6.4 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 of any spurious emission is 43 + $log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

The minimum permissible attenuation level for Band 7 is > 43 + $10log_{10}$ (P[Watts]) at channel edges and > 55 + $10log_{10}$ (P[Watts]) at 5.5 MHz away and beyond channel edges.

Test Procedure Used

KDB 971168 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.

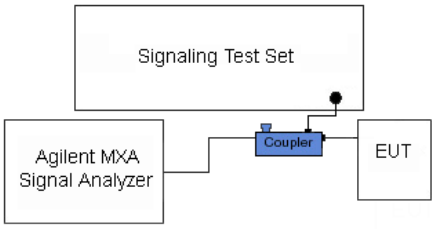


Figure 6-3. Test Instrument & Measurement Setup

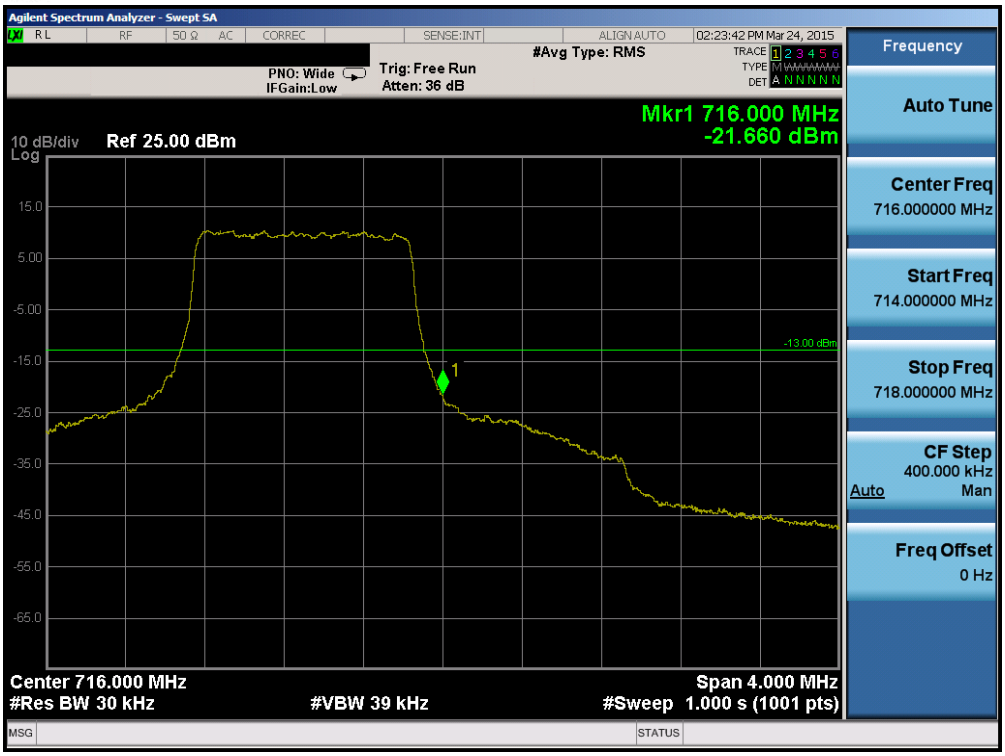
Test Notes

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.

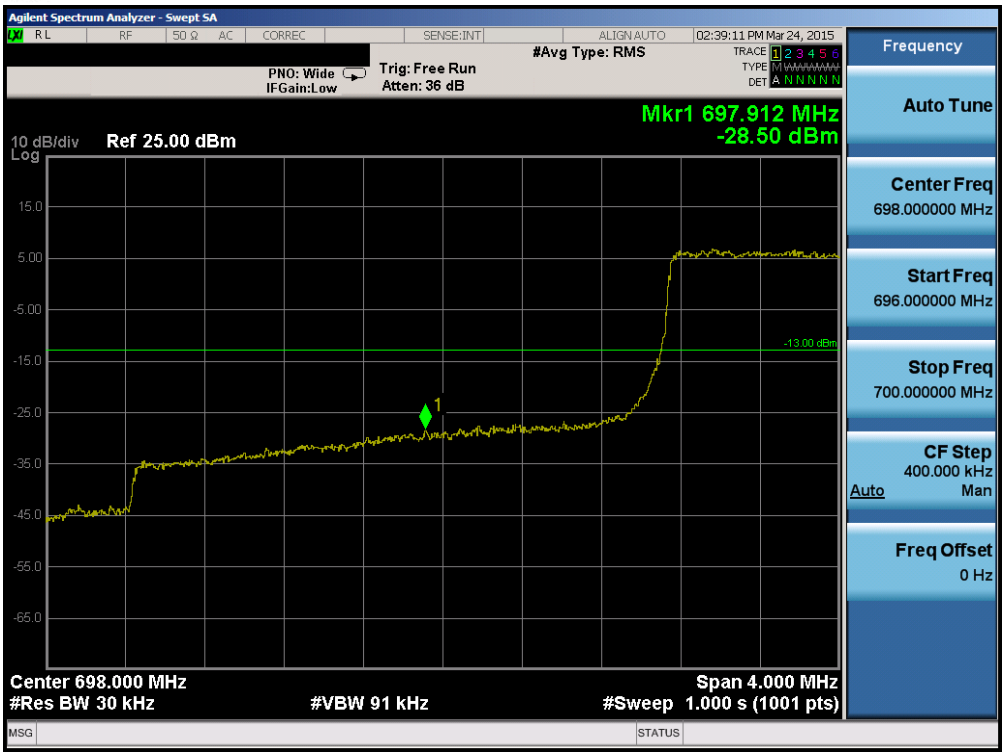
Plot 6-94. Lower Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)

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



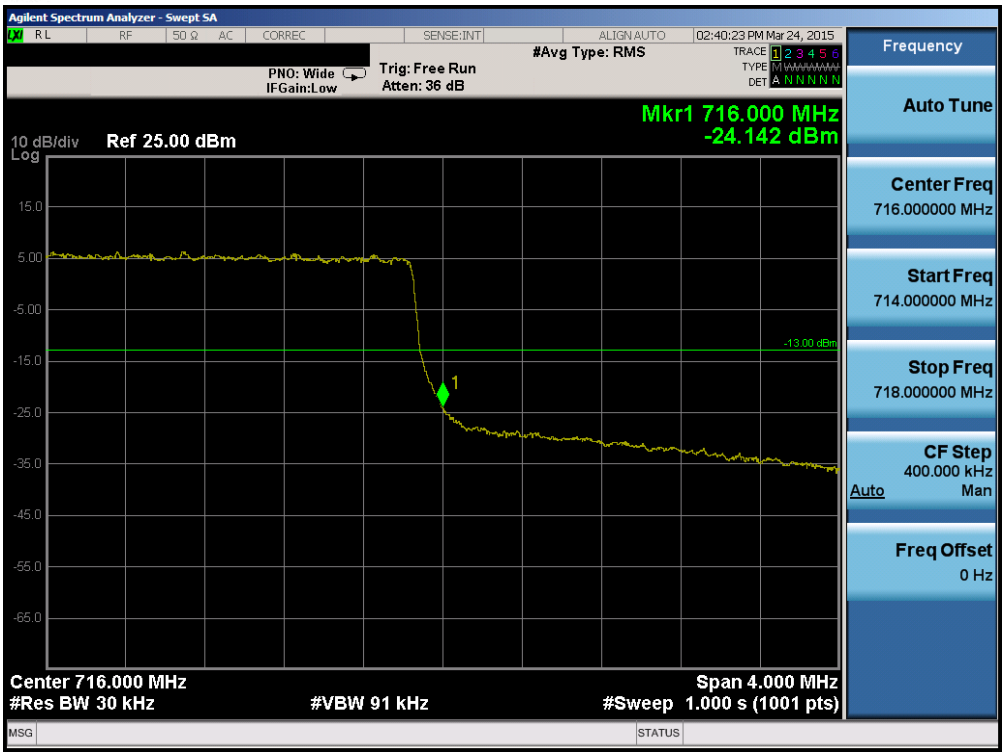
Plot 6-96. Upper Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)

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



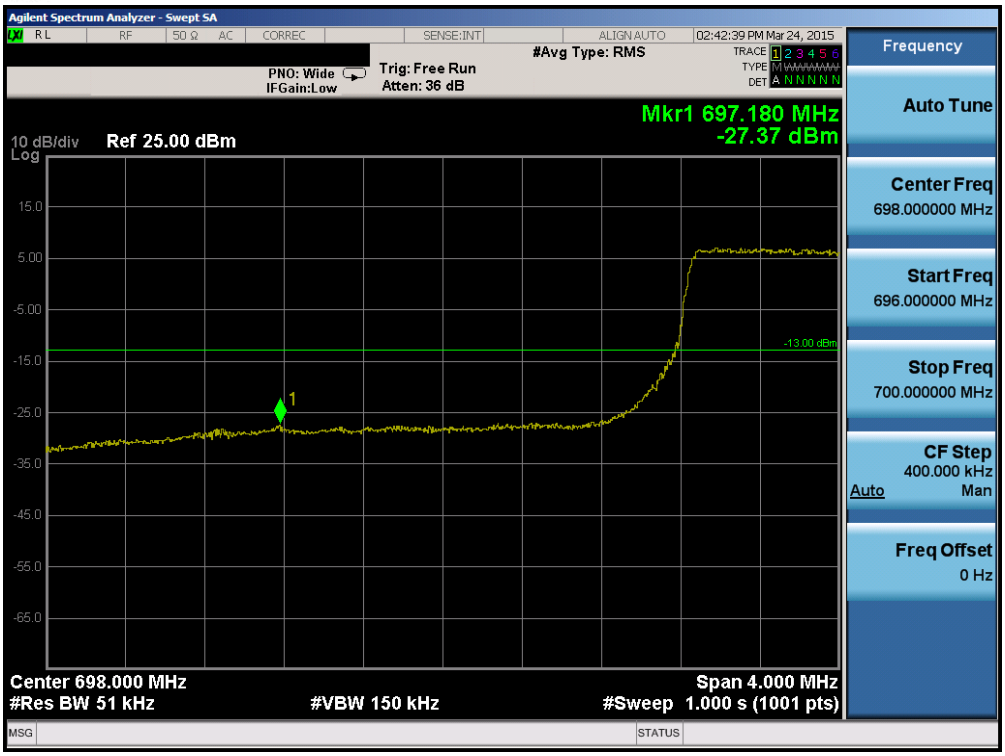
Plot 6-98. Lower Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

Plot 6-99. Lower Extended Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)



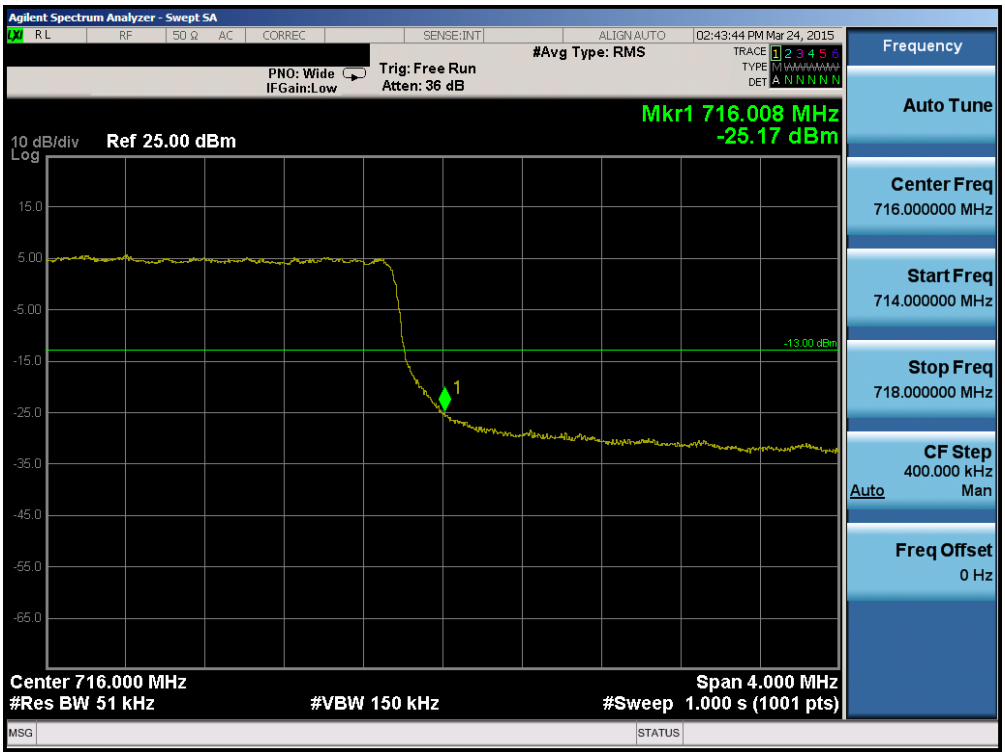
Plot 6-100. Upper Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

Plot 6-101. Upper Extended Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)



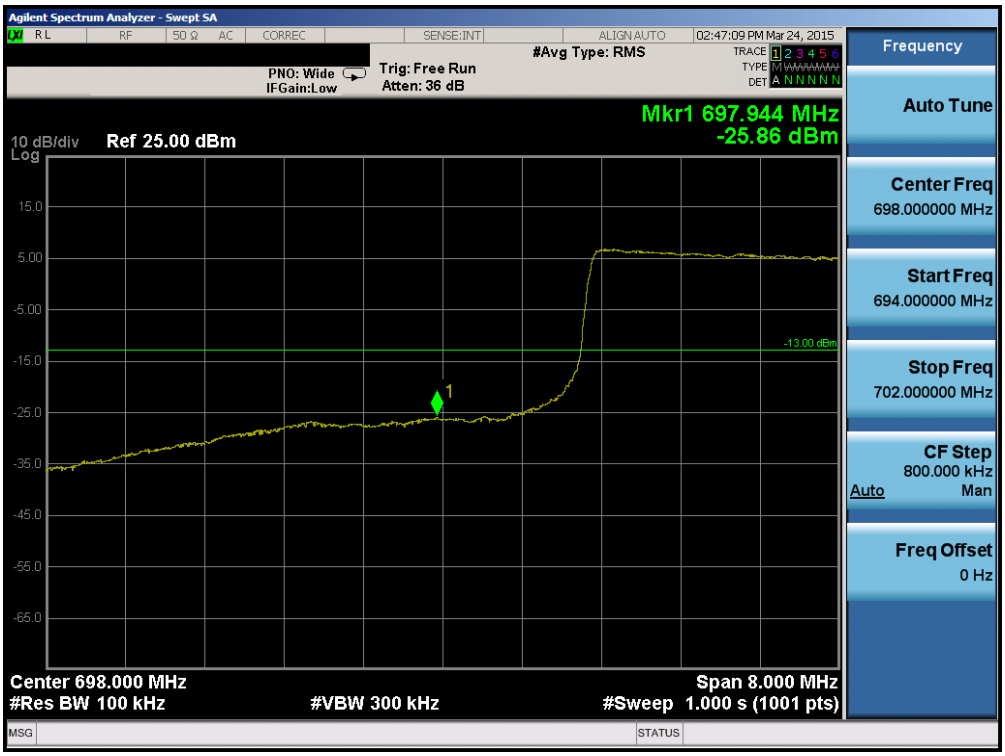
Plot 6-102. Lower Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)

Plot 6-103. Lower Extended Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)



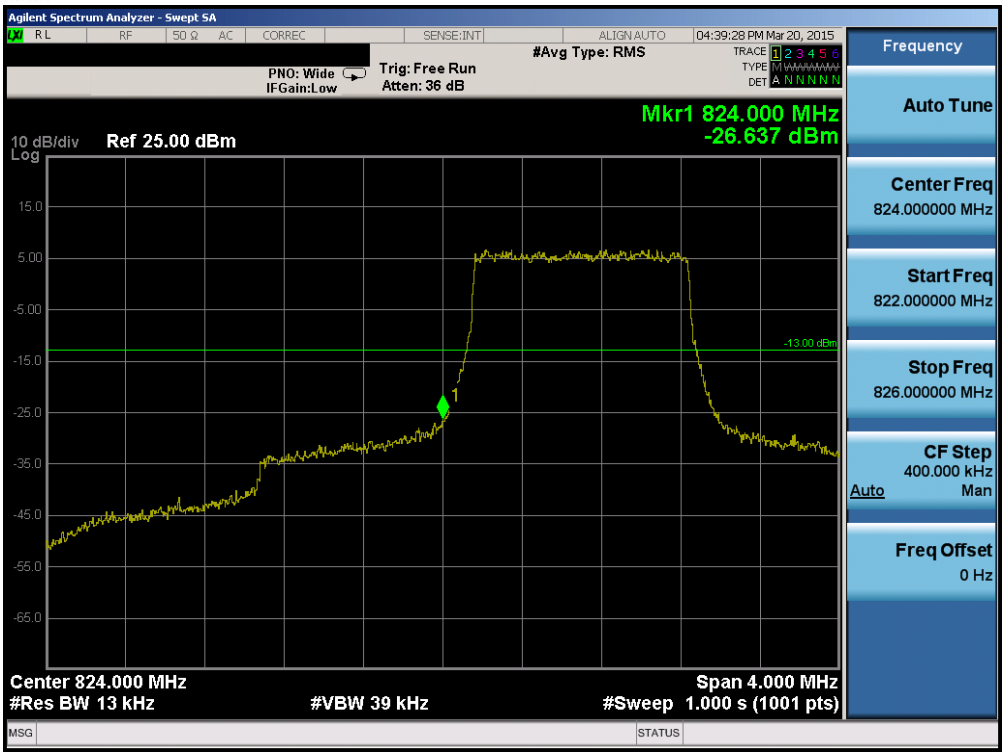
Plot 6-104. Upper Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)

Plot 6-105. Upper Extended Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)



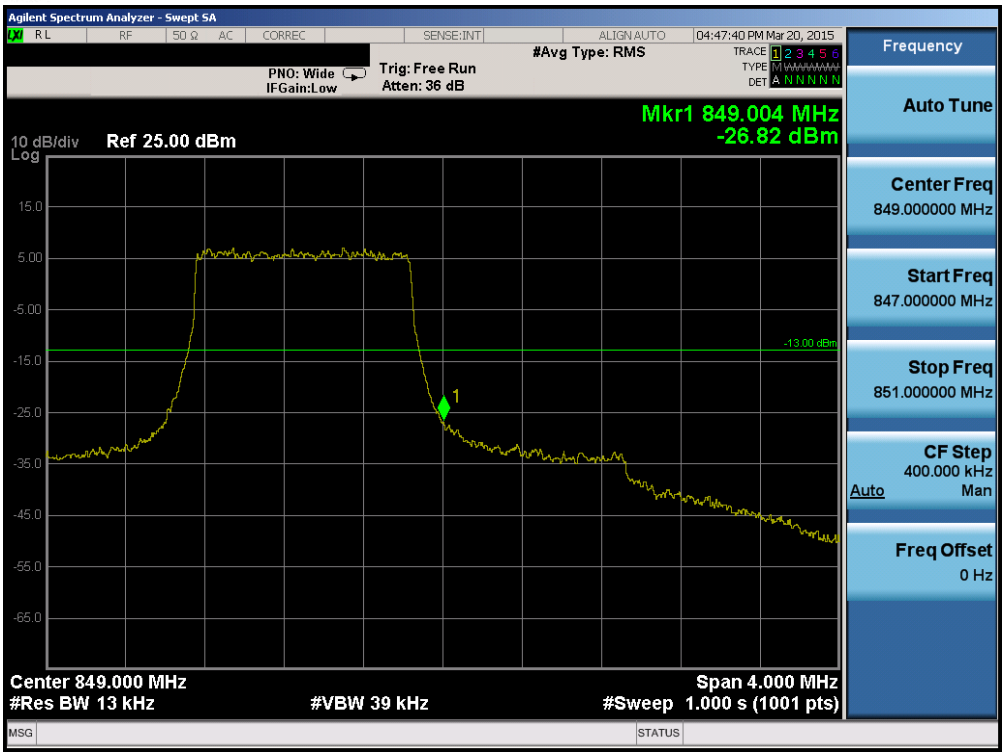
Plot 6-106. Lower Band Edge Plot (Band 12 – 10.0MHz QPSK – RB Size 50)

Plot 6-107. Upper Band Edge Plot (Band 12 – 10.0MHz QPSK – RB Size 50)



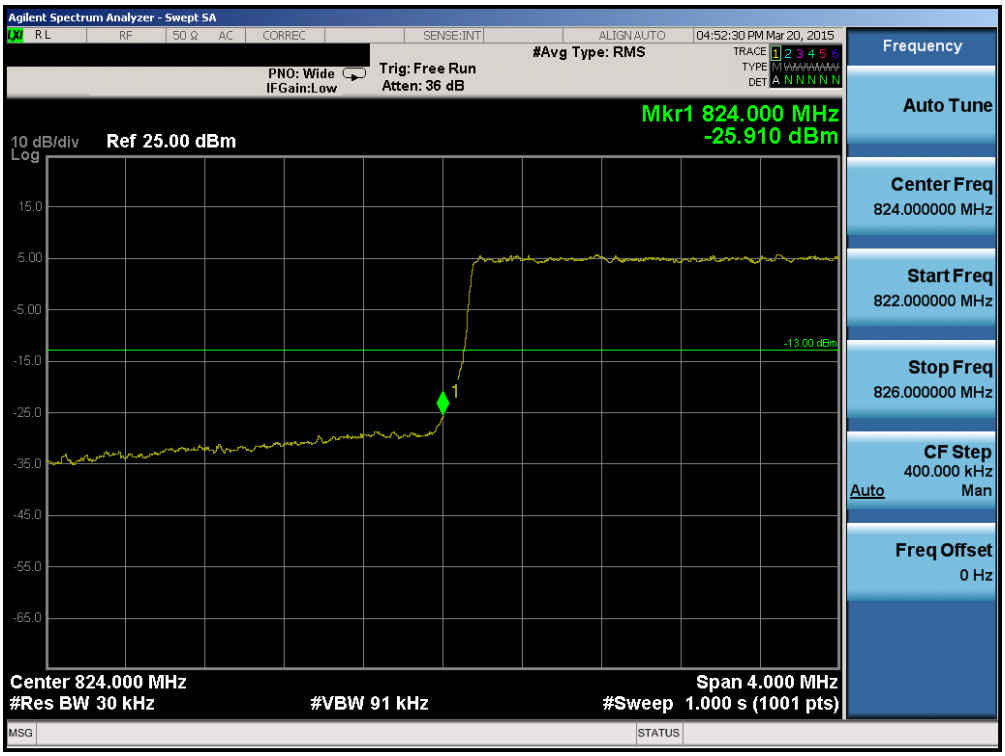
Plot 6-108. Lower Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

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



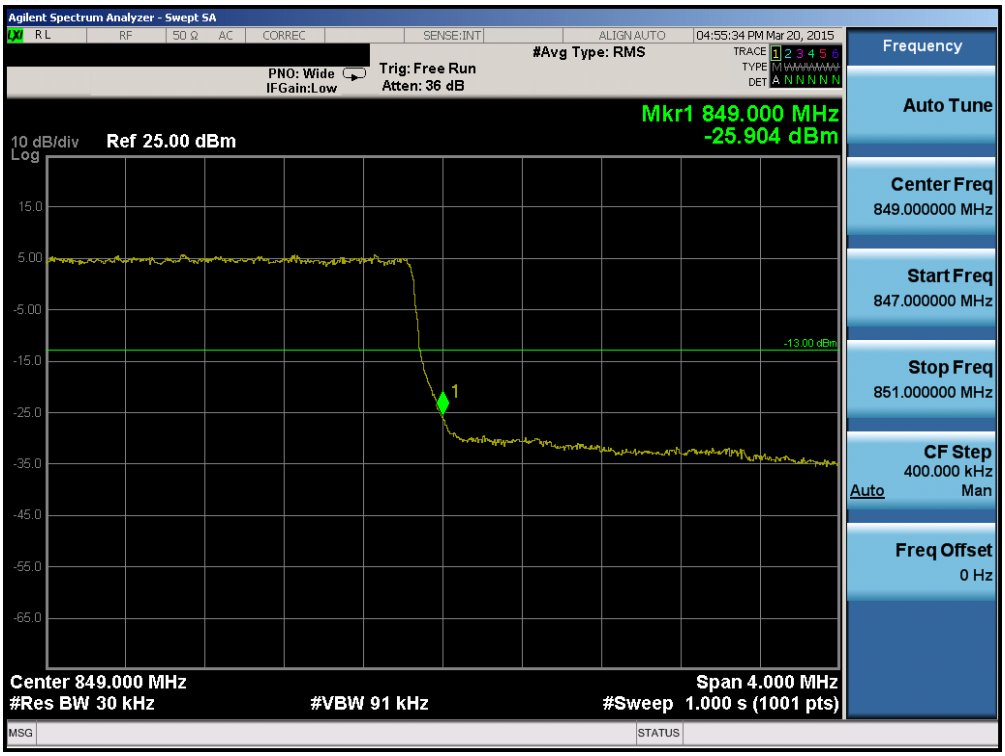
Plot 6-110. Upper Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

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



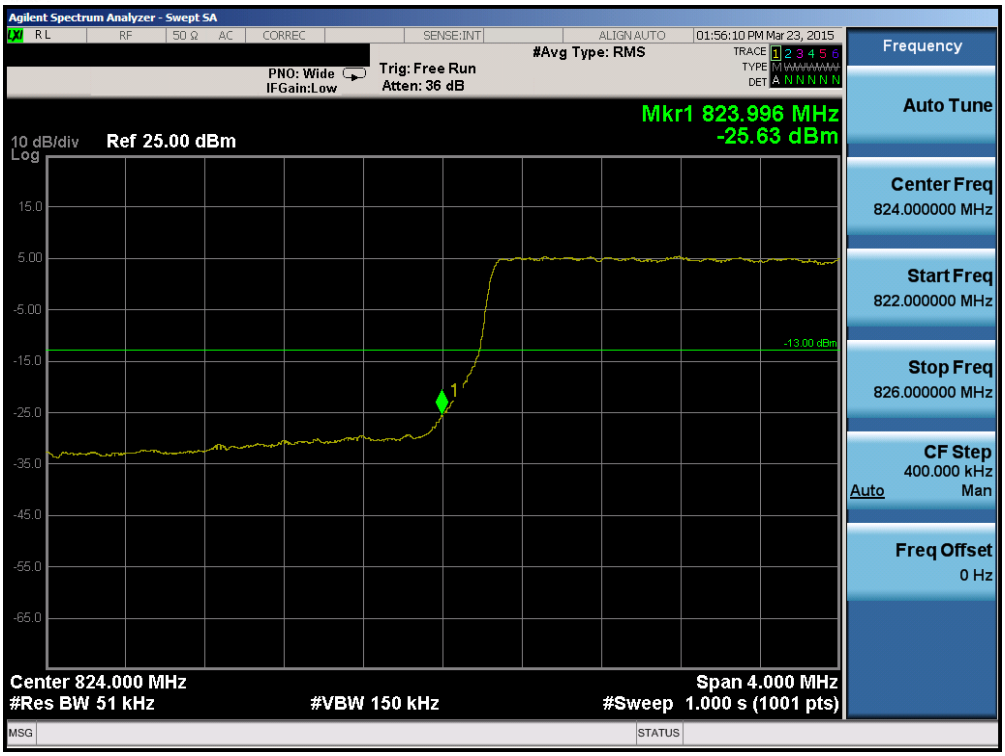
Plot 6-112. Lower Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)

Plot 6-113. Lower Extended Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)



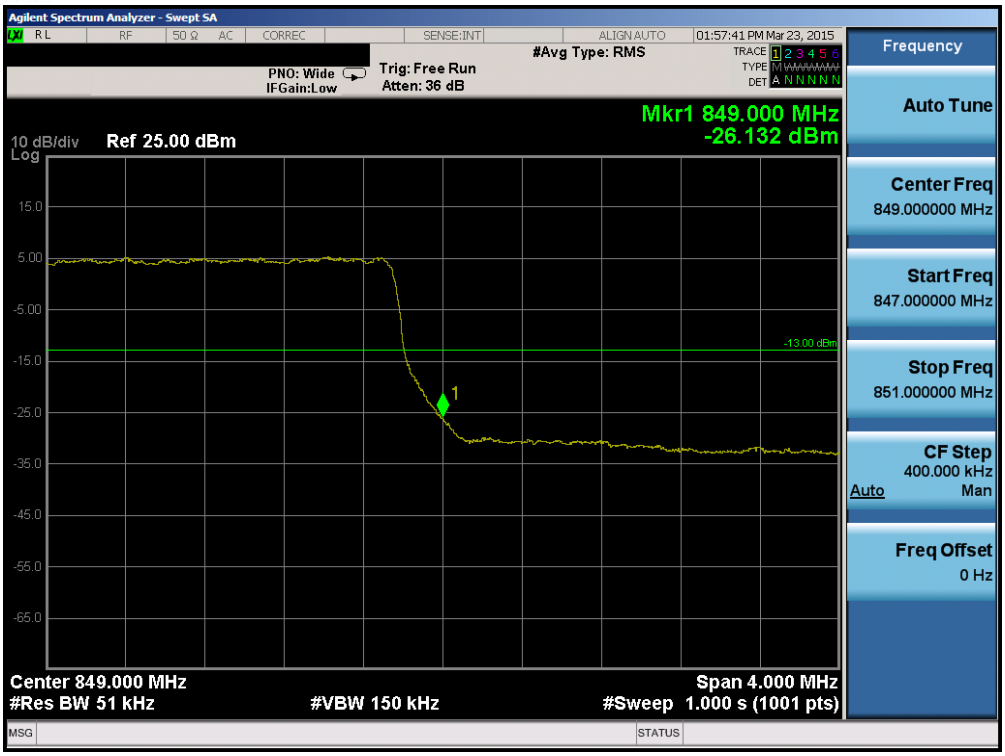
Plot 6-114. Upper Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)

Plot 6-115. Upper Extended Band Edge Plot (Band 5 – Band 5 – 3.0MHz QPSK – RB Size 15)



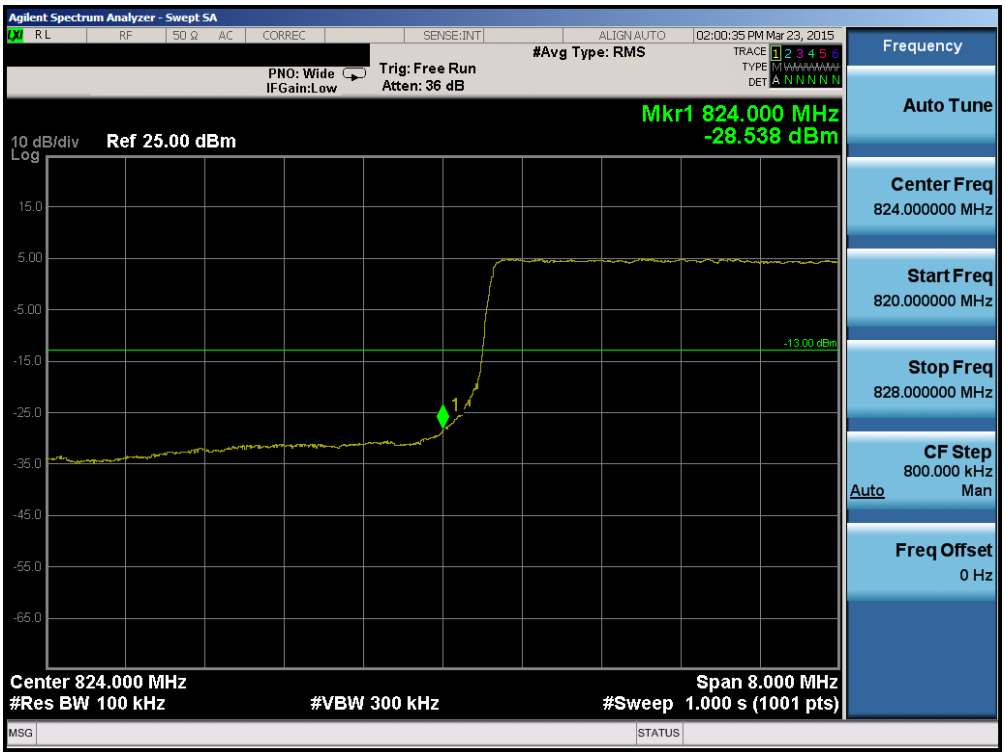
Plot 6-116. Lower Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

Plot 6-117. Lower Extended Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)



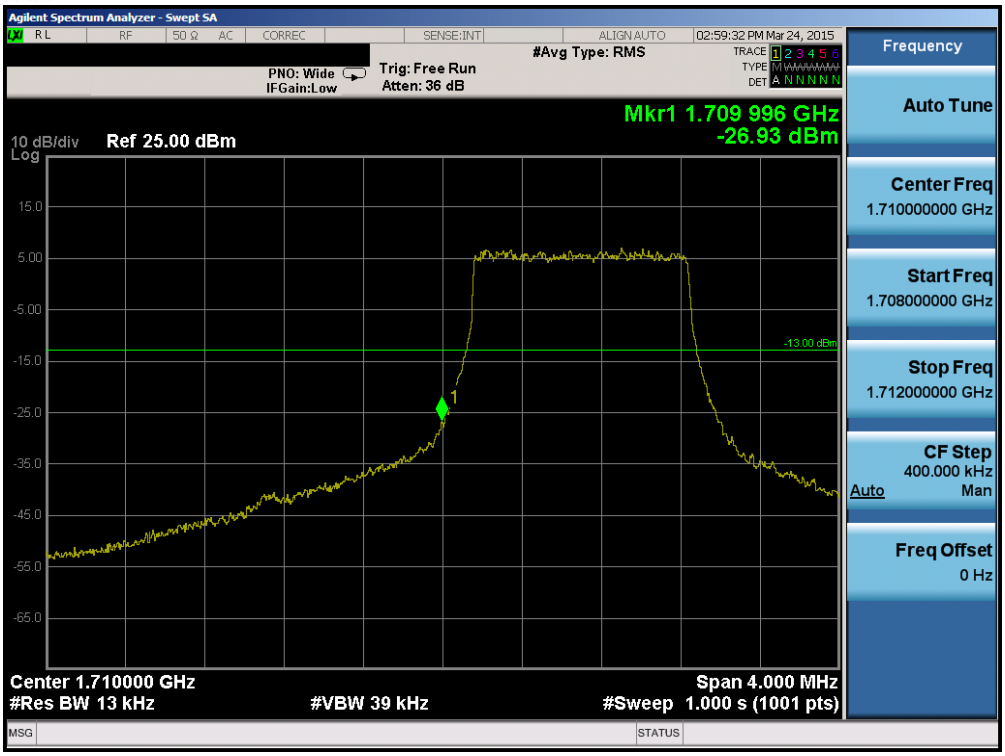
Plot 6-118. Upper Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

Plot 6-119. Upper Extended Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

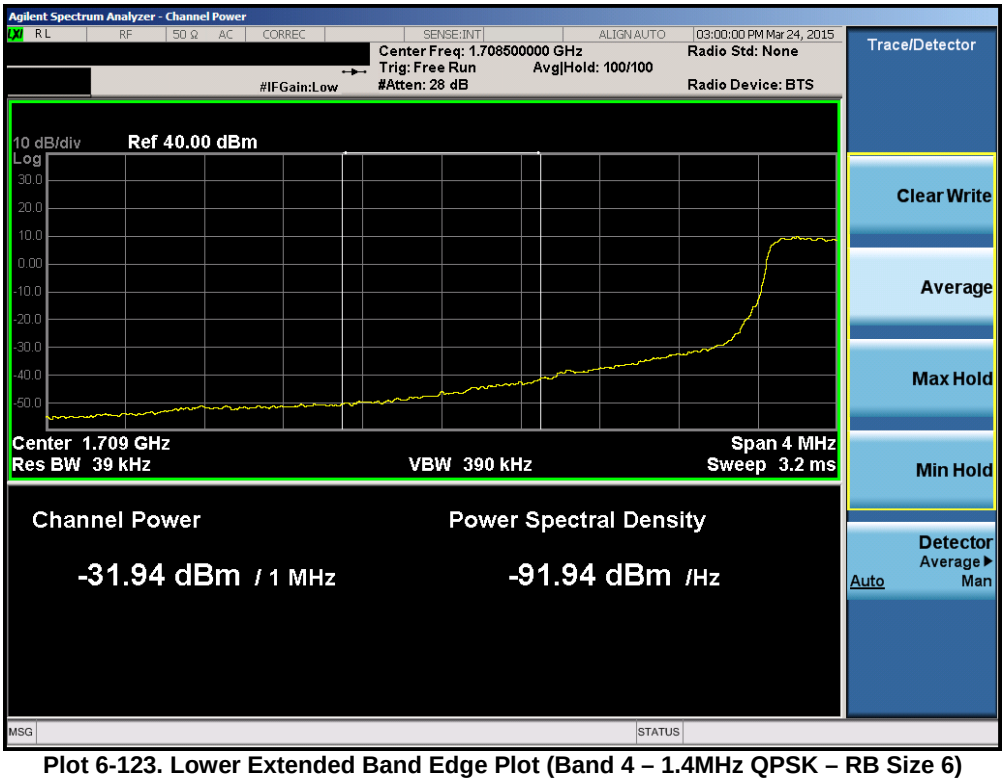


Plot 6-120. Lower Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)

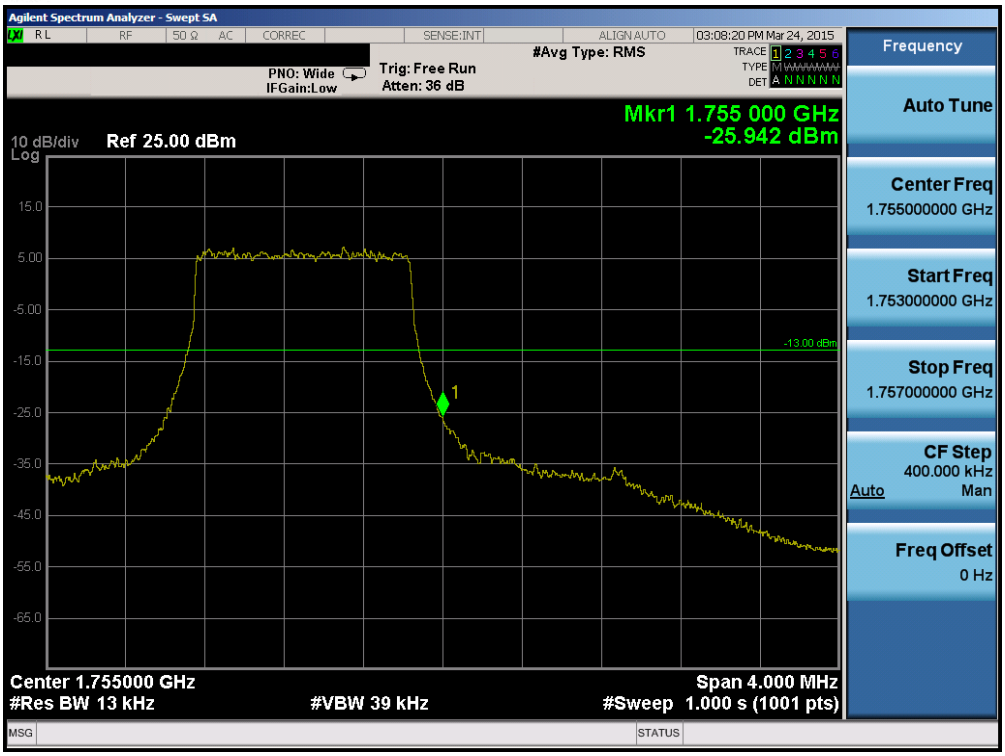
Plot 6-121. Upper Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)



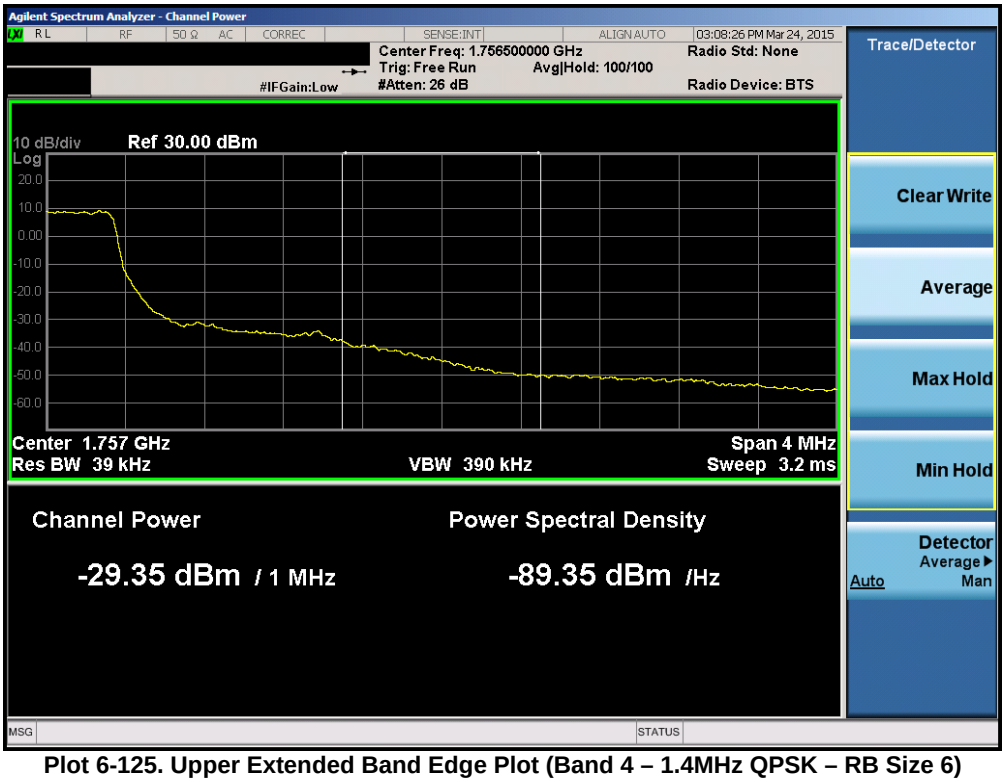
Plot 6-122. Lower Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



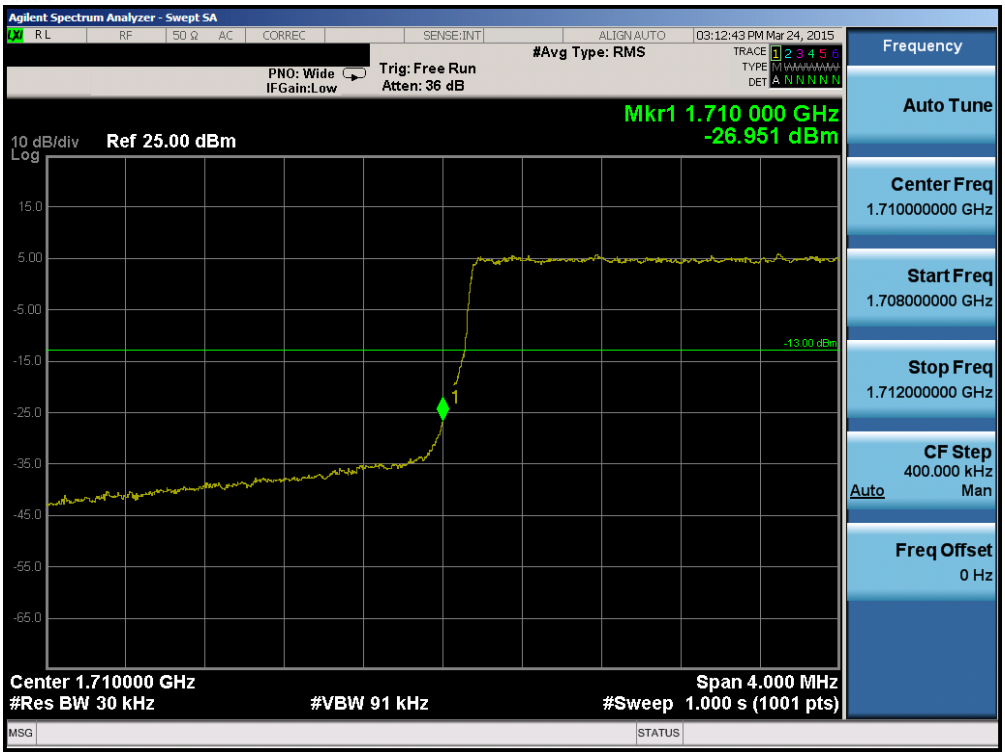
Plot 6-123. Lower Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



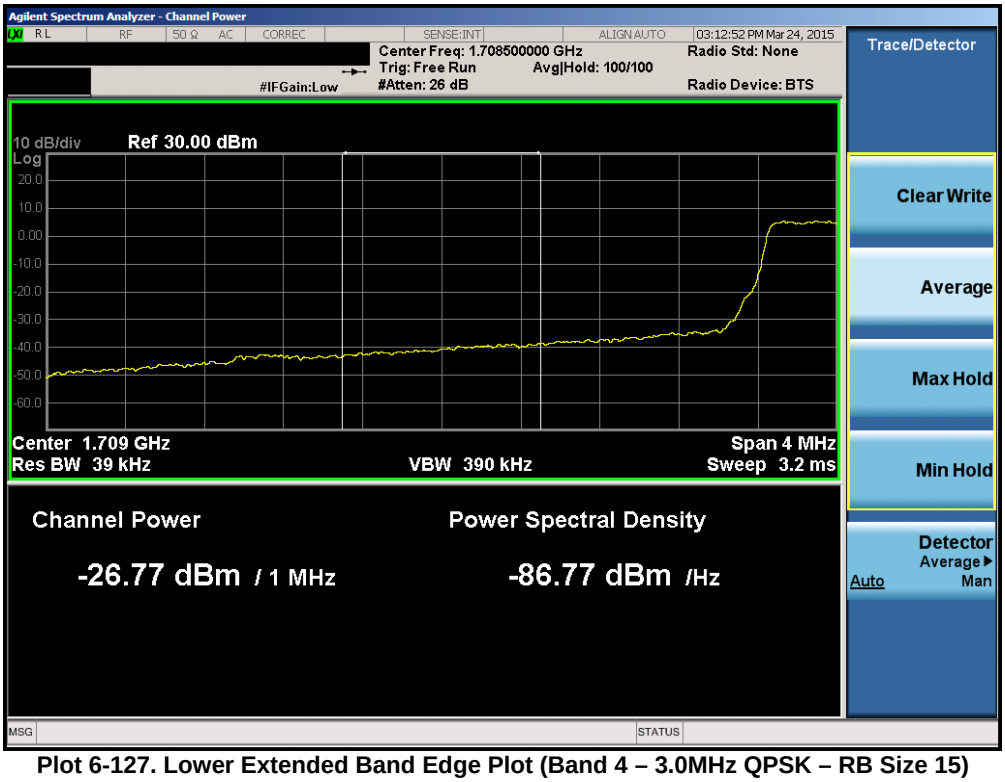
Plot 6-124. Upper Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



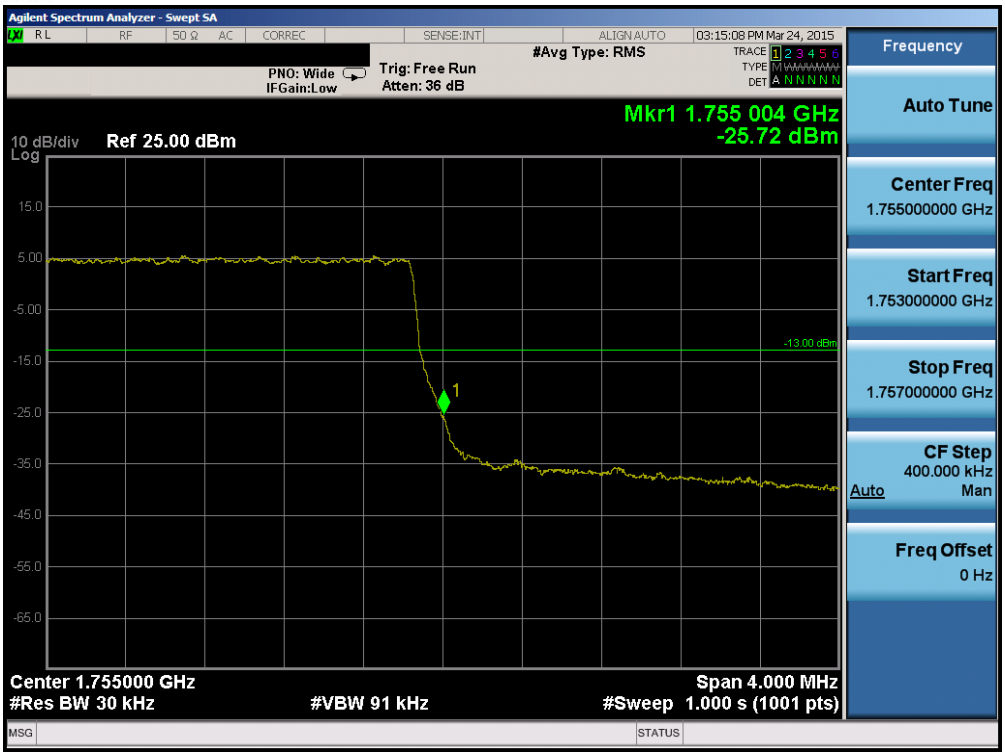
Plot 6-125. Upper Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



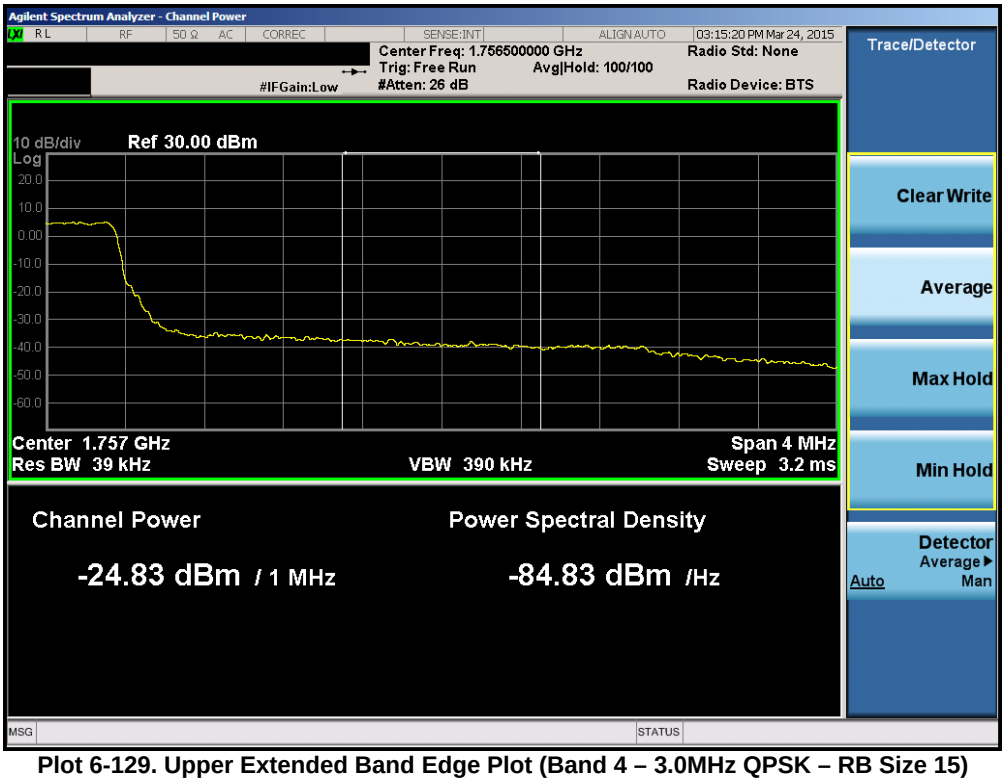
Plot 6-126. Lower Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



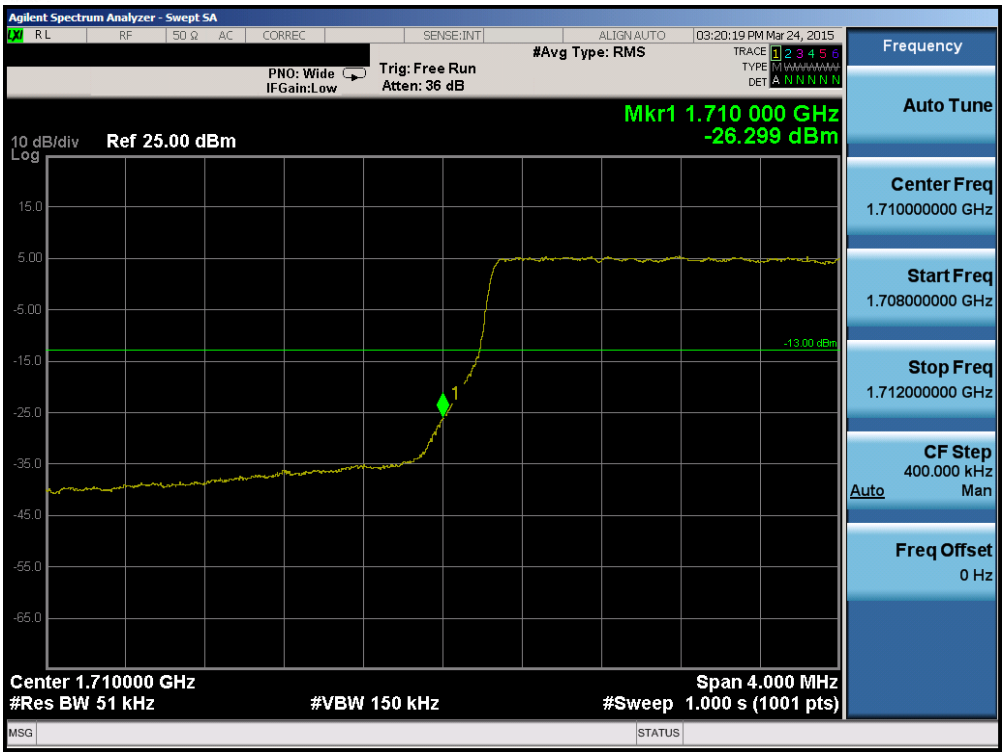
Plot 6-127. Lower Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



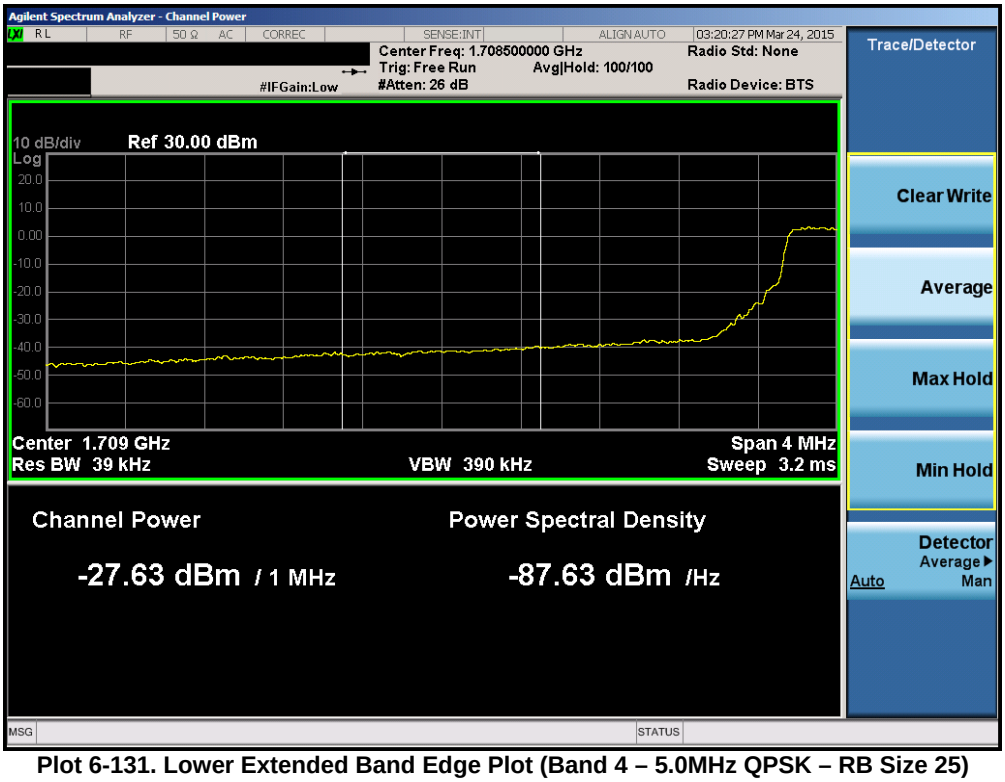
Plot 6-128. Upper Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



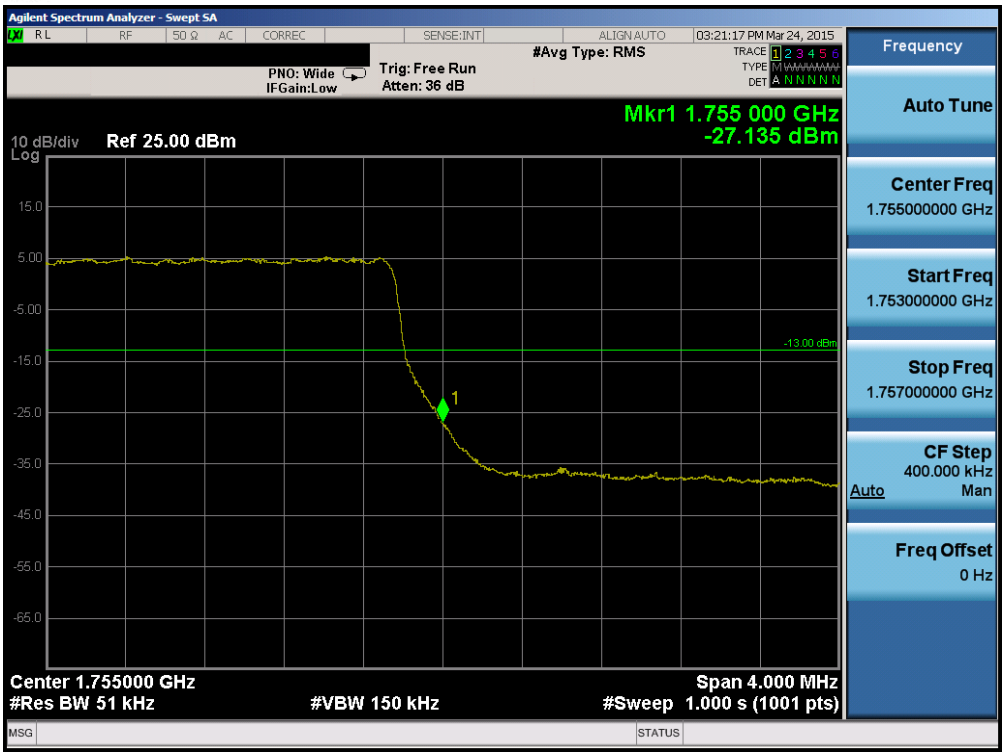
Plot 6-129. Upper Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



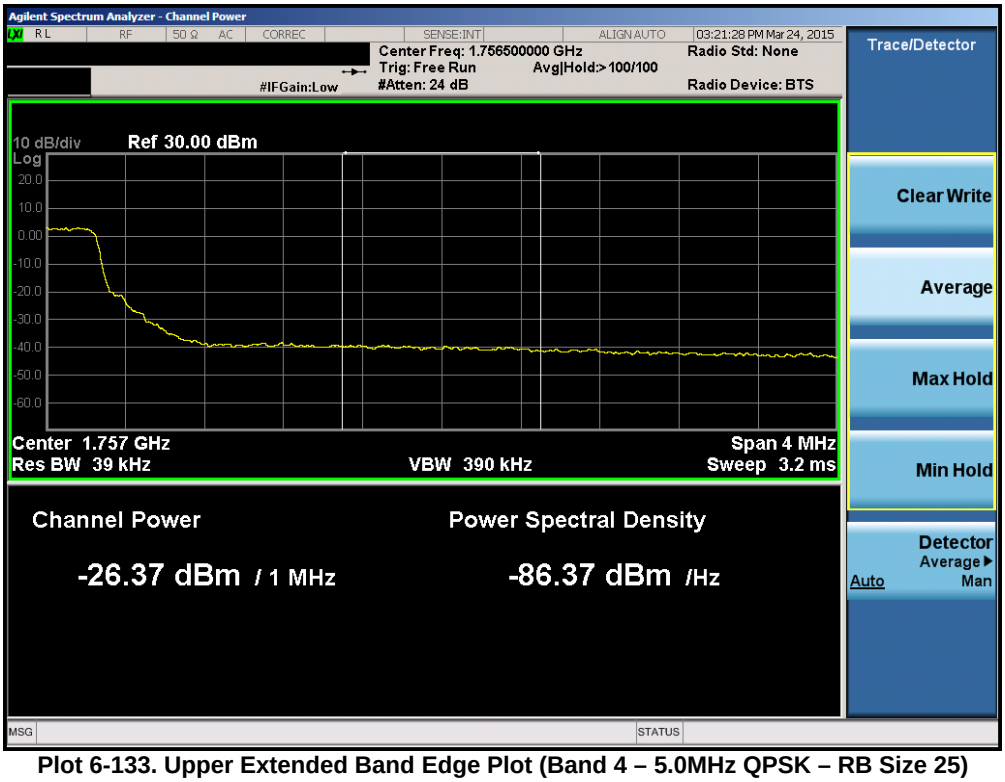
Plot 6-130. Lower Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



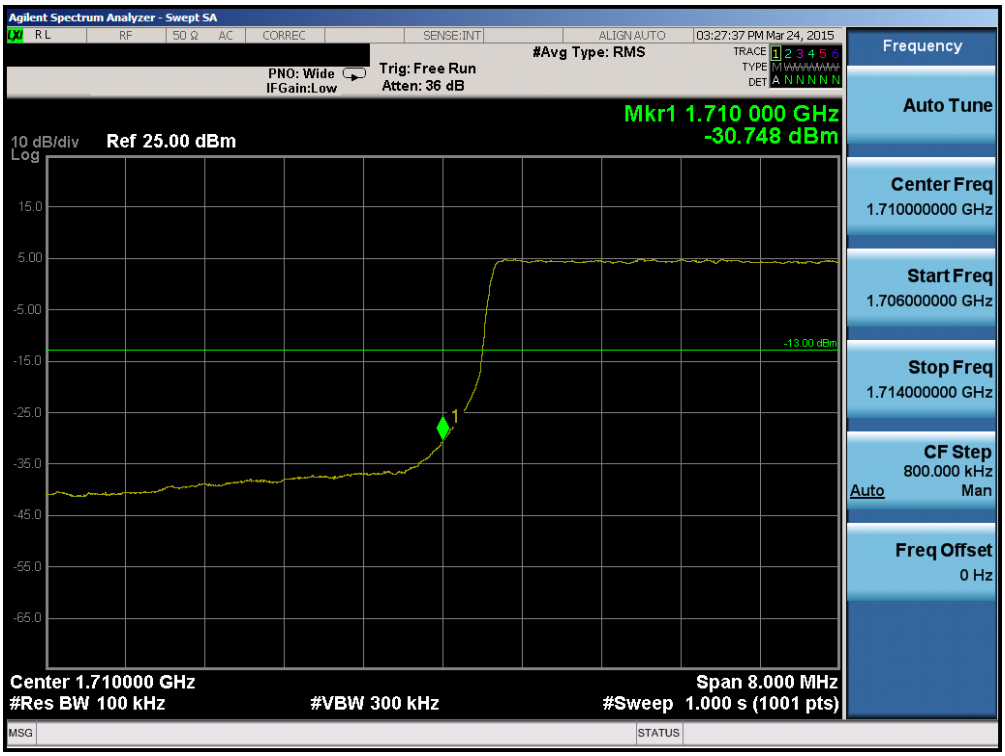
Plot 6-131. Lower Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



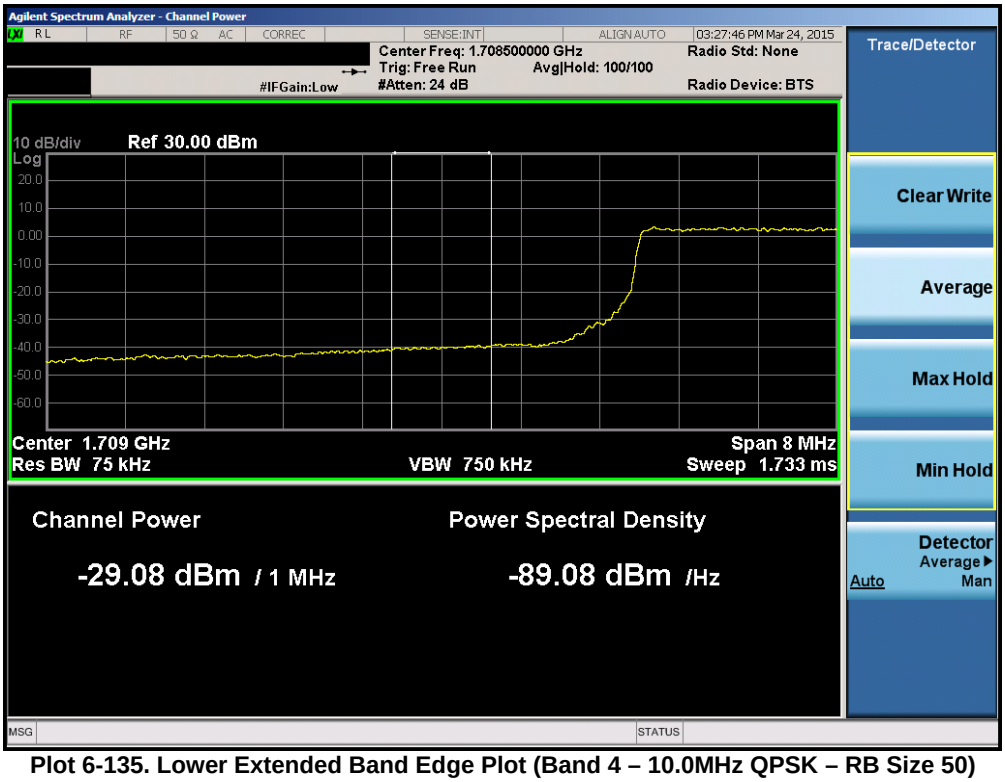
Plot 6-132. Upper Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



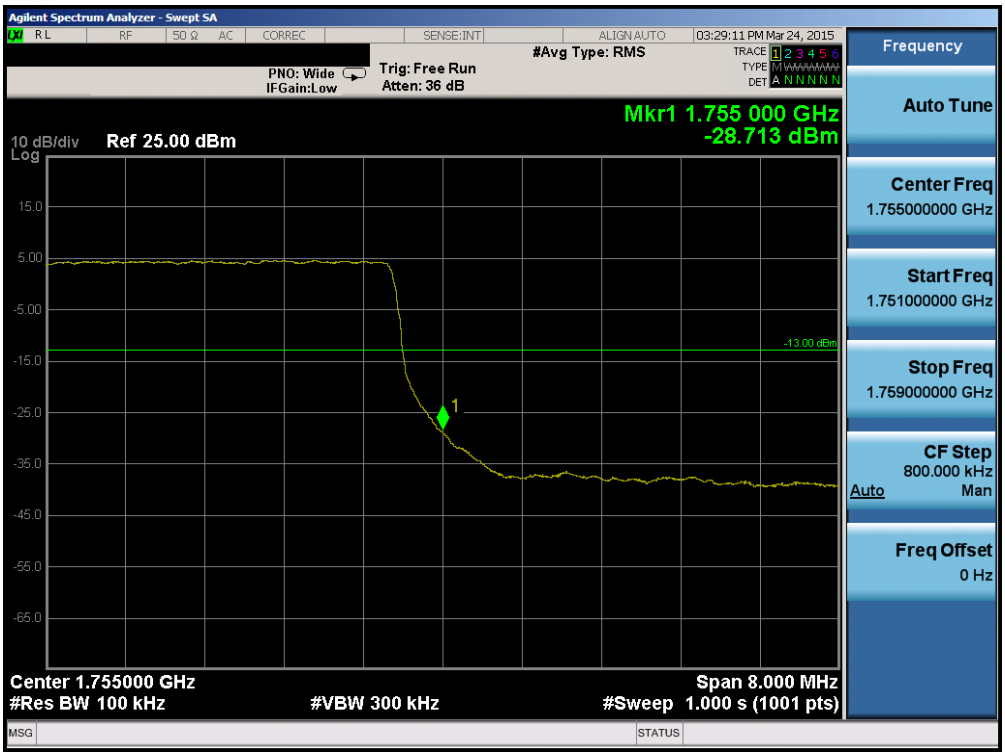
Plot 6-133. Upper Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



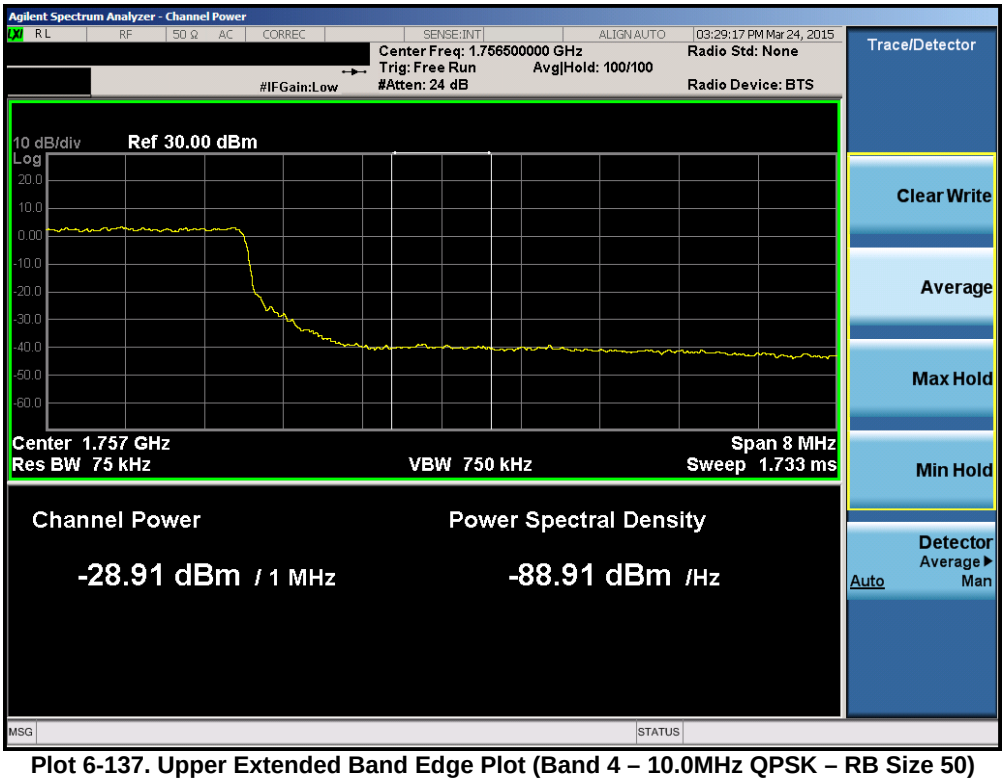
Plot 6-134. Lower Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)



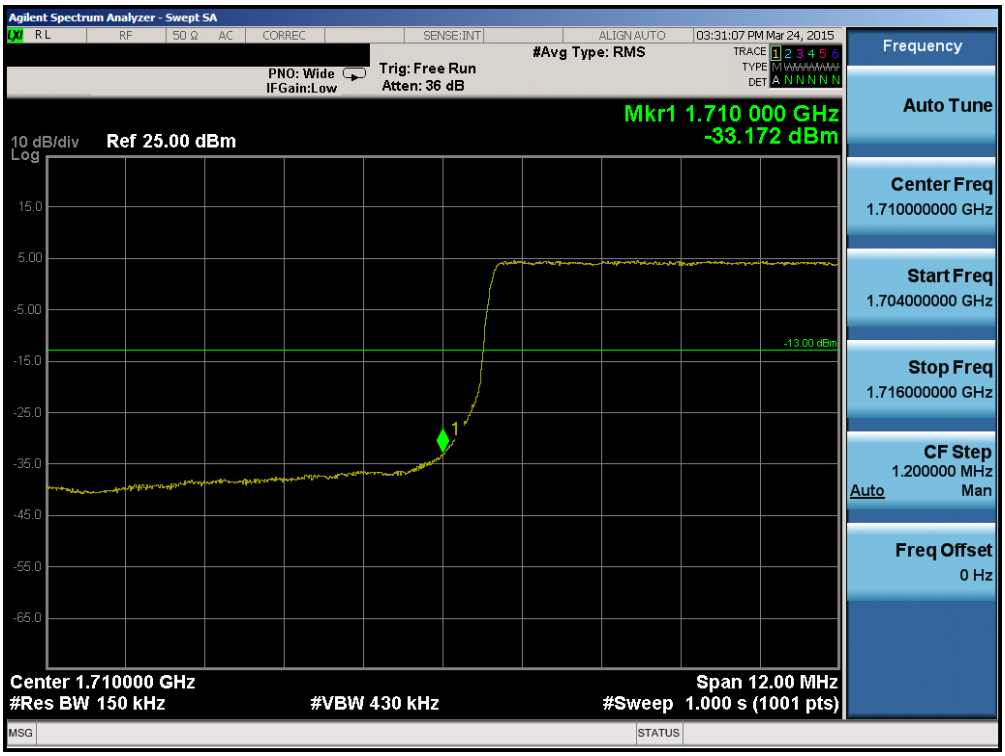
Plot 6-135. Lower Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)



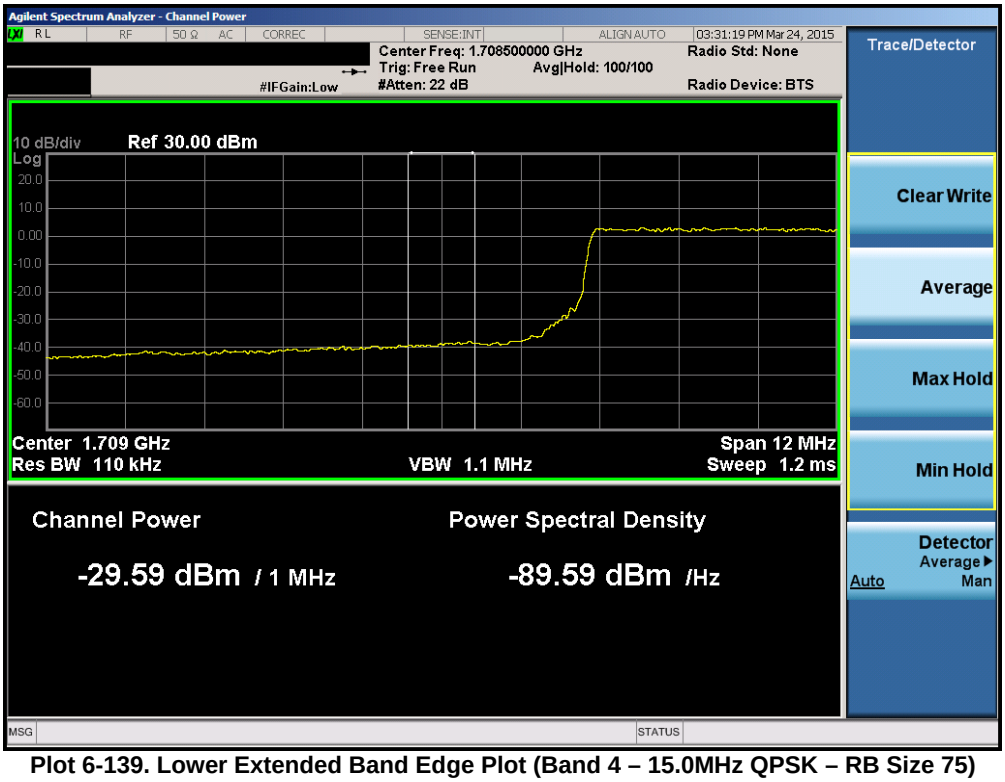
Plot 6-136. Upper Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)



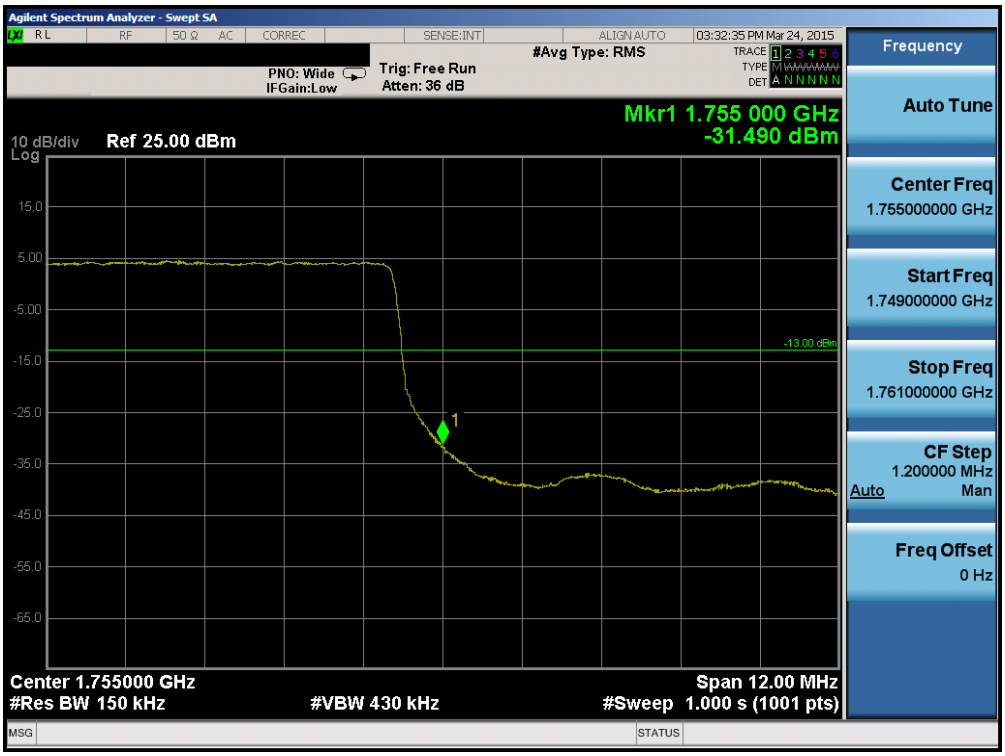
Plot 6-137. Upper Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)



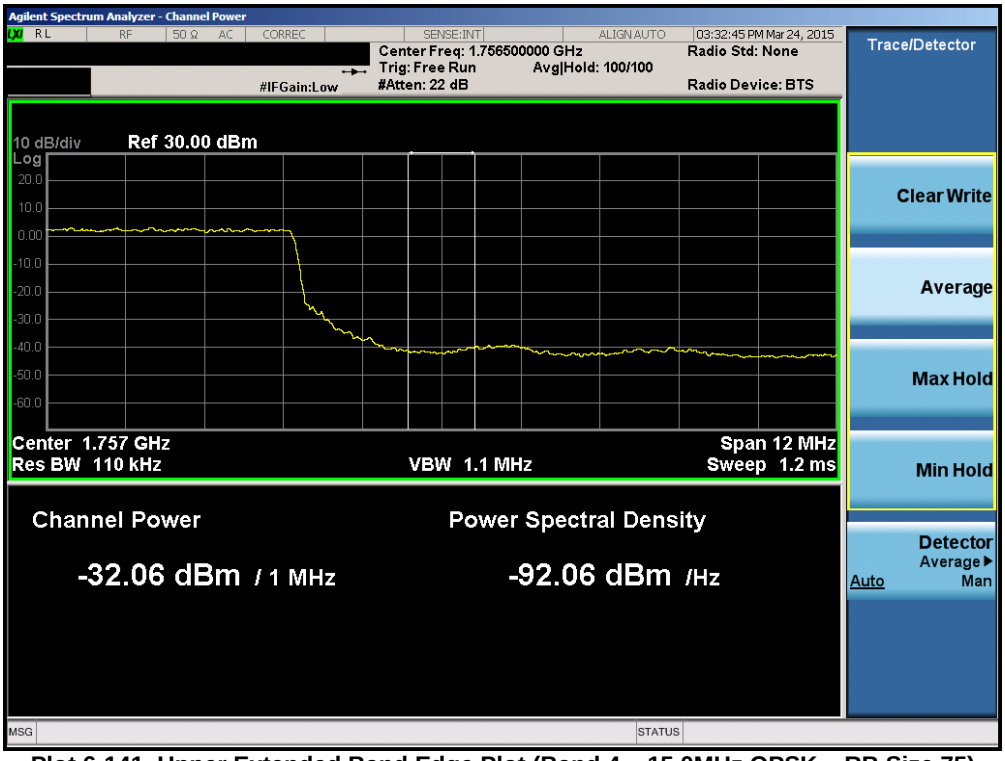
Plot 6-138. Lower Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)



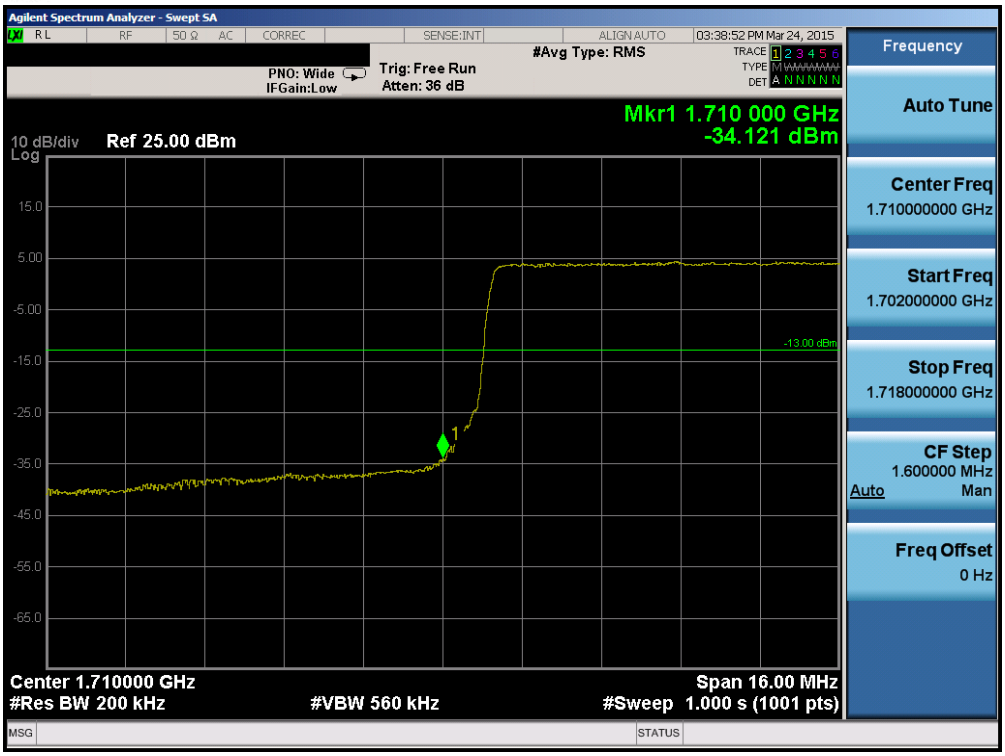
Plot 6-139. Lower Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)



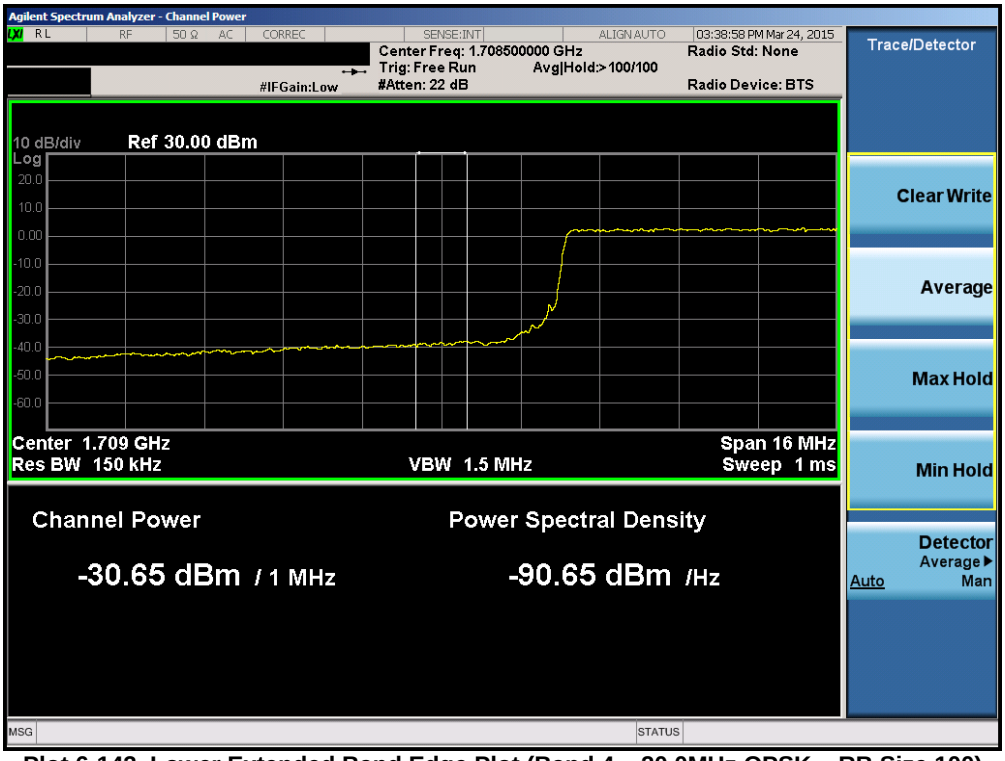
Plot 6-140. Upper Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)



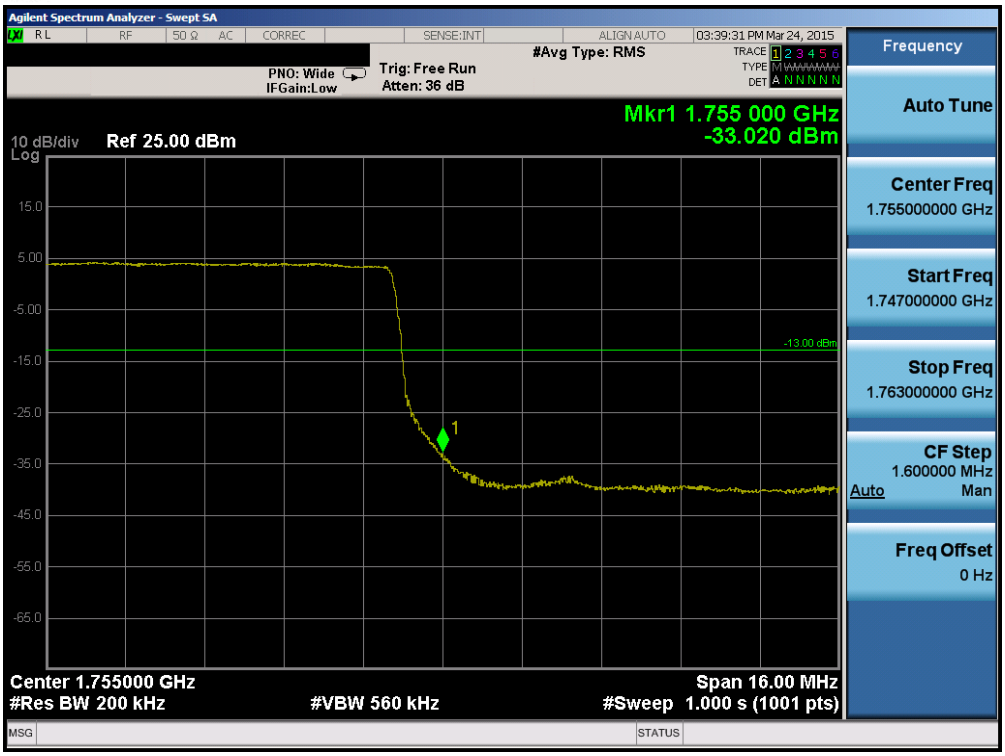
Plot 6-141. Upper Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)



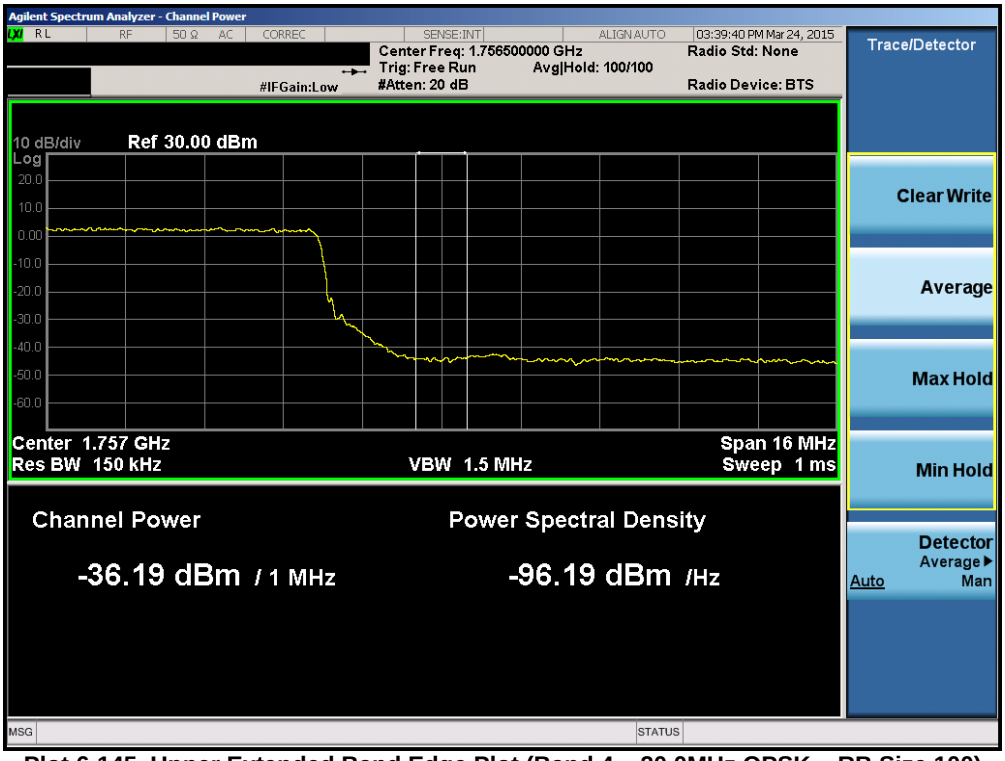
Plot 6-142. Lower Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



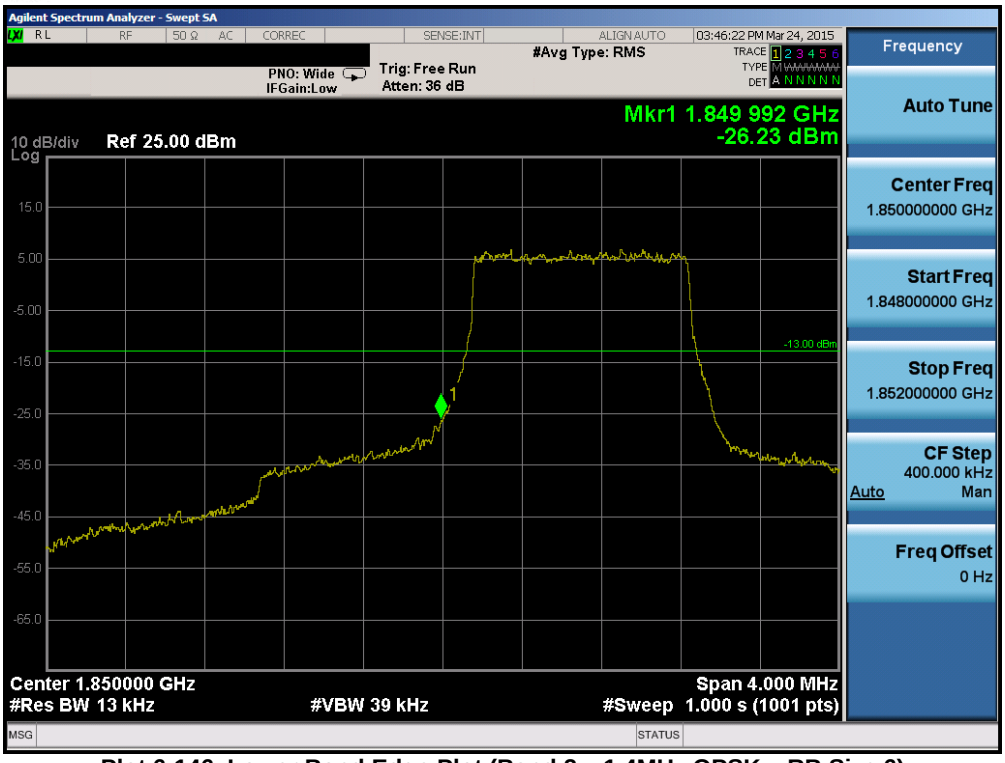
Plot 6-143. Lower Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



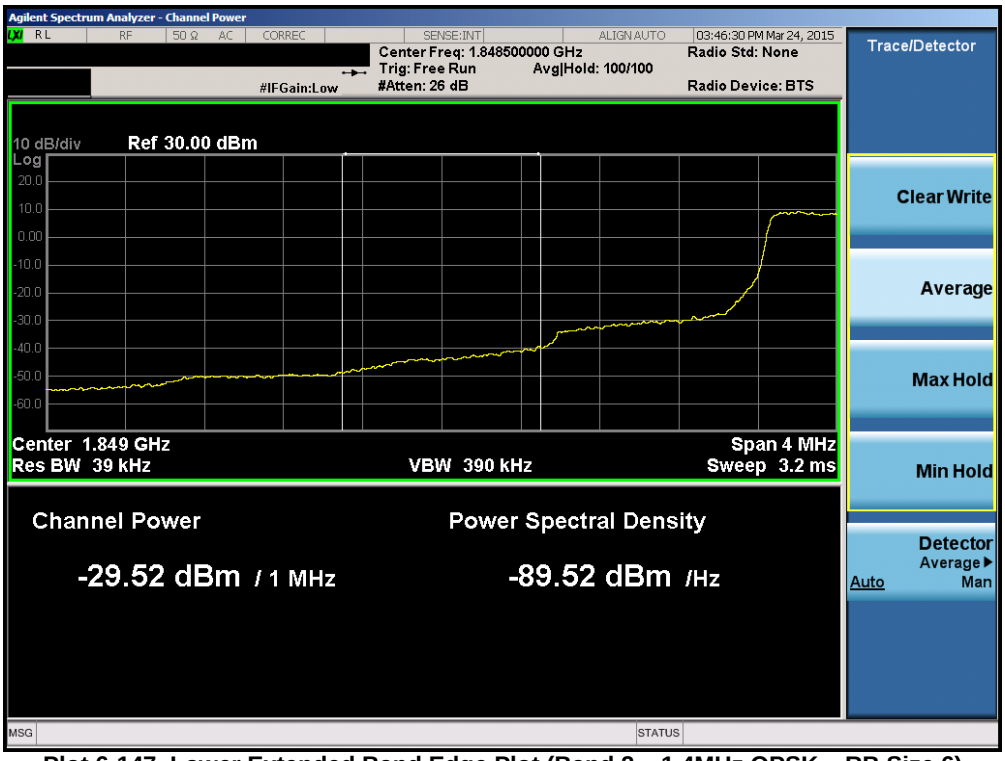
Plot 6-144. Upper Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



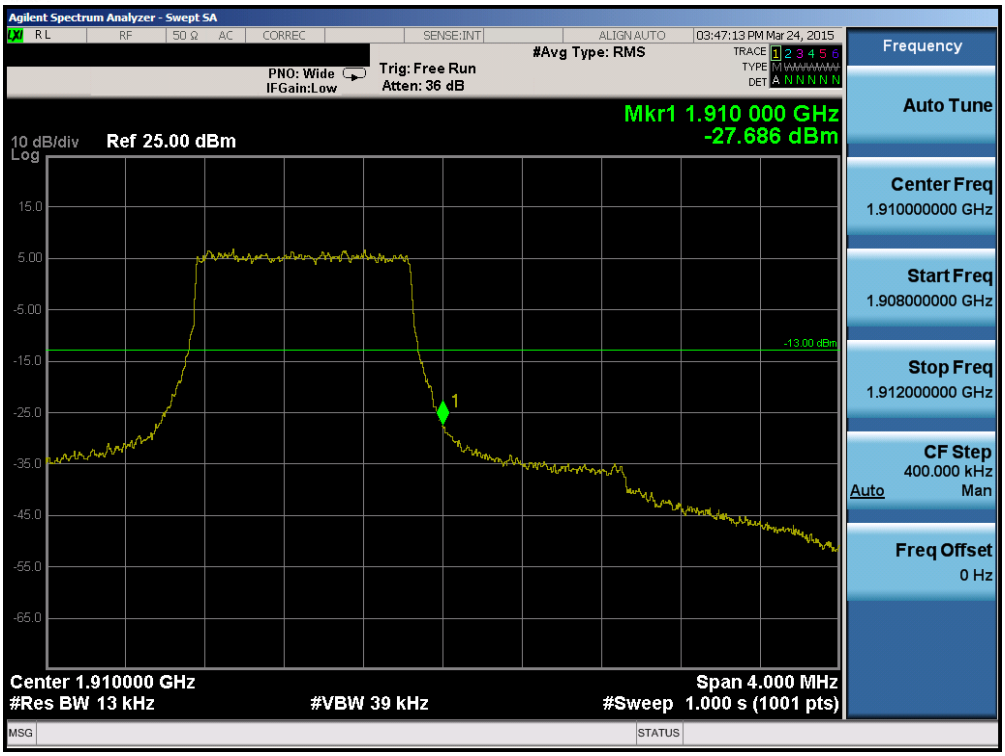
Plot 6-145. Upper Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



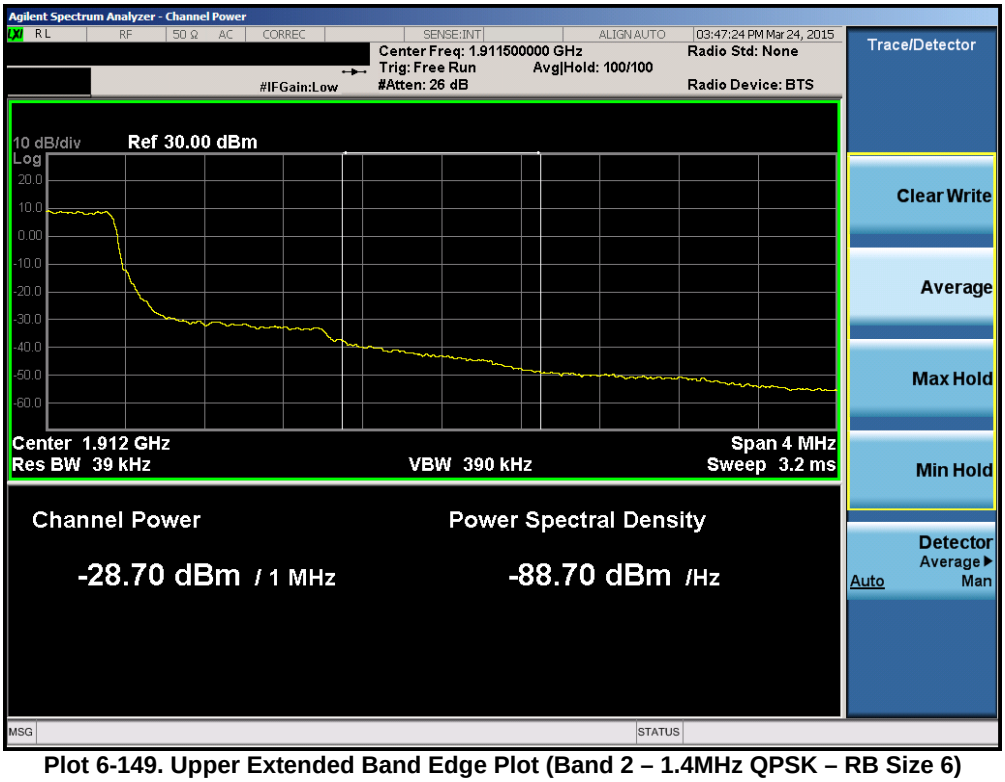
Plot 6-146. Lower Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)



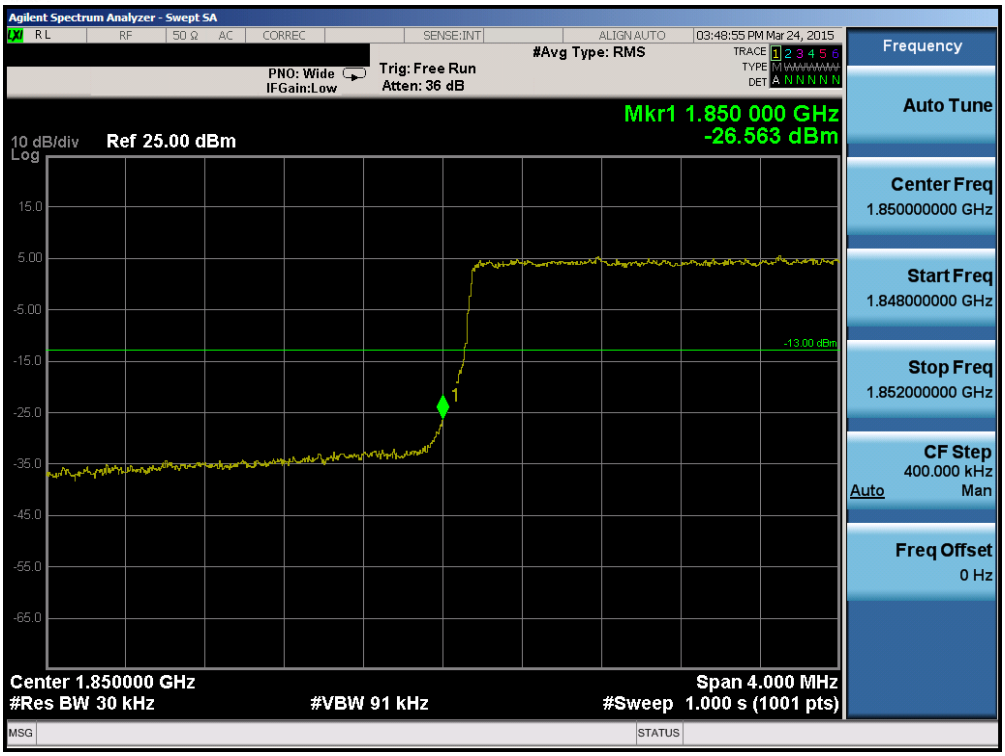
Plot 6-147. Lower Extended Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)



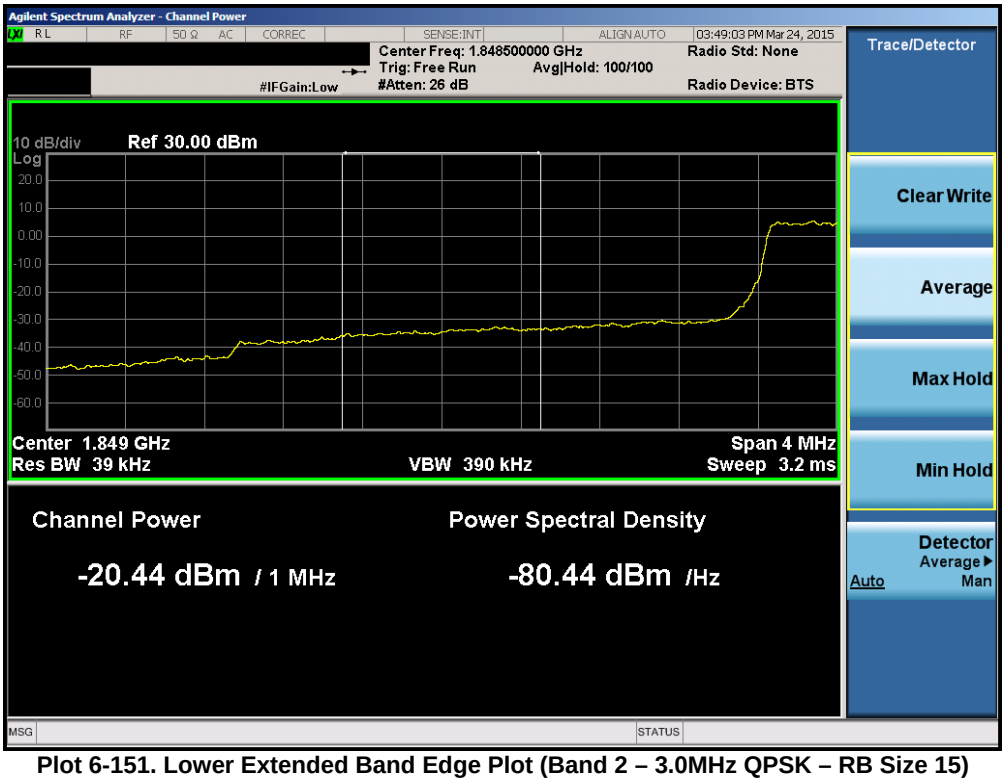
Plot 6-148. Upper Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)



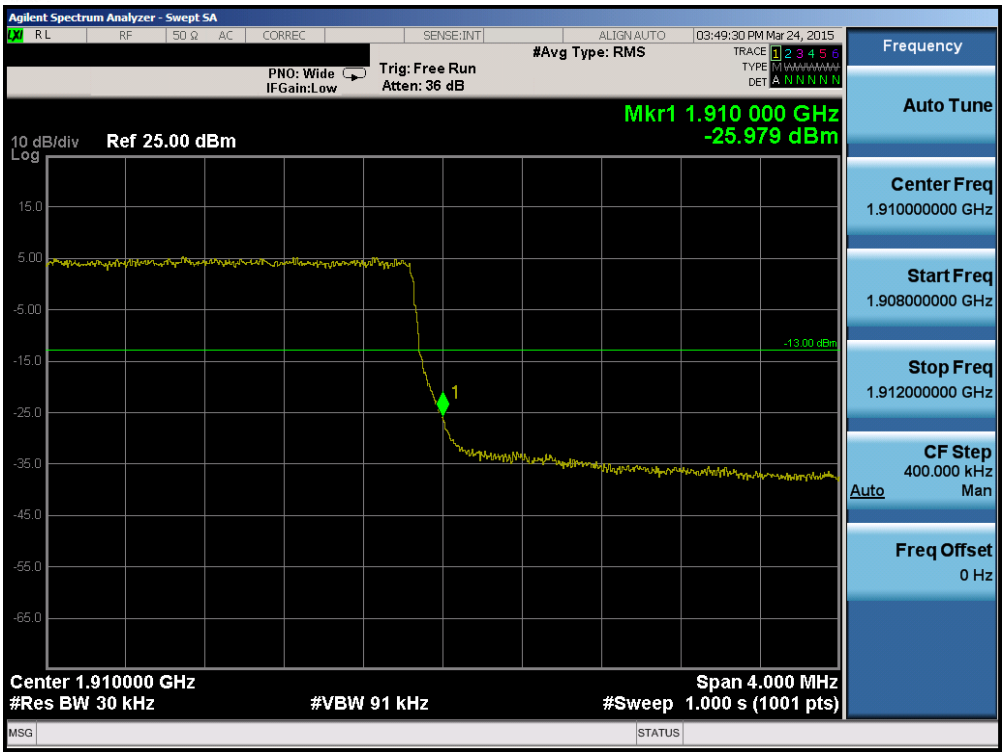
Plot 6-149. Upper Extended Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)



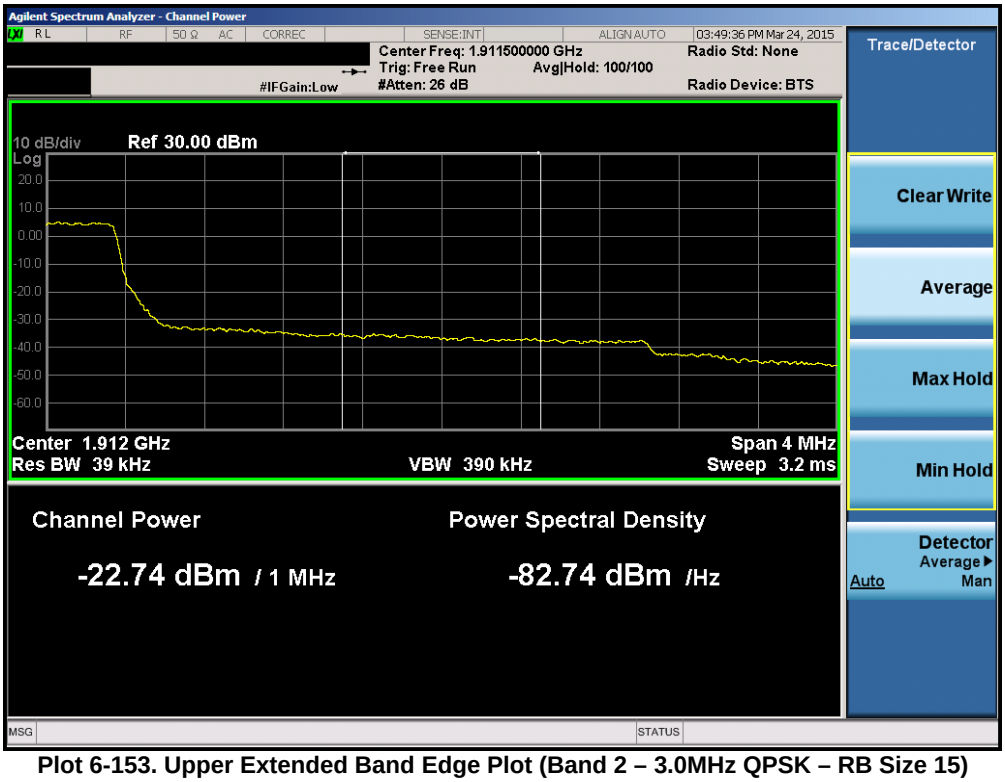
Plot 6-150. Lower Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)



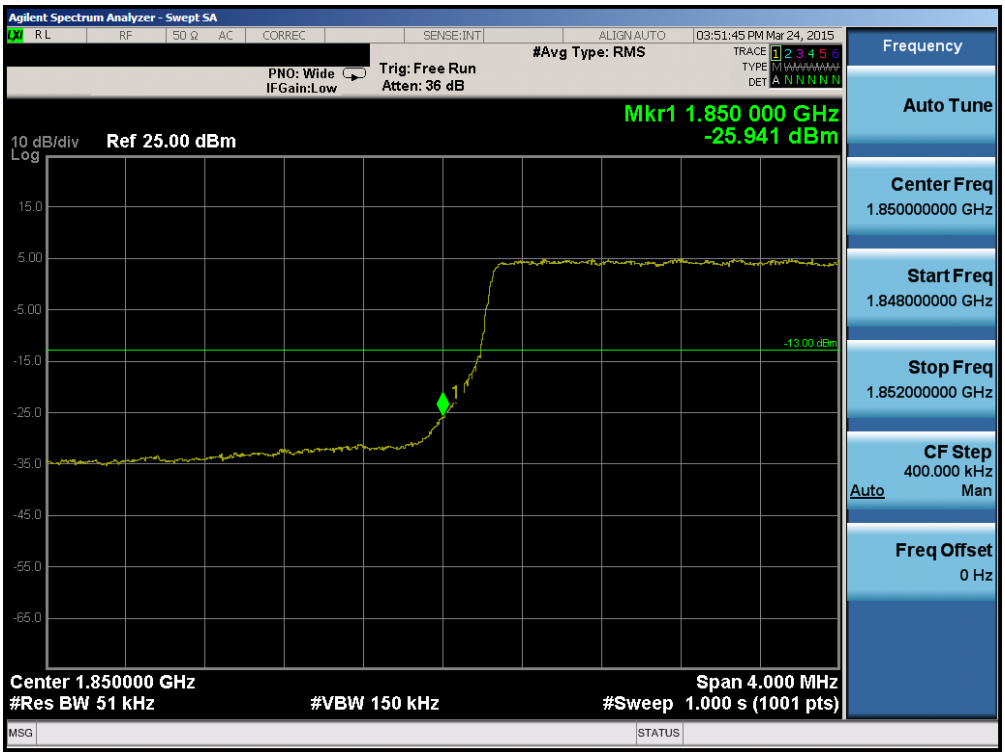
Plot 6-151. Lower Extended Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)



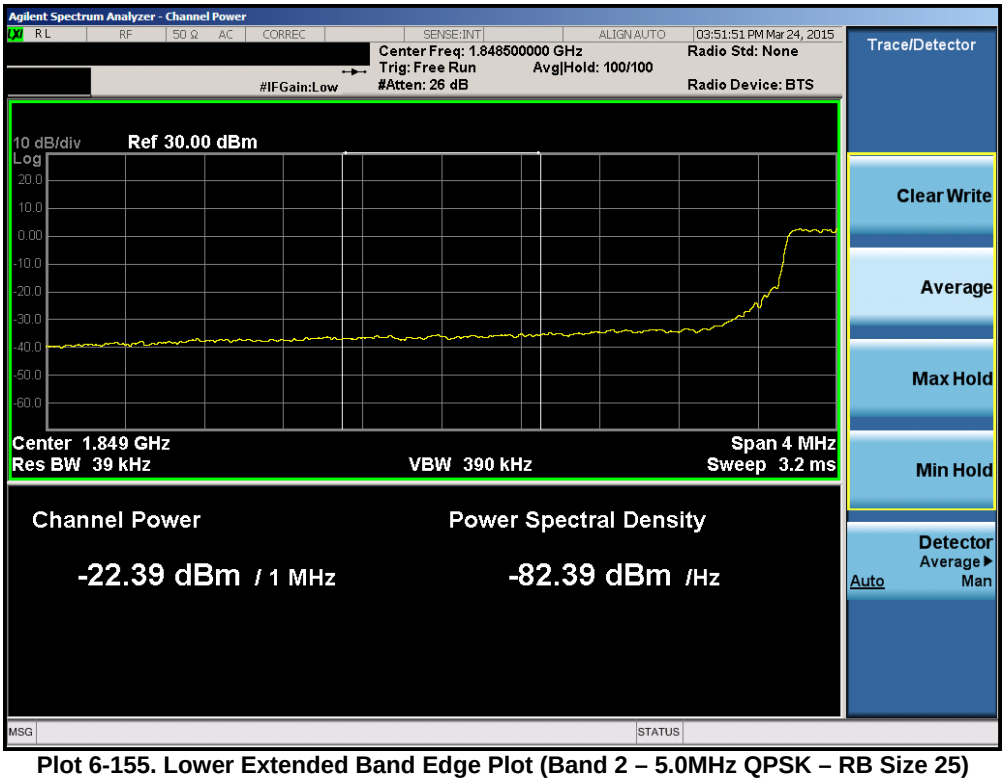
Plot 6-152. Upper Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)



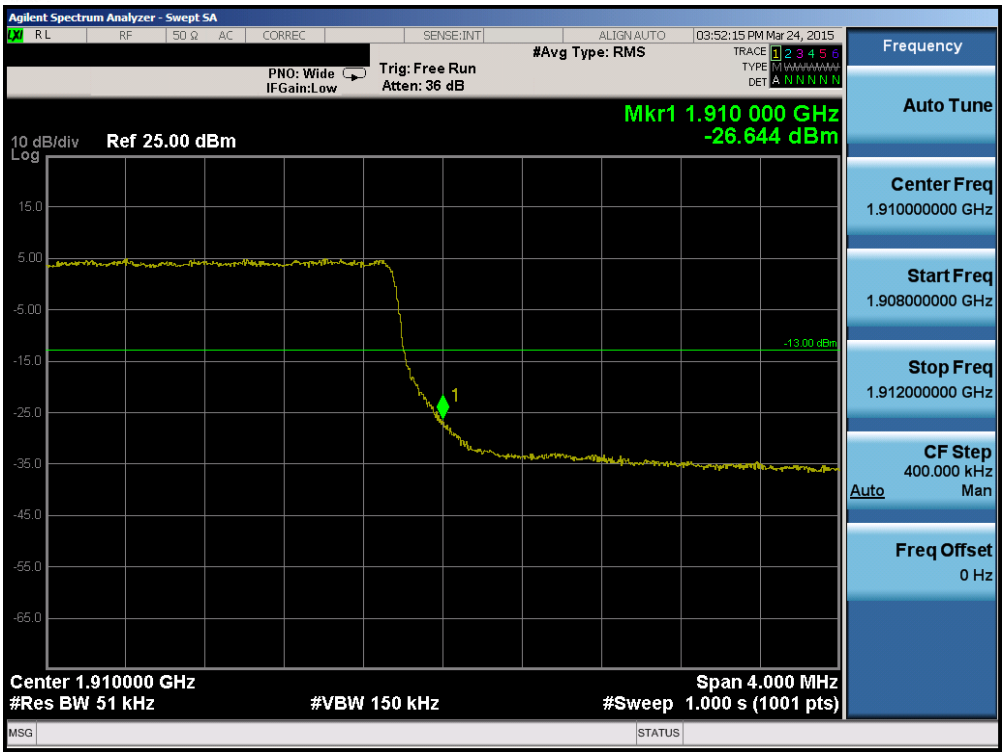
Plot 6-153. Upper Extended Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)



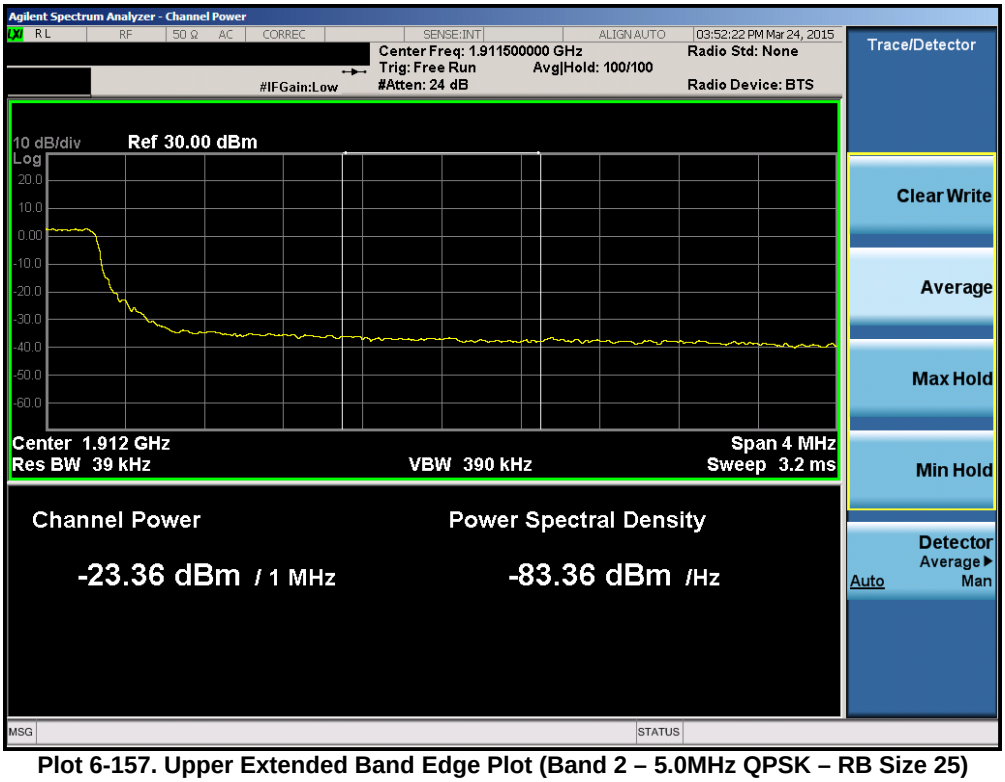
Plot 6-154. Lower Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)



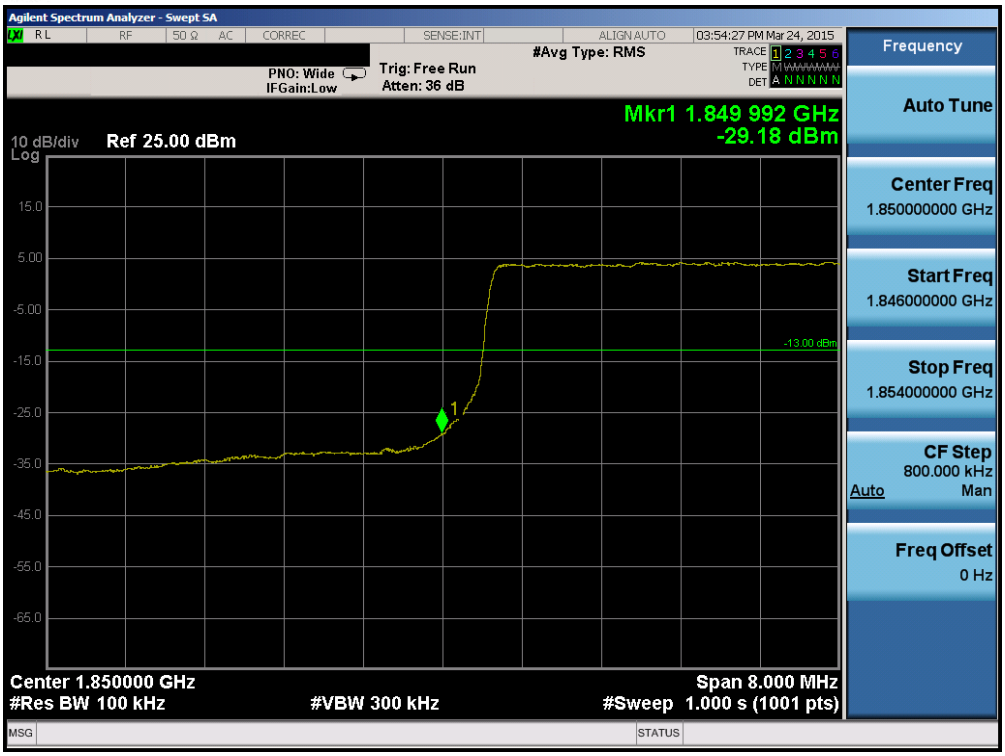
Plot 6-155. Lower Extended Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)



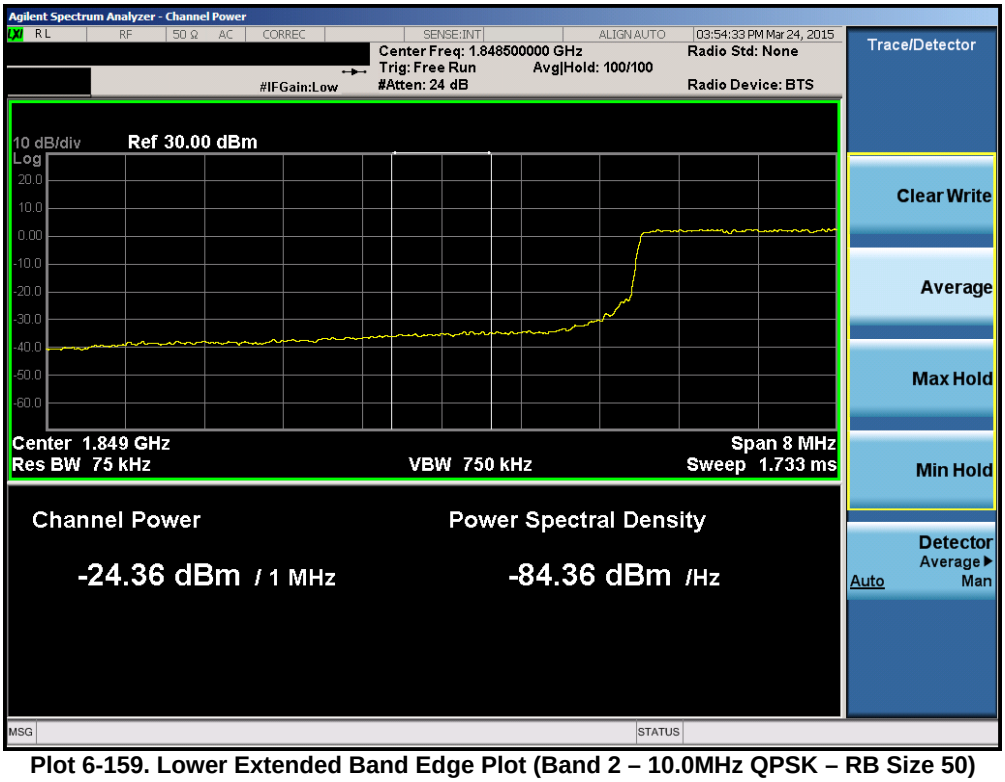
Plot 6-156. Upper Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)



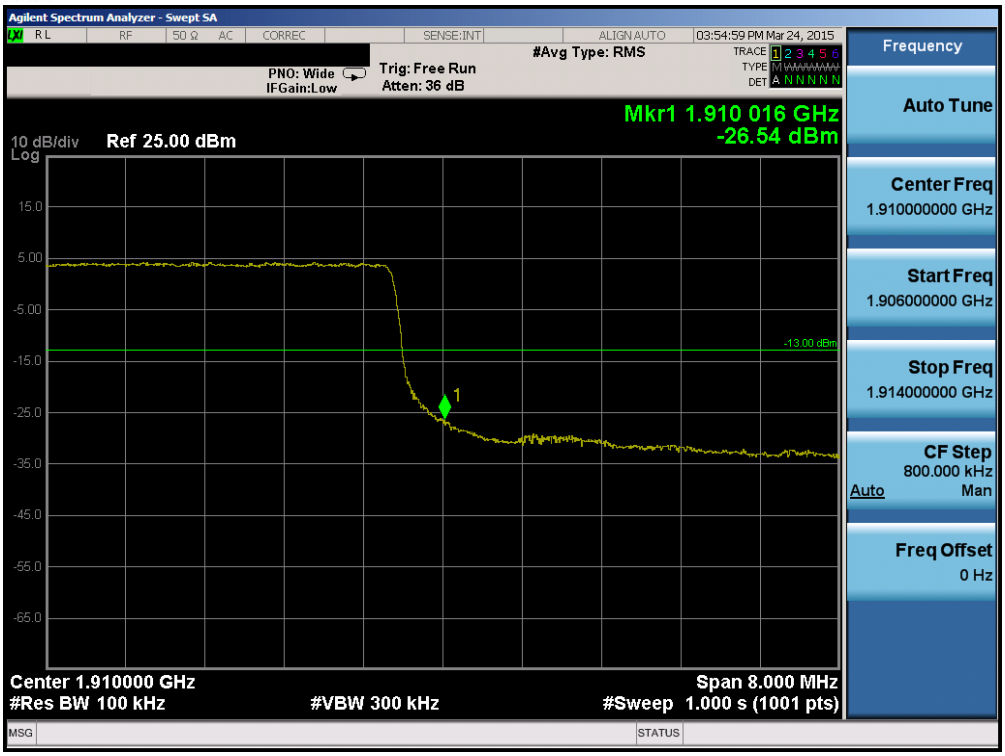
Plot 6-157. Upper Extended Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)



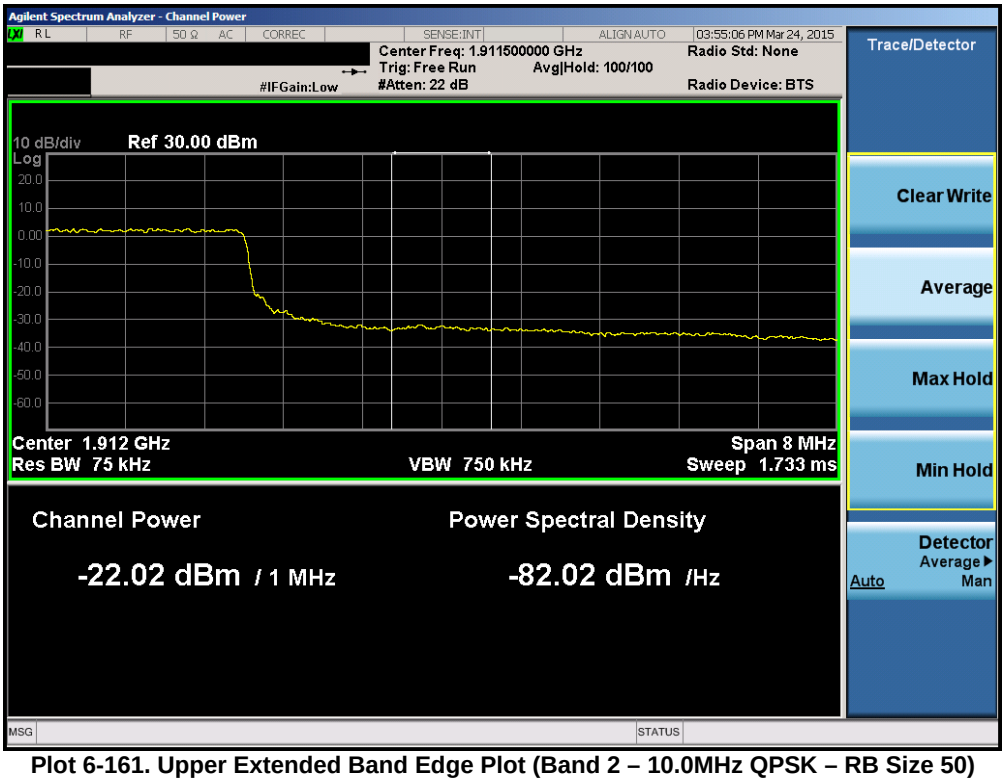
Plot 6-158. Lower Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)



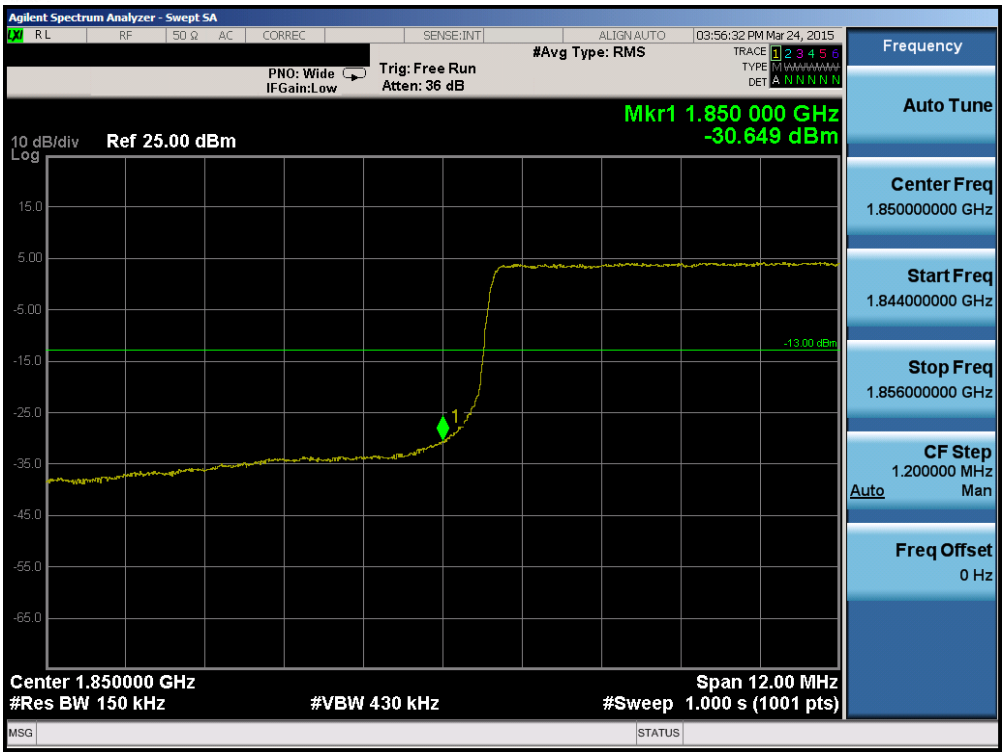
Plot 6-159. Lower Extended Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)



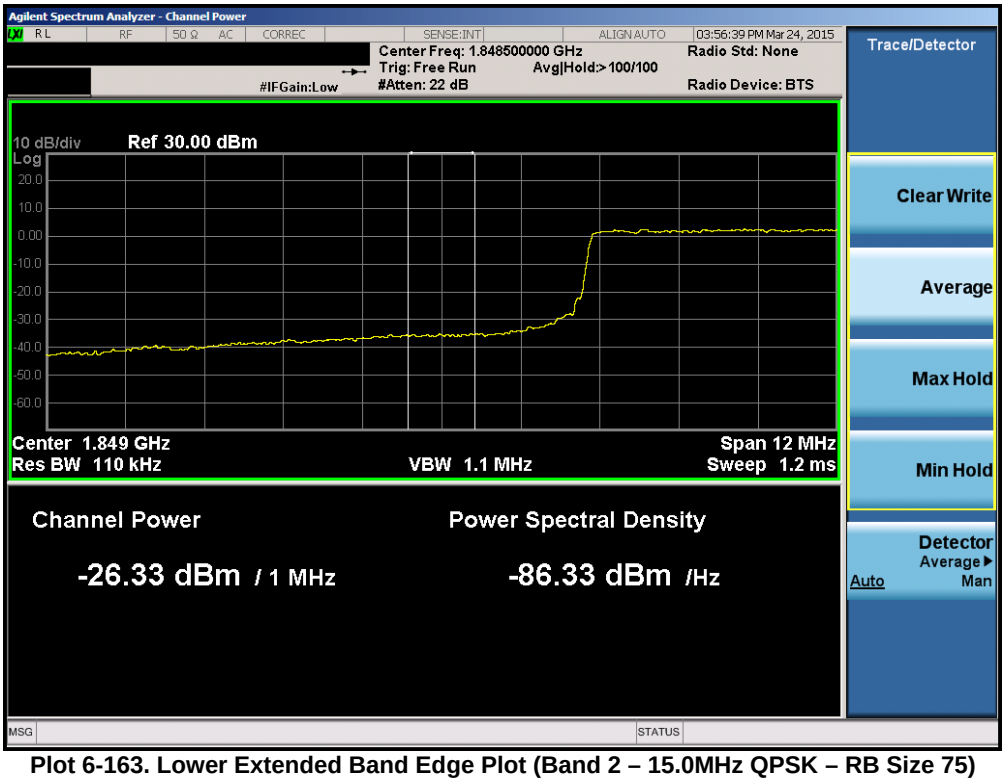
Plot 6-160. Upper Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)



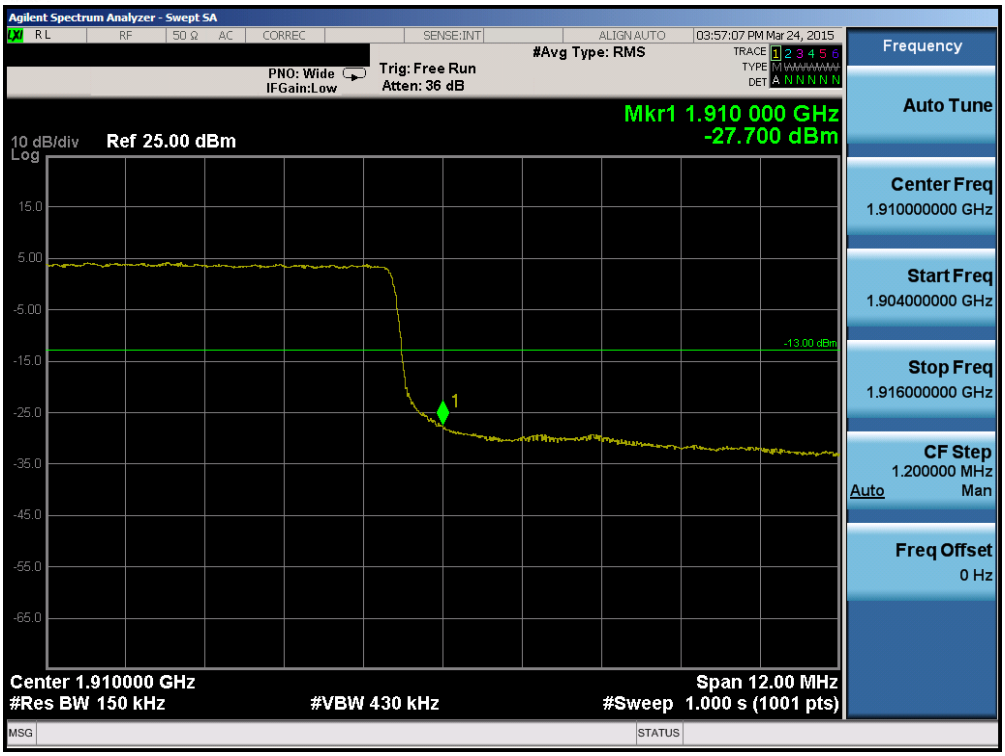
Plot 6-161. Upper Extended Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)



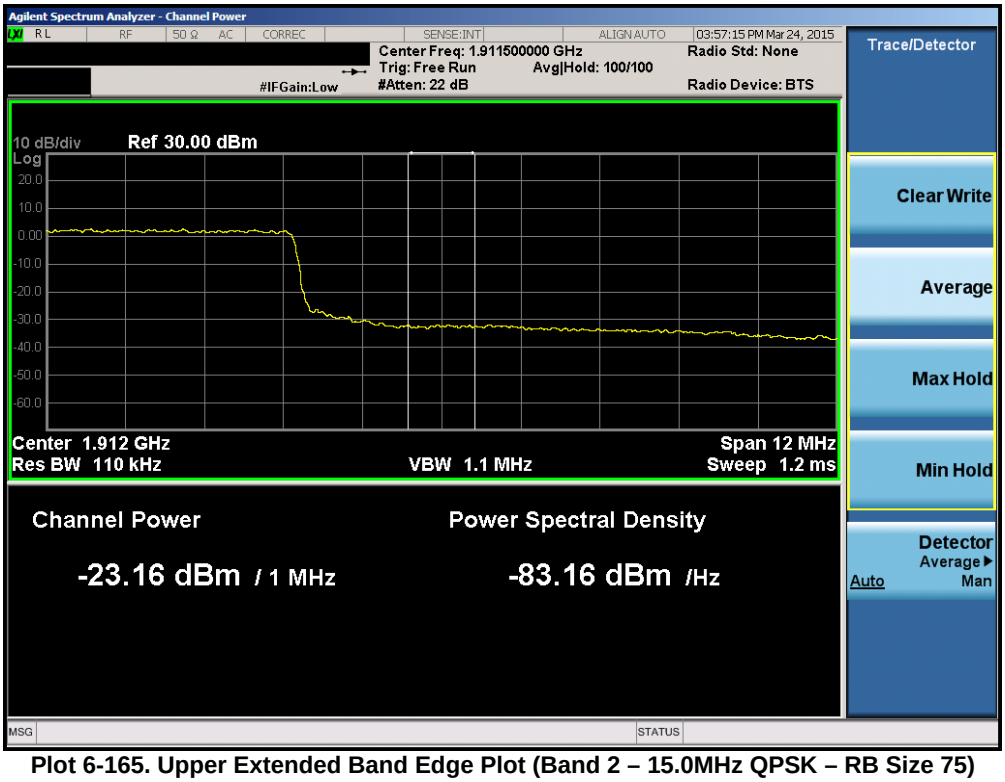
Plot 6-162. Lower Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)



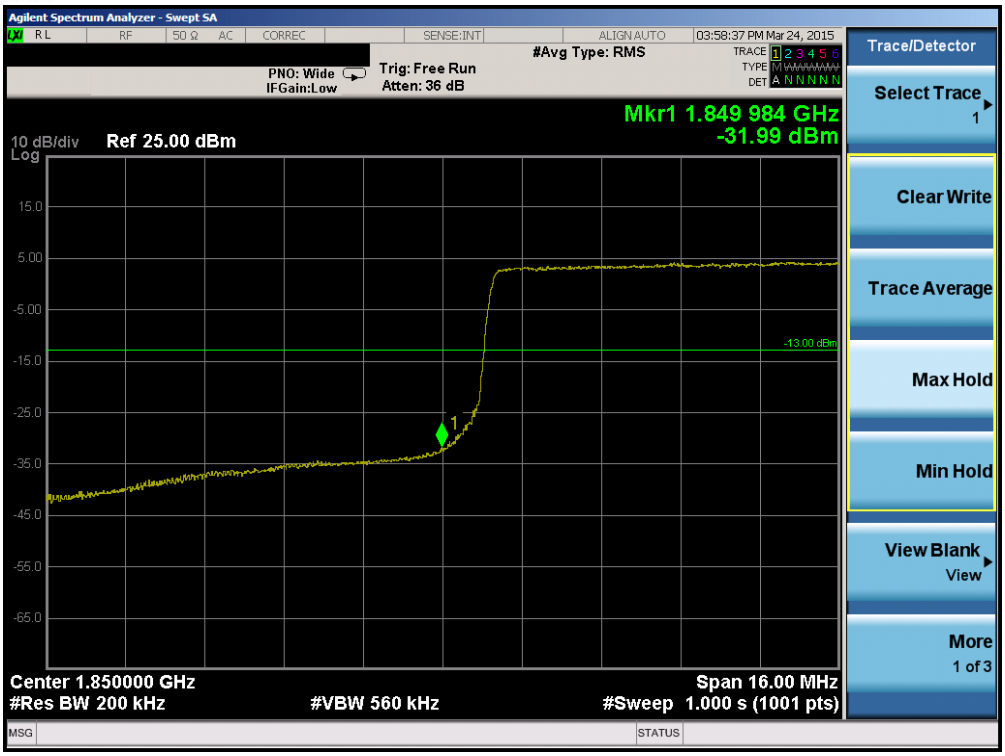
Plot 6-163. Lower Extended Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)



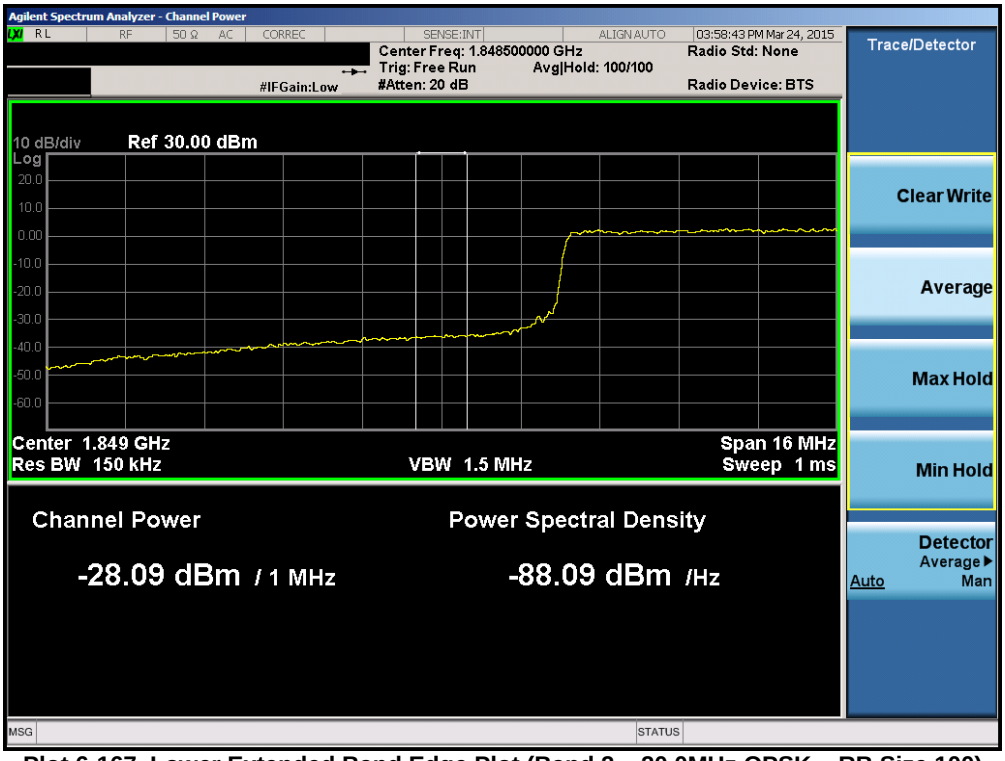
Plot 6-164. Upper Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)



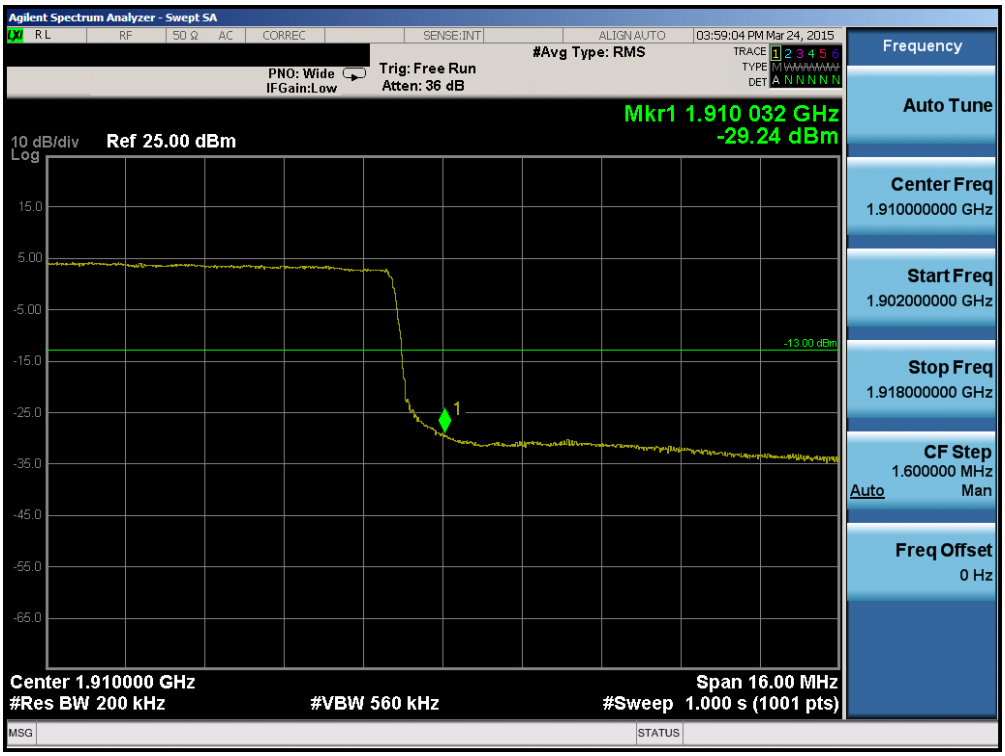
Plot 6-165. Upper Extended Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)



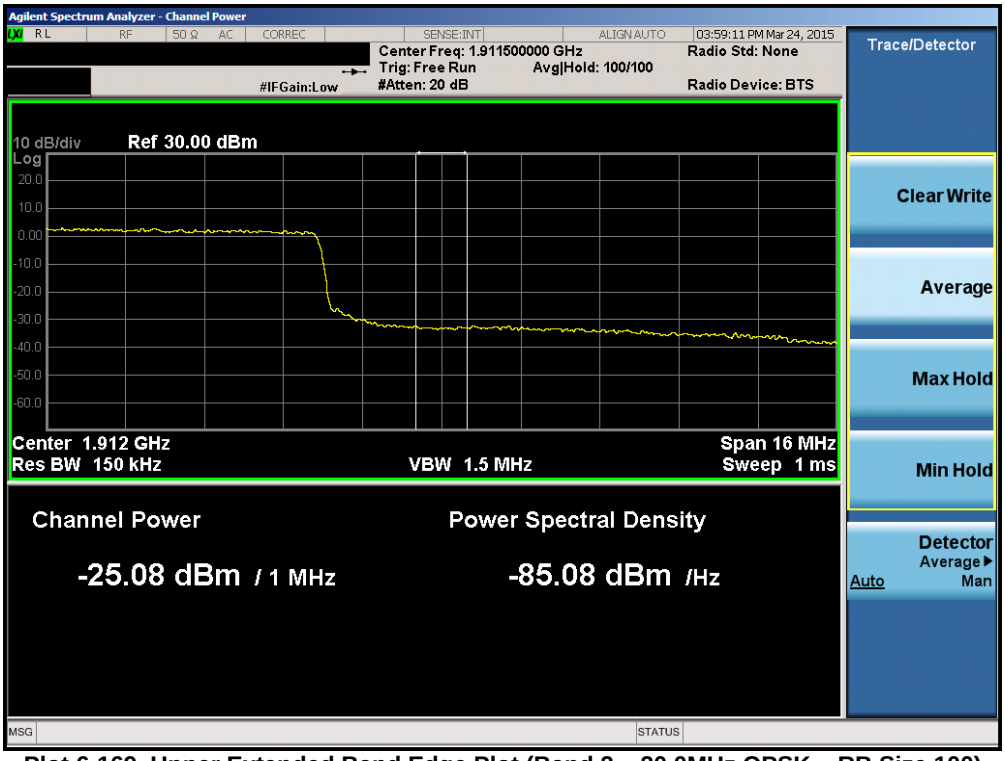
Plot 6-166. Lower Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



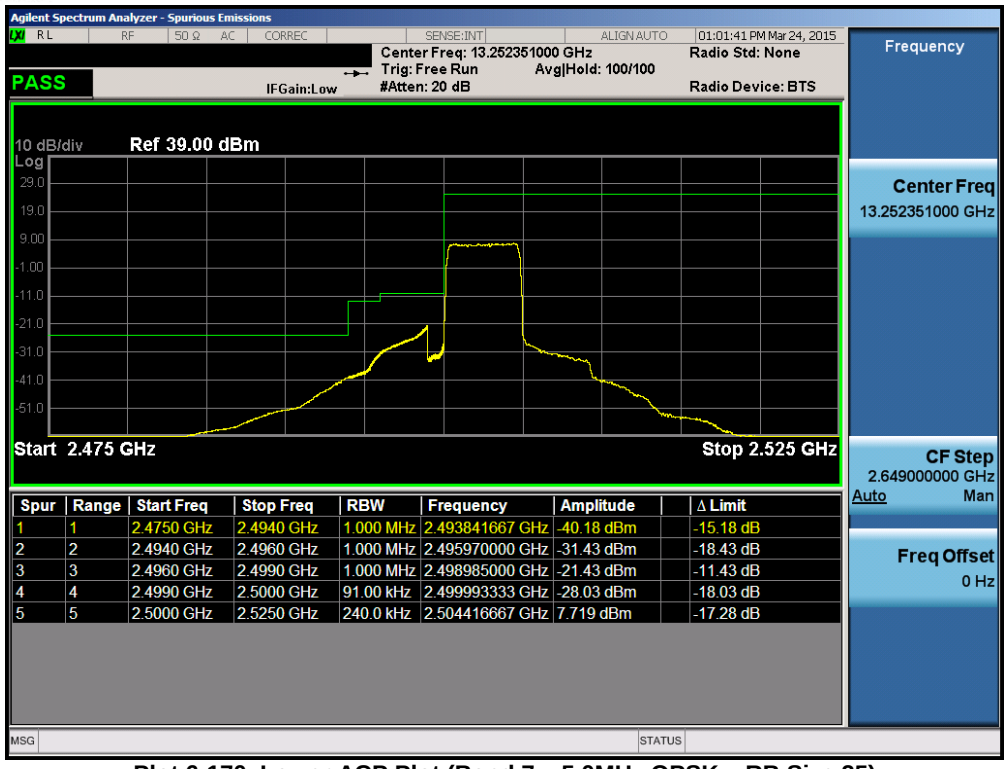
Plot 6-167. Lower Extended Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



Plot 6-168. Upper Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)

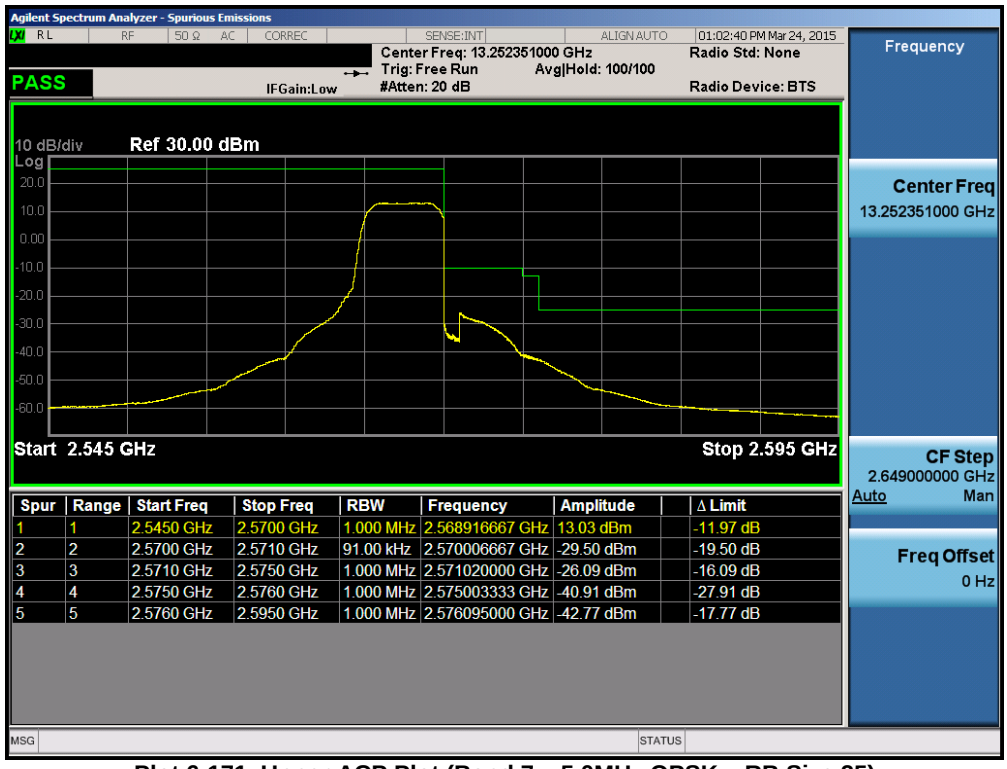


Plot 6-169. Upper Extended Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



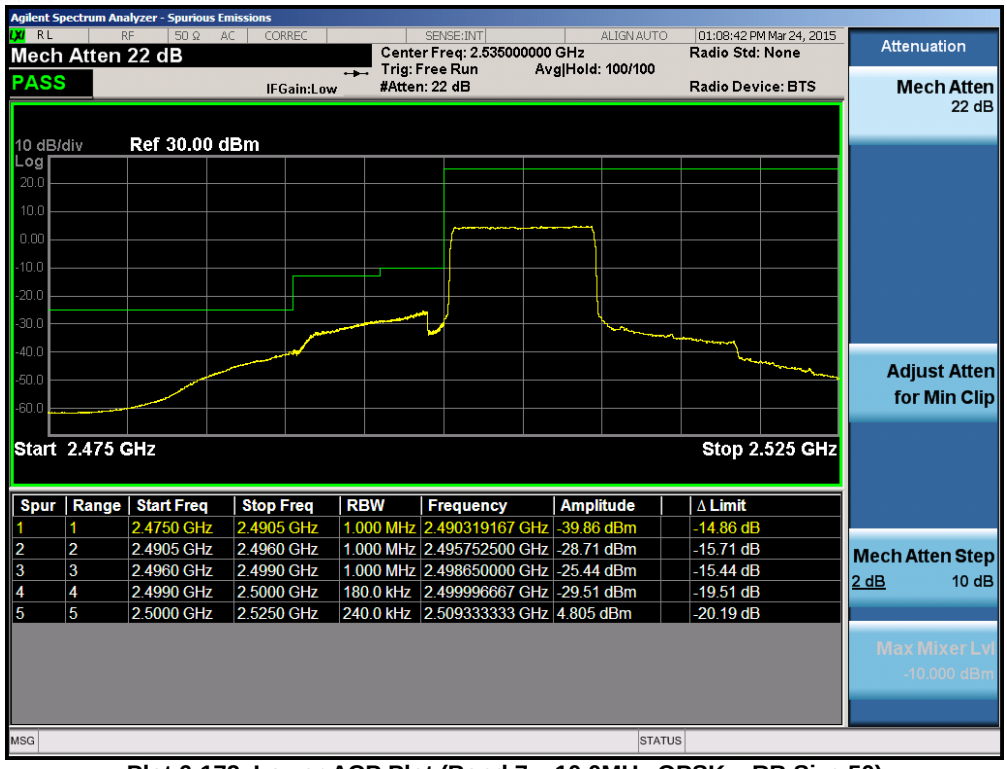
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4940 GHz	1.000 MHz	2.493841667 GHz	-40.18 dBm	-15.18 dB
2	2	2.4940 GHz	2.4960 GHz	1.000 MHz	2.495970000 GHz	-31.43 dBm	-18.43 dB
3	3	2.4960 GHz	2.4990 GHz	1.000 MHz	2.498985000 GHz	-21.43 dBm	-11.43 dB
4	4	2.4990 GHz	2.5000 GHz	91.00 kHz	2.499993333 GHz	-28.03 dBm	-18.03 dB
5	5	2.5000 GHz	2.5250 GHz	240.0 kHz	2.504416667 GHz	7.719 dBm	-17.28 dB

Plot 6-170. Lower ACP Plot (Band 7 – 5.0MHz QPSK – RB Size 25)



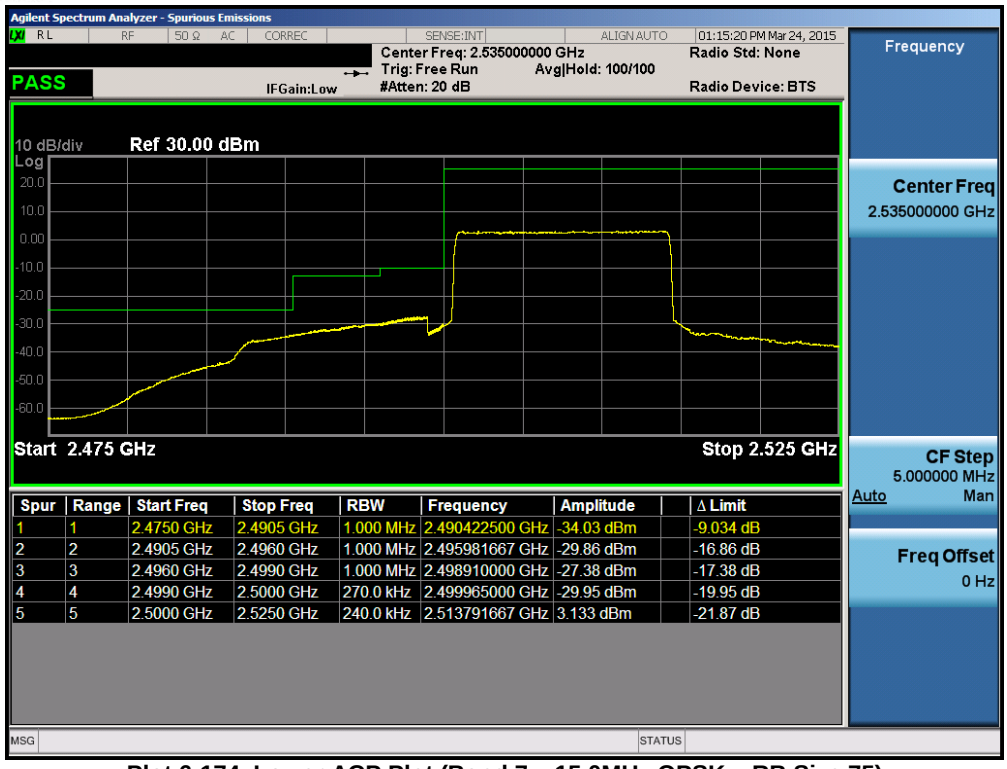
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.5450 GHz	2.5700 GHz	1.000 MHz	2.568916667 GHz	13.03 dBm	-11.97 dB
2	2	2.5700 GHz	2.5710 GHz	91.00 kHz	2.570006667 GHz	-29.50 dBm	-19.50 dB
3	3	2.5710 GHz	2.5750 GHz	1.000 MHz	2.571020000 GHz	-26.09 dBm	-16.09 dB
4	4	2.5750 GHz	2.5760 GHz	1.000 MHz	2.575003333 GHz	-40.91 dBm	-27.91 dB
5	5	2.5760 GHz	2.5950 GHz	1.000 MHz	2.576095000 GHz	-42.77 dBm	-17.77 dB

Plot 6-171. Upper ACP Plot (Band 7 – 5.0MHz QPSK – RB Size 25)



Plot 6-172. Lower ACP Plot (Band 7 – 10.0MHz QPSK – RB Size 50)

Plot 6-173. Upper ACP Plot (Band 7 – 10.0MHz QPSK – RB Size 50)

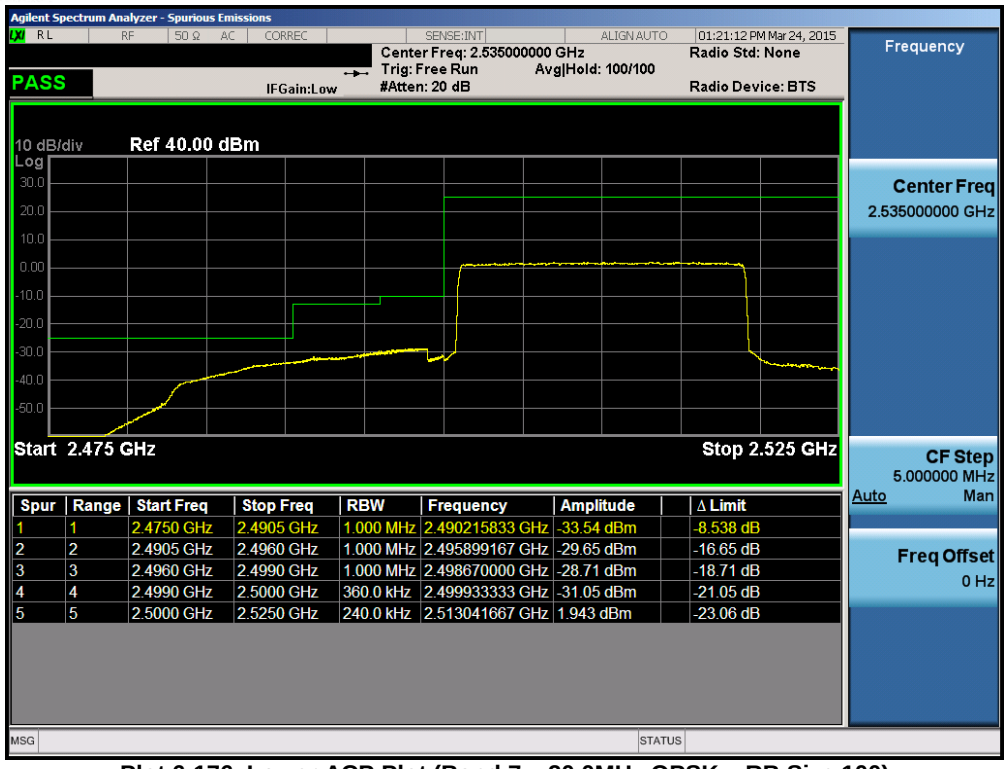


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4905 GHz	1.000 MHz	2.490422500 GHz	-34.03 dBm	-9.034 dB
2	2	2.4905 GHz	2.4960 GHz	1.000 MHz	2.495981667 GHz	-29.86 dBm	-16.86 dB
3	3	2.4960 GHz	2.4990 GHz	1.000 MHz	2.498910000 GHz	-27.38 dBm	-17.38 dB
4	4	2.4990 GHz	2.5000 GHz	270.0 kHz	2.499965000 GHz	-29.95 dBm	-19.95 dB
5	5	2.5000 GHz	2.5250 GHz	240.0 kHz	2.513791667 GHz	3.133 dBm	-21.87 dB

Plot 6-174. 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	2.558166667 GHz	8.487 dBm	-16.51 dB
2	2	2.5700 GHz	2.5710 GHz	270.0 kHz	2.570038333 GHz	-31.85 dBm	-21.85 dB
3	3	2.5710 GHz	2.5750 GHz	1.000 MHz	2.571106667 GHz	-29.67 dBm	-19.67 dB
4	4	2.5750 GHz	2.5835 GHz	1.000 MHz	2.575028307 GHz	-32.62 dBm	-19.62 dB
5	5	2.5835 GHz	2.5950 GHz	1.000 MHz	2.583568720 GHz	-43.91 dBm	-18.91 dB

Plot 6-175. 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	2.490215833 GHz	-33.54 dBm	-8.538 dB
2	2	2.4905 GHz	2.4960 GHz	1.000 MHz	2.495899167 GHz	-29.65 dBm	-16.65 dB
3	3	2.4960 GHz	2.4990 GHz	1.000 MHz	2.498670000 GHz	-28.71 dBm	-18.71 dB
4	4	2.4990 GHz	2.5000 GHz	360.0 kHz	2.499933333 GHz	-31.05 dBm	-21.05 dB
5	5	2.5000 GHz	2.5250 GHz	240.0 kHz	2.513041667 GHz	1.943 dBm	-23.06 dB

Plot 6-176. 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	2.554333333 GHz	7.364 dBm	-17.64 dB
2	2	2.5700 GHz	2.5710 GHz	360.0 kHz	2.570026667 GHz	-32.64 dBm	-22.64 dB
3	3	2.5710 GHz	2.5750 GHz	1.000 MHz	2.571406667 GHz	-30.69 dBm	-20.69 dB
4	4	2.5750 GHz	2.5880 GHz	1.000 MHz	2.575064810 GHz	-32.79 dBm	-19.79 dB
5	5	2.5880 GHz	2.5950 GHz	1.000 MHz	2.588220060 GHz	-45.61 dBm	-20.61 dB

Plot 6-177. Upper ACP Plot (Band 7 – 20.0MHz QPSK – RB Size 100)

6.5 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 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.

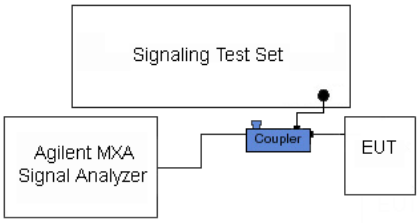
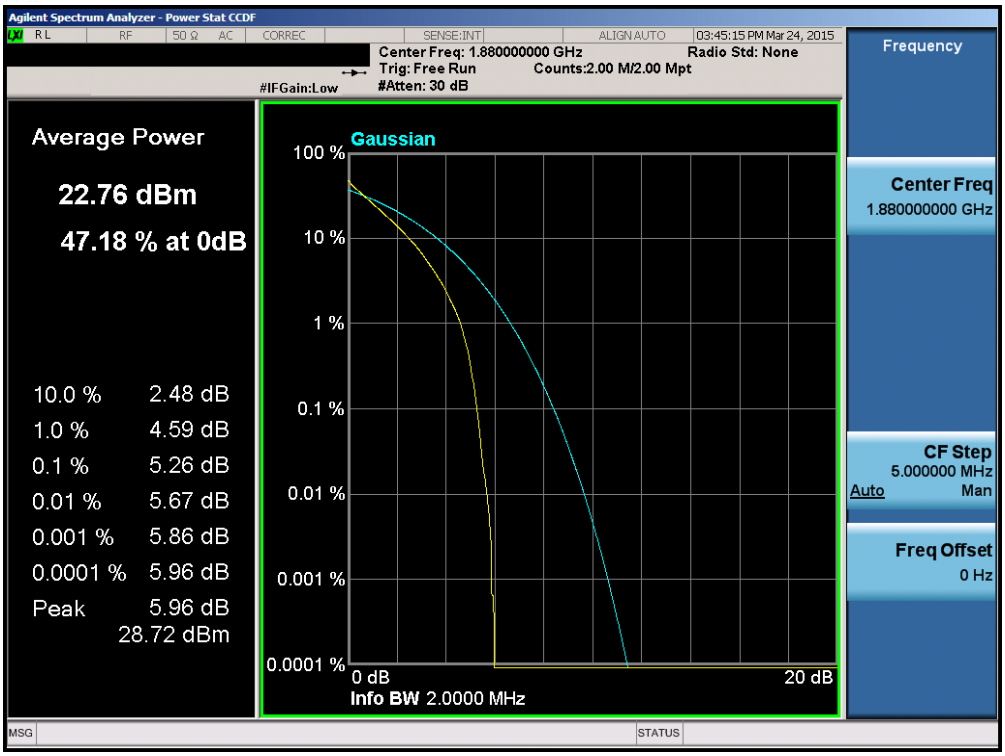


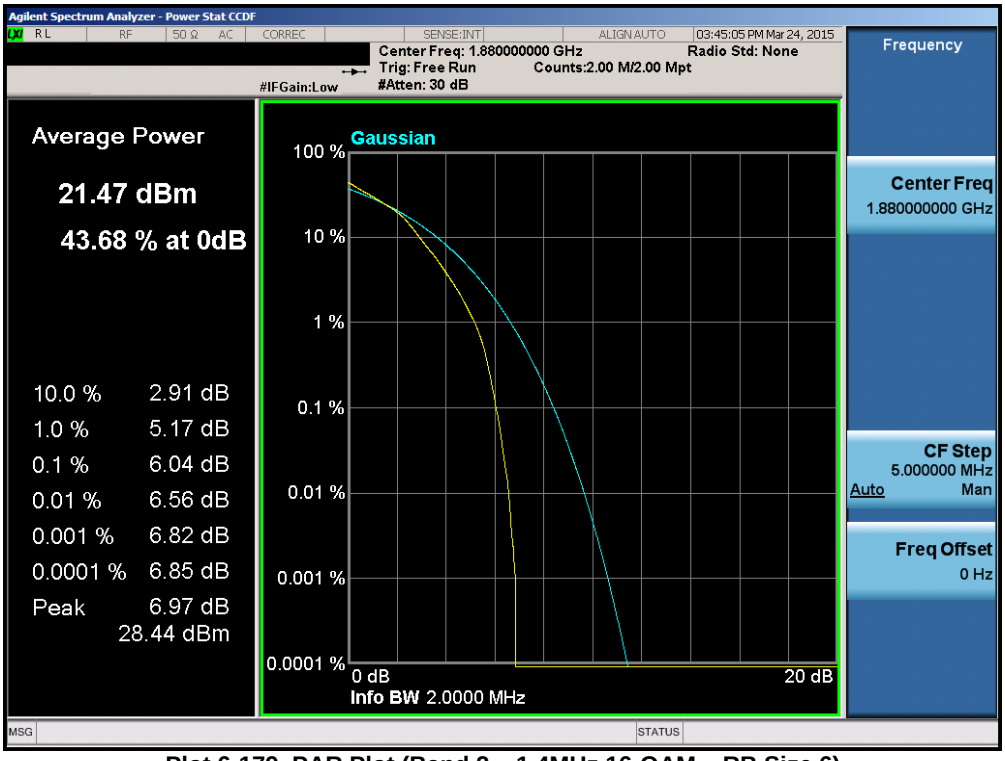
Figure 6-4. Test Instrument & Measurement Setup

Test Notes

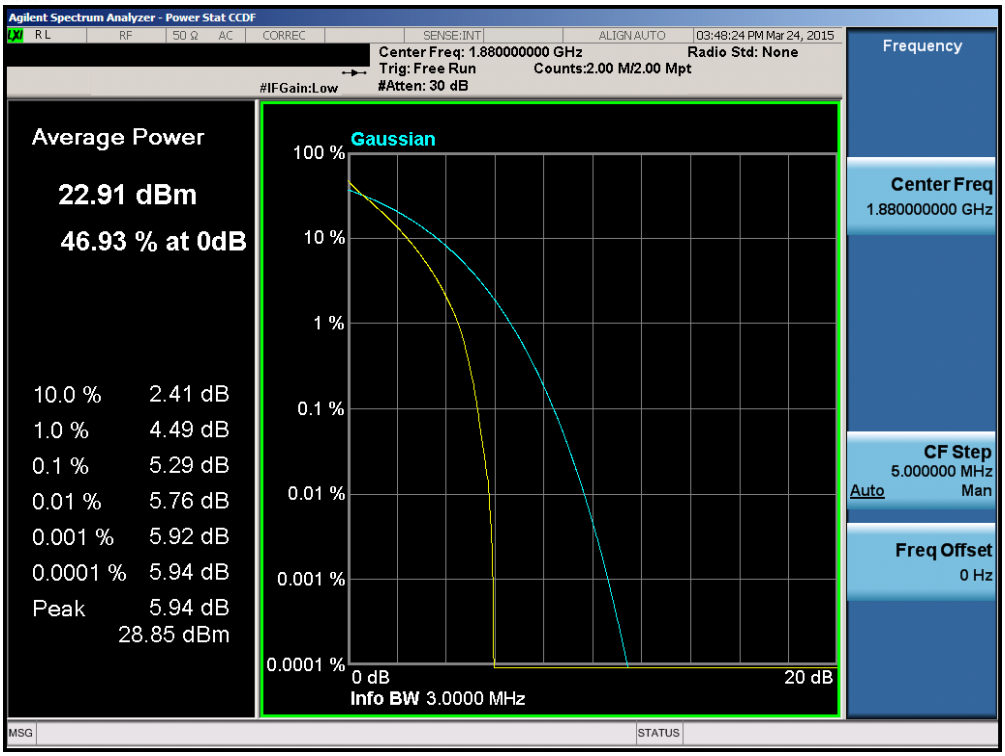
None.



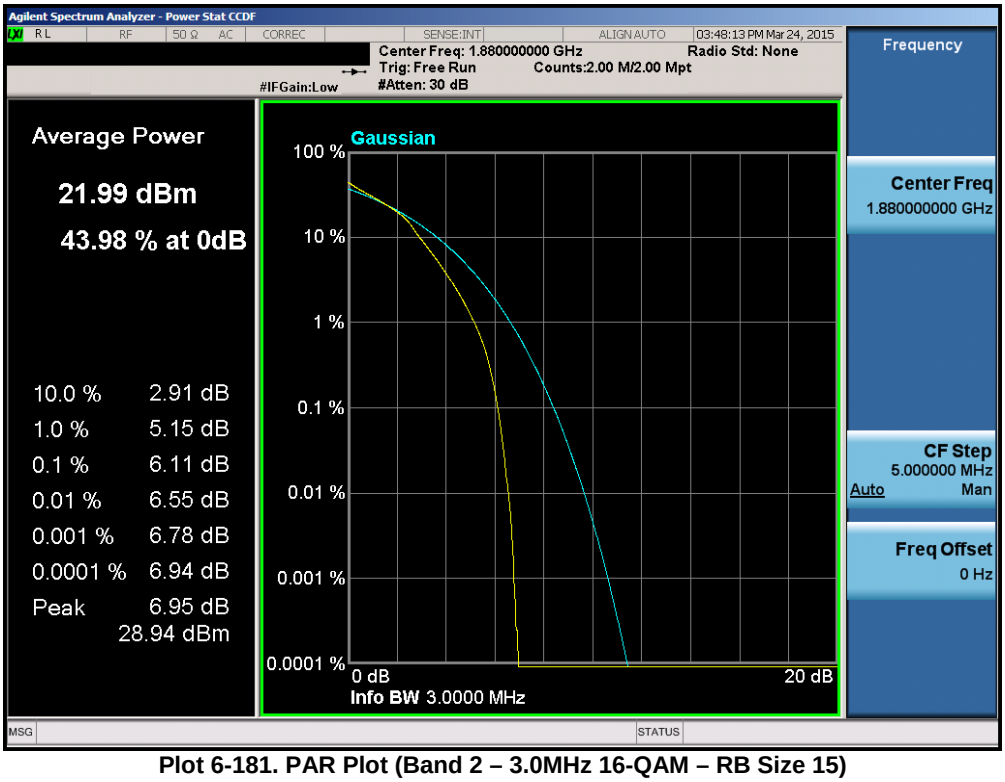
Plot 6-178. PAR Plot (Band 2 – 1.4MHz QPSK – RB Size 6)



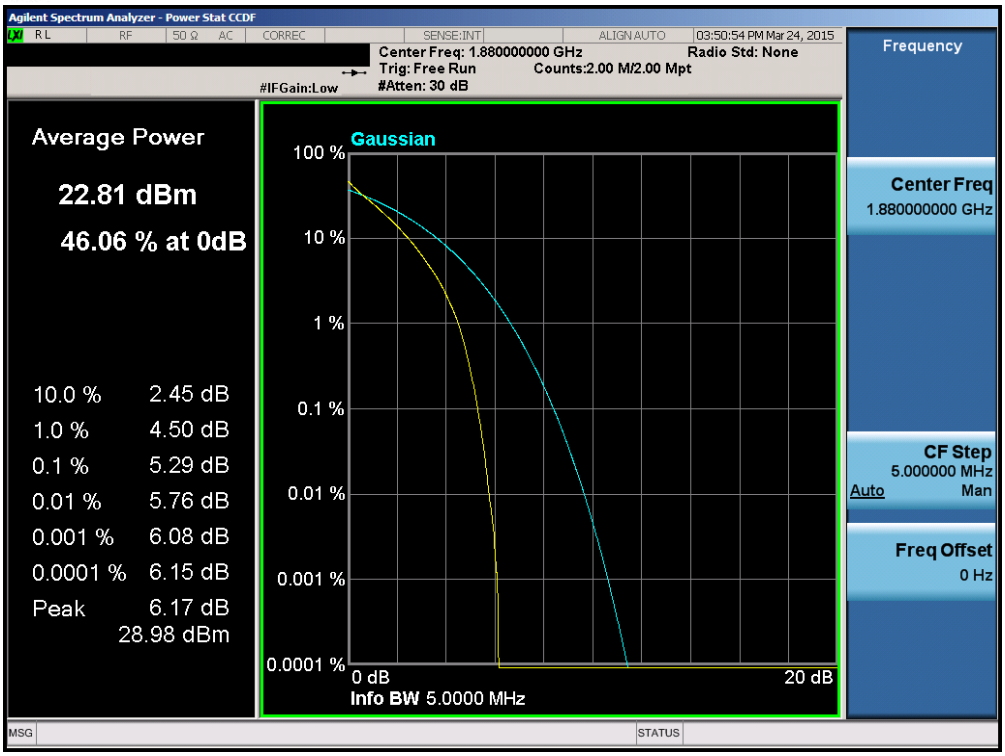
Plot 6-179. PAR Plot (Band 2 – 1.4MHz 16-QAM – RB Size 6)



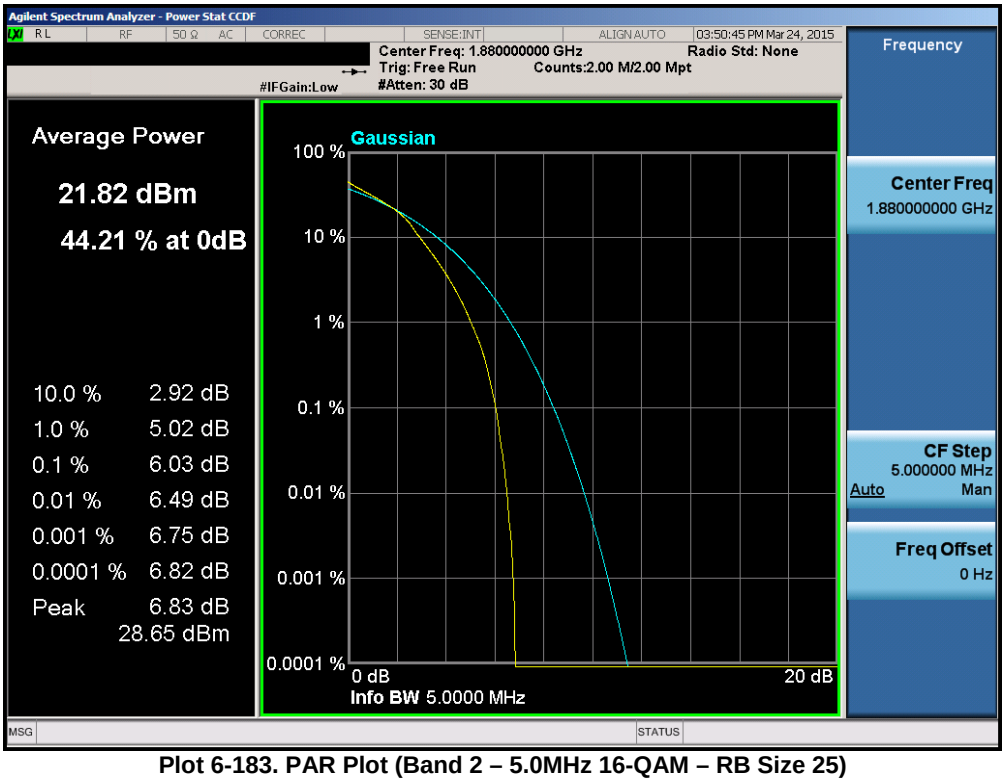
Plot 6-180. PAR Plot (Band 2 – 3.0MHz QPSK – RB Size 15)



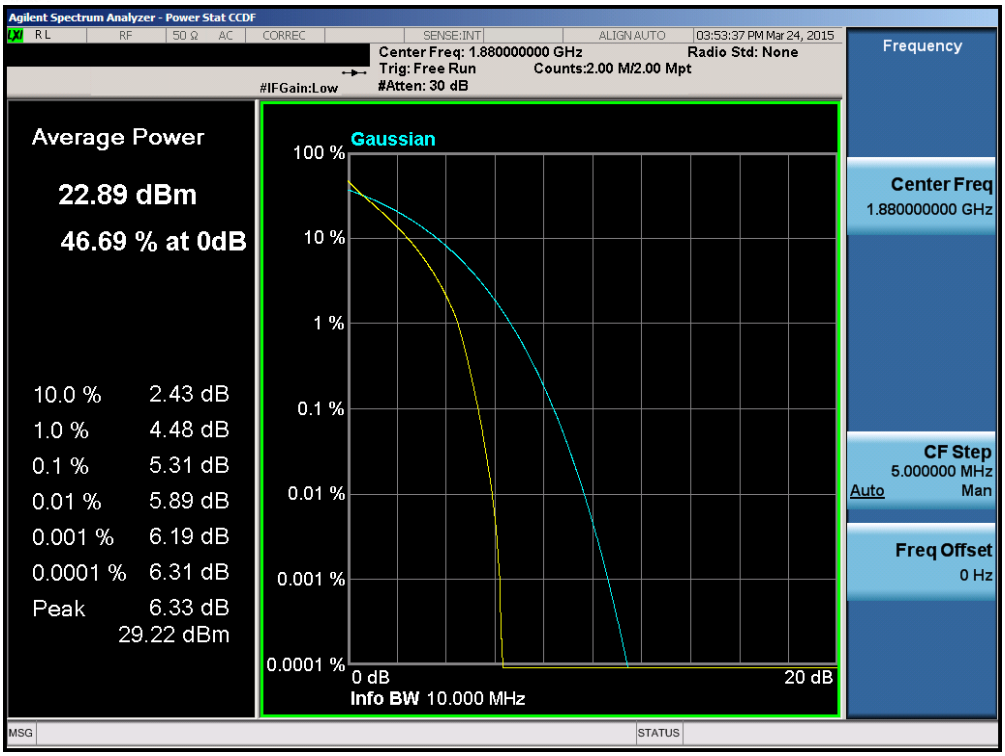
Plot 6-181. PAR Plot (Band 2 – 3.0MHz 16-QAM – RB Size 15)



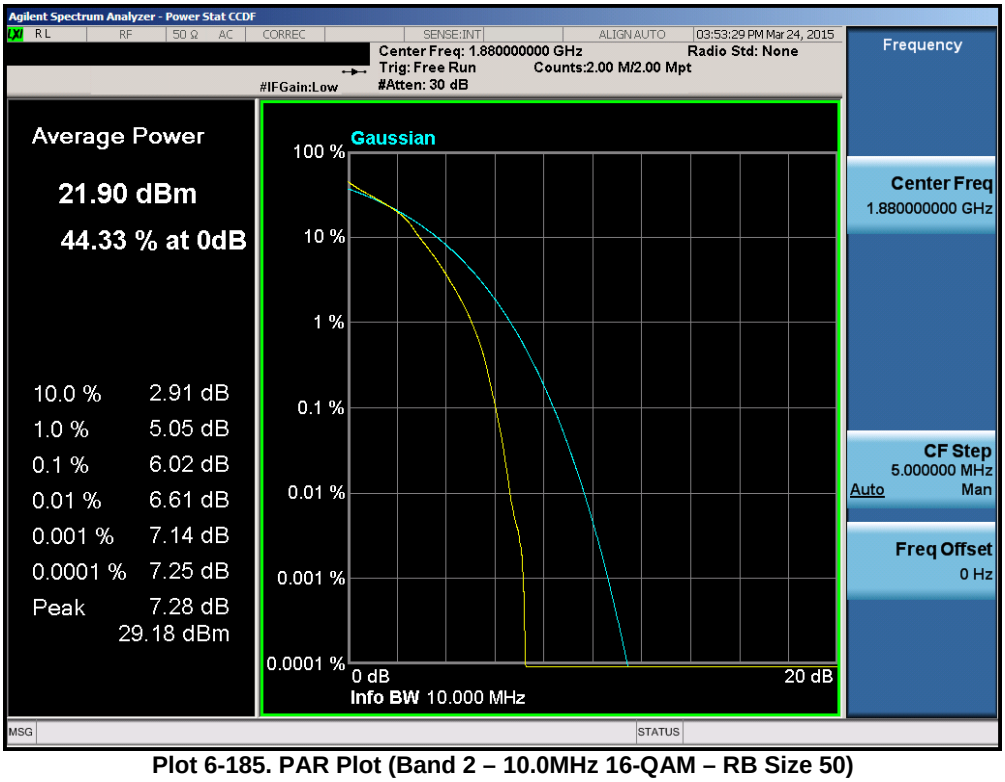
Plot 6-182. PAR Plot (Band 2 – 5.0MHz QPSK – RB Size 25)



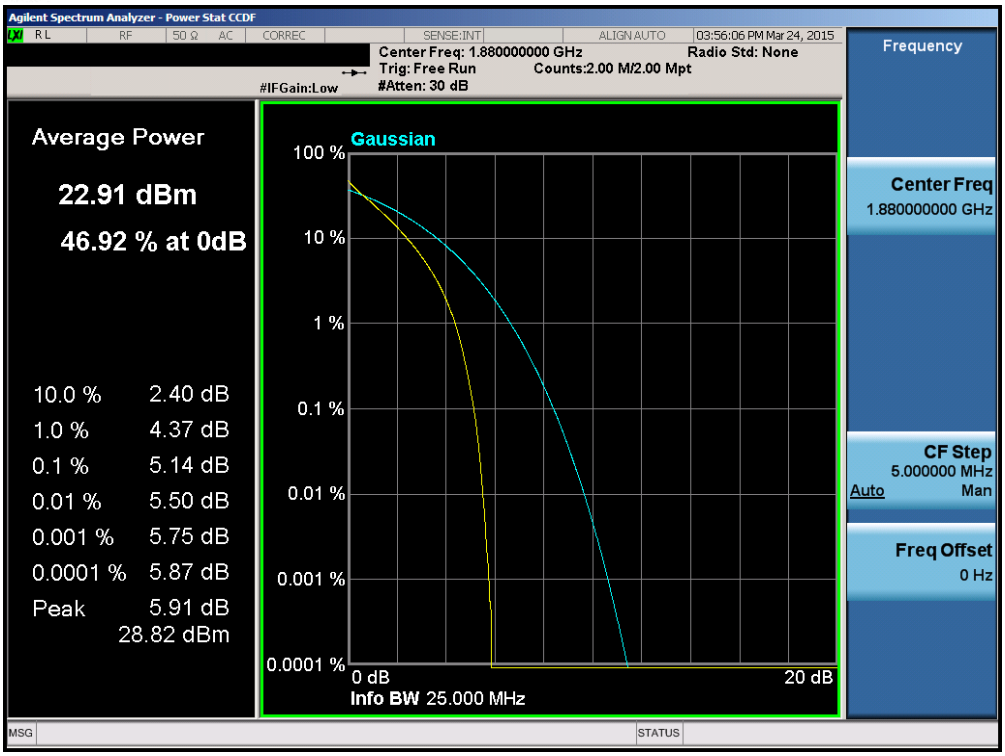
Plot 6-183. PAR Plot (Band 2 – 5.0MHz 16-QAM – RB Size 25)



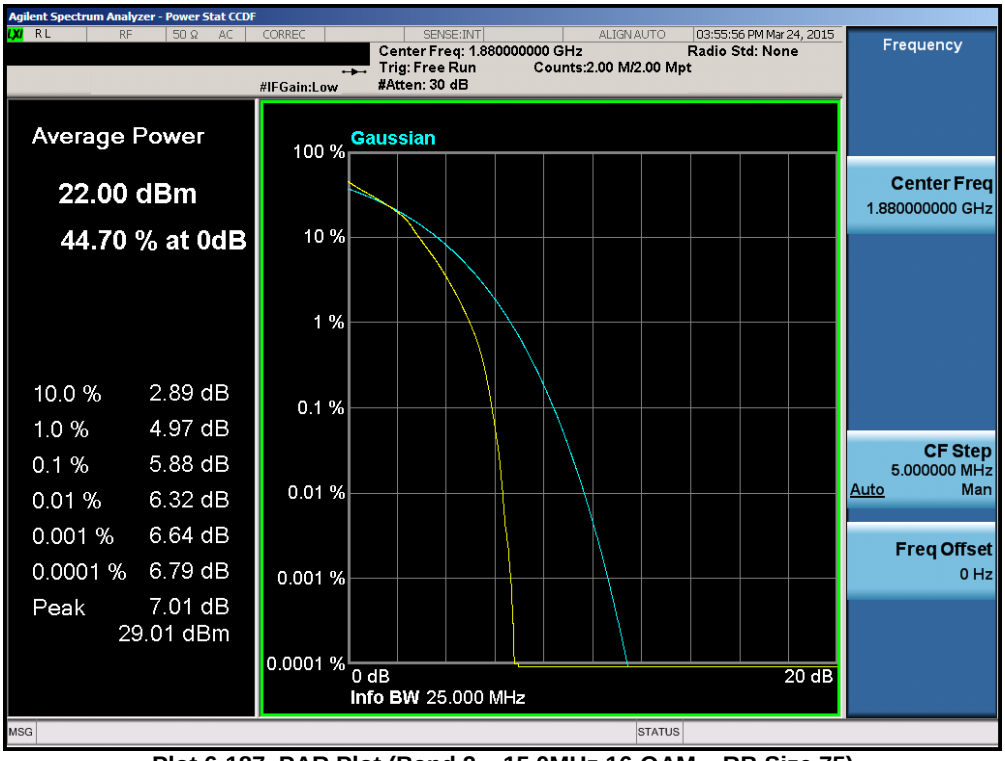
Plot 6-184. PAR Plot (Band 2 – 10.0MHz QPSK – RB Size 50)



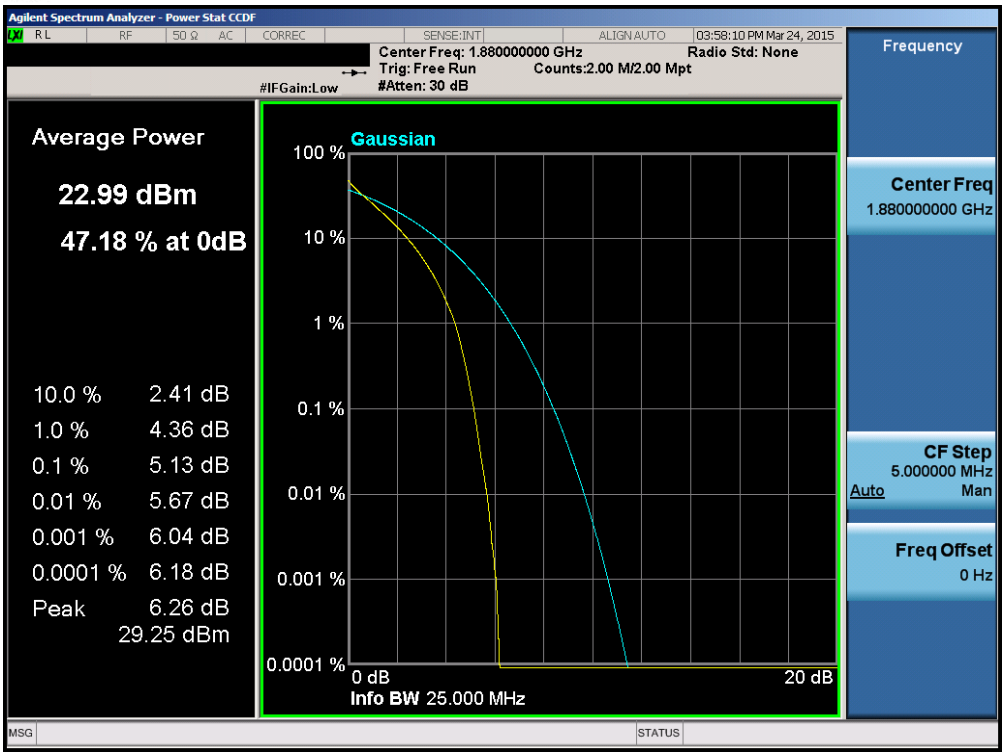
Plot 6-185. PAR Plot (Band 2 – 10.0MHz 16-QAM – RB Size 50)



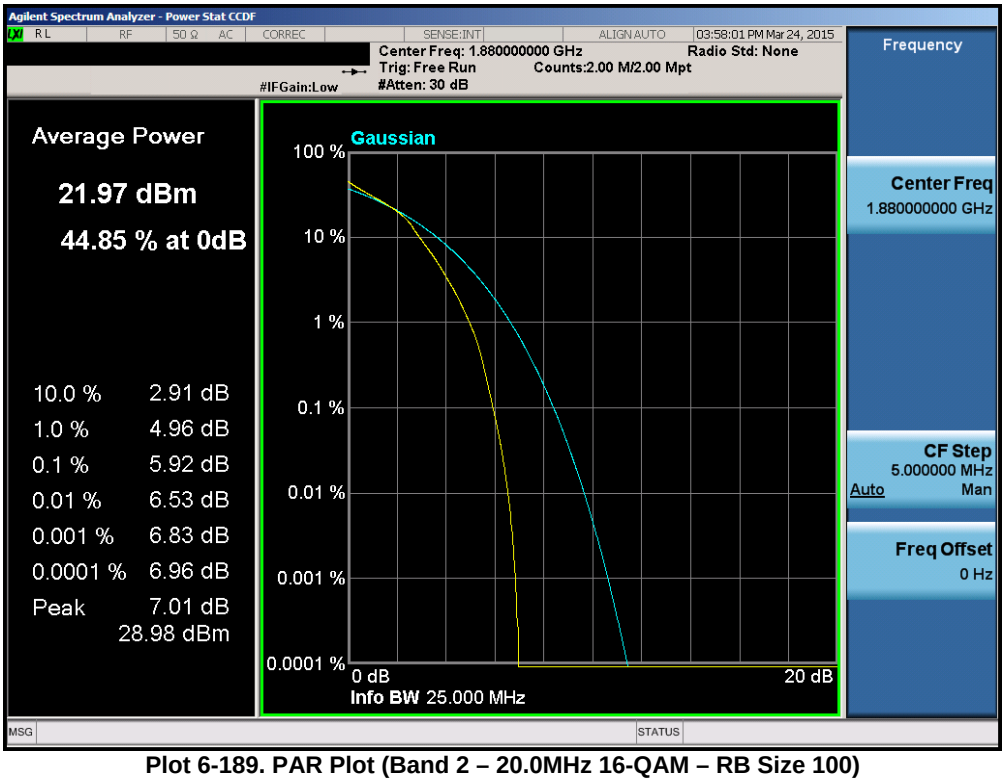
Plot 6-186. PAR Plot (Band 2 – 15.0MHz QPSK – RB Size 75)



Plot 6-187. PAR Plot (Band 2 – 15.0MHz 16-QAM – RB Size 75)



Plot 6-188. PAR Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



Plot 6-189. PAR Plot (Band 2 – 20.0MHz 16-QAM – RB Size 100)

6.6 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 polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically polarized broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 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.

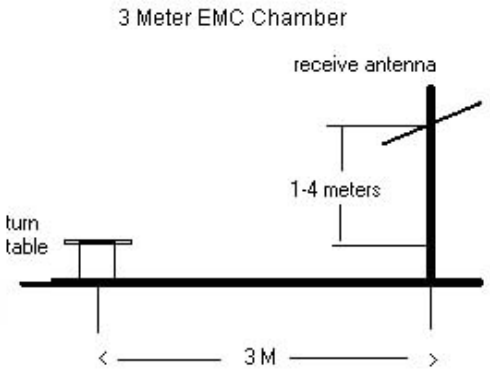


Figure 6-5. Test Instrument & Measurement Setup

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.

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Battery	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	Ant. Pol. [H/V]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
699.70	1.4	QPSK	Standard	3 / 2	17.84	2.71	V	20.55	34.77	-14.22
707.50	1.4	QPSK	Standard	3 / 2	18.02	2.71	V	20.73	34.77	-14.04
715.30	1.4	QPSK	Standard	3 / 2	17.46	2.71	V	20.17	34.77	-14.60
699.70	1.4	16-QAM	Standard	3 / 2	17.43	2.71	V	20.14	34.77	-14.63
707.50	1.4	16-QAM	Standard	3 / 2	17.49	2.71	V	20.20	34.77	-14.57
715.30	1.4	16-QAM	Standard	3 / 2	16.67	2.71	V	19.38	34.77	-15.39
700.50	3	QPSK	Standard	8 / 4	17.35	2.71	V	20.06	34.77	-14.71
707.50	3	QPSK	Standard	8 / 4	17.57	2.71	V	20.28	34.77	-14.49
714.50	3	QPSK	Standard	1 / 0	17.14	2.71	V	19.85	34.77	-14.92
700.50	3	16-QAM	Standard	8 / 4	16.59	2.71	V	19.30	34.77	-15.47
707.50	3	16-QAM	Standard	8 / 4	16.44	2.71	V	19.15	34.77	-15.62
714.50	3	16-QAM	Standard	1 / 0	16.45	2.71	V	19.16	34.77	-15.61
701.50	5	QPSK	Standard	1 / 24	17.90	2.71	V	20.61	34.77	-14.16
707.50	5	QPSK	Standard	1 / 0	17.98	2.71	V	20.69	34.77	-14.08
713.50	5	QPSK	Standard	1 / 0	17.72	2.71	V	20.43	34.77	-14.34
701.50	5	16-QAM	Standard	1 / 24	17.00	2.71	V	19.71	34.77	-15.06
707.50	5	16-QAM	Standard	1 / 0	17.32	2.71	V	20.03	34.77	-14.74
713.50	5	16-QAM	Standard	1 / 0	16.51	2.71	V	19.22	34.77	-15.55
704.00	10	QPSK	Standard	1 / 49	18.20	2.71	V	20.91	34.77	-13.86
707.50	10	QPSK	Standard	1 / 0	18.17	2.71	V	20.88	34.77	-13.89
711.00	10	QPSK	Standard	1 / 0	18.12	2.71	V	20.83	34.77	-13.94
704.00	10	16-QAM	Standard	1 / 49	17.51	2.71	V	20.22	34.77	-14.55
707.50	10	16-QAM	Standard	1 / 0	17.28	2.71	V	19.99	34.77	-14.78
711.00	10	16-QAM	Standard	1 / 0	17.56	2.71	V	20.27	34.77	-14.50

Table 6-2. ERP Data (Band 12)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Battery	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	Ant. Pol. [H/V]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
824.70	1.4	QPSK	Standard	3 / 2	16.63	3.06	V	19.69	38.45	-18.76
836.50	1.4	QPSK	Standard	3 / 2	15.18	3.15	V	18.33	38.45	-20.13
848.30	1.4	QPSK	Standard	3 / 2	11.93	3.23	V	15.16	38.45	-23.29
824.70	1.4	16-QAM	Standard	3 / 2	15.51	3.06	V	18.57	38.45	-19.88
836.50	1.4	16-QAM	Standard	3 / 2	14.11	3.15	V	17.26	38.45	-21.20
848.30	1.4	16-QAM	Standard	3 / 2	10.99	3.23	V	14.22	38.45	-24.23
825.50	3	QPSK	Standard	1 / 14	15.96	3.06	V	19.02	38.45	-19.43
836.50	3	QPSK	Standard	1 / 0	14.78	3.15	V	17.93	38.45	-20.53
847.50	3	QPSK	Standard	1 / 0	11.97	3.23	V	15.20	38.45	-23.25
825.50	3	16-QAM	Standard	1 / 14	14.11	3.06	V	17.17	38.45	-21.28
836.50	3	16-QAM	Standard	1 / 0	14.14	3.15	V	17.29	38.45	-21.17
847.50	3	16-QAM	Standard	1 / 0	10.81	3.23	V	14.04	38.45	-24.41
826.50	5	QPSK	Standard	1 / 0	16.00	3.06	V	19.06	38.45	-19.39
836.50	5	QPSK	Standard	1 / 0	15.44	3.15	V	18.59	38.45	-19.87
846.50	5	QPSK	Standard	1 / 0	13.04	3.23	V	16.27	38.45	-22.18
826.50	5	16-QAM	Standard	1 / 0	14.30	3.06	V	17.36	38.45	-21.09
836.50	5	16-QAM	Standard	1 / 0	13.91	3.15	V	17.06	38.45	-21.40
846.50	5	16-QAM	Standard	1 / 0	11.27	3.23	V	14.50	38.45	-23.95
829.00	10	QPSK	Standard	1 / 0	16.71	3.06	V	19.77	38.45	-18.68
836.50	10	QPSK	Standard	1 / 0	16.00	3.15	V	19.15	38.45	-19.31
844.00	10	QPSK	Standard	1 / 0	14.45	3.23	V	17.68	38.45	-20.77
829.00	10	16-QAM	Standard	1 / 0	14.73	3.06	V	17.79	38.45	-20.66
836.50	10	16-QAM	Standard	1 / 0	14.79	3.15	V	17.94	38.45	-20.52
844.00	10	16-QAM	Standard	1 / 0	13.20	3.23	V	16.43	38.45	-22.02

Table 6-3. ERP Data (Band 5)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Battery	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	Ant. Pol. [H/V]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
1710.70	1.4	QPSK	Standard	3 / 2	15.34	9.29	V	24.63	30.00	-5.37
1732.50	1.4	QPSK	Standard	3 / 2	14.94	9.34	V	24.28	30.00	-5.72
1754.30	1.4	QPSK	Standard	3 / 2	14.46	9.38	V	23.84	30.00	-6.16
1710.70	1.4	16-QAM	Standard	3 / 2	14.21	9.29	V	23.50	30.00	-6.50
1732.50	1.4	16-QAM	Standard	3 / 2	14.00	9.34	V	23.34	30.00	-6.66
1754.30	1.4	16-QAM	Standard	3 / 2	13.05	9.38	V	22.43	30.00	-7.57
1711.50	3	QPSK	Standard	1 / 0	14.77	9.29	V	24.06	30.00	-5.94
1732.50	3	QPSK	Standard	1 / 0	14.48	9.34	V	23.82	30.00	-6.18
1753.50	3	QPSK	Standard	1 / 0	13.72	9.38	V	23.10	30.00	-6.90
1711.50	3	16-QAM	Standard	1 / 0	13.04	9.29	V	22.33	30.00	-7.67
1732.50	3	16-QAM	Standard	1 / 0	12.75	9.34	V	22.09	30.00	-7.91
1753.50	3	16-QAM	Standard	1 / 0	12.87	9.38	V	22.25	30.00	-7.75
1712.50	5	QPSK	Standard	1 / 24	14.86	9.29	V	24.15	30.00	-5.85
1732.50	5	QPSK	Standard	1 / 0	14.74	9.34	V	24.08	30.00	-5.92
1752.50	5	QPSK	Standard	1 / 24	14.29	9.38	V	23.67	30.00	-6.33
1712.50	5	16-QAM	Standard	1 / 24	13.34	9.29	V	22.63	30.00	-7.37
1732.50	5	16-QAM	Standard	1 / 0	13.20	9.34	V	22.54	30.00	-7.46
1752.50	5	16-QAM	Standard	1 / 24	12.85	9.38	V	22.23	30.00	-7.77
1715.00	10	QPSK	Standard	1 / 0	15.31	9.29	V	24.60	30.00	-5.40
1732.50	10	QPSK	Standard	1 / 0	15.12	9.34	V	24.46	30.00	-5.54
1750.00	10	QPSK	Standard	1 / 49	14.37	9.38	V	23.75	30.00	-6.25
1715.00	10	16-QAM	Standard	1 / 0	14.04	9.29	V	23.33	30.00	-6.67
1732.50	10	16-QAM	Standard	1 / 0	13.85	9.34	V	23.19	30.00	-6.81
1750.00	10	16-QAM	Standard	1 / 49	13.75	9.38	V	23.13	30.00	-6.87
1717.50	15	QPSK	Standard	1 / 0	15.47	9.29	V	24.76	30.00	-5.24
1732.50	15	QPSK	Standard	1 / 0	15.70	9.34	V	25.04	30.00	-4.96
1747.50	15	QPSK	Standard	1 / 74	15.00	9.38	V	24.38	30.00	-5.62
1717.50	15	16-QAM	Standard	1 / 0	14.18	9.29	V	23.47	30.00	-6.53
1732.50	15	16-QAM	Standard	1 / 0	14.13	9.34	V	23.47	30.00	-6.53
1747.50	15	16-QAM	Standard	1 / 74	13.56	9.38	V	22.94	30.00	-7.06
1720.00	20	QPSK	Standard	1 / 0	15.32	9.29	V	24.61	30.00	-5.39
1732.50	20	QPSK	Standard	1 / 0	15.57	9.34	V	24.91	30.00	-5.09
1745.00	20	QPSK	Standard	1 / 99	14.29	9.38	V	23.67	30.00	-6.33
1720.00	20	16-QAM	Standard	1 / 0	14.42	9.29	V	23.71	30.00	-6.29
1732.50	20	16-QAM	Standard	1 / 0	13.78	9.34	V	23.12	30.00	-6.88
1745.00	20	16-QAM	Standard	1 / 99	13.61	9.38	V	22.99	30.00	-7.01

Table 6-4. EIRP Data (Band 4)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Battery	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	Ant. Pol. [H/V]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
1850.70	1.4	QPSK	Standard	3 / 2	10.21	9.37	V	19.58	33.01	-13.43
1880.00	1.4	QPSK	Standard	3 / 2	12.92	9.33	V	22.25	33.01	-10.76
1909.30	1.4	QPSK	Standard	3 / 2	12.45	9.29	V	21.74	33.01	-11.27
1850.70	1.4	16-QAM	Standard	3 / 2	8.85	9.37	V	18.22	33.01	-14.79
1880.00	1.4	16-QAM	Standard	3 / 2	11.87	9.33	V	21.20	33.01	-11.81
1909.30	1.4	16-QAM	Standard	3 / 2	11.53	9.29	V	20.82	33.01	-12.19
1851.50	3	QPSK	Standard	1 / 0	9.42	9.37	V	18.79	33.01	-14.22
1880.00	3	QPSK	Standard	1 / 0	12.54	9.33	V	21.87	33.01	-11.14
1908.50	3	QPSK	Standard	1 / 0	11.87	9.29	V	21.16	33.01	-11.85
1851.50	3	16-QAM	Standard	1 / 0	8.05	9.37	V	17.42	33.01	-15.59
1880.00	3	16-QAM	Standard	1 / 0	11.57	9.33	V	20.90	33.01	-12.11
1908.50	3	16-QAM	Standard	1 / 0	11.13	9.29	V	20.42	33.01	-12.59
1852.50	5	QPSK	Standard	1 / 0	10.09	9.37	V	19.46	33.01	-13.55
1880.00	5	QPSK	Standard	1 / 24	12.74	9.33	V	22.07	33.01	-10.94
1907.50	5	QPSK	Standard	1 / 0	12.43	9.29	V	21.72	33.01	-11.29
1852.50	5	16-QAM	Standard	1 / 0	8.47	9.37	V	17.84	33.01	-15.17
1880.00	5	16-QAM	Standard	1 / 24	11.85	9.33	V	21.18	33.01	-11.83
1907.50	5	16-QAM	Standard	1 / 0	11.08	9.29	V	20.37	33.01	-12.64
1855.00	10	QPSK	Standard	1 / 49	10.56	9.37	V	19.93	33.01	-13.08
1880.00	10	QPSK	Standard	1 / 49	13.21	9.33	V	22.54	33.01	-10.47
1905.00	10	QPSK	Standard	1 / 0	12.63	9.29	V	21.92	33.01	-11.09
1855.00	10	16-QAM	Standard	1 / 49	9.21	9.37	V	18.58	33.01	-14.43
1880.00	10	16-QAM	Standard	1 / 49	11.47	9.33	V	20.80	33.01	-12.21
1905.00	10	16-QAM	Standard	1 / 0	11.28	9.29	V	20.57	33.01	-12.44
1857.50	15	QPSK	Standard	1 / 74	11.94	9.37	V	21.31	33.01	-11.70
1880.00	15	QPSK	Standard	1 / 74	12.95	9.33	V	22.28	33.01	-10.73
1902.50	15	QPSK	Standard	1 / 74	12.48	9.29	V	21.77	33.01	-11.24
1857.50	15	16-QAM	Standard	1 / 74	10.38	9.37	V	19.75	33.01	-13.26
1880.00	15	16-QAM	Standard	1 / 74	11.25	9.33	V	20.58	33.01	-12.43
1902.50	15	16-QAM	Standard	1 / 74	11.91	9.29	V	21.20	33.01	-11.81
1860.00	20	QPSK	Standard	1 / 99	12.36	9.37	V	21.73	33.01	-11.28
1880.00	20	QPSK	Standard	1 / 99	12.73	9.33	V	22.06	33.01	-10.95
1900.00	20	QPSK	Standard	1 / 99	12.51	9.29	V	21.80	33.01	-11.21
1860.00	20	16-QAM	Standard	1 / 99	11.45	9.37	V	20.82	33.01	-12.19
1880.00	20	16-QAM	Standard	1 / 99	11.69	9.33	V	21.02	33.01	-11.99
1900.00	20	16-QAM	Standard	1 / 99	11.43	9.29	V	20.72	33.01	-12.29

Table 6-5. EIRP Data (Band 2)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Battery	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	Ant. Pol. [H/V]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
2502.50	5	QPSK	Standard	1 / 0	9.99	9.09	V	19.08	33.01	-13.93
2535.00	5	QPSK	Standard	1 / 0	9.97	8.89	V	18.86	33.01	-14.15
2567.50	5	QPSK	Standard	1 / 0	10.92	8.70	V	19.62	33.01	-13.39
2502.50	5	16-QAM	Standard	1 / 0	8.41	9.09	V	17.50	33.01	-15.51
2535.00	5	16-QAM	Standard	1 / 0	8.33	8.89	V	17.22	33.01	-15.79
2567.50	5	16-QAM	Standard	1 / 0	9.39	8.70	V	18.09	33.01	-14.92
2505.00	10	QPSK	Standard	1 / 0	10.11	9.09	V	19.20	33.01	-13.81
2535.00	10	QPSK	Standard	1 / 49	10.63	8.89	V	19.52	33.01	-13.49
2565.00	10	QPSK	Standard	1 / 49	11.00	8.70	V	19.70	33.01	-13.31
2505.00	10	16-QAM	Standard	1 / 0	9.00	9.09	V	18.09	33.01	-14.92
2535.00	10	16-QAM	Standard	1 / 49	9.19	8.89	V	18.08	33.01	-14.93
2565.00	10	16-QAM	Standard	1 / 49	10.04	8.70	V	18.74	33.01	-14.27
2507.50	15	QPSK	Standard	1 / 74	10.32	9.09	V	19.41	33.01	-13.60
2535.00	15	QPSK	Standard	1 / 74	10.64	8.89	V	19.53	33.01	-13.48
2562.50	15	QPSK	Standard	1 / 0	11.21	8.70	V	19.91	33.01	-13.10
2507.50	15	16-QAM	Standard	1 / 74	9.71	9.09	V	18.80	33.01	-14.21
2535.00	15	16-QAM	Standard	1 / 74	8.72	8.89	V	17.61	33.01	-15.40
2562.50	15	16-QAM	Standard	1 / 74	9.75	8.70	V	18.45	33.01	-14.56
2510.00	20	QPSK	Standard	1 / 99	10.95	9.09	V	20.04	33.01	-12.97
2535.00	20	QPSK	Standard	1 / 99	10.44	8.89	V	19.33	33.01	-13.68
2560.00	20	QPSK	Standard	1 / 0	11.21	8.70	V	19.91	33.01	-13.10
2510.00	20	16-QAM	Standard	1 / 99	9.40	9.09	V	18.49	33.01	-14.52
2535.00	20	16-QAM	Standard	1 / 99	8.95	8.89	V	17.84	33.01	-15.17
2560.00	20	16-QAM	Standard	1 / 99	9.68	8.70	V	18.38	33.01	-14.63

Table 6-6. EIRP Data (Band 7)

6.7 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 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.

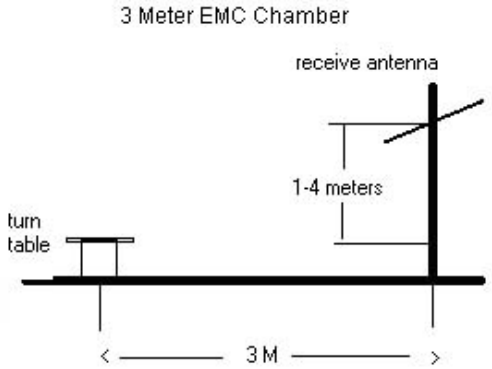


Figure 6-6. Test Instrument & Measurement Setup

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.

OPERATING FREQUENCY:	704.00	MHz		
CHANNEL:	23060			
MEASURED OUTPUT POWER:	20.91	dBm	=	0.123 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	10.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	33.91	dBc	

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
1408.00	-54.31	5.69	-48.62	H	69.5
2112.00	-63.92	6.67	-57.24	H	78.2
2816.00	-64.56	7.82	-56.74	H	77.6
3520.00	-61.87	7.58	-54.28	H	75.2
4224.00	-60.32	8.33	-51.99	H	72.9
4928.00	-60.08	8.72	-51.35	H	72.3
5632.00	-58.67	8.86	-49.81	H	70.7
6336.00	-57.66	9.49	-48.17	H	69.1
7040.00	-55.74	9.60	-46.14	H	67.1
7744.00	-54.08	9.07	-45.01	H	65.9

Table 6-7. Radiated Spurious Data (Band 12 – Low Channel)

OPERATING FREQUENCY:	707.50	MHz			
CHANNEL:	23095				
MEASURED OUTPUT POWER:	20.88	dBm	=	0.122	W
MODULATION SIGNAL:	QPSK				
BANDWIDTH:	10.0	MHz			
DISTANCE:	3	meters			
LIMIT:	43 + 10 $\log_{10}$ (W) =	33.88	dBc		

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
1415.00	-51.48	5.73	-45.75	H	66.6
2122.50	-61.54	6.73	-54.81	H	75.7
2830.00	-61.45	7.80	-53.65	H	74.5
3537.50	-61.91	7.59	-54.32	H	75.2

Table 6-8. Radiated Spurious Data (Band 12 – Mid Channel)

OPERATING FREQUENCY:	711.00	MHz			
CHANNEL:	23130				
MEASURED OUTPUT POWER:	20.83	dBm	=	0.121	W
MODULATION SIGNAL:	QPSK				
BANDWIDTH:	10.0	MHz			
DISTANCE:	3	meters			
LIMIT:	43 + 10 $\log_{10}$ (W) =	33.83	dBc		

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
1422.00	-55.81	5.77	-50.04	H	70.9
2133.00	-63.96	6.79	-57.17	H	78.0
2844.00	-65.01	7.78	-57.23	H	78.1

Table 6-9. Radiated Spurious Data (Band 12 – High Channel)

OPERATING FREQUENCY:	829.00	MHz			
CHANNEL:	20450				
MEASURED OUTPUT POWER:	19.77	dBm	=	0.095	W
MODULATION SIGNAL:	QPSK				
BANDWIDTH:	10.0	MHz			
DISTANCE:	3	meters			
LIMIT:	43 + 10 $\log_{10}$ (W) =	32.77	dBc		

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
1658.00	-40.87	6.56	-34.31	H	54.1
2487.00	-64.40	7.32	-57.08	H	76.8
3316.00	-62.36	7.39	-54.96	H	74.7

Table 6-10. Radiated Spurious Data (Band 5 – Low Channel)

OPERATING FREQUENCY:	836.50	MHz			
CHANNEL:	20525				
MEASURED OUTPUT POWER:	19.15	dBm	=	0.082	W
MODULATION SIGNAL:	QPSK				
BANDWIDTH:	10.0	MHz			
DISTANCE:	3	meters			
LIMIT:	43 + 10 $\log_{10}$ (W) =	32.15	dBc		

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
1673.00	-41.72	6.55	-35.17	H	54.3
2509.50	-63.06	7.34	-55.72	H	74.9
3346.00	-62.55	7.44	-55.11	H	74.3

Table 6-11. Radiated Spurious Data (Band 5 – Mid Channel)

OPERATING FREQUENCY:	844.00	MHz			
CHANNEL:	20600				
MEASURED OUTPUT POWER:	17.68	dBm	=	0.059	W
MODULATION SIGNAL:	QPSK				
BANDWIDTH:	10.0	MHz			
DISTANCE:	3	meters			
LIMIT:	43 + 10 $\log_{10}$ (W) =	30.68	dBc		

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
1688.00	-33.09	6.55	-26.54	H	44.2
2532.00	-65.02	7.35	-57.66	H	75.3
3376.00	-62.95	7.48	-55.46	H	73.1

Table 6-12. Radiated Spurious Data (Band 5 – High Channel)

OPERATING FREQUENCY:	1717.50	MHz			
CHANNEL:	20025				
MEASURED OUTPUT POWER:	24.76	dBm	=	0.300	W
MODULATION SIGNAL:	QPSK				
BANDWIDTH:	15.0	MHz			
DISTANCE:	3	meters			
LIMIT:	43 + 10 $\log_{10}$ (W) =	37.76	dBc		

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
3435.00	-51.80	9.69	-42.11	H	66.9
5152.50	-57.93	10.65	-47.27	H	72.0
6870.00	-57.29	11.74	-45.55	H	70.3
8587.50	-53.22	11.04	-42.17	H	66.9
10305.00	-53.64	12.30	-41.34	H	66.1

Table 6-13. Radiated Spurious Data (Band 4 – Low Channel)

OPERATING FREQUENCY:	1732.50	MHz		
CHANNEL:	20175			
MEASURED OUTPUT POWER:	25.04	dBm	=	0.319 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	15.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	38.04	dBc	

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
3465.00	-50.09	9.71	-40.38	H	65.4
5197.50	-58.19	10.59	-47.61	H	72.6
6930.00	-57.68	11.75	-45.93	H	71.0
8662.50	-52.66	11.06	-41.60	H	66.6
10395.00	-53.95	12.37	-41.57	H	66.6

Table 6-14. Radiated Spurious Data (Band 4 – Mid Channel)

OPERATING FREQUENCY:	1747.50	MHz		
CHANNEL:	20325			
MEASURED OUTPUT POWER:	24.38	dBm	=	0.274 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	15.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	37.38	dBc	

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
3495.00	-51.90	9.72	-42.18	H	66.6
5242.50	-59.18	10.62	-48.56	H	72.9
6990.00	-58.93	11.76	-47.17	H	71.6
8737.50	-54.44	11.03	-43.41	H	67.8
10485.00	-52.89	12.46	-40.43	H	64.8
12232.50	-53.26	13.03	-40.24	H	64.6
13980.00	-47.76	11.52	-36.25	H	60.6

Table 6-15. Radiated Spurious Data (Band 4 – High Channel)

OPERATING FREQUENCY:	1855.00	MHz			
CHANNEL:	18650				
MEASURED OUTPUT POWER:	19.93	dBm	=	0.099	W
MODULATION SIGNAL:	QPSK				
BANDWIDTH:	10.0	MHz			
DISTANCE:	3	meters			
LIMIT:	43 + 10 $\log_{10}$ (W) =	32.93	dBc		

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
3710.00	-50.98	9.41	-41.57	H	61.5
5565.00	-58.62	10.82	-47.80	H	67.7
7420.00	-53.31	10.74	-42.58	H	62.5
9275.00	-53.31	11.59	-41.72	H	61.7

Table 6-16. Radiated Spurious Data (Band 2 – Low Channel)

OPERATING FREQUENCY:	1880.00	MHz			
CHANNEL:	18900				
MEASURED OUTPUT POWER:	22.54	dBm	=	0.180	W
MODULATION SIGNAL:	QPSK				
BANDWIDTH:	10.0	MHz			
DISTANCE:	3	meters			
LIMIT:	43 + 10 $\log_{10}$ (W) =	35.54	dBc		

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
3760.00	-51.16	9.28	-41.87	H	64.4
5640.00	-58.70	11.03	-47.67	H	70.2
7520.00	-53.18	10.97	-42.21	H	64.8
9400.00	-53.14	11.53	-41.61	H	64.2

Table 6-17. Radiated Spurious Data (Band 2 – Mid Channel)

OPERATING FREQUENCY:	1905.00	MHz		
CHANNEL:	19150			
MEASURED OUTPUT POWER:	21.92	dBm	=	0.156 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	10.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	34.92	dBc	

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
3810.00	-49.31	9.19	-40.13	H	62.1
5715.00	-58.78	11.26	-47.52	H	69.4
7620.00	-56.41	11.16	-45.25	H	67.2
9525.00	-54.19	11.76	-42.43	H	64.4
11430.00	-53.07	12.73	-40.34	H	62.3
13335.00	-49.89	12.51	-37.38	H	59.3

Table 6-18. Radiated Spurious Data (Band 2 – High Channel)

OPERATING FREQUENCY:	2510.00	MHz		
CHANNEL:	20850			
MEASURED OUTPUT POWER:	20.04	dBm	=	0.101 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	20.0	MHz		
DISTANCE:	3	meters		
LIMIT:	55 + 10 log10 (W) =	45.04	dBc	

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
5020.00	-50.68	10.91	-39.77	V	59.8
7530.00	-57.41	10.99	-46.42	V	66.5
10040.00	-50.09	12.06	-38.03	V	58.1
12550.00	-53.49	13.55	-39.94	V	60.0
15060.00	-51.83	13.63	-38.20	V	58.2
17570.00	-43.73	11.44	-32.28	V	52.3
20080.00	-68.66	15.88	-52.78	V	72.8

Table 6-19. Radiated Spurious Data (Band 7 – Low Channel)

OPERATING FREQUENCY:	2535.00	MHz		
CHANNEL:	21100			
MEASURED OUTPUT POWER:	19.33	dBm	=	0.086 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	20.0	MHz		
DISTANCE:	3	meters		
LIMIT:	55 + 10 log10 (W) =	44.33	dBc	

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
5070.00	-47.25	10.80	-36.45	V	55.8
7605.00	-57.00	11.13	-45.87	V	65.2
10140.00	-51.82	12.14	-39.69	V	59.0
12675.00	-54.53	13.72	-40.81	V	60.1
15210.00	-56.28	14.43	-41.85	V	61.2
17745.00	-41.04	9.90	-31.14	V	50.5
20280.00	-68.57	15.99	-52.58	V	71.9

Table 6-20. Radiated Spurious Data (Band 7 – Mid Channel)

OPERATING FREQUENCY:	2560.00	MHz		
CHANNEL:	21350			
MEASURED OUTPUT POWER:	19.91	dBm	=	0.098 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	20.0	MHz		
DISTANCE:	3	meters		
LIMIT:	55 + 10 log10 (W) =	44.91	dBc	

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
5120.00	-45.15	10.71	-34.44	V	54.4
7680.00	-53.13	11.21	-41.92	V	61.8
10240.00	-53.12	12.24	-40.89	V	60.8
12800.00	-54.21	13.58	-40.63	V	60.5
15360.00	-57.17	15.38	-41.78	V	61.7

Table 6-21. Radiated Spurious Data (Band 7 – High Channel)

6.8 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 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)	707,499,752	-248	-0.0000351
100 %		- 30	707,499,716	-284	-0.0000401
100 %		- 20	707,499,904	-96	-0.0000136
100 %		- 10	707,499,828	-172	-0.0000243
100 %		0	707,500,202	202	0.0000286
100 %		+ 10	707,499,827	-173	-0.0000245
100 %		+ 20	707,500,296	296	0.0000418
100 %		+ 30	707,500,019	19	0.0000027
100 %		+ 40	707,500,256	256	0.0000362
100 %		+ 50	707,500,428	428	0.0000605
BATT. ENDPOINT	3.45	+ 20	707,500,013	13	0.0000018

Table 6-22. Frequency Stability Data (Band 12)

Note:

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

Band 12 Frequency Stability Measurements

§2.1055 §27.54

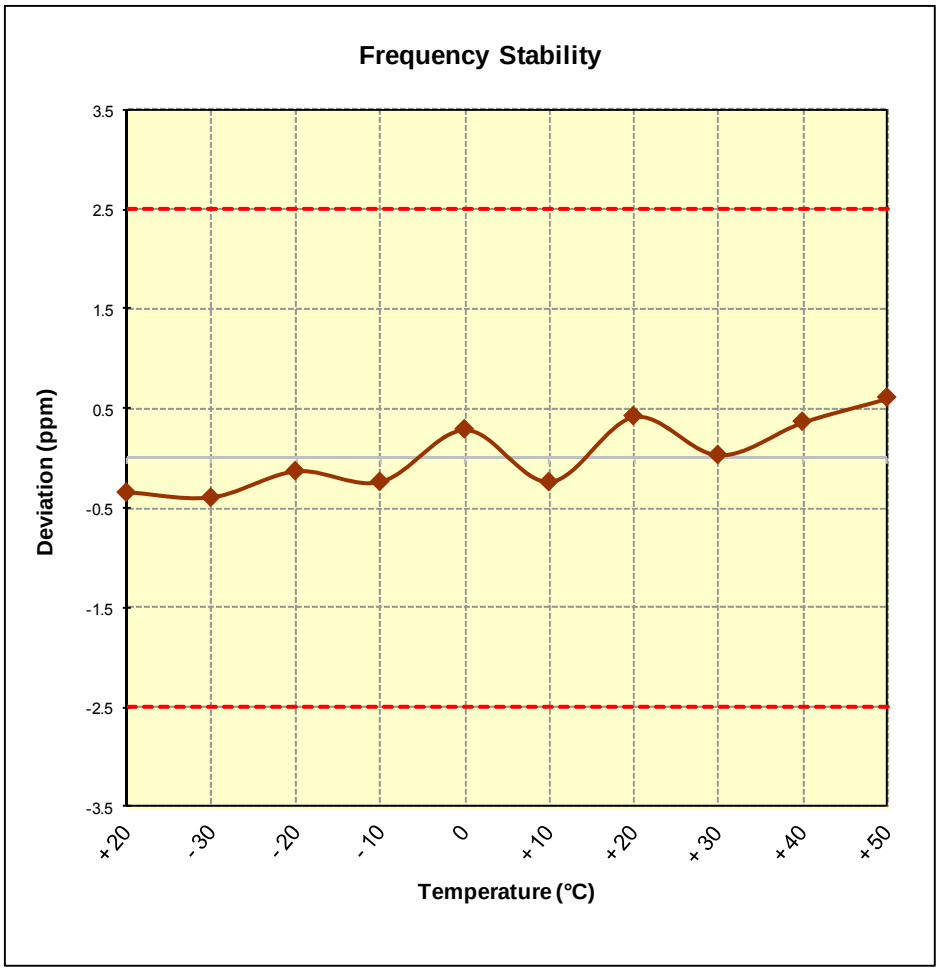


Figure 6-7. Frequency Stability Graph (Band 12)

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)	836,500,279	279	0.0000334
100 %		- 30	836,499,975	-25	-0.0000030
100 %		- 20	836,499,969	-31	-0.0000037
100 %		- 10	836,499,671	-329	-0.0000393
100 %		0	836,500,286	286	0.0000342
100 %		+ 10	836,499,788	-212	-0.0000253
100 %		+ 20	836,500,215	215	0.0000257
100 %		+ 30	836,499,860	-140	-0.0000167
100 %		+ 40	836,500,028	28	0.0000033
100 %		+ 50	836,500,086	86	0.0000103
BATT. ENDPOINT	3.45	+ 20	836,500,401	401	0.0000479

Table 6-23. Frequency Stability Data (Band 5)

Band 5 Frequency Stability Measurements

§2.1055 §22.355

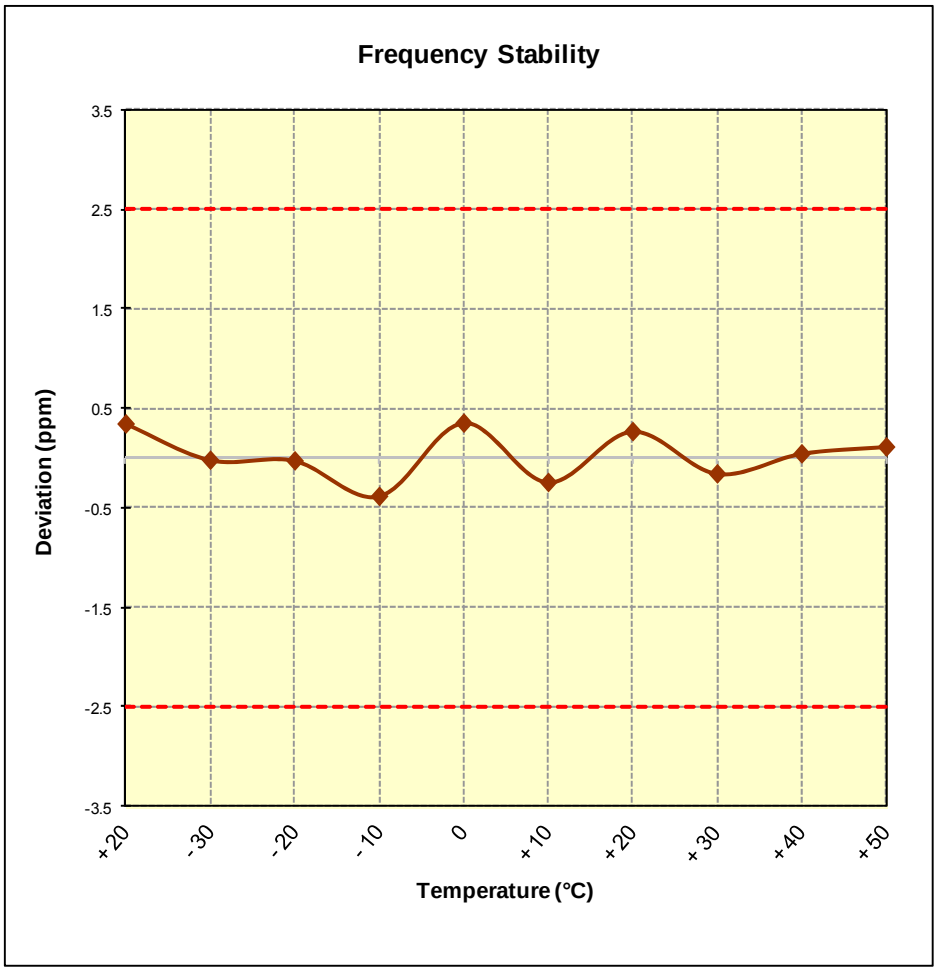


Figure 6-8. Frequency Stability Graph (Band 5)

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)	1,732,499,736	-264	-0.0000152
100 %		- 30	1,732,499,904	-96	-0.0000055
100 %		- 20	1,732,500,012	12	0.0000007
100 %		- 10	1,732,500,200	200	0.0000115
100 %		0	1,732,499,881	-119	-0.0000069
100 %		+ 10	1,732,499,947	-53	-0.0000031
100 %		+ 20	1,732,500,060	60	0.0000035
100 %		+ 30	1,732,500,156	156	0.0000090
100 %		+ 40	1,732,499,745	-255	-0.0000147
100 %		+ 50	1,732,499,903	-97	-0.0000056
BATT. ENDPOINT	3.45	+ 20	1,732,499,943	-57	-0.0000033

Table 6-24. Frequency Stability Data (Band 4)

Note:

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

Band 4 Frequency Stability Measurements

§2.1055 §§27.54

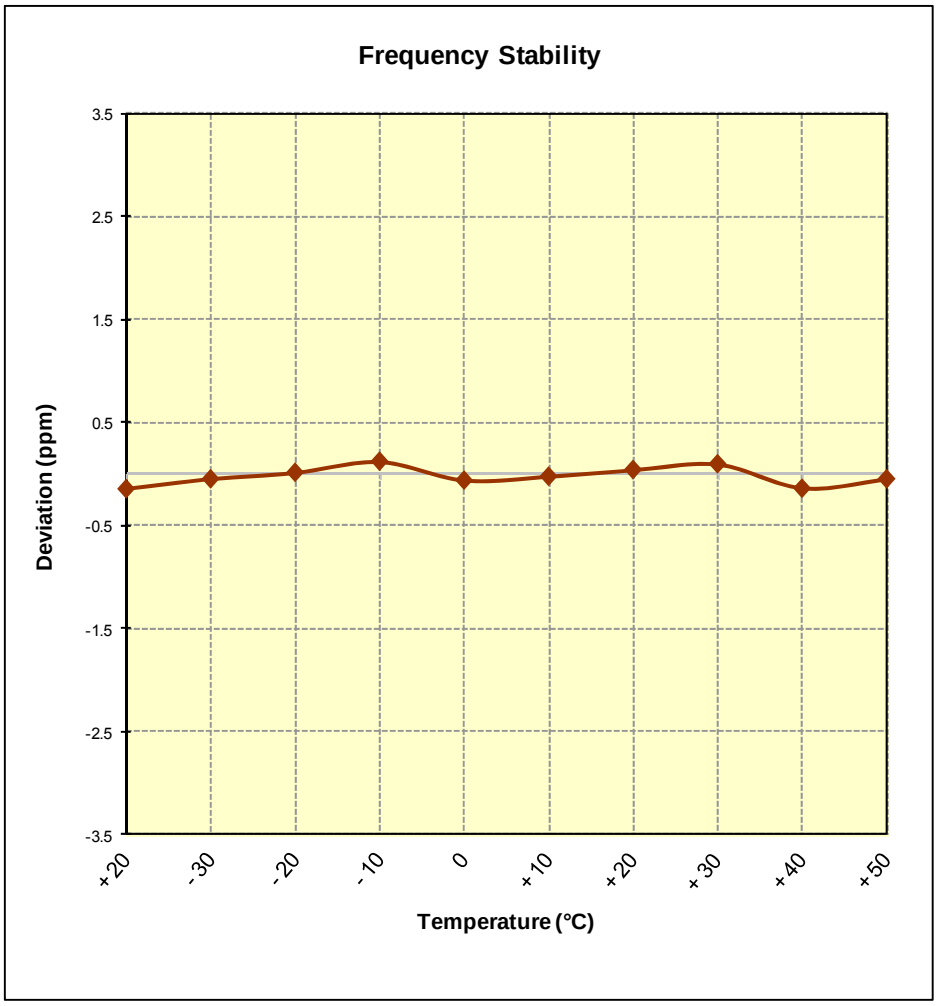


Figure 6-9. Frequency Stability Graph (Band 4)

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)	1,880,000,186	186	0.0000099
100 %		- 30	1,880,000,093	93	0.0000049
100 %		- 20	1,879,999,775	-225	-0.0000120
100 %		- 10	1,880,000,445	445	0.0000237
100 %		0	1,880,000,152	152	0.0000081
100 %		+ 10	1,880,000,145	145	0.0000077
100 %		+ 20	1,879,999,819	-181	-0.0000096
100 %		+ 30	1,880,000,026	26	0.0000014
100 %		+ 40	1,879,999,937	-63	-0.0000034
100 %		+ 50	1,879,999,963	-37	-0.0000020
BATT. ENDPOINT	3.45	+ 20	1,880,000,066	66	0.0000035

Table 6-25. 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

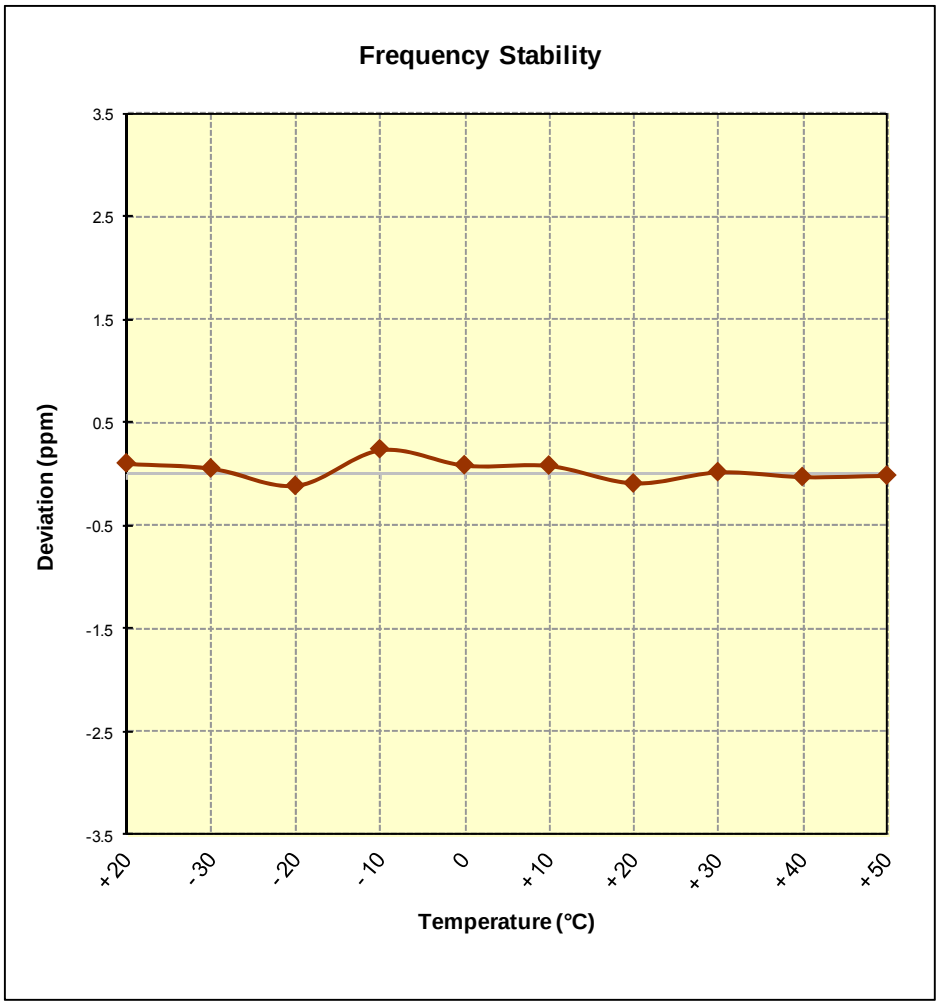


Figure 6-10. Frequency Stability Graph (Band 2)

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)	2,534,999,952	-48	-0.0000019
100 %		- 30	2,534,999,779	-221	-0.0000087
100 %		- 20	2,535,000,012	12	0.0000005
100 %		- 10	2,534,999,977	-23	-0.0000009
100 %		0	2,535,000,178	178	0.0000070
100 %		+ 10	2,535,000,151	151	0.0000060
100 %		+ 20	2,534,999,756	-244	-0.0000096
100 %		+ 30	2,535,000,422	422	0.0000166
100 %		+ 40	2,535,000,210	210	0.0000083
100 %		+ 50	2,535,000,348	348	0.0000137
BATT. ENDPOINT	3.45	+ 20	2,534,999,724	-276	-0.0000109

Table 6-26. 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

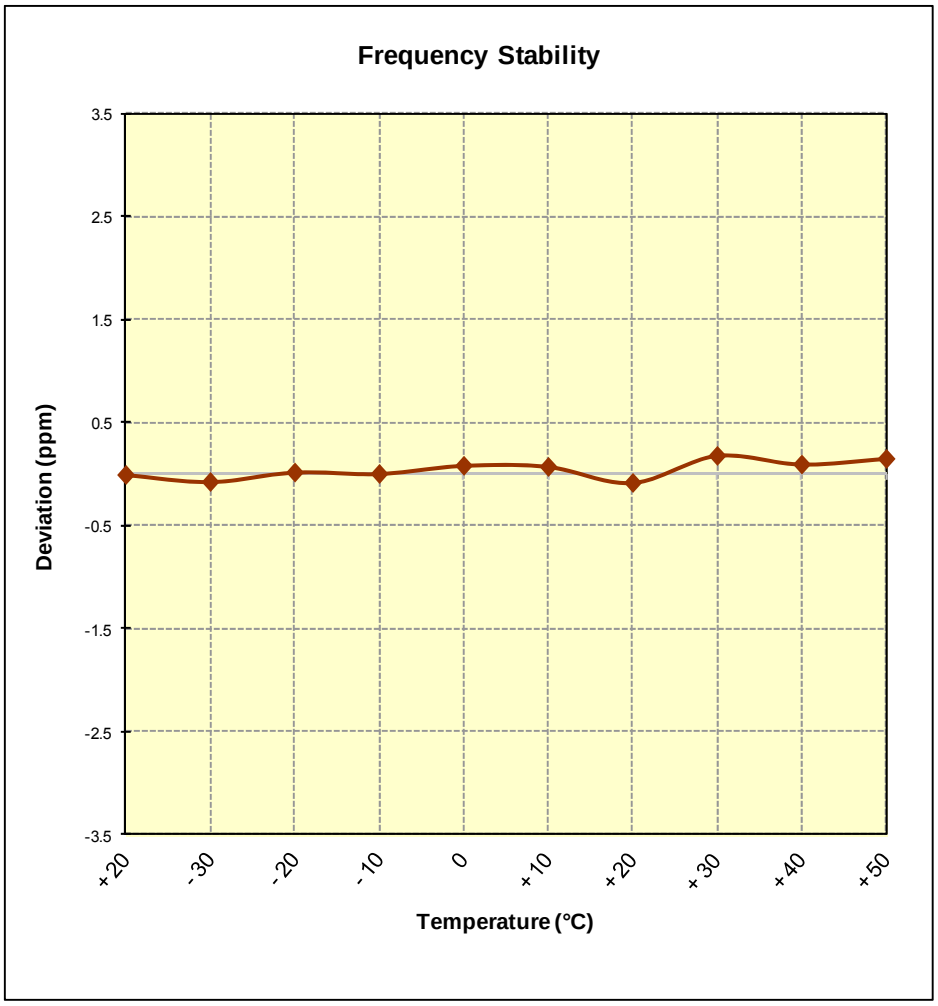


Figure 6-11. Frequency Stability Graph (Band 7)

7.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFH636** complies with all the requirements of Parts 22, 24, & 27 of the FCC rules for LTE operation only.