

## 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

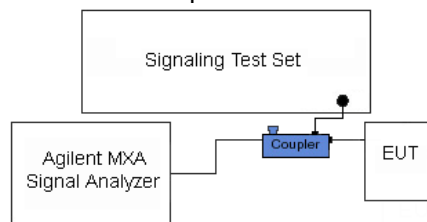
KDB 971168 v02r02 – Section 6.0

### 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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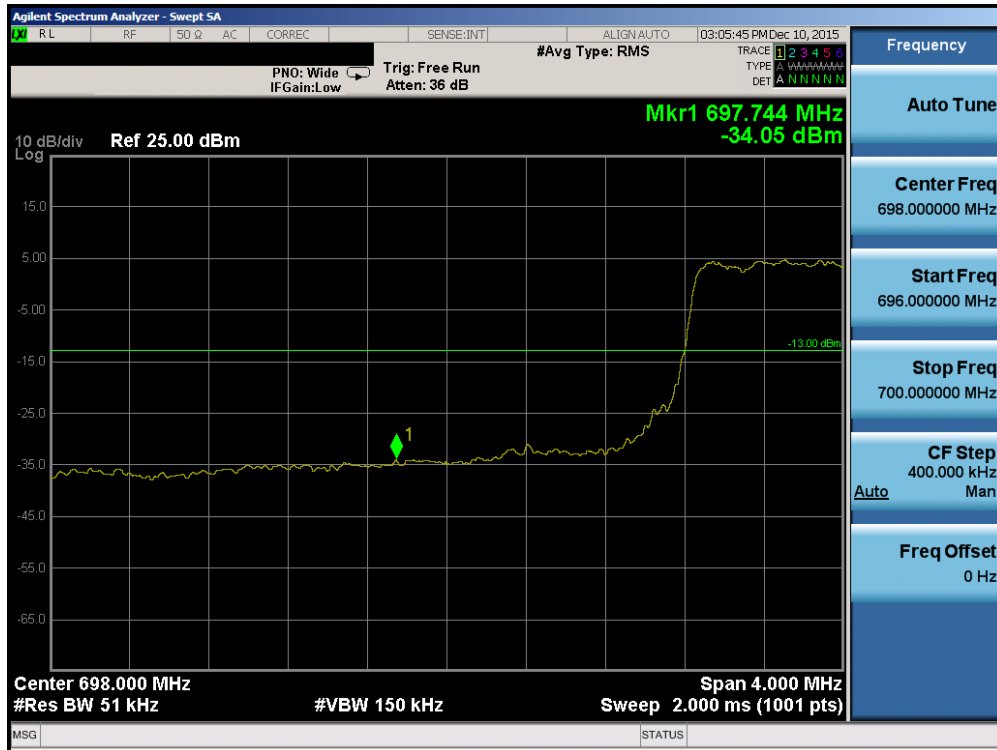


Plot 7-77. Lower Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)

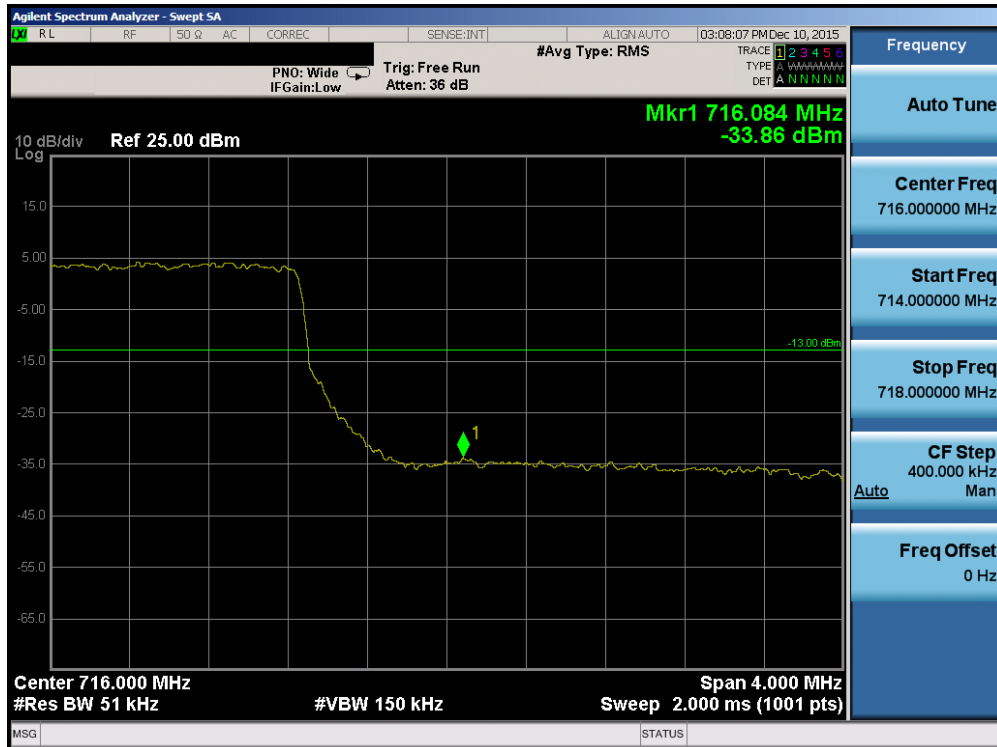


Plot 7-78. Upper Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)

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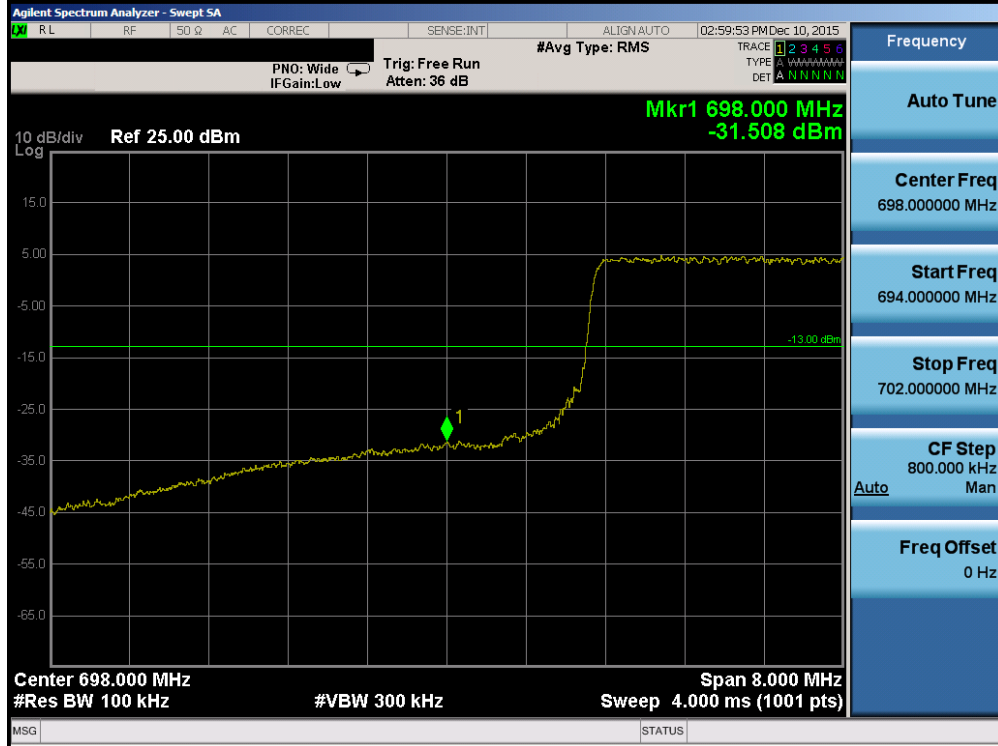


Plot 7-79. Lower Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)

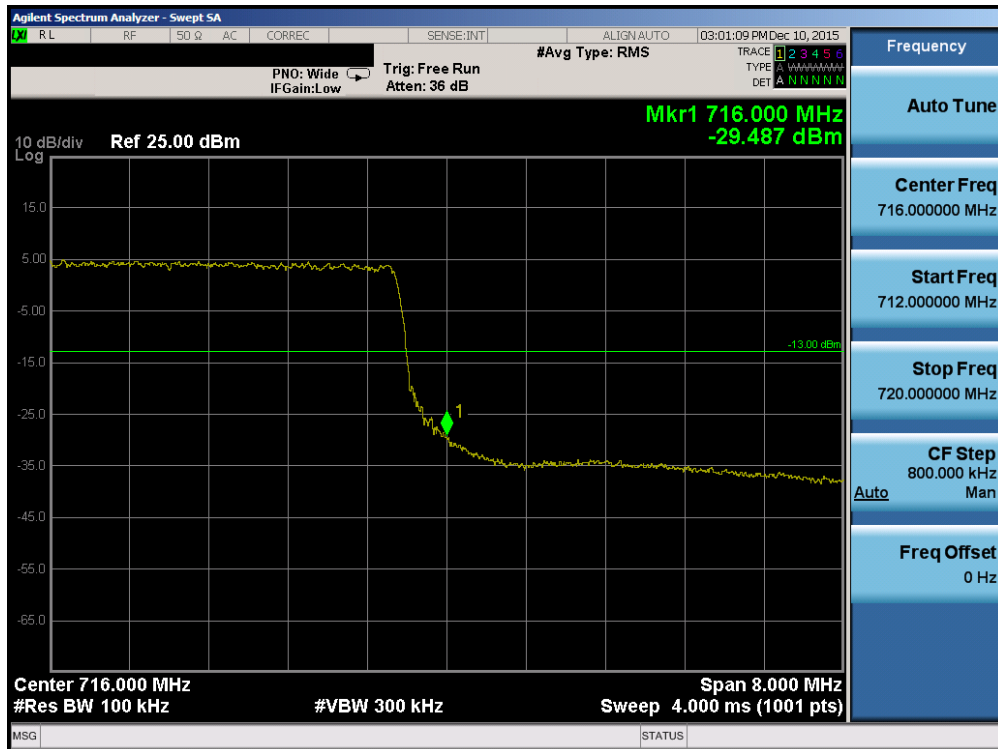


Plot 7-80. Upper Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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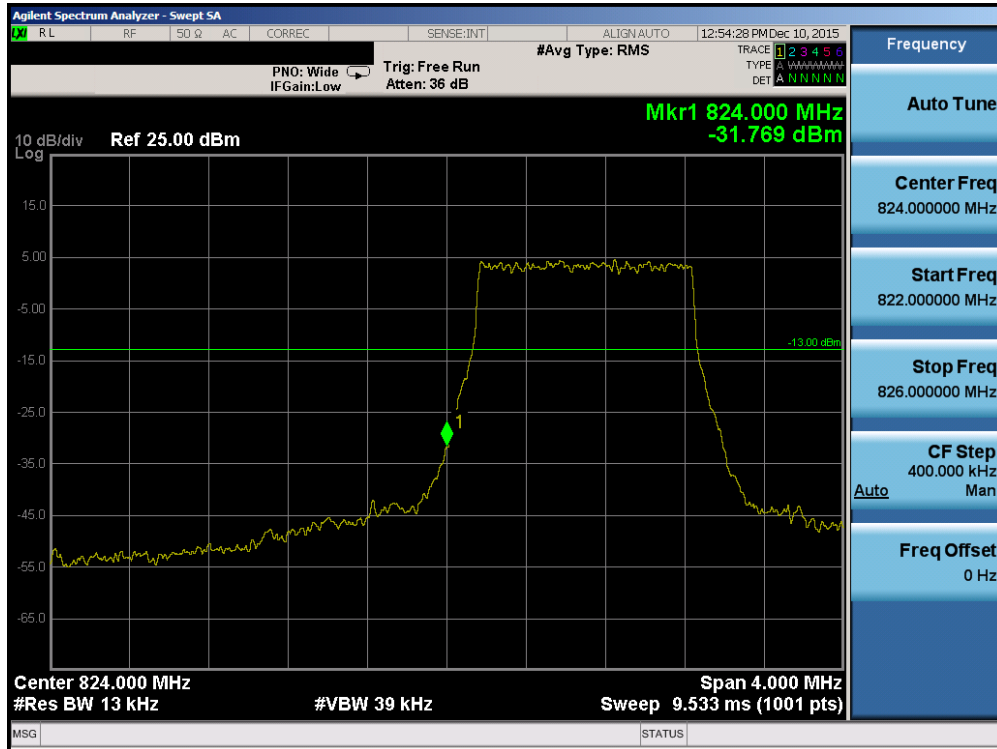


Plot 7-81. Lower Band Edge Plot (Band 12 – 10.0MHz QPSK – RB Size 50)

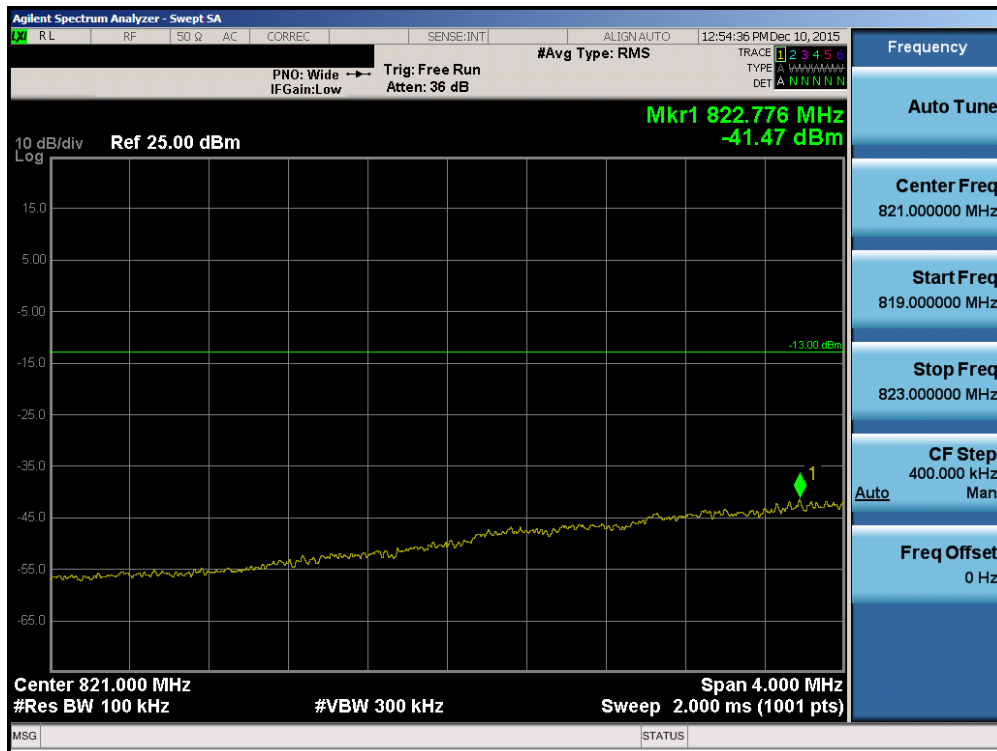


Plot 7-82. Upper Band Edge Plot (Band 12 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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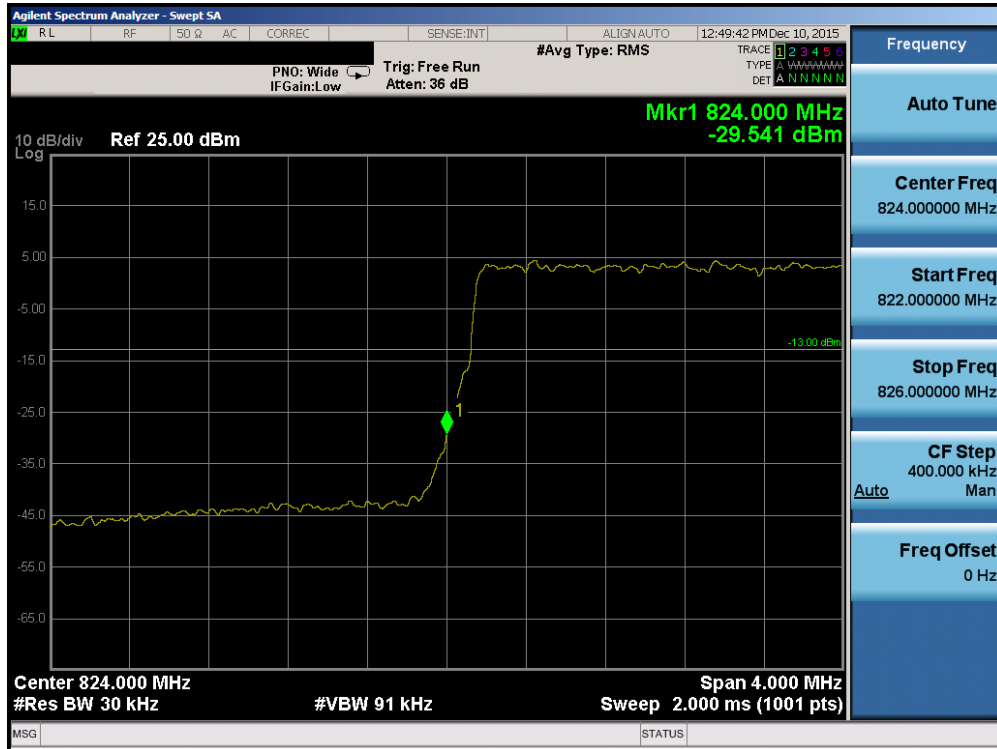
Plot 7-83. Lower Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)



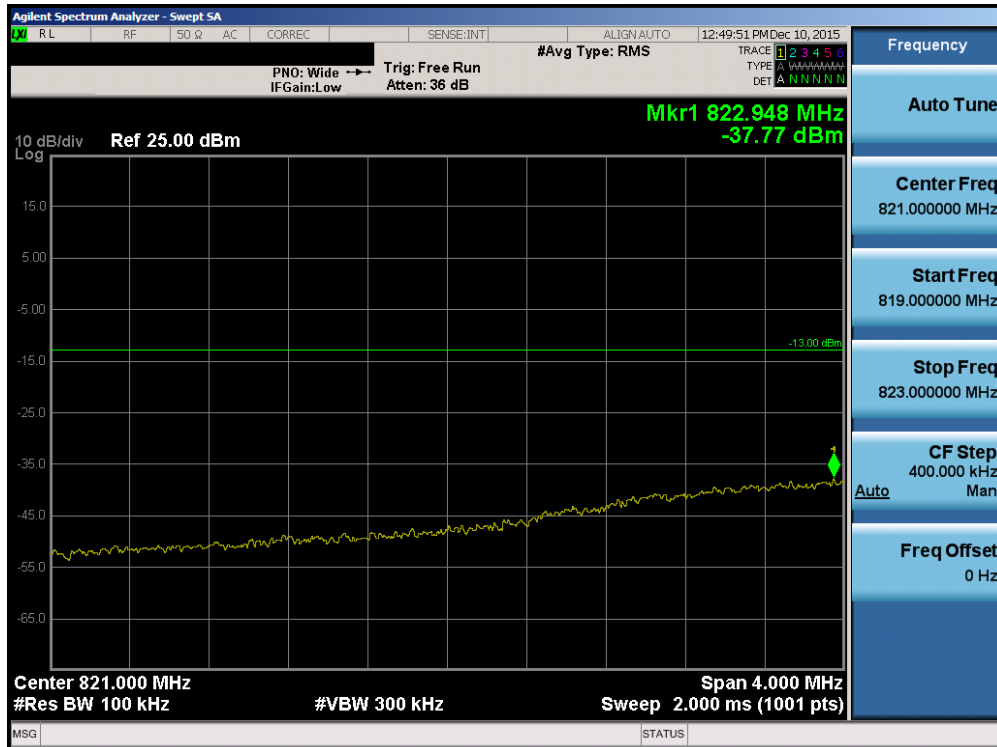
Plot 7-84. Lower Extended Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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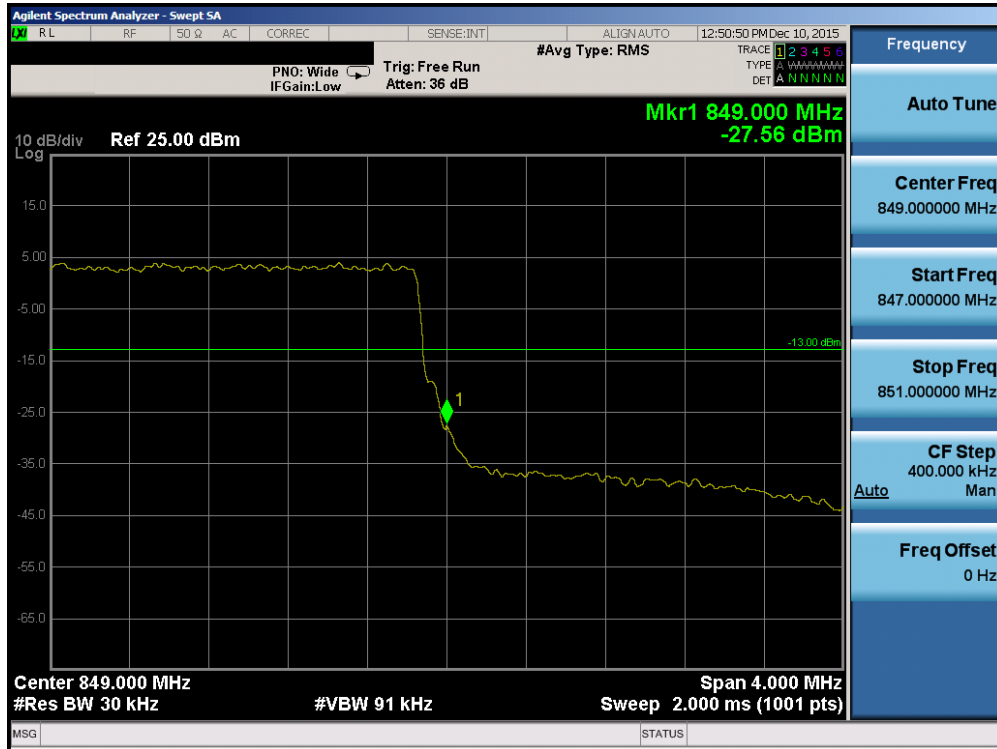
Plot 7-87. Lower Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)



Plot 7-88. Lower Extended Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFL81AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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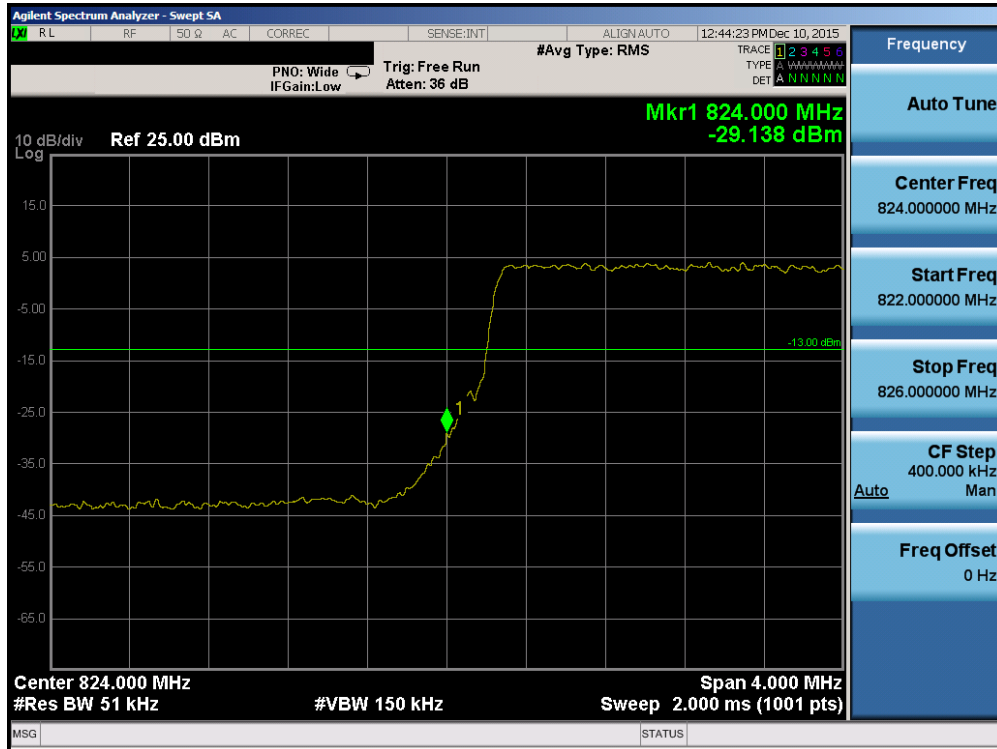
Plot 7-89. Upper Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)



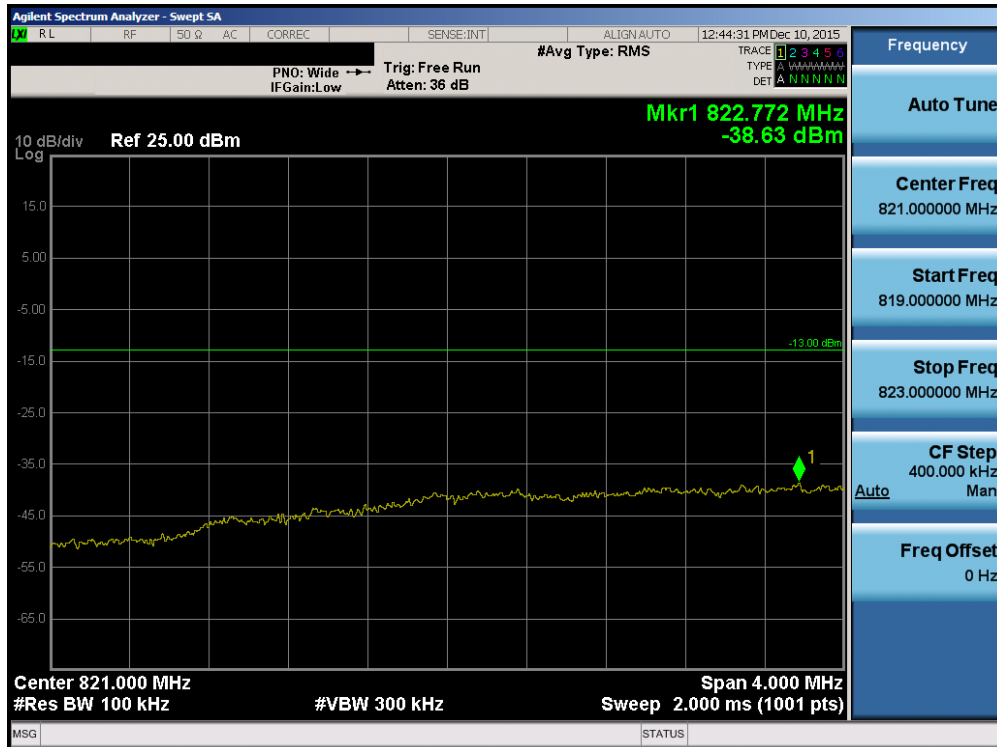
Plot 7-90. Upper Extended Band Edge Plot (Band 5 – Band 5 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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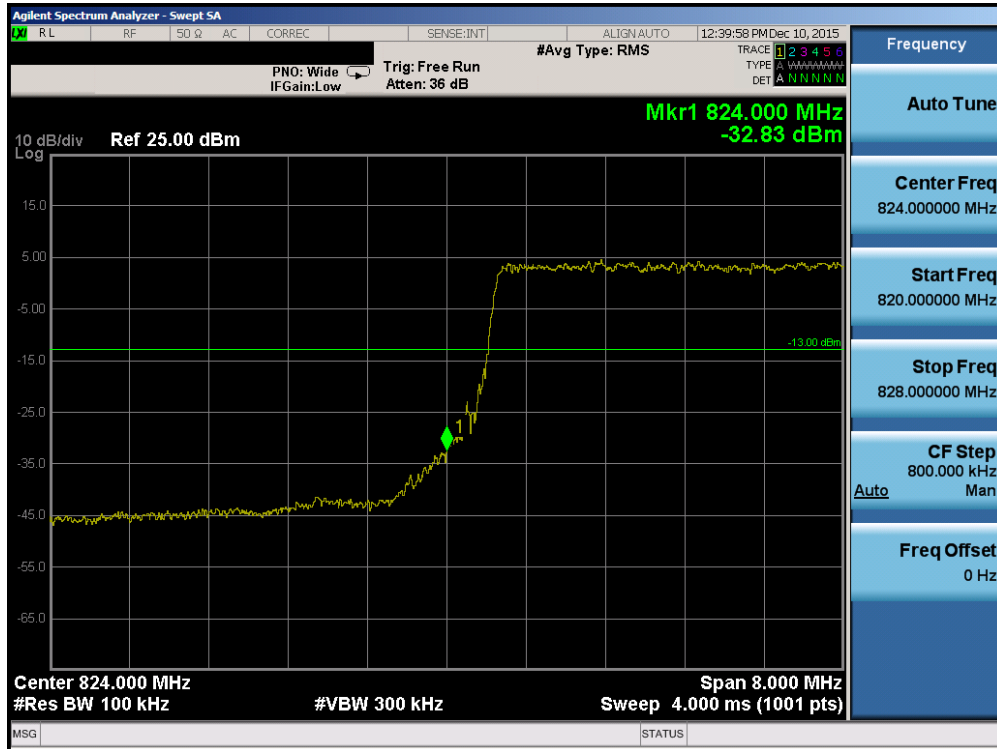
Plot 7-91. Lower Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)



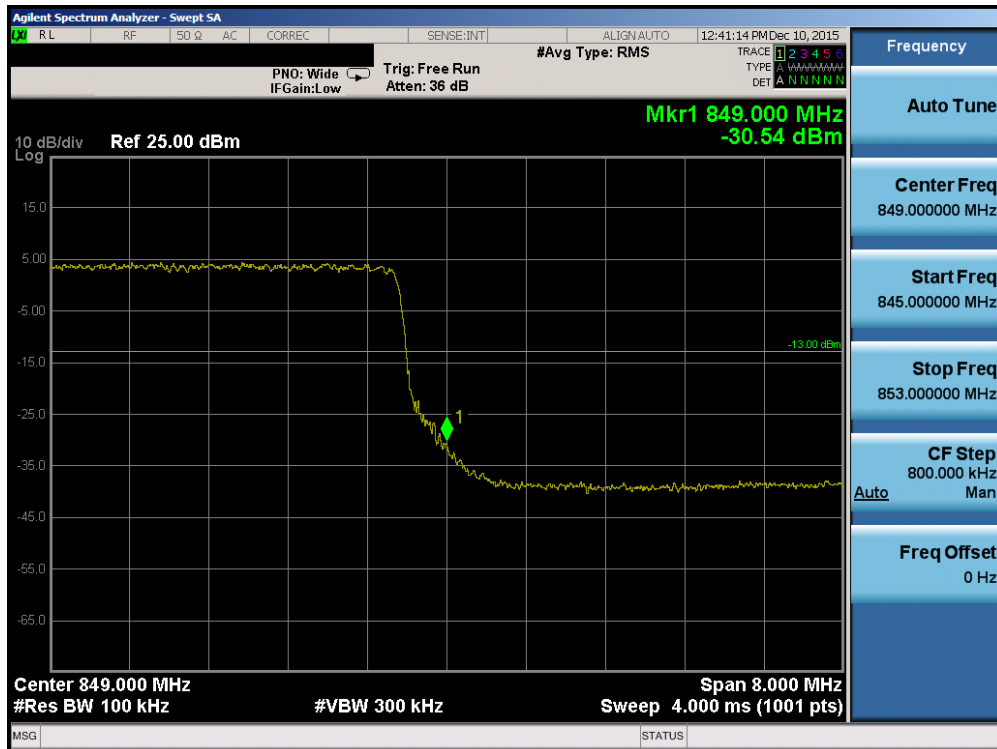
Plot 7-92. Lower Extended Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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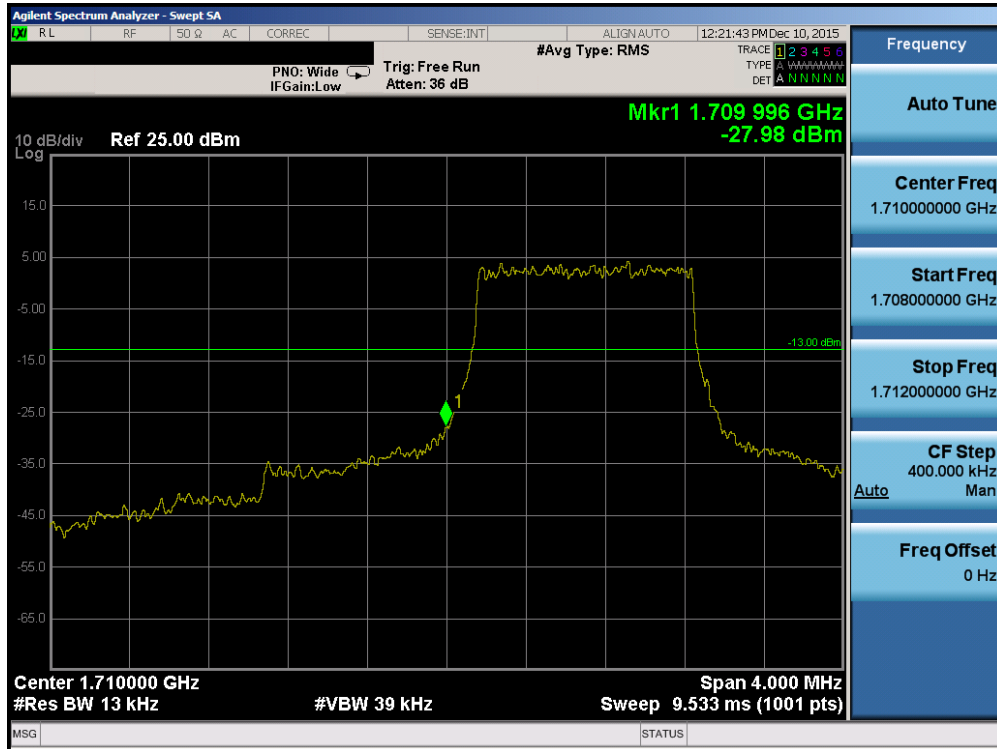


Plot 7-95. Lower Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)

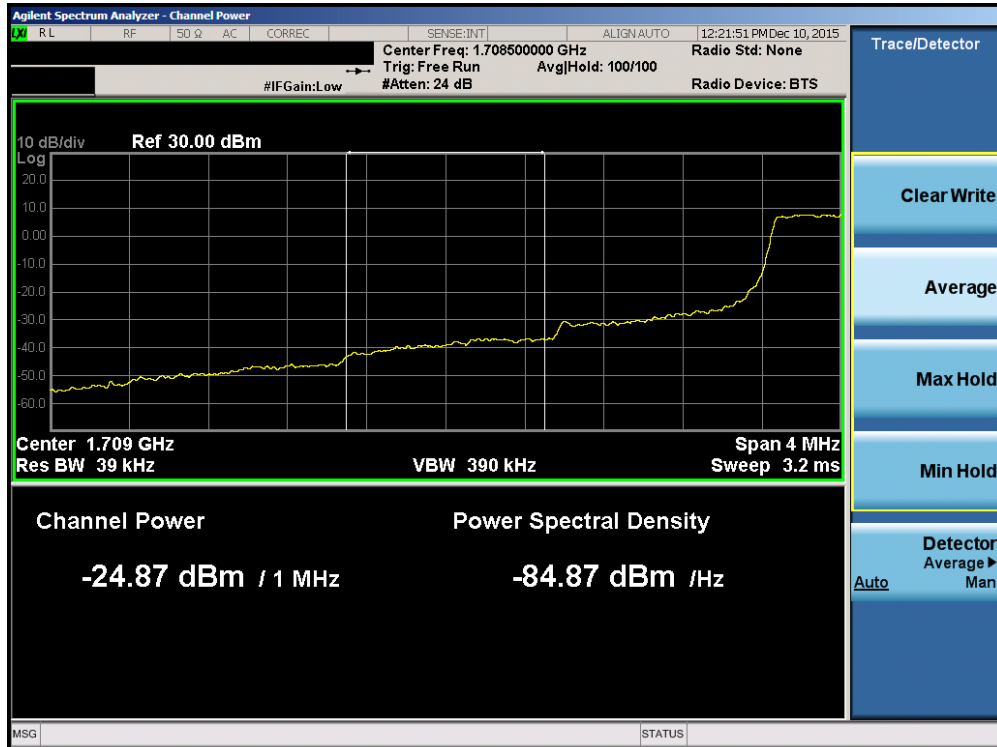


Plot 7-96. Upper Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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Plot 7-97. Lower Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

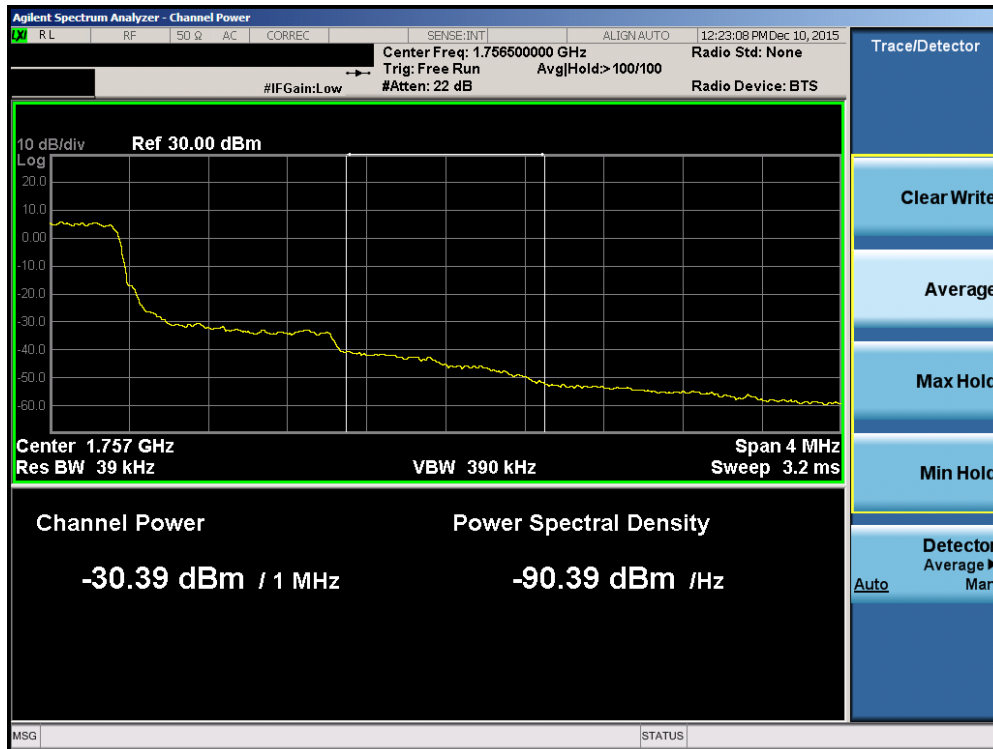


Plot 7-98. Lower Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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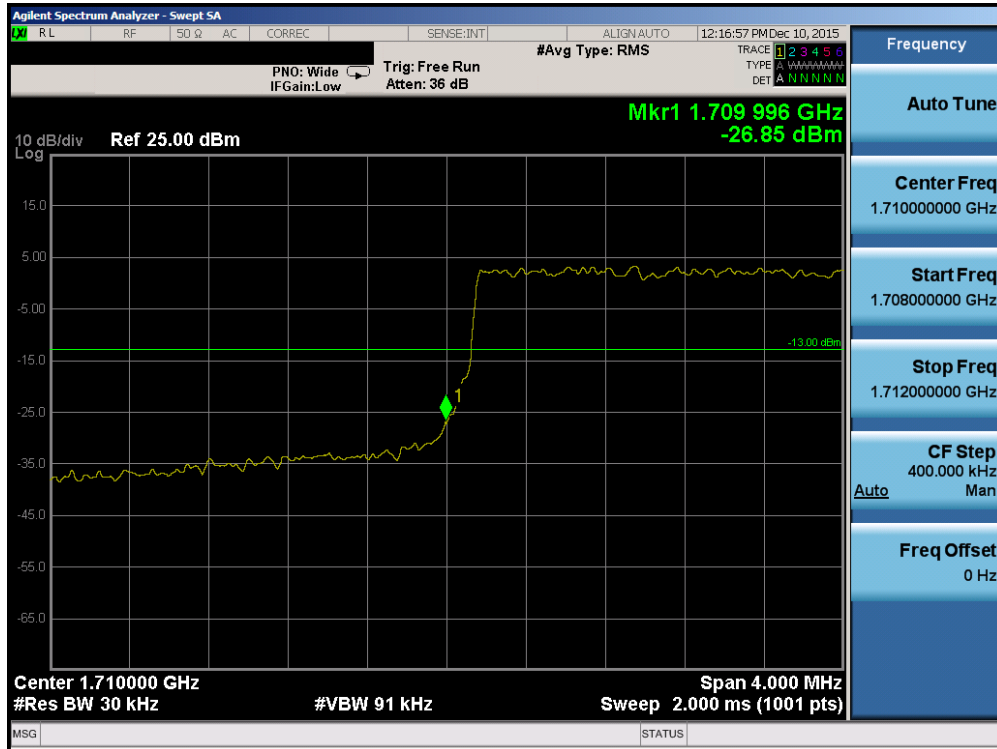


Plot 7-99. Upper Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

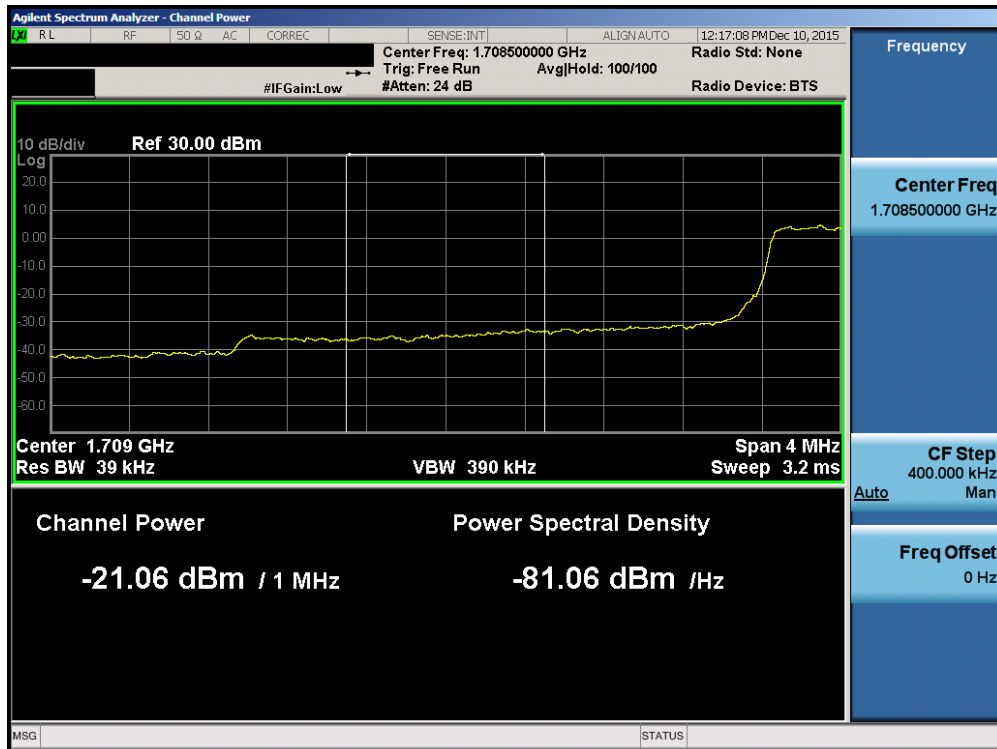


Plot 7-100. Upper Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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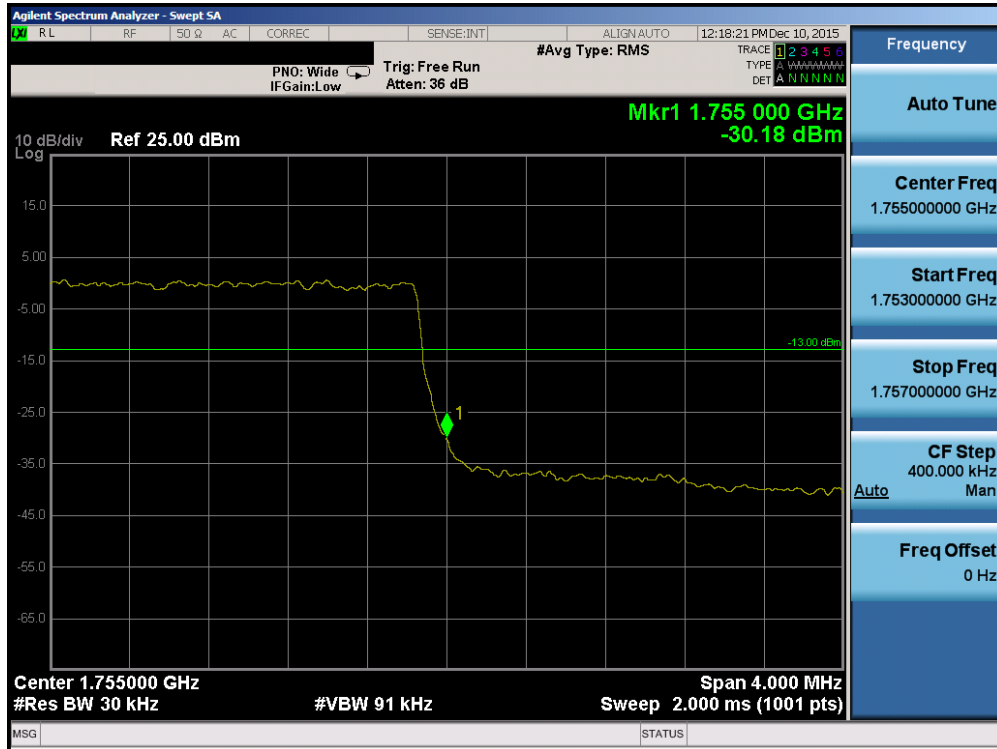


Plot 7-101. Lower Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

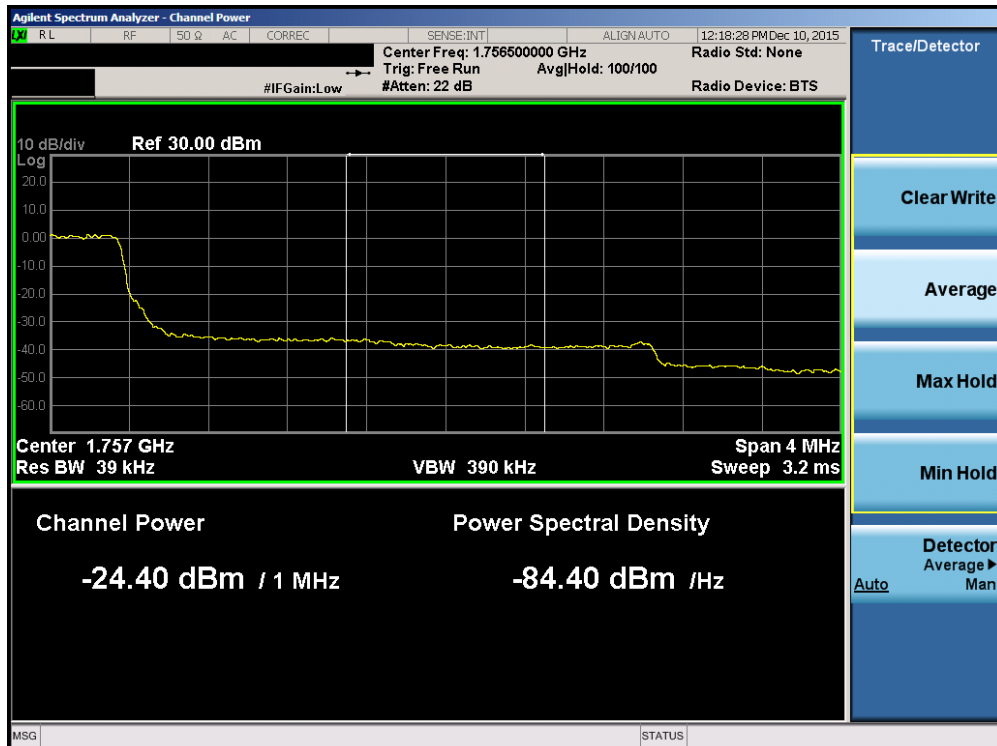


Plot 7-102. Lower Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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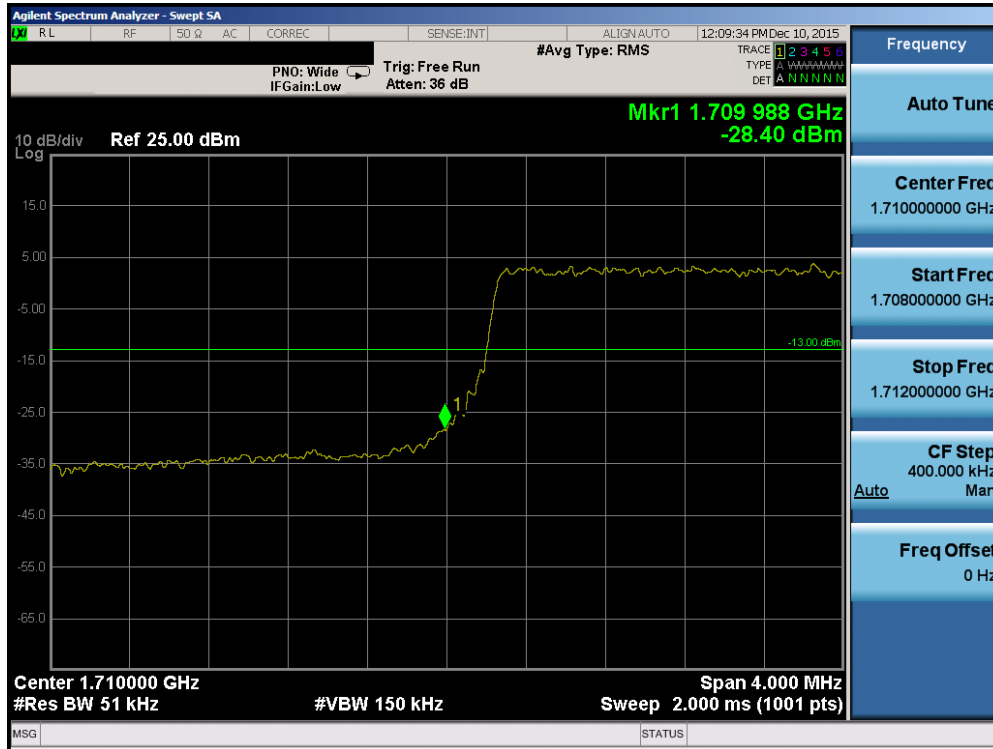
Plot 7-103. Upper Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



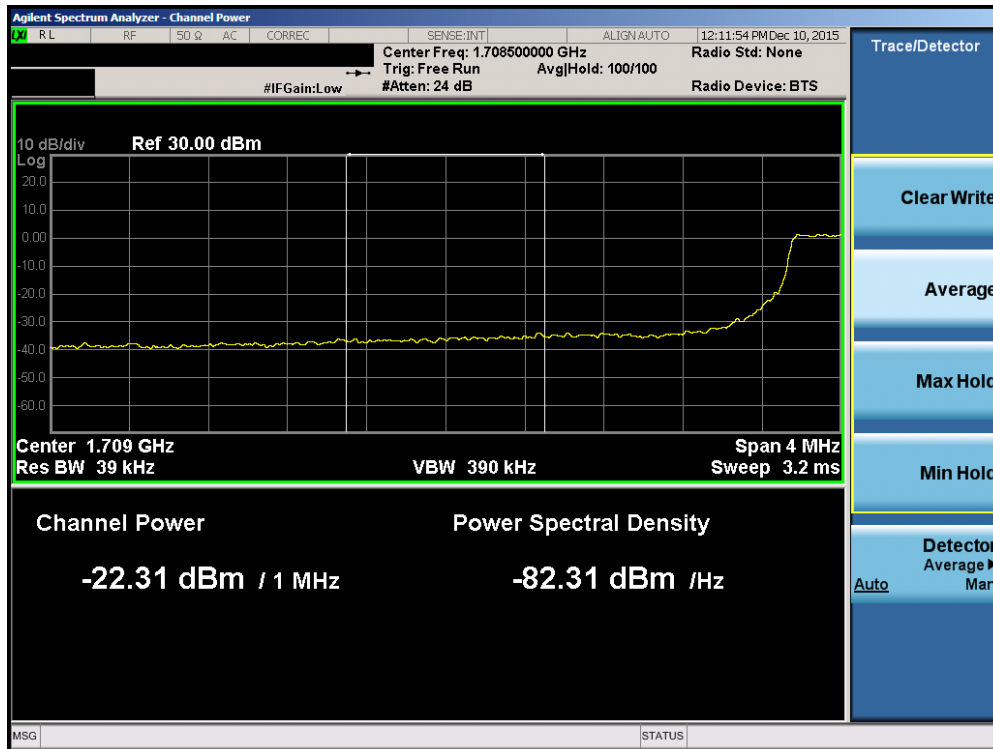
Plot 7-104. Upper Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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Plot 7-105. Lower Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

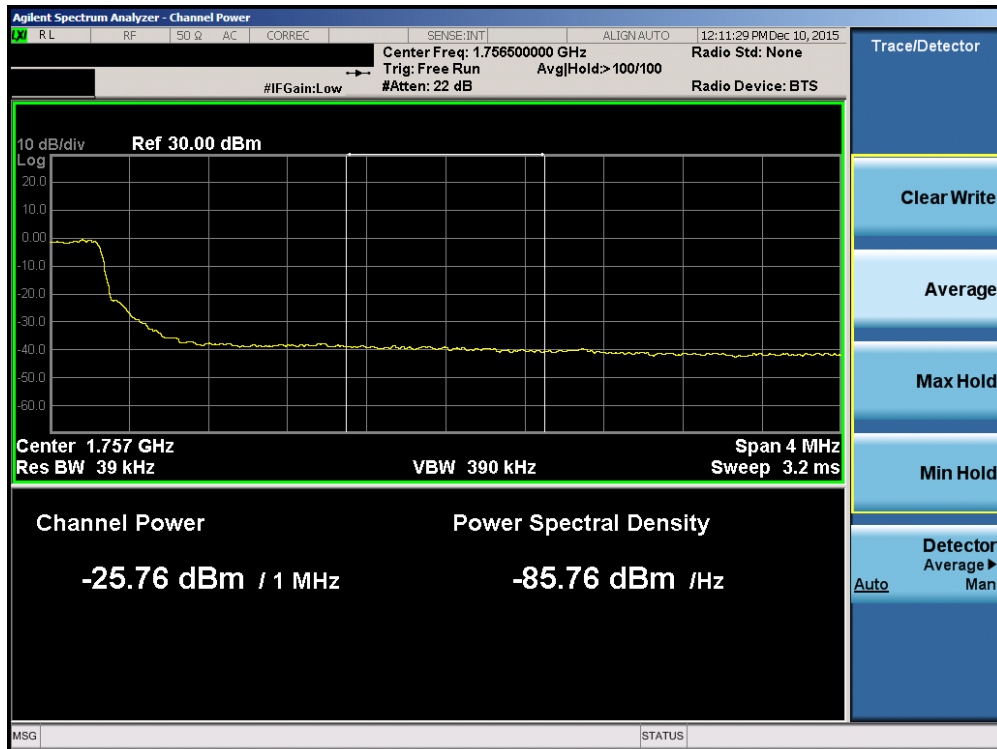


Plot 7-106. Lower Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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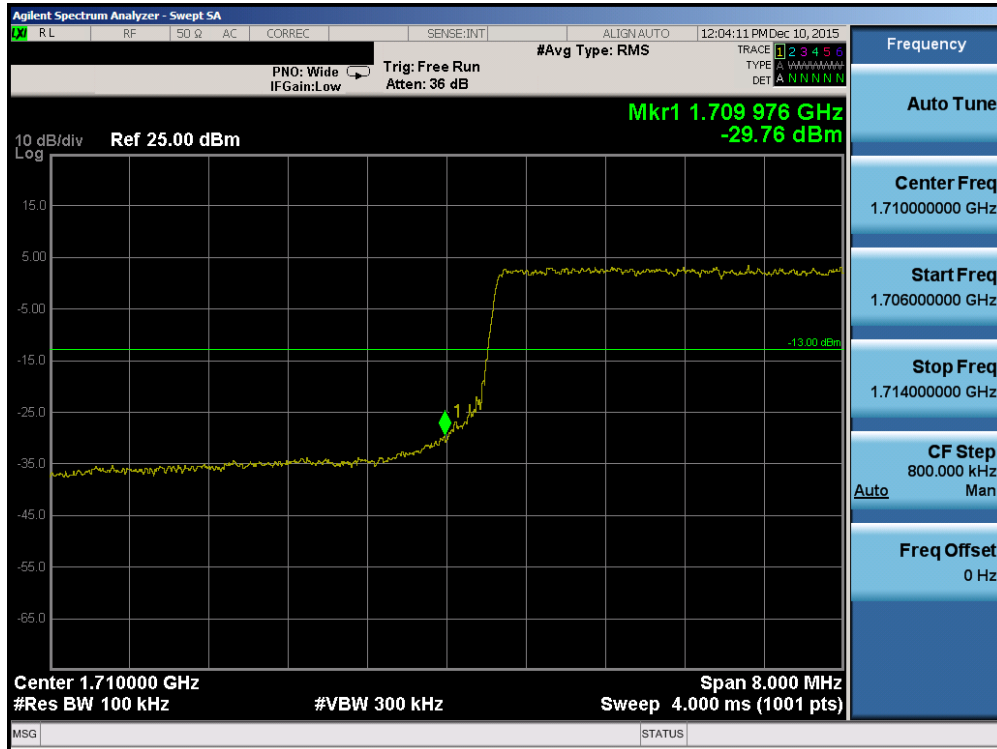


Plot 7-107. Upper Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

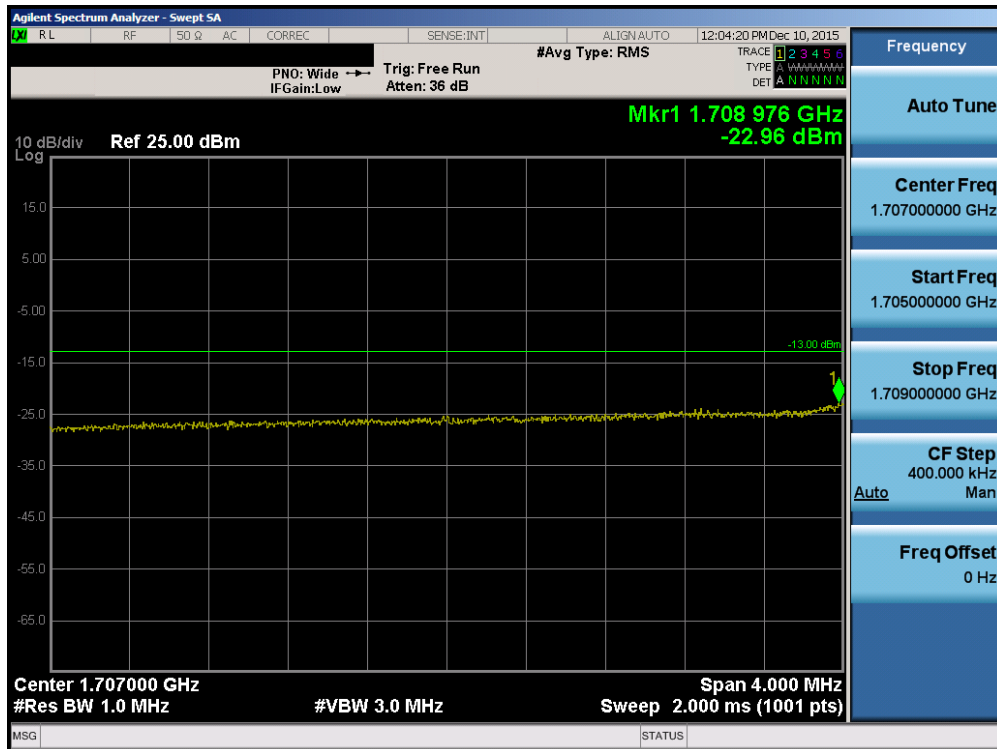


Plot 7-108. Upper Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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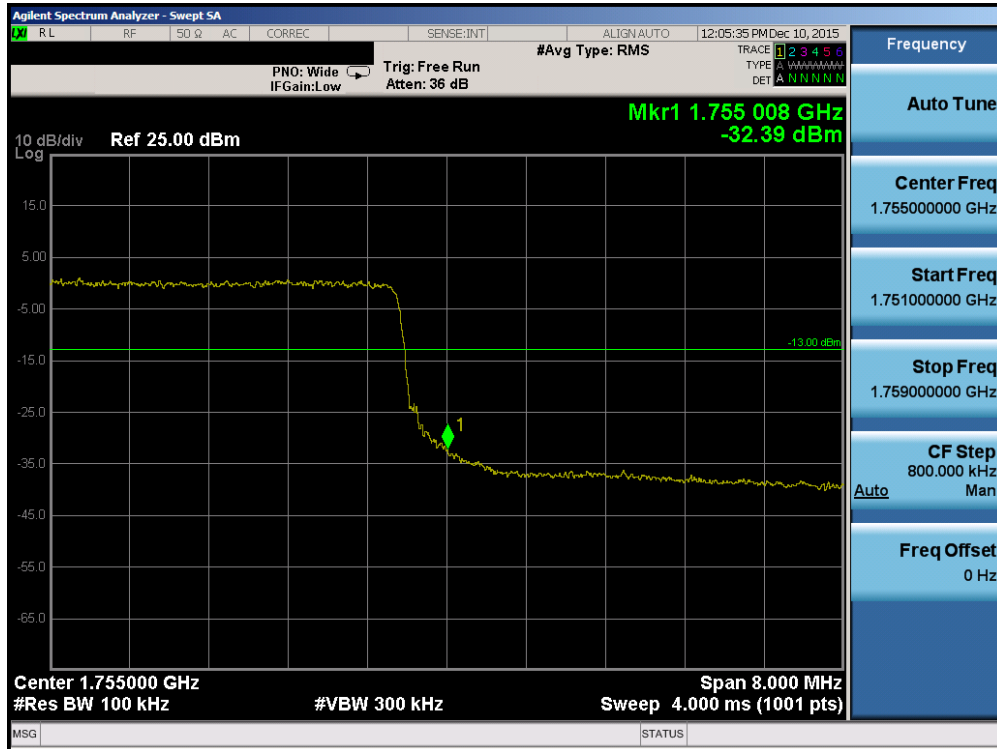


Plot 7-109. Lower Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

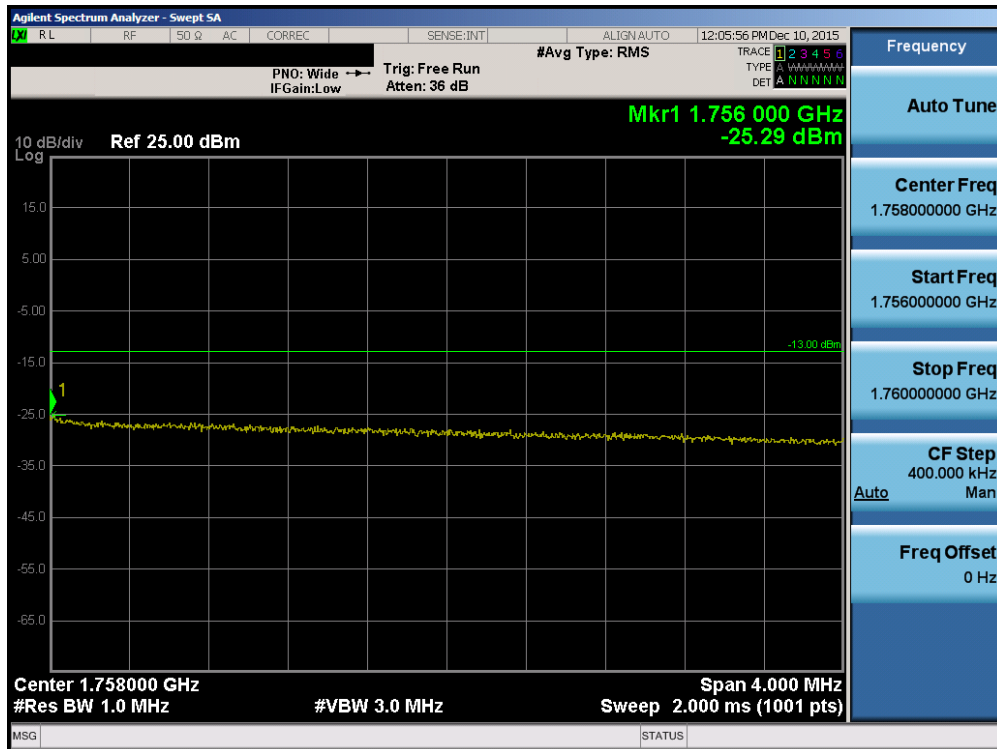


Plot 7-110. Lower Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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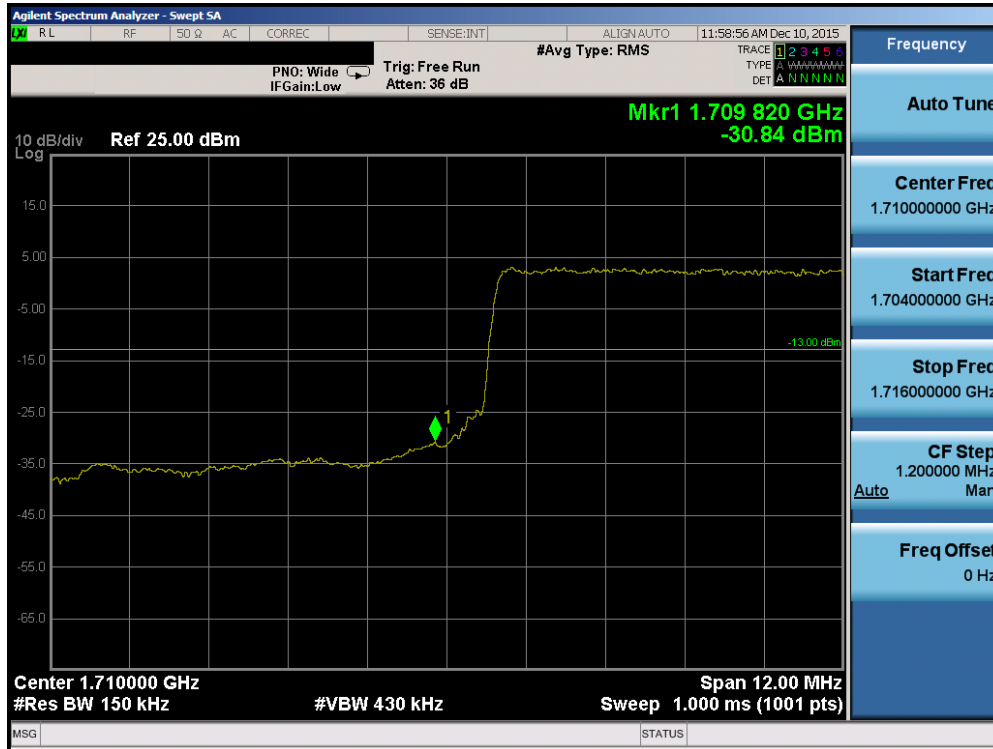


Plot 7-111. Upper Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

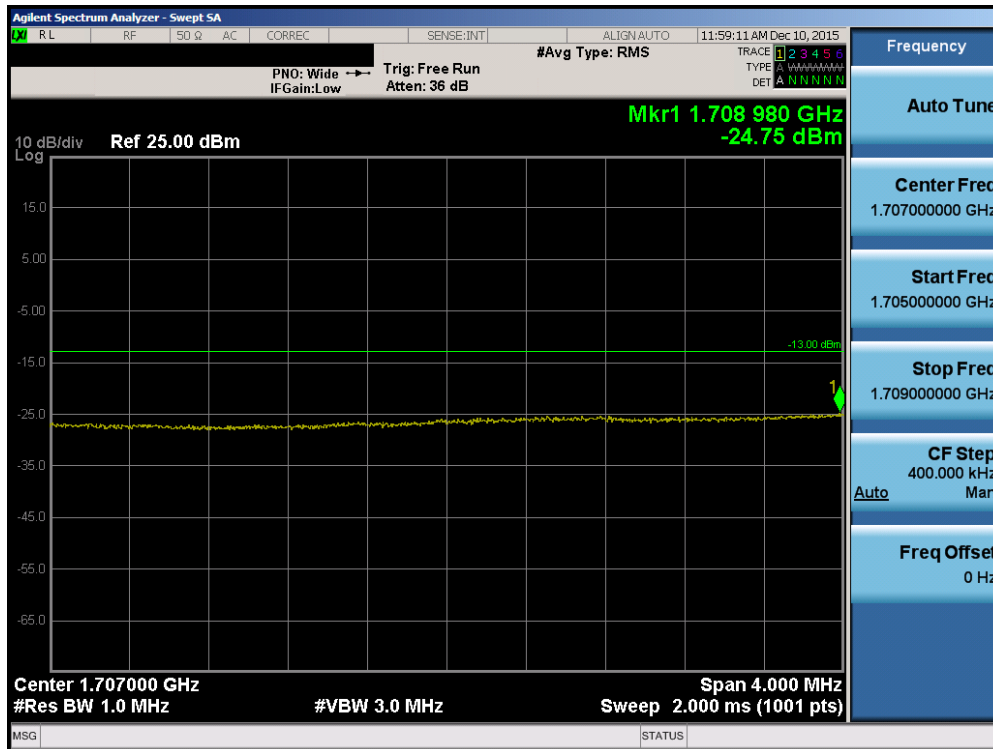


Plot 7-112. Upper Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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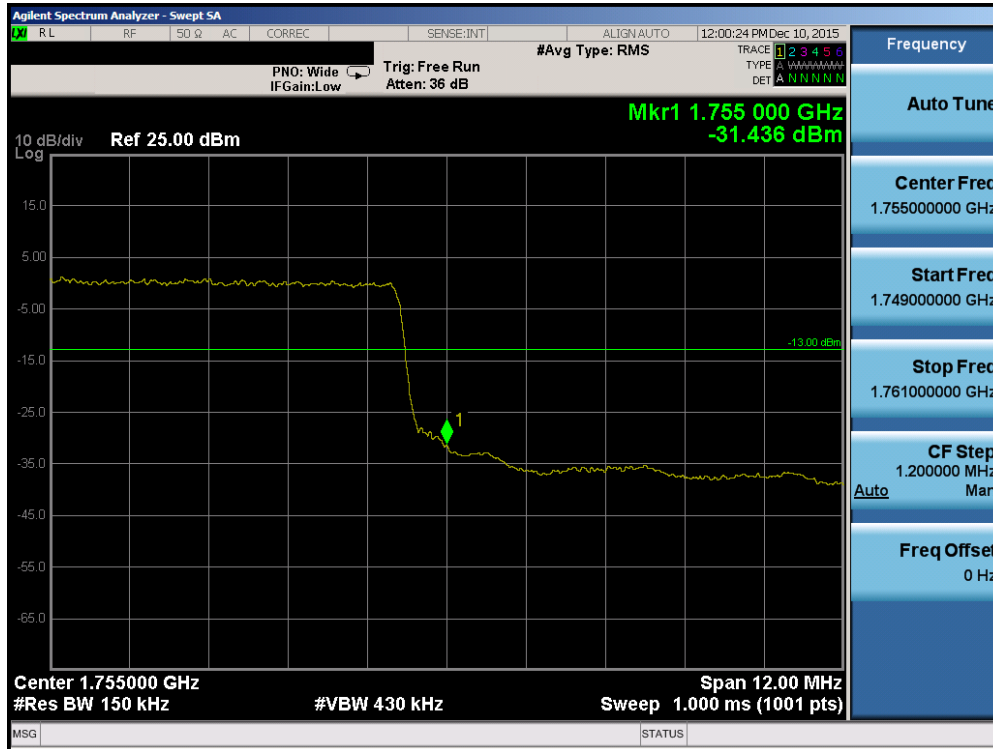


Plot 7-113. Lower Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

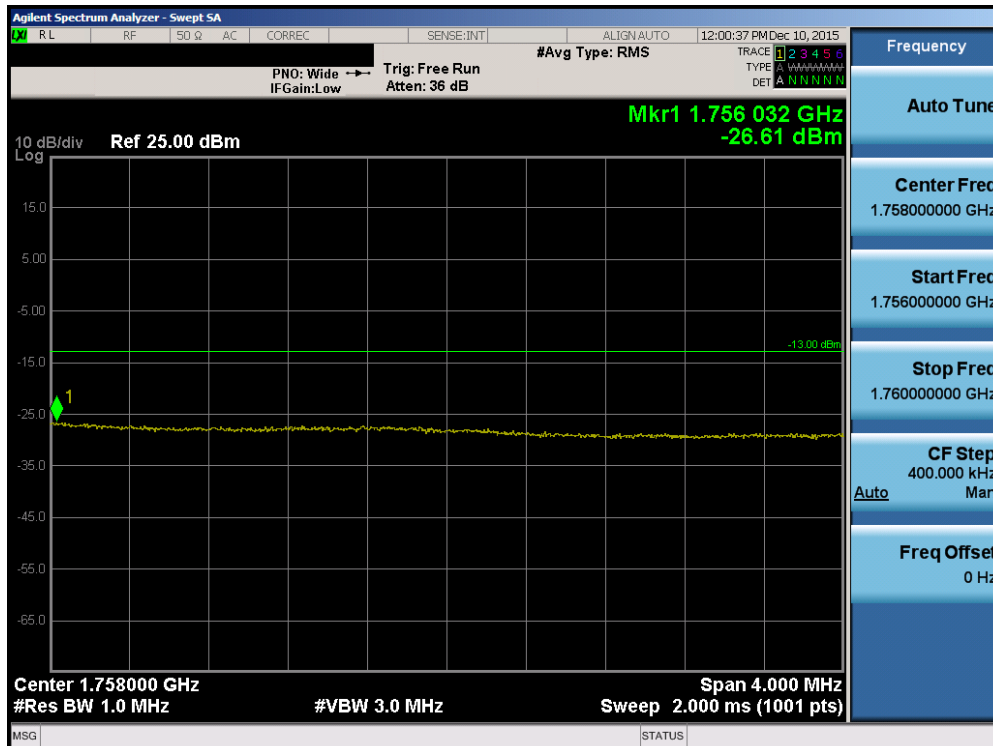


Plot 7-114. Lower Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFL81AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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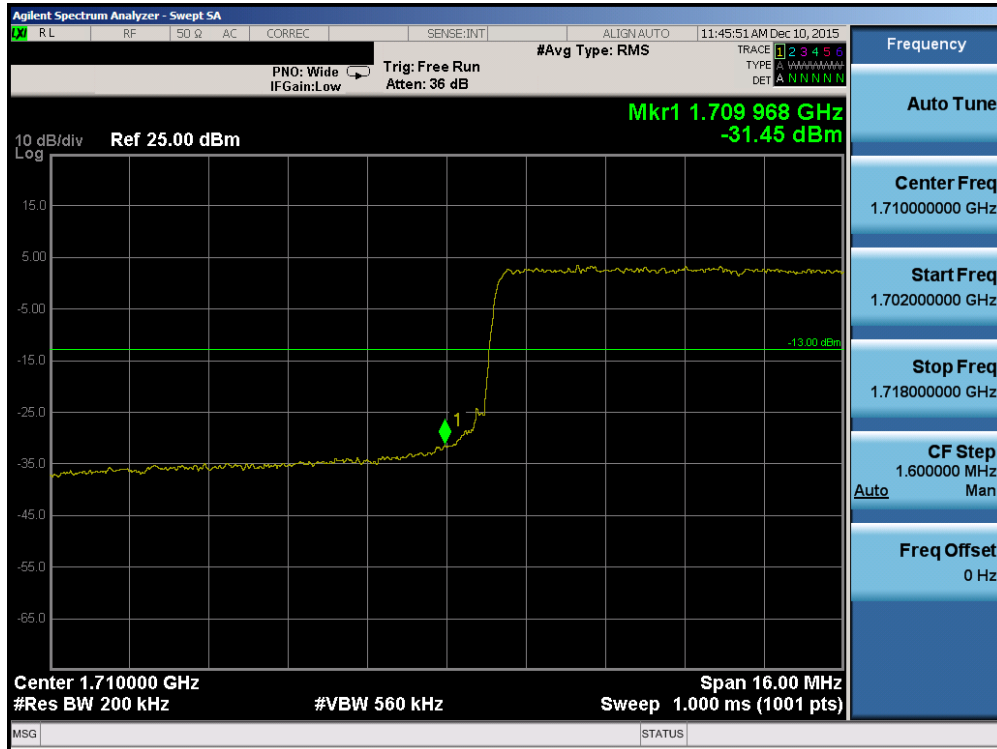


Plot 7-115. Upper Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

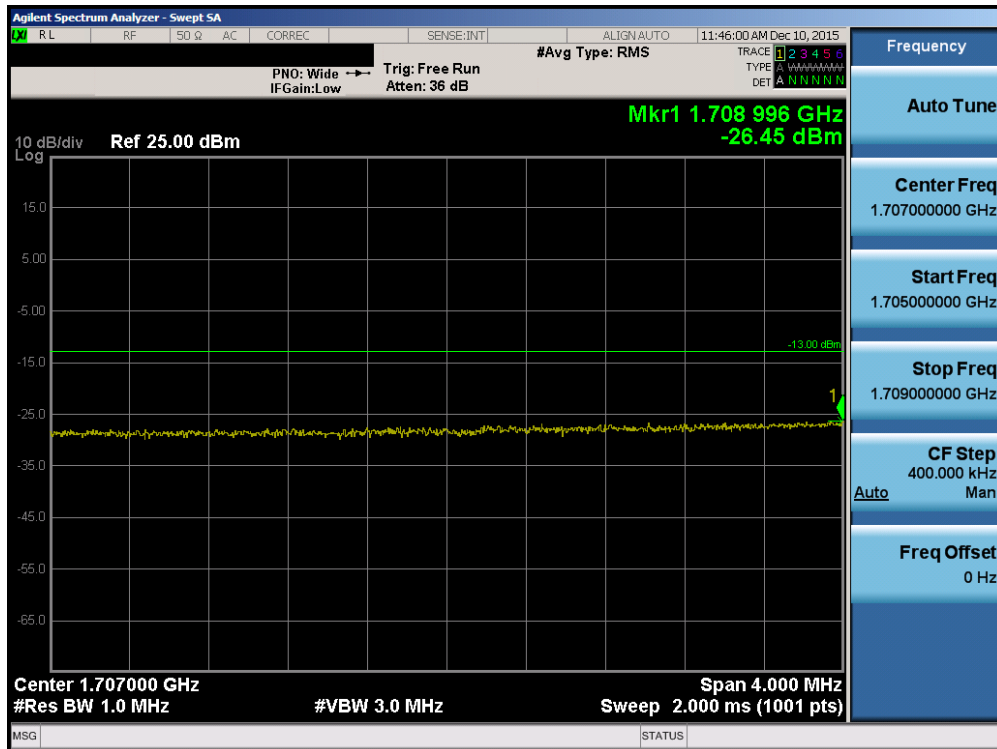


Plot 7-116. Upper Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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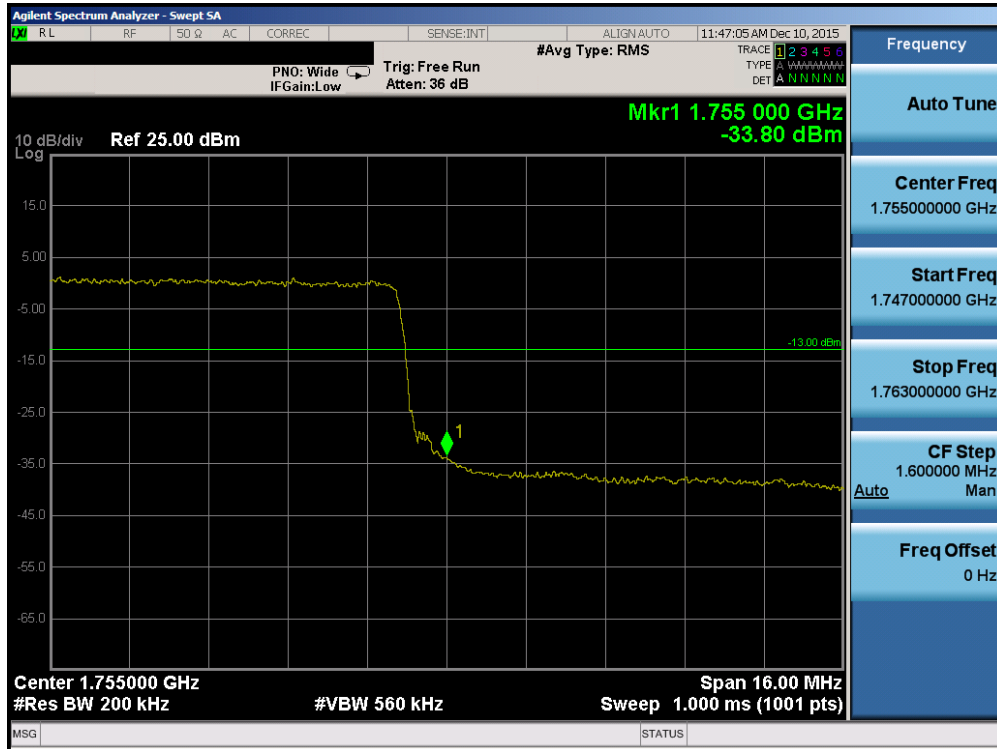
Plot 7-117. Lower Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



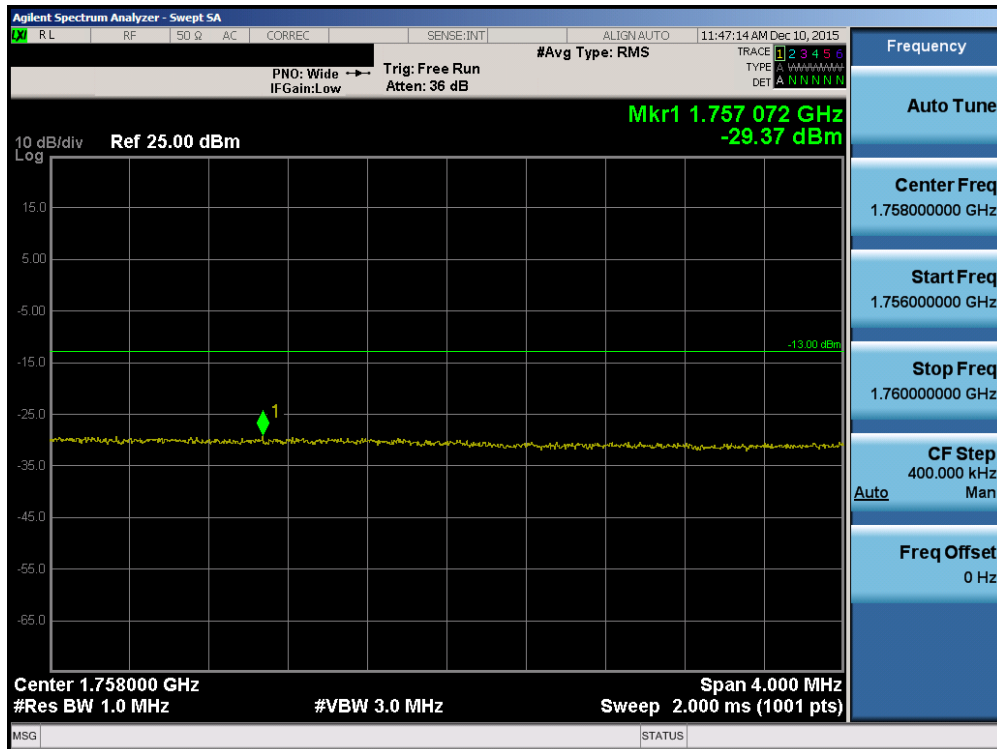
Plot 7-118. Lower Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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Plot 7-119. Upper Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

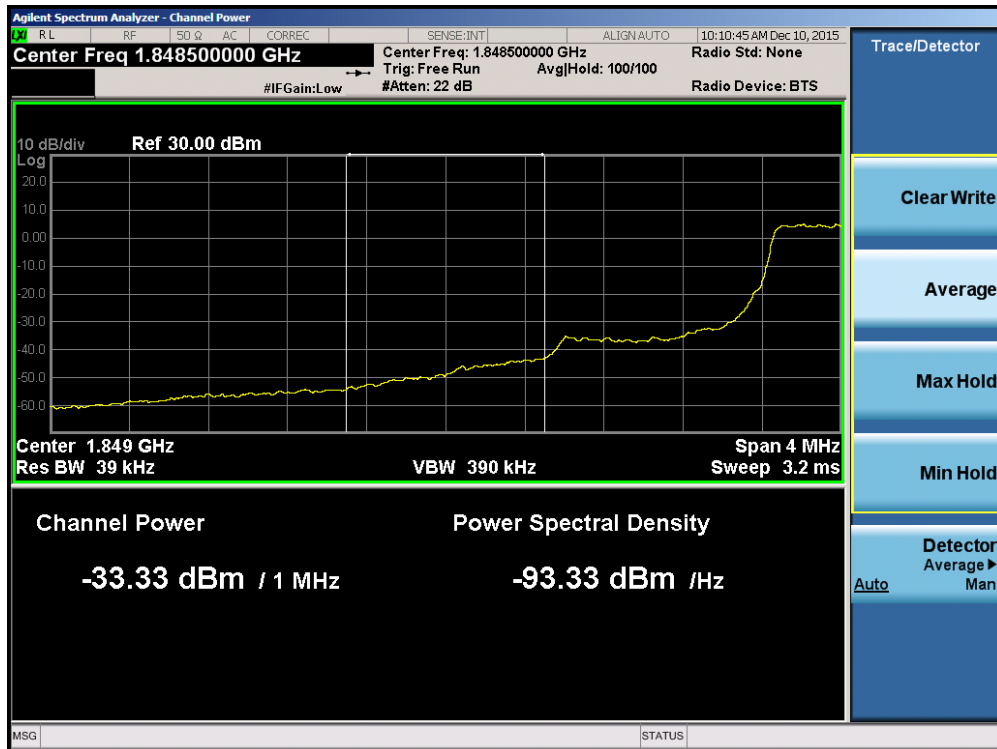


Plot 7-120. Upper Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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Plot 7-121. Lower Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

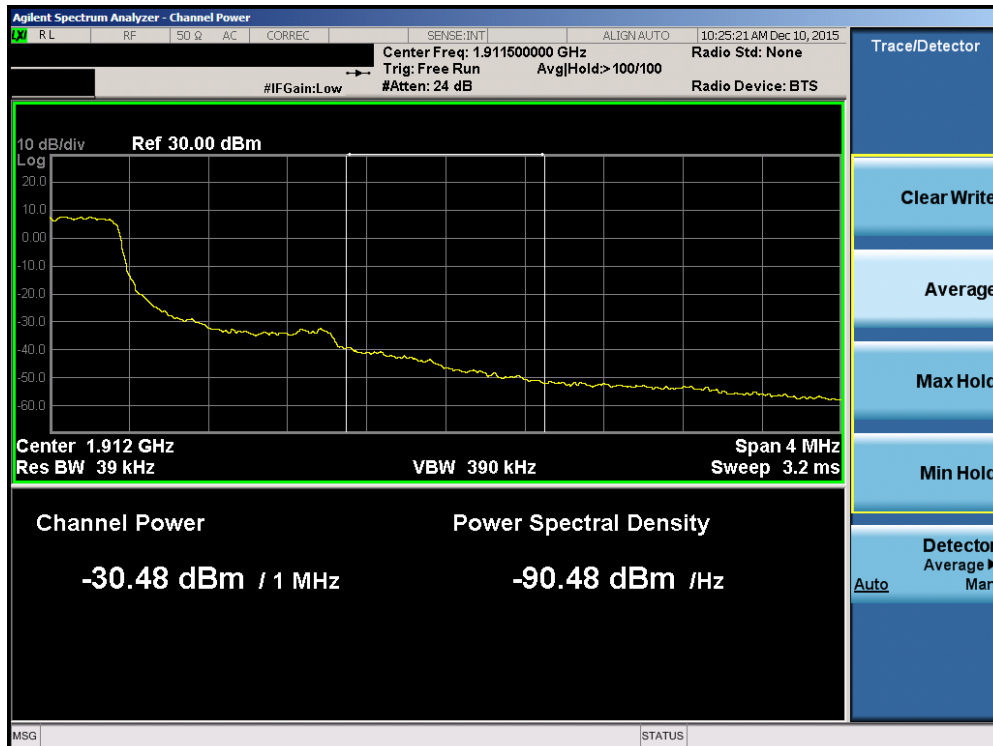


Plot 7-122. Lower Extended Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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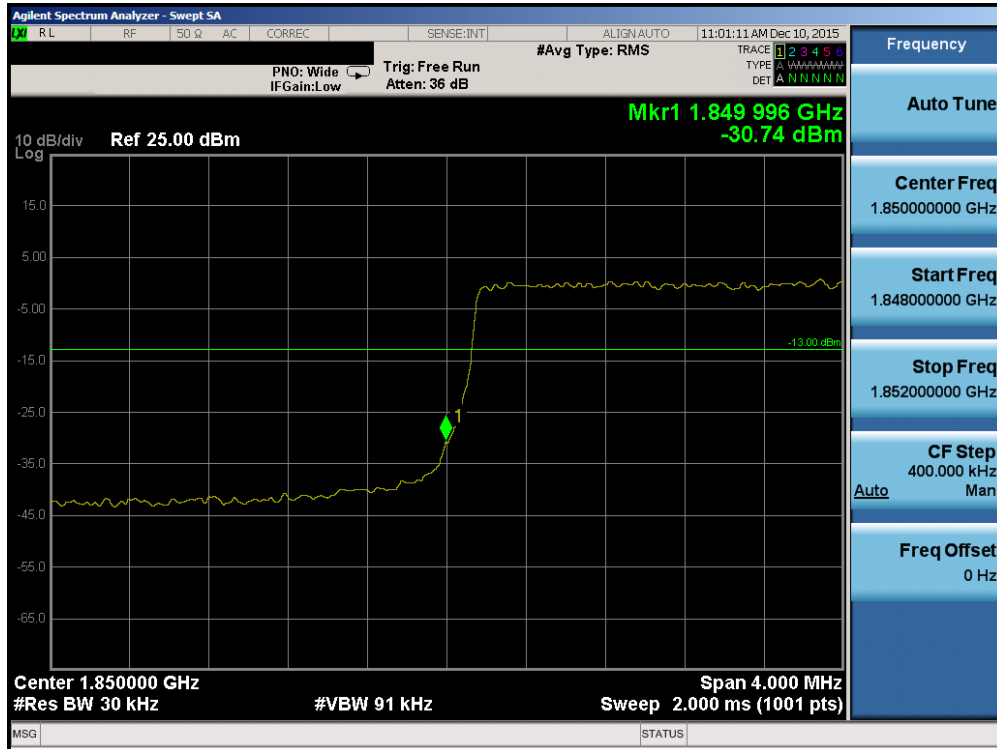


Plot 7-123. Upper Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

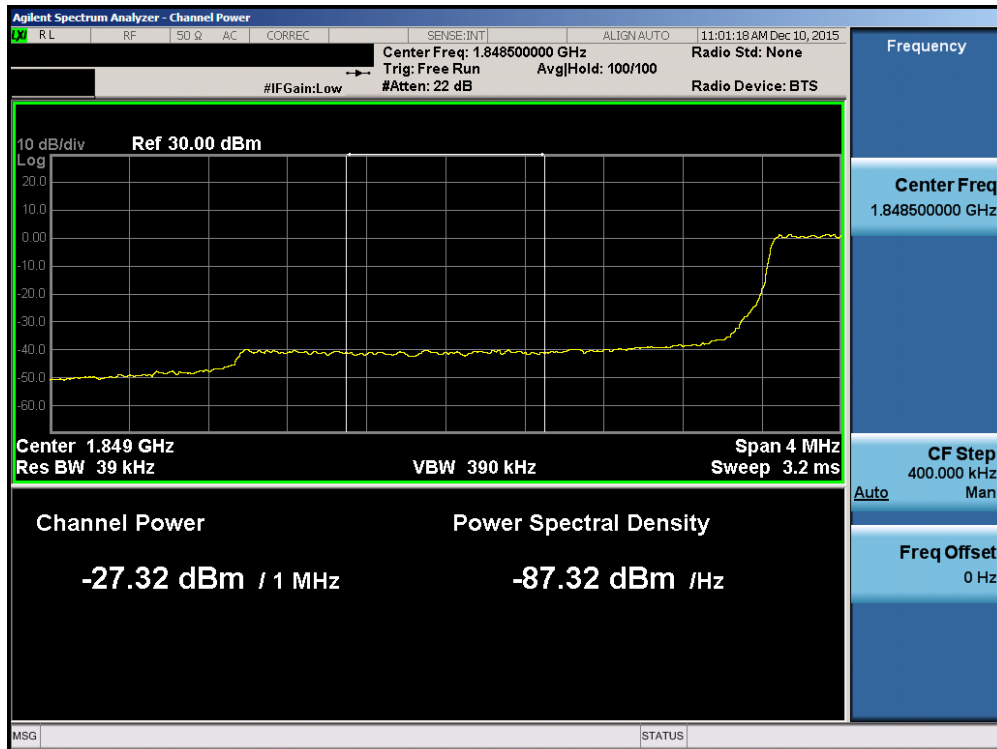


Plot 7-124. Upper Extended Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFL81AL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1512092087-R1.ZNF	Test Dates: Dec 10 - 24, 2015	EUT Type: Portable Handset		Page 77 of 118

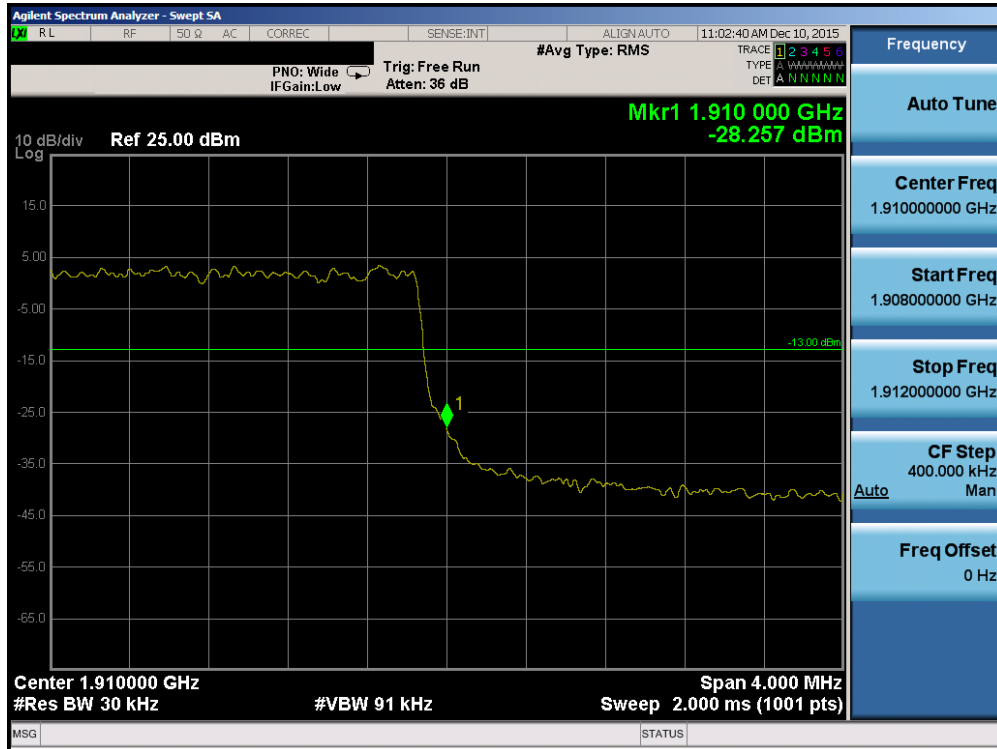


Plot 7-125. Lower Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

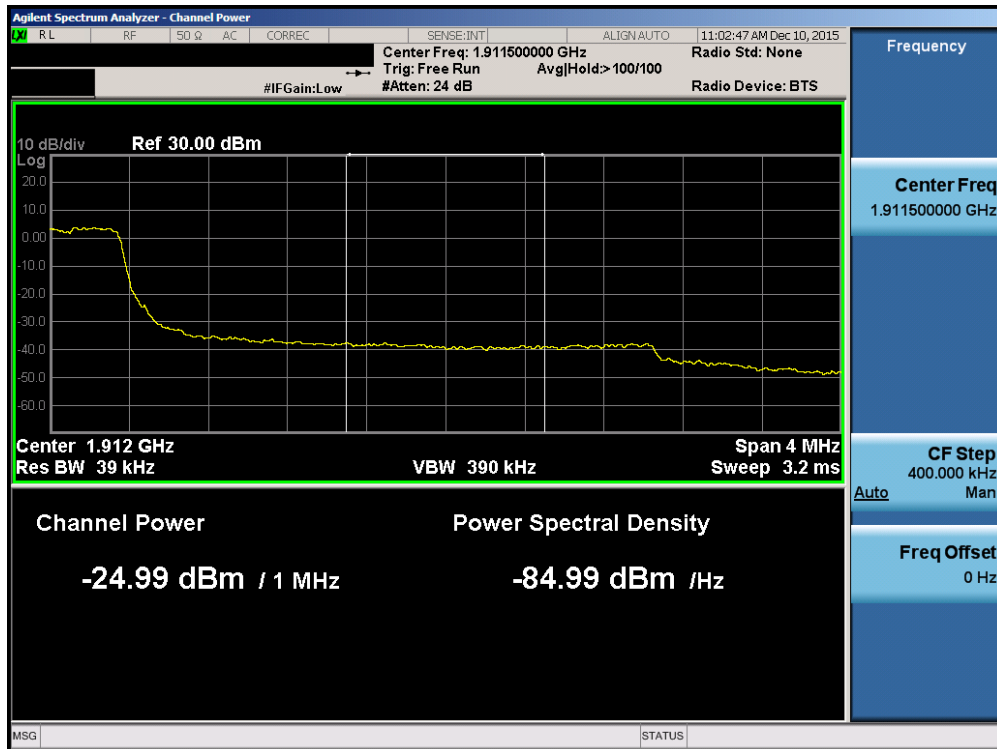


Plot 7-126. Lower Extended Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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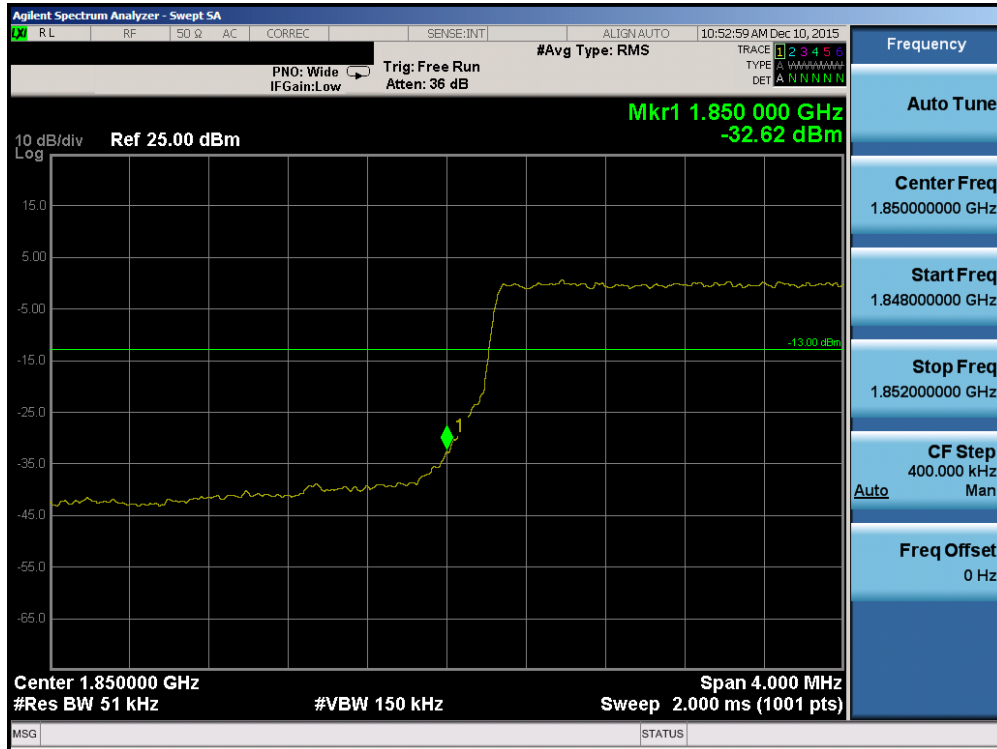


Plot 7-127. Upper Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

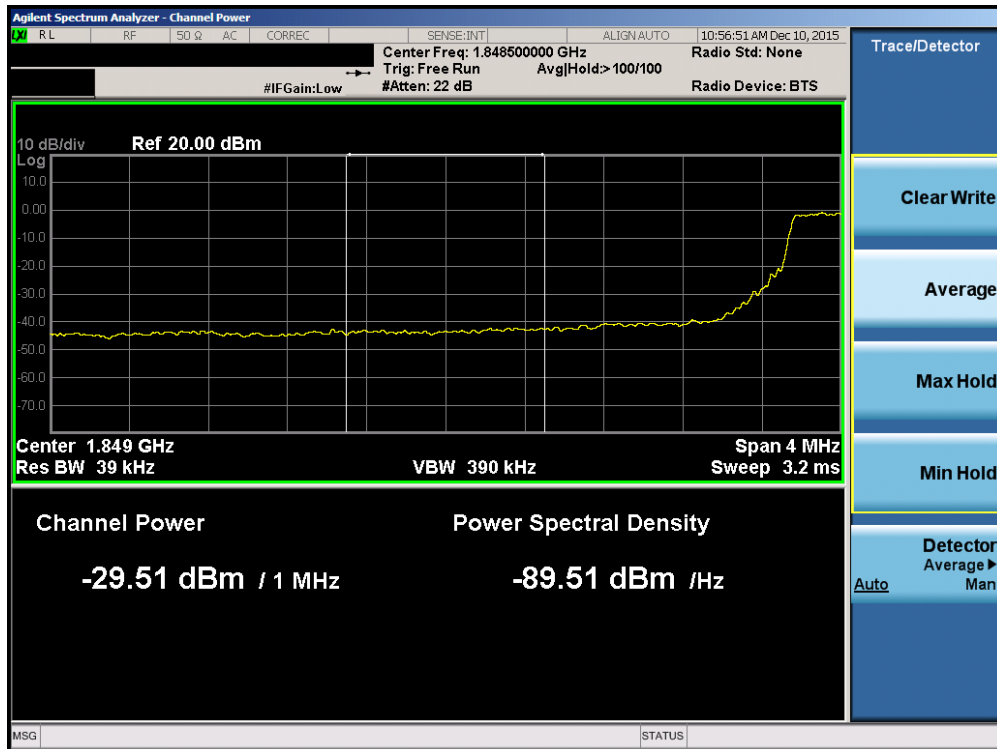


Plot 7-128. Upper Extended Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1512092087-R1.ZNF	Test Dates: Dec 10 - 24, 2015	EUT Type: Portable Handset		Page 79 of 118

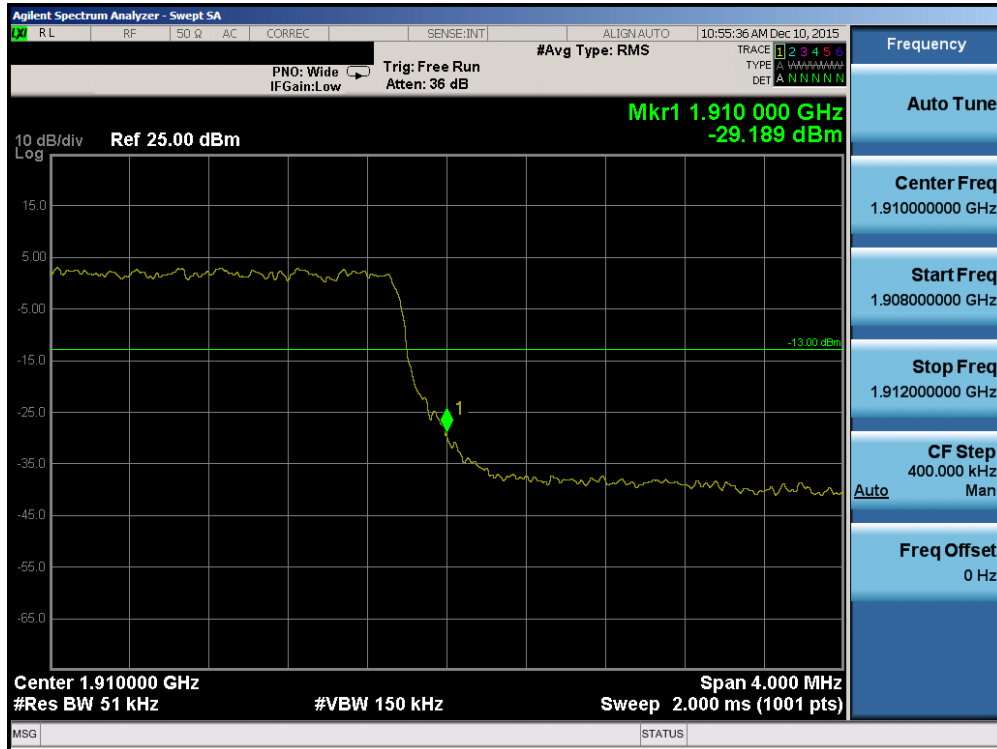


Plot 7-129. Lower Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

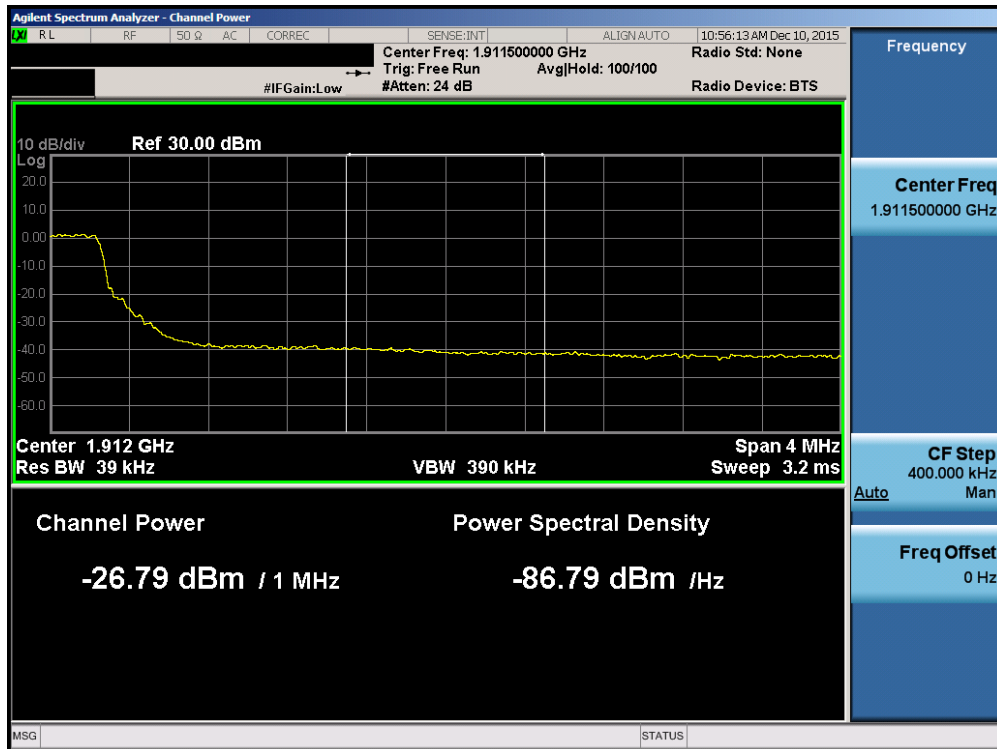


Plot 7-130. Lower Extended Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1512092087-R1.ZNF	Test Dates: Dec 10 - 24, 2015	EUT Type: Portable Handset		Page 80 of 118



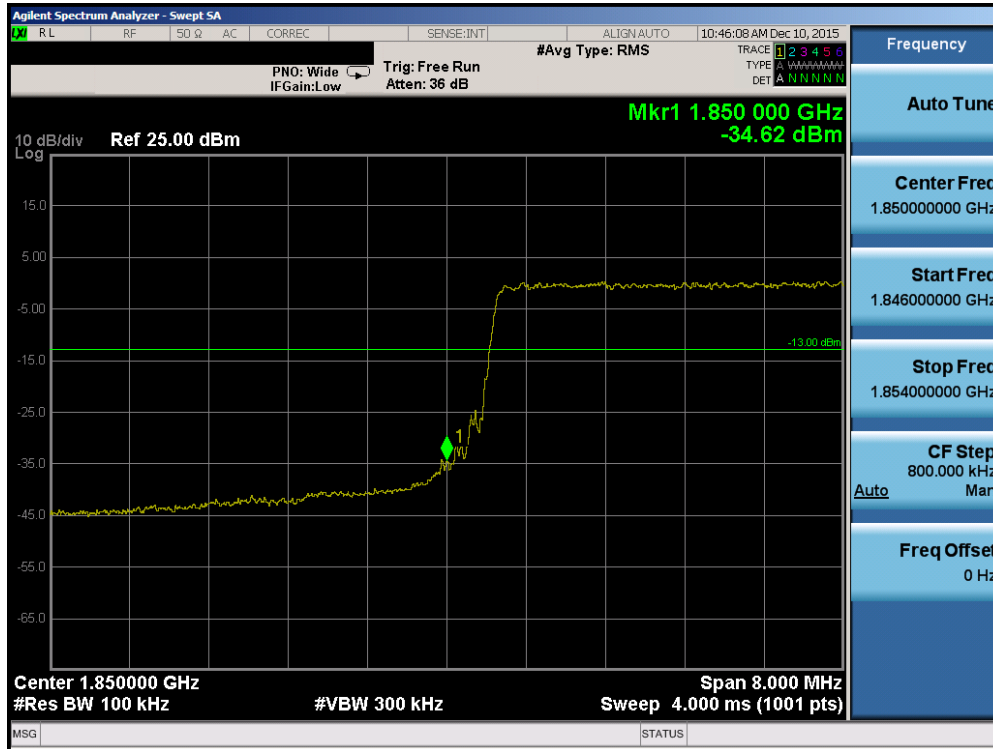
Plot 7-131. Upper Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)



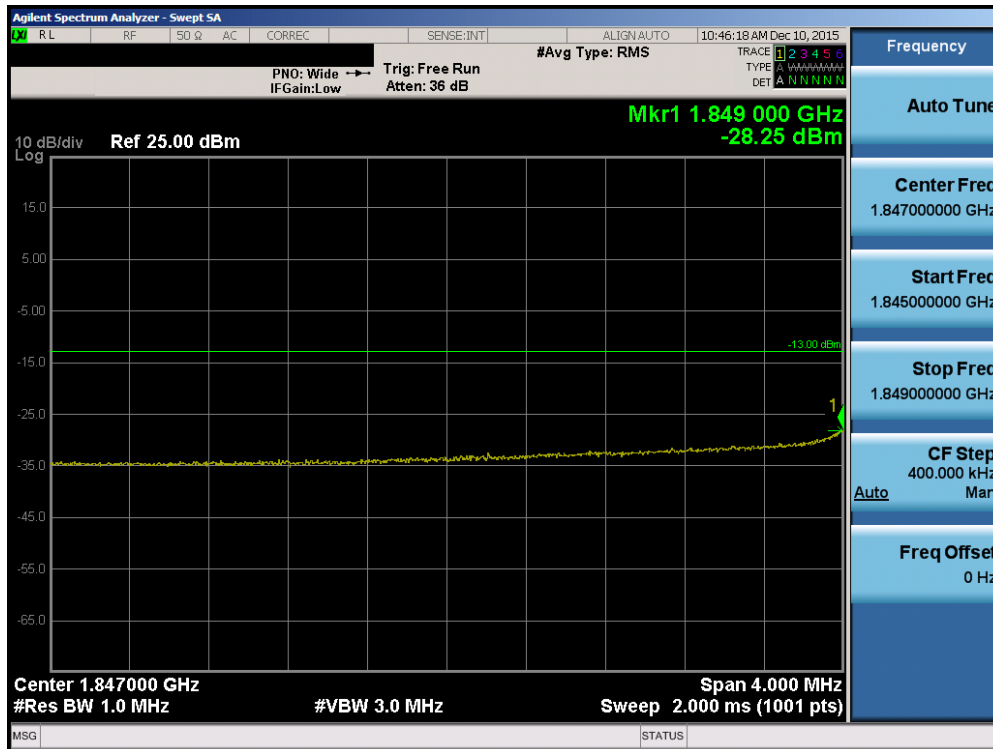
Plot 7-132. Upper Extended Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1512092087-R1.ZNF	Test Dates: Dec 10 - 24, 2015	EUT Type: Portable Handset		Page 81 of 118



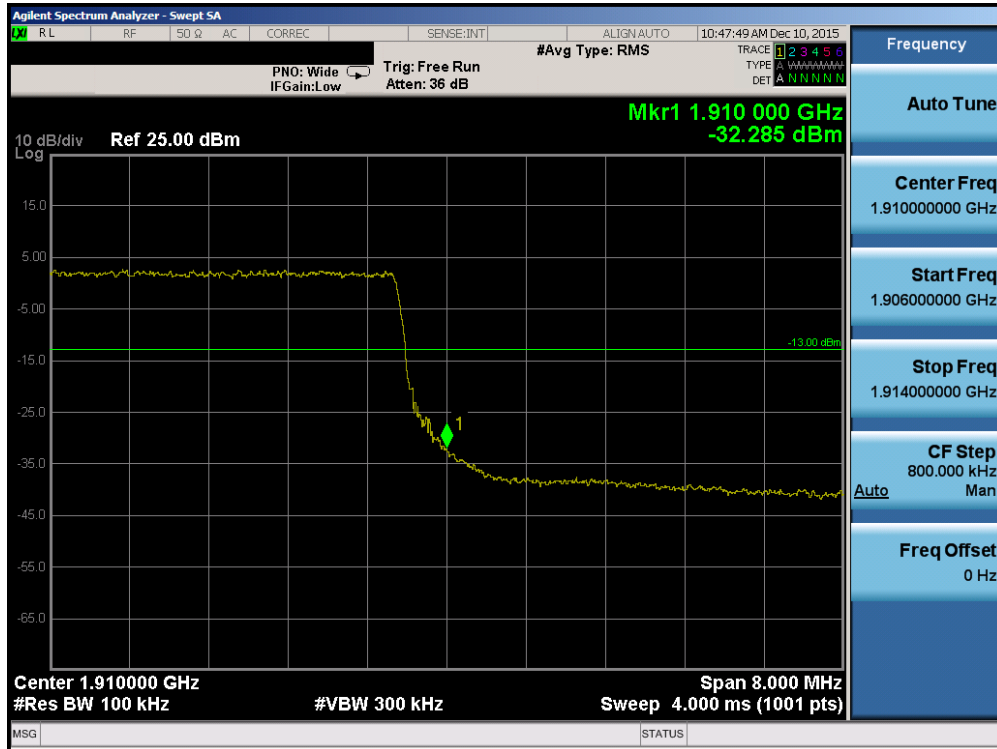


Plot 7-133. Lower Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

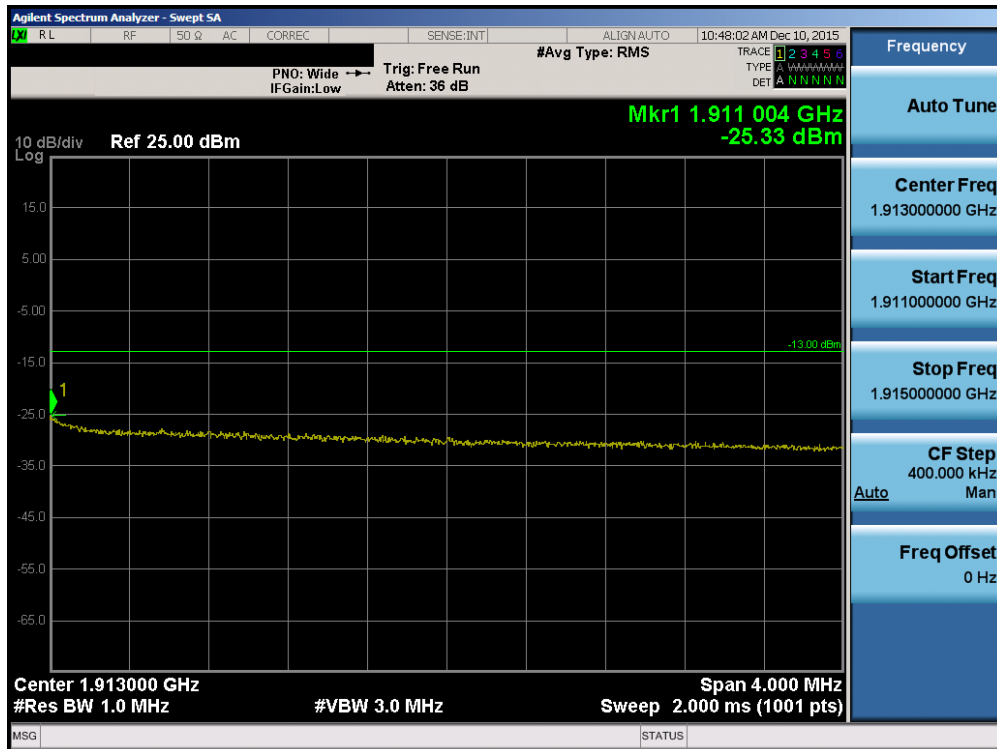


Plot 7-134. Lower Extended Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1512092087-R1.ZNF	Test Dates: Dec 10 - 24, 2015	EUT Type: Portable Handset		Page 82 of 118

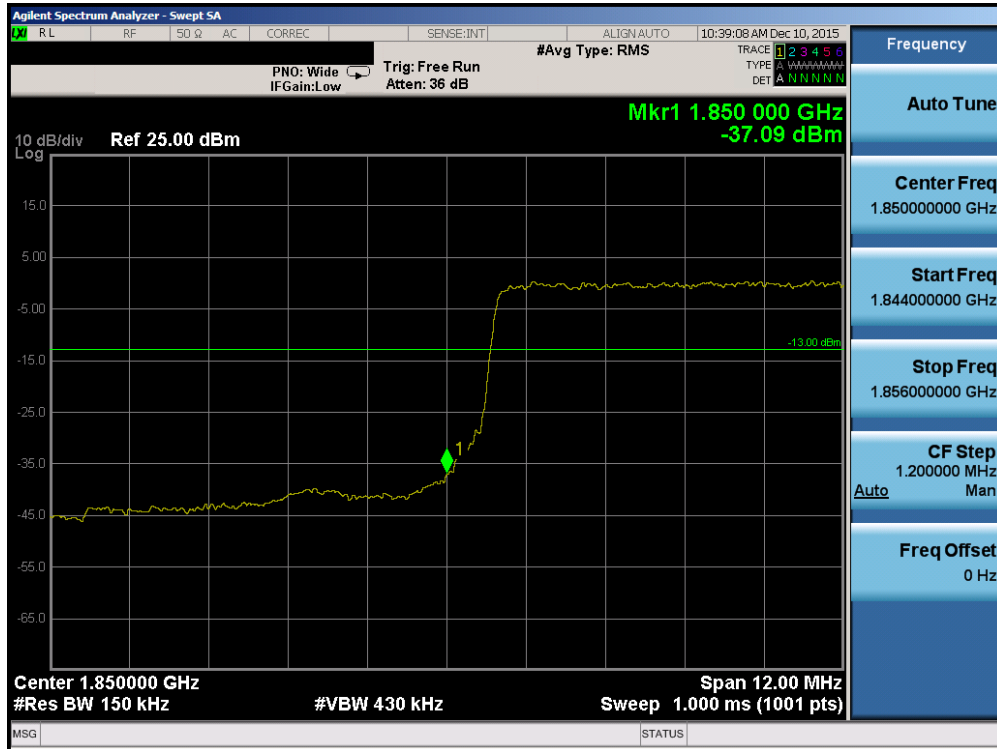


Plot 7-135. Upper Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

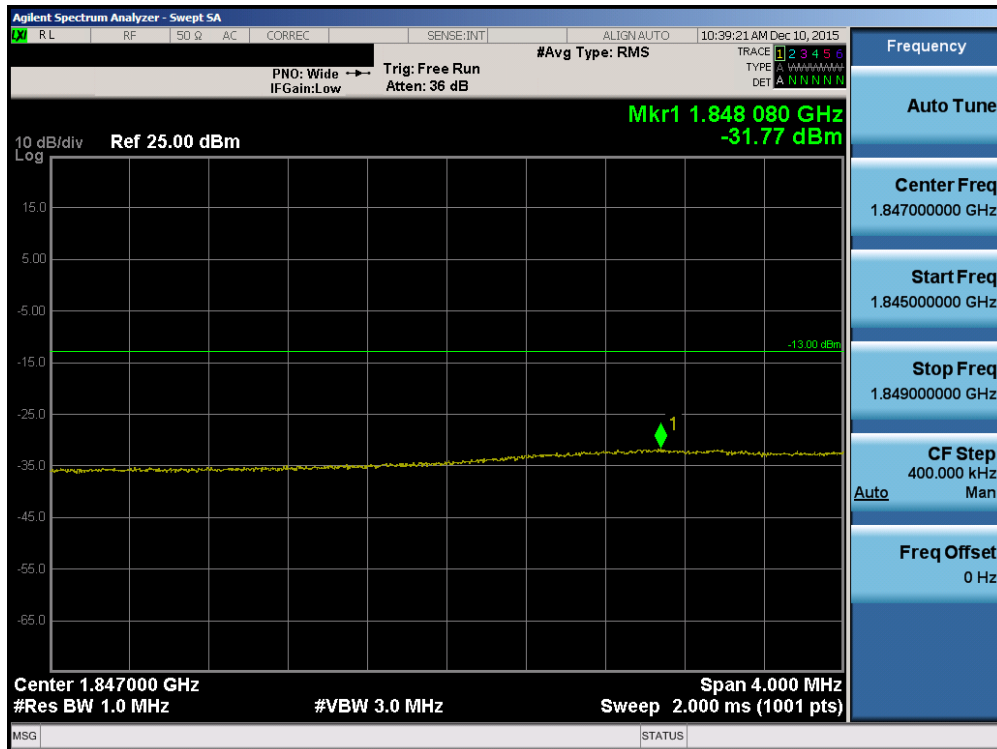


Plot 7-136. Upper Extended Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1512092087-R1.ZNF	Test Dates: Dec 10 - 24, 2015	EUT Type: Portable Handset		Page 83 of 118

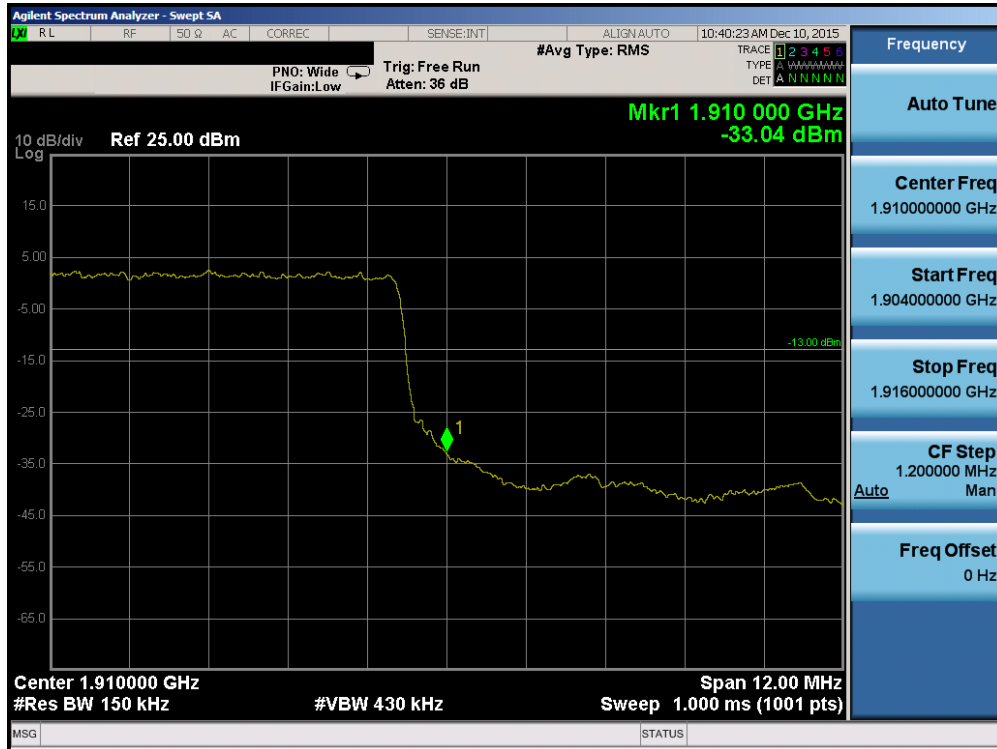


Plot 7-137. Lower Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

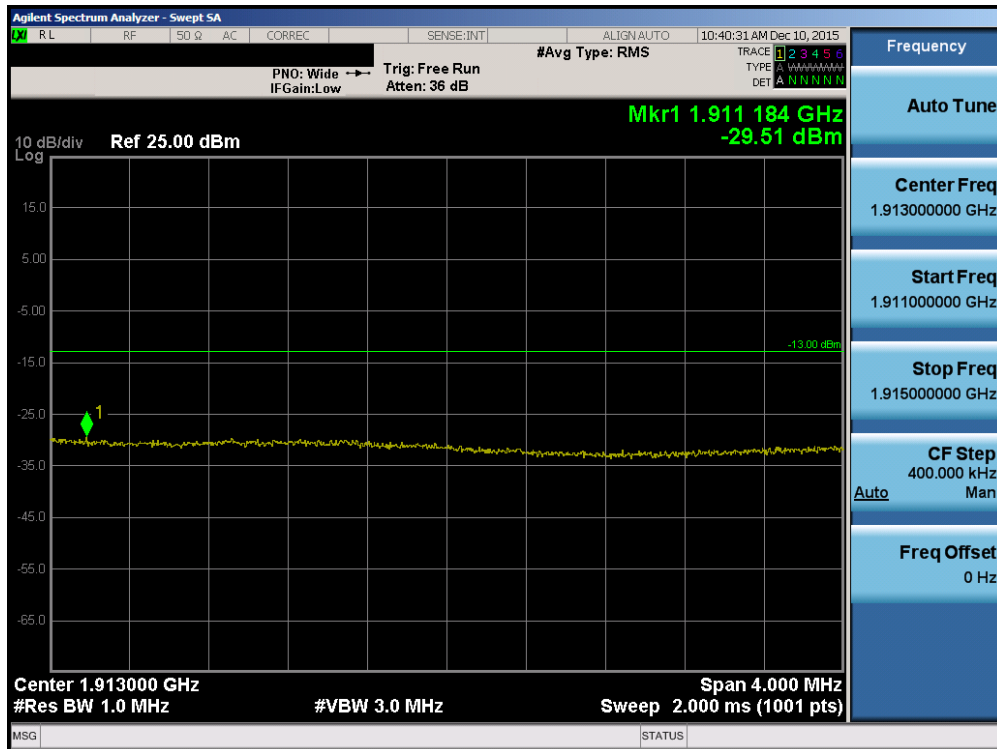


Plot 7-138. Lower Extended Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1512092087-R1.ZNF	Test Dates: Dec 10 - 24, 2015	EUT Type: Portable Handset		Page 84 of 118

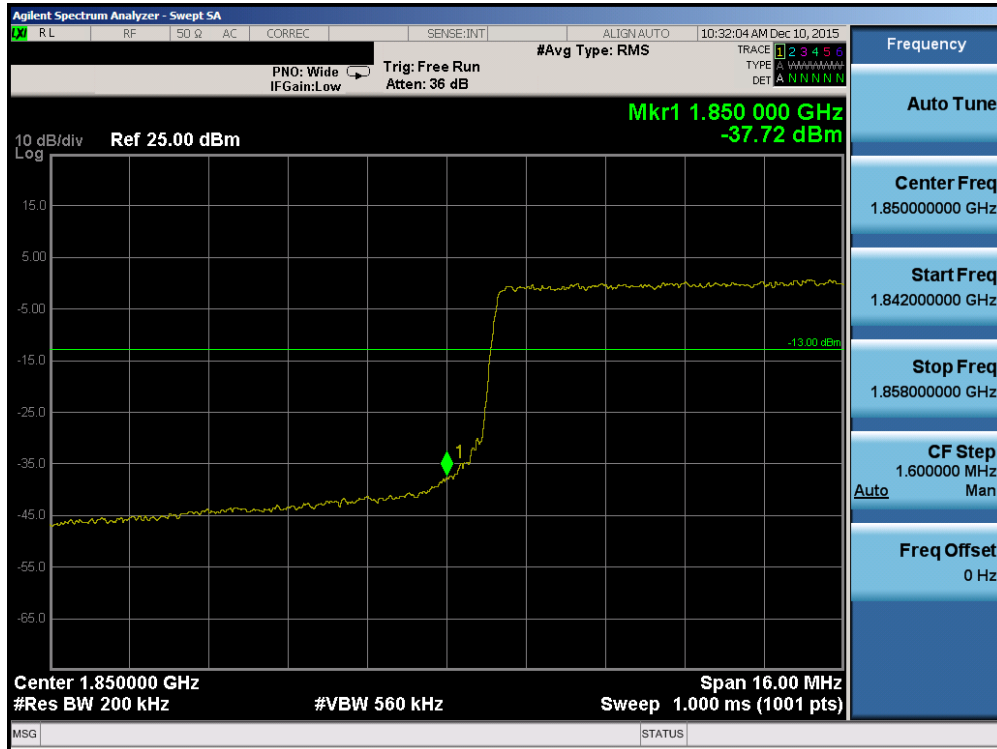


Plot 7-139. Upper Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

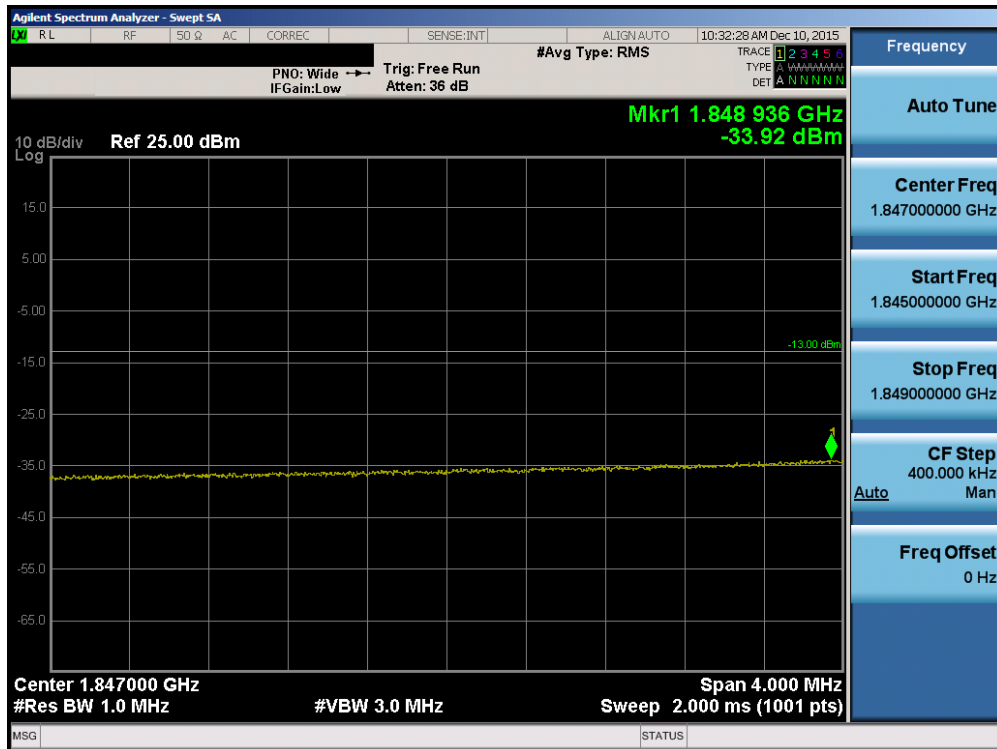


Plot 7-140. Upper Extended Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1512092087-R1.ZNF	Test Dates: Dec 10 - 24, 2015	EUT Type: Portable Handset		Page 85 of 118

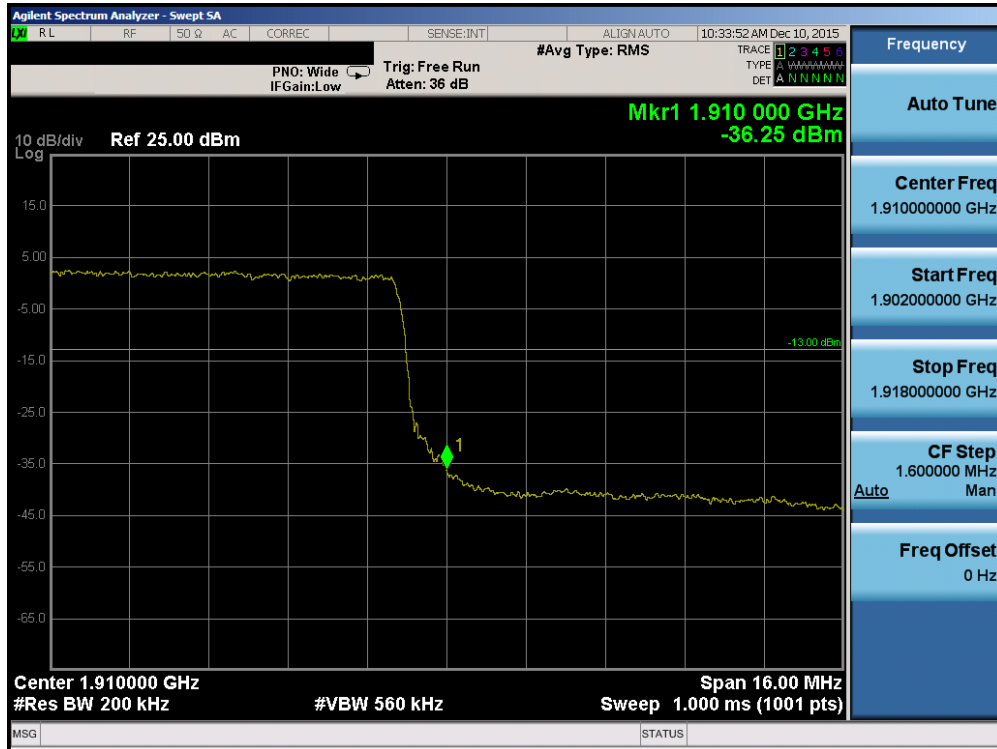


Plot 7-141. Lower Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)

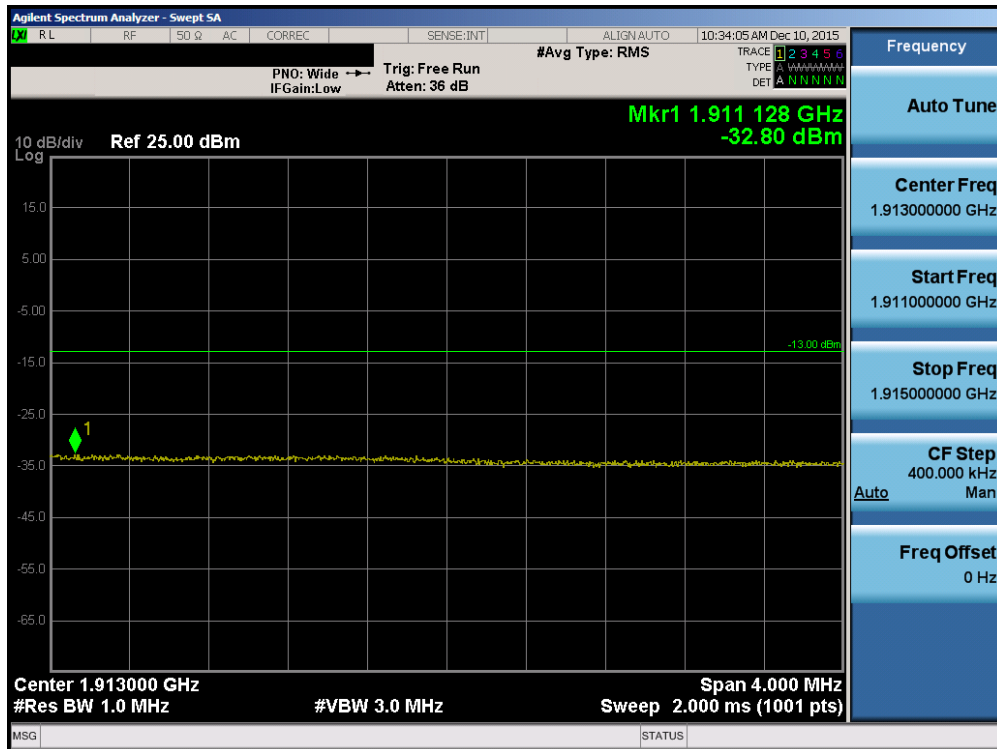


Plot 7-142. Lower Extended Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1512092087-R1.ZNF	Test Dates: Dec 10 - 24, 2015	EUT Type: Portable Handset	Page 86 of 118	



Plot 7-143. Upper Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



Plot 7-144. Upper Extended Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1512092087-R1.ZNF	Test Dates: Dec 10 - 24, 2015	EUT Type: Portable Handset		Page 87 of 118

## 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

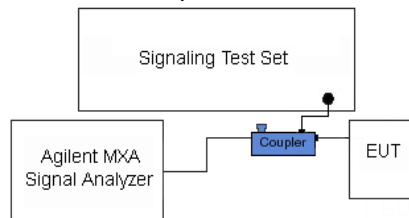
KDB 971168 v02r02 – Section 5.7.1

#### 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.



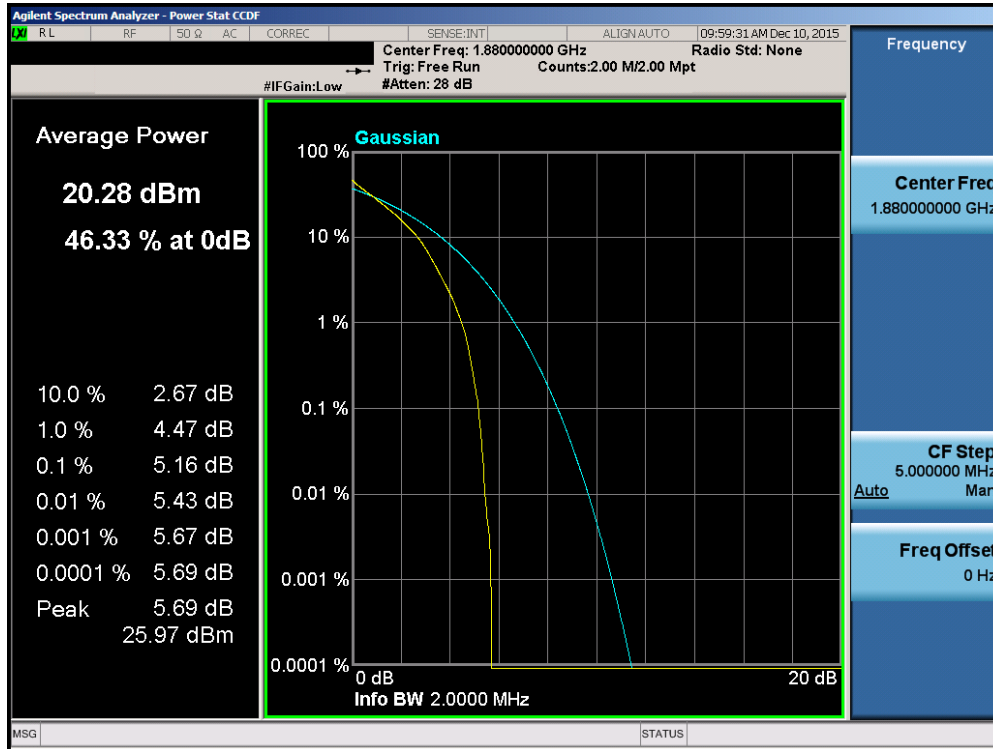
**Figure 7-4. Test Instrument & Measurement Setup**

#### Test Notes

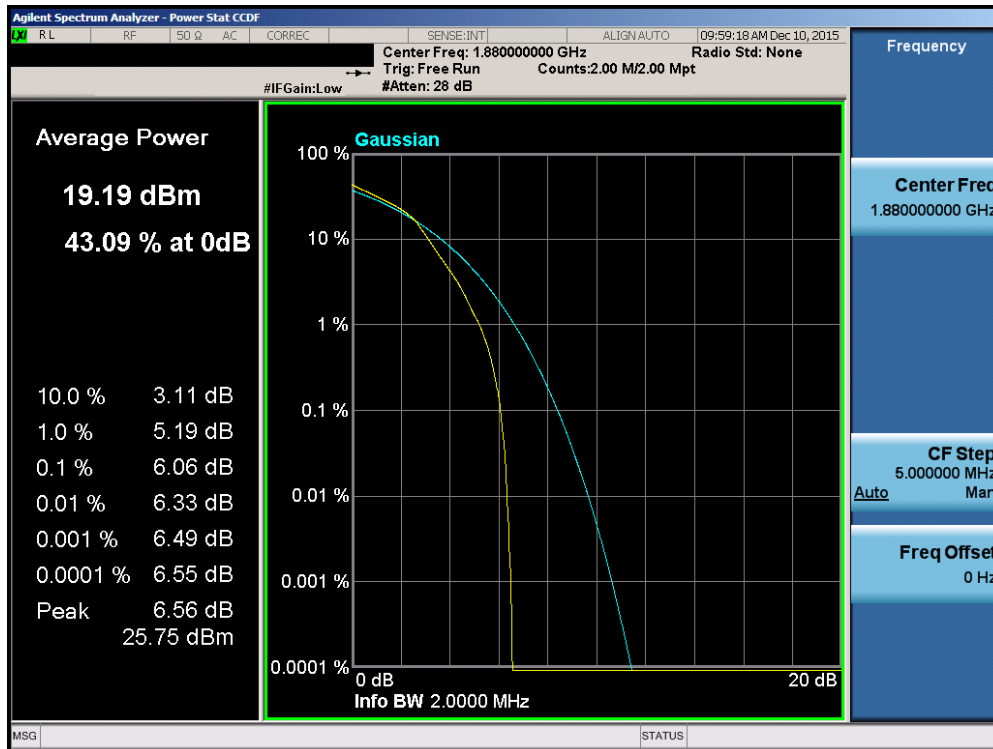
None.

FCC ID: ZNFL81AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1512092087-R1.ZNF	Test Dates: Dec 10 - 24, 2015	EUT Type: Portable Handset		Page 88 of 118



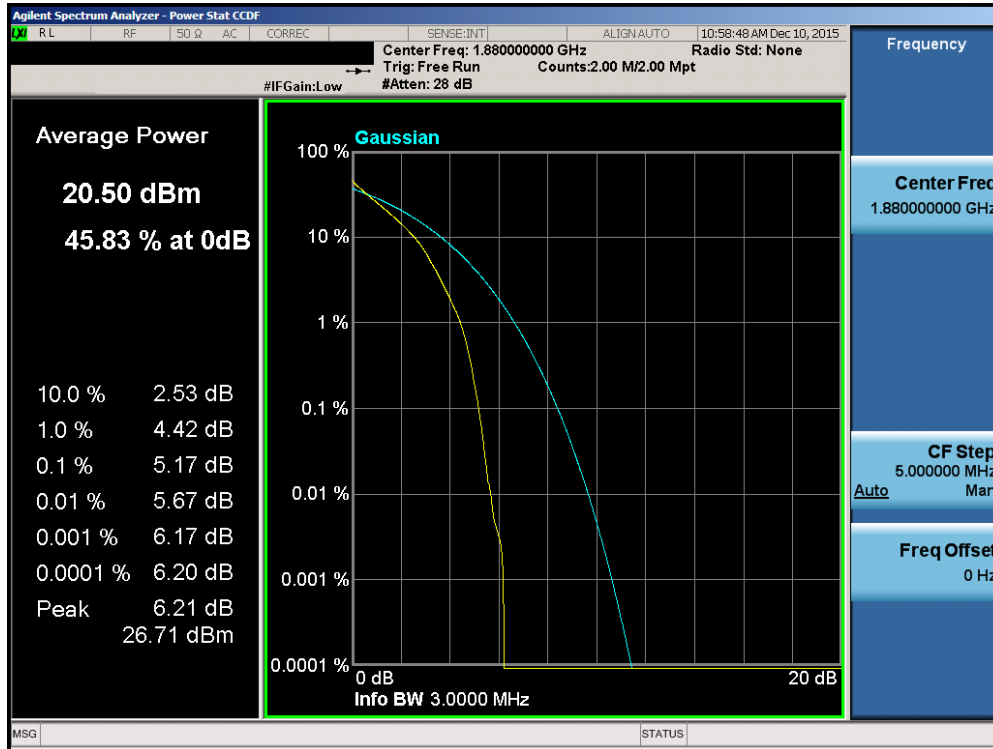


Plot 7-145. PAR Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

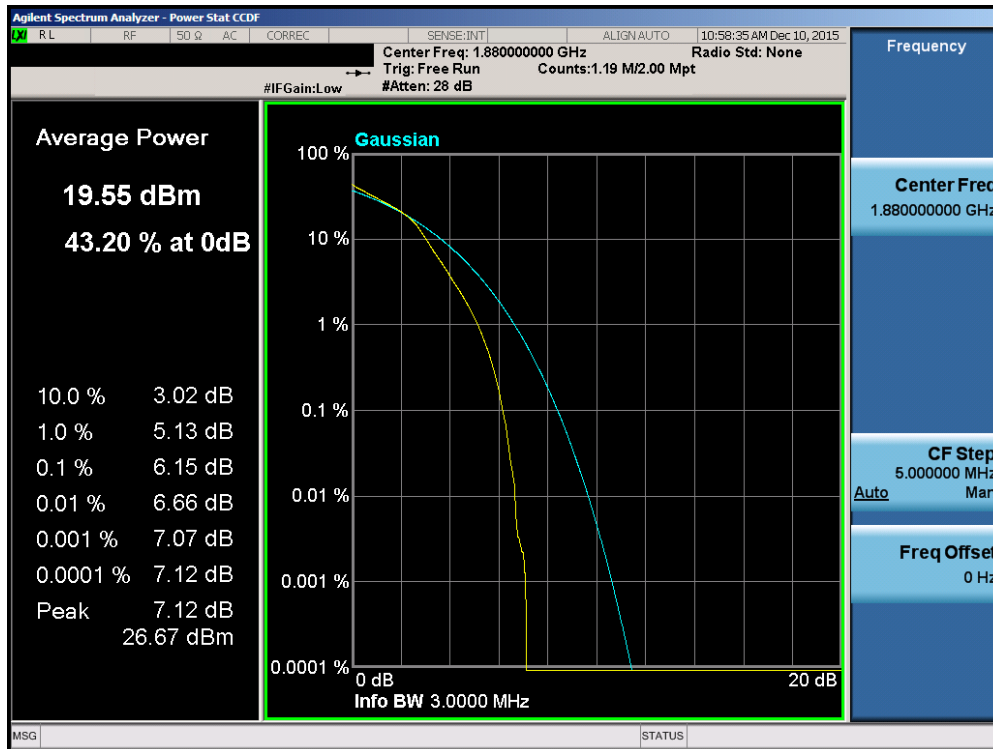


Plot 7-146. PAR Plot (Band 2 – 1.4MHz 16-QAM – RB Size 6)

FCC ID: ZNFL81AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1512092087-R1.ZNF	Test Dates: Dec 10 - 24, 2015	EUT Type: Portable Handset		Page 89 of 118

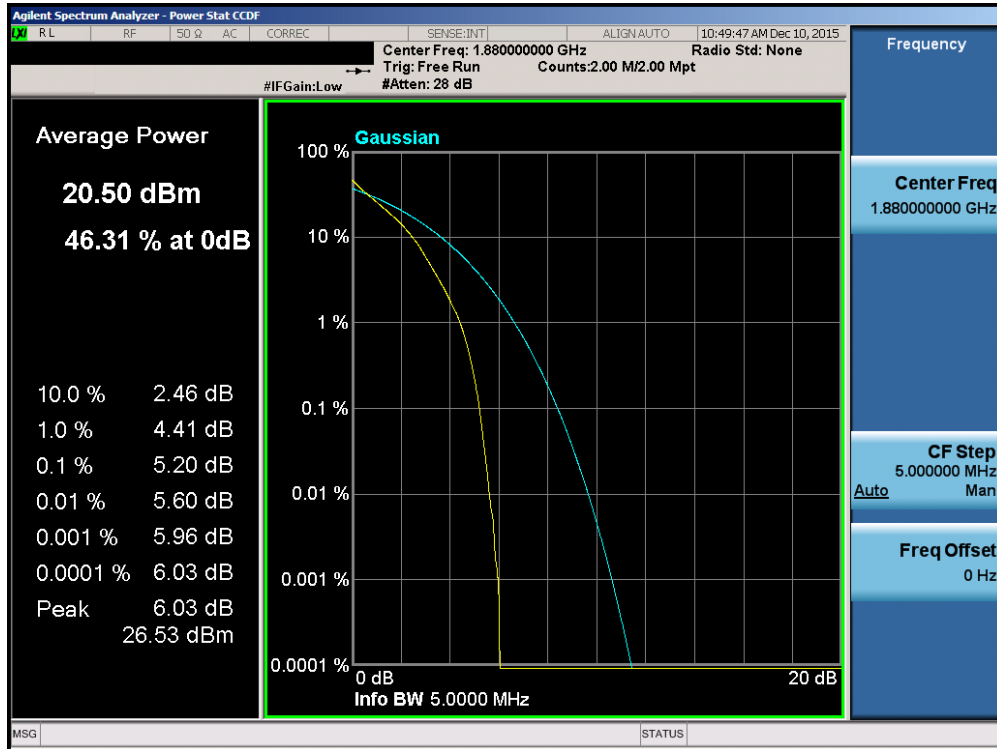


Plot 7-147. PAR Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

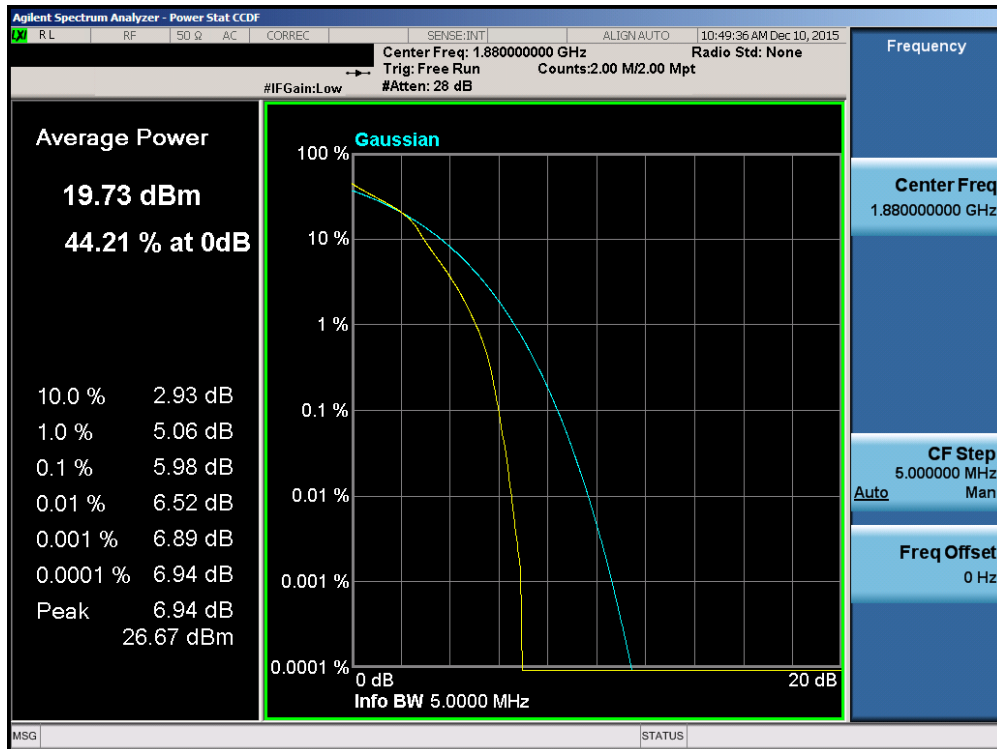


Plot 7-148. PAR Plot (Band 2 – 3.0MHz 16-QAM – RB Size 15)

FCC ID: ZNFL81AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1512092087-R1.ZNF	Test Dates: Dec 10 - 24, 2015	EUT Type: Portable Handset		Page 90 of 118

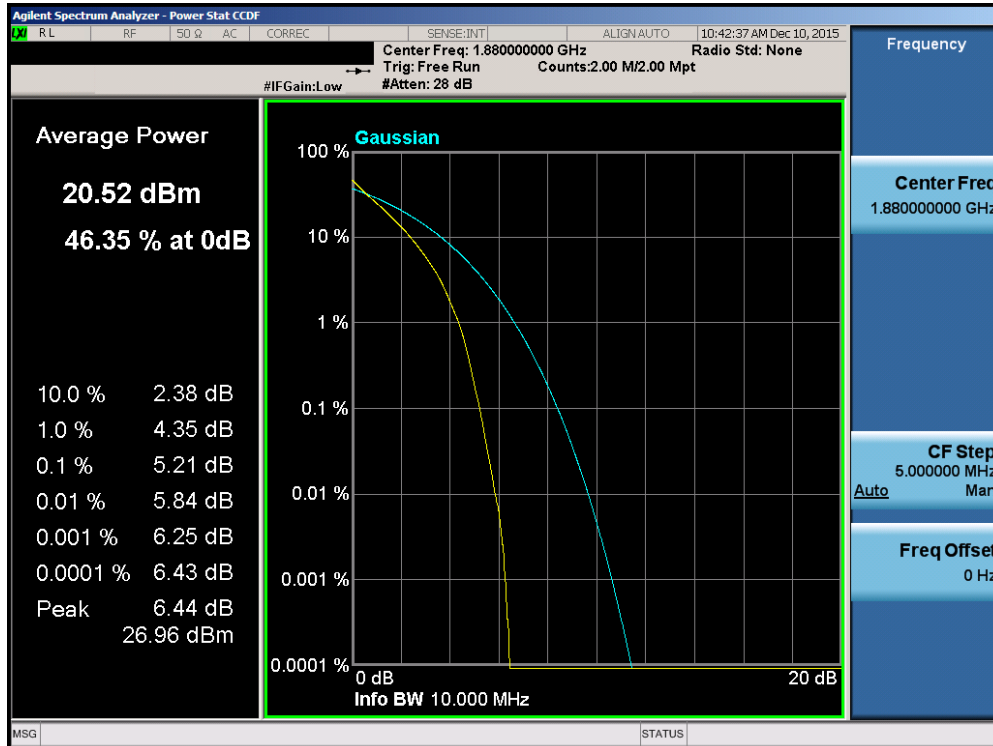


Plot 7-149. PAR Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

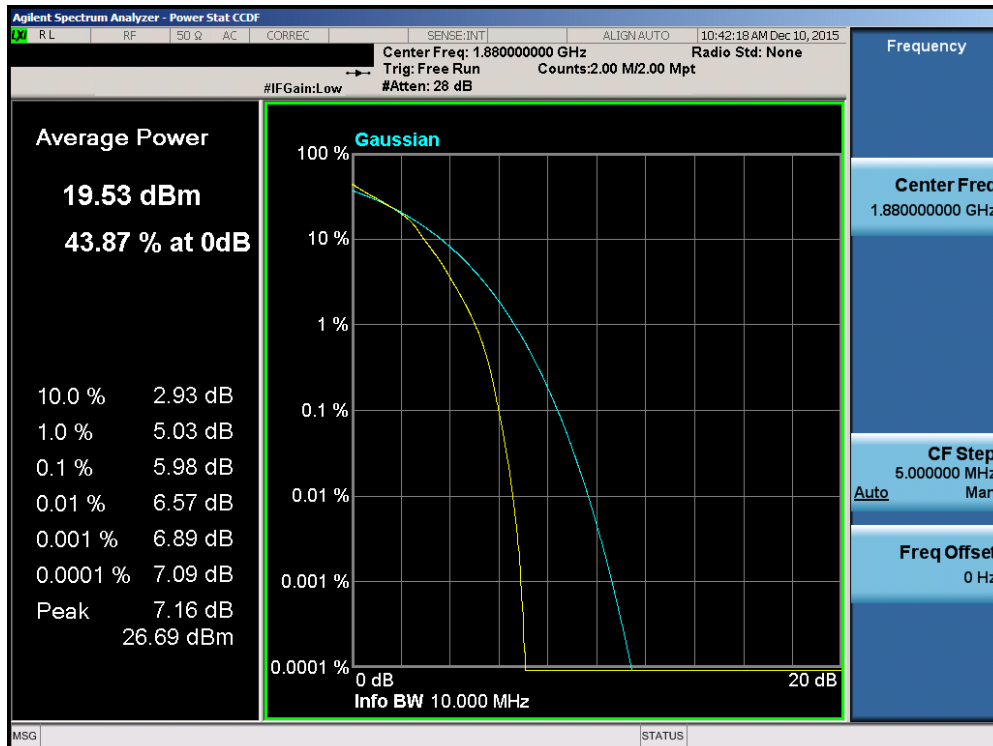


Plot 7-150. PAR Plot (Band 2 – 5.0MHz 16-QAM – RB Size 25)

FCC ID: ZNFL81AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1512092087-R1.ZNF	Test Dates: Dec 10 - 24, 2015	EUT Type: Portable Handset		Page 91 of 118

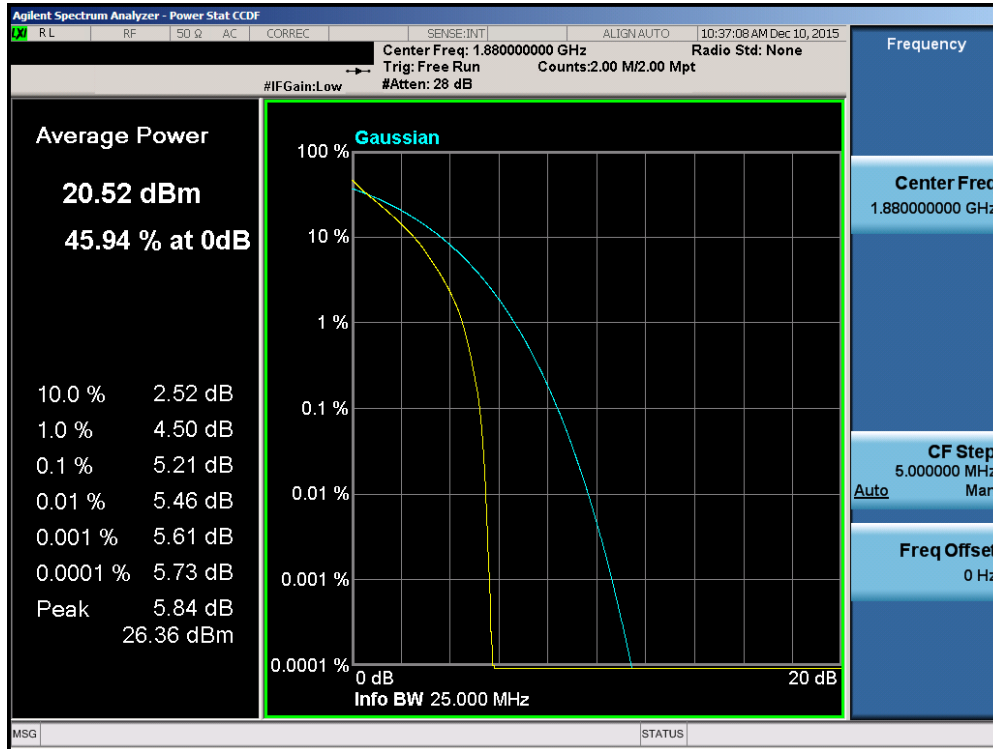


Plot 7-151. PAR Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

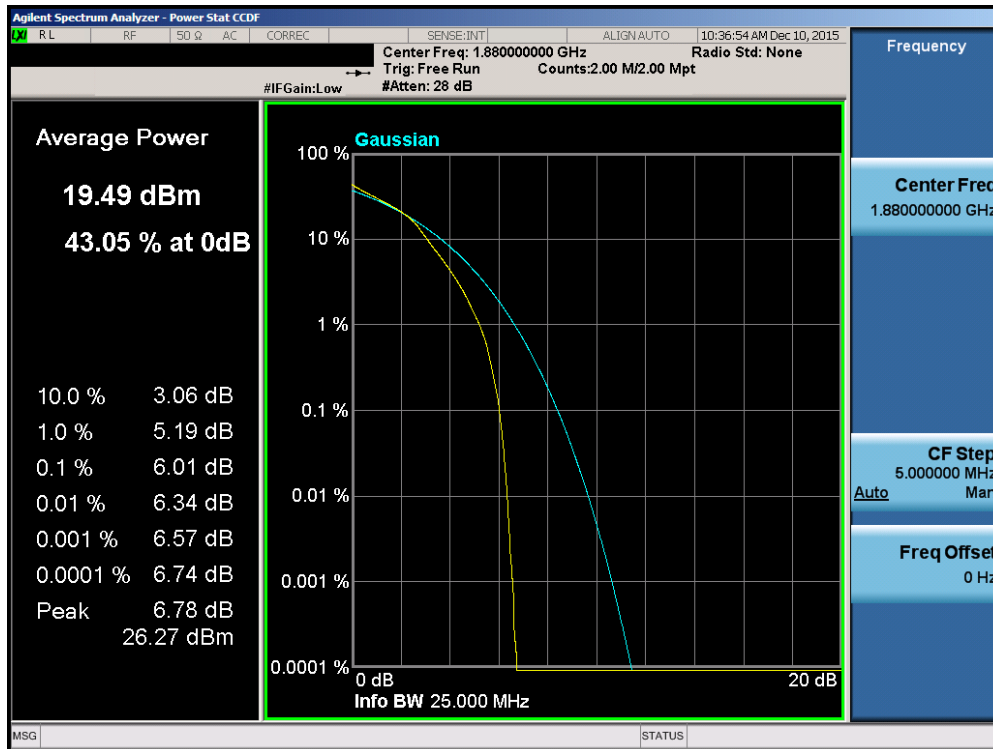


Plot 7-152. PAR Plot (Band 2 – 10.0MHz 16-QAM – RB Size 50)

FCC ID: ZNFL81AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1512092087-R1.ZNF	Test Dates: Dec 10 - 24, 2015	EUT Type: Portable Handset		Page 92 of 118

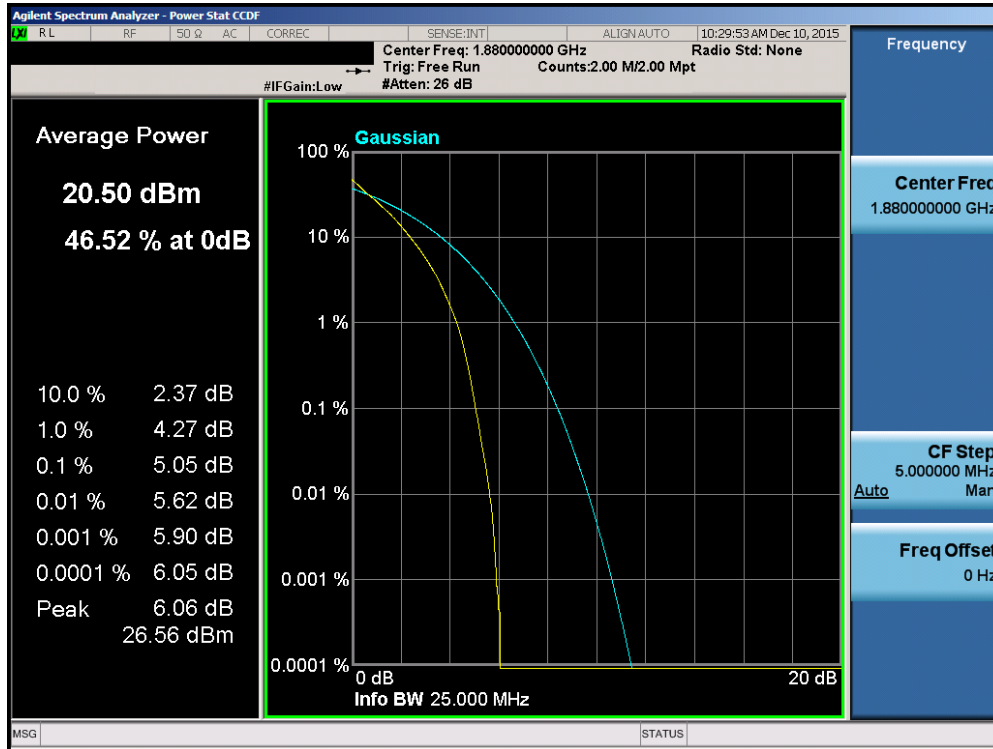


Plot 7-153. PAR Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

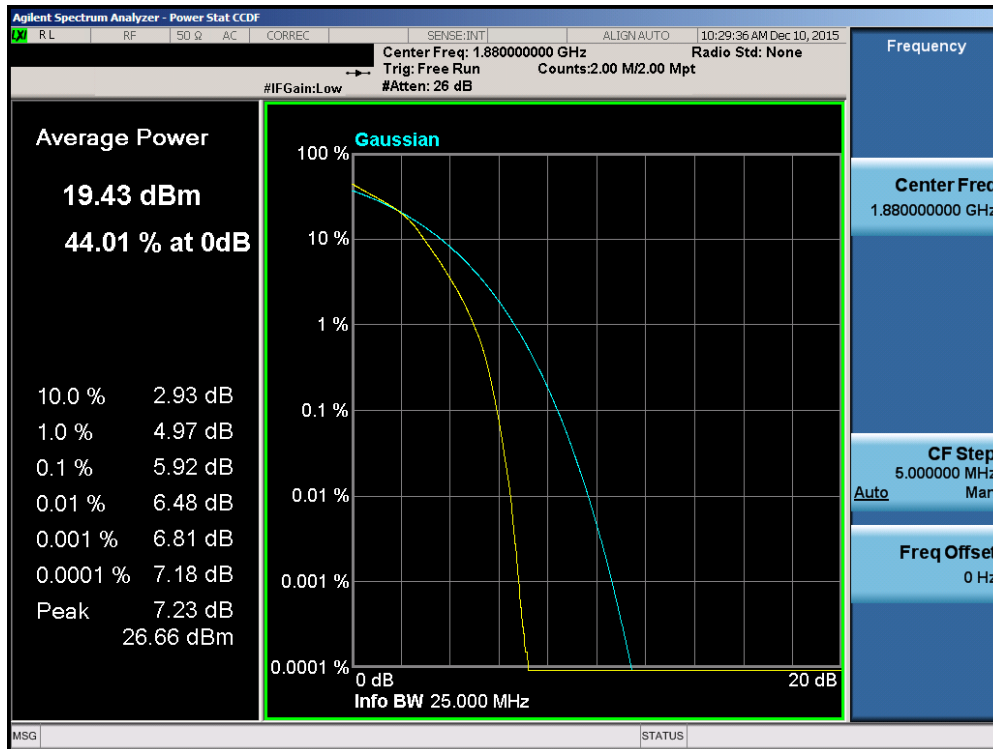


Plot 7-154. PAR Plot (Band 2 – 15.0MHz 16-QAM – RB Size 75)

FCC ID: ZNFL81AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1512092087-R1.ZNF	Test Dates: Dec 10 - 24, 2015	EUT Type: Portable Handset		Page 93 of 118



Plot 7-155. PAR Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



Plot 7-156. PAR Plot (Band 2 – 20.0MHz 16-QAM – RB Size 100)

FCC ID: ZNFL81AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1512092087-R1.ZNF	Test Dates: Dec 10 - 24, 2015	EUT Type: Portable Handset		Page 94 of 118

**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-C-2004 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically 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 v02r02 – Section 5.2.1

ANSI/TIA-603-C-2004 – Section 2.2.17

**Test Settings**

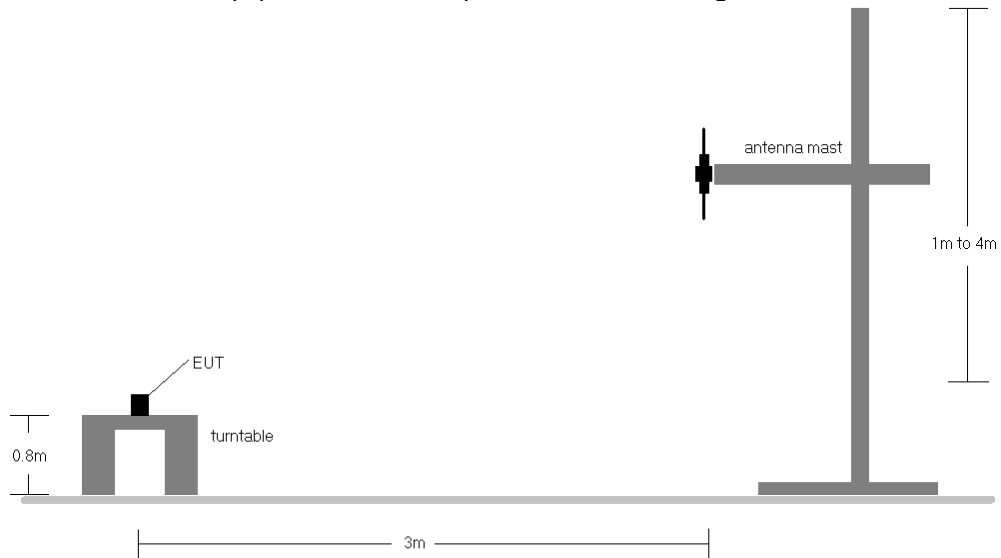
1. Radiated power measurements are performed using the signal analyzer’s “channel power” measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW  $\geq$  3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points  $\geq$  2 x span / 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: ZNFL81AL		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1512092087-R1.ZNF	Test Dates: Dec 10 - 24, 2015	EUT Type: Portable Handset		Page 95 of 118

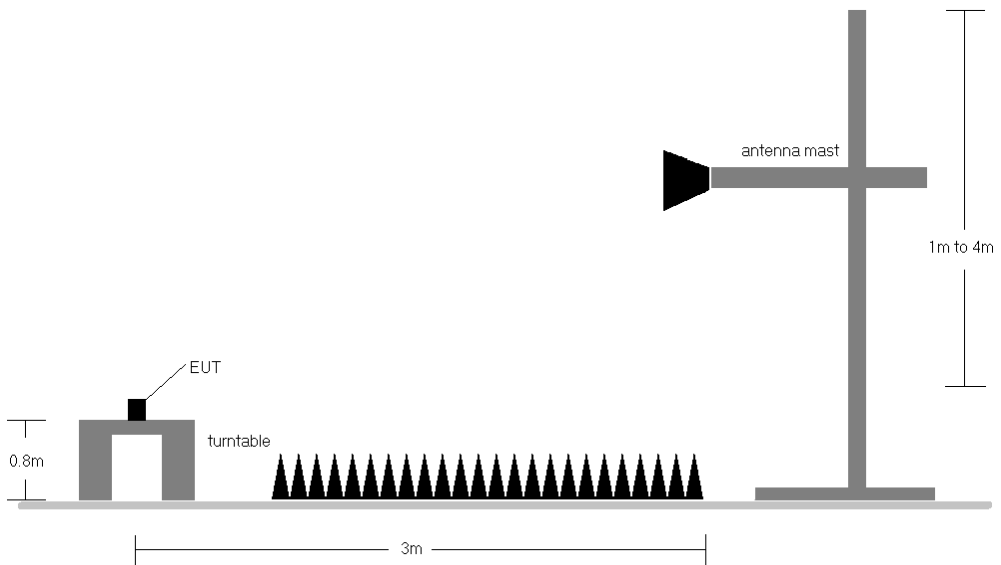


### Test Setup

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: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1512092087-R1.ZNF	Test Dates: Dec 10 - 24, 2015	EUT Type: Portable Handset		Page 96 of 118



Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
699.70	1.4	QPSK	V	1.00	90	1 / 0	19.42	-0.95	18.47	34.77	-16.30
707.50	1.4	QPSK	V	1.60	76	1 / 0	19.72	-0.98	18.74	34.77	-16.03
715.30	1.4	QPSK	V	1.60	140	1 / 0	19.98	-1.01	18.97	34.77	-15.80
699.70	1.4	16-QAM	V	1.00	90	1 / 0	18.57	-0.95	17.62	34.77	-17.15
707.50	1.4	16-QAM	V	1.60	76	1 / 0	19.37	-0.98	18.39	34.77	-16.38
715.30	1.4	16-QAM	V	1.60	140	1 / 0	19.19	-1.01	18.18	34.77	-16.59
700.50	3	QPSK	V	1.00	115	1 / 0	19.40	-0.95	18.45	34.77	-16.32
707.50	3	QPSK	V	1.60	108	1 / 0	19.83	-0.98	18.85	34.77	-15.92
714.50	3	QPSK	V	1.60	108	1 / 0	20.33	-1.01	19.32	34.77	-15.45
700.50	3	16-QAM	V	1.00	115	1 / 0	19.02	-0.95	18.07	34.77	-16.70
707.50	3	16-QAM	V	1.60	108	1 / 0	18.75	-0.98	17.77	34.77	-17.00
714.50	3	16-QAM	V	1.60	108	1 / 0	19.55	-1.01	18.54	34.77	-16.23
701.50	5	QPSK	V	1.00	95	1 / 0	19.22	-0.96	18.26	34.77	-16.51
707.50	5	QPSK	V	1.60	60	1 / 0	19.35	-0.98	18.37	34.77	-16.40
713.50	5	QPSK	V	1.00	108	1 / 0	18.66	-1.00	17.66	34.77	-17.12
701.50	5	16-QAM	V	1.00	95	1 / 0	18.24	-0.96	17.28	34.77	-17.49
707.50	5	16-QAM	V	1.60	60	1 / 0	18.65	-0.98	17.67	34.77	-17.10
713.50	5	16-QAM	V	1.00	108	1 / 0	17.81	-1.00	16.81	34.77	-17.97
704.00	10	QPSK	V	1.00	60	1 / 0	19.47	-0.97	18.50	34.77	-16.27
707.50	10	QPSK	V	1.00	124	1 / 0	19.28	-0.98	18.30	34.77	-16.47
711.00	10	QPSK	V	1.70	70	1 / 0	19.71	-0.99	18.72	34.77	-16.06
704.00	10	16-QAM	V	1.00	60	1 / 0	18.53	-0.97	17.56	34.77	-17.21
707.50	10	16-QAM	V	1.00	124	1 / 0	18.63	-0.98	17.65	34.77	-17.12
711.00	10	16-QAM	V	1.70	70	1 / 0	19.01	-0.99	18.02	34.77	-16.76

**Table 7-2. ERP Data (Band 12)**

FCC ID: ZNFL81AL	 <b>FCC Pt. 22, 24, &amp; 27 LTE MEASUREMENT REPORT (CERTIFICATION)</b>			Reviewed by: Quality Manager
Test Report S/N: 0Y1512092087-R1.ZNF	Test Dates: Dec 10 - 24, 2015	EUT Type: Portable Handset	Page 97 of 118	



Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
824.70	1.4	QPSK	V	1.36	340	1 / 0	20.48	-1.65	18.83	38.45	-19.62
836.50	1.4	QPSK	V	1.37	75	1 / 0	21.44	-1.74	19.70	38.45	-18.75
848.30	1.4	QPSK	V	1.39	15	1 / 0	19.80	-1.84	17.96	38.45	-20.49
824.70	1.4	16-QAM	V	1.36	340	1 / 0	19.76	-1.65	18.11	38.45	-20.34
836.50	1.4	16-QAM	V	1.37	75	1 / 0	20.64	-1.74	18.90	38.45	-19.55
848.30	1.4	16-QAM	V	1.39	15	1 / 0	19.12	-1.84	17.28	38.45	-21.17
825.50	3	QPSK	V	1.40	340	1 / 0	20.46	-1.65	18.81	38.45	-19.65
836.50	3	QPSK	V	1.39	350	1 / 0	21.42	-1.74	19.68	38.45	-18.77
847.50	3	QPSK	V	1.41	60	1 / 0	20.47	-1.83	18.64	38.45	-19.81
825.50	3	16-QAM	V	1.40	340	1 / 0	19.87	-1.65	18.22	38.45	-20.24
836.50	3	16-QAM	V	1.39	350	1 / 0	21.15	-1.74	19.41	38.45	-19.04
847.50	3	16-QAM	V	1.41	60	1 / 0	19.55	-1.83	17.72	38.45	-20.73
826.50	5	QPSK	V	1.39	10	1 / 0	20.32	-1.66	18.66	38.45	-19.79
836.50	5	QPSK	V	1.39	10	1 / 0	21.07	-1.74	19.33	38.45	-19.12
846.50	5	QPSK	V	1.40	10	1 / 0	20.43	-1.82	18.61	38.45	-19.84
826.50	5	16-QAM	V	1.39	10	1 / 0	19.12	-1.66	17.46	38.45	-20.99
836.50	5	16-QAM	V	1.39	10	1 / 0	20.12	-1.74	18.38	38.45	-20.07
846.50	5	16-QAM	V	1.40	10	1 / 0	19.87	-1.82	18.05	38.45	-20.40
829.00	10	QPSK	V	1.39	350	1 / 0	20.80	-1.68	19.12	38.45	-19.33
836.50	10	QPSK	V	1.37	350	1 / 0	20.98	-1.74	19.24	38.45	-19.21
844.00	10	QPSK	V	1.38	350	1 / 0	21.43	-1.80	19.63	38.45	-18.82
829.00	10	16-QAM	V	1.39	350	1 / 0	20.01	-1.68	18.33	38.45	-20.12
836.50	10	16-QAM	V	1.37	350	1 / 0	19.87	-1.74	18.13	38.45	-20.32
844.00	10	16-QAM	V	1.38	355	1 / 0	20.23	-1.80	18.43	38.45	-20.02

**Table 7-3. ERP Data (Band 5)**

FCC ID: ZNLF81AL	 <b>FCC Pt. 22, 24, &amp; 27 LTE MEASUREMENT REPORT (CERTIFICATION)</b>			Reviewed by: Quality Manager
Test Report S/N: 0Y1512092087-R1.ZNF	Test Dates: Dec 10 - 24, 2015	EUT Type: Portable Handset	Page 98 of 118	

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
1710.70	1.4	QPSK	V	1.44	185	1 / 0	12.79	8.23	21.02	30.00	-8.98
1732.50	1.4	QPSK	V	1.07	340	1 / 0	15.36	8.18	23.54	30.00	-6.46
1754.30	1.4	QPSK	V	1.40	230	1 / 0	12.62	8.12	20.74	30.00	-9.26
1710.70	1.4	16-QAM	V	1.44	185	1 / 0	11.99	8.23	20.22	30.00	-9.78
1732.50	1.4	16-QAM	V	1.07	340	1 / 0	14.42	8.18	22.60	30.00	-7.40
1754.30	1.4	16-QAM	V	1.40	230	1 / 0	11.77	8.12	19.89	30.00	-10.11
1711.50	3	QPSK	V	1.39	233	1 / 0	12.84	8.23	21.07	30.00	-8.93
1732.50	3	QPSK	V	1.40	60	1 / 0	13.99	8.18	22.17	30.00	-7.83
1753.50	3	QPSK	V	1.33	76	1 / 0	13.65	8.12	21.77	30.00	-8.23
1711.50	3	16-QAM	V	1.39	233	1 / 0	12.10	8.23	20.33	30.00	-9.67
1732.50	3	16-QAM	V	1.40	60	1 / 0	13.27	8.18	21.45	30.00	-8.55
1753.50	3	16-QAM	V	1.33	76	1 / 0	12.74	8.12	20.86	30.00	-9.14
1712.50	5	QPSK	V	1.35	320	1 / 0	12.73	8.23	20.96	30.00	-9.04
1732.50	5	QPSK	V	1.37	313	1 / 0	13.79	8.18	21.97	30.00	-8.03
1752.50	5	QPSK	V	1.02	308	1 / 0	14.18	8.13	22.31	30.00	-7.69
1712.50	5	16-QAM	V	1.35	320	1 / 0	11.60	8.23	19.83	30.00	-10.17
1732.50	5	16-QAM	V	1.37	313	1 / 0	12.42	8.18	20.60	30.00	-9.40
1752.50	5	16-QAM	V	1.02	308	1 / 0	13.61	8.13	21.74	30.00	-8.26
1715.00	10	QPSK	V	1.32	330	1 / 0	14.51	8.22	22.73	30.00	-7.27
1732.50	10	QPSK	V	1.33	70	1 / 0	13.14	8.18	21.32	30.00	-8.68
1750.00	10	QPSK	V	1.10	200	1 / 0	14.27	8.13	22.40	30.00	-7.60
1715.00	10	16-QAM	V	1.32	330	1 / 0	12.76	8.22	20.98	30.00	-9.02
1732.50	10	16-QAM	V	1.33	70	1 / 0	12.25	8.18	20.43	30.00	-9.57
1750.00	10	16-QAM	V	1.10	200	1 / 0	13.23	8.13	21.36	30.00	-8.64
1717.50	15	QPSK	V	1.09	93	1 / 0	14.33	8.22	22.55	30.00	-7.45
1732.50	15	QPSK	V	1.04	240	1 / 0	13.02	8.18	21.20	30.00	-8.80
1747.50	15	QPSK	V	1.06	202	1 / 0	13.47	8.14	21.61	30.00	-8.39
1717.50	15	16-QAM	V	1.09	93	1 / 0	13.50	8.22	21.72	30.00	-8.28
1732.50	15	16-QAM	V	1.04	240	1 / 0	12.63	8.18	20.81	30.00	-9.19
1747.50	15	16-QAM	V	1.06	202	1 / 0	12.89	8.14	21.03	30.00	-8.97
1720.00	20	QPSK	V	1.06	95	1 / 0	14.25	8.21	22.46	30.00	-7.54
1732.50	20	QPSK	V	1.05	249	1 / 0	13.38	8.18	21.56	30.00	-8.44
1745.00	20	QPSK	V	1.08	251	1 / 0	13.54	8.15	21.69	30.00	-8.31
1720.00	20	16-QAM	V	1.06	95	1 / 0	13.47	8.21	21.68	30.00	-8.32
1732.50	20	16-QAM	V	1.05	249	1 / 0	11.98	8.18	20.16	30.00	-9.84
1745.00	20	16-QAM	V	1.08	251	1 / 0	12.62	8.15	20.77	30.00	-9.23

**Table 7-4. EIRP Data (Band 4)**

FCC ID: ZNFL81AL	 <b>FCC Pt. 22, 24, &amp; 27 LTE MEASUREMENT REPORT (CERTIFICATION)</b>			Reviewed by: Quality Manager
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Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
1850.70	1.4	QPSK	V	1.92	150	1 / 0	9.95	7.99	17.94	33.01	-15.07
1880.00	1.4	QPSK	V	1.75	160	1 / 0	11.41	7.98	19.39	33.01	-13.63
1909.30	1.4	QPSK	V	1.45	144	1 / 0	10.40	8.04	18.44	33.01	-14.57
1850.70	1.4	16-QAM	V	1.92	150	1 / 0	9.37	7.99	17.36	33.01	-15.65
1880.00	1.4	16-QAM	V	1.75	160	1 / 0	10.76	7.98	18.74	33.01	-14.28
1909.30	1.4	16-QAM	V	1.45	144	1 / 0	9.89	8.04	17.93	33.01	-15.08
1851.50	3	QPSK	V	1.92	156	1 / 0	9.96	7.99	17.95	33.01	-15.06
1880.00	3	QPSK	V	1.85	185	1 / 0	6.69	7.98	14.67	33.01	-18.35
1908.50	3	QPSK	V	1.83	150	1 / 0	10.78	8.03	18.81	33.01	-14.20
1851.50	3	16-QAM	V	1.92	156	1 / 0	9.25	7.99	17.24	33.01	-15.77
1880.00	3	16-QAM	V	1.85	185	1 / 0	5.72	7.98	13.70	33.01	-19.32
1908.50	3	16-QAM	V	1.83	150	1 / 0	9.89	8.03	17.92	33.01	-15.09
1852.50	5	QPSK	V	1.93	10	1 / 0	9.29	7.99	17.28	33.01	-15.73
1880.00	5	QPSK	V	1.83	342	1 / 0	10.03	7.98	18.01	33.01	-15.01
1907.50	5	QPSK	V	1.11	10	1 / 0	8.18	8.02	16.20	33.01	-16.81
1852.50	5	16-QAM	V	1.93	10	1 / 0	8.10	7.99	16.09	33.01	-16.92
1880.00	5	16-QAM	V	1.83	342	1 / 0	8.94	7.98	16.92	33.01	-16.10
1907.50	5	16-QAM	V	1.11	10	1 / 0	7.68	8.02	15.70	33.01	-17.31
1855.00	10	QPSK	V	1.50	10	1 / 0	8.76	7.99	16.75	33.01	-16.26
1880.00	10	QPSK	V	1.41	340	1 / 0	10.39	7.98	18.37	33.01	-14.65
1905.00	10	QPSK	V	1.44	326	1 / 0	8.94	8.00	16.94	33.01	-16.07
1855.00	10	16-QAM	V	1.50	10	1 / 0	7.94	7.99	15.93	33.01	-17.08
1880.00	10	16-QAM	V	1.41	340	1 / 0	9.79	7.98	17.77	33.01	-15.25
1905.00	10	16-QAM	V	1.44	326	1 / 0	7.75	8.00	15.75	33.01	-17.26
1857.50	15	QPSK	V	1.50	333	1 / 0	8.62	7.98	16.60	33.01	-16.41
1880.00	15	QPSK	V	1.46	340	1 / 0	9.97	7.98	17.95	33.01	-15.07
1902.50	15	QPSK	V	1.82	333	1 / 0	10.29	7.99	18.28	33.01	-14.73
1857.50	15	16-QAM	V	1.50	333	1 / 0	7.64	7.98	15.62	33.01	-17.39
1880.00	15	16-QAM	V	1.46	340	1 / 0	9.23	7.98	17.21	33.01	-15.81
1902.50	15	16-QAM	V	1.82	333	1 / 0	10.10	7.99	18.09	33.01	-14.92
1860.00	20	QPSK	V	1.53	330	1 / 0	9.32	7.98	17.30	33.01	-15.71
1880.00	20	QPSK	V	1.84	10	1 / 0	11.86	7.98	19.84	33.01	-13.18
1900.00	20	QPSK	V	1.83	330	1 / 0	9.44	7.97	17.41	33.01	-15.60
1860.00	20	16-QAM	V	1.53	330	1 / 0	8.29	7.98	16.27	33.01	-16.74
1880.00	20	16-QAM	V	1.18	80	1 / 0	11.14	7.98	19.12	33.01	-13.90
1900.00	20	16-QAM	V	1.83	330	1 / 0	8.08	7.97	16.05	33.01	-16.96

**Table 7-5. EIRP Data (Band 2)**

FCC ID: ZNFL81AL	 <b>FCC Pt. 22, 24, &amp; 27 LTE MEASUREMENT REPORT (CERTIFICATION)</b>			<b>Reviewed by:</b> Quality Manager
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## 7.7 Radiated Spurious Emissions Measurements

§2.1053 §22.917(a) §24.238(a) §27.53(q) §27.53(h)

### Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-C-2004 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 v02r02 – Section 5.8

ANSI/TIA-603-C-2004 – Section 2.2.12

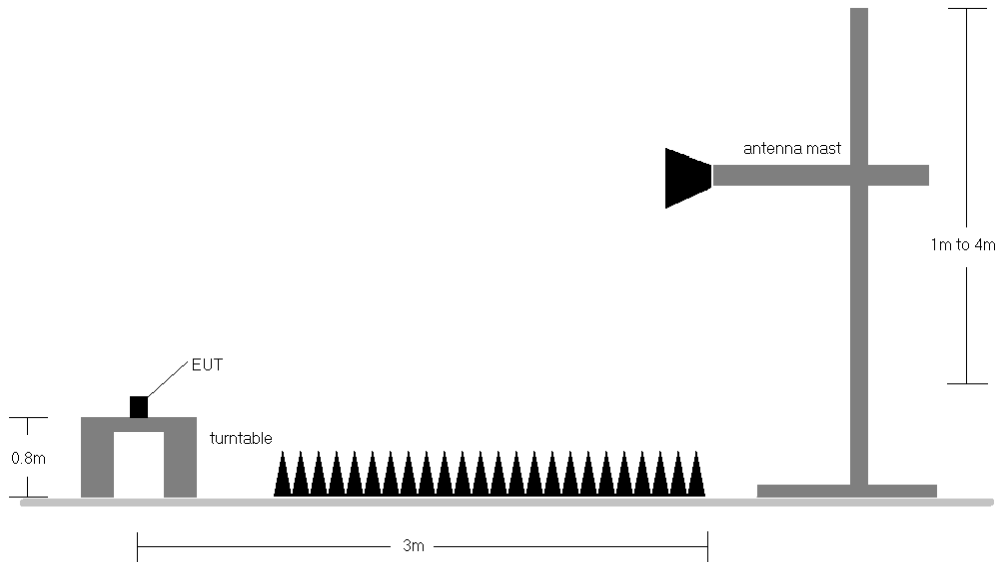
### Test Settings

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

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**Test Setup**

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



**Figure 7-7. Test Instrument & Measurement Setup**

**Test Notes**

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

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OPERATING FREQUENCY: 700.50 MHz  
 CHANNEL: 23025  
 MEASURED OUTPUT POWER: 18.45 dBm = 0.070 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 3.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  31.45 dBc



Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1401.00	H	1.30	5	-58.57	6.19	-52.38	70.8
2101.50	H	1.32	350	-62.49	6.76	-55.73	74.2
2802.00	H	-	-	-61.40	8.03	-53.38	71.8

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

OPERATING FREQUENCY: 707.50 MHz  
 CHANNEL: 23095  
 MEASURED OUTPUT POWER: 18.85 dBm = 0.077 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 3.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  31.85 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1415.00	H	1.29	5	-63.25	6.23	-57.02	75.9
2122.50	H	-	-	-62.33	6.80	-55.53	74.4

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

FCC ID: ZNFL81AL			FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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OPERATING FREQUENCY: 714.50 MHz  
 CHANNEL: 23165  
 MEASURED OUTPUT POWER: 19.32 dBm = 0.086 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 3.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  32.32 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1429.00	H	1.37	350	-62.96	6.27	-56.69	76.0
2143.50	H	-	-	-62.57	6.84	-55.73	75.0

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

OPERATING FREQUENCY: 824.70 MHz  
 CHANNEL: 20407  
 MEASURED OUTPUT POWER: 18.83 dBm = 0.076 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 1.4 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  31.83 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1649.40	H	1.30	212	-54.48	6.25	-48.23	67.1
2474.10	H	1.40	230	-60.69	6.61	-54.08	72.9
3298.80	H	-	-	-57.82	6.99	-50.83	69.7

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

FCC ID: ZNFL81AL			FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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OPERATING FREQUENCY: 836.50 MHz  
 CHANNEL: 20525  
 MEASURED OUTPUT POWER: 19.70 dBm = 0.093 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 1.4 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  32.70 dBc



Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1673.00	H	1.36	196	-55.40	6.13	-49.27	69.0
2509.50	H	1.60	201	-59.09	6.64	-52.45	72.1
3346.00	H	-	-	-57.59	7.14	-50.45	70.1

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

OPERATING FREQUENCY: 848.30 MHz  
 CHANNEL: 20643  
 MEASURED OUTPUT POWER: 17.96 dBm = 0.063 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 1.4 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  30.96 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1696.60	H	1.32	5	-48.03	6.01	-42.02	60.0
2544.90	H	1.80	350	-50.91	6.74	-44.17	62.1
3393.20	H	1.61	260	-50.03	7.29	-42.74	60.7
4241.50	H	-	-	-67.88	8.34	-59.54	77.5

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

FCC ID: ZNFL81AL			FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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OPERATING FREQUENCY: 1710.70 MHz  
 CHANNEL: 19957  
 MEASURED OUTPUT POWER: 21.02 dBm = 0.127 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 1.4 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  34.02 dBc


Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3421.40	H	1.42	266	-40.58	9.52	-31.05	52.1
5132.10	H	1.60	255	-54.66	11.03	-43.63	64.6
6842.80	H	1.30	260	-45.11	10.74	-34.37	55.4
8553.50	H	1.80	350	-51.81	11.27	-40.54	61.6
10264.20	H	-	-	-49.77	12.51	-37.27	58.3

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

OPERATING FREQUENCY: 1732.50 MHz  
 CHANNEL: 20175  
 MEASURED OUTPUT POWER: 23.54 dBm = 0.226 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 1.4 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  36.54 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3465.00	H	1.40	137	-42.87	9.64	-33.22	56.8
5197.50	H	1.30	130	-54.94	10.98	-43.96	67.5
6930.00	H	1.40	260	-47.66	10.85	-36.81	60.3
8662.50	H	1.60	350	-52.71	11.53	-41.18	64.7
10395.00	H	-	-	-49.30	12.58	-36.72	60.3

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

FCC ID: ZNFL81AL	 <b>FCC Pt. 22, 24, &amp; 27 LTE MEASUREMENT REPORT (CERTIFICATION)</b>			<b>Reviewed by:</b> Quality Manager
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OPERATING FREQUENCY: 1754.30 MHz  
 CHANNEL: 20393  
 MEASURED OUTPUT POWER: 20.74 dBm = 0.119 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 1.4 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  33.74 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3508.60	H	1.30	197	-46.15	9.76	-36.39	57.1
5262.90	H	1.27	160	-55.31	11.06	-44.25	65.0
7017.20	H	1.40	260	-46.73	11.01	-35.71	56.5
8771.50	H	-	-	-54.04	11.74	-42.30	63.0

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

OPERATING FREQUENCY: 1855.00 MHz  
 CHANNEL: 18700  
 MEASURED OUTPUT POWER: 17.30 dBm = 0.054 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 20.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  30.30 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3710.00	H	1.30	5	-54.01	9.87	-44.14	61.4
5565.00	H	1.61	5	-55.54	11.18	-44.36	61.7
7420.00	H	1.27	350	-46.86	10.85	-36.02	53.3
9275.00	H	-	-	-58.51	12.29	-46.22	63.5

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

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OPERATING FREQUENCY: 1880.00 MHz  
 CHANNEL: 18900  
 MEASURED OUTPUT POWER: 19.84 dBm = 0.096 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 20.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  32.84 dBc


Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3760.00	H	1.20	55	-54.75	9.63	-45.12	65.0
5640.00	H	1.37	5	-55.67	11.29	-44.38	64.2
7520.00	H	1.62	350	-47.10	11.12	-35.98	55.8
9400.00	H	-	-	-55.82	12.28	-43.54	63.4

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

OPERATING FREQUENCY: 1900.00 MHz  
 CHANNEL: 19100  
 MEASURED OUTPUT POWER: 17.41 dBm = 0.055 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 20.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  30.41 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3800.00	H	1.30	258	-50.38	9.44	-40.93	58.3
5700.00	H	1.70	260	-54.96	11.37	-43.59	61.0
7600.00	H	1.60	5	-43.53	11.32	-32.22	49.6
9500.00	H	-	-	-52.97	12.39	-40.58	58.0

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

FCC ID: ZNFL81AL			FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed 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-C-2004. 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  $\pm 0.00025\%$  ( $\pm 2.5$  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-C-2004

### Test Settings



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

### Test Setup

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

### Test Notes

None

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## Band 12 Frequency Stability Measurements

§2.1055 §27.54



OPERATING FREQUENCY: 707,500,000 Hz  
 CHANNEL: 23790  
 REFERENCE VOLTAGE: 3.85 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	707,499,856	-144	-0.0000204
100 %		- 30	707,499,828	-172	-0.0000243
100 %		- 20	707,499,870	-130	-0.0000184
100 %		- 10	707,499,875	-125	-0.0000177
100 %		0	707,499,832	-168	-0.0000237
100 %		+ 10	707,499,796	-204	-0.0000288
100 %		+ 20	707,499,856	-144	-0.0000204
100 %		+ 30	707,499,851	-149	-0.0000211
100 %		+ 40	707,499,793	-207	-0.0000293
100 %		+ 50	707,499,784	-216	-0.0000305
BATT. ENDPOINT		3.45	+ 20	707,499,767	-233

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

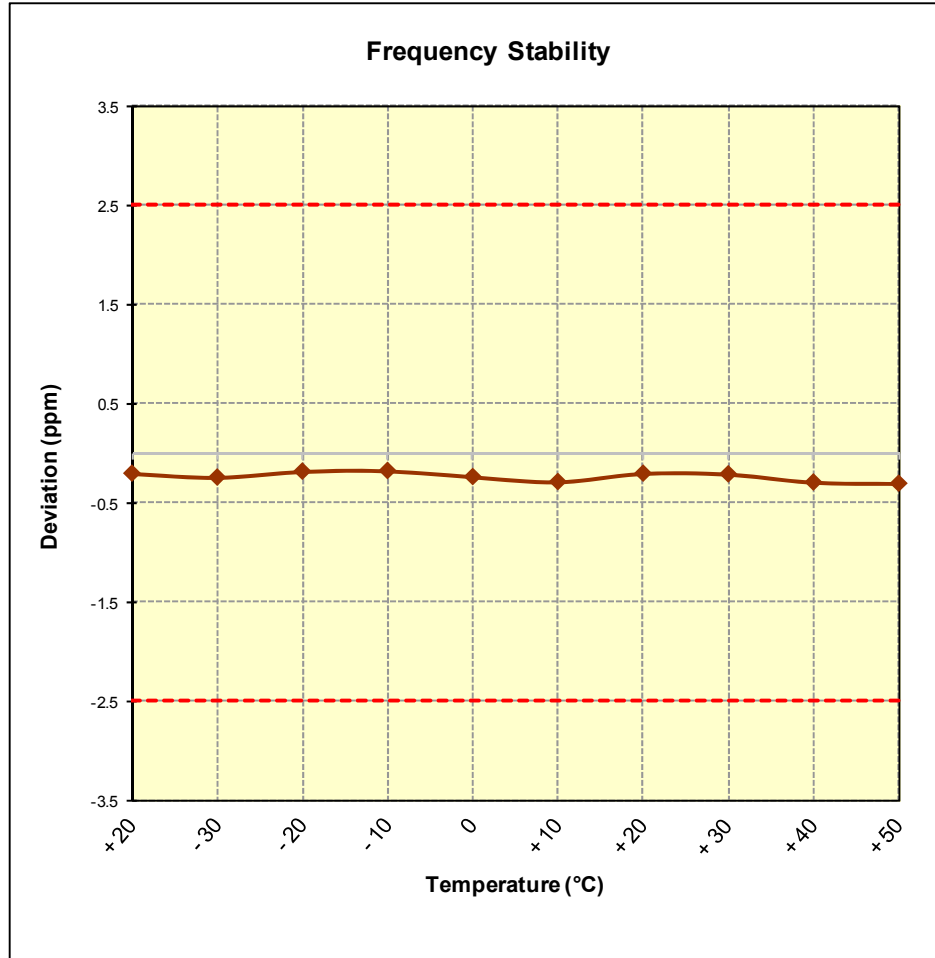
**Note:**

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.

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**Band 12 Frequency Stability Measurements**  
**§2.1055 §27.54**



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

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## Band 5 Frequency Stability Measurements

§2.1055 §22.355

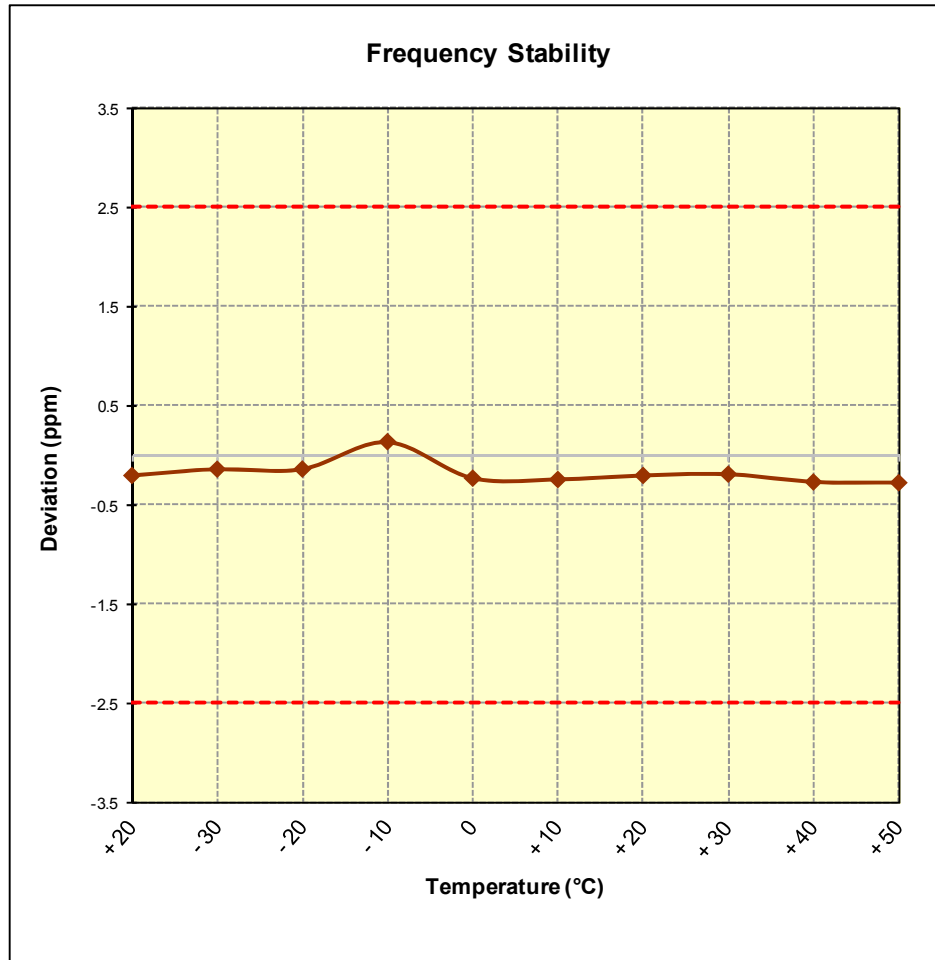
OPERATING FREQUENCY: 836,500,000 Hz  
 CHANNEL: 20525  
 REFERENCE VOLTAGE: 3.85 VDC  
 DEVIATION LIMIT: ± 0.00025 % or 2.5 ppm

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	836,499,827	-173	-0.0000207
100 %		- 30	836,499,880	-120	-0.0000143
100 %		- 20	836,499,881	-119	-0.0000142
100 %		- 10	836,500,112	112	0.0000134
100 %		0	836,499,804	-196	-0.0000234
100 %		+ 10	836,499,793	-207	-0.0000247
100 %		+ 20	836,499,827	-173	-0.0000207
100 %		+ 30	836,499,838	-162	-0.0000194
100 %		+ 40	836,499,772	-228	-0.0000273
100 %		+ 50	836,499,766	-234	-0.0000280
BATT. ENDPOINT		3.45	+ 20	836,499,743	-257

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

FCC ID: ZNFL81AL	 <b>FCC Pt. 22, 24, &amp; 27 LTE MEASUREMENT REPORT (CERTIFICATION)</b>			Reviewed by: Quality Manager
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**Band 5 Frequency Stability Measurements**  
§2.1055 §22.355



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

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## Band 4 Frequency Stability Measurements

§2.1055 §§27.54



OPERATING FREQUENCY: 1,732,500,000 Hz  
 CHANNEL: 20175  
 REFERENCE VOLTAGE: 3.85 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	1,732,499,799	-201	-0.0000116
100 %		- 30	1,732,499,812	-188	-0.0000109
100 %		- 20	1,732,499,807	-193	-0.0000111
100 %		- 10	1,732,499,818	-182	-0.0000105
100 %		0	1,732,499,810	-190	-0.0000110
100 %		+ 10	1,732,499,779	-221	-0.0000128
100 %		+ 20	1,732,499,799	-201	-0.0000116
100 %		+ 30	1,732,499,783	-217	-0.0000125
100 %		+ 40	1,732,499,772	-228	-0.0000132
100 %		+ 50	1,732,499,803	-197	-0.0000114
BATT. ENDPOINT		3.45	+ 20	1,732,499,756	-244

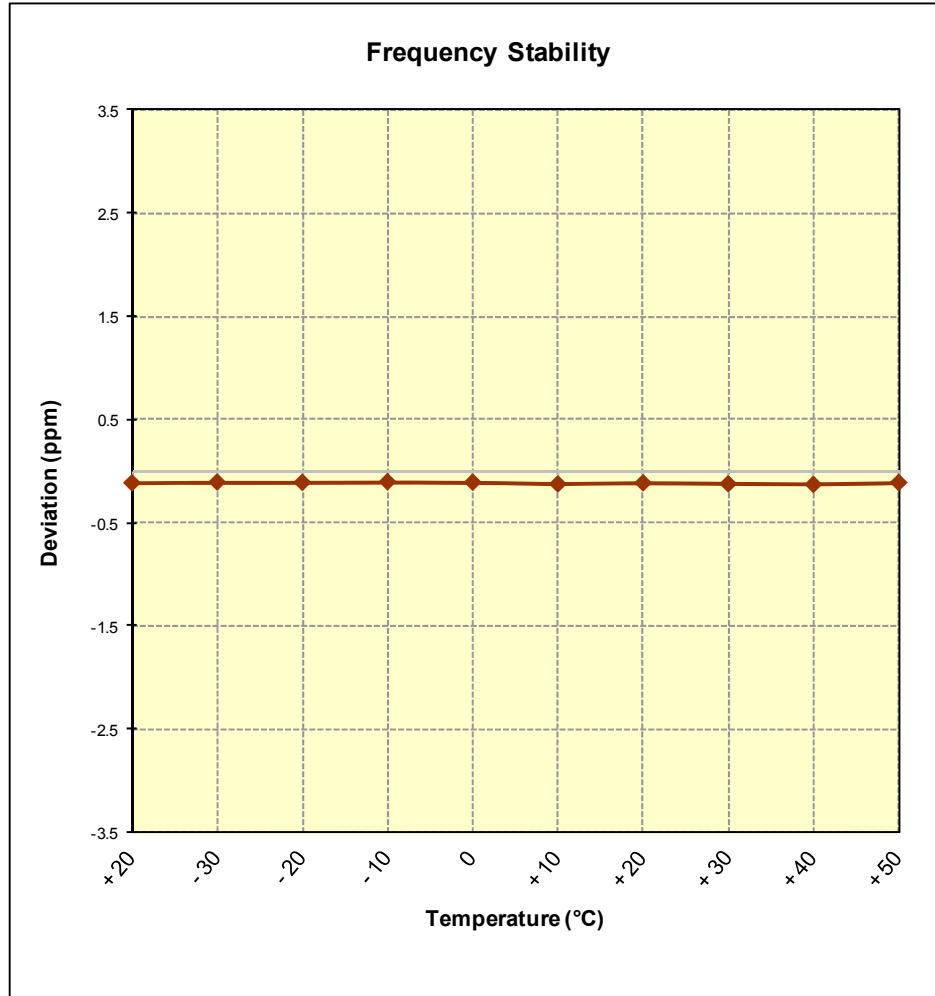
Table 7-20. Frequency Stability Data (Band 4)

**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.

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

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## Band 2 Frequency Stability Measurements

§2.1055 §24.235



OPERATING FREQUENCY: 1,880,000,000 Hz  
 CHANNEL: 18900  
 REFERENCE VOLTAGE: 3.85 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	1,879,999,812	-188	-0.0000100
100 %		- 30	1,879,999,846	-154	-0.0000082
100 %		- 20	1,880,000,135	135	0.0000072
100 %		- 10	1,879,999,815	-185	-0.0000098
100 %		0	1,879,999,789	-211	-0.0000112
100 %		+ 10	1,879,999,837	-163	-0.0000087
100 %		+ 20	1,879,999,812	-188	-0.0000100
100 %		+ 30	1,879,999,792	-208	-0.0000111
100 %		+ 40	1,879,999,782	-218	-0.0000116
100 %		+ 50	1,879,999,761	-239	-0.0000127
BATT. ENDPOINT		3.45	+ 20	1,879,999,745	-255

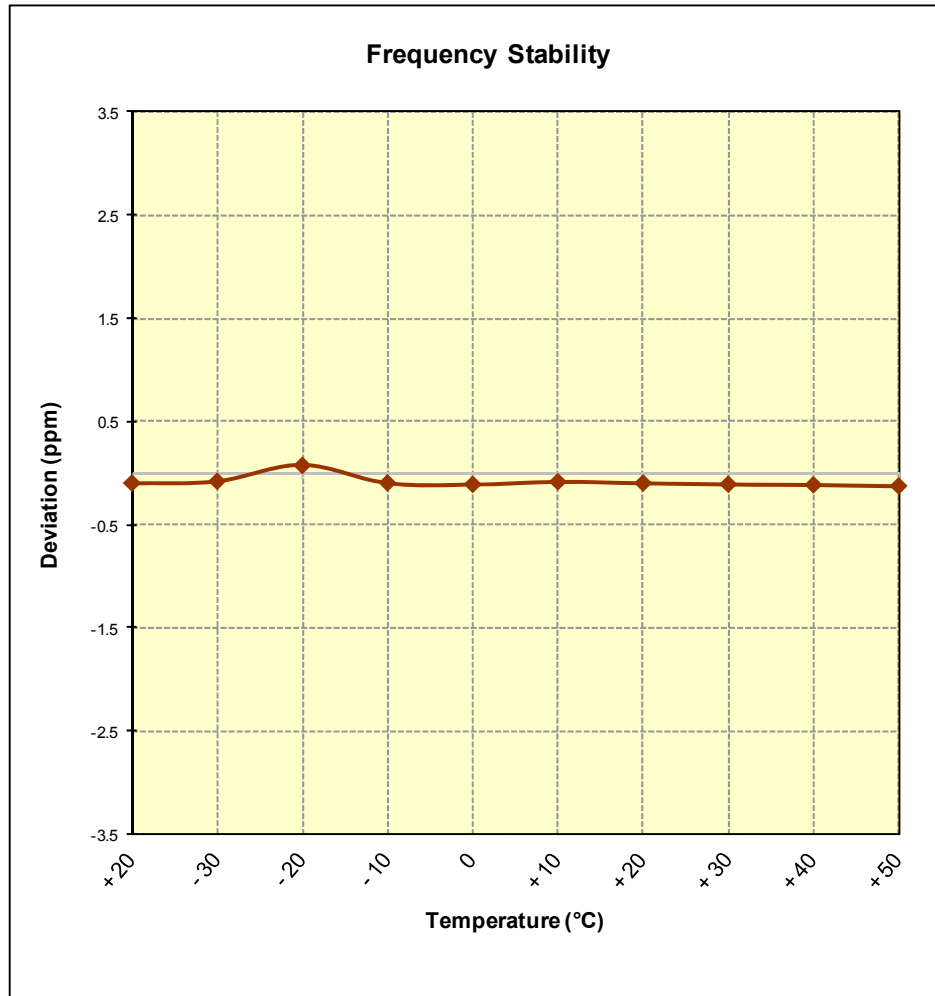
**Table 7-21. Frequency Stability Data (Band 2)**

**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: ZNFL81AL	 <b>FCC Pt. 22, 24, &amp; 27 LTE MEASUREMENT REPORT (CERTIFICATION)</b>			Reviewed 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: ZNFL81AL	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed 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: ZNFL81AL** complies with all the requirements of Parts 22, 24, & 27 of the FCC rules for LTE operation only.

FCC ID: ZNFL81AL		<b>FCC Pt. 22, 24, &amp; 27 LTE MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Reviewed by:</b> Quality Manager
<b>Test Report S/N:</b> 0Y1512092087-R1.ZNF	<b>Test Dates:</b> Dec 10 - 24, 2015	<b>EUT Type:</b> Portable Handset	Page 118 of 118	