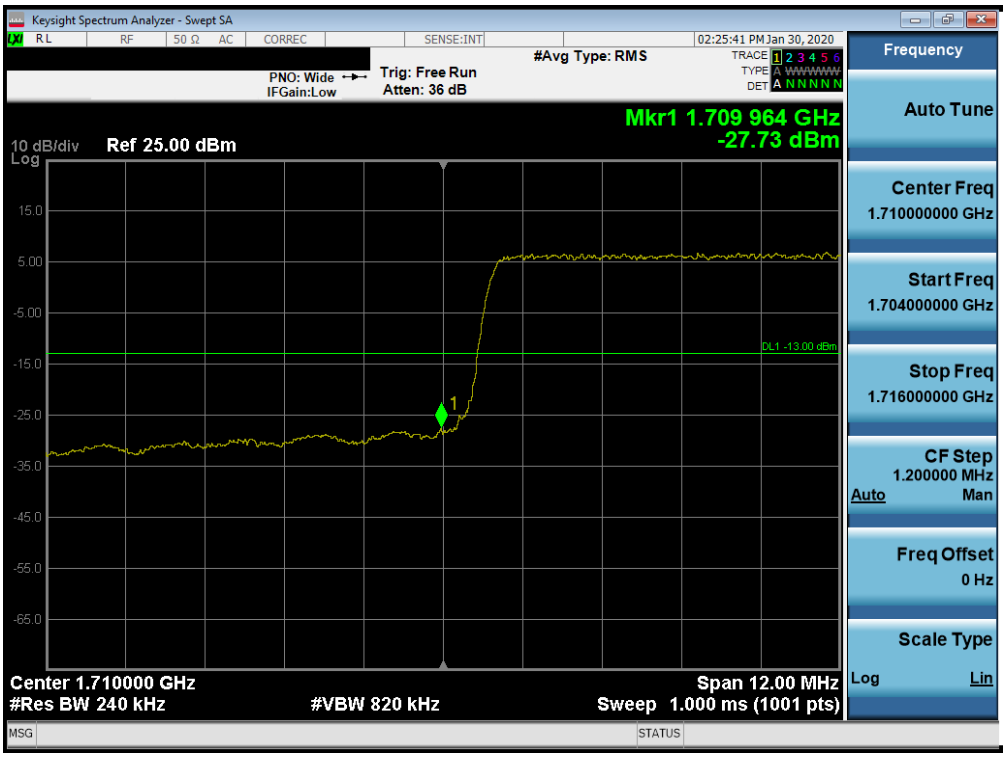
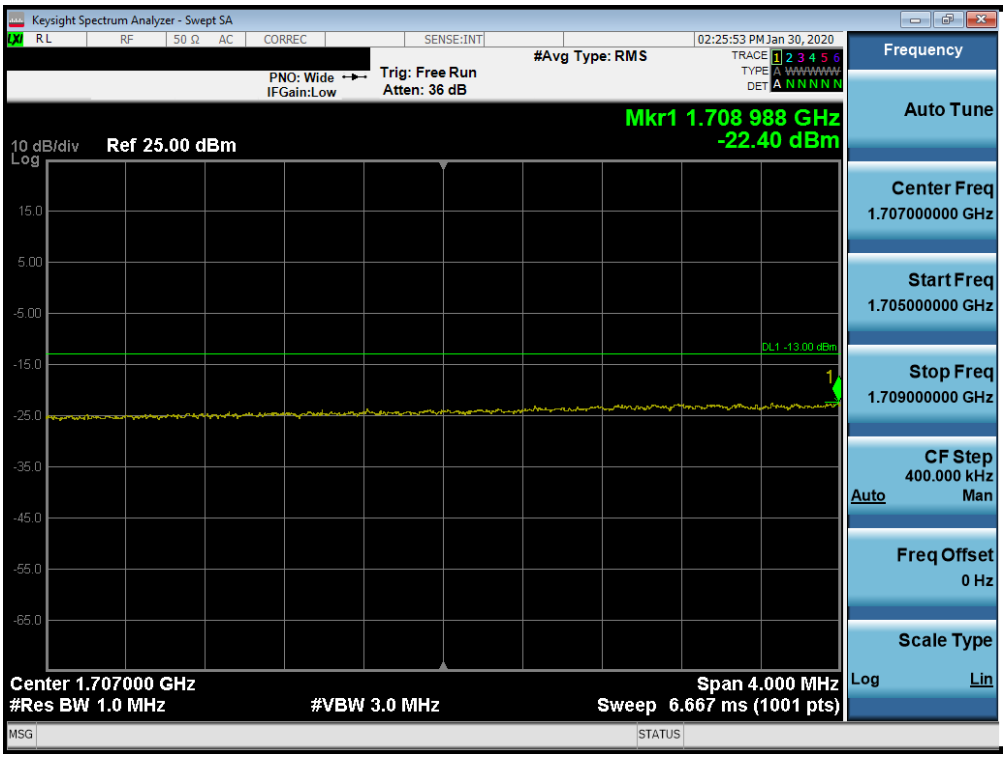
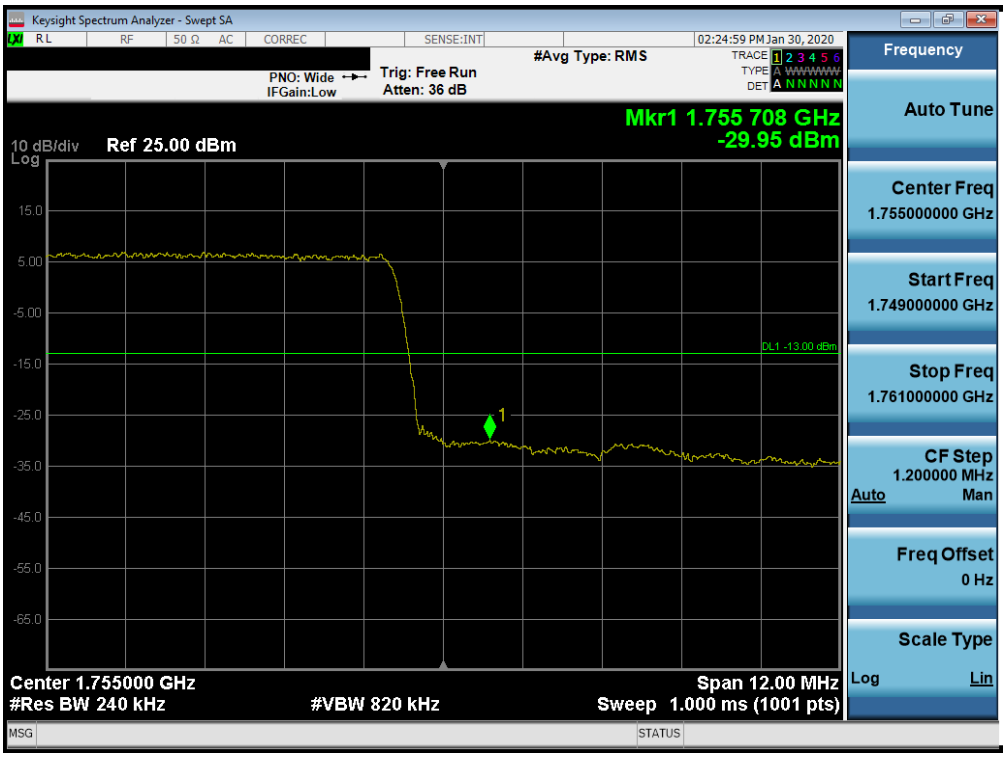


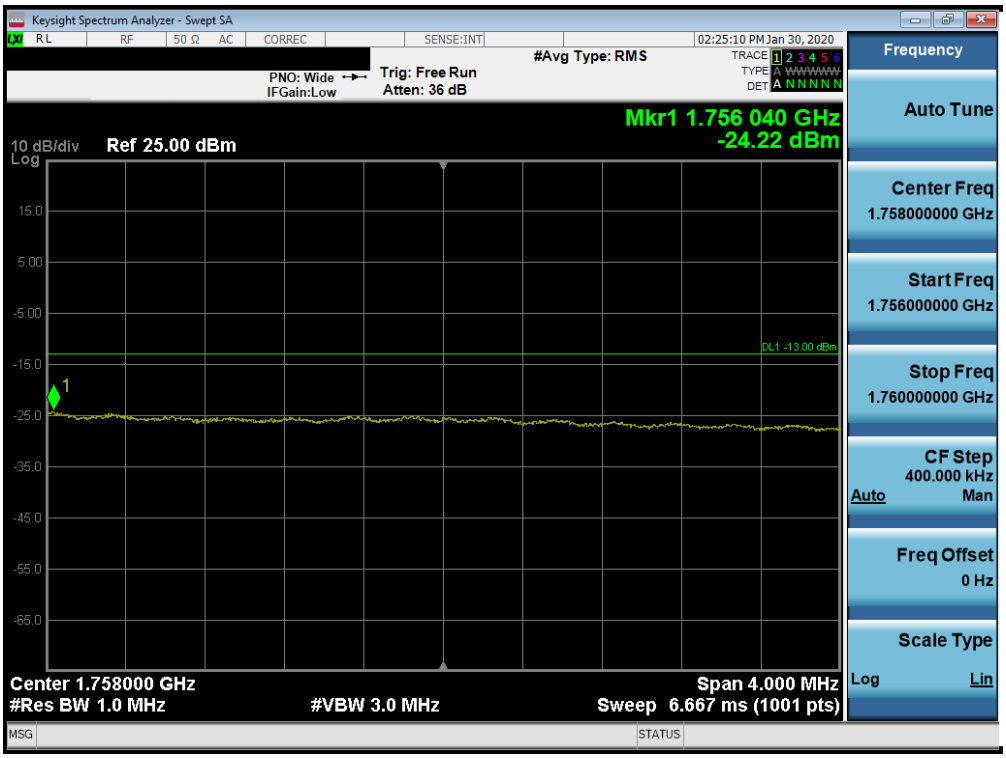
Plot 7-116. Lower Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)



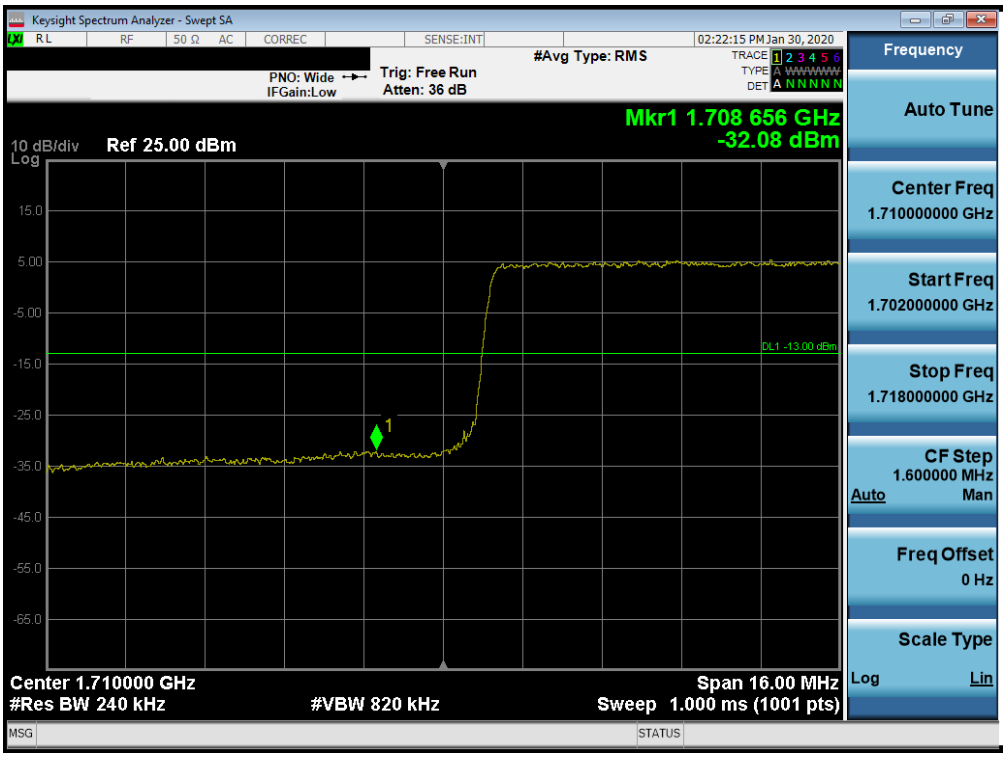
Plot 7-117. Lower Extended Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)



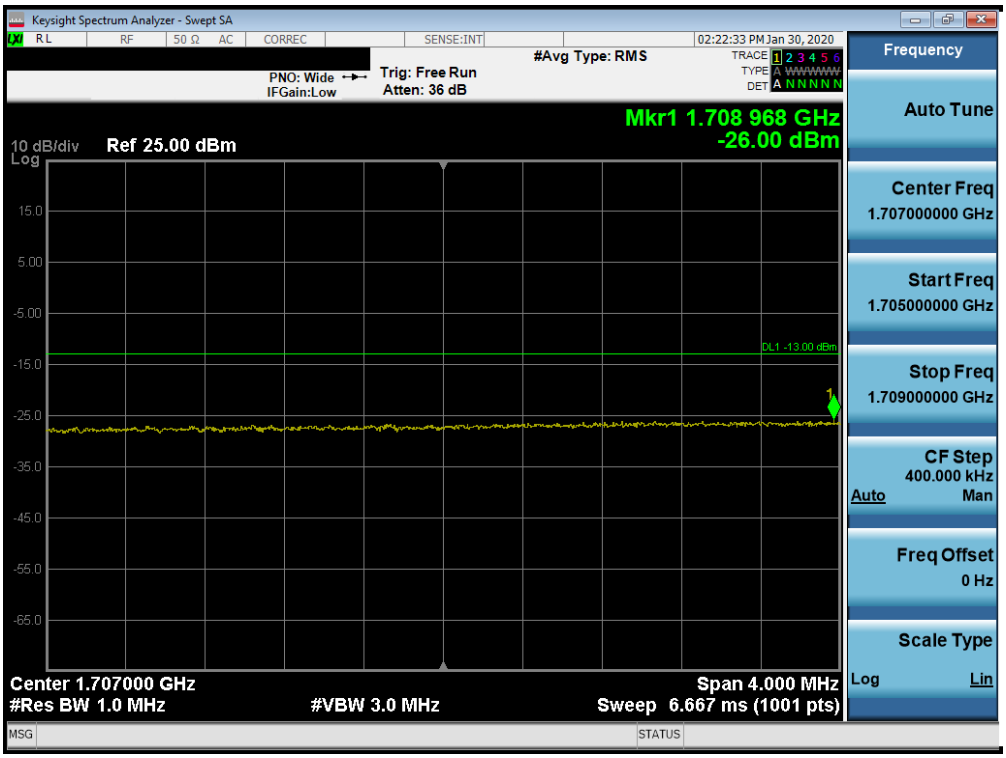
Plot 7-118. Upper Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)



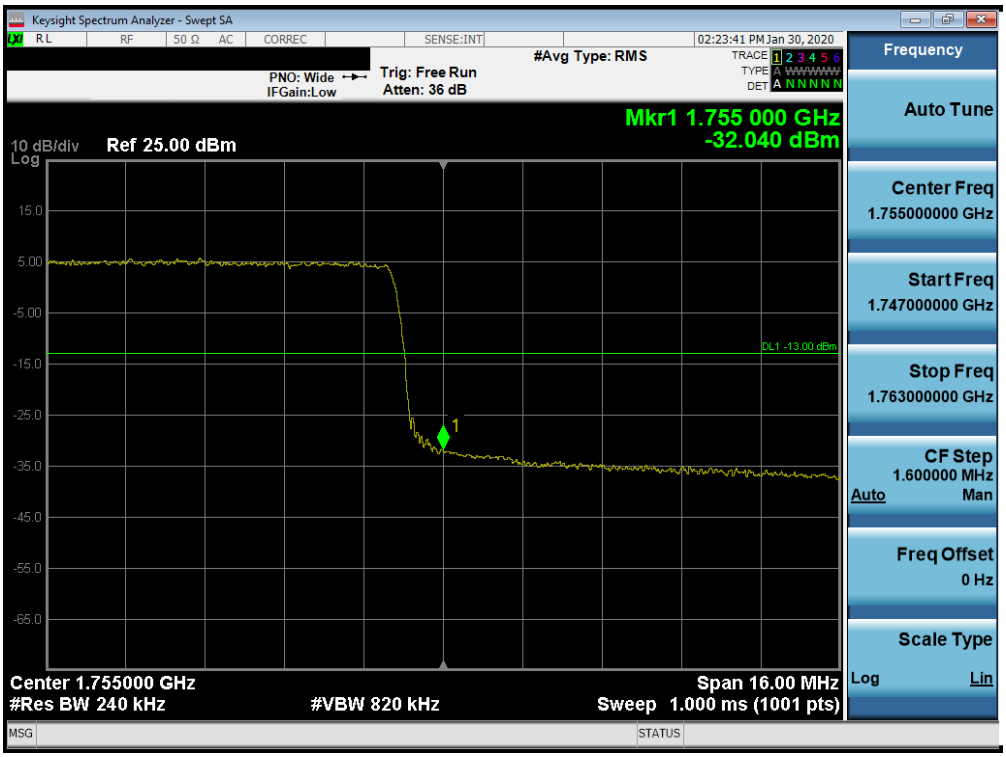
Plot 7-119. Upper Extended Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)



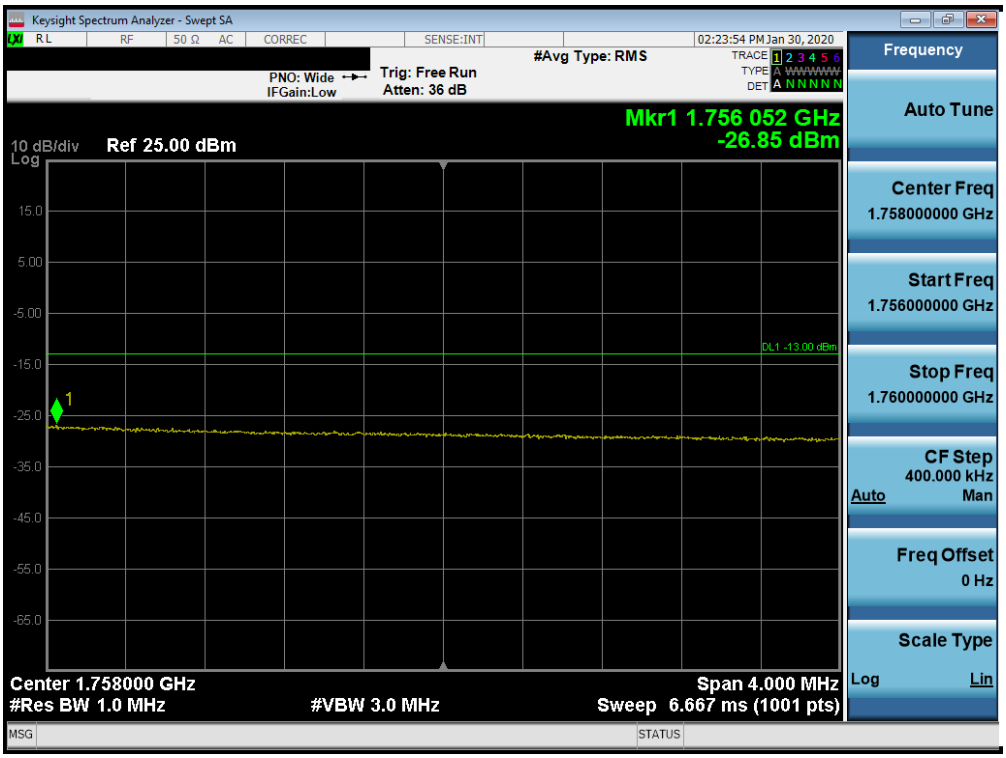
Plot 7-120. Lower Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-121. Lower Extended Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)

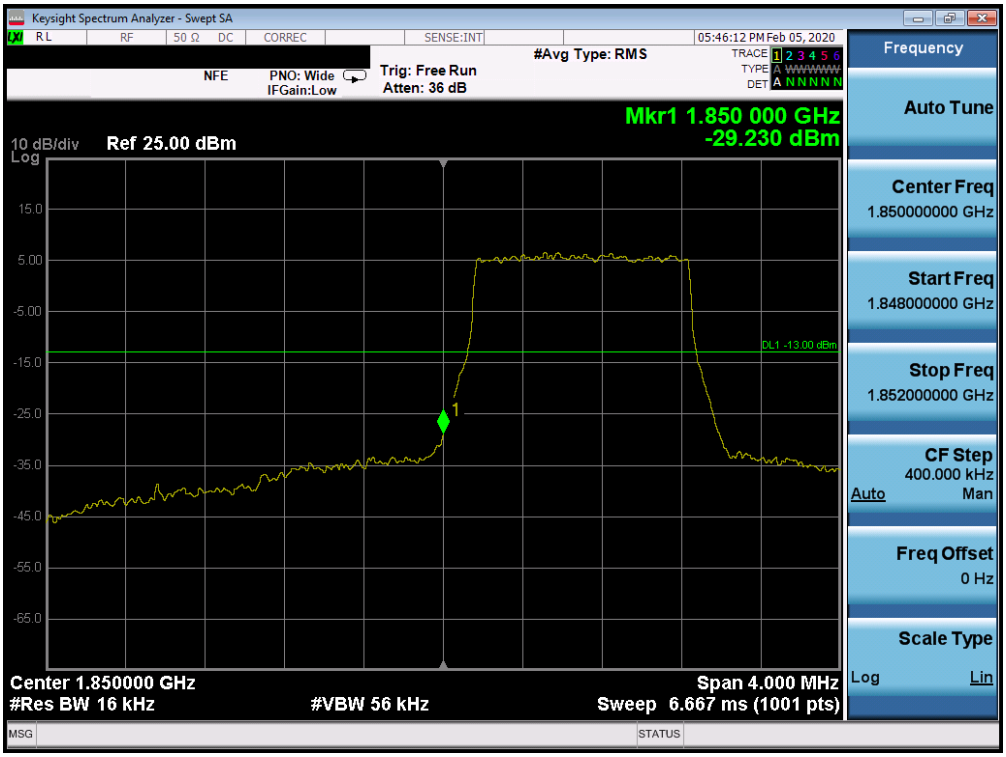


Plot 7-122. Upper Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)

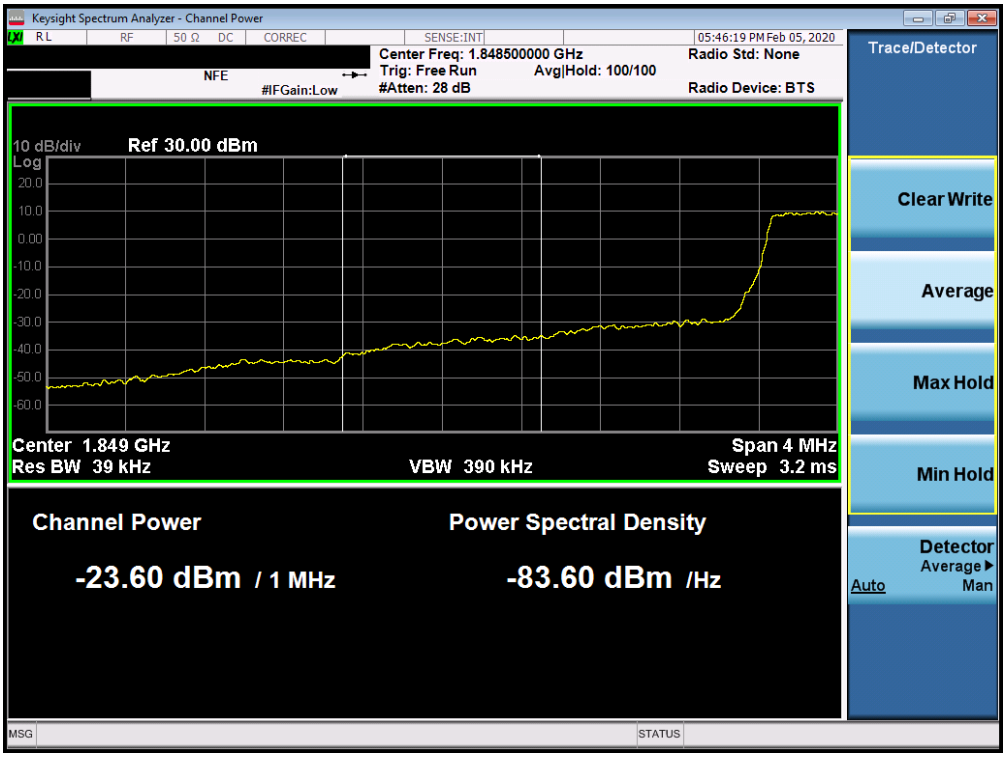


Plot 7-123. Upper Extended Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)

Band 2

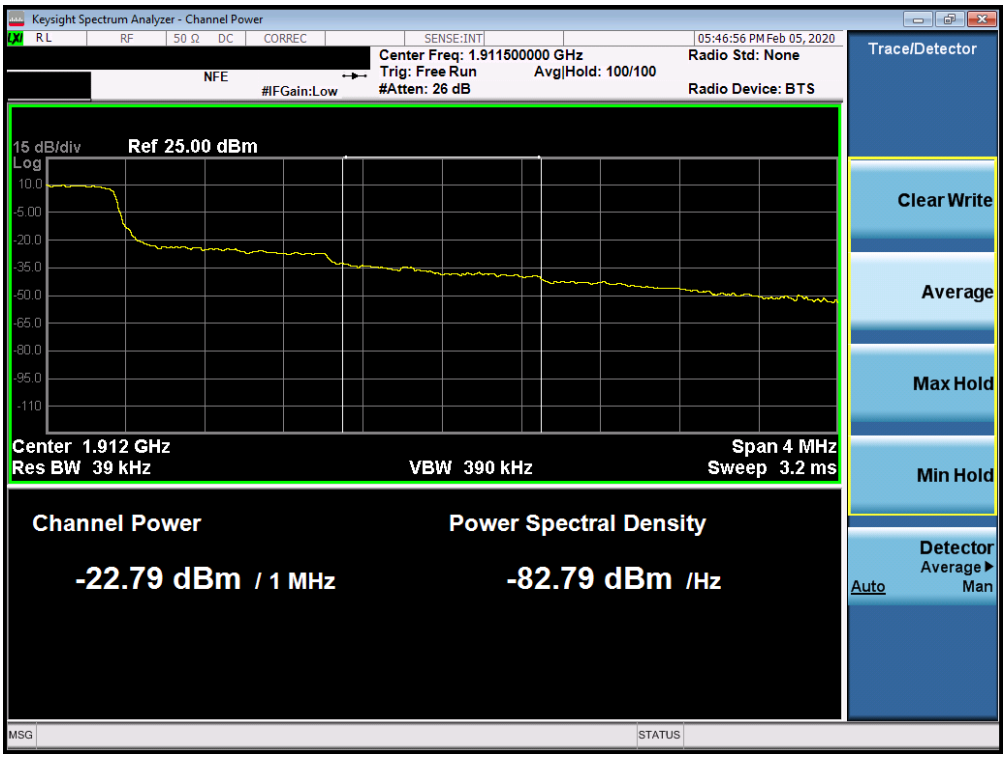


Plot 7-124. Lower Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)

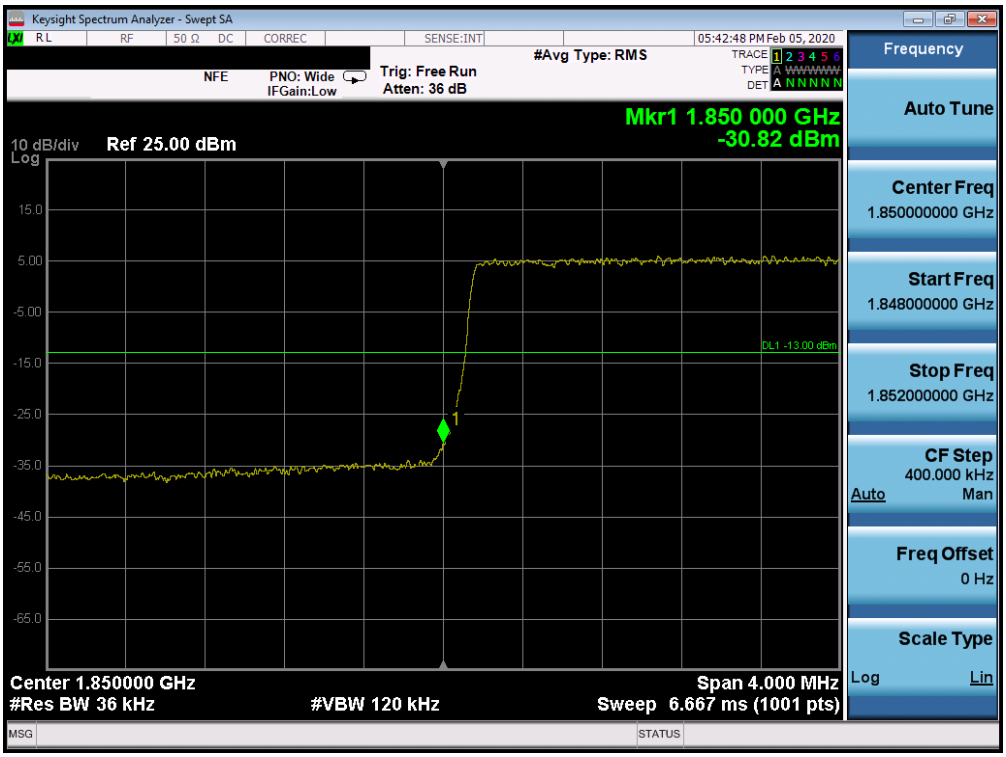


Plot 7-125. Lower Extended Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)

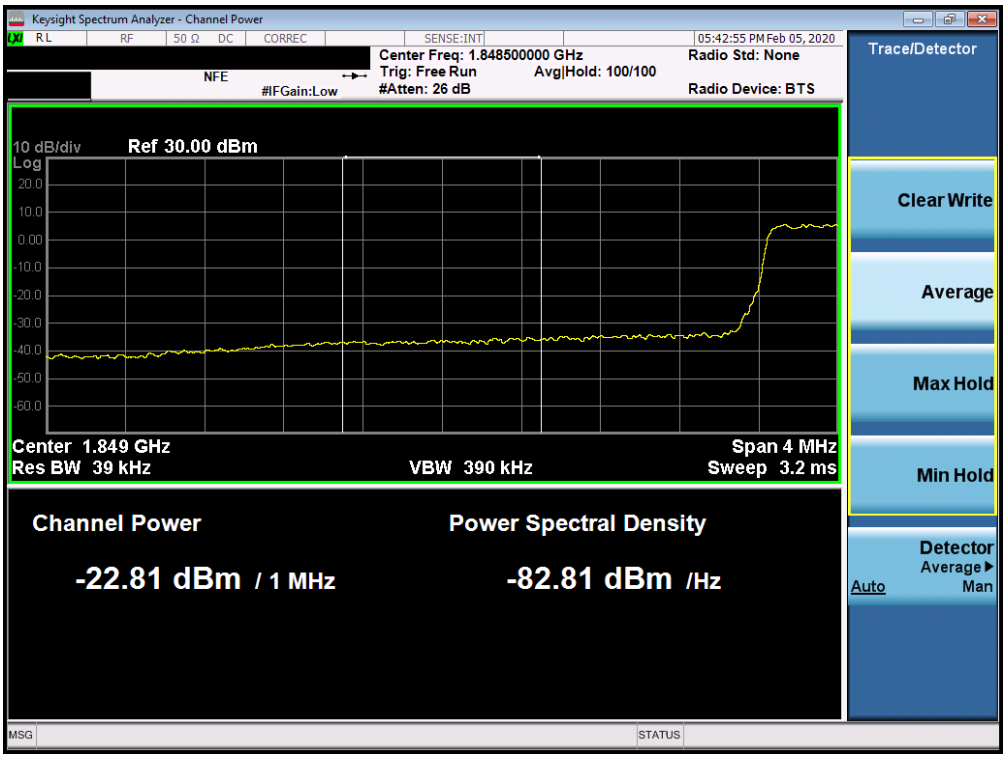
Plot 7-126. Upper Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



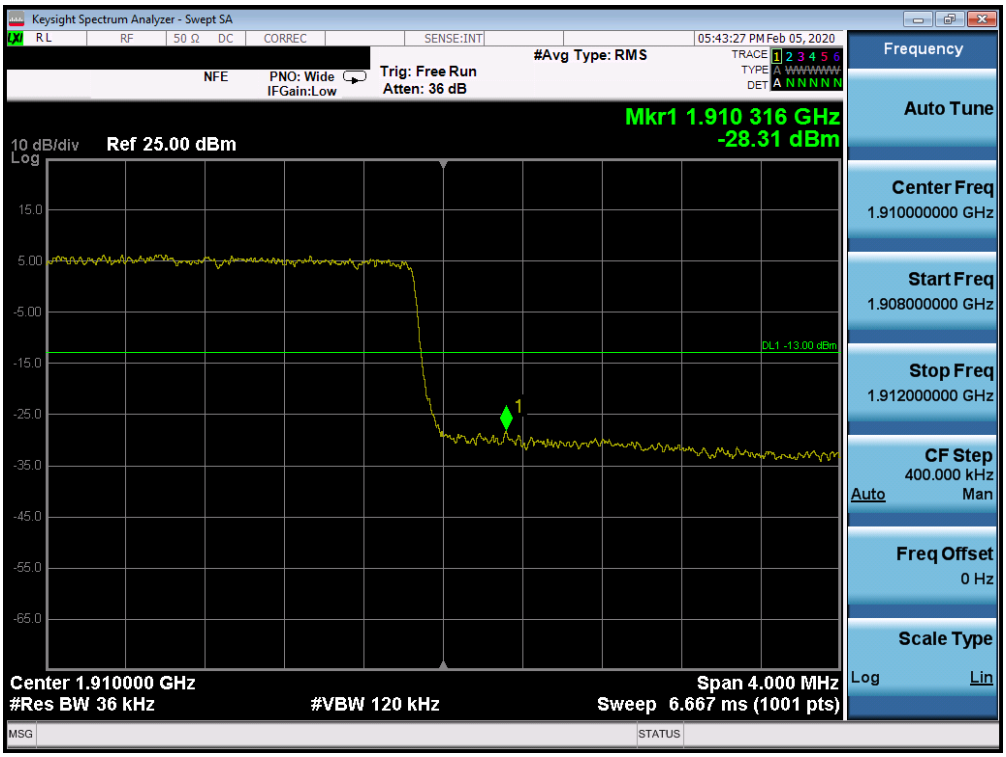
Plot 7-127. Upper Extended Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



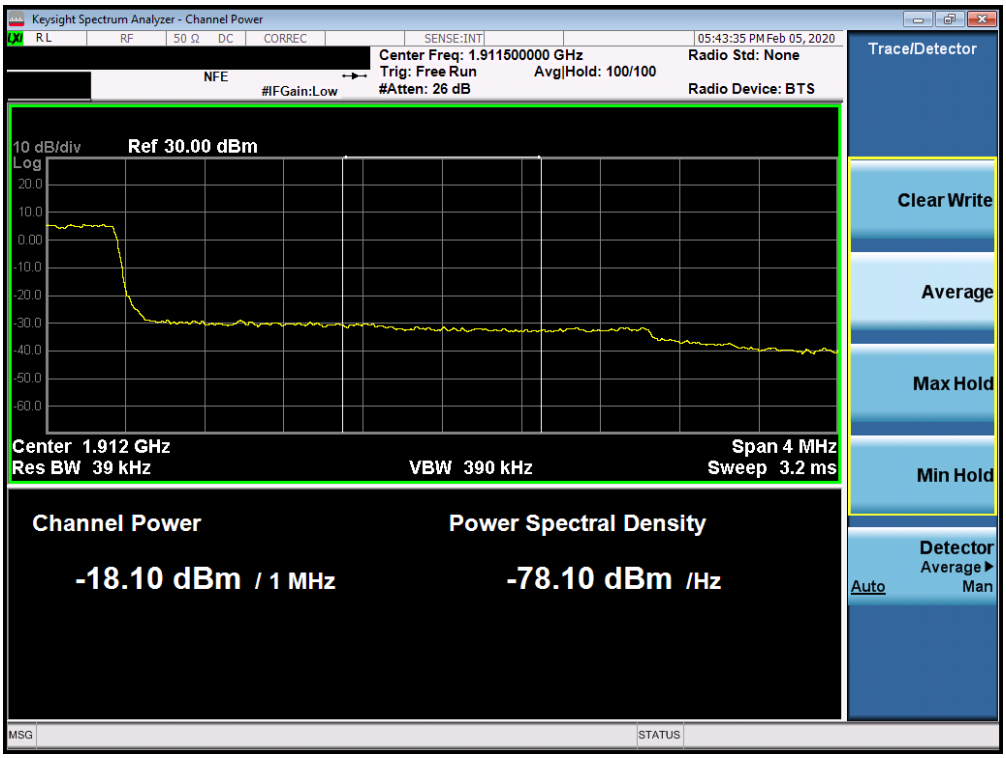
Plot 7-128. Lower Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



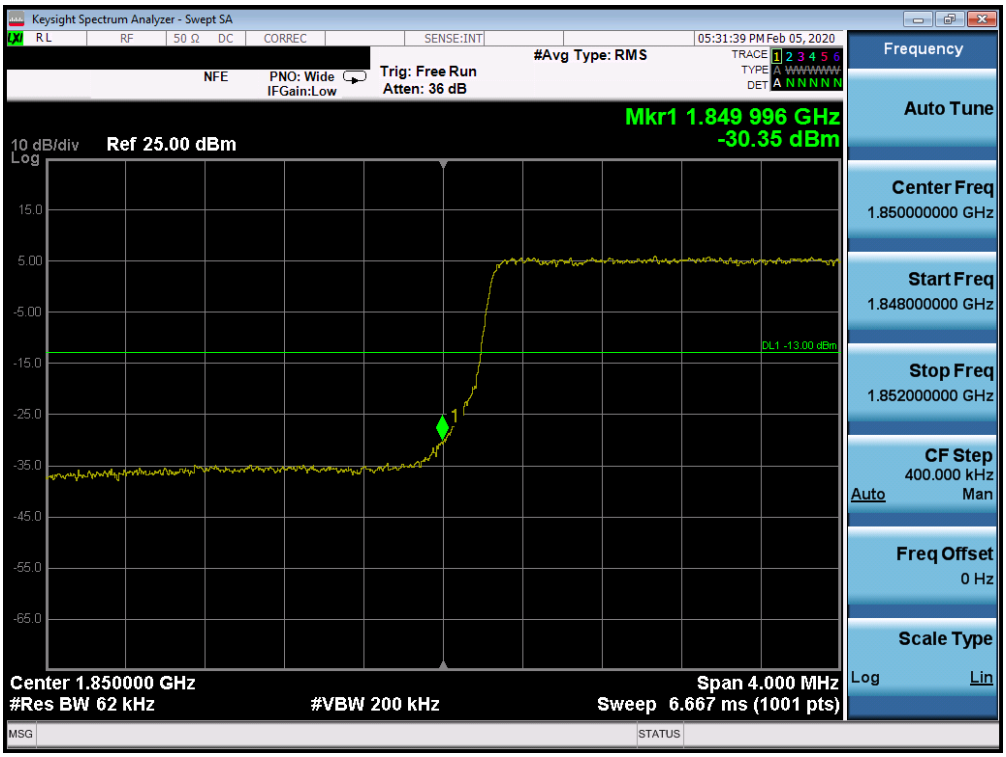
Plot 7-129. Lower Extended Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



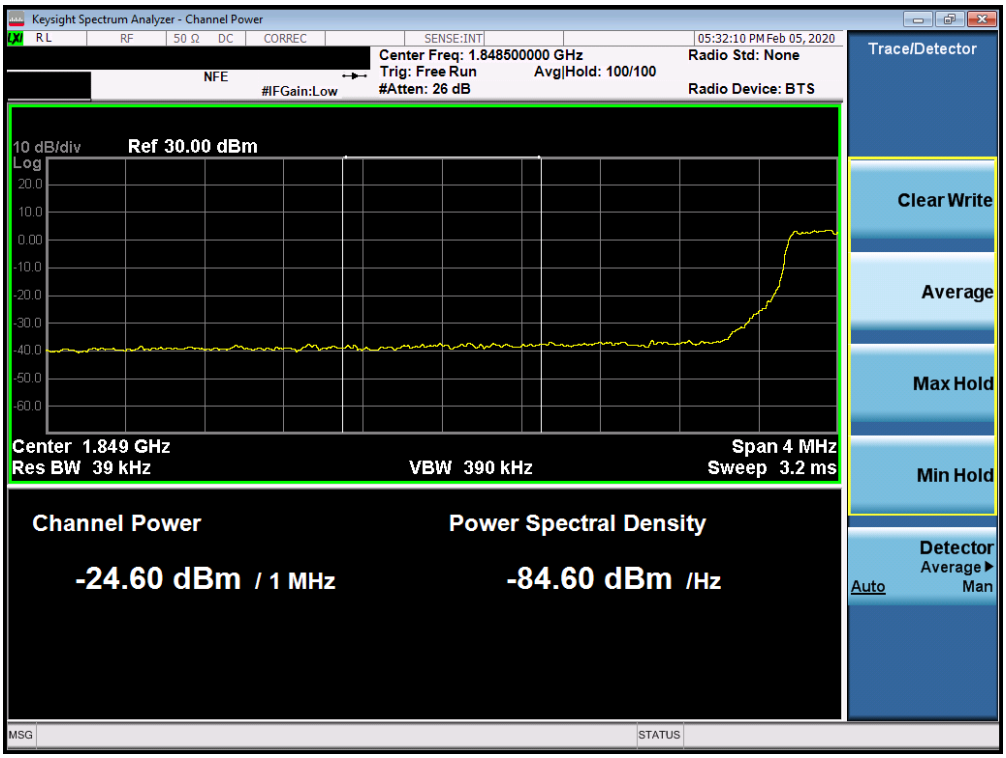
Plot 7-130. Upper Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



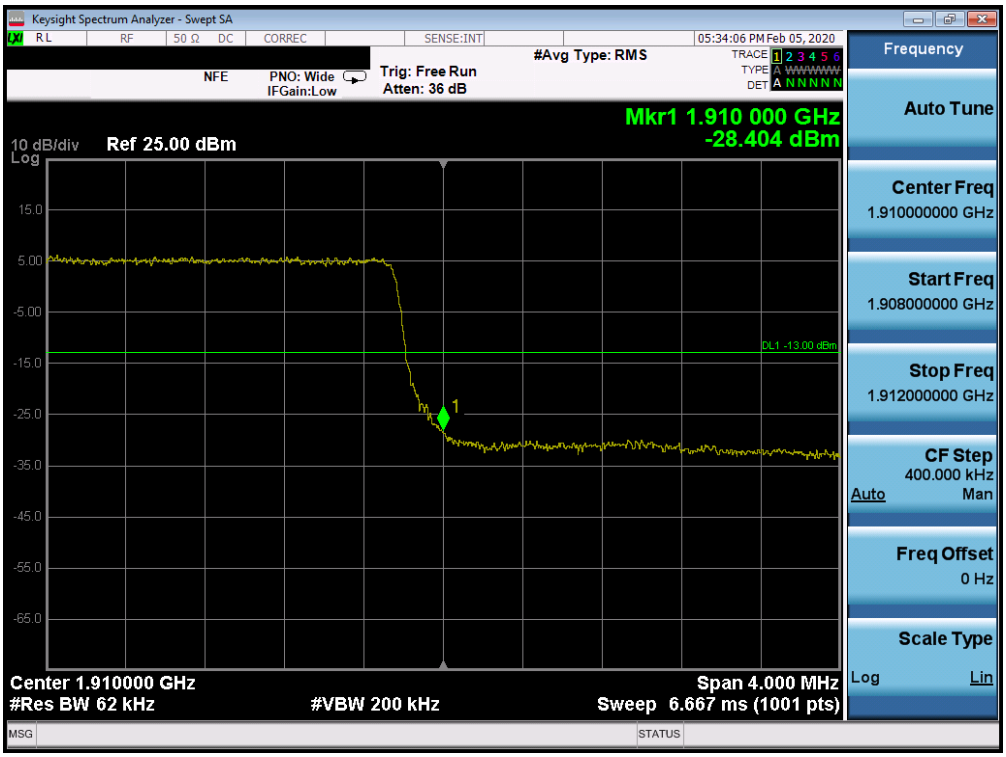
Plot 7-131. Upper Extended Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



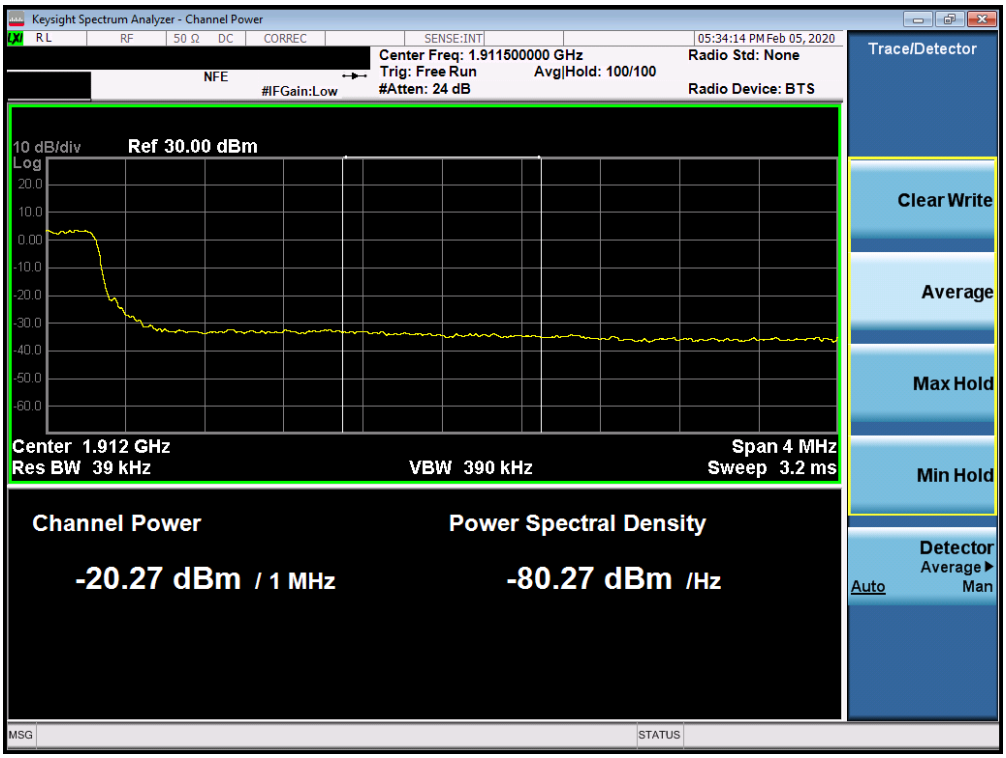
Plot 7-132. Lower Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



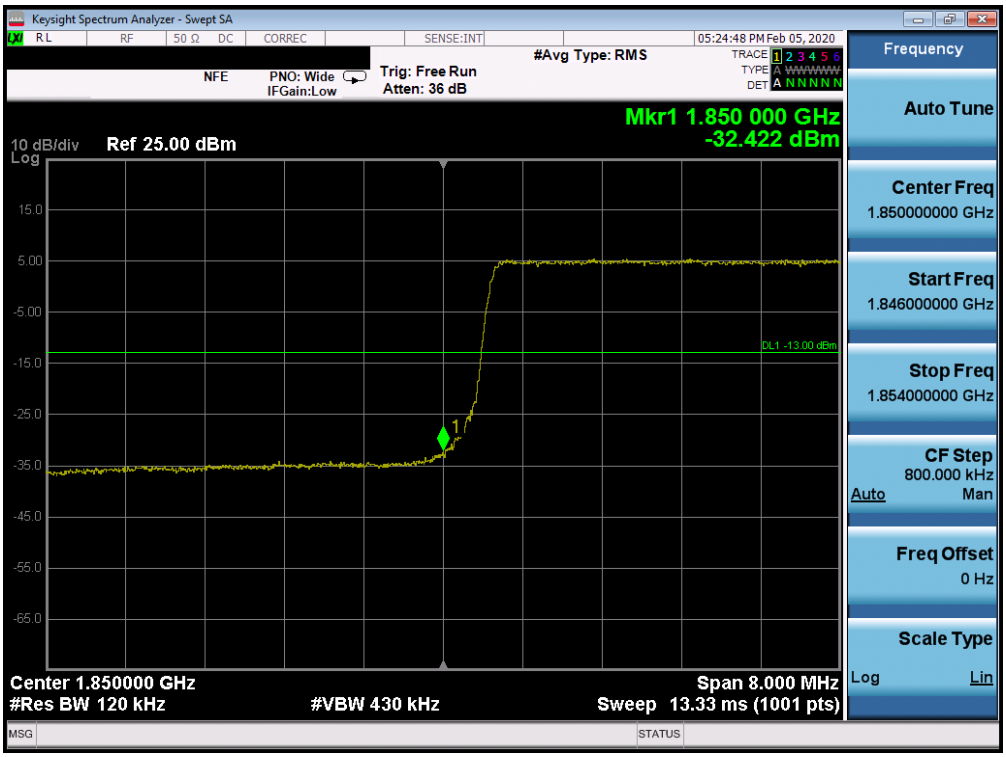
Plot 7-133. Lower Extended Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



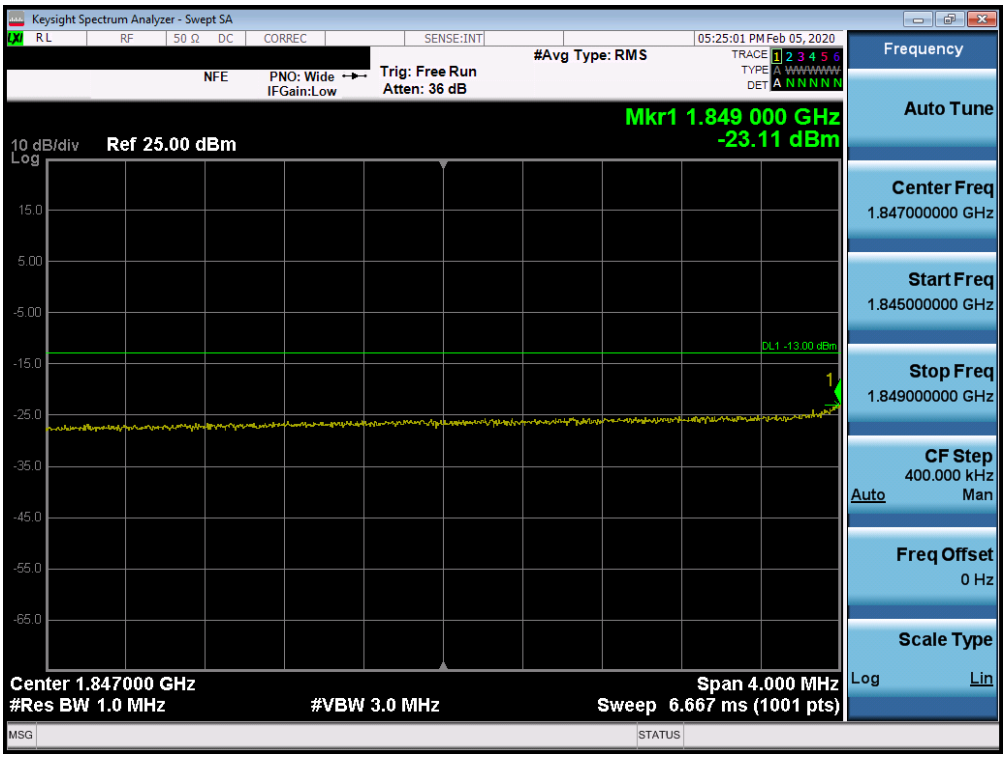
Plot 7-134. Upper Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



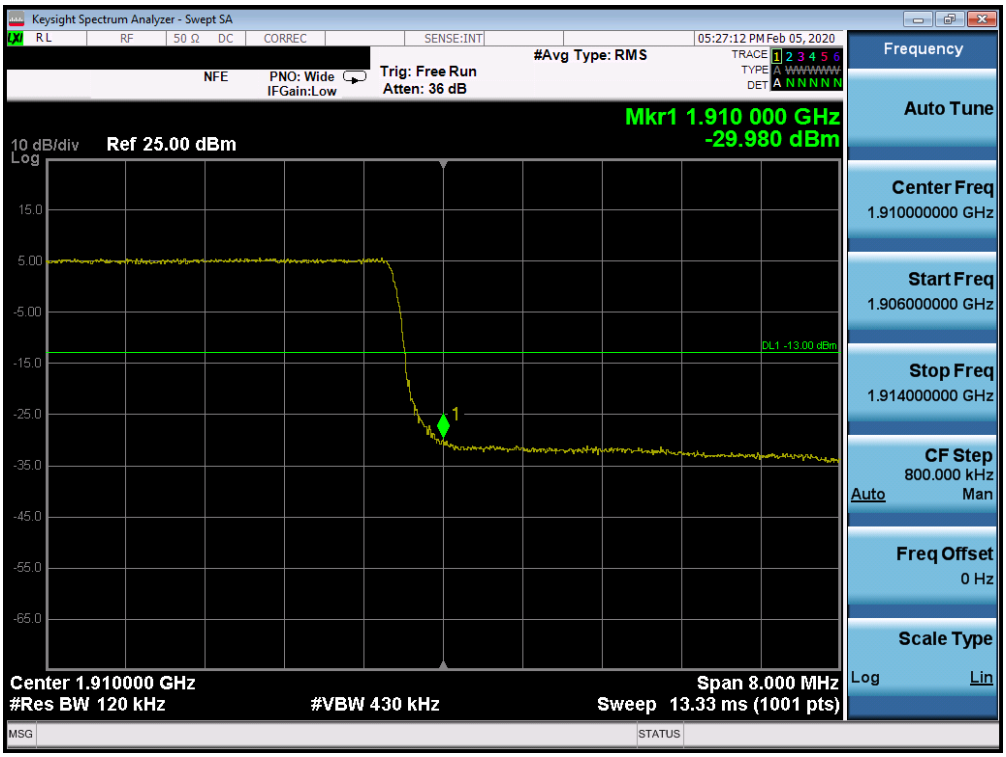
Plot 7-135. Upper Extended Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



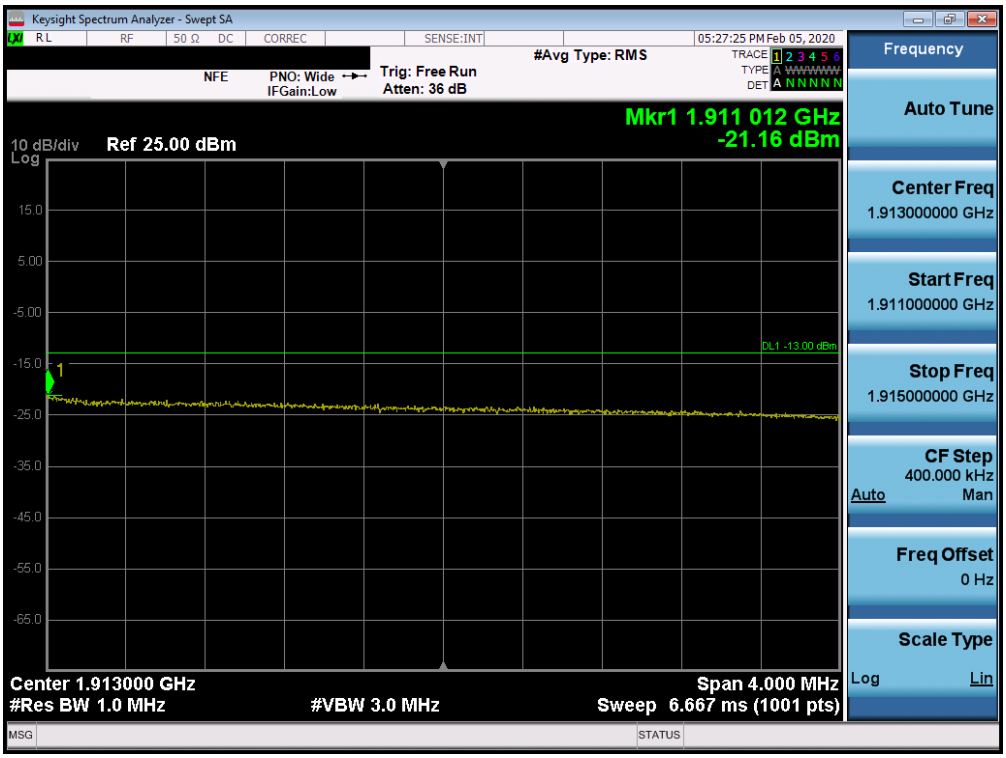
Plot 7-136. Lower Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



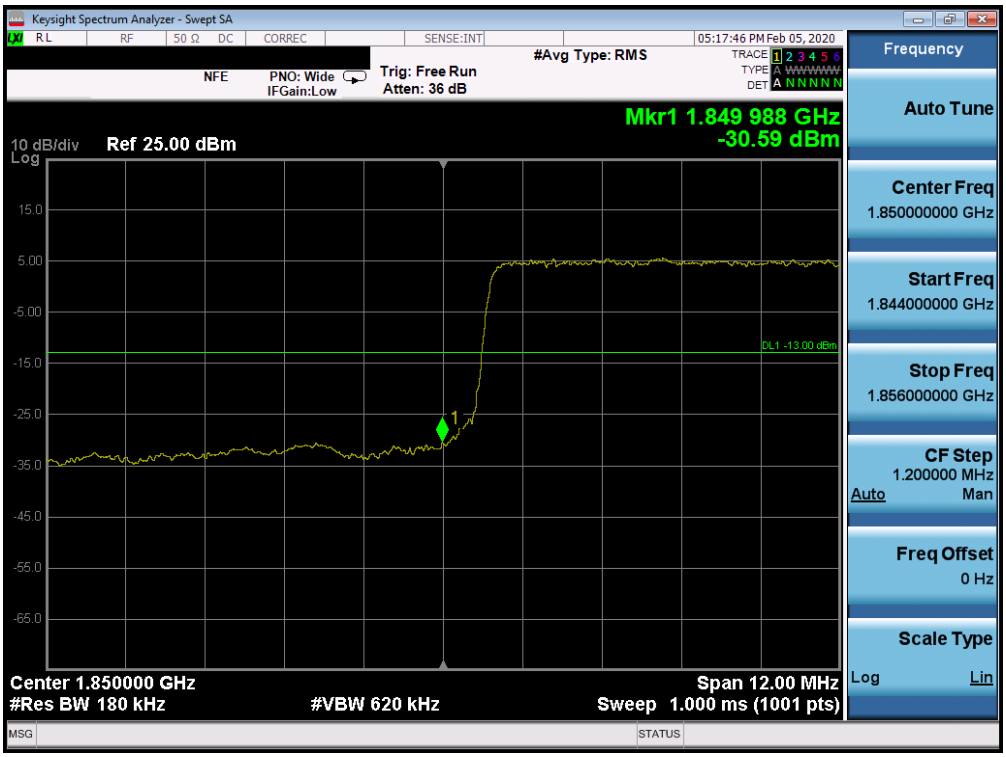
Plot 7-137. Lower Extended Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



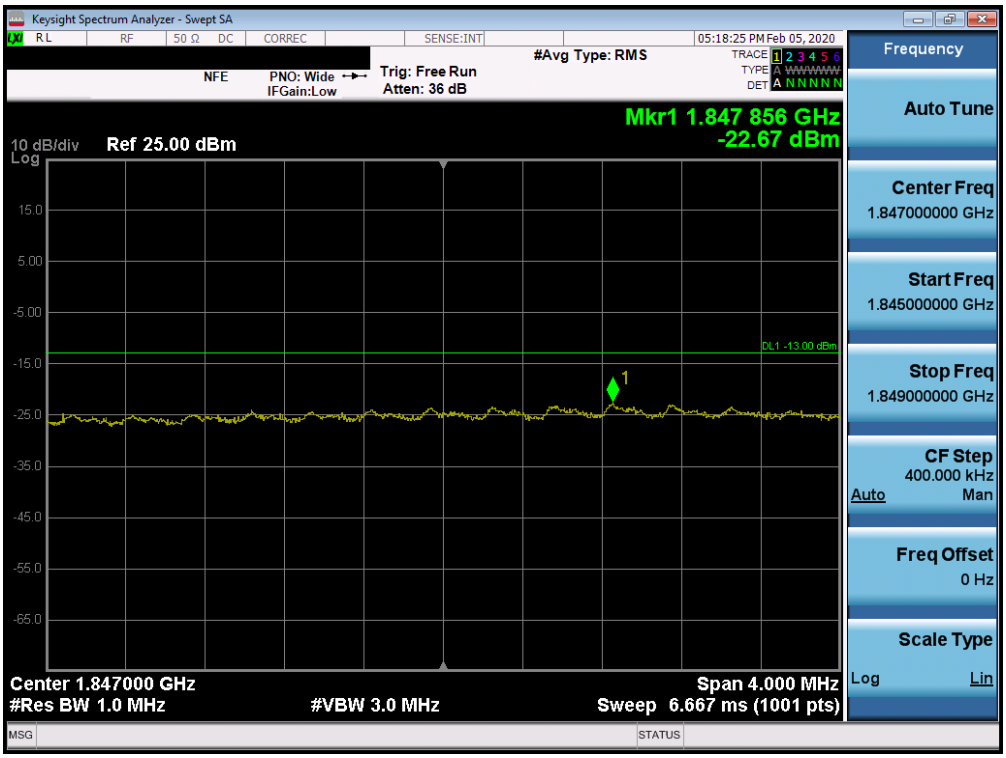
Plot 7-138. Upper Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



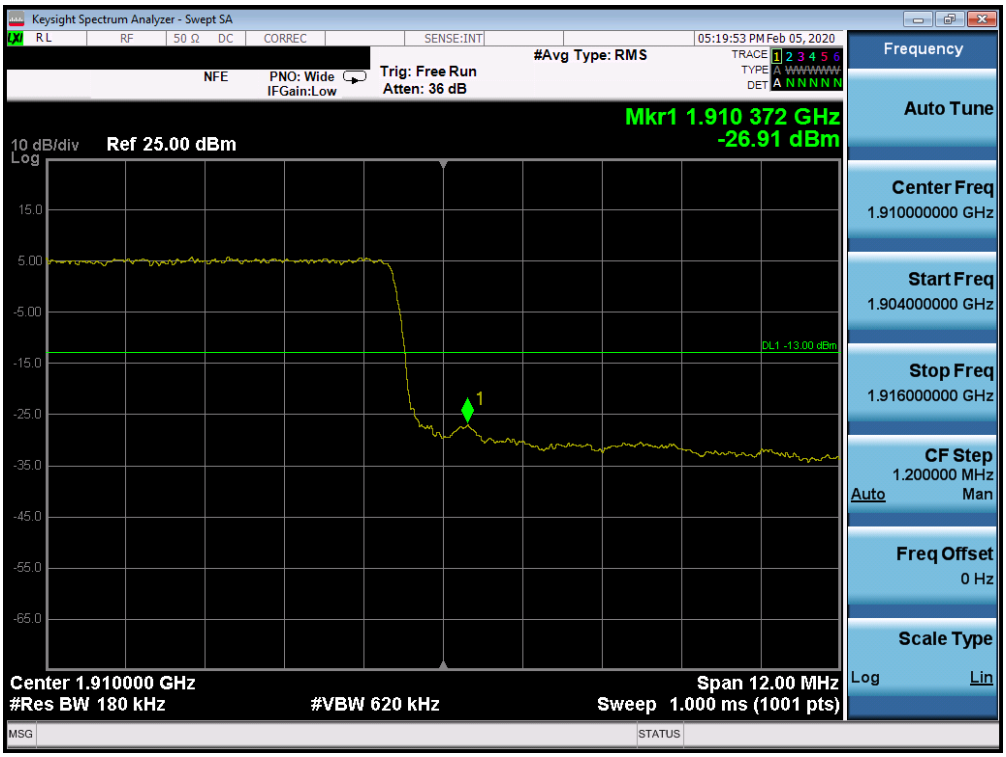
Plot 7-139. Upper Extended Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



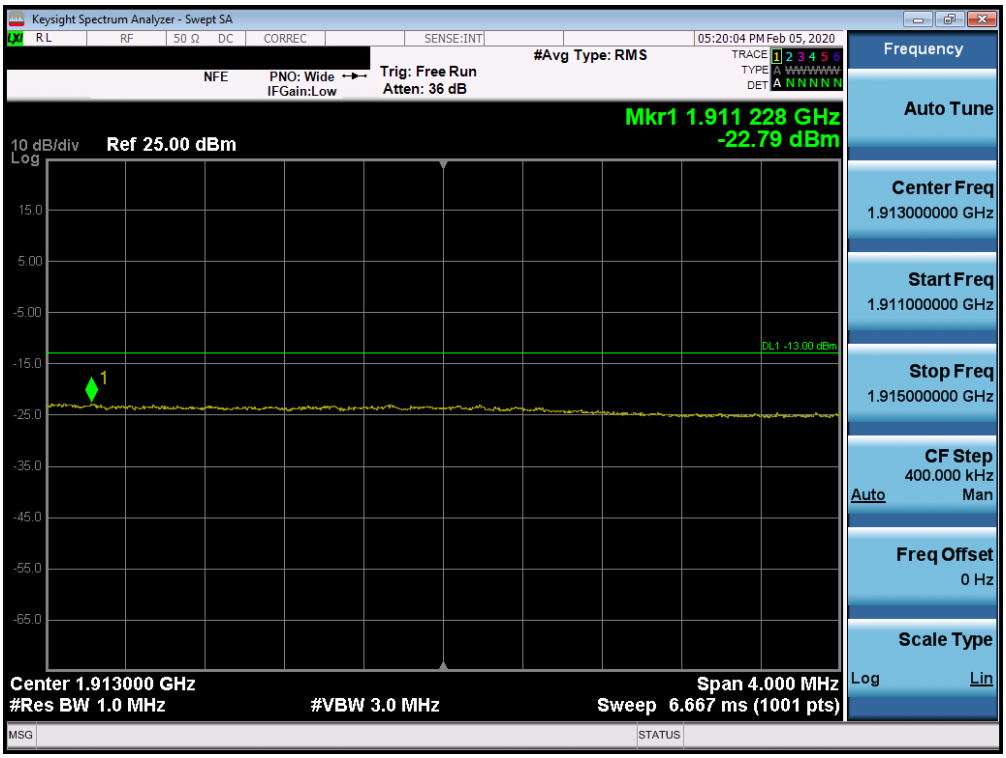
Plot 7-140. Lower Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



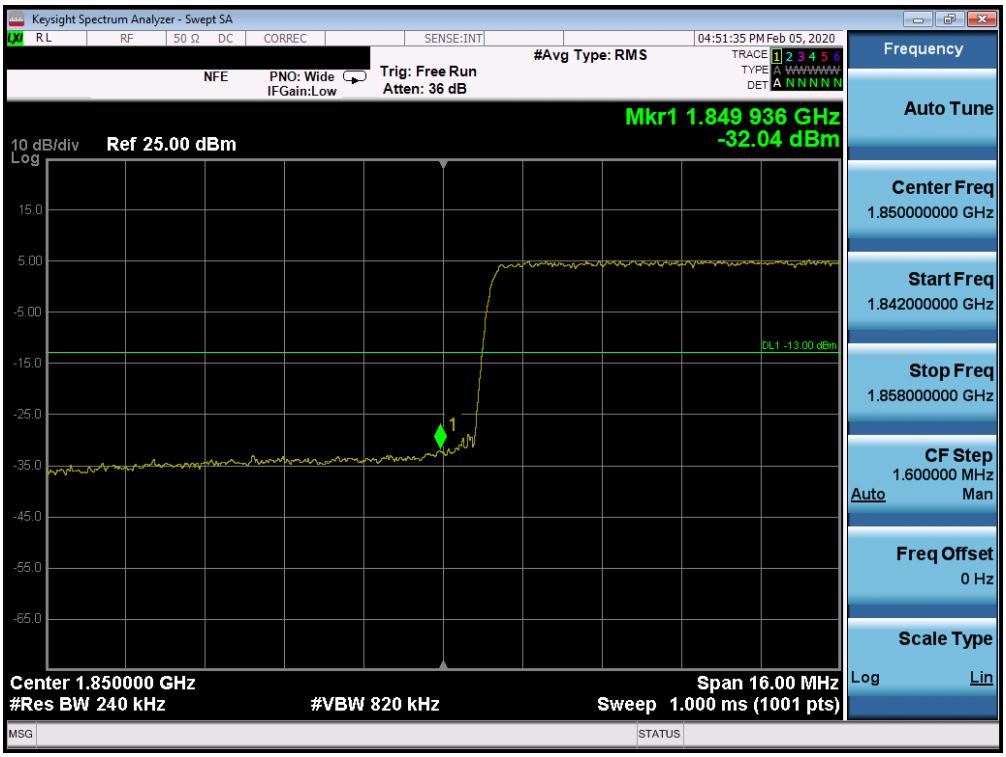
Plot 7-141. Lower Extended Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



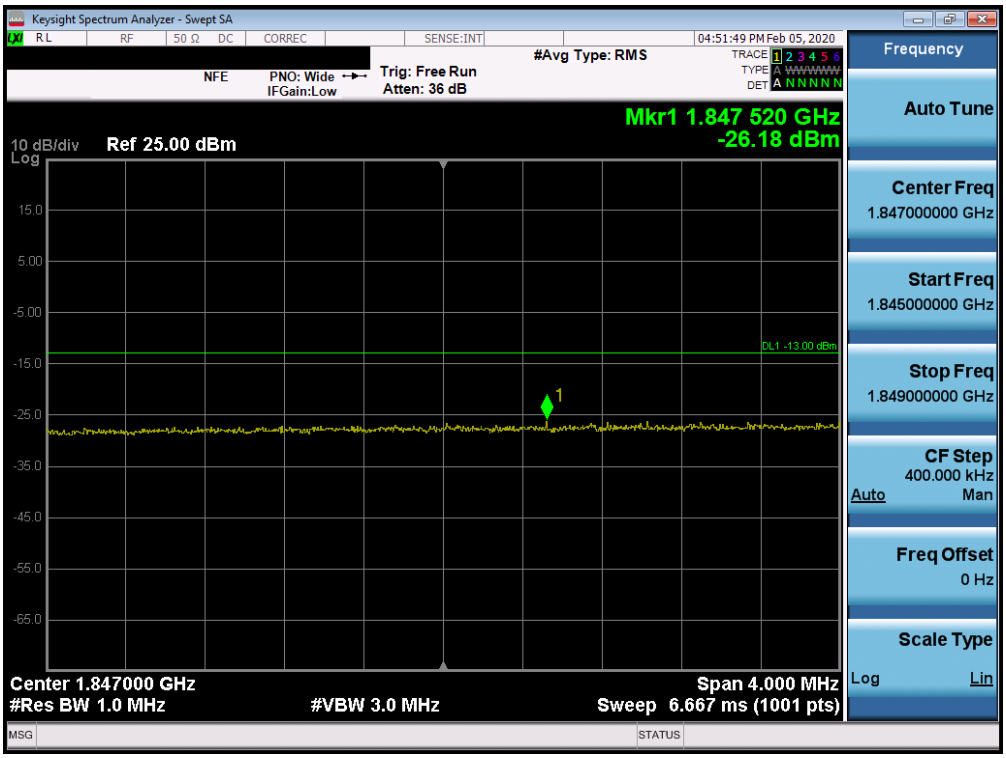
Plot 7-142. Upper Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



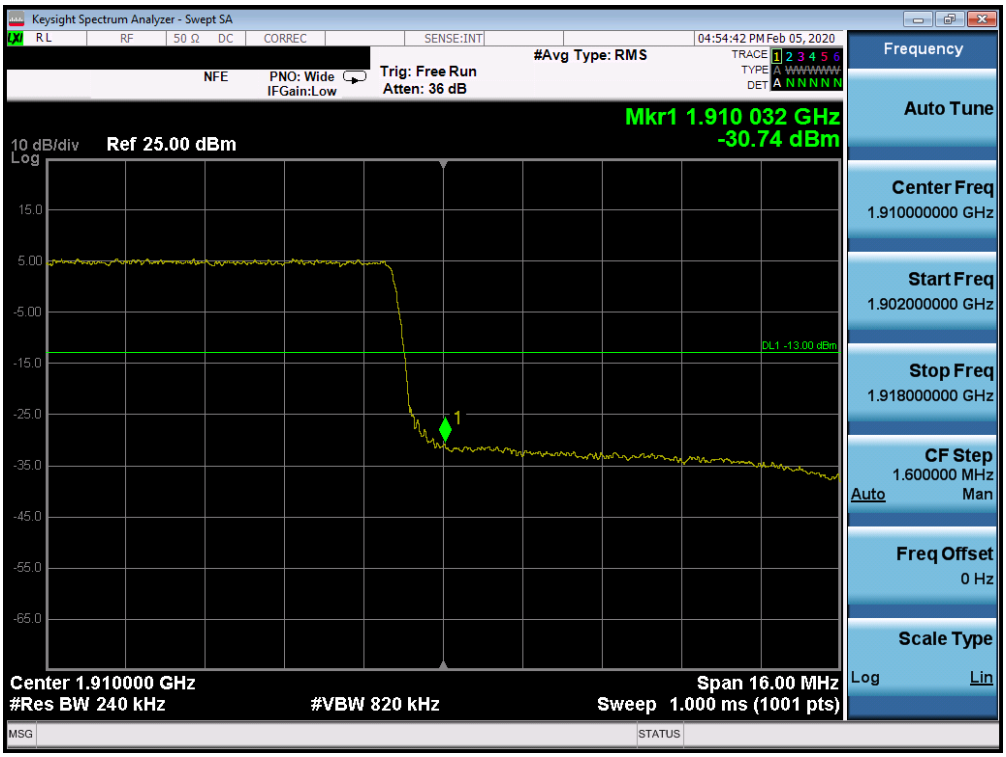
Plot 7-143. Upper Extended Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



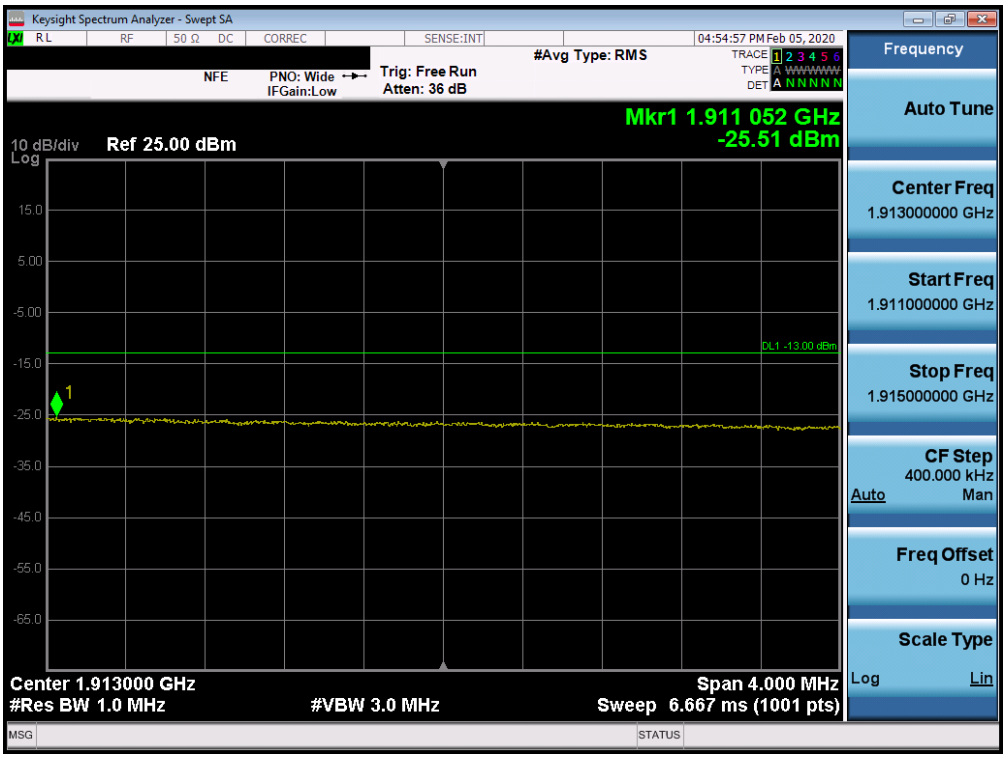
Plot 7-144. Lower Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-145. Lower Extended Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)

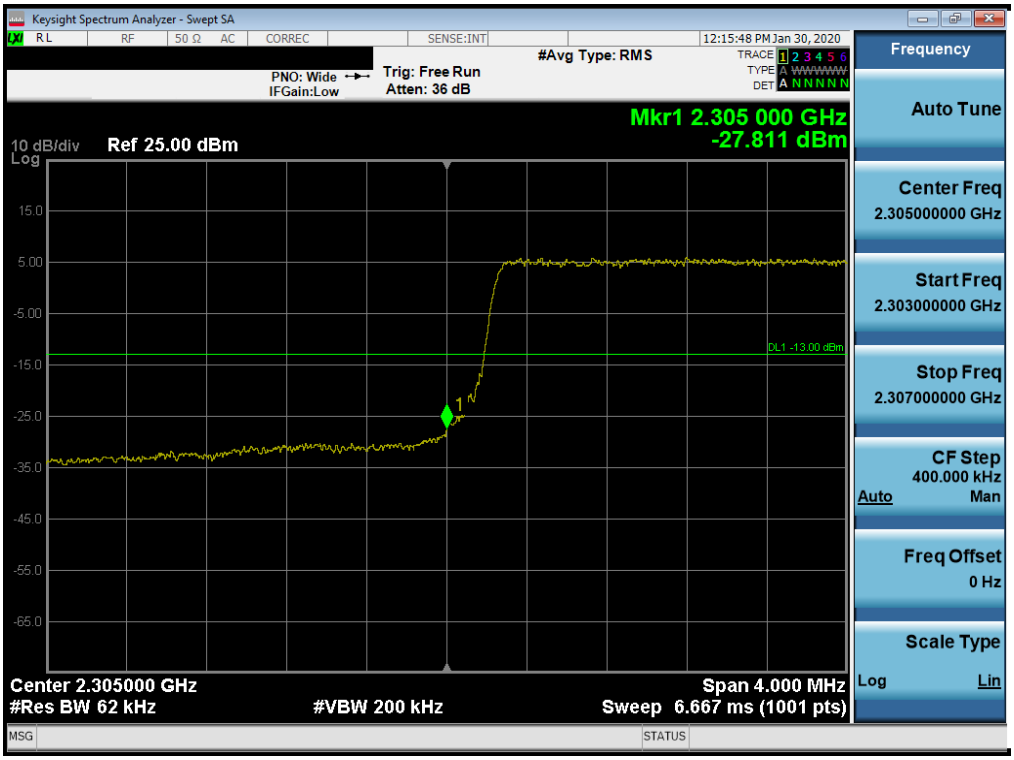


Plot 7-146. Upper Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



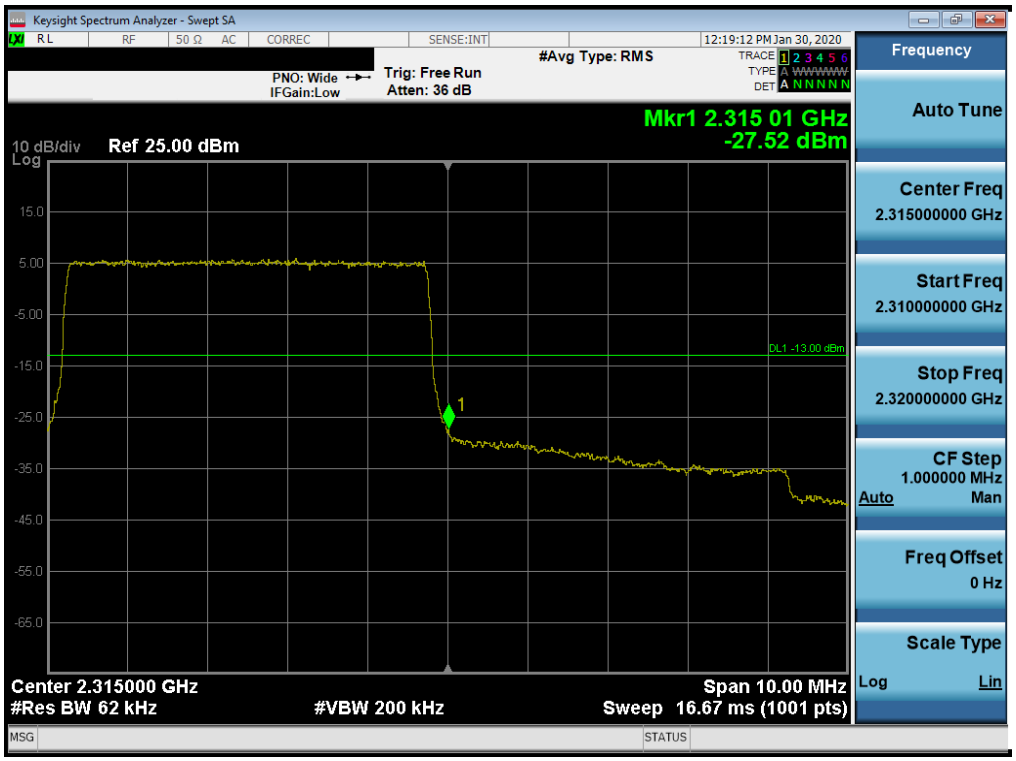
Plot 7-147. Upper Extended Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)

Band 30



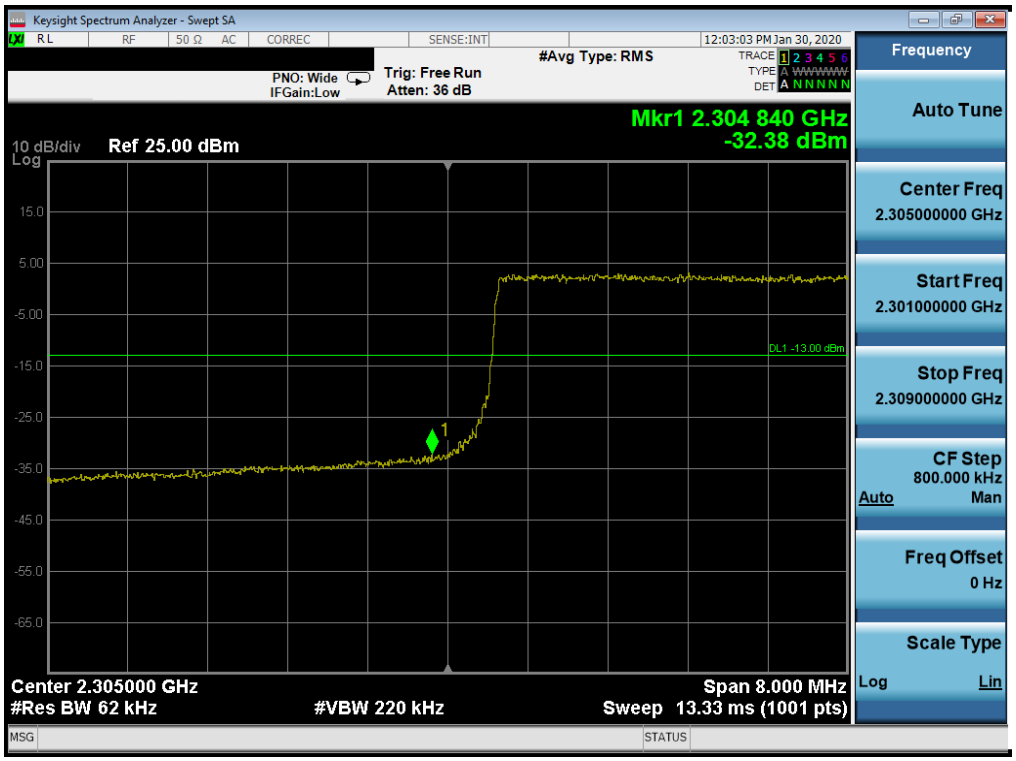
Plot 7-148. Lower Band Edge Plot (Band 30 - 5.0MHz QPSK - Full RB Configuration)

Plot 7-149. Lower Extended Band Edge Plot (Band 30 - 5.0MHz QPSK - Full RB Configuration)



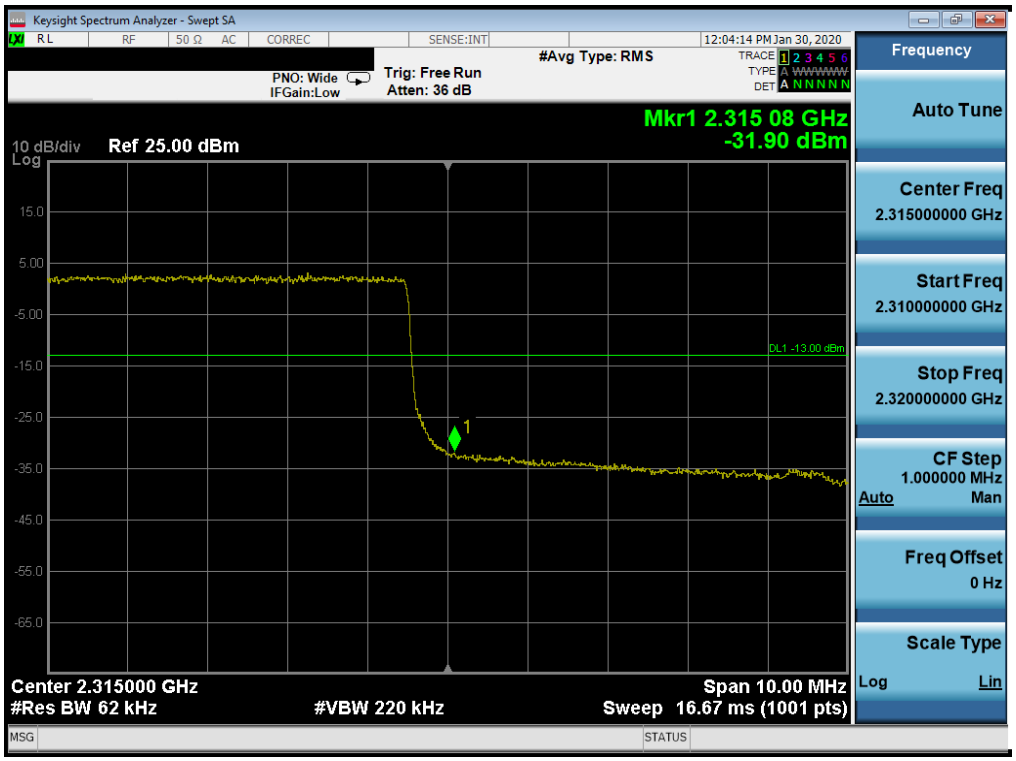
Plot 7-150. Upper Band Edge Plot (Band 30 - 5.0MHz QPSK - Full RB Configuration)

Plot 7-151. Upper Extended Band Edge Plot (Band 30 - 5.0MHz QPSK - Full RB Configuration)

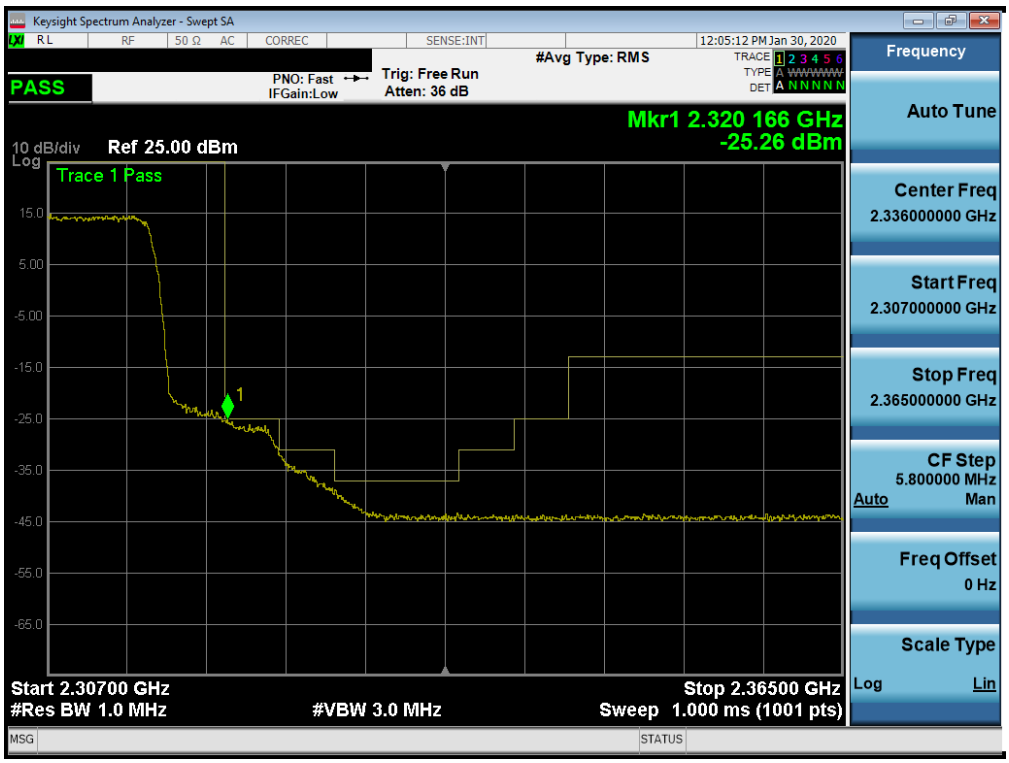


Plot 7-152. Lower Band Edge Plot (Band 30 - 10.0MHz QPSK - Full RB Configuration)

Plot 7-153. Lower Extended Band Edge Plot (Band 30 - 10.0MHz QPSK - Full RB Configuration)



Plot 7-154. Upper Band Edge Plot (Band 30- 10.0MHz QPSK - Full RB Configuration)



Plot 7-155. Upper Extended Band Edge Plot (Band 30 - 10.0MHz QPSK - Full RB Configuration)

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 v03r01 – Section 5.7.1

Test Settings

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW ≥ OBW or specified reference bandwidth
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.

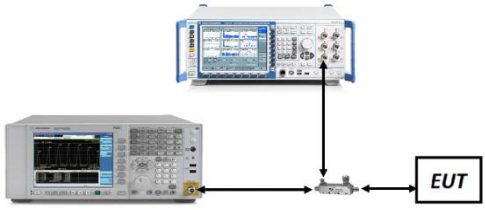
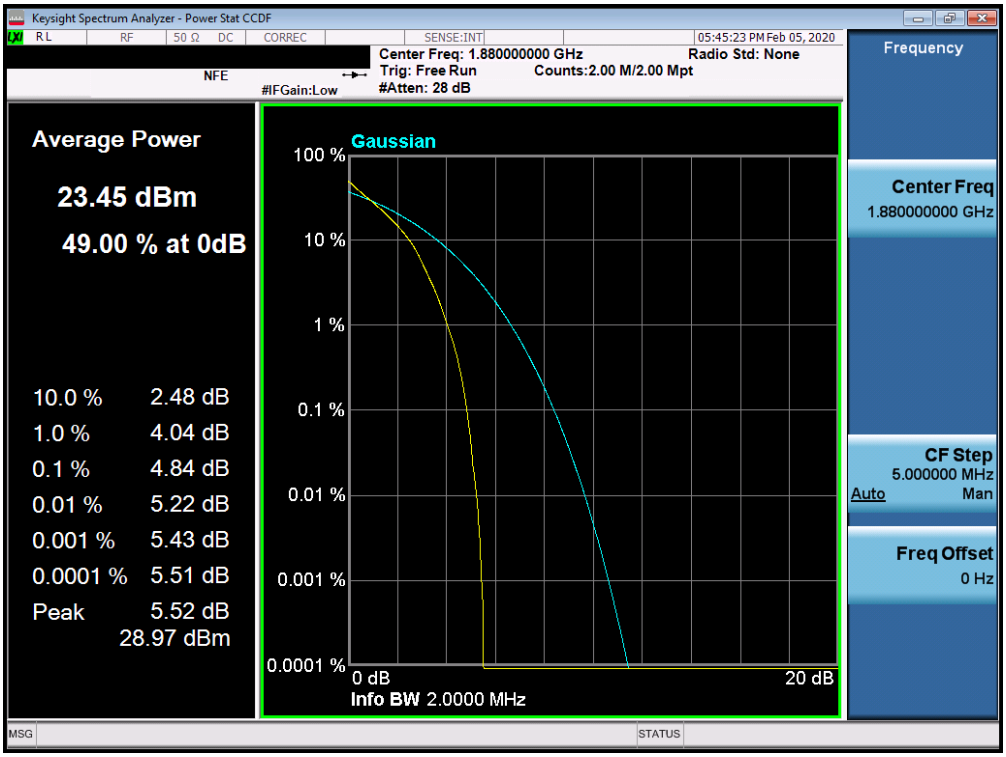


Figure 7-4. Test Instrument & Measurement Setup

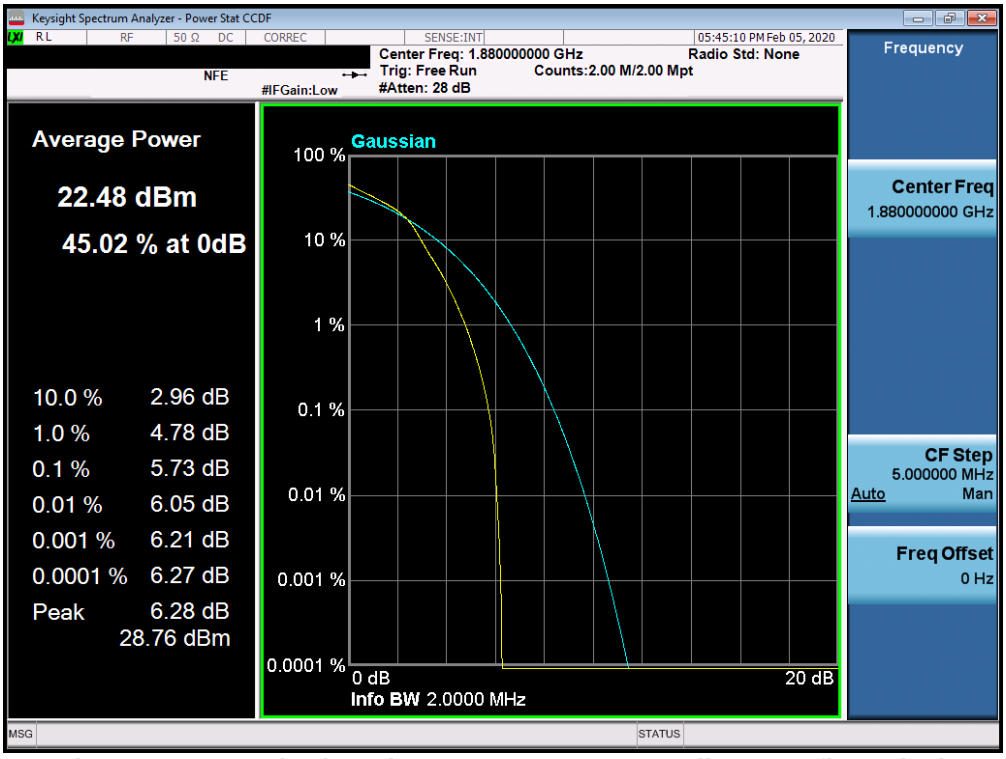
Test Notes

None.

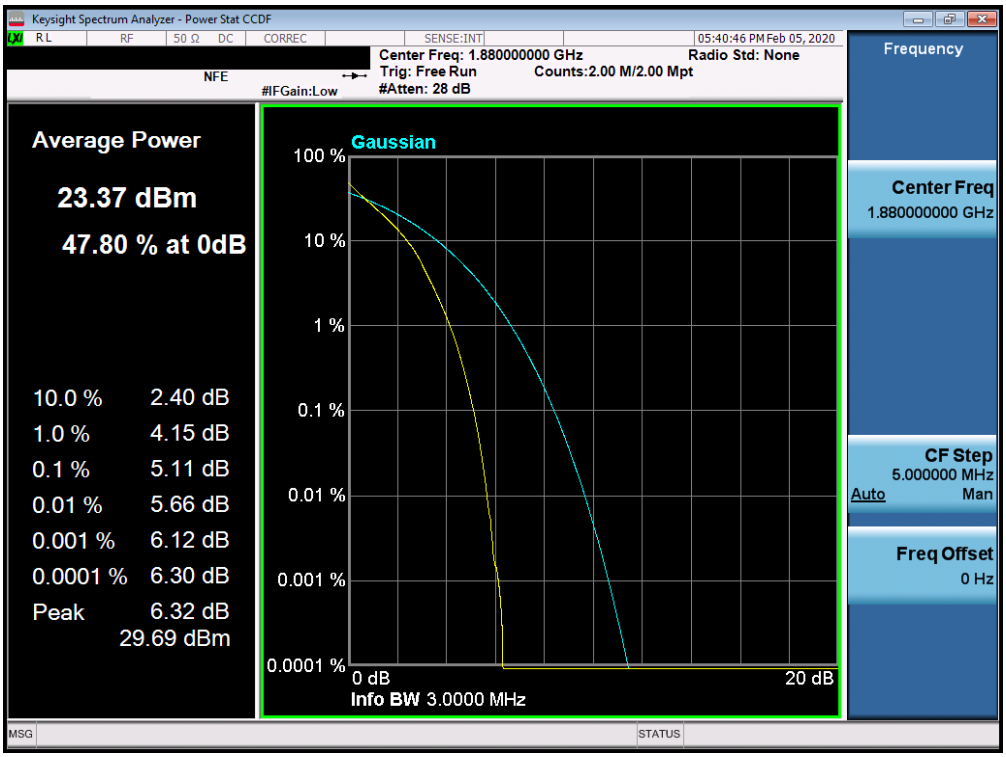
Band 2



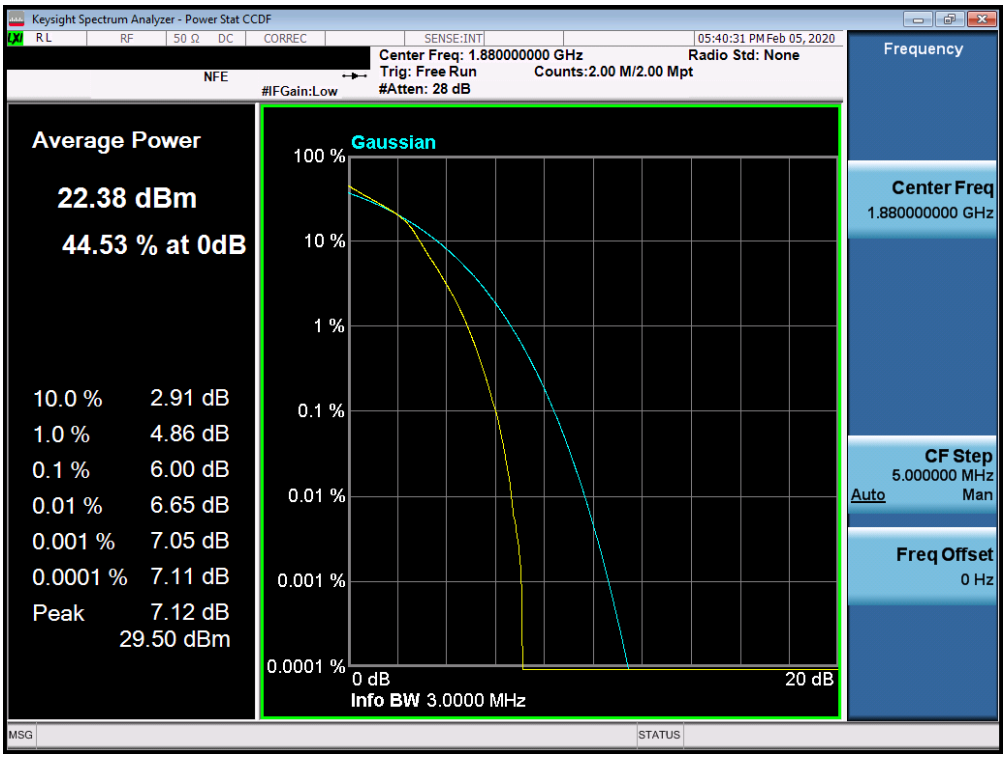
Plot 7-156. PAR Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



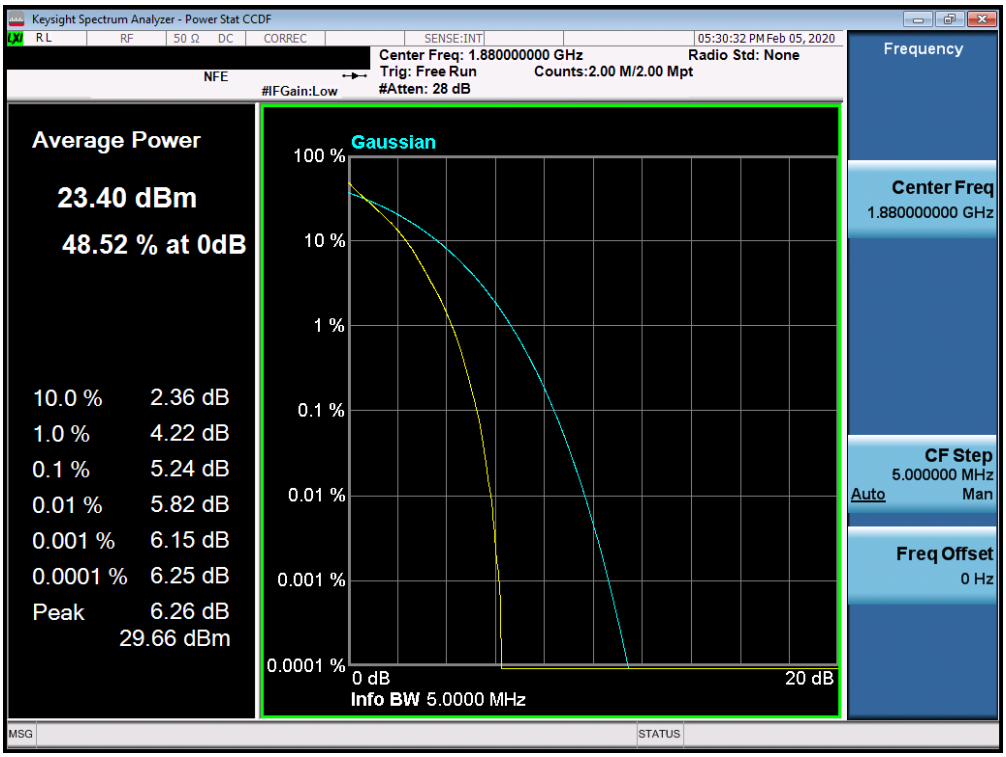
Plot 7-157. PAR Plot (Band 2 - 1.4MHz 16-QAM - Full RB Configuration)



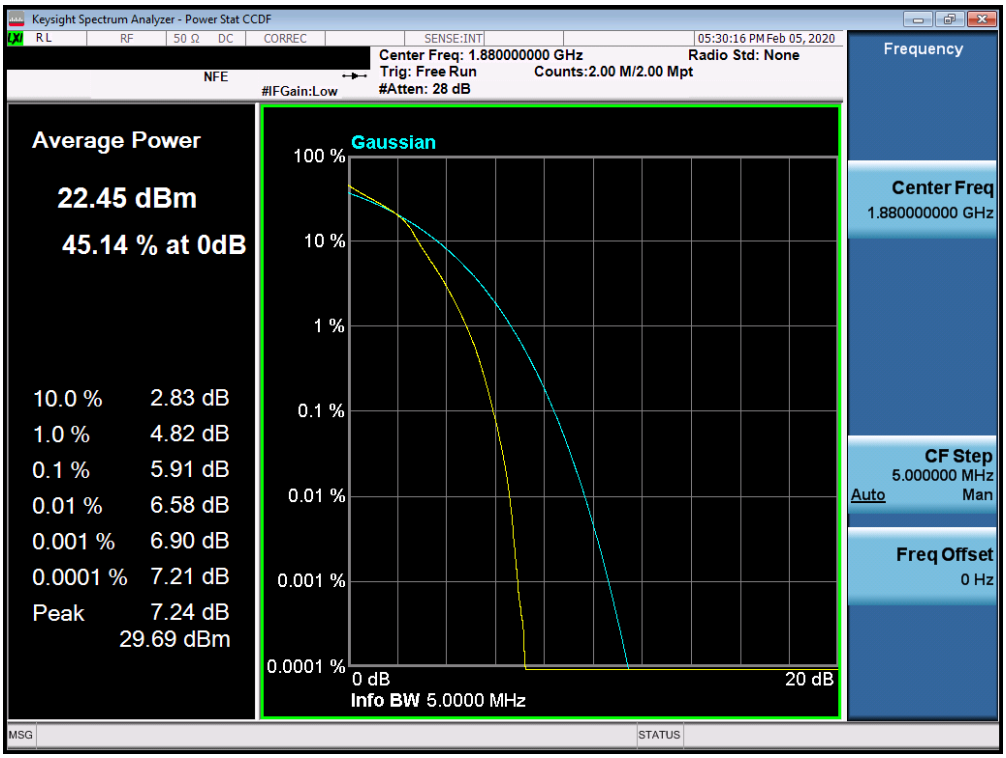
Plot 7-158. PAR Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



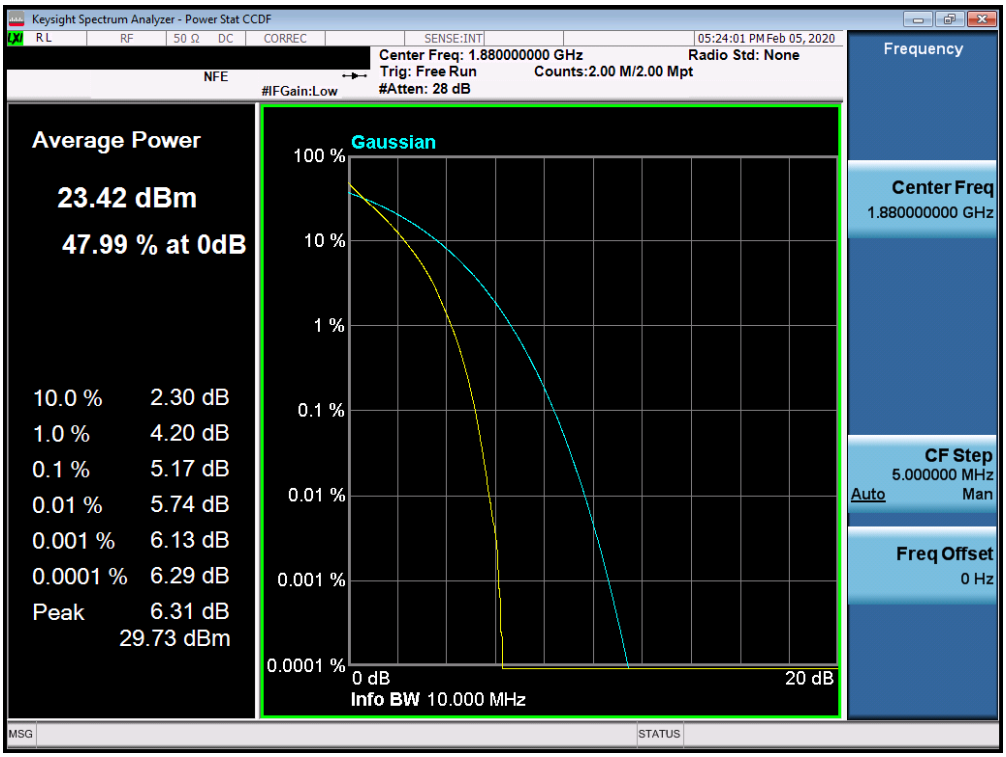
Plot 7-159. PAR Plot (Band 2 - 3.0MHz 16-QAM - Full RB Configuration)



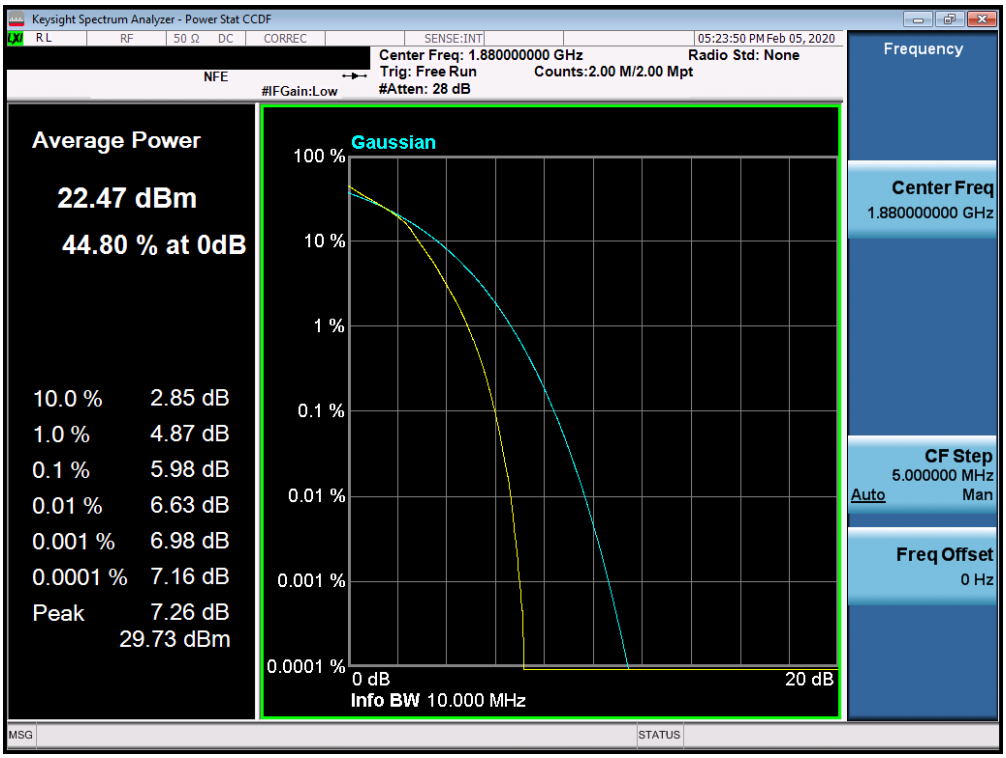
Plot 7-160. PAR Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



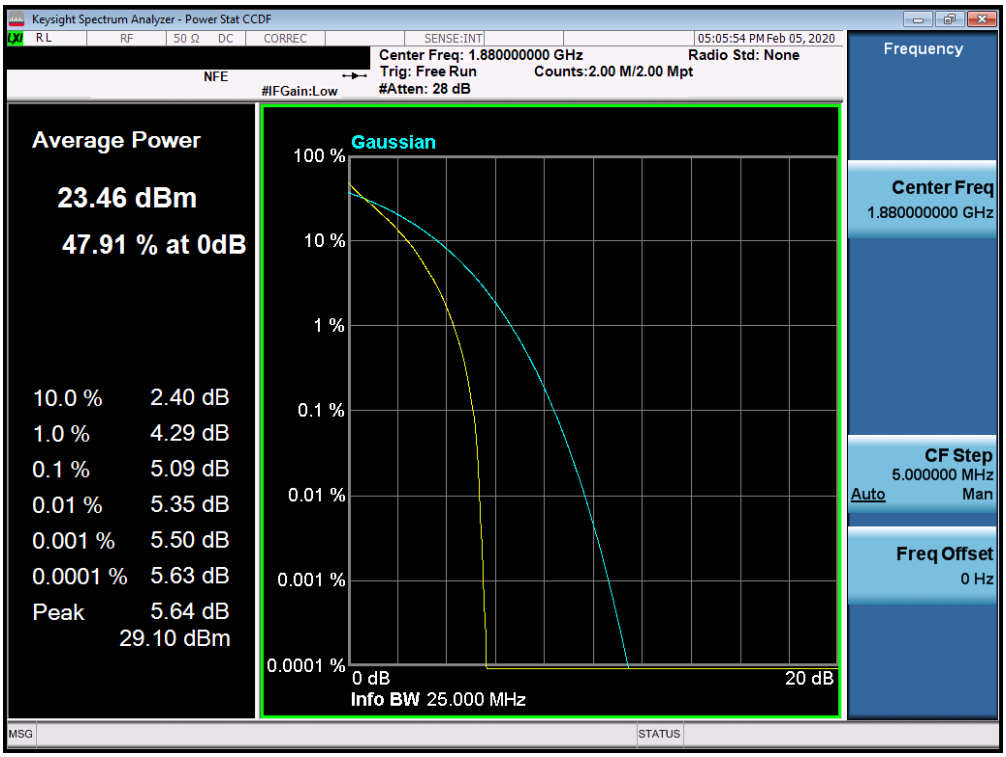
Plot 7-161. PAR Plot (Band 2 - 5.0MHz 16-QAM - Full RB Configuration)



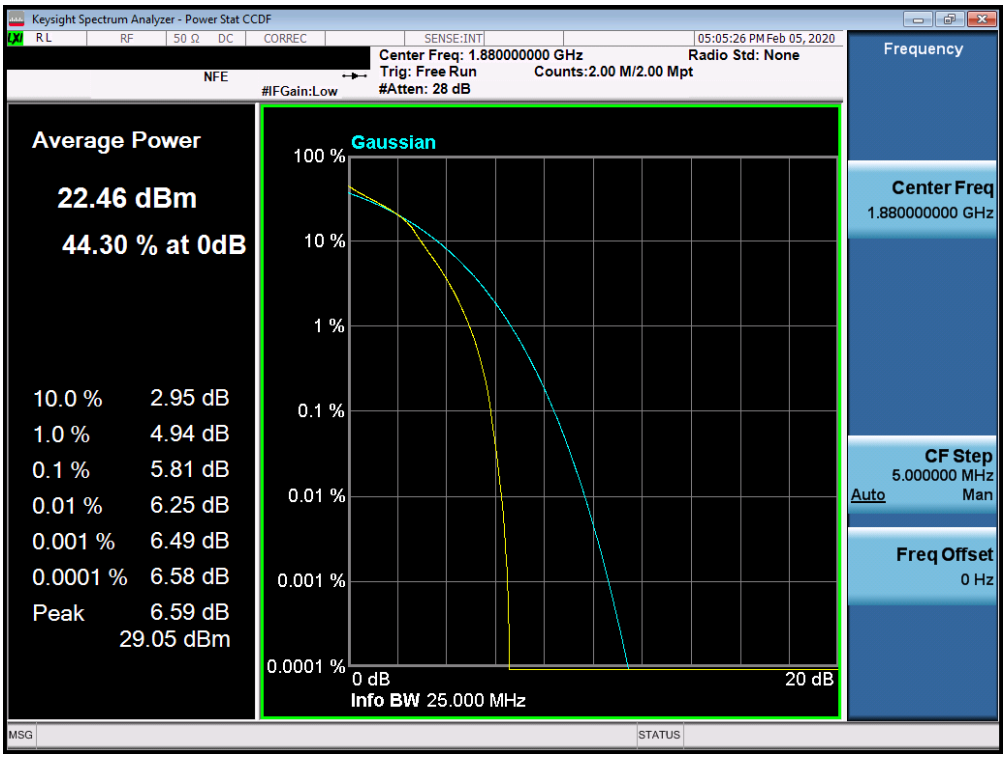
Plot 7-162. PAR Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



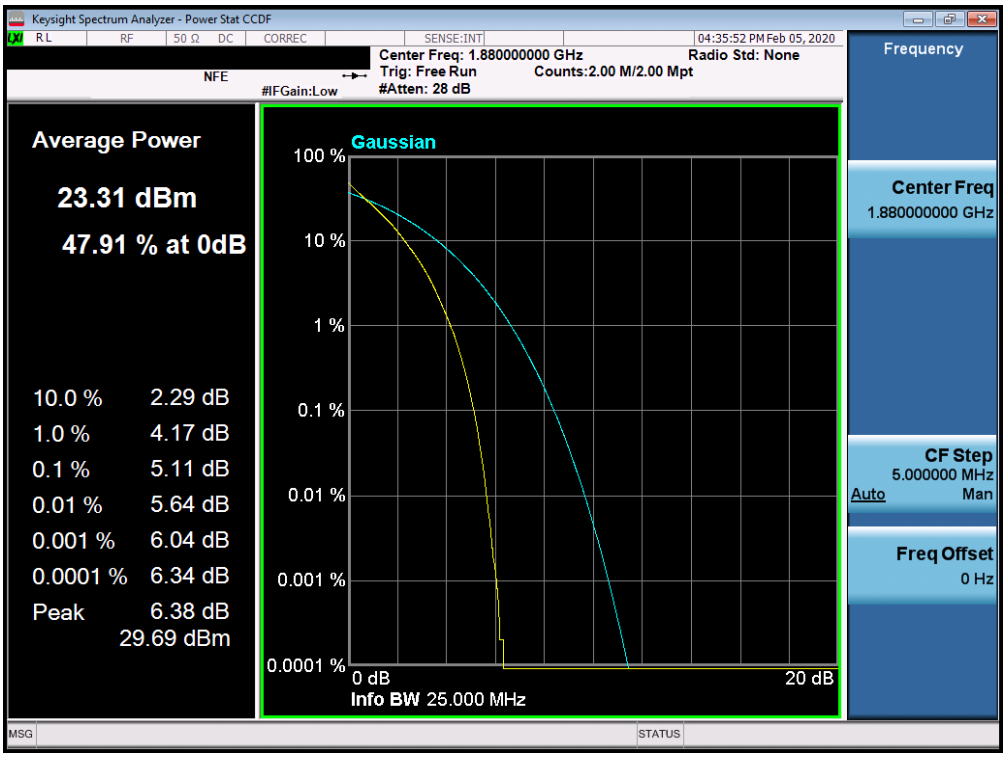
Plot 7-163. PAR Plot (Band 2 - 10.0MHz 16-QAM - Full RB Configuration)



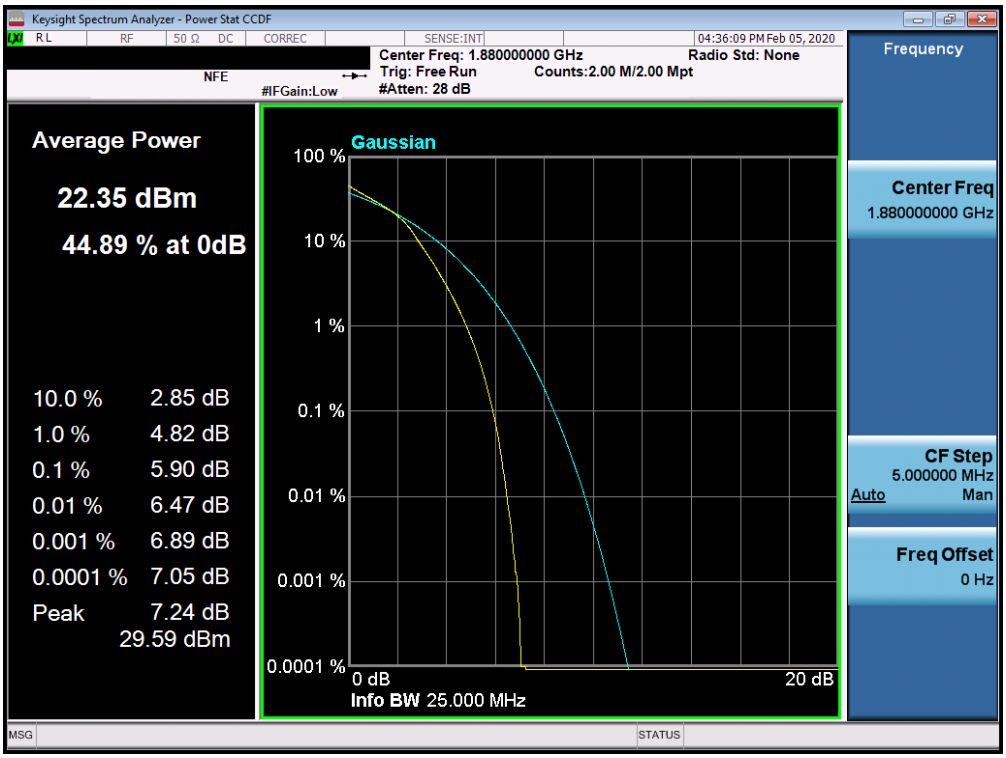
Plot 7-164. PAR Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-165. PAR Plot (Band 2 - 15.0MHz 16-QAM - Full RB Configuration)



Plot 7-166. PAR Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-167. 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 v03r01 – 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.

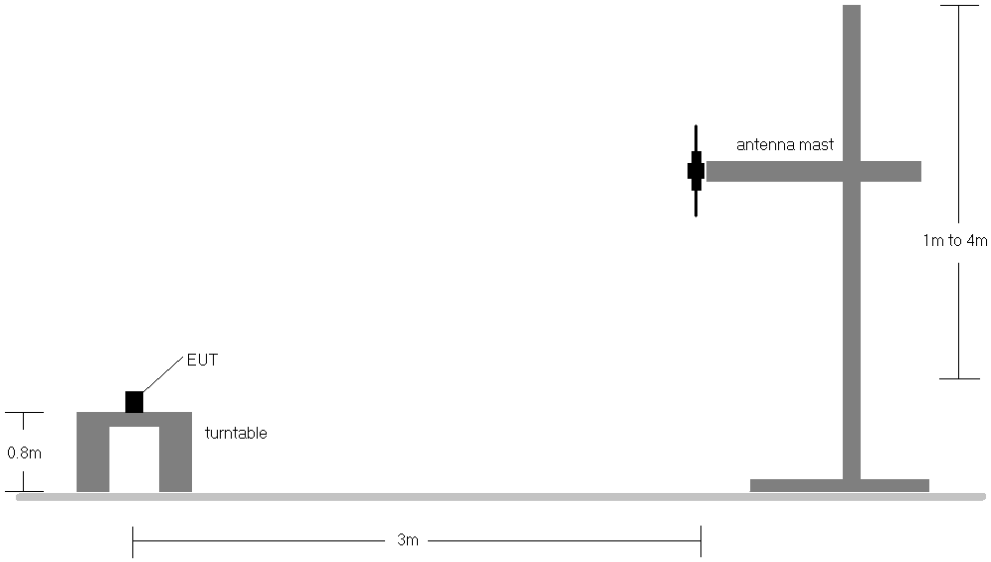


Figure 7-5. Radiated Test Setup <1GHz

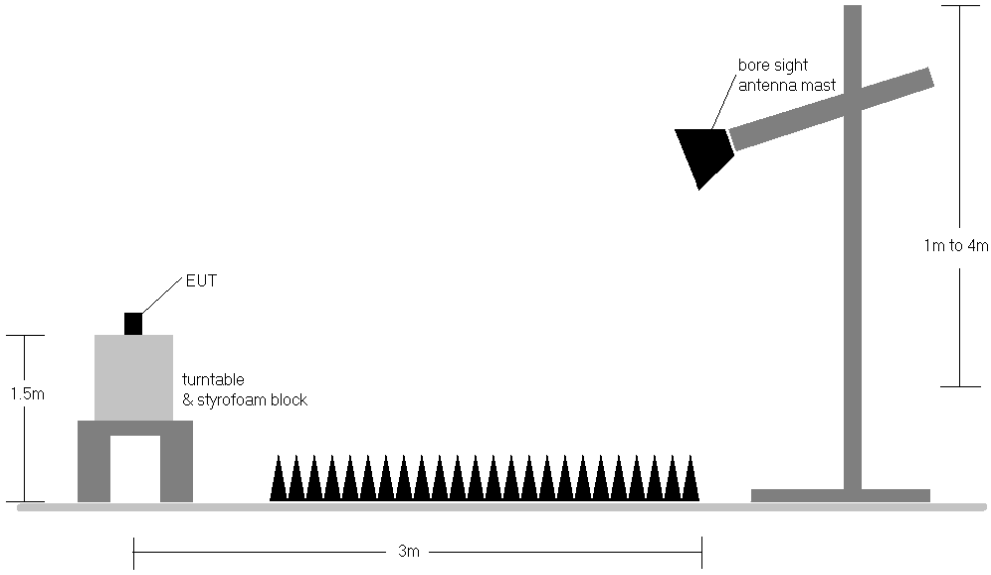


Figure 7-6. Radiated Test Setup >1GHz

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]
699.70	1.4	QPSK	V	168	53	1 / 2	17.95	4.50	20.30	0.107	34.77	-14.47
707.50	1.4	QPSK	V	164	47	1 / 2	18.00	4.60	20.45	0.111	34.77	-14.32
715.30	1.4	QPSK	V	168	58	1 / 2	17.98	4.63	**20.46**	0.111	34.77	-14.31
715.30	1.4	16-QAM	V	168	58	1 / 2	16.66	4.63	**19.14**	0.082	34.77	-15.63
700.50	3	QPSK	V	168	53	1 / 7	18.09	4.55	20.49	0.112	34.77	-14.28
707.50	3	QPSK	V	164	47	1 / 7	18.19	4.60	**20.64**	**0.116**	34.77	-14.13
714.50	3	QPSK	V	168	58	1 / 7	17.93	4.60	20.38	0.109	34.77	-14.39
707.50	3	16-QAM	V	164	47	1 / 7	17.07	4.60	**19.52**	0.090	34.77	-15.25
701.50	5	QPSK	V	168	53	1 / 12	17.73	4.60	20.18	0.104	34.77	-14.59
707.50	5	QPSK	V	164	47	1 / 12	17.89	4.60	**20.34**	0.108	34.77	-14.43
713.50	5	QPSK	V	168	58	1 / 12	17.80	4.60	20.25	0.106	34.77	-14.52
707.50	5	16-QAM	V	164	47	1 / 12	16.81	4.60	**19.26**	0.084	34.77	-15.51
704.00	10	QPSK	V	168	53	1 / 25	17.99	4.50	**20.34**	0.108	34.77	-14.43
707.50	10	QPSK	V	164	47	1 / 0	17.84	4.60	20.29	0.107	34.77	-14.48
711.00	10	QPSK	V	168	58	1 / 0	17.67	4.60	20.12	0.103	34.77	-14.65
704.00	10	16-QAM	V	168	53	1 / 25	17.04	4.50	**19.39**	0.087	34.77	-15.38
707.50	3	QPSK	H	153	69	1 / 7	16.32	3.50	17.67	0.058	34.77	-17.10

Table 7-3. ERP Data (Band 12)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
824.70	1.4	QPSK	H	205	286	1 / 2	14.72	6.70	**19.27**	0.085	38.45	-19.18
836.50	1.4	QPSK	H	203	293	1 / 2	14.32	6.70	18.87	0.077	38.45	-19.58
848.30	1.4	QPSK	H	205	279	1 / 0	13.87	6.70	18.42	0.070	38.45	-20.03
824.70	1.4	16-QAM	H	205	286	1 / 2	14.15	6.70	**18.70**	0.074	38.45	-19.75
825.50	3	QPSK	H	205	286	1 / 7	14.81	6.70	**19.36**	0.086	38.45	-19.09
836.50	3	QPSK	H	203	293	1 / 7	14.23	6.70	18.78	0.076	38.45	-19.67
847.50	3	QPSK	H	205	279	1 / 7	13.93	6.65	18.43	0.070	38.45	-20.02
825.50	3	16-QAM	H	205	286	8 / 4	14.18	6.70	**18.73**	0.075	38.45	-19.72
826.50	5	QPSK	H	205	286	1 / 12	14.82	6.70	**19.37**	**0.086**	38.45	-19.08
836.50	5	QPSK	H	203	293	1 / 12	14.39	6.70	18.94	0.078	38.45	-19.51
846.50	5	QPSK	H	205	279	1 / 12	14.07	6.60	18.52	0.071	38.45	-19.93
826.50	5	16-QAM	H	205	286	12 / 6	13.79	6.70	**18.34**	0.068	38.45	-20.11
829.00	10	QPSK	H	205	286	1 / 25	14.59	6.70	**19.14**	0.082	38.45	-19.31
836.50	10	QPSK	H	203	293	1 / 0	14.26	6.70	18.81	0.076	38.45	-19.64
844.00	10	QPSK	H	205	279	1 / 0	13.89	6.60	18.34	0.068	38.45	-20.11
829.00	10	16-QAM	H	205	286	1 / 25	13.58	6.70	**18.13**	0.065	38.45	-20.32
826.50	5	QPSK	V	133	246	1 / 12	14.48	6.30	18.63	0.073	38.45	-19.82

Table 7-4. ERP Data (Band 5)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1710.70	1.4	QPSK	H	109	329	1 / 5	11.40	9.44	**20.84**	0.121	30.00	-9.16
1732.50	1.4	QPSK	H	172	319	1 / 5	11.44	9.31	20.75	0.119	30.00	-9.25
1754.30	1.4	QPSK	H	224	323	1 / 2	11.52	9.21	20.73	0.118	30.00	-9.27
1710.70	1.4	16-QAM	H	109	329	1 / 5	10.41	9.44	**19.85**	0.097	30.00	-10.15
1711.50	3	QPSK	H	109	329	1 / 7	11.42	9.44	**20.85**	0.122	30.00	-9.15
1732.50	3	QPSK	H	172	319	1 / 7	11.39	9.31	20.70	0.117	30.00	-9.30
1753.50	3	QPSK	H	224	323	1 / 14	11.55	9.21	20.76	0.119	30.00	-9.24
1711.50	3	16-QAM	H	109	329	1 / 7	10.66	9.44	**20.09**	0.102	30.00	-9.91
1712.50	5	QPSK	H	109	329	1 / 12	11.51	9.43	**20.94**	0.124	30.00	-9.06
1732.50	5	QPSK	H	172	319	1 / 24	11.42	9.31	20.73	0.118	30.00	-9.27
1752.50	5	QPSK	H	224	323	1 / 12	11.60	9.21	20.80	0.120	30.00	-9.20
1712.50	5	16-QAM	H	109	329	1 / 12	10.67	9.43	**20.10**	0.102	30.00	-9.90
1715.00	10	QPSK	H	109	329	1 / 25	11.49	9.42	**20.90**	0.123	30.00	-9.10
1732.50	10	QPSK	H	172	319	1 / 25	11.47	9.31	20.78	0.120	30.00	-9.22
1750.00	10	QPSK	H	224	323	1 / 25	11.52	9.20	20.72	0.118	30.00	-9.28
1715.00	10	16-QAM	H	109	329	1 / 25	10.69	9.42	**20.11**	0.102	30.00	-9.89
1717.50	15	QPSK	H	109	329	1 / 36	11.35	9.40	**20.75**	0.119	30.00	-9.25
1732.50	15	QPSK	H	172	319	1 / 74	11.34	9.31	20.65	0.116	30.00	-9.35
1747.50	15	QPSK	H	224	323	1 / 0	11.52	9.22	20.73	0.118	30.00	-9.27
1717.50	15	16-QAM	H	109	329	1 / 36	10.69	9.40	**20.09**	0.102	30.00	-9.91
1720.00	20	QPSK	H	109	329	1 / 50	11.58	9.38	**20.96**	**0.125**	30.00	-9.04
1732.50	20	QPSK	H	172	319	1 / 0	11.24	9.31	20.55	0.113	30.00	-9.45
1745.00	20	QPSK	H	224	323	1 / 50	11.69	9.23	20.92	0.124	30.00	-9.08
1720.00	20	16-QAM	H	109	329	1 / 50	10.68	9.38	**20.06**	0.102	30.00	-9.94
1720.00	20	QPSK	V	141	309	1 / 50	11.33	9.34	20.67	0.117	30.00	-9.33

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	126	355	1 / 2	12.81	9.48	22.30	0.170	33.01	-10.71
1880.00	1.4	QPSK	H	155	351	1 / 2	12.03	9.90	21.93	0.156	33.01	-11.08
1909.30	1.4	QPSK	H	161	341	1 / 5	12.31	10.25	**22.56**	**0.180**	33.01	-10.45
1909.30	1.4	16-QAM	H	161	341	1 / 5	11.28	10.25	**21.53**	0.142	33.01	-11.48
1851.50	3	QPSK	H	126	355	1 / 7	12.73	9.50	22.23	0.167	33.01	-10.78
1880.00	3	QPSK	H	155	351	1 / 7	11.96	9.90	21.86	0.153	33.01	-11.15
1908.50	3	QPSK	H	161	341	1 / 7	12.08	10.25	**22.33**	0.171	33.01	-10.68
1908.50	3	16-QAM	H	161	341	1 / 7	11.30	10.25	**21.55**	0.143	33.01	-11.46
1852.50	5	QPSK	H	126	355	1 / 12	12.74	9.51	22.25	0.168	33.01	-10.76
1880.00	5	QPSK	H	155	351	1 / 12	11.96	9.90	21.86	0.153	33.01	-11.15
1907.50	5	QPSK	H	161	341	1 / 12	12.12	10.24	**22.36**	0.172	33.01	-10.65
1907.50	5	16-QAM	H	161	341	1 / 12	11.29	10.24	**21.53**	0.142	33.01	-11.48
1855.00	10	QPSK	H	126	355	1 / 25	12.68	9.55	22.23	0.167	33.01	-10.78
1880.00	10	QPSK	H	155	351	1 / 25	11.97	9.90	21.87	0.154	33.01	-11.14
1905.00	10	QPSK	H	161	341	1 / 25	12.27	10.22	**22.49**	0.177	33.01	-10.52
1905.00	10	16-QAM	H	161	341	1 / 25	11.45	10.22	**21.67**	0.147	33.01	-11.34
1857.50	15	QPSK	H	126	355	1 / 36	12.50	9.58	22.08	0.161	33.01	-10.93
1880.00	15	QPSK	H	155	351	1 / 36	11.76	9.90	21.66	0.147	33.01	-11.35
1902.50	15	QPSK	H	161	341	1 / 36	12.17	10.20	**22.37**	0.173	33.01	-10.64
1902.50	15	16-QAM	H	161	341	1 / 36	11.44	10.20	**21.64**	0.146	33.01	-11.37
1860.00	20	QPSK	H	126	355	1 / 0	12.52	9.62	22.14	0.164	33.01	-10.87
1880.00	20	QPSK	H	155	351	1 / 0	11.79	9.90	21.69	0.148	33.01	-11.32
1900.00	20	QPSK	H	161	341	1 / 50	12.27	10.18	**22.45**	0.176	33.01	-10.56
1900.00	20	16-QAM	H	161	341	1 / 50	11.40	10.18	**21.58**	0.144	33.01	-11.43
1909.30	1.4	QPSK	V	102	58	1 / 5	11.44	10.26	21.70	0.148	33.01	-11.31

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]
2307.50	5	QPSK	V	135	276	1 / 12	12.14	10.23	**22.37**	0.173	23.98	-1.61
2312.50	5	QPSK	V	135	276	1 / 24	11.89	10.21	22.10	0.162	23.98	-1.88
2307.50	5	16-QAM	V	135	276	1 / 12	11.42	10.23	21.65	0.146	23.98	-2.33
2310.00	10	QPSK	V	135	276	1 / 25	12.22	10.22	**22.44**	**0.175**	23.98	-1.54
2310.00	10	16-QAM	V	135	276	1 / 25	11.27	10.22	21.49	0.141	23.98	-2.49
2310.00	10	QPSK	H	117	189	1 / 25	10.41	10.31	20.72	0.118	23.98	-3.26

Table 7-7. EIRP Data (Band 30)

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 v03r01 – 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.

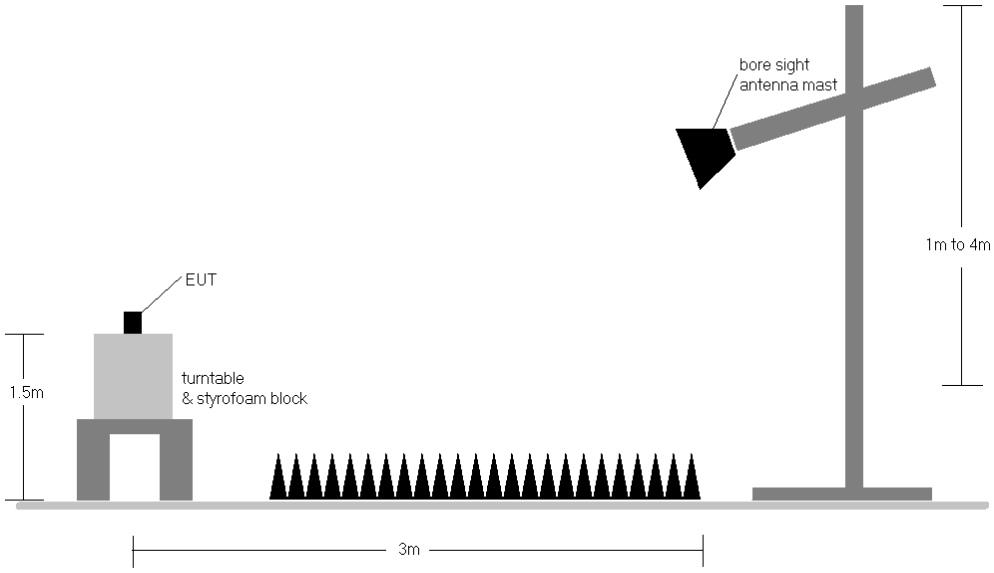


Figure 7-7. Test Instrument & Measurement Setup

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.

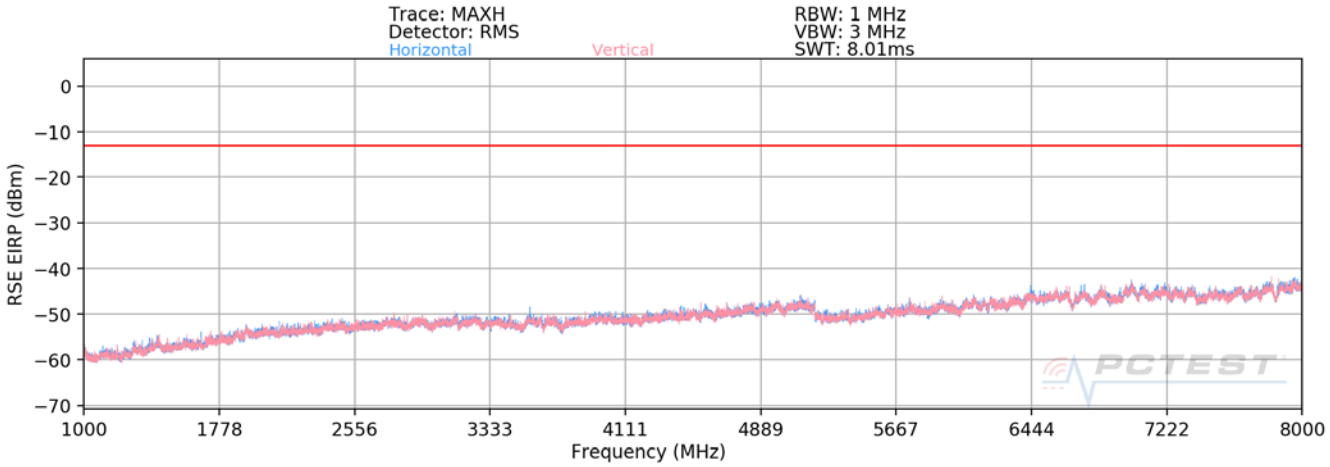
2) This unit was tested with its standard battery.

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



Plot 7-168. Radiated Spurious Plot above 1GHz (Band 12)

OPERATING FREQUENCY:	704.00	MHz
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]
1408.00	H	-	-	-68.69	2.30	-66.38	-53.4
2112.00	H	102	189	-61.23	3.12	-58.10	-45.1
2816.00	H	-	-	-67.63	4.82	-62.81	-49.8
3520.00	H	-	-	-69.60	6.48	-63.12	-50.1

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

OPERATING FREQUENCY:	707.50	MHz
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]
1415.00	H	-	-	-68.58	2.39	-66.19	-53.2
2122.50	H	143	181	-60.63	3.14	-57.49	-44.5
2830.00	H	-	-	-67.77	4.87	-62.90	-49.9
3537.50	H	-	-	-68.58	6.45	-62.13	-49.1

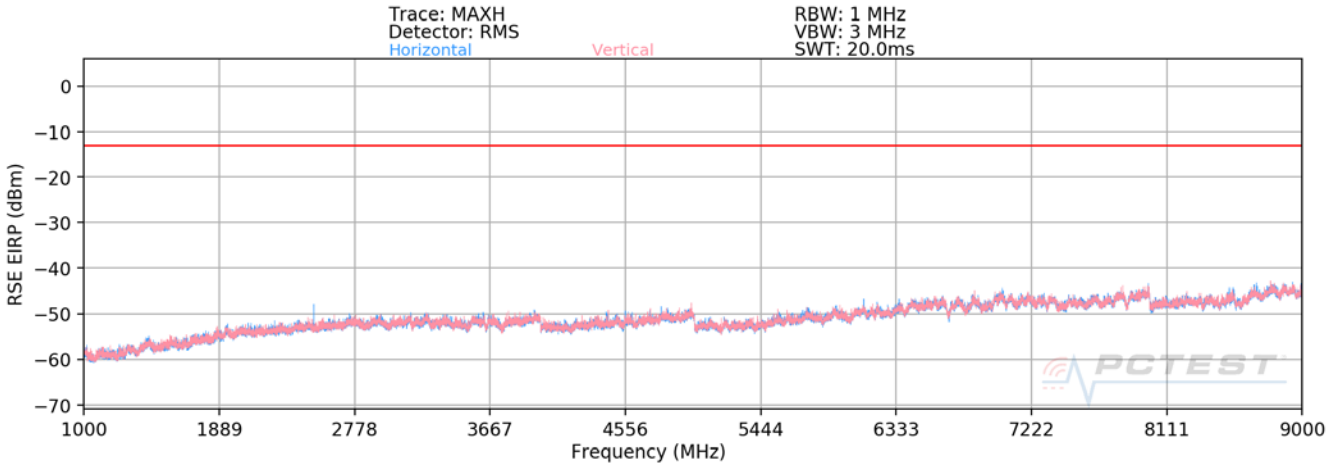
Table 7-9. Radiated Spurious Data (Band 12 – Mid Channel)

OPERATING FREQUENCY:	711.00	MHz
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]
1422.00	H	-	-	-68.56	2.53	-66.04	-53.0
2133.00	H	107	193	-62.20	3.11	-59.09	-46.1
2844.00	H	-	-	-68.01	4.91	-63.10	-50.1
3555.00	H	-	-	-67.65	6.46	-61.20	-48.2

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

Band 5



Plot 7-169. Radiated Spurious Plot above 1GHz (Band 5)

OPERATING FREQUENCY:	826.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	5.0	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]
1653.00	H	-	-	-68.77	3.12	-65.65	-52.7
2479.50	H	170	177	-65.16	3.87	-61.29	-48.3
3306.00	H	-	-	-68.12	6.01	-62.11	-49.1
4132.50	H	-	-	-70.04	7.77	-62.27	-49.3

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

OPERATING FREQUENCY:	836.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	5.0	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	-	-	-68.70	3.10	-65.60	-52.6
2509.50	H	103	37	-66.57	4.02	-62.55	-49.6
3346.00	H	-	-	-68.36	6.03	-62.34	-49.3
4182.50	H	-	-	-69.60	7.79	-61.81	-48.8

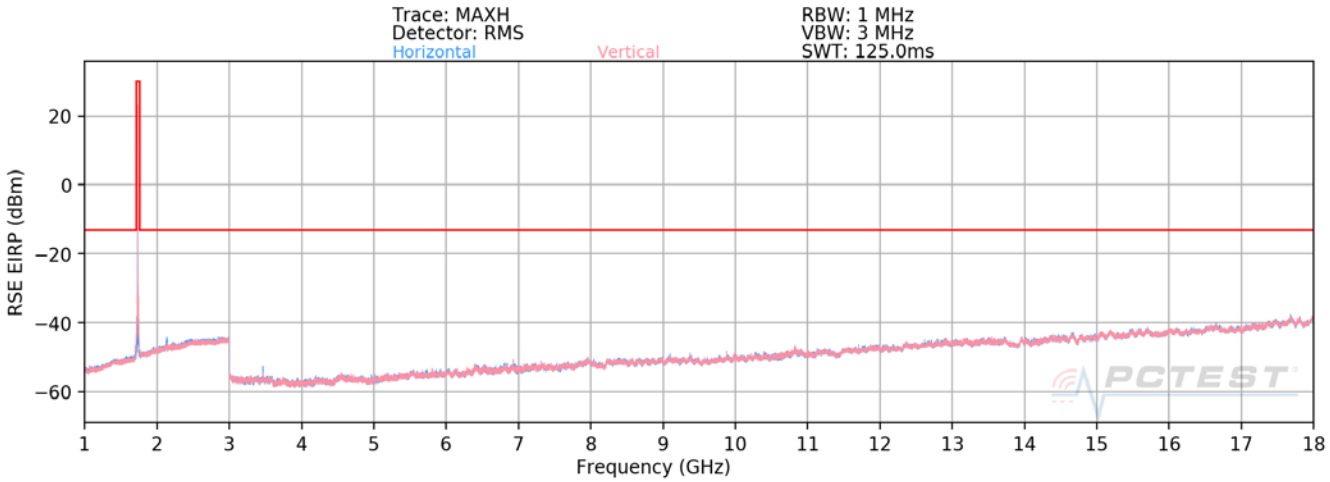
Table 7-12. Radiated Spurious Data (Band 5 – Mid Channel)

OPERATING FREQUENCY:	846.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	5.0	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]
1693.00	H	-	-	-69.24	3.18	-66.06	-53.1
2539.50	H	133	172	-66.44	4.10	-62.34	-49.3
3386.00	H	-	-	-67.89	6.15	-61.74	-48.7
4232.50	H	-	-	-69.35	7.88	-61.47	-48.5

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

Band 4



Plot 7-170. Radiated Spurious Plot above 1GHz (Band 4)

OPERATING FREQUENCY:	1720.00	MHz
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	H	107	131	-61.04	6.22	-54.82	-41.8
5160.00	H	321	31	-67.21	8.68	-58.54	-45.5
6880.00	H	122	49	-63.28	8.76	-54.52	-41.5
8600.00	H	-	-	-65.80	9.17	-56.63	-43.6
10320.00	H	107	48	-62.25	9.64	-52.61	-39.6
12040.00	H	-	-	-61.43	9.23	-52.20	-39.2
13760.00	H	-	-	-60.13	9.01	-51.12	-38.1

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

OPERATING FREQUENCY:	1732.50	MHz
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	H	118	127	-61.65	6.27	-55.38	-42.4
5197.50	H	-	-	-69.65	8.71	-60.94	-47.9
6930.00	H	136	44	-62.14	8.72	-53.42	-40.4
8662.50	H	-	-	-65.13	9.27	-55.86	-42.9
10395.00	H	266	33	-61.21	9.61	-51.60	-38.6
12127.50	H	-	-	-61.32	9.16	-52.16	-39.2
13860.00	H	-	-	-60.24	9.00	-51.25	-38.2

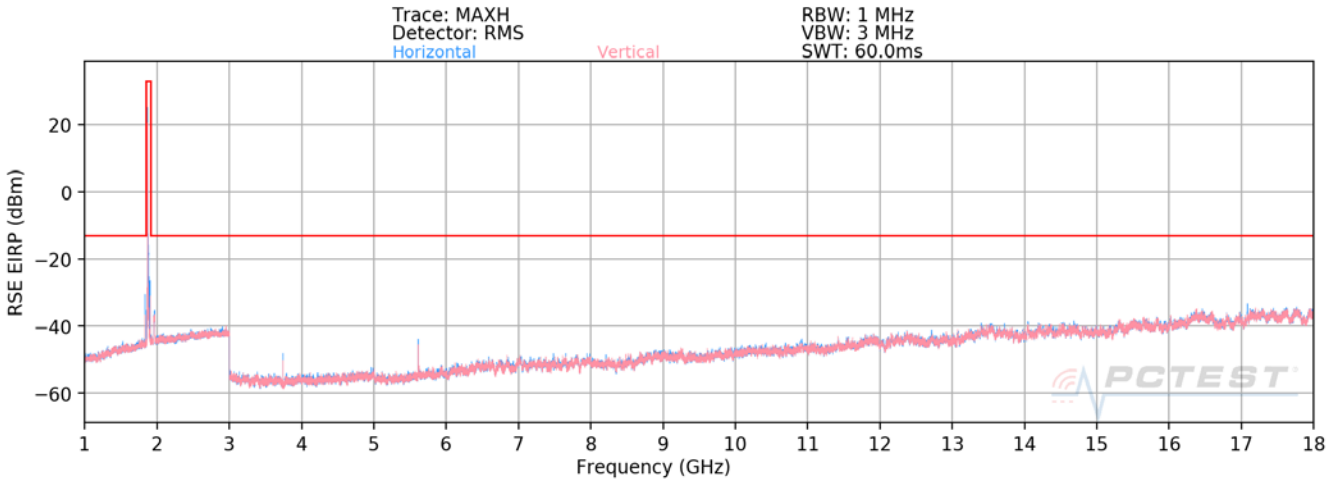
Table 7-15. Radiated Spurious Data (Band 4 – Mid Channel)

OPERATING FREQUENCY:	1745.00	MHz
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	H	102	133	-61.20	6.32	-54.88	-41.9
5235.00	H	243	9	-67.59	8.71	-58.88	-45.9
6980.00	H	286	49	-62.20	8.74	-53.47	-40.5
8725.00	H	-	-	-65.99	9.42	-56.58	-43.6
10470.00	H	101	19	-63.25	9.62	-53.63	-40.6
12215.00	H	-	-	-61.17	9.09	-52.08	-39.1
13960.00	H	-	-	-59.75	8.90	-50.84	-37.8

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

Band 2



Plot 7-171. Radiated Spurious Plot above 1GHz (Band 2)

OPERATING FREQUENCY:	1850.70	MHz
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	129	148	-65.47	6.58	-58.89	-45.9
5552.10	H	344	207	-67.98	8.74	-59.25	-46.2
7402.80	H	100	4	-59.35	8.41	-50.93	-37.9
9253.50	H	-	-	-64.98	9.33	-55.65	-42.7
11104.20	H	273	296	-57.92	9.32	-48.60	-35.6
12954.90	H	-	-	-59.60	8.96	-50.64	-37.6
14805.60	H	-	-	-58.37	8.67	-49.70	-36.7

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

OPERATING FREQUENCY:	1880.00	MHz
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	102	341	-64.19	6.67	-57.52	-44.5
5640.00	H	112	357	-67.63	8.81	-58.82	-45.8
7520.00	H	226	4	-58.64	8.48	-50.16	-37.2
9400.00	H	-	-	-65.00	9.32	-55.68	-42.7
11280.00	H	245	287	-56.39	9.24	-47.16	-34.2
13160.00	H	199	95	-59.34	9.07	-50.27	-37.3
15040.00	H	-	-	-58.13	8.77	-49.37	-36.4
16920.00	H	-	-	-57.19	8.03	-49.16	-36.2

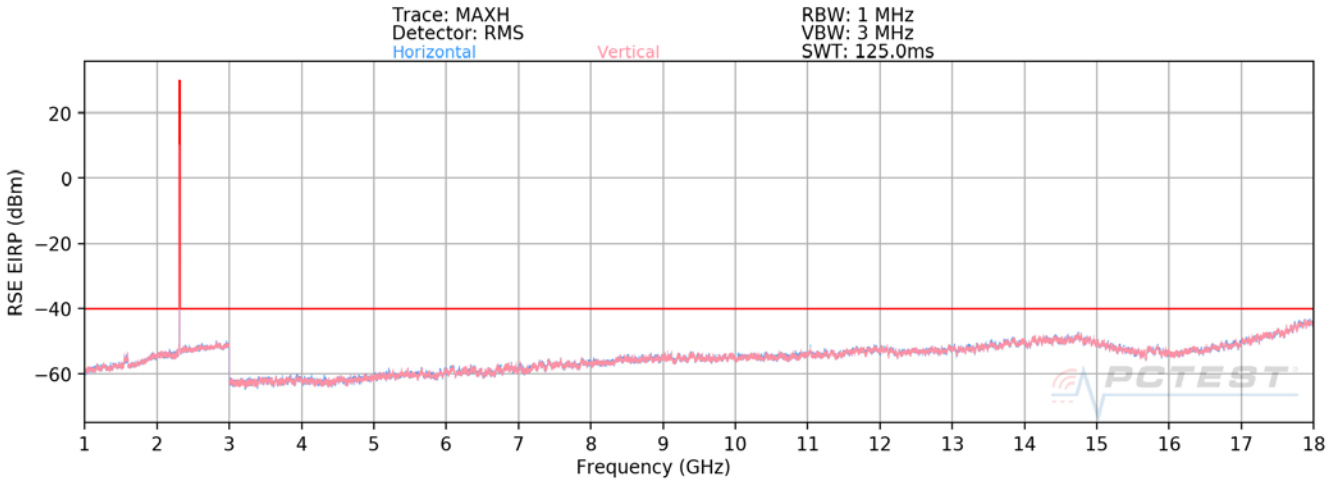
Table 7-18. Radiated Spurious Data (Band 2 – Mid Channel)

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

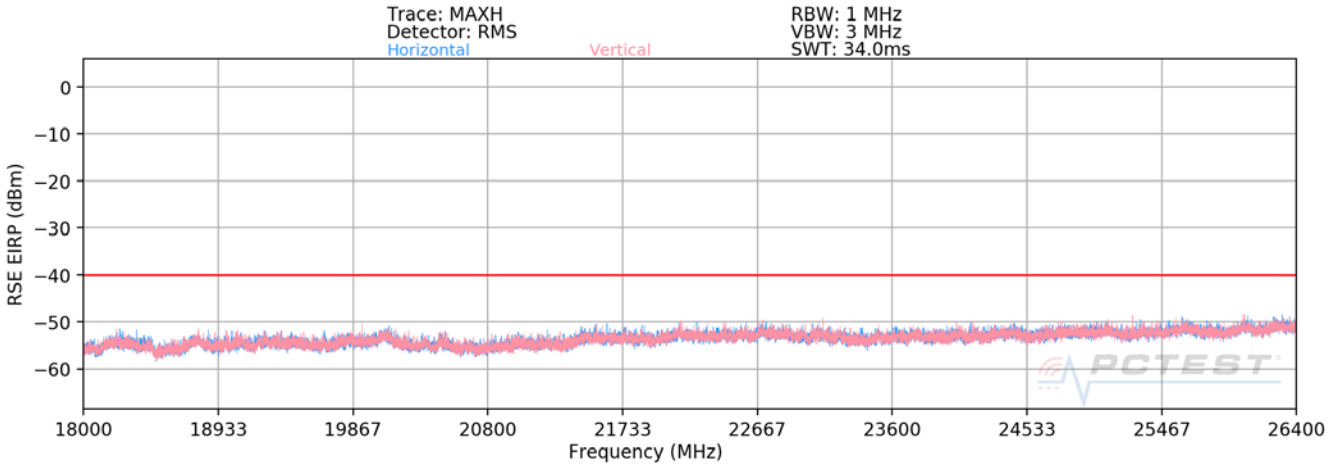
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3818.60	H	112	356	-67.56	6.87	-60.68	-47.7
5727.90	H	122	352	-67.20	8.76	-58.43	-45.4
7637.20	H	237	356	-60.12	8.47	-51.65	-38.6
9546.50	H	-	-	-65.10	9.37	-55.73	-42.7
11455.80	H	163	76	-61.17	9.23	-51.94	-38.9
13365.10	H	-	-	-59.98	8.93	-51.05	-38.0
15274.40	H	-	-	-56.60	8.49	-48.11	-35.1

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

Band 30



Plot 7-172. Radiated Spurious Plot above 1GHz (Band 30)



Plot 7-173. Radiated Spurious Plot above 18GHz (Band 30)

OPERATING FREQUENCY:	2310.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-40	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]
4620.00	H	101	344	-60.61	8.42	-52.19	-12.2
6930.00	H	-	-	-67.65	9.38	-58.26	-18.3
9240.00	H	-	-	-63.78	9.46	-54.32	-14.3

Table 7-20. Radiated Spurious Data (Band 30 – Mid 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, 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

Band 12 Frequency Stability Measurements

OPERATING FREQUENCY:	707,500,000	Hz
CHANNEL:	23790	
REFERENCE VOLTAGE:	4.34	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.34	- 30	707,500,049	49	0.0000069
100 %		- 20	707,500,146	146	0.0000206
100 %		- 10	707,500,064	64	0.0000090
100 %		0	707,499,654	-346	-0.0000489
100 %		+ 10	707,499,902	-98	-0.0000139
100 %		+ 20	707,500,047	47	0.0000066
100 %		+ 30	707,500,045	45	0.0000064
100 %		+ 40	707,500,016	16	0.0000023
100 %		+ 50	707,499,856	-144	-0.0000204
BATT. ENDPOINT	3.29	+ 20	707,499,807	-193	-0.0000273

Table 7-21. 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

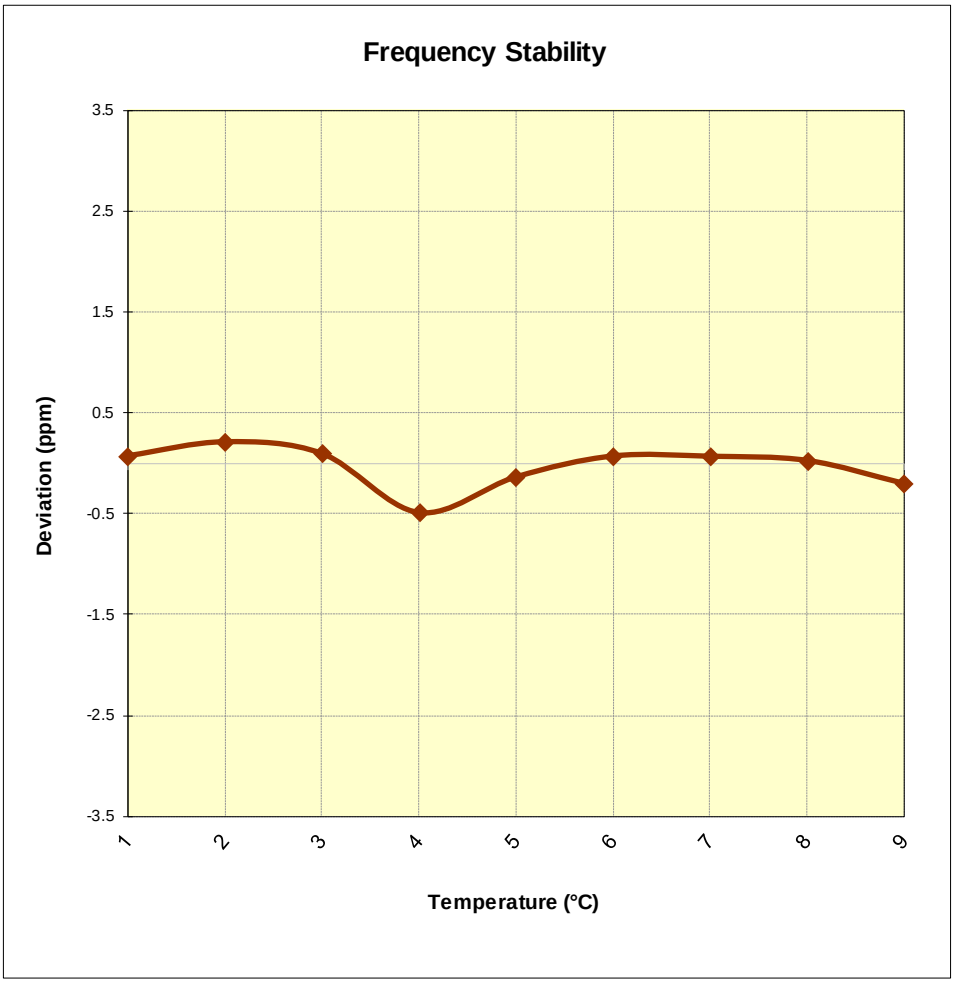


Figure 7-8. Frequency Stability Graph (Band 12)

Band 5 Frequency Stability Measurements

OPERATING FREQUENCY:	836,500,000	Hz
CHANNEL:	20525	
REFERENCE VOLTAGE:	4.34	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.34	- 30	836,500,249	249	0.0000298
100 %		- 20	836,499,738	-262	-0.0000313
100 %		- 10	836,500,000	0	0.0000000
100 %		0	836,500,056	56	0.0000067
100 %		+ 10	836,499,990	-10	-0.0000012
100 %		+ 20	836,500,016	16	0.0000019
100 %		+ 30	836,499,956	-44	-0.0000053
100 %		+ 40	836,500,202	202	0.0000241
100 %		+ 50	836,499,790	-210	-0.0000251
BATT. ENDPOINT	3.29	+ 20	836,499,901	-99	-0.0000118

Table 7-22. Frequency Stability Data (Band 5)

Band 5 Frequency Stability Measurements

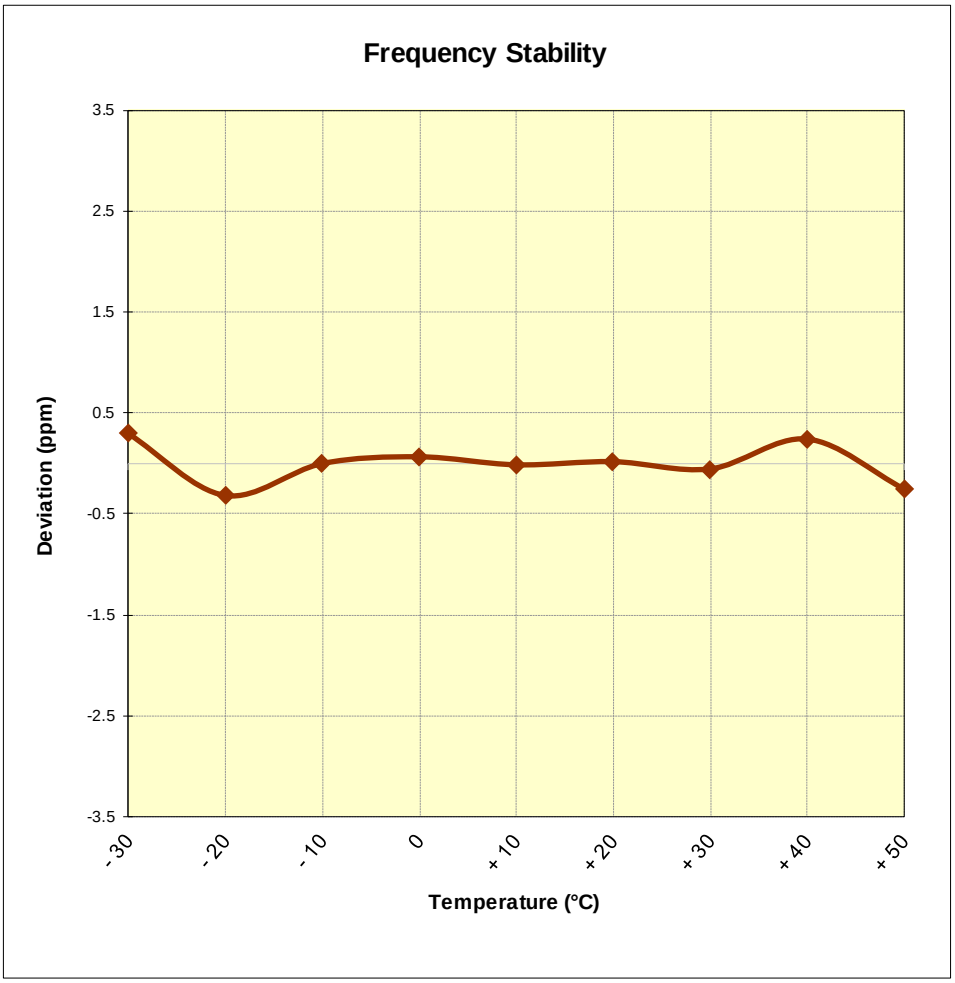


Figure 7-9. Frequency Stability Graph (Band 5)

Band 4 Frequency Stability Measurements

OPERATING FREQUENCY:	1,732,500,000	Hz
CHANNEL:	20175	
REFERENCE VOLTAGE:	4.34	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.34	- 30	1,732,500,001	1	0.0000001
100 %		- 20	1,732,499,742	-258	-0.0000149
100 %		- 10	1,732,499,869	-131	-0.0000076
100 %		0	1,732,499,894	-106	-0.0000061
100 %		+ 10	1,732,500,055	55	0.0000032
100 %		+ 20	1,732,499,742	-258	-0.0000149
100 %		+ 30	1,732,500,219	219	0.0000126
100 %		+ 40	1,732,499,666	-334	-0.0000193
100 %		+ 50	1,732,499,994	-6	-0.0000003
BATT. ENDPOINT	3.29	+ 20	1,732,500,068	68	0.0000039

Table 7-23. 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

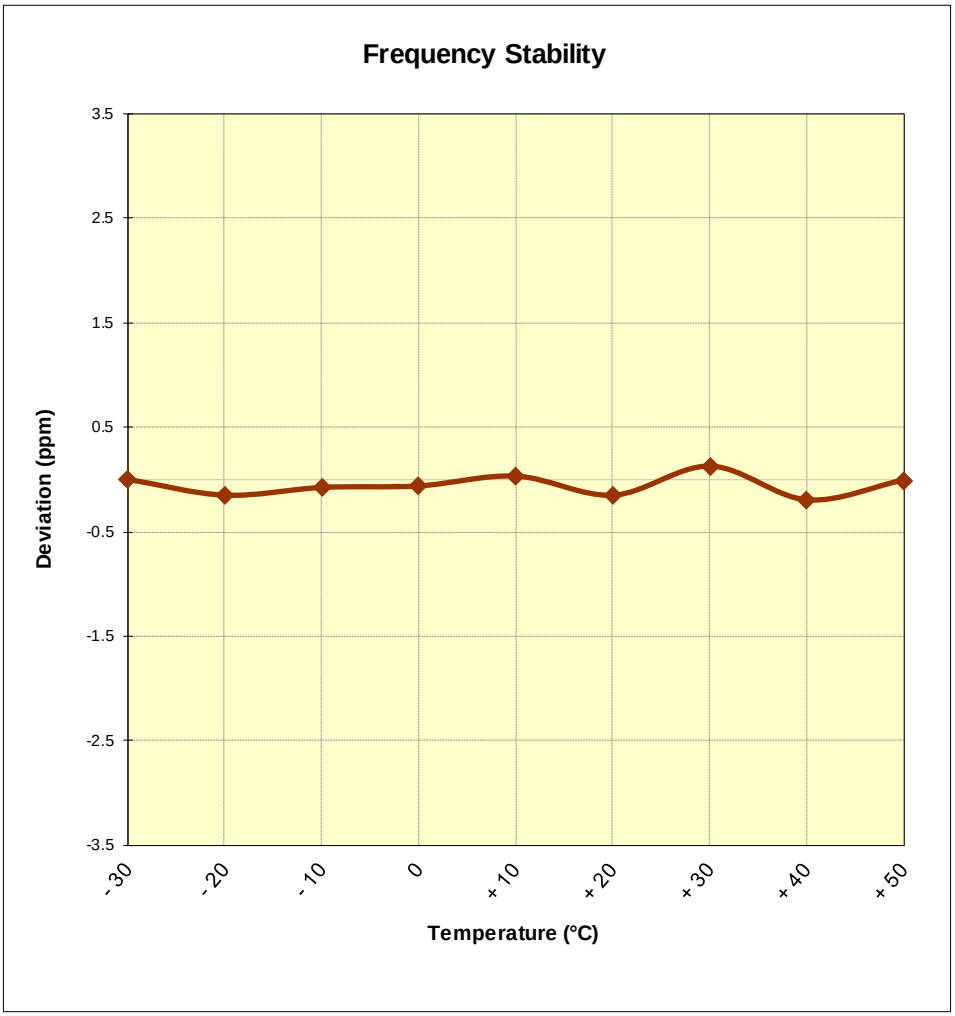


Figure 7-10. Frequency Stability Graph (Band 4)

Band 2 Frequency Stability Measurements

OPERATING FREQUENCY:	1,880,000,000	Hz
CHANNEL:	18900	
REFERENCE VOLTAGE:	4.34	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.34	- 30	1,879,999,785	-215	-0.0000114
100 %		- 20	1,880,000,052	52	0.0000028
100 %		- 10	1,880,000,046	46	0.0000024
100 %		0	1,879,999,724	-276	-0.0000147
100 %		+ 10	1,880,000,342	342	0.0000182
100 %		+ 20	1,879,999,996	-4	-0.0000002
100 %		+ 30	1,879,999,796	-204	-0.0000109
100 %		+ 40	1,879,999,658	-342	-0.0000182
100 %		+ 50	1,879,999,904	-96	-0.0000051
BATT. ENDPOINT	3.29	+ 20	1,880,000,061	61	0.0000032

Table 7-24. Frequency Stability Data (Band 2)

Band 2 Frequency Stability Measurements

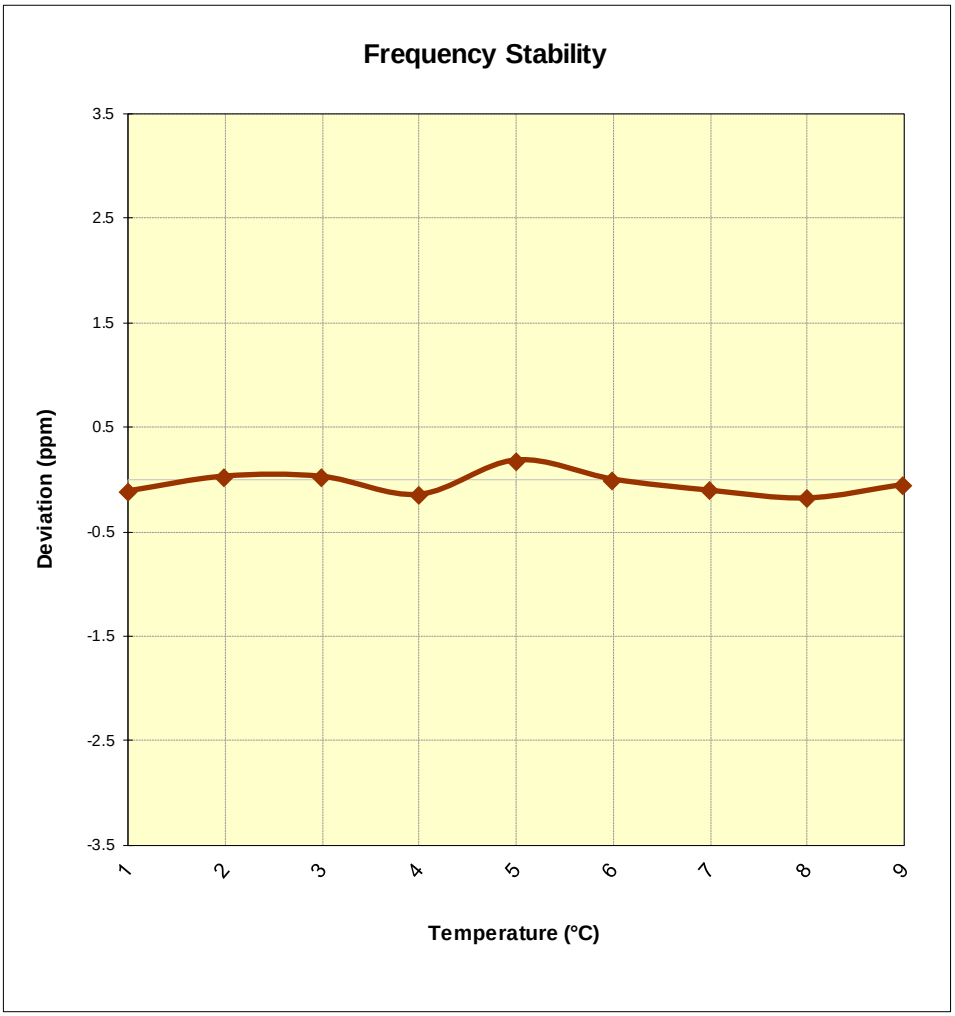


Figure 7-11. Frequency Stability Graph (Band 2)

Band 30 Frequency Stability Measurements

OPERATING FREQUENCY:	2,310,000,000	Hz
CHANNEL:	27710	
REFERENCE VOLTAGE:	4.34	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.34	- 30	2,309,999,957	-43	-0.0000019
100 %		- 20	2,310,000,078	78	0.0000034
100 %		- 10	2,310,000,078	78	0.0000034
100 %		0	2,310,000,168	168	0.0000073
100 %		+ 10	2,310,000,437	437	0.0000189
100 %		+ 20	2,309,999,974	-26	-0.0000011
100 %		+ 30	2,309,999,563	-437	-0.0000189
100 %		+ 40	2,310,000,032	32	0.0000014
100 %		+ 50	2,310,000,284	284	0.0000123
BATT. ENDPOINT	3.29	+ 20	2,310,000,121	121	0.0000052

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

Band 30 Frequency Stability Measurements

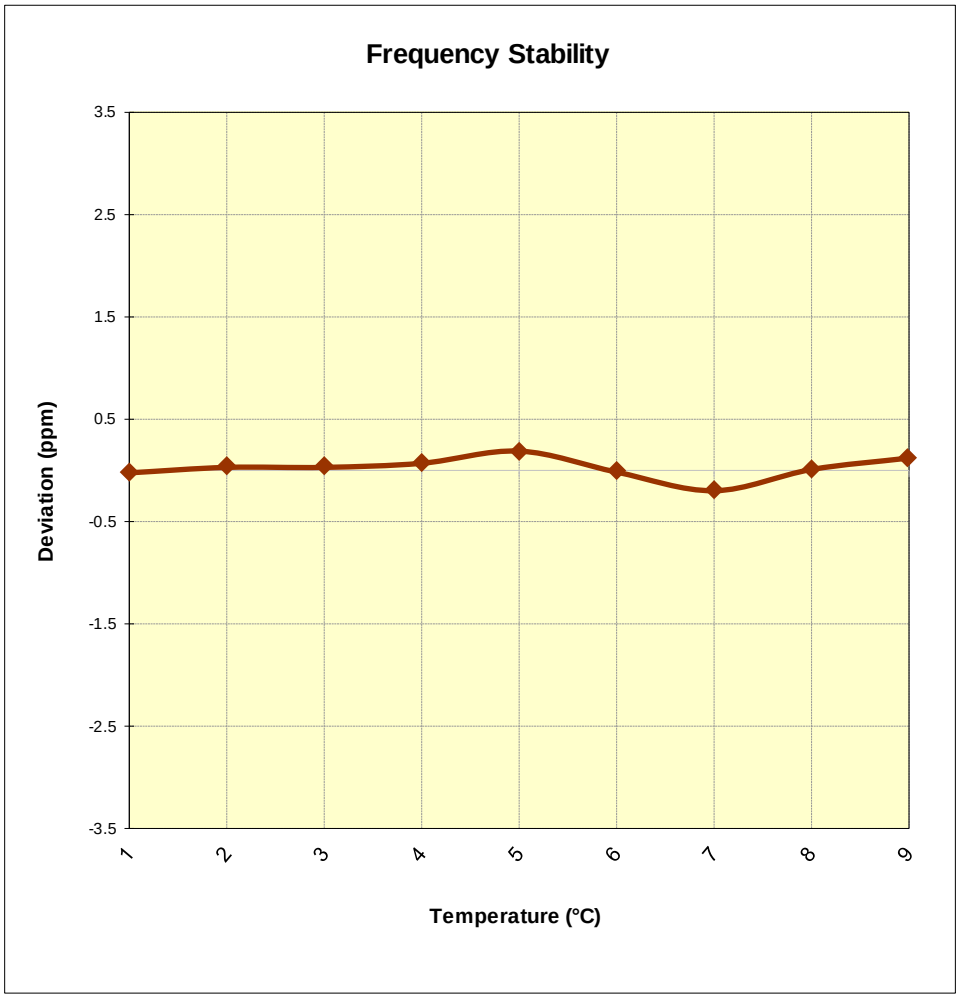


Figure 7-12. Frequency Stability Graph (Band 30)

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFK300AM** complies with all the requirements of Part **22, 24, & 27** of the FCC Rules for LTE operation only.