7.4 Band Edge Emissions at Antenna Terminal

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

Test Overview

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

The minimum permissible attenuation level for Band 7 is as noted in the Test Notes on the following page.

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

Test Procedure Used

KDB 971168 D01 v02r02 – Section 6.0

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW ≥ 1% of the emission bandwidth
4. VBW ≥ 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Setup

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

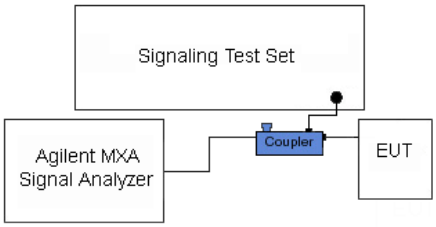


Figure 7-3. Test Instrument & Measurement Setup

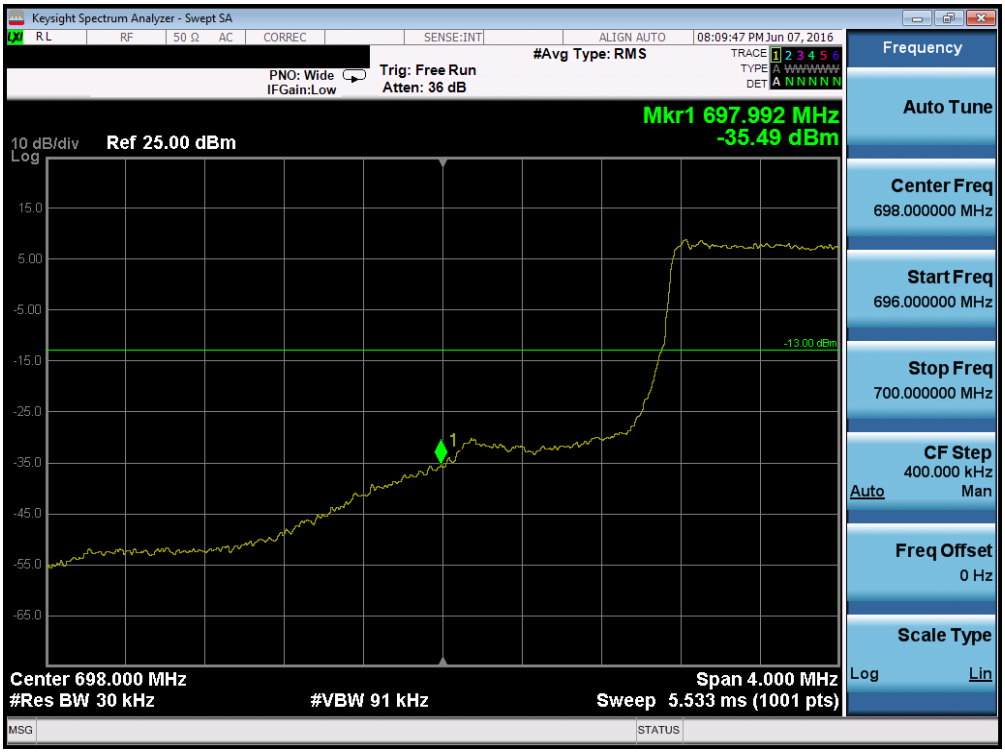
Test Notes

Per 22.917(b), 24.238(a), and 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(m) for operations in the BRS/EBS bands, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz.

In the plots below VBW = 3x RBW. For plots where VBW is not exactly equal to 3x RBW it was determined this small difference in VBW does not affect the measurement.

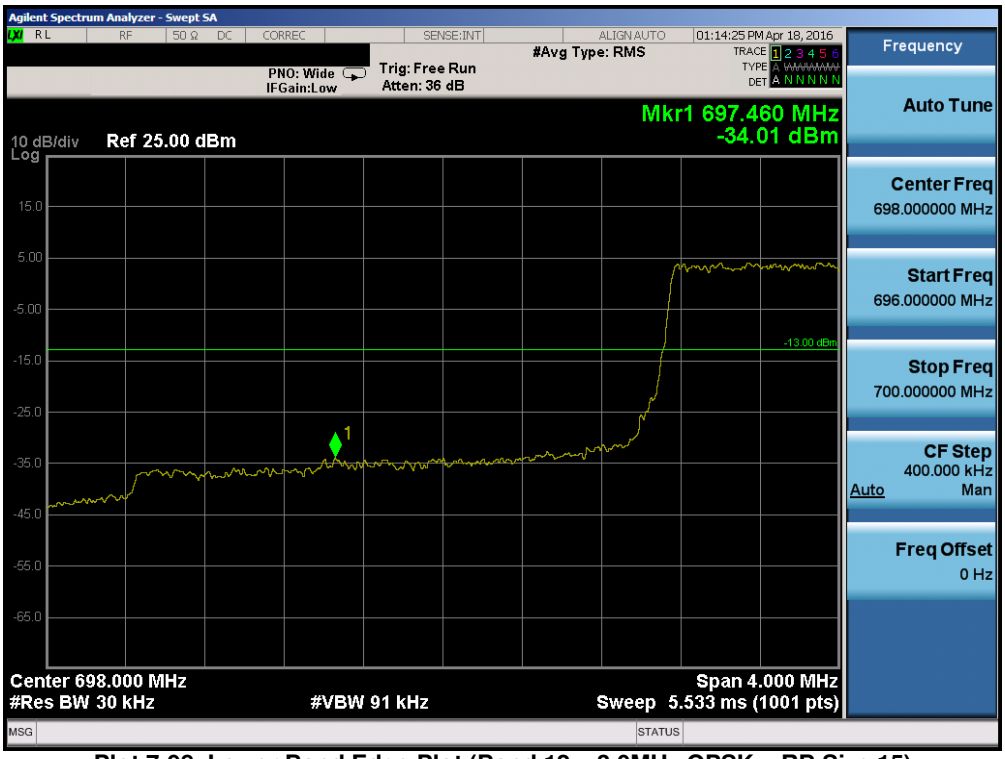


Plot 7-94. Lower Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)

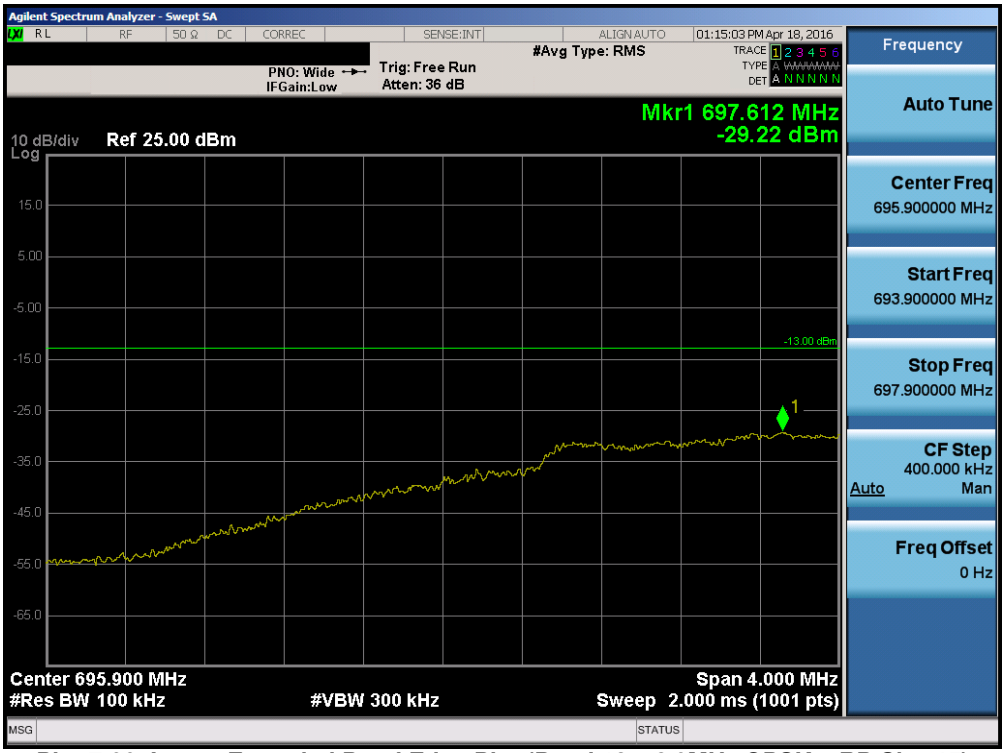
Plot 7-95. Lower Extended Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)

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

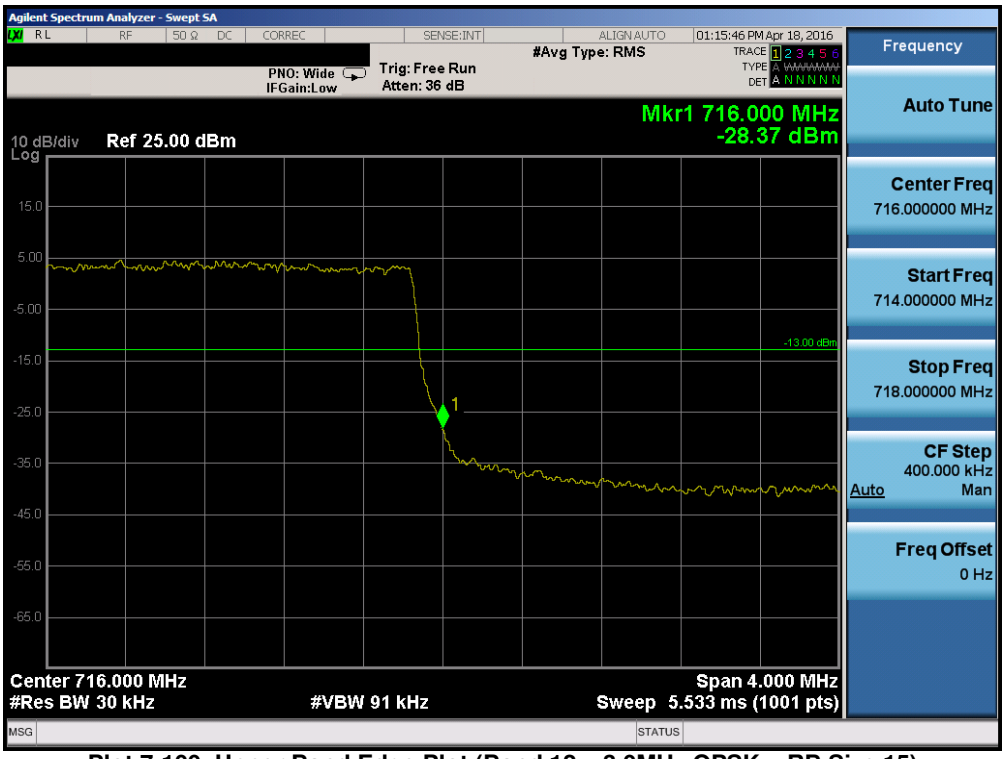
Plot 7-97. Upper Extended Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)



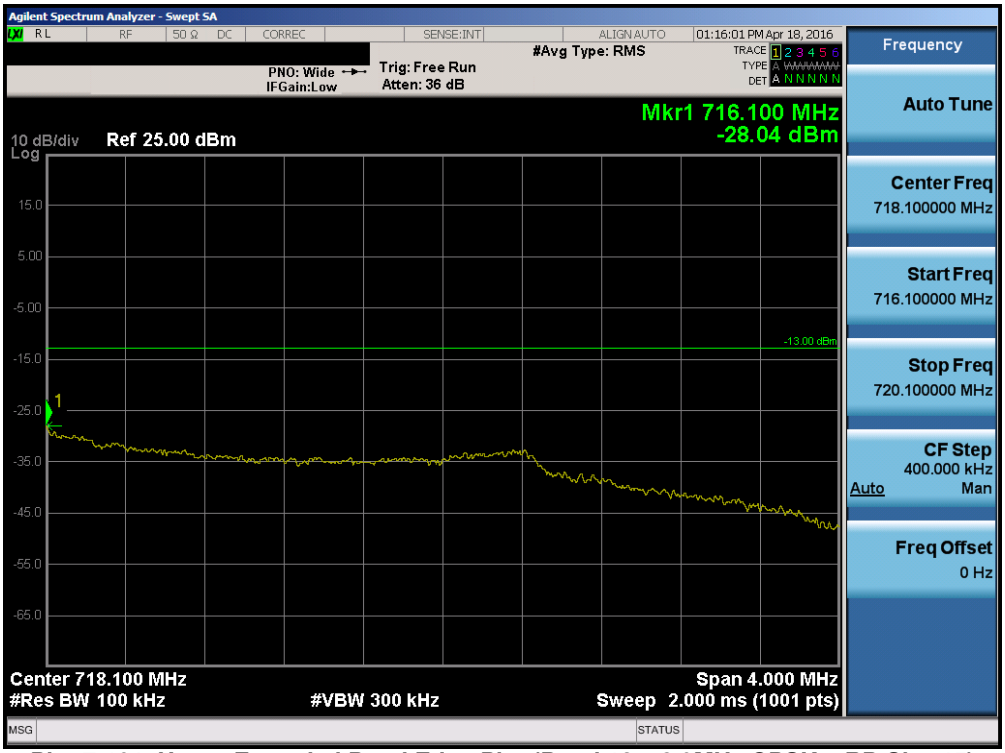
Plot 7-98. Lower Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)



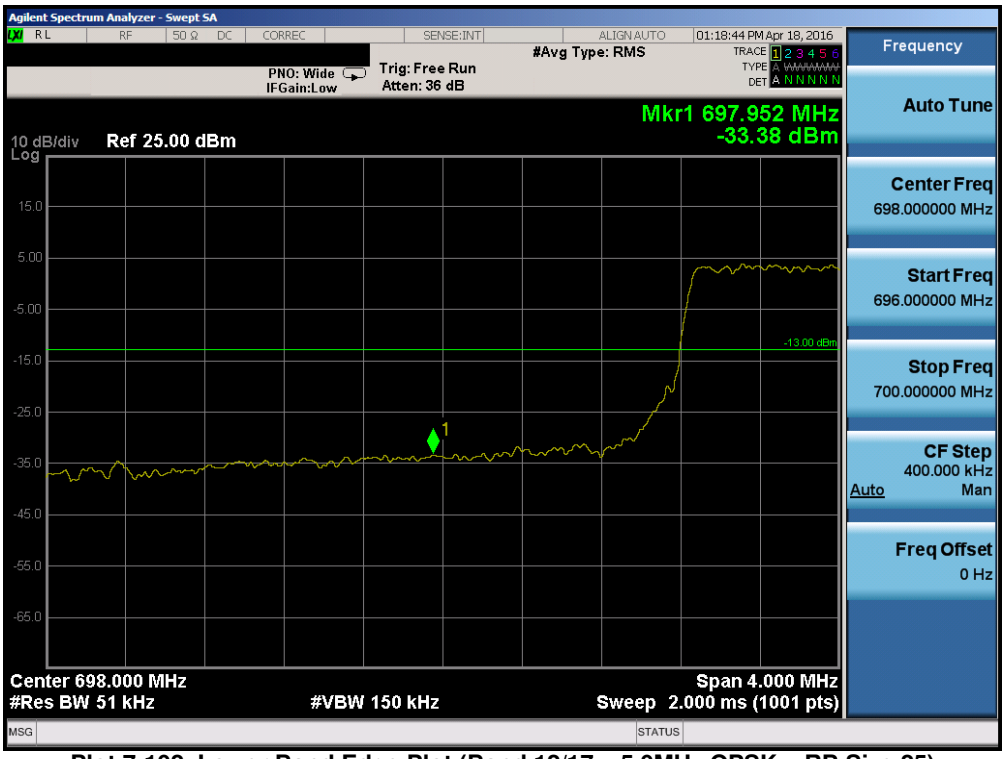
Plot 7-99. Lower Extended Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)



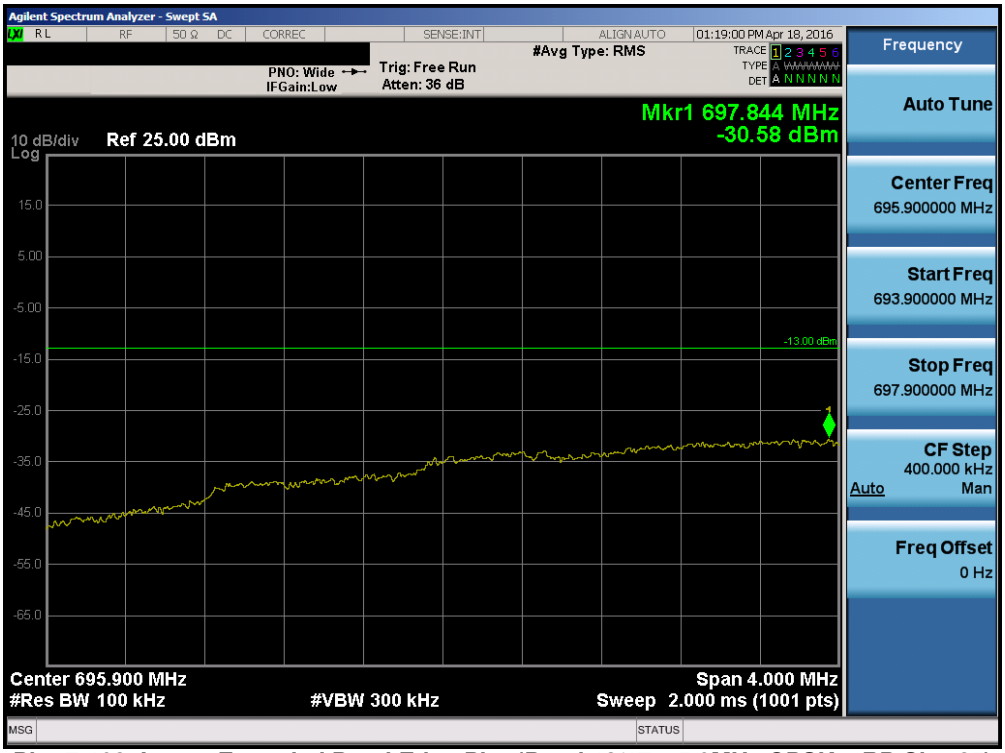
Plot 7-100. Upper Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)



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

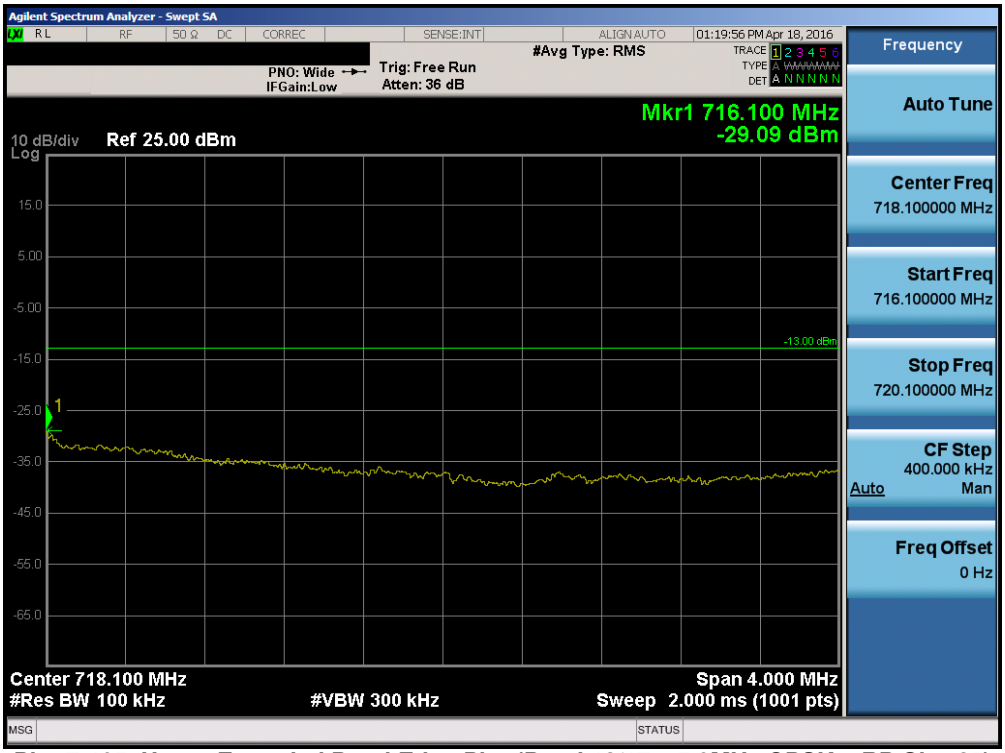


Plot 7-102. Lower Band Edge Plot (Band 12/17 – 5.0MHz QPSK – RB Size 25)



Plot 7-103. Lower Extended Band Edge Plot (Band 12/17 – 5.0MHz QPSK – RB Size 25)

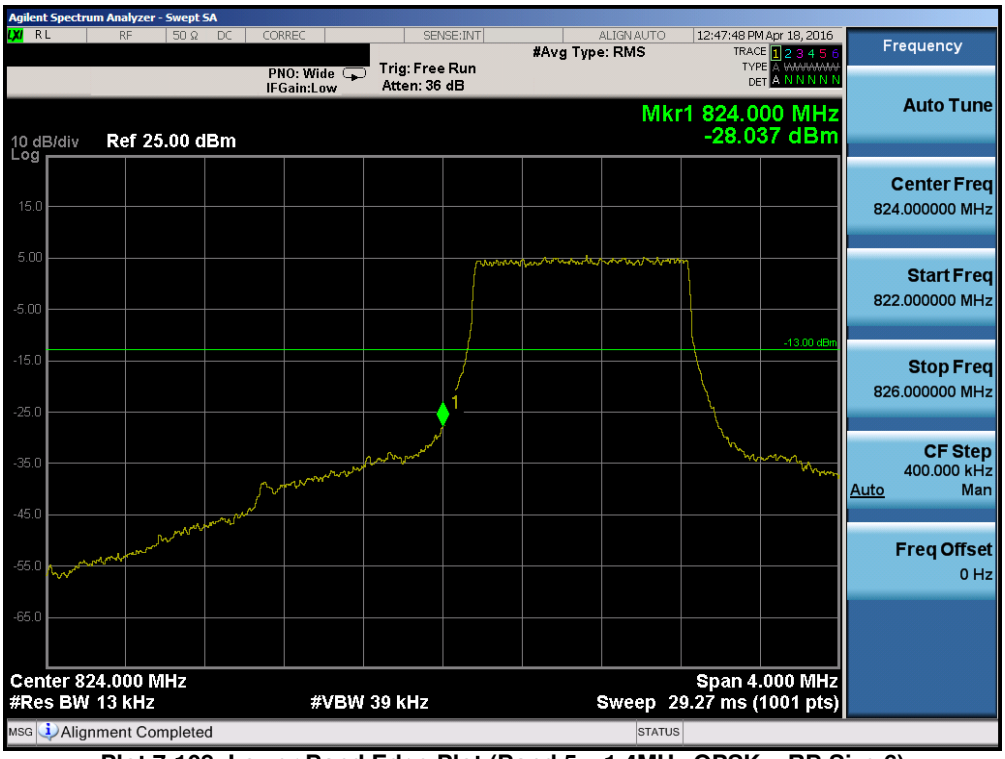
Plot 7-104. Upper Band Edge Plot (Band 12/17 – 5.0MHz QPSK – RB Size 25)



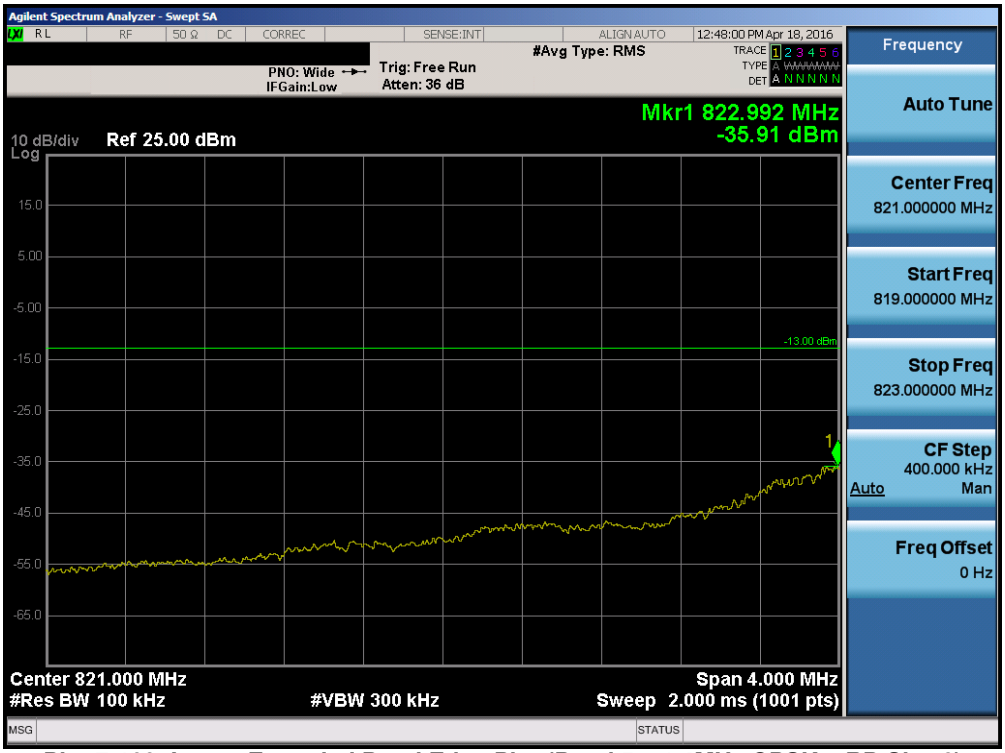
Plot 7-105. Upper Extended Band Edge Plot (Band 12/17 – 5.0MHz QPSK – RB Size 25)

Plot 7-106. Lower Band Edge Plot (Band 12/17 – 10.0MHz QPSK – RB Size 50)

Plot 7-107. Upper Band Edge Plot (Band 12/17 – 10.0MHz QPSK – RB Size 50)

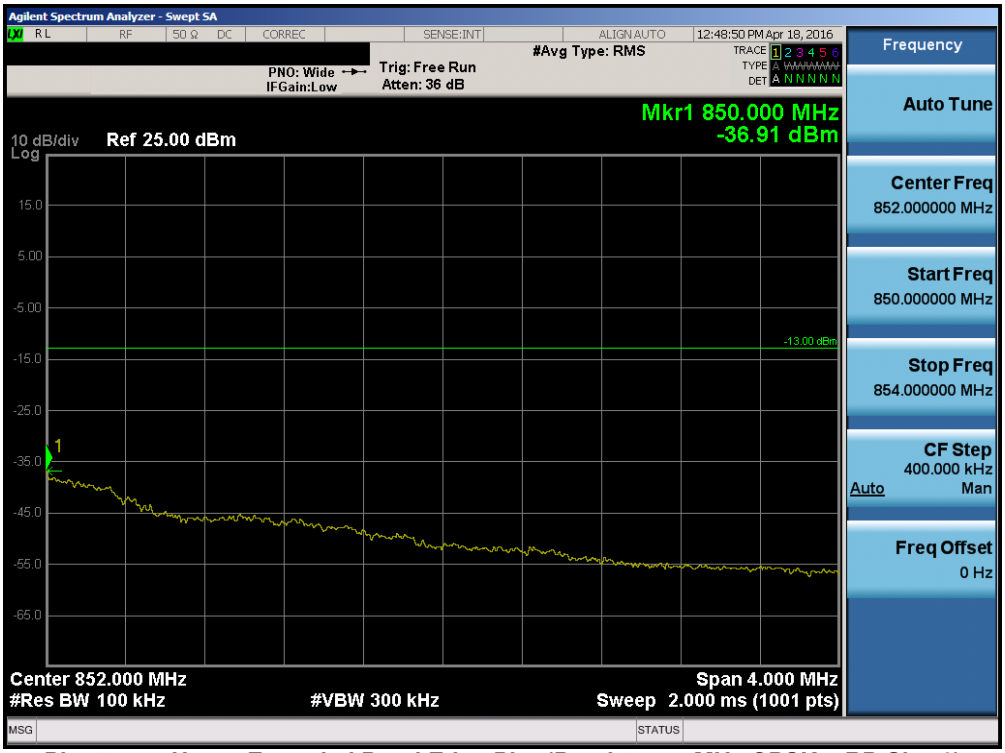


Plot 7-108. Lower Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

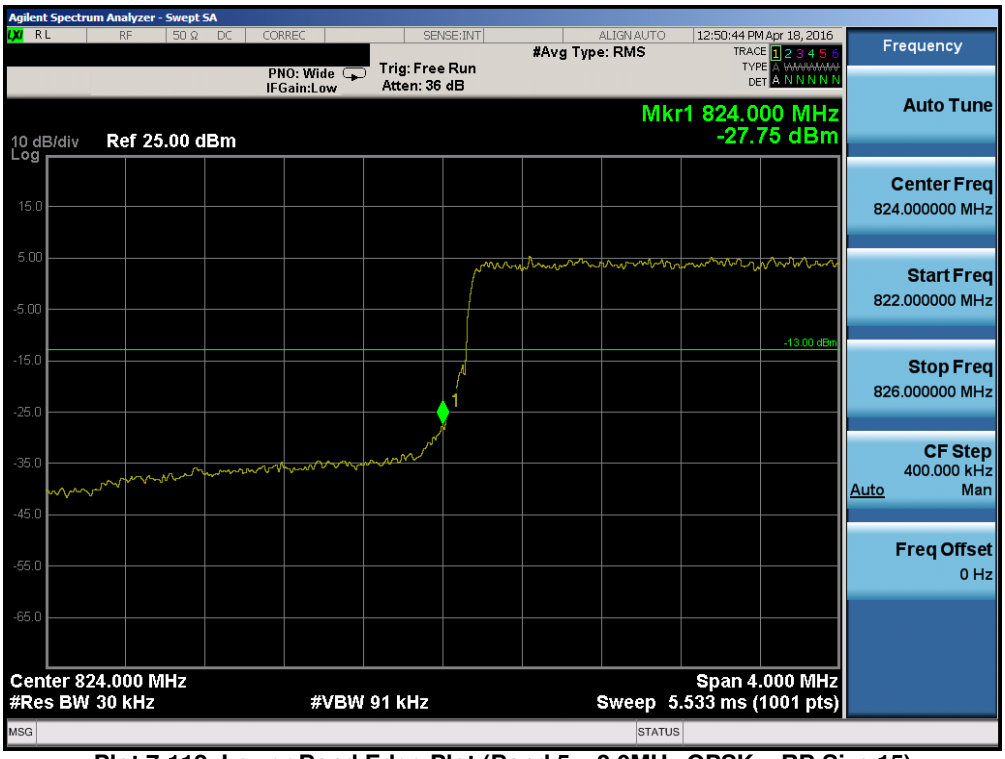


Plot 7-109. Lower Extended Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

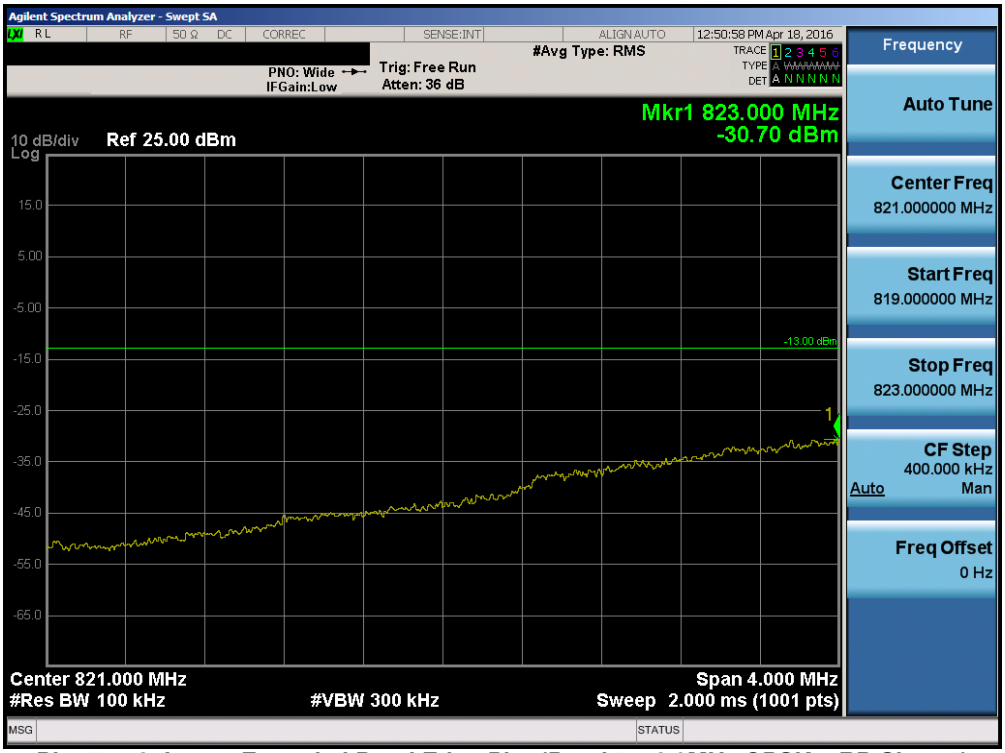
Plot 7-110. Upper Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)



Plot 7-111. Upper Extended Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

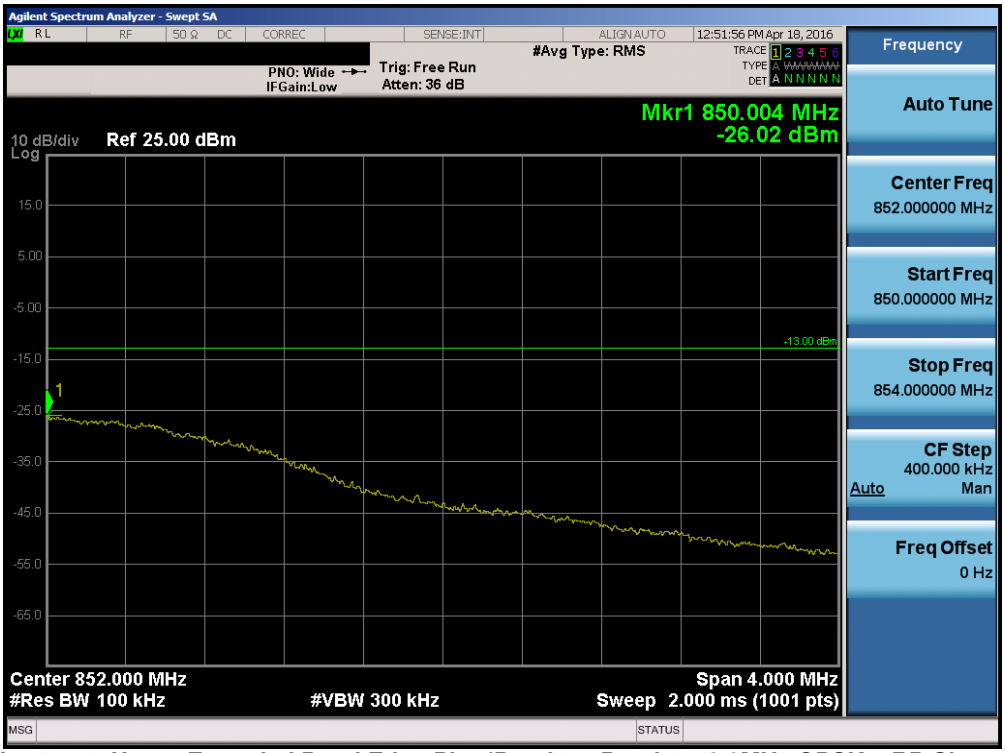


Plot 7-112. Lower Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)

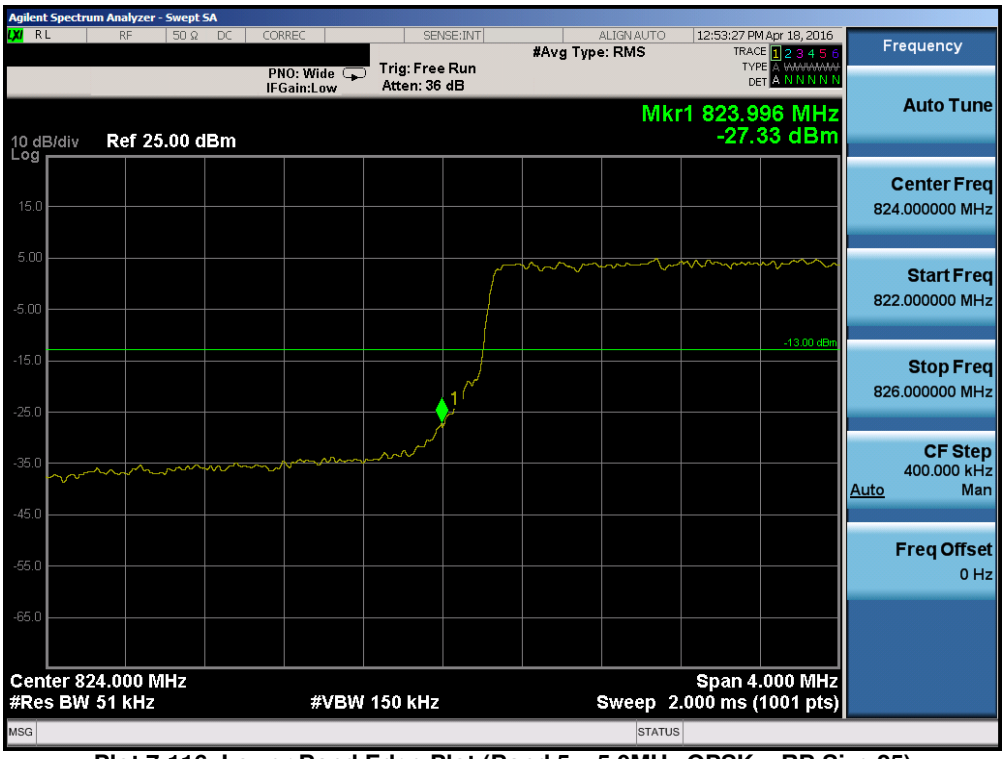


Plot 7-113. Lower Extended Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)

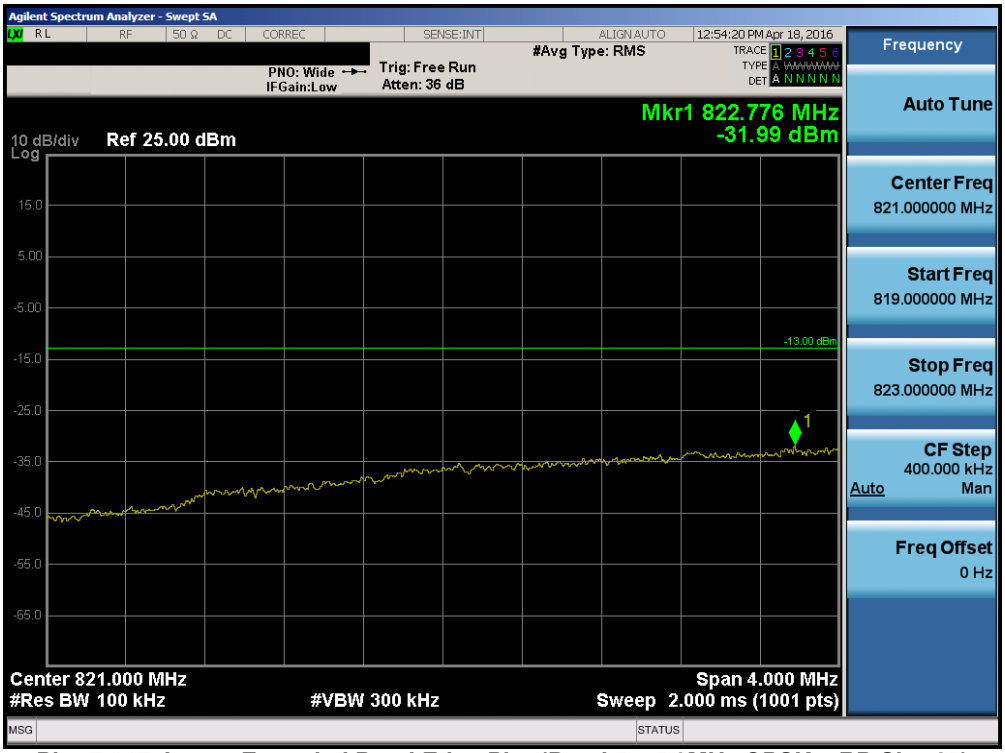
Plot 7-114. Upper Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)



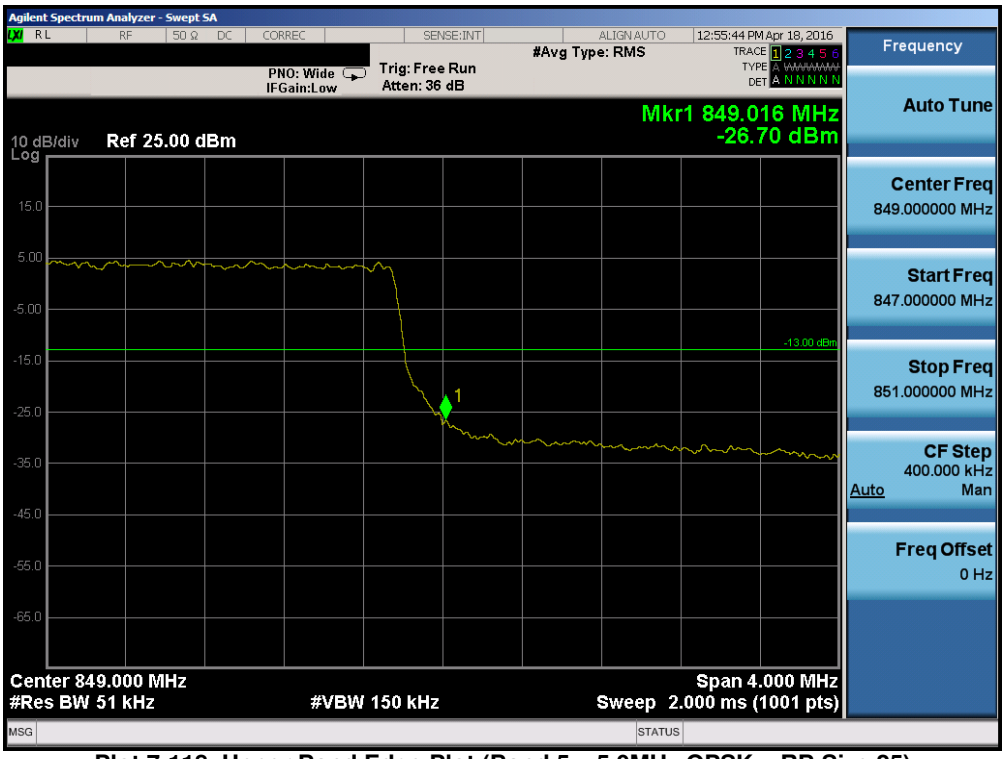
Plot 7-115. Upper Extended Band Edge Plot (Band 5 – Band 5 – 3.0MHz QPSK – RB Size 15)



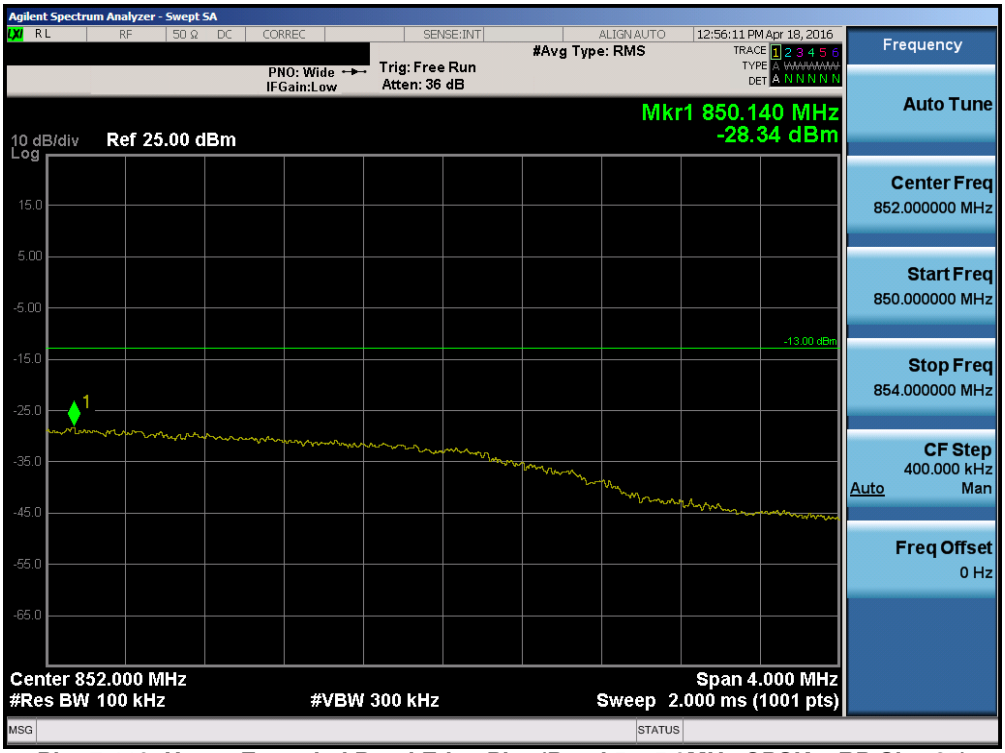
Plot 7-116. Lower Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)



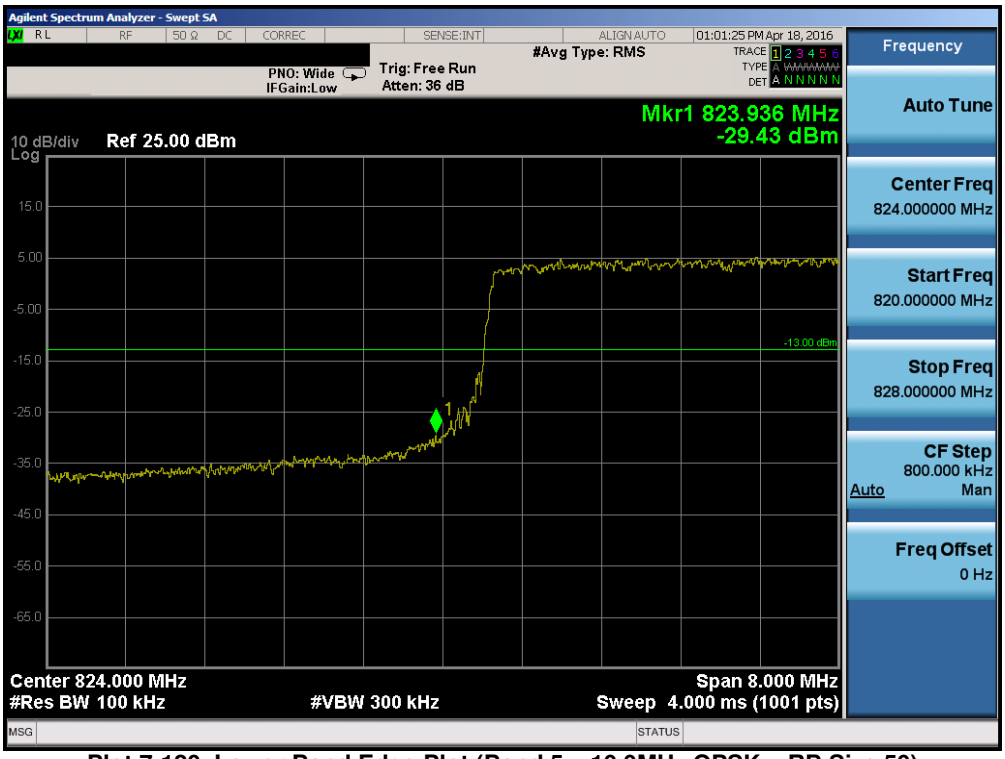
Plot 7-117. Lower Extended Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)



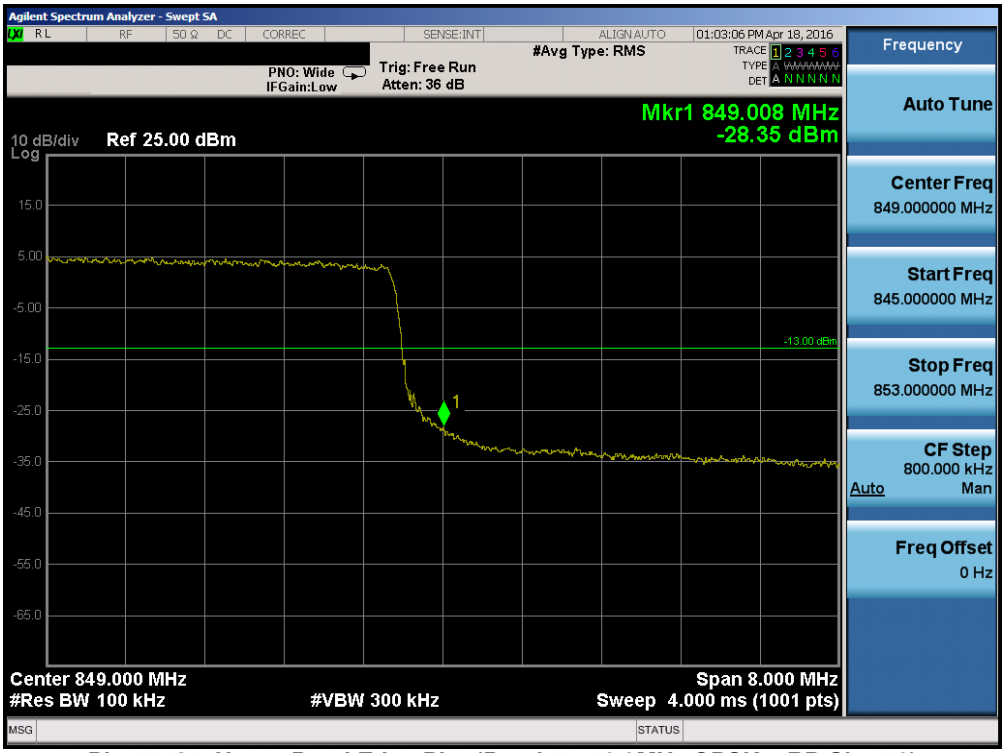
Plot 7-118. Upper Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)



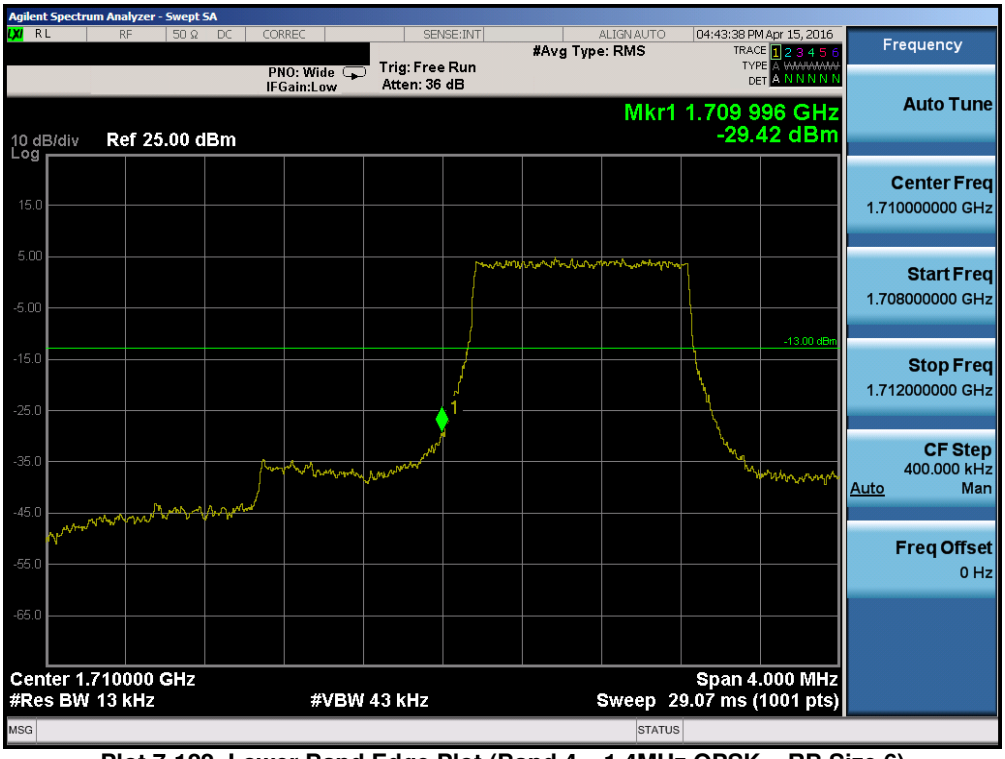
Plot 7-119. Upper Extended Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)



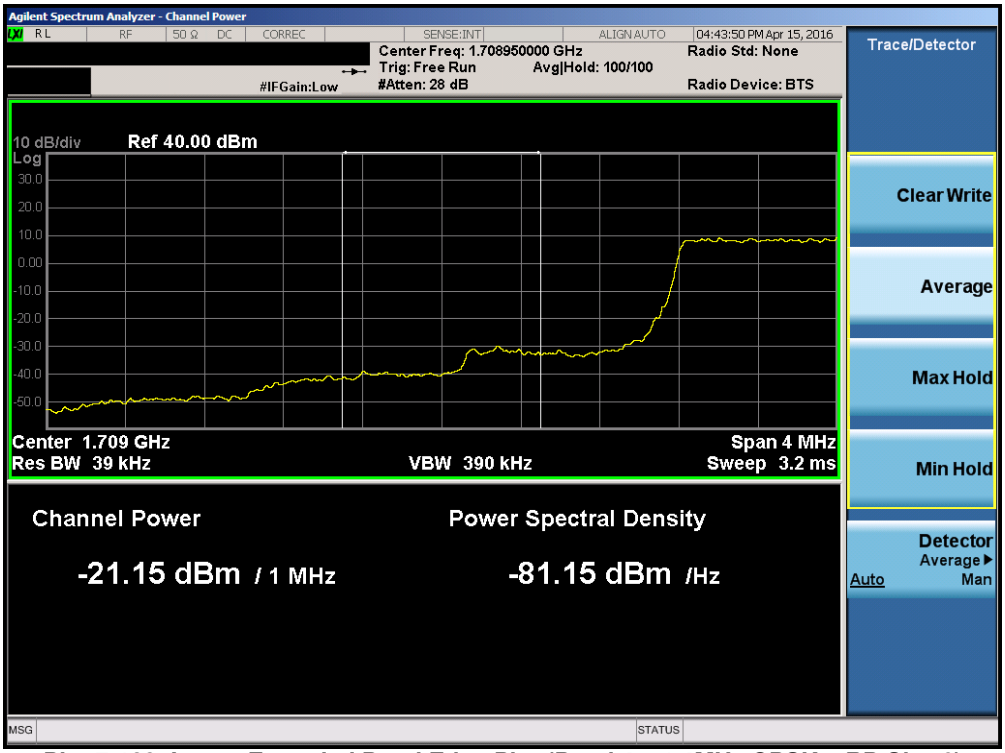
Plot 7-120. Lower Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)



Plot 7-121. Upper Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)

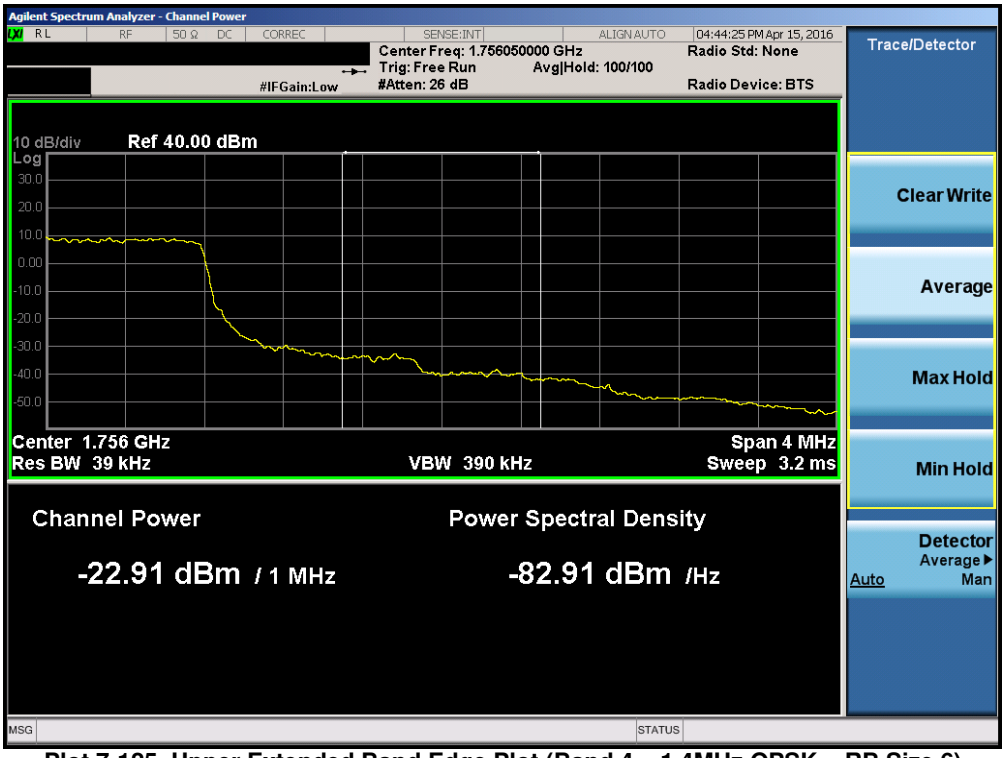


Plot 7-122. Lower Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

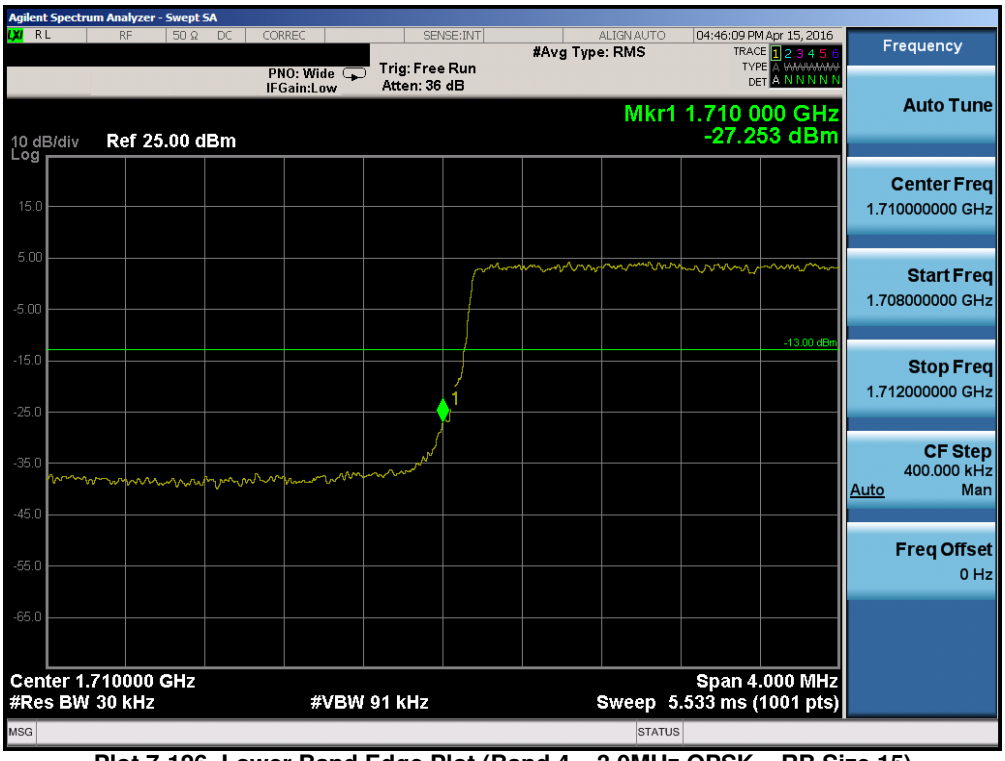


Plot 7-123. Lower Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

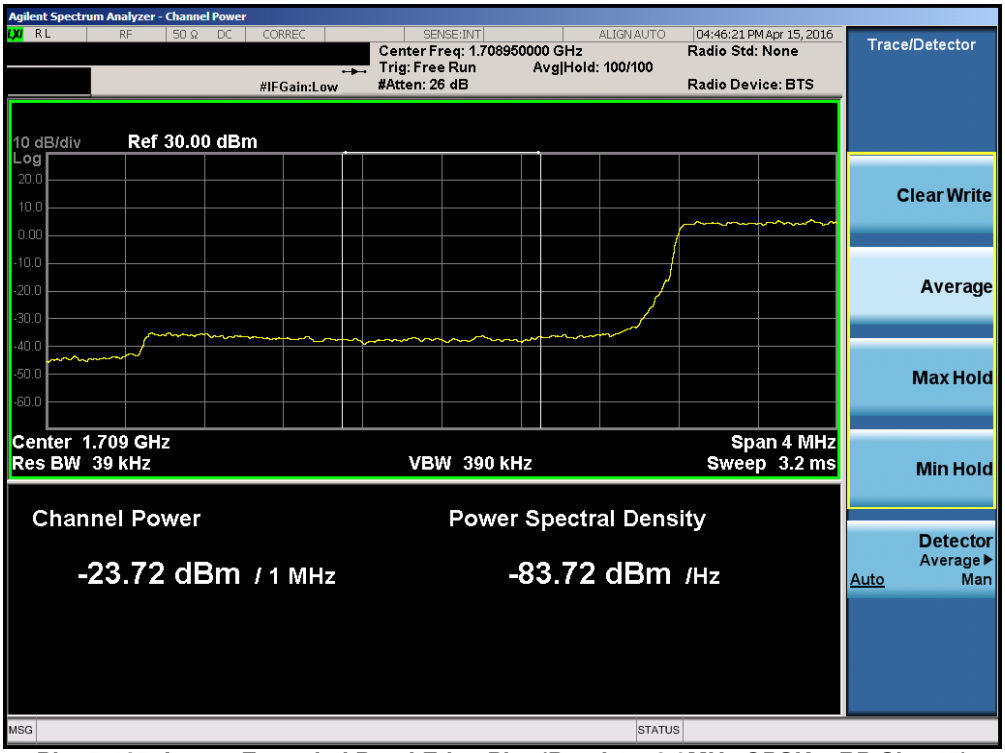
Plot 7-124. Upper Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



Plot 7-125. Upper Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

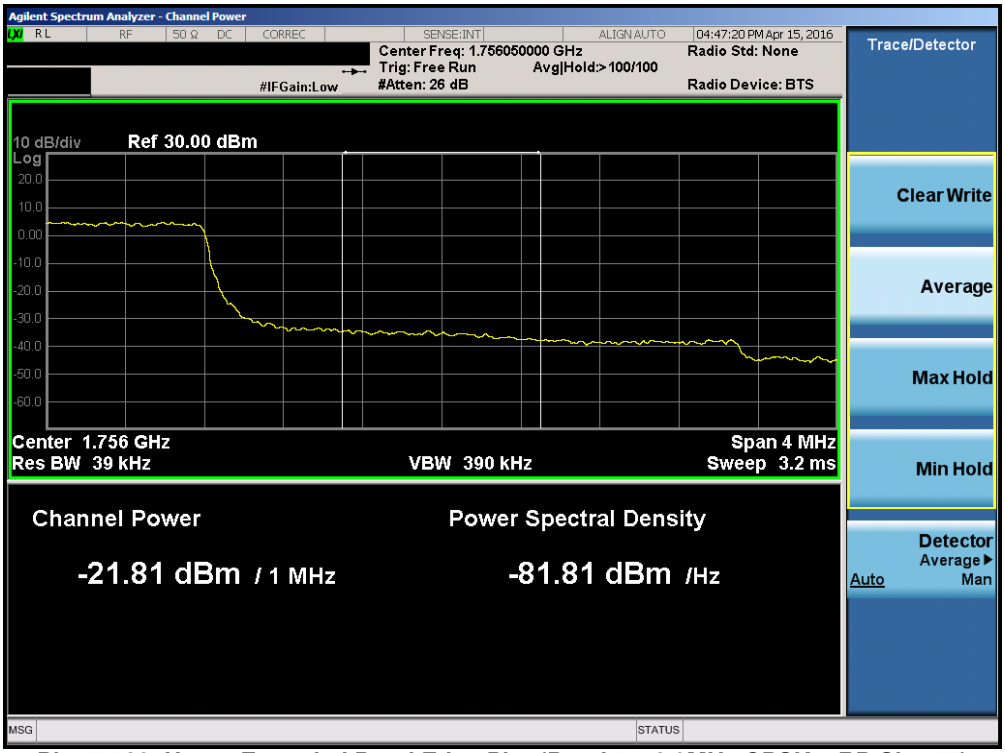


Plot 7-126. Lower Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

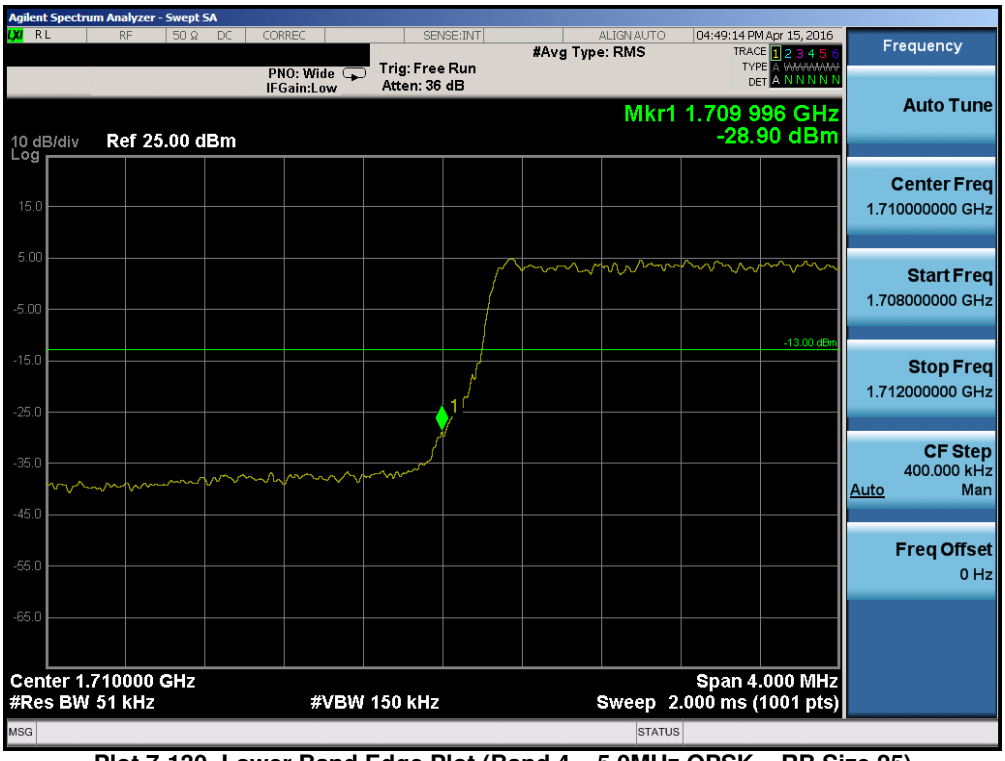


Plot 7-127. Lower Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

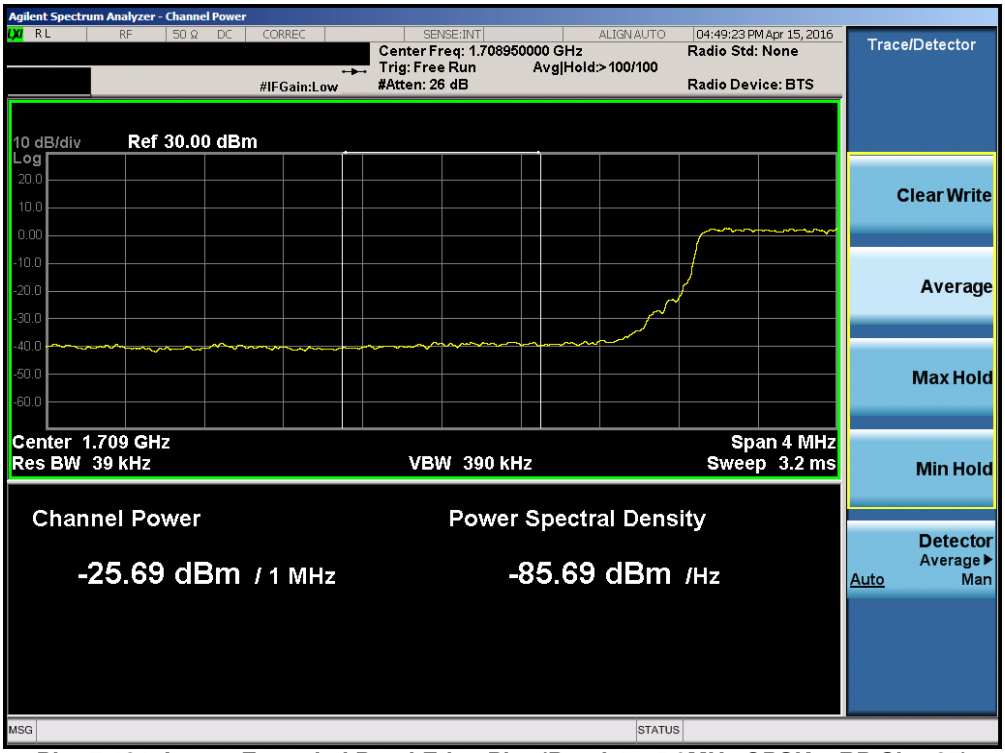
Plot 7-128. Upper Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



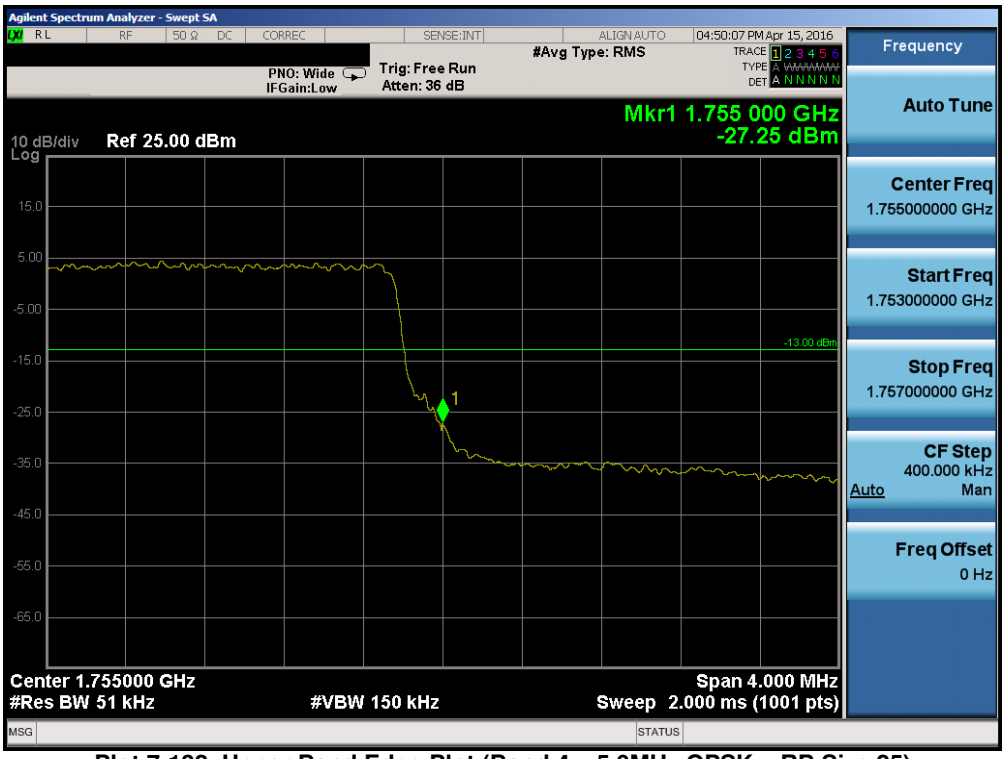
Plot 7-129. Upper Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



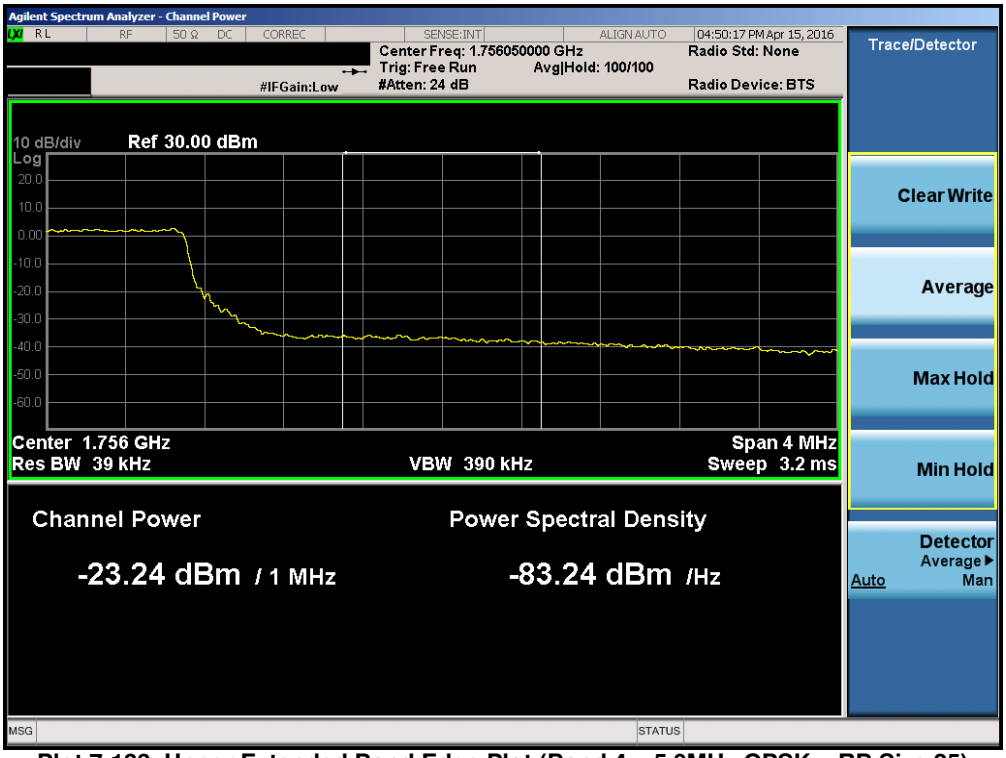
Plot 7-130. Lower Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



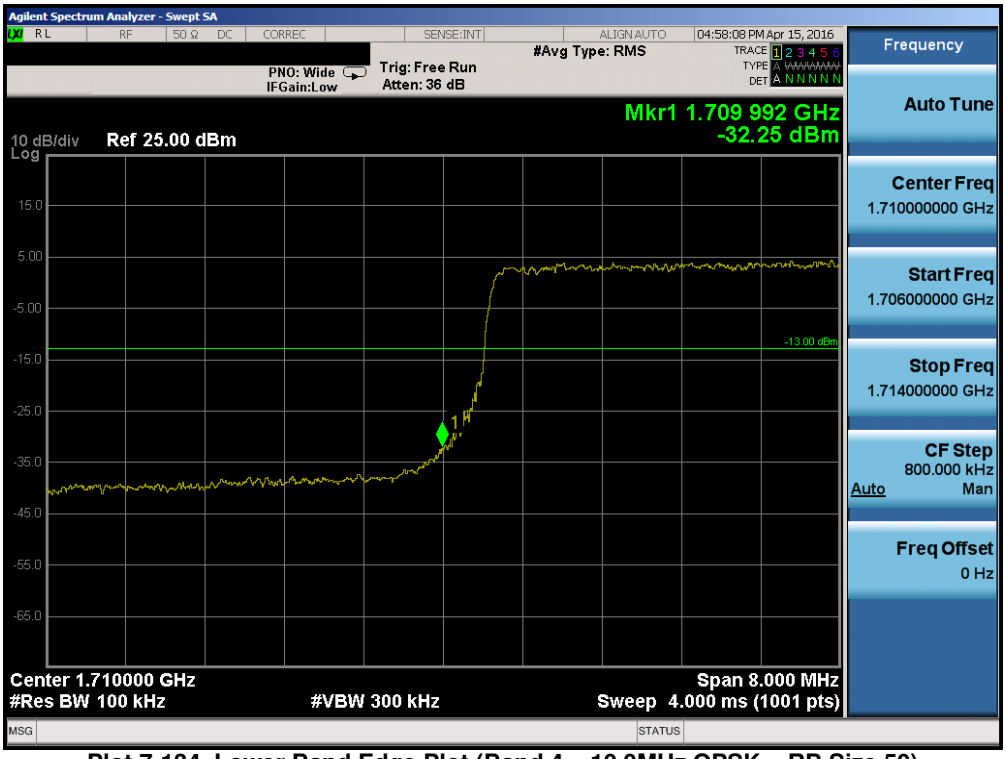
Plot 7-131. Lower Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



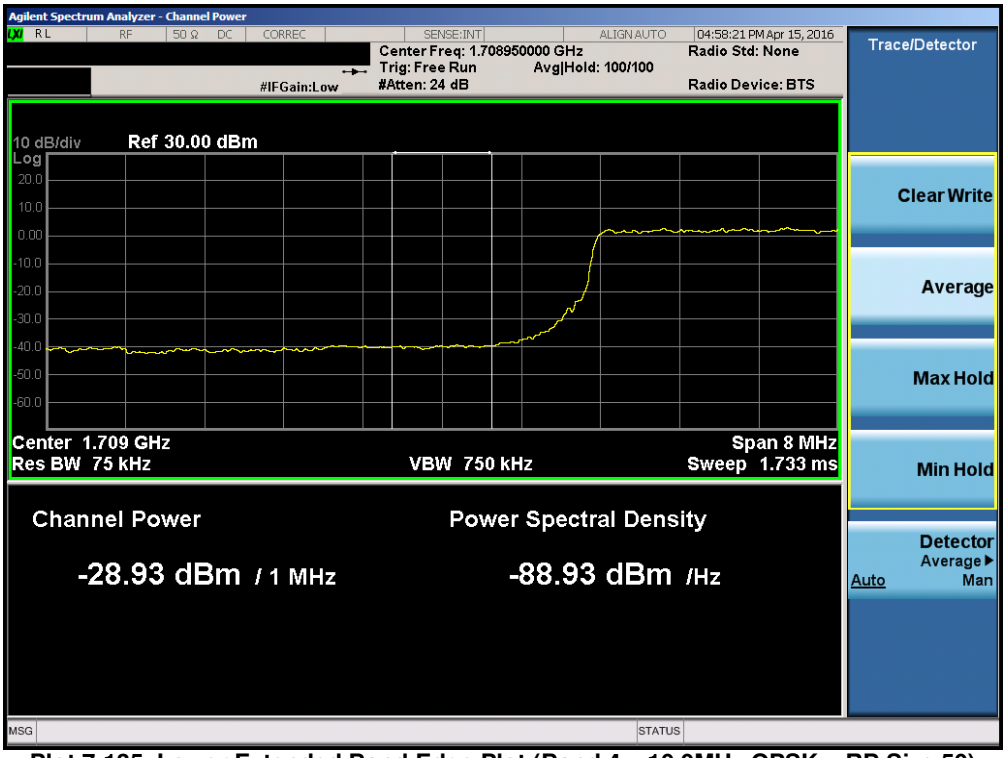
Plot 7-132. Upper Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



Plot 7-133. Upper Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

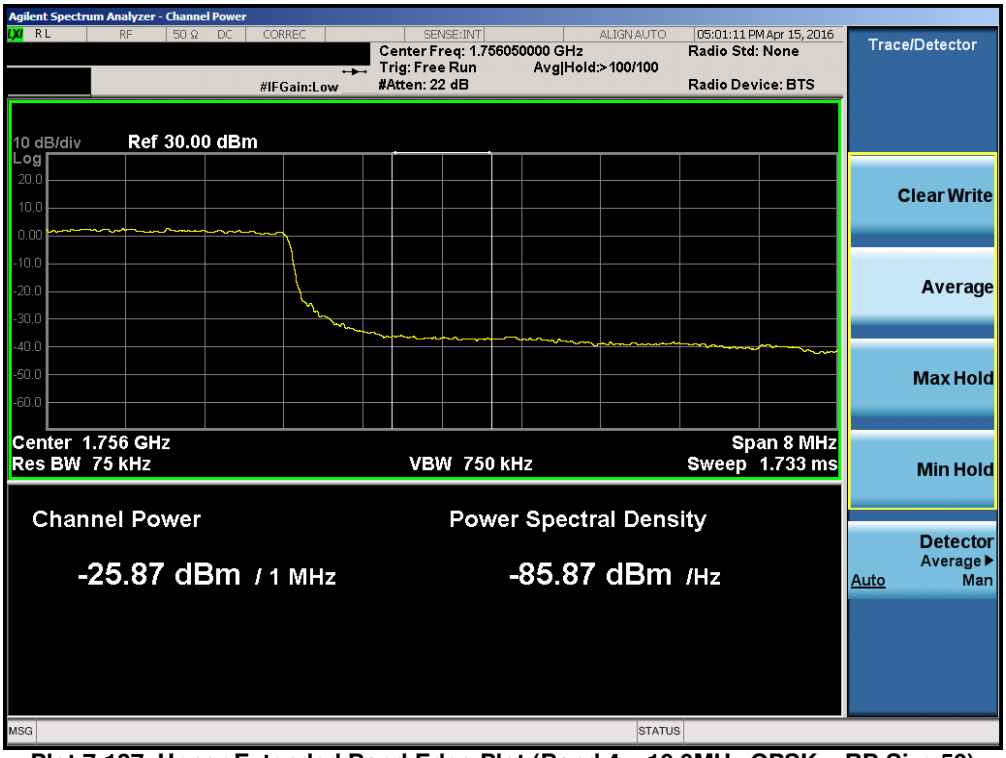


Plot 7-134. Lower Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

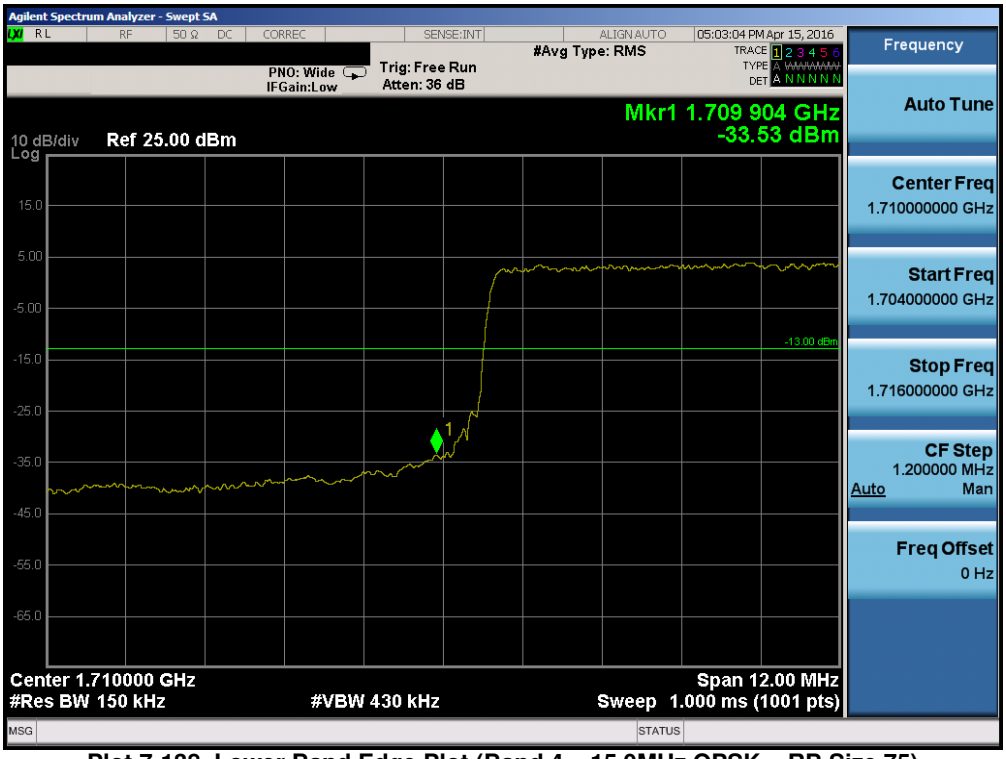


Plot 7-135. Lower Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

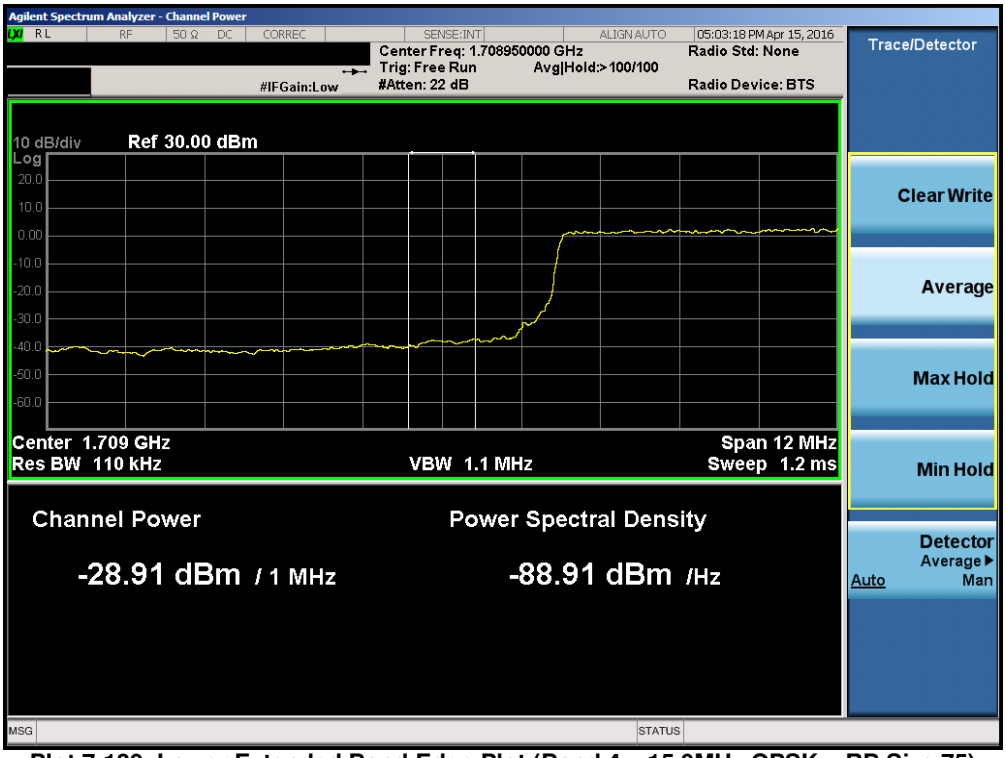
Plot 7-136. Upper Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)



Plot 7-137. Upper Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

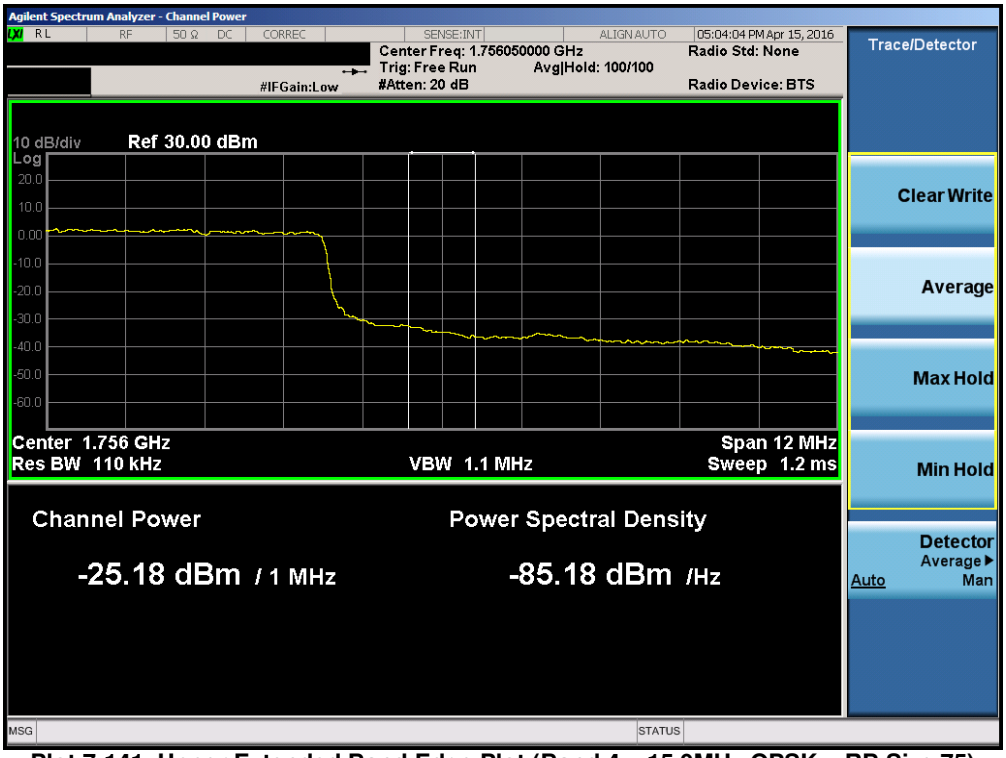


Plot 7-138. Lower Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

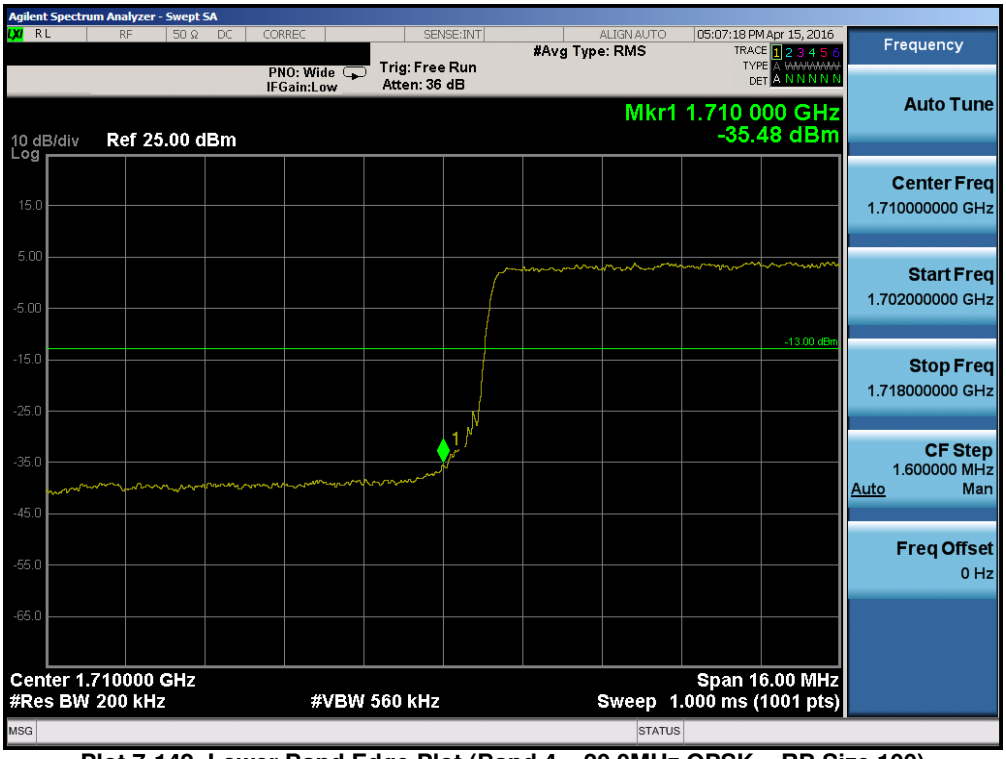


Plot 7-139. Lower Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

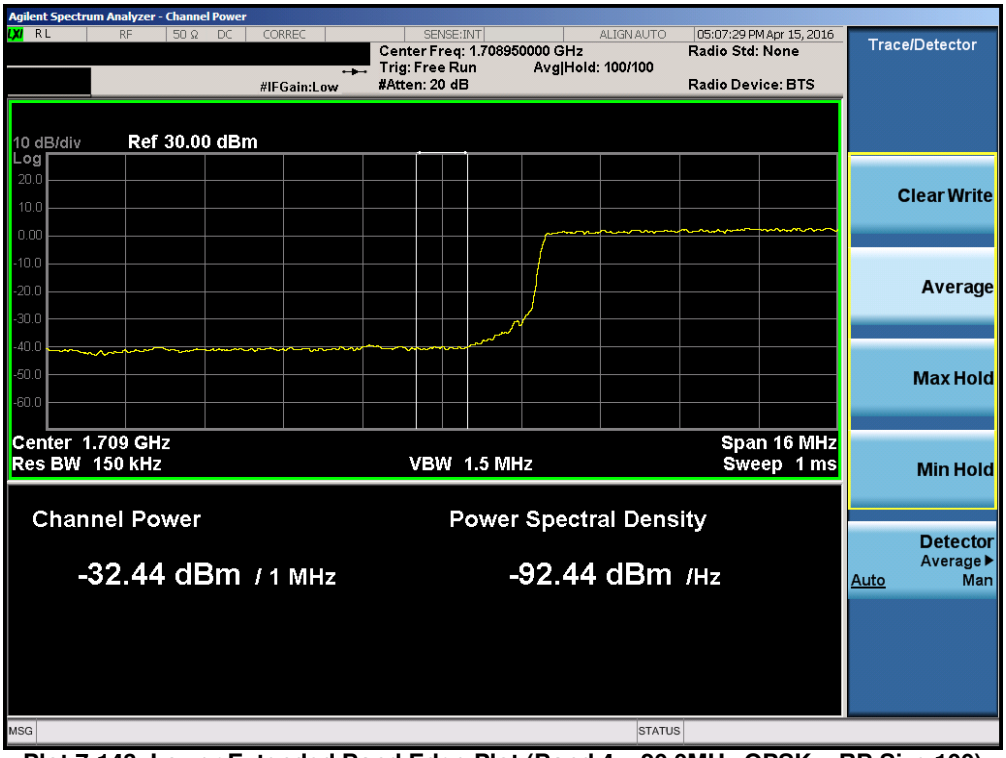
Plot 7-140. Upper Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)



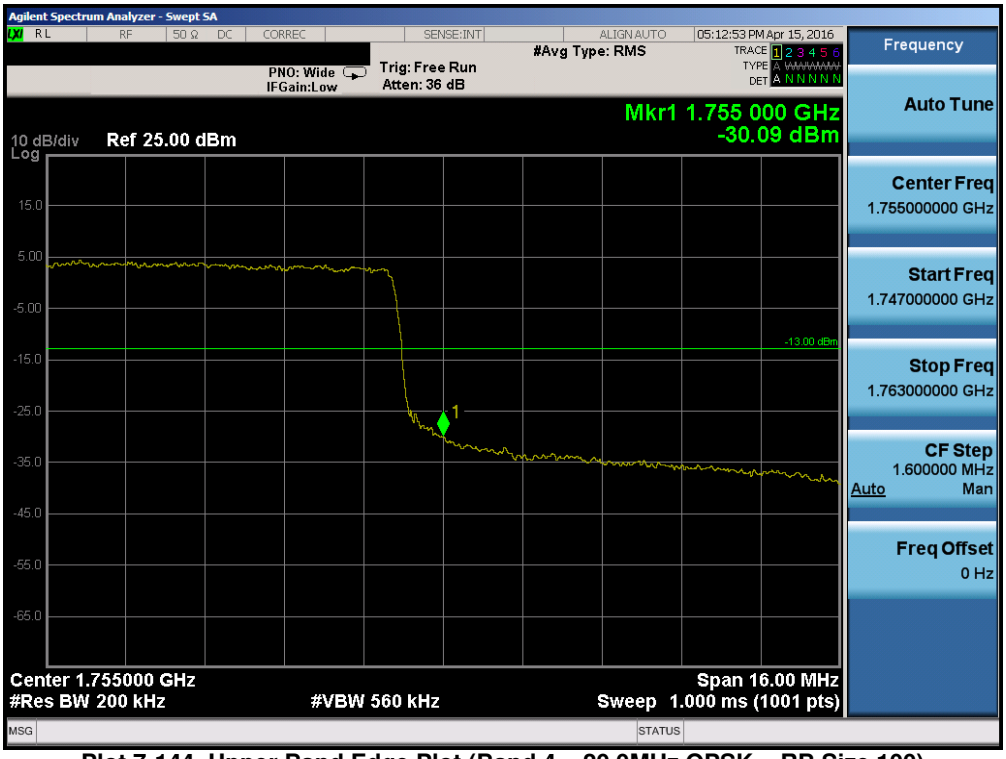
Plot 7-141. Upper Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)



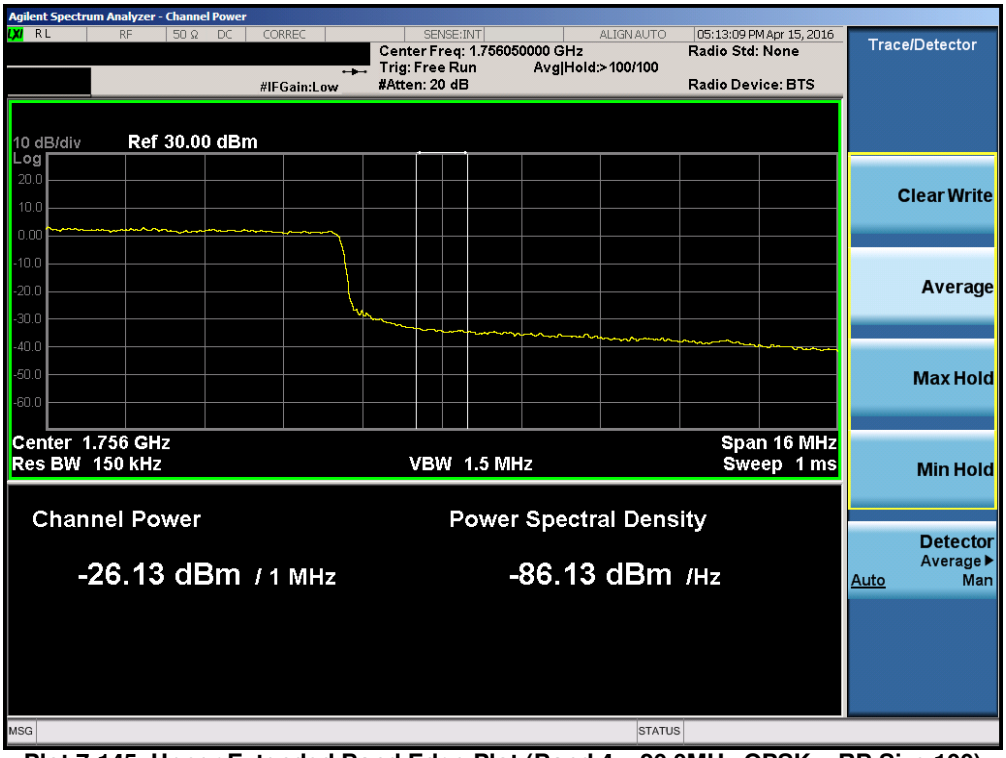
Plot 7-142. Lower Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



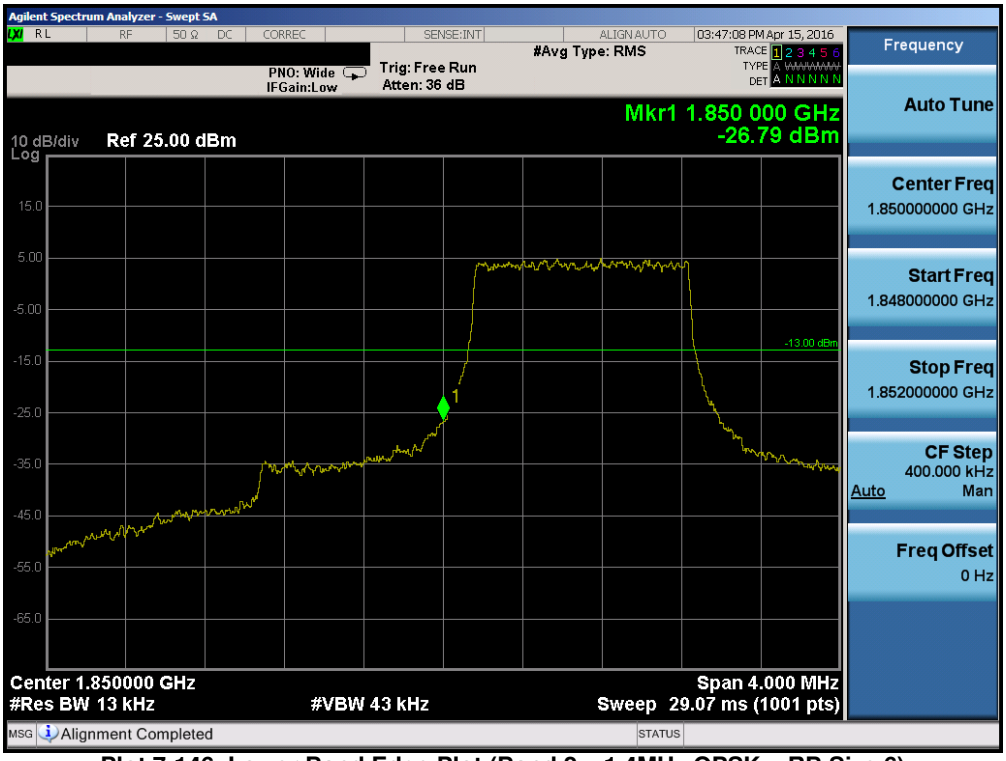
Plot 7-143. Lower Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



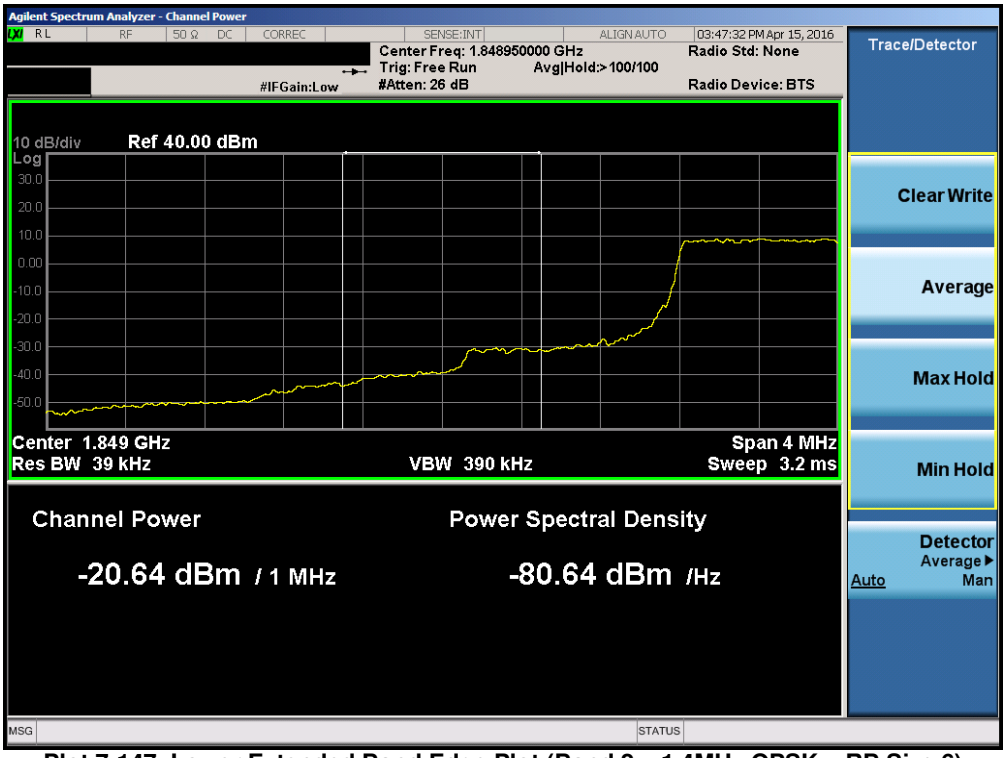
Plot 7-144. Upper Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



Plot 7-145. Upper Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

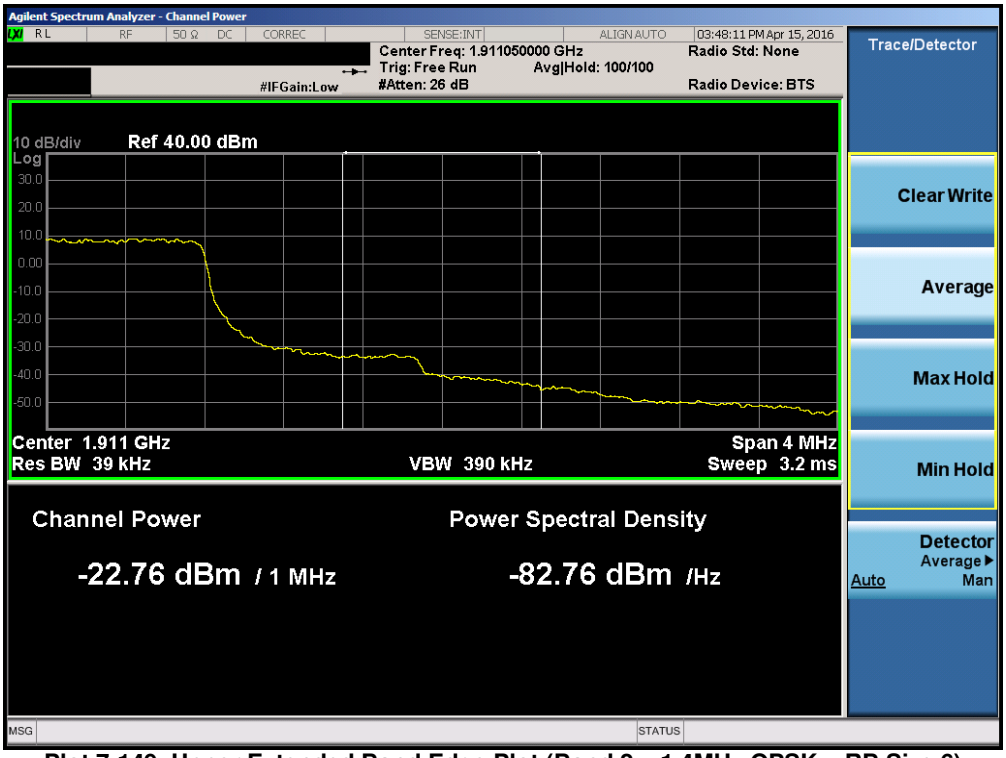


Plot 7-146. Lower Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

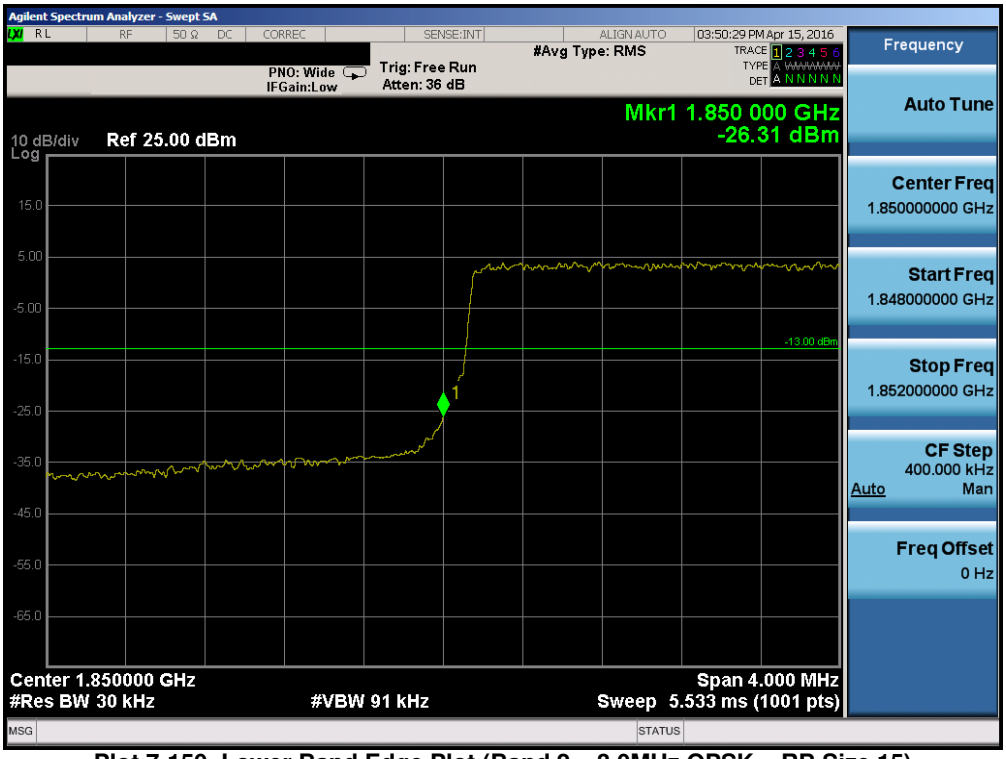


Plot 7-147. Lower Extended Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

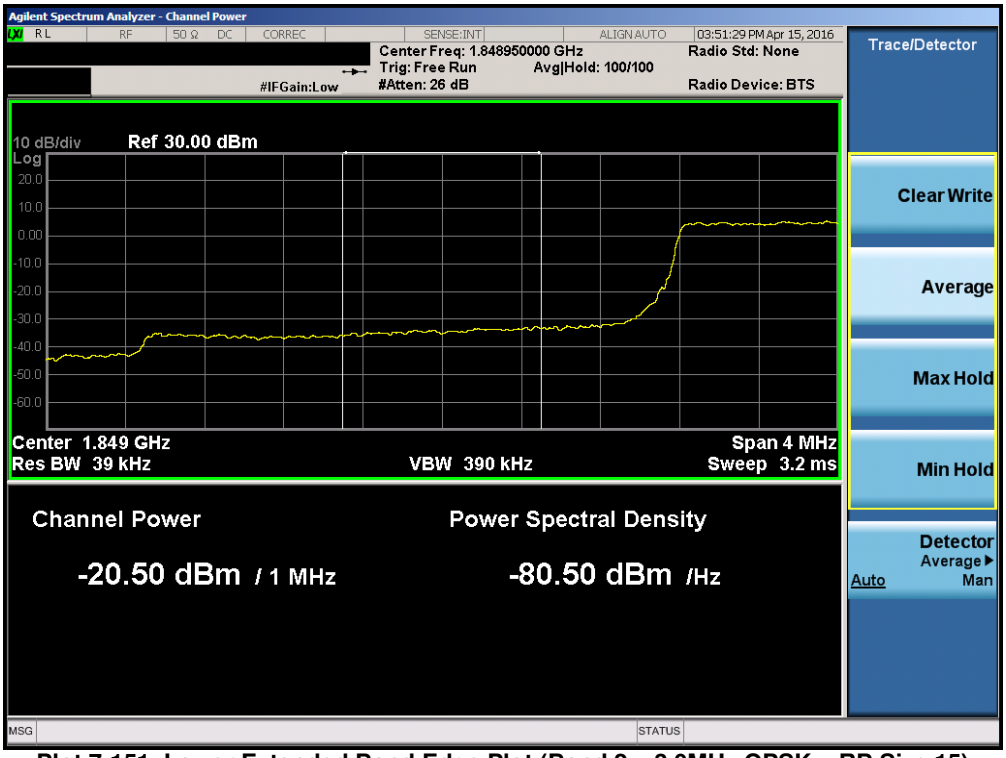
Plot 7-148. Upper Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)



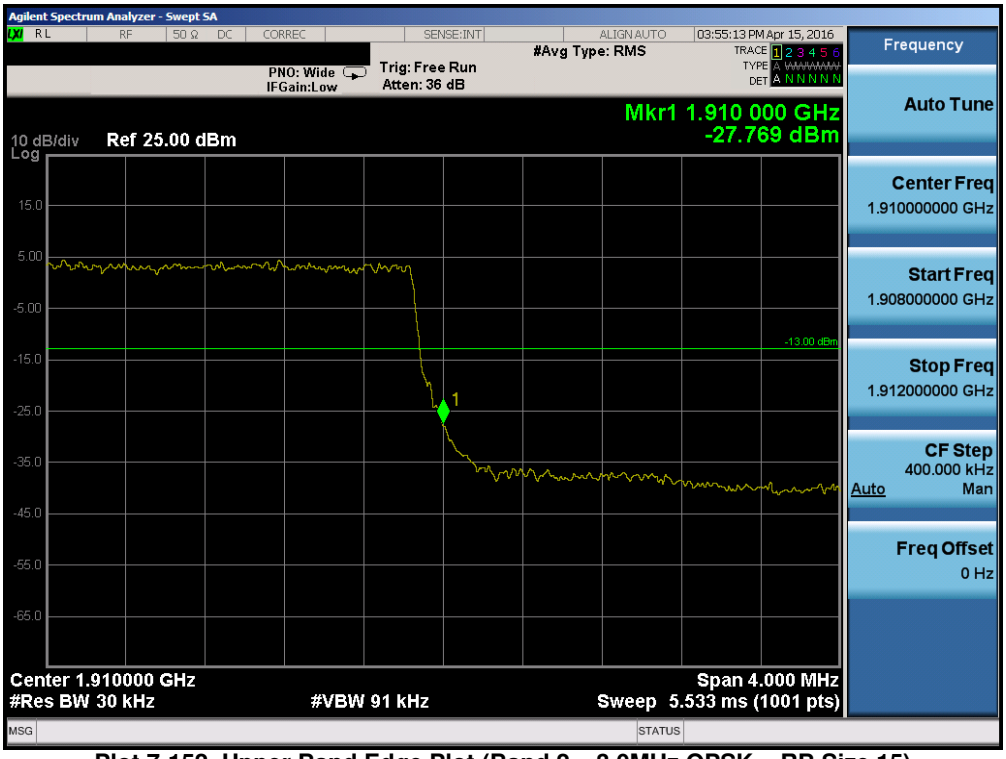
Plot 7-149. Upper Extended Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)



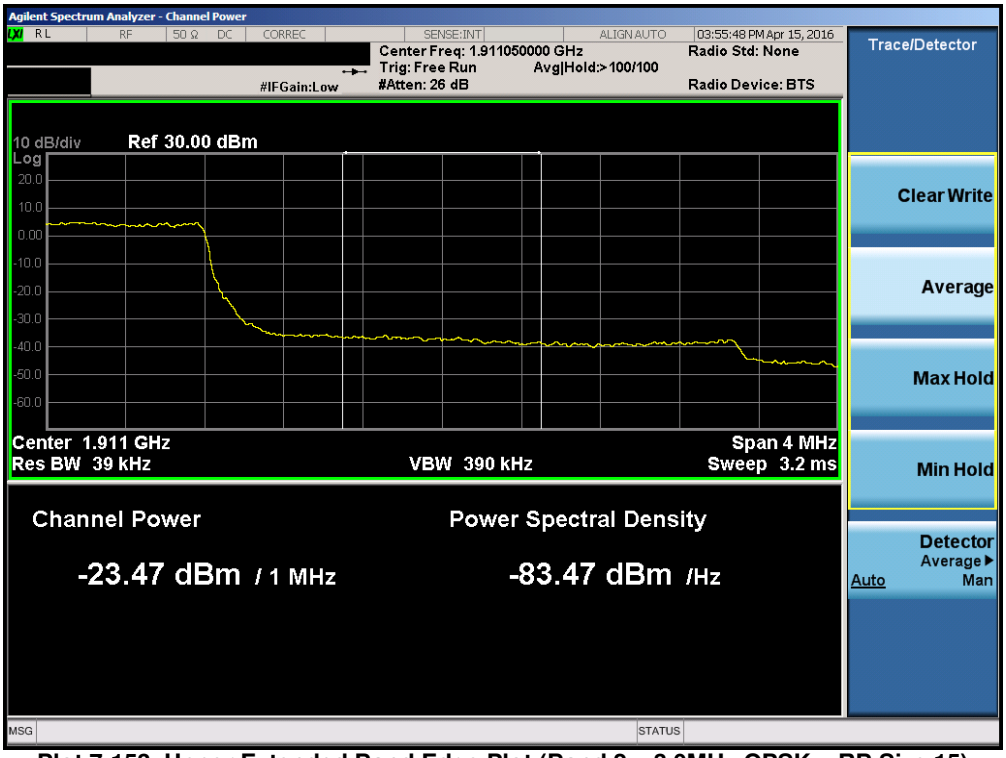
Plot 7-150. Lower Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)



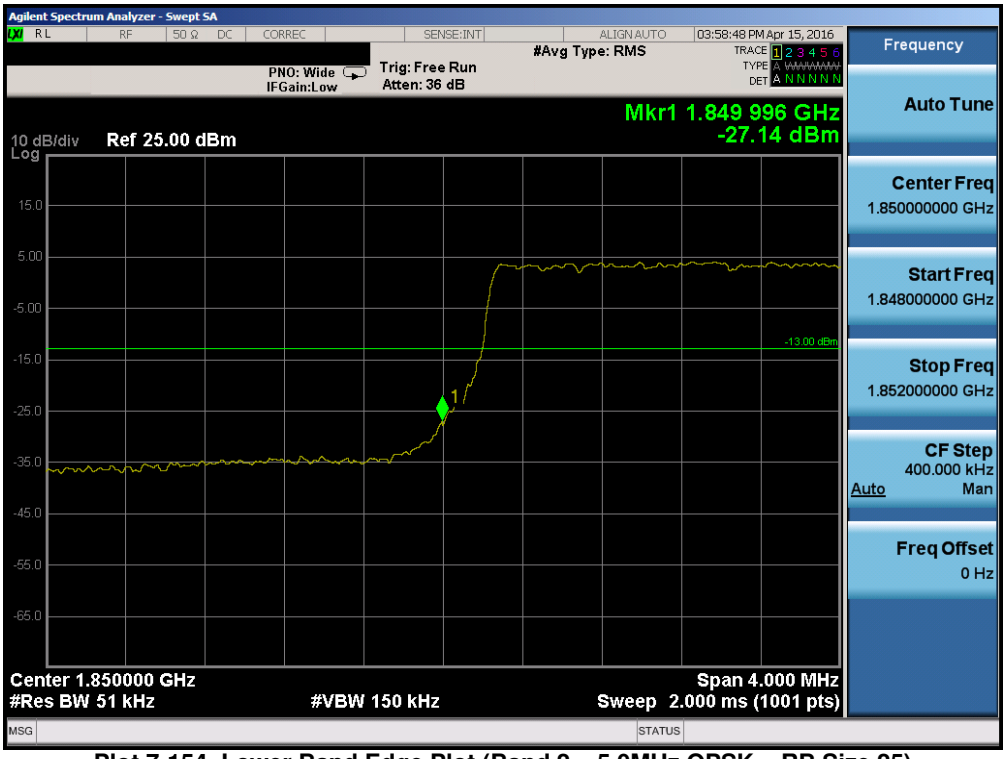
Plot 7-151. Lower Extended Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)



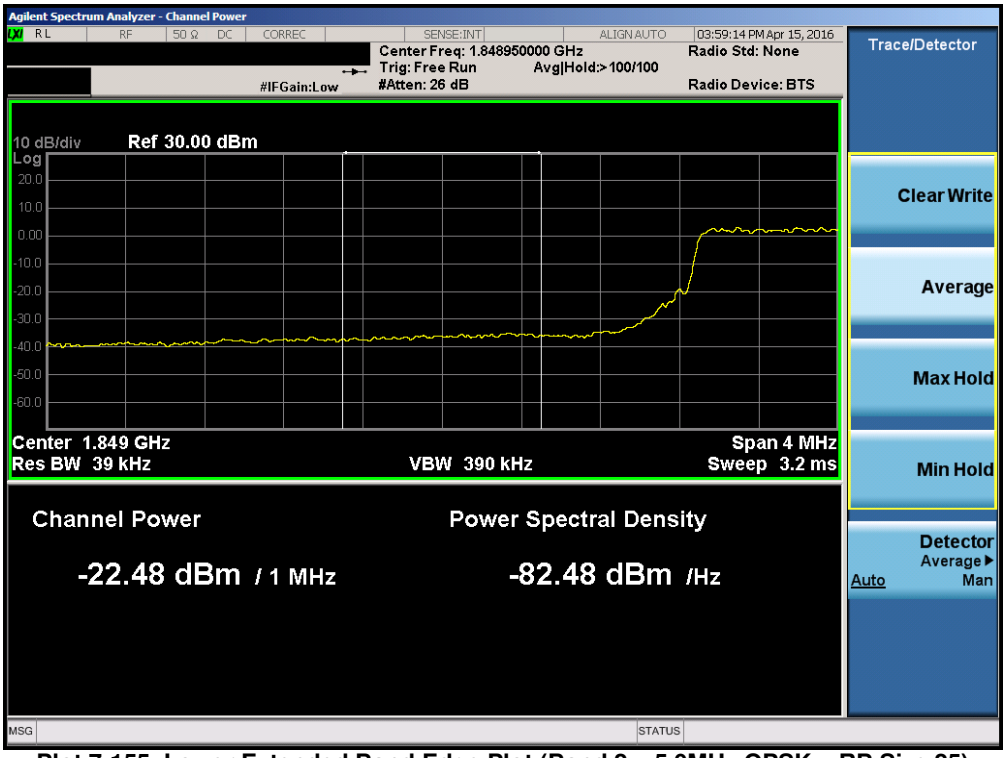
Plot 7-152. Upper Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)



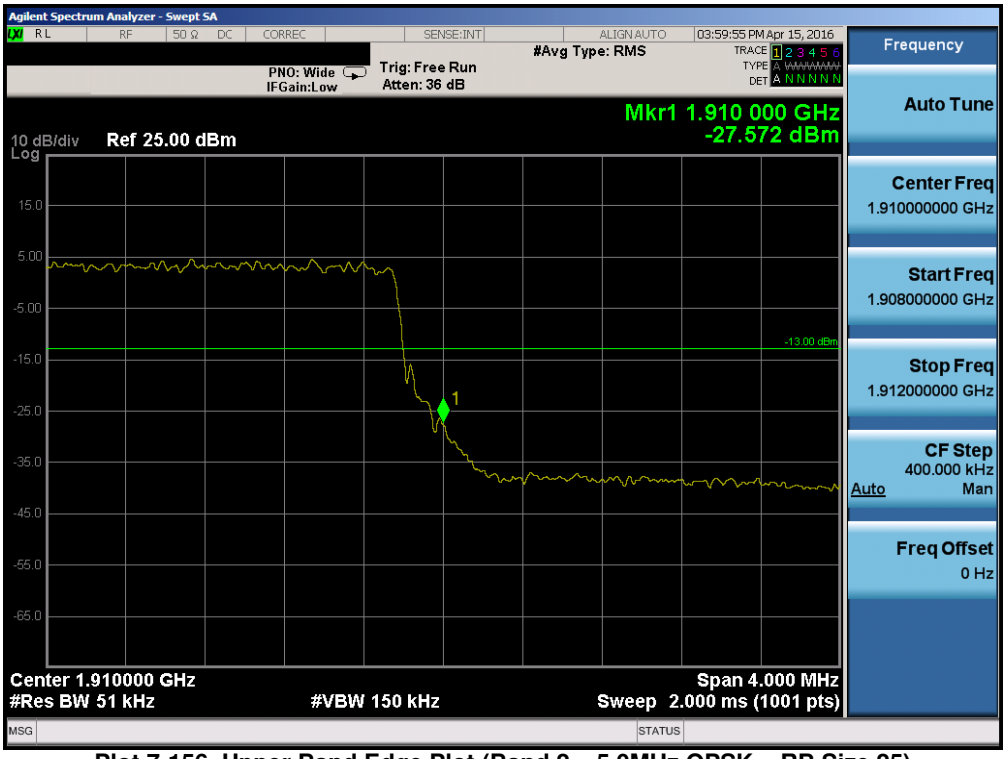
Plot 7-153. Upper Extended Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)



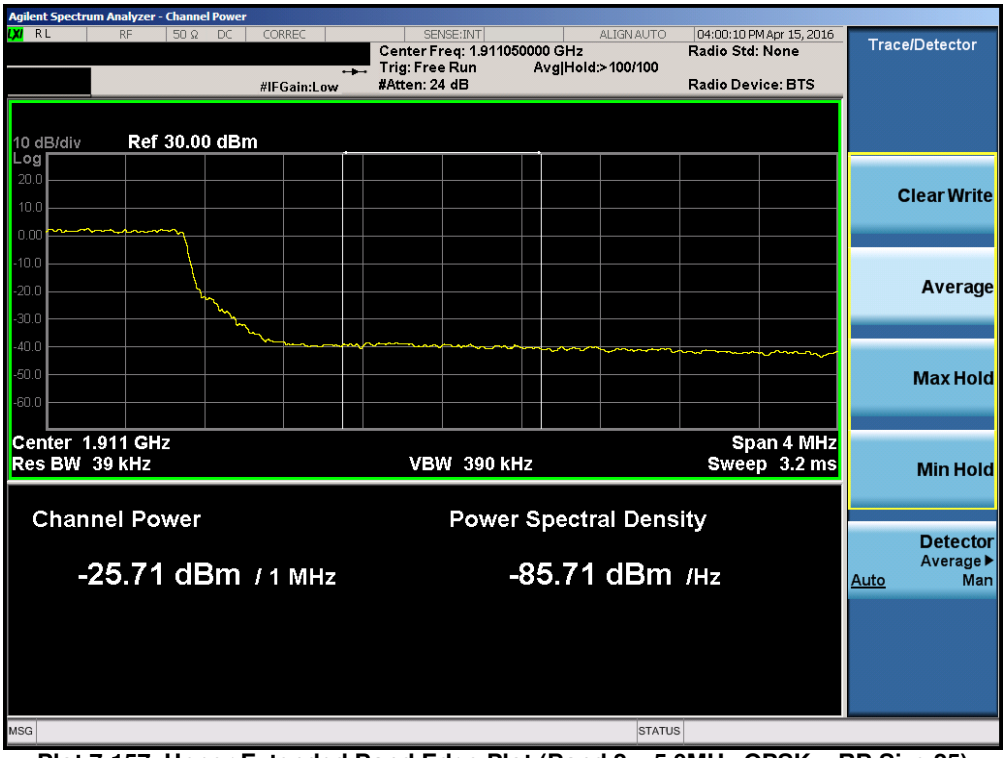
Plot 7-154. Lower Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)



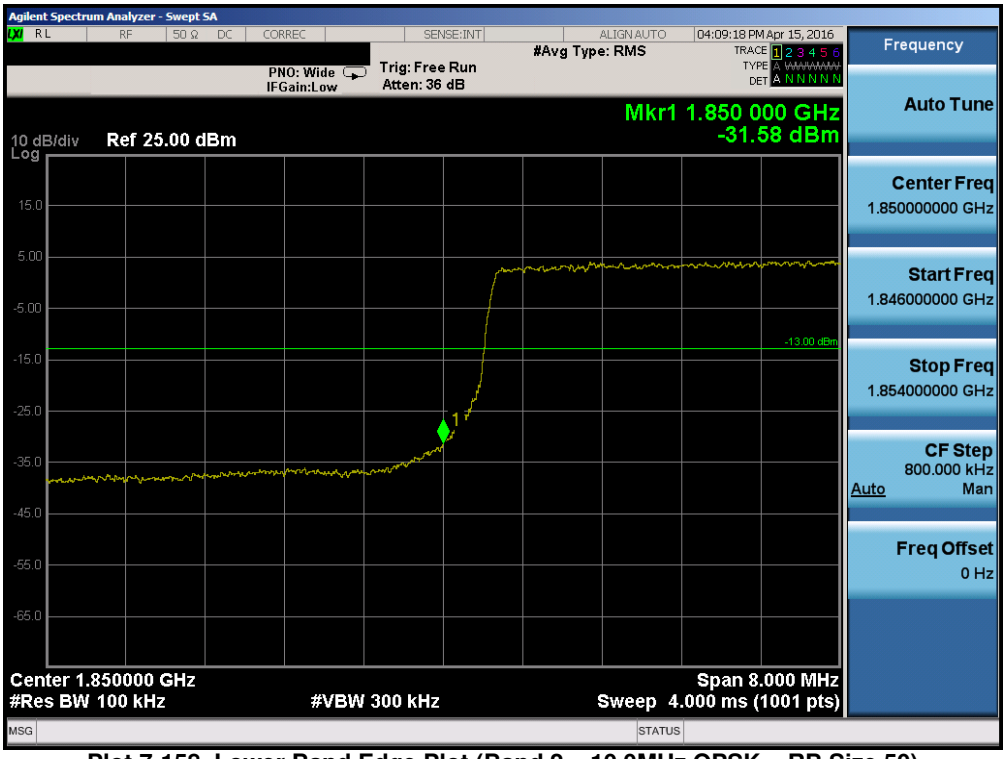
Plot 7-155. Lower Extended Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)



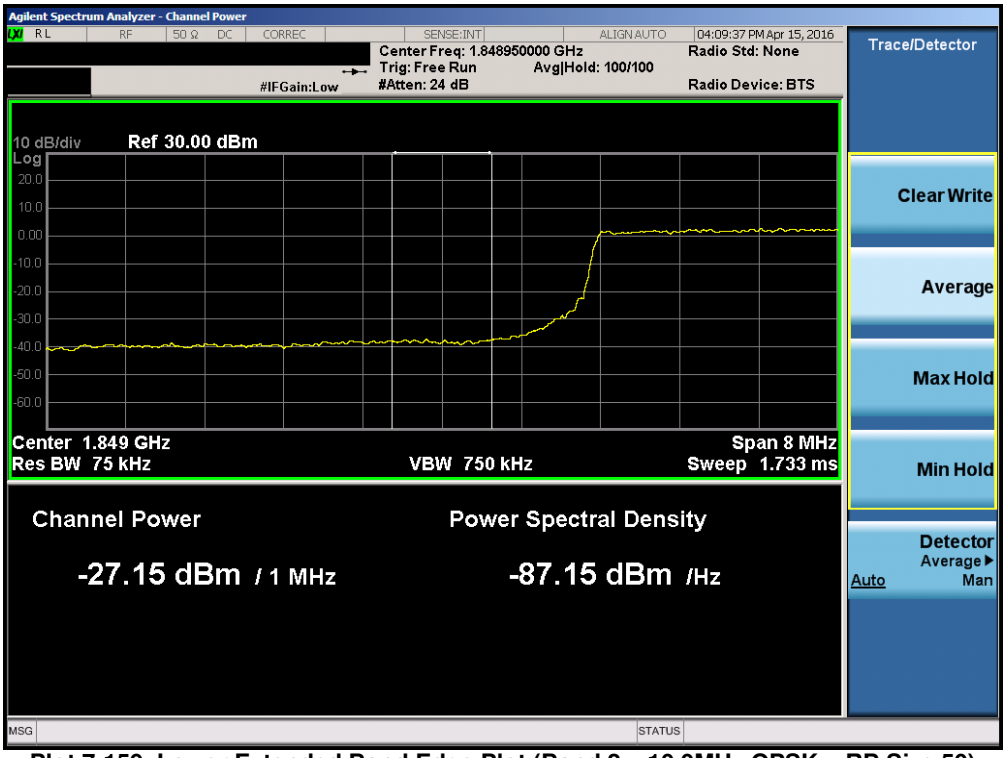
Plot 7-156. Upper Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)



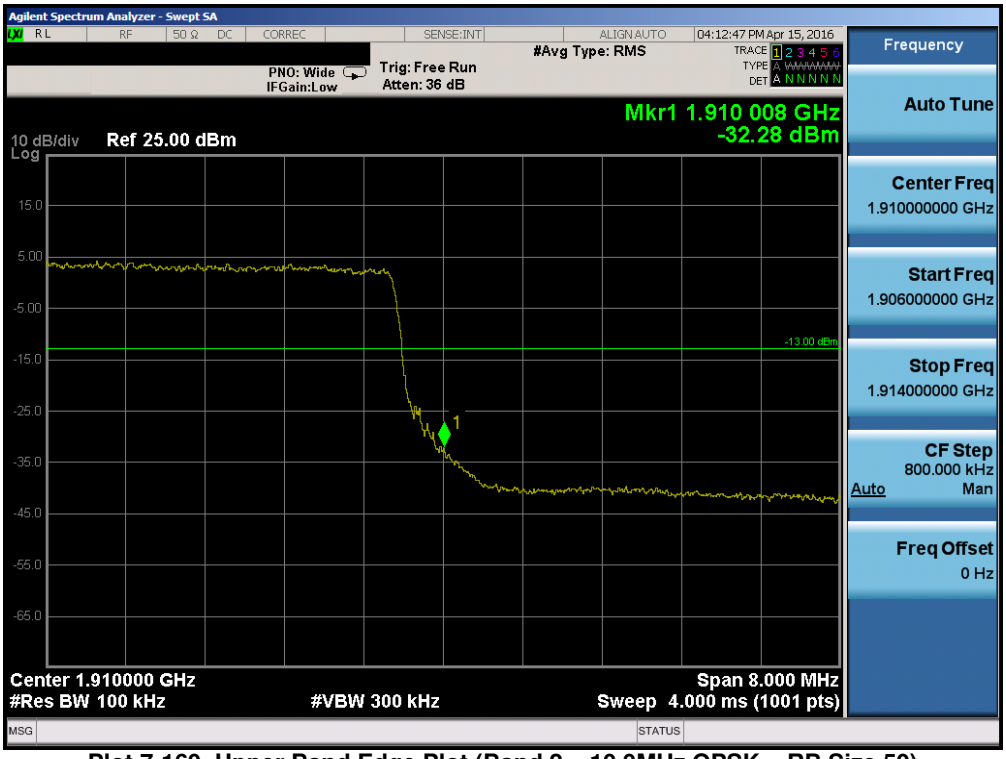
Plot 7-157. Upper Extended Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)



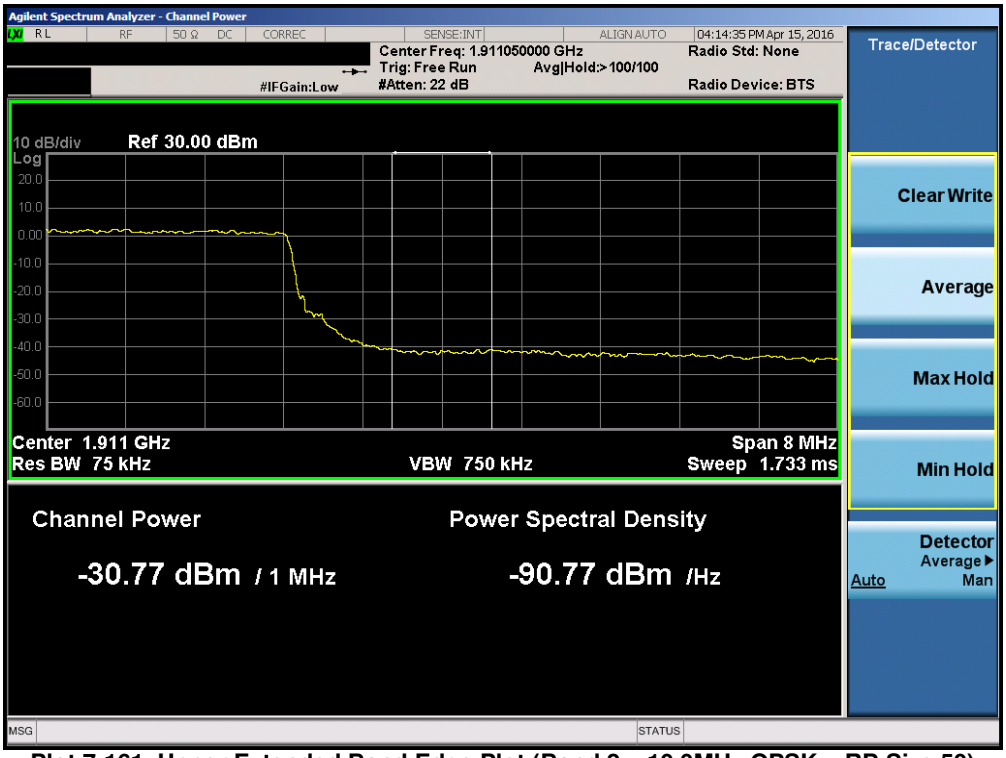
Plot 7-158. Lower Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)



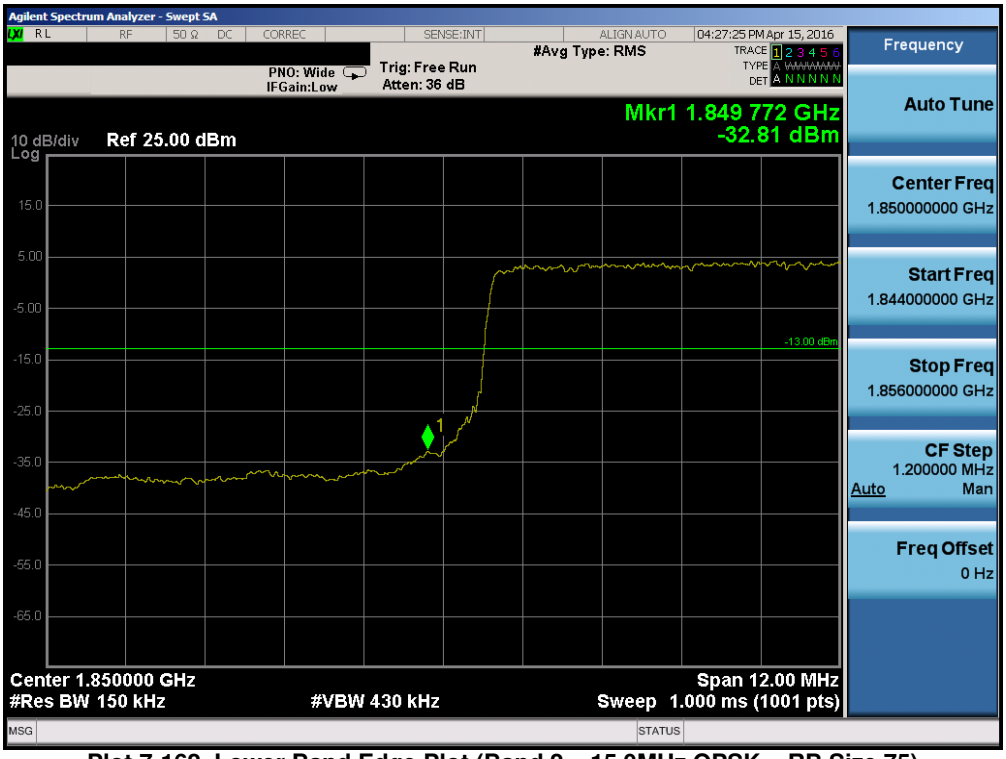
Plot 7-159. Lower Extended Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)



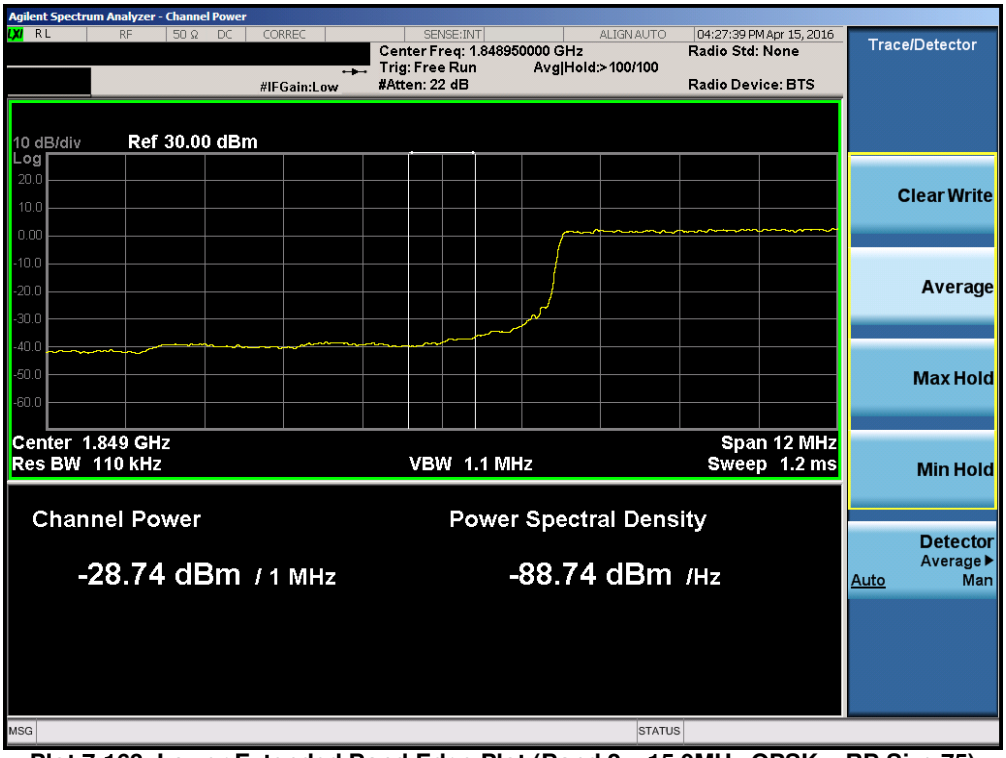
Plot 7-160. Upper Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)



Plot 7-161. Upper Extended Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

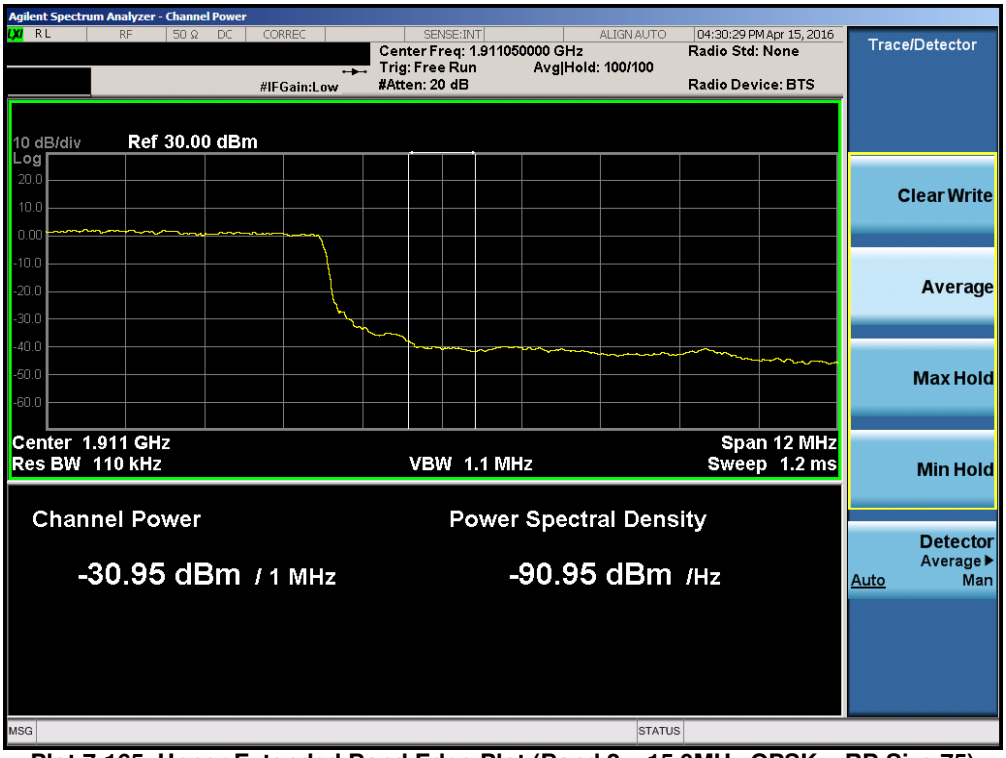


Plot 7-162. Lower Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

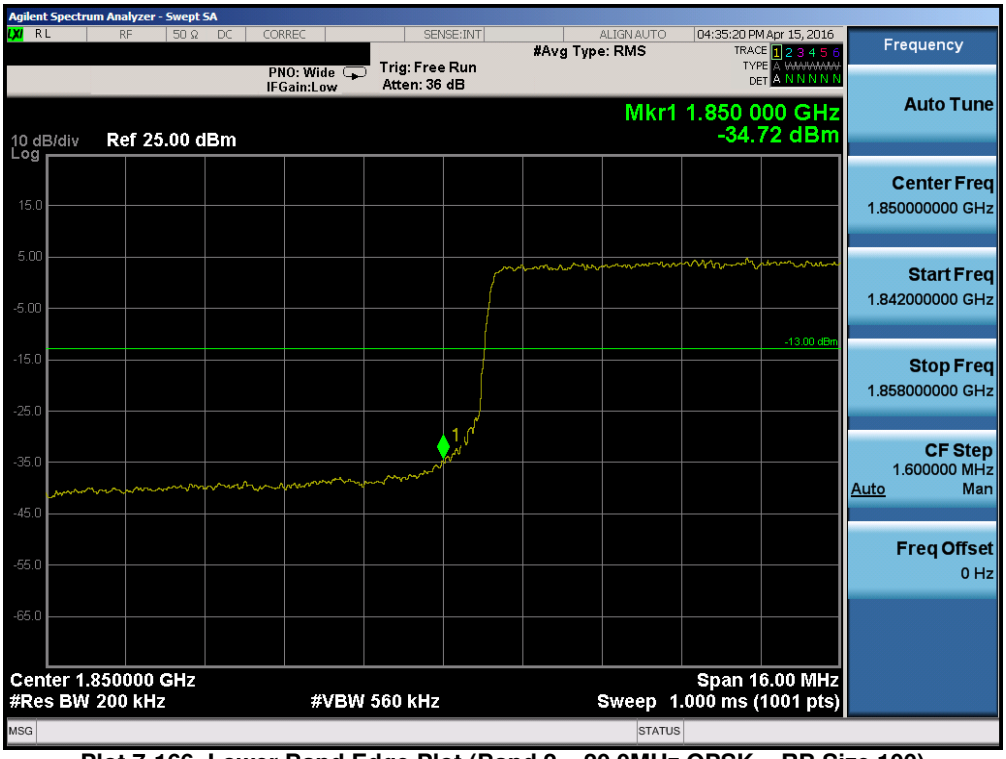


Plot 7-163. Lower Extended Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

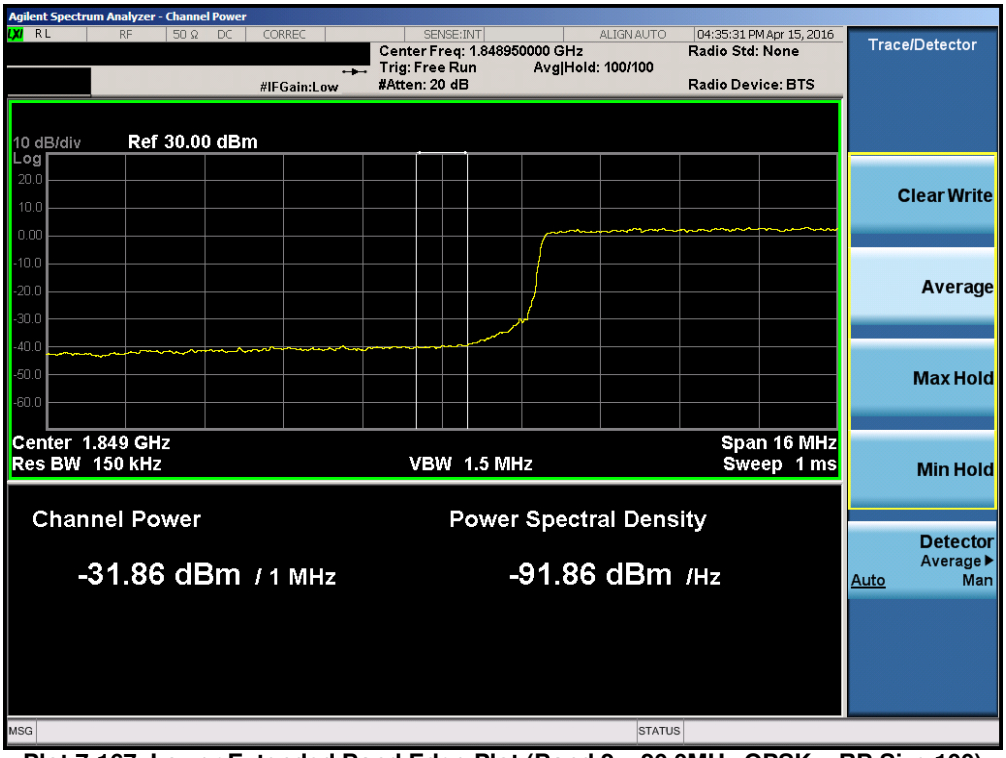
Plot 7-164. Upper Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)



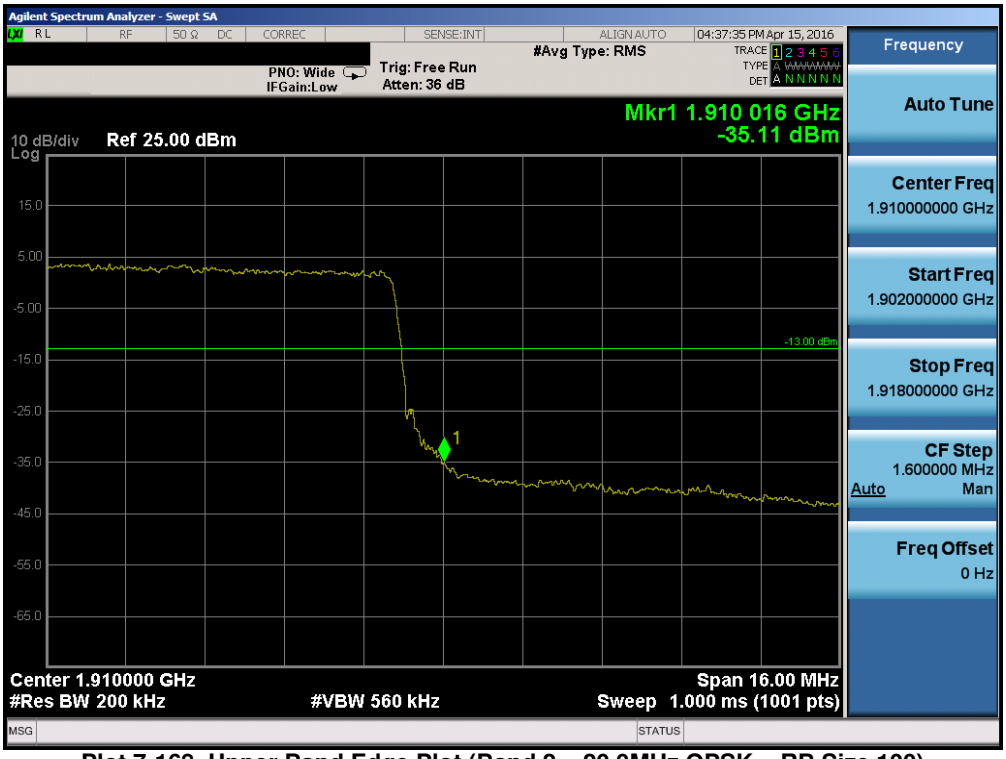
Plot 7-165. Upper Extended Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)



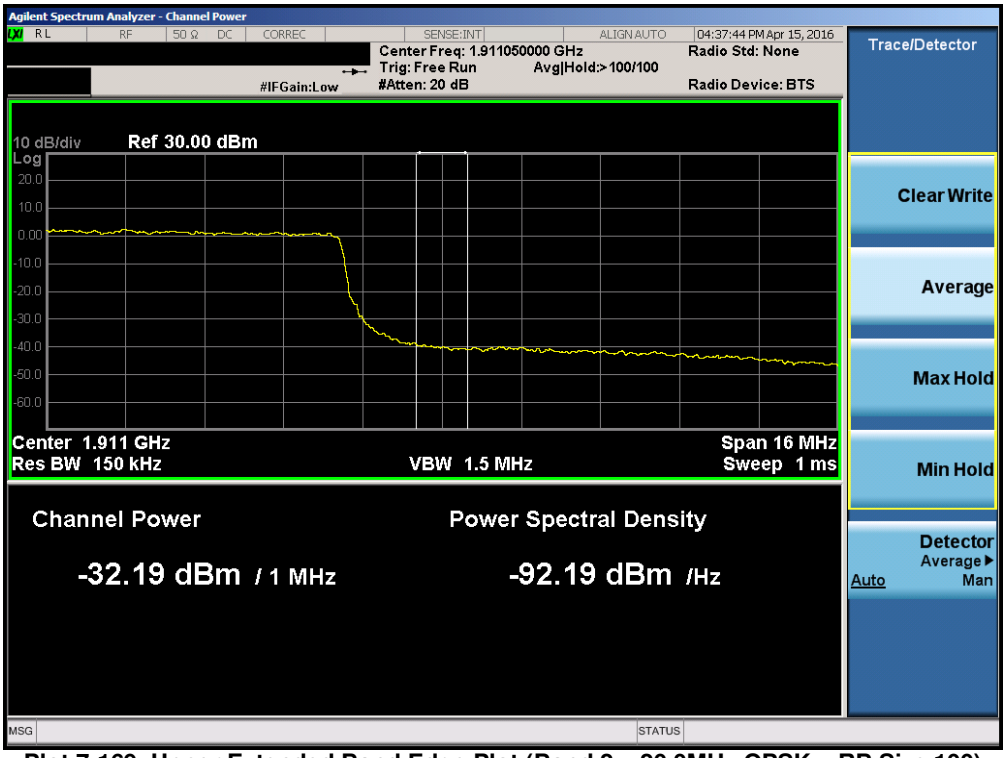
Plot 7-166. Lower Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



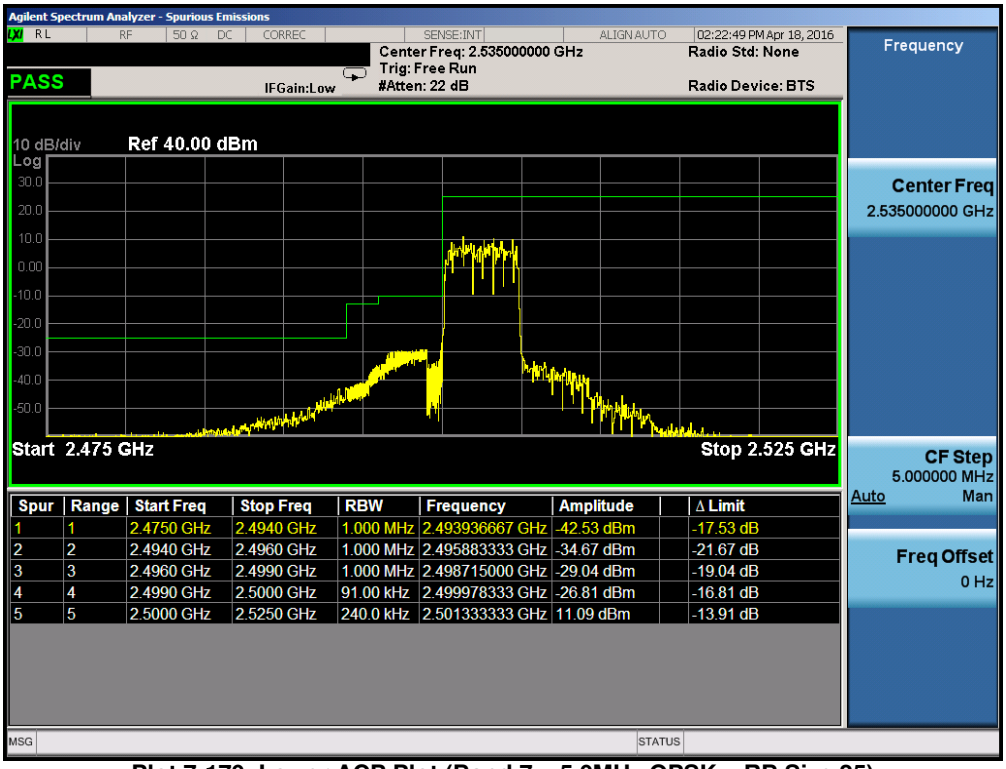
Plot 7-167. Lower Extended Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



Plot 7-168. Upper Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)

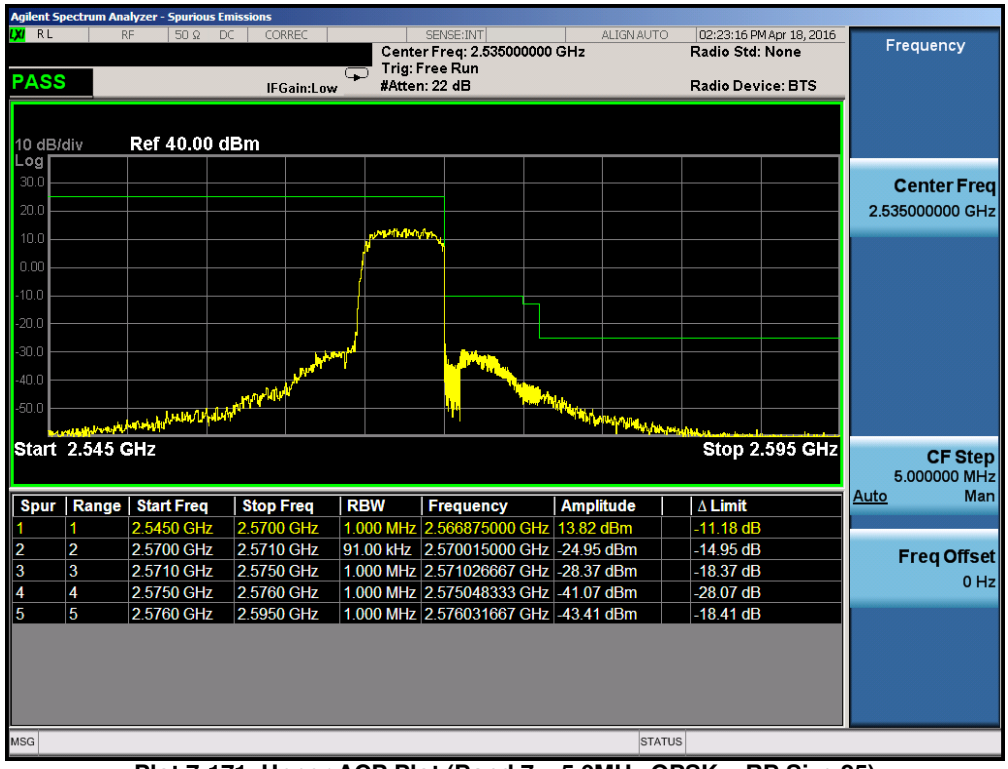


Plot 7-169. Upper Extended Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)

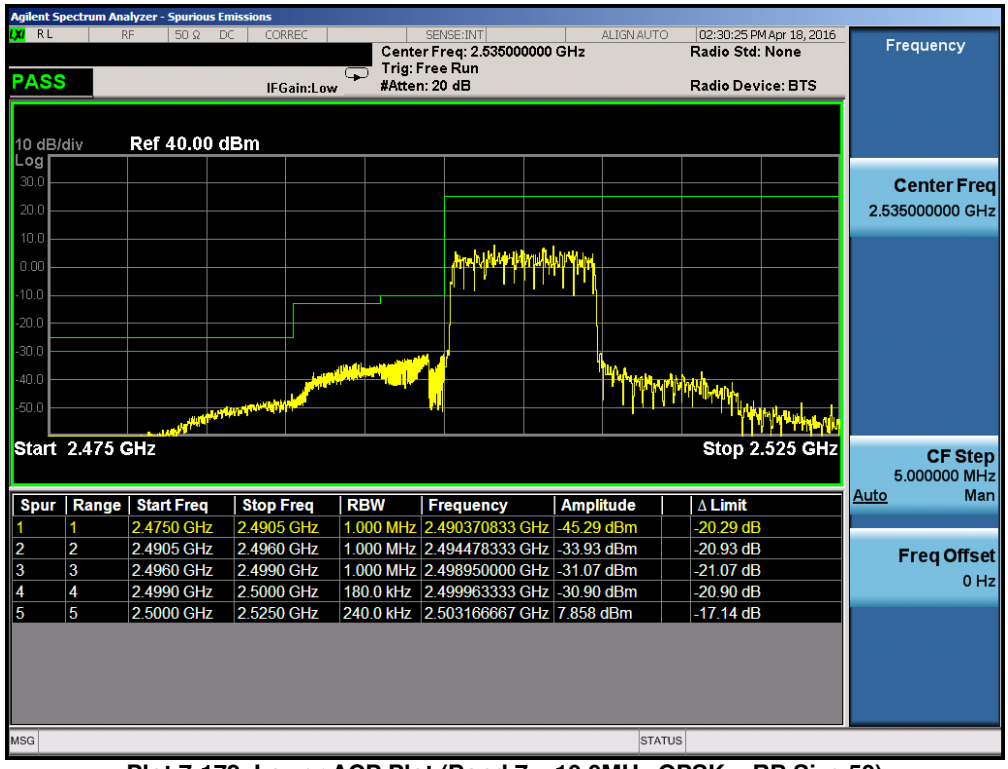


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4940 GHz	1.000 MHz	2.493936667 GHz	-42.53 dBm	-17.53 dB
2	2	2.4940 GHz	2.4960 GHz	1.000 MHz	2.495883333 GHz	-34.67 dBm	-21.67 dB
3	3	2.4960 GHz	2.4990 GHz	1.000 MHz	2.498715000 GHz	-29.04 dBm	-19.04 dB
4	4	2.4990 GHz	2.5000 GHz	91.00 kHz	2.499978333 GHz	-26.81 dBm	-16.81 dB
5	5	2.5000 GHz	2.5250 GHz	240.0 kHz	2.501333333 GHz	11.09 dBm	-13.91 dB

Plot 7-170. Lower ACP Plot (Band 7 – 5.0MHz QPSK – RB Size 25)



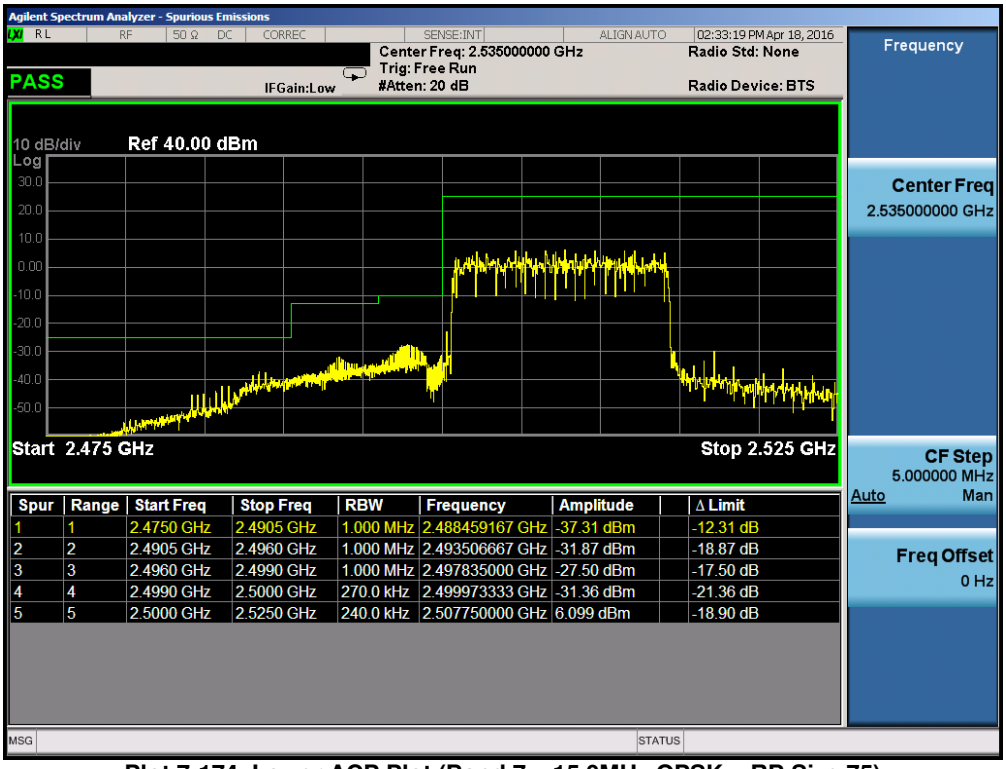
Plot 7-171. Upper ACP Plot (Band 7 – 5.0MHz QPSK – RB Size 25)



Plot 7-172. Lower ACP Plot (Band 7 – 10.0MHz QPSK – RB Size 50)

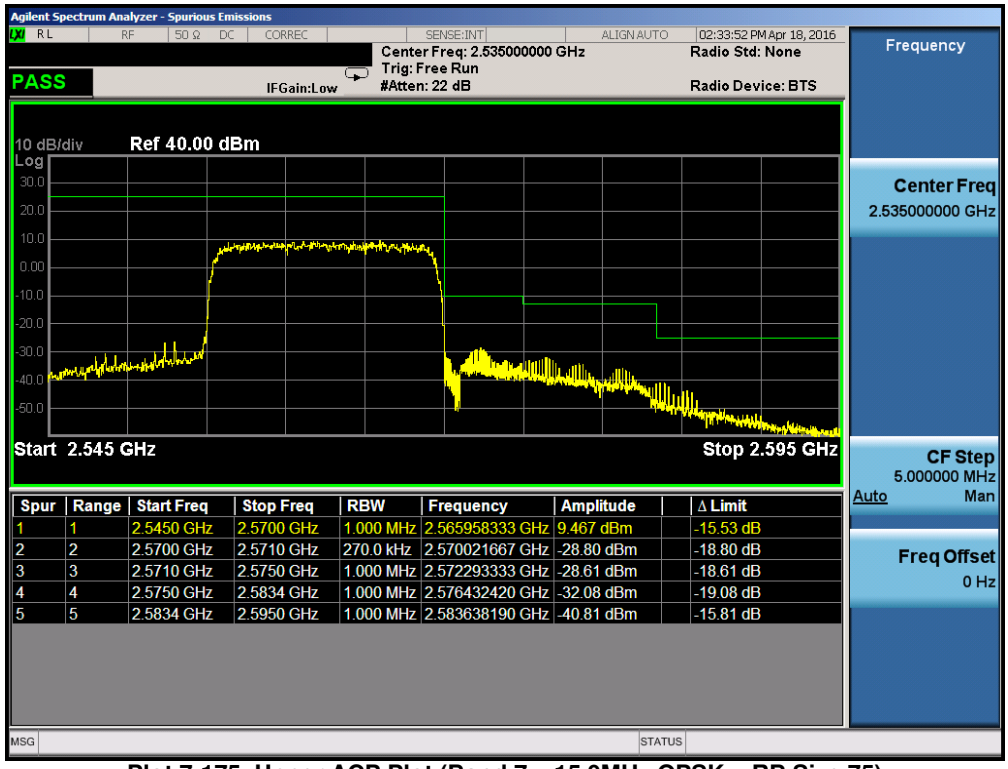
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.5450 GHz	2.5700 GHz	1.000 MHz	2.564708333 GHz	11.26 dBm	-13.74 dB
2	2	2.5700 GHz	2.5710 GHz	180.0 kHz	2.570030000 GHz	-28.85 dBm	-18.85 dB
3	3	2.5710 GHz	2.5750 GHz	1.000 MHz	2.571020000 GHz	-31.89 dBm	-21.89 dB
4	4	2.5750 GHz	2.5790 GHz	1.000 MHz	2.576173215 GHz	-35.00 dBm	-22.00 dB
5	5	2.5790 GHz	2.5950 GHz	1.000 MHz	2.579057115 GHz	-45.05 dBm	-20.05 dB

Plot 7-173. Upper ACP Plot (Band 7 – 10.0MHz QPSK – RB Size 50)



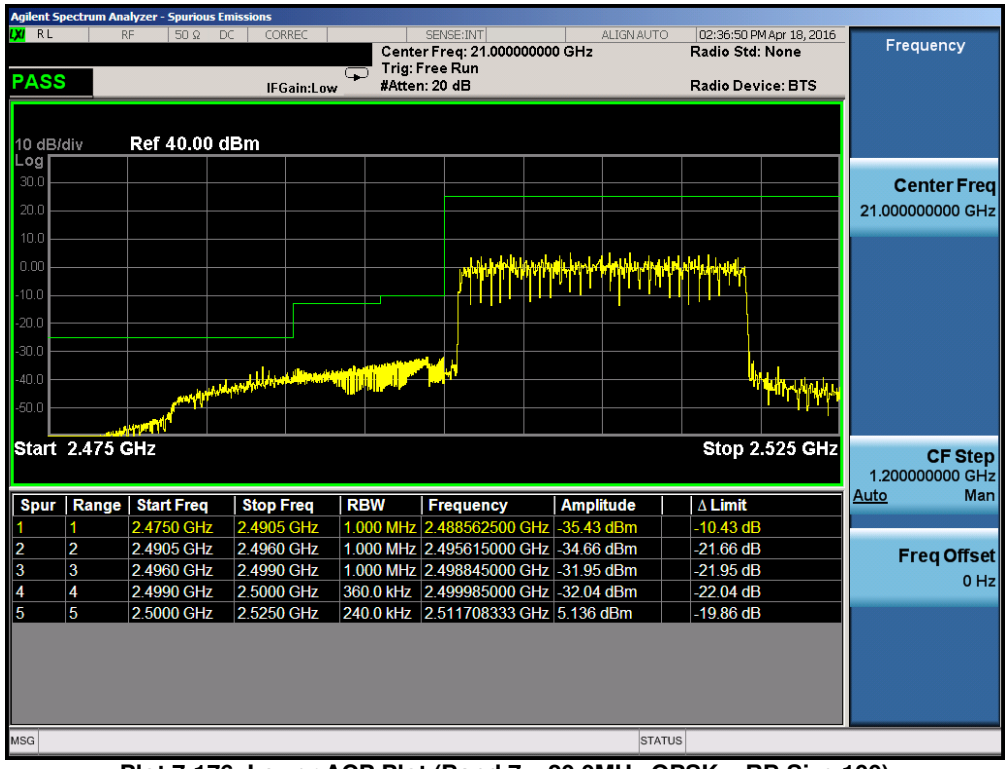
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4905 GHz	1.000 MHz	2.488459167 GHz	-37.31 dBm	-12.31 dB
2	2	2.4905 GHz	2.4960 GHz	1.000 MHz	2.493506667 GHz	-31.87 dBm	-18.87 dB
3	3	2.4960 GHz	2.4990 GHz	1.000 MHz	2.497835000 GHz	-27.50 dBm	-17.50 dB
4	4	2.4990 GHz	2.5000 GHz	270.0 kHz	2.499973333 GHz	-31.36 dBm	-21.36 dB
5	5	2.5000 GHz	2.5250 GHz	240.0 kHz	2.507750000 GHz	6.099 dBm	-18.90 dB

Plot 7-174. Lower ACP Plot (Band 7 – 15.0MHz QPSK – RB Size 75)



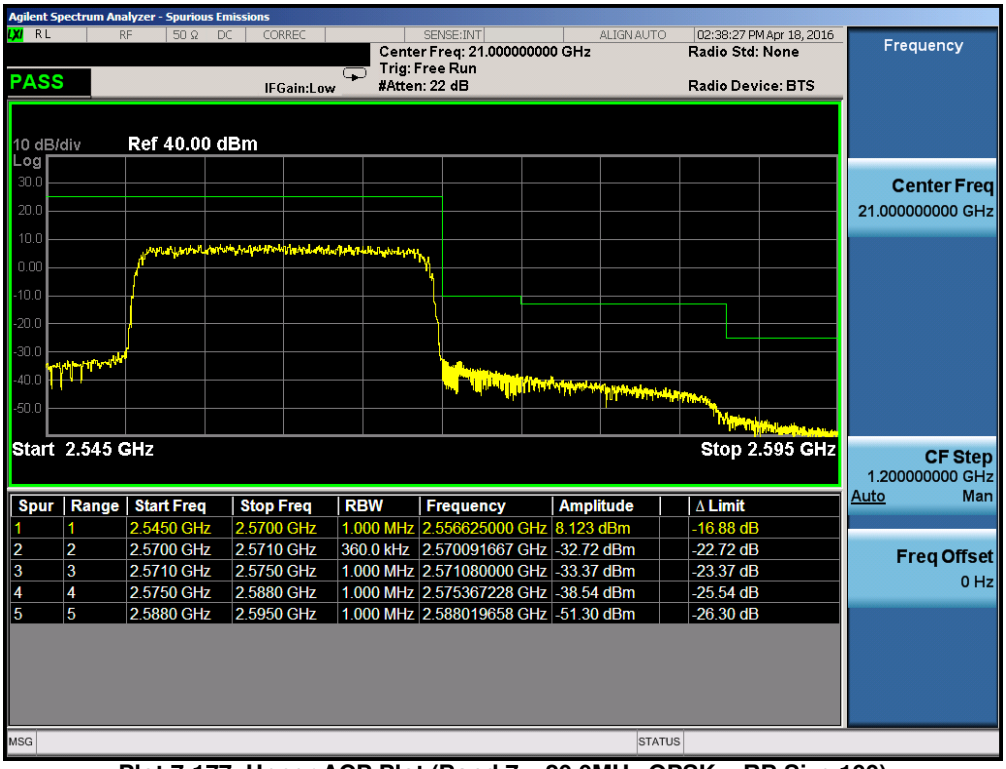
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.5450 GHz	2.5700 GHz	1.000 MHz	2.565958333 GHz	9.467 dBm	-15.53 dB
2	2	2.5700 GHz	2.5710 GHz	270.0 kHz	2.570021667 GHz	-28.80 dBm	-18.80 dB
3	3	2.5710 GHz	2.5750 GHz	1.000 MHz	2.572293333 GHz	-28.61 dBm	-18.61 dB
4	4	2.5750 GHz	2.5834 GHz	1.000 MHz	2.576432420 GHz	-32.08 dBm	-19.08 dB
5	5	2.5834 GHz	2.5950 GHz	1.000 MHz	2.583638190 GHz	-40.81 dBm	-15.81 dB

Plot 7-175. Upper ACP Plot (Band 7 – 15.0MHz QPSK – RB Size 75)



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4905 GHz	1.000 MHz	2.488562500 GHz	-35.43 dBm	-10.43 dB
2	2	2.4905 GHz	2.4960 GHz	1.000 MHz	2.495615000 GHz	-34.66 dBm	-21.66 dB
3	3	2.4960 GHz	2.4990 GHz	1.000 MHz	2.498845000 GHz	-31.95 dBm	-21.95 dB
4	4	2.4990 GHz	2.5000 GHz	360.0 kHz	2.499985000 GHz	-32.04 dBm	-22.04 dB
5	5	2.5000 GHz	2.5250 GHz	240.0 kHz	2.511708333 GHz	5.136 dBm	-19.86 dB

Plot 7-176. Lower ACP Plot (Band 7 – 20.0MHz QPSK – RB Size 100)



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.5450 GHz	2.5700 GHz	1.000 MHz	2.556625000 GHz	8.123 dBm	-16.88 dB
2	2	2.5700 GHz	2.5710 GHz	360.0 kHz	2.570091667 GHz	-32.72 dBm	-22.72 dB
3	3	2.5710 GHz	2.5750 GHz	1.000 MHz	2.571080000 GHz	-33.37 dBm	-23.37 dB
4	4	2.5750 GHz	2.5880 GHz	1.000 MHz	2.575367228 GHz	-38.54 dBm	-25.54 dB
5	5	2.5880 GHz	2.5950 GHz	1.000 MHz	2.588019658 GHz	-51.30 dBm	-26.30 dB

Plot 7-177. Upper ACP Plot (Band 7 – 20.0MHz QPSK – RB Size 100)

7.5 Peak-Average Ratio

§24.232(d)

Test Overview

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

Test Procedure Used

KDB 971168 D01 v02r02 – Section 5.7.1

Test Settings

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW > Emission bandwidth of signal
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms.

Test Setup

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

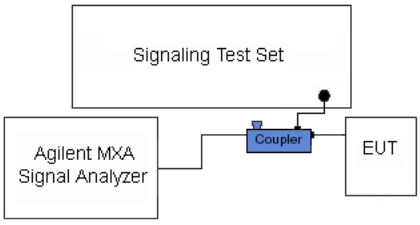
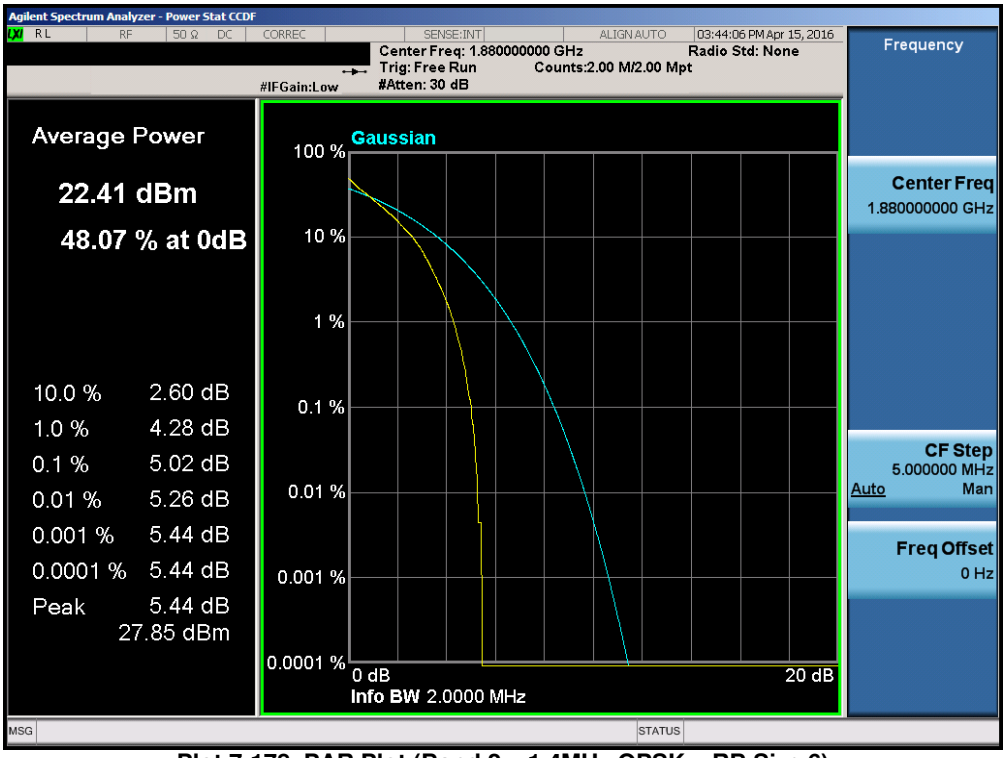


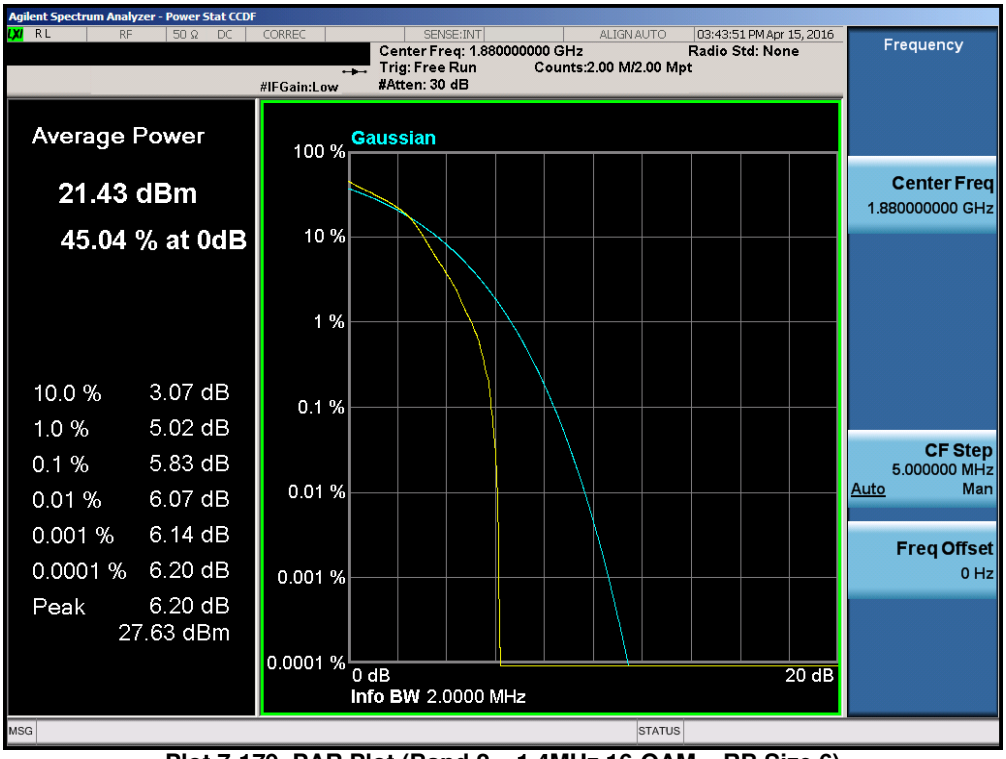
Figure 7-4. Test Instrument & Measurement Setup

Test Notes

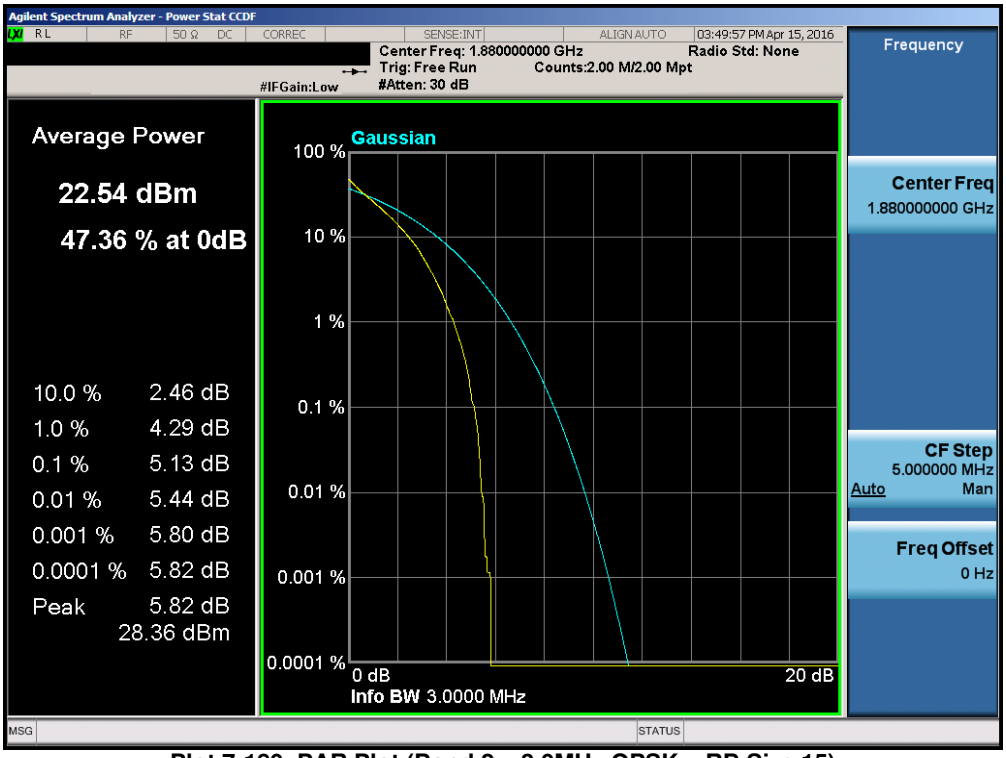
None.



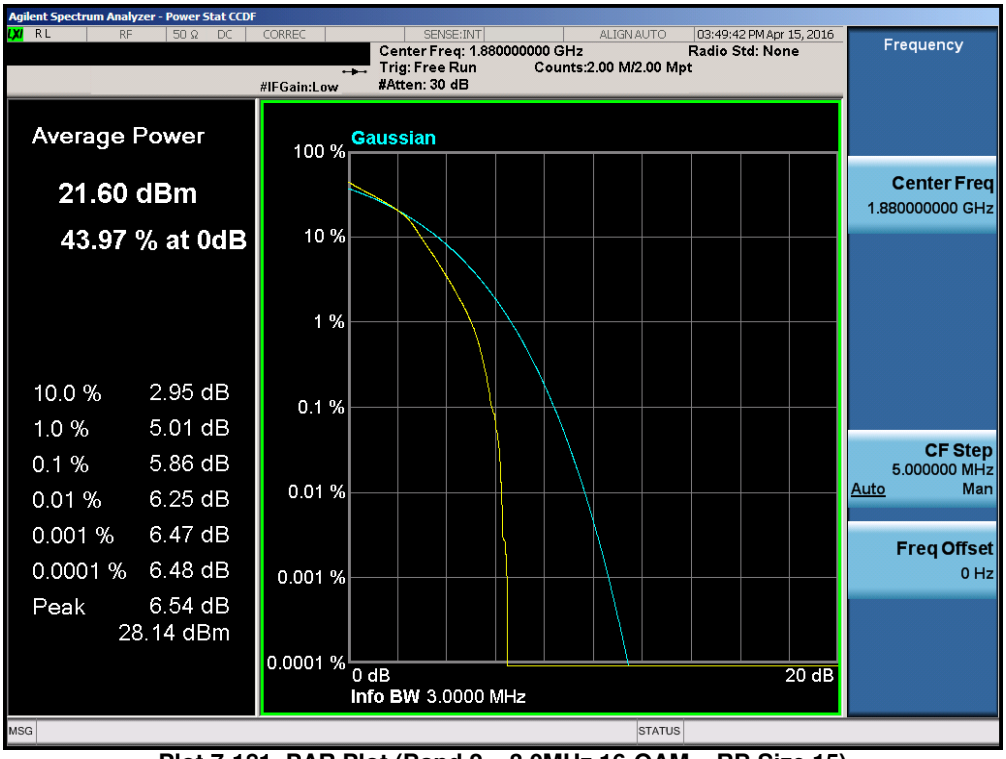
Plot 7-178. PAR Plot (Band 2 – 1.4MHz QPSK – RB Size 6)



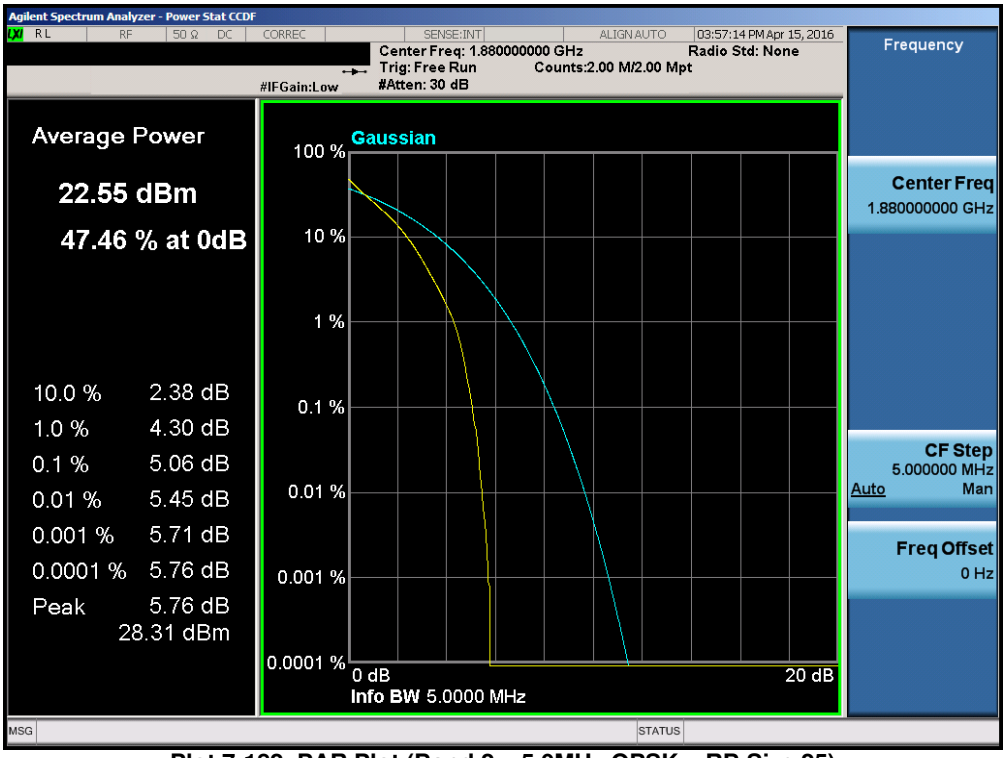
Plot 7-179. PAR Plot (Band 2 – 1.4MHz 16-QAM – RB Size 6)



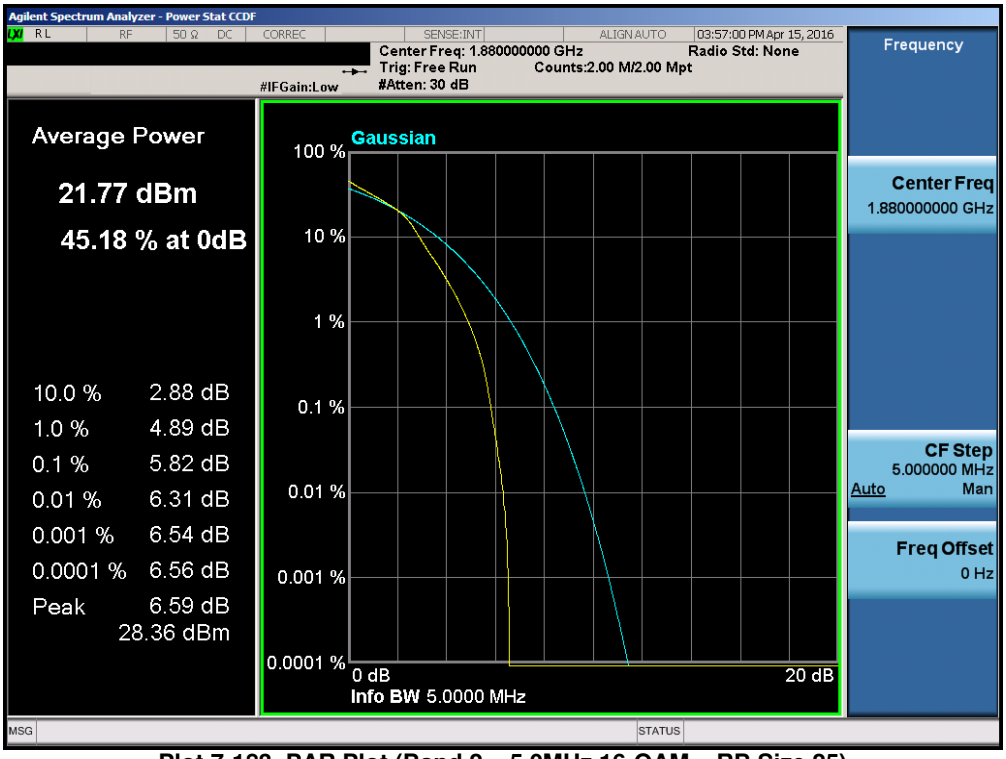
Plot 7-180. PAR Plot (Band 2 – 3.0MHz QPSK – RB Size 15)



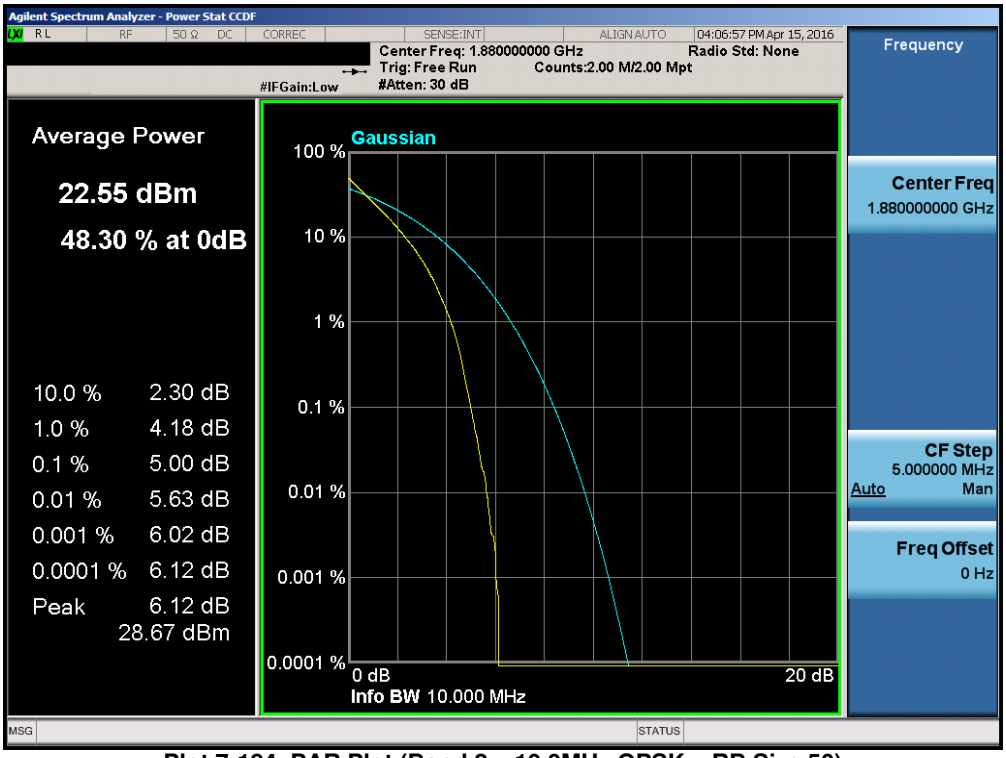
Plot 7-181. PAR Plot (Band 2 – 3.0MHz 16-QAM – RB Size 15)



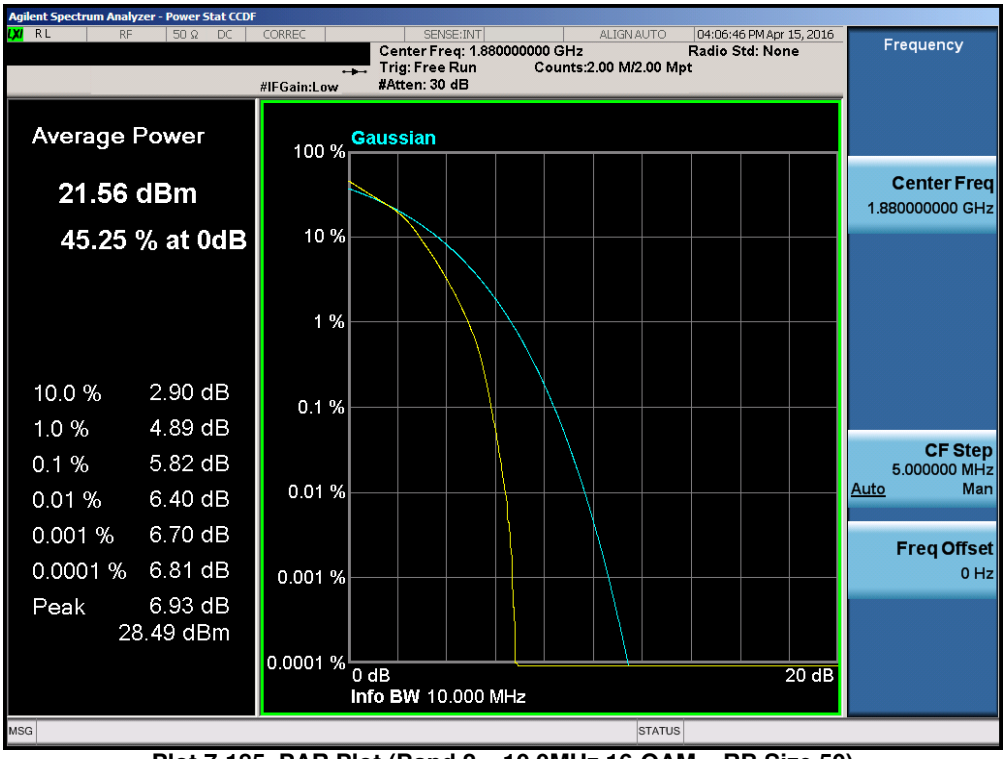
Plot 7-182. PAR Plot (Band 2 – 5.0MHz QPSK – RB Size 25)



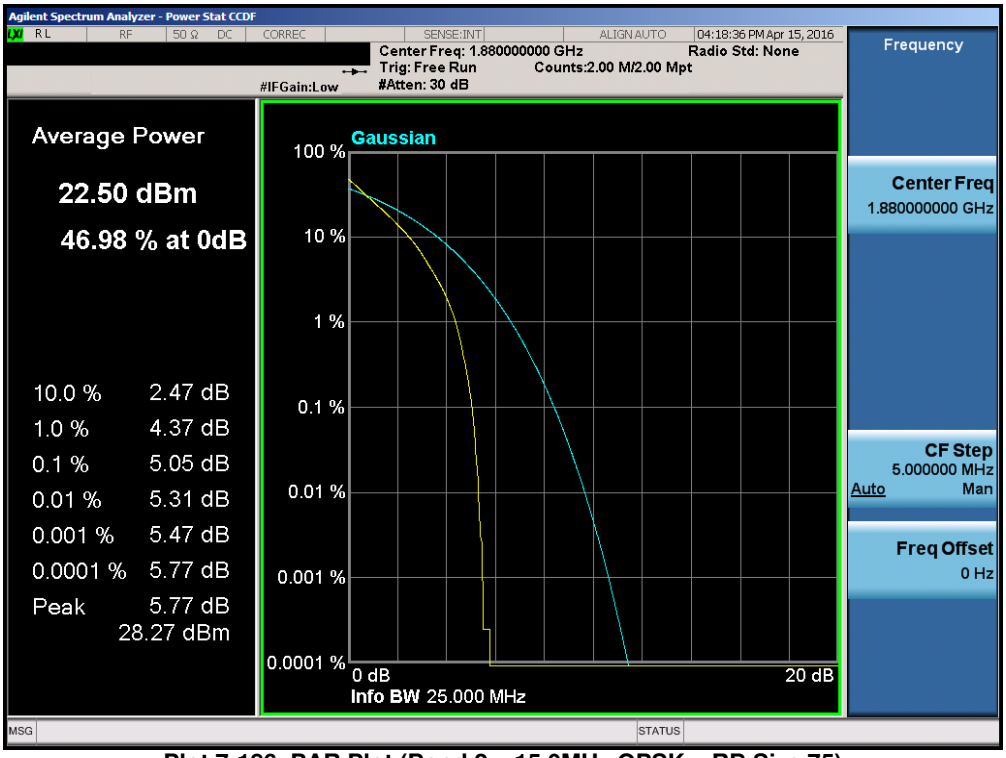
Plot 7-183. PAR Plot (Band 2 – 5.0MHz 16-QAM – RB Size 25)



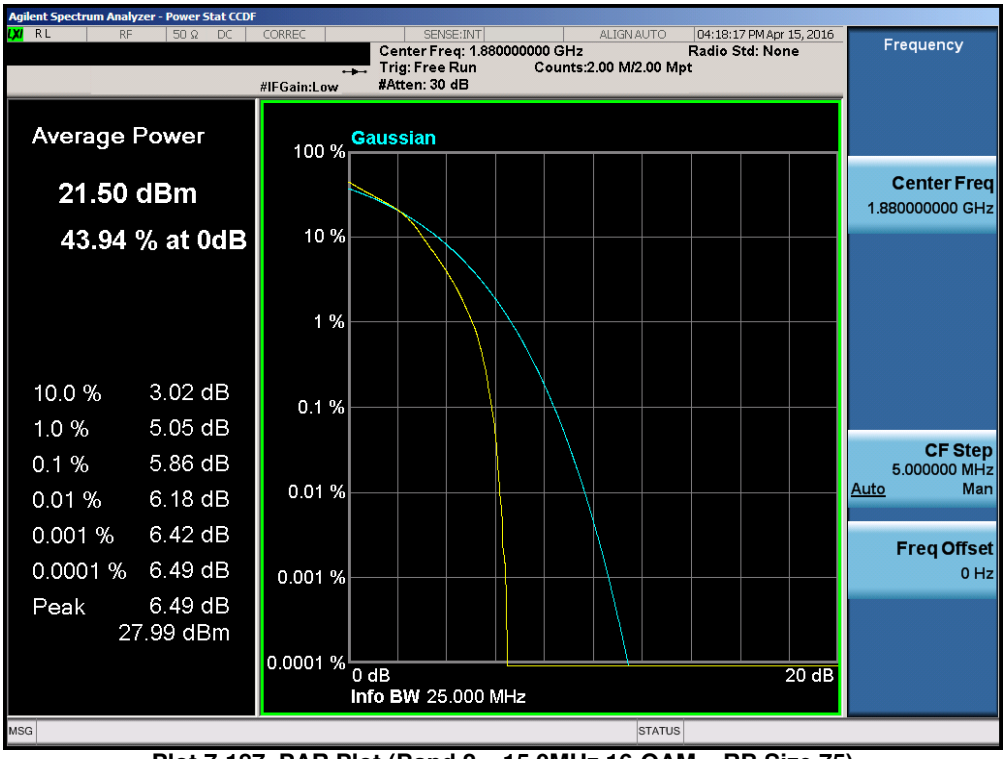
Plot 7-184. PAR Plot (Band 2 – 10.0MHz QPSK – RB Size 50)



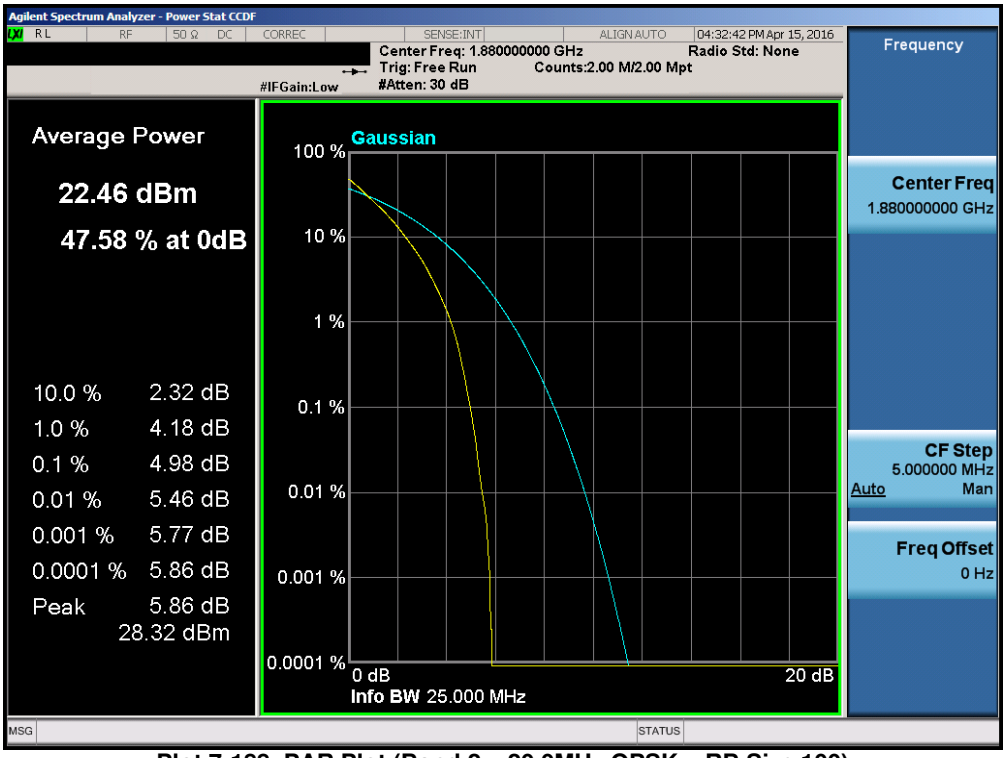
Plot 7-185. PAR Plot (Band 2 – 10.0MHz 16-QAM – RB Size 50)



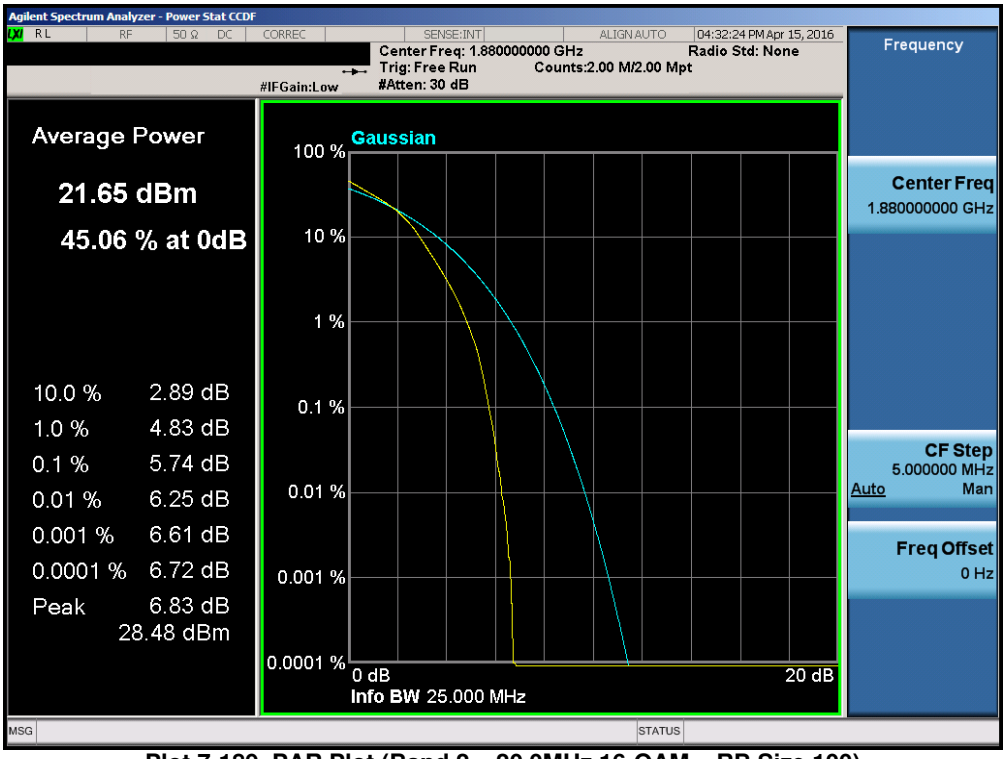
Plot 7-186. PAR Plot (Band 2 – 15.0MHz QPSK – RB Size 75)



Plot 7-187. PAR Plot (Band 2 – 15.0MHz 16-QAM – RB Size 75)



Plot 7-188. PAR Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



Plot 7-189. PAR Plot (Band 2 – 20.0MHz 16-QAM – RB Size 100)

7.6 Radiated Power (ERP/EIRP)

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

Test Overview

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/TIA-603-C-2004 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using 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-C-2004 – Section 2.2.17

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
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

Test Setup

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

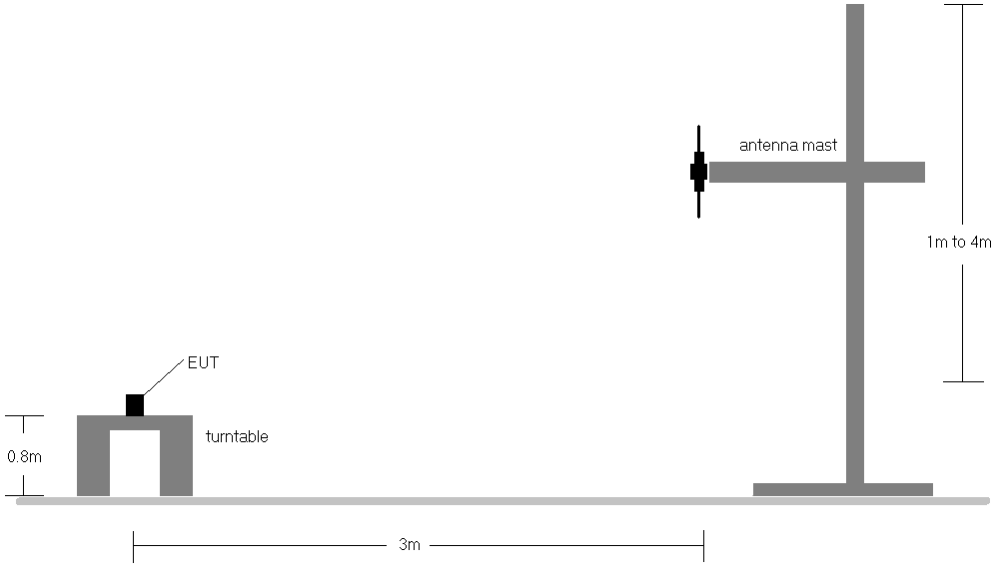


Figure 7-5. Radiated Test Setup <1GHz

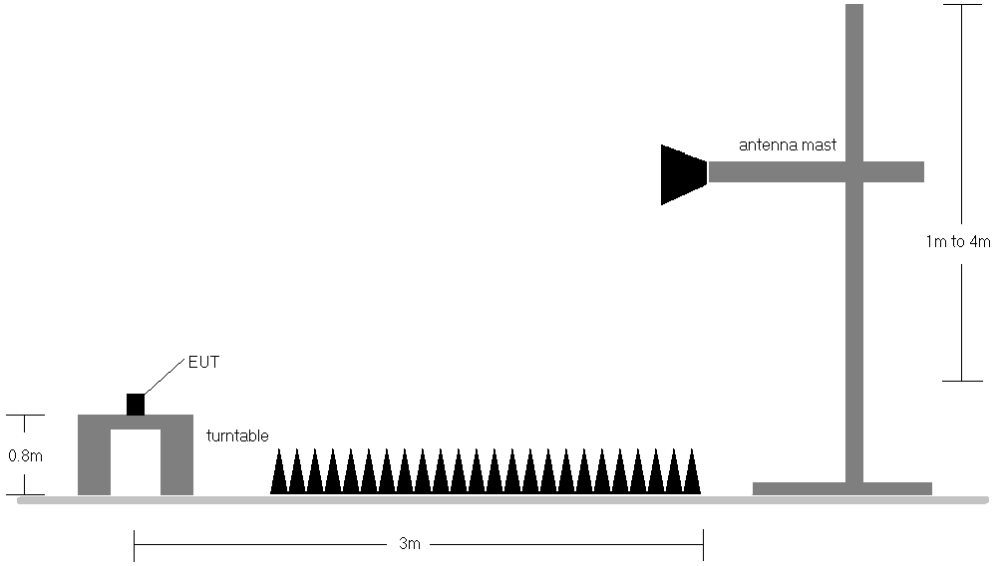


Figure 7-6. Radiated Test Setup >1GHz

Test Notes

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

2) This unit was tested with its standard battery.

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
699.70	1.4	QPSK	H	207	179	3 / 2	15.13	2.12	17.25	34.77	-17.52
707.50	1.4	QPSK	H	196	176	3 / 2	15.20	2.31	17.51	34.77	-17.26
715.30	1.4	QPSK	H	250	314	1 / 0	15.66	2.52	18.18	34.77	-16.59
699.70	1.4	16-QAM	H	207	179	3 / 2	14.16	2.12	16.28	34.77	-18.49
707.50	1.4	16-QAM	H	196	176	3 / 2	14.33	2.31	16.64	34.77	-18.13
715.30	1.4	16-QAM	H	250	314	1 / 0	14.74	2.52	17.26	34.77	-17.51
700.50	3	QPSK	H	197	181	1 / 0	15.58	2.12	17.70	34.77	-17.07
707.50	3	QPSK	H	186	171	1 / 0	15.52	2.31	17.83	34.77	-16.94
714.50	3	QPSK	H	179	177	1 / 14	14.86	2.50	17.36	34.77	-17.41
700.50	3	16-QAM	H	197	181	1 / 0	14.04	2.12	16.16	34.77	-18.61
707.50	3	16-QAM	H	186	171	1 / 0	14.65	2.31	16.96	34.77	-17.81
714.50	3	16-QAM	H	179	177	1 / 14	13.97	2.50	16.47	34.77	-18.30

Table 7-2. ERP Data (Band 12)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
701.50	5	QPSK	H	200	180	1 / 24	15.54	2.15	17.69	34.77	-17.08
707.50	5	QPSK	H	186	171	1 / 0	16.51	2.31	18.82	34.77	-15.95
713.50	5	QPSK	H	180	181	1 / 24	16.16	2.48	18.64	34.77	-16.14
701.50	5	16-QAM	H	200	180	1 / 24	14.51	2.15	16.66	34.77	-18.11
707.50	5	16-QAM	H	186	171	1 / 0	15.27	2.31	17.58	34.77	-17.19
713.50	5	16-QAM	H	180	181	1 / 24	14.97	2.48	17.45	34.77	-17.33
704.00	10	QPSK	H	255	323	1 / 49	16.21	2.22	18.43	34.77	-16.35
707.50	10	QPSK	H	255	321	1 / 49	15.94	2.31	18.25	34.77	-16.52
711.00	10	QPSK	H	255	328	1 / 49	15.95	2.41	18.36	34.77	-16.41
704.00	10	16-QAM	H	255	323	1 / 49	14.78	2.22	17.00	34.77	-17.78
707.50	10	16-QAM	H	255	321	1 / 49	15.05	2.31	17.36	34.77	-17.41
711.00	10	16-QAM	H	255	328	1 / 49	15.00	2.41	17.41	34.77	-17.36
707.50	5	QPSK	V	186	171	1 / 0	15.90	2.88	18.78	34.77	-15.99

Table 7-3. ERP Data (Band 12/17)

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	242	312	1 / 0	13.32	5.01	18.33	38.45	-20.12
836.50	1.4	QPSK	H	225	327	3 / 2	13.79	5.16	18.95	38.45	-19.50
848.30	1.4	QPSK	H	226	317	1 / 0	12.94	5.30	18.24	38.45	-20.21
824.70	1.4	16-QAM	H	242	312	1 / 0	12.57	5.01	17.58	38.45	-20.87
836.50	1.4	16-QAM	H	225	327	3 / 2	12.88	5.16	18.04	38.45	-20.41
848.30	1.4	16-QAM	H	226	317	1 / 0	11.91	5.30	17.21	38.45	-21.24
825.50	3	QPSK	H	221	319	1 / 14	13.88	5.02	18.90	38.45	-19.55
836.50	3	QPSK	H	226	310	1 / 14	13.83	5.16	18.99	38.45	-19.46
847.50	3	QPSK	H	227	326	1 / 0	13.48	5.29	18.77	38.45	-19.68
825.50	3	16-QAM	H	221	319	1 / 14	12.46	5.02	17.48	38.45	-20.97
836.50	3	16-QAM	H	226	310	1 / 14	13.27	5.16	18.43	38.45	-20.02
847.50	3	16-QAM	H	227	326	1 / 14	12.01	5.29	17.30	38.45	-21.15
826.50	5	QPSK	H	229	320	1 / 24	13.66	5.03	18.69	38.45	-19.76
836.50	5	QPSK	H	225	316	1 / 0	13.98	5.16	19.14	38.45	-19.31
846.50	5	QPSK	H	226	325	1 / 0	13.55	5.28	18.83	38.45	-19.62
826.50	5	16-QAM	H	229	320	1 / 24	12.46	5.03	17.49	38.45	-20.96
836.50	5	16-QAM	H	225	316	1 / 24	12.61	5.16	17.77	38.45	-20.68
846.50	5	16-QAM	H	226	325	1 / 0	12.48	5.28	17.76	38.45	-20.69
829.00	10	QPSK	H	359	15	1 / 49	14.96	5.06	20.02	38.45	-18.43
836.50	10	QPSK	H	356	17	1 / 0	14.92	5.16	20.08	38.45	-18.37
844.00	10	QPSK	H	382	19	1 / 0	14.25	5.25	19.50	38.45	-18.95
829.00	10	16-QAM	H	359	15	1 / 49	13.64	5.06	18.70	38.45	-19.75
836.50	10	16-QAM	H	356	17	1 / 0	13.57	5.16	18.73	38.45	-19.72
844.00	10	16-QAM	H	382	19	1 / 0	12.48	5.25	17.73	38.45	-20.72
836.50	10	QPSK	V	356	17	1 / 0	13.94	5.00	18.94	38.45	-19.51

Table 7-4. ERP Data (Band 5)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
1710.70	1.4	QPSK	H	318	7	3 / 2	15.91	9.66	25.57	30.00	-4.43
1732.50	1.4	QPSK	H	309	0	1 / 5	16.67	9.61	26.28	30.00	-3.72
1754.30	1.4	QPSK	H	298	2	1 / 0	15.45	9.57	25.02	30.00	-4.98
1710.70	1.4	16-QAM	H	318	7	3 / 2	14.94	9.66	24.60	30.00	-5.40
1732.50	1.4	16-QAM	H	309	0	1 / 5	15.84	9.61	25.45	30.00	-4.55
1754.30	1.4	16-QAM	H	298	2	1 / 0	14.64	9.57	24.21	30.00	-5.79
1711.50	3	QPSK	H	320	360	1 / 0	15.52	9.65	25.17	30.00	-4.83
1732.50	3	QPSK	H	311	360	1 / 14	16.47	9.61	26.08	30.00	-3.92
1753.50	3	QPSK	H	296	356	1 / 0	15.67	9.57	25.24	30.00	-4.76
1711.50	3	16-QAM	H	320	360	1 / 0	14.47	9.65	24.12	30.00	-5.88
1732.50	3	16-QAM	H	311	360	1 / 14	15.54	9.61	25.15	30.00	-4.85
1753.50	3	16-QAM	H	296	356	1 / 0	14.83	9.57	24.40	30.00	-5.60
1712.50	5	QPSK	H	309	359	1 / 24	16.59	9.65	26.24	30.00	-3.76
1732.50	5	QPSK	H	309	2	1 / 24	16.81	9.61	26.42	30.00	-3.58
1732.50	5	QPSK	V	205	180	1 / 24	12.94	9.61	22.55	30.00	-7.45
1752.50	5	QPSK	H	303	0	1 / 0	16.00	9.57	25.57	30.00	-4.43
1712.50	5	16-QAM	H	309	359	1 / 24	15.35	9.65	25.00	30.00	-5.00
1732.50	5	16-QAM	H	309	2	1 / 24	15.48	9.61	25.09	30.00	-4.91
1752.50	5	16-QAM	H	303	0	1 / 0	14.89	9.57	24.46	30.00	-5.54
1715.00	10	QPSK	H	307	360	1 / 49	16.02	9.65	25.67	30.00	-4.33
1732.50	10	QPSK	H	301	0	1 / 0	16.48	9.61	26.09	30.00	-3.91
1750.00	10	QPSK	H	300	360	1 / 0	16.00	9.58	25.58	30.00	-4.42
1715.00	10	16-QAM	H	307	360	1 / 49	14.98	9.65	24.63	30.00	-5.37
1732.50	10	16-QAM	H	301	0	1 / 0	15.37	9.61	24.98	30.00	-5.02
1750.00	10	16-QAM	H	300	360	1 / 0	15.28	9.58	24.86	30.00	-5.14
1717.50	15	QPSK	H	309	1	1 / 74	16.43	9.64	26.07	30.00	-3.93
1732.50	15	QPSK	H	311	364	1 / 0	16.31	9.61	25.92	30.00	-4.08
1747.50	15	QPSK	H	306	0	1 / 0	16.29	9.58	25.87	30.00	-4.13
1717.50	15	16-QAM	H	309	1	1 / 74	15.24	9.64	24.88	30.00	-5.12
1732.50	15	16-QAM	H	311	364	1 / 0	15.49	9.61	25.10	30.00	-4.90
1747.50	15	16-QAM	H	306	0	1 / 0	15.71	9.58	25.29	30.00	-4.71
1720.00	20	QPSK	H	308	358	1 / 99	16.52	9.64	26.16	30.00	-3.84
1732.50	20	QPSK	H	308	0	1 / 0	16.23	9.61	25.84	30.00	-4.16
1745.00	20	QPSK	H	301	357	1 / 0	16.19	9.59	25.78	30.00	-4.22
1720.00	20	16-QAM	H	308	358	1 / 99	15.54	9.64	25.18	30.00	-4.82
1732.50	20	16-QAM	H	308	0	1 / 0	15.32	9.61	24.93	30.00	-5.07
1745.00	20	16-QAM	H	301	357	1 / 0	15.44	9.59	25.03	30.00	-4.97

Table 7-5. EIRP Data (Band 4)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
1850.70	1.4	QPSK	H	272	0	1 / 0	17.31	9.35	26.66	33.01	-6.35
1880.00	1.4	QPSK	H	266	355	1 / 5	17.90	9.27	27.17	33.01	-5.84
1909.30	1.4	QPSK	H	261	0	1 / 5	16.76	9.25	26.01	33.01	-7.00
1850.70	1.4	16-QAM	H	272	0	1 / 0	16.38	9.35	25.73	33.01	-7.28
1880.00	1.4	16-QAM	H	266	355	1 / 5	16.68	9.27	25.95	33.01	-7.06
1909.30	1.4	16-QAM	H	261	0	1 / 5	15.94	9.25	25.19	33.01	-7.82
1851.50	3	QPSK	H	272	0	1 / 14	17.51	9.35	26.86	33.01	-6.15
1880.00	3	QPSK	H	266	358	1 / 14	17.47	9.27	26.74	33.01	-6.27
1908.50	3	QPSK	H	261	0	1 / 14	16.76	9.25	26.01	33.01	-7.00
1851.50	3	16-QAM	H	272	0	1 / 14	16.46	9.35	25.81	33.01	-7.20
1880.00	3	16-QAM	H	266	358	1 / 14	16.54	9.27	25.81	33.01	-7.20
1908.50	3	16-QAM	H	261	0	1 / 14	16.00	9.25	25.25	33.01	-7.76
1852.50	5	QPSK	H	274	357	1 / 24	17.72	9.34	27.06	33.01	-5.95
1880.00	5	QPSK	H	266	0	1 / 24	18.07	9.27	27.34	33.01	-5.67
1907.50	5	QPSK	H	261	357	1 / 24	17.09	9.24	26.33	33.01	-6.68
1852.50	5	16-QAM	H	274	357	1 / 24	16.65	9.34	25.99	33.01	-7.02
1880.00	5	16-QAM	H	266	0	1 / 24	17.21	9.27	26.48	33.01	-6.53
1907.50	5	16-QAM	H	261	357	1 / 24	16.26	9.24	25.50	33.01	-7.51
1855.00	10	QPSK	H	272	0	1 / 49	17.33	9.34	26.67	33.01	-6.34
1880.00	10	QPSK	H	266	0	1 / 49	17.69	9.27	26.96	33.01	-6.05
1905.00	10	QPSK	H	270	0	1 / 0	17.30	9.24	26.54	33.01	-6.47
1855.00	10	16-QAM	H	272	0	1 / 49	16.39	9.34	25.73	33.01	-7.28
1880.00	10	16-QAM	H	266	0	1 / 49	16.90	9.27	26.17	33.01	-6.84
1905.00	10	16-QAM	H	270	0	1 / 0	16.37	9.24	25.61	33.01	-7.40
1857.50	15	QPSK	H	272	0	1 / 74	18.08	9.33	27.41	33.01	-5.60
1857.50	15	QPSK	V	190	45	1 / 74	13.95	9.33	23.28	33.01	-9.73
1880.00	15	QPSK	H	276	0	1 / 0	17.09	9.27	26.36	33.01	-6.65
1902.50	15	QPSK	H	261	358	1 / 0	16.95	9.23	26.18	33.01	-6.83
1857.50	15	16-QAM	H	272	0	1 / 74	17.03	9.33	26.36	33.01	-6.65
1880.00	15	16-QAM	H	276	0	1 / 0	16.21	9.27	25.48	33.01	-7.53
1902.50	15	16-QAM	H	261	358	1 / 0	16.34	9.23	25.57	33.01	-7.44
1860.00	20	QPSK	H	271	0	1 / 99	17.40	9.32	26.72	33.01	-6.29
1880.00	20	QPSK	H	268	0	1 / 0	16.95	9.27	26.22	33.01	-6.79
1900.00	20	QPSK	H	260	0	1 / 0	16.84	9.22	26.06	33.01	-6.95
1860.00	20	16-QAM	H	271	0	1 / 99	16.12	9.32	25.44	33.01	-7.57
1880.00	20	16-QAM	H	268	0	1 / 0	15.85	9.27	25.12	33.01	-7.89
1900.00	20	16-QAM	H	260	0	1 / 0	16.09	9.22	25.31	33.01	-7.70

Table 7-6. EIRP Data (Band 2)

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]
2502.50	5	QPSK	H	100	310	1 / 24	12.75	8.59	21.34	33.01	-11.67
2535.00	5	QPSK	H	108	311	1 / 0	11.64	8.57	20.21	33.01	-12.80
2567.50	5	QPSK	H	120	296	1 / 24	11.29	8.55	19.84	33.01	-13.17
2502.50	5	16-QAM	H	100	310	1 / 24	11.56	8.59	20.15	33.01	-12.86
2535.00	5	16-QAM	H	108	311	1 / 0	10.52	8.57	19.09	33.01	-13.92
2567.50	5	16-QAM	H	120	296	1 / 24	10.08	8.55	18.63	33.01	-14.38
2505.00	10	QPSK	H	100	311	1 / 49	12.75	8.59	21.34	33.01	-11.67
2535.00	10	QPSK	H	100	308	1 / 0	11.43	8.57	20.00	33.01	-13.01
2565.00	10	QPSK	H	100	310	1 / 49	11.09	8.55	19.64	33.01	-13.37
2505.00	10	16-QAM	H	100	311	1 / 49	11.28	8.59	19.87	33.01	-13.14
2535.00	10	16-QAM	H	100	308	1 / 0	10.25	8.57	18.82	33.01	-14.19
2565.00	10	16-QAM	H	100	310	1 / 49	10.22	8.55	18.77	33.01	-14.24
2507.50	15	QPSK	H	100	150	1 / 74	12.64	8.59	21.23	33.01	-11.78
2535.00	15	QPSK	H	100	147	1 / 0	11.74	8.57	20.31	33.01	-12.70
2562.50	15	QPSK	H	128	150	1 / 0	11.07	8.55	19.62	33.01	-13.39
2507.50	15	16-QAM	H	100	150	1 / 74	11.37	8.59	19.96	33.01	-13.05
2535.00	15	16-QAM	H	100	147	1 / 0	10.72	8.57	19.29	33.01	-13.72
2562.50	15	16-QAM	H	128	150	1 / 0	9.79	8.55	18.34	33.01	-14.67
2510.00	20	QPSK	H	100	308	1 / 0	12.74	8.59	21.33	33.01	-11.68
2535.00	20	QPSK	H	100	309	1 / 99	12.13	8.57	20.70	33.01	-12.31
2560.00	20	QPSK	H	129	148	1 / 99	10.68	8.56	19.24	33.01	-13.77
2510.00	20	16-QAM	H	100	308	1 / 0	11.12	8.59	19.71	33.01	-13.30
2535.00	20	16-QAM	H	100	309	1 / 99	10.68	8.57	19.25	33.01	-13.76
2560.00	20	16-QAM	H	129	148	1 / 99	9.37	8.56	17.93	33.01	-15.08
2502.50	5	QPSK	V	100	310	1 / 24	8.79	8.50	17.29	33.01	-15.72

Table 7-7. EIRP Data (Band 7)

7.7 Radiated Spurious Emissions Measurements

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

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-C-2004 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as peak measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v02r02 – Section 5.8

ANSI/TIA-603-C-2004 – Section 2.2.12

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW ≥ 3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points ≥ 2 x span / RBW
5. Detector = Peak
6. Trace mode = max hold
7. The trace was allowed to stabilize

Test Setup

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

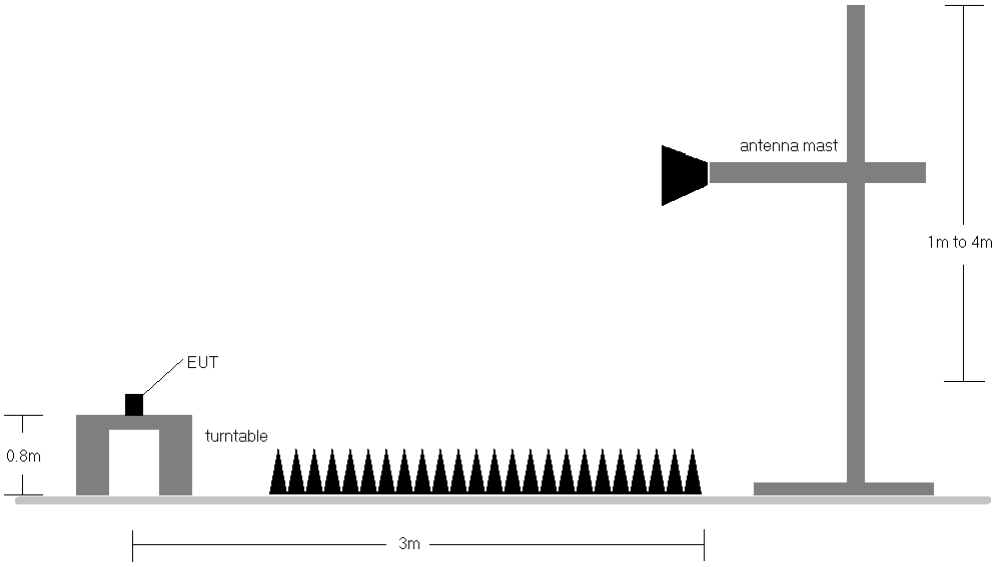


Figure 7-7. Test Instrument & Measurement Setup

Test Notes

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

2) This unit was tested with its standard battery.

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

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

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

OPERATING FREQUENCY:	701.50	MHz			
CHANNEL:	23035				
MEASURED OUTPUT POWER:	17.69	dBm	=	0.059	W
MODULATION SIGNAL:	QPSK				
BANDWIDTH:	5.0	MHz			
DISTANCE:	3	meters			
LIMIT:	43 + 10 $\log_{10}$ (W) =	30.69	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	101	215	-61.94	6.17	-55.77	73.5
2104.50	H	100	192	-54.50	6.10	-48.40	66.1
2806.00	H	-	-	-60.69	7.46	-53.24	70.9

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

OPERATING FREQUENCY:	707.50	MHz			
CHANNEL:	23095				
MEASURED OUTPUT POWER:	18.82	dBm	=	0.076	W
MODULATION SIGNAL:	QPSK				
BANDWIDTH:	5.0	MHz			
DISTANCE:	3	meters			
LIMIT:	43 + 10 $\log_{10}$ (W) =	31.82	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	107	217	-62.85	6.14	-56.71	75.5
2122.50	H	115	258	-60.02	6.20	-53.82	72.6
2830.00	H	240	0	-60.78	7.50	-53.28	72.1
3537.50	H	-	-	-58.68	7.23	-51.45	70.3

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

OPERATING FREQUENCY:	713.50	MHz			
CHANNEL:	23155				
MEASURED OUTPUT POWER:	18.64	dBm	=	0.073	W
MODULATION SIGNAL:	QPSK				
BANDWIDTH:	5.0	MHz			
DISTANCE:	3	meters			
LIMIT:	43 + 10 $\log_{10}$ (W) =	31.64	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	242	41	-64.39	6.12	-58.28	76.9
2140.50	H	252	231	-57.43	6.31	-51.12	69.8
2854.00	H	-	-	-61.05	7.54	-53.51	72.1

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

OPERATING FREQUENCY:	829.00	MHz			
CHANNEL:	20450				
MEASURED OUTPUT POWER:	20.02	dBm	=	0.101	W
MODULATION SIGNAL:	QPSK				
BANDWIDTH:	10.0	MHz			
DISTANCE:	3	meters			
LIMIT:	43 + 10 $\log_{10}$ (W) =	33.02	dBc		

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1658.00	H	112	109	-65.46	5.45	-60.01	80.0
2487.00	H	105	291	-53.90	6.75	-47.15	67.2
3316.00	H	-	-	-60.13	7.11	-53.02	73.0

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

OPERATING FREQUENCY:	836.50	MHz			
CHANNEL:	20525				
MEASURED OUTPUT POWER:	20.08	dBm	=	0.102	W
MODULATION SIGNAL:	QPSK				
BANDWIDTH:	10.0	MHz			
DISTANCE:	3	meters			
LIMIT:	43 + 10 $\log_{10}$ (W) =	33.08	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]
1673.00	H	193	311	-61.07	5.33	-55.74	75.8
2509.50	H	107	33	-56.26	6.79	-49.47	69.5
3346.00	H	-	-	-59.72	7.08	-52.63	72.7

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

OPERATING FREQUENCY:	844.00	MHz			
CHANNEL:	20600				
MEASURED OUTPUT POWER:	19.50	dBm	=	0.089	W
MODULATION SIGNAL:	QPSK				
BANDWIDTH:	10.0	MHz			
DISTANCE:	3	meters			
LIMIT:	43 + 10 $\log_{10}$ (W) =	32.50	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]
1688.00	H	182	186	-56.65	5.22	-51.44	70.9
2532.00	H	101	300	-51.67	6.84	-44.83	64.3
3376.00	H	-	-	-57.94	7.06	-50.88	70.4

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

OPERATING FREQUENCY:	1712.50	MHz		
CHANNEL:	19975			
MEASURED OUTPUT POWER:	26.24	dBm	=	0.421 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	39.24	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]
3425.00	H	247	134	-55.46	8.15	-47.31	73.6
5137.50	H	103	242	-54.71	10.26	-44.44	70.7
6850.00	H	159	119	-51.89	11.39	-40.51	66.7
8562.50	H	159	178	-53.41	13.02	-40.39	66.6
10275.00	H	-	-	-52.37	13.27	-39.10	65.3

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

OPERATING FREQUENCY:	1732.50	MHz		
CHANNEL:	20175			
MEASURED OUTPUT POWER:	26.42	dBm	=	0.439 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	39.42	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3465.00	H	101	17	-55.51	8.29	-47.22	73.6
5197.50	H	100	243	-54.04	10.35	-43.69	70.1
6930.00	H	100	112	-50.14	11.49	-38.65	65.1
8662.50	H	103	160	-54.06	13.02	-41.04	67.5
10395.00	H	-	-	-51.97	13.16	-38.81	65.2

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

OPERATING FREQUENCY:	1752.50	MHz		
CHANNEL:	20375			
MEASURED OUTPUT POWER:	25.57	dBm	=	0.361 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	38.57	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]
3505.00	H	101	211	-56.28	8.40	-47.88	73.5
5257.50	H	100	246	-54.35	10.36	-43.99	69.6
7010.00	H	154	117	-46.19	11.56	-34.63	60.2
8762.50	H	151	119	-54.64	13.02	-41.62	67.2
10515.00	H	-	-	-51.52	13.01	-38.52	64.1

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

OPERATING FREQUENCY:	1857.50	MHz		
CHANNEL:	18675			
MEASURED OUTPUT POWER:	27.41	dBm	=	0.551 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	15.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	40.41	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]
3715.00	H	147	287	-56.24	8.40	-47.85	75.3
5572.50	H	183	158	-52.75	10.60	-42.15	69.6
7430.00	H	105	115	-44.28	12.06	-32.22	59.6
9287.50	H	-	-	-54.10	13.22	-40.89	68.3

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

OPERATING FREQUENCY:	1880.00	MHz		
CHANNEL:	18900			
MEASURED OUTPUT POWER:	26.36	dBm	=	0.433 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	15.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	39.36	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3760.00	H	107	244	-53.56	8.38	-45.17	71.5
5640.00	H	107	347	-51.50	10.70	-40.80	67.2
7520.00	H	100	166	-50.44	12.10	-38.34	64.7
9400.00	H	-	-	-57.87	13.19	-44.68	71.0

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

OPERATING FREQUENCY:	1902.50	MHz		
CHANNEL:	19125			
MEASURED OUTPUT POWER:	26.18	dBm	=	0.415 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	15.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	39.18	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]
3805.00	H	100	243	-53.66	8.38	-45.28	71.5
5707.50	H	100	2	-52.59	10.75	-41.84	68.0
7610.00	H	101	285	-45.57	12.19	-33.39	59.6
9512.50	H	-	-	-60.57	13.19	-47.38	73.6

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

OPERATING FREQUENCY:	2502.50	MHz		
CHANNEL:	20775			
MEASURED OUTPUT POWER:	21.34	dBm	=	0.136 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	55 + 10 log10 (W)	46.34	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]
5005.00	H	101	230	-40.33	10.95	-29.38	50.7
7507.50	H	101	140	-49.22	10.65	-38.57	59.9
10010.00	H	101	142	-46.43	12.34	-34.09	55.4
12512.50	H	-	-	-46.99	12.59	-34.40	55.7

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

OPERATING FREQUENCY:	2535.00	MHz		
CHANNEL:	21100			
MEASURED OUTPUT POWER:	20.21	dBm	=	0.105 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	55 + 10 log10 (W)	45.21	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
5070.00	H	112	163	-41.72	10.92	-30.80	51.0
7605.00	H	112	160	-48.08	10.84	-37.23	57.4
10140.00	H	112	142	-48.69	12.47	-36.22	56.4
12675.00	H	-	-	-46.41	12.64	-33.77	54.0

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

OPERATING FREQUENCY:	2567.50	MHz		
CHANNEL:	21425			
MEASURED OUTPUT POWER:	19.84	dBm	=	0.096 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	55 + 10 log10 (W)	44.84	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]
5135.00	H	167	231	-39.81	10.87	-28.94	48.8
7702.50	H	167	159	-45.08	10.87	-34.21	54.1
10270.00	H	167	162	-49.30	12.57	-36.73	56.6
12837.50	H	-	-	-46.58	12.45	-34.12	54.0

Table 7-22. Radiated Spurious Data (Band 7 – High Channel)

7.8 Frequency Stability / Temperature Variation

§2.1055 §22.355 §24.235 §27.54

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-C-2004. The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

For Part 22, the frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency. For Part 24 and Part 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure Used

ANSI/TIA-603-C-2004

Test Settings

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

Test Setup

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

Test Notes

None

Band 12/17 Frequency Stability Measurements

§2.1055 §27.54

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

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	707,500,092	92	0.0000130
100 %		- 30	707,500,047	47	0.0000066
100 %		- 20	707,499,764	-236	-0.0000334
100 %		- 10	707,499,695	-305	-0.0000431
100 %		0	707,499,618	-382	-0.0000540
100 %		+ 10	707,499,974	-26	-0.0000037
100 %		+ 20	707,500,184	184	0.0000260
100 %		+ 30	707,499,840	-160	-0.0000226
100 %		+ 40	707,499,962	-38	-0.0000054
100 %		+ 50	707,500,254	254	0.0000359
BATT. ENDPOINT	3.45	+ 20	707,500,344	344	0.0000486

Table 7-23. Frequency Stability Data (Band 12/17)

Note:

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

Band 12/17 Frequency Stability Measurements

§2.1055 §27.54

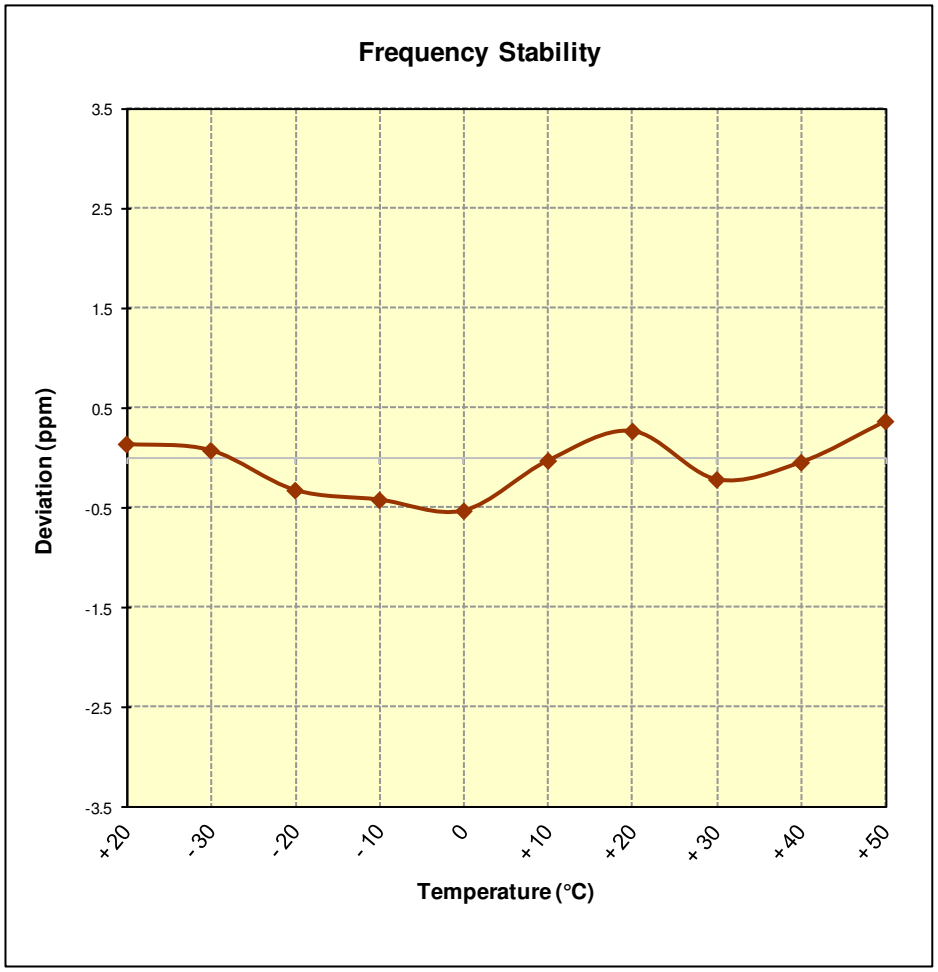


Figure 7-8. Frequency Stability Graph (Band 12/17)

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)	836,500,017	17	0.0000020
100 %		- 30	836,499,997	-3	-0.0000004
100 %		- 20	836,499,755	-245	-0.0000293
100 %		- 10	836,500,127	127	0.0000152
100 %		0	836,499,946	-54	-0.0000065
100 %		+ 10	836,500,081	81	0.0000097
100 %		+ 20	836,499,677	-323	-0.0000386
100 %		+ 30	836,500,218	218	0.0000261
100 %		+ 40	836,499,993	-7	-0.0000008
100 %		+ 50	836,499,762	-238	-0.0000285
BATT. ENDPOINT	3.45	+ 20	836,499,911	-89	-0.0000106

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

Band 5 Frequency Stability Measurements

§2.1055 §22.355

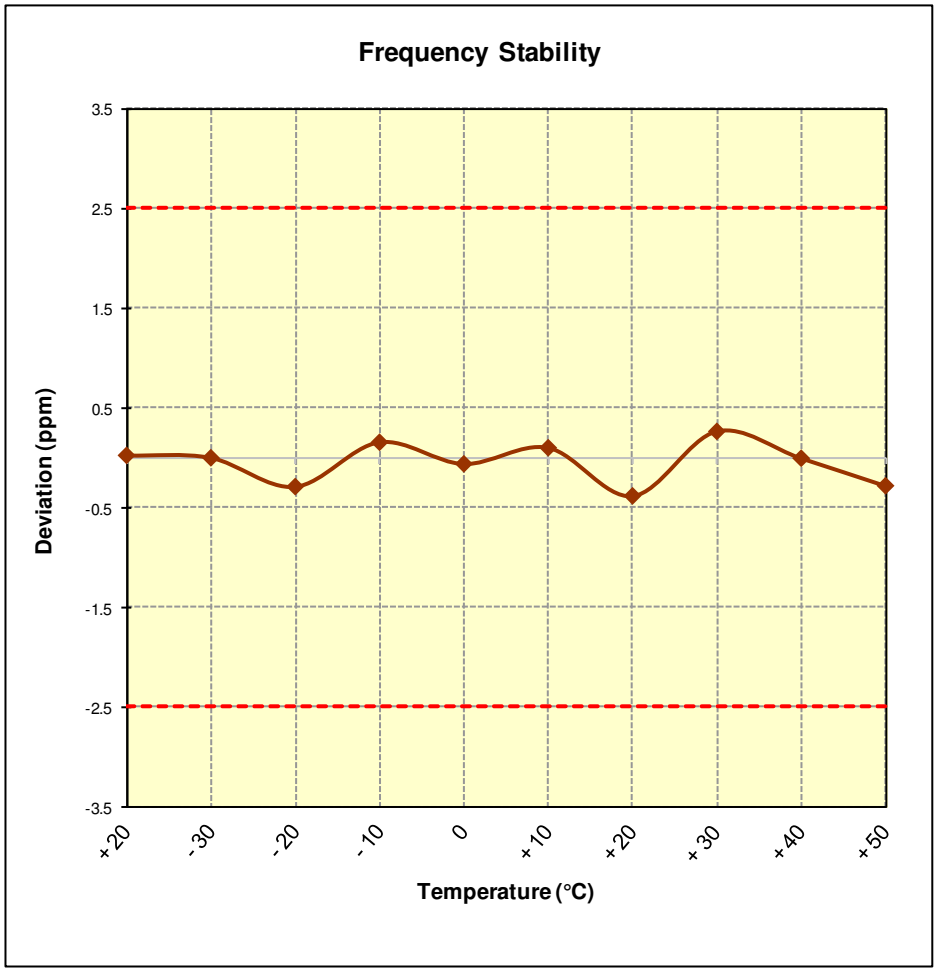


Figure 7-9. Frequency Stability Graph (Band 5)

Band 4 Frequency Stability Measurements

§2.1055 §§27.54

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

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	1,732,499,926	-74	-0.0000043
100 %		- 30	1,732,499,971	-29	-0.0000017
100 %		- 20	1,732,500,075	75	0.0000043
100 %		- 10	1,732,499,951	-49	-0.0000028
100 %		0	1,732,500,243	243	0.0000140
100 %		+ 10	1,732,499,808	-192	-0.0000111
100 %		+ 20	1,732,500,290	290	0.0000167
100 %		+ 30	1,732,500,239	239	0.0000138
100 %		+ 40	1,732,500,243	243	0.0000140
100 %		+ 50	1,732,500,233	233	0.0000134
BATT. ENDPOINT	3.45	+ 20	1,732,500,048	48	0.0000028

Table 7-25. Frequency Stability Data (Band 4)

Note:

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

Band 4 Frequency Stability Measurements

§2.1055 §§27.54

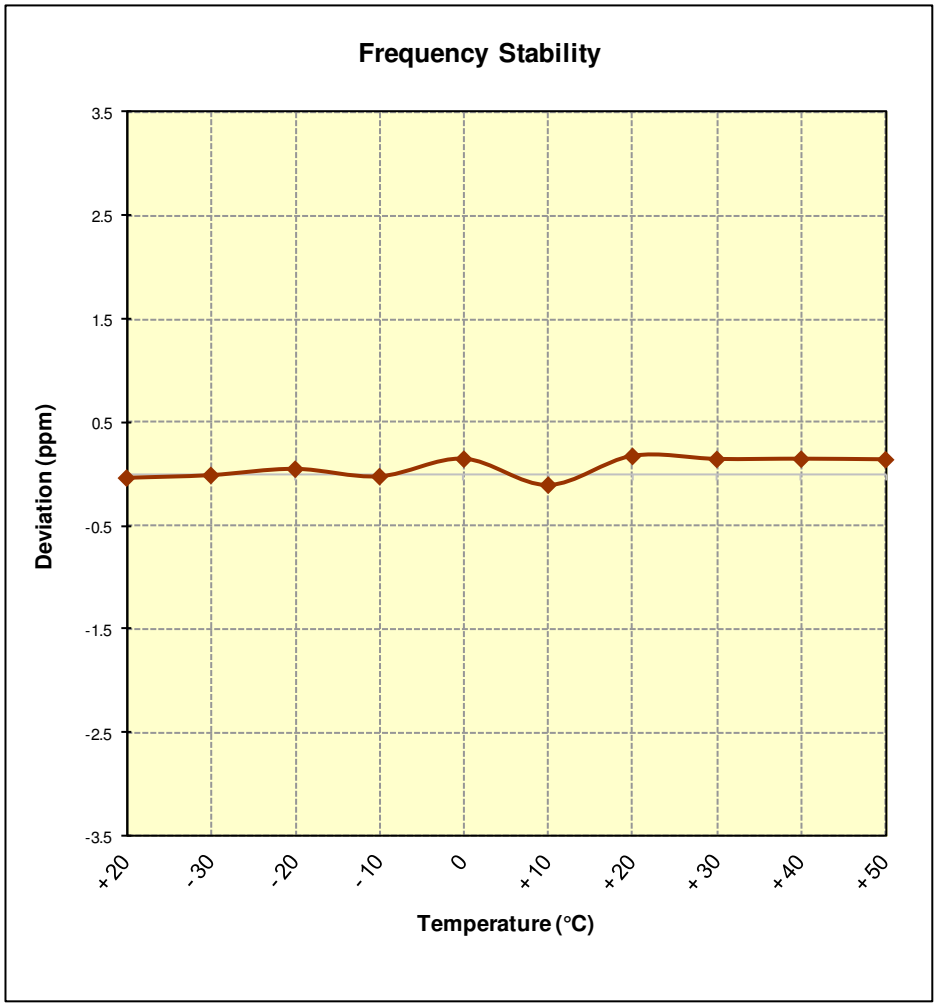


Figure 7-10. Frequency Stability Graph (Band 4)

Band 2 Frequency Stability Measurements

§2.1055 §24.235

OPERATING FREQUENCY:	1,880,000,000	Hz
CHANNEL:	18900	
REFERENCE VOLTAGE:	3.85	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	1,879,999,854	-146	-0.0000078
100 %		- 30	1,880,000,298	298	0.0000159
100 %		- 20	1,879,999,845	-155	-0.0000082
100 %		- 10	1,879,999,977	-23	-0.0000012
100 %		0	1,879,999,902	-98	-0.0000052
100 %		+ 10	1,880,000,089	89	0.0000047
100 %		+ 20	1,880,000,161	161	0.0000086
100 %		+ 30	1,880,000,013	13	0.0000007
100 %		+ 40	1,879,999,954	-46	-0.0000024
100 %		+ 50	1,880,000,167	167	0.0000089
BATT. ENDPOINT	3.45	+ 20	1,879,999,638	-362	-0.0000193

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

Note:

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

Band 2 Frequency Stability Measurements

§2.1055 §24.235

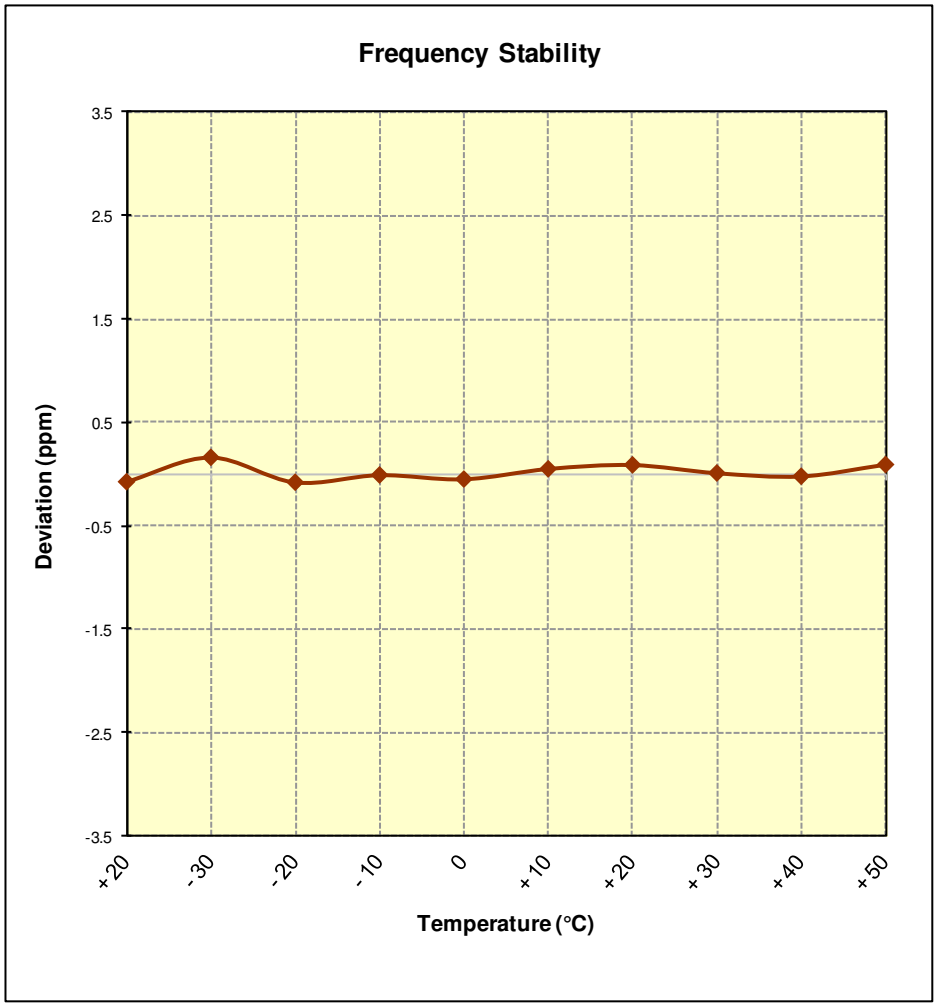


Figure 7-11. Frequency Stability Graph (Band 2)

Band 7 Frequency Stability Measurements

§2.1055 §27.54

OPERATING FREQUENCY:	2,535,000,000	Hz
CHANNEL:	21100	
REFERENCE VOLTAGE:	3.85	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	2,534,999,695	-305	-0.0000120
100 %		- 30	2,534,999,935	-65	-0.0000026
100 %		- 20	2,534,999,659	-341	-0.0000135
100 %		- 10	2,534,999,794	-206	-0.0000081
100 %		0	2,534,999,872	-128	-0.0000050
100 %		+ 10	2,535,000,103	103	0.0000041
100 %		+ 20	2,534,999,708	-292	-0.0000115
100 %		+ 30	2,535,000,192	192	0.0000076
100 %		+ 40	2,534,999,645	-355	-0.0000140
100 %		+ 50	2,534,999,951	-49	-0.0000019
BATT. ENDPOINT	3.45	+ 20	2,534,999,948	-52	-0.0000021

Table 7-27. Frequency Stability Data (Band 7)

Note:

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

Band 7 Frequency Stability Measurements

§2.1055 §27.54

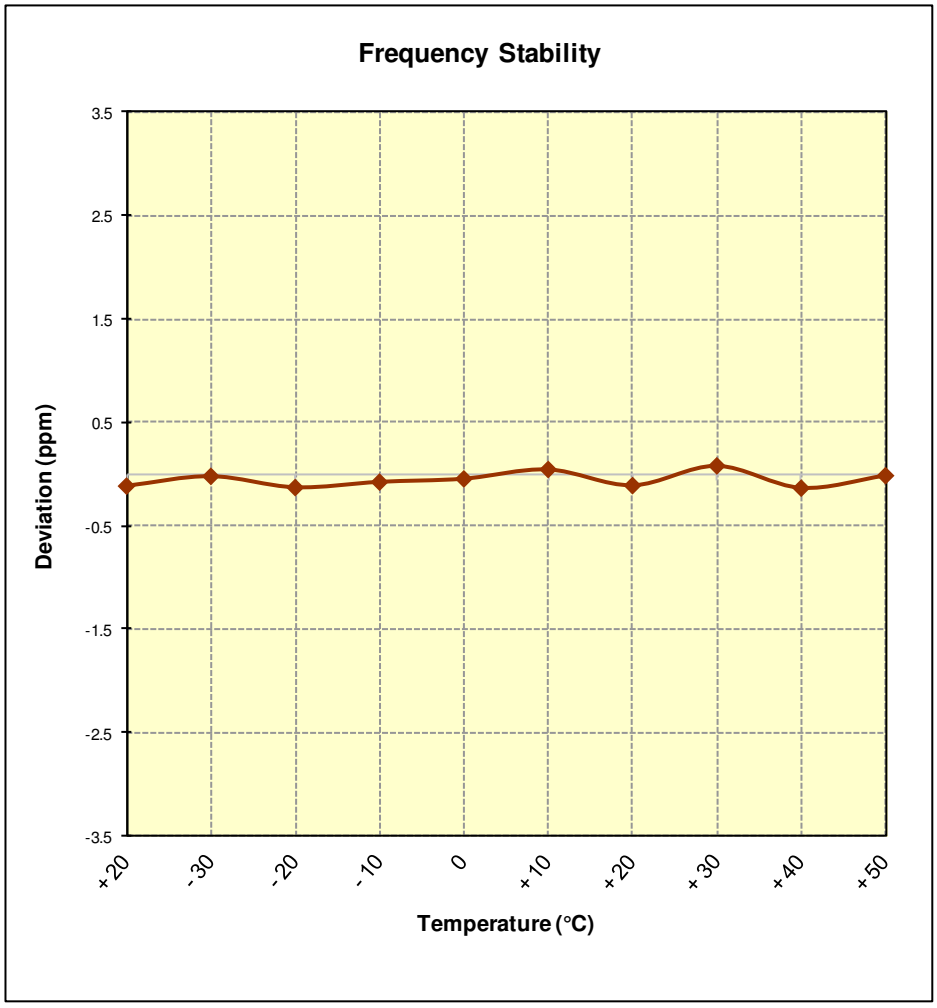


Figure 7-12. Frequency Stability Graph (Band 7)

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset** **FCC ID: ZNFK557** complies with all the requirements of Parts 22, 24, & 27 of the FCC rules for LTE operation only.