7.4 Band Edge Emissions at Antenna Terminal

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

Test Overview

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

The minimum permissible attenuation level for Band 41 is as noted in the Test Notes on the following page.

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

Test Procedure Used

KDB 971168 D01 v02r02 – Section 6.0

Test Settings

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

Test Setup

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

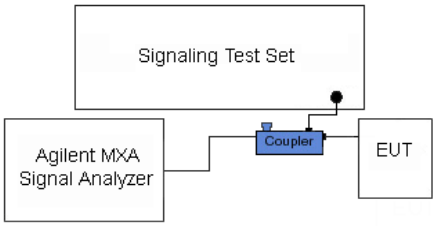


Figure 7-3. Test Instrument & Measurement Setup

Test Notes

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

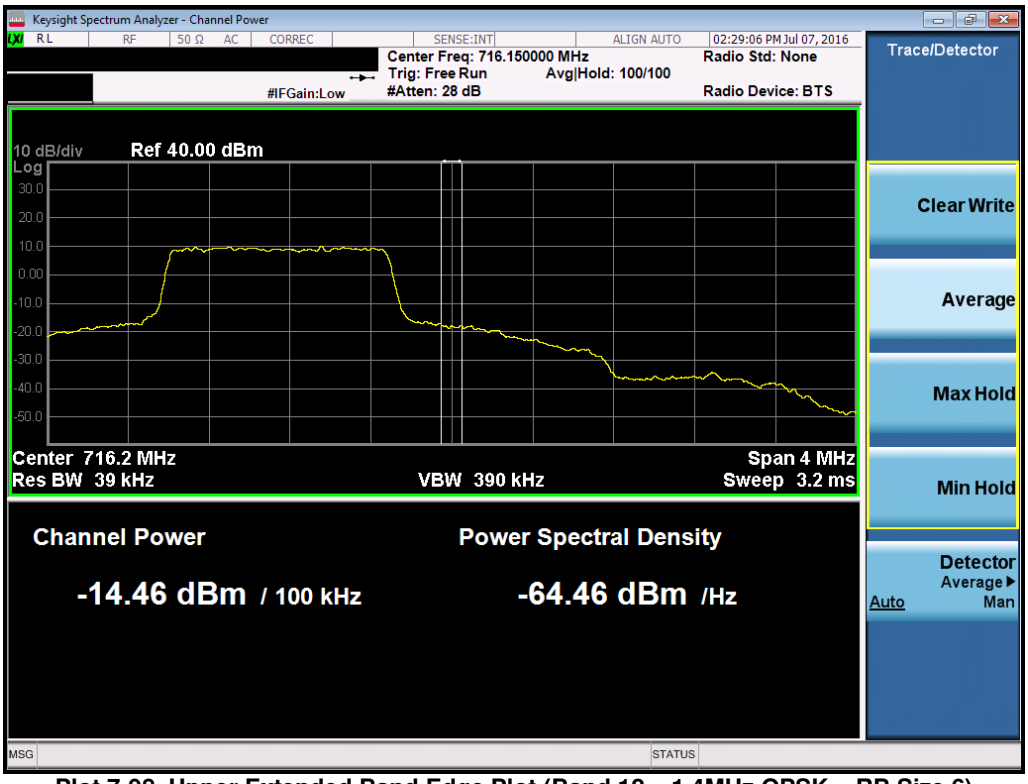
Per 27.53(g) for operations in the 698-746 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

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.

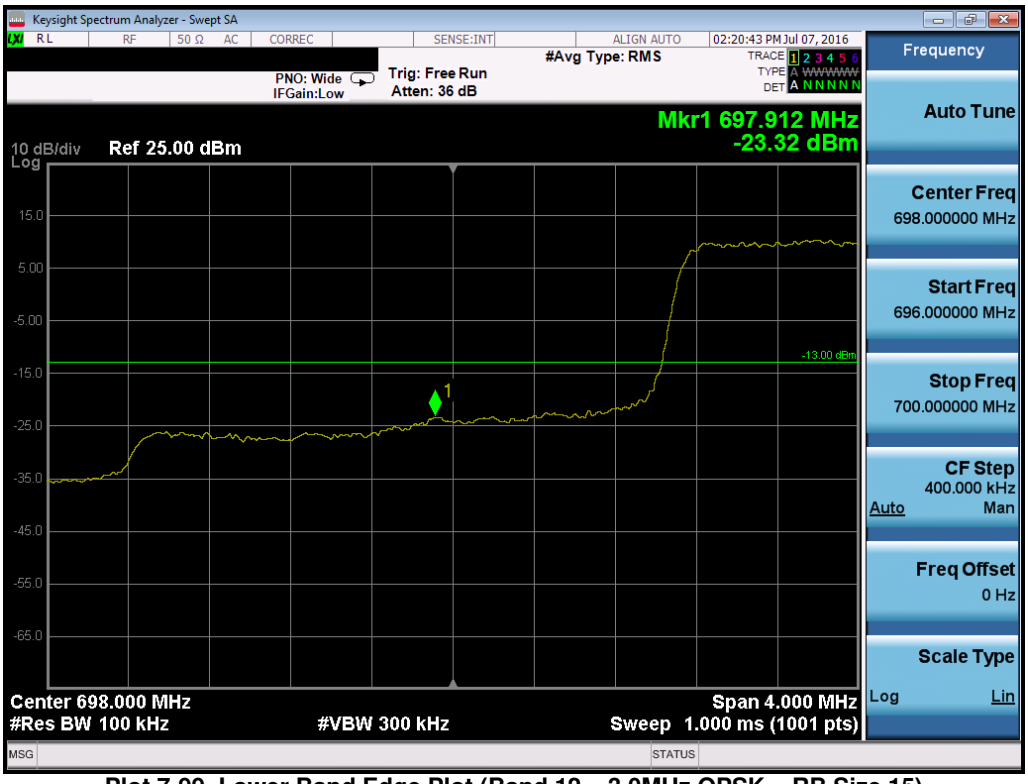
In the plots below VBW = 3x RBW. For plots where VBW is not exactly equal to 3x RBW it was determined this small difference in VBW does not affect the measurement.

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

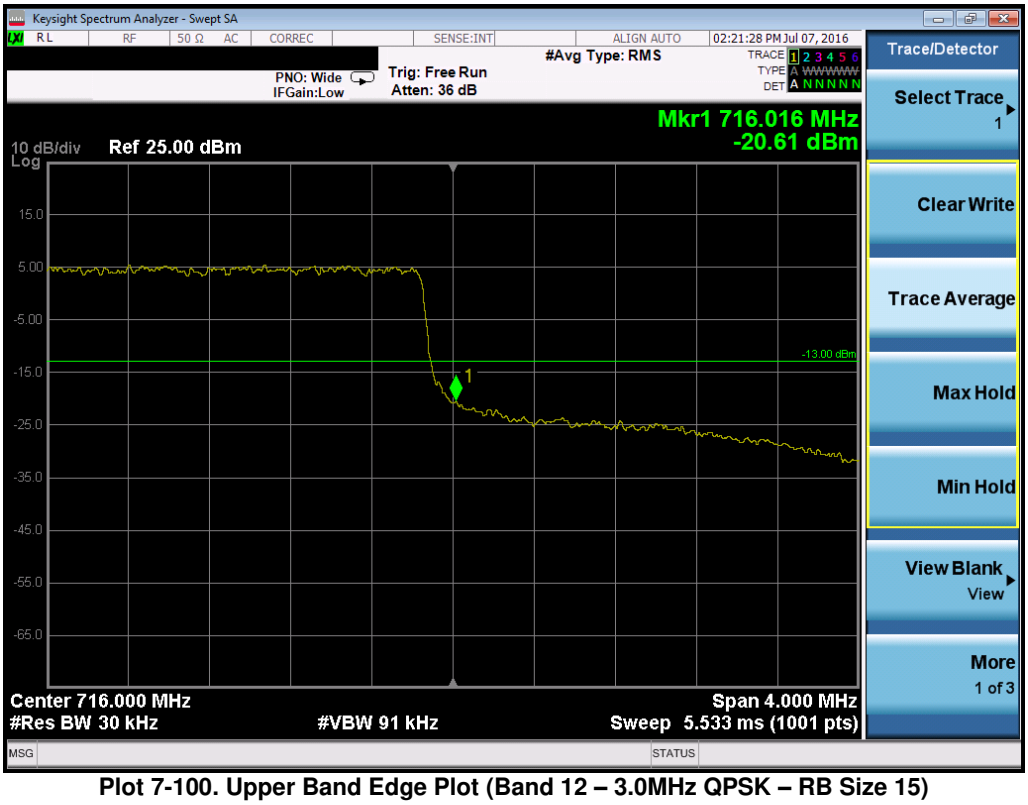
Plot 7-97. Upper Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)



Plot 7-98. Upper Extended Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)



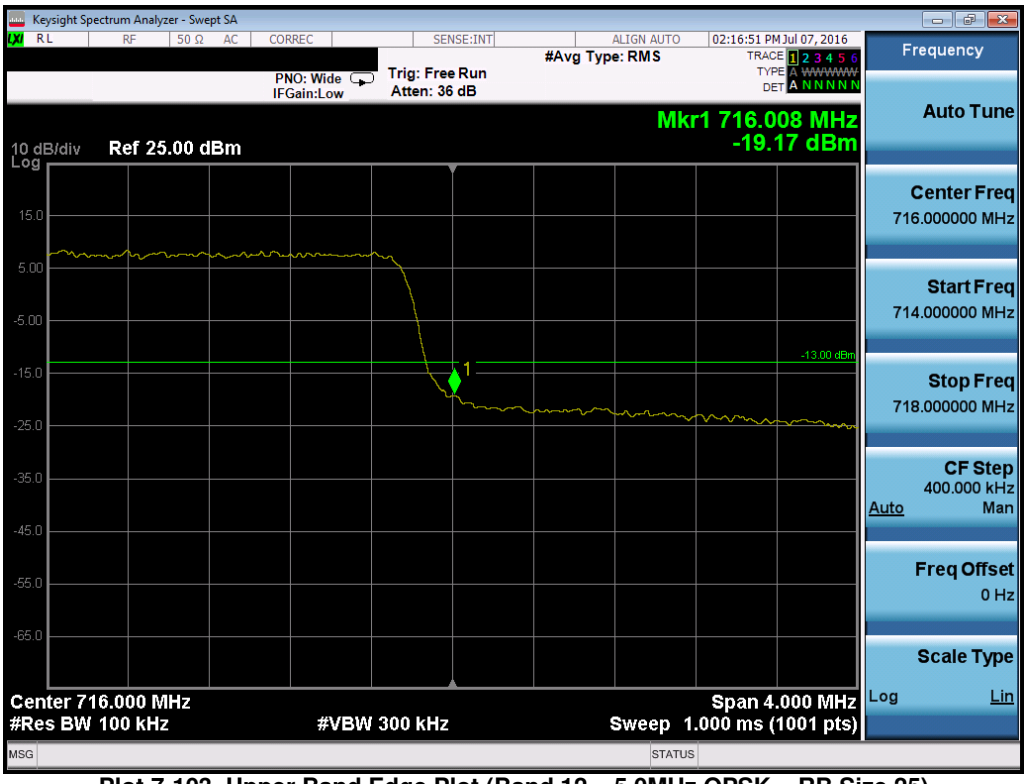
Plot 7-99. Lower Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)



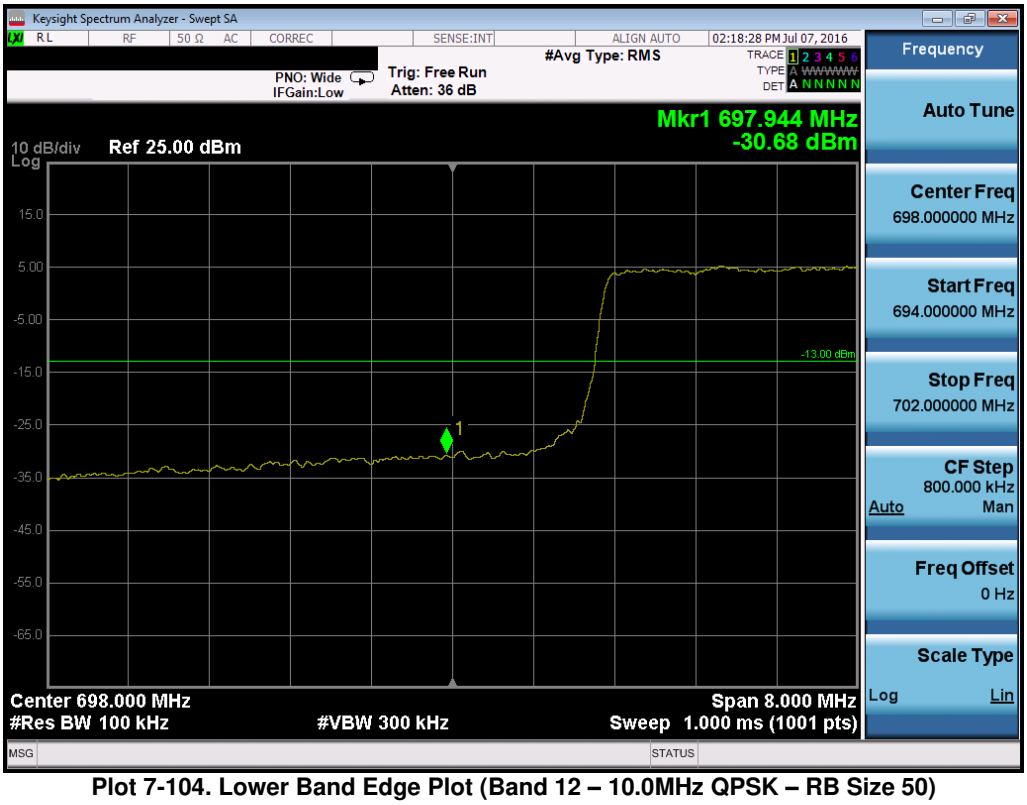
Plot 7-100. Upper Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

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 – 5.0MHz QPSK – RB Size 25)

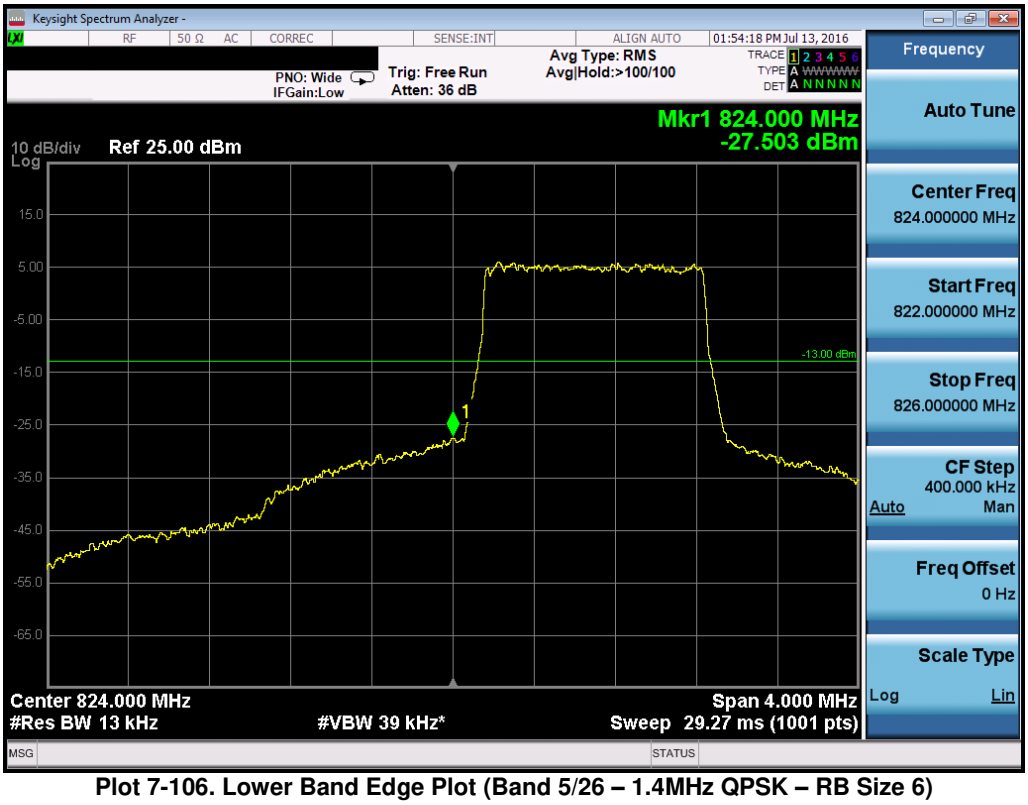


Plot 7-103. Upper Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)



Plot 7-104. Lower Band Edge Plot (Band 12 – 10.0MHz QPSK – RB Size 50)

Plot 7-105. Upper Band Edge Plot (Band 12 – 10.0MHz QPSK – RB Size 50)

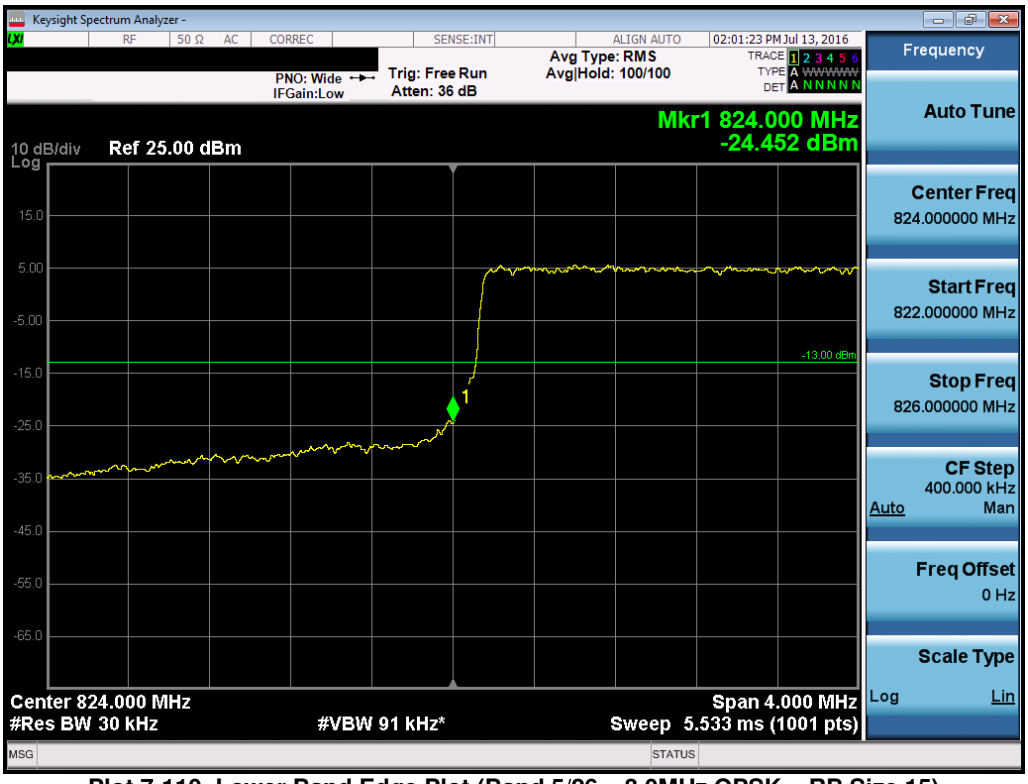


Plot 7-106. Lower Band Edge Plot (Band 5/26 – 1.4MHz QPSK – RB Size 6)

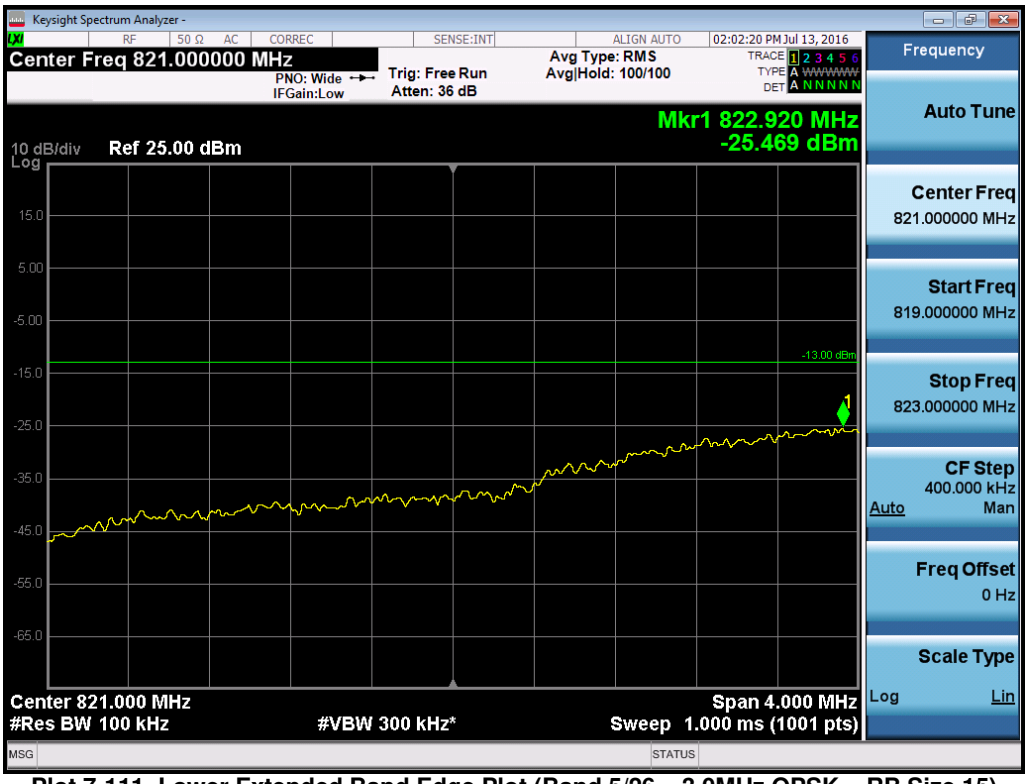
Plot 7-107. Lower Extended Band Edge Plot (Band 5/26 – 1.4MHz QPSK – RB Size 6)

Plot 7-108. Upper Band Edge Plot (Band 5/26 – 1.4MHz QPSK – RB Size 6)

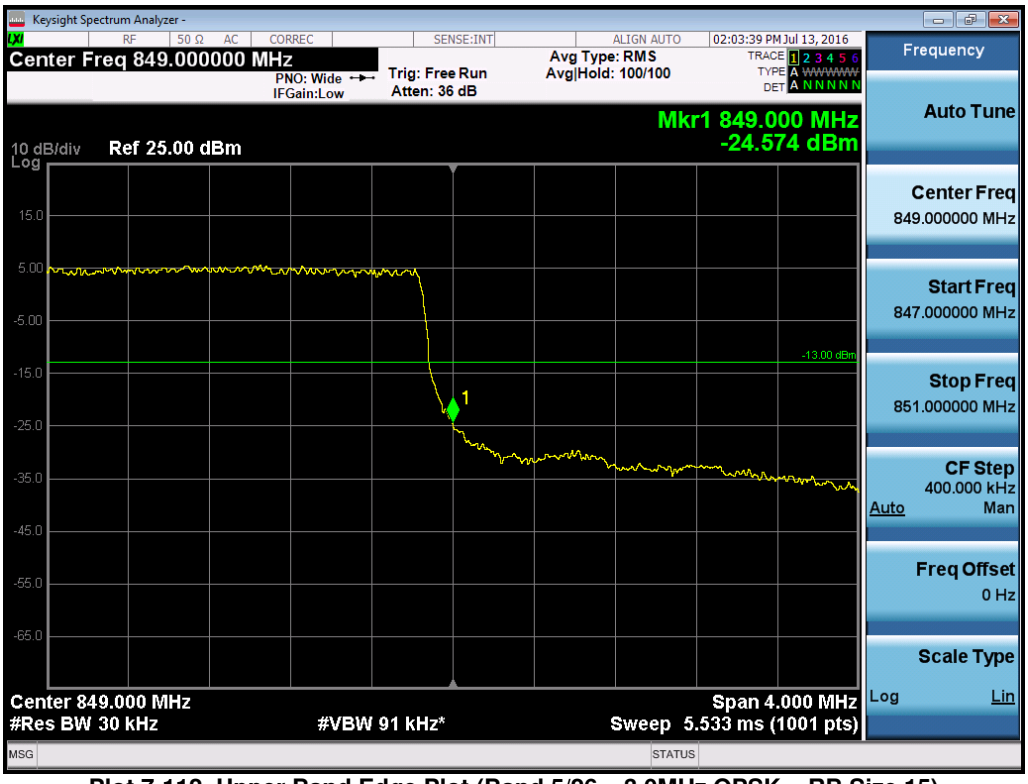
Plot 7-109. Upper Extended Band Edge Plot (Band 5/26 – 1.4MHz QPSK – RB Size 6)



Plot 7-110. Lower Band Edge Plot (Band 5/26 – 3.0MHz QPSK – RB Size 15)

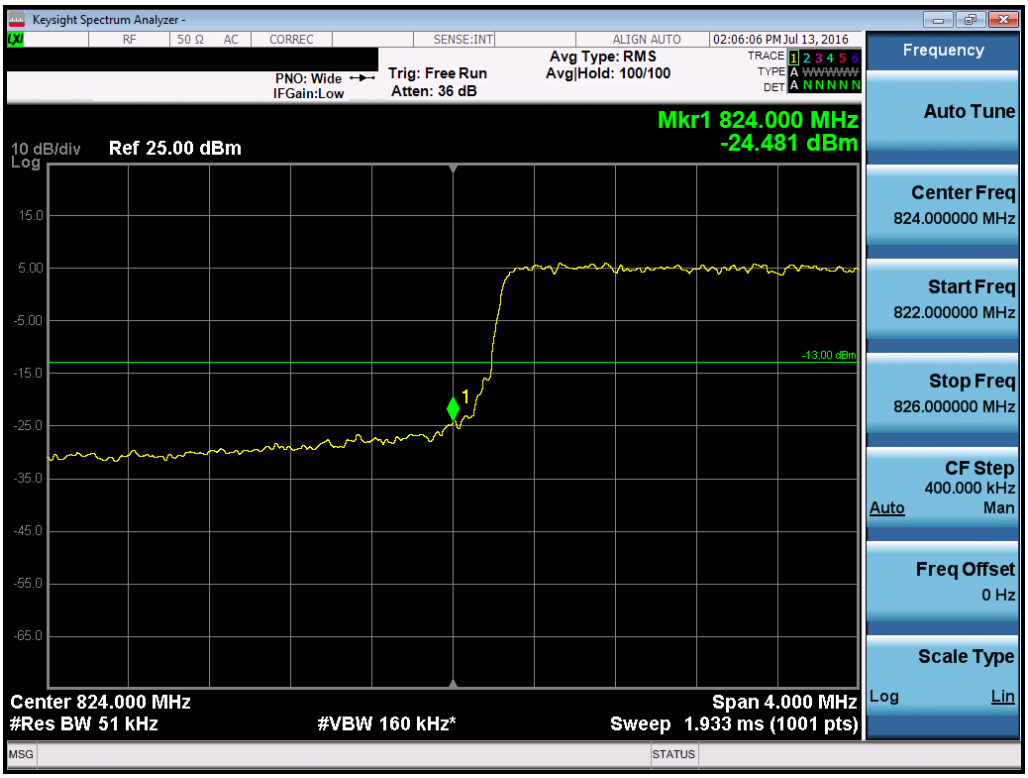


Plot 7-111. Lower Extended Band Edge Plot (Band 5/26 – 3.0MHz QPSK – RB Size 15)

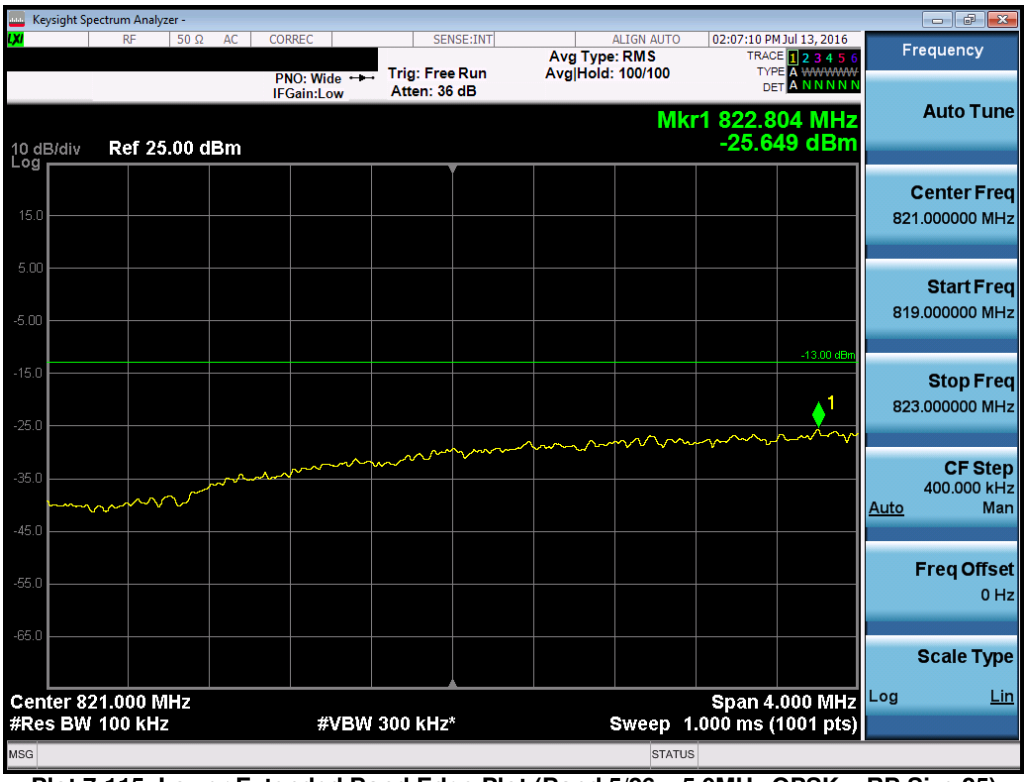


Plot 7-112. Upper Band Edge Plot (Band 5/26 – 3.0MHz QPSK – RB Size 15)

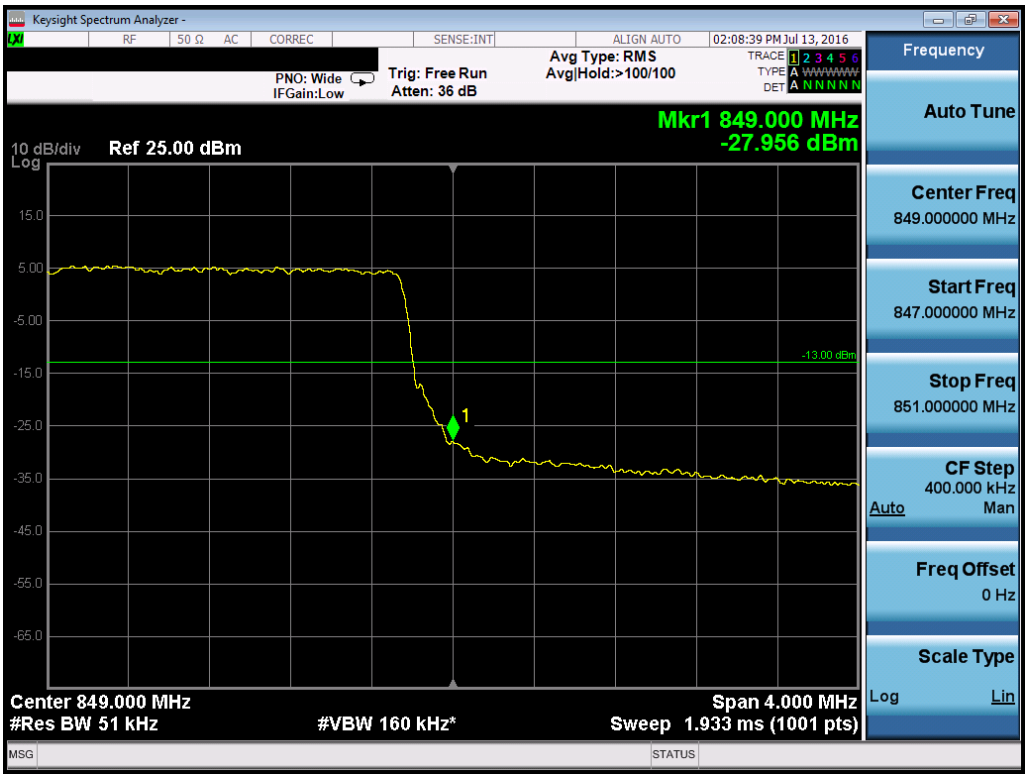
Plot 7-113. Upper Extended Band Edge Plot (Band 5/26 – Band 5 – 3.0MHz QPSK – RB Size 15)



Plot 7-114. Lower Band Edge Plot (Band 5/26 – 5.0MHz QPSK – RB Size 25)

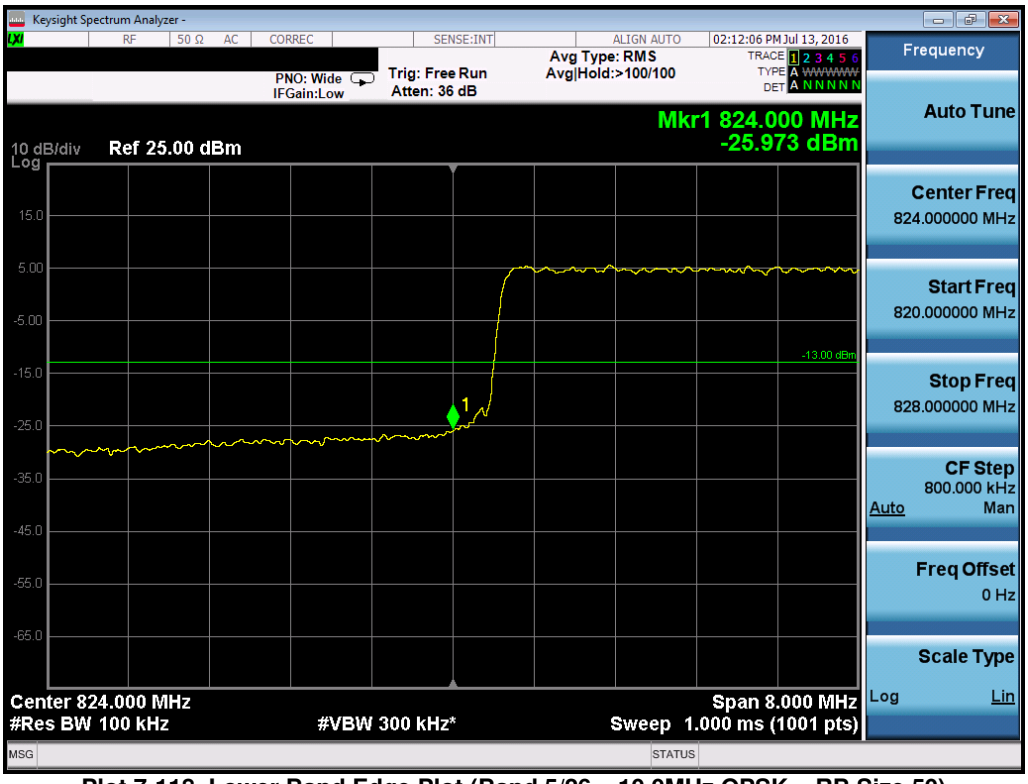


Plot 7-115. Lower Extended Band Edge Plot (Band 5/26 – 5.0MHz QPSK – RB Size 25)



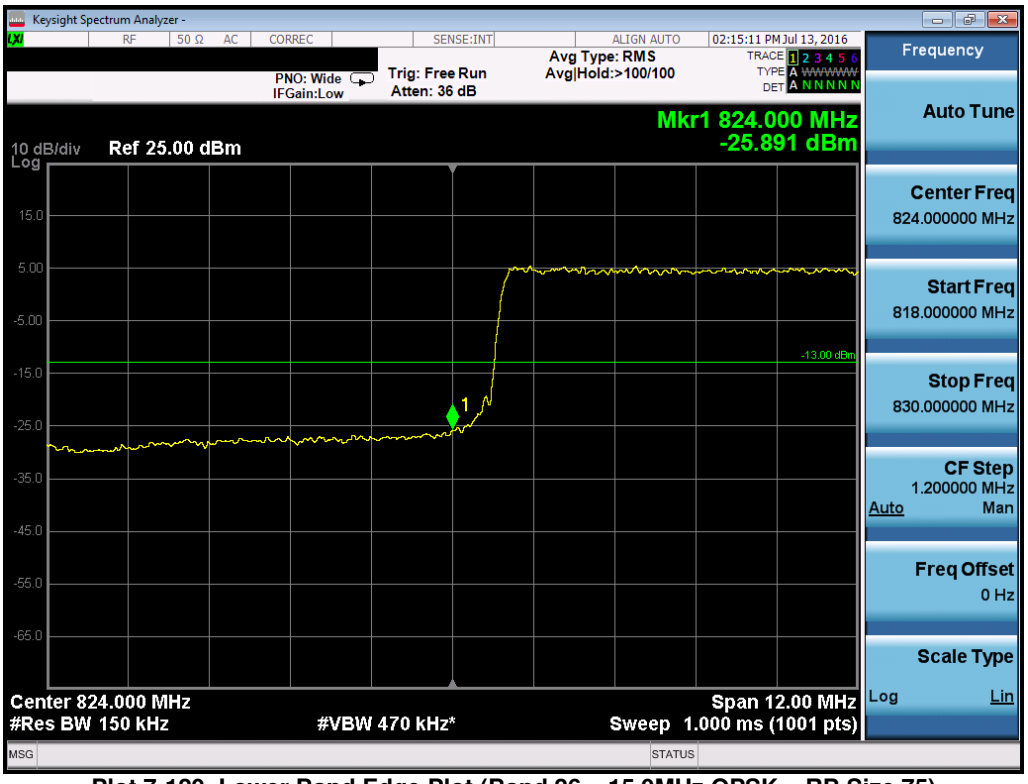
Plot 7-116. Upper Band Edge Plot (Band 5/26 – 5.0MHz QPSK – RB Size 25)

Plot 7-117. Upper Extended Band Edge Plot (Band 5/26 – 5.0MHz QPSK – RB Size 25)



Plot 7-118. Lower Band Edge Plot (Band 5/26 – 10.0MHz QPSK – RB Size 50)

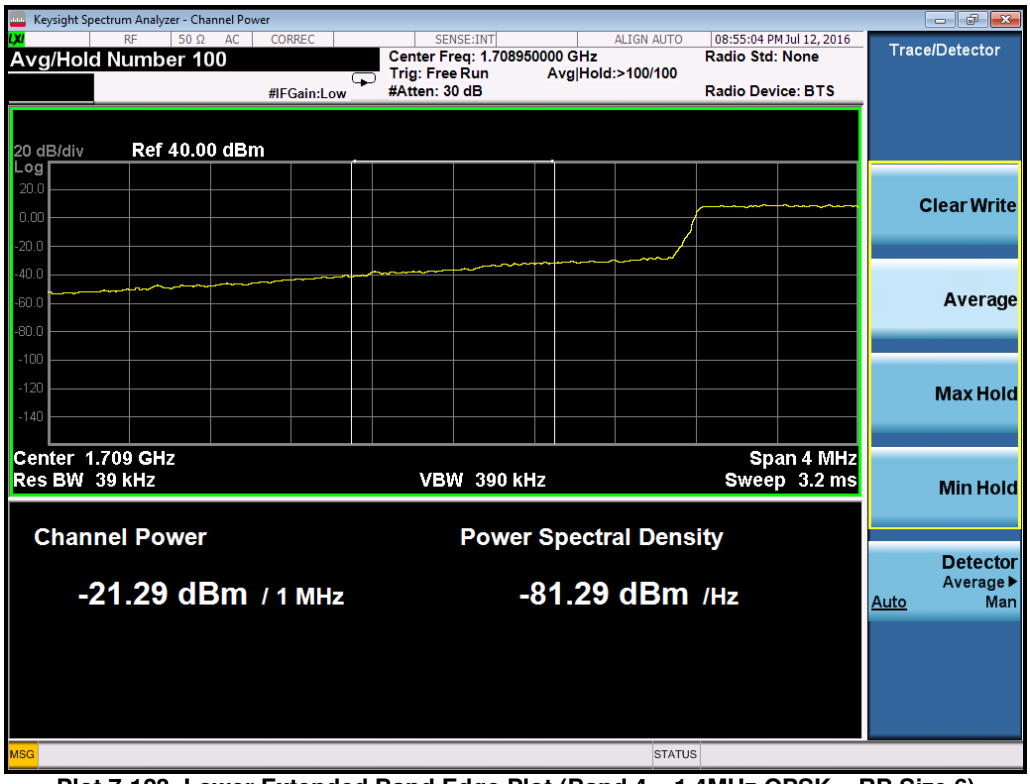
Plot 7-119. Upper Band Edge Plot (Band 5/26 – 10.0MHz QPSK – RB Size 50)



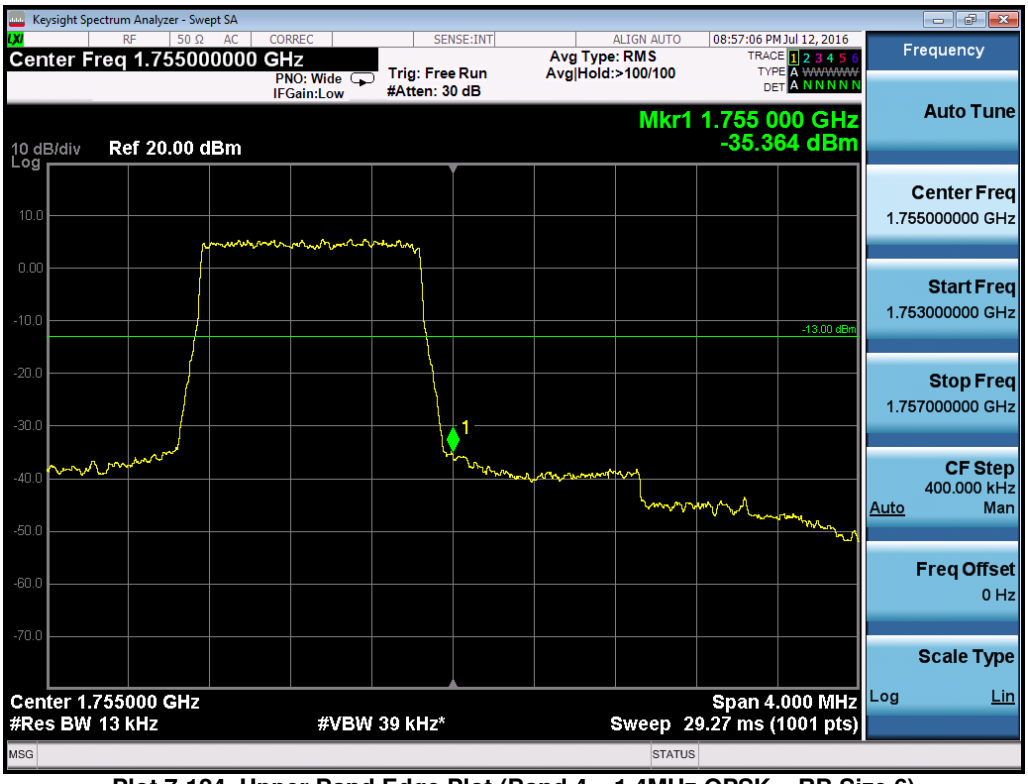
Plot 7-120. Lower Band Edge Plot (Band 26 – 15.0MHz QPSK – RB Size 75)

Plot 7-121. Upper Band Edge Plot (Band 26 – 15.0MHz QPSK – RB Size 75)

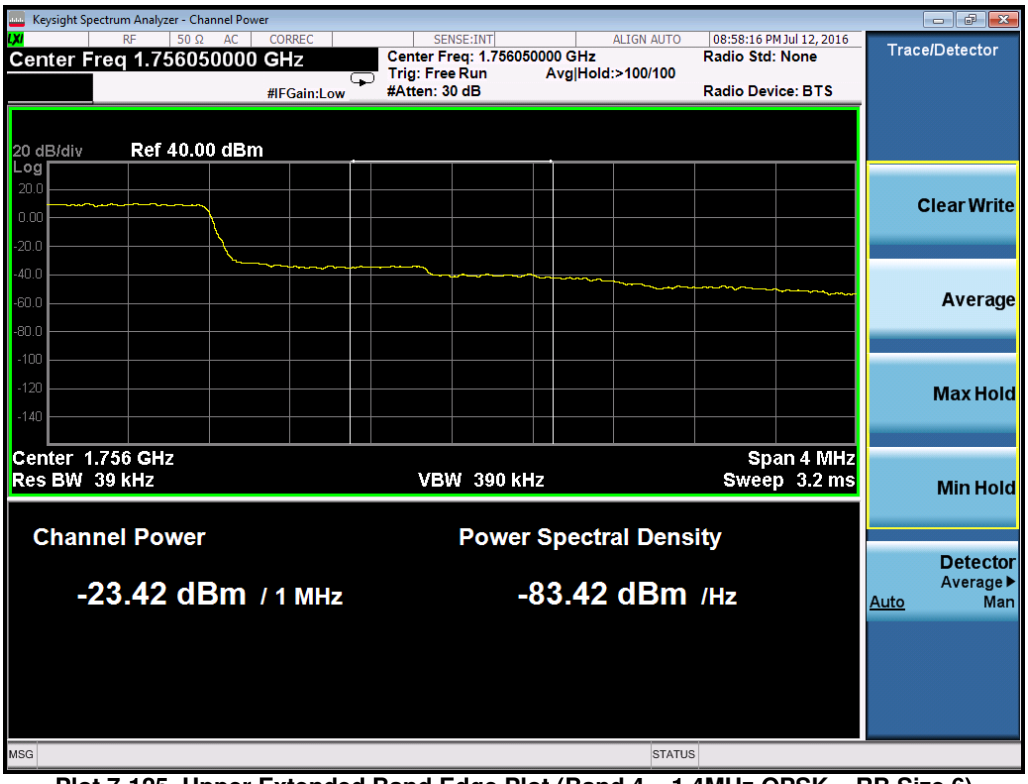
Plot 7-122. Lower Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



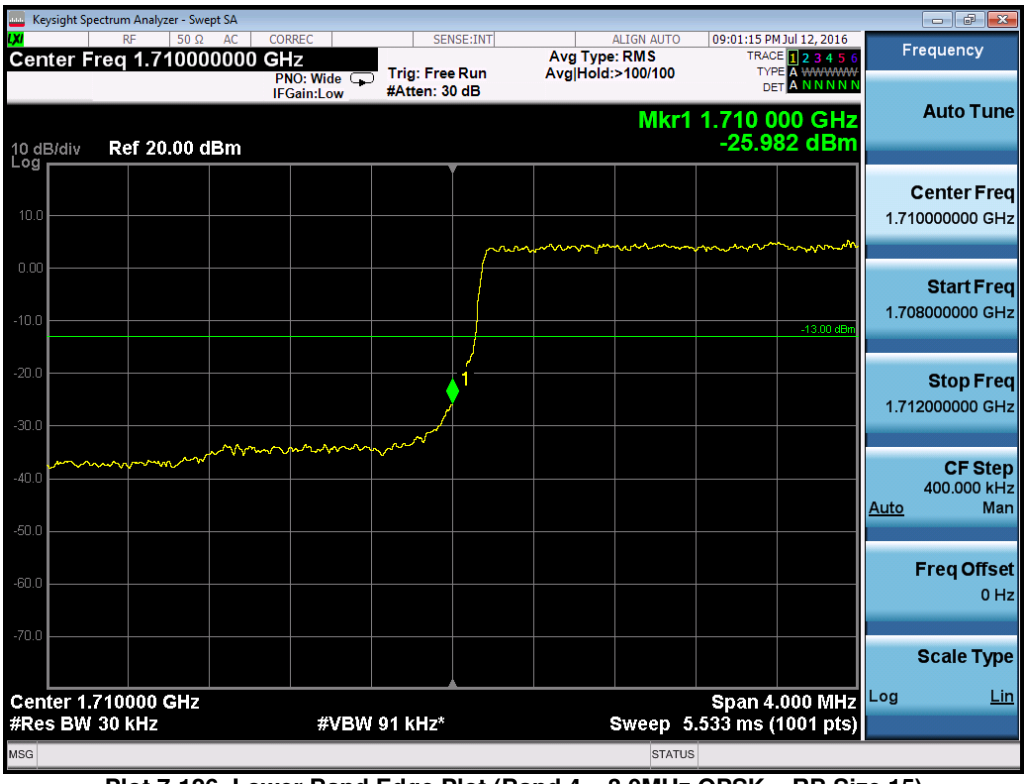
Plot 7-123. Lower Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



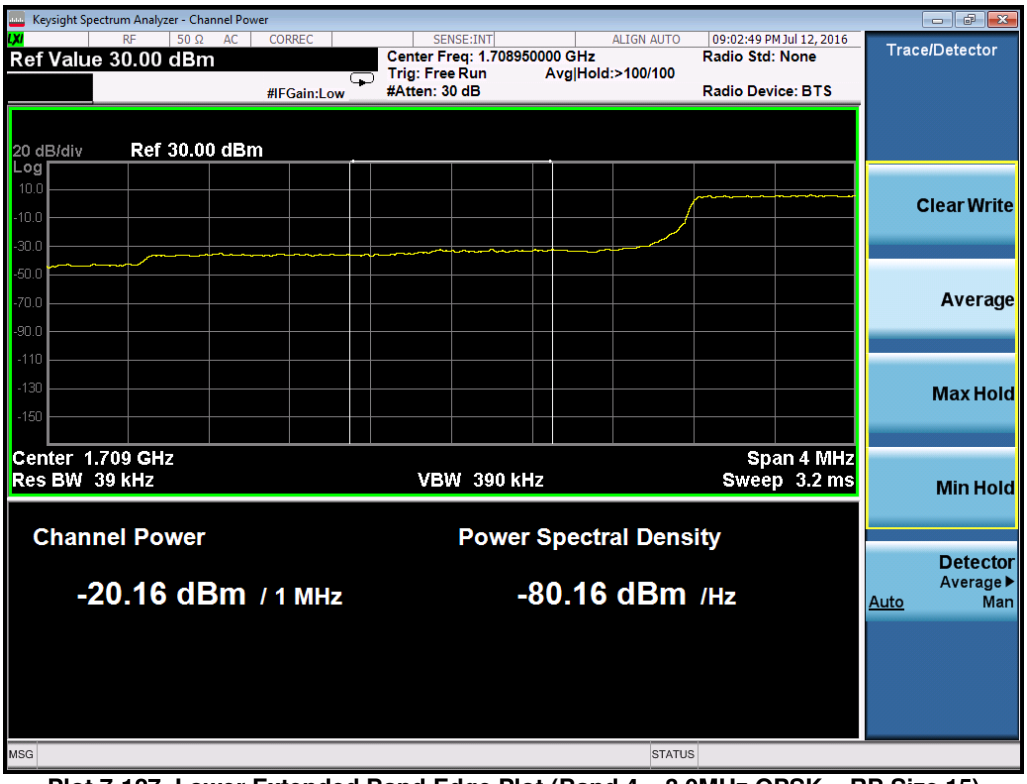
Plot 7-124. Upper Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



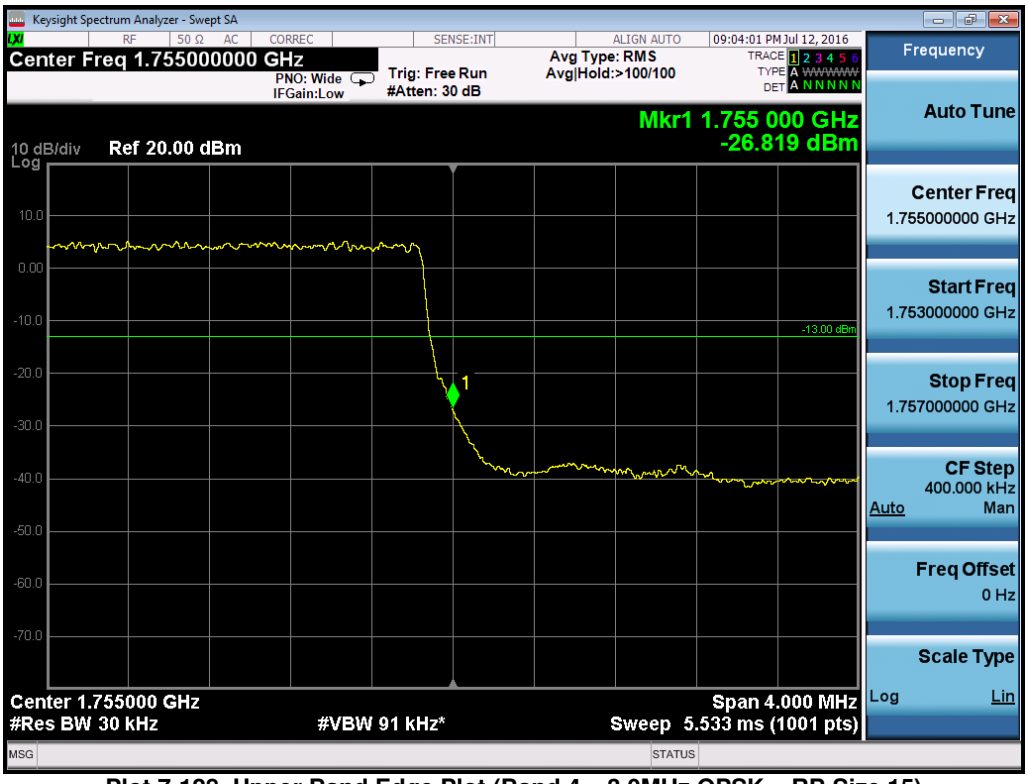
Plot 7-125. Upper Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



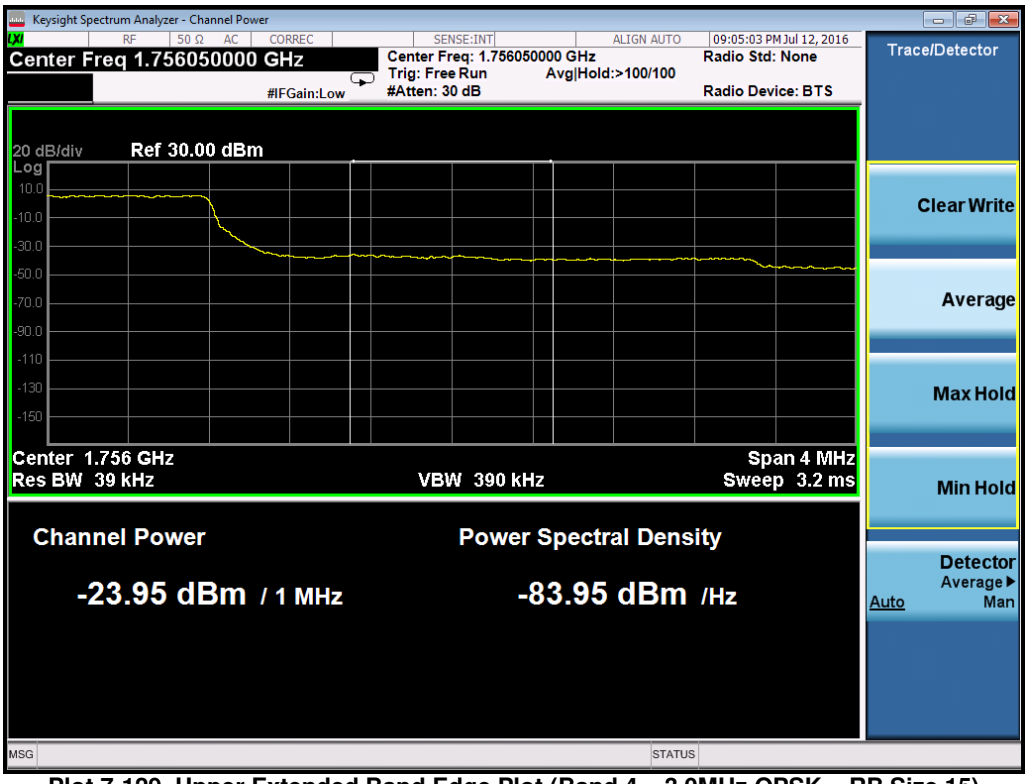
Plot 7-126. Lower Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



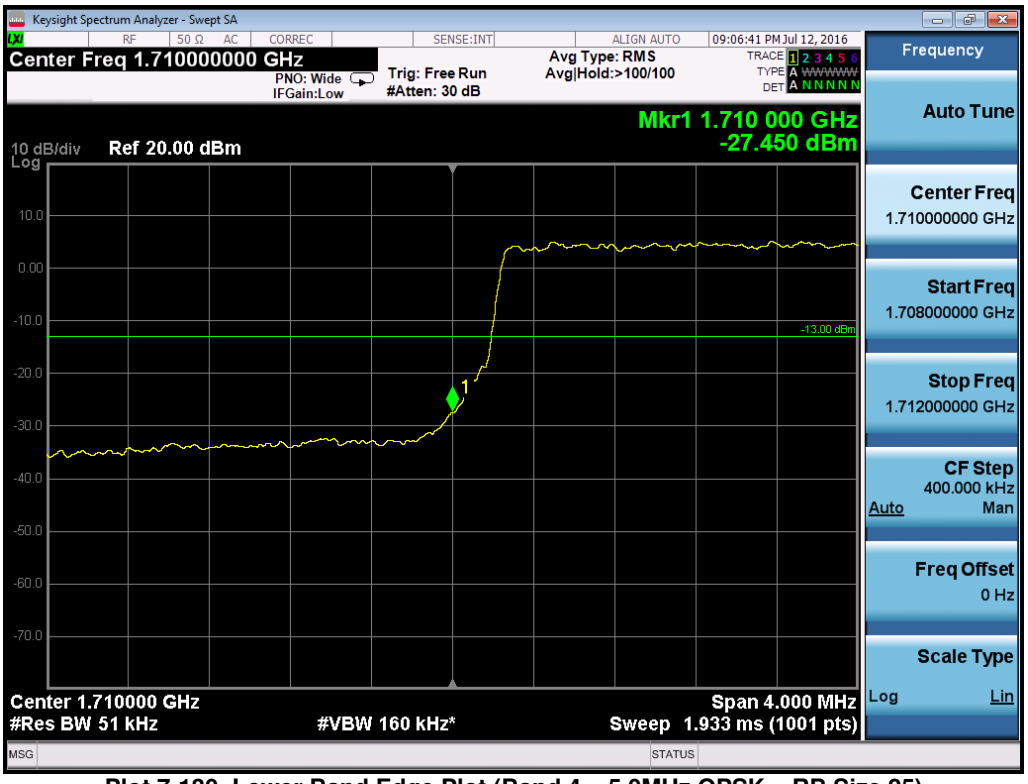
Plot 7-127. Lower Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



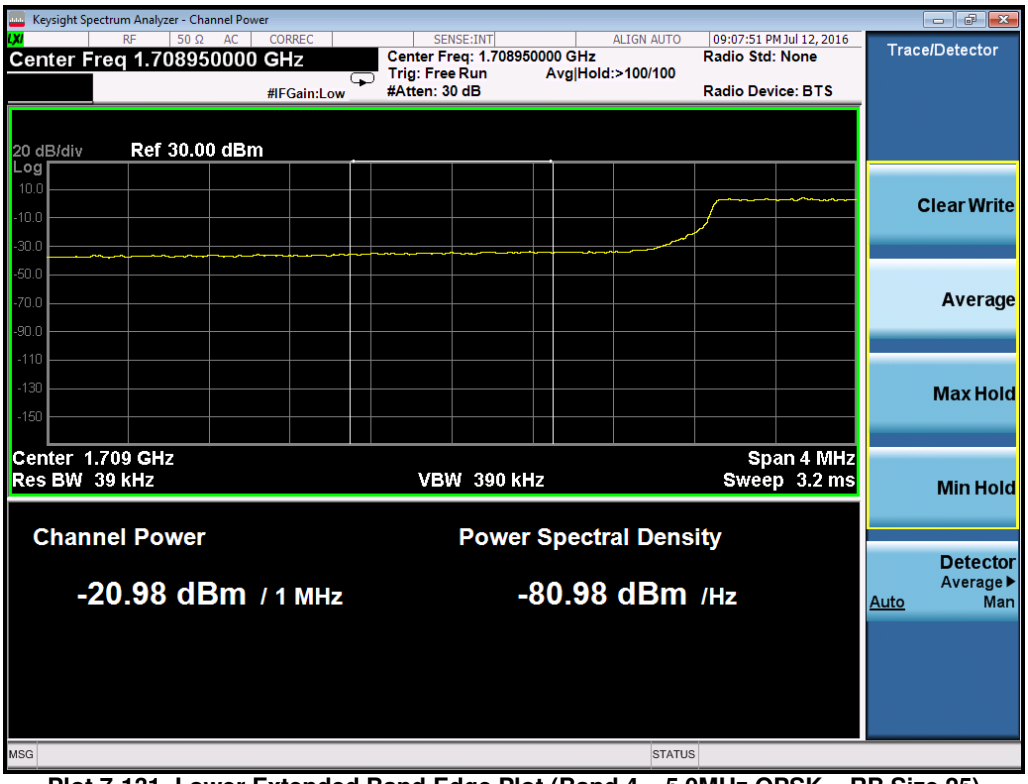
Plot 7-128. Upper Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



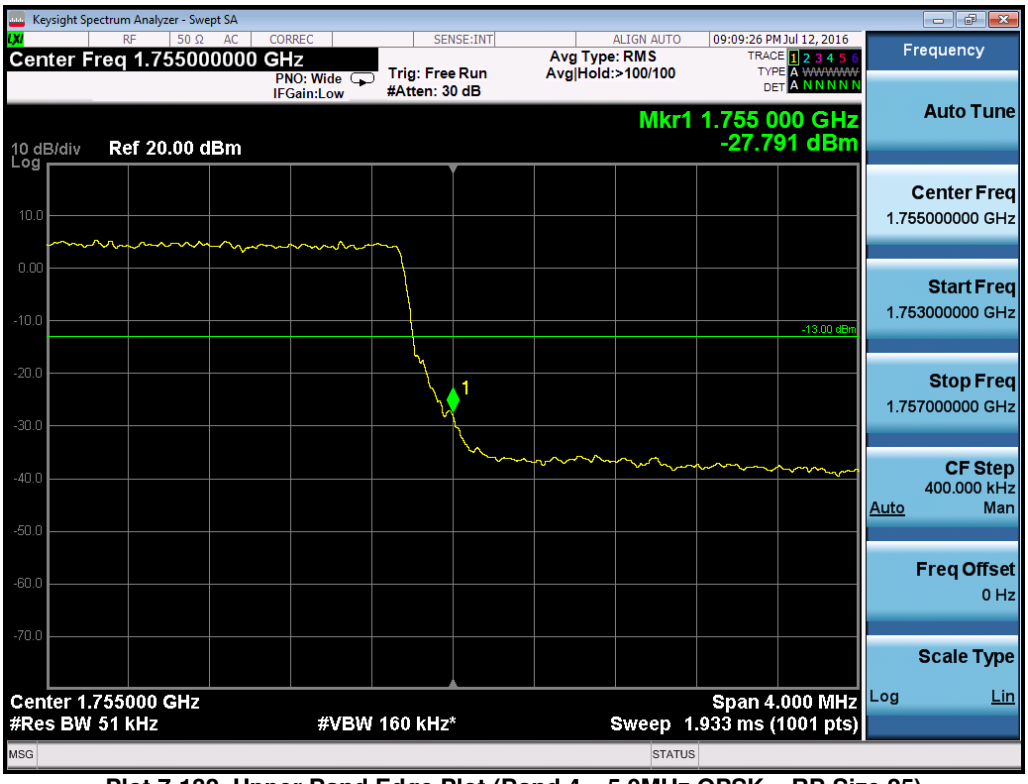
Plot 7-129. Upper Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



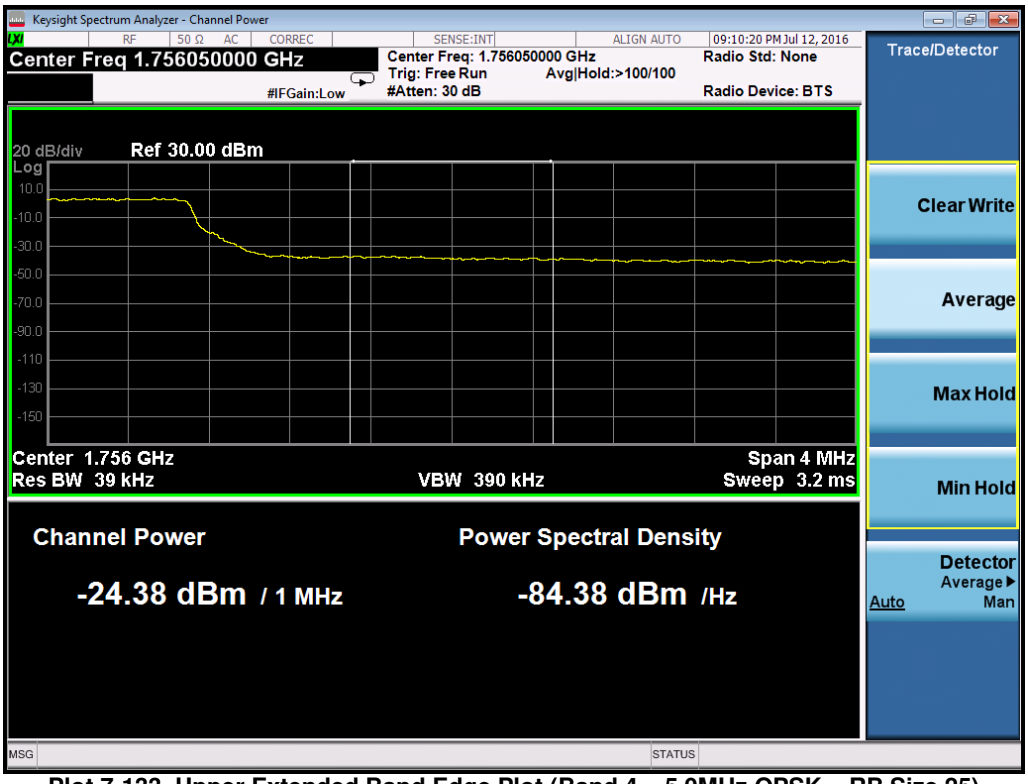
Plot 7-130. Lower Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



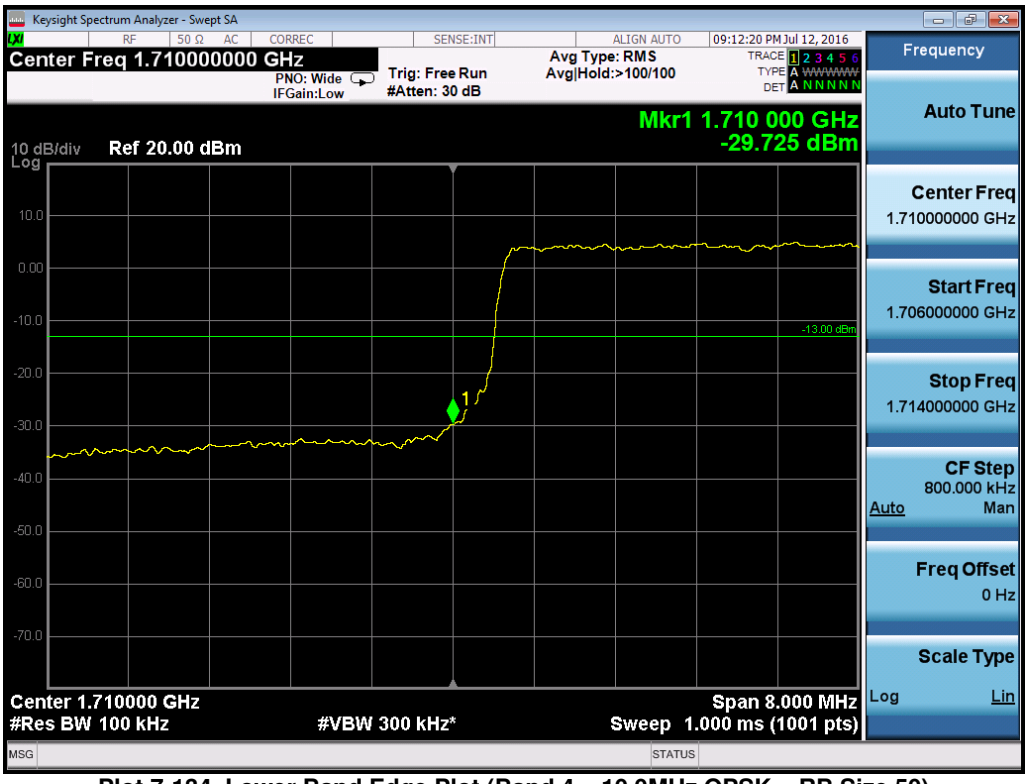
Plot 7-131. Lower Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



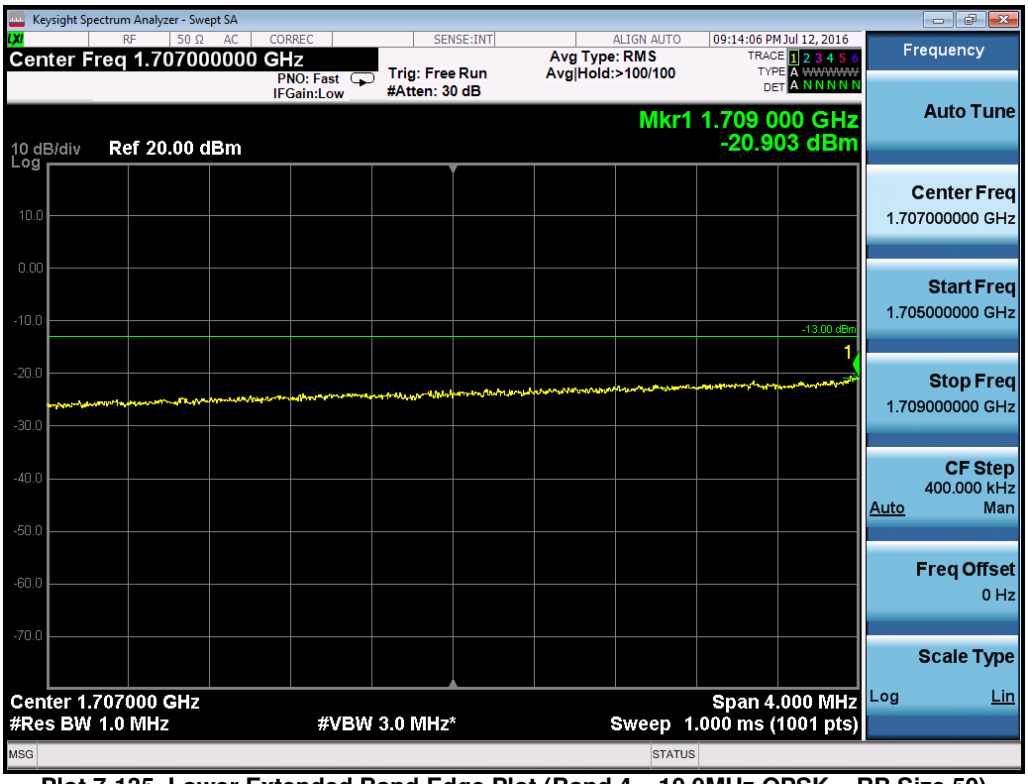
Plot 7-132. Upper Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



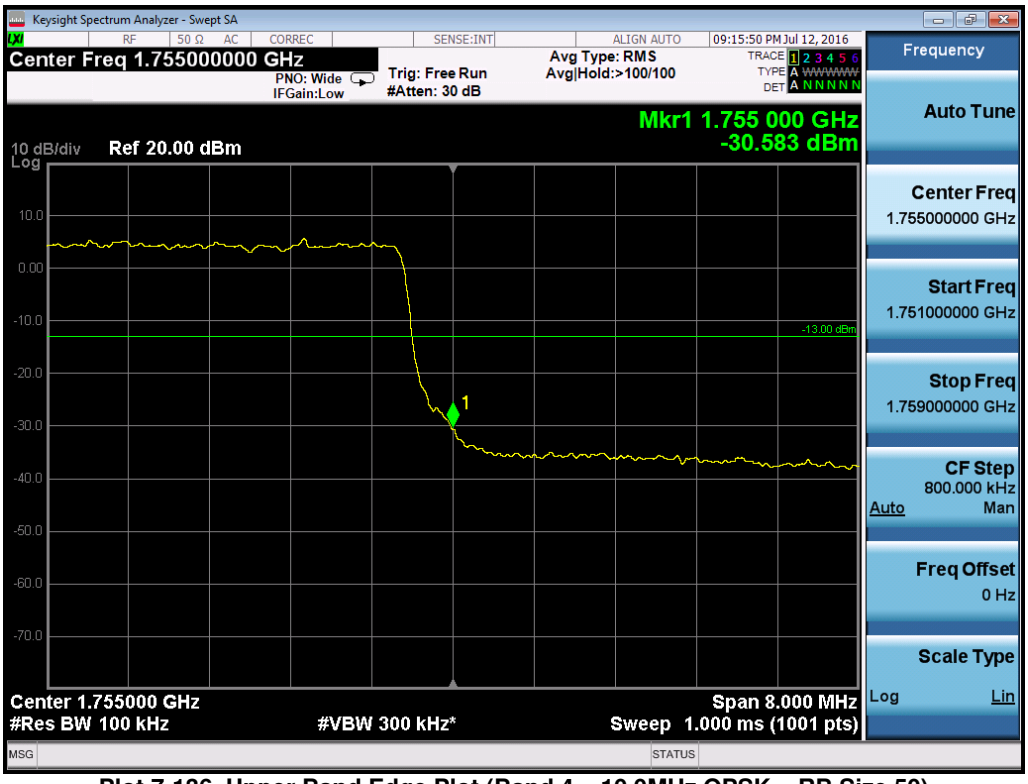
Plot 7-133. Upper Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



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

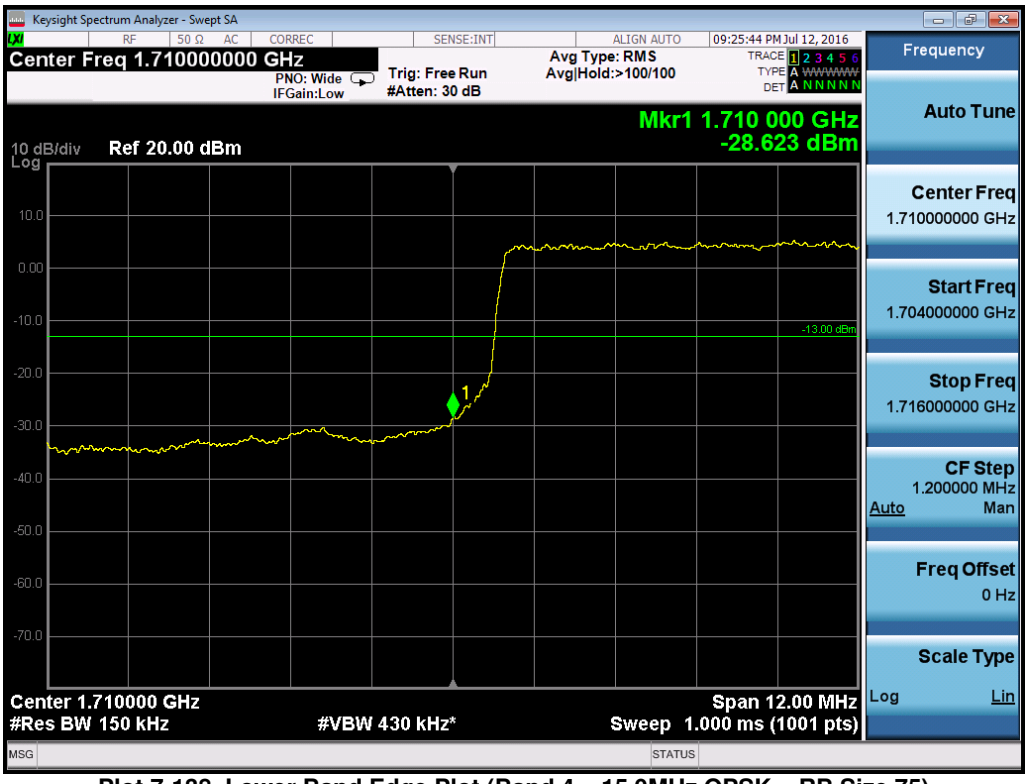


Plot 7-135. Lower Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)



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)

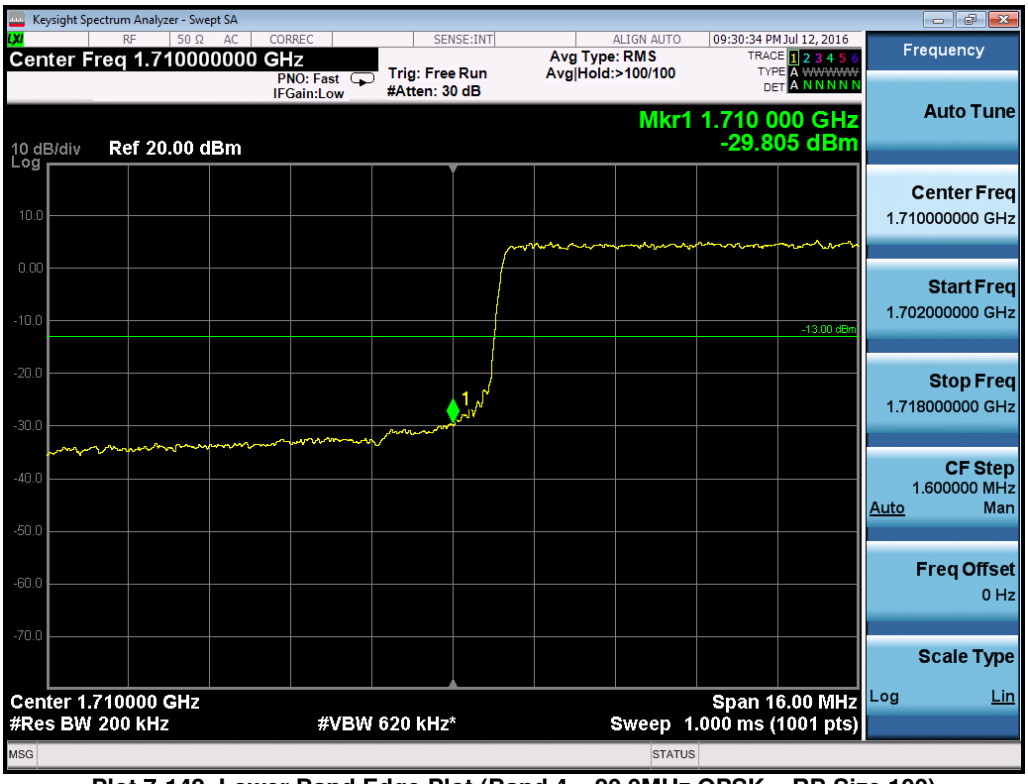


Plot 7-138. Lower Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

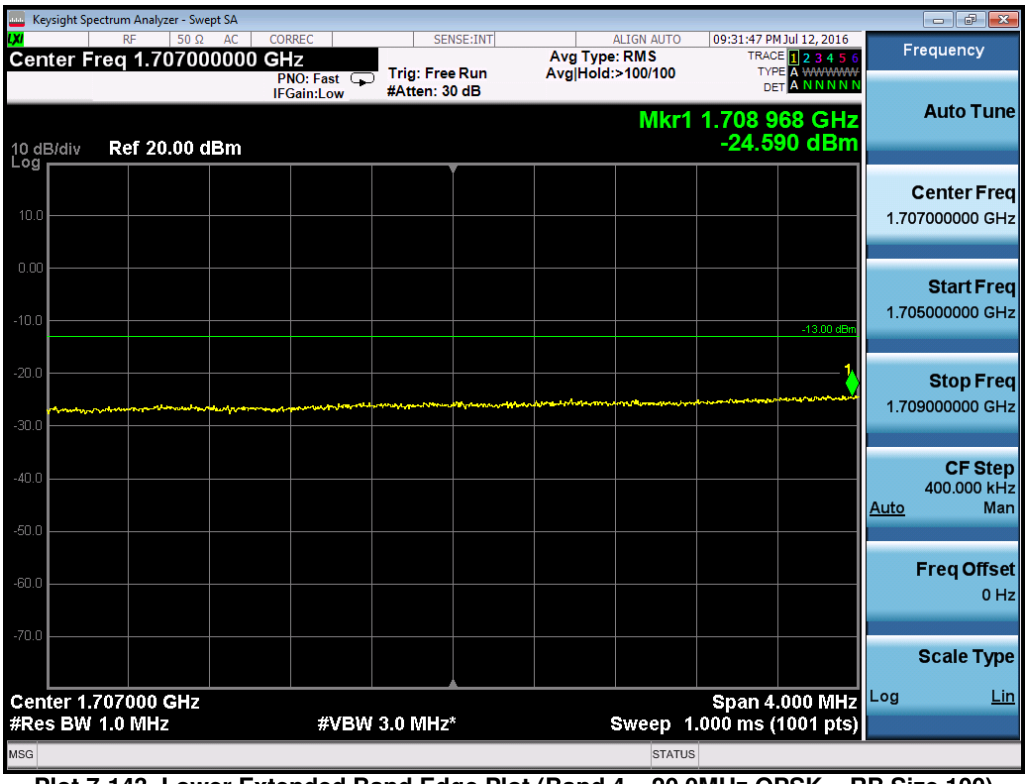
Plot 7-139. Lower Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

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

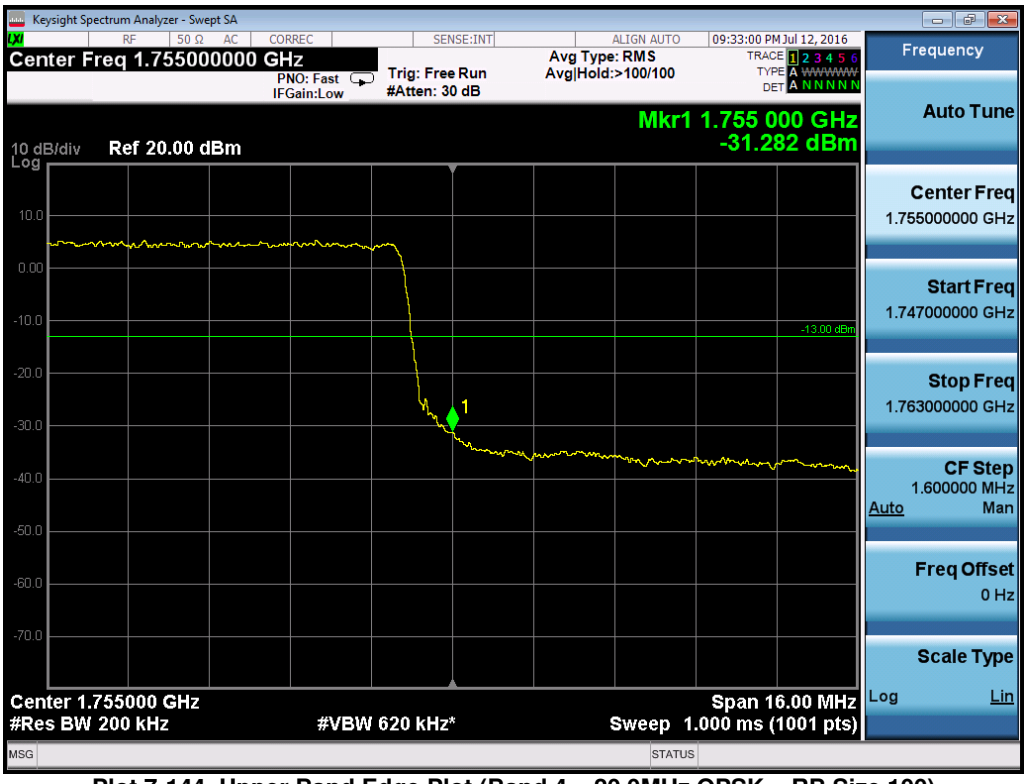
Plot 7-141. Upper Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)



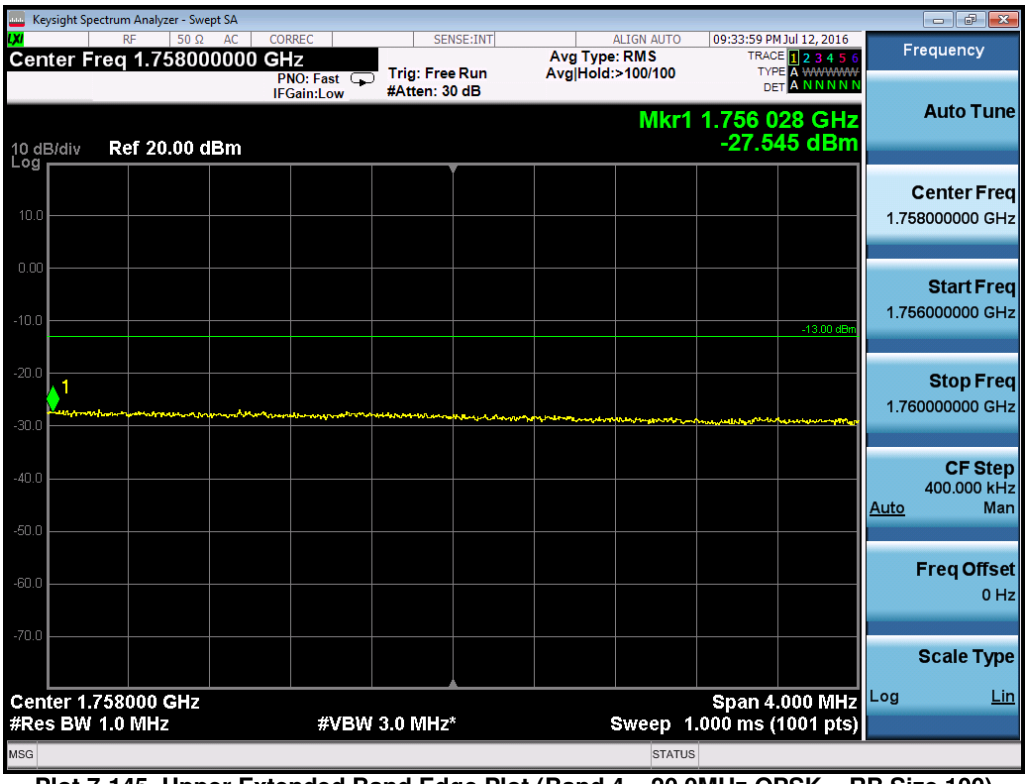
Plot 7-142. Lower Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



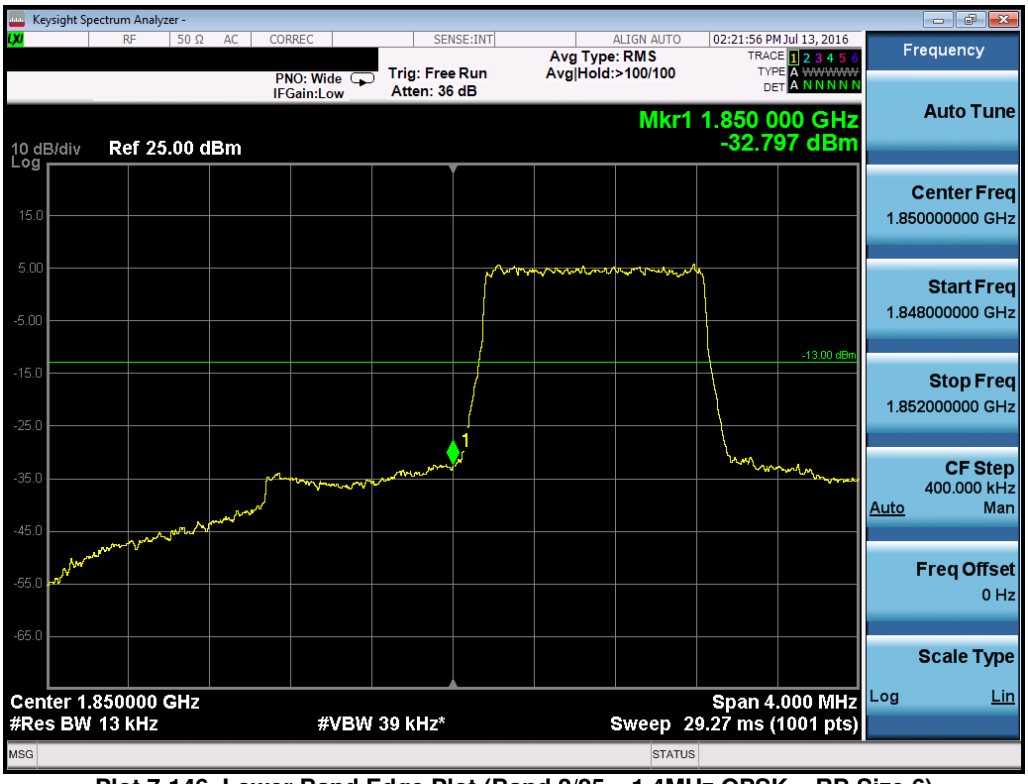
Plot 7-143. Lower Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



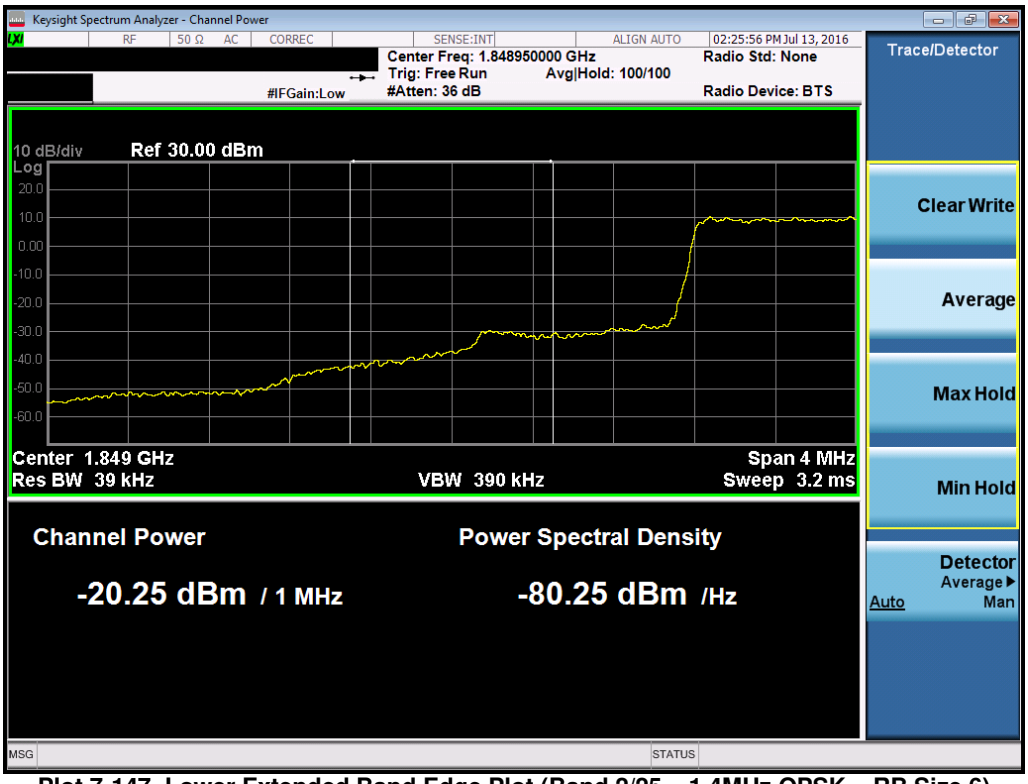
Plot 7-144. Upper Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



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

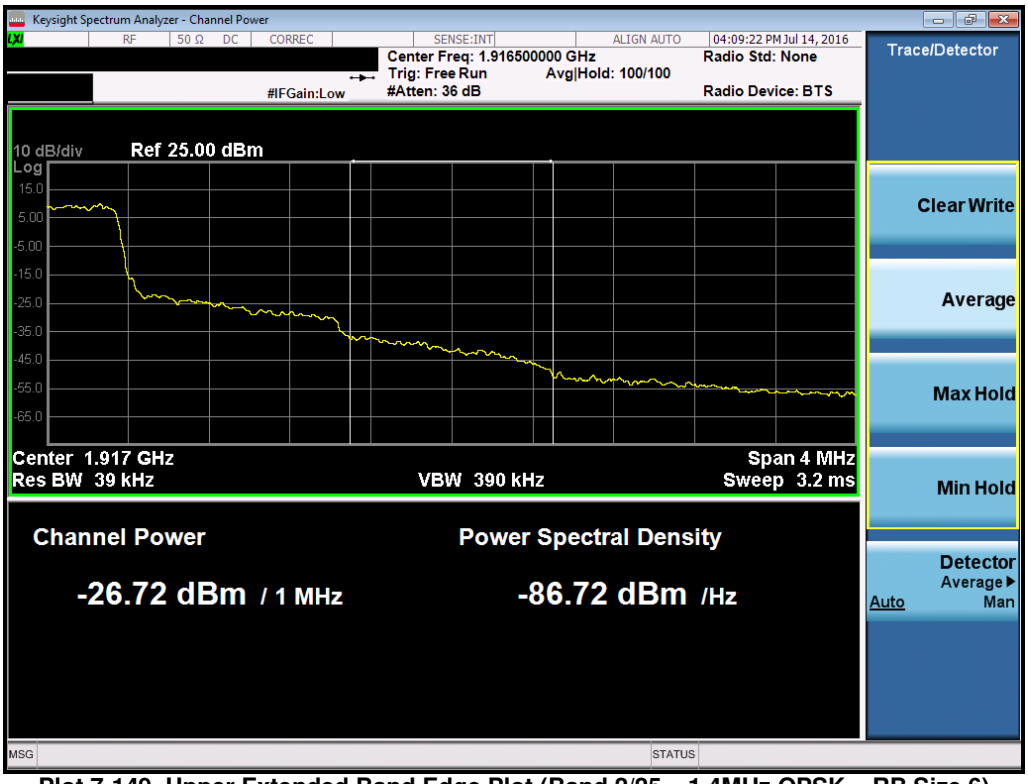


Plot 7-146. Lower Band Edge Plot (Band 2/25 – 1.4MHz QPSK – RB Size 6)

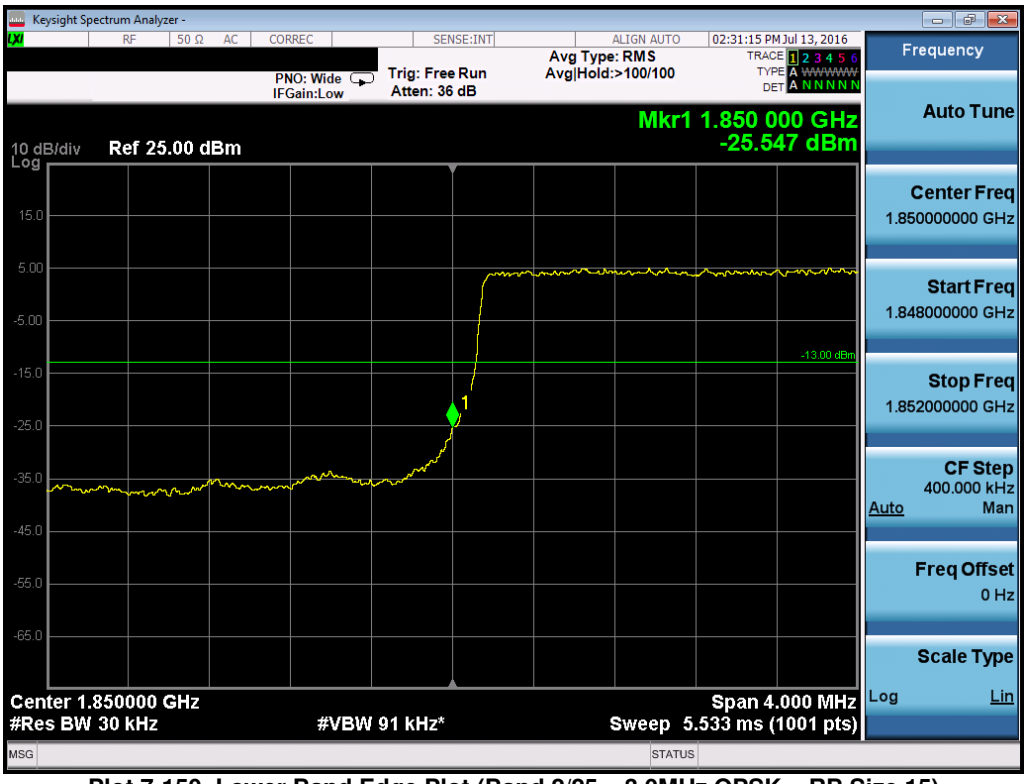


Plot 7-147. Lower Extended Band Edge Plot (Band 2/25 – 1.4MHz QPSK – RB Size 6)

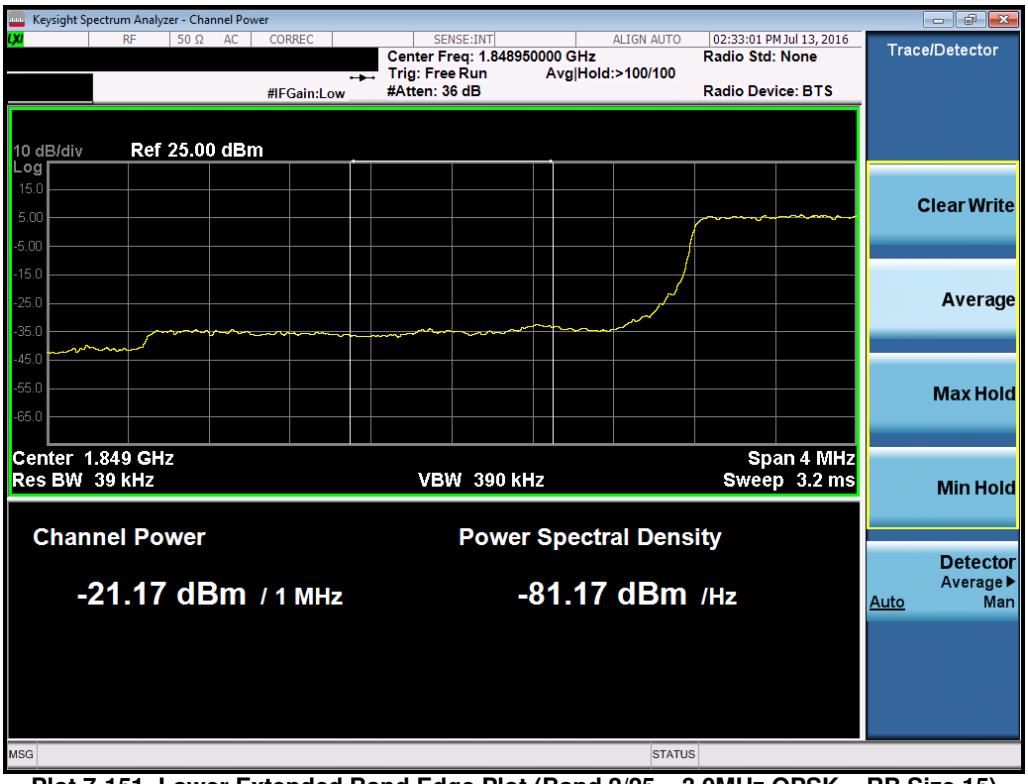
Plot 7-148. Upper Band Edge Plot (Band 2/25 – 1.4MHz QPSK – RB Size 6)



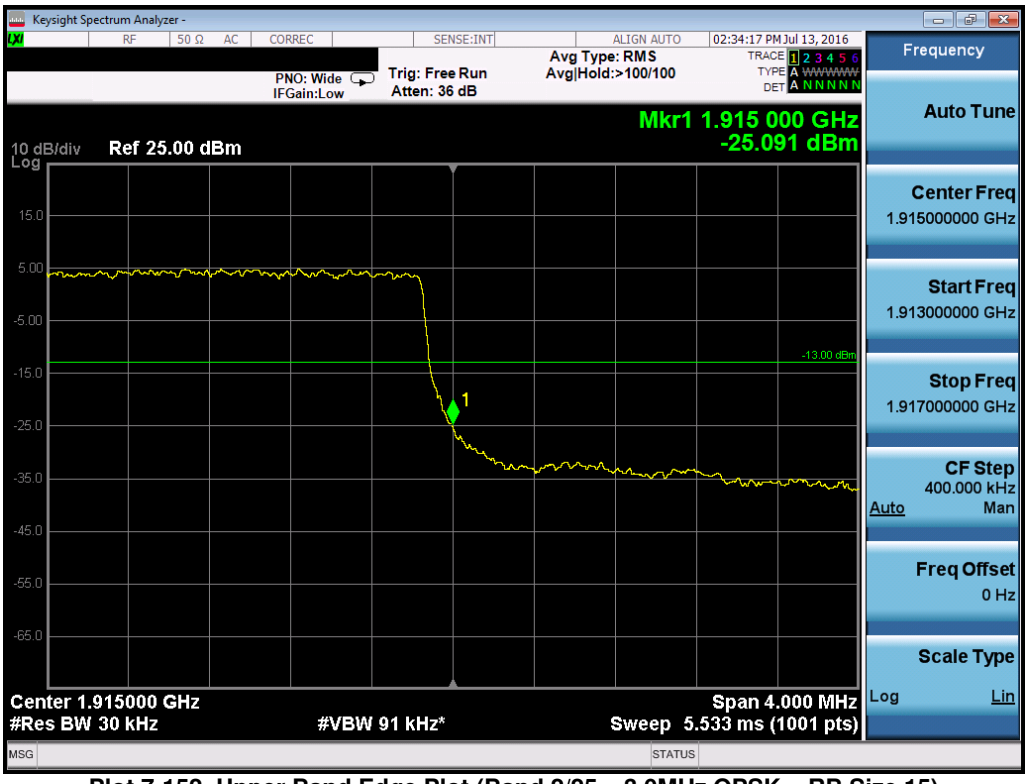
Plot 7-149. Upper Extended Band Edge Plot (Band 2/25 – 1.4MHz QPSK – RB Size 6)



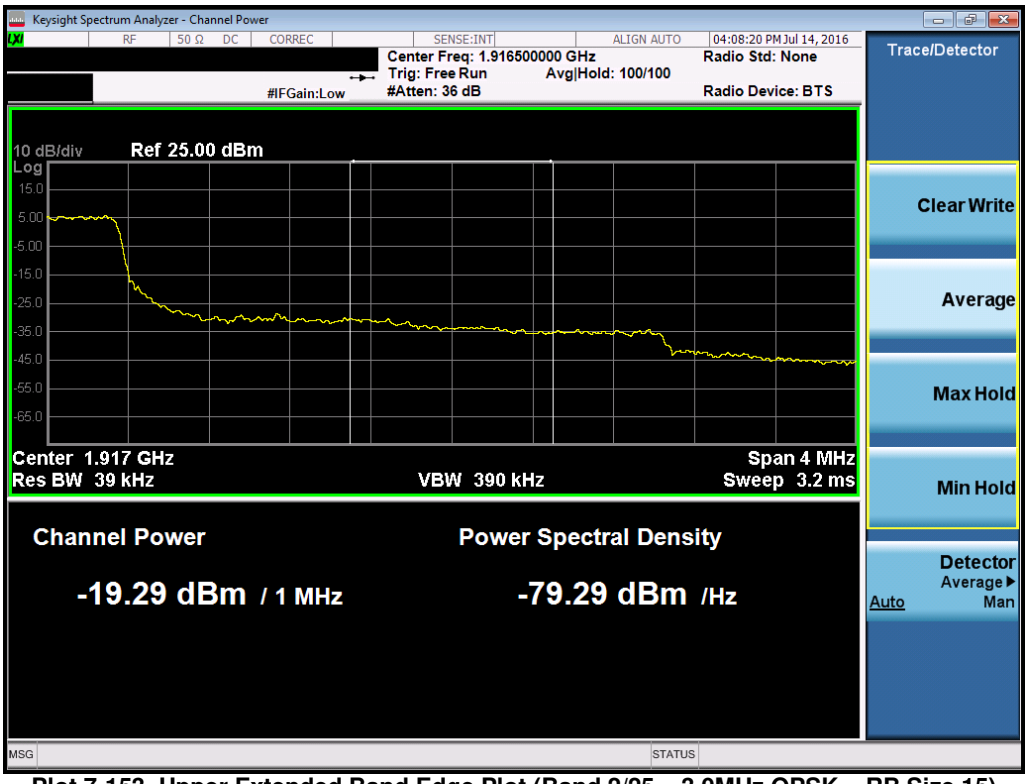
Plot 7-150. Lower Band Edge Plot (Band 2/25 – 3.0MHz QPSK – RB Size 15)



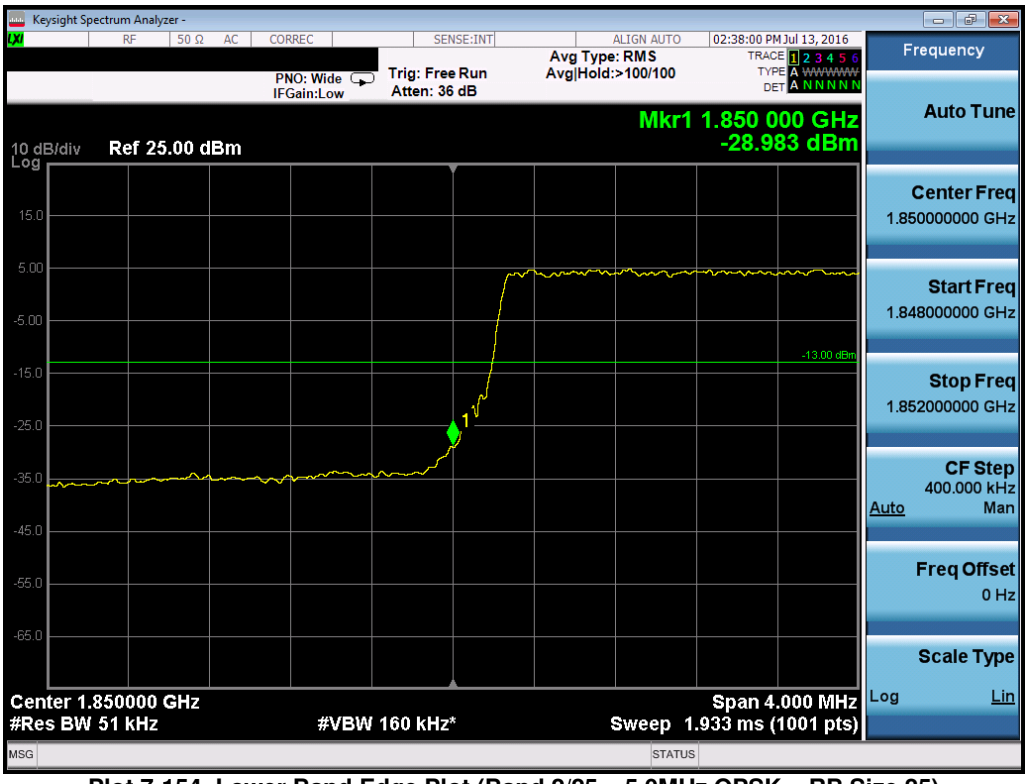
Plot 7-151. Lower Extended Band Edge Plot (Band 2/25 – 3.0MHz QPSK – RB Size 15)



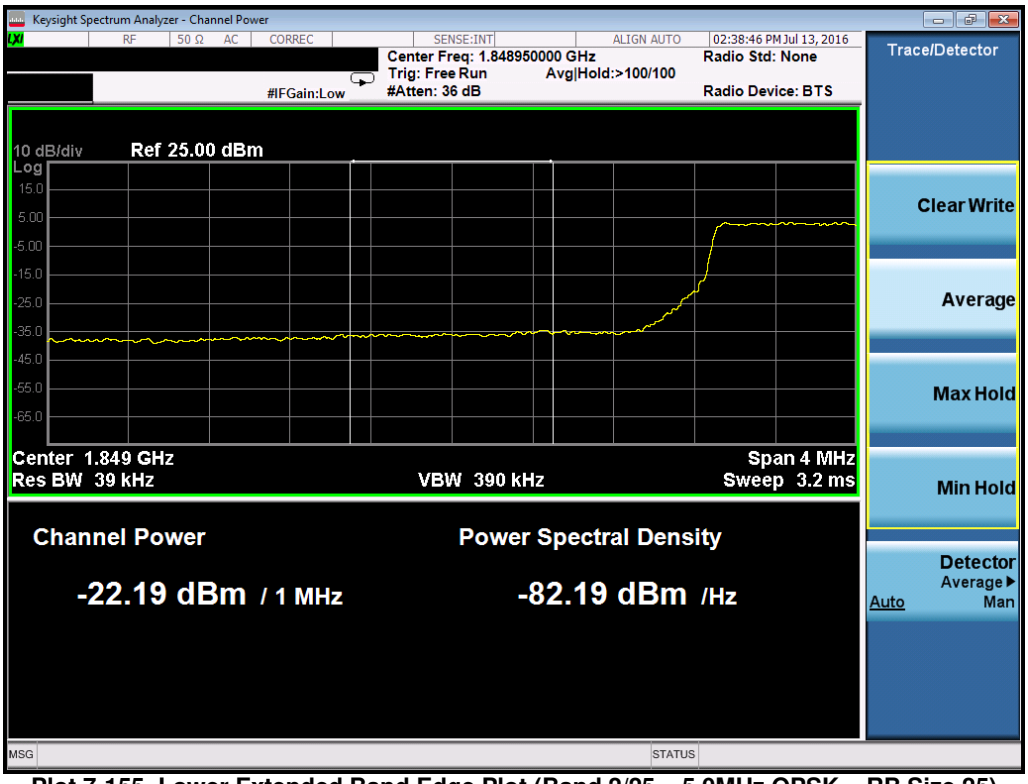
Plot 7-152. Upper Band Edge Plot (Band 2/25 – 3.0MHz QPSK – RB Size 15)



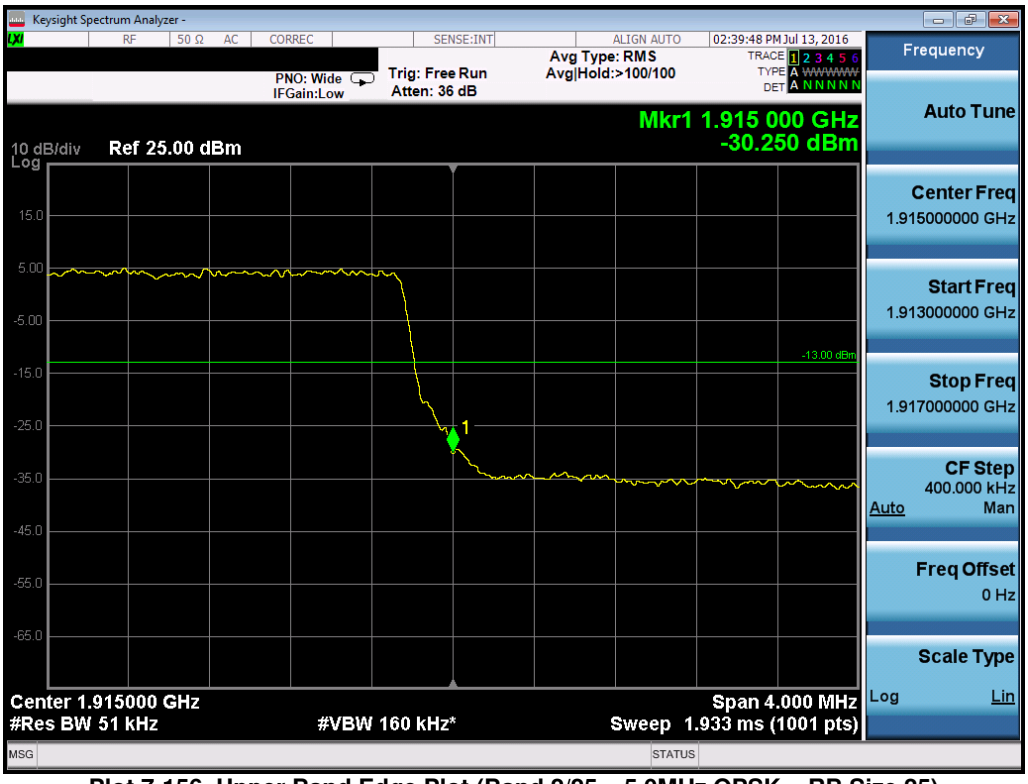
Plot 7-153. Upper Extended Band Edge Plot (Band 2/25 – 3.0MHz QPSK – RB Size 15)



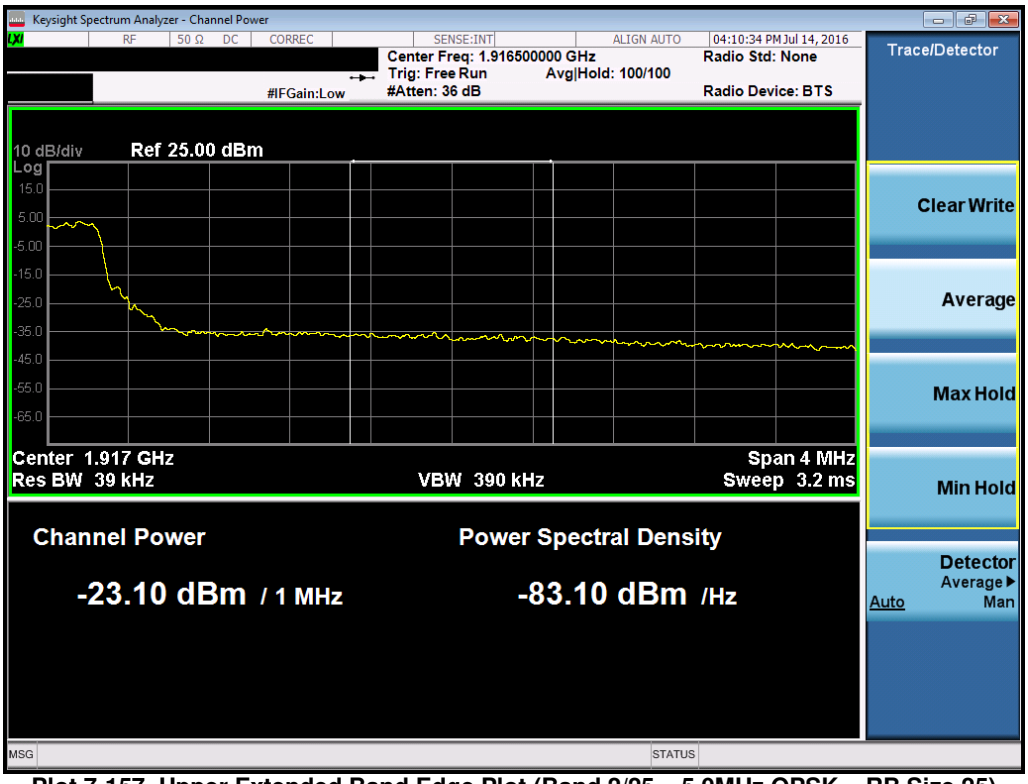
Plot 7-154. Lower Band Edge Plot (Band 2/25 – 5.0MHz QPSK – RB Size 25)



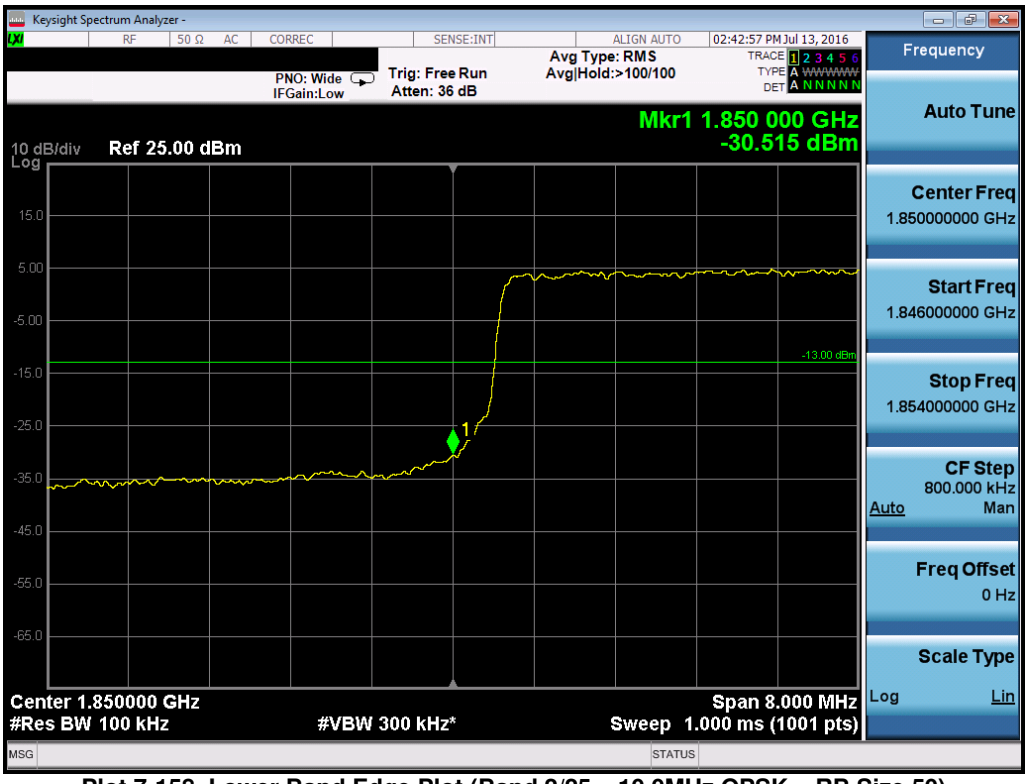
Plot 7-155. Lower Extended Band Edge Plot (Band 2/25 – 5.0MHz QPSK – RB Size 25)



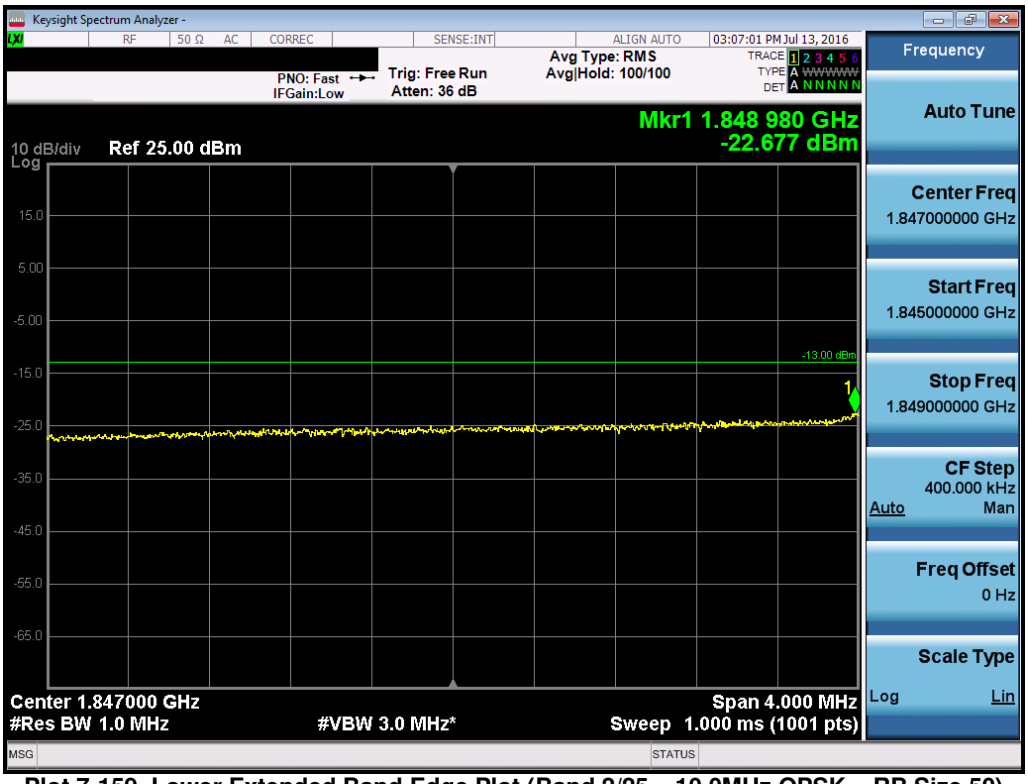
Plot 7-156. Upper Band Edge Plot (Band 2/25 – 5.0MHz QPSK – RB Size 25)



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

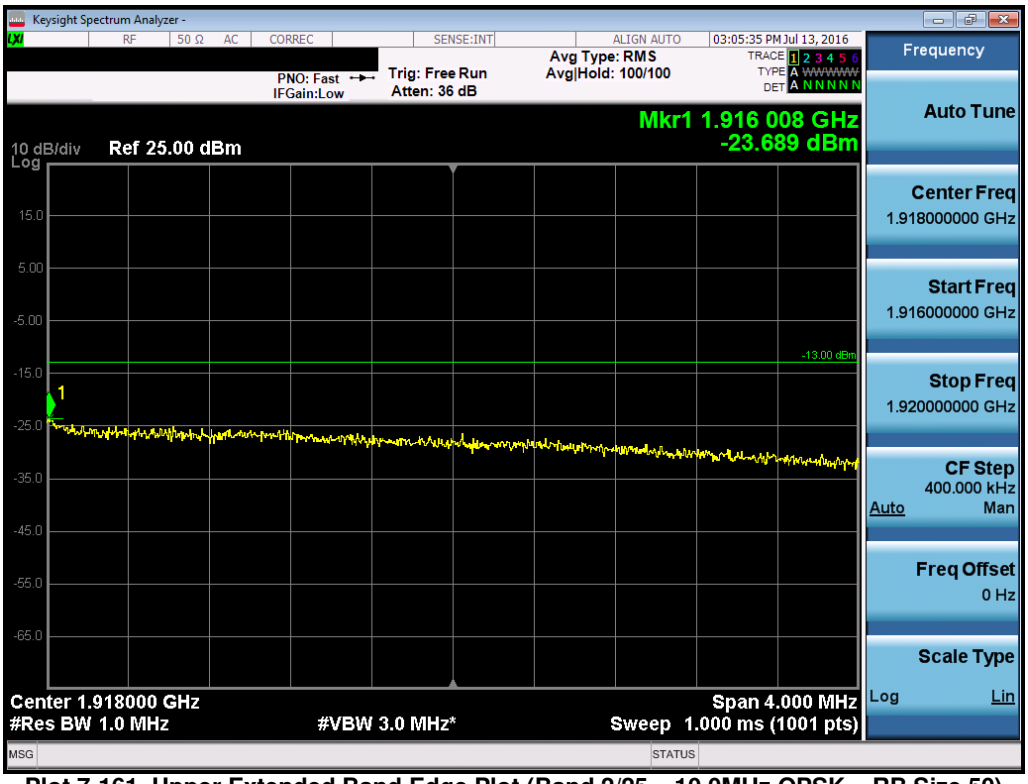


Plot 7-158. Lower Band Edge Plot (Band 2/25 – 10.0MHz QPSK – RB Size 50)

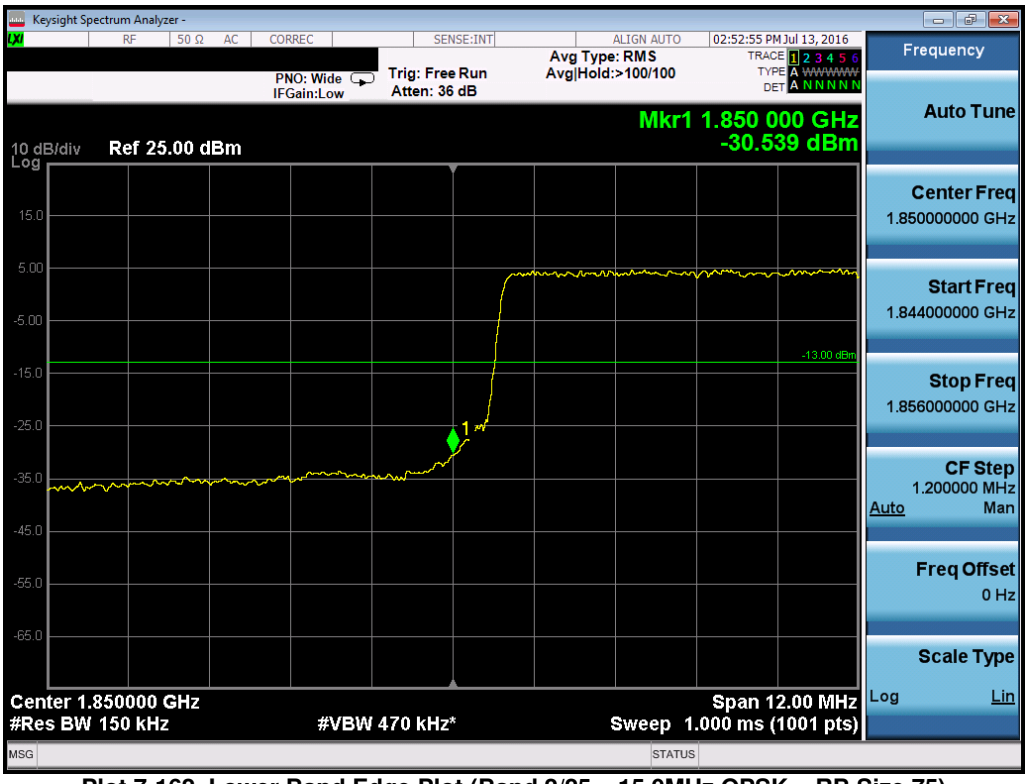


Plot 7-159. Lower Extended Band Edge Plot (Band 2/25 – 10.0MHz QPSK – RB Size 50)

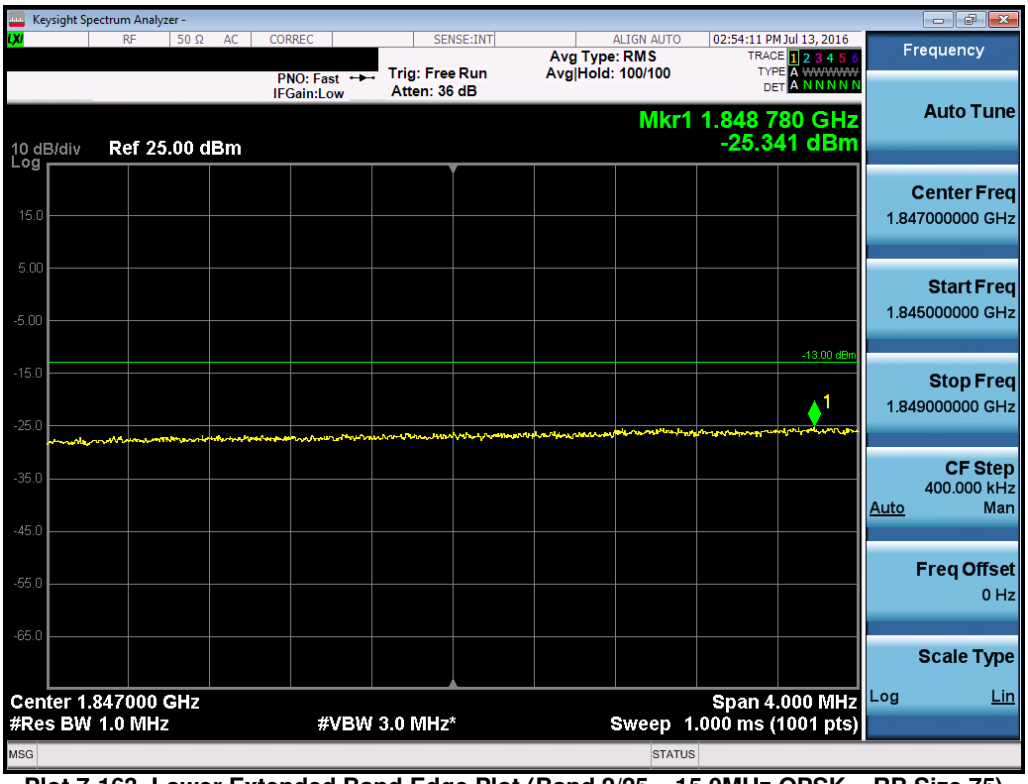
Plot 7-160. Upper Band Edge Plot (Band 2/25 – 10.0MHz QPSK – RB Size 50)



Plot 7-161. Upper Extended Band Edge Plot (Band 2/25 – 10.0MHz QPSK – RB Size 50)

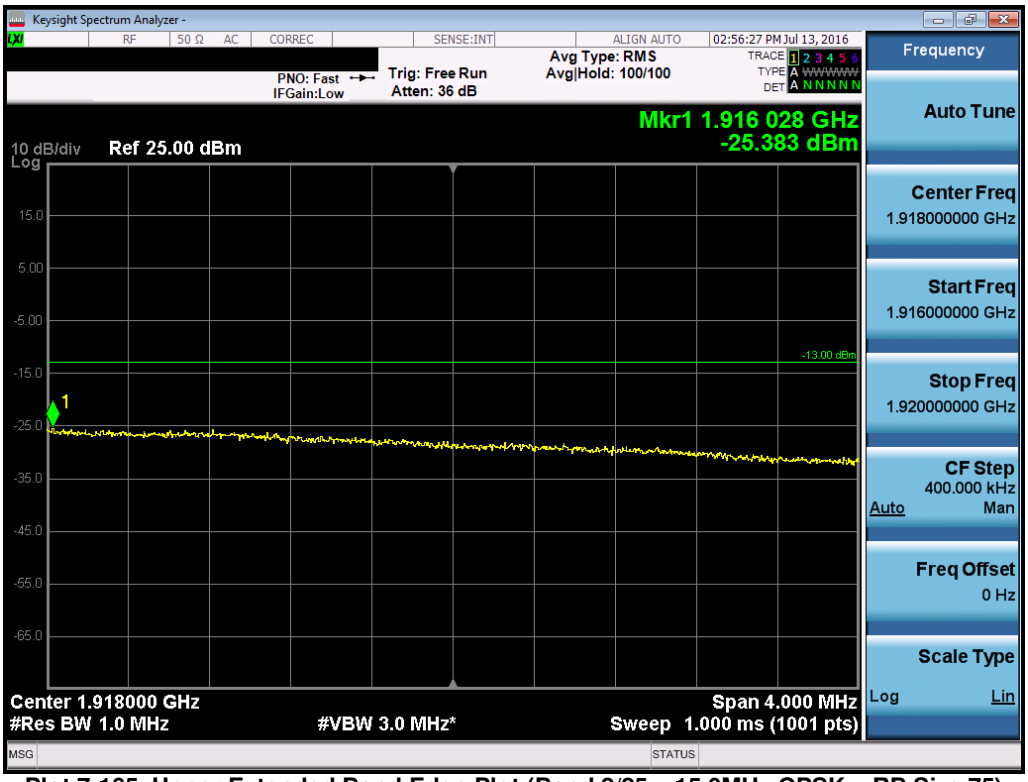


Plot 7-162. Lower Band Edge Plot (Band 2/25 – 15.0MHz QPSK – RB Size 75)

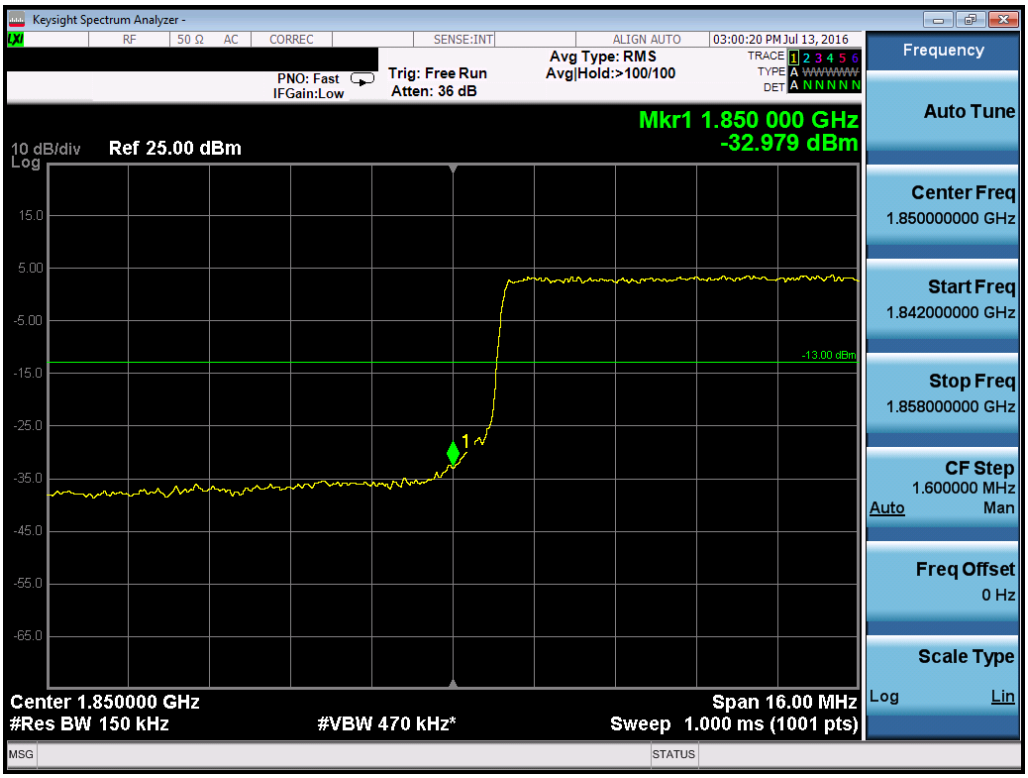


Plot 7-163. Lower Extended Band Edge Plot (Band 2/25 – 15.0MHz QPSK – RB Size 75)

Plot 7-164. Upper Band Edge Plot (Band 2/25 – 15.0MHz QPSK – RB Size 75)



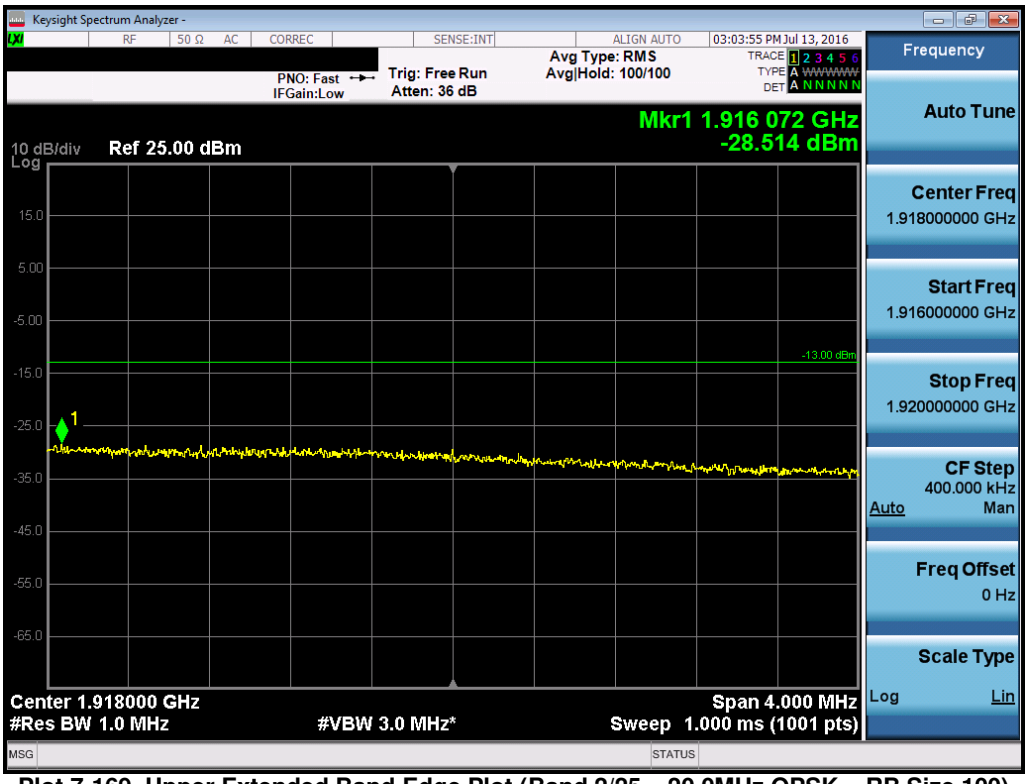
Plot 7-165. Upper Extended Band Edge Plot (Band 2/25 – 15.0MHz QPSK – RB Size 75)



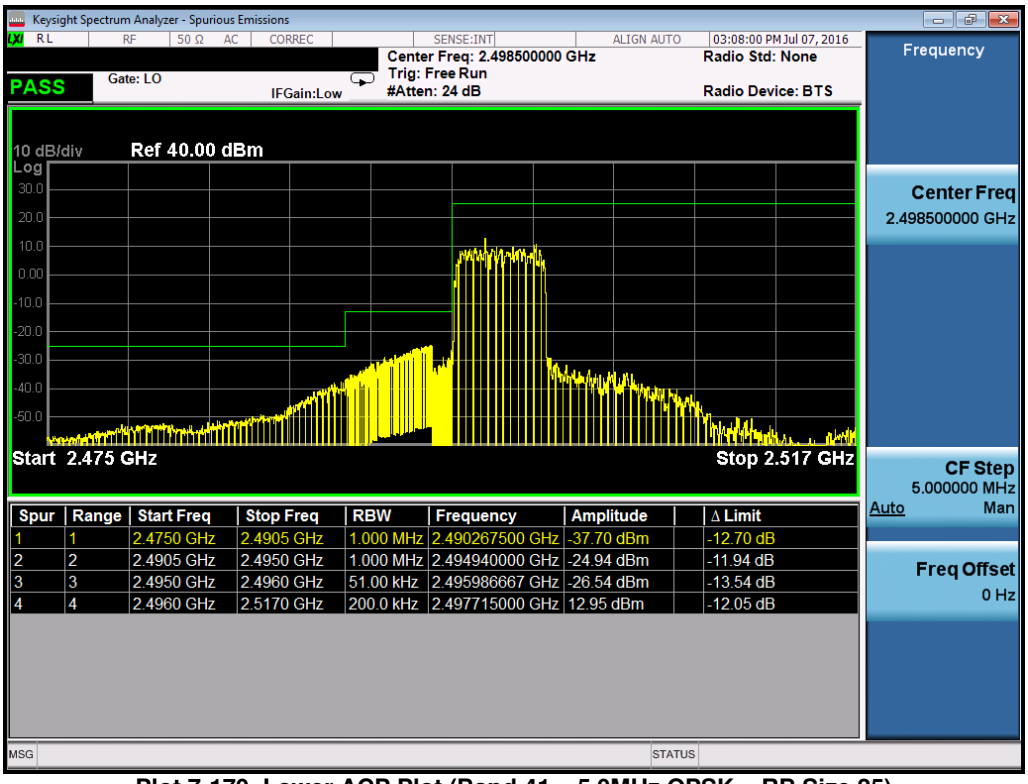
Plot 7-166. Lower Band Edge Plot (Band 2/25 – 20.0MHz QPSK – RB Size 100)

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

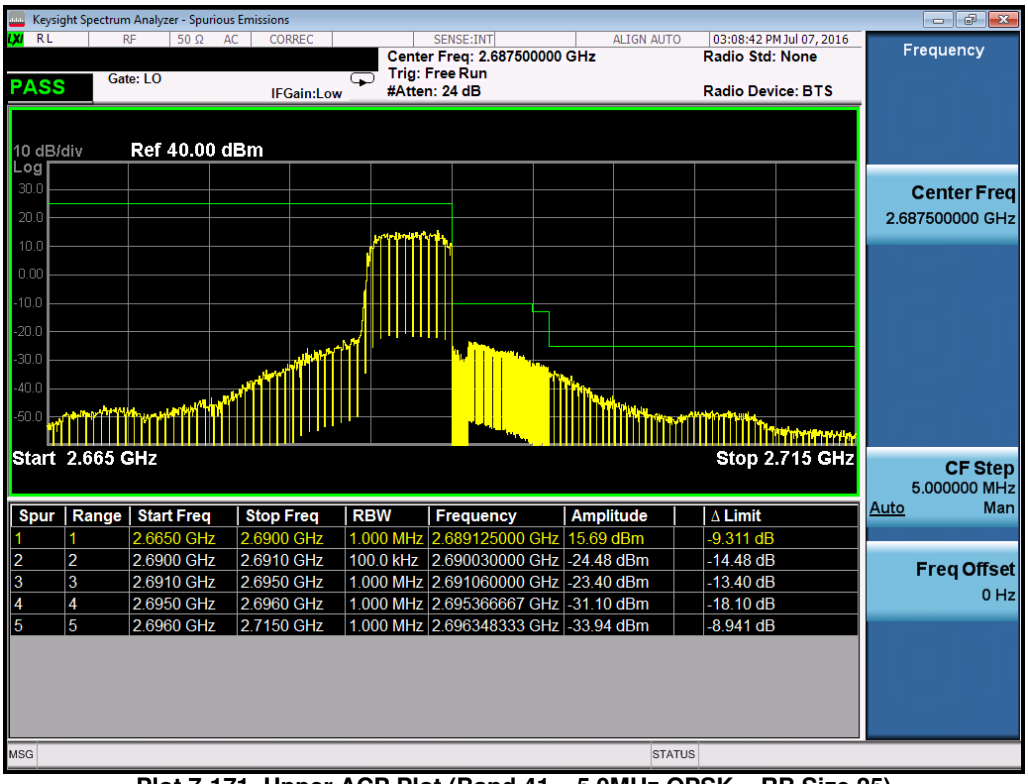
Plot 7-168. Upper Band Edge Plot (Band 2/25 – 20.0MHz QPSK – RB Size 100)



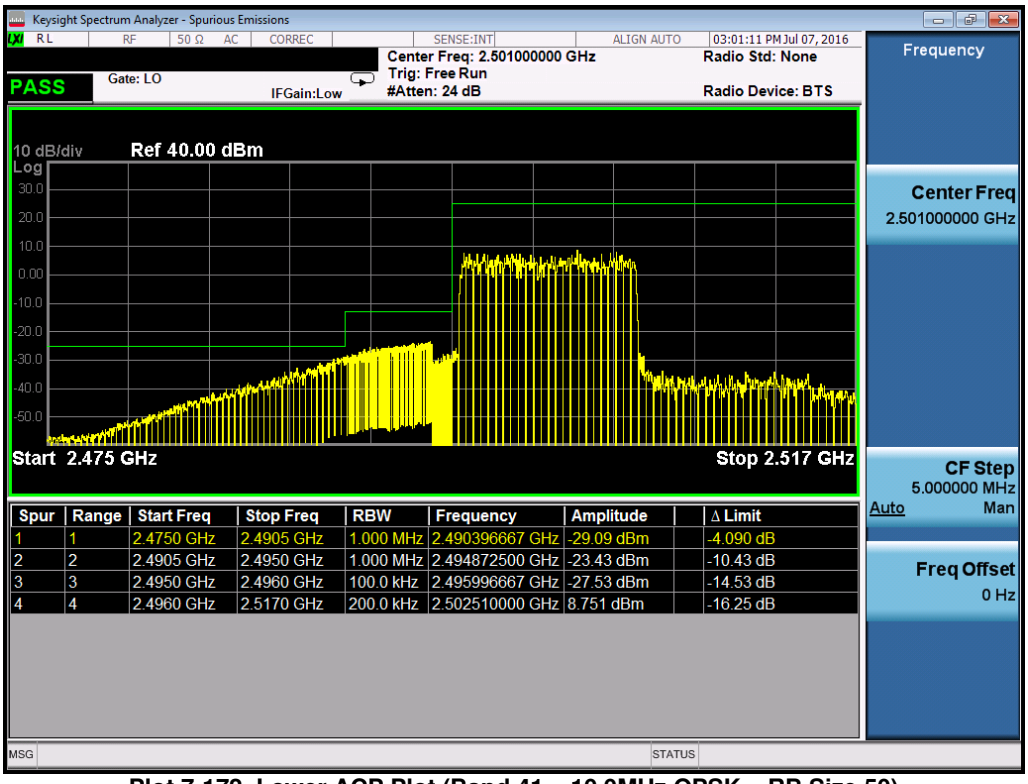
Plot 7-169. Upper Extended Band Edge Plot (Band 2/25 – 20.0MHz QPSK – RB Size 100)



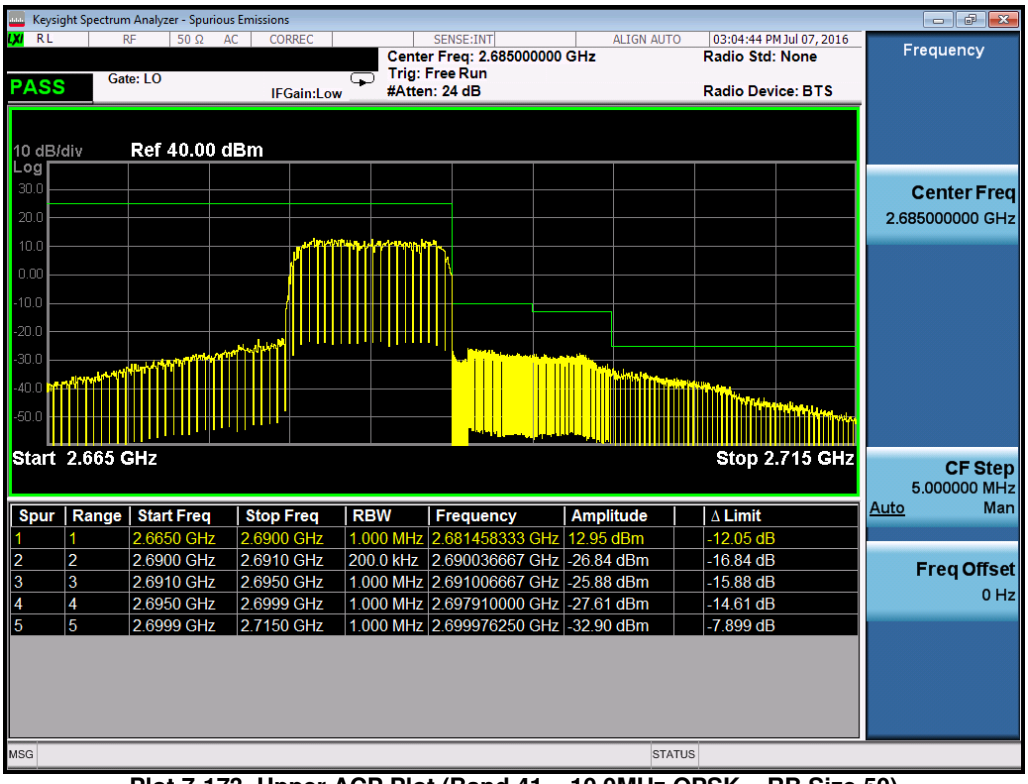
Plot 7-170. Lower ACP Plot (Band 41 – 5.0MHz QPSK – RB Size 25)



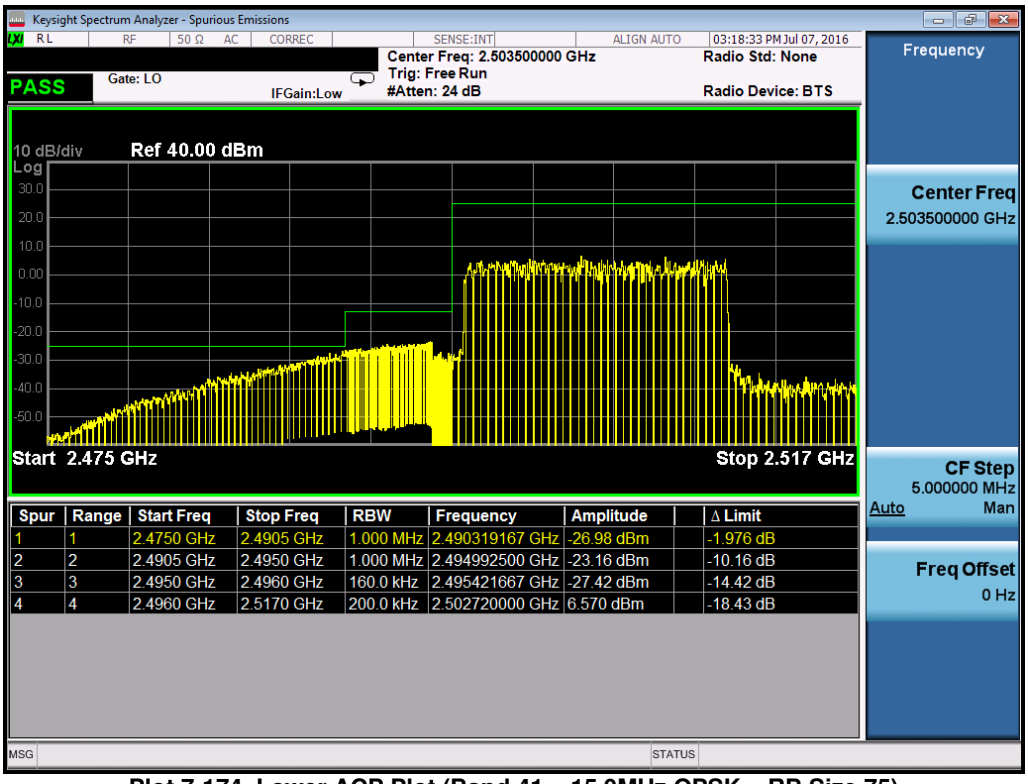
Plot 7-171. Upper ACP Plot (Band 41 – 5.0MHz QPSK – RB Size 25)



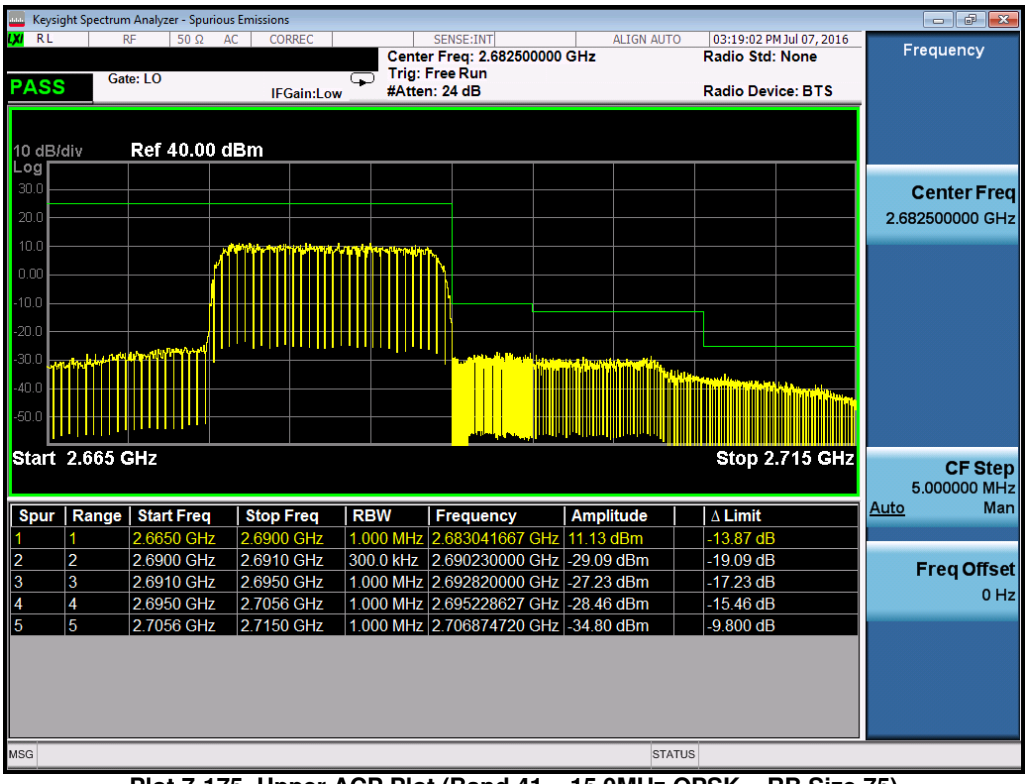
Plot 7-172. Lower ACP Plot (Band 41 – 10.0MHz QPSK – RB Size 50)



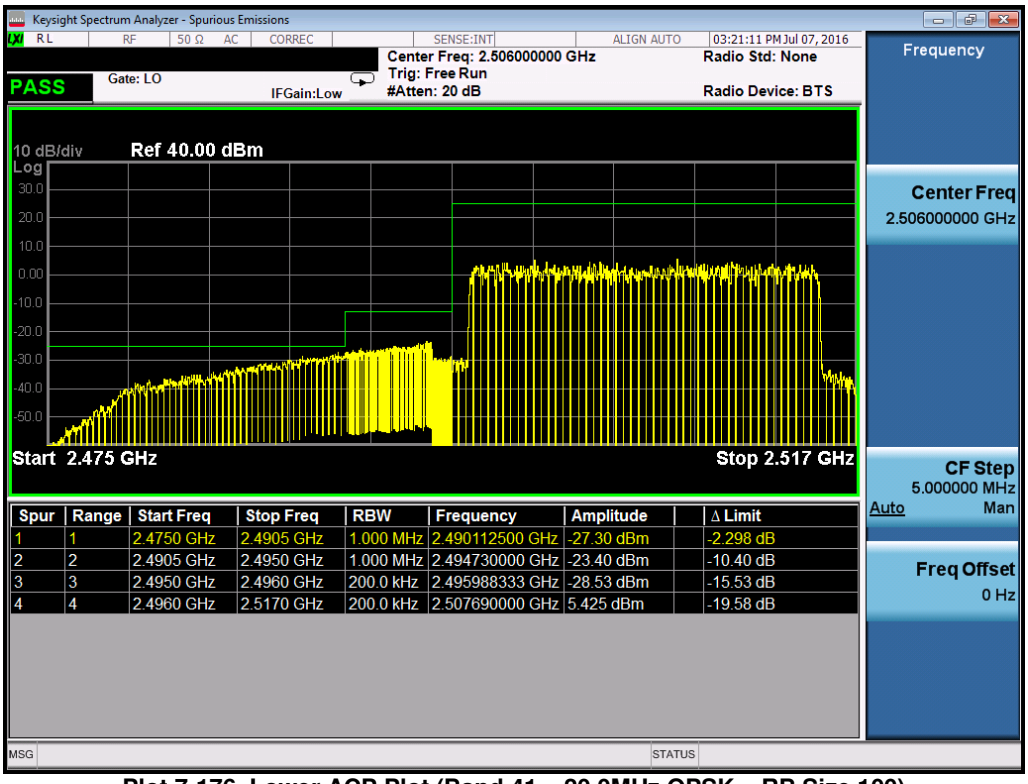
Plot 7-173. Upper ACP Plot (Band 41 – 10.0MHz QPSK – RB Size 50)



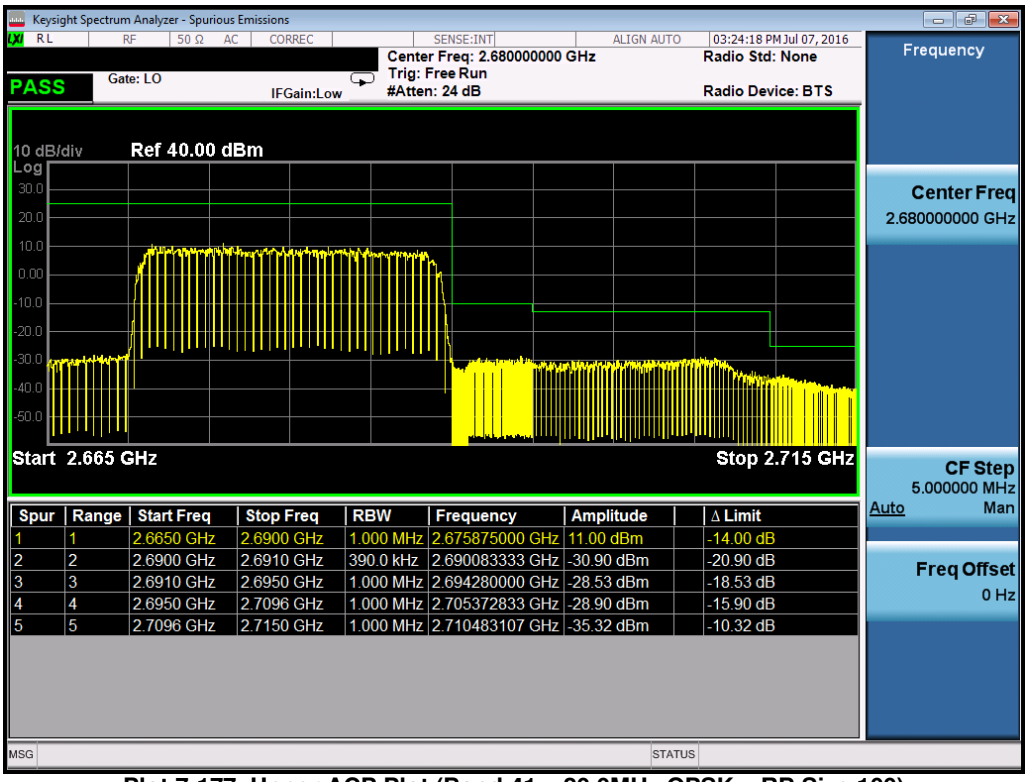
Plot 7-174. Lower ACP Plot (Band 41 – 15.0MHz QPSK – RB Size 75)



Plot 7-175. Upper ACP Plot (Band 41 – 15.0MHz QPSK – RB Size 75)



Plot 7-176. Lower ACP Plot (Band 41 – 20.0MHz QPSK – RB Size 100)



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.6650 GHz	2.6900 GHz	1.000 MHz	2.675875000 GHz	11.00 dBm	-14.00 dB
2	2	2.6900 GHz	2.6910 GHz	390.0 kHz	2.690083333 GHz	-30.90 dBm	-20.90 dB
3	3	2.6910 GHz	2.6950 GHz	1.000 MHz	2.694280000 GHz	-28.53 dBm	-18.53 dB
4	4	2.6950 GHz	2.7096 GHz	1.000 MHz	2.705372833 GHz	-28.90 dBm	-15.90 dB
5	5	2.7096 GHz	2.7150 GHz	1.000 MHz	2.710483107 GHz	-35.32 dBm	-10.32 dB

Plot 7-177. Upper ACP Plot (Band 41 – 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. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

Test Setup

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

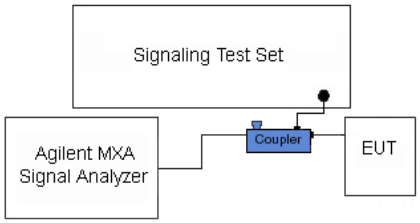
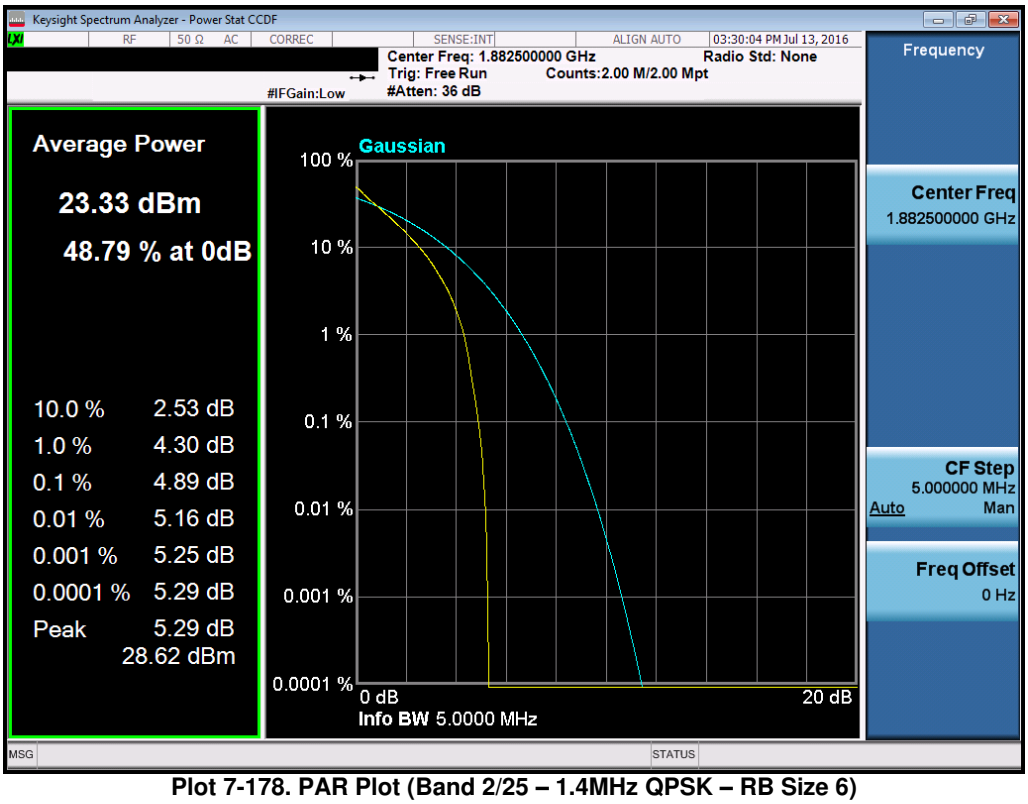


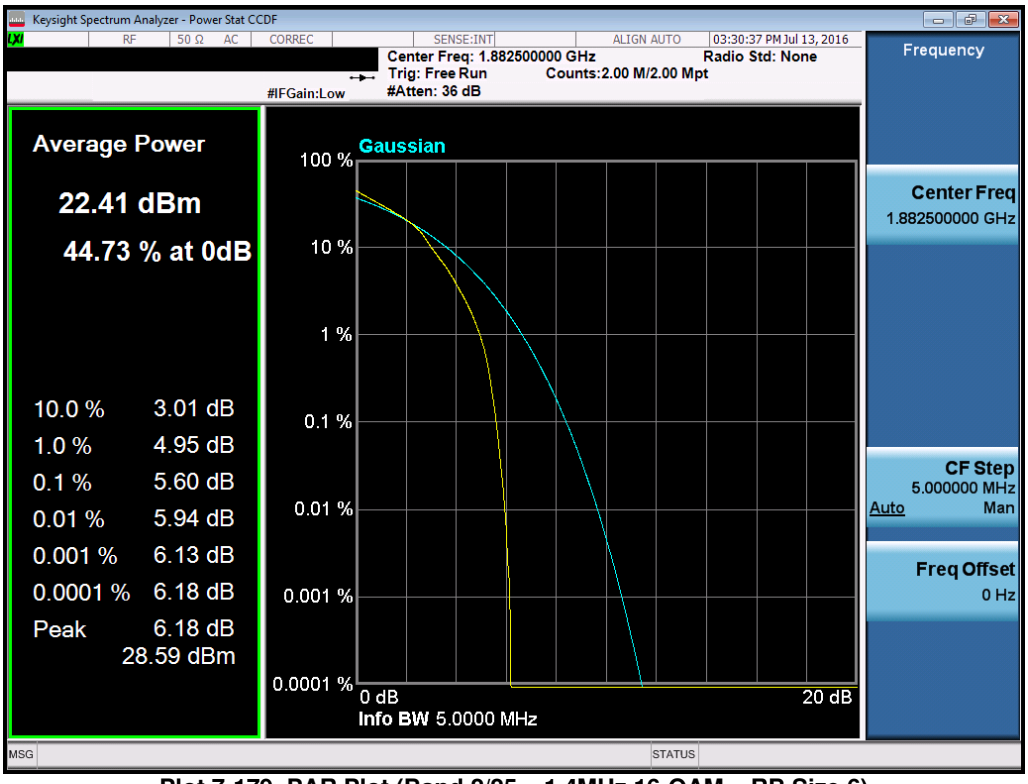
Figure 7-4. Test Instrument & Measurement Setup

Test Notes

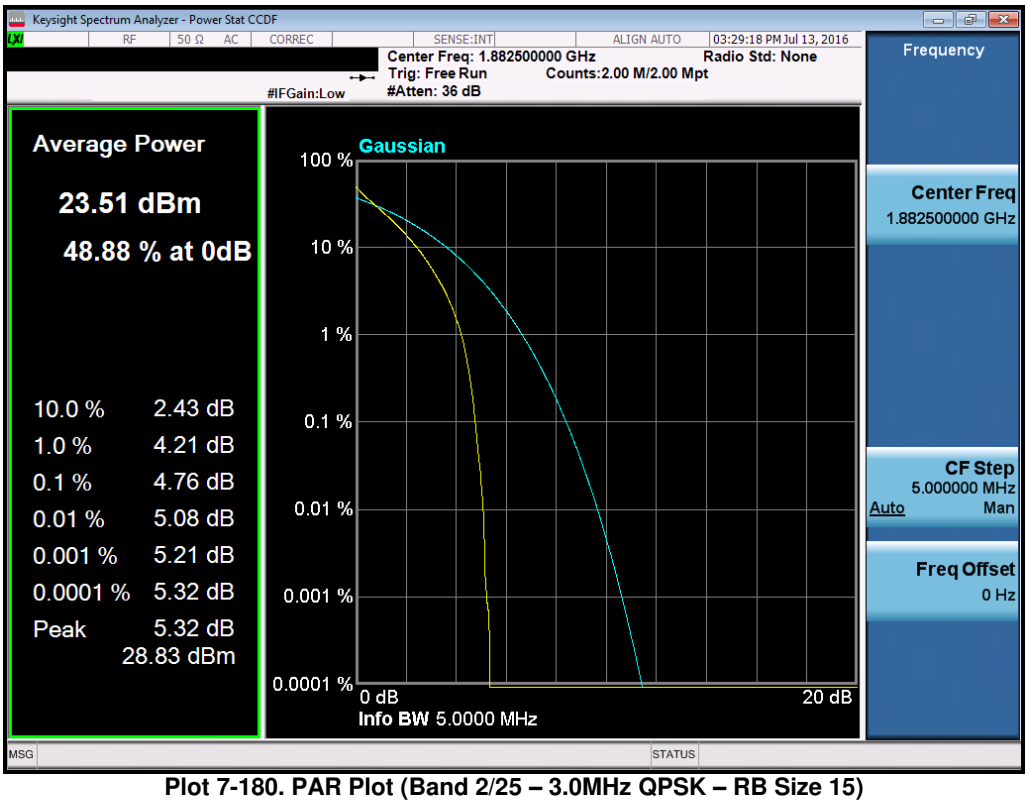
None.



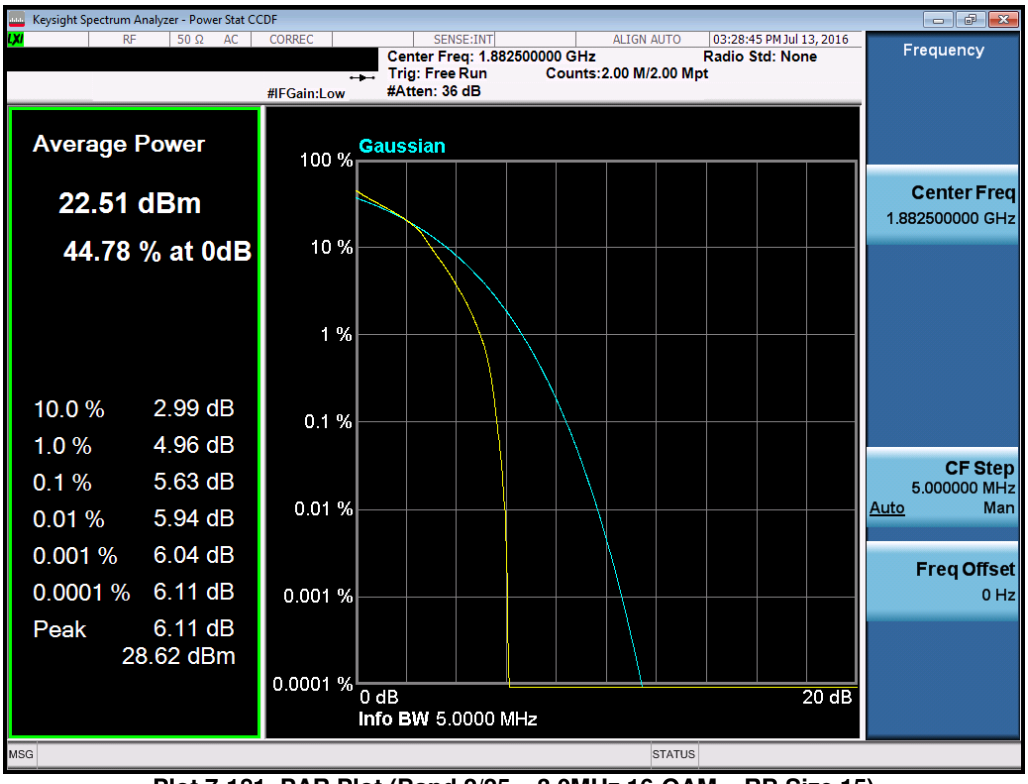
Plot 7-178. PAR Plot (Band 2/25 – 1.4MHz QPSK – RB Size 6)



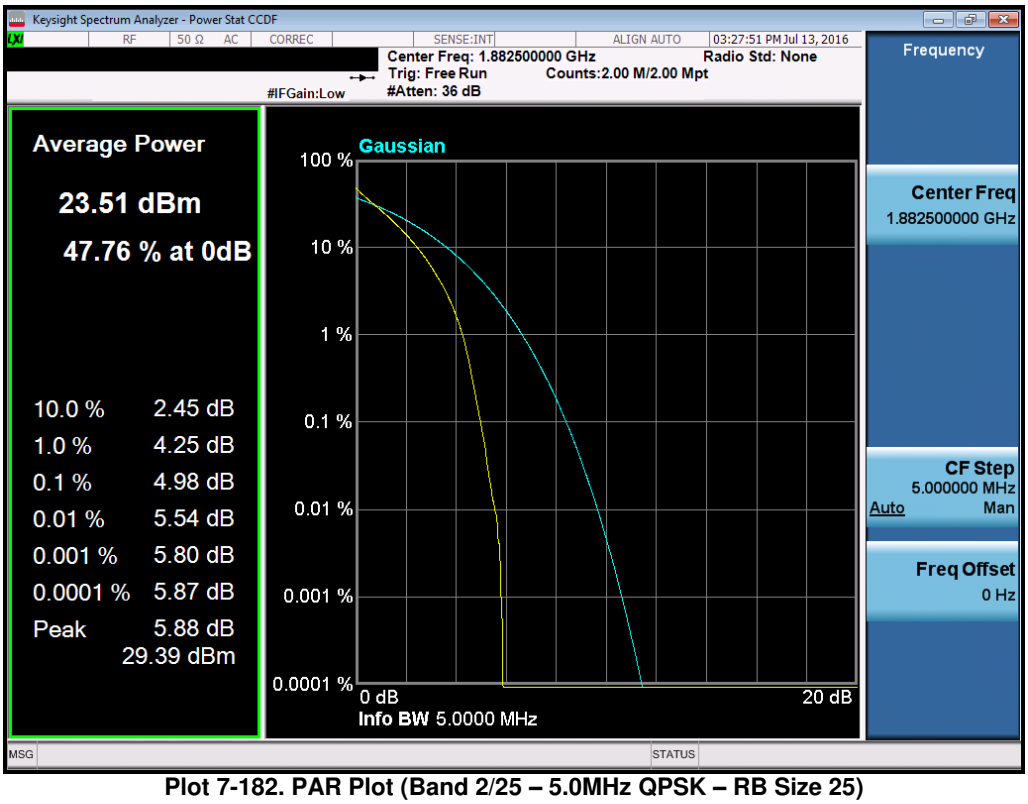
Plot 7-179. PAR Plot (Band 2/25 – 1.4MHz 16-QAM – RB Size 6)



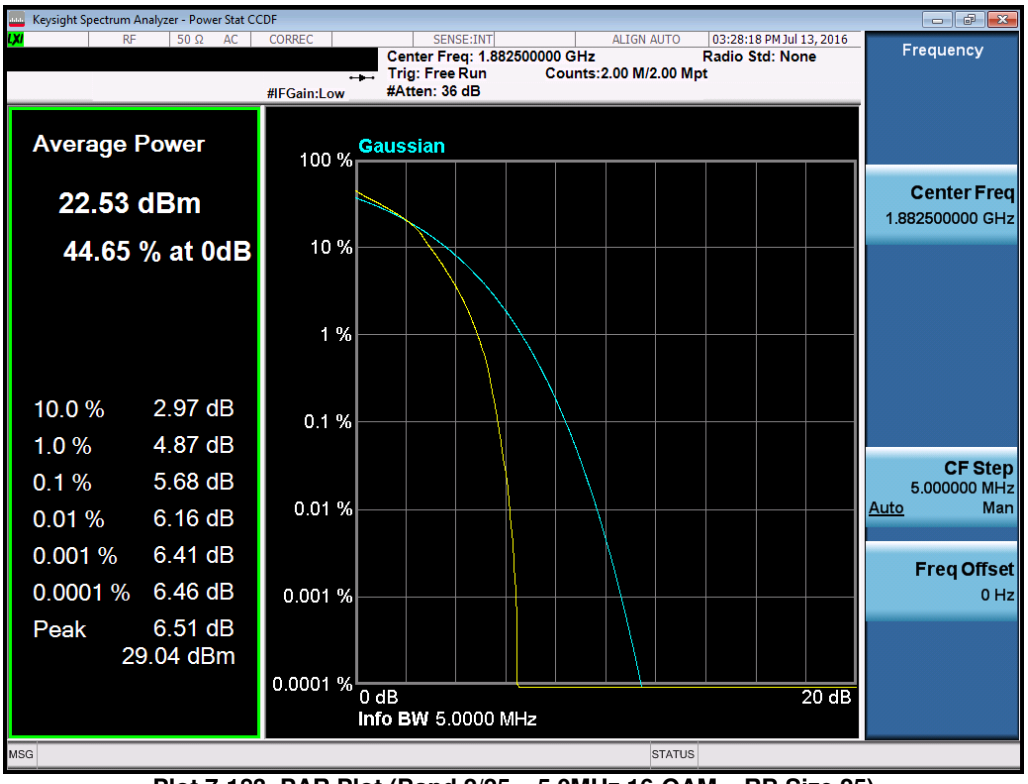
Plot 7-180. PAR Plot (Band 2/25 – 3.0MHz QPSK – RB Size 15)



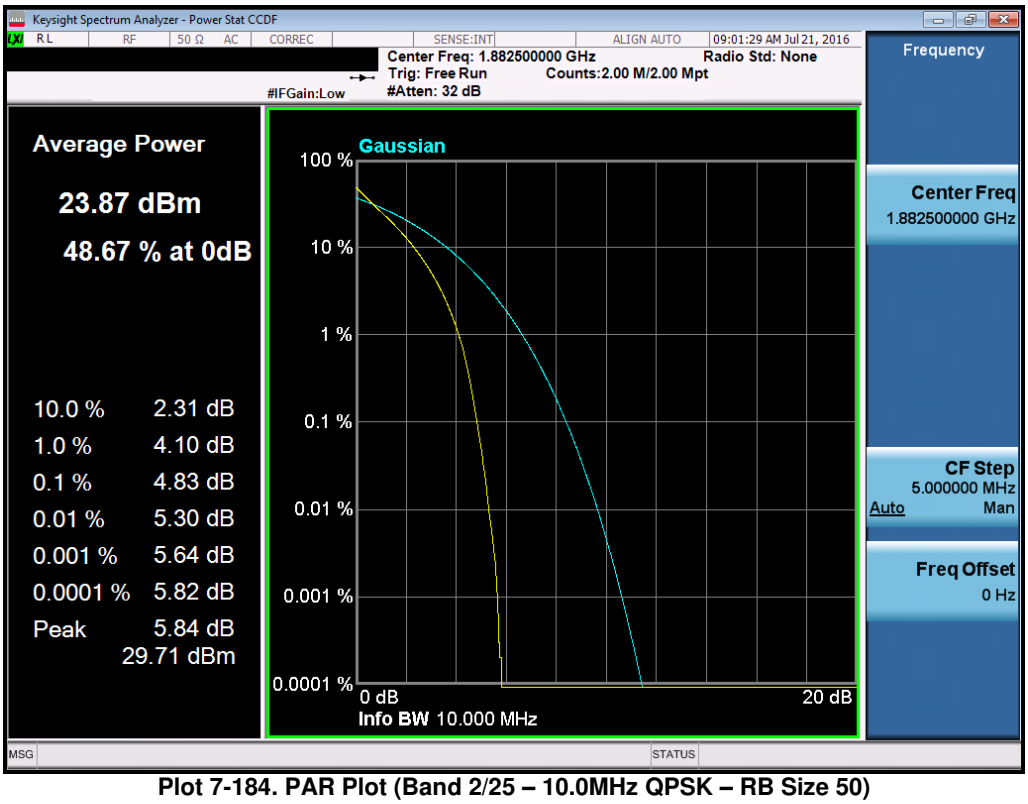
Plot 7-181. PAR Plot (Band 2/25 – 3.0MHz 16-QAM – RB Size 15)



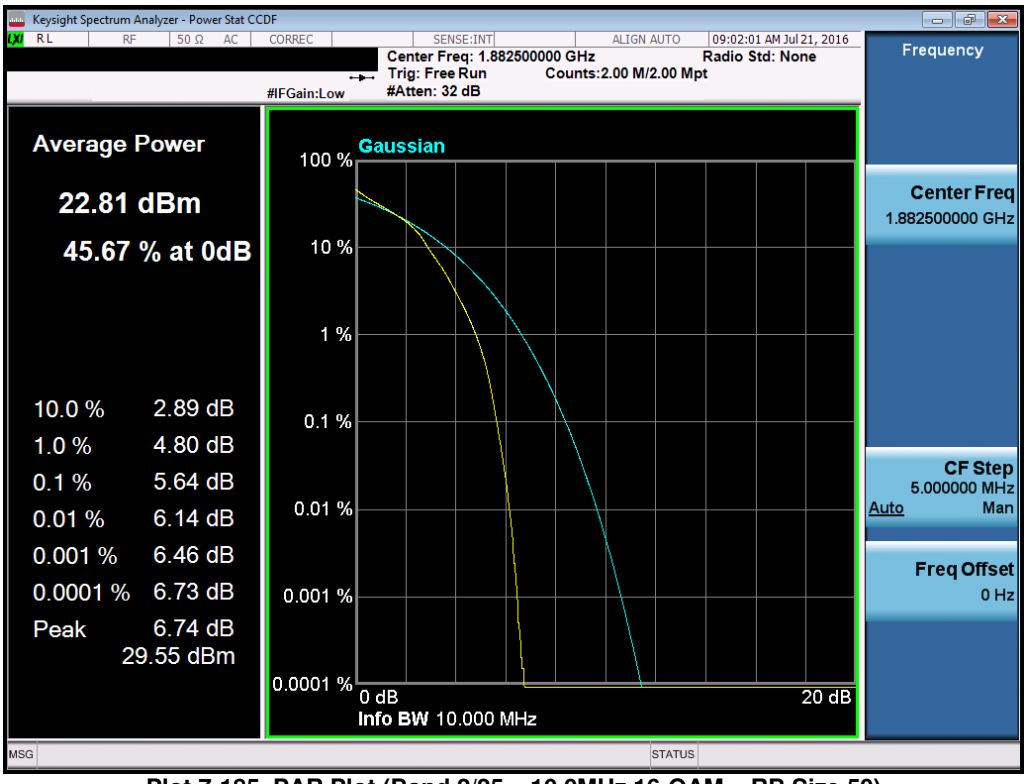
Plot 7-182. PAR Plot (Band 2/25 – 5.0MHz QPSK – RB Size 25)



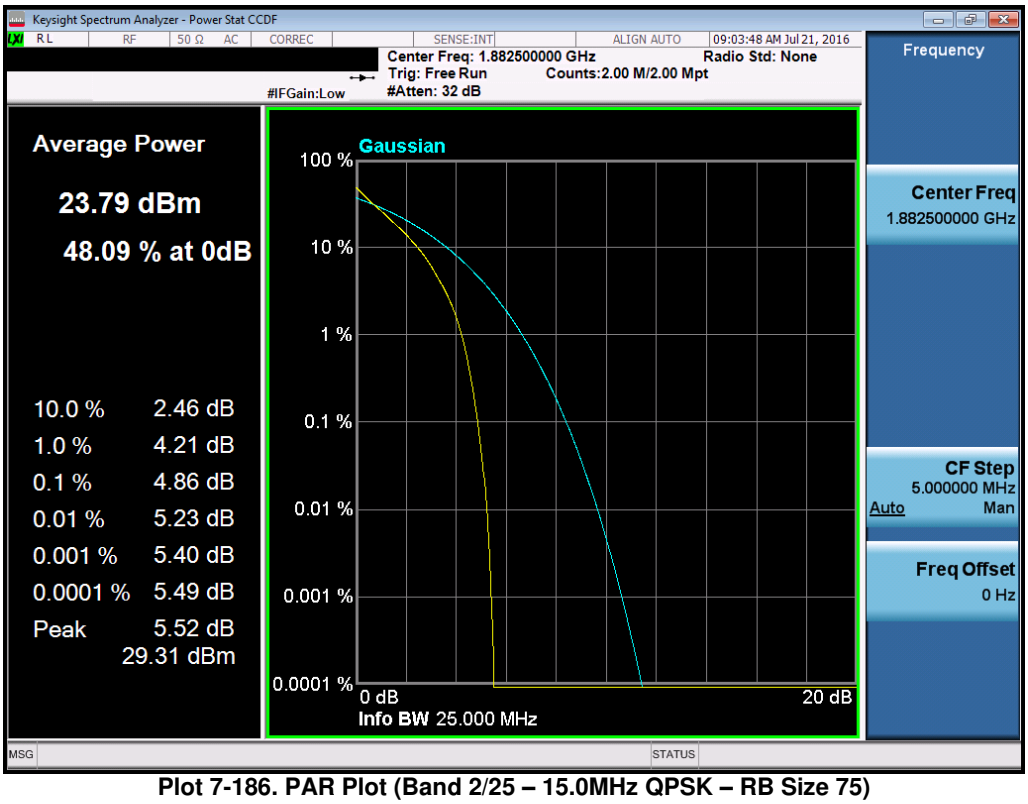
Plot 7-183. PAR Plot (Band 2/25 – 5.0MHz 16-QAM – RB Size 25)



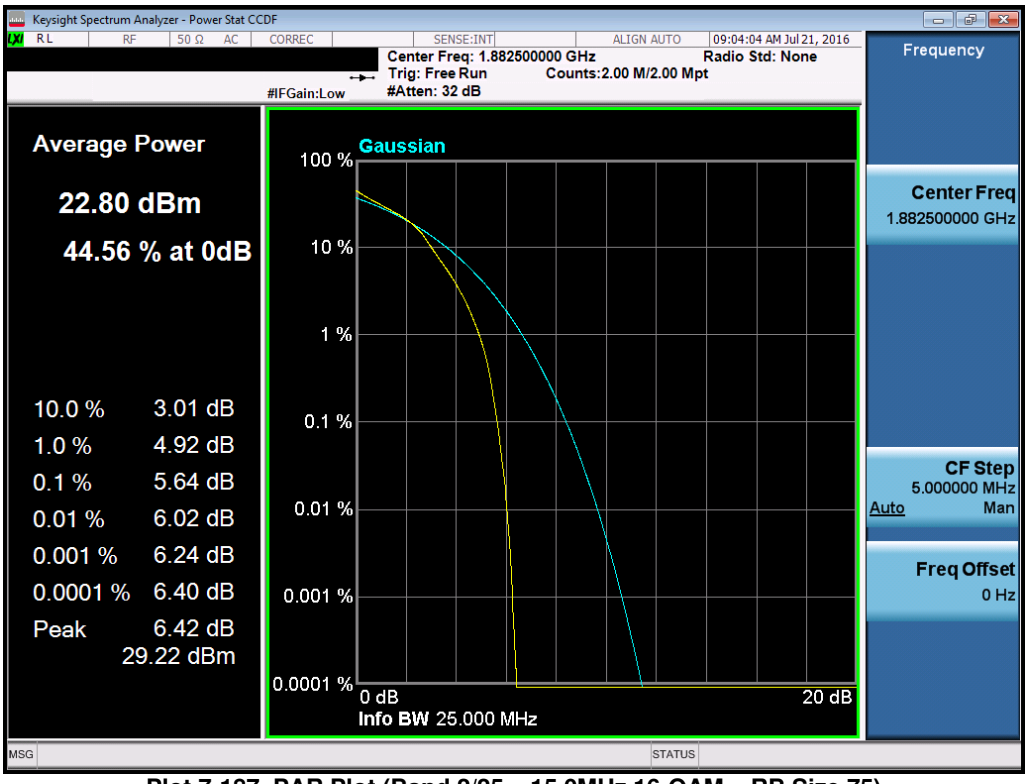
Plot 7-184. PAR Plot (Band 2/25 – 10.0MHz QPSK – RB Size 50)



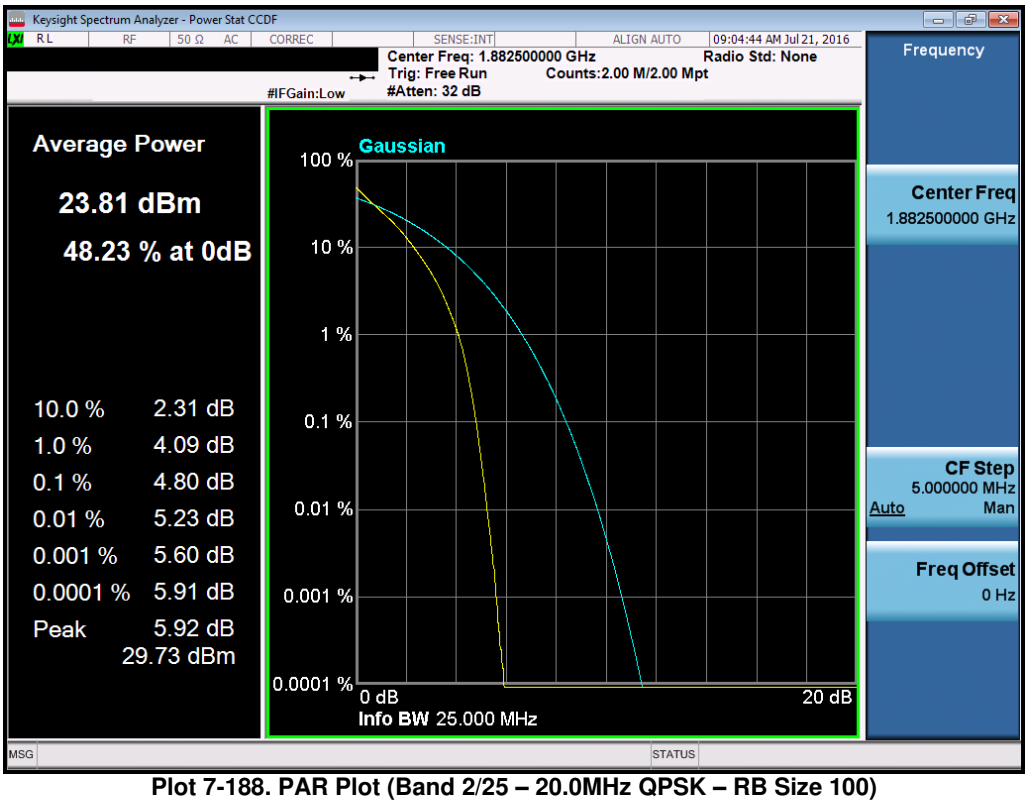
Plot 7-185. PAR Plot (Band 2/25 – 10.0MHz 16-QAM – RB Size 50)



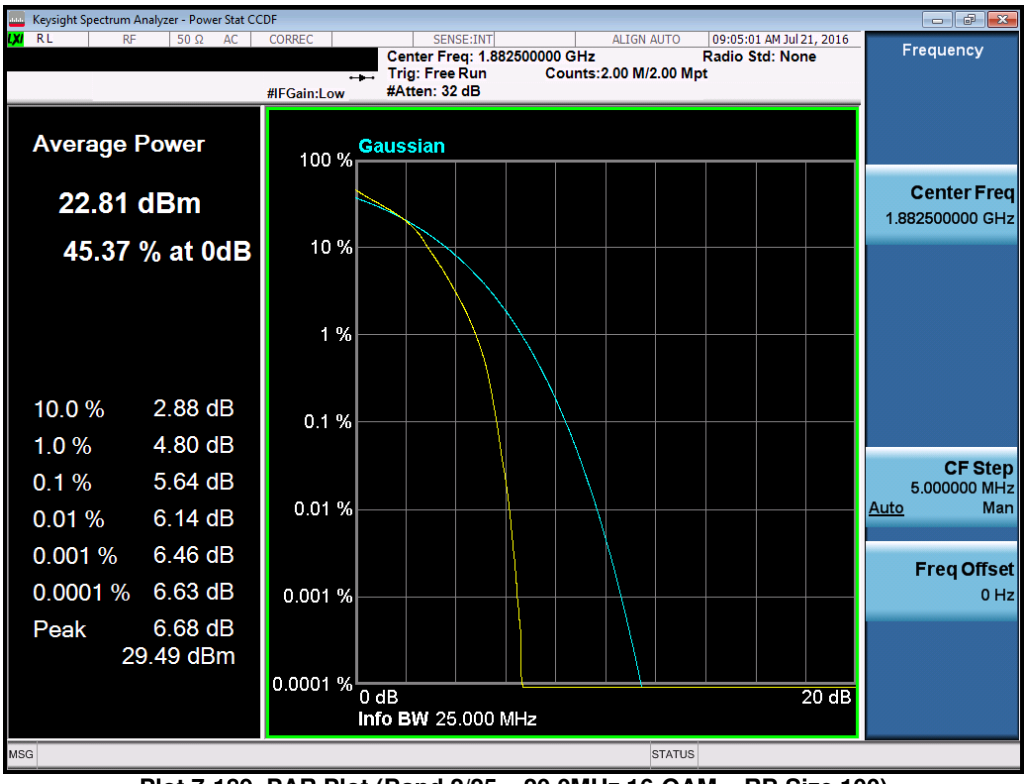
Plot 7-186. PAR Plot (Band 2/25 – 15.0MHz QPSK – RB Size 75)



Plot 7-187. PAR Plot (Band 2/25 – 15.0MHz 16-QAM – RB Size 75)



Plot 7-188. PAR Plot (Band 2/25 – 20.0MHz QPSK – RB Size 100)



Plot 7-189. PAR Plot (Band 2/25 – 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-D-2010 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v02r02 – Section 5.2.1

ANSI/TIA-603-D-2010 – Section 2.2.17

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation. For signals with burst transmission, the signal analyzer's "time domain power" measurement capability is used
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points ≥ 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto". Trigger is set to enable triggering only on full power bursts with the sweep time set less than or equal to the transmission burst duration
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation. For signals with burst transmission, the "gating" function was enabled to ensure that measurements are performed during times in which the transmitter is operating at its maximum power
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

Test Setup

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

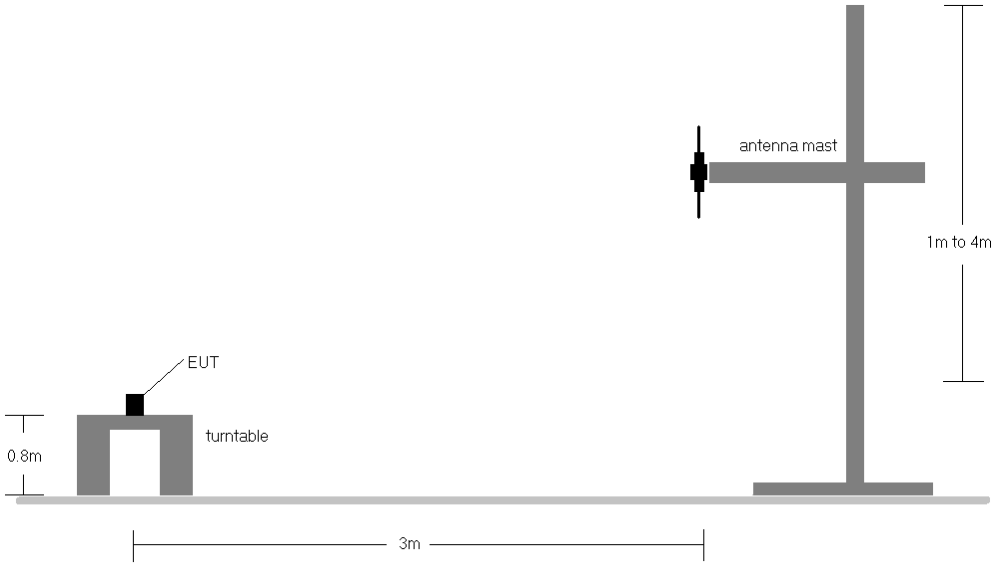


Figure 7-5. Radiated Test Setup <1GHz

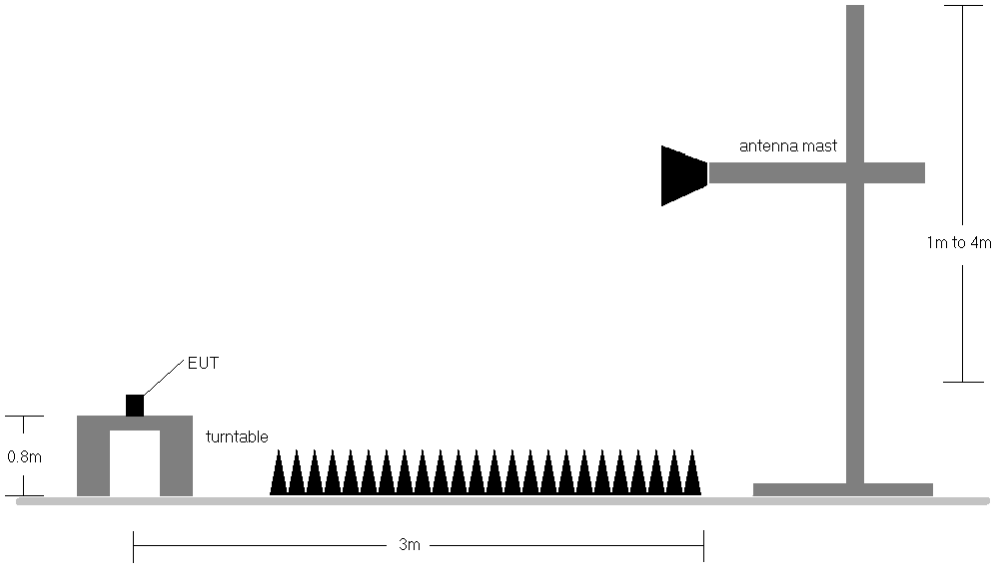


Figure 7-6. Radiated Test Setup >1GHz

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.

7.6.1 Antenna 1 Radiated Power (ERP/EIRP)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
699.70	1.4	QPSK	V	162	162	3 / 2	19.08	2.72	21.80	34.77	-12.97
707.50	1.4	QPSK	V	149	141	3 / 2	19.67	2.88	22.55	34.77	-12.22
715.30	1.4	QPSK	V	148	119	3 / 2	19.22	3.06	22.28	34.77	-12.49
699.70	1.4	16-QAM	V	162	162	3 / 2	17.83	2.72	20.55	34.77	-14.22
707.50	1.4	16-QAM	V	149	141	3 / 2	18.26	2.88	21.14	34.77	-13.63
715.30	1.4	16-QAM	V	148	119	3 / 2	17.73	3.06	20.79	34.77	-13.98
700.50	3	QPSK	V	155	159	1 / 14	20.06	2.72	22.78	34.77	-11.99
707.50	3	QPSK	V	156	142	1 / 14	20.00	2.88	22.88	34.77	-11.89
714.50	3	QPSK	V	149	141	1 / 0	20.07	3.04	23.11	34.77	-11.66
700.50	3	16-QAM	V	155	159	1 / 14	18.95	2.72	21.67	34.77	-13.10
707.50	3	16-QAM	V	156	142	1 / 14	18.92	2.88	21.80	34.77	-12.97
714.50	3	16-QAM	V	149	141	1 / 0	18.97	3.04	22.01	34.77	-12.76
701.50	5	QPSK	V	158	154	1 / 24	20.34	2.75	23.09	34.77	-11.68
707.50	5	QPSK	V	159	189	1 / 0	20.15	2.88	23.03	34.77	-11.74
713.50	5	QPSK	V	158	138	1 / 0	20.26	3.02	23.28	34.77	-11.49
701.50	5	16-QAM	V	158	154	1 / 24	19.36	2.75	22.11	34.77	-12.66
707.50	5	16-QAM	V	159	189	1 / 0	19.05	2.88	21.93	34.77	-12.84
713.50	5	16-QAM	V	158	138	1 / 0	19.32	3.02	22.34	34.77	-12.43
704.00	10	QPSK	V	150	155	1 / 49	19.54	2.80	22.34	34.77	-12.43
707.50	10	QPSK	V	154	155	1 / 0	19.98	2.88	22.86	34.77	-11.91
711.00	10	QPSK	V	153	138	1 / 0	19.45	2.96	22.41	34.77	-12.36
704.00	10	16-QAM	V	150	155	1 / 49	18.48	2.80	21.28	34.77	-13.49
707.50	10	16-QAM	V	154	155	1 / 0	18.85	2.88	21.73	34.77	-13.04
711.00	10	16-QAM	V	153	138	1 / 0	18.31	2.96	21.27	34.77	-13.50
713.50	5	QPSK	H	264	354	1 / 74	19.42	2.48	21.90	34.77	-12.87

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]
824.70	1.4	QPSK	H	190	185	1 / 0	16.44	5.01	21.45	38.45	-17.00
836.50	1.4	QPSK	H	204	188	3 / 2	16.84	5.16	22.00	38.45	-16.45
848.30	1.4	QPSK	H	191	185	1 / 0	16.63	5.30	21.93	38.45	-16.52
824.70	1.4	16-QAM	H	190	185	1 / 0	15.20	5.01	20.21	38.45	-18.24
836.50	1.4	16-QAM	H	204	188	3 / 2	15.78	5.16	20.94	38.45	-17.51
848.30	1.4	16-QAM	H	191	185	1 / 0	15.41	5.30	20.71	38.45	-17.74
825.50	3	QPSK	H	190	185	1 / 14	16.73	5.02	21.75	38.45	-16.70
836.50	3	QPSK	H	191	187	1 / 14	17.39	5.16	22.55	38.45	-15.90
847.50	3	QPSK	H	190	174	1 / 0	16.68	5.29	21.97	38.45	-16.48
825.50	3	16-QAM	H	190	185	1 / 14	15.40	5.02	20.42	38.45	-18.03
836.50	3	16-QAM	H	191	187	1 / 14	16.14	5.16	21.30	38.45	-17.15
847.50	3	16-QAM	H	190	174	1 / 0	15.61	5.29	20.90	38.45	-17.55
826.50	5	QPSK	H	191	173	1 / 24	16.53	5.03	21.56	38.45	-16.89
836.50	5	QPSK	H	206	14	1 / 24	17.09	5.16	22.25	38.45	-16.20
846.50	5	QPSK	H	191	190	1 / 0	16.63	5.28	21.91	38.45	-16.54
826.50	5	16-QAM	H	191	173	1 / 24	15.20	5.03	20.23	38.45	-18.22
836.50	5	16-QAM	H	206	14	1 / 24	15.78	5.16	20.94	38.45	-17.51
846.50	5	16-QAM	H	191	190	1 / 0	15.41	5.28	20.69	38.45	-17.76
829.00	10	QPSK	H	192	186	1 / 49	16.84	5.06	21.90	38.45	-16.55
836.50	10	QPSK	H	188	190	1 / 49	16.95	5.16	22.11	38.45	-16.34
844.00	10	QPSK	H	193	183	1 / 0	16.98	5.25	22.23	38.45	-16.22
829.00	10	16-QAM	H	192	186	1 / 49	15.54	5.06	20.60	38.45	-17.85
836.50	10	16-QAM	H	188	190	1 / 49	15.67	5.16	20.83	38.45	-17.62
844.00	10	16-QAM	H	193	183	1 / 0	15.68	5.25	20.93	38.45	-17.52
836.50	3	QPSK	V	139	203	1 / 0	15.56	5.00	20.56	38.45	-17.89

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

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
831.50	15	QPSK	H	191	187	1 / 74	16.81	5.10	21.91	38.45	-16.55
836.50	15	QPSK	H	190	185	1 / 0	16.65	5.16	21.81	38.45	-16.64
841.50	15	QPSK	H	191	185	1 / 0	16.78	5.22	22.00	38.45	-16.45
831.50	15	16-QAM	H	191	187	1 / 74	15.69	5.10	20.79	38.45	-17.67
836.50	15	16-QAM	H	190	185	1 / 0	15.50	5.16	20.66	38.45	-17.79
841.50	15	16-QAM	H	191	185	1 / 0	15.68	5.22	20.90	38.45	-17.55

Table 7-4. ERP Data (Band 26)

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	111	273	1 / 5	12.30	9.66	21.96	30.00	-8.04
1732.50	1.4	QPSK	H	100	274	1 / 0	13.02	9.61	22.63	30.00	-7.37
1754.30	1.4	QPSK	H	106	284	1 / 0	13.65	9.57	23.22	30.00	-6.78
1710.70	1.4	16-QAM	H	111	273	1 / 5	11.10	9.66	20.76	30.00	-9.24
1732.50	1.4	16-QAM	H	100	274	1 / 0	11.87	9.61	21.48	30.00	-8.52
1754.30	1.4	16-QAM	H	106	284	1 / 0	12.52	9.57	22.09	30.00	-7.91
1711.50	3	QPSK	H	109	272	1 / 14	13.26	9.65	22.91	30.00	-7.09
1732.50	3	QPSK	H	101	273	1 / 14	13.73	9.61	23.34	30.00	-6.66
1753.50	3	QPSK	H	105	279	1 / 14	14.59	9.57	24.16	30.00	-5.84
1711.50	3	16-QAM	H	109	272	1 / 14	12.01	9.65	21.66	30.00	-8.34
1732.50	3	16-QAM	H	101	273	1 / 14	12.44	9.61	22.05	30.00	-7.95
1753.50	3	16-QAM	H	105	279	1 / 14	13.34	9.57	22.91	30.00	-7.09
1712.50	5	QPSK	H	121	105	1 / 0	12.36	9.65	22.01	30.00	-7.99
1732.50	5	QPSK	H	115	105	1 / 0	13.69	9.61	23.30	30.00	-6.70
1752.50	5	QPSK	H	113	96	1 / 0	13.70	9.57	23.27	30.00	-6.73
1712.50	5	16-QAM	H	121	105	1 / 0	11.73	9.65	21.38	30.00	-8.62
1732.50	5	16-QAM	H	115	105	1 / 0	12.43	9.61	22.04	30.00	-7.96
1752.50	5	16-QAM	H	113	96	1 / 0	12.47	9.57	22.04	30.00	-7.96
1715.00	10	QPSK	H	110	270	1 / 49	13.23	9.65	22.88	30.00	-7.12
1732.50	10	QPSK	H	103	270	1 / 49	13.92	9.61	23.53	30.00	-6.47
1750.00	10	QPSK	H	102	281	1 / 49	14.70	9.58	24.28	30.00	-5.72
1715.00	10	16-QAM	H	110	270	1 / 49	11.86	9.65	21.51	30.00	-8.49
1732.50	10	16-QAM	H	103	270	1 / 49	12.54	9.61	22.15	30.00	-7.85
1750.00	10	16-QAM	H	102	281	1 / 49	13.35	9.58	22.93	30.00	-7.07
1717.50	15	QPSK	H	111	271	1 / 74	12.58	9.64	22.22	30.00	-7.78
1732.50	15	QPSK	H	101	273	1 / 74	13.74	9.61	23.35	30.00	-6.65
1747.50	15	QPSK	H	105	280	1 / 74	14.20	9.58	23.78	30.00	-6.22
1717.50	15	16-QAM	H	111	271	1 / 74	11.20	9.64	20.84	30.00	-9.16
1732.50	15	16-QAM	H	101	273	1 / 74	12.49	9.61	22.10	30.00	-7.90
1747.50	15	16-QAM	H	105	280	1 / 74	12.69	9.58	22.27	30.00	-7.73
1720.00	20	QPSK	H	114	272	1 / 99	12.89	9.64	22.53	30.00	-7.47
1732.50	20	QPSK	H	100	274	1 / 99	13.99	9.61	23.60	30.00	-6.40
1745.00	20	QPSK	H	100	274	1 / 99	14.00	9.59	23.59	30.00	-6.41
1720.00	20	16-QAM	H	114	272	1 / 99	11.41	9.64	21.05	30.00	-8.95
1732.50	20	16-QAM	H	100	274	1 / 99	12.63	9.61	22.24	30.00	-7.76
1745.00	20	16-QAM	H	100	274	1 / 99	12.67	9.59	22.26	30.00	-7.74
1750.00	10	QPSK	V	101	252	1 / 0	12.51	9.42	21.93	30.00	-8.07

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	114	276	3 / 2	14.48	9.35	23.83	33.01	-9.18
1882.50	1.4	QPSK	H	115	277	3 / 2	14.82	9.27	24.09	33.01	-8.92
1914.30	1.4	QPSK	H	100	274	3 / 2	14.72	9.26	23.98	33.01	-9.03
1850.70	1.4	16-QAM	H	114	276	3 / 2	13.38	9.35	22.73	33.01	-10.28
1882.50	1.4	16-QAM	H	115	277	3 / 2	13.61	9.27	22.88	33.01	-10.13
1914.30	1.4	16-QAM	H	100	274	3 / 2	13.47	9.26	22.73	33.01	-10.28
1851.50	3	QPSK	H	117	275	1 / 0	15.08	9.35	24.43	33.01	-8.58
1882.50	3	QPSK	H	100	275	1 / 0	15.02	9.27	24.29	33.01	-8.72
1913.50	3	QPSK	H	112	274	1 / 14	14.56	9.26	23.82	33.01	-9.19
1851.50	3	16-QAM	H	117	275	1 / 0	13.96	9.35	23.31	33.01	-9.70
1882.50	3	16-QAM	H	100	275	1 / 0	13.88	9.27	23.15	33.01	-9.86
1913.50	3	16-QAM	H	112	274	1 / 14	13.69	9.26	22.95	33.01	-10.06
1852.50	5	QPSK	H	117	277	1 / 0	15.06	9.34	24.40	33.01	-8.61
1882.50	5	QPSK	H	115	280	1 / 0	15.41	9.27	24.68	33.01	-8.33
1912.50	5	QPSK	H	108	276	1 / 24	14.84	9.26	24.10	33.01	-8.91
1852.50	5	16-QAM	H	117	277	1 / 0	13.77	9.34	23.11	33.01	-9.90
1882.50	5	16-QAM	H	115	280	1 / 0	14.35	9.27	23.62	33.01	-9.39
1912.50	5	16-QAM	H	108	276	1 / 24	13.69	9.26	22.95	33.01	-10.06
1855.00	10	QPSK	H	100	275	1 / 49	15.14	9.34	24.48	33.01	-8.53
1882.50	10	QPSK	H	111	278	1 / 0	15.63	9.27	24.90	33.01	-8.11
1910.00	10	QPSK	H	112	272	1 / 49	14.82	9.25	24.07	33.01	-8.94
1855.00	10	16-QAM	H	100	275	1 / 49	14.05	9.34	23.39	33.01	-9.62
1882.50	10	16-QAM	H	111	278	1 / 0	14.44	9.27	23.71	33.01	-9.30
1910.00	10	16-QAM	H	112	272	1 / 49	13.51	9.25	22.76	33.01	-10.25
1857.50	15	QPSK	H	106	272	1 / 74	15.15	9.33	24.48	33.01	-8.53
1882.50	15	QPSK	H	110	275	1 / 0	15.18	9.27	24.45	33.01	-8.56
1907.50	15	QPSK	H	106	271	1 / 74	15.09	9.24	24.33	33.01	-8.68
1857.50	15	16-QAM	H	106	272	1 / 74	14.08	9.33	23.41	33.01	-9.60
1882.50	15	16-QAM	H	110	275	1 / 0	14.00	9.27	23.27	33.01	-9.74
1907.50	15	16-QAM	H	106	271	1 / 74	13.89	9.24	23.13	33.01	-9.88
1860.00	20	QPSK	H	113	274	1 / 99	16.09	9.32	25.41	33.01	-7.60
1882.50	20	QPSK	H	117	273	1 / 0	15.04	9.27	24.31	33.01	-8.70
1905.00	20	QPSK	H	103	274	1 / 99	15.23	9.24	24.47	33.01	-8.54
1860.00	20	16-QAM	H	113	274	1 / 99	15.13	9.32	24.45	33.01	-8.56
1882.50	20	16-QAM	H	117	273	1 / 0	13.81	9.27	23.08	33.01	-9.93
1905.00	20	16-QAM	H	103	274	1 / 99	14.31	9.24	23.55	33.01	-9.46
1860.00	20	QPSK	V	100	227	1 / 0	9.79	9.23	19.02	33.01	-13.99

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

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
2498.50	5	QPSK	H	115	97	1 / 0	11.84	8.60	20.44	33.01	-12.57
2593.00	5	QPSK	H	100	99	1 / 24	11.66	8.53	20.19	33.01	-12.82
2687.50	5	QPSK	H	108	96	1 / 24	12.24	8.79	21.03	33.01	-11.98
2498.50	5	16-QAM	H	115	97	1 / 0	11.52	8.60	20.12	33.01	-12.89
2593.00	5	16-QAM	H	100	99	1 / 24	11.44	8.53	19.97	33.01	-13.04
2687.50	5	16-QAM	H	108	96	1 / 24	11.31	8.79	20.10	33.01	-12.91
2501.00	10	QPSK	H	100	97	1 / 0	11.46	8.60	20.06	33.01	-12.95
2593.00	10	QPSK	H	100	112	1 / 49	11.18	8.53	19.71	33.01	-13.30
2685.00	10	QPSK	H	106	98	1 / 49	12.36	8.78	21.14	33.01	-11.87
2501.00	10	16-QAM	H	100	97	1 / 0	11.03	8.60	19.63	33.01	-13.38
2593.00	10	16-QAM	H	100	112	1 / 49	9.23	8.53	17.76	33.01	-15.25
2685.00	10	16-QAM	H	106	98	1 / 49	11.51	8.78	20.29	33.01	-12.72
2503.50	15	QPSK	H	113	103	1 / 74	11.34	8.59	19.93	33.01	-13.08
2593.00	15	QPSK	H	110	101	1 / 0	11.08	8.53	19.61	33.01	-13.40
2682.50	15	QPSK	H	100	101	1 / 74	11.14	8.77	19.91	33.01	-13.10
2503.50	15	16-QAM	H	113	103	1 / 74	9.61	8.59	18.20	33.01	-14.81
2593.00	15	16-QAM	H	110	101	1 / 0	9.35	8.53	17.88	33.01	-15.13
2682.50	15	16-QAM	H	100	101	1 / 74	11.12	8.77	19.89	33.01	-13.12
2506.00	20	QPSK	H	116	297	1 / 0	10.42	8.59	19.01	33.01	-14.00
2593.00	20	QPSK	H	108	276	1 / 99	11.89	8.53	20.42	33.01	-12.59
2680.00	20	QPSK	H	104	278	1 / 0	12.26	8.77	21.03	33.01	-11.98
2506.00	20	16-QAM	H	116	297	1 / 0	9.15	8.59	17.74	33.01	-15.27
2593.00	20	16-QAM	H	108	276	1 / 99	11.41	8.53	19.94	33.01	-13.07
2680.00	20	16-QAM	H	104	278	1 / 0	11.40	8.77	20.17	33.01	-12.84
2685.00	10	QPSK	V	100	20	1 / 99	11.07	8.93	20.00	33.01	-13.01

Table 7-7. EIRP Data (Band 41)

7.6.2 Antenna 2 Radiated Power (ERP)

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	224	322	3 / 2	7.45	5.01	12.46	38.45	-25.99
836.50	1.4	QPSK	H	224	322	3 / 2	5.97	5.16	11.13	38.45	-27.32
848.30	1.4	QPSK	H	230	334	1 / 0	5.02	5.30	10.32	38.45	-28.13
824.70	1.4	16-QAM	H	224	322	3 / 2	6.29	5.01	11.30	38.45	-27.15
836.50	1.4	16-QAM	H	224	322	3 / 2	4.79	5.16	9.95	38.45	-28.50
848.30	1.4	16-QAM	H	230	334	1 / 0	3.81	5.30	9.11	38.45	-29.34
825.50	3	QPSK	H	223	332	1 / 0	8.13	5.02	13.15	38.45	-25.30
836.50	3	QPSK	H	224	323	1 / 0	7.04	5.16	12.20	38.45	-26.25
847.50	3	QPSK	H	213	338	1 / 14	5.65	5.29	10.94	38.45	-27.51
825.50	3	16-QAM	H	223	332	1 / 0	7.02	5.02	12.04	38.45	-26.41
836.50	3	16-QAM	H	224	323	1 / 0	6.00	5.16	11.16	38.45	-27.29
847.50	3	16-QAM	H	213	338	1 / 14	4.63	5.29	9.92	38.45	-28.53
826.50	5	QPSK	H	225	335	1 / 24	8.07	5.03	13.10	38.45	-25.35
836.50	5	QPSK	H	226	322	1 / 0	7.63	5.16	12.79	38.45	-25.66
846.50	5	QPSK	H	228	332	1 / 0	5.93	5.28	11.21	38.45	-27.24
826.50	5	16-QAM	H	225	335	1 / 24	6.53	5.03	11.56	38.45	-26.89
836.50	5	16-QAM	H	226	322	1 / 0	6.52	5.16	11.68	38.45	-26.77
846.50	5	16-QAM	H	228	332	1 / 0	4.92	5.28	10.20	38.45	-28.25
829.00	10	QPSK	H	227	333	1 / 0	7.57	5.06	12.63	38.45	-25.82
836.50	10	QPSK	H	227	330	1 / 0	7.52	5.16	12.68	38.45	-25.77
844.00	10	QPSK	H	227	333	1 / 0	6.69	5.25	11.94	38.45	-26.51
829.00	10	16-QAM	H	227	333	1 / 0	6.48	5.06	11.54	38.45	-26.91
836.50	10	16-QAM	H	227	330	1 / 0	6.43	5.16	11.59	38.45	-26.86
844.00	10	16-QAM	H	227	333	1 / 0	5.53	5.25	10.78	38.45	-27.67
831.50	15	QPSK	H	224	334	1 / 0	7.85	5.10	12.95	38.45	-25.51
836.50	15	QPSK	H	224	334	1 / 0	7.52	5.16	12.68	38.45	-25.77
841.50	15	QPSK	H	227	335	1 / 0	6.91	5.22	12.13	38.45	-26.32
831.50	15	16-QAM	H	224	334	1 / 0	6.71	5.10	11.81	38.45	-26.65
836.50	15	16-QAM	H	224	334	1 / 0	6.42	5.16	11.58	38.45	-26.87
841.50	15	16-QAM	H	227	335	1 / 0	5.75	5.22	10.97	38.45	-27.48
825.50	3	QPSK	V	206	266	1 / 0	2.06	4.95	7.01	38.45	-31.44

Table 7-8. ERP Data (Band26)

7.7 Radiated Spurious Emissions Measurements

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

Test Overview

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

Test Procedures Used

KDB 971168 D01 v02r02 – Section 5.8

ANSI/TIA-603-D-2010 – Section 2.2.12

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW ≥ 3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points ≥ 2 x span / RBW
5. Detector = 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.

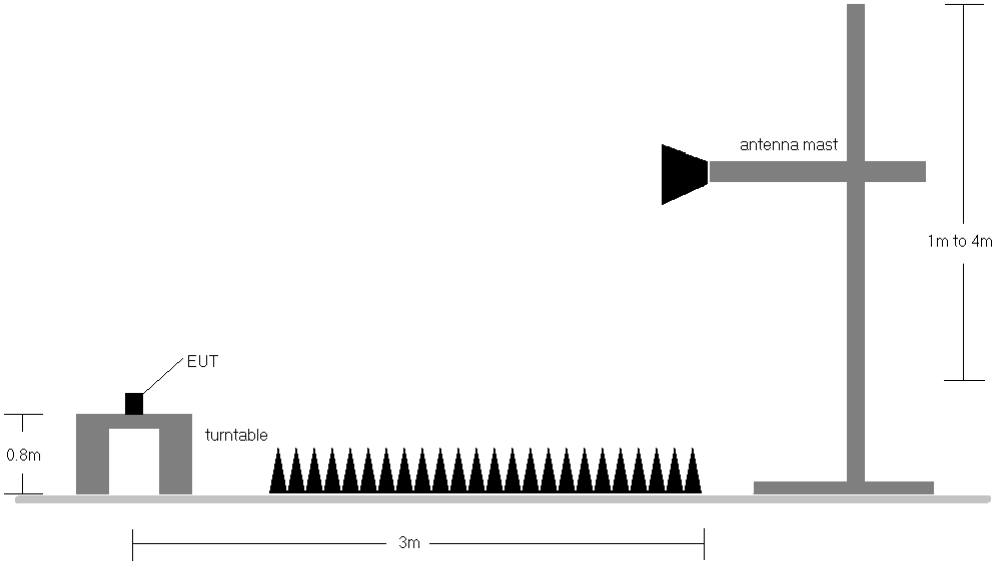


Figure 7-7. Test Instrument & Measurement Setup

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.

7.7.1 Antenna 1 Radiated Spurious Emissions Measurements

OPERATING FREQUENCY:	701.50	MHz		
CHANNEL:	23035			
MEASURED OUTPUT POWER:	23.09	dBm	=	0.204 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	36.09	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1403.00	H	238	43	-57.47	2.39	-55.08	78.2
2104.50	H	-	-	-56.96	3.46	-53.50	76.6

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

OPERATING FREQUENCY:	707.50	MHz		
CHANNEL:	23095			
MEASURED OUTPUT POWER:	23.03	dBm	=	0.201 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	36.03	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1415.00	H	228	348	-57.00	2.54	-54.45	77.5
2122.50	H	-	-	-55.76	3.42	-52.34	75.4

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

OPERATING FREQUENCY:	713.50	MHz		
CHANNEL:	23155			
MEASURED OUTPUT POWER:	23.28	dBm	=	0.213 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	36.28	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1427.00	H	161	73	-57.59	2.70	-54.90	78.2
2140.50	H	-	-	-55.94	3.38	-52.56	75.8

Table 7-11. Radiated Spurious Data (Band 12 – High Channel)

OPERATING FREQUENCY:	825.50	MHz		
CHANNEL:	26805			
MEASURED OUTPUT POWER:	21.75	dBm	=	0.150 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	34.75	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]
1651.00	H	277	211	-60.82	3.63	-57.18	78.9
2476.50	H	100	334	-49.74	3.56	-46.18	67.9
3302.00	H	-	-	-57.25	5.82	-51.42	73.2

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

OPERATING FREQUENCY:	836.50	MHz		
CHANNEL:	26915			
MEASURED OUTPUT POWER:	22.55	dBm	=	0.180 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	35.55	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	215	48	-59.95	3.52	-56.43	79.0
2509.50	H	213	31	-47.44	3.59	-43.85	66.4
3346.00	H	-	-	-57.56	5.87	-51.69	74.2

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

OPERATING FREQUENCY:	847.50	MHz		
CHANNEL:	27025			
MEASURED OUTPUT POWER:	21.97	dBm	=	0.158 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	34.97	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1695.00	H	100	25	-57.33	3.41	-53.93	75.9
2542.50	H	232	300	-53.23	3.73	-49.50	71.5
3390.00	H	-	-	-57.56	5.92	-51.65	73.6

Table 7-14. Radiated Spurious Data (Band 5/26 – High Channel)

OPERATING FREQUENCY:	1715.00	MHz		
CHANNEL:	20000			
MEASURED OUTPUT POWER:	22.88	dBm	=	0.194 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	10.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	35.88	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3430.00	H	100	300	-55.26	8.16	-47.09	70.0
5145.00	H	100	98	-53.10	10.37	-42.73	65.6
6860.00	H	-	-	-52.12	11.48	-40.64	63.5

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

OPERATING FREQUENCY:	1732.50	MHz		
CHANNEL:	20175			
MEASURED OUTPUT POWER:	23.53	dBm	=	0.226 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	10.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	36.53	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	100	261	-54.17	8.26	-45.91	69.4
5197.50	H	100	77	-51.90	10.41	-41.48	65.0
6930.00	H	-	-	-52.74	11.53	-41.22	64.7

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

OPERATING FREQUENCY:	1750.00	MHz		
CHANNEL:	20350			
MEASURED OUTPUT POWER:	24.28	dBm	=	0.268 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	10.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	37.28	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3500.00	H	100	295	-52.39	8.35	-44.04	68.3
5250.00	H	100	87	-50.31	10.36	-39.95	64.2
7000.00	H	-	-	-51.72	11.57	-40.15	64.4

Table 7-17. Radiated Spurious Data (Band 4 – High Channel)

OPERATING FREQUENCY:	1860.00	MHz		
CHANNEL:	26140			
MEASURED OUTPUT POWER:	25.41	dBm	=	0.348 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	20.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	38.41	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]
3720.00	H	185	222	-52.12	9.48	-42.64	68.1
5580.00	H	190	215	-47.09	11.11	-35.98	61.4
7440.00	H	188	105	-48.10	10.99	-37.11	62.5
9300.00	H	190	259	-48.28	11.54	-36.74	62.2
11160.00	H	-	-	-48.50	12.78	-35.72	61.1

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

OPERATING FREQUENCY:	1882.50	MHz		
CHANNEL:	26365			
MEASURED OUTPUT POWER:	24.31	dBm	=	0.270 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	20.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	37.31	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3765.00	H	142	244	-53.38	9.37	-44.00	68.3
5647.50	H	142	79	-50.31	11.23	-39.08	63.4
7530.00	H	150	34	-50.31	11.13	-39.18	63.5
9412.50	H	-	-	-48.75	11.55	-37.19	61.5

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

OPERATING FREQUENCY:	1905.00	MHz		
CHANNEL:	26590			
MEASURED OUTPUT POWER:	24.47	dBm	=	0.280 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	20.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	37.47	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3810.00	H	100	355	-54.42	9.31	-45.12	69.6
5715.00	H	102	216	-47.65	11.33	-36.33	60.8
7620.00	H	-	-	-50.69	11.31	-39.37	63.8

Table 7-20. Radiated Spurious Data (Band 2/25 – High Channel)

OPERATING FREQUENCY:	2501.00	MHz			
CHANNEL:	39700				
MEASURED OUTPUT POWER:	20.06	dBm	=	0.101	W
MODULATION SIGNAL:	QPSK				
BANDWIDTH:	10.0	MHz			
DISTANCE:	3	meters			
LIMIT:	55 + 10 log10 (W)	45.06	dBc		

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
5002.00	H	-	-	-56.58	10.93	-45.65	65.7

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

OPERATING FREQUENCY:	2593.00	MHz			
CHANNEL:	40620				
MEASURED OUTPUT POWER:	19.71	dBm	=	0.094	W
MODULATION SIGNAL:	QPSK				
BANDWIDTH:	10.0	MHz			
DISTANCE:	3	meters			
LIMIT:	55 + 10 log10 (W)	44.71	dBc		

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
5186.00	H	167	259	-54.22	10.75	-43.47	63.2
7779.00	H	100	48	-49.49	11.40	-38.09	57.8
10372.00	H	100	355	-42.54	12.59	-29.95	49.7
12965.00	H	-	-	-47.05	13.37	-33.69	53.4

Table 7-22. Radiated Spurious Data (Band 41 – Mid Channel)

OPERATING FREQUENCY:	2685.00	MHz			
CHANNEL:	41540				
MEASURED OUTPUT POWER:	21.14	dBm	=	0.130	W
MODULATION SIGNAL:	QPSK				
BANDWIDTH:	10.0	MHz			
DISTANCE:	3	meters			
LIMIT:	55 + 10 log10 (W)	46.14	dBc		

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
5370.00	H	121	256	-49.19	10.75	-38.43	59.6
8055.00	H	133	167	-44.46	11.15	-33.31	54.4
10740.00	H	137	111	-41.14	12.80	-28.34	49.5
13425.00	H	-	-	-45.38	12.52	-32.86	54.0

Table 7-23. Radiated Spurious Data (Band 41 – High Channel)

7.7.2 Antenna 2 Radiated Spurious Emissions Measurements

OPERATING FREQUENCY:	825.50	MHz		
CHANNEL:	26805			
MEASURED OUTPUT POWER:	13.15	dBm	=	0.021 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	$43 + 10 \log_{10}$ (W) =	26.15	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]
1651.00	H	-	-	-60.69	3.63	-57.05	78.8
2476.50	H	261	87	-54.63	3.56	-51.07	72.8
3302.00	H	-	-	-57.49	5.82	-51.66	73.4

Table 7-24. Radiated Spurious Data (Band 26 – Low Channel)

OPERATING FREQUENCY:	836.50	MHz		
CHANNEL:	26915			
MEASURED OUTPUT POWER:	12.20	dBm	=	0.017 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	$43 + 10 \log_{10}$ (W) =	25.20	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	-	-	-59.62	3.52	-56.10	68.3
2509.50	H	100	0	-55.62	3.59	-52.03	64.2
3346.00	H	-	-	-57.75	5.87	-51.88	64.1

Table 7-25. Radiated Spurious Data (Band 26 – Mid Channel)

OPERATING FREQUENCY:	847.50	MHz		
CHANNEL:	27025			
MEASURED OUTPUT POWER:	10.94	dBm	=	0.012 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	23.94	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1695.00	H	100	104	-58.89	3.41	-55.49	66.4
2542.50	H	100	65	-54.87	3.73	-51.14	62.1
3390.00	H	-	-	-57.16	5.92	-51.25	62.2

Table 7-26. Radiated Spurious Data (Band 26 – 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-D-2010. The frequency stability of the transmitter is measured by:

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

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

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

Test Procedure Used

ANSI/TIA-603-D-2010

Test Settings

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

Test Setup

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

Test Notes

None

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)	707,499,558	-442	-0.0000625
100 %		- 30	707,500,188	188	0.0000266
100 %		- 20	707,500,041	41	0.0000058
100 %		- 10	707,500,052	52	0.0000073
100 %		0	707,499,737	-263	-0.0000372
100 %		+ 10	707,500,121	121	0.0000171
100 %		+ 20	707,500,005	5	0.0000007
100 %		+ 30	707,500,284	284	0.0000401
100 %		+ 40	707,499,920	-80	-0.0000113
100 %		+ 50	707,499,947	-53	-0.0000075
BATT. ENDPOINT	3.45	+ 20	707,500,194	194	0.0000274

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

Band 12 Frequency Stability Measurements

§2.1055 §27.54

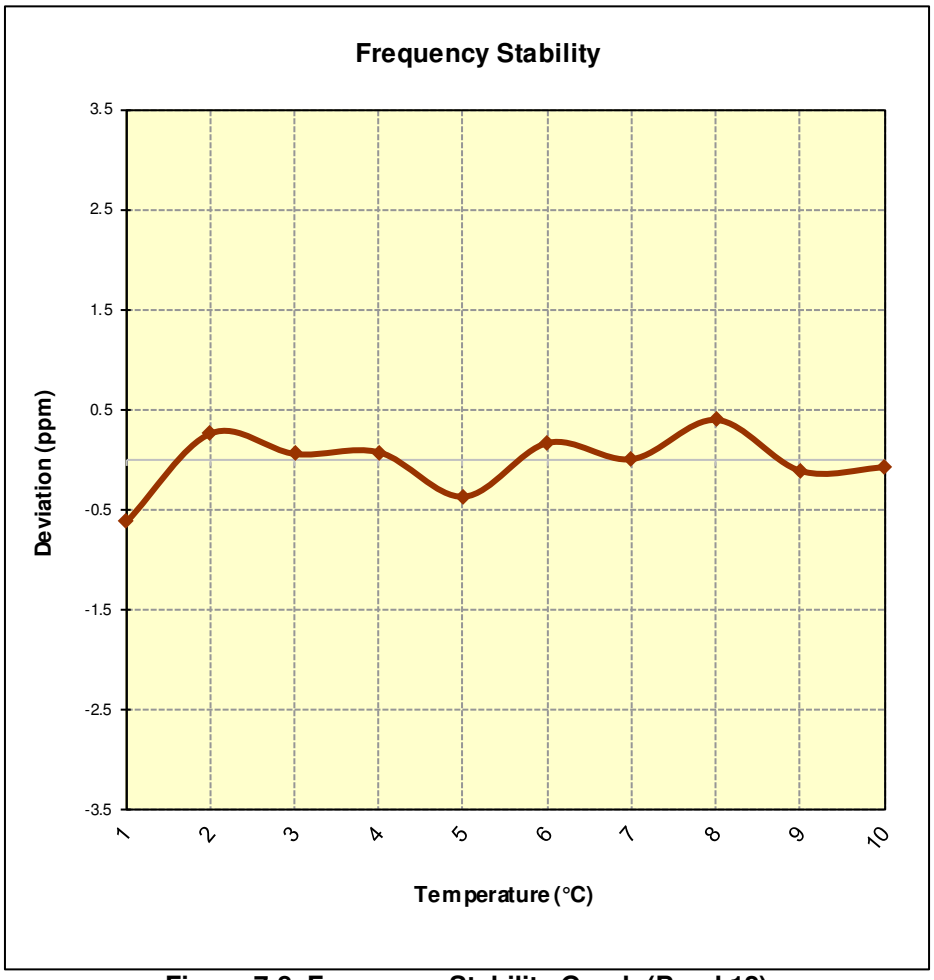


Figure 7-8. Frequency Stability Graph (Band 12)

Band 5/26 Frequency Stability Measurements

§2.1055 §22.355

OPERATING FREQUENCY:	831,500,000	Hz
CHANNEL:	26865	
REFERENCE VOLTAGE:	3.85	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	831,499,989	-11	-0.0000013
100 %		- 30	831,499,848	-152	-0.0000183
100 %		- 20	831,499,960	-40	-0.0000048
100 %		- 10	831,500,306	306	0.0000368
100 %		0	831,499,998	-2	-0.0000002
100 %		+ 10	831,500,070	70	0.0000084
100 %		+ 20	831,500,154	154	0.0000185
100 %		+ 30	831,500,032	32	0.0000038
100 %		+ 40	831,500,307	307	0.0000369
100 %		+ 50	831,499,672	-328	-0.0000394
BATT. ENDPOINT	3.45	+ 20	831,500,256	256	0.0000308

Table 7-28. Frequency Stability Data (Band 5/26)

Band 5/26 Frequency Stability Measurements

§2.1055 §22.355

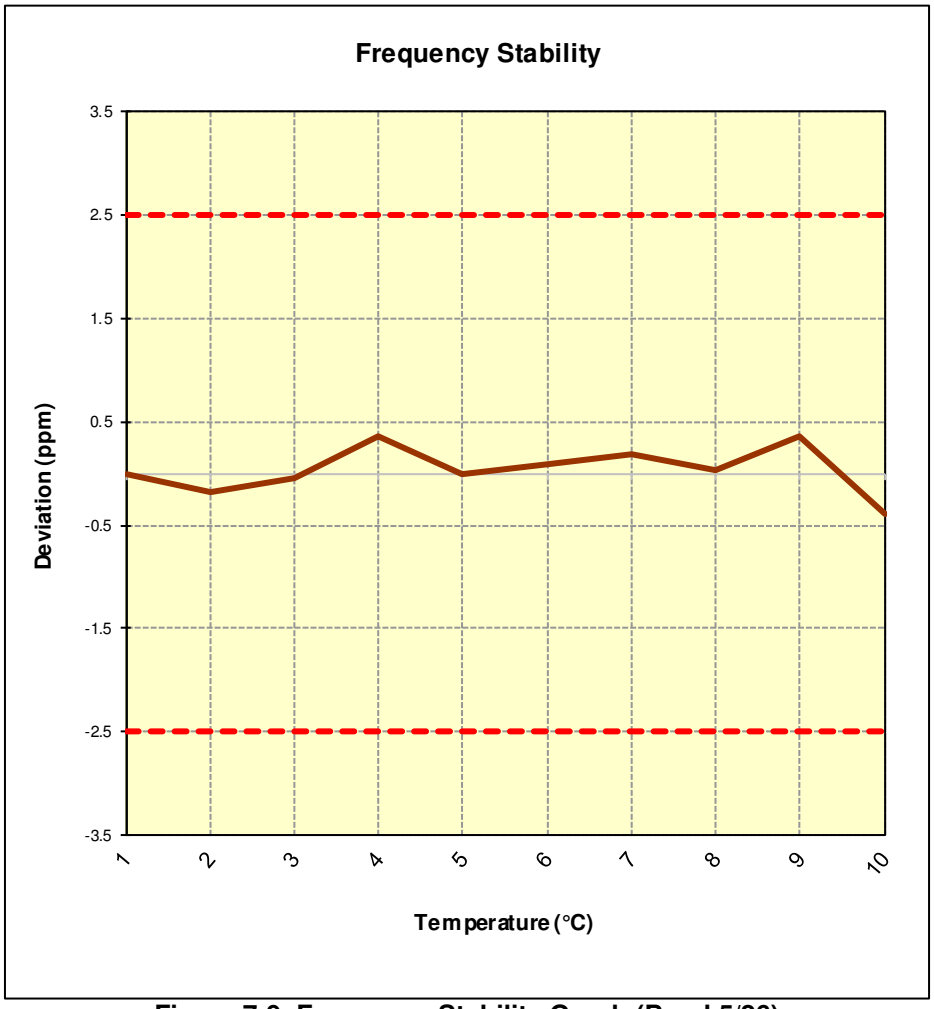


Figure 7-9. Frequency Stability Graph (Band 5/26)

Band 4 Frequency Stability Measurements

§2.1055 §§27.54

OPERATING FREQUENCY: 1,732,500,000 Hz

CHANNEL: 20175

REFERENCE VOLTAGE: 3.85 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	1,732,500,013	13	0.0000008
100 %		- 30	1,732,499,925	-75	-0.0000043
100 %		- 20	1,732,499,964	-36	-0.0000021
100 %		- 10	1,732,500,055	55	0.0000032
100 %		0	1,732,500,102	102	0.0000059
100 %		+ 10	1,732,500,151	151	0.0000087
100 %		+ 20	1,732,500,077	77	0.0000044
100 %		+ 30	1,732,500,047	47	0.0000027
100 %		+ 40	1,732,500,336	336	0.0000194
100 %		+ 50	1,732,499,621	-379	-0.0000219
BATT. ENDPOINT	3.45	+ 20	1,732,500,196	196	0.0000113

Table 7-29. 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

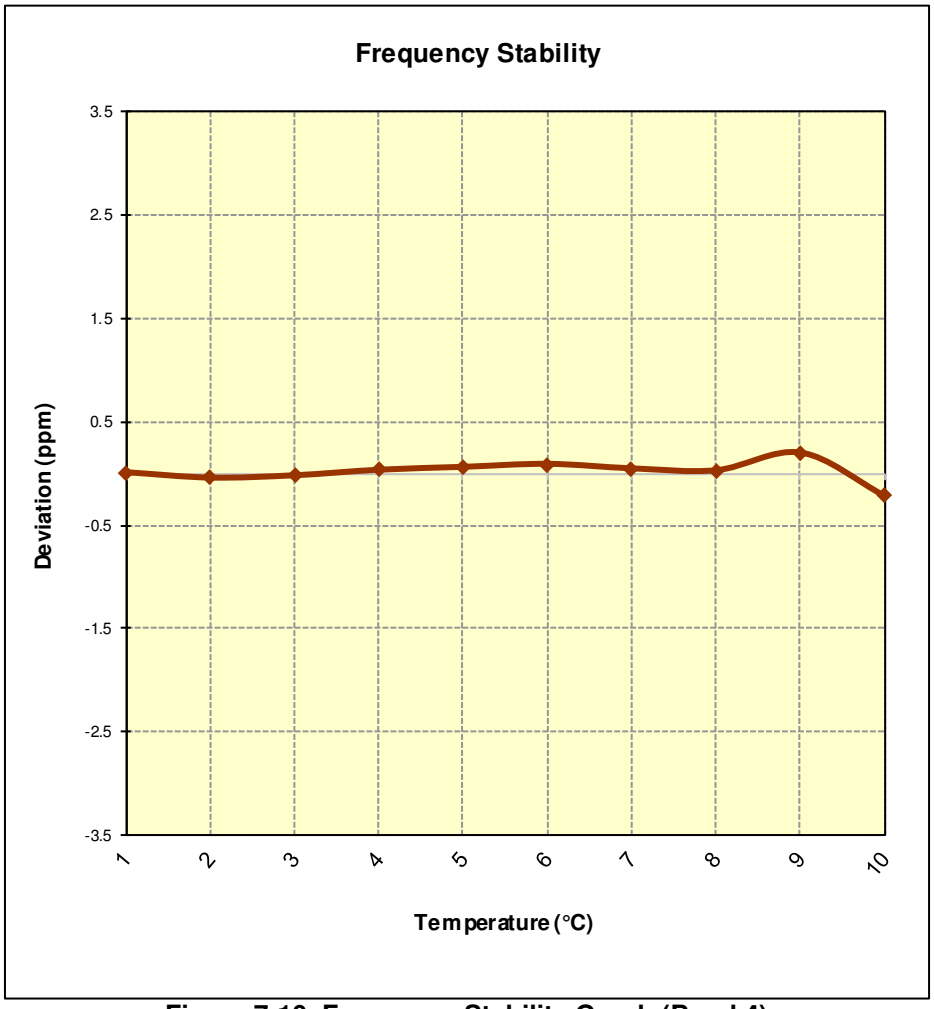


Figure 7-10. Frequency Stability Graph (Band 4)

Band 2/25 Frequency Stability Measurements

§2.1055 §24.235

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

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	1,882,500,139	139	0.0000074
100 %		- 30	1,882,500,041	41	0.0000022
100 %		- 20	1,882,500,073	73	0.0000039
100 %		- 10	1,882,499,995	-5	-0.0000003
100 %		0	1,882,500,211	211	0.0000112
100 %		+ 10	1,882,500,014	14	0.0000007
100 %		+ 20	1,882,499,719	-281	-0.0000149
100 %		+ 30	1,882,499,871	-129	-0.0000069
100 %		+ 40	1,882,499,922	-78	-0.0000041
100 %		+ 50	1,882,499,717	-283	-0.0000150
BATT. ENDPOINT	3.45	+ 20	1,882,499,848	-152	-0.0000081

Table 7-30. Frequency Stability Data (Band 2/25)

Note:

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

Band 2/25 Frequency Stability Measurements

§2.1055 §24.235

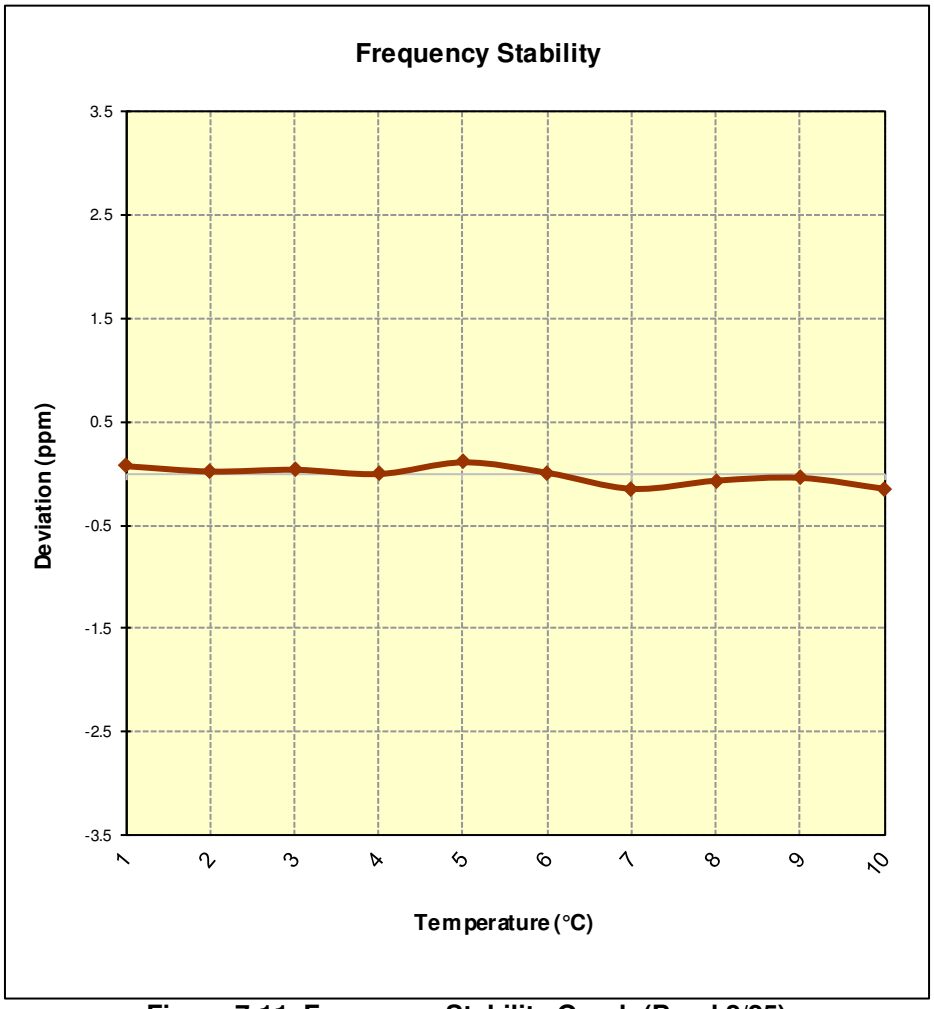


Figure 7-11. Frequency Stability Graph (Band 2/25)

Band 41 Frequency Stability Measurements

§2.1055 §27.54

OPERATING FREQUENCY:	2,593,000,000	Hz
CHANNEL:	40620	
REFERENCE VOLTAGE:	3.85	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	2,592,999,664	-336	-0.0000130
100 %		- 30	2,592,999,836	-164	-0.0000063
100 %		- 20	2,592,999,930	-70	-0.0000027
100 %		- 10	2,592,999,757	-243	-0.0000094
100 %		0	2,593,000,043	43	0.0000017
100 %		+ 10	2,592,999,935	-65	-0.0000025
100 %		+ 20	2,592,999,918	-82	-0.0000032
100 %		+ 30	2,593,000,153	153	0.0000059
100 %		+ 40	2,593,000,015	15	0.0000006
100 %		+ 50	2,592,999,988	-12	-0.0000005
BATT. ENDPOINT	3.45	+ 20	2,592,999,863	-137	-0.0000053

Table 7-31. Frequency Stability Data (Band 41)

Note:

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

Band 41 Frequency Stability Measurements

§2.1055 §27.54

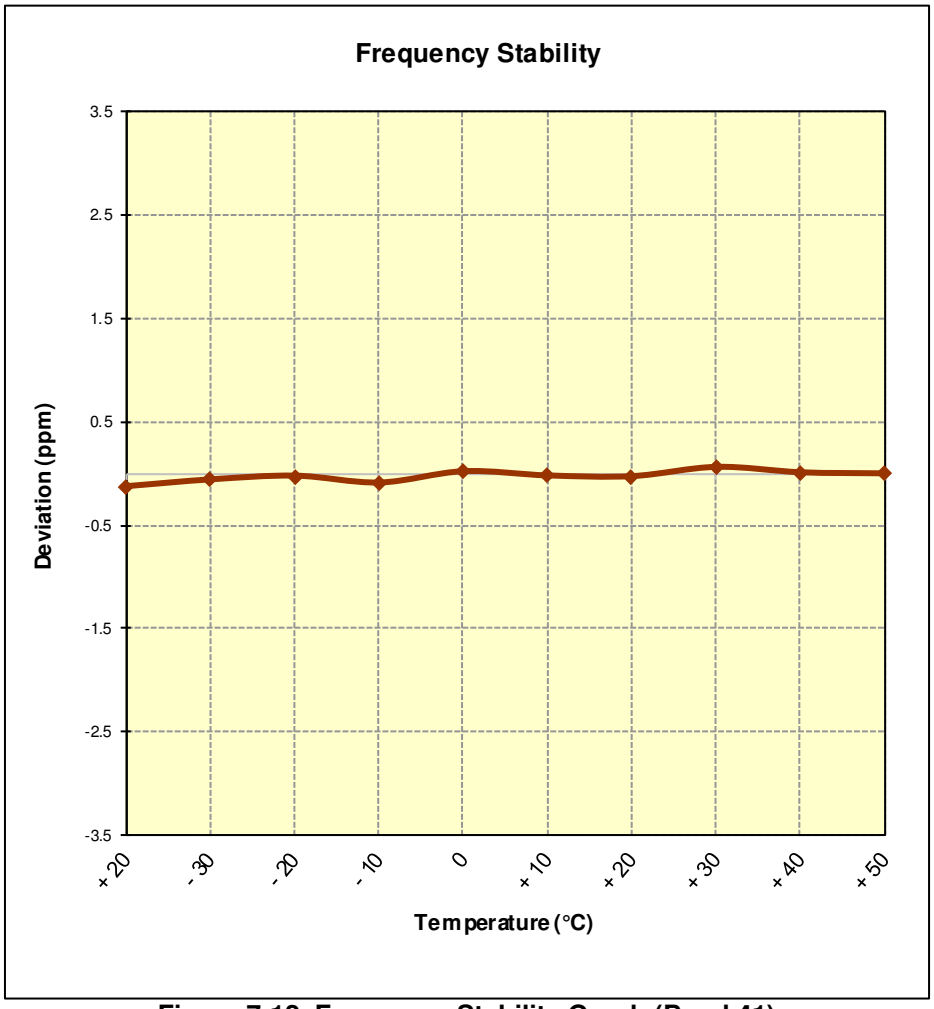


Figure 7-12. Frequency Stability Graph (Band 41)

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset** **FCC ID: ZNFLS997** complies with all the requirements of Parts 22, 24, & 27 of the FCC rules for LTE operation only.