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.

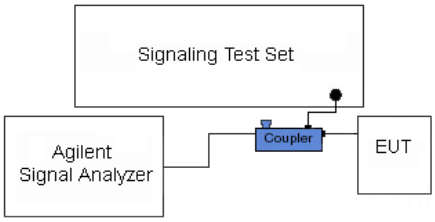

Figure 7-3. Test Instrument & Measurement Setup

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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.
27.53(c)(5) for operations in the 776-788 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.

For all plots showing emissions in the 763 – 775MHz and 793 – 805MHz band, the FCC limit per 27.53(c)(4) is 65 + $10\log_{10}(P)$ = -35dBm in a 6.25kHz bandwidth.

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.

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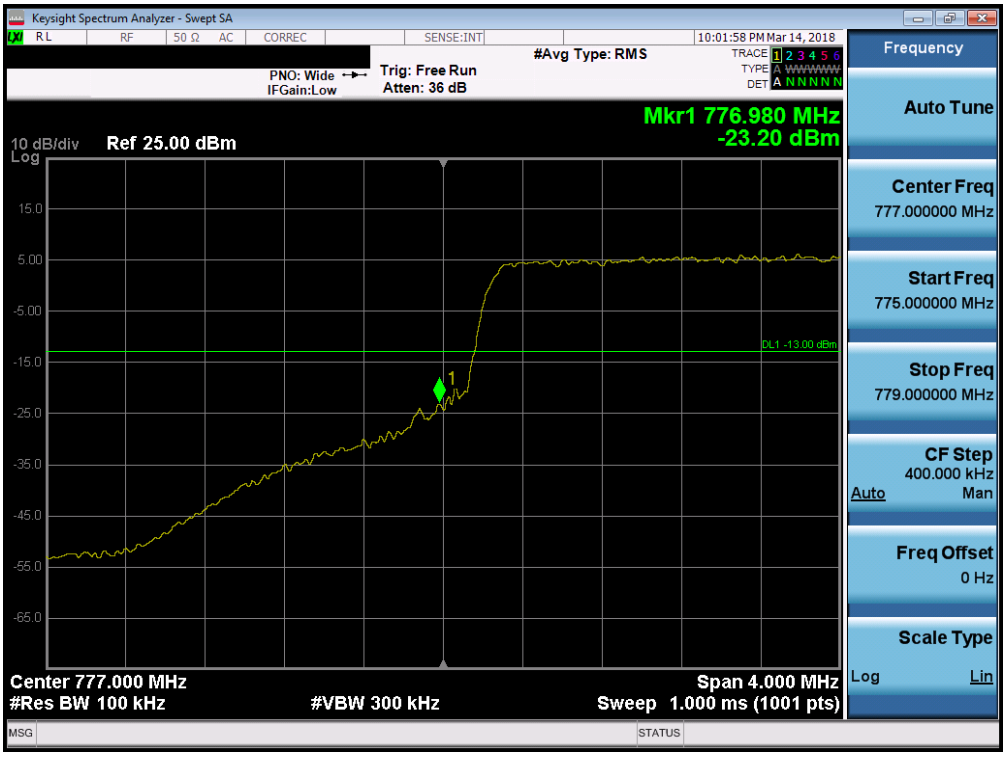
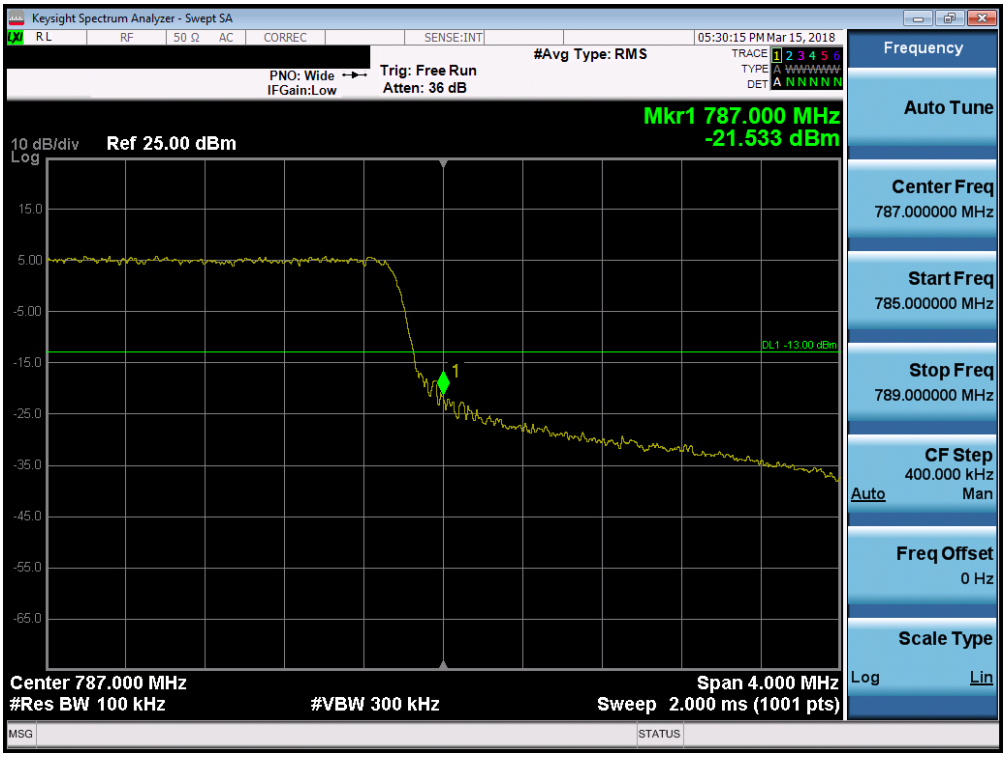


Plot 7-84. Lower Band Edge Plot (Band 13 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-85. Upper Band Edge Plot (Band 13 - 5.0MHz QPSK - Full RB Configuration)

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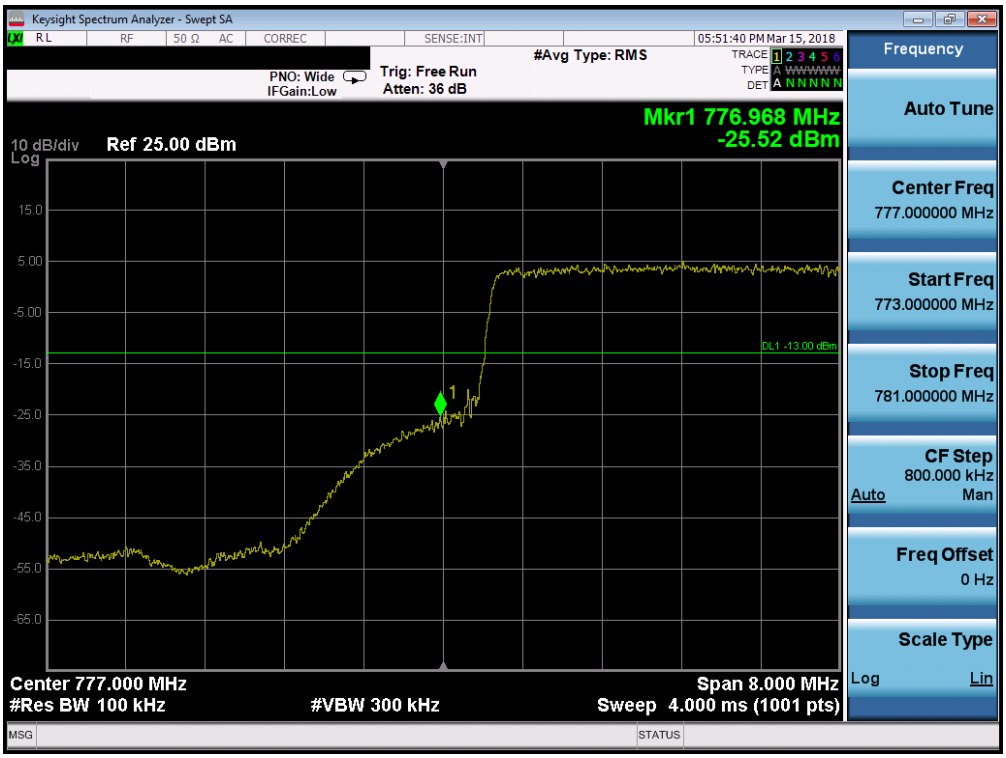

Plot 7-86. Lower Band Edge Plot (Band 13 - 10.0MHz QPSK - Full RB Configuration)

Plot 7-87. Upper Band Edge Plot (Band 13 - 10.0MHz QPSK - Full RB Configuration)

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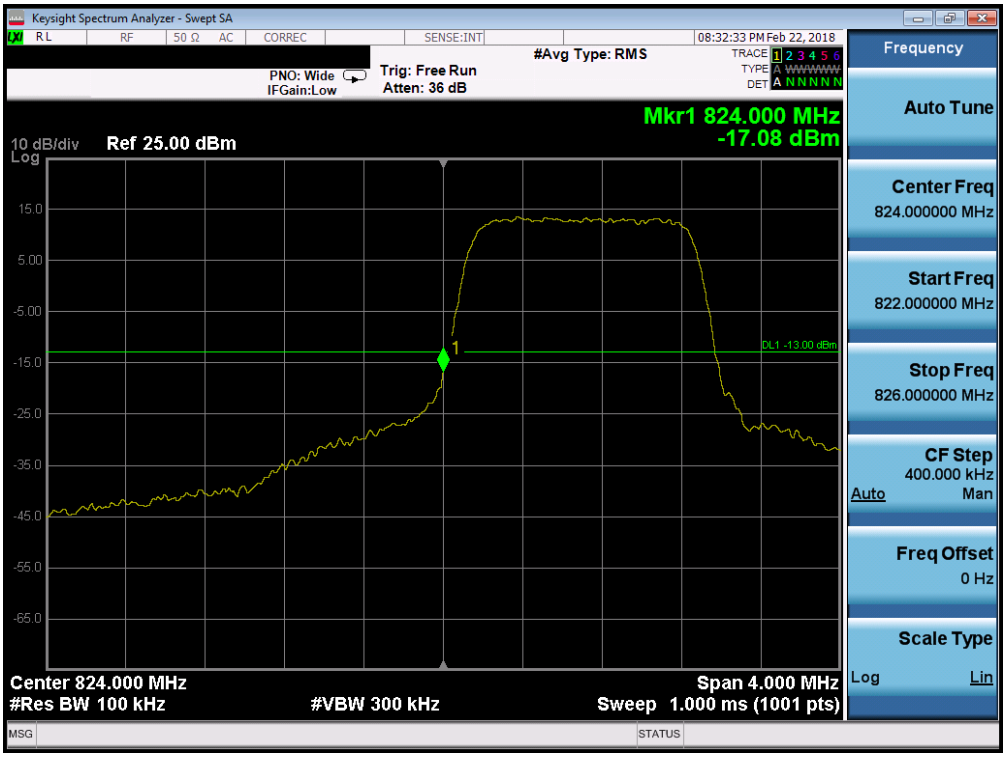
Band 5



Plot 7-88. Lower Band Edge Plot (Band 5 - 1.4MHz QPSK - Full RB Configuration)

Plot 7-89. Upper Band Edge Plot (Band 5 - 1.4MHz QPSK - Full RB Configuration)

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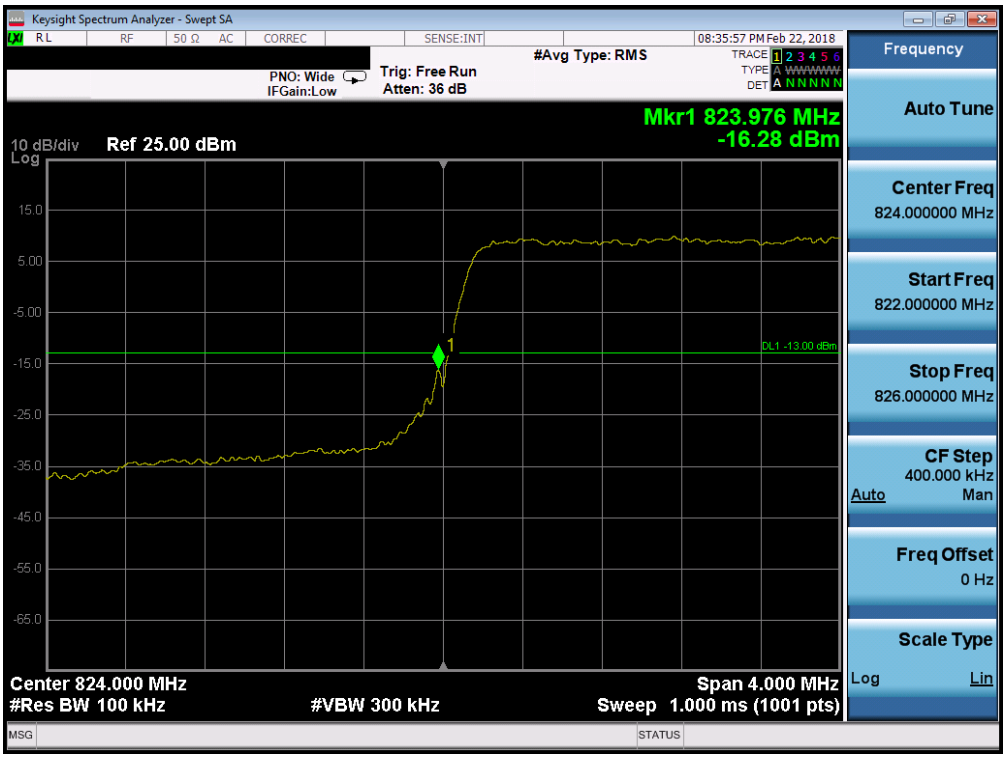

Plot 7-90. Lower Band Edge Plot (Band 5 - 3.0MHz QPSK - Full RB Configuration)

Plot 7-91. Upper Band Edge Plot (Band 5 - 3.0MHz QPSK - Full RB Configuration)

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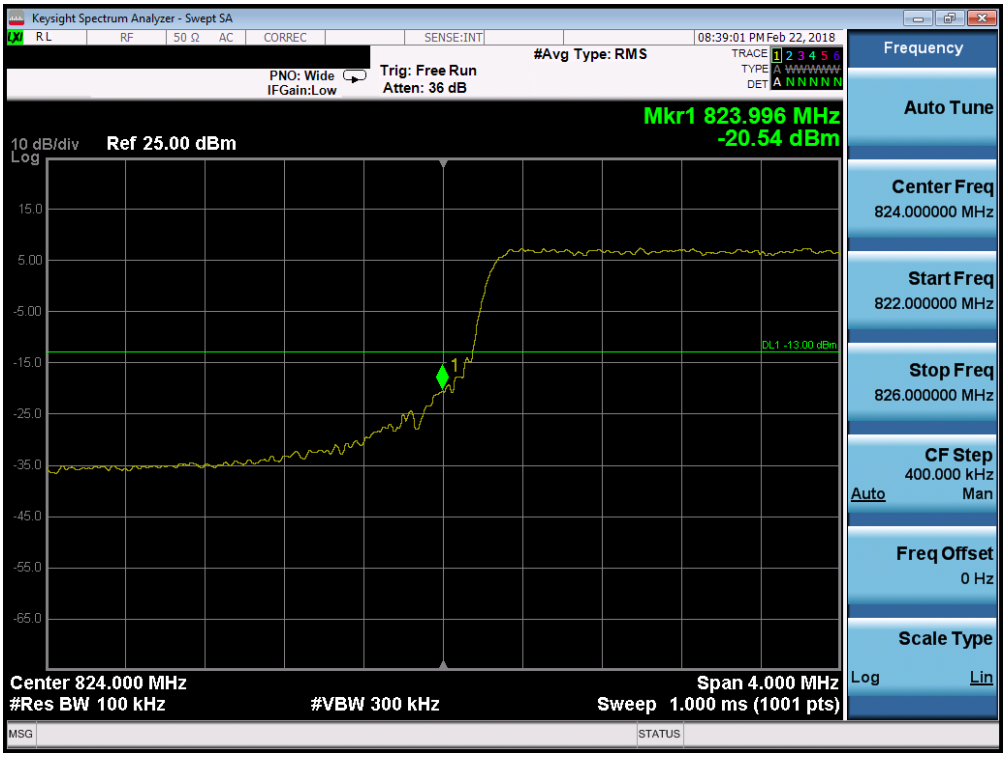

Plot 7-92. Lower Band Edge Plot (Band 5 - 5.0MHz QPSK - Full RB Configuration)

Plot 7-93. Upper Band Edge Plot (Band 5 - 5.0MHz QPSK - Full RB Configuration)

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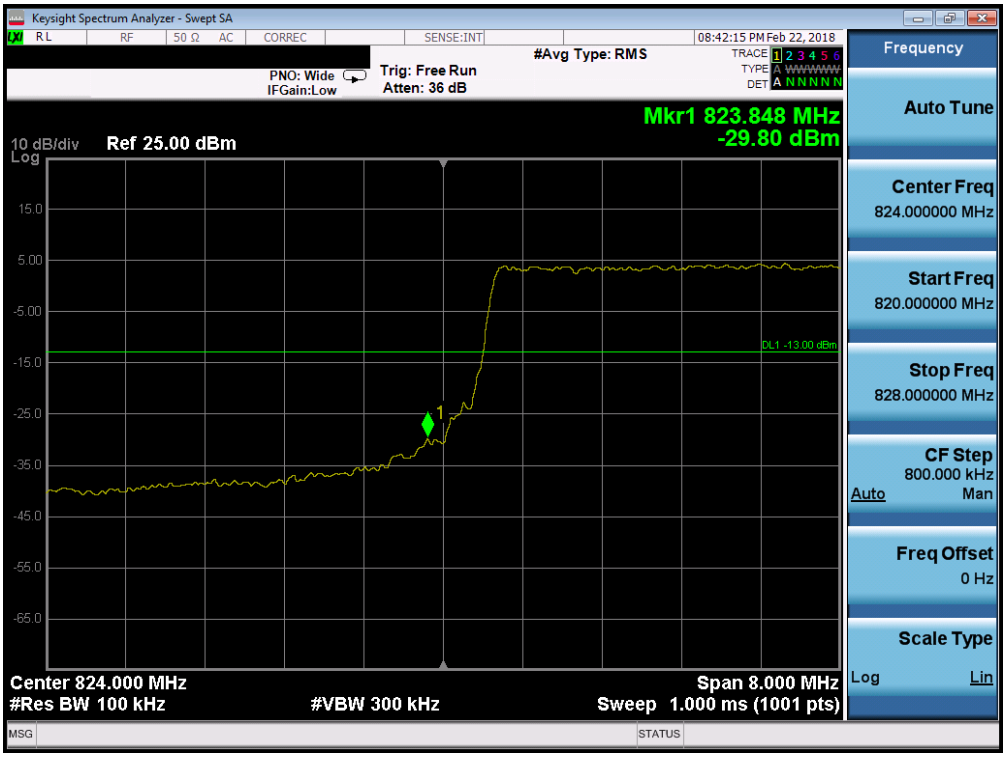

Plot 7-94. Lower Band Edge Plot (Band 5 - 10.0MHz QPSK - Full RB Configuration)

Plot 7-95. Upper Band Edge Plot (Band 5 - 10.0MHz QPSK - Full RB Configuration)

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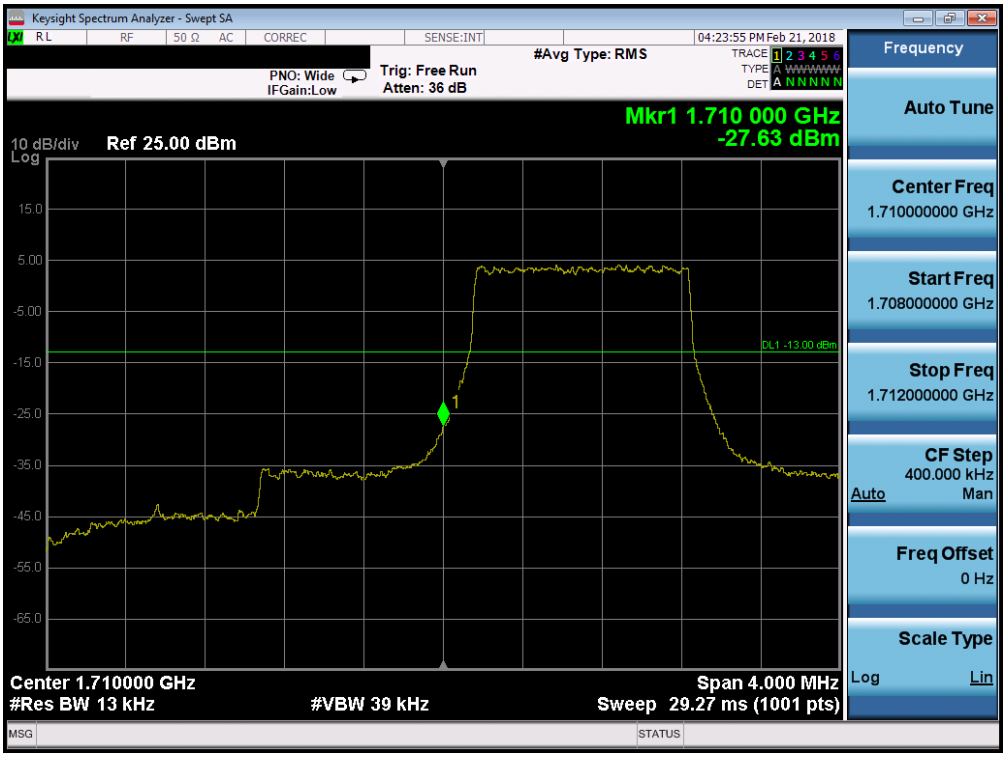
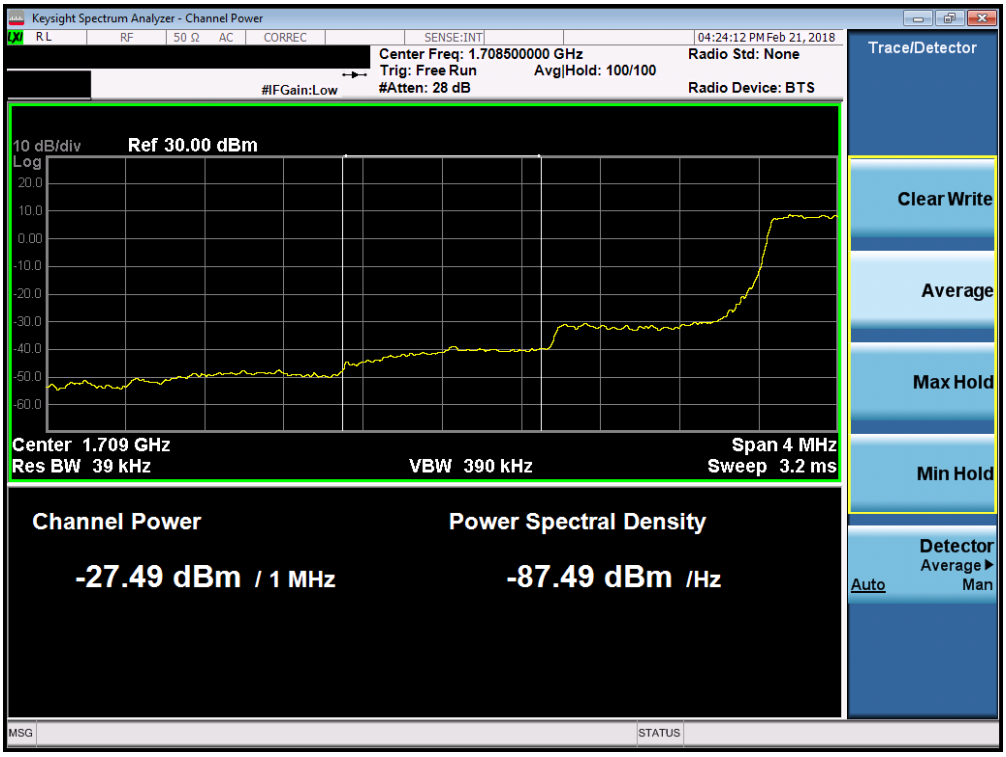
Band 4



Plot 7-96. Lower Band Edge Plot (Band 4 - 1.4MHz QPSK - Full RB Configuration)



Plot 7-97. Lower Extended Band Edge Plot (Band 4 - 1.4MHz QPSK - Full RB Configuration)

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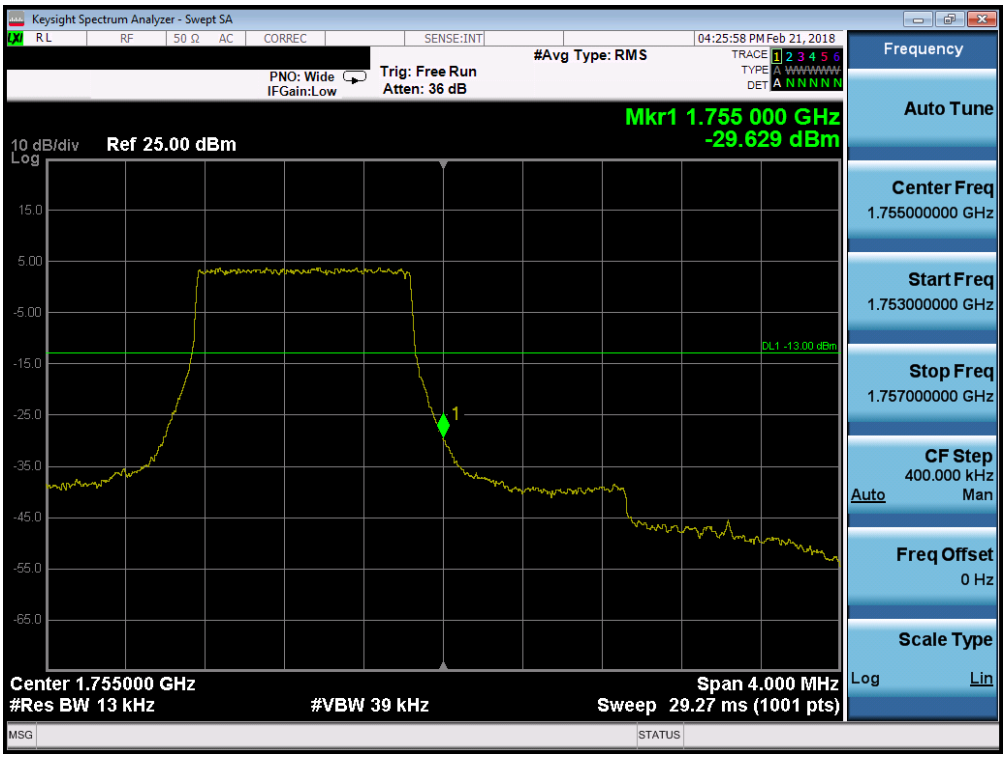
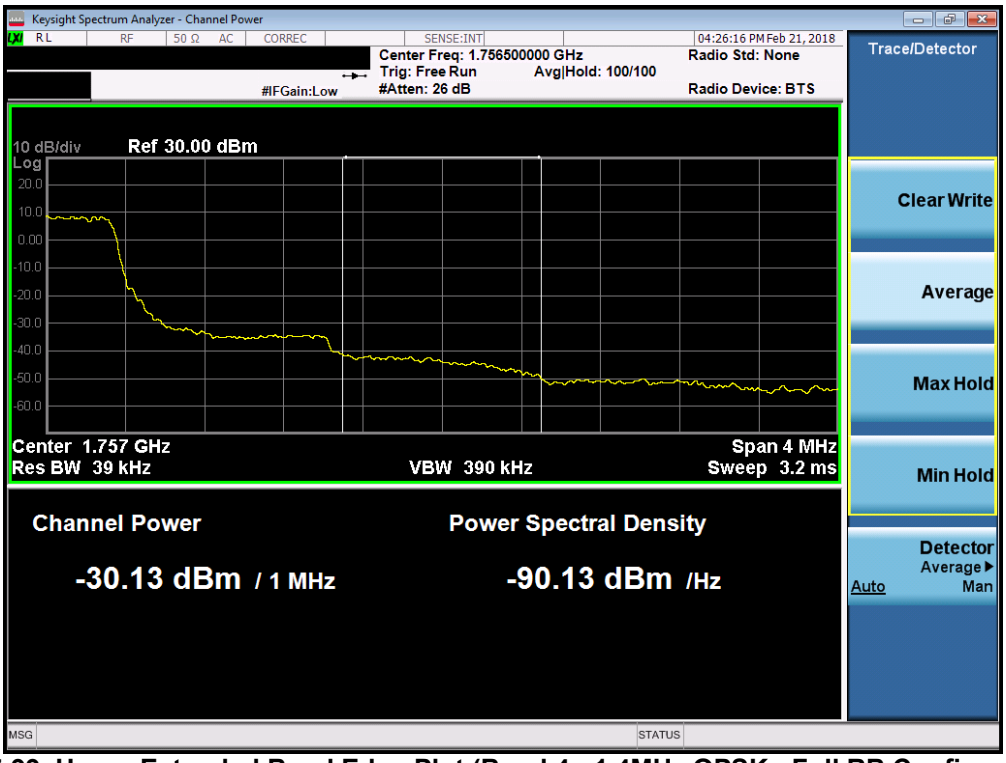


Plot 7-98. Upper Band Edge Plot (Band 4 - 1.4MHz QPSK - Full RB Configuration)



Plot 7-99. Upper Extended Band Edge Plot (Band 4 - 1.4MHz QPSK - Full RB Configuration)

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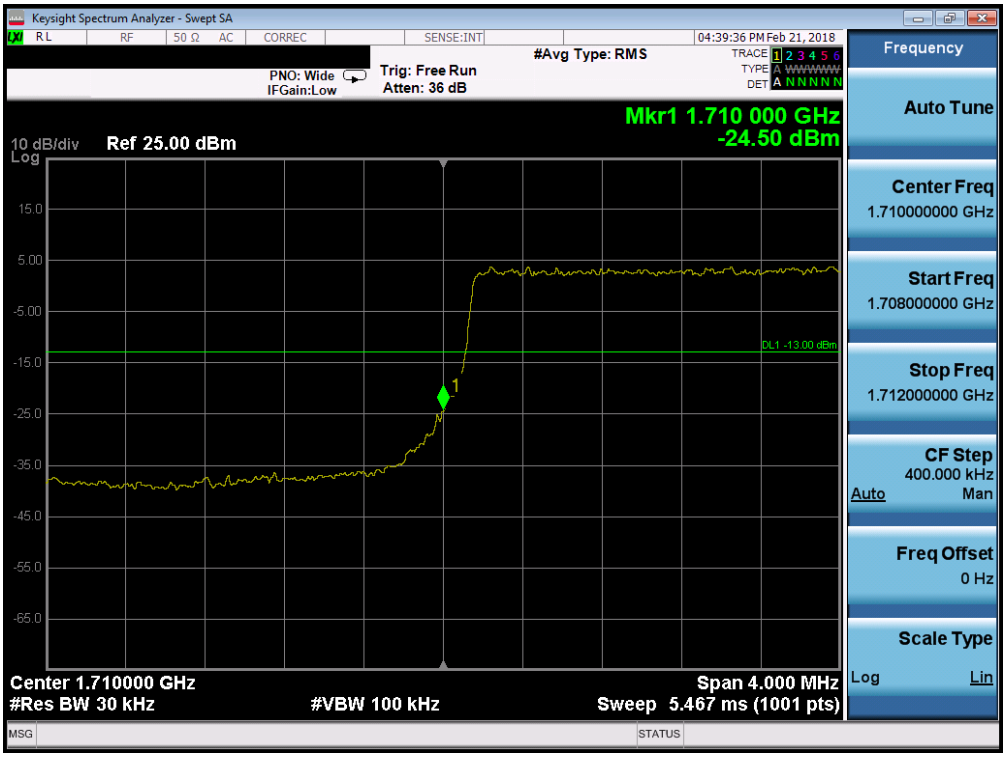
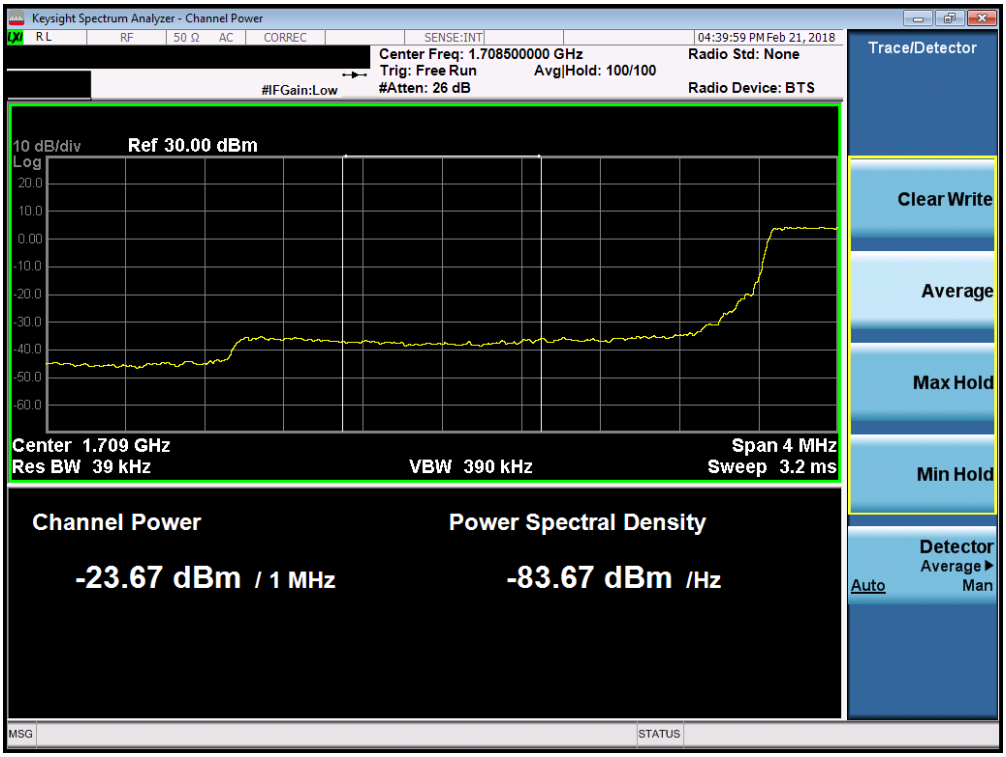


Plot 7-100. Lower Band Edge Plot (Band 4 - 3.0MHz QPSK - Full RB Configuration)



Plot 7-101. Lower Extended Band Edge Plot (Band 4 - 3.0MHz QPSK - Full RB Configuration)

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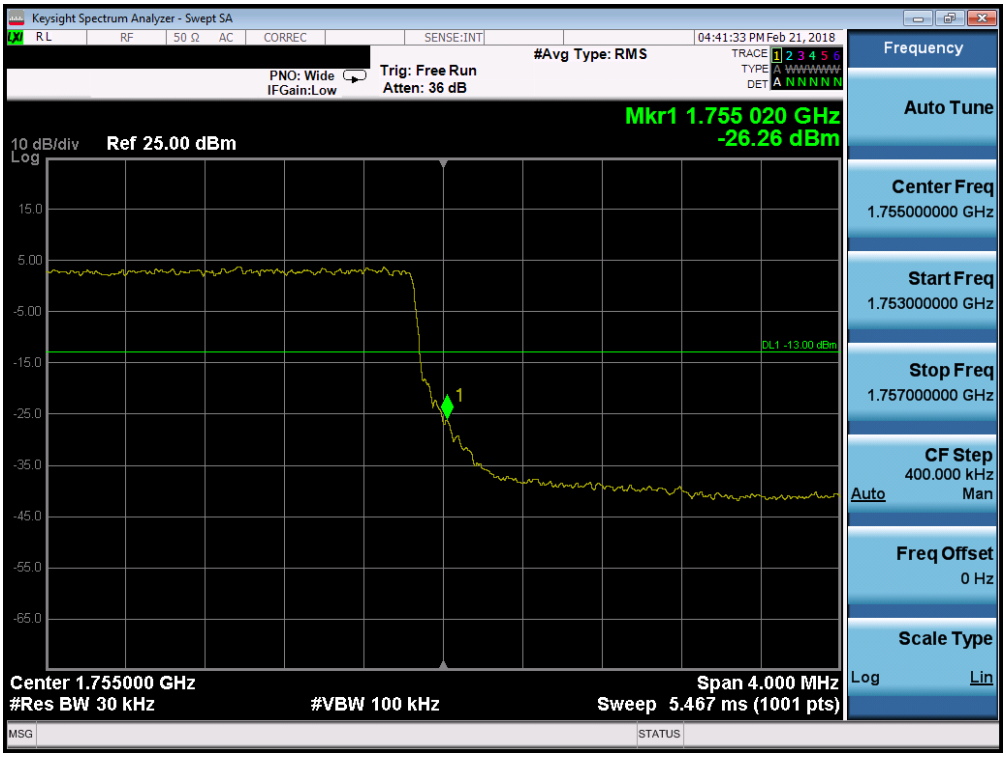
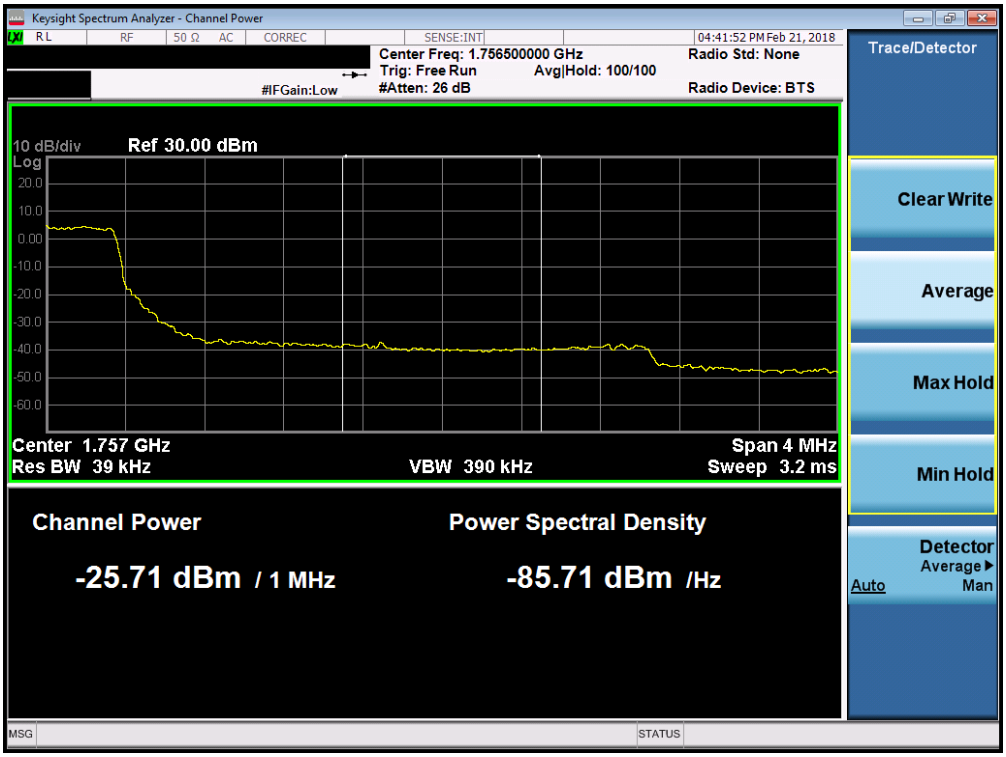


Plot 7-102. Upper Band Edge Plot (Band 4 - 3.0MHz QPSK - Full RB Configuration)



Plot 7-103. Upper Extended Band Edge Plot (Band 4 - 3.0MHz QPSK - Full RB Configuration)

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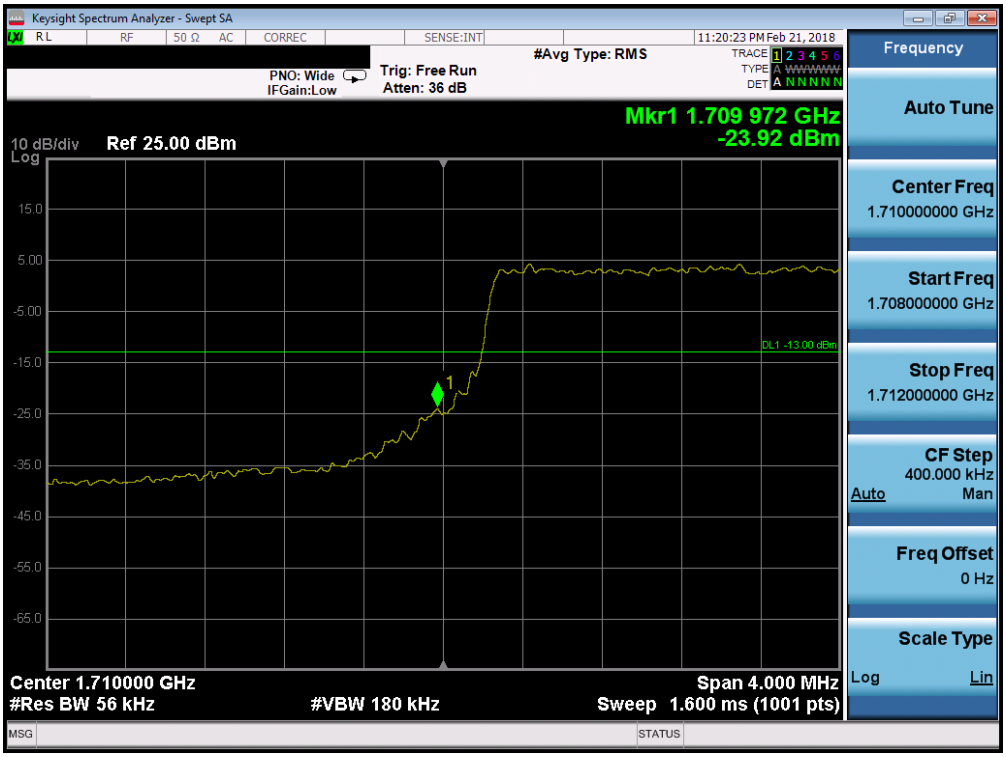
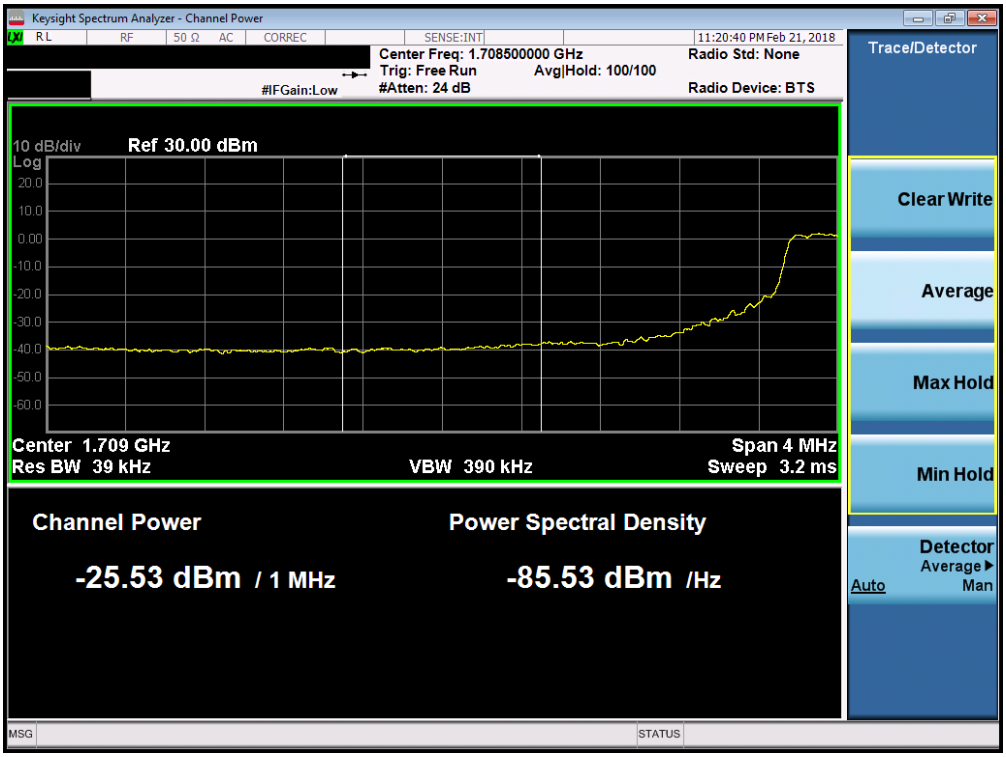


Plot 7-104. Lower Band Edge Plot (Band 4 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-105. Lower Extended Band Edge Plot (Band 4 - 5.0MHz QPSK - Full RB Configuration)

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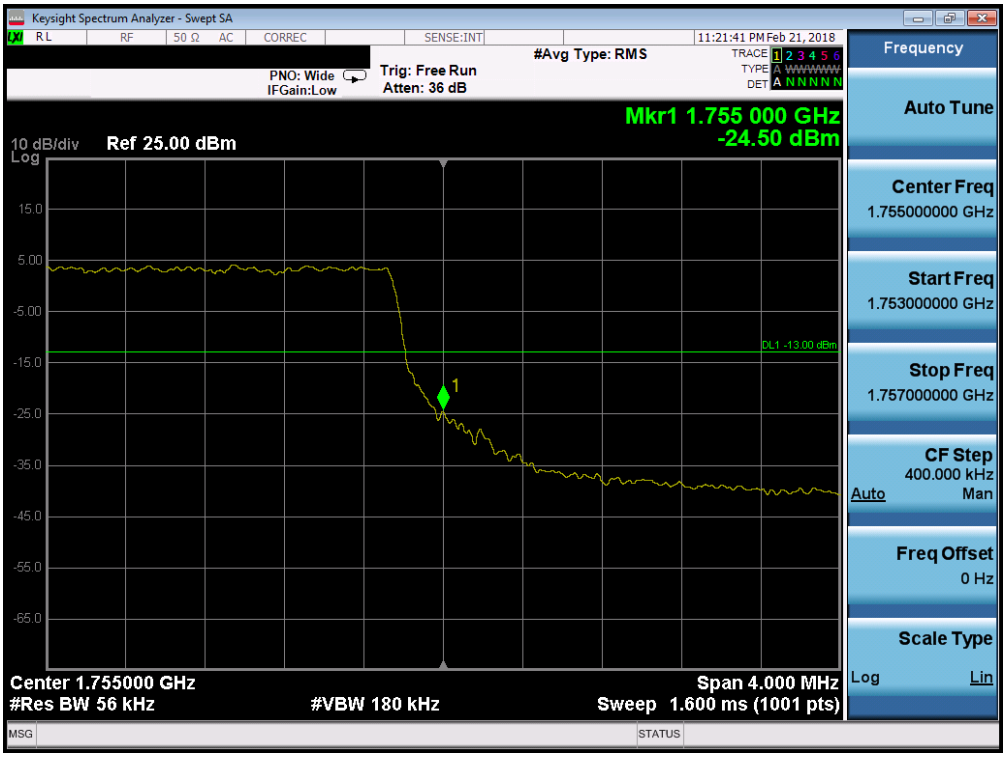
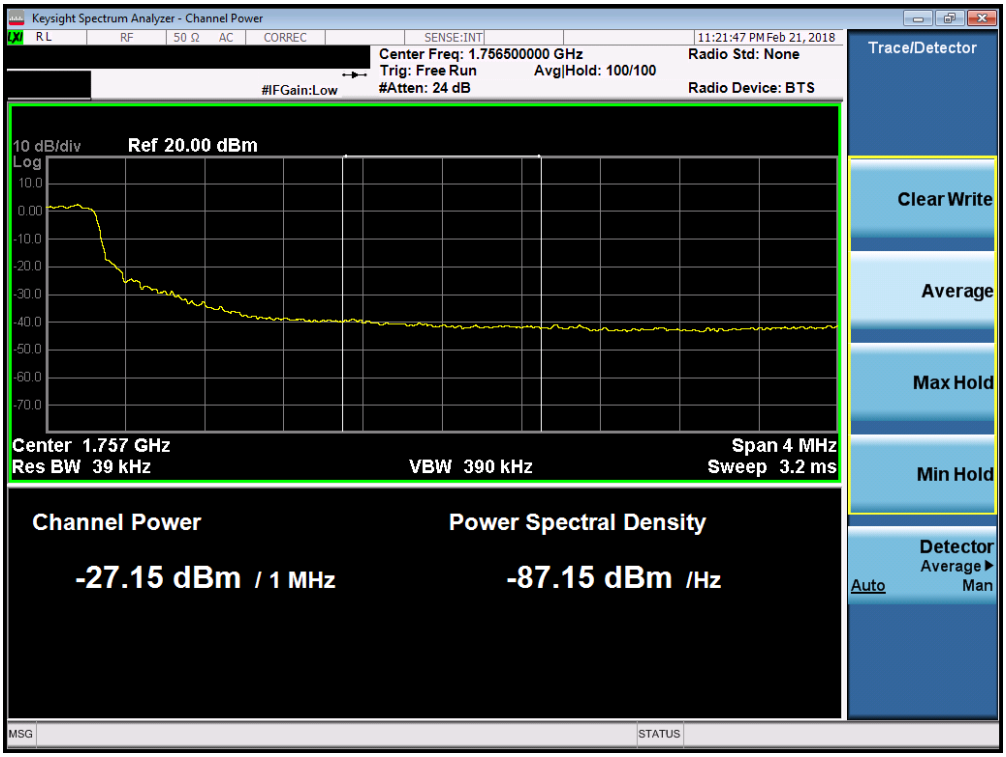


Plot 7-106. Upper Band Edge Plot (Band 4 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-107. Upper Extended Band Edge Plot (Band 4 - 5.0MHz QPSK - Full RB Configuration)

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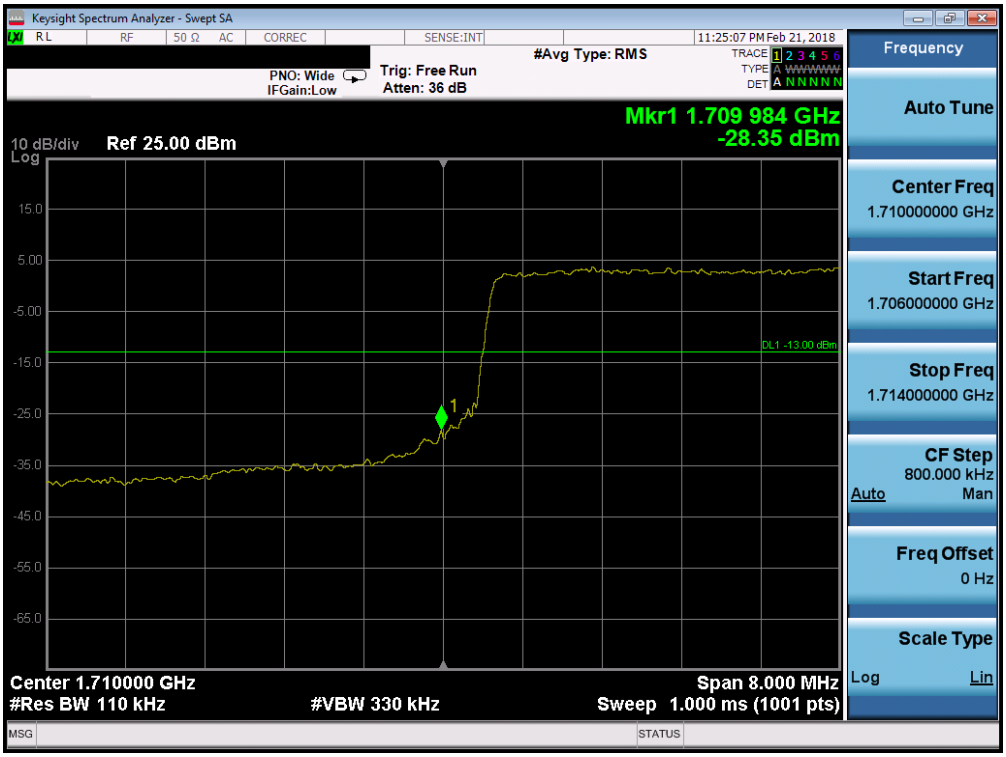
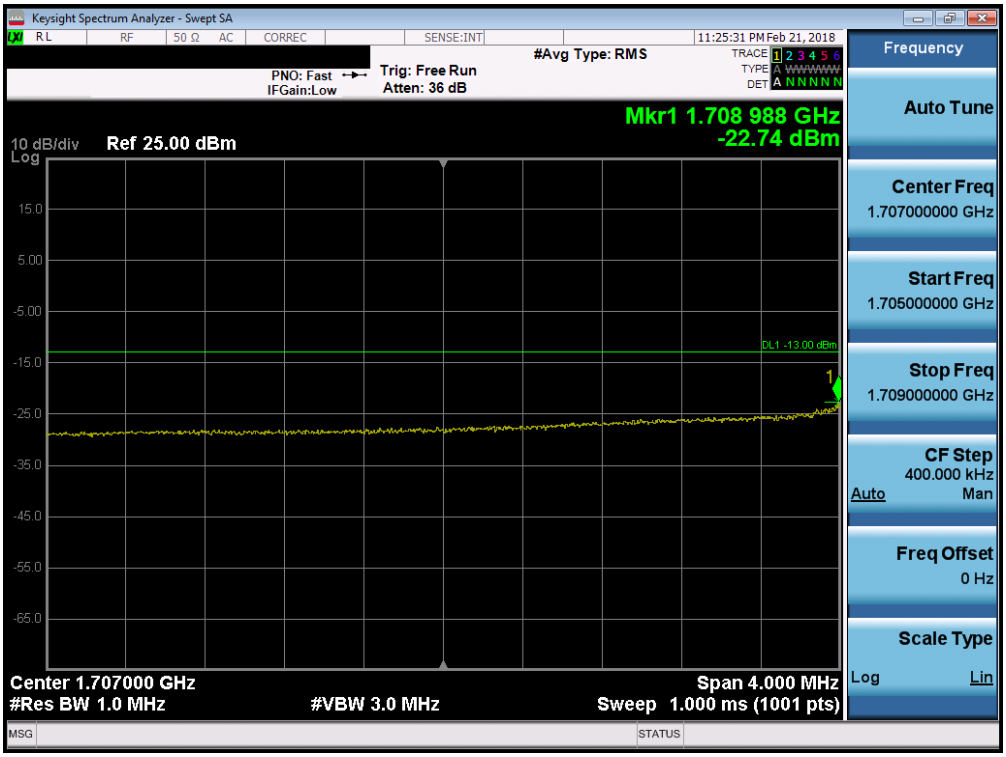


Plot 7-108. Lower Band Edge Plot (Band 4 - 10.0MHz QPSK - Full RB Configuration)



Plot 7-109. Lower Extended Band Edge Plot (Band 4 - 10.0MHz QPSK - Full RB Configuration)

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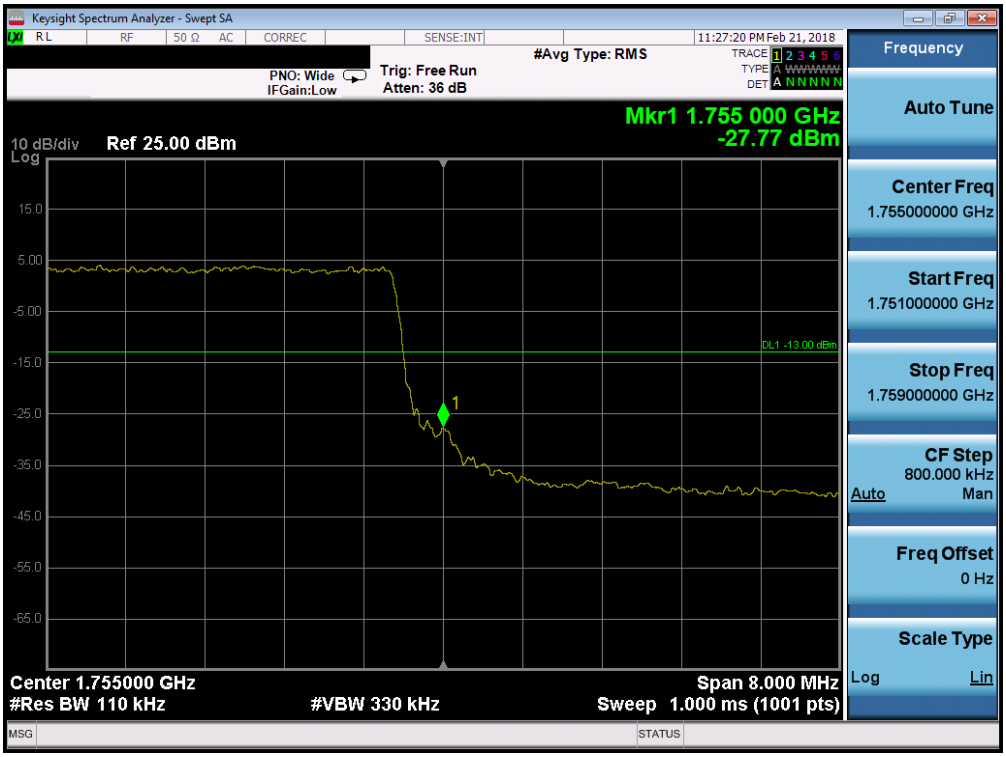
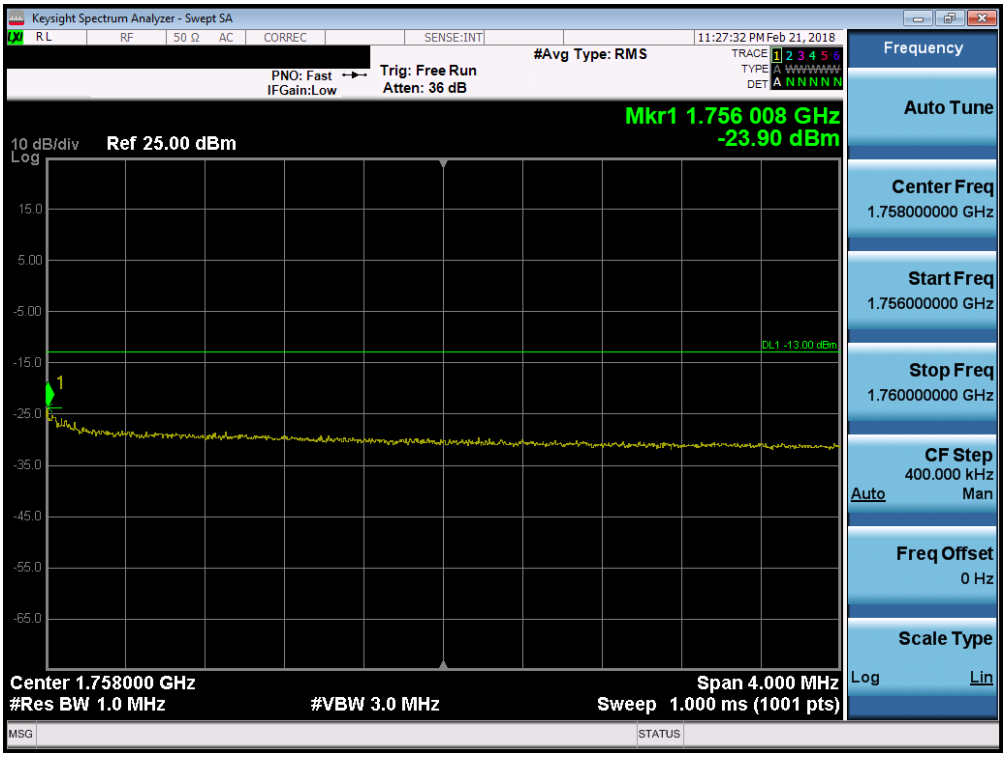


Plot 7-110. Upper Band Edge Plot (Band 4 - 10.0MHz QPSK - Full RB Configuration)



Plot 7-111. Upper Extended Band Edge Plot (Band 4 - 10.0MHz QPSK - Full RB Configuration)

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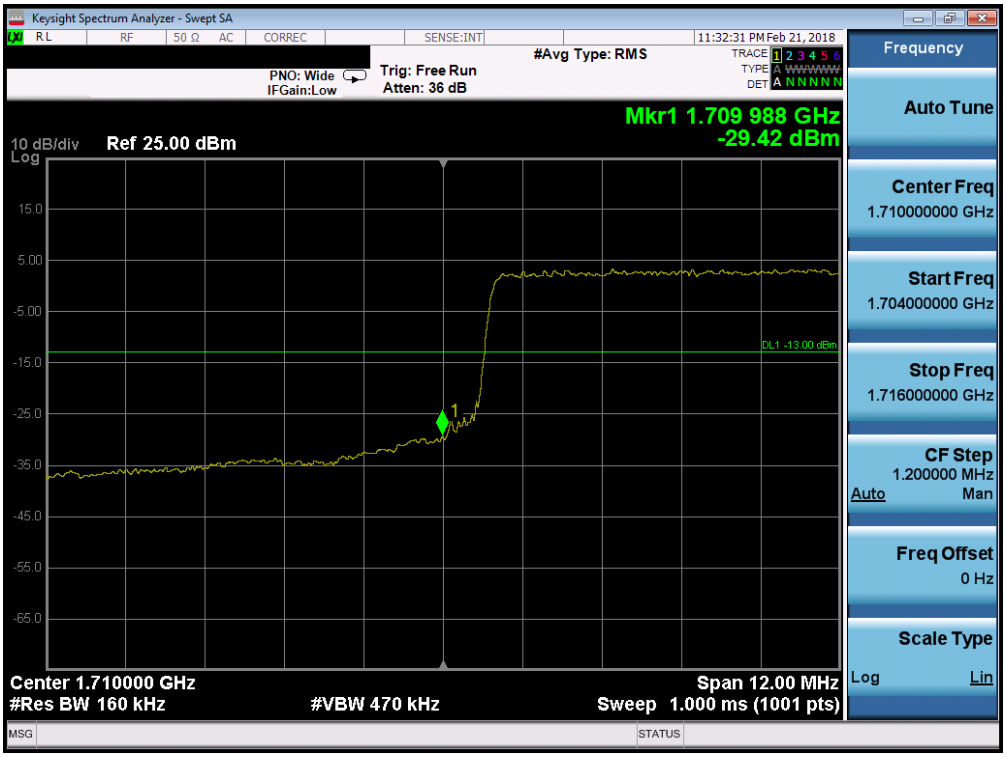
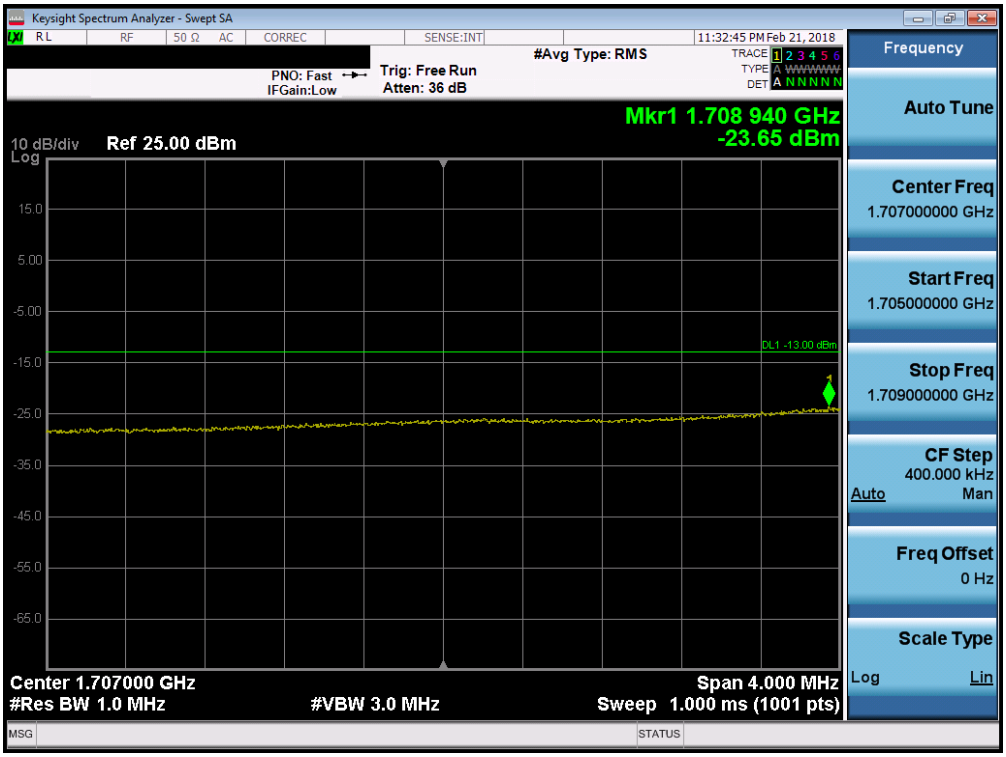


Plot 7-112. Lower Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-113. Lower Extended Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)

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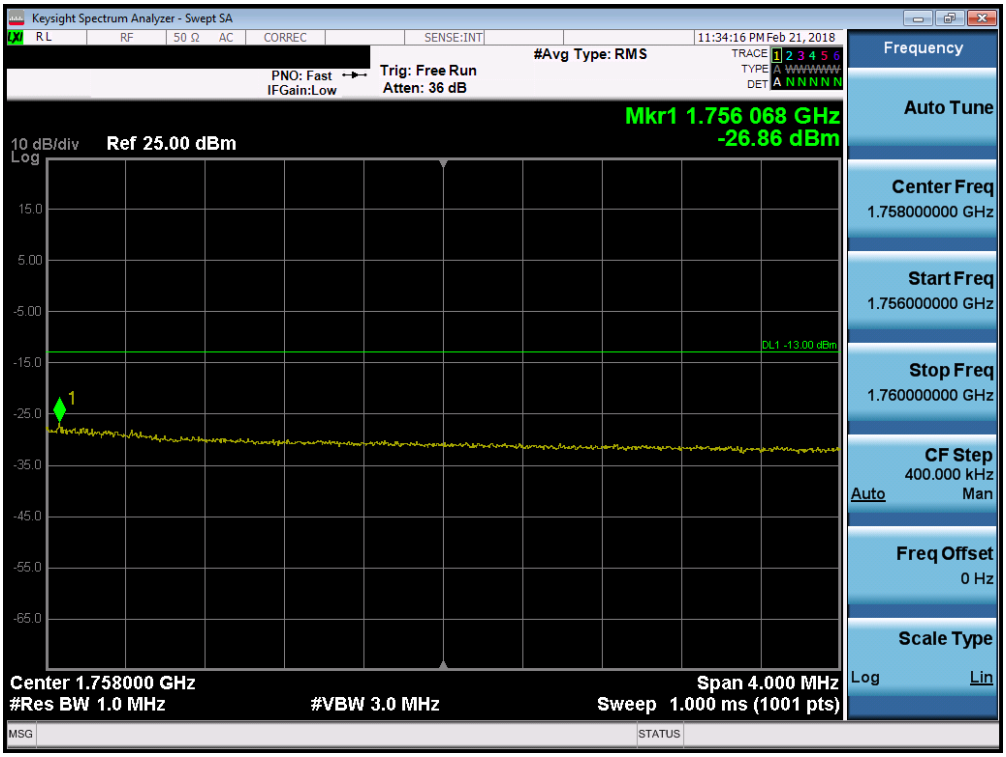
Plot 7-114. Upper Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-115. Upper Extended Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)

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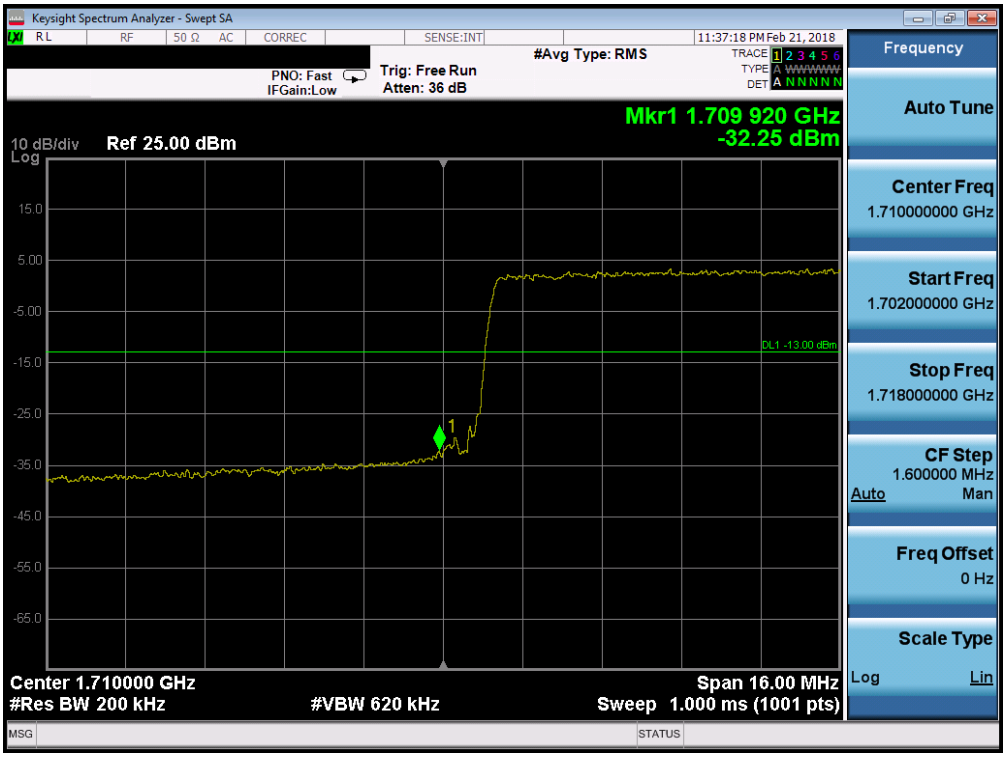
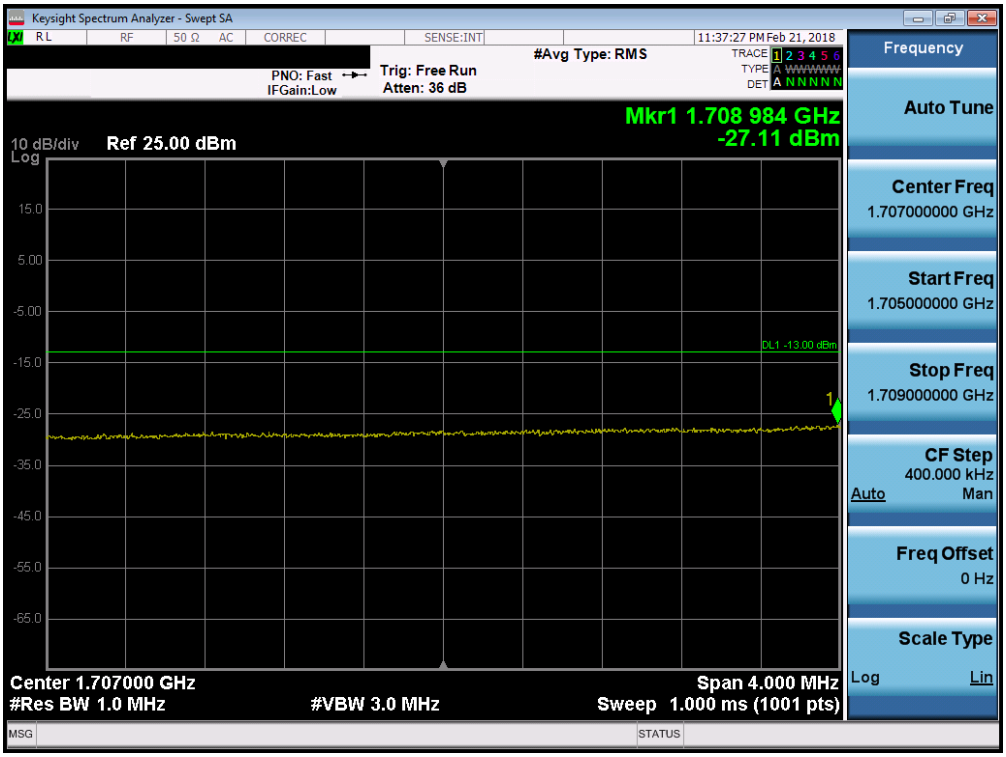


Plot 7-116. Lower Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-117. Lower Extended Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)

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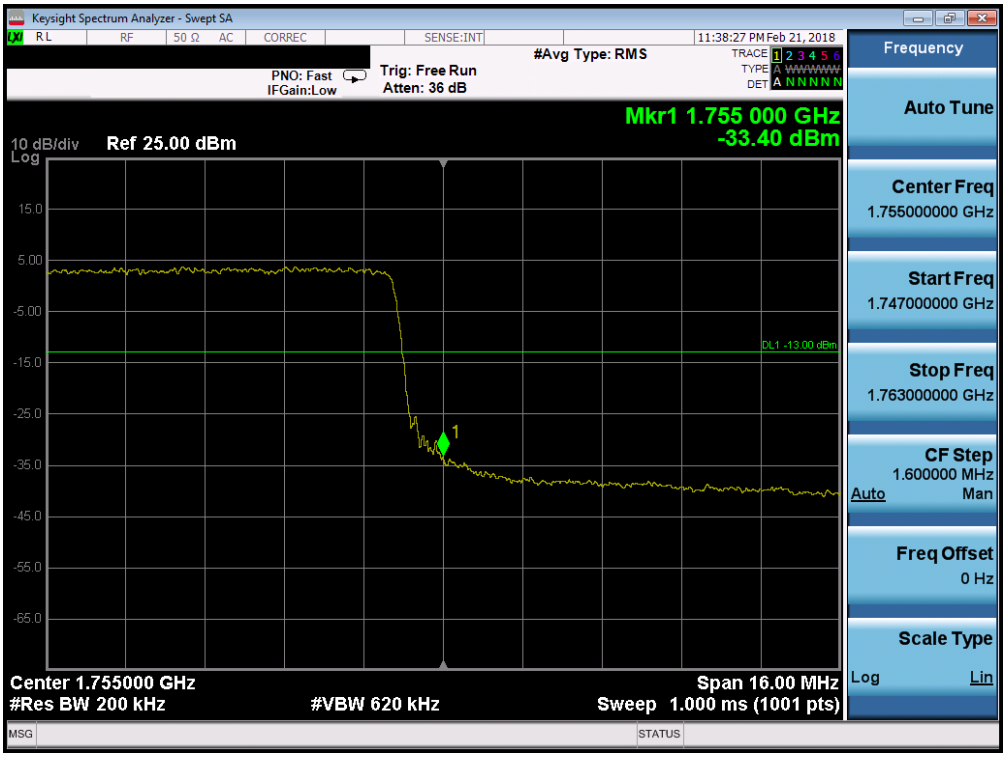
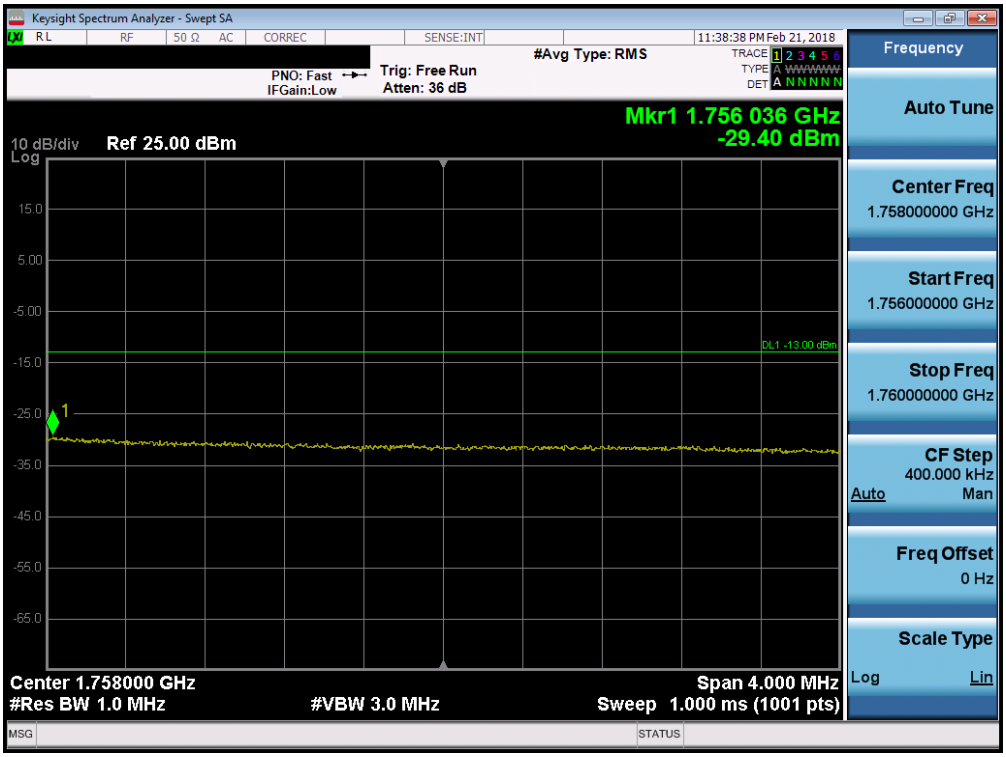


Plot 7-118. Upper Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-119. Upper Extended Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)

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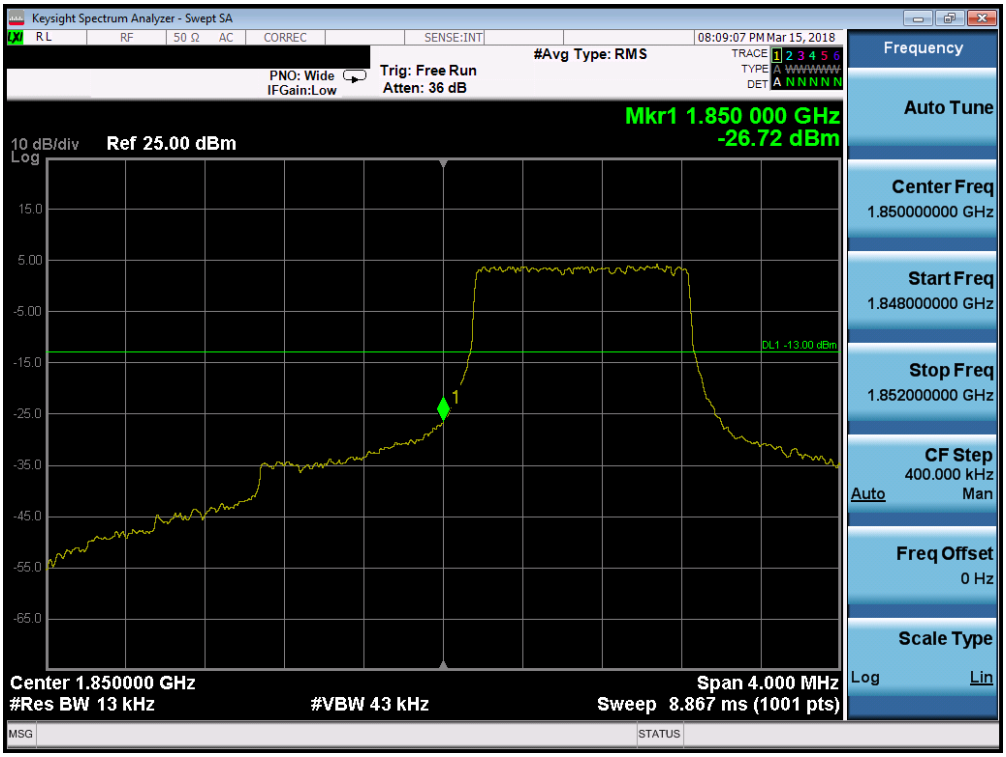
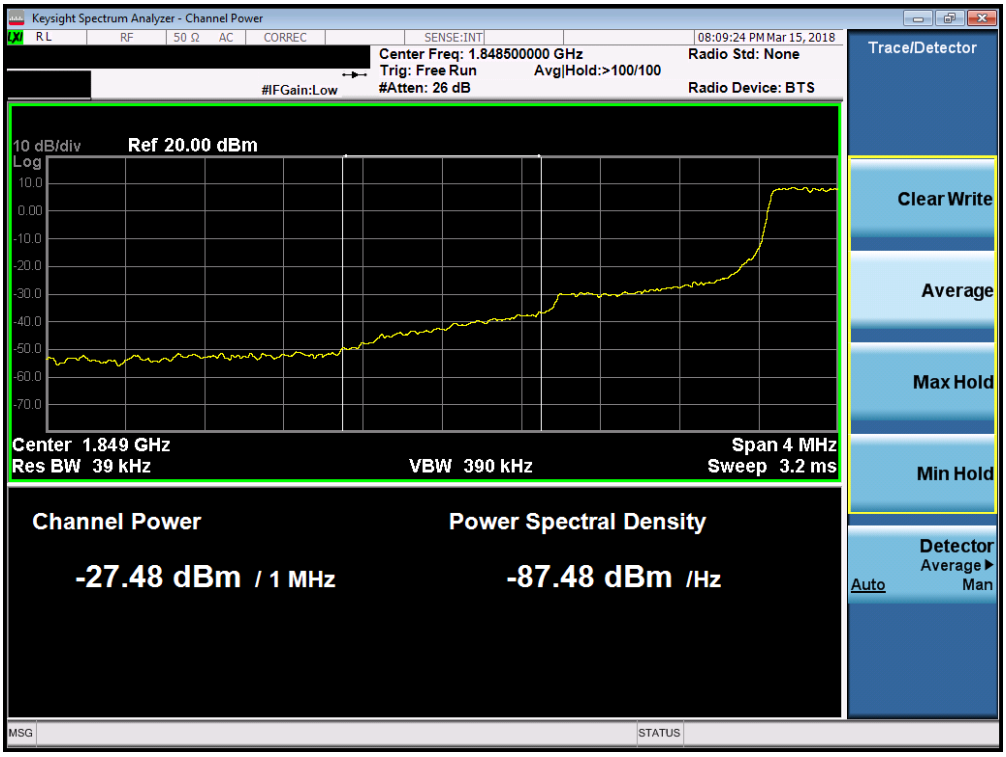
Band 2



Plot 7-120. Lower Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



Plot 7-121. Lower Extended Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)

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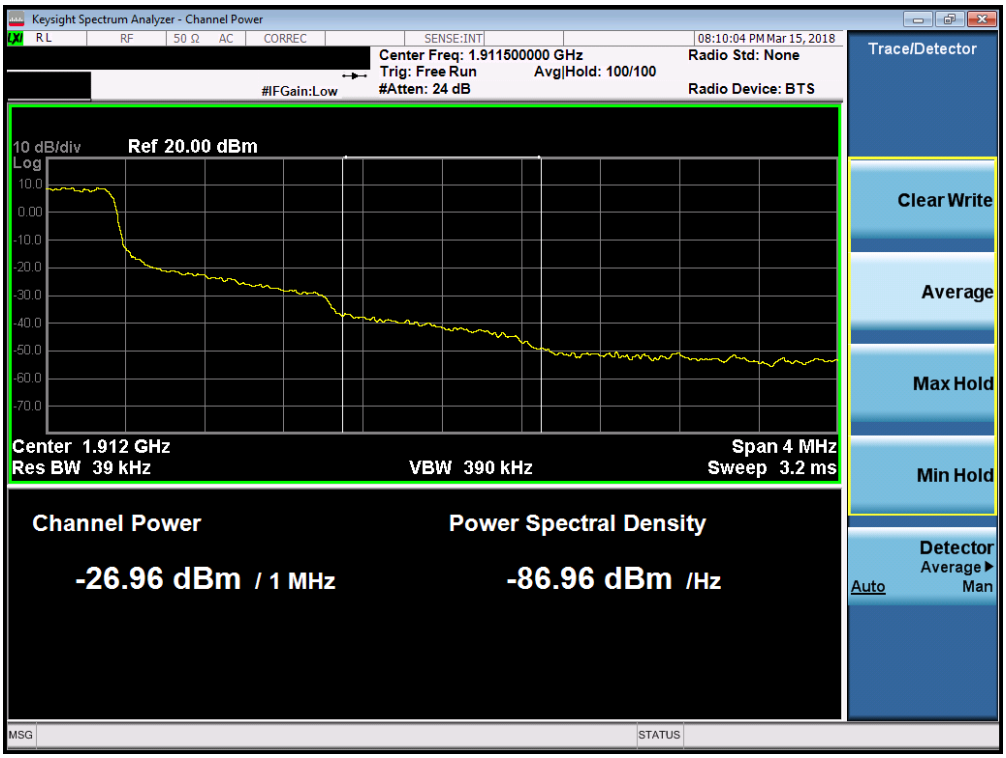
Plot 7-122. Upper Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



Plot 7-123. Upper Extended Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)

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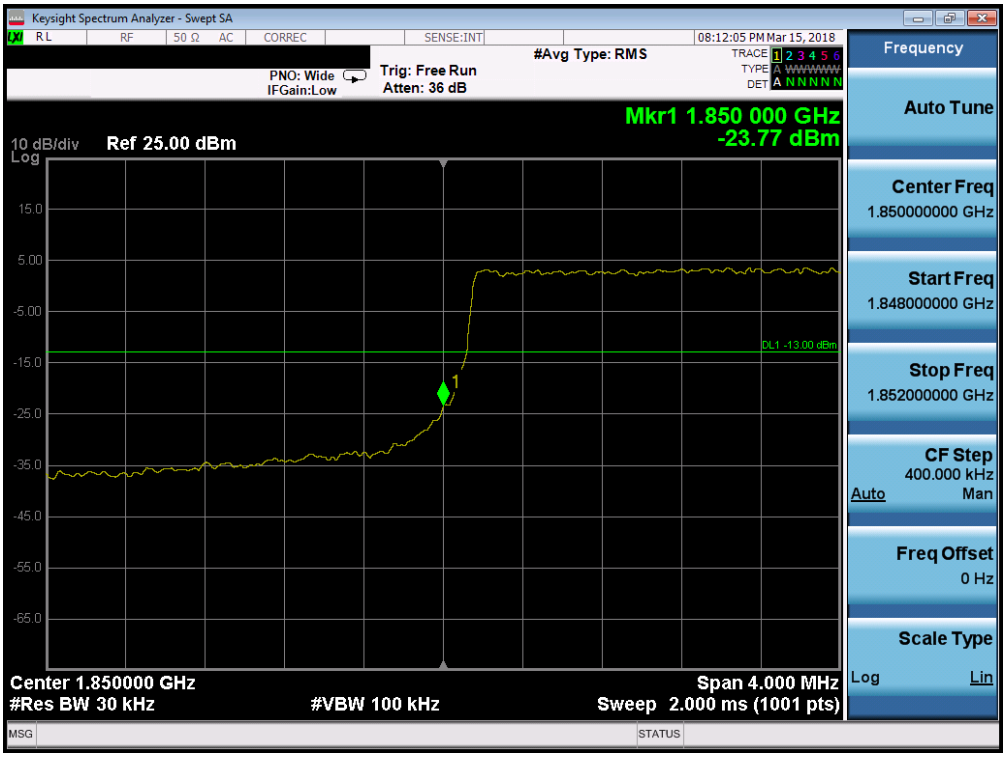
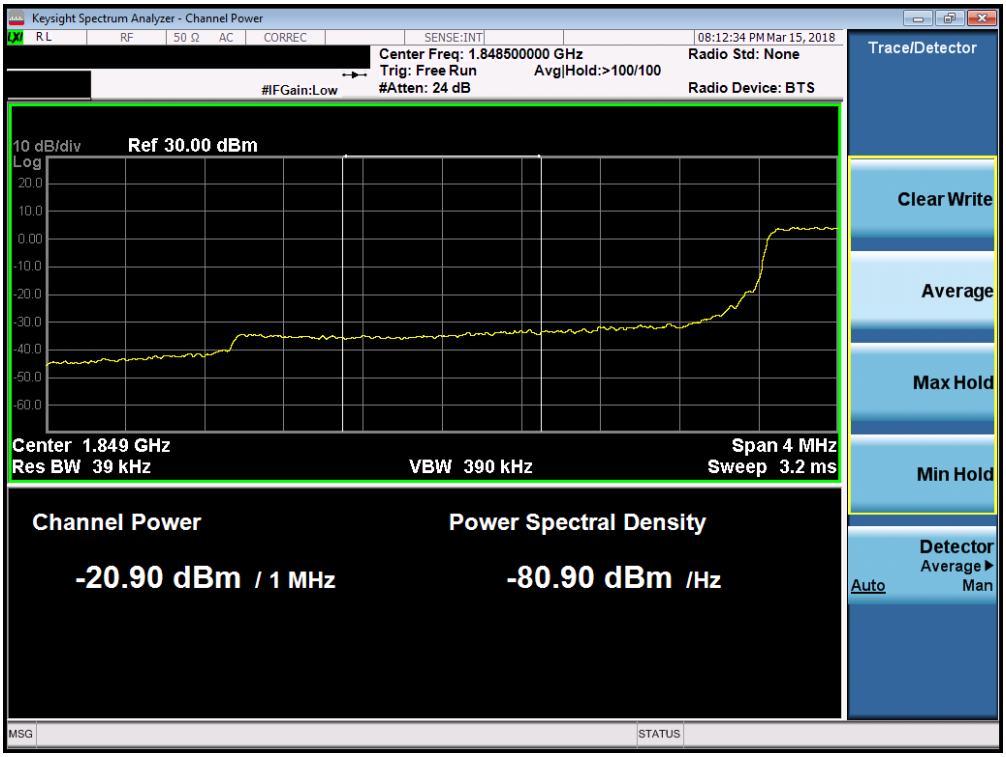


Plot 7-124. Lower Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



Plot 7-125. Lower Extended Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)

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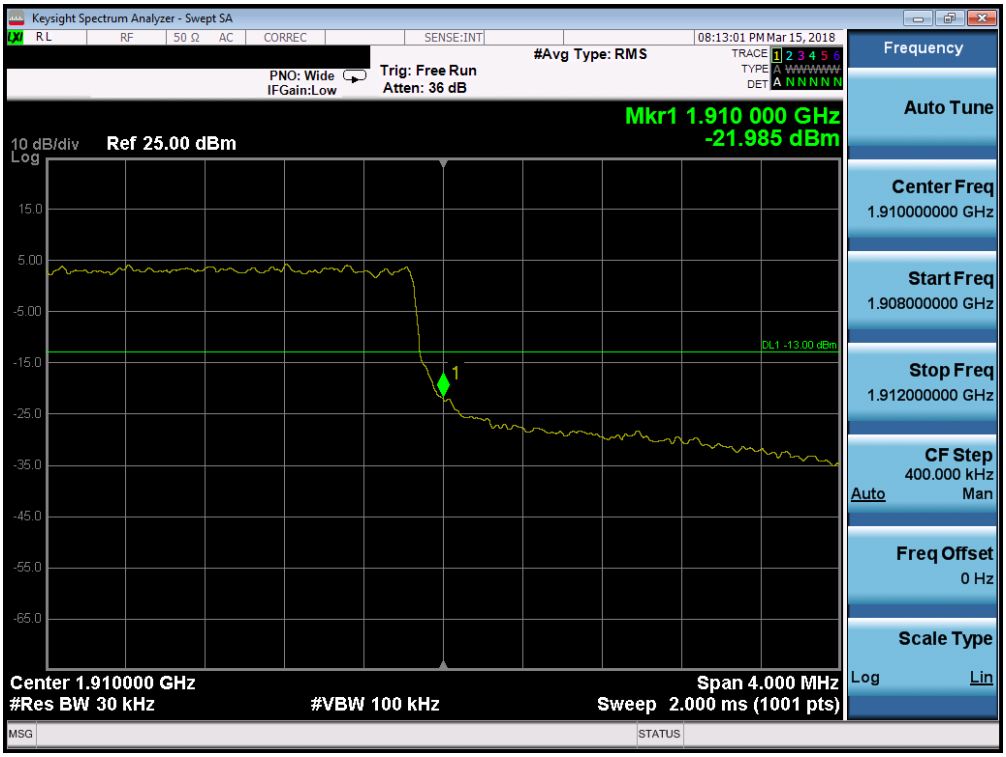
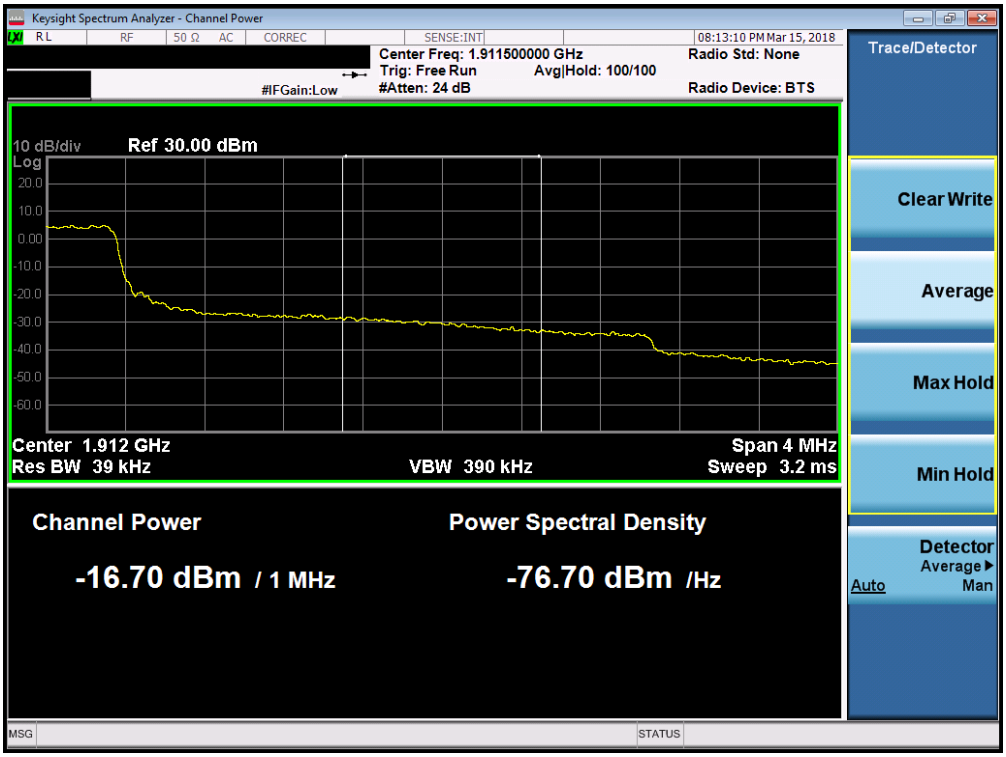


Plot 7-126. Upper Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



Plot 7-127. Upper Extended Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)

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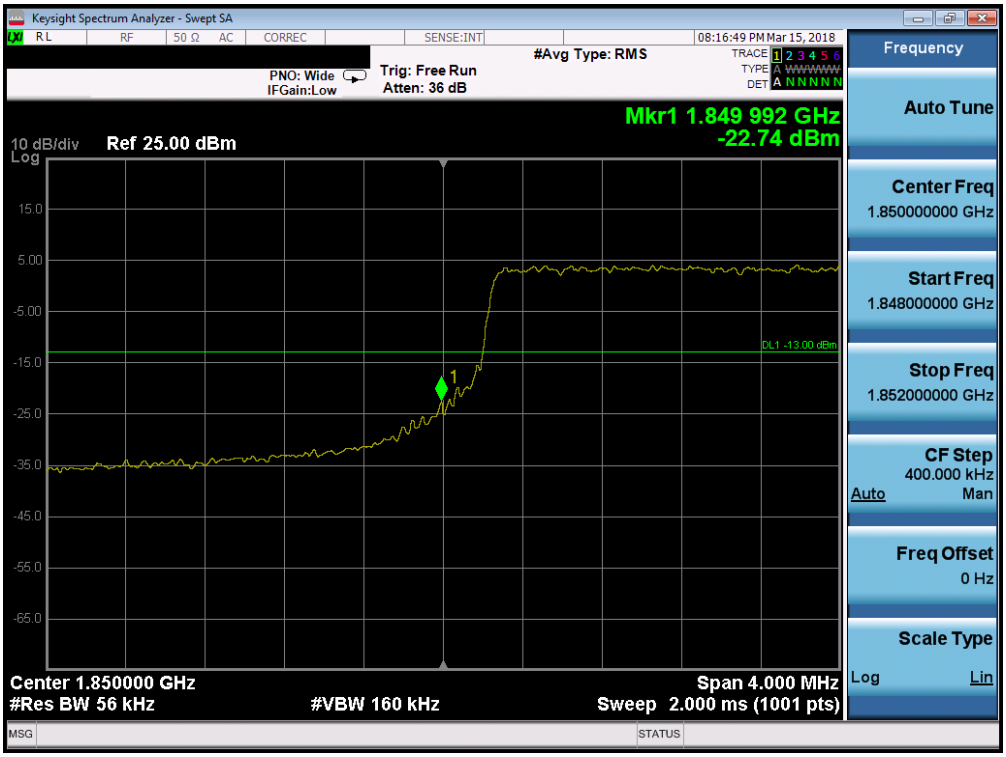
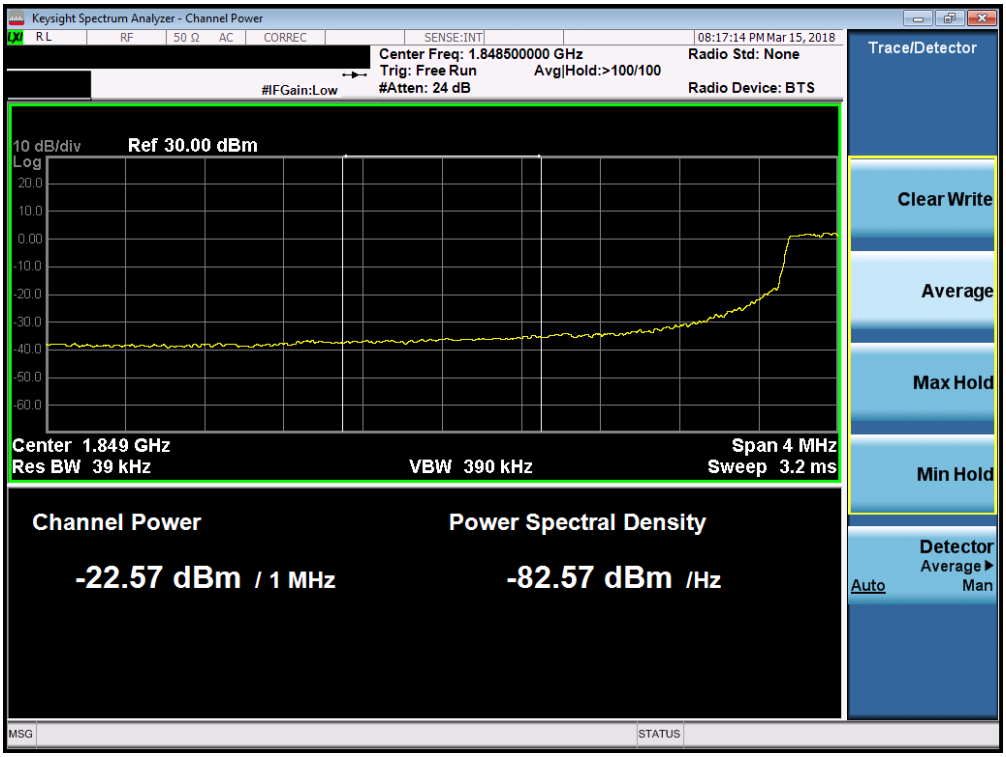


Plot 7-128. Lower Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-129. Lower Extended Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)

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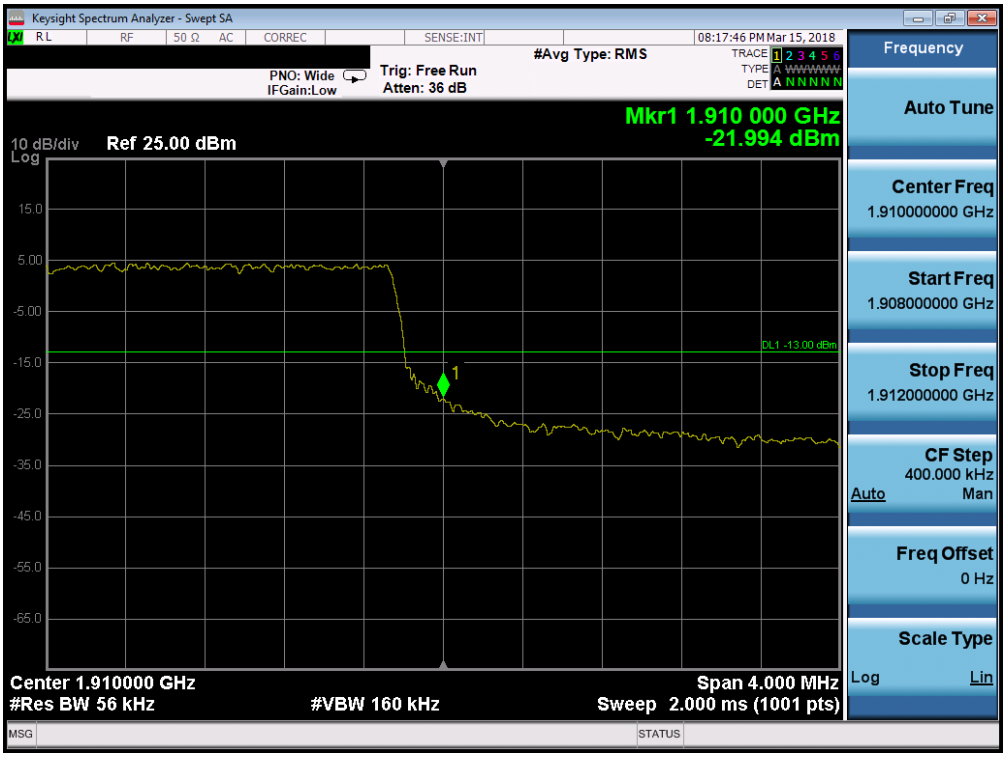
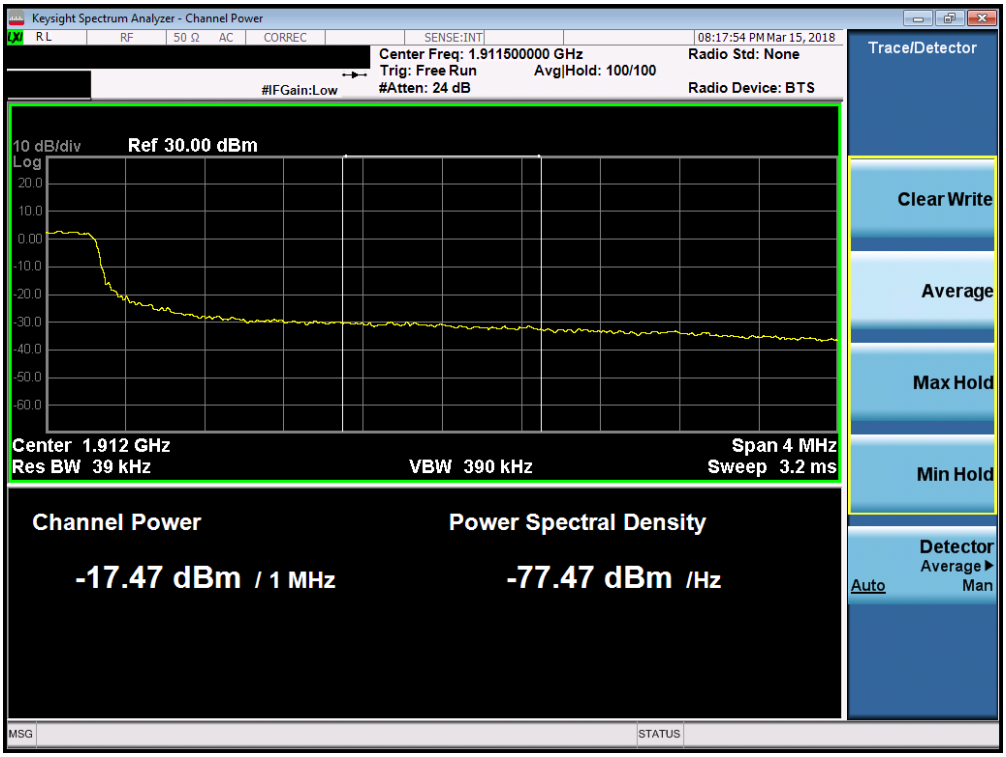


Plot 7-130. Upper Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-131. Upper Extended Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)

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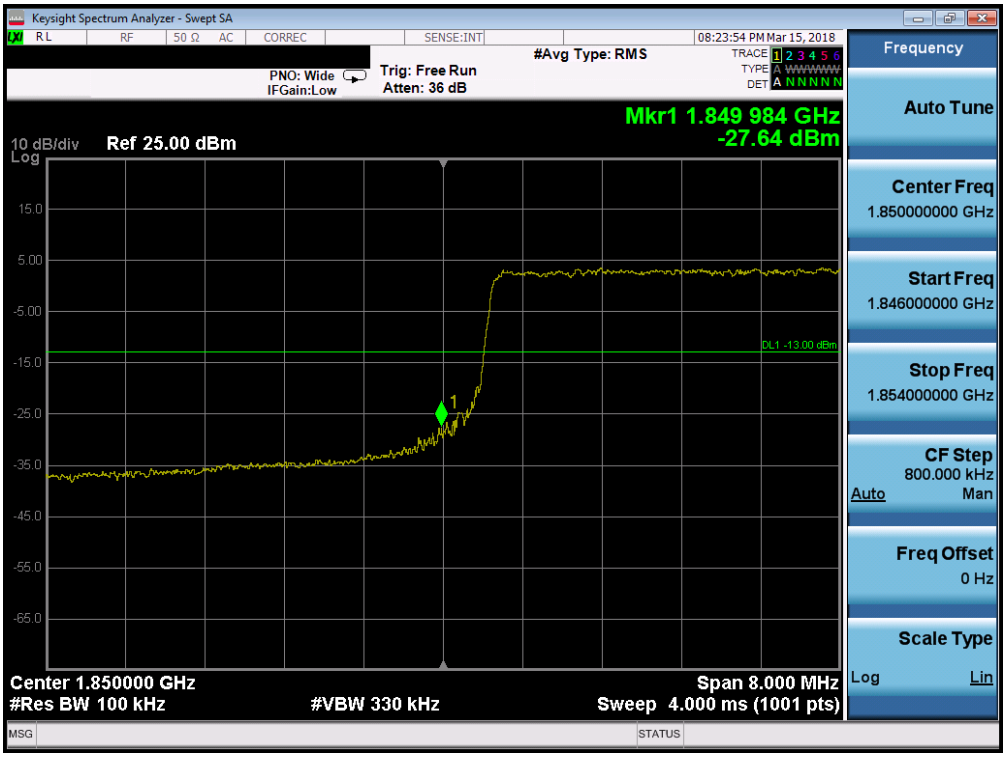
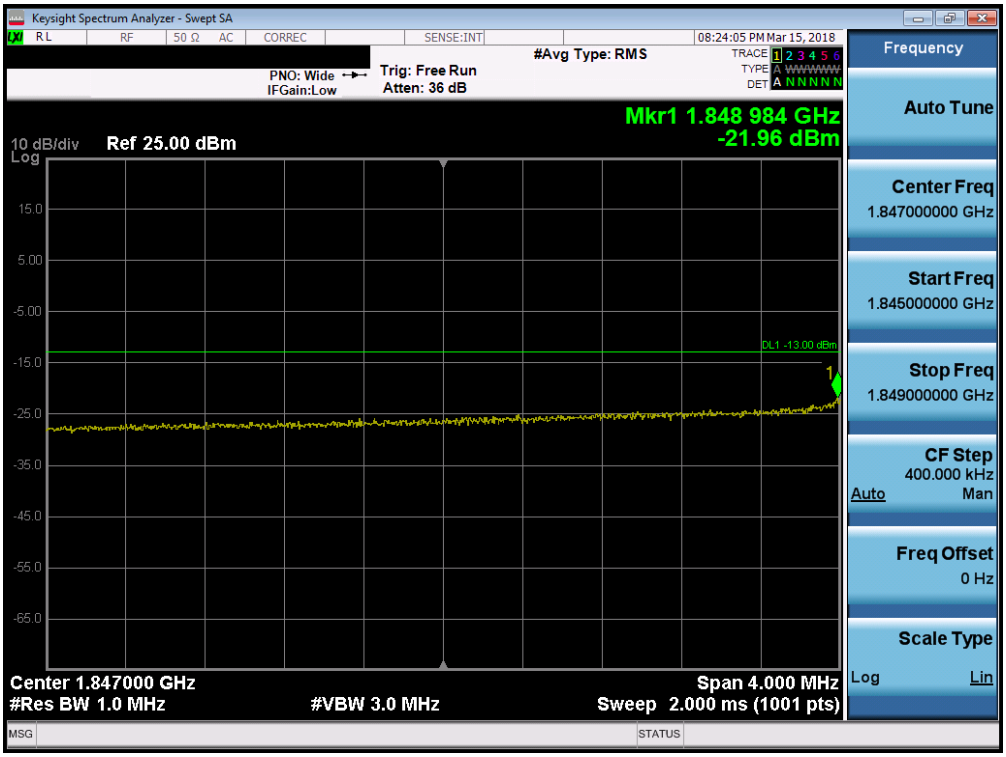


Plot 7-132. Lower Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



Plot 7-133. Lower Extended Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)

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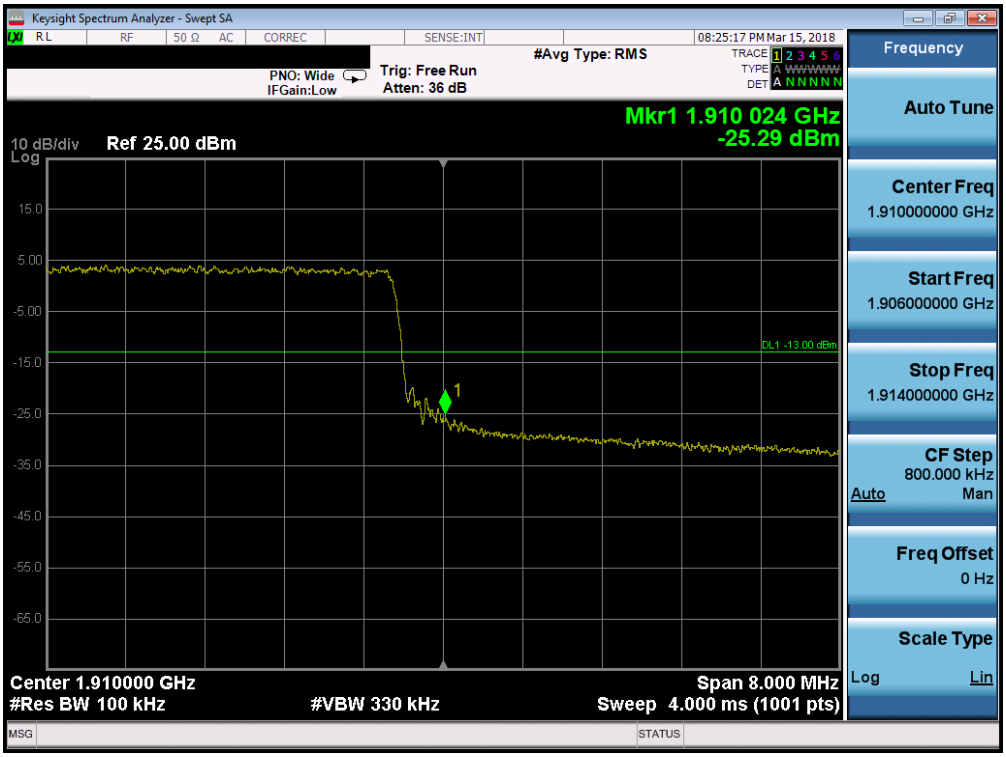
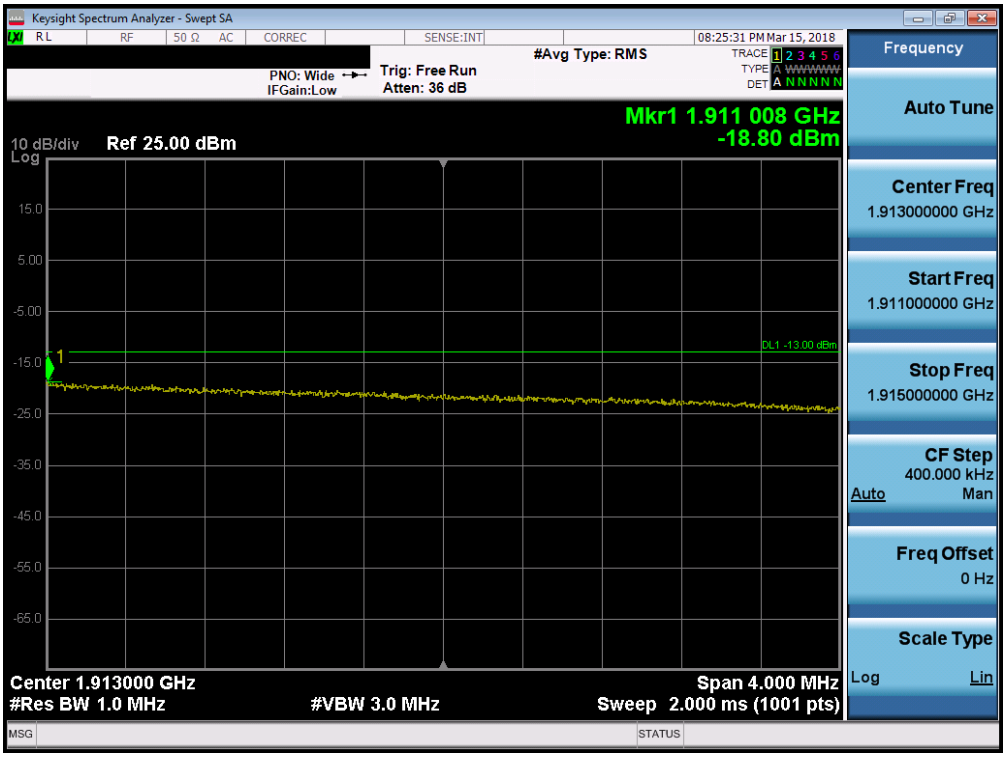


Plot 7-134. Upper Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



Plot 7-135. Upper Extended Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)

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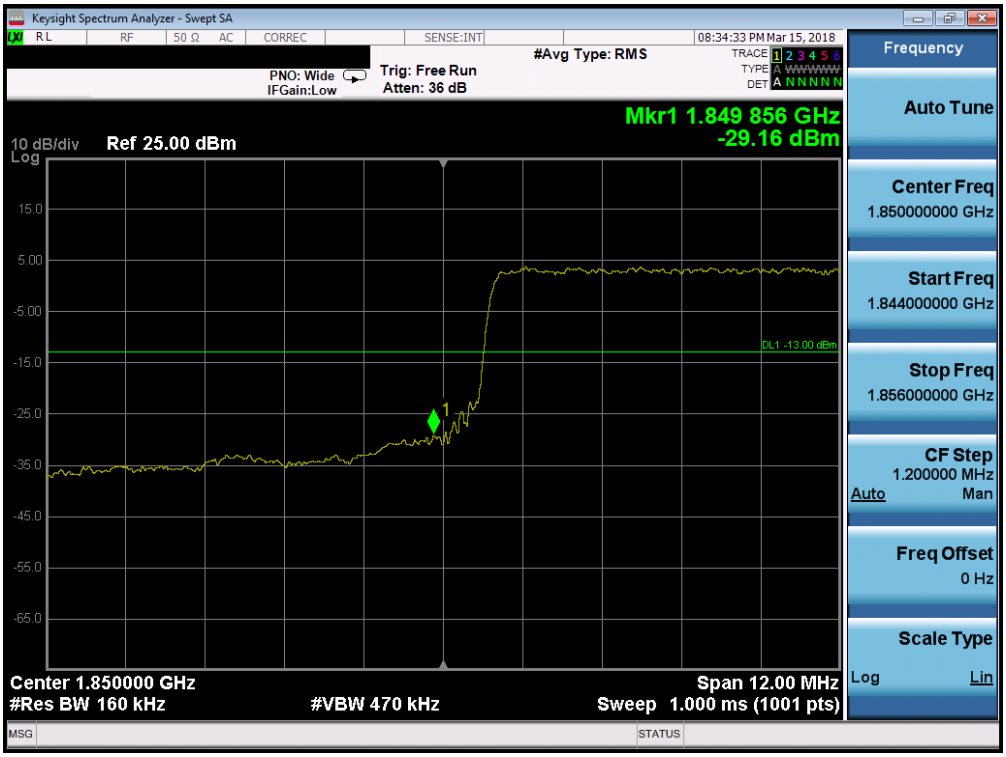
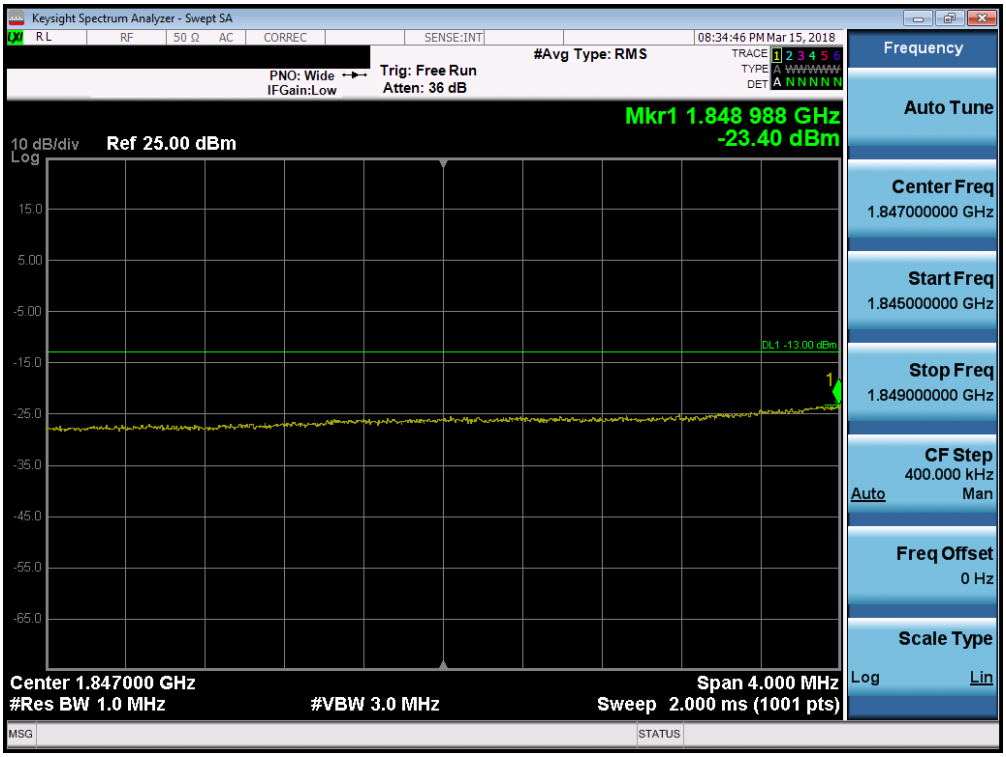


Plot 7-136. Lower Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-137. Lower Extended Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)

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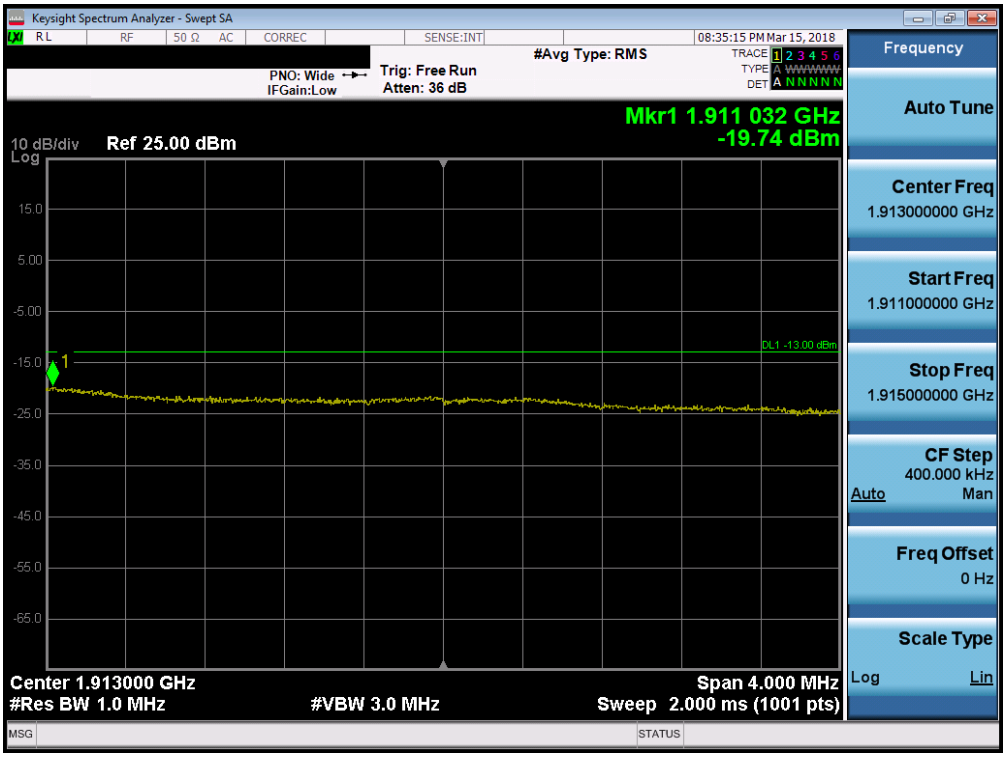
Plot 7-138. Upper Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-139. Upper Extended Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)

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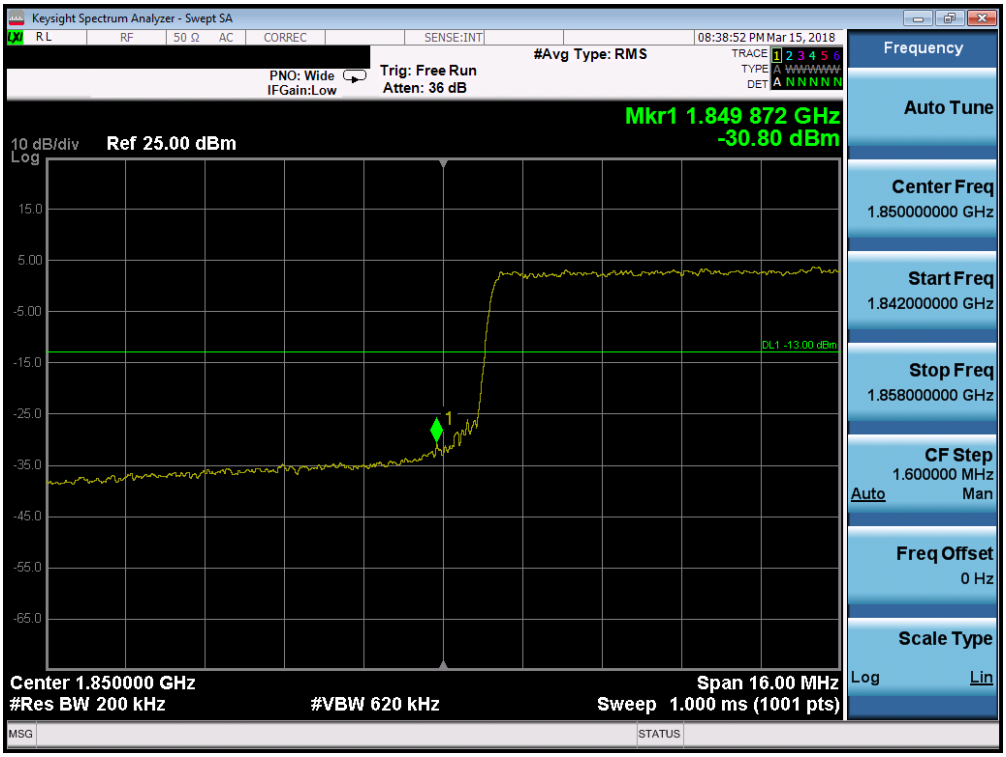
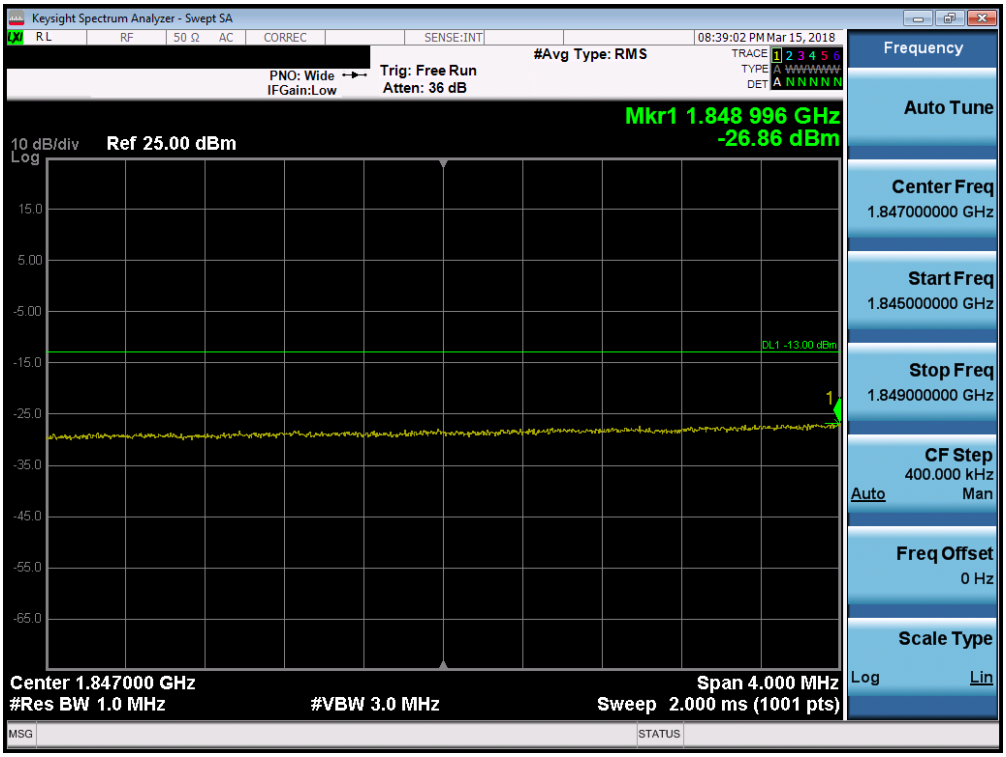


Plot 7-140. Lower Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-141. Lower Extended Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)

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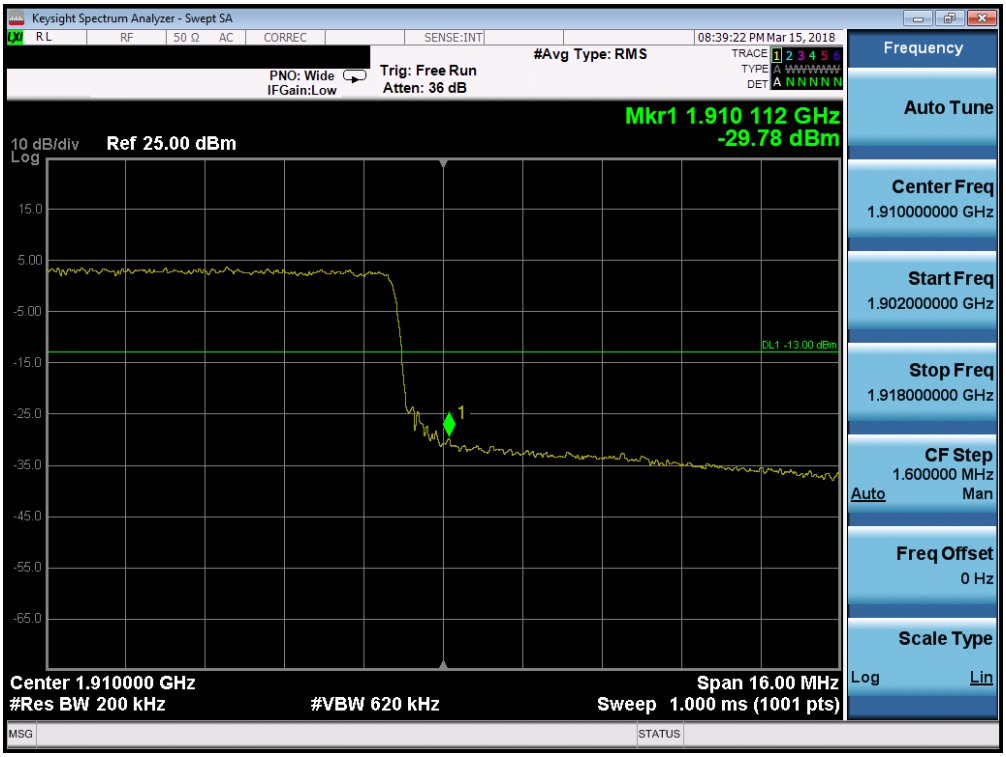
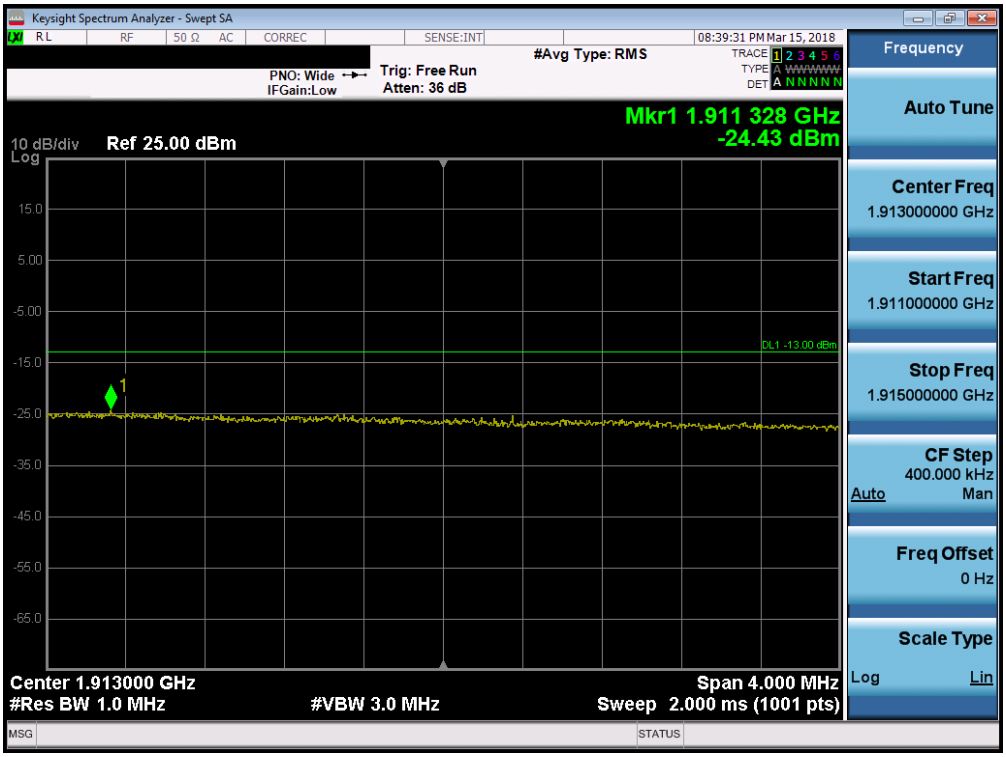


Plot 7-142. Upper Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-143. Upper Extended Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)

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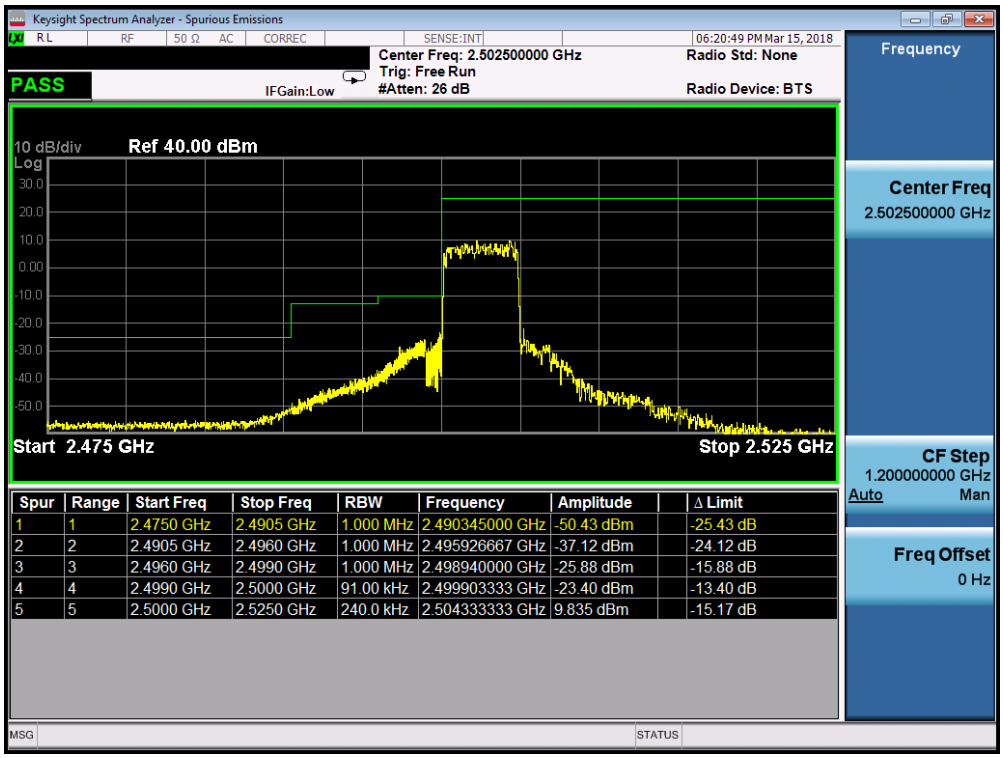
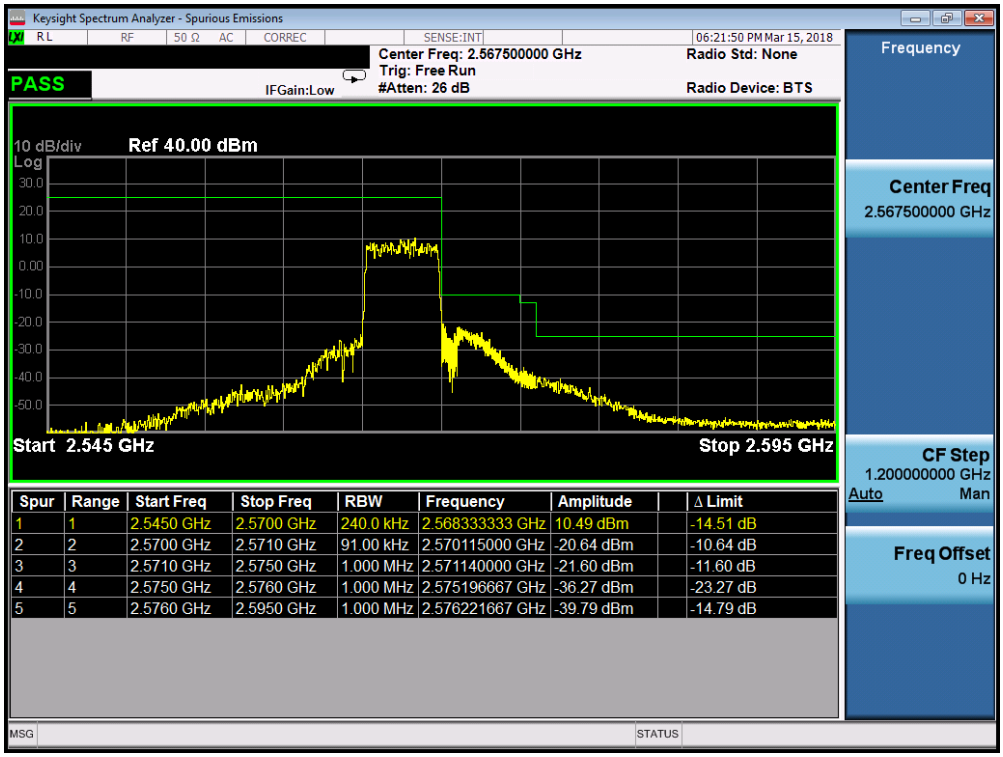
Band 7



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4905 GHz	1.000 MHz	2.490345000 GHz	-50.43 dBm	-25.43 dB
2	2	2.4905 GHz	2.4960 GHz	1.000 MHz	2.495926667 GHz	-37.12 dBm	-24.12 dB
3	3	2.4960 GHz	2.4990 GHz	1.000 MHz	2.498940000 GHz	-25.88 dBm	-15.88 dB
4	4	2.4990 GHz	2.5000 GHz	91.00 kHz	2.499903333 GHz	-23.40 dBm	-13.40 dB
5	5	2.5000 GHz	2.5250 GHz	240.0 kHz	2.504333333 GHz	9.835 dBm	-15.17 dB

Plot 7-144. Lower ACP Plot (Band 7 – 5.0MHz QPSK – RB Size 25)



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.5450 GHz	2.5700 GHz	240.0 kHz	2.568333333 GHz	10.49 dBm	-14.51 dB
2	2	2.5700 GHz	2.5710 GHz	91.00 kHz	2.570115000 GHz	-20.64 dBm	-10.64 dB
3	3	2.5710 GHz	2.5750 GHz	1.000 MHz	2.571140000 GHz	-21.60 dBm	-11.60 dB
4	4	2.5750 GHz	2.5760 GHz	1.000 MHz	2.575196667 GHz	-36.27 dBm	-23.27 dB
5	5	2.5760 GHz	2.5950 GHz	1.000 MHz	2.576221667 GHz	-39.79 dBm	-14.79 dB

Plot 7-145. Upper ACP Plot (Band 7 – 5.0MHz QPSK – RB Size 25)

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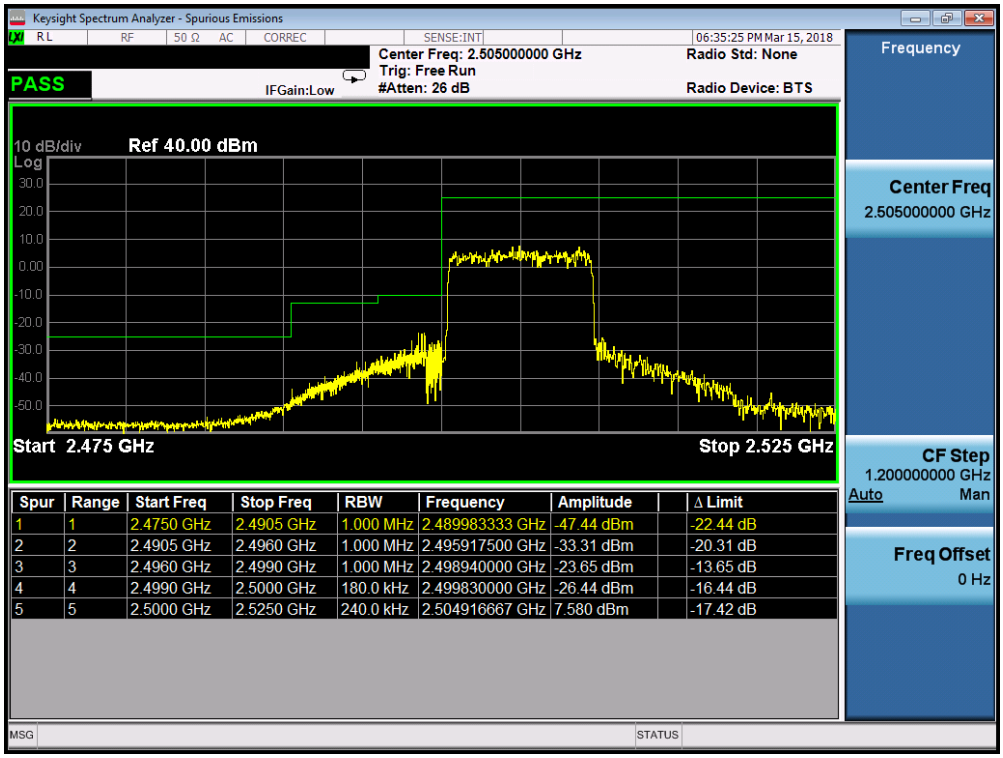
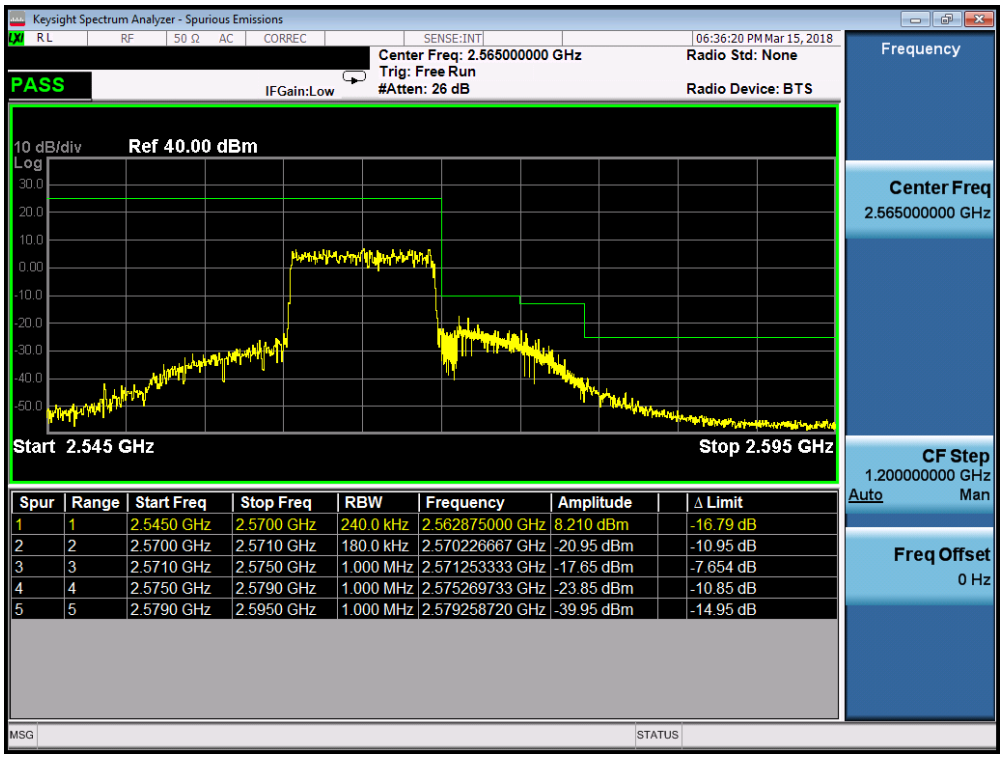


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4905 GHz	1.000 MHz	2.489983333 GHz	-47.44 dBm	-22.44 dB
2	2	2.4905 GHz	2.4960 GHz	1.000 MHz	2.495917500 GHz	-33.31 dBm	-20.31 dB
3	3	2.4960 GHz	2.4990 GHz	1.000 MHz	2.498940000 GHz	-23.65 dBm	-13.65 dB
4	4	2.4990 GHz	2.5000 GHz	180.0 kHz	2.499830000 GHz	-26.44 dBm	-16.44 dB
5	5	2.5000 GHz	2.5250 GHz	240.0 kHz	2.504916667 GHz	7.580 dBm	-17.42 dB

Plot 7-146. Lower ACP Plot (Band 7 – 10.0MHz QPSK – RB Size 50)



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.5450 GHz	2.5700 GHz	240.0 kHz	2.562875000 GHz	8.210 dBm	-16.79 dB
2	2	2.5700 GHz	2.5710 GHz	180.0 kHz	2.570226667 GHz	-20.95 dBm	-10.95 dB
3	3	2.5710 GHz	2.5750 GHz	1.000 MHz	2.571253333 GHz	-17.65 dBm	-7.654 dB
4	4	2.5750 GHz	2.5790 GHz	1.000 MHz	2.575269733 GHz	-23.85 dBm	-10.85 dB
5	5	2.5790 GHz	2.5950 GHz	1.000 MHz	2.579258720 GHz	-39.95 dBm	-14.95 dB

Plot 7-147. Upper ACP Plot (Band 7 – 10.0MHz QPSK – RB Size 50)

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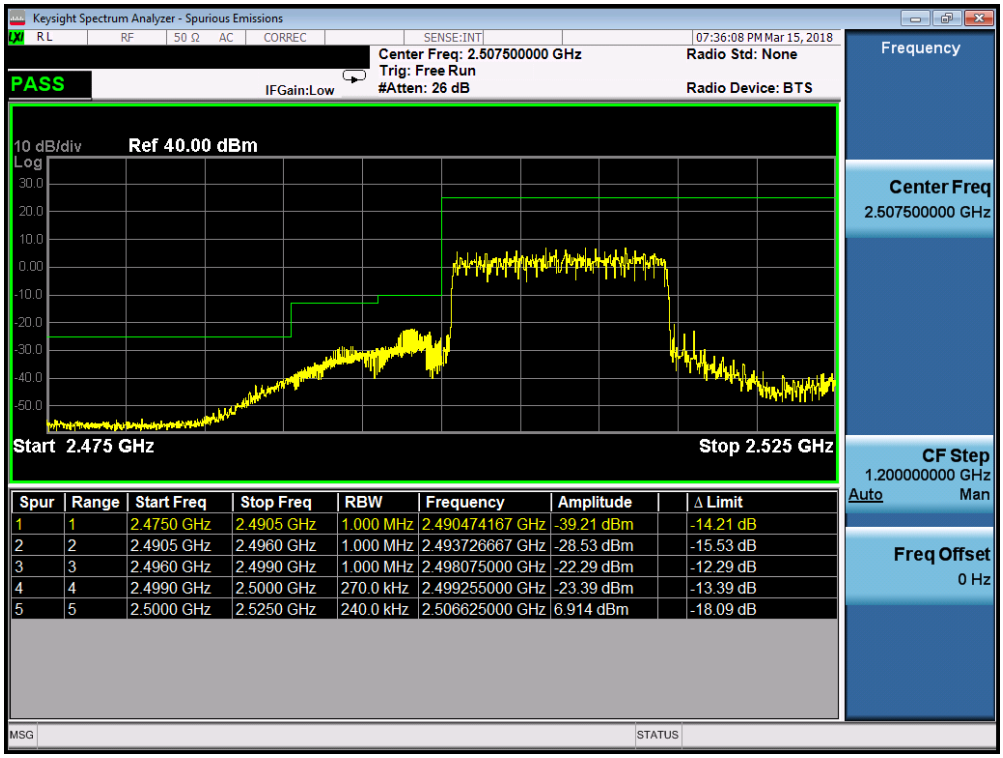
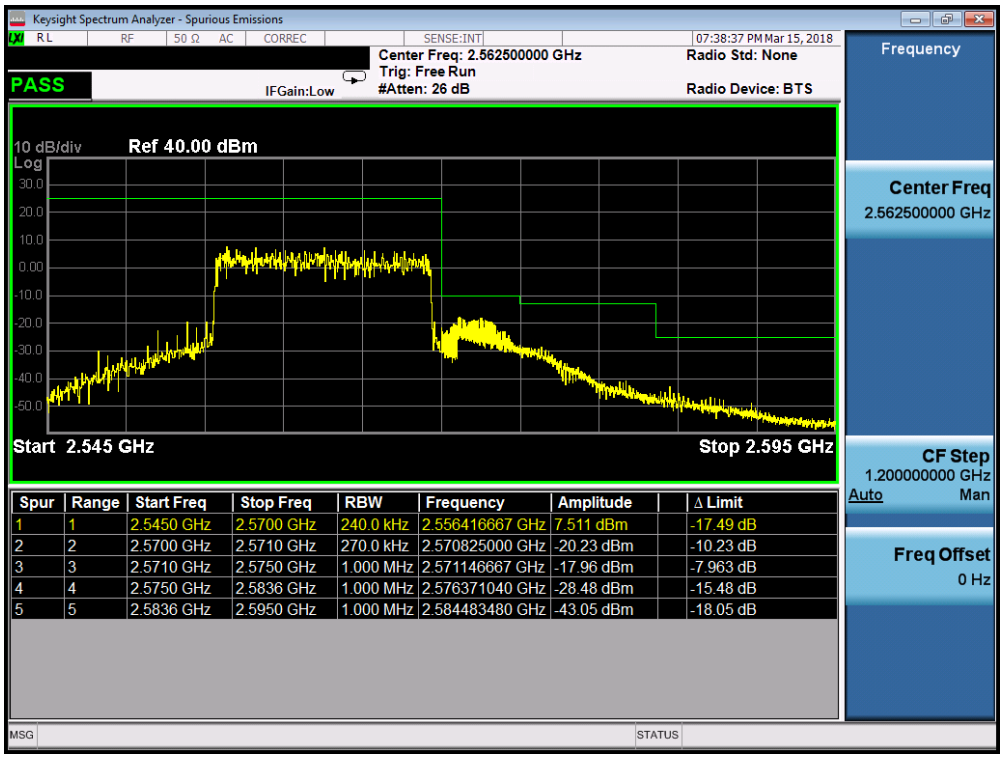


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4905 GHz	1.000 MHz	2.490474167 GHz	-39.21 dBm	-14.21 dB
2	2	2.4905 GHz	2.4960 GHz	1.000 MHz	2.493726667 GHz	-28.53 dBm	-15.53 dB
3	3	2.4960 GHz	2.4990 GHz	1.000 MHz	2.498075000 GHz	-22.29 dBm	-12.29 dB
4	4	2.4990 GHz	2.5000 GHz	270.0 kHz	2.499255000 GHz	-23.39 dBm	-13.39 dB
5	5	2.5000 GHz	2.5250 GHz	240.0 kHz	2.506625000 GHz	6.914 dBm	-18.09 dB

Plot 7-148. 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	2.556416667 GHz	7.511 dBm	-17.49 dB
2	2	2.5700 GHz	2.5710 GHz	270.0 kHz	2.570825000 GHz	-20.23 dBm	-10.23 dB
3	3	2.5710 GHz	2.5750 GHz	1.000 MHz	2.571146667 GHz	-17.96 dBm	-7.963 dB
4	4	2.5750 GHz	2.5836 GHz	1.000 MHz	2.576371040 GHz	-28.48 dBm	-15.48 dB
5	5	2.5836 GHz	2.5950 GHz	1.000 MHz	2.584483480 GHz	-43.05 dBm	-18.05 dB

Plot 7-149. Upper ACP Plot (Band 7 – 15.0MHz QPSK – RB Size 75)

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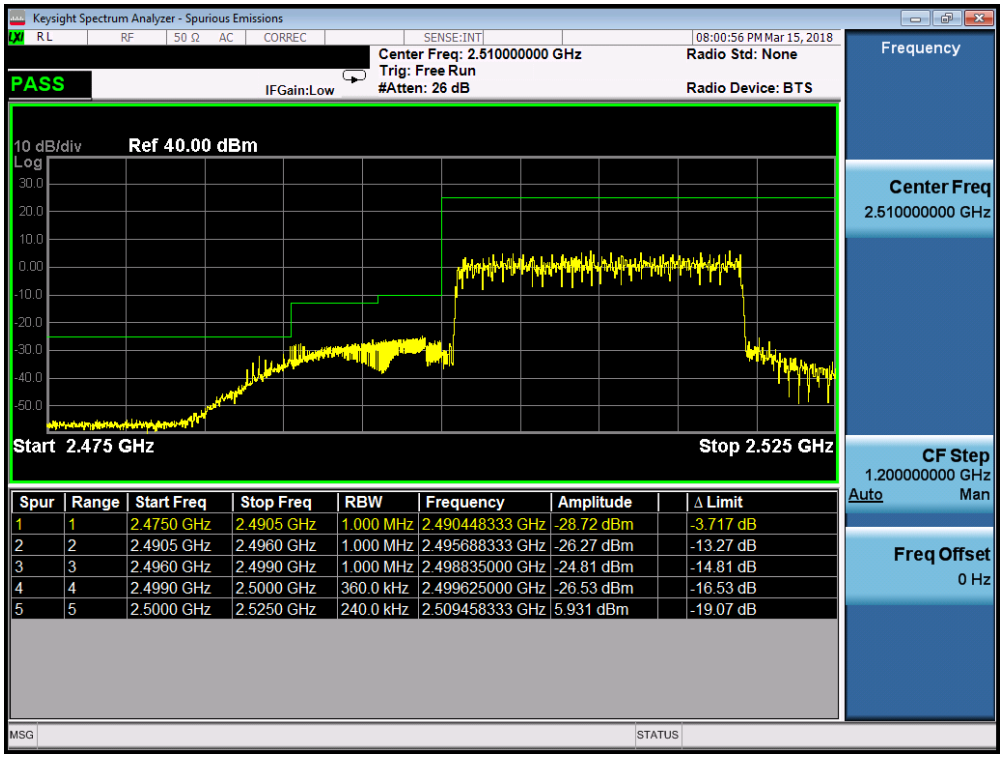
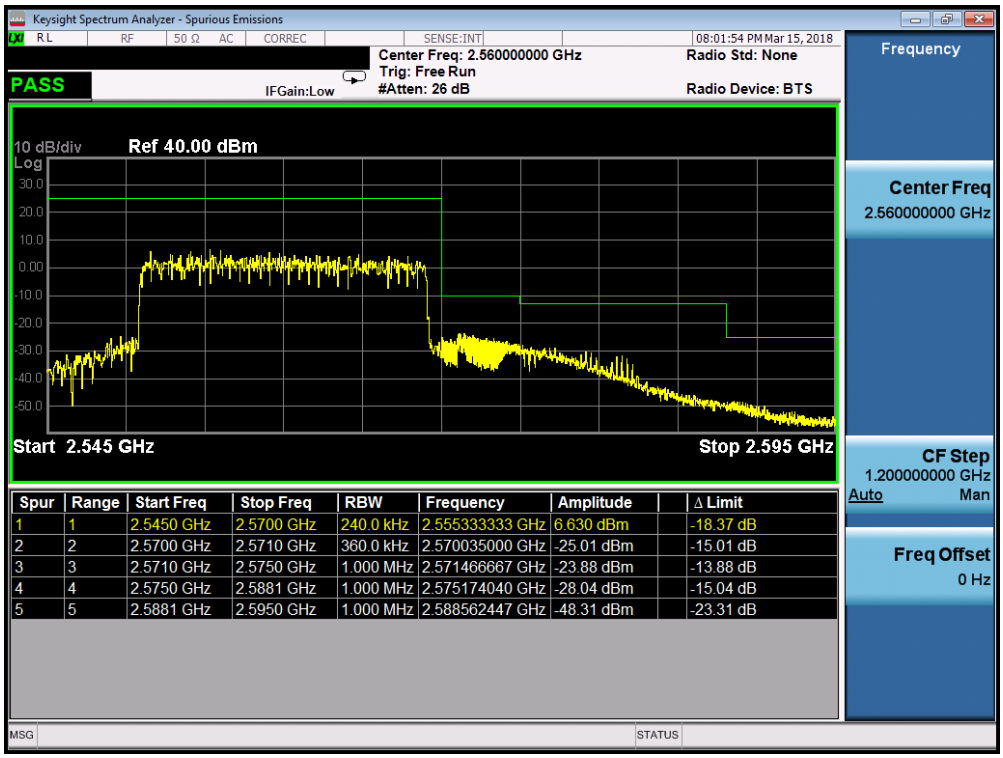


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4905 GHz	1.000 MHz	2.490448333 GHz	-28.72 dBm	-3.717 dB
2	2	2.4905 GHz	2.4960 GHz	1.000 MHz	2.495688333 GHz	-26.27 dBm	-13.27 dB
3	3	2.4960 GHz	2.4990 GHz	1.000 MHz	2.498835000 GHz	-24.81 dBm	-14.81 dB
4	4	2.4990 GHz	2.5000 GHz	360.0 kHz	2.499625000 GHz	-26.53 dBm	-16.53 dB
5	5	2.5000 GHz	2.5250 GHz	240.0 kHz	2.509458333 GHz	5.931 dBm	-19.07 dB

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



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.5450 GHz	2.5700 GHz	240.0 kHz	2.555333333 GHz	6.630 dBm	-18.37 dB
2	2	2.5700 GHz	2.5710 GHz	360.0 kHz	2.570035000 GHz	-25.01 dBm	-15.01 dB
3	3	2.5710 GHz	2.5750 GHz	1.000 MHz	2.571466667 GHz	-23.88 dBm	-13.88 dB
4	4	2.5750 GHz	2.5881 GHz	1.000 MHz	2.575174040 GHz	-28.04 dBm	-15.04 dB
5	5	2.5881 GHz	2.5950 GHz	1.000 MHz	2.588562447 GHz	-48.31 dBm	-23.31 dB

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

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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.

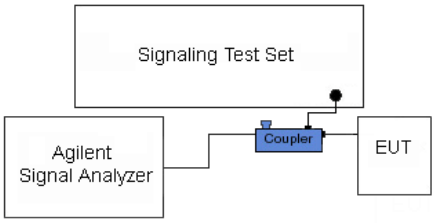

Figure 7-4. Test Instrument & Measurement Setup

Test Notes

None.

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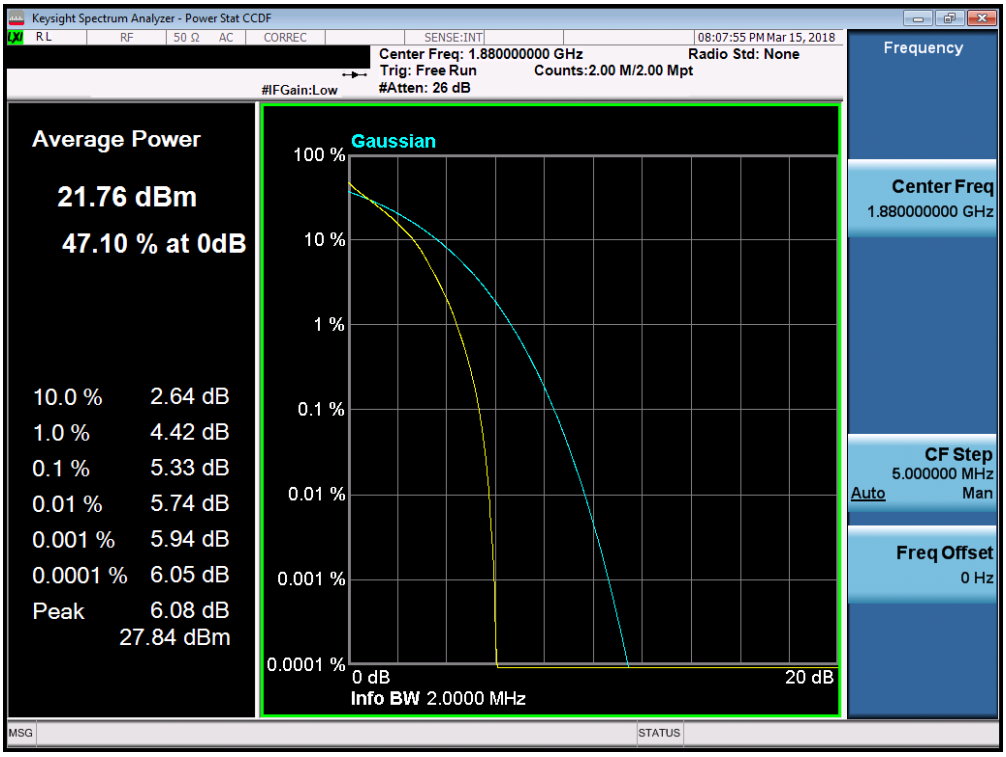
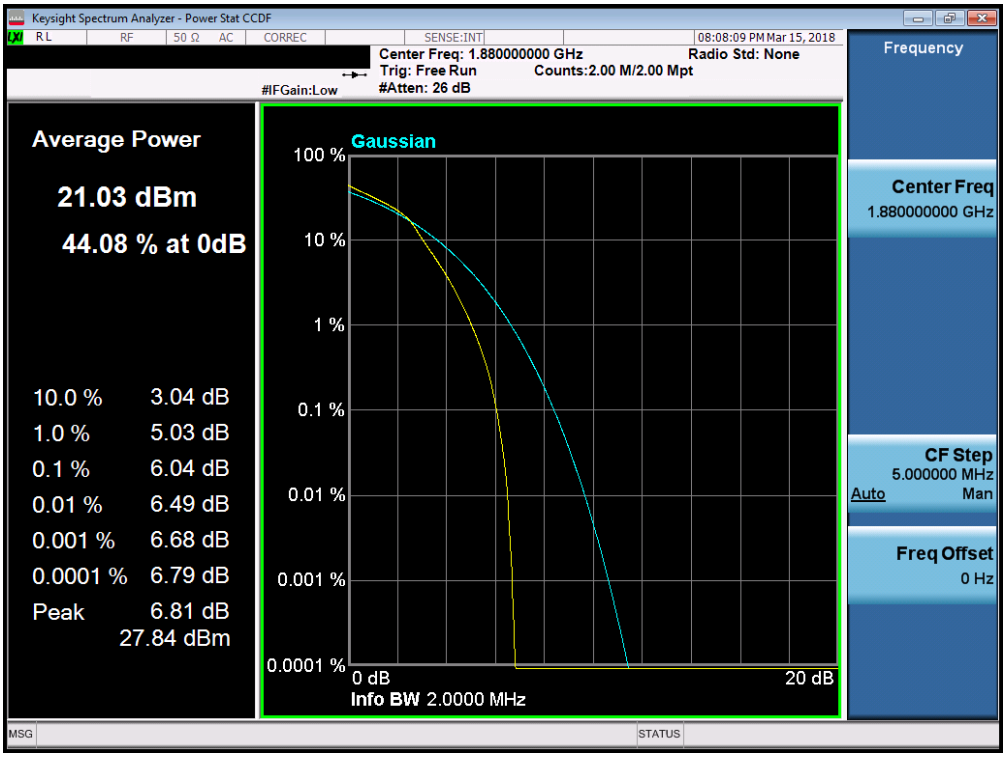
Band 2



Plot 7-152. PAR Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



Plot 7-153. PAR Plot (Band 2 - 1.4MHz 16-QAM - Full RB Configuration)

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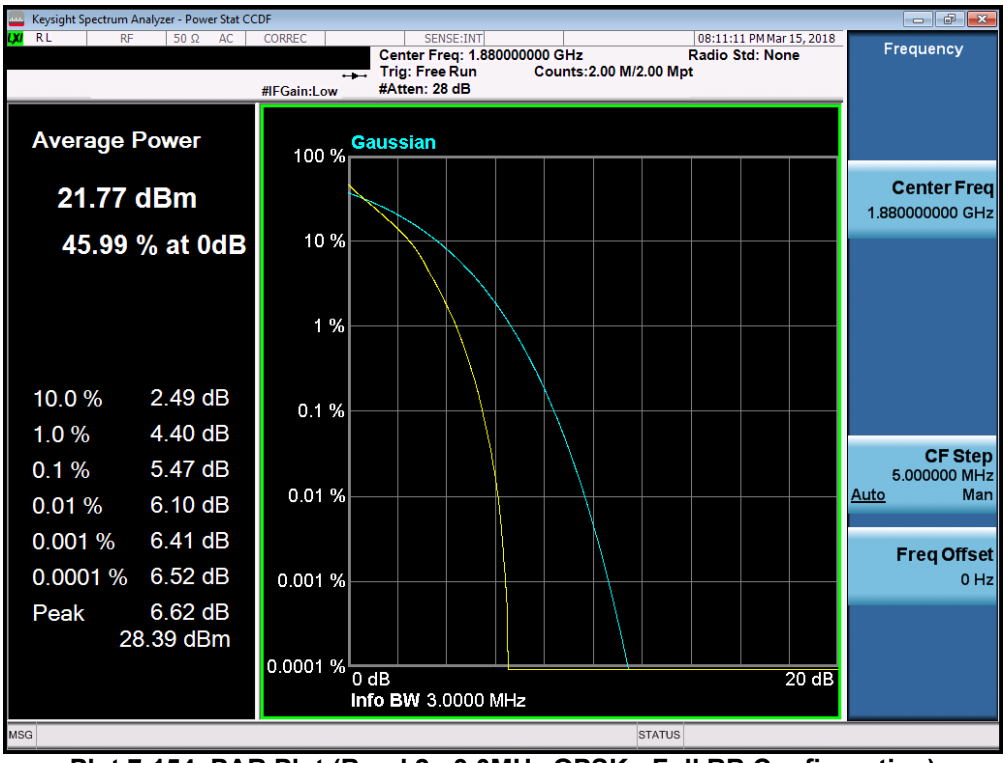
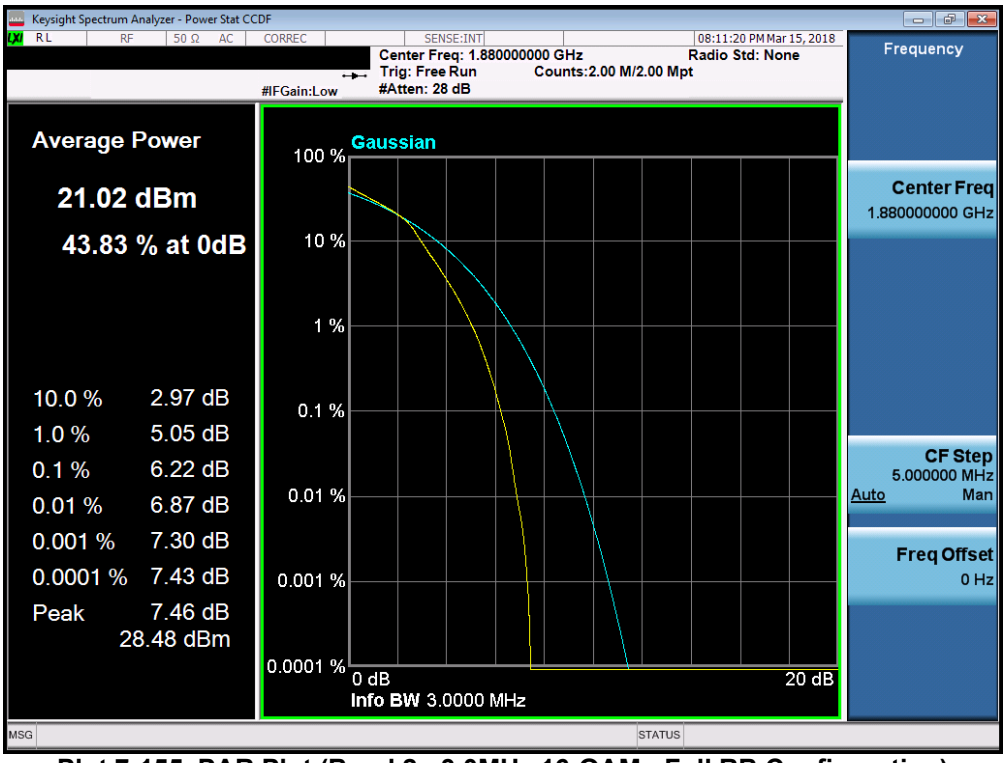


Plot 7-154. PAR Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



Plot 7-155. PAR Plot (Band 2 - 3.0MHz 16-QAM - Full RB Configuration)

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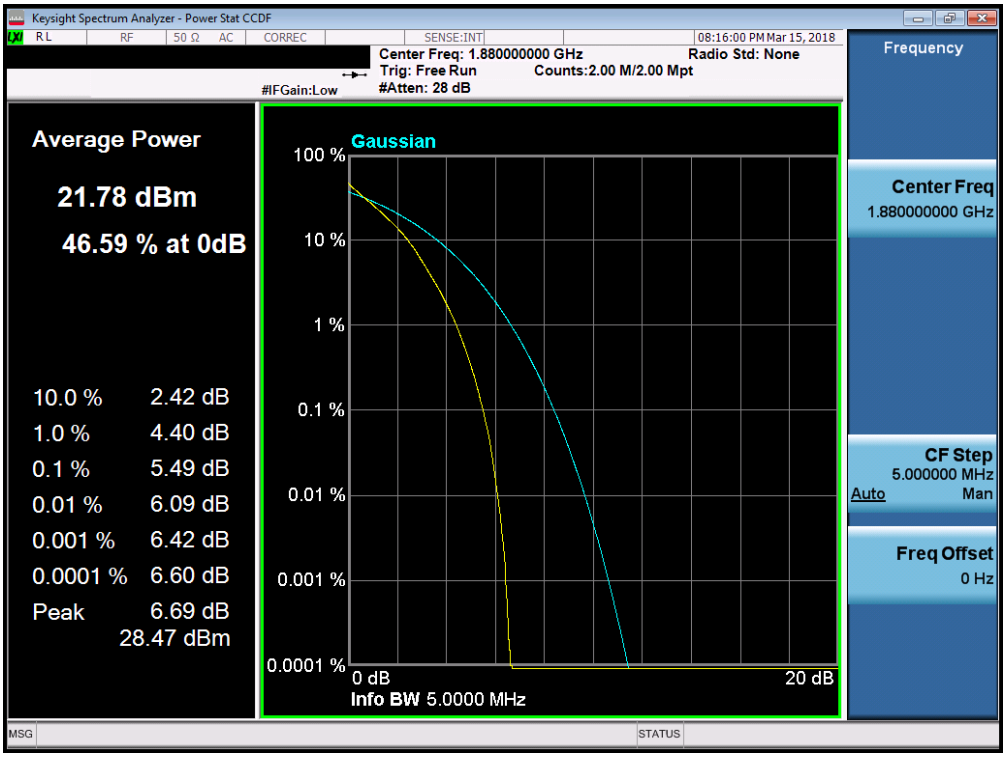
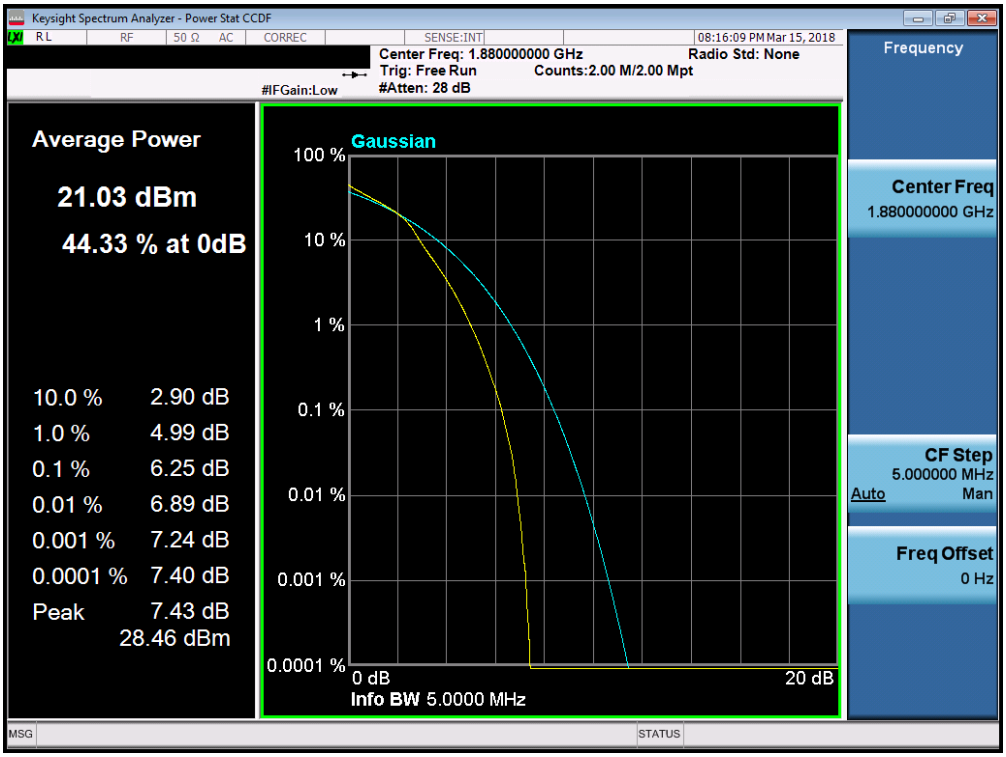


Plot 7-156. PAR Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-157. PAR Plot (Band 2 - 5.0MHz 16-QAM - Full RB Configuration)

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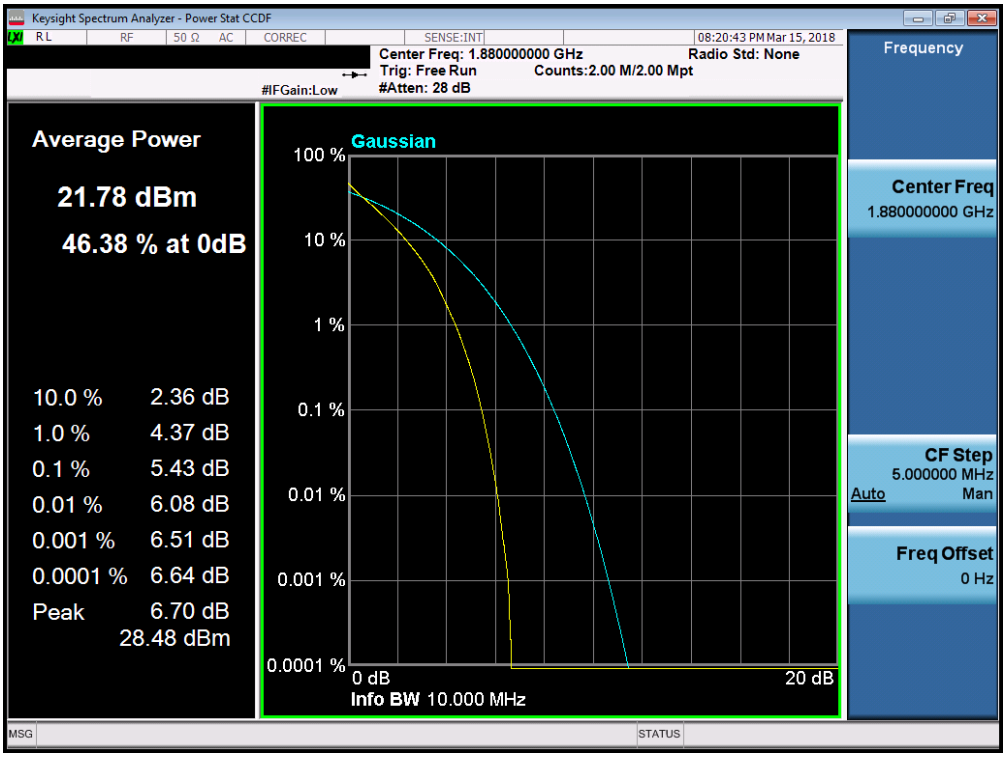
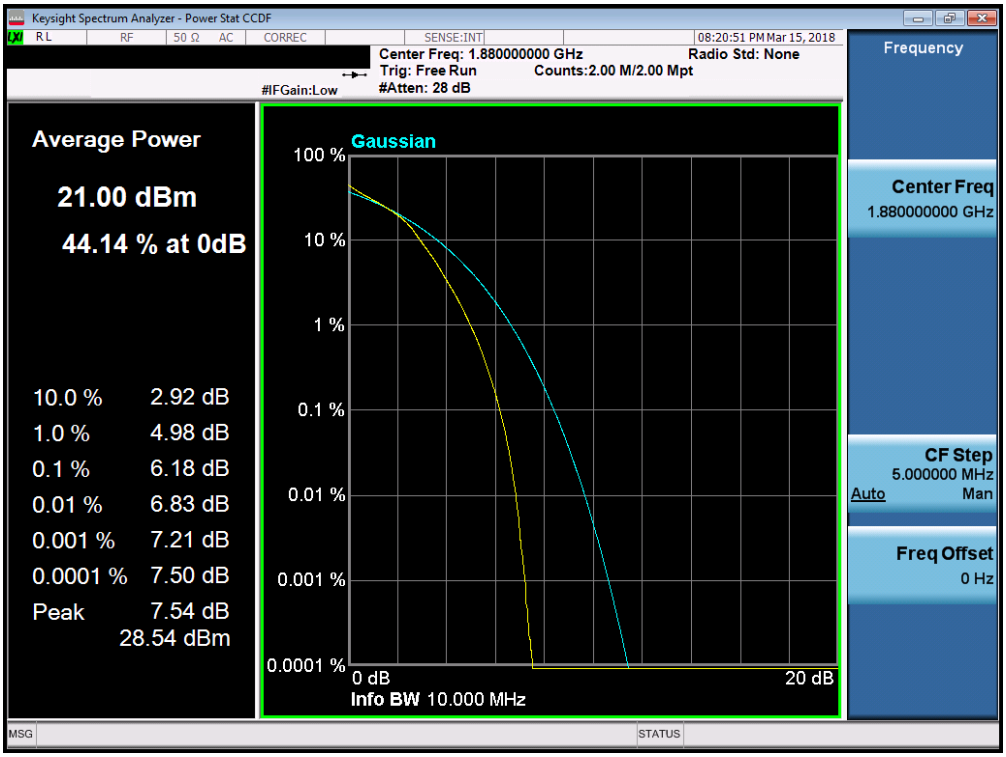


Plot 7-158. PAR Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



Plot 7-159. PAR Plot (Band 2 - 10.0MHz 16-QAM - Full RB Configuration)

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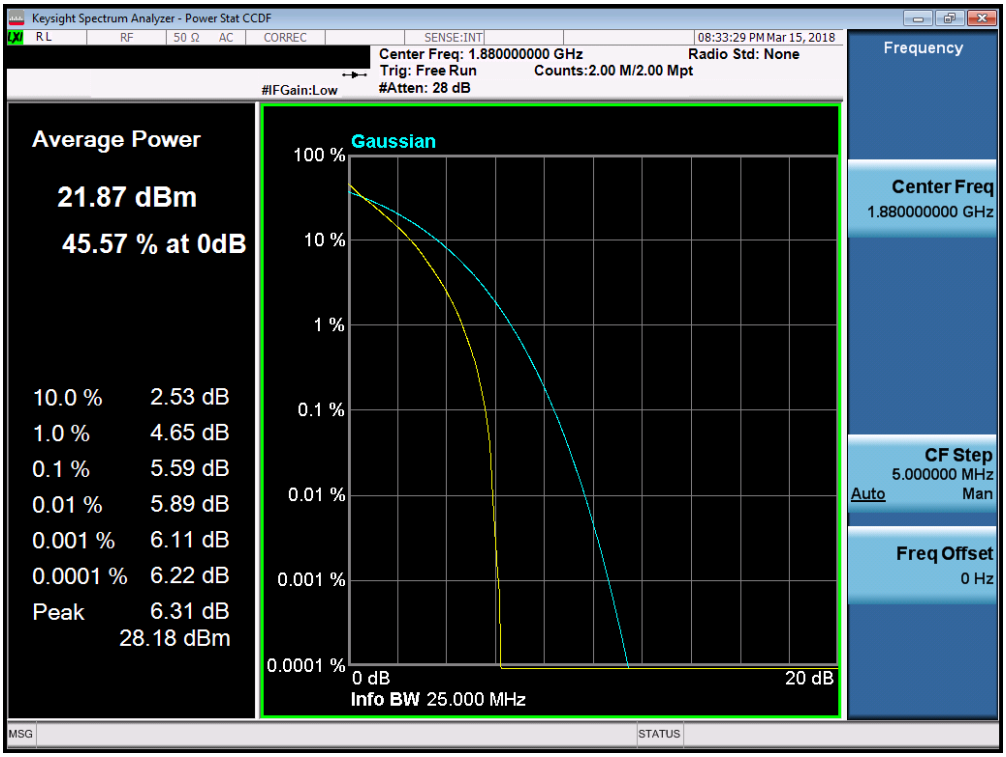
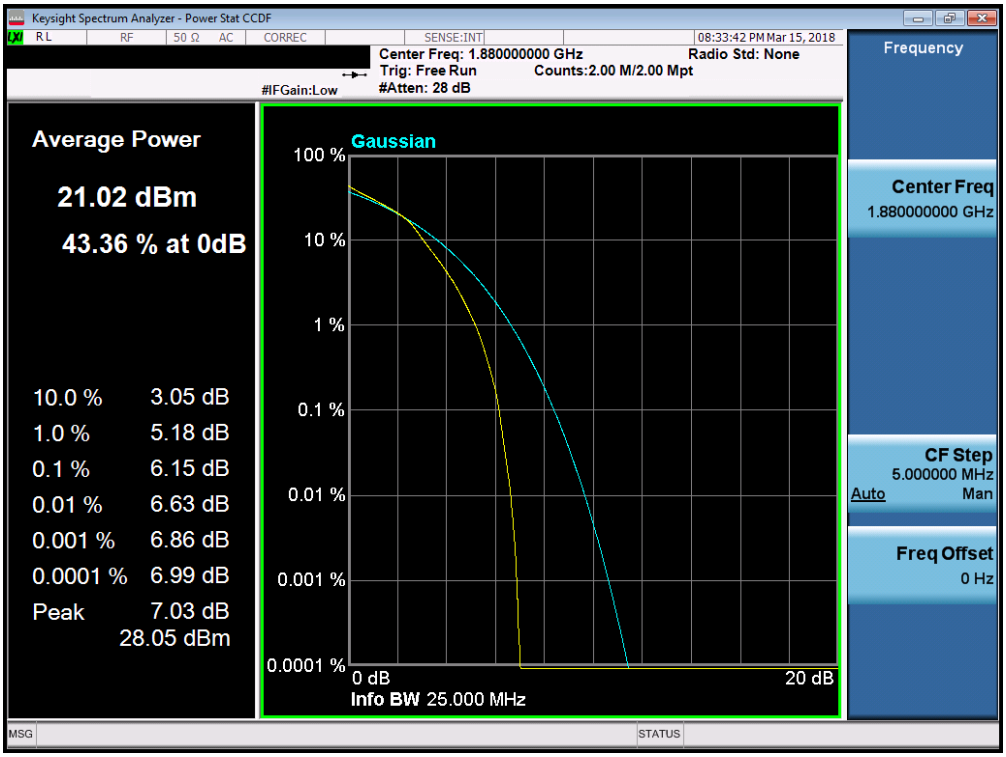


Plot 7-160. PAR Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-161. PAR Plot (Band 2 - 15.0MHz 16-QAM - Full RB Configuration)

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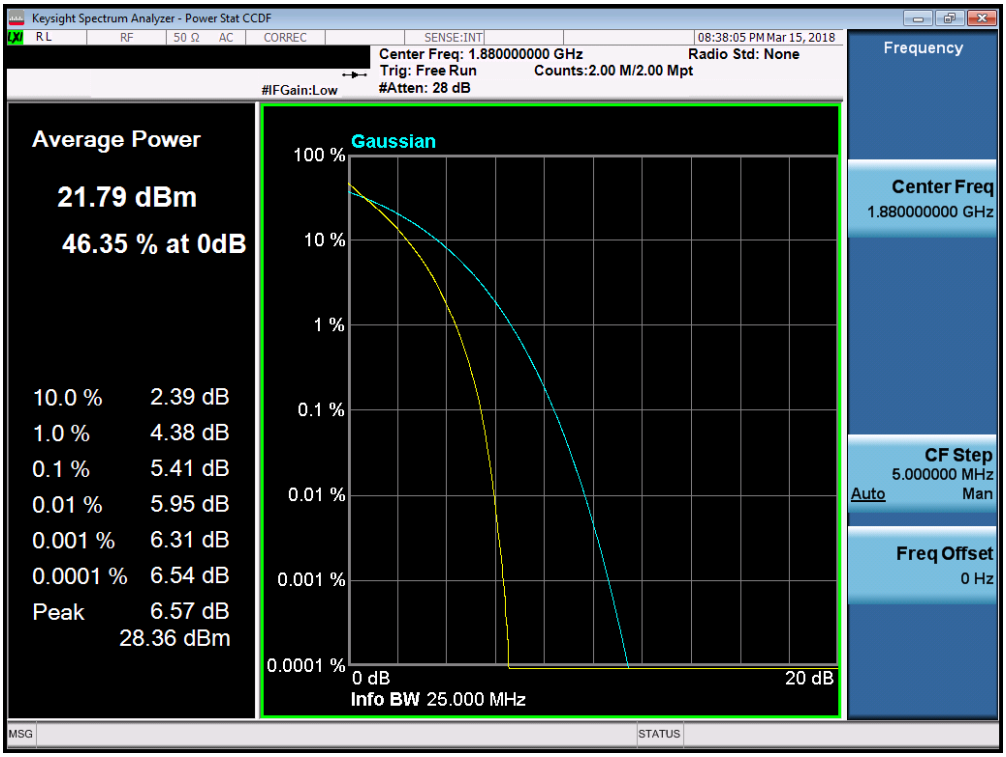
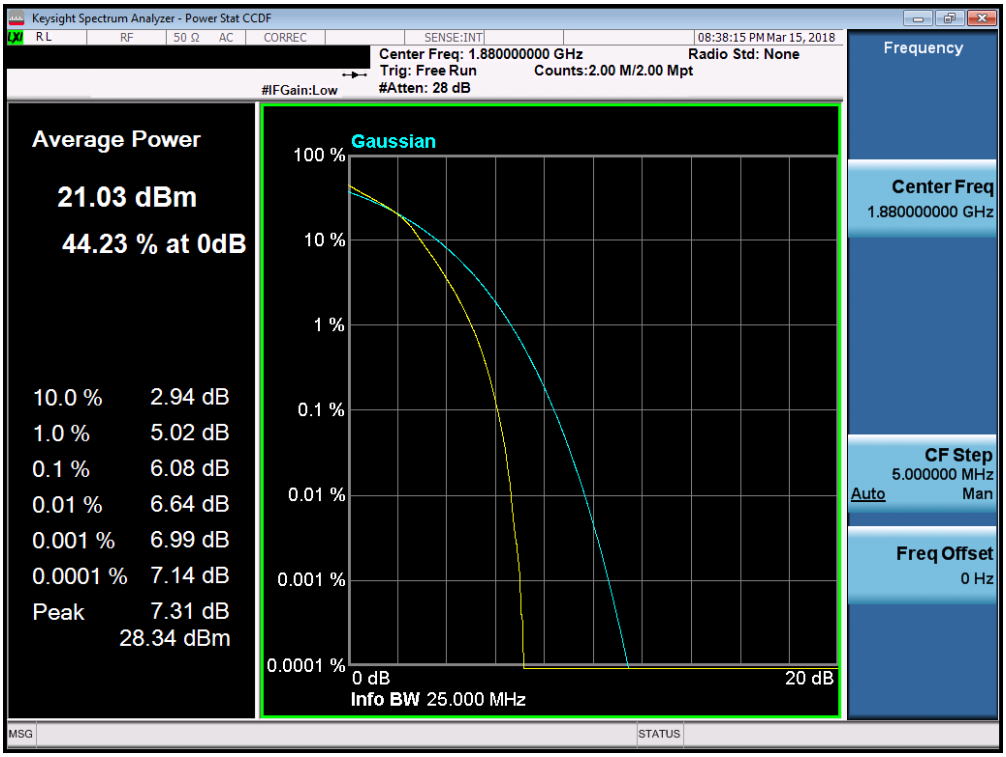


Plot 7-162. PAR Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-163. PAR Plot (Band 2 - 20.0MHz 16-QAM - Full RB Configuration)

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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

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Test Setup

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

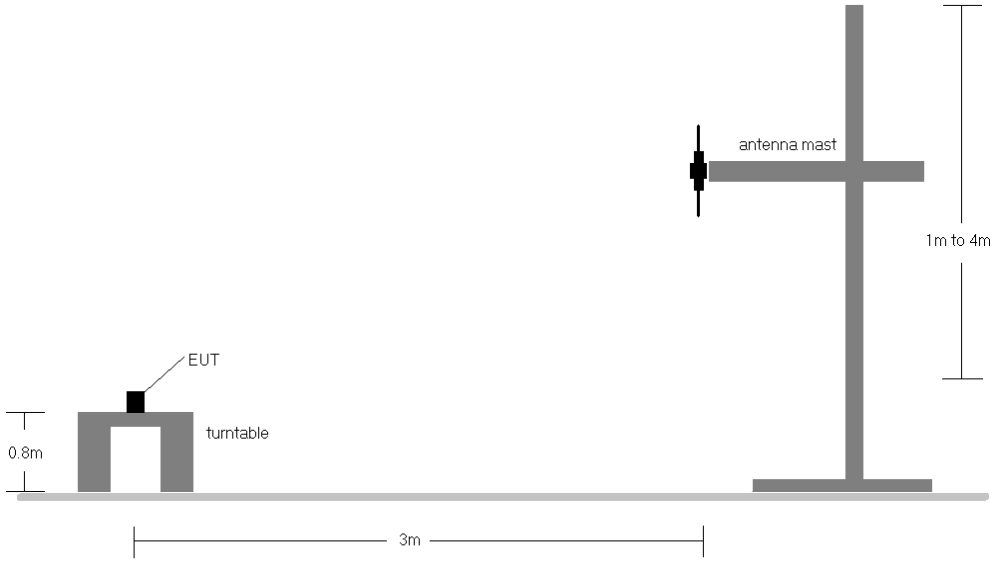

Figure 7-5. Radiated Test Setup <1GHz

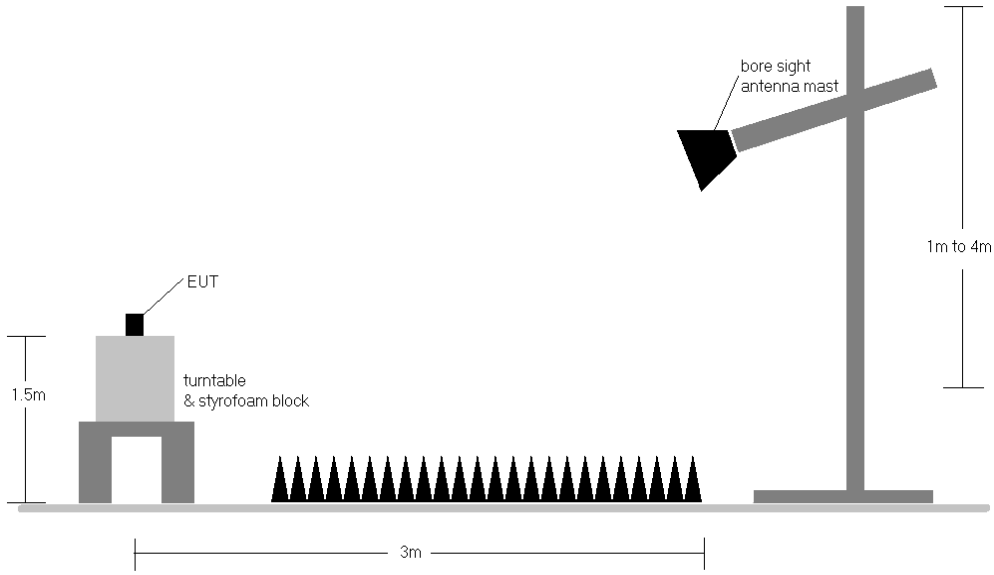

Figure 7-6. Radiated Test Setup >1GHz

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.

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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]
779.50	5	QPSK	V	150	3	1 / 0	20.11	1.32	19.28	0.085	34.77	-15.49
782.00	5	QPSK	V	150	353	1 / 0	21.22	1.33	**20.40**	0.110	34.77	-14.37
784.50	5	QPSK	V	150	353	1 / 0	21.02	1.34	20.21	0.105	34.77	-14.56
784.50	5	16-QAM	V	150	353	1 / 0	20.09	1.34	**19.28**	0.085	34.77	-15.49
782.00	10	QPSK	V	150	348	1 / 0	21.23	1.33	**20.41**	**0.110**	34.77	-14.36
782.00	10	16-QAM	V	150	348	1 / 0	20.30	1.33	**19.48**	0.089	34.77	-15.29
782.00	10	QPSK	H	150	282	1 / 0	19.23	1.33	18.41	0.069	34.77	-16.36

Table 7-3. ERP Data (Band 13)

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]
824.70	1.4	QPSK	H	150	8	1 / 5	18.98	1.50	18.33	0.068	38.45	-20.12
836.50	1.4	QPSK	H	150	7	1 / 5	19.39	1.50	**18.74**	0.075	38.45	-19.71
848.30	1.4	QPSK	H	150	6	1 / 5	19.29	1.50	18.64	0.073	38.45	-19.81
836.50	1.4	16-QAM	H	150	7	1 / 5	18.27	1.50	**17.62**	0.058	38.45	-20.83
825.50	3	QPSK	H	150	3	1 / 14	18.92	1.50	18.27	0.067	38.45	-20.18
836.50	3	QPSK	H	150	4	1 / 14	19.33	1.50	**18.68**	0.074	38.45	-19.77
847.50	3	QPSK	H	150	10	1 / 14	19.28	1.50	18.63	0.073	38.45	-19.82
836.50	3	16-QAM	H	150	4	1 / 14	18.30	1.50	**17.65**	0.058	38.45	-20.80
826.50	5	QPSK	H	150	12	1 / 24	19.06	1.50	18.41	0.069	38.45	-20.04
836.50	5	QPSK	H	150	10	1 / 24	19.55	1.50	**18.90**	0.078	38.45	-19.55
846.50	5	QPSK	H	150	13	1 / 24	19.03	1.50	18.38	0.069	38.45	-20.07
836.50	5	16-QAM	H	150	10	1 / 24	18.61	1.50	**17.96**	0.063	38.45	-20.49
829.00	10	QPSK	H	150	13	1 / 49	19.09	1.50	18.44	0.070	38.45	-20.01
836.50	10	QPSK	H	150	8	1 / 49	19.54	1.50	18.89	0.077	38.45	-19.56
844.00	10	QPSK	H	150	4	1 / 49	19.59	1.50	**18.94**	**0.078**	38.45	-19.51
844.00	10	16-QAM	H	150	4	1 / 49	18.73	1.50	**18.08**	0.064	38.45	-20.37
844.00	10	QPSK	V	150	353	1 / 74	18.58	1.50	17.93	0.062	38.45	-20.52

Table 7-4. ERP Data (Band 5)

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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	H	150	5	1 / 5	19.57	5.56	**25.13**	0.326	30.00	-4.87
1732.50	1.4	QPSK	H	150	3	1 / 5	19.63	5.41	25.04	0.319	30.00	-4.96
1754.30	1.4	QPSK	H	150	0	1 / 5	19.44	5.26	24.70	0.295	30.00	-5.30
1710.70	1.4	16-QAM	H	150	5	1 / 5	18.58	5.56	**24.14**	0.259	30.00	-5.86
1711.50	3	QPSK	H	150	3	1 / 14	19.62	5.55	**25.17**	0.329	30.00	-4.83
1732.50	3	QPSK	H	150	358	1 / 14	19.47	5.41	24.88	0.307	30.00	-5.12
1753.50	3	QPSK	H	150	357	1 / 14	19.42	5.26	24.68	0.294	30.00	-5.32
1711.50	3	16-QAM	H	150	3	1 / 14	18.70	5.55	**24.25**	0.266	30.00	-5.75
1712.50	5	QPSK	H	150	3	1 / 24	19.52	5.55	**25.07**	0.321	30.00	-4.93
1732.50	5	QPSK	H	150	358	1 / 24	19.54	5.41	24.95	0.312	30.00	-5.05
1752.50	5	QPSK	H	150	358	1 / 24	19.62	5.27	24.89	0.308	30.00	-5.11
1732.50	5	16-QAM	H	150	358	1 / 24	18.69	5.41	**24.10**	0.257	30.00	-5.90
1715.00	10	QPSK	H	150	360	1 / 49	19.61	5.53	**25.14**	0.326	30.00	-4.86
1732.50	10	QPSK	H	150	355	1 / 49	19.13	5.41	24.54	0.284	30.00	-5.46
1750.00	10	QPSK	H	150	358	1 / 49	19.55	5.29	24.84	0.305	30.00	-5.16
1715.00	10	16-QAM	H	150	360	1 / 49	18.81	5.53	**24.34**	0.272	30.00	-5.66
1717.50	15	QPSK	H	150	2	1 / 74	19.55	5.51	**25.06**	0.321	30.00	-4.94
1732.50	15	QPSK	H	150	1	1 / 74	19.47	5.41	24.88	0.307	30.00	-5.12
1747.50	15	QPSK	H	150	0	1 / 74	19.59	5.31	24.90	0.309	30.00	-5.10
1717.50	15	16-QAM	H	150	2	1 / 74	18.67	5.51	**24.18**	0.262	30.00	-5.82
1720.00	20	QPSK	H	150	4	1 / 0	19.70	5.49	**25.19**	**0.331**	30.00	-4.81
1732.50	20	QPSK	H	150	2	1 / 0	19.62	5.41	25.03	0.318	30.00	-4.97
1745.00	20	QPSK	H	150	2	1 / 0	19.69	5.32	25.01	0.317	30.00	-4.99
1720.00	20	16-QAM	H	150	4	1 / 0	18.84	5.49	**24.33**	0.271	30.00	-5.67
1720.00	20	QPSK	V	150	261	1 / 0	16.99	5.64	22.63	0.183	30.00	-7.37

Table 7-5. EIRP Data (Band 4)

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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	359	1 / 0	20.91	4.82	**25.73**	**0.374**	33.01	-7.28
1880.00	1.4	QPSK	H	150	358	1 / 0	20.69	4.74	25.43	0.349	33.01	-7.58
1909.30	1.4	QPSK	H	150	357	1 / 0	20.46	4.68	25.14	0.327	33.01	-7.87
1850.70	1.4	16-QAM	H	150	359	1 / 0	20.01	4.82	**24.83**	0.304	33.01	-8.18
1851.50	3	QPSK	H	150	1	1 / 0	20.70	4.82	**25.52**	0.356	33.01	-7.49
1880.00	3	QPSK	H	150	2	1 / 0	20.57	4.74	25.31	0.340	33.01	-7.70
1908.50	3	QPSK	H	150	356	1 / 0	20.41	4.68	25.09	0.323	33.01	-7.92
1851.50	3	16-QAM	H	150	1	1 / 0	19.83	4.82	**24.65**	0.291	33.01	-8.36
1852.50	5	QPSK	H	150	2	1 / 0	20.82	4.81	**25.63**	0.366	33.01	-7.38
1880.00	5	QPSK	H	150	350	1 / 0	20.52	4.74	25.26	0.336	33.01	-7.75
1907.50	5	QPSK	H	150	357	1 / 0	20.64	4.68	25.32	0.341	33.01	-7.69
1852.50	5	16-QAM	H	150	2	1 / 0	19.97	4.81	**24.78**	0.301	33.01	-8.23
1855.00	10	QPSK	H	150	355	1 / 0	20.66	4.81	**25.47**	0.352	33.01	-7.54
1880.00	10	QPSK	H	150	1	1 / 0	20.67	4.74	25.41	0.348	33.01	-7.60
1905.00	10	QPSK	H	150	360	1 / 0	20.48	4.68	25.16	0.328	33.01	-7.85
1855.00	10	16-QAM	H	150	355	1 / 0	19.84	4.81	**24.65**	0.291	33.01	-8.36
1857.50	15	QPSK	H	150	356	1 / 0	20.81	4.80	**25.61**	0.364	33.01	-7.40
1880.00	15	QPSK	H	150	348	1 / 0	20.57	4.74	25.31	0.340	33.01	-7.70
1902.50	15	QPSK	H	150	354	1 / 0	20.41	4.69	25.10	0.323	33.01	-7.91
1880.00	15	16-QAM	H	150	348	1 / 0	19.73	4.74	**24.47**	0.280	33.01	-8.54
1860.00	20	QPSK	H	150	360	1 / 0	20.88	4.79	**25.67**	0.369	33.01	-7.34
1880.00	20	QPSK	H	150	352	1 / 0	20.85	4.74	25.59	0.362	33.01	-7.42
1900.00	20	QPSK	H	150	358	1 / 0	20.45	4.69	25.14	0.326	33.01	-7.87
1860.00	20	16-QAM	H	150	360	1 / 0	20.01	4.79	24.80	0.302	33.01	-8.21
1880.00	20	16-QAM	H	150	352	1 / 0	20.10	4.74	**24.84**	0.305	33.01	-8.17
1900.00	20	16-QAM	H	150	358	1 / 0	19.55	4.69	24.24	0.265	33.01	-8.77
1850.70	1.4	QPSK	V	150	91	1 / 0	20.20	4.79	24.99	0.316	33.01	-8.02

Table 7-6. EIRP Data (Band 2)

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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	340	1 / 24	19.23	5.74	24.97	0.314	33.01	-8.04
2535.00	5	QPSK	H	150	342	1 / 24	19.68	5.86	**25.54**	0.358	33.01	-7.47
2567.50	5	QPSK	H	150	341	1 / 24	19.33	5.98	25.31	0.340	33.01	-7.70
2535.00	5	16-QAM	H	150	342	1 / 24	18.54	5.86	**24.40**	0.275	33.01	-8.61
2505.00	10	QPSK	H	150	343	1 / 49	19.55	5.75	25.30	0.339	33.01	-7.71
2535.00	10	QPSK	H	150	342	1 / 49	19.69	5.86	**25.55**	**0.359**	33.01	-7.46
2565.00	10	QPSK	H	150	341	1 / 49	19.49	5.97	25.46	0.352	33.01	-7.55
2535.00	10	16-QAM	H	150	342	1 / 49	18.51	5.86	**24.37**	0.274	33.01	-8.64
2507.50	15	QPSK	H	150	341	1 / 74	19.42	5.76	25.18	0.329	33.01	-7.83
2535.00	15	QPSK	H	150	343	1 / 74	19.68	5.86	**25.54**	0.358	33.01	-7.47
2562.50	15	QPSK	H	150	343	1 / 74	19.49	5.96	25.45	0.351	33.01	-7.56
2562.50	15	16-QAM	H	150	343	1 / 74	18.50	5.96	**24.46**	0.279	33.01	-8.55
2510.00	20	QPSK	H	150	343	1 / 0	19.51	5.77	25.28	0.337	33.01	-7.73
2535.00	20	QPSK	H	150	345	1 / 0	19.63	5.86	**25.49**	0.354	33.01	-7.52
2560.00	20	QPSK	H	150	344	1 / 99	19.45	5.95	25.40	0.347	33.01	-7.61
2560.00	20	16-QAM	H	150	344	1 / 99	18.38	5.95	**24.33**	0.271	33.01	-8.68
2535.00	10	QPSK	V	150	101	1/49	17.76	6.07	23.83	0.242	33.01	-9.18

Table 7-7. EIRP Data (Band 7)

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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

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Test Setup

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

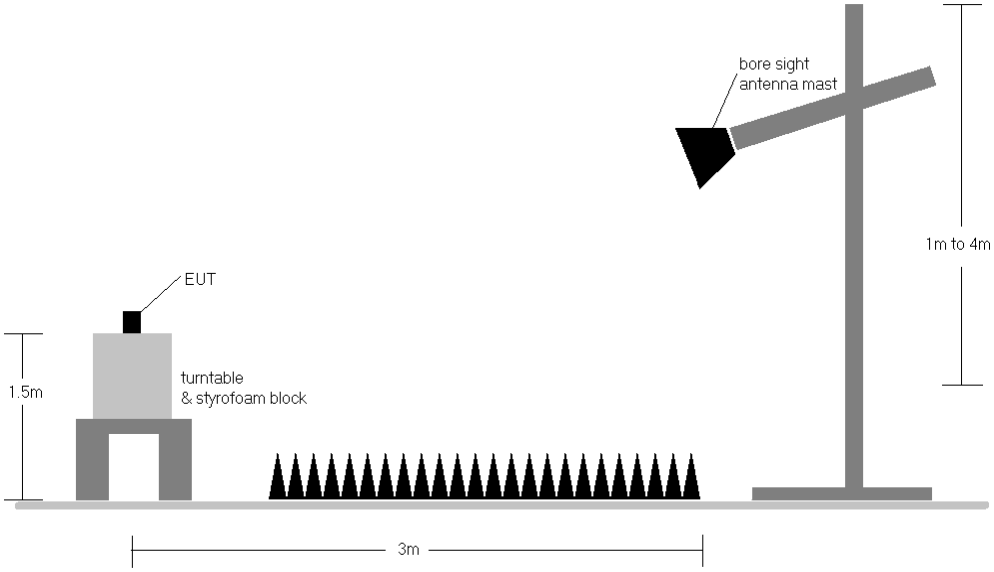

Figure 7-7. Test Instrument & Measurement Setup

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.

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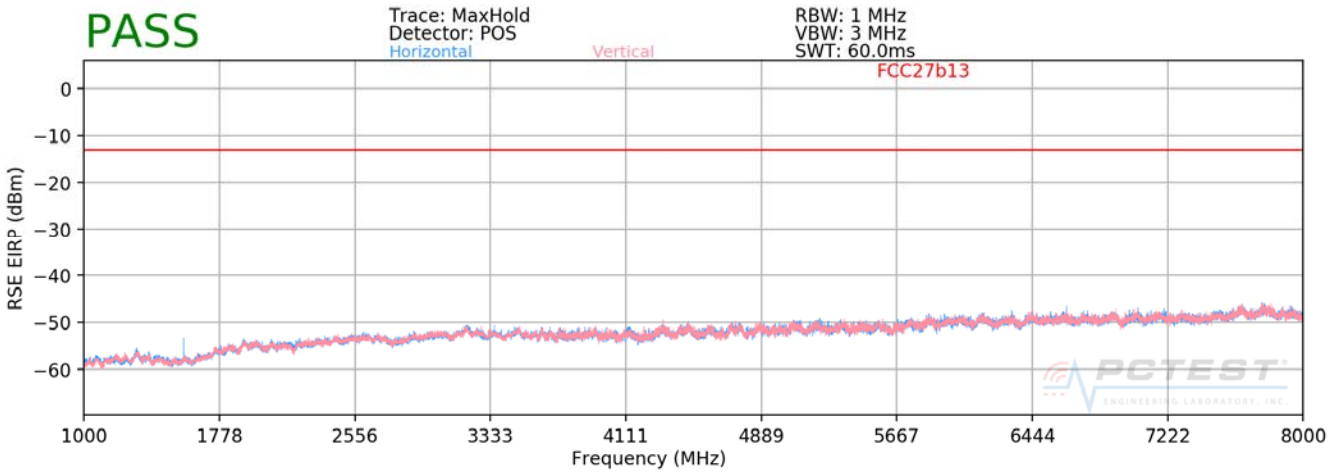
Band 13



Plot 7-164. Radiated Spurious Plot above 1GHz (Band 13)

OPERATING FREQUENCY:	782.00	MHz
CHANNEL:	23230	
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]
2346.00	H	328	158	-69.09	5.72	-63.36	-50.4
3128.00	H	-	-	-70.58	6.93	-63.65	-50.6

Table 7-8. Radiated Spurious Data (Band 13)

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MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.00	MHz
DISTANCE:	3	meters
NARROWBAND EMISSION LIMIT:	-50	dBm
WIDEBAND EMISSION LIMIT:	-40	dBm/MHz

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]
1564.00	H	191	320	-62.80	5.88	-56.92	-16.9

Table 7-9. Radiated Spurious Data (Band 13 – 1559-1610MHz Band)

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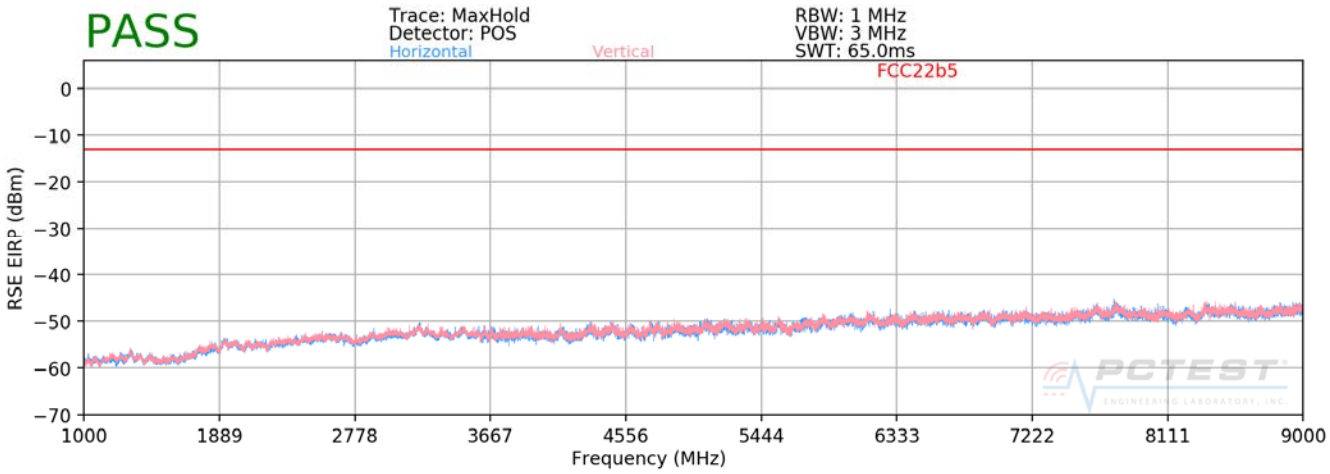
Band 5



Plot 7-165. Radiated Spurious Plot above 1GHz (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	H	117	10	-72.57	5.78	-66.79	-53.8
2487.00	H	111	41	-69.58	5.73	-63.86	-50.9
3316.00	H	-	-	-71.53	7.87	-63.66	-50.7

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

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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	H	279	306	-72.34	5.73	-66.61	-53.6
2509.50	H	109	28	-68.85	5.77	-63.09	-50.1
3346.00	H	-	-	-70.79	7.91	-62.88	-49.9

Table 7-11. 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	H	109	29	-70.55	5.67	-64.88	-51.9
2532.00	H	110	27	-69.72	5.85	-63.87	-50.9
3376.00	H	-	-	-71.31	7.94	-63.36	-50.4

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

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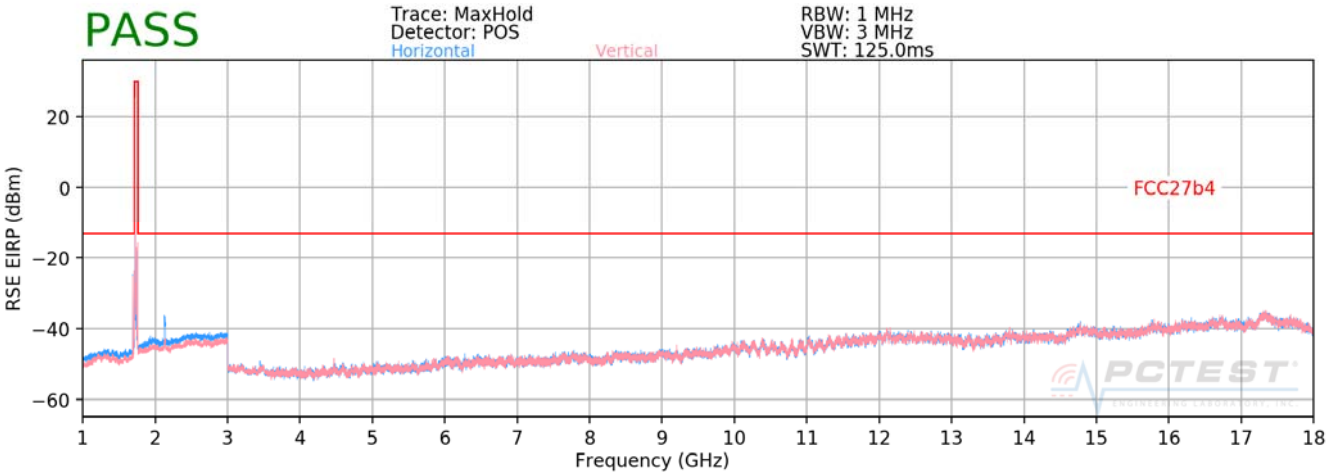
Band 4



Plot 7-166. Radiated Spurious Plot above 1GHz (Band 4)

OPERATING FREQUENCY:	1720.00	MHz
CHANNEL:	20050	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	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]
3440.00	V	109	91	-68.69	8.25	-60.44	-47.4
5160.00	V	110	79	-64.84	10.29	-54.55	-41.6
6880.00	V	-	-	-70.99	11.42	-59.57	-46.6

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

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OPERATING FREQUENCY: 1732.50 MHz
CHANNEL: 20175
MODULATION SIGNAL: QPSK
BANDWIDTH: 20.0 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	115	74	-61.70	8.30	-53.40	-40.4
5197.50	V	110	91	-66.58	10.25	-56.33	-43.3
6930.00	V	-	-	-71.16	11.45	-59.71	-46.7

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

OPERATING FREQUENCY: 1745.00 MHz
CHANNEL: 20300
MODULATION SIGNAL: QPSK
BANDWIDTH: 20.0 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]
3490.00	V	129	77	-65.74	8.35	-57.39	-44.4
5235.00	V	109	94	-63.66	10.29	-53.37	-40.4
6980.00	V	110	104	-71.38	11.50	-59.89	-46.9
8725.00	V	-	-	-71.99	13.20	-58.79	-45.8

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

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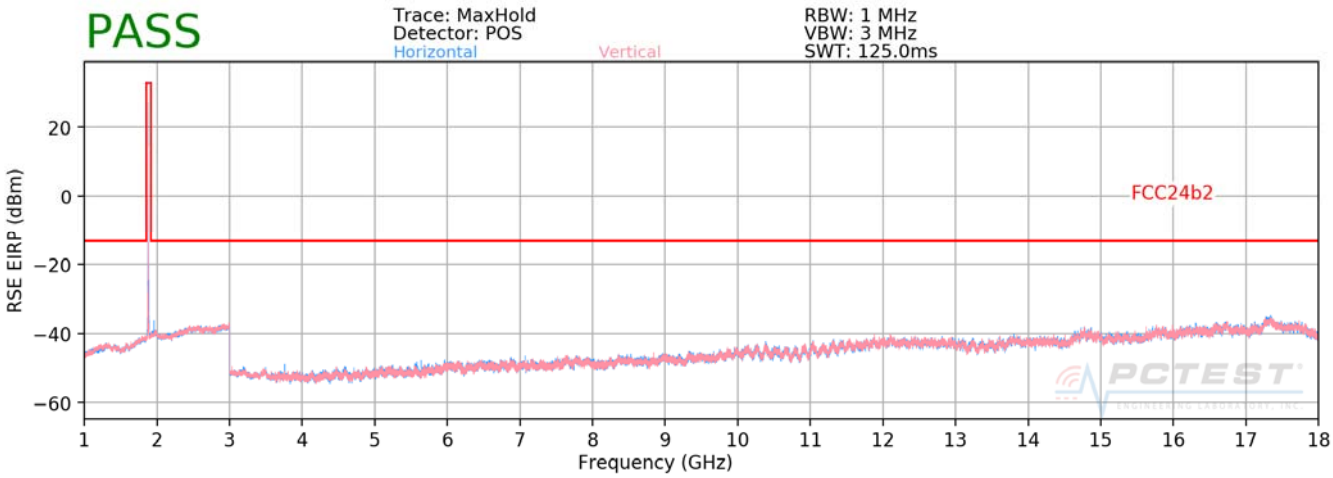
Band 2



Plot 7-167. Radiated Spurious Plot above 1GHz (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	H	113	190	-67.75	8.30	-59.45	-46.5
5552.10	H	111	14	-59.66	10.53	-49.14	-36.1
7402.80	H	360	113	-64.79	11.91	-52.88	-39.9
9253.50	H	-	-	-72.50	13.41	-59.09	-46.1

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

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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	H	120	163	-64.75	8.46	-56.29	-43.3
5640.00	H	116	15	-61.95	10.60	-51.35	-38.4
7520.00	H	360	114	-63.57	12.11	-51.47	-38.5
9400.00	H	-	-	-72.09	13.35	-58.74	-45.7

Table 7-17. 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	H	111	37	-57.99	8.56	-49.43	-36.4
5727.90	H	113	23	-64.49	10.64	-53.85	-40.9
7637.20	H	113	277	-65.24	12.19	-53.05	-40.1
9546.50	H	-	-	-71.57	13.30	-58.28	-45.3

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

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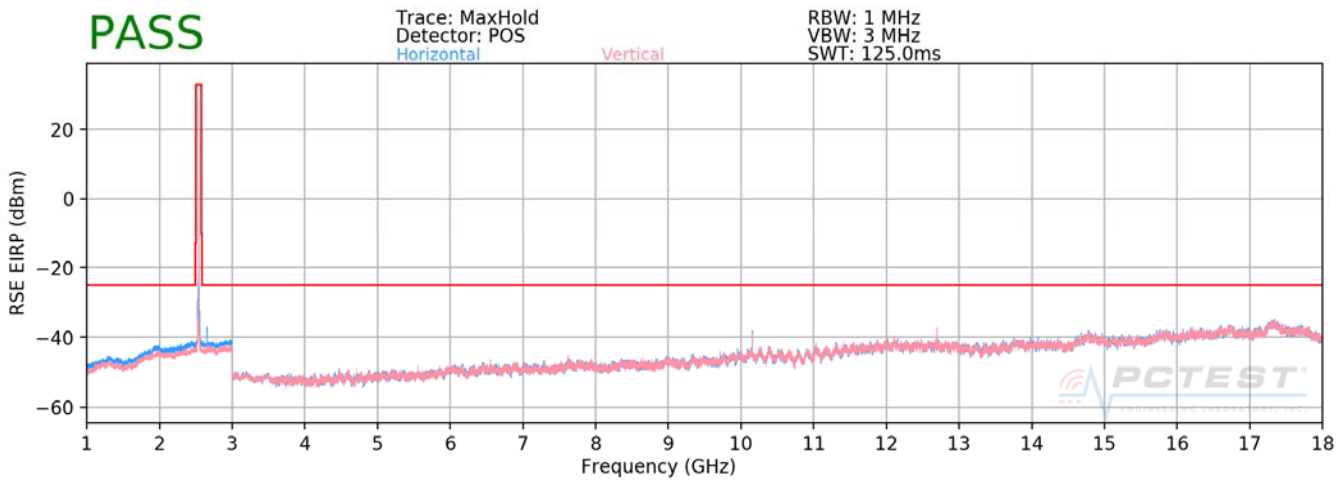
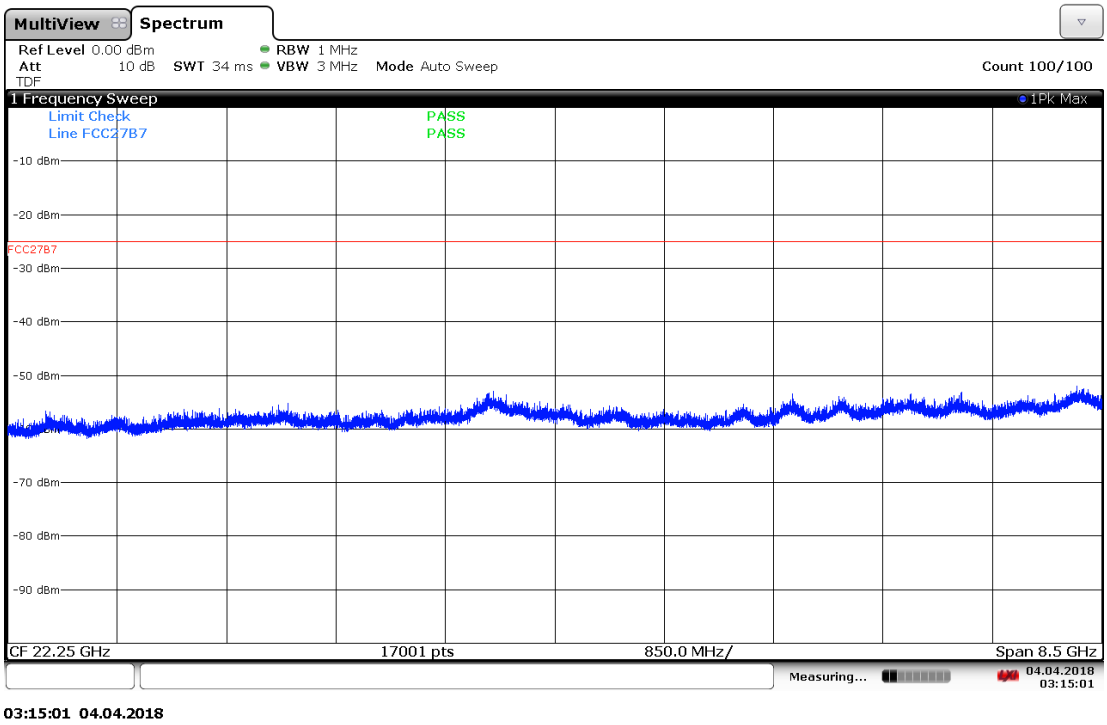
Band 7



Plot 7-168. Radiated Spurious Plot 1GHz - 18GHz (Band 7)



Plot 7-169. Radiated Spurious Plot 18GHz – 26.5GHz (Band 7 Ant. H)

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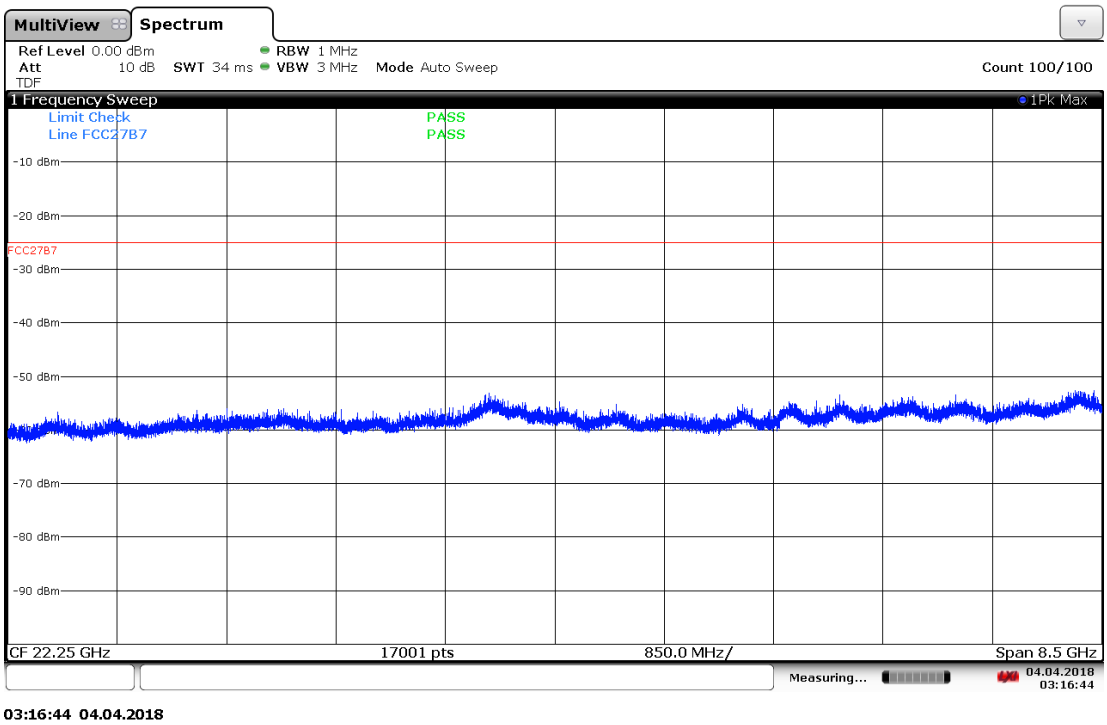

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Plot 7-170. Radiated Spurious Plot 18GHz – 26.5GHz (Band 7 Ant. V)

OPERATING FREQUENCY:	2505.00	MHz
CHANNEL:	20800	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	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]
5010.00	H	150	163	-64.96	8.34	-56.63	-31.6
7515.00	H	150	134	-62.88	8.44	-54.44	-29.4
10020.00	H	150	296	-48.01	9.87	-38.15	-13.1
12525.00	H	150	306	-44.73	9.34	-35.39	-10.4
15030.00	H	-	-	-56.77	9.39	-47.37	-22.4

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

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OPERATING FREQUENCY:	2535.00	MHz
CHANNEL:	21100	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	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	150	155	-64.45	8.39	-56.06	-31.1
7605.00	H	150	123	-58.92	8.51	-50.41	-25.4
10140.00	H	150	303	-49.21	9.70	-39.51	-14.5
12675.00	H	150	305	-51.16	9.24	-41.92	-16.9
15210.00	H	-	-	-56.44	9.31	-47.13	-22.1

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

OPERATING FREQUENCY:	2565.00	MHz
CHANNEL:	21400	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	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]
5130.00	H	150	153	-65.88	8.43	-57.45	-32.5
7695.00	H	150	240	-57.73	8.66	-49.07	-24.1
10260.00	H	150	302	-42.23	9.72	-32.51	-7.5
12825.00	H	150	306	-43.92	9.22	-34.70	-9.7
15390.00	H	-	-	-56.53	9.17	-47.36	-22.4

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

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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, the frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency. For Part 24, 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-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

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Band 13 Frequency Stability Measurements

OPERATING FREQUENCY: 782,000,000 Hz

CHANNEL: 23230

REFERENCE VOLTAGE: 4.30 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.30	+ 20 (Ref)	781,999,959	-41	-0.0000052
100 %		- 30	781,999,752	-248	-0.0000317
100 %		- 20	782,000,024	24	0.0000031
100 %		- 10	781,999,823	-177	-0.0000226
100 %		0	781,999,665	-335	-0.0000428
100 %		+ 10	781,999,938	-62	-0.0000079
100 %		+ 20	781,999,942	-58	-0.0000074
100 %		+ 30	782,000,295	295	0.0000377
100 %		+ 40	781,999,752	-248	-0.0000317
100 %		+ 50	781,999,992	-8	-0.0000010
BATT. ENDPOINT	3.70	+ 20	781,999,599	-401	-0.0000513

Table 7-22. Frequency Stability Data (Band 13)

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.

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Band 13 Frequency Stability Measurements

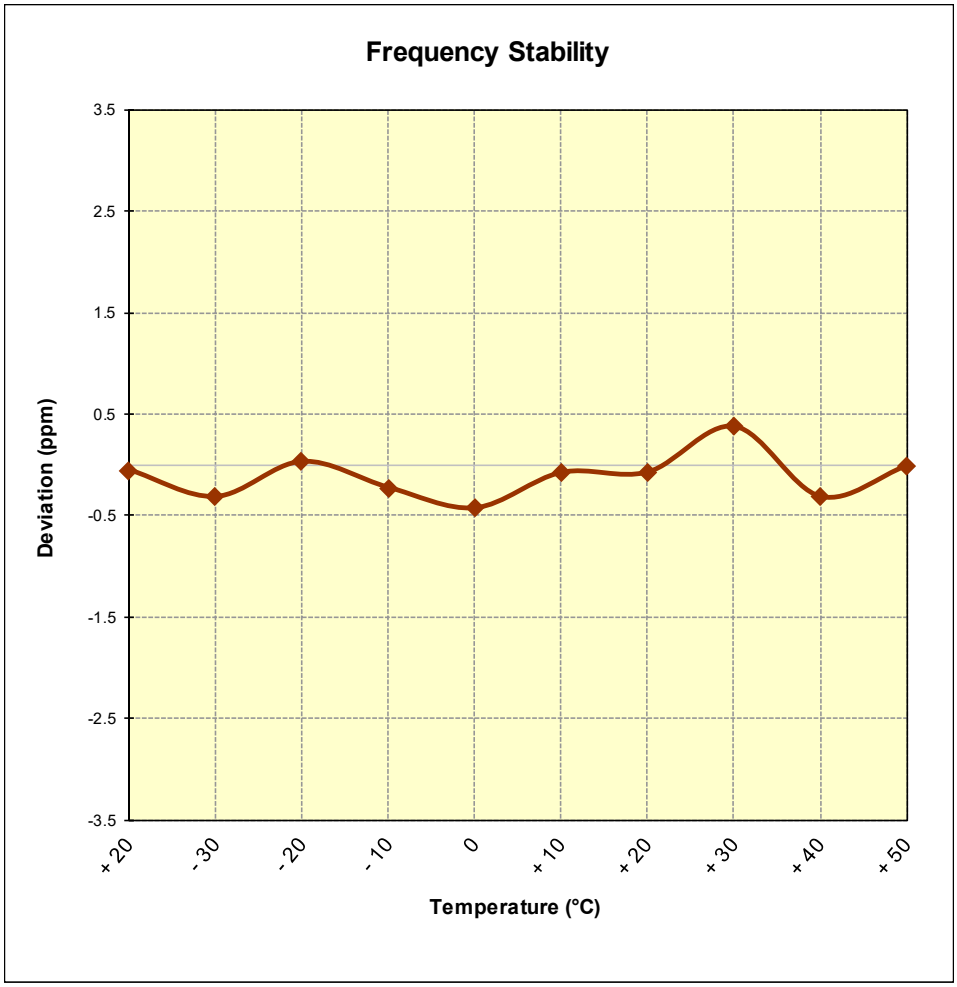

Figure 7-8. Frequency Stability Graph (Band 13)

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Band 5 Frequency Stability Measurements

OPERATING FREQUENCY:	836,500,000	Hz
CHANNEL:	20525	
REFERENCE VOLTAGE:	4.30	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.30	+ 20 (Ref)	836,499,898	-102	-0.0000122
100 %		- 30	836,500,040	40	0.0000048
100 %		- 20	836,500,265	265	0.0000317
100 %		- 10	836,500,076	76	0.0000091
100 %		0	836,499,979	-21	-0.0000025
100 %		+ 10	836,499,839	-161	-0.0000192
100 %		+ 20	836,499,705	-295	-0.0000353
100 %		+ 30	836,500,244	244	0.0000292
100 %		+ 40	836,500,105	105	0.0000126
100 %		+ 50	836,500,055	55	0.0000066
BATT. ENDPOINT	3.70	+ 20	836,500,254	254	0.0000304

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

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Band 5 Frequency Stability Measurements

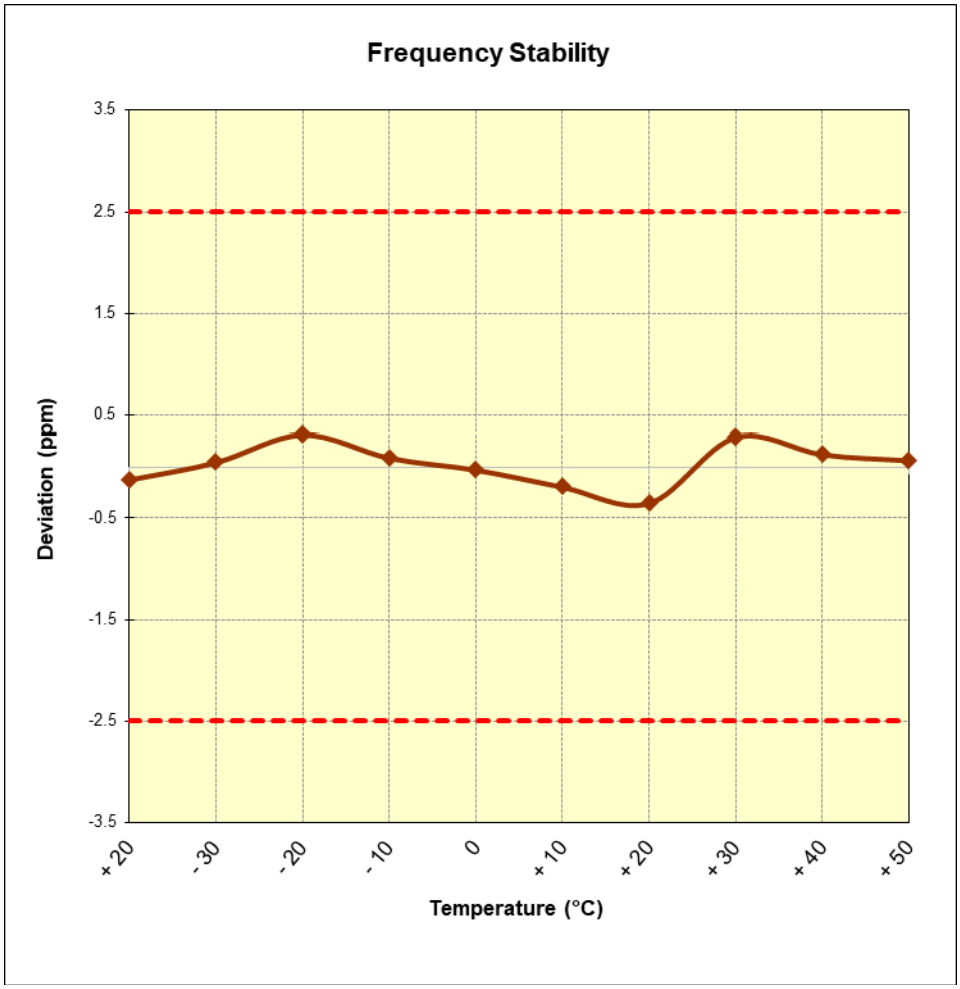

Figure 7-9. Frequency Stability Graph (Band 5)

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Band 4 Frequency Stability Measurements

OPERATING FREQUENCY: 1,732,500,000 Hz

CHANNEL: 20175

REFERENCE VOLTAGE: 4.30 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.30	+ 20 (Ref)	1,732,499,754	-246	-0.0000142
100 %		- 30	1,732,500,335	335	0.0000193
100 %		- 20	1,732,500,024	24	0.0000014
100 %		- 10	1,732,500,286	286	0.0000165
100 %		0	1,732,499,998	-2	-0.0000001
100 %		+ 10	1,732,500,076	76	0.0000044
100 %		+ 20	1,732,499,891	-109	-0.0000063
100 %		+ 30	1,732,500,266	266	0.0000154
100 %		+ 40	1,732,500,303	303	0.0000175
100 %		+ 50	1,732,499,957	-43	-0.0000025
BATT. ENDPOINT	3.70	+ 20	1,732,499,972	-28	-0.0000016

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.

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Band 4 Frequency Stability Measurements

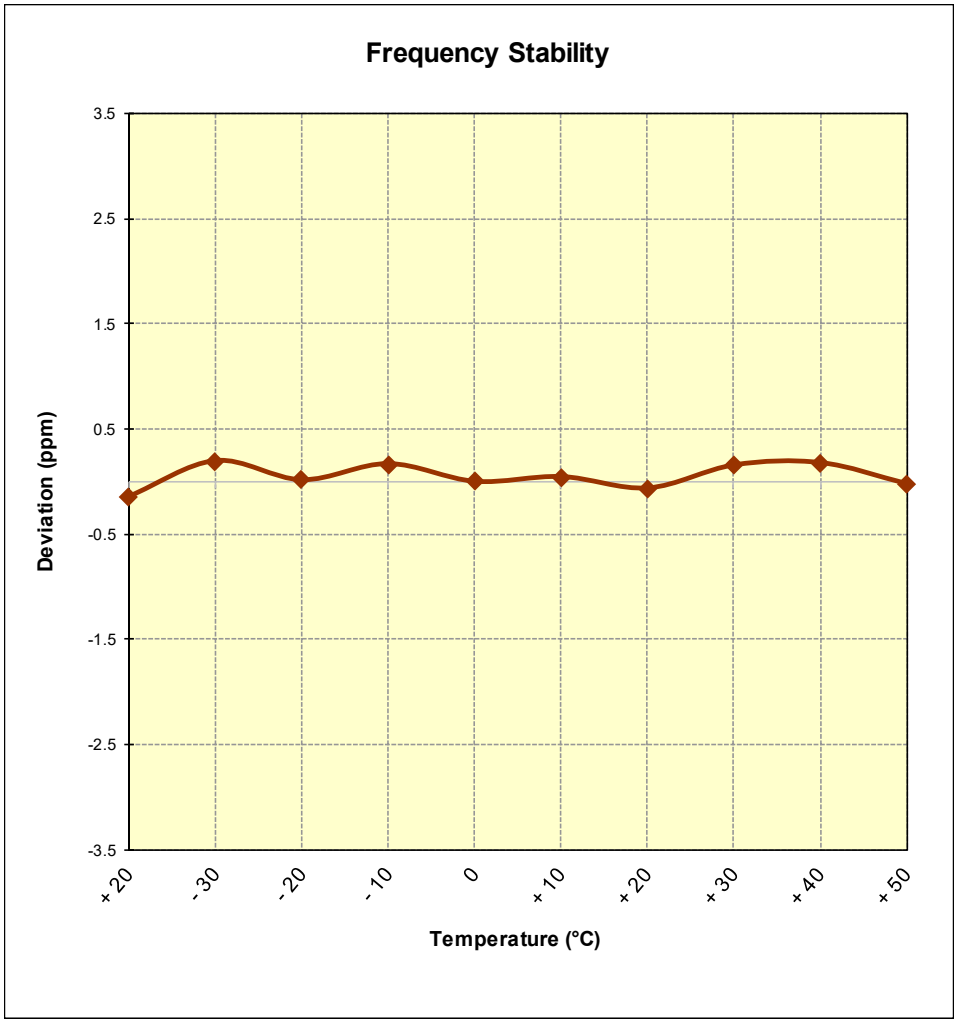

Figure 7-10. Frequency Stability Graph (Band 4)

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Band 2 Frequency Stability Measurements

OPERATING FREQUENCY: 1,880,000,000 Hz

CHANNEL: 18900

REFERENCE VOLTAGE: 4.30 VDC

DEVIATION LIMIT: ± 0.00025 % or 2.5 ppm

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.30	+ 20 (Ref)	1,880,000,280	280	0.0000149
100 %		- 30	1,880,000,042	42	0.0000022
100 %		- 20	1,879,999,822	-178	-0.0000095
100 %		- 10	1,879,999,815	-185	-0.0000098
100 %		0	1,880,000,203	203	0.0000108
100 %		+ 10	1,879,999,749	-251	-0.0000134
100 %		+ 20	1,879,999,875	-125	-0.0000066
100 %		+ 30	1,880,000,296	296	0.0000157
100 %		+ 40	1,880,000,081	81	0.0000043
100 %		+ 50	1,879,999,701	-299	-0.0000159
BATT. ENDPOINT	3.70	+ 20	1,879,999,797	-203	-0.0000108

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

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Band 2 Frequency Stability Measurements

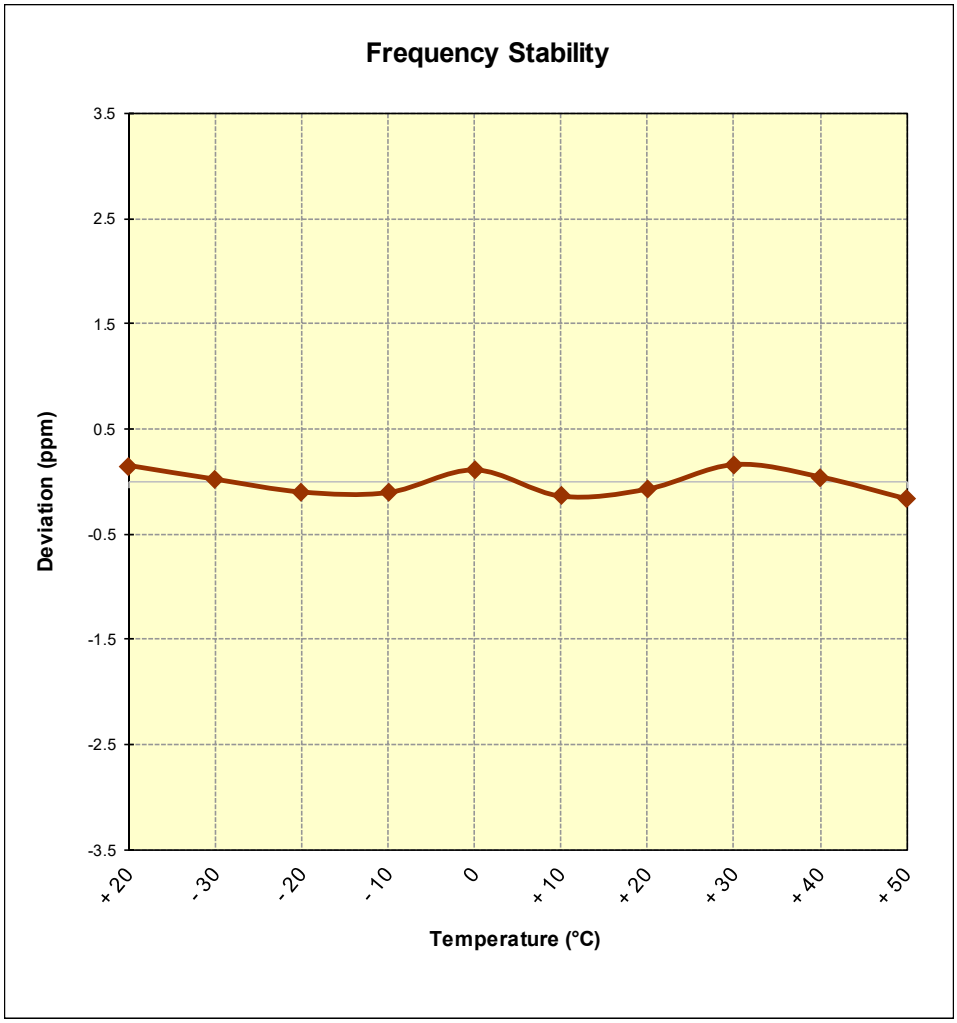

Figure 7-11. Frequency Stability Graph (Band 2)

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Band 7 Frequency Stability Measurements

OPERATING FREQUENCY: 2,535,000,000 Hz

CHANNEL: 21100

REFERENCE VOLTAGE: 4.30 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.30	+ 20 (Ref)	2,534,999,990	-10	-0.0000004
100 %		- 30	2,534,999,798	-202	-0.0000080
100 %		- 20	2,535,000,034	34	0.0000013
100 %		- 10	2,535,000,023	23	0.0000009
100 %		0	2,534,999,995	-5	-0.0000002
100 %		+ 10	2,534,999,624	-376	-0.0000148
100 %		+ 20	2,535,000,358	358	0.0000141
100 %		+ 30	2,535,000,126	126	0.0000050
100 %		+ 40	2,535,000,043	43	0.0000017
100 %		+ 50	2,534,999,994	-6	-0.0000002
BATT. ENDPOINT	3.70	+ 20	2,534,999,877	-123	-0.0000049

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

Note:

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

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Band 7 Frequency Stability Measurements

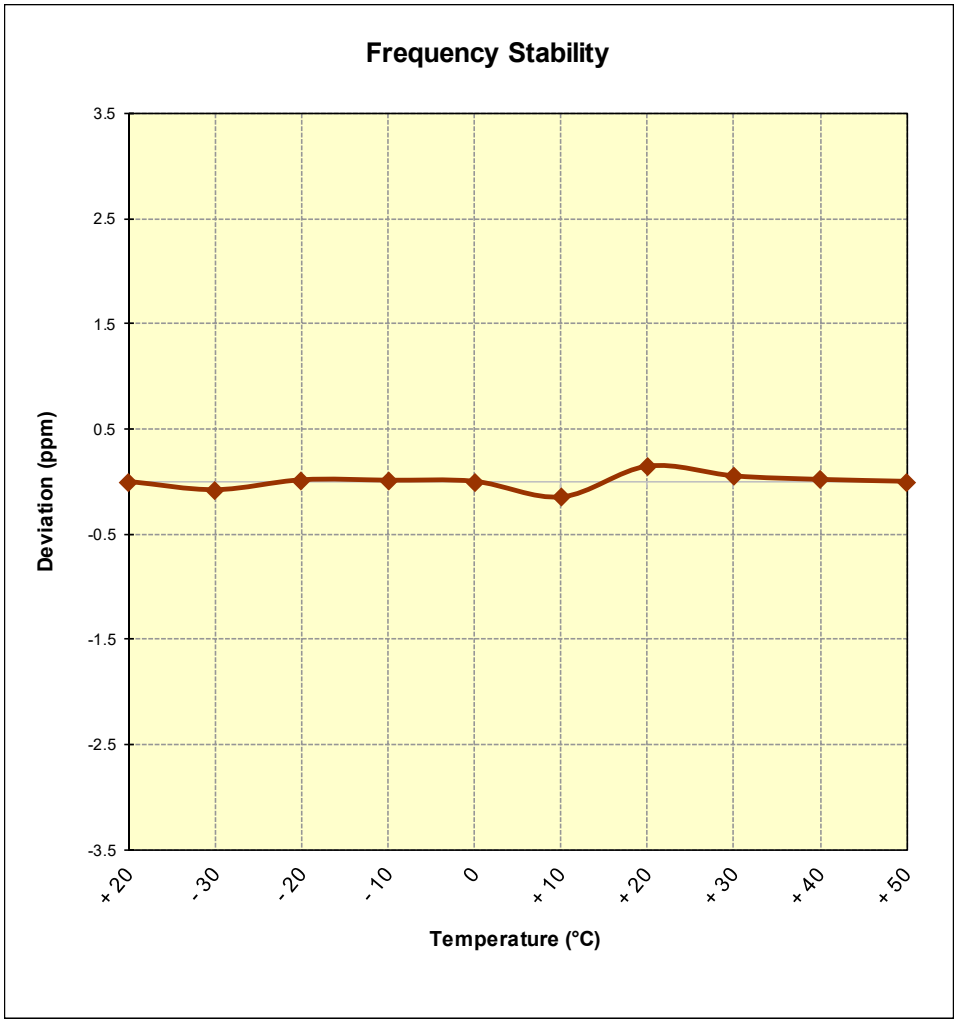

Figure 7-12. Frequency Stability Graph (Band 7)

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset** **FCC ID: A3LSMJ737V** complies with all the requirements of Part 22, 24, & 27 of the FCC Rules for LTE operation only.

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