7.4 Band Edge Emissions at Antenna Terminal

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

Test Overview

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

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

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

Test Procedure Used

KDB 971168 D01 v02r02 – Section 6.0

Test Settings

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

Test Setup

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

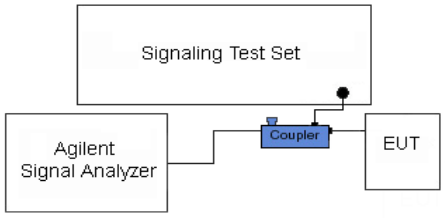


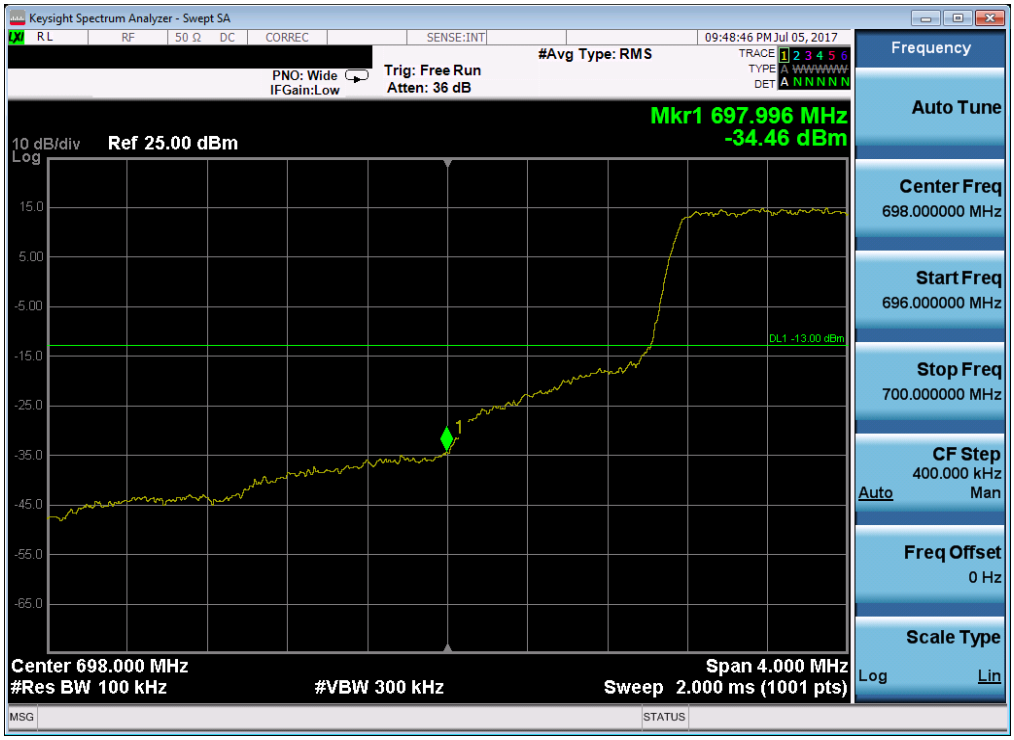
Figure 7-3. Test Instrument & Measurement Setup

Test Notes

Per 22.917(b) 24.238(a) 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.

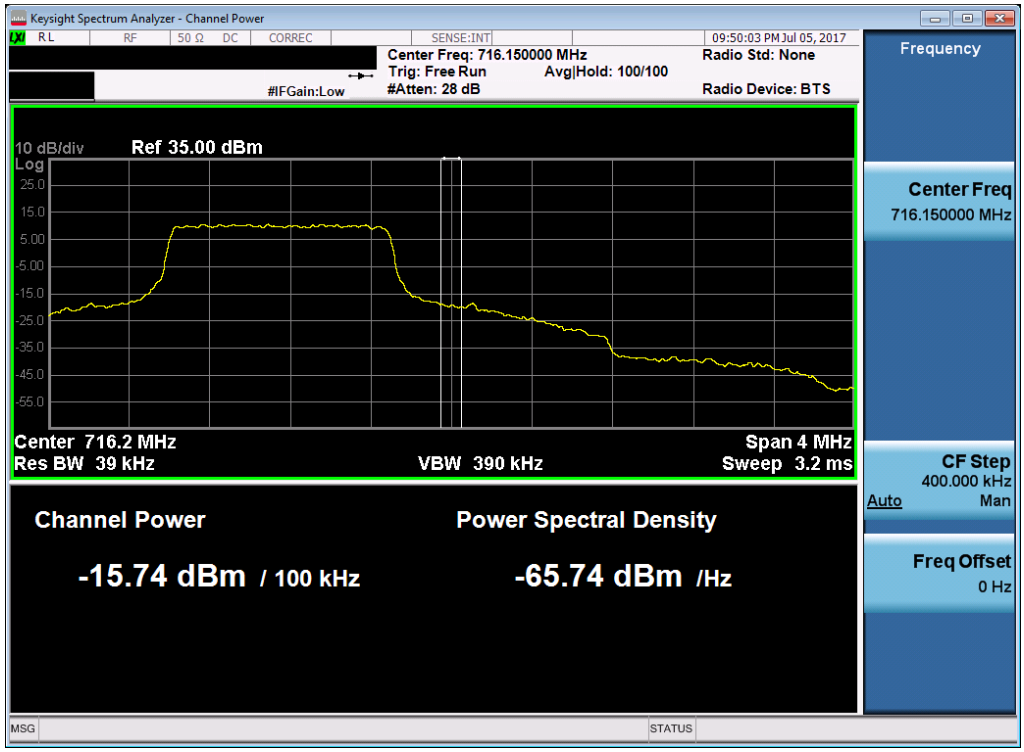
Per 27.53(g) for operations in the 698-746 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

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.

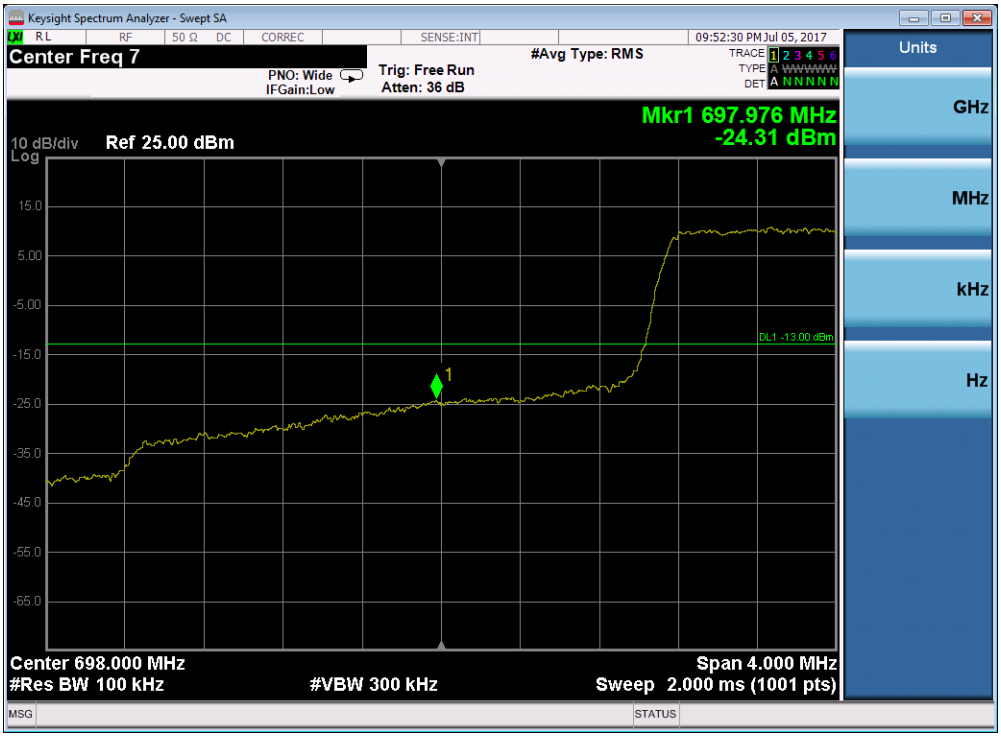


Plot 7-94. Lower Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)

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

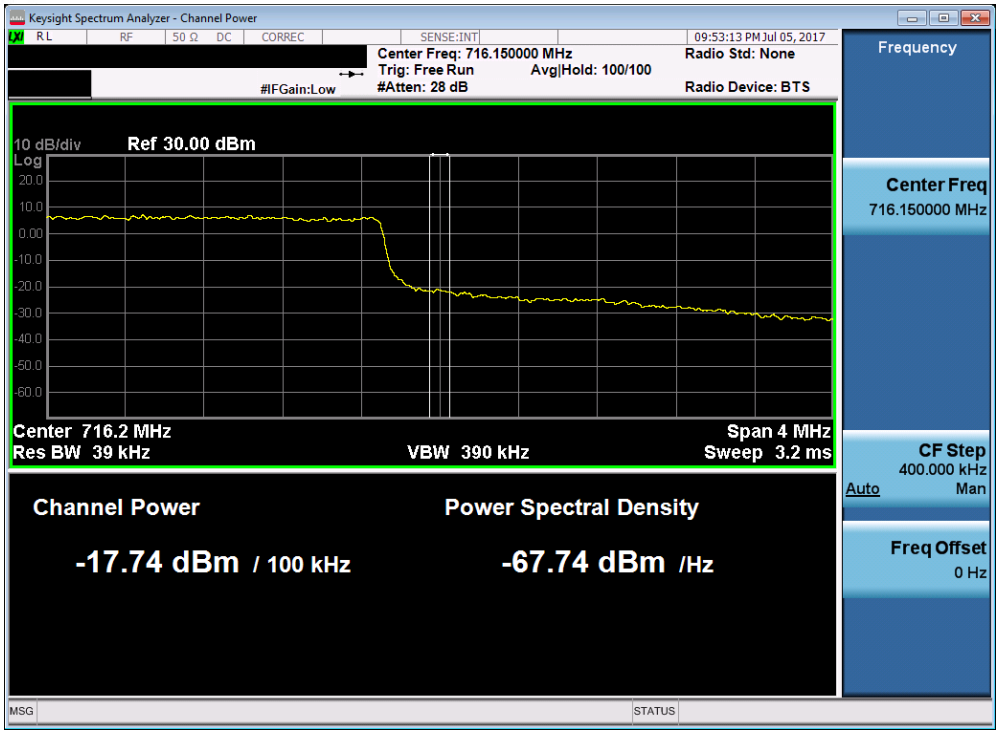


Plot 7-96. Upper Extended Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)

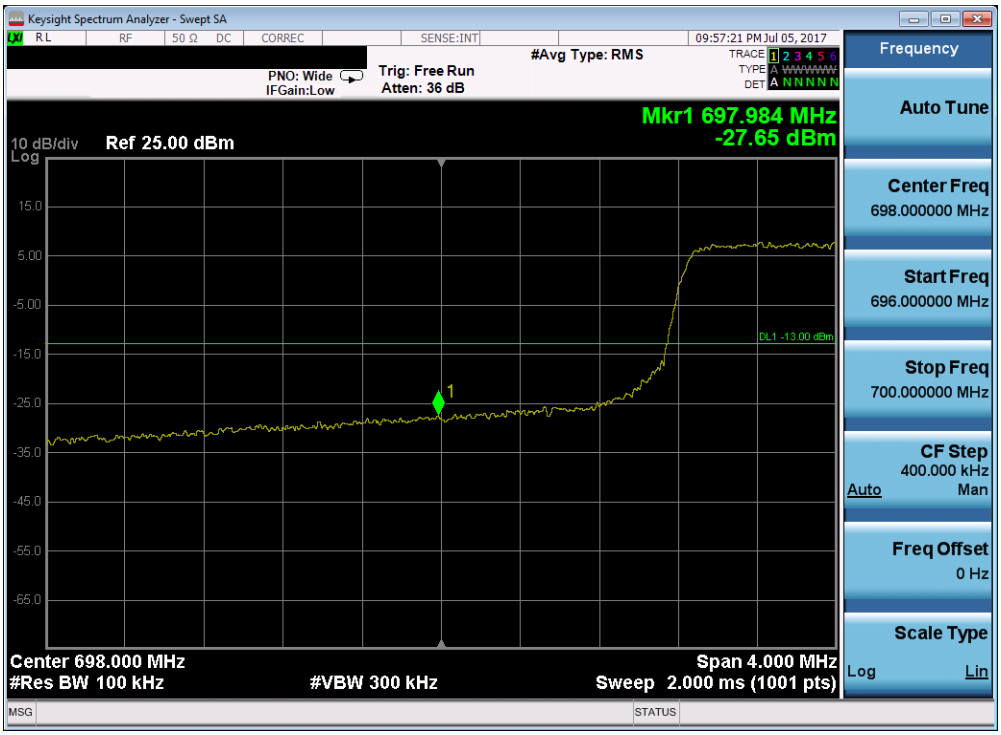


Plot 7-97. Lower Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

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

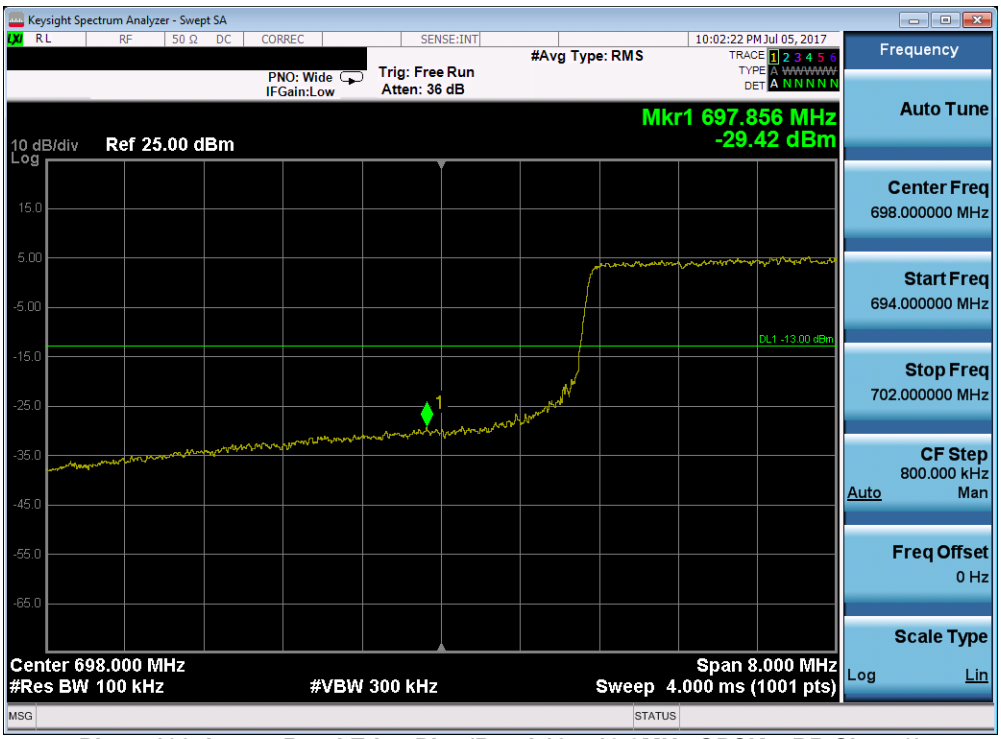


Plot 7-99. Upper Extended Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

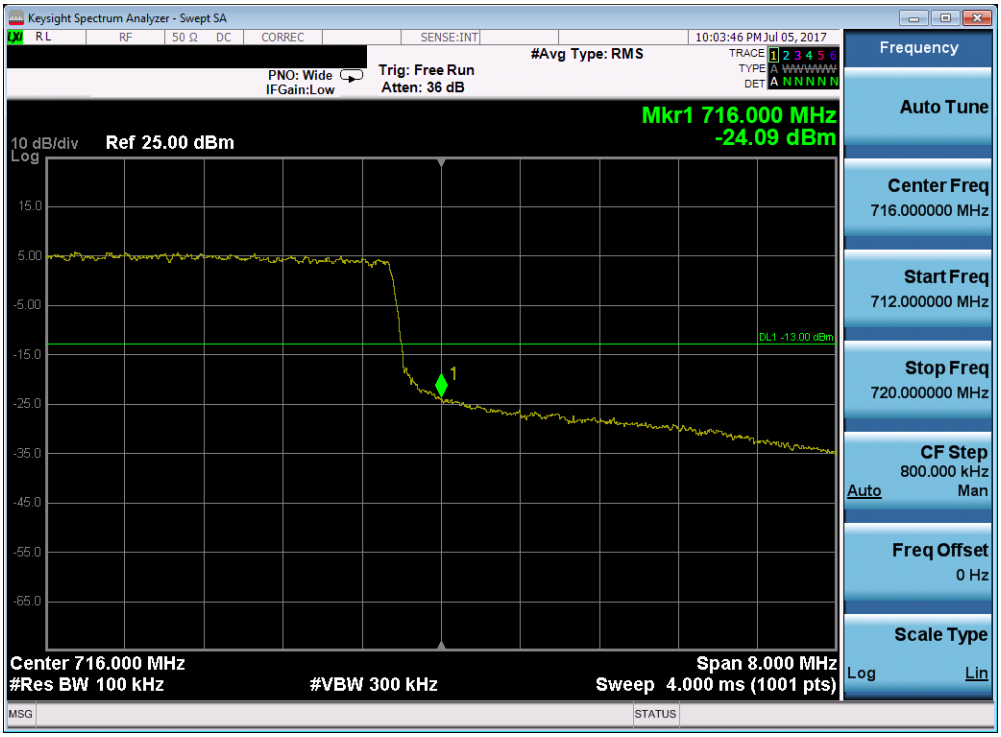


Plot 7-100. Lower Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)

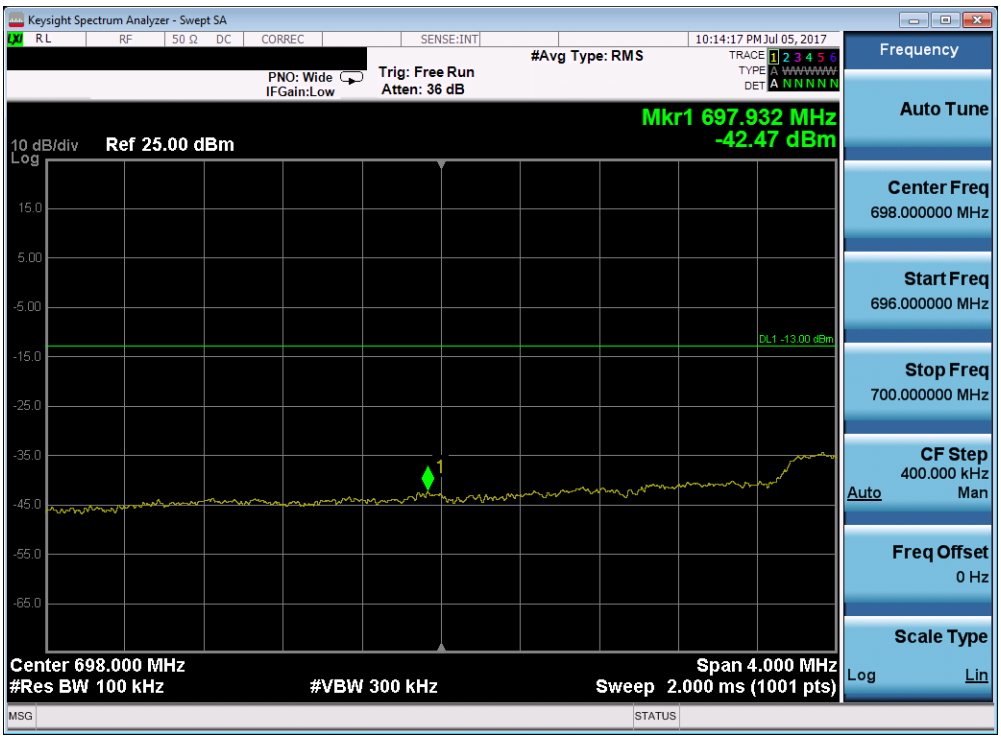
Plot 7-101. Upper Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)



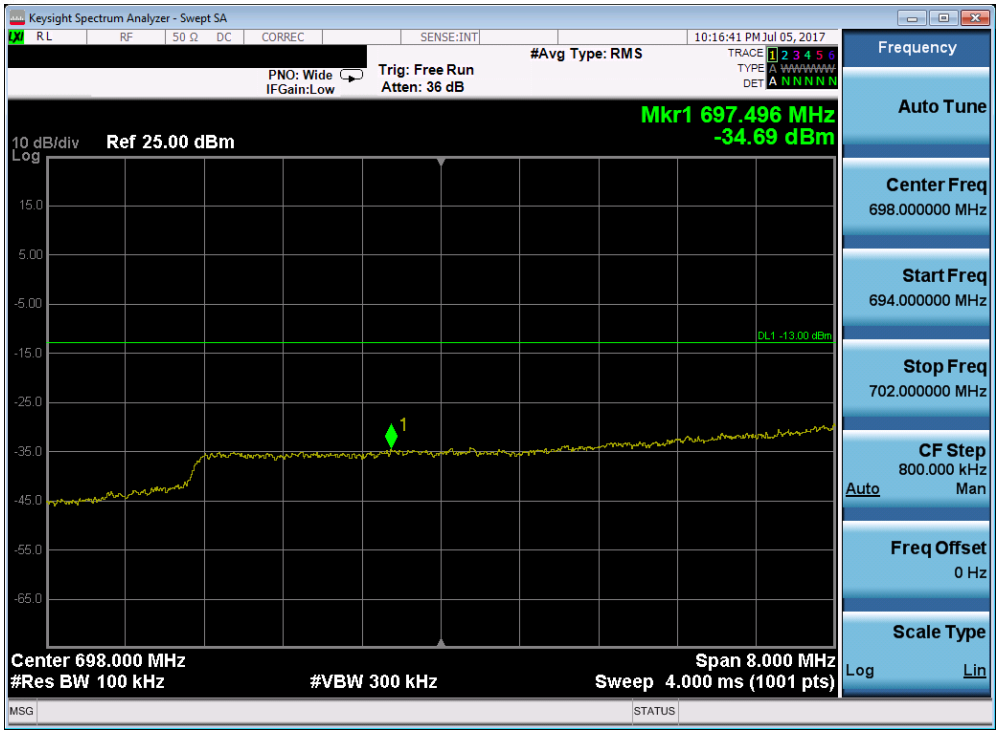
Plot 7-102. Lower Band Edge Plot (Band 12 – 10.0MHz QPSK – RB Size 50)



Plot 7-103. Upper Band Edge Plot (Band 12 – 10.0MHz QPSK – RB Size 50)



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



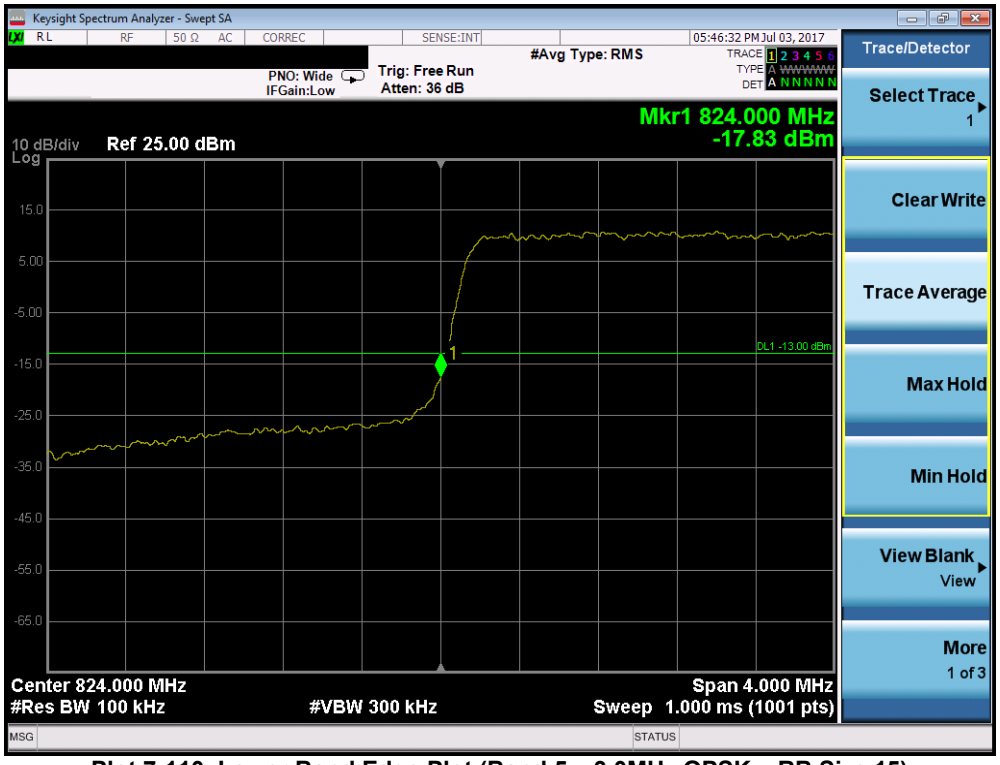
Plot 7-105. Lower Band Edge Plot (Band 17 – 10.0MHz QPSK – RB Size 50)

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

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

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

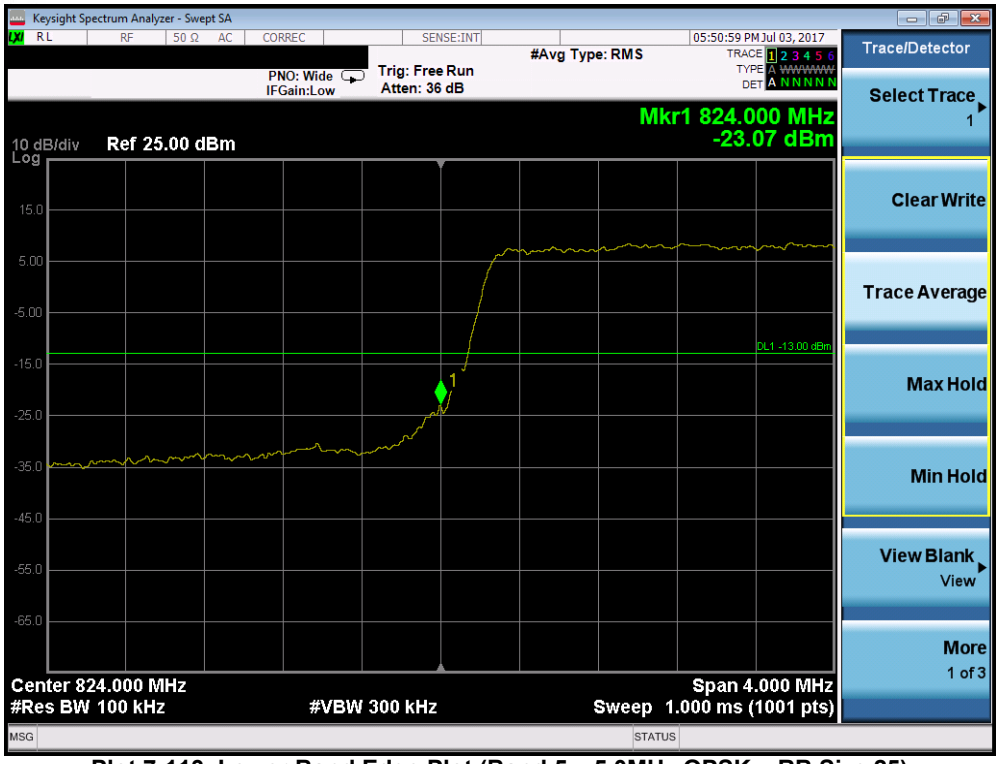
Plot 7-109. Upper Extended Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)



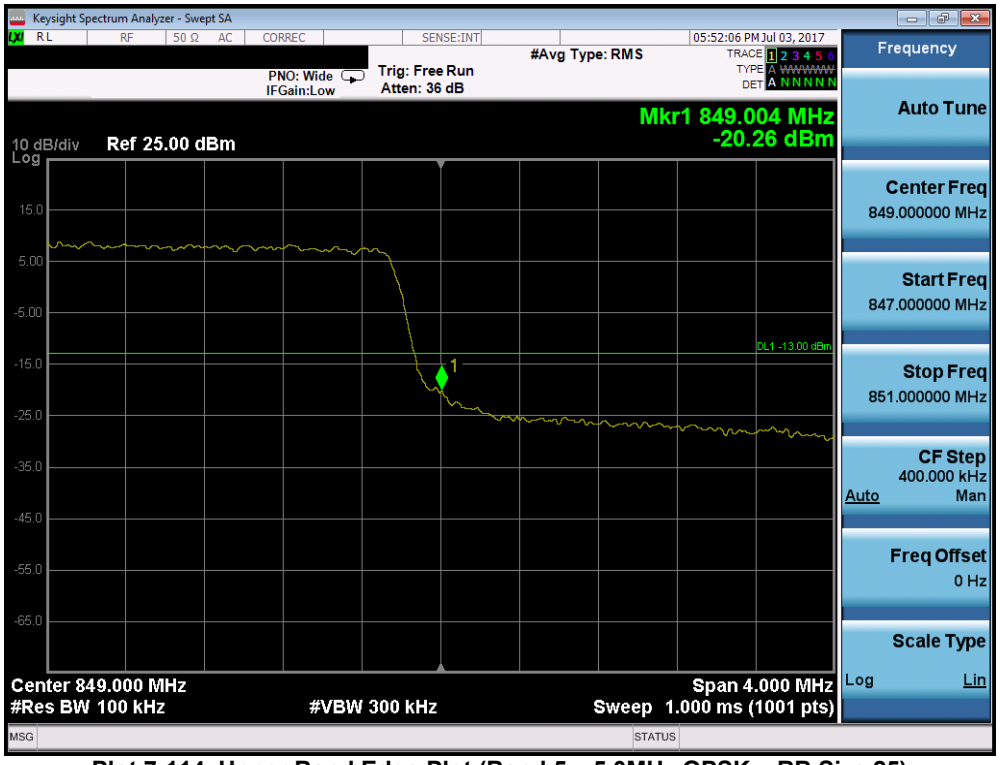
Plot 7-110. Lower Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)

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

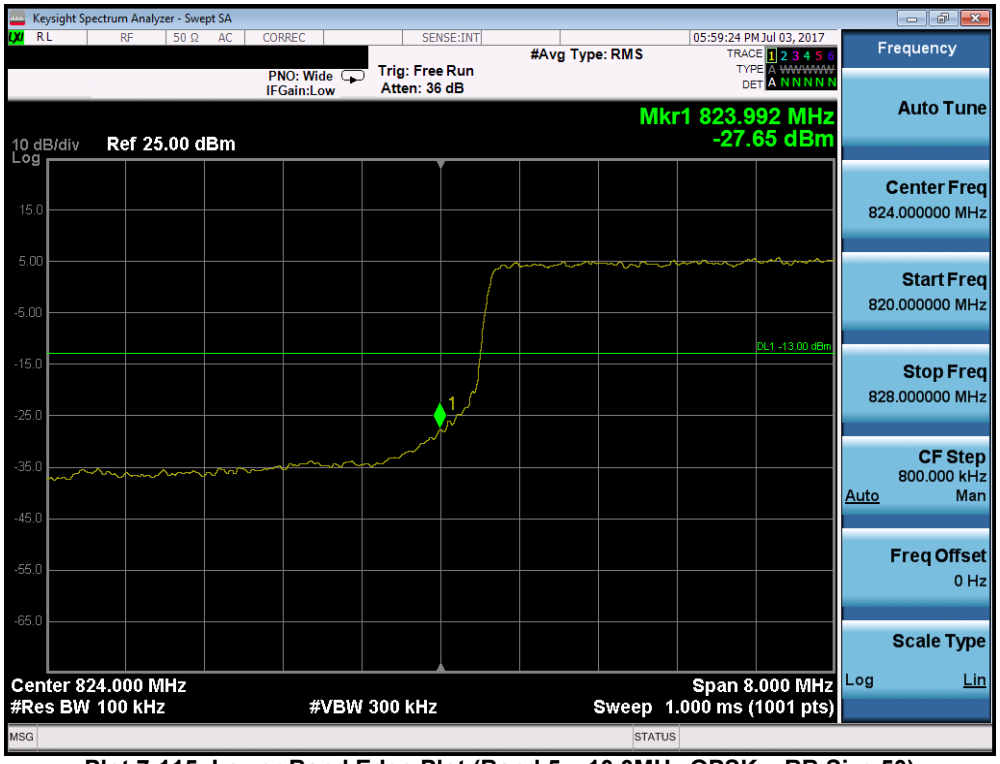
Plot 7-112. Upper Extended Band Edge Plot (Band 5 – Band 5 – 3.0MHz QPSK – RB Size 15)



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



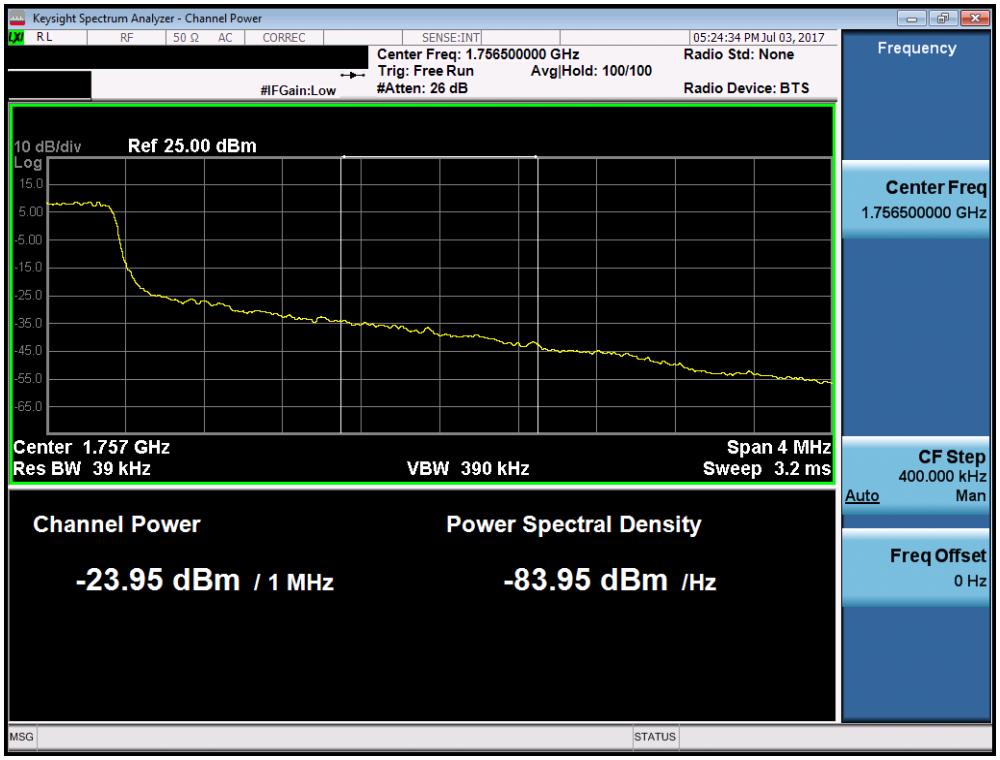
Plot 7-114. Upper Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)



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

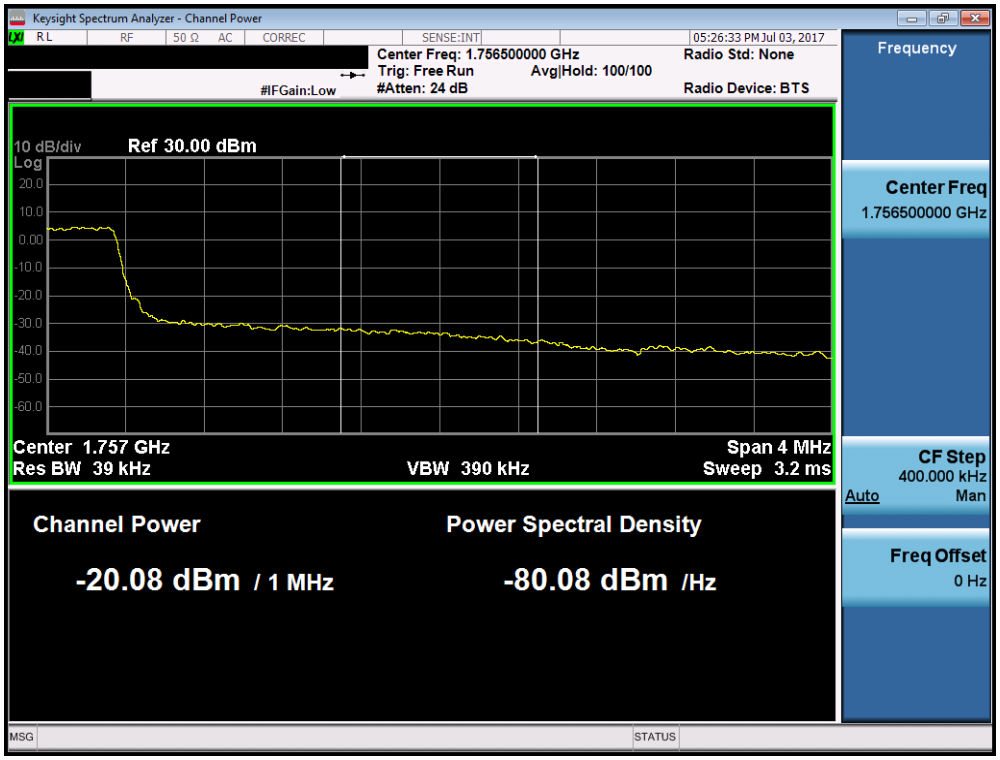
Plot 7-116. Upper Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)

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



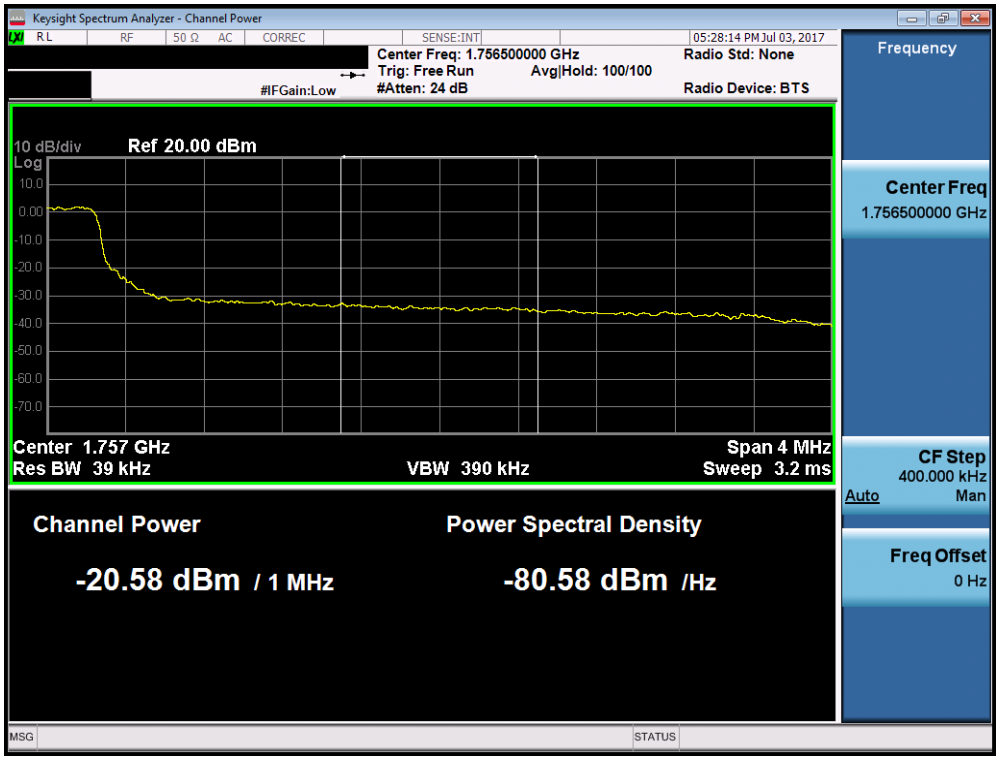
Plot 7-118. Upper Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

Plot 7-119. Upper Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



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

Plot 7-121. Upper Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

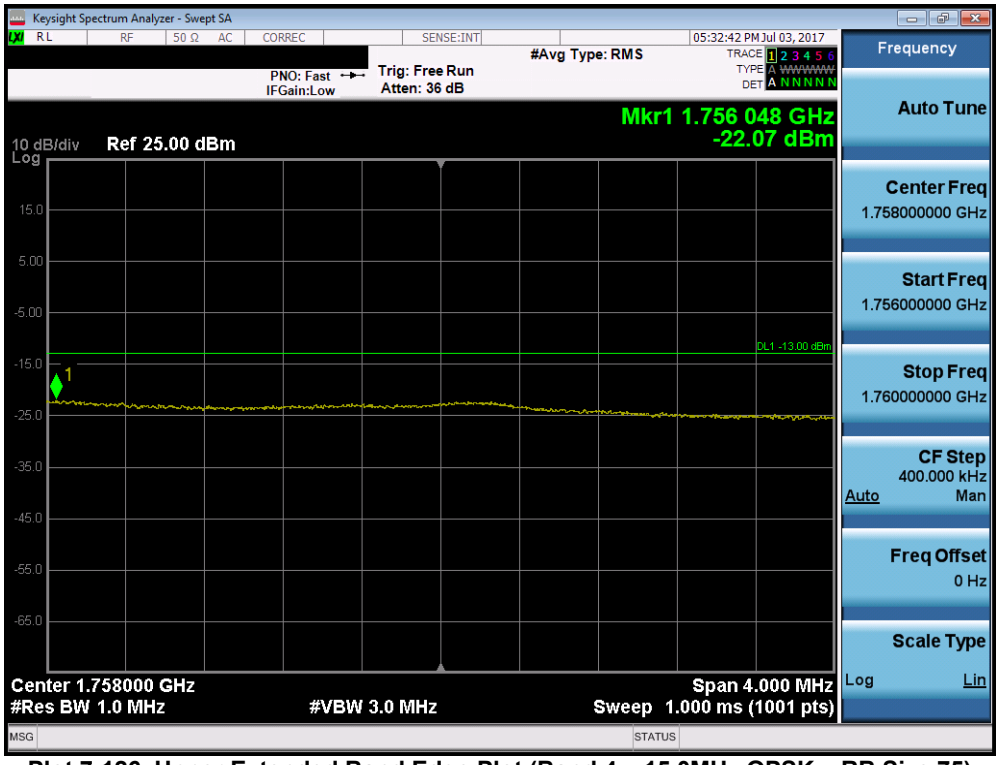


Plot 7-122. Upper Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

Plot 7-123. Upper Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

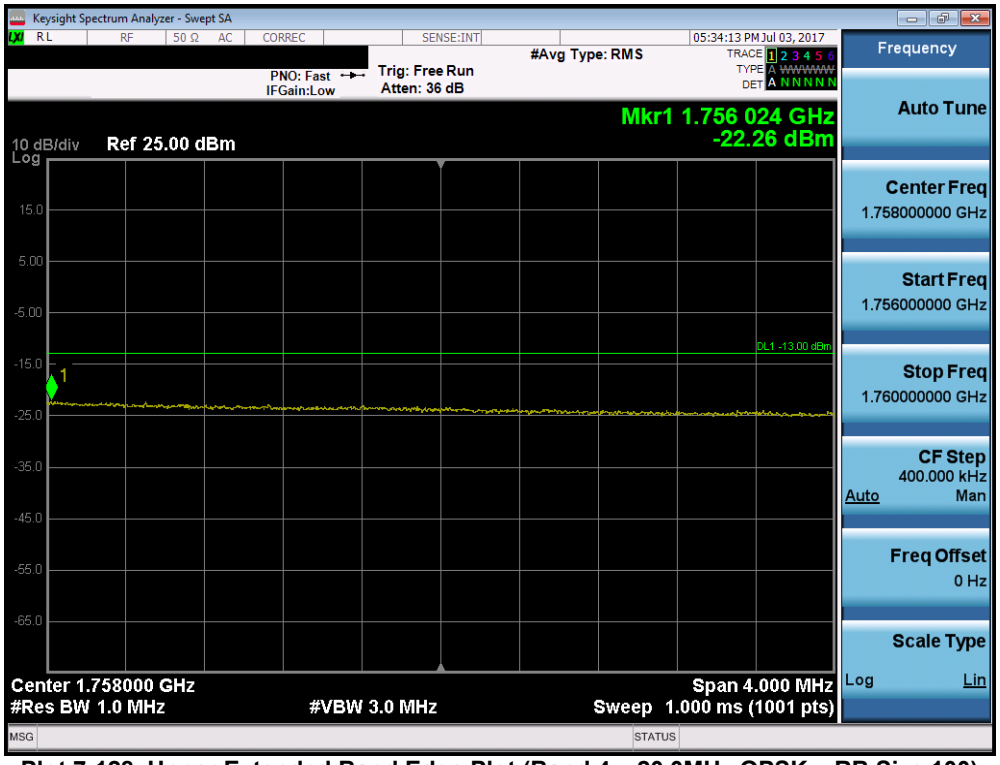
Plot 7-124. Upper Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

Plot 7-125. Upper Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

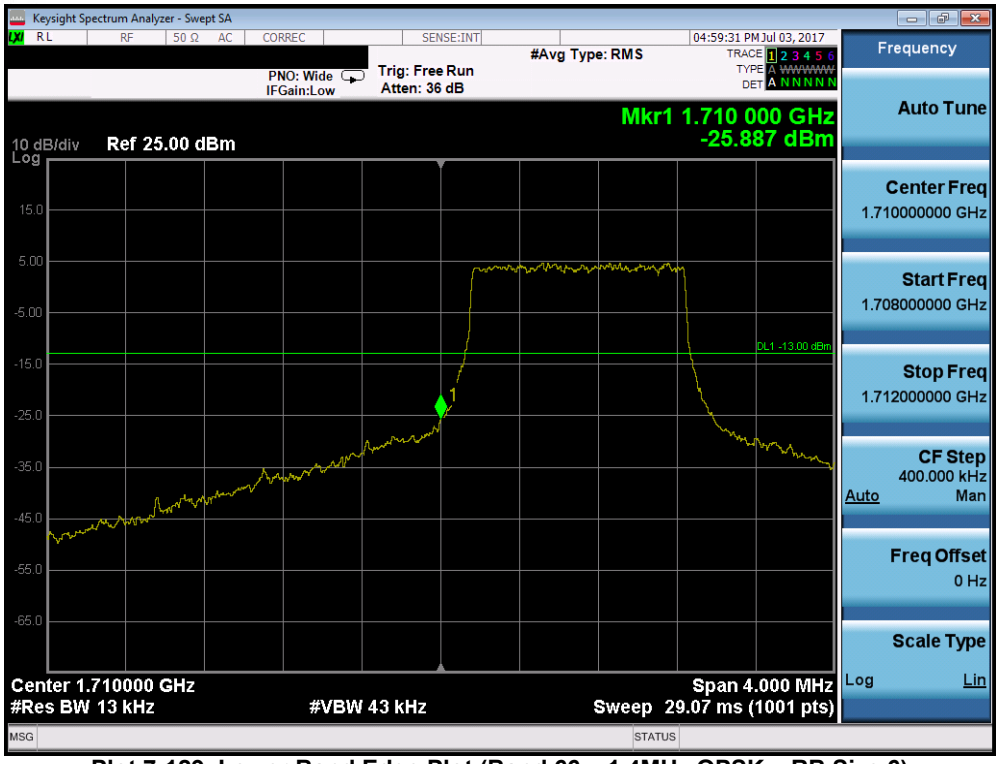


Plot 7-126. Upper Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

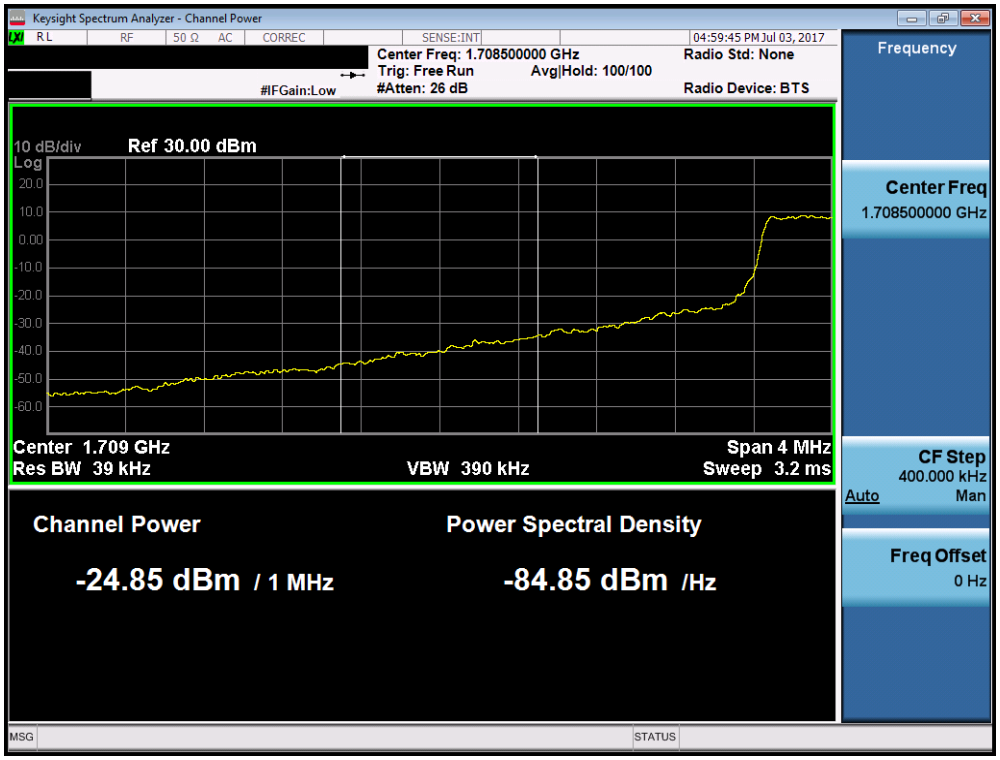
Plot 7-127. Upper Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



Plot 7-128. Upper Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

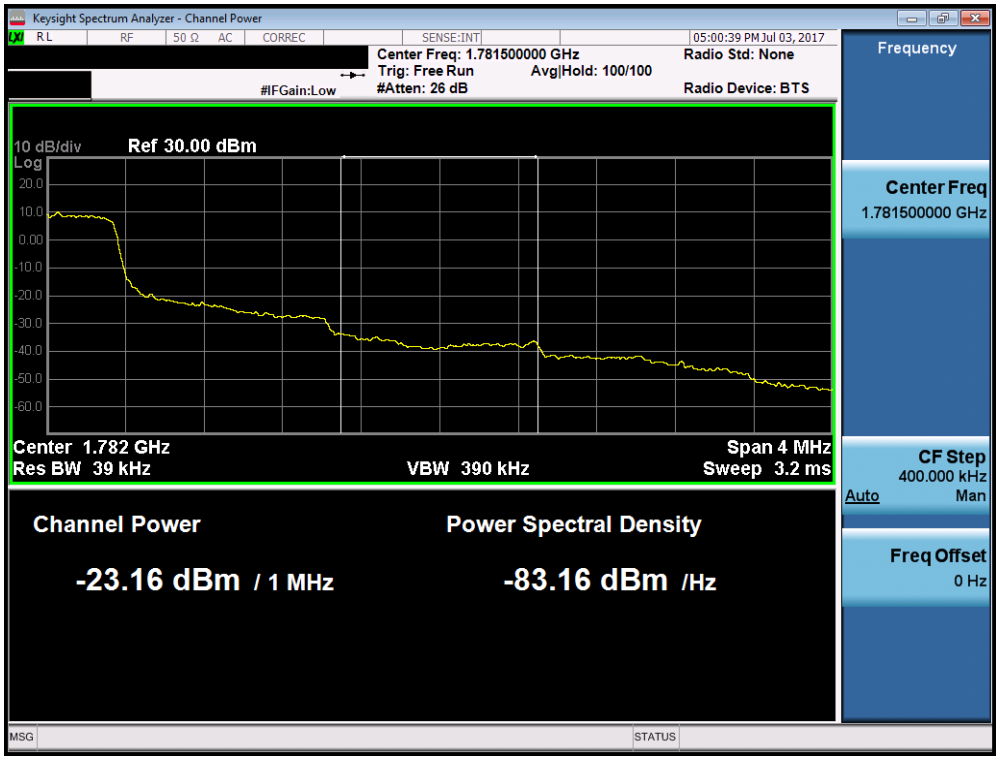


Plot 7-129. Lower Band Edge Plot (Band 66 – 1.4MHz QPSK – RB Size 6)

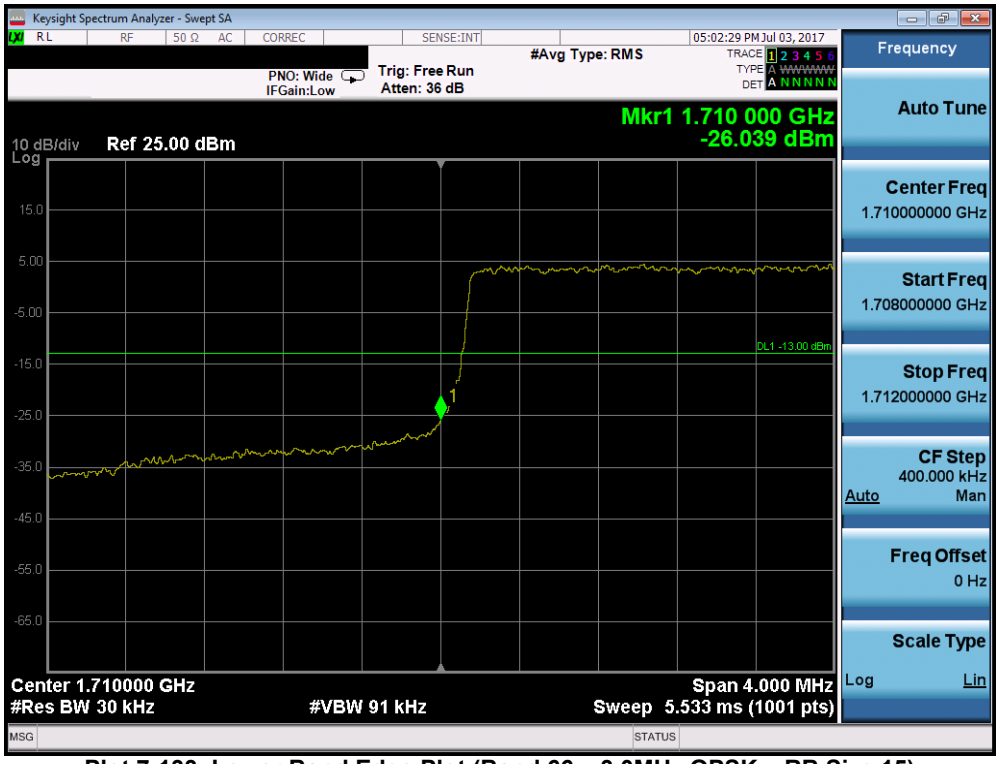


Plot 7-130. Lower Extended Band Edge Plot (Band 66 – 1.4MHz QPSK – RB Size 6)

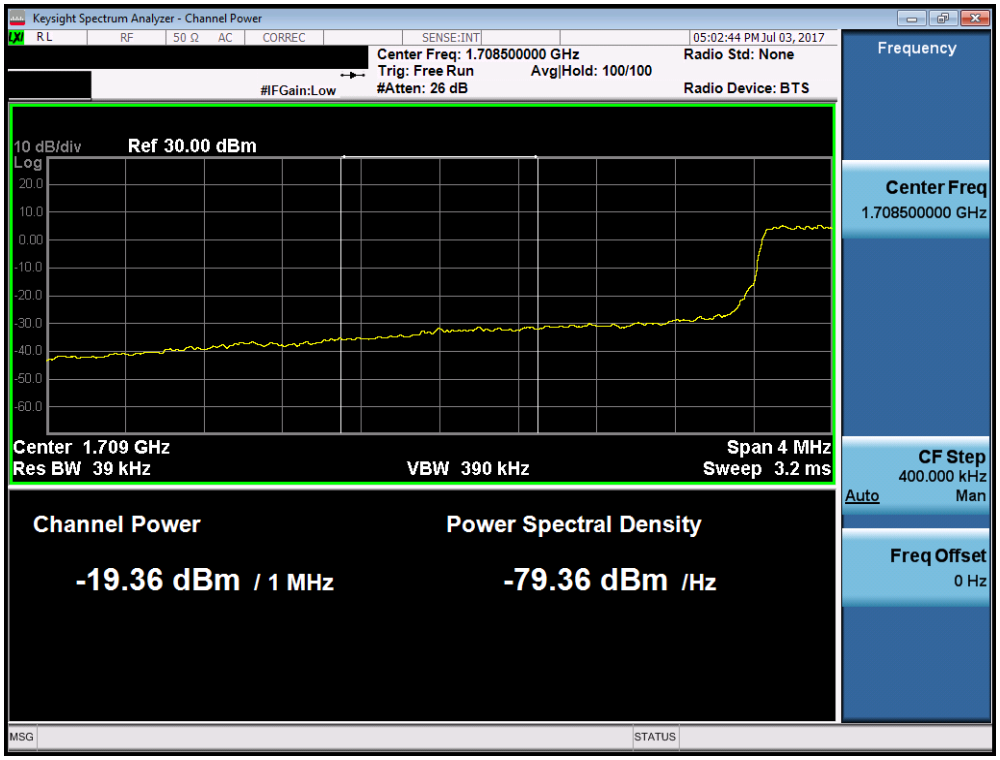
Plot 7-131. Upper Band Edge Plot (Band 66 – 1.4MHz QPSK – RB Size 6)



Plot 7-132. Upper Extended Band Edge Plot (Band 66 – 1.4MHz QPSK – RB Size 6)



Plot 7-133. Lower Band Edge Plot (Band 66 – 3.0MHz QPSK – RB Size 15)



Plot 7-134. Lower Extended Band Edge Plot (Band 66 – 3.0MHz QPSK – RB Size 15)

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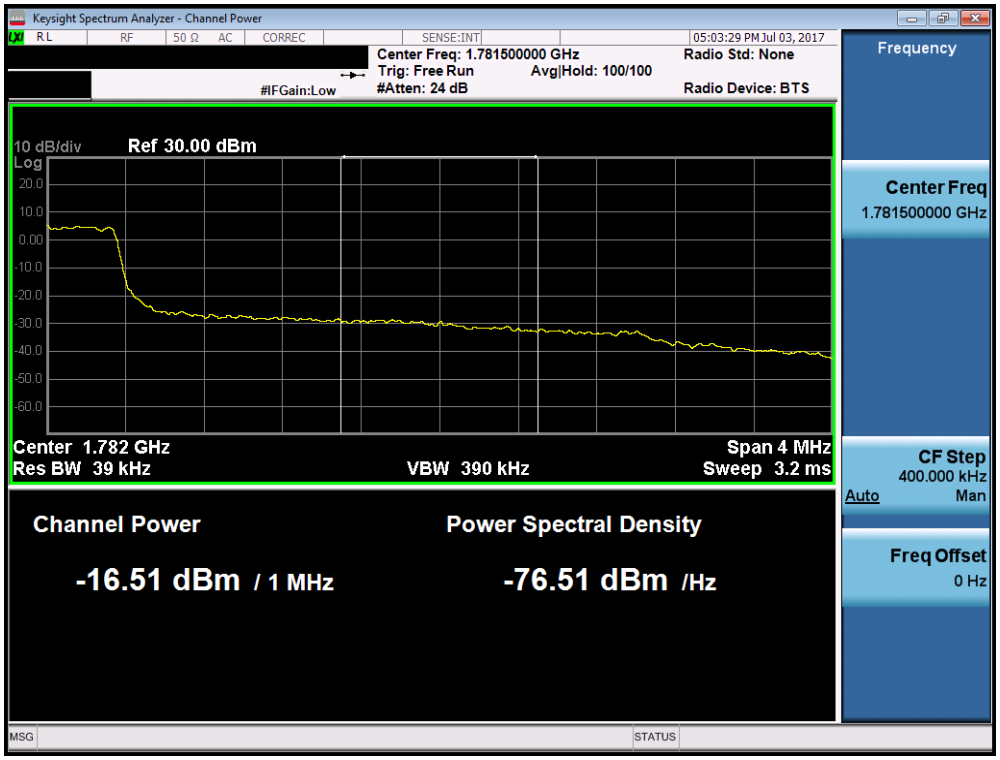
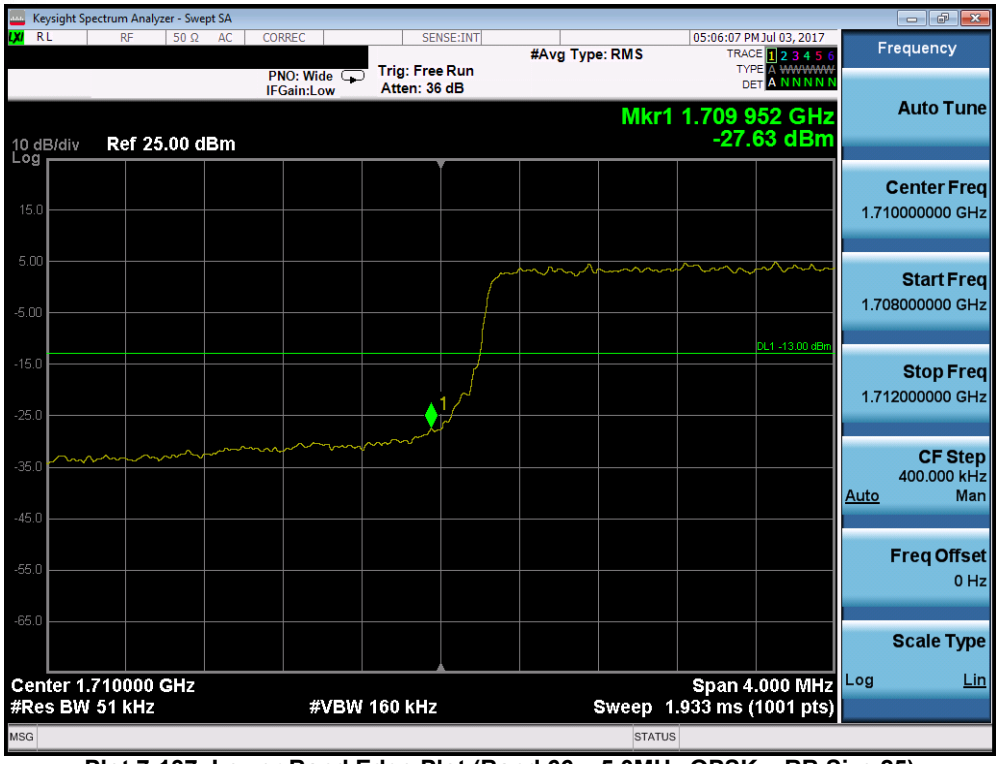
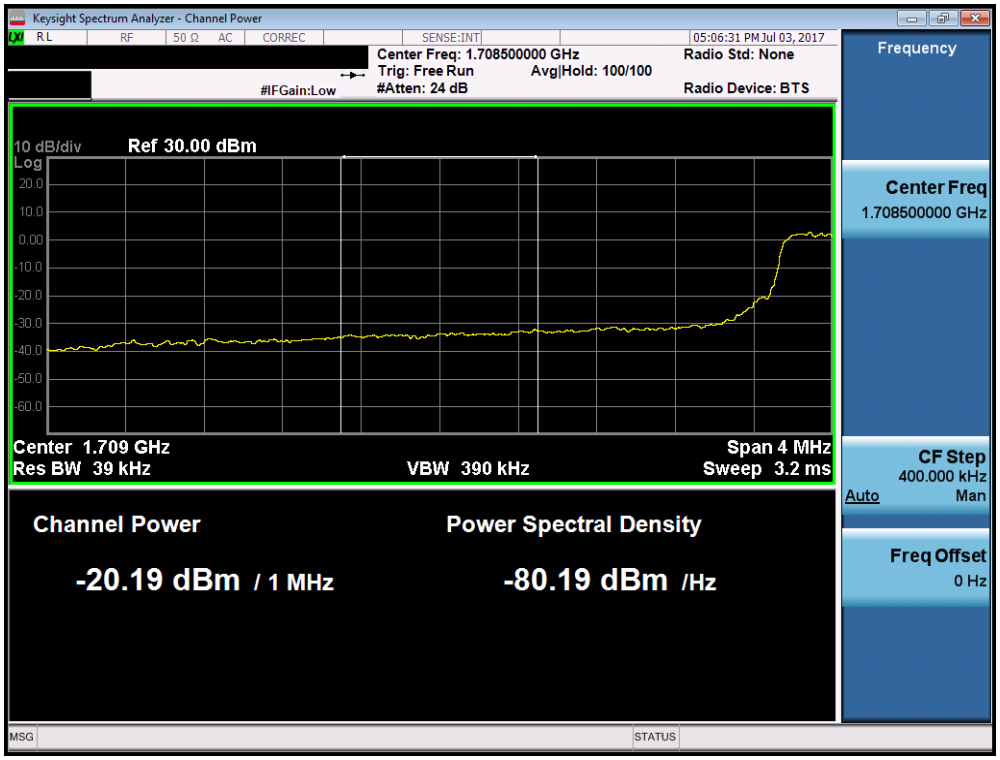
Plot 7-135. Upper Band Edge Plot (Band 66 – 3.0MHz QPSK – RB Size 15)



Plot 7-136. Upper Extended Band Edge Plot (Band 66 – 3.0MHz QPSK – RB Size 15)

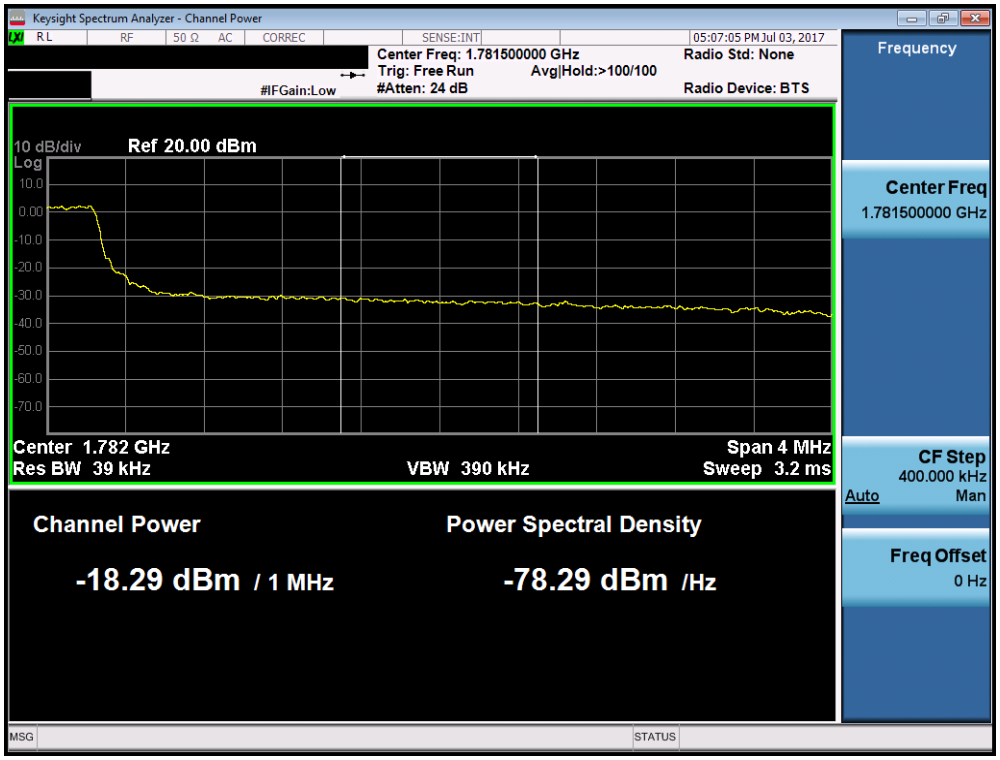


Plot 7-137. Lower Band Edge Plot (Band 66 – 5.0MHz QPSK – RB Size 25)



Plot 7-138. Lower Extended Band Edge Plot (Band 66 – 5.0MHz QPSK – RB Size 25)

Plot 7-139. Upper Band Edge Plot (Band 66 – 5.0MHz QPSK – RB Size 25)

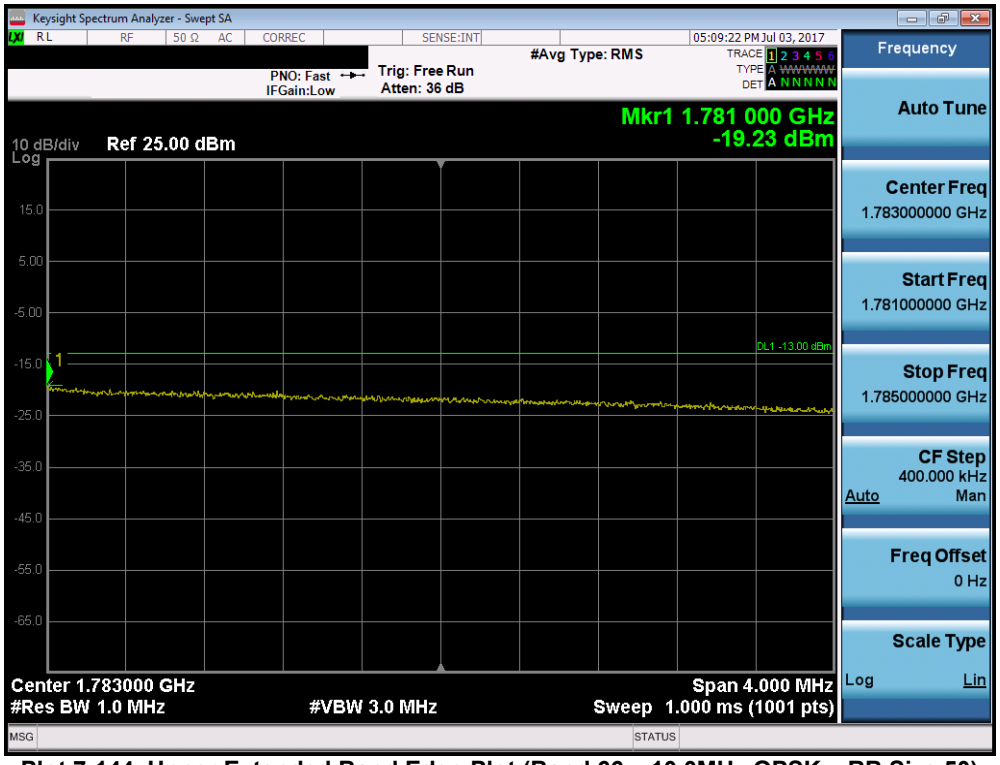


Plot 7-140. Upper Extended Band Edge Plot (Band 66 – 5.0MHz QPSK – RB Size 25)

Plot 7-141. Lower Band Edge Plot (Band 66 – 10.0MHz QPSK – RB Size 50)

Plot 7-142. Lower Extended Band Edge Plot (Band 66 – 10.0MHz QPSK – RB Size 50)

Plot 7-143. Upper Band Edge Plot (Band 66 – 10.0MHz QPSK – RB Size 50)

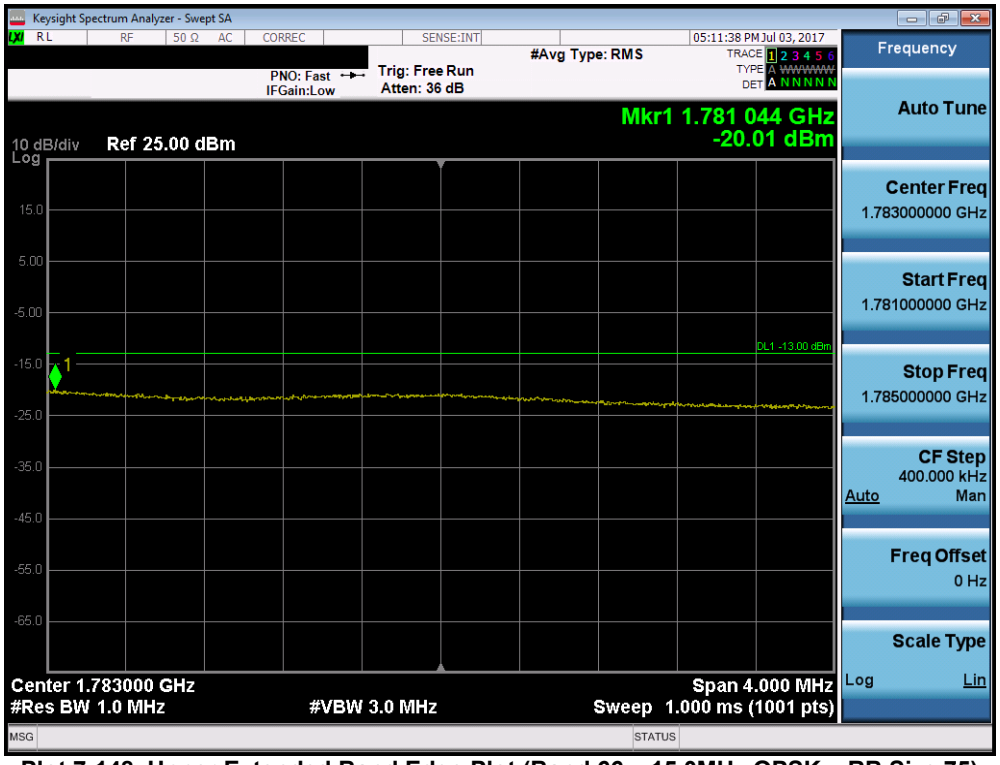


Plot 7-144. Upper Extended Band Edge Plot (Band 66 – 10.0MHz QPSK – RB Size 50)

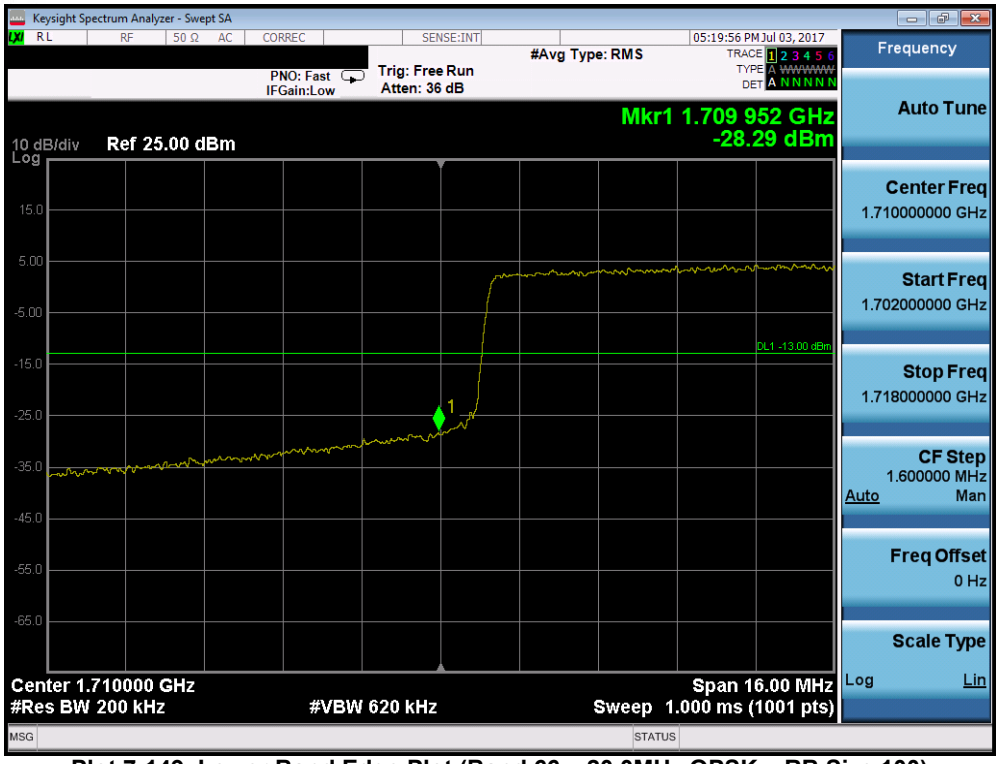
Plot 7-145. Lower Band Edge Plot (Band 66 – 15.0MHz QPSK – RB Size 75)

Plot 7-146. Lower Extended Band Edge Plot (Band 66 – 15.0MHz QPSK – RB Size 75)

Plot 7-147. Upper Band Edge Plot (Band 66 – 15.0MHz QPSK – RB Size 75)



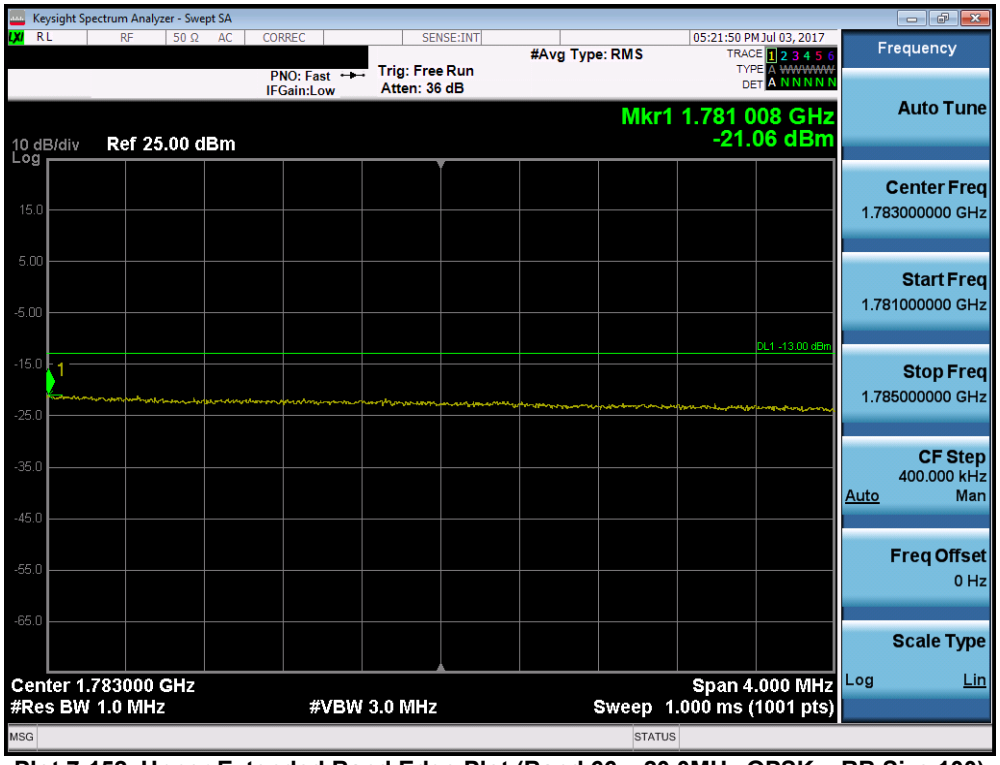
Plot 7-148. Upper Extended Band Edge Plot (Band 66 – 15.0MHz QPSK – RB Size 75)



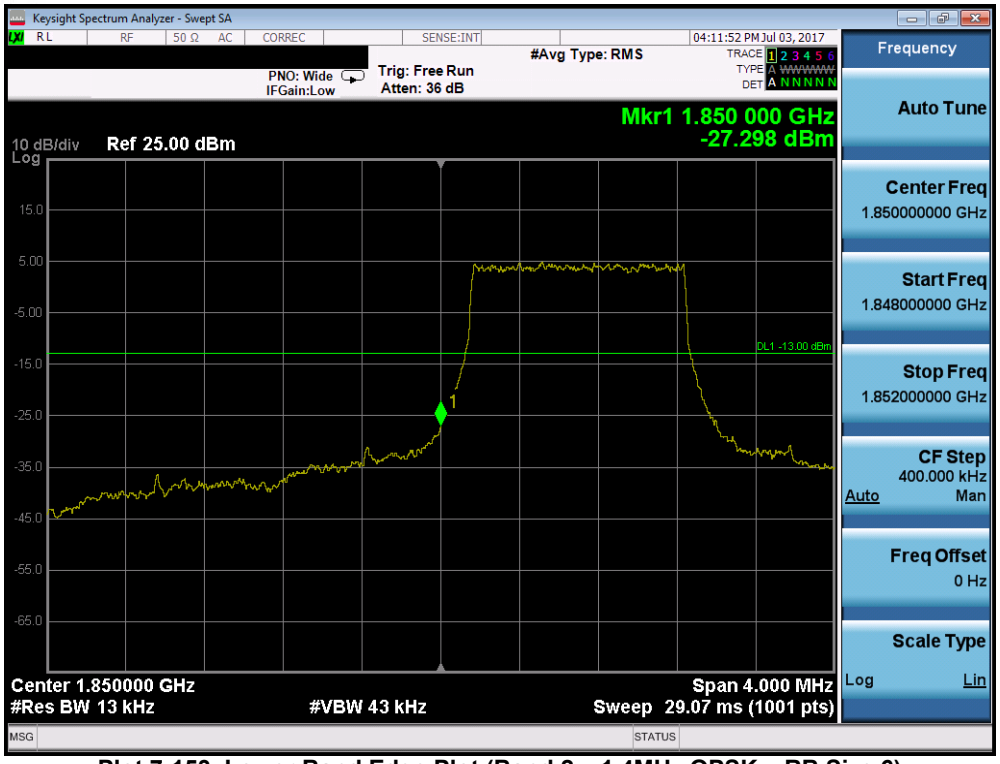
Plot 7-149. Lower Band Edge Plot (Band 66 – 20.0MHz QPSK – RB Size 100)

Plot 7-150. Lower Extended Band Edge Plot (Band 66 – 20.0MHz QPSK – RB Size 100)

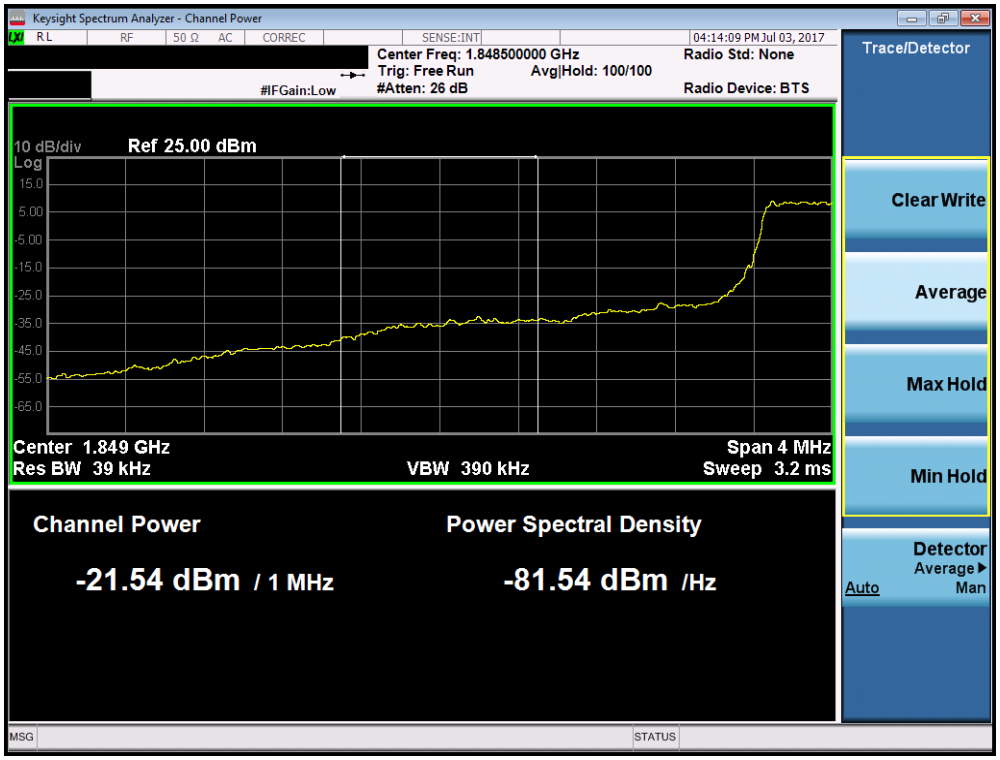
Plot 7-151. Upper Band Edge Plot (Band 66 – 20.0MHz QPSK – RB Size 100)



Plot 7-152. Upper Extended Band Edge Plot (Band 66 – 20.0MHz QPSK – RB Size 100)

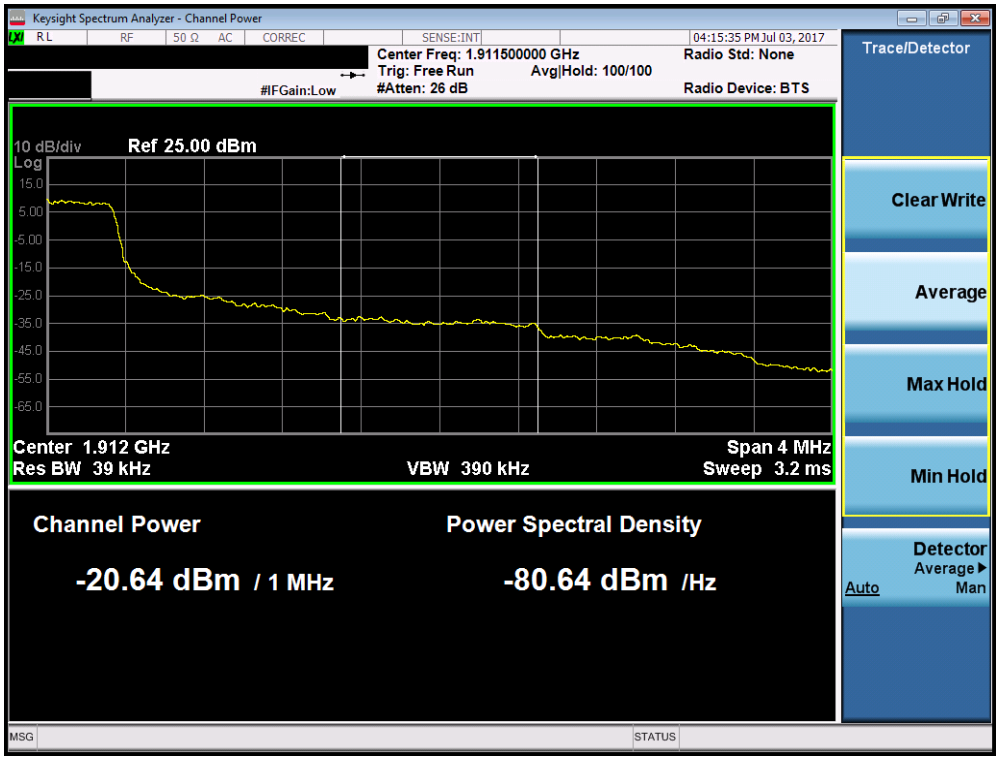


Plot 7-153. Lower Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

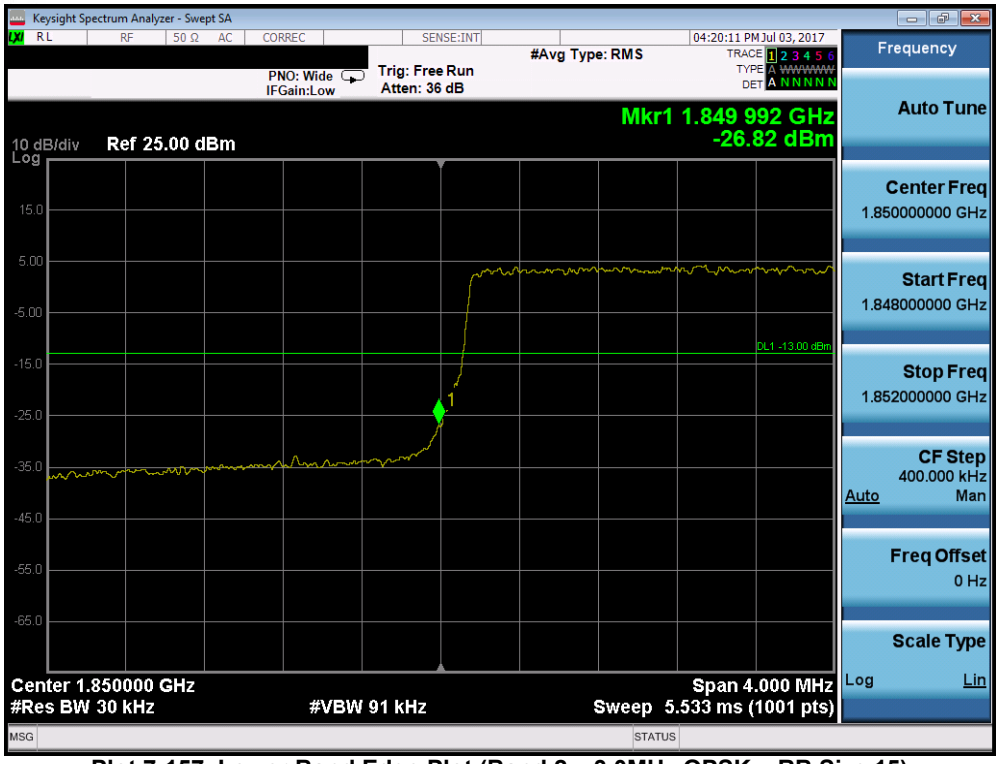


Plot 7-154. Lower Extended Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

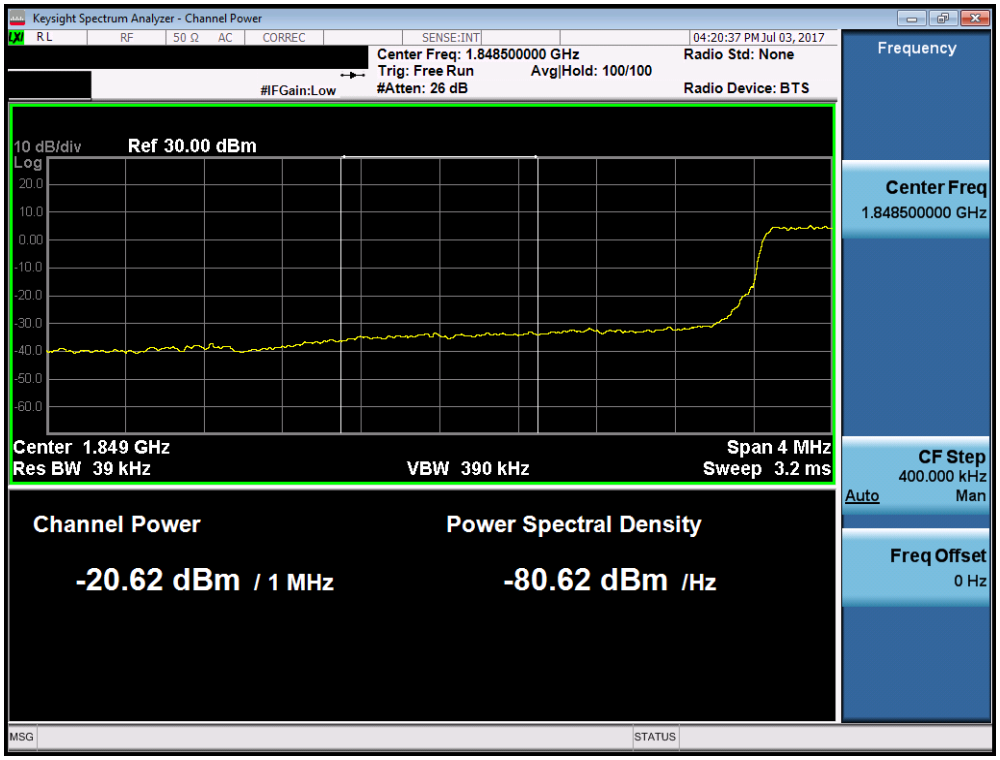
Plot 7-155. Upper Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)



Plot 7-156. Upper Extended Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

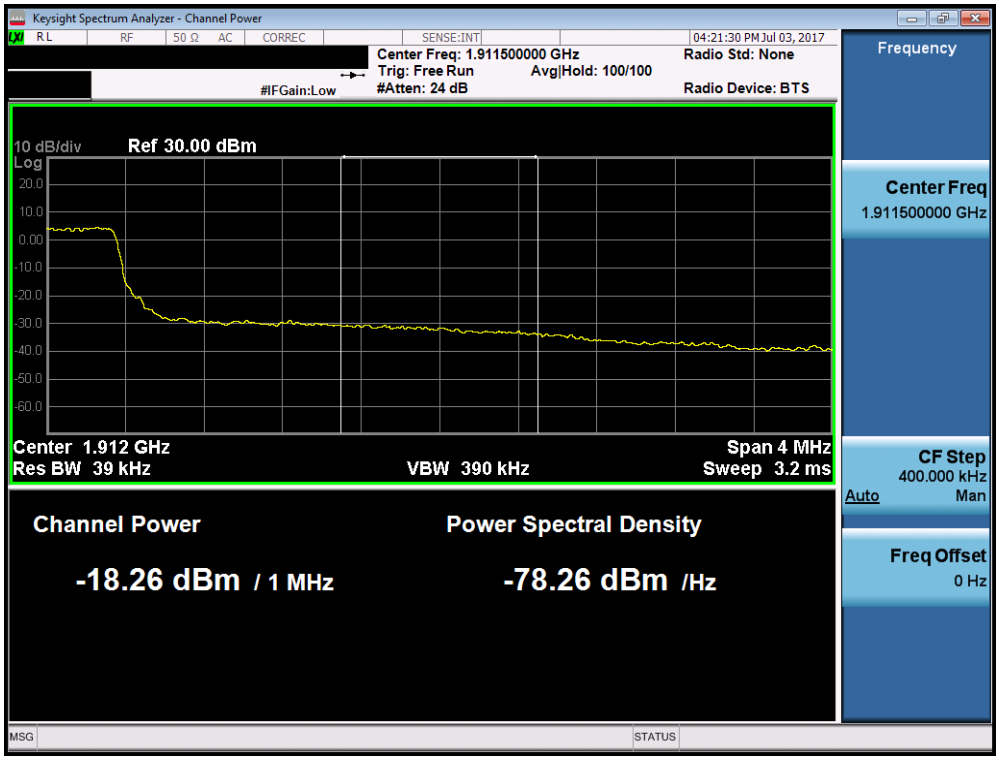


Plot 7-157. Lower Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

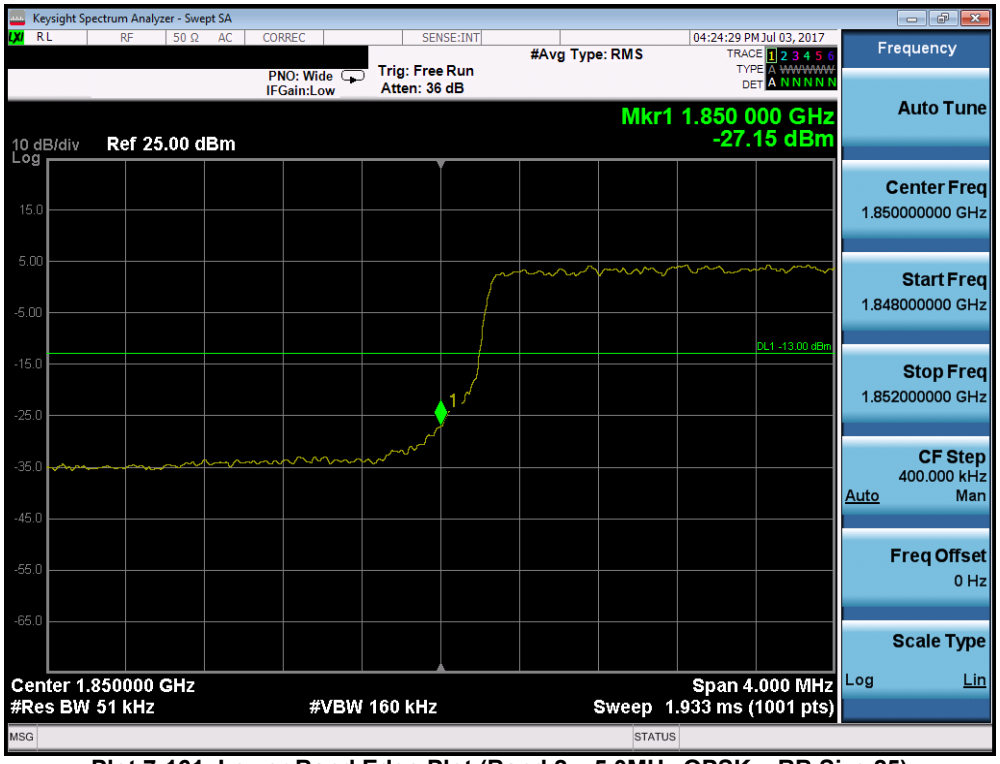


Plot 7-158. Lower Extended Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

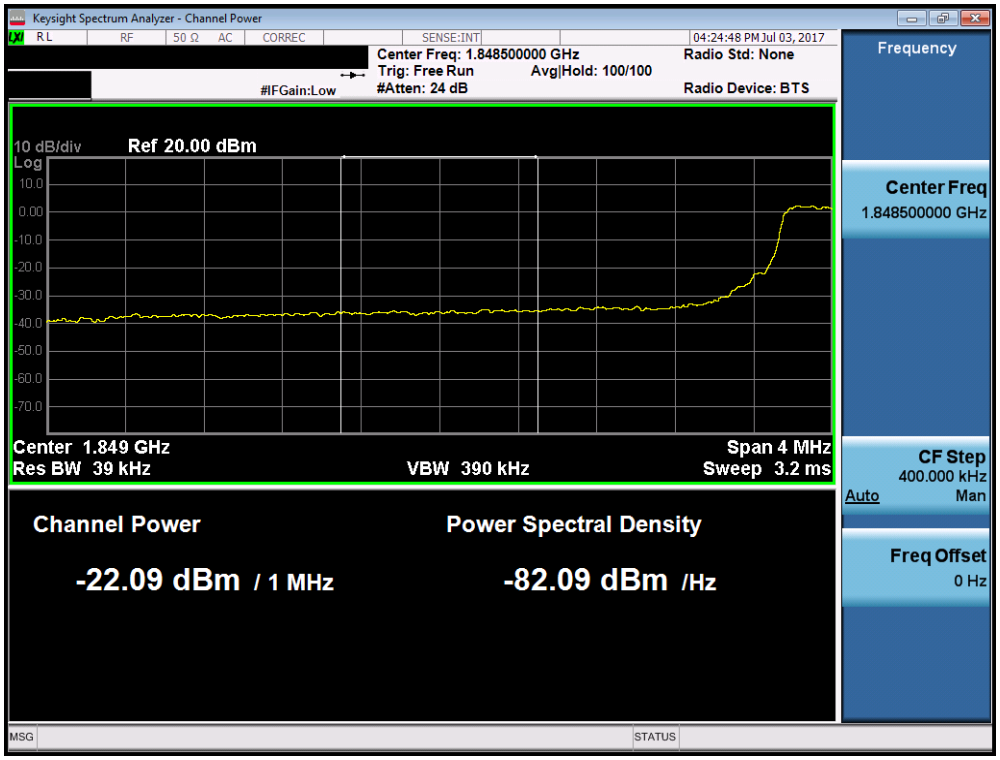
Plot 7-159. Upper Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)



Plot 7-160. Upper Extended Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)



Plot 7-161. Lower Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)



Plot 7-162. Lower Extended Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

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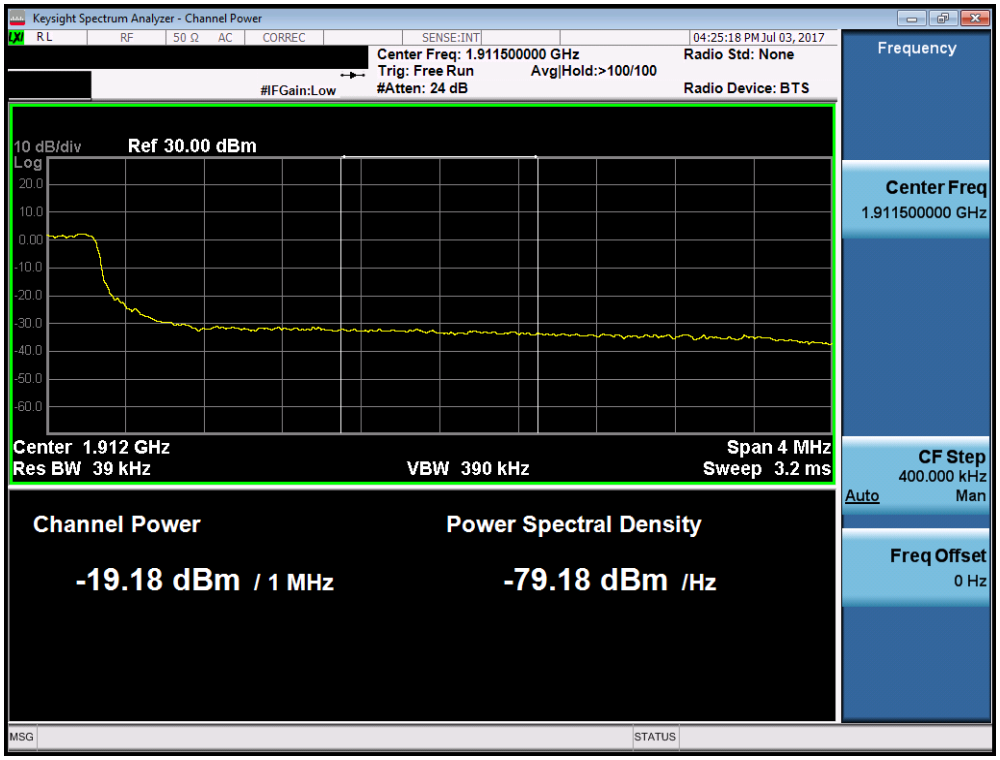
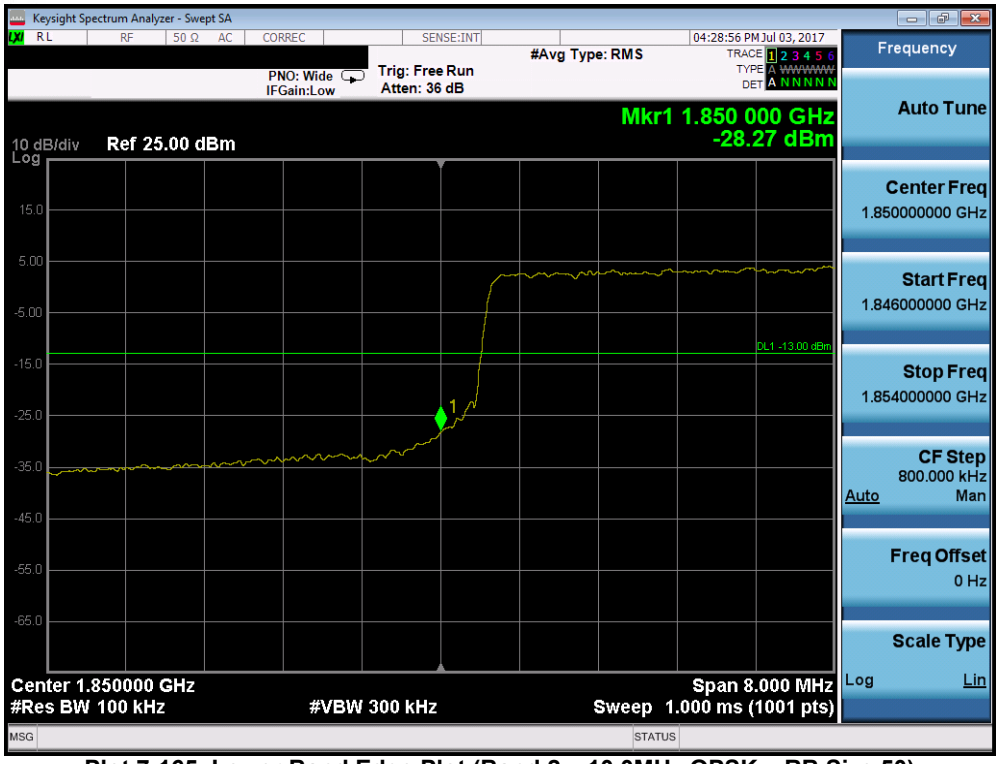
Plot 7-163. Upper Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)



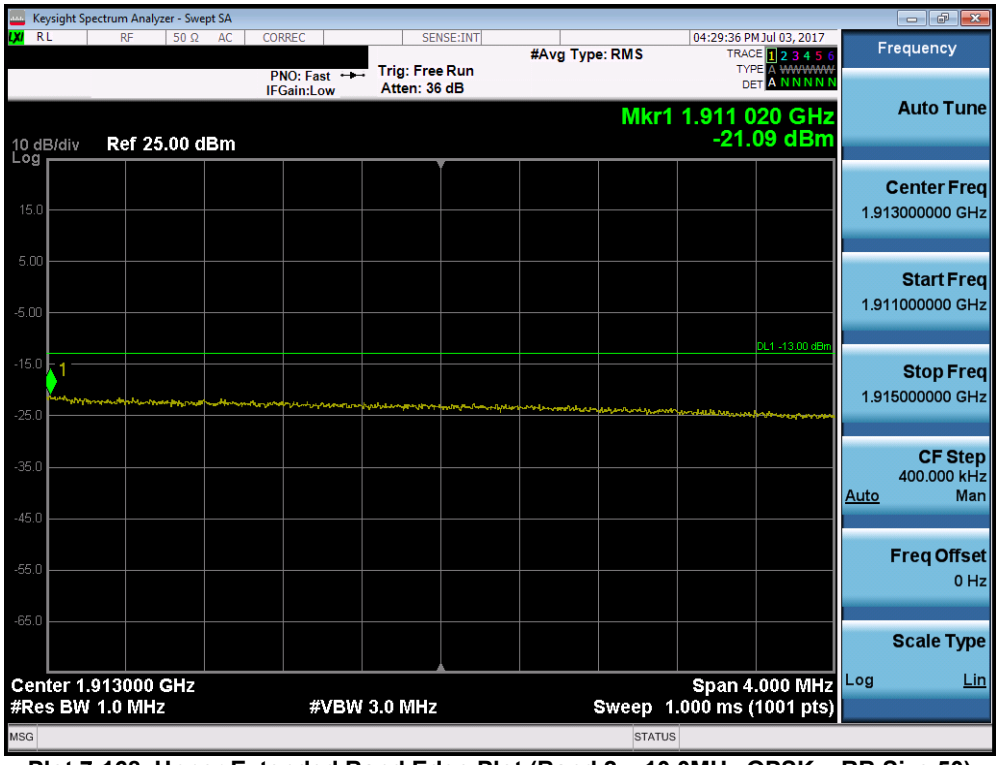
Plot 7-164. Upper Extended Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)



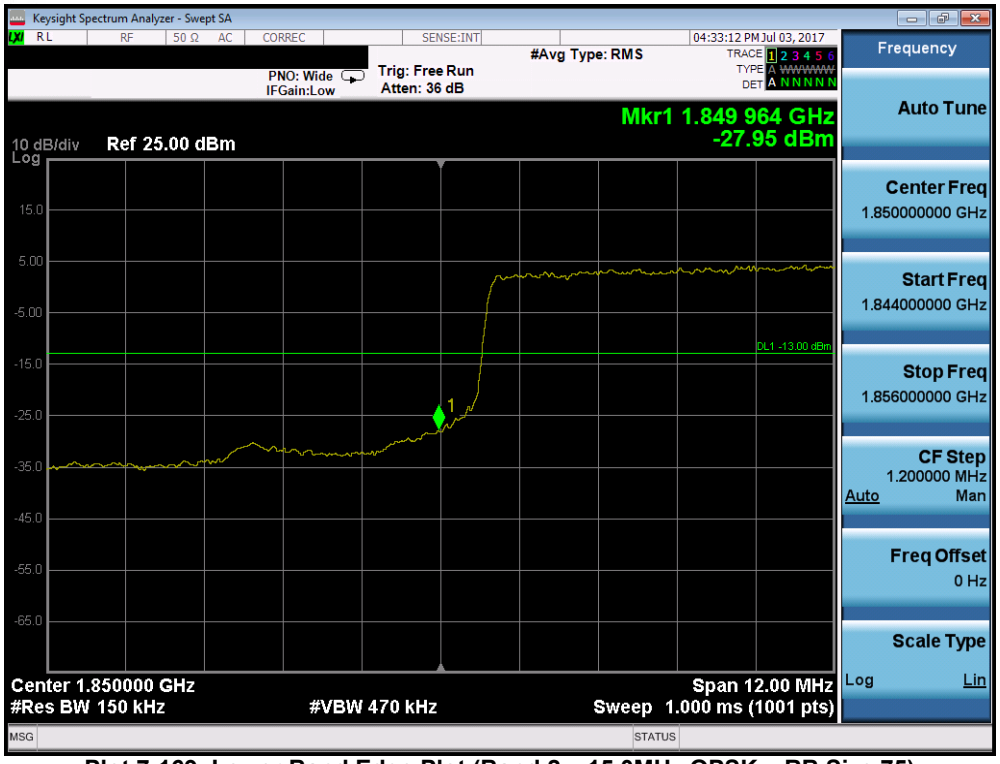
Plot 7-165. Lower Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

Plot 7-166. Lower Extended Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

Plot 7-167. Upper Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)



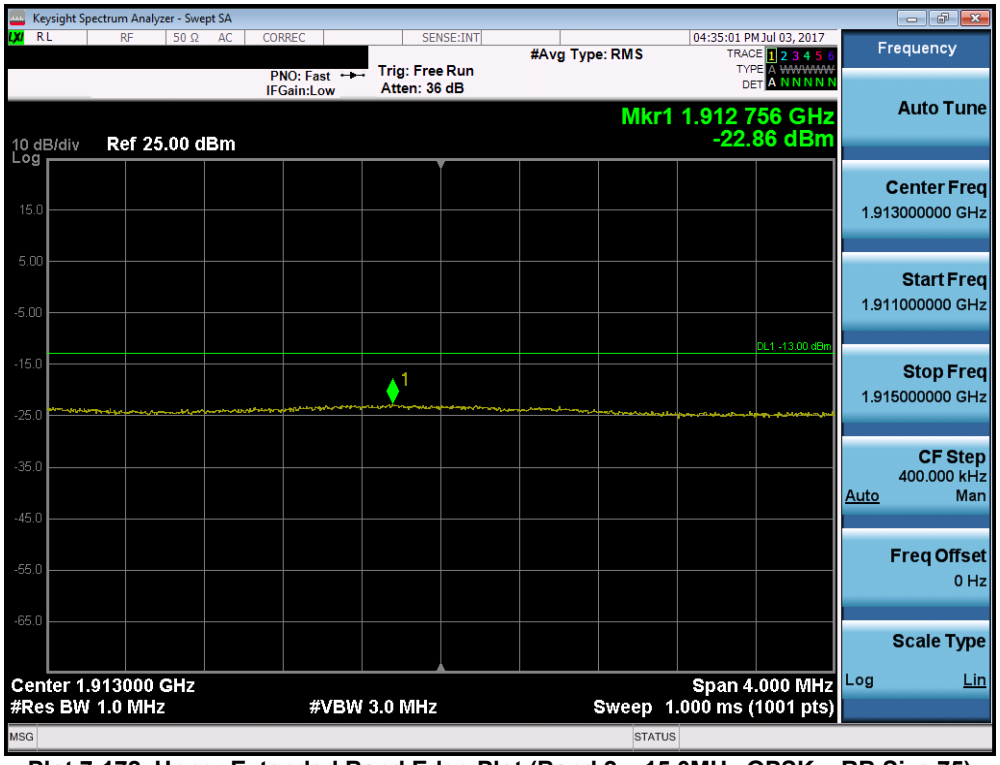
Plot 7-168. Upper Extended Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)



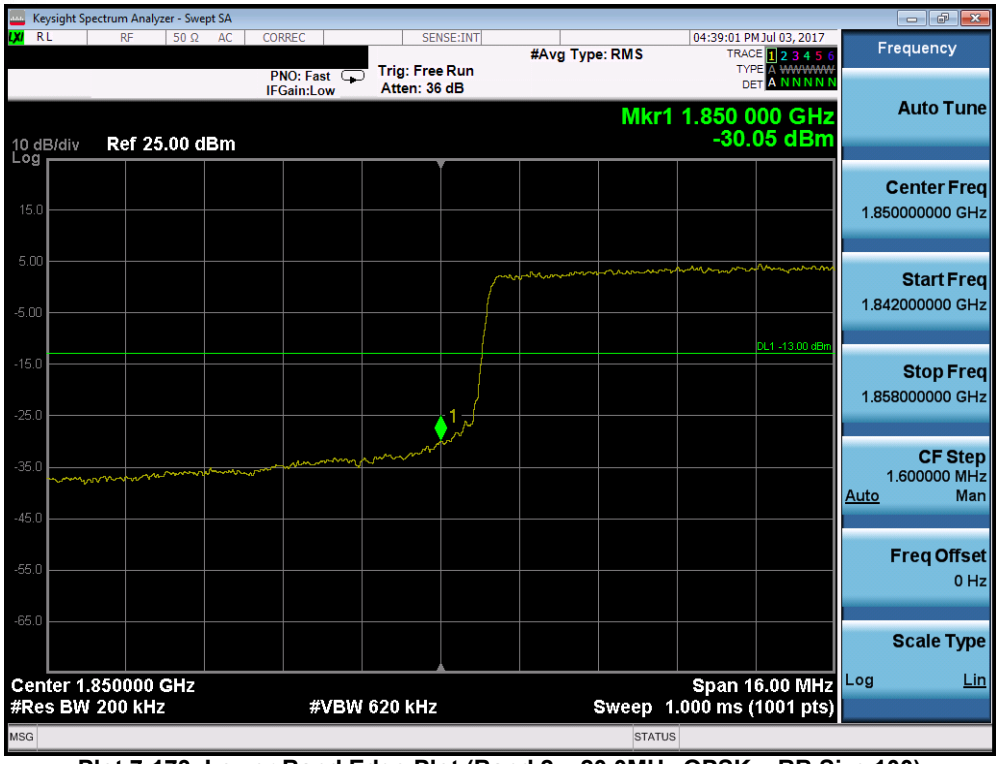
Plot 7-169. Lower Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

Plot 7-170. Lower Extended Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

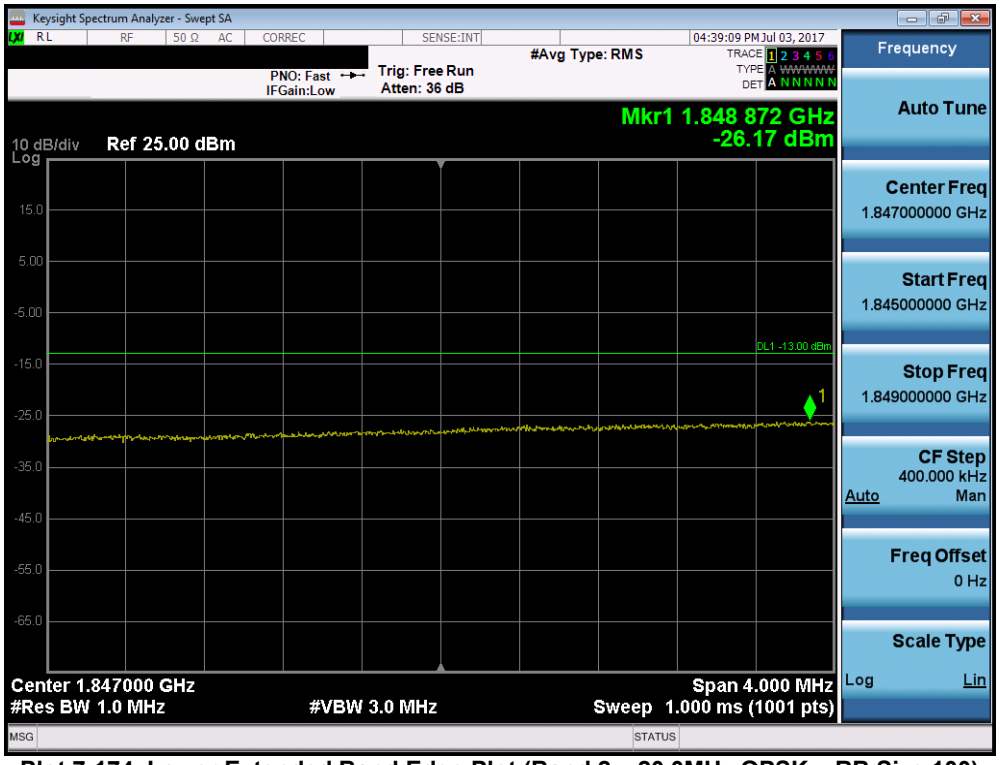
Plot 7-171. Upper Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)



Plot 7-172. Upper Extended Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

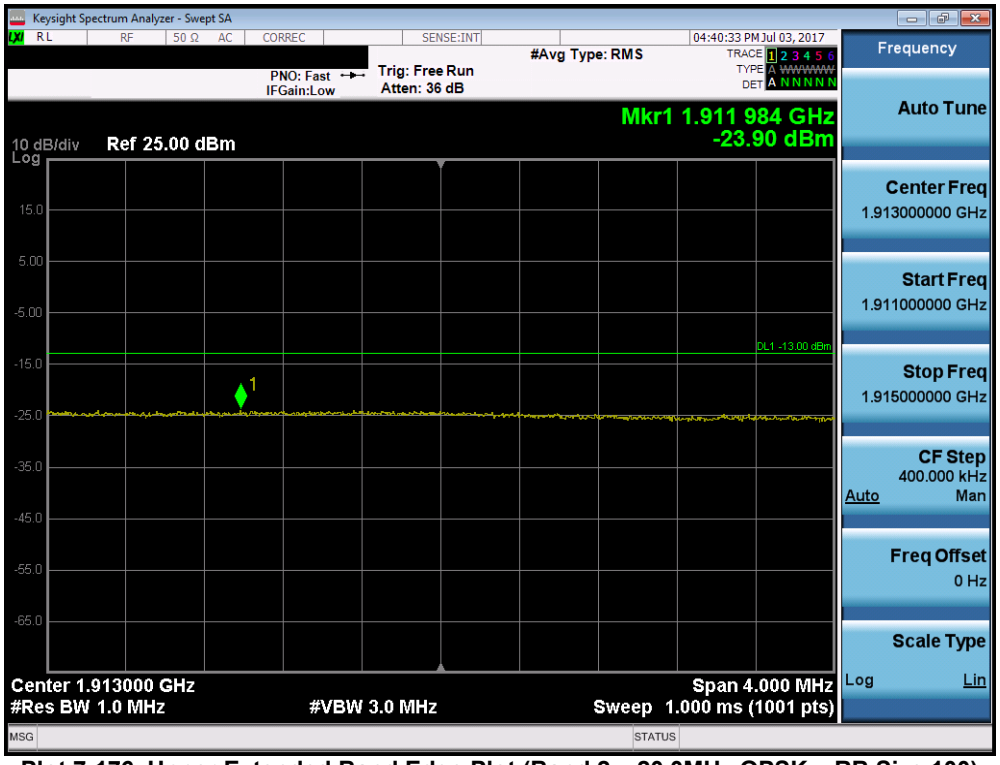


Plot 7-173. Lower Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)

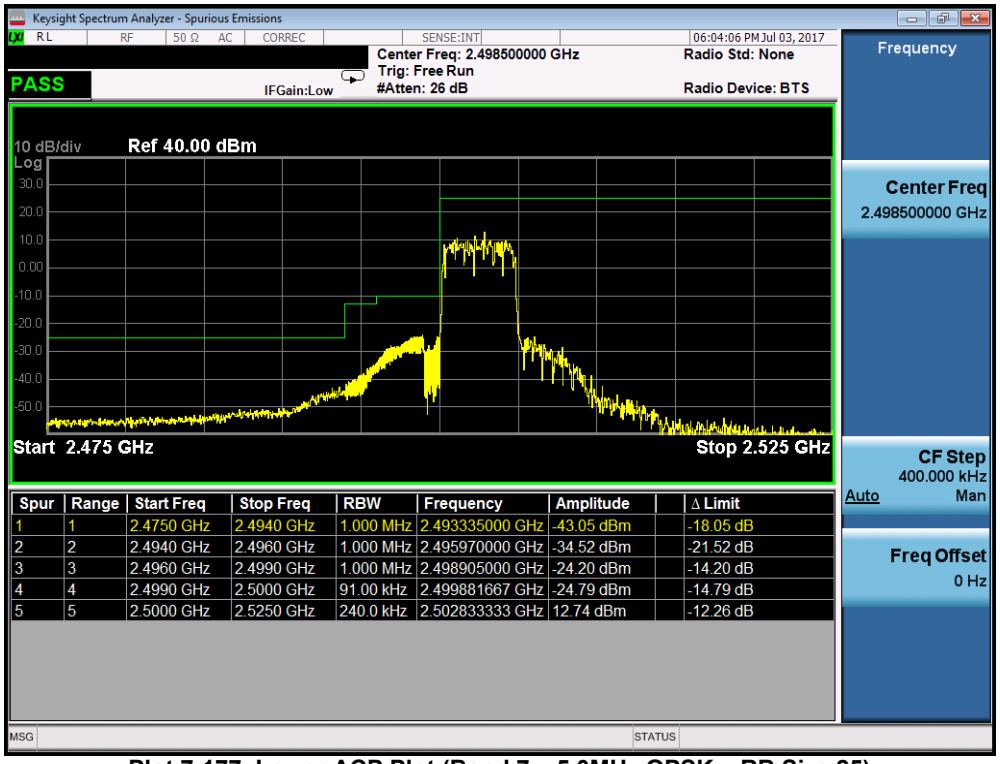


Plot 7-174. Lower Extended Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)

Plot 7-175. Upper Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)

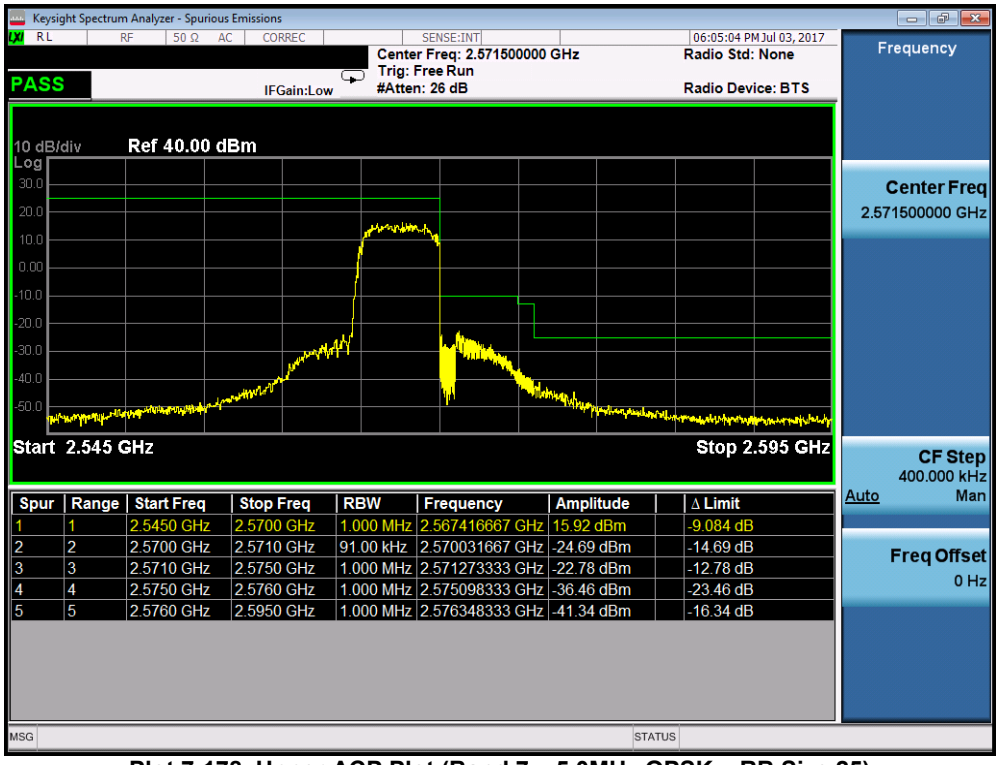


Plot 7-176. Upper Extended Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



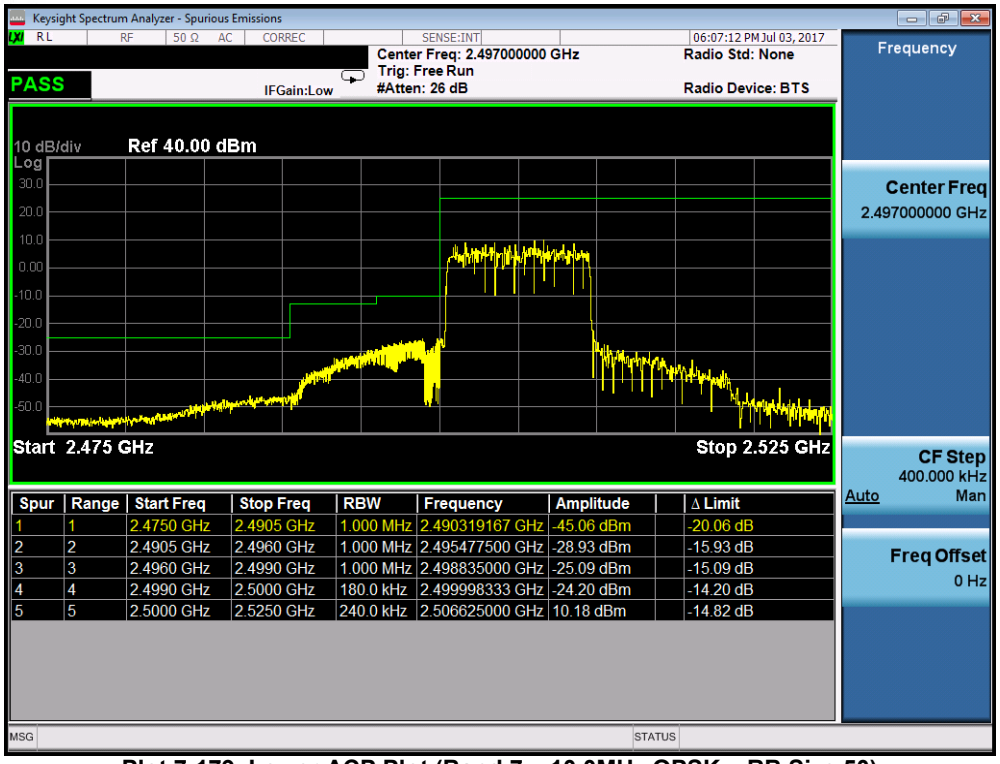
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4940 GHz	1.000 MHz	2.493335000 GHz	-43.05 dBm	-18.05 dB
2	2	2.4940 GHz	2.4960 GHz	1.000 MHz	2.495970000 GHz	-34.52 dBm	-21.52 dB
3	3	2.4960 GHz	2.4990 GHz	1.000 MHz	2.498905000 GHz	-24.20 dBm	-14.20 dB
4	4	2.4990 GHz	2.5000 GHz	91.00 kHz	2.499881667 GHz	-24.79 dBm	-14.79 dB
5	5	2.5000 GHz	2.5250 GHz	240.0 kHz	2.502833333 GHz	12.74 dBm	-12.26 dB

Plot 7-177. Lower ACP Plot (Band 7 – 5.0MHz QPSK – RB Size 25)

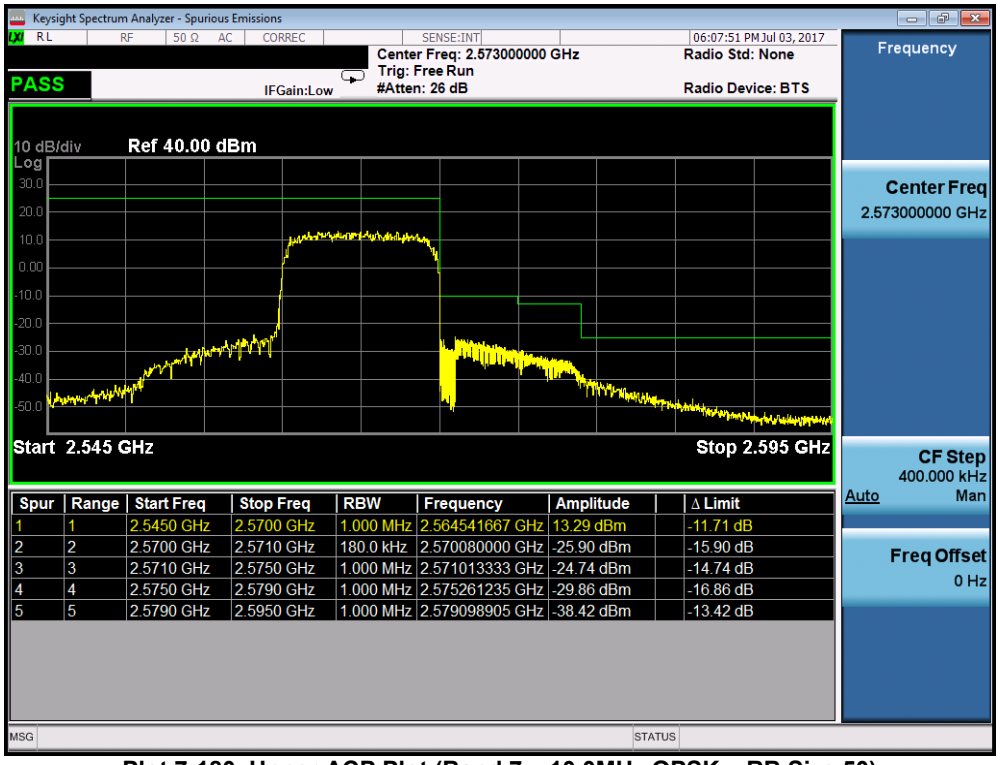


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.5450 GHz	2.5700 GHz	1.000 MHz	2.567416667 GHz	15.92 dBm	-9.084 dB
2	2	2.5700 GHz	2.5710 GHz	91.00 kHz	2.570031667 GHz	-24.69 dBm	-14.69 dB
3	3	2.5710 GHz	2.5750 GHz	1.000 MHz	2.571273333 GHz	-22.78 dBm	-12.78 dB
4	4	2.5750 GHz	2.5760 GHz	1.000 MHz	2.575098333 GHz	-36.46 dBm	-23.46 dB
5	5	2.5760 GHz	2.5950 GHz	1.000 MHz	2.576348333 GHz	-41.34 dBm	-16.34 dB

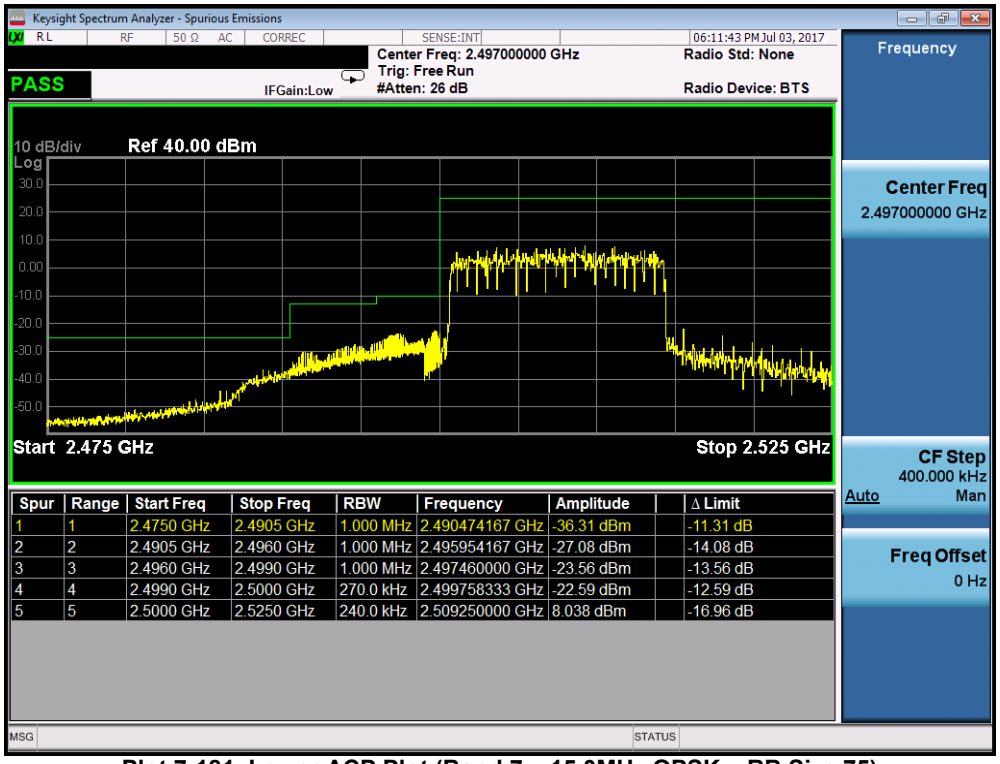
Plot 7-178. Upper ACP Plot (Band 7 – 5.0MHz QPSK – RB Size 25)



Plot 7-179. Lower ACP Plot (Band 7 – 10.0MHz QPSK – RB Size 50)

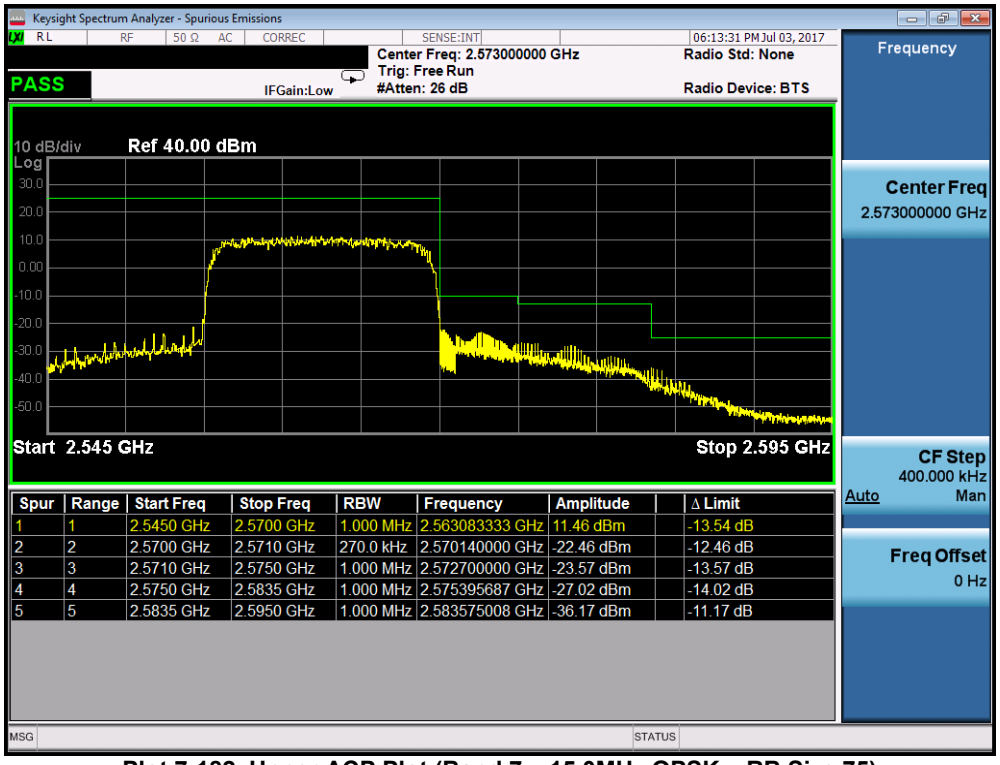


Plot 7-180. Upper ACP Plot (Band 7 – 10.0MHz QPSK – RB Size 50)



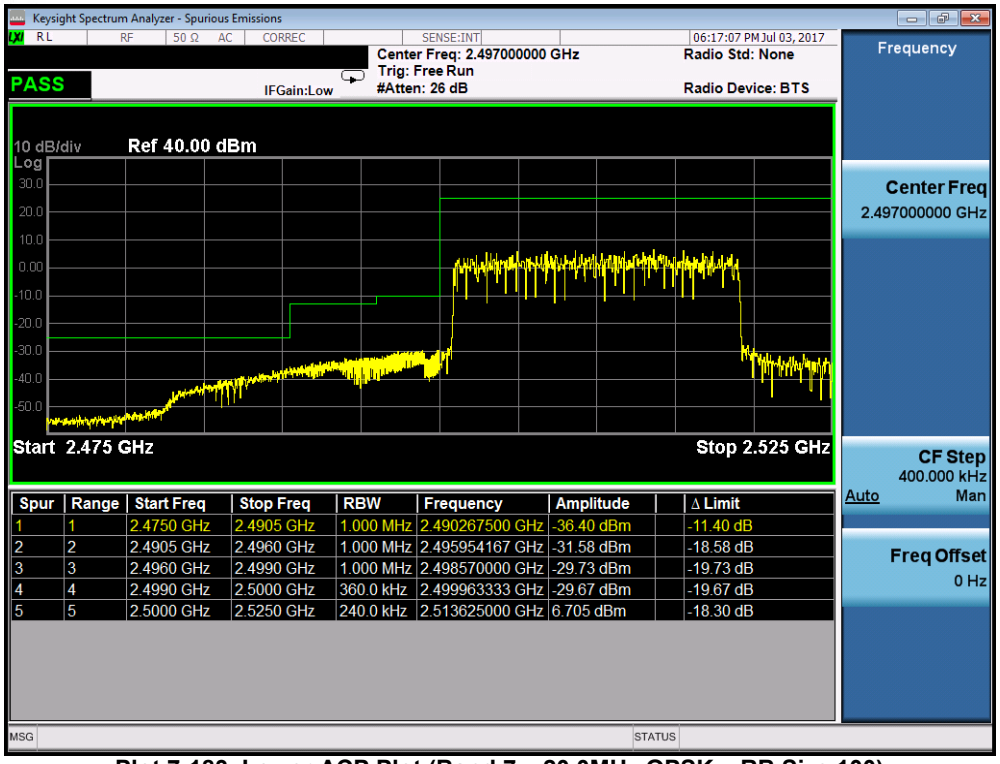
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4905 GHz	1.000 MHz	2.490474167 GHz	-36.31 dBm	-11.31 dB
2	2	2.4905 GHz	2.4960 GHz	1.000 MHz	2.495954167 GHz	-27.08 dBm	-14.08 dB
3	3	2.4960 GHz	2.4990 GHz	1.000 MHz	2.497460000 GHz	-23.56 dBm	-13.56 dB
4	4	2.4990 GHz	2.5000 GHz	270.0 kHz	2.499758333 GHz	-22.59 dBm	-12.59 dB
5	5	2.5000 GHz	2.5250 GHz	240.0 kHz	2.509250000 GHz	8.038 dBm	-16.96 dB

Plot 7-181. Lower ACP Plot (Band 7 – 15.0MHz QPSK – RB Size 75)

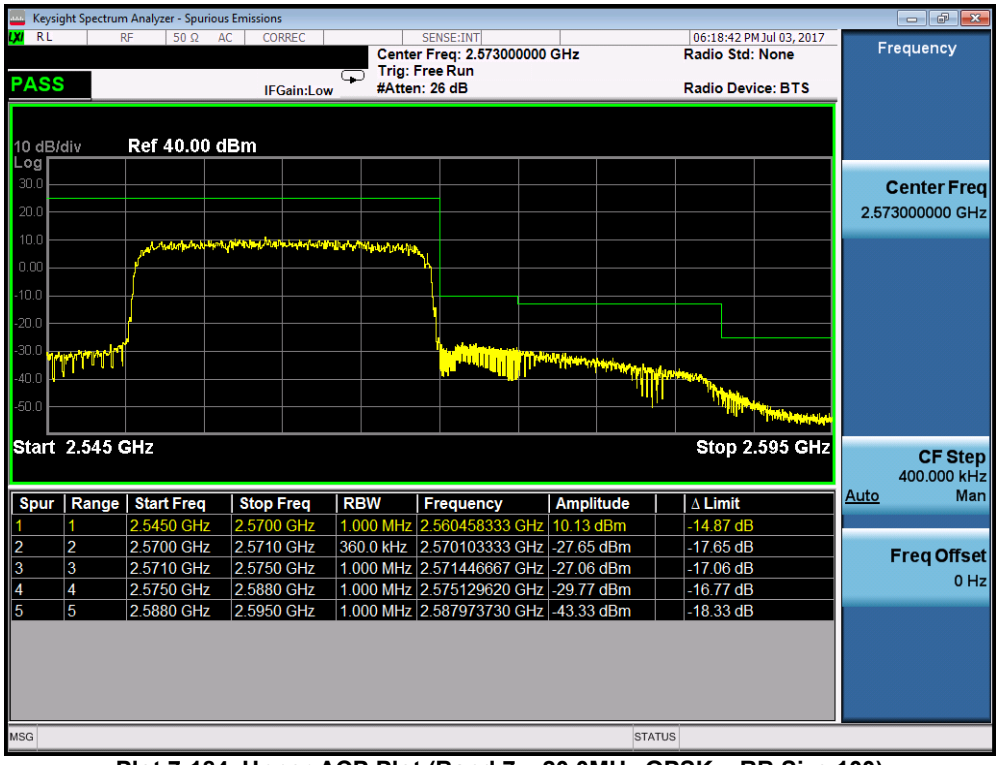


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.5450 GHz	2.5700 GHz	1.000 MHz	2.563083333 GHz	11.46 dBm	-13.54 dB
2	2	2.5700 GHz	2.5710 GHz	270.0 kHz	2.570140000 GHz	-22.46 dBm	-12.46 dB
3	3	2.5710 GHz	2.5750 GHz	1.000 MHz	2.572700000 GHz	-23.57 dBm	-13.57 dB
4	4	2.5750 GHz	2.5835 GHz	1.000 MHz	2.575395687 GHz	-27.02 dBm	-14.02 dB
5	5	2.5835 GHz	2.5950 GHz	1.000 MHz	2.583575008 GHz	-36.17 dBm	-11.17 dB

Plot 7-182. Upper ACP Plot (Band 7 – 15.0MHz QPSK – RB Size 75)



Plot 7-183. Lower ACP Plot (Band 7 – 20.0MHz QPSK – RB Size 100)



Plot 7-184. Upper ACP Plot (Band 7 – 20.0MHz QPSK – RB Size 100)

7.5 Peak-Average Ratio

§24.232(d)

Test Overview

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

Test Procedure Used

KDB 971168 D01 v02r02 – Section 5.7.1

Test Settings

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

Test Setup

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

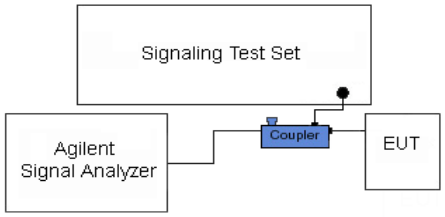
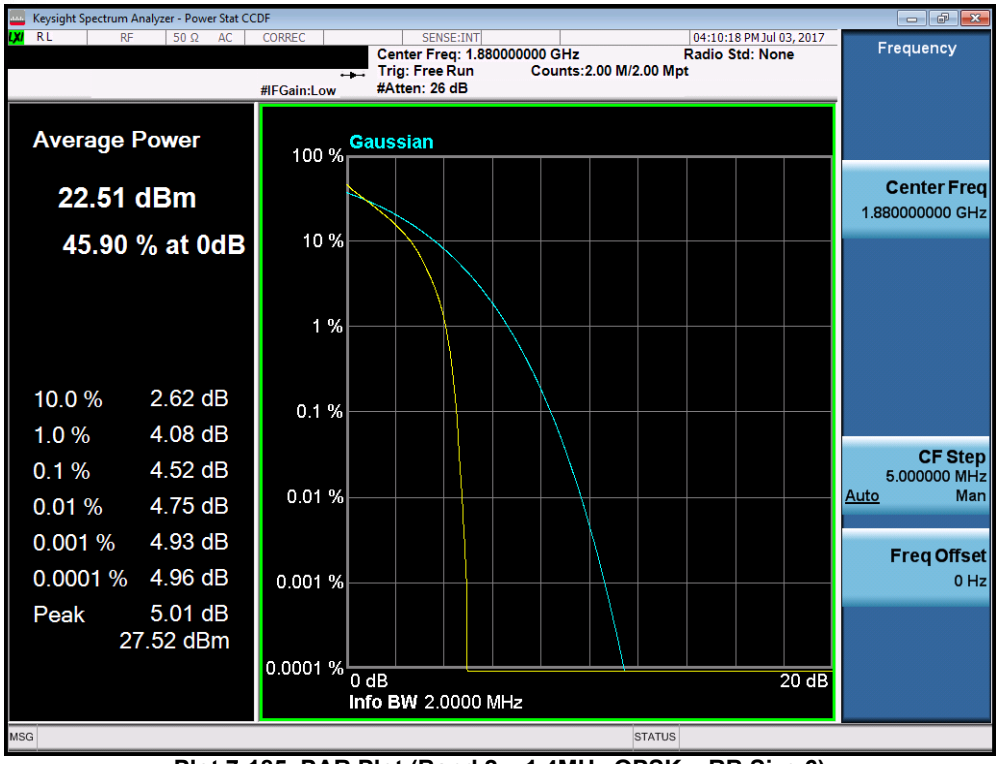


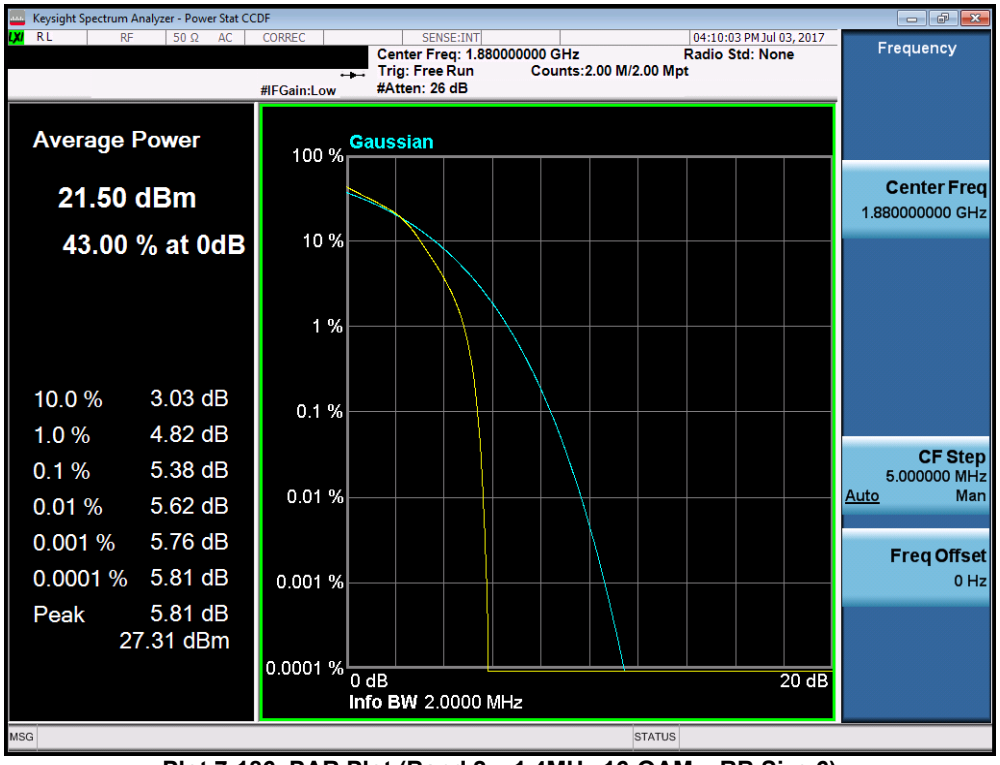
Figure 7-4. Test Instrument & Measurement Setup

Test Notes

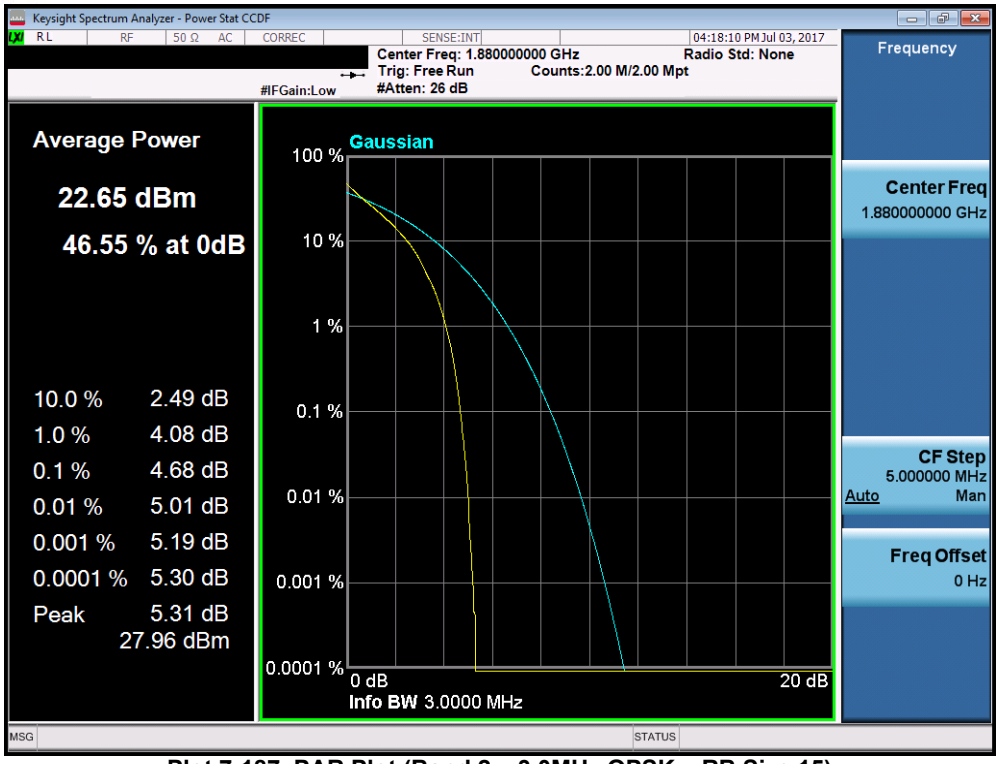
None.



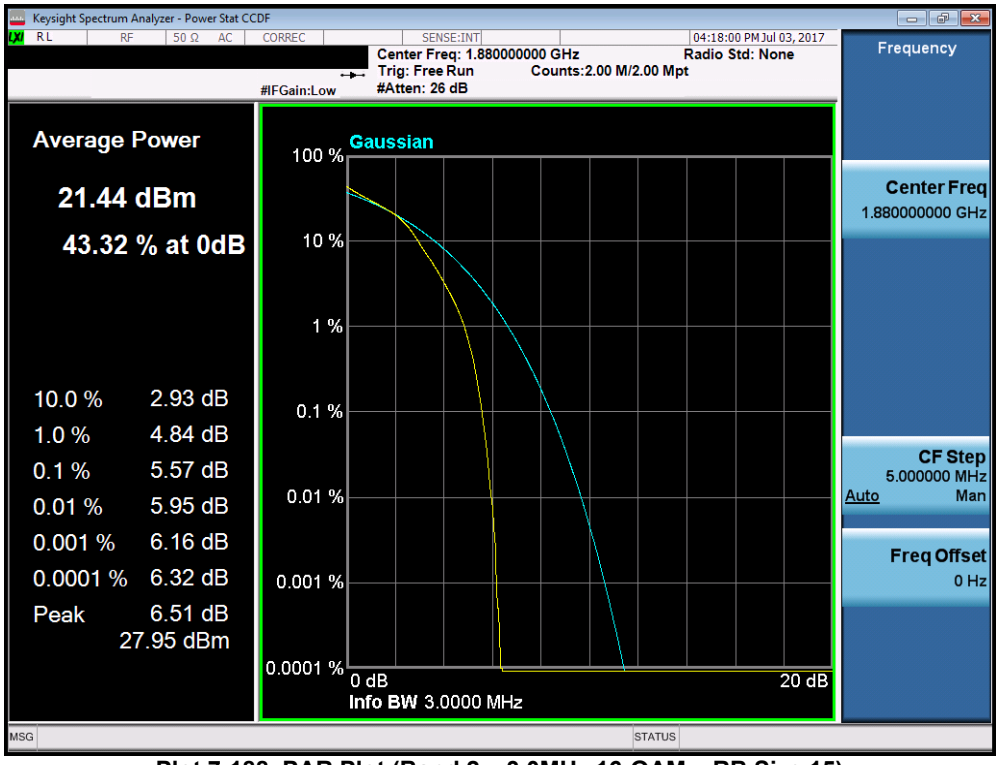
Plot 7-185. PAR Plot (Band 2 – 1.4MHz QPSK – RB Size 6)



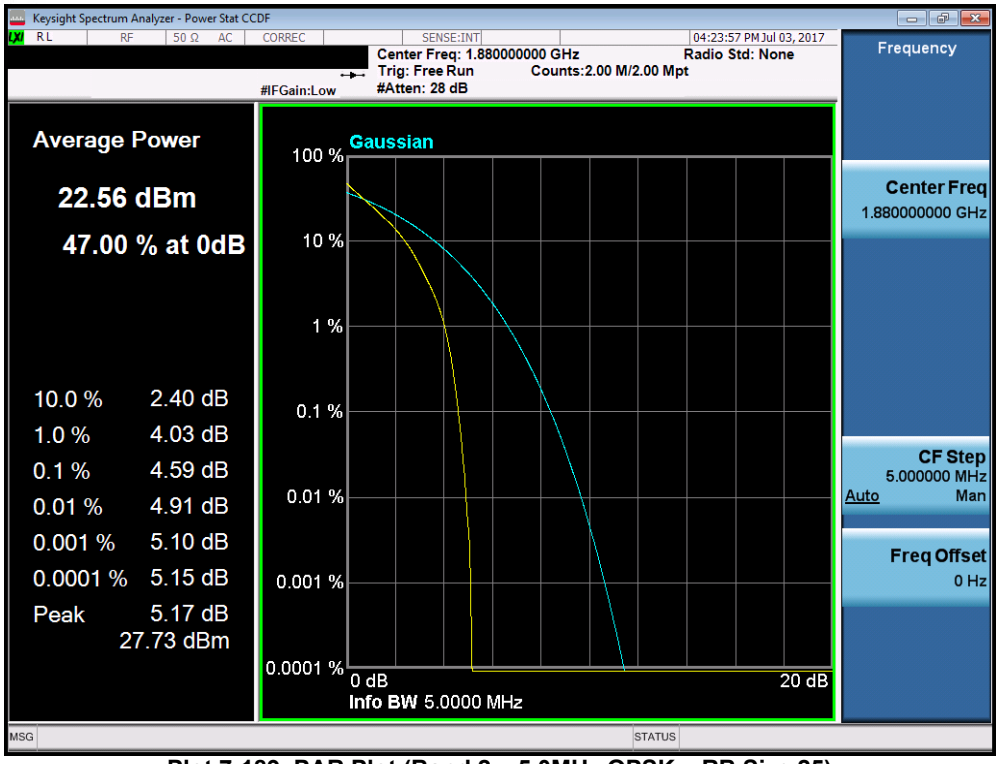
Plot 7-186. PAR Plot (Band 2 – 1.4MHz 16-QAM – RB Size 6)



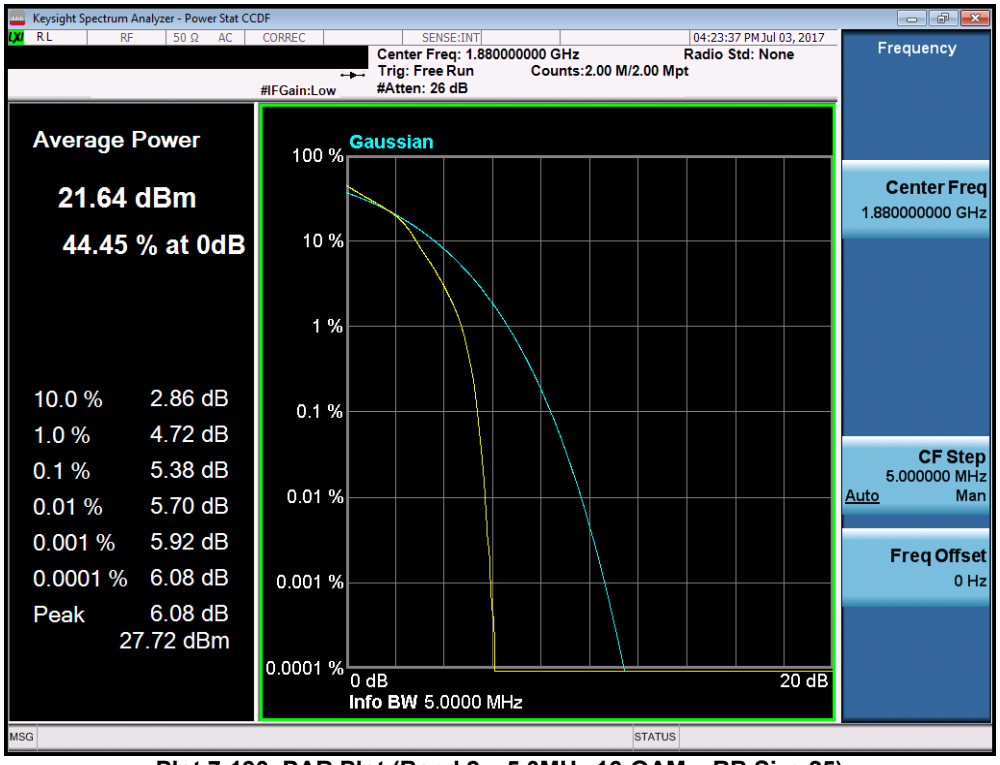
Plot 7-187. PAR Plot (Band 2 – 3.0MHz QPSK – RB Size 15)



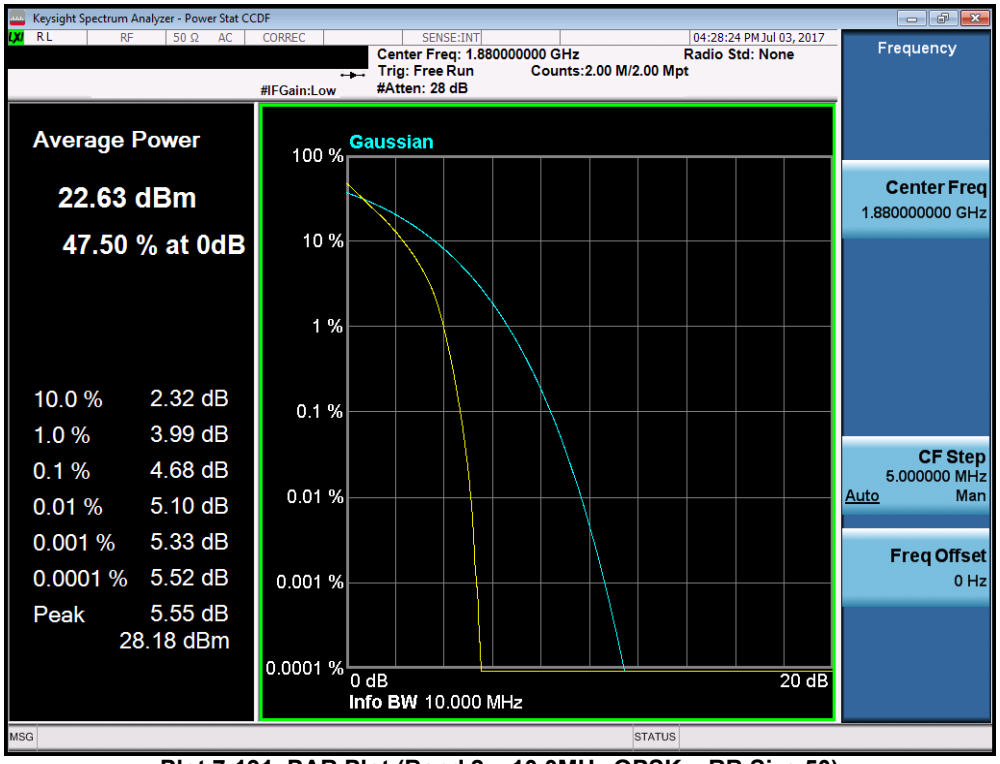
Plot 7-188. PAR Plot (Band 2 – 3.0MHz 16-QAM – RB Size 15)



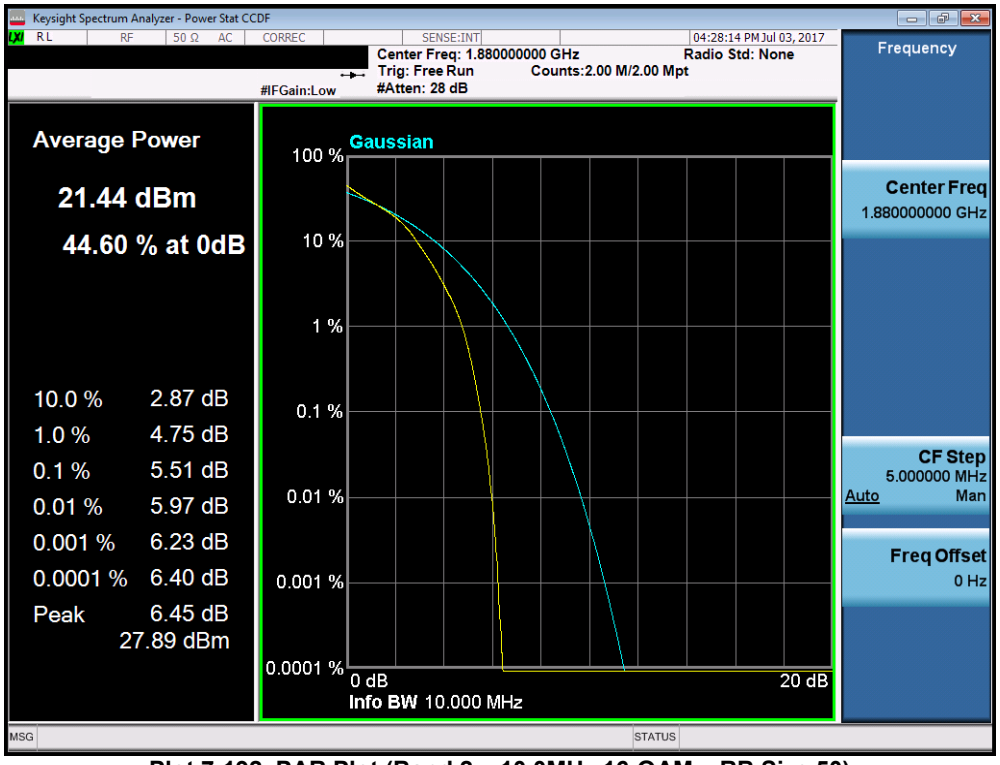
Plot 7-189. PAR Plot (Band 2 – 5.0MHz QPSK – RB Size 25)



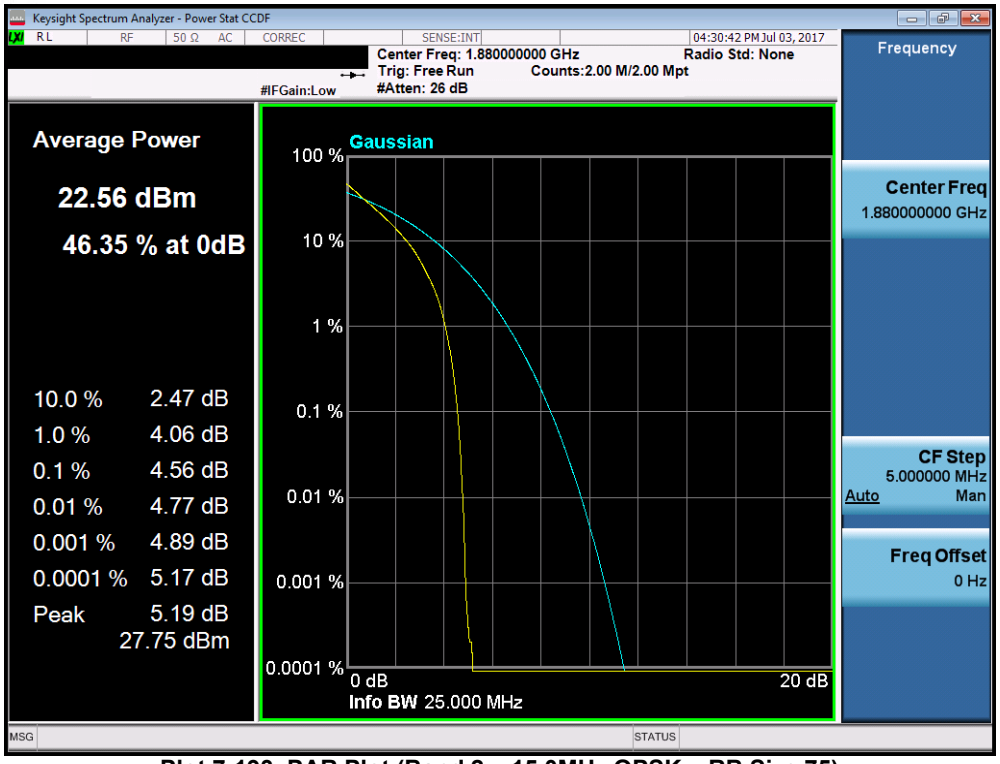
Plot 7-190. PAR Plot (Band 2 – 5.0MHz 16-QAM – RB Size 25)



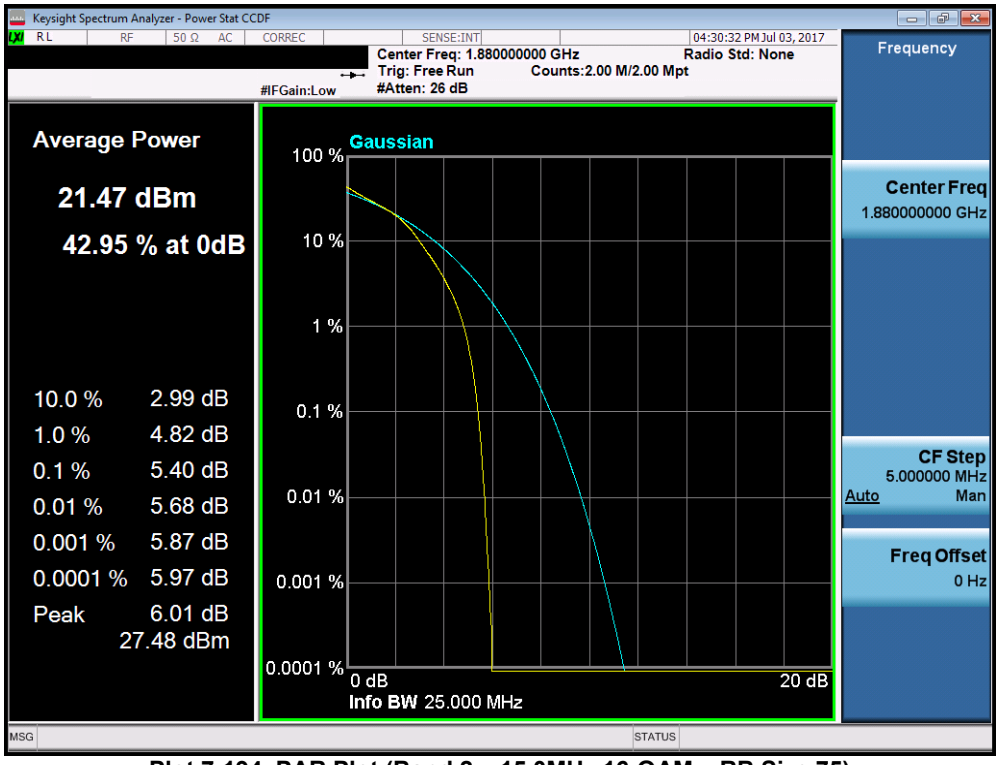
Plot 7-191. PAR Plot (Band 2 – 10.0MHz QPSK – RB Size 50)



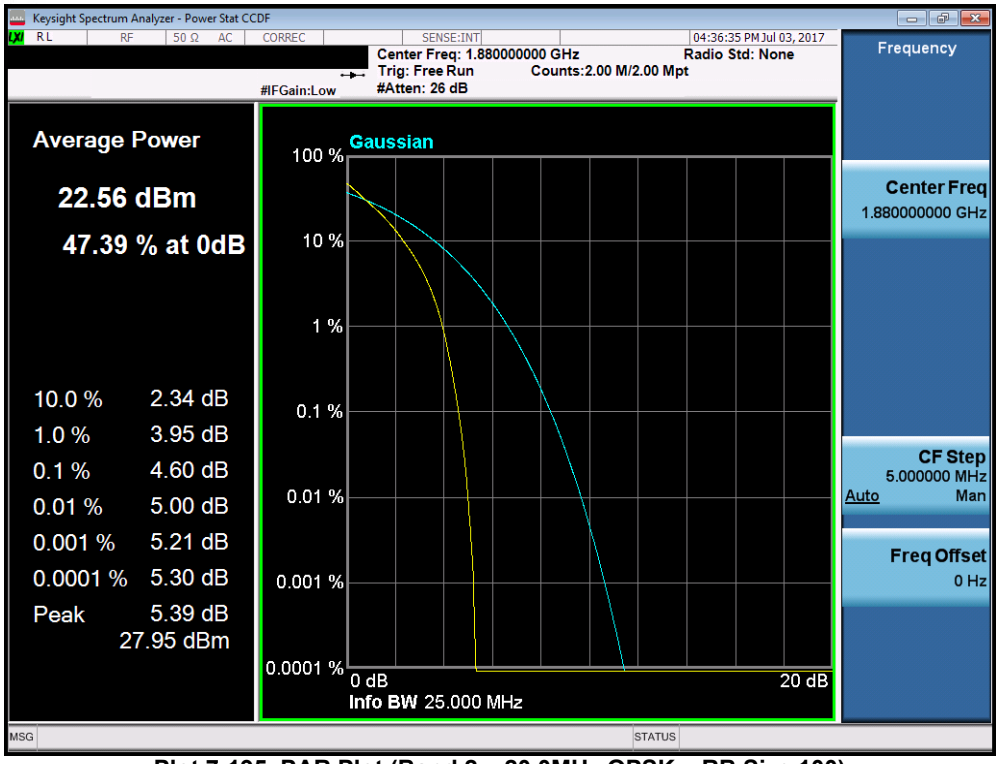
Plot 7-192. PAR Plot (Band 2 – 10.0MHz 16-QAM – RB Size 50)



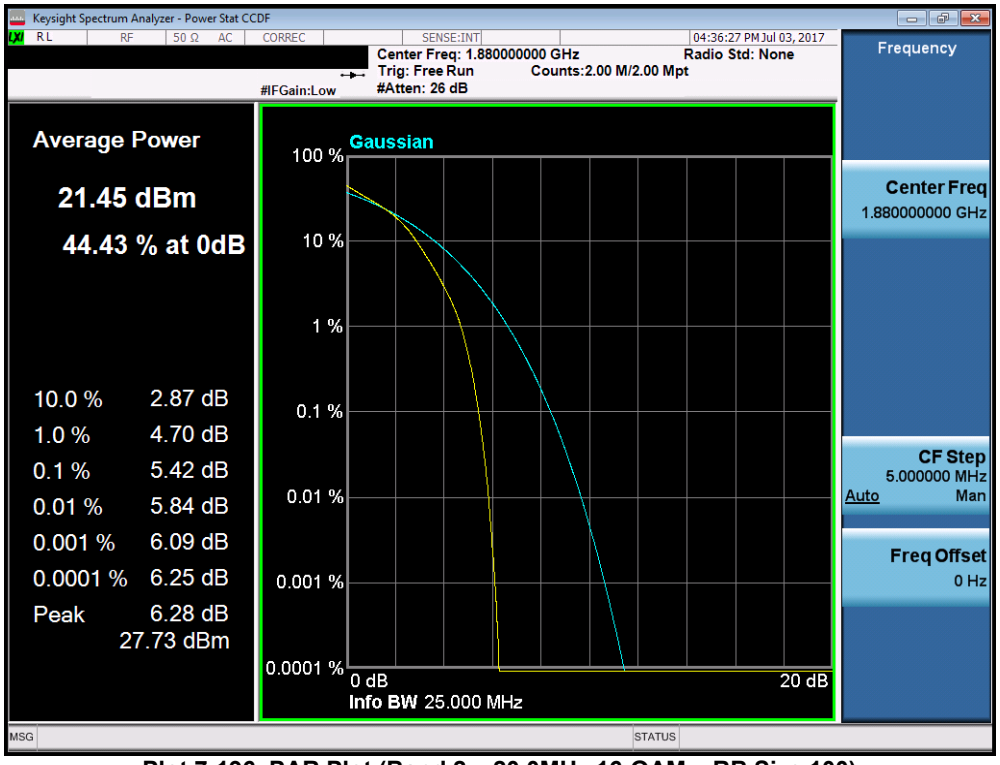
Plot 7-193. PAR Plot (Band 2 – 15.0MHz QPSK – RB Size 75)



Plot 7-194. PAR Plot (Band 2 – 15.0MHz 16-QAM – RB Size 75)



Plot 7-195. PAR Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



Plot 7-196. PAR Plot (Band 2 – 20.0MHz 16-QAM – RB Size 100)

7.6 Radiated Power (ERP/EIRP)

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

Test Overview

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

Test Procedures Used

KDB 971168 D01 v02r02 – Section 5.2.1

ANSI/TIA-603-D-2010 – Section 2.2.17

Test Settings

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

Test Setup

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

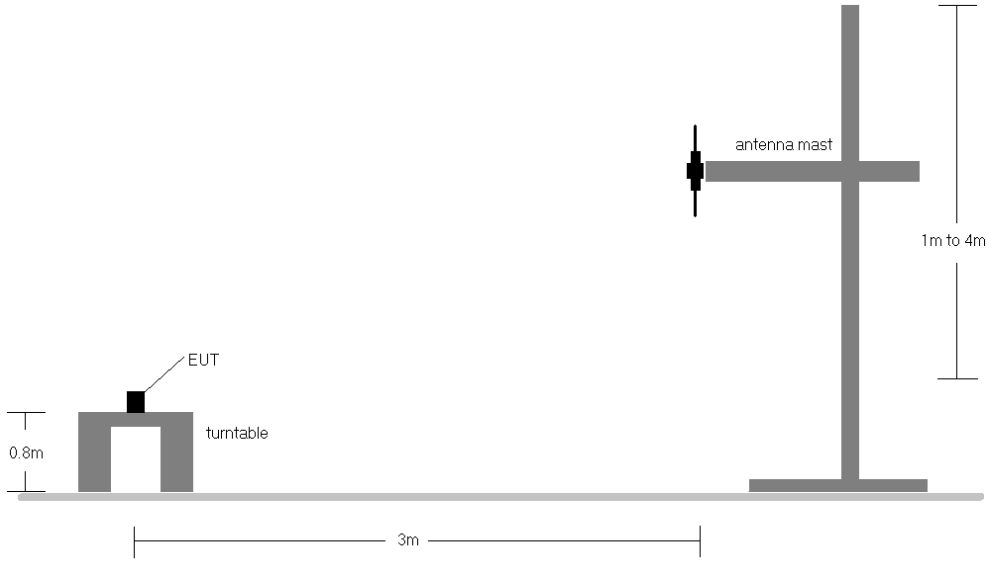


Figure 7-5. Radiated Test Setup <1GHz

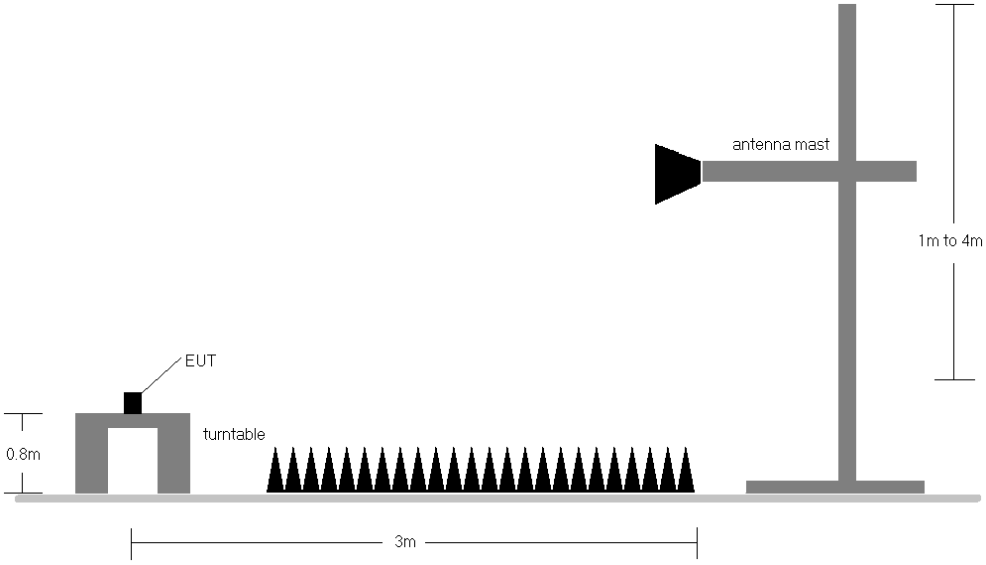


Figure 7-6. Radiated Test Setup >1GHz

Test Notes

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

2) This unit was tested with its standard battery.

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
699.70	1.4	QPSK	H	116	32	1 / 5	19.60	-0.25	19.35	34.77	-15.42
707.50	1.4	QPSK	H	110	17	1 / 5	19.57	-0.28	19.29	34.77	-15.48
715.30	1.4	QPSK	H	116	26	1 / 5	19.62	-0.31	19.31	34.77	-15.46
699.70	1.4	16-QAM	H	116	32	1 / 5	18.69	-0.25	18.44	34.77	-16.33
707.50	1.4	16-QAM	H	110	17	1 / 5	18.46	-0.28	18.18	34.77	-16.59
715.30	1.4	16-QAM	H	116	26	1 / 5	18.59	-0.31	18.28	34.77	-16.49
700.50	3	QPSK	H	116	27	1 / 14	19.80	-0.25	19.55	34.77	-15.22
707.50	3	QPSK	H	112	24	1 / 14	19.74	-0.28	19.46	34.77	-15.31
714.50	3	QPSK	H	106	18	1 / 14	19.98	-0.31	19.67	34.77	-15.10
700.50	3	16-QAM	H	116	27	1 / 14	18.57	-0.25	18.32	34.77	-16.45
707.50	3	16-QAM	H	112	24	1 / 14	18.46	-0.28	18.18	34.77	-16.59
714.50	3	16-QAM	H	106	18	1 / 14	18.53	-0.31	18.22	34.77	-16.55
701.50	5	QPSK	H	114	29	1 / 24	19.73	-0.26	19.47	34.77	-15.30
707.50	5	QPSK	H	116	29	1 / 24	19.70	-0.28	19.42	34.77	-15.35
713.50	5	QPSK	H	116	24	1 / 24	19.76	-0.30	19.46	34.77	-15.32
701.50	5	16-QAM	H	114	29	1 / 24	18.49	-0.26	18.23	34.77	-16.54
707.50	5	16-QAM	H	116	29	1 / 24	18.26	-0.28	17.98	34.77	-16.79
713.50	5	16-QAM	H	116	24	1 / 24	18.17	-0.30	17.87	34.77	-16.91
704.00	10	QPSK	H	114	28	1 / 49	19.67	-0.27	19.40	34.77	-15.37
707.50	10	QPSK	H	112	30	1 / 49	19.72	-0.28	19.44	34.77	-15.33
711.00	10	QPSK	H	112	5	1 / 49	19.69	-0.29	19.40	34.77	-15.38
704.00	10	16-QAM	H	114	28	1 / 49	18.51	-0.27	18.24	34.77	-16.53
707.50	10	16-QAM	H	112	30	1 / 49	18.67	-0.28	18.39	34.77	-16.38
711.00	10	16-QAM	H	112	5	1 / 49	18.52	-0.29	18.23	34.77	-16.55
714.50	3	QPSK	V	108	304	1 / 0	19.08	-1.18	17.90	34.77	-16.87

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

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
824.70	1.4	QPSK	H	100	5	1 / 0	21.53	-0.75	20.78	38.45	-17.67
836.50	1.4	QPSK	H	100	5	1 / 0	22.85	-0.84	22.00	38.45	-16.45
848.30	1.4	QPSK	H	100	5	1 / 0	20.74	-0.94	19.80	38.45	-18.65
824.70	1.4	16-QAM	H	100	5	1 / 0	20.64	-0.75	19.89	38.45	-18.56
836.50	1.4	16-QAM	H	100	5	1 / 0	21.49	-0.84	20.64	38.45	-17.81
848.30	1.4	16-QAM	H	100	5	1 / 0	19.71	-0.94	18.77	38.45	-19.68
825.50	3	QPSK	H	100	8	1 / 0	21.38	-0.75	20.62	38.45	-17.83
836.50	3	QPSK	H	100	5	1 / 0	22.62	-0.84	21.77	38.45	-16.68
847.50	3	QPSK	H	100	6	1 / 0	21.08	-0.93	20.15	38.45	-18.31
825.50	3	16-QAM	H	100	8	1 / 0	20.49	-0.75	19.73	38.45	-18.72
836.50	3	16-QAM	H	100	5	1 / 0	21.47	-0.84	20.62	38.45	-17.83
847.50	3	16-QAM	H	100	6	1 / 0	19.81	-0.93	18.88	38.45	-19.58
826.50	5	QPSK	H	100	10	1 / 0	22.17	-0.76	21.40	38.45	-17.05
836.50	5	QPSK	H	100	5	1 / 0	22.40	-0.84	21.55	38.45	-16.90
846.50	5	QPSK	H	100	5	1 / 0	20.38	-0.92	19.45	38.45	-19.00
826.50	5	16-QAM	H	100	10	1 / 0	20.93	-0.76	20.16	38.45	-18.29
836.50	5	16-QAM	H	100	5	1 / 0	21.53	-0.84	20.68	38.45	-17.77
846.50	5	16-QAM	H	100	5	1 / 0	19.38	-0.92	18.45	38.45	-20.00
829.00	10	QPSK	H	100	5	1 / 0	21.49	-0.78	20.70	38.45	-17.75
836.50	10	QPSK	H	100	5	1 / 0	22.34	-0.84	21.49	38.45	-16.96
844.00	10	QPSK	H	102	5	1 / 0	22.67	-0.90	21.76	38.45	-16.69
829.00	10	16-QAM	H	100	5	1 / 0	20.54	-0.78	19.75	38.45	-18.70
836.50	10	16-QAM	H	100	5	1 / 0	21.54	-0.84	20.69	38.45	-17.76
844.00	10	16-QAM	H	102	5	1 / 0	21.62	-0.90	20.71	38.45	-17.74
836.50	1.4	QPSK	V	127	160	1 / 0	22.17	-1.40	20.77	38.45	-17.68

Table 7-3. ERP Data (Band 5)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
1710.70	1.4	QPSK	V	125	159	1 / 0	16.27	8.23	24.50	30.00	-5.50
1745.00	1.4	QPSK	V	124	50	1 / 0	14.89	7.97	22.86	30.00	-7.14
1779.30	1.4	QPSK	V	126	331	1 / 0	15.45	7.71	23.16	30.00	-6.84
1710.70	1.4	16-QAM	V	125	159	1 / 0	15.21	8.23	23.44	30.00	-6.56
1745.00	1.4	16-QAM	V	124	50	1 / 0	13.94	7.97	21.91	30.00	-8.09
1779.30	1.4	16-QAM	V	126	331	1 / 0	14.20	7.71	21.91	30.00	-8.09
1711.50	3	QPSK	V	122	154	1 / 0	16.32	8.22	24.54	30.00	-5.46
1745.00	3	QPSK	V	129	190	1 / 0	15.29	7.97	23.26	30.00	-6.74
1778.50	3	QPSK	V	121	216	1 / 0	16.04	7.72	23.76	30.00	-6.24
1711.50	3	16-QAM	V	122	154	1 / 0	14.95	8.22	23.17	30.00	-6.83
1745.00	3	16-QAM	V	129	190	1 / 0	14.48	7.97	22.45	30.00	-7.55
1778.50	3	16-QAM	V	121	216	1 / 0	14.97	7.72	22.69	30.00	-7.31
1712.50	5	QPSK	V	124	158	1 / 0	16.34	8.21	24.55	30.00	-5.45
1745.00	5	QPSK	V	124	183	1 / 0	15.13	7.97	23.10	30.00	-6.90
1777.50	5	QPSK	V	126	324	1 / 0	15.75	7.72	23.47	30.00	-6.53
1712.50	5	16-QAM	V	124	158	1 / 0	14.85	8.21	23.06	30.00	-6.94
1745.00	5	16-QAM	V	124	183	1 / 0	13.97	7.97	21.94	30.00	-8.06
1777.50	5	16-QAM	V	126	324	1 / 0	14.72	7.72	22.44	30.00	-7.56
1715.00	10	QPSK	V	125	352	1 / 0	16.37	8.19	24.56	30.00	-5.44
1745.00	10	QPSK	V	125	154	1 / 0	15.90	7.97	23.87	30.00	-6.13
1775.00	10	QPSK	V	123	152	1 / 0	16.15	7.74	23.89	30.00	-6.11
1715.00	10	16-QAM	V	125	352	1 / 0	15.15	8.19	23.34	30.00	-6.66
1745.00	10	16-QAM	V	125	154	1 / 0	14.79	7.97	22.76	30.00	-7.24
1775.00	10	16-QAM	V	123	152	1 / 0	14.98	7.74	22.72	30.00	-7.28
1717.50	15	QPSK	V	128	160	1 / 0	16.28	8.17	24.45	30.00	-5.55
1745.00	15	QPSK	V	124	303	1 / 0	16.20	7.97	24.17	30.00	-5.83
1772.50	15	QPSK	V	126	341	1 / 0	15.54	7.76	23.30	30.00	-6.70
1717.50	15	16-QAM	V	128	160	1 / 0	15.05	8.17	23.22	30.00	-6.78
1745.00	15	16-QAM	V	124	303	1 / 0	14.94	7.97	22.91	30.00	-7.09
1772.50	15	16-QAM	V	126	341	1 / 0	14.48	7.76	22.24	30.00	-7.76
1720.00	20	QPSK	V	124	126	1 / 0	16.02	8.15	24.17	30.00	-5.83
1745.00	20	QPSK	V	127	188	1 / 0	13.87	7.97	21.84	30.00	-8.16
1770.00	20	QPSK	V	123	327	1 / 0	15.41	7.78	23.19	30.00	-6.81
1720.00	20	16-QAM	V	124	126	1 / 0	14.62	8.15	22.77	30.00	-7.23
1745.00	20	16-QAM	V	127	188	1 / 0	15.85	7.97	23.82	30.00	-6.18
1770.00	20	16-QAM	V	123	327	1 / 0	14.49	7.78	22.27	30.00	-7.73
1715.00	10	QPSK	H	139	120	1 / 0	15.24	8.19	23.43	30.00	-6.57

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

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
2502.50	5	QPSK	H	119	143	1 / 0	12.78	8.81	21.59	33.01	-11.42
2535.00	5	QPSK	H	117	255	1 / 0	12.14	8.81	20.95	33.01	-12.06
2567.50	5	QPSK	H	194	110	1 / 0	12.56	8.81	21.37	33.01	-11.64
2502.50	5	16-QAM	H	119	143	1 / 0	11.76	8.81	20.57	33.01	-12.44
2535.00	5	16-QAM	H	117	255	1 / 0	10.96	8.81	19.77	33.01	-13.24
2567.50	5	16-QAM	H	194	110	1 / 0	11.27	8.81	20.08	33.01	-12.93
2505.00	10	QPSK	H	117	325	1 / 0	12.66	8.81	21.47	33.01	-11.54
2535.00	10	QPSK	H	100	94	1 / 0	14.30	8.81	23.11	33.01	-9.90
2565.00	10	QPSK	H	119	307	1 / 0	13.46	8.81	22.27	33.01	-10.74
2505.00	10	16-QAM	H	117	325	1 / 0	11.45	8.81	20.26	33.01	-12.75
2535.00	10	16-QAM	H	100	94	1 / 0	13.34	8.81	22.15	33.01	-10.86
2565.00	10	16-QAM	H	119	307	1 / 0	12.43	8.81	21.24	33.01	-11.77
2507.50	15	QPSK	H	100	270	1 / 0	15.38	8.81	24.19	33.01	-8.82
2535.00	15	QPSK	H	100	331	1 / 0	13.68	8.81	22.49	33.01	-10.52
2562.50	15	QPSK	H	121	268	1 / 0	12.68	8.81	21.49	33.01	-11.52
2507.50	15	16-QAM	H	100	270	1 / 0	14.33	8.81	23.14	33.01	-9.87
2535.00	15	16-QAM	H	100	331	1 / 0	12.80	8.81	21.61	33.01	-11.40
2562.50	15	16-QAM	H	121	268	1 / 0	11.83	8.81	20.64	33.01	-12.37
2510.00	20	QPSK	H	100	275	1 / 0	15.40	8.81	24.21	33.01	-8.80
2535.00	20	QPSK	H	100	327	1 / 0	13.26	8.81	22.07	33.01	-10.94
2560.00	20	QPSK	H	172	263	1 / 0	11.97	8.81	20.78	33.01	-12.23
2510.00	20	16-QAM	H	100	275	1 / 0	14.28	8.81	23.09	33.01	-9.92
2535.00	20	16-QAM	H	100	327	1 / 0	12.27	8.81	21.08	33.01	-11.93
2560.00	20	16-QAM	H	172	263	1 / 0	10.85	8.81	19.66	33.01	-13.35
2510.00	20	QPSK	V	132	224	1 / 0	13.67	8.81	22.48	33.01	-10.53

Table 7-5. EIRP Data (Band 7)

7.7 Radiated Spurious Emissions Measurements

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

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-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.

Test Procedures Used

KDB 971168 D01 v02r02 – Section 5.8

ANSI/TIA-603-D-2010 – Section 2.2.12

Test Settings

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

Test Setup

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

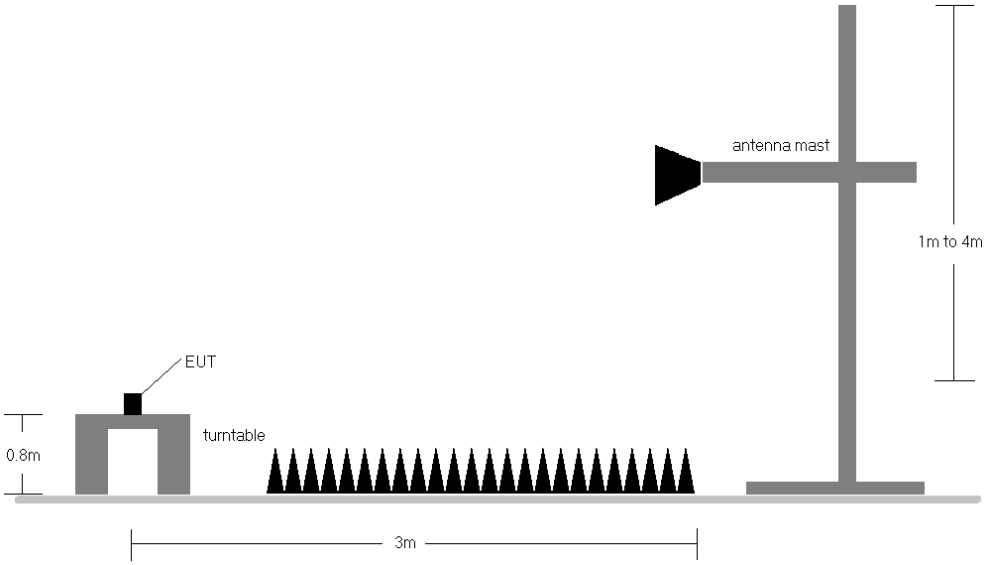


Figure 7-7. Test Instrument & Measurement Setup

Test Notes

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

2) This unit was tested with its standard battery.

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

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

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

OPERATING FREQUENCY:	700.50	MHz		
CHANNEL:	23025			
MEASURED OUTPUT POWER:	19.55	dBm	=	0.090 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	32.55	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]
1401.00	V	160	232	-62.21	6.12	-56.09	75.6
2101.50	V	108	335	-49.02	6.77	-42.25	61.8
2802.00	V	-	-	-61.38	8.03	-53.35	72.9

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

OPERATING FREQUENCY:	707.50	MHz		
CHANNEL:	23095			
MEASURED OUTPUT POWER:	19.46	dBm	=	0.088 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	32.46	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	V	127	5	-62.16	6.17	-55.99	75.4
2122.50	V	134	350	-50.33	6.81	-43.52	63.0
2830.00	V	-	-	-61.00	8.05	-52.95	72.4

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

OPERATING FREQUENCY:	714.50	MHz		
CHANNEL:	23165			
MEASURED OUTPUT POWER:	19.67	dBm	=	0.093 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	$43 + 10 \log_{10}(W) =$	32.67	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1429.00	V	110	235	-61.39	6.22	-55.17	74.8
2143.50	V	127	317	-51.78	6.85	-44.93	64.6
2858.00	V	-	-	-61.33	8.07	-53.26	72.9

Table 7-8. Radiated Spurious Data (Band 12 – High Channel)

OPERATING FREQUENCY:	824.70	MHz		
CHANNEL:	20407			
MEASURED OUTPUT POWER:	20.78	dBm	=	0.120 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	1.4	MHz		
DISTANCE:	3	meters		
LIMIT:	$43 + 10 \log_{10}(W) =$	33.78	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1649.40	H	100	352	-60.78	6.25	-54.53	75.3
2474.10	H	141	330	-53.26	6.61	-46.64	67.4
3298.80	H	-	-	-57.21	6.99	-50.22	71.0

Table 7-9. Radiated Spurious Data (Band 5 – Low Channel)

OPERATING FREQUENCY:	836.50	MHz		
CHANNEL:	20525			
MEASURED OUTPUT POWER:	22.00	dBm	=	0.159 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	1.4	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	35.00	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	105	350	-57.89	6.13	-51.76	73.8
2509.50	H	100	5	-56.72	6.64	-50.08	72.1
3346.00	H	-	-	-57.07	7.14	-49.93	71.9

Table 7-10. Radiated Spurious Data (Band 5 – Mid Channel)

OPERATING FREQUENCY:	848.30	MHz		
CHANNEL:	20643			
MEASURED OUTPUT POWER:	19.80	dBm	=	0.095 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	1.4	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	32.80	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1696.60	H	117	5	-60.67	6.01	-54.66	74.5
2544.90	H	140	33	-55.83	6.74	-49.09	68.9
3393.20	H	-	-	-57.94	7.29	-50.64	70.4

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

OPERATING FREQUENCY:	1715.00	MHz		
CHANNEL:	132022			
MEASURED OUTPUT POWER:	24.56	dBm	=	0.286 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	10.0	MHz		
DISTANCE:	3	meters		
LIMIT:	$43 + 10 \log_{10}(W)$ =	37.56	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	V	134	242	-56.19	9.55	-46.64	71.2
5145.00	V	160	158	-45.62	10.98	-34.64	59.2
6860.00	V	-	-	-51.38	10.78	-40.59	65.2

Table 7-12. Radiated Spurious Data (Band 66 – Low Channel)

OPERATING FREQUENCY:	1745.00	MHz		
CHANNEL:	132322			
MEASURED OUTPUT POWER:	23.87	dBm	=	0.244 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	10.0	MHz		
DISTANCE:	3	meters		
LIMIT:	$43 + 10 \log_{10}(W)$ =	36.87	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3490.00	V	138	190	-56.20	9.69	-46.51	70.4
5235.00	V	137	350	-47.07	10.98	-36.08	60.0
6980.00	V	-	-	-50.76	10.97	-39.80	63.7

Table 7-13. Radiated Spurious Data (Band 66 – Mid Channel)

OPERATING FREQUENCY:	1775.00	MHz		
CHANNEL:	132622			
MEASURED OUTPUT POWER:	23.89	dBm	=	0.245 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	10.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	36.89	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]
3550.00	V	108	337	-56.50	9.83	-46.67	70.6
5325.00	V	107	188	-44.02	11.09	-32.93	56.8
7100.00	V	-	-	-50.49	11.05	-39.44	63.3

Table 7-14. Radiated Spurious Data (Band 66 – High Channel)

OPERATING FREQUENCY:	2510.00	MHz		
CHANNEL:	20850			
MEASURED OUTPUT POWER:	24.21	dBm	=	0.263 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	20.0	MHz		
DISTANCE:	3	meters		
LIMIT:	55 + 10 log10 (W)	49.21	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
5020.00	H	-	-	-53.19	11.15	-42.04	66.2
7530.00	H	-	-	-49.39	11.15	-38.24	62.5

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

OPERATING FREQUENCY:	2535.00	MHz		
CHANNEL:	21100			
MEASURED OUTPUT POWER:	22.07	dBm	=	0.161 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	20.0	MHz		
DISTANCE:	3	meters		
LIMIT:	55 + 10 log10 (W)	47.07	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
5070.00	H	-	-	-53.96	11.09	-42.86	64.9
7605.00	H	-	-	-50.38	11.32	-39.06	61.1

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

OPERATING FREQUENCY:	2560.00	MHz		
CHANNEL:	21350			
MEASURED OUTPUT POWER:	20.78	dBm	=	0.120 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	20.0	MHz		
DISTANCE:	3	meters		
LIMIT:	55 + 10 log10 (W)	45.78	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
5120.00	H	-	-	-53.53	11.04	-42.48	63.3
7680.00	H	-	-	-50.32	11.37	-38.94	59.7

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

7.8 Frequency Stability / Temperature Variation

§2.1055 §22.355 §24.235 §27.54

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-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)	707,499,832	-168	-0.0000237
100 %		- 30	707,500,114	114	0.0000161
100 %		- 20	707,499,862	-138	-0.0000195
100 %		- 10	707,499,872	-128	-0.0000181
100 %		0	707,500,100	100	0.0000141
100 %		+ 10	707,499,825	-175	-0.0000247
100 %		+ 20	707,499,832	-168	-0.0000237
100 %		+ 30	707,499,866	-134	-0.0000189
100 %		+ 40	707,499,834	-166	-0.0000235
100 %		+ 50	707,499,843	-157	-0.0000222
BATT. ENDPOINT	3.45	+ 20	707,499,803	-197	-0.0000278

Table 7-18. Frequency Stability Data (Band 12/17)

Band 12 Frequency Stability Measurements

§2.1055 §27.54

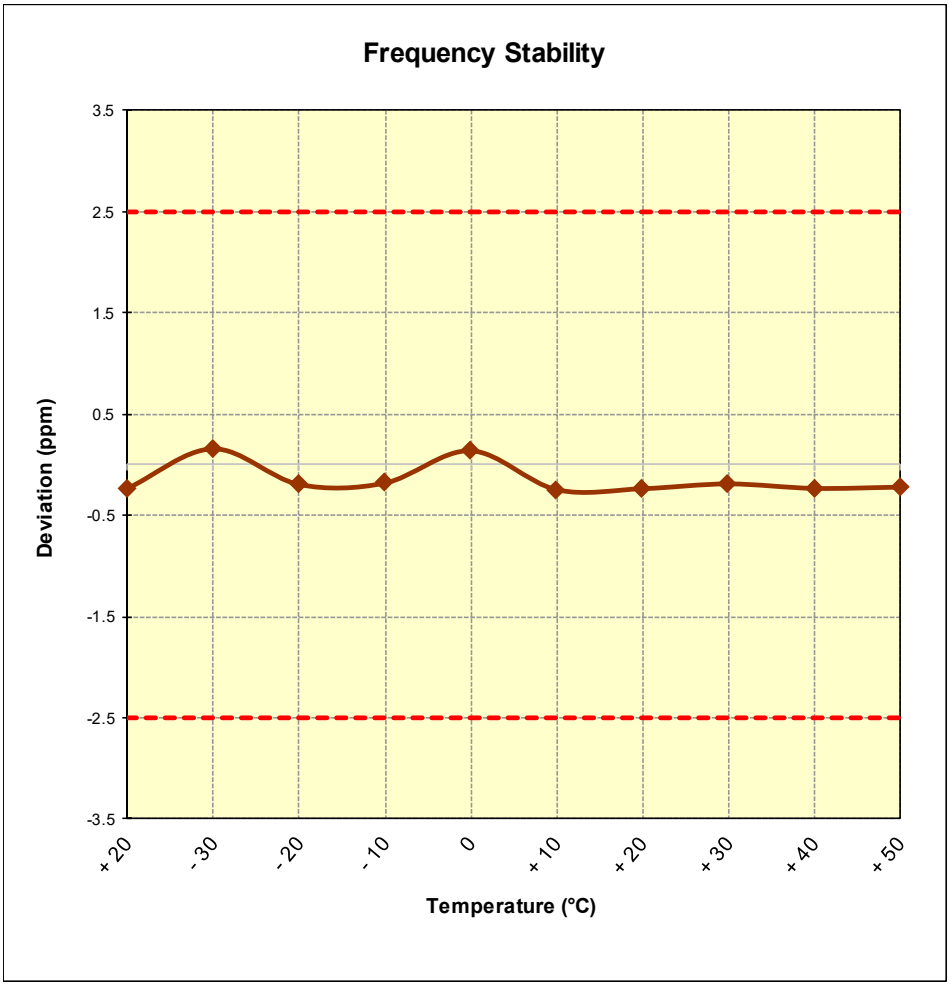


Figure 7-8. Frequency Stability Graph (Band 12/17)

Band 5 Frequency Stability Measurements

§2.1055 §22.355

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

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	836,499,873	-127	-0.0000152
100 %		- 30	836,499,846	-154	-0.0000184
100 %		- 20	836,499,882	-118	-0.0000141
100 %		- 10	836,499,839	-161	-0.0000192
100 %		0	836,499,808	-192	-0.0000230
100 %		+ 10	836,499,878	-122	-0.0000146
100 %		+ 20	836,499,873	-127	-0.0000152
100 %		+ 30	836,499,871	-129	-0.0000154
100 %		+ 40	836,499,862	-138	-0.0000165
100 %		+ 50	836,499,890	-110	-0.0000132
BATT. ENDPOINT	3.45	+ 20	836,499,831	-169	-0.0000202

Table 7-19. Frequency Stability Data (Band 5)

Band 5 Frequency Stability Measurements

§2.1055 §22.355

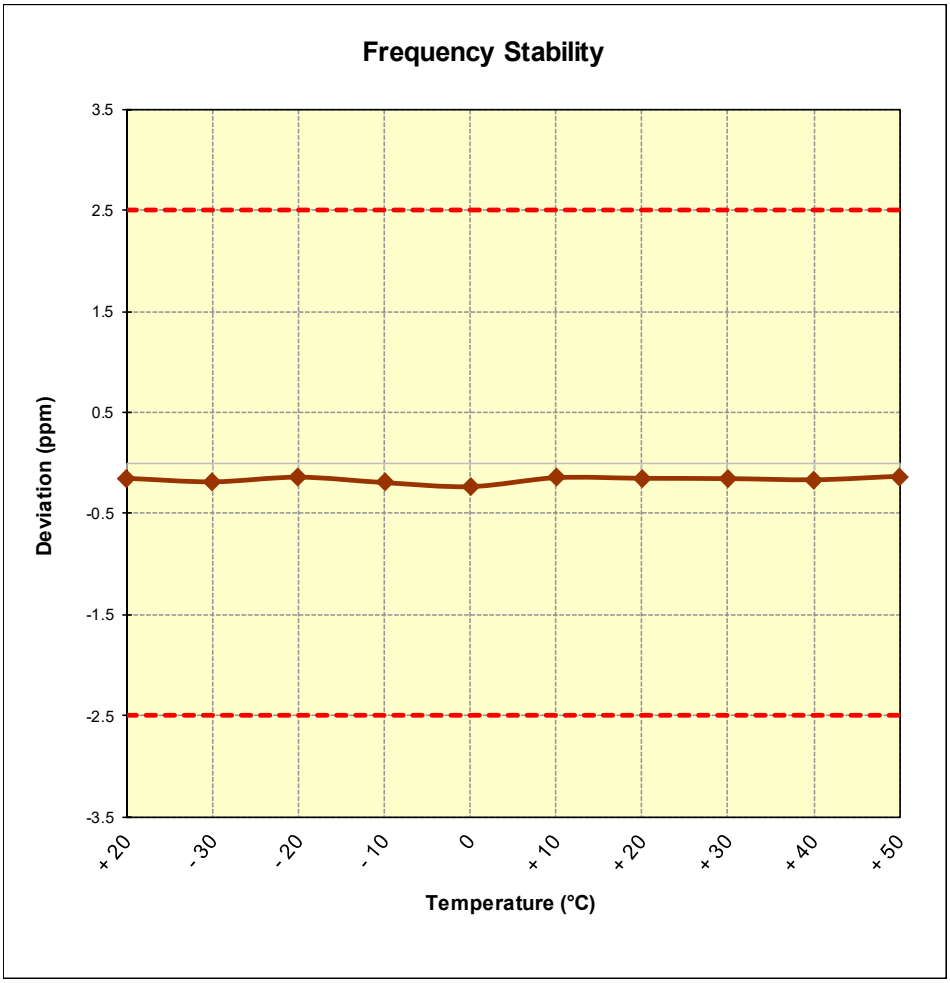


Figure 7-9. Frequency Stability Graph (Band 5)

Band 66 Frequency Stability Measurements

§2.1055 §§27.54

OPERATING FREQUENCY:	1,745,000,000	Hz
CHANNEL:	132322	
REFERENCE VOLTAGE:	3.85	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	1,744,999,843	-157	-0.0000090
100 %		- 30	1,744,999,880	-120	-0.0000069
100 %		- 20	1,745,000,102	102	0.0000058
100 %		- 10	1,744,999,808	-192	-0.0000110
100 %		0	1,744,999,859	-141	-0.0000081
100 %		+ 10	1,744,999,868	-132	-0.0000076
100 %		+ 20	1,744,999,843	-157	-0.0000090
100 %		+ 30	1,744,999,891	-109	-0.0000062
100 %		+ 40	1,744,999,879	-121	-0.0000069
100 %		+ 50	1,744,999,884	-116	-0.0000066
BATT. ENDPOINT	3.45	+ 20	1,744,999,812	-188	-0.0000108

Table 7-20. Frequency Stability Data (Band 4/66)

Note:

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

Band 66 Frequency Stability Measurements

§2.1055 §§27.54

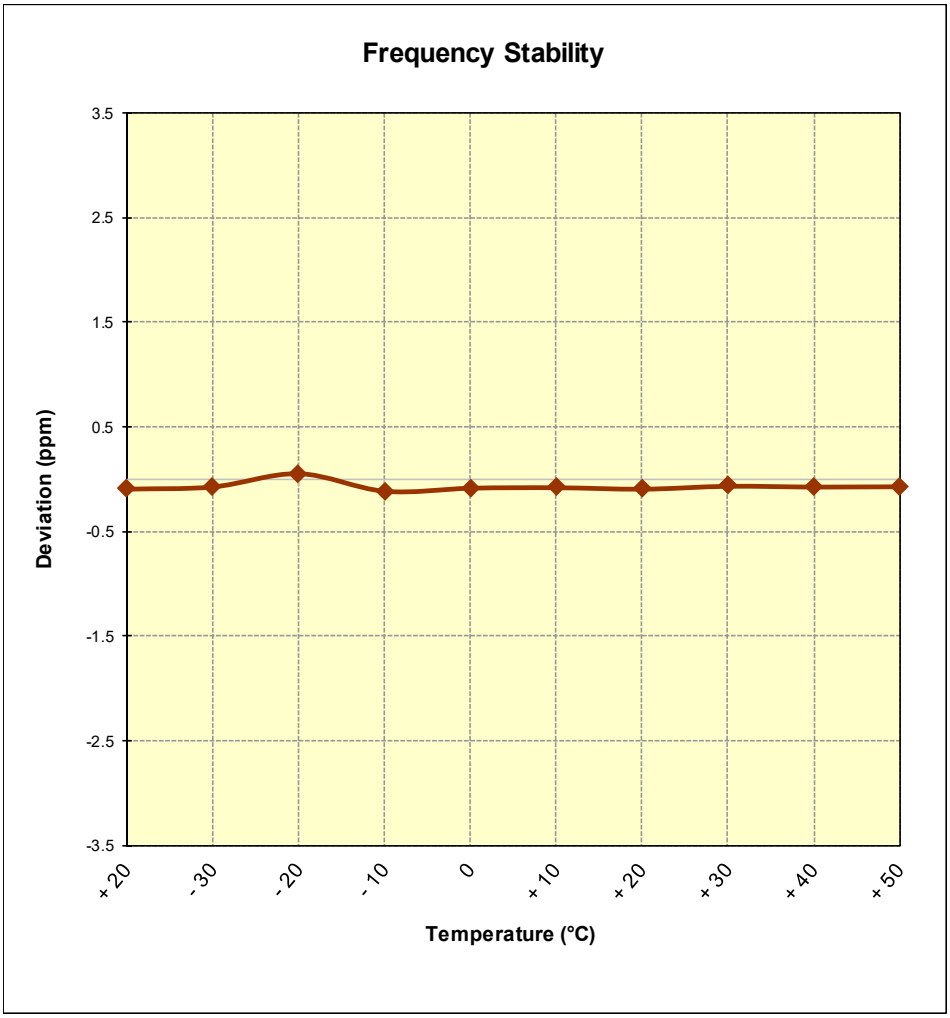


Figure 7-10. Frequency Stability Graph (Band 4/66)

Band 2 Frequency Stability Measurements

§2.1055 §24.235

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

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	1,879,999,858	-142	-0.0000076
100 %		- 30	1,879,999,834	-166	-0.0000088
100 %		- 20	1,879,999,876	-124	-0.0000066
100 %		- 10	1,879,999,882	-118	-0.0000063
100 %		0	1,879,999,813	-187	-0.0000099
100 %		+ 10	1,879,999,898	-102	-0.0000054
100 %		+ 20	1,879,999,858	-142	-0.0000076
100 %		+ 30	1,879,999,883	-117	-0.0000062
100 %		+ 40	1,879,999,848	-152	-0.0000081
100 %		+ 50	1,879,999,834	-166	-0.0000088
85 %	3.27	+ 20	1,879,999,829	-171	-0.0000091
BATT. ENDPOINT	3.45	+ 20	1,879,999,816	-184	-0.0000098

Table 7-21. Frequency Stability Data (Band 2)

Note:

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

Band 2 Frequency Stability Measurements

§2.1055 §24.235

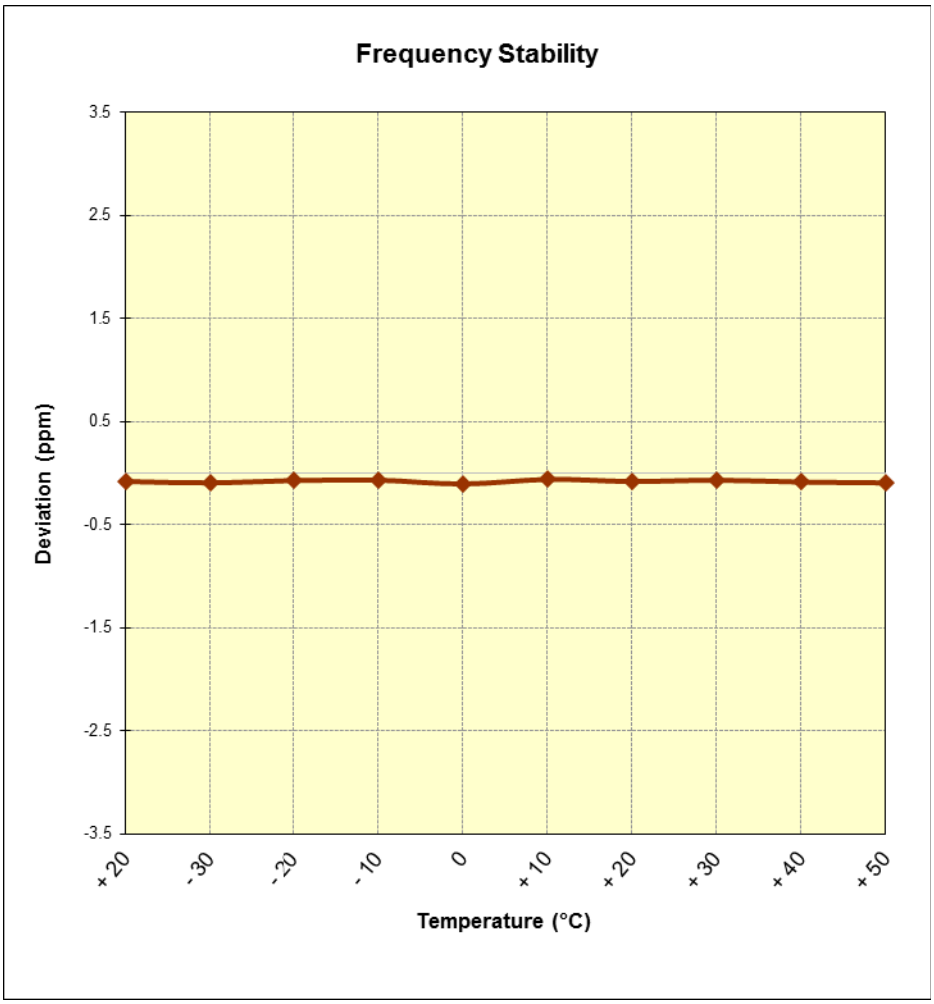


Figure 7-11. Frequency Stability Graph (Band 2)

Band 7 Frequency Stability Measurements

§2.1055 §27.54

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

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	2,534,999,883	-117	-0.0000046
100 %		- 30	2,534,999,847	-153	-0.0000060
100 %		- 20	2,534,999,869	-131	-0.0000052
100 %		- 10	2,535,000,109	109	0.0000043
100 %		0	2,534,999,884	-116	-0.0000046
100 %		+ 10	2,534,999,858	-142	-0.0000056
100 %		+ 20	2,534,999,883	-117	-0.0000046
100 %		+ 30	2,534,999,867	-133	-0.0000052
100 %		+ 40	2,534,999,832	-168	-0.0000066
100 %		+ 50	2,534,999,839	-161	-0.0000064
BATT. ENDPOINT	3.45	+ 20	2,534,999,808	-192	-0.0000076

Table 7-22. Frequency Stability Data (Band 7)

Note:

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

Band 7 Frequency Stability Measurements

§2.1055 §27.54

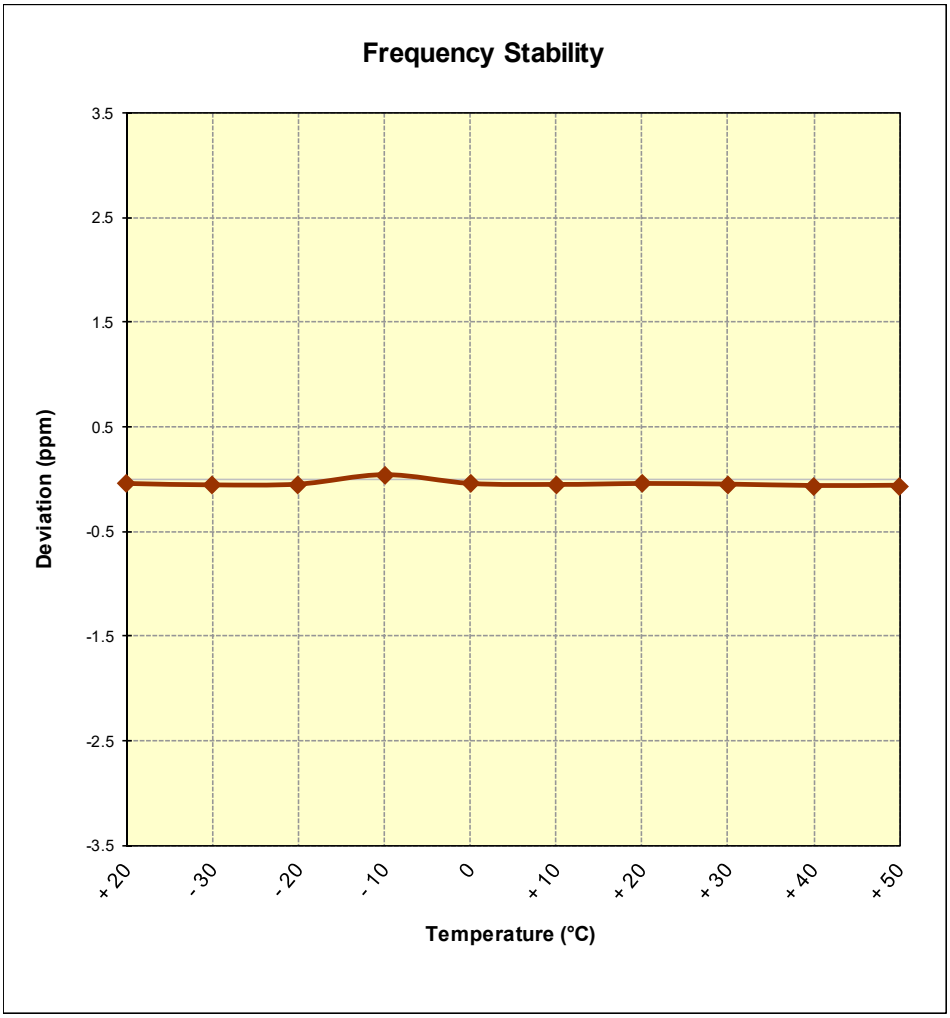


Figure 7-12. Frequency Stability Graph (Band 7)

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFM703** complies with all the requirements of Parts 22, 24, & 27 of the FCC rules for LTE operation only.