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.

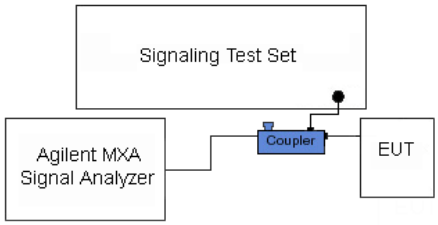


Figure 7-3. Test Instrument & Measurement Setup

Test Notes

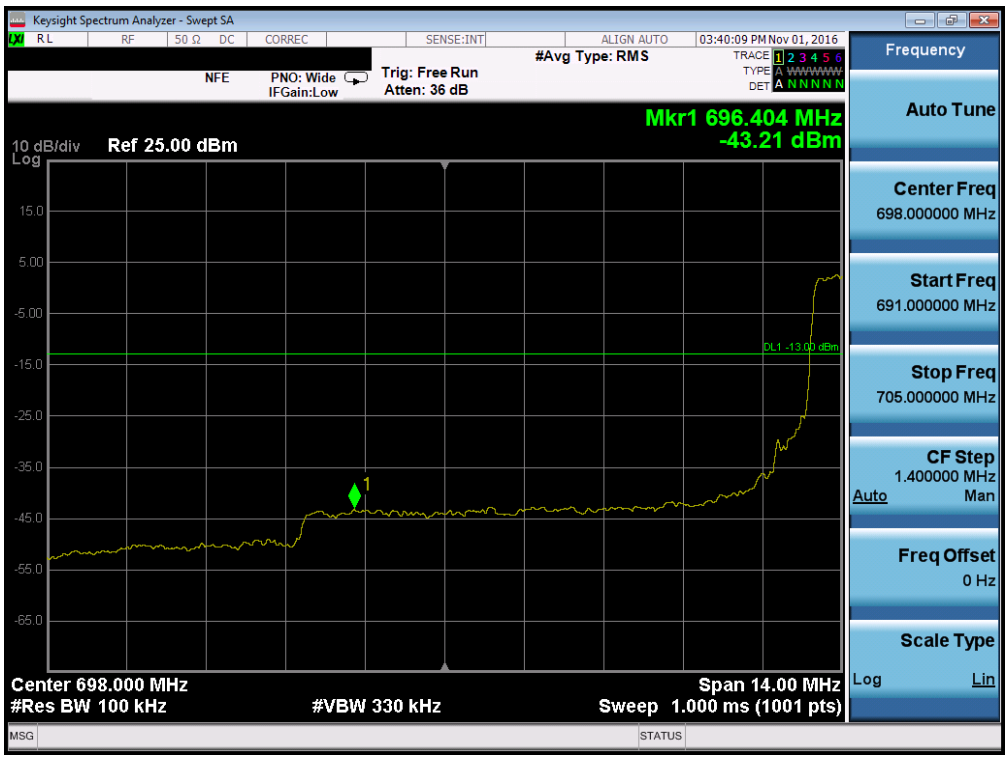
Per 22.917(b) 24.238(a) 27.53(h) in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions 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.

Plot 7-90. Lower Band Edge Plot (Band 17 – 5.0MHz QPSK – RB Size 25)

Plot 7-91. Upper Band Edge Plot (Band 17 – 5.0MHz QPSK – RB Size 25)



Plot 7-92. Lower Band Edge Plot (Band 17 – 10.0MHz QPSK – RB Size 50)

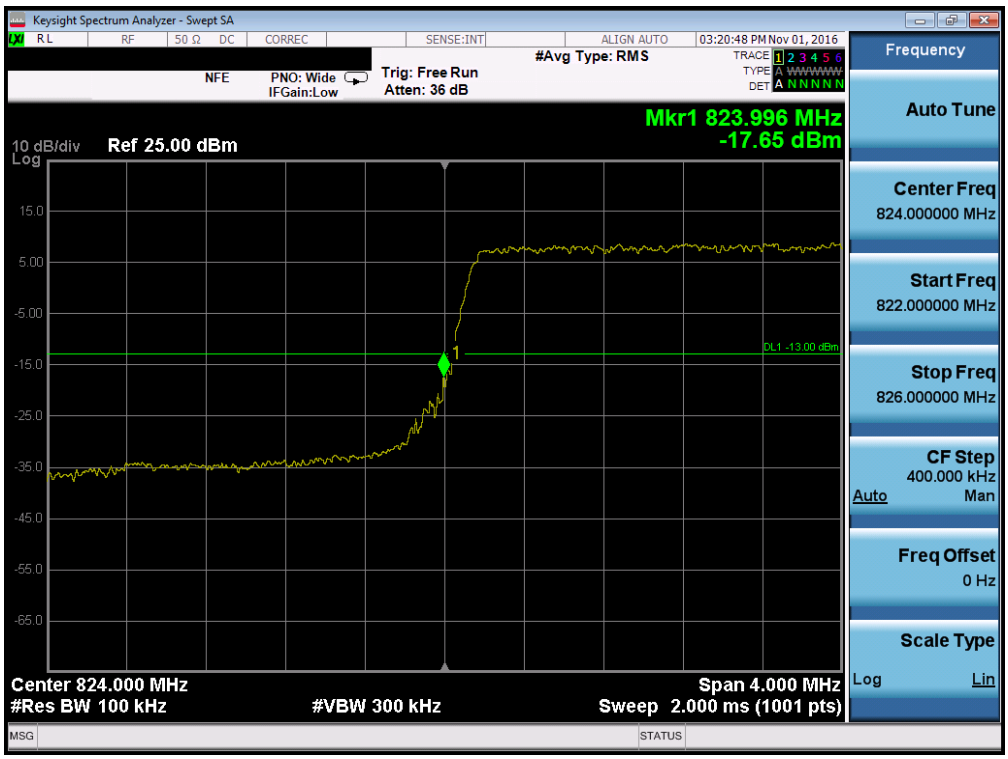
Plot 7-93. Upper Band Edge Plot (Band 17 – 10.0MHz QPSK – RB Size 50)

Plot 7-94. Lower Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

Plot 7-95. Lower Extended Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

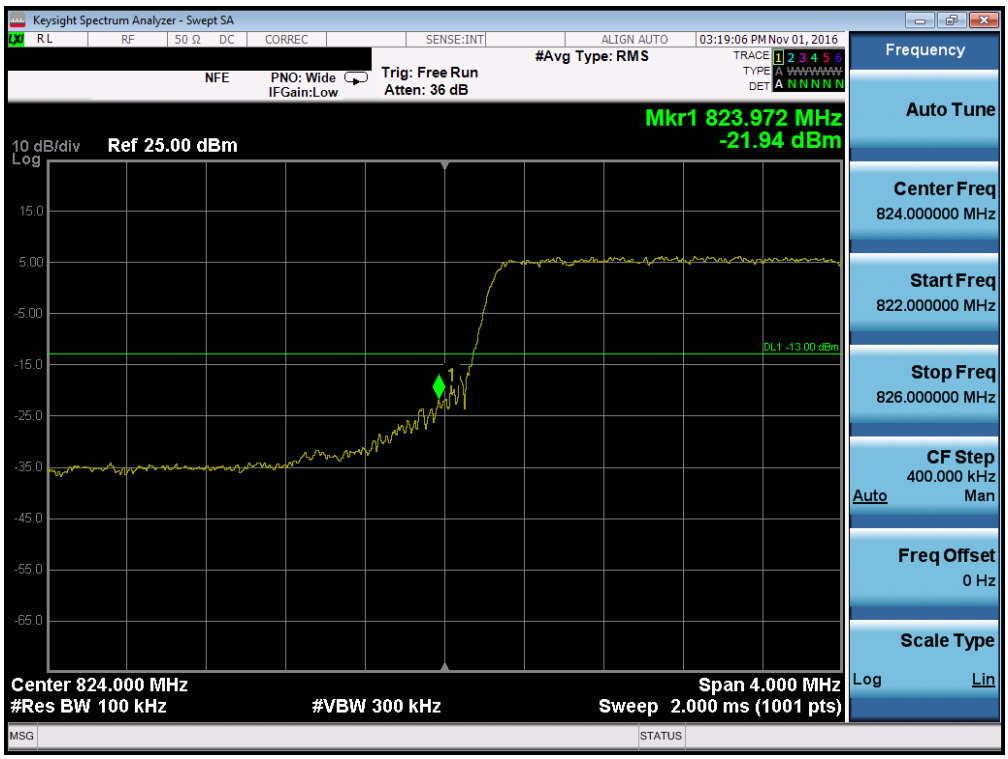
Plot 7-96. Upper Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

Plot 7-97. Upper Extended Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)



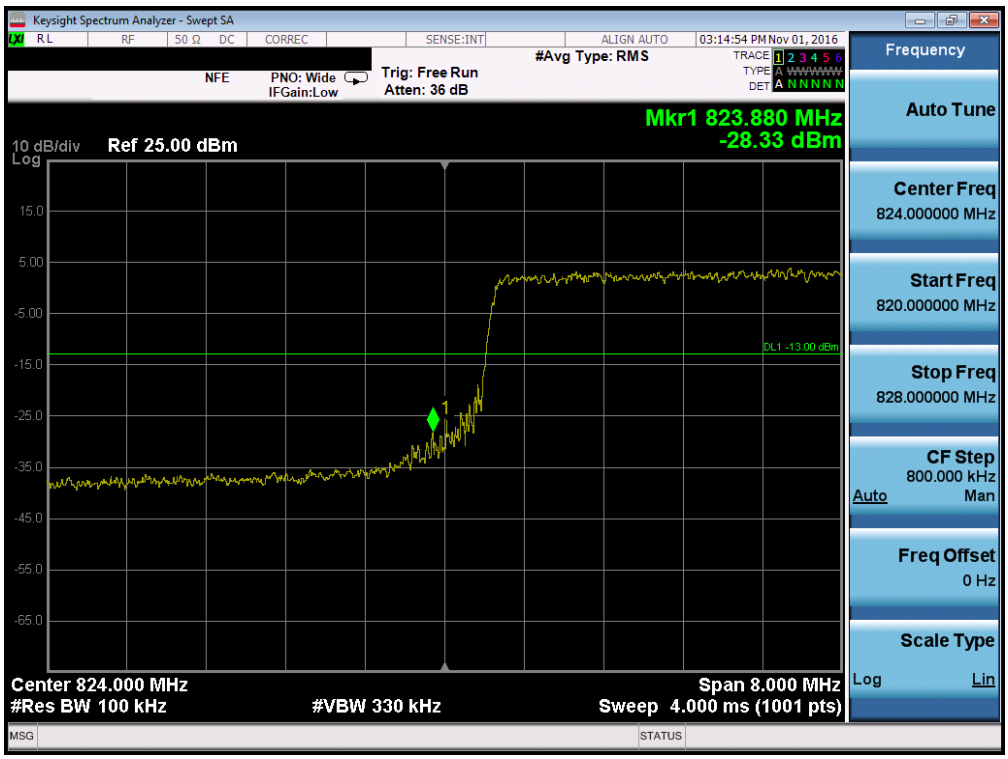
Plot 7-98. Lower Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)

Plot 7-99. Upper Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)



Plot 7-100. Lower Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

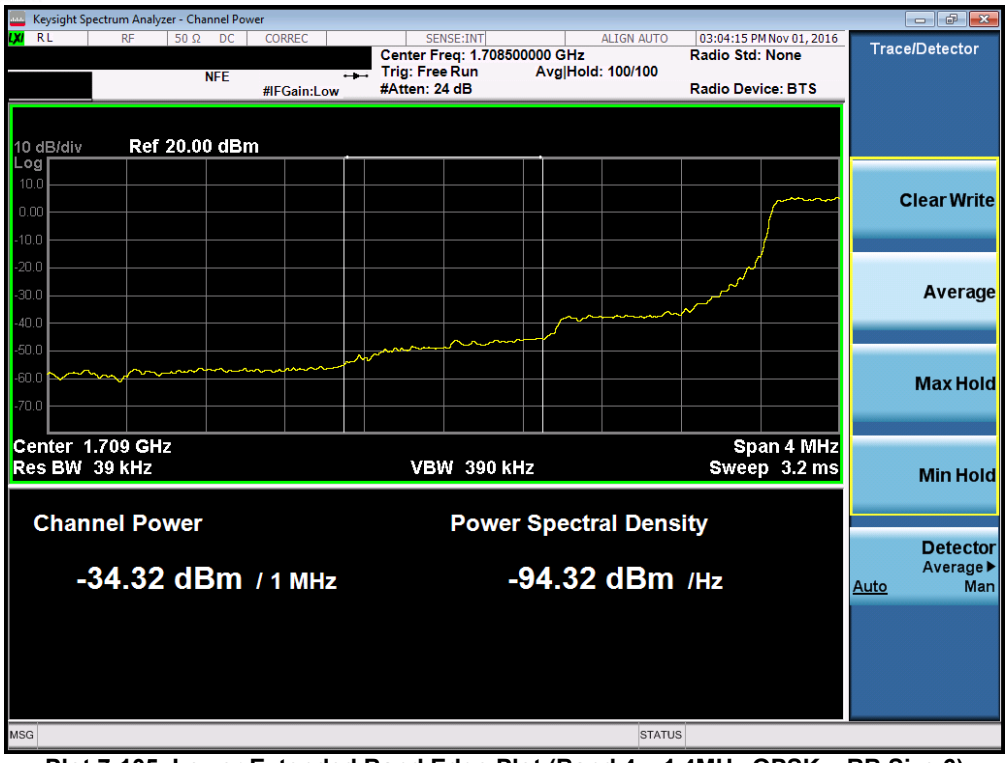
Plot 7-101. Upper Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)



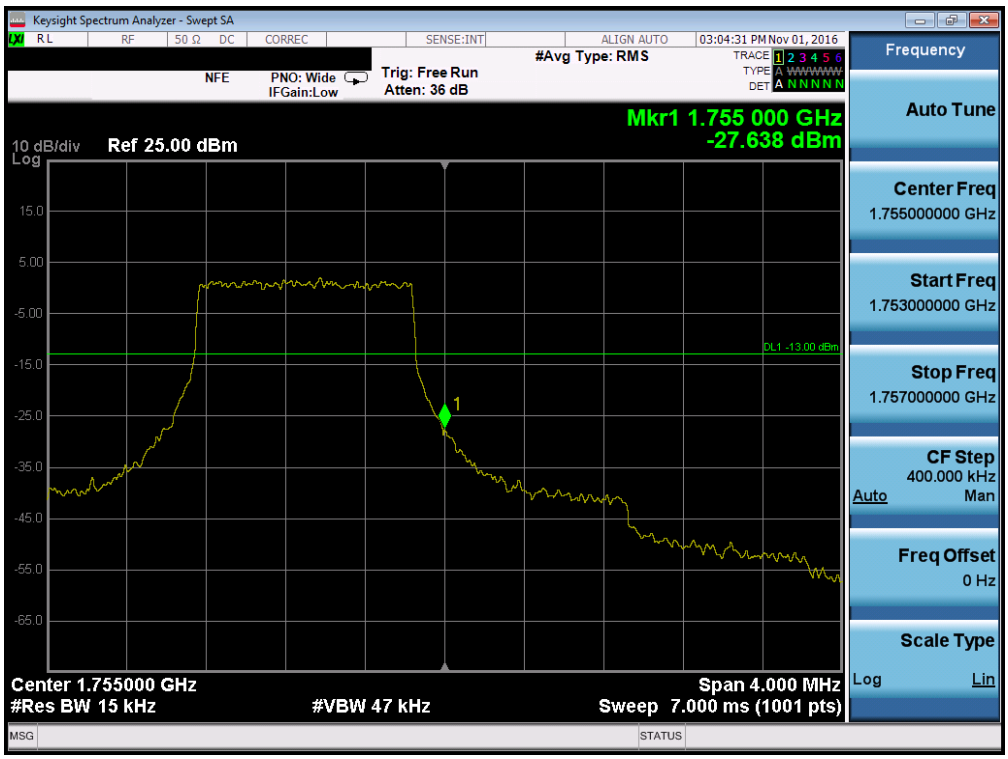
Plot 7-102. Lower Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)

Plot 7-103. Upper Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)

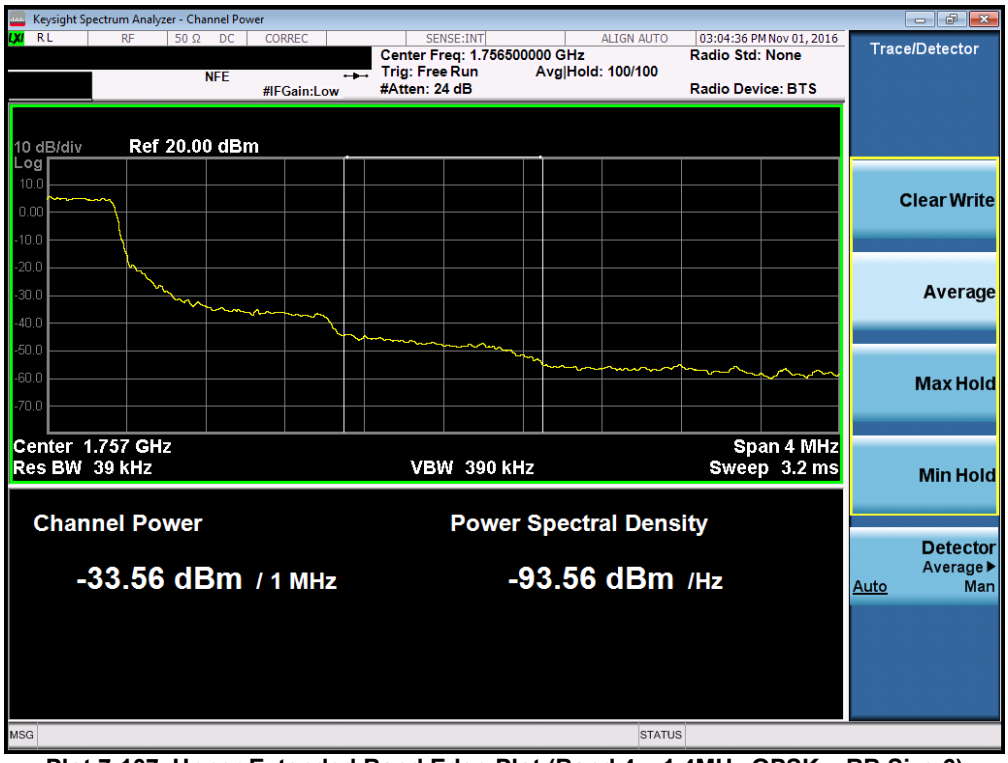
Plot 7-104. Lower Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



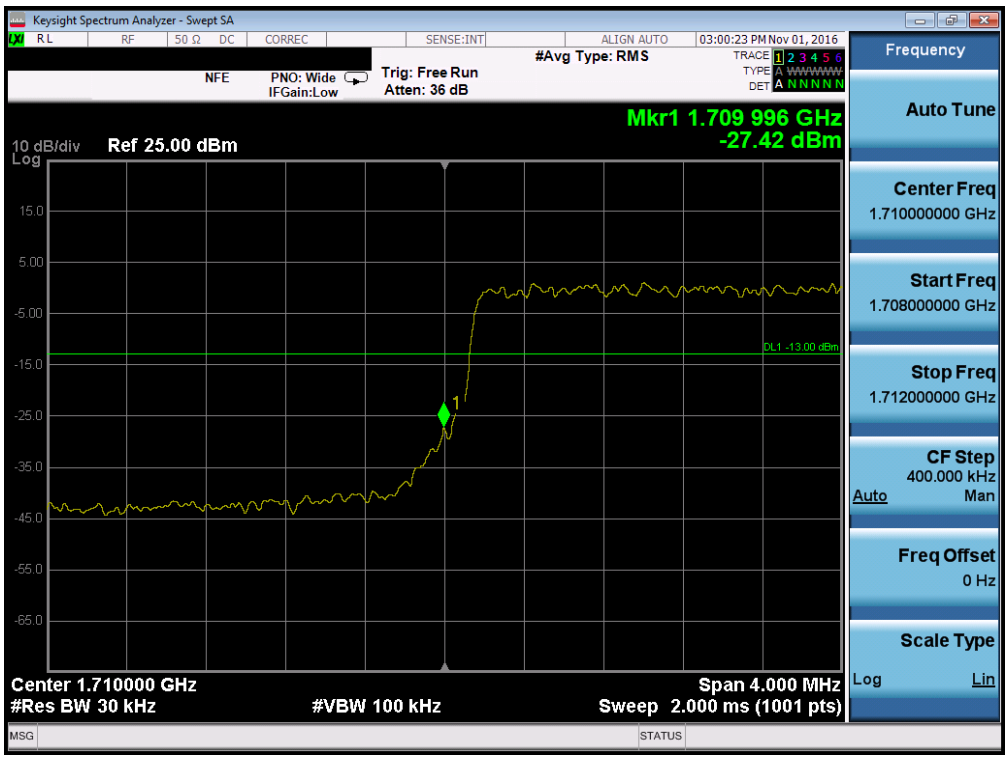
Plot 7-105. Lower Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



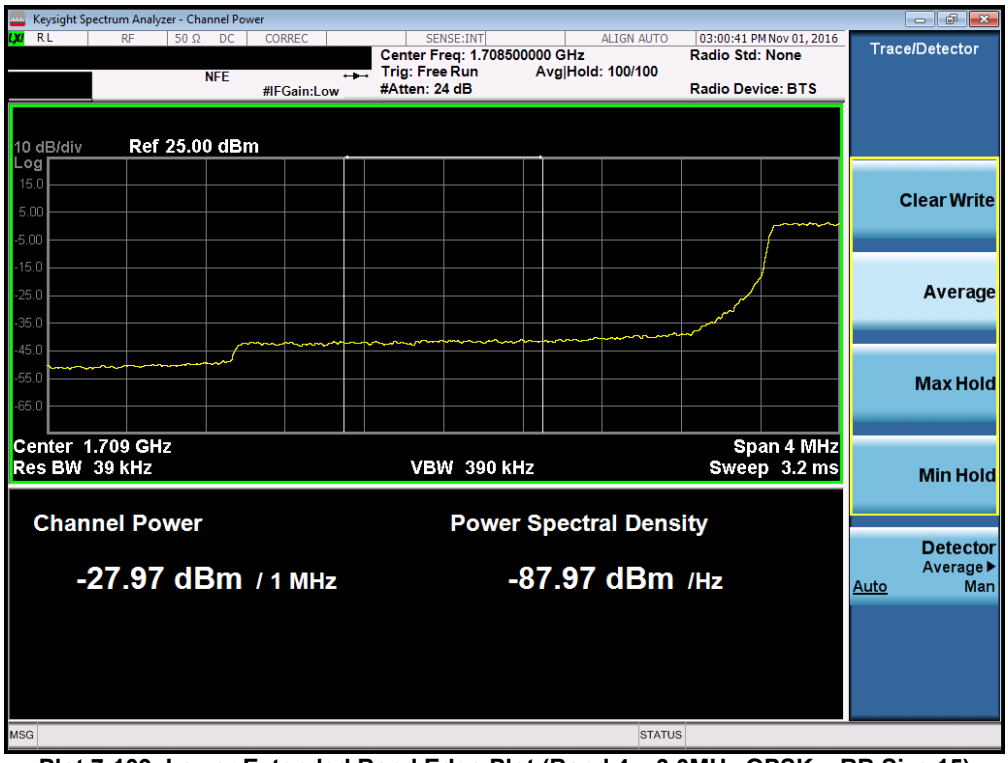
Plot 7-106. Upper Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



Plot 7-107. Upper Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

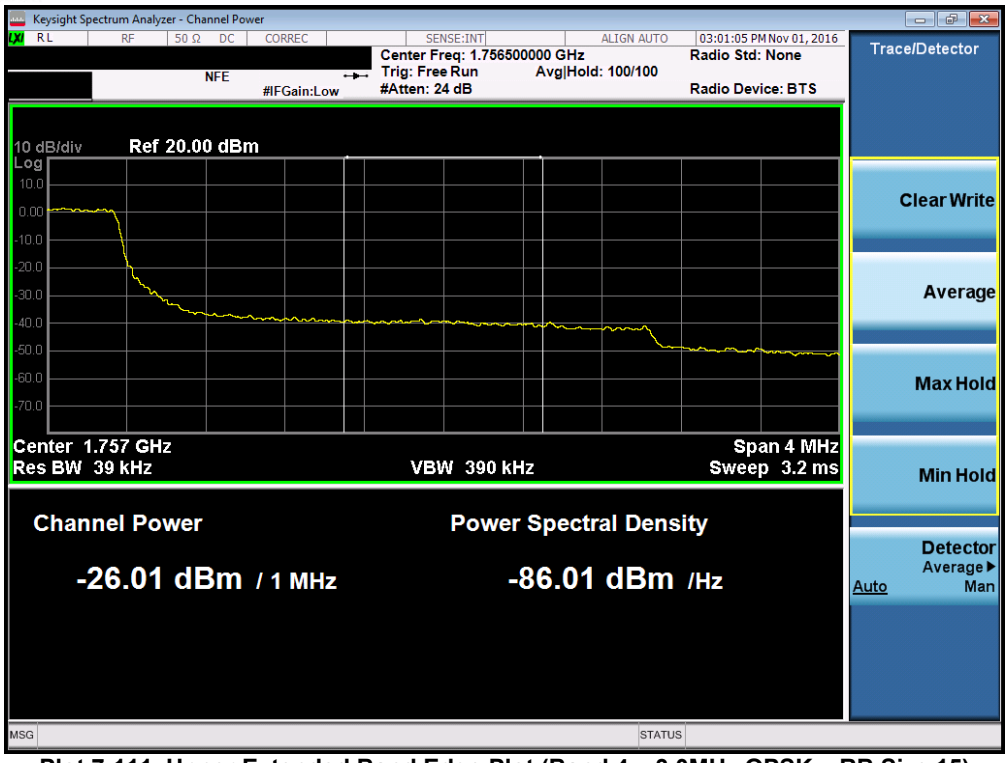


Plot 7-108. Lower Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

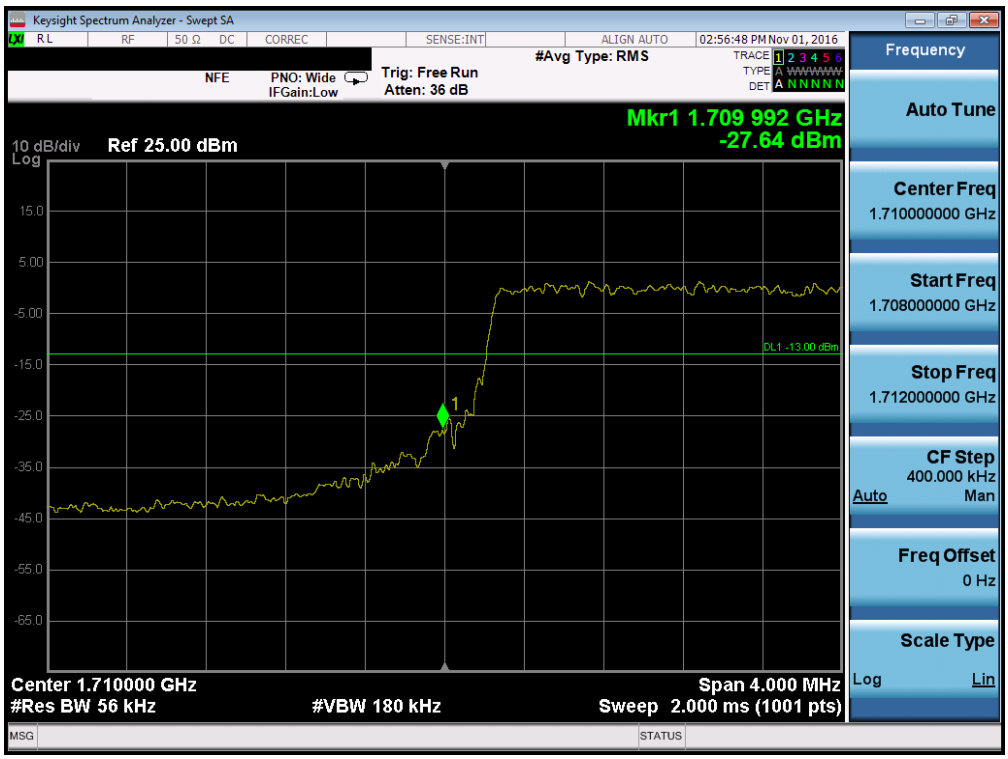


Plot 7-109. Lower Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

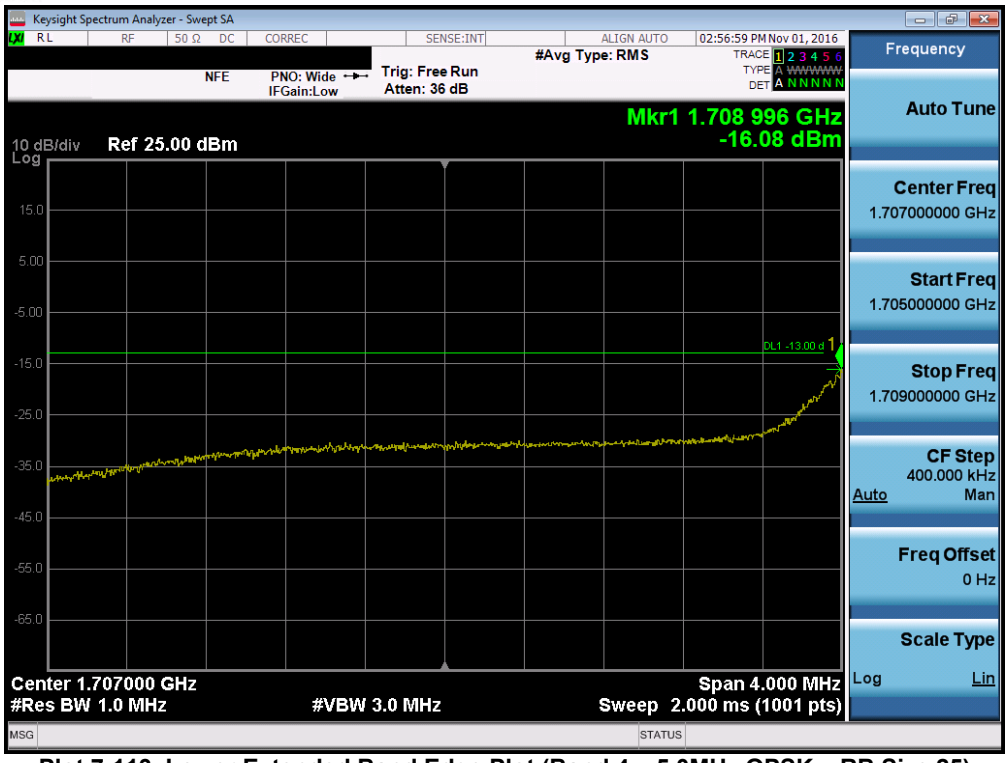
Plot 7-110. Upper Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



Plot 7-111. Upper Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

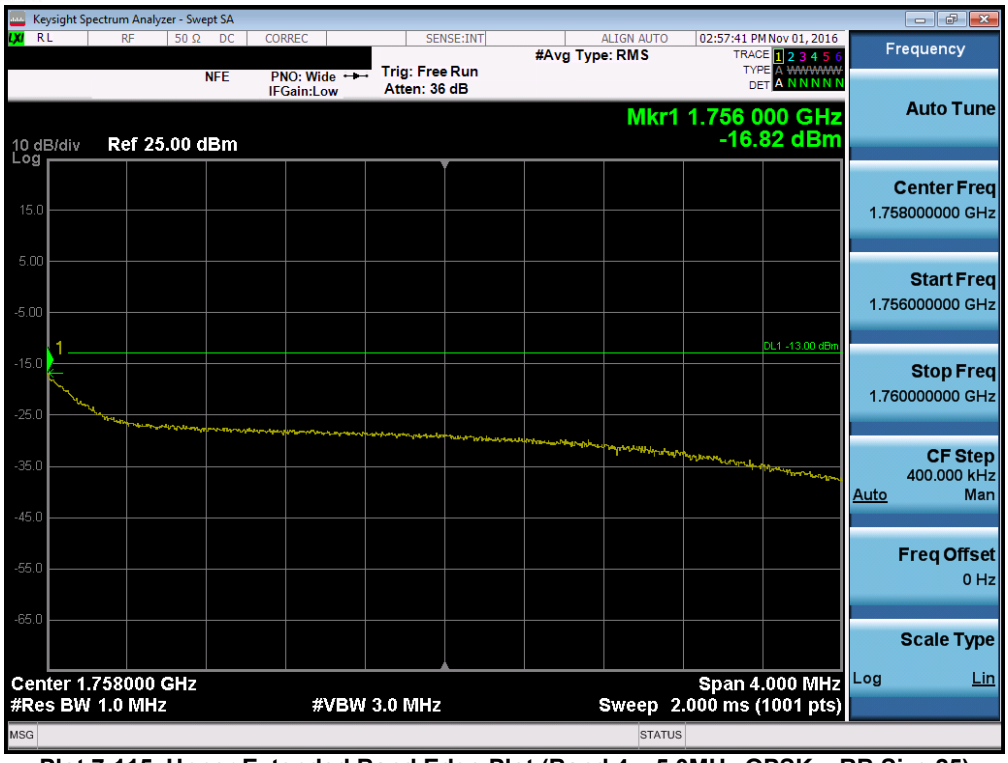


Plot 7-112. Lower Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

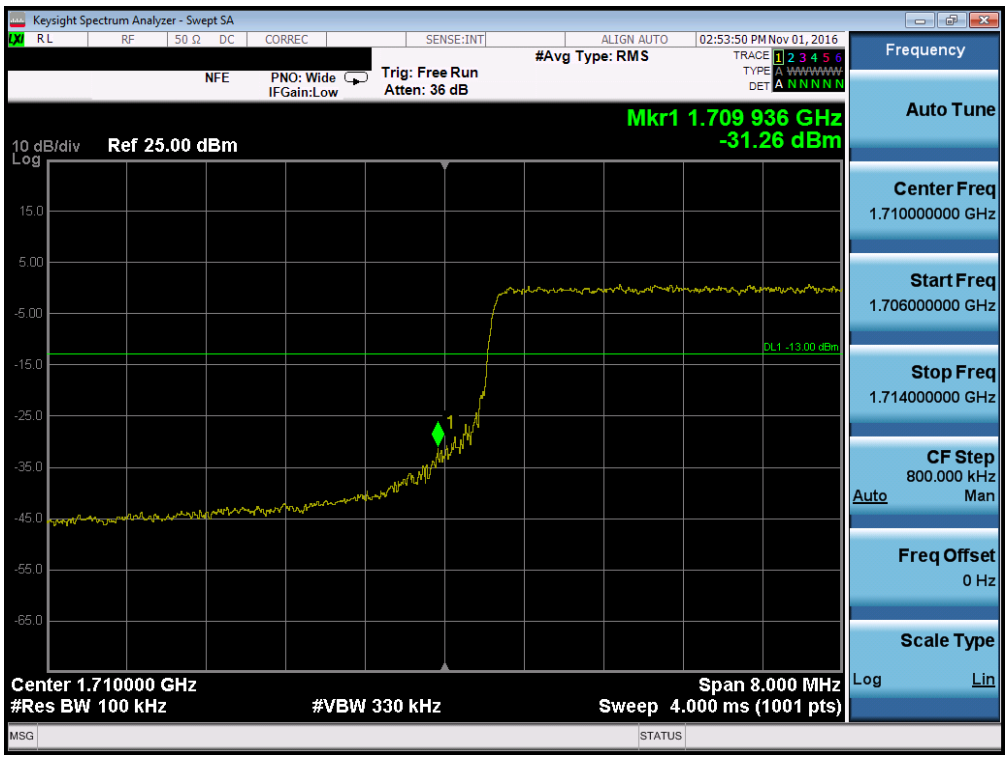


Plot 7-113. Lower Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

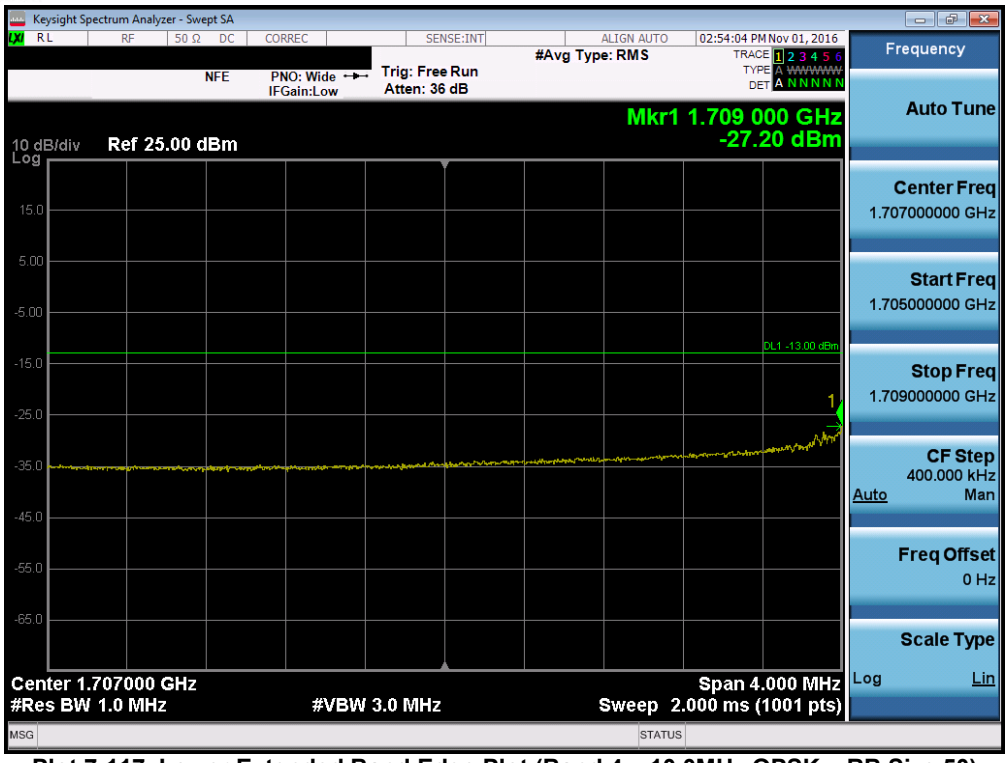
Plot 7-114. Upper Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



Plot 7-115. Upper Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



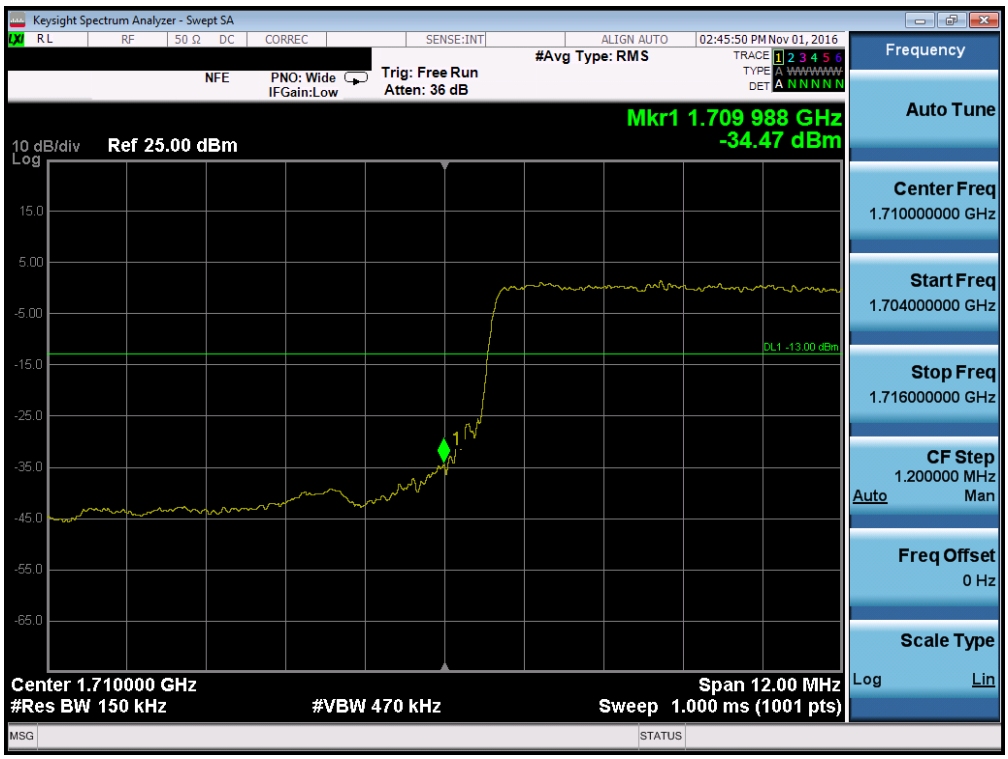
Plot 7-116. Lower Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)



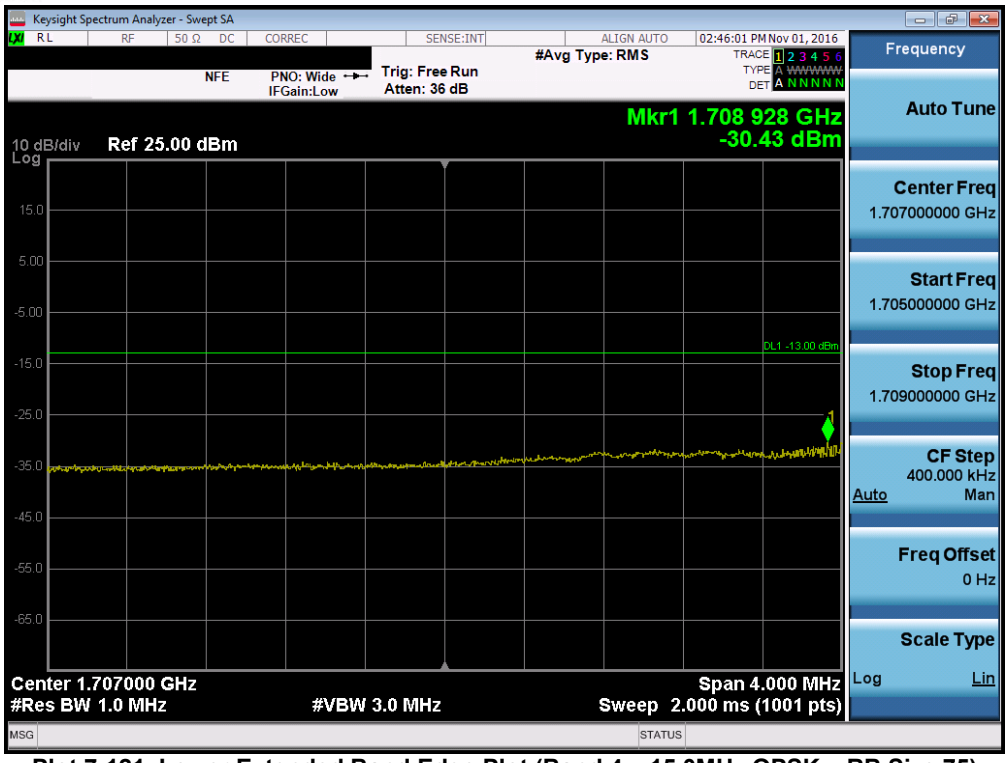
Plot 7-117. Lower Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

Plot 7-118. Upper Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

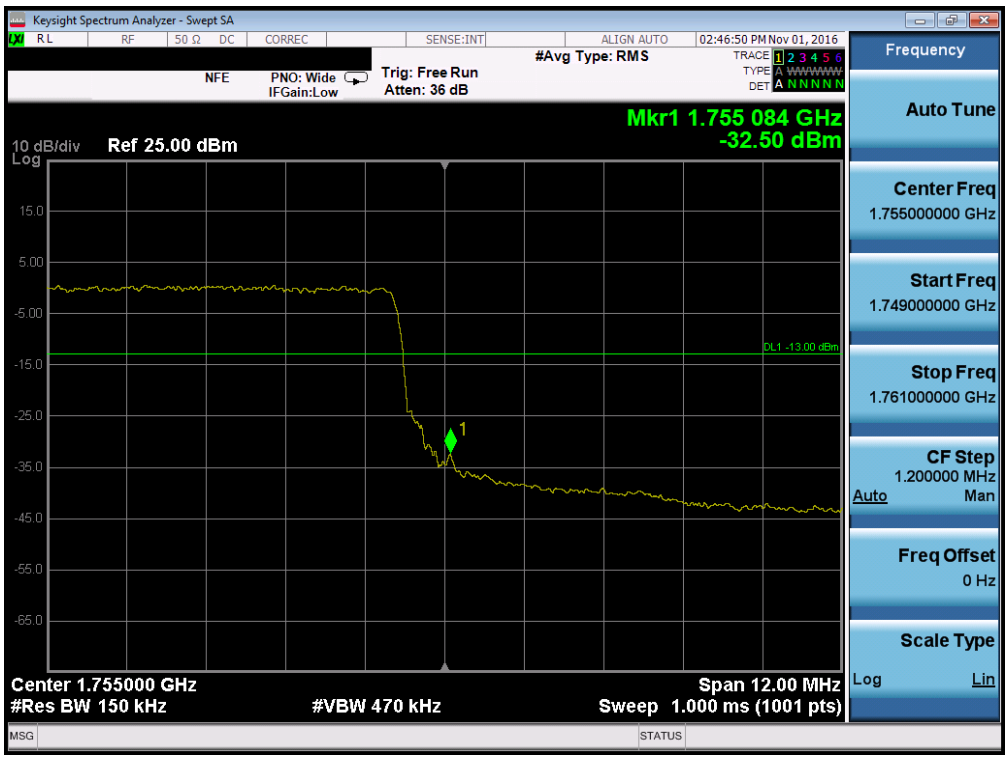
Plot 7-119. Upper Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)



Plot 7-120. Lower Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

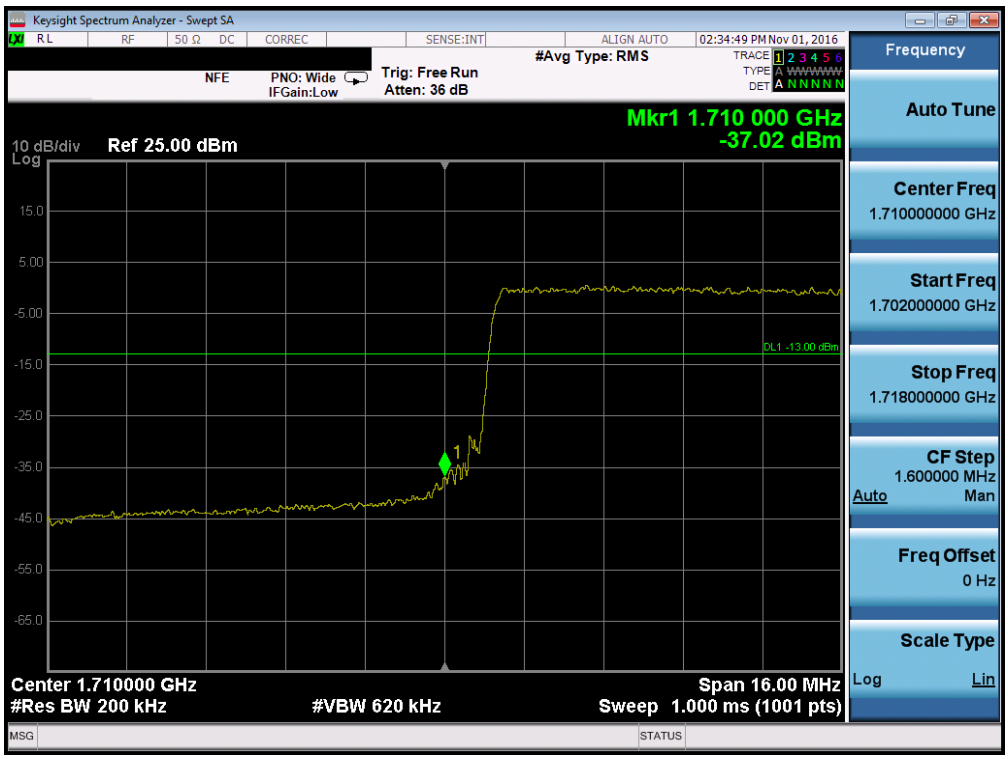


Plot 7-121. Lower Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

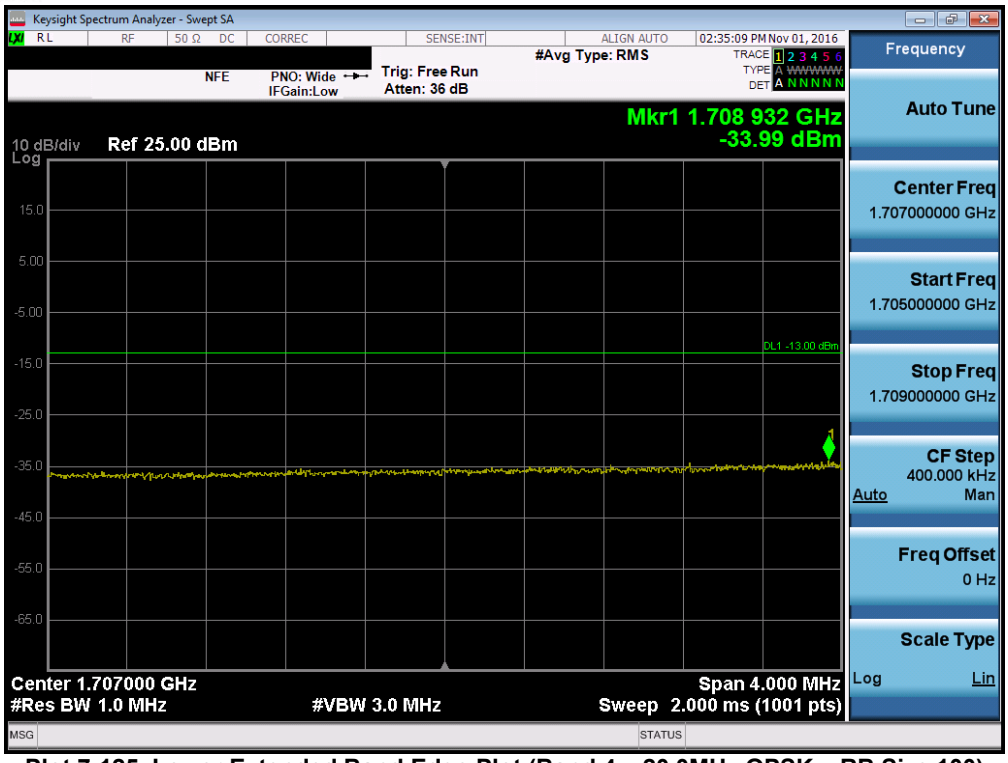


Plot 7-122. Upper Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

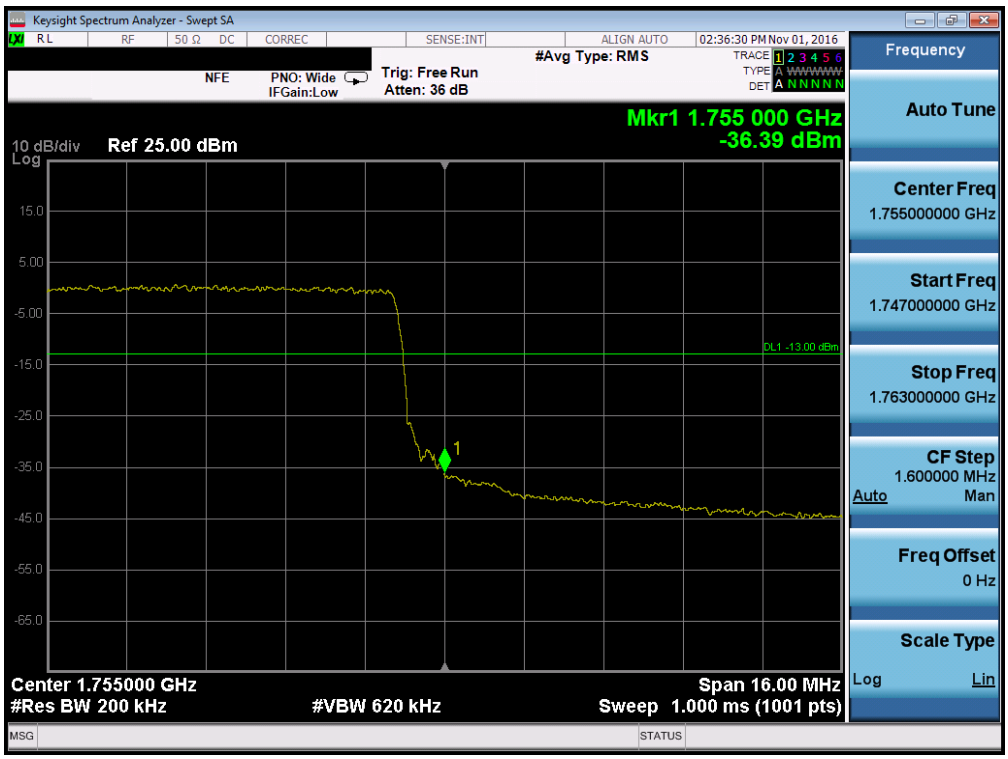
Plot 7-123. Upper Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)



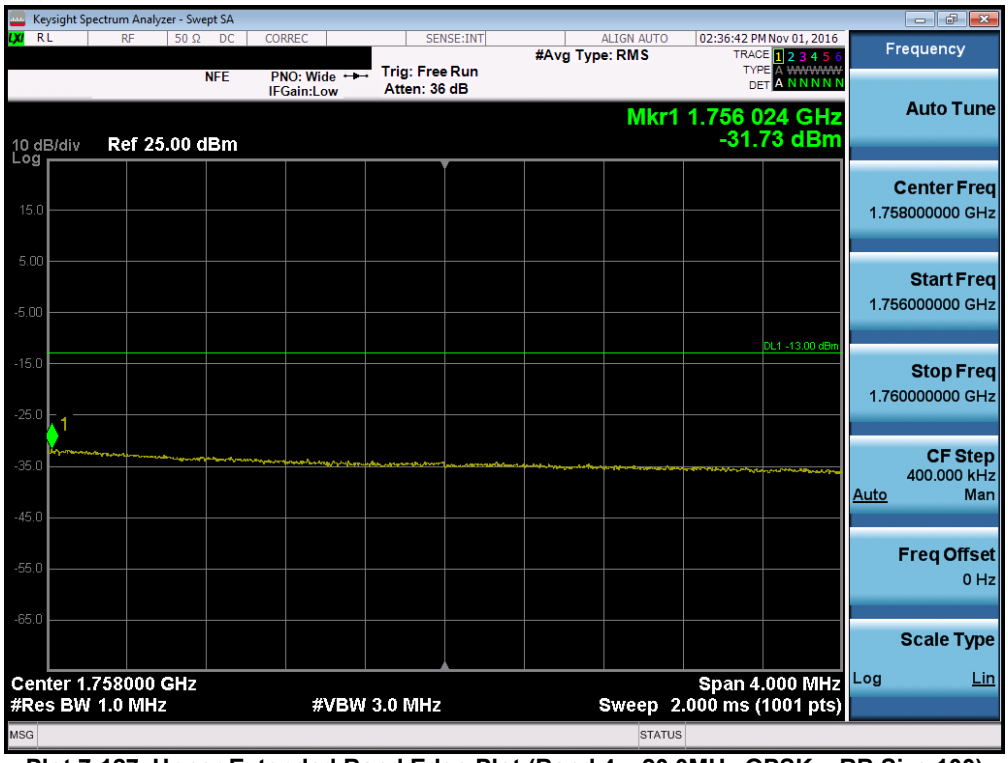
Plot 7-124. Lower Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



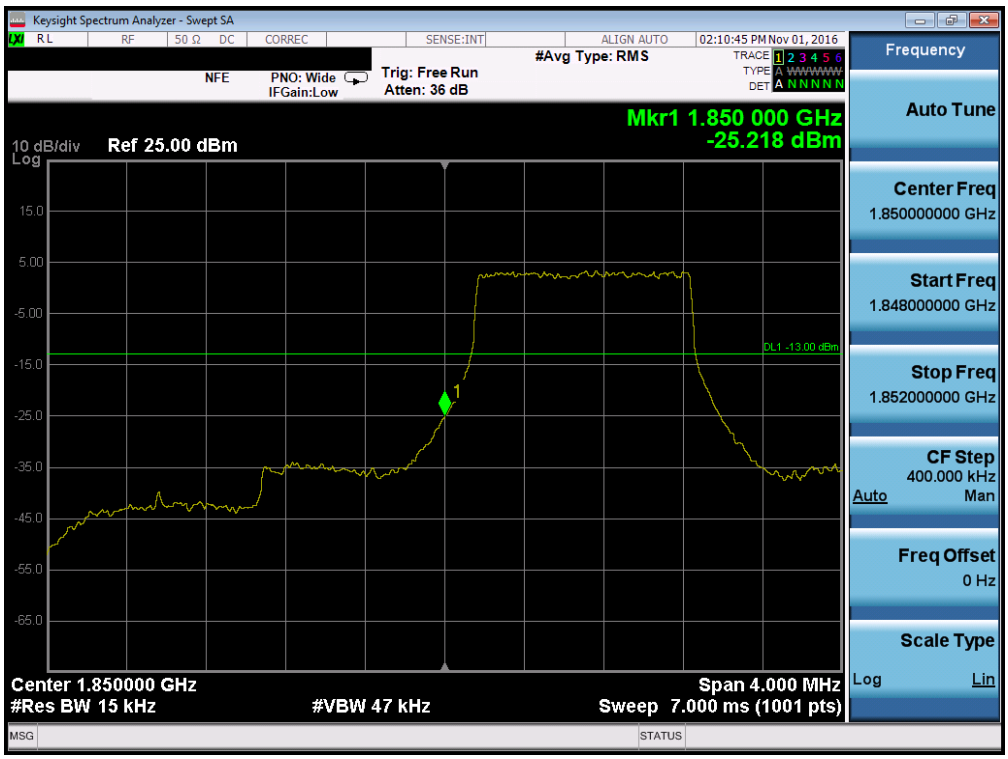
Plot 7-125. Lower Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



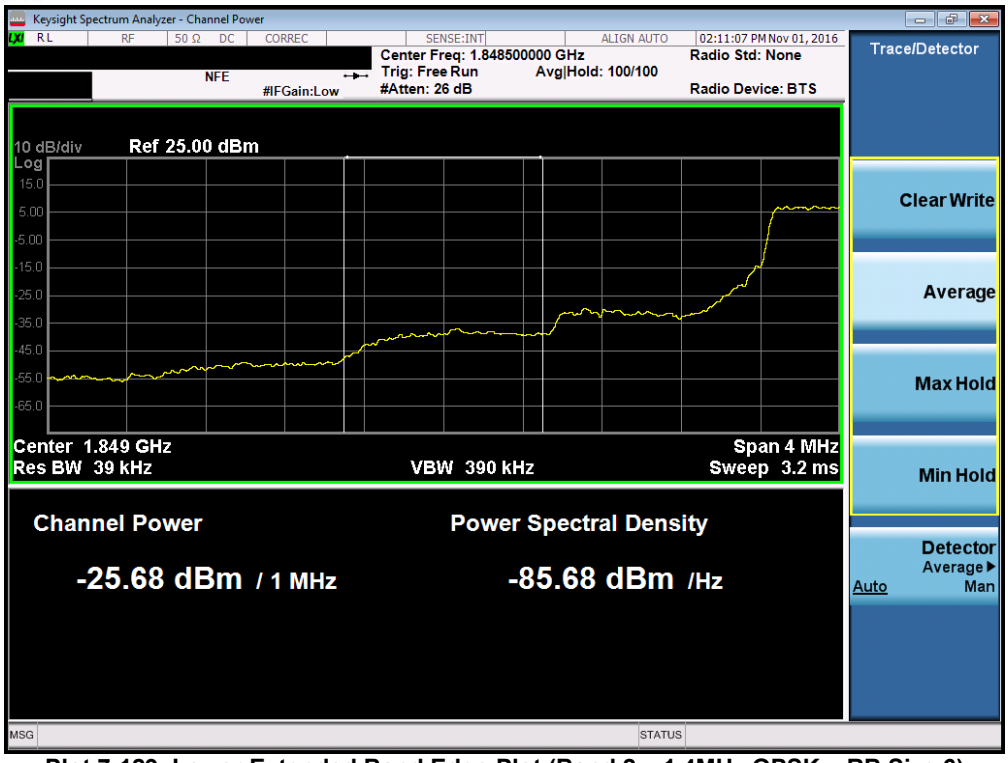
Plot 7-126. Upper Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



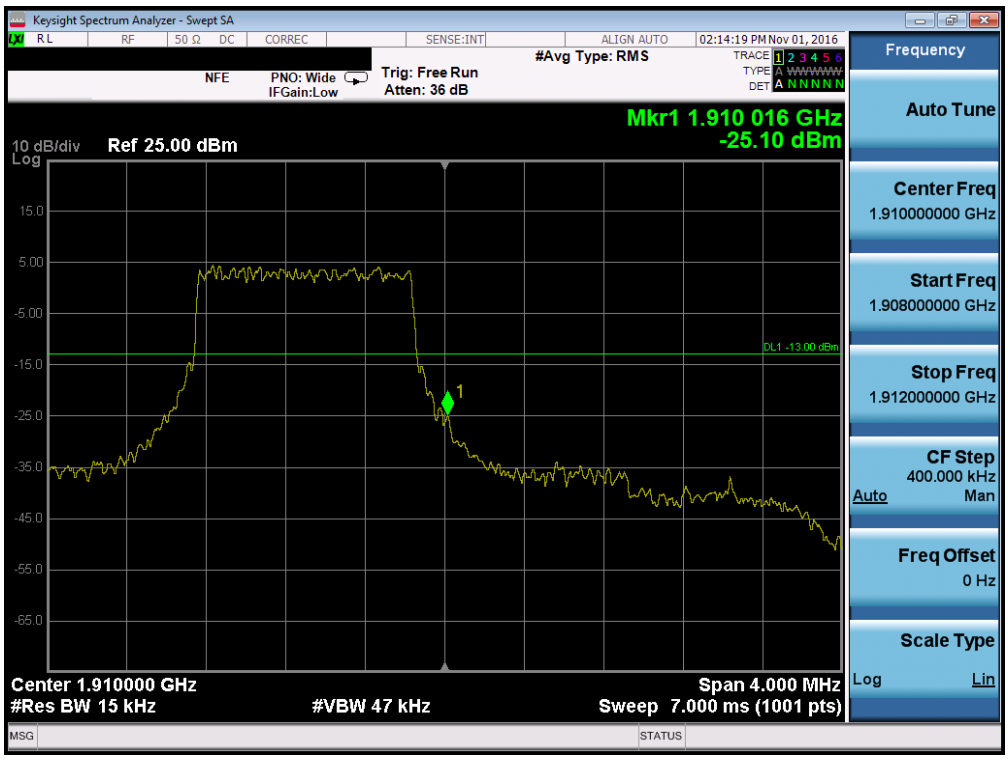
Plot 7-127. Upper Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



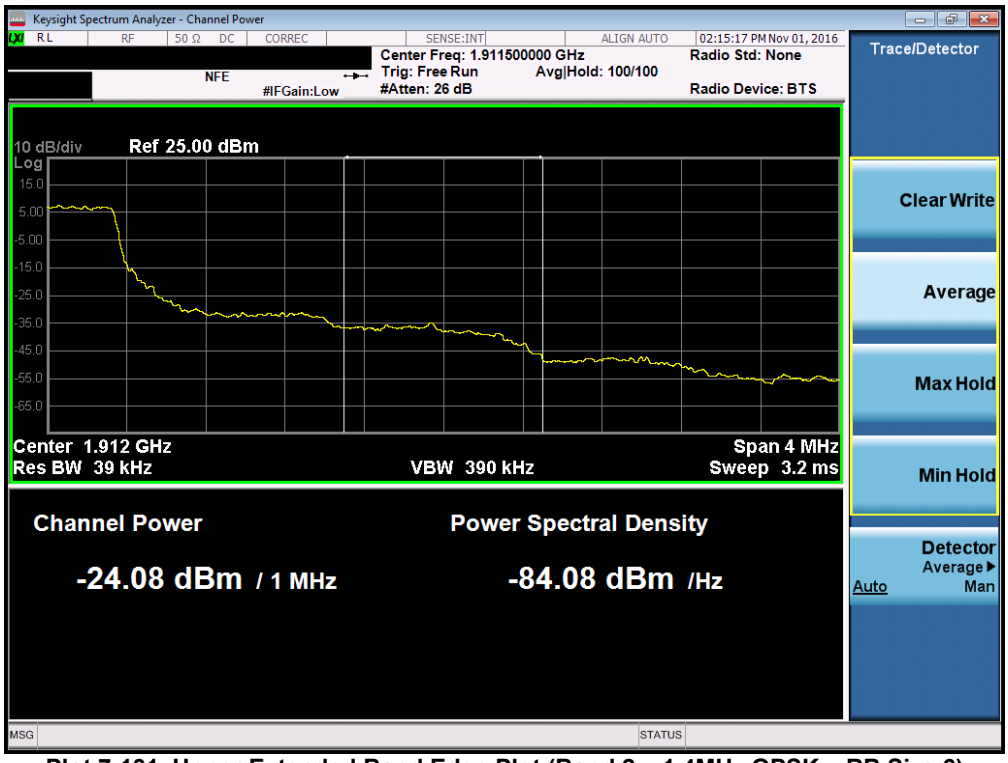
Plot 7-128. Lower Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)



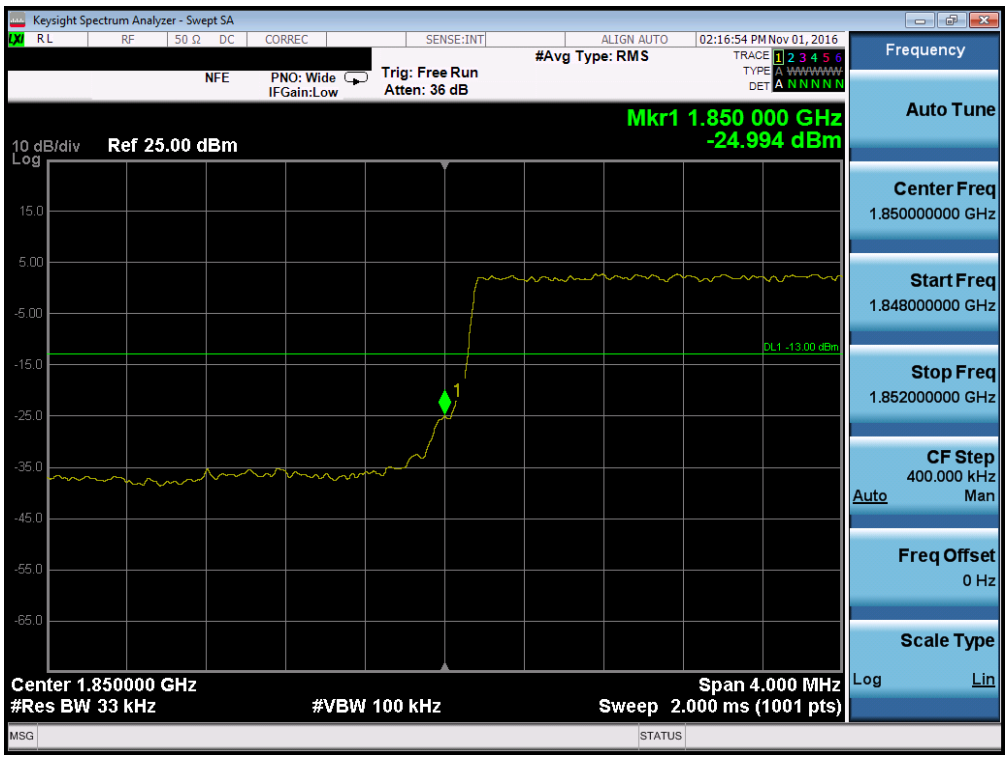
Plot 7-129. Lower Extended Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)



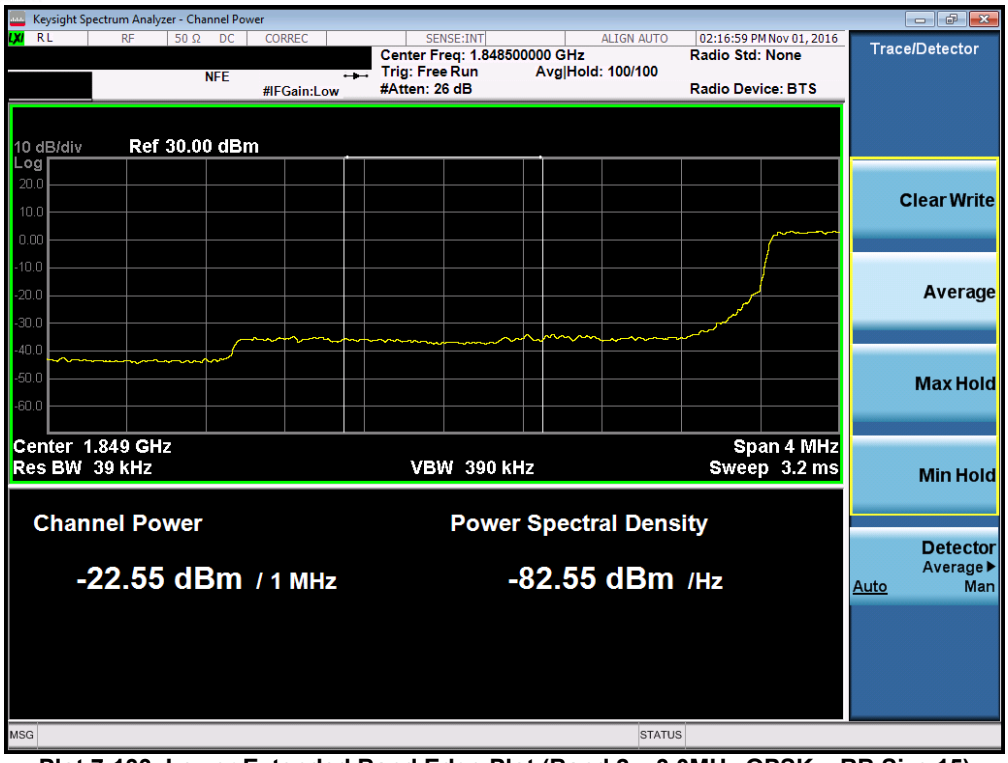
Plot 7-130. Upper Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)



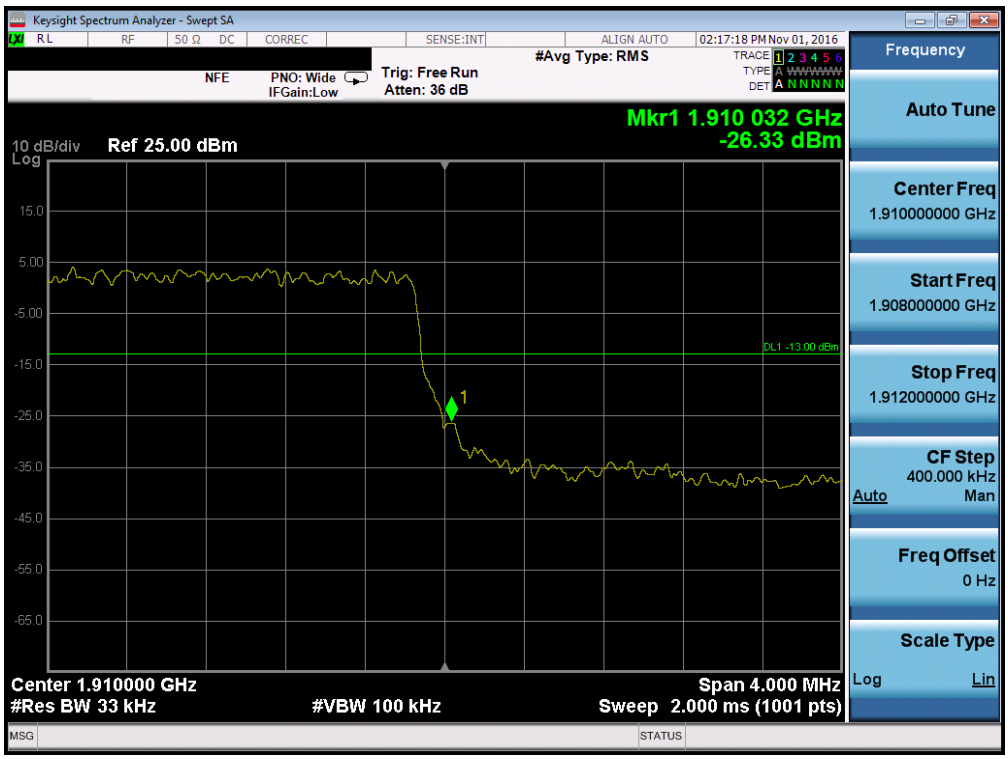
Plot 7-131. Upper Extended Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)



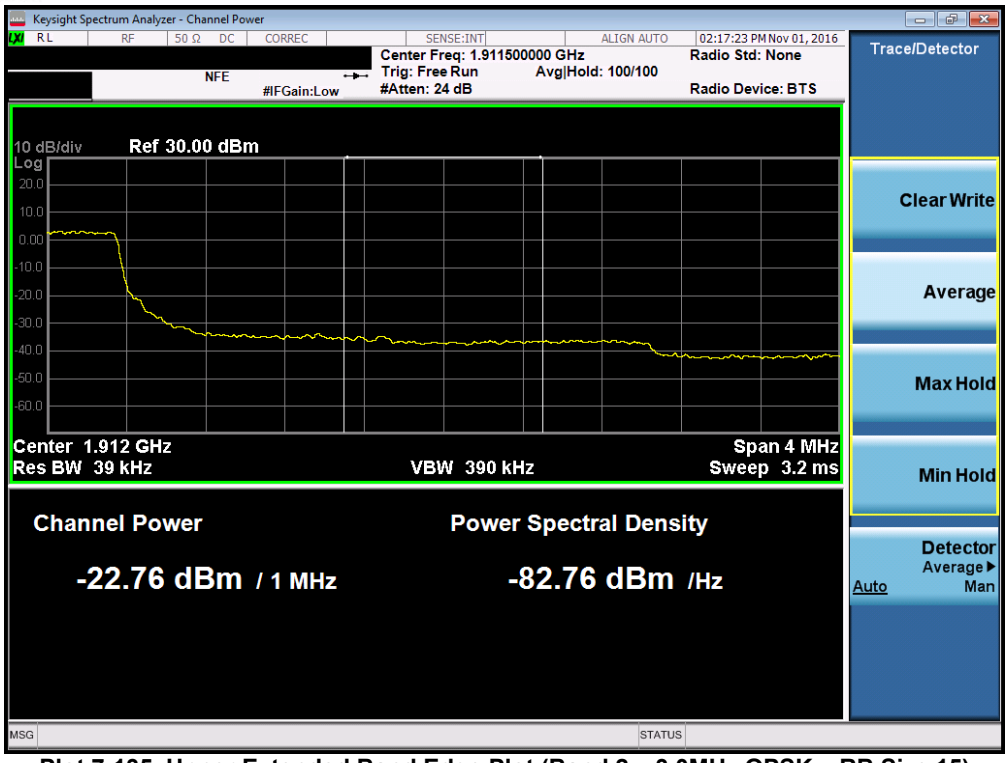
Plot 7-132. Lower Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)



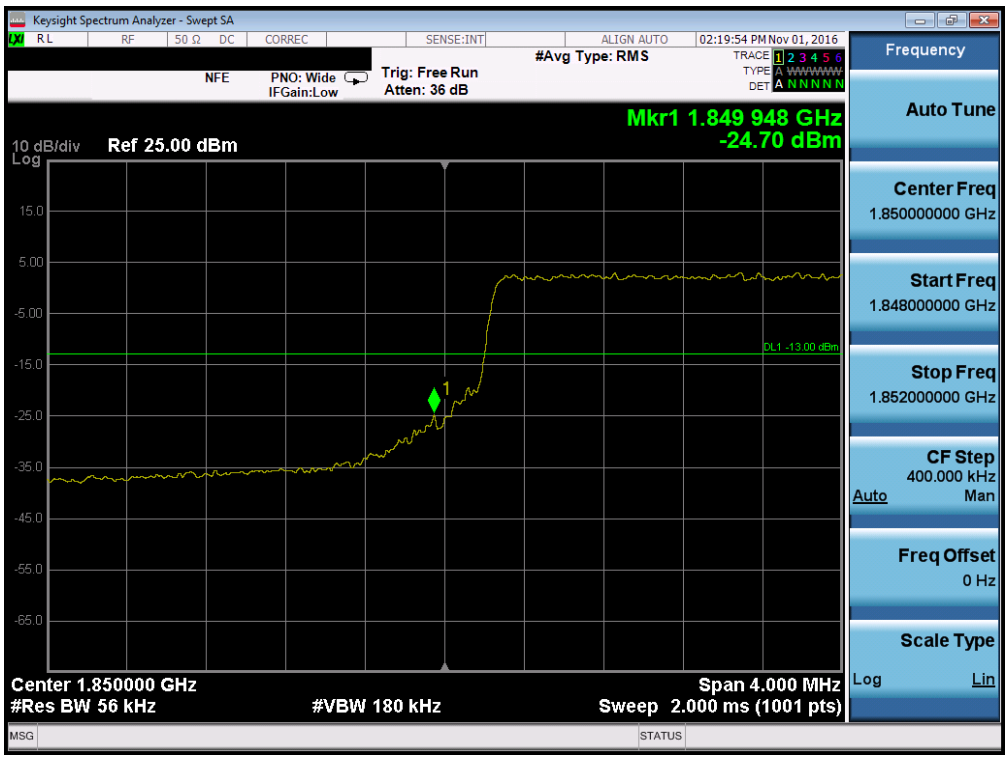
Plot 7-133. Lower Extended Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)



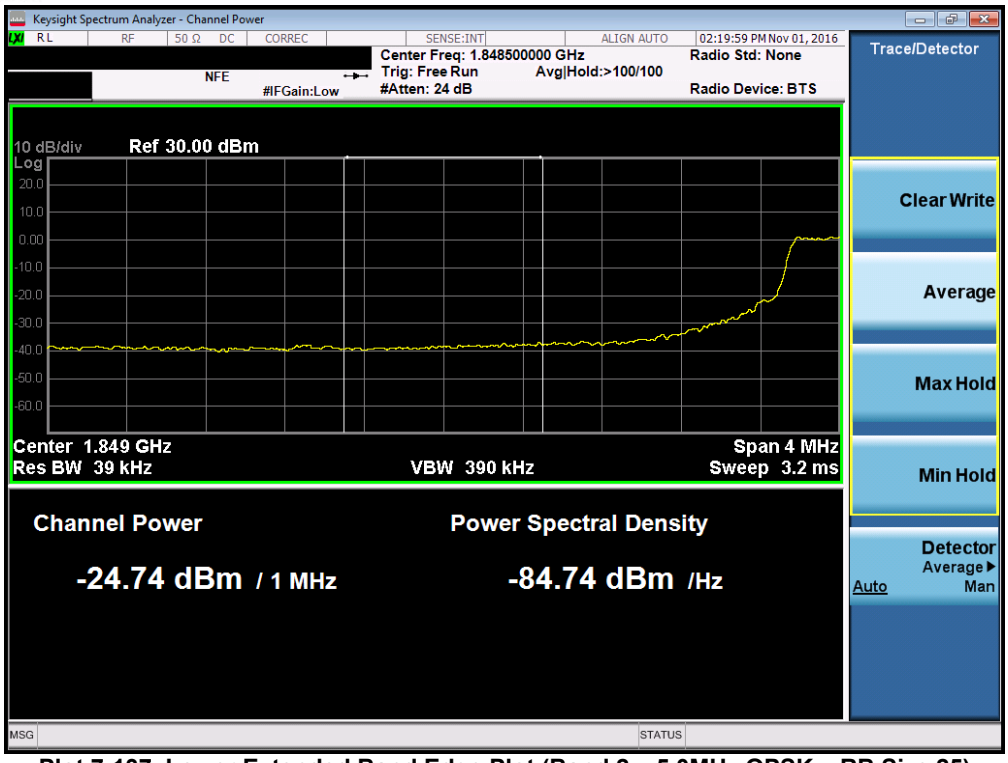
Plot 7-134. Upper Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)



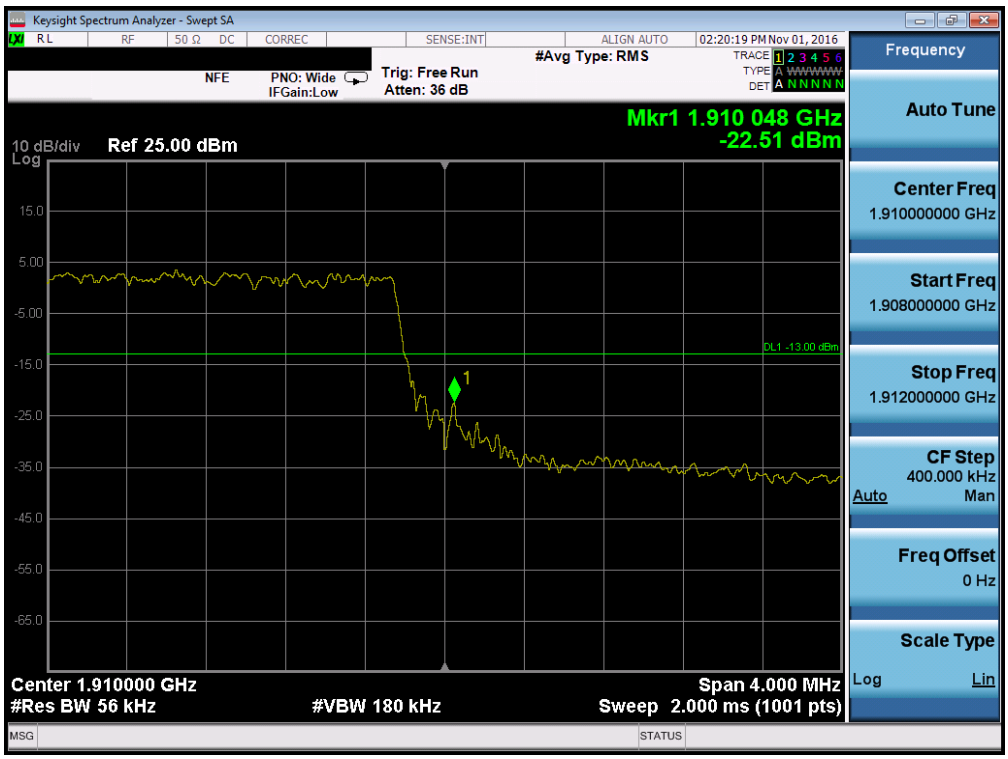
Plot 7-135. Upper Extended Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)



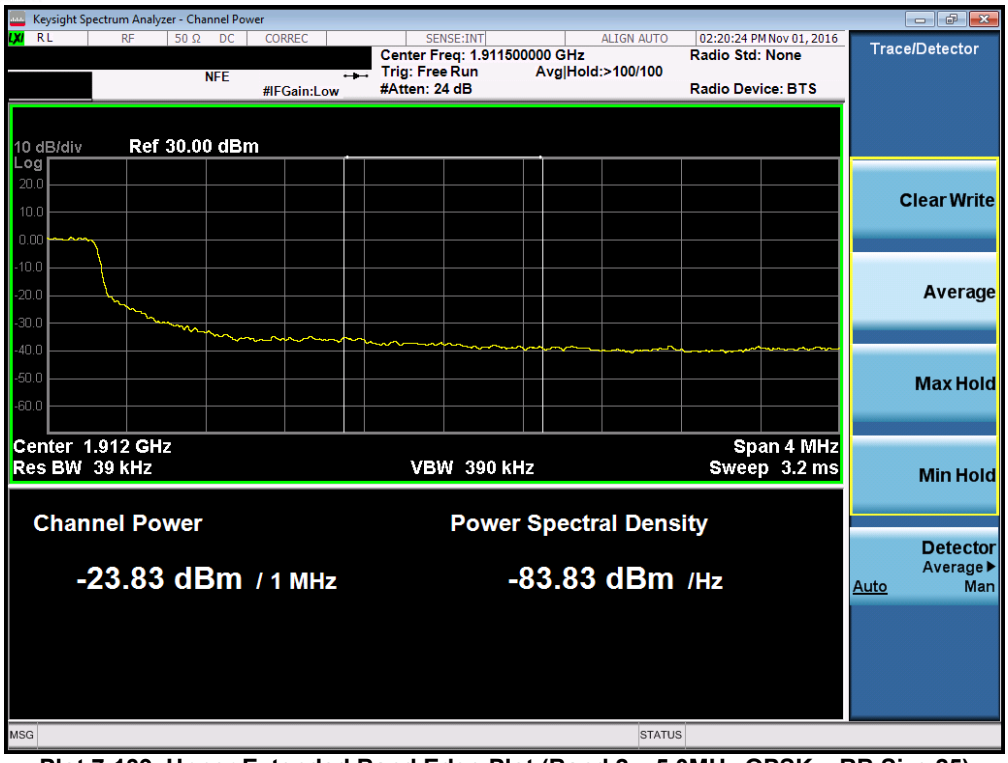
Plot 7-136. Lower Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)



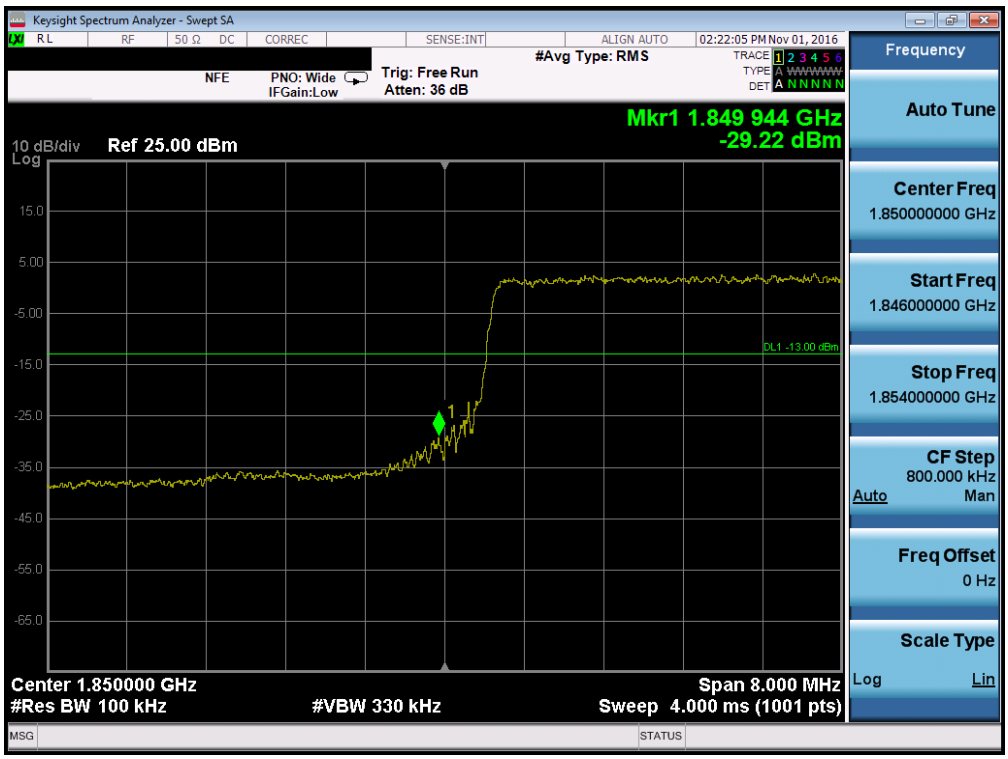
Plot 7-137. Lower Extended Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)



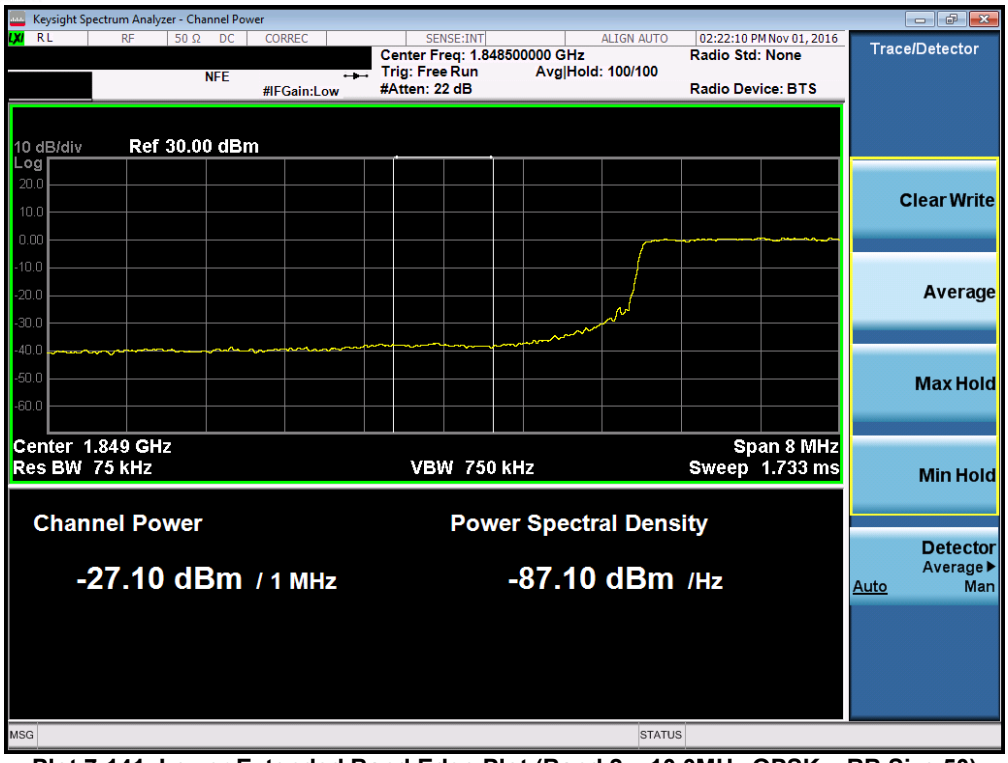
Plot 7-138. Upper Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)



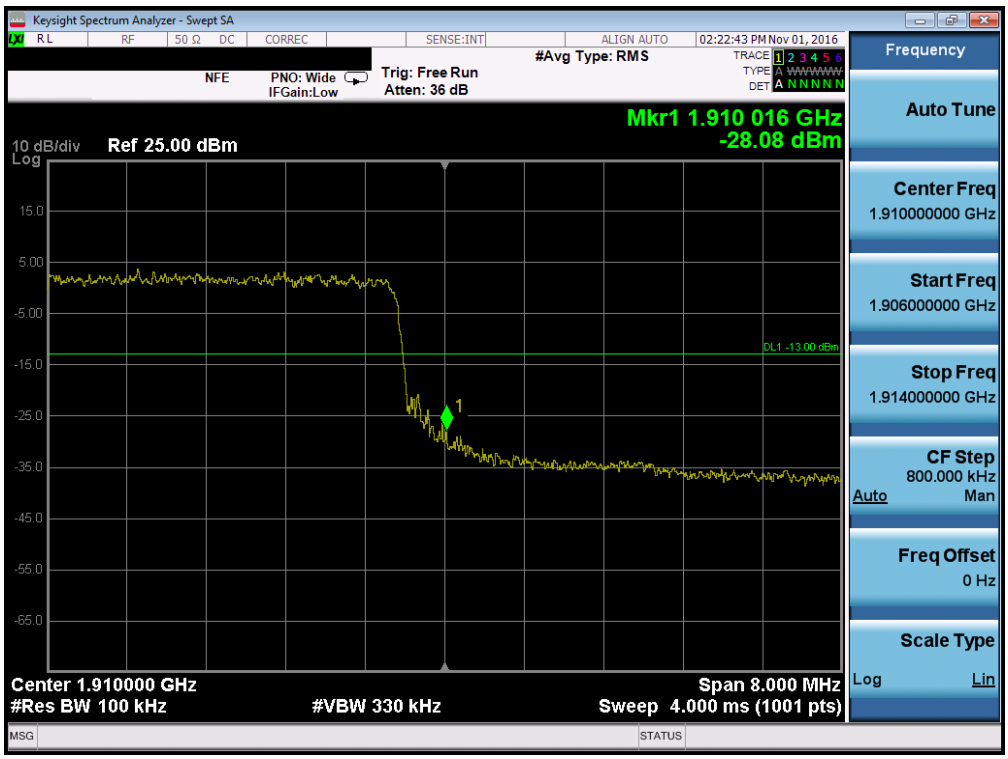
Plot 7-139. Upper Extended Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)



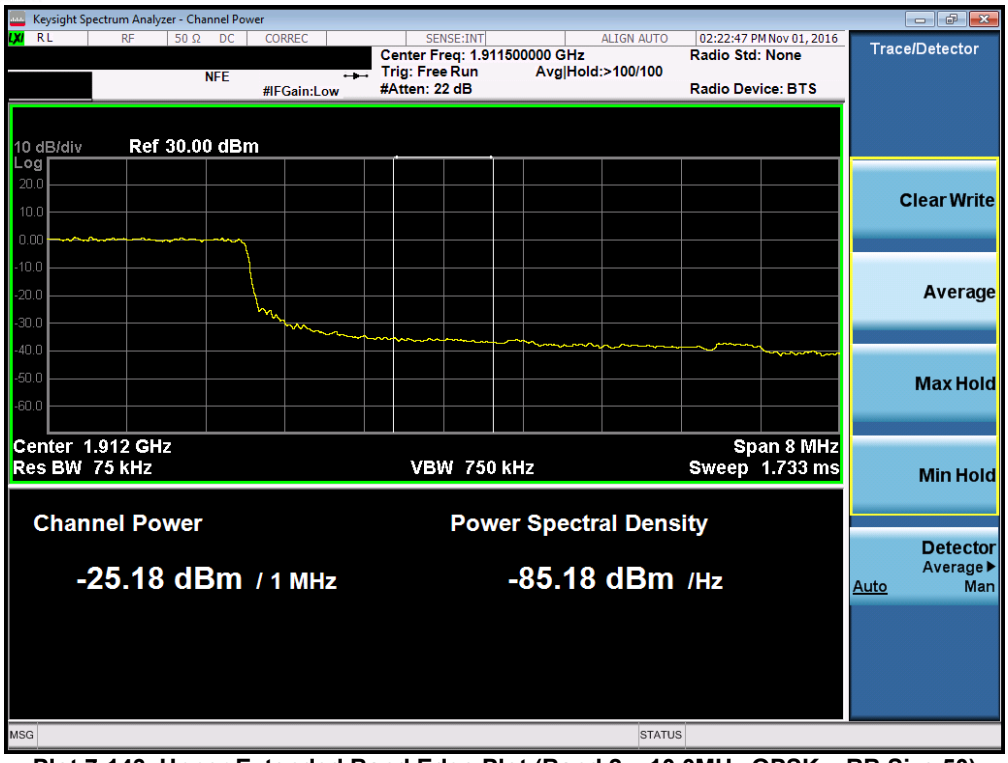
Plot 7-140. Lower Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)



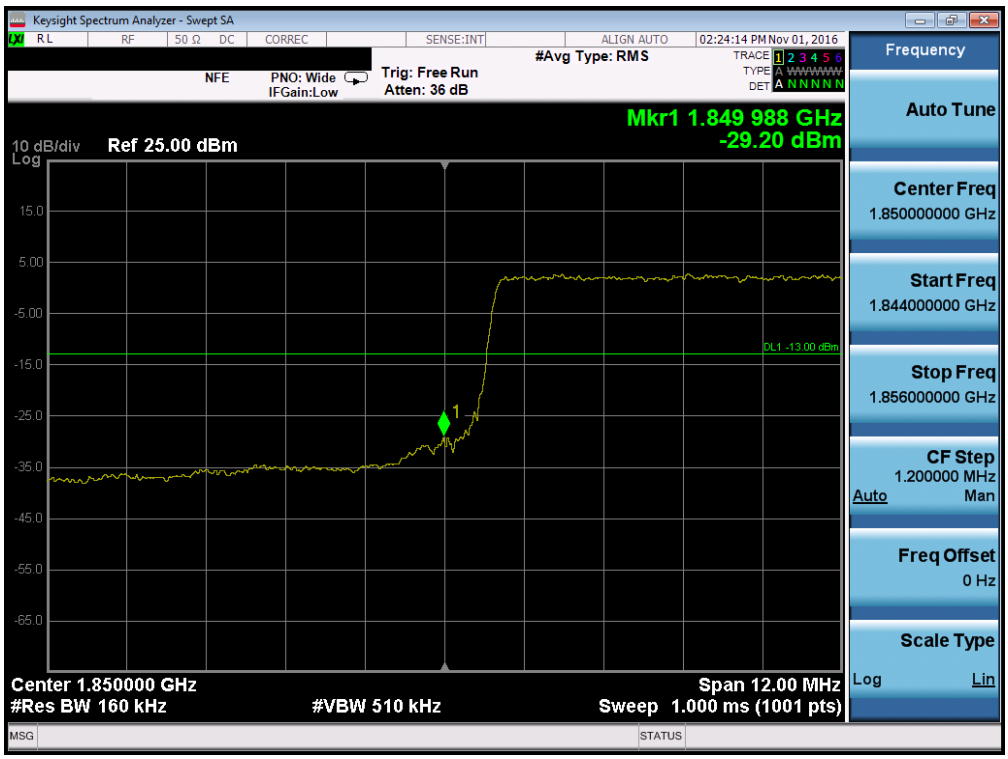
Plot 7-141. Lower Extended Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)



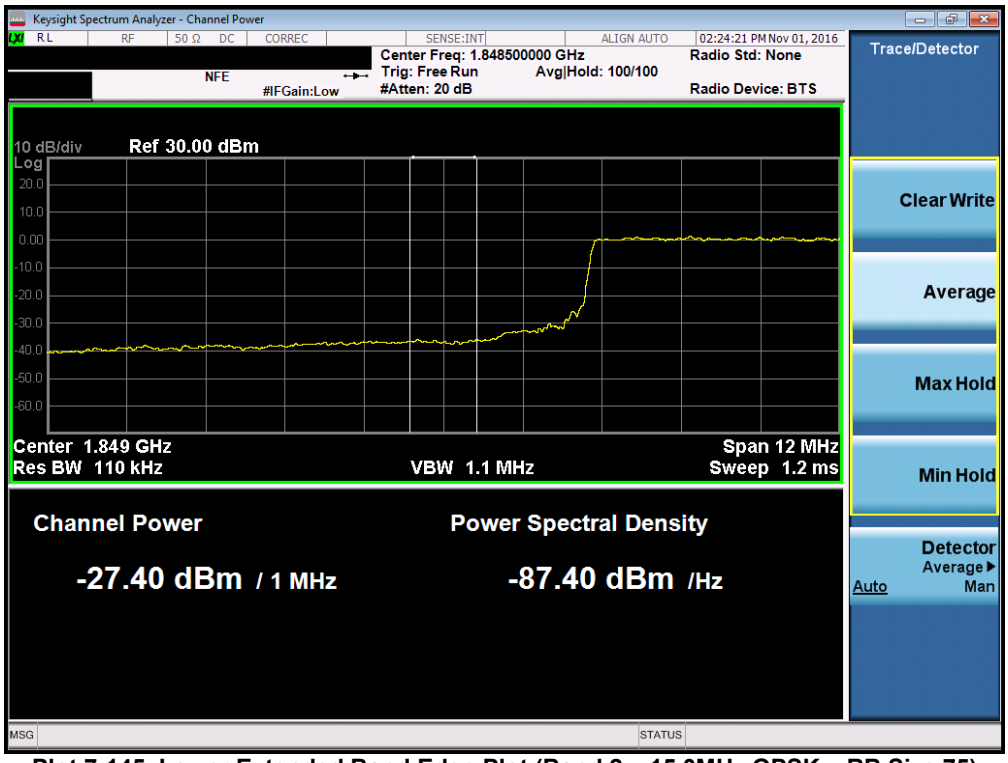
Plot 7-142. Upper Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)



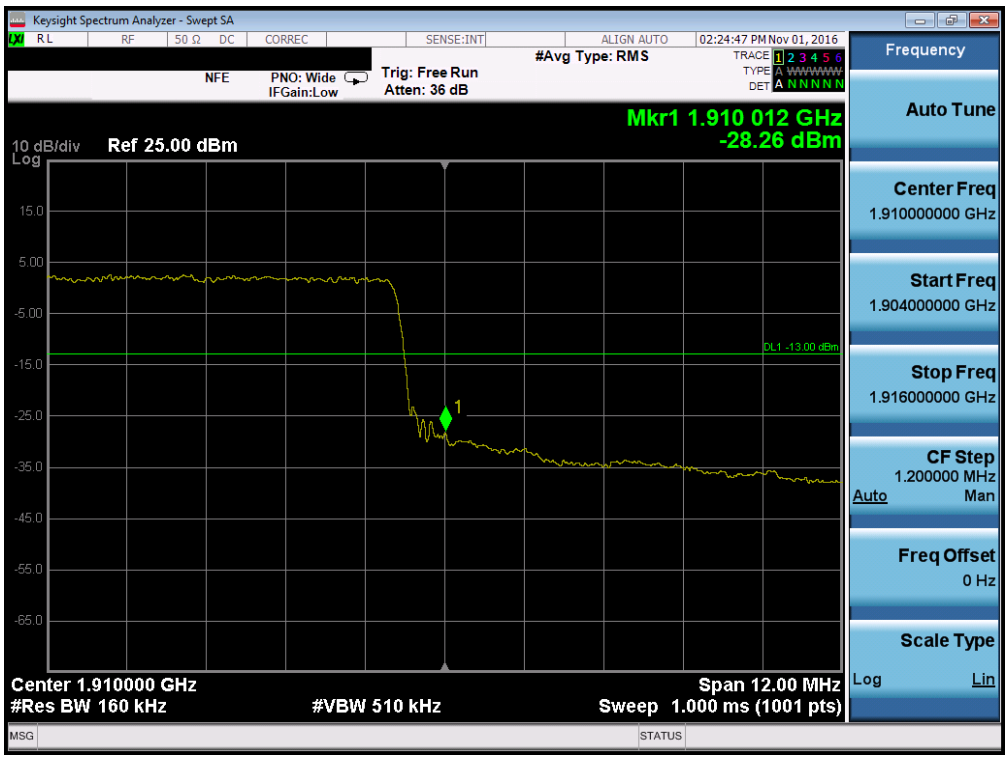
Plot 7-143. Upper Extended Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)



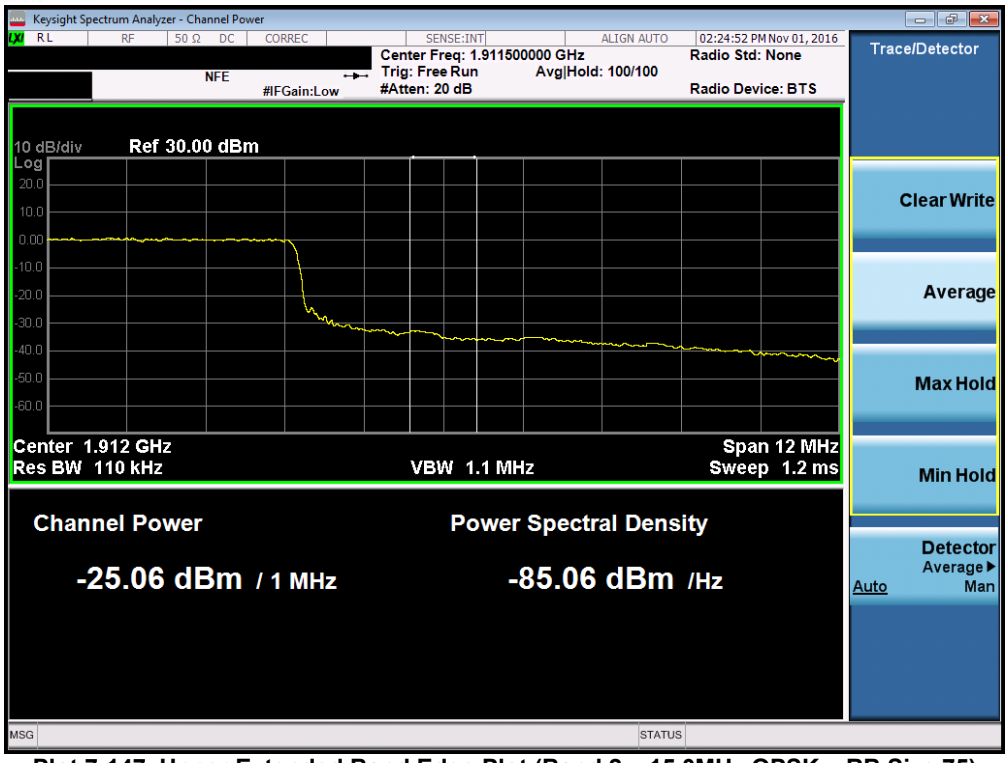
Plot 7-144. Lower Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)



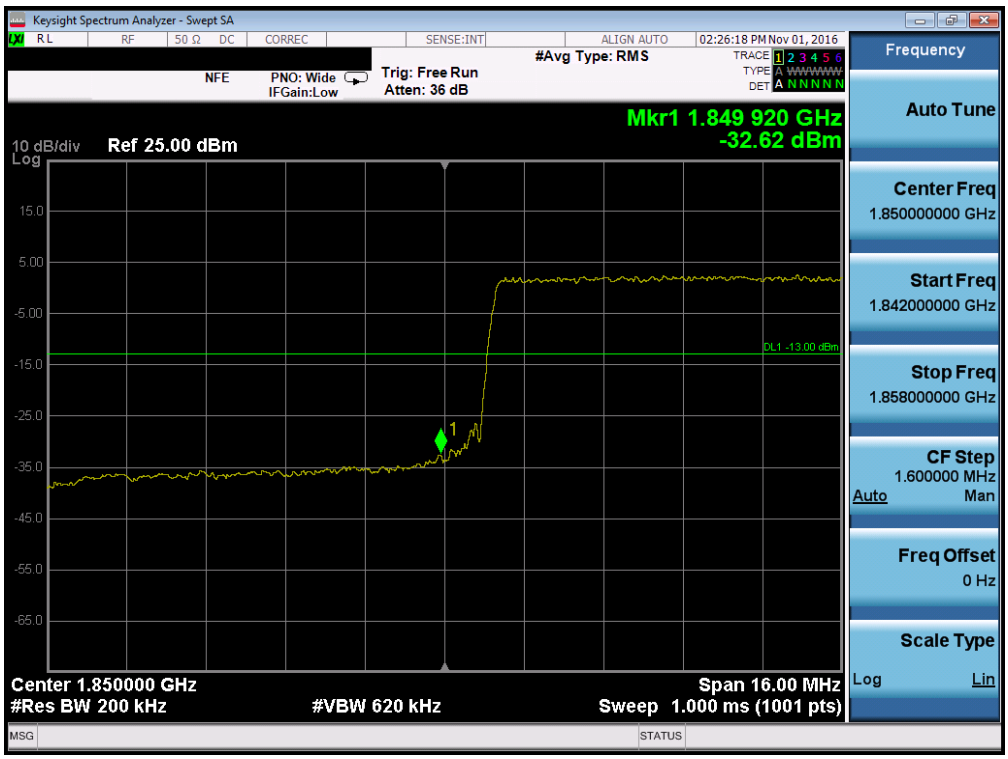
Plot 7-145. Lower Extended Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)



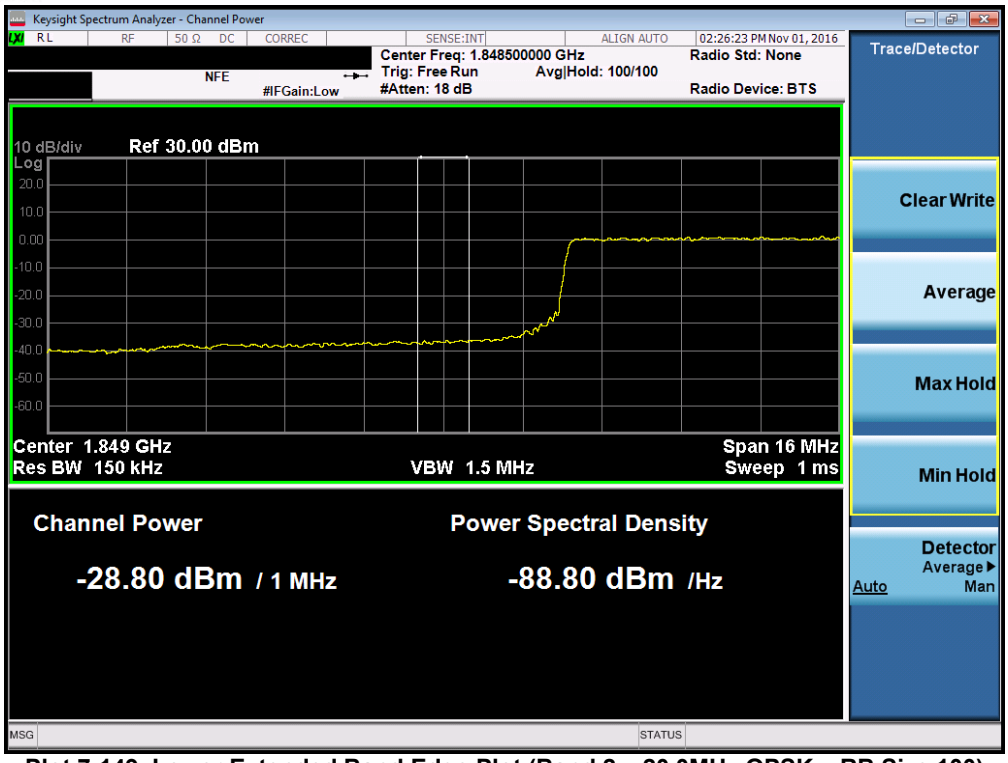
Plot 7-146. Upper Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)



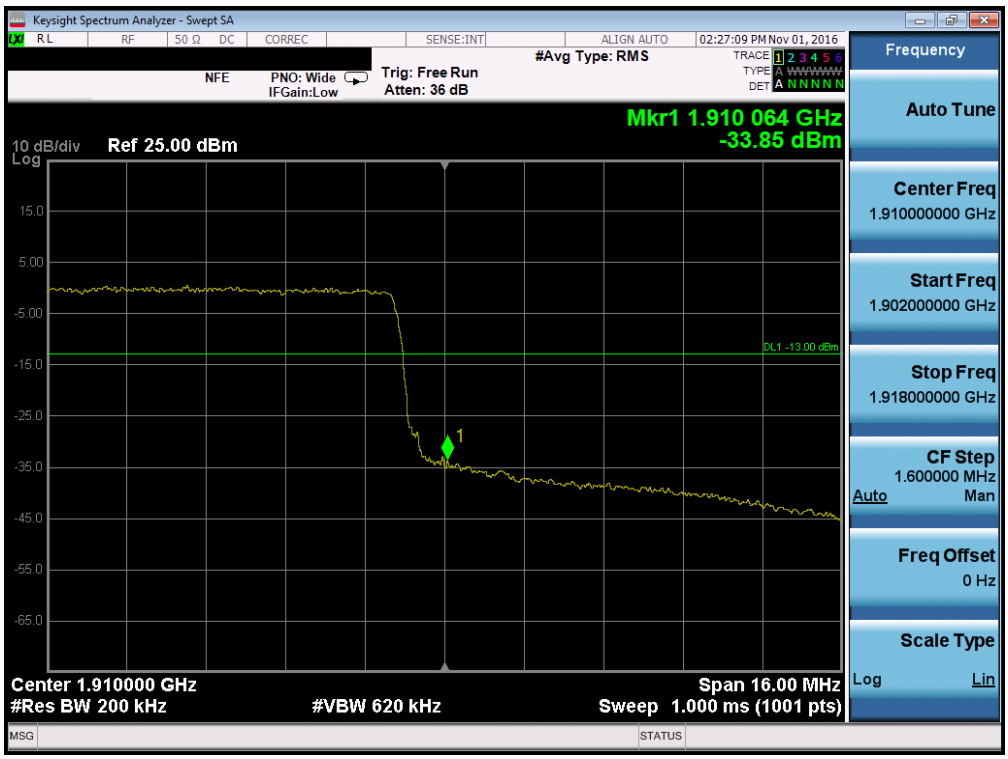
Plot 7-147. Upper Extended Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)



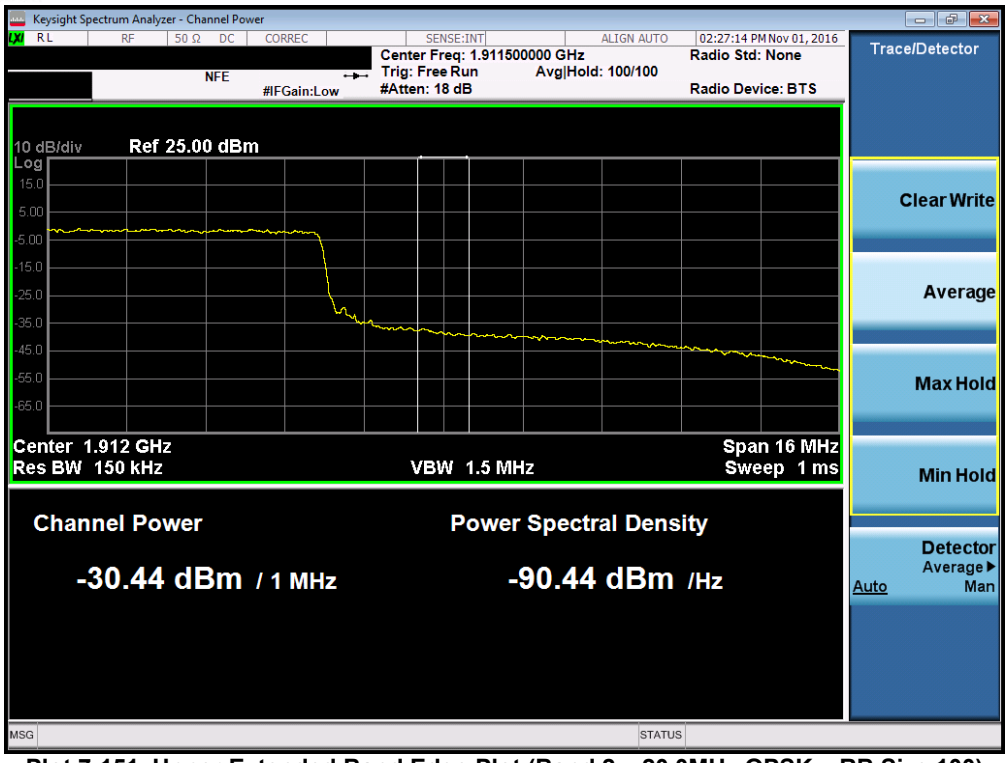
Plot 7-148. Lower Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



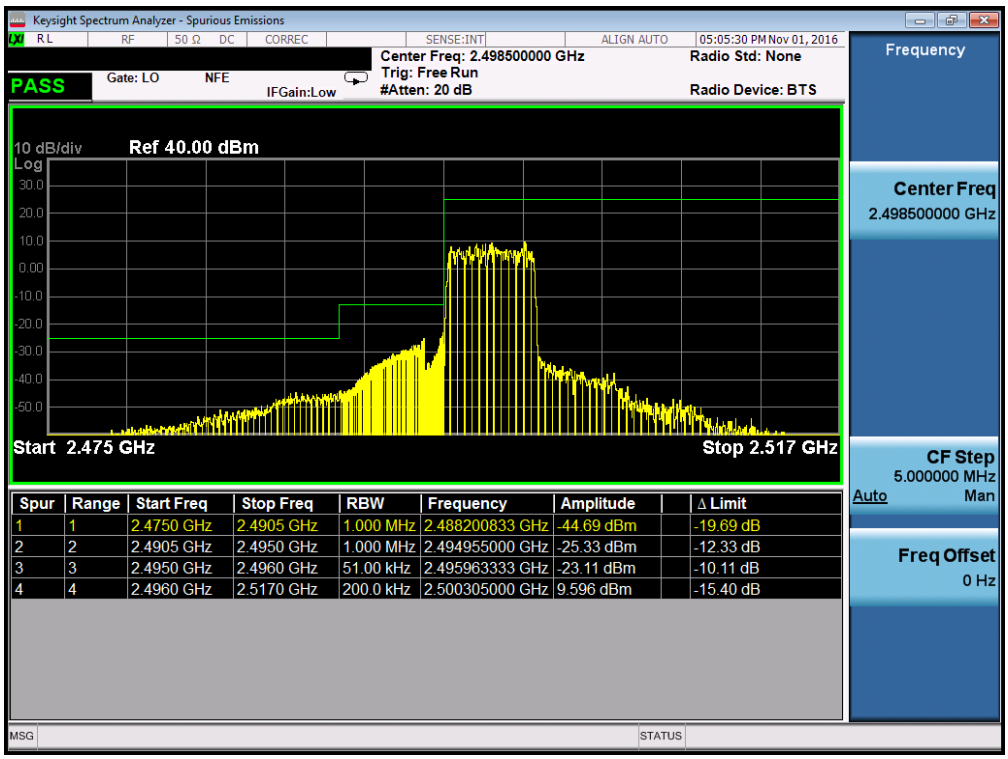
Plot 7-149. Lower Extended Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



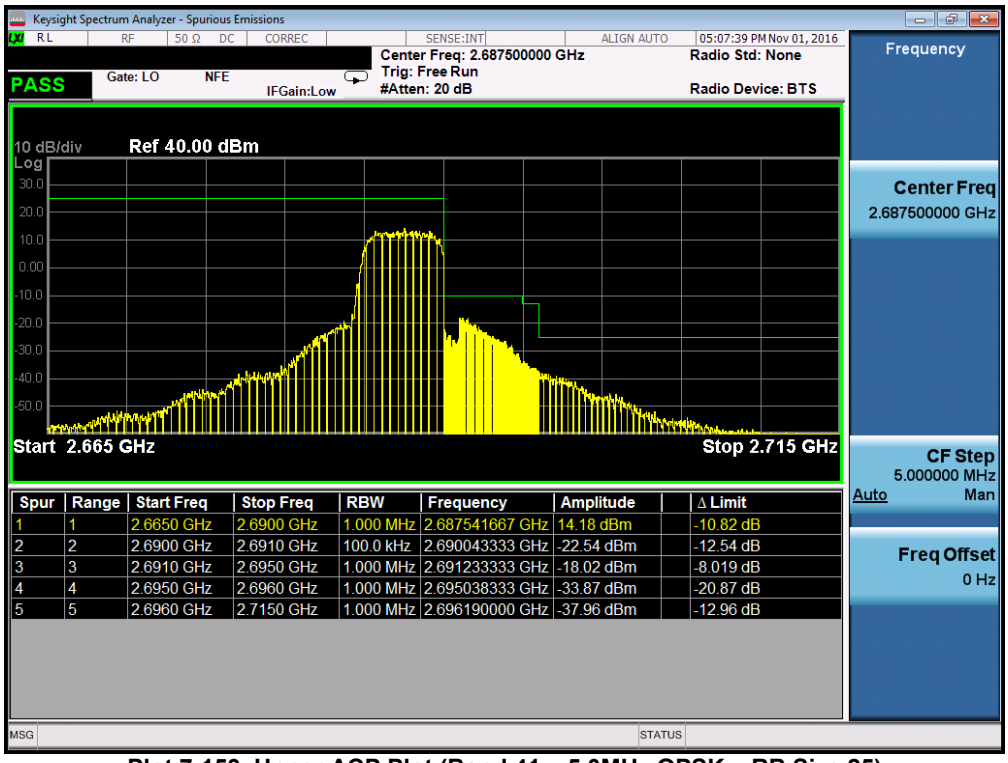
Plot 7-150. Upper Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



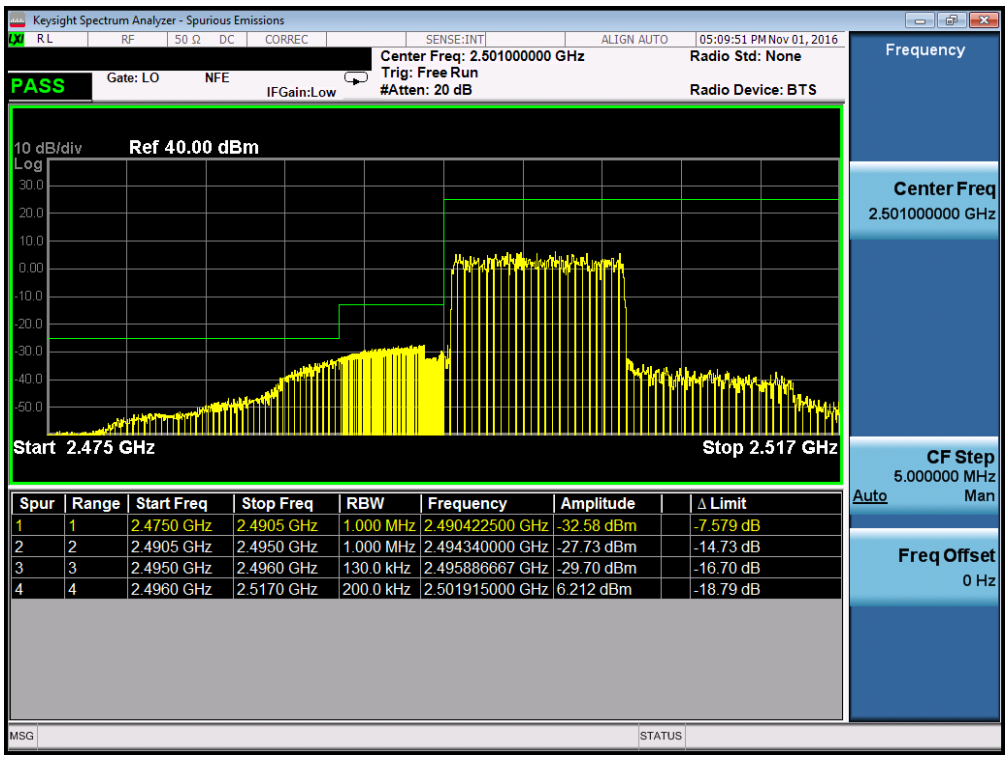
Plot 7-151. Upper Extended Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



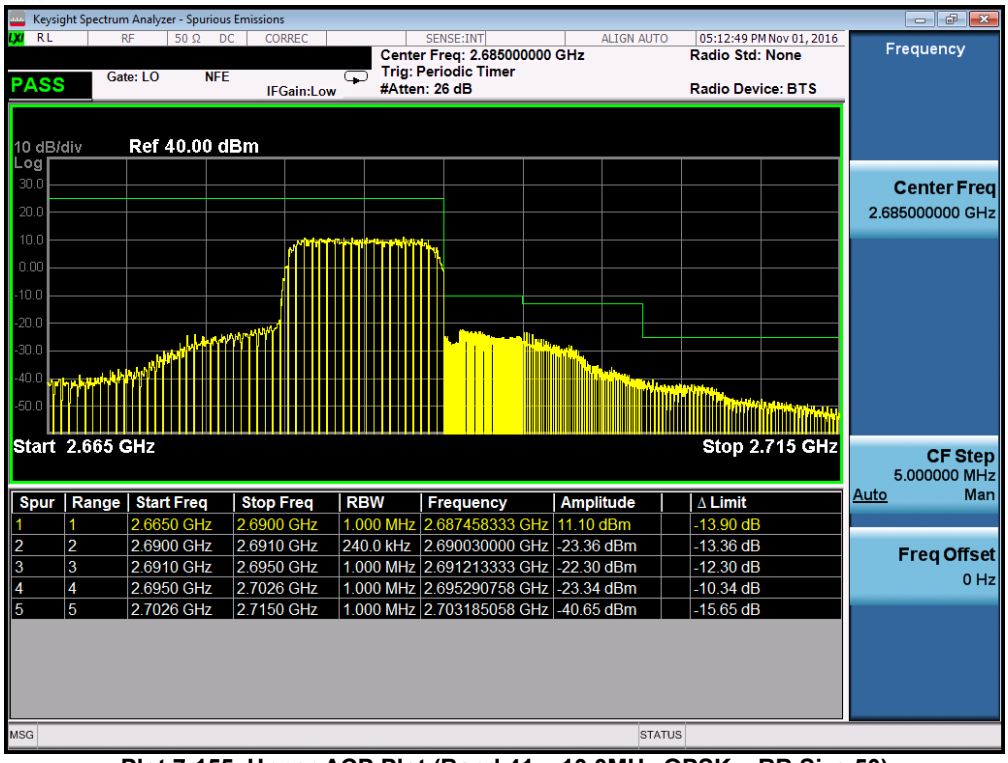
Plot 7-152. Lower ACP Plot (Band 41 – 5.0MHz QPSK – RB Size 25)



Plot 7-153. Upper ACP Plot (Band 41 – 5.0MHz QPSK – RB Size 25)

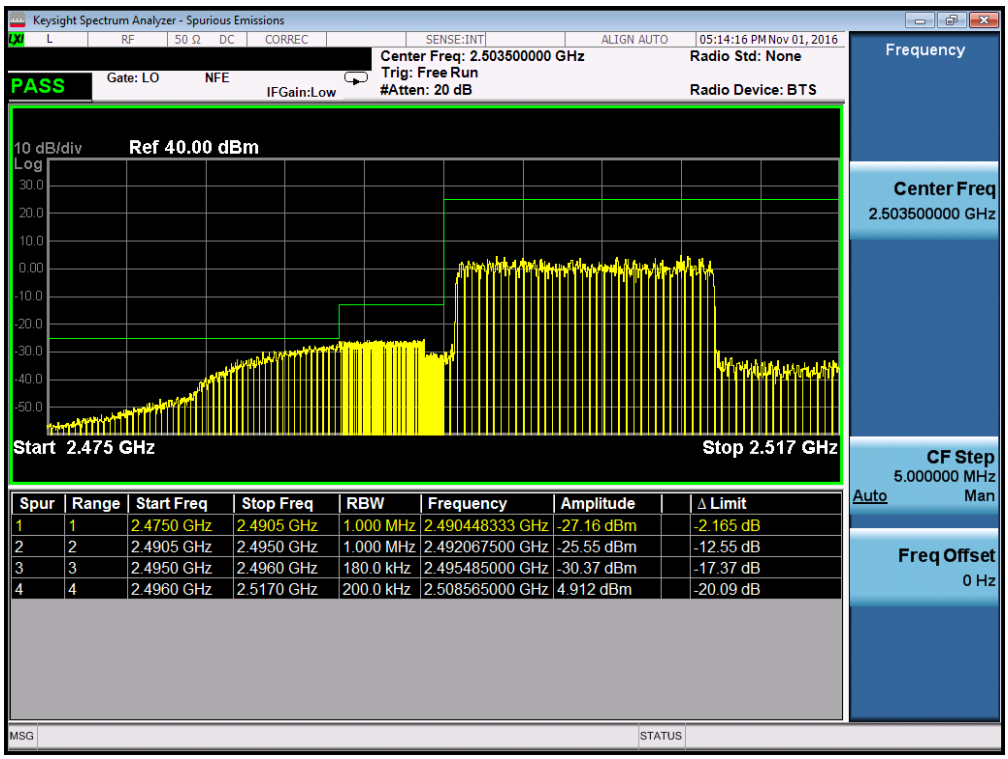


Plot 7-154. Lower ACP Plot (Band 41 – 10.0MHz QPSK – RB Size 50)



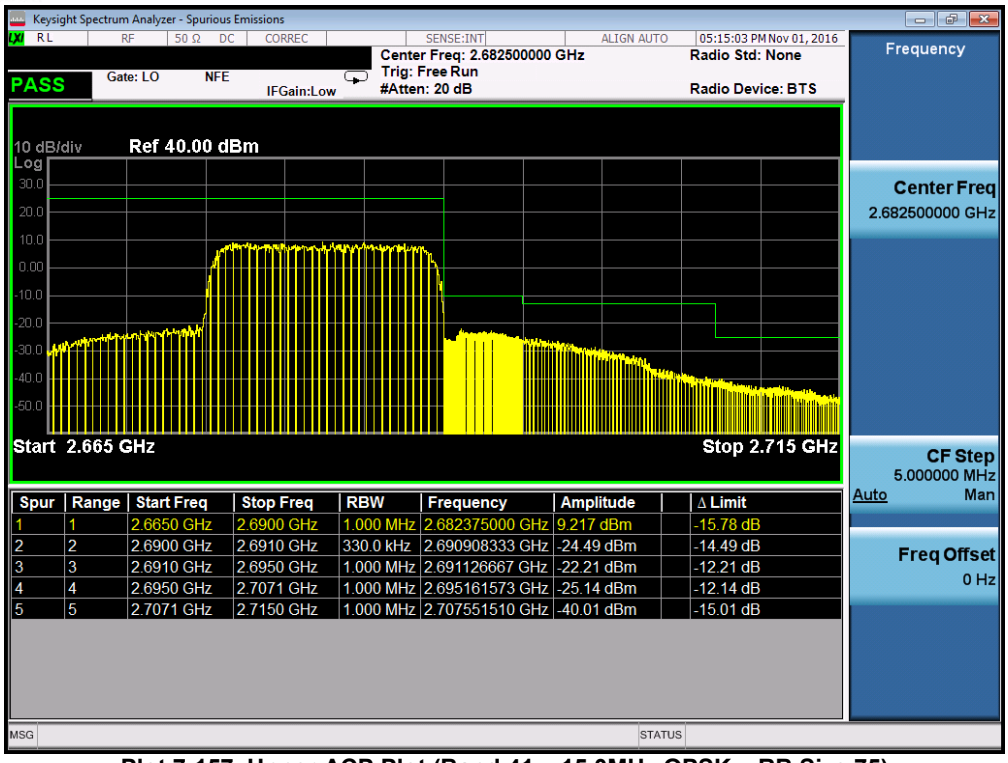
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.6650 GHz	2.6900 GHz	1.000 MHz	2.687458333 GHz	11.10 dBm	-13.90 dB
2	2	2.6900 GHz	2.6910 GHz	240.0 kHz	2.690030000 GHz	-23.36 dBm	-13.36 dB
3	3	2.6910 GHz	2.6950 GHz	1.000 MHz	2.691213333 GHz	-22.30 dBm	-12.30 dB
4	4	2.6950 GHz	2.7026 GHz	1.000 MHz	2.695290758 GHz	-23.34 dBm	-10.34 dB
5	5	2.7026 GHz	2.7150 GHz	1.000 MHz	2.703185058 GHz	-40.65 dBm	-15.65 dB

Plot 7-155. Upper ACP Plot (Band 41 – 10.0MHz QPSK – RB Size 50)



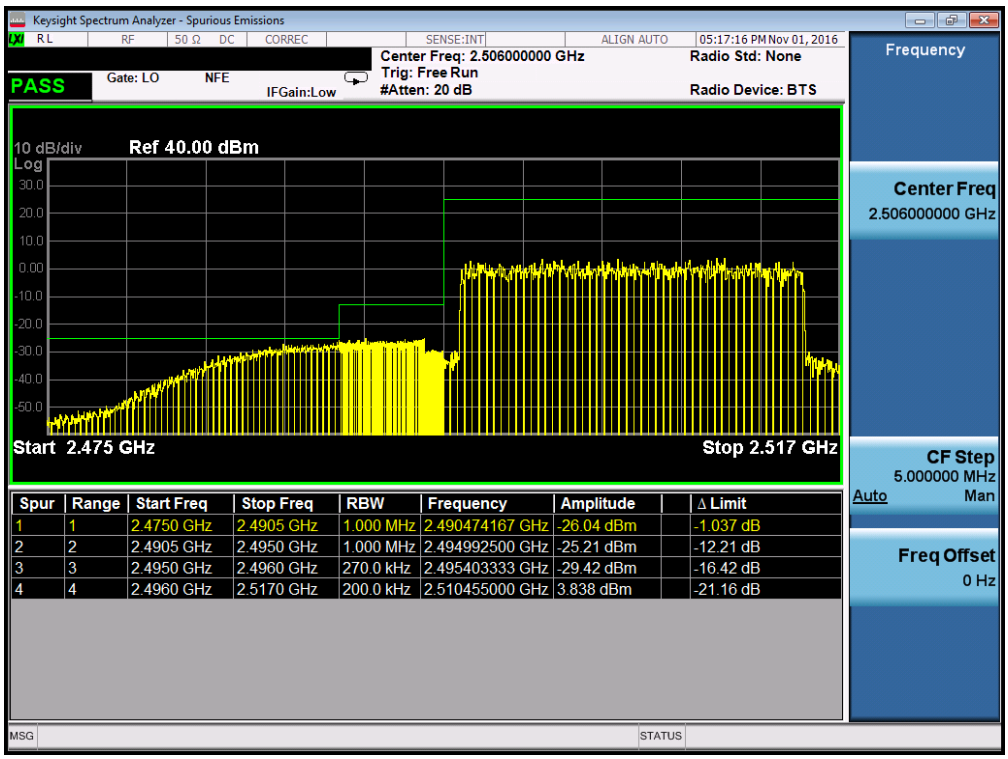
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4905 GHz	1.000 MHz	2.490448333 GHz	-27.16 dBm	-2.165 dB
2	2	2.4905 GHz	2.4950 GHz	1.000 MHz	2.492067500 GHz	-25.55 dBm	-12.55 dB
3	3	2.4950 GHz	2.4960 GHz	180.0 kHz	2.495485000 GHz	-30.37 dBm	-17.37 dB
4	4	2.4960 GHz	2.5170 GHz	200.0 kHz	2.508565000 GHz	4.912 dBm	-20.09 dB

Plot 7-156. Lower ACP Plot (Band 41 – 15.0MHz QPSK – RB Size 75)



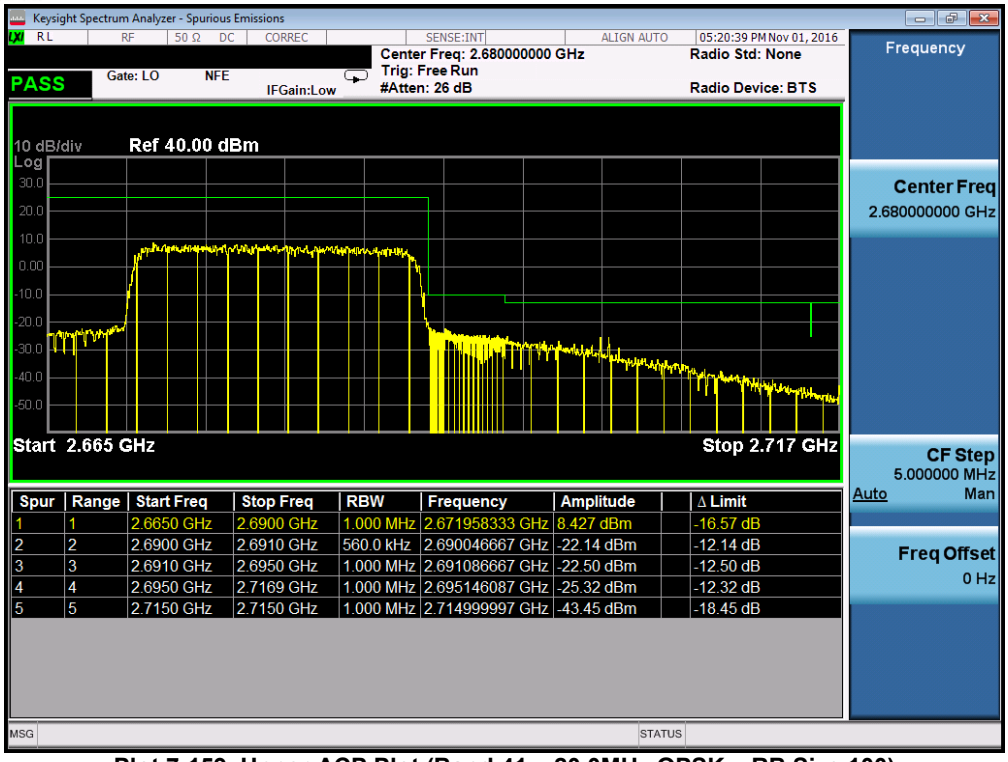
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.6650 GHz	2.6900 GHz	1.000 MHz	2.682375000 GHz	9.217 dBm	-15.78 dB
2	2	2.6900 GHz	2.6910 GHz	330.0 kHz	2.690908333 GHz	-24.49 dBm	-14.49 dB
3	3	2.6910 GHz	2.6950 GHz	1.000 MHz	2.691126667 GHz	-22.21 dBm	-12.21 dB
4	4	2.6950 GHz	2.7071 GHz	1.000 MHz	2.695161573 GHz	-25.14 dBm	-12.14 dB
5	5	2.7071 GHz	2.7150 GHz	1.000 MHz	2.707551510 GHz	-40.01 dBm	-15.01 dB

Plot 7-157. Upper ACP Plot (Band 41 – 15.0MHz QPSK – RB Size 75)



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4905 GHz	1.000 MHz	2.490474167 GHz	-26.04 dBm	-1.037 dB
2	2	2.4905 GHz	2.4950 GHz	1.000 MHz	2.494992500 GHz	-25.21 dBm	-12.21 dB
3	3	2.4950 GHz	2.4960 GHz	270.0 kHz	2.495403333 GHz	-29.42 dBm	-16.42 dB
4	4	2.4960 GHz	2.5170 GHz	200.0 kHz	2.510455000 GHz	3.838 dBm	-21.16 dB

Plot 7-158. 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	2.671958333 GHz	8.427 dBm	-16.57 dB
2	2	2.6900 GHz	2.6910 GHz	560.0 kHz	2.690046667 GHz	-22.14 dBm	-12.14 dB
3	3	2.6910 GHz	2.6950 GHz	1.000 MHz	2.691086667 GHz	-22.50 dBm	-12.50 dB
4	4	2.6950 GHz	2.7169 GHz	1.000 MHz	2.695146087 GHz	-25.32 dBm	-12.32 dB
5	5	2.7150 GHz	2.7150 GHz	1.000 MHz	2.714999997 GHz	-43.45 dBm	-18.45 dB

Plot 7-159. 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.

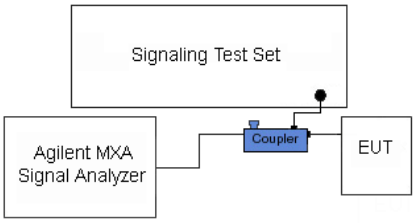
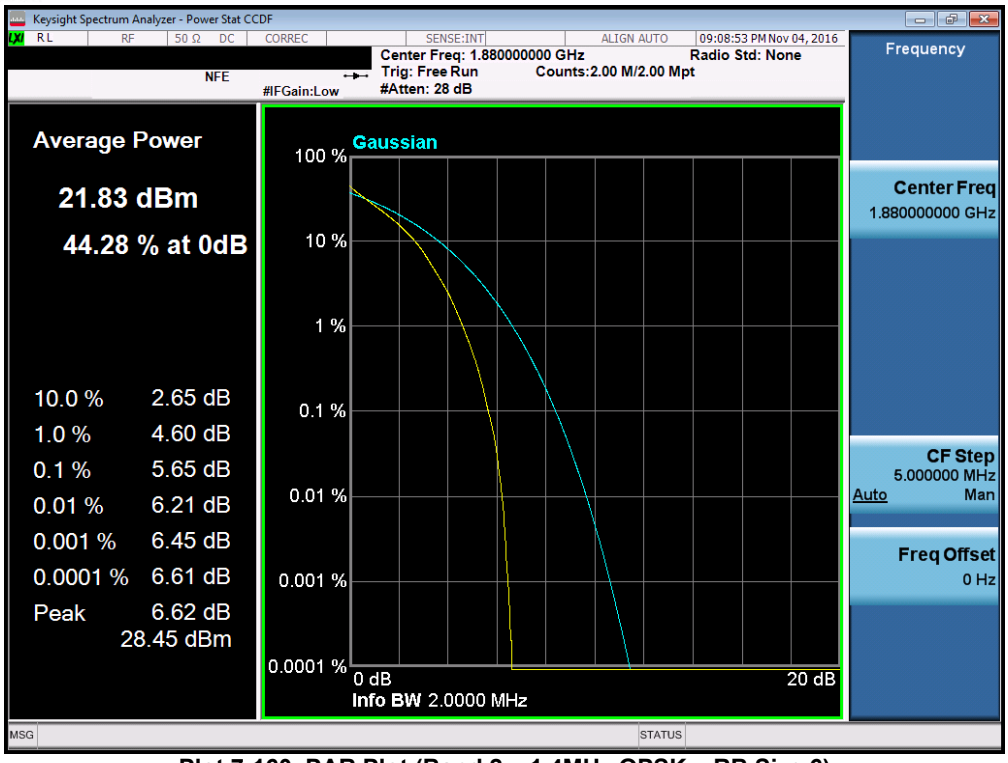


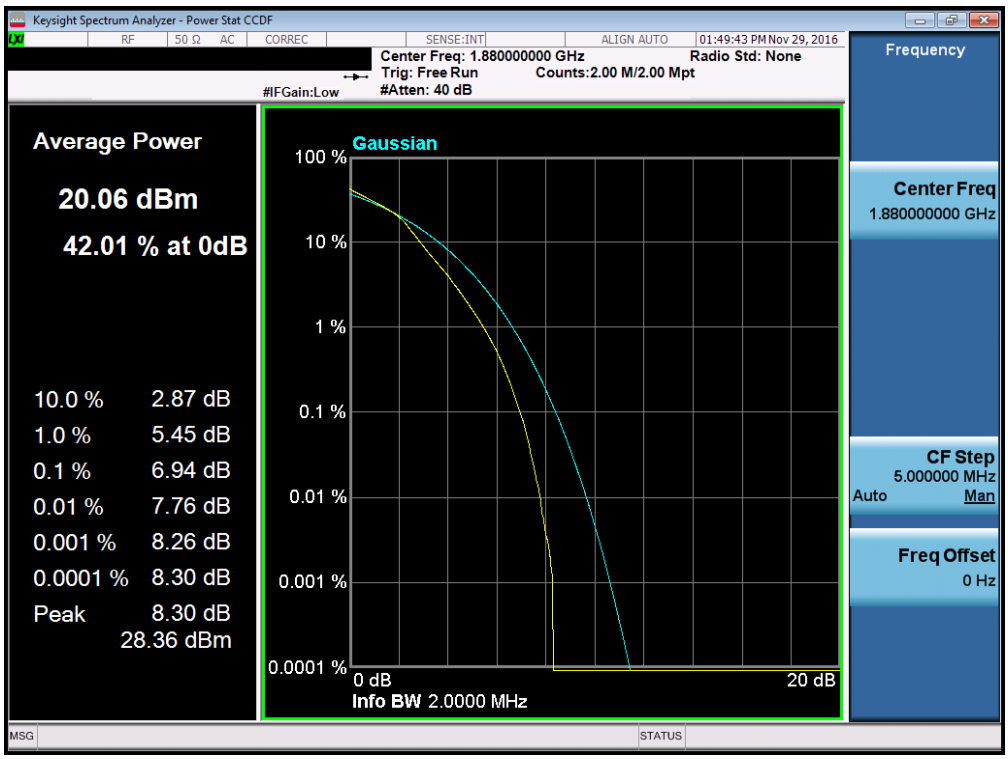
Figure 7-4. Test Instrument & Measurement Setup

Test Notes

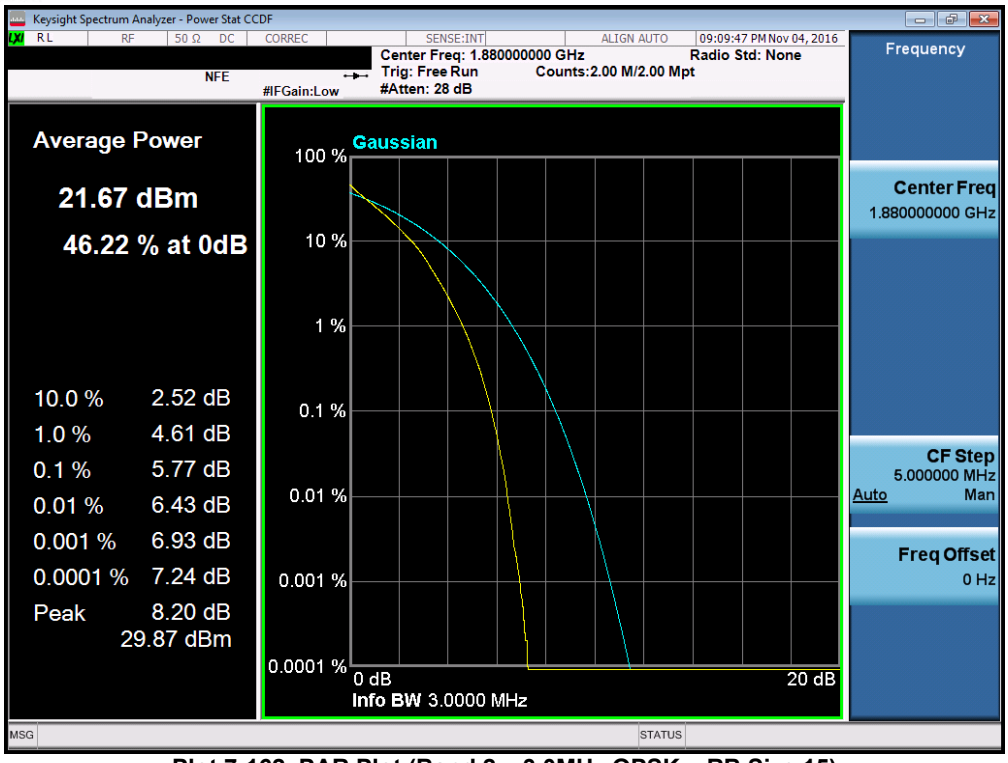
None.



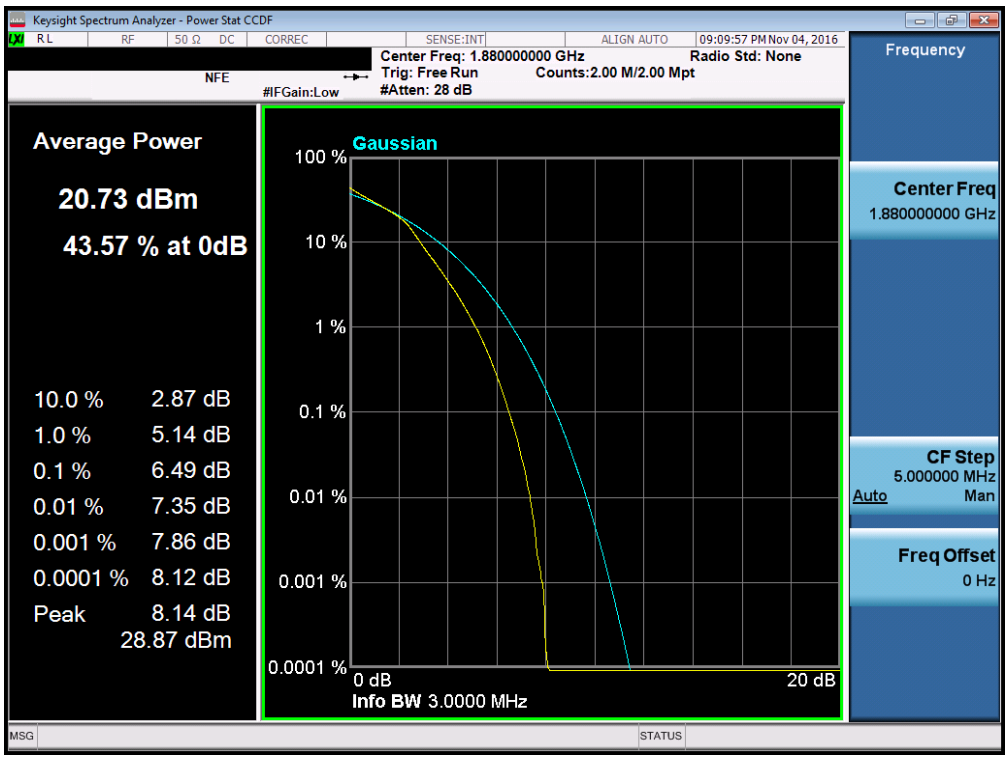
Plot 7-160. PAR Plot (Band 2 – 1.4MHz QPSK – RB Size 6)



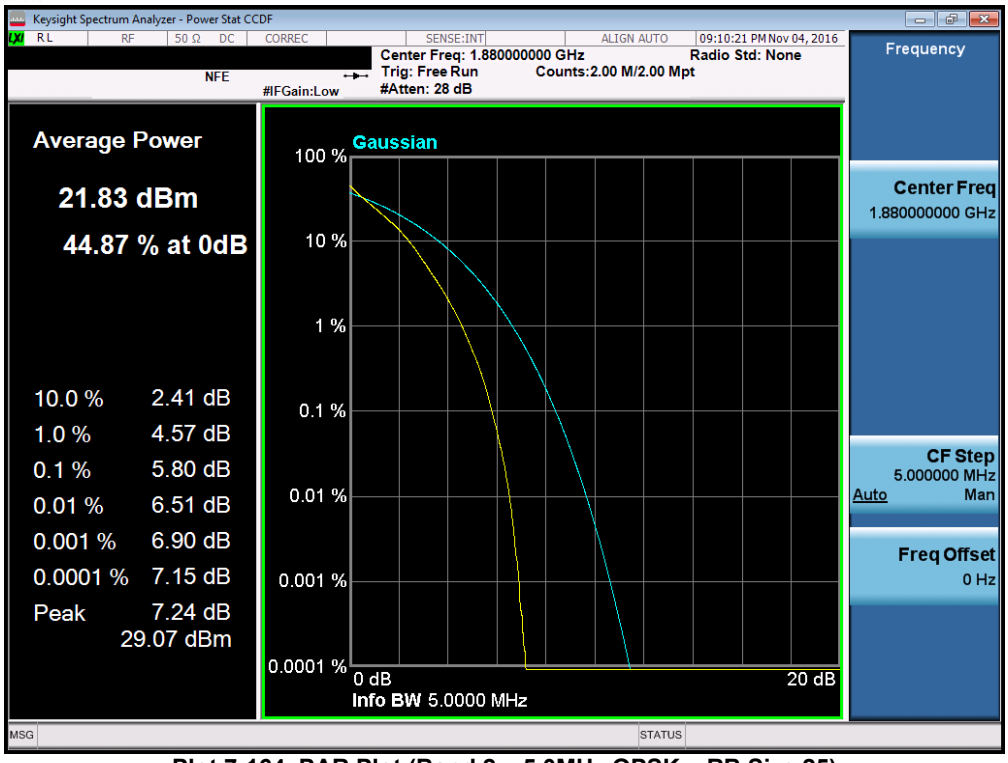
Plot 7-161. PAR Plot (Band 2 – 1.4MHz 16-QAM – RB Size 6)



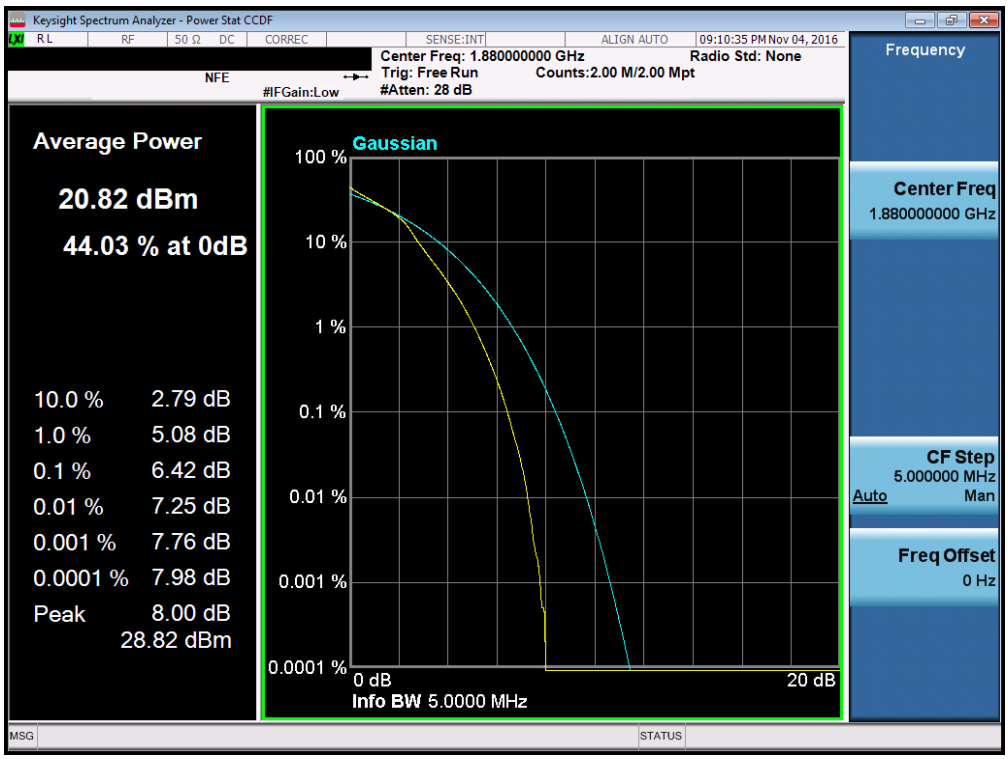
Plot 7-162. PAR Plot (Band 2 – 3.0MHz QPSK – RB Size 15)



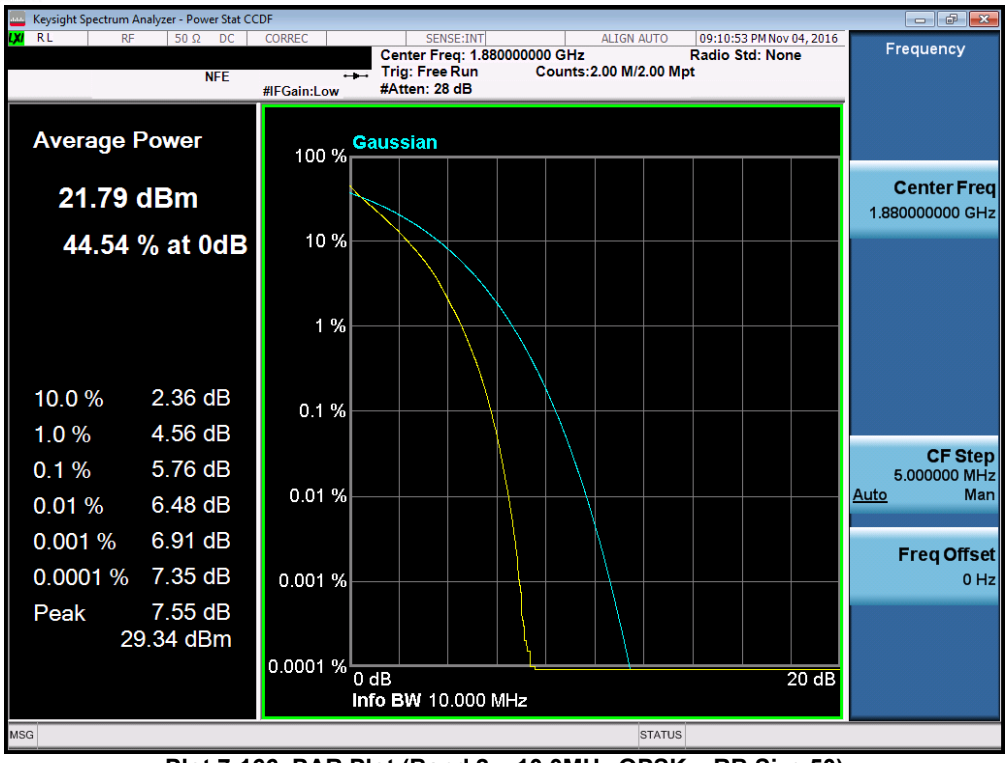
Plot 7-163. PAR Plot (Band 2 – 3.0MHz 16-QAM – RB Size 15)



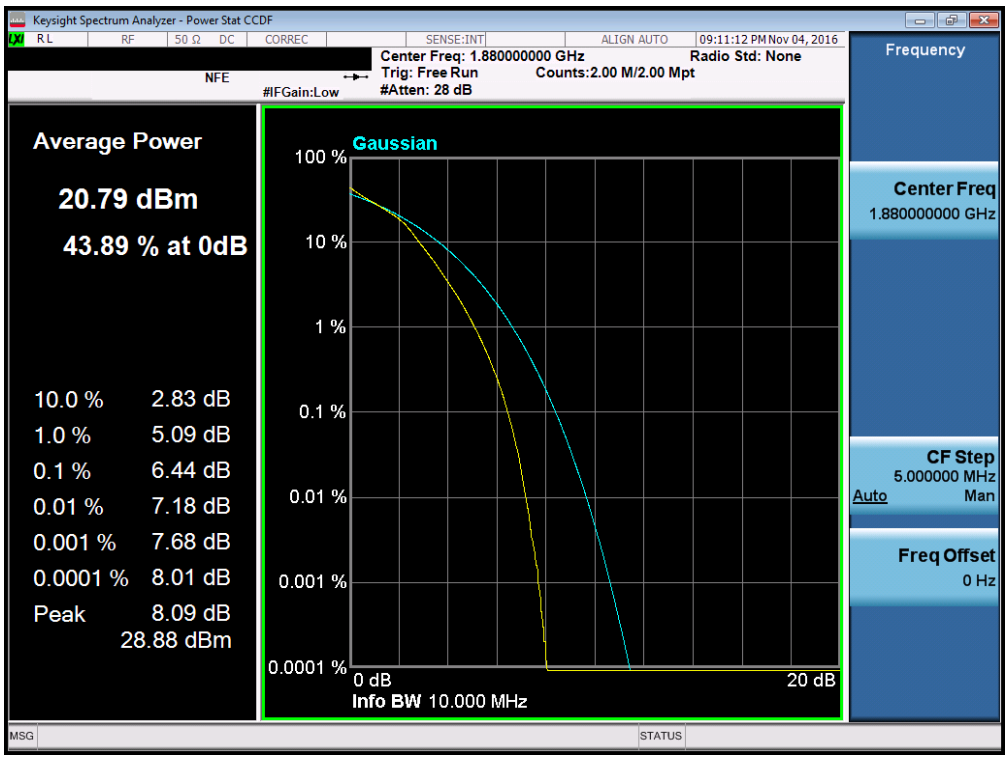
Plot 7-164. PAR Plot (Band 2 – 5.0MHz QPSK – RB Size 25)



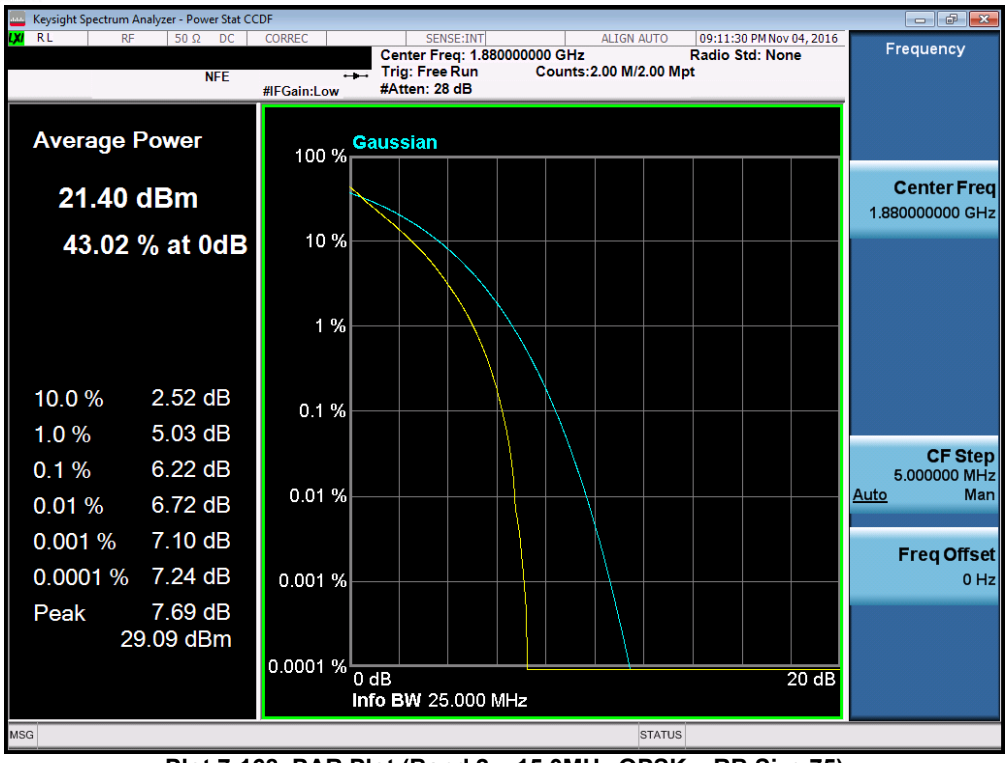
Plot 7-165. PAR Plot (Band 2 – 5.0MHz 16-QAM – RB Size 25)



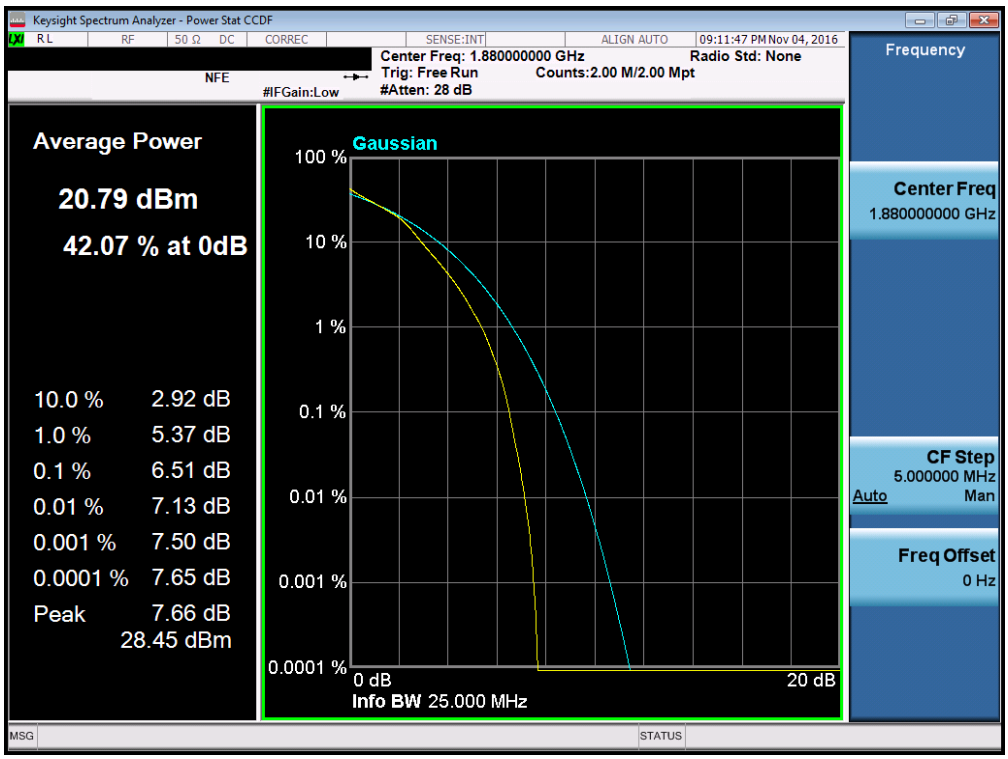
Plot 7-166. PAR Plot (Band 2 – 10.0MHz QPSK – RB Size 50)



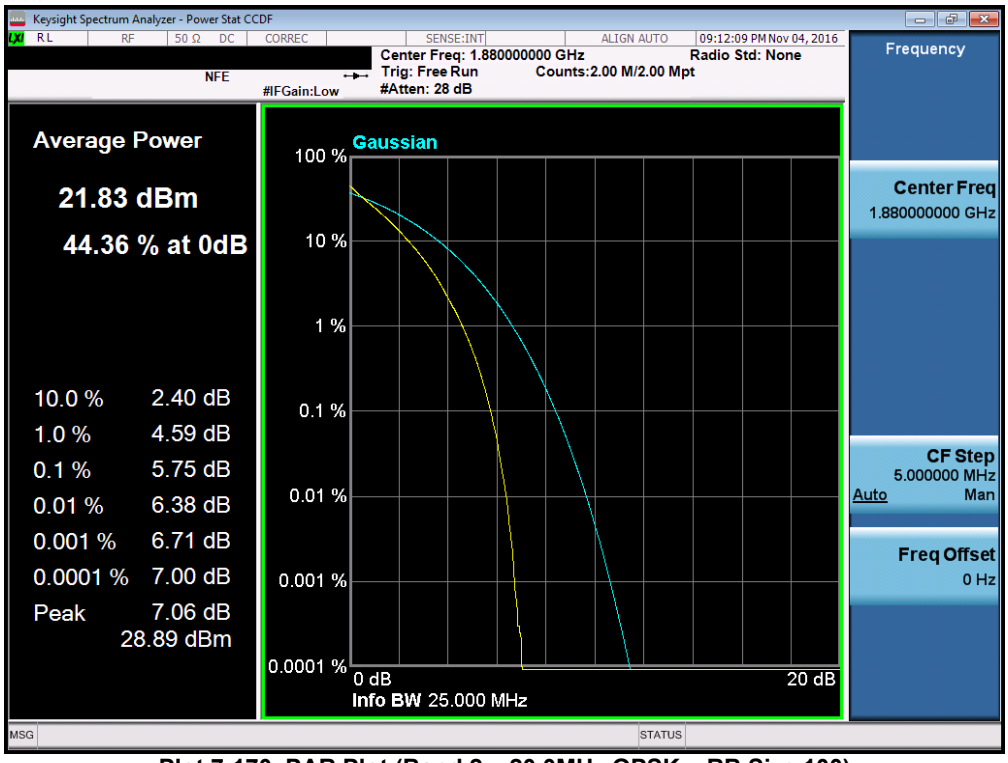
Plot 7-167. PAR Plot (Band 2 – 10.0MHz 16-QAM – RB Size 50)



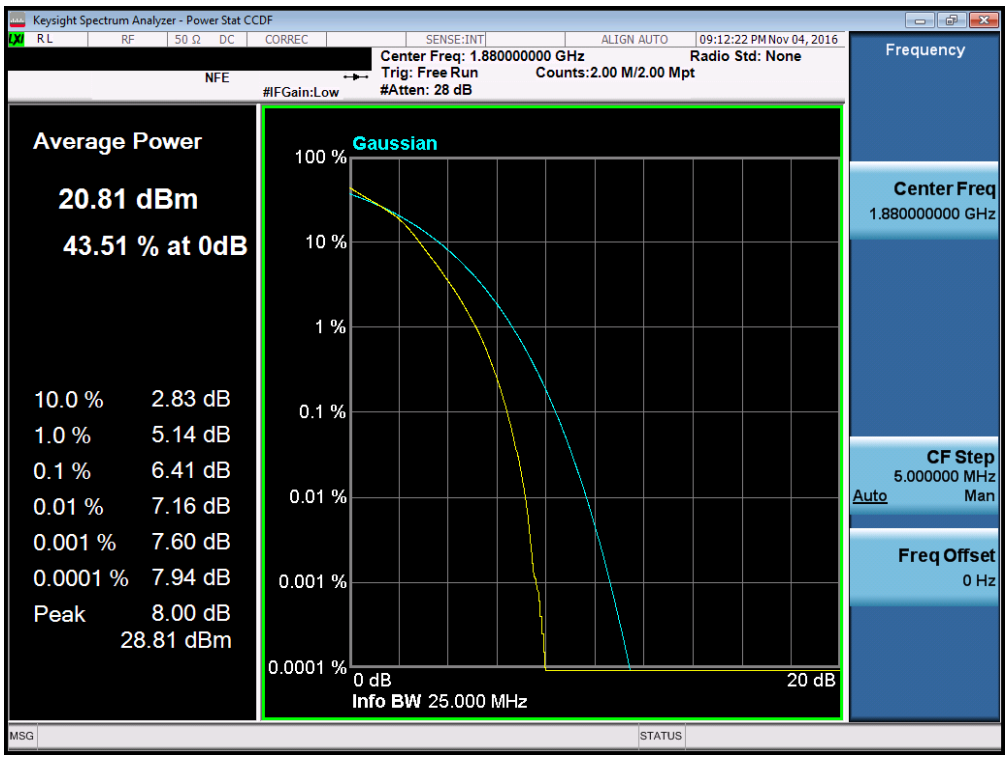
Plot 7-168. PAR Plot (Band 2 – 15.0MHz QPSK – RB Size 75)



Plot 7-169. PAR Plot (Band 2 – 15.0MHz 16-QAM – RB Size 75)



Plot 7-170. PAR Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



Plot 7-171. 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. 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.

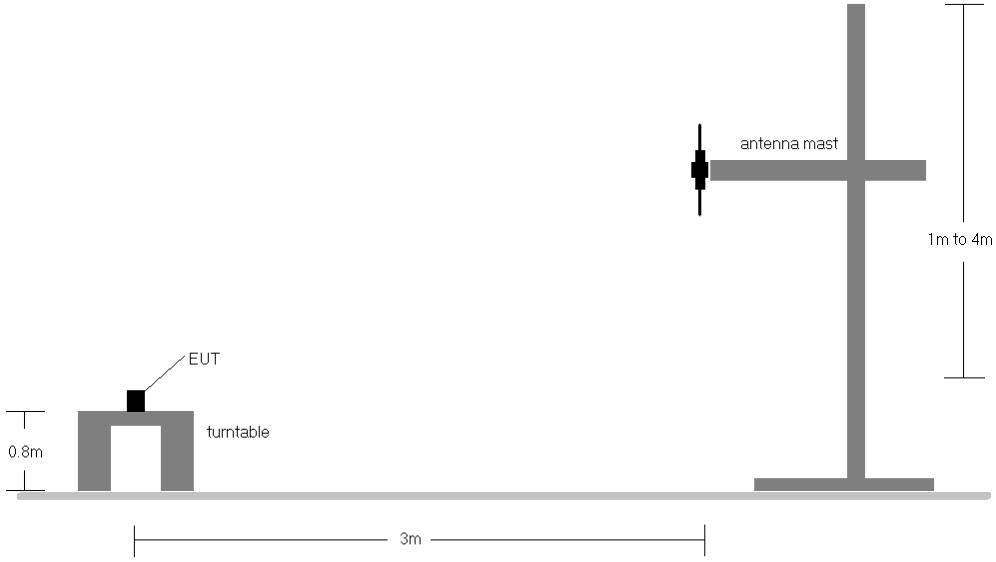


Figure 7-5. Radiated Test Setup <1GHz

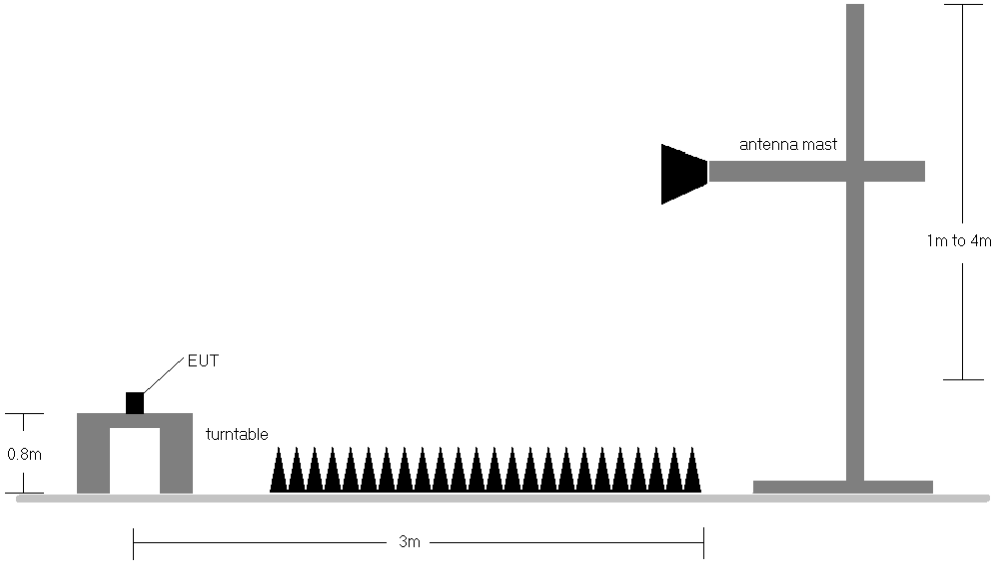


Figure 7-6. Radiated Test Setup >1GHz

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.

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]
706.50	5	QPSK	V	174	234	1 / 24	17.58	2.86	20.44	34.77	-14.33
710.00	5	QPSK	V	164	235	1 / 24	16.89	2.94	19.83	34.77	-14.94
713.50	5	QPSK	V	166	256	1 / 24	17.53	3.02	20.55	34.77	-14.22
706.50	5	16-QAM	V	174	234	1 / 24	16.02	2.86	18.88	34.77	-15.89
710.00	5	16-QAM	V	164	235	1 / 24	15.57	2.94	18.51	34.77	-16.26
713.50	5	16-QAM	V	166	256	1 / 24	15.71	3.02	18.73	34.77	-16.04
709.00	10	QPSK	V	158	268	1 / 49	16.86	2.92	19.78	34.77	-15.00
710.00	10	QPSK	V	175	289	1 / 49	16.99	2.94	19.93	34.77	-14.84
711.00	10	QPSK	V	165	266	1 / 49	17.29	2.96	20.25	34.77	-14.52
709.00	10	16-QAM	V	158	268	1 / 49	15.24	2.92	18.16	34.77	-16.62
710.00	10	16-QAM	V	175	289	1 / 49	15.53	2.94	18.47	34.77	-16.30
711.00	10	16-QAM	V	165	266	1 / 49	15.60	2.96	18.56	34.77	-16.21
713.50	5	QPSK	H	190	190	1 / 0	17.19	2.48	19.67	34.77	-15.11

Table 7-2. ERP Data (Band 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	221	359	1 / 0	16.44	5.01	21.45	38.45	-17.00
836.50	1.4	QPSK	H	393	0	1 / 5	14.91	5.16	20.07	38.45	-18.38
848.30	1.4	QPSK	H	196	359	1 / 0	15.39	5.30	20.69	38.45	-17.76
824.70	1.4	16-QAM	H	221	359	1 / 0	15.57	5.01	20.58	38.45	-17.87
836.50	1.4	16-QAM	H	393	0	1 / 5	13.91	5.16	19.07	38.45	-19.38
848.30	1.4	16-QAM	H	196	359	1 / 0	14.04	5.30	19.34	38.45	-19.11
825.50	3	QPSK	H	197	0	1 / 0	17.46	5.02	22.48	38.45	-15.97
836.50	3	QPSK	H	211	1	1 / 14	16.77	5.16	21.93	38.45	-16.52
847.50	3	QPSK	H	185	8	1 / 0	16.47	5.29	21.76	38.45	-16.69
825.50	3	16-QAM	H	197	0	1 / 0	16.25	5.02	21.27	38.45	-17.18
836.50	3	16-QAM	H	211	1	1 / 0	15.55	5.16	20.71	38.45	-17.74
847.50	3	16-QAM	H	185	8	1 / 0	14.12	5.29	19.41	38.45	-19.04
826.50	5	QPSK	H	205	14	1 / 24	18.10	5.03	23.13	38.45	-15.32
836.50	5	QPSK	H	209	9	1 / 0	17.90	5.16	23.06	38.45	-15.39
846.50	5	QPSK	H	192	6	1 / 0	17.00	5.28	22.28	38.45	-16.17
826.50	5	16-QAM	H	205	14	1 / 24	16.66	5.03	21.69	38.45	-16.76
836.50	5	16-QAM	H	209	9	1 / 0	16.27	5.16	21.43	38.45	-17.02
846.50	5	16-QAM	H	192	6	1 / 0	15.37	5.28	20.65	38.45	-17.80
829.00	10	QPSK	H	209	8	1 / 49	17.87	5.06	22.93	38.45	-15.52
836.50	10	QPSK	H	210	8	1 / 0	18.01	5.16	23.17	38.45	-15.28
844.00	10	QPSK	H	196	9	1 / 0	17.22	5.25	22.47	38.45	-15.98
829.00	10	16-QAM	H	209	8	1 / 49	16.16	5.06	21.22	38.45	-17.23
836.50	10	16-QAM	H	210	8	1 / 0	16.24	5.16	21.40	38.45	-17.05
844.00	10	16-QAM	H	196	9	1 / 0	15.68	5.25	20.93	38.45	-17.52
836.50	10	QPSK	V	157	257	1 / 0	13.20	5.00	18.20	38.45	-20.25

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	H	119	94	3 / 2	13.62	9.66	23.28	30.00	-6.72
1732.50	1.4	QPSK	H	214	80	3 / 2	11.27	9.61	20.88	30.00	-9.12
1754.30	1.4	QPSK	H	212	75	1 / 0	10.52	9.57	20.09	30.00	-9.91
1710.70	1.4	16-QAM	H	119	94	3 / 2	12.36	9.66	22.02	30.00	-7.98
1732.50	1.4	16-QAM	H	214	80	3 / 2	9.93	9.61	19.54	30.00	-10.46
1754.30	1.4	16-QAM	H	212	75	1 / 0	9.19	9.57	18.76	30.00	-11.24
1711.50	3	QPSK	H	110	79	1 / 14	14.39	9.65	24.04	30.00	-5.96
1732.50	3	QPSK	H	163	71	1 / 14	12.55	9.61	22.16	30.00	-7.84
1753.50	3	QPSK	H	156	68	1 / 14	13.14	9.57	22.71	30.00	-7.29
1711.50	3	16-QAM	H	110	79	1 / 14	13.12	9.65	22.77	30.00	-7.23
1732.50	3	16-QAM	H	163	71	1 / 14	11.18	9.61	20.79	30.00	-9.21
1753.50	3	16-QAM	H	156	68	1 / 14	11.83	9.57	21.40	30.00	-8.60
1712.50	5	QPSK	H	110	79	1 / 24	12.84	9.65	22.49	30.00	-7.51
1732.50	5	QPSK	H	110	84	1 / 24	13.16	9.61	22.77	30.00	-7.23
1752.50	5	QPSK	H	110	69	1 / 0	12.85	9.57	22.42	30.00	-7.58
1712.50	5	16-QAM	H	110	79	1 / 24	11.51	9.65	21.16	30.00	-8.84
1732.50	5	16-QAM	H	110	84	1 / 24	11.66	9.61	21.27	30.00	-8.73
1752.50	5	16-QAM	H	110	69	1 / 0	11.16	9.57	20.73	30.00	-9.27
1715.00	10	QPSK	H	110	63	1 / 49	12.82	9.65	22.47	30.00	-7.53
1732.50	10	QPSK	H	100	203	1 / 49	8.51	9.61	18.12	30.00	-11.88
1750.00	10	QPSK	H	159	183	1 / 0	12.28	9.58	21.86	30.00	-8.14
1715.00	10	16-QAM	H	110	63	1 / 49	11.06	9.65	20.71	30.00	-9.29
1732.50	10	16-QAM	H	100	203	1 / 49	11.12	9.61	20.73	30.00	-9.27
1750.00	10	16-QAM	H	159	183	1 / 0	11.24	9.58	20.82	30.00	-9.18
1717.50	15	QPSK	H	169	202	1 / 0	11.86	9.64	21.50	30.00	-8.50
1732.50	15	QPSK	H	154	164	1 / 74	12.08	9.61	21.69	30.00	-8.31
1747.50	15	QPSK	H	100	182	1 / 74	11.82	9.58	21.40	30.00	-8.60
1717.50	15	16-QAM	H	169	202	1 / 0	11.03	9.64	20.67	30.00	-9.33
1732.50	15	16-QAM	H	154	164	1 / 74	10.81	9.61	20.42	30.00	-9.58
1747.50	15	16-QAM	H	100	182	1 / 0	10.63	9.58	20.21	30.00	-9.79
1720.00	20	QPSK	H	100	158	1 / 0	12.14	9.64	21.78	30.00	-8.22
1732.50	20	QPSK	H	100	157	1 / 99	11.75	9.61	21.36	30.00	-8.64
1745.00	20	QPSK	H	100	159	1 / 99	11.76	9.59	21.35	30.00	-8.65
1720.00	20	16-QAM	H	100	158	1 / 0	10.91	9.64	20.55	30.00	-9.45
1732.50	20	16-QAM	H	100	157	1 / 99	10.87	9.61	20.48	30.00	-9.52
1745.00	20	16-QAM	H	100	159	1 / 0	10.42	9.59	20.01	30.00	-9.99
1711.50	3	QPSK	V	135	263	1 / 99	10.28	9.67	19.95	30.00	-10.05

Table 7-4. 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	V	162	335	1 / 5	12.12	9.21	21.33	30.00	-8.67
1880.00	1.4	QPSK	V	200	335	1 / 5	11.87	9.27	21.14	30.00	-8.86
1909.30	1.4	QPSK	V	155	335	1 / 0	13.07	9.36	22.43	30.00	-7.57
1850.70	1.4	16-QAM	V	162	335	1 / 5	10.51	9.21	19.72	30.00	-10.28
1880.00	1.4	16-QAM	V	200	335	1 / 5	10.10	9.27	19.37	30.00	-10.63
1909.30	1.4	16-QAM	V	155	335	1 / 0	11.55	9.36	20.91	30.00	-9.09
1851.50	3	QPSK	V	110	10	1 / 14	12.20	9.21	21.41	30.00	-8.59
1880.00	3	QPSK	V	114	9	1 / 14	14.06	9.27	23.33	30.00	-6.67
1908.50	3	QPSK	V	160	11	1 / 0	12.65	9.36	22.01	30.00	-7.99
1851.50	3	16-QAM	V	110	10	1 / 14	11.00	9.21	20.21	30.00	-9.79
1880.00	3	16-QAM	V	114	9	1 / 14	13.29	9.27	22.56	30.00	-7.44
1908.50	3	16-QAM	V	160	11	1 / 0	11.43	9.36	20.79	30.00	-9.21
1852.50	5	QPSK	V	110	48	1 / 24	14.80	9.22	24.02	30.00	-5.98
1880.00	5	QPSK	V	153	28	1 / 24	13.07	9.27	22.34	30.00	-7.66
1907.50	5	QPSK	V	196	66	1 / 0	12.32	9.35	21.67	30.00	-8.33
1852.50	5	16-QAM	V	110	48	1 / 24	13.17	9.22	22.39	30.00	-7.61
1880.00	5	16-QAM	V	153	28	1 / 24	11.37	9.27	20.64	30.00	-9.36
1907.50	5	16-QAM	V	196	66	1 / 0	10.66	9.35	20.01	30.00	-9.99
1855.00	10	QPSK	V	110	50	1 / 49	14.87	9.22	24.09	30.00	-5.91
1880.00	10	QPSK	V	156	39	1 / 49	13.36	9.27	22.63	30.00	-7.37
1905.00	10	QPSK	V	196	68	1 / 0	12.50	9.34	21.84	30.00	-8.16
1855.00	10	16-QAM	V	110	50	1 / 49	14.12	9.22	23.34	30.00	-6.66
1880.00	10	16-QAM	V	156	39	1 / 49	10.95	9.27	20.22	30.00	-9.78
1905.00	10	16-QAM	V	196	68	1 / 0	10.42	9.34	19.76	30.00	-10.24
1857.50	15	QPSK	V	110	60	1 / 74	15.15	9.23	24.38	30.00	-5.62
1880.00	15	QPSK	V	154	47	1 / 74	13.01	9.27	22.28	30.00	-7.72
1902.50	15	QPSK	V	194	69	1 / 74	13.17	9.33	22.50	30.00	-7.50
1857.50	15	16-QAM	V	110	60	1 / 74	14.21	9.23	23.44	30.00	-6.56
1880.00	15	16-QAM	V	154	47	1 / 74	12.07	9.27	21.34	30.00	-8.66
1902.50	15	16-QAM	V	194	69	1 / 74	11.29	9.33	20.62	30.00	-9.38
1860.00	20	QPSK	V	110	47	1 / 99	14.91	9.23	24.14	30.00	-5.86
1880.00	20	QPSK	V	151	46	1 / 0	15.00	9.27	24.27	30.00	-5.73
1900.00	20	QPSK	V	200	77	1 / 99	14.53	9.31	23.84	30.00	-6.16
1860.00	20	16-QAM	V	110	47	1 / 99	12.97	9.23	22.20	30.00	-7.80
1880.00	20	16-QAM	V	151	46	1 / 0	13.16	9.27	22.43	30.00	-7.57
1900.00	20	16-QAM	V	200	77	1 / 99	12.90	9.31	22.21	30.00	-7.79
1857.50	15	QPSK	H	283	172	1 / 99	5.21	9.32	14.53	30.00	-15.47

Table 7-5. EIRP Data (Band 2)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
2498.50	5	QPSK	H	196	295	1 / 0	13.73	8.60	22.33	33.01	-10.68
2593.00	5	QPSK	H	188	152	1 / 0	13.94	8.53	22.47	33.01	-10.54
2687.50	5	QPSK	H	182	291	1 / 0	13.63	8.79	22.42	33.01	-10.59
2498.50	5	16-QAM	H	196	295	1 / 0	12.84	8.60	21.44	33.01	-11.57
2593.00	5	16-QAM	H	188	152	1 / 0	11.14	8.53	19.67	33.01	-13.34
2687.50	5	16-QAM	H	182	291	1 / 0	12.42	8.79	21.21	33.01	-11.80
2501.00	10	QPSK	H	193	300	1 / 0	12.57	8.60	21.17	33.01	-11.84
2593.00	10	QPSK	H	193	291	1 / 0	12.81	8.53	21.34	33.01	-11.67
2685.00	10	QPSK	H	193	291	1 / 0	12.72	8.78	21.50	33.01	-11.51
2501.00	10	16-QAM	H	193	300	1 / 0	11.96	8.60	20.56	33.01	-12.45
2593.00	10	16-QAM	H	193	291	1 / 0	11.92	8.53	20.45	33.01	-12.56
2685.00	10	16-QAM	H	193	291	1 / 0	11.94	8.78	20.72	33.01	-12.29
2503.50	15	QPSK	H	201	245	1 / 0	12.93	8.59	21.52	33.01	-11.49
2593.00	15	QPSK	H	183	292	1 / 0	12.01	8.53	20.54	33.01	-12.47
2682.50	15	QPSK	H	183	292	1 / 0	13.15	8.77	21.92	33.01	-11.09
2503.50	15	16-QAM	H	201	245	1 / 0	12.30	8.59	20.89	33.01	-12.12
2593.00	15	16-QAM	H	183	292	1 / 0	11.60	8.53	20.13	33.01	-12.88
2682.50	15	16-QAM	H	183	292	1 / 0	11.91	8.77	20.68	33.01	-12.33
2506.00	20	QPSK	H	235	240	1 / 0	13.15	8.59	21.74	33.01	-11.27
2593.00	20	QPSK	H	225	125	1 / 0	11.80	8.53	20.33	33.01	-12.68
2680.00	20	QPSK	H	225	338	1 / 0	11.92	8.77	20.69	33.01	-12.32
2506.00	20	16-QAM	H	235	240	1 / 0	11.14	8.59	19.73	33.01	-13.28
2593.00	20	16-QAM	H	225	125	1 / 0	11.69	8.53	20.22	33.01	-12.79
2680.00	20	16-QAM	H	225	338	1 / 0	10.89	8.77	19.66	33.01	-13.35
2593.00	5	QPSK	V	100	51	1 / 0	12.44	8.93	21.37	33.01	-11.64

Table 7-6. EIRP Data (Band 41)

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 = 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.

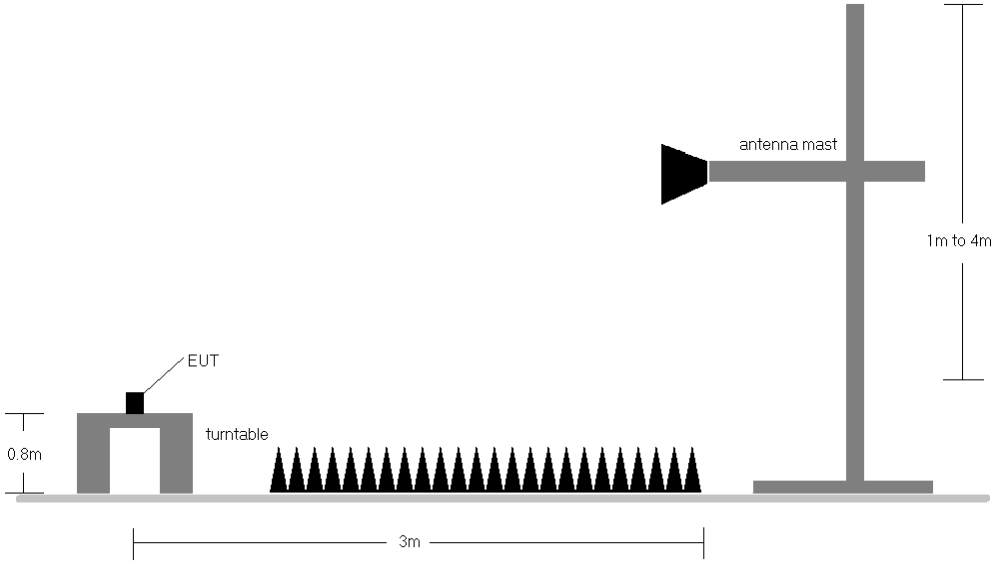


Figure 7-7. Test Instrument & Measurement Setup

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:	706.50	MHz			
CHANNEL:	23755				
MEASURED OUTPUT POWER:	20.44	dBm	=	0.111	W
MODULATION SIGNAL:	QPSK				
BANDWIDTH:	5.0	MHz			
DISTANCE:	3	meters			
LIMIT:	43 + 10 $\log_{10}$ (W) =	33.44	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]
1413.00	V	151	37	-66.13	2.76	-63.37	84.2
2119.50	V	-	-	-66.18	3.40	-62.78	80.6
2826.00	V	-	-	-65.93	4.90	-61.03	78.9

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

OPERATING FREQUENCY:	710.00	MHz			
CHANNEL:	23790				
MEASURED OUTPUT POWER:	19.83	dBm	=	0.096	W
MODULATION SIGNAL:	QPSK				
BANDWIDTH:	5.0	MHz			
DISTANCE:	3	meters			
LIMIT:	43 + 10 $\log_{10}$ (W) =	32.83	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]
1420.00	V	100	137	-62.28	2.84	-59.44	80.7
2130.00	V	100	285	-63.33	3.42	-59.91	77.2
2840.00	V	-	-	-65.26	4.93	-60.32	77.6
3550.00	V	-	-	-64.72	6.18	-58.54	75.8

Table 7-8. Radiated Spurious Data (Band 17 – Mid Channel)

OPERATING FREQUENCY:	713.50	MHz		
CHANNEL:	23825			
MEASURED OUTPUT POWER:	20.55	dBm	=	0.113 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	33.55	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]
1427.00	V	115	676	-64.14	2.91	-61.23	80.9
2140.50	V	240	88	-58.34	3.44	-54.90	72.9
2854.00	V	-	-	-61.88	4.97	-56.91	74.9
3567.50	V	-	-	-61.26	6.18	-55.08	73.1
4281.00	V	-	-	-64.94	7.26	-57.68	75.7

Table 7-9. Radiated Spurious Data (Band 17 – High Channel)

OPERATING FREQUENCY:	829.00	MHz		
CHANNEL:	20450			
MEASURED OUTPUT POWER:	22.93	dBm	=	0.197 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	10.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	35.93	dBc	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1658.00	H	110	98	-66.09	3.60	-62.50	85.4
2487.00	H	-	-	-61.35	3.56	-57.79	80.7
3316.00	H	-	-	-62.67	5.84	-56.83	79.8
4145.00	H	-	-	-65.02	7.04	-57.97	80.9

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

OPERATING FREQUENCY:	836.50	MHz			
CHANNEL:	20525				
MEASURED OUTPUT POWER:	23.17	dBm	=	0.207	W
MODULATION SIGNAL:	QPSK				
BANDWIDTH:	10.0	MHz			
DISTANCE:	3	meters			
LIMIT:	43 + 10 $\log_{10}$ (W) =	36.17	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	112	94	-62.39	3.52	-58.87	82.0
2509.50	H	-	-	-62.15	3.59	-58.56	81.7
3346.00	H	-	-	-61.09	5.87	-55.22	78.4
4182.50	H	-	-	-65.06	7.16	-57.90	81.1

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

OPERATING FREQUENCY:	844.00	MHz			
CHANNEL:	20600				
MEASURED OUTPUT POWER:	22.47	dBm	=	0.177	W
MODULATION SIGNAL:	QPSK				
BANDWIDTH:	10.0	MHz			
DISTANCE:	3	meters			
LIMIT:	43 + 10 $\log_{10}$ (W) =	35.47	dBc		

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1688.00	H	-	-	-65.42	3.44	-61.98	84.5
2532.00	H	-	-	-60.92	3.69	-57.23	79.7
3376.00	H	-	-	-61.65	5.90	-55.74	78.2

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

OPERATING FREQUENCY:	1711.50	MHz		
CHANNEL:	19965			
MEASURED OUTPUT POWER:	24.04	dBm	=	0.254 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	37.04	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]
3423.00	H	225	191	-50.77	8.17	-42.60	66.6
5134.50	H	242	332	-63.08	10.38	-52.70	76.7
6846.00	H	142	317	-61.95	11.49	-50.46	74.5
8557.50	H	124	295	-56.33	13.05	-43.28	67.3
10269.00	H	-	-	-61.34	13.13	-48.21	72.3

Table 7-13. Radiated Spurious Data (Band 4 – Low Channel)

OPERATING FREQUENCY:	1732.50	MHz		
CHANNEL:	20175			
MEASURED OUTPUT POWER:	22.16	dBm	=	0.165 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	35.16	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	228	14	-49.23	8.26	-40.97	63.1
5197.50	H	262	350	-65.97	10.41	-55.55	77.7
6930.00	H	136	323	-60.28	11.53	-48.75	70.9
8662.50	H	149	295	-59.89	13.07	-46.82	69.0
10395.00	H	-	-	-60.40	13.13	-47.27	69.4

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

OPERATING FREQUENCY:	1753.50	MHz		
CHANNEL:	20385			
MEASURED OUTPUT POWER:	22.71	dBm	=	0.187 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	3.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	35.71	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]
3507.00	H	228	7	-50.72	8.34	-42.38	65.1
5260.50	H	-	-	-65.47	10.37	-55.10	77.8
7014.00	H	129	291	-62.01	11.56	-50.44	73.2
8767.50	H	132	308	-59.55	13.08	-46.47	69.2
10521.00	H	-	-	-60.19	12.97	-47.22	69.9

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

OPERATING FREQUENCY:	1857.50	MHz		
CHANNEL:	18675			
MEASURED OUTPUT POWER:	24.38	dBm	=	0.274 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	15.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	37.38	dBc	

Frequency [MHz]	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	117	170	-38.05	8.48	-29.57	55.7
5580.00	H	101	204	-63.24	10.55	-52.69	78.8
7440.00	H	144	219	-54.04	12.01	-42.03	68.2
9300.00	H	-	-	-62.49	13.27	-49.21	75.3

Table 7-16. Radiated Spurious Data (Band 2 – Low Channel)

OPERATING FREQUENCY:	1880.00	MHz		
CHANNEL:	18900			
MEASURED OUTPUT POWER:	22.28	dBm	=	0.169 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	15.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	35.28	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]
3760.00	H	196	179	-33.34	8.64	-24.70	49.0
5640.00	H	144	220	-62.64	10.62	-52.03	76.3
7520.00	H	147	223	-52.15	12.04	-40.11	64.4
9400.00	H	149	138	-62.47	13.23	-49.24	73.5
11280.00	H	-	-	-59.64	13.31	-46.33	70.6

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

OPERATING FREQUENCY:	1902.50	MHz		
CHANNEL:	19125			
MEASURED OUTPUT POWER:	22.50	dBm	=	0.178 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	15.0	MHz		
DISTANCE:	3	meters		
LIMIT:	43 + 10 $\log_{10}$ (W) =	35.50	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]
3800.00	H	186	176	-33.72	8.80	-24.92	48.7
5700.00	H	119	130	-58.78	10.68	-48.10	71.9
7600.00	H	117	224	-50.65	12.15	-38.50	62.2
9500.00	H	115	245	-61.42	13.33	-48.09	71.8
11400.00	H	-	-	-59.12	13.20	-45.93	69.7

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

OPERATING FREQUENCY:	2498.50	MHz		
CHANNEL:	39675			
MEASURED OUTPUT POWER:	22.33	dBm	=	0.171 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	55 + 10 log10 (W)	47.33	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]
4997.00	H	100	307	-55.40	11.19	-44.21	66.5
7495.50	H	100	126	-60.25	11.14	-49.11	71.4
9994.00	H	-	-	-58.93	12.55	-46.38	68.7

Table 7-19. Radiated Spurious Data (Band 41 – Low Channel)

OPERATING FREQUENCY:	2593.00	MHz		
CHANNEL:	40620			
MEASURED OUTPUT POWER:	22.47	dBm	=	0.177 W
MODULATION SIGNAL:	QPSK			
BANDWIDTH:	5.0	MHz		
DISTANCE:	3	meters		
LIMIT:	55 + 10 log10 (W)	47.47	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]
5186.00	H	100	262	-60.13	10.83	-49.30	71.8
7779.00	H	100	158	-59.73	11.60	-48.14	70.6
10372.00	H	-	-	-58.06	12.74	-45.32	67.8

Table 7-20. Radiated Spurious Data (Band 41 – Mid Channel)

OPERATING FREQUENCY:	2687.50	MHz			
CHANNEL:	41565				
MEASURED OUTPUT POWER:	22.42	dBm	=	0.174	W
MODULATION SIGNAL:	QPSK				
BANDWIDTH:	5.0	MHz			
DISTANCE:	3	meters			
LIMIT:	55 + 10 log10 (W)	47.42	dBc		

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
5375.00	H	100	293	-48.52	11.10	-37.42	59.8
8062.50	H	100	315	-51.34	11.56	-39.78	62.2
10750.00	H	-	-	-58.60	13.03	-45.58	68.0

Table 7-21. Radiated Spurious Data (Band 41 – 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 17 Frequency Stability Measurements

§2.1055 §27.54

OPERATING FREQUENCY:	710,000,000	Hz
CHANNEL:	23090	
REFERENCE VOLTAGE:	3.85	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	710,000,013	13	0.0000018
100 %		- 30	709,999,586	-414	-0.0000583
100 %		- 20	709,999,910	-90	-0.0000127
100 %		- 10	710,000,313	313	0.0000441
100 %		0	710,000,048	48	0.0000068
100 %		+ 10	710,000,051	51	0.0000072
100 %		+ 20	710,000,102	102	0.0000144
100 %		+ 30	709,999,696	-304	-0.0000428
100 %		+ 40	710,000,268	268	0.0000377
100 %		+ 50	710,000,113	113	0.0000159
BATT. ENDPOINT	3.45	+ 20	709,999,656	-344	-0.0000485

Table 7-22. Frequency Stability Data (Band 17)

Band 17 Frequency Stability Measurements

§2.1055 §27.54

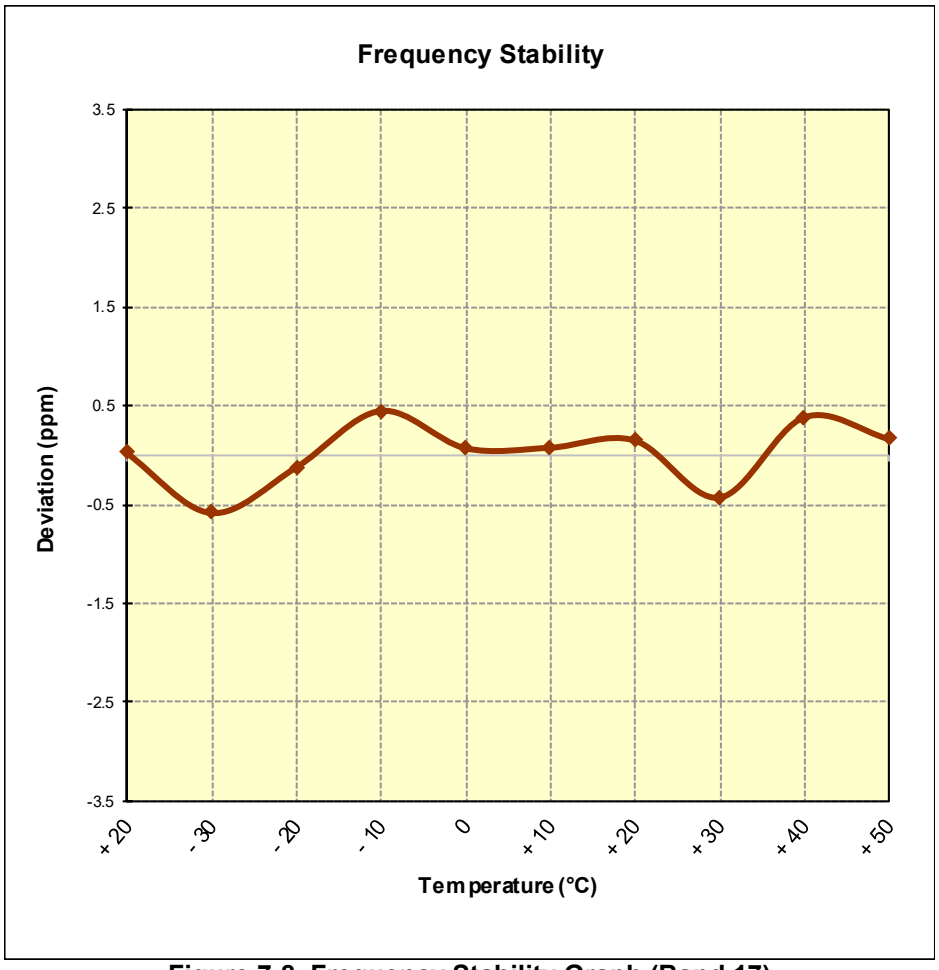


Figure 7-8. Frequency Stability Graph (Band 17)

Band 5 Frequency Stability Measurements

§2.1055 §22.355

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

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	836,500,300	300	0.0000359
100 %		- 30	836,499,853	-147	-0.0000176
100 %		- 20	836,500,225	225	0.0000269
100 %		- 10	836,499,651	-349	-0.0000417
100 %		0	836,499,851	-149	-0.0000178
100 %		+ 10	836,499,969	-31	-0.0000037
100 %		+ 20	836,499,983	-17	-0.0000020
100 %		+ 30	836,500,052	52	0.0000062
100 %		+ 40	836,499,818	-182	-0.0000218
100 %		+ 50	836,499,943	-57	-0.0000068
BATT. ENDPOINT	3.45	+ 20	836,500,044	44	0.0000053

Table 7-23. Frequency Stability Data (Band 5)

Band 5 Frequency Stability Measurements

§2.1055 §22.355

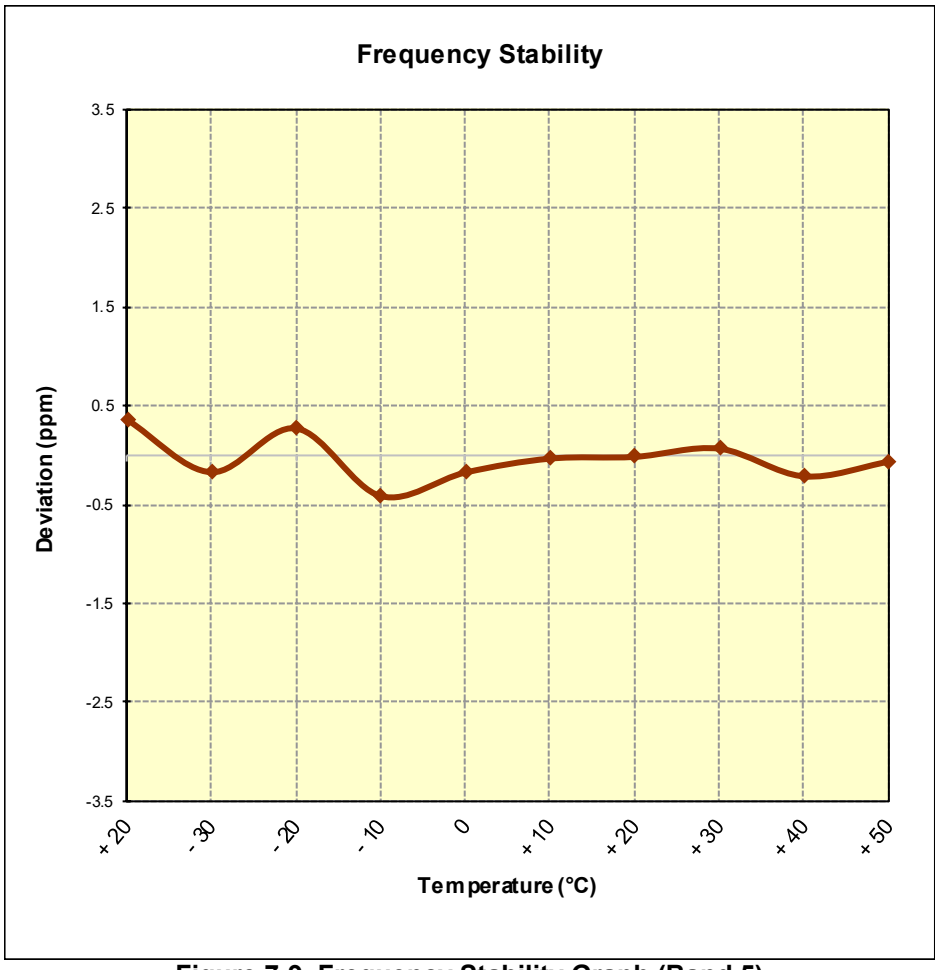


Figure 7-9. Frequency Stability Graph (Band 5)

Band 4 Frequency Stability Measurements

§2.1055 §§27.54

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

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	1,732,499,930	-70	-0.0000040
100 %		- 30	1,732,499,947	-53	-0.0000031
100 %		- 20	1,732,500,103	103	0.0000059
100 %		- 10	1,732,499,953	-47	-0.0000027
100 %		0	1,732,500,007	7	0.0000004
100 %		+ 10	1,732,500,117	117	0.0000068
100 %		+ 20	1,732,500,058	58	0.0000033
100 %		+ 30	1,732,500,085	85	0.0000049
100 %		+ 40	1,732,499,928	-72	-0.0000042
100 %		+ 50	1,732,499,949	-51	-0.0000029
BATT. ENDPOINT	3.45	+ 20	1,732,499,804	-196	-0.0000113

Table 7-24. Frequency Stability Data (Band 4)

Note:

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

Band 4 Frequency Stability Measurements

§2.1055 §§27.54

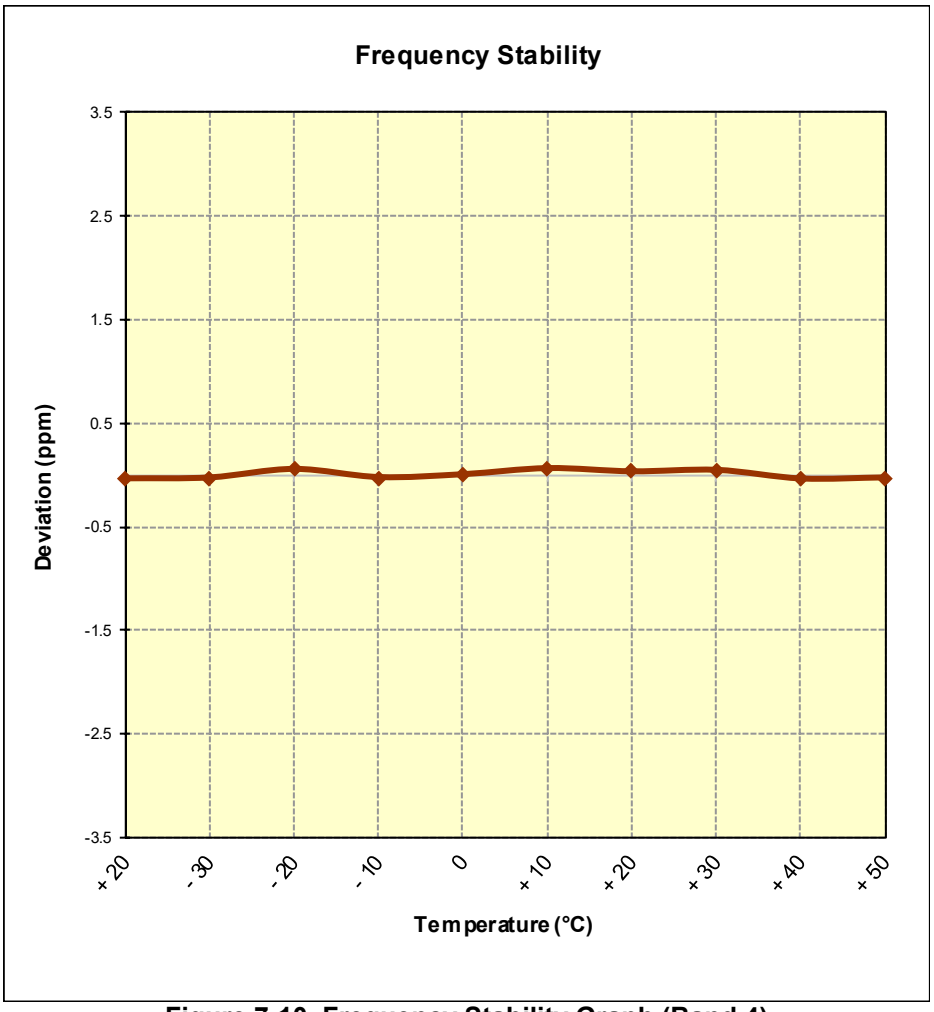


Figure 7-10. Frequency Stability Graph (Band 4)

Band 2 Frequency Stability Measurements

§2.1055 §24.235

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

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	1,879,999,827	-173	-0.0000092
100 %		- 30	1,880,000,003	3	0.0000002
100 %		- 20	1,879,999,831	-169	-0.0000090
100 %		- 10	1,879,999,971	-29	-0.0000015
100 %		0	1,879,999,592	-408	-0.0000217
100 %		+ 10	1,880,000,006	6	0.0000003
100 %		+ 20	1,880,000,158	158	0.0000084
100 %		+ 30	1,880,000,080	80	0.0000043
100 %		+ 40	1,880,000,293	293	0.0000156
100 %		+ 50	1,879,999,764	-236	-0.0000126
BATT. ENDPOINT	3.45	+ 20	1,879,999,624	-376	-0.0000200

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

Note:

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

Band 2 Frequency Stability Measurements

§2.1055 §24.235

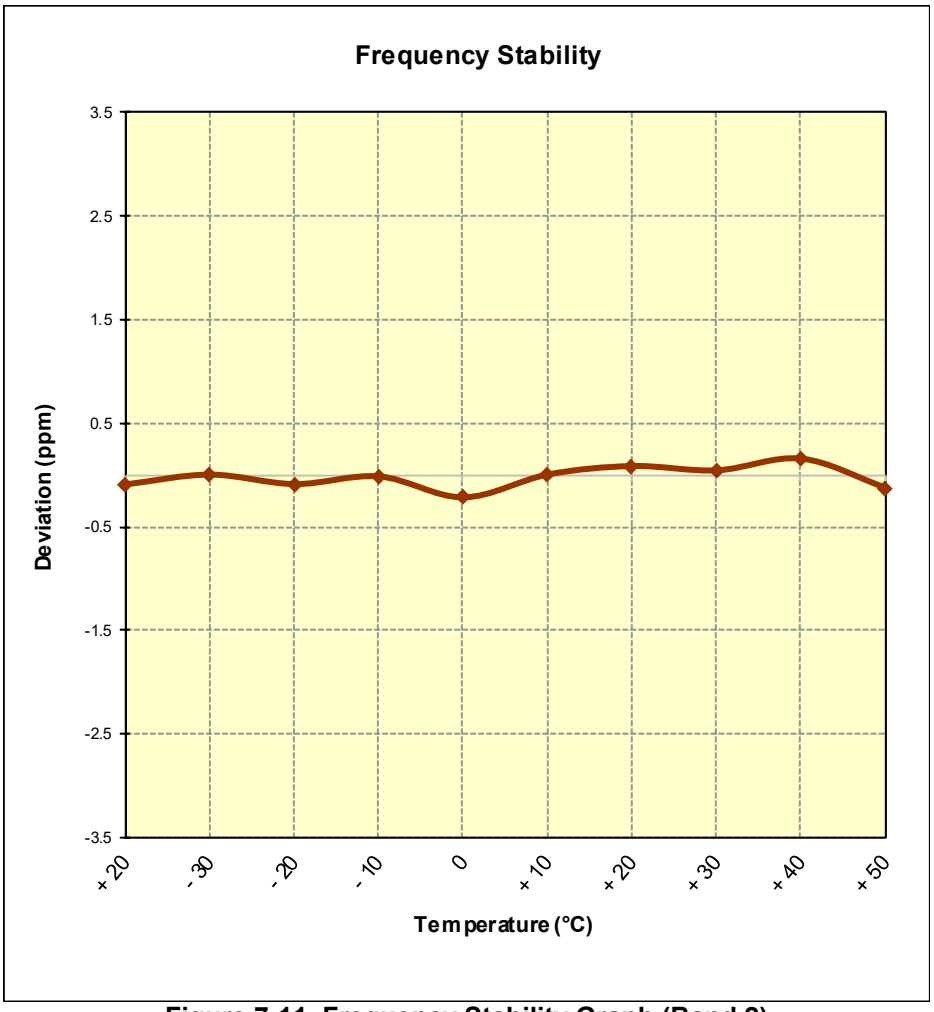


Figure 7-11. Frequency Stability Graph (Band 2)

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)	2,593,000,102	102	0.0000039
100 %		- 30	2,592,999,628	-372	-0.0000143
100 %		- 20	2,593,000,086	86	0.0000033
100 %		- 10	2,592,999,881	-119	-0.0000046
100 %		0	2,592,999,927	-73	-0.0000028
100 %		+ 10	2,592,999,997	-3	-0.0000001
100 %		+ 20	2,592,999,762	-238	-0.0000092
100 %		+ 30	2,592,999,960	-40	-0.0000015
100 %		+ 40	2,592,999,949	-51	-0.0000020
100 %		+ 50	2,593,000,249	249	0.0000096
BATT. ENDPOINT	3.45	+ 20	2,593,000,175	175	0.0000067

Table 7-26. 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

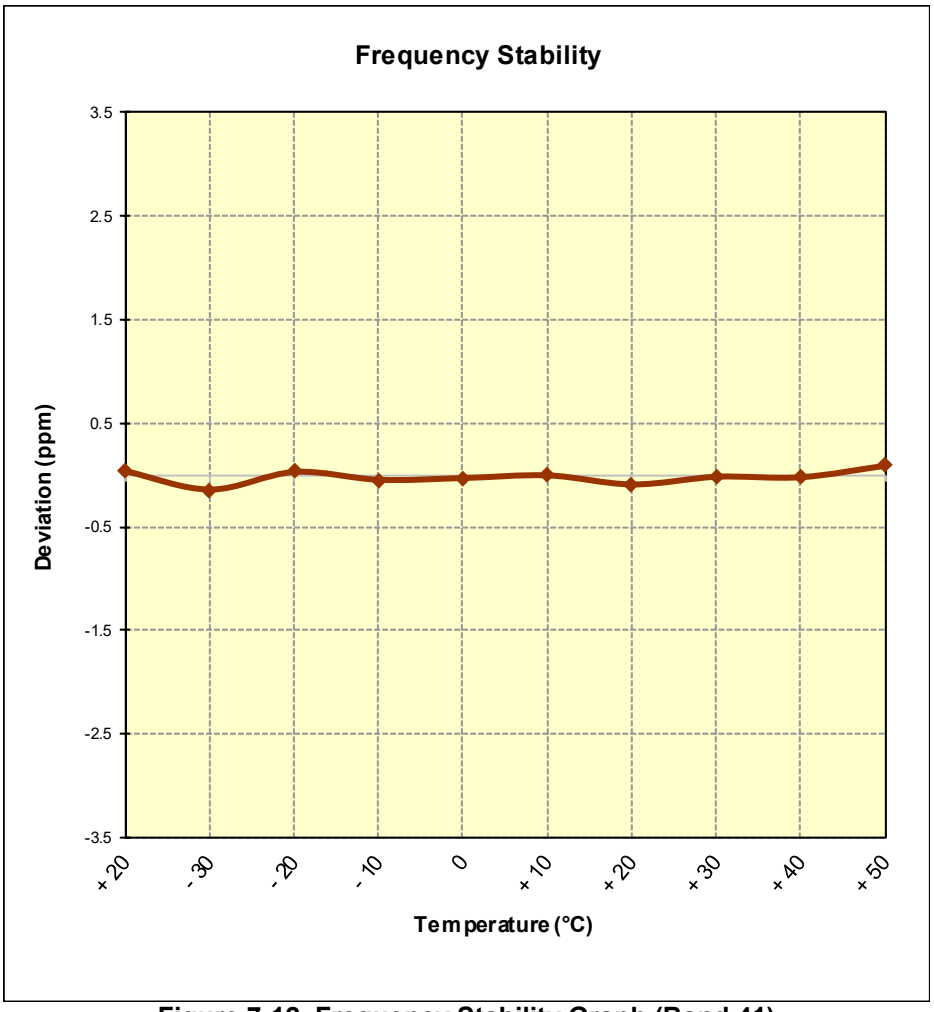


Figure 7-12. Frequency Stability Graph (Band 41)

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMA520F** complies with all the requirements of Parts 22, 24, & 27 of the FCC rules for LTE operation only.