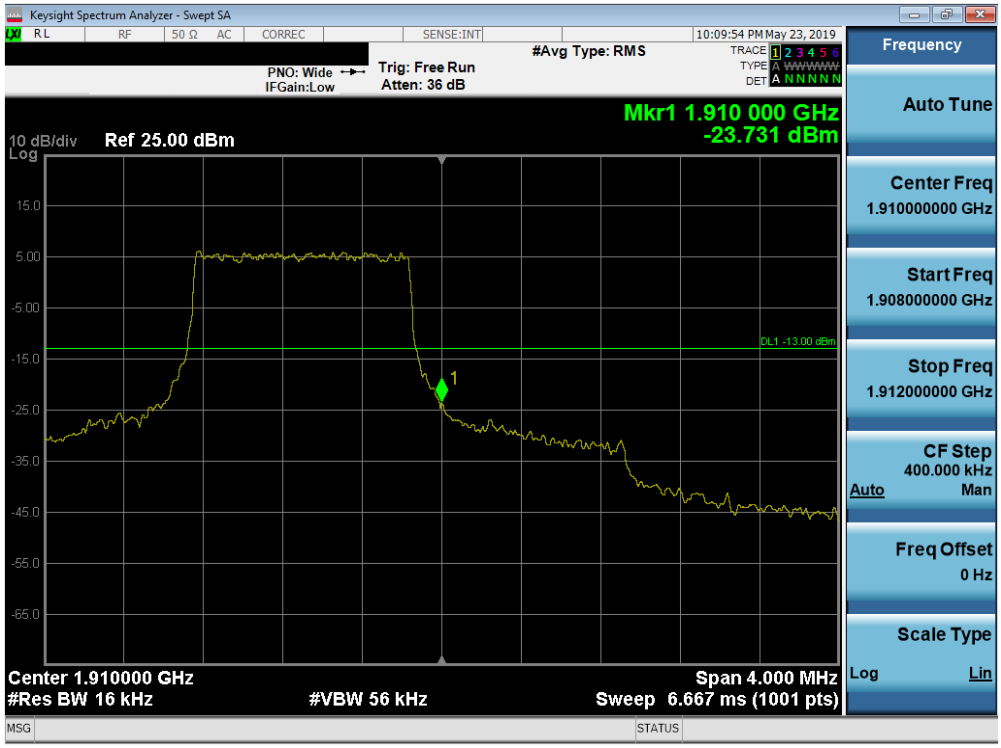
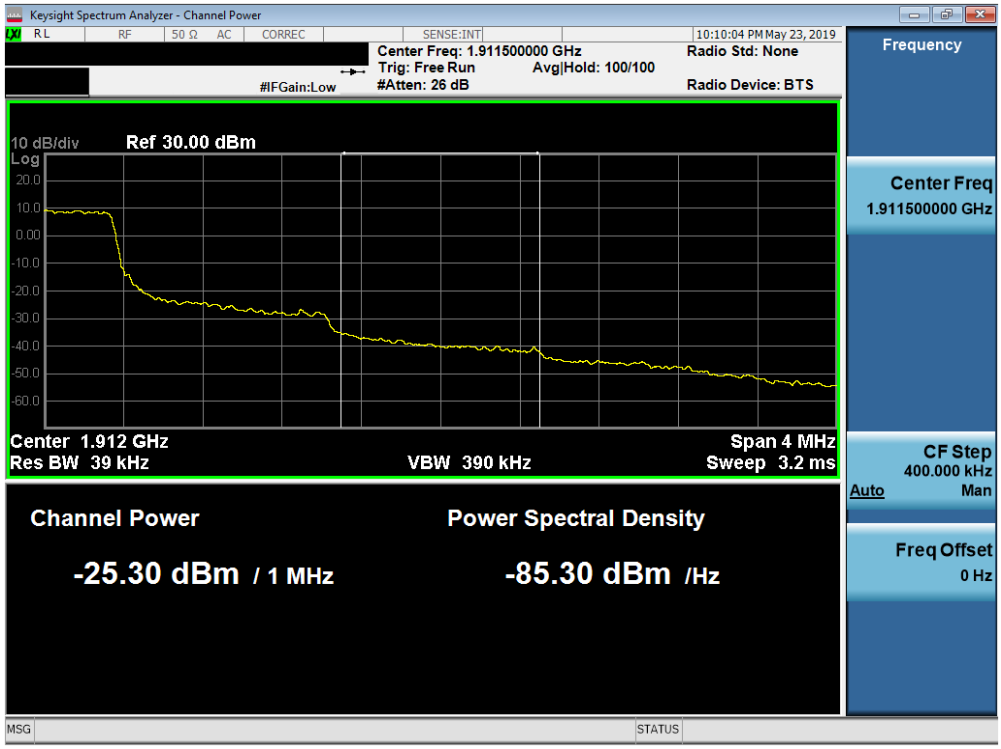


Plot 7-120. Upper Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



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

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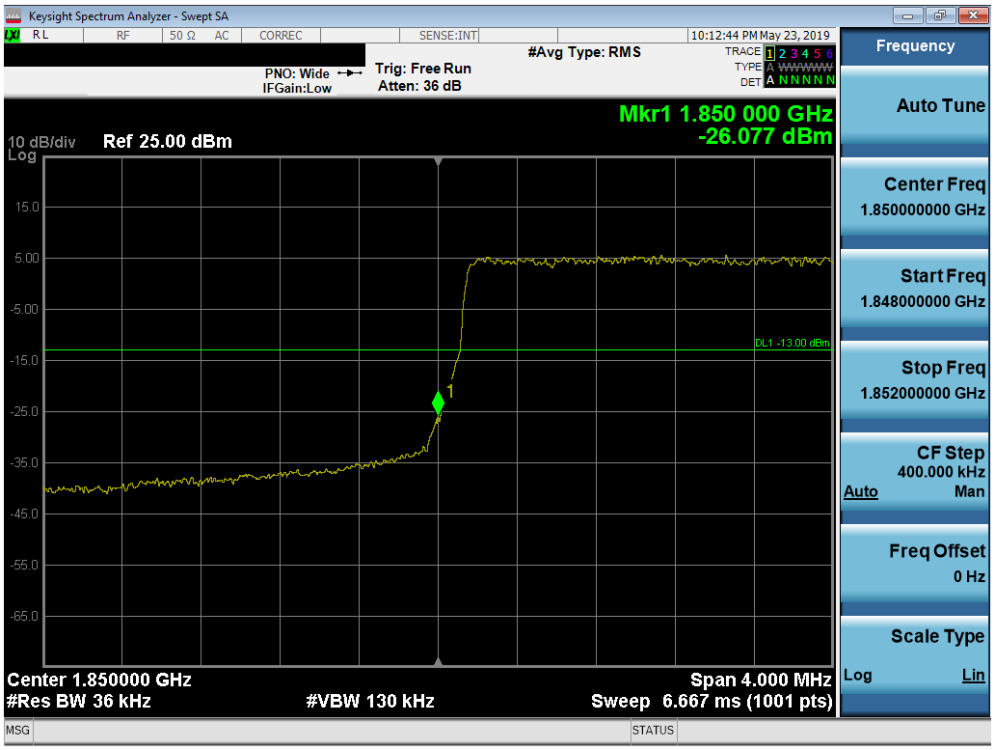
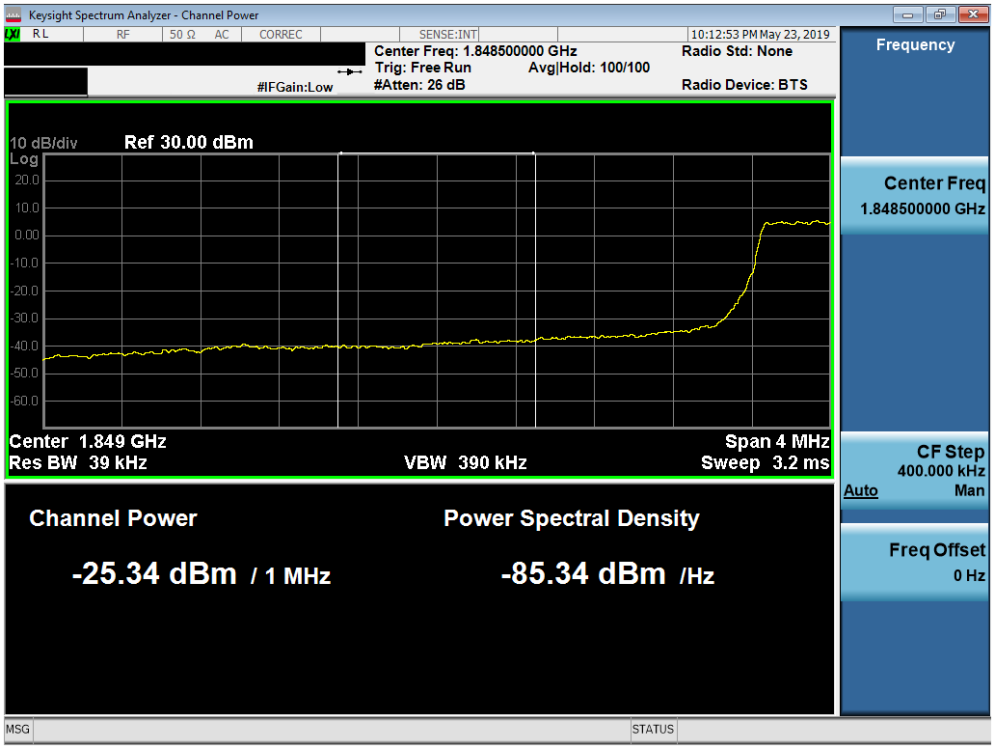


Plot 7-122. Lower Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



Plot 7-123. Lower Extended Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)

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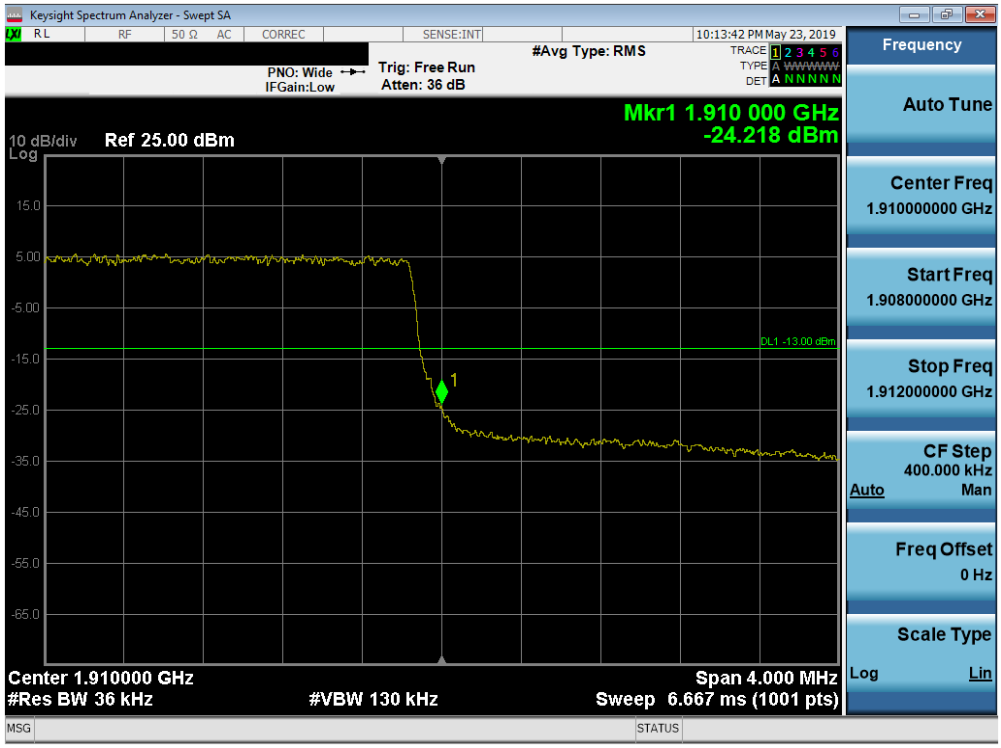
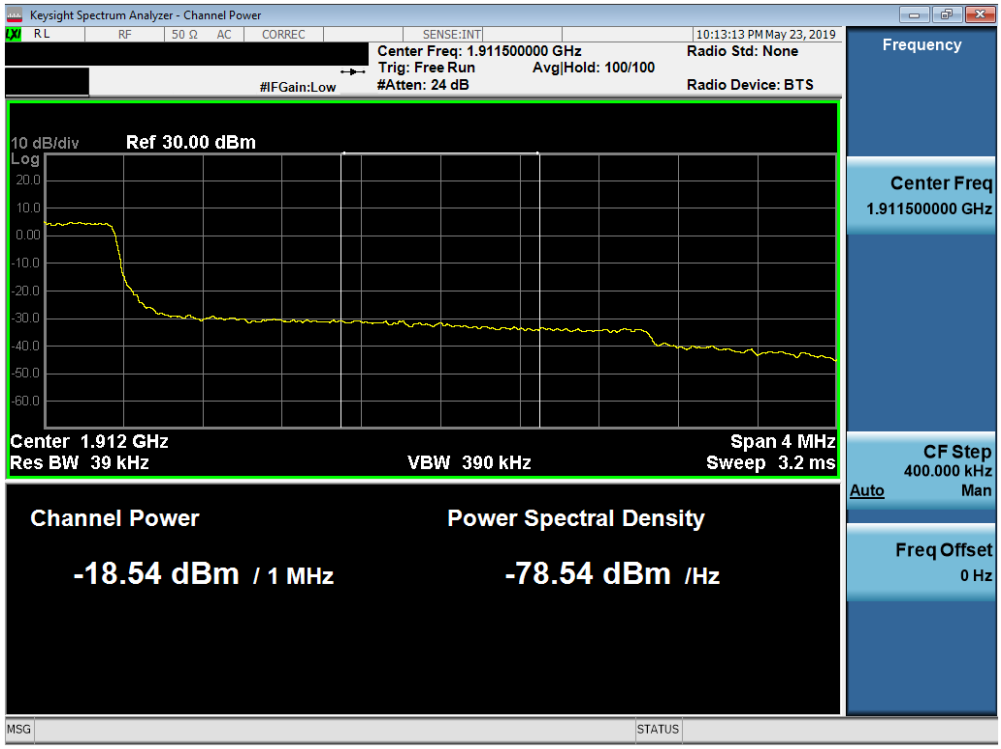


Plot 7-124. Upper Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



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

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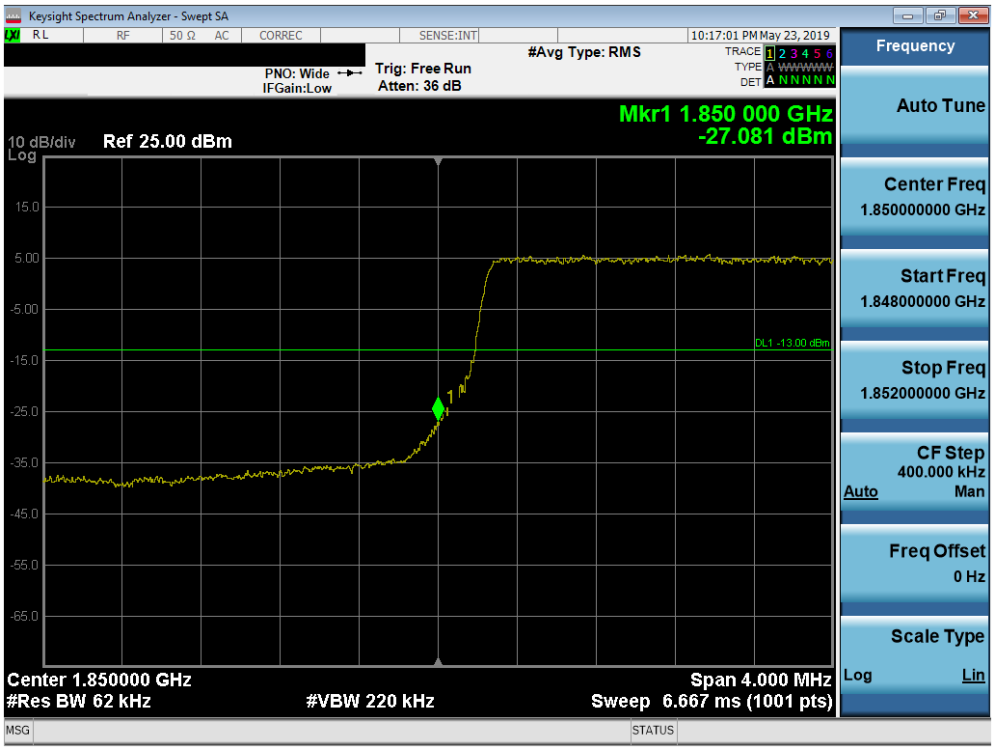
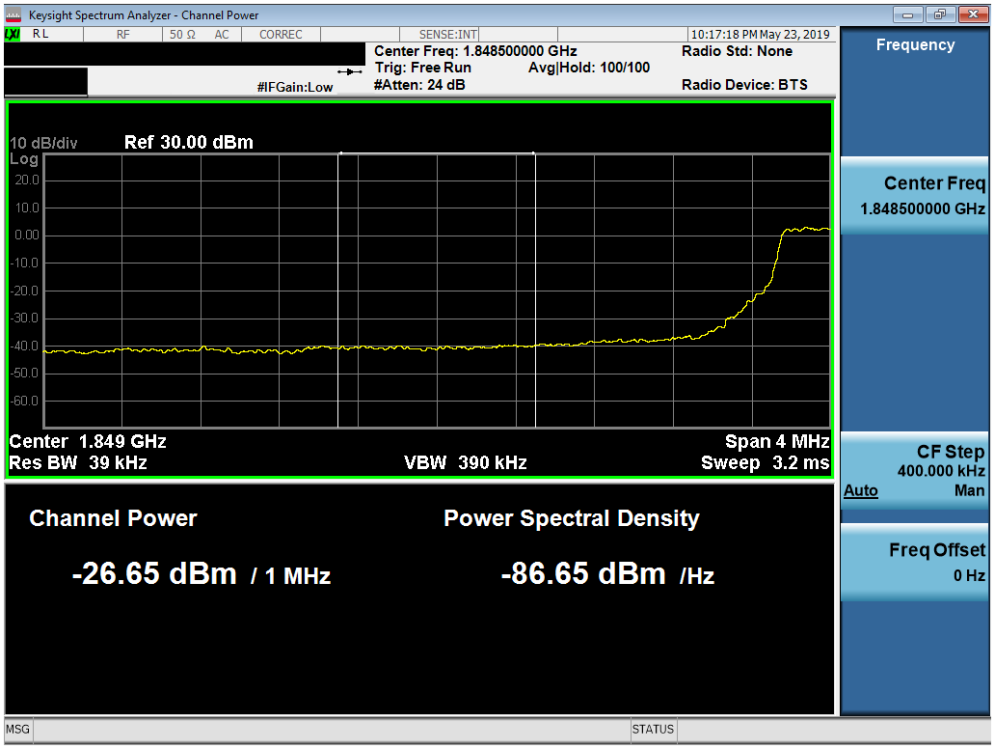


Plot 7-126. Lower Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-127. Lower Extended Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)

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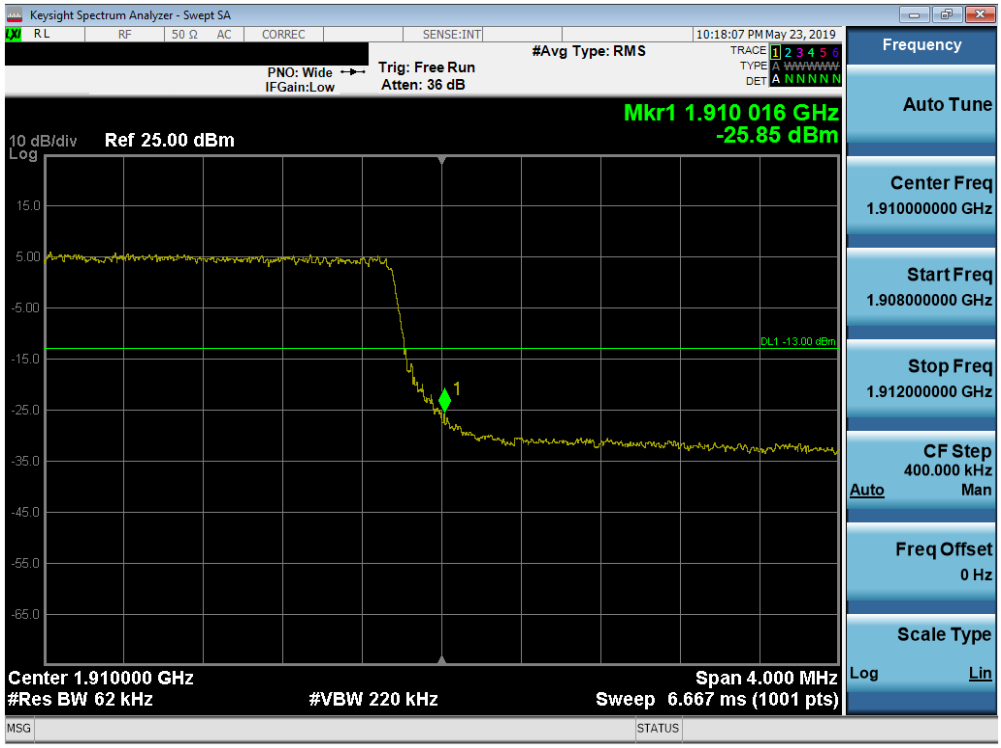
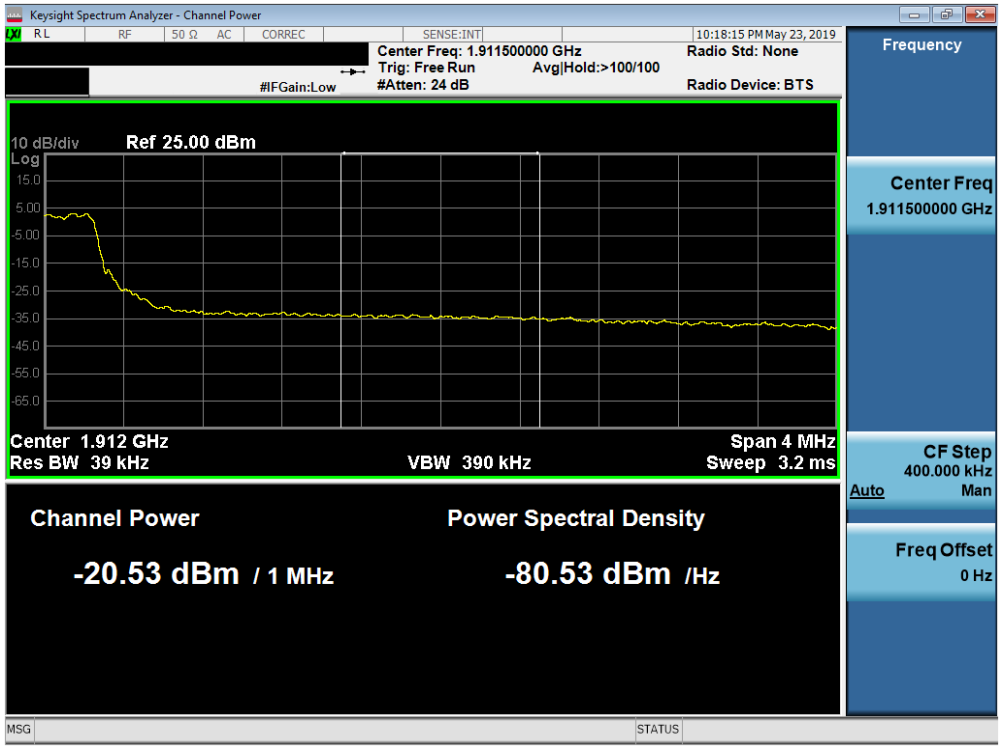


Plot 7-128. Upper Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



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

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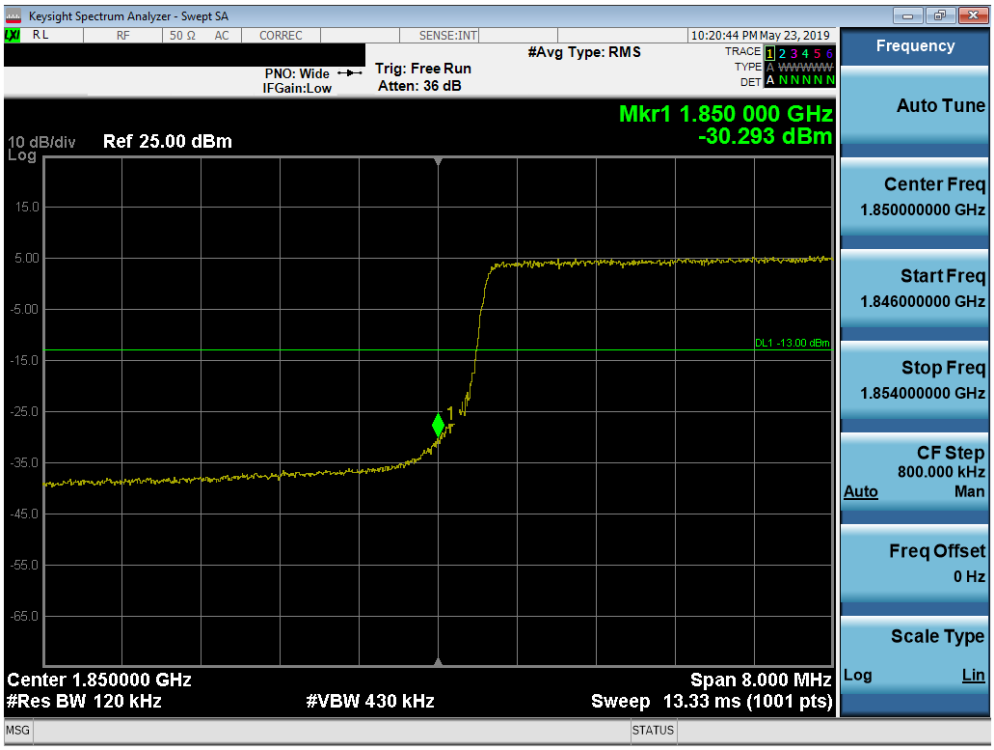
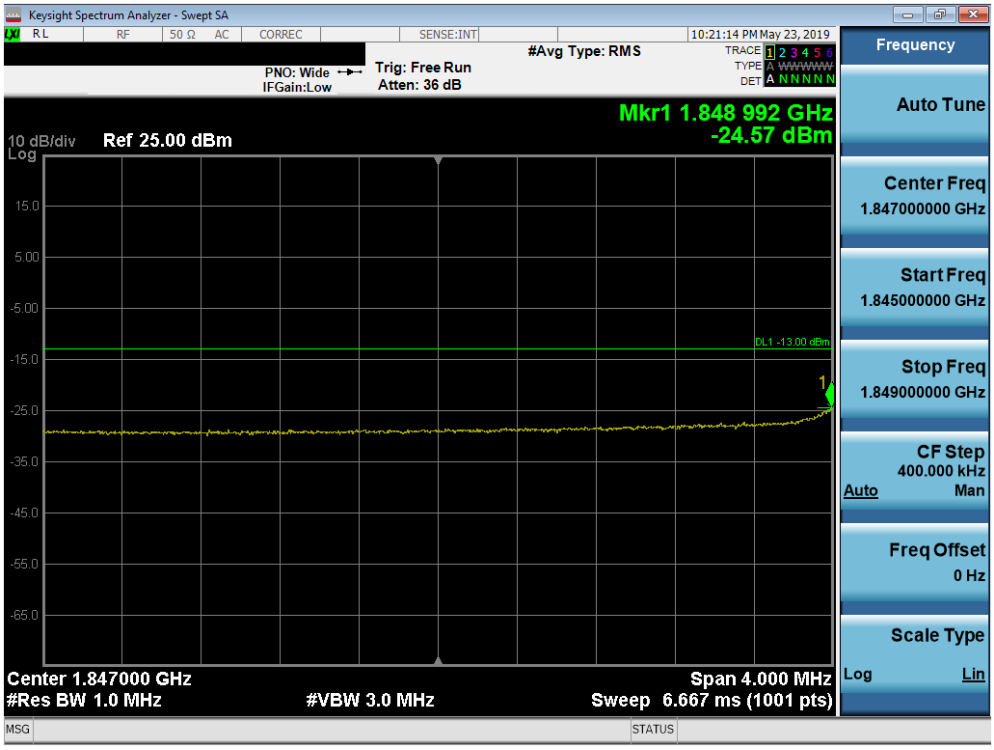


Plot 7-130. Lower Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



Plot 7-131. Lower Extended Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)

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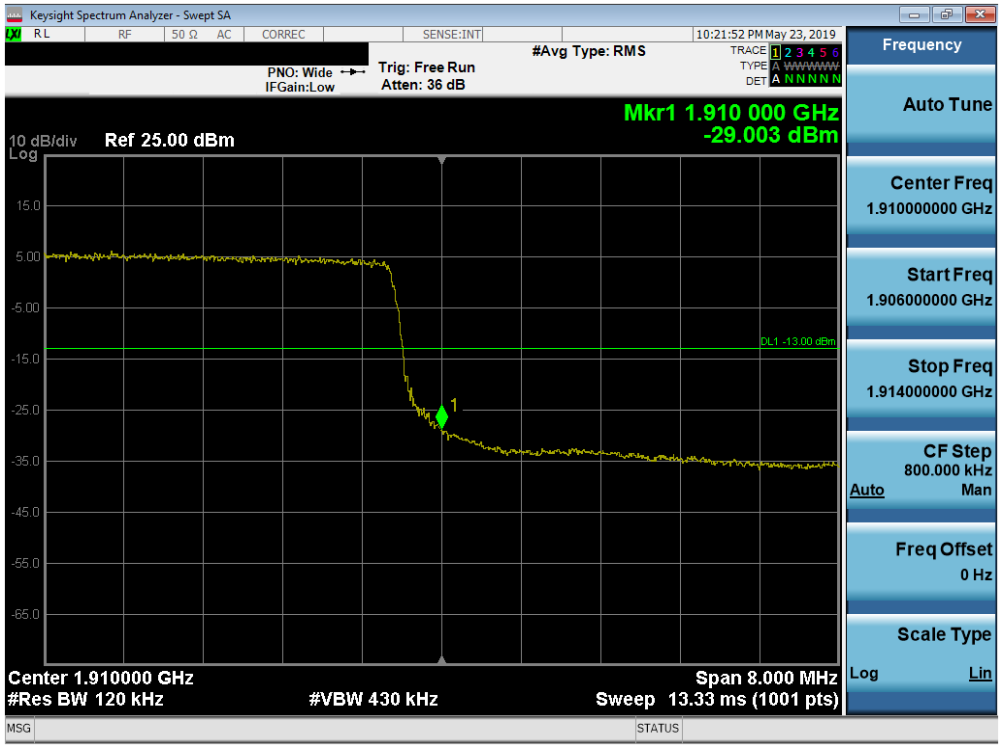
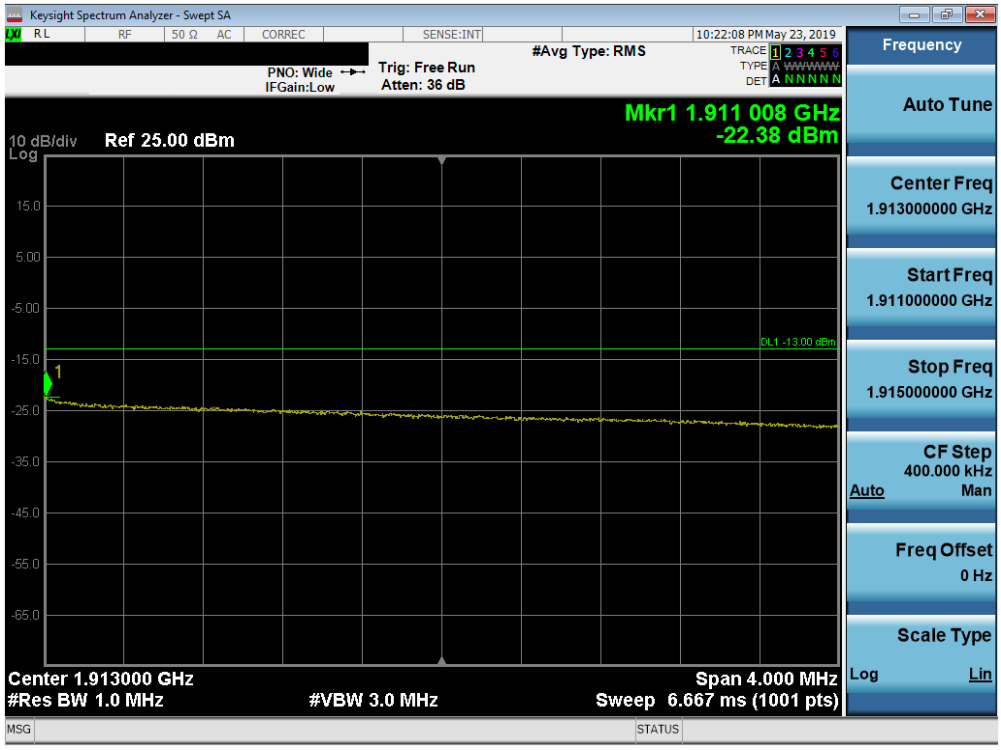


Plot 7-132. Upper Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



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

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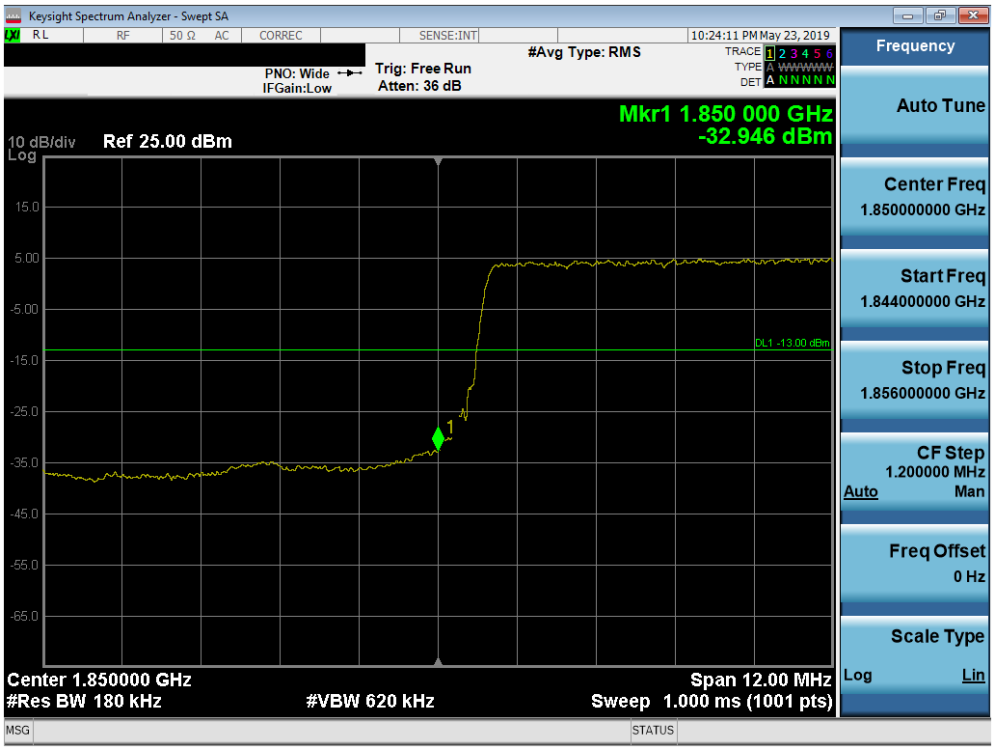
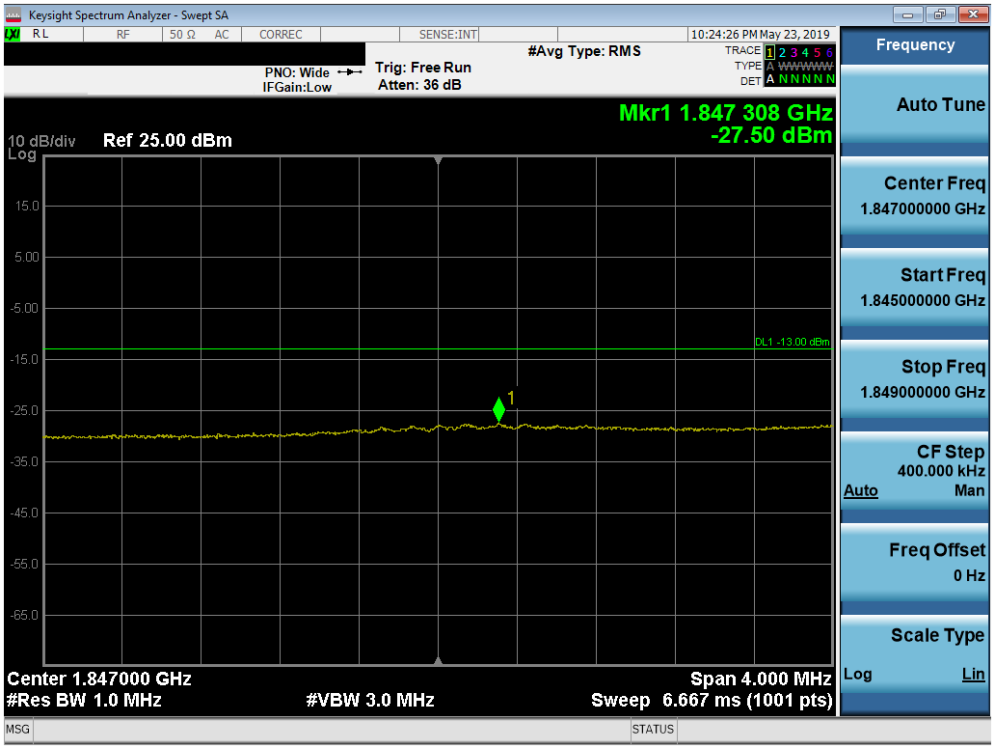


Plot 7-134. Lower Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-135. Lower Extended Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)

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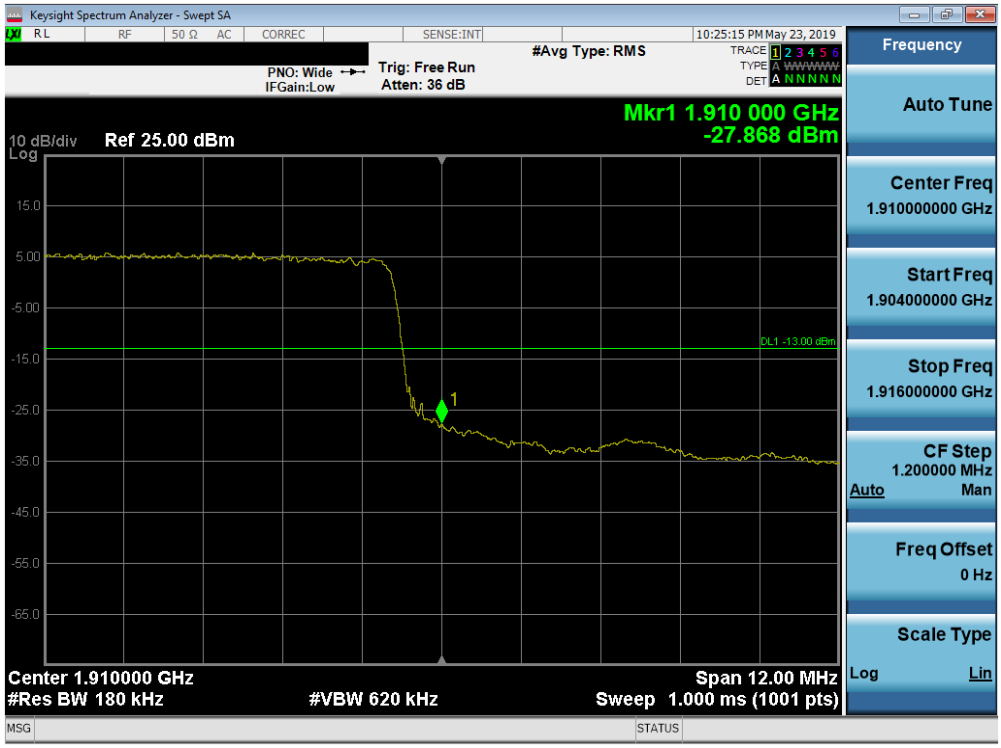
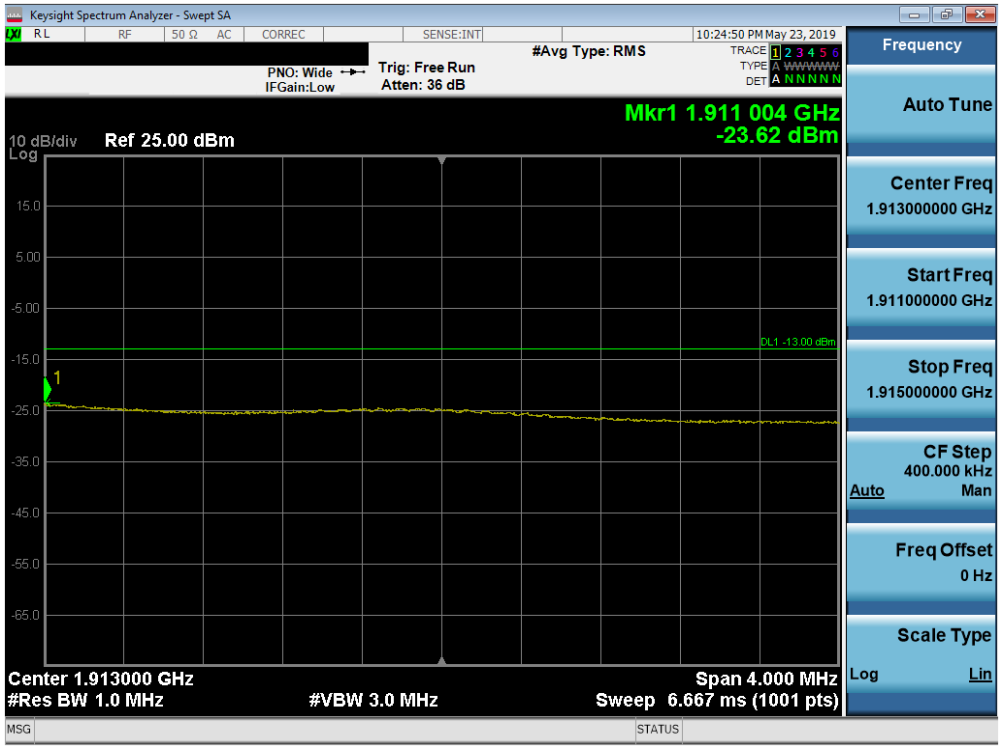


Plot 7-136. Upper Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



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

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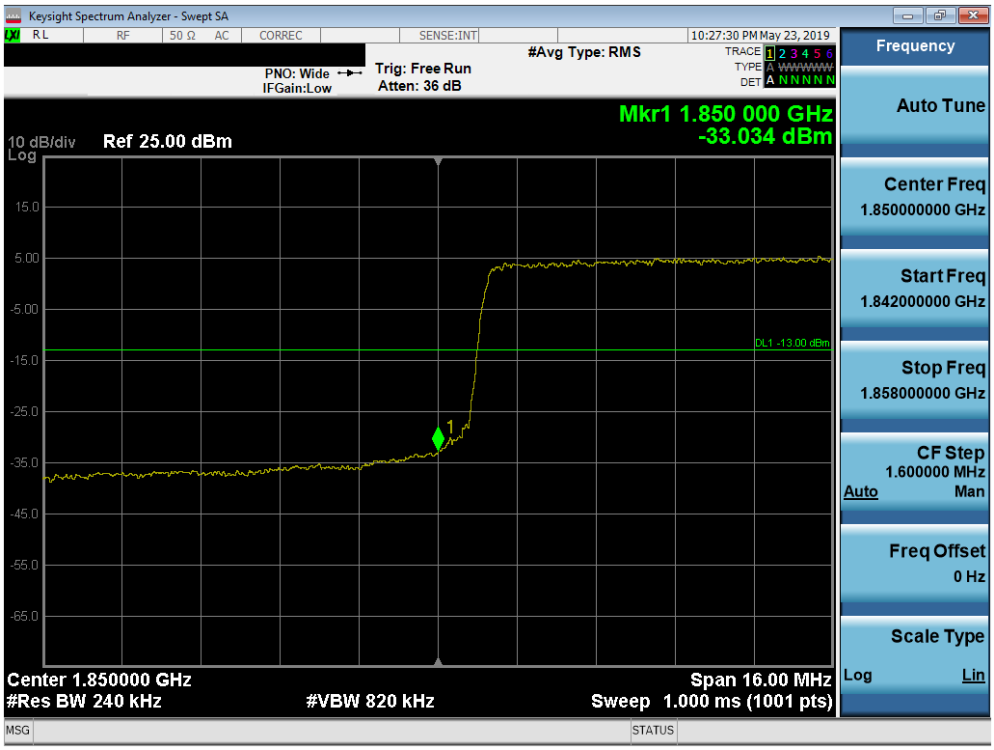
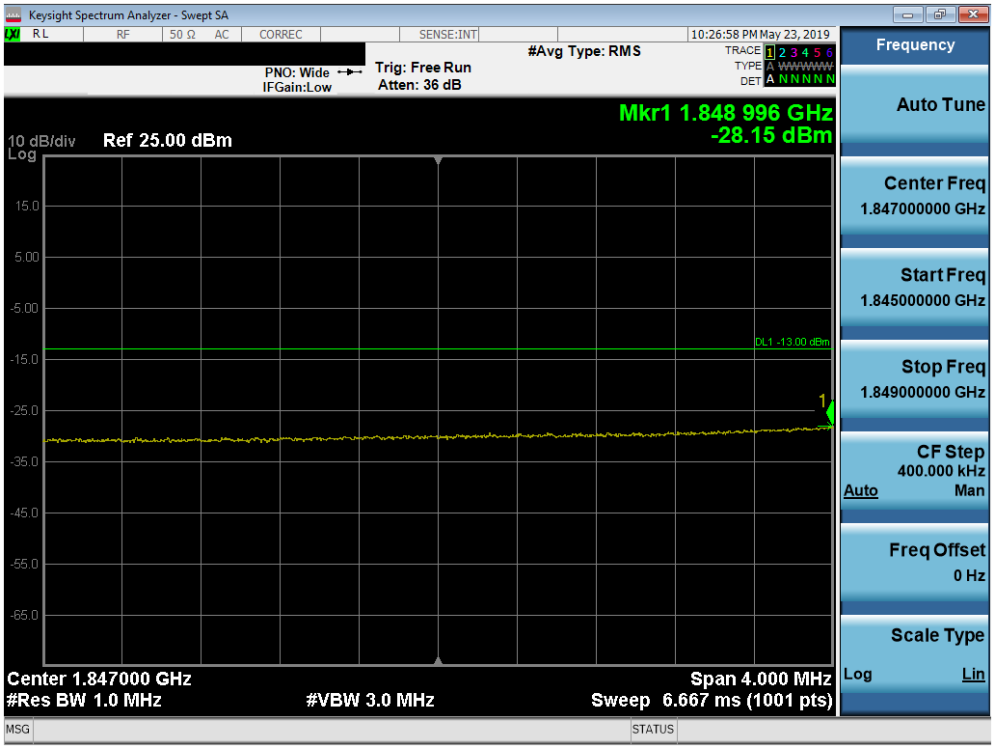


Plot 7-138. Lower Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-139. Lower Extended Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)

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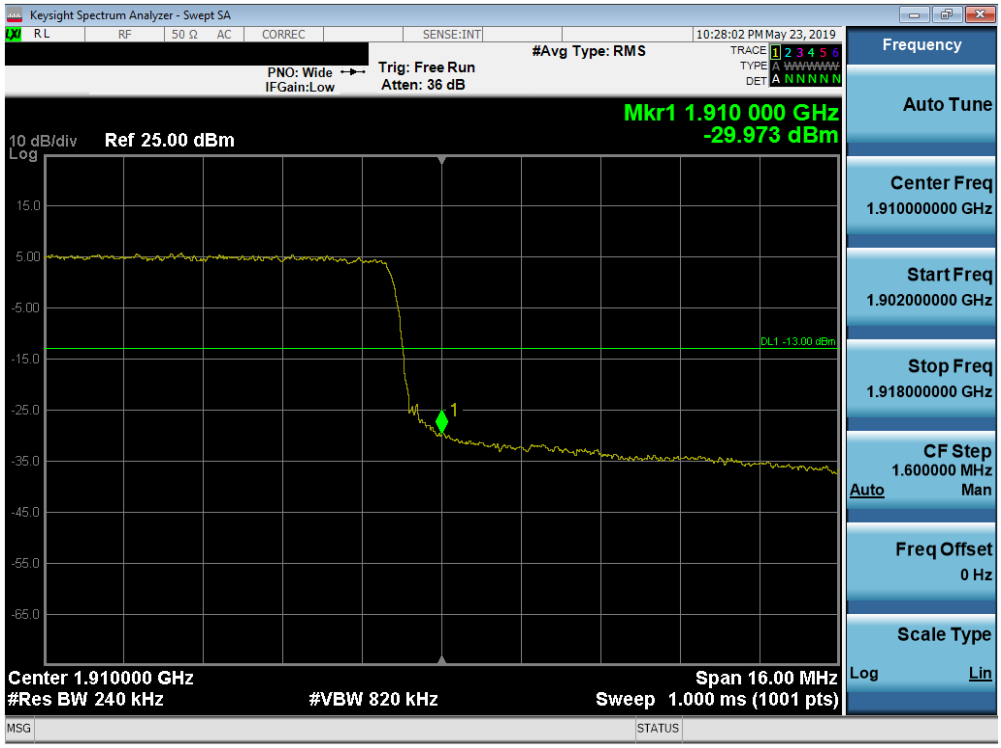
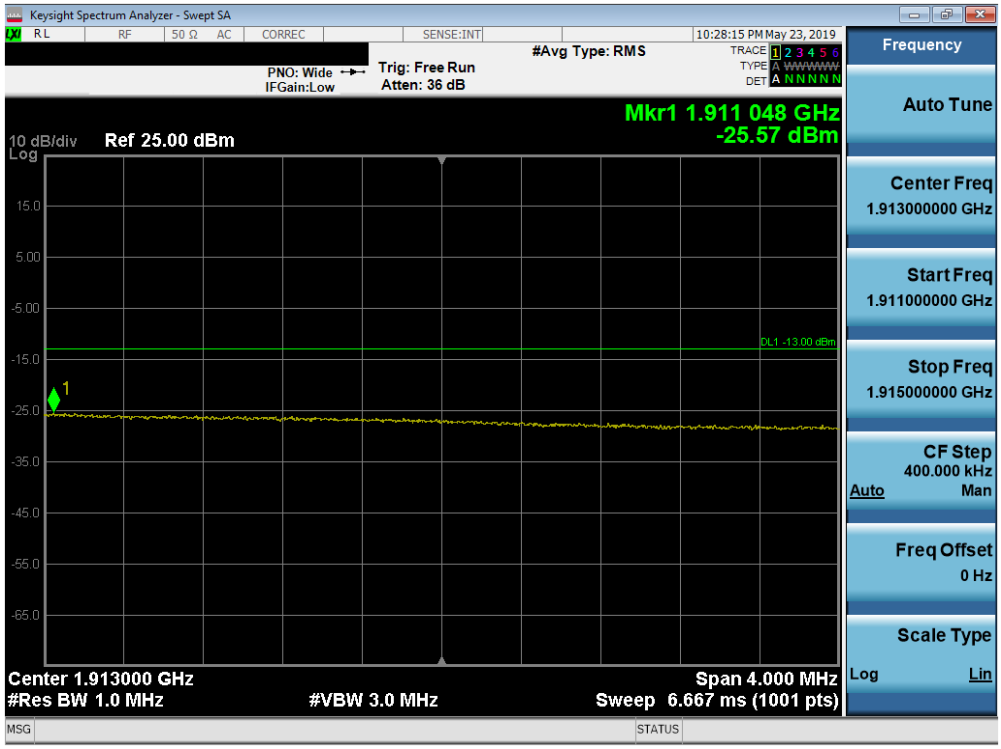


Plot 7-140. Upper Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



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

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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 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.

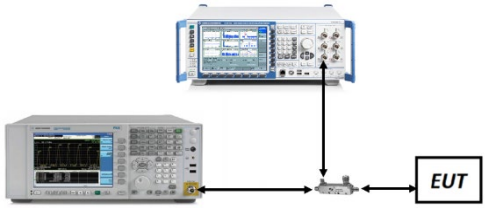

Figure 7-4. Test Instrument & Measurement Setup

Test Notes

None.

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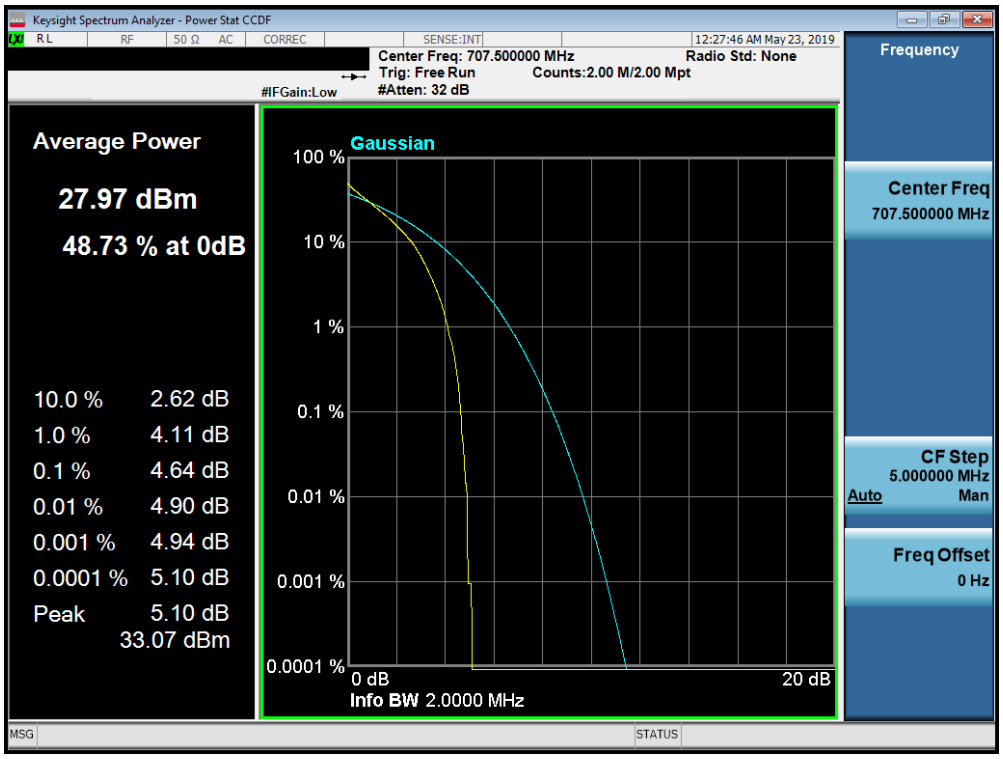
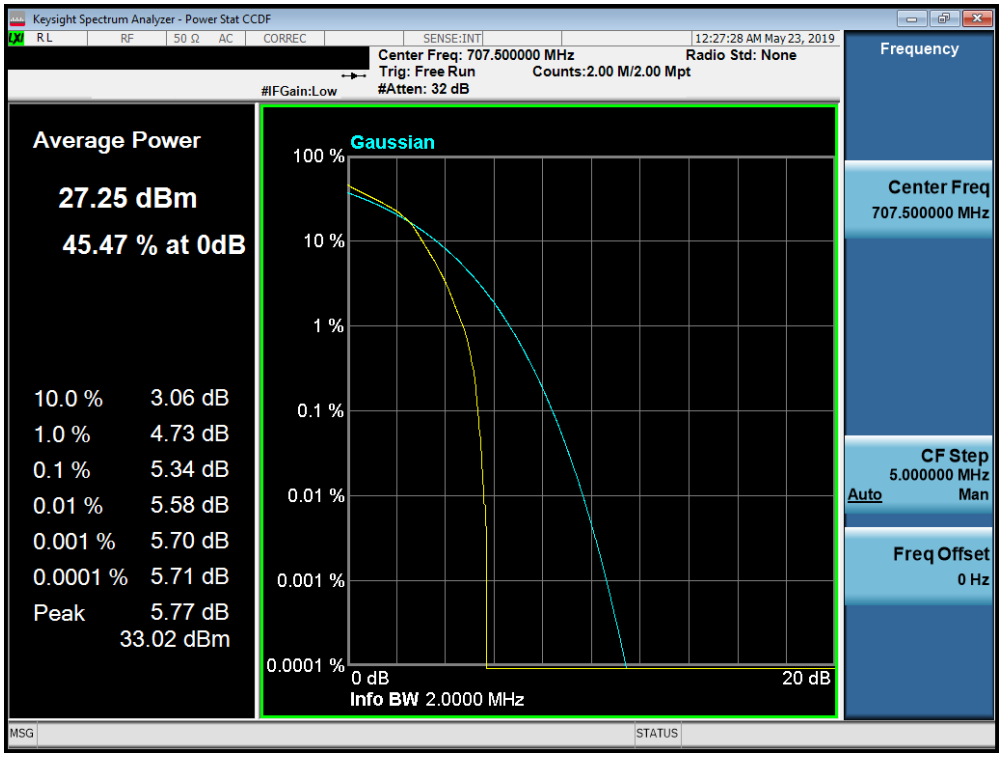
Band 12



Plot 7-142. PAR Plot (Band 12 - 1.4MHz QPSK - Full RB Configuration)



Plot 7-143. PAR Plot (Band 12 - 1.4MHz 16-QAM - Full RB Configuration)

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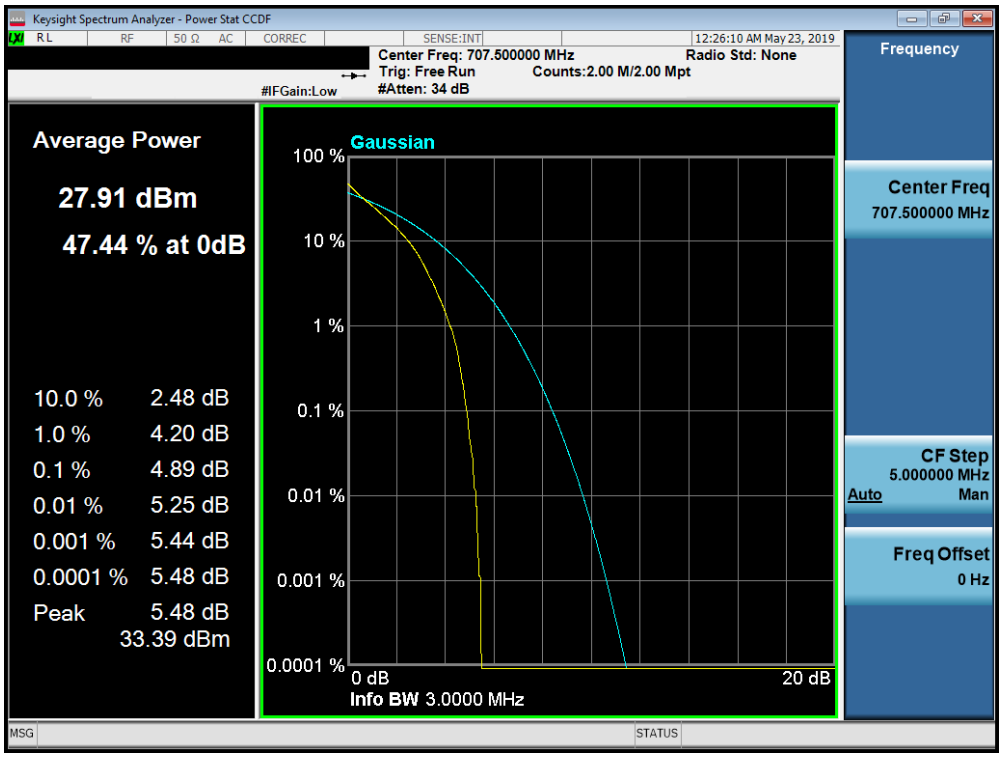
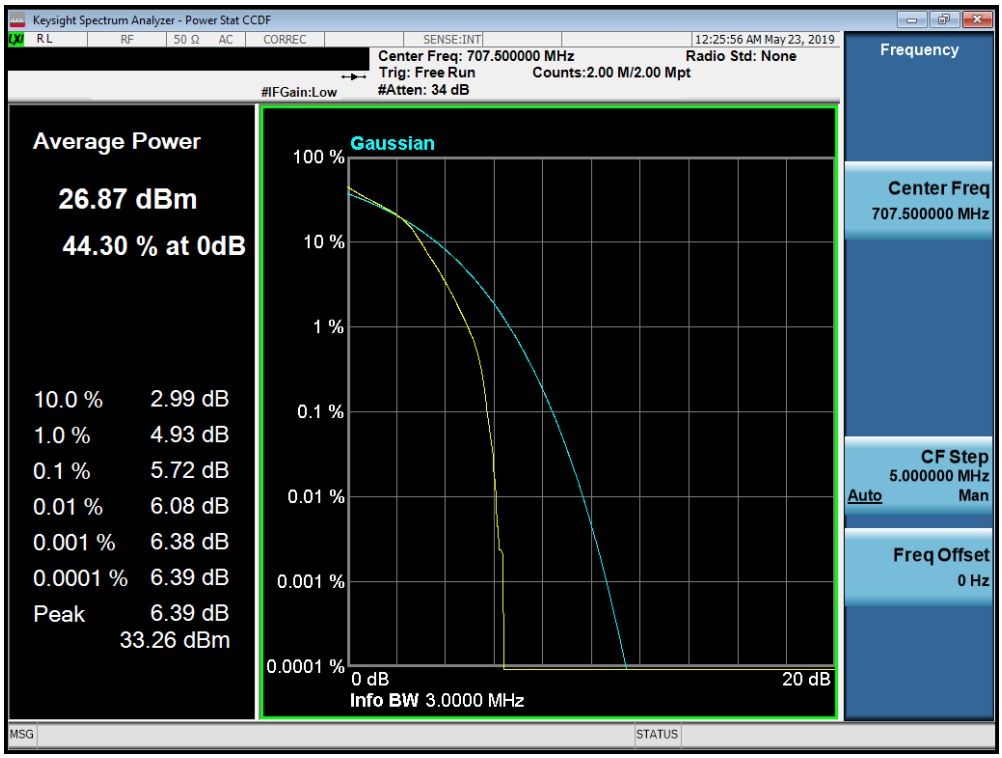


Plot 7-144. PAR Plot (Band 12 - 3.0MHz QPSK - Full RB Configuration)



Plot 7-145. PAR Plot (Band 12 - 3.0MHz 16-QAM - Full RB Configuration)

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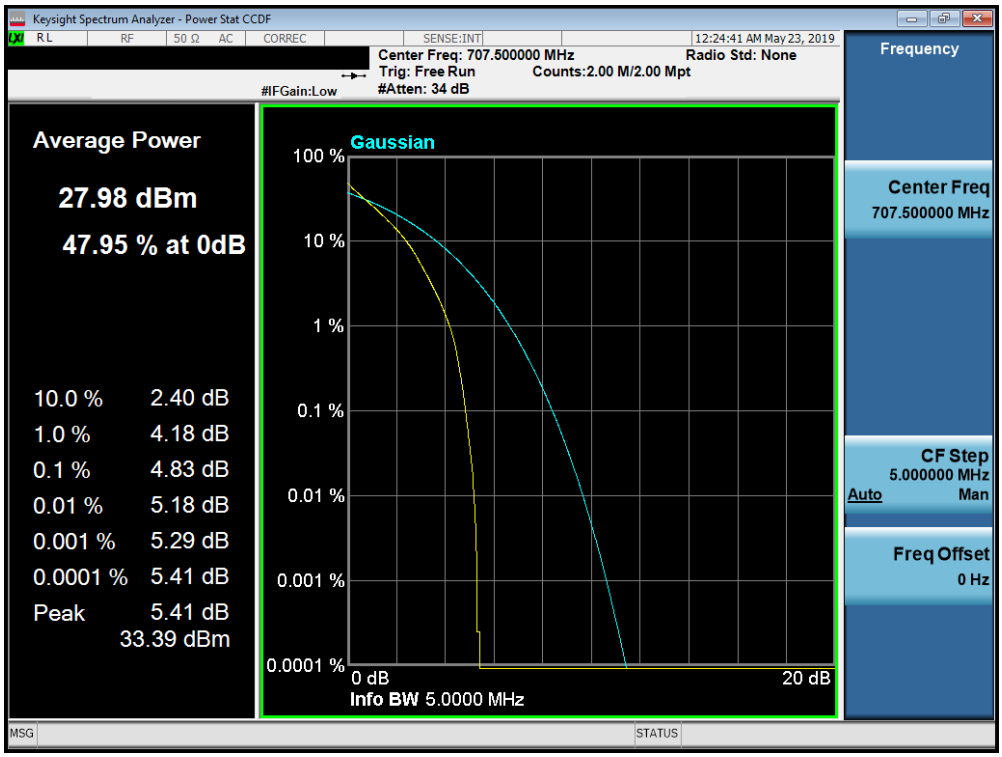
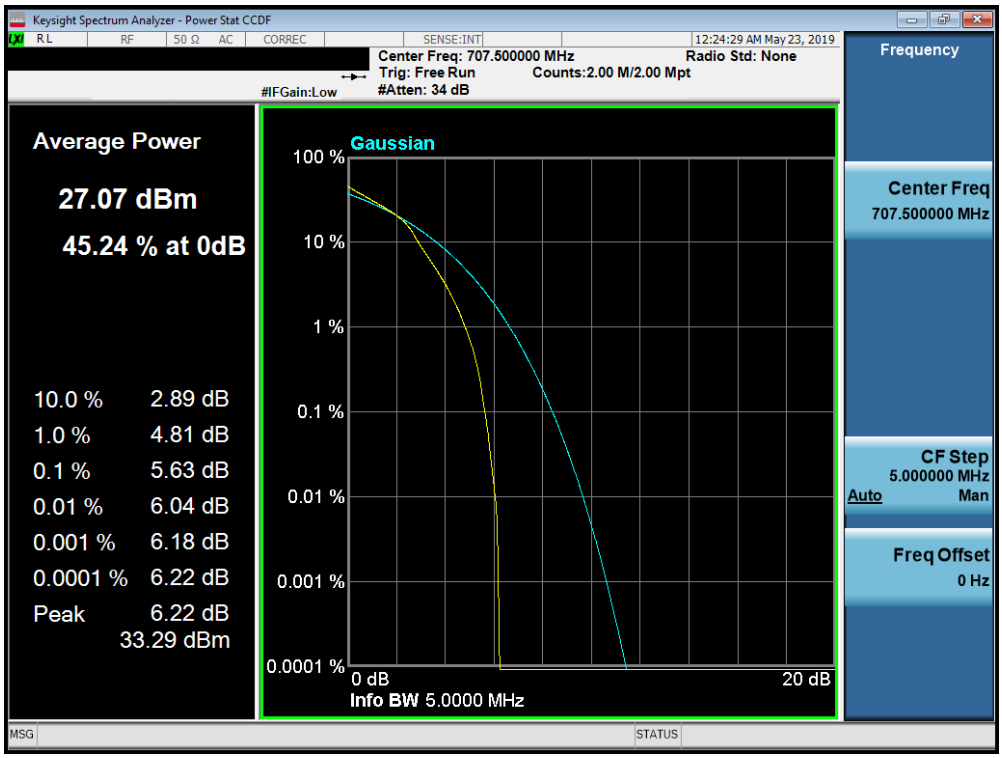


Plot 7-146. PAR Plot (Band 12 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-147. PAR Plot (Band 12 - 5.0MHz 16-QAM - Full RB Configuration)

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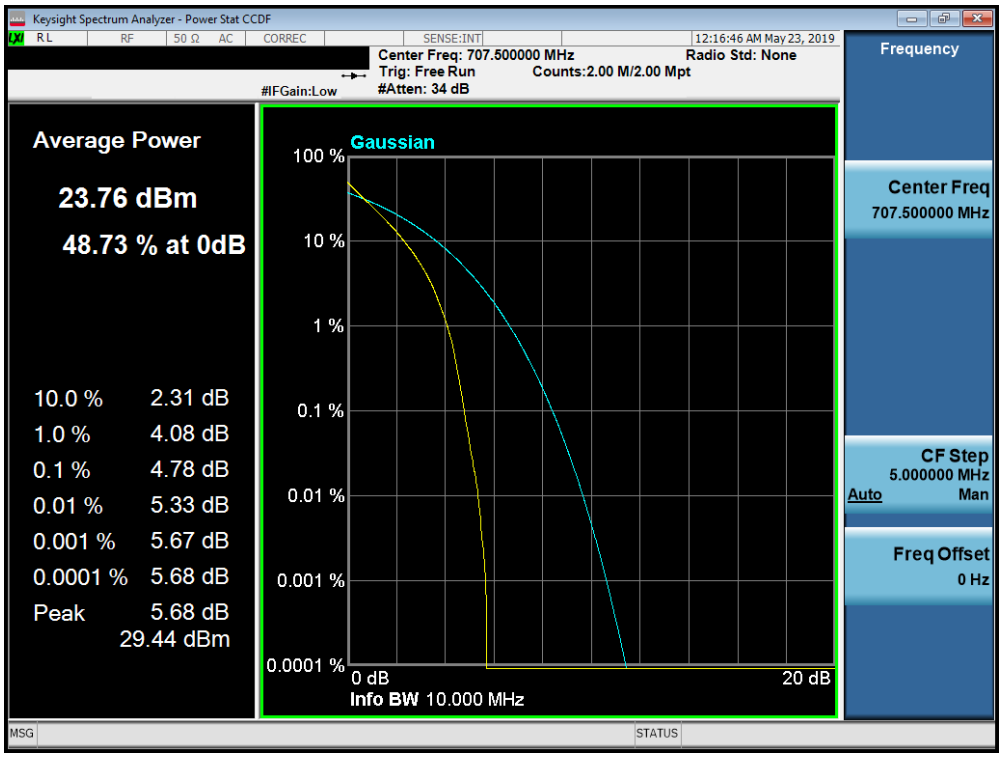
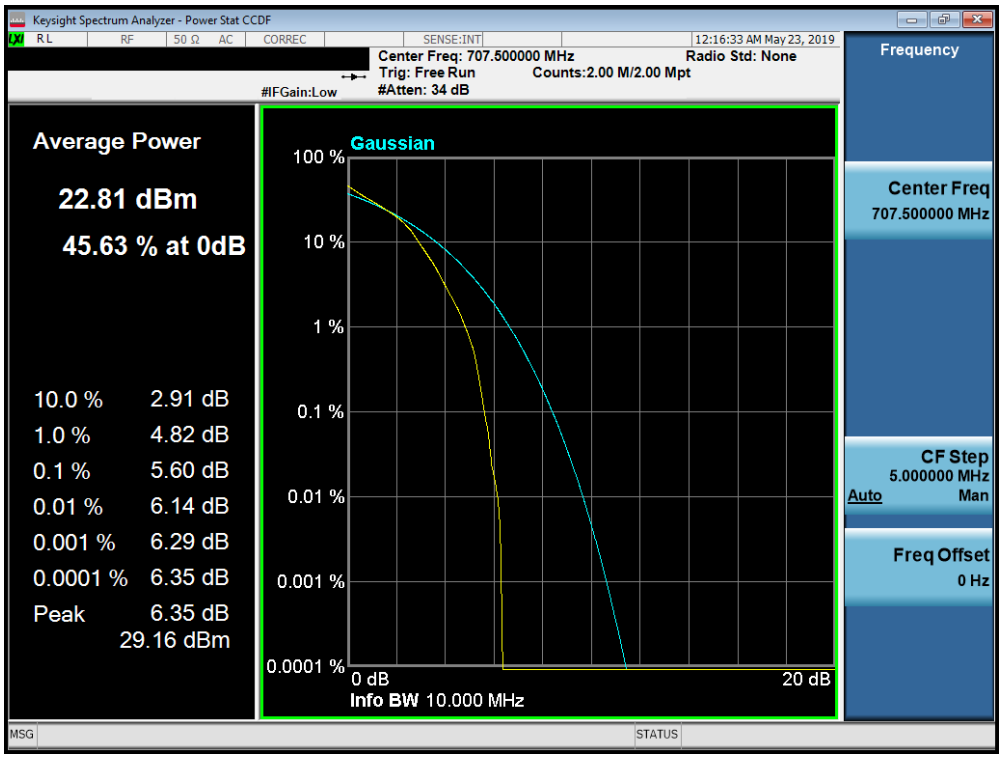


Plot 7-148. PAR Plot (Band 12 - 10.0MHz QPSK - Full RB Configuration)



Plot 7-149. PAR Plot (Band 12 - 10.0MHz 16-QAM - Full RB Configuration)

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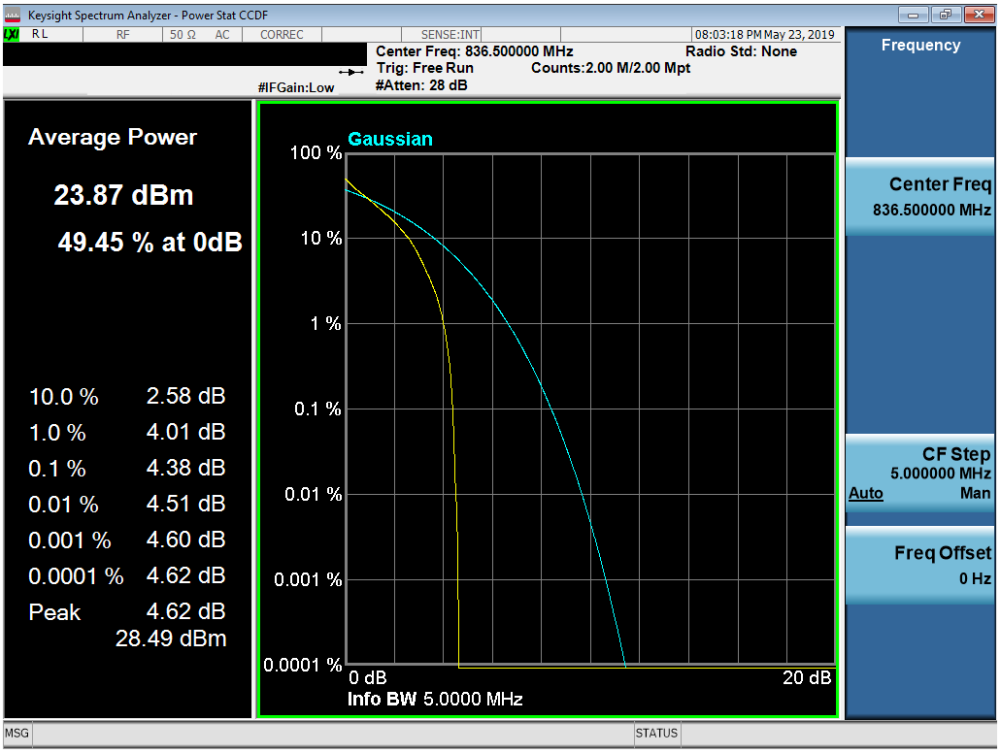
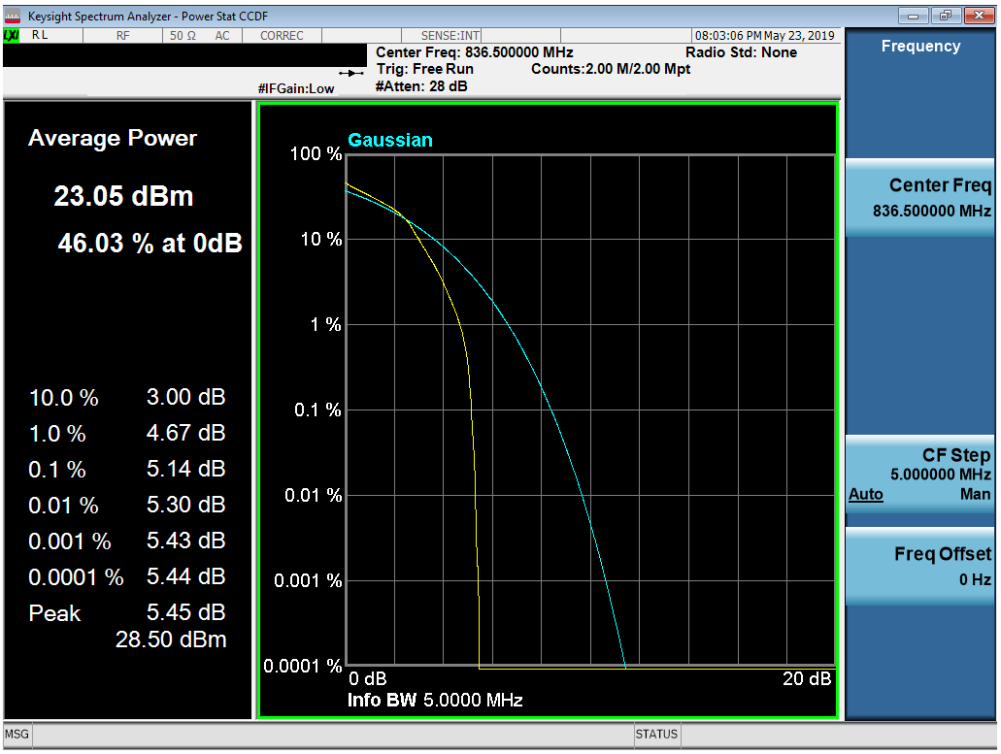
Band 5



Plot 7-150. PAR plot Bandwidth Plot (Band 5 - 1.4MHz QPSK - Full RB Configuration)



Plot 7-151. PAR plot Bandwidth Plot (Band 5 - 1.4MHz 16QAM - Full RB Configuration)

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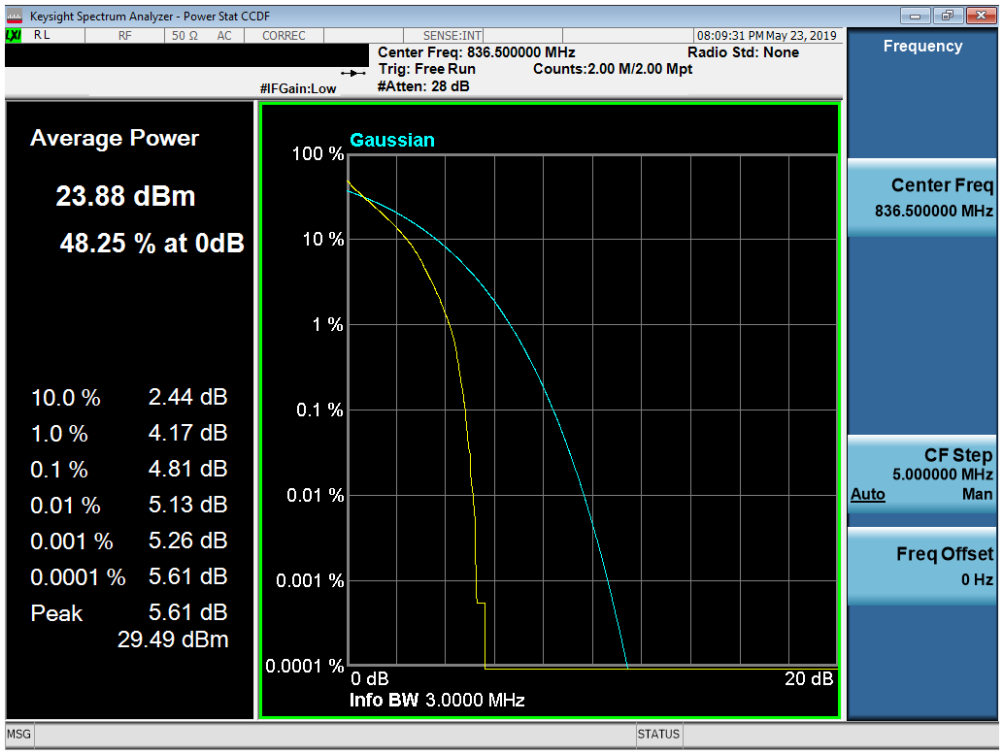
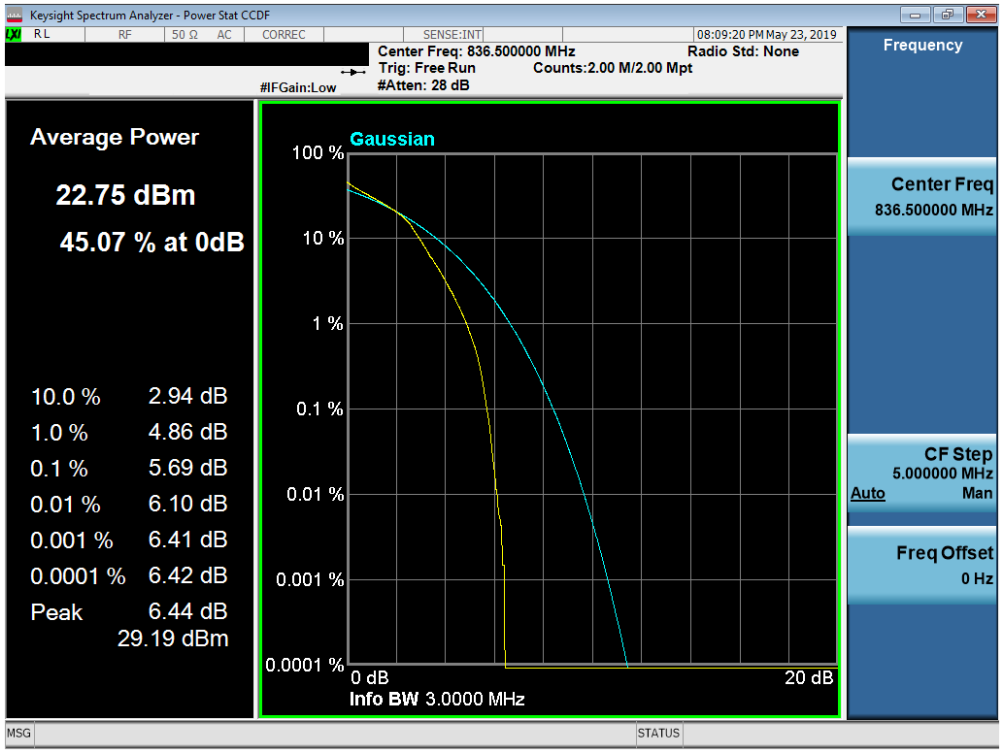


Plot 7-152. PAR plot Bandwidth Plot (Band 5 – 3.0MHz QPSK - Full RB Configuration)



Plot 7-153. PAR plot Bandwidth Plot (Band 5 – 3.0MHz 16QAM - Full RB Configuration)

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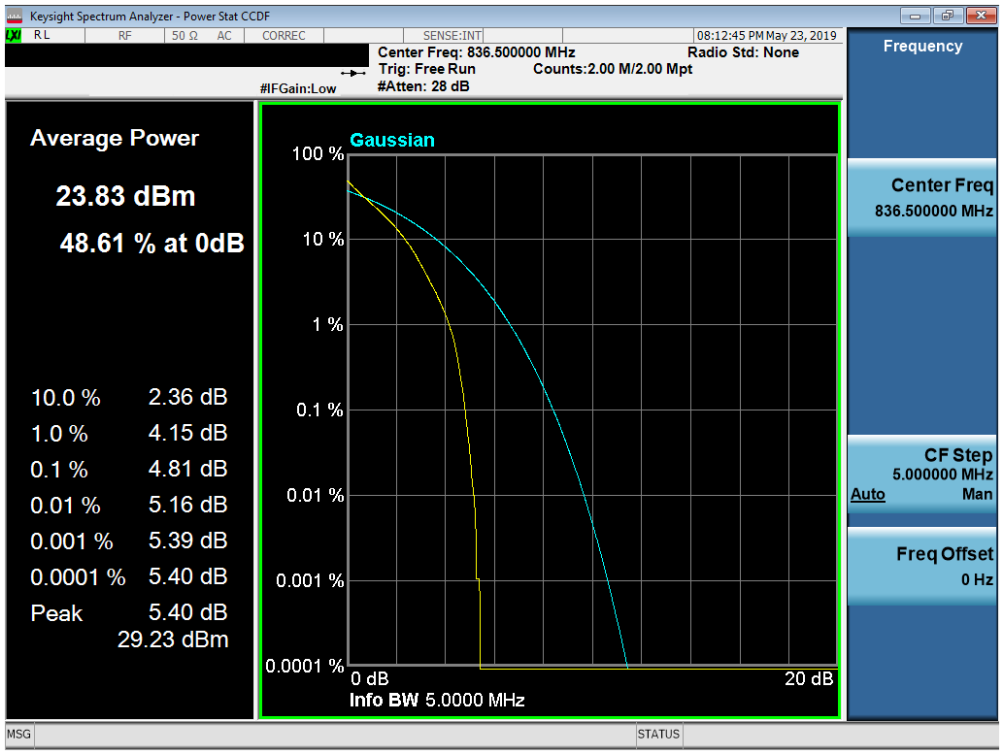
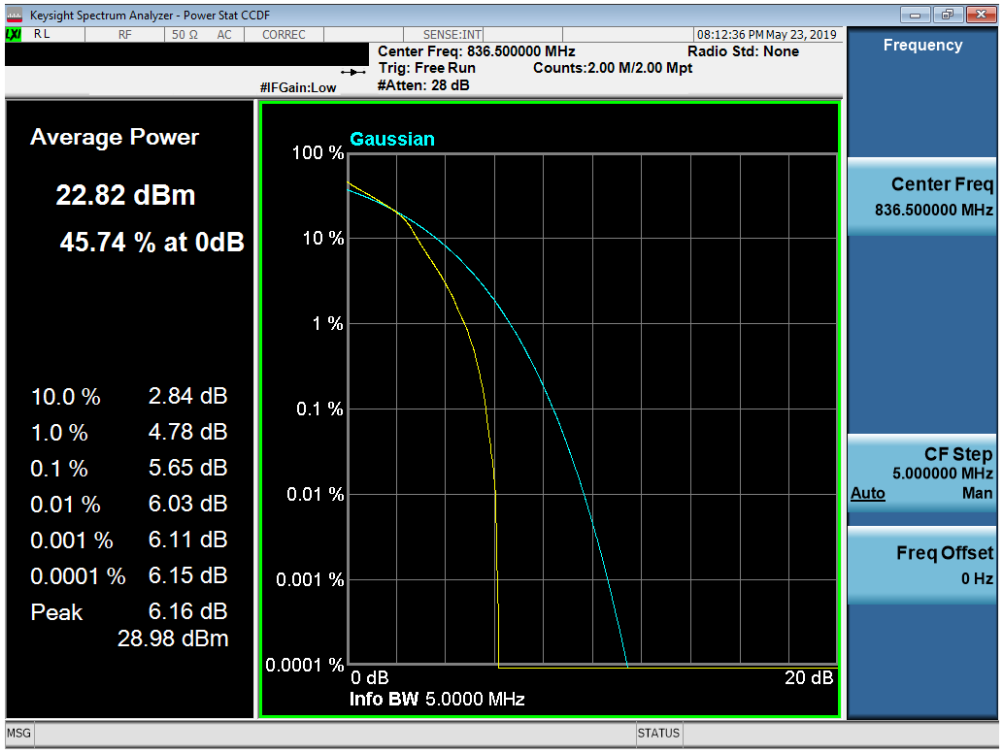


Plot 7-154. PAR plot Bandwidth Plot (Band 5 – 5.0MHz QPSK - Full RB Configuration)



Plot 7-155. PAR plot Bandwidth Plot (Band 5 – 5.0MHz 16QAM - Full RB Configuration)

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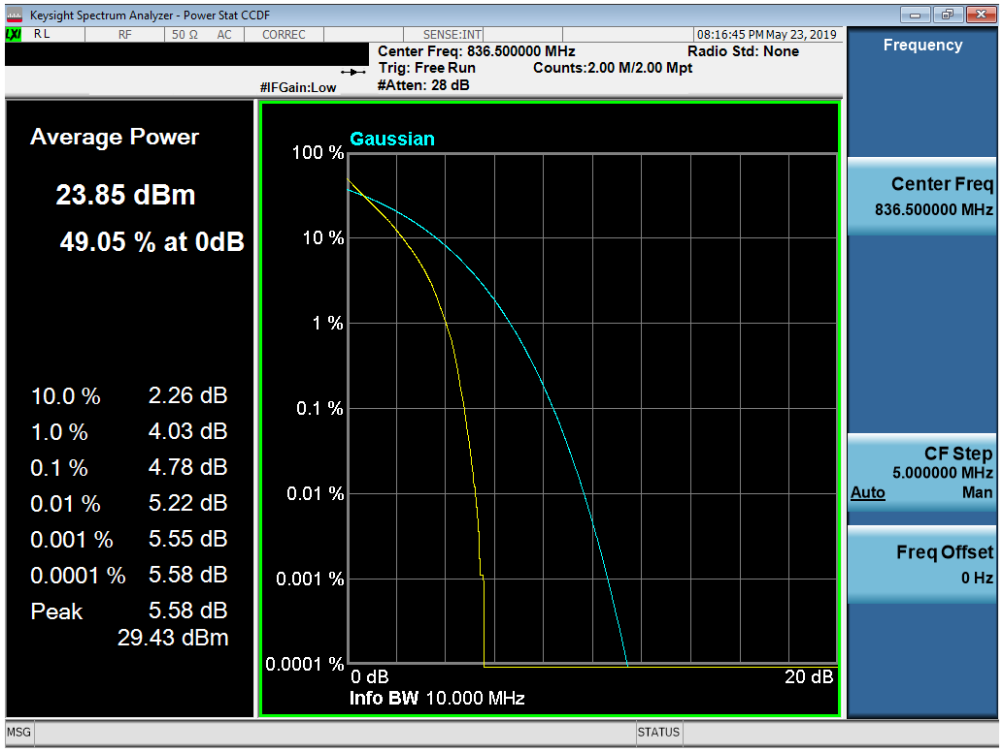
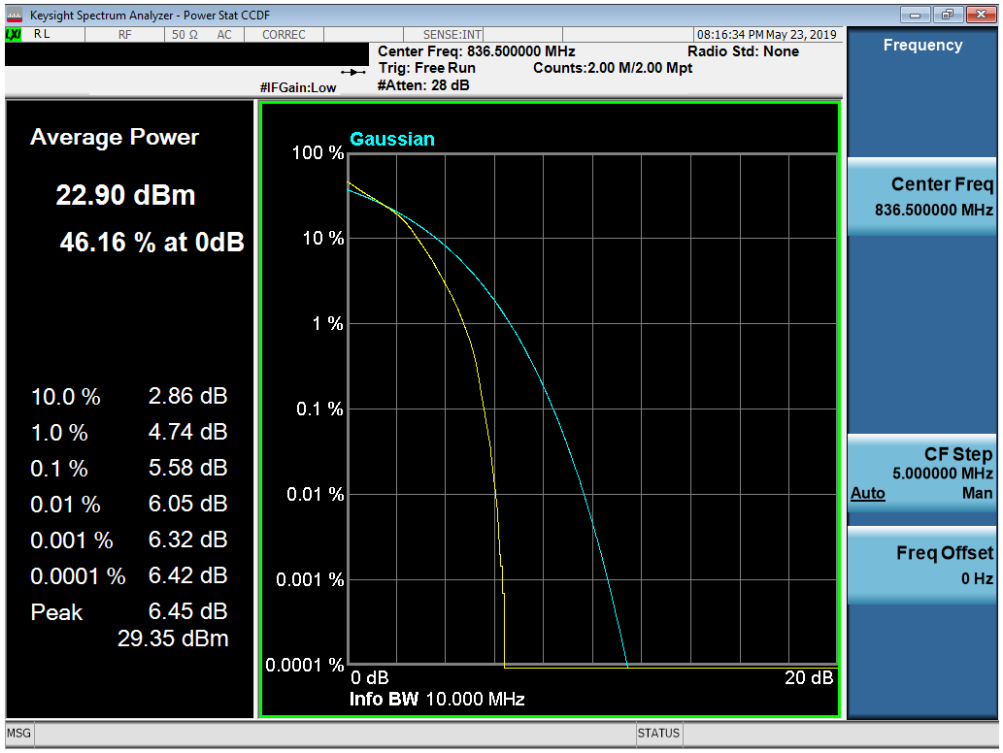


Plot 7-156. PAR plot Bandwidth Plot (Band 5 – 10.0MHz QPSK - Full RB Configuration)



Plot 7-157. PAR plot Bandwidth Plot (Band 5 – 10.0MHz 16QAM - Full RB Configuration)

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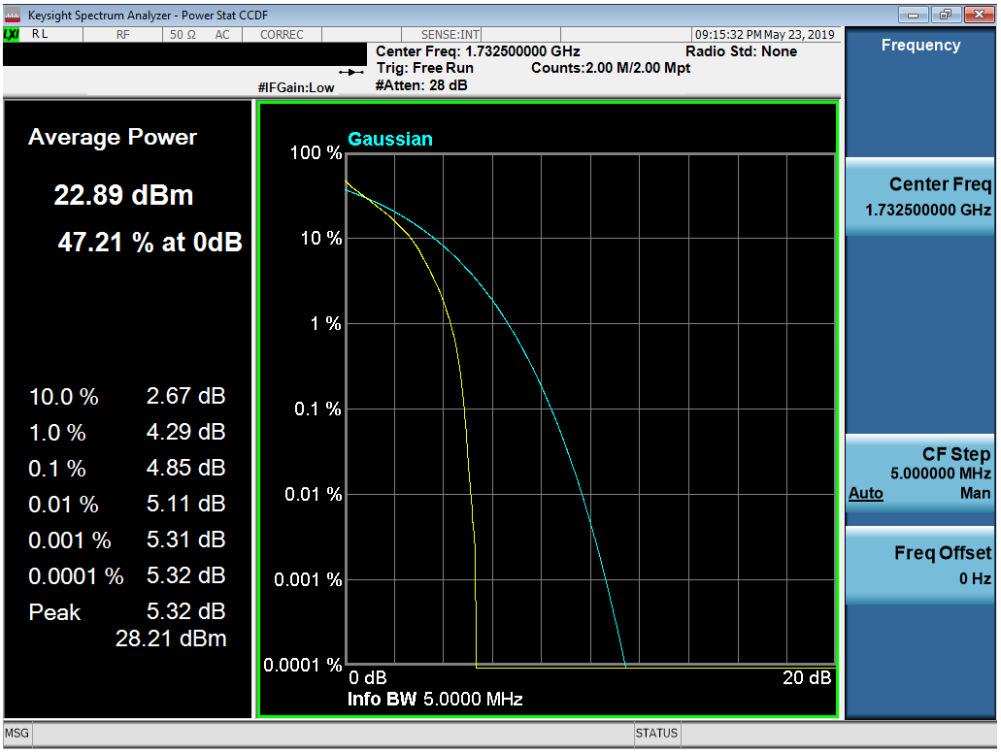
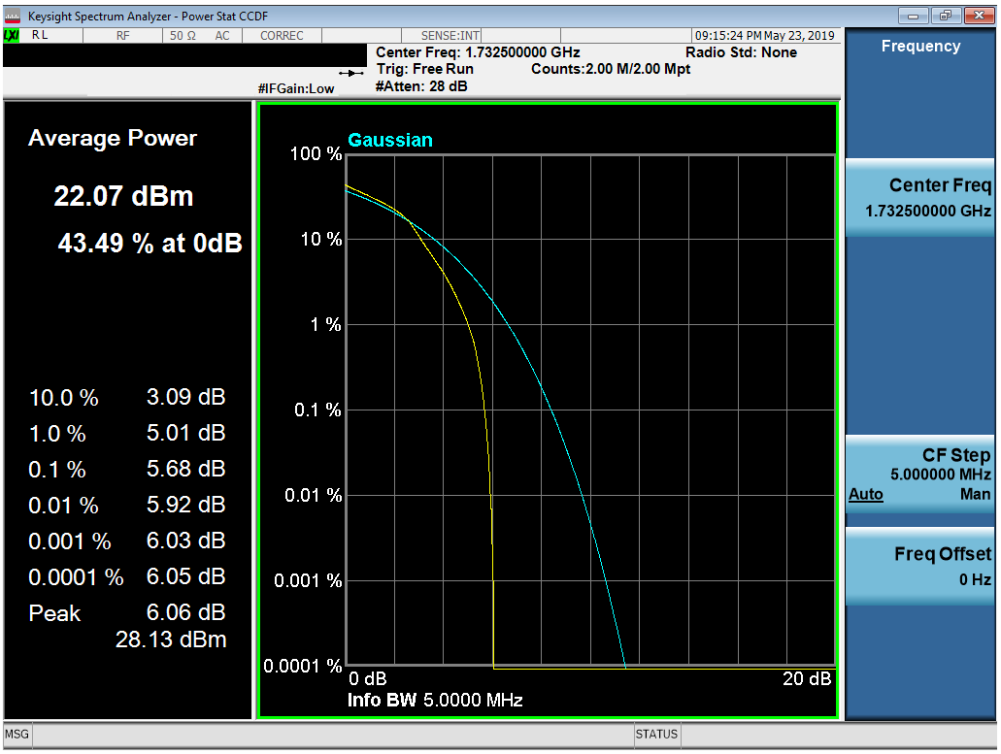
Band 4



Plot 7-158. PAR plot Bandwidth Plot (Band 4 - 1.4MHz QPSK - Full RB Configuration)



Plot 7-159. PAR plot Bandwidth Plot (Band 4 - 1.4MHz 16QAM - Full RB Configuration)

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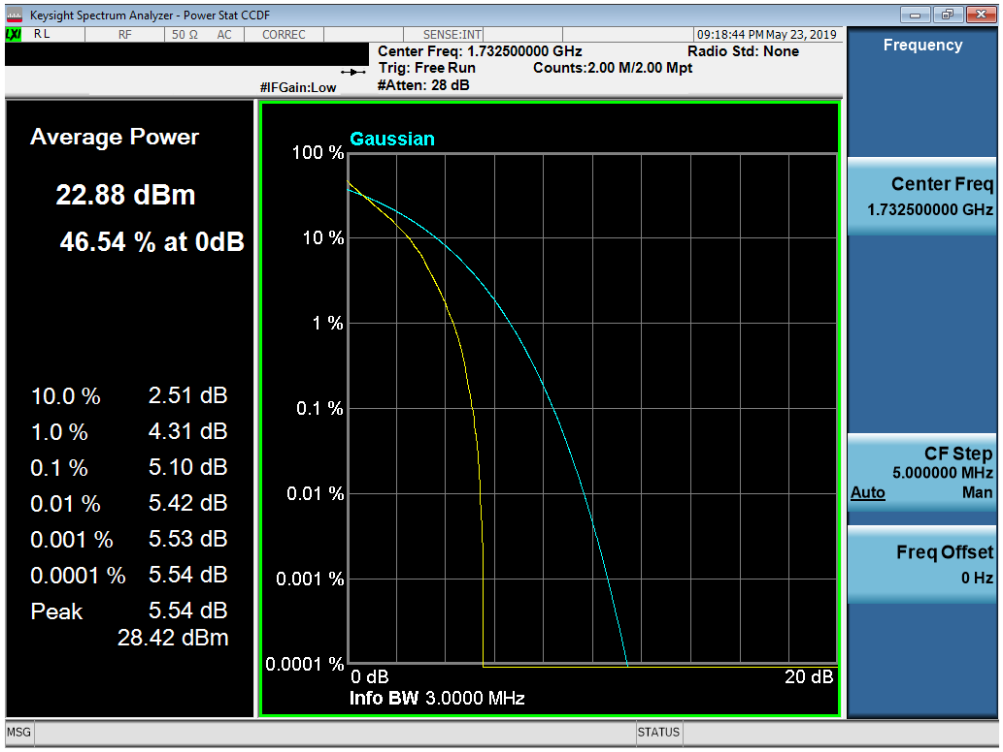
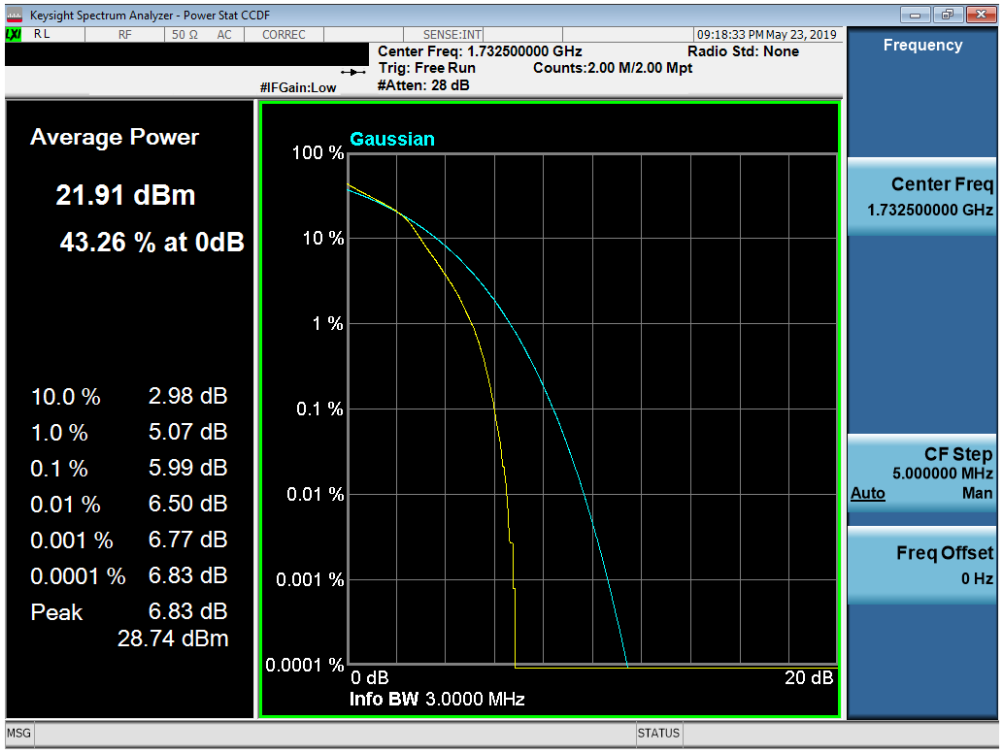


Plot 7-160. PAR plot Bandwidth Plot (Band 4 – 3.0MHz QPSK - Full RB Configuration)



Plot 7-161. PAR plot Bandwidth Plot (Band 4 – 3.0MHz 16QAM - Full RB Configuration)

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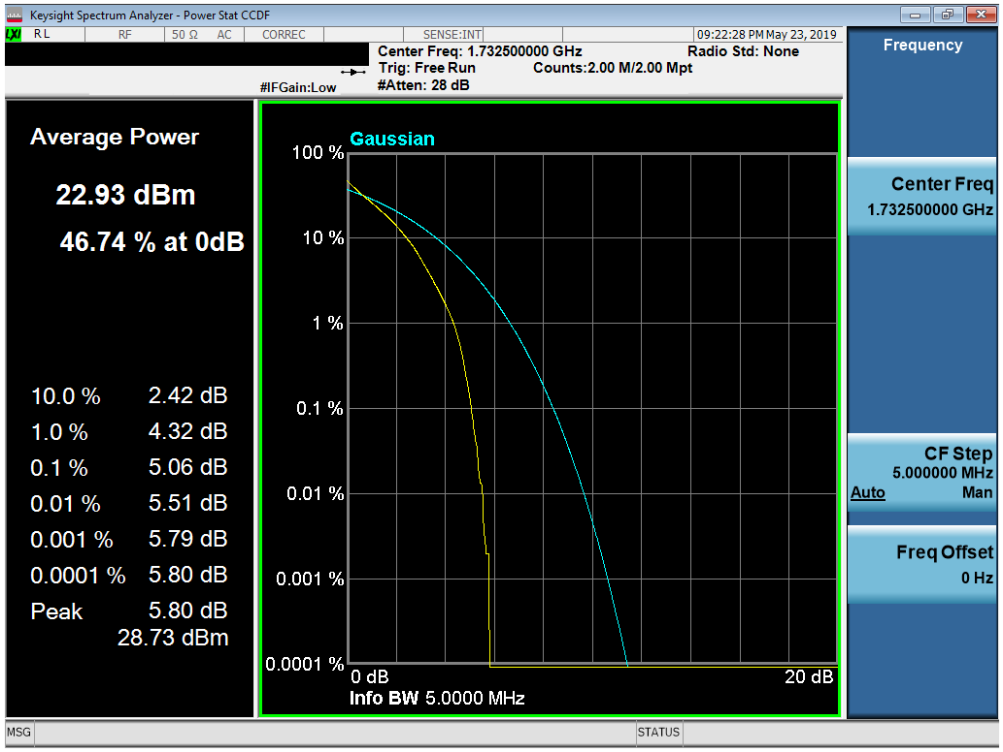
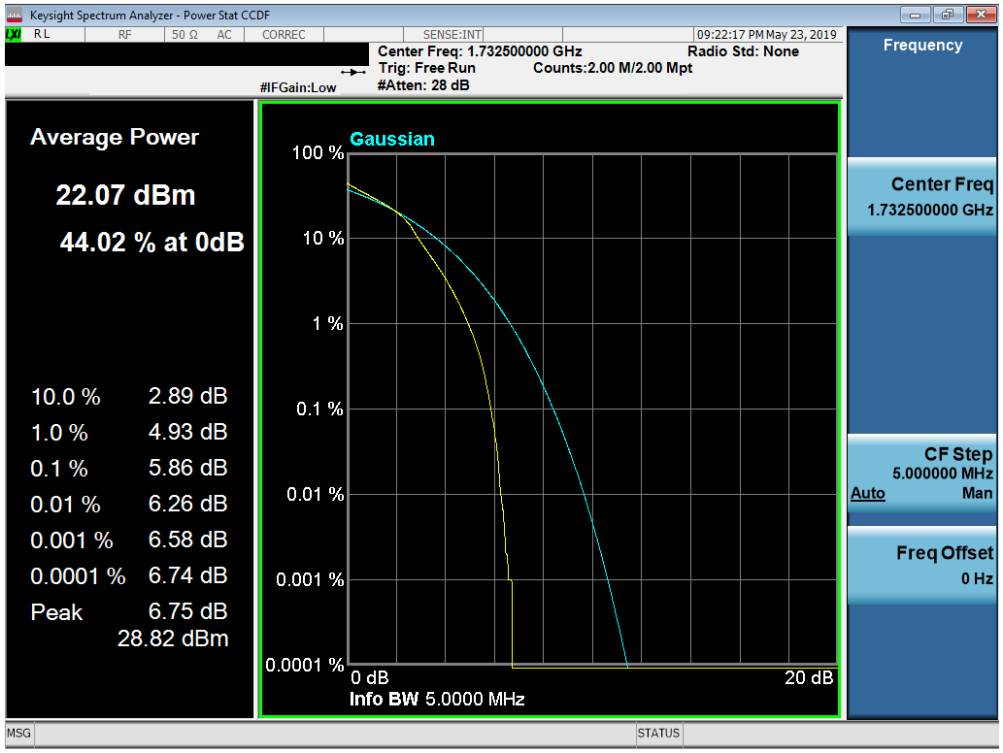


Plot 7-162. PAR plot Bandwidth Plot (Band 4 – 5.0MHz QPSK - Full RB Configuration)



Plot 7-163. PAR plot Bandwidth Plot (Band 4 – 5.0MHz 16QAM - Full RB Configuration)

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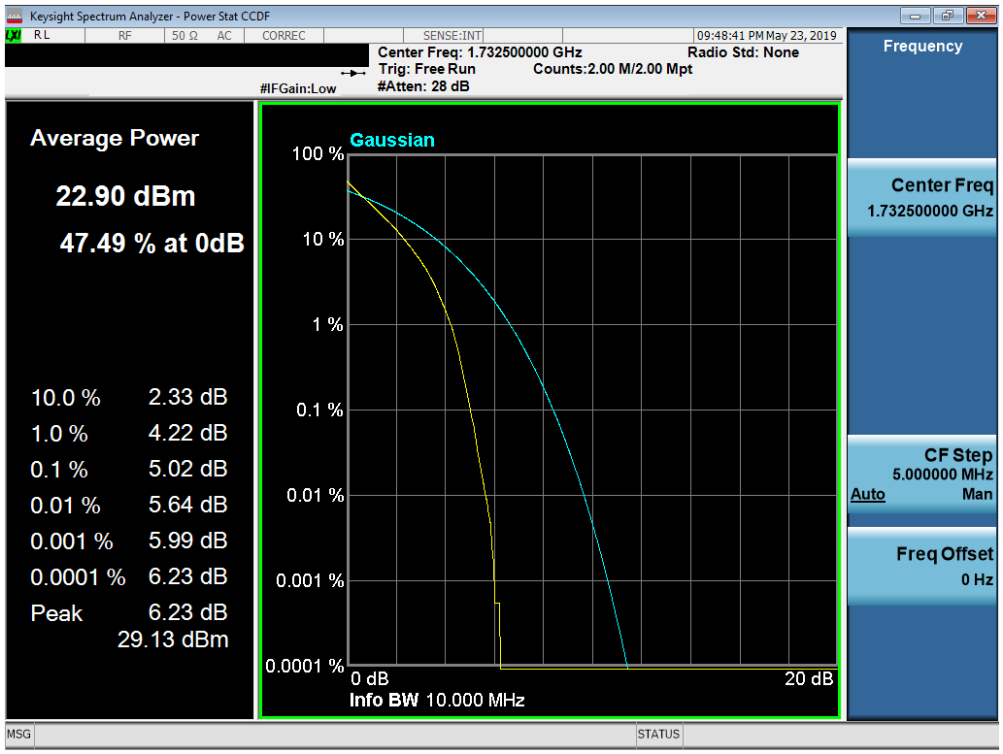
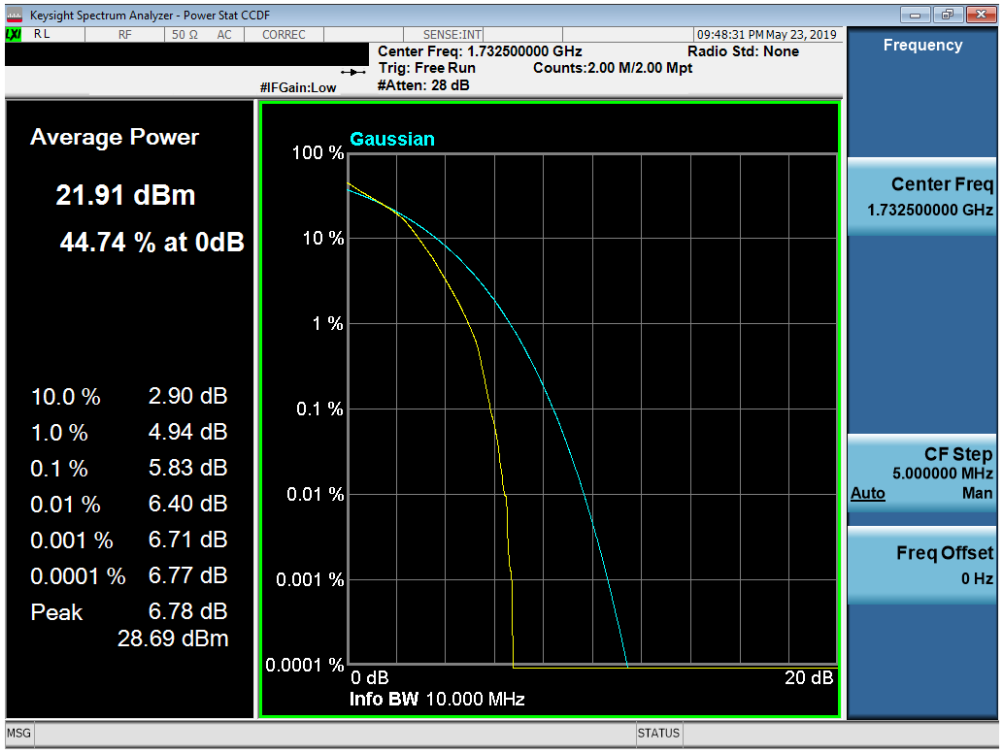


Plot 7-164. PAR plot Bandwidth Plot (Band 4 – 10.0MHz QPSK - Full RB Configuration)



Plot 7-165. PAR plot Bandwidth Plot (Band 4 – 10.0MHz 16QAM - Full RB Configuration)

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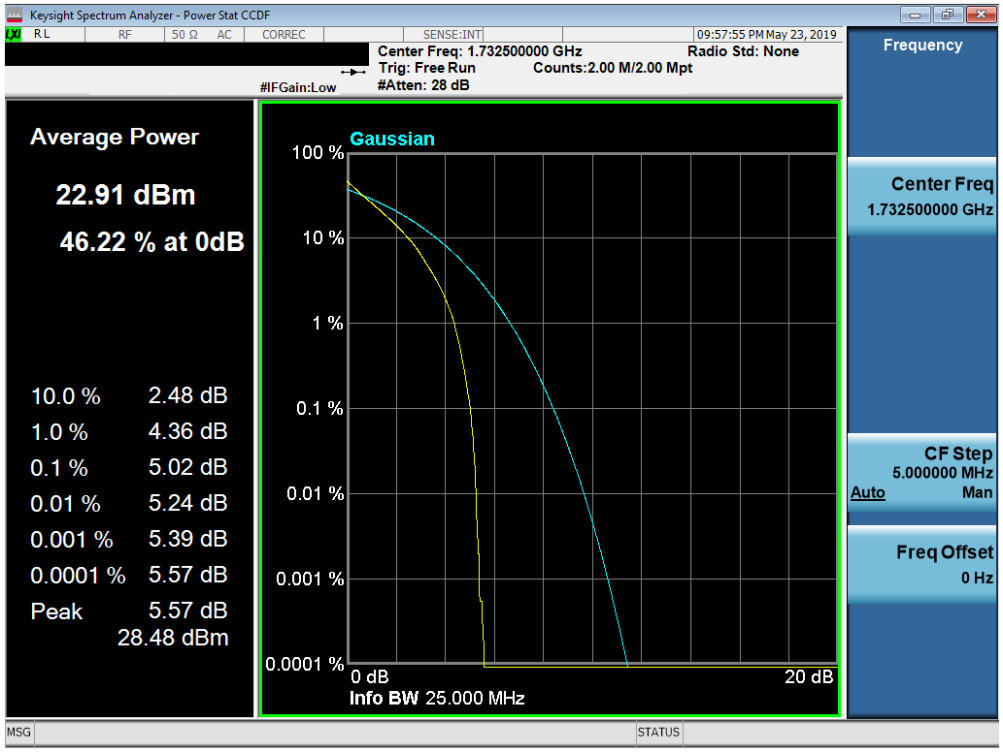
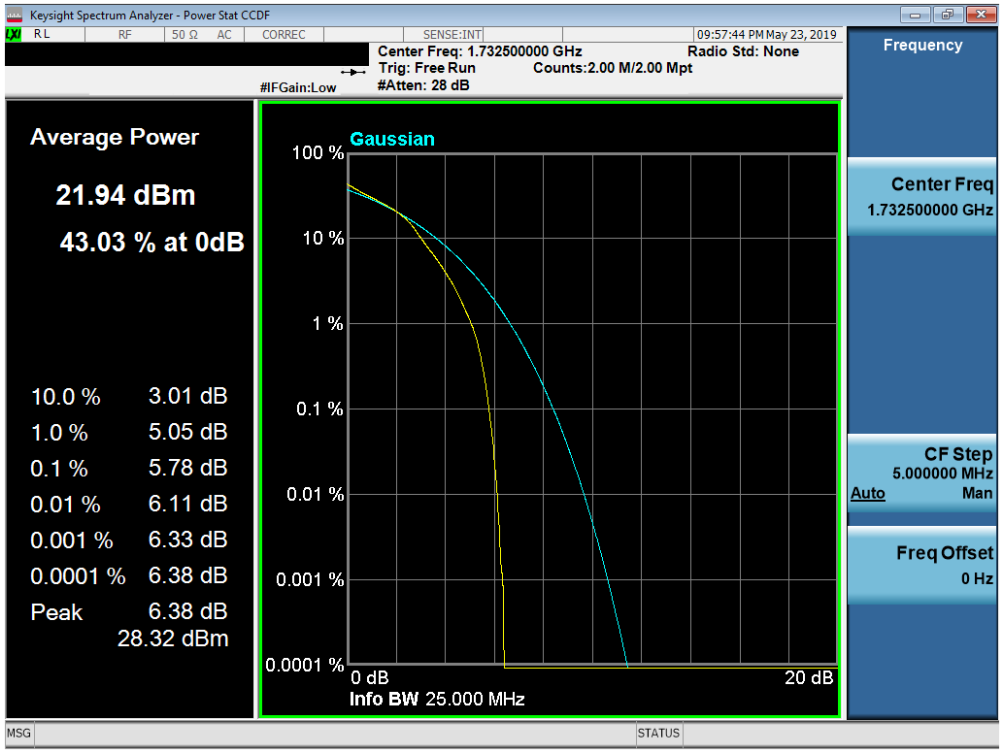


Plot 7-166. PAR plot Bandwidth Plot (Band 4 – 15.0MHz QPSK - Full RB Configuration)



Plot 7-167. PAR plot Bandwidth Plot (Band 4 – 15.0MHz 16QAM - Full RB Configuration)

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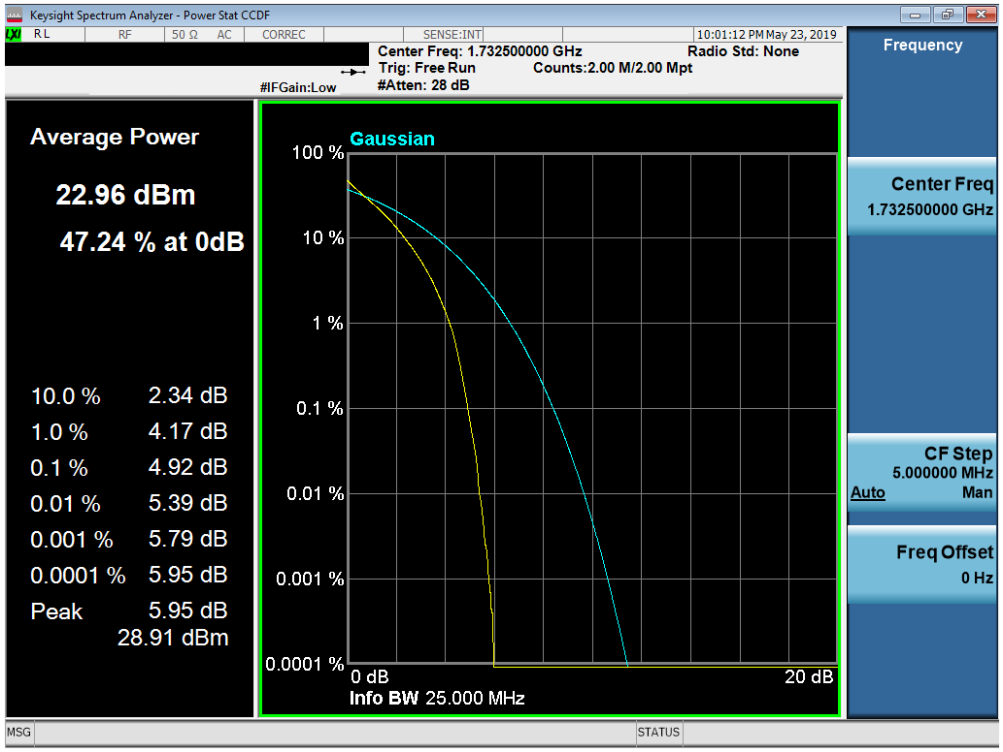
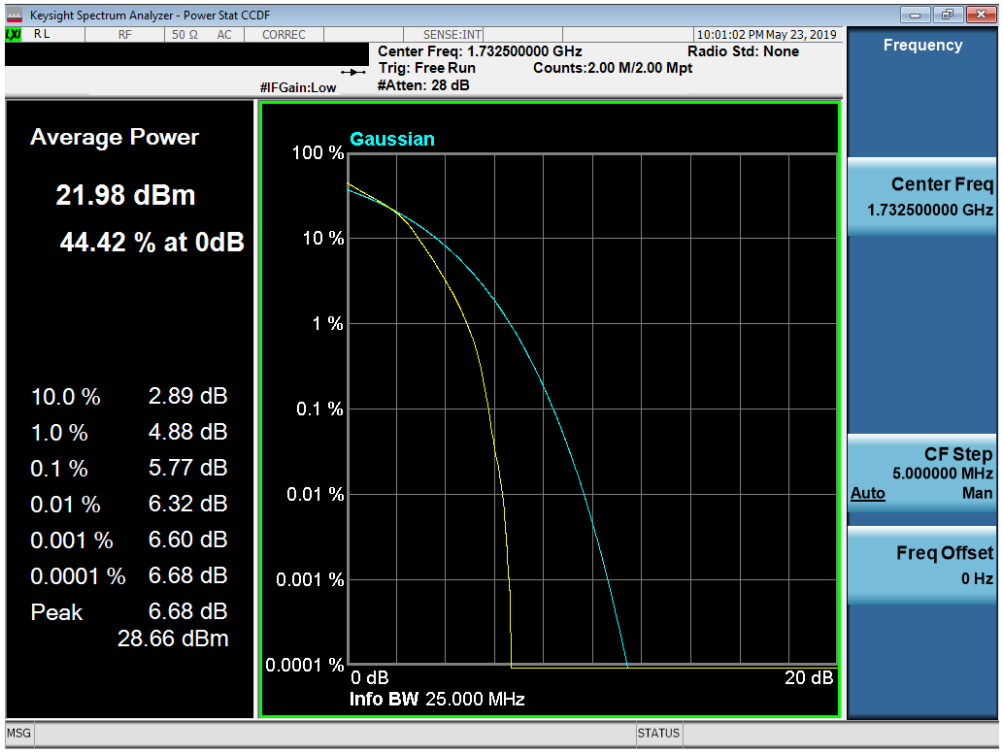


Plot 7-168. PAR plot Bandwidth Plot (Band 4 – 20.0MHz QPSK - Full RB Configuration)



Plot 7-169. PAR plot Bandwidth Plot (Band 4 – 20.0MHz 16QAM - Full RB Configuration)

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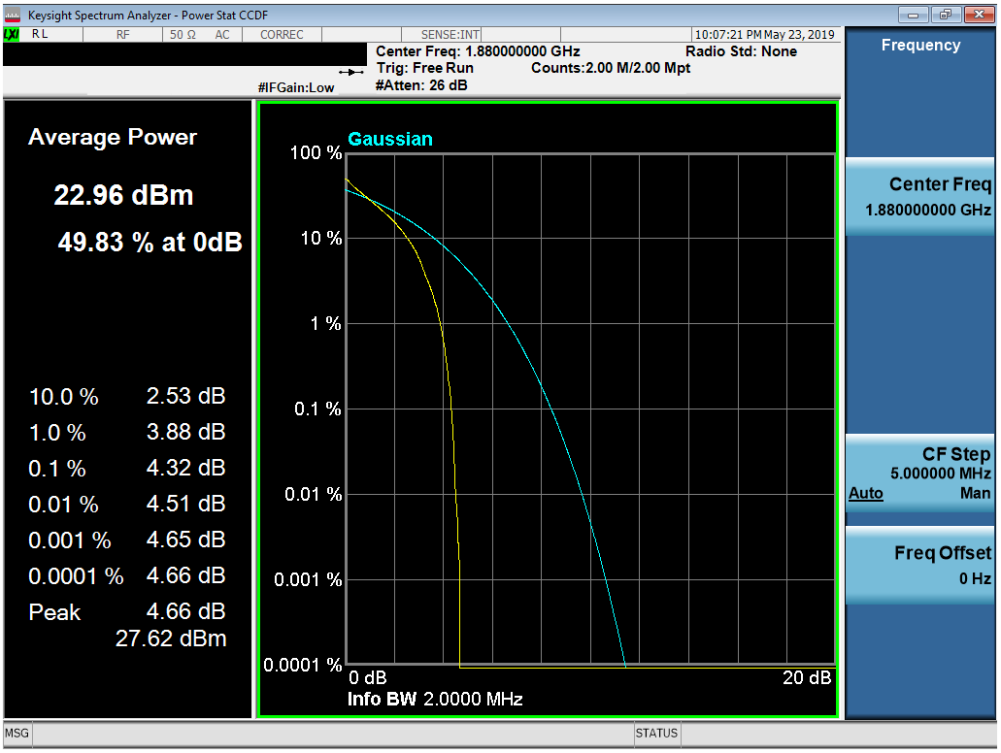
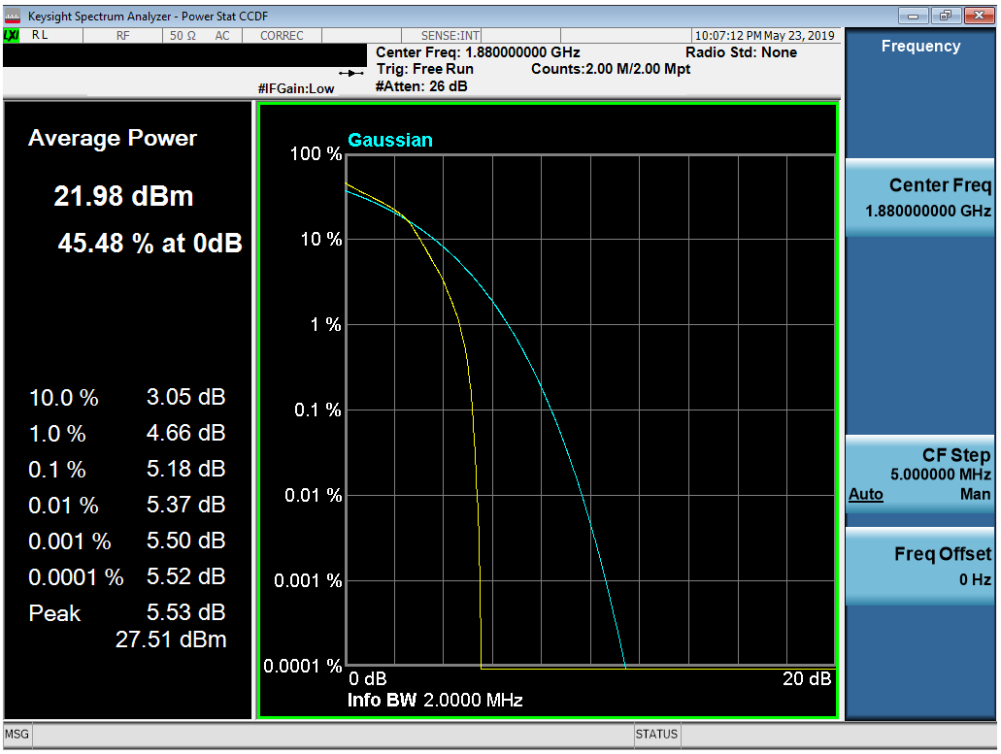
Band 2



Plot 7-170. PAR plot Bandwidth Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



Plot 7-171. PAR plot Bandwidth Plot (Band 2 - 1.4MHz 16QAM - Full RB Configuration)

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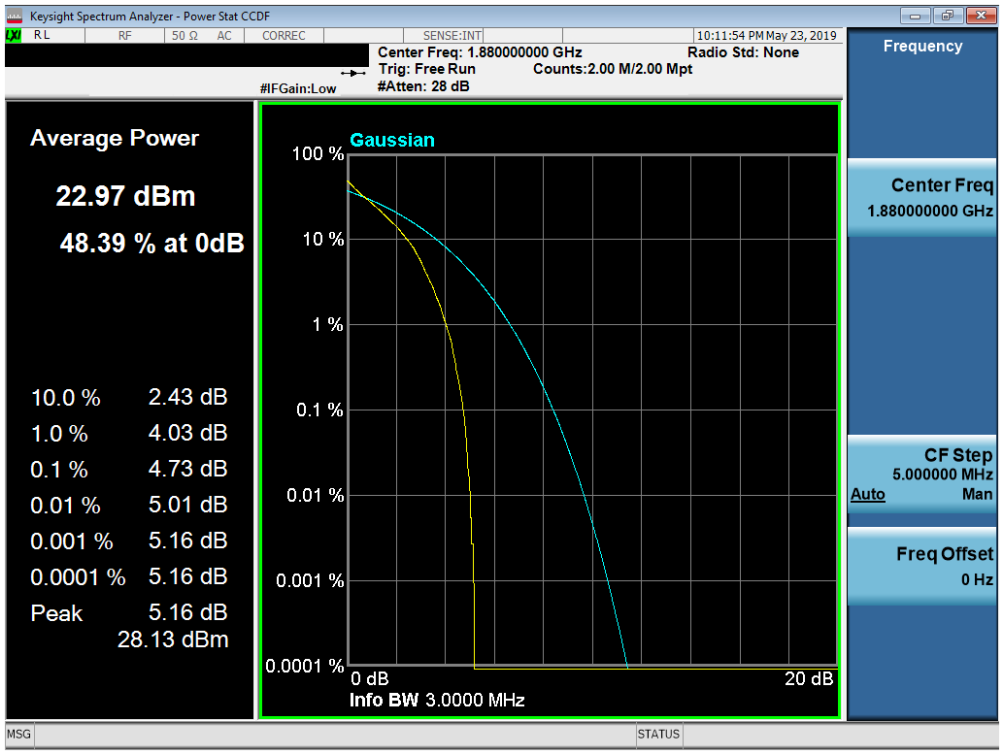
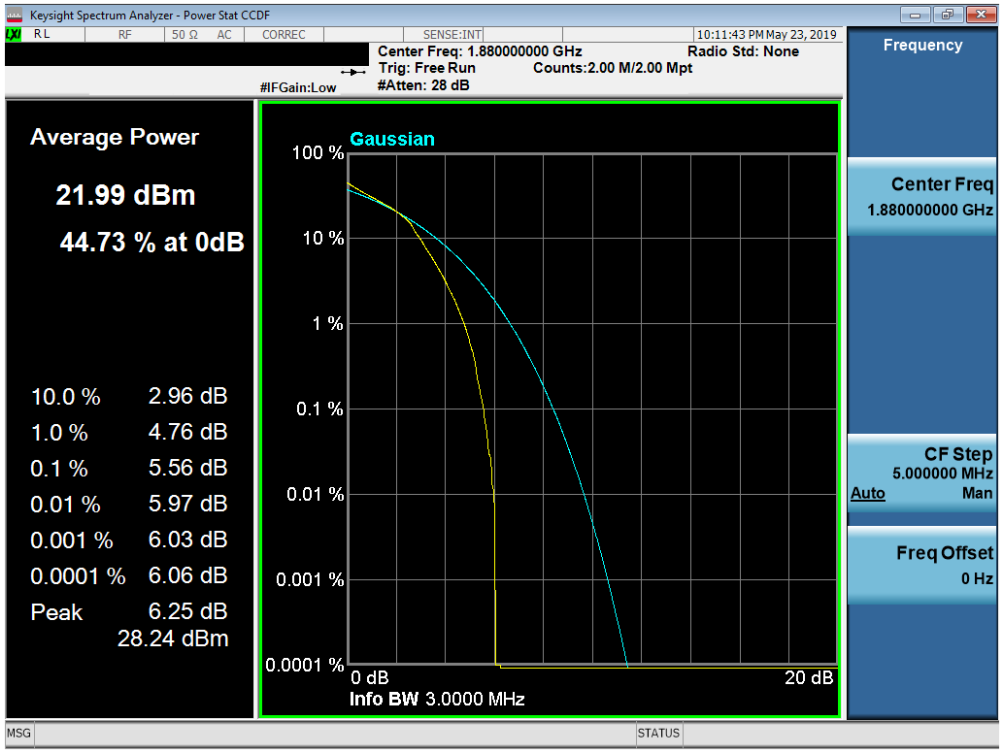


Plot 7-172. PAR plot Bandwidth Plot (Band 2 – 3.0MHz QPSK - Full RB Configuration)



Plot 7-173. PAR plot Bandwidth Plot (Band 2 – 3.0MHz 16QAM - Full RB Configuration)

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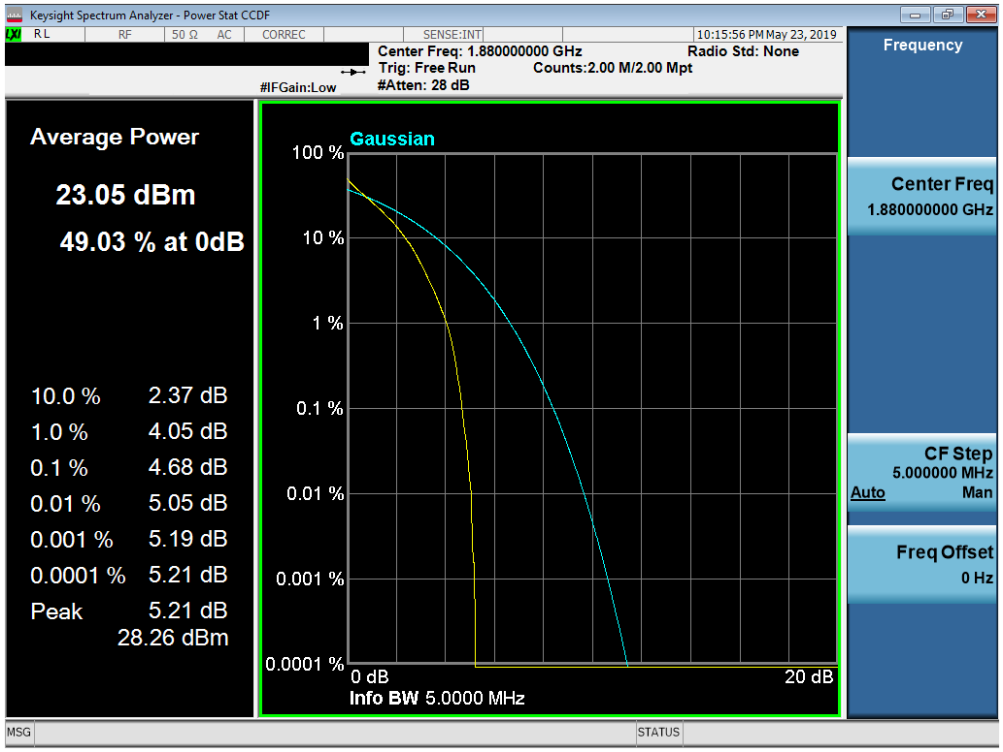
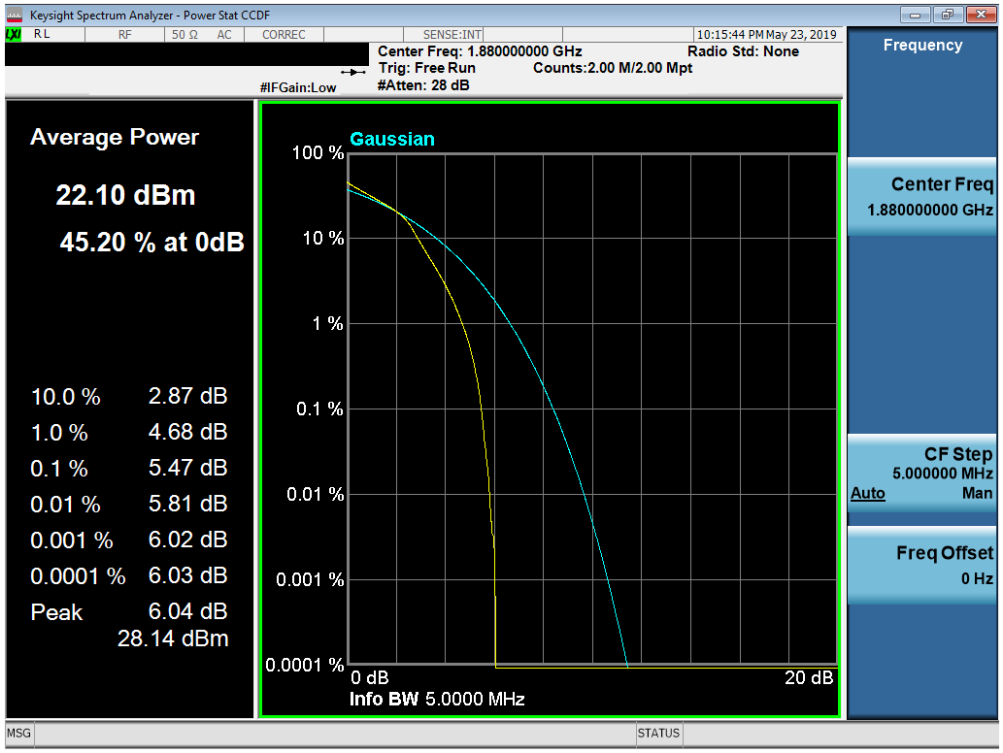


Plot 7-174. PAR plot Bandwidth Plot (Band 2 – 5.0MHz QPSK - Full RB Configuration)



Plot 7-175. PAR plot Bandwidth Plot (Band 2 – 5.0MHz 16QAM - Full RB Configuration)

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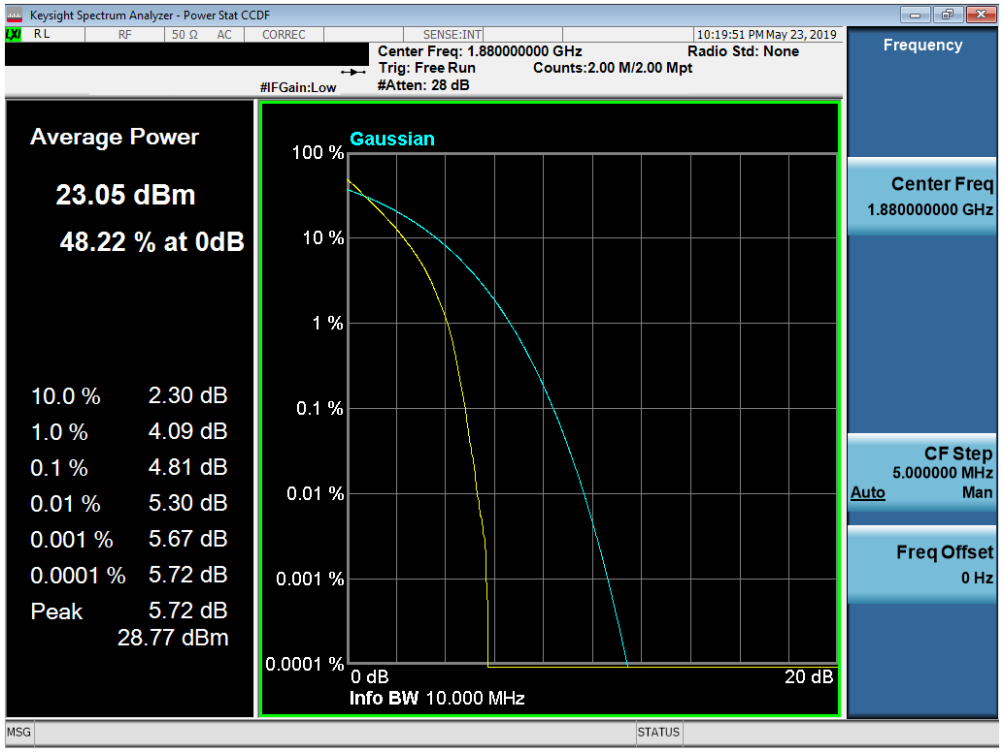
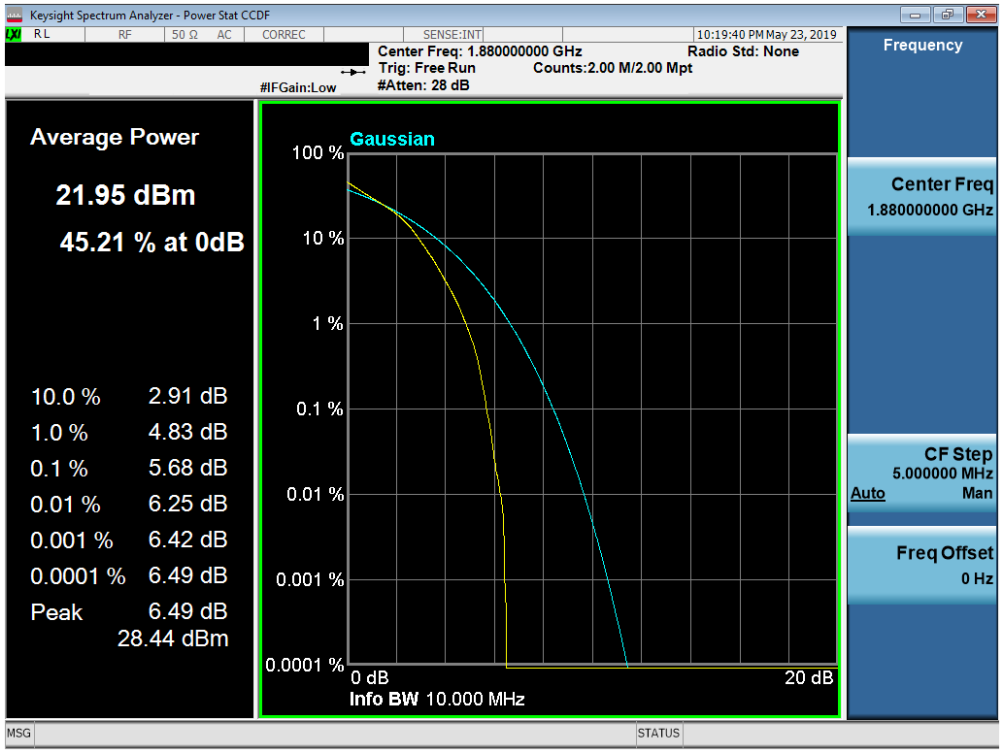


Plot 7-176. PAR plot Bandwidth Plot (Band 2 – 10.0MHz QPSK - Full RB Configuration)



Plot 7-177. PAR plot Bandwidth Plot (Band 2 – 10.0MHz 16QAM - Full RB Configuration)

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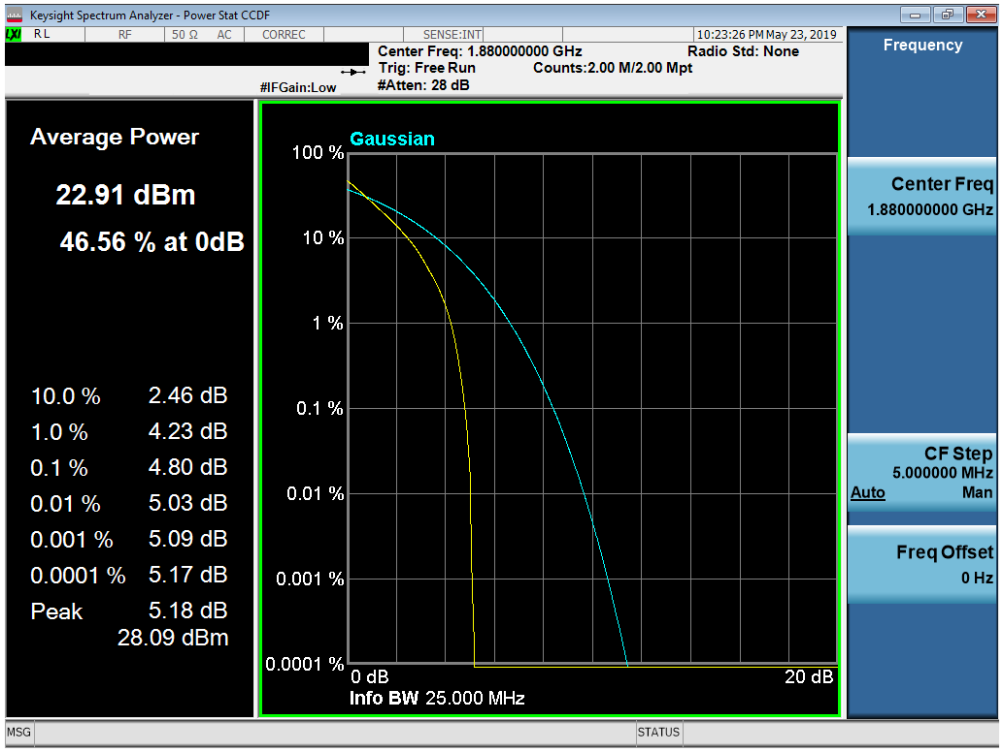
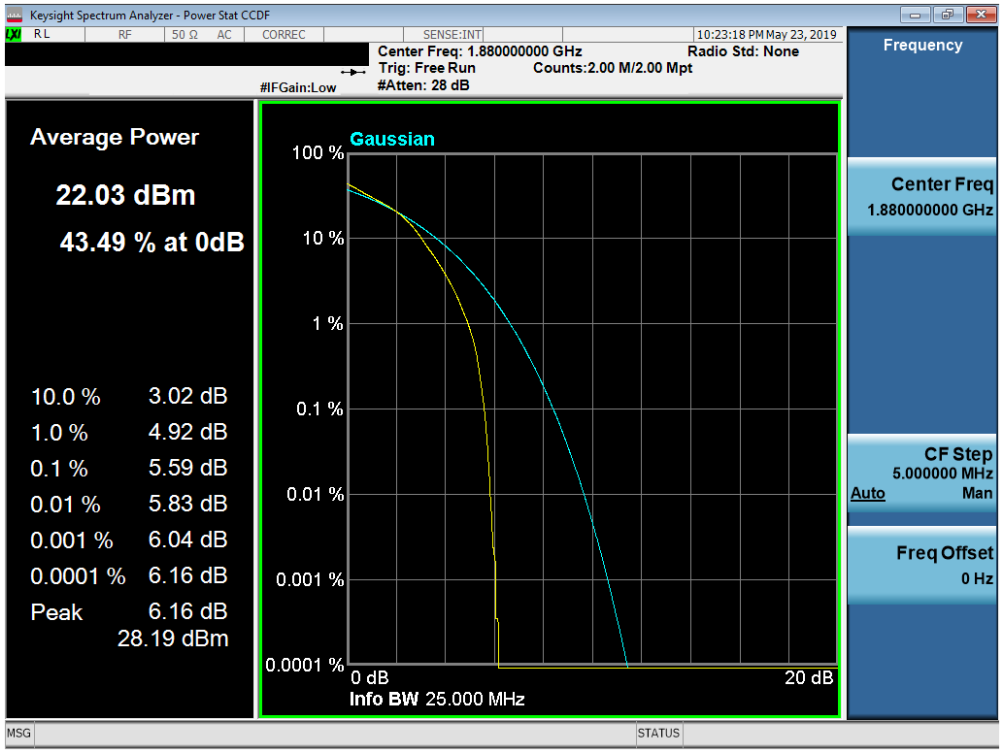


Plot 7-178. PAR plot Bandwidth Plot (Band 2 – 15.0MHz QPSK - Full RB Configuration)



Plot 7-179. PAR plot Bandwidth Plot (Band 2 – 15.0MHz 16QAM - Full RB Configuration)

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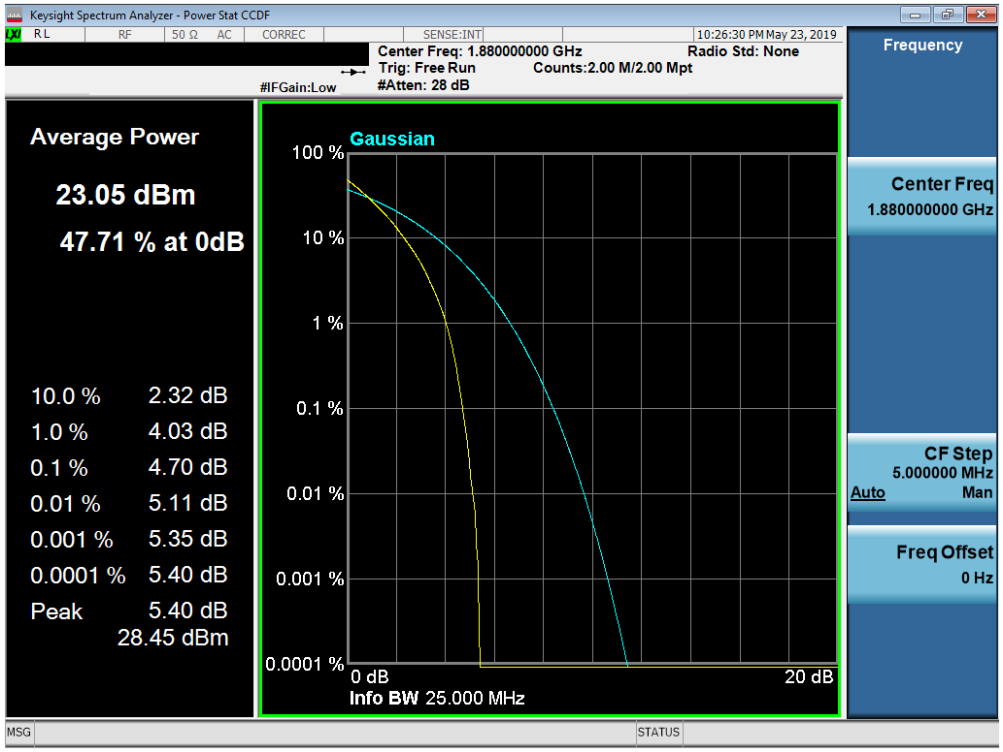
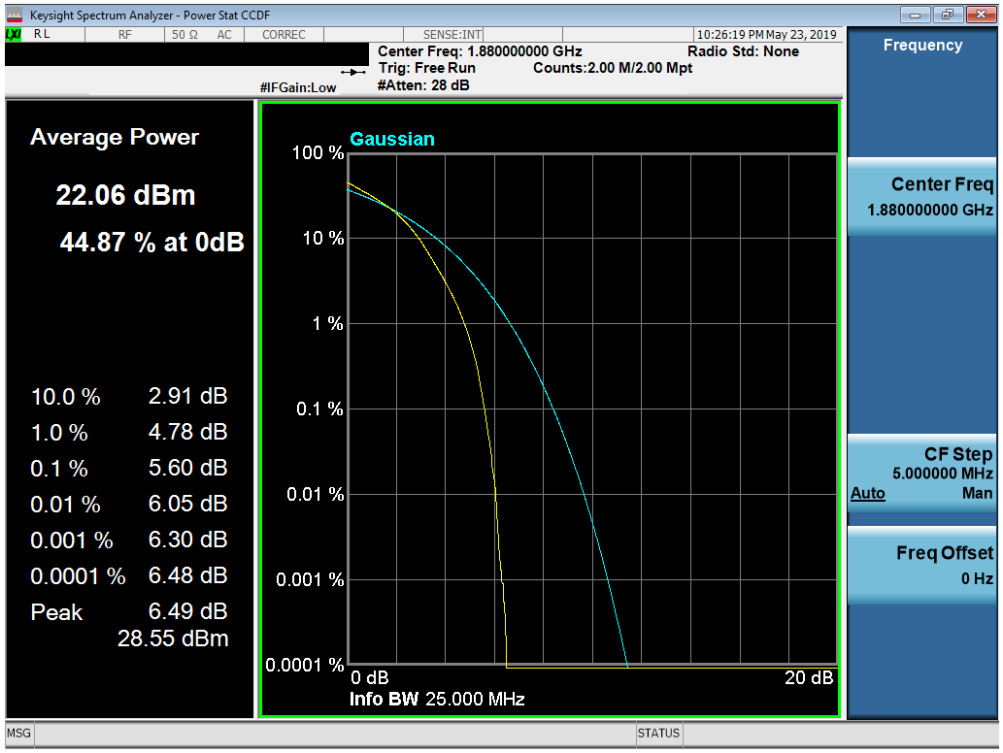


Plot 7-180. PAR plot Bandwidth Plot (Band 2 – 20.0MHz QPSK - Full RB Configuration)



Plot 7-181. PAR plot Bandwidth Plot (Band 2 – 20.0MHz 16QAM - 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 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

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Test Setup

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

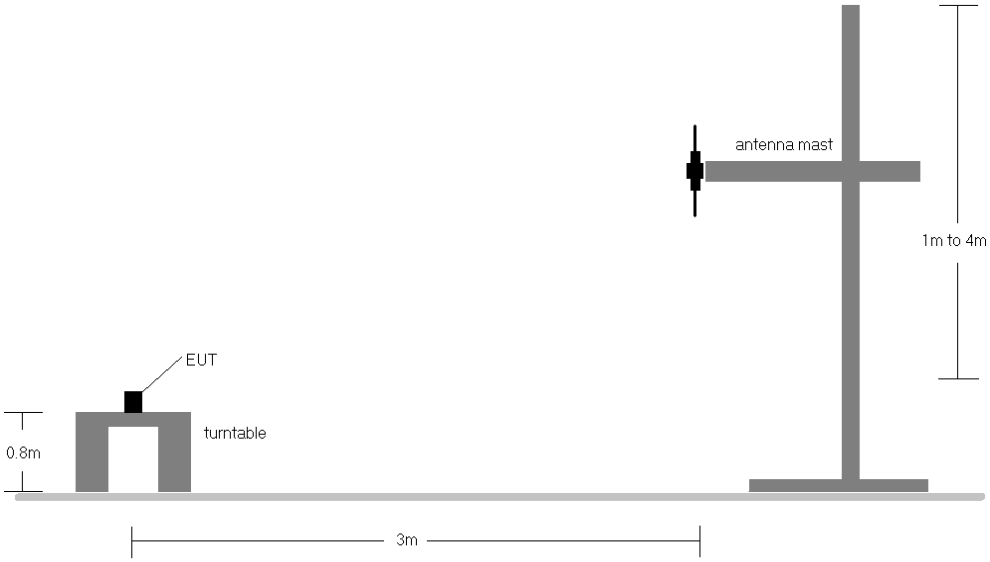

Figure 7-5. Radiated Test Setup <1GHz

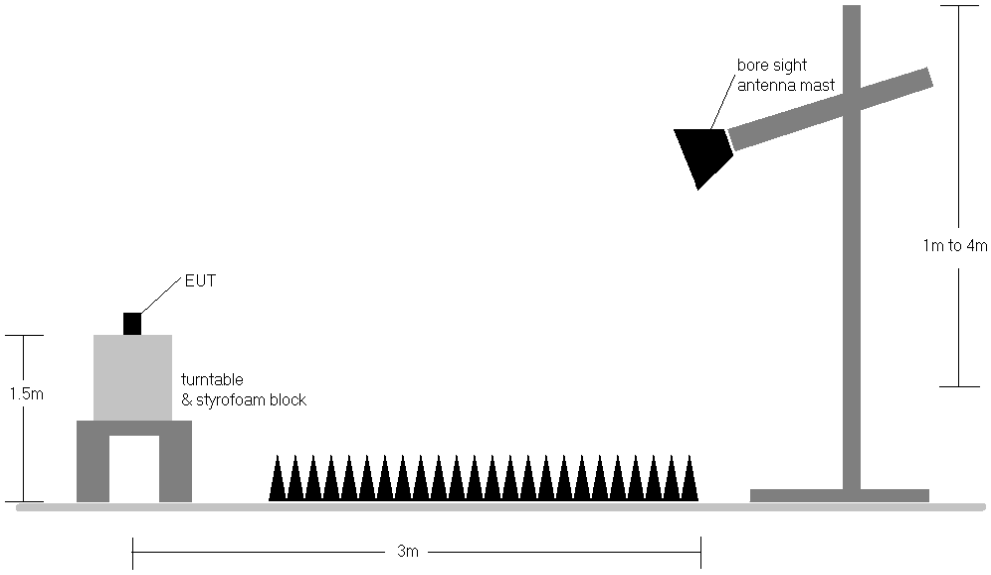

Figure 7-6. Radiated Test Setup >1GHz

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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7.6.1 Radiated Power (ERP/EIRP)

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	H	292	280	1 / 5	14.17	3.40	15.42	0.035	34.77	-19.35
707.50	1.4	QPSK	H	303	271	1 / 0	14.48	3.65	15.98	0.040	34.77	-18.79
715.30	1.4	QPSK	H	307	273	1 / 5	14.72	3.70	**16.27**	0.042	34.77	-18.50
707.50	1.4	16-QAM	H	303	271	1 / 0	13.45	3.65	**14.95**	0.031	34.77	-19.82
700.50	3	QPSK	H	290	281	1 / 14	14.41	3.40	15.66	0.037	34.77	-19.11
707.50	3	QPSK	H	297	276	1 / 14	15.07	3.65	16.57	0.045	34.77	-18.20
714.50	3	QPSK	H	305	277	1 / 0	15.11	3.70	**16.66**	0.046	34.77	-18.11
707.50	3	16-QAM	H	297	276	1 / 14	14.21	3.65	**15.71**	0.037	34.77	-19.06
701.50	5	QPSK	H	301	283	1 / 24	14.41	3.40	15.66	0.037	34.77	-19.11
707.50	5	QPSK	H	296	110	1 / 24	14.95	3.65	**16.45**	0.044	34.77	-18.32
713.50	5	QPSK	H	301	274	1 / 0	14.90	3.70	16.45	0.044	34.77	-18.32
713.50	5	16-QAM	H	301	274	1 / 0	13.77	3.70	**15.32**	0.034	34.77	-19.45
704.00	10	QPSK	H	292	110	1 / 49	14.68	3.50	16.03	0.040	34.77	-18.74
707.50	10	QPSK	H	291	109	1 / 49	15.22	3.65	**16.72**	**0.047**	34.77	-18.05
711.00	10	QPSK	H	303	112	1 / 49	15.14	3.70	16.69	0.047	34.77	-18.08
707.50	10	16-QAM	H	291	109	1 / 49	13.76	3.65	**15.26**	0.034	34.77	-19.51
707.50	10	QPSK	V	354	225	1 / 49	14.79	3.65	16.29	0.043	34.77	-18.48

Table 7-3. ERP Data (Band 12)

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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]
824.70	1.4	QPSK	V	139	236	1 / 0	15.42	6.30	**19.57**	**0.091**	38.45	-18.88
836.50	1.4	QPSK	V	125	232	1 / 5	15.20	6.40	19.45	0.088	38.45	-19.00
848.30	1.4	QPSK	V	137	224	1 / 5	15.18	6.50	**19.53**	0.090	38.45	-18.92
824.70	1.4	16-QAM	V	139	236	1 / 0	14.11	6.30	18.26	0.067	38.45	-20.19
825.50	3	QPSK	V	139	236	1 / 0	15.13	6.30	19.28	0.085	38.45	-19.17
836.50	3	QPSK	V	125	232	1 / 14	14.99	6.40	19.24	0.084	38.45	-19.21
847.50	3	QPSK	V	137	224	1 / 14	14.93	6.50	19.28	0.085	38.45	-19.17
825.50	3	16-QAM	V	139	236	1 / 0	13.67	6.30	17.82	0.061	38.45	-20.63
826.50	5	QPSK	V	139	236	1 / 0	14.82	6.30	18.97	0.079	38.45	-19.48
836.50	5	QPSK	V	125	232	1 / 24	14.98	6.40	19.23	0.084	38.45	-19.22
846.50	5	QPSK	V	137	224	1 / 24	14.92	6.50	19.27	0.085	38.45	-19.18
826.50	5	16-QAM	V	139	236	1 / 0	13.71	6.30	17.86	0.061	38.45	-20.59
829.00	10	QPSK	V	139	236	1 / 0	12.80	6.30	16.95	0.050	38.45	-21.50
836.50	10	QPSK	V	125	232	1 / 49	14.07	6.40	18.32	0.068	38.45	-20.13
844.00	10	QPSK	V	137	224	1 / 49	15.05	6.40	**19.30**	0.085	38.45	-19.15
844.00	10	16-QAM	V	137	224	1 / 49	13.84	6.40	**18.09**	0.064	38.45	-20.36
824.70	1	QPSK	H	180	21	1 / 0	12.91	6.70	17.46	0.056	38.45	-20.99

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	100	39	1 / 5	15.06	9.44	24.50	0.282	30.00	-5.50
1732.50	1.4	QPSK	H	100	22	1 / 5	15.19	9.31	24.50	0.282	30.00	-5.50
1754.30	1.4	QPSK	H	100	24	1 / 0	15.30	9.21	**24.51**	0.282	30.00	-5.49
1732.50	1.4	16-QAM	H	100	22	1 / 5	13.04	9.31	**22.35**	0.172	30.00	-7.65
1711.50	3	QPSK	H	100	39	1 / 14	15.05	9.44	24.49	0.281	30.00	-5.51
1732.50	3	QPSK	H	100	22	1 / 14	15.22	9.31	**24.53**	0.284	30.00	-5.47
1753.50	3	QPSK	H	100	24	1 / 0	15.30	9.21	24.51	0.282	30.00	-5.49
1711.50	3	16-QAM	H	100	39	1 / 14	13.12	9.44	**22.56**	0.180	30.00	-7.44
1712.50	5	QPSK	H	100	39	1 / 24	15.08	9.43	24.51	0.282	30.00	-5.49
1732.50	5	QPSK	H	100	22	1 / 24	15.08	9.31	24.39	0.275	30.00	-5.61
1752.50	5	QPSK	H	100	24	1 / 0	15.33	9.21	**24.54**	0.284	30.00	-5.46
1752.50	5	16-QAM	H	100	24	1 / 0	12.90	9.21	**22.11**	0.163	30.00	-7.89
1715.00	10	QPSK	H	100	39	1 / 49	15.08	9.42	24.50	0.282	30.00	-5.50
1732.50	10	QPSK	H	100	22	1 / 49	15.30	9.31	**24.61**	0.289	30.00	-5.39
1750.00	10	QPSK	H	100	24	1 / 0	15.39	9.20	24.59	0.288	30.00	-5.41
1732.50	10	16-QAM	H	100	22	1 / 49	13.24	9.31	**22.55**	0.180	30.00	-7.45
1717.50	15	QPSK	H	100	39	1 / 74	15.45	9.40	**24.85**	0.305	30.00	-5.15
1732.50	15	QPSK	H	100	22	1 / 74	15.53	9.31	24.84	0.305	30.00	-5.16
1747.50	15	QPSK	H	100	24	1 / 0	15.45	9.22	24.67	0.293	30.00	-5.33
1747.50	15	16-QAM	H	100	24	1 / 0	13.95	9.22	**23.17**	0.207	30.00	-6.83
1720.00	20	QPSK	H	100	39	1 / 99	15.33	9.38	24.71	0.296	30.00	-5.29
1732.50	20	QPSK	H	100	22	1 / 99	15.53	9.31	24.84	0.305	30.00	-5.16
1745.00	20	QPSK	H	100	24	1 / 0	15.79	9.23	**25.02**	**0.318**	30.00	-4.98
1720.00	20	16-QAM	H	100	39	1 / 99	14.17	9.38	**23.55**	0.227	30.00	-6.45
1745.00	20	QPSK	V	110	61	1 / 0	14.75	9.11	23.86	0.243	30.00	-6.14

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	V	108	63	1 / 0	12.88	9.88	**22.76**	0.189	33.01	-10.25
1880.00	1.4	QPSK	V	102	64	1 / 0	12.25	10.10	22.35	0.172	33.01	-10.66
1909.30	1.4	QPSK	V	100	63	1 / 0	12.07	10.31	22.38	0.173	33.01	-10.63
1850.70	1.4	16-QAM	V	108	63	1 / 0	10.79	9.88	**20.67**	0.117	33.01	-12.34
1851.50	3	QPSK	V	108	63	1 / 0	14.48	9.88	24.36	0.273	33.01	-8.65
1880.00	3	QPSK	V	102	64	1 / 0	14.07	10.10	24.17	0.261	33.01	-8.84
1908.50	3	QPSK	V	100	63	1 / 0	14.18	10.30	**24.48**	0.281	33.01	-8.53
1908.50	3	16-QAM	V	100	63	1 / 0	11.86	10.30	**22.16**	0.164	33.01	-10.85
1852.50	5	QPSK	V	108	63	1 / 0	14.42	9.89	24.31	0.270	33.01	-8.70
1880.00	5	QPSK	V	102	64	1 / 0	14.04	10.10	24.14	0.259	33.01	-8.87
1907.50	5	QPSK	V	100	63	1 / 0	14.05	10.30	**24.35**	0.272	33.01	-8.66
1907.50	5	16-QAM	V	100	63	1 / 0	12.11	10.30	**22.41**	0.174	33.01	-10.60
1855.00	10	QPSK	V	108	63	1 / 0	14.58	9.91	24.49	0.281	33.01	-8.52
1880.00	10	QPSK	V	102	64	1 / 0	14.31	10.10	24.41	0.276	33.01	-8.60
1905.00	10	QPSK	V	100	63	1 / 0	14.28	10.28	**24.56**	0.286	33.01	-8.45
1905.00	10	16-QAM	V	100	63	1 / 0	12.13	10.28	**22.41**	0.174	33.01	-10.60
1857.50	15	QPSK	V	108	63	1 / 0	14.29	9.93	24.22	0.264	33.01	-8.79
1880.00	15	QPSK	V	102	64	1 / 0	14.32	10.10	24.42	0.277	33.01	-8.59
1902.50	15	QPSK	V	100	63	1 / 0	14.25	10.27	**24.52**	0.283	33.01	-8.49
1902.50	15	16-QAM	V	100	63	1 / 0	12.36	10.27	**22.63**	0.183	33.01	-10.38
1860.00	20	QPSK	V	108	63	1 / 0	16.40	9.95	**24.60**	**0.288**	33.01	-8.41
1880.00	20	QPSK	V	102	64	1 / 0	16.08	10.10	24.43	0.278	33.01	-8.58
1900.00	20	QPSK	V	100	63	1 / 0	15.42	10.26	23.93	0.247	33.01	-9.08
1860.00	20	16-QAM	V	108	63	1 / 0	15.01	9.95	**23.21**	0.209	33.01	-9.80
1860.00	20	QPSK	H	120	18	1 / 0	16.17	9.62	24.04	0.254	33.01	-8.97

Table 7-6. EIRP Data (Band 2)

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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 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

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Test Setup

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

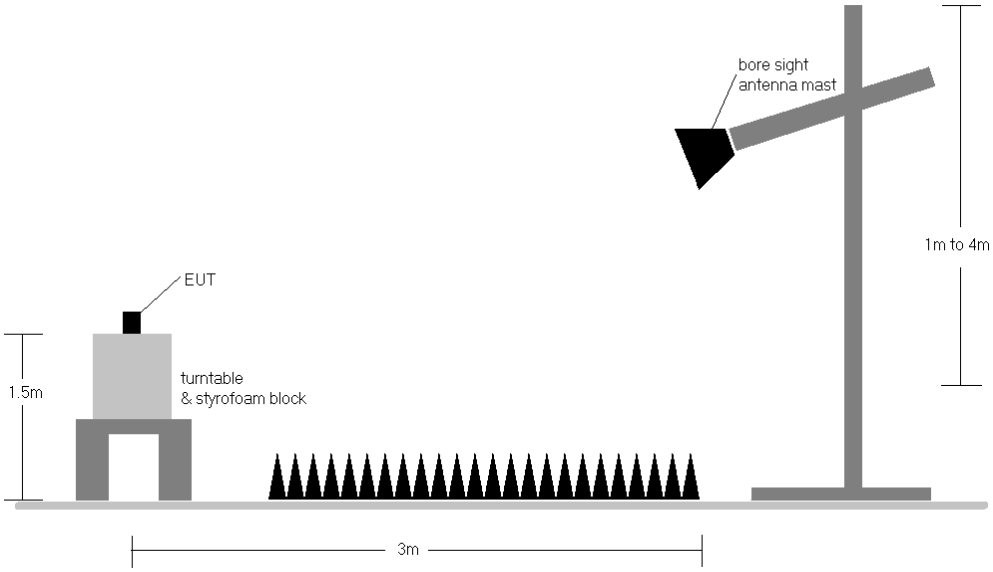

Figure 7-7. Test Instrument & Measurement Setup

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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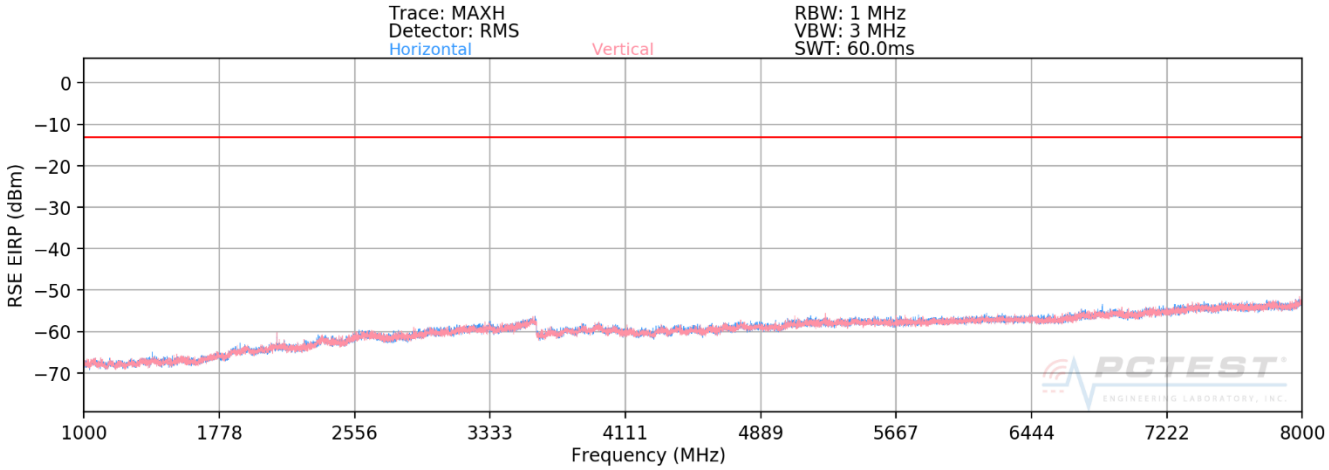
7.7.1 Radiated Spurious Emissions Measurements

Band 12



Plot 7-182. 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	-	-	-69.85	2.71	-67.13	-54.1
2112.00	H	100	322	-62.90	3.57	-59.33	-46.3
2816.00	H	-	-	-68.23	4.98	-63.25	-50.3
3520.00	H	-	-	-68.84	6.33	-62.51	-49.5

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

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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	-	-	-70.02	2.80	-67.22	-54.2
2122.50	H	157	331	-62.89	3.57	-59.31	-46.3
2830.00	H	-	-	-68.32	5.02	-63.30	-50.3
3537.50	H	-	-	-68.73	6.31	-62.42	-49.4

Table 7-8. 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	-	-	-70.08	2.88	-67.20	-54.2
2133.00	H	105	323	-62.39	3.58	-58.81	-45.8
2844.00	H	-	-	-68.44	5.07	-63.37	-50.4
3555.00	H	-	-	-68.68	6.31	-62.37	-49.4

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

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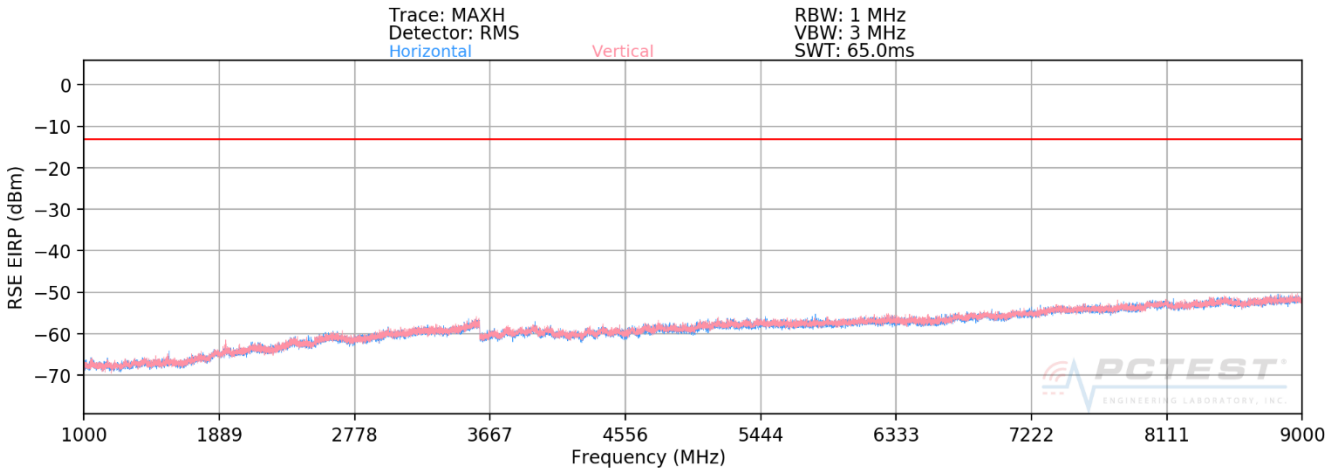
Band 5



Plot 7-183. Radiated Spurious Plot above 1GHz (Band 5)

OPERATING FREQUENCY:	824.70	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]
1649.40	V	-	-	-69.05	3.08	-65.97	-53.0
2474.10	V	-	-	-66.44	3.84	-62.60	-49.6

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

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OPERATING FREQUENCY: 836.50 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]
1673.00	V	-	-	-68.73	3.10	-65.63	-52.6
2509.50	V	-	-	-67.14	4.02	-63.13	-50.1

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

OPERATING FREQUENCY: 848.30 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]
1696.60	V	-	-	-68.96	3.15	-65.80	-52.8
2544.90	V	-	-	-66.87	4.14	-62.73	-49.7

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

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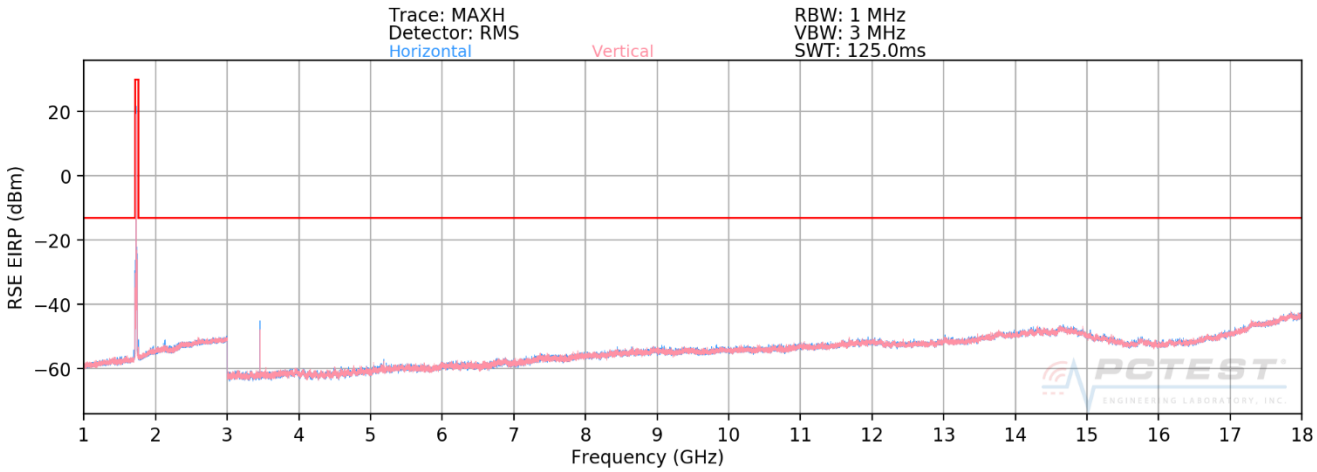
Band 4



Plot 7-184. 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	103	125	-51.56	6.22	-45.34	-32.3
5160.00	H	118	226	-61.65	8.68	-52.98	-40.0
6880.00	H	-	-	-66.39	8.76	-57.63	-44.6
8600.00	H	-	-	-66.24	9.17	-57.06	-44.1

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

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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	126	-49.81	6.27	-43.54	-30.5
5197.50	H	102	225	-63.49	8.71	-54.78	-41.8
6930.00	H	-	-	-67.15	8.72	-58.43	-45.4
8662.50	H	-	-	-66.13	9.27	-56.86	-43.9

Table 7-14. 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	116	127	-49.86	6.32	-43.54	-30.5
5235.00	H	108	221	-63.77	8.71	-55.06	-42.1
6980.00	H	-	-	-66.38	8.74	-57.65	-44.6
8725.00	H	-	-	-66.11	9.42	-56.70	-43.7

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

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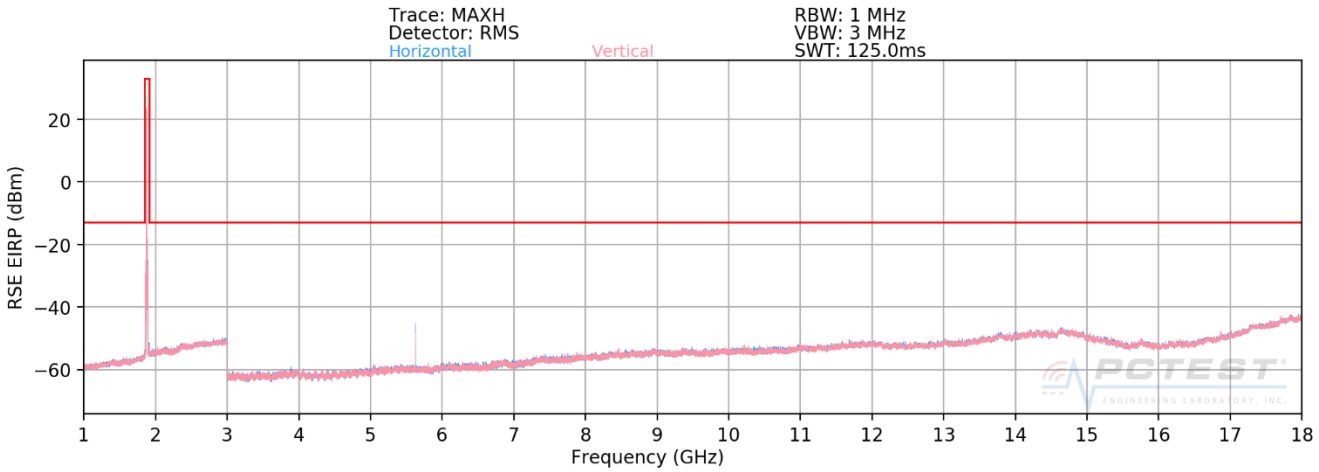
Band 2



Plot 7-185. Radiated Spurious Plot above 1GHz (Band 2)

OPERATING FREQUENCY:	1860.00	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]
3720.00	V	110	287	-58.19	6.58	-51.61	-38.6
5580.00	V	105	288	-58.43	8.74	-49.70	-36.7
7440.00	V	-	-	-65.20	8.41	-56.79	-43.8
9300.00	V	-	-	-64.84	9.33	-55.51	-42.5

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

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OPERATING FREQUENCY: 1880.00 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]
3760.00	V	110	95	-64.52	6.67	-57.85	-44.8
5640.00	V	152	323	-55.03	8.81	-46.22	-33.2
7520.00	V	-	-	-65.31	8.48	-56.82	-43.8
9400.00	V	-	-	-65.66	9.32	-56.34	-43.3

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

OPERATING FREQUENCY: 1900.00 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]
3800.00	V	133	278	-60.06	6.87	-53.18	-40.2
5700.00	V	118	327	-51.84	8.76	-43.08	-30.1
7600.00	V	-	-	-65.27	8.47	-56.79	-43.8
9500.00	V	-	-	-65.69	9.37	-56.32	-43.3

Table 7-18.. Radiated Spurious Data (Band 2 - 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.

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 12 Frequency Stability Measurements

OPERATING FREQUENCY: 707,500,000 Hz

CHANNEL: 23790

REFERENCE VOLTAGE: 3.85 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	- 30	707,499,950	-50	-0.0000071
100 %		- 20	707,499,933	-67	-0.0000095
100 %		- 10	707,500,017	17	0.0000024
100 %		0	707,499,596	-404	-0.0000571
100 %		+ 10	707,500,074	74	0.0000105
100 %		+ 20	707,500,020	20	0.0000028
100 %		+ 30	707,500,135	135	0.0000191
100 %		+ 40	707,499,836	-164	-0.0000232
100 %		+ 50	707,500,102	102	0.0000144
BATT. ENDPOINT	2.80	+ 20	707,499,772	-228	-0.0000322

Table 7-19. 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.

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Band 12 Frequency Stability Measurements

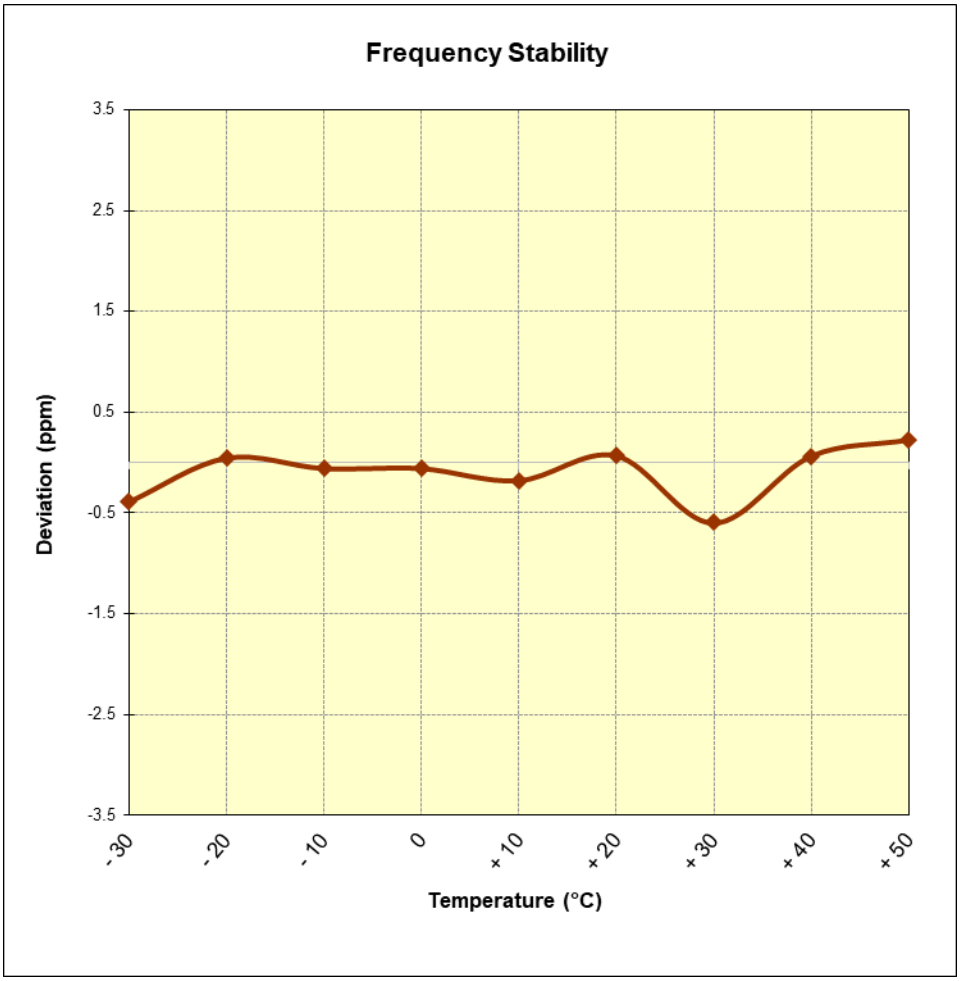

Figure 7-8. frequency Stability Graph (Band 12)

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Band 5 Frequency Stability Measurements

OPERATING FREQUENCY: 836,500,000 Hz

CHANNEL: 20525

REFERENCE VOLTAGE: 3.85 VDC

DEVIATION LIMIT: ± 0.00025 % or 2.5 ppm

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	- 30	836,499,880	-120	-0.0000143
100 %		- 20	836,500,108	108	0.0000129
100 %		- 10	836,500,006	6	0.0000007
100 %		0	836,499,927	-73	-0.0000087
100 %		+ 10	836,499,630	-370	-0.0000442
100 %		+ 20	836,499,944	-56	-0.0000067
100 %		+ 30	836,500,061	61	0.0000073
100 %		+ 40	836,500,462	462	0.0000552
100 %		+ 50	836,499,880	-120	-0.0000143
BATT. ENDPOINT	2.80	+ 20	836,499,740	-260	-0.0000311

Table 7-20. Frequency Stability Data (Band 5)

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 5 Frequency Stability Measurements

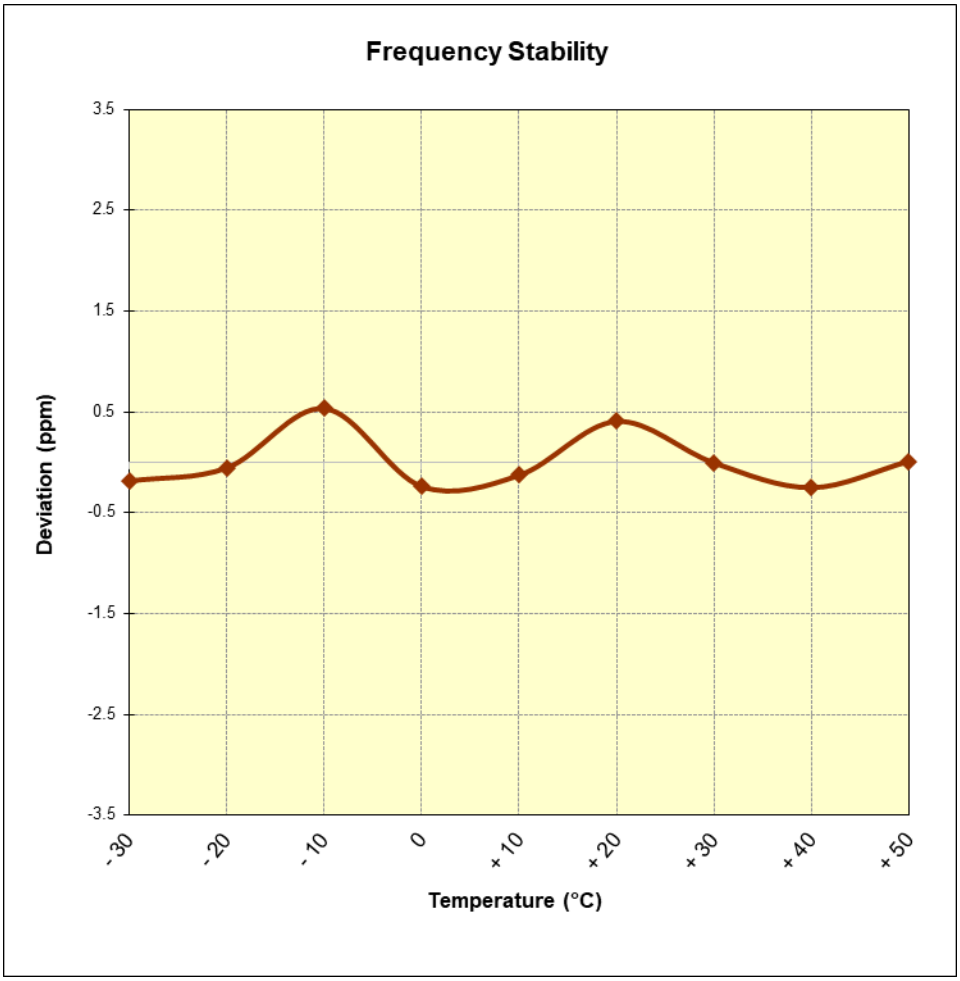

Figure 7-9. frequency Stability Graph (Band 5)

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Band 4 Frequency Stability Measurements

OPERATING FREQUENCY: 1,732,500,000 Hz

CHANNEL: 20175

REFERENCE VOLTAGE: 3.85 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	- 30	1,732,500,101	101	0.0000058
100 %		- 20	1,732,500,146	146	0.0000084
100 %		- 10	1,732,499,829	-171	-0.0000099
100 %		0	1,732,499,908	-92	-0.0000053
100 %		+ 10	1,732,499,736	-264	-0.0000152
100 %		+ 20	1,732,499,822	-178	-0.0000103
100 %		+ 30	1,732,500,006	6	0.0000003
100 %		+ 40	1,732,499,879	-121	-0.0000070
100 %		+ 50	1,732,500,014	14	0.0000008
BATT. ENDPOINT		+ 20	1,732,500,256	256	0.0000148

Table 7-21. 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

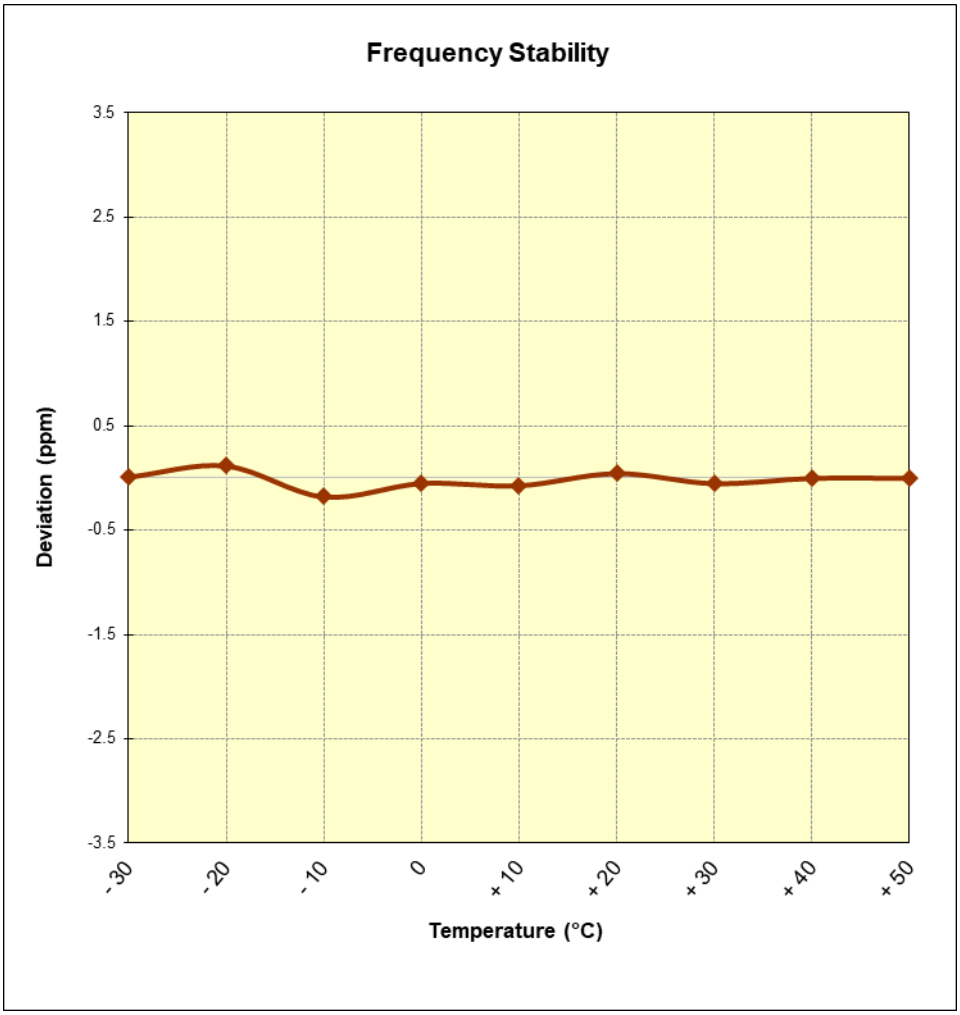

Figure 7-10. frequency Stability Graph (Band 4)

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Band 2 Frequency Stability Measurements

OPERATING FREQUENCY: 1,880,000,000 Hz

CHANNEL: 18900

REFERENCE VOLTAGE: 3.85 VDC

DEVIATION LIMIT: ± 0.00025 % or 2.5 ppm

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	- 30	1,880,000,239	239	0.0000127
100 %		- 20	1,880,000,024	24	0.0000013
100 %		- 10	1,879,999,896	-104	-0.0000055
100 %		0	1,880,000,391	391	0.0000208
100 %		+ 10	1,879,999,810	-190	-0.0000101
100 %		+ 20	1,880,000,172	172	0.0000091
100 %		+ 30	1,879,999,876	-124	-0.0000066
100 %		+ 40	1,879,999,686	-314	-0.0000167
100 %		+ 50	1,880,000,024	24	0.0000013
BATT. ENDPOINT		+ 20	1,880,000,126	126	0.0000067

Table 7-22. Frequency Stability Data (Band 2)

Note:

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

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Band 2 Frequency Stability Measurements

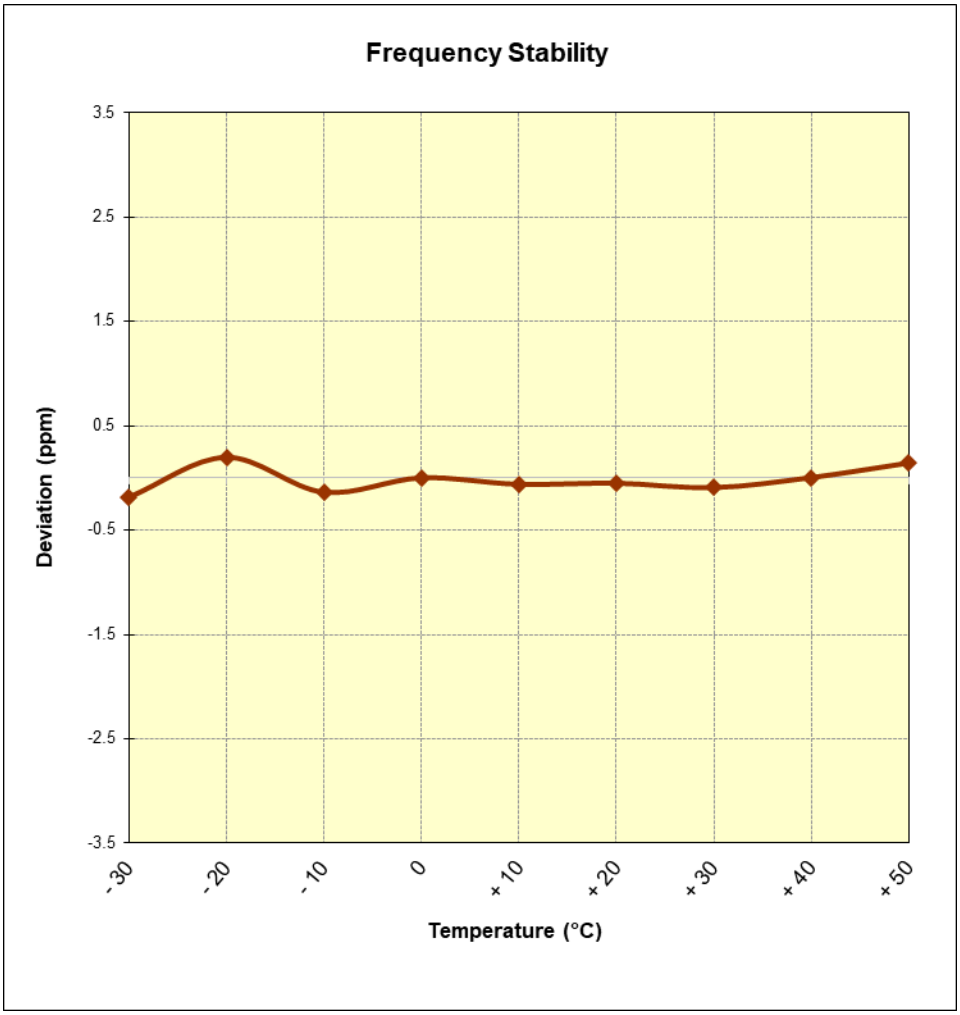

Figure 7-11. frequency Stability Graph (Band 2)

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFX320APM** complies with all the requirements of Part 22, 24, & 27 of the FCC Rules for LTE operation only.

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