

7.4 Band Edge Emissions at Antenna Terminal

§2.1051 §22.917(a) §24.238(a) §27.53(c) §27.53(h)

Test Overview

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

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

Test Procedure Used

KDB 971168 D01 v02r02 – 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 \geq 1% of the emission bandwidth
4. VBW \geq 3 x RBW
5. Detector = RMS
6. Number of sweep points \geq 2 x Span/RBW
7. Trace mode = trace average
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.

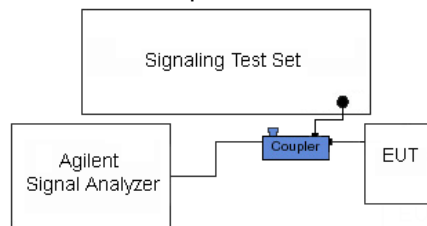




Figure 7-3. Test Instrument & Measurement Setup

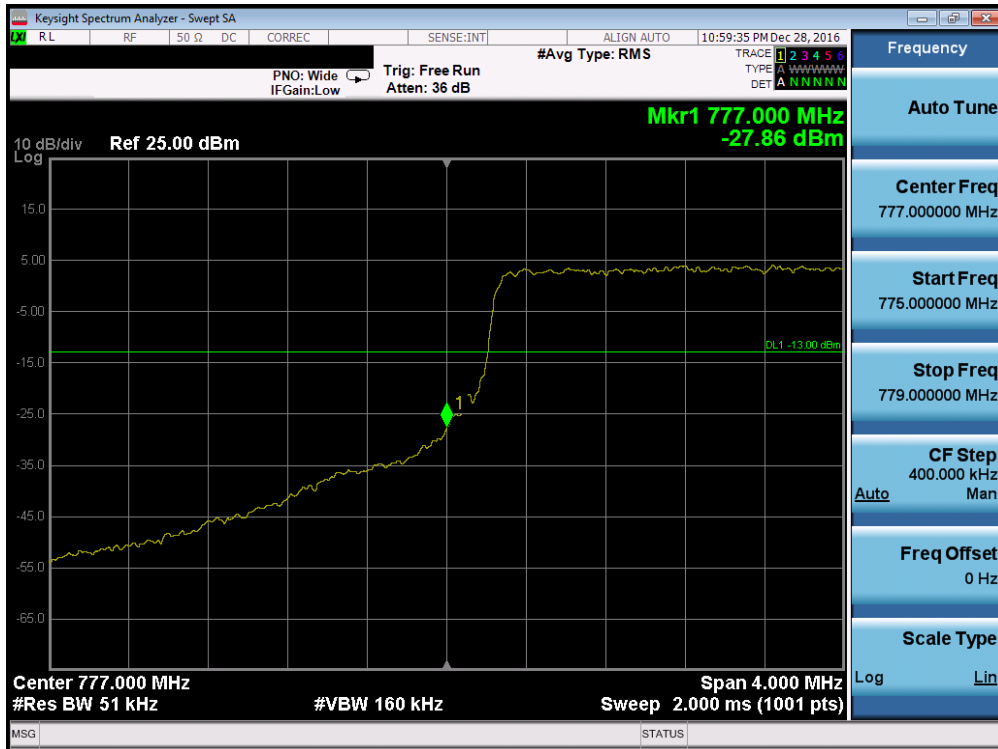
Test Notes

Per 22.917(b) 24.238(a) 27.53(h) in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

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.

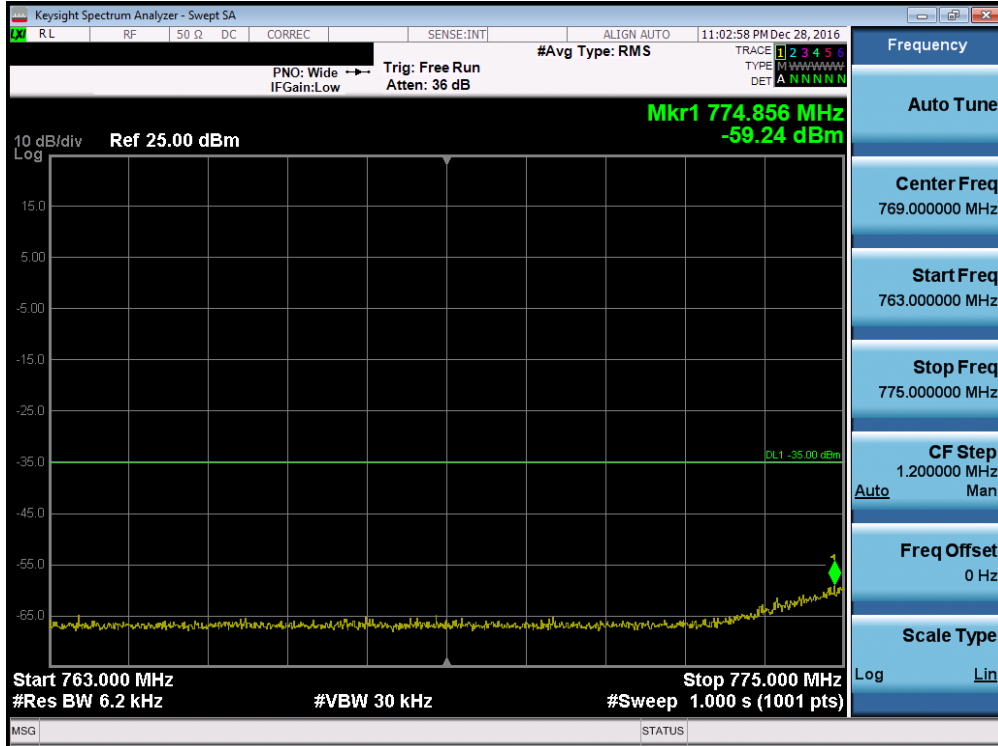
FCC ID: ZNFUS110	 PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	 LG	Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset	Page 52 of 116	

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

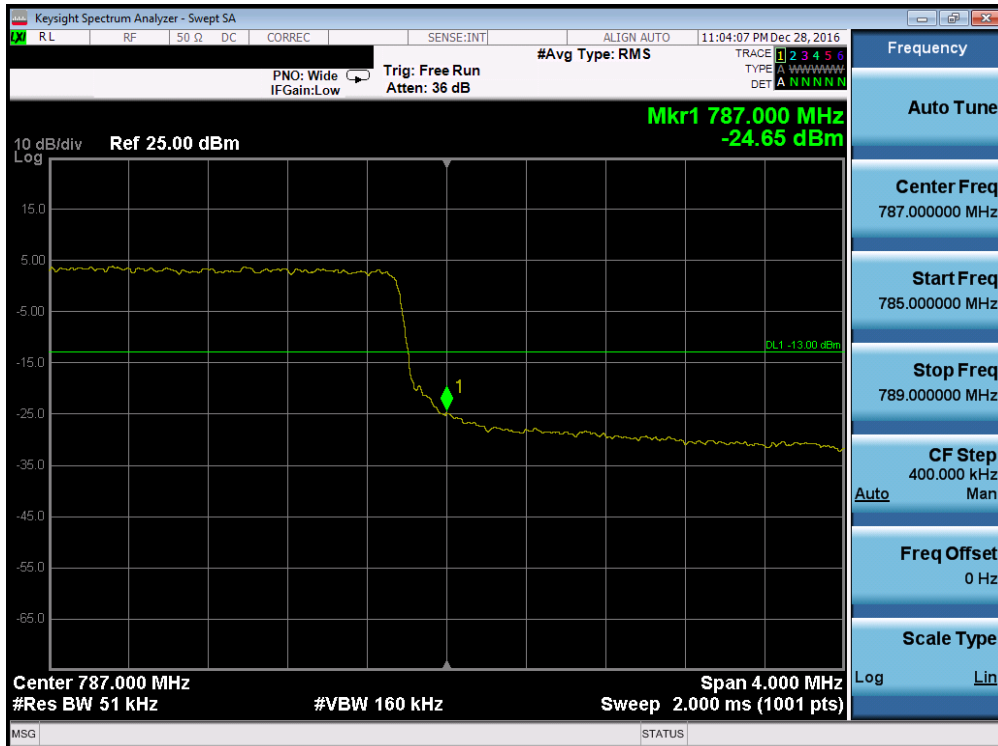


Plot 7-73. Lower Band Edge Plot (Band 13 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
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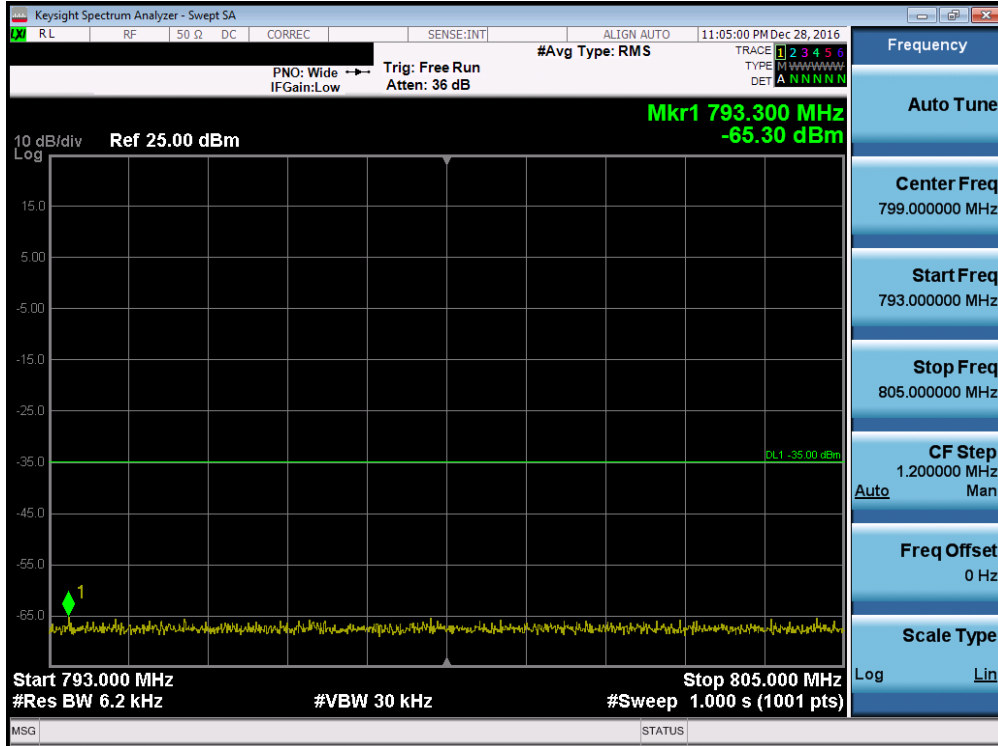


Plot 7-74. Lower Emission Mask Edge Plot (Band 13 – 5.0MHz QPSK – RB Size 25)

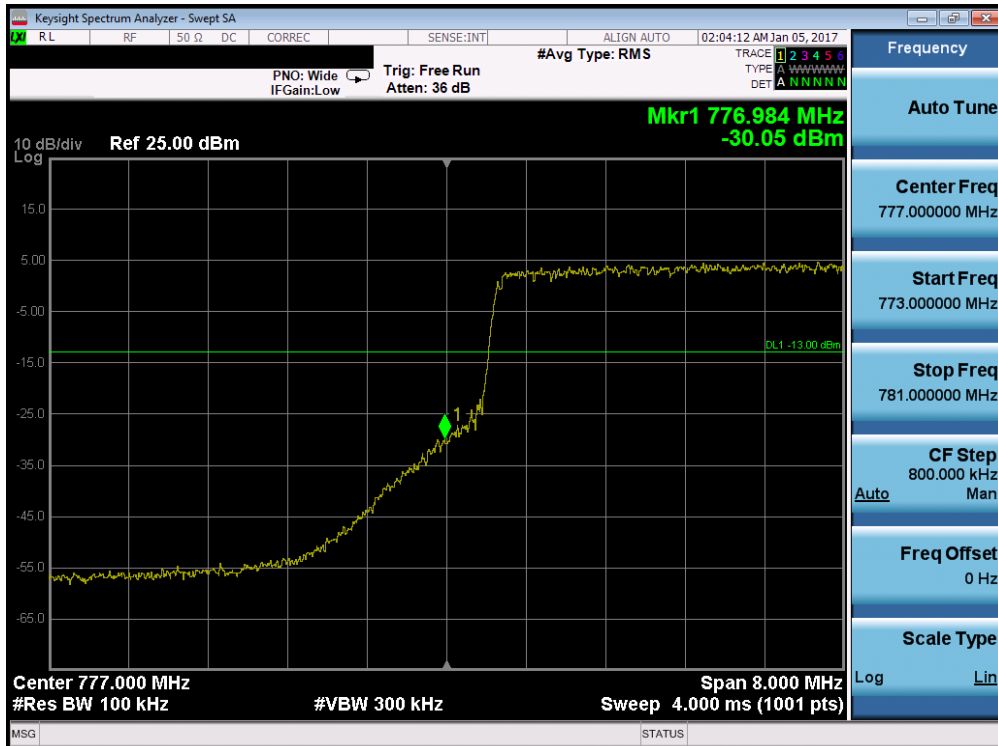


Plot 7-75. Upper Band Edge Plot (Band 13 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset	Page 54 of 116	

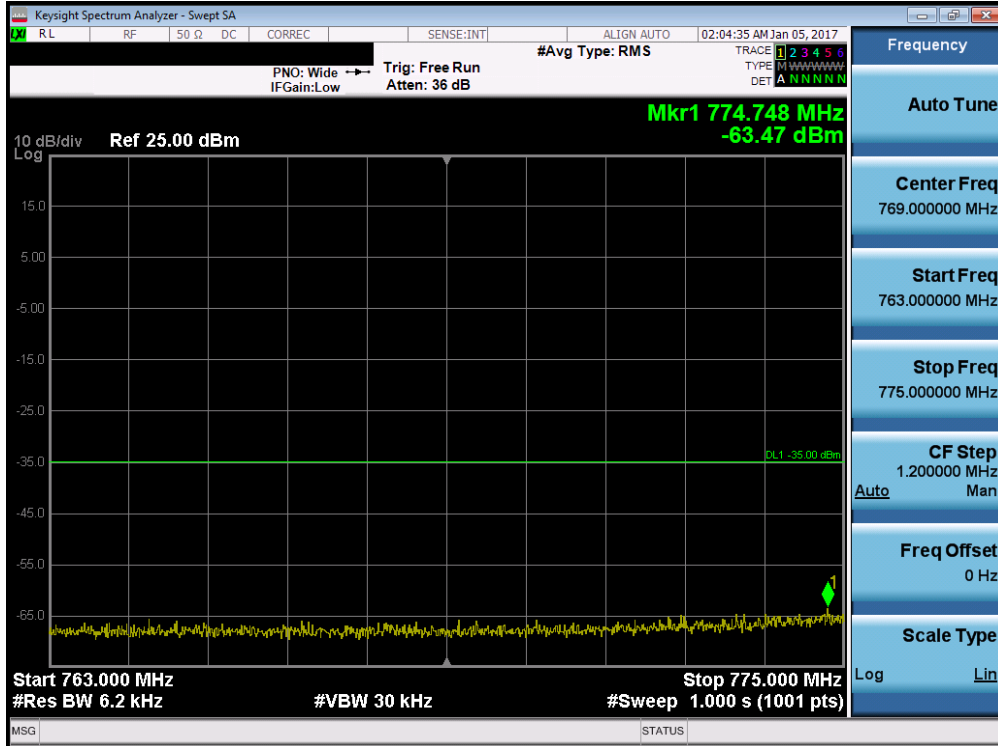


Plot 7-76. Upper Emission Mask Edge Plot (Band 13 – 5.0MHz QPSK – RB Size 25)

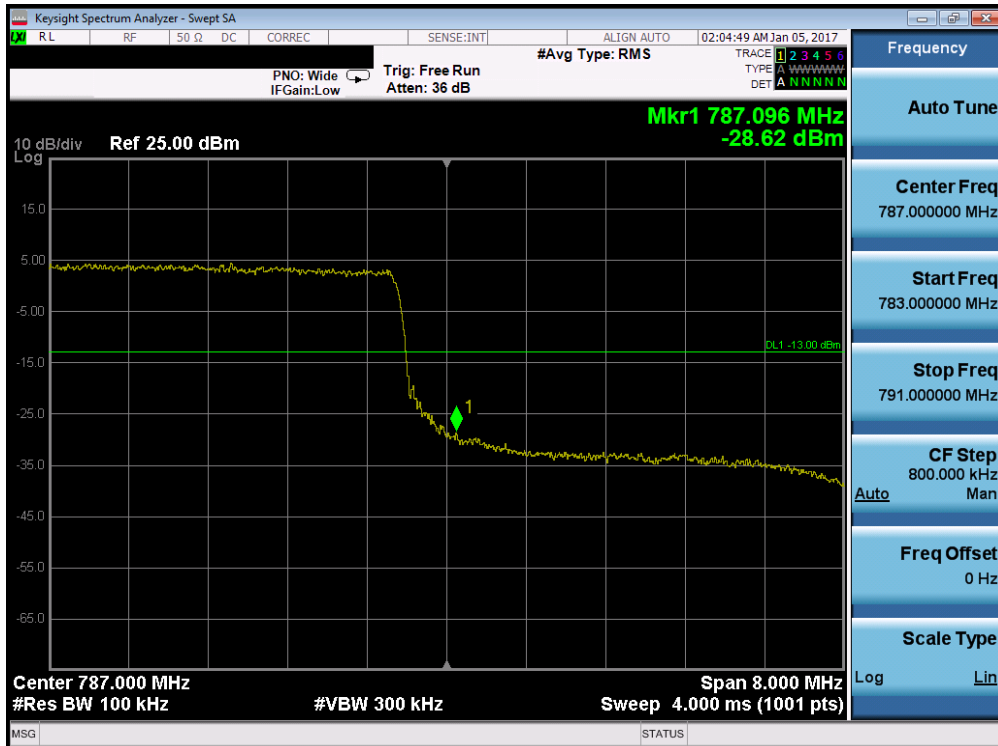


Plot 7-77. Lower Band Edge Plot (Band 13 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 55 of 116

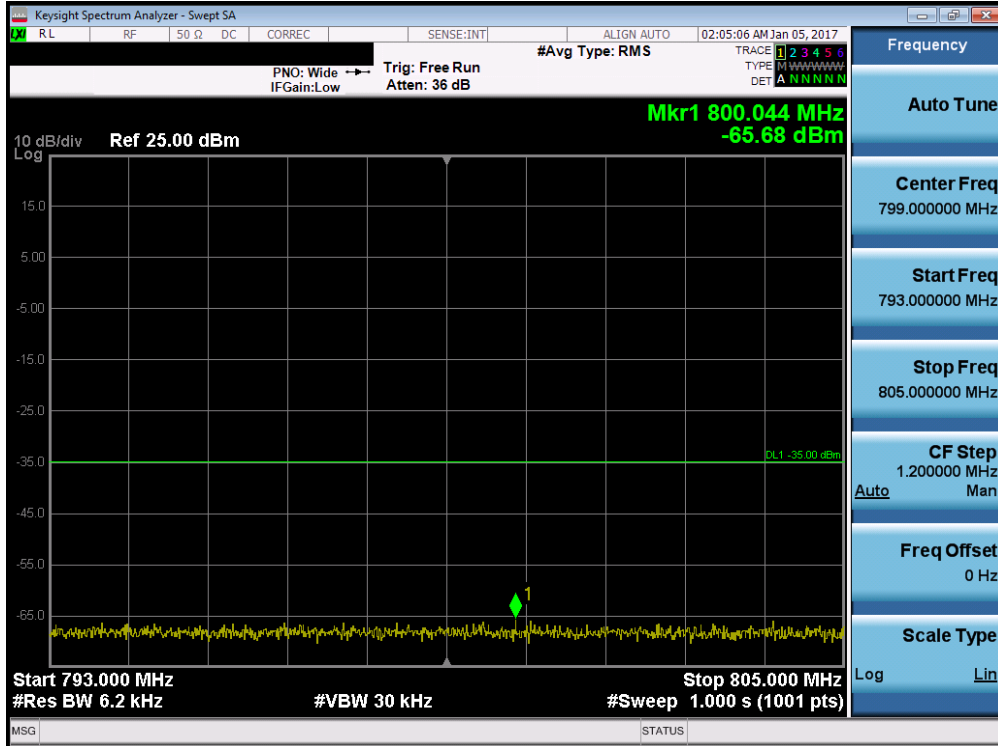


Plot 7-78. Lower Emission Mask Edge Plot (Band 13 – 10.0MHz QPSK – RB Size 50)

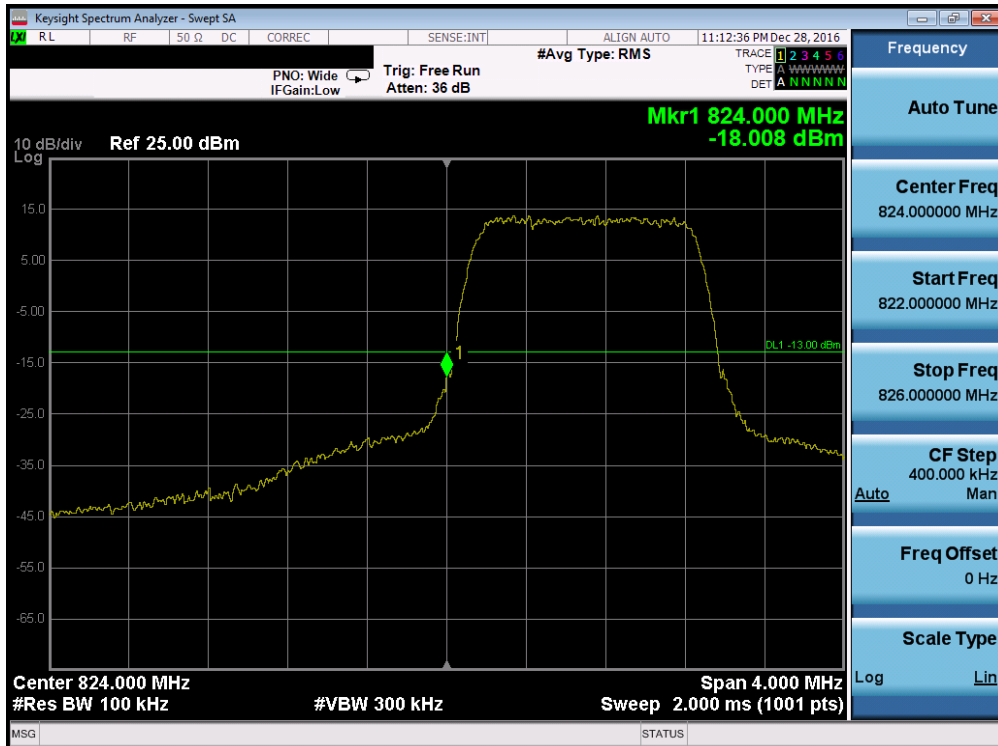


Plot 7-79. Upper Band Edge Plot (Band 13 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFUS110		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 56 of 116

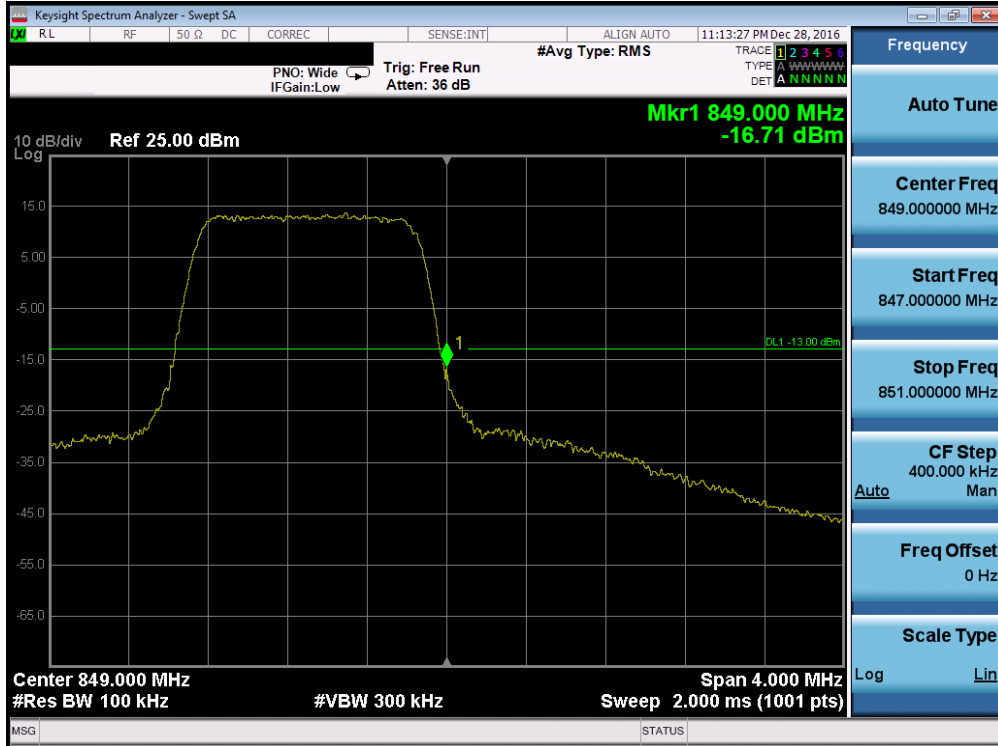


Plot 7-80. Upper Emission Mask Edge Plot (Band 13 – 10.0MHz QPSK – RB Size 50)

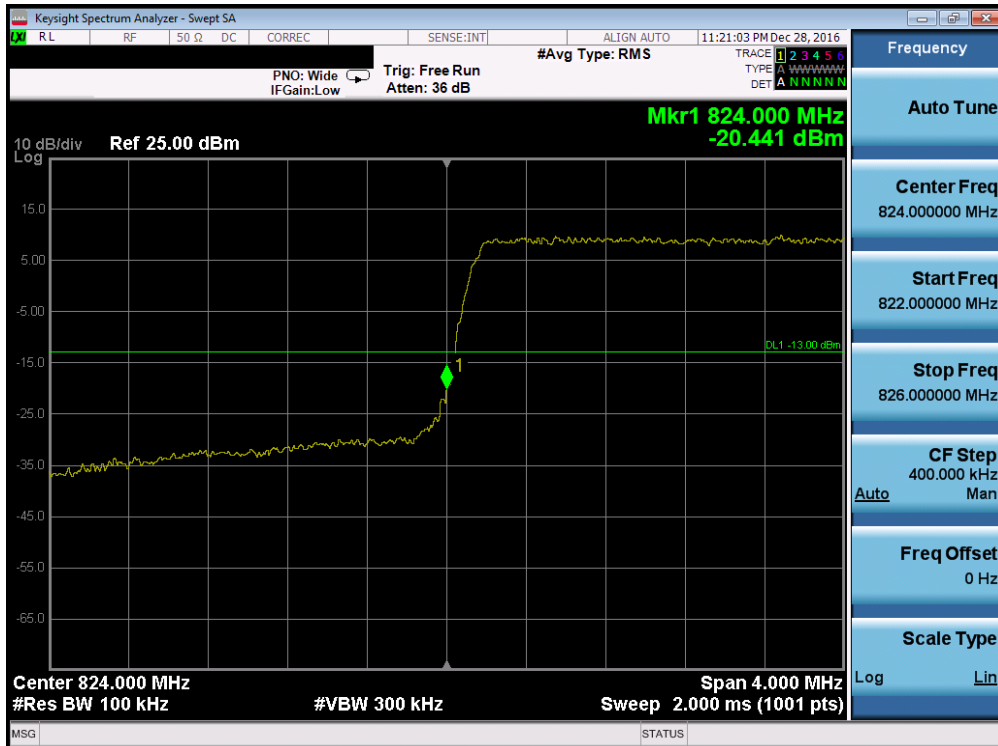


Plot 7-81. Lower Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 57 of 116

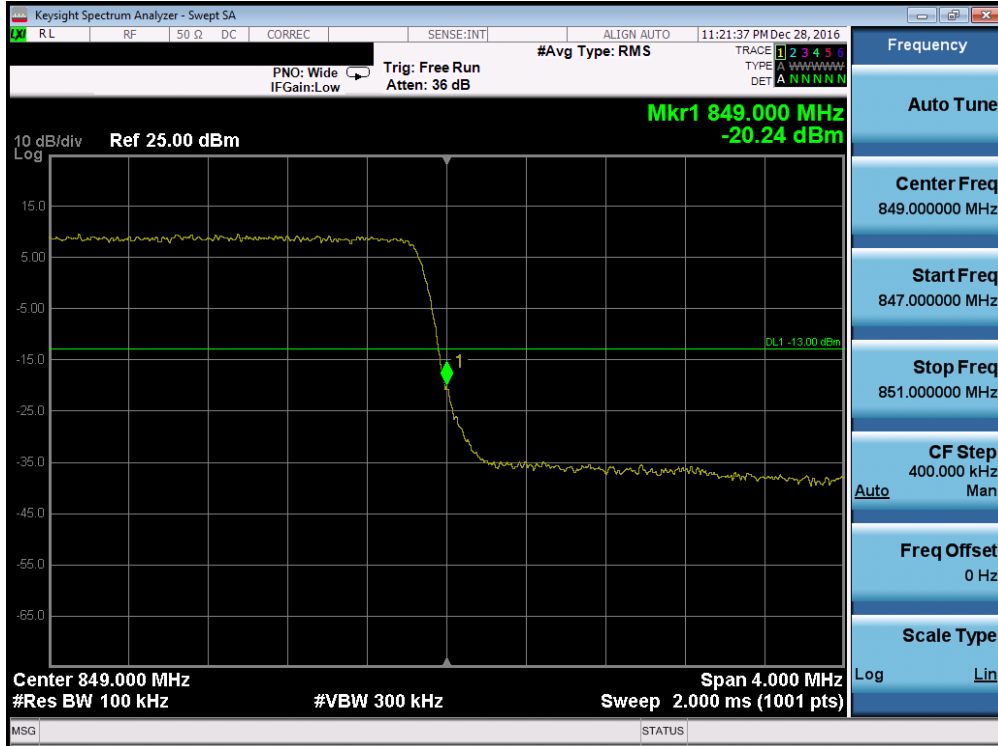


Plot 7-82. Upper Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

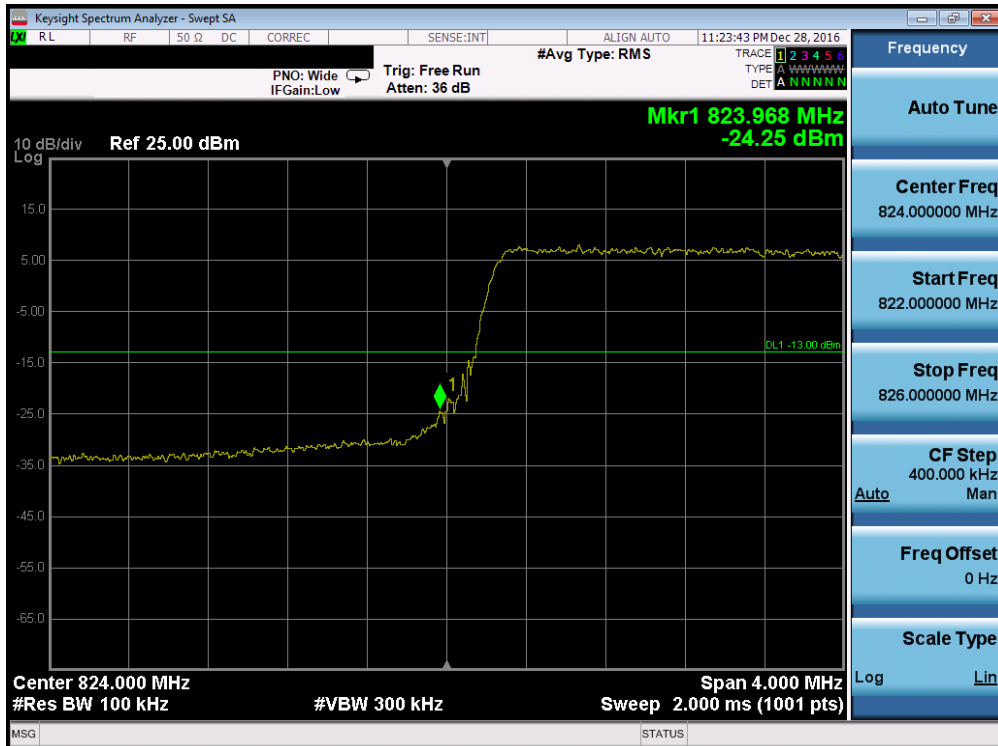


Plot 7-83. Lower Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 58 of 116

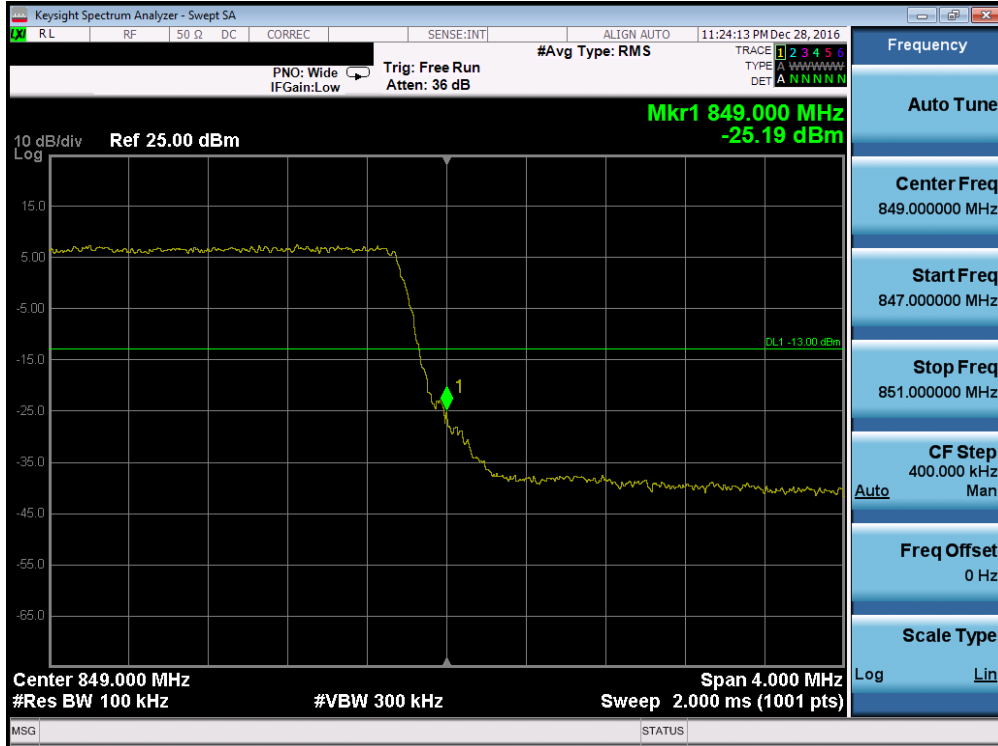


Plot 7-84. Upper Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)

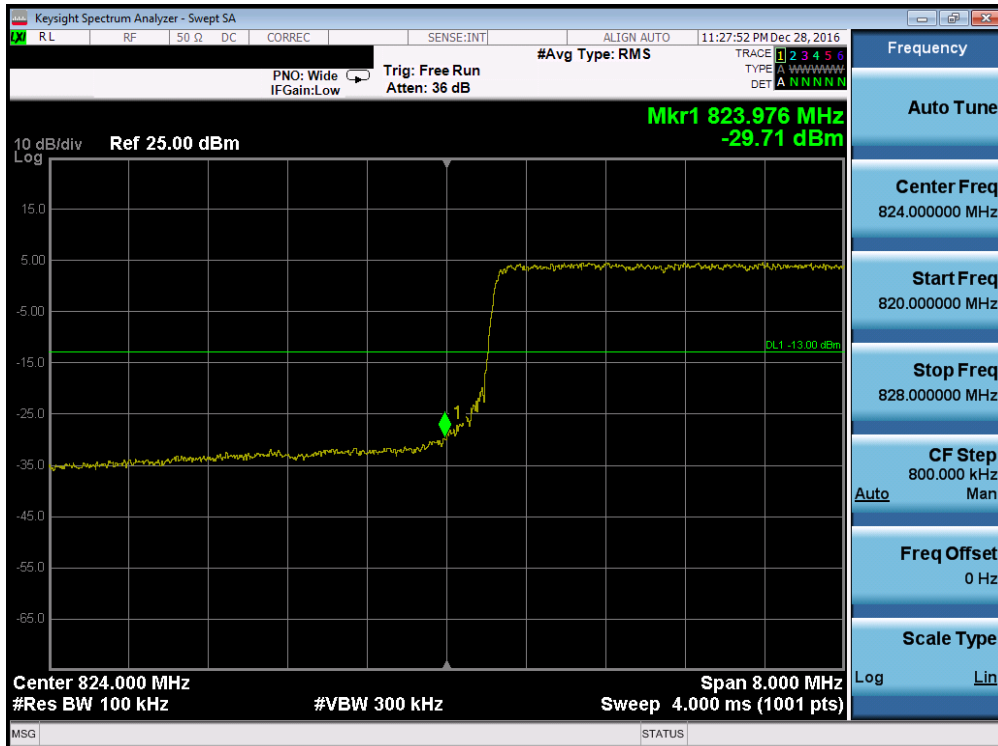


Plot 7-85. Lower Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
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Plot 7-86. Upper Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

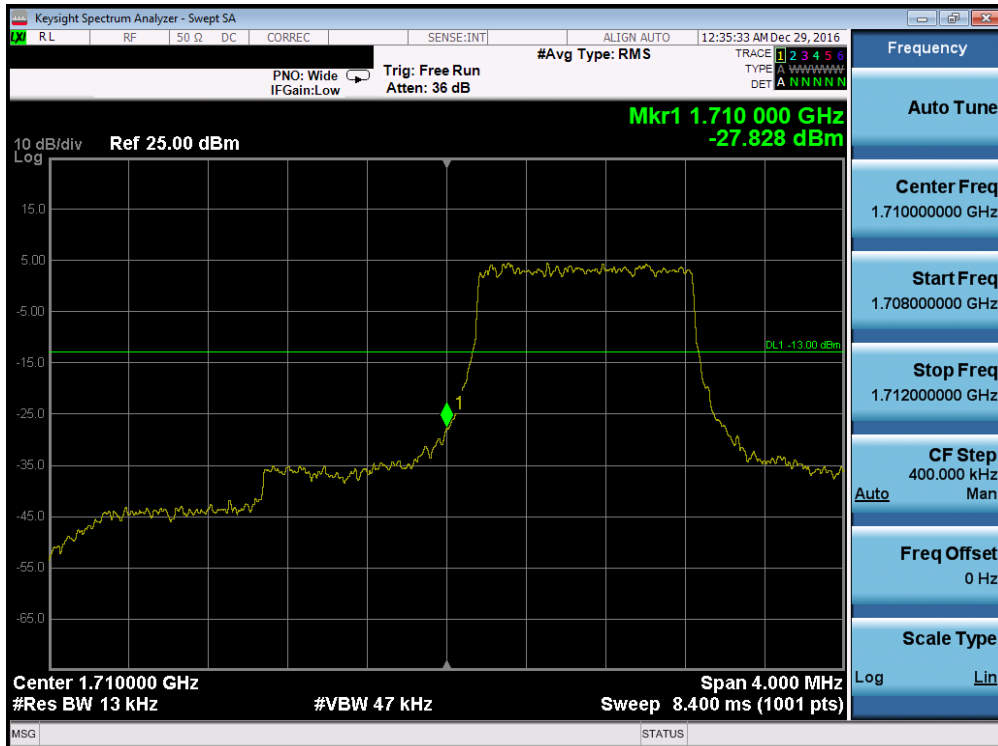


Plot 7-87. Lower Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset	Page 60 of 116	

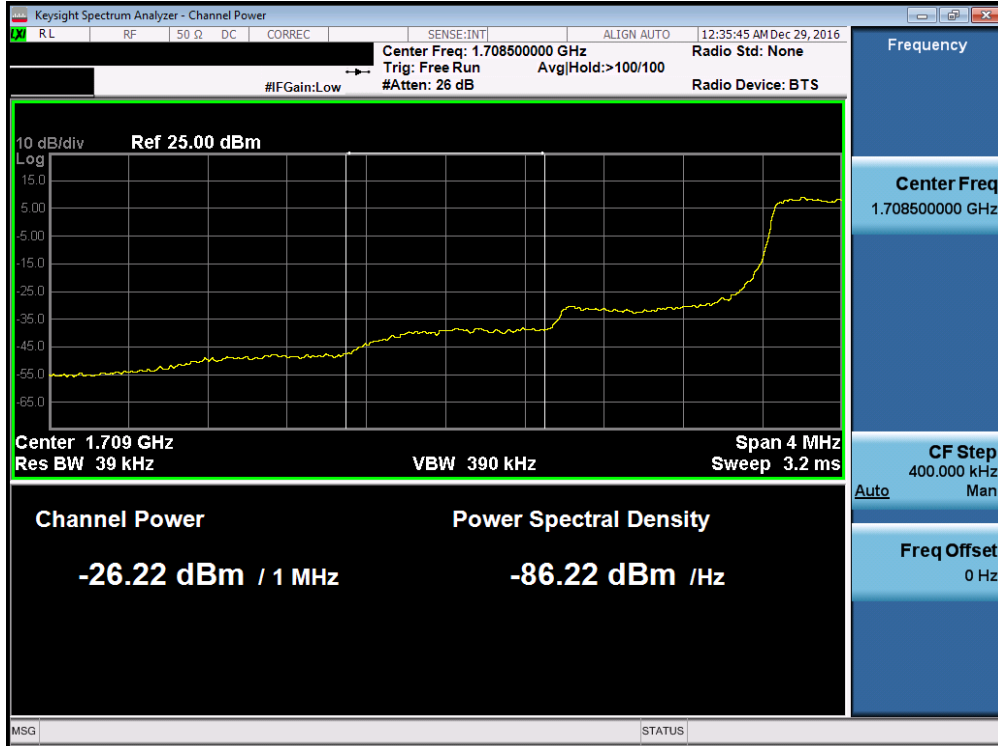


Plot 7-88. Upper Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)



Plot 7-89. Lower Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 61 of 116

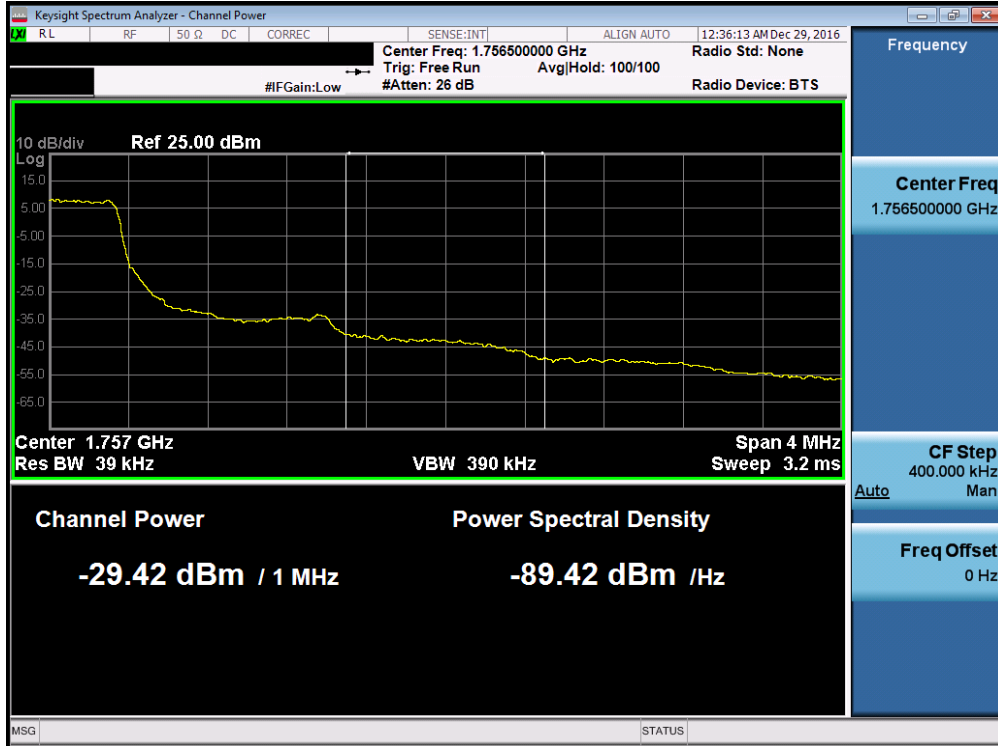


Plot 7-90. Lower Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

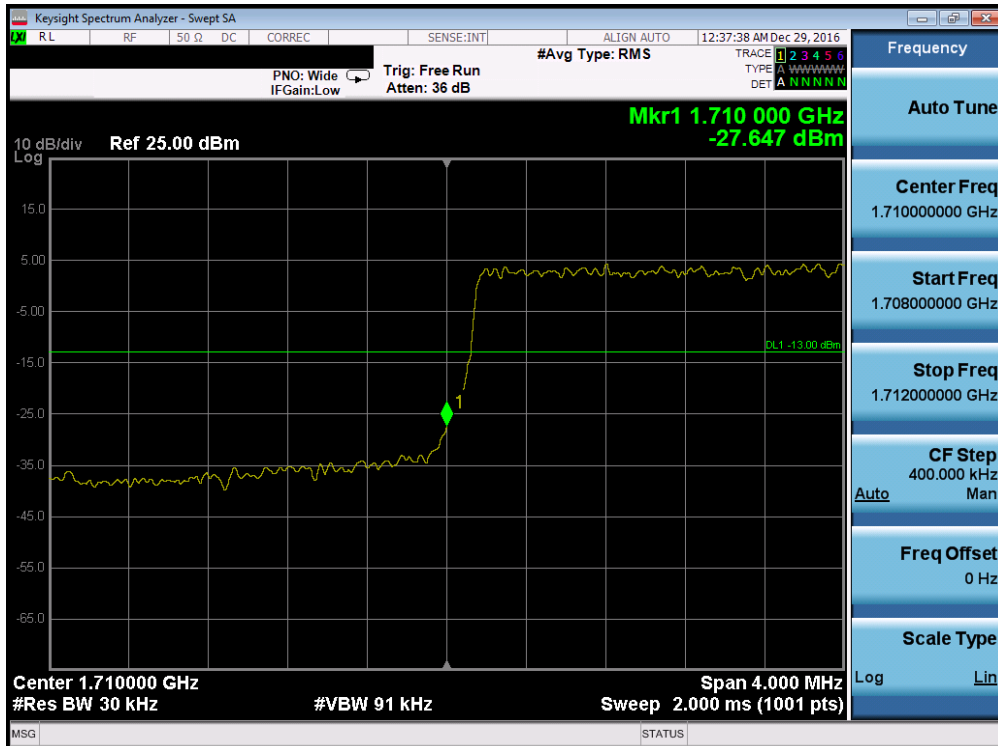


Plot 7-91. Upper Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 62 of 116

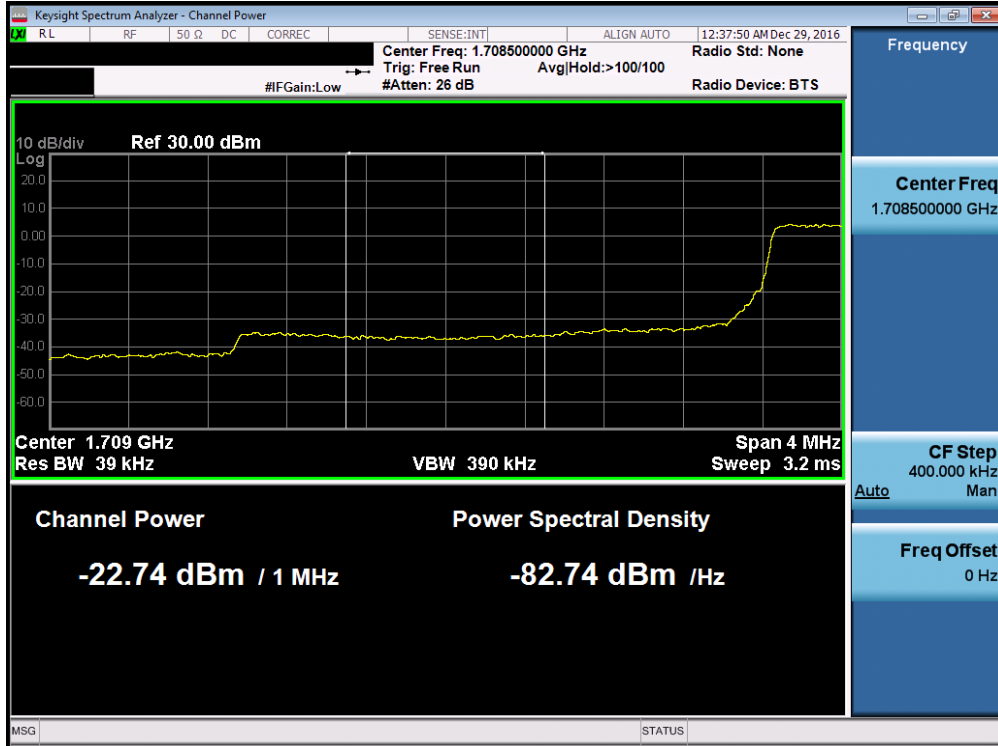


Plot 7-92. Upper Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



Plot 7-93. Lower Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 63 of 116

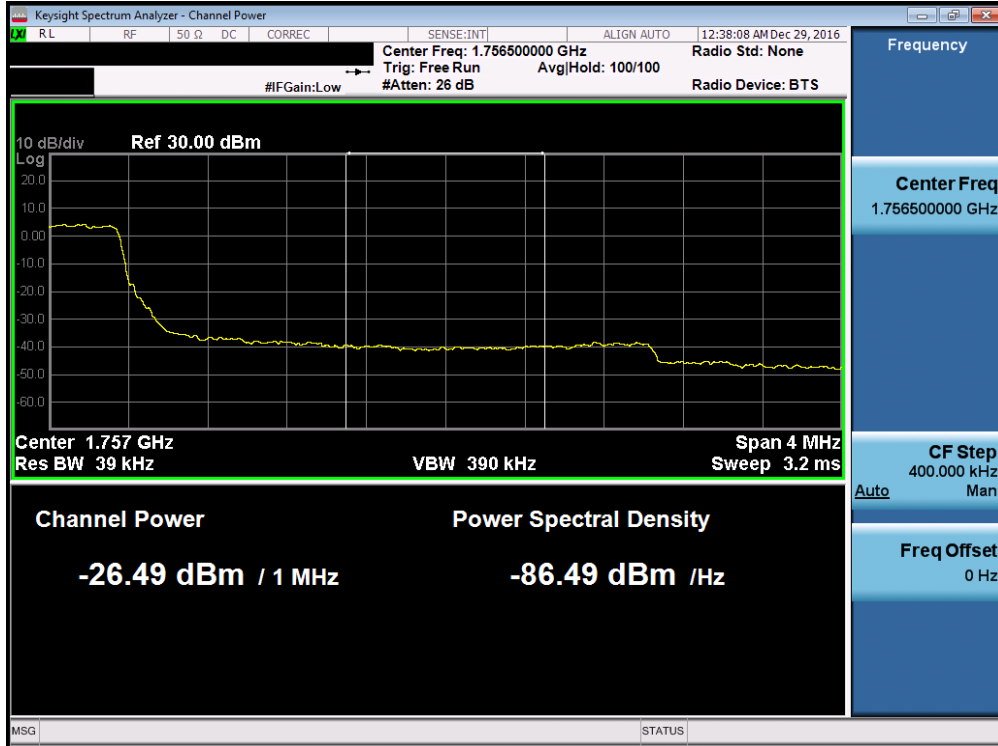


Plot 7-94. Lower Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

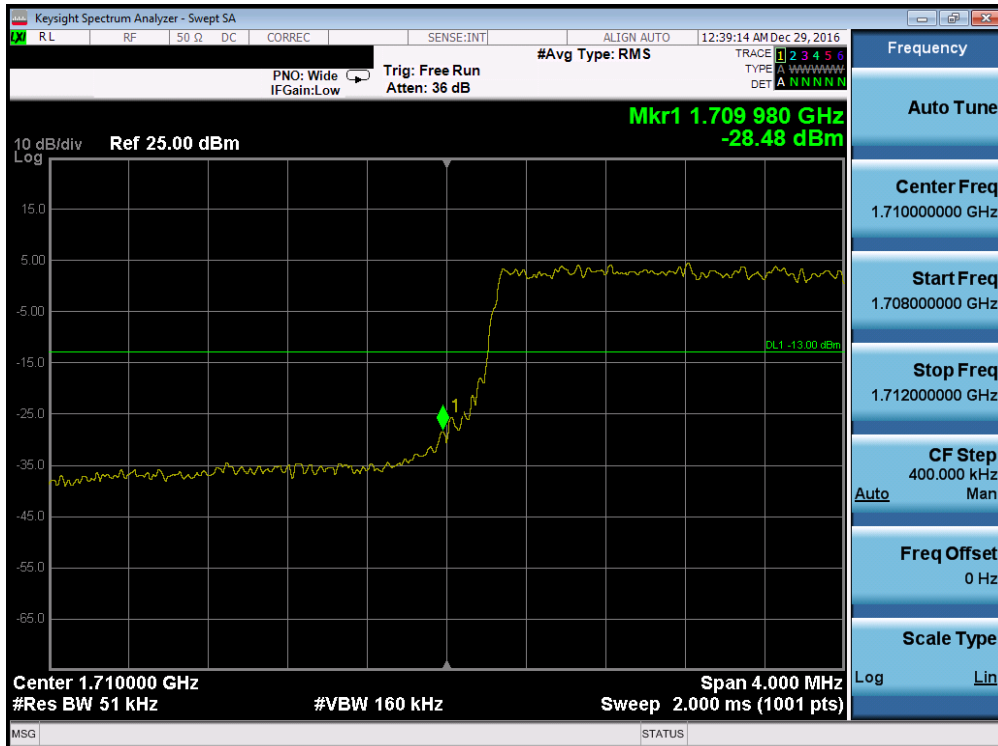


Plot 7-95. Upper Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFUS110		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 64 of 116

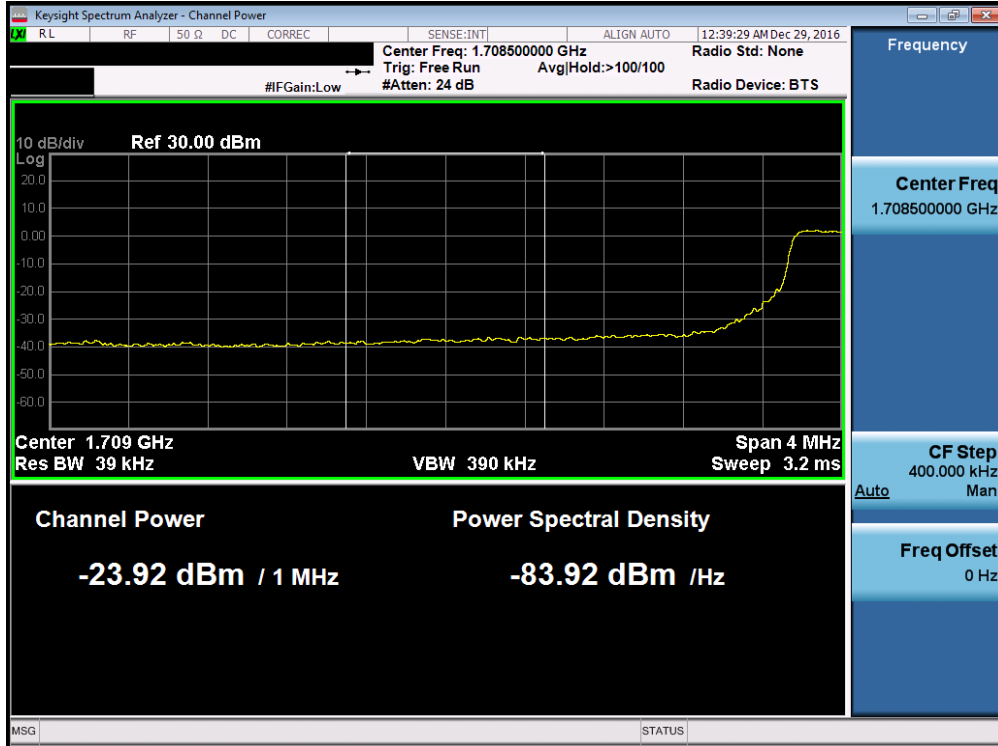


Plot 7-96. Upper Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

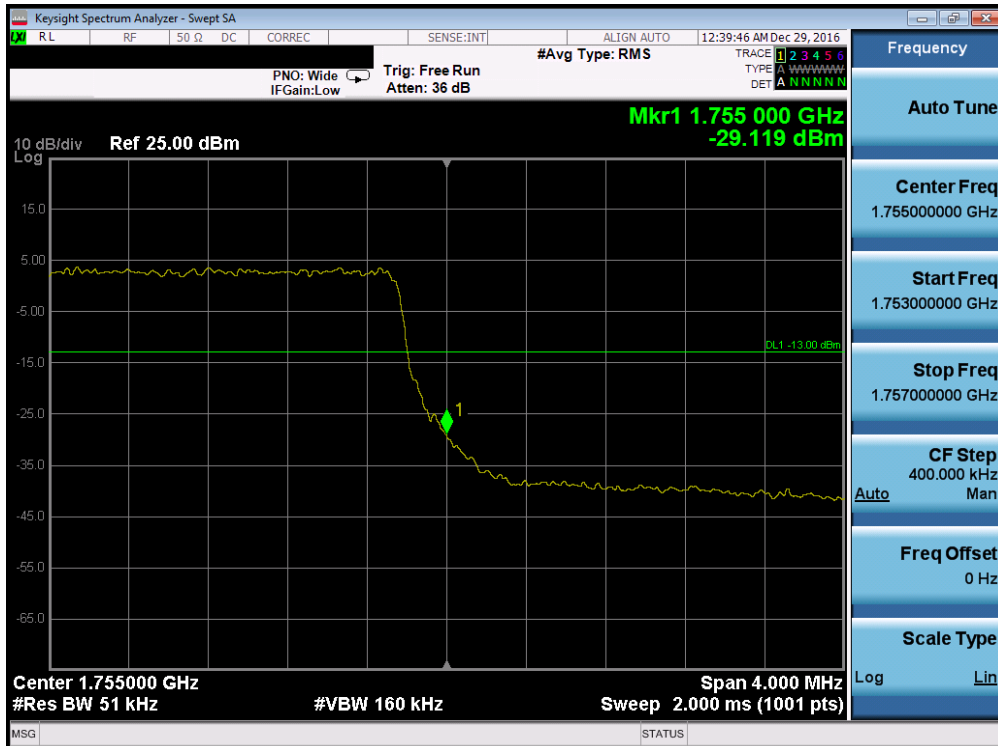


Plot 7-97. Lower Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 65 of 116

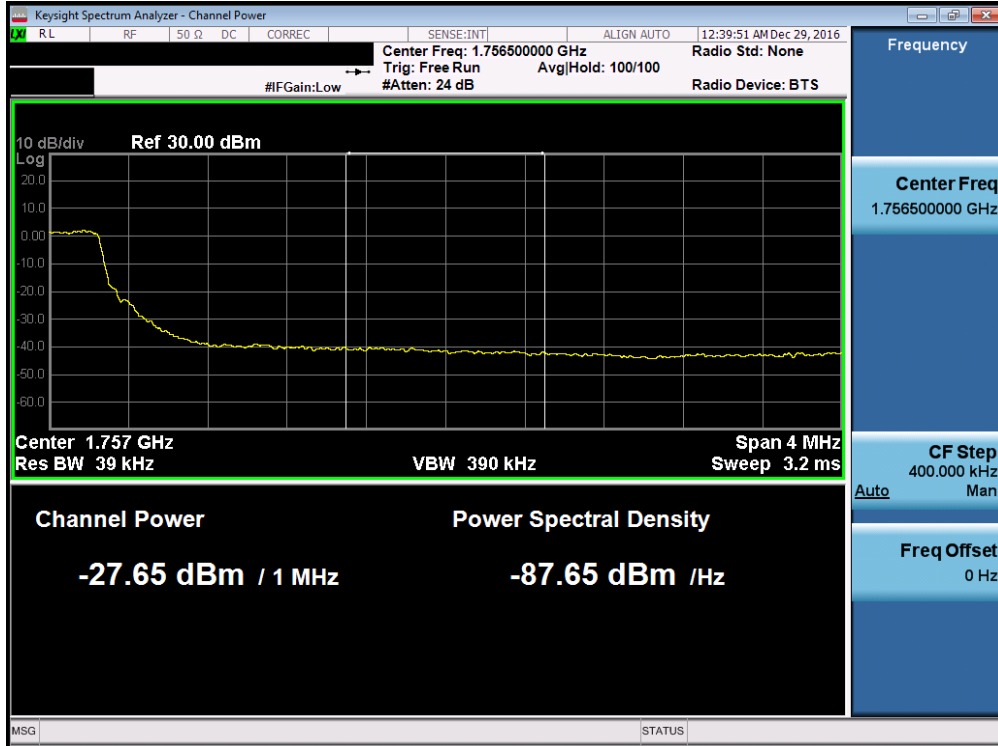


Plot 7-98. Lower Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

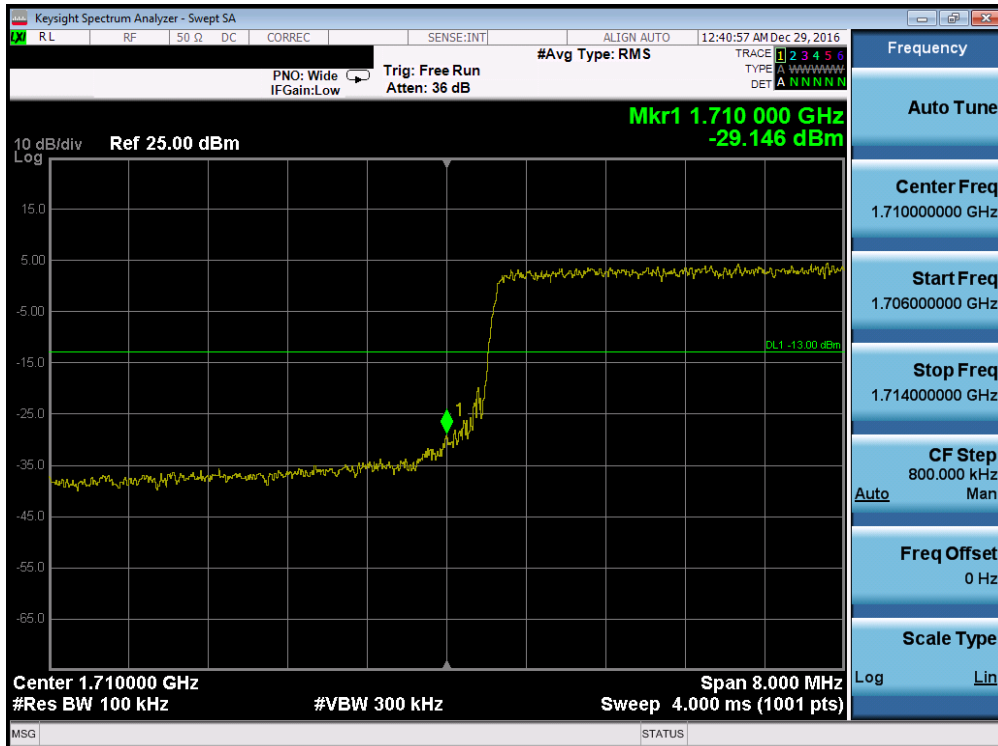


Plot 7-99. Upper Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 66 of 116

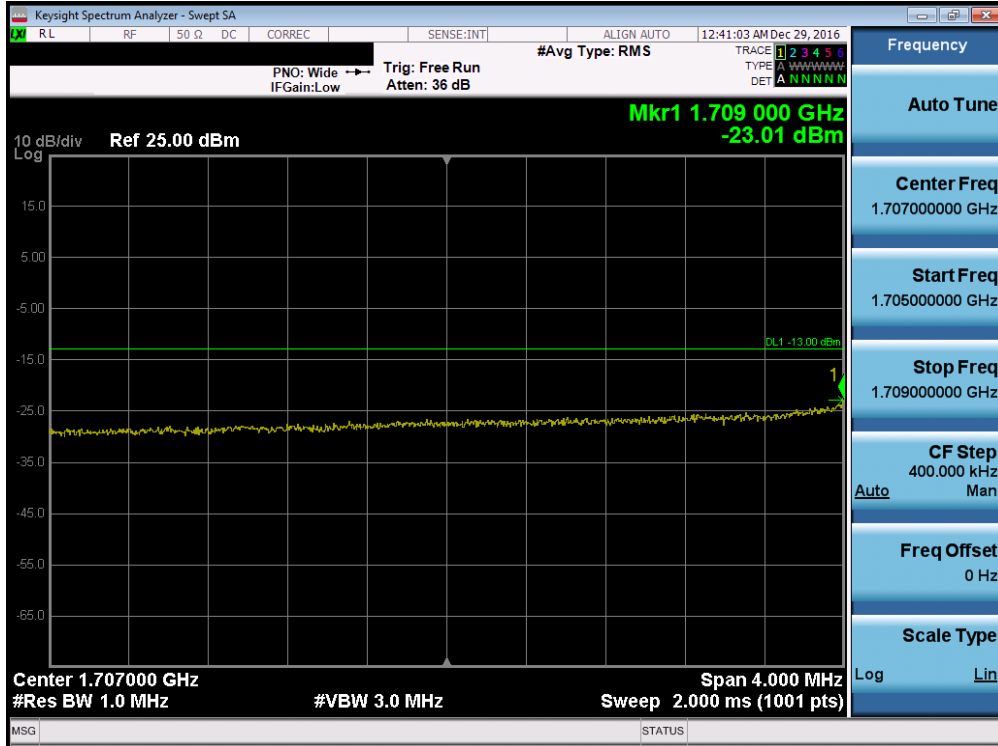


Plot 7-100. Upper Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

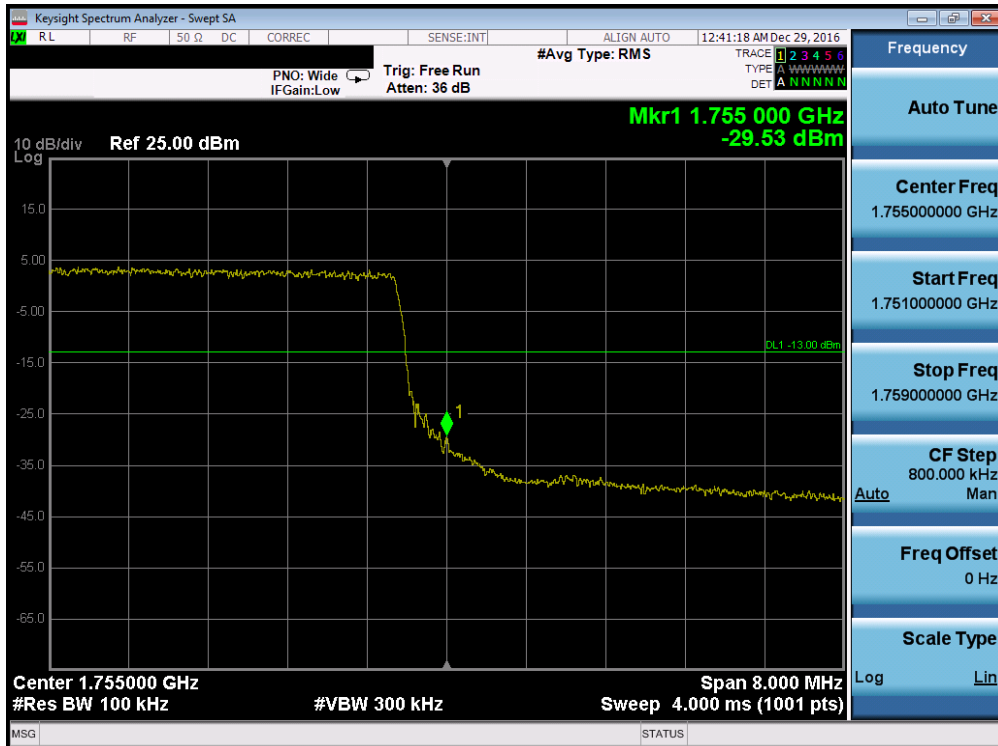


Plot 7-101. Lower Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Plot 7-102. Lower Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

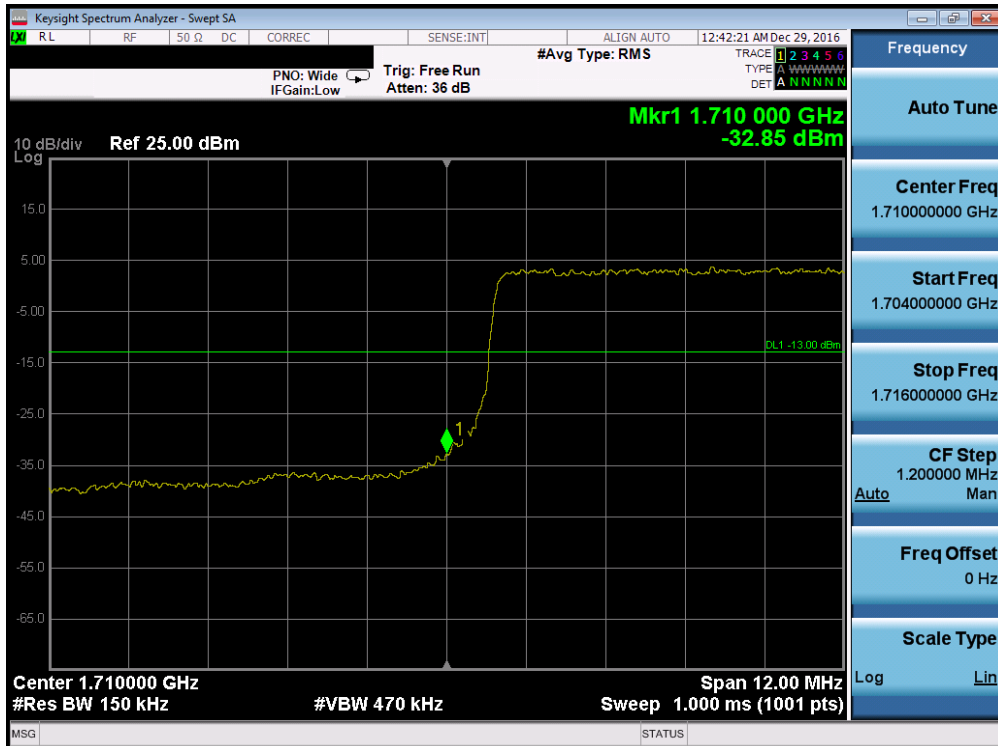


Plot 7-103. Upper Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFUS110		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 68 of 116

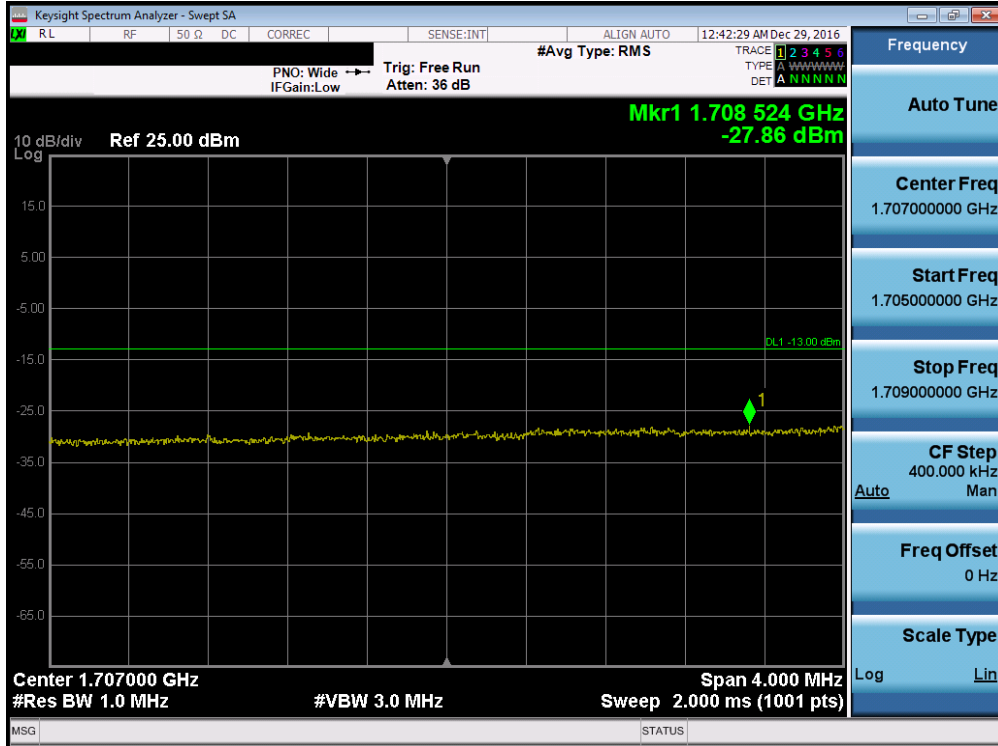


Plot 7-104. Upper Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

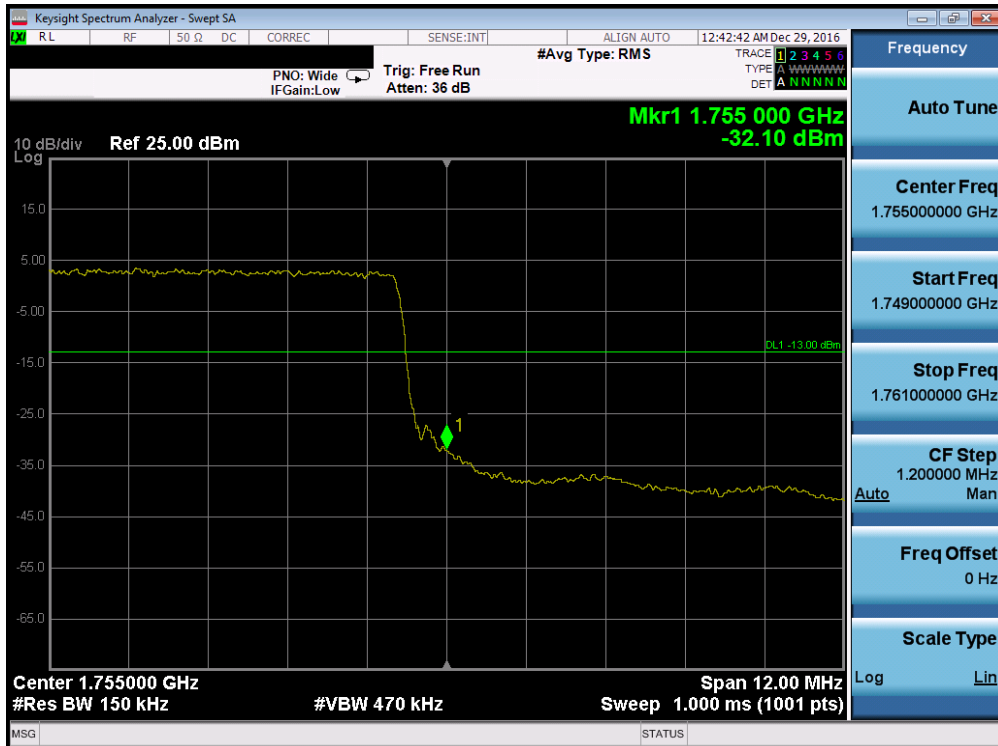


Plot 7-105. Lower Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 69 of 116

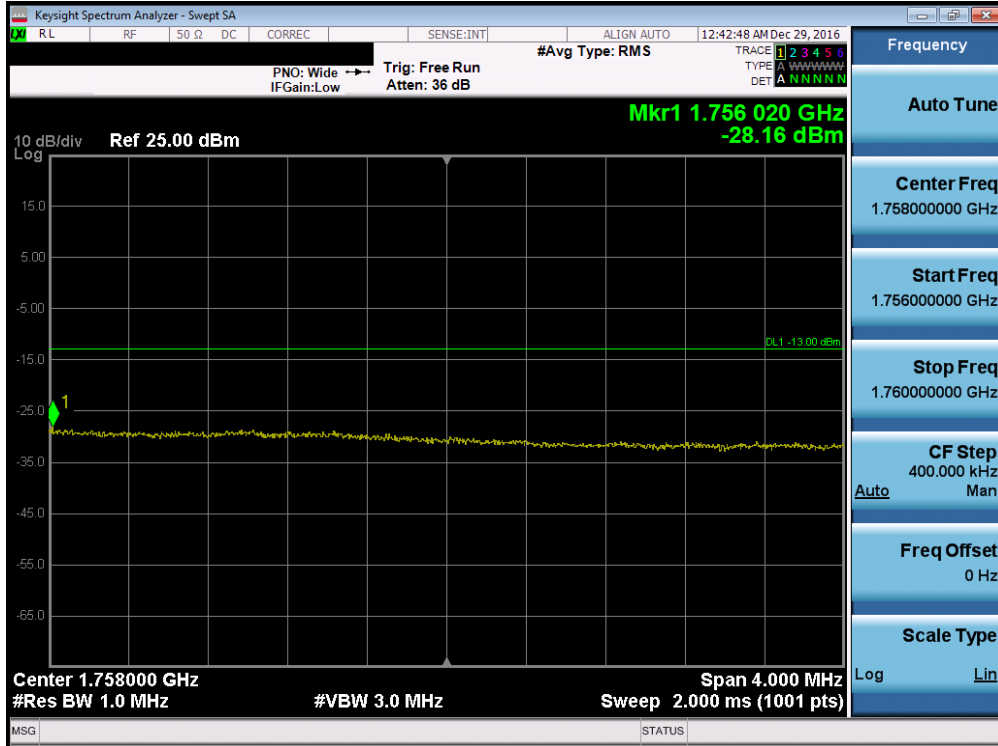


Plot 7-106. Lower Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

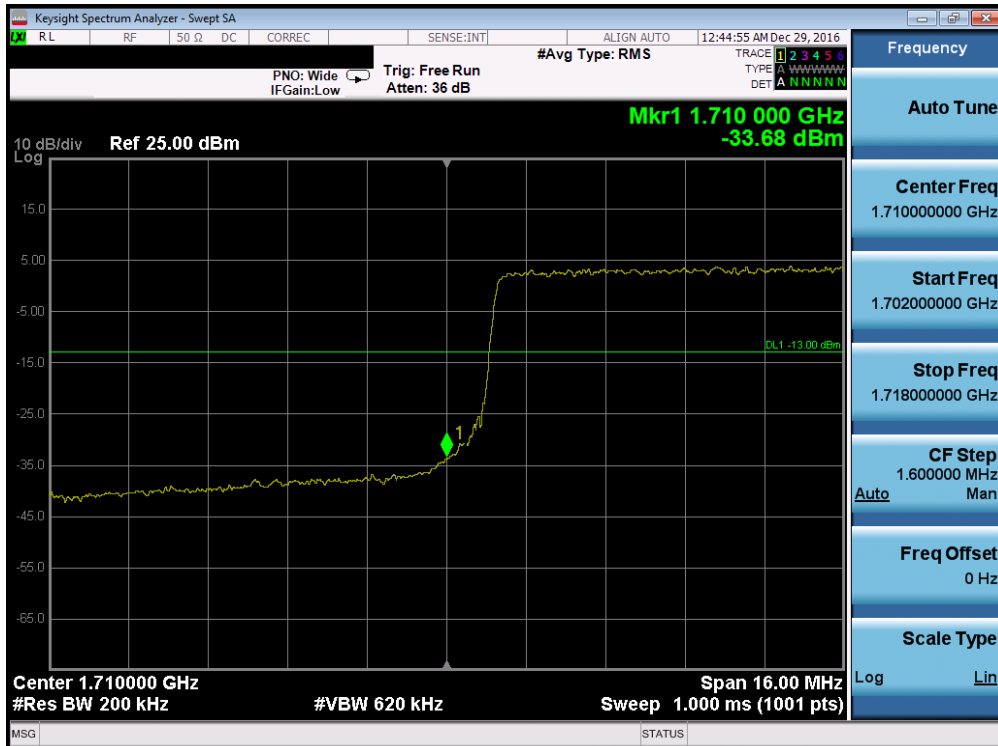


Plot 7-107. Upper Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 70 of 116

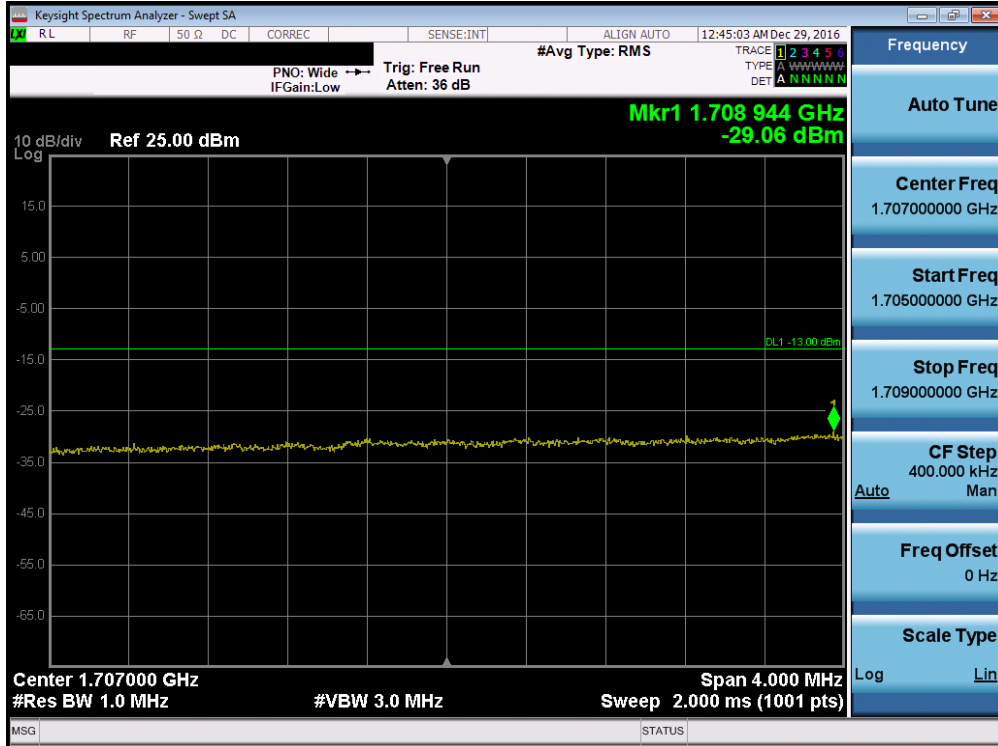


Plot 7-108. Upper Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

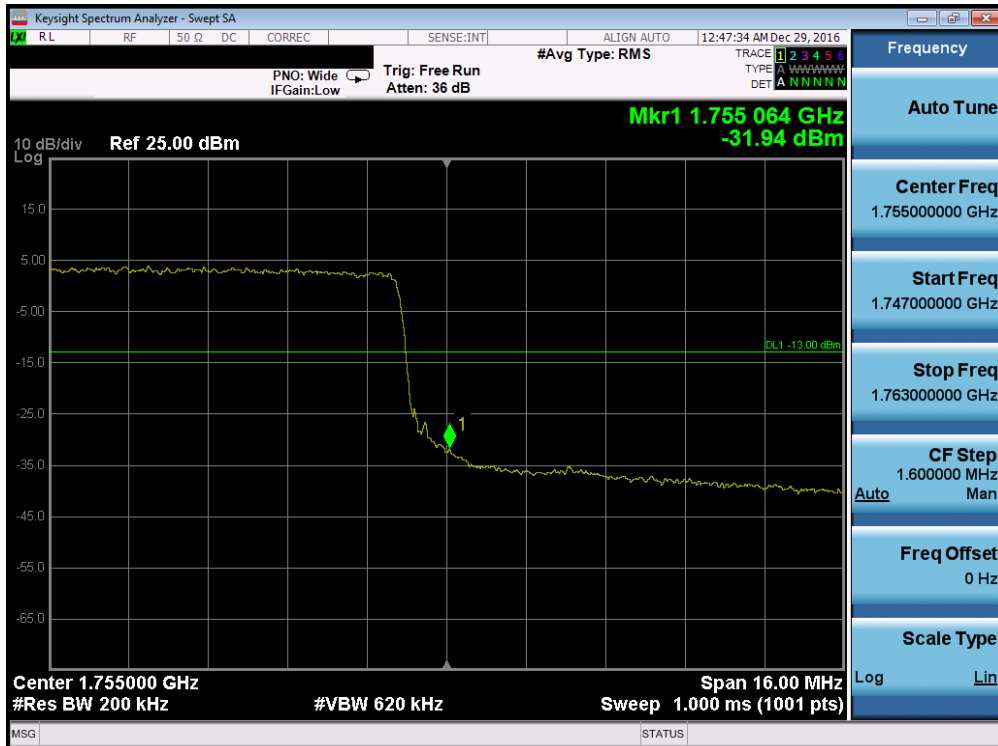


Plot 7-109. Lower Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 71 of 116

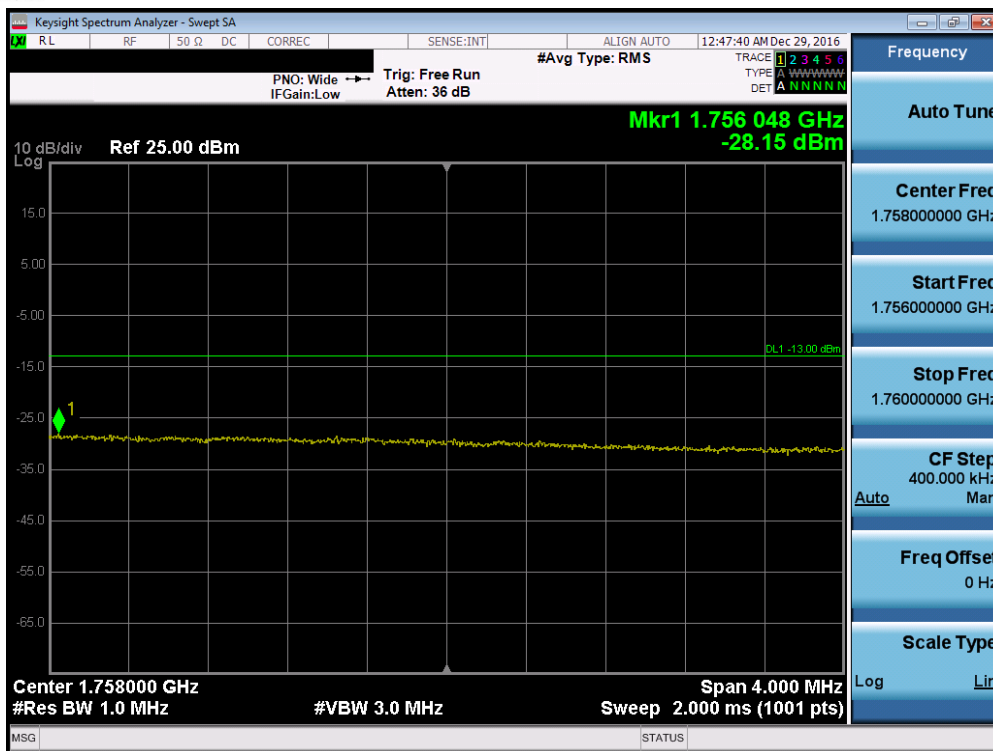


Plot 7-110. Lower Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

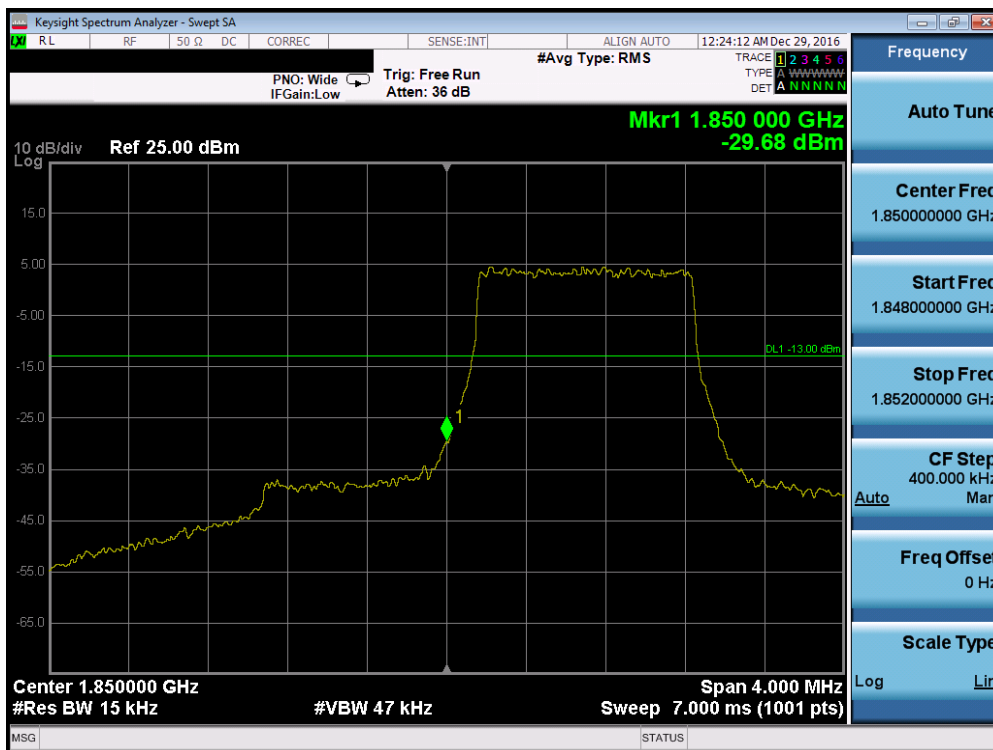


Plot 7-111. Upper Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 72 of 116

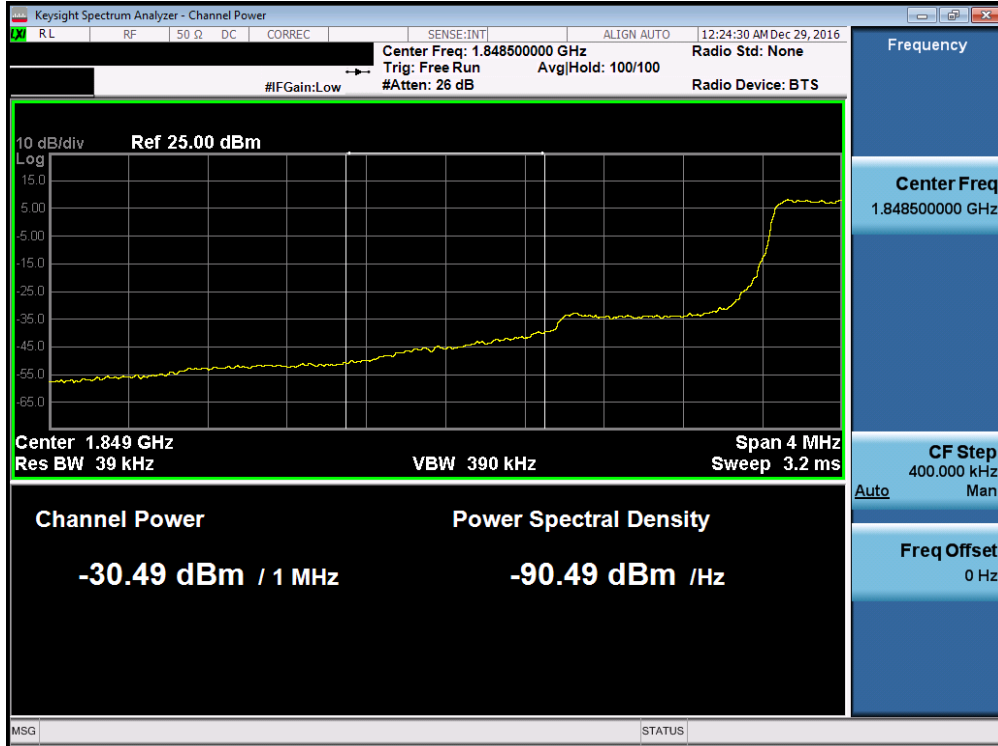


Plot 7-112. Upper Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



Plot 7-113. Lower Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFUS110		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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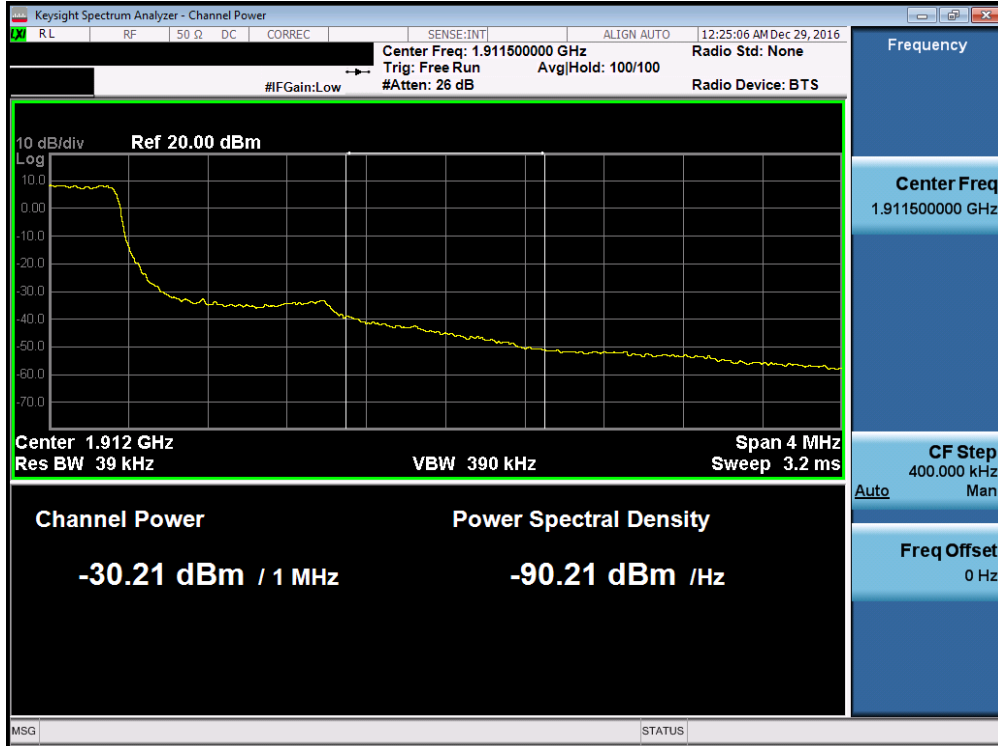


Plot 7-114. Lower Extended Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

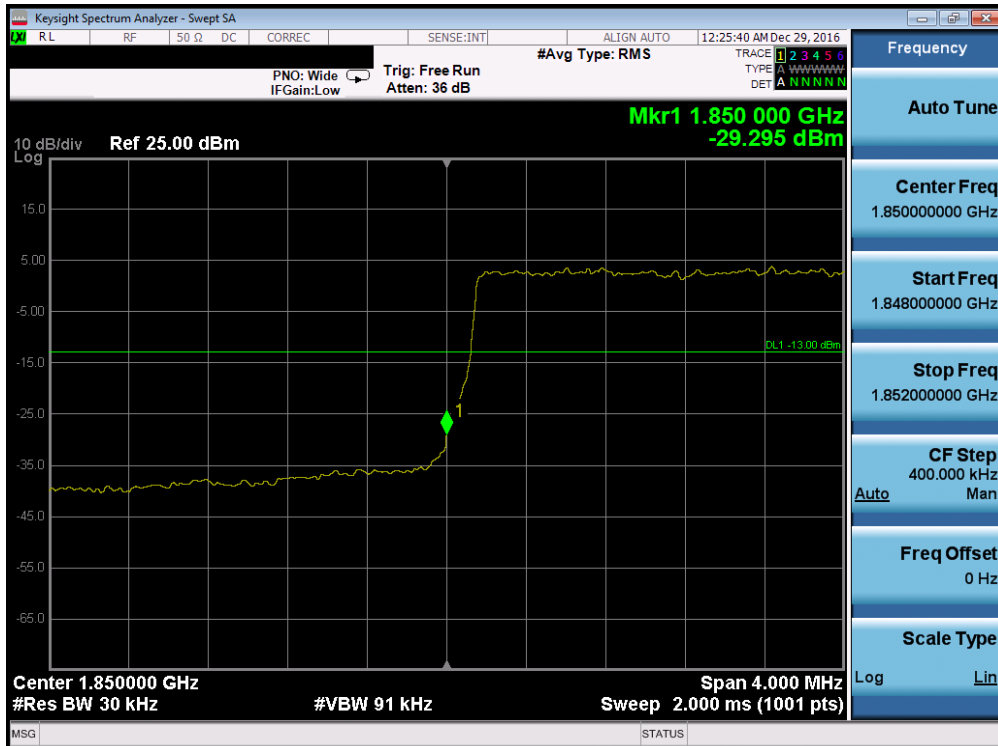


Plot 7-115. Upper Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 74 of 116

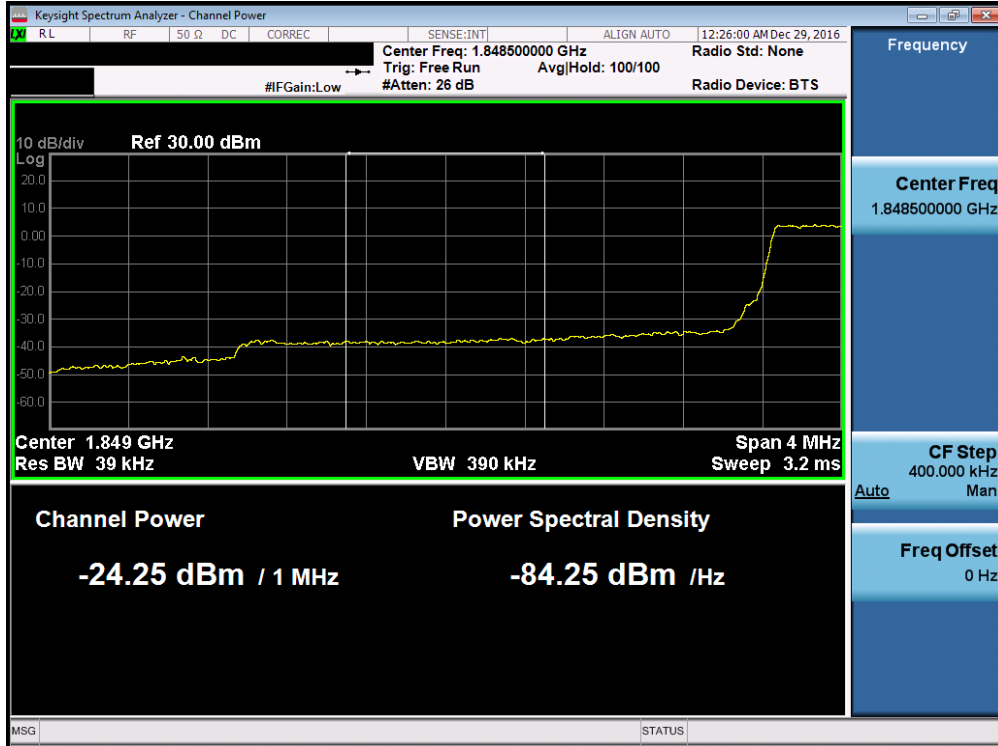


Plot 7-116. Upper Extended Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

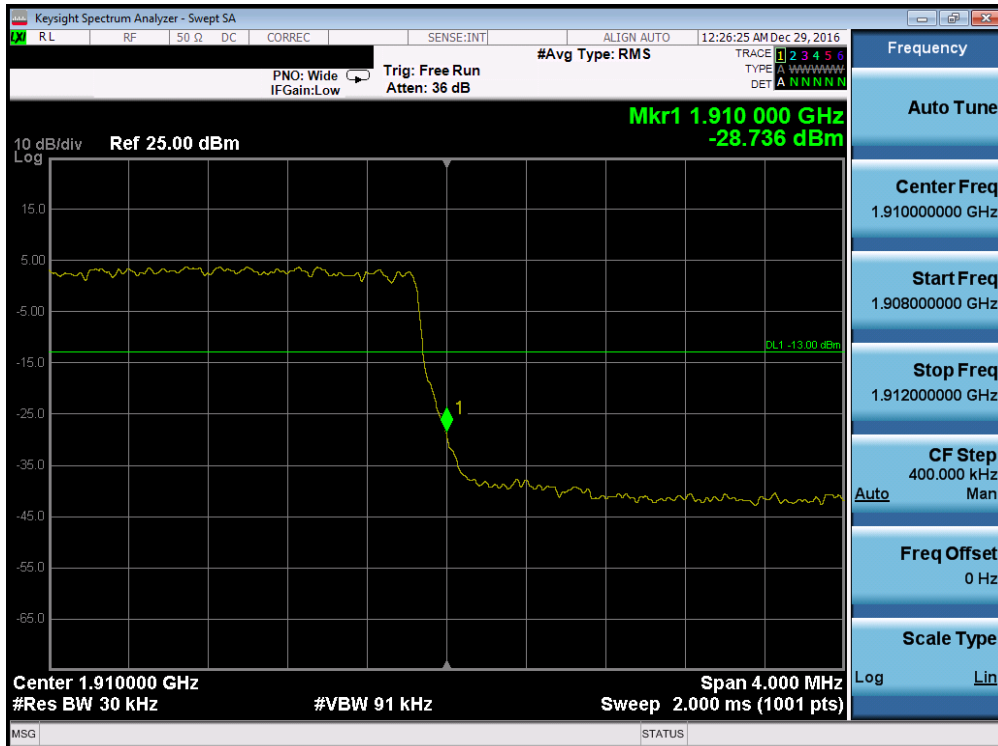


Plot 7-117. Lower Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 75 of 116

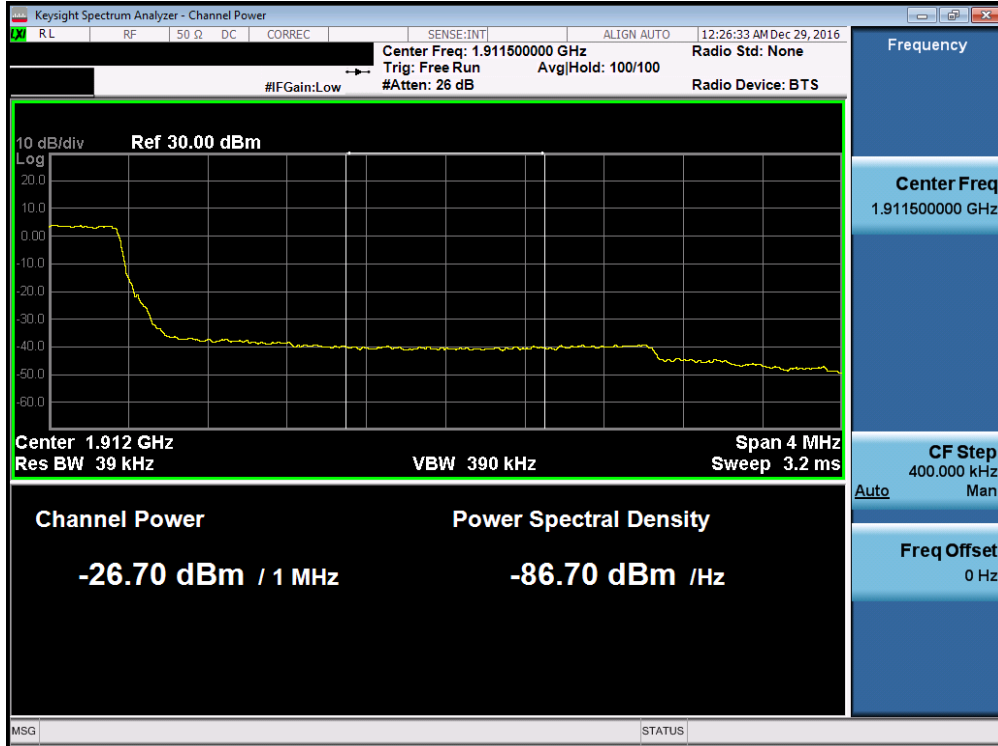


Plot 7-118. Lower Extended Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

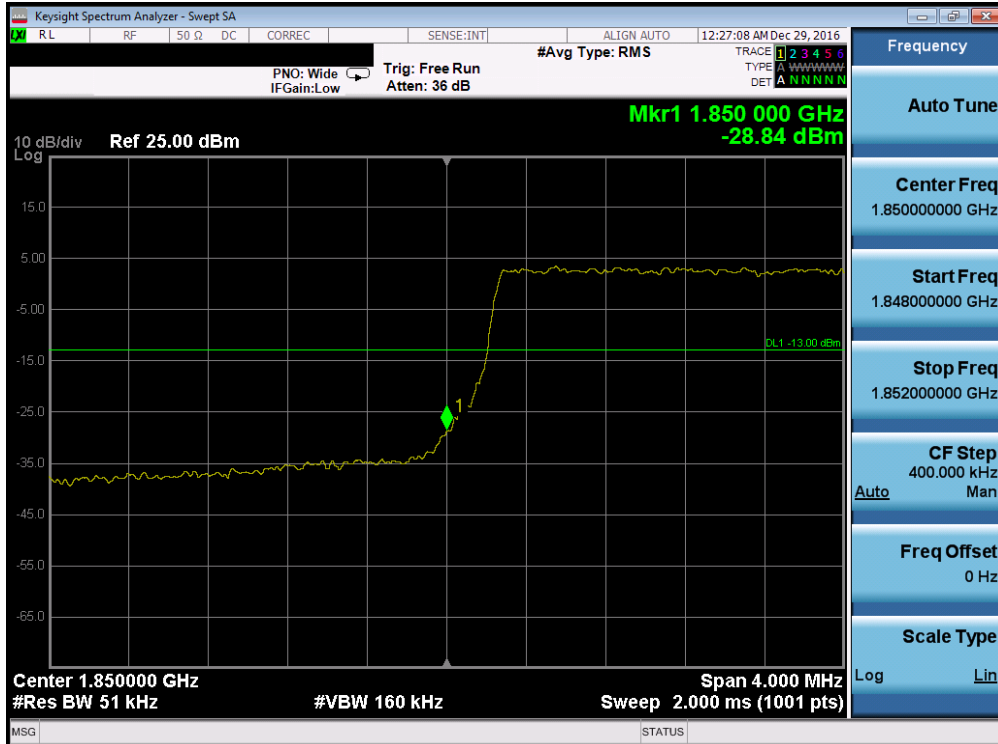


Plot 7-119. Upper Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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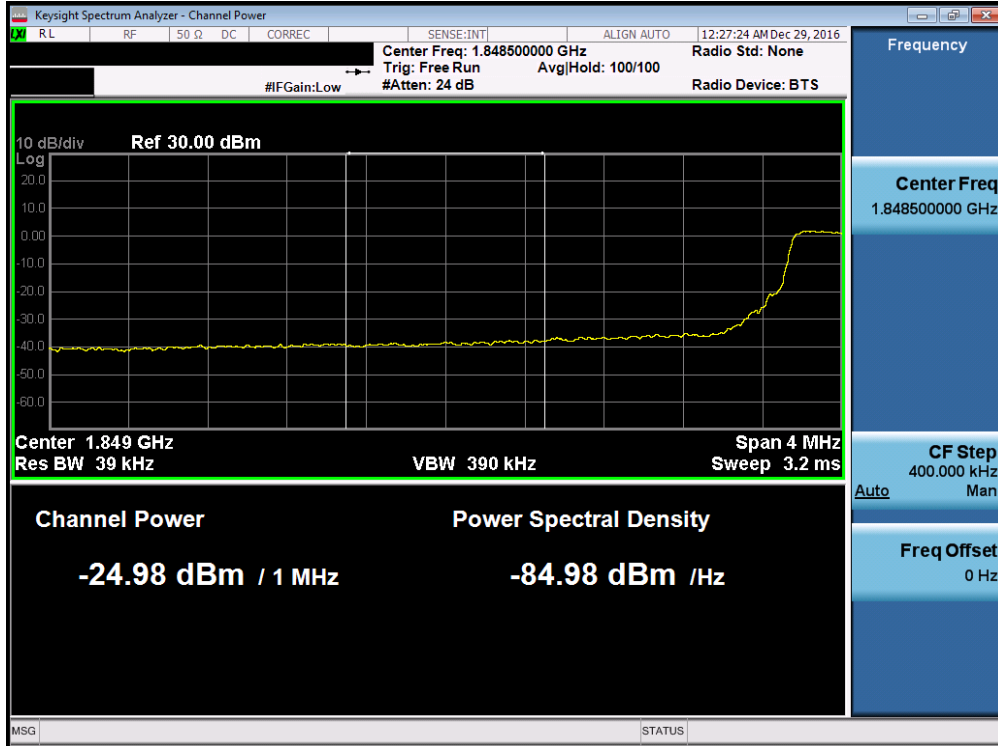


Plot 7-120. Upper Extended Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

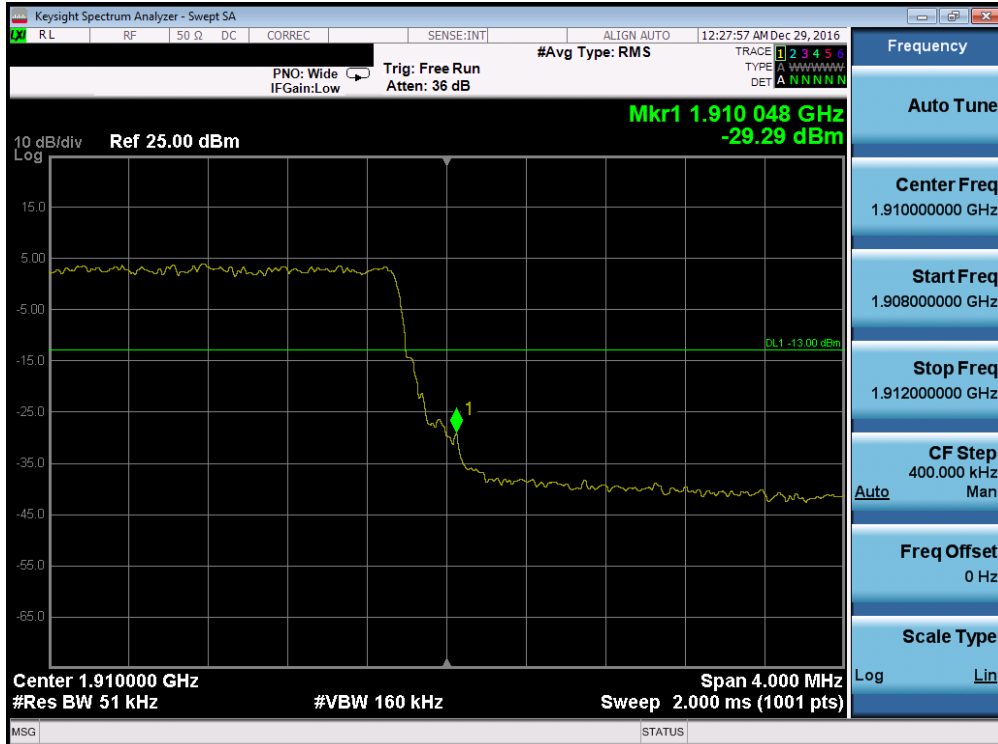


Plot 7-121. Lower Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFUS110		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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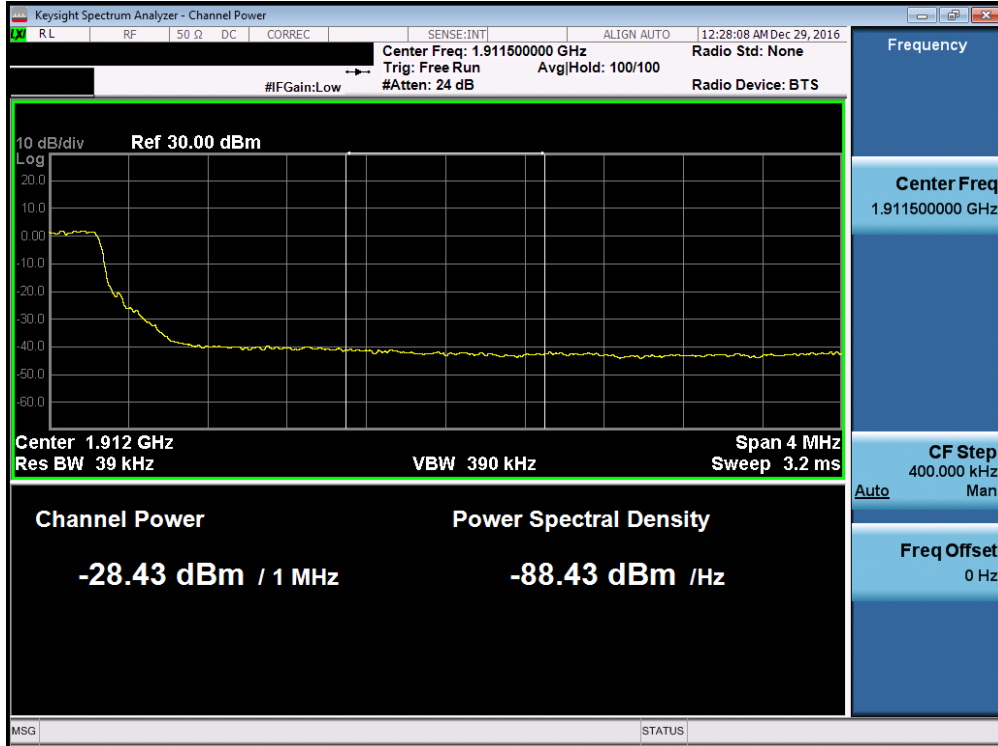


Plot 7-122. Lower Extended Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

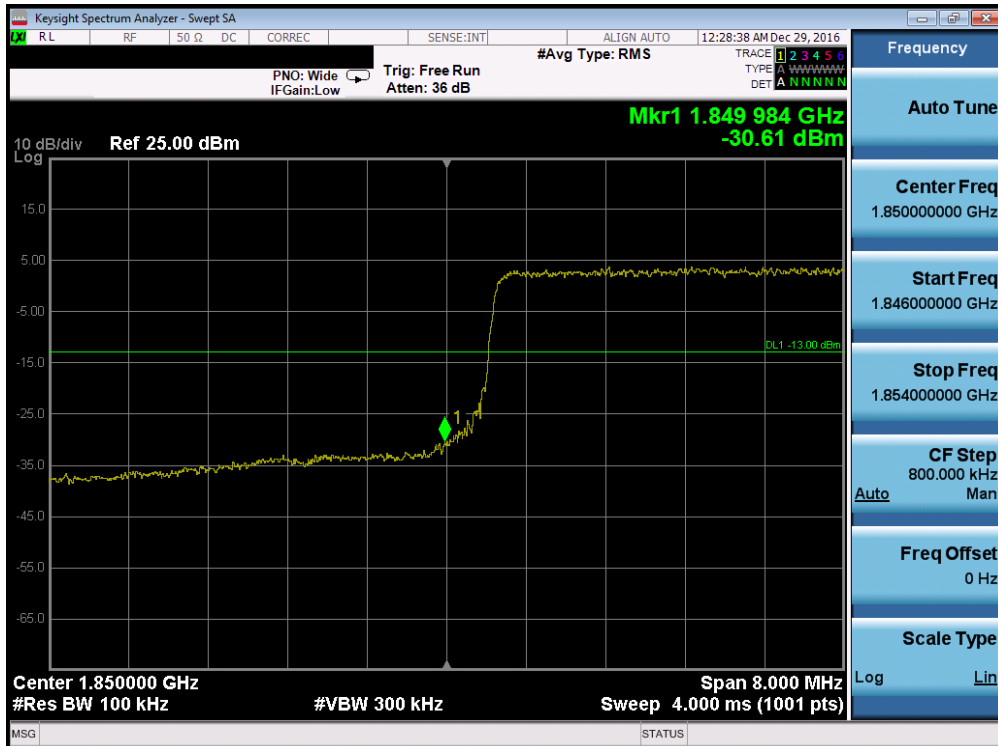


Plot 7-123. Upper Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFUS110		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 78 of 116

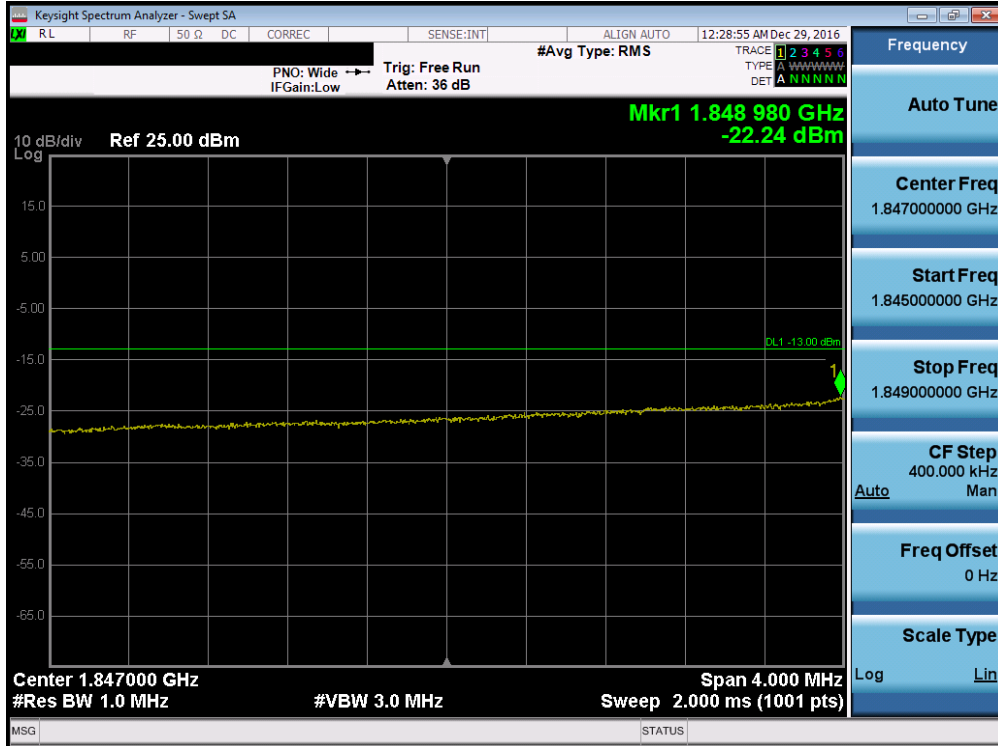


Plot 7-124. Upper Extended Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

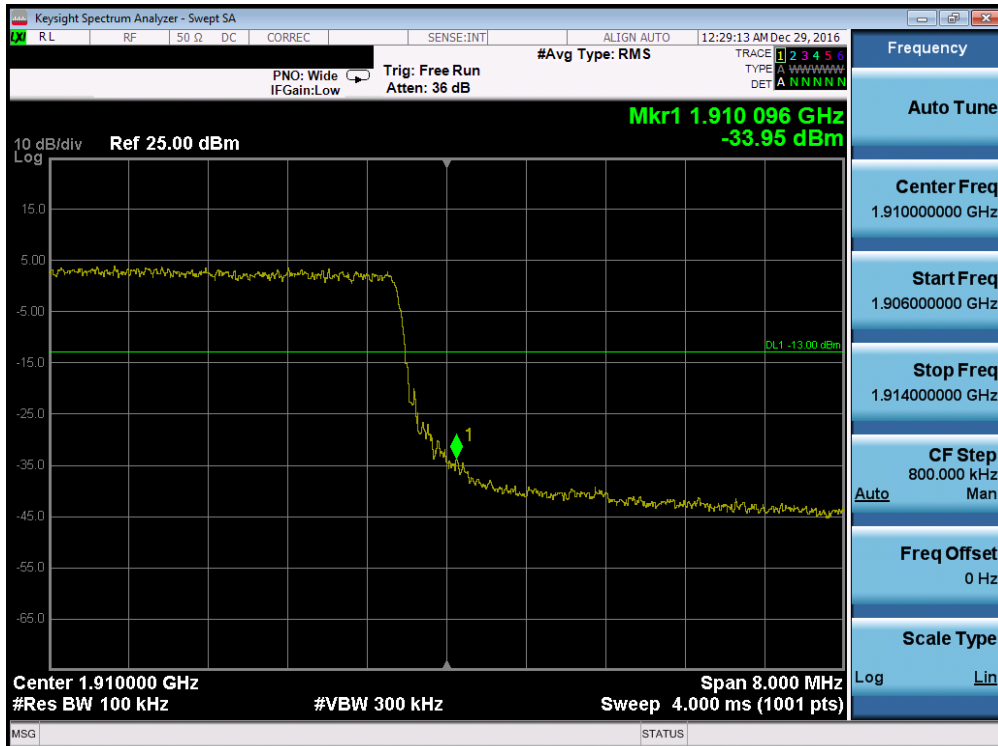


Plot 7-125. Lower Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 79 of 116

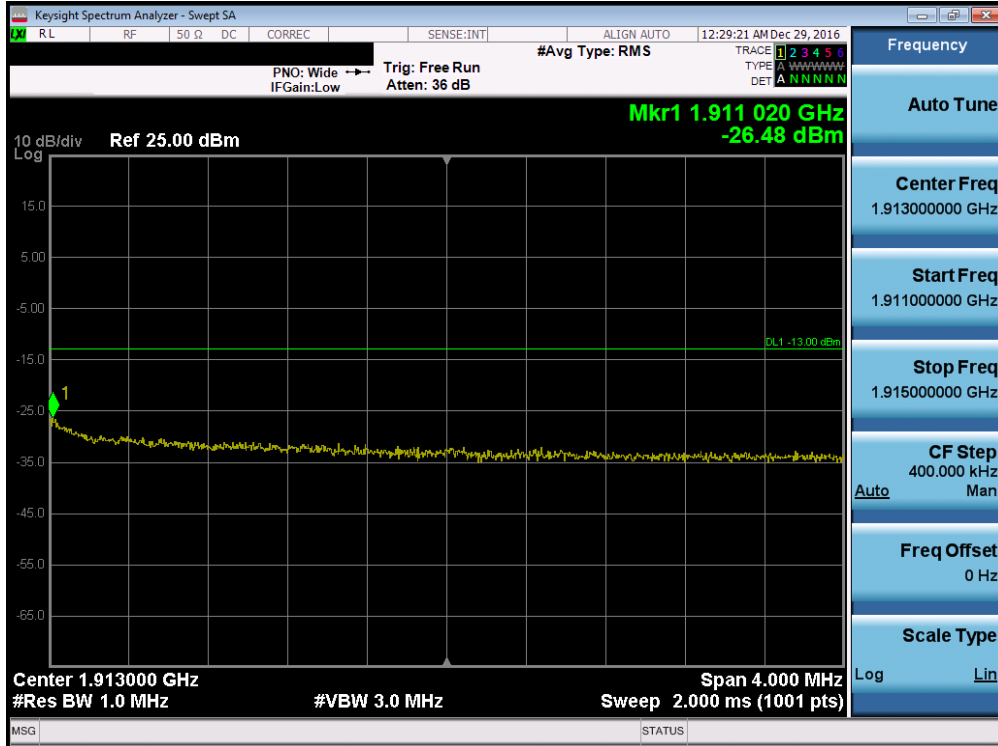


Plot 7-126. Lower Extended Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

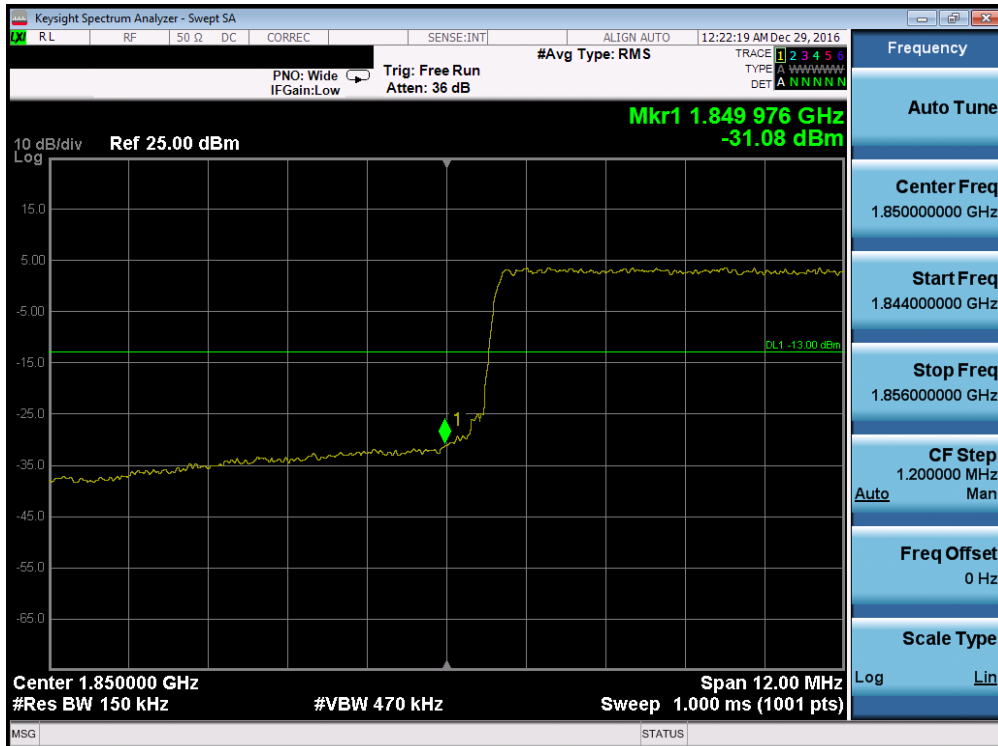


Plot 7-127. Upper Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFUS110		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 80 of 116

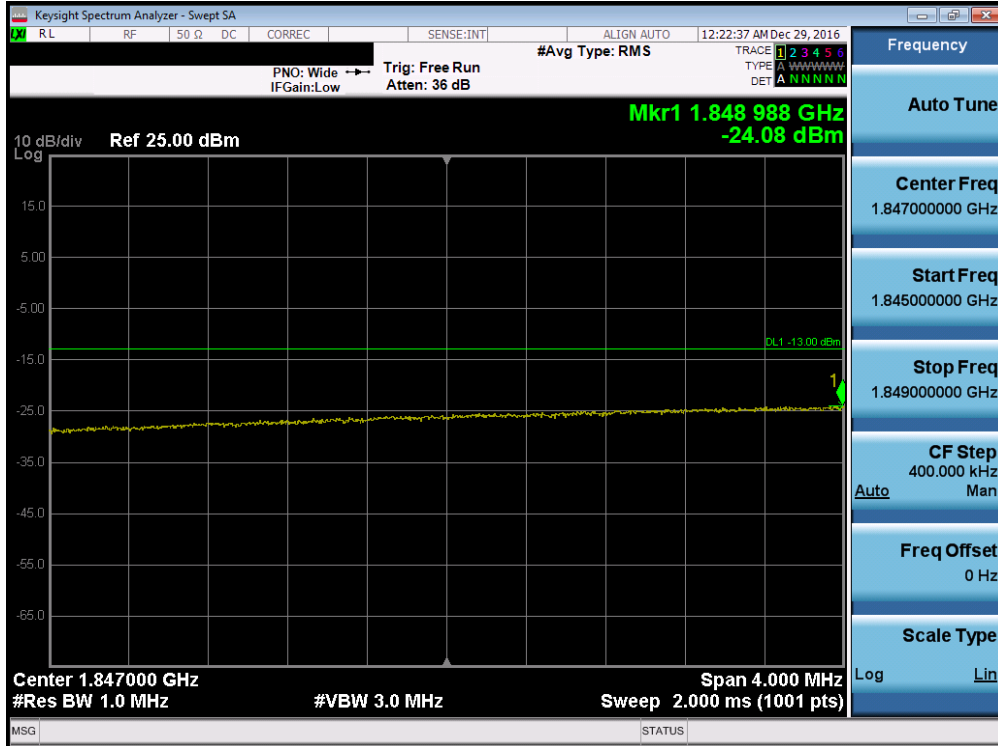


Plot 7-128. Upper Extended Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

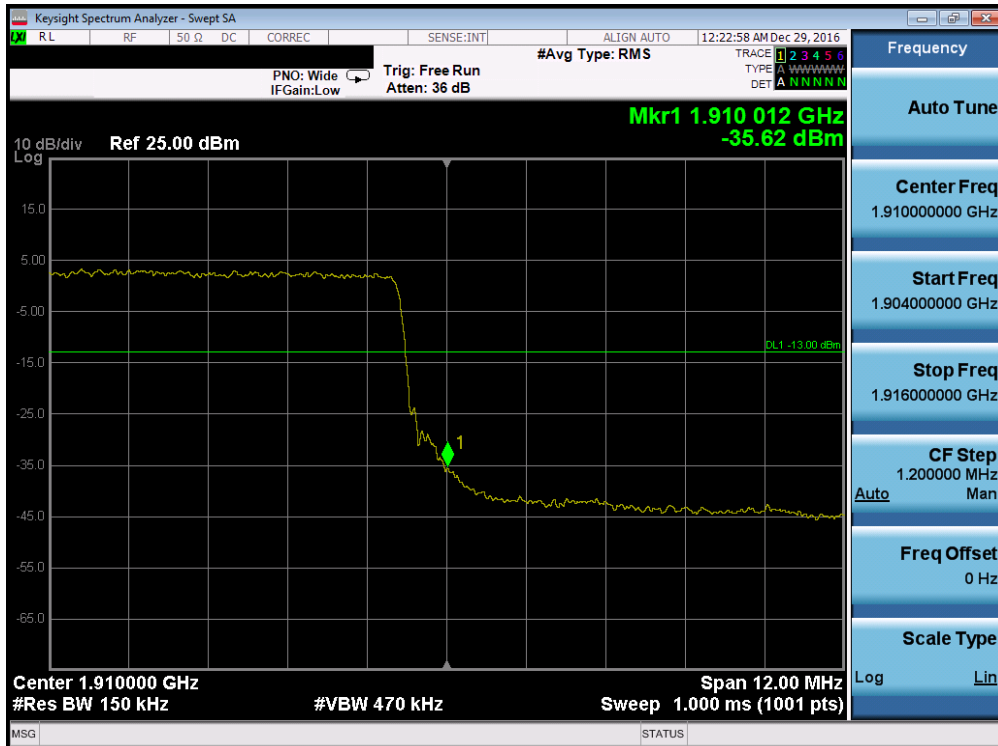


Plot 7-129. Lower Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFUS110		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 81 of 116

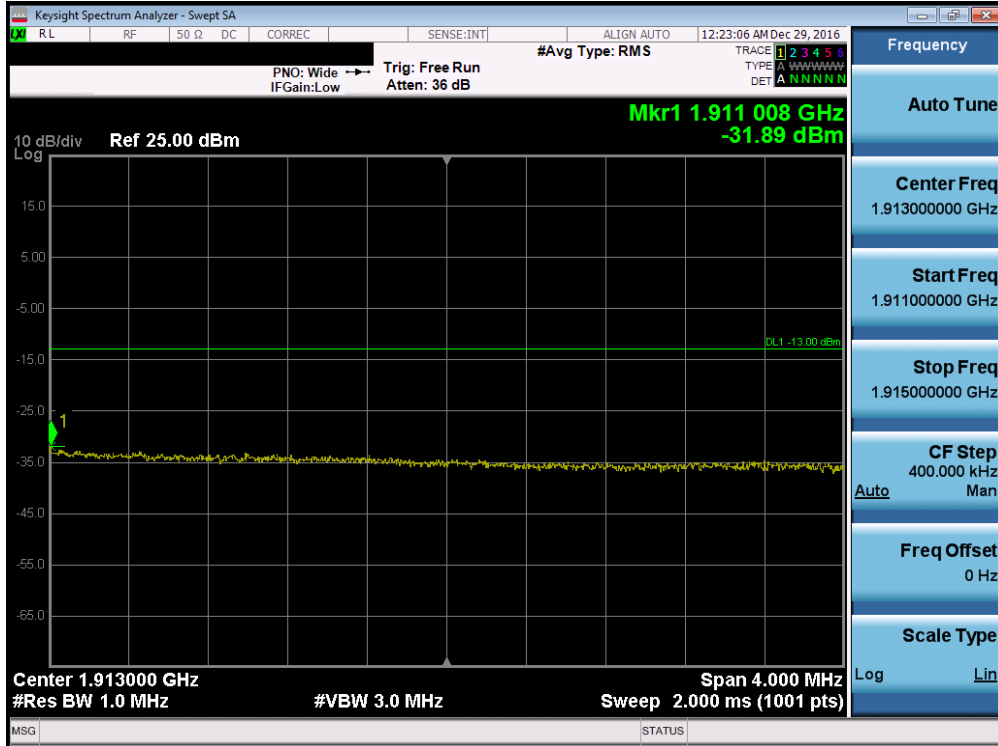


Plot 7-130. Lower Extended Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

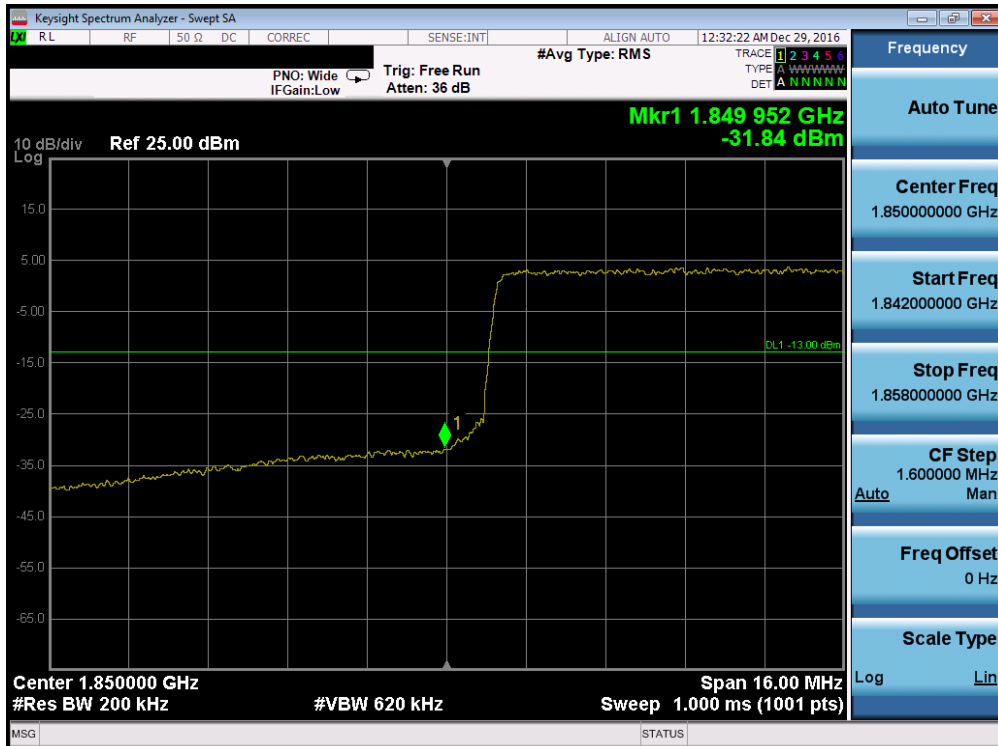


Plot 7-131. Upper Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFUS110		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 82 of 116



Plot 7-132. Upper Extended Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

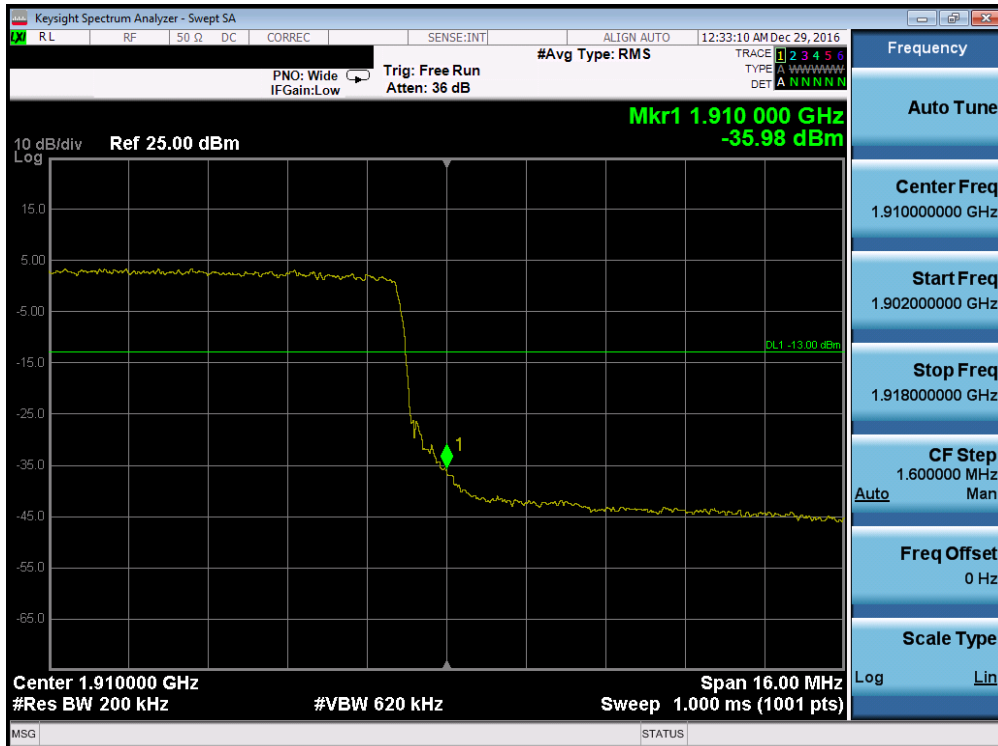


Plot 7-133. Lower Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 83 of 116

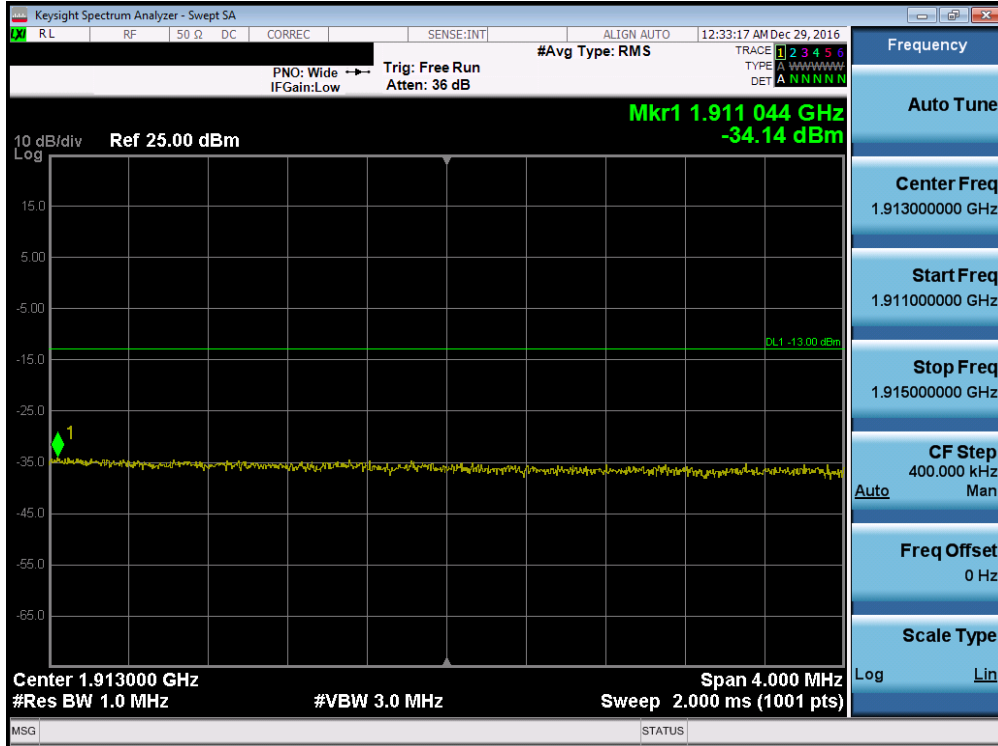


Plot 7-134. Lower Extended Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



Plot 7-135. Upper Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 84 of 116



Plot 7-136. Upper Extended Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFUS110		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 85 of 116

7.5 Peak-Average Ratio

§24.232(d)

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 v02r02 – Section 5.7.1

Test Settings

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW > Emission bandwidth of signal
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms.

Test Setup

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

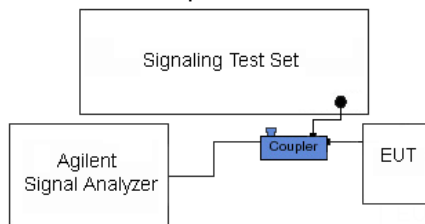


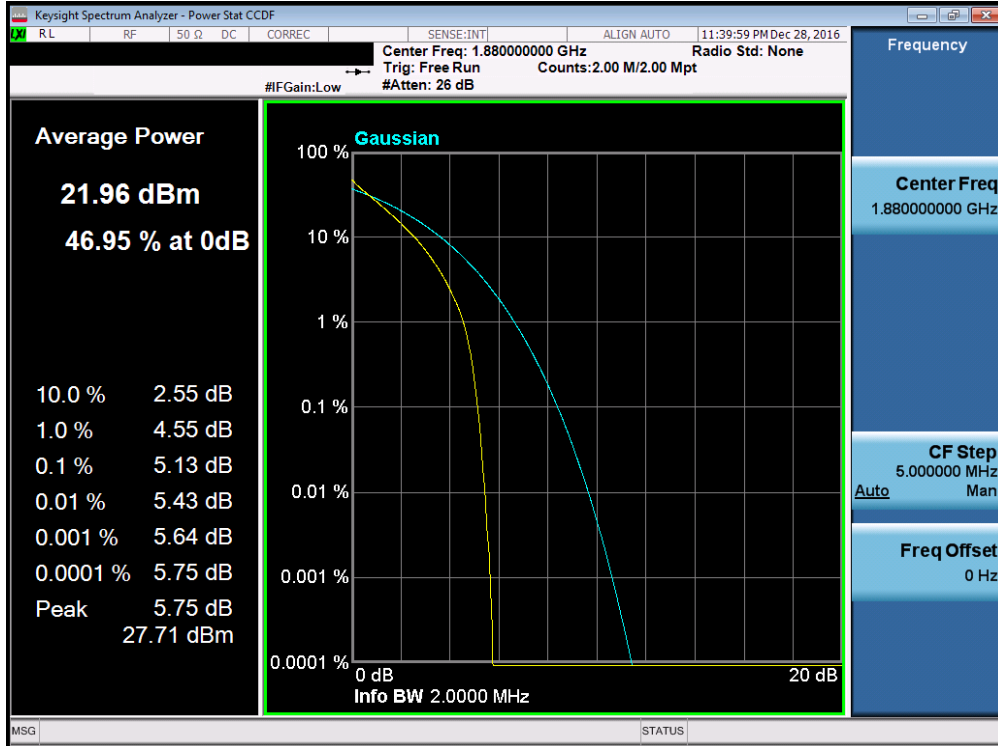


Figure 7-4. Test Instrument & Measurement Setup

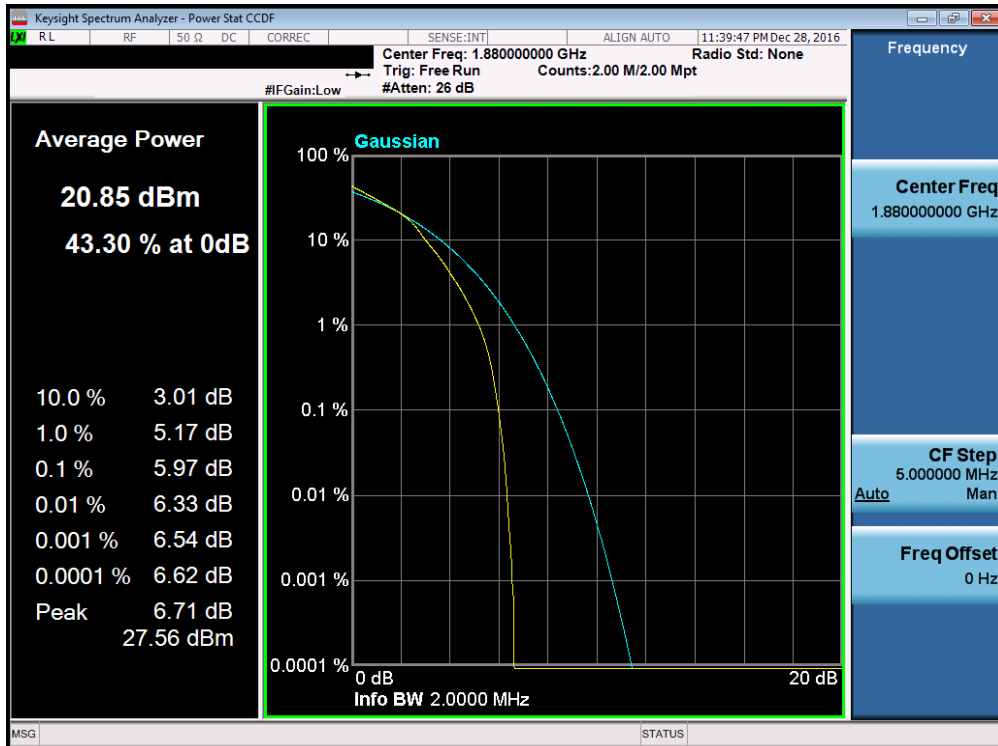
Test Notes

None.

FCC ID: ZNFUS110		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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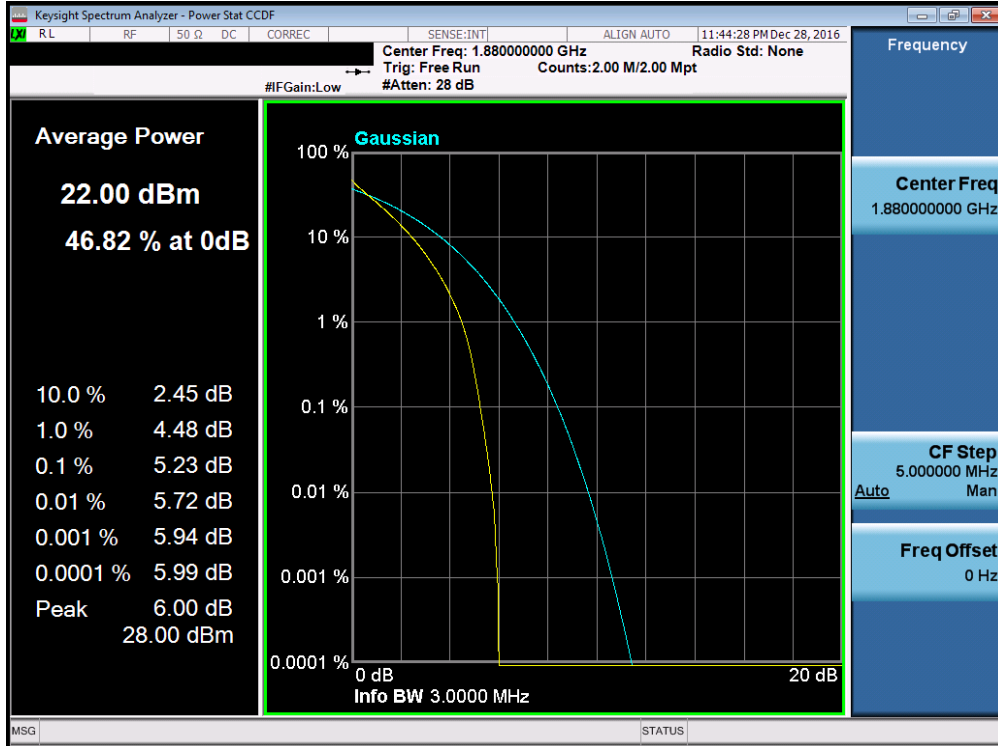


Plot 7-137. PAR Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

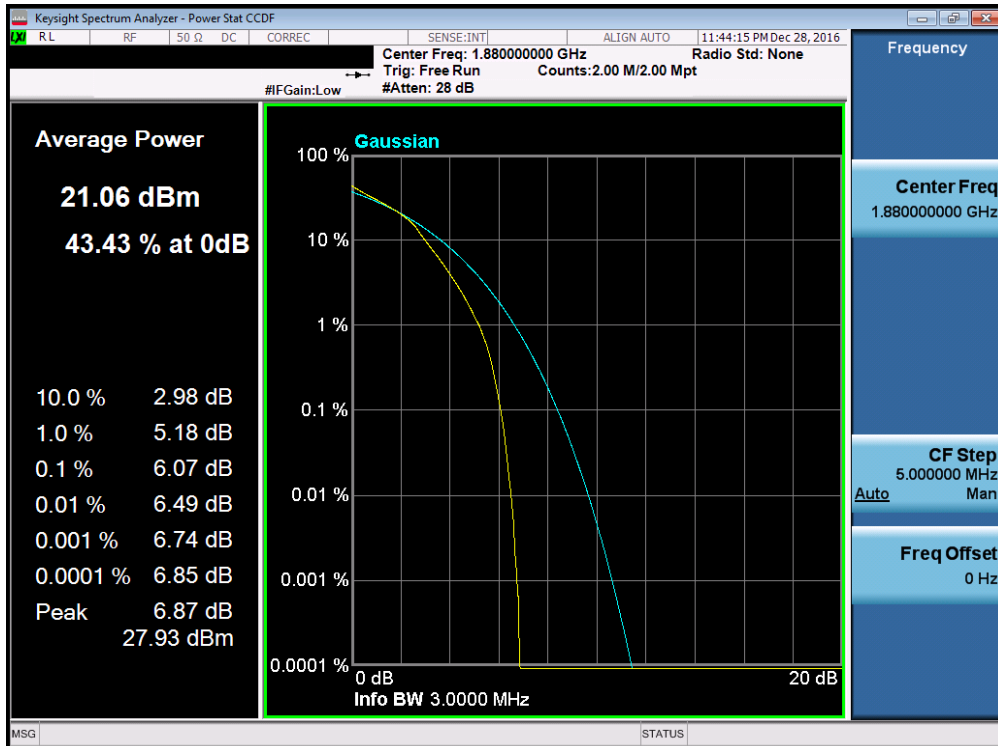


Plot 7-138. PAR Plot (Band 2 – 1.4MHz 16-QAM – RB Size 6)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 87 of 116

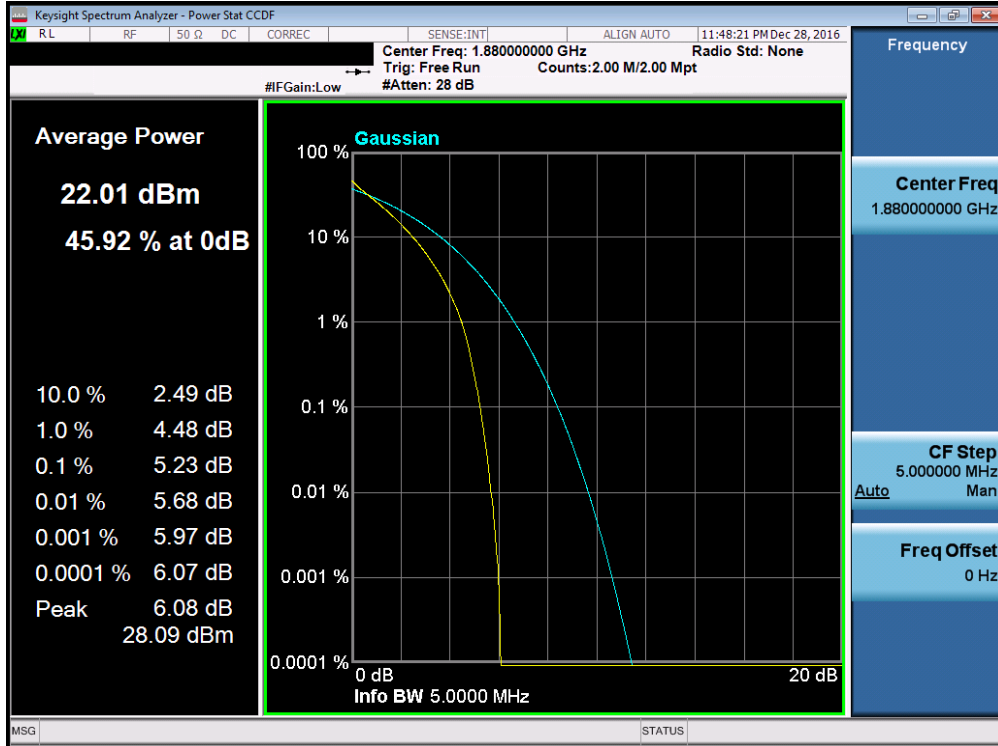


Plot 7-139. PAR Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

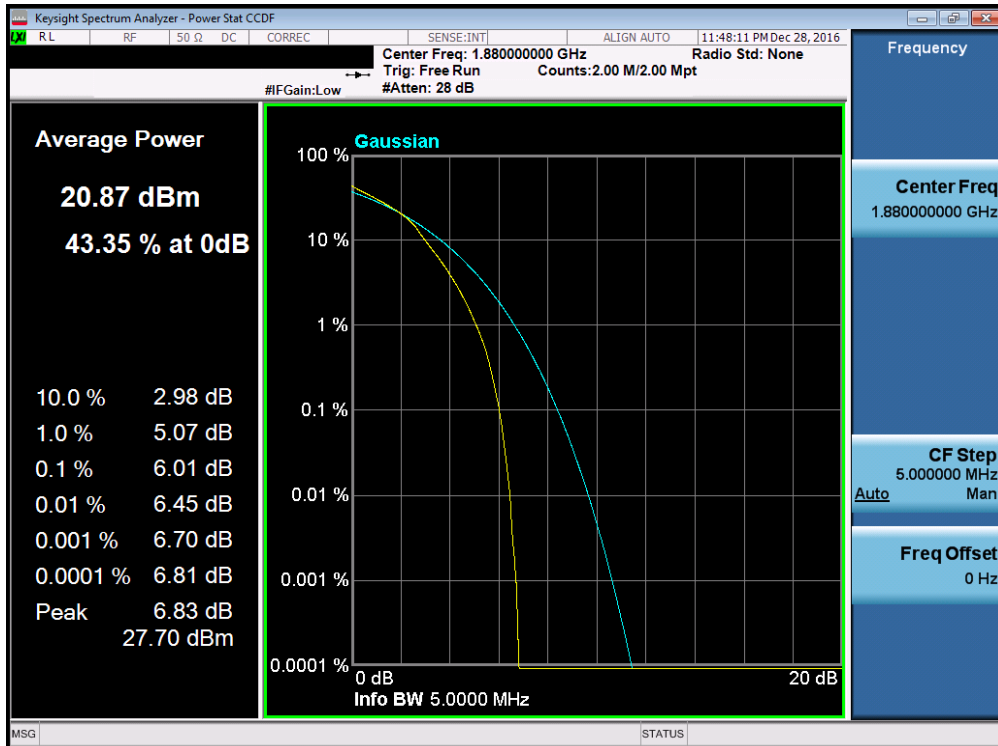


Plot 7-140. PAR Plot (Band 2 – 3.0MHz 16-QAM – RB Size 15)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset	Page 88 of 116	

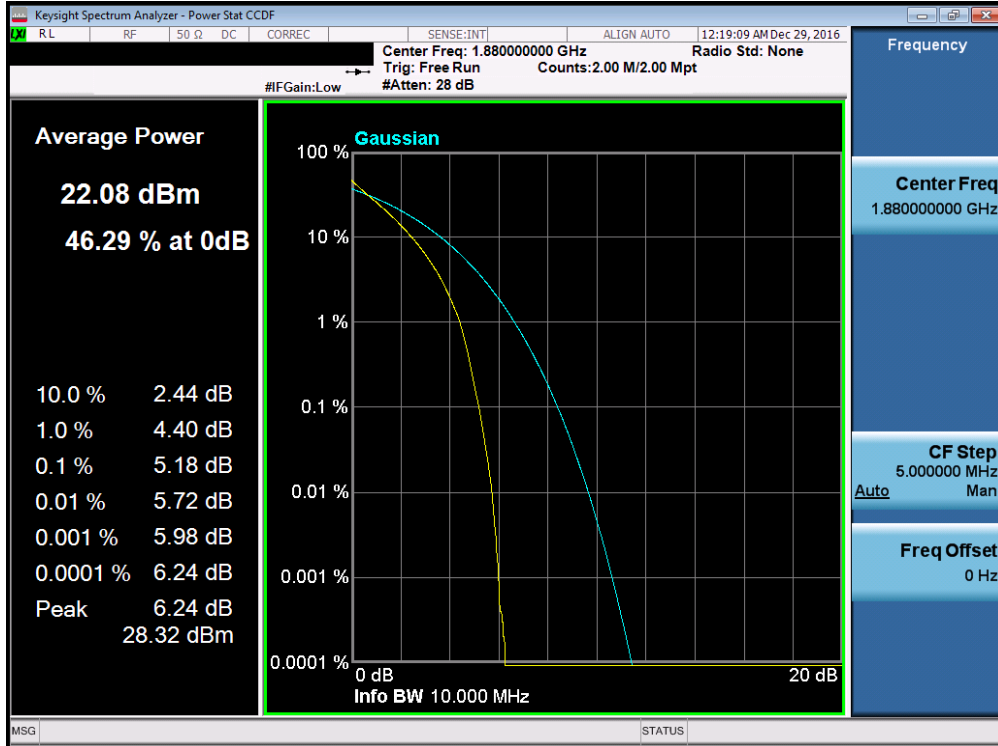


Plot 7-141. PAR Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

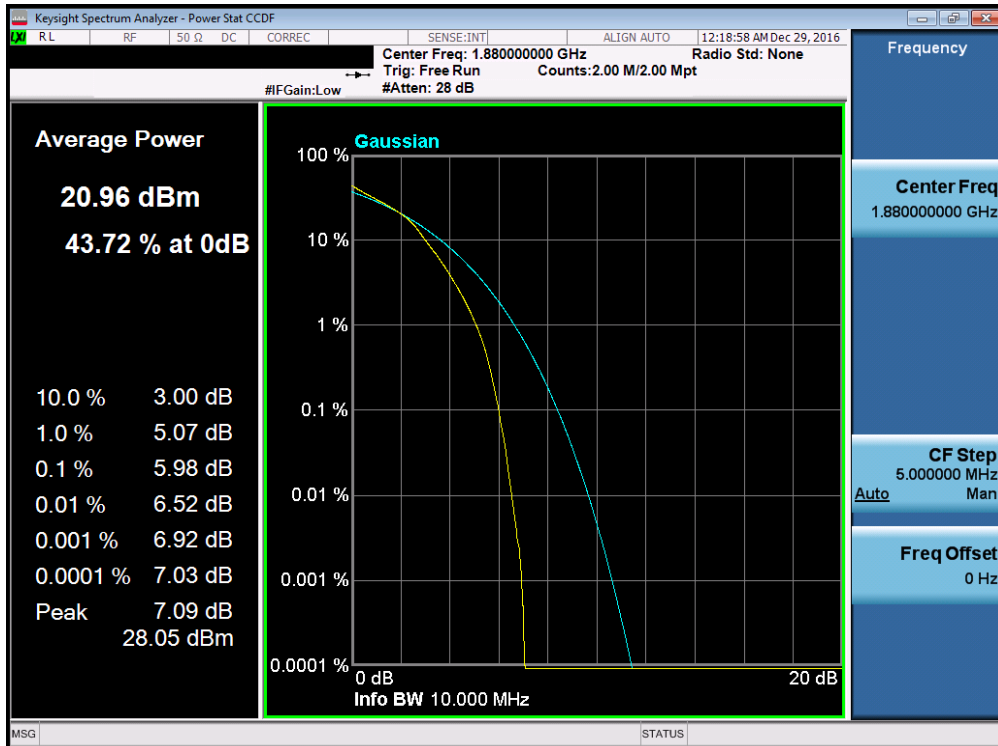


Plot 7-142. PAR Plot (Band 2 – 5.0MHz 16-QAM – RB Size 25)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset	Page 89 of 116	

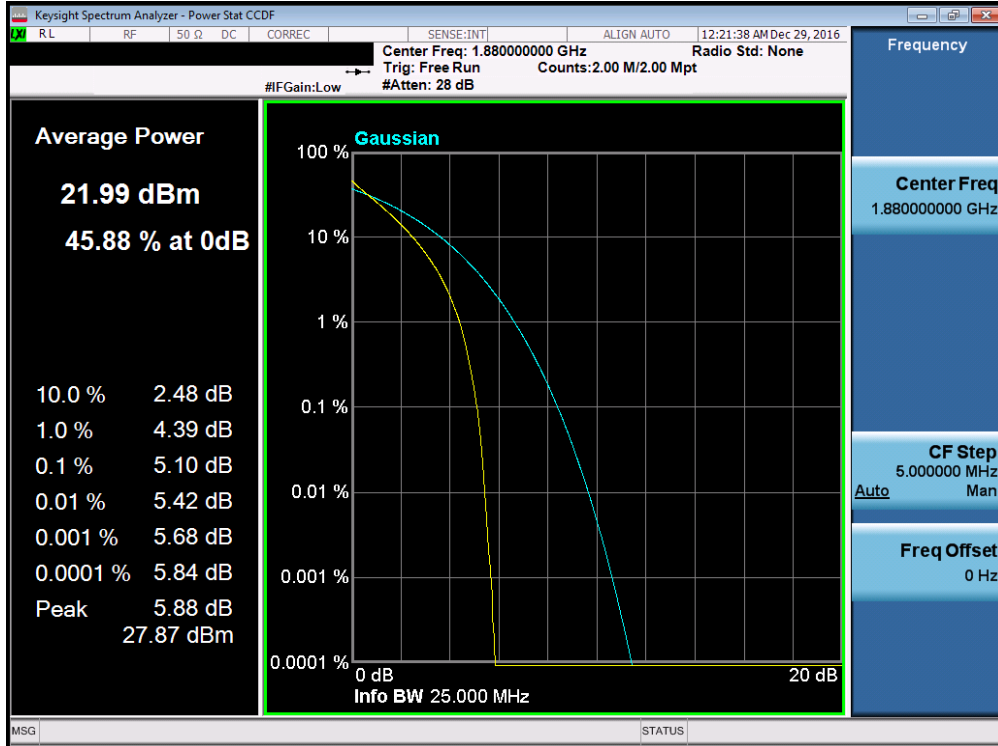


Plot 7-143. PAR Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

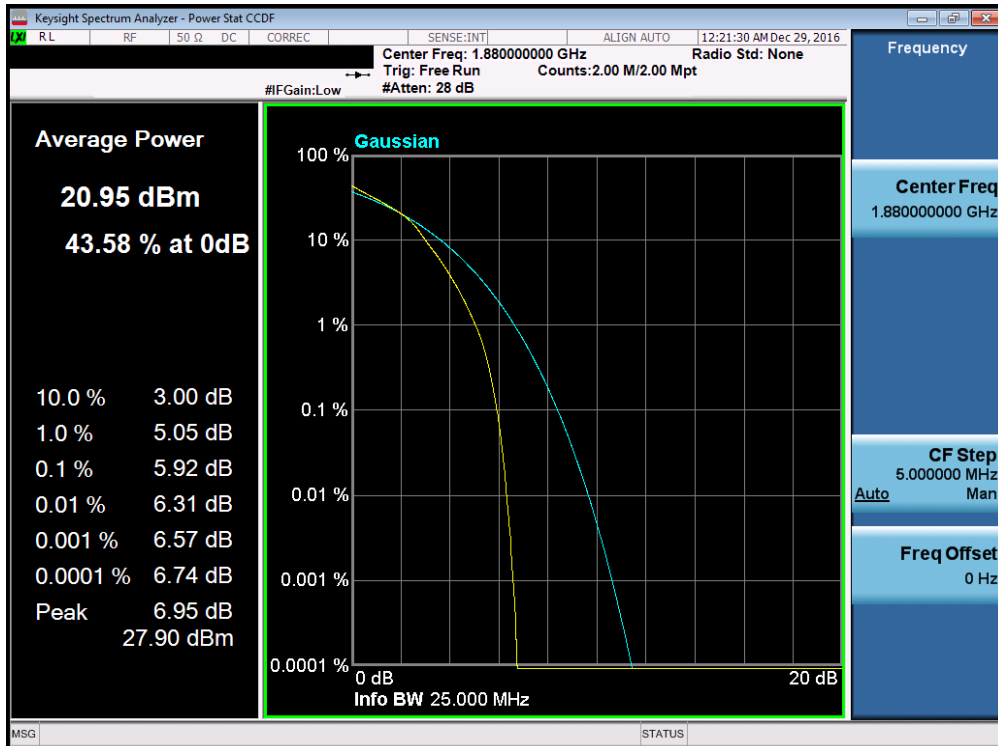


Plot 7-144. PAR Plot (Band 2 – 10.0MHz 16-QAM – RB Size 50)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset	Page 90 of 116	

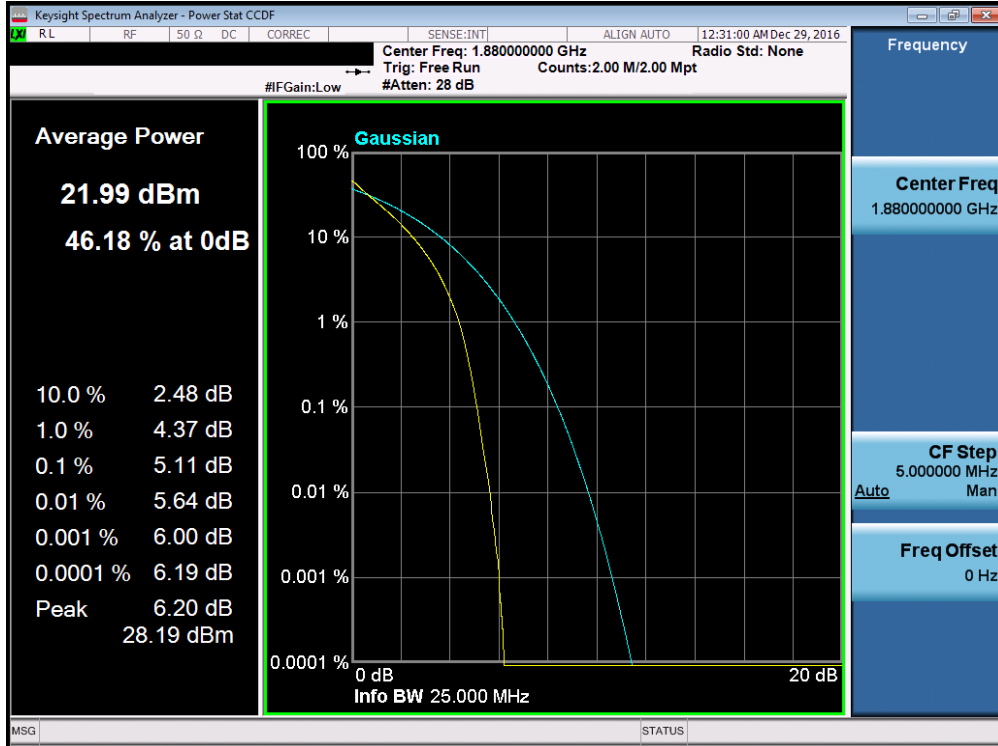


Plot 7-145. PAR Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

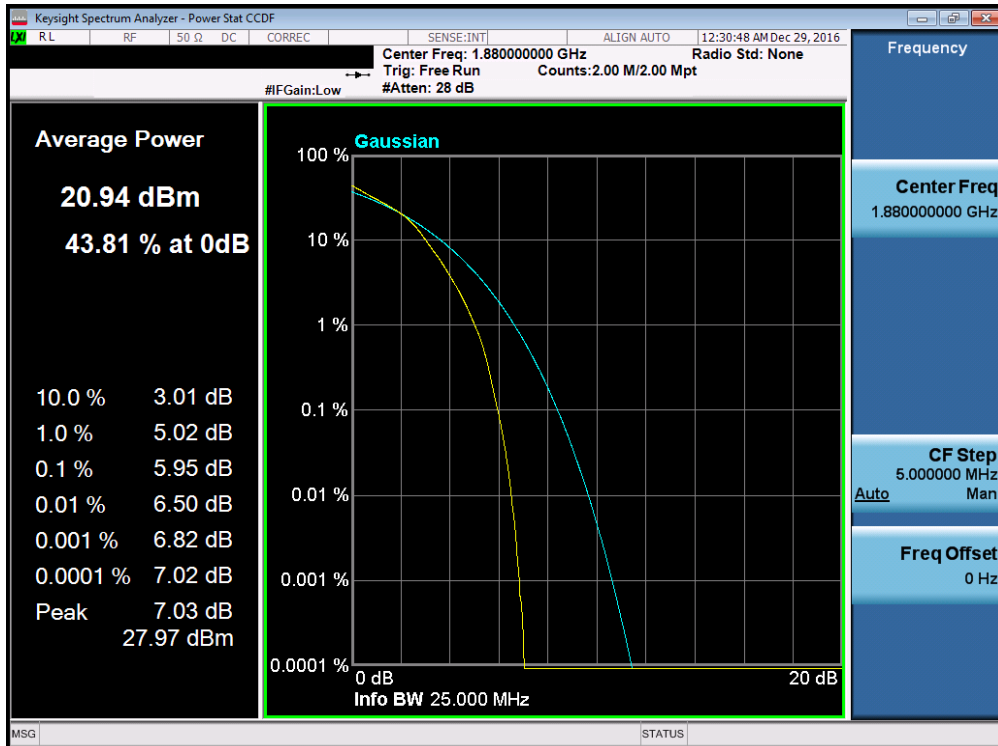


Plot 7-146. PAR Plot (Band 2 – 15.0MHz 16-QAM – RB Size 75)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
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Plot 7-147. PAR Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



Plot 7-148. PAR Plot (Band 2 – 20.0MHz 16-QAM – RB Size 100)

FCC ID: ZNFUS110	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1612232004.ZNF	Test Dates: 12/27/2016 - 1/4/2017, 1/26/2017	EUT Type: Portable Handset		Page 92 of 116

7.6 Radiated Power (ERP/EIRP)
§22.913(a.2) §24.232(c.2) §27.50(b.10) §27.50(d.4)

Test Overview

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) 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 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 v02r02 – Section 5.2.1

ANSI/TIA-603-D-2010 – Section 2.2.17

Test Settings

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

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Test Setup

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

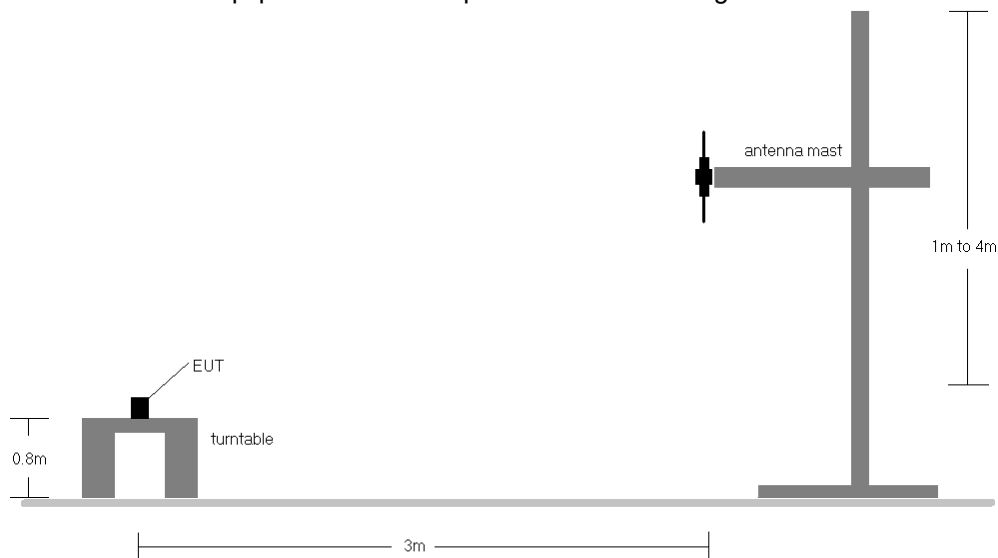


Figure 7-5. Radiated Test Setup <1GHz

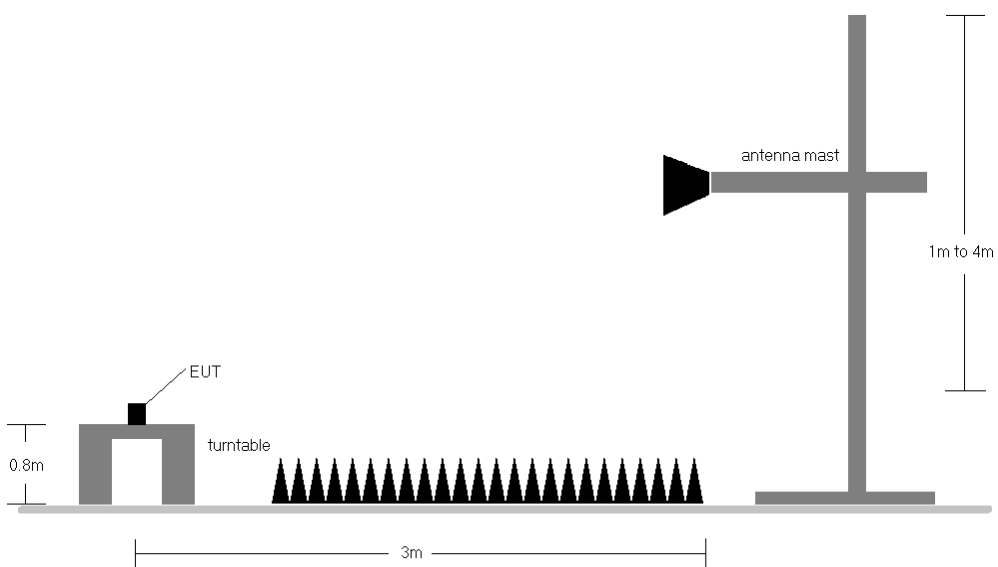




Figure 7-6. Radiated Test Setup >1GHz



Test Notes

- 1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested with its standard battery.

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Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Positioner Azimuth [degree]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
779.50	5	QPSK	H	186	92	1 / 24	20.97	-0.83	20.14	34.77	-14.63
782.00	5	QPSK	H	191	89	1 / 0	21.06	-0.82	20.24	34.77	-14.53
784.50	5	QPSK	H	191	80	1 / 0	21.02	-0.81	20.21	34.77	-14.56
779.50	5	16QAM	H	186	92	1 / 24	20.36	-0.83	19.53	34.77	-15.24
782.00	5	16QAM	H	191	89	1 / 0	20.50	-0.82	19.68	34.77	-15.09
784.50	5	16QAM	H	191	80	1 / 0	20.32	-0.81	19.51	34.77	-15.26
782.00	10	QPSK	H	0	280	1 / 49	21.10	-0.82	20.28	34.77	-14.49
782.00	10	16QAM	H	0	280	1 / 49	20.16	-0.82	19.34	34.77	-15.43
782.00	10	QPSK	V	0	38	1 / 0	20.29	-0.82	19.47	34.77	-15.30

Table 7-2. ERP Data (Band 13)

FCC ID: ZNFUS110		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Positioner Azimuth [degree]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
824.70	1.4	QPSK	H	5	73	3 / 2	20.97	-0.65	20.32	38.45	-18.13
836.50	1.4	QPSK	H	0	70	1 / 5	21.58	-0.65	20.93	38.45	-17.52
848.30	1.4	QPSK	H	0	69	3 / 2	21.53	-0.65	20.88	38.45	-17.57
824.70	1.4	16-QAM	H	5	73	3 / 2	20.07	-0.65	19.42	38.45	-19.03
836.50	1.4	16-QAM	H	0	70	1 / 5	20.20	-0.65	19.55	38.45	-18.90
848.30	1.4	16-QAM	H	0	69	3 / 2	20.19	-0.65	19.54	38.45	-18.91
825.50	3	QPSK	H	0	82	1 / 14	20.89	-0.65	20.24	38.45	-18.21
836.50	3	QPSK	H	0	73	1 / 14	21.62	-0.65	20.97	38.45	-17.48
847.50	3	QPSK	H	0	75	1 / 0	21.48	-0.65	20.83	38.45	-17.62
825.50	3	16-QAM	H	0	82	1 / 14	20.12	-0.65	19.47	38.45	-18.98
836.50	3	16-QAM	H	0	73	1 / 14	20.81	-0.65	20.16	38.45	-18.29
847.50	3	16-QAM	H	0	75	1 / 0	20.83	-0.65	20.18	38.45	-18.27
826.50	5	QPSK	H	0	80	1 / 24	20.94	-0.65	20.29	38.45	-18.16
836.50	5	QPSK	H	0	76	1 / 24	21.38	-0.65	20.73	38.45	-17.72
846.50	5	QPSK	H	0	71	1 / 0	21.80	-0.65	21.15	38.45	-17.30
826.50	5	16-QAM	H	0	80	1 / 24	20.29	-0.65	19.64	38.45	-18.81
836.50	5	16-QAM	H	0	76	1 / 24	20.72	-0.65	20.07	38.45	-18.38
846.50	5	16-QAM	H	0	71	1 / 0	21.20	-0.65	20.55	38.45	-17.90
829.00	10	QPSK	H	0	75	1 / 49	21.23	-0.65	20.58	38.45	-17.87
836.50	10	QPSK	H	0	75	1 / 49	21.84	-0.65	21.19	38.45	-17.26
844.00	10	QPSK	H	0	70	1 / 0	21.57	-0.65	20.92	38.45	-17.53
829.00	10	16-QAM	H	0	75	1 / 49	20.30	-0.65	19.65	38.45	-18.80
836.50	10	16-QAM	H	0	75	1 / 49	20.84	-0.65	20.19	38.45	-18.26
844.00	10	16-QAM	H	0	70	1 / 0	20.61	-0.65	19.96	38.45	-18.49
836.50	10	QPSK	V	73	39	1 / 0	20.17	-0.65	19.52	38.45	-18.93

Table 7-3. ERP Data (Band 5)

FCC ID: ZNFUS110	 PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)			Approved by: Quality Manager
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Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
1710.70	1.4	QPSK	H	342	0	3 / 2	18.68	5.56	24.24	30.00	-5.76
1732.50	1.4	QPSK	H	348	0	3 / 2	18.47	5.41	23.88	30.00	-6.12
1754.30	1.4	QPSK	H	348	0	3 / 2	18.37	5.26	23.63	30.00	-6.37
1710.70	1.4	16-QAM	H	342	0	3 / 2	17.70	5.56	23.26	30.00	-6.74
1732.50	1.4	16-QAM	H	348	0	3 / 2	17.38	5.41	22.79	30.00	-7.21
1754.30	1.4	16-QAM	H	348	0	3 / 2	17.13	5.26	22.39	30.00	-7.61
1711.50	3	QPSK	H	322	0	1 / 14	18.73	5.55	24.28	30.00	-5.72
1732.50	3	QPSK	H	331	35	1 / 0	18.32	5.41	23.73	30.00	-6.27
1753.50	3	QPSK	H	322	0	1 / 0	17.89	5.26	23.15	30.00	-6.85
1711.50	3	16-QAM	H	322	0	1 / 14	17.94	5.55	23.49	30.00	-6.51
1732.50	3	16-QAM	H	331	35	1 / 0	17.63	5.41	23.04	30.00	-6.96
1753.50	3	16-QAM	H	322	0	1 / 0	17.57	5.26	22.83	30.00	-7.17
1712.50	5	QPSK	H	341	0	1 / 0	18.62	5.55	24.17	30.00	-5.83
1732.50	5	QPSK	H	348	0	1 / 0	18.63	5.41	24.04	30.00	-5.96
1752.50	5	QPSK	H	355	0	1 / 0	17.94	5.27	23.21	30.00	-6.79
1712.50	5	16-QAM	H	341	0	1 / 0	18.04	5.55	23.59	30.00	-6.41
1732.50	5	16-QAM	H	348	0	1 / 0	17.87	5.41	23.28	30.00	-6.72
1752.50	5	16-QAM	H	355	0	1 / 0	17.25	5.27	22.52	30.00	-7.48
1715.00	10	QPSK	H	349	0	1 / 0	18.74	5.53	24.27	30.00	-5.73
1732.50	10	QPSK	H	345	0	1 / 0	18.49	5.41	23.90	30.00	-6.10
1750.00	10	QPSK	H	341	0	1 / 0	17.89	5.29	23.18	30.00	-6.82
1715.00	10	16-QAM	H	349	0	1 / 0	17.86	5.53	23.39	30.00	-6.61
1732.50	10	16-QAM	H	345	0	1 / 0	17.39	5.41	22.80	30.00	-7.20
1750.00	10	16-QAM	H	341	0	1 / 0	17.26	5.29	22.55	30.00	-7.45
1717.50	15	QPSK	H	345	0	1 / 0	18.77	5.51	24.28	30.00	-5.72
1732.50	15	QPSK	H	337	5	1 / 0	18.46	5.41	23.87	30.00	-6.13
1747.50	15	QPSK	H	341	0	1 / 0	18.14	5.31	23.45	30.00	-6.55
1717.50	15	16-QAM	H	345	0	1 / 0	17.75	5.51	23.26	30.00	-6.74
1732.50	15	16-QAM	H	337	5	1 / 0	17.77	5.41	23.18	30.00	-6.82
1747.50	15	16-QAM	H	341	0	1 / 74	16.48	5.31	21.79	30.00	-8.21
1720.00	20	QPSK	H	0	15	1 / 0	18.62	5.49	24.11	30.00	-5.89
1732.50	20	QPSK	H	0	0	1 / 0	18.35	5.41	23.76	30.00	-6.24
1745.00	20	QPSK	H	0	0	1 / 0	18.08	5.32	23.40	30.00	-6.60
1720.00	20	16-QAM	H	0	15	1 / 0	17.97	5.49	23.46	30.00	-6.54
1732.50	20	16-QAM	H	0	0	1 / 0	17.69	5.41	23.10	30.00	-6.90
1745.00	20	16-QAM	H	0	0	1 / 0	17.37	5.32	22.69	30.00	-7.31
1711.50	3	QPSK	V	70	216	1 / 0	16.79	5.55	22.34	30.00	-7.66

Table 7-4. EIRP Data (Band 4)

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Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
1850.70	1.4	QPSK	H	0	0	1 / 5	19.13	4.82	23.95	33.01	-9.06
1880.00	1.4	QPSK	H	0	0	3 / 2	17.80	4.74	22.54	33.01	-10.47
1909.30	1.4	QPSK	H	0	0	3 / 2	17.22	4.68	21.90	33.01	-11.11
1850.70	1.4	16-QAM	H	0	0	1 / 5	18.04	4.82	22.86	33.01	-10.15
1880.00	1.4	16-QAM	H	0	0	3 / 2	16.73	4.74	21.47	33.01	-11.54
1909.30	1.4	16-QAM	H	0	0	3 / 2	16.06	4.68	20.74	33.01	-12.27
1851.50	3	QPSK	H	0	349	1 / 0	18.99	4.82	23.81	33.01	-9.20
1880.00	3	QPSK	H	0	0	1 / 14	17.53	4.74	22.27	33.01	-10.74
1908.50	3	QPSK	H	0	0	1 / 14	16.90	4.68	21.58	33.01	-11.43
1851.50	3	16-QAM	H	0	349	1 / 0	18.18	4.82	23.00	33.01	-10.01
1880.00	3	16-QAM	H	0	0	1 / 0	16.80	4.74	21.54	33.01	-11.47
1908.50	3	16-QAM	H	0	0	1 / 14	16.15	4.68	20.83	33.01	-12.18
1852.50	5	QPSK	H	0	3	1 / 24	18.89	4.81	23.70	33.01	-9.31
1880.00	5	QPSK	H	0	355	1 / 0	17.54	4.74	22.28	33.01	-10.73
1907.50	5	QPSK	H	0	0	1 / 24	16.91	4.68	21.59	33.01	-11.42
1852.50	5	16-QAM	H	0	3	1 / 24	18.06	4.81	22.87	33.01	-10.14
1880.00	5	16-QAM	H	0	355	1 / 24	16.41	4.74	21.15	33.01	-11.86
1907.50	5	16-QAM	H	0	0	1 / 24	15.97	4.68	20.65	33.01	-12.36
1855.00	10	QPSK	H	0	349	1 / 0	18.96	4.81	23.77	33.01	-9.24
1880.00	10	QPSK	H	0	7	1 / 0	17.75	4.74	22.49	33.01	-10.52
1905.00	10	QPSK	H	356	0	1 / 49	16.75	4.68	21.43	33.01	-11.58
1855.00	10	16-QAM	H	0	349	1 / 0	18.05	4.81	22.86	33.01	-10.15
1880.00	10	16-QAM	H	0	7	1 / 0	16.90	4.74	21.64	33.01	-11.37
1905.00	10	16-QAM	H	356	0	1 / 49	15.95	4.68	20.63	33.01	-12.38
1857.50	15	QPSK	H	0	9	1 / 0	19.01	4.80	23.81	33.01	-9.20
1880.00	15	QPSK	H	0	0	1 / 0	17.92	4.74	22.66	33.01	-10.35
1902.50	15	QPSK	H	0	0	1 / 0	16.91	4.69	21.60	33.01	-11.41
1857.50	15	16-QAM	H	0	9	1 / 0	18.26	4.80	23.06	33.01	-9.95
1880.00	15	16-QAM	H	0	0	1 / 0	17.20	4.74	21.94	33.01	-11.07
1902.50	15	16-QAM	H	0	0	1 / 0	16.10	4.69	20.79	33.01	-12.22
1860.00	20	QPSK	H	355	7	1 / 0	19.07	4.79	23.86	33.01	-9.15
1880.00	20	QPSK	H	0	10	1 / 0	18.09	4.74	22.83	33.01	-10.18
1900.00	20	QPSK	H	0	0	1 / 0	17.03	4.69	21.72	33.01	-11.29
1860.00	20	16-QAM	H	355	7	1 / 0	18.17	4.79	22.96	33.01	-10.05
1880.00	20	16-QAM	H	0	10	1 / 0	17.61	4.74	22.35	33.01	-10.66
1900.00	20	16-QAM	H	0	0	1 / 0	16.36	4.69	21.05	33.01	-11.96
1850.70	1.4	QPSK	V	0	159	1 / 0	17.33	4.79	22.12	33.01	-10.89

Table 7-5. EIRP Data (Band 2)

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7.7 Radiated Spurious Emissions Measurements

§2.1053 §22.917(a) §24.238(a) §27.53(c) §27.53(f) §27.53(h)

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 $\geq 3 \times$ RBW
3. Span = 1.5 times the OBW
4. No. of sweep points $\geq 2 \times$ span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

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

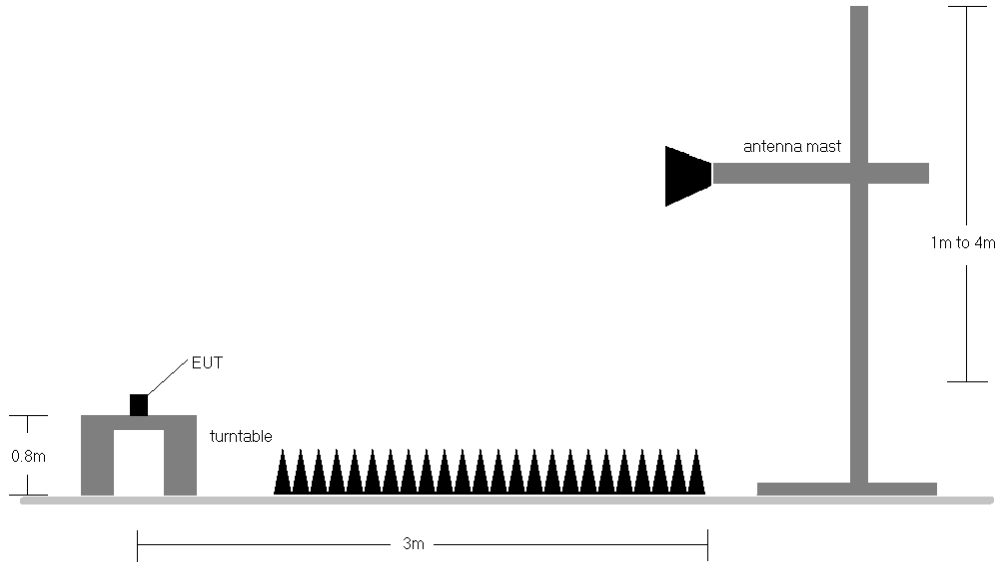




Figure 7-7. Test Instrument & Measurement Setup

Test Notes

- 1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested with its standard battery.
- 3) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 4) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
- 5) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

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OPERATING FREQUENCY: 782.00 MHz
 CHANNEL: 23230
 MEASURED OUTPUT POWER: 20.28 dBm = 0.107 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 10.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 33.28 dBc



Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
2346.00	H	-	-	-62.99	6.80	-56.19	76.5
3128.00	H	-	-	-59.82	6.88	-52.94	73.2
3910.00	H	-	-	-56.71	7.05	-49.66	69.9

Table 7-6. Radiated Spurious Data (Band 13 – Mid Channel)

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

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Margin [dB]
1564.00	H	-	-	-66.69	6.50	-60.18	-20.2

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

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OPERATING FREQUENCY: 829.00 MHz
 CHANNEL: 20450
 MEASURED OUTPUT POWER: 20.58 dBm = 0.114 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 10.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 33.58 dBc



Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1658.00	H	151	100	-60.31	6.21	-54.10	74.7
2487.00	H	-	-	-61.09	6.61	-54.48	75.1
3316.00	H	-	-	-58.49	7.04	-51.45	72.0
4145.00	H	-	-	-58.43	7.83	-50.60	71.2

Table 7-8. Radiated Spurious Data (Band 5 – Low Channel)

OPERATING FREQUENCY: 836.50 MHz
 CHANNEL: 20525
 MEASURED OUTPUT POWER: 21.19 dBm = 0.132 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 10.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 34.19 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1673.00	H	156	100	-60.46	6.13	-54.33	75.5
2509.50	H	-	-	-61.73	6.64	-55.09	76.3
3346.00	H	-	-	-59.27	7.14	-52.13	73.3
4182.50	H	-	-	-58.02	8.06	-49.96	71.2

Table 7-9. Radiated Spurious Data (Band 5 – Mid Channel)

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OPERATING FREQUENCY: 844.00 MHz
 CHANNEL: 20600
 MEASURED OUTPUT POWER: 20.92 dBm = 0.124 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 10.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 33.92 dBc



Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1688.00	H	144	100	-59.71	6.05	-53.65	74.6
2532.00	H	-	-	-61.42	6.70	-54.72	75.6
3376.00	H	-	-	-58.48	7.24	-51.24	72.2
4220.00	H	-	-	-58.73	8.25	-50.48	71.4

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

OPERATING FREQUENCY: 1711.50 MHz
 CHANNEL: 19965
 MEASURED OUTPUT POWER: 24.28 dBm = 0.268 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 3.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 37.28 dBc

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]	[dBc]
3423.00	H	294	100	-48.45	9.57	-38.88	63.2
5134.50	H	124	100	-54.91	11.01	-43.90	68.2
6846.00	H	-	-	-52.75	10.77	-41.98	66.3
8557.50	H	-	-	-49.65	11.34	-38.31	62.6
10269.00	H	-	-	-50.60	12.54	-38.06	62.3

Table 7-11. Radiated Spurious Data (Band 4 – Low Channel)

FCC ID: ZNFUS110		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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OPERATING FREQUENCY: 1732.50 MHz
 CHANNEL: 20175
 MEASURED OUTPUT POWER: 23.73 dBm = 0.236 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 3.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 36.73 dBc



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]	[dBc]
3465.00	H	330	104	-48.08	9.64	-38.44	62.2
5197.50	H	98	100	-54.77	10.98	-43.79	67.5
6930.00	H	-	-	-52.37	10.85	-41.52	65.2
8662.50	H	-	-	-50.76	11.53	-39.23	63.0
10395.00	H	-	-	-50.44	12.58	-37.86	61.6

Table 7-12. Radiated Spurious Data (Band 4 – Mid Channel)

OPERATING FREQUENCY: 1753.50 MHz
 CHANNEL: 20385
 MEASURED OUTPUT POWER: 23.15 dBm = 0.207 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 3.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 36.15 dBc

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]	[dBc]
3507.00	H	311	100	-47.10	9.71	-37.39	60.5
5260.50	H	120	100	-54.07	11.03	-43.04	66.2
7014.00	H	-	-	-51.74	10.95	-40.78	63.9
8767.50	H	-	-	-50.70	11.68	-39.02	62.2
10521.00	H	-	-	-49.36	12.57	-36.80	60.0

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

FCC ID: ZNFUS110		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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OPERATING FREQUENCY: 1850.70 MHz
 CHANNEL: 18607
 MEASURED OUTPUT POWER: 23.95 dBm = 0.248 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 1.4 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 36.95 dBc



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]	[dBc]
3701.40	H	285	137	-51.08	9.82	-41.26	65.2
5552.10	H	-	-	-56.52	11.20	-45.31	69.3
7402.80	H	-	-	-51.65	10.90	-40.74	64.7
9253.50	H	-	-	-51.92	12.27	-39.65	63.6

Table 7-14. Radiated Spurious Data (Band 2 – Low Channel)

OPERATING FREQUENCY: 1880.00 MHz
 CHANNEL: 18900
 MEASURED OUTPUT POWER: 22.54 dBm = 0.179 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 1.4 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 35.54 dBc

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]	[dBc]
3760.00	H	296	145	-51.64	9.63	-42.01	64.6
5640.00	H	-	-	-55.90	11.29	-44.61	67.2
7520.00	H	-	-	-51.26	11.12	-40.14	62.7
9400.00	H	-	-	-52.15	12.28	-39.87	62.4



Table 7-15. Radiated Spurious Data (Band 2 – Mid Channel)

FCC ID: ZNFUS110	 PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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OPERATING FREQUENCY: 1909.30 MHz
 CHANNEL: 19193
 MEASURED OUTPUT POWER: 21.90 dBm = 0.155 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 1.4 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 34.90 dBc

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]	[dBc]
3818.60	H	296	145	-50.10	9.44	-40.65	62.6
5727.90	H	-	-	-55.84	11.37	-44.47	66.4
7637.20	H	-	-	-51.84	11.32	-40.53	62.4
9546.50	H	-	-	-52.13	12.39	-39.74	61.6

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

FCC ID: ZNFUS110	 PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	 LG	Approved by: Quality Manager
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7.8 Frequency Stability / Temperature Variation

\$2.1055 \$22.355 \$24.235 \$27.54

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-D-2010. The frequency stability of the transmitter is measured by:

- a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.
- b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

For Part 22, the frequency stability of the transmitter shall be maintained within $\pm 0.00025\%$ (± 2.5 ppm) of the center frequency. For Part 24 and 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-D-2010

Test Settings



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

Test Setup

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

Test Notes

None

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Band 13 Frequency Stability Measurements

§2.1055 §27.54

OPERATING FREQUENCY: 782,000,000 Hz
 CHANNEL: 23230
 REFERENCE VOLTAGE: 3.80 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	782,000,304	304	0.0000389
100 %		- 30	781,999,986	-14	-0.0000018
100 %		- 20	781,999,749	-251	-0.0000321
100 %		- 10	782,000,034	34	0.0000043
100 %		0	781,999,876	-124	-0.0000159
100 %		+ 10	782,000,001	1	0.0000001
100 %		+ 20	782,000,081	81	0.0000104
100 %		+ 30	781,999,630	-370	-0.0000473
100 %		+ 40	781,999,915	-85	-0.0000109
100 %		+ 50	781,999,848	-152	-0.0000194
BATT. ENDPOINT	3.40	+ 20	782,000,200	200	0.0000256

Table 7-17. Frequency Stability Data (Band 13)

FCC ID: ZNFUS110		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Band 13 Frequency Stability Measurements
§2.1055 §27.54

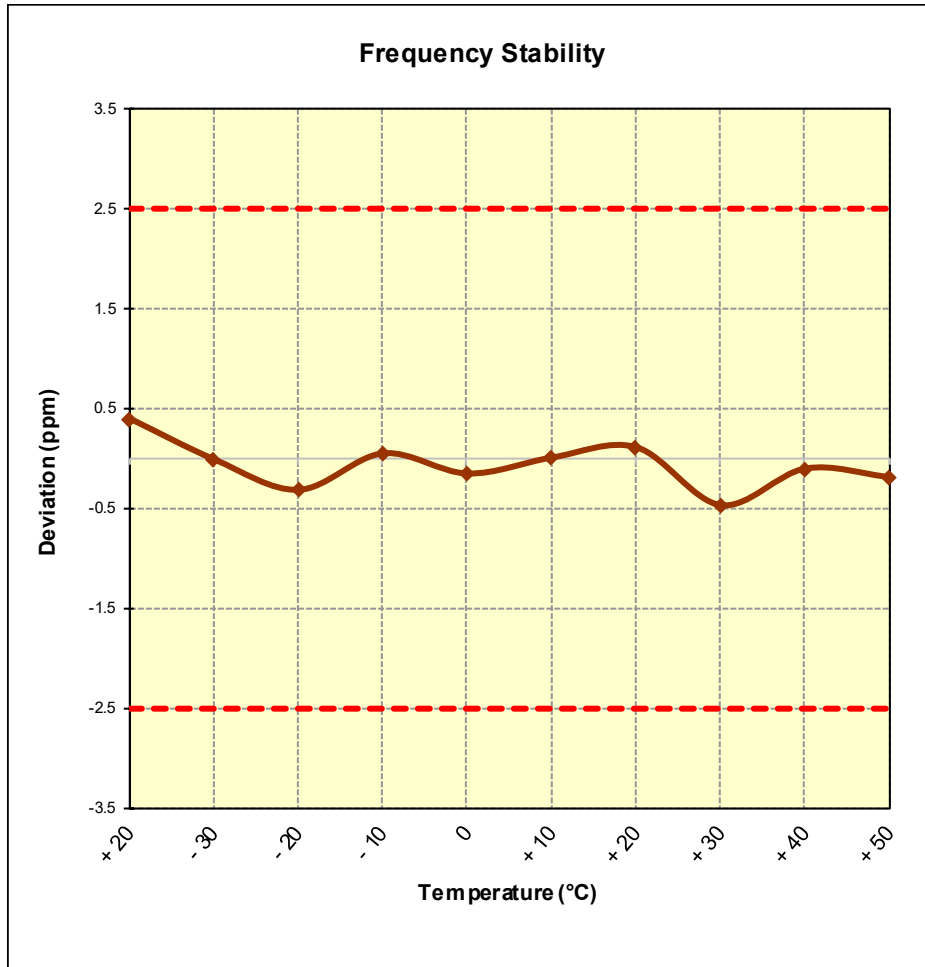




Figure 7-8. Frequency Stability Graph (Band 13)

FCC ID: ZNFUS110		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Band 5 Frequency Stability Measurements

§2.1055 §22.355

OPERATING FREQUENCY: 836,500,000 Hz
 CHANNEL: 20525
 REFERENCE VOLTAGE: 3.80 VDC
 DEVIATION LIMIT: ± 0.00025 % or 2.5 ppm

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	836,500,353	353	0.0000422
100 %		- 30	836,500,290	290	0.0000347
100 %		- 20	836,499,801	-199	-0.0000238
100 %		- 10	836,499,952	-48	-0.0000057
100 %		0	836,499,956	-44	-0.0000053
100 %		+ 10	836,499,879	-121	-0.0000145
100 %		+ 20	836,500,044	44	0.0000053
100 %		+ 30	836,499,854	-146	-0.0000175
100 %		+ 40	836,499,938	-62	-0.0000074
100 %		+ 50	836,499,950	-50	-0.0000060
BATT. ENDPOINT	3.40	+ 20	836,500,235	235	0.0000281

Table 7-18. Frequency Stability Data (Band 5)

FCC ID: ZNFUS110		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Band 5 Frequency Stability Measurements
§2.1055 §22.355

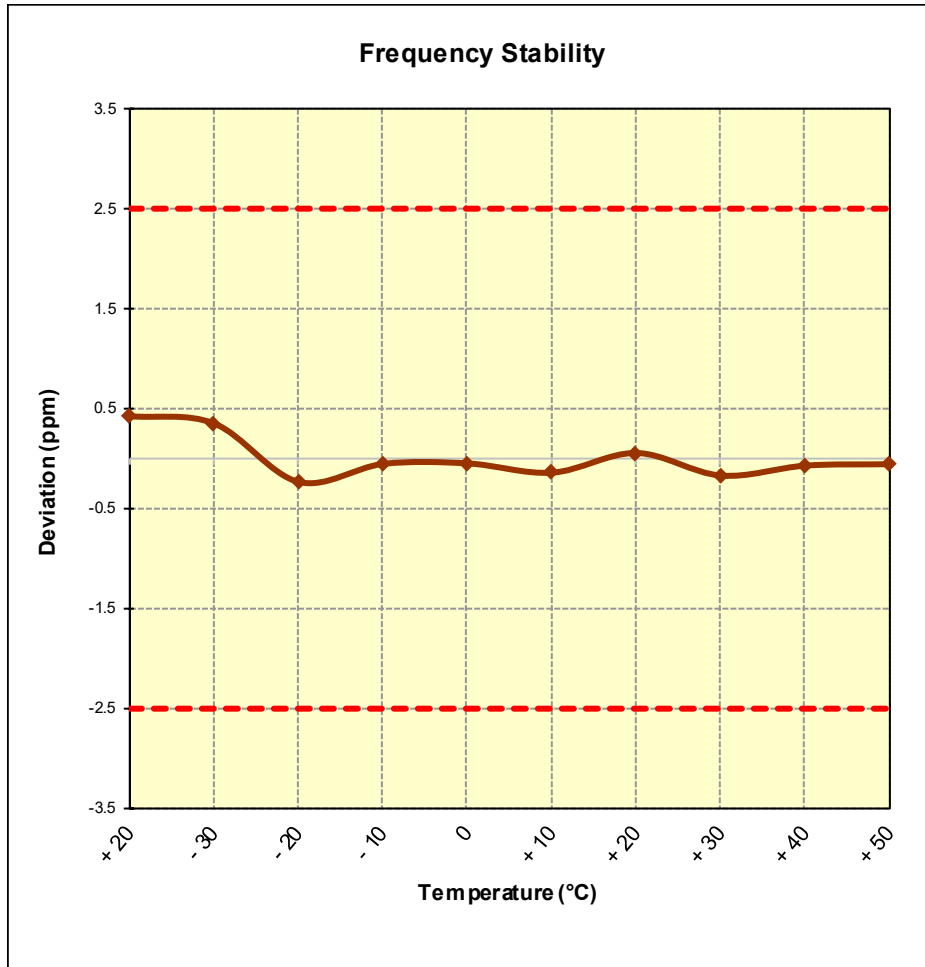




Figure 7-9. Frequency Stability Graph (Band 5)

FCC ID: ZNFUS110		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	 Approved by: Quality Manager
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Band 4 Frequency Stability Measurements

§2.1055 §§27.54



OPERATING FREQUENCY: 1,732,500,000 Hz
 CHANNEL: 20175
 REFERENCE VOLTAGE: 3.80 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	1,732,500,346	346	0.0000200
100 %		- 30	1,732,499,813	-187	-0.0000108
100 %		- 20	1,732,499,873	-127	-0.0000073
100 %		- 10	1,732,500,065	65	0.0000038
100 %		0	1,732,499,758	-242	-0.0000140
100 %		+ 10	1,732,499,986	-14	-0.0000008
100 %		+ 20	1,732,500,305	305	0.0000176
100 %		+ 30	1,732,499,961	-39	-0.0000023
100 %		+ 40	1,732,500,303	303	0.0000175
100 %		+ 50	1,732,500,012	12	0.0000007
BATT. ENDPOINT	3.40	+ 20	1,732,499,844	-156	-0.0000090

Table 7-19. Frequency Stability Data (Band 4)

Note:

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

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Band 4 Frequency Stability Measurements
§2.1055 §§27.54

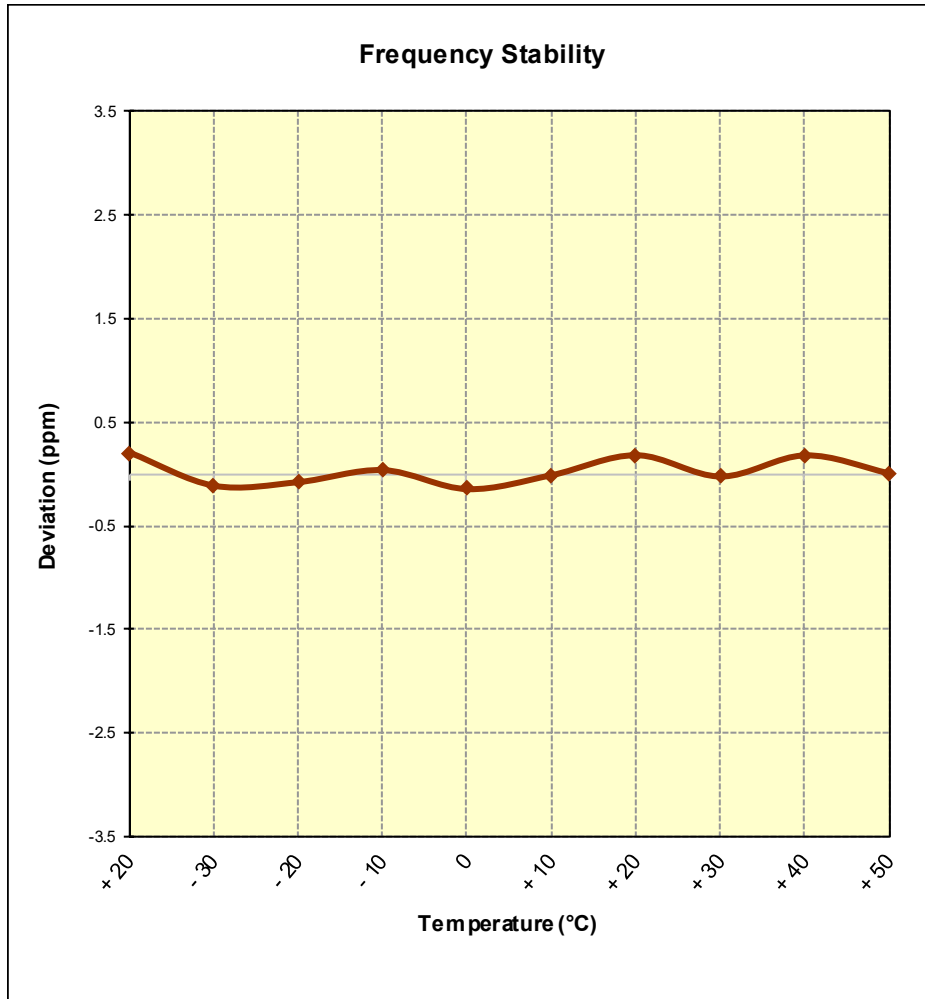




Figure 7-10. Frequency Stability Graph (Band 4)

FCC ID: ZNFUS110		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	 Approved by: Quality Manager
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Band 2 Frequency Stability Measurements

§2.1055 §24.235



OPERATING FREQUENCY: 1,880,000,000 Hz
 CHANNEL: 18900
 REFERENCE VOLTAGE: 3.80 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	1,880,000,011	11	0.0000006
100 %		- 30	1,879,999,887	-113	-0.0000060
100 %		- 20	1,879,999,984	-16	-0.0000009
100 %		- 10	1,880,000,064	64	0.0000034
100 %		0	1,879,999,676	-324	-0.0000172
100 %		+ 10	1,879,999,952	-48	-0.0000026
100 %		+ 20	1,880,000,100	100	0.0000053
100 %		+ 30	1,879,999,953	-47	-0.0000025
100 %		+ 40	1,879,999,800	-200	-0.0000106
100 %		+ 50	1,879,999,671	-329	-0.0000175
BATT. ENDPOINT	3.40	+ 20	1,879,999,942	-58	-0.0000031

Table 7-20. Frequency Stability Data (Band 2)

Note:

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

FCC ID: ZNFUS110		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Band 2 Frequency Stability Measurements
§2.1055 §24.235

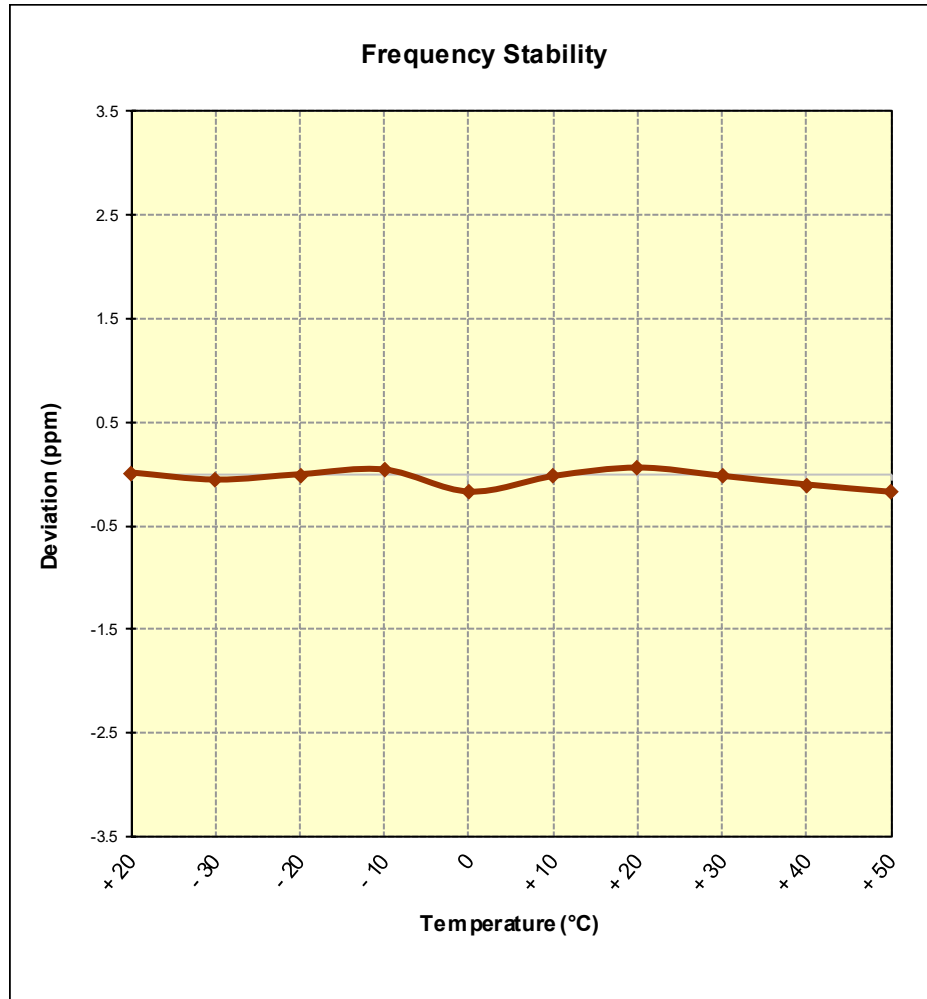






Figure 7-11. Frequency Stability Graph (Band 2)

FCC ID: ZNFUS110		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	 Approved by: Quality Manager
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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFUS110** complies with all the requirements of Parts 22, 24, & 27 of the FCC rules for LTE operation only.

FCC ID: ZNFUS110		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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