7.4 Band Edge Emissions at Antenna Terminal

Test Overview

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

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

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

Test Procedure Used

KDB 971168 D01 v03 – 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.

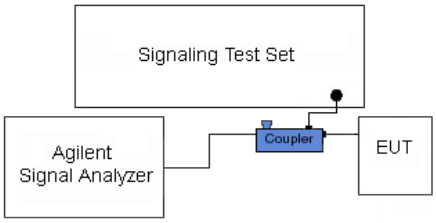


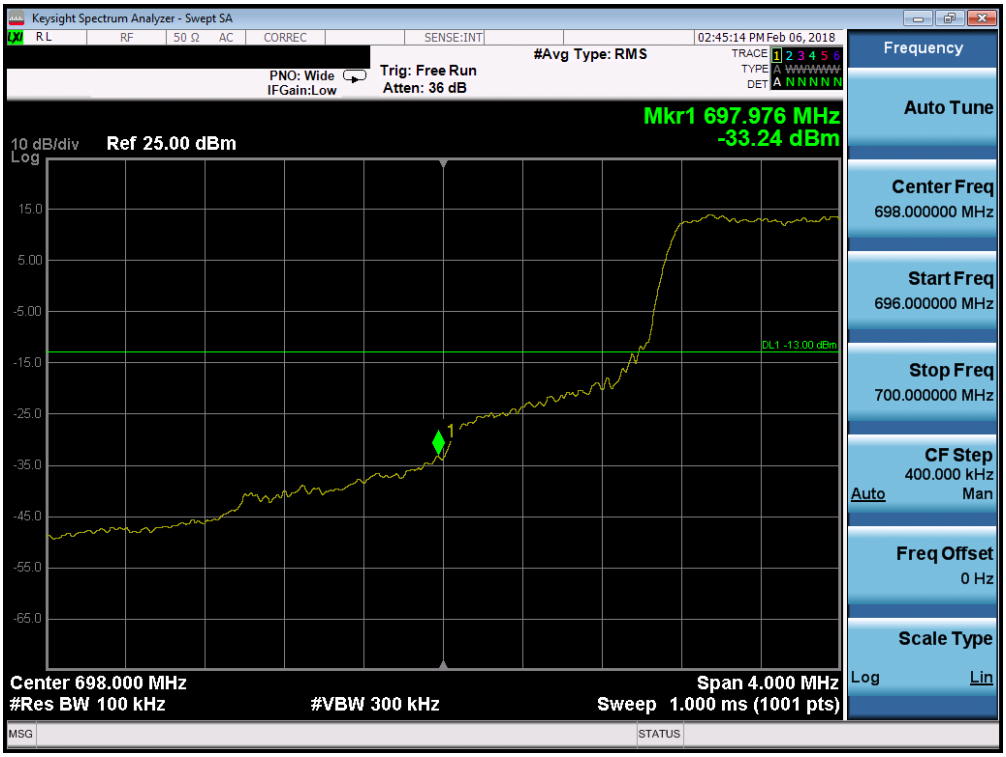
Figure 7-3. Test Instrument & Measurement Setup

Test Notes

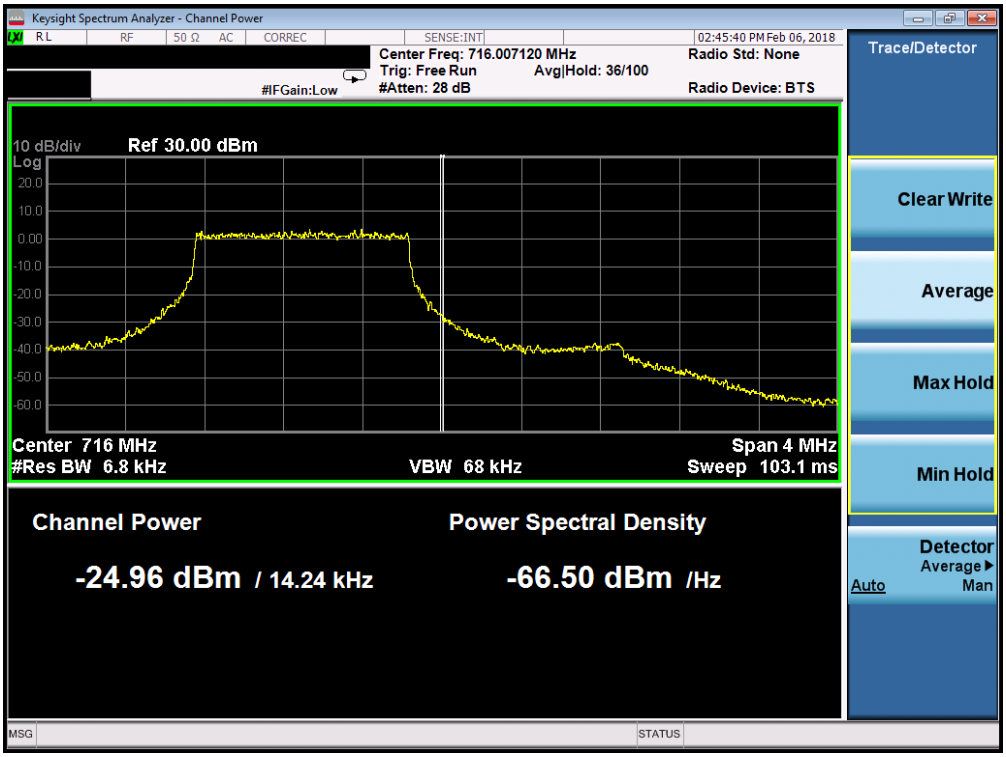
Per 22.917(b) 24.238(a) 27.53(h) RSS-130(4.6) RSS-132(5.5) RSS-133(6.5) RSS-139(6.5) RSS-199(4.5) in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed 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) RSS-130(4.6) 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) RSS-199(4.5) 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.

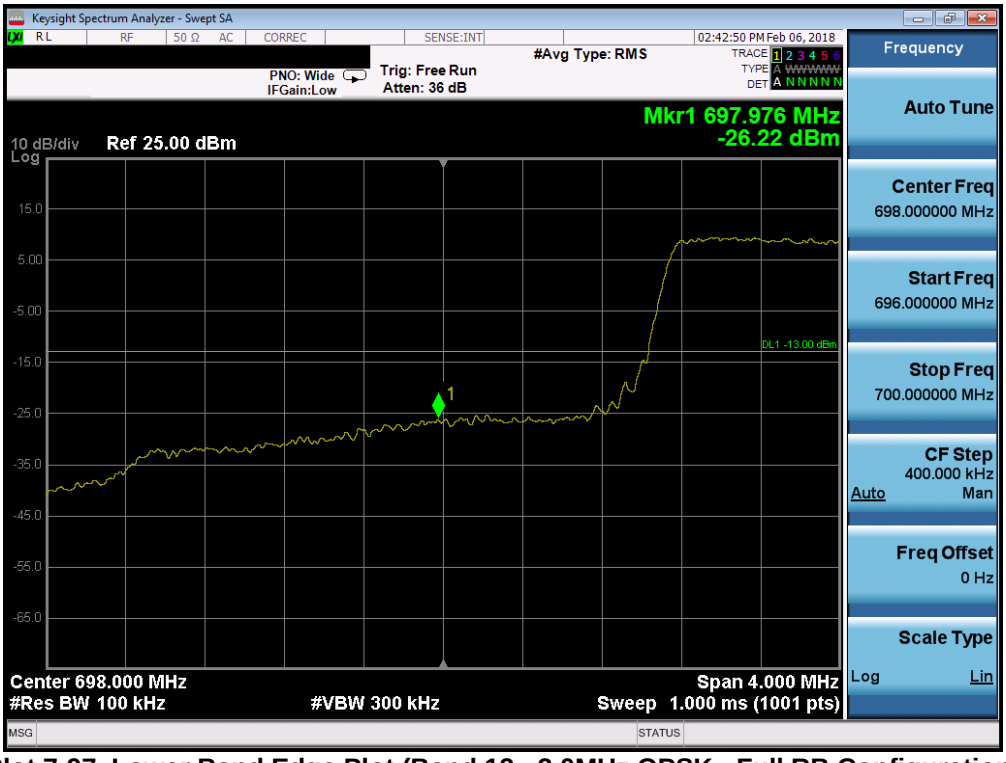


Plot 7-94. Lower Band Edge Plot (Band 12 - 1.4MHz QPSK - Full RB Configuration)



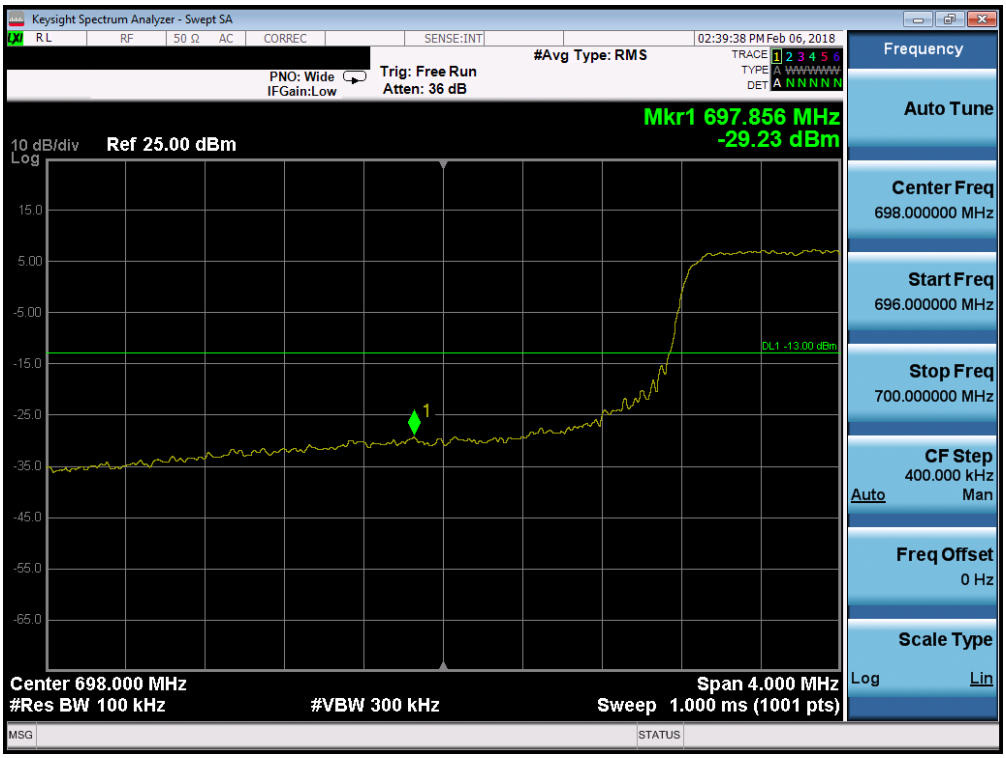
Plot 7-95. Upper Band Edge Plot (Band 12 - 1.4MHz QPSK - Full RB Configuration)

Plot 7-96. Upper Extended Band Edge Plot (Band 12 - 1.4MHz QPSK - Full RB Configuration)



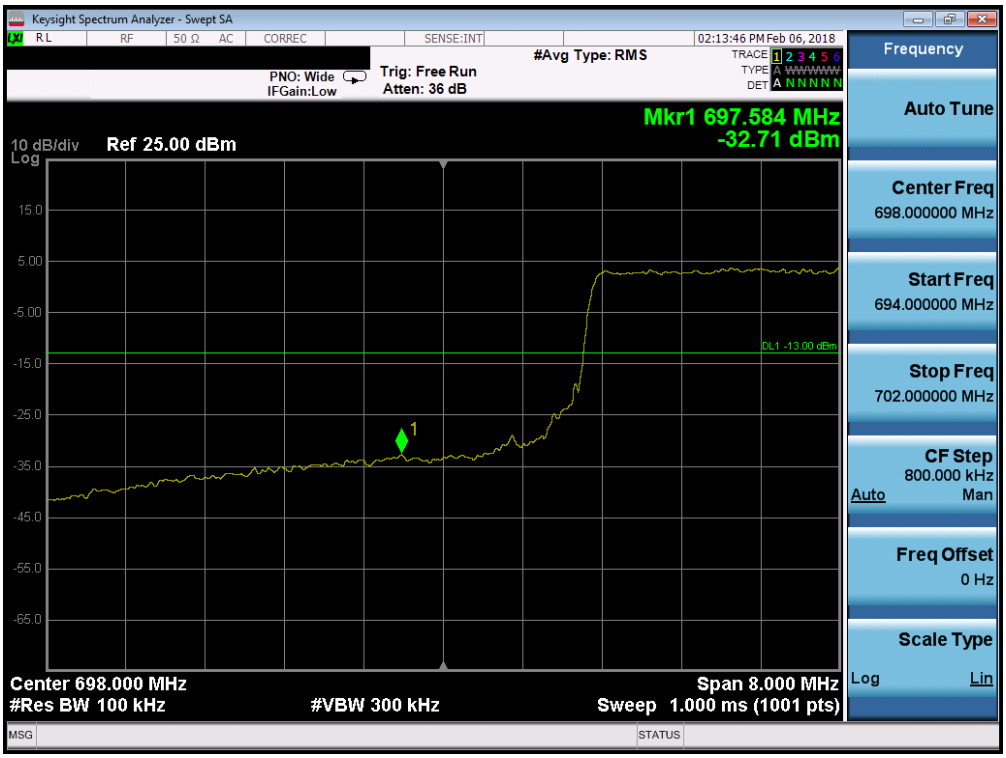
Plot 7-97. Lower Band Edge Plot (Band 12 - 3.0MHz QPSK - Full RB Configuration)

Plot 7-98. Upper Band Edge Plot (Band 12 - 3.0MHz QPSK - Full RB Configuration)



Plot 7-99. Lower Band Edge Plot (Band 12 - 5.0MHz QPSK - Full RB Configuration)

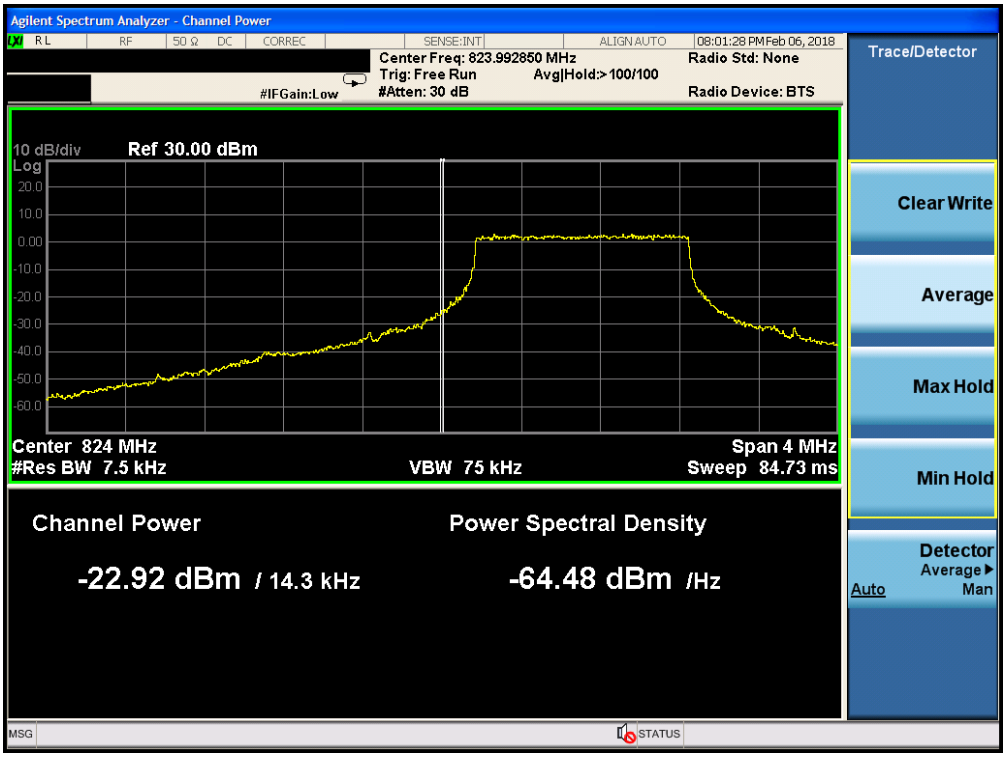
Plot 7-100. Upper Band Edge Plot (Band 12 - 5.0MHz QPSK - Full RB Configuration)



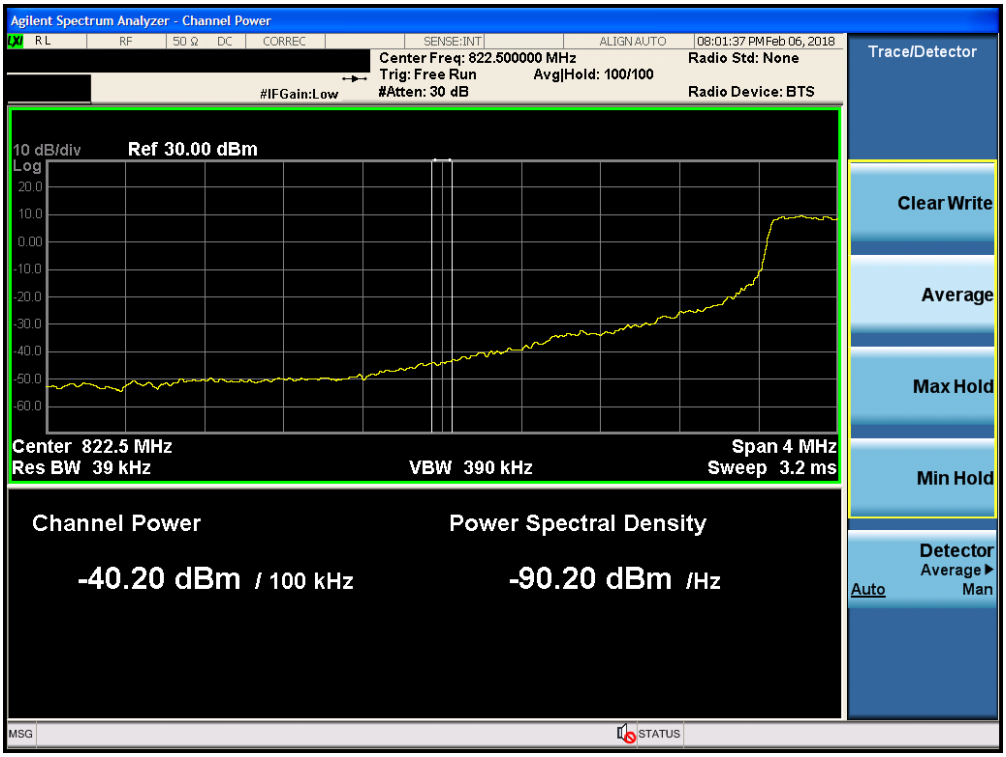
Plot 7-101. Lower Band Edge Plot (Band 12 - 10.0MHz QPSK - Full RB Configuration)

Plot 7-102. Upper Band Edge Plot (Band 12 - 10.0MHz QPSK - Full RB Configuration)

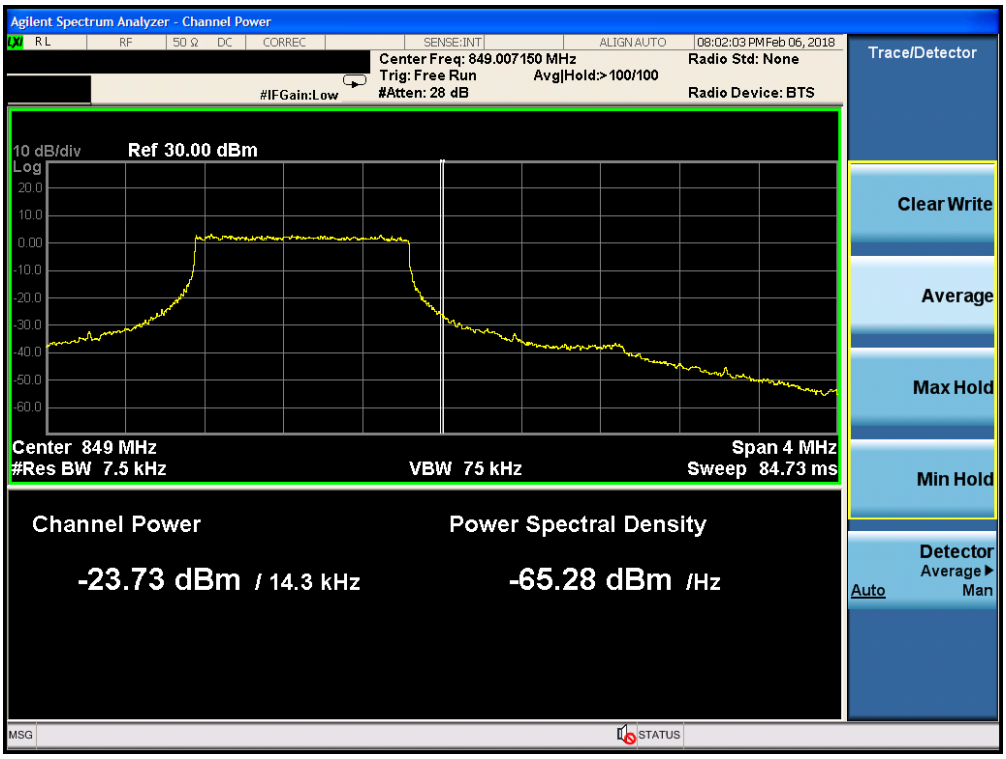
Band 5



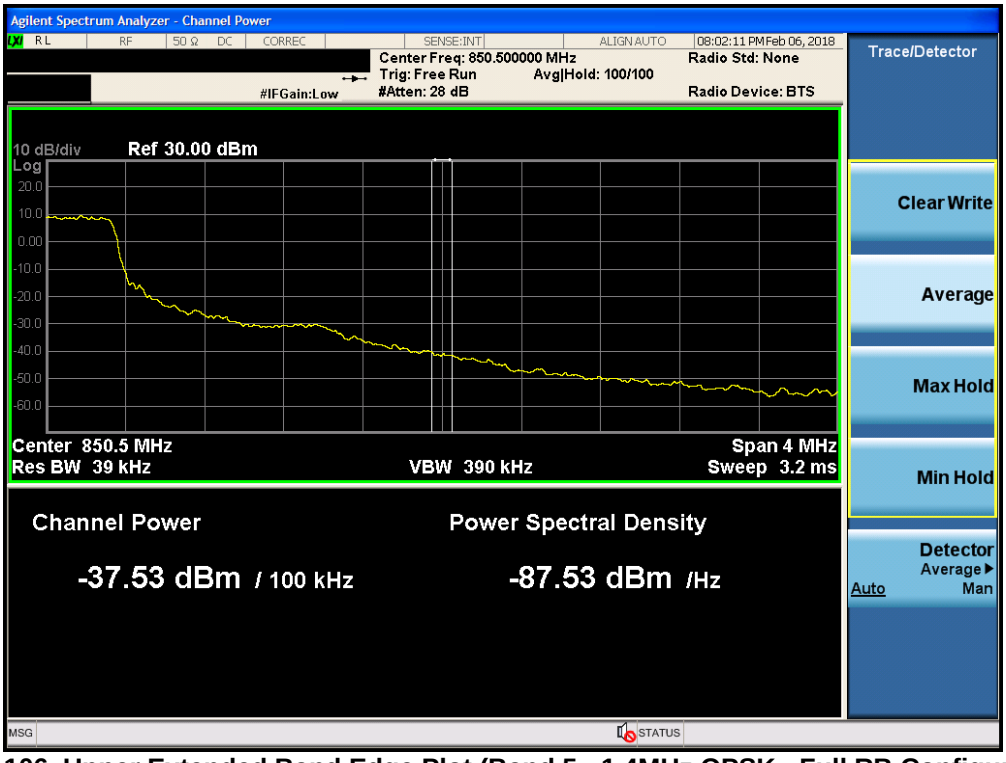
Plot 7-103. Lower Band Edge Plot (Band 5 - 1.4MHz QPSK - Full RB Configuration)



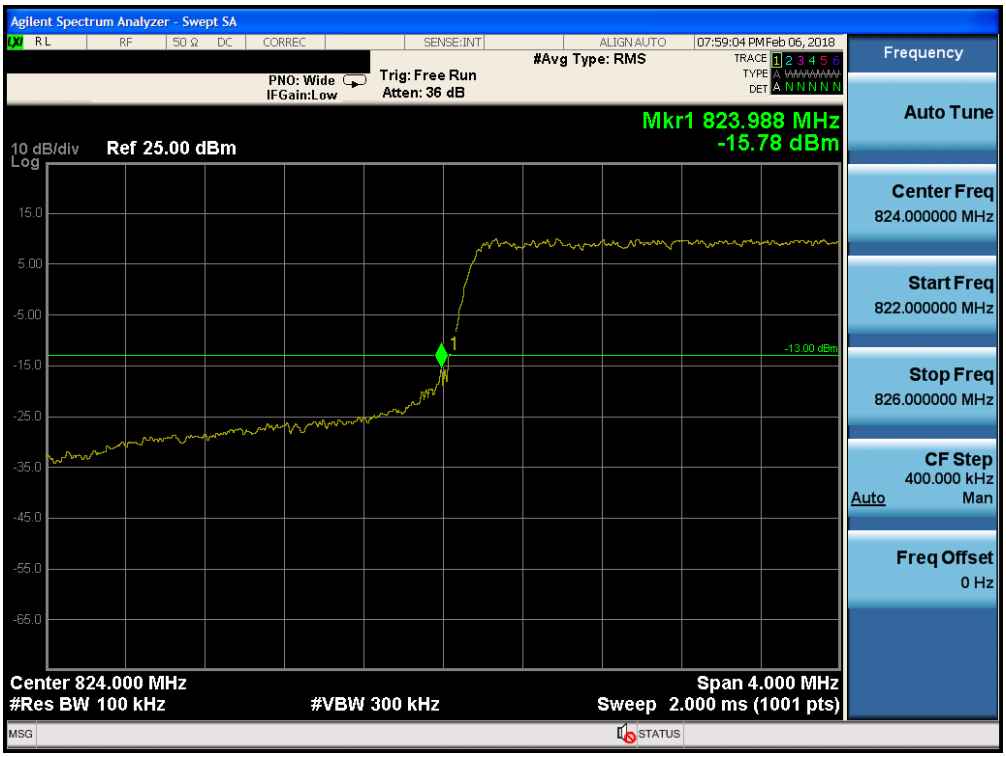
Plot 7-104. Lower Extended Band Edge Plot (Band 5 - 1.4MHz QPSK - Full RB Configuration)



Plot 7-105. Upper Band Edge Plot (Band 5 - 1.4MHz QPSK - Full RB Configuration)

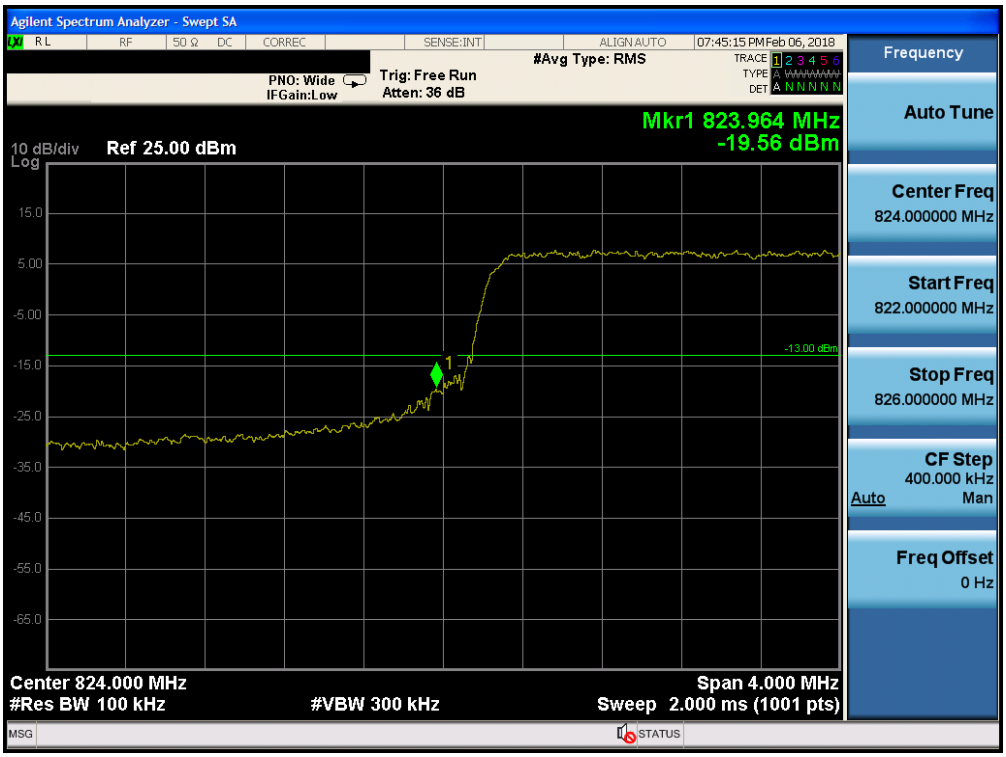


Plot 7-106. Upper Extended Band Edge Plot (Band 5 - 1.4MHz QPSK - Full RB Configuration)



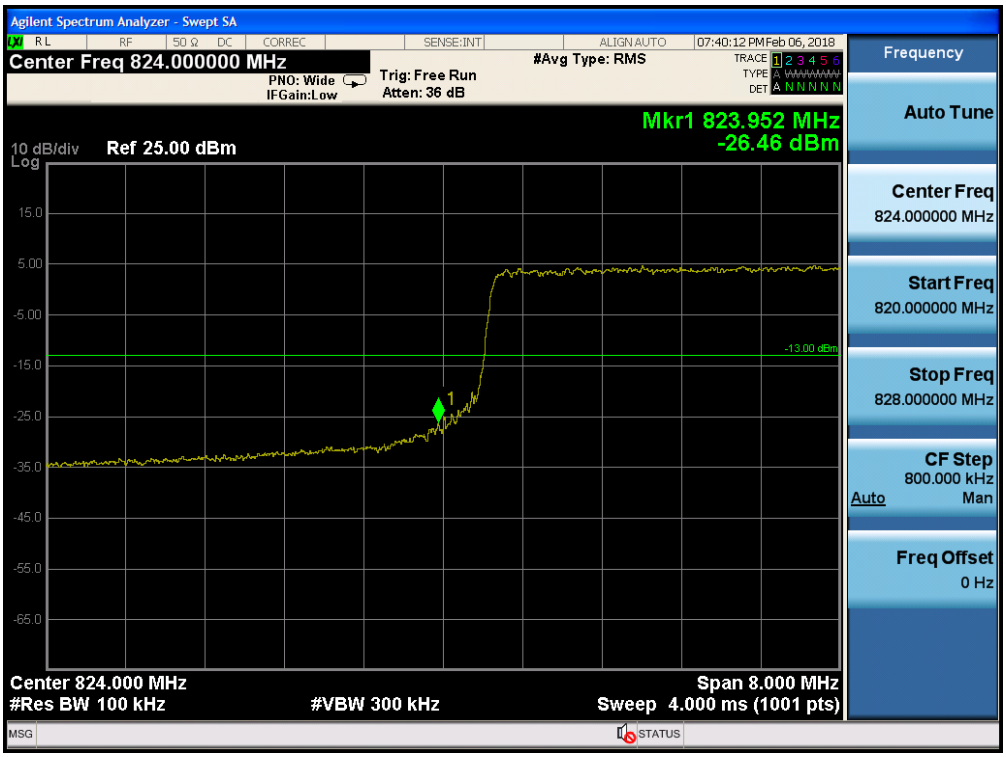
Plot 7-107. Lower Band Edge Plot (Band 5 - 3.0MHz QPSK - Full RB Configuration)

Plot 7-108. Upper Band Edge Plot (Band 5 - 3.0MHz QPSK - Full RB Configuration)

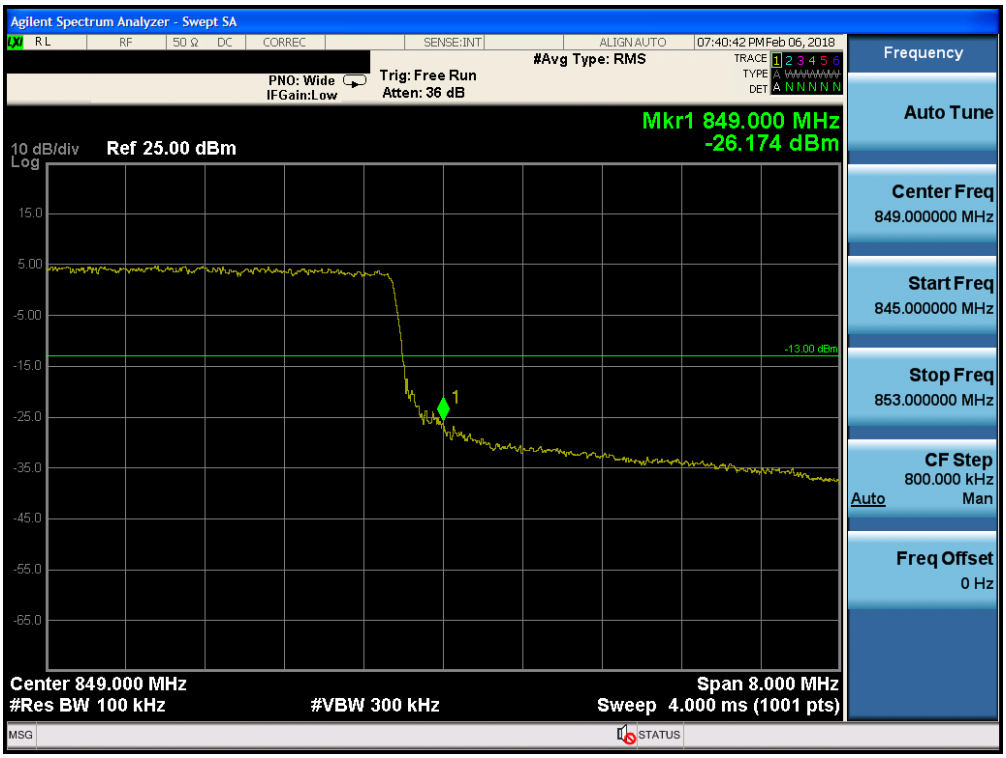


Plot 7-109. Lower Band Edge Plot (Band 5 - 5.0MHz QPSK - Full RB Configuration)

Plot 7-110. Upper Band Edge Plot (Band 5 - 5.0MHz QPSK - Full RB Configuration)

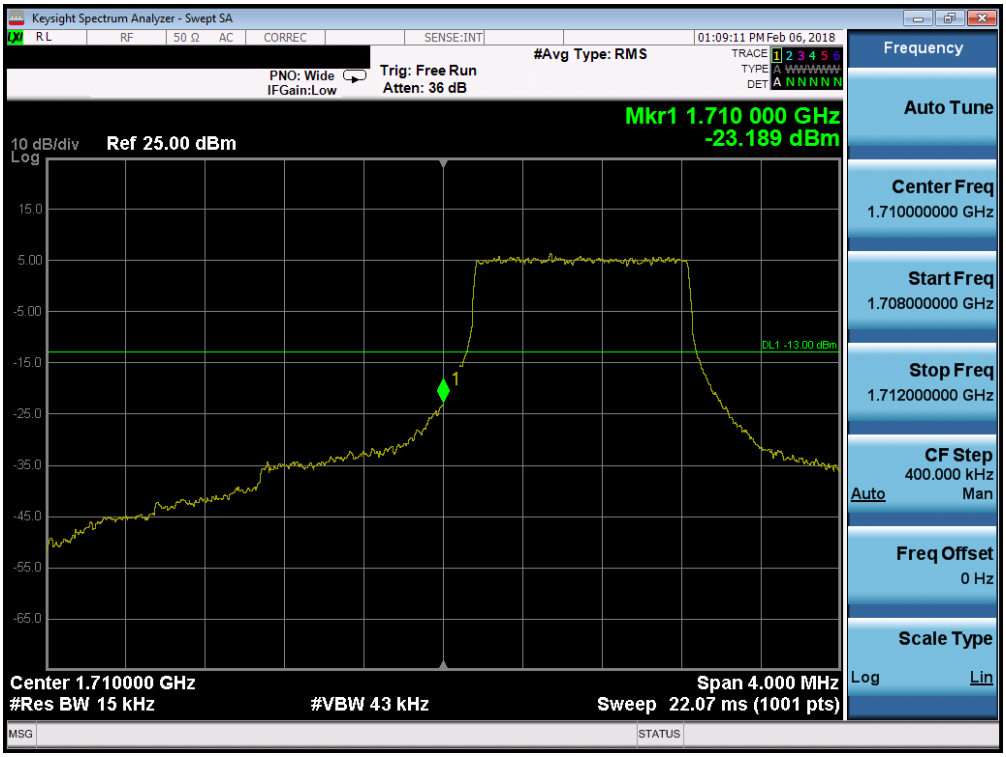


Plot 7-111. Lower Band Edge Plot (Band 5 - 10.0MHz QPSK - Full RB Configuration)

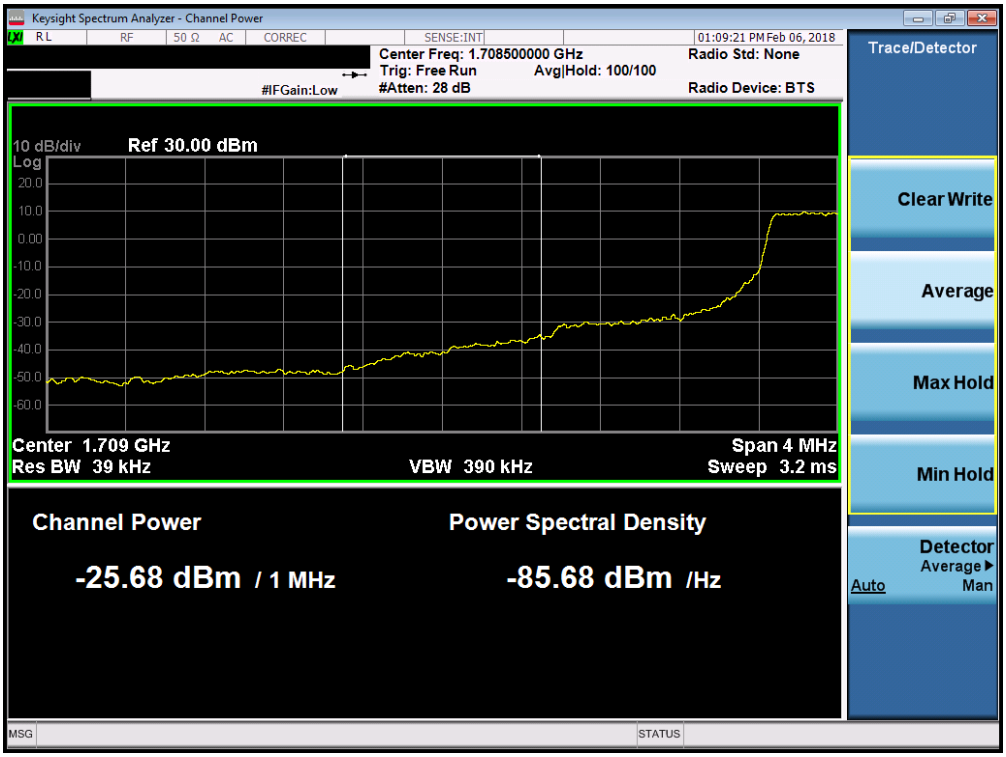


Plot 7-112. Upper Band Edge Plot (Band 5 - 10.0MHz QPSK - Full RB Configuration)

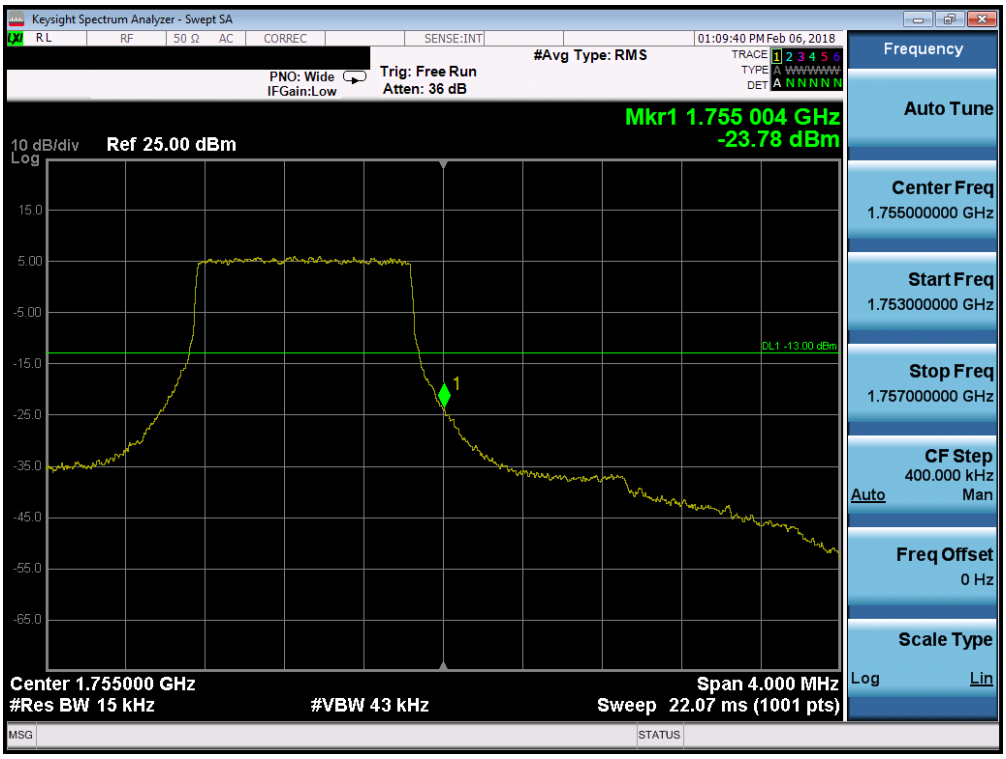
Band 4



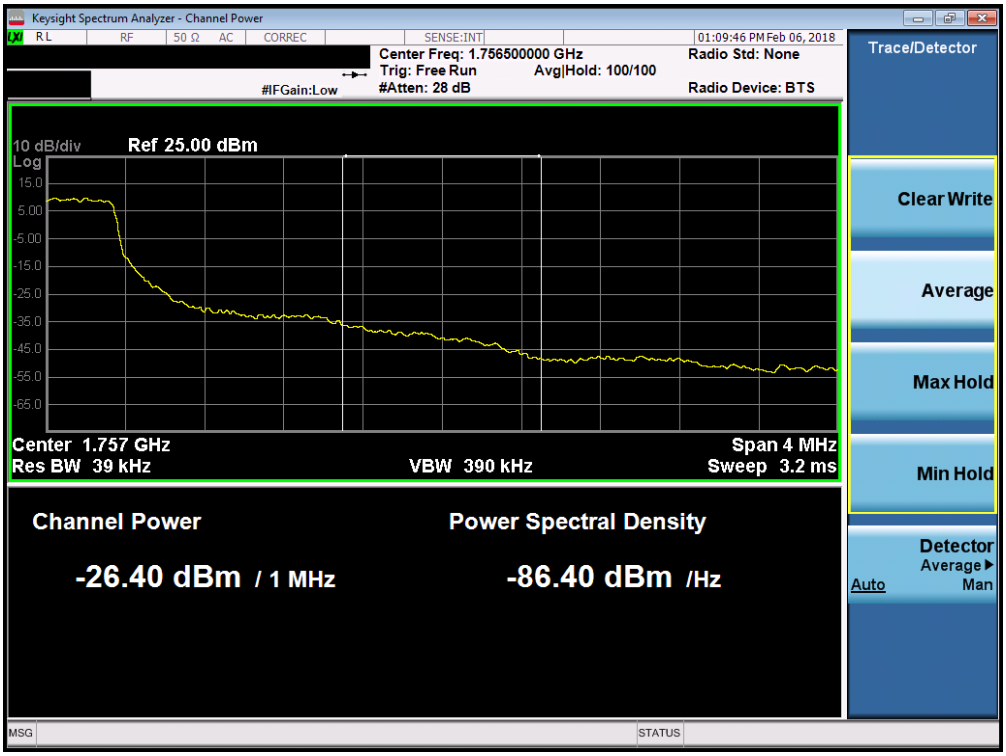
Plot 7-113. Lower Band Edge Plot (Band 4 - 1.4MHz QPSK - Full RB Configuration)



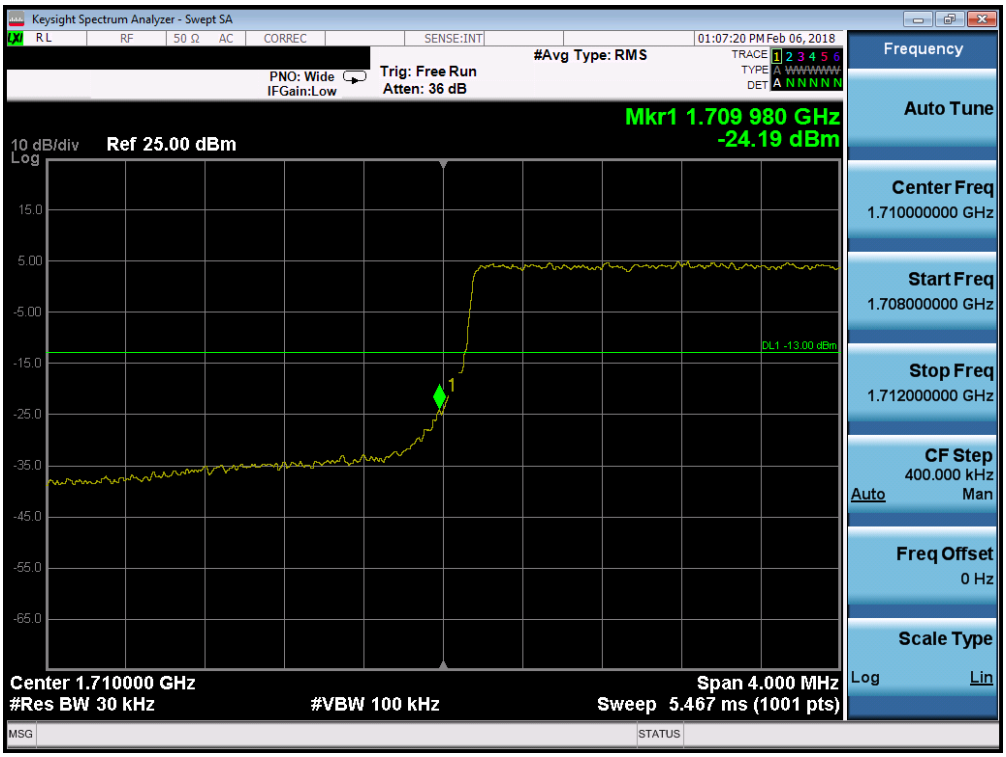
Plot 7-114. Lower Extended Band Edge Plot (Band 4 - 1.4MHz QPSK - Full RB Configuration)



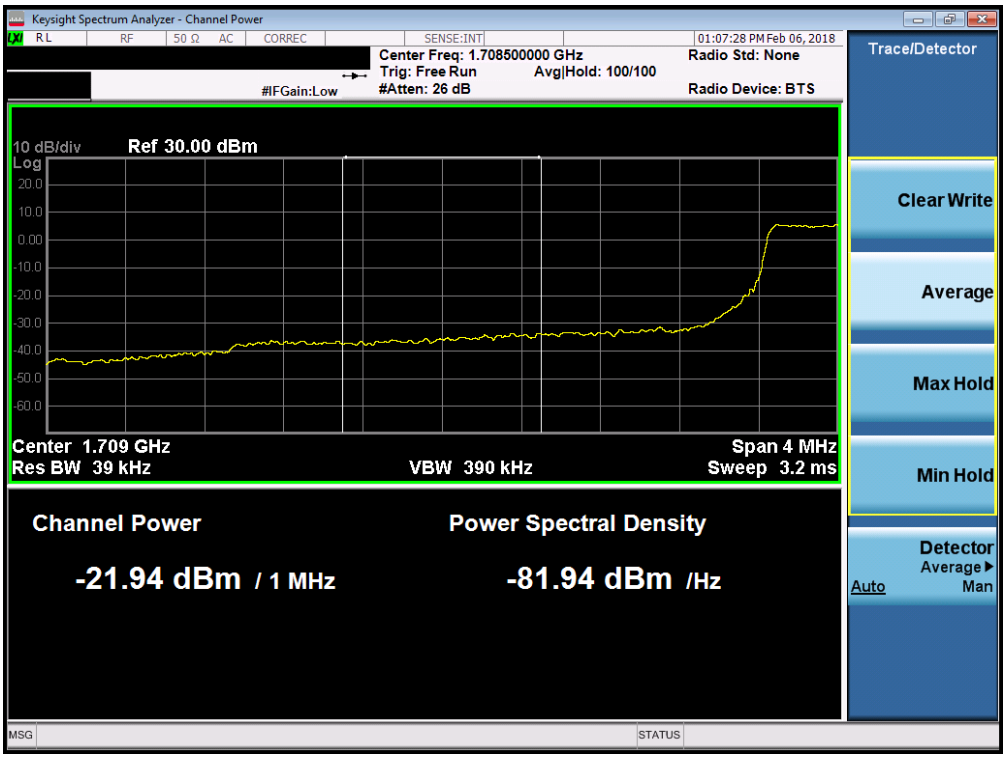
Plot 7-115. Upper Band Edge Plot (Band 4 - 1.4MHz QPSK - Full RB Configuration)



Plot 7-116. Upper Extended Band Edge Plot (Band 4 - 1.4MHz QPSK - Full RB Configuration)

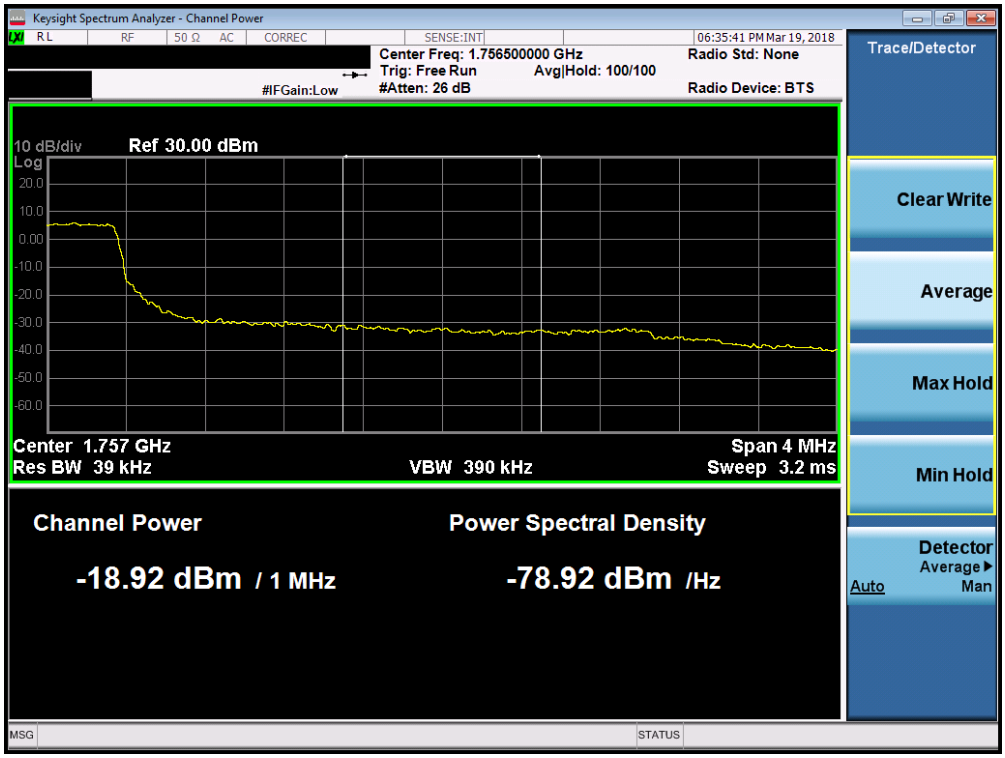


Plot 7-117. Lower Band Edge Plot (Band 4 - 3.0MHz QPSK - Full RB Configuration)

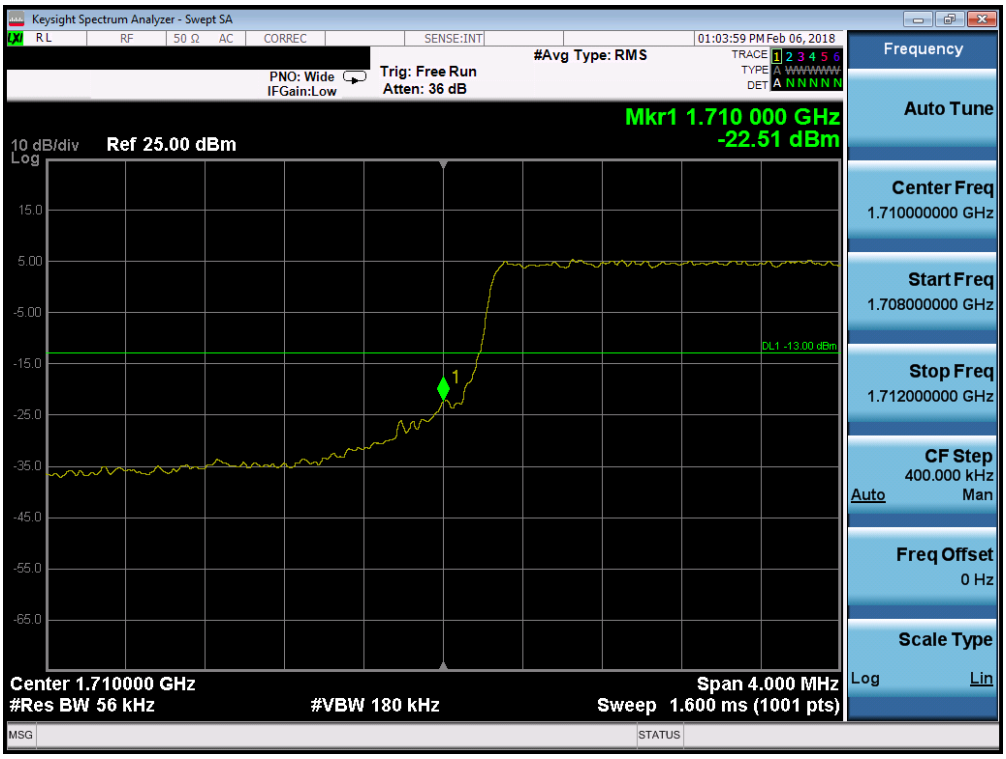


Plot 7-118. Lower Extended Band Edge Plot (Band 4 - 3.0MHz QPSK - Full RB Configuration)

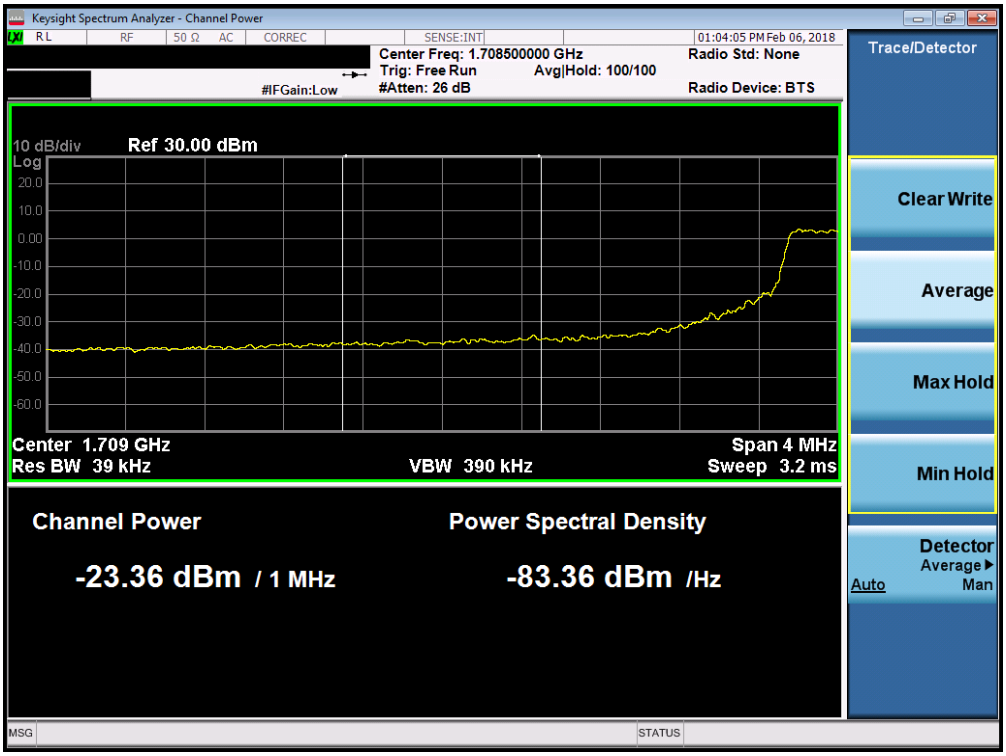
Plot 7-119. Upper Band Edge Plot (Band 4 - 3.0MHz QPSK - Full RB Configuration)



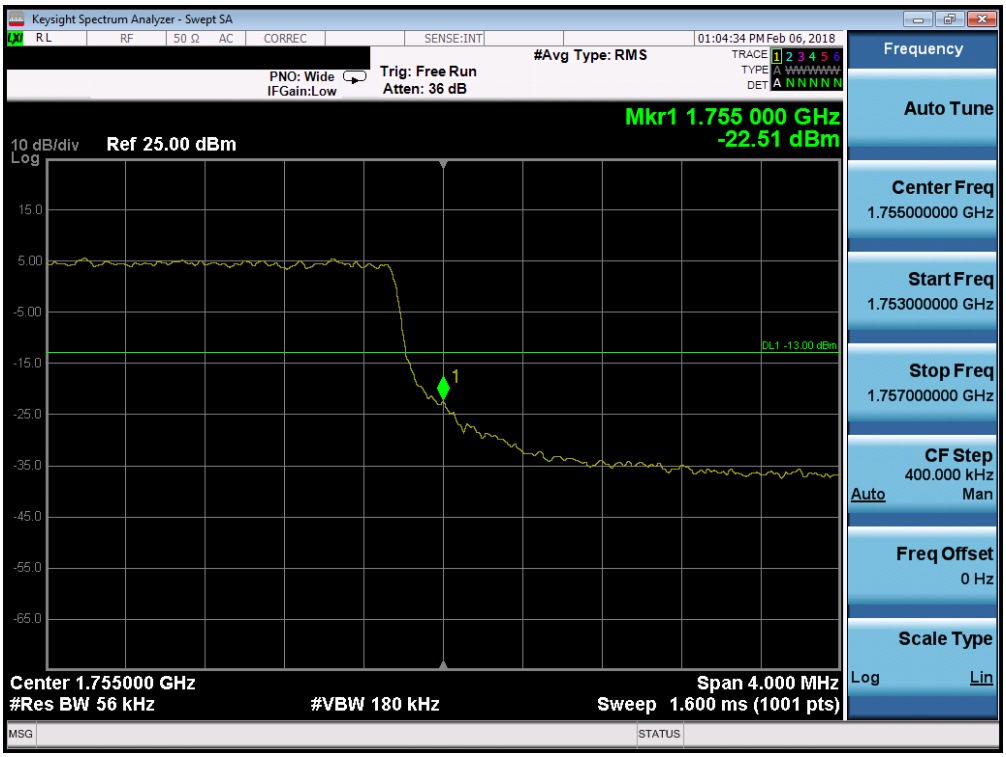
Plot 7-120. Upper Extended Band Edge Plot (Band 4 - 3.0MHz QPSK - Full RB Configuration)



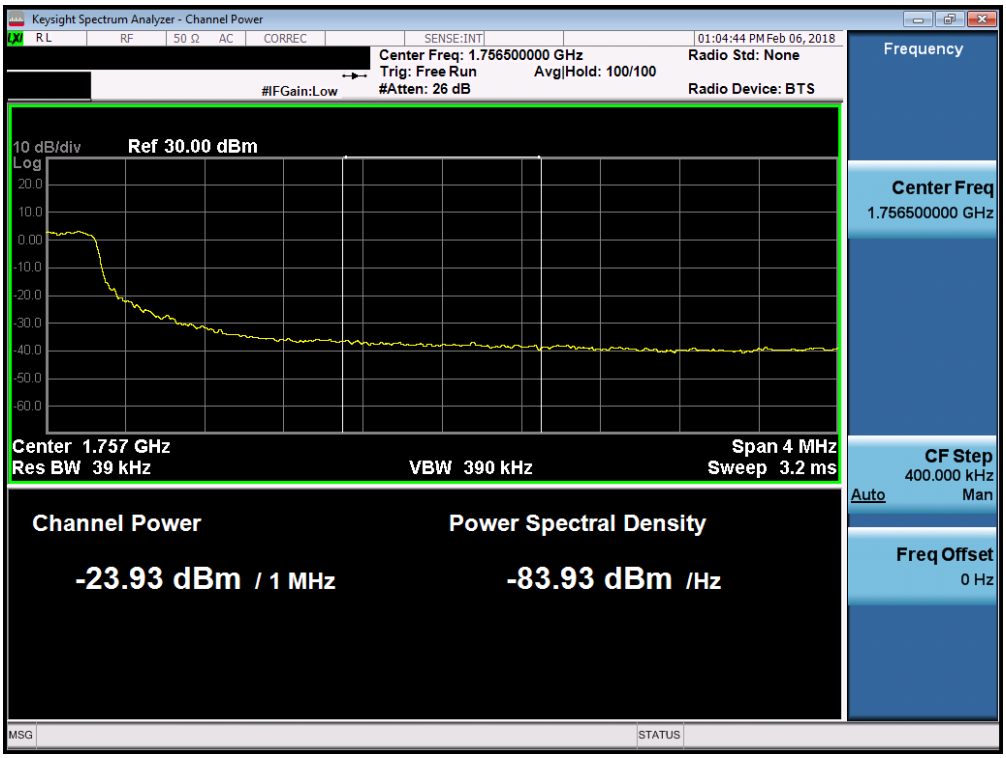
Plot 7-121. Lower Band Edge Plot (Band 4 - 5.0MHz QPSK - Full RB Configuration)



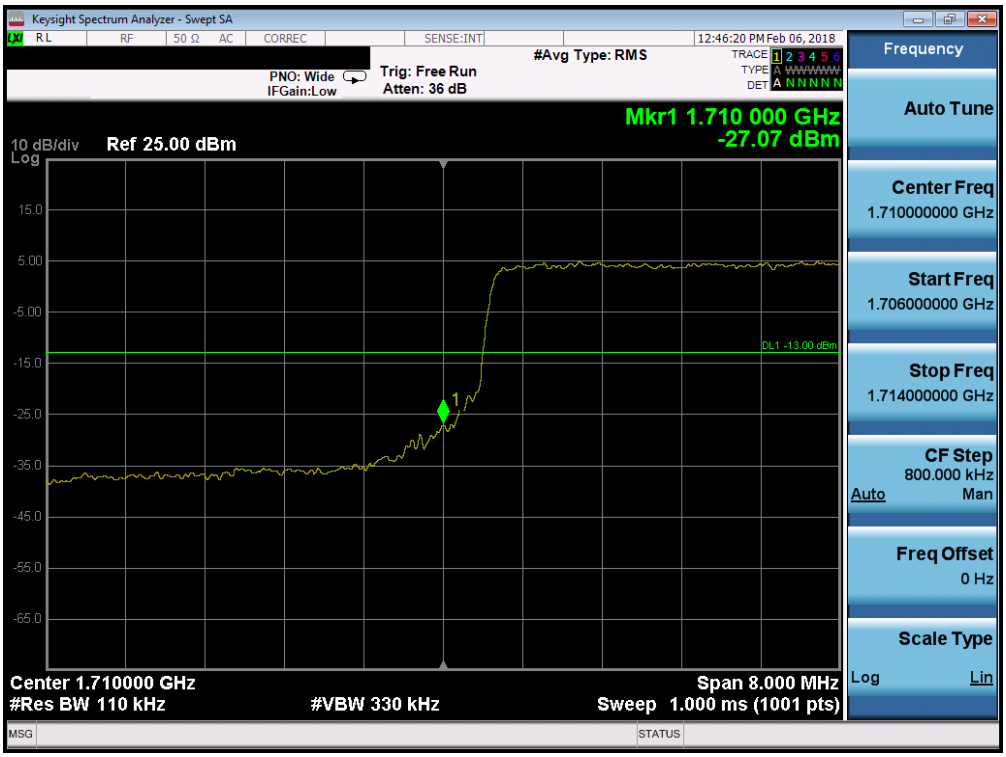
Plot 7-122. Lower Extended Band Edge Plot (Band 4 - 5.0MHz QPSK - Full RB Configuration)



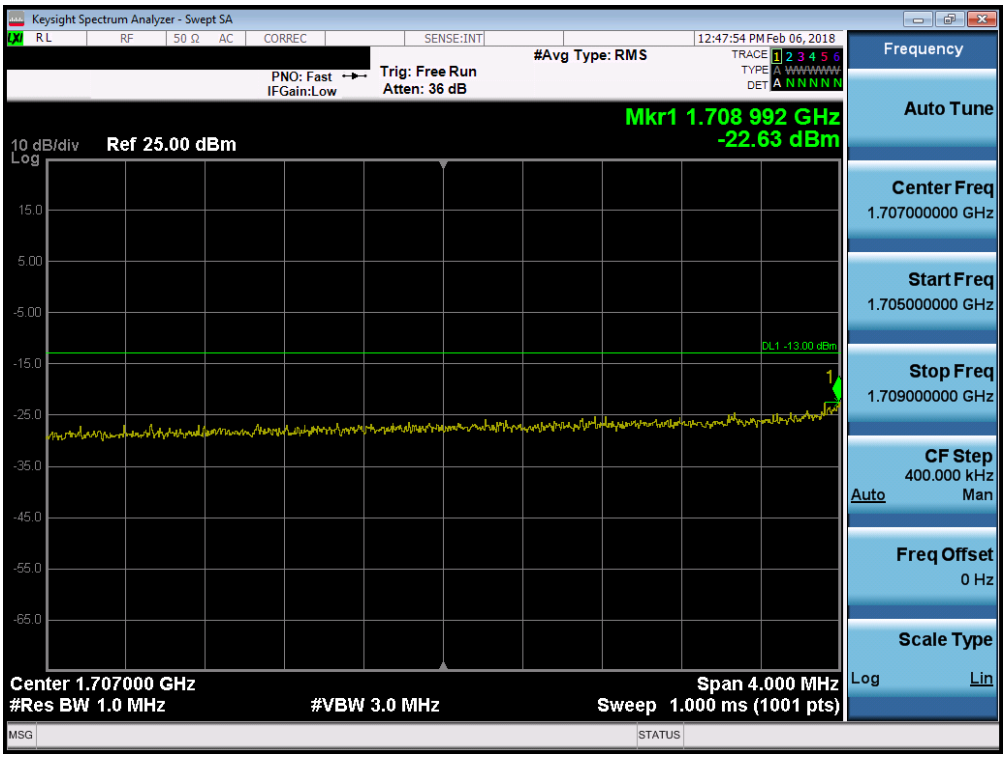
Plot 7-123. Upper Band Edge Plot (Band 4 - 5.0MHz QPSK - Full RB Configuration)



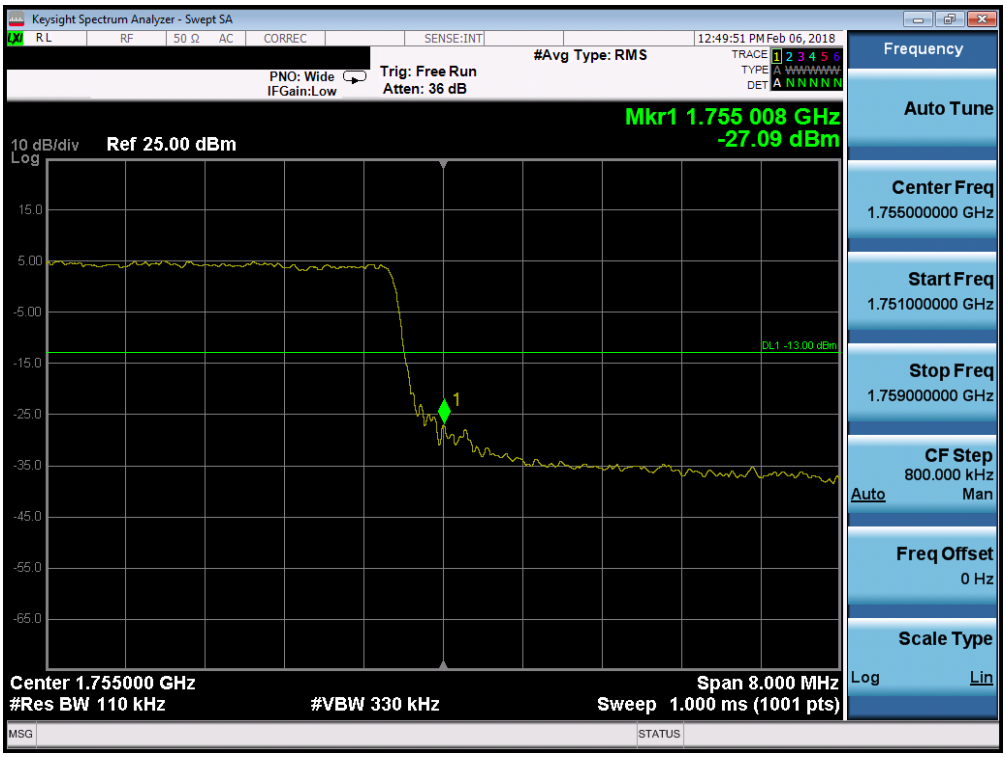
Plot 7-124. Upper Extended Band Edge Plot (Band 4 - 5.0MHz QPSK - Full RB Configuration)



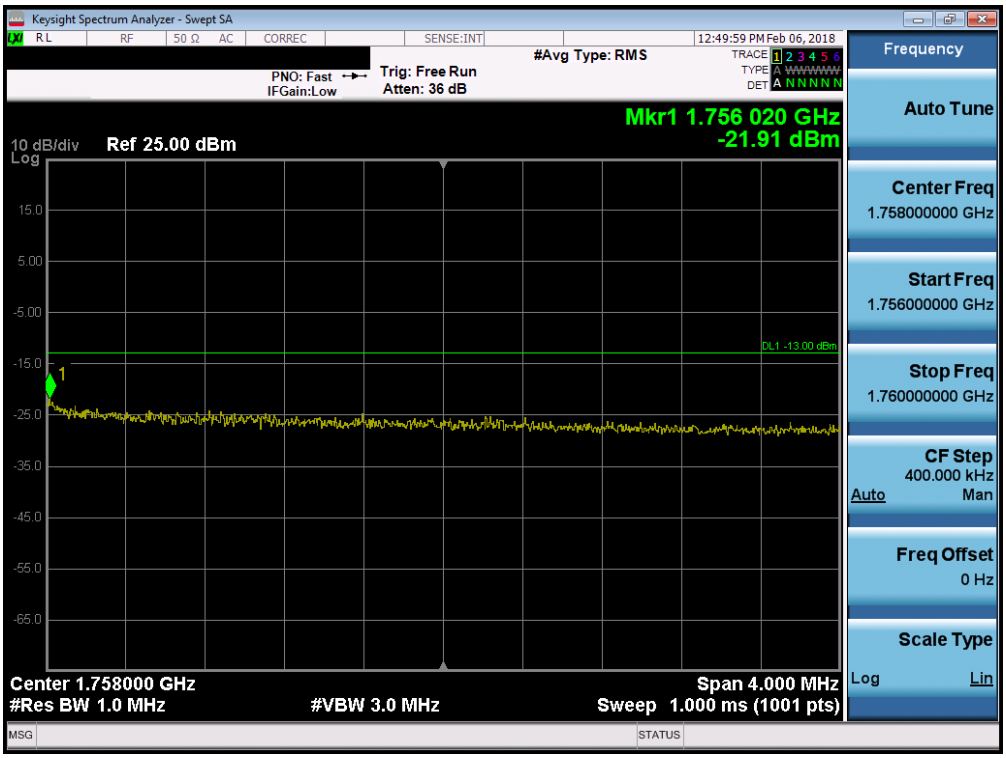
Plot 7-125. Lower Band Edge Plot (Band 4 - 10.0MHz QPSK - Full RB Configuration)



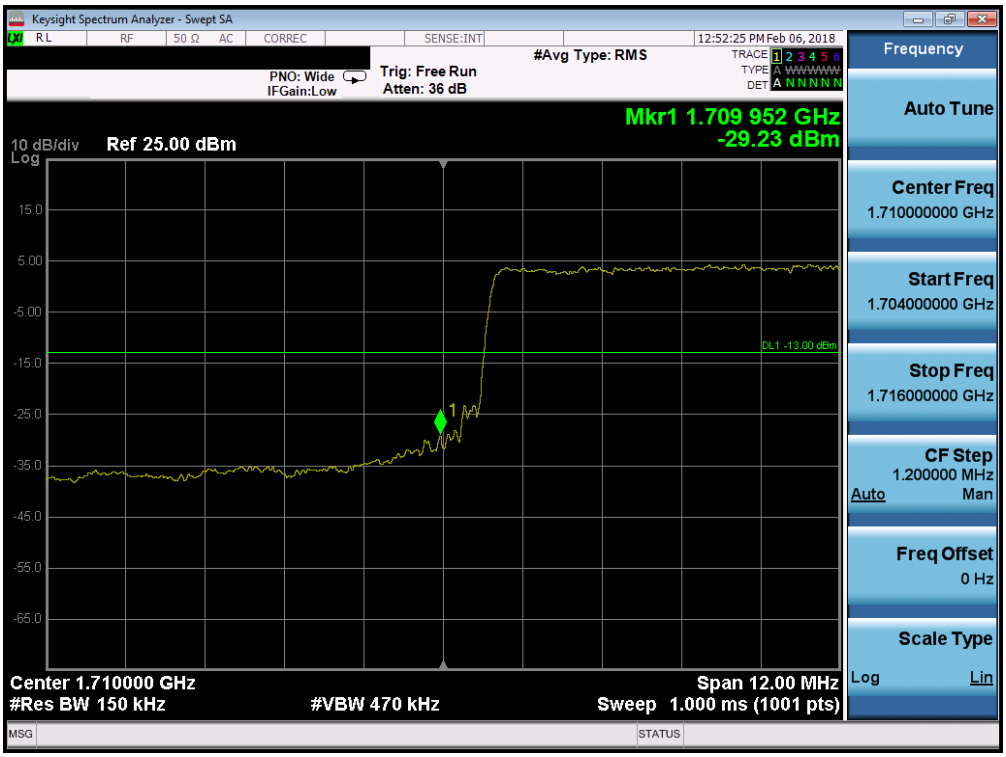
Plot 7-126. Lower Extended Band Edge Plot (Band 4 - 10.0MHz QPSK - Full RB Configuration)



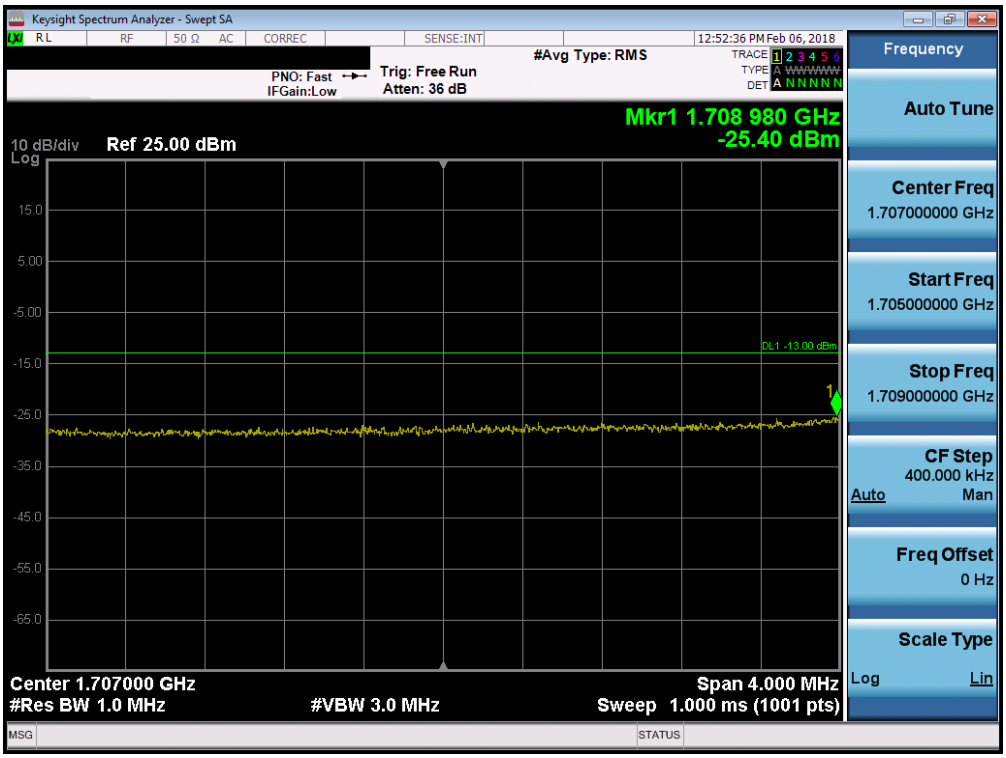
Plot 7-127. Upper Band Edge Plot (Band 4 - 10.0MHz QPSK - Full RB Configuration)



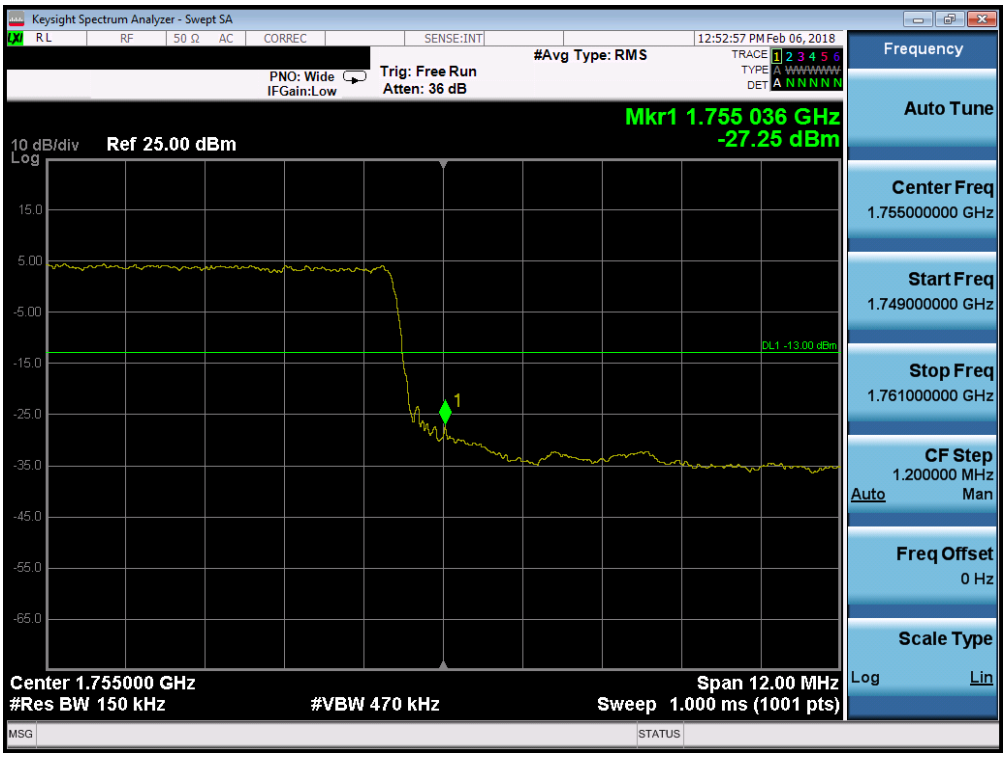
Plot 7-128. Upper Extended Band Edge Plot (Band 4 - 10.0MHz QPSK - Full RB Configuration)



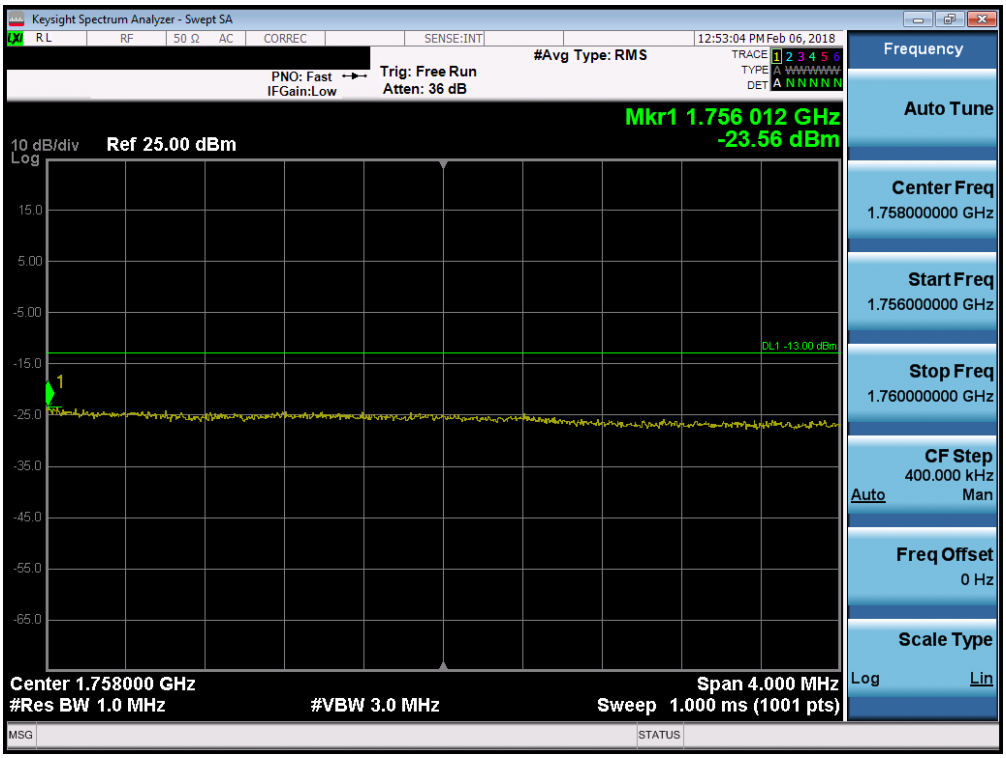
Plot 7-129. Lower Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)



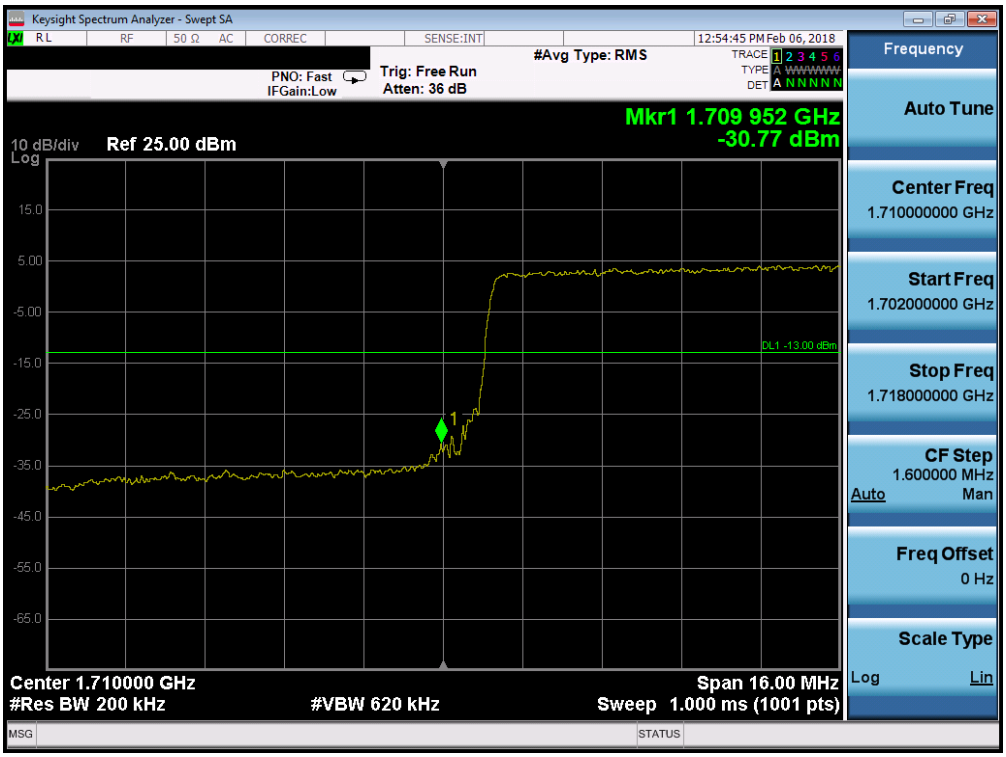
Plot 7-130. Lower Extended Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)



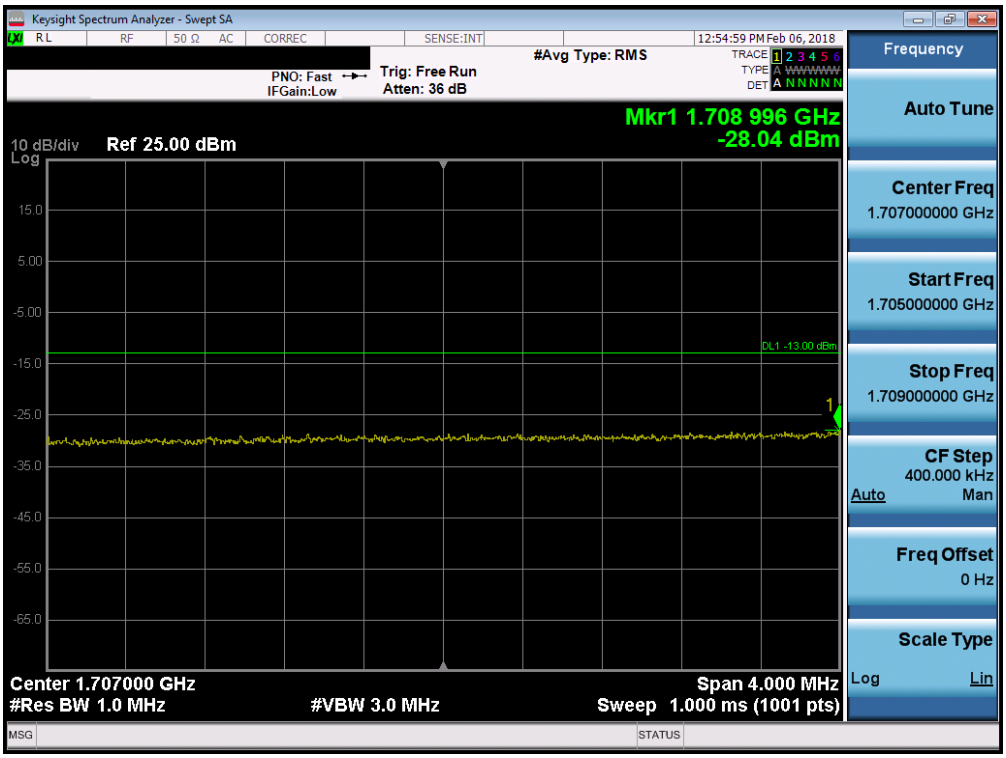
Plot 7-131. Upper Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)



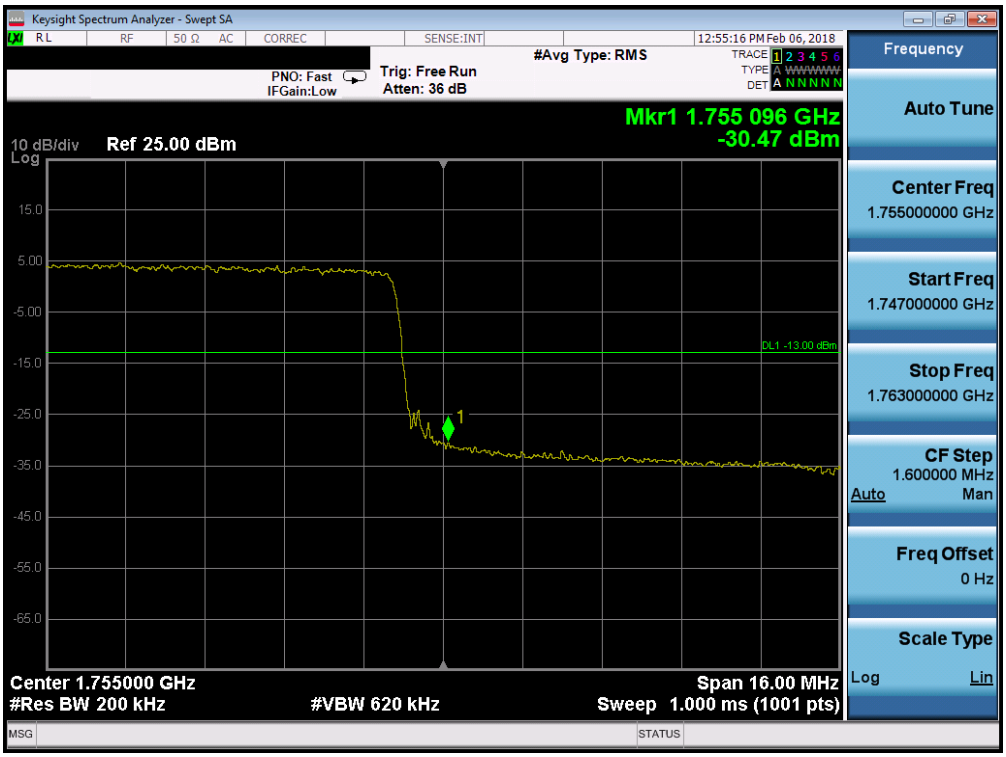
Plot 7-132. Upper Extended Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)



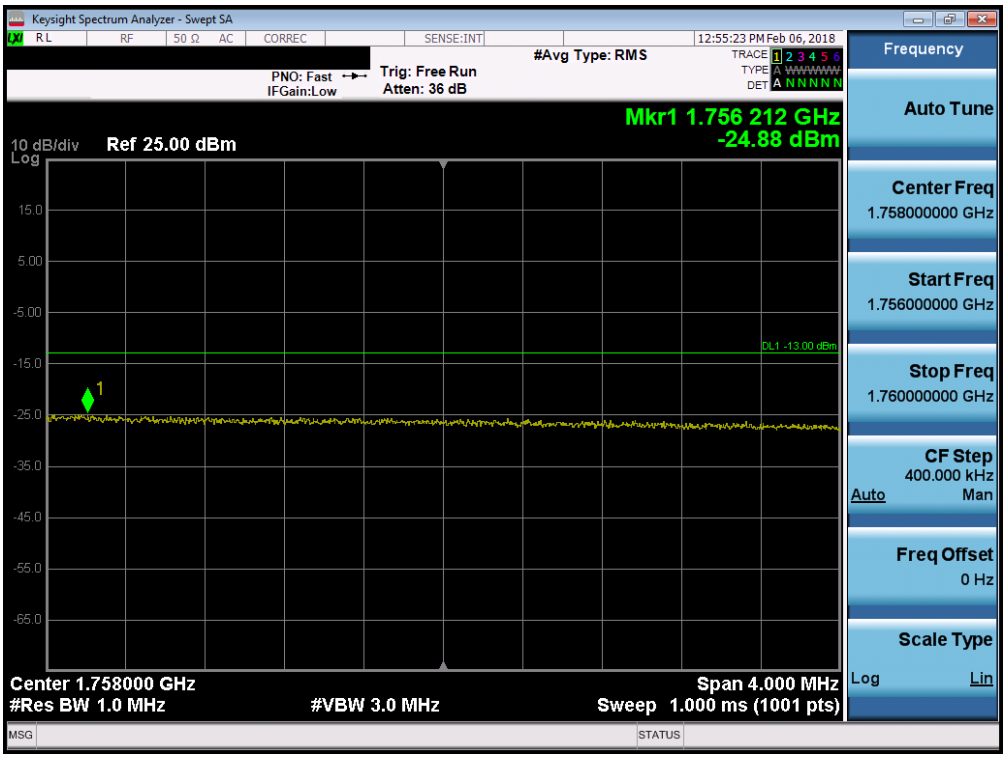
Plot 7-133. Lower Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-134. Lower Extended Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)



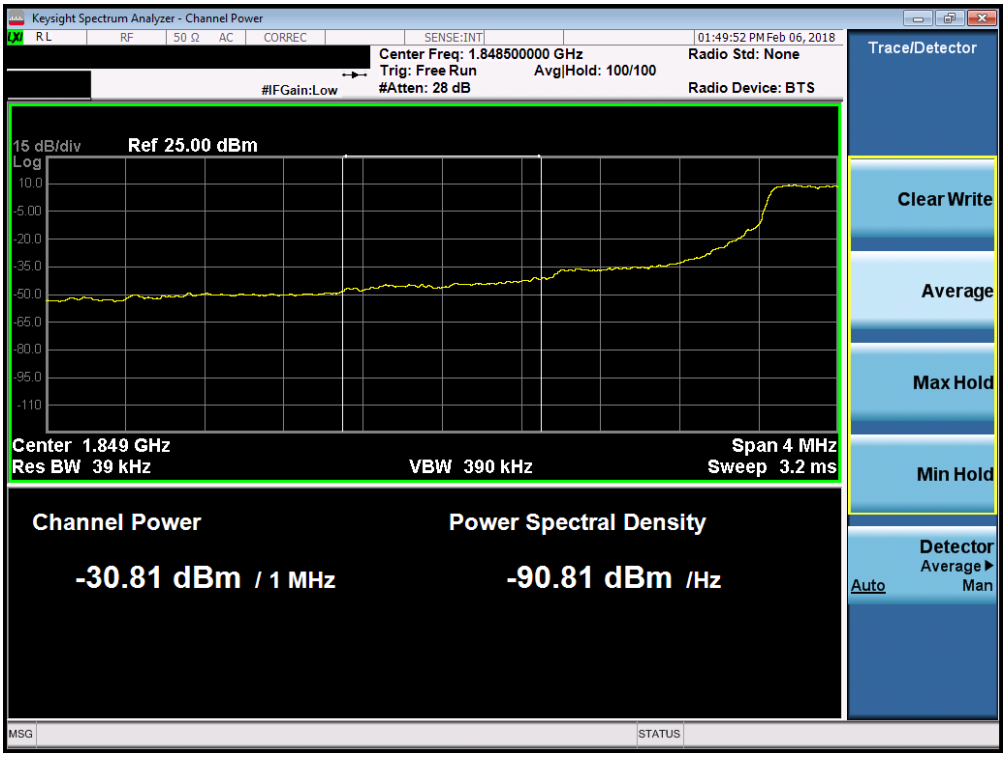
Plot 7-135. Upper Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-136. Upper Extended Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)

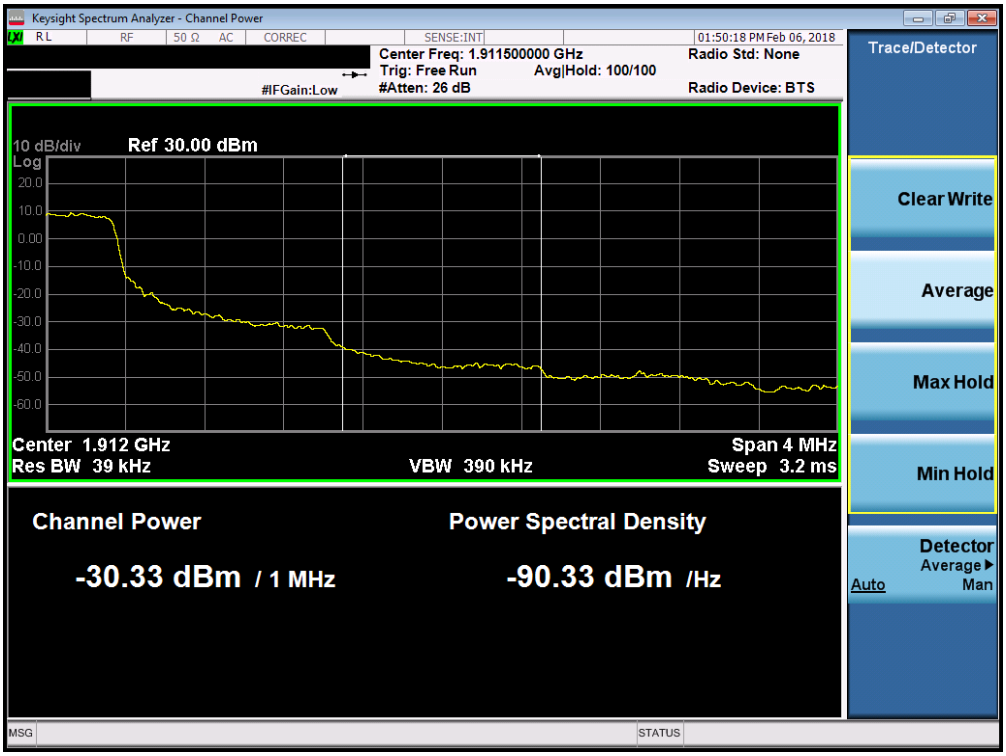
Band 2

Plot 7-137. Lower Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)

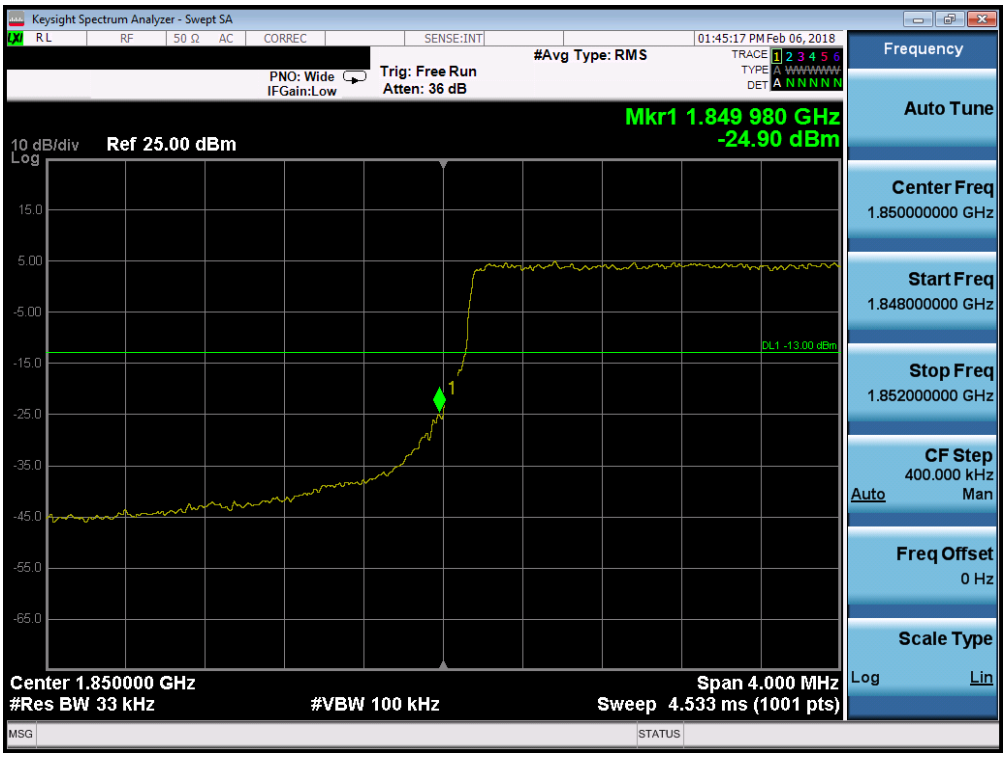


Plot 7-138. Lower Extended Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)

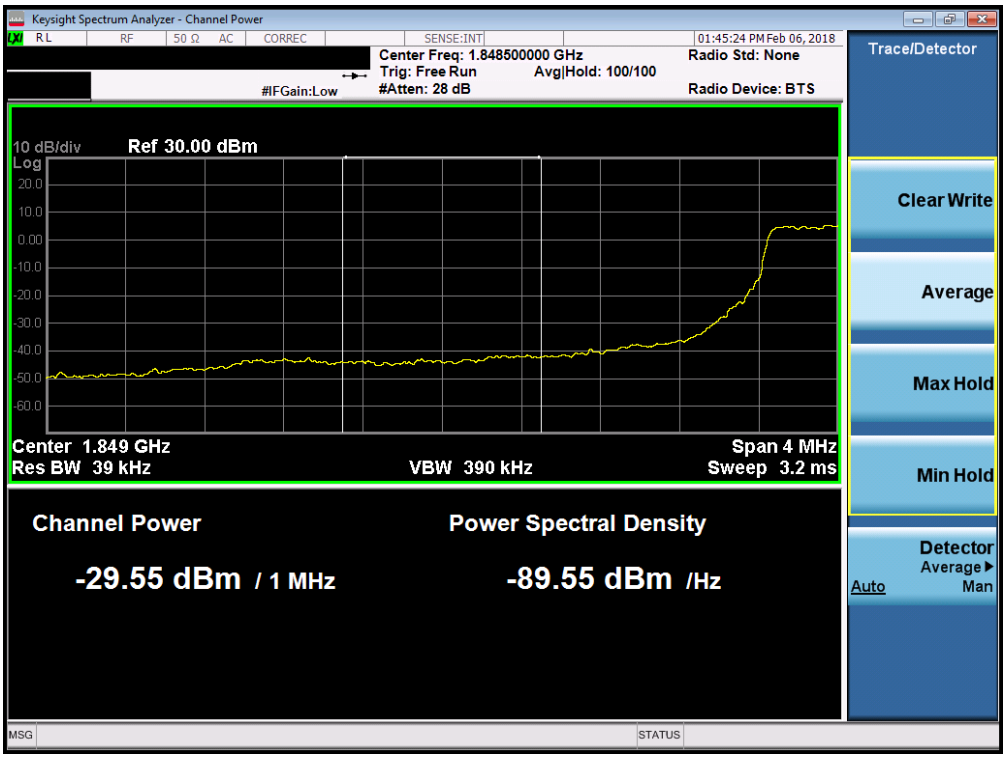
Plot 7-139. Upper Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



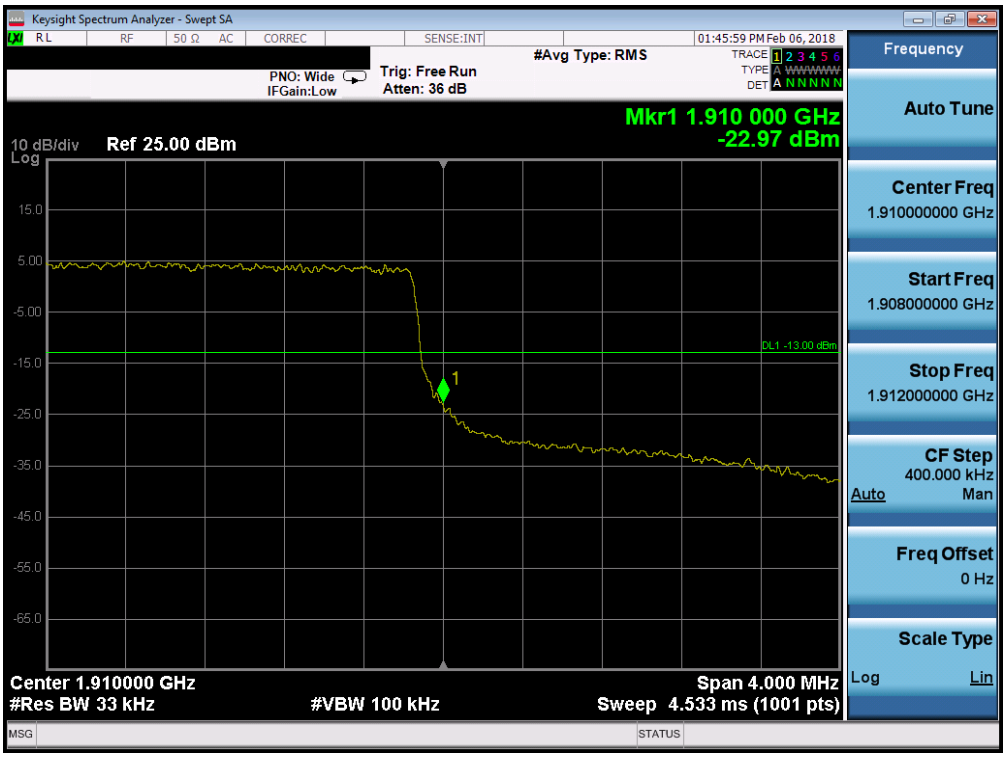
Plot 7-140. Upper Extended Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



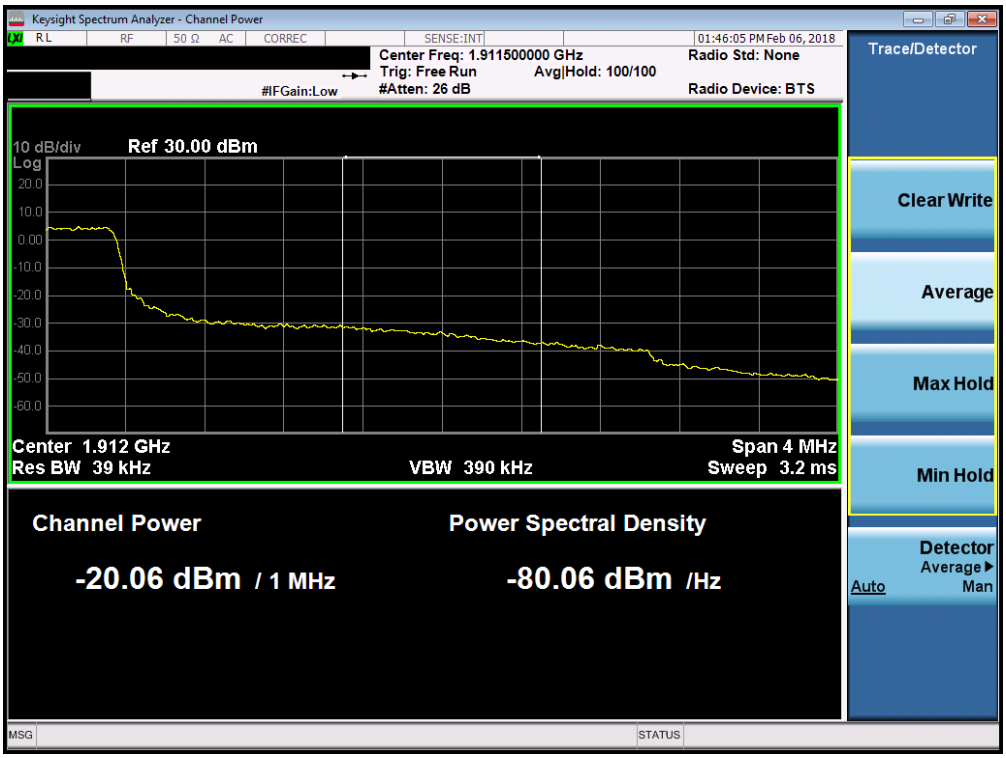
Plot 7-141. Lower Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



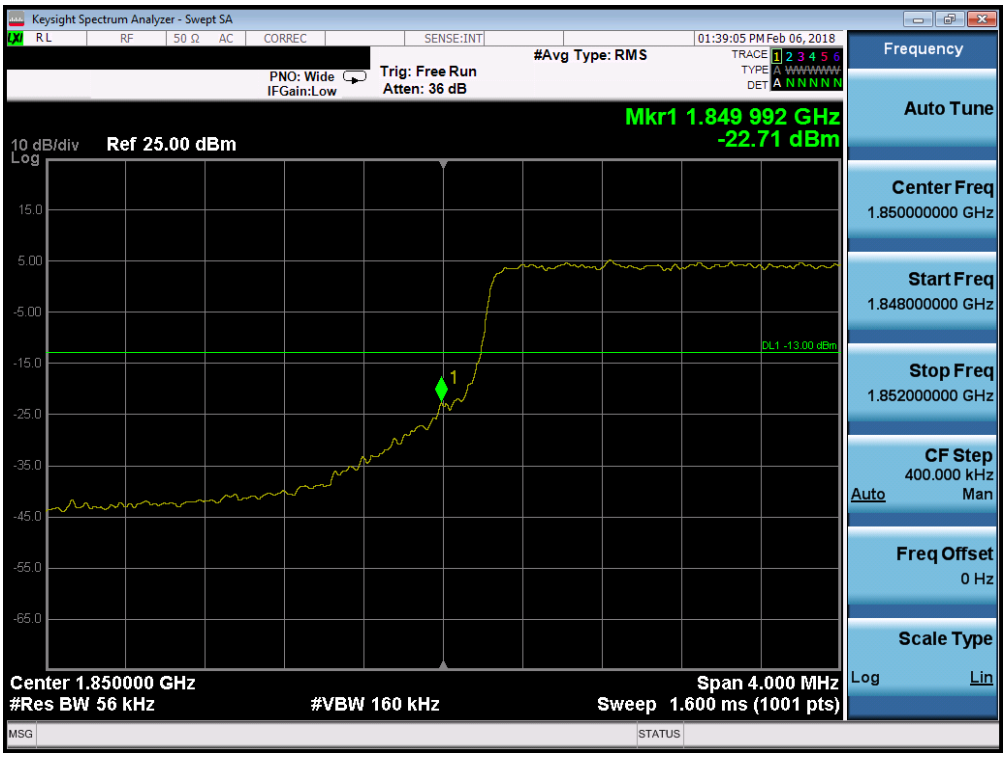
Plot 7-142. Lower Extended Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



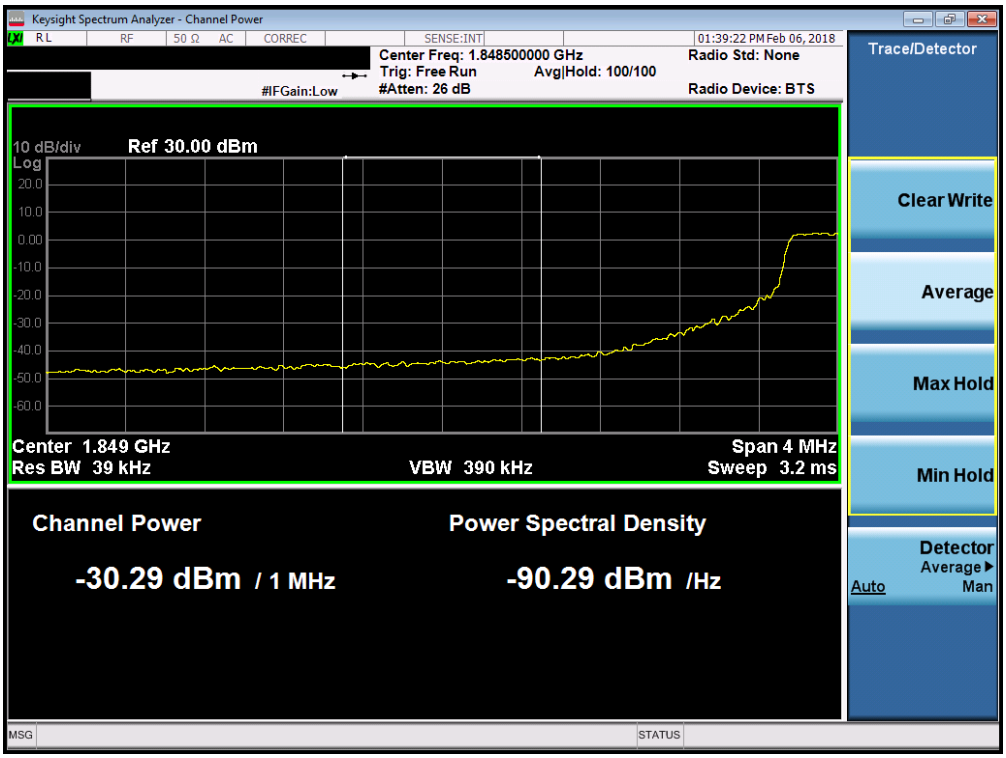
Plot 7-143. Upper Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



Plot 7-144. Upper Extended Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)

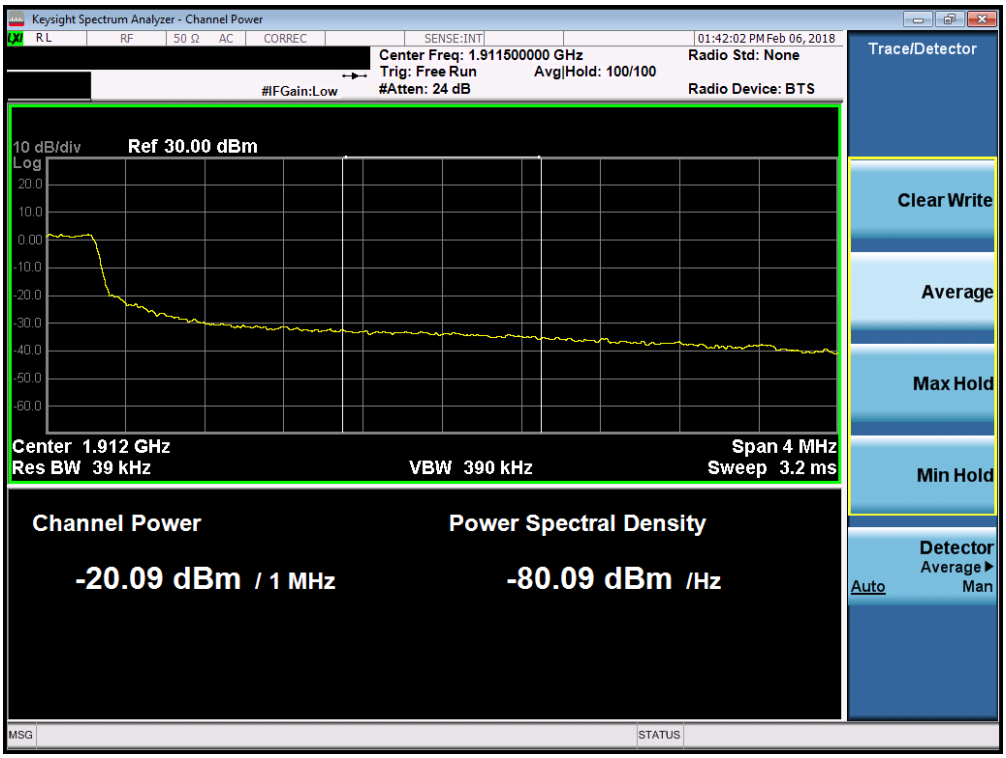


Plot 7-145. Lower Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)

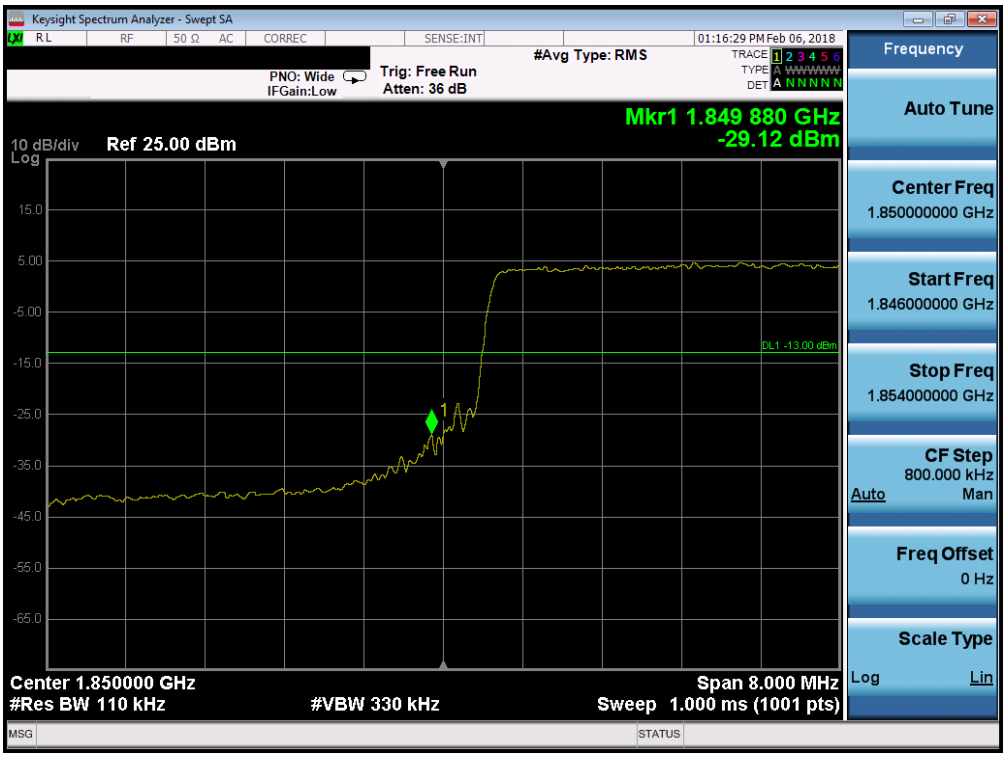


Plot 7-146. Lower Extended Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)

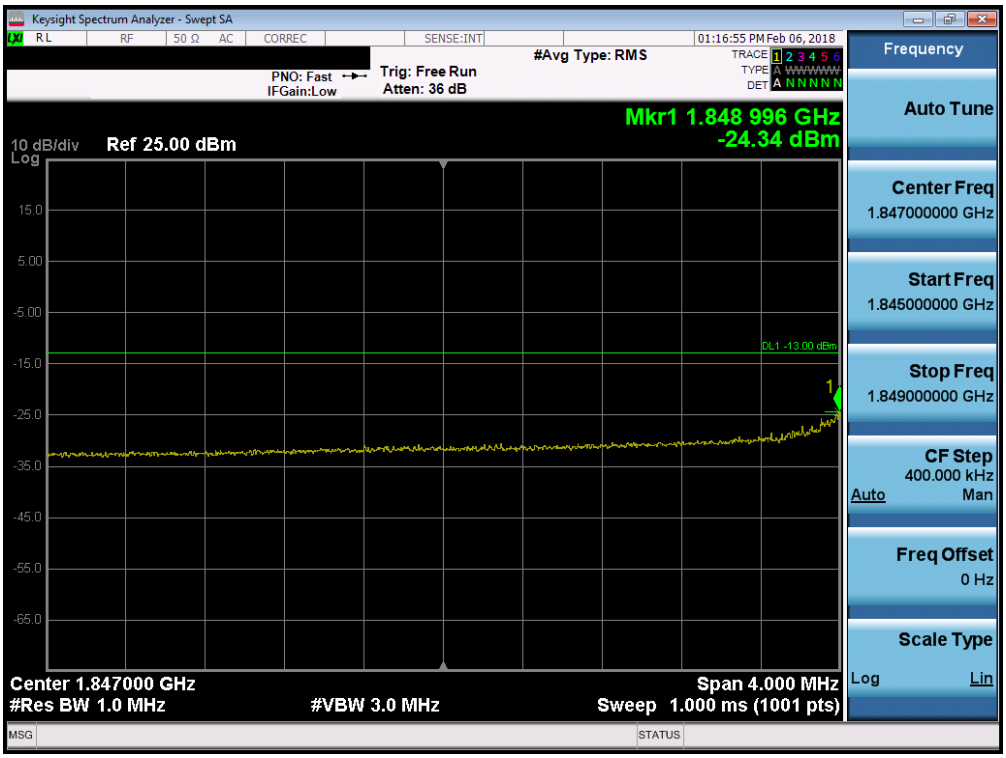
Plot 7-147. Upper Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-148. Upper Extended Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)

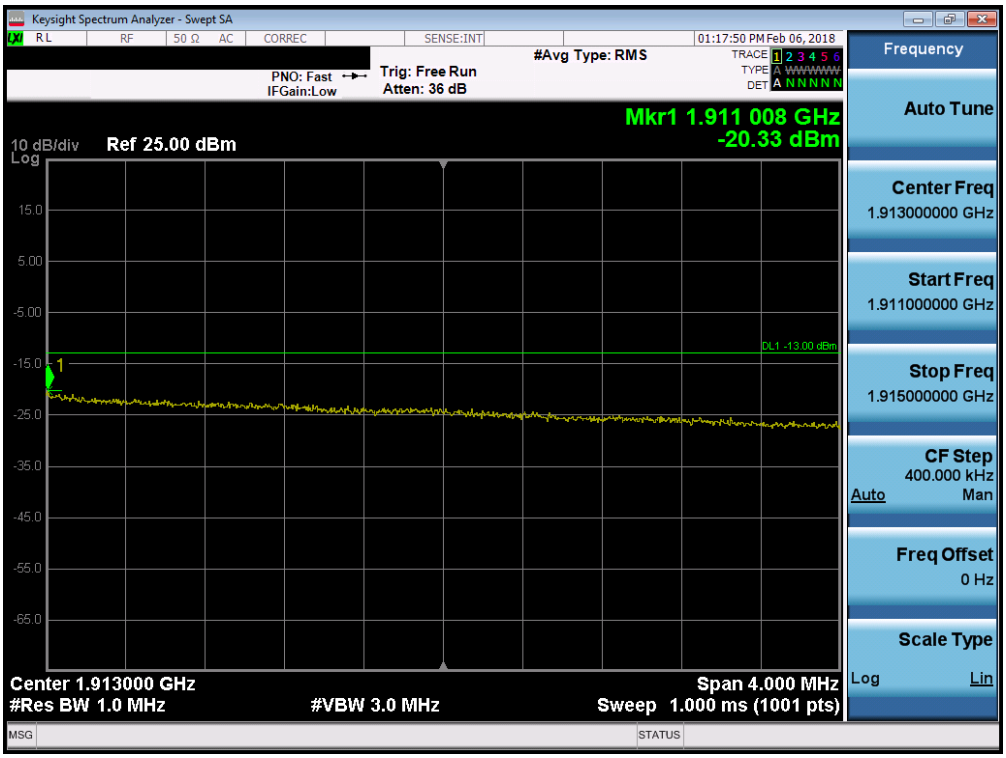


Plot 7-149. Lower Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)

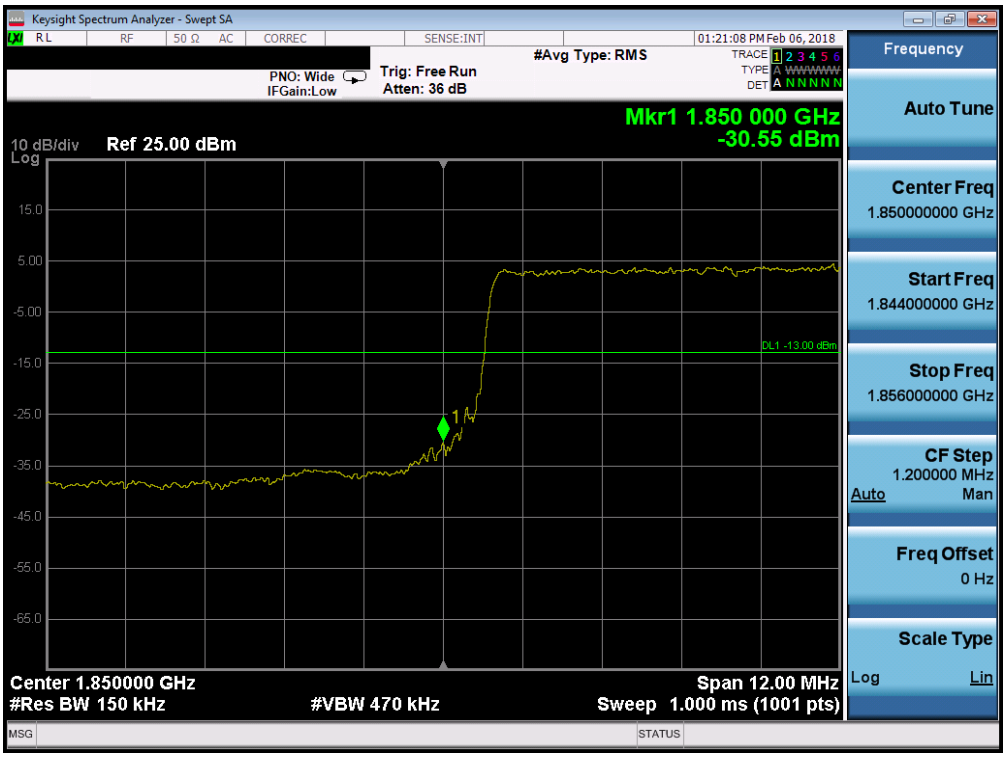


Plot 7-150. Lower Extended Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)

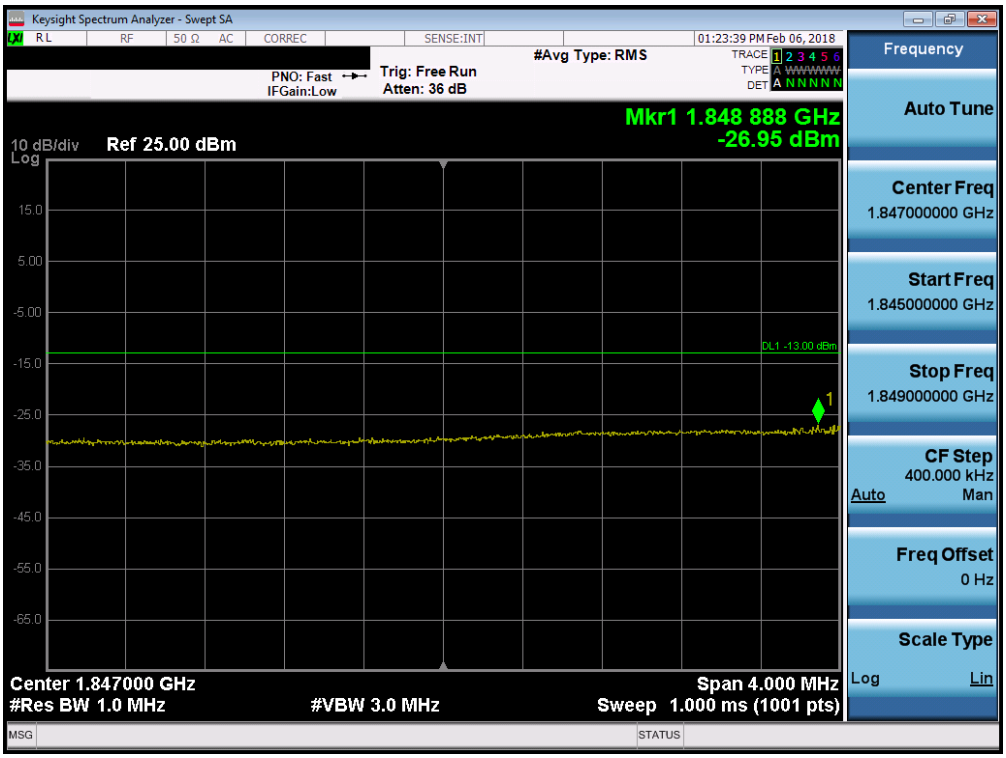
Plot 7-151. Upper Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



Plot 7-152. Upper Extended Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)

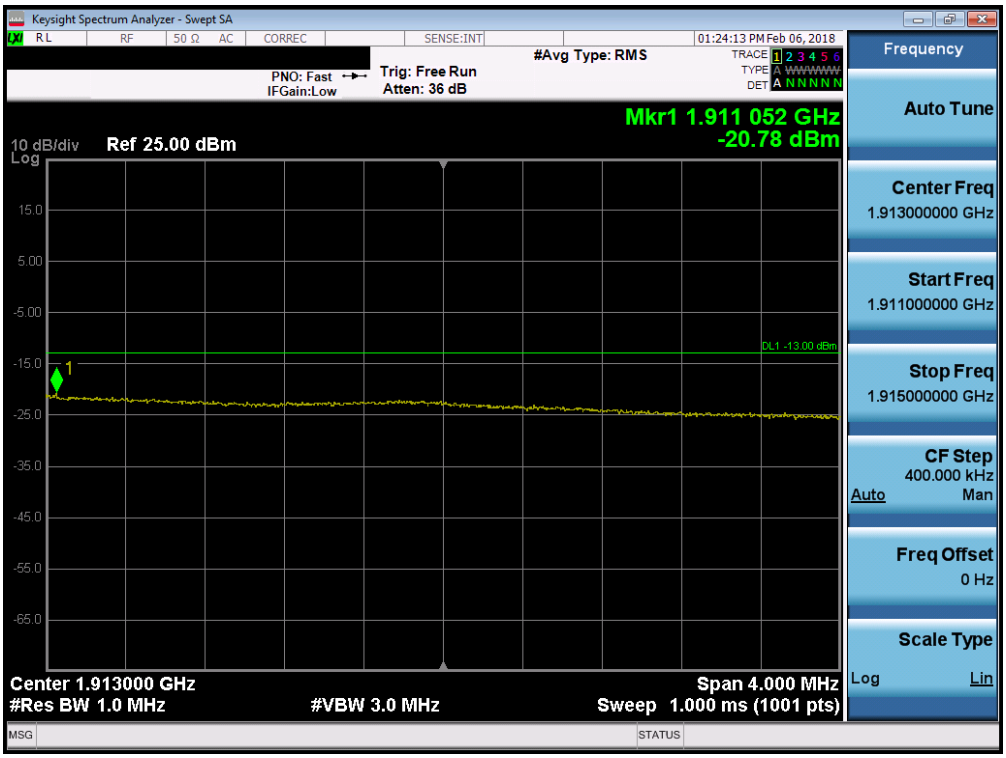


Plot 7-153. Lower Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)

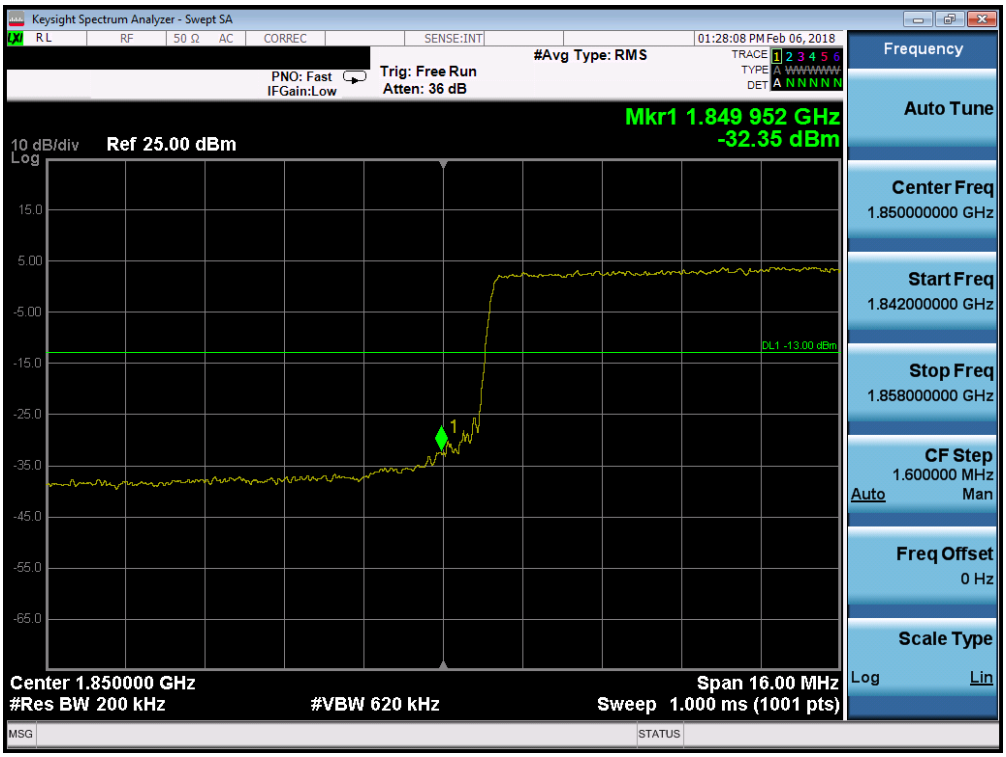


Plot 7-154. Lower Extended Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)

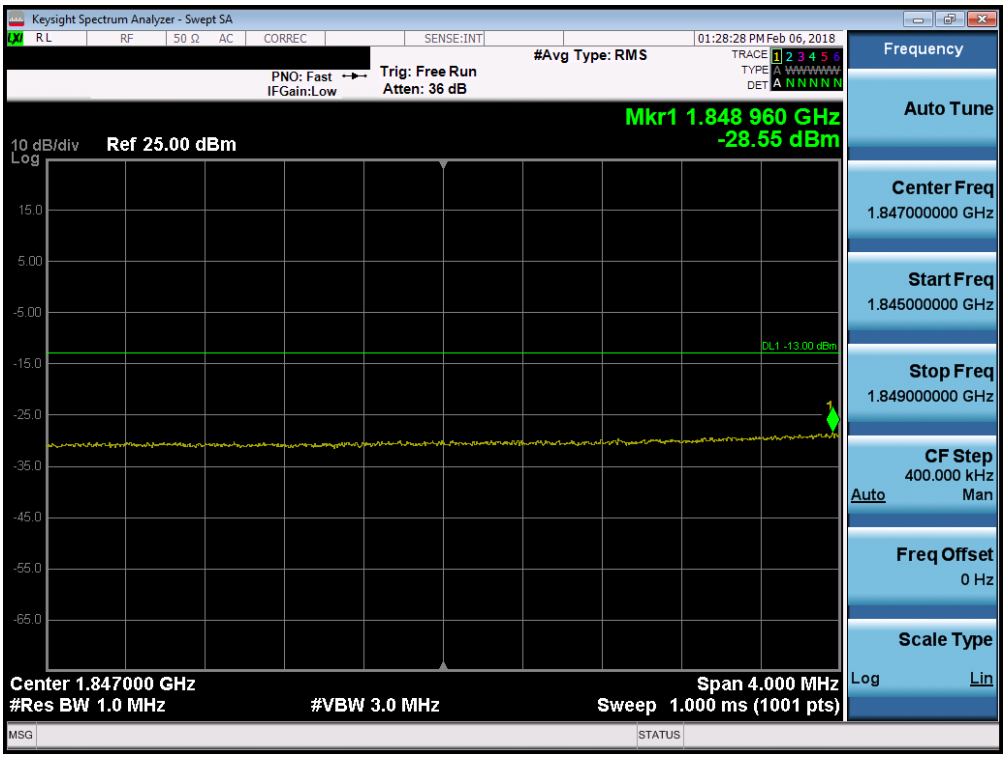
Plot 7-155. Upper Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-156. Upper Extended Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)

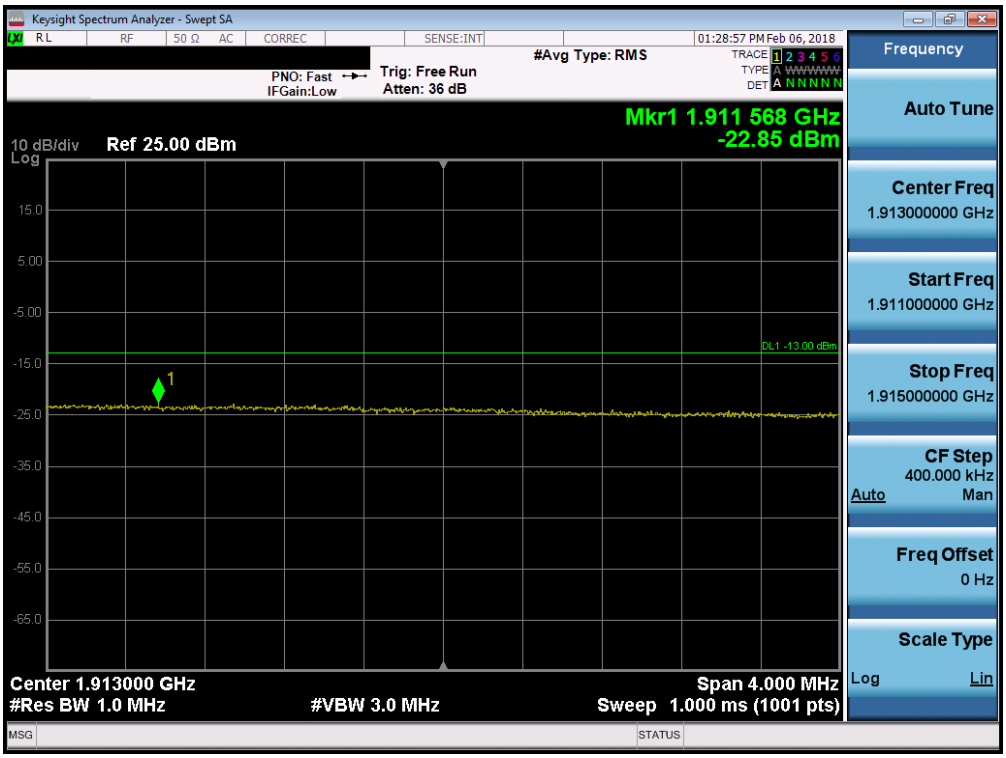


Plot 7-157. Lower Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)

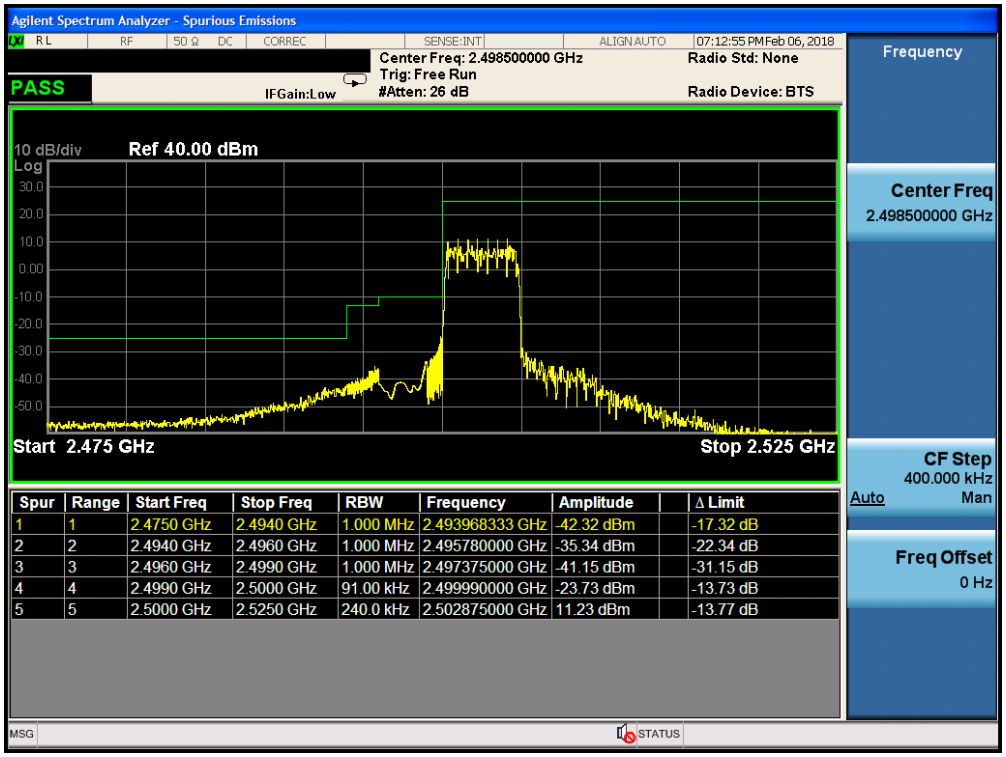


Plot 7-158. Lower Extended Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)

Plot 7-159. Upper Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)

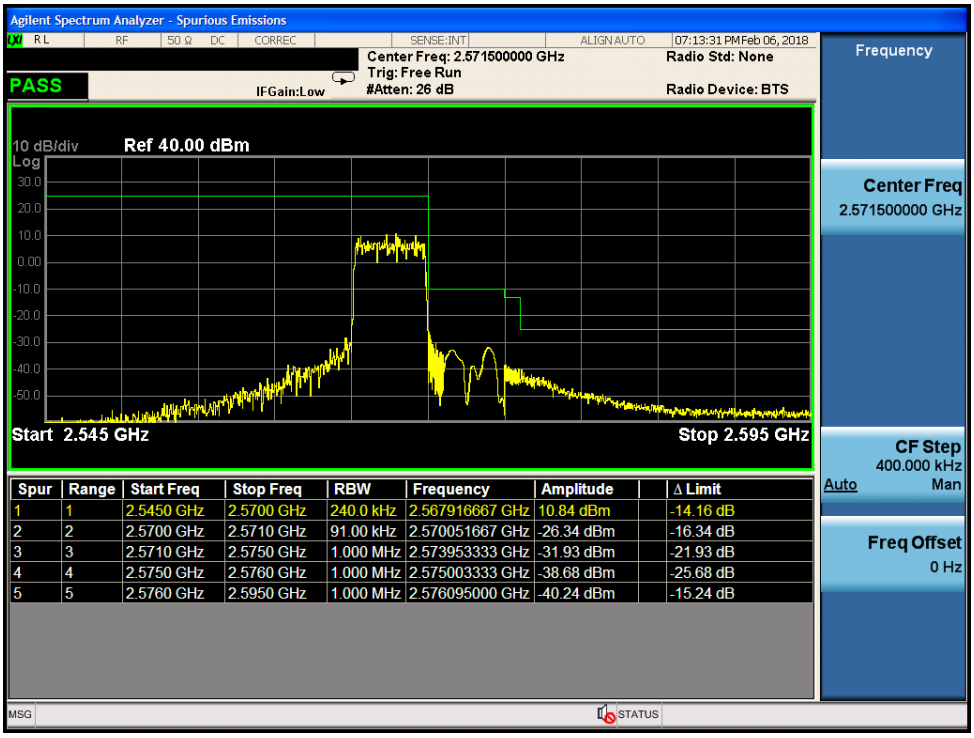


Plot 7-160. Upper Extended Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



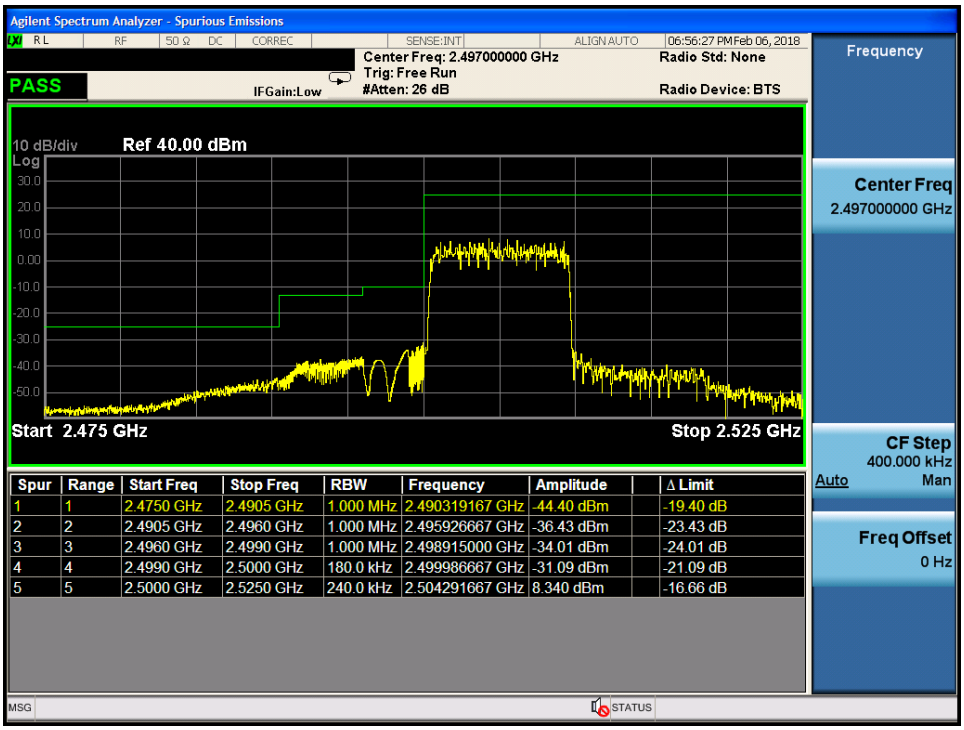
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4940 GHz	1.000 MHz	2.493968333 GHz	-42.32 dBm	-17.32 dB
2	2	2.4940 GHz	2.4960 GHz	1.000 MHz	2.495780000 GHz	-35.34 dBm	-22.34 dB
3	3	2.4960 GHz	2.4990 GHz	1.000 MHz	2.497375000 GHz	-41.15 dBm	-31.15 dB
4	4	2.4990 GHz	2.5000 GHz	91.00 kHz	2.499990000 GHz	-23.73 dBm	-13.73 dB
5	5	2.5000 GHz	2.5250 GHz	240.0 kHz	2.502875000 GHz	11.23 dBm	-13.77 dB

Plot 7-161. Lower ACP Plot at 2496 MHz (Band 7 - 5.0MHz QPSK - RB Size 25)

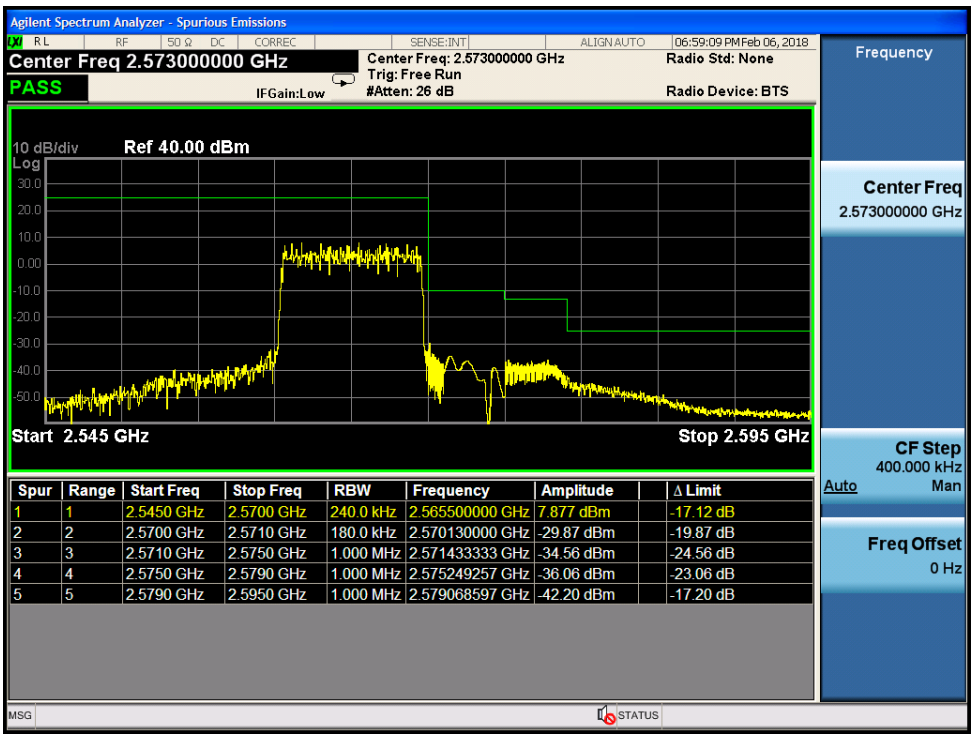


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.5450 GHz	2.5700 GHz	240.0 kHz	2.567916667 GHz	10.84 dBm	-14.16 dB
2	2	2.5700 GHz	2.5710 GHz	91.00 kHz	2.570051667 GHz	-26.34 dBm	-16.34 dB
3	3	2.5710 GHz	2.5750 GHz	1.000 MHz	2.573953333 GHz	-31.93 dBm	-21.93 dB
4	4	2.5750 GHz	2.5760 GHz	1.000 MHz	2.575003333 GHz	-38.68 dBm	-25.68 dB
5	5	2.5760 GHz	2.5950 GHz	1.000 MHz	2.576095000 GHz	-40.24 dBm	-15.24 dB

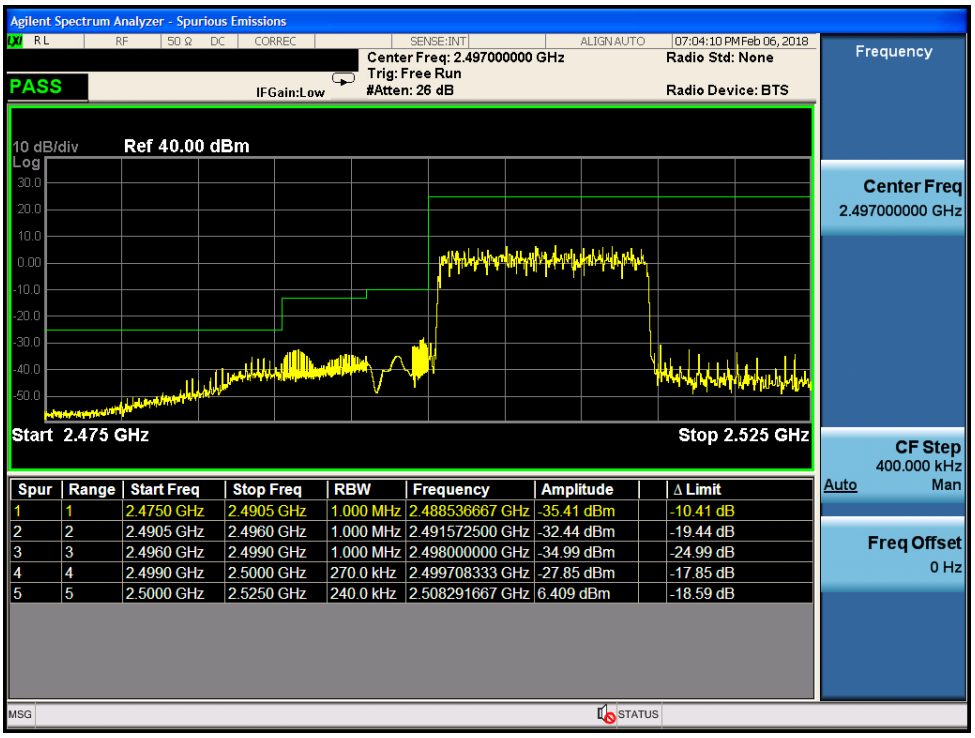
Plot 7-162. Lower ACP Plot (Band 7 – 5.0MHz QPSK – RB Size 25)



Plot 7-163. Upper ACP Plot (Band 7 – 10.0MHz QPSK – RB Size 50)

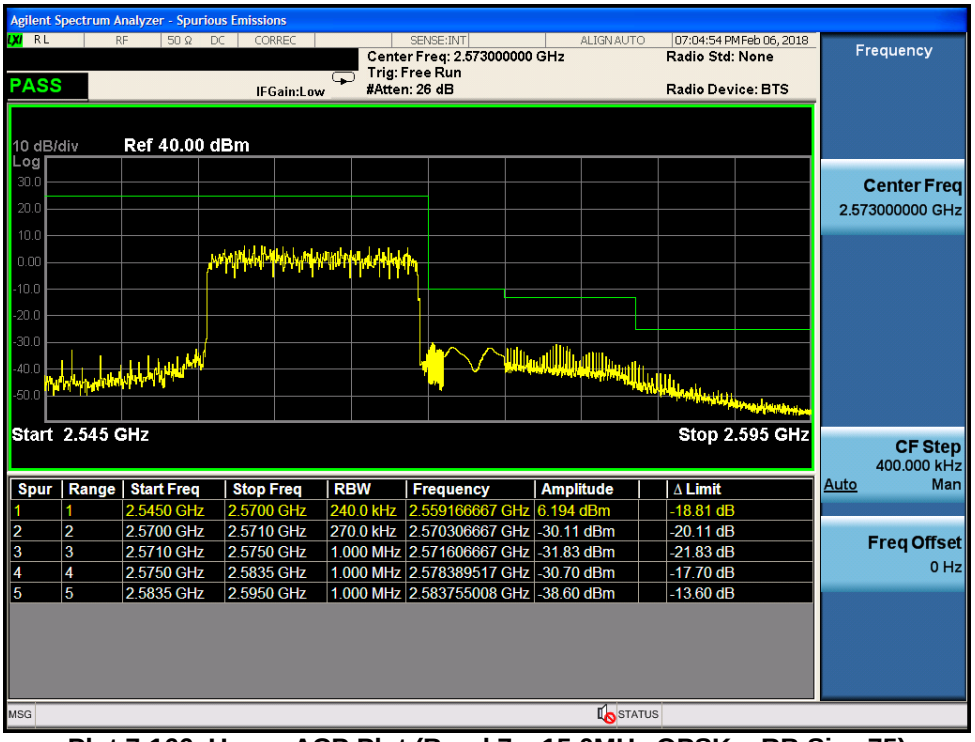


Plot 7-164. Lower ACP Plot (Band 7 - 10.0MHz QPSK - RB Size 50)



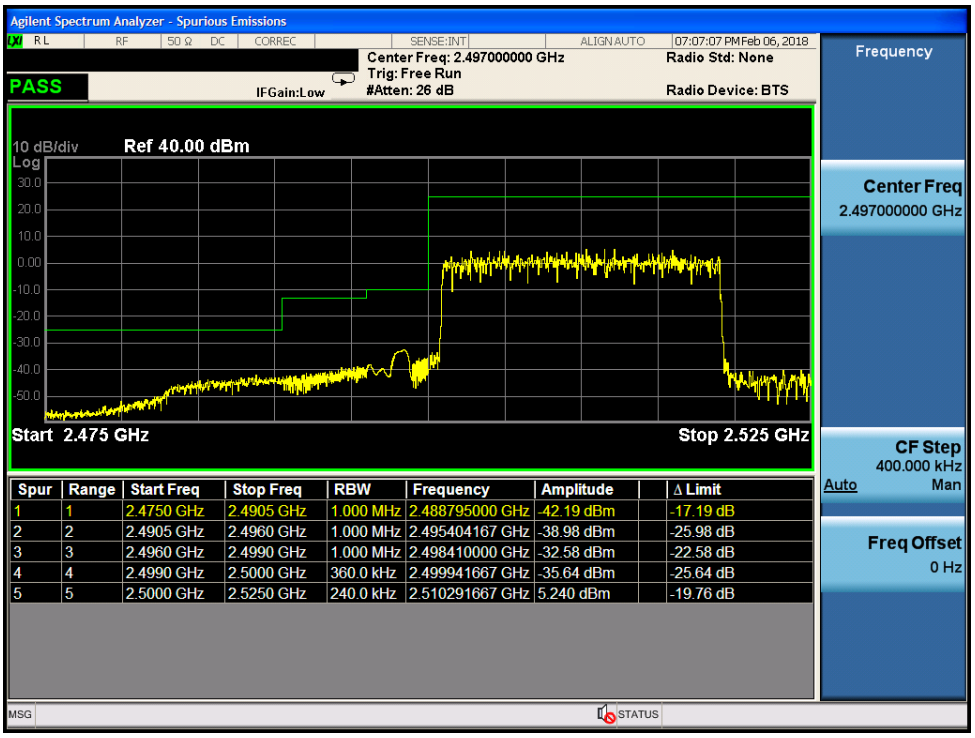
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4905 GHz	1.000 MHz	2.488536667 GHz	-35.41 dBm	-10.41 dB
2	2	2.4905 GHz	2.4960 GHz	1.000 MHz	2.491572500 GHz	-32.44 dBm	-19.44 dB
3	3	2.4960 GHz	2.4990 GHz	1.000 MHz	2.498000000 GHz	-34.99 dBm	-24.99 dB
4	4	2.4990 GHz	2.5000 GHz	270.0 kHz	2.499708333 GHz	-27.85 dBm	-17.85 dB
5	5	2.5000 GHz	2.5250 GHz	240.0 kHz	2.508291667 GHz	6.409 dBm	-18.59 dB

Plot 7-165. Lower ACP Plot (Band 7 – 15.0MHz QPSK – RB Size 75)

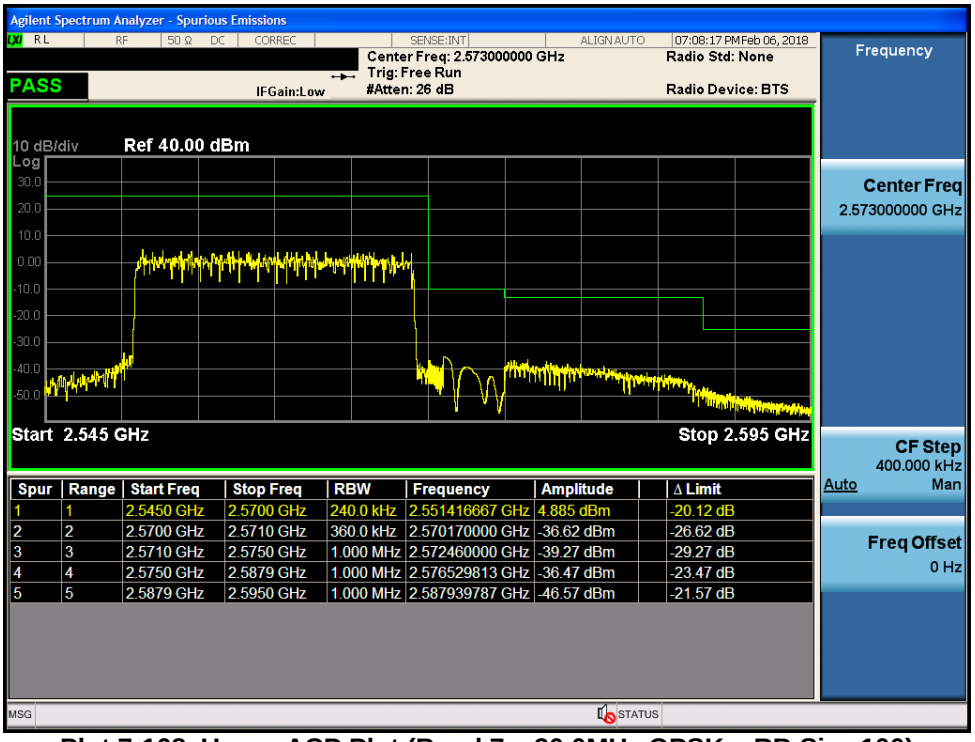


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.5450 GHz	2.5700 GHz	240.0 kHz	2.559166667 GHz	6.194 dBm	-18.81 dB
2	2	2.5700 GHz	2.5710 GHz	270.0 kHz	2.570306667 GHz	-30.11 dBm	-20.11 dB
3	3	2.5710 GHz	2.5750 GHz	1.000 MHz	2.571606667 GHz	-31.83 dBm	-21.83 dB
4	4	2.5750 GHz	2.5835 GHz	1.000 MHz	2.578389517 GHz	-30.70 dBm	-17.70 dB
5	5	2.5835 GHz	2.5950 GHz	1.000 MHz	2.583755008 GHz	-38.60 dBm	-13.60 dB

Plot 7-166. Upper ACP Plot (Band 7 – 15.0MHz QPSK – RB Size 75)



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



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

7.5 Peak-Average Ratio

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 v03 – 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.

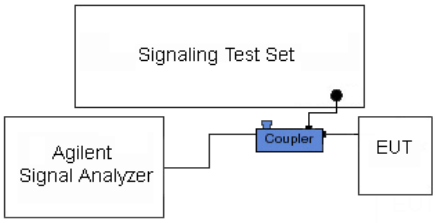
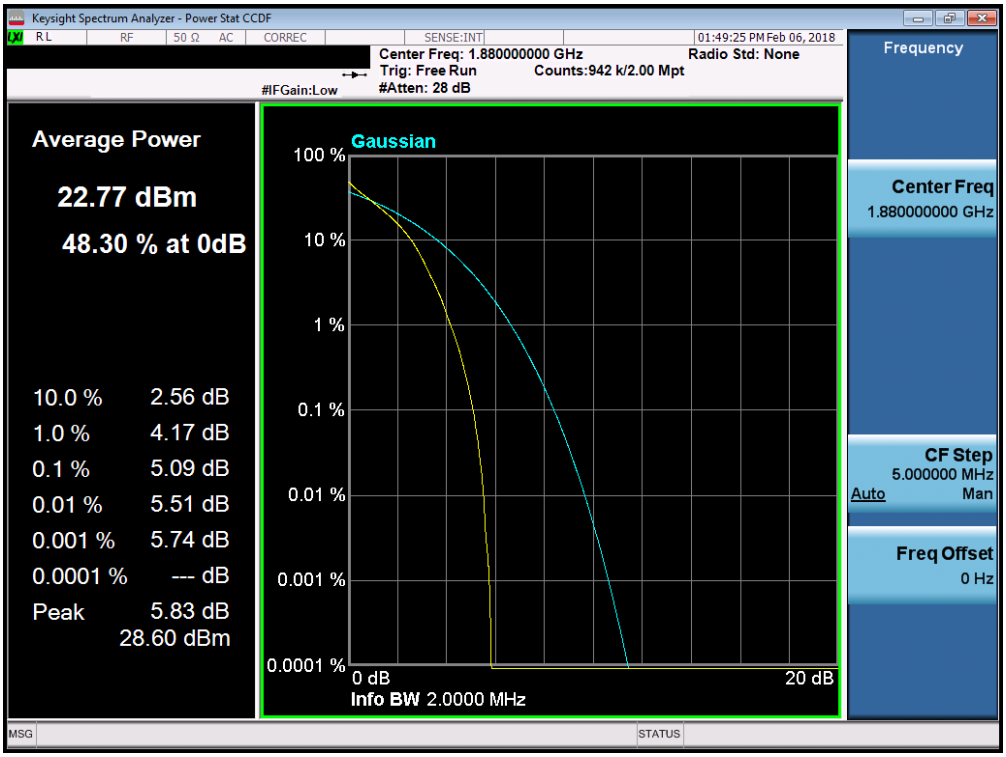


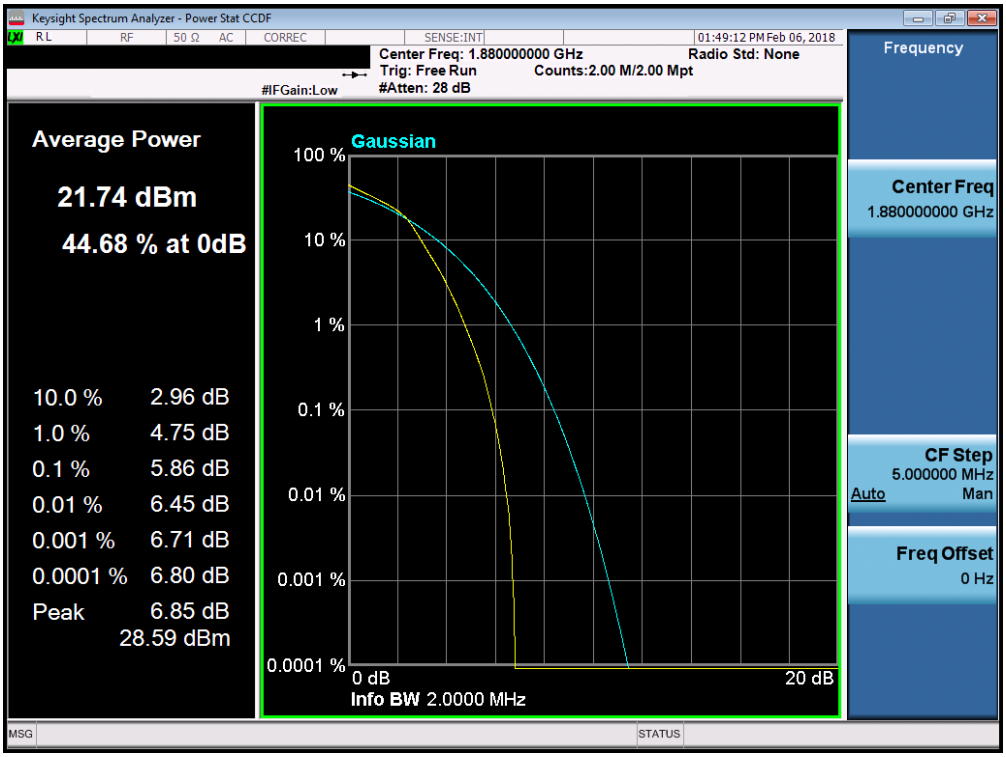
Figure 7-4. Test Instrument & Measurement Setup

Test Notes

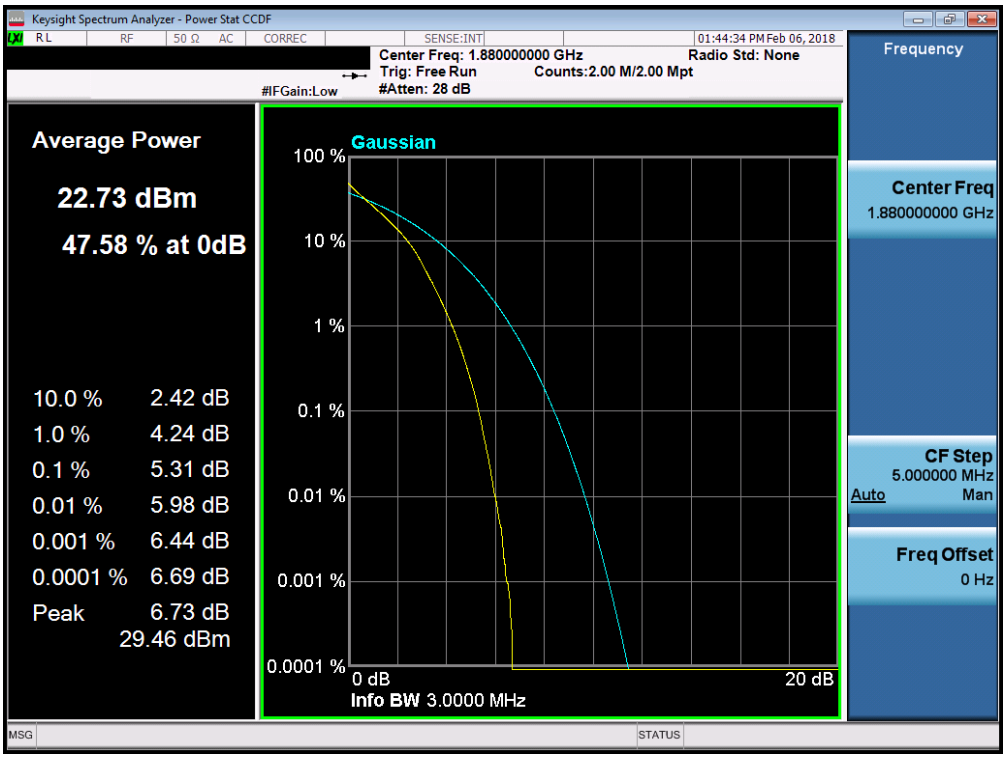
None.



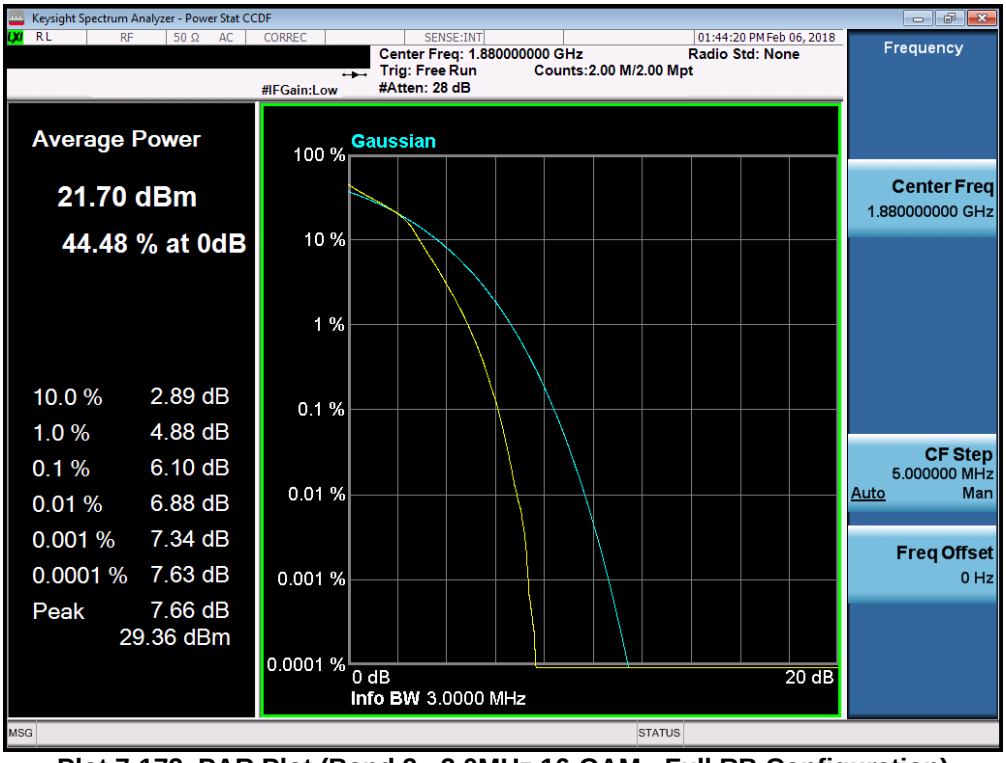
Plot 7-169. PAR Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



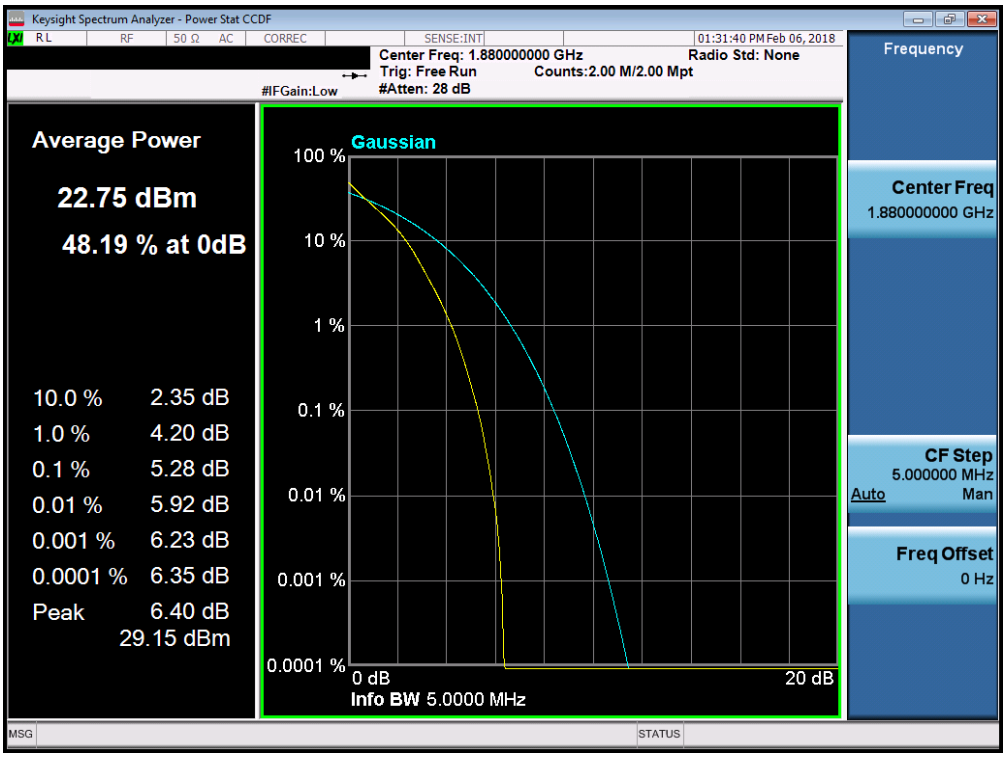
Plot 7-170. PAR Plot (Band 2 - 1.4MHz 16-QAM - Full RB Configuration)



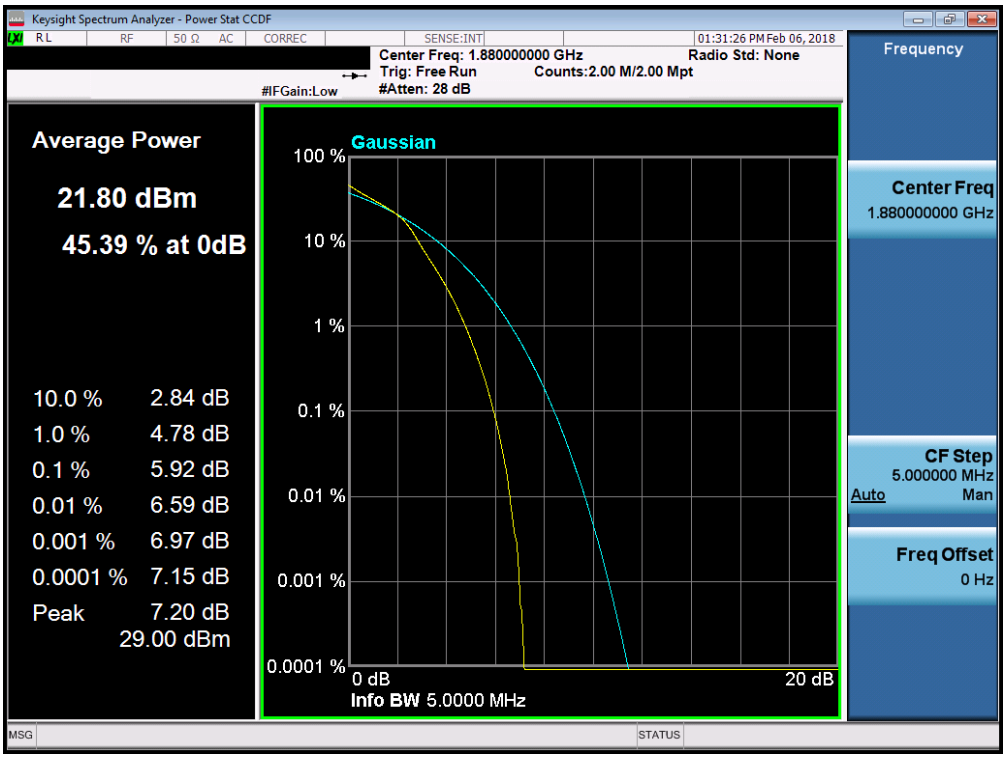
Plot 7-171. PAR Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



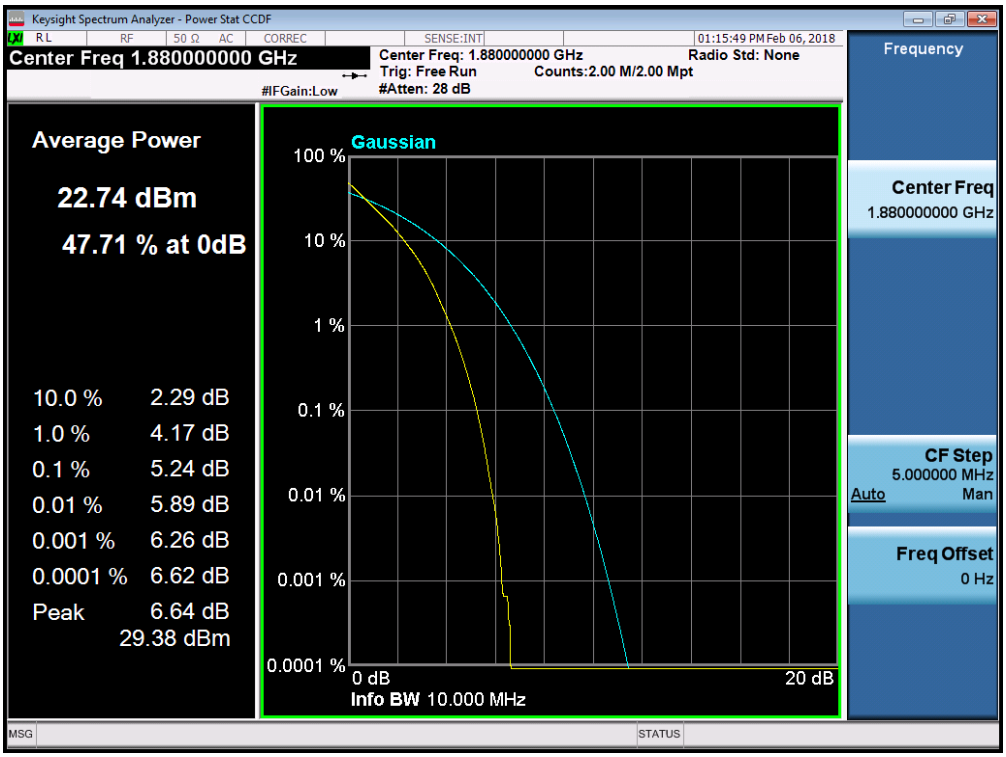
Plot 7-172. PAR Plot (Band 2 - 3.0MHz 16-QAM - Full RB Configuration)



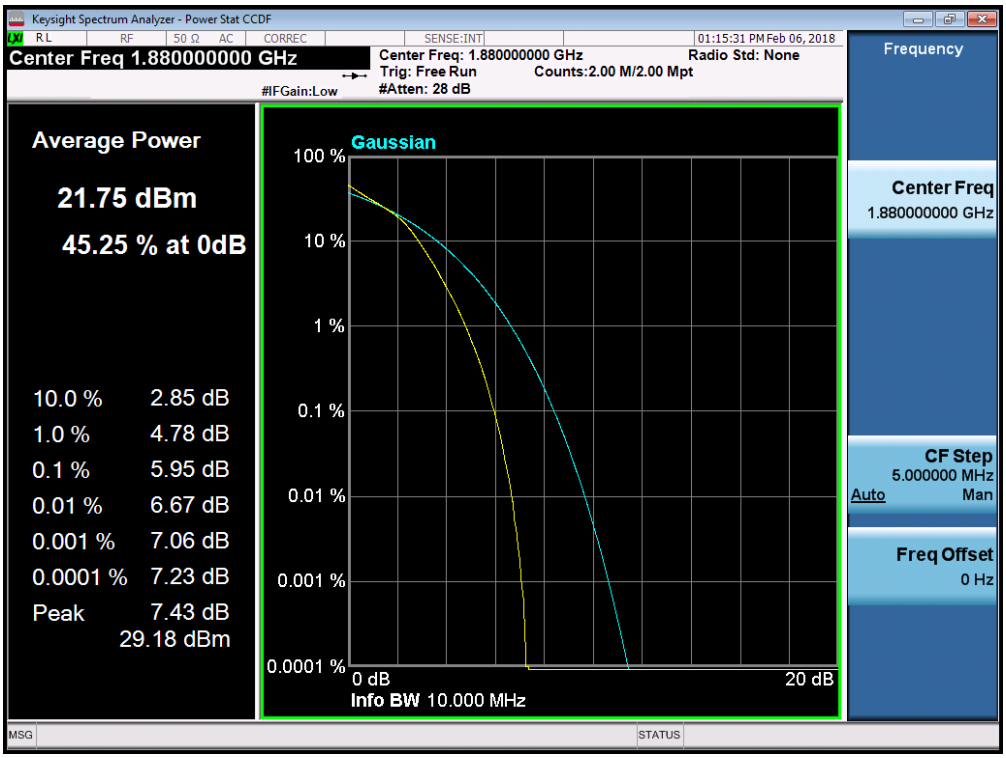
Plot 7-173. PAR Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



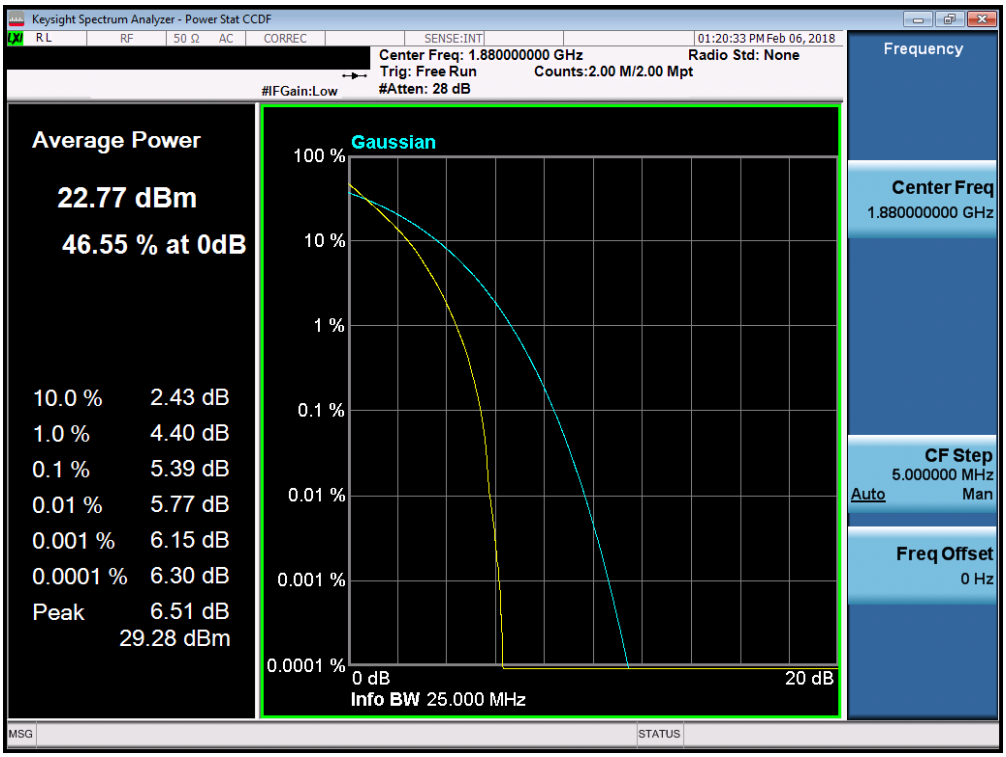
Plot 7-174. PAR Plot (Band 2 - 5.0MHz 16-QAM - Full RB Configuration)



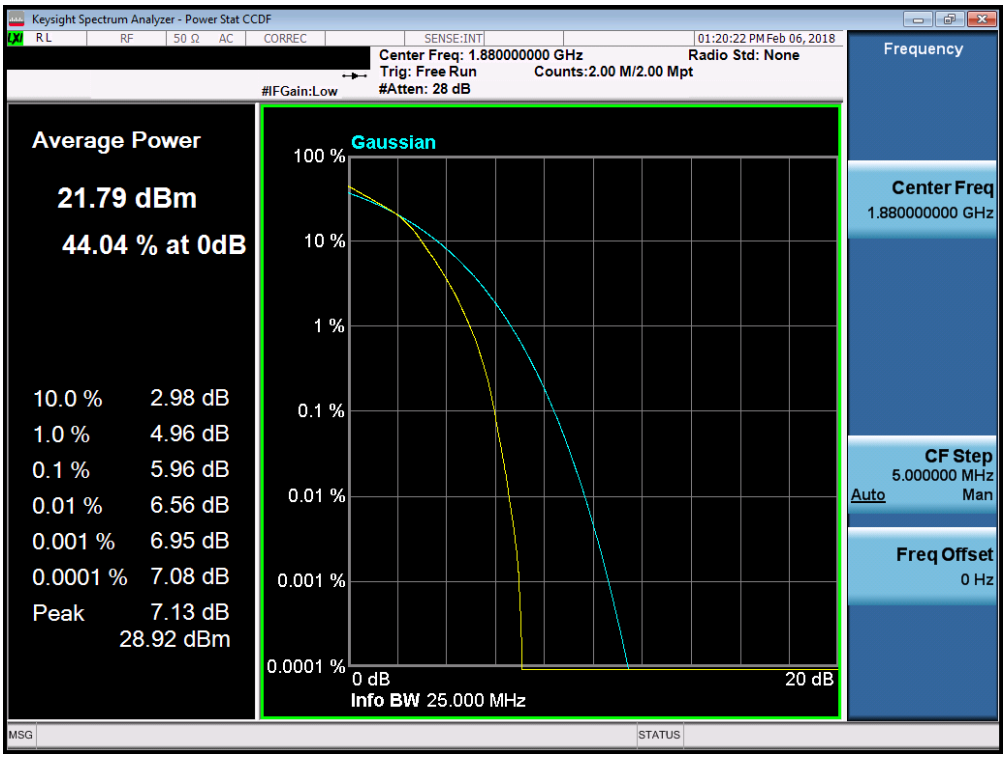
Plot 7-175. PAR Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



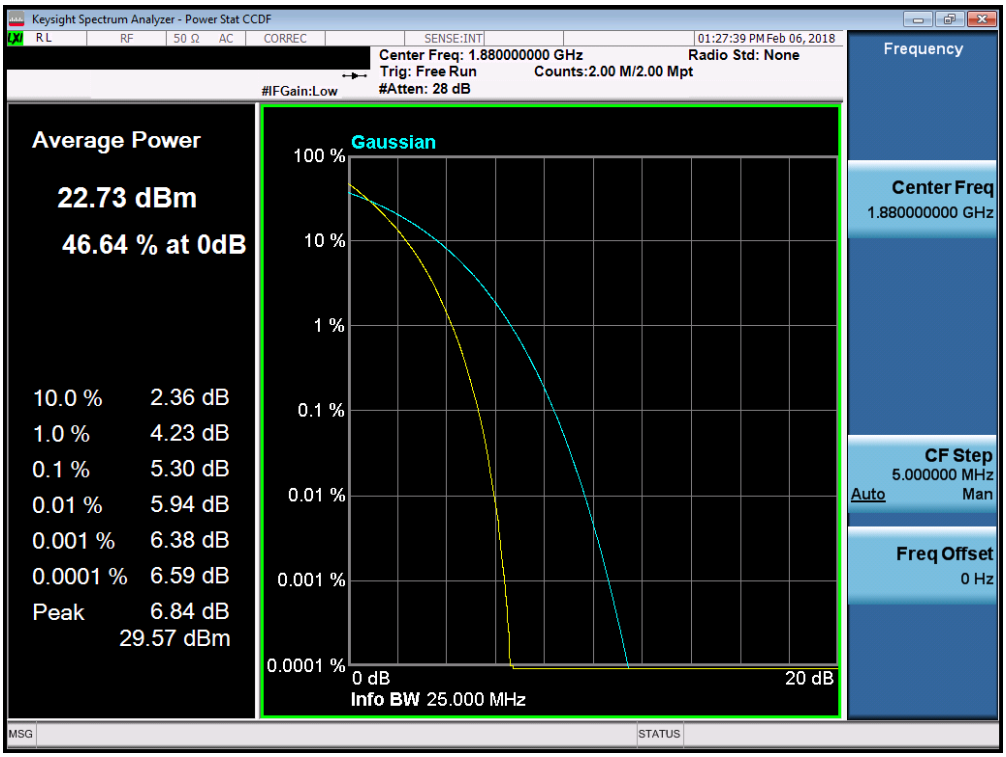
Plot 7-176. PAR Plot (Band 2 - 10.0MHz 16-QAM - Full RB Configuration)



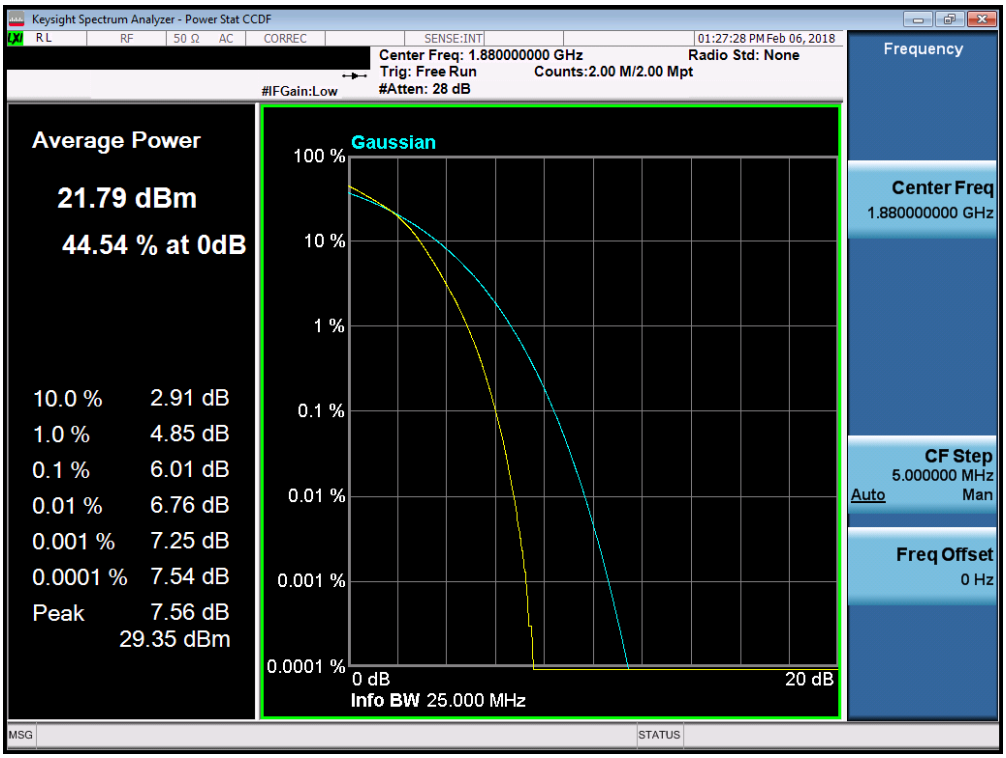
Plot 7-177. PAR Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-178. PAR Plot (Band 2 - 15.0MHz 16-QAM - Full RB Configuration)



Plot 7-179. PAR Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-180. PAR Plot (Band 2 - 20.0MHz 16-QAM - Full RB Configuration)

7.6 Radiated Power (ERP/EIRP)

Test Overview

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 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 v03 – Section 5.2.1

ANSI/TIA-603-E-2016 – 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.

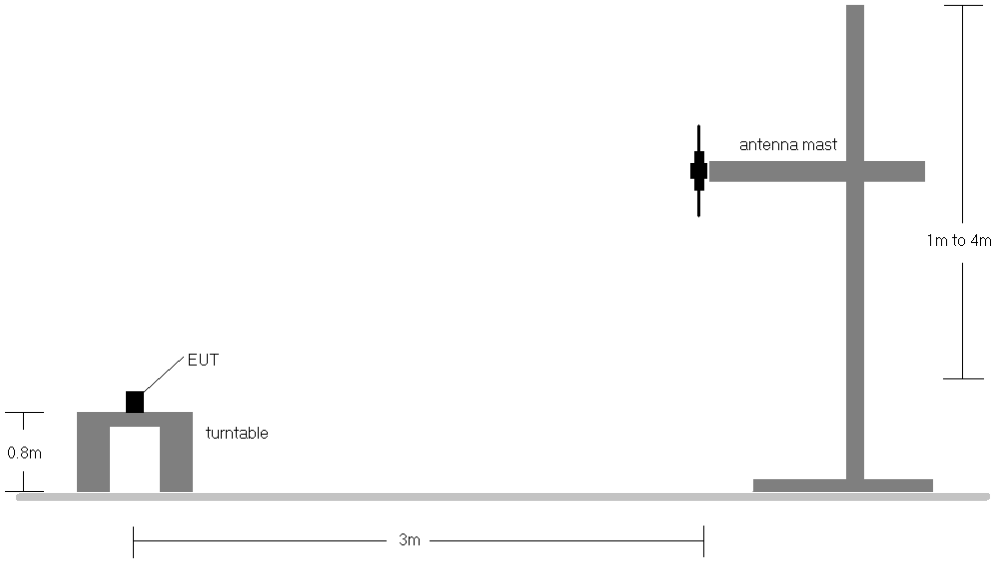


Figure 7-5. Radiated Test Setup <1GHz

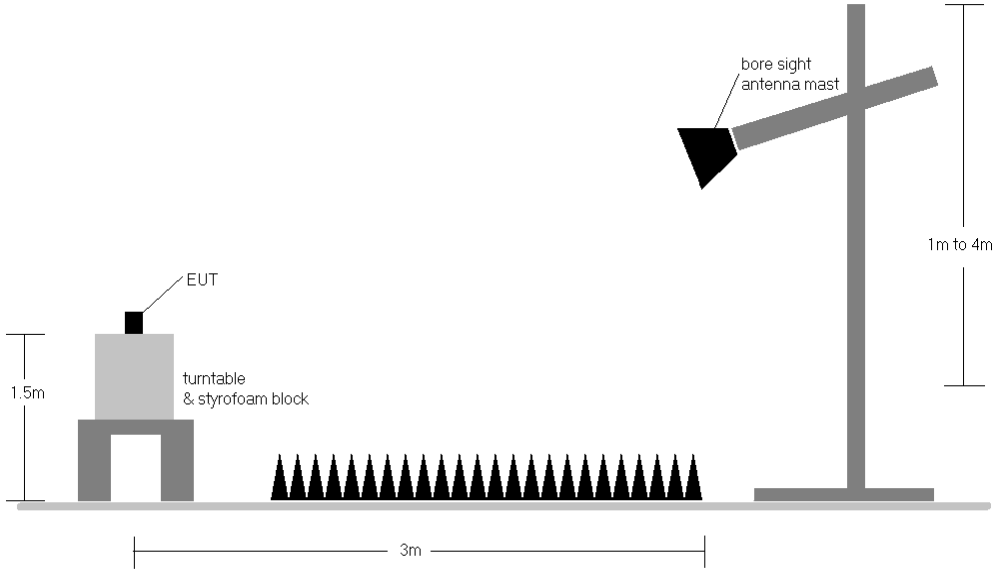


Figure 7-6. Radiated Test Setup >1GHz

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 [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
699.70	1.4	QPSK	H	150	192	1 / 0	19.88	1.10	18.83	0.076	34.77	-15.94	20.98	0.125	36.99	-16.01
707.50	1.4	QPSK	H	150	187	1 / 5	20.10	1.13	19.08	0.081	34.77	-15.69	21.23	0.133	36.99	-15.76
715.30	1.4	QPSK	H	150	183	1 / 0	20.92	1.16	**19.93**	**0.098**	34.77	-14.84	**22.08**	**0.161**	36.99	-14.91
699.70	1.4	16-QAM	H	150	192	1 / 5	18.54	1.10	17.49	0.056	34.77	-17.28	19.64	0.092	36.99	-17.35
707.50	1.4	16-QAM	H	150	187	1 / 5	18.91	1.13	17.89	0.062	34.77	-16.88	20.04	0.101	36.99	-16.95
715.30	1.4	16-QAM	H	150	183	1 / 0	19.55	1.16	**18.56**	0.072	34.77	-16.21	**20.71**	0.118	36.99	-16.28
700.50	3	QPSK	H	150	346	1 / 14	19.97	1.10	18.92	0.078	34.77	-15.85	21.07	0.128	36.99	-15.92
707.50	3	QPSK	H	150	348	1 / 14	20.31	1.13	19.29	0.085	34.77	-15.48	21.44	0.139	36.99	-15.55
714.50	3	QPSK	H	150	354	1 / 14	20.48	1.16	**19.49**	0.089	34.77	-15.28	**21.64**	0.146	36.99	-15.35
700.50	3	16-QAM	H	150	346	1 / 0	18.50	1.10	17.45	0.056	34.77	-17.32	19.60	0.091	36.99	-17.39
707.50	3	16-QAM	H	150	348	1 / 14	18.65	1.13	17.63	0.058	34.77	-17.14	19.78	0.095	36.99	-17.21
714.50	3	16-QAM	H	150	354	1 / 0	19.14	1.16	**18.15**	0.065	34.77	-16.62	**20.30**	0.107	36.99	-16.69
701.50	5	QPSK	H	150	122	1 / 0	13.75	1.11	12.71	0.019	34.77	-22.07	14.86	0.031	36.99	-22.13
707.50	5	QPSK	H	150	353	1 / 24	20.29	1.13	**19.27**	0.085	34.77	-15.50	**21.42**	0.139	36.99	-15.57
713.50	5	QPSK	H	150	137	1 / 0	17.13	1.15	16.13	0.041	34.77	-18.64	18.28	0.067	36.99	-18.71
701.50	5	16-QAM	H	150	122	1 / 0	12.53	1.11	11.49	0.014	34.77	-23.29	13.64	0.023	36.99	-23.35
707.50	5	16-QAM	H	150	353	1 / 0	18.99	1.13	**17.97**	0.063	34.77	-16.80	**20.12**	0.103	36.99	-16.87
713.50	5	16-QAM	H	150	137	1 / 24	15.78	1.15	14.78	0.030	34.77	-19.99	16.93	0.049	36.99	-20.06
704.00	10	QPSK	H	150	339	1 / 49	19.89	1.12	18.86	0.077	34.77	-15.91	21.01	0.126	36.99	-15.98
707.50	10	QPSK	H	150	354	1 / 49	19.98	1.13	18.96	0.079	34.77	-15.81	21.11	0.129	36.99	-15.88
711.00	10	QPSK	H	150	351	1 / 0	20.08	1.14	**19.07**	0.081	34.77	-15.70	**21.22**	0.133	36.99	-15.77
704.00	10	16-QAM	H	150	339	1 / 49	18.54	1.12	17.51	0.056	34.77	-17.26	19.66	0.092	36.99	-17.33
707.50	10	16-QAM	H	150	354	1 / 49	18.76	1.13	**17.74**	0.059	34.77	-17.03	**19.89**	0.098	36.99	-17.10
711.00	10	16-QAM	H	150	351	1 / 0	18.72	1.14	17.71	0.059	34.77	-17.06	19.86	0.097	36.99	-17.13
715.30	1.4	QPSK	V	150	0	1 / 0	20.50	1.16	19.51	0.089	34.77	-15.26	21.66	0.147	36.99	-15.33

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

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
824.70	1.4	QPSK	V	150	356	1 / 5	21.87	1.50	21.22	0.132	38.45	-17.23	23.37	0.217	40.61	-17.24
836.50	1.4	QPSK	V	150	0	1 / 5	22.27	1.50	21.62	0.145	38.45	-16.83	23.77	0.238	40.61	-16.84
848.30	1.4	QPSK	V	150	10	1 / 5	22.43	1.50	**21.78**	0.151	38.45	-16.67	**23.93**	0.247	40.61	-16.68
824.70	1.4	16-QAM	V	150	356	1 / 5	20.84	1.50	20.19	0.104	38.45	-18.26	22.34	0.171	40.61	-18.27
836.50	1.4	16-QAM	V	150	0	1 / 5	21.15	1.50	20.50	0.112	38.45	-17.95	22.65	0.184	40.61	-17.96
848.30	1.4	16-QAM	V	150	10	1 / 5	21.37	1.50	**20.72**	0.118	38.45	-17.73	**22.87**	0.194	40.61	-17.74
825.50	3	QPSK	V	150	4	1 / 14	22.21	1.50	21.56	0.143	38.45	-16.89	23.71	0.235	40.61	-16.90
836.50	3	QPSK	V	150	6	1 / 14	22.24	1.50	21.59	0.144	38.45	-16.86	23.74	0.237	40.61	-16.87
847.50	3	QPSK	V	150	2	1 / 0	22.44	1.50	**21.79**	0.151	38.45	-16.66	**23.94**	0.248	40.61	-16.67
825.50	3	16-QAM	V	150	4	1 / 0	21.20	1.50	**20.55**	0.114	38.45	-17.90	**22.70**	0.186	40.61	-17.91
836.50	3	16-QAM	V	150	6	1 / 14	20.47	1.50	19.82	0.096	38.45	-18.63	21.97	0.157	40.61	-18.64
847.50	3	16-QAM	V	150	2	1 / 0	20.93	1.50	20.28	0.107	38.45	-18.17	22.43	0.175	40.61	-18.18
826.50	5	QPSK	V	150	0	1 / 0	21.93	1.50	21.28	0.134	38.45	-17.17	23.43	0.220	40.61	-17.18
836.50	5	QPSK	V	150	356	1 / 0	21.98	1.50	**21.33**	0.136	38.45	-17.12	**23.48**	0.223	40.61	-17.13
846.50	5	QPSK	V	150	10	1 / 0	21.89	1.50	21.24	0.133	38.45	-17.21	23.39	0.218	40.61	-17.22
826.50	5	16-QAM	V	150	0	1 / 0	20.58	1.50	19.93	0.098	38.45	-18.52	22.08	0.161	40.61	-18.53
836.50	5	16-QAM	V	150	356	1 / 0	20.26	1.50	19.61	0.091	38.45	-18.84	21.76	0.150	40.61	-18.85
846.50	5	16-QAM	V	150	10	1 / 0	20.73	1.50	**20.08**	0.102	38.45	-18.37	**22.23**	0.167	40.61	-18.38
829.00	10	QPSK	V	150	1	1 / 49	22.01	1.50	21.36	0.137	38.45	-17.09	23.51	0.224	40.61	-17.10
836.50	10	QPSK	V	150	350	1 / 49	22.31	1.50	21.66	0.147	38.45	-16.79	23.81	0.240	40.61	-16.80
844.00	10	QPSK	V	150	0	1 / 49	22.55	1.50	**21.90**	**0.155**	38.45	-16.55	**24.05**	**0.254**	40.61	-16.56
829.00	10	16-QAM	V	150	1	1 / 49	20.64	1.50	19.99	0.100	38.45	-18.46	22.14	0.164	40.61	-18.47
836.50	10	16-QAM	V	150	350	1 / 49	20.44	1.50	19.79	0.095	38.45	-18.66	21.94	0.156	40.61	-18.67
844.00	10	16-QAM	V	150	0	1 / 49	21.04	1.50	**20.39**	0.109	38.45	-18.06	**22.54**	0.179	40.61	-18.07
844.00	10	QPSK	H	150	172	1 / 0	21.43	1.50	20.78	0.120	38.45	-17.67	22.93	0.196	40.61	-17.68

Table 7-4. ERP/EIRP 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 [Watts]	EIRP Limit [dBm]	Margin [dB]
1710.70	1.4	QPSK	V	150	256	1 / 0	19.77	4.43	24.20	0.263	30.00	-5.80
1732.50	1.4	QPSK	V	150	261	1 / 0	19.85	4.41	**24.26**	0.267	30.00	-5.74
1754.30	1.4	QPSK	V	150	264	1 / 0	19.81	4.39	24.20	0.263	30.00	-5.80
1710.70	1.4	16-QAM	V	150	256	1 / 0	18.71	4.43	23.14	0.206	30.00	-6.86
1732.50	1.4	16-QAM	V	150	261	1 / 0	18.73	4.41	23.14	0.206	30.00	-6.86
1754.30	1.4	16-QAM	V	150	264	1 / 0	18.80	4.39	**23.19**	0.209	30.00	-6.81
1711.50	3	QPSK	V	150	260	1 / 0	19.75	4.43	24.18	0.262	30.00	-5.82
1732.50	3	QPSK	V	150	265	1 / 0	20.00	4.41	**24.41**	**0.276**	30.00	-5.59
1753.50	3	QPSK	V	150	267	1 / 0	19.97	4.39	24.36	0.273	30.00	-5.64
1711.50	3	16-QAM	V	150	260	1 / 0	18.88	4.43	**23.31**	0.214	30.00	-6.69
1732.50	3	16-QAM	V	150	265	1 / 0	18.31	4.41	22.72	0.187	30.00	-7.28
1753.50	3	16-QAM	V	150	267	1 / 0	18.75	4.39	23.14	0.206	30.00	-6.86
1712.50	5	QPSK	V	150	256	1 / 0	19.70	4.43	**24.13**	0.259	30.00	-5.87
1732.50	5	QPSK	V	150	258	1 / 0	19.60	4.41	24.01	0.252	30.00	-5.99
1752.50	5	QPSK	V	150	264	1 / 0	19.71	4.40	24.11	0.257	30.00	-5.89
1712.50	5	16-QAM	V	150	256	1 / 0	18.83	4.43	**23.26**	0.212	30.00	-6.74
1732.50	5	16-QAM	V	150	258	1 / 0	18.52	4.41	22.93	0.196	30.00	-7.07
1752.50	5	16-QAM	V	150	264	1 / 0	18.44	4.40	22.84	0.192	30.00	-7.16
1715.00	10	QPSK	V	150	257	1 / 0	19.85	4.43	**24.28**	0.268	30.00	-5.72
1732.50	10	QPSK	V	150	258	1 / 0	19.63	4.41	24.04	0.254	30.00	-5.96
1750.00	10	QPSK	V	150	265	1 / 0	19.87	4.40	24.27	0.267	30.00	-5.73
1715.00	10	16-QAM	V	150	257	1 / 0	18.57	4.43	23.00	0.199	30.00	-7.00
1732.50	10	16-QAM	V	150	258	1 / 0	18.29	4.41	22.70	0.186	30.00	-7.30
1750.00	10	16-QAM	V	150	265	1 / 0	18.78	4.40	**23.18**	0.208	30.00	-6.82
1717.50	15	QPSK	V	150	262	1 / 74	19.64	4.42	24.06	0.255	30.00	-5.94
1732.50	15	QPSK	V	150	264	1 / 74	19.76	4.41	**24.17**	0.261	30.00	-5.83
1747.50	15	QPSK	V	150	263	1 / 74	19.40	4.40	23.80	0.240	30.00	-6.20
1717.50	15	16-QAM	V	150	262	1 / 74	18.82	4.42	**23.24**	0.211	30.00	-6.76
1732.50	15	16-QAM	V	150	264	1 / 74	18.54	4.41	22.95	0.197	30.00	-7.05
1747.50	15	16-QAM	V	150	263	1 / 74	18.48	4.40	22.88	0.194	30.00	-7.12
1720.00	20	QPSK	V	150	264	1 / 0	18.88	4.42	23.30	0.214	30.00	-6.70
1732.50	20	QPSK	V	150	263	1 / 0	19.80	4.41	24.21	0.264	30.00	-5.79
1745.00	20	QPSK	V	150	266	1 / 0	19.85	4.40	**24.25**	0.266	30.00	-5.75
1720.00	20	16-QAM	V	150	264	1 / 0	18.18	4.42	22.60	0.182	30.00	-7.40
1732.50	20	16-QAM	V	150	263	1 / 0	18.40	4.41	22.81	0.191	30.00	-7.19
1745.00	20	16-QAM	V	150	266	1 / 0	18.67	4.40	**23.07**	0.203	30.00	-6.93
1732.50	3	QPSK	H	150	259	1 / 0	19.09	4.41	23.50	0.224	30.00	-6.50

Table 7-5. EIRP Data (Band 4)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1850.70	1.4	QPSK	H	150	349	1 / 5	21.38	4.82	**26.20**	**0.417**	33.01	-6.81
1880.00	1.4	QPSK	H	150	351	1 / 5	20.66	4.74	25.40	0.347	33.01	-7.61
1909.30	1.4	QPSK	H	150	354	1 / 5	20.81	4.68	25.49	0.354	33.01	-7.52
1850.70	1.4	16-QAM	H	150	349	1 / 5	19.96	4.82	**24.78**	0.300	33.01	-8.23
1880.00	1.4	16-QAM	H	150	351	1 / 5	19.40	4.74	24.14	0.259	33.01	-8.87
1909.30	1.4	16-QAM	H	150	354	1 / 5	19.57	4.68	24.25	0.266	33.01	-8.76
1851.50	3	QPSK	H	150	349	1 / 0	21.31	4.82	**26.13**	0.410	33.01	-6.88
1880.00	3	QPSK	H	150	351	1 / 0	20.47	4.74	25.21	0.332	33.01	-7.80
1908.50	3	QPSK	H	150	354	1 / 14	20.70	4.68	25.38	0.345	33.01	-7.63
1851.50	3	16-QAM	H	150	349	1 / 0	19.89	4.82	**24.71**	0.296	33.01	-8.30
1880.00	3	16-QAM	H	150	351	1 / 14	19.21	4.74	23.95	0.248	33.01	-9.06
1908.50	3	16-QAM	H	150	354	1 / 14	19.50	4.68	24.18	0.262	33.01	-8.83
1852.50	5	QPSK	H	150	349	1 / 0	21.27	4.81	**26.08**	0.406	33.01	-6.93
1880.00	5	QPSK	H	150	355	1 / 0	20.31	4.74	25.05	0.320	33.01	-7.96
1907.50	5	QPSK	H	150	362	1 / 0	21.27	4.68	25.95	0.394	33.01	-7.06
1852.50	5	16-QAM	H	150	349	1 / 0	19.98	4.81	**24.79**	0.302	33.01	-8.22
1880.00	5	16-QAM	H	150	355	1 / 24	19.19	4.74	23.93	0.247	33.01	-9.08
1907.50	5	16-QAM	H	150	362	1 / 24	19.98	4.68	24.66	0.293	33.01	-8.35
1855.00	10	QPSK	H	150	349	1 / 0	21.09	4.81	**25.90**	0.389	33.01	-7.11
1880.00	10	QPSK	H	150	348	1 / 0	20.41	4.74	25.15	0.327	33.01	-7.86
1905.00	10	QPSK	H	150	351	1 / 49	20.76	4.68	25.44	0.350	33.01	-7.57
1855.00	10	16-QAM	H	150	349	1 / 0	19.84	4.81	**24.65**	0.291	33.01	-8.36
1880.00	10	16-QAM	H	150	348	1 / 0	19.17	4.74	23.91	0.246	33.01	-9.10
1905.00	10	16-QAM	H	150	351	1 / 49	19.25	4.68	23.93	0.247	33.01	-9.08
1857.50	15	QPSK	H	150	359	1 / 74	21.39	4.80	**26.19**	0.416	33.01	-6.82
1880.00	15	QPSK	H	150	1	1 / 74	21.19	4.74	25.93	0.392	33.01	-7.08
1902.50	15	QPSK	H	150	4	1 / 0	21.07	4.69	25.76	0.376	33.01	-7.25
1857.50	15	16-QAM	H	150	359	1 / 0	20.01	4.80	**24.81**	0.303	33.01	-8.20
1880.00	15	16-QAM	H	150	1	1 / 0	19.81	4.74	24.55	0.285	33.01	-8.46
1902.50	15	16-QAM	H	150	4	1 / 74	19.86	4.69	24.55	0.285	33.01	-8.46
1860.00	20	QPSK	H	150	353	1 / 0	21.13	4.79	**25.92**	0.391	33.01	-7.09
1880.00	20	QPSK	H	150	351	1 / 0	20.61	4.74	25.35	0.343	33.01	-7.66
1900.00	20	QPSK	H	150	351	1 / 99	20.70	4.69	25.39	0.346	33.01	-7.62
1860.00	20	16-QAM	H	150	353	1 / 0	20.04	4.79	**24.83**	0.304	33.01	-8.18
1880.00	20	16-QAM	H	150	351	1 / 0	19.18	4.74	23.92	0.247	33.01	-9.09
1900.00	20	16-QAM	H	150	351	1 / 99	19.41	4.69	24.10	0.257	33.01	-8.91
1850.70	1	QPSK	V	150	144	1 / 0	17.76	4.80	22.56	0.180	33.01	-10.45

Table 7-6. EIRP Data (Band 2)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
2502.50	5	QPSK	H	150	335	1 / 0	15.54	5.74	21.28	0.134	33.01	-11.73
2535.00	5	QPSK	H	150	334	1 / 0	17.56	5.86	**23.42**	**0.220**	33.01	-9.59
2567.50	5	QPSK	H	150	333	1 / 0	16.84	5.98	22.82	0.191	33.01	-10.19
2502.50	5	16-QAM	H	150	335	1 / 0	14.55	5.74	20.29	0.107	33.01	-12.72
2535.00	5	16-QAM	H	150	334	1 / 0	15.91	5.86	**21.77**	0.150	33.01	-11.24
2567.50	5	16-QAM	H	150	333	1 / 0	15.49	5.98	21.47	0.140	33.01	-11.54
2505.00	10	QPSK	H	150	334	1 / 49	16.49	5.75	22.24	0.167	33.01	-10.77
2535.00	10	QPSK	H	150	330	1 / 49	17.48	5.86	**23.34**	0.216	33.01	-9.67
2565.00	10	QPSK	H	150	335	1 / 49	17.15	5.97	23.12	0.205	33.01	-9.89
2505.00	10	16-QAM	H	150	334	1 / 49	15.25	5.75	21.00	0.126	33.01	-12.01
2535.00	10	16-QAM	H	150	330	1 / 49	16.10	5.86	**21.96**	0.157	33.01	-11.05
2565.00	10	16-QAM	H	150	335	1 / 49	15.82	5.97	21.79	0.151	33.01	-11.22
2507.50	15	QPSK	H	150	335	1 / 0	16.15	5.76	21.91	0.155	33.01	-11.10
2535.00	15	QPSK	H	150	337	1 / 0	16.97	5.86	22.83	0.192	33.01	-10.18
2562.50	15	QPSK	H	150	335	1 / 0	17.12	5.96	**23.08**	0.203	33.01	-9.93
2507.50	15	16-QAM	H	150	335	1 / 0	15.14	5.76	20.90	0.123	33.01	-12.11
2535.00	15	16-QAM	H	150	337	1 / 0	15.87	5.86	21.73	0.149	33.01	-11.28
2562.50	15	16-QAM	H	150	335	1 / 0	16.48	5.96	**22.44**	0.175	33.01	-10.57
2510.00	20	QPSK	H	150	332	1 / 0	16.12	5.77	21.89	0.154	33.01	-11.12
2535.00	20	QPSK	H	150	331	1 / 0	17.10	5.86	22.96	0.198	33.01	-10.05
2560.00	20	QPSK	H	150	330	1 / 0	17.09	5.95	**23.04**	0.201	33.01	-9.97
2510.00	20	16-QAM	H	150	332	1 / 0	14.76	5.77	20.53	0.113	33.01	-12.48
2535.00	20	16-QAM	H	150	331	1 / 0	16.11	5.86	21.97	0.157	33.01	-11.04
2560.00	20	16-QAM	H	150	330	1 / 0	16.30	5.95	**22.25**	0.168	33.01	-10.76
2535.00	5	QPSK	V	150	58	1 / 99	14.59	5.86	20.45	0.111	33.01	-12.56

Table 7-7. EIRP Data (Band 7)

7.7 Radiated Spurious Emissions Measurements

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 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 v03 – Section 5.8

ANSI/TIA-603-E-2016 – 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.

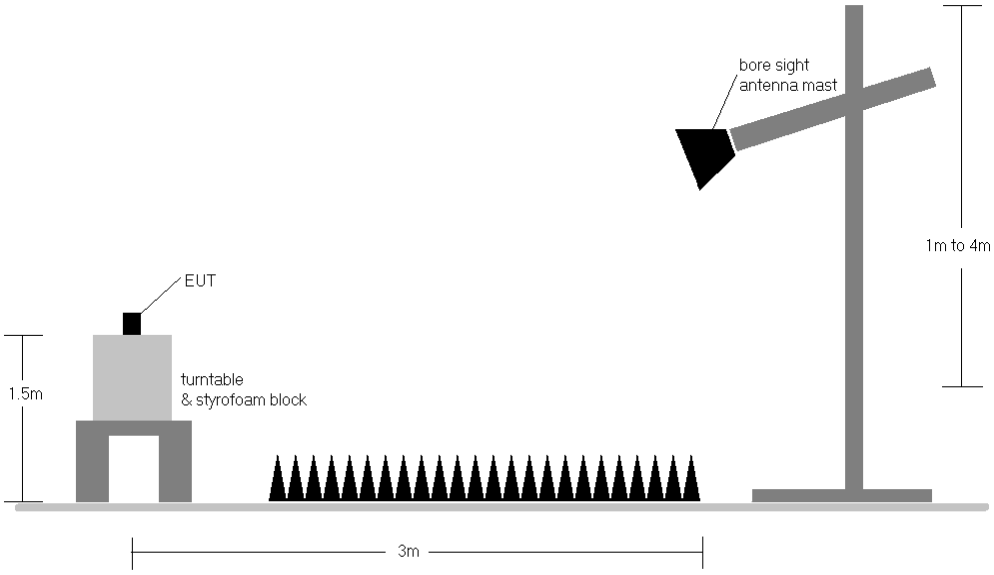


Figure 7-7. Test Instrument & Measurement Setup

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.

Band 12

OPERATING FREQUENCY:	699.70	MHz
CHANNEL:	23017	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	1.4	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

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]	Margin [dB]
1399.40	H	150	176	-43.77	3.77	-39.99	-27.0
2099.10	H	150	361	-63.77	4.80	-58.96	-46.0
2798.80	H	-	-	-66.16	5.64	-60.52	-47.5

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

OPERATING FREQUENCY:	707.50	MHz
CHANNEL:	23095	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	1.4	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

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]	Margin [dB]
1415.00	H	150	176	-46.47	3.90	-42.56	-29.6
2122.50	H	150	196	-65.30	4.78	-60.52	-47.5
2830.00	H	-	-	-66.22	5.73	-60.49	-47.5

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

OPERATING FREQUENCY:	715.30	MHz
CHANNEL:	23173	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	1.4	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

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]	Margin [dB]
1430.60	H	150	179	-47.36	4.04	-43.32	-30.3
2145.90	H	150	10	-60.21	4.76	-55.45	-42.4
2861.20	H	-	-	-66.03	5.79	-60.24	-47.2

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

Band 5

OPERATING FREQUENCY:	829.00	MHz
CHANNEL:	20450	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

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]	Margin [dB]
1658.00	V	150	88	-64.10	4.83	-59.27	-46.3
2487.00	V	150	67	-62.91	5.02	-57.88	-44.9
3316.00	V	-	-	-65.37	6.25	-59.12	-46.1

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

OPERATING FREQUENCY:	836.50	MHz
CHANNEL:	20525	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

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]	Margin [dB]
1673.00	V	150	95	-63.42	4.86	-58.56	-45.6
2509.50	V	-	-	-65.87	5.10	-60.77	-47.8

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

OPERATING FREQUENCY:	844.00	MHz
CHANNEL:	20600	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

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]	Margin [dB]
1688.00	V	303	15	-64.75	4.89	-59.86	-46.9
2532.00	V	150	61	-64.48	5.21	-59.27	-46.3
3376.00	V	-	-	-65.27	6.33	-58.93	-45.9

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

Band 4

OPERATING FREQUENCY:	1711.50	MHz
CHANNEL:	19965	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	3.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

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]	Margin [dB]
3423.00	V	104	94	-65.96	9.50	-56.46	-43.5
5134.50	V	283	5	-56.59	10.75	-45.84	-32.8
6846.00	V	135	1	-67.40	10.81	-56.60	-43.6
8557.50	V	-	-	-68.28	11.64	-56.64	-43.6

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

OPERATING FREQUENCY:	1732.50	MHz
CHANNEL:	20175	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	3.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

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]	Margin [dB]
3465.00	V	100	88	-67.16	9.57	-57.59	-44.6
5197.50	V	100	80	-69.42	10.79	-58.63	-45.6
6930.00	V	204	1	-68.01	10.86	-57.15	-44.2
8662.50	V	-	-	-68.37	11.79	-56.58	-43.6

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

OPERATING FREQUENCY:	1753.50	MHz
CHANNEL:	20385	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	3.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

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]	Margin [dB]
3507.00	V	100	83	-66.35	9.65	-56.70	-43.7
5260.50	V	116	102	-56.06	10.96	-45.10	-32.1
7014.00	V	104	1	-65.88	10.94	-54.94	-41.9
8767.50	V	-	-	-69.13	11.89	-57.24	-44.2

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

Band 2

OPERATING FREQUENCY:	1850.70	MHz
CHANNEL:	18607	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	1.4	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

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]	Margin [dB]
3701.40	V	109	97	-47.62	9.82	-37.80	-24.8
5552.10	V	104	318	-61.04	10.97	-50.07	-37.1
7402.80	V	112	356	-67.36	10.72	-56.64	-43.6
9253.50	V	100	19	-66.90	12.32	-54.58	-41.6
11104.20	V	-	-	-68.17	12.95	-55.22	-42.2

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

OPERATING FREQUENCY:	1880.00	MHz
CHANNEL:	18900	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	1.4	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

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]	Margin [dB]
3760.00	V	100	94	-51.58	9.62	-41.96	-29.0
5640.00	V	109	346	-61.94	11.12	-50.82	-37.8
7520.00	V	236	87	-68.83	11.00	-57.83	-44.8
9400.00	V	269	17	-65.52	12.15	-53.37	-40.4
11280.00	V	-	-	-69.05	13.22	-55.83	-42.8

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

OPERATING FREQUENCY:	1909.30	MHz
CHANNEL:	19193	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	1.4	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

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]	Margin [dB]
3818.60	V	104	94	-55.57	9.24	-46.33	-33.3
5727.90	V	100	347	-62.43	11.29	-51.15	-38.1
7637.20	V	159	95	-69.01	11.29	-57.72	-44.7
9546.50	V	258	13	-66.24	12.21	-54.02	-41.0
11455.80	V	-	-	-69.09	13.24	-55.85	-42.8

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

Band 7

OPERATING FREQUENCY:	2502.50	MHz
CHANNEL:	20775	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-25	dBm

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]	Margin [dB]
5005.00	H	150	63	-55.90	8.33	-47.57	-22.6
7507.50	H	-	-	-62.62	8.43	-54.19	-29.2

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

OPERATING FREQUENCY:	2535.00	MHz
CHANNEL:	21100	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-25	dBm

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]	Margin [dB]
5070.00	H	-	-	-65.64	8.39	-57.25	-32.3
7605.00	H	150	56	-59.77	8.51	-51.26	-26.3
10140.00	H	-	-	-62.13	9.70	-52.43	-27.4

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

OPERATING FREQUENCY:	1753.50	MHz
CHANNEL:	20385	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	3.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

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]	Margin [dB]
3507.00	V	100	83	-66.35	9.65	-56.70	-43.7
5260.50	V	116	102	-56.06	10.96	-45.10	-32.1
7014.00	V	104	1	-65.88	10.94	-54.94	-41.9
8767.50	V	-	-	-69.13	11.89	-57.24	-44.2

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

7.8 Frequency Stability / Temperature Variation

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-E-2016. 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, RSS-132, RSS-133, the frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency. For Part 24, Part 27, RSS-130, RSS-139, RSS-199, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure Used

ANSI/TIA-603-E-2016

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

OPERATING FREQUENCY:	707,500,000	Hz
CHANNEL:	23790	
REFERENCE VOLTAGE:	4.35	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.35	+ 20 (Ref)	707,499,937	-63	-0.0000090
100 %		- 30	707,499,907	-93	-0.0000131
100 %		- 20	707,499,894	-106	-0.0000150
100 %		- 10	707,499,854	-146	-0.0000206
100 %		0	707,499,845	-155	-0.0000219
100 %		+ 10	707,499,818	-182	-0.0000258
100 %		+ 20	707,499,926	-74	-0.0000104
100 %		+ 30	707,499,805	-195	-0.0000276
100 %		+ 40	707,499,820	-180	-0.0000254
100 %		+ 50	707,499,906	-94	-0.0000133
BATT. ENDPOINT	3.40	+ 20	707,499,905	-95	-0.0000134

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

Note:

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

Band 12 Frequency Stability Measurements

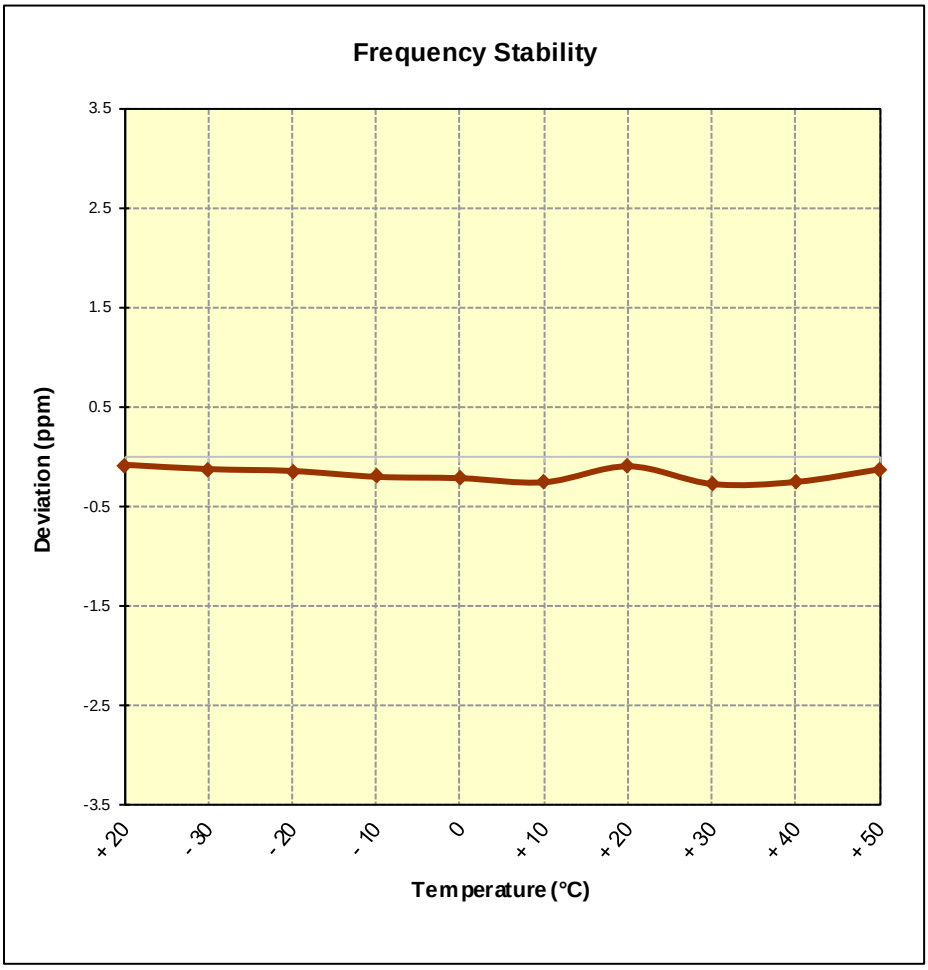


Figure 7-8. Frequency Stability Graph (Band 12)

Band 5 Frequency Stability Measurements

OPERATING FREQUENCY:	836,500,000	Hz
CHANNEL:	20525	
REFERENCE VOLTAGE:	4.35	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.35	+ 20 (Ref)	836,499,859	-141	-0.0000169
100 %		- 30	836,499,802	-198	-0.0000237
100 %		- 20	836,499,832	-168	-0.0000200
100 %		- 10	836,499,878	-122	-0.0000146
100 %		0	836,499,817	-183	-0.0000219
100 %		+ 10	836,499,878	-122	-0.0000146
100 %		+ 20	836,499,972	-28	-0.0000034
100 %		+ 30	836,499,996	-4	-0.0000005
100 %		+ 40	836,499,837	-163	-0.0000195
100 %		+ 50	836,499,803	-197	-0.0000235
BATT. ENDPOINT	3.40	+ 20	836,499,882	-118	-0.0000142

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

Band 5 Frequency Stability Measurements

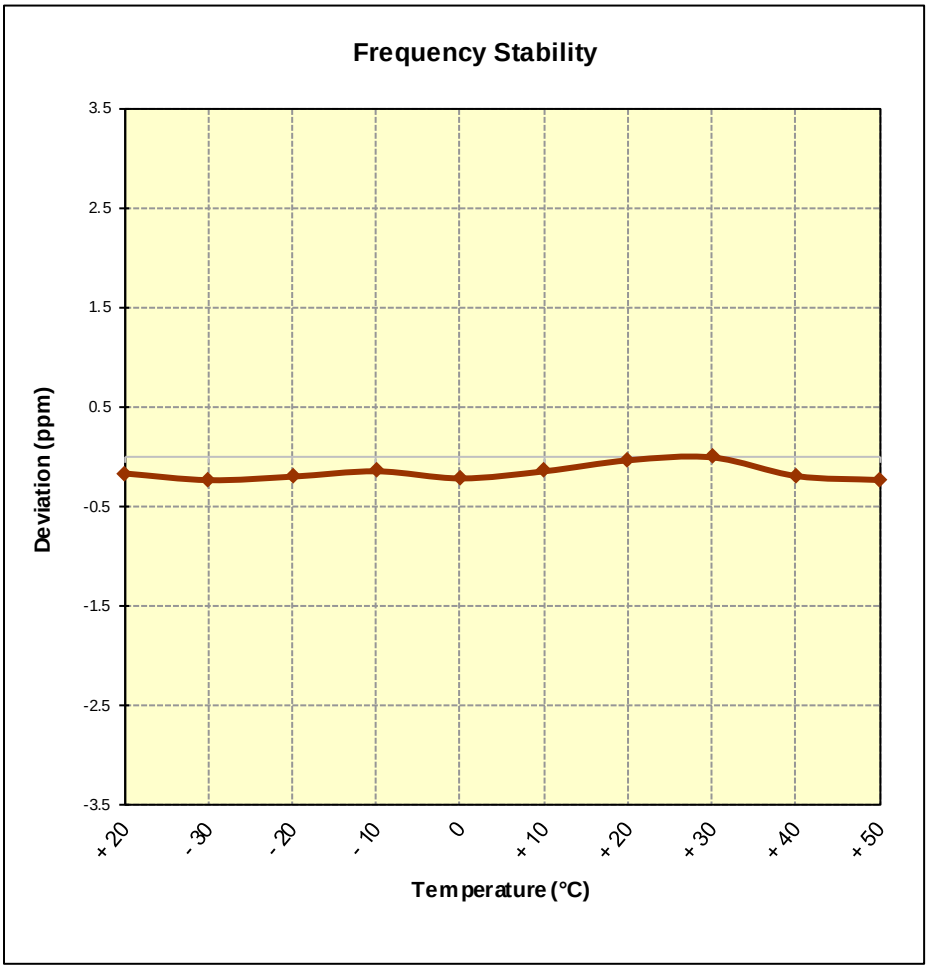


Figure 7-9. Frequency Stability Graph (Band 5)

Band 4 Frequency Stability Measurements

OPERATING FREQUENCY:	1,732,500,000	Hz
CHANNEL:	20175	
REFERENCE VOLTAGE:	4.35	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.35	+ 20 (Ref)	1,732,499,851	-149	-0.0000086
100 %		- 30	1,732,499,909	-91	-0.0000053
100 %		- 20	1,732,499,834	-166	-0.0000096
100 %		- 10	1,732,499,858	-142	-0.0000082
100 %		0	1,732,499,901	-99	-0.0000057
100 %		+ 10	1,732,499,969	-31	-0.0000018
100 %		+ 20	1,732,500,000	0	0.0000000
100 %		+ 30	1,732,500,000	0	0.0000000
100 %		+ 40	1,732,499,843	-157	-0.0000091
100 %		+ 50	1,732,499,845	-155	-0.0000089
BATT. ENDPOINT	3.40	+ 20	1,732,499,821	-179	-0.0000103

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

Note:

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

Band 4 Frequency Stability Measurements

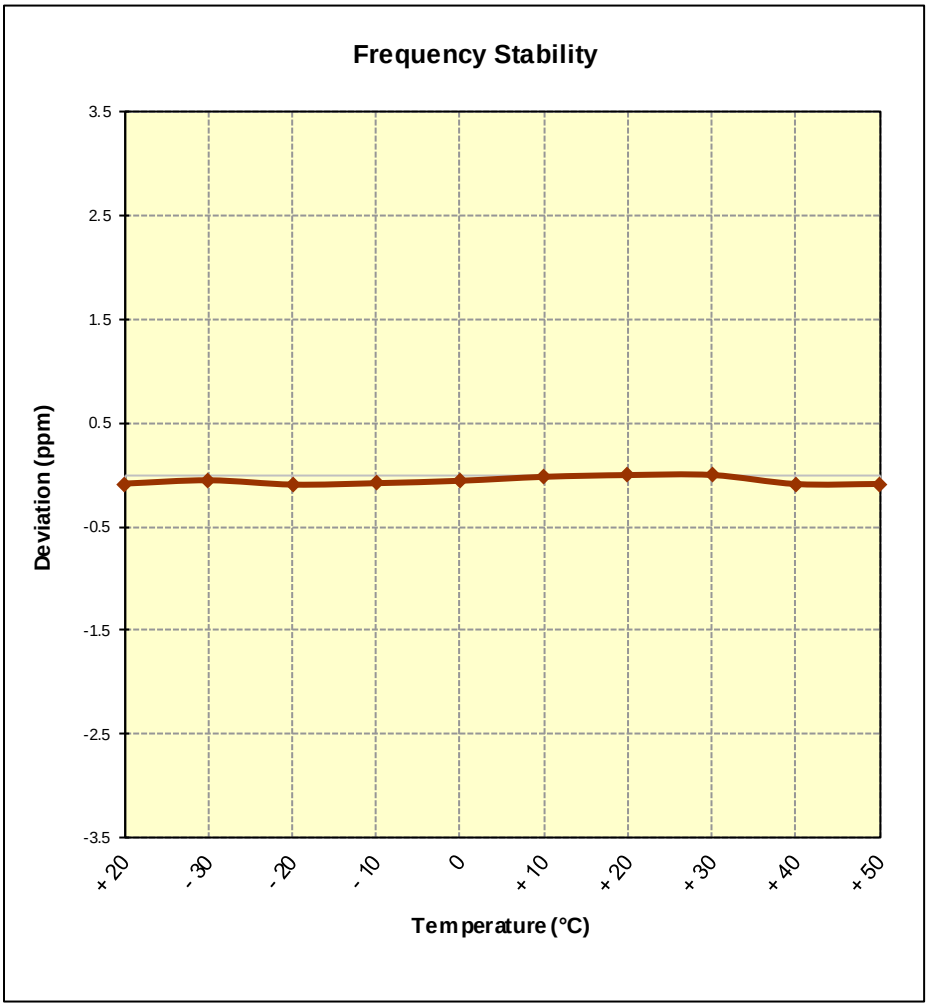


Figure 7-10. Frequency Stability Graph (Band 4)

Band 2 Frequency Stability Measurements

OPERATING FREQUENCY:	1,880,000,000	Hz
CHANNEL:	18900	
REFERENCE VOLTAGE:	4.35	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.35	+ 20 (Ref)	1,879,999,898	-102	-0.0000054
100 %		- 30	1,879,999,918	-82	-0.0000043
100 %		- 20	1,879,999,813	-187	-0.0000099
100 %		- 10	1,879,999,800	-200	-0.0000106
100 %		0	1,879,999,888	-112	-0.0000059
100 %		+ 10	1,879,999,933	-67	-0.0000035
100 %		+ 20	1,879,999,867	-133	-0.0000071
100 %		+ 30	1,879,999,983	-17	-0.0000009
100 %		+ 40	1,879,999,942	-58	-0.0000031
100 %		+ 50	1,879,999,861	-139	-0.0000074
BATT. ENDPOINT	3.40	+ 20	1,879,999,854	-146	-0.0000078

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

Band 2 Frequency Stability Measurements

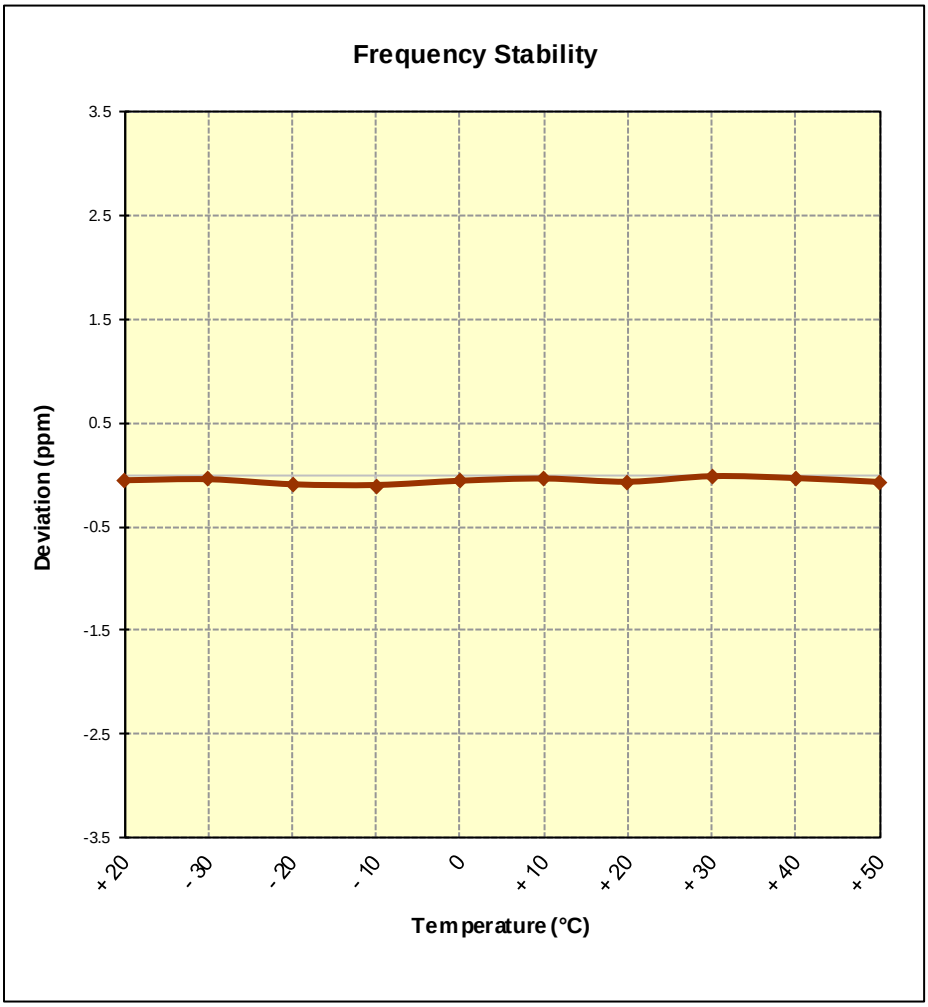


Figure 7-11. Frequency Stability Graph (Band 2)

Band 7 Frequency Stability Measurements

OPERATING FREQUENCY:	2,535,000,000	Hz
CHANNEL:	21100	
REFERENCE VOLTAGE:	4.35	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.35	+ 20 (Ref)	2,534,999,973	-27	-0.0000011
100 %		- 30	2,534,999,864	-136	-0.0000054
100 %		- 20	2,534,999,816	-184	-0.0000073
100 %		- 10	2,534,999,889	-111	-0.0000044
100 %		0	2,534,999,957	-43	-0.0000017
100 %		+ 10	2,534,999,949	-51	-0.0000020
100 %		+ 20	2,534,999,951	-49	-0.0000019
100 %		+ 30	2,534,999,915	-85	-0.0000034
100 %		+ 40	2,534,999,998	-2	-0.0000001
100 %		+ 50	2,534,999,815	-185	-0.0000073
BATT. ENDPOINT	3.40	+ 20	2,534,999,876	-124	-0.0000049

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

Note:

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

Band 7 Frequency Stability Measurements

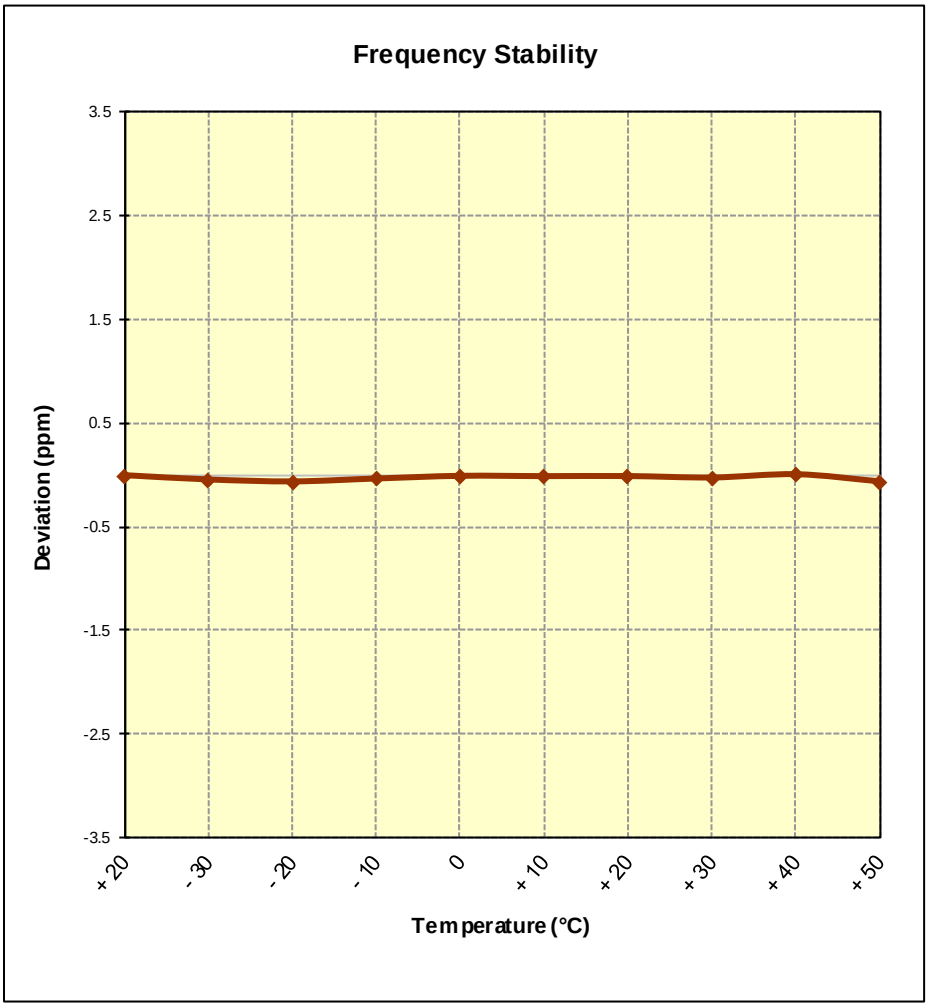


Figure 7-12. Frequency Stability Graph (Band 7)

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMJ337A** complies with all the requirements of Part 22, 24, & 27 of the FCC Rules for LTE operation only.