

7.4 Band Edge Emissions at Antenna Terminal

§2.1051 §22.917(a) §24.238(a) §27.53(g) §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.

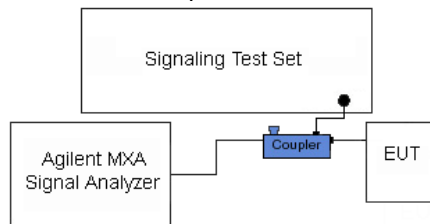


Figure 7-3. Test Instrument & Measurement Setup

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(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.

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Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 53 of 122

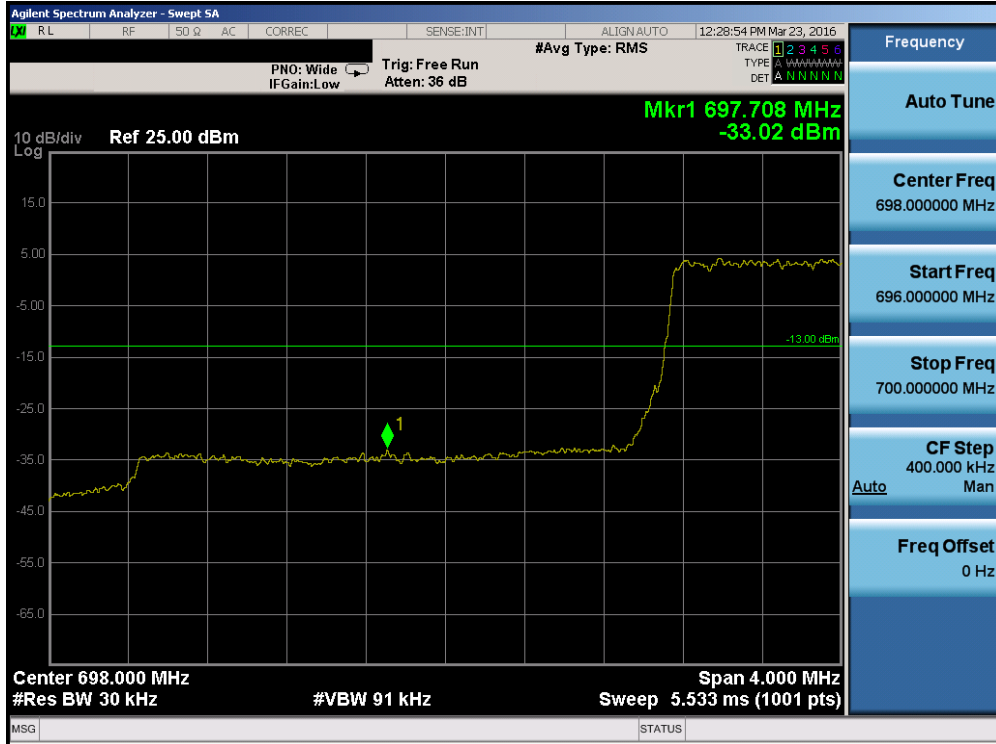


Plot 7-79. Upper Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)



Plot 7-80. Upper Extended Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 55 of 122	

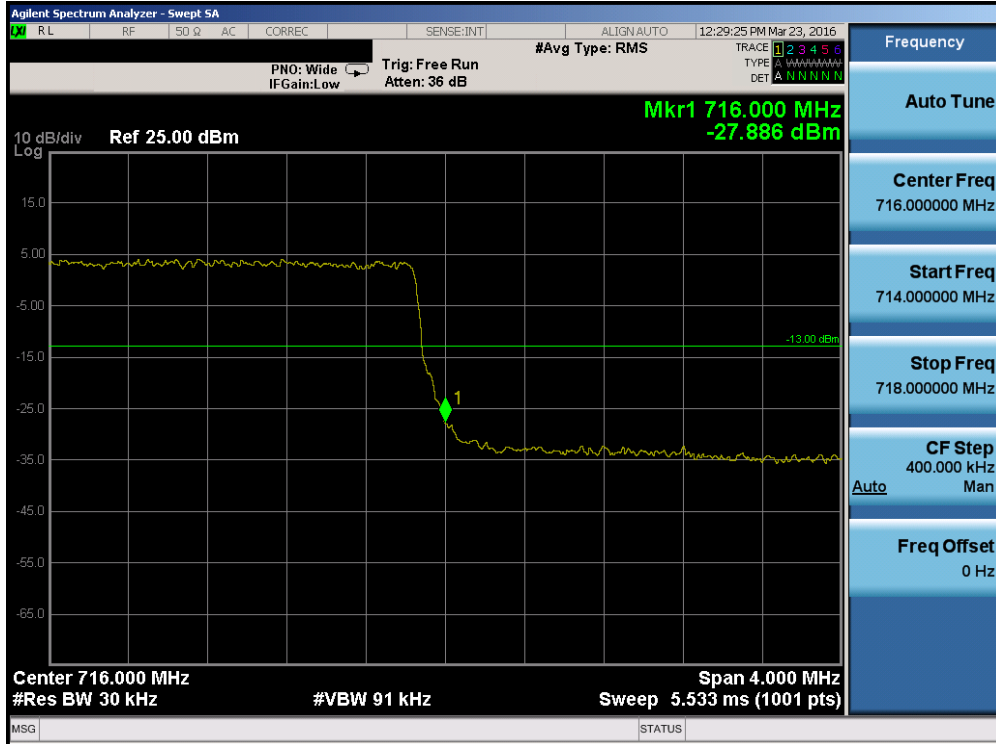


Plot 7-81. Lower Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

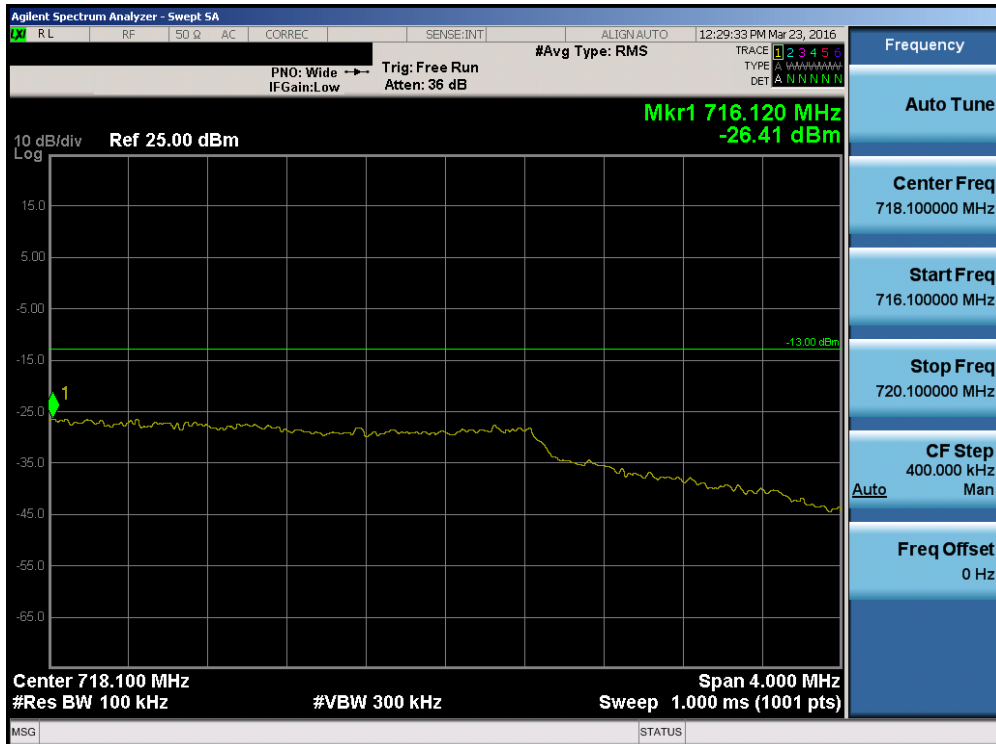


Plot 7-82. Lower Extended Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 56 of 122	

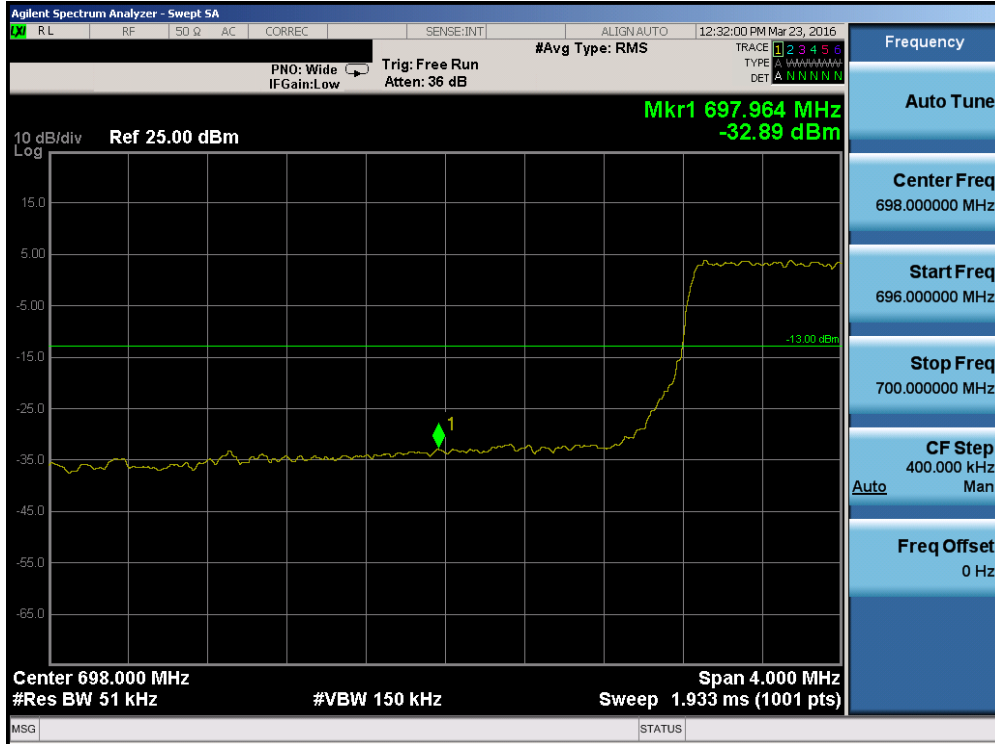


Plot 7-83. Upper Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

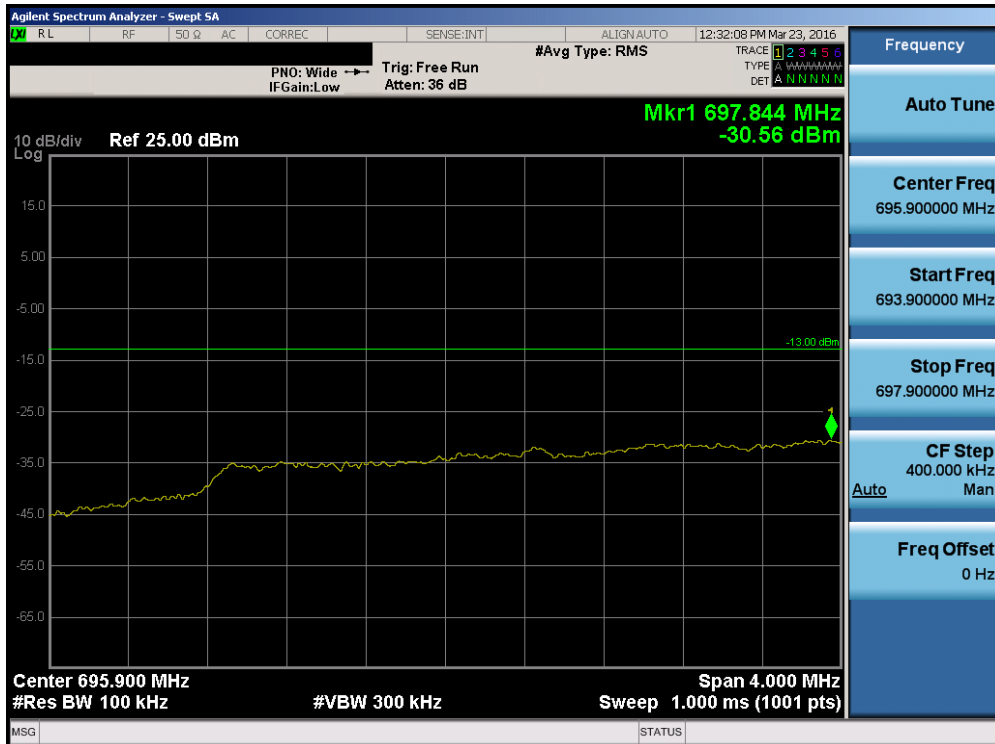


Plot 7-84. Upper Extended Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 57 of 122	

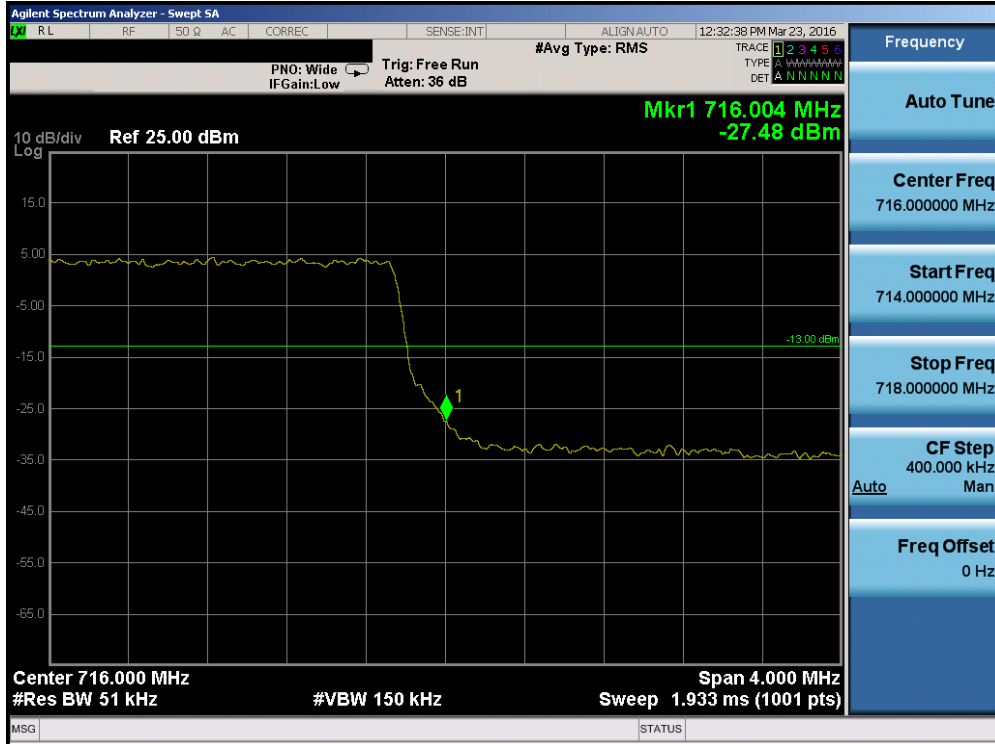


Plot 7-85. Lower Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)

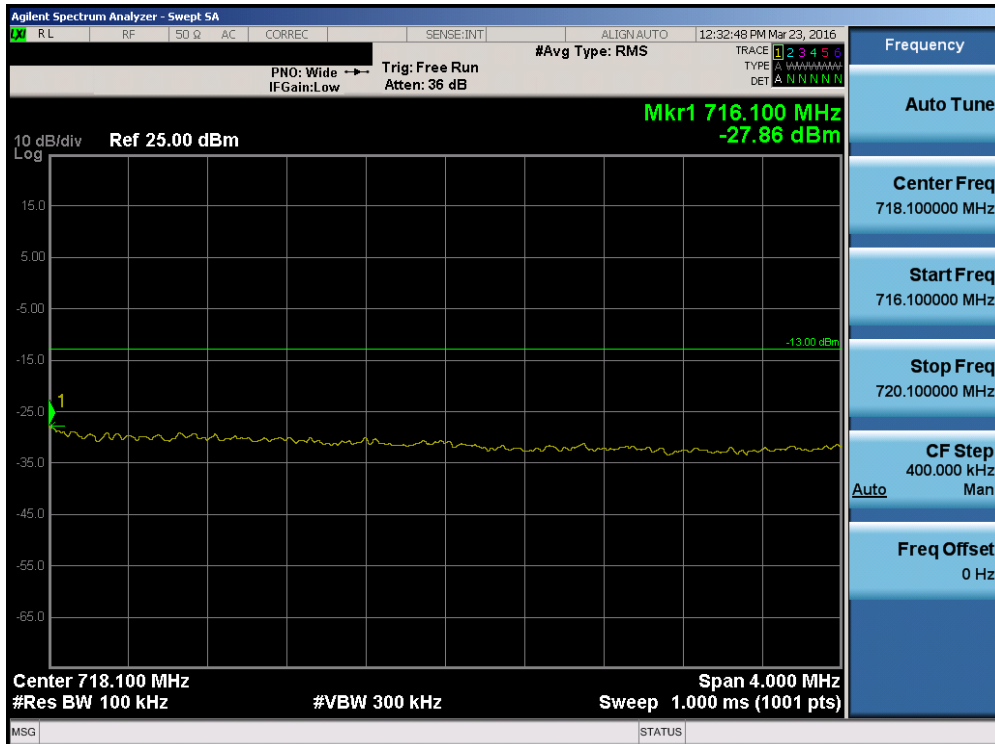


Plot 7-86. Lower Extended Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 58 of 122	



Plot 7-87. Upper Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)

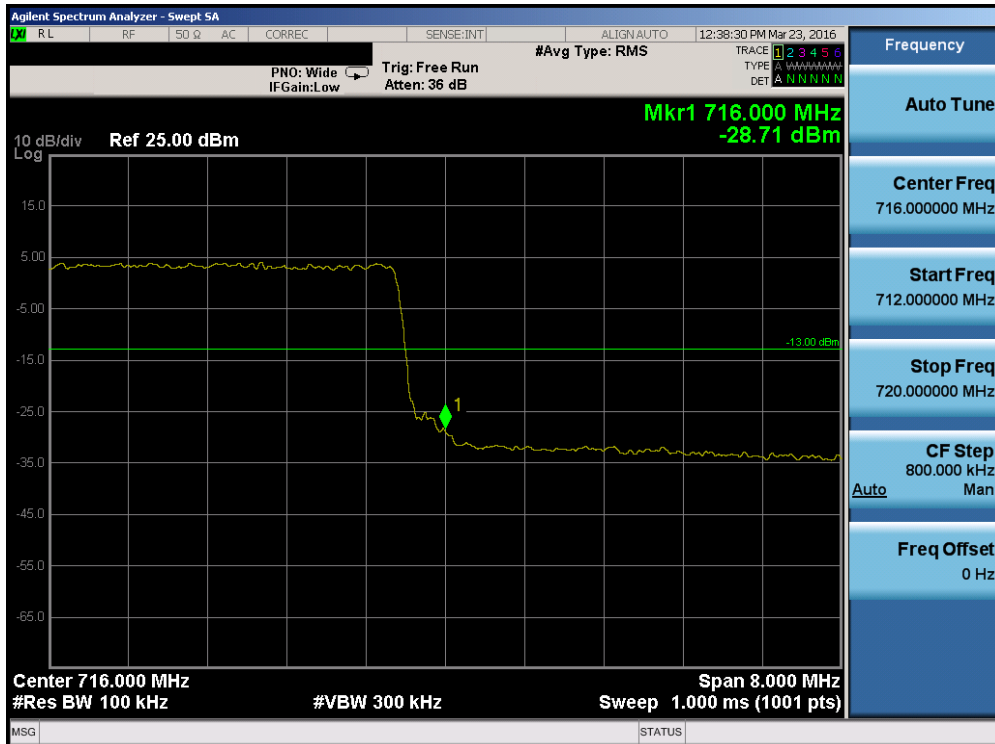


Plot 7-88. Upper Extended Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 59 of 122	

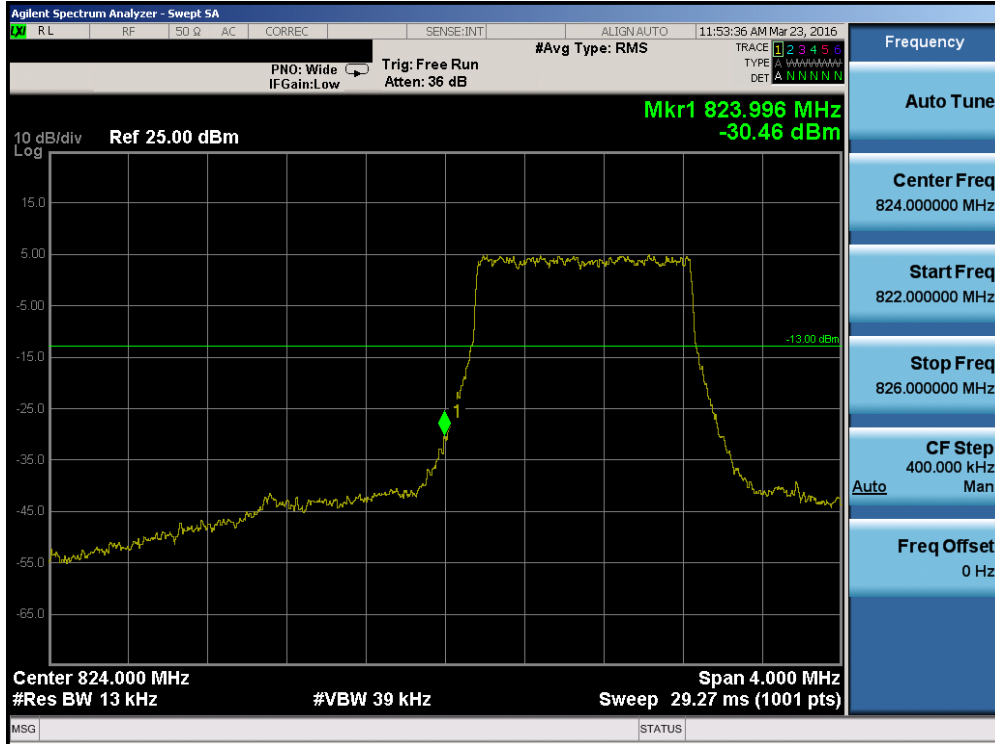


Plot 7-89. Lower Band Edge Plot (Band 12 – 10.0MHz QPSK – RB Size 50)



Plot 7-90. Upper Band Edge Plot (Band 12 – 10.0MHz QPSK – RB Size 50)

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Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 60 of 122	



Plot 7-91. Lower Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

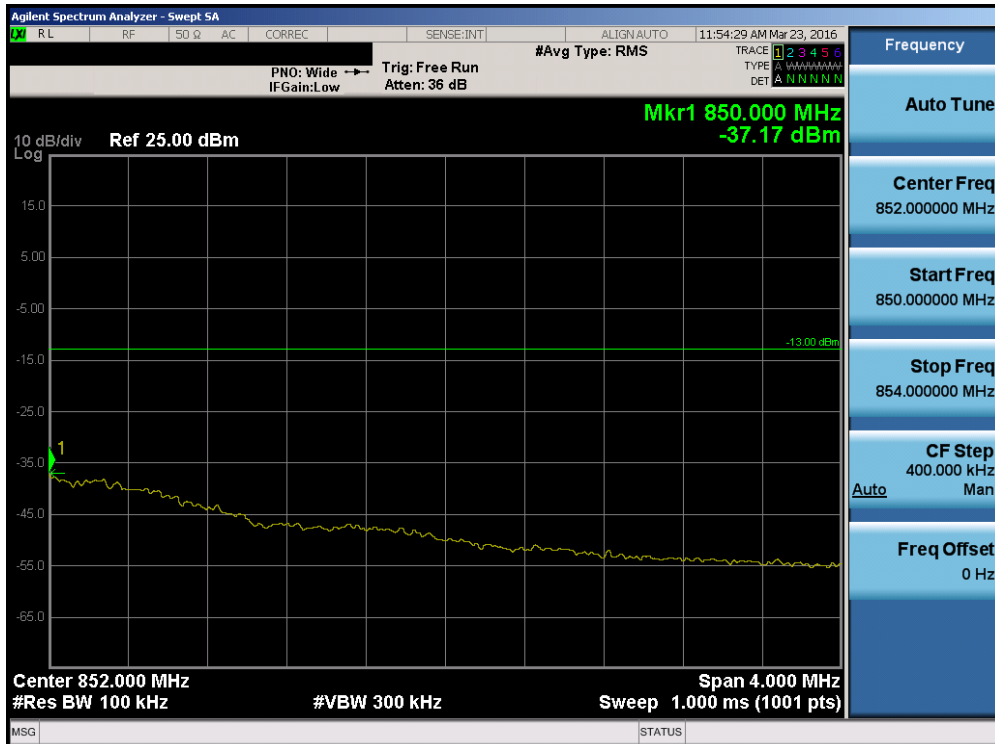


Plot 7-92. Lower Extended Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 61 of 122	

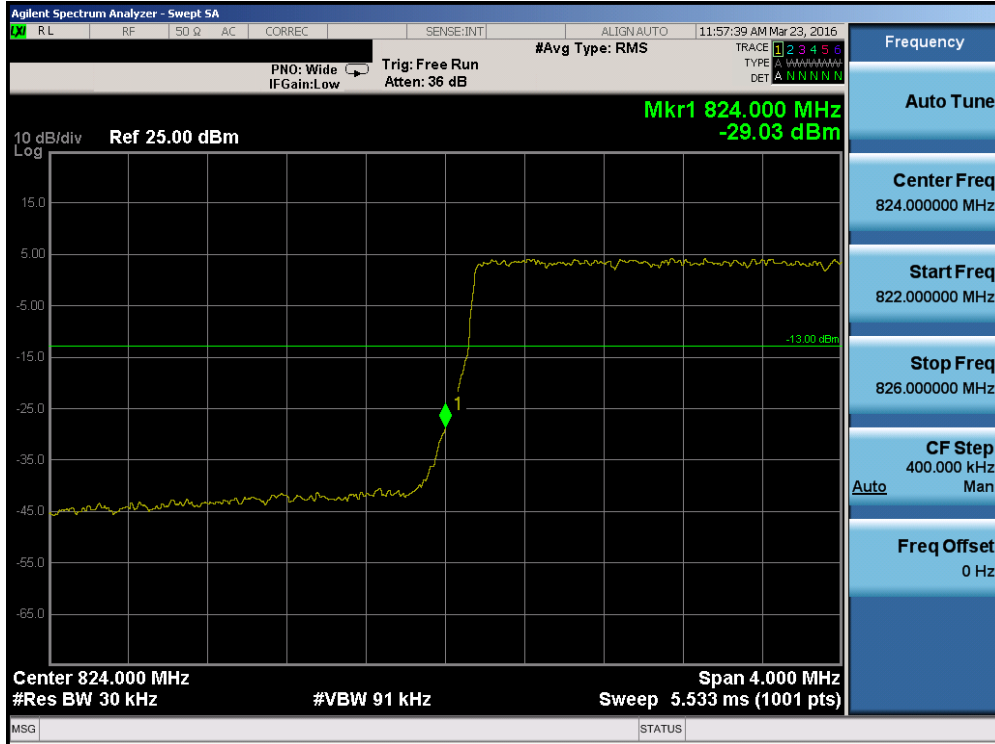


Plot 7-93. Upper Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

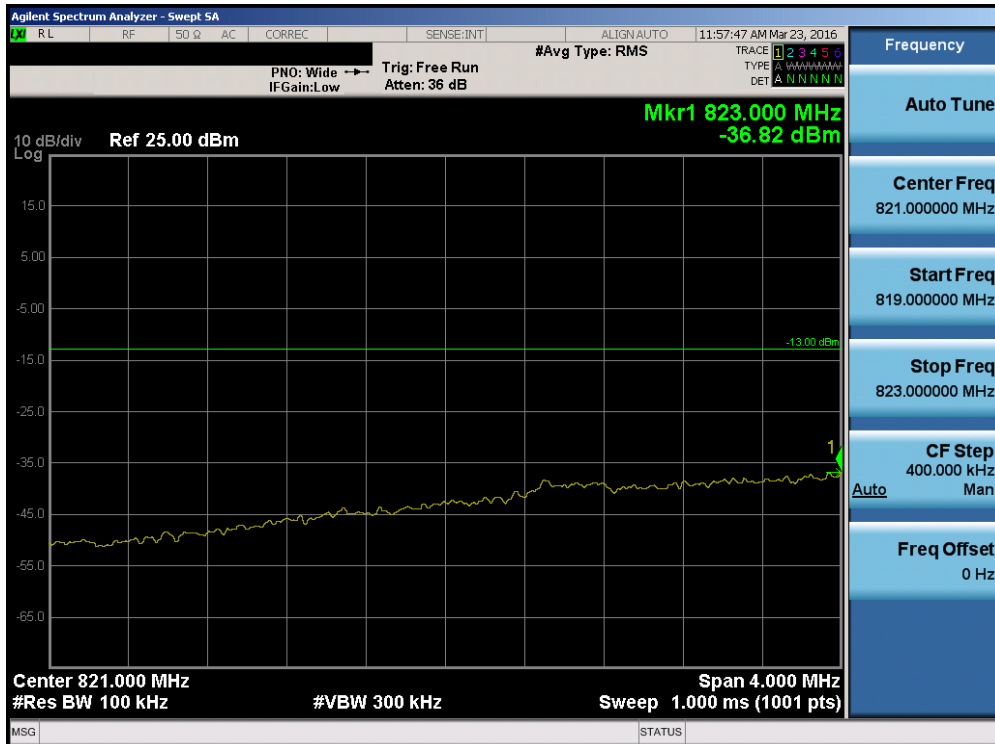


Plot 7-94. Upper Extended Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 62 of 122	

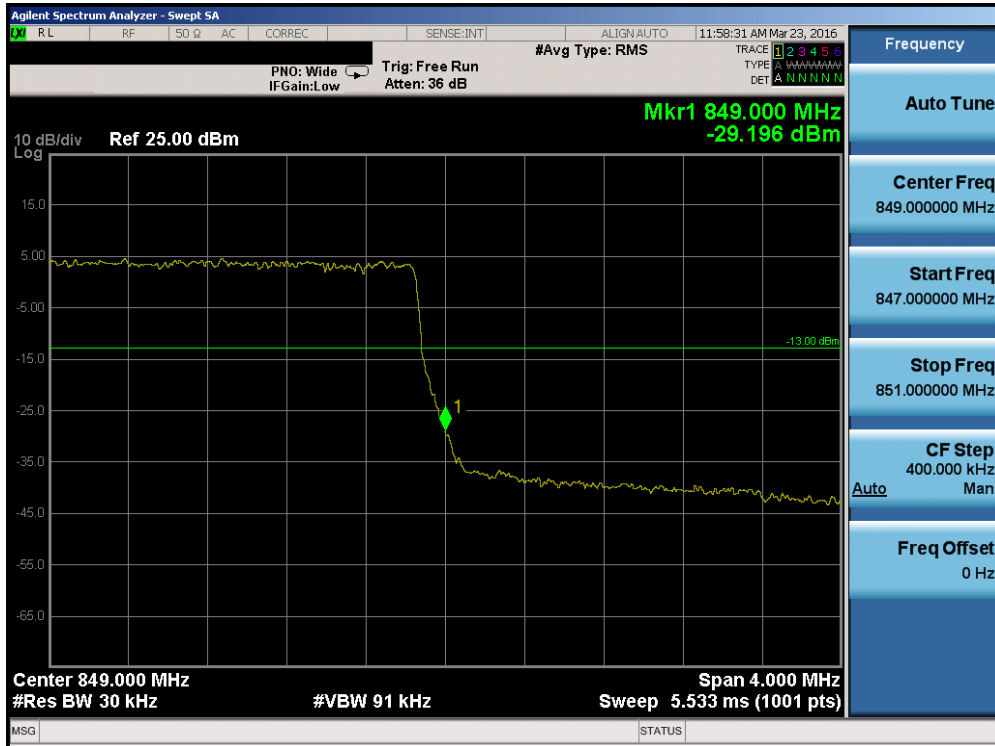


Plot 7-95. Lower Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)



Plot 7-96. Lower Extended Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 63 of 122	

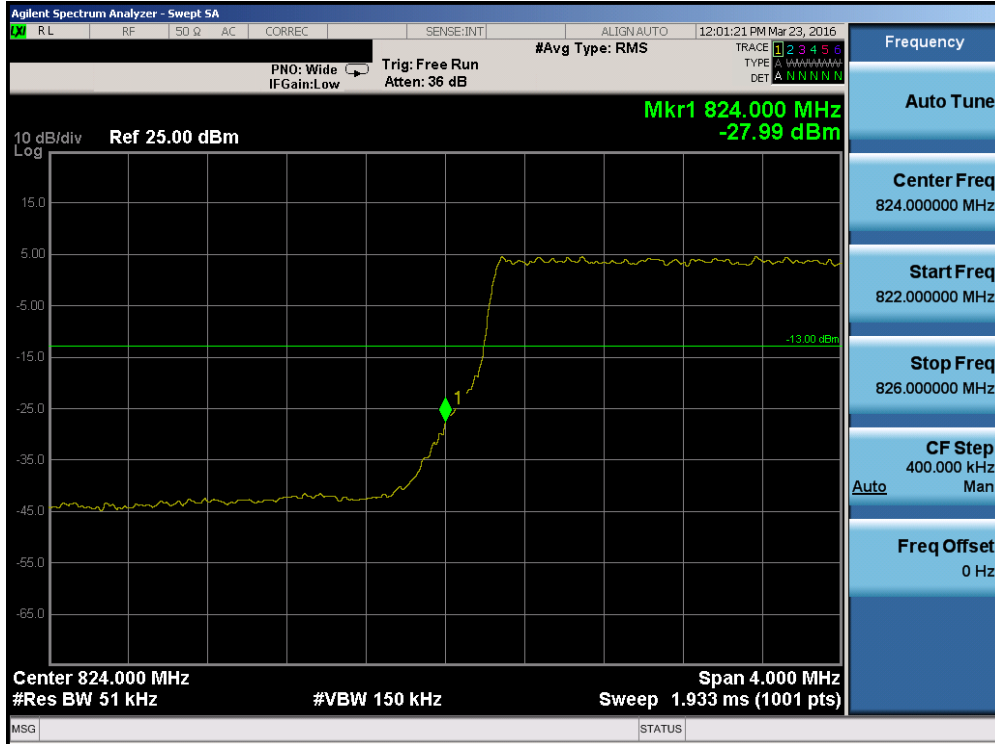


Plot 7-97. Upper Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)

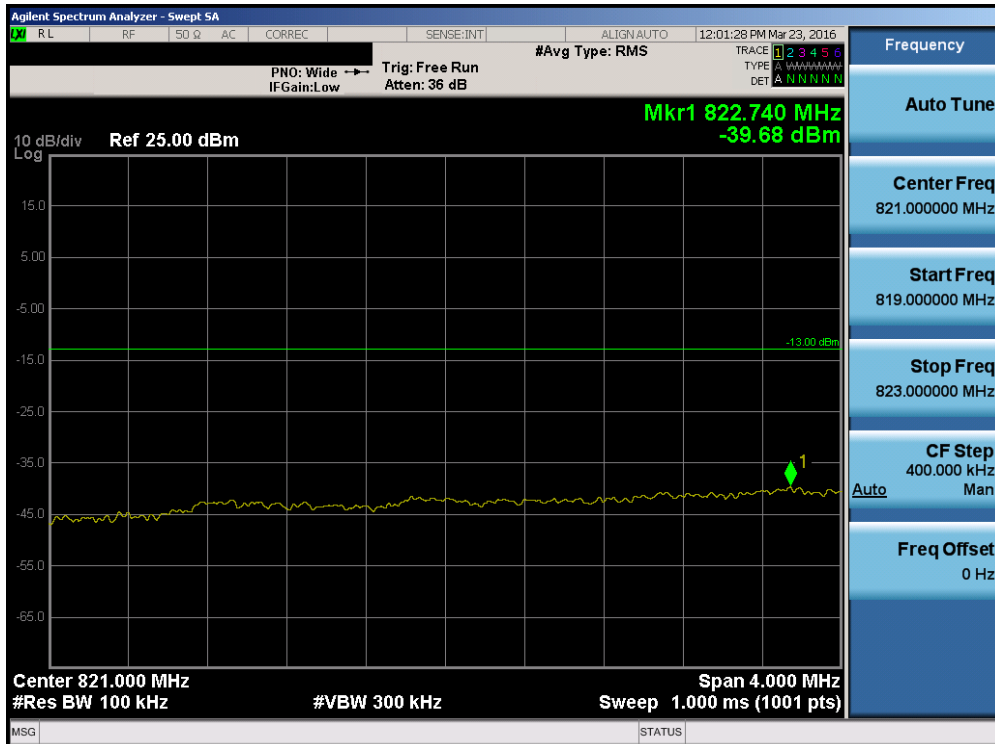


Plot 7-98. Upper Extended Band Edge Plot (Band 5 – Band 5 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 64 of 122	

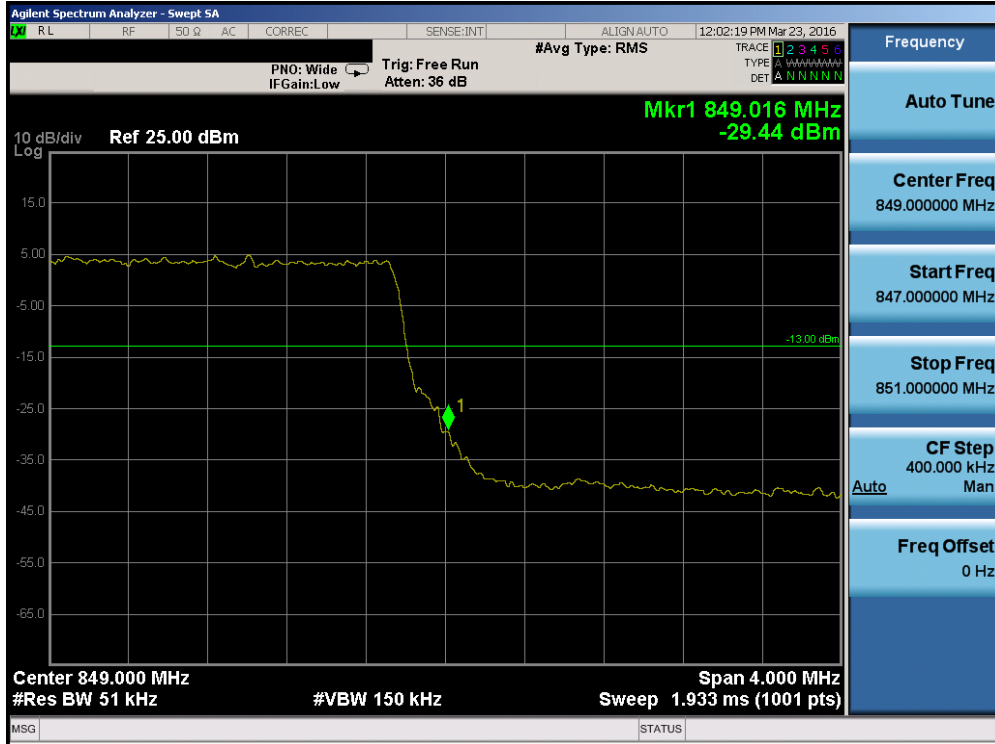


Plot 7-99. Lower Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

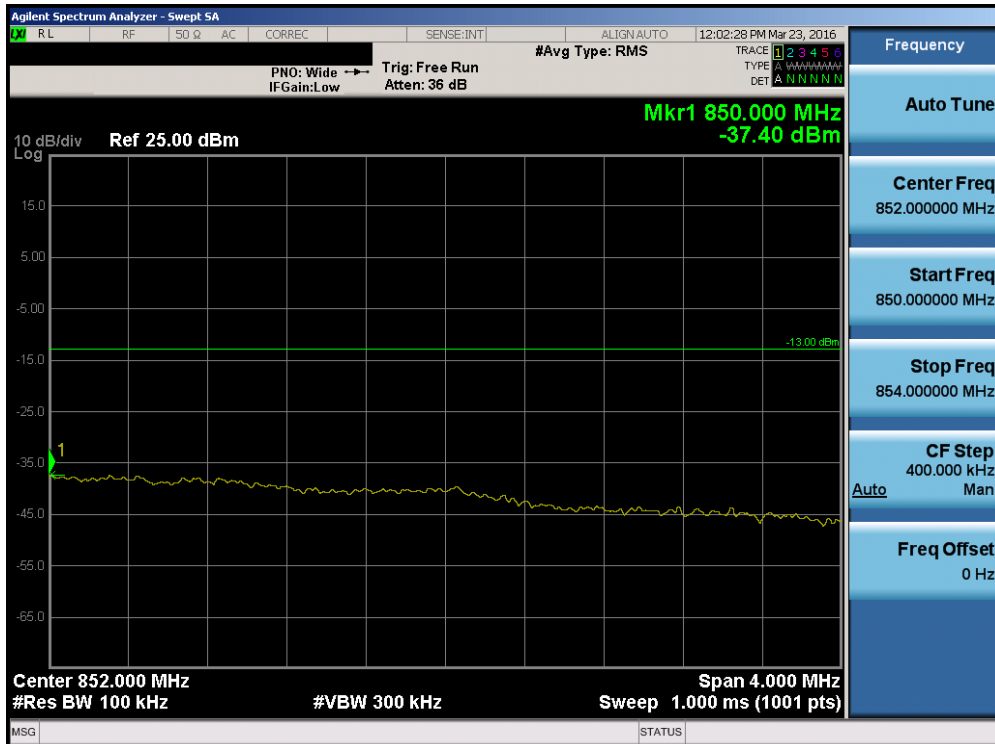


Plot 7-100. Lower Extended Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 65 of 122	

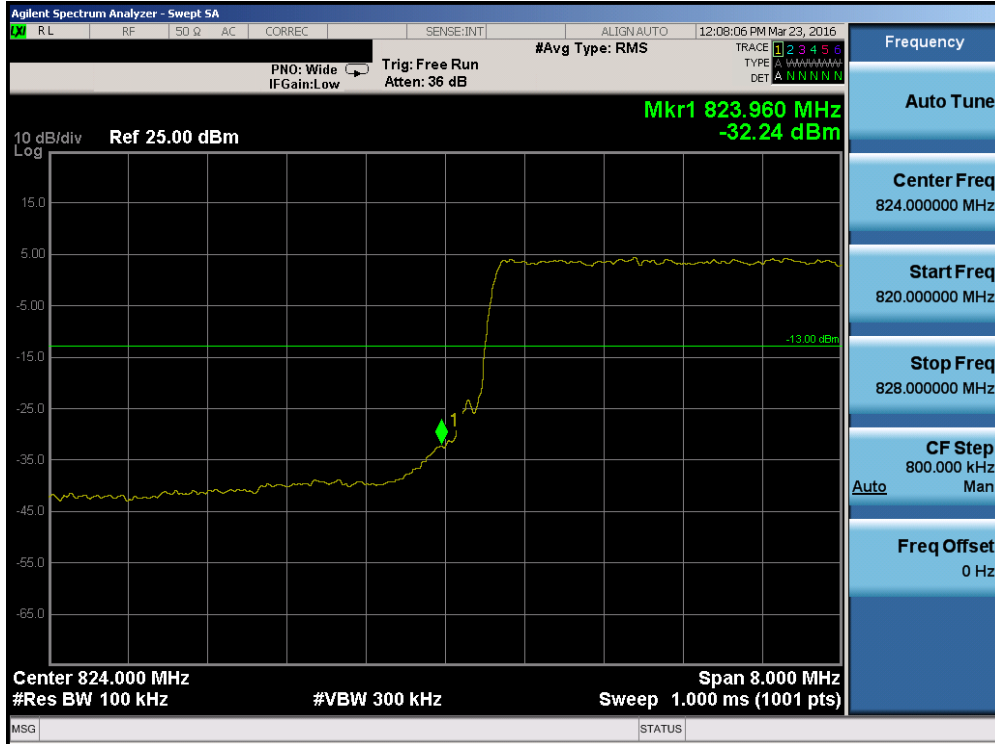


Plot 7-101. Upper Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)



Plot 7-102. Upper Extended Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 66 of 122	

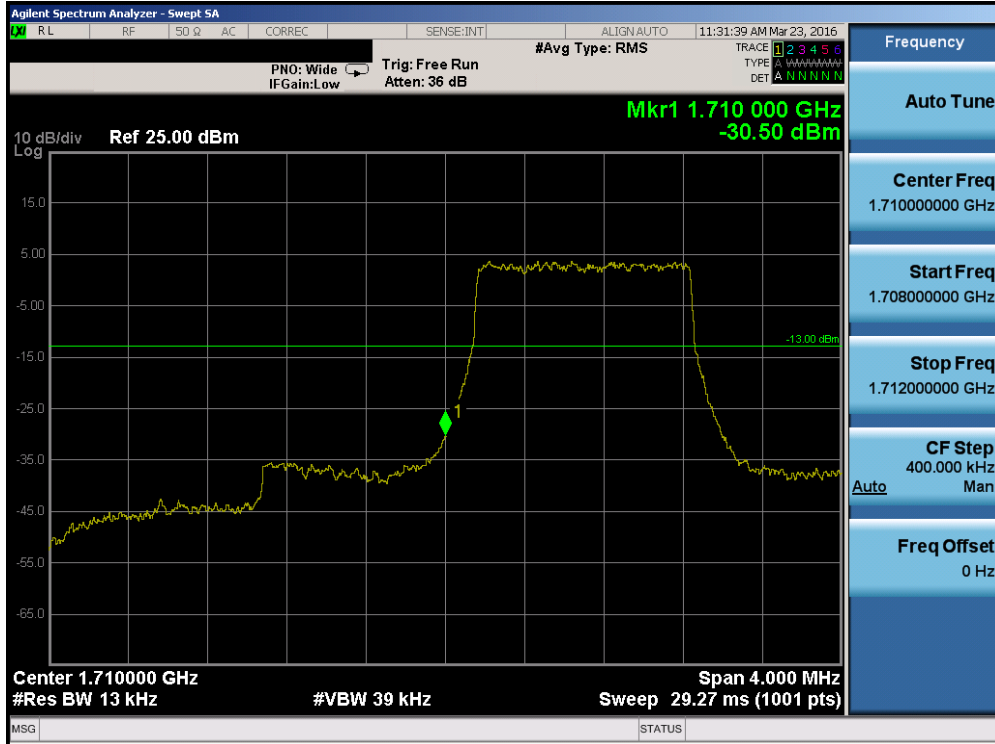


Plot 7-103. Lower Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)

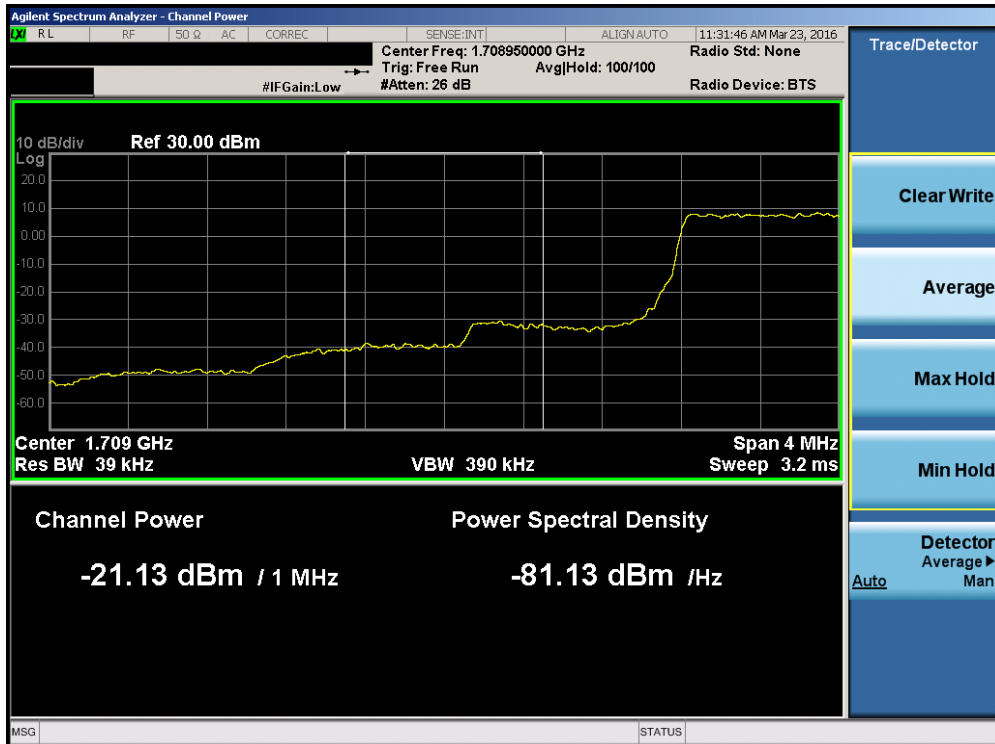


Plot 7-104. Upper Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 67 of 122	



Plot 7-105. Lower Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

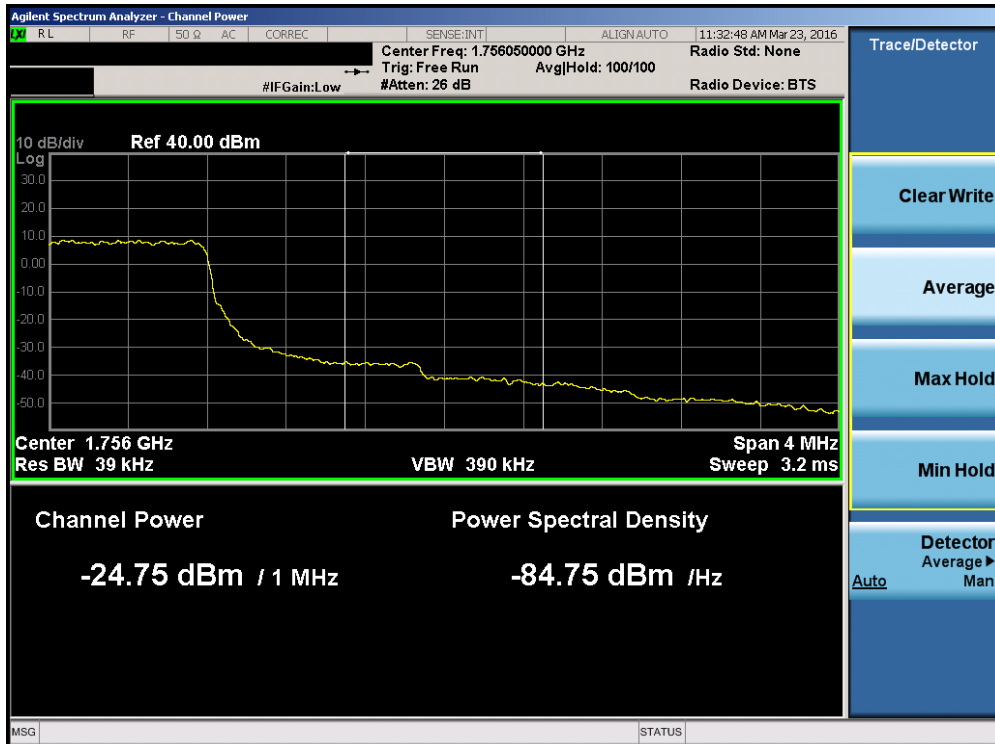


Plot 7-106. Lower Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 68 of 122	

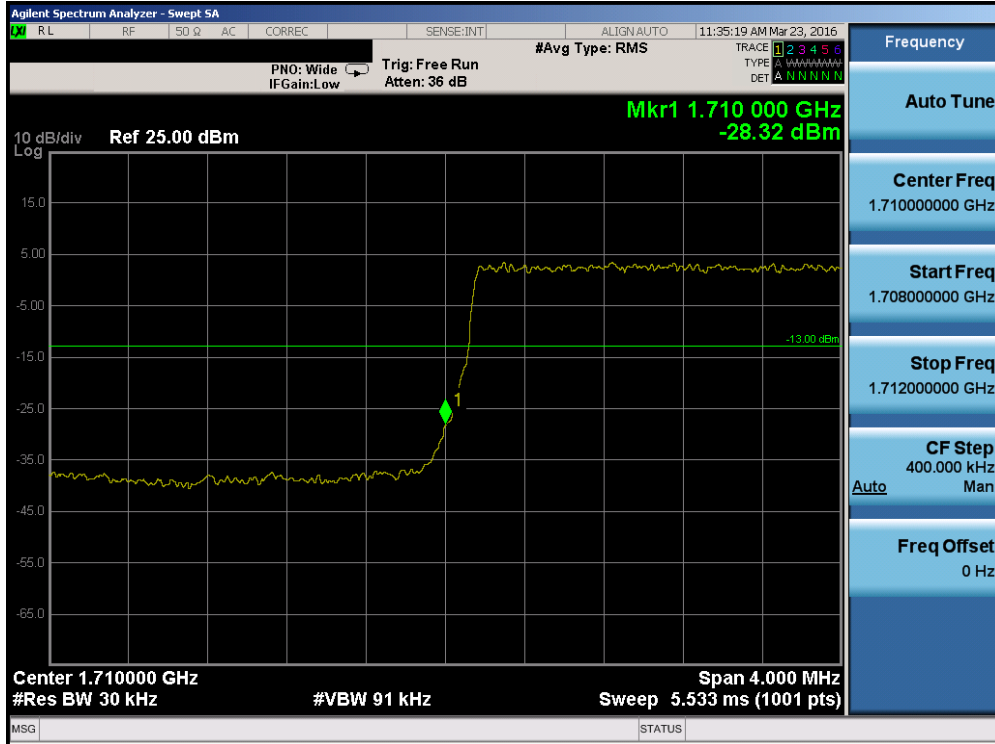


Plot 7-107. Upper Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

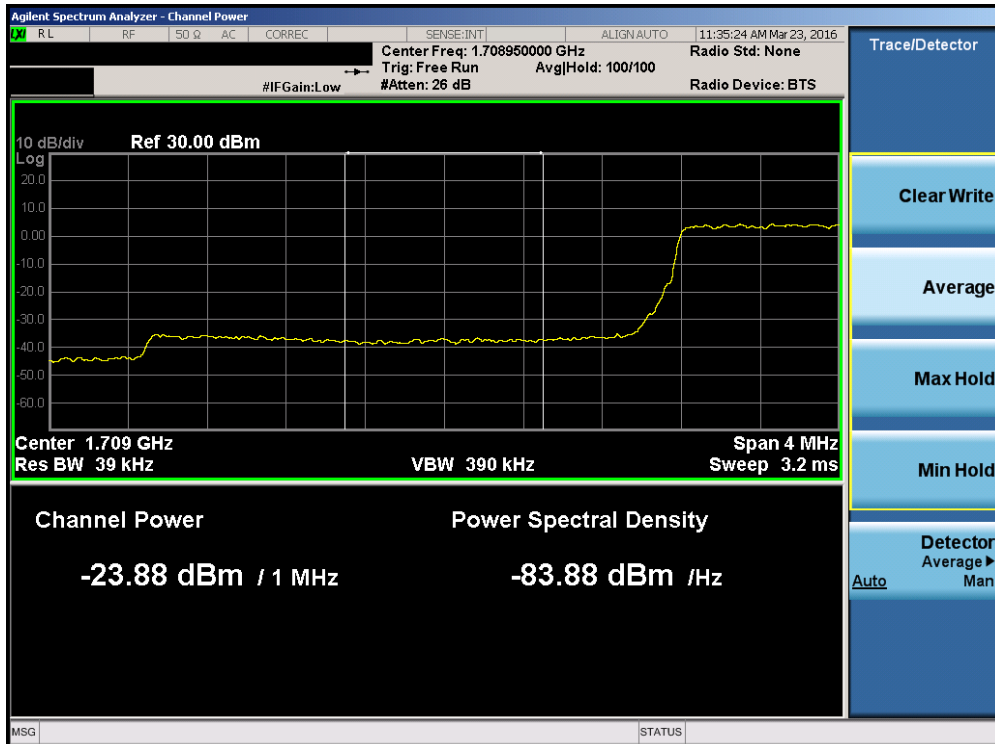


Plot 7-108. Upper Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 69 of 122

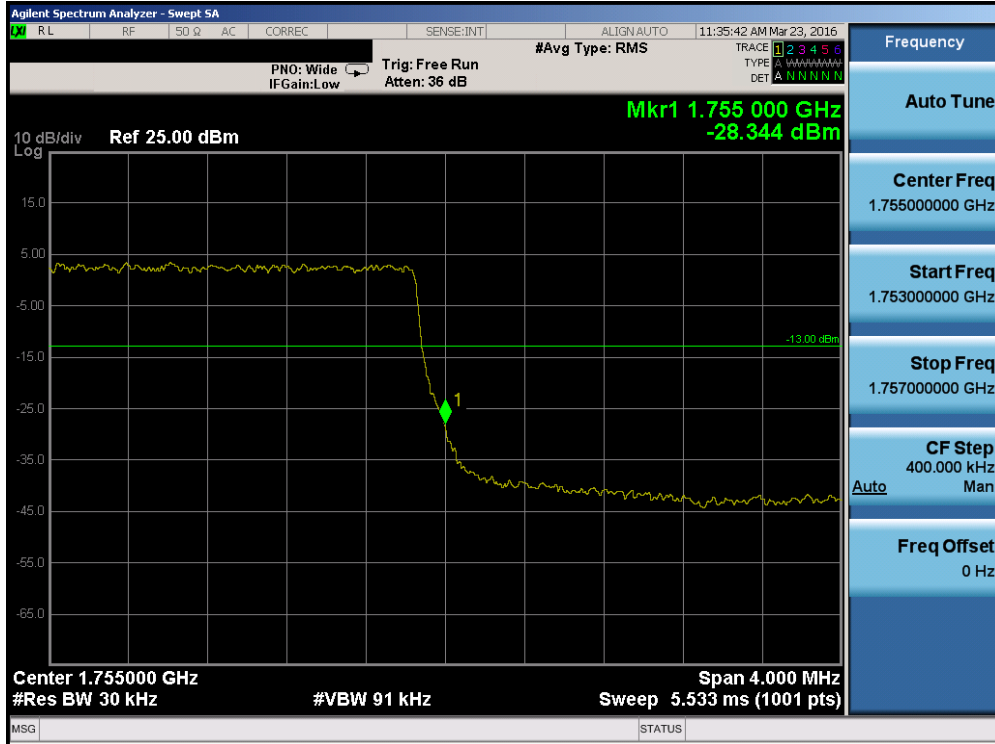


Plot 7-109. Lower Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

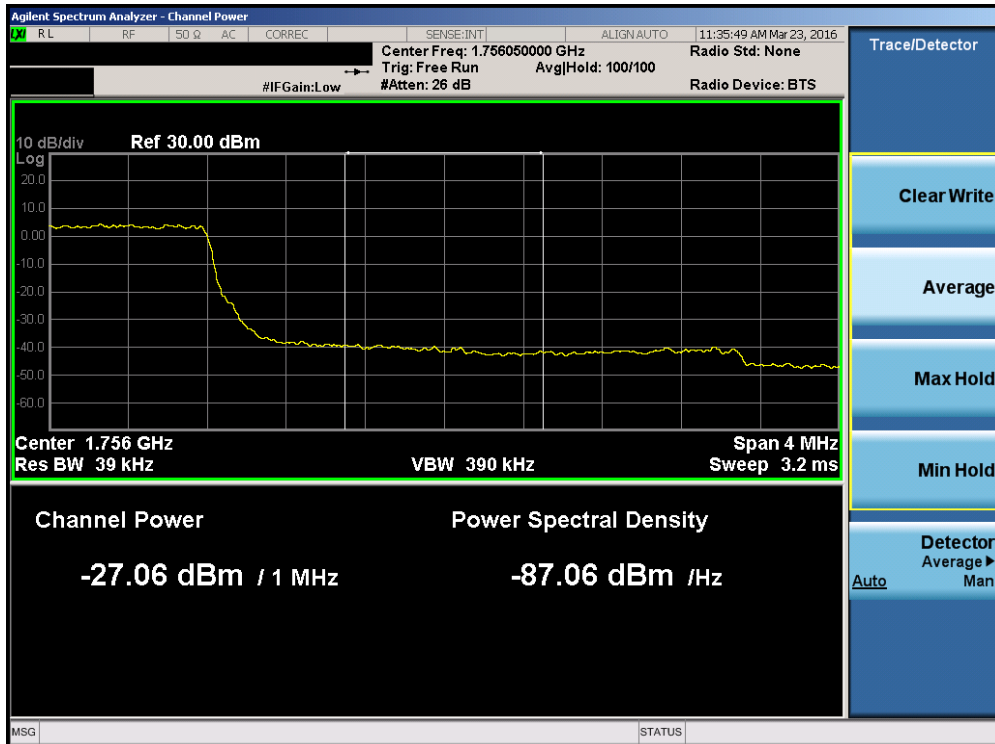


Plot 7-110. Lower Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 70 of 122	

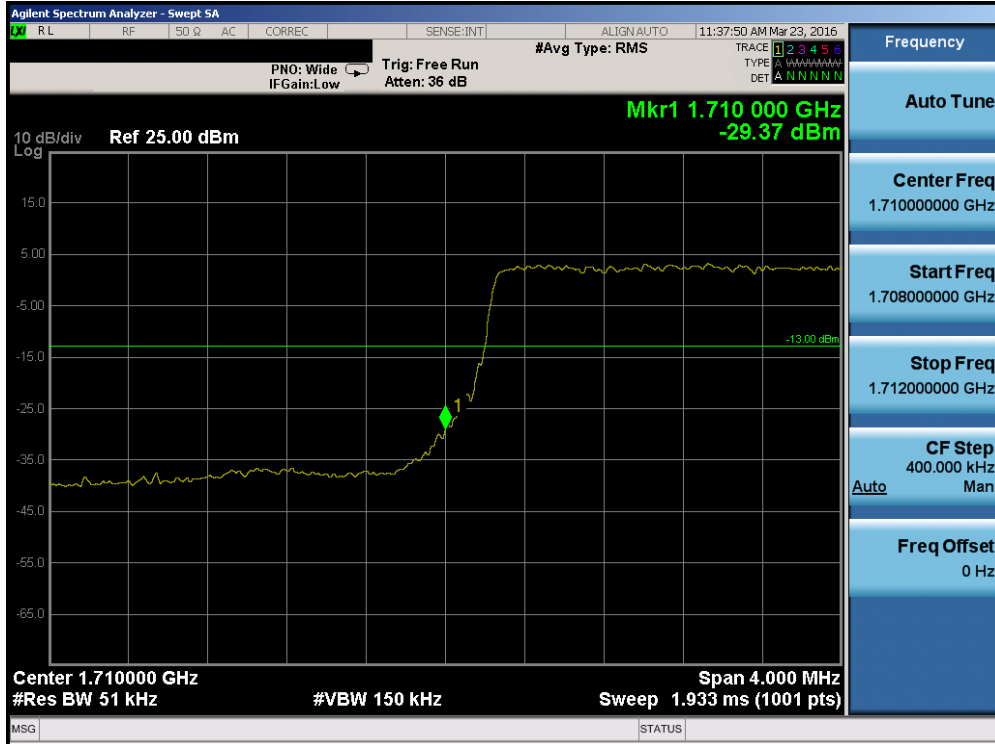


Plot 7-111. Upper Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

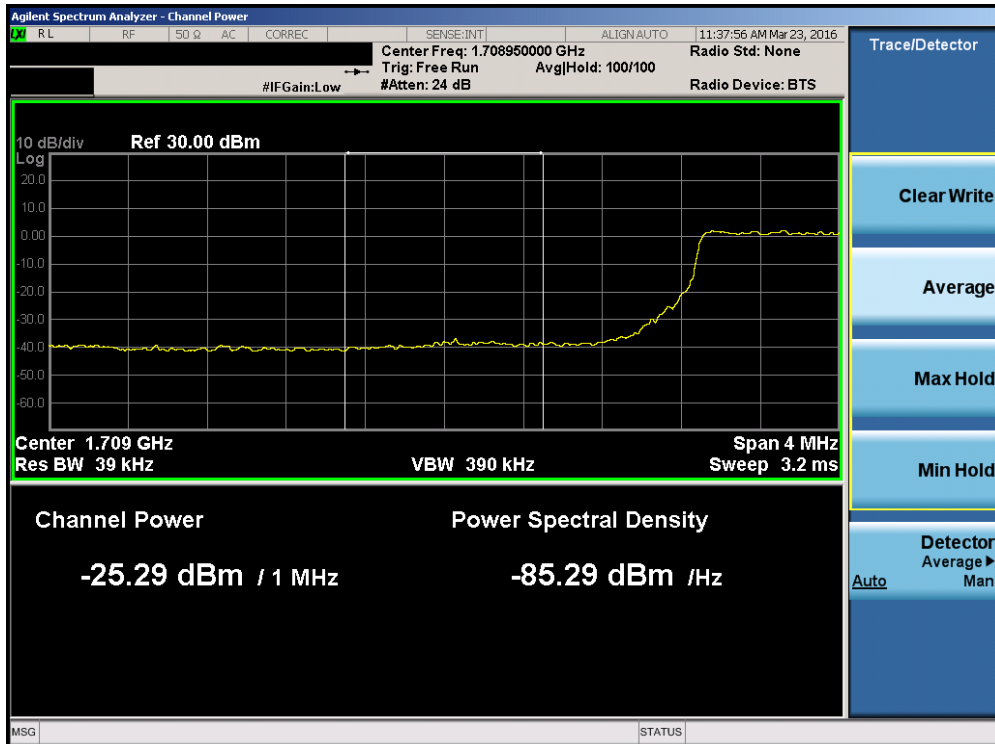


Plot 7-112. Upper Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 71 of 122

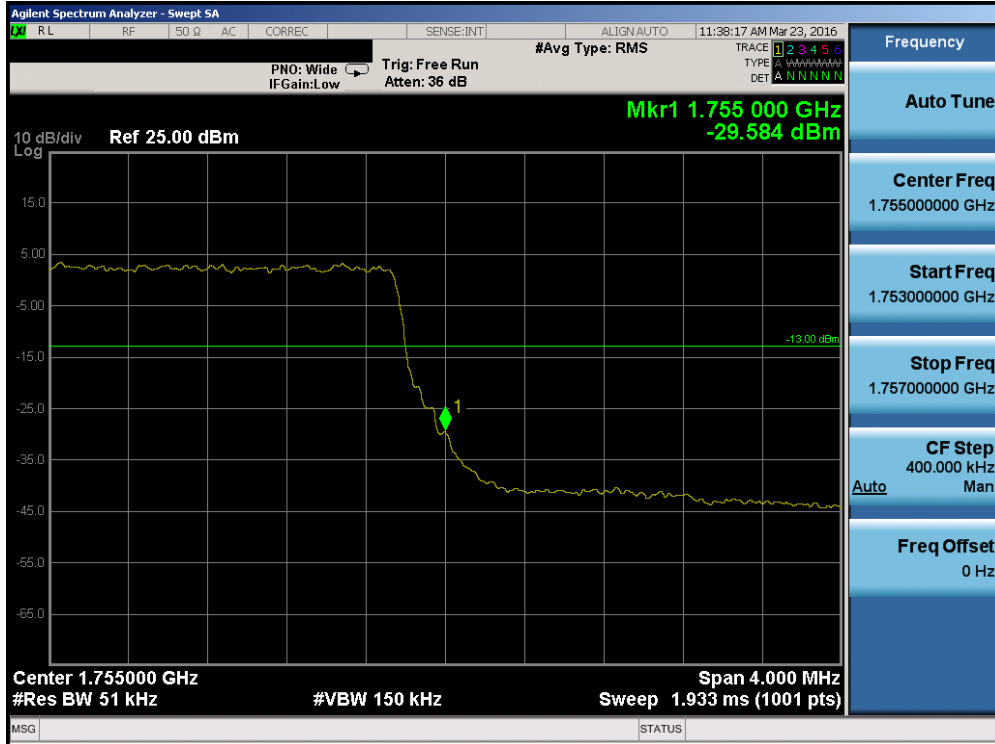


Plot 7-113. Lower Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

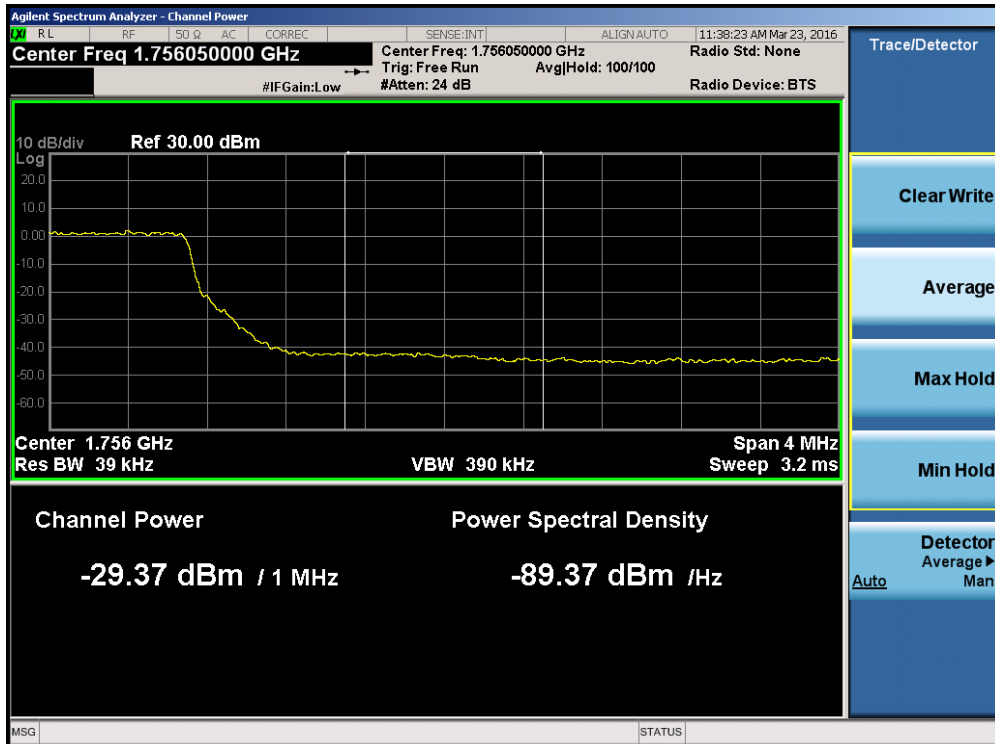


Plot 7-114. Lower Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 72 of 122

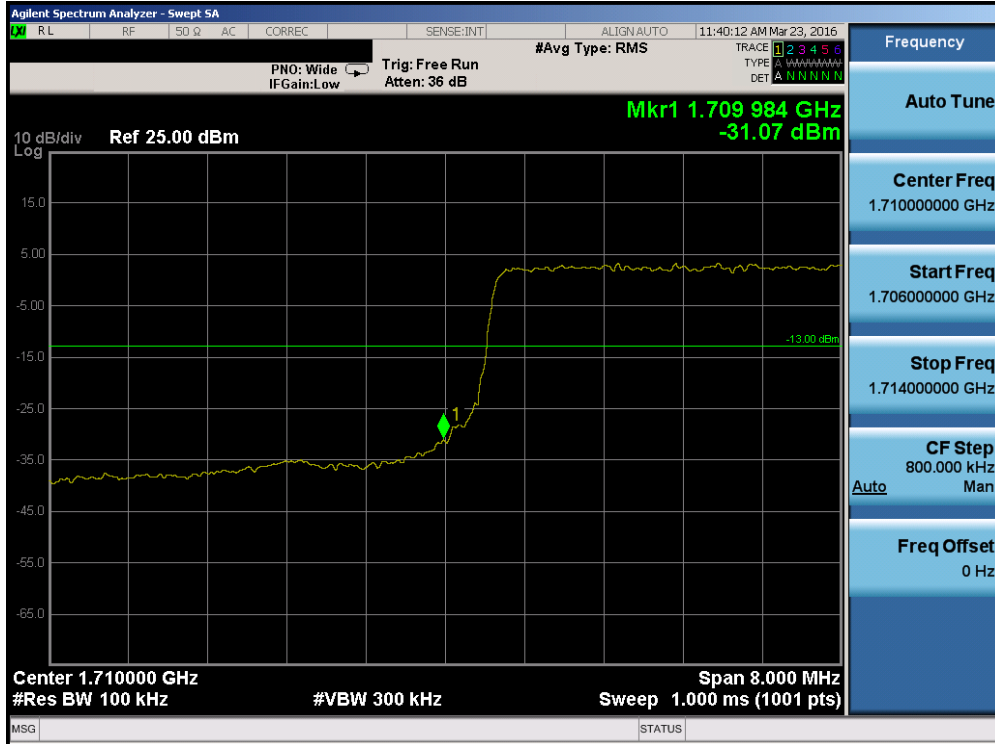


Plot 7-115. Upper Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

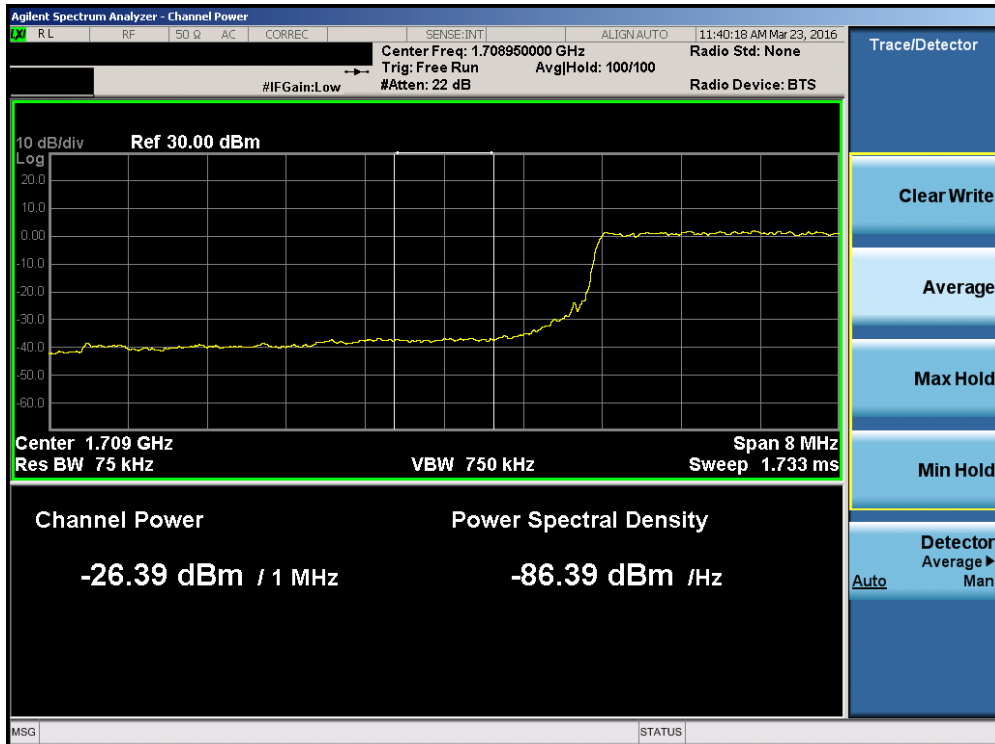


Plot 7-116. Upper Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 73 of 122

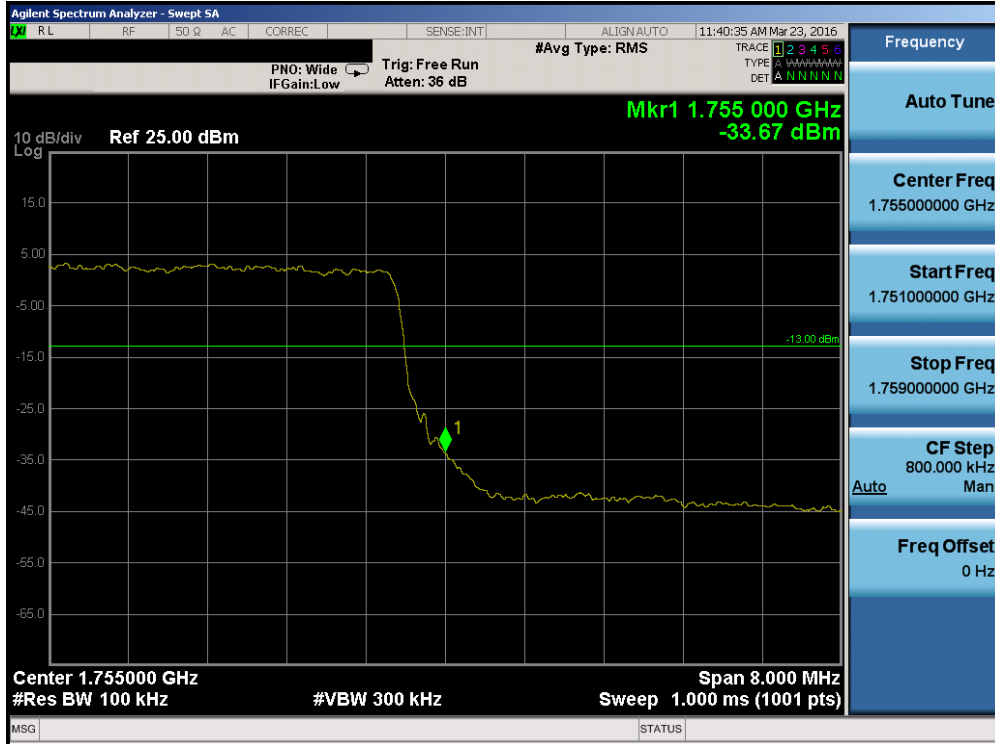


Plot 7-117. Lower Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

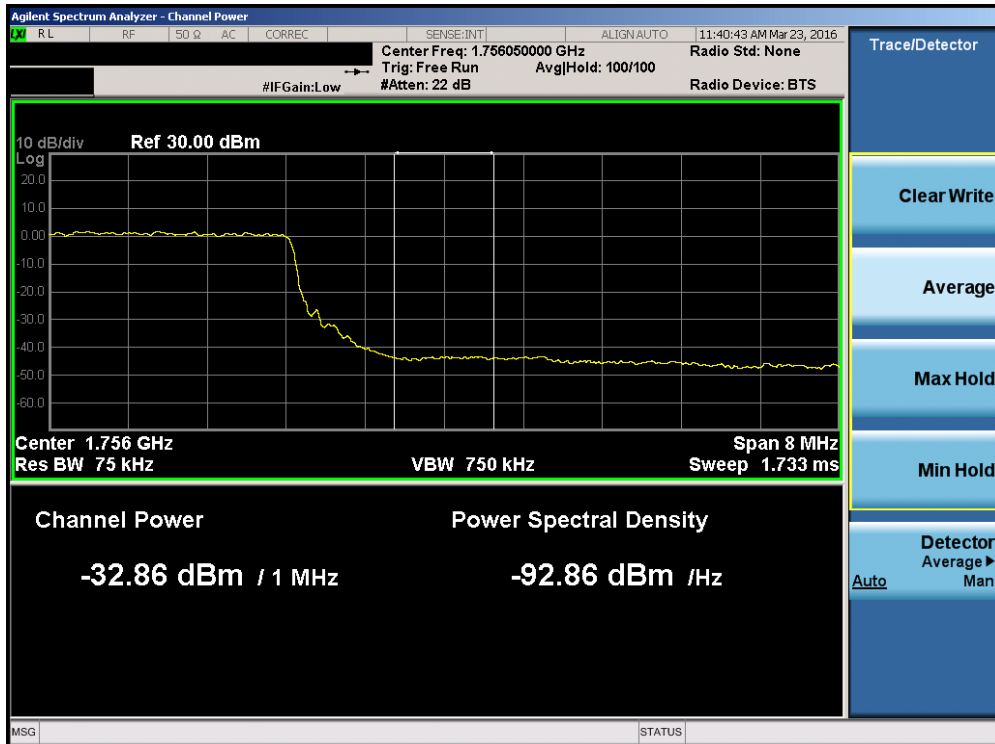


Plot 7-118. Lower Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 74 of 122

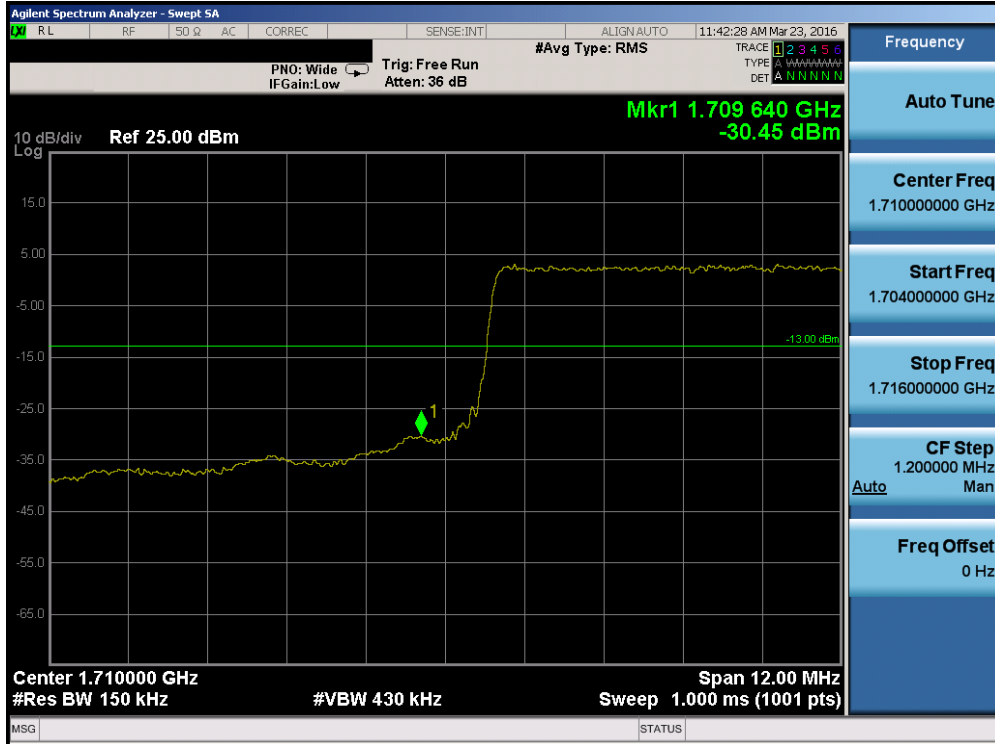


Plot 7-119. Upper Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

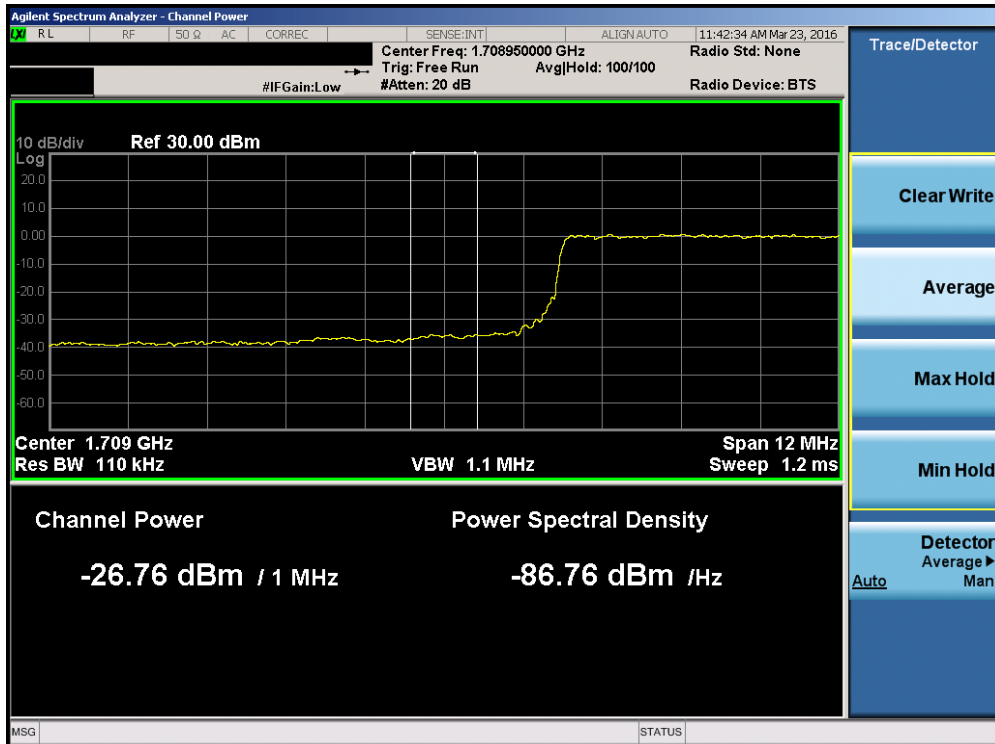


Plot 7-120. Upper Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 75 of 122	

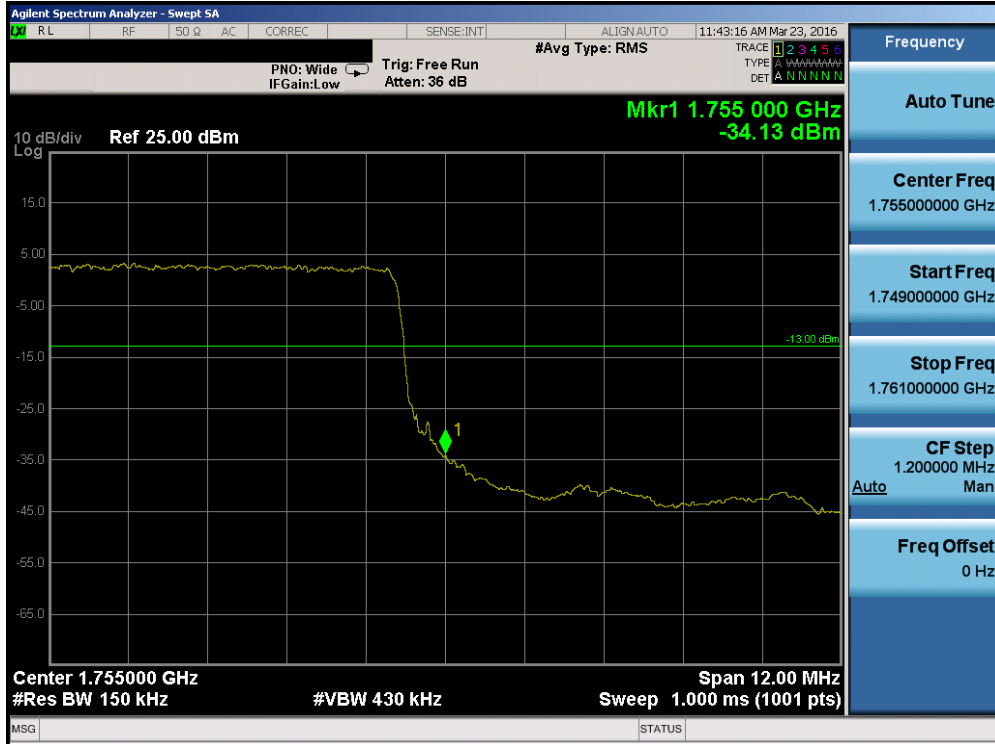


Plot 7-121. Lower Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

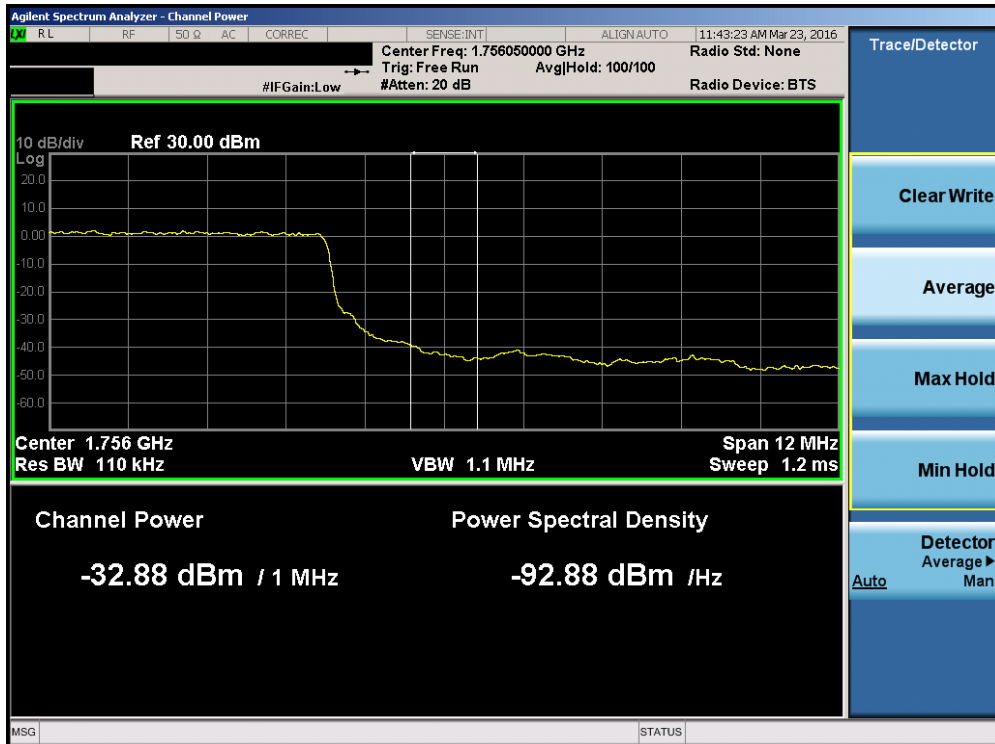


Plot 7-122. Lower Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 76 of 122

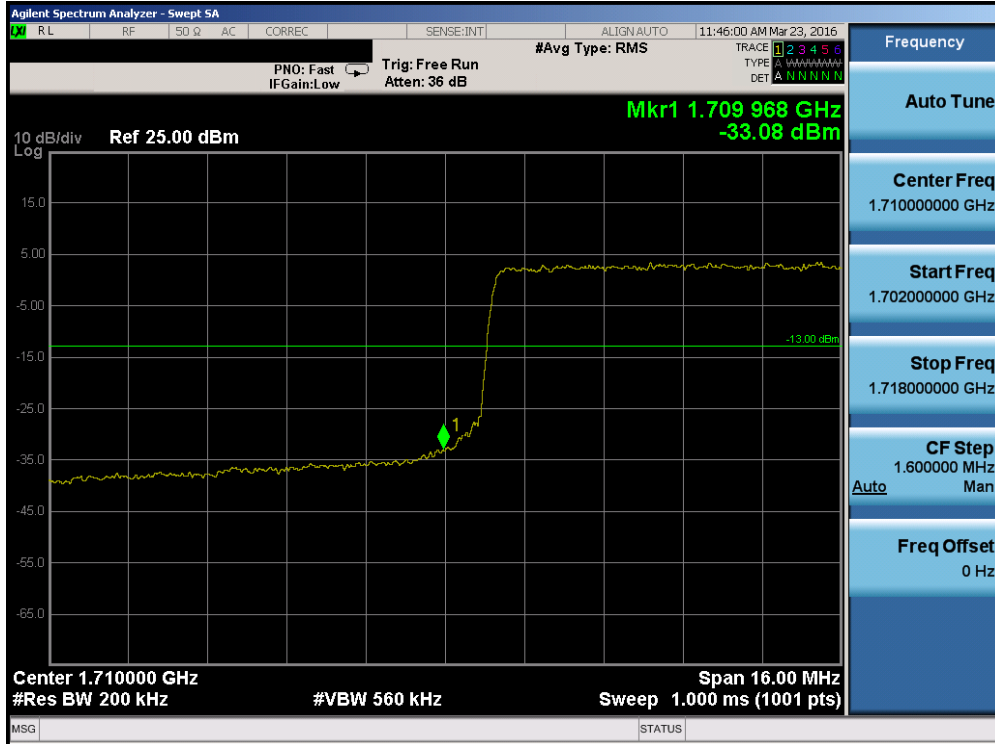


Plot 7-123. Upper Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

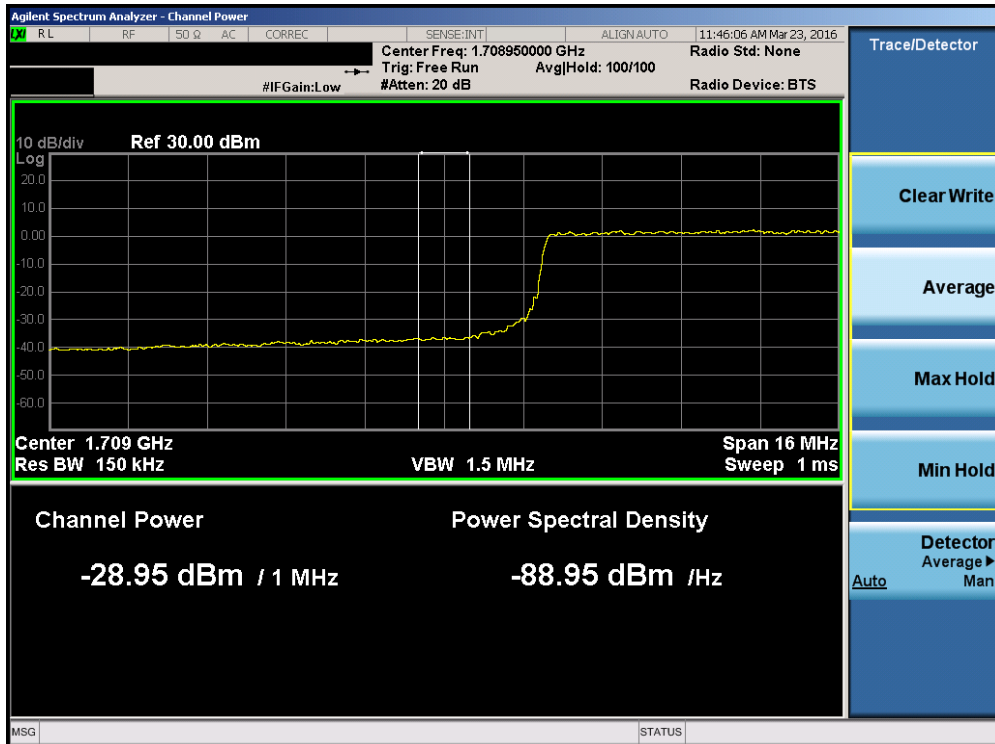


Plot 7-124. Upper Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 77 of 122

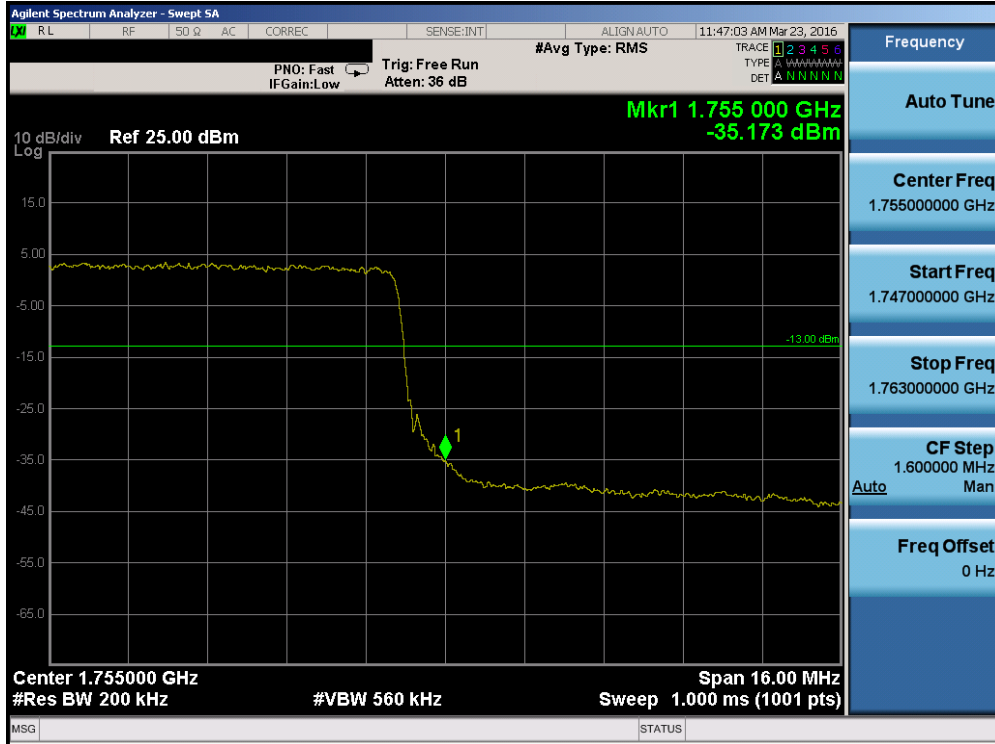


Plot 7-125. Lower Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

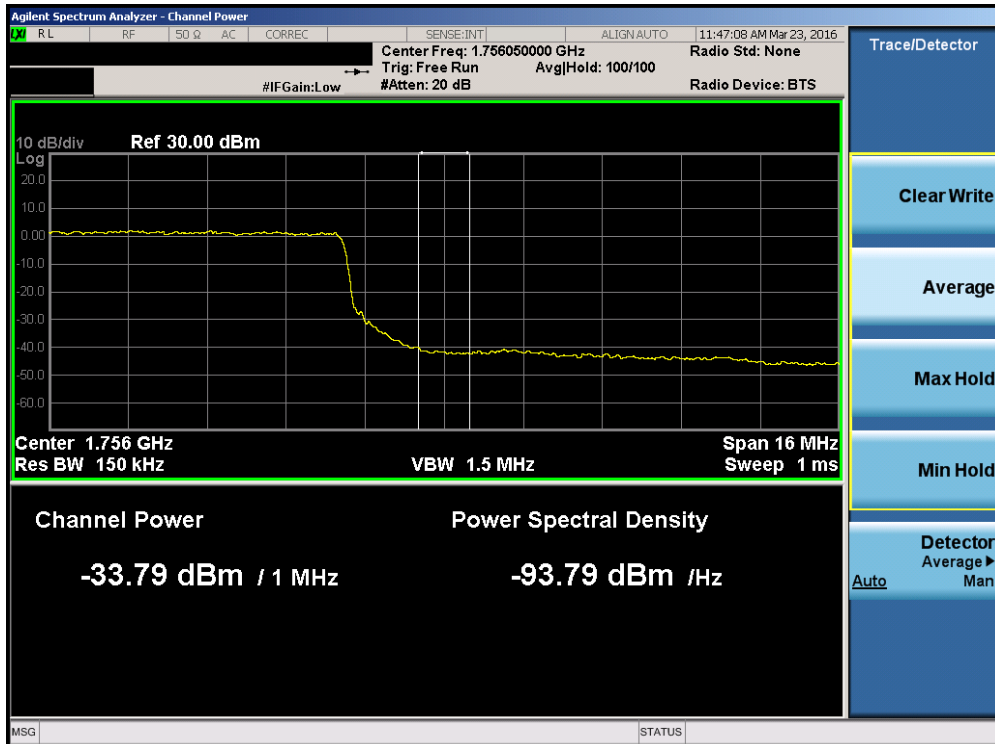


Plot 7-126. Lower Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 78 of 122	

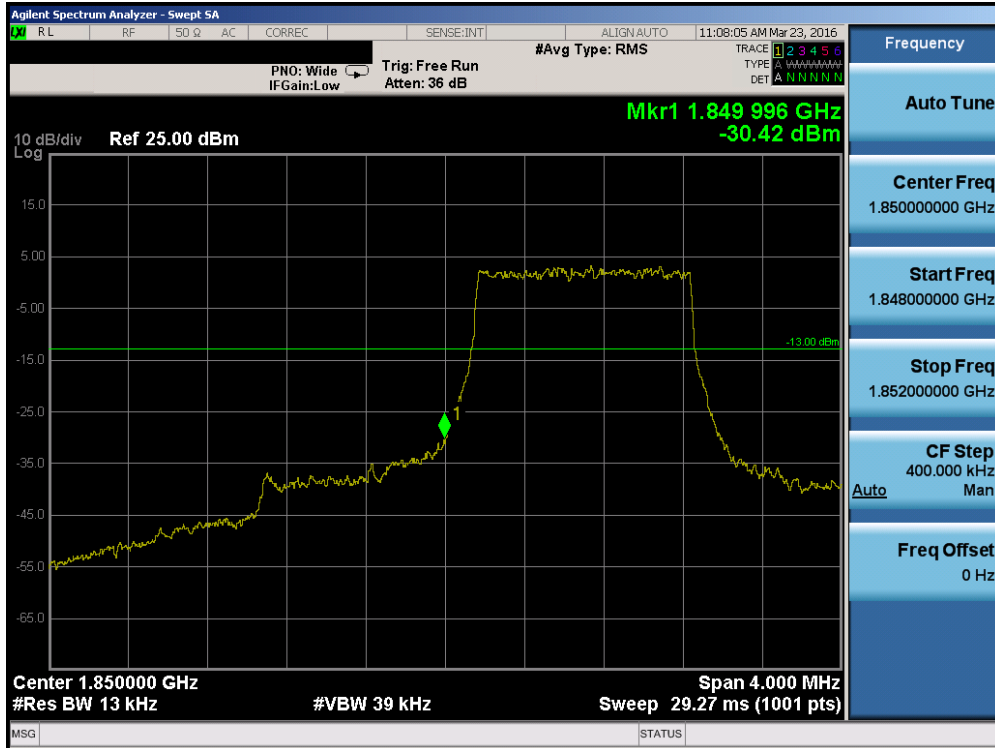


Plot 7-127. Upper Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

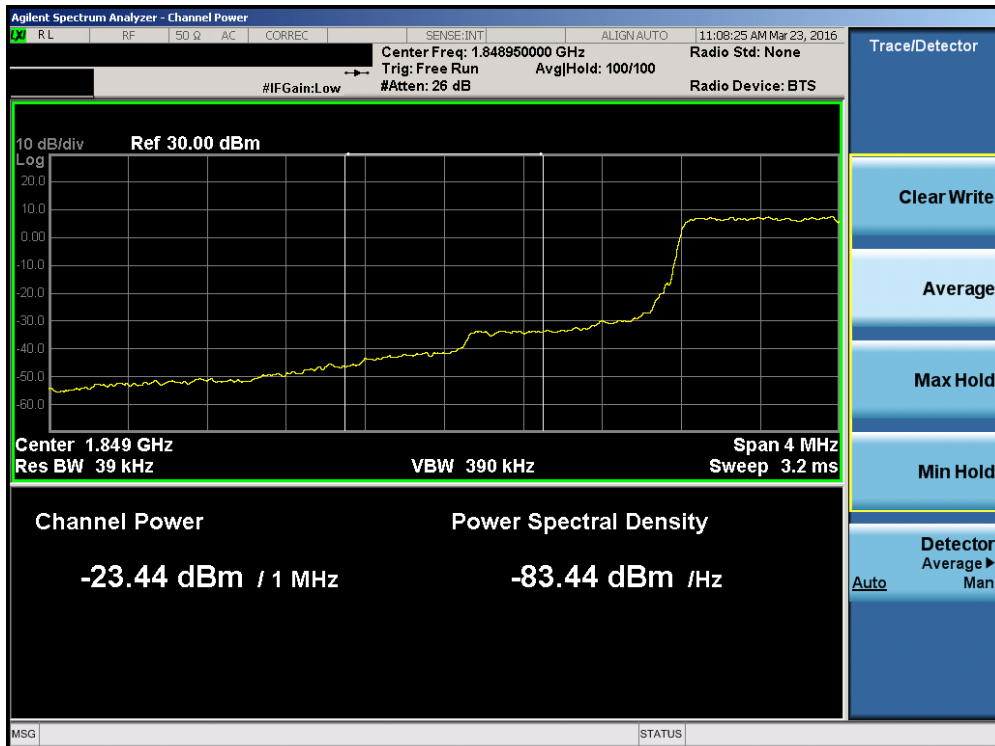


Plot 7-128. Upper Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 79 of 122	



Plot 7-129. Lower Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

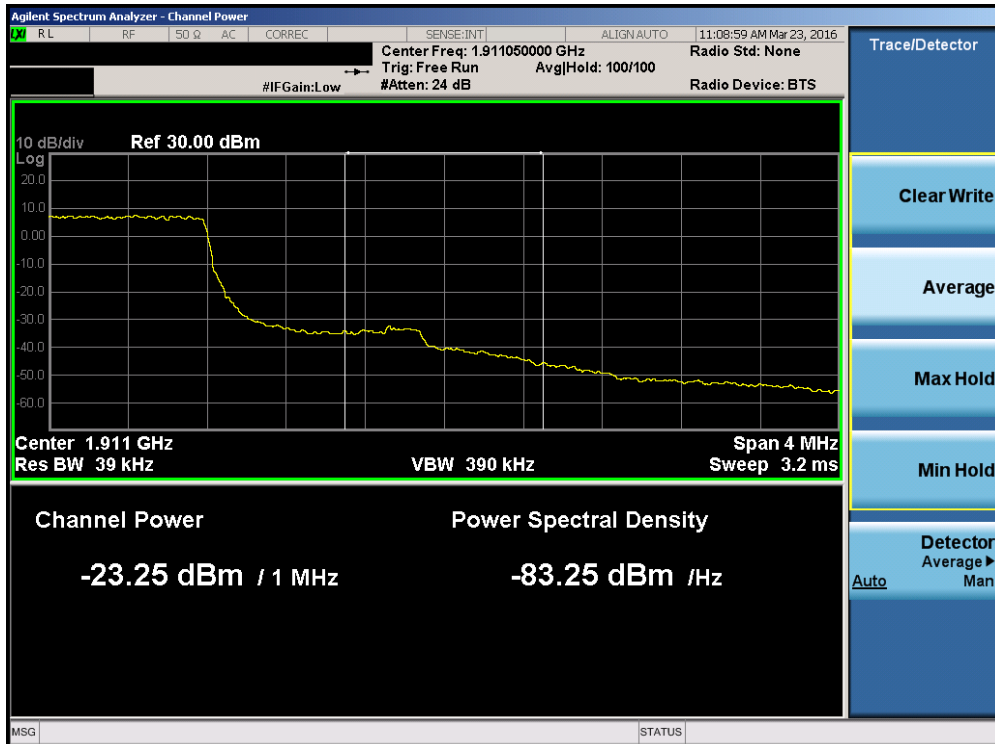


Plot 7-130. Lower Extended Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 80 of 122

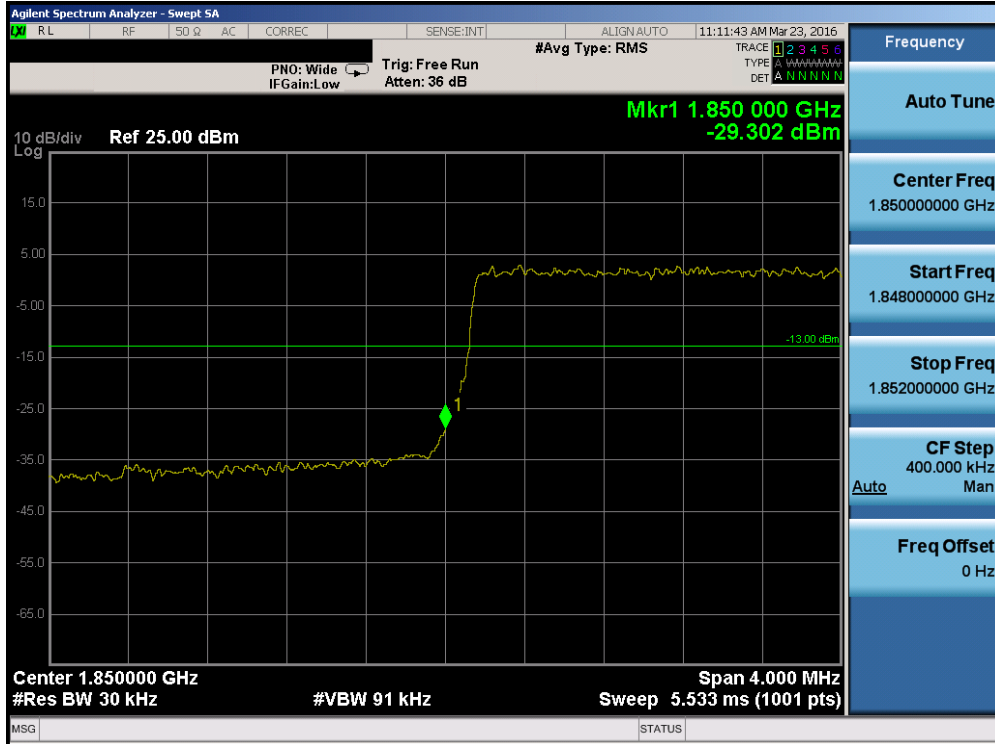


Plot 7-131. Upper Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

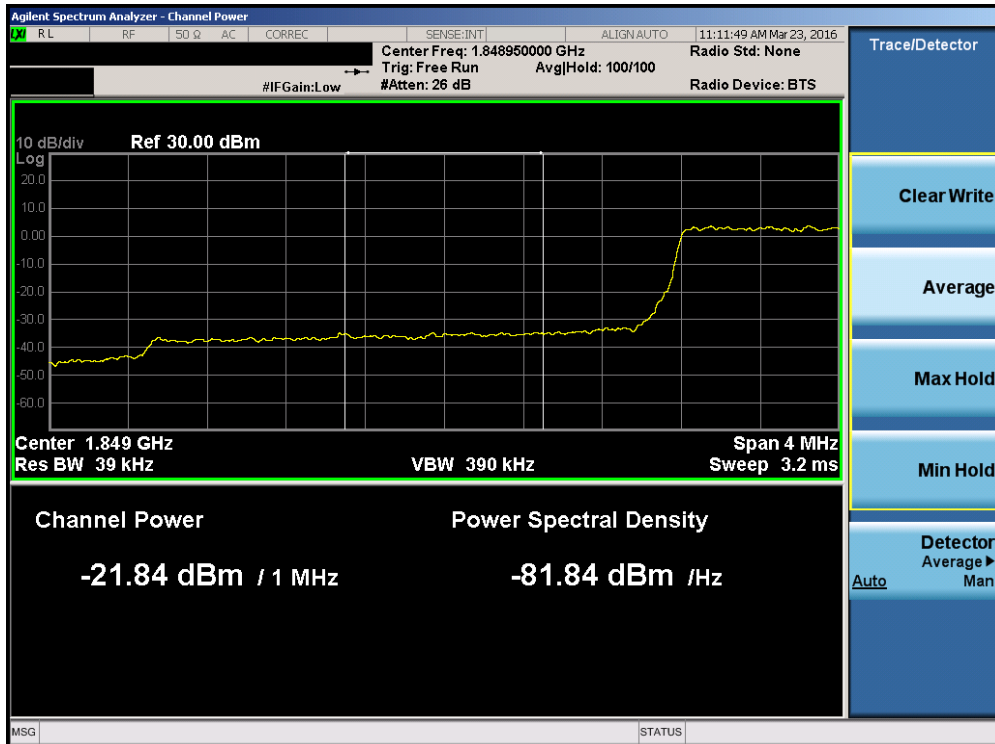


Plot 7-132. Upper Extended Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 81 of 122

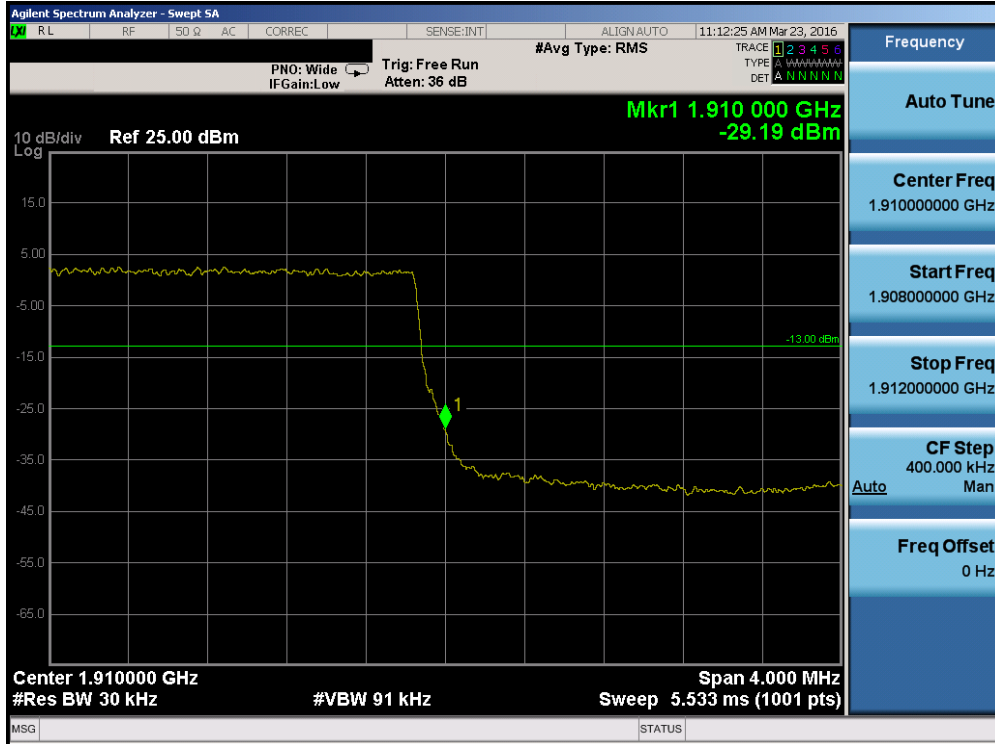


Plot 7-133. Lower Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

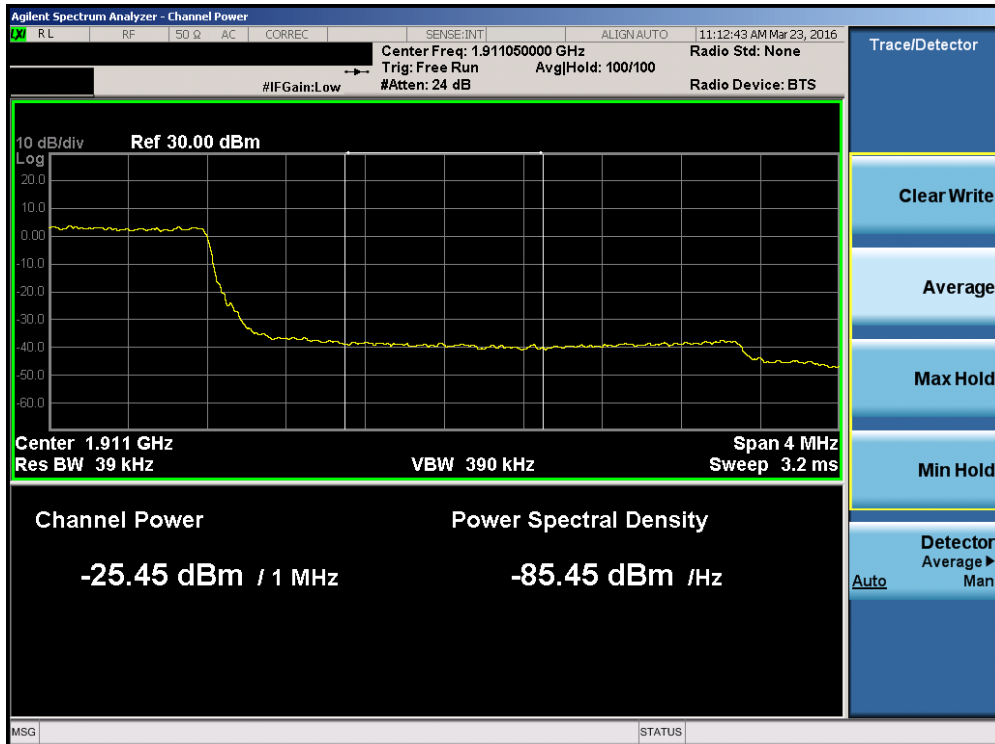


Plot 7-134. Lower Extended Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 82 of 122

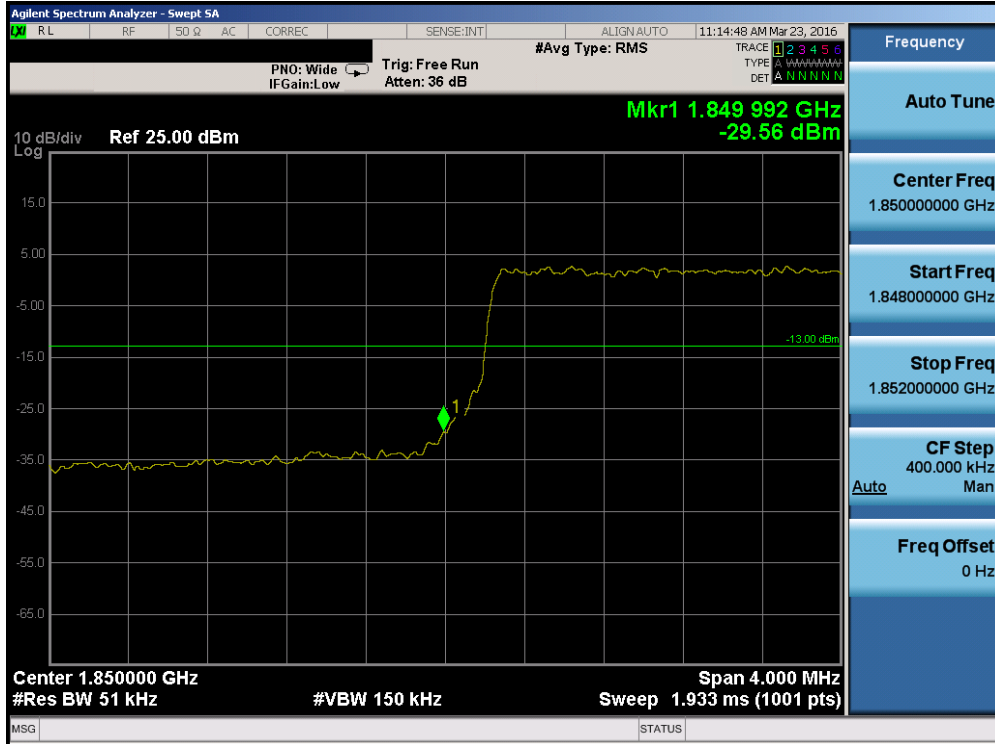


Plot 7-135. Upper Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

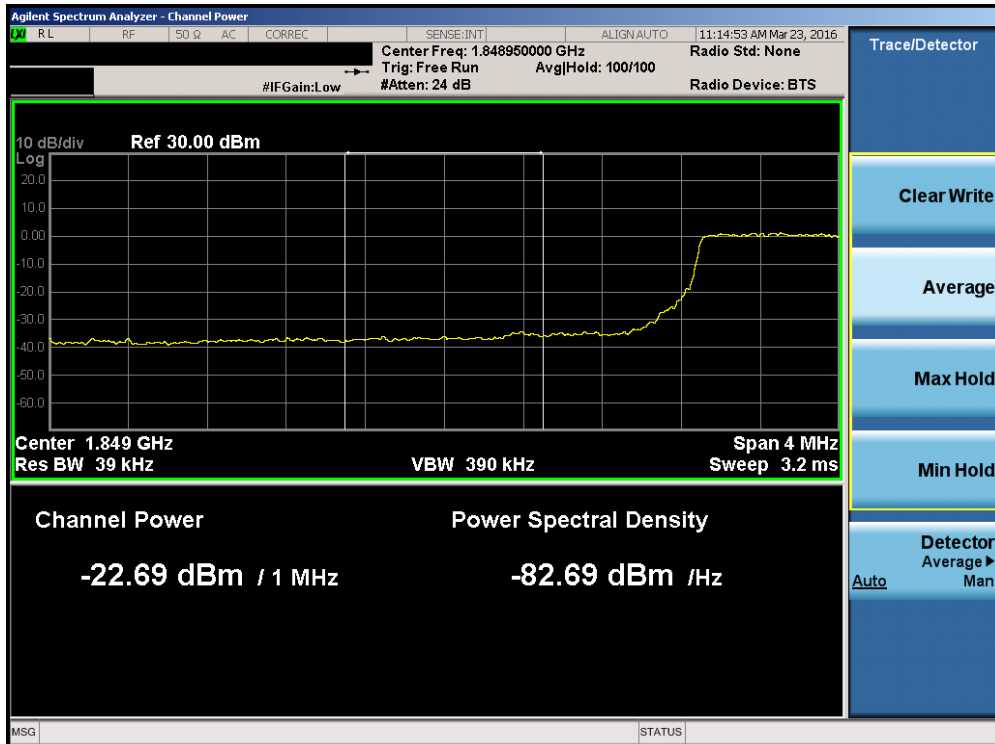


Plot 7-136. Upper Extended Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 83 of 122

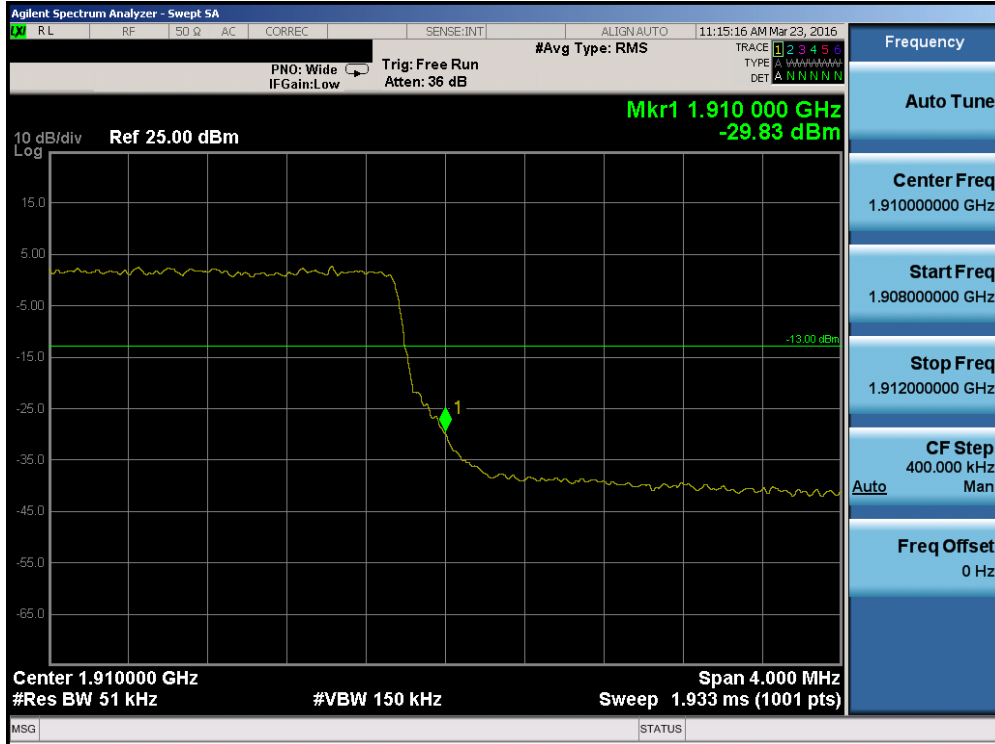


Plot 7-137. Lower Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

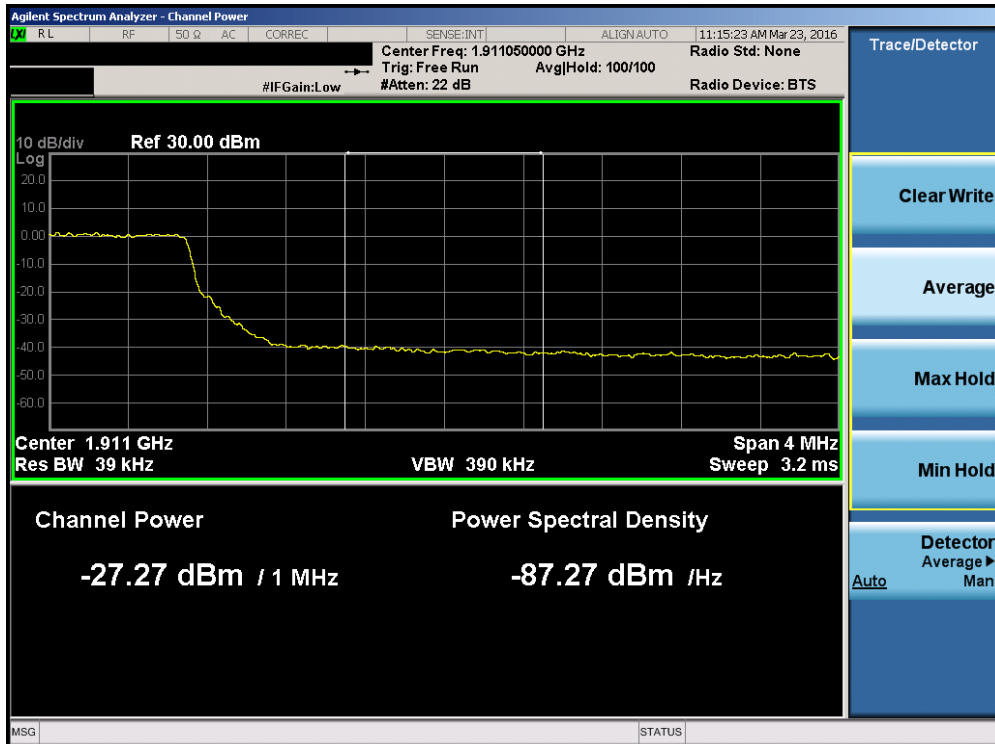


Plot 7-138. Lower Extended Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 84 of 122	

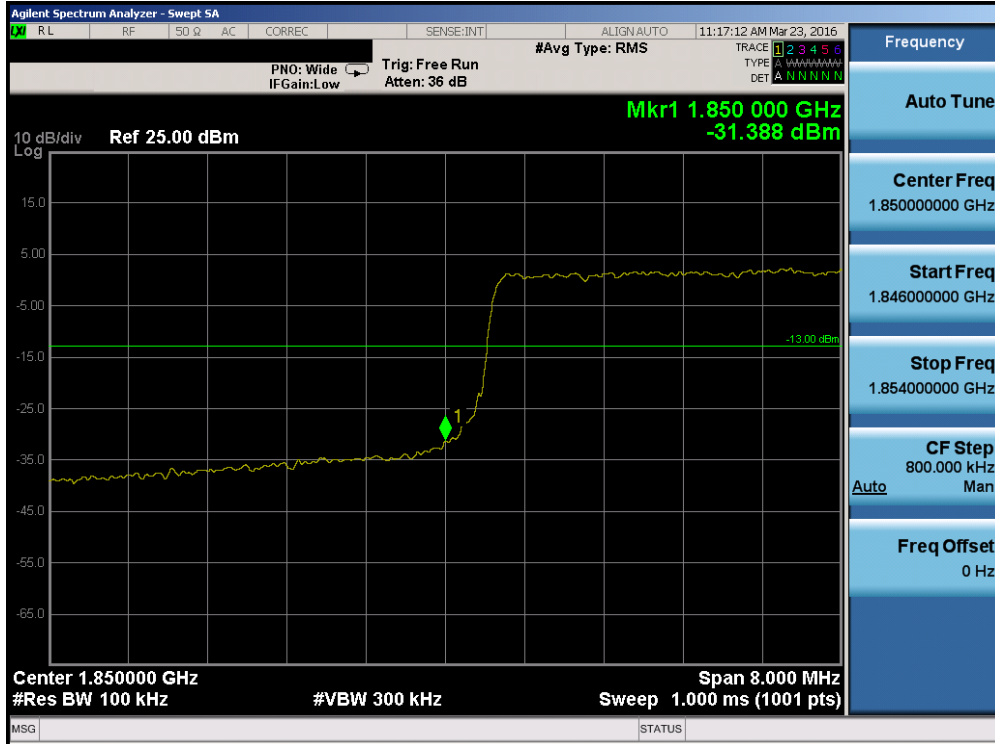


Plot 7-139. Upper Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

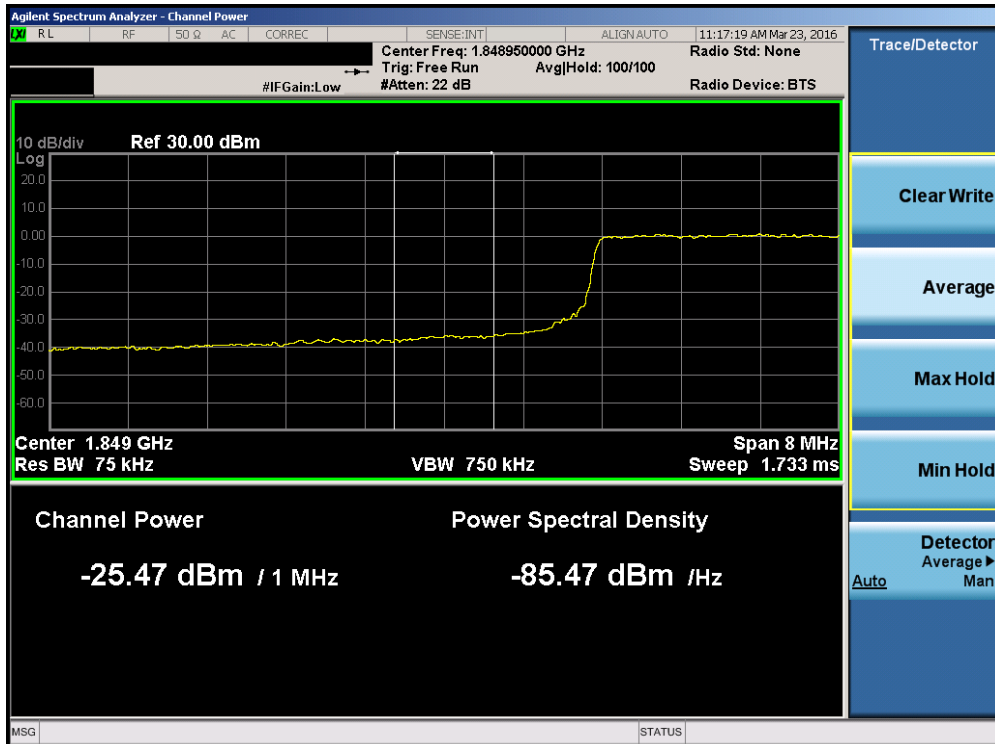


Plot 7-140. Upper Extended Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 85 of 122

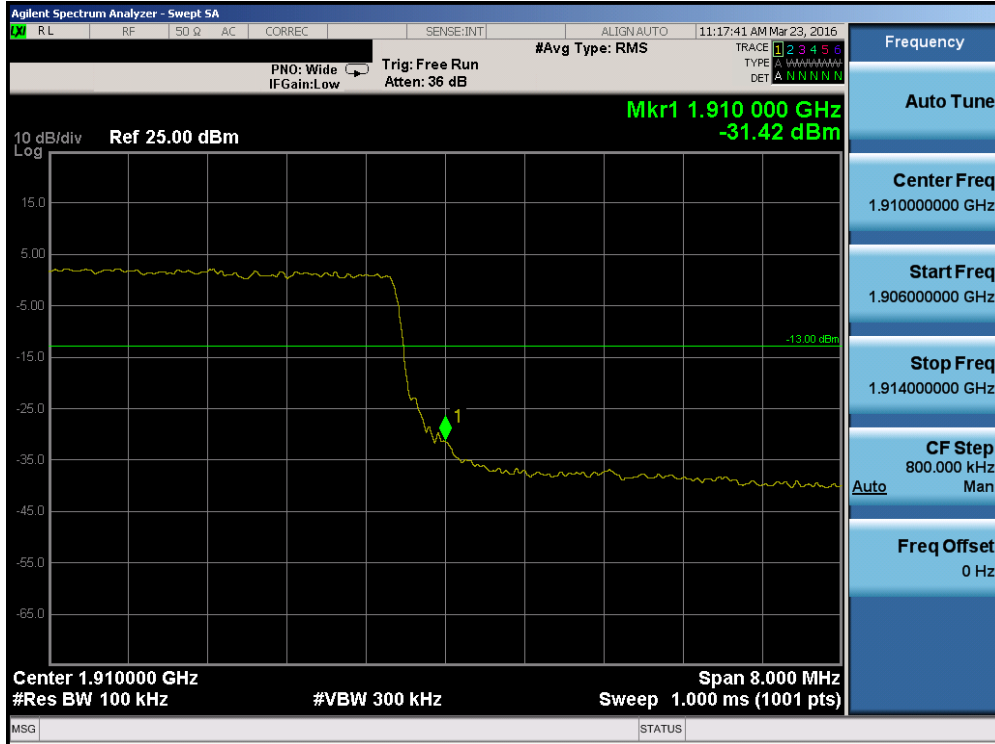


Plot 7-141. Lower Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

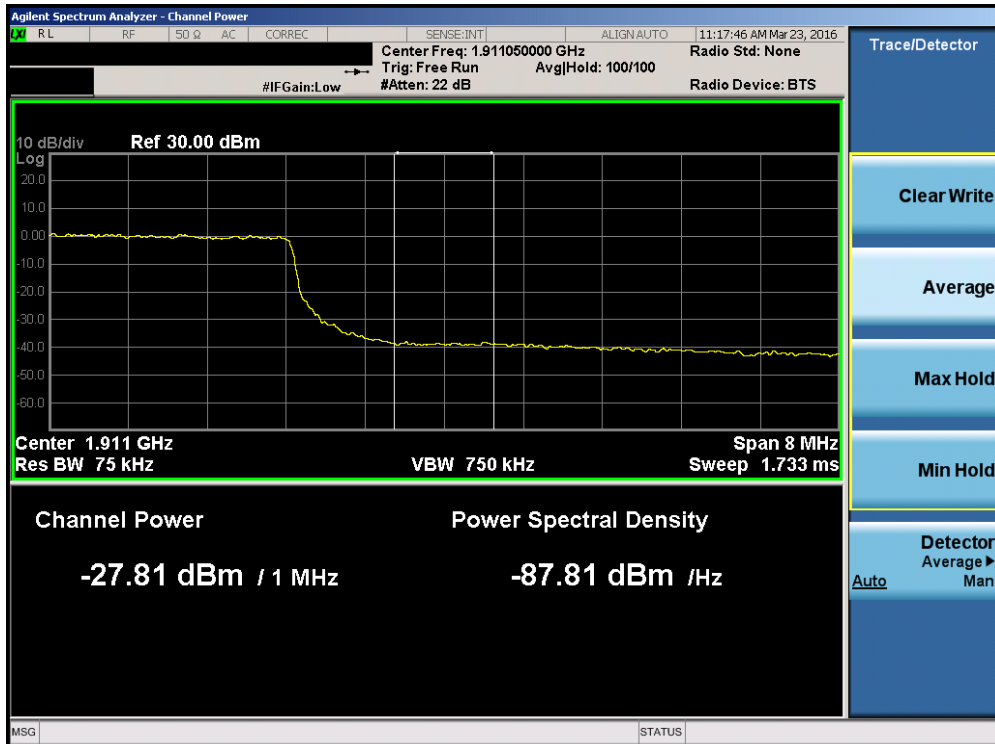


Plot 7-142. Lower Extended Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 86 of 122

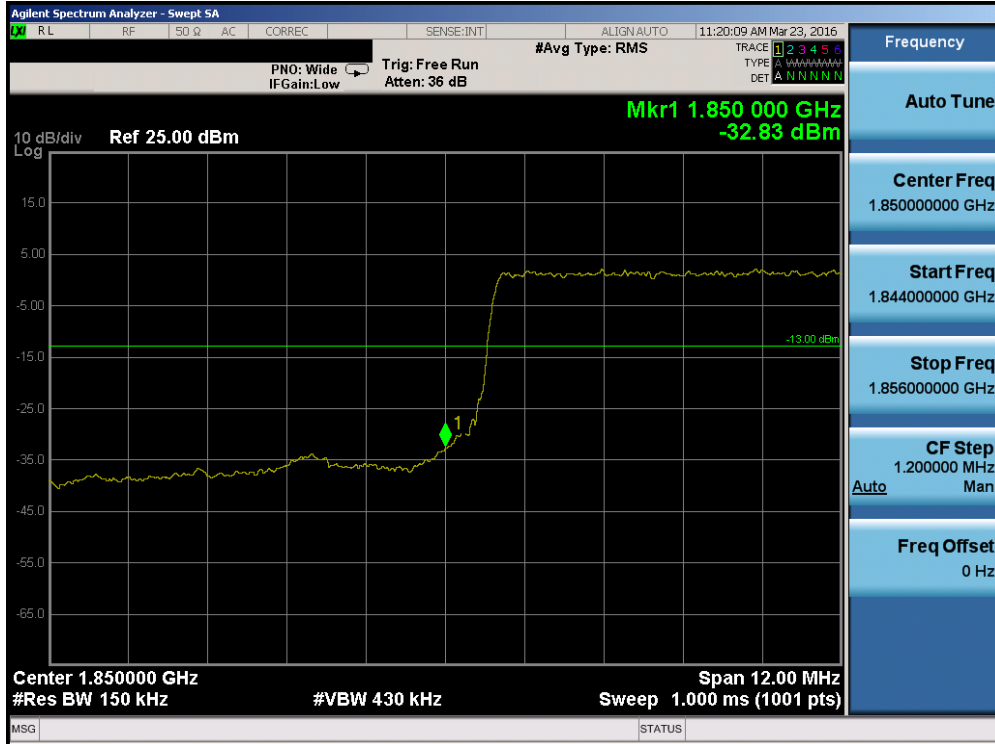


Plot 7-143. Upper Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

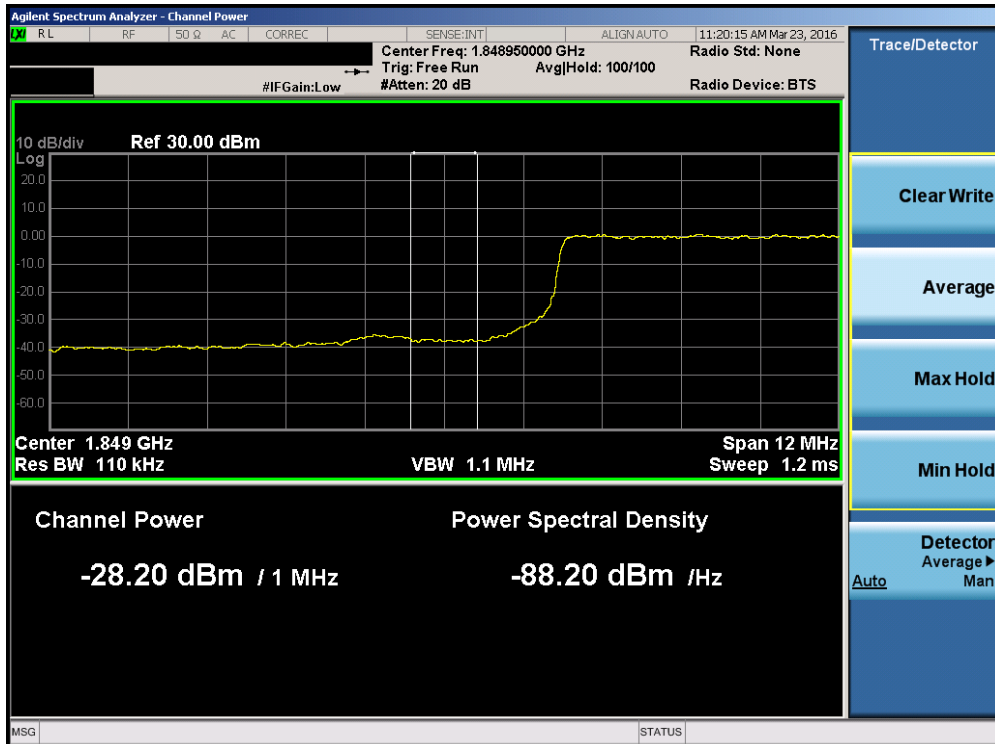


Plot 7-144. Upper Extended Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 87 of 122

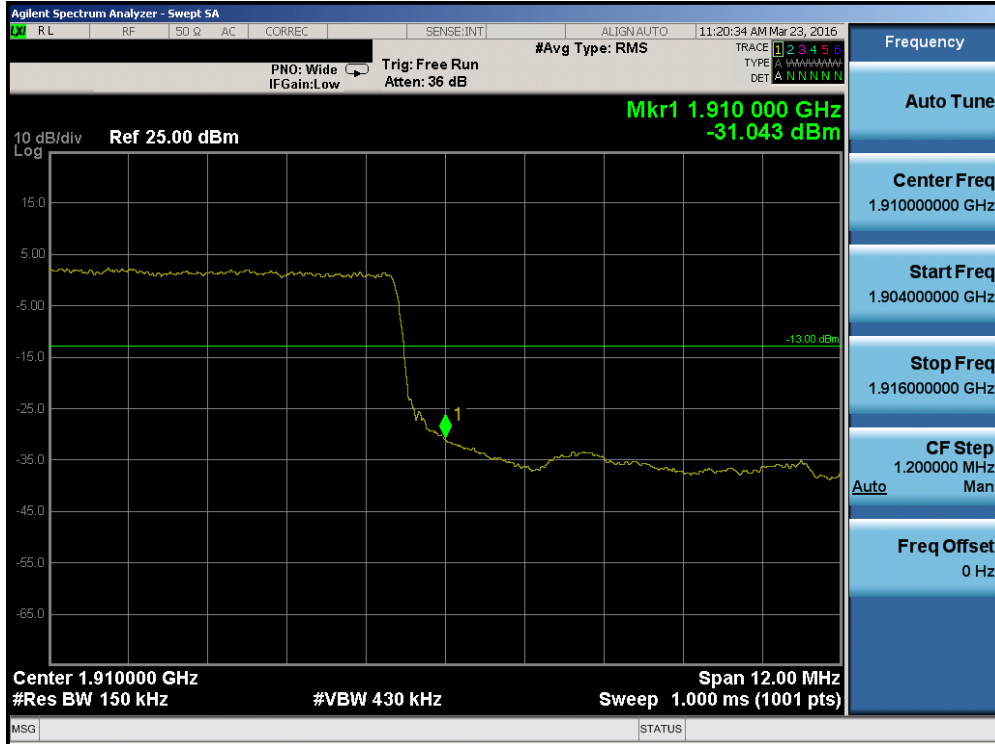


Plot 7-145. Lower Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

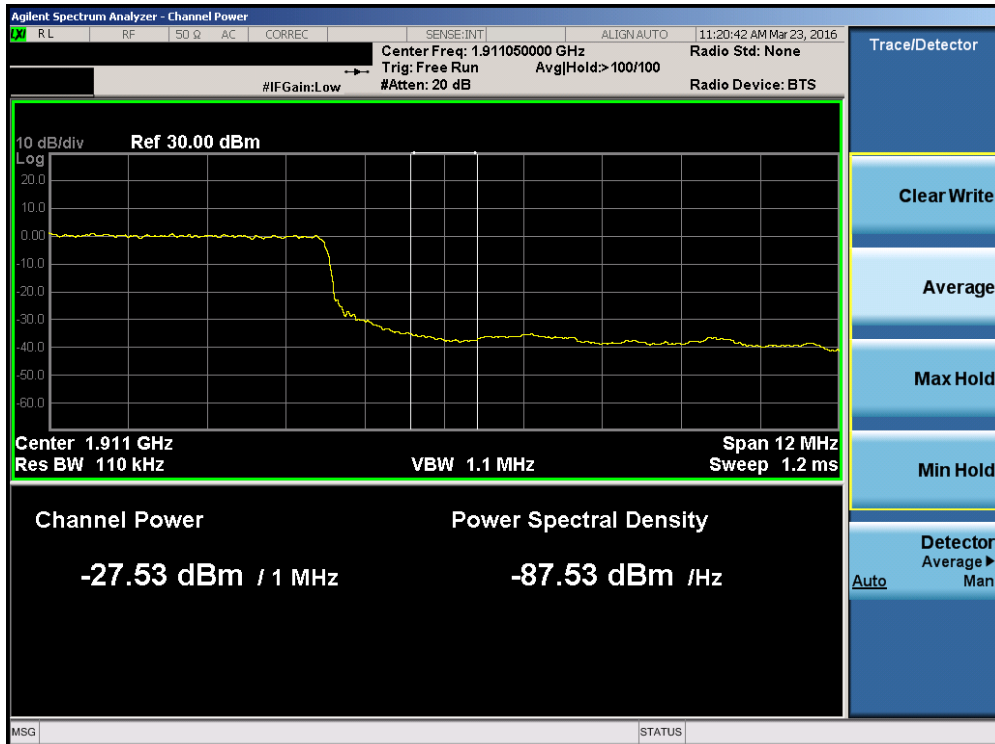


Plot 7-146. Lower Extended Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 88 of 122

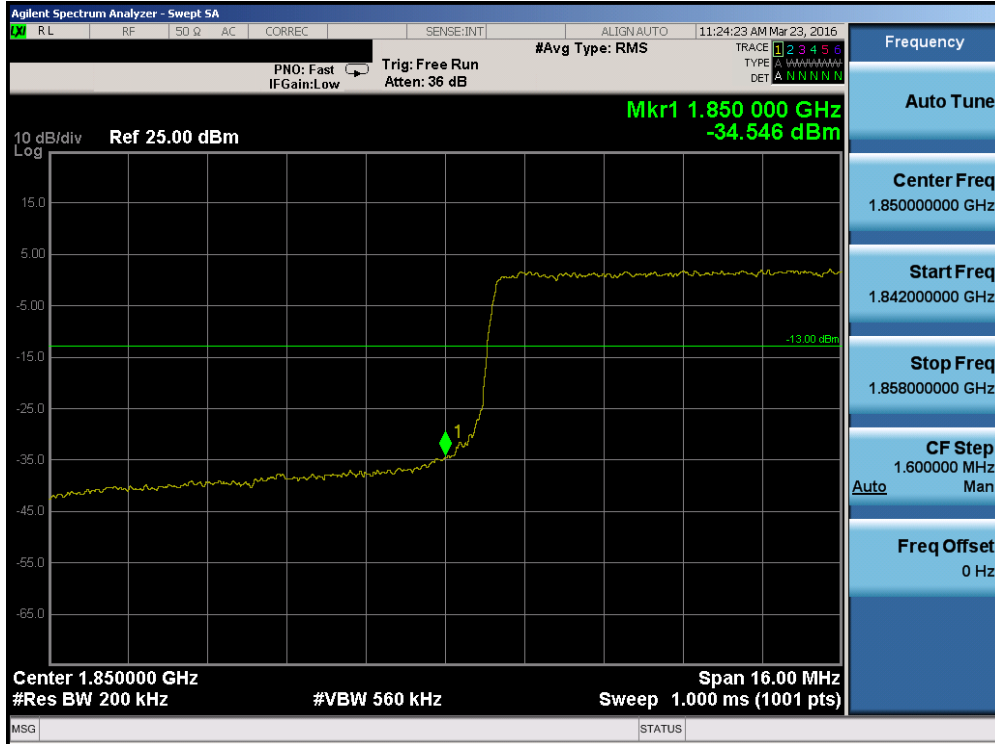


Plot 7-147. Upper Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

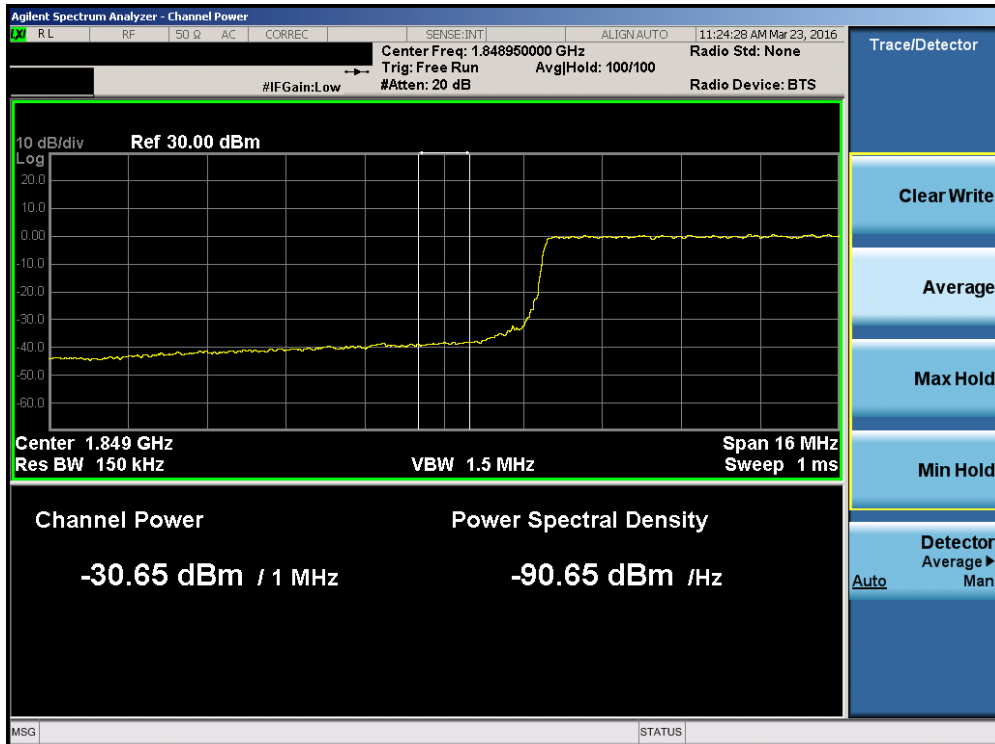


Plot 7-148. Upper Extended Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 89 of 122

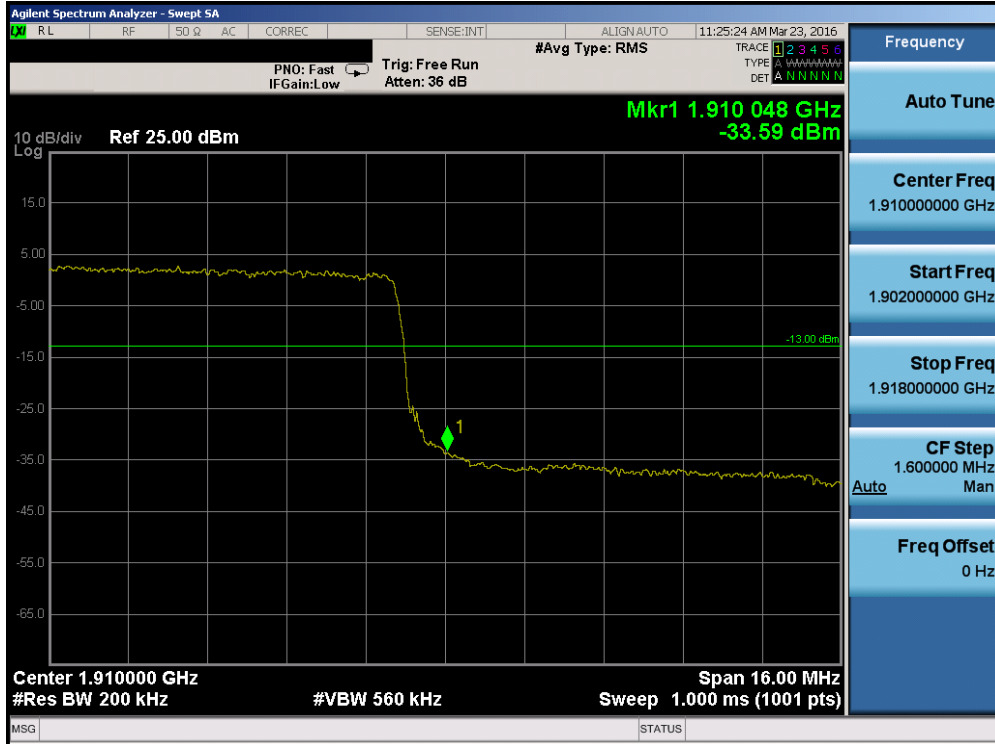


Plot 7-149. Lower Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)

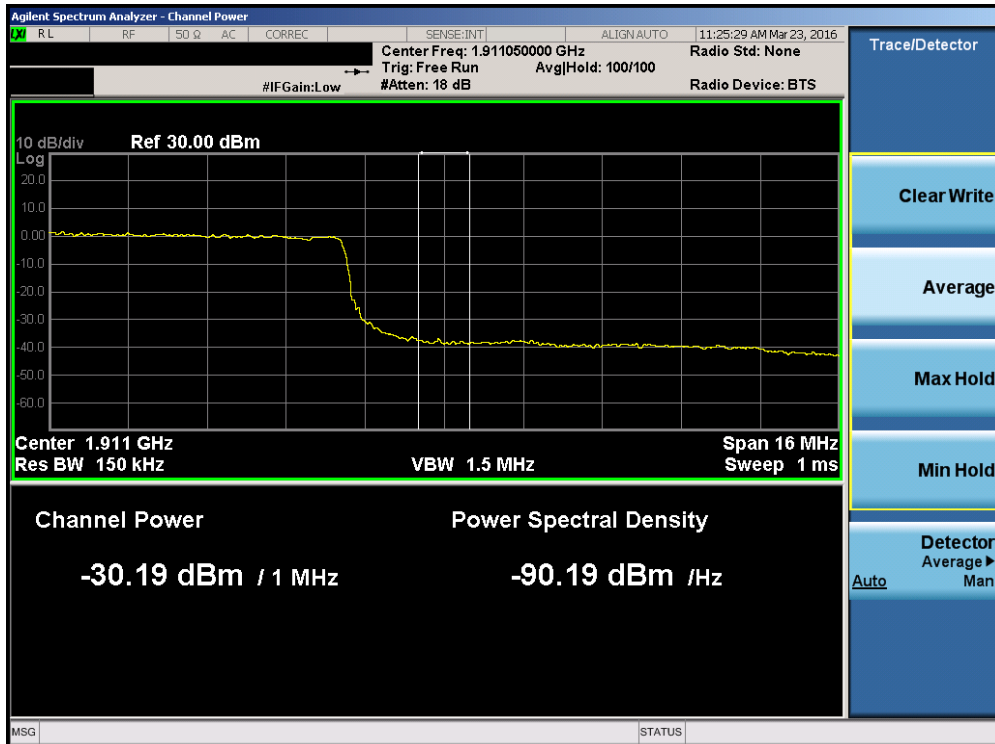


Plot 7-150. Lower Extended Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 90 of 122



Plot 7-151. Upper Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



Plot 7-152. Upper Extended Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 91 of 122	

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.

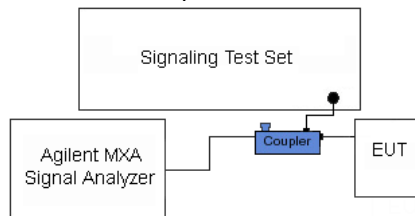


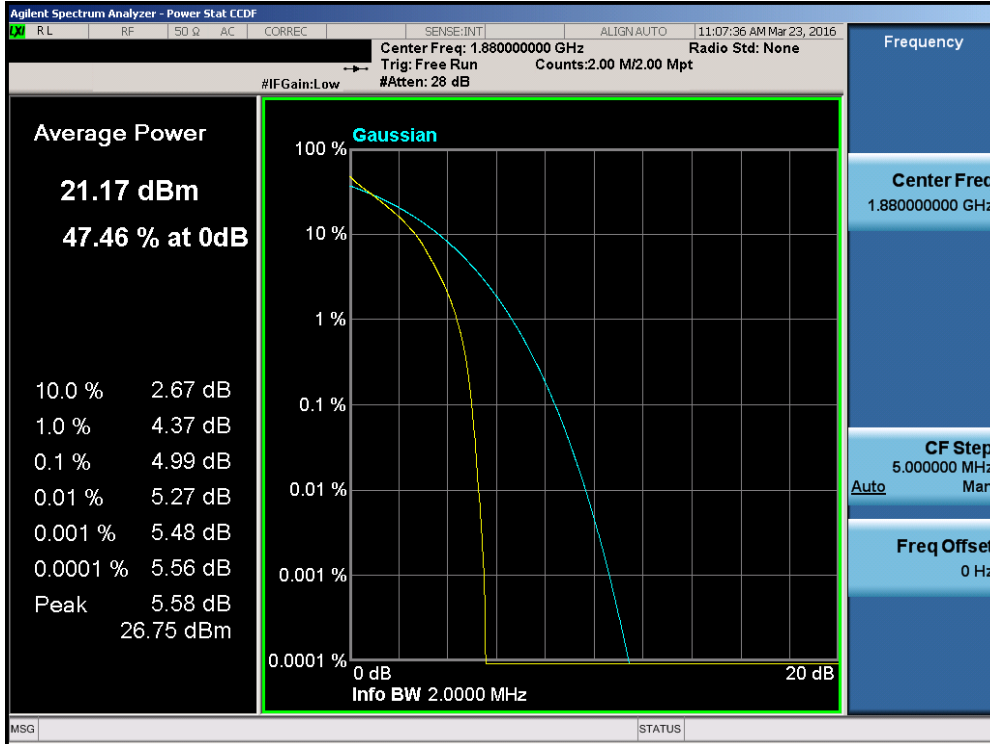


Figure 7-4. Test Instrument & Measurement Setup

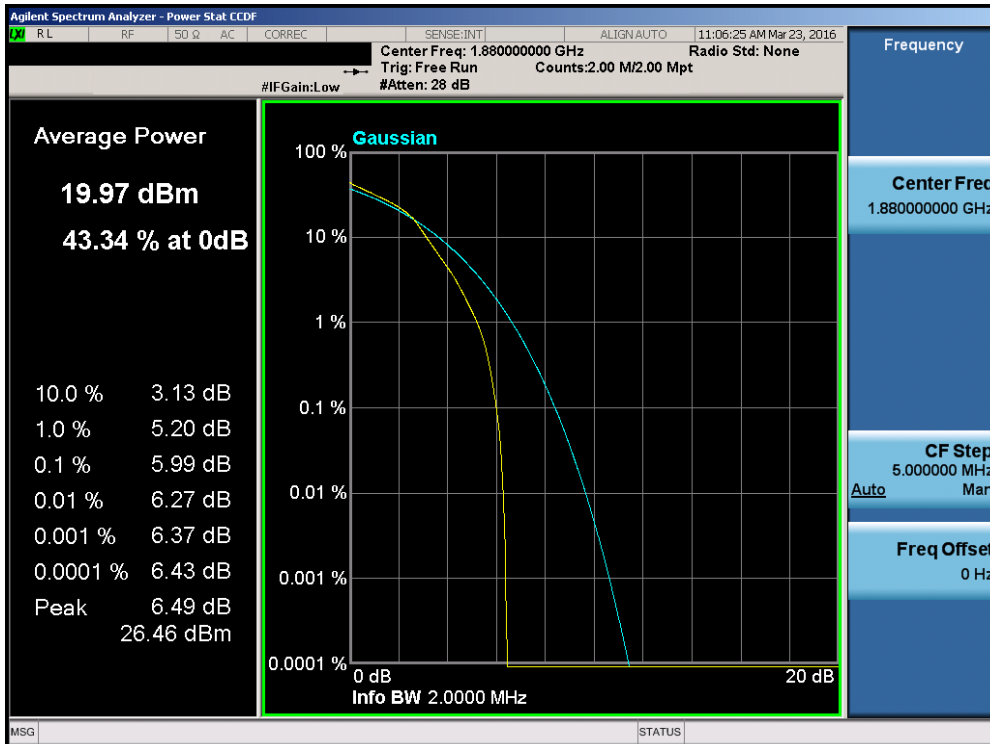
Test Notes

None.

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 92 of 122	

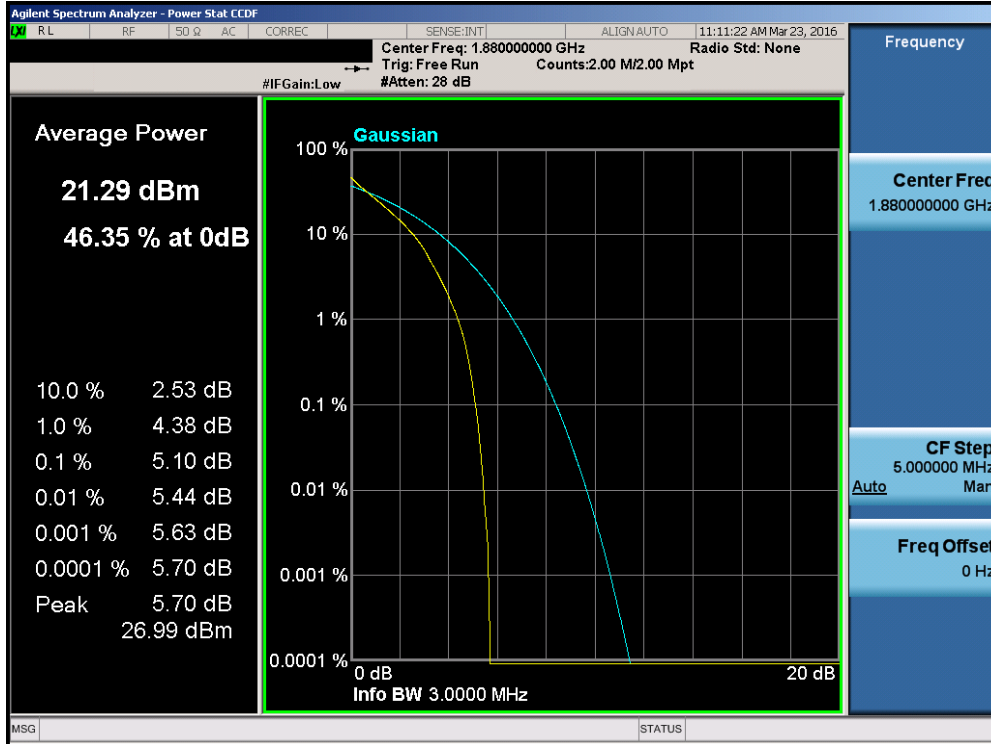


Plot 7-153. PAR Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

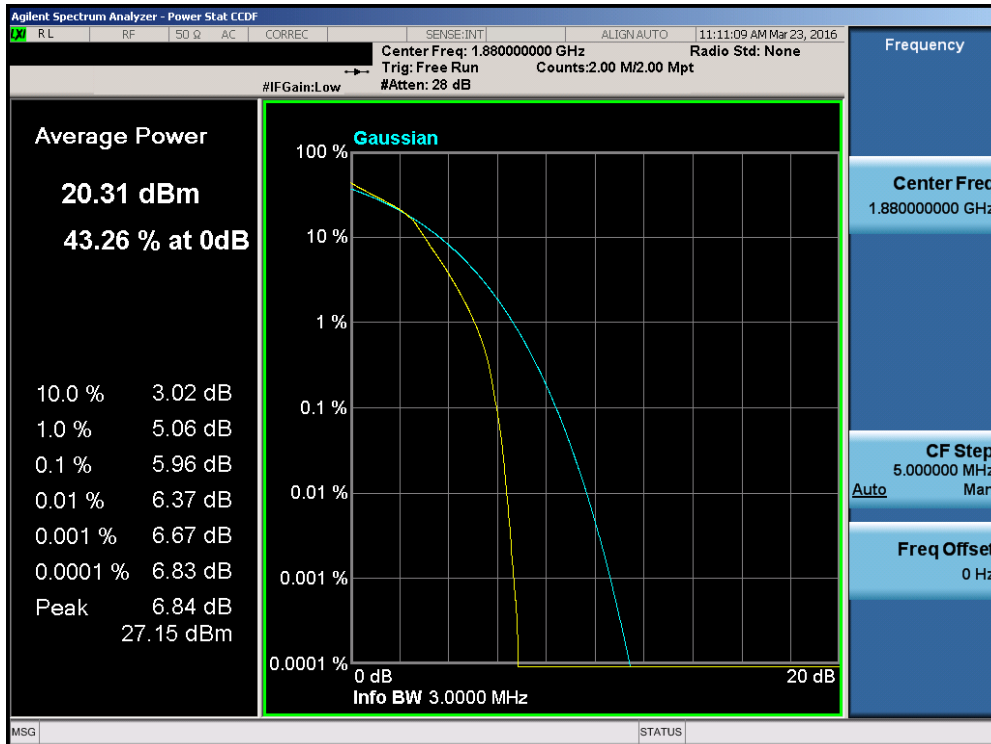


Plot 7-154. PAR Plot (Band 2 – 1.4MHz 16-QAM – RB Size 6)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 93 of 122

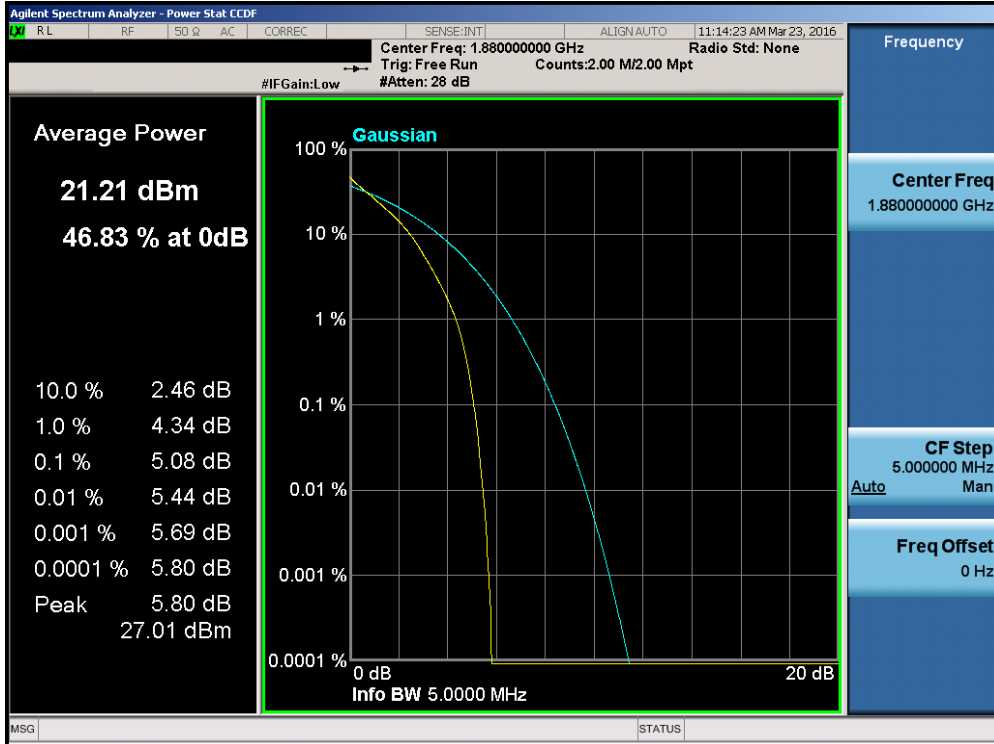


Plot 7-155. PAR Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

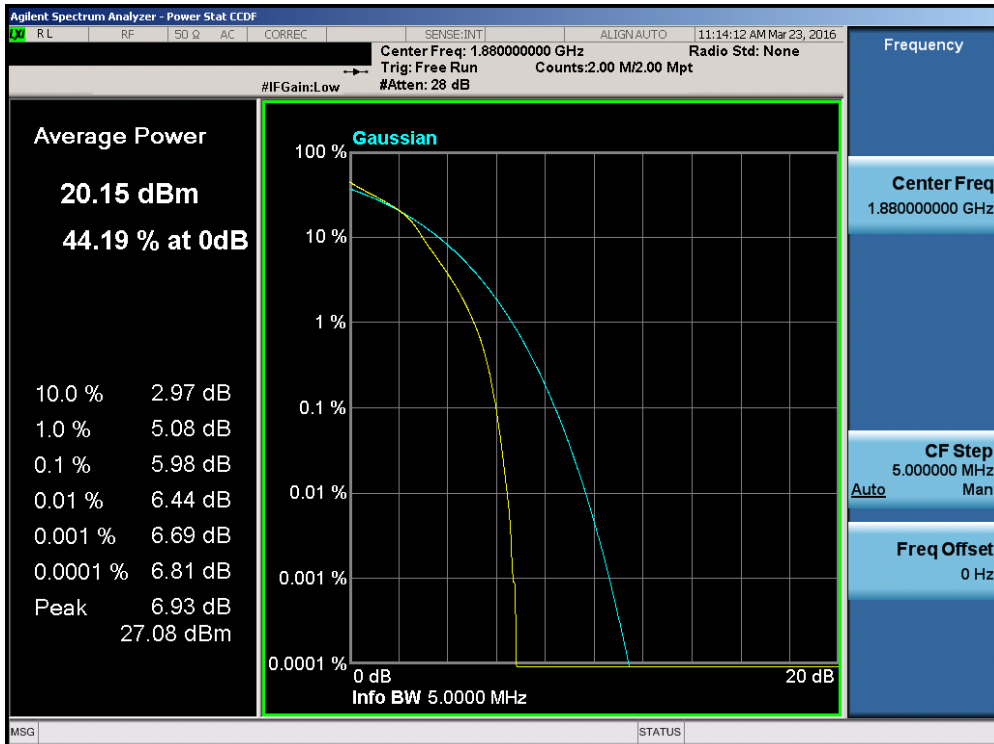


Plot 7-156. PAR Plot (Band 2 – 3.0MHz 16-QAM – RB Size 15)

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 94 of 122

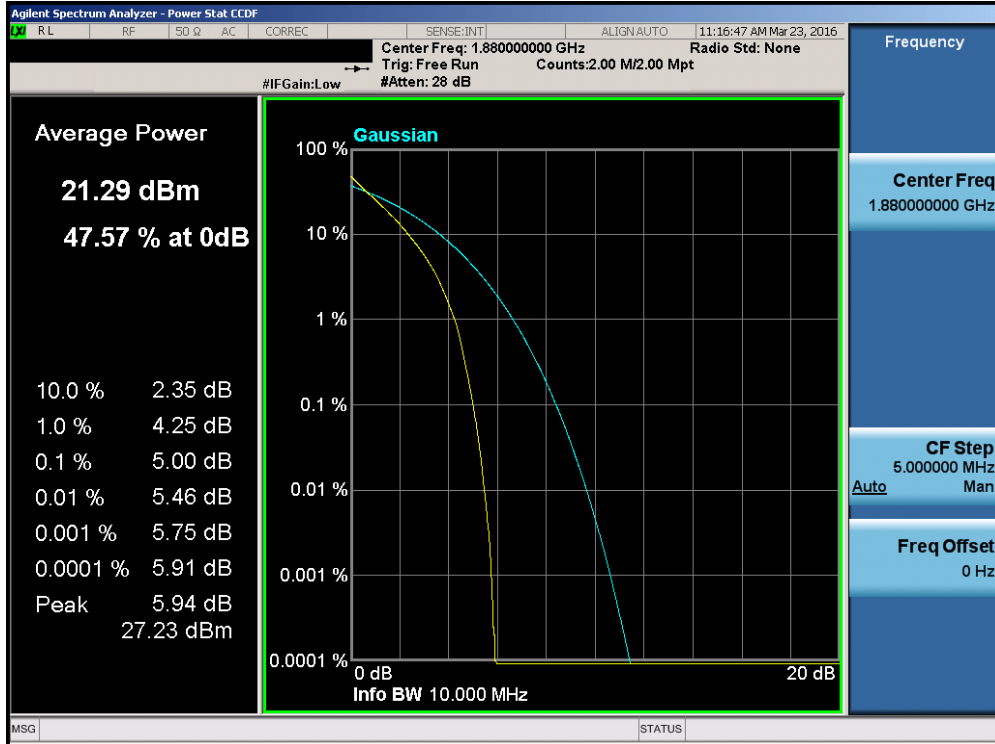


Plot 7-157. PAR Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

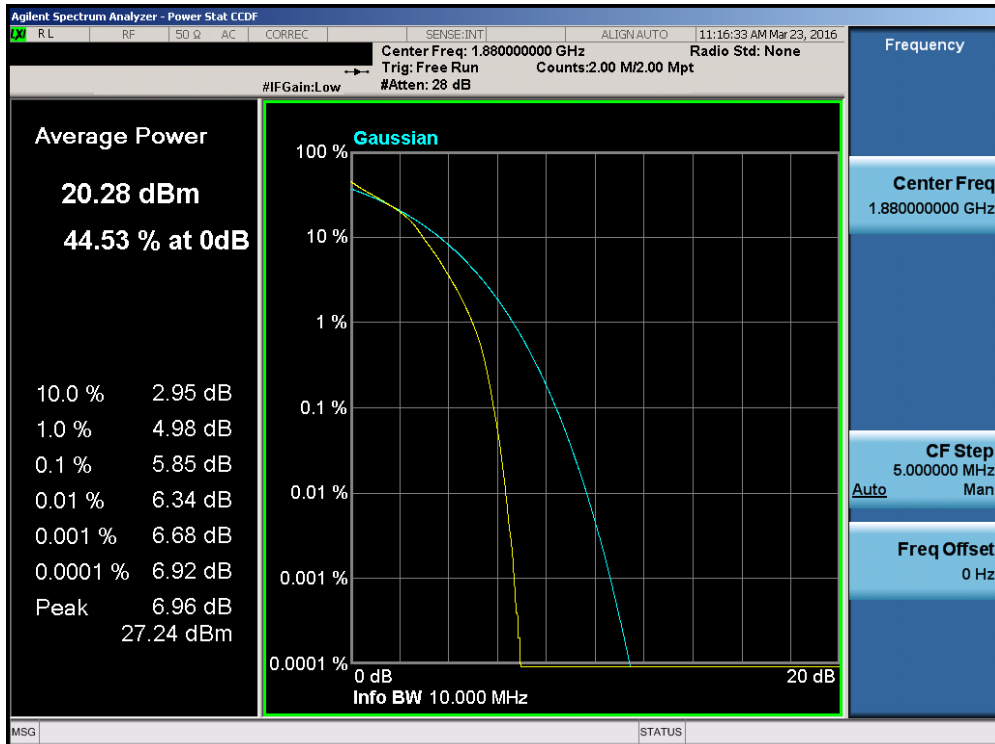


Plot 7-158. PAR Plot (Band 2 – 5.0MHz 16-QAM – RB Size 25)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 95 of 122

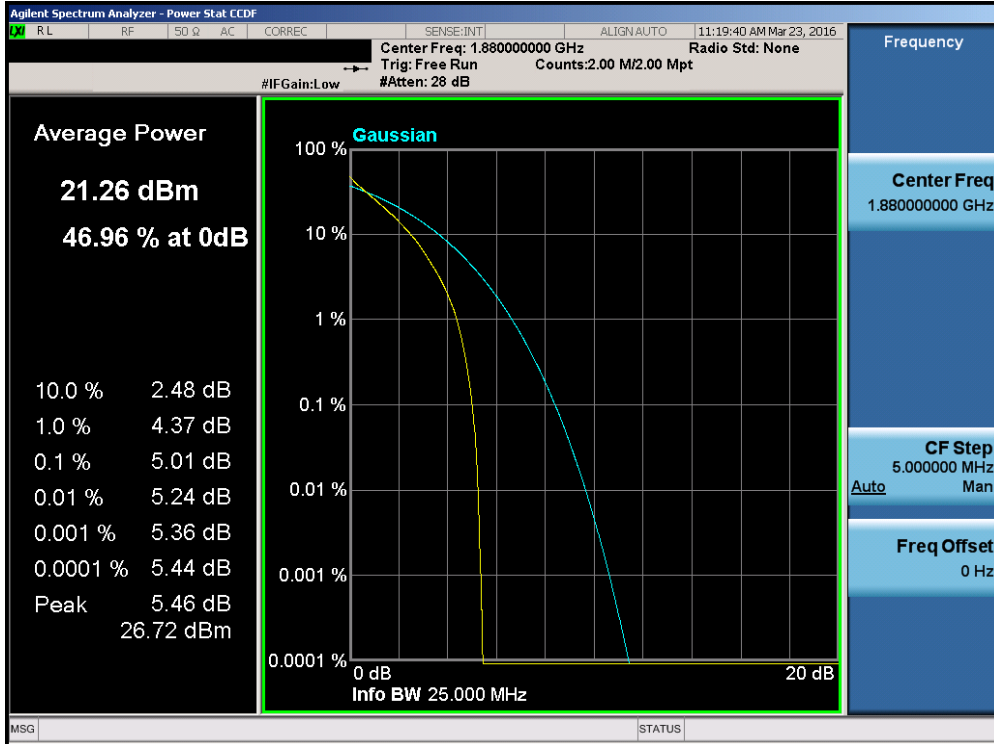


Plot 7-159. PAR Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

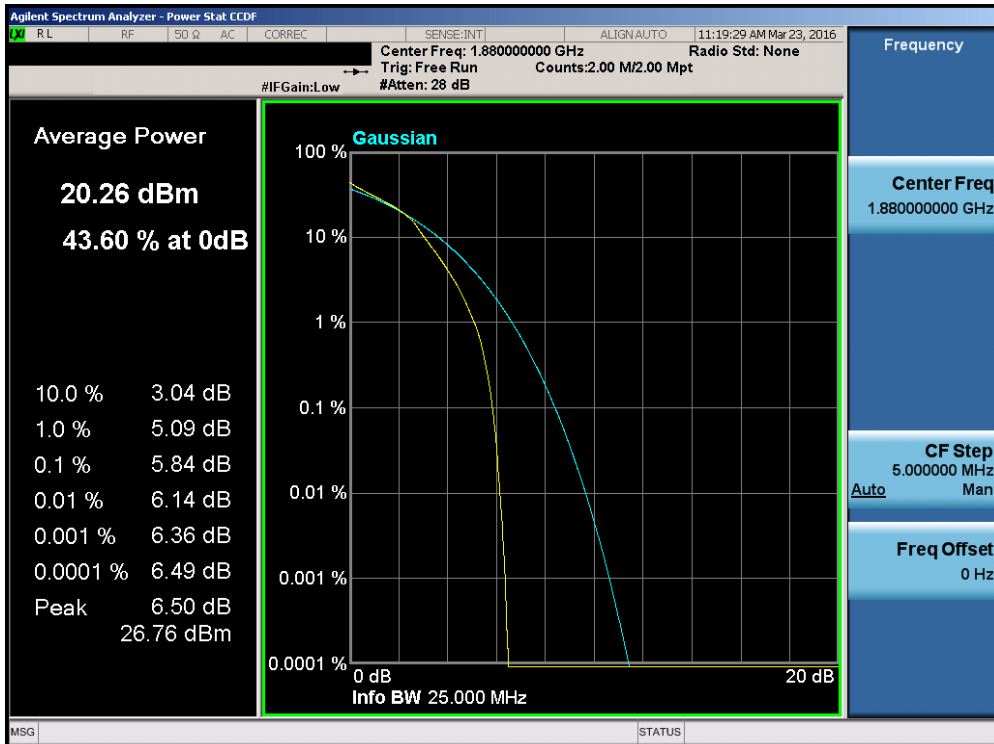


Plot 7-160. PAR Plot (Band 2 – 10.0MHz 16-QAM – RB Size 50)

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 96 of 122

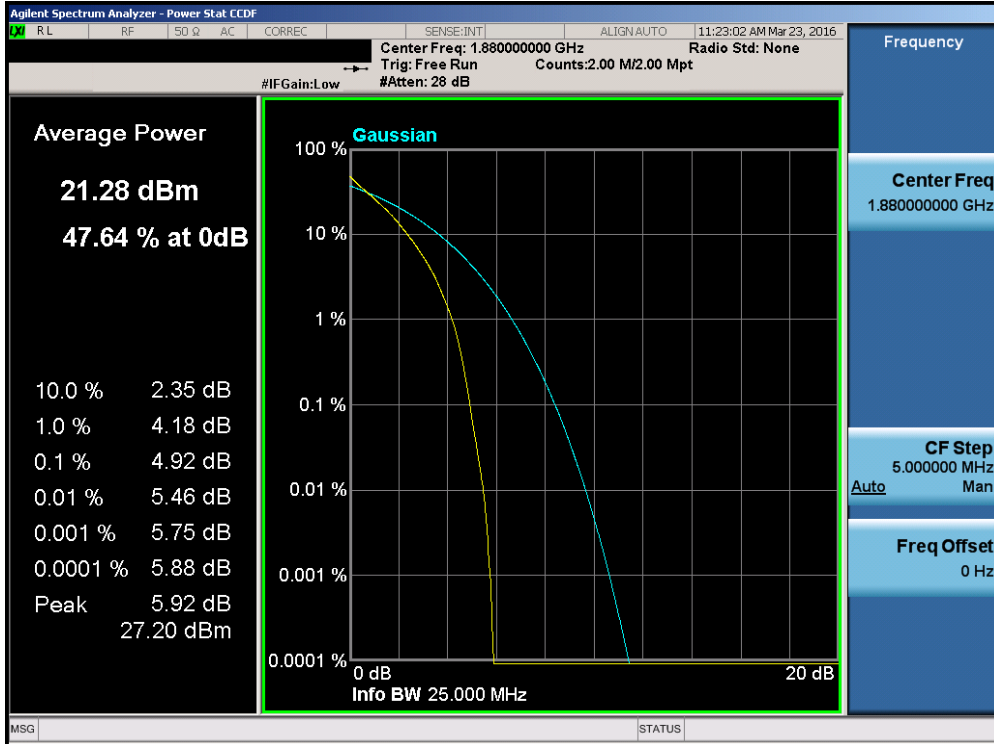


Plot 7-161. PAR Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

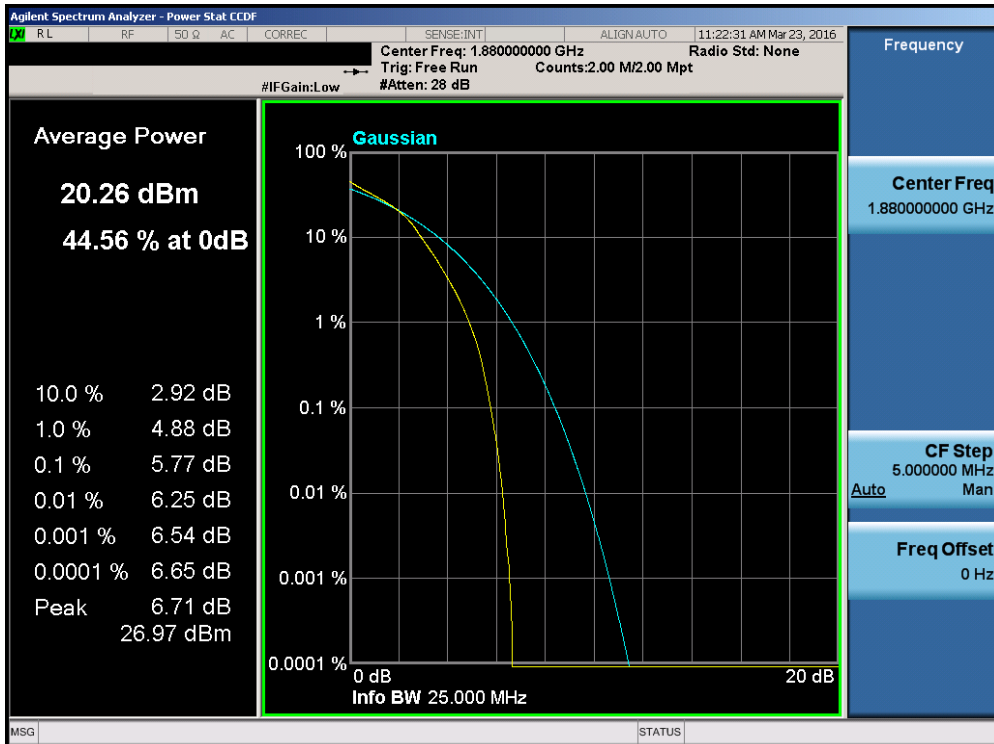


Plot 7-162. PAR Plot (Band 2 – 15.0MHz 16-QAM – RB Size 75)

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 97 of 122



Plot 7-163. PAR Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



Plot 7-164. PAR Plot (Band 2 – 20.0MHz 16-QAM – RB Size 100)

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 98 of 122

7.6 Radiated Power (ERP/EIRP)

§22.913(a.2) §24.232(c.2) §27.50(c.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 \geq 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points \geq 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

FCC ID: ZNFL53AL	 FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)			Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 99 of 122	

Test Setup

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

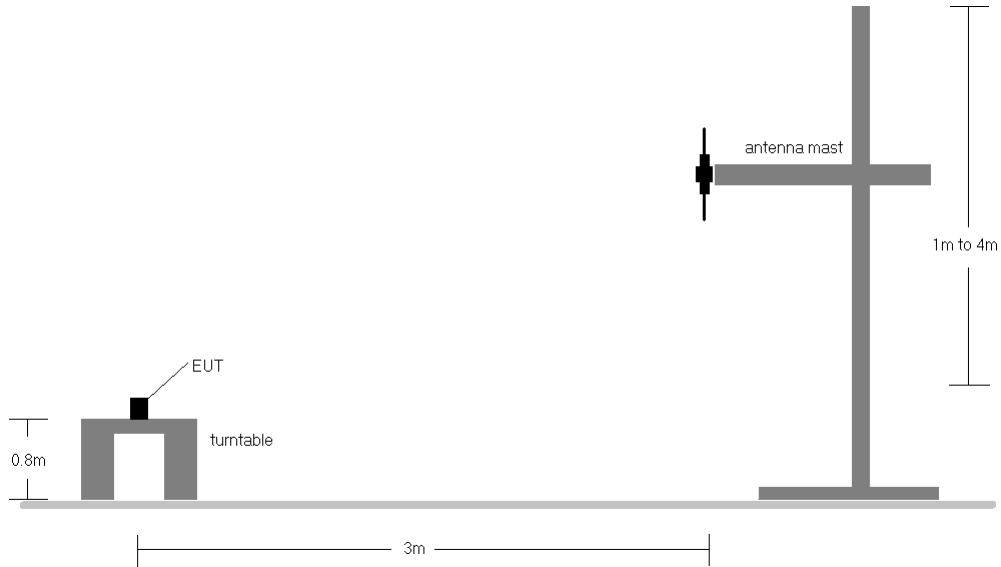


Figure 7-5. Radiated Test Setup <1GHz

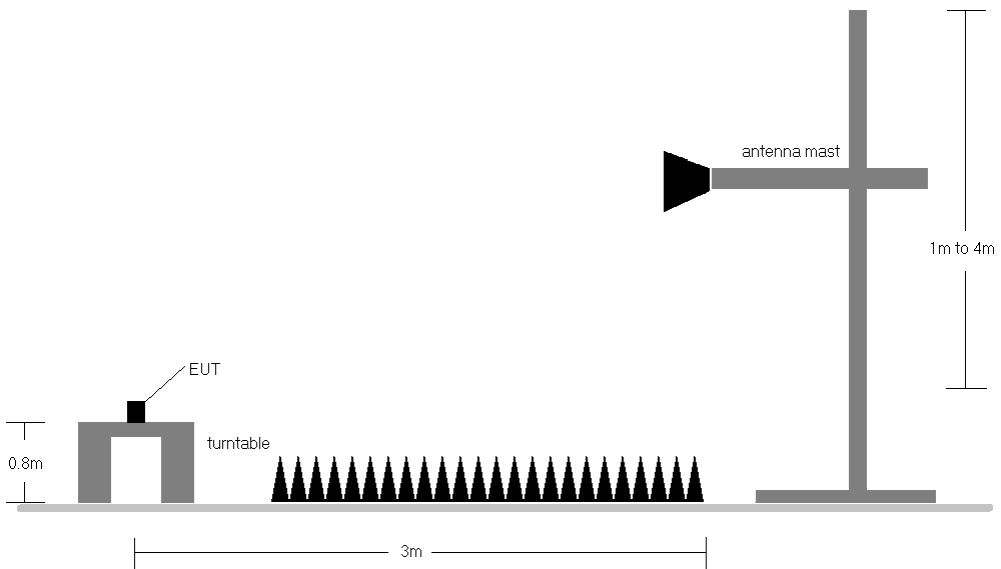


Figure 7-6. Radiated Test Setup >1GHz

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.

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 100 of 122	



Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
699.70	1.4	QPSK	H	283	814	3 / 2	16.32	2.12	18.44	34.77	-16.33
707.50	1.4	QPSK	H	289	178	3 / 2	16.51	2.31	18.82	34.77	-15.95
715.30	1.4	QPSK	H	287	171	1 / 5	15.39	2.52	17.91	34.77	-16.86
699.70	1.4	16-QAM	H	283	814	3 / 2	15.53	2.12	17.65	34.77	-17.12
707.50	1.4	16-QAM	H	289	178	3 / 2	15.52	2.31	17.83	34.77	-16.94
715.30	1.4	16-QAM	H	287	171	1 / 5	14.66	2.52	17.18	34.77	-17.59
700.50	3	QPSK	H	283	184	1 / 0	16.57	2.12	18.69	34.77	-16.08
707.50	3	QPSK	H	287	176	1 / 14	16.75	2.31	19.06	34.77	-15.71
714.50	3	QPSK	H	291	172	1 / 0	15.35	2.50	17.85	34.77	-16.92
700.50	3	16-QAM	H	283	184	1 / 0	15.74	2.12	17.86	34.77	-16.91
707.50	3	16-QAM	H	287	176	1 / 14	16.23	2.31	18.54	34.77	-16.23
714.50	3	16-QAM	H	291	172	1 / 0	14.43	2.50	16.93	34.77	-17.84
701.50	5	QPSK	H	283	184	1 / 0	16.60	2.15	18.75	34.77	-16.02
707.50	5	QPSK	H	291	174	1 / 24	16.00	2.31	18.31	34.77	-16.46
713.50	5	QPSK	H	289	175	1 / 0	15.66	2.48	18.14	34.77	-16.64
701.50	5	16-QAM	H	283	184	1 / 0	15.57	2.15	17.72	34.77	-17.05
707.50	5	16-QAM	H	291	174	1 / 24	14.93	2.31	17.24	34.77	-17.53
713.50	5	16-QAM	H	289	175	1 / 0	14.55	2.48	17.03	34.77	-17.75
704.00	10	QPSK	H	285	187	1 / 49	16.15	2.22	18.37	34.77	-16.41
707.50	10	QPSK	H	291	178	1 / 49	15.18	2.31	17.49	34.77	-17.28
711.00	10	QPSK	H	259	173	1 / 0	16.00	2.41	18.41	34.77	-16.36
704.00	10	16-QAM	H	285	187	1 / 49	15.45	2.22	17.67	34.77	-17.11
707.50	10	16-QAM	H	291	178	1 / 49	14.74	2.31	17.05	34.77	-17.72
711.00	10	16-QAM	H	259	173	1 / 0	15.26	2.41	17.67	34.77	-17.10
707.50	3	QPSK	V	140	176	1 / 14	15.82	2.88	18.70	34.77	-16.07

Table 7-2. ERP Data (Band 12)

FCC ID: ZNFL53AL	 FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)			Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 101 of 122	

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	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	192	204	1 / 0	16.34	5.01	21.35	38.45	-17.10
836.50	1.4	QPSK	H	353	200	3 / 2	16.52	5.16	21.68	38.45	-16.77
848.30	1.4	QPSK	H	211	213	1 / 0	16.37	5.30	21.67	38.45	-16.78
824.70	1.4	16-QAM	H	192	204	1 / 0	15.64	5.01	20.65	38.45	-17.80
836.50	1.4	16-QAM	H	353	200	3 / 2	15.27	5.16	20.43	38.45	-18.02
848.30	1.4	16-QAM	H	211	213	1 / 0	15.52	5.30	20.82	38.45	-17.63
825.50	3	QPSK	H	196	204	1 / 0	16.91	5.02	21.93	38.45	-16.52
836.50	3	QPSK	H	206	204	1 / 0	17.08	5.16	22.24	38.45	-16.21
847.50	3	QPSK	H	205	204	1 / 14	16.38	5.29	21.67	38.45	-16.78
825.50	3	16-QAM	H	196	204	1 / 0	15.92	5.02	20.94	38.45	-17.51
836.50	3	16-QAM	H	206	204	1 / 0	16.49	5.16	21.65	38.45	-16.80
847.50	3	16-QAM	H	205	204	1 / 14	15.49	5.29	20.78	38.45	-17.67
826.50	5	QPSK	H	198	191	1 / 0	16.78	5.03	21.81	38.45	-16.64
836.50	5	QPSK	H	206	197	1 / 0	16.97	5.16	22.13	38.45	-16.32
846.50	5	QPSK	H	207	208	1 / 0	16.44	5.28	21.72	38.45	-16.73
826.50	5	16-QAM	H	198	191	1 / 0	15.54	5.03	20.57	38.45	-17.88
836.50	5	16-QAM	H	206	197	1 / 0	15.84	5.16	21.00	38.45	-17.45
846.50	5	16-QAM	H	207	208	1 / 0	15.56	5.28	20.84	38.45	-17.61
829.00	10	QPSK	H	199	200	1 / 0	16.72	5.06	21.78	38.45	-16.67
836.50	10	QPSK	H	199	213	1 / 0	16.21	5.16	21.37	38.45	-17.08
844.00	10	QPSK	H	213	200	1 / 0	15.83	5.25	21.08	38.45	-17.37
829.00	10	16-QAM	H	199	200	1 / 0	16.17	5.06	21.23	38.45	-17.22
836.50	10	16-QAM	H	199	213	1 / 0	15.33	5.16	20.49	38.45	-17.96
844.00	10	16-QAM	H	213	200	1 / 0	15.07	5.25	20.32	38.45	-18.13
836.50	3	QPSK	V	204	204	1 / 0	15.60	5.00	20.60	38.45	-17.85

Table 7-3. ERP Data (Band 5)

FCC ID: ZNFL53AL	 FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)			Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 102 of 122

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	237	99	3 / 2	12.73	9.66	22.39	30.00	-7.61
1732.50	1.4	QPSK	H	115	109	3 / 2	13.78	9.61	23.39	30.00	-6.61
1754.30	1.4	QPSK	H	108	100	1 / 0	13.48	9.57	23.05	30.00	-6.95
1710.70	1.4	16-QAM	H	237	99	3 / 2	11.98	9.66	21.64	30.00	-8.36
1732.50	1.4	16-QAM	H	115	109	3 / 2	12.41	9.61	22.02	30.00	-7.98
1754.30	1.4	16-QAM	H	108	100	1 / 0	12.73	9.57	22.30	30.00	-7.70
1711.50	3	QPSK	H	120	91	1 / 0	13.10	9.65	22.75	30.00	-7.25
1732.50	3	QPSK	H	117	108	1 / 14	14.23	9.61	23.84	30.00	-6.16
1753.50	3	QPSK	H	115	104	1 / 0	14.78	9.57	24.35	30.00	-5.65
1711.50	3	16-QAM	H	120	91	1 / 0	12.43	9.65	22.08	30.00	-7.92
1732.50	3	16-QAM	H	117	108	1 / 14	13.60	9.61	23.21	30.00	-6.79
1753.50	3	16-QAM	H	115	104	1 / 0	14.07	9.57	23.64	30.00	-6.36
1712.50	5	QPSK	H	118	93	1 / 0	13.18	9.65	22.83	30.00	-7.17
1732.50	5	QPSK	H	117	104	1 / 24	14.21	9.61	23.82	30.00	-6.18
1752.50	5	QPSK	H	104	104	1 / 0	14.61	9.57	24.18	30.00	-5.82
1712.50	5	16-QAM	H	118	93	1 / 0	11.92	9.65	21.57	30.00	-8.43
1732.50	5	16-QAM	H	117	104	1 / 24	13.00	9.61	22.61	30.00	-7.39
1752.50	5	16-QAM	H	104	104	1 / 0	14.13	9.57	23.70	30.00	-6.30
1715.00	10	QPSK	H	299	101	1 / 0	12.73	9.65	22.38	30.00	-7.62
1732.50	10	QPSK	H	299	97	1 / 0	13.48	9.61	23.09	30.00	-6.91
1750.00	10	QPSK	H	111	101	1 / 0	14.42	9.58	24.00	30.00	-6.00
1715.00	10	16-QAM	H	299	101	1 / 0	12.08	9.65	21.73	30.00	-8.27
1732.50	10	16-QAM	H	299	97	1 / 0	12.51	9.61	22.12	30.00	-7.88
1750.00	10	16-QAM	H	111	101	1 / 0	13.56	9.58	23.14	30.00	-6.86
1717.50	15	QPSK	H	119	86	1 / 0	12.60	9.64	22.24	30.00	-7.76
1732.50	15	QPSK	H	118	98	1 / 74	13.97	9.61	23.58	30.00	-6.42
1747.50	15	QPSK	H	111	100	1 / 0	13.55	9.58	23.13	30.00	-6.87
1717.50	15	16-QAM	H	119	86	1 / 0	12.00	9.64	21.64	30.00	-8.36
1732.50	15	16-QAM	H	118	98	1 / 74	13.42	9.61	23.03	30.00	-6.97
1747.50	15	16-QAM	H	111	100	1 / 0	13.14	9.58	22.72	30.00	-7.28
1720.00	20	QPSK	H	113	106	1 / 99	13.44	9.64	23.08	30.00	-6.92
1732.50	20	QPSK	H	115	104	1 / 99	13.73	9.61	23.34	30.00	-6.66
1745.00	20	QPSK	H	107	107	1 / 99	14.38	9.59	23.97	30.00	-6.03
1720.00	20	16-QAM	H	113	106	1 / 99	12.29	9.64	21.93	30.00	-8.07
1732.50	20	16-QAM	H	115	104	1 / 99	12.35	9.61	21.96	30.00	-8.04
1745.00	20	16-QAM	H	107	107	1 / 99	13.15	9.59	22.74	30.00	-7.26
1753.50	3	QPSK	V	115	137	1 / 0	12.22	9.57	21.79	30.00	-8.21

Table 7-4. EIRP Data (Band 4)

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 103 of 122	

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	279	113	1 / 0	14.09	9.35	23.44	33.01	-9.57
1880.00	1.4	QPSK	H	265	113	1 / 5	14.66	9.27	23.93	33.01	-9.08
1909.30	1.4	QPSK	H	278	87	1 / 5	13.83	9.25	23.08	33.01	-9.93
1850.70	1.4	16-QAM	H	279	113	1 / 0	13.22	9.35	22.57	33.01	-10.44
1880.00	1.4	16-QAM	H	265	113	1 / 5	14.28	9.27	23.55	33.01	-9.46
1909.30	1.4	16-QAM	H	278	87	1 / 5	12.97	9.25	22.22	33.01	-10.79
1851.50	3	QPSK	H	275	111	1 / 14	13.86	9.35	23.21	33.01	-9.80
1880.00	3	QPSK	H	268	106	1 / 14	15.45	9.27	24.72	33.01	-8.29
1908.50	3	QPSK	H	263	101	1 / 14	13.49	9.25	22.74	33.01	-10.27
1851.50	3	16-QAM	H	275	111	1 / 14	13.00	9.35	22.35	33.01	-10.66
1880.00	3	16-QAM	H	268	106	1 / 14	15.18	9.27	24.45	33.01	-8.56
1908.50	3	16-QAM	H	263	101	1 / 14	12.68	9.25	21.93	33.01	-11.08
1852.50	5	QPSK	H	278	110	1 / 24	14.56	9.34	23.90	33.01	-9.11
1880.00	5	QPSK	H	268	110	1 / 24	15.43	9.27	24.70	33.01	-8.31
1907.50	5	QPSK	H	263	100	1 / 24	13.73	9.24	22.97	33.01	-10.04
1852.50	5	16-QAM	H	278	110	1 / 24	13.26	9.34	22.60	33.01	-10.41
1880.00	5	16-QAM	H	268	110	1 / 24	14.56	9.27	23.83	33.01	-9.18
1907.50	5	16-QAM	H	263	100	1 / 24	12.71	9.24	21.95	33.01	-11.06
1855.00	10	QPSK	H	274	109	1 / 0	14.31	9.34	23.65	33.01	-9.36
1880.00	10	QPSK	H	265	107	1 / 0	15.00	9.27	24.27	33.01	-8.74
1905.00	10	QPSK	H	269	101	1 / 0	14.82	9.24	24.06	33.01	-8.95
1855.00	10	16-QAM	H	274	109	1 / 0	13.49	9.34	22.83	33.01	-10.18
1880.00	10	16-QAM	H	265	107	1 / 0	14.14	9.27	23.41	33.01	-9.60
1905.00	10	16-QAM	H	269	101	1 / 0	14.10	9.24	23.34	33.01	-9.67
1857.50	15	QPSK	H	272	110	1 / 0	14.10	9.33	23.43	33.01	-9.58
1880.00	15	QPSK	H	269	106	1 / 74	14.40	9.27	23.67	33.01	-9.34
1902.50	15	QPSK	H	268	102	1 / 0	14.67	9.23	23.90	33.01	-9.11
1857.50	15	16-QAM	H	272	110	1 / 0	13.55	9.33	22.88	33.01	-10.13
1880.00	15	16-QAM	H	269	106	1 / 74	13.87	9.27	23.14	33.01	-9.87
1902.50	15	16-QAM	H	268	102	1 / 0	14.36	9.23	23.59	33.01	-9.42
1860.00	20	QPSK	H	263	116	1 / 99	13.42	9.32	22.74	33.01	-10.27
1880.00	20	QPSK	H	268	107	1 / 99	14.22	9.27	23.49	33.01	-9.52
1900.00	20	QPSK	H	269	102	1 / 0	14.86	9.22	24.08	33.01	-8.93
1860.00	20	16-QAM	H	263	116	1 / 99	12.55	9.32	21.87	33.01	-11.14
1880.00	20	16-QAM	H	268	107	1 / 99	12.99	9.27	22.26	33.01	-10.75
1900.00	20	16-QAM	H	269	102	1 / 0	14.17	9.22	23.39	33.01	-9.62
1880.00	3	QPSK	V	110	141	1 / 0	11.51	9.27	20.78	33.01	-12.23

Table 7-5. EIRP Data (Band 2)

FCC ID: ZNFL53AL	 PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	 LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 104 of 122	

7.7 Radiated Spurious Emissions Measurements

§2.1053 §22.917(a) §24.238(a) §27.53(g) §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 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points \geq 2 x span / RBW
5. Detector = Peak
6. Trace mode = max hold
7. The trace was allowed to stabilize

FCC ID: ZNFL53AL	 FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		 Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 105 of 122

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

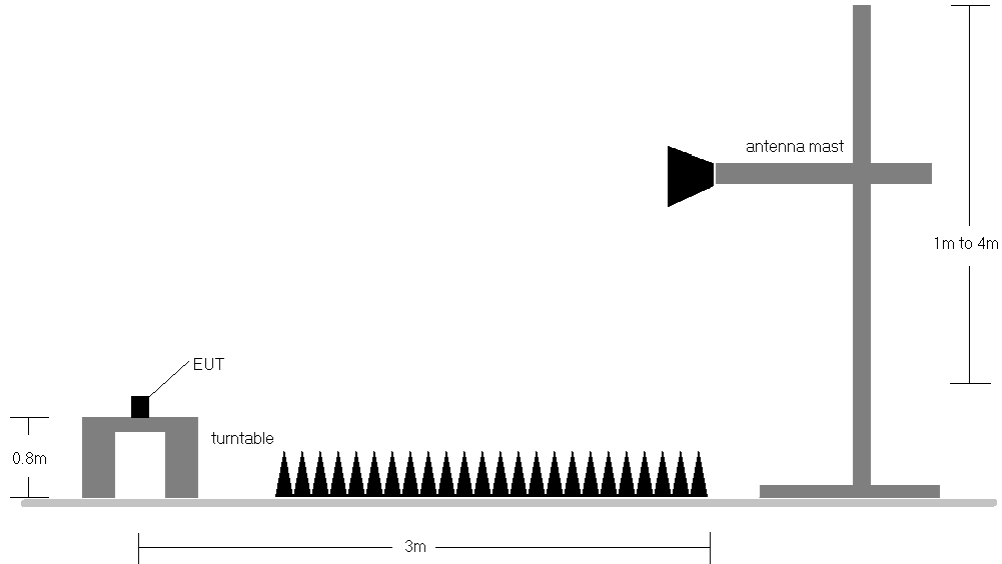


Figure 7-7. Test Instrument & Measurement Setup

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.

FCC ID: ZNFL53AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 106 of 122

OPERATING FREQUENCY: 700.50 MHz
 CHANNEL: 23025
 MEASURED OUTPUT POWER: 18.69 dBm = 0.074 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 3.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 31.69 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]
1401.00	H	201	324	-53.19	2.36	-50.83	69.5
2101.50	H	252	236	-48.18	3.46	-44.71	63.4
2802.00	H	357	254	-54.06	4.74	-49.32	68.0
3502.50	H	173	175	-56.63	6.21	-50.42	69.1
4203.00	H	-	-	-56.36	7.22	-49.14	67.8

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

OPERATING FREQUENCY: 707.50 MHz
 CHANNEL: 23095
 MEASURED OUTPUT POWER: 19.06 dBm = 0.081 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 3.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 32.06 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]
1415.00	H	292	78	-54.35	2.54	-51.81	70.9
2122.50	H	104	25	-43.23	3.42	-39.81	58.9
2830.00	H	201	6	-54.84	4.85	-49.98	69.0
3537.50	H	-	-	-57.20	6.26	-50.94	70.0

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

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 107 of 122	

OPERATING FREQUENCY: 714.50 MHz
 CHANNEL: 23165
 MEASURED OUTPUT POWER: 17.85 dBm = 0.061 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 3.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 30.85 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]
1429.00	H	171	343	-56.06	2.72	-53.34	71.2
2143.50	H	218	300	-46.96	3.37	-43.59	61.4
2858.00	H	210	107	-56.44	4.96	-51.47	69.3
3572.50	H	151	192	-56.96	6.31	-50.64	68.5
4287.00	H	-	-	-56.05	7.37	-48.68	66.5

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

OPERATING FREQUENCY: 825.50 MHz
 CHANNEL: 20415
 MEASURED OUTPUT POWER: 21.93 dBm = 0.156 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 3.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 34.93 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]
1651.00	H	127	121	-57.24	3.63	-53.60	75.5
2476.50	H	103	32	-41.37	3.56	-37.80	59.7
3302.00	H	-	-	-57.01	5.82	-51.19	73.1
4127.50	H	222	354	-53.83	6.99	-46.84	68.8
4953.00	H	-	-	-55.78	7.96	-47.82	69.8

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

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 108 of 122	

OPERATING FREQUENCY: 836.50 MHz
 CHANNEL: 20525
 MEASURED OUTPUT POWER: 22.24 dBm = 0.167 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 3.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 35.24 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	242	32	-58.44	3.52	-54.92	77.2
2509.50	H	240	189	-43.22	3.59	-39.63	61.9
3346.00	H	-	-	-56.81	5.87	-50.94	73.2

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

OPERATING FREQUENCY: 847.50 MHz
 CHANNEL: 20635
 MEASURED OUTPUT POWER: 21.67 dBm = 0.147 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 3.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 34.67 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]
1695.00	H	223	2	-51.78	3.41	-48.38	70.0
2542.50	H	220	216	-46.66	3.73	-42.93	64.6
3390.00	H	-	-	-57.17	5.92	-51.26	72.9

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

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 109 of 122	

OPERATING FREQUENCY: 1711.50 MHz
 CHANNEL: 19965
 MEASURED OUTPUT POWER: 22.75 dBm = 0.189 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 3.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 35.75 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	100	194	-50.35	8.14	-42.21	65.0
5134.50	H	122	320	-45.21	10.36	-34.84	57.6
6846.00	H	103	110	-53.01	11.48	-41.54	64.3
8557.50	H	-	-	-55.95	13.04	-42.90	65.7

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

OPERATING FREQUENCY: 1732.50 MHz
 CHANNEL: 20175
 MEASURED OUTPUT POWER: 23.84 dBm = 0.242 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 3.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 36.84 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	100	195	-51.15	8.26	-42.89	66.7
5197.50	H	124	105	-47.88	10.41	-37.46	61.3
6930.00	H	124	194	-53.73	11.53	-42.20	66.0
8662.50	H	-	-	-56.29	13.07	-43.22	67.1

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

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 110 of 122	

OPERATING FREQUENCY: 1753.50 MHz
 CHANNEL: 20385
 MEASURED OUTPUT POWER: 24.35 dBm = 0.272 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 3.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 37.35 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	100	194	-51.25	8.36	-42.89	67.2
5260.50	H	105	317	-44.64	10.35	-34.29	58.6
7014.00	H	122	109	-52.67	11.59	-41.08	65.4
8767.50	H	-	-	-55.36	13.08	-42.28	66.6

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

OPERATING FREQUENCY: 1851.50 MHz
 CHANNEL: 18615
 MEASURED OUTPUT POWER: 23.21 dBm = 0.209 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 3.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 36.21 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]
3703.00	H	191	253	-53.45	8.41	-45.04	68.2
5554.50	H	117	109	-46.70	10.52	-36.19	59.4
7406.00	H	132	84	-53.00	12.01	-40.99	64.2
9257.50	H	-	-	-54.54	13.27	-41.28	64.5

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

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 111 of 122	

OPERATING FREQUENCY: 1880.00 MHz
 CHANNEL: 18900
 MEASURED OUTPUT POWER: 24.72 dBm = 0.297 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 3.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 37.72 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	112	268	-53.19	8.64	-44.56	69.3
5640.00	H	127	313	-44.55	10.62	-33.93	58.7
7520.00	H	127	85	-53.80	12.04	-41.75	66.5
9400.00	H	-	-	-53.91	13.23	-40.68	65.4

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

OPERATING FREQUENCY: 1908.50 MHz
 CHANNEL: 19185
 MEASURED OUTPUT POWER: 22.74 dBm = 0.188 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 3.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 35.74 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]
3817.00	H	103	266	-50.10	8.77	-41.33	64.1
5725.50	H	100	322	-45.80	10.71	-35.09	57.8
7634.00	H	122	83	-52.45	12.17	-40.28	63.0
9542.50	H	-	-	-53.47	13.30	-40.18	62.9

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

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 112 of 122	

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

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 113 of 122	

Band 12 Frequency Stability Measurements

§2.1055 §27.54



OPERATING FREQUENCY: 707,500,000 Hz
 CHANNEL: 23790
 REFERENCE VOLTAGE: 3.80 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	707,499,900	-100	-0.0000141
100 %		- 30	707,499,963	-37	-0.0000052
100 %		- 20	707,500,050	50	0.0000071
100 %		- 10	707,500,096	96	0.0000136
100 %		0	707,500,100	100	0.0000141
100 %		+ 10	707,499,862	-138	-0.0000195
100 %		+ 20	707,500,049	49	0.0000069
100 %		+ 30	707,499,860	-140	-0.0000198
100 %		+ 40	707,499,976	-24	-0.0000034
100 %		+ 50	707,499,890	-110	-0.0000155
BATT. ENDPOINT	3.40	+ 20	707,500,043	43	0.0000061

Table 7-18. Frequency Stability Data (Band 12)

Note:

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

FCC ID: ZNFL53AL	 FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)			Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 114 of 122	

Band 12 Frequency Stability Measurements
§2.1055 §27.54

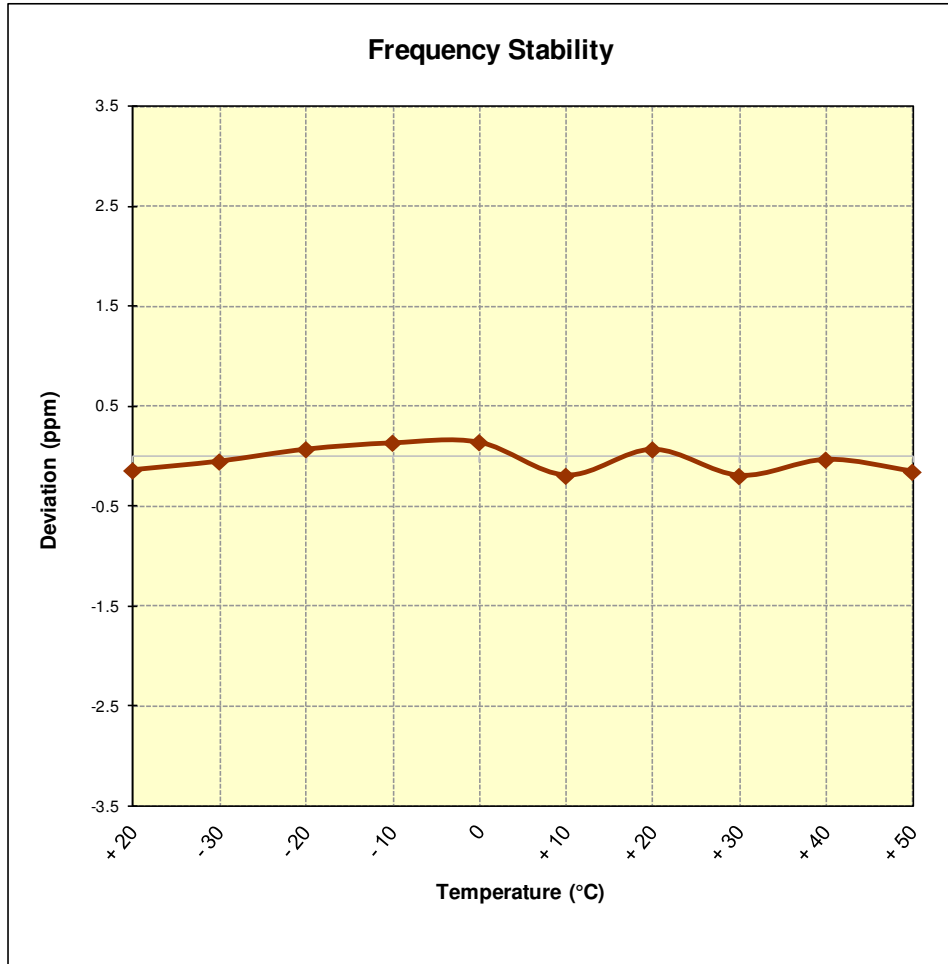


Figure 7-8. Frequency Stability Graph (Band 12)

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 115 of 122	



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)	836,500,029	29	0.0000035
100 %		- 30	836,499,979	-21	-0.0000025
100 %		- 20	836,500,102	102	0.0000122
100 %		- 10	836,500,067	67	0.0000080
100 %		0	836,499,939	-61	-0.0000073
100 %		+ 10	836,499,903	-97	-0.0000116
100 %		+ 20	836,499,924	-76	-0.0000091
100 %		+ 30	836,499,942	-58	-0.0000069
100 %		+ 40	836,499,961	-39	-0.0000047
100 %		+ 50	836,499,879	-121	-0.0000145
BATT. ENDPOINT	3.40	+ 20	836,499,958	-42	-0.0000050

Table 7-19. Frequency Stability Data (Band 5)

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 116 of 122	

Band 5 Frequency Stability Measurements
§2.1055 §22.355

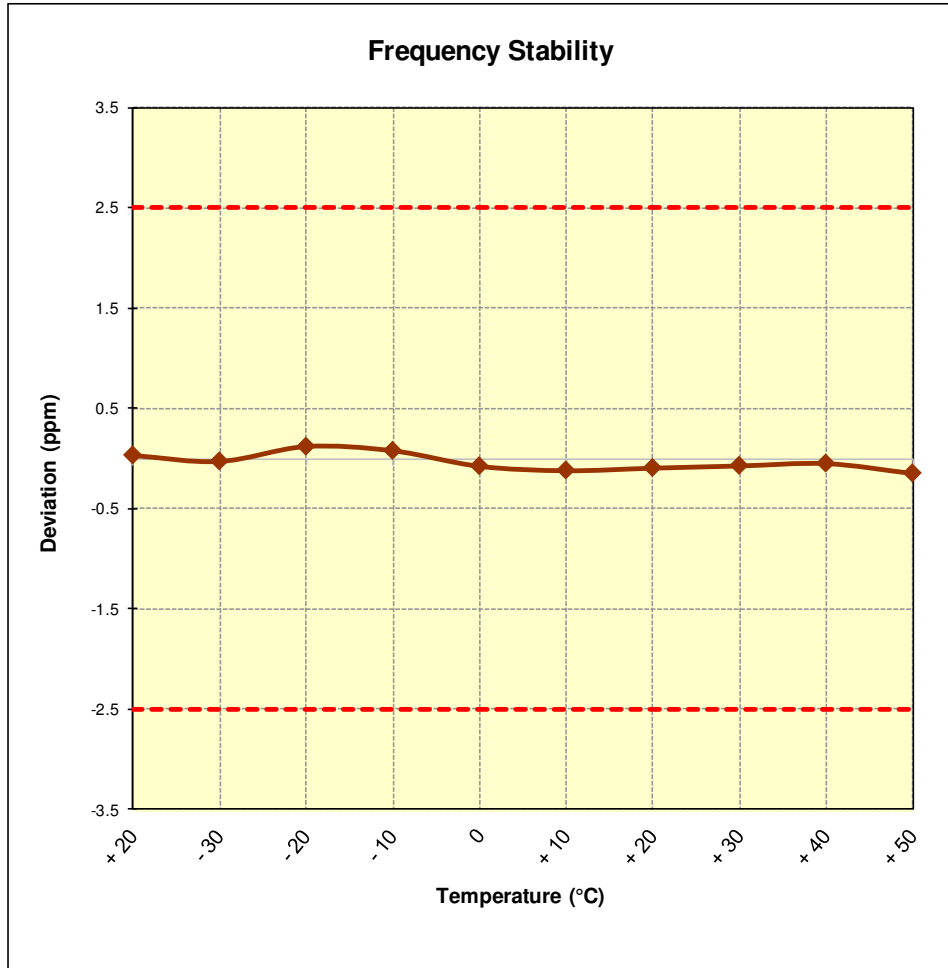




Figure 7-9. Frequency Stability Graph (Band 5)

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 117 of 122	

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)	1,732,500,086	86	0.0000050
100 %		- 30	1,732,499,862	-138	-0.0000080
100 %		- 20	1,732,499,915	-85	-0.0000049
100 %		- 10	1,732,499,924	-76	-0.0000044
100 %		0	1,732,499,953	-47	-0.0000027
100 %		+ 10	1,732,499,965	-35	-0.0000020
100 %		+ 20	1,732,500,001	1	0.0000001
100 %		+ 30	1,732,499,976	-24	-0.0000014
100 %		+ 40	1,732,499,870	-130	-0.0000075
100 %		+ 50	1,732,500,031	31	0.0000018
BATT. ENDPOINT	3.40	+ 20	1,732,500,084	84	0.0000048

Table 7-20. 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.

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 118 of 122	

Band 4 Frequency Stability Measurements
§2.1055 §§27.54

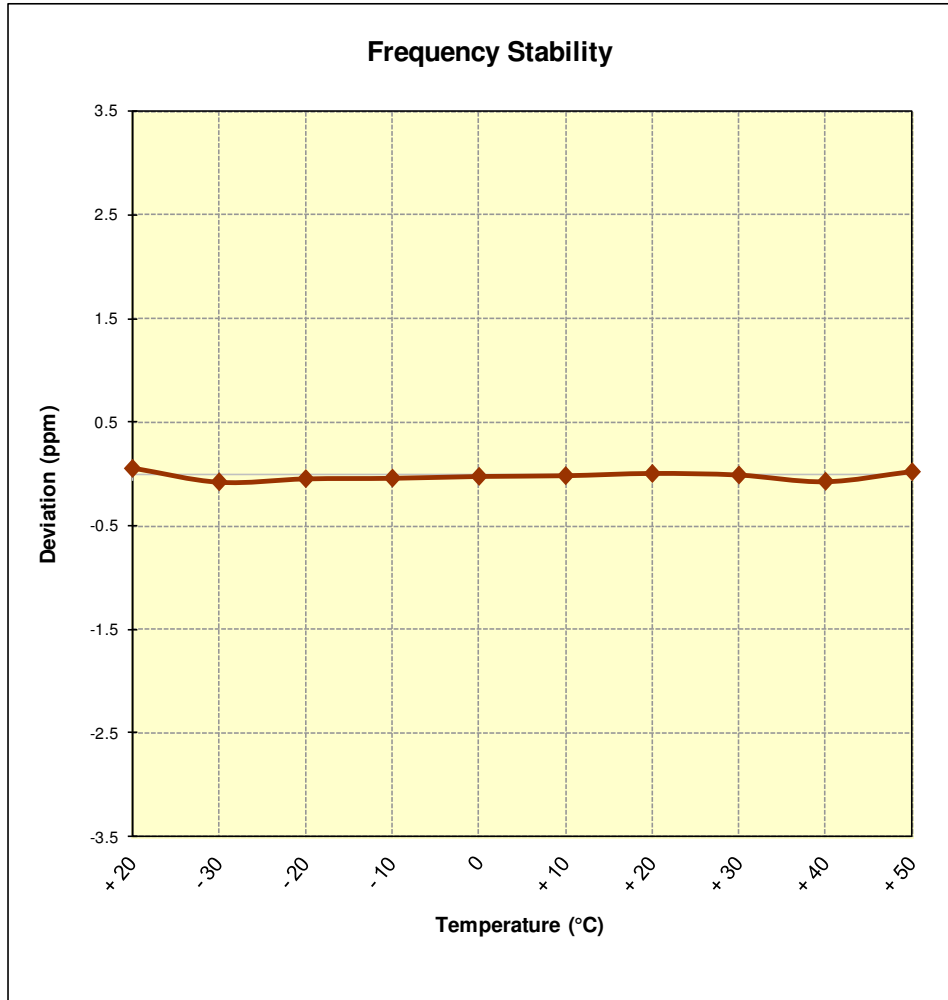


Figure 7-10. Frequency Stability Graph (Band 4)

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 119 of 122

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)	1,880,000,121	121	0.0000064
100 %		- 30	1,879,999,927	-73	-0.0000039
100 %		- 20	1,880,000,083	83	0.0000044
100 %		- 10	1,880,000,114	114	0.0000061
100 %		0	1,879,999,985	-15	-0.0000008
100 %		+ 10	1,880,000,148	148	0.0000079
100 %		+ 20	1,880,000,058	58	0.0000031
100 %		+ 30	1,880,000,064	64	0.0000034
100 %		+ 40	1,880,000,125	125	0.0000066
100 %		+ 50	1,879,999,995	-5	-0.0000003
BATT. ENDPOINT	3.40	+ 20	1,880,000,098	98	0.0000052

Table 7-21. 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: ZNFL53AL	 FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)			Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 120 of 122	

Band 2 Frequency Stability Measurements
§2.1055 §24.235

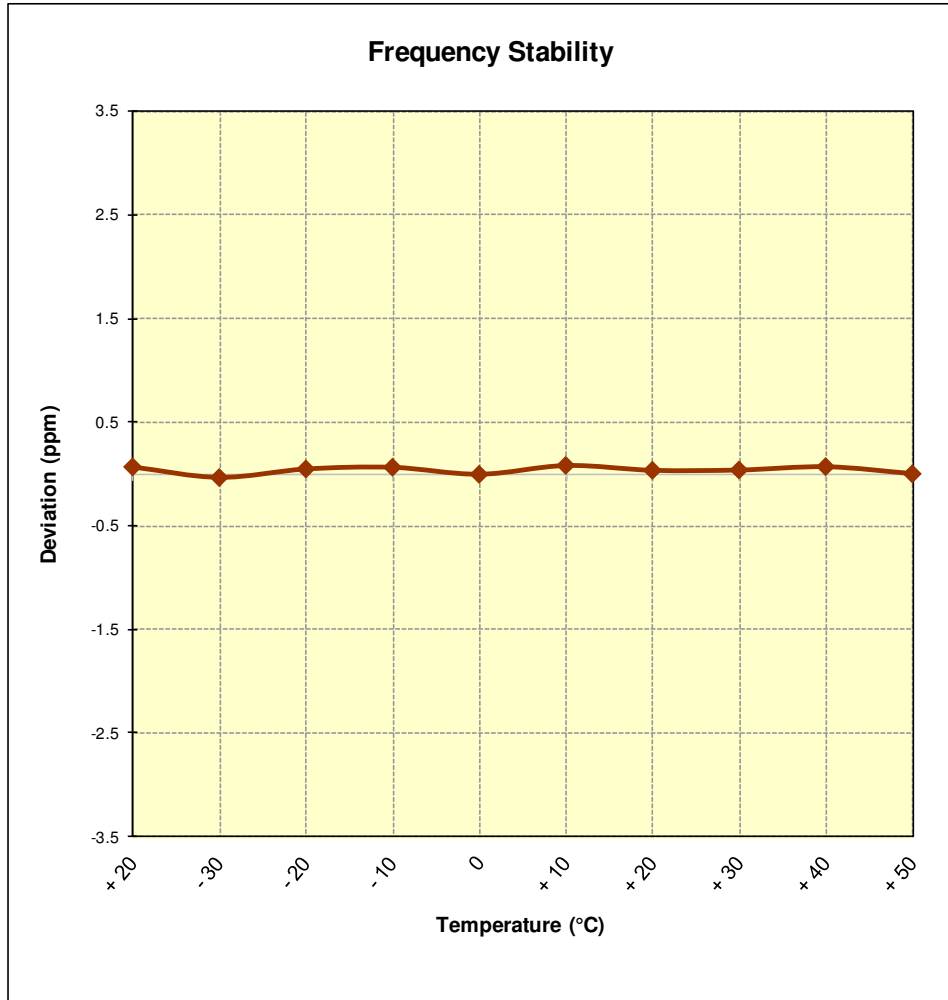




Figure 7-11. Frequency Stability Graph (Band 2)

FCC ID: ZNFL53AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset	Page 121 of 122

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFL53AL** complies with all the requirements of Parts 22, 24, & 27 of the FCC rules for LTE operation only.

FCC ID: ZNFL53AL	 FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)			Reviewed by: Quality Manager
Test Report S/N: 0Y1603220592-R1.ZNF	Test Dates: 3/23 - 5/13/2016	EUT Type: Portable Handset		Page 122 of 122