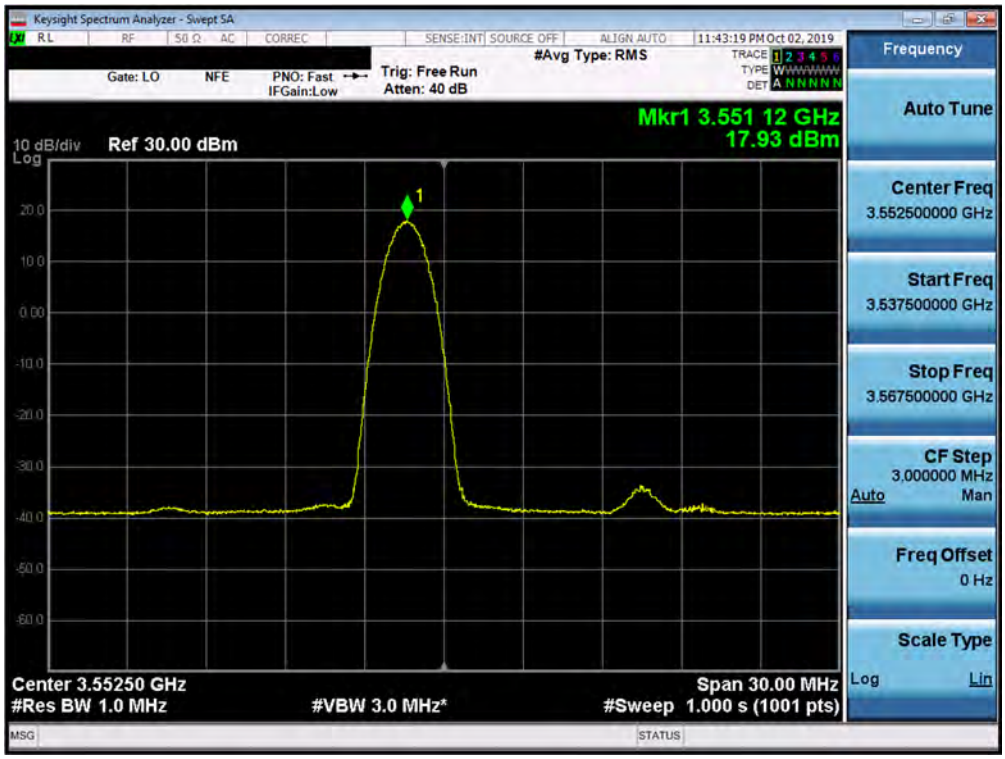
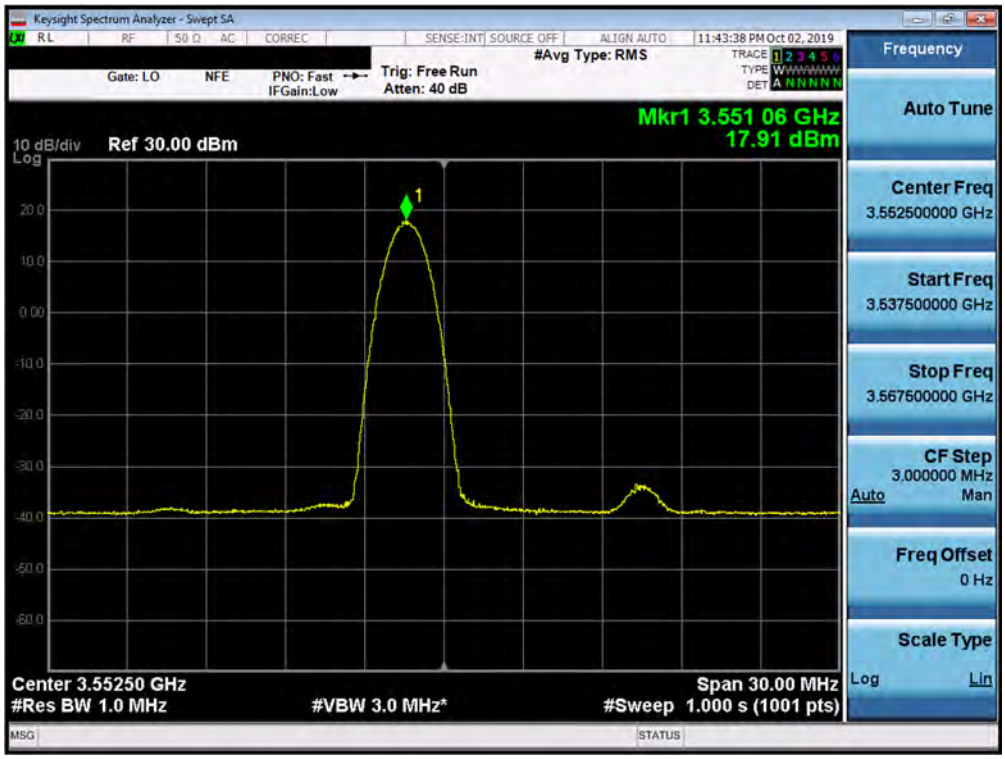
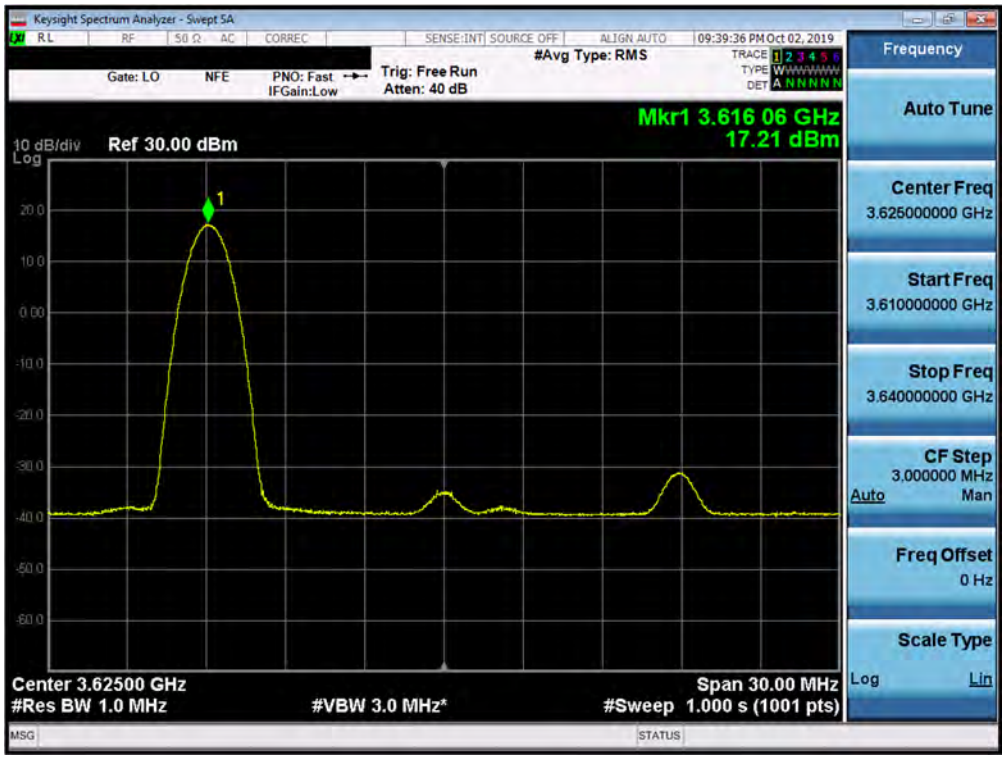


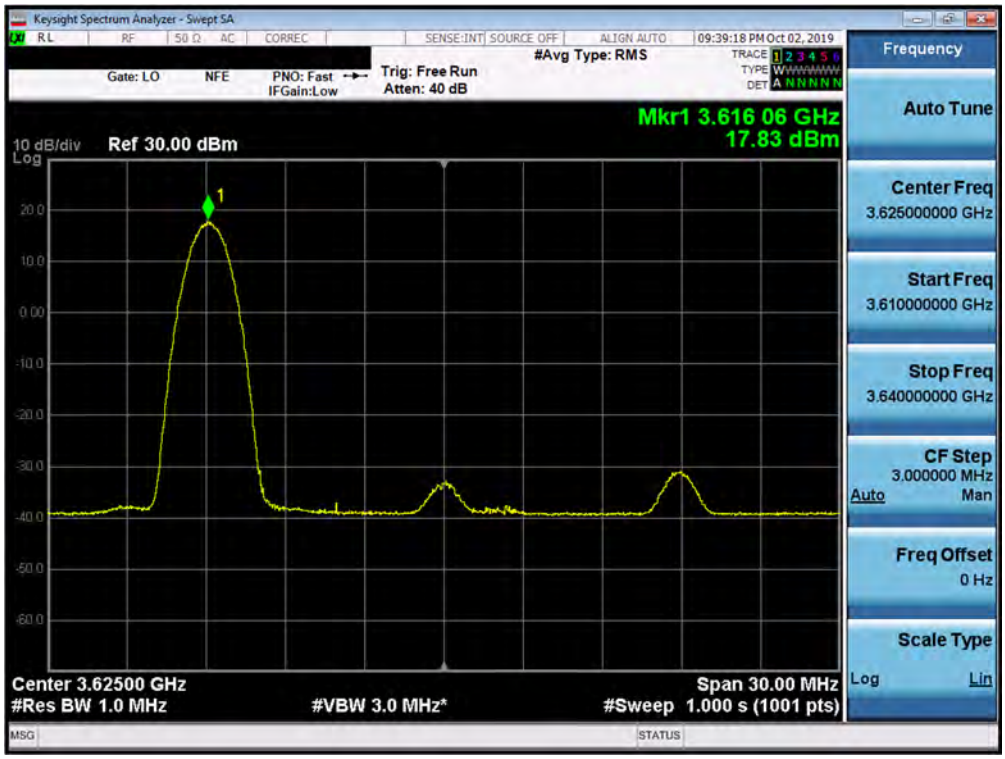
Plot 7-113. Peak Power Spectral Density Plot (B48 – 20.0MHz 16-QAM – Low Channel RB: 1 RB, Offset: 0 – Main Antenna)



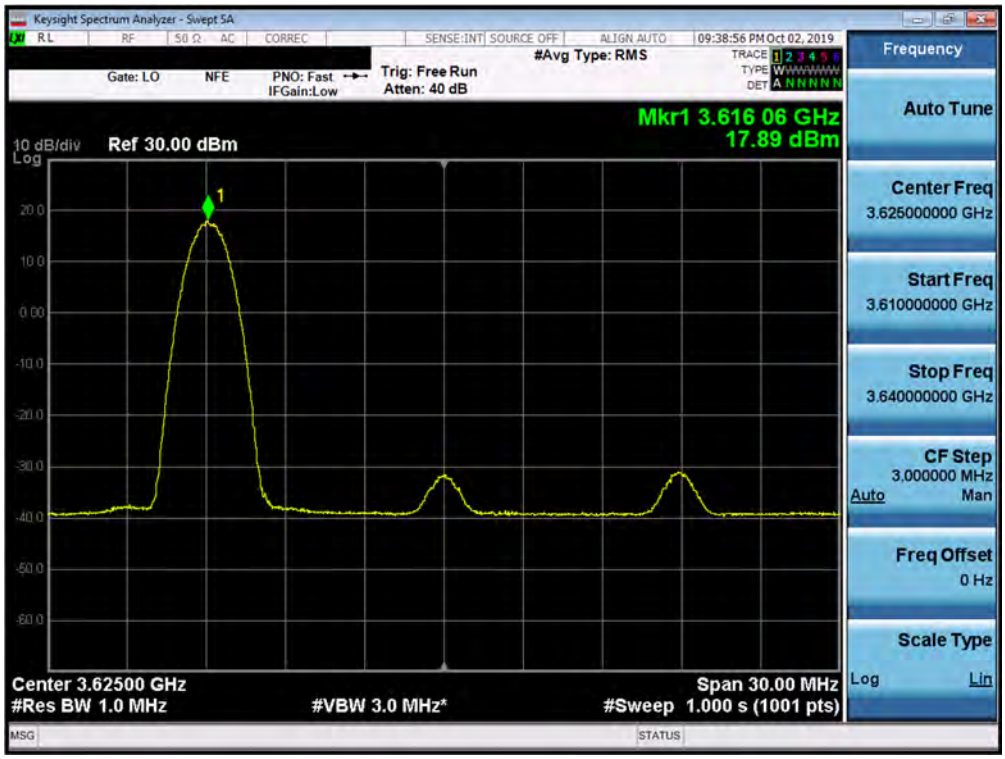
Plot 7-114. Peak Power Spectral Density Plot (B48 – 20.0MHz 64-QAM – Low Channel RB: 1 RB, Offset: 0 – Main Antenna)



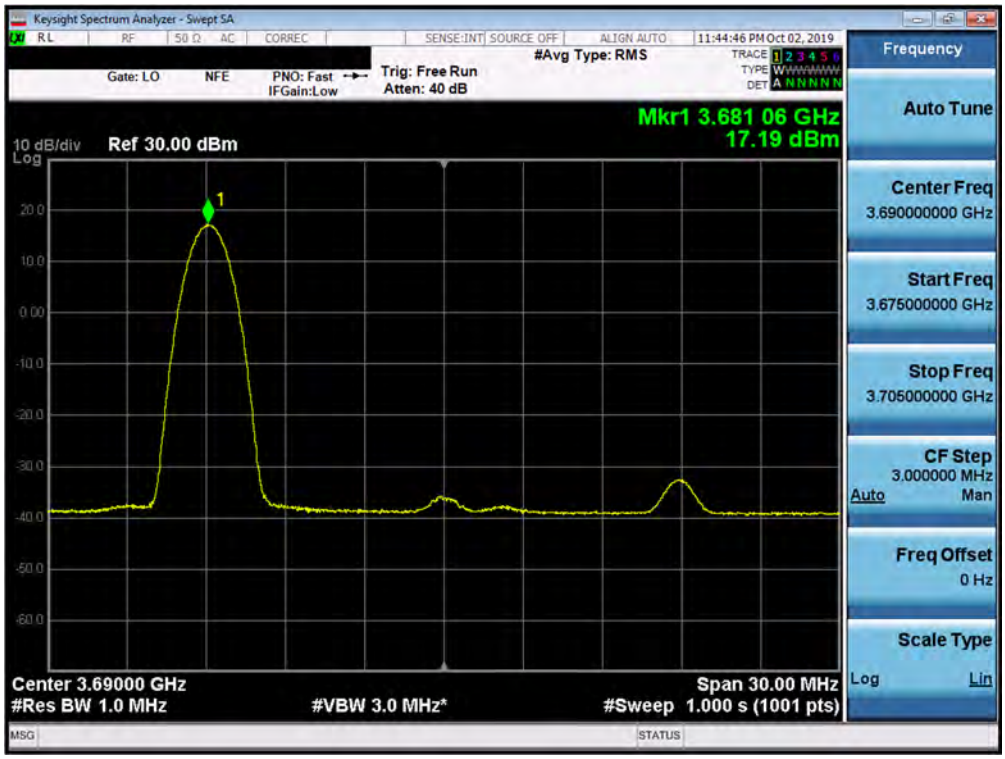
Plot 7-115. Peak Power Spectral Density Plot (B48 – 20.0MHz QPSK – Mid Channel RB: 1 RB, Offset: 0 – Main Antenna)



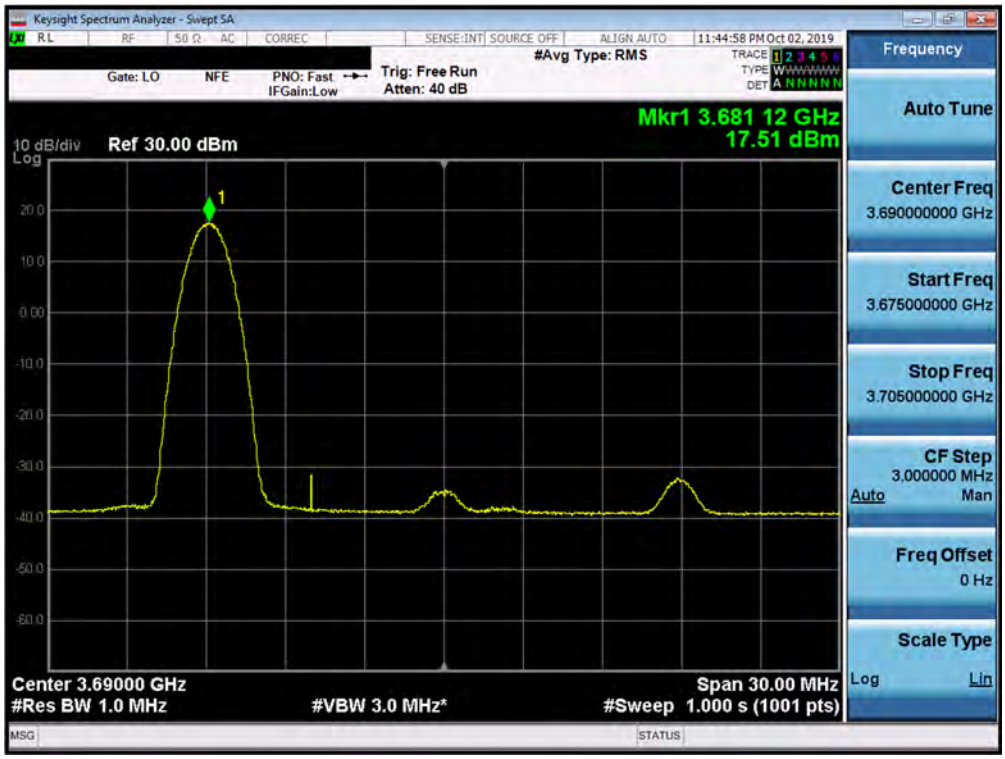
Plot 7-116. Peak Power Spectral Density Plot (B48 – 20.0MHz 16-QAM – Mid Channel RB: 1 RB, Offset: 0 – Main Antenna)



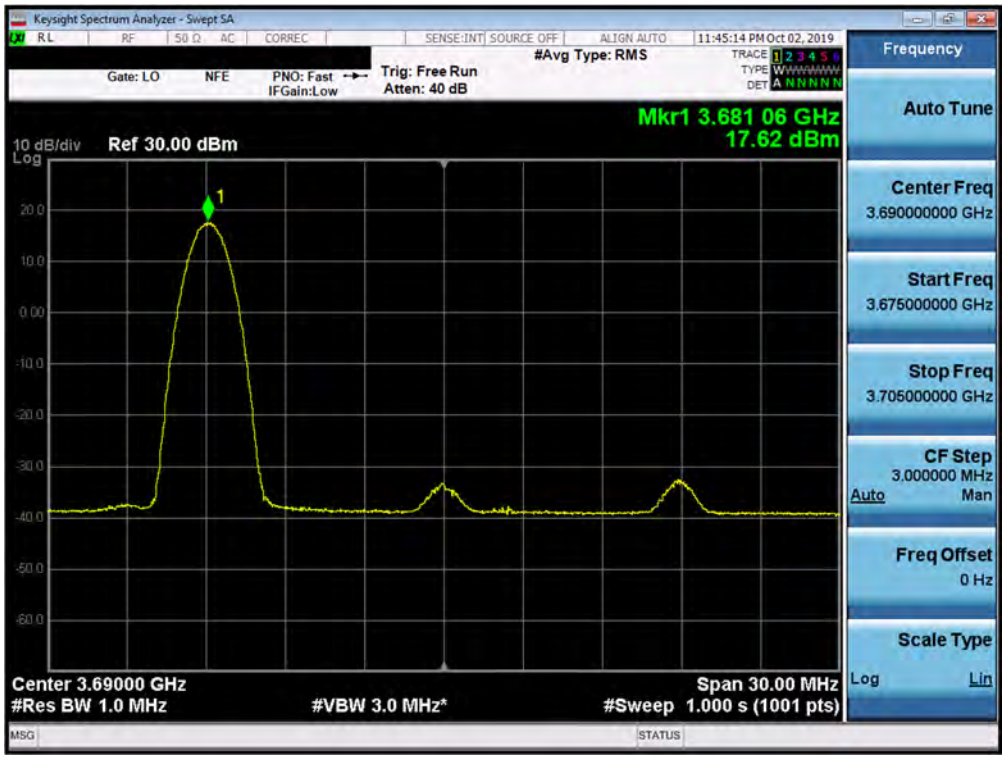
Plot 7-117. Peak Power Spectral Density Plot (B48 – 20.0MHz 64-QAM – Mid Channel RB: 1 RB, Offset: 0 – Main Antenna)



Plot 7-118. Peak Power Spectral Density Plot (B48 – 20.0MHz QPSK – High Channel RB: 1 RB, Offset: 0 – Main Antenna)



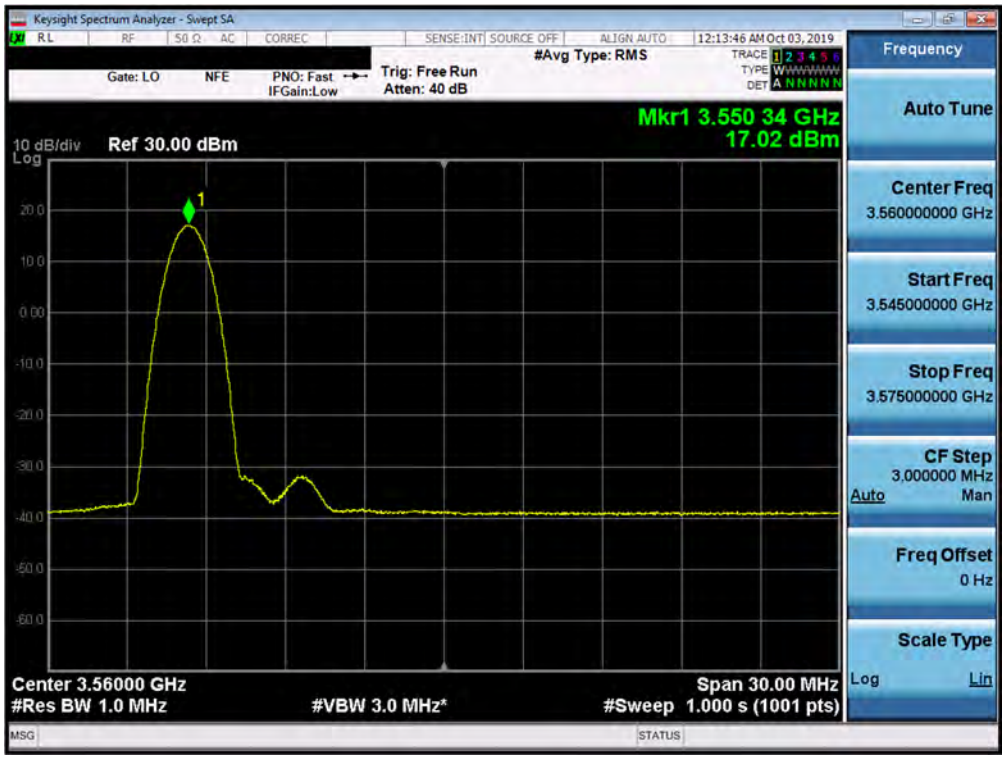
Plot 7-119. Peak Power Spectral Density Plot (B48 – 20.0MHz 16-QAM – High Channel RB: 1 RB, Offset: 0 – Main Antenna)



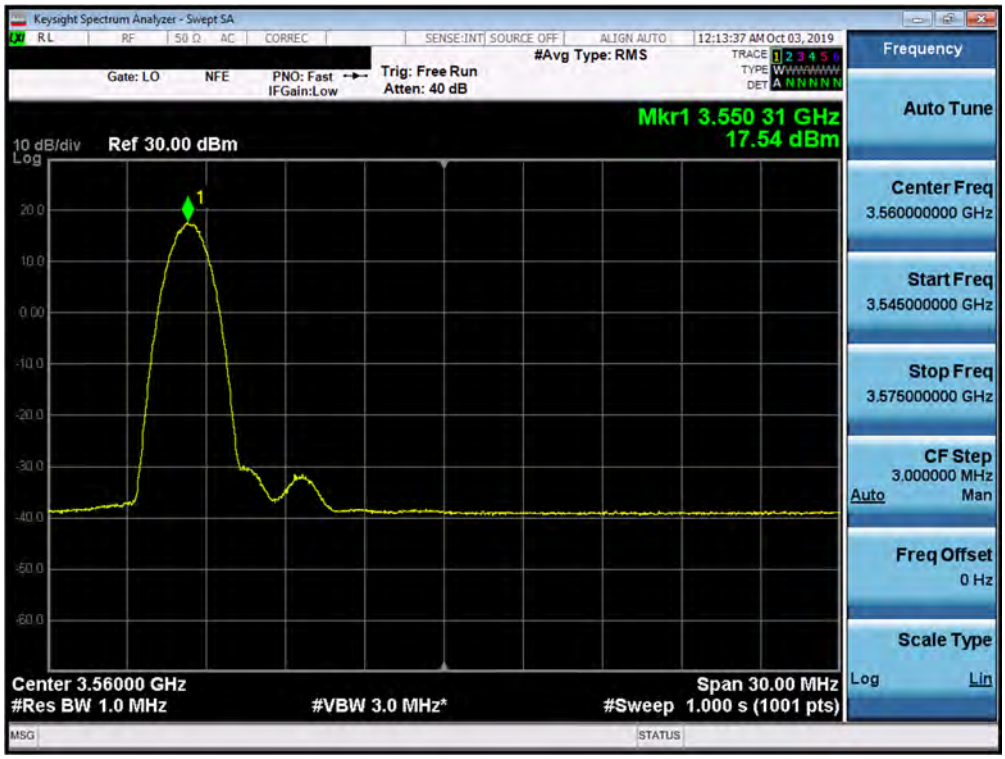
Plot 7-120. Peak Power Spectral Density Plot (B48 – 20.0MHz 64-QAM – High Channel RB: 1 RB, Offset: 0 – Main Antenna)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	RB Size/Offset	Conducted PSD [dBm/MHz]	Ant. Gain [dBi]	PSD [dBm/MHz]	PSD [Watts/MHz]	PSD Limit [dBm/MHz]	Margin [dB]
3552.50	5	QPSK	1 / 0	17.02	19.00	36.02	3.999	37.00	-0.98
3625.00	5	QPSK	1 / 0	17.21	19.00	**36.21**	4.178	37.00	-0.79
3697.50	5	QPSK	1 / 0	16.76	19.00	35.76	3.767	37.00	-1.24
3552.50	5	16-QAM	1 / 0	17.54	19.00	36.54	4.508	37.00	-0.46
3625.00	5	16-QAM	1 / 0	17.66	19.00	**36.66**	4.634	37.00	-0.34
3697.50	5	16-QAM	1 / 0	17.06	19.00	36.06	4.036	37.00	-0.94
3552.50	5	64-QAM	1 / 0	17.16	19.00	36.16	4.130	37.00	-0.84
3625.00	5	64-QAM	1 / 0	17.43	19.00	**36.43**	4.395	37.00	-0.57
3697.50	5	64-QAM	1 / 0	17.07	19.00	36.07	4.046	37.00	-0.93
3555.00	10	QPSK	1 / 0	17.14	19.00	36.14	4.111	37.00	-0.86
3625.00	10	QPSK	1 / 0	17.34	19.00	**36.34**	4.305	37.00	-0.66
3695.00	10	QPSK	1 / 0	16.83	19.00	35.83	3.828	37.00	-1.17
3555.00	10	16-QAM	1 / 0	17.54	19.00	36.54	4.508	37.00	-0.46
3625.00	10	16-QAM	1 / 0	17.80	19.00	**36.80**	4.786	37.00	-0.20
3695.00	10	16-QAM	1 / 0	17.25	19.00	36.25	4.217	37.00	-0.75
3555.00	10	64-QAM	1 / 0	17.48	19.00	36.48	4.446	37.00	-0.52
3625.00	10	64-QAM	1 / 0	17.71	19.00	**36.71**	4.688	37.00	-0.29
3695.00	10	64-QAM	1 / 0	17.15	19.00	36.15	4.121	37.00	-0.85
3557.50	15	QPSK	1 / 0	17.31	19.00	36.31	4.276	37.00	-0.69
3625.00	15	QPSK	1 / 0	17.47	19.00	**36.47**	4.436	37.00	-0.53
3692.50	15	QPSK	1 / 0	16.90	19.00	35.90	3.890	37.00	-1.10
3557.50	15	16-QAM	1 / 0	17.51	19.00	36.51	4.477	37.00	-0.49
3625.00	15	16-QAM	1 / 0	17.91	19.00	**36.91**	4.909	37.00	-0.09
3692.50	15	16-QAM	1 / 0	17.36	19.00	36.36	4.325	37.00	-0.64
3557.50	15	64-QAM	1 / 0	17.51	19.00	36.51	4.477	37.00	-0.49
3625.00	15	64-QAM	1 / 0	17.85	19.00	**36.85**	4.842	37.00	-0.15
3692.50	15	64-QAM	1 / 0	17.26	19.00	36.26	4.227	37.00	-0.74
3560.00	20	QPSK	1 / 0	17.28	19.00	36.28	4.246	37.00	-0.72
3625.00	20	QPSK	1 / 0	17.52	19.00	**36.52**	4.487	37.00	-0.48
3690.00	20	QPSK	1 / 0	17.06	19.00	36.06	4.036	37.00	-0.94
3560.00	20	16-QAM	1 / 0	17.67	19.00	36.67	4.645	37.00	-0.33
3625.00	20	16-QAM	1 / 0	17.98	19.00	**36.98**	**4.989**	37.00	-0.02
3690.00	20	16-QAM	1 / 0	17.52	19.00	36.52	4.487	37.00	-0.48
3560.00	20	64-QAM	1 / 0	17.77	19.00	36.77	4.753	37.00	-0.23
3625.00	20	64-QAM	1 / 0	17.90	19.00	**36.90**	4.898	37.00	-0.10
3690.00	20	64-QAM	1 / 0	17.54	19.00	36.54	4.508	37.00	-0.46

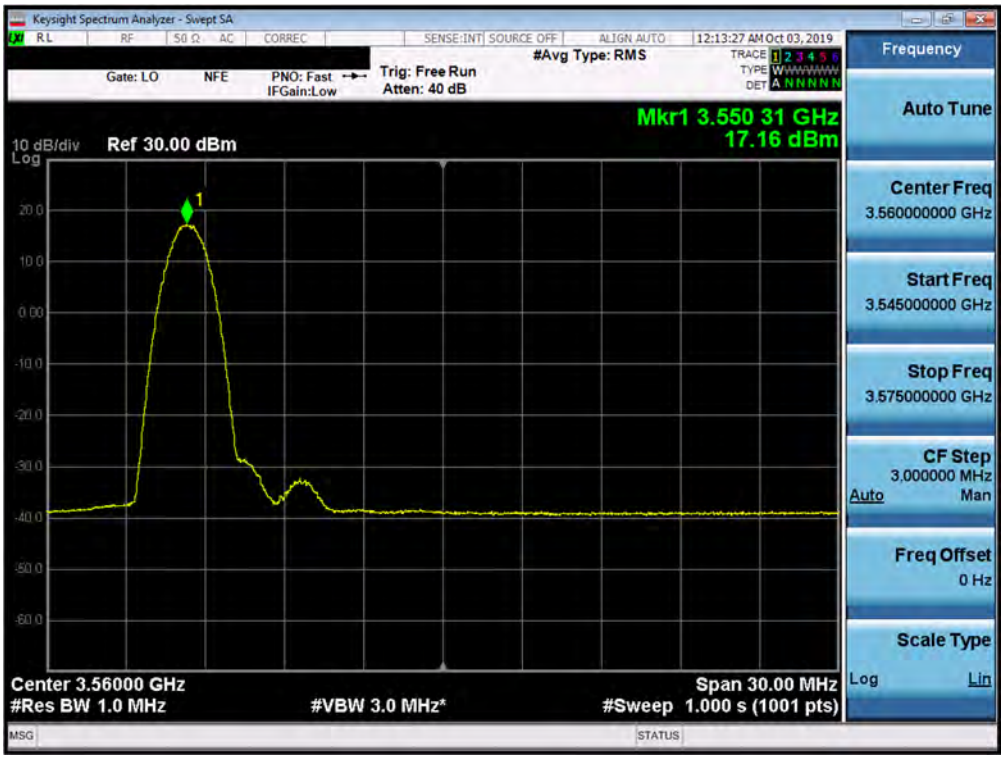
Table 7-4. Peak Power Spectral Density (Band 48 – Diversity Antenna)



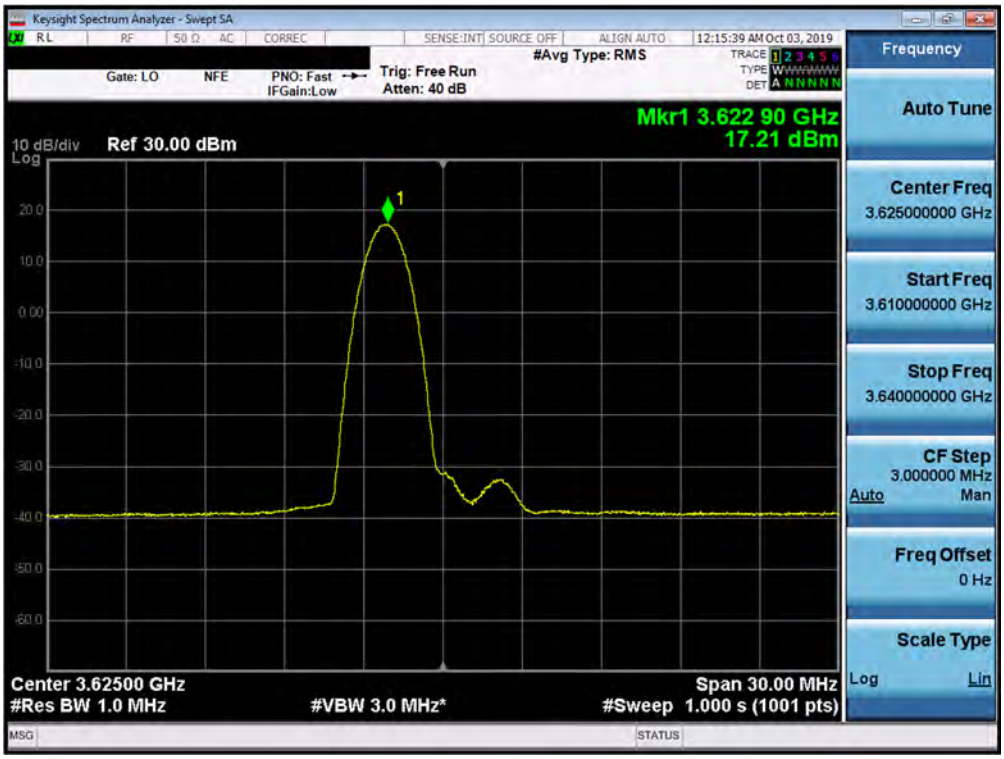
Plot 7-121. Peak Power Spectral Density Plot (B48 – 5.0MHz QPSK – Low Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



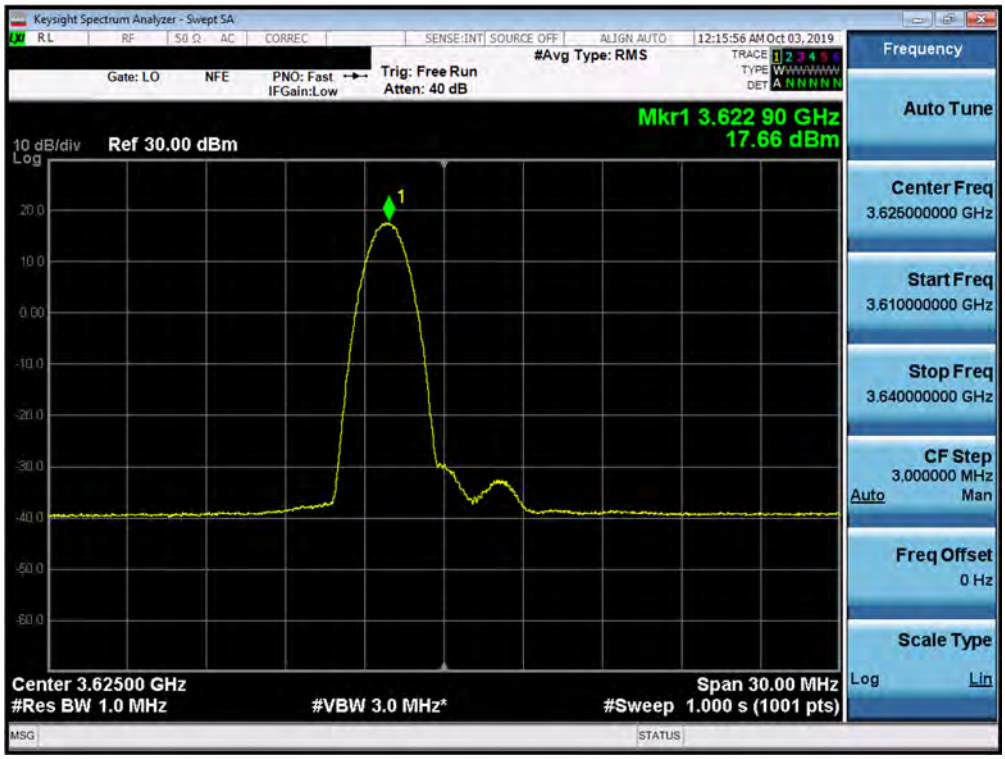
Plot 7-122. Peak Power Spectral Density Plot (B48 – 5.0MHz 16-QAM – Low Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



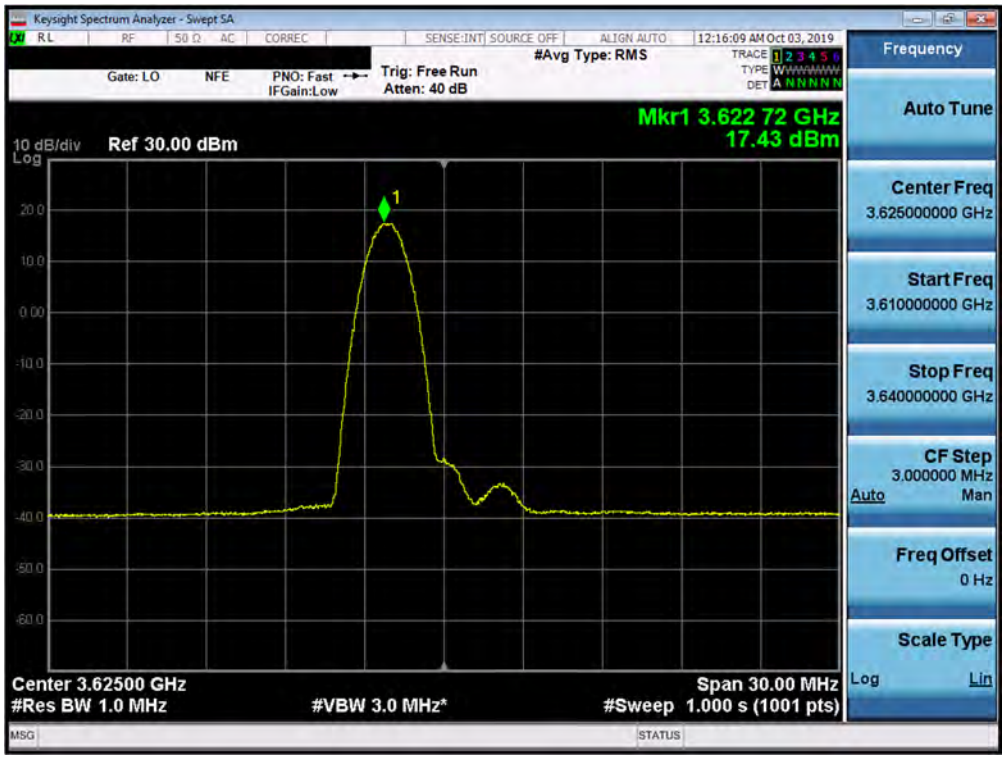
Plot 7-123. Peak Power Spectral Density Plot (B48 – 5.0MHz 64-QAM – Low Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



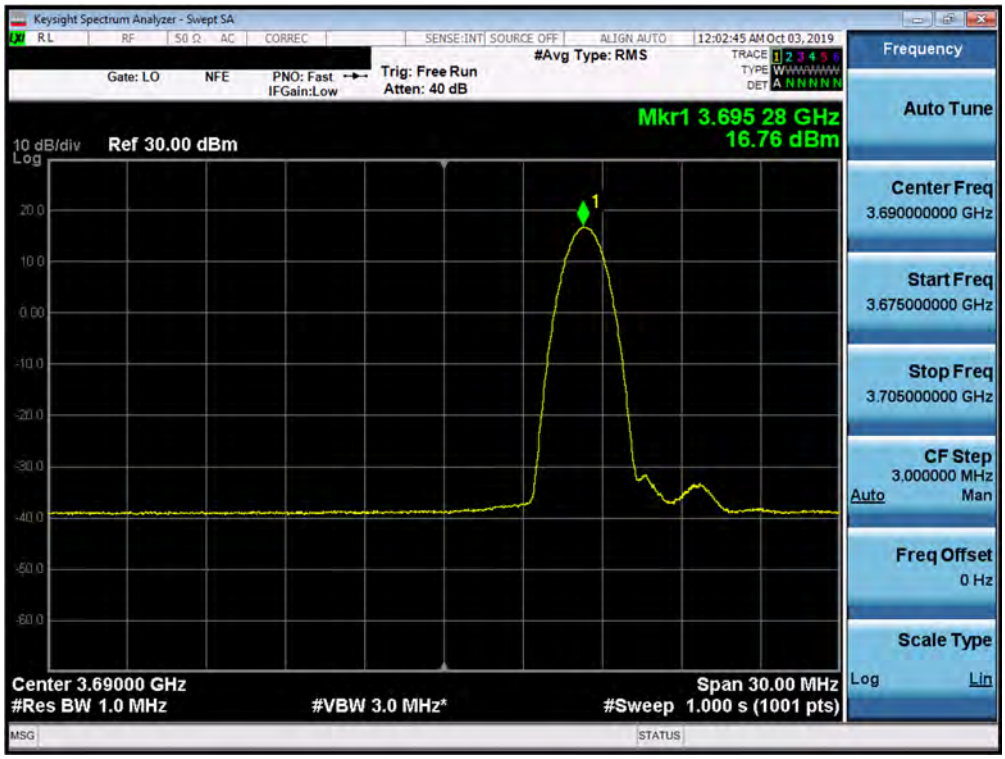
Plot 7-124. Peak Power Spectral Density Plot (B48 – 5.0MHz QPSK – Mid Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



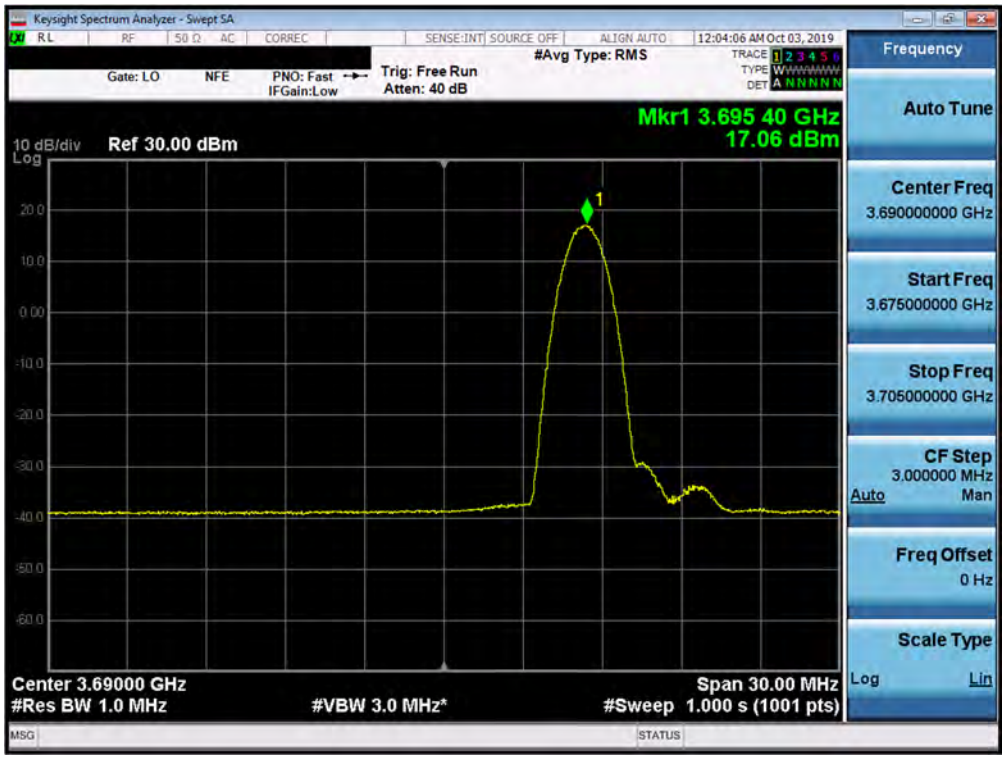
Plot 7-125. Peak Power Spectral Density Plot (B48 – 5.0MHz 16-QAM – Mid Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



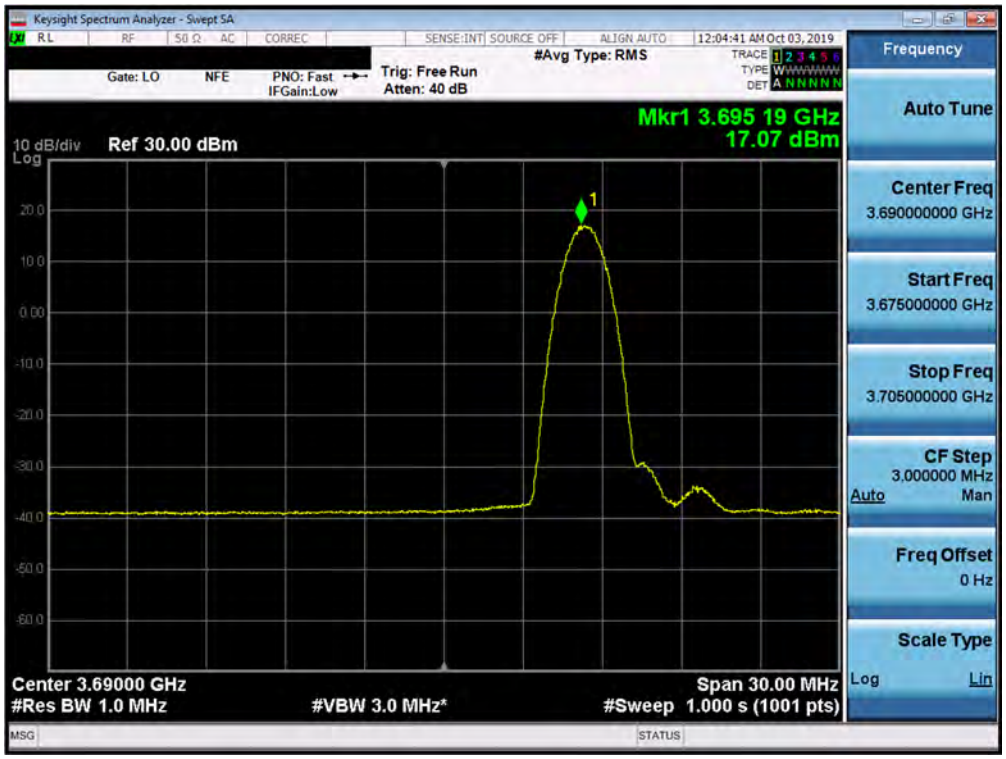
Plot 7-126. Peak Power Spectral Density Plot (B48 – 5.0MHz 64-QAM – Mid Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



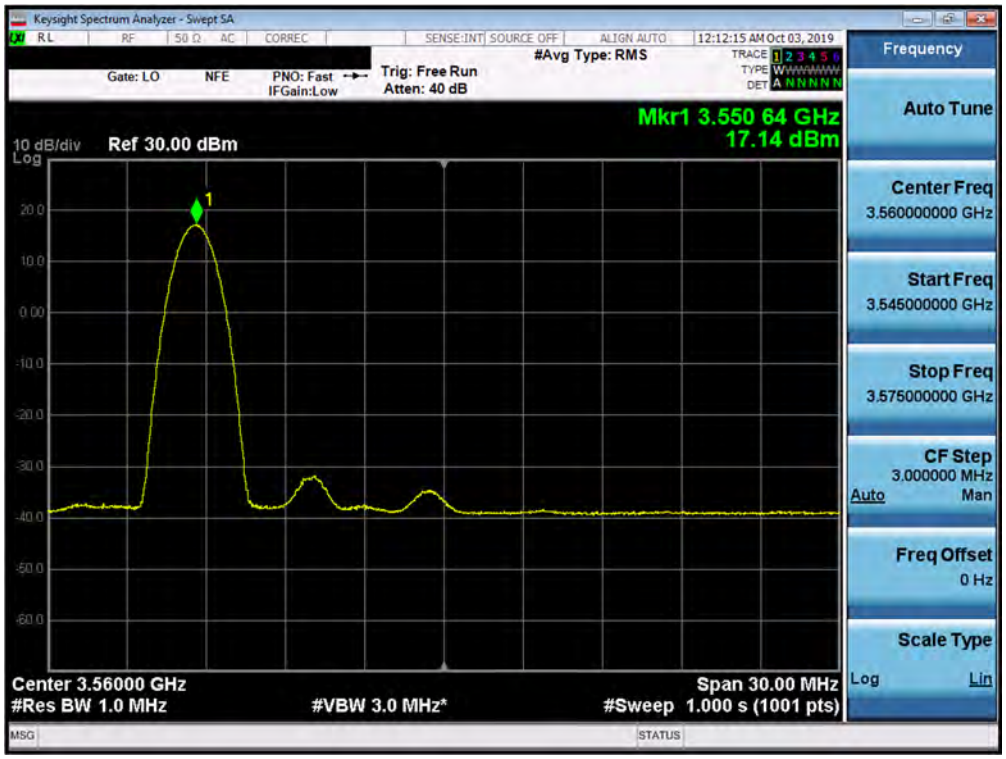
Plot 7-127. Peak Power Spectral Density Plot (B48 – 5.0MHz QPSK – High Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



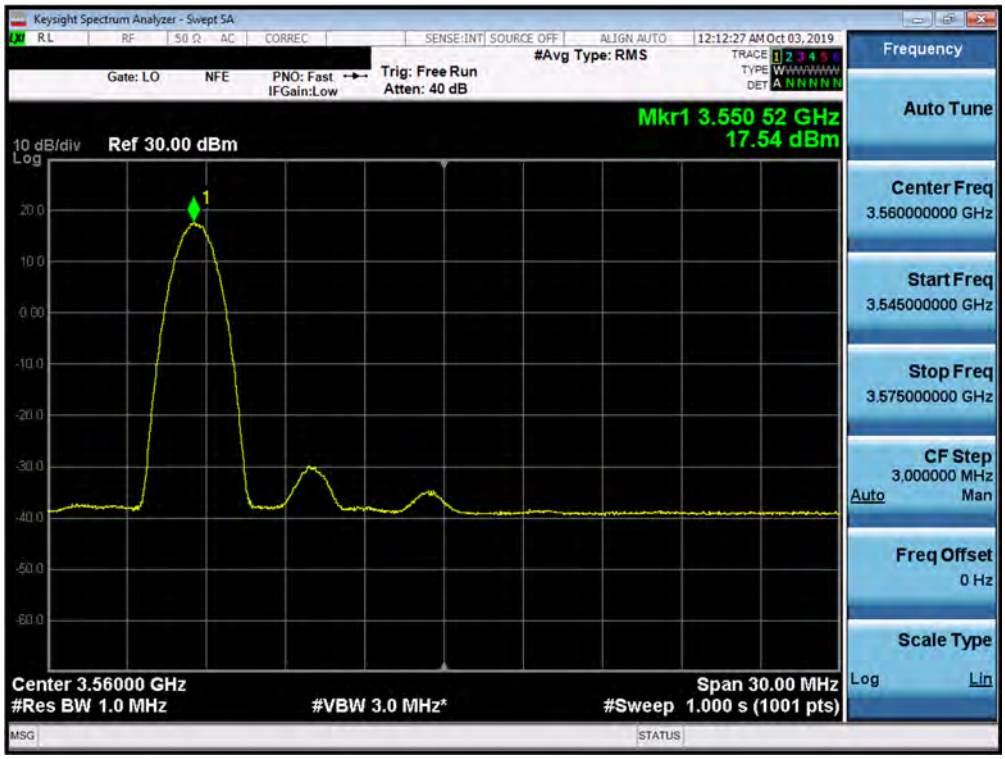
Plot 7-128. Peak Power Spectral Density Plot (B48 – 5.0MHz 16-QAM – High Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



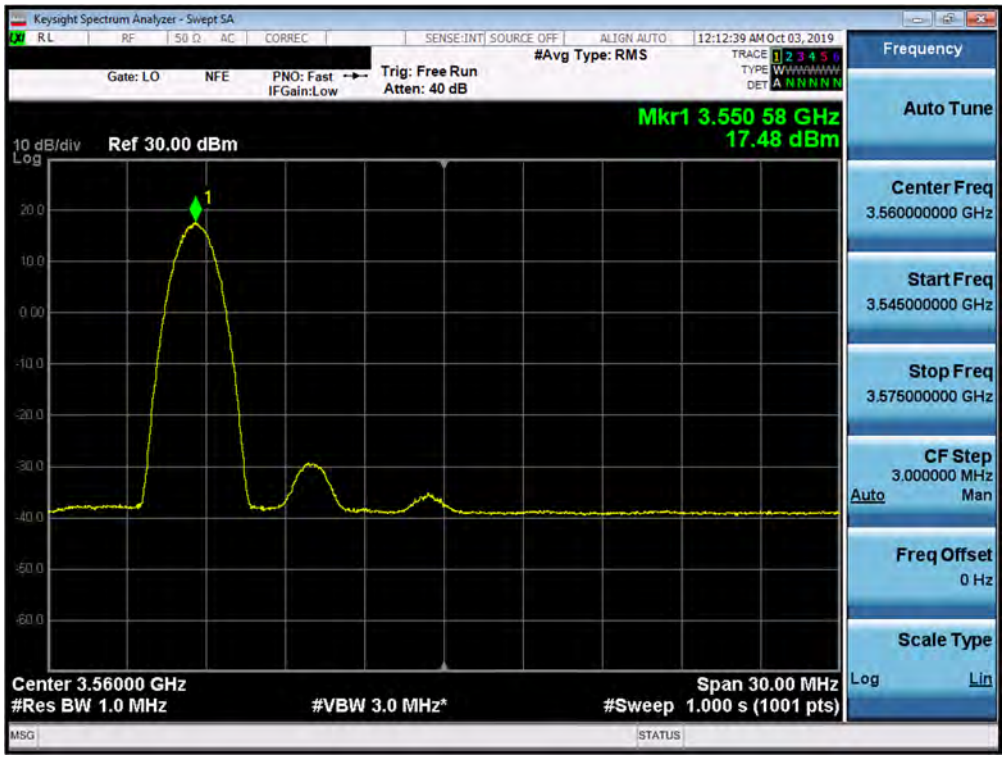
Plot 7-129. Peak Power Spectral Density Plot (B48 – 5.0MHz 64-QAM – High Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



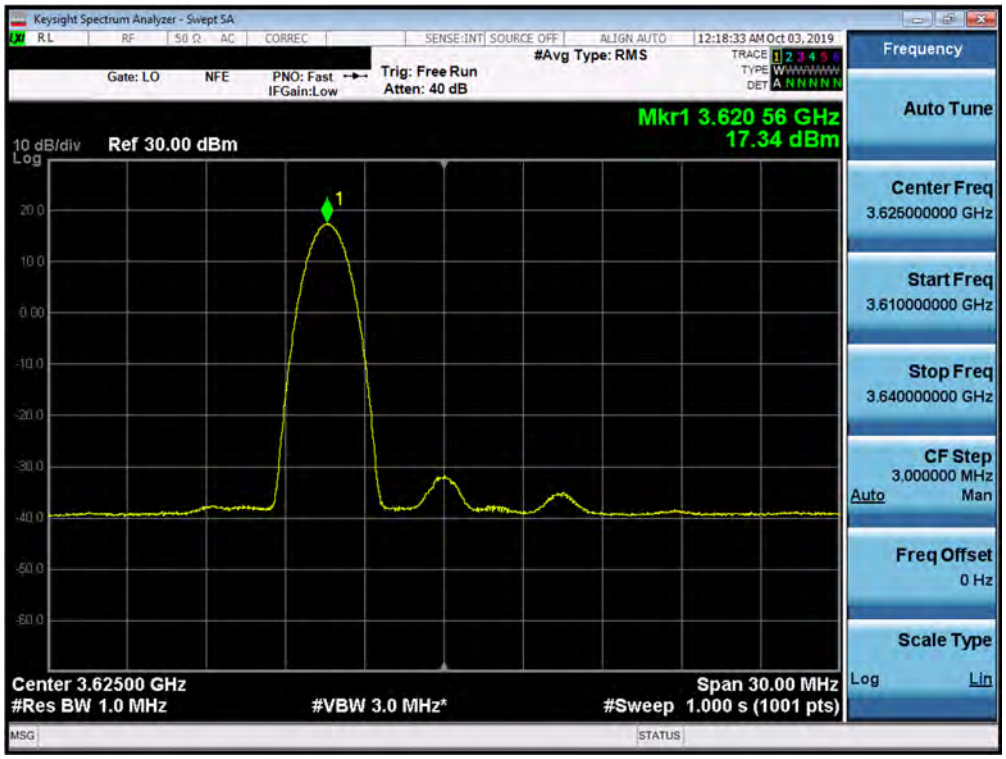
Plot 7-130. Peak Power Spectral Density Plot (B48 – 10.0MHz QPSK – Low Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



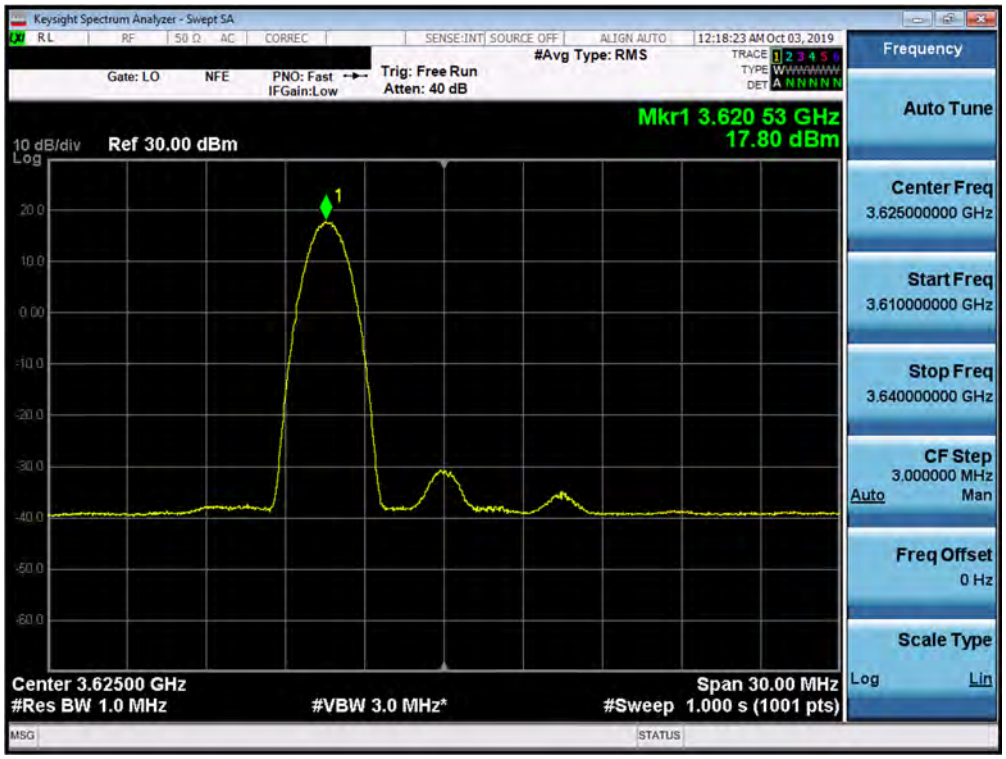
Plot 7-131. Peak Power Spectral Density Plot (B48 – 10.0MHz 16-QAM – Low Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



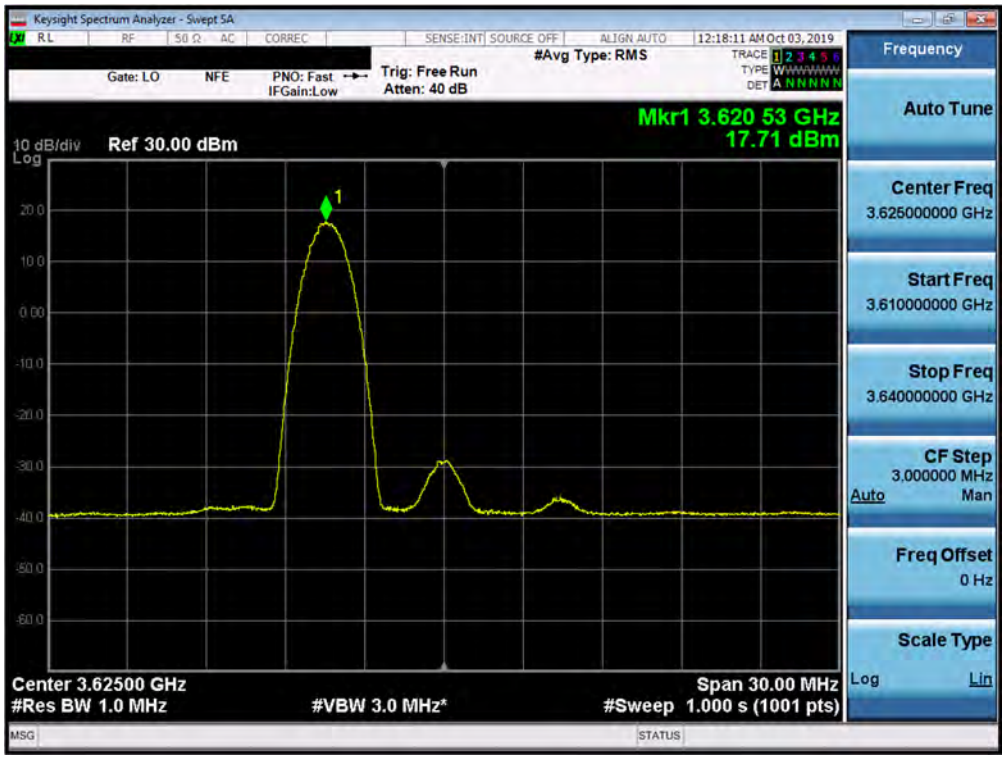
Plot 7-132. Peak Power Spectral Density Plot (B48 – 10.0MHz 64-QAM – Low Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



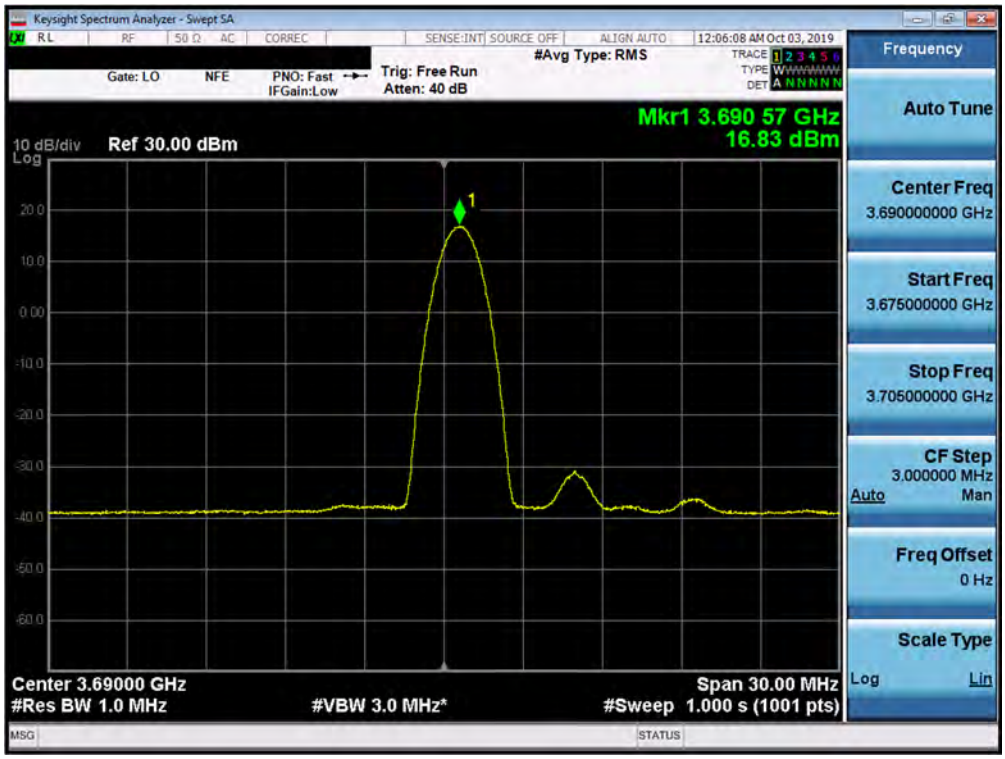
Plot 7-133. Peak Power Spectral Density Plot (B48 – 10.0MHz QPSK – Mid Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



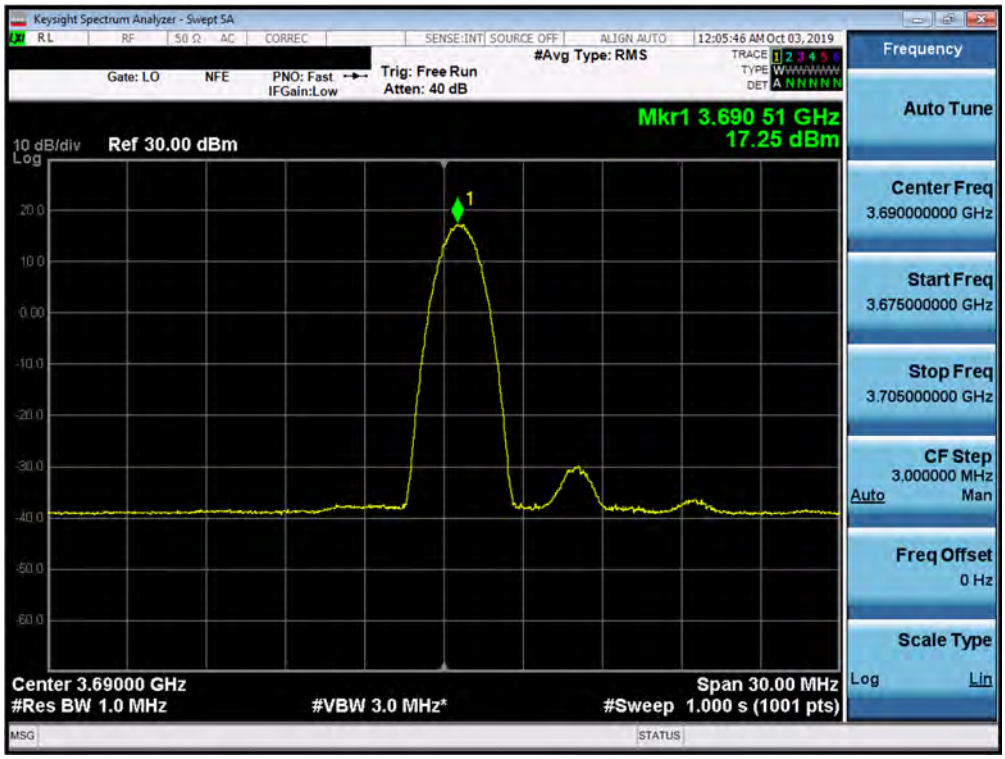
Plot 7-134. Peak Power Spectral Density Plot (B48 – 10.0MHz 16-QAM – Mid Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



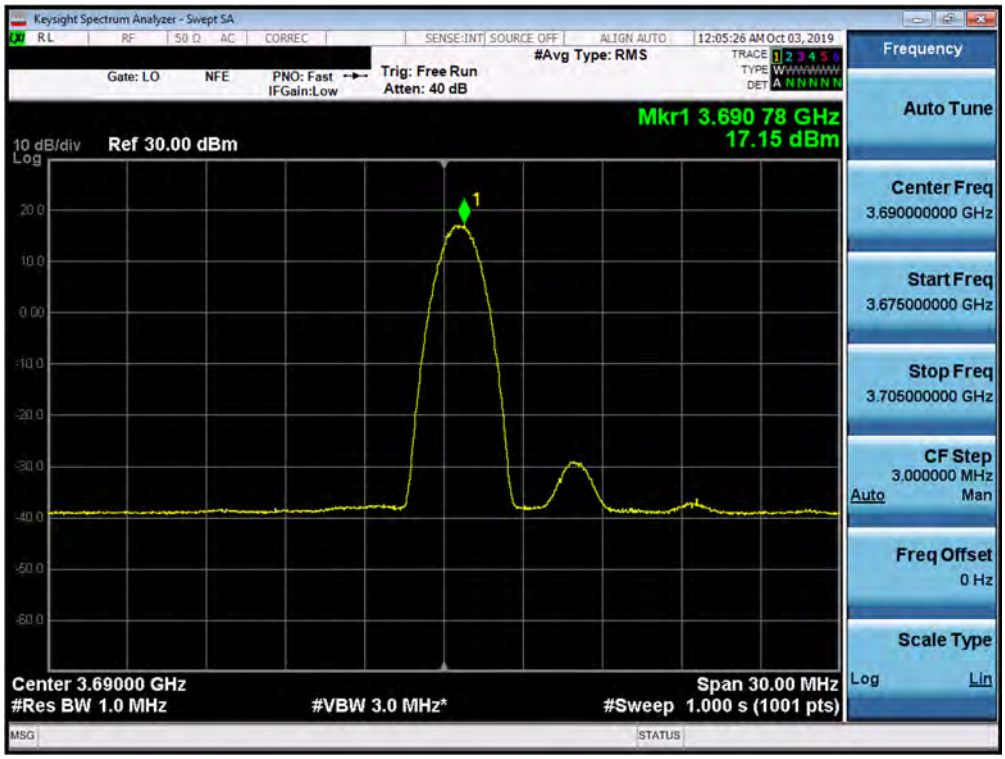
Plot 7-135. Peak Power Spectral Density Plot (B48 – 10.0MHz 64-QAM – Mid Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



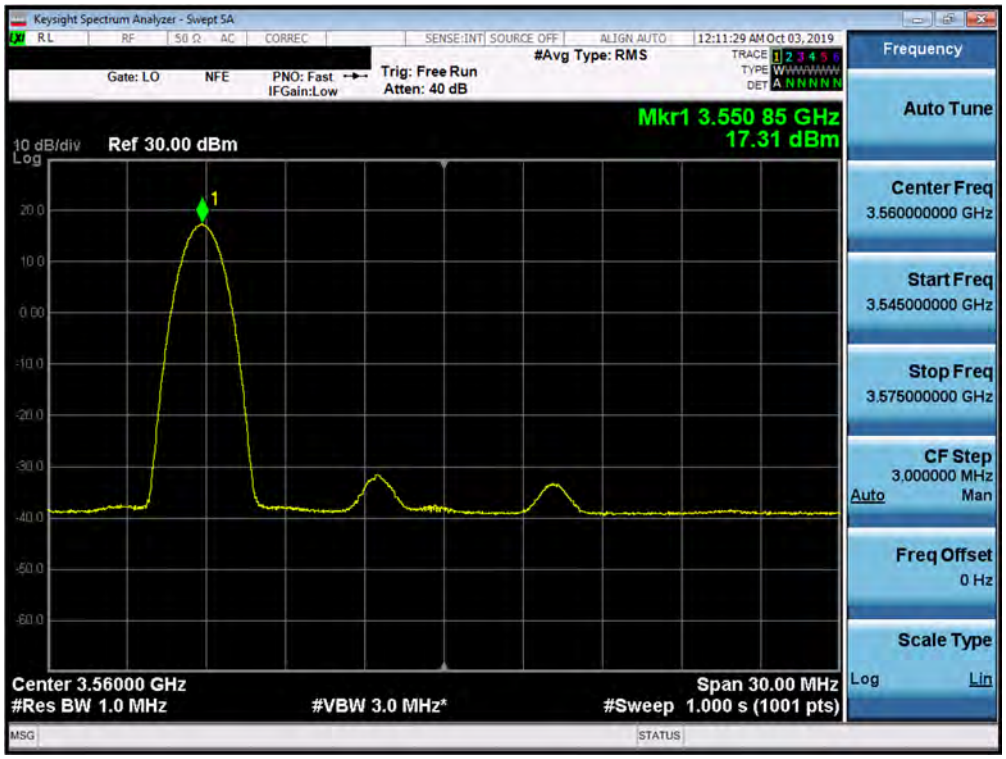
Plot 7-136. Peak Power Spectral Density Plot (B48 – 10.0MHz QPSK – High Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



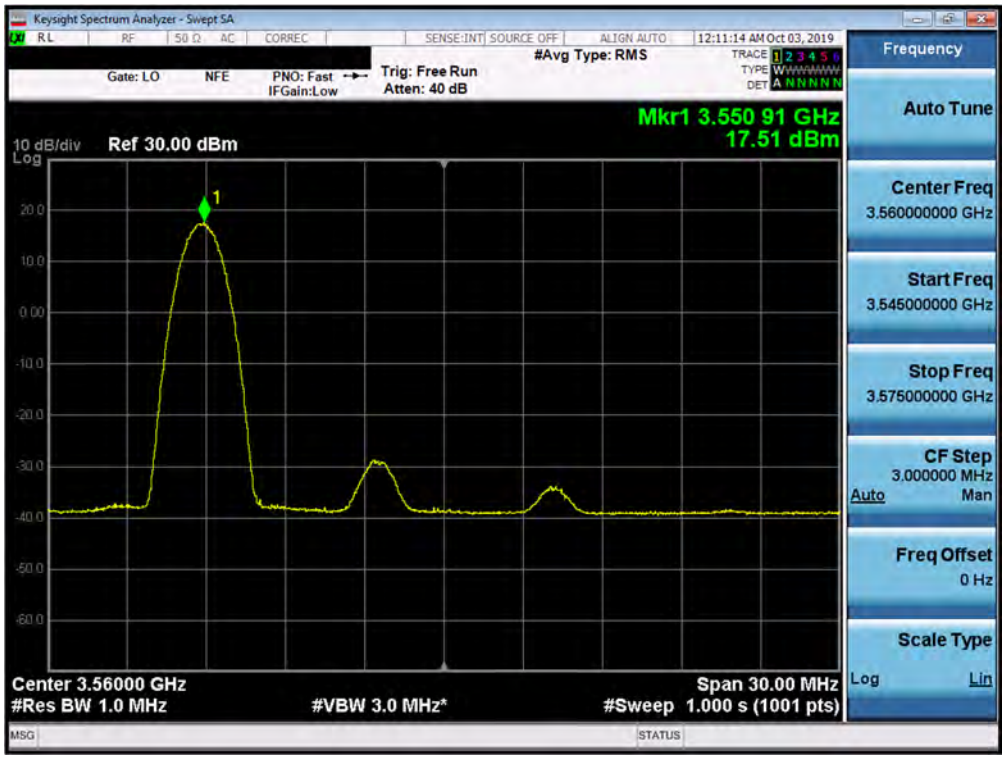
Plot 7-137. Peak Power Spectral Density Plot (B48 – 10.0MHz 16-QAM – High Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



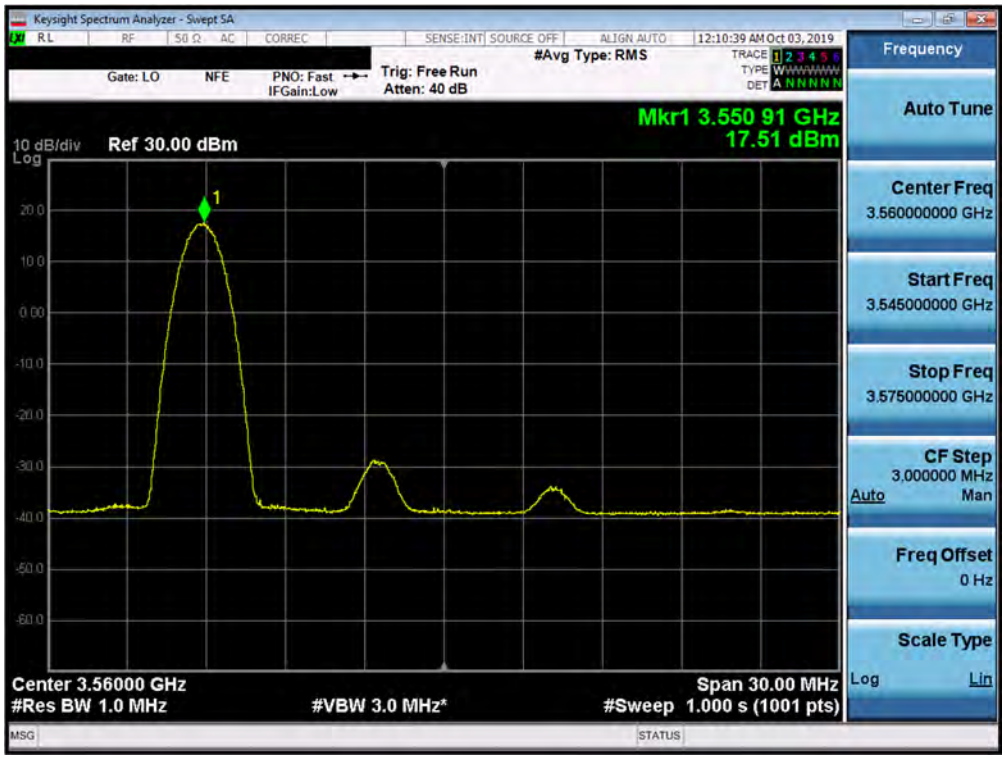
Plot 7-138. Peak Power Spectral Density Plot (B48 – 10.0MHz 64-QAM – High Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



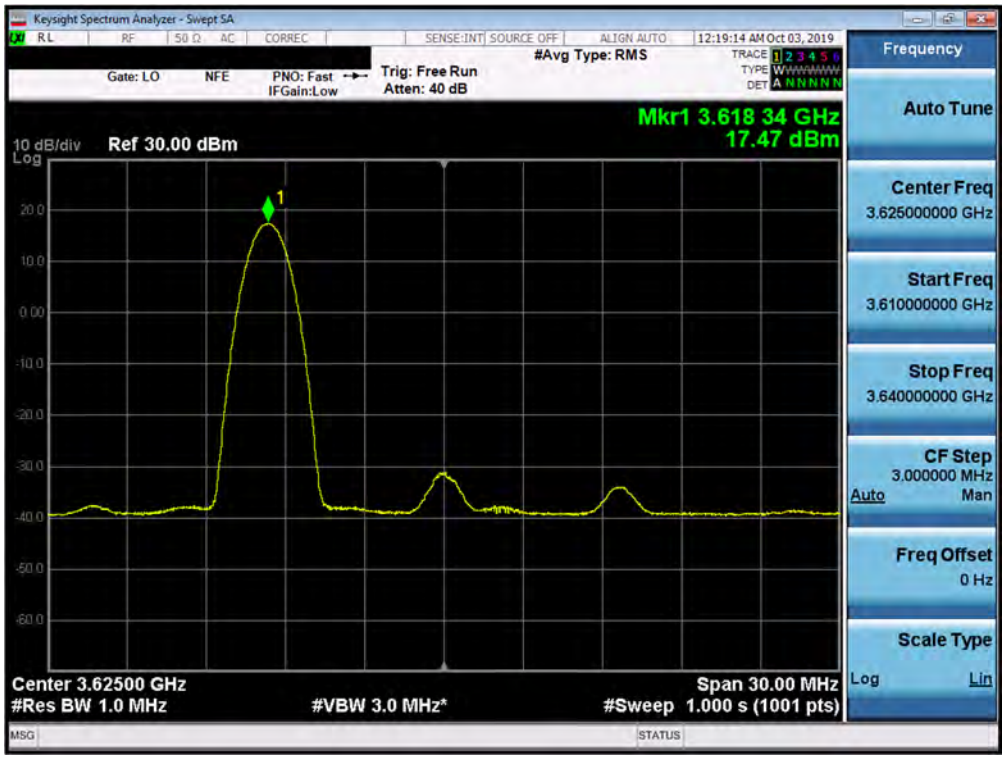
Plot 7-139. Peak Power Spectral Density Plot (B48 – 15.0MHz QPSK – Low Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



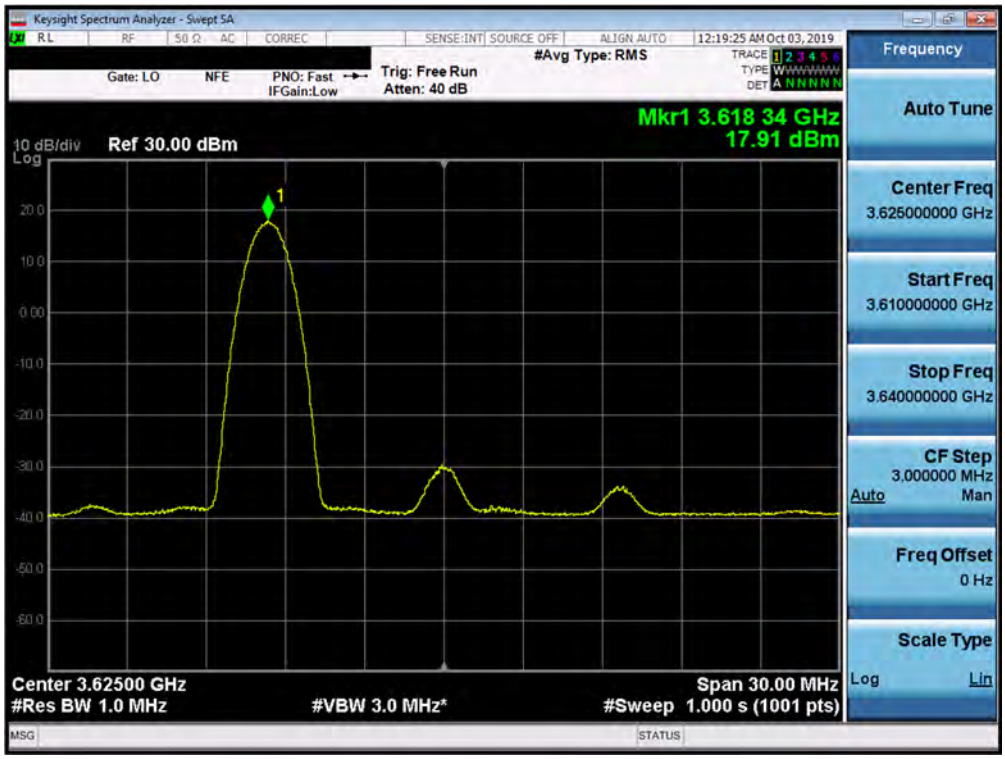
Plot 7-140. Peak Power Spectral Density Plot (B48 – 15.0MHz 16-QAM – Low Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



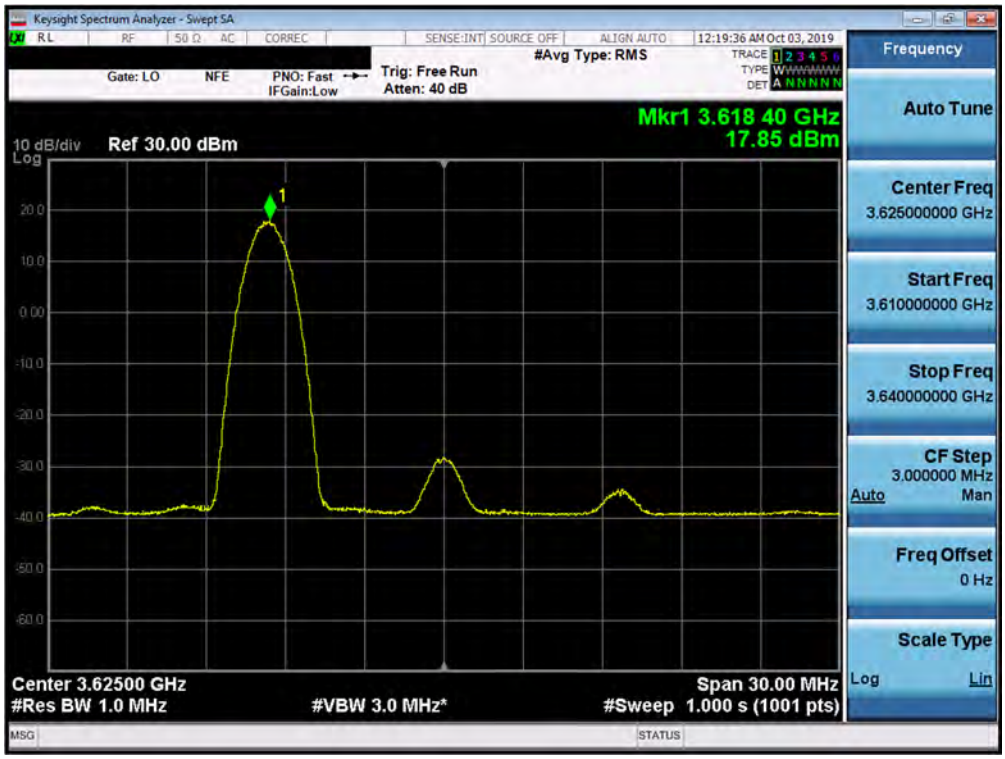
Plot 7-141. Peak Power Spectral Density Plot (B48 – 15.0MHz 64-QAM – Low Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



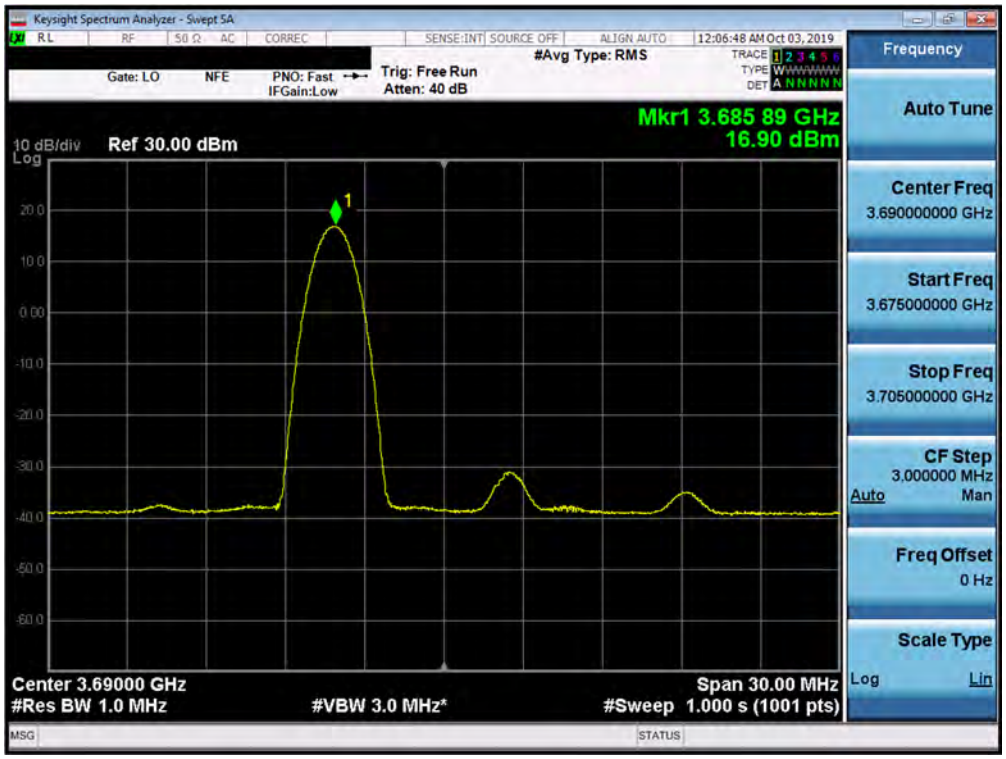
Plot 7-142. Peak Power Spectral Density Plot (B48 – 15.0MHz QPSK – Mid Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



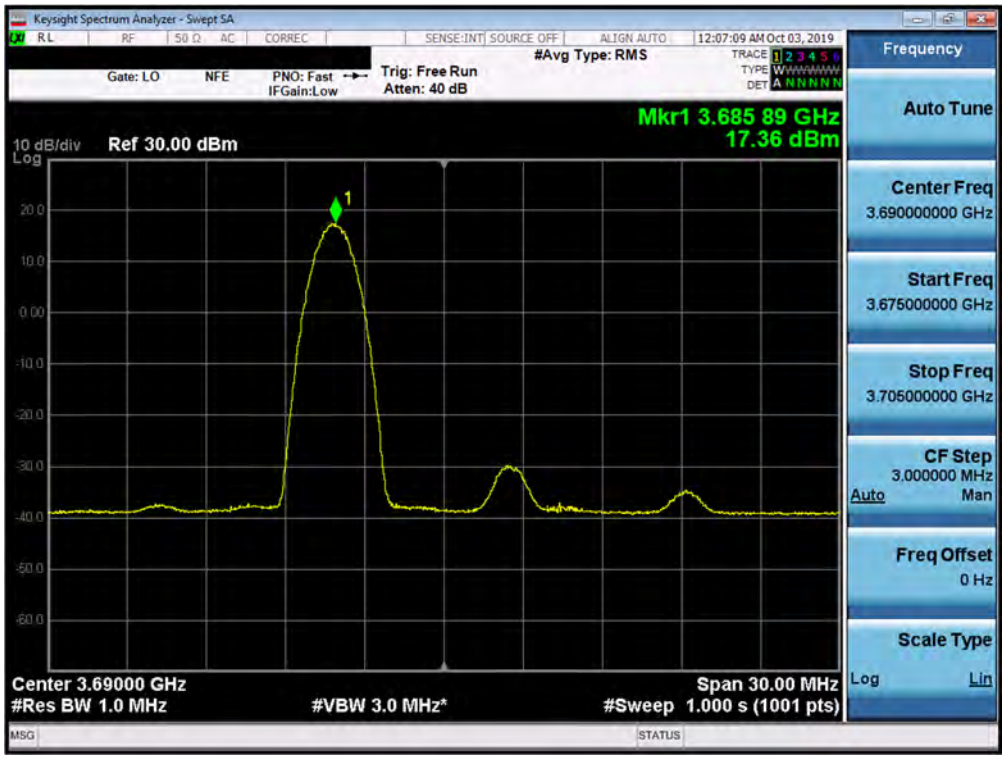
Plot 7-143. Peak Power Spectral Density Plot (B48 – 15.0MHz 16-QAM – Mid Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



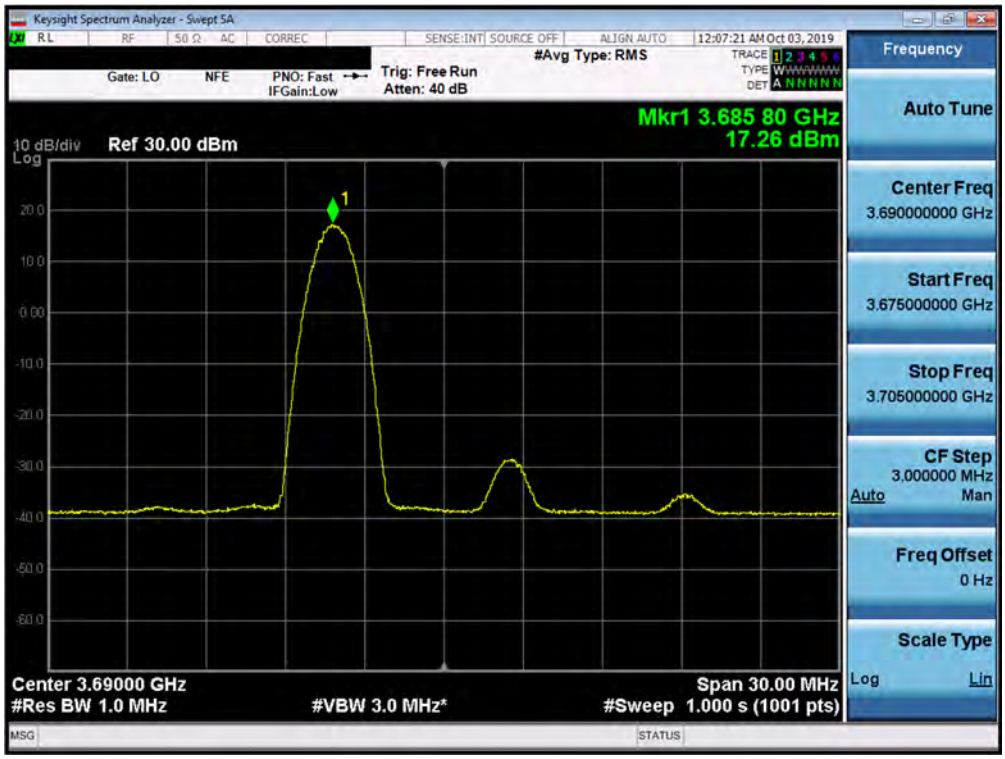
Plot 7-144. Peak Power Spectral Density Plot (B48 – 15.0MHz 64-QAM – Mid Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



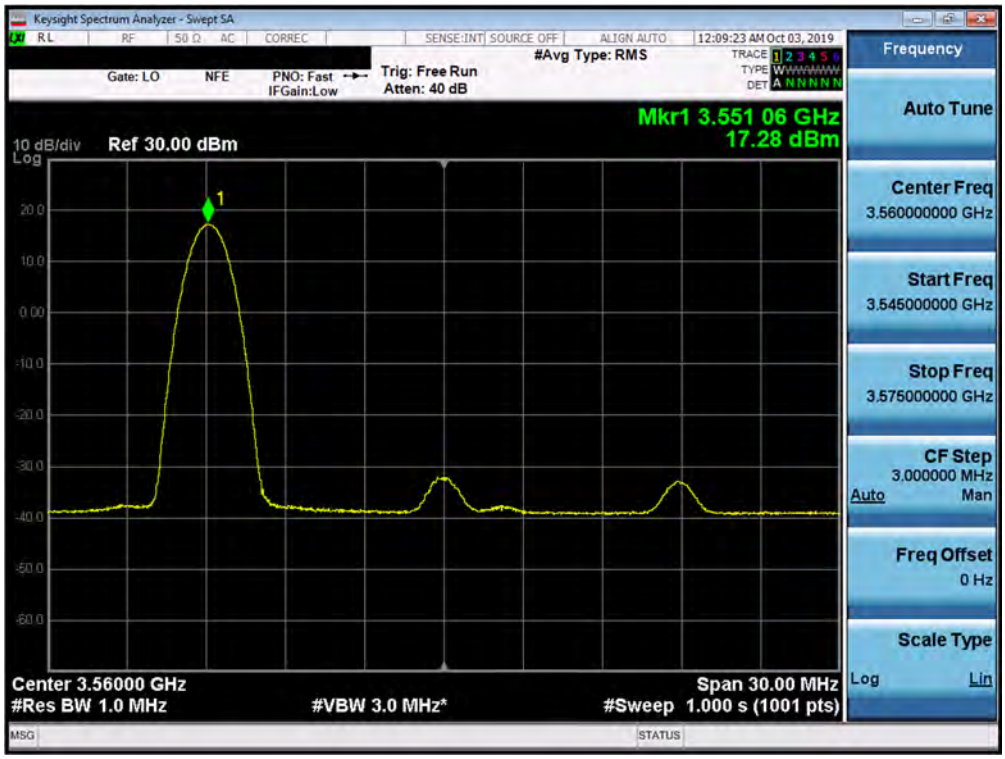
Plot 7-145. Peak Power Spectral Density Plot (B48 – 15.0MHz QPSK – High Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



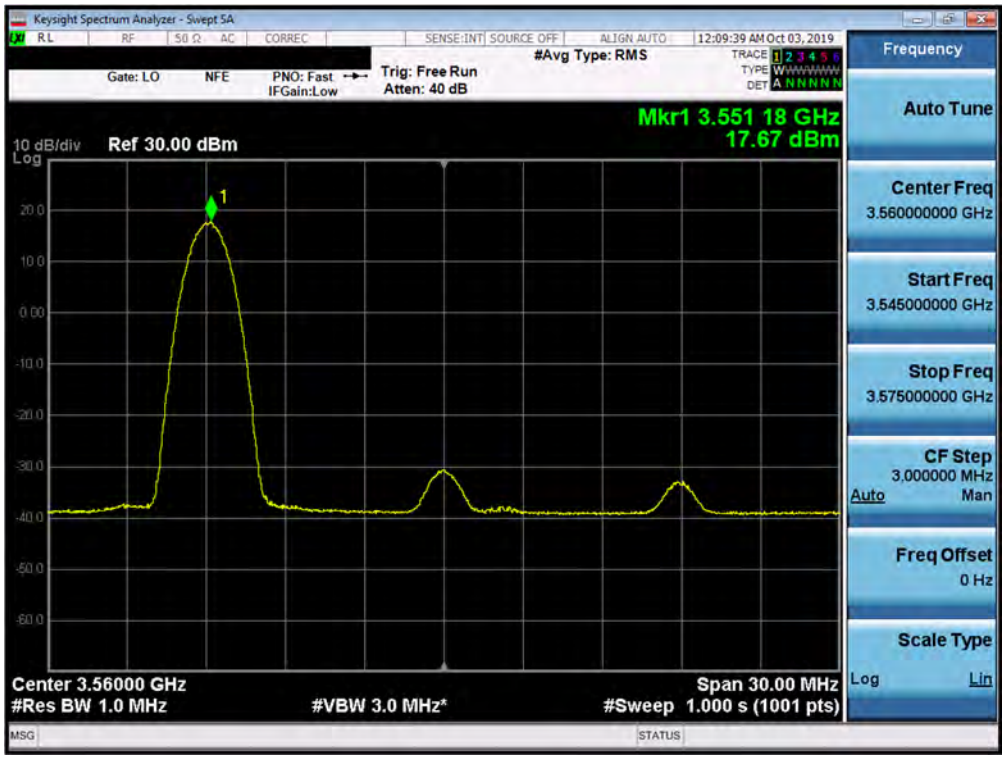
Plot 7-146. Peak Power Spectral Density Plot (B48 – 15.0MHz 16-QAM – High Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



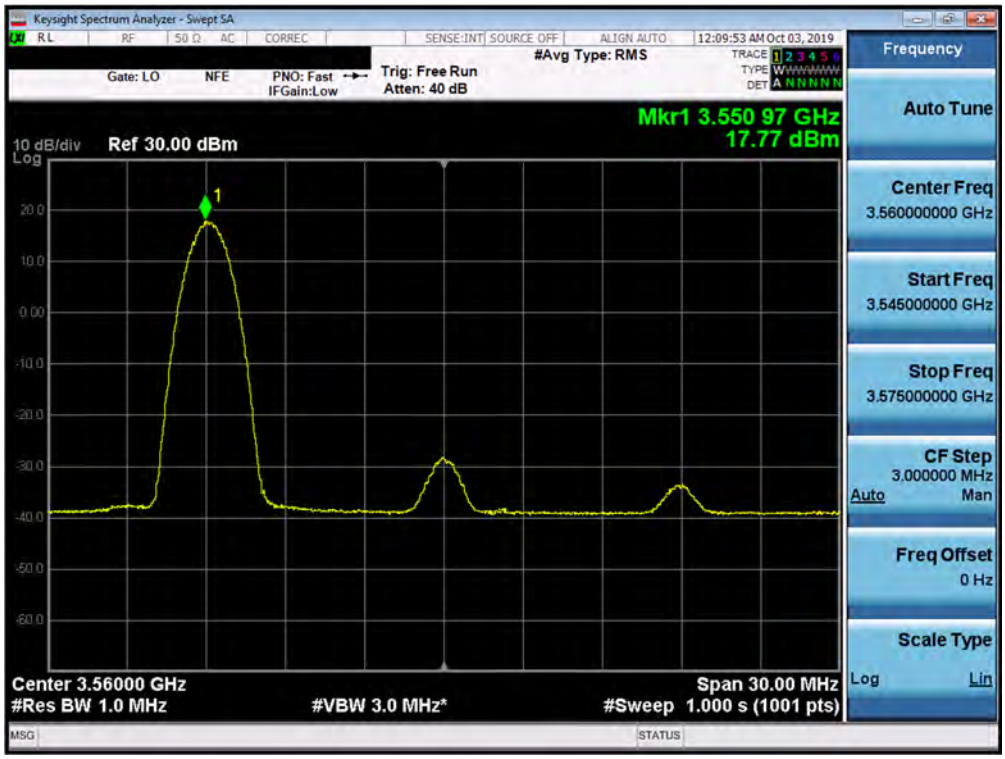
Plot 7-147. Peak Power Spectral Density Plot (B48 – 15.0MHz 64-QAM – High Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



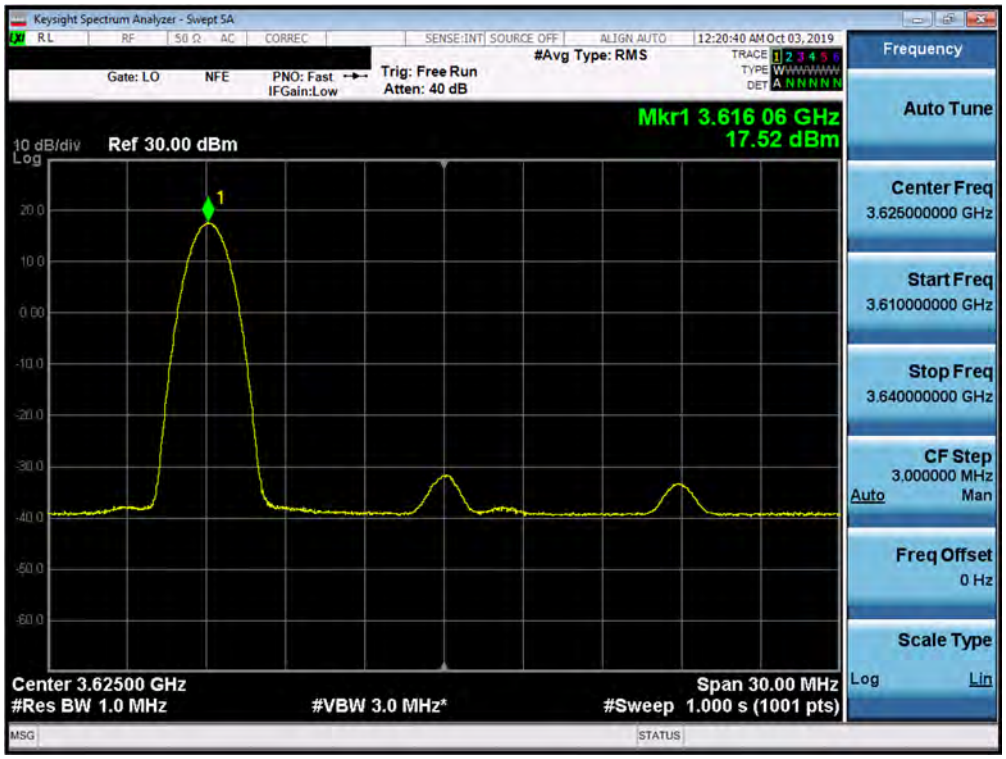
Plot 7-148. Peak Power Spectral Density Plot (B48 – 20.0MHz QPSK – Low Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



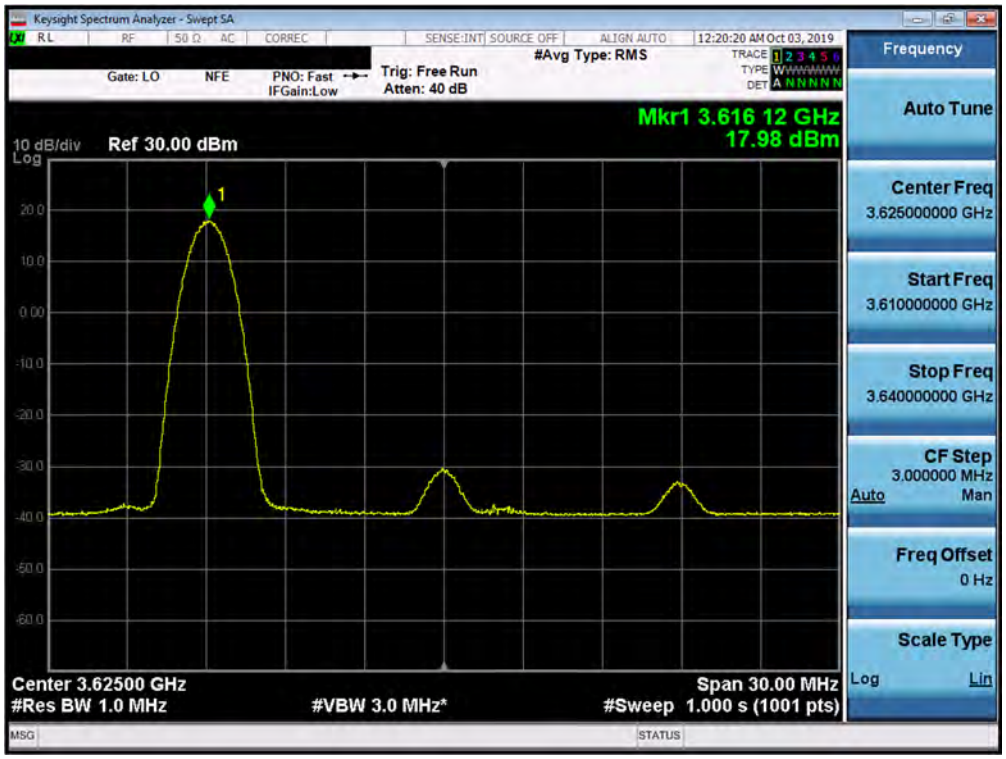
Plot 7-149. Peak Power Spectral Density Plot (B48 – 20.0MHz 16-QAM – Low Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



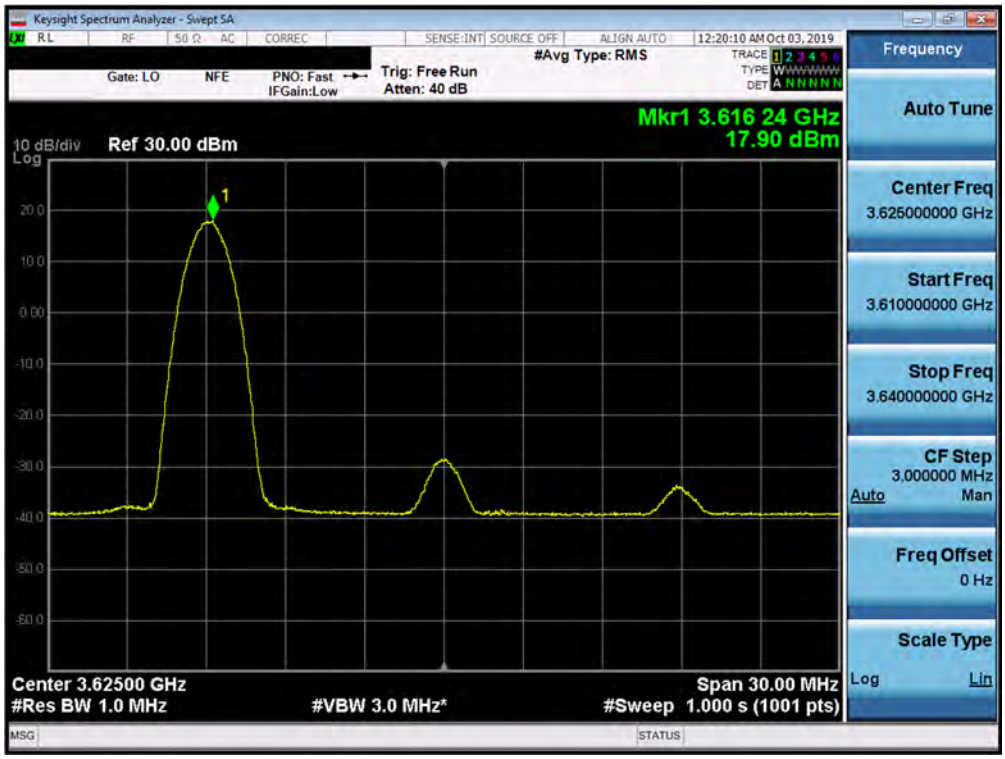
Plot 7-150. Peak Power Spectral Density Plot (B48 – 20.0MHz 64-QAM – Low Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



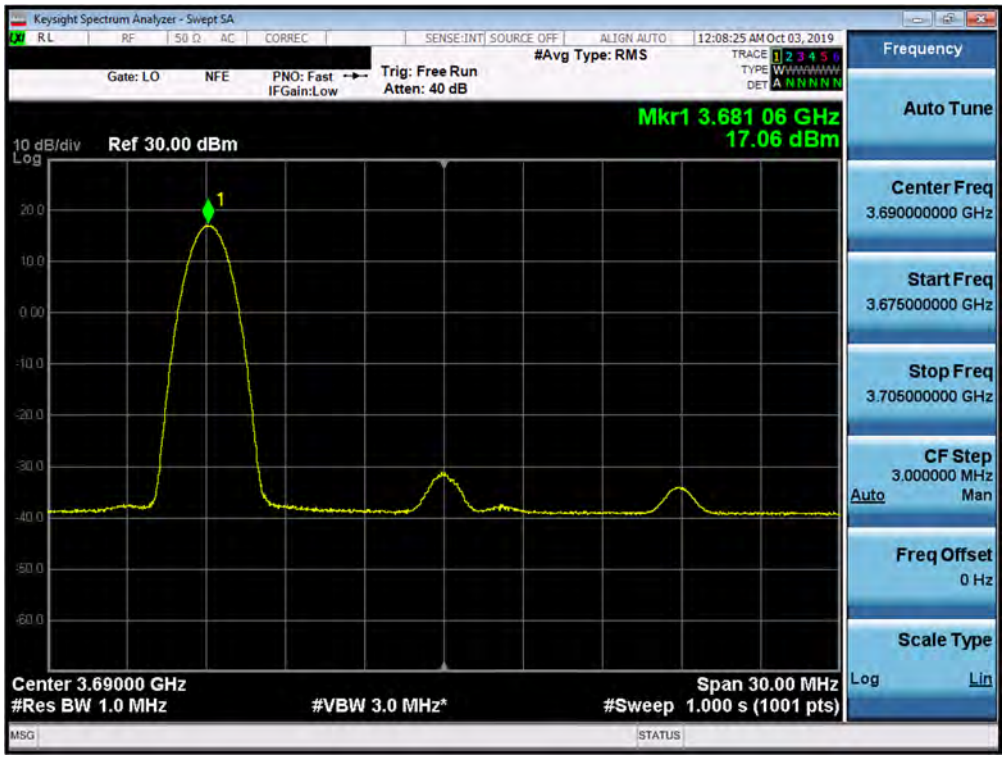
Plot 7-151. Peak Power Spectral Density Plot (B48 – 20.0MHz QPSK – Mid Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



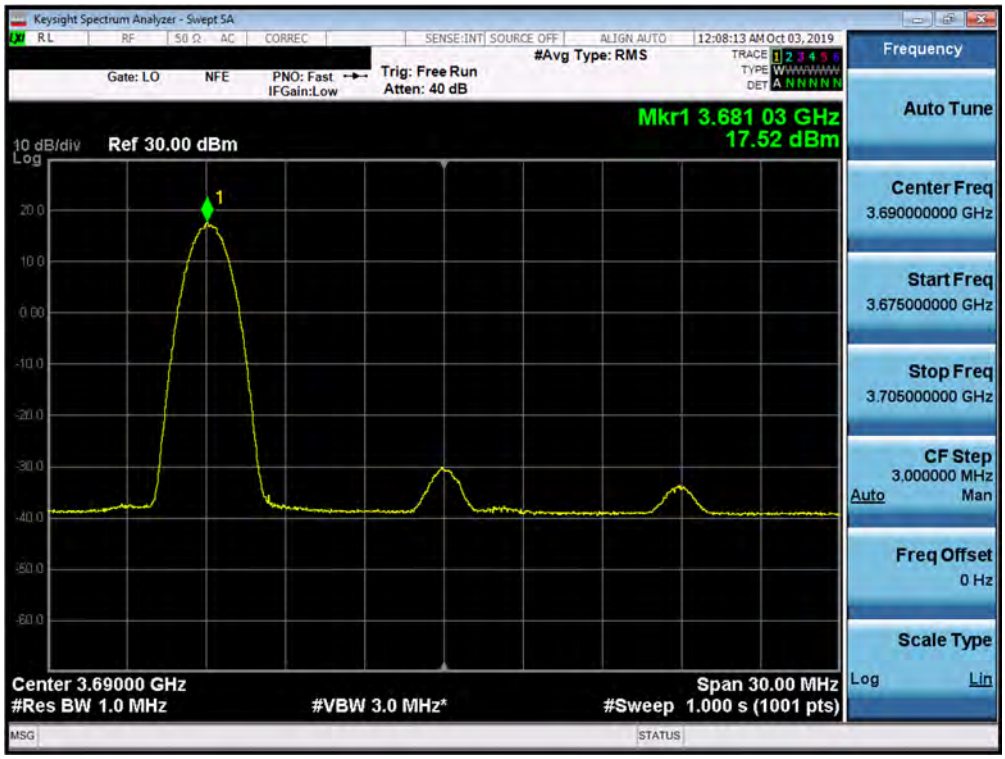
Plot 7-152. Peak Power Spectral Density Plot (B48 – 20.0MHz 16-QAM – Mid Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



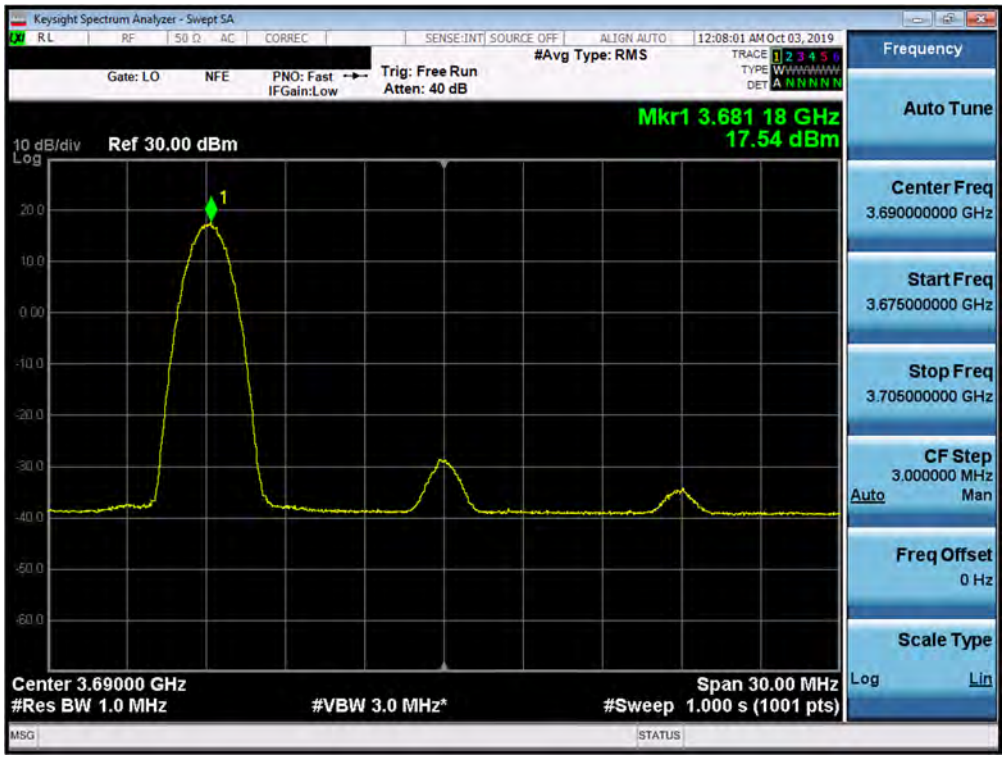
Plot 7-153. Peak Power Spectral Density Plot (B48 – 20.0MHz 64-QAM – Mid Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



Plot 7-154. Peak Power Spectral Density Plot (B48 – 20.0MHz QPSK – High Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



Plot 7-155. Peak Power Spectral Density Plot (B48 – 20.0MHz 16-QAM – High Channel RB: 1 RB, Offset: 0 – Diversity Antenna)



Plot 7-156. Peak Power Spectral Density Plot (B48 – 20.0MHz 64-QAM – High Channel RB: 1 RB, Offset: 0 – Diversity Antenna)

7.6 Peak-Average Ratio

§96.41(g)

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

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 two million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed.
6. An RF-Burst triggering method ensured measurement in the on time of the signal.

Test Setup

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

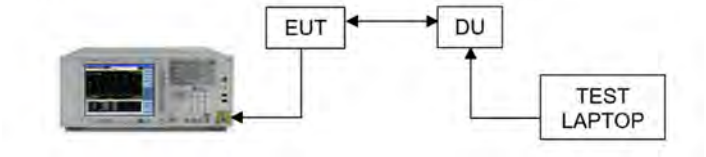
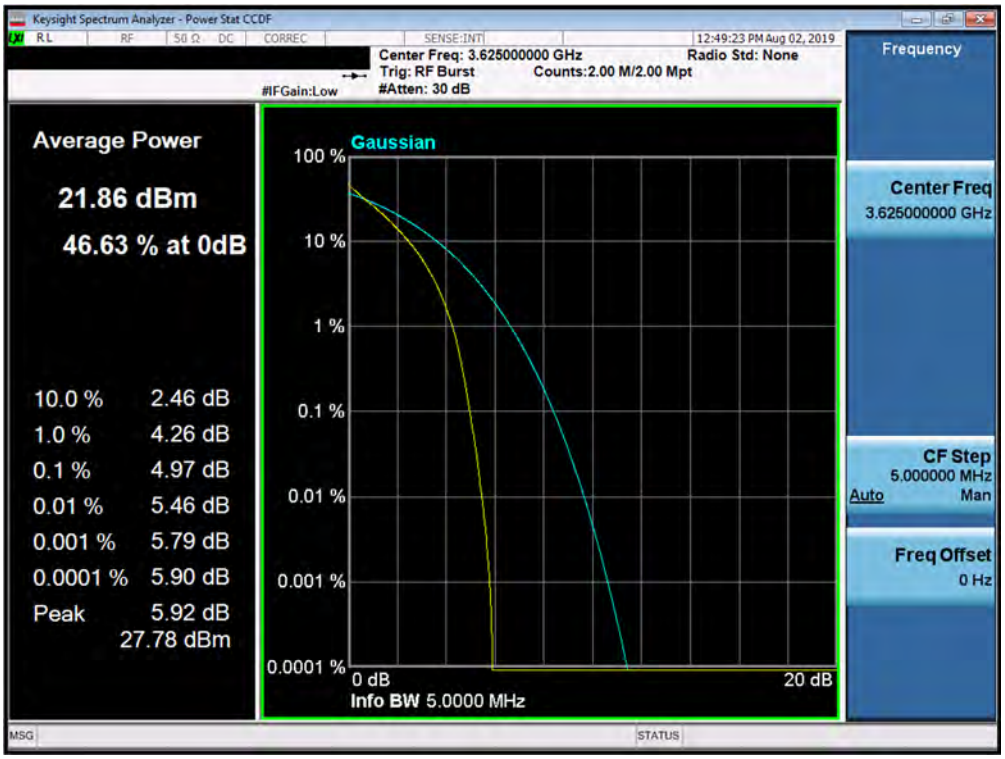


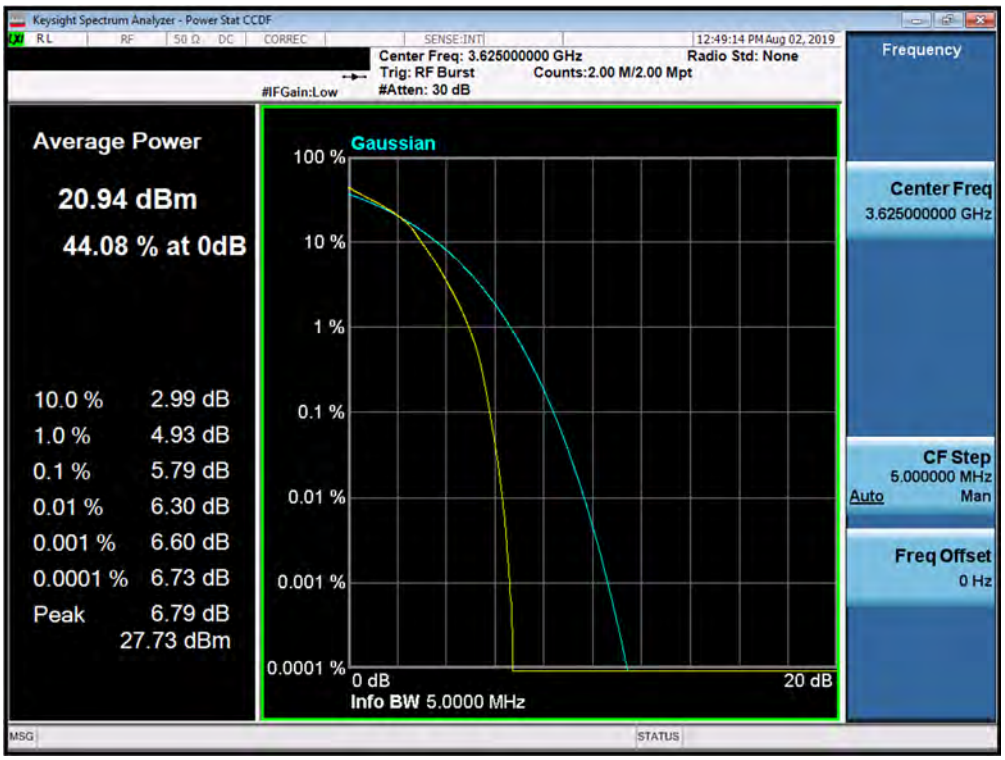
Figure 7-5. Test Instrument & Measurement Setup

Test Notes

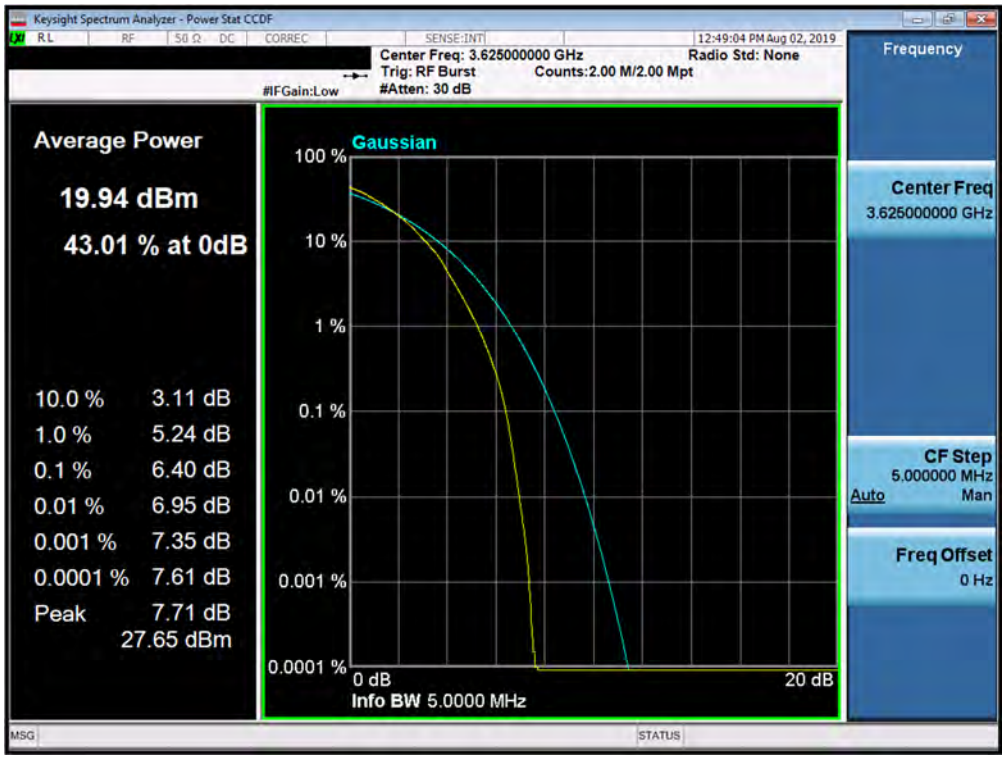
None



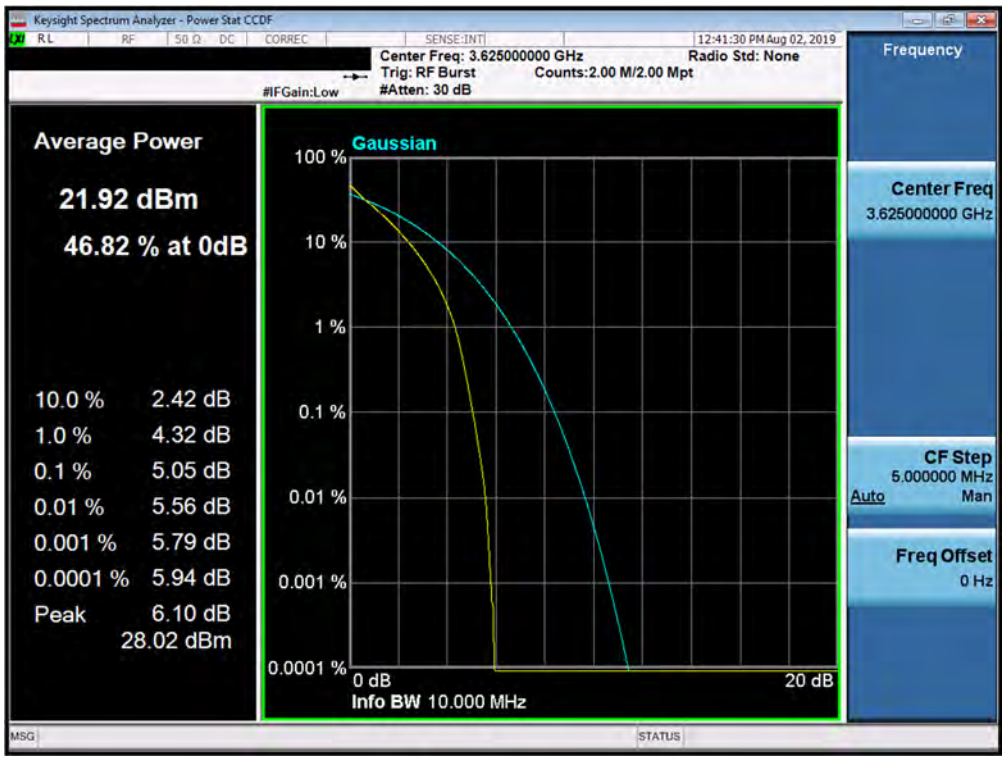
Plot 7-157. PAR Plot (Band 48 – 5.0MHz QPSK – Full RB Configuration – Main Antenna)



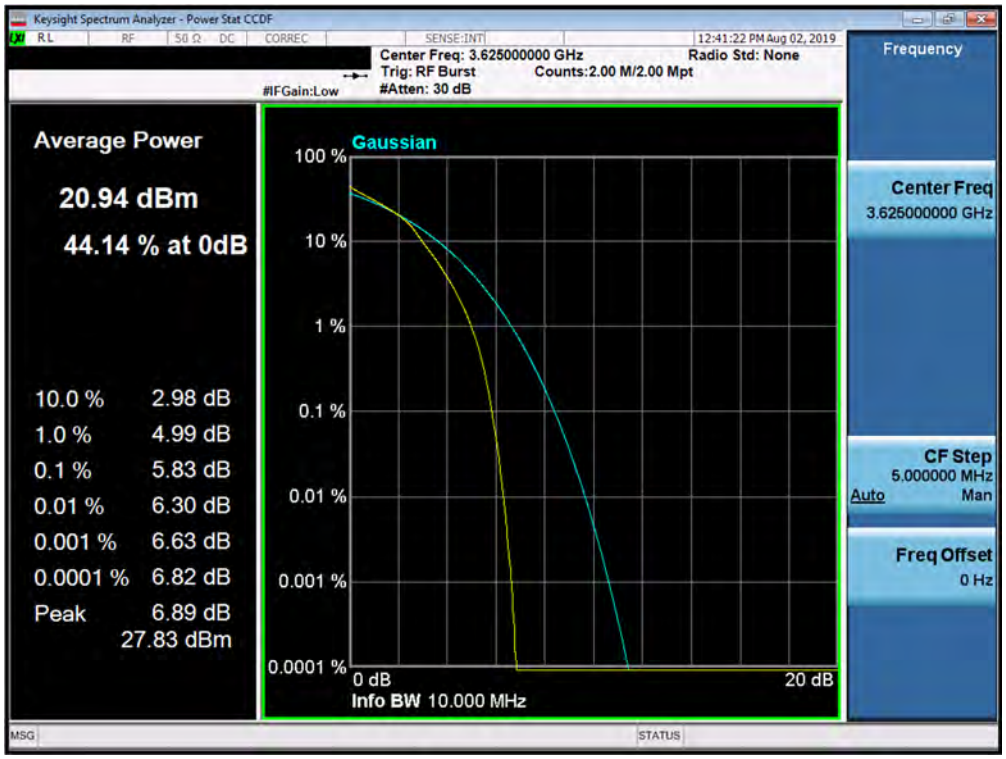
Plot 7-158. PAR Plot (Band 48 – 5.0MHz 16-QAM – Full RB Configuration – Main Antenna)



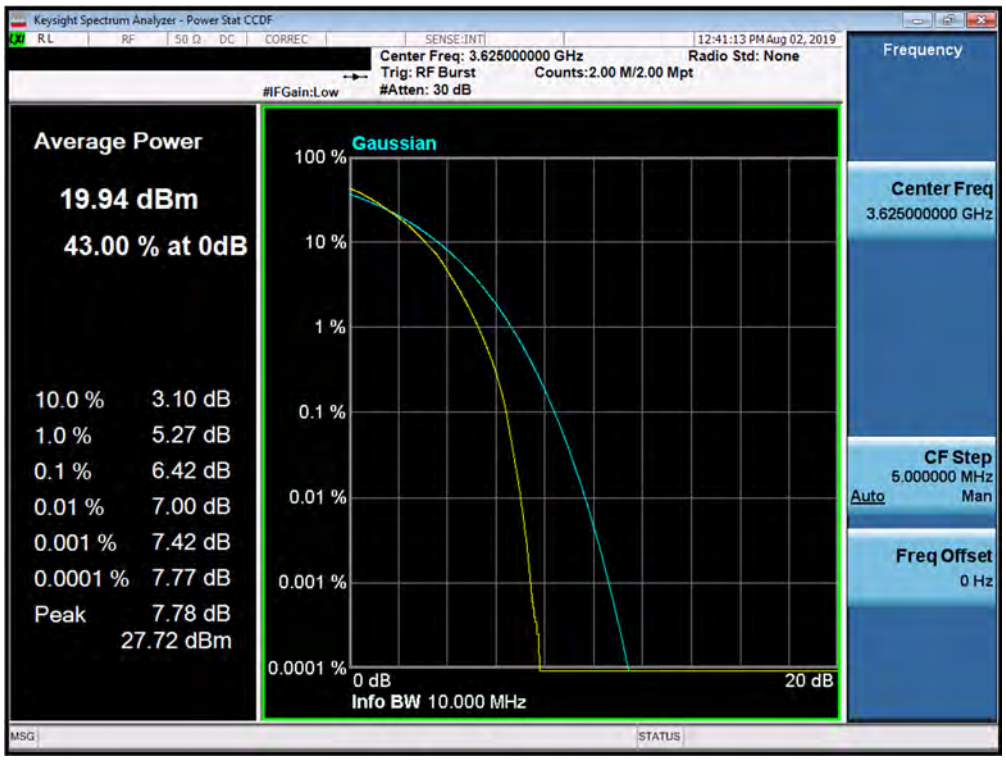
Plot 7-159. PAR Plot (Band 48 – 5.0MHz 64-QAM – Full RB Configuration – Main Antenna)



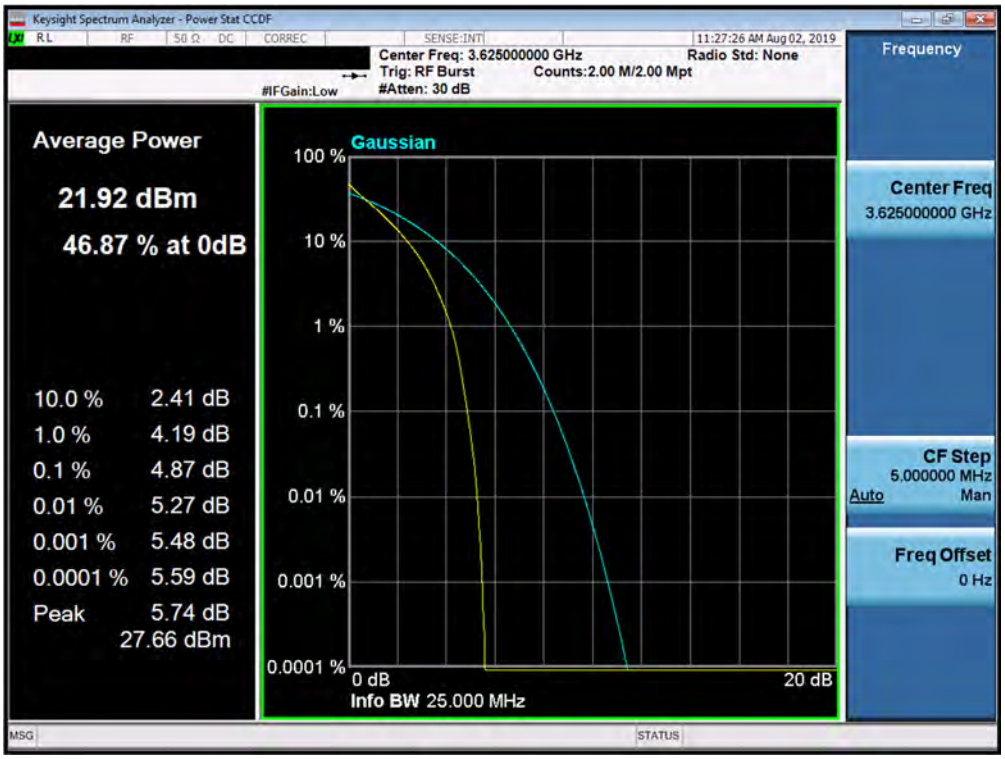
Plot 7-160. PAR Plot (Band 48 – 10.0MHz QPSK – Full RB Configuration – Main Antenna)



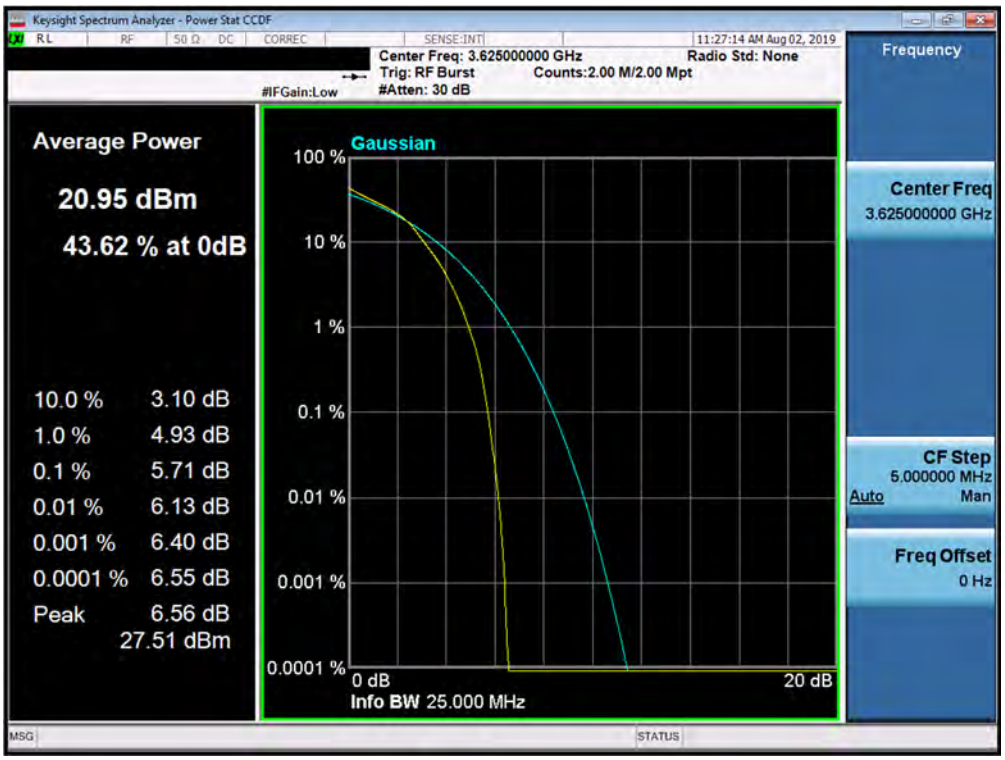
Plot 7-161. PAR Plot (Band 48 – 10.0MHz 16-QAM – Full RB Configuration – Main Antenna)



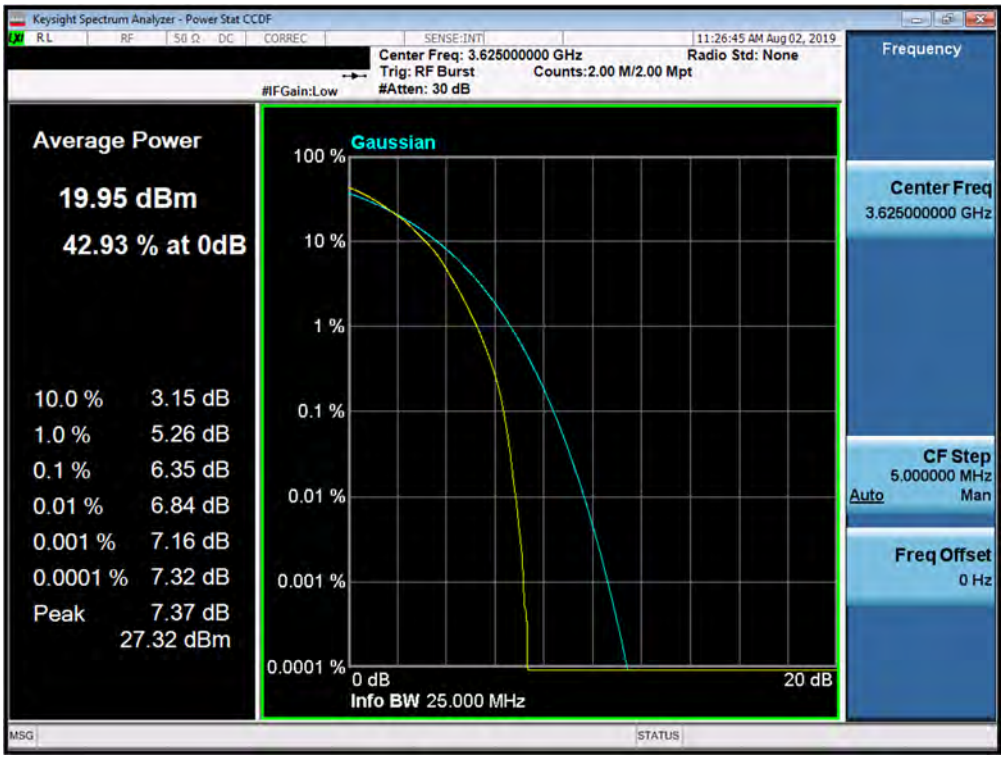
Plot 7-162. PAR Plot (Band 48 – 10.0MHz 64-QAM – Full RB Configuration – Main Antenna)



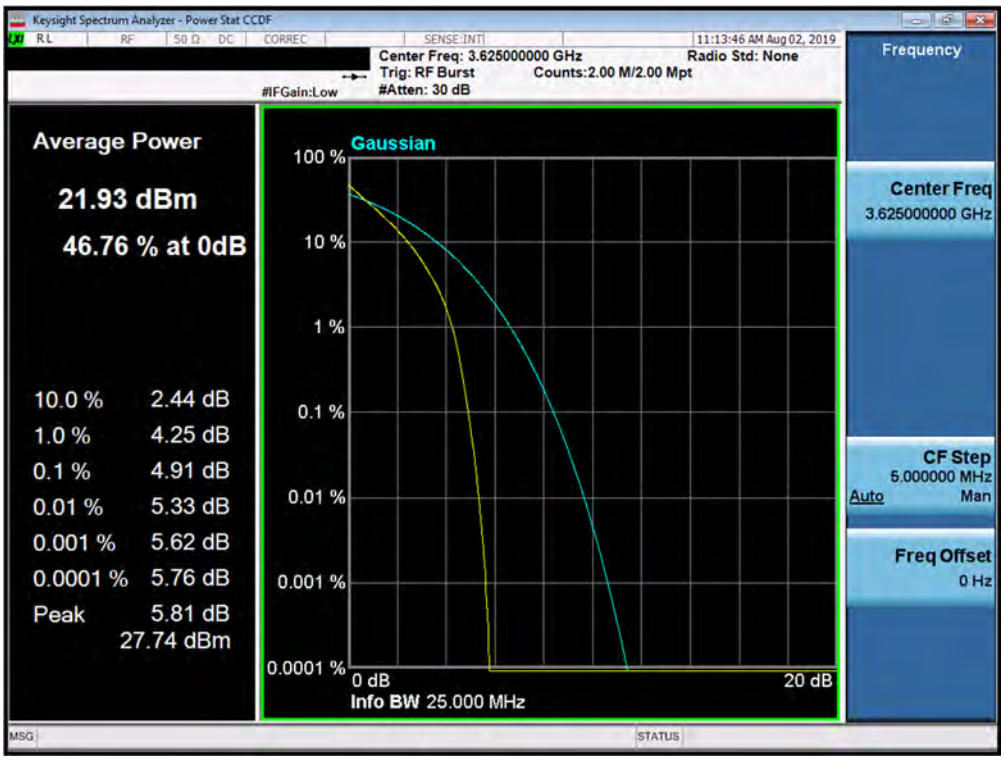
Plot 7-163. PAR Plot (Band 48 – 15.0MHz QPSK – Full RB Configuration – Main Antenna)



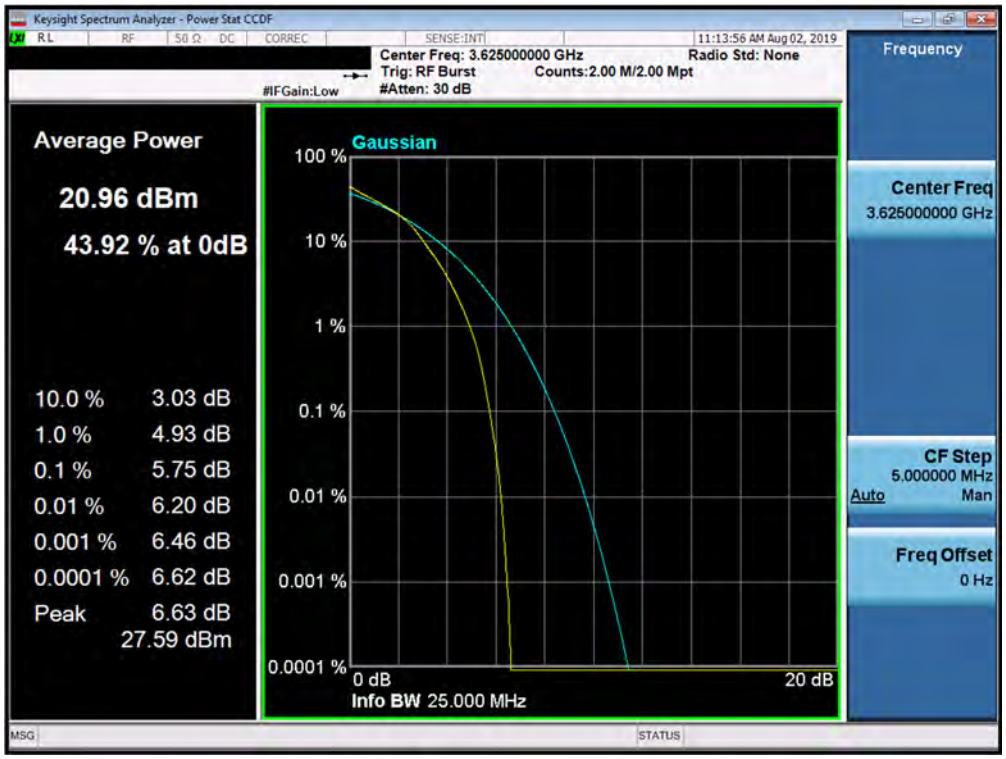
Plot 7-164. PAR Plot (Band 48 – 15.0MHz 16-QAM – Full RB Configuration – Main Antenna)



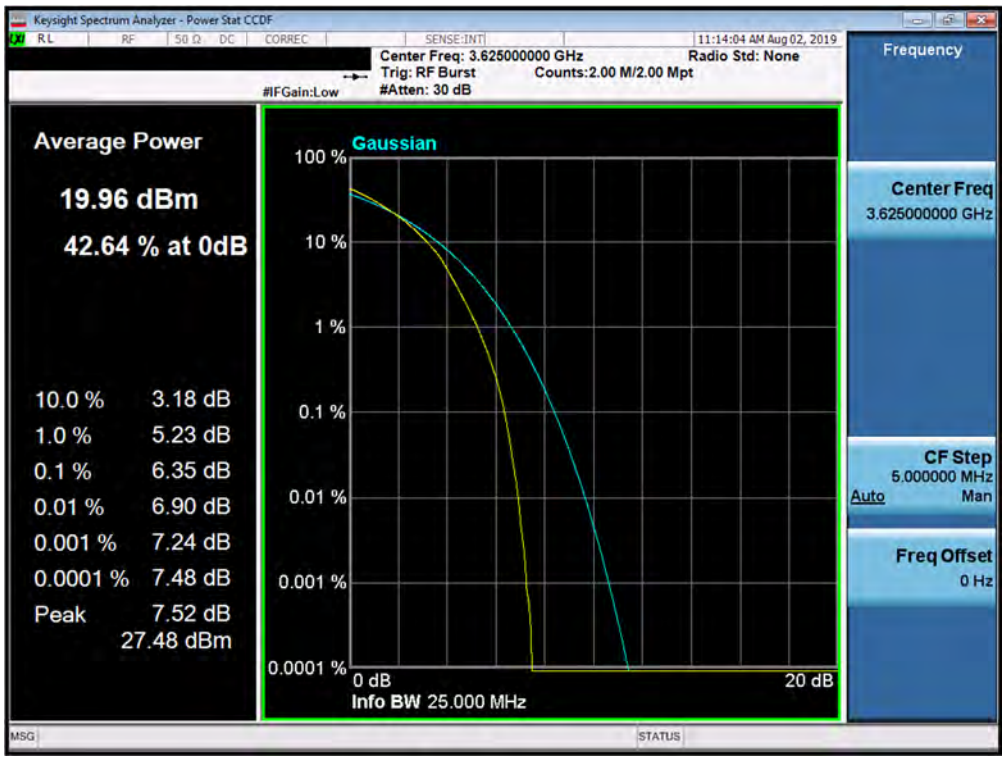
Plot 7-165. PAR Plot (Band 48 – 15.0MHz 64-QAM – Full RB Configuration – Main Antenna)



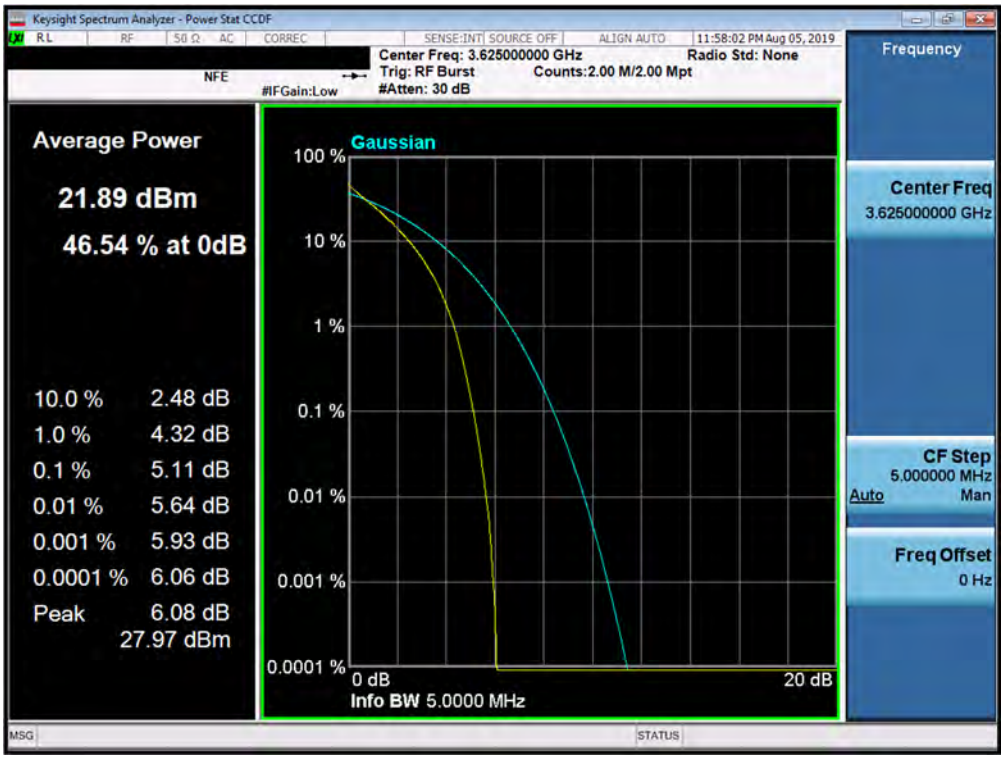
Plot 7-166. PAR Plot (Band 48 – 20.0MHz QPSK – Full RB Configuration – Main Antenna)



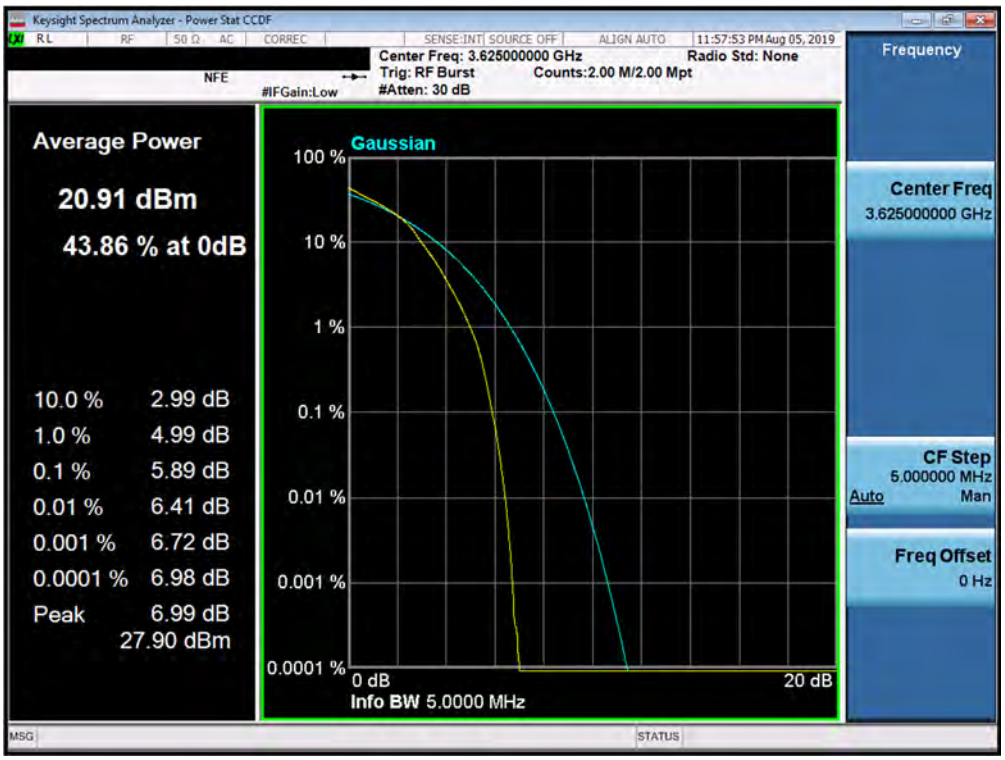
Plot 7-167. PAR Plot (Band 48 – 20.0MHz 16-QAM – Full RB Configuration – Main Antenna)



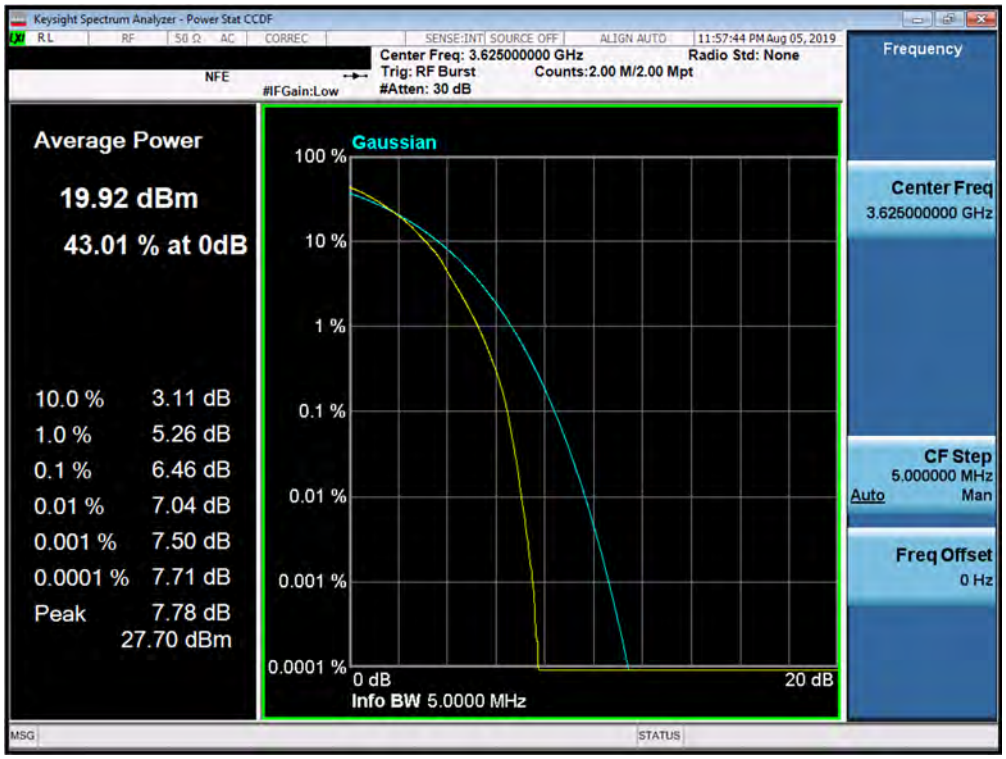
Plot 7-168. PAR Plot (Band 48 – 20.0MHz 64-QAM – Full RB Configuration – Main Antenna)



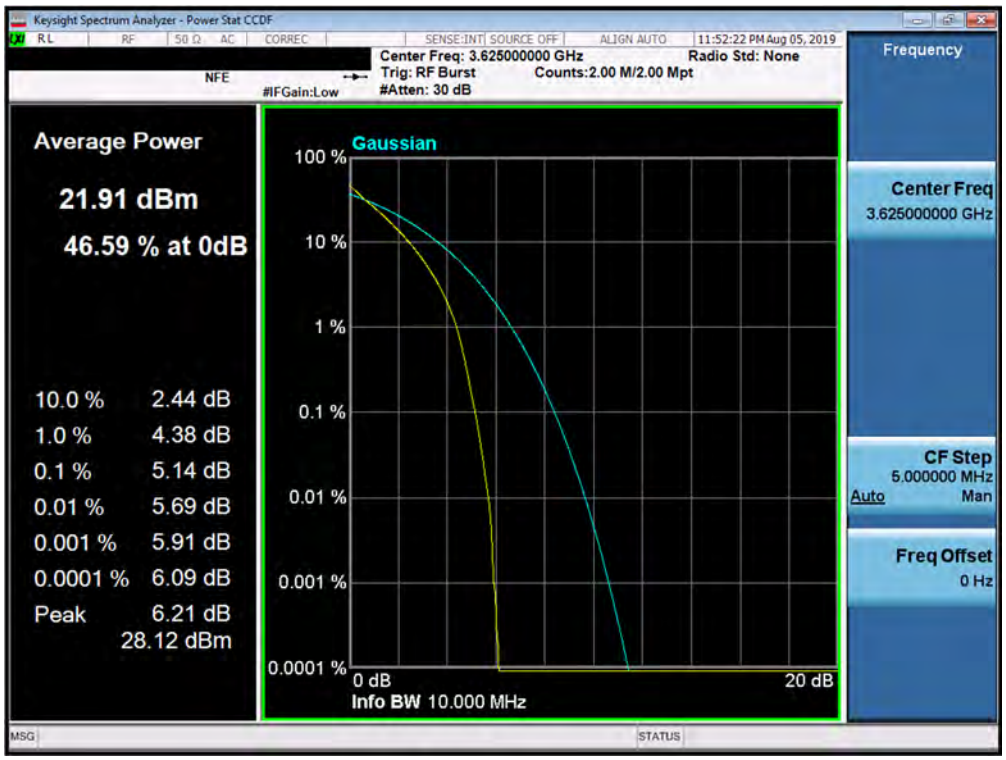
Plot 7-169. PAR Plot (Band 48 – 5.0MHz QPSK – Full RB Configuration – Diversity Antenna)



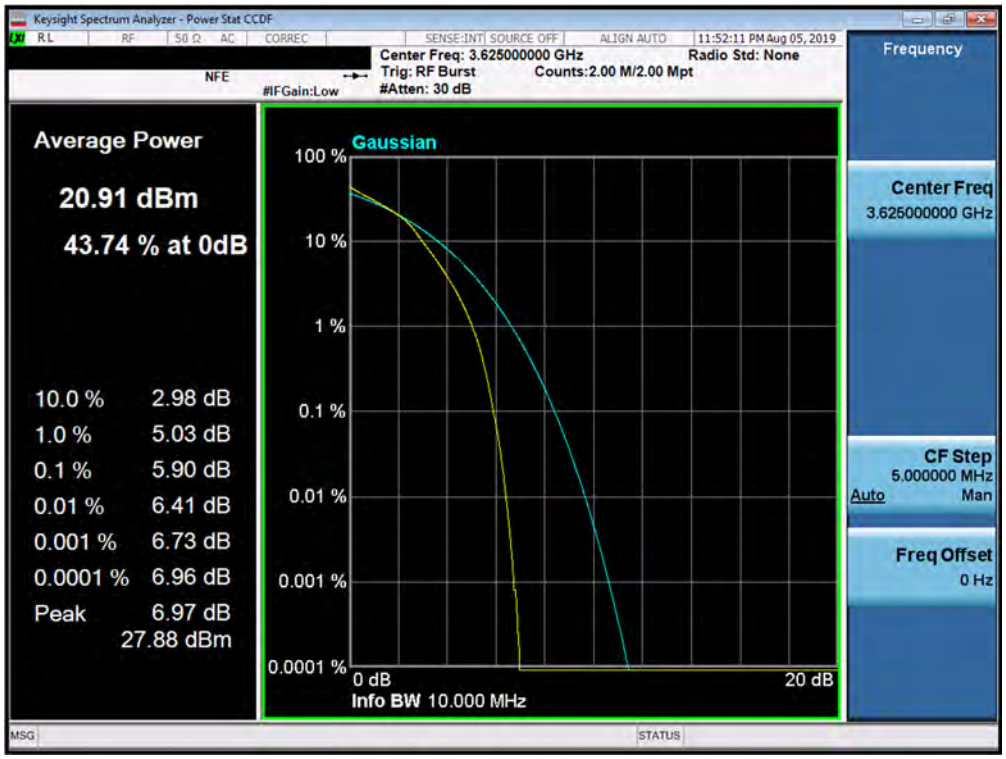
Plot 7-170. PAR Plot (Band 48 – 5.0MHz 16-QAM – Full RB Configuration – Diversity Antenna)



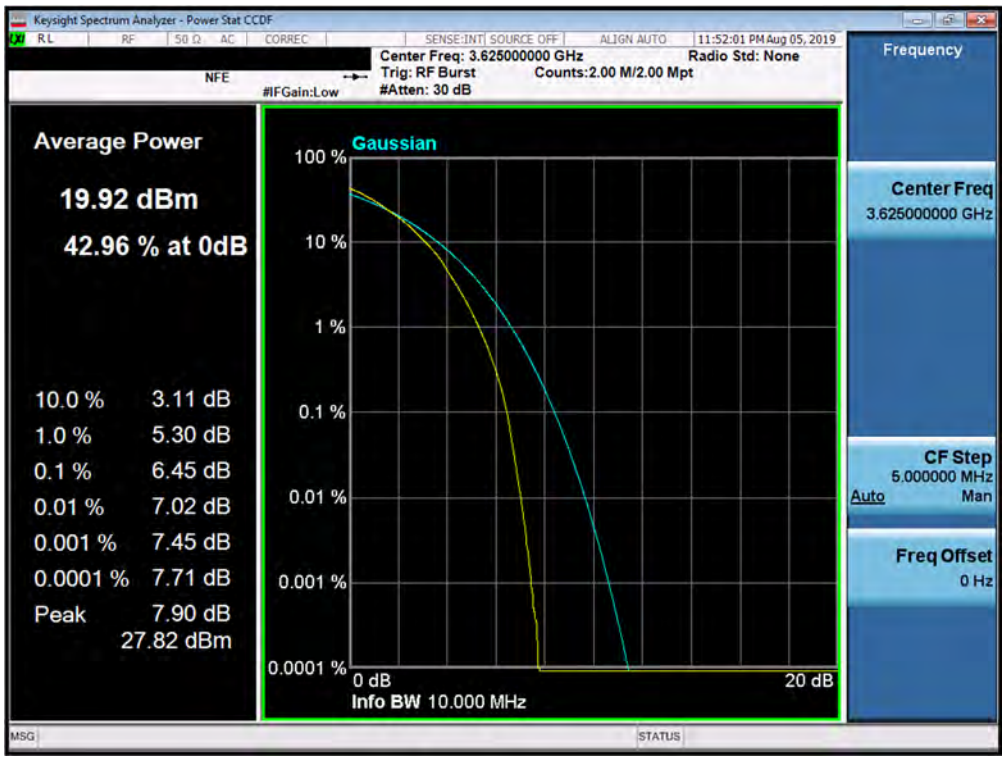
Plot 7-171. PAR Plot (Band 48 – 5.0MHz 64-QAM – Full RB Configuration – Diversity Antenna)



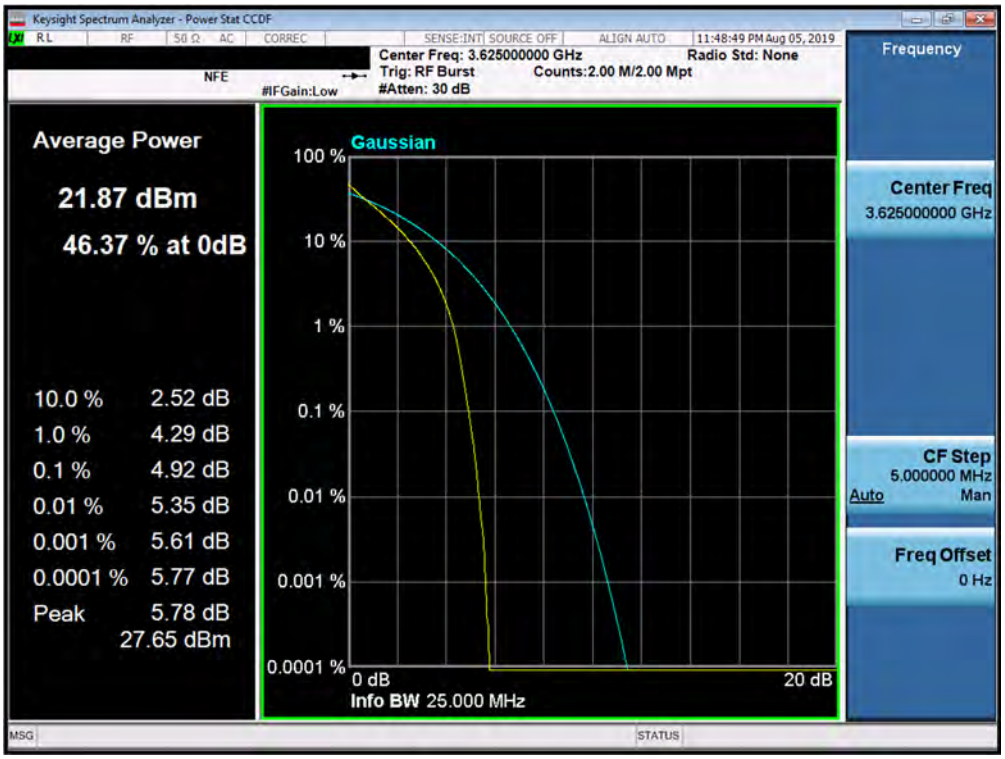
Plot 7-172. PAR Plot (Band 48 – 10.0MHz QPSK – Full RB Configuration – Diversity Antenna)



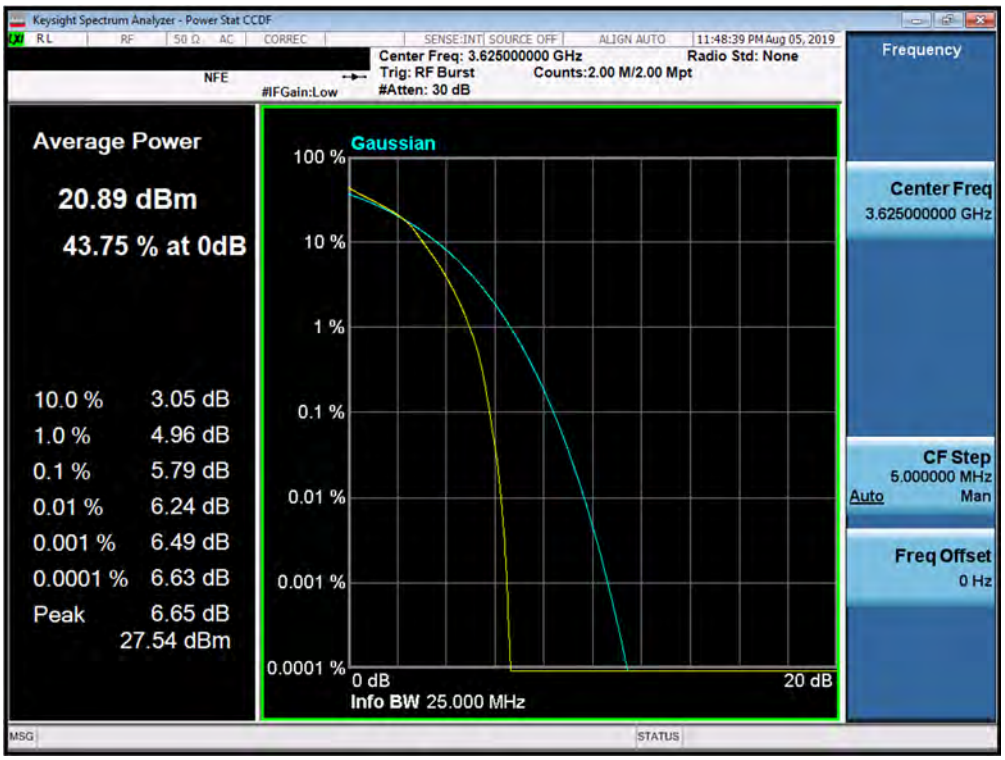
Plot 7-173. PAR Plot (Band 48 – 10.0MHz 16-QAM – Full RB Configuration – Diversity Antenna)



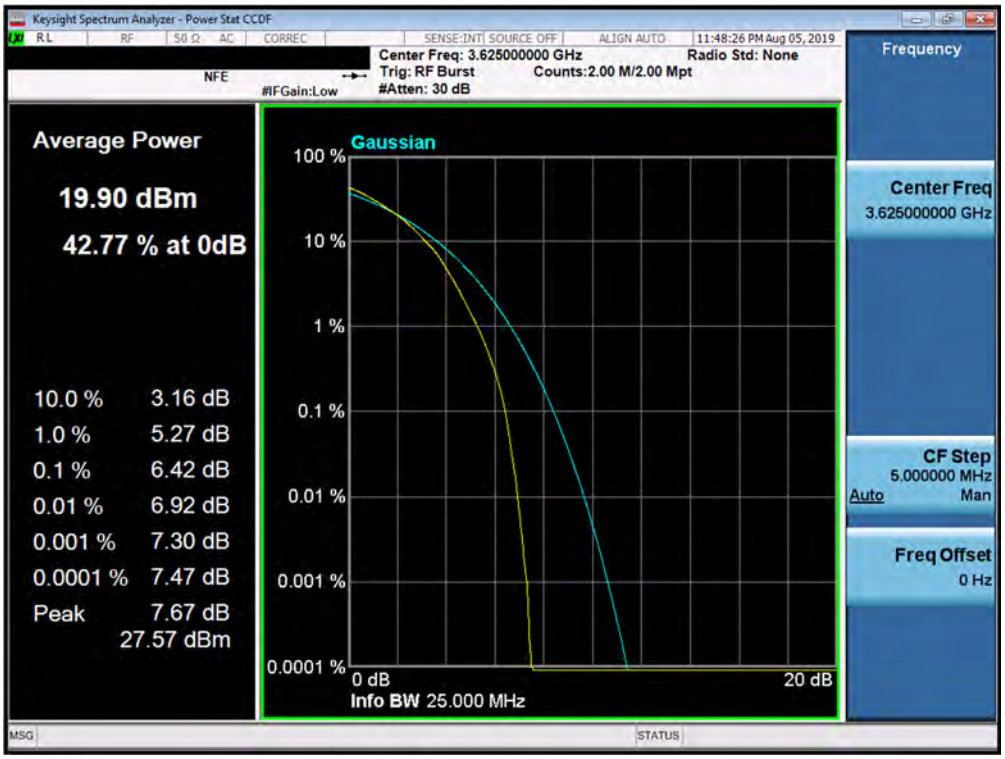
Plot 7-174. PAR Plot (Band 48 – 10.0MHz 64-QAM – Full RB Configuration – Diversity Antenna)



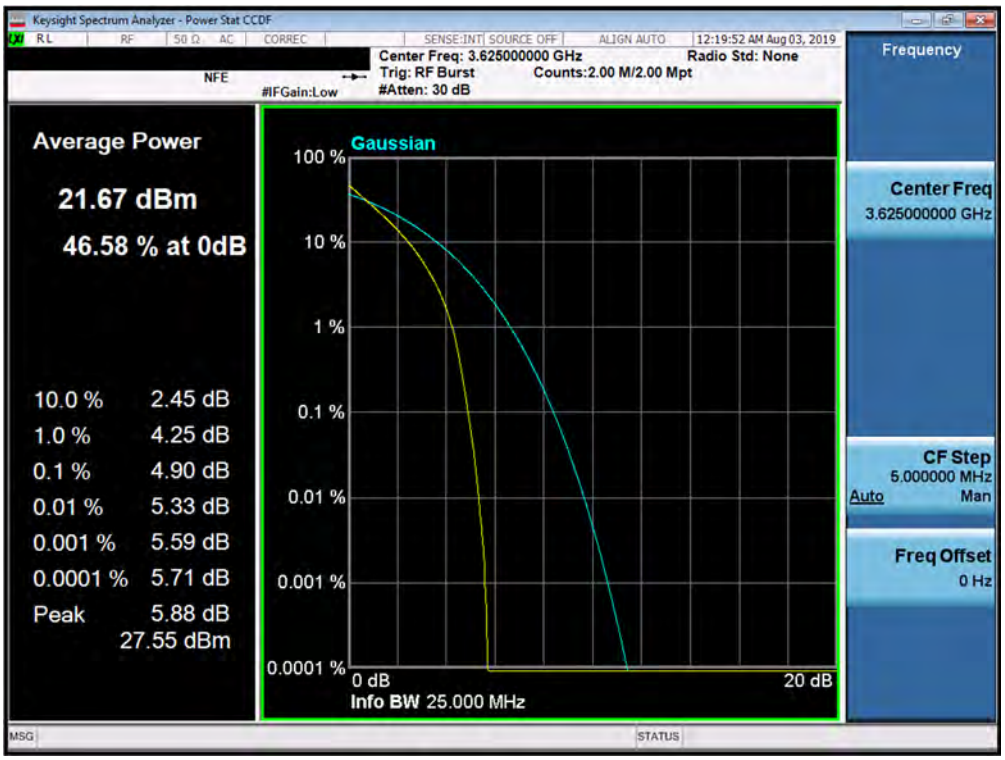
Plot 7-175. PAR Plot (Band 48 – 15.0MHz QPSK – Full RB Configuration – Diversity Antenna)



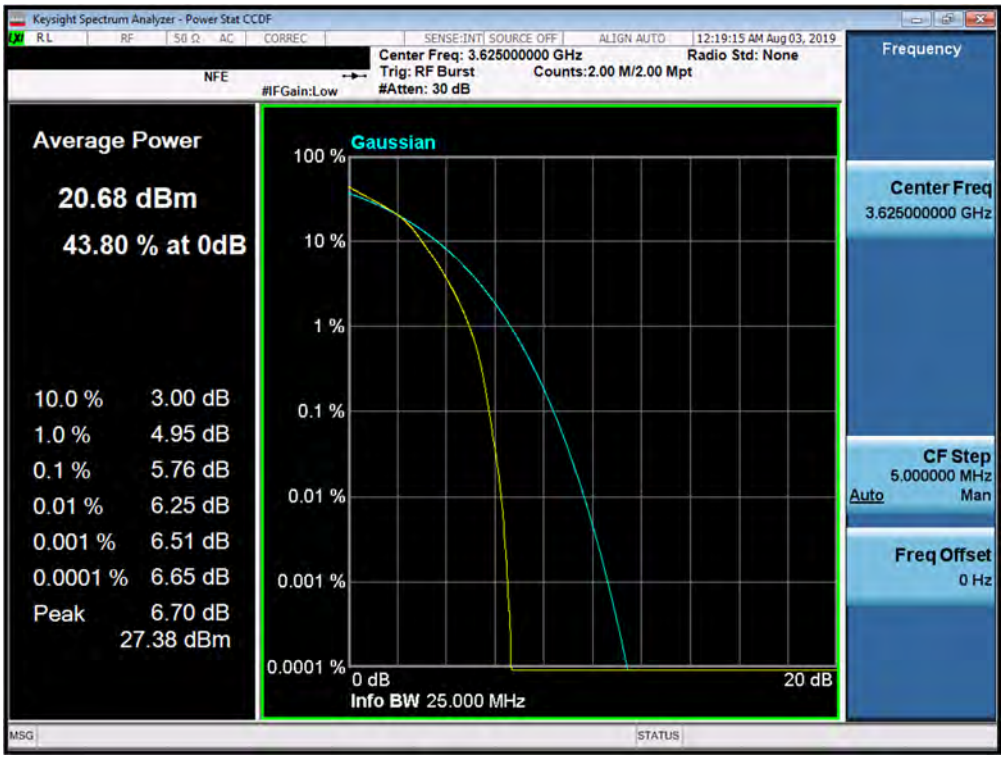
Plot 7-176. PAR Plot (Band 48 – 15.0MHz 16-QAM – Full RB Configuration – Diversity Antenna)



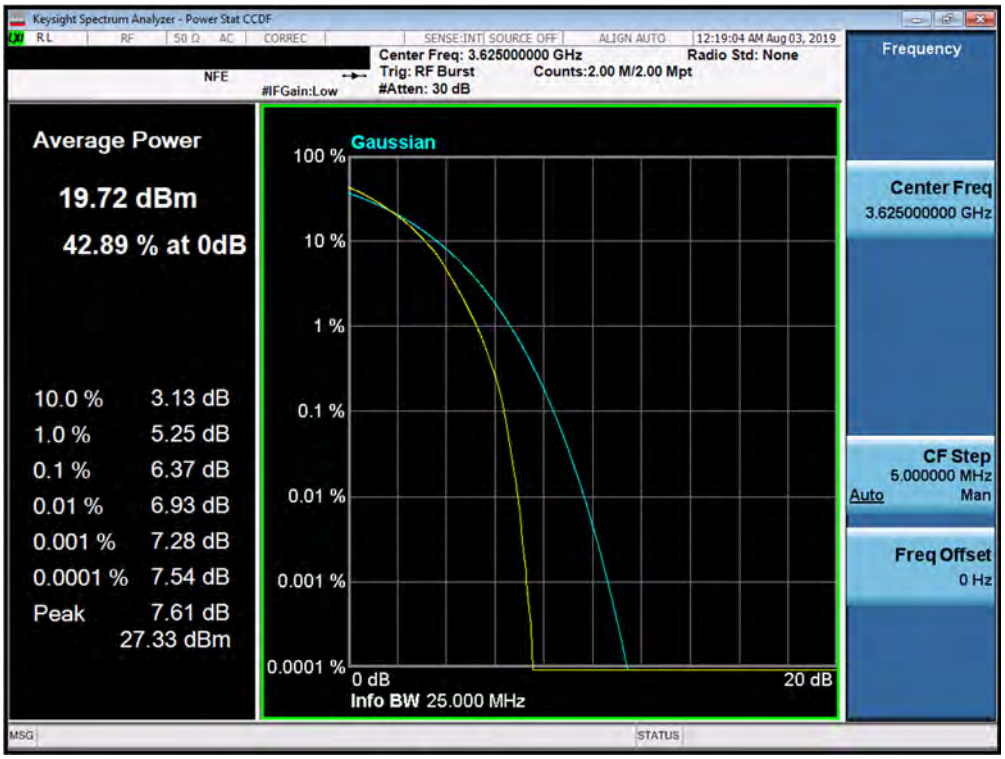
Plot 7-177. PAR Plot (Band 48 – 15.0MHz 64-QAM – Full RB Configuration – Diversity Antenna)



Plot 7-178. PAR Plot (Band 48 – 20.0MHz QPSK – Full RB Configuration – Diversity Antenna)



Plot 7-179. PAR Plot (Band 48 – 20.0MHz 16-QAM – Full RB Configuration – Diversity Antenna)



Plot 7-180. PAR Plot (Band 48 – 20.0MHz 64-QAM – Full RB Configuration – Diversity Antenna)

7.7 Uplink Carrier Aggregation

§96.41(e)

Test Overview

The EUT is set up to transmit two contiguous LTE channels. The power level of both carriers and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

The conducted power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed −13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any emission shall not exceed −25 dBm/MHz.

The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/Mhz.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to at least 10 * the fundamental frequency (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

Test Setup

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

Figure 7-6. Test Instrument & Measurement Setup

Test Notes

1. Conducted power and spurious emissions measurements were evaluated for the two contiguous channels using various combinations of RB size, RB offset, modulation, and channel bandwidth. Channel bandwidth data is shown in the tables below based only on the channel bandwidths that were supported in this device. The worst case (highest) powers were found while operating with QPSK modulation, as shown in Table 7-3 and 7-4 below, with both carriers set to transmit using 1RB.

2. Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

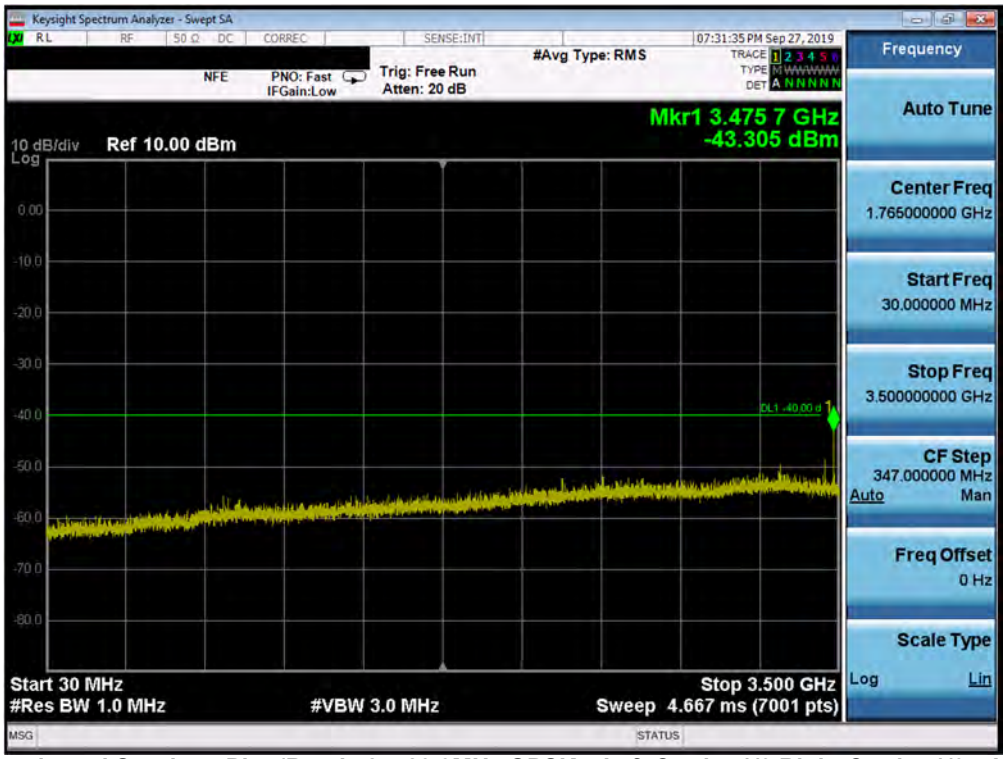
Band 48 – Main Antenna

Power State	PCC							SCC							Power
	PCC Band	PCC Bandwidth [MHz]	PCC (UL) Channel	PCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	SCC Band	SCC Bandwidth [MHz]	SCC (UL) Channel	SCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	ULCA Tx.Power (dBm)
Max	LTE B48	5	55265	3552.5	QPSK	1	0	LTE B48	20	55382	3564.2	QPSK	1	0	10.01
Max	LTE B48	10	55290	3555	QPSK	1	0	LTE B48	20	55434	3569.4	QPSK	1	0	9.93
Max	LTE B48	15	55315	3557.5	QPSK	1	0	LTE B48	20	55486	3574.6	QPSK	1	0	9.77
Max	LTE B48	20	55340	3560	QPSK	1	0	LTE B48	20	55538	3579.8	QPSK	1	0	10.05
Max	LTE B48	5	55990	3625	QPSK	1	0	LTE B48	20	56107	3636.7	QPSK	1	0	9.13
Max	LTE B48	10	55990	3625	QPSK	1	0	LTE B48	20	56134	3639.4	QPSK	1	0	9.22
Max	LTE B48	15	55990	3625	QPSK	1	0	LTE B48	20	56161	3642.1	QPSK	1	0	9.20
Max	LTE B48	20	55990	3625	QPSK	1	0	LTE B48	20	56188	3644.8	QPSK	1	0	9.32
Max	LTE B48	20	56640	3690	QPSK	1	0	LTE B48	5	56523	3678.3	QPSK	1	0	8.20
Max	LTE B48	20	56640	3690	QPSK	1	0	LTE B48	10	56496	3675.6	QPSK	1	0	8.23
Max	LTE B48	20	56640	3690	QPSK	1	0	LTE B48	15	56469	3672.9	QPSK	1	0	8.10
Max	LTE B48	20	56640	3690	QPSK	1	0	LTE B48	20	56442	3670.2	QPSK	1	0	8.85

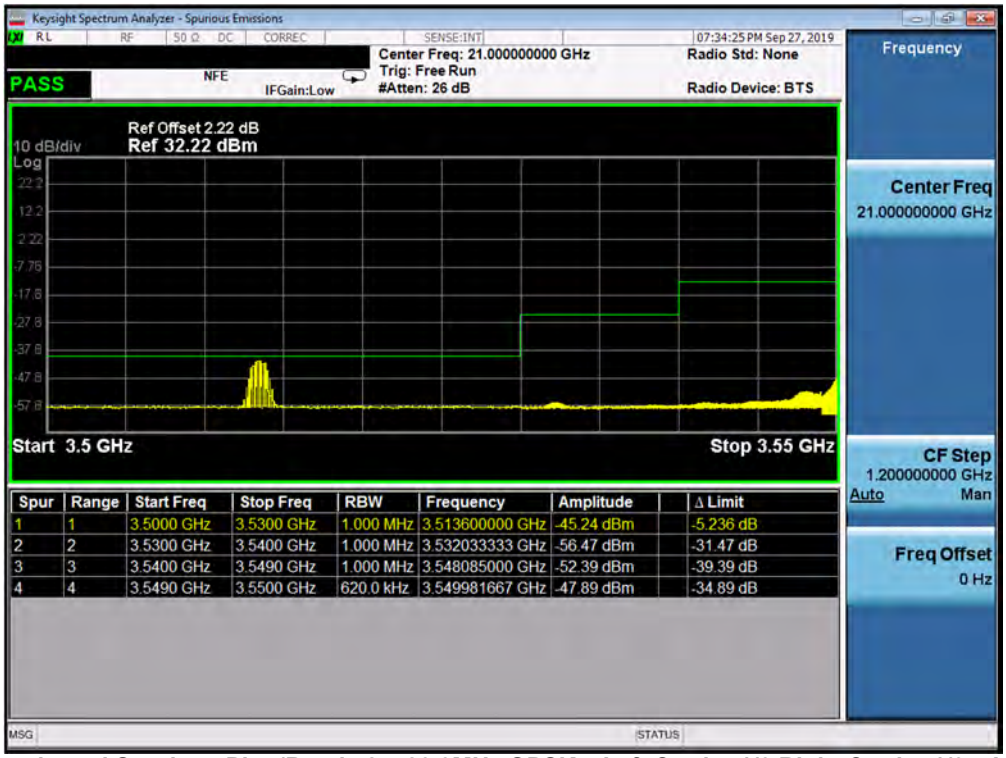
Table 7-5. Conducted Powers (B48 – Left Carrier: RB Size 1 Offset 0 Right Carrier: RB Size 1 Offset 0)

Power State	PCC							SCC							Power
	PCC Band	PCC Bandwidth [MHz]	PCC (UL) Channel	PCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	SCC Band	SCC Bandwidth [MHz]	SCC (UL) Channel	SCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	ULCA Tx.Power (dBm)
Max	LTE B48	20	55340	3560	QPSK	1	0	LTE B48	20	55538	3579.8	QPSK	1	0	10.05
Max	LTE B48	20	55340	3560	QPSK	1	99	LTE B48	20	55538	3579.8	QPSK	1	99	9.48
Max	LTE B48	20	55340	3560	QPSK	1	0	LTE B48	20	55538	3579.8	QPSK	1	99	10.03
Max	LTE B48	20	55340	3560	QPSK	1	50	LTE B48	20	55538	3579.8	QPSK	1	50	9.75
Max	LTE B48	20	55340	3560	QPSK	1	99	LTE B48	20	55538	3579.8	QPSK	1	0	10.04
Max	LTE B48	20	55340	3560	QPSK	100	0	LTE B48	20	55142	3540.2	QPSK	100	0	9.84
Max	LTE B48	20	55340	3560	16-QAM	100	0	LTE B48	20	55142	3540.2	16-QAM	100	0	9.82
Max	LTE B48	20	55340	3560	64-QAM	100	0	LTE B48	20	55142	3540.2	64-QAM	100	0	9.74

Table 7-6. Conducted Powers (B48 with Various Combinations for 20MHz Channel Bandwidth)

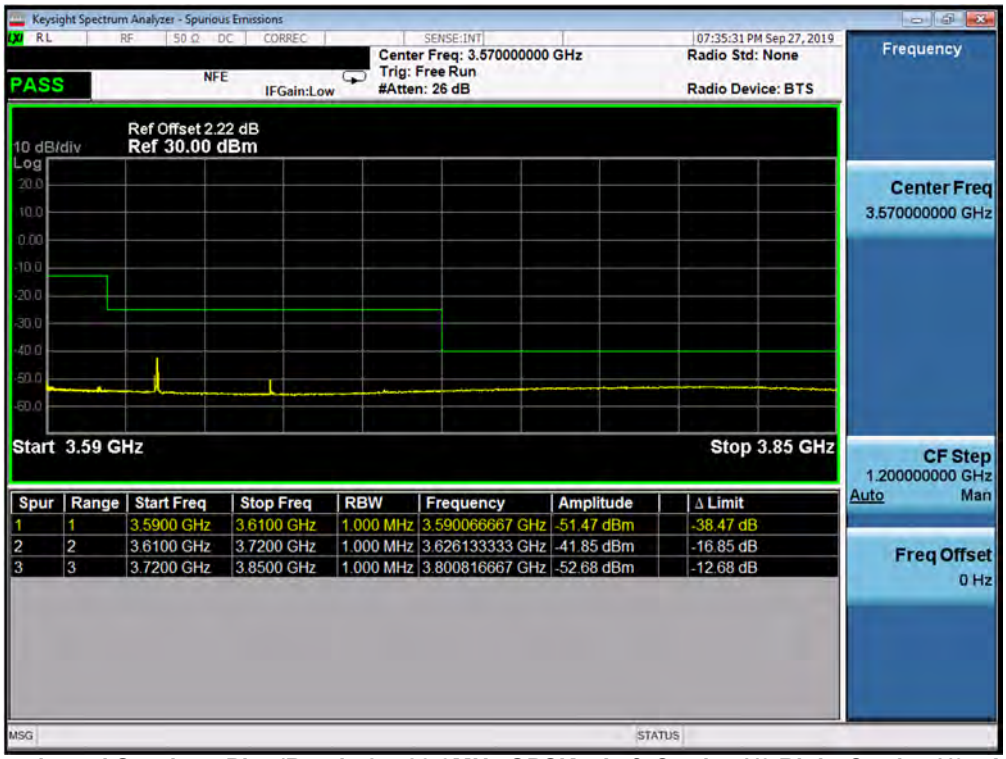


Plot 7-181. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)

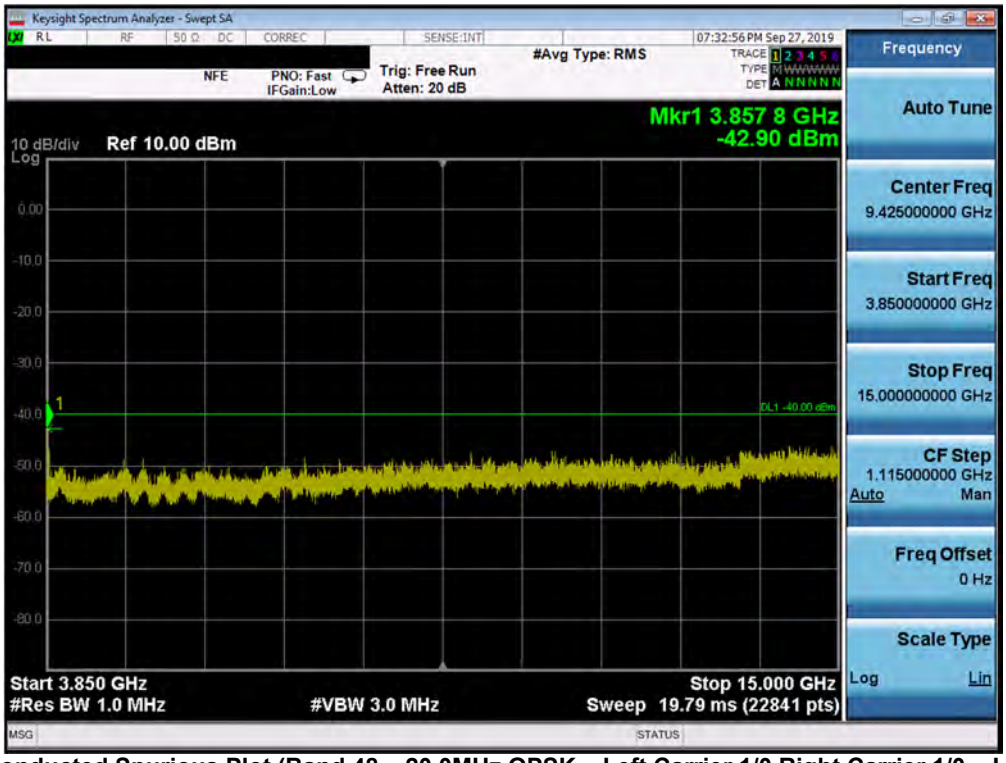


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5000 GHz	3.5300 GHz	1.000 MHz	3.513600000 GHz	-45.24 dBm	-5.236 dB
2	2	3.5300 GHz	3.5400 GHz	1.000 MHz	3.532033333 GHz	-56.47 dBm	-31.47 dB
3	3	3.5400 GHz	3.5490 GHz	1.000 MHz	3.548085000 GHz	-52.39 dBm	-39.39 dB
4	4	3.5490 GHz	3.5500 GHz	620.0 kHz	3.549981667 GHz	-47.89 dBm	-34.89 dB

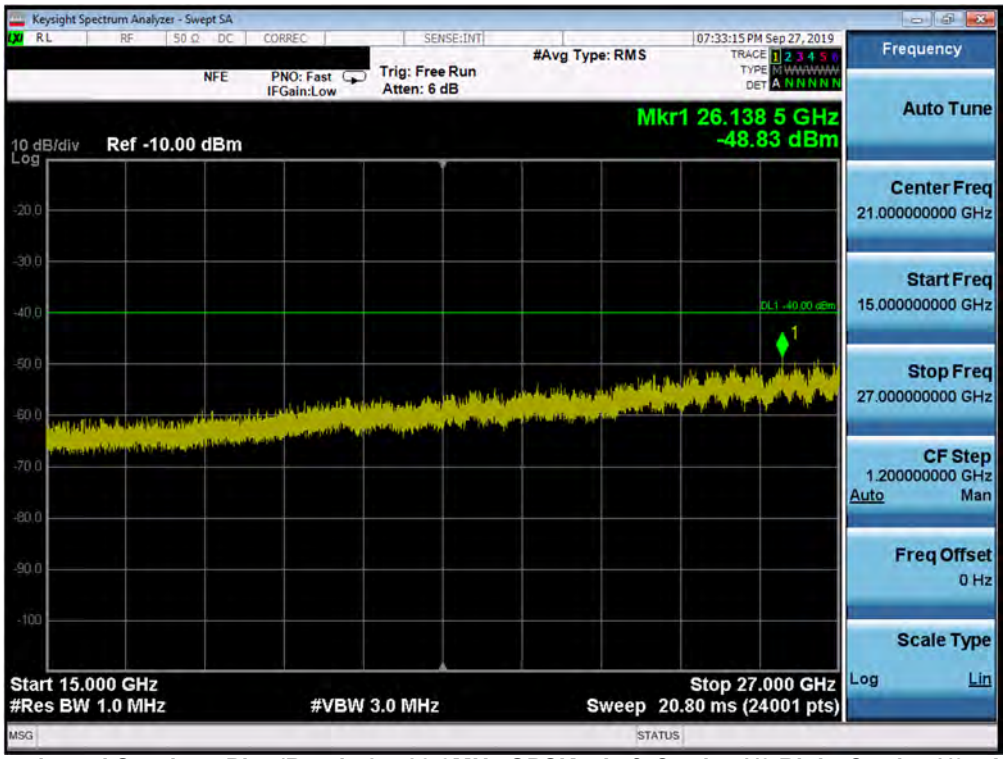
Plot 7-182. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)



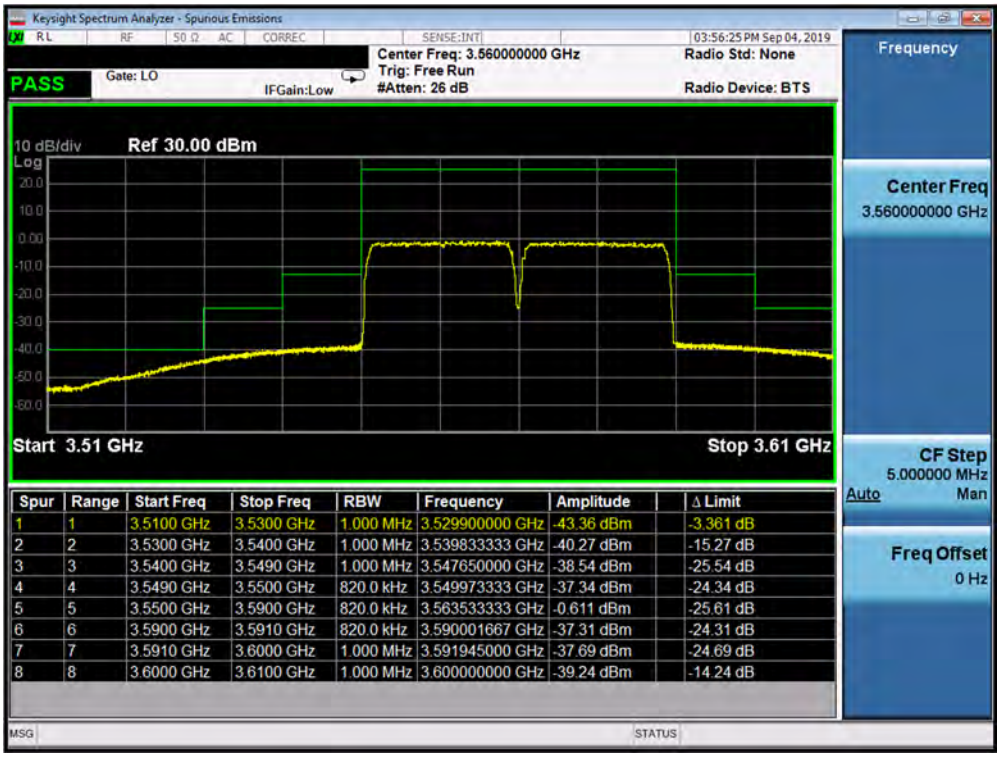
Plot 7-183. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)



Plot 7-184. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)

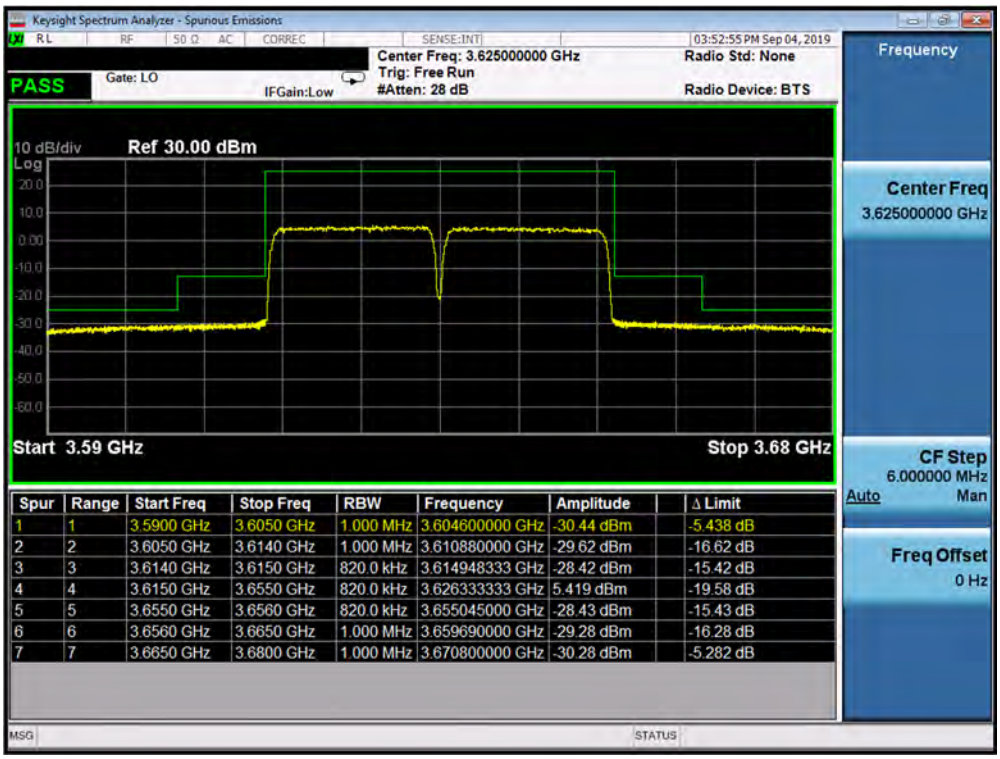


Plot 7-185. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)



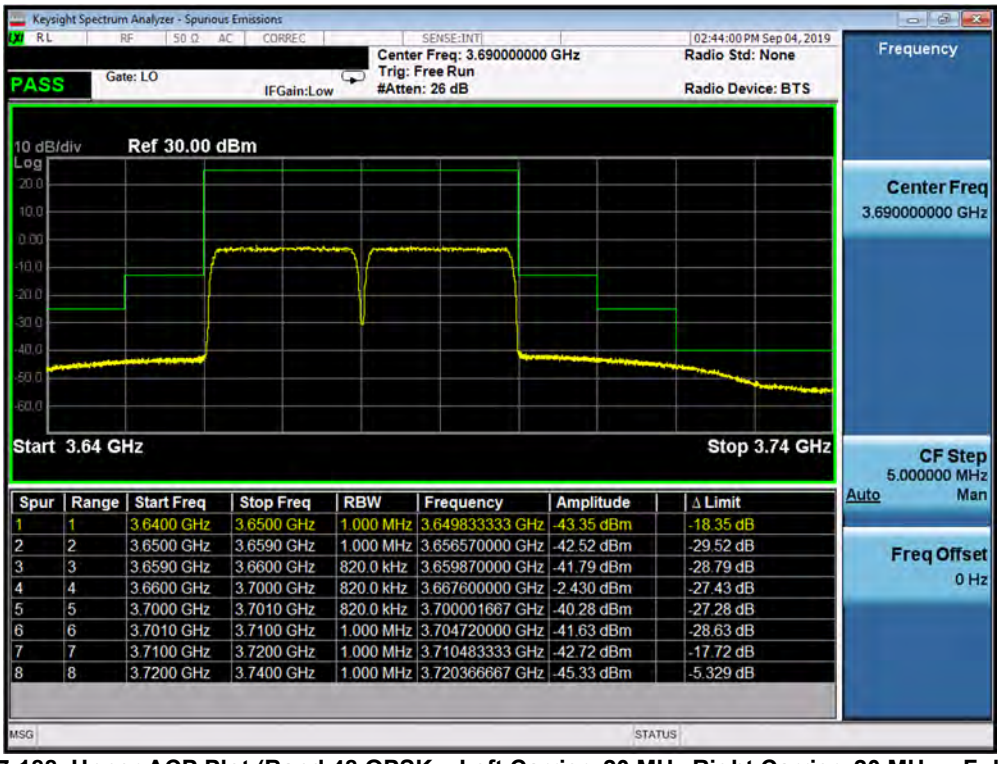
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5100 GHz	3.5300 GHz	1.000 MHz	3.529900000 GHz	-43.36 dBm	-3.361 dB
2	2	3.5300 GHz	3.5400 GHz	1.000 MHz	3.539833333 GHz	-40.27 dBm	-15.27 dB
3	3	3.5400 GHz	3.5490 GHz	1.000 MHz	3.547650000 GHz	-38.54 dBm	-25.54 dB
4	4	3.5490 GHz	3.5500 GHz	820.0 kHz	3.549973333 GHz	-37.34 dBm	-24.34 dB
5	5	3.5500 GHz	3.5900 GHz	820.0 kHz	3.563533333 GHz	-0.611 dBm	-25.61 dB
6	6	3.5900 GHz	3.5910 GHz	820.0 kHz	3.590001667 GHz	-37.31 dBm	-24.31 dB
7	7	3.5910 GHz	3.6000 GHz	1.000 MHz	3.591945000 GHz	-37.69 dBm	-24.69 dB
8	8	3.6000 GHz	3.6100 GHz	1.000 MHz	3.600000000 GHz	-39.24 dBm	-14.24 dB

Plot 7-186. Lower ACP Plot (Band 48 QPSK – Left Carrier: 20 MHz Right Carrier: 20 MHz – Full RB)



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5900 GHz	3.6050 GHz	1.000 MHz	3.604600000 GHz	-30.44 dBm	-5.438 dB
2	2	3.6050 GHz	3.6140 GHz	1.000 MHz	3.610880000 GHz	-29.62 dBm	-16.62 dB
3	3	3.6140 GHz	3.6150 GHz	820.0 kHz	3.614948333 GHz	-28.42 dBm	-15.42 dB
4	4	3.6150 GHz	3.6550 GHz	820.0 kHz	3.626333333 GHz	5.419 dBm	-19.58 dB
5	5	3.6550 GHz	3.6560 GHz	820.0 kHz	3.655045000 GHz	-28.43 dBm	-15.43 dB
6	6	3.6560 GHz	3.6650 GHz	1.000 MHz	3.659690000 GHz	-29.28 dBm	-16.28 dB
7	7	3.6650 GHz	3.6800 GHz	1.000 MHz	3.670800000 GHz	-30.28 dBm	-5.282 dB

Plot 7-187. Mid ACP Plot (Band 48 QPSK – Left Carrier: 20 MHz Right Carrier: 20 MHz – Full RB)



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.6400 GHz	3.6500 GHz	1.000 MHz	3.649833333 GHz	-43.35 dBm	-18.35 dB
2	2	3.6500 GHz	3.6590 GHz	1.000 MHz	3.656570000 GHz	-42.52 dBm	-29.52 dB
3	3	3.6590 GHz	3.6600 GHz	820.0 kHz	3.659870000 GHz	-41.79 dBm	-28.79 dB
4	4	3.6600 GHz	3.7000 GHz	820.0 kHz	3.667600000 GHz	-2.430 dBm	-27.43 dB
5	5	3.7000 GHz	3.7010 GHz	820.0 kHz	3.700001667 GHz	-40.28 dBm	-27.28 dB
6	6	3.7010 GHz	3.7100 GHz	1.000 MHz	3.704720000 GHz	-41.63 dBm	-28.63 dB
7	7	3.7100 GHz	3.7200 GHz	1.000 MHz	3.710483333 GHz	-42.72 dBm	-17.72 dB
8	8	3.7200 GHz	3.7400 GHz	1.000 MHz	3.720366667 GHz	-45.33 dBm	-5.329 dB

Plot 7-188. Upper ACP Plot (Band 48 QPSK – Left Carrier: 20 MHz Right Carrier: 20 MHz – Full RB)

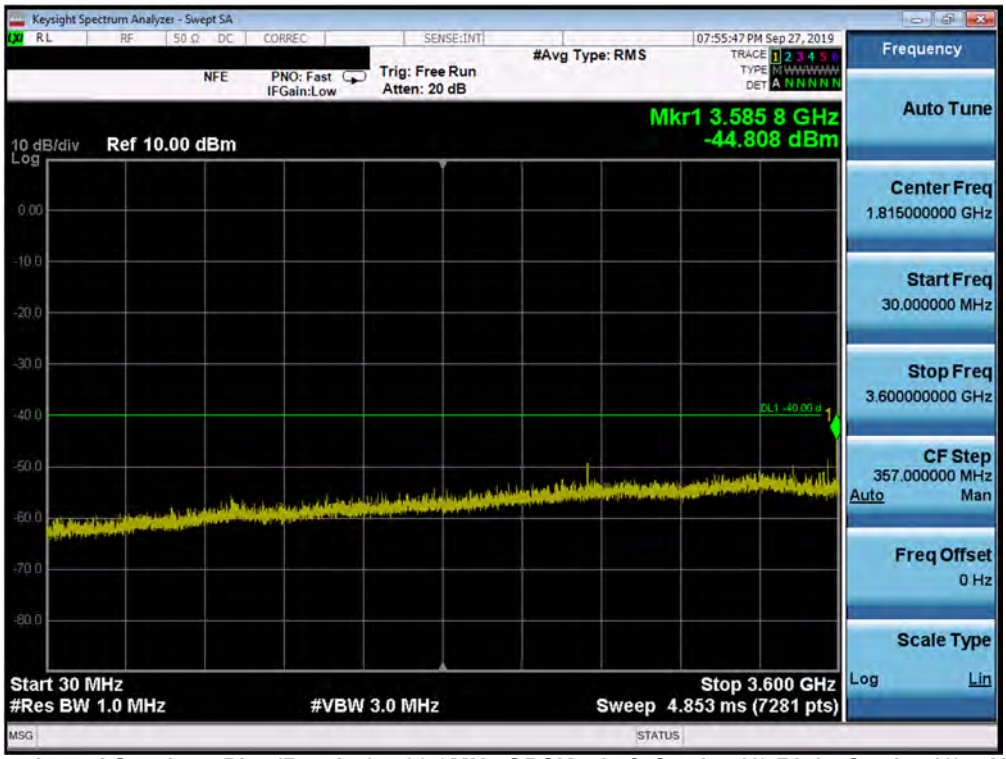
Band 48 – Diversity Antenna

Power State	PCC							SCC							Power
	PCC Band	PCC Bandwidth [MHz]	PCC (UL) Channel	PCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	SCC Band	SCC Bandwidth [MHz]	SCC (UL) Channel	SCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	ULCA Tx.Power (dBm)
Max	LTE B48	5	55265	3552.5	QPSK	1	0	LTE B48	20	55382	3564.2	QPSK	1	0	10.95
Max	LTE B48	10	55290	3555	QPSK	1	0	LTE B48	20	55434	3569.4	QPSK	1	0	10.97
Max	LTE B48	15	55315	3557.5	QPSK	1	0	LTE B48	20	55486	3574.6	QPSK	1	0	11.02
Max	LTE B48	20	55340	3560	QPSK	1	0	LTE B48	20	55538	3579.8	QPSK	1	0	11.02
Max	LTE B48	5	55990	3625	QPSK	1	0	LTE B48	20	56107	3636.7	QPSK	1	0	11.15
Max	LTE B48	10	55990	3625	QPSK	1	0	LTE B48	20	56134	3639.4	QPSK	1	0	11.19
Max	LTE B48	15	55990	3625	QPSK	1	0	LTE B48	20	56161	3642.1	QPSK	1	0	11.11
Max	LTE B48	20	55990	3625	QPSK	1	0	LTE B48	20	56188	3644.8	QPSK	1	0	11.14
Max	LTE B48	20	56640	3690	QPSK	1	0	LTE B48	5	56523	3678.3	QPSK	1	0	10.95
Max	LTE B48	20	56640	3690	QPSK	1	0	LTE B48	10	56496	3675.6	QPSK	1	0	11.02
Max	LTE B48	20	56640	3690	QPSK	1	0	LTE B48	15	56469	3672.9	QPSK	1	0	11.01
Max	LTE B48	20	56640	3690	QPSK	1	0	LTE B48	20	56442	3670.2	QPSK	1	0	11.15

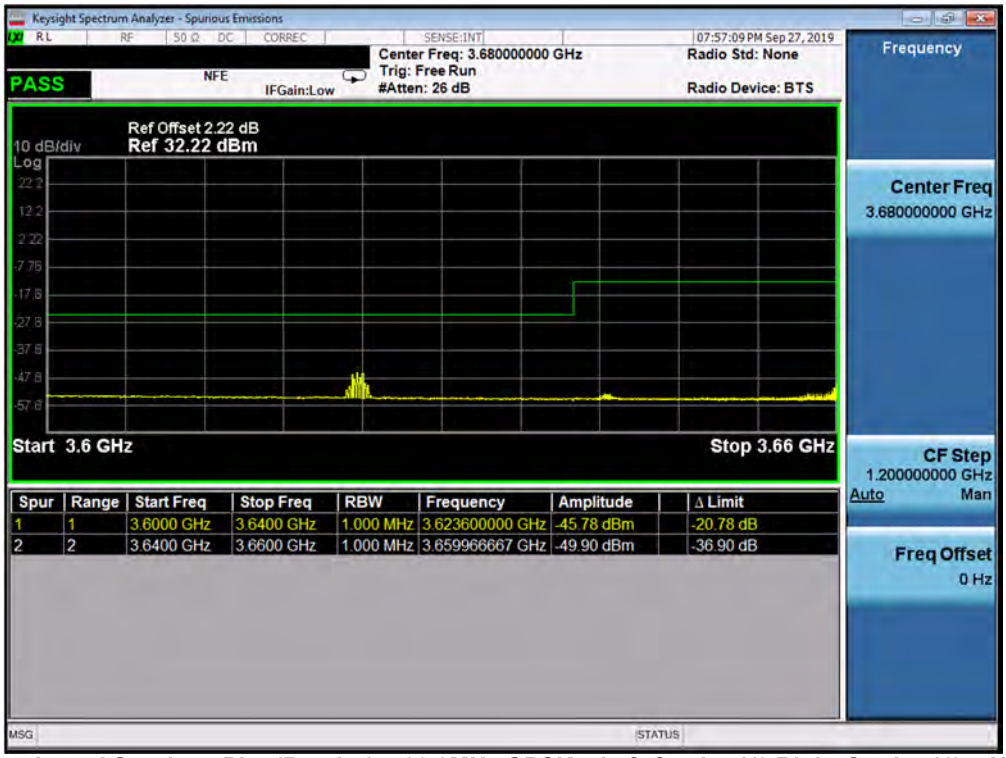
Table 7-7. Conducted Powers (B48 – Left Carrier: RB Size 1 Offset 0 Right Carrier: RB Size 1 Offset 0)

Power State	PCC							SCC							Power
	PCC Band	PCC Bandwidth [MHz]	PCC (UL) Channel	PCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	SCC Band	SCC Bandwidth [MHz]	SCC (UL) Channel	SCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	ULCA Tx.Power (dBm)
Max	LTE B48	20	56640	3690	QPSK	1	0	LTE B48	20	56442	3670.2	QPSK	1	0	11.11
Max	LTE B48	20	56640	3690	QPSK	1	99	LTE B48	20	56442	3670.2	QPSK	1	99	10.64
Max	LTE B48	20	56640	3690	QPSK	1	0	LTE B48	20	56442	3670.2	QPSK	1	99	10.71
Max	LTE B48	20	56640	3690	QPSK	1	50	LTE B48	20	56442	3670.2	QPSK	1	50	10.73
Max	LTE B48	20	56640	3690	QPSK	1	99	LTE B48	20	56442	3670.2	QPSK	1	0	11.00
Max	LTE B48	20	56640	3690	QPSK	100	0	LTE B48	20	56442	3670.2	QPSK	100	0	10.86
Max	LTE B48	20	56640	3690	16-QAM	100	0	LTE B48	20	56442	3670.2	16-QAM	100	0	10.85
Max	LTE B48	20	56640	3690	64-QAM	100	0	LTE B48	20	56442	3670.2	64-QAM	100	0	10.81

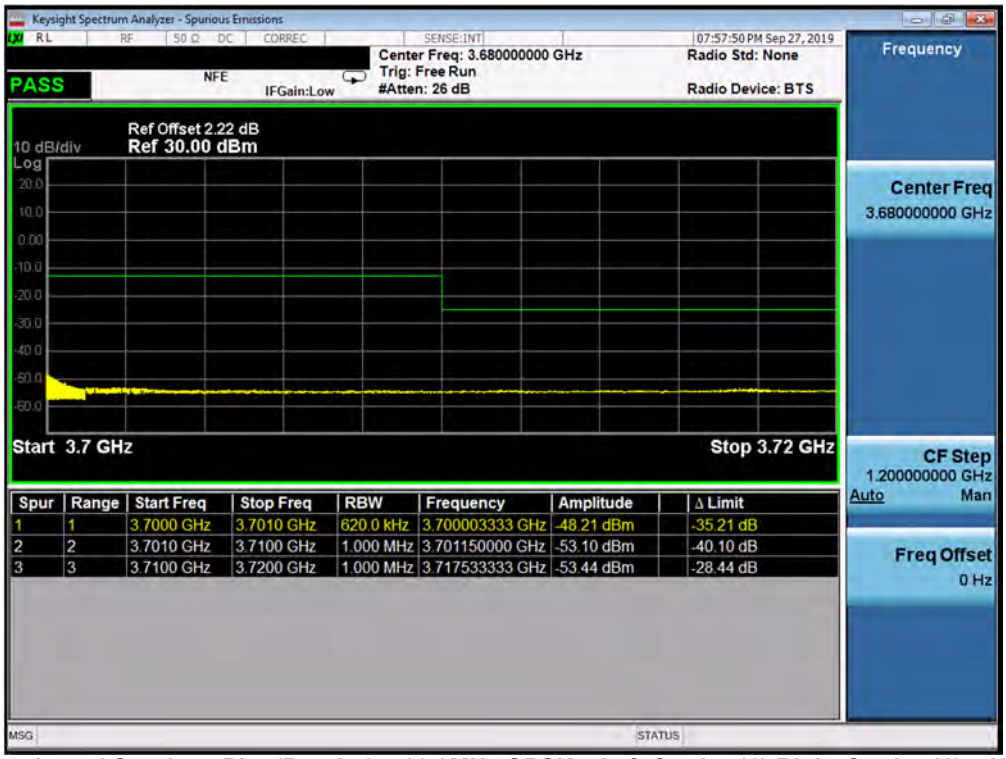
Table 7-8. Conducted Powers (B48 with Various Combinations for 20MHz Channel Bandwidth)



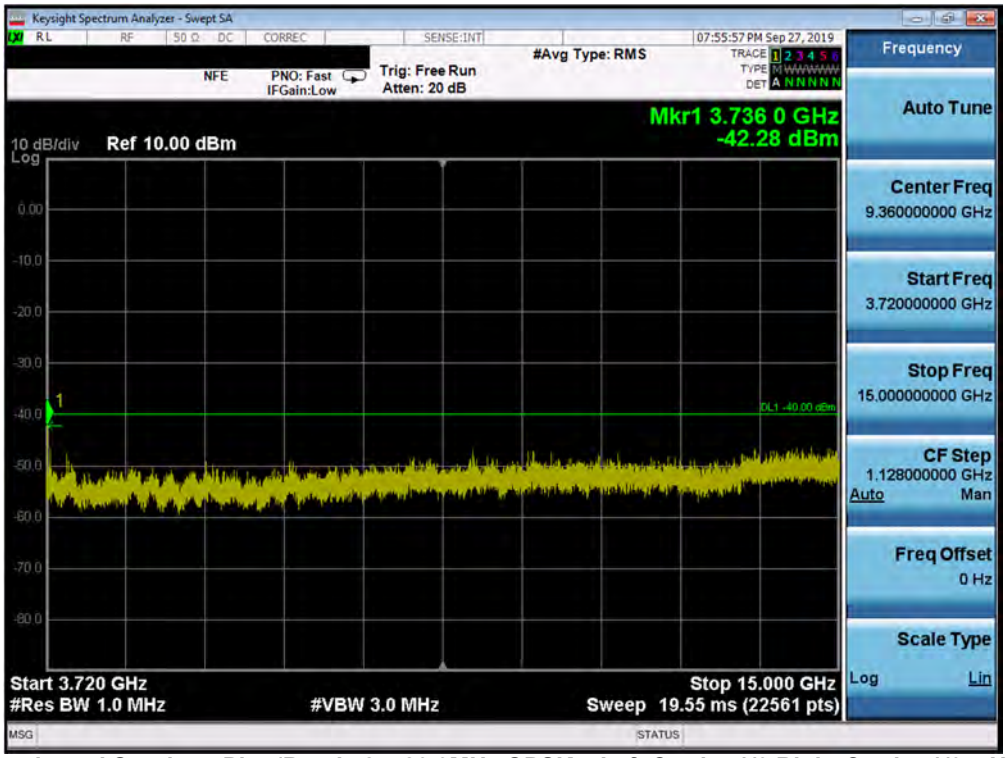
Plot 7-189. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – High Channel)



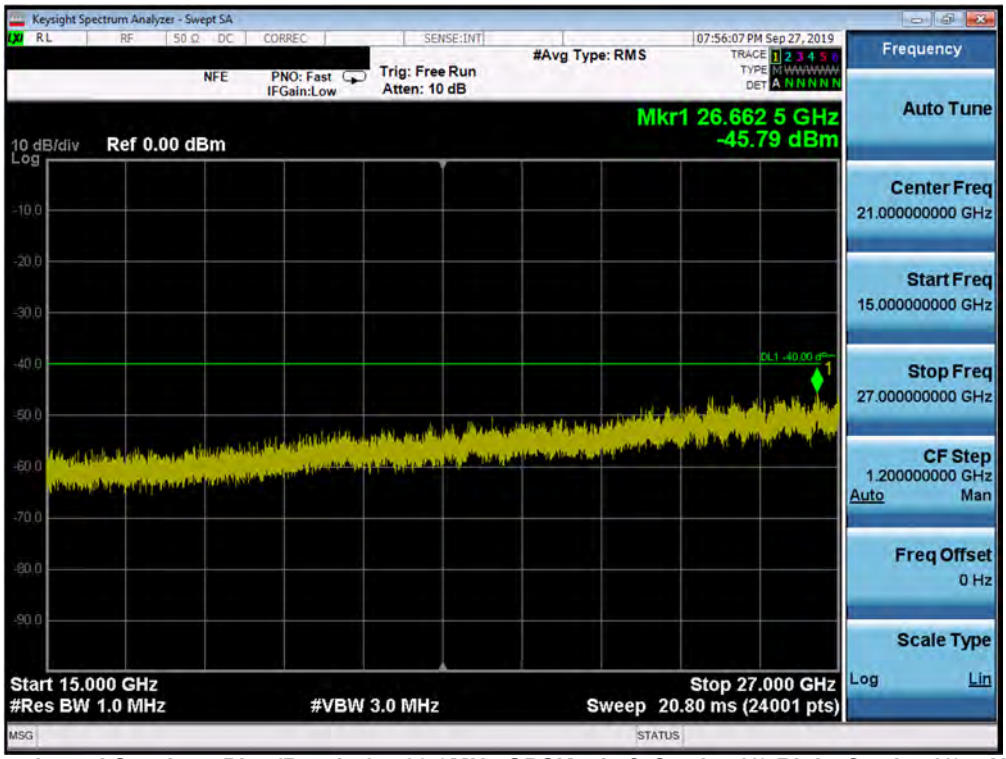
Plot 7-190. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – High Channel)



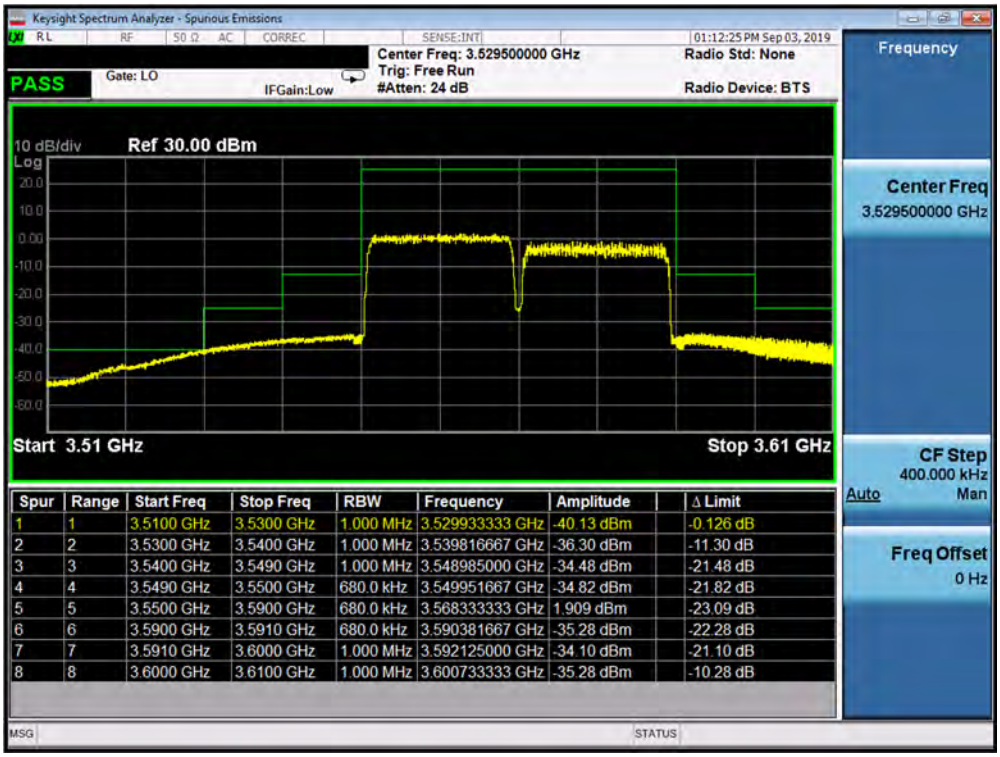
Plot 7-191. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – High Channel)



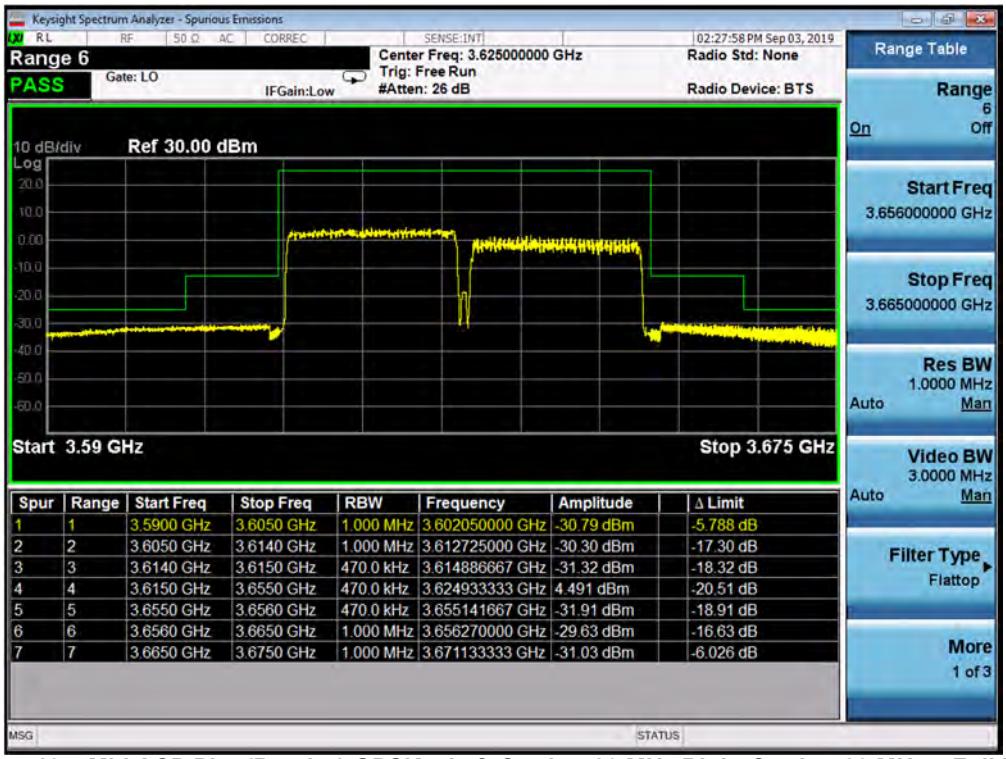
Plot 7-192. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – High Channel)



Plot 7-193. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – High Channel)

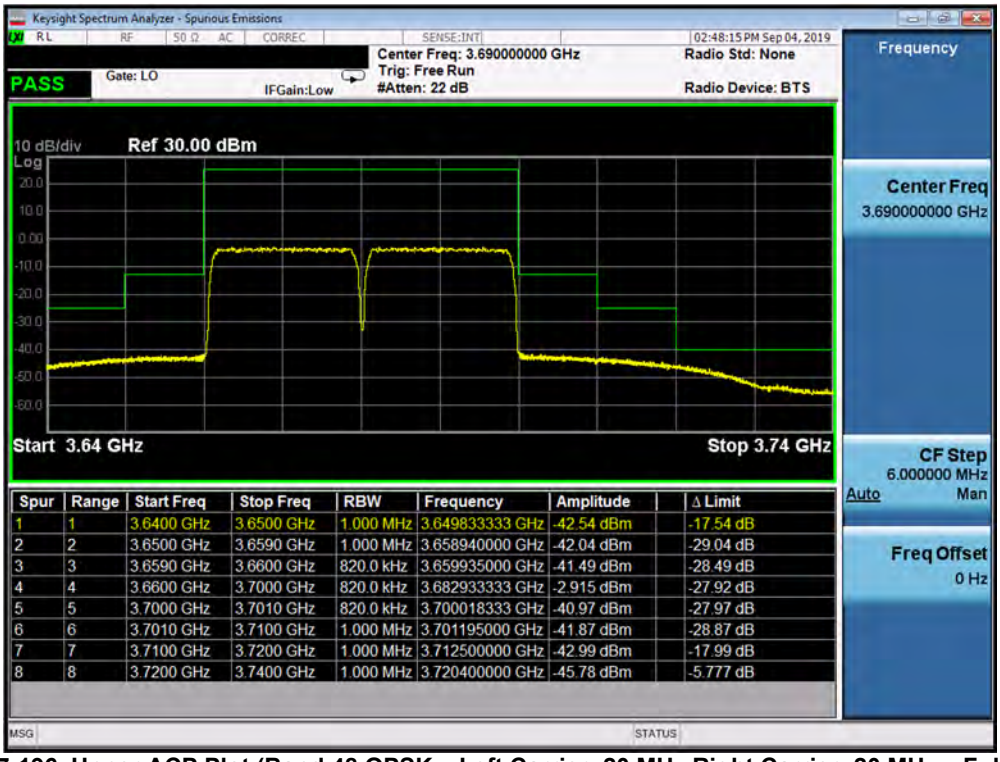


Plot 7-194. Lower ACP Plot (Band 48 QPSK – Left Carrier: 20 MHz Right Carrier: 20 MHz – Full RB)



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5900 GHz	3.6050 GHz	1.000 MHz	3.602050000 GHz	-30.79 dBm	-5.788 dB
2	2	3.6050 GHz	3.6140 GHz	1.000 MHz	3.612725000 GHz	-30.30 dBm	-17.30 dB
3	3	3.6140 GHz	3.6150 GHz	470.0 kHz	3.614886667 GHz	-31.32 dBm	-18.32 dB
4	4	3.6150 GHz	3.6550 GHz	470.0 kHz	3.624933333 GHz	4.491 dBm	-20.51 dB
5	5	3.6550 GHz	3.6560 GHz	470.0 kHz	3.655141667 GHz	-31.91 dBm	-18.91 dB
6	6	3.6560 GHz	3.6650 GHz	1.000 MHz	3.656270000 GHz	-29.63 dBm	-16.63 dB
7	7	3.6650 GHz	3.6750 GHz	1.000 MHz	3.671133333 GHz	-31.03 dBm	-6.026 dB

Plot 7-195. Mid ACP Plot (Band 48 QPSK – Left Carrier: 20 MHz Right Carrier: 20 MHz – Full RB)



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.6400 GHz	3.6500 GHz	1.000 MHz	3.649833333 GHz	-42.54 dBm	-17.54 dB
2	2	3.6500 GHz	3.6590 GHz	1.000 MHz	3.658940000 GHz	-42.04 dBm	-29.04 dB
3	3	3.6590 GHz	3.6600 GHz	820.0 kHz	3.659935000 GHz	-41.49 dBm	-28.49 dB
4	4	3.6600 GHz	3.7000 GHz	820.0 kHz	3.682933333 GHz	-2.915 dBm	-27.92 dB
5	5	3.7000 GHz	3.7010 GHz	820.0 kHz	3.700018333 GHz	-40.97 dBm	-27.97 dB
6	6	3.7010 GHz	3.7100 GHz	1.000 MHz	3.701195000 GHz	-41.87 dBm	-28.87 dB
7	7	3.7100 GHz	3.7200 GHz	1.000 MHz	3.712500000 GHz	-42.99 dBm	-17.99 dB
8	8	3.7200 GHz	3.7400 GHz	1.000 MHz	3.720400000 GHz	-45.78 dBm	-5.777 dB

Plot 7-196. Upper ACP Plot (Band 48 QPSK – Left Carrier: 20 MHz Right Carrier: 20 MHz – Full RB)

7.8 Radiated Power (EIRP)

§96.41(b)

Test Overview

Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the method described in KDB 971168. 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

Test Settings

The relevant equation for determining the ERP or EIRP from the conducted RF output power measured is:

ERP/EIRP = PMeas – LC + GT

Where:

ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as PMeas, typically dBW or dBm)

PMeas = measured transmitter output power or PSD, in dBW or dBm

LC = signal attenuation in the connecting cable between the transmitter and antenna in dB

GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

Test Setup

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

Figure 7-7. ERP/EIRP Measurement Setup

Test Notes

1) 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 while powered by an Power Over Ethernet (POE) power source.

3) The worst case EIRP shown in this section is found with LTE operating only using 1RB. As such, the EIRP/10MHz and full channel EIRP values will be identical since 1RB is fully contained within all available channel bandwidths for LTE Band 48 (i.e. 5, 10, 15, 20MHz).

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	RB Size/Offset	Conducted Power [dBm/10MHz]	Ant. Gain [dBi]	EIRP [dBm/10MHz]	EIRP [Watts/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
3552.50	5	QPSK	1/0	22.93	19.00	**41.93**	15.596	47.00	-5.07
3625.00	5	QPSK	1/0	22.81	19.00	41.81	15.171	47.00	-5.19
3697.50	5	QPSK	1/0	22.76	19.00	41.76	14.997	47.00	-5.24
3552.50	5	16-QAM	1/0	22.06	19.00	**41.06**	12.764	47.00	-5.94
3552.50	5	64-QAM	1/0	20.99	19.00	**39.99**	9.977	47.00	-7.01
3555.00	10	QPSK	1/0	22.83	19.00	41.83	15.241	47.00	-5.17
3625.00	10	QPSK	1/0	22.78	19.00	41.78	15.066	47.00	-5.22
3695.00	10	QPSK	1/0	23.00	19.00	**42.00**	15.849	47.00	-5.00
3555.00	10	16-QAM	1/0	21.96	19.00	**40.96**	12.474	47.00	-6.04
3695.00	10	64-QAM	1/0	20.98	19.00	**39.98**	9.954	47.00	-7.02
3557.50	15	QPSK	1/0	23.02	19.00	**42.02**	15.922	47.00	-4.98
3625.00	15	QPSK	1/0	22.80	19.00	41.80	15.136	47.00	-5.20
3692.50	15	QPSK	1/0	22.84	19.00	41.84	15.276	47.00	-5.16
3692.50	15	16-QAM	1/0	21.95	19.00	**40.95**	12.445	47.00	-6.05
3692.50	15	64-QAM	1/0	20.91	19.00	**39.91**	9.795	47.00	-7.09
3560.00	20	QPSK	1/0	23.13	19.00	**42.13**	**16.331**	47.00	-4.87
3625.00	20	QPSK	1/0	22.87	19.00	41.87	15.382	47.00	-5.13
3690.00	20	QPSK	1/0	22.98	19.00	41.98	15.776	47.00	-5.02
3560.00	20	16-QAM	1/0	22.29	19.00	**41.29**	13.459	47.00	-5.71
3690.00	20	64-QAM	1/0	21.10	19.00	**40.10**	10.233	47.00	-6.90

Table 7-9. LTE Band 48 EIRP Data (Main Antenna)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm/10MHz]	EIRP [Watts/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
3552.50	5	QPSK	1/0	22.77	19.00	**41.77**	15.031	47.00	-5.23
3625.00	5	QPSK	1/0	22.54	19.00	41.54	14.256	47.00	-5.46
3697.50	5	QPSK	1/0	22.56	19.00	41.56	14.322	47.00	-5.44
3552.50	5	16-QAM	1/0	21.92	19.00	**40.92**	12.359	47.00	-6.08
3552.50	5	64-QAM	1/0	20.62	19.00	**39.62**	9.162	47.00	-7.38
3555.00	10	QPSK	1/0	22.71	19.00	**41.71**	14.825	47.00	-5.29
3625.00	10	QPSK	1/0	22.53	19.00	41.53	14.223	47.00	-5.47
3695.00	10	QPSK	1/0	22.64	19.00	41.64	14.588	47.00	-5.36
3555.00	10	16-QAM	1/0	21.99	19.00	**40.99**	12.560	47.00	-6.01
3555.00	10	64-QAM	1/0	20.86	19.00	**39.86**	9.683	47.00	-7.14
3557.50	15	QPSK	1/0	22.80	19.00	**41.80**	15.136	47.00	-5.20
3625.00	15	QPSK	1/0	22.62	19.00	41.62	14.521	47.00	-5.38
3692.50	15	QPSK	1/0	22.69	19.00	41.69	14.757	47.00	-5.31
3557.50	15	16-QAM	1/0	21.98	19.00	**40.98**	12.531	47.00	-6.02
3557.50	15	64-QAM	1/0	20.84	19.00	**39.84**	9.638	47.00	-7.16
3560.00	20	QPSK	1/0	22.87	19.00	**41.87**	**15.382**	47.00	-5.13
3625.00	20	QPSK	1/0	22.66	19.00	41.66	14.655	47.00	-5.34
3690.00	20	QPSK	1/0	22.75	19.00	41.75	14.962	47.00	-5.25
3560.00	20	16-QAM	1/0	22.10	19.00	**41.10**	12.882	47.00	-5.90
3560.00	20	64-QAM	1/0	20.90	19.00	**39.90**	9.772	47.00	-7.10

Table 7-10. LTE Band 48 EIRP Data (Diversity Antenna)

7.9 Radiated Spurious Emissions Measurements

§2.1053 §96.41(e)

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.

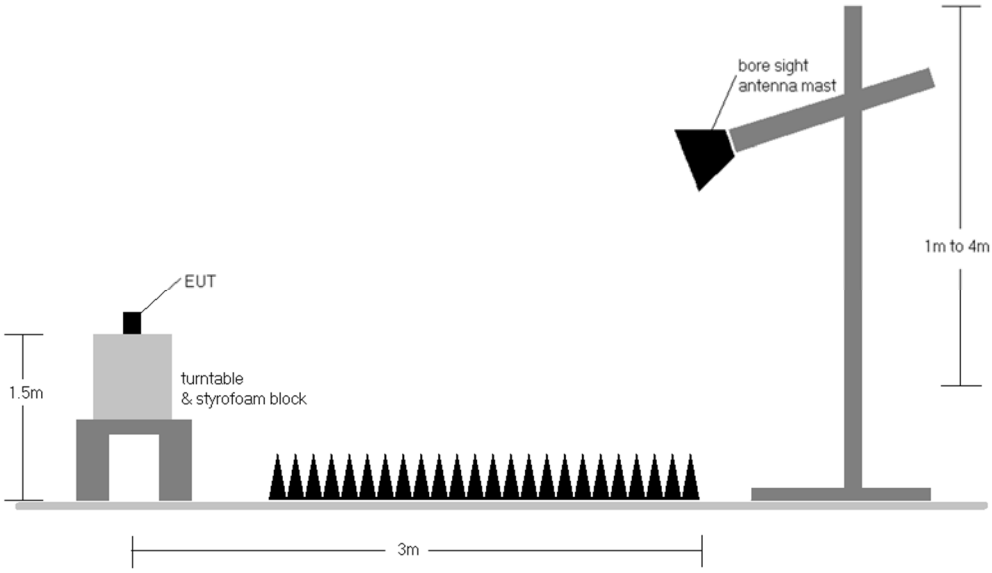


Figure 7-8. Test Instrument & Measurement Setup

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.

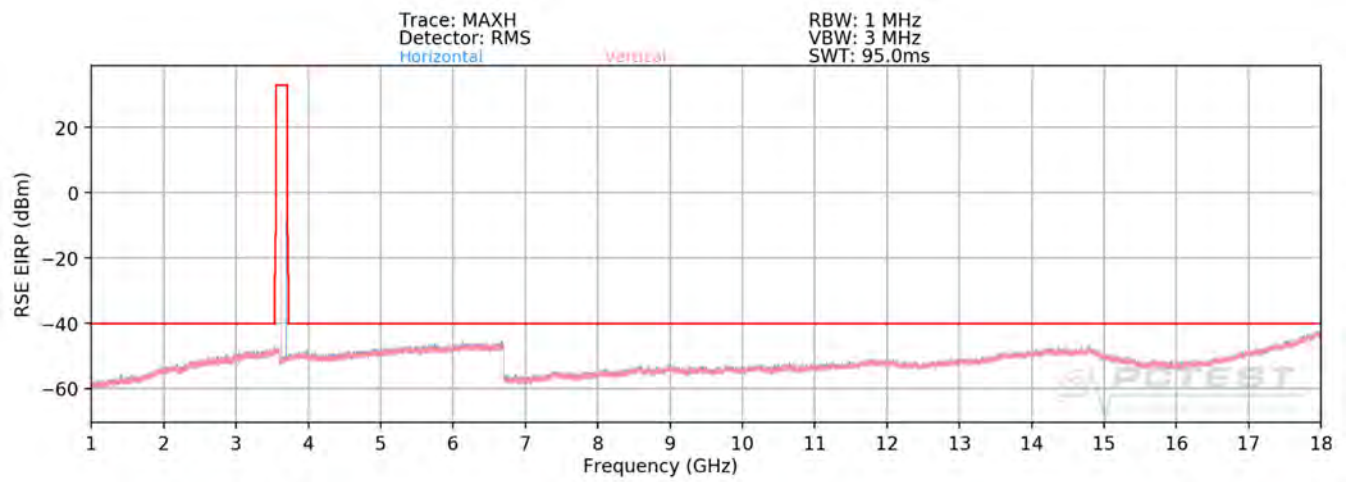
2) This unit was tested while powered by an Power Over Ethernet (POE) power source.

3) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.

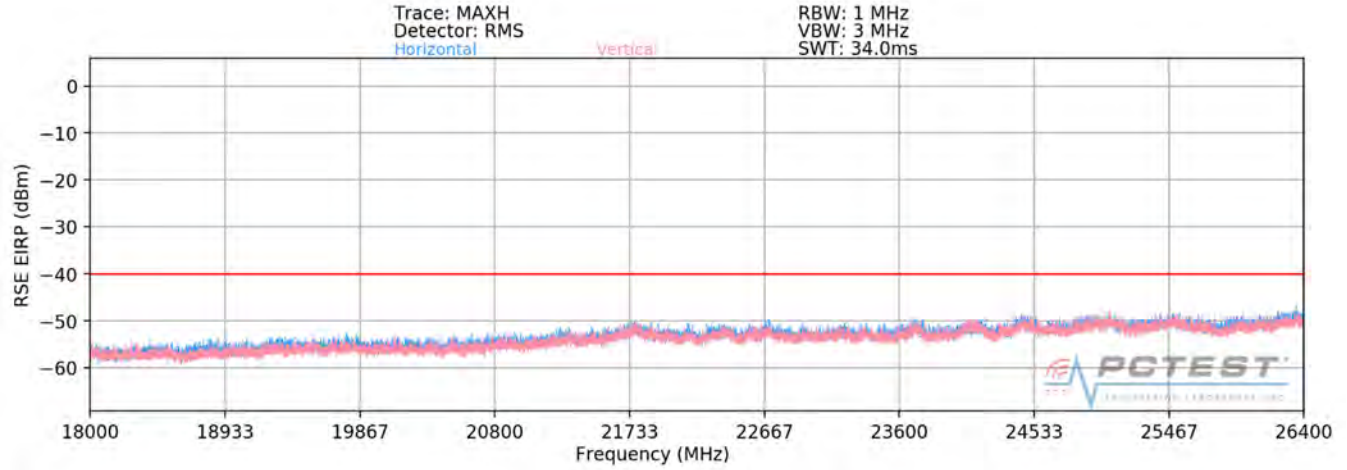
4) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.

5) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

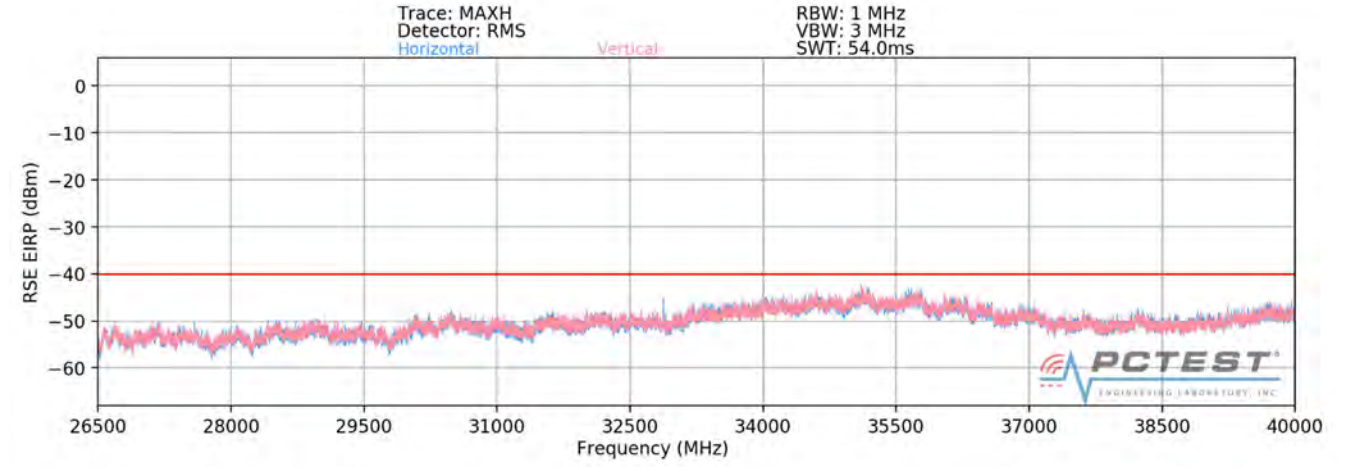
Band 48 – Main antenna



Plot 7-197. Radiated Spurious Plot 1 - 18GHz (Band 48)



Plot 7-198. Radiated Spurious Plot 18 - 26.5GHz (Band 48)



Plot 7-199. Radiated Spurious Plot 26.5 - 40GHz (Band 48)

OPERATING FREQUENCY:	3560.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	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]
7120.00	H	136	4	-65.97	11.71	-54.27	-14.3
10680.00	H	-	-	-65.66	12.55	-53.11	-13.1
14240.00	H	-	-	-59.56	11.35	-48.21	-8.2

Table 7-11. Radiated Spurious Data (Band 48 – Low Channel)

OPERATING FREQUENCY:	3625.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	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]
7250.00	H	325	196	-61.85	11.32	-50.53	-10.5
10875.00	H	112	298	-64.17	12.71	-51.46	-11.5
14500.00	H	-	-	-60.08	11.61	-48.47	-8.5

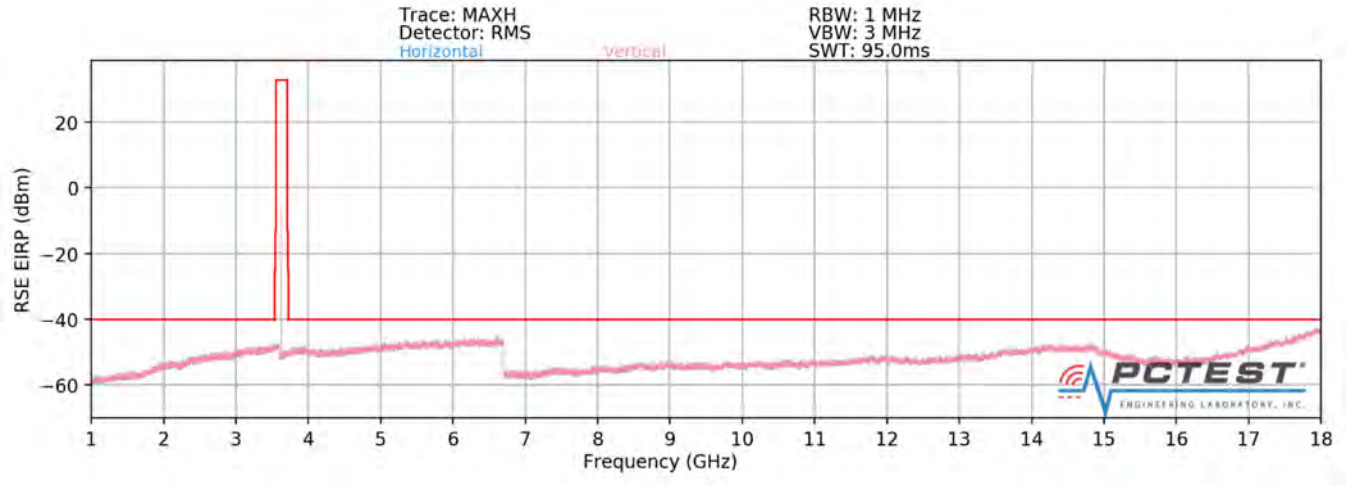
Table 7-12. Radiated Spurious Data (Band 48 – Mid Channel)

OPERATING FREQUENCY:	3690.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-40	dBm

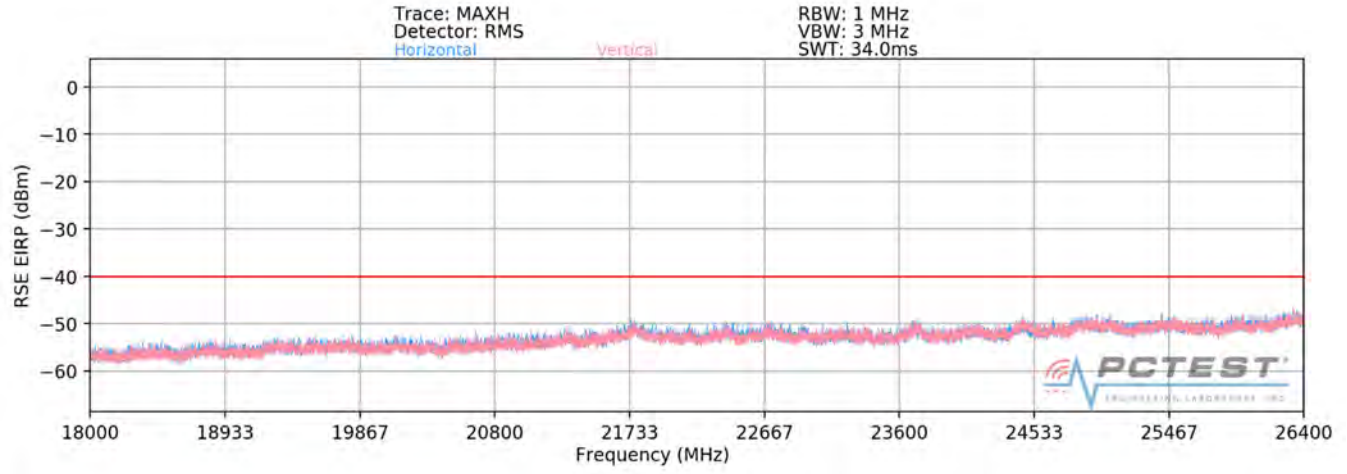
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7380.00	H	153	202	-61.32	10.96	-50.36	-10.4
11070.00	H	150	76	-65.19	12.72	-52.46	-12.5
14760.00	H	-	-	-60.74	12.02	-48.71	-8.7

Table 7-13. Radiated Spurious Data (Band 48 – High Channel)

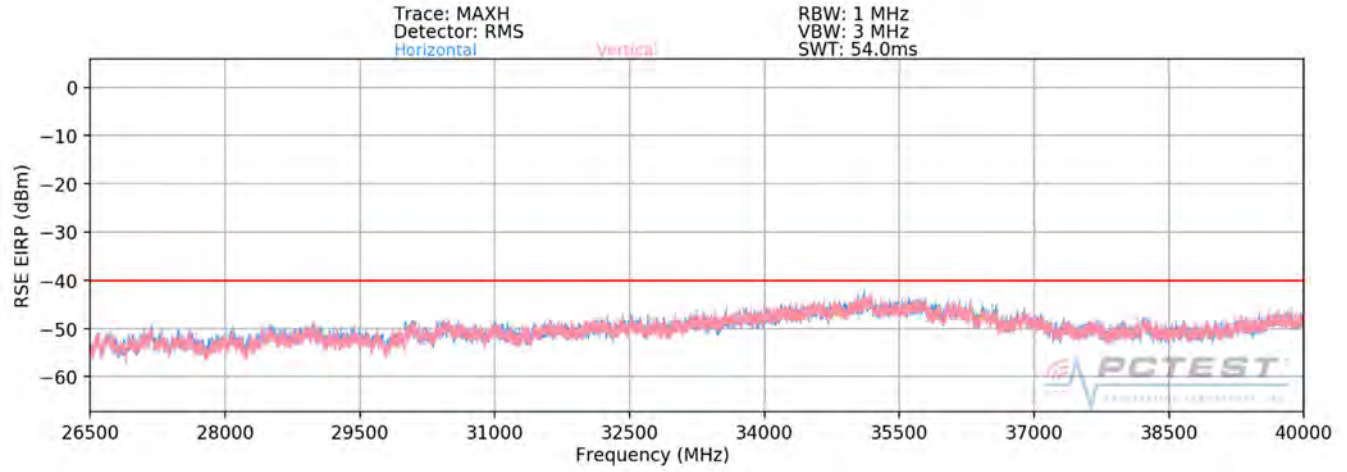
Band 48 – Diversity Antenna



Plot 7-200. Radiated Spurious Plot 1 - 18GHz (Band 48)



Plot 7-201. Radiated Spurious Plot 18 - 26.5GHz (Band 48)



Plot 7-202. Radiated Spurious Plot 26.5 - 40GHz (Band 48)

OPERATING FREQUENCY:	3560.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	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]
7120.00	V	135	351	-65.37	11.71	-53.67	-13.7
10680.00	V	-	-	-65.29	12.55	-52.74	-12.7
14240.00	V	-	-	-59.80	11.35	-48.45	-8.4

Table 7-14. Radiated Spurious Data (Band 48 – Low Channel)

OPERATING FREQUENCY:	3625.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	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]
7250.00	V	211	7	-61.85	11.32	-50.53	-10.5
10875.00	V	-	-	-66.50	12.71	-53.79	-13.8
14500.00	V	-	-	-60.29	11.61	-48.68	-8.7

Table 7-15. Radiated Spurious Data (Band 48 – Mid Channel)

OPERATING FREQUENCY:	3690.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	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]
7380.00	V	251	194	-63.87	10.96	-52.91	-12.9
11070.00	V	-	-	-66.29	12.72	-53.56	-13.6
14760.00	V	-	-	-60.89	12.02	-48.86	-8.9

Table 7-16. Radiated Spurious Data (Band 48 – High Channel)

7.10 Uplink Carrier Aggregation Radiated Measurements

§2.1053, §96.41(e)

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-D-2010 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as peak measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v02r02 – Section 5.8

ANSI/TIA-603-D-2010 – Section 2.2.12

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW ≥ 3 x RBW
3. No. of sweep points ≥ 2 x span / RBW
4. Detector = RMS
5. Trace mode = trace average for continuous emissions, max hold for pulse emissions
6. The trace was allowed to stabilize

Test Setup

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

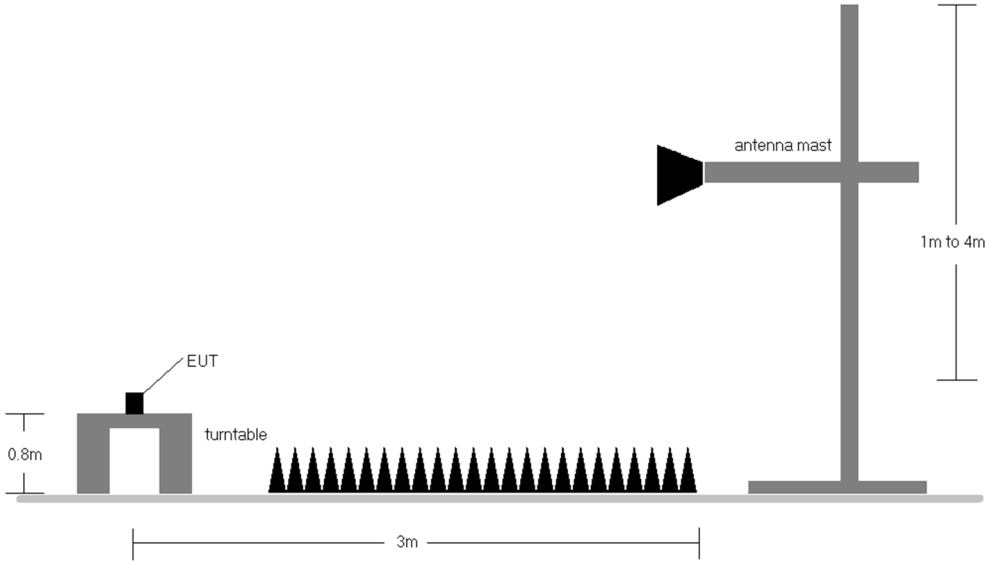


Figure 7-9. Test Instrument & Measurement Setup

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 while powered by an Power Over Ethernet (POE) power source.

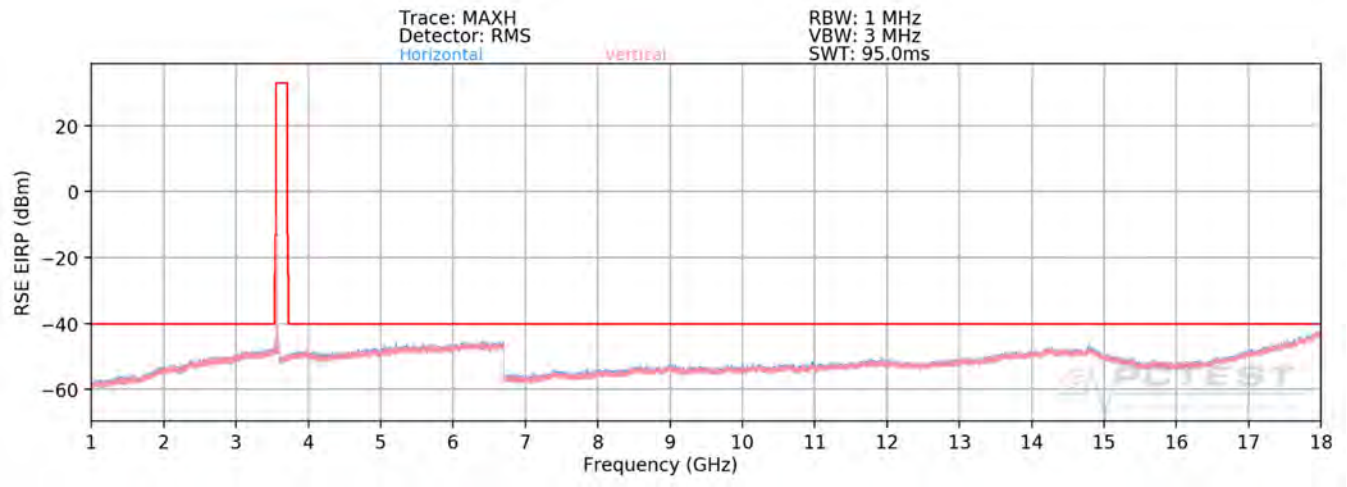
3) Radiated spurious emissions measurements were evaluated for the two contiguous channels using various combinations of RB size, RB offset, modulation, and channel bandwidth. The worst case (highest) emissions were found while operating with QPSK modulation with both carriers set to transmit using 1RB.

4) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.

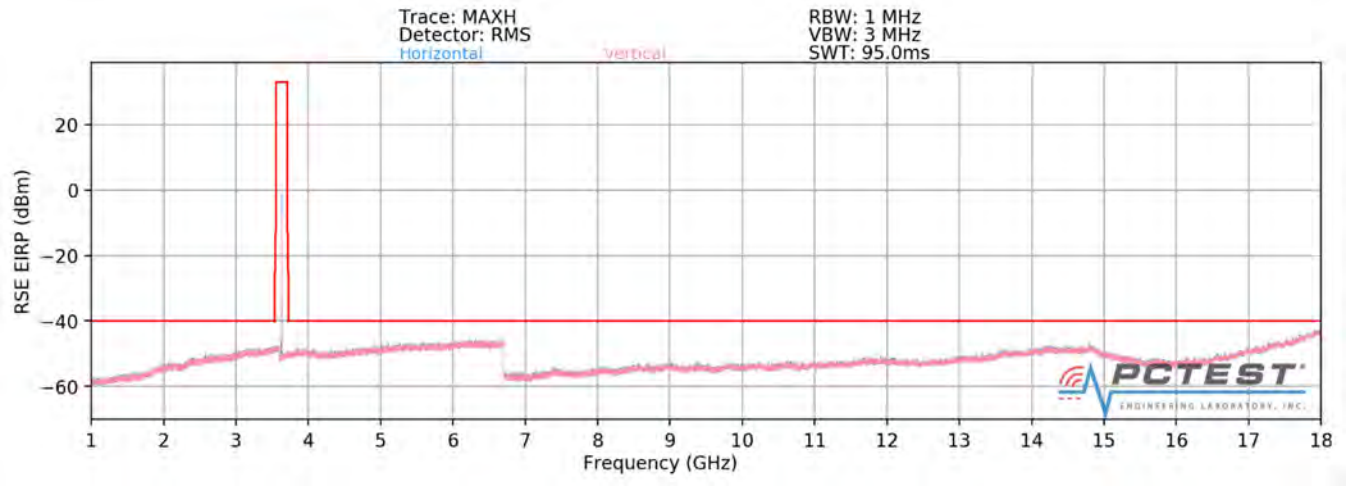
5) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.

6) No significant emissions were found as a result of two uplink carriers operating contiguously.

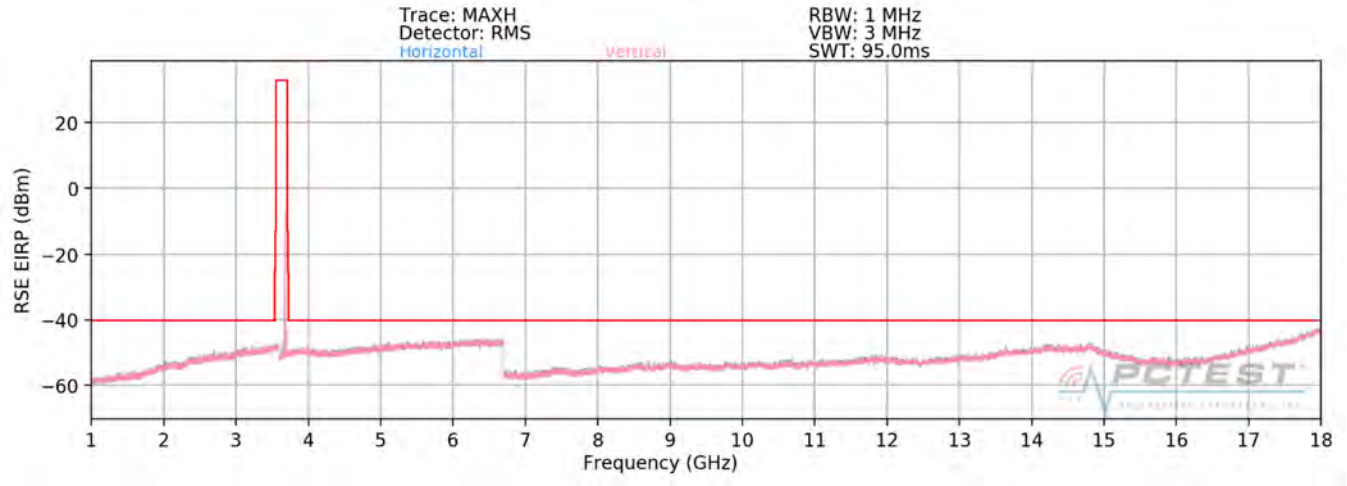
ULCA Band 48 – Main Antenna



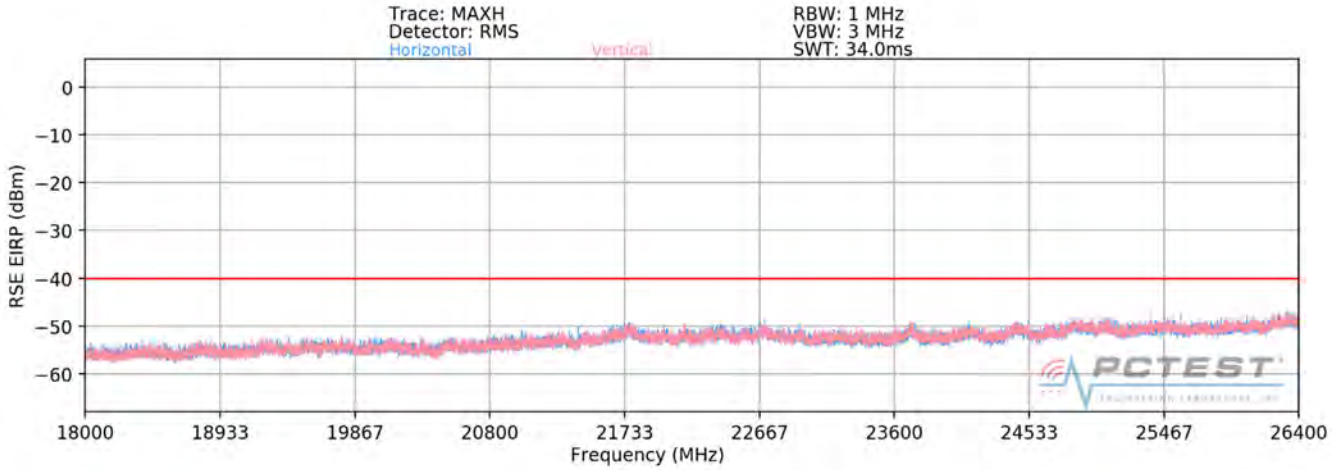
Plot 7-203. Radiated Spurious Plot 1GHz - 18GHz (ULCA Band 48 Low Channel – PCC/SCC: 1RB)



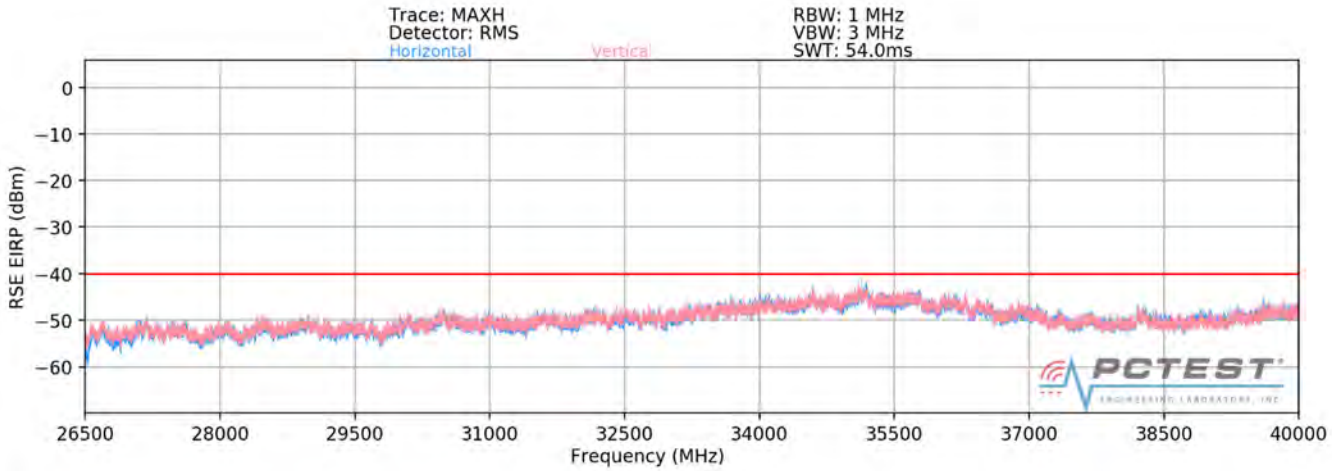
Plot 7-204. Radiated Spurious Plot 1GHz - 18GHz (ULCA Band 48 Mid Channel – PCC/SCC: 1RB)



Plot 7-205. Radiated Spurious Plot 1GHz - 18GHz (ULCA Band 48 High Channel – PCC/SCC: 1RB)



Plot 7-206. Radiated Spurious Plot 18GHz – 26.5GHz (ULCA Band 48)



Plot 7-207. Radiated Spurious Plot 26.5GHz – 40GHz (ULCA Band 48)

OPERATING FREQUENCY (PCC):	3560.00	MHz
OPERATING FREQUENCY (SCC):	3579.80	MHz
CHANNEL (PCC):	55340	
CHANNEL (SCC):	55538	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	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]
7120.00	V	186	118	-61.23	11.71	-49.53	-9.5
10680.00	V	-	-	-66.01	12.55	-53.46	-13.5
14240.00	V	-	-	-59.80	11.35	-48.45	-8.4
17800.00	V	-	-	-54.34	10.01	-44.32	-4.3

Plot 7-17. Radiated Spurious Data (ULCA BAND 48 PCC: RB 1 Offset 99, SCC: RB 1 Offset 0 – Low Channel)

OPERATING FREQUENCY (PCC):	3625.00	MHz
OPERATING FREQUENCY (SCC):	3644.80	MHz
CHANNEL (PCC):	55990	
CHANNEL (SCC):	56188	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	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]
7250.00	V	191	128	-60.41	11.32	-49.09	-9.1
10875.00	V	-	-	-66.95	12.71	-54.24	-14.2
14500.00	V	-	-	-60.22	11.61	-48.61	-8.6

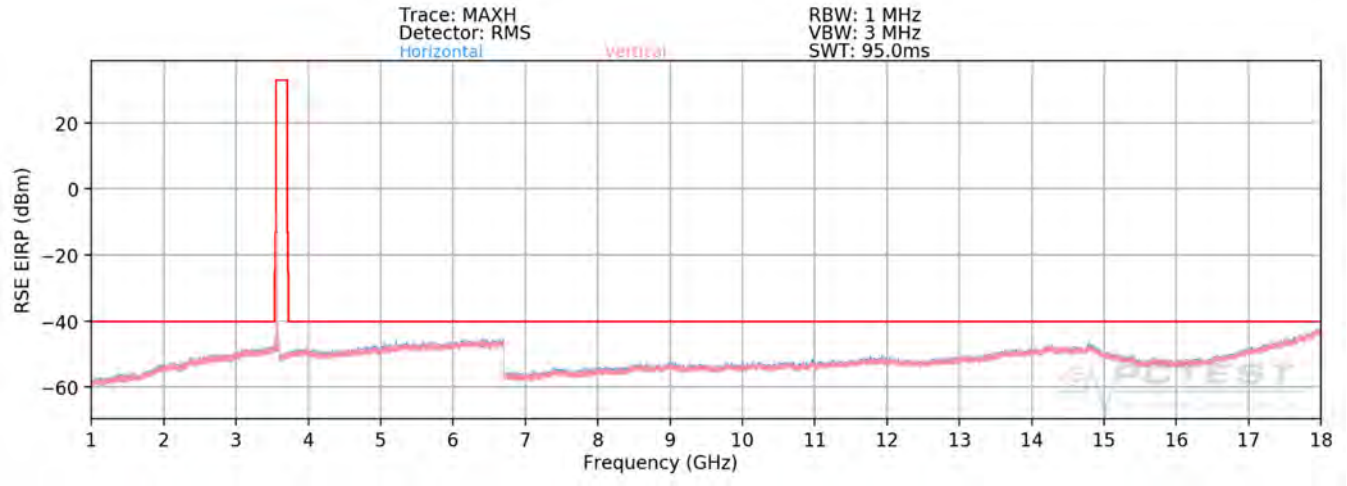
Plot 7-18. Radiated Spurious Data (ULCA BAND 48 PCC: RB 1 Offset 99, SCC: RB 1 Offset 0 – Mid Channel)

OPERATING FREQUENCY (PCC):	3690.00	MHz
OPERATING FREQUENCY (SCC):	3670.20	MHz
CHANNEL (PCC):	56640	
CHANNEL (SCC):	56442	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-40	dBm

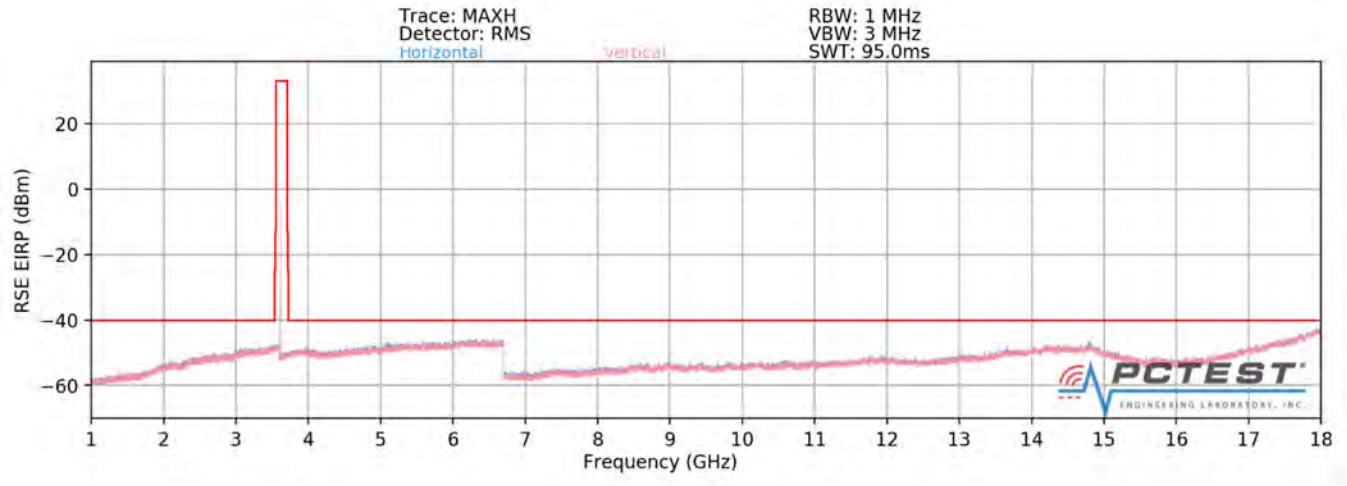
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7380.00	V	210	122	-58.84	10.96	-47.88	-7.9
11070.00	V	-	-	-66.41	12.72	-53.68	-13.7
14760.00	V	-	-	-61.05	12.02	-49.02	-9.0

Plot 7-19. Radiated Spurious Data (ULCA BAND 48 PCC: RB 1 Offset 0, SCC: RB 1 Offset 99 – High Channel)

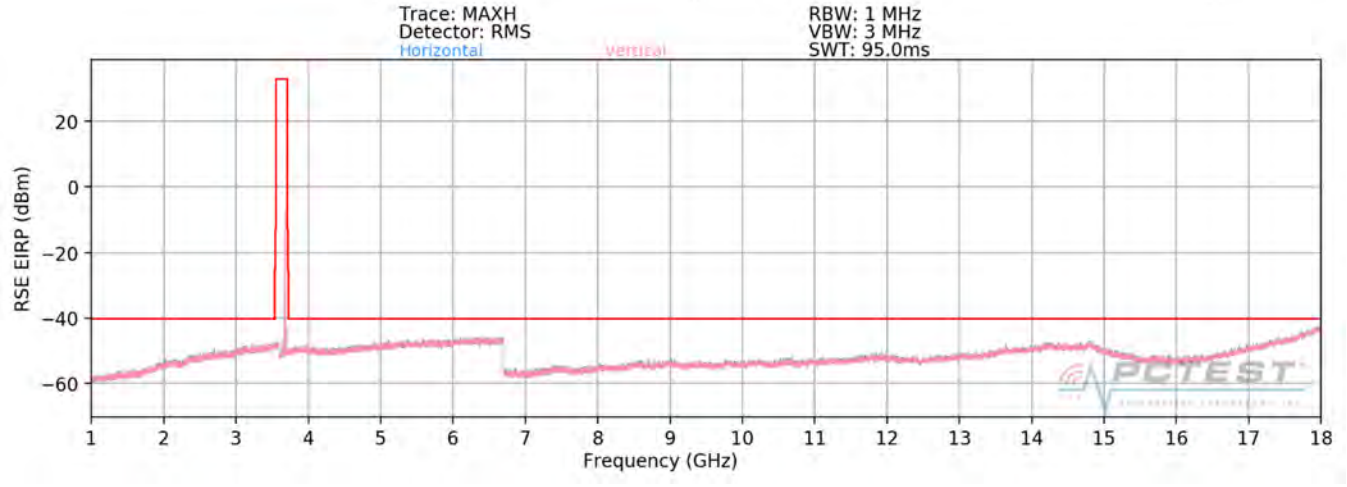
ULCA Band 48 – Diversity Antenna



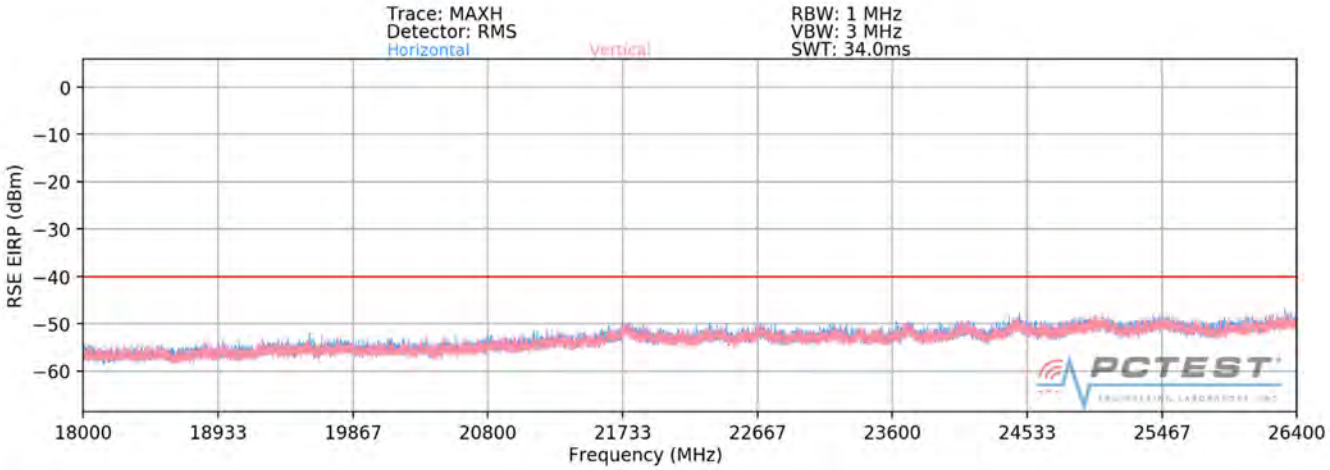
Plot 7-208. Radiated Spurious Plot 1GHz - 18GHz (ULCA Band 48 Low Channel – PCC/SCC: 1RB)



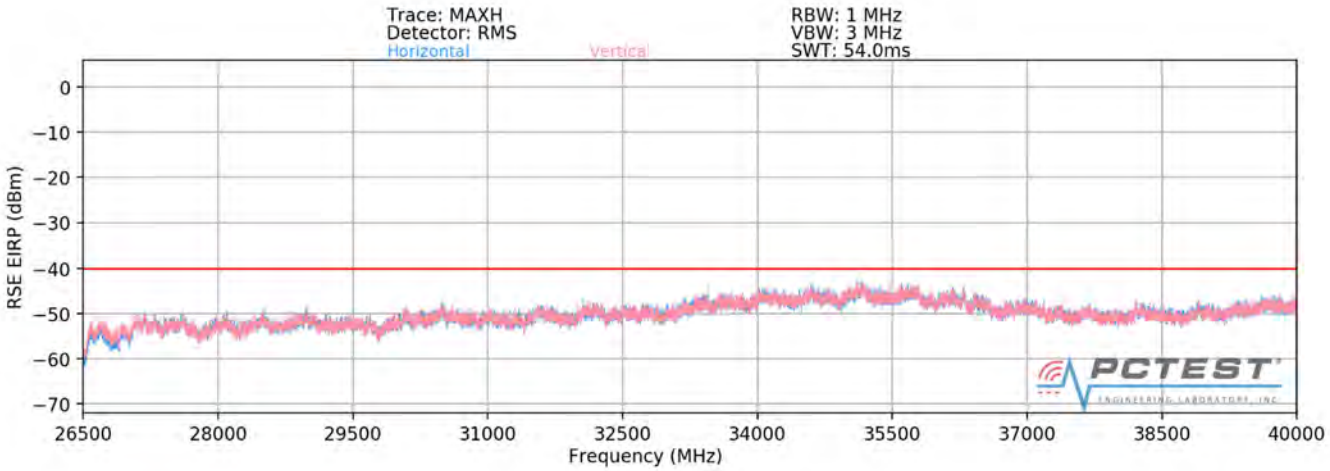
Plot 7-209. Radiated Spurious Plot 1GHz - 18GHz (ULCA Band 48 Mid Channel – PCC/SCC: 1RB)



Plot 7-210. Radiated Spurious Plot 1GHz - 18GHz (ULCA Band 48 High Channel – PCC/SCC: 1RB)



Plot 7-211. Radiated Spurious Plot 18GHz – 26.5GHz (ULCA Band 48)



Plot 7-212. Radiated Spurious Plot 26.5GHz – 40GHz (ULCA Band 48)

OPERATING FREQUENCY (PCC):	3560.00	MHz
OPERATING FREQUENCY (SCC):	3579.80	MHz
CHANNEL (PCC):	55340	
CHANNEL (SCC):	55538	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	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]
7120.00	V	184	128	-61.47	11.71	-49.77	-9.8
10680.00	V	303	113	-62.50	12.55	-49.95	-10.0
14240.00	V	-	-	-59.62	11.35	-48.27	-8.3
17800.00	V	-	-	-54.41	10.01	-44.39	-4.4

Plot 7-20. Radiated Spurious Data (ULCA B48 PCC: RB 1 Offset 99, SCC: RB 1 Offset 0 – Low Channel)

OPERATING FREQUENCY (PCC):	3625.00	MHz
OPERATING FREQUENCY (SCC):	3644.80	MHz
CHANNEL (PCC):	55990	
CHANNEL (SCC):	56188	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	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]
7250.00	V	174	120	-60.29	11.32	-48.97	-9.0
10875.00	V	228	241	-64.62	12.71	-51.91	-11.9
14500.00	V	-	-	-60.48	11.61	-48.87	-8.9

Plot 7-21. Radiated Spurious Data (ULCA B48 PCC: RB 1 Offset 99, SCC: RB 1 Offset 0 – Mid Channel)

OPERATING FREQUENCY (PCC):	3690.00	MHz
OPERATING FREQUENCY (SCC):	3670.20	MHz
CHANNEL (PCC):	56640	
CHANNEL (SCC):	56442	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	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]
7380.00	V	213	130	-59.20	10.96	-48.24	-8.2
11070.00	V	241	88	-62.87	12.72	-50.14	-10.1
14760.00	V	-	-	-60.81	12.02	-48.78	-8.8

Plot 7-22. Radiated Spurious Data (ULCA B48 PCC: RB 1 Offset 0, SCC: RB 1 Offset 99 – High Channel)

7.11 Frequency Stability / Temperature Variation

§2.1055

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 96, 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 48 Frequency Stability Measurements

OPERATING FREQUENCY:	3,625,000,000	Hz
CHANNEL:	55990	
REFERENCE VOLTAGE:	48	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	48	- 30	3,624,999,671	-329	-0.0000091
100 %		- 20	3,624,999,810	-190	-0.0000052
100 %		- 10	3,624,999,819	-181	-0.0000050
100 %		0	3,625,000,057	57	0.0000016
100 %		+ 10	3,624,999,910	-90	-0.0000025
100 %		+ 20	3,624,999,997	-3	-0.0000001
100 %		+ 30	3,625,000,162	162	0.0000045
100 %		+ 40	3,624,999,888	-112	-0.0000031
100 %		+ 50	3,625,000,200	200	0.0000055

Table 7-23. Frequency Stability Data (Band 48)

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 48 Frequency Stability Measurements

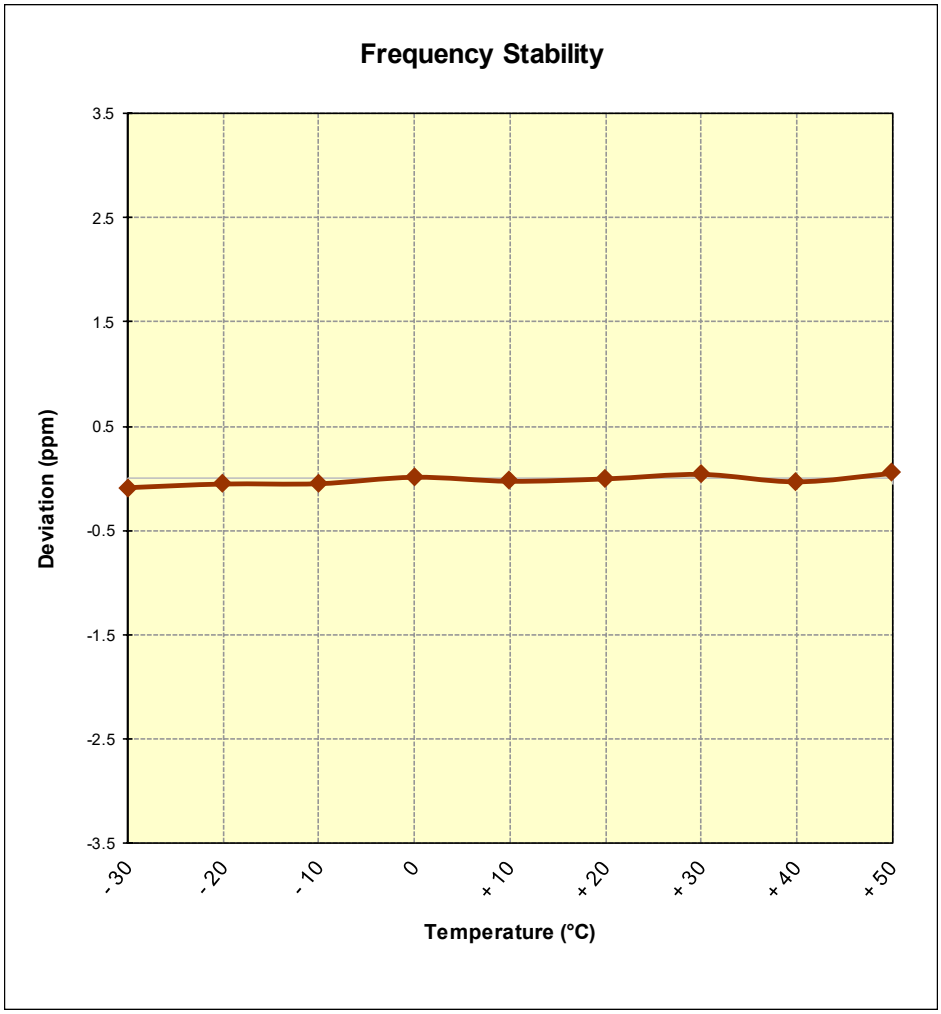


Figure 7-10. Frequency Stability Graph (Band 48)

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Netcomm Outdoor LTE Router FCC ID: XIA-IFWA661** complies with all of the requirements of Part 96 of the FCC Rules for LTE operation only.