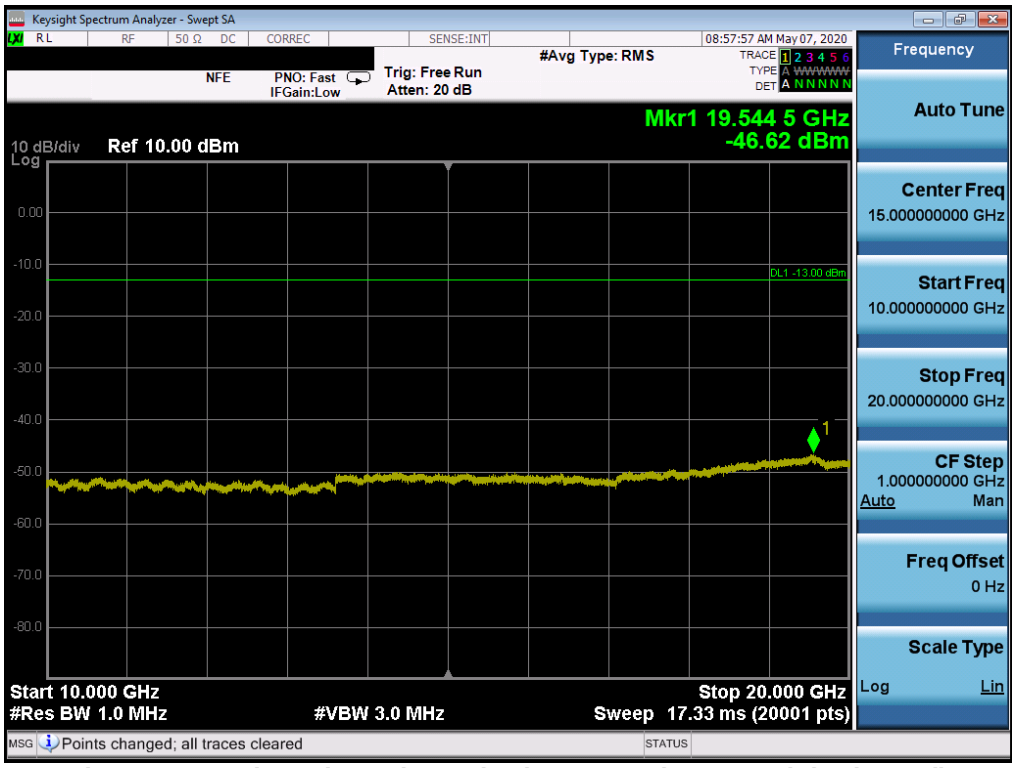


Plot 7-31. Conducted Spurious Plot (WCDMA Ch. 1513- High Channel)

7.4 Band Edge Emissions at Antenna Terminal

Test Overview

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

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

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW ≥ 1% of the emission bandwidth
4. VBW ≥ 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Setup

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

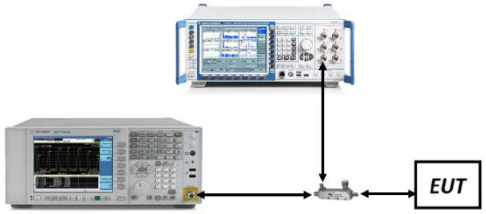


Figure 7-3. Test Instrument & Measurement Setup

Test Notes

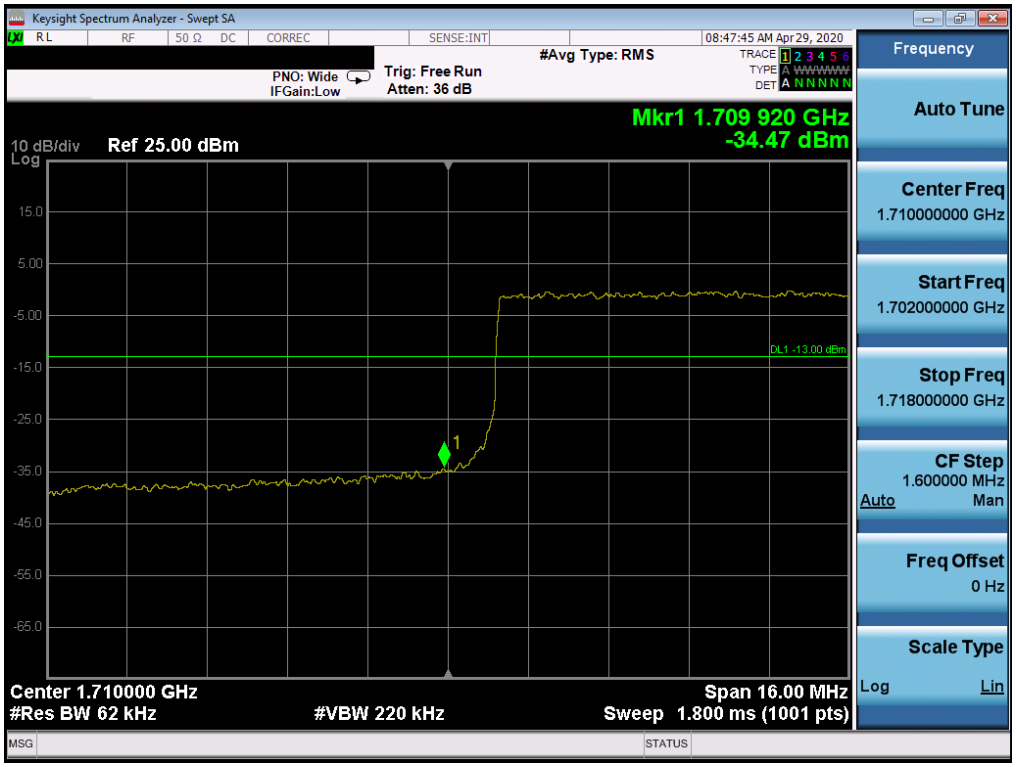
Per 27.53(h) in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

Per 27.53(g) for operations in the 698-746 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

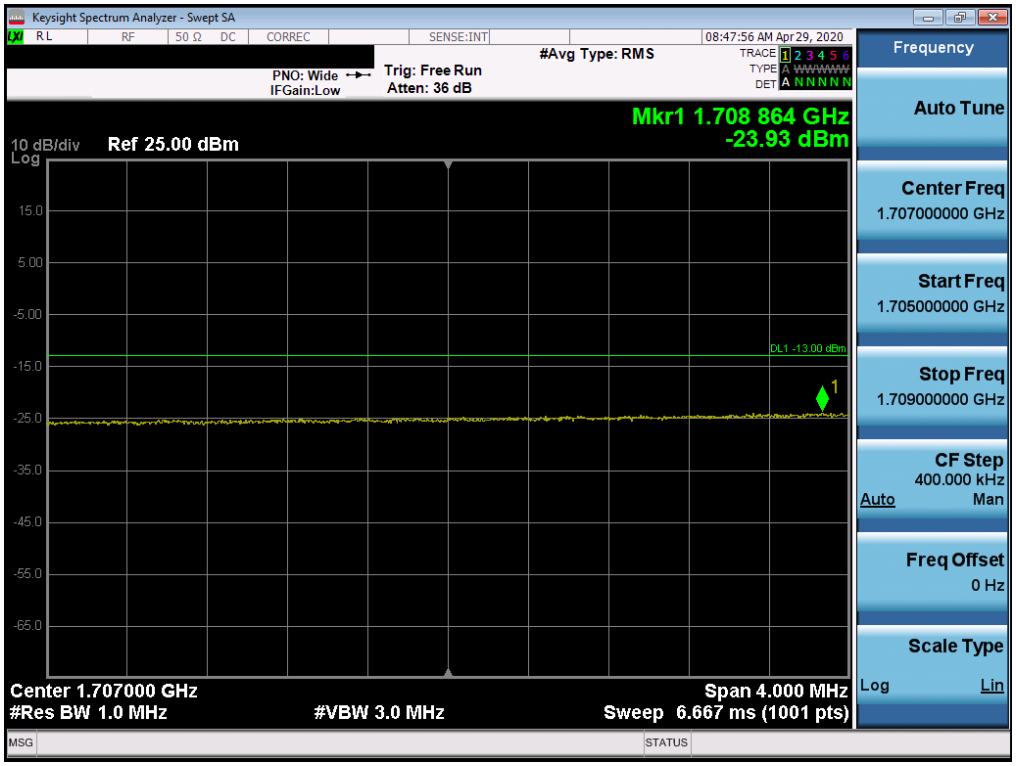
Per 27.53(c)(5) for operations in the 776-788 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

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

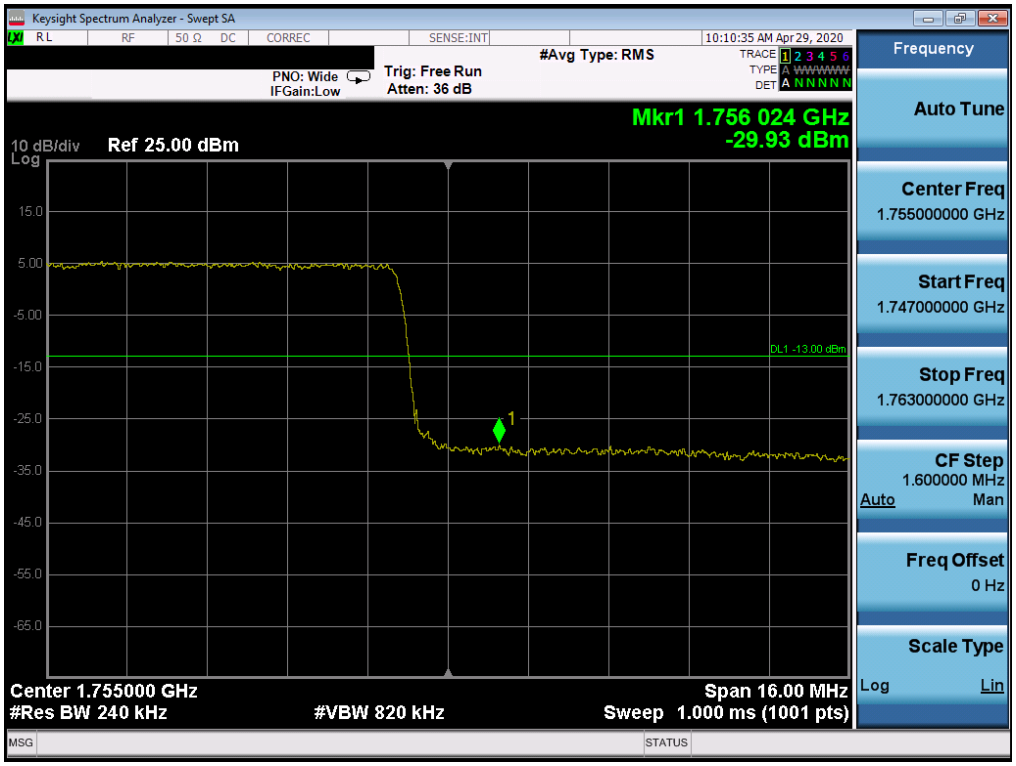
LTE Band 66/4



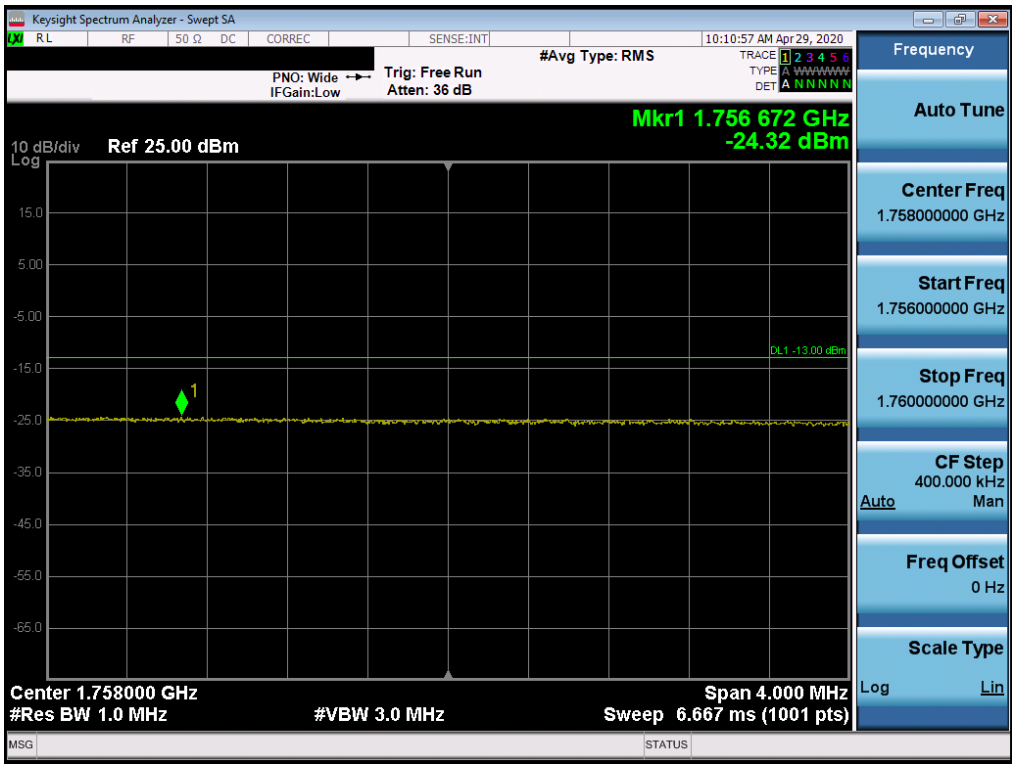
Plot 7-80. Lower Band Edge Plot (LTE Band 66/4 - 20MHz QPSK – Full RB Configuration)



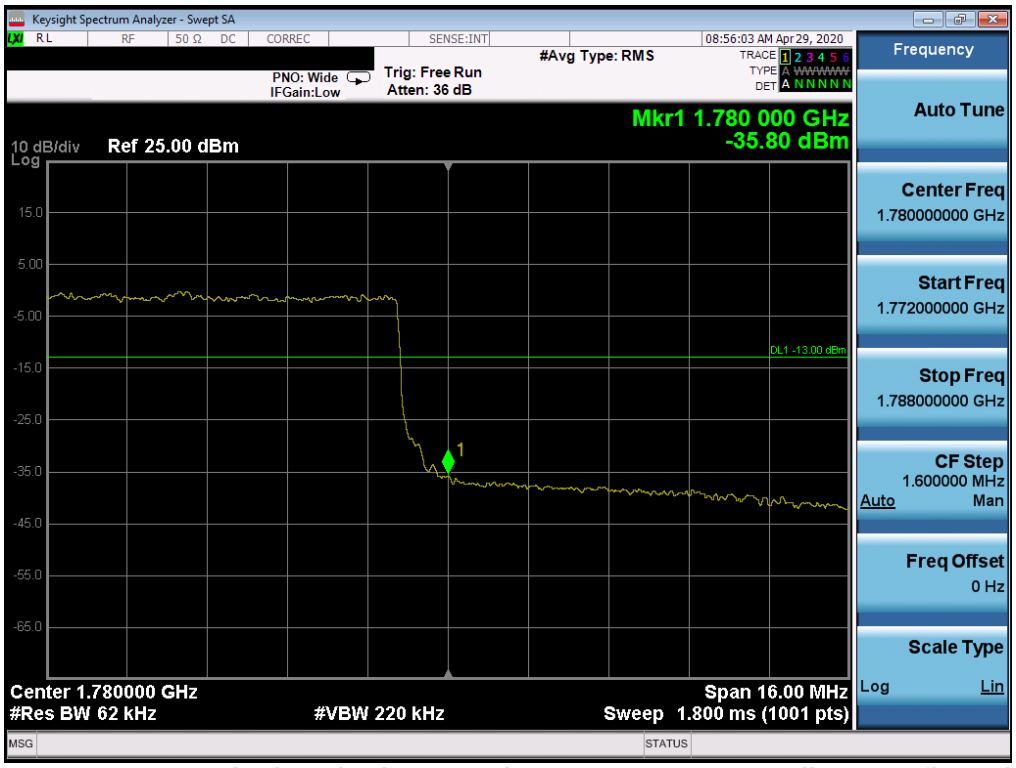
Plot 7-81. Lower Extended Band Edge Plot (LTE Band 66/4 - 20MHz QPSK – Full RB Configuration)



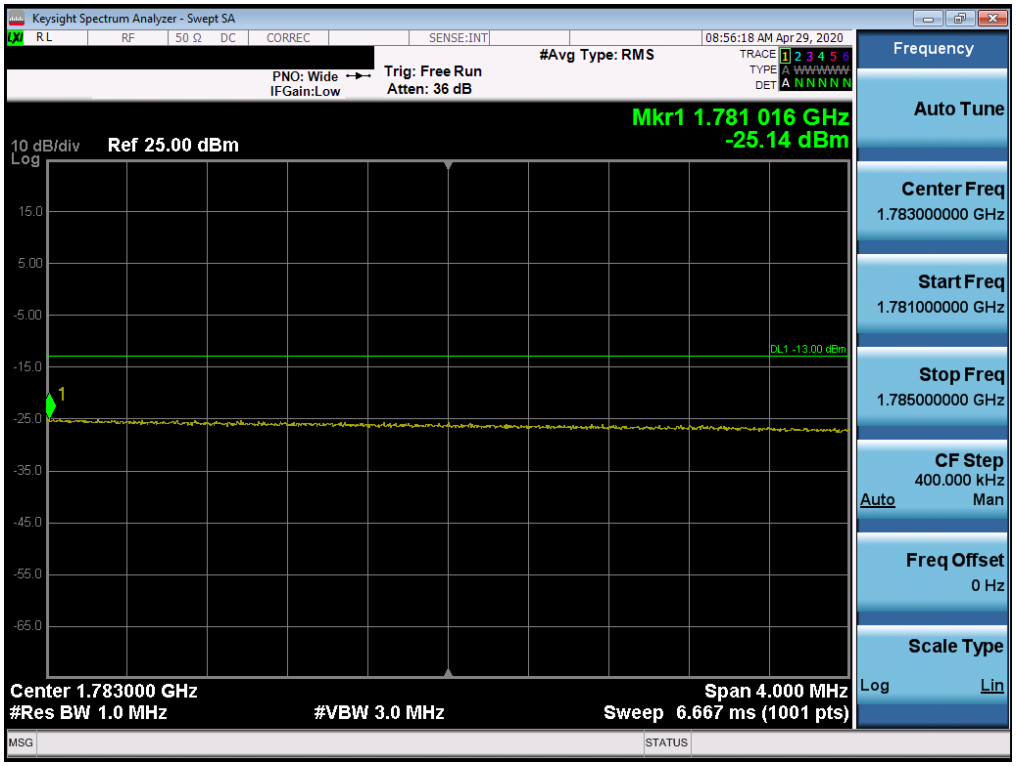
Plot 7-82. Upper Band Edge Plot (LTE Band 4 - 20MHz QPSK – Full RB Configuration)



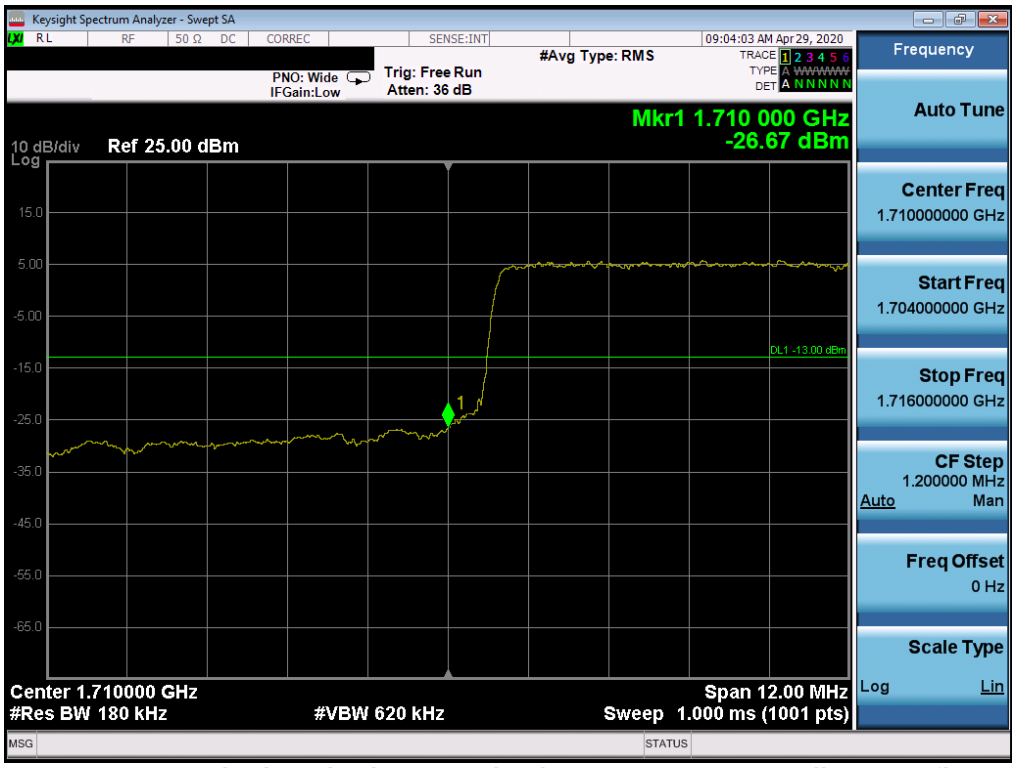
Plot 7-83. Upper Extended Band Edge Plot (LTE Band 4 - 20MHz QPSK – Full RB Configuration)



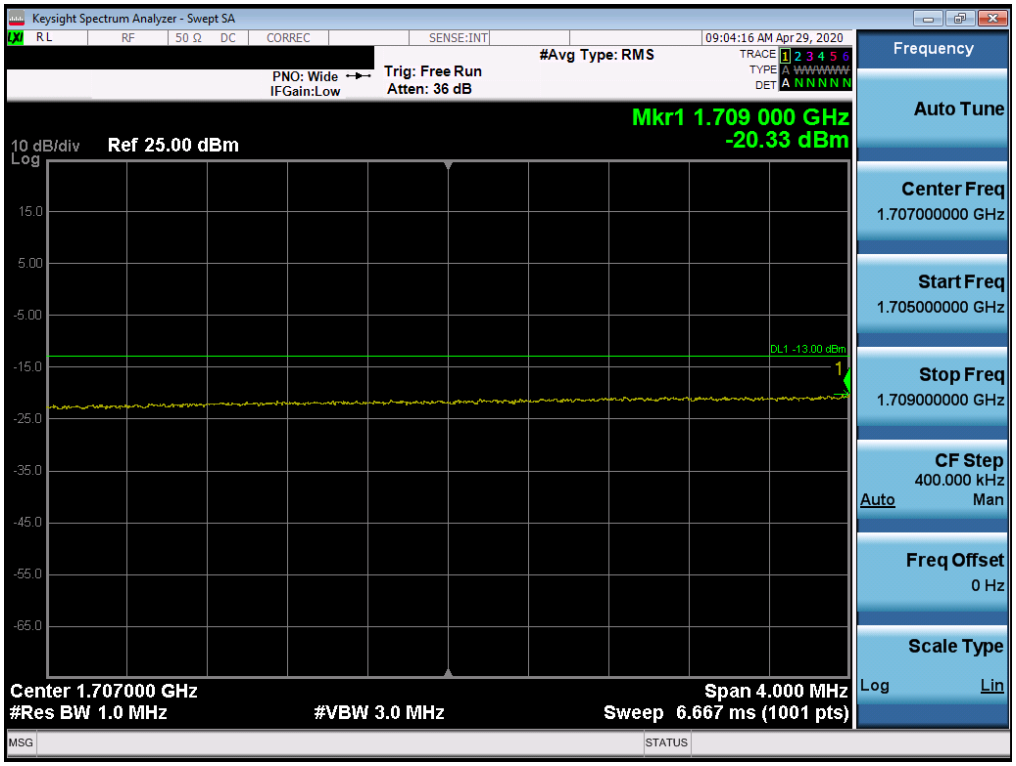
Plot 7-84. Upper Band Edge Plot (LTE Band 66 - 20MHz QPSK – Full RB Configuration)



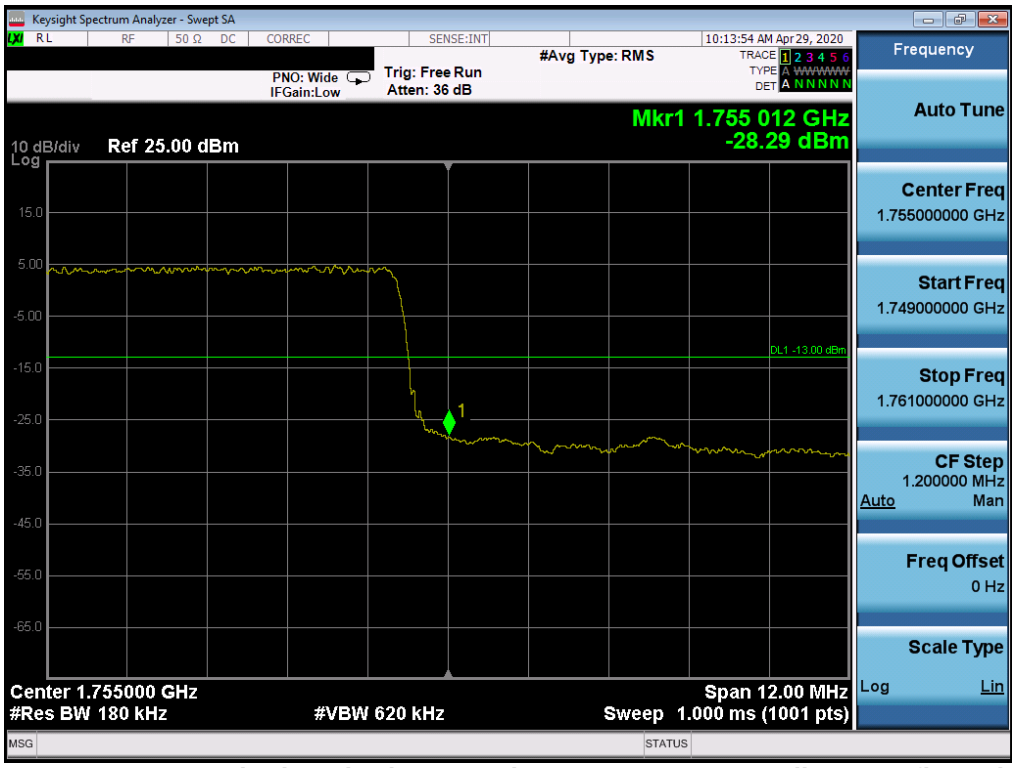
Plot 7-85. Channel Edge Plot (LTE Band 66 - 20MHz QPSK – Full RB Conifiguration)



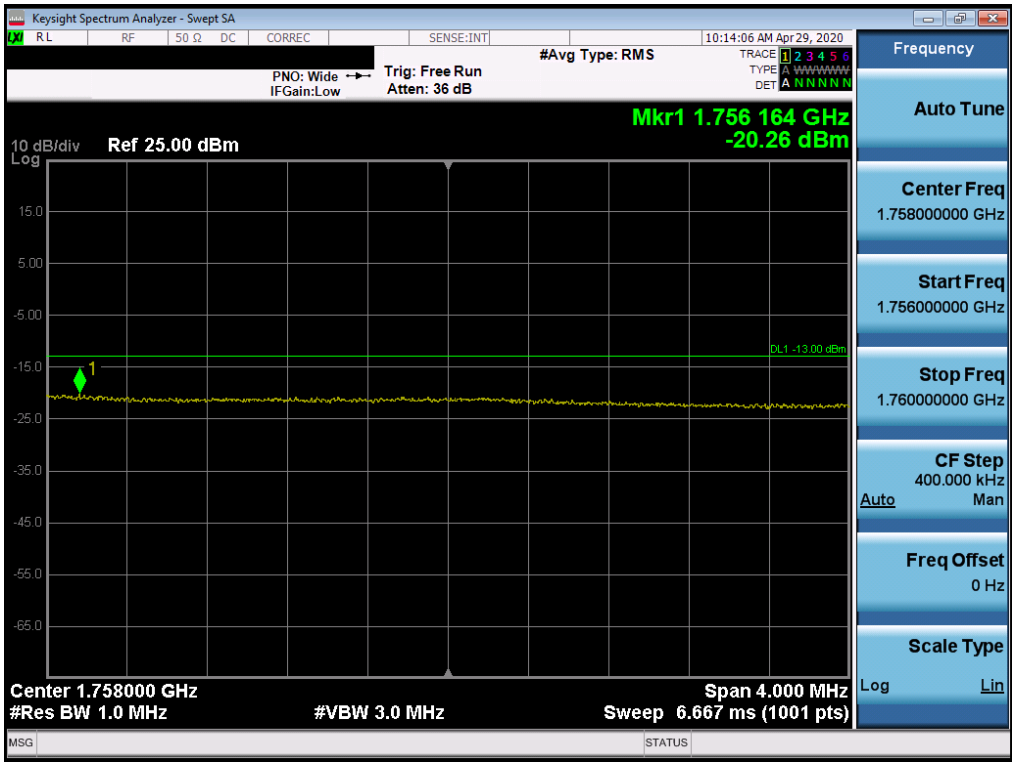
Plot 7-86. Lower Band Edge Plot (LTE Band 66/4 - 15MHz QPSK – Full RB Configuration)



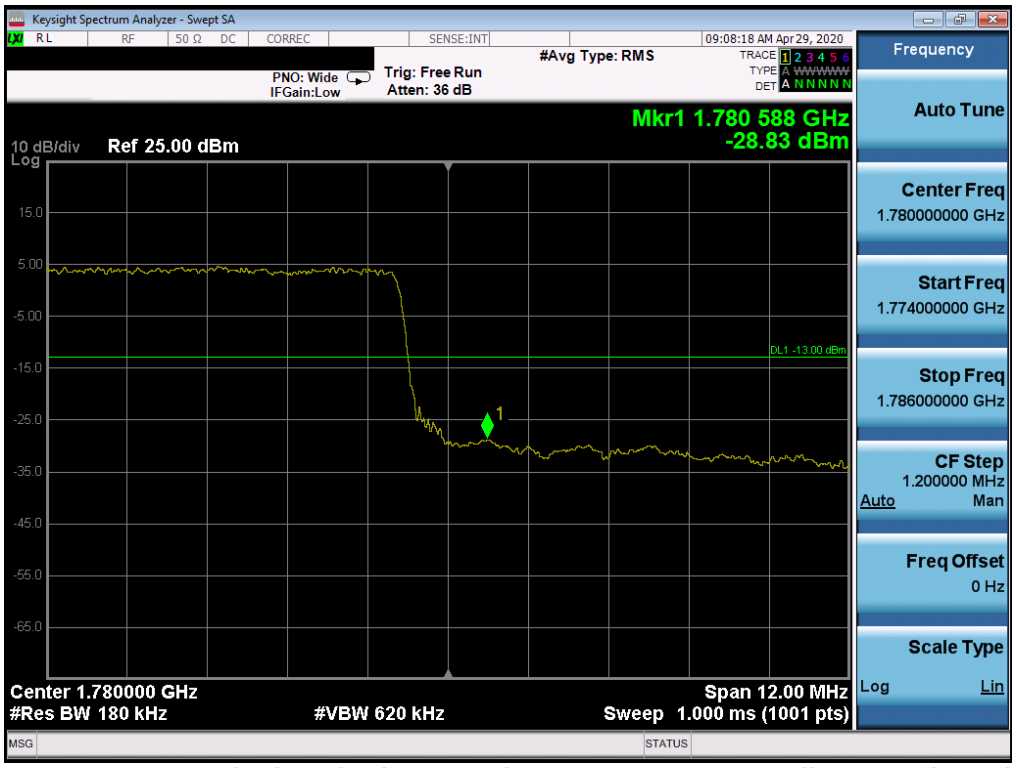
Plot 7-87. Lower Extended Band Edge Plot (LTE Band 66/4 - 15MHz QPSK – Full RB Configuration)



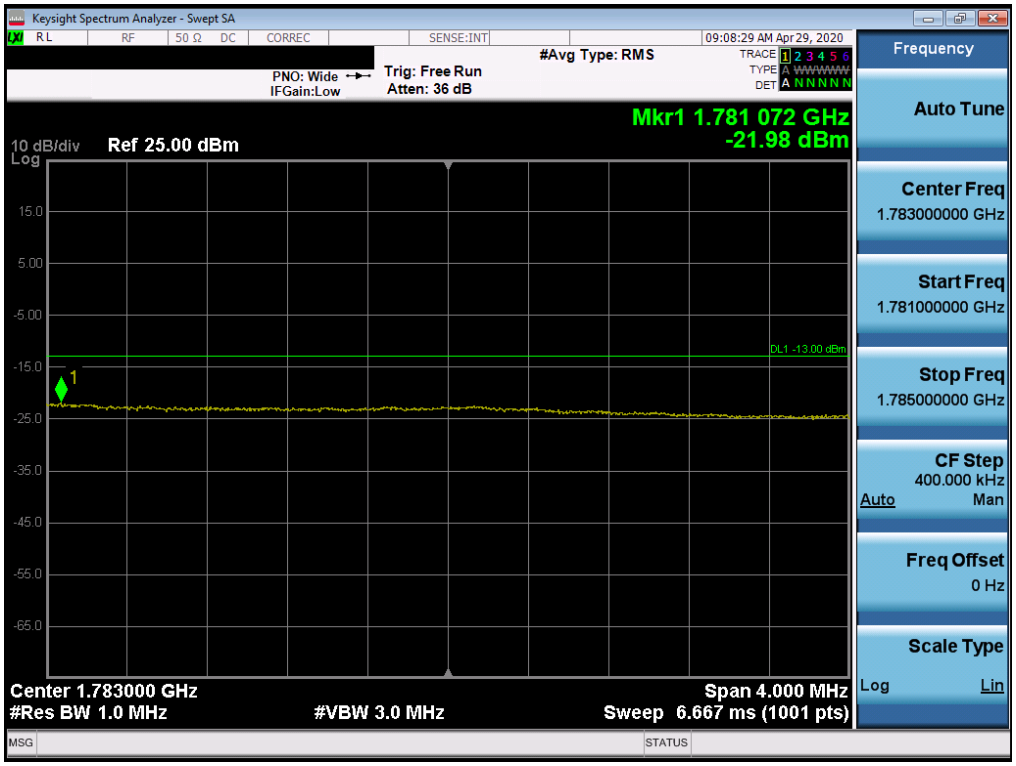
Plot 7-88. Upper Band Edge Plot (LTE Band 4 - 15MHz QPSK – Full RB Configuration)



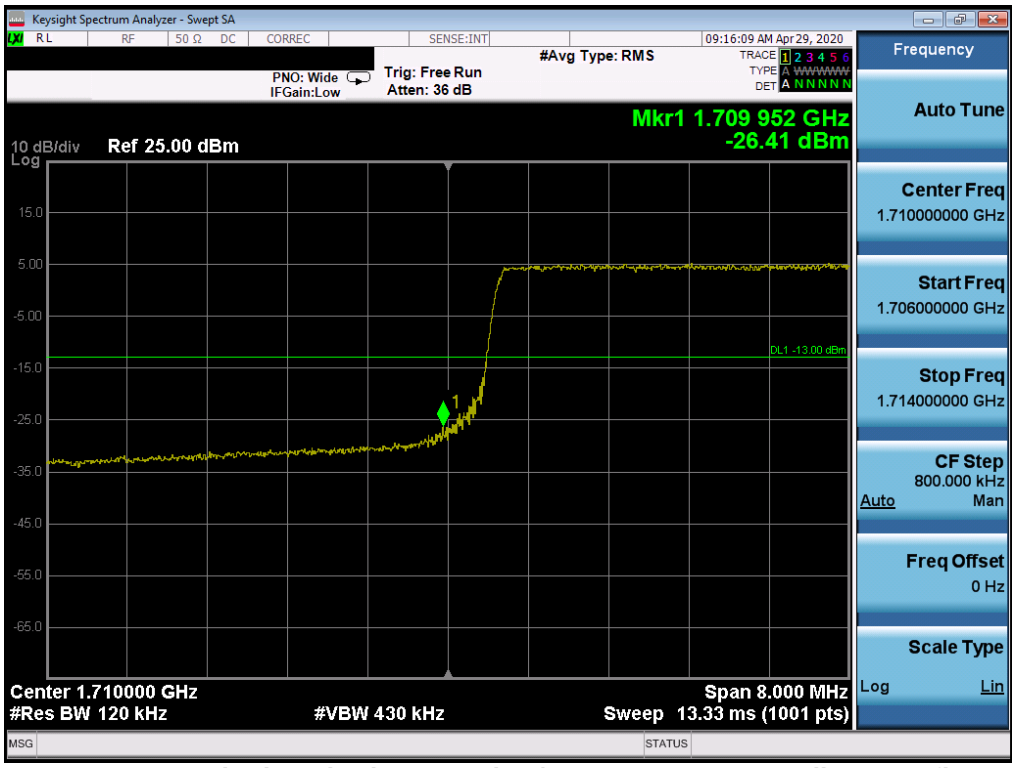
Plot 7-89. Upper Extended Band Edge Plot (LTE Band 4 - 15MHz QPSK – Full RB Configuration)



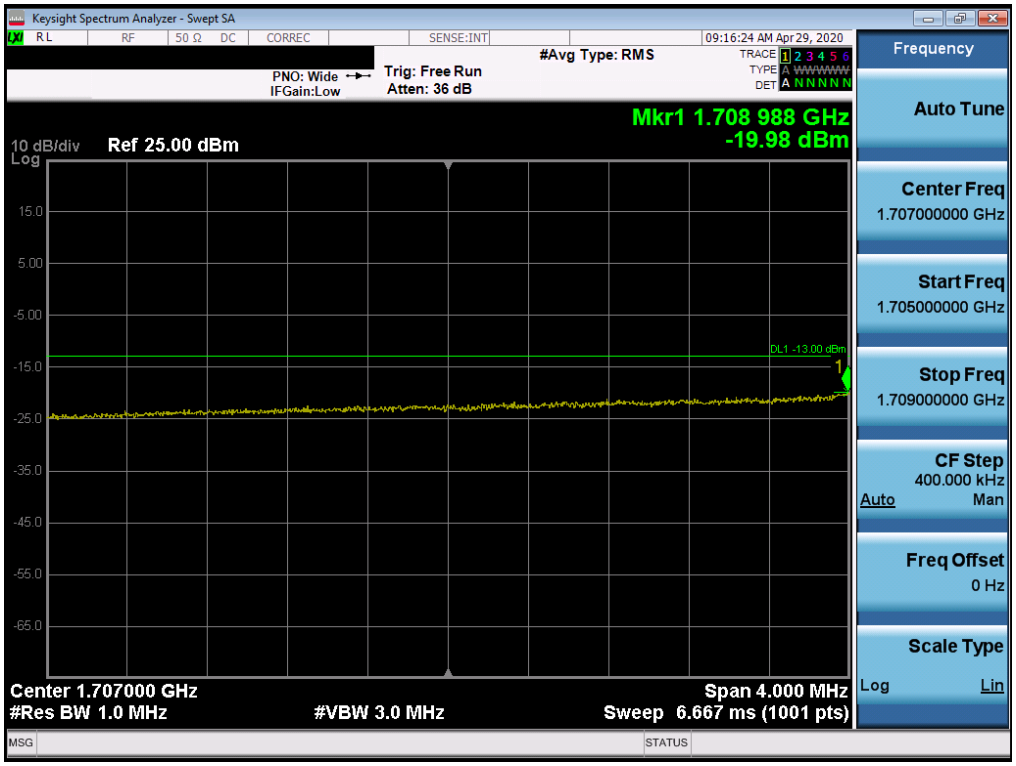
Plot 7-90. Upper Band Edge Plot (LTE Band 66 - 15MHz QPSK – Full RB Configuration)



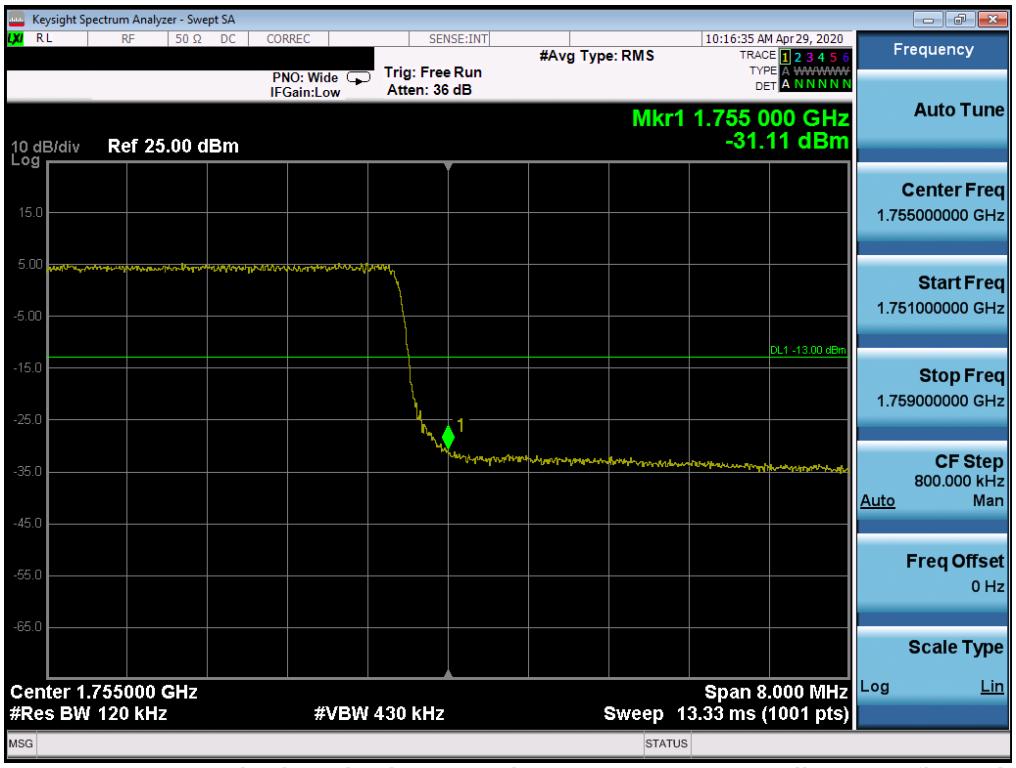
Plot 7-91. Upper Extended Band Edge Plot (LTE Band 66 - 15MHz QPSK – Full RB Conifiguration)



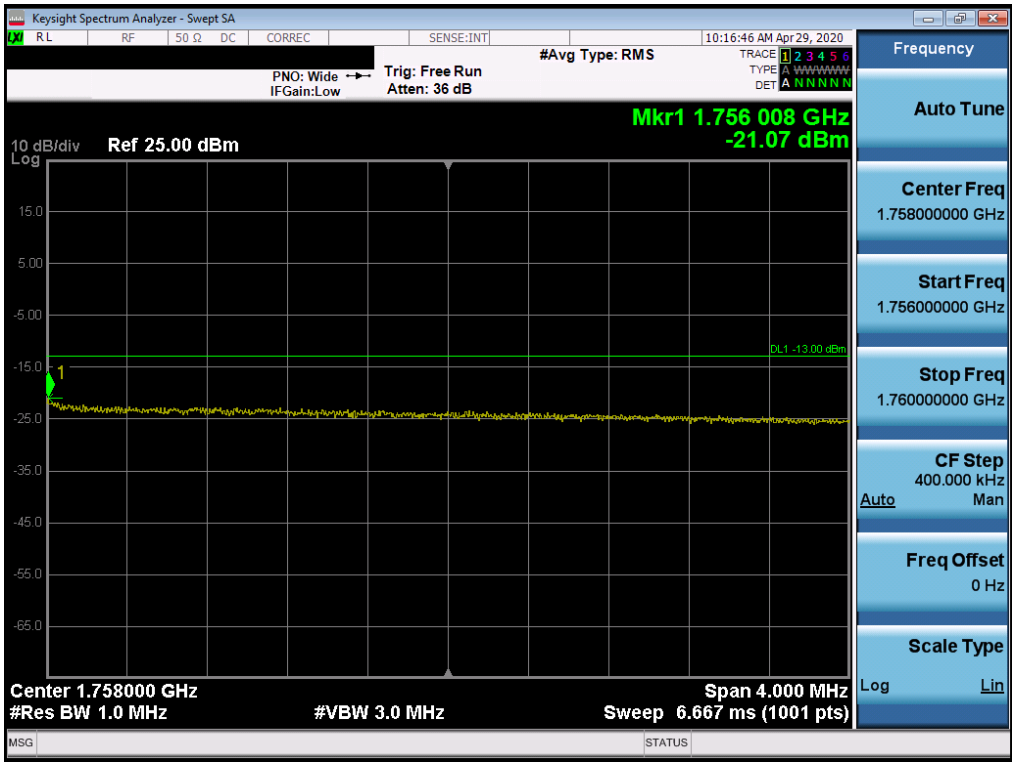
Plot 7-92. Lower Band Edge Plot (LTE Band 66/4 - 10MHz QPSK – Full RB Configuration)



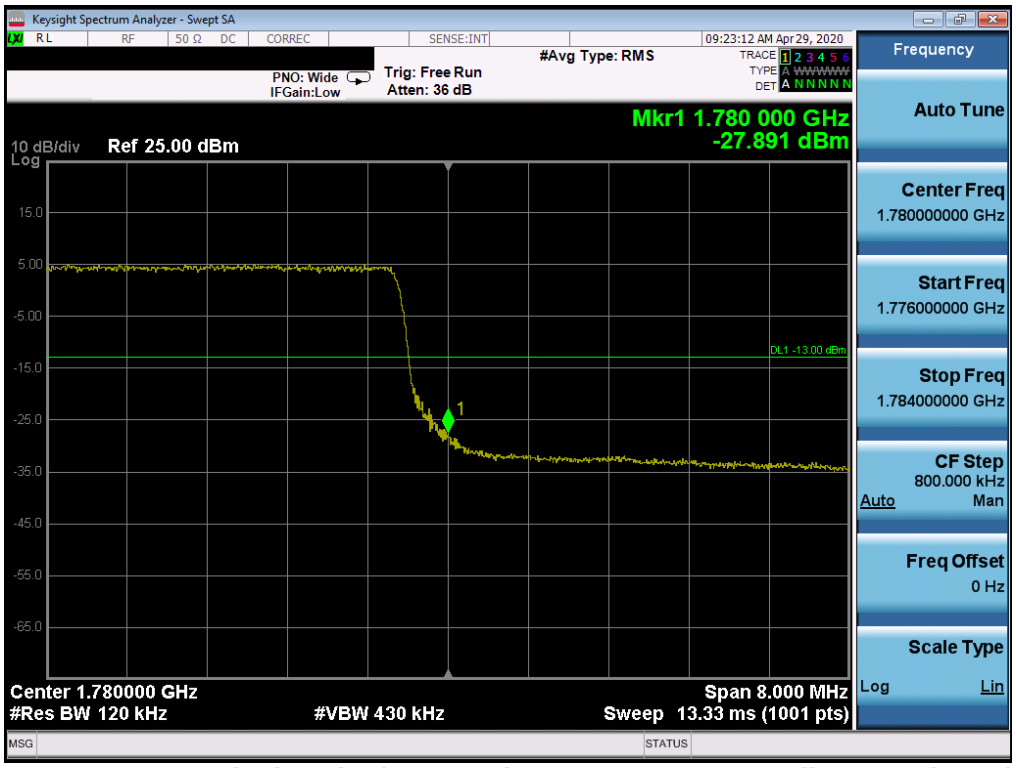
Plot 7-93. Lower Extended Band Edge Plot (LTE Band 66/4 - 10MHz QPSK – Full RB Configuration)



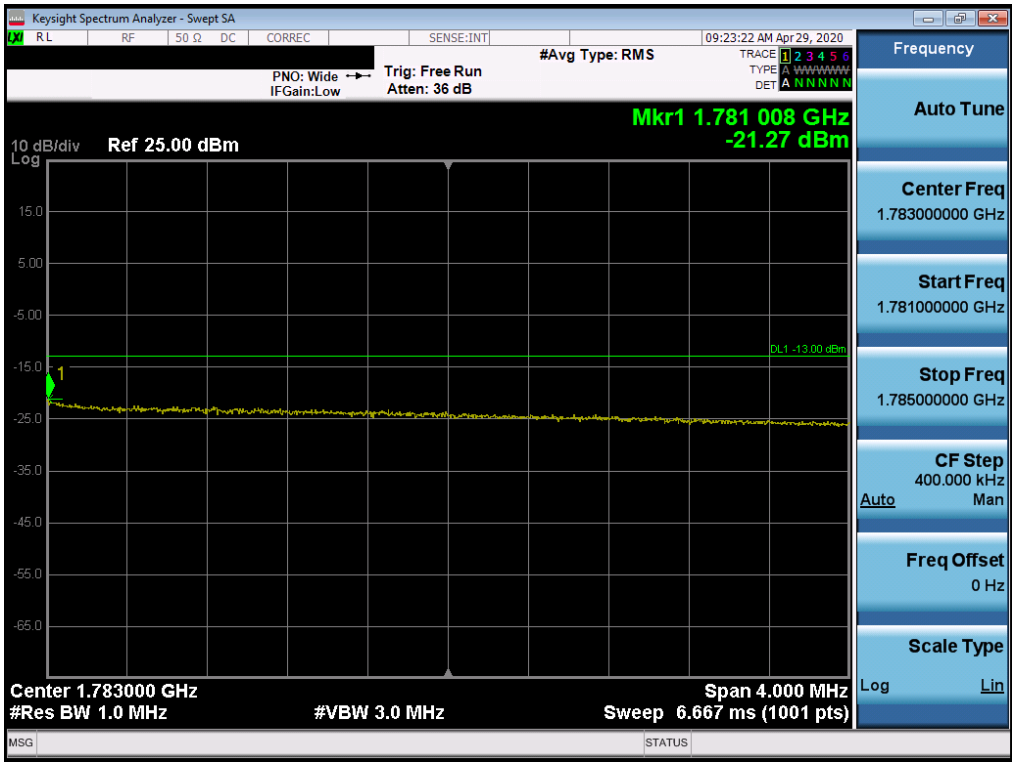
Plot 7-94. Upper Band Edge Plot (LTE Band 4 - 10MHz QPSK – Full RB Configuration)



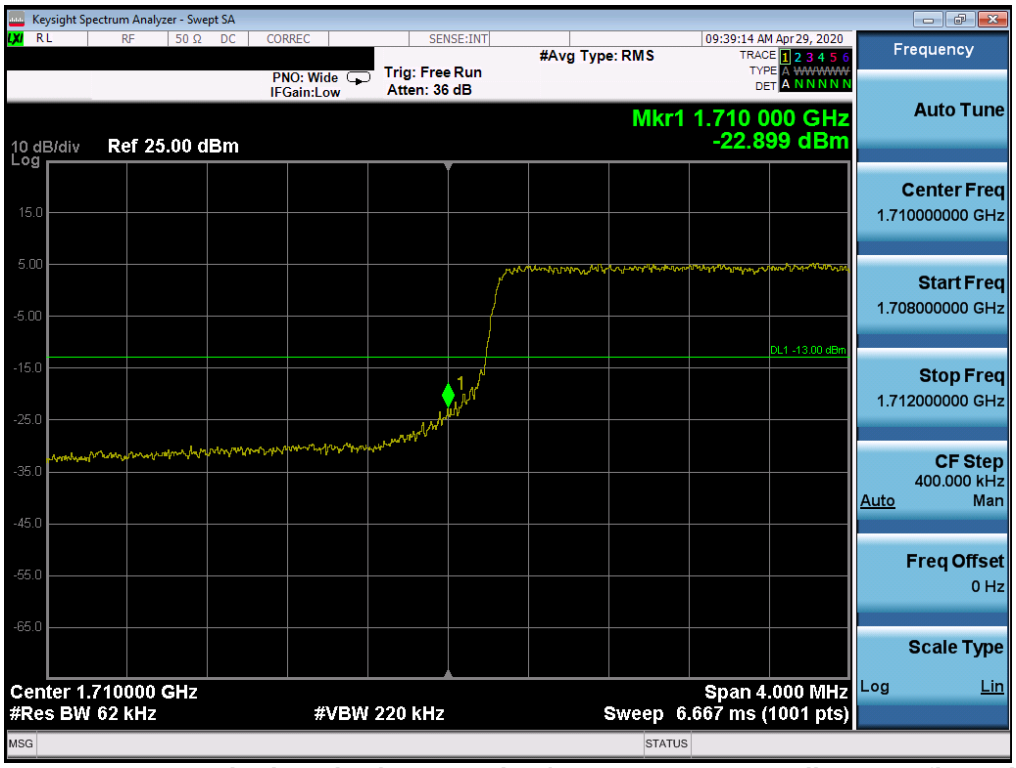
Plot 7-95. Upper Extended Band Edge Plot (LTE Band 4 - 10MHz QPSK – Full RB Configuration)



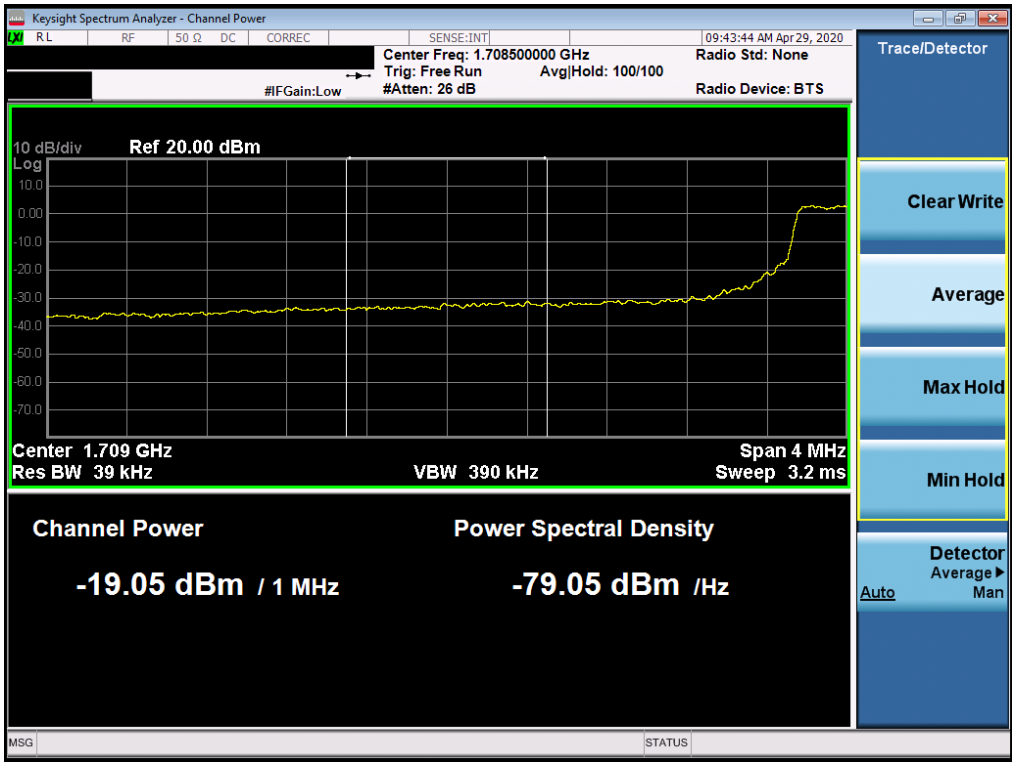
Plot 7-96. Upper Band Edge Plot (LTE Band 66 - 10MHz QPSK – Full RB Configuration)



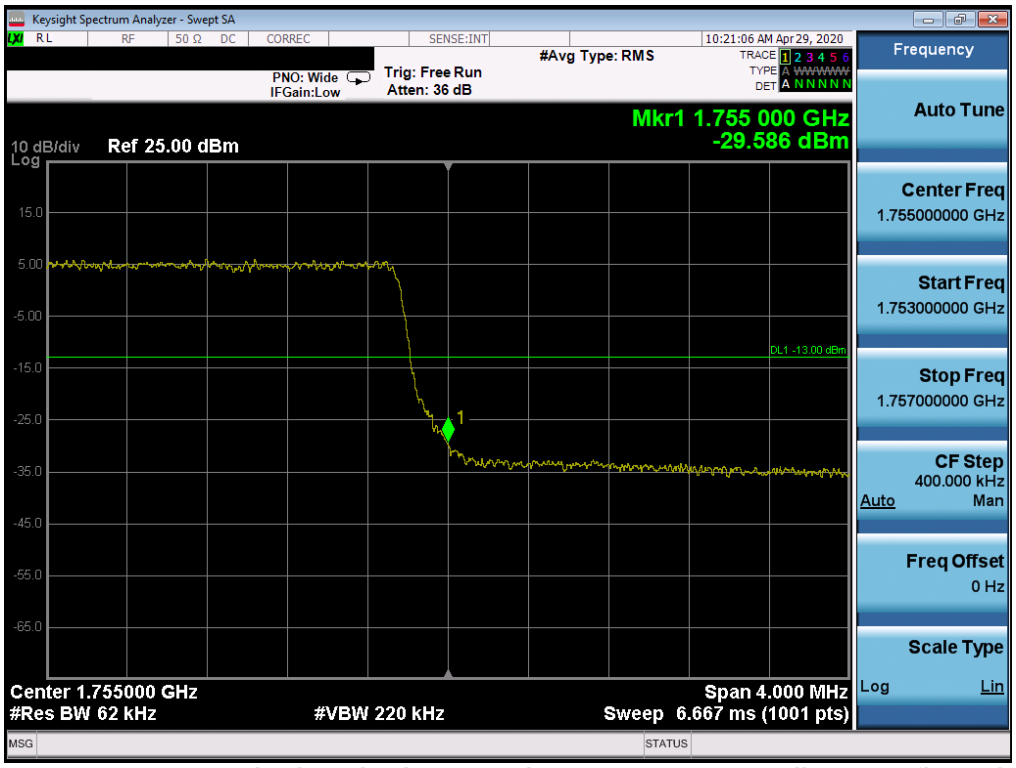
Plot 7-97. Upper Extended Band Edge Plot (LTE Band 66 - 10MHz QPSK – Full RB Conifiguration)



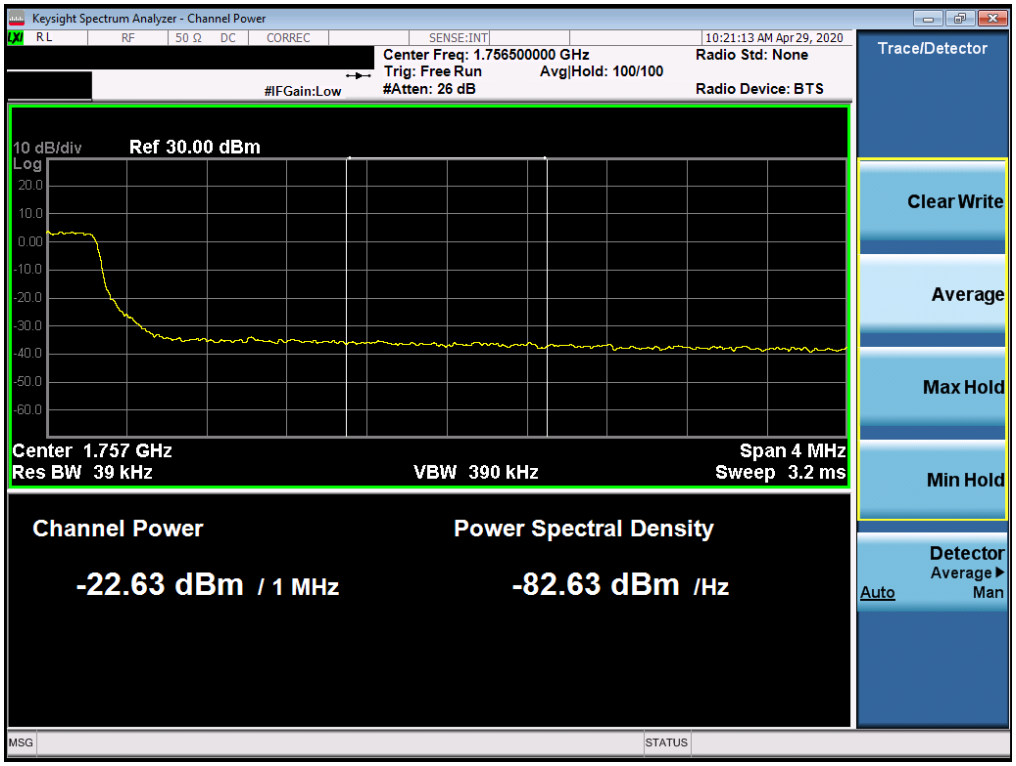
Plot 7-98. Lower Band Edge Plot (LTE Band 66/4 - 5MHz QPSK – Full RB Configuration)



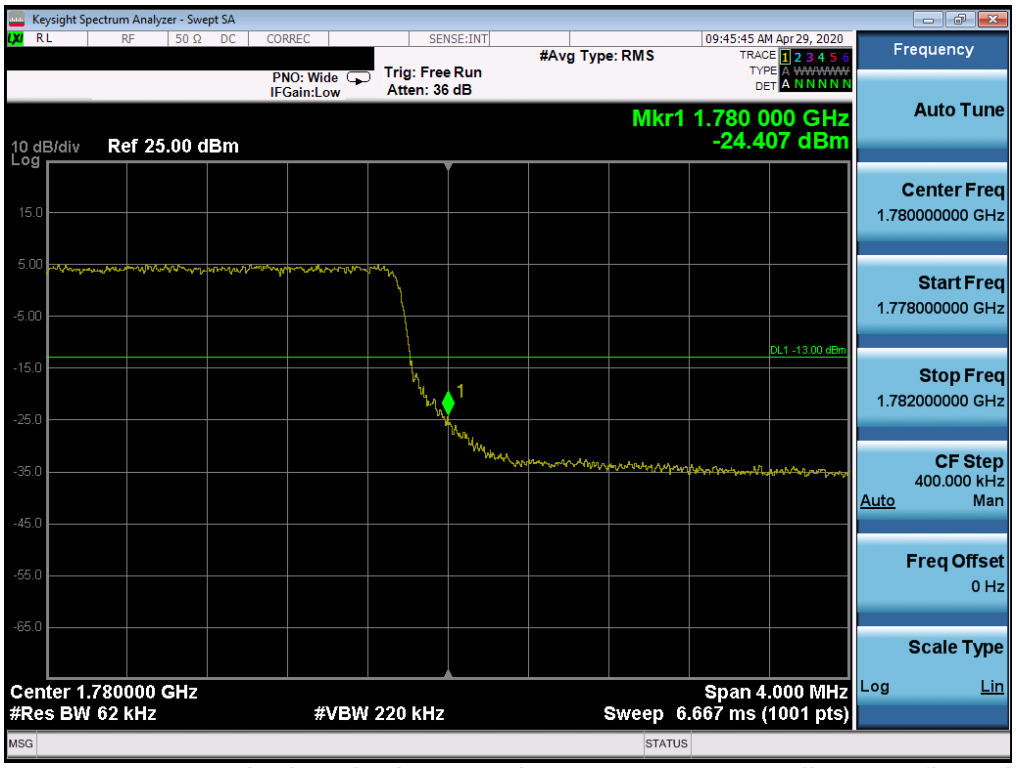
Plot 7-99. Lower Extended Band Edge Plot (LTE Band 66/4 - 5MHz QPSK – Full RB Configuration)



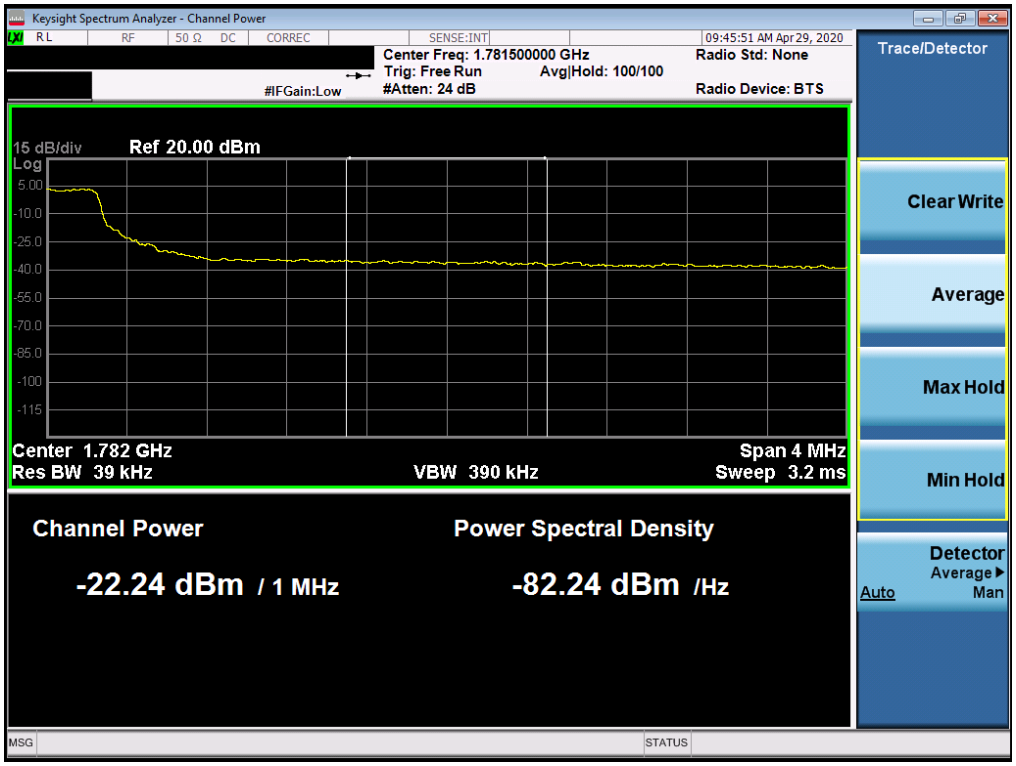
Plot 7-100. Upper Band Edge Plot (LTE Band 4 - 5MHz QPSK – Full RB Configuration)



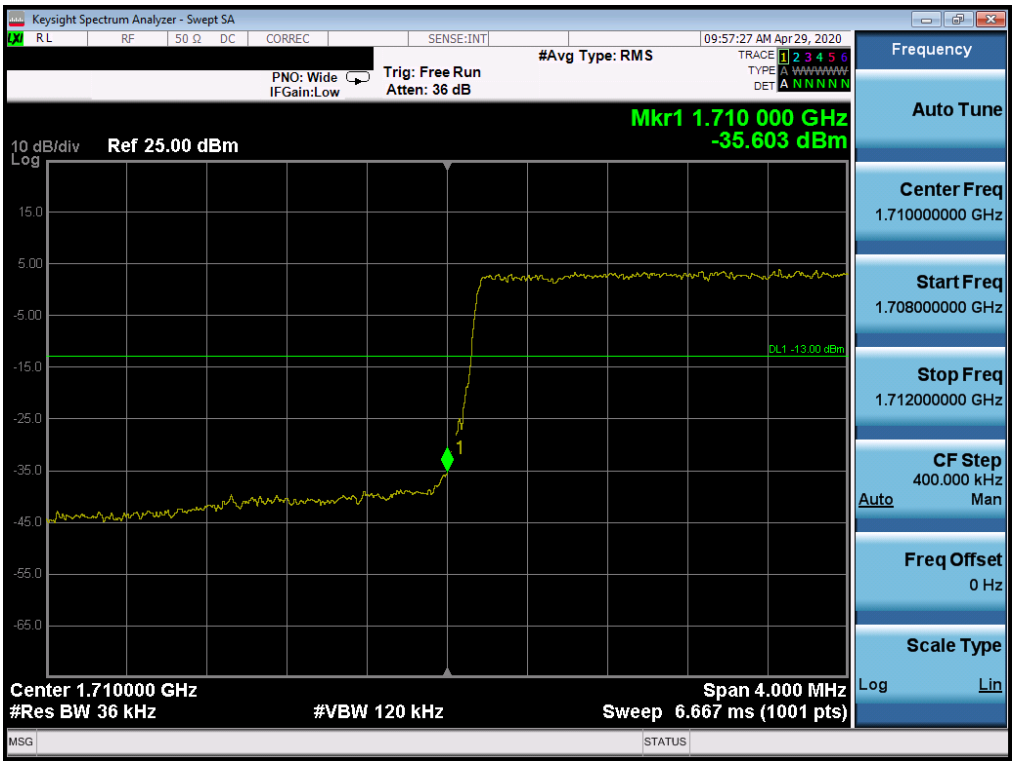
Plot 7-101. Upper Extended Band Edge Plot (LTE Band 4 - 5MHz QPSK – Full RB Configuration)



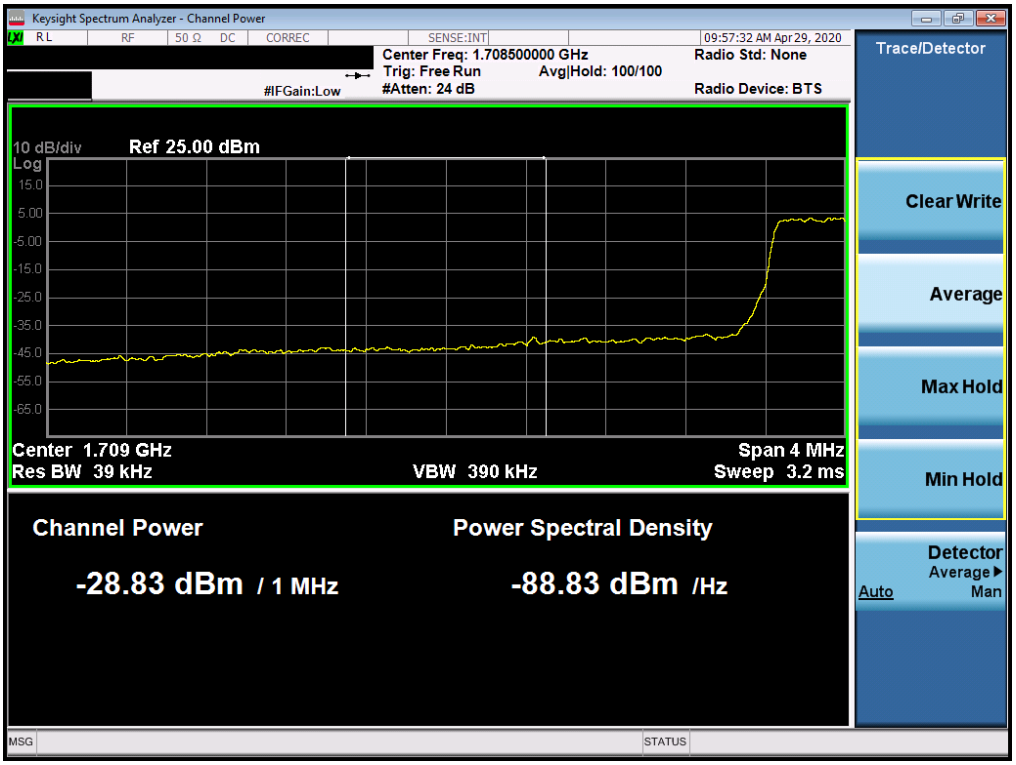
Plot 7-102. Upper Band Edge Plot (LTE Band 66 - 5MHz QPSK – Full RB Configuration)



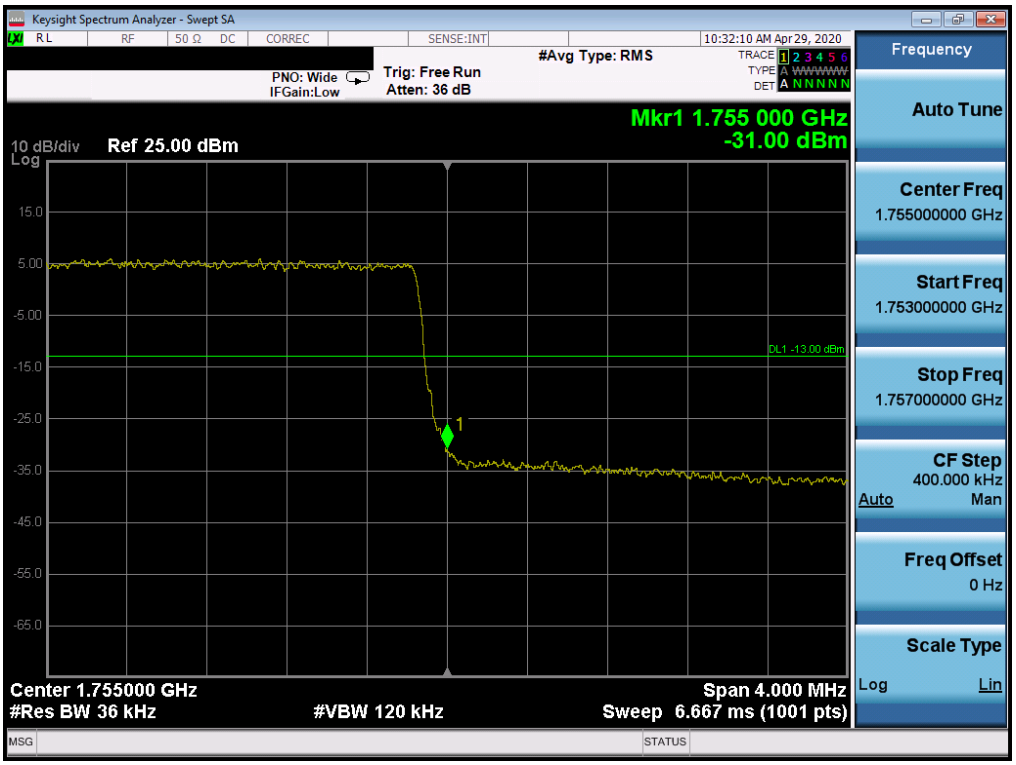
Plot 7-103. Upper Extended Band Edge Plot (LTE Band 66 - 5MHz QPSK – Full RB Conifiguration)



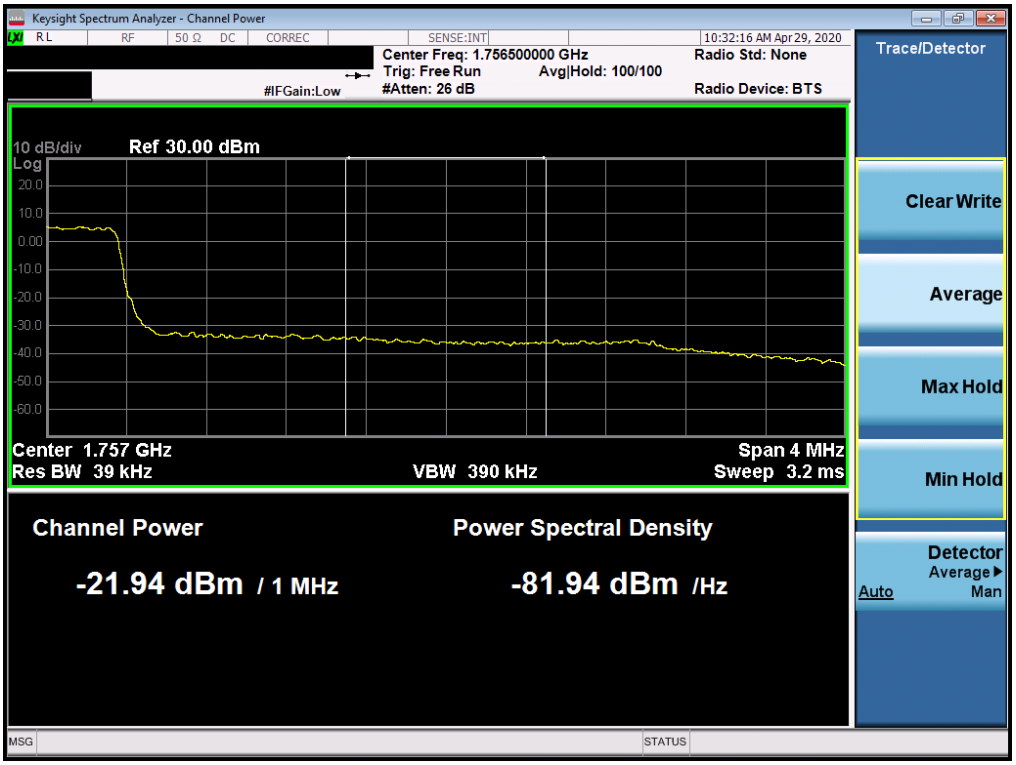
Plot 7-104. Lower Band Edge Plot (LTE Band 66/4 - 3MHz QPSK – Full RB Configuration)



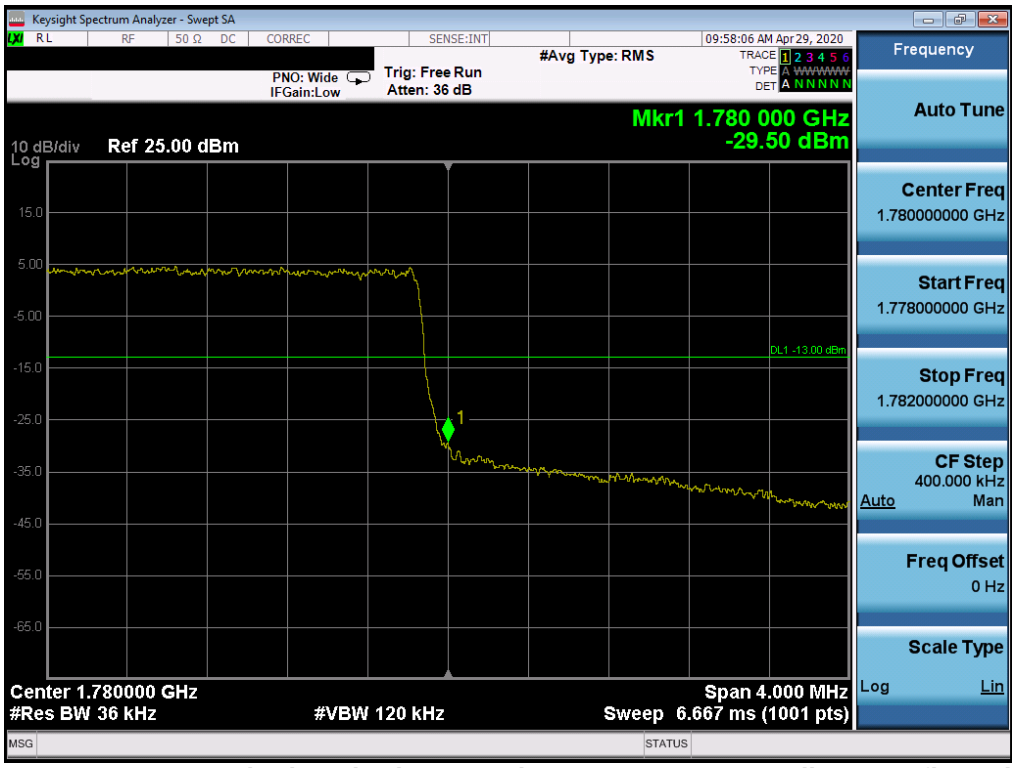
Plot 7-105. Lower Extended Band Edge Plot (LTE Band 66/4 - 3MHz QPSK – Full RB Configuration)



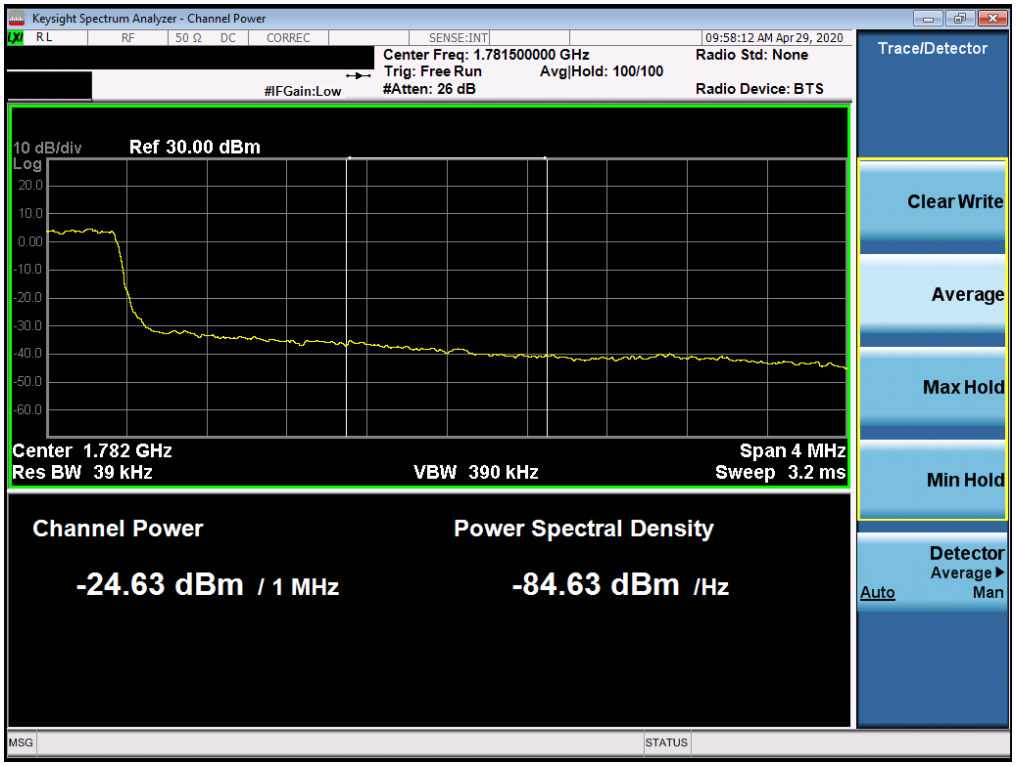
Plot 7-106. Upper Band Edge Plot (LTE Band 4 - 3MHz QPSK – Full RB Configuration)



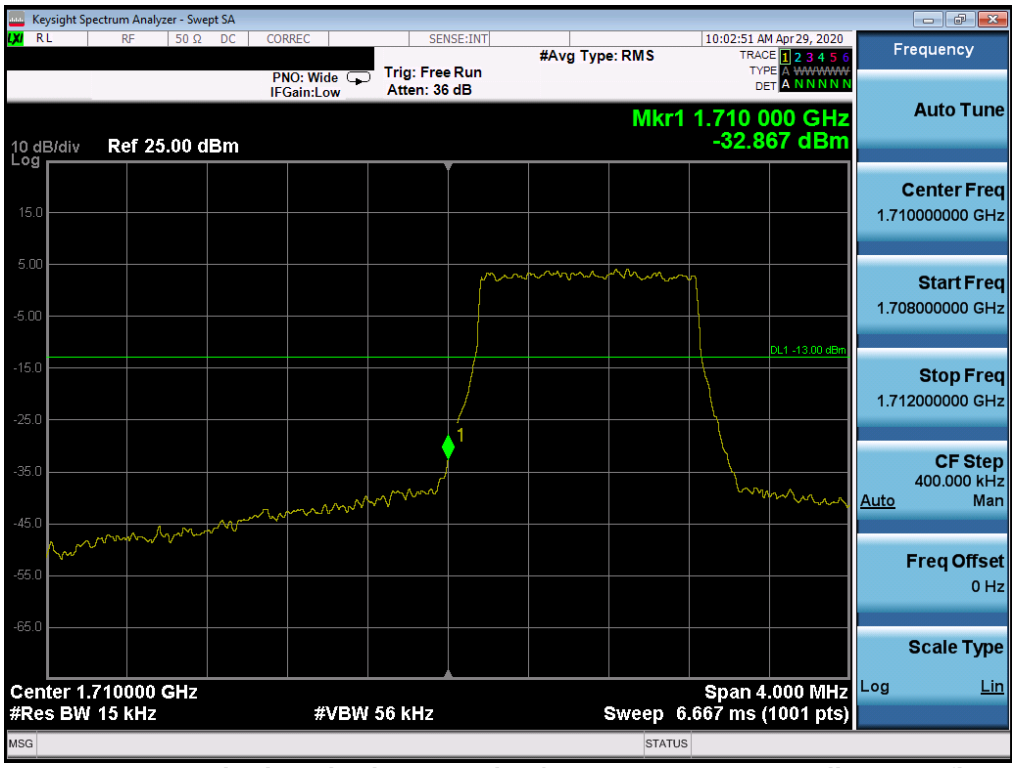
Plot 7-107. Upper Extended Band Edge Plot (LTE Band 4 - 3MHz QPSK – Full RB Configuration)



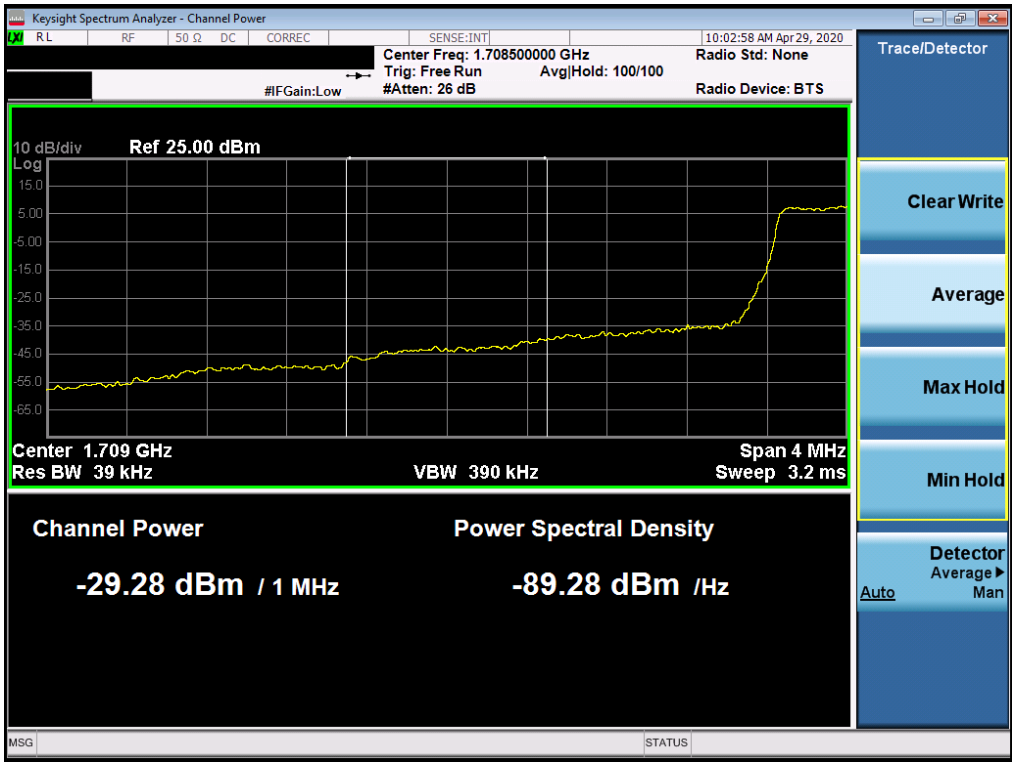
Plot 7-108. Upper Band Edge Plot (LTE Band 66 - 3MHz QPSK – Full RB Configuration)



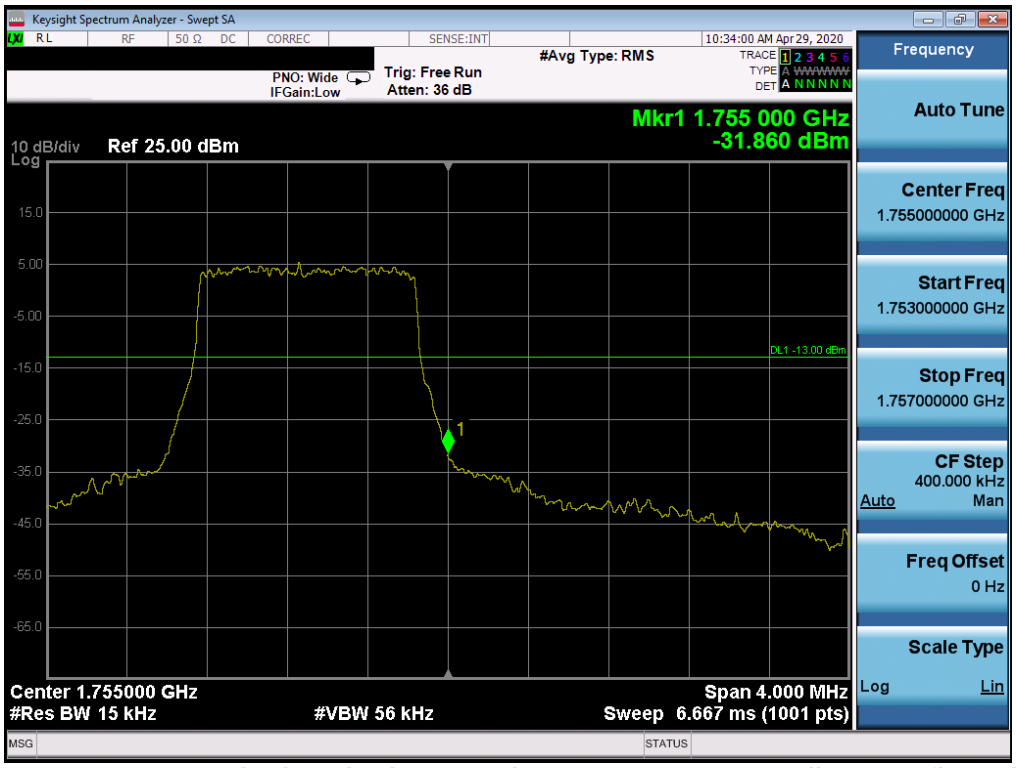
Plot 7-109. Upper Extended Band Edge Plot (LTE Band 66 - 3MHz QPSK – Full RB Conifiguration)



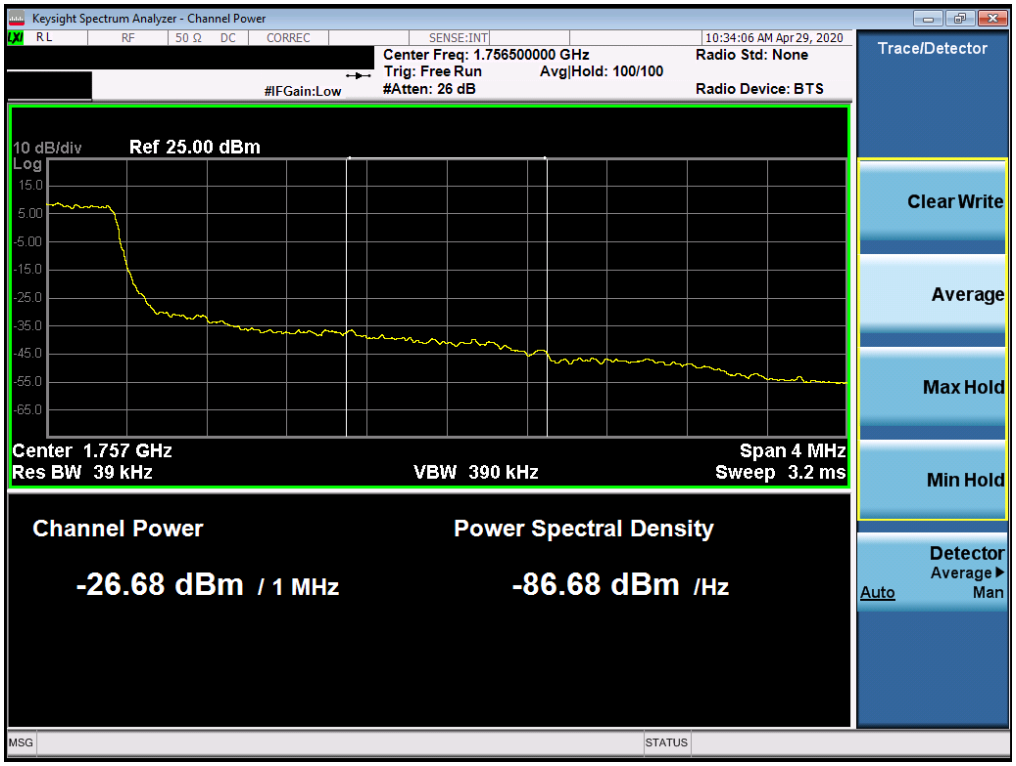
Plot 7-110. Lower Band Edge Plot (LTE Band 66/4 – 1.4MHz QPSK – Full RB Configuration)



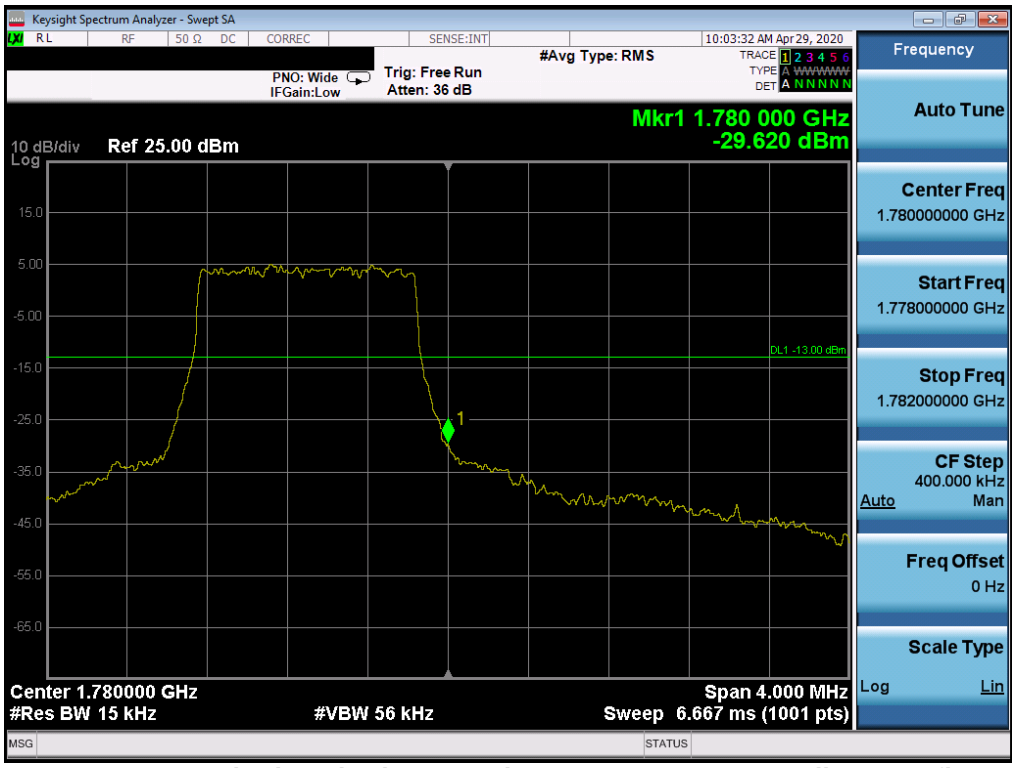
Plot 7-111. Lower Extended Band Edge Plot (LTE Band 66/4 – 1.4MHz QPSK – Full RB Configuration)



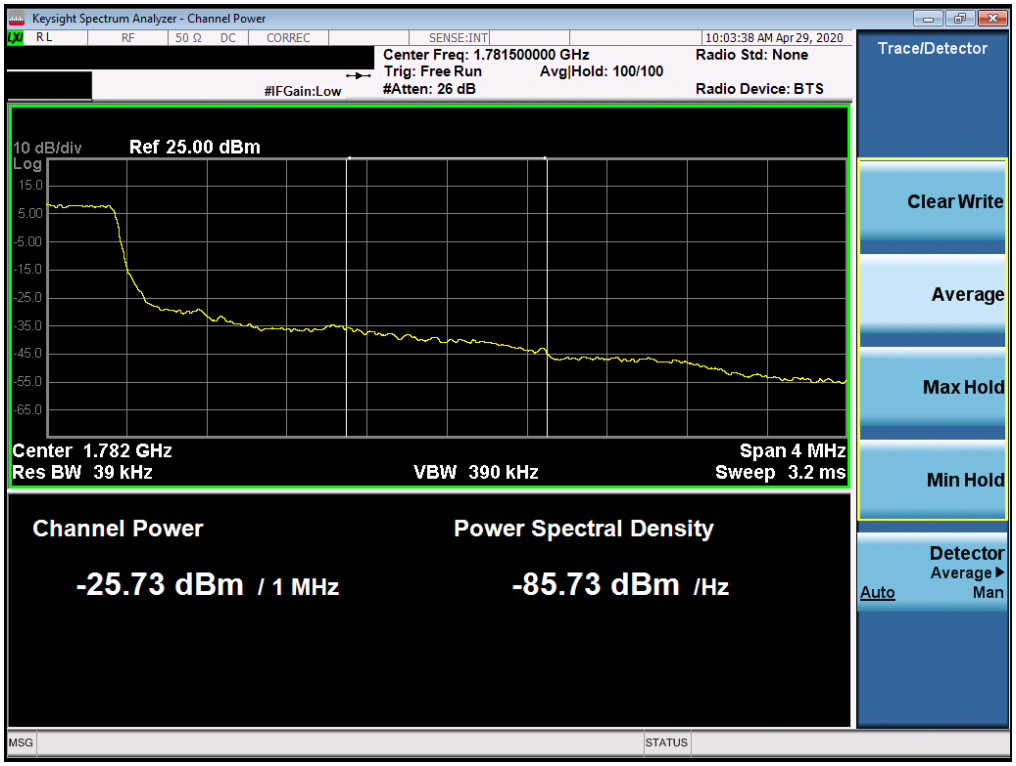
Plot 7-112. Upper Band Edge Plot (LTE Band 4 – 1.4MHz QPSK – Full RB Configuration)



Plot 7-113. Upper Extended Band Edge Plot (LTE Band 4 – 1.4MHz QPSK – Full RB Configuration)

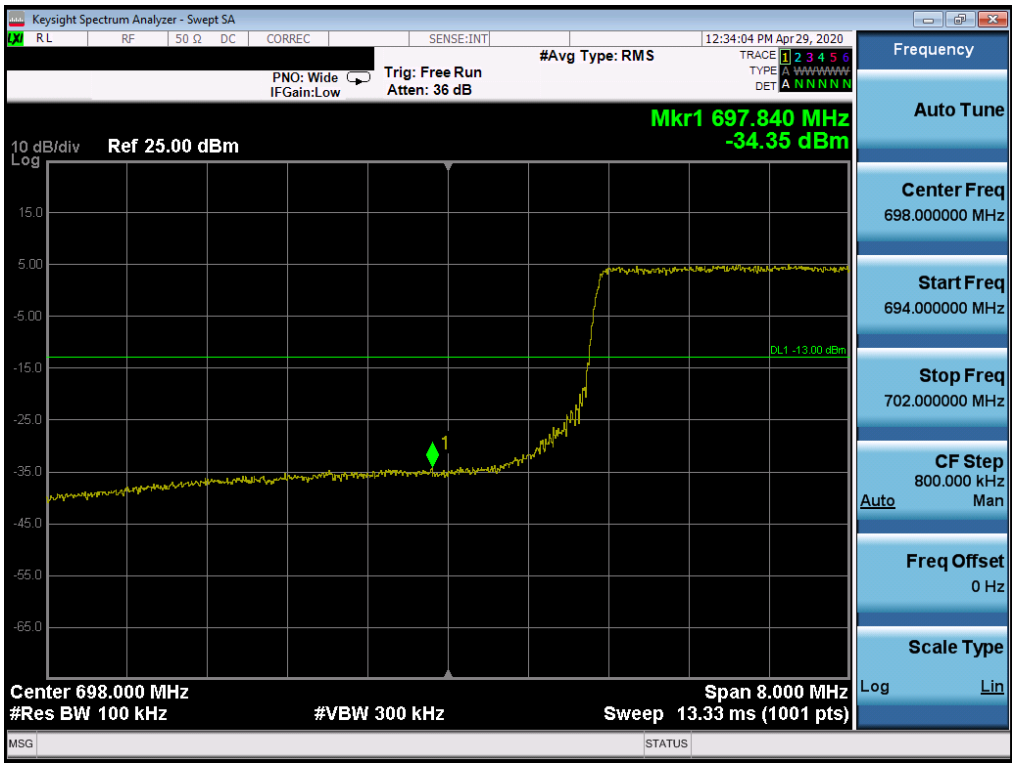


Plot 7-114. Upper Band Edge Plot (LTE Band 66 – 1.4MHz QPSK – Full RB Configuration)

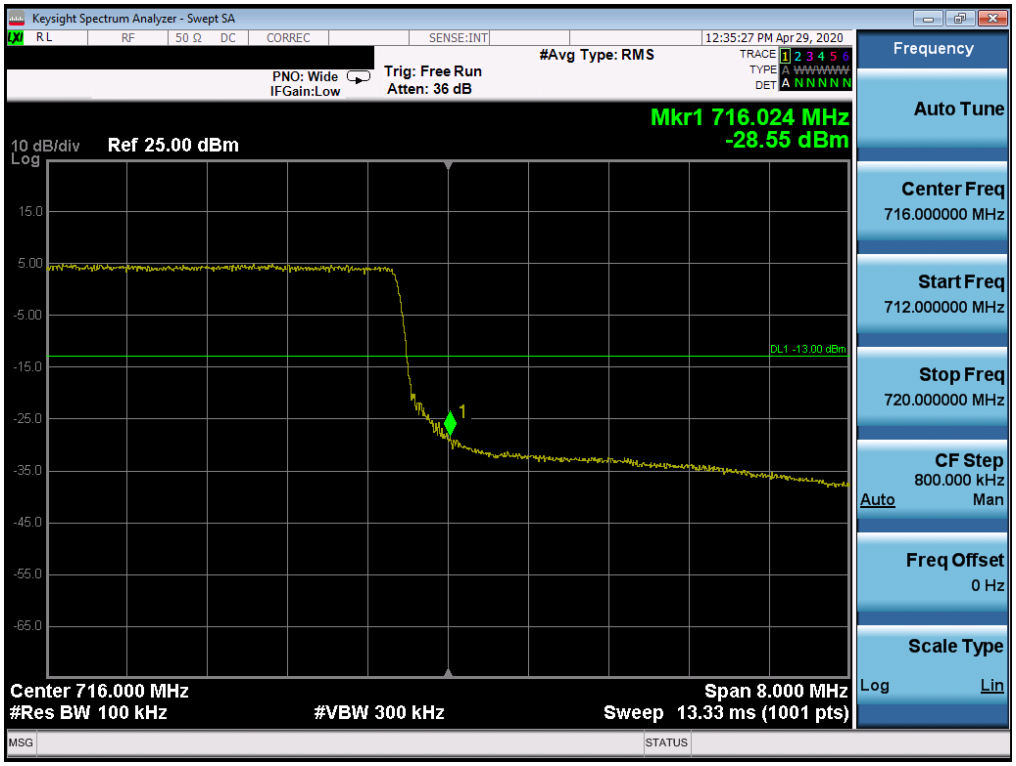


Plot 7-115. Upper Extended Band Edge Plot (LTE Band 66 – 1.4MHz QPSK – Full RB Conifiguration)

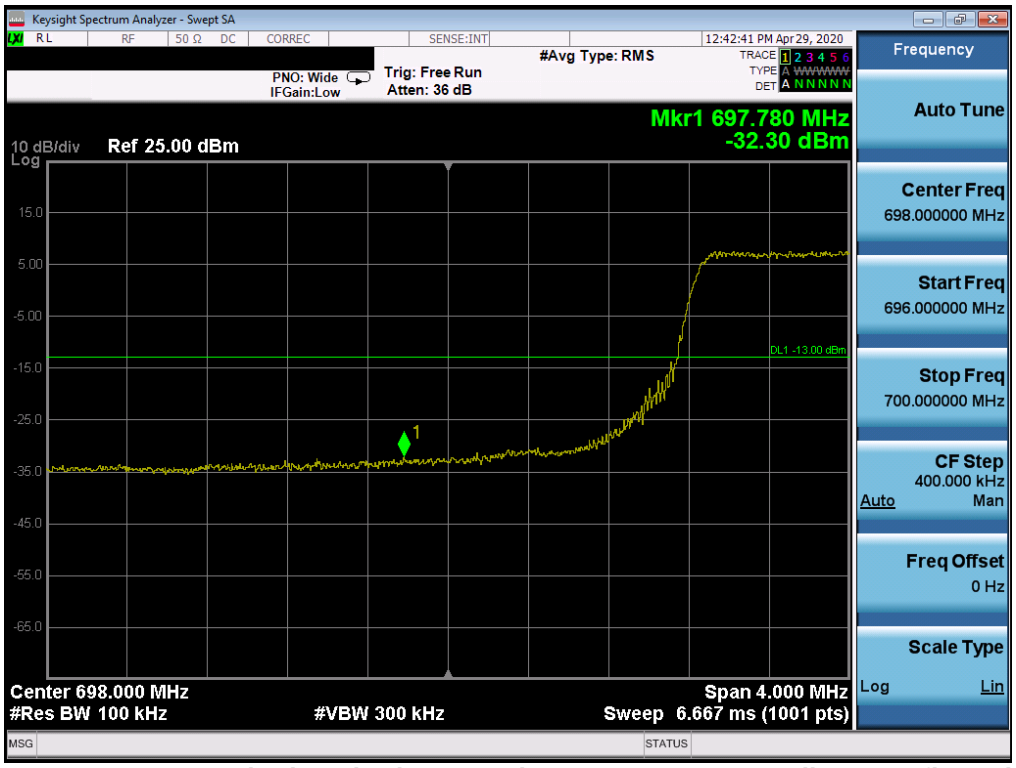
LTE Band 12



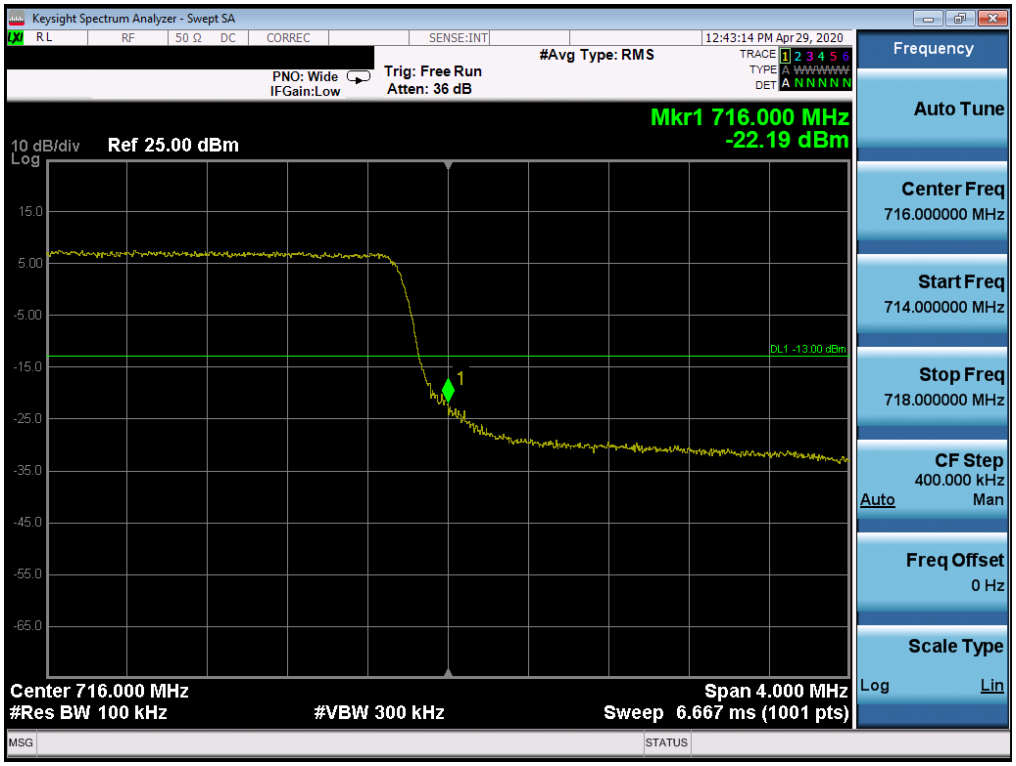
Plot 7-116. Lower Band Edge Plot (LTE Band 12 - 10MHz QPSK – Full RB Configuration)



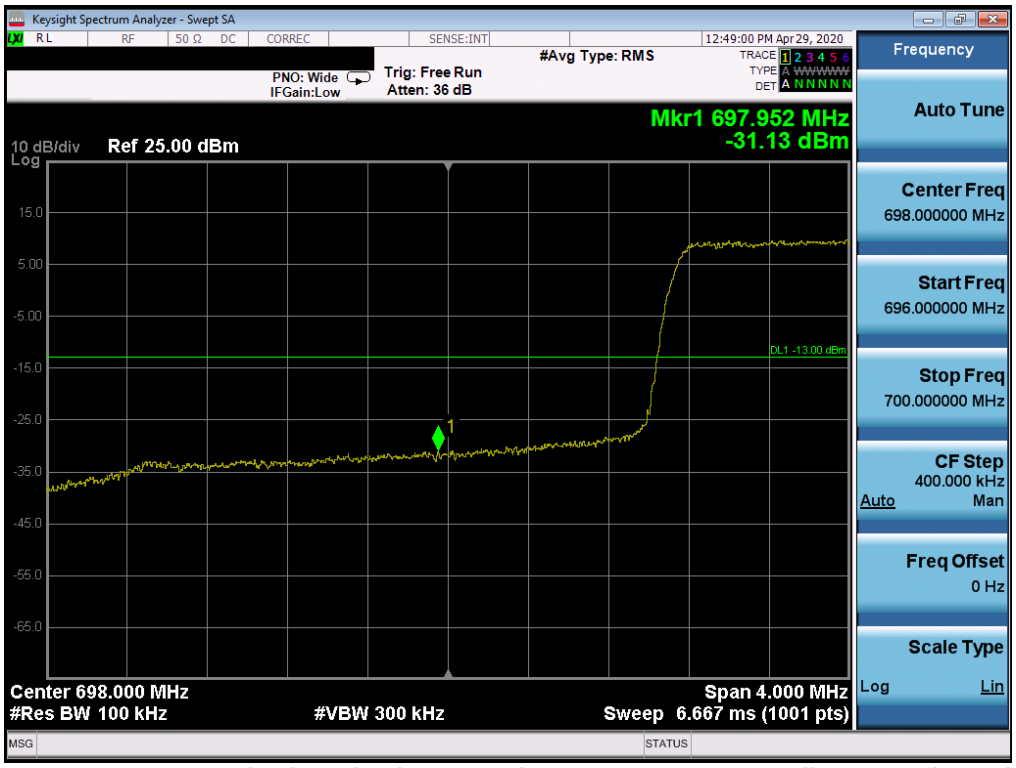
Plot 7-117. Upper Band Edge Plot (LTE Band 12 - 10MHz QPSK – Full RB Configuration)



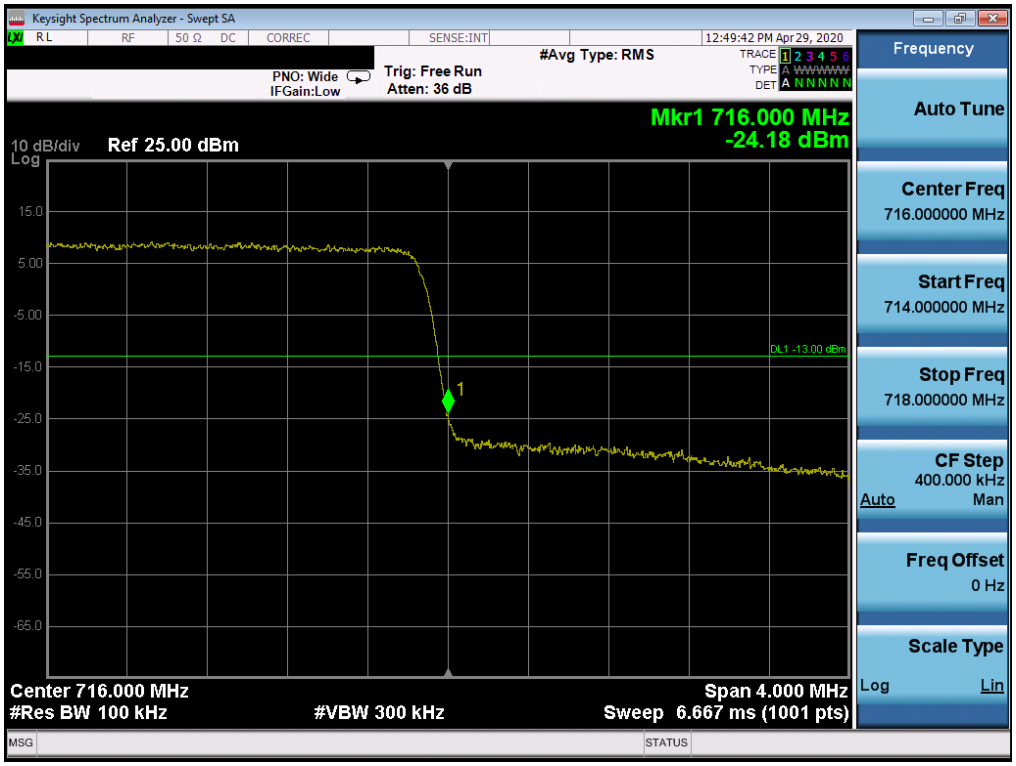
Plot 7-118. Lower Band Edge Plot (LTE Band 12 - 5MHz QPSK – Full RB Configuration)



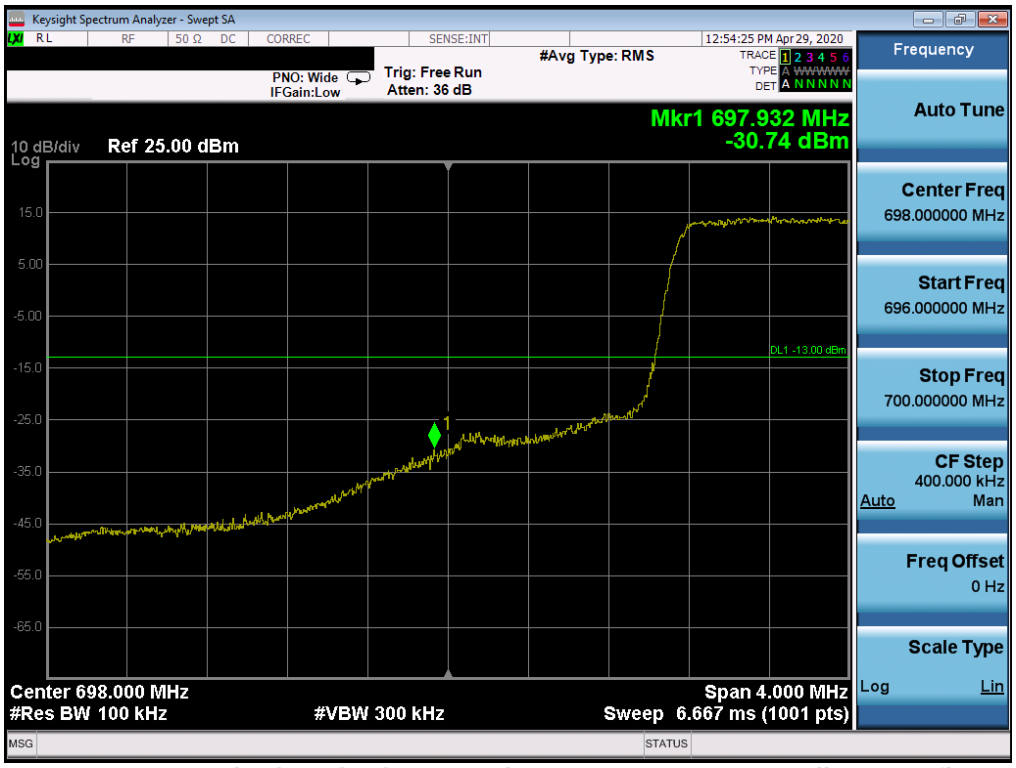
Plot 7-119. Upper Band Edge Plot (LTE Band 12 - 5MHz QPSK – Full RB Configuration)



Plot 7-120. Lower Band Edge Plot (LTE Band 12 - 3MHz QPSK – Full RB Configuration)



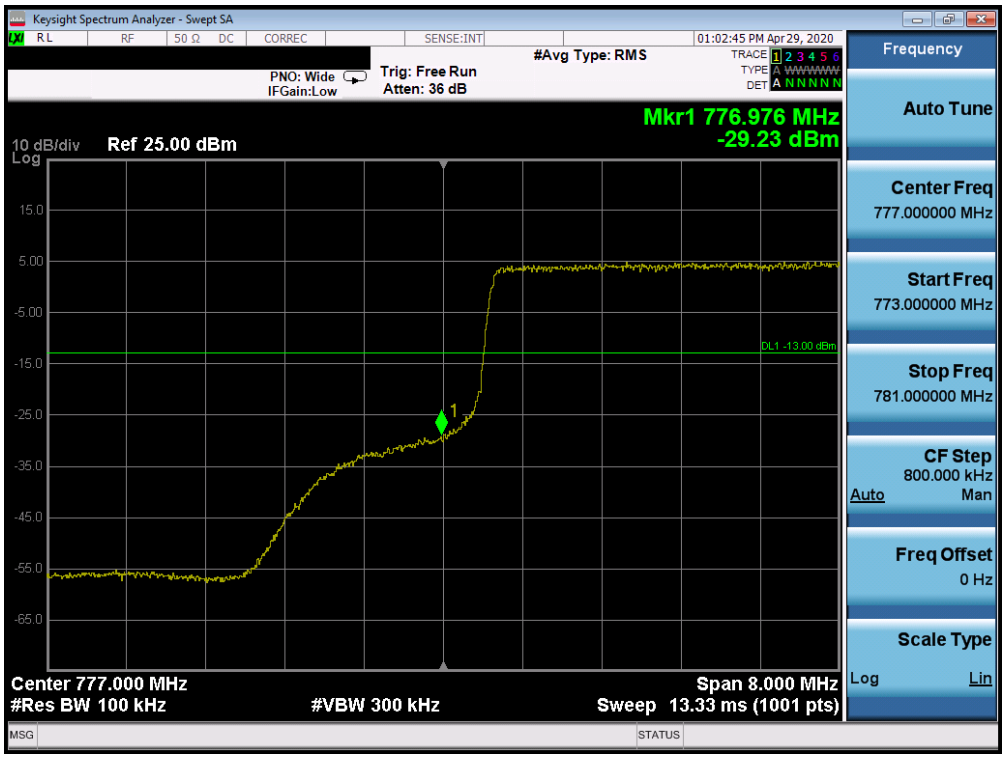
Plot 7-121. Upper Band Edge Plot (LTE Band 12 - 3MHz QPSK – Full RB Configuration)



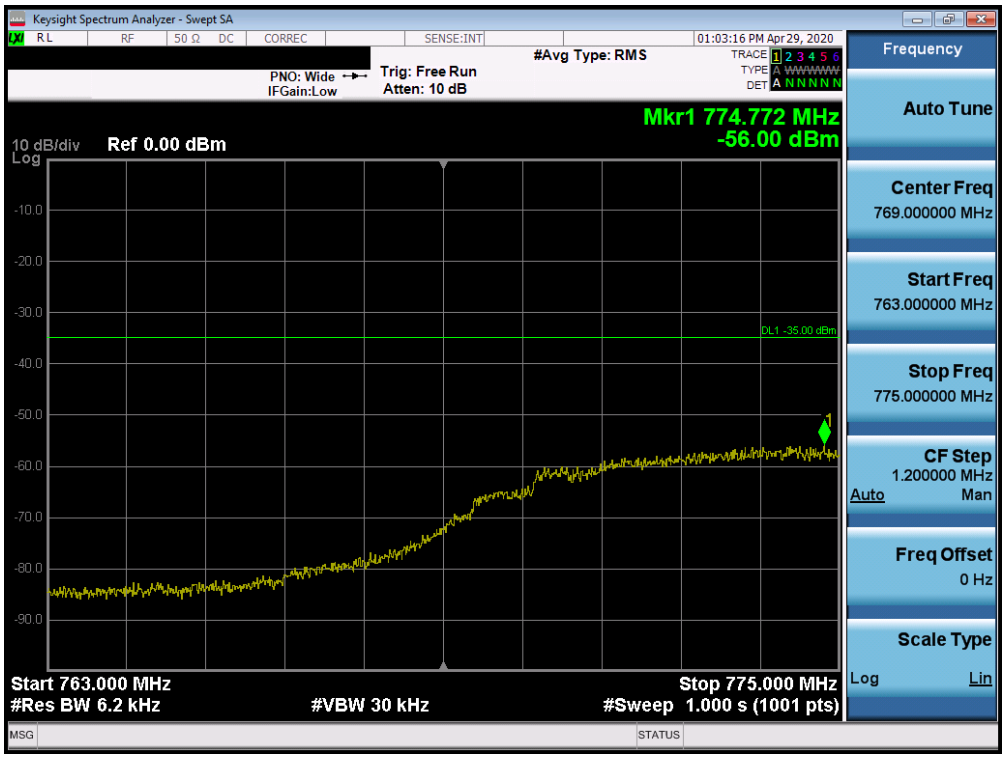
Plot 7-122. Lower Band Edge Plot (LTE Band 12 – 1.4MHz QPSK – Full RB Configuration)

Plot 7-123. Upper Band Edge Plot (LTE Band 12 – 1.4MHz QPSK – Full RB Configuration)

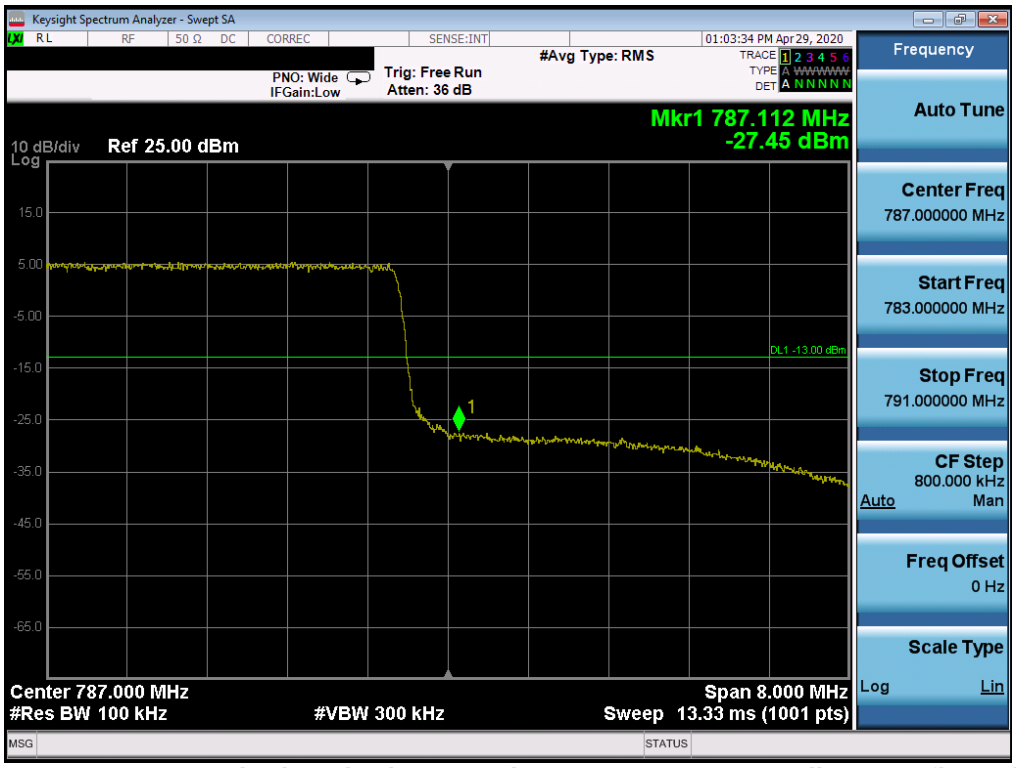
LTE Band 13



Plot 7-124. Lower Band Edge Plot (LTE Band 13 - 10MHz QPSK – Full RB Configuration)

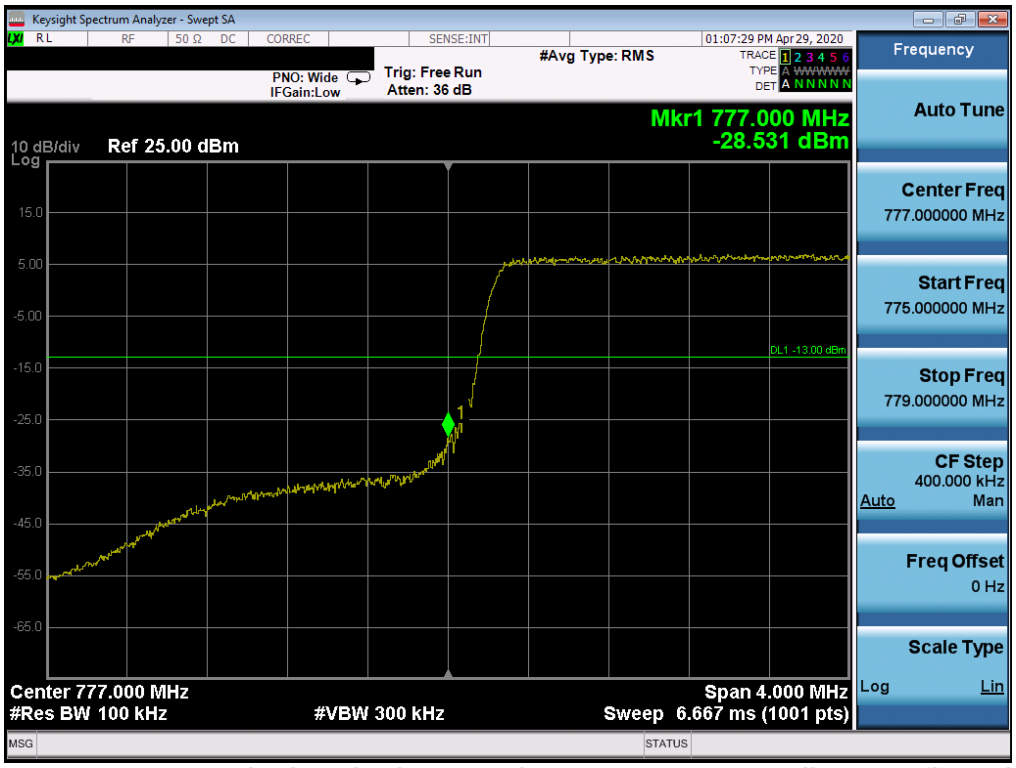


Plot 7-125. Lower Emission Mask Plot (LTE Band 13 - 10MHz QPSK – Full RB Configuration)

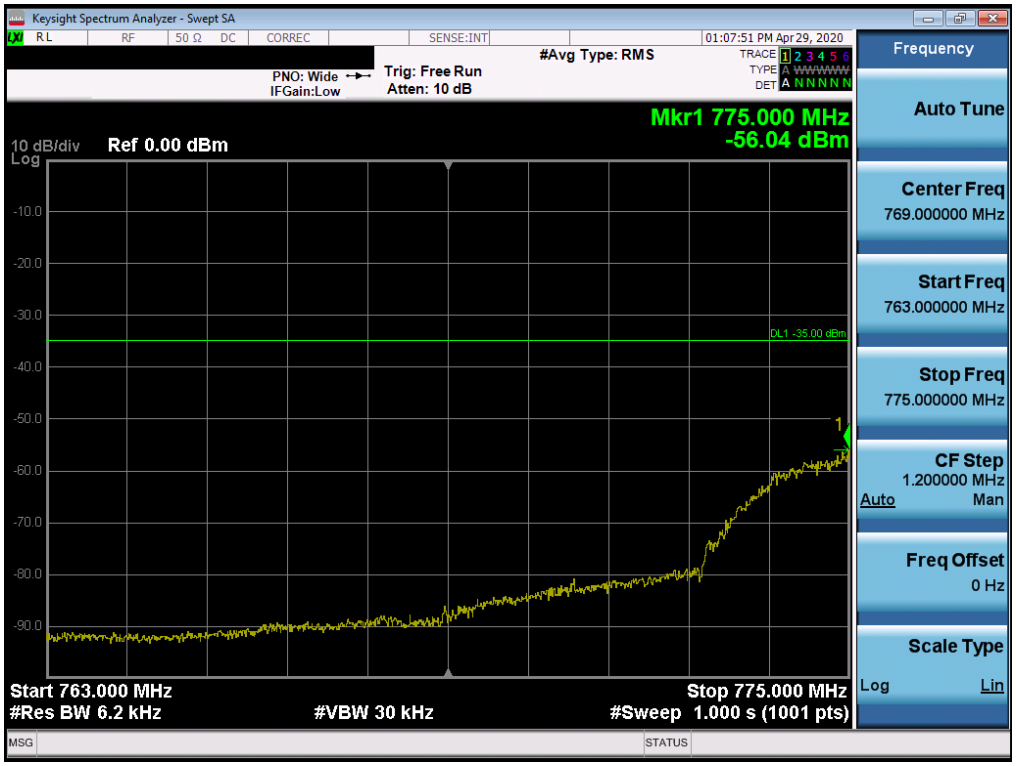


Plot 7-126. Upper Band Edge Plot (LTE Band 13 - 10MHz QPSK – Full RB Configuration)

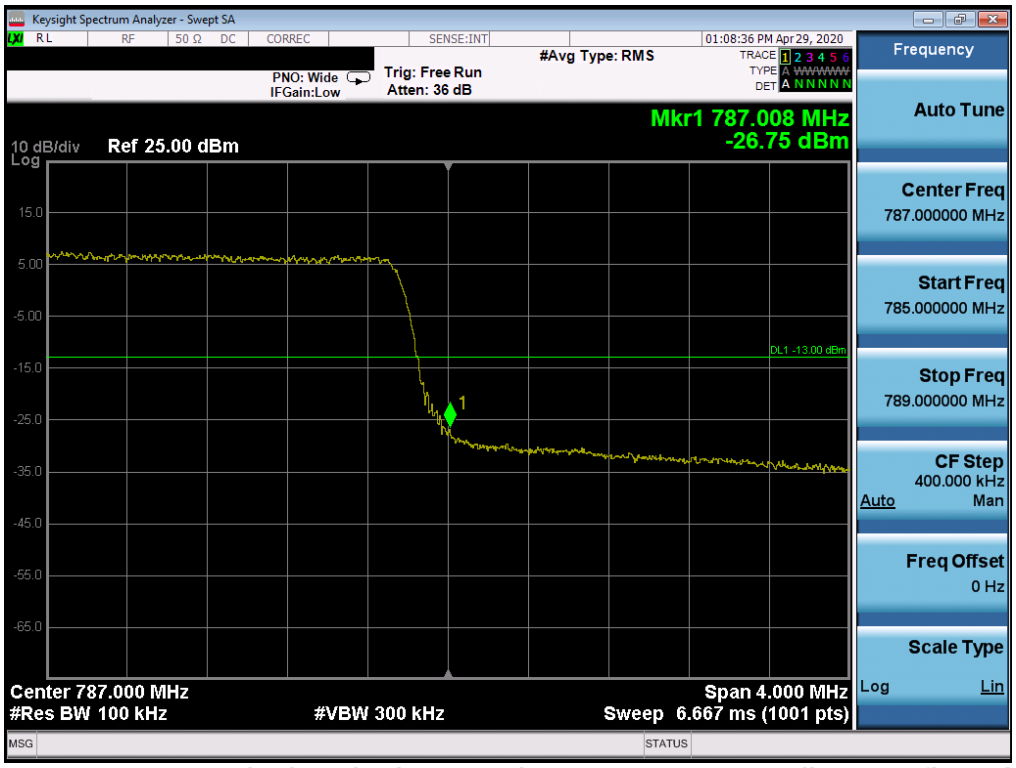
Plot 7-127. Upper Emission Mask Plot (LTE Band 13 - 10MHz QPSK – Full RB Configuration)



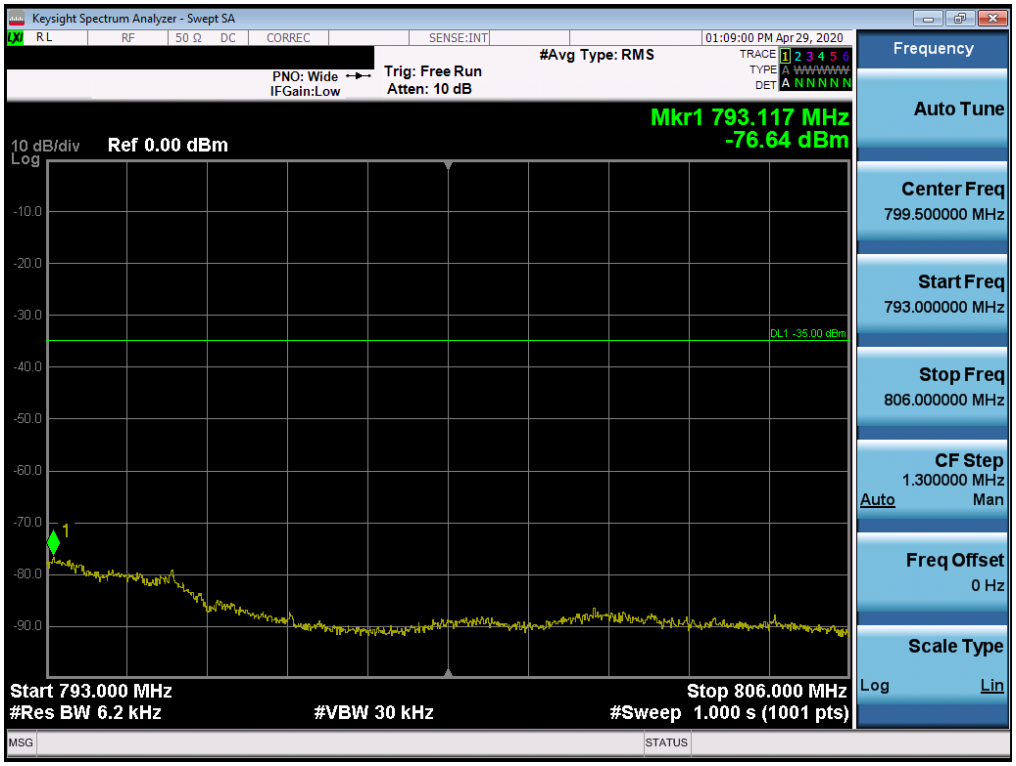
Plot 7-128. Lower Band Edge Plot (LTE Band 13 - 5MHz QPSK – Full RB Configuration)



Plot 7-129. Lower Emission Mask Plot (LTE Band 13 - 5MHz QPSK – Full RB Configuration)

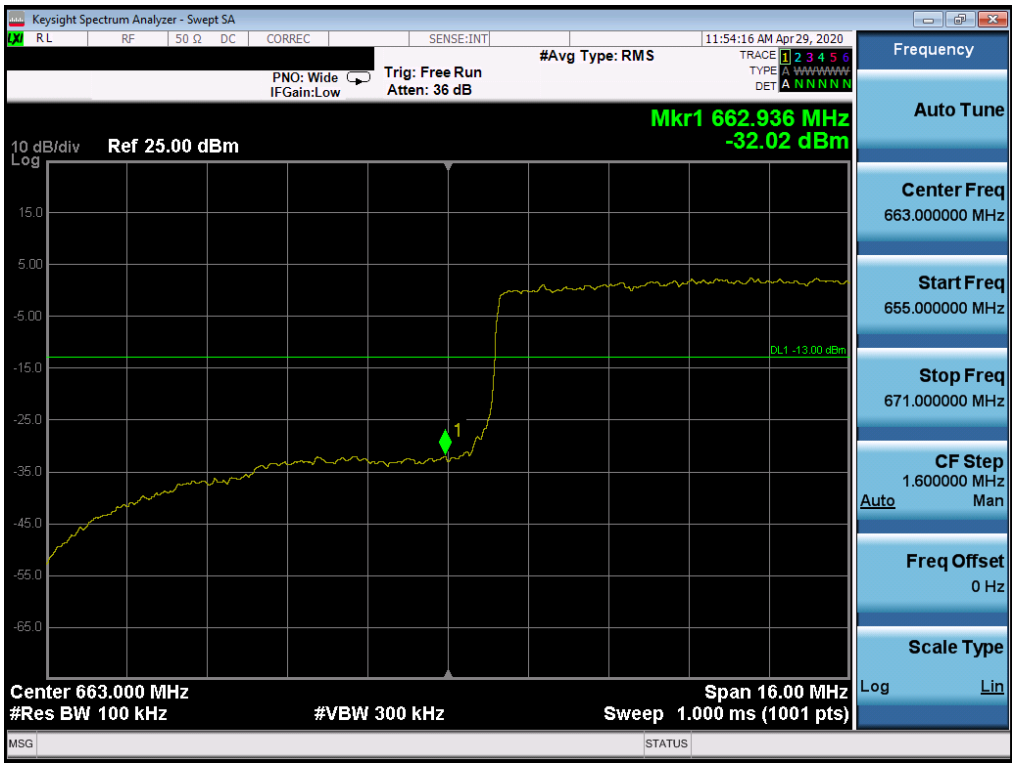


Plot 7-130. Upper Band Edge Plot (LTE Band 13 - 5MHz QPSK – Full RB Configuration)

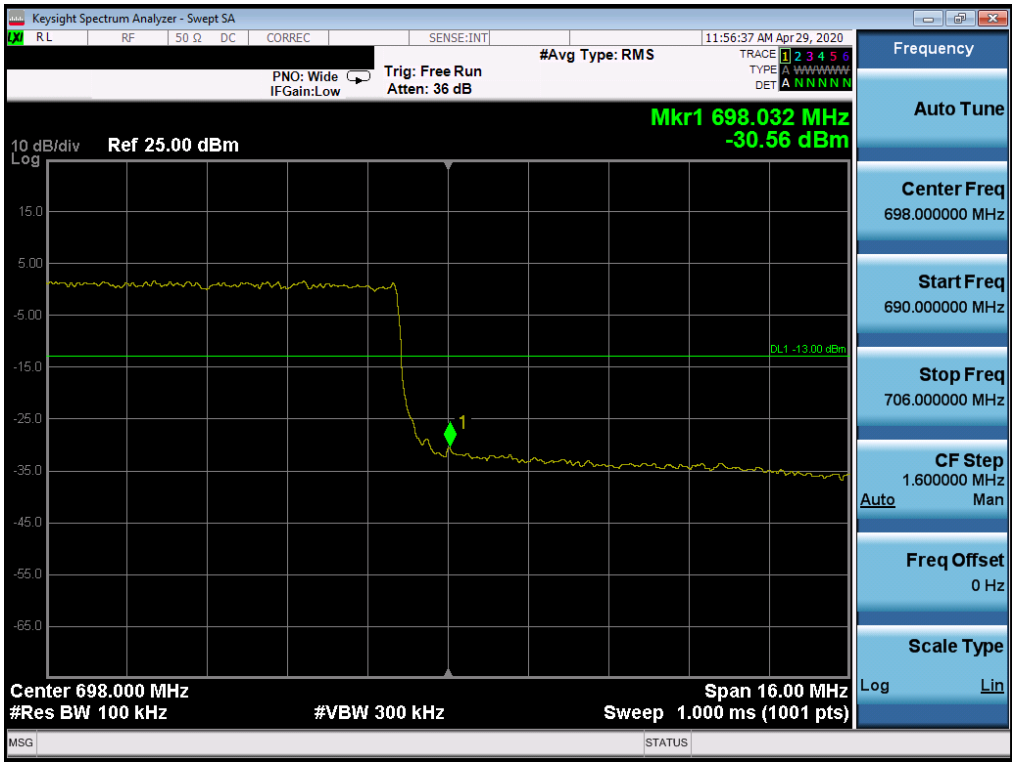


Plot 7-131. Upper Emission Mask Plot (LTE Band 13 - 5MHz QPSK – Full RB Configuration)

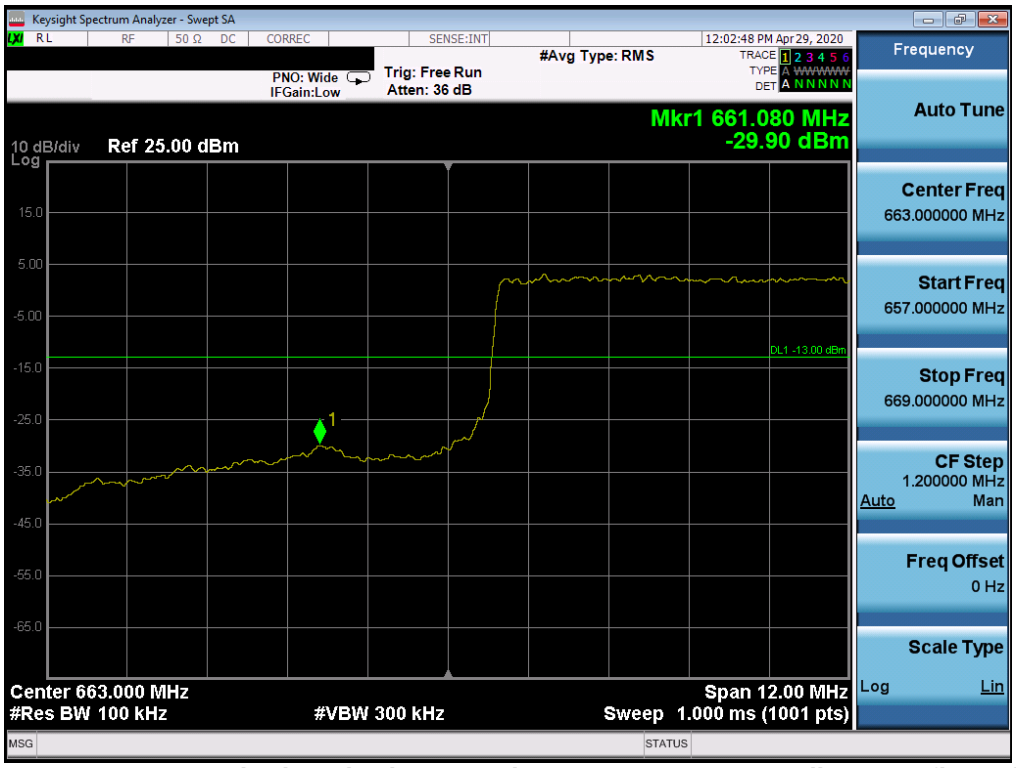
LTE Band 71



Plot 7-132. Lower Band Edge Plot (LTE Band 71 - 20MHz QPSK – Full RB Configuration)

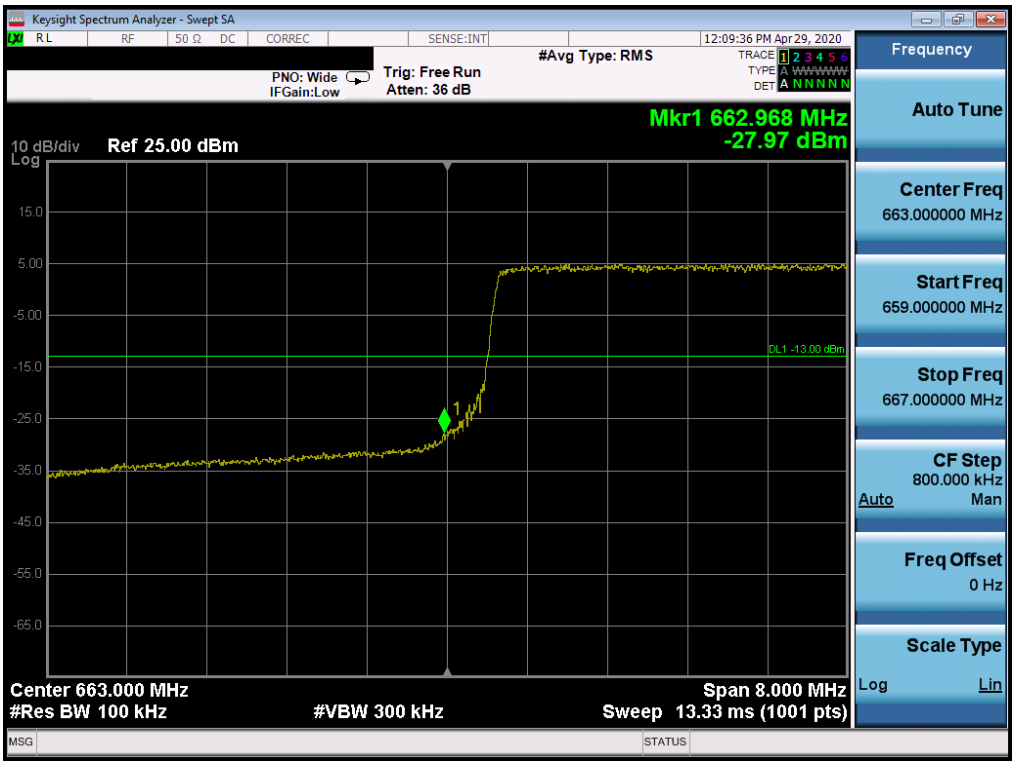


Plot 7-133. Upper Band Edge Plot (LTE Band 71 - 20MHz QPSK – Full RB Configuration)

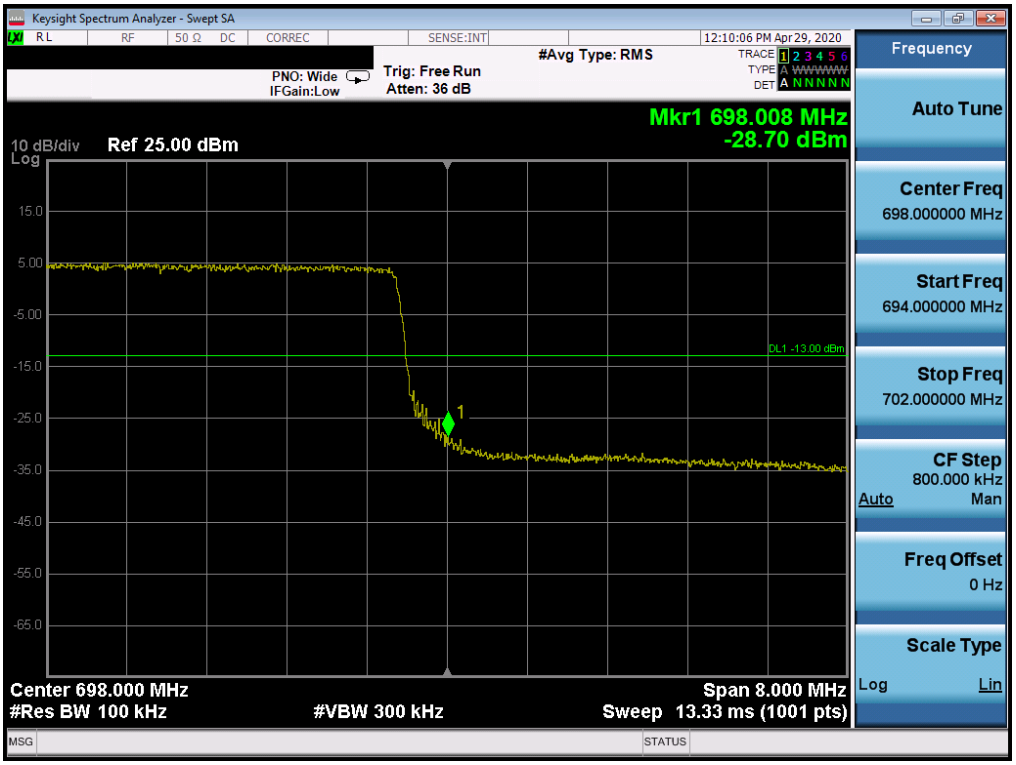


Plot 7-134. Lower Band Edge Plot (LTE Band 71 - 15MHz QPSK – Full RB Configuration)

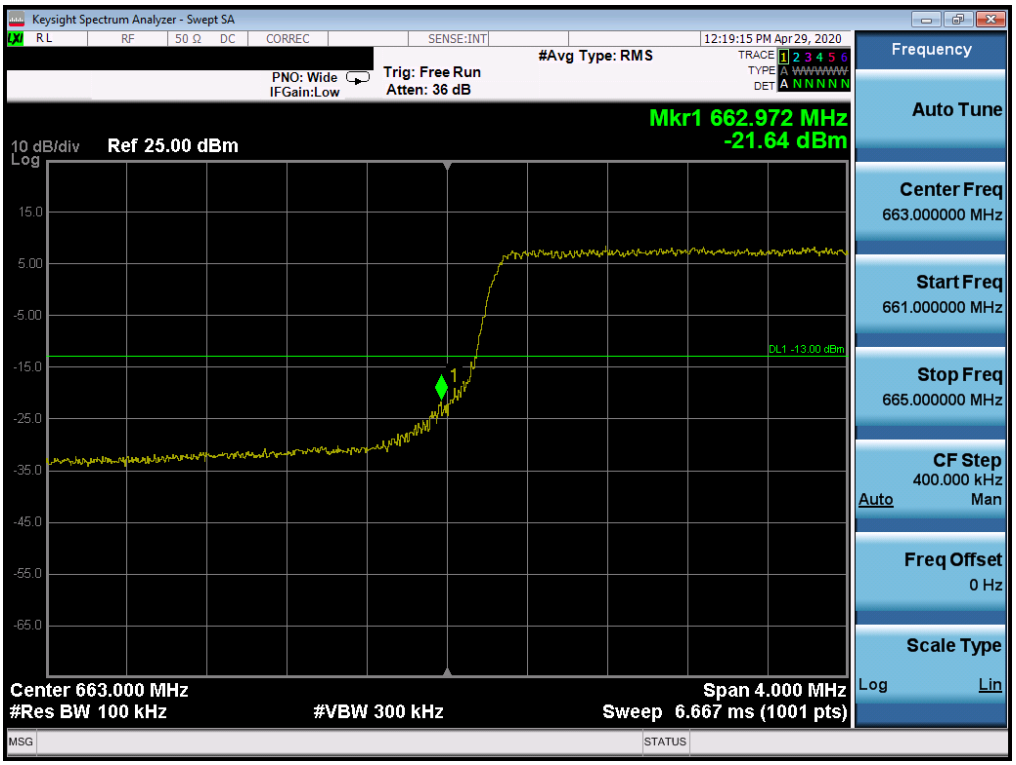
Plot 7-135. Upper Band Edge Plot (LTE Band 71 - 15MHz QPSK – Full RB Configuration)



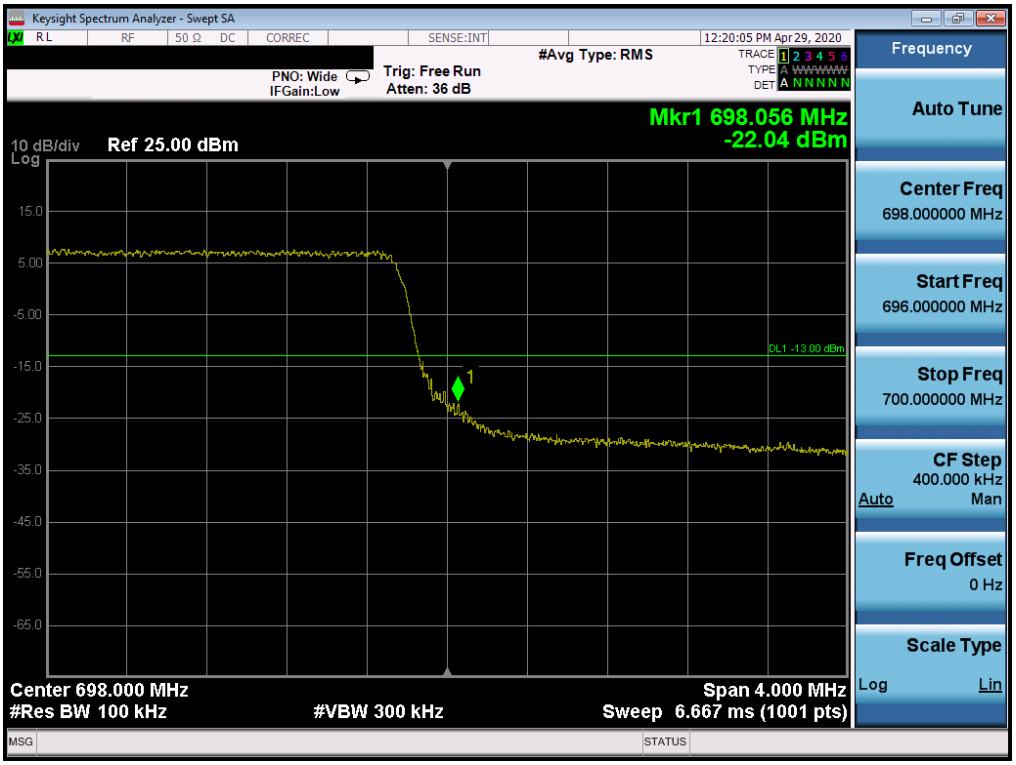
Plot 7-136. Lower Band Edge Plot (LTE Band 71 - 10MHz QPSK – Full RB Configuration)



Plot 7-137. Upper Band Edge Plot (LTE Band 71 - 10MHz QPSK – Full RB Configuration)

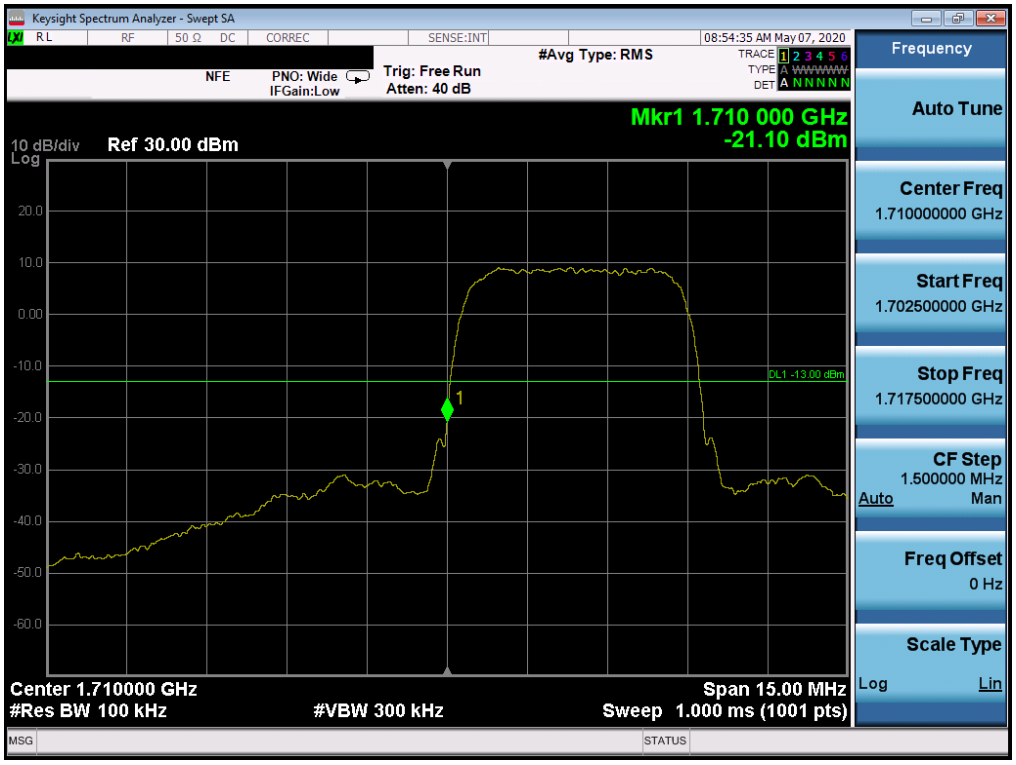


Plot 7-138. Lower Band Edge Plot (LTE Band 71 - 5MHz QPSK – Full RB Configuration)

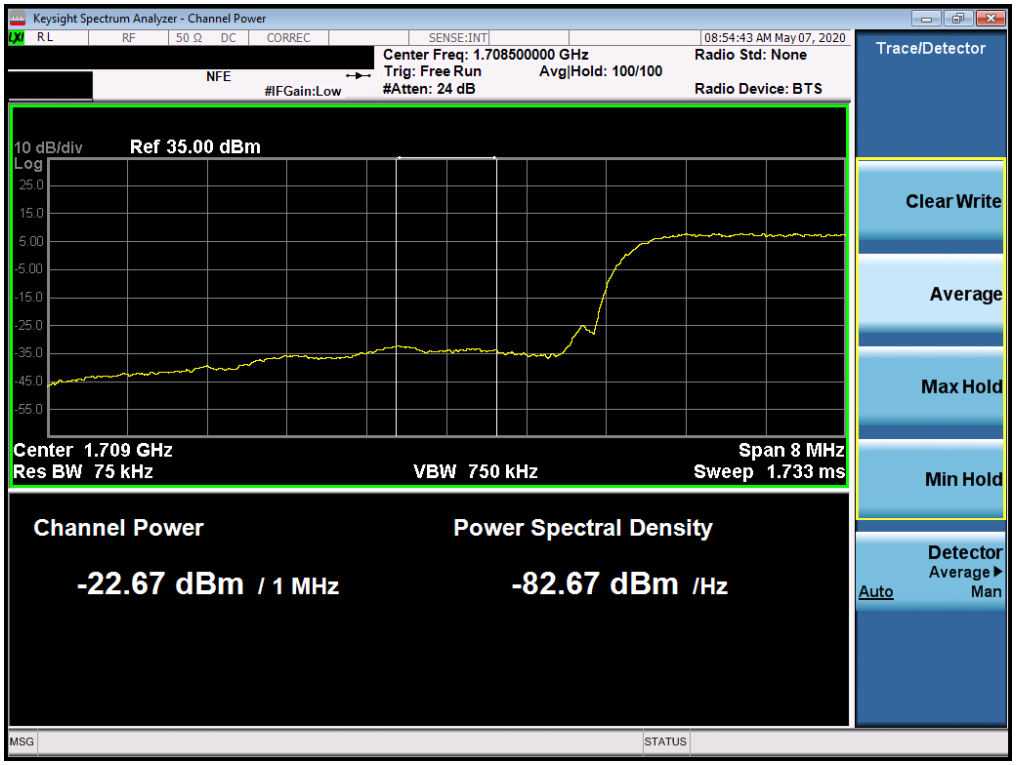


Plot 7-139. Upper Band Edge Plot (LTE Band 71 - 5MHz QPSK – Full RB Configuration)

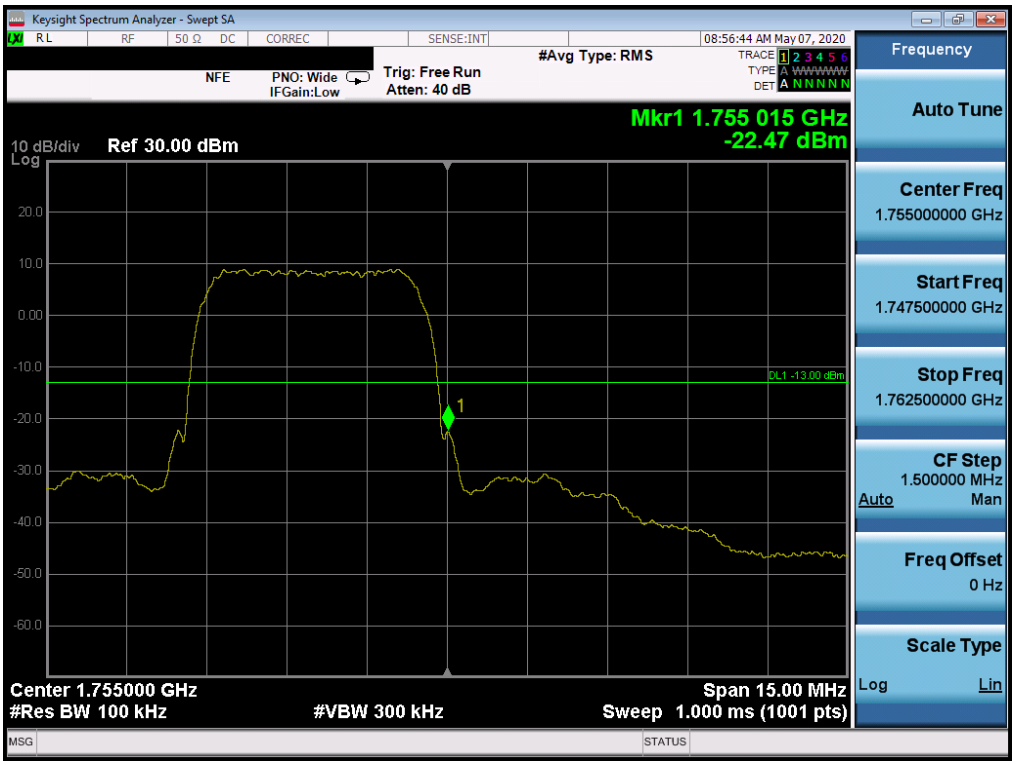
WCDMA AWS



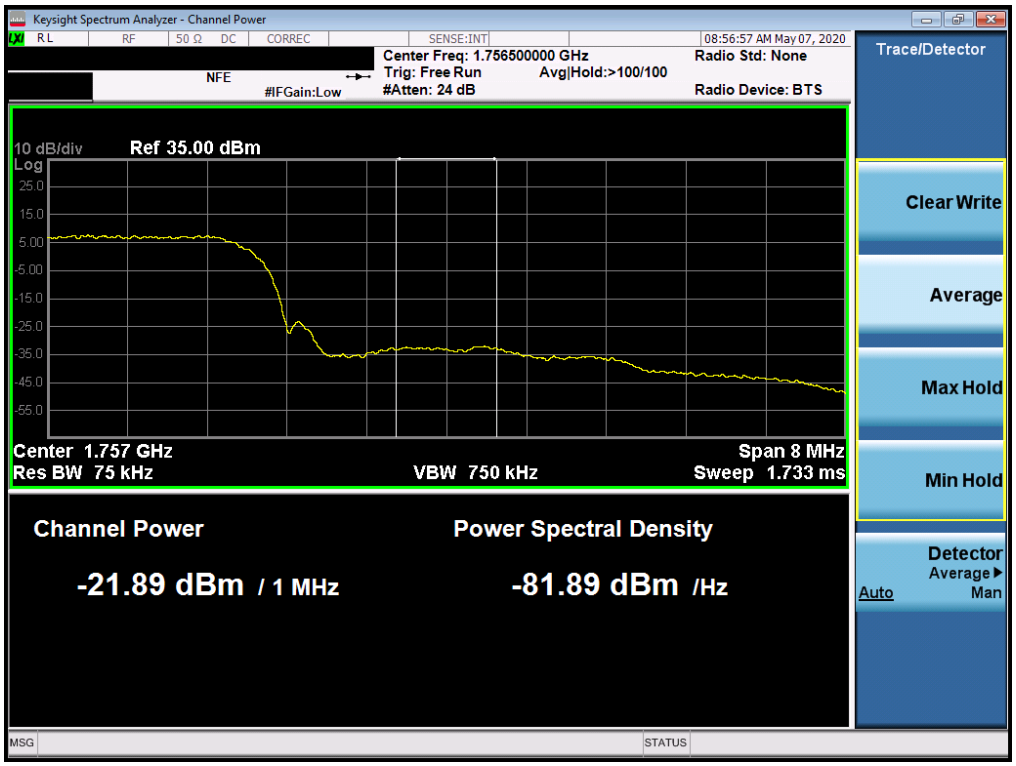
Plot 7-140. Lower Band Edge Plot (WCDMA AWS – Ch. 1312)



Plot 7-141. Lower Extended Band Edge Plot (WCDMA AWS – Ch. 1312)



Plot 7-142. Upper Band Edge Plot (WCDMA AWS – Ch. 1513)



Plot 7-143. Upper Extended Band Edge Plot (WCDMA AWS – Ch. 1513)

7.5 Radiated Power (ERP/EIRP)

Test Overview

Effective Radiated Power (ERP) 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. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.2.1

ANSI/TIA-603-E-2016 – Section 2.2.17

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points ≥ 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

Test Setup

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

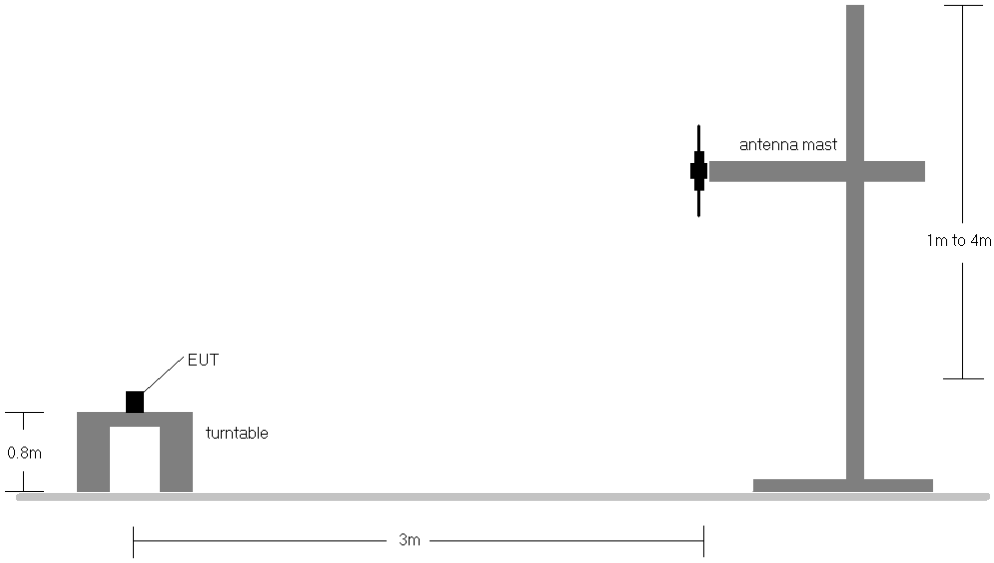


Figure 7-4. Radiated Test Setup <1GHz

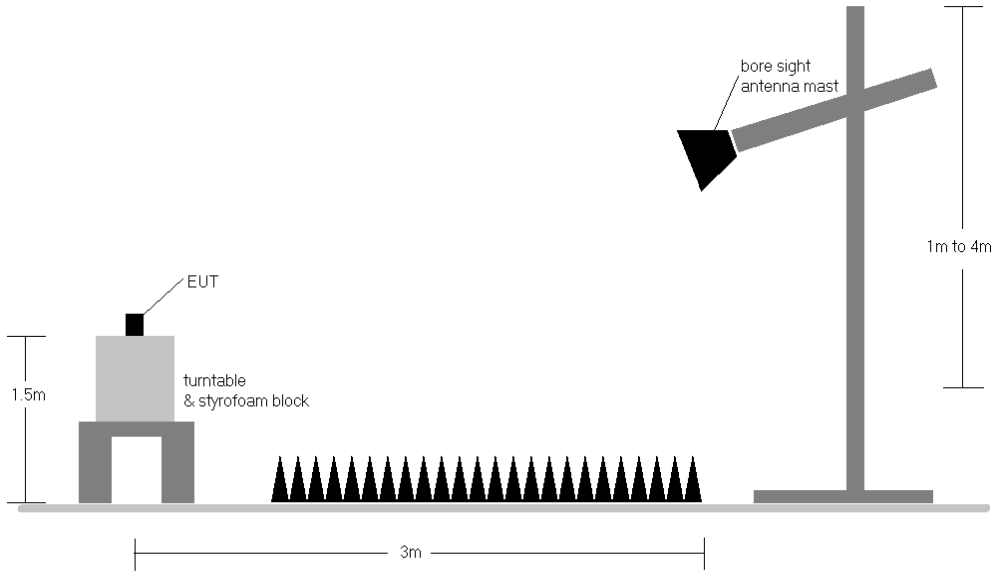


Figure 7-5. Radiated Test Setup >1GHz

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.

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
20 MHz	QPSK	1720.0	V	201.0	301.0	9.31	1 / 99	11.76	21.07	0.128	30.00	-8.93
		1745.0	V	215.0	134.0	9.14	1 / 99	12.72	**21.86**	0.153	30.00	-8.14
		1770.0	V	269.0	284.0	9.17	1 / 50	12.53	21.70	0.148	30.00	-8.30
	16-QAM	1745.0	V	215.0	134.0	9.14	1 / 50	11.88	**21.02**	0.126	30.00	-8.98
	64-QAM	1745.0	V	215.0	134.0	9.14	1 / 50	10.97	**20.11**	0.103	30.00	-9.89
15 MHz	QPSK	1717.5	V	201.0	301.0	9.33	1 / 37	11.86	21.19	0.132	30.00	-8.81
		1745.0	V	215.0	134.0	9.14	1 / 37	12.78	**21.92**	0.156	30.00	-8.08
		1772.5	V	269.0	284.0	9.18	1 / 37	12.52	21.70	0.148	30.00	-8.30
	16-QAM	1745.0	V	215.0	134.0	9.14	1 / 37	11.86	**21.00**	0.126	30.00	-9.00
	64-QAM	1745.0	V	215.0	134.0	9.14	1 / 37	10.99	**20.13**	0.103	30.00	-9.87
10 MHz	QPSK	1715.0	V	201.0	301.0	9.35	1 / 25	11.90	21.25	0.133	30.00	-8.75
		1745.0	V	215.0	134.0	9.14	1 / 25	12.89	**22.03**	0.160	30.00	-7.97
		1775.0	V	269.0	284.0	9.18	1 / 25	12.64	21.83	0.152	30.00	-8.17
	16-QAM	1745.0	V	215.0	134.0	9.14	1 / 25	11.95	**21.09**	0.128	30.00	-8.91
	64-QAM	1745.0	V	215.0	134.0	9.14	1 / 25	11.02	**20.16**	0.104	30.00	-9.84
5 MHz	QPSK	1712.5	V	201.0	301.0	9.37	1 / 0	11.83	21.19	0.132	30.00	-8.81
		1745.0	V	215.0	134.0	9.14	1 / 12	12.77	**21.91**	0.155	30.00	-8.09
		1777.5	V	269.0	284.0	9.19	1 / 12	12.59	21.78	0.151	30.00	-8.22
	16-QAM	1745.0	V	215.0	134.0	9.14	1 / 12	11.88	**21.02**	0.126	30.00	-8.98
	64-QAM	1745.0	V	215.0	134.0	9.14	1 / 12	10.98	**20.12**	0.103	30.00	-9.88
3 MHz	QPSK	1711.5	V	201.0	301.0	9.37	1 / 0	11.52	20.89	0.123	30.00	-9.11
		1745.0	V	215.0	134.0	9.14	1 / 7	12.55	**21.69**	0.147	30.00	-8.31
		1778.5	V	269.0	284.0	9.20	1 / 7	12.34	21.54	0.143	30.00	-8.46
	16-QAM	1745.0	V	215.0	134.0	9.14	1 / 7	11.67	**20.81**	0.120	30.00	-9.19
	64-QAM	1745.0	V	215.0	134.0	9.14	1 / 7	10.80	**19.94**	0.099	30.00	-10.06
1.4 MHz	QPSK	1710.7	V	201.0	301.0	9.38	1 / 0	11.57	20.95	0.125	30.00	-9.05
		1745.0	V	215.0	134.0	9.14	1 / 0	12.53	**21.67**	0.147	30.00	-8.33
		1779.3	V	269.0	284.0	9.20	1 / 0	12.34	21.54	0.143	30.00	-8.46
	16-QAM	1745.0	V	215.0	134.0	9.14	1 / 0	11.57	**20.71**	0.118	30.00	-9.29
	64-QAM	1745.0	V	215.0	134.0	9.14	1 / 0	10.57	**19.71**	0.093	30.00	-10.29
	Opposite Pol.	1745.0	H	129.0	177.0	9.14	1 / 99	12.36	21.50	0.141	30.00	-8.50

Table 7-144. EIRP Data (LTE Band 66/4)

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
10 MHz	QPSK	704.0	H	176.0	182.0	4.58	1 / 25	15.13	**19.71**	0.094	36.99	-17.28	**17.56**	0.057	34.77	-17.21
		707.5	H	177.0	188.0	4.62	1 / 0	14.64	19.26	0.084	36.99	-17.73	17.11	0.051	34.77	-17.66
		711.0	H	181.0	175.0	4.67	1 / 49	14.78	19.45	0.088	36.99	-17.54	17.30	0.054	34.77	-17.47
	16-QAM	704.0	H	176.0	182.0	4.58	1 / 0	14.09	**18.67**	0.074	36.99	-18.32	**16.52**	0.045	34.77	-18.25
	64-QAM	704.0	H	176.0	182.0	4.58	1 / 0	13.07	**17.65**	0.058	36.99	-19.34	**15.50**	0.035	34.77	-19.27
5 MHz	QPSK	701.5	H	176.0	182.0	4.60	1 / 12	15.27	**19.87**	0.097	36.99	-17.12	**17.72**	0.059	34.77	-17.05
		707.5	H	177.0	188.0	4.62	1 / 12	14.67	19.29	0.085	36.99	-17.70	17.14	0.052	34.77	-17.63
		713.5	H	181.0	175.0	4.70	1 / 12	14.84	19.54	0.090	36.99	-17.45	17.39	0.055	34.77	-17.38
	16-QAM	701.5	H	176.0	182.0	4.60	1 / 12	14.03	**18.63**	0.073	36.99	-18.36	**16.48**	0.044	34.77	-18.29
	64-QAM	701.5	H	176.0	182.0	4.60	1 / 12	13.16	**17.76**	0.060	36.99	-19.23	**15.61**	0.036	34.77	-19.16
3 MHz	QPSK	700.5	H	176.0	182.0	4.59	1 / 7	15.10	**19.69**	0.093	36.99	-17.30	**17.54**	0.057	34.77	-17.23
		707.5	H	177.0	188.0	4.62	1 / 7	14.58	19.20	0.083	36.99	-17.79	17.05	0.051	34.77	-17.72
		714.5	H	181.0	175.0	4.71	1 / 7	14.75	19.46	0.088	36.99	-17.53	17.31	0.054	34.77	-17.46
	16-QAM	700.5	H	176.0	182.0	4.59	1 / 7	13.96	**18.55**	0.072	36.99	-18.44	**16.40**	0.044	34.77	-18.37
	64-QAM	700.5	H	176.0	182.0	4.59	1 / 7	13.17	**17.76**	0.060	36.99	-19.23	**15.61**	0.036	34.77	-19.16
1.4 MHz	QPSK	699.7	H	176.0	182.0	4.56	1 / 0	15.04	**19.60**	0.091	36.99	-17.39	**17.45**	0.056	34.77	-17.32
		707.5	H	177.0	188.0	4.62	1 / 0	14.42	19.04	0.080	36.99	-17.95	16.89	0.049	34.77	-17.88
		715.3	H	181.0	175.0	4.72	1 / 3	14.57	19.29	0.085	36.99	-17.70	17.14	0.052	34.77	-17.63
	16-QAM	699.7	H	176.0	182.0	4.56	1 / 0	13.91	**18.47**	0.070	36.99	-18.52	**16.32**	0.043	34.77	-18.45
	64-QAM	699.7	H	176.0	182.0	4.56	1 / 0	13.05	**17.61**	0.058	36.99	-19.38	**15.46**	0.035	34.77	-19.31
	QPSK (Opp. Pol.)	704.0	V	296.0	121.0	4.62	1 / 25	9.07	13.69	0.023	36.99	-23.30	11.54	0.014	34.77	-23.23

Table 7-145. ERP Data (LTE Band 12)

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
10 MHz	QPSK	782.0	H	158.0	17.0	5.89	1 / 25	13.58	**19.47**	0.089	36.99	-17.52	**17.32**	0.054	34.77	-17.45
	16-QAM	782.0	H	158.0	17.0	5.89	1 / 25	12.75	**18.64**	0.073	36.99	-18.35	**16.49**	0.045	34.77	-18.28
	64-QAM	782.0	H	158.0	17.0	5.89	1 / 25	11.75	**17.64**	0.058	36.99	-19.35	**15.49**	0.035	34.77	-19.28
5 MHz	QPSK	779.5	H	158.0	17.0	5.82	1 / 12	13.73	19.54	0.090	36.99	-17.45	17.39	0.055	34.77	-17.38
		782.0	H	158.0	17.0	5.89	1 / 12	13.69	**19.58**	0.091	36.99	-17.41	**17.43**	0.055	34.77	-17.34
		784.5	H	158.0	17.0	5.92	1 / 12	13.63	19.55	0.090	36.99	-17.44	17.40	0.055	34.77	-17.37
	16-QAM	779.5	H	158.0	17.0	5.82	1 / 12	12.84	**18.65**	0.073	36.99	-18.34	**16.50**	0.045	34.77	-18.27
	64-QAM	782.0	H	158.0	17.0	5.89	1 / 12	11.76	**17.65**	0.058	36.99	-19.34	**15.50**	0.036	34.77	-19.27
	Opposite Pol.	782.0	V	327.0	349.0	5.89	1 / 25	8.12	14.01	0.025	36.99	-22.98	11.86	0.015	34.77	-22.91

Table 7-146. ERP Data (LTE Band 13)

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
20 MHz	QPSK	673.0	H	177.0	193.0	4.09	1 / 99	15.04	19.13	0.082	36.99	-17.86	16.98	0.050	34.77	-17.79
		680.5	H	179.0	195.0	4.24	1 / 50	15.96	**20.20**	0.105	36.99	-16.79	**18.05**	0.064	34.77	-16.73
		688.0	H	182.0	195.0	4.48	1 / 0	15.45	19.93	0.098	36.99	-17.06	17.78	0.060	34.77	-16.99
	16-QAM	680.5	H	179.0	195.0	4.24	1 / 50	15.07	**19.31**	0.085	36.99	-17.68	**17.16**	0.052	34.77	-17.62
	64-QAM	680.5	H	179.0	195.0	4.24	1 / 50	14.08	**18.32**	0.068	36.99	-18.67	**16.17**	0.041	34.77	-18.61
15 MHz	QPSK	670.5	H	177.0	193.0	3.96	1 / 37	15.25	19.21	0.083	36.99	-17.78	17.06	0.051	34.77	-17.71
		680.5	H	179.0	195.0	4.24	1 / 37	16.00	**20.24**	0.106	36.99	-16.75	**18.09**	0.064	34.77	-16.69
		690.5	H	182.0	195.0	4.41	1 / 37	15.58	19.99	0.100	36.99	-17.00	17.84	0.061	34.77	-16.93
	16-QAM	680.5	H	179.0	195.0	4.24	1 / 37	15.01	**19.25**	0.084	36.99	-17.74	**17.10**	0.051	34.77	-17.68
	64-QAM	680.5	H	179.0	195.0	4.24	1 / 37	14.12	**18.36**	0.068	36.99	-18.63	**16.21**	0.042	34.77	-18.57
10 MHz	QPSK	668.0	H	177.0	193.0	3.82	1 / 25	15.29	19.12	0.082	36.99	-17.87	16.97	0.050	34.77	-17.80
		680.5	H	179.0	195.0	4.24	1 / 25	15.92	**20.16**	0.104	36.99	-16.83	**18.01**	0.063	34.77	-16.77
		693.0	H	182.0	195.0	4.44	1 / 25	15.45	19.89	0.098	36.99	-17.10	17.74	0.059	34.77	-17.03
	16-QAM	680.5	H	179.0	195.0	4.24	1 / 25	14.94	**19.18**	0.083	36.99	-17.81	**17.03**	0.050	34.77	-17.75
	64-QAM	680.5	H	179.0	195.0	4.24	1 / 25	13.96	**18.20**	0.066	36.99	-18.79	**16.05**	0.040	34.77	-18.73
5 MHz	QPSK	665.5	H	177.0	193.0	3.79	1 / 12	15.24	19.03	0.080	36.99	-17.96	16.88	0.049	34.77	-17.89
		680.5	H	179.0	195.0	4.24	1 / 12	15.86	**20.10**	0.102	36.99	-16.89	**17.95**	0.062	34.77	-16.83
		695.5	H	182.0	195.0	4.58	1 / 12	15.16	19.73	0.094	36.99	-17.26	17.58	0.057	34.77	-17.19
	16-QAM	680.5	H	179.0	195.0	4.24	1 / 12	14.84	**19.08**	0.081	36.99	-17.91	**16.93**	0.049	34.77	-17.85
	64-QAM	680.5	H	179.0	195.0	4.24	1 / 12	13.83	**18.07**	0.064	36.99	-18.92	**15.92**	0.039	34.77	-18.86
	Opposite Pol.	680.5	V	120.0	332.0	4.24	1 / 50	14.39	18.63	0.073	36.99	-18.36	16.48	0.044	34.77	-18.30

Table 7-147. ERP Data (LTE Band 71)

Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1712.40	WCDMA1700	H	141	216	13.23	9.46	22.69	0.186	30.00	-7.31
1732.60	WCDMA1700	H	109	307	13.24	9.34	22.58	0.181	30.00	-7.42
1752.60	WCDMA1700	H	101	307	13.54	9.24	**22.78**	**0.190**	30.00	-7.22
1752.60	WCDMA1700	V	153	9	12.05	9.24	21.29	0.135	30.00	-8.71

Table 7-148. EIRP Data (WCDMA AWS)

7.6 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 horizontally and vertically 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 maximum power, and at the appropriate frequencies.

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.

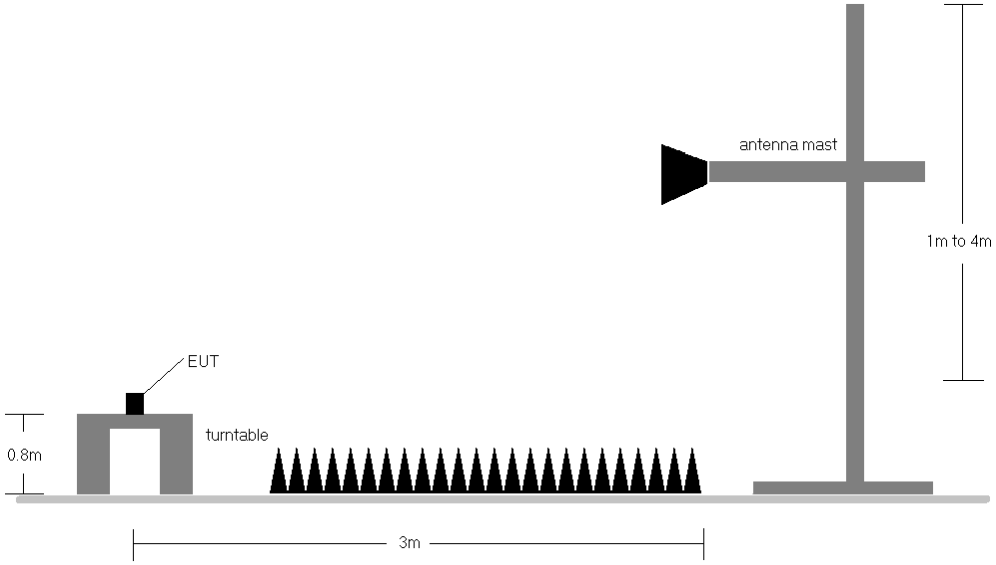


Figure 7-6. Test Instrument & Measurement Setup

Test Notes

1. This device employs UMTS technology with WCDMA (AMR/RMC) and HSDPA capabilities. The EUT was tested under all configurations and the highest power is reported in WCDMA mode with HSDPA Inactive at 12.2 kbps RMC and TPC bits all set to “1”.

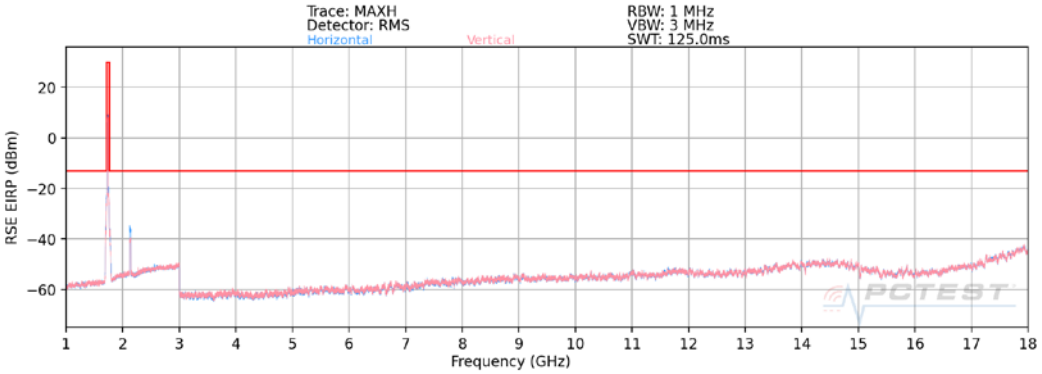
2. For LTE mode, the device was tested under all modulations, RB sizes and offsets, and channel bandwidth configurations and the worst case emissions are reported with 1 RB.

3. This unit was tested with its standard battery.

4. The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case setup is reported in the tables below.

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

LTE Band 66/4



Plot 7-149. Radiated Spurious Plot (LTE Band 66/4)

Bandwidth (MHz):	20
Frequency (MHz):	1720.0
RB / Offset:	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3440.0	V	400	304	-67.12	1.29	41.17	-54.09	-13.00	-41.09
5160.0	V	-	-	-70.73	4.50	40.77	-54.48	-13.00	-41.48
6880.0	V	-	-	-69.98	7.76	44.78	-50.48	-13.00	-37.48
8600.0	V	-	-	-70.07	10.47	47.40	-47.86	-13.00	-34.86

Table 7-2. Radiated Spurious Data (LTE Band 66/4 – Low Channel)

Bandwidth (MHz):	20
Frequency (MHz):	1745.0
RB / Offset:	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3490.0	V	377	294	-67.91	1.11	40.20	-55.06	-13.00	-42.06
5235.0	V	-	-	-69.81	4.96	42.15	-53.11	-13.00	-40.11
6980.0	V	-	-	-70.00	6.31	43.31	-51.95	-13.00	-38.95
8725.0	V	-	-	-70.02	10.78	47.76	-47.49	-13.00	-34.49
10470.0	V	396	183	-68.48	11.65	50.17	-45.09	-13.00	-32.09

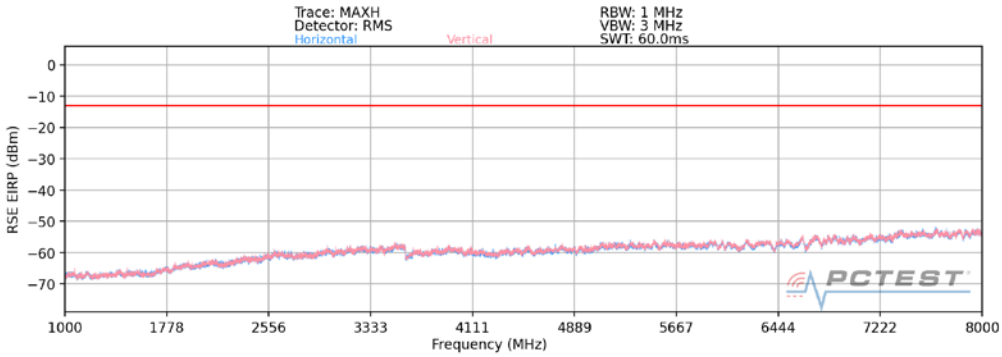
Table 7-3. Radiated Spurious Data (LTE Band 66/4 – Mid Channel)

Bandwidth (MHz):	20
Frequency (MHz):	1770.0
RB / Offset:	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3540.00	V	400	308	-67.35	1.42	41.07	-54.18	-13.00	-41.18
5310.00	V	-	-	-69.68	4.99	42.31	-52.94	-13.00	-39.94
7080.00	V	-	-	-69.79	6.30	43.51	-51.74	-13.00	-38.74
8850.00	V	-	-	-70.03	10.46	47.43	-47.82	-13.00	-34.82

Table 7-4. Radiated Spurious Data (LTE Band 66/4 – High Channel)

LTE Band 12



Plot 7-150. Radiated Spurious Plot (LTE Band 12)

Bandwidth (MHz):	10
Frequency (MHz):	704.0
RB / Offset:	1 / 25

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1408.0	V	398	55	-74.20	-5.99	26.81	-68.45	-13.00	-55.45
2112.0	V	121	103	-68.23	-2.77	36.00	-59.26	-13.00	-46.26
2816.0	V	-	-	-73.64	-1.85	31.51	-63.75	-13.00	-50.75
3520.0	V	-	-	-73.60	1.65	35.05	-60.20	-13.00	-47.20

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

Bandwidth (MHz):	10
Frequency (MHz):	707.5
RB / Offset:	1 / 25

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1415.0	V	129	295	-72.69	-5.96	28.35	-66.91	-13.00	-53.91
2122.5	V	112	104	-68.29	-2.79	35.92	-59.34	-13.00	-46.34
2830.0	V	-	-	-73.79	-1.47	31.74	-63.52	-13.00	-50.52

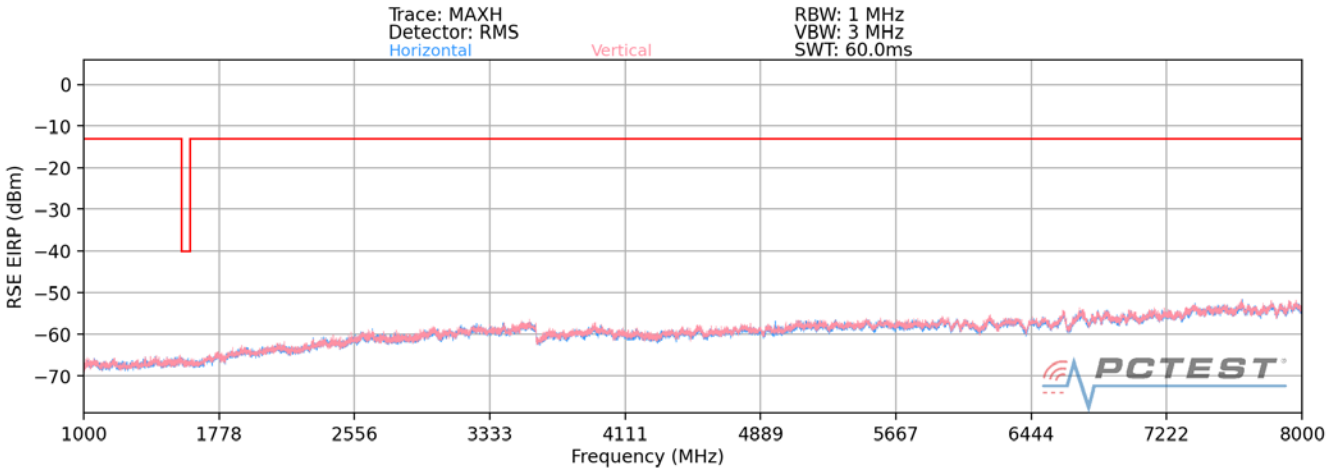
Table 7-6. Radiated Spurious Data (LTE Band 12 – Mid Channel)

Bandwidth (MHz):	10
Frequency (MHz):	711.0
RB / Offset:	1 / 25

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1422.0	V	121	302	-72.42	-5.96	28.62	-66.64	-13.00	-53.64
2133.0	V	119	107	-68.12	-3.20	35.68	-59.58	-13.00	-46.58
2844.0	V	-	-	-73.62	-1.37	32.01	-63.25	-13.00	-50.25
3555.0	V	-	-	-73.52	1.28	34.76	-60.49	-13.00	-47.49

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

LTE Band 13



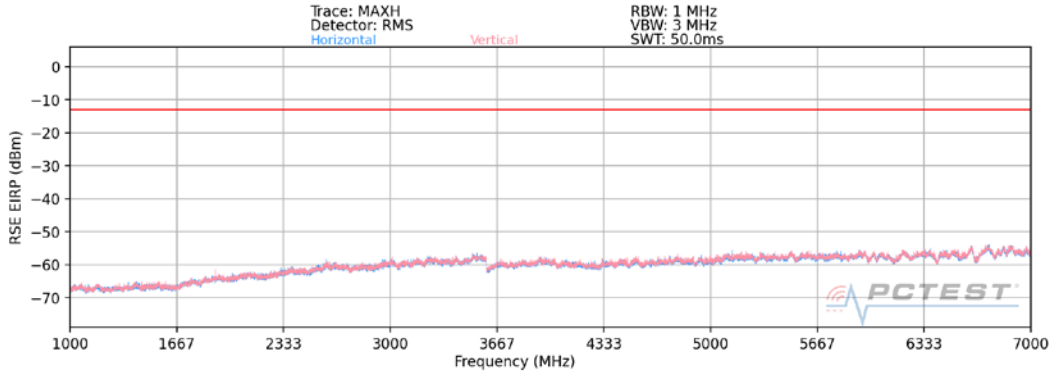
Plot 7-151. Radiated Spurious Plot (LTE Band 13)

Bandwidth (MHz):	10
Frequency (MHz):	782.0
RB / Offset:	1 / 25

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1564.0	V	128	194	-51.01	-5.95	50.04	-45.22	-40.00	-5.22
2346.0	V	-	-	-74.07	-2.90	30.03	-65.23	-13.00	-52.23
3128.0	V	396	125	-75.93	-0.17	30.90	-64.36	-13.00	-51.36
3910.0	V	-	-	-77.12	2.86	32.74	-62.52	-13.00	-49.52
4692.0	V	-	-	-77.96	3.26	32.30	-62.96	-13.00	-49.96
5474.0	V	-	-	-78.09	5.25	34.16	-61.10	-13.00	-48.10

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

LTE Band 71



Plot 7-152. Radiated Spurious Plot (LTE Band 71)

Bandwidth (MHz):	10
Frequency (MHz):	668.0
RB / Offset:	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1336.0	H	-	-	-70.10	-6.45	30.45	-64.81	-13.00	-51.81
2004.0	H	-	-	-69.98	-4.16	32.86	-62.40	-13.00	-49.40

Table 7-9. Radiated Spurious Data (LTE Band 71 – Low Channel)

Bandwidth (MHz):	10
Frequency (MHz):	680.5
RB / Offset:	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1361.0	H	396	194	-70.56	-6.38	30.06	-65.20	-13.00	-52.20
2041.5	H	-	-	-69.64	-3.65	33.71	-61.55	-13.00	-48.55
2722.0	H	-	-	-69.27	-1.61	36.12	-59.14	-13.00	-46.14

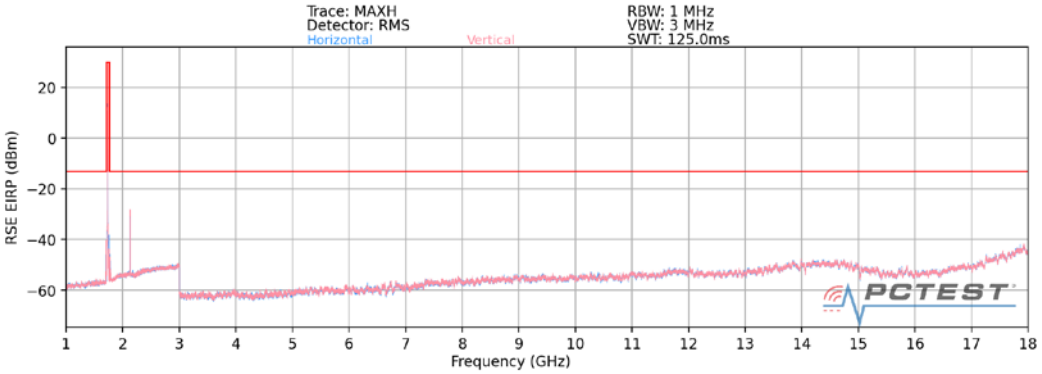
Table 7-10. Radiated Spurious Data (LTE Band 71 – Mid Channel)

Bandwidth (MHz):	10
Frequency (MHz):	693.0
RB / Offset:	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1386.0	H	-	-	-70.84	-6.15	30.01	-65.24	-13.00	-52.24
2079.0	H	136	174	-68.49	-3.49	35.02	-60.23	-13.00	-47.23
2772.0	H	-	-	-69.40	-1.90	35.70	-59.55	-13.00	-46.55

Table 7-11. Radiated Spurious Data (LTE Band 71 – High Channel)

WCDMA AWS



Plot 7-153. Radiated Spurious Plot (WCDMA AWS)

Mode:	WCDMA RMC
Channel:	1312
Frequency (MHz):	1712.4

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3424.8	V	301	345	-64.53	1.64	44.11	-51.14	-13.00	-38.14
5137.2	V	-	-	-69.55	4.59	42.04	-53.22	-13.00	-40.22
6849.6	V	-	-	-69.68	7.58	44.90	-50.35	-13.00	-37.35

Table 7-12. Radiated Spurious Data (WCDMA AWS – Low Channel)

Mode:	WCDMA RMC
Channel:	1413
Frequency (MHz):	1732.6

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3465.2	V	337	97	-68.21	1.16	39.95	-55.31	-13.00	-42.31
5197.8	V	-	-	-69.59	4.89	42.30	-52.95	-13.00	-39.95
6930.4	V	-	-	-69.71	7.22	44.51	-50.75	-13.00	-37.75

Table 7-13. Radiated Spurious Data (WCDMA AWS – Mid Channel)

Mode:	WCDMA RMC
Channel:	1513
Frequency (MHz):	1752.6

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3505.2	V	322	18	-68.51	0.96	39.45	-55.81	-13.00	-42.81
5257.8	V	-	-	-70.14	4.99	41.85	-53.41	-13.00	-40.41
7010.4	V	-	-	-69.89	7.46	44.57	-50.69	-13.00	-37.69

Table 7-14. Radiated Spurious Data (WCDMA AWS – High Channel)

7.7 Frequency Stability / Temperature Variation

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-E-2016. The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

For Part 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure Used

ANSI/TIA-603-E-2016

Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a "standby" condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Test Setup

The EUT was connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

Test Notes

None

Frequency Stability / Temperature Variation

LTE Band 66/4

Operating Frequency (Hz):	1,745,000,000
Ref. Voltage (VDC):	3.85

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	- 30	1,745,000,802	1,223	0.0000701
		- 20	1,745,000,912	1,333	0.0000764
		- 10	1,745,000,522	943	0.0000540
		0	1,745,000,085	506	0.0000290
		+ 10	1,744,999,987	408	0.0000234
		+ 20 (Ref)	1,744,999,579	0	0.0000000
		+ 30	1,744,999,519	-60	-0.0000034
		+ 40	1,745,000,914	1,335	0.0000765
		+ 50	1,744,999,181	-398	-0.0000228
Battery Endpoint	3.11	+ 20	1,744,999,894	315	0.0000181

Table 7-9. LTE Band 66/4 Frequency Stability Data

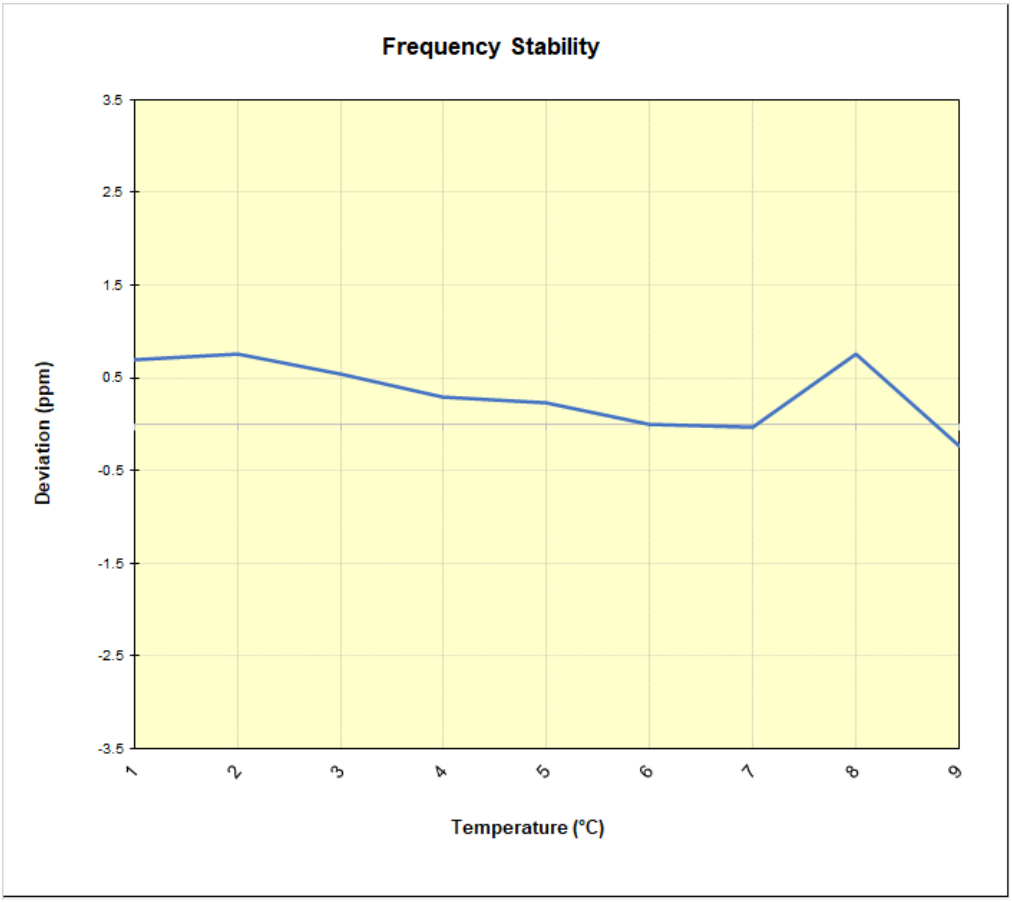


Table 7-9. LTE Band 66/4 Frequency Stability Chart

Frequency Stability / Temperature Variation

LTE Band 12

Operating Frequency (Hz):	707,500,000
Ref. Voltage (VDC):	3.85

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	- 30	707,500,068	42	0.0000059
		- 20	707,499,978	-48	-0.0000068
		- 10	707,499,853	-173	-0.0000245
		0	707,500,127	101	0.0000143
		+ 10	707,499,528	-498	-0.0000704
		+ 20 (Ref)	707,500,026	0	0.0000000
		+ 30	707,500,115	89	0.0000126
		+ 40	707,499,856	-170	-0.0000240
		+ 50	707,500,143	117	0.0000165
Battery Endpoint	3.11	+ 20	707,500,181	155	0.0000219

Table 7-9. LTE Band 12 Frequency Stability Data

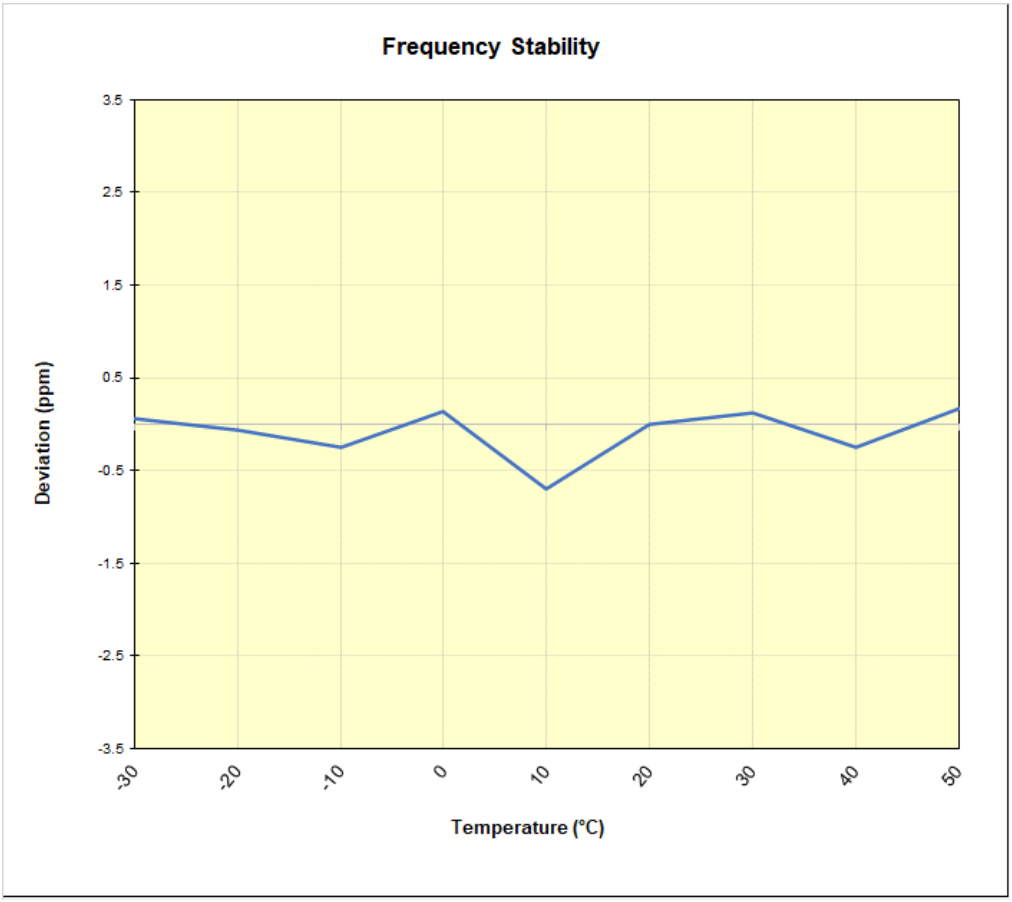


Table 7-9. LTE Band 12 Frequency Stability Chart

Frequency Stability / Temperature Variation

LTE Band 13

Operating Frequency (Hz):	782,000,000
Ref. Voltage (VDC):	3.85

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	- 30	782,000,182	513	0.0000656
		- 20	781,999,588	-81	-0.0000104
		- 10	782,000,033	364	0.0000465
		0	782,000,154	485	0.0000620
		+ 10	781,999,698	29	0.0000037
		+ 20 (Ref)	781,999,669	0	0.0000000
		+ 30	781,999,961	292	0.0000373
		+ 40	781,999,947	278	0.0000355
		+ 50	782,000,114	445	0.0000569
Battery Endpoint	3.11	+ 20	782,000,321	652	0.0000834

Table 7-9. LTE Band 13 Frequency Stability Data

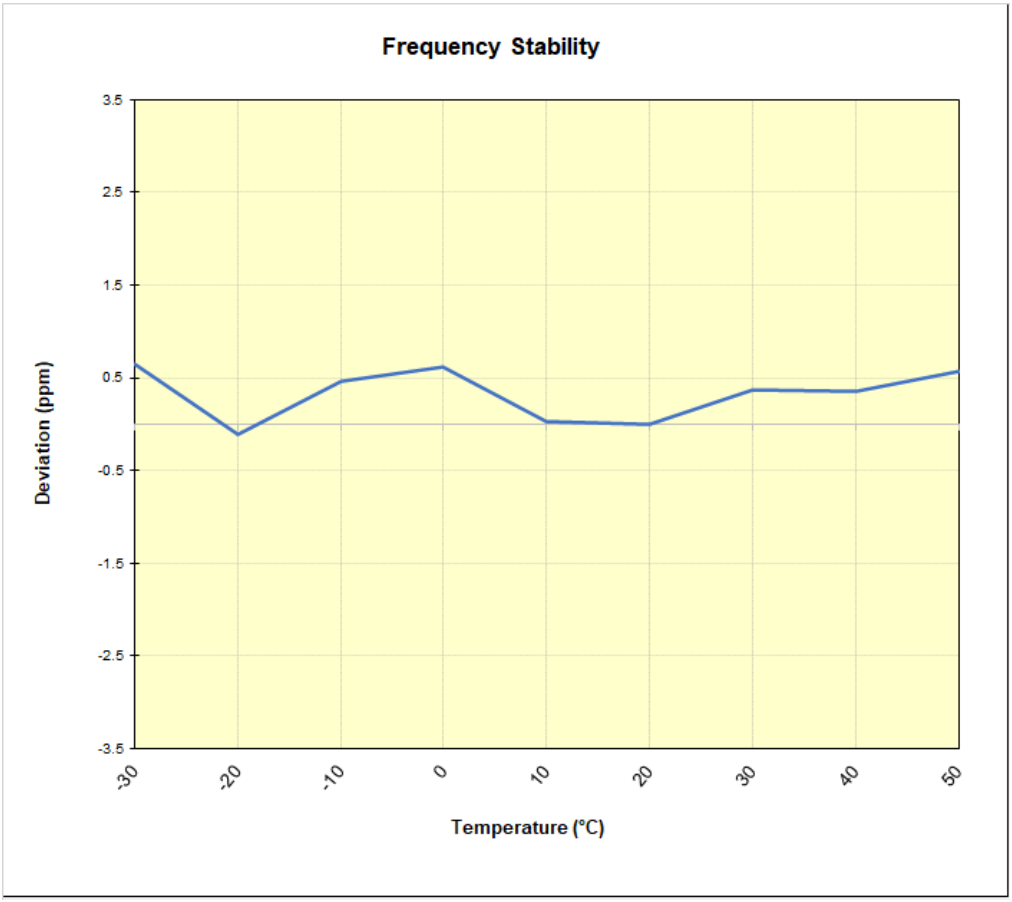


Table 7-9. LTE Band 13 Frequency Stability Chart

Frequency Stability / Temperature Variation

LTE Band 71

Operating Frequency (Hz):	680,500,000
Ref. Voltage (VDC):	3.85

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	- 30	680,500,197	146	0.0000215
		- 20	680,500,497	446	0.0000655
		- 10	680,499,938	-113	-0.0000166
		0	680,500,493	442	0.0000650
		+ 10	680,499,538	-513	-0.0000754
		+ 20 (Ref)	680,500,051	0	0.0000000
		+ 30	680,500,030	-21	-0.0000031
		+ 40	680,499,982	-69	-0.0000101
		+ 50	680,499,672	-379	-0.0000557
Battery Endpoint	3.11	+ 20	680,500,119	68	0.0000100

Table 7-9. LTE Band 71 Frequency Stability Data

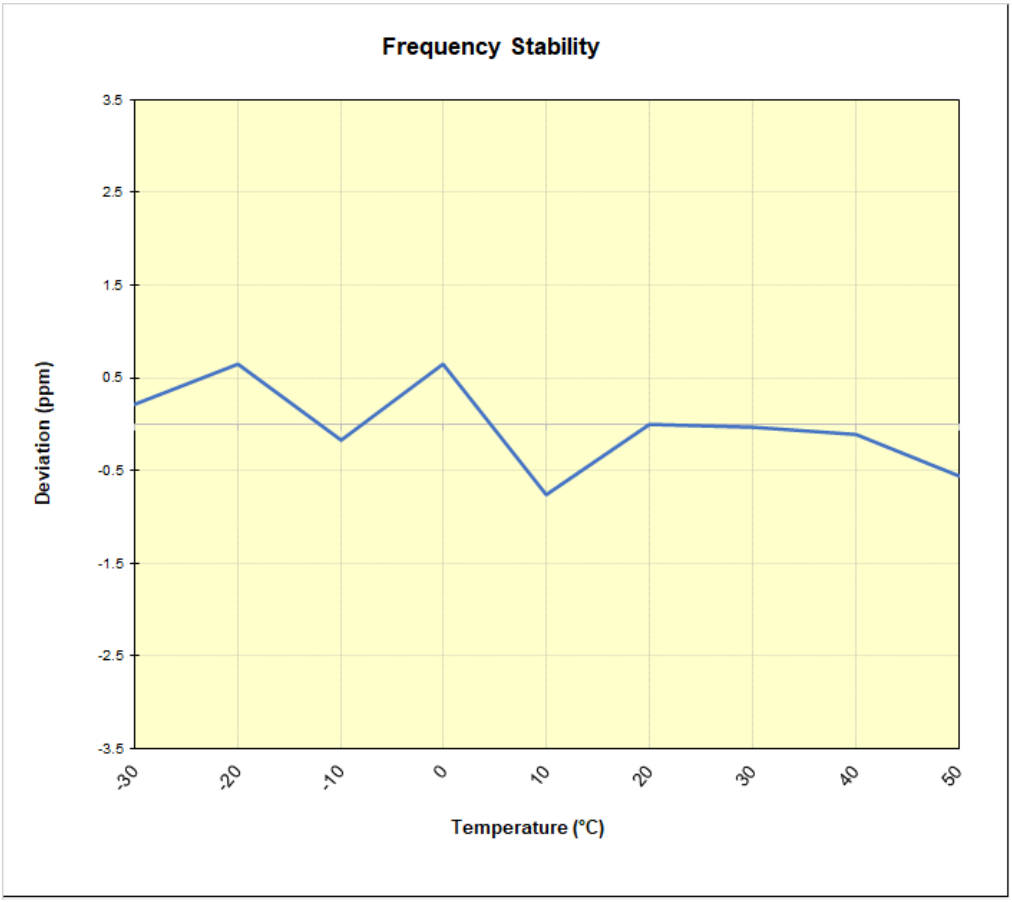


Table 7-9. LTE Band 71 Frequency Stability Chart

Frequency Stability / Temperature Variation

WCDMA AWS

Operating Frequency (Hz):	1,732,600,000
Ref. Voltage (VDC):	3.85

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	- 30	1,732,599,741	-350	-0.0000202
		- 20	1,732,600,951	860	0.0000496
		- 10	1,732,599,216	-875	-0.0000505
		0	1,732,600,732	641	0.0000370
		+ 10	1,732,600,124	33	0.0000019
		+ 20 (Ref)	1,732,600,091	0	0.0000000
		+ 30	1,732,599,430	-661	-0.0000382
		+ 40	1,732,600,224	133	0.0000077
		+ 50	1,732,600,058	-33	-0.0000019
Battery Endpoint	3.11	+ 20	1,732,600,960	869	0.0000502

Table 7-9. WCDMA AWS Frequency Stability Data

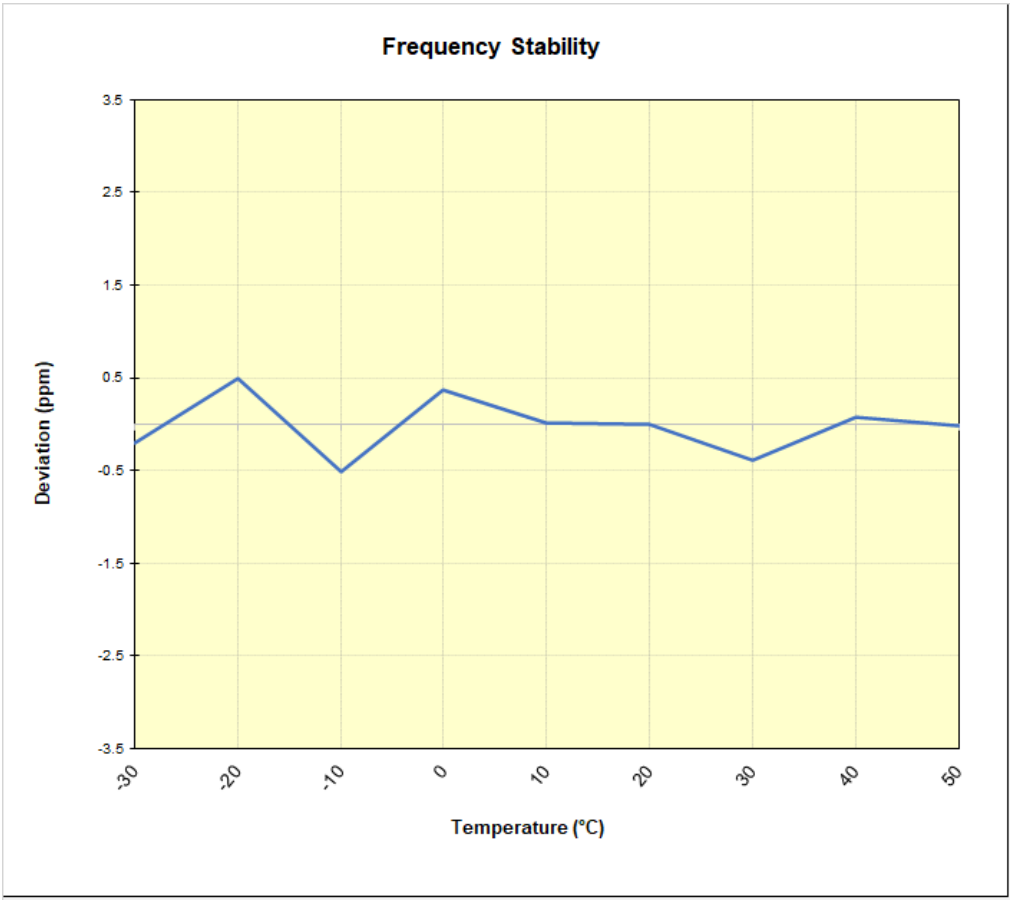


Table 7-9. WCDMA AWS Frequency Stability Chart

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFL355DL** complies with all the requirements of Parts 27 of the FCC rules.