63	30.00	-9.37
1745.00	10	16-QAM	H	174	212	1 / 49	12.57	9.59	22.16	30.00	-7.84
1775.00	10	16-QAM	H	100	214	1 / 0	11.96	9.53	21.49	30.00	-8.51
1717.50	15	QPSK	H	113	223	1 / 0	13.33	9.64	22.97	30.00	-7.03
1745.00	15	QPSK	H	230	204	1 / 74	13.38	9.59	22.97	30.00	-7.03
1772.50	15	QPSK	H	100	217	1 / 74	13.09	9.54	22.63	30.00	-7.37
1717.50	15	16-QAM	H	113	223	1 / 0	11.39	9.64	21.03	30.00	-8.97
1745.00	15	16-QAM	H	230	204	1 / 74	12.02	9.59	21.61	30.00	-8.39
1772.50	15	16-QAM	H	100	217	1 / 74	11.70	9.54	21.24	30.00	-8.76
1720.00	20	QPSK	H	189	216	1 / 0	12.74	9.64	22.38	30.00	-7.62
1745.00	20	QPSK	H	121	223	1 / 0	14.21	9.59	23.80	30.00	-6.20
1770.00	20	QPSK	H	182	217	1 / 0	12.87	9.54	22.41	30.00	-7.59
1720.00	20	16-QAM	H	189	216	1 / 0	12.20	9.64	21.84	30.00	-8.16
1745.00	20	16-QAM	H	121	223	1 / 0	13.49	9.59	23.08	30.00	-6.92
1770.00	20	16-QAM	H	182	217	1 / 0	11.67	9.54	21.21	30.00	-8.79
1745.00	20	QPSK	V	180	13	1 / 0	13.41	9.59	23.00	30.00	-7.00

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

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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	111	191	1 / 0	13.56	9.35	22.91	33.01	-10.10
1882.50	1.4	QPSK	H	100	195	1 / 3	12.94	9.27	22.21	33.01	-10.80
1914.30	1.4	QPSK	H	107	188	1 / 3	12.86	9.26	22.12	33.01	-10.89
1850.70	1.4	16-QAM	H	111	191	1 / 0	12.43	9.35	21.78	33.01	-11.23
1882.50	1.4	16-QAM	H	100	195	1 / 3	11.87	9.27	21.14	33.01	-11.87
1914.30	1.4	16-QAM	H	107	188	1 / 3	11.62	9.26	20.88	33.01	-12.13
1851.50	3	QPSK	H	100	187	1 / 7	14.41	9.35	23.76	33.01	-9.25
1882.50	3	QPSK	H	100	194	1 / 7	12.43	9.27	21.70	33.01	-11.31
1913.50	3	QPSK	H	100	189	1 / 7	12.45	9.26	21.71	33.01	-11.30
1851.50	3	16-QAM	H	100	187	1 / 7	12.61	9.35	21.96	33.01	-11.05
1882.50	3	16-QAM	H	100	194	1 / 7	11.06	9.27	20.33	33.01	-12.68
1913.50	3	16-QAM	H	100	189	1 / 7	11.08	9.26	20.34	33.01	-12.67
1852.50	5	QPSK	H	100	188	1 / 12	14.33	9.34	23.67	33.01	-9.34
1882.50	5	QPSK	H	100	196	1 / 12	12.42	9.27	21.69	33.01	-11.32
1912.50	5	QPSK	H	100	195	1 / 12	12.39	9.26	21.65	33.01	-11.36
1852.50	5	16-QAM	H	100	188	1 / 12	12.88	9.34	22.22	33.01	-10.79
1882.50	5	16-QAM	H	100	196	1 / 12	10.96	9.27	20.23	33.01	-12.78
1912.50	5	16-QAM	H	100	195	1 / 12	11.25	9.26	20.51	33.01	-12.50
1855.00	10	QPSK	H	100	100	1 / 0	12.89	9.34	22.23	33.01	-10.78
1882.50	10	QPSK	H	100	93	1 / 49	12.18	9.27	21.45	33.01	-11.56
1910.00	10	QPSK	H	285	107	1 / 0	11.36	9.25	20.61	33.01	-12.40
1855.00	10	16-QAM	H	100	100	1 / 0	11.56	9.34	20.90	33.01	-12.11
1882.50	10	16-QAM	H	100	93	1 / 49	10.78	9.27	20.05	33.01	-12.96
1910.00	10	16-QAM	H	285	107	1 / 0	9.90	9.25	19.15	33.01	-13.86
1857.50	15	QPSK	H	100	100	1 / 0	13.69	9.33	23.02	33.01	-9.99
1882.50	15	QPSK	H	100	91	1 / 74	12.08	9.27	21.35	33.01	-11.66
1907.50	15	QPSK	H	284	104	1 / 74	11.65	9.24	20.89	33.01	-12.12
1857.50	15	16-QAM	H	100	100	1 / 0	11.81	9.33	21.14	33.01	-11.87
1882.50	15	16-QAM	H	100	91	1 / 74	10.98	9.27	20.25	33.01	-12.76
1907.50	15	16-QAM	H	284	104	1 / 74	10.18	9.24	19.42	33.01	-13.59
1860.00	20	QPSK	H	100	104	1 / 0	12.59	9.32	21.91	33.01	-11.10
1882.50	20	QPSK	H	100	92	1 / 0	12.05	9.27	21.32	33.01	-11.69
1905.00	20	QPSK	H	180	93	1 / 99	12.47	9.24	21.71	33.01	-11.30
1860.00	20	16-QAM	H	100	104	1 / 0	11.25	9.32	20.57	33.01	-12.44
1882.50	20	16-QAM	H	100	92	1 / 0	10.95	9.27	20.22	33.01	-12.79
1905.00	20	16-QAM	H	180	93	1 / 99	11.42	9.24	20.66	33.01	-12.35
1851.50	3	QPSK	V	118	5	1 / 99	12.99	9.35	22.34	33.01	-10.67

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

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7.6.2 Antenna-2 Radiated Power (ERP/EIRP)

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	262	360	1 / 5	11.39	2.31	13.70	34.77	-21.07
707.50	1.4	QPSK	H	240	10	3 / 2	12.68	2.31	14.99	34.77	-19.78
715.30	1.4	QPSK	H	200	220	1 / 0	10.65	2.52	13.17	34.77	-21.60
699.70	1.4	16-QAM	H	262	360	1 / 5	10.49	2.31	12.80	34.77	-21.97
707.50	1.4	16-QAM	H	240	10	1 / 0	11.62	2.31	13.93	34.77	-20.84
715.30	1.4	16-QAM	H	200	220	1 / 0	9.65	2.52	12.17	34.77	-22.60
700.50	3	QPSK	H	223	13	1 / 14	11.63	2.12	13.75	34.77	-21.02
707.50	3	QPSK	H	238	11	1 / 14	12.48	2.31	14.79	34.77	-19.98
714.50	3	QPSK	H	223	13	1 / 0	12.57	2.50	15.07	34.77	-19.70
700.50	3	16-QAM	H	223	13	1 / 14	10.71	2.12	12.83	34.77	-21.94
707.50	3	16-QAM	H	238	11	1 / 14	11.50	2.31	13.81	34.77	-20.96
714.50	3	16-QAM	H	223	13	1 / 0	11.68	2.50	14.18	34.77	-20.59
701.50	5	QPSK	H	140	100	1 / 24	12.12	2.15	14.27	34.77	-20.50
707.50	5	QPSK	H	234	0	1 / 24	12.70	2.31	15.01	34.77	-19.76
713.50	5	QPSK	H	245	90	1 / 0	12.74	2.48	15.22	34.77	-19.56
701.50	5	16-QAM	H	140	100	1 / 24	11.29	2.15	13.44	34.77	-21.33
707.50	5	16-QAM	H	234	0	1 / 24	11.88	2.31	14.19	34.77	-20.58
713.50	5	16-QAM	H	245	90	1 / 0	11.91	2.48	14.39	34.77	-20.39
704.00	10	QPSK	H	200	129	1 / 49	12.44	2.22	14.66	34.77	-20.12
707.50	10	QPSK	H	224	100	1 / 49	12.48	2.31	14.79	34.77	-19.98
711.00	10	QPSK	H	230	250	1 / 0	12.37	2.41	14.78	34.77	-19.99
704.00	10	16-QAM	H	200	129	1 / 49	11.49	2.22	13.71	34.77	-21.07
707.50	10	16-QAM	H	224	100	1 / 49	11.60	2.31	13.91	34.77	-20.86
711.00	10	16-QAM	H	230	250	1 / 0	11.47	2.41	13.88	34.77	-20.89
713.50	5	QPSK	V	167	223	1 / 0	12.66	2.48	15.14	34.77	-19.64

Table 7-7. 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]
779.50	5	QPSK	H	200	122	1 / 0	11.21	4.19	15.40	34.77	-19.37
782.00	5	QPSK	H	223	161	1 / 24	11.04	4.25	15.29	34.77	-19.48
784.50	5	QPSK	H	100	250	1 / 0	11.21	4.32	15.53	34.77	-19.24
779.50	5	16QAM	H	200	122	1 / 0	9.95	4.19	14.14	34.77	-20.63
782.00	5	16QAM	H	223	161	1 / 24	10.17	4.25	14.42	34.77	-20.35
784.50	5	16QAM	H	100	250	1 / 0	10.07	4.32	14.39	34.77	-20.38
782.00	10	QPSK	H	220	190	1 / 49	10.66	4.25	14.91	34.77	-19.86
782.00	10	16QAM	H	220	190	1 / 49	9.69	4.25	13.94	34.77	-20.83
784.50	5	QPSK	V	100	59	1 / 74	8.34	4.32	12.66	34.77	-22.11

Table 7-8. 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	H	122	150	1 / 0	6.46	5.01	11.47	38.45	-26.98
836.50	1.4	QPSK	H	200	190	1 / 5	5.94	5.16	11.10	38.45	-27.35
848.30	1.4	QPSK	H	150	210	1 / 5	5.95	5.30	11.25	38.45	-27.20
824.70	1.4	16-QAM	H	122	150	1 / 0	5.52	5.01	10.53	38.45	-27.92
836.50	1.4	16-QAM	H	200	190	1 / 0	4.97	5.16	10.13	38.45	-28.32
848.30	1.4	16-QAM	H	150	210	1 / 5	4.93	5.30	10.23	38.45	-28.22
825.50	3	QPSK	H	120	200	1 / 0	5.94	5.02	10.96	38.45	-27.49
836.50	3	QPSK	H	187	153	1 / 0	5.51	5.16	10.67	38.45	-27.78
847.50	3	QPSK	H	321	158	1 / 0	4.50	5.29	9.79	38.45	-28.66
825.50	3	16-QAM	H	120	200	1 / 14	4.89	5.02	9.91	38.45	-28.54
836.50	3	16-QAM	H	187	153	1 / 0	5.01	5.16	10.17	38.45	-28.28
847.50	3	16-QAM	H	321	158	1 / 14	3.53	5.29	8.82	38.45	-29.63
826.50	5	QPSK	H	192	100	1 / 0	6.16	5.03	11.19	38.45	-27.26
836.50	5	QPSK	H	315	152	1 / 24	5.40	5.16	10.56	38.45	-27.89
846.50	5	QPSK	H	205	162	1 / 0	4.95	5.28	10.23	38.45	-28.22
826.50	5	16-QAM	H	192	100	1 / 0	5.27	5.03	10.30	38.45	-28.15
836.50	5	16-QAM	H	315	152	1 / 24	4.40	5.16	9.56	38.45	-28.89
846.50	5	16-QAM	H	205	162	1 / 0	3.93	5.28	9.21	38.45	-29.24
829.00	10	QPSK	H	120	200	1 / 0	5.86	5.06	10.92	38.45	-27.53
836.50	10	QPSK	H	182	148	1 / 0	5.85	5.16	11.01	38.45	-27.44
844.00	10	QPSK	H	125	225	1 / 0	5.28	5.25	10.53	38.45	-27.92
829.00	10	16-QAM	H	120	200	1 / 0	4.89	5.06	9.95	38.45	-28.50
836.50	10	16-QAM	H	182	148	1 / 0	4.90	5.16	10.06	38.45	-28.39
844.00	10	16-QAM	H	125	225	1 / 0	4.36	5.25	9.61	38.45	-28.84
824.70	1.4	QPSK	V	123	283	1 / 0	2.83	5.01	7.84	38.45	-30.61

Table 7-9. ERP Data (Band 5)

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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 = Peak
6. Trace mode = max hold
7. The trace was allowed to stabilize

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Test Setup

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

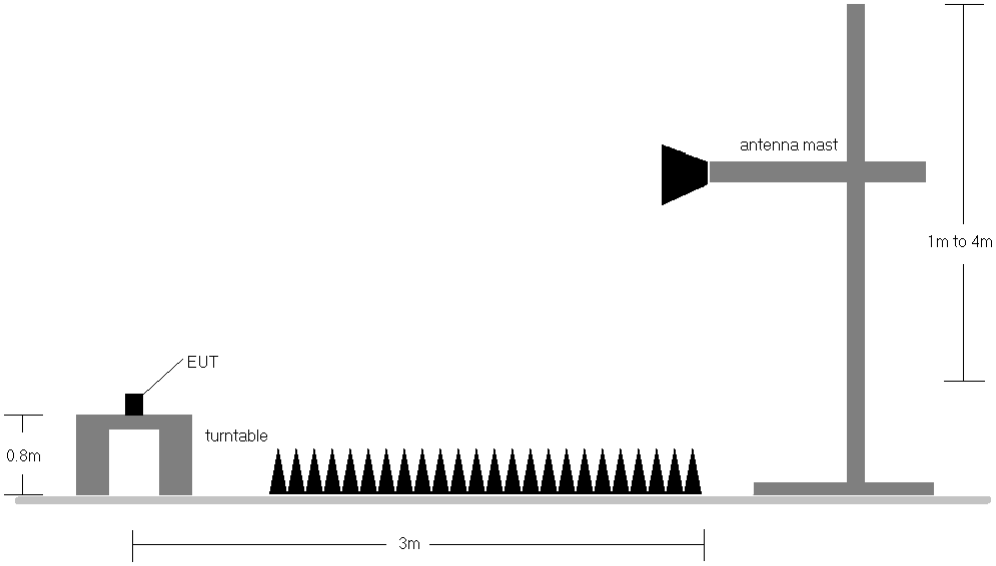

Figure 7-7. Test Instrument & Measurement Setup

Test Notes

1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.

2) This unit was tested with its standard battery.

3) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.

4) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.

5) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

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7.7.1 Antenna-1 Radiated Spurious Emissions Measurements

OPERATING FREQUENCY:	701.50	MHz		
CHANNEL:	23035			
MEASURED OUTPUT POWER:	18.74	dBm	=	0.075 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	31.74	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1403.00	H	-	-	-57.84	2.39	-55.45	74.2
2104.50	H	110	131	-51.70	3.46	-48.24	67.0
2806.00	H	-	-	-55.75	4.76	-50.99	69.7

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

OPERATING FREQUENCY:	707.50	MHz		
CHANNEL:	23095			
MEASURED OUTPUT POWER:	19.08	dBm	=	0.081 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	32.08	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	-	-	-58.29	2.54	-55.74	74.8
2122.50	H	122	132	-50.97	3.42	-47.55	66.6
2830.00	H	-	-	-55.12	4.85	-50.27	69.4

Table 7-11. Radiated Spurious Data (Band 12/17 – Mid Channel)

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OPERATING FREQUENCY:	713.50	MHz		
CHANNEL:	23155			
MEASURED OUTPUT POWER:	19.96	dBm	=	0.099 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	32.96	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	-	-	-58.03	2.70	-55.34	75.3
2140.50	H	112	108	-52.43	3.38	-49.05	69.0
2854.00	H	-	-	-55.85	4.95	-50.91	70.9

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

OPERATING FREQUENCY:	782.00	MHz		
CHANNEL:	23230			
MEASURED OUTPUT POWER:	19.41	dBm	=	0.087 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	10.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	32.41	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	-	-	-56.54	3.63	-52.91	72.3
3128.00	H	-	-	-55.89	4.95	-50.94	70.3
3910.00	H	-	-	-55.77	6.55	-49.22	68.6

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

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MODULATION SIGNAL:	QPSK	
BANDWIDTH:	5.00	MHz
DISTANCE:	3	meters
NARROWBAND EMISSION LIMIT:	-50	dBm
WIDEBAND EMISSION LIMIT:	-40	dBm/MHz

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Margin [dB]
1564.00	H	120	130	-65.93	6.57	-59.36	-19.4

Table 7-14. Radiated Spurious Data (Band 13 – 1559-1610MHz Band)

OPERATING FREQUENCY:	825.50	MHz		
CHANNEL:	20415			
MEASURED OUTPUT POWER:	19.94	dBm	=	0.099 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	32.94	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]
1651.00	H	-	-	-59.04	3.63	-55.40	75.3

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

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OPERATING FREQUENCY:	836.50	MHz		
CHANNEL:	20525			
MEASURED OUTPUT POWER:	19.40	dBm	=	0.087 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	32.40	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	-	-	-58.40	3.52	-54.88	74.3

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

OPERATING FREQUENCY:	847.50	MHz		
CHANNEL:	20635			
MEASURED OUTPUT POWER:	19.28	dBm	=	0.085 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	32.28	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]
1695.00	H	205	287	-55.89	3.41	-52.49	71.8
2542.50	H	-	-	-54.22	3.73	-50.49	69.8

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

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OPERATING FREQUENCY:	1720.00	MHz		
CHANNEL:	132072			
MEASURED OUTPUT POWER:	22.38	dBm	=	0.173 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	20.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	35.38	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	-	-	-55.71	8.19	-47.53	69.9
5160.00	H	-	-	-54.23	10.38	-43.85	66.2

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

OPERATING FREQUENCY:	1745.00	MHz		
CHANNEL:	132122			
MEASURED OUTPUT POWER:	23.80	dBm	=	0.240 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	20.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	36.80	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	H	100	212	-49.32	8.33	-40.99	64.8
5235.00	H	-	-	-54.19	10.38	-43.82	67.6

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

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OPERATING FREQUENCY:	1770.00	MHz		
CHANNEL:	132572			
MEASURED OUTPUT POWER:	22.41	dBm	=	0.174 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	20.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	35.41	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	H	-	-	-55.13	8.42	-46.72	69.1
5310.00	H	-	-	-55.16	10.32	-44.84	67.3

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

OPERATING FREQUENCY:	1851.50	MHz		
CHANNEL:	26055			
MEASURED OUTPUT POWER:	23.76	dBm	=	0.238 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	36.76	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3703.00	H	110	250	-53.59	8.41	-45.18	68.9
5554.50	H	125	200	-53.11	10.52	-42.59	66.3
7406.00	H	-	-	-53.45	12.01	-41.44	65.2

Table 7-21. Radiated Spurious Data (Band 2/25 – Low Channel)

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OPERATING FREQUENCY:	1882.50	MHz		
CHANNEL:	26365			
MEASURED OUTPUT POWER:	21.70	dBm	=	0.148 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	34.70	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	232	142	-49.71	8.66	-41.05	62.8
5647.50	H	106	132	-55.46	10.62	-44.84	66.5
7530.00	H	-	-	-52.65	12.06	-40.59	62.3

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

OPERATING FREQUENCY:	1913.50	MHz		
CHANNEL:	26675			
MEASURED OUTPUT POWER:	21.71	dBm	=	0.148 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	34.71	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3827.00	H	110	200	-55.76	8.76	-47.01	68.7
5740.50	H	122	250	-55.11	10.73	-44.38	66.1
7654.00	H	-	-	-53.21	12.18	-41.04	62.7

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

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7.7.2 Antenna-2 Radiated Spurious Emissions Measurements

OPERATING FREQUENCY:	701.50	MHz		
CHANNEL:	23035			
MEASURED OUTPUT POWER:	14.27	dBm	=	0.027 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	27.27	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	218	-25.58	2.39	-23.19	37.5
2104.50	H	-	-	-28.61	3.46	-25.15	39.4
2806.00	H	-	-	-27.18	4.76	-22.42	36.7

Table 7-24. Radiated Spurious Data (Band 12 – Low Channel)

OPERATING FREQUENCY:	707.50	MHz		
CHANNEL:	23095			
MEASURED OUTPUT POWER:	15.01	dBm	=	0.032 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	28.01	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	140	153	-27.90	2.54	-25.36	40.4
2122.50	H	247	287	-28.34	3.42	-24.92	39.9

Table 7-25. Radiated Spurious Data (Band 12 – Mid Channel)

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OPERATING FREQUENCY:	713.50	MHz		
CHANNEL:	23155			
MEASURED OUTPUT POWER:	15.22	dBm	=	0.033 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	$43 + 10 \log_{10}(W) =$	28.22	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	136	205	-27.74	2.70	-25.04	40.3
2140.50	H	-	-	-28.40	3.38	-25.02	40.2

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

OPERATING FREQUENCY:	779.50	MHz		
CHANNEL:	23205			
MEASURED OUTPUT POWER:	15.40	dBm	=	0.035 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	$43 + 10 \log_{10}(W) =$	28.40	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
2338.50	H	-	-	-58.05	3.64	-54.41	69.8
3118.00	H	100	142	-56.38	4.98	-51.39	66.8

Table 7-27. Radiated Spurious Data (Band 13 – Low Channel)

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OPERATING FREQUENCY:	782.00	MHz		
CHANNEL:	23230			
MEASURED OUTPUT POWER:	15.29	dBm	=	0.034 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	28.29	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	-	-	-56.53	3.63	-52.90	68.2
3128.00	H	100	347	-53.61	4.95	-48.66	64.0

Table 7-28. Radiated Spurious Data (Band 13 – Mid Channel)

OPERATING FREQUENCY:	784.50	MHz		
CHANNEL:	23255			
MEASURED OUTPUT POWER:	15.53	dBm	=	0.036 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	28.53	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
2353.50	H	-	-	-56.55	3.63	-52.92	68.4
3138.00	H	100	146	-52.28	4.92	-47.36	62.9

Table 7-29. Radiated Spurious Data (Band 13 – High Channel)

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MODULATION SIGNAL:	QPSK	
BANDWIDTH:	5.00	MHz
DISTANCE:	3	meters
NARROWBAND EMISSION LIMIT:	-50	dBm
WIDEBAND EMISSION LIMIT:	-40	dBm/MHz

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Margin [dB]
1559.00	H	120	221	-66.40	6.55	-59.85	-19.8
1564.00	H	110	122	-65.43	6.57	-58.86	-18.9
1569.00	H	102	160	-65.64	6.59	-59.06	-19.1

Table 7-30. Radiated Spurious Data (Band 13 – 1559-1610MHz Band)

OPERATING FREQUENCY:	824.70	MHz		
CHANNEL:	20407			
MEASURED OUTPUT POWER:	11.47	dBm	=	0.014 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	1.4	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	24.47	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]
1649.40	H	-	-	-54.54	6.25	-48.29	59.8
2474.90	H	100	128	-49.72	7.45	-42.27	53.7
3300.40	H	-	-	-53.00	8.21	-44.79	56.3

Table 7-31. Radiated Spurious Data (Band 5 – Low Channel)

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OPERATING FREQUENCY:	836.50	MHz		
CHANNEL:	20525			
MEASURED OUTPUT POWER:	11.10	dBm	=	0.013 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	1.4	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	24.10	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	110	150	-55.12	6.51	-48.62	59.7
2509.50	H	122	200	-50.81	7.40	-43.42	54.5
3346.00	H	-	-	-52.74	8.27	-44.48	55.6

Table 7-32. Radiated Spurious Data (Band 5 – Mid Channel)

OPERATING FREQUENCY:	848.30	MHz		
CHANNEL:	20643			
MEASURED OUTPUT POWER:	11.25	dBm	=	0.013 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	1.4	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	24.25	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]
1696.60	H	-	-	-55.18	6.60	-48.57	59.8
2544.10	H	207	360	-52.75	7.42	-45.33	56.6
3391.60	H	-	-	-53.91	8.33	-45.58	56.8

Table 7-33. Radiated Spurious Data (Band 5 – 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)	707,499,919	-81	-0.0000115
100 %		- 30	707,499,848	-152	-0.0000215
100 %		- 20	707,499,847	-153	-0.0000216
100 %		- 10	707,499,979	-21	-0.0000029
100 %		0	707,499,985	-15	-0.0000022
100 %		+ 10	707,499,970	-30	-0.0000043
100 %		+ 20	707,499,993	-7	-0.0000009
100 %		+ 30	707,499,885	-115	-0.0000163
100 %		+ 40	707,499,984	-16	-0.0000023
100 %		+ 50	707,499,993	-7	-0.0000009
BATT. ENDPOINT	3.45	+ 20	707,499,892	-108	-0.0000153

Table 7-34. Frequency Stability Data (Band 12/17)

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Band 12 Frequency Stability Measurements

§2.1055 §27.54

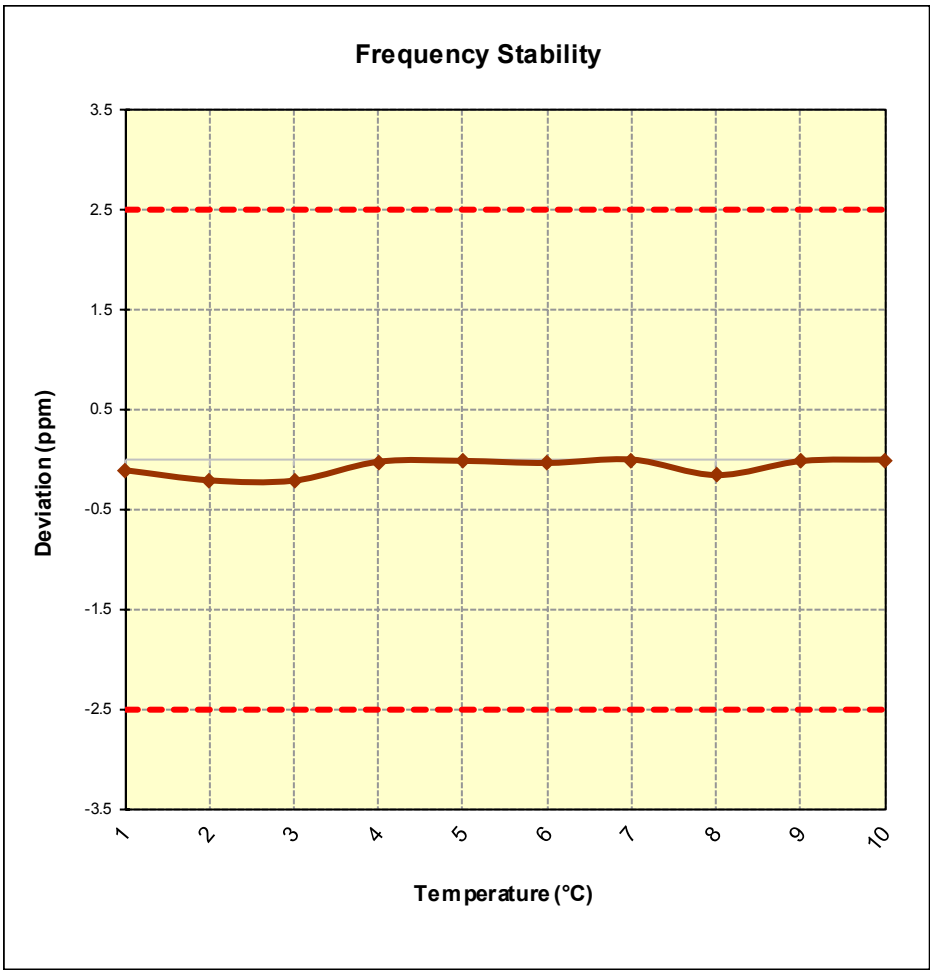

Figure 7-8. Frequency Stability Graph (Band 12)

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Band 13 Frequency Stability Measurements

§2.1055 §27.54

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

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	781,999,958	-42	-0.0000053
100 %		- 30	781,999,862	-138	-0.0000176
100 %		- 20	781,999,888	-112	-0.0000143
100 %		- 10	781,999,988	-12	-0.0000016
100 %		0	781,999,998	-2	-0.0000003
100 %		+ 10	781,999,927	-73	-0.0000093
100 %		+ 20	781,999,886	-114	-0.0000146
100 %		+ 30	781,999,883	-117	-0.0000150
100 %		+ 40	781,999,873	-127	-0.0000162
100 %		+ 50	781,999,875	-125	-0.0000160
BATT. ENDPOINT	3.45	+ 20	781,999,827	-173	-0.0000222

Table 7-35. Frequency Stability Data (Band 13)

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Band 13 Frequency Stability Measurements

§2.1055 §27.54

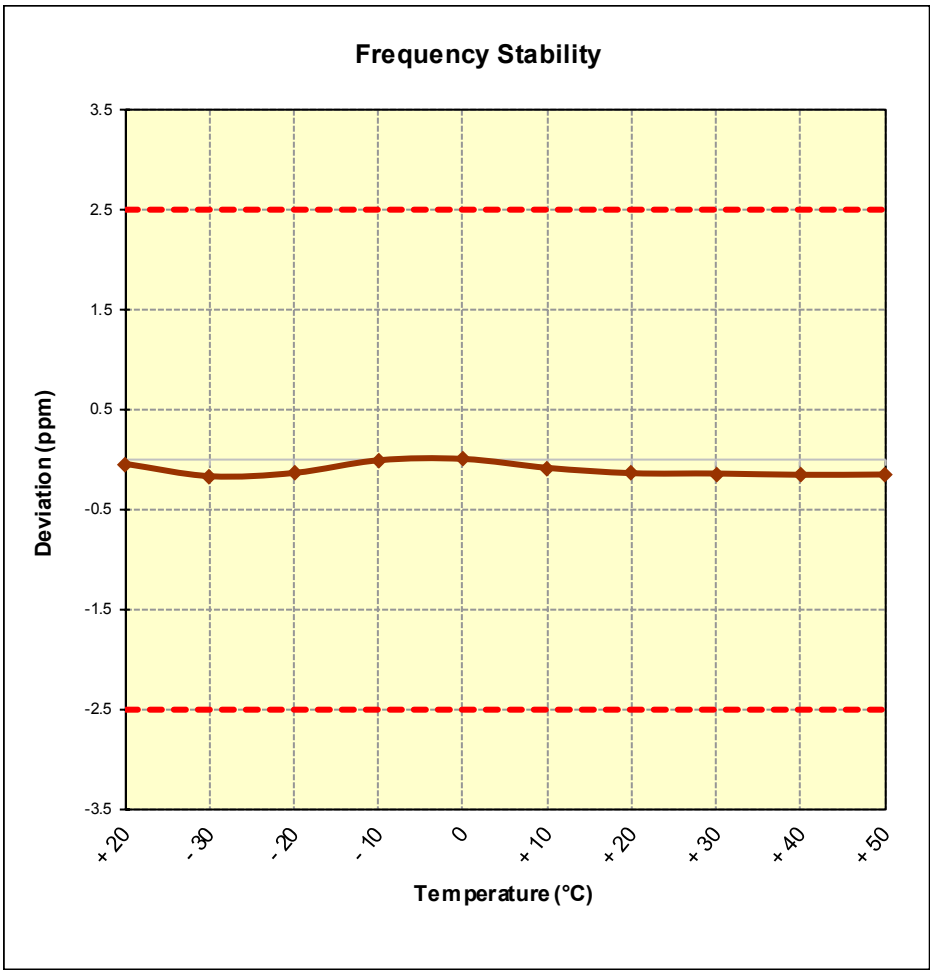

Figure 7-9. Frequency Stability Graph (Band 13)

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Band 5 Frequency Stability Measurements

§2.1055 §22.355

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

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	836,499,954	-46	-0.0000055
100 %		- 30	836,499,988	-12	-0.0000015
100 %		- 20	836,499,846	-154	-0.0000184
100 %		- 10	836,499,834	-166	-0.0000198
100 %		0	836,499,906	-94	-0.0000113
100 %		+ 10	836,499,882	-118	-0.0000141
100 %		+ 20	836,499,821	-179	-0.0000213
100 %		+ 30	836,499,934	-66	-0.0000079
100 %		+ 40	836,499,819	-181	-0.0000217
100 %		+ 50	836,499,991	-9	-0.0000011
BATT. ENDPOINT	3.45	+ 20	836,499,816	-184	-0.0000220

Table 7-36. Frequency Stability Data (Band 5)

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Band 5 Frequency Stability Measurements

§2.1055 §22.355

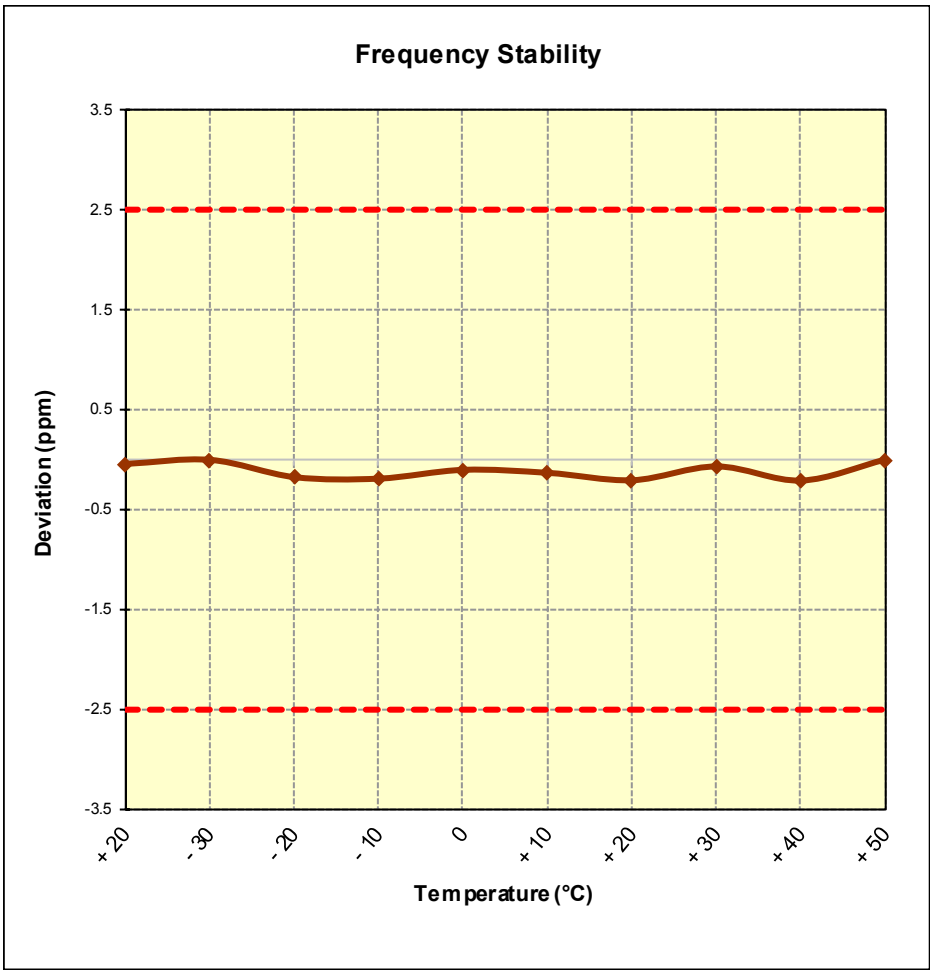

Figure 7-10. Frequency Stability Graph (Band 5)

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Band 66 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)	1,732,499,852	-148	-0.0000085
100 %		- 30	1,732,499,834	-166	-0.0000096
100 %		- 20	1,732,499,963	-37	-0.0000022
100 %		- 10	1,732,499,980	-20	-0.0000012
100 %		0	1,732,499,870	-130	-0.0000075
100 %		+ 10	1,732,499,929	-71	-0.0000041
100 %		+ 20	1,732,499,935	-65	-0.0000037
100 %		+ 30	1,732,499,898	-102	-0.0000059
100 %		+ 40	1,732,499,846	-154	-0.0000089
100 %		+ 50	1,732,499,881	-119	-0.0000069
BATT. ENDPOINT	3.45	+ 20	1,732,499,980	-20	-0.0000012

Table 7-37. 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 Frequency Stability Measurements

§2.1055 §§27.54

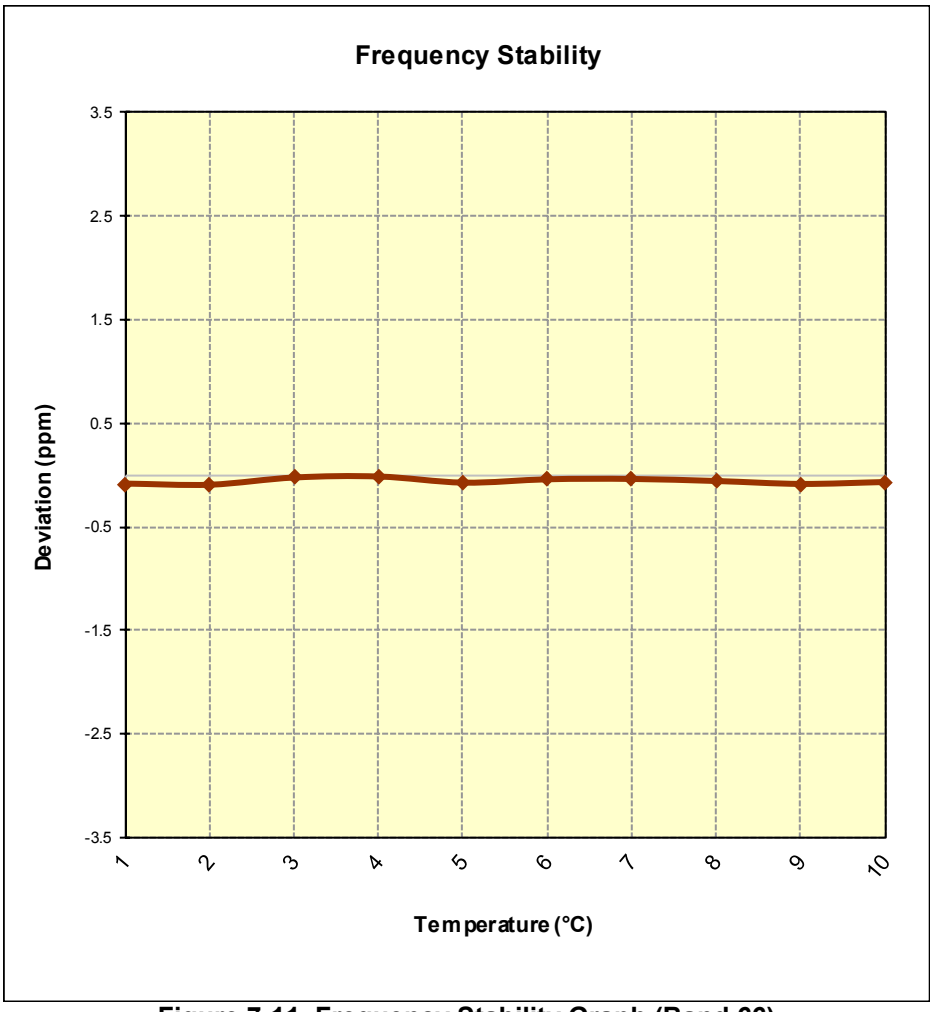

Figure 7-11. Frequency Stability Graph (Band 66)

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Band 25 Frequency Stability Measurements

§2.1055 §24.235

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

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	1,882,499,891	-109	-0.0000058
100 %		- 30	1,882,499,828	-172	-0.0000091
100 %		- 20	1,882,499,821	-179	-0.0000095
100 %		- 10	1,882,499,852	-148	-0.0000079
100 %		0	1,882,499,830	-170	-0.0000090
100 %		+ 10	1,882,499,820	-180	-0.0000096
100 %		+ 20	1,882,499,921	-79	-0.0000042
100 %		+ 30	1,882,499,821	-179	-0.0000095
100 %		+ 40	1,882,499,932	-68	-0.0000036
100 %		+ 50	1,882,499,926	-74	-0.0000039
BATT. ENDPOINT	3.45	+ 20	1,882,499,822	-178	-0.0000094

Table 7-38. 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 25 Frequency Stability Measurements

§2.1055 §24.235

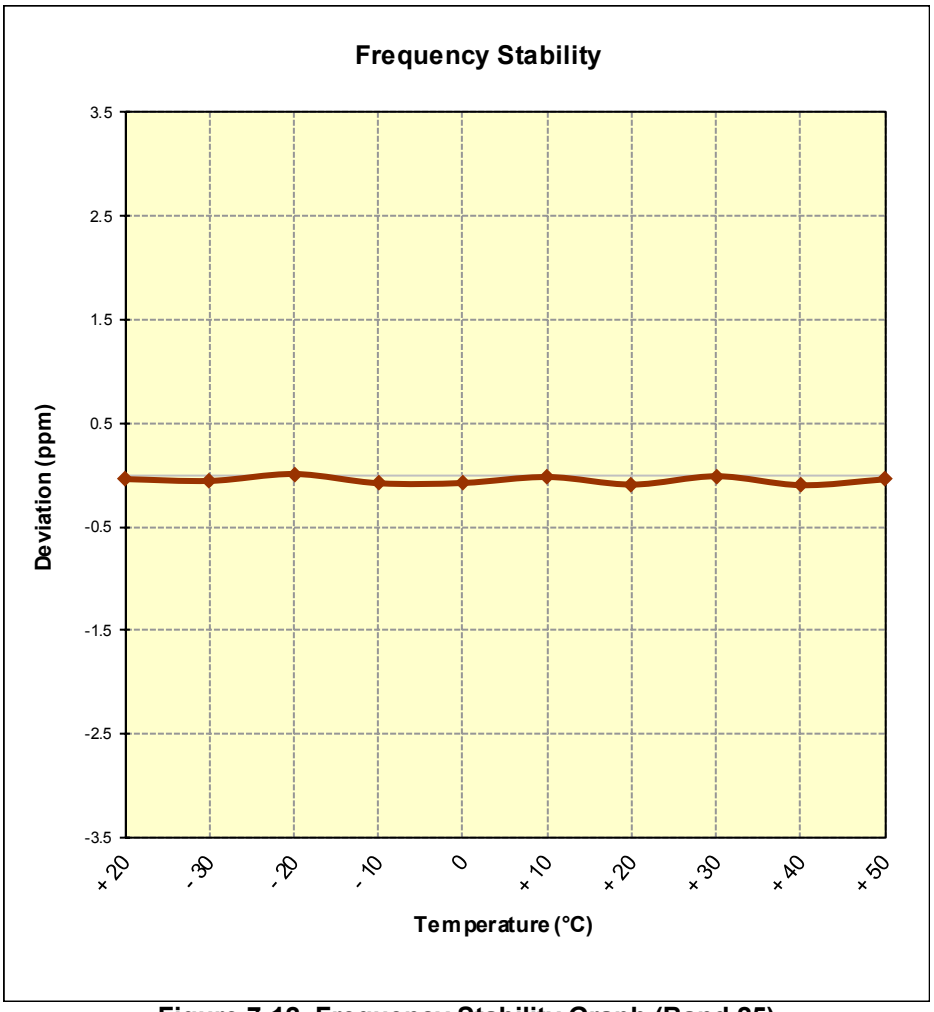

Figure 7-12. Frequency Stability Graph (Band 25)

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LGE Portable Handset FCC ID: ZNFVS995** complies with all the requirements of Parts 22, 24, & 27 of the FCC rules for LTE operation only.

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