

## 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

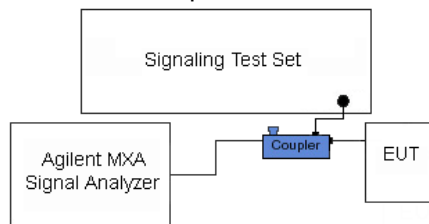
KDB 971168 D01 v02r02 – Section 6.0

### 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.



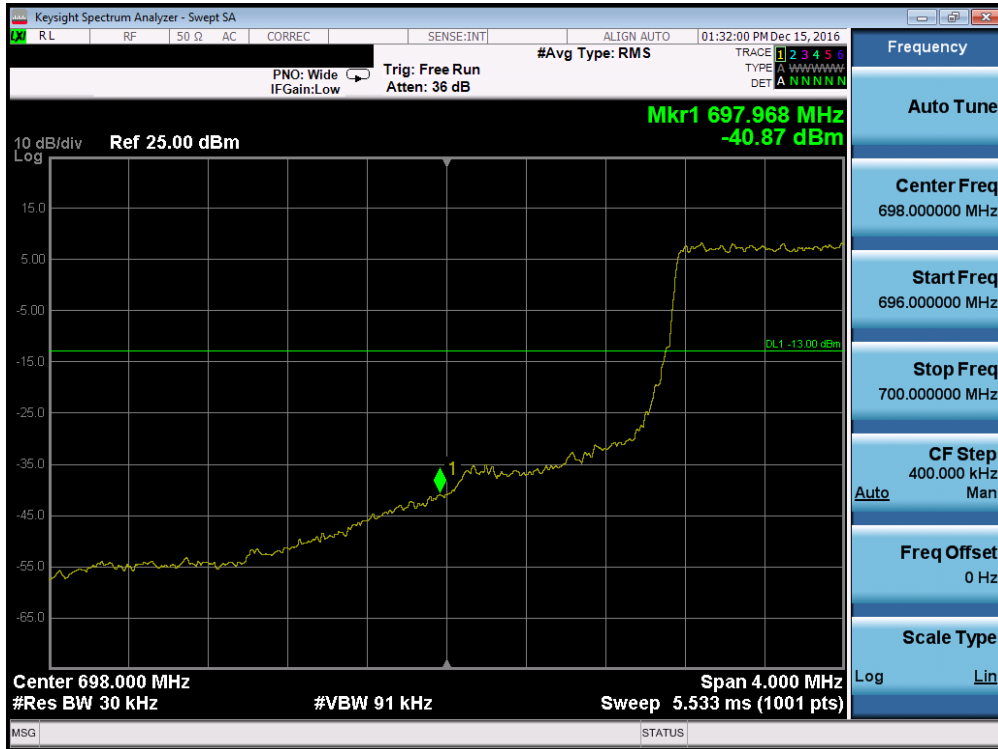
**Figure 7-3. Test Instrument & Measurement Setup**

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



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

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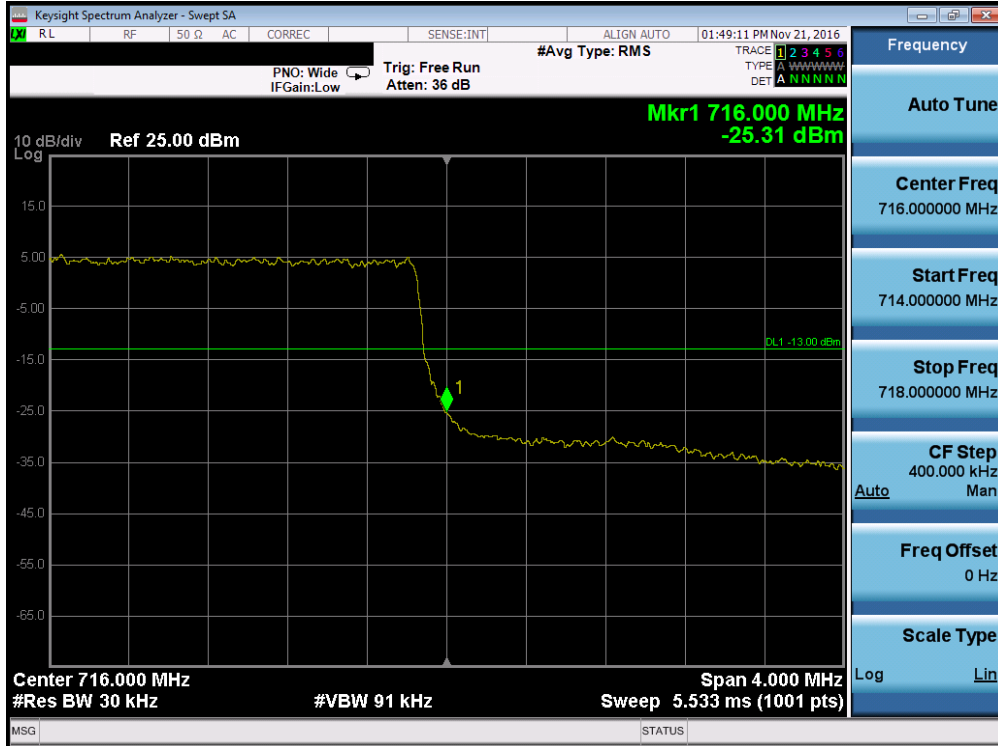
Plot 7-79. Upper Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)



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

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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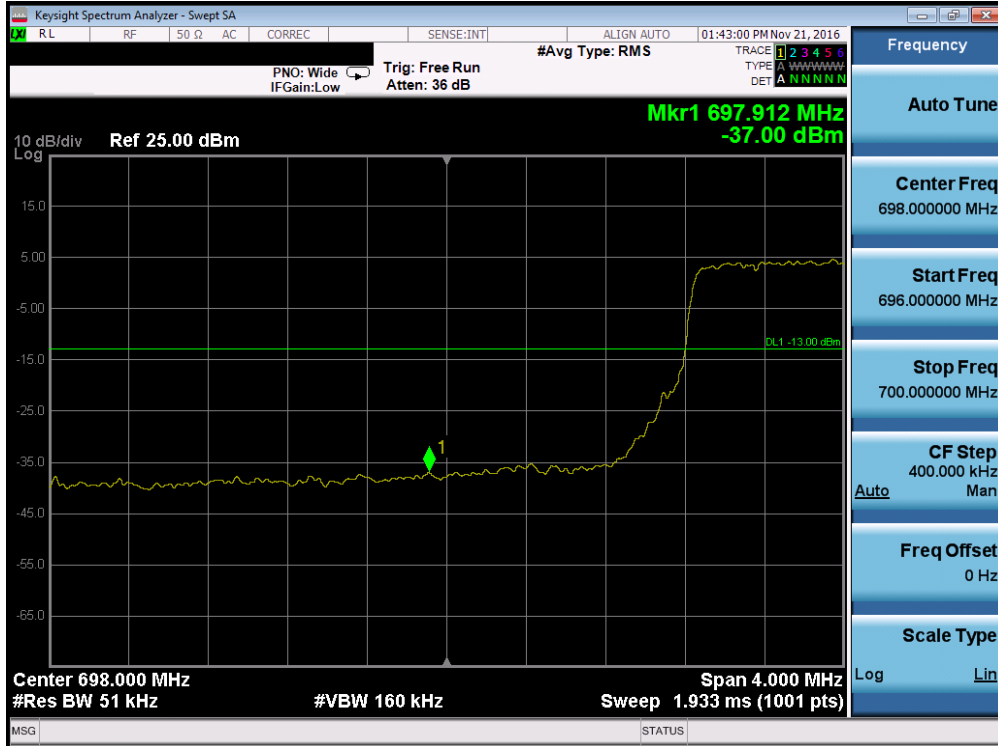


Plot 7-83. Upper Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

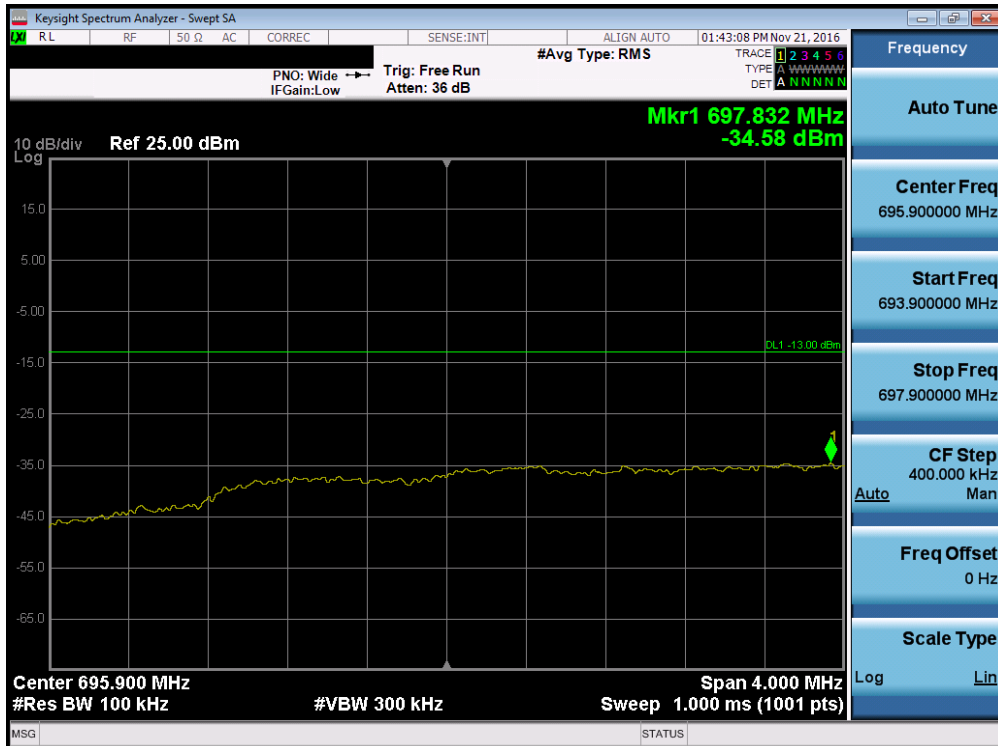


Plot 7-84. Upper Extended Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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Plot 7-85. Lower Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)



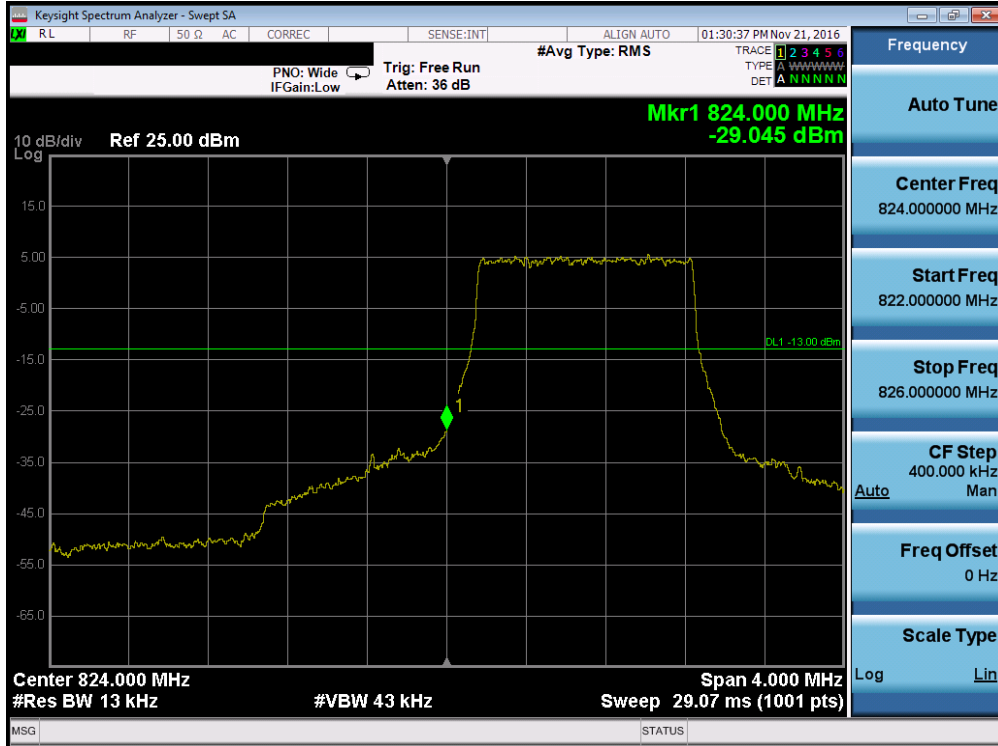
Plot 7-86. Lower Extended Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFUS215	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 – 1.4MHz QPSK – RB Size 6)



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

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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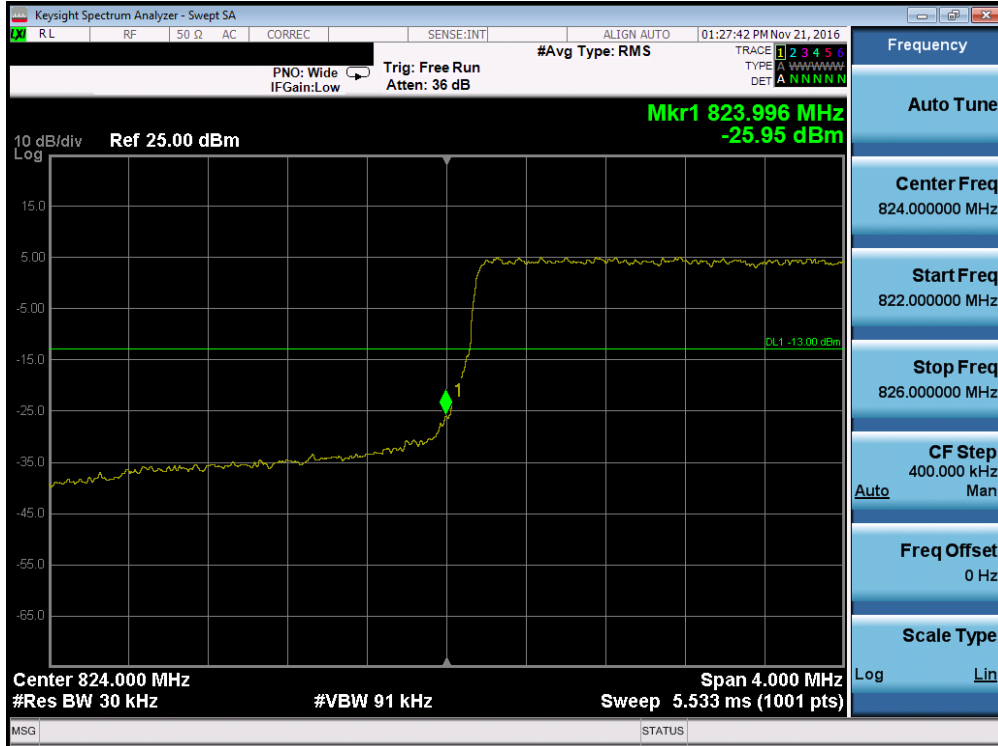


Plot 7-93. Upper Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)



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

FCC ID: ZNFUS215	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 – 3.0MHz QPSK – RB Size 15)

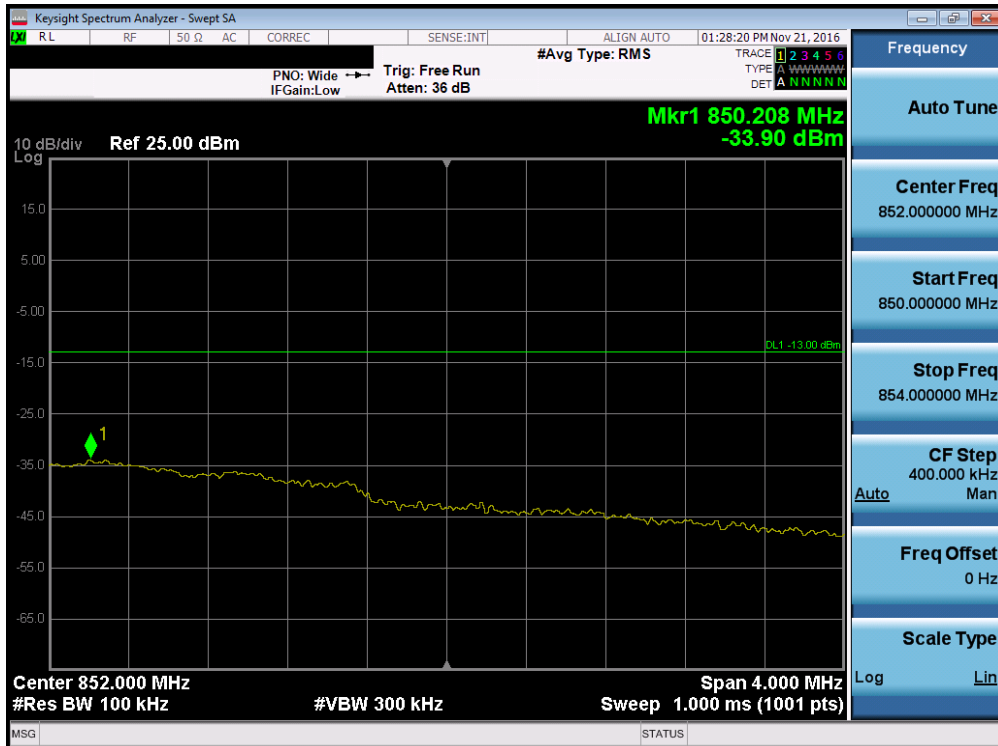


Plot 7-96. Lower Extended Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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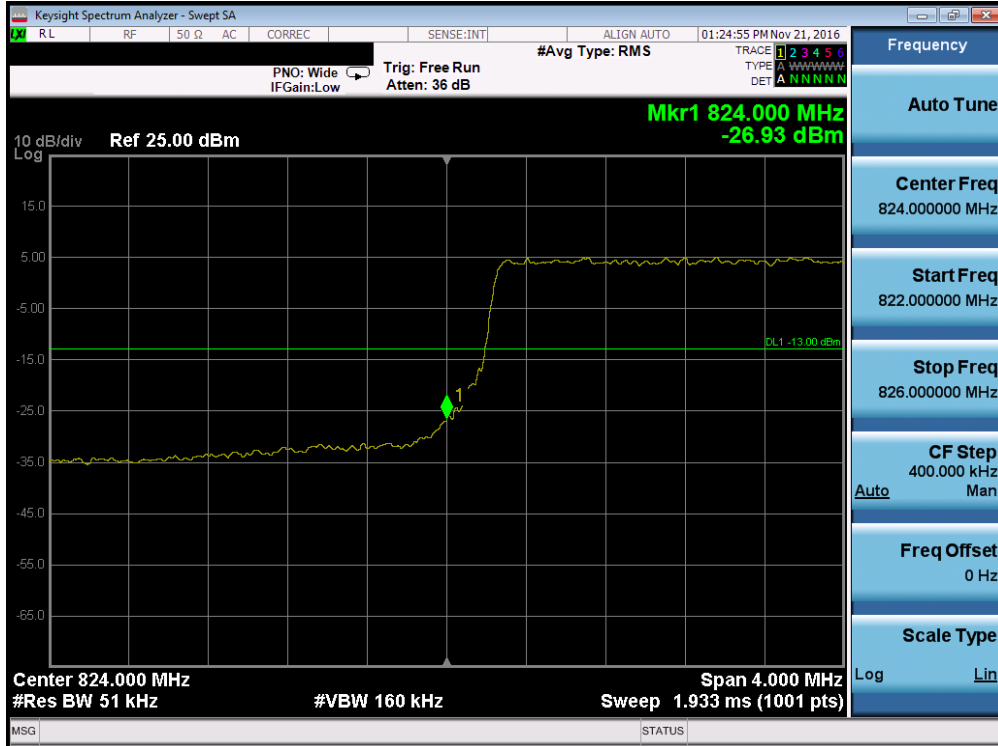


Plot 7-97. Upper Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)



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

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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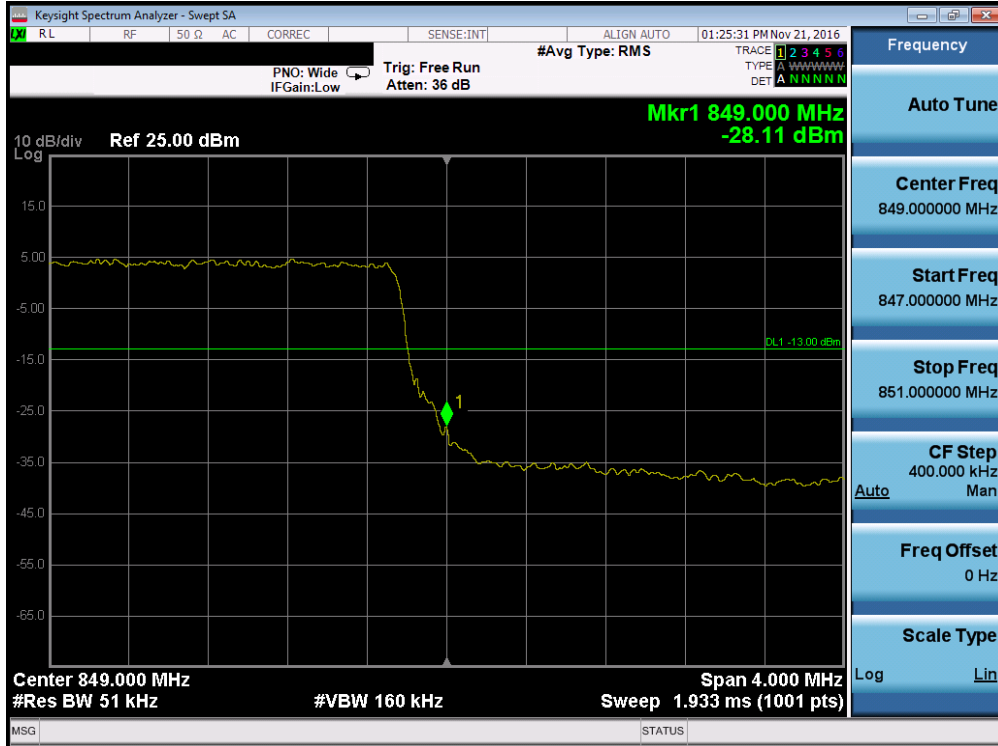


Plot 7-99. Lower Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

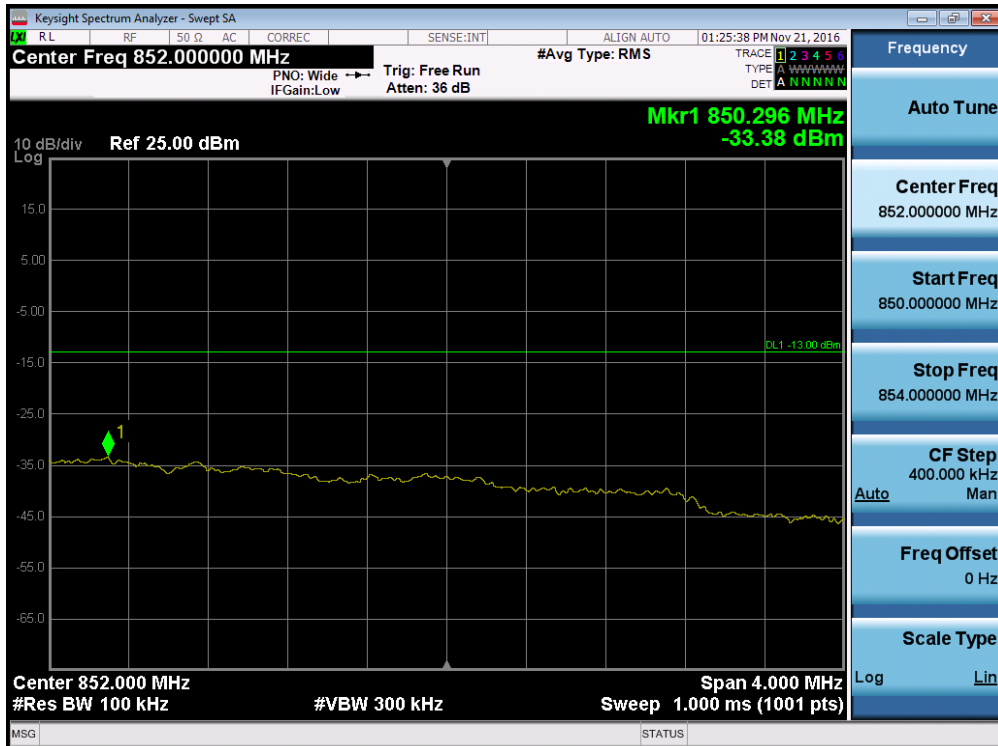


Plot 7-100. Lower Extended Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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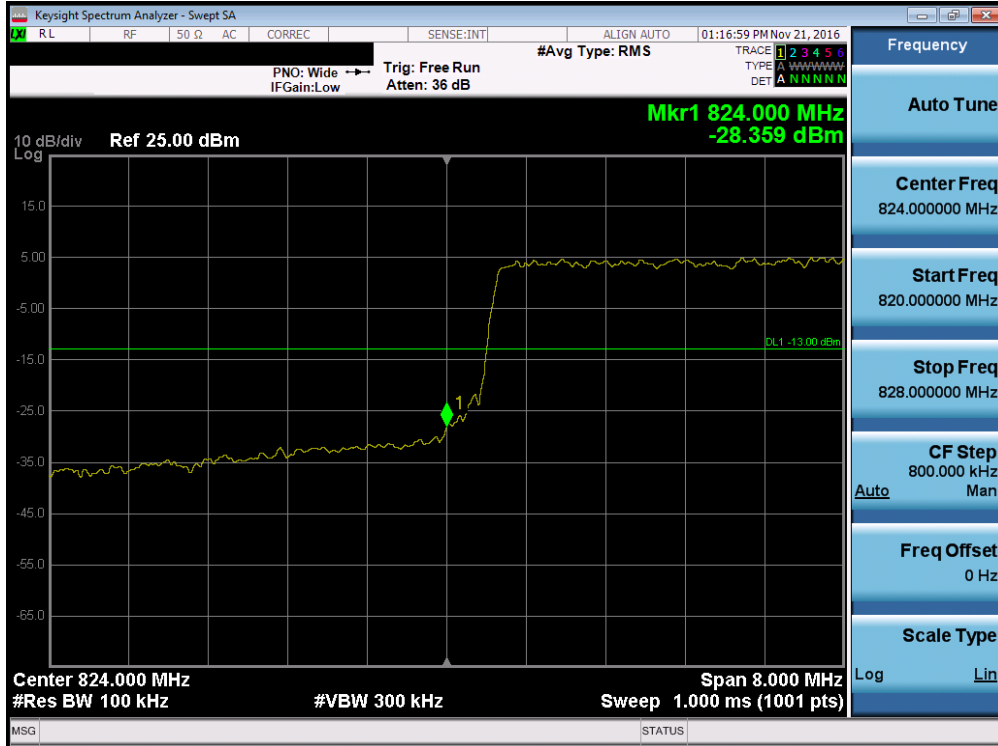


Plot 7-101. Upper Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

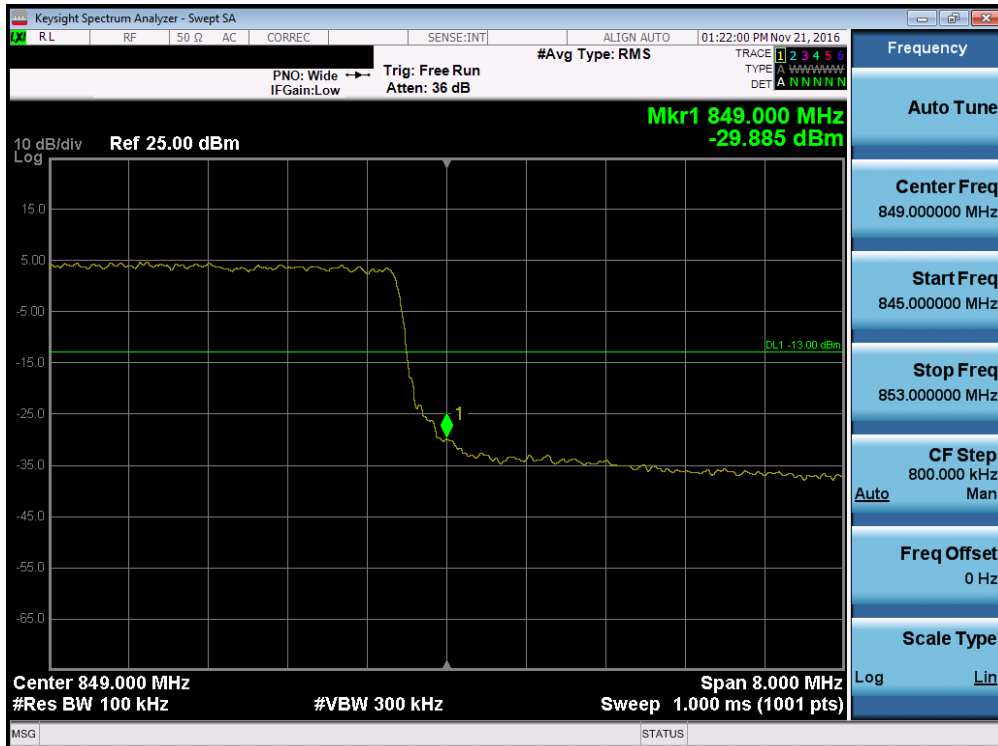


Plot 7-102. Upper Extended Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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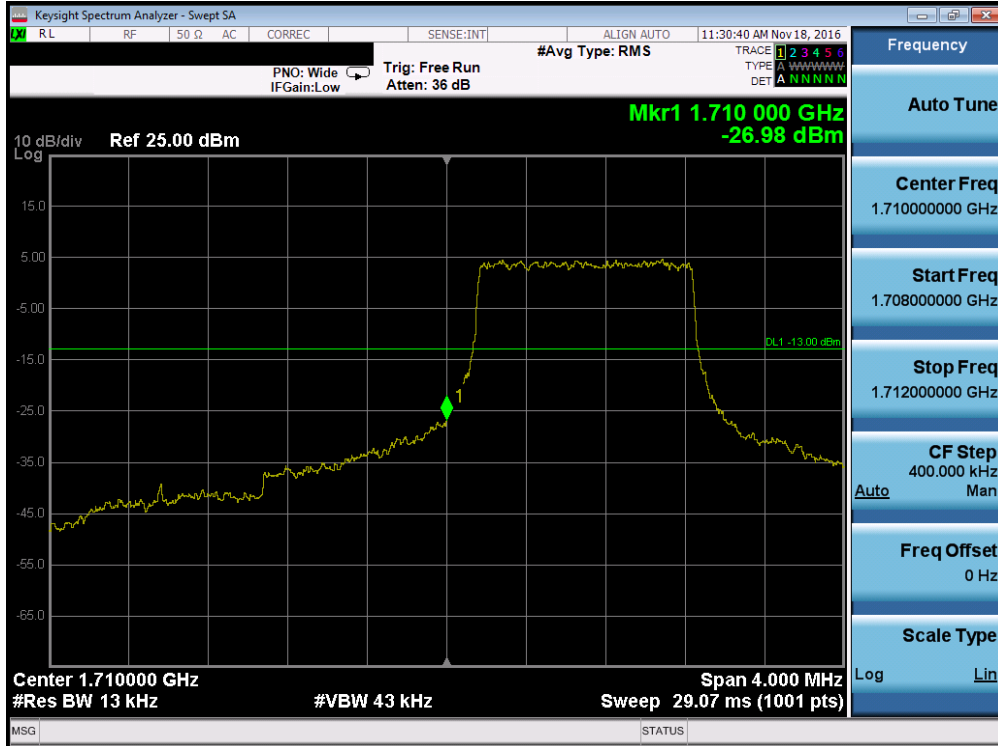


Plot 7-103. Lower Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)

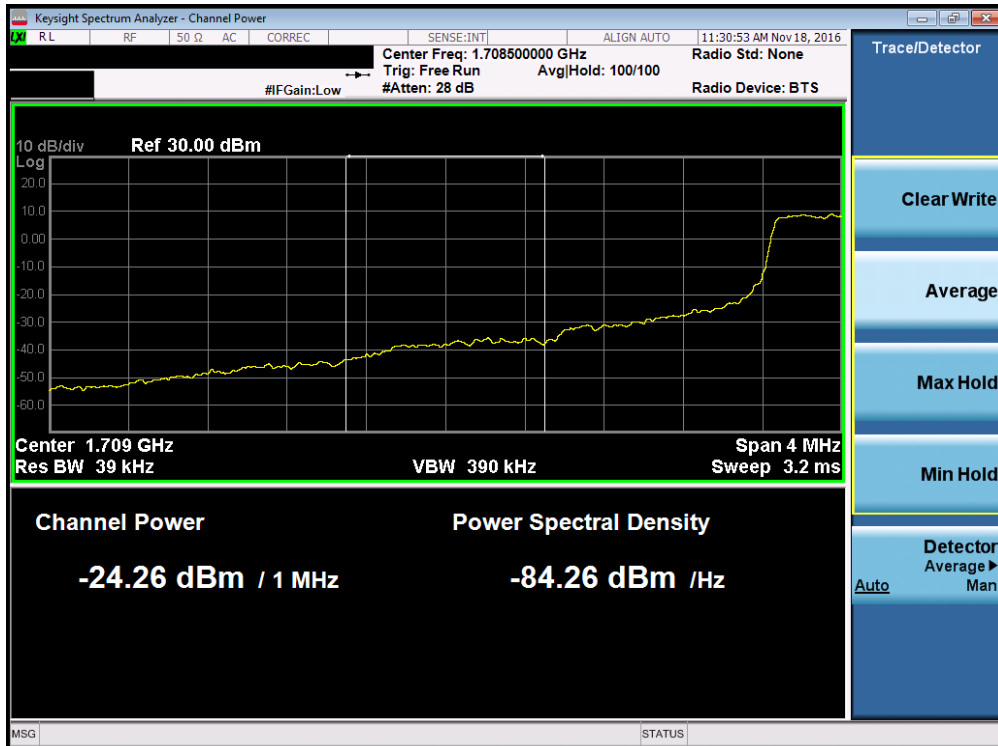


Plot 7-104. Upper Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFUS215	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 – 1.4MHz QPSK – RB Size 6)



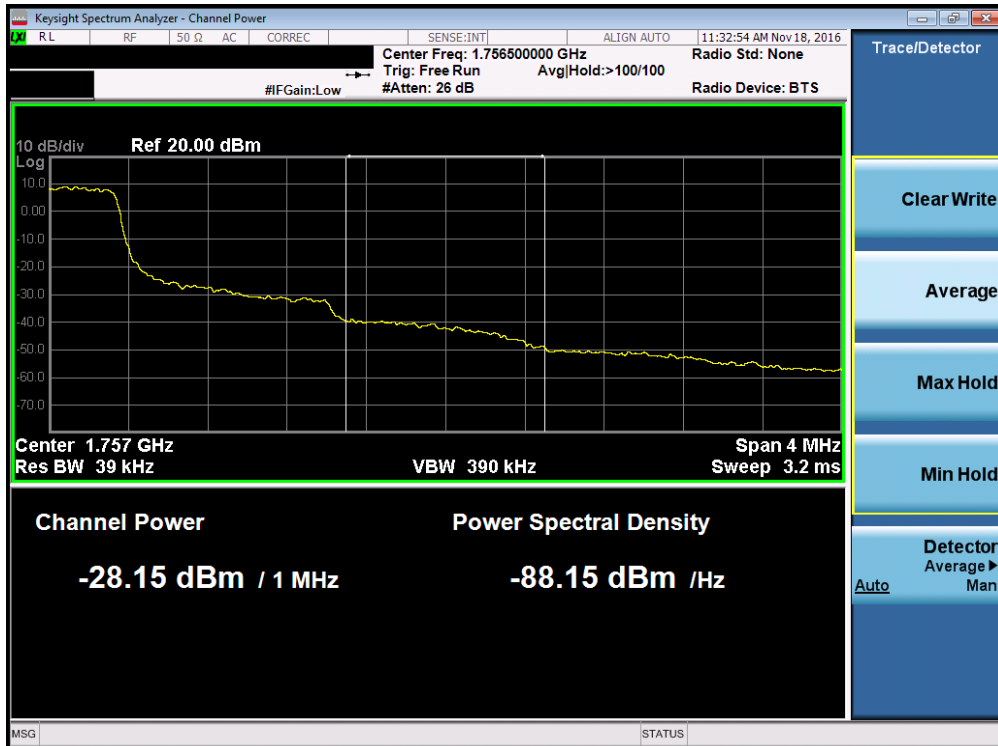
Plot 7-106. Lower Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFUS215		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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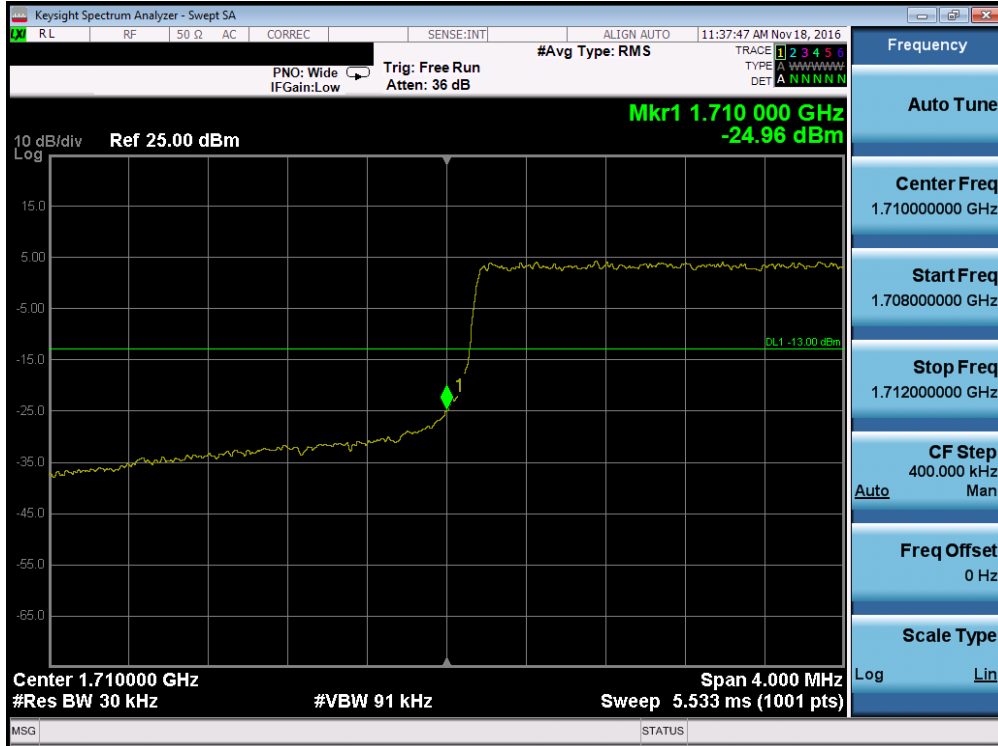


Plot 7-107. Upper Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

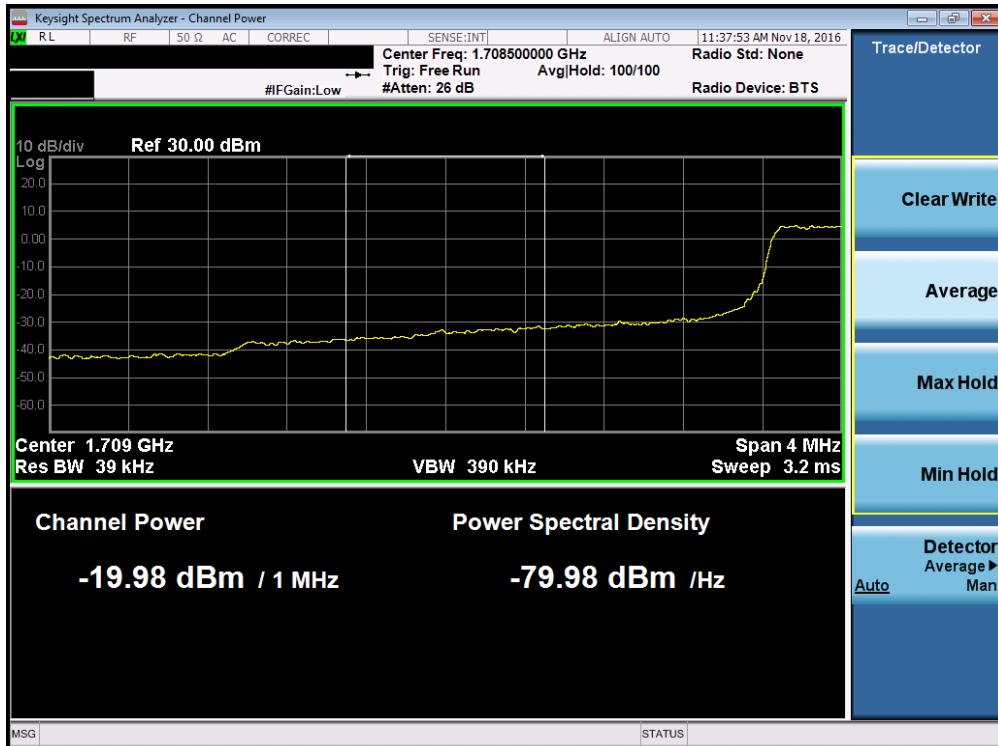


Plot 7-108. Upper Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFUS215		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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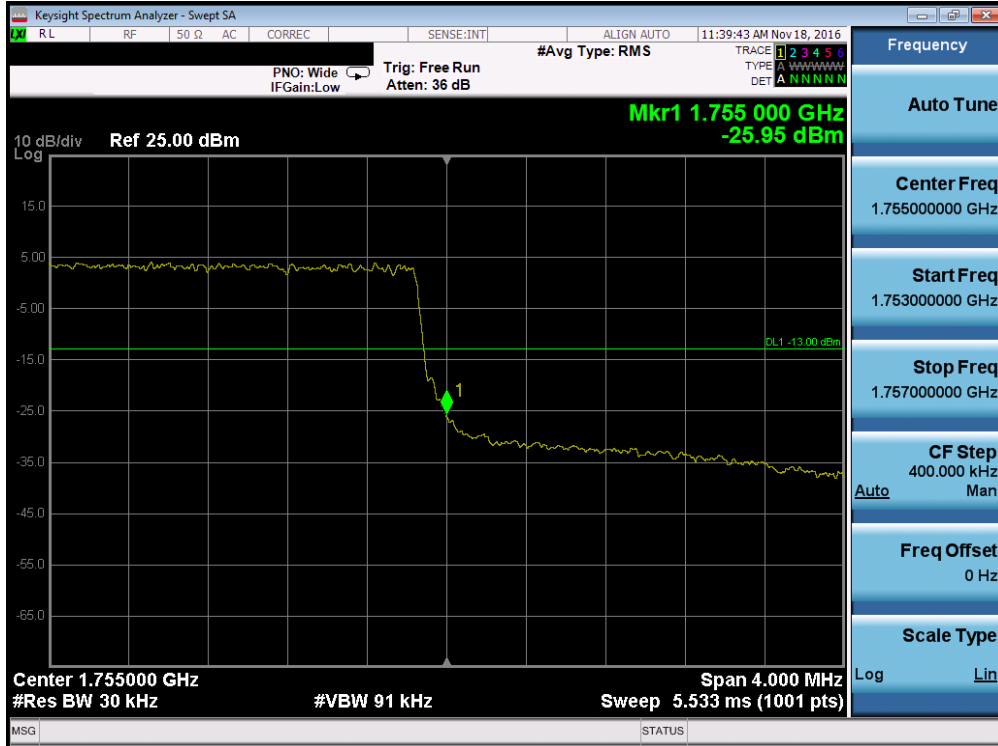


Plot 7-109. Lower Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

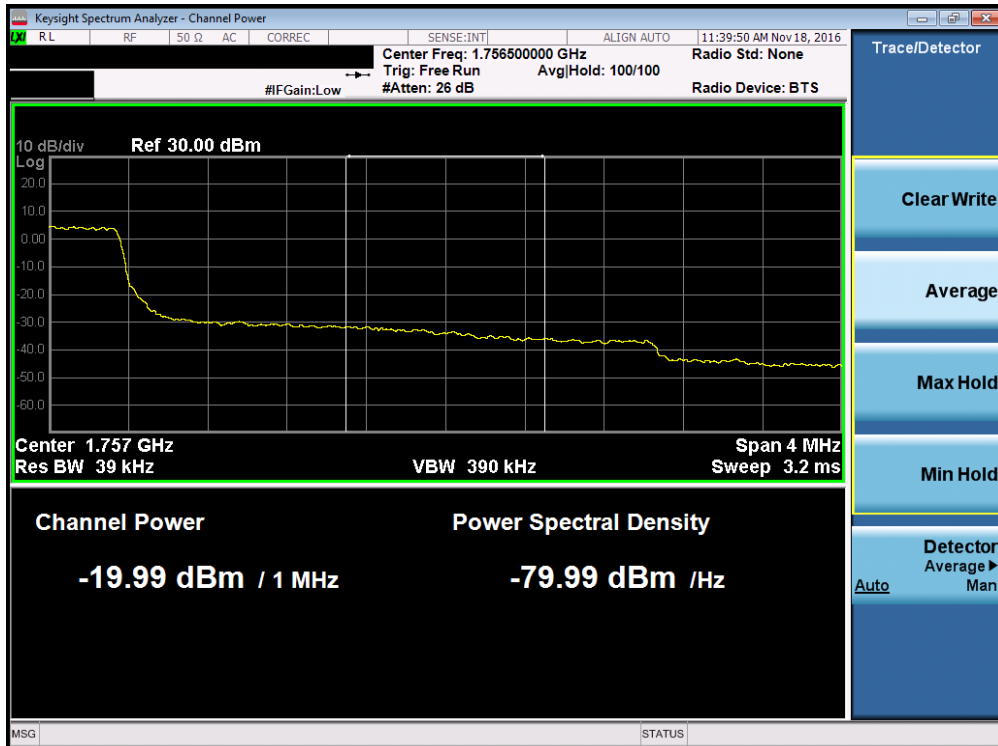


Plot 7-110. Lower Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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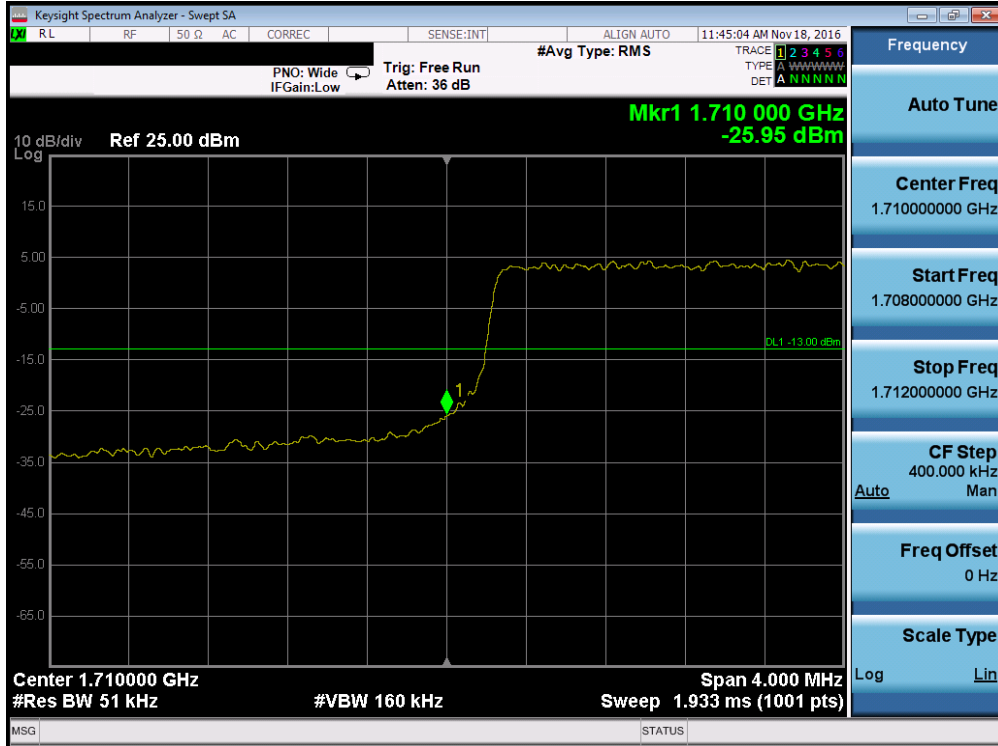


Plot 7-111. Upper Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

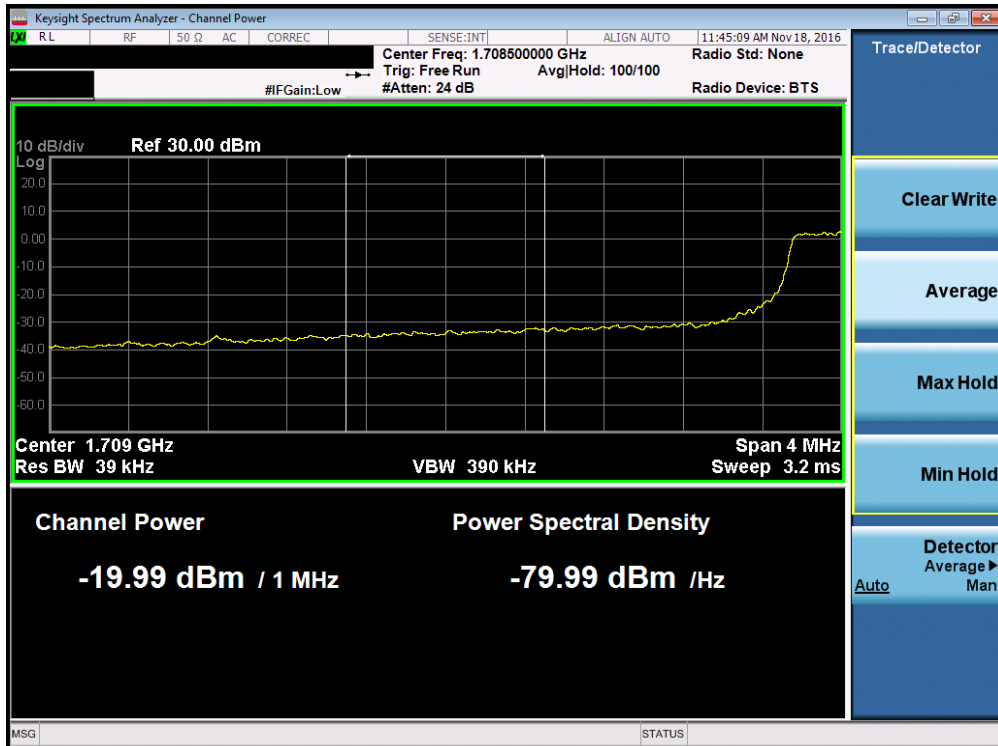


Plot 7-112. Upper Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFUS215		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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Plot 7-113. Lower Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

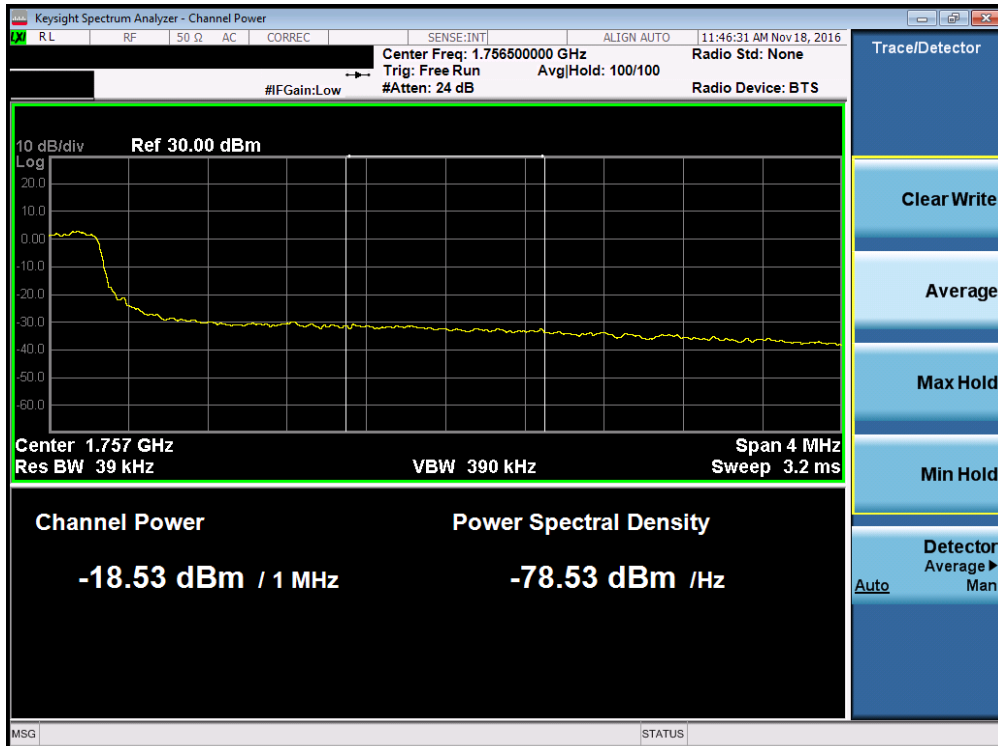


Plot 7-114. Lower Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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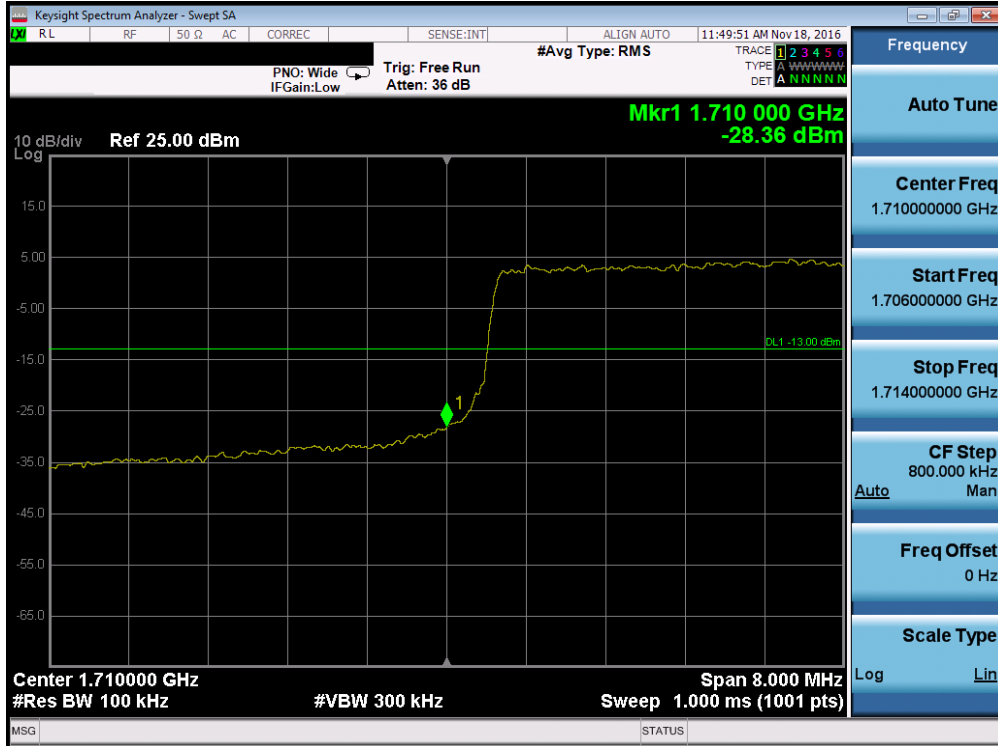


Plot 7-115. Upper Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

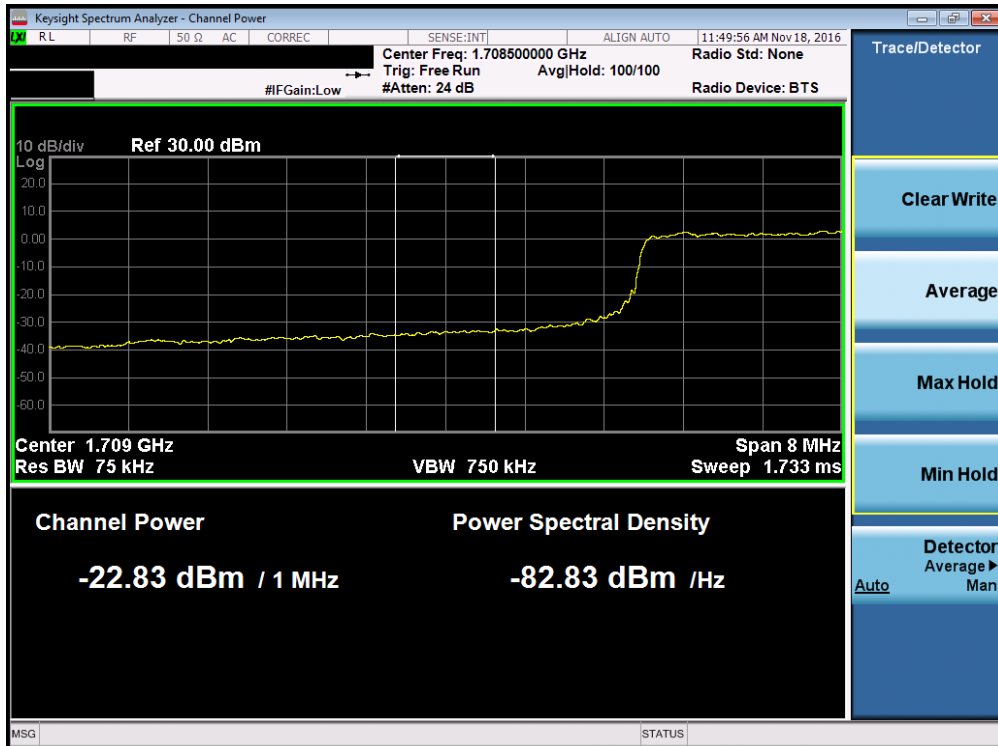


Plot 7-116. Upper Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFUS215		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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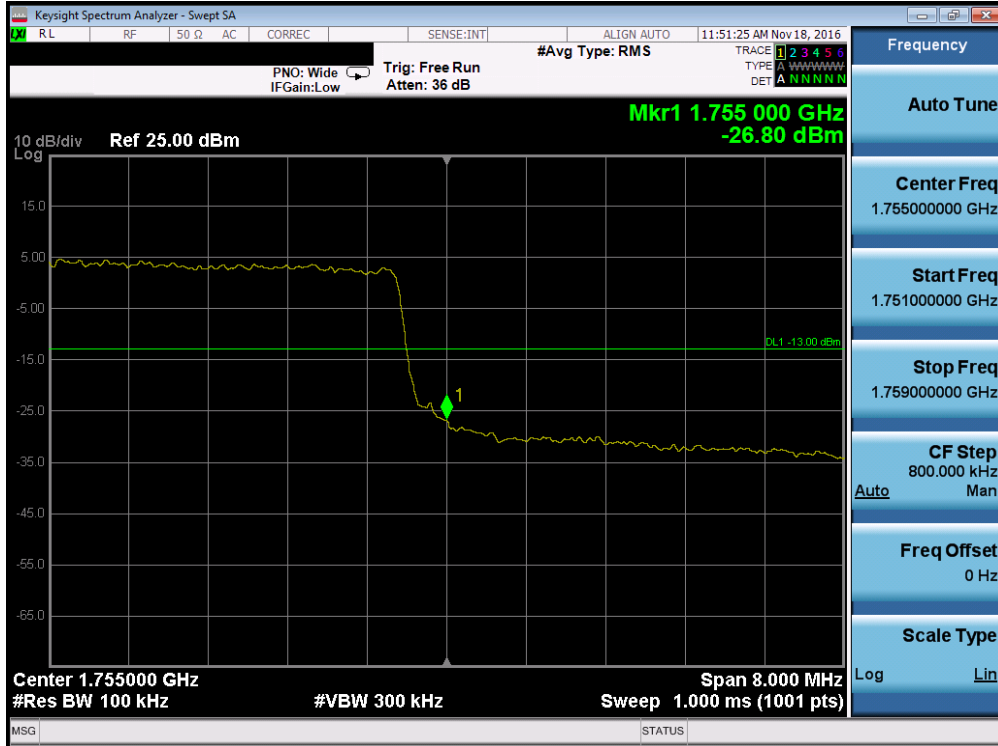


Plot 7-117. Lower Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

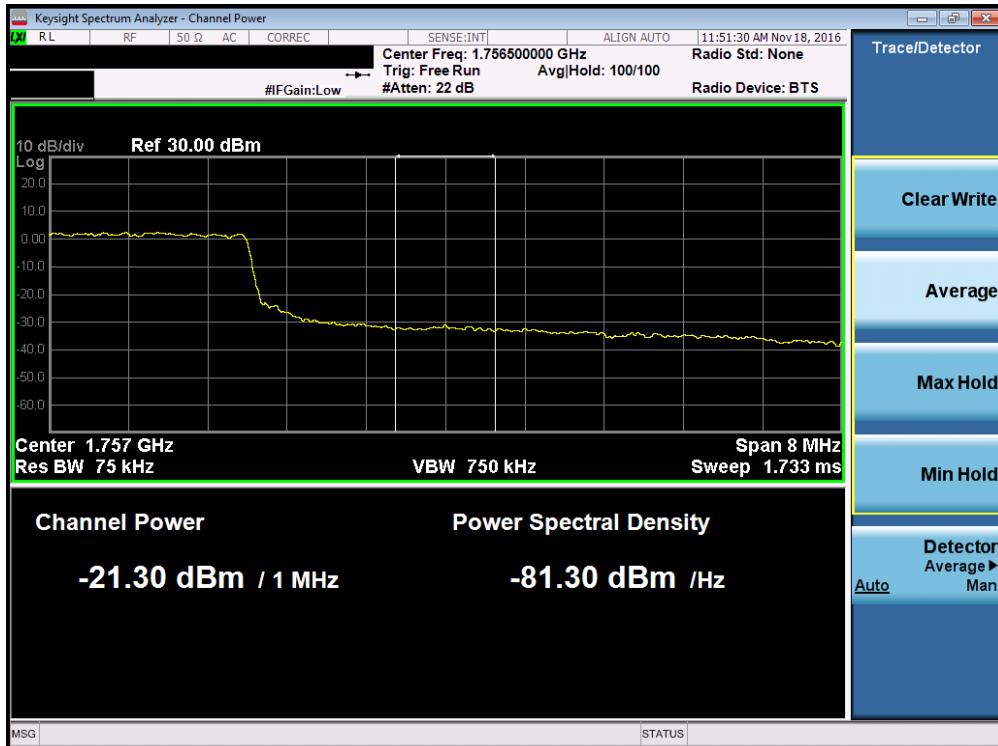


Plot 7-118. Lower Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFUS215		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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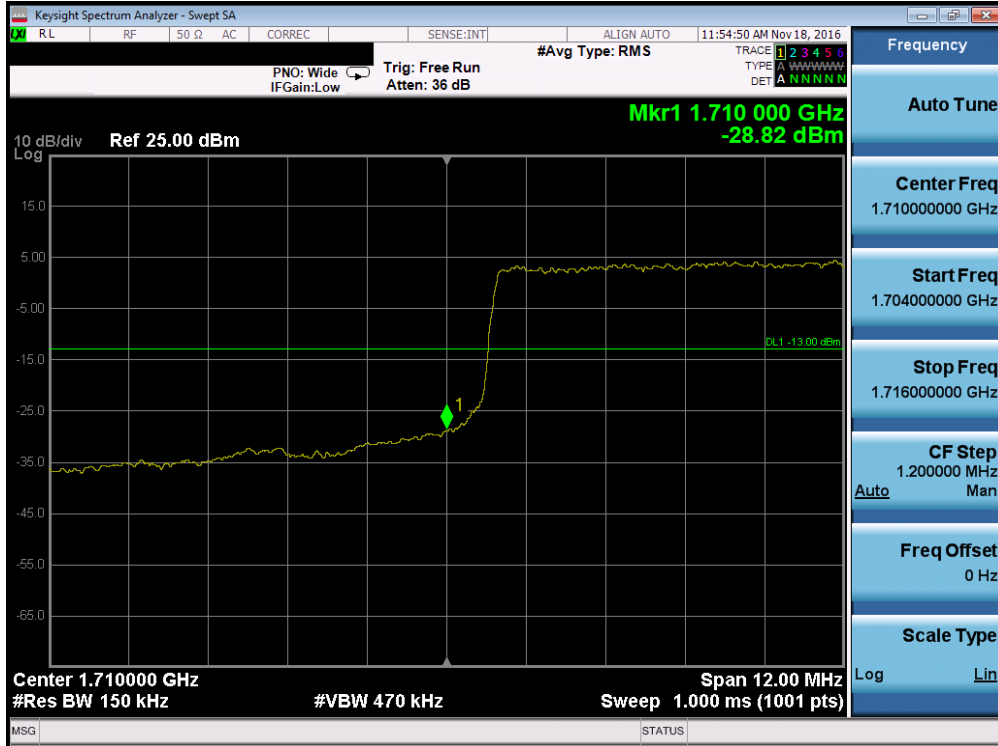


Plot 7-119. Upper Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

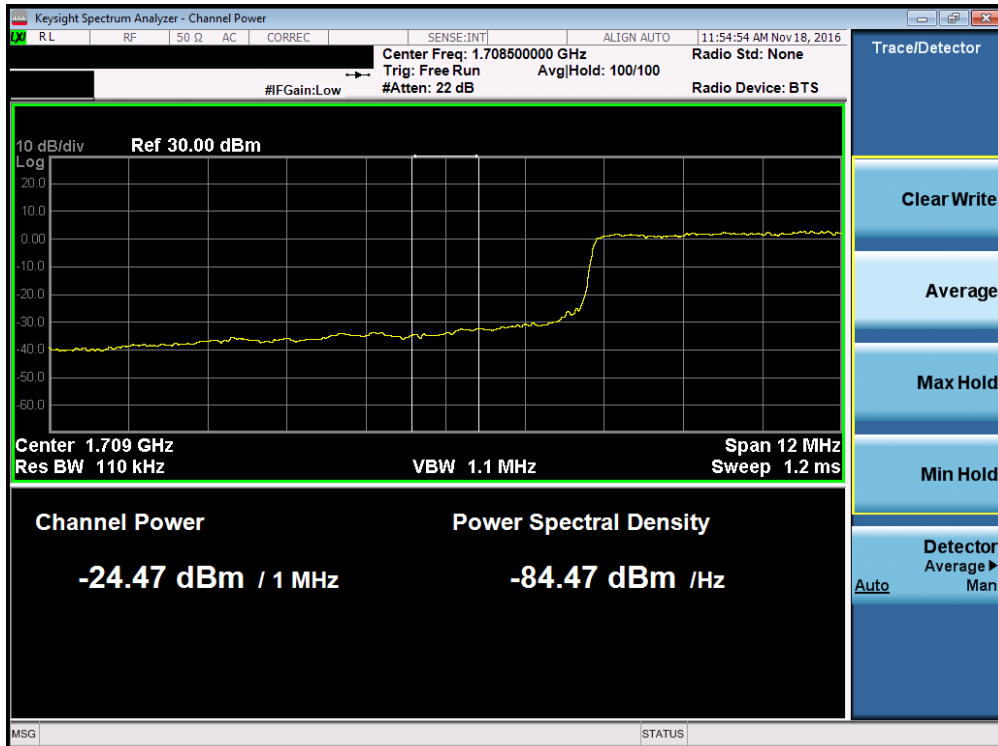


Plot 7-120. Upper Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFUS215		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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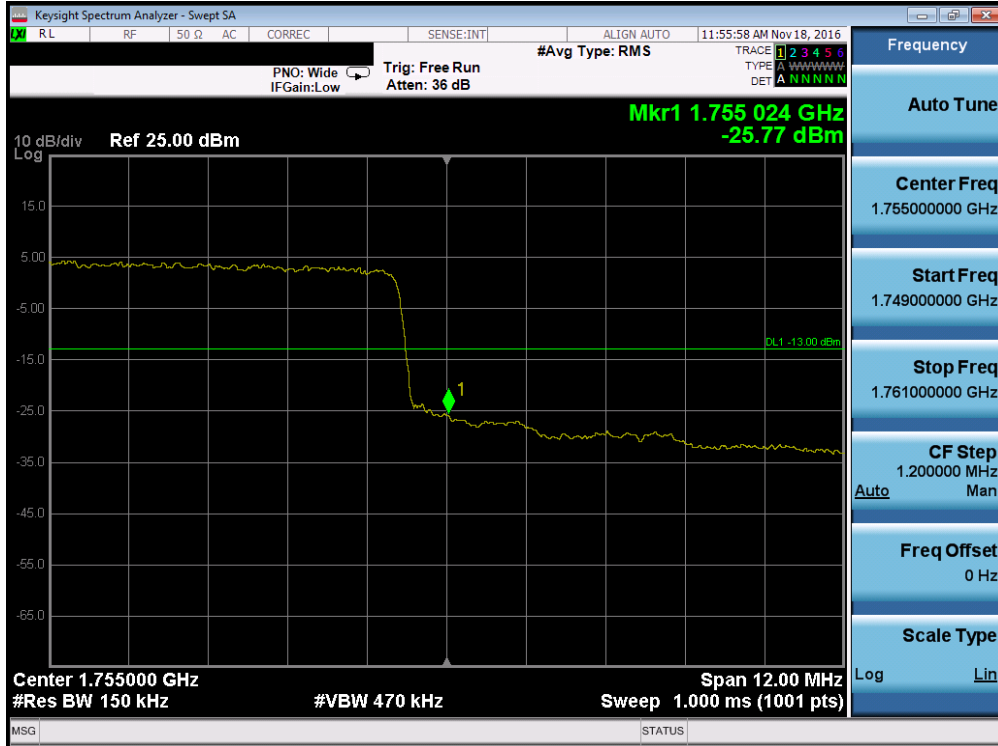
Plot 7-121. Lower Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)



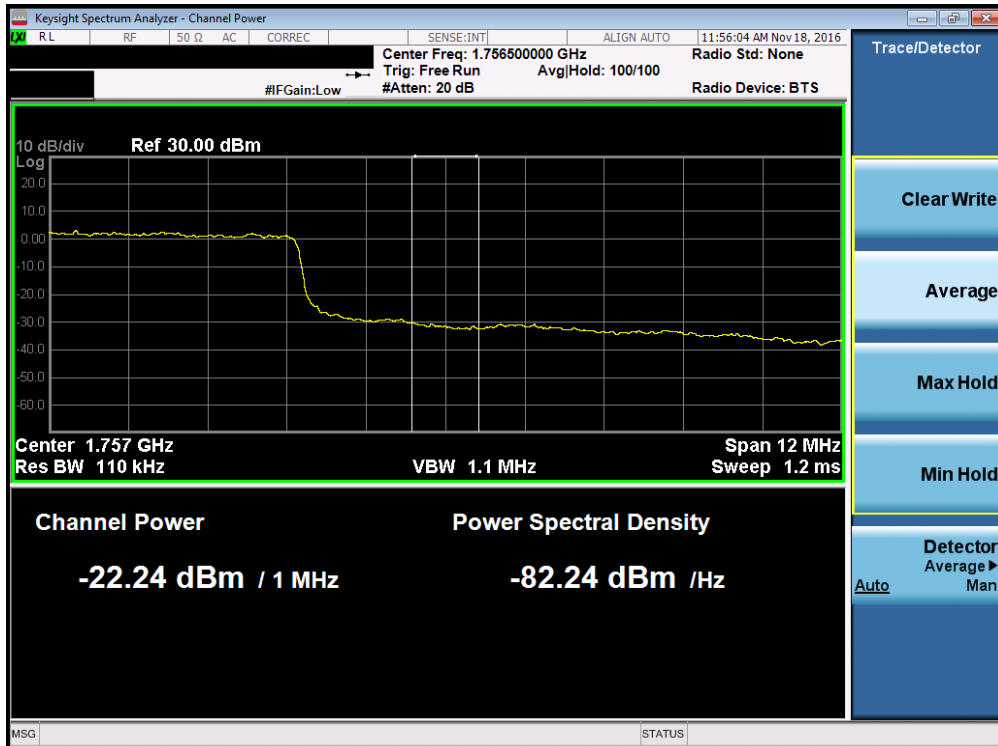
Plot 7-122. Lower Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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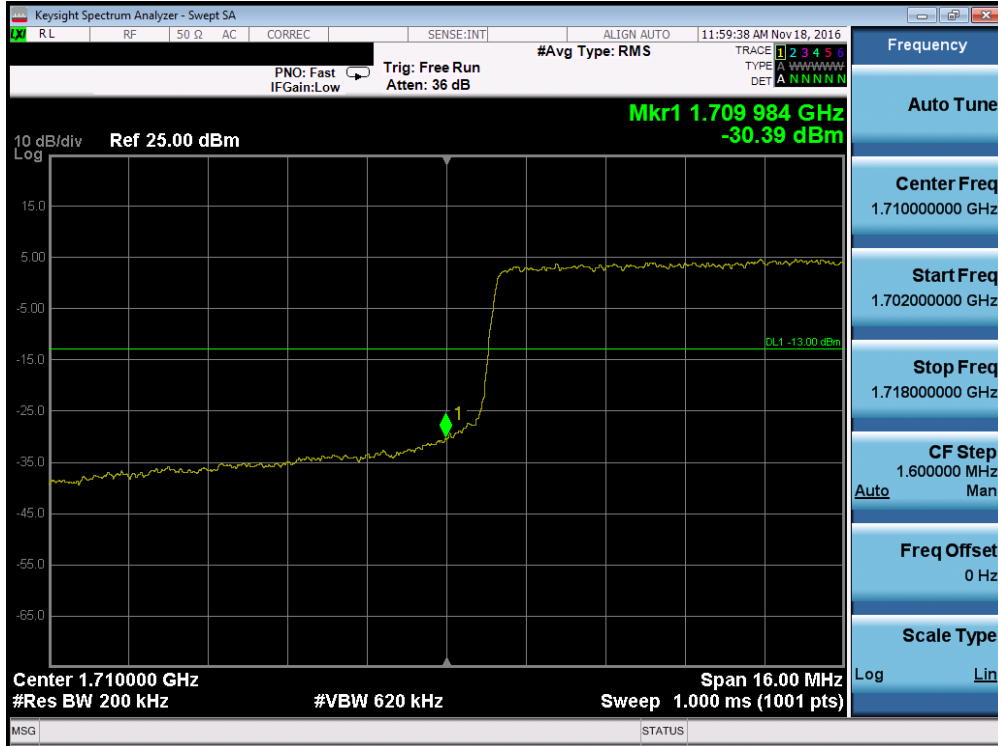


Plot 7-123. Upper Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

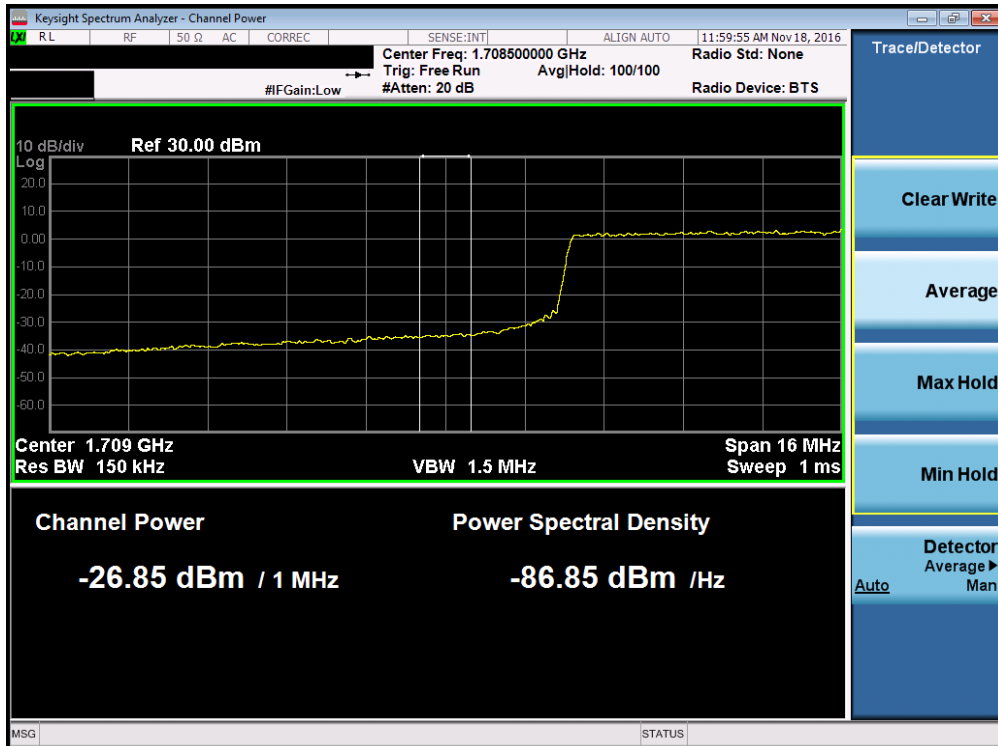


Plot 7-124. Upper Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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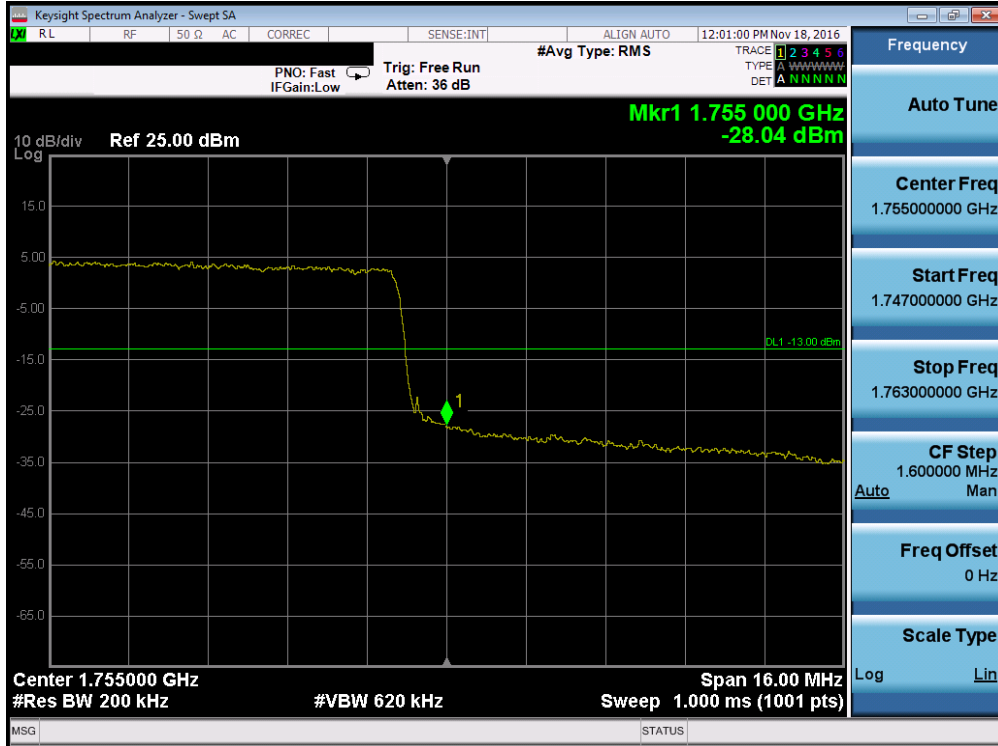


Plot 7-125. Lower Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

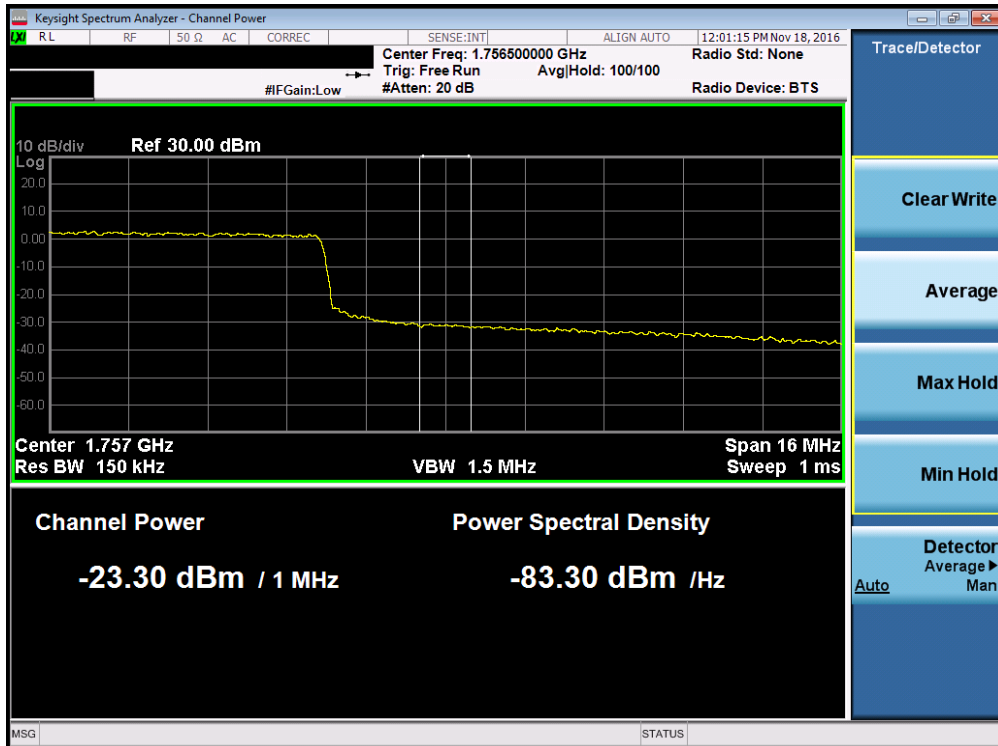


Plot 7-126. Lower Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFUS215		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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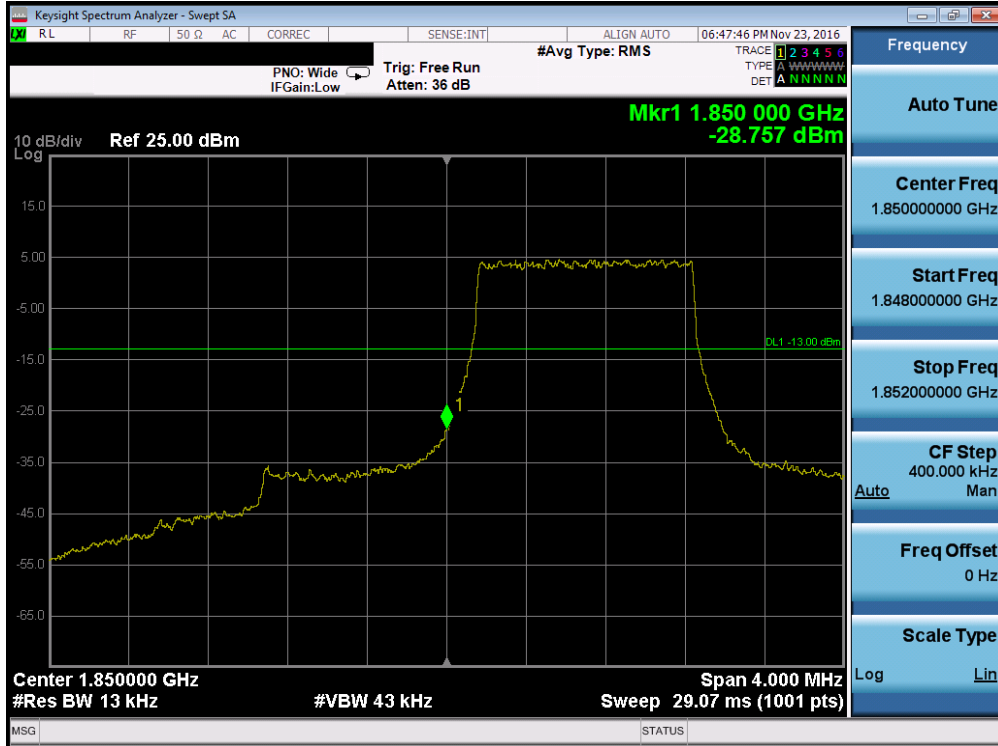


Plot 7-127. Upper Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

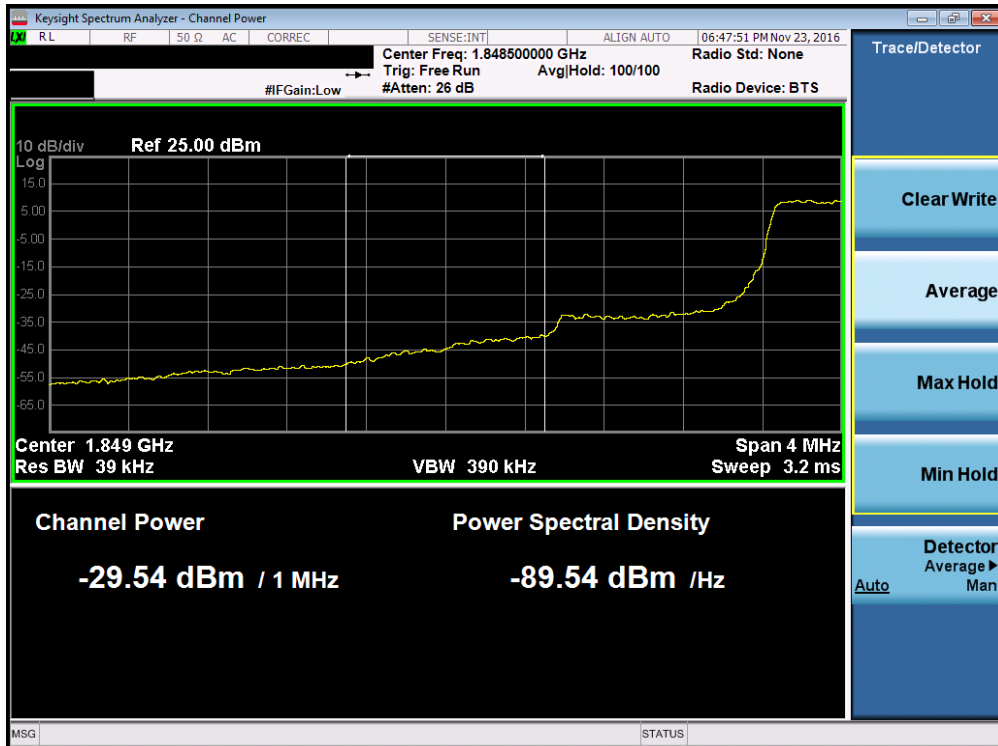


Plot 7-128. Upper Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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Plot 7-129. Lower Band Edge Plot (Band 2/25 – 1.4MHz QPSK – RB Size 6)

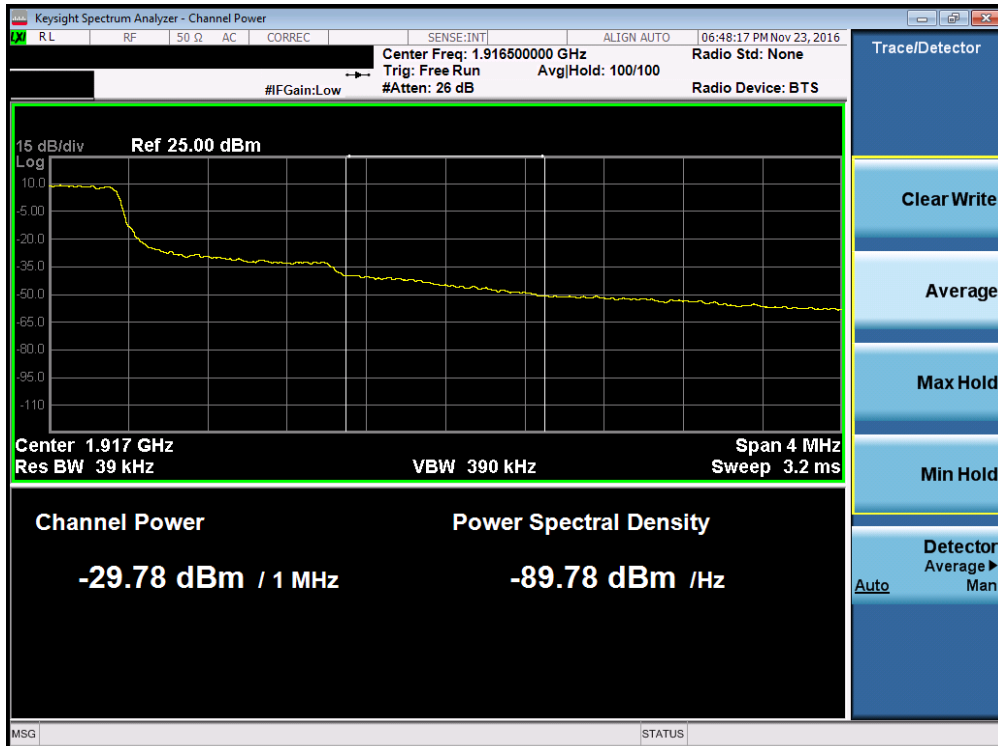


Plot 7-130. Lower Extended Band Edge Plot (Band 2/25 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFUS215		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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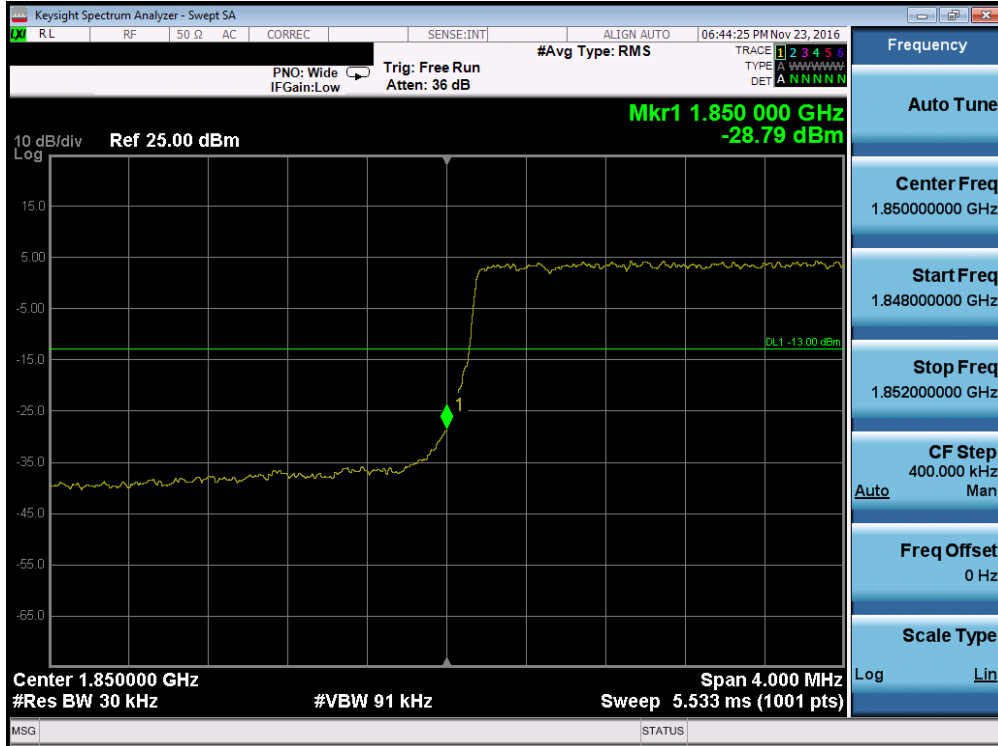


Plot 7-131. Upper Band Edge Plot (Band 2/25 – 1.4MHz QPSK – RB Size 6)

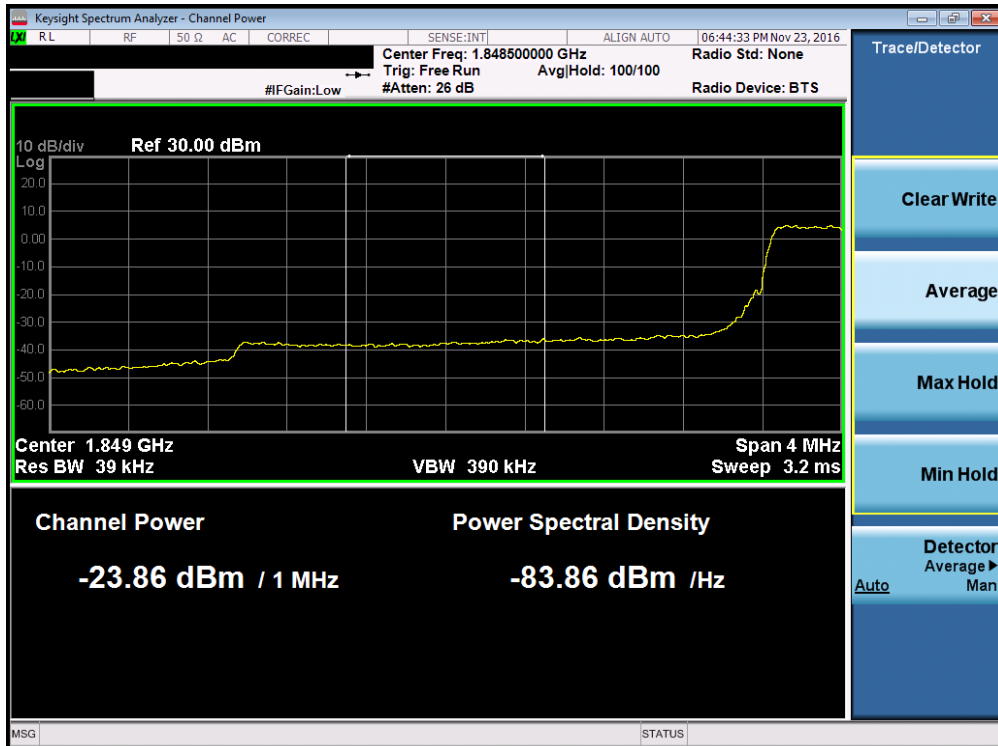


Plot 7-132. Upper Extended Band Edge Plot (Band 2/25 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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Plot 7-133. Lower Band Edge Plot (Band 2/25 – 3.0MHz QPSK – RB Size 15)

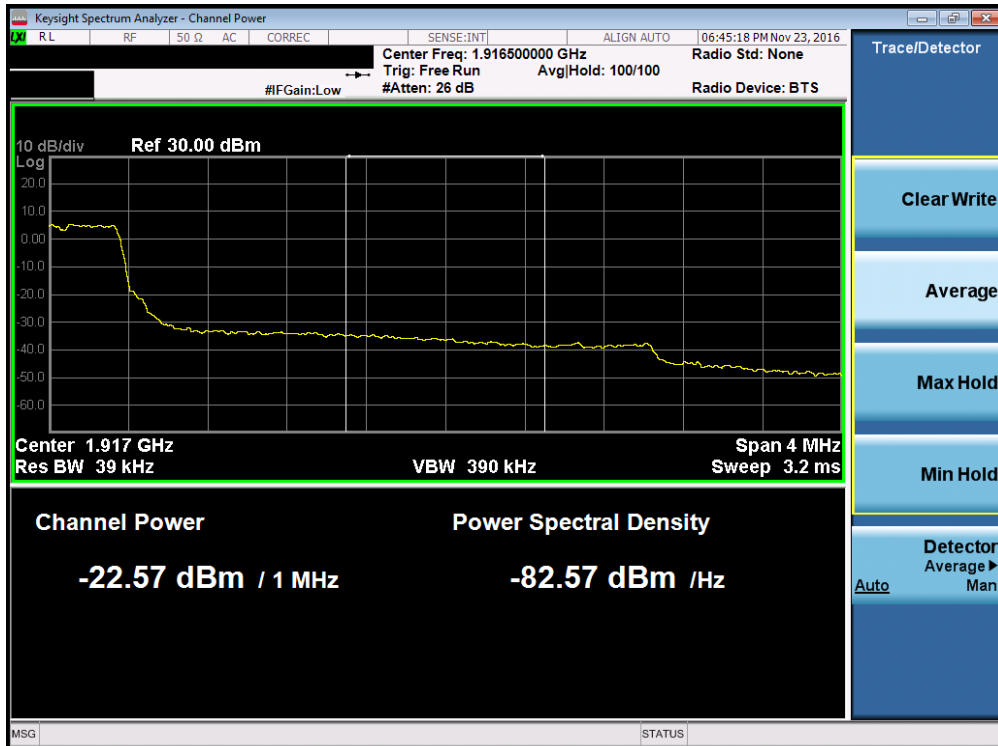


Plot 7-134. Lower Extended Band Edge Plot (Band 2/25 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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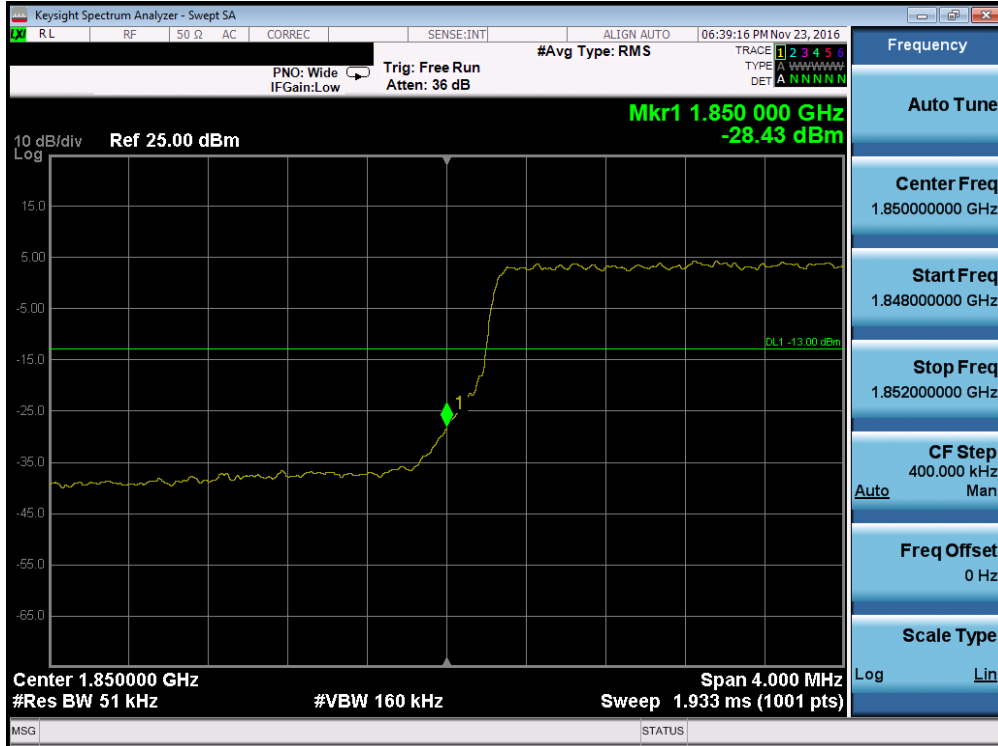


Plot 7-135. Upper Band Edge Plot (Band 2/25 – 3.0MHz QPSK – RB Size 15)

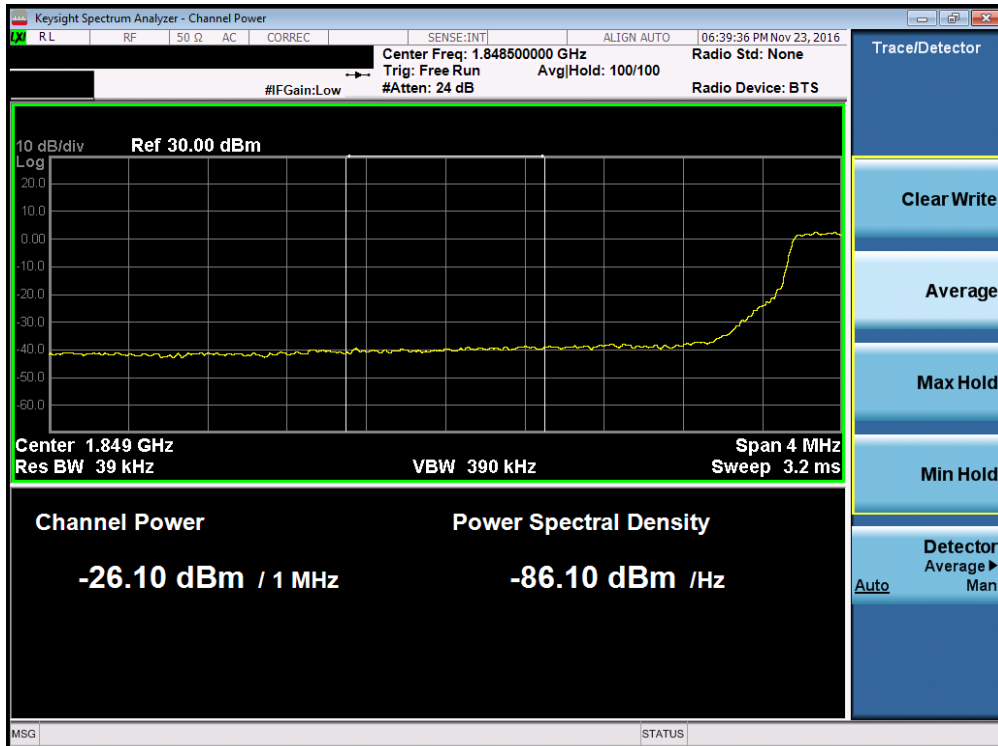


Plot 7-136. Upper Extended Band Edge Plot (Band 2/25 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1611151774.ZNF	Test Dates: 11/15 - 11/28/2016	EUT Type: Portable Handset		Page 84 of 123



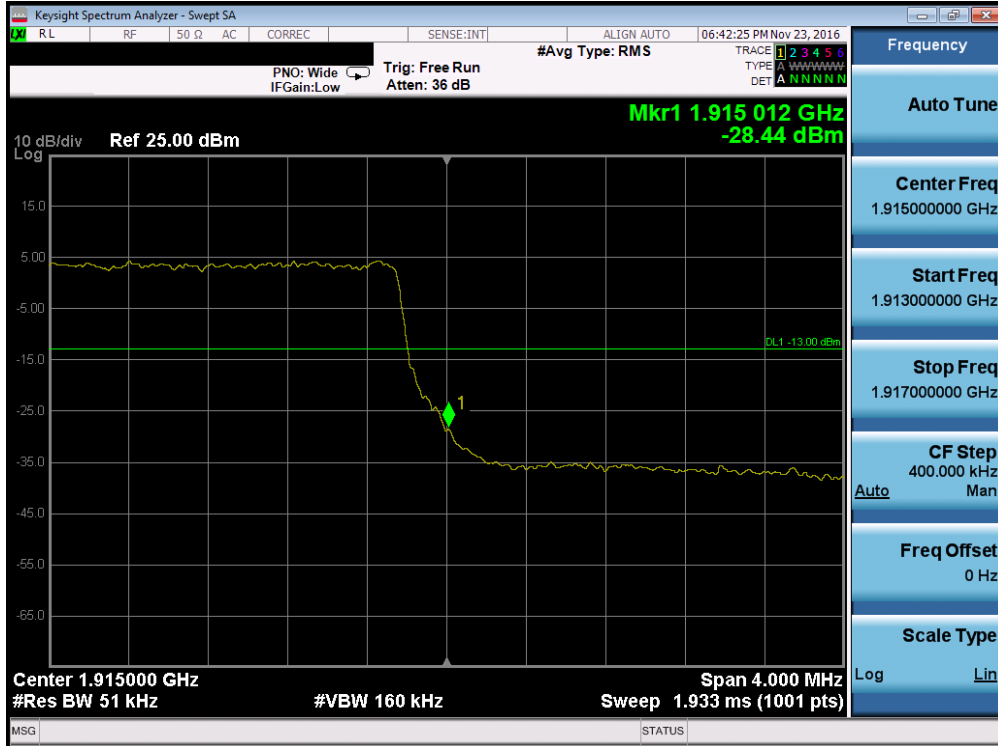
Plot 7-137. Lower Band Edge Plot (Band 2/25 – 5.0MHz QPSK – RB Size 25)



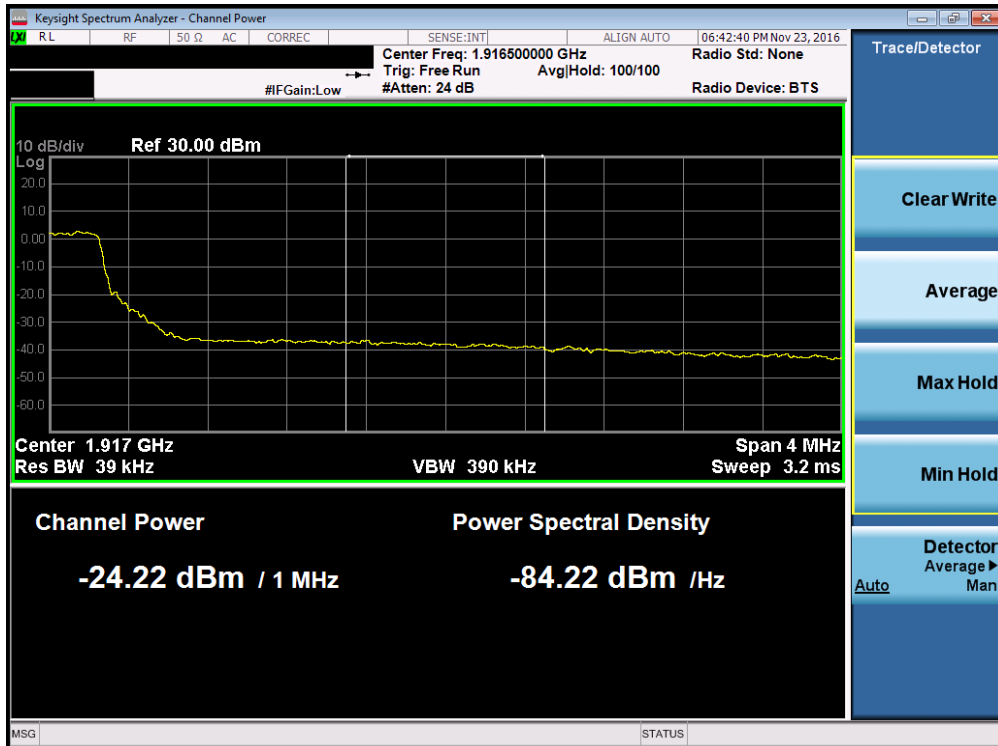
Plot 7-138. Lower Extended Band Edge Plot (Band 2/25 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1611151774.ZNF	Test Dates: 11/15 - 11/28/2016	EUT Type: Portable Handset		Page 85 of 123



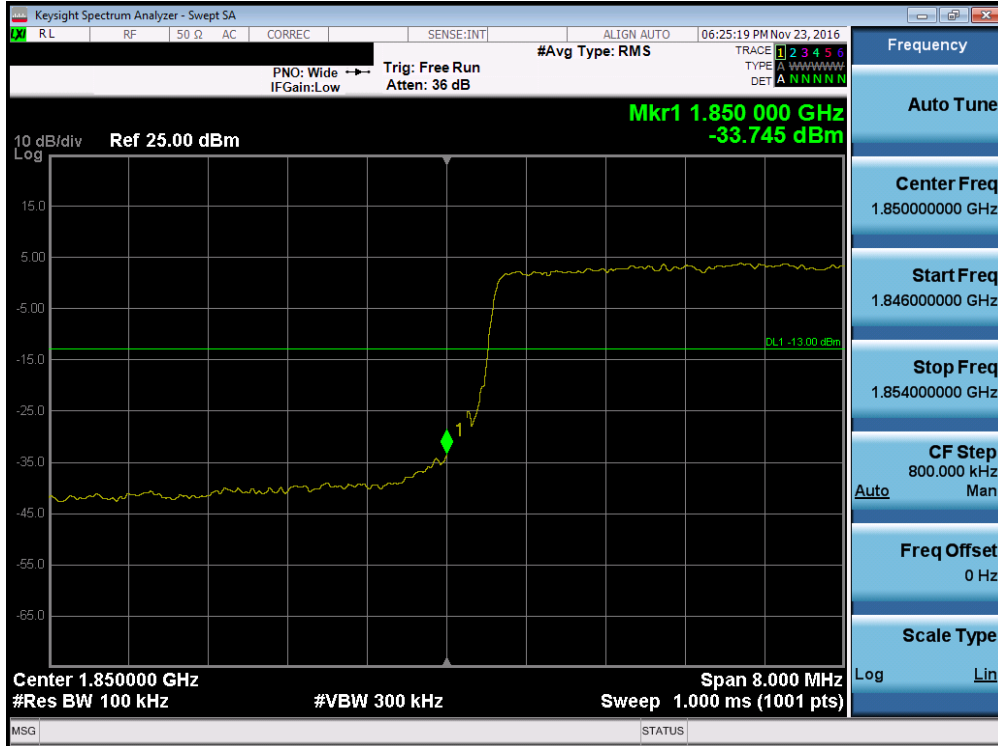


Plot 7-139. Upper Band Edge Plot (Band 2/25 – 5.0MHz QPSK – RB Size 25)

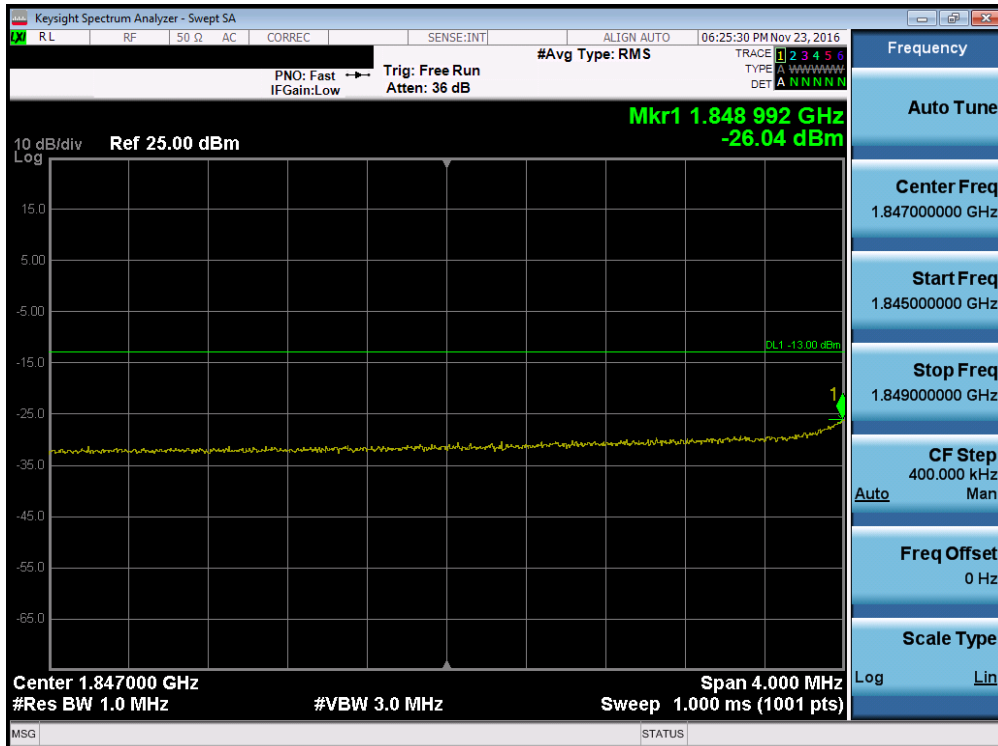


Plot 7-140. Upper Extended Band Edge Plot (Band 2/25 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1611151774.ZNF	Test Dates: 11/15 - 11/28/2016	EUT Type: Portable Handset		Page 86 of 123

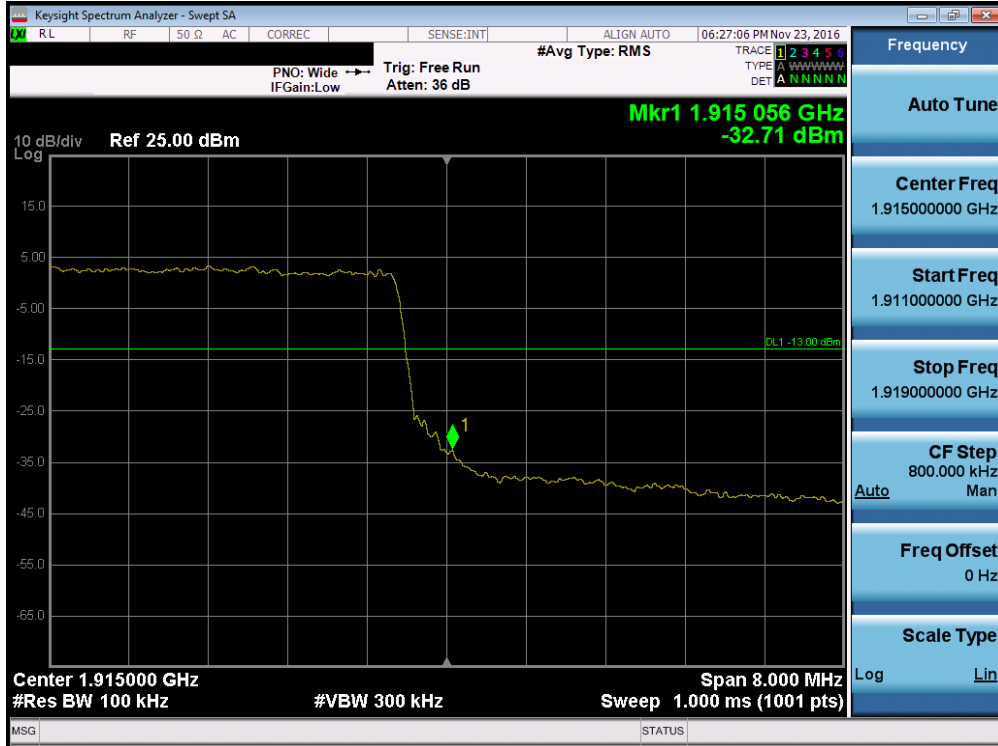


Plot 7-141. Lower Band Edge Plot (Band 2/25 – 10.0MHz QPSK – RB Size 50)

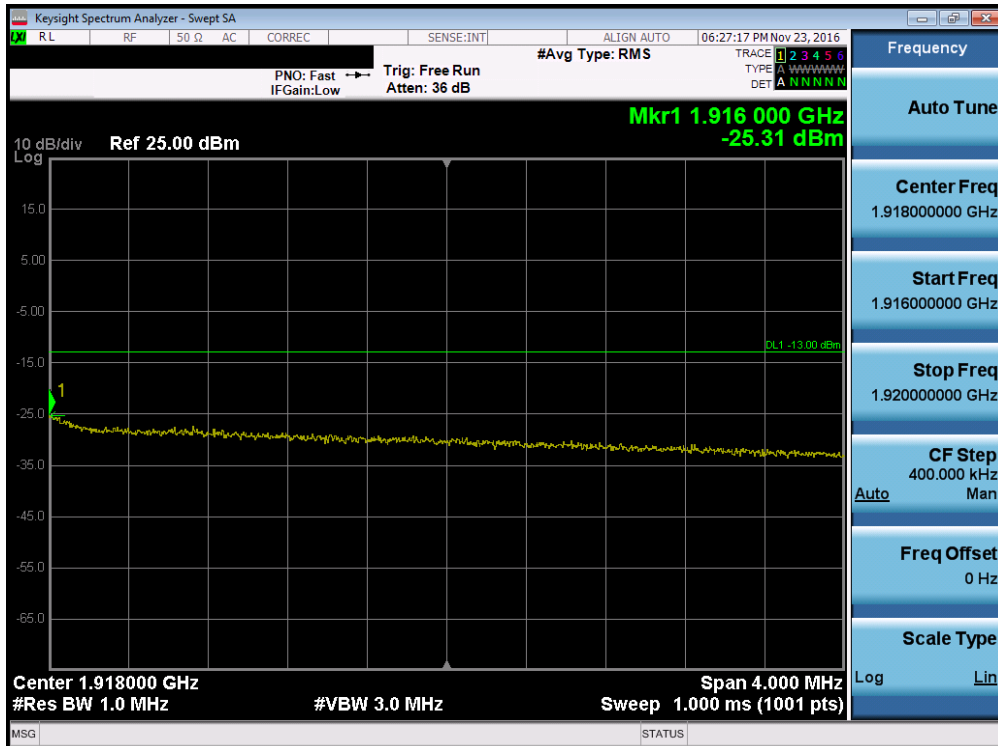


Plot 7-142. Lower Extended Band Edge Plot (Band 2/25 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1611151774.ZNF	Test Dates: 11/15 - 11/28/2016	EUT Type: Portable Handset		Page 87 of 123

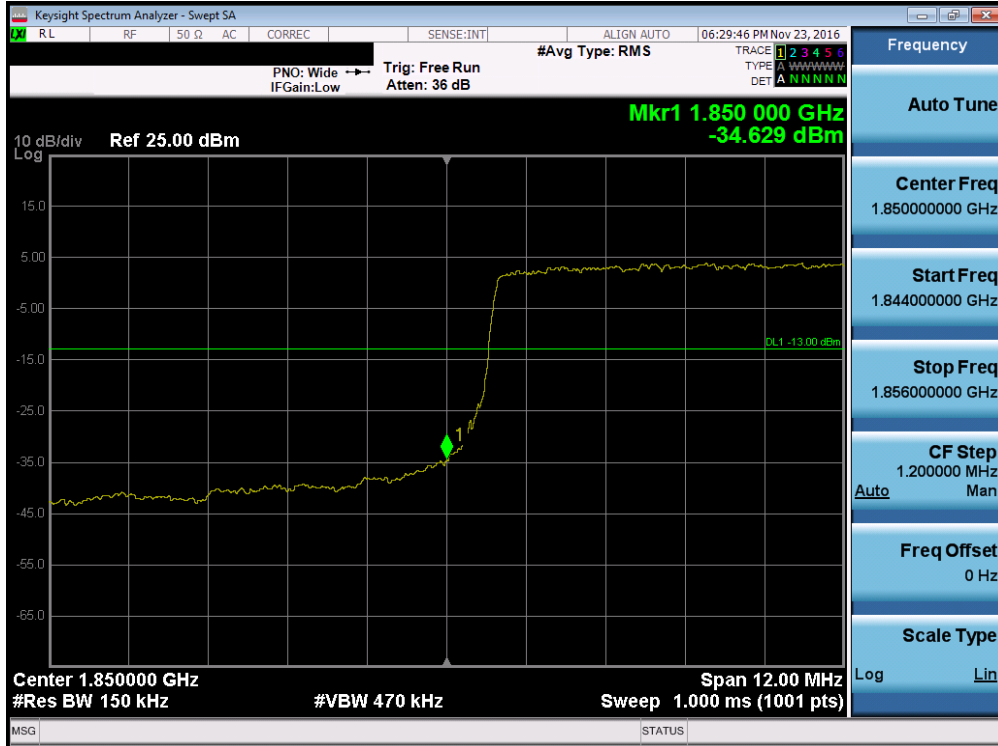


Plot 7-143. Upper Band Edge Plot (Band 2/25 – 10.0MHz QPSK – RB Size 50)

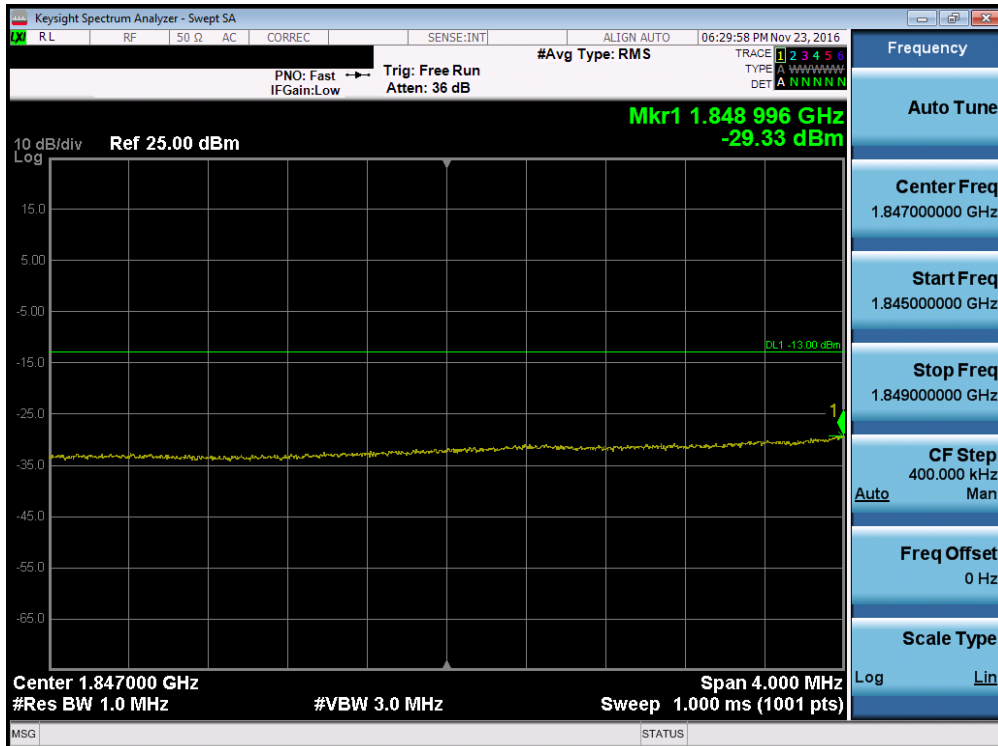


Plot 7-144. Upper Extended Band Edge Plot (Band 2/25 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1611151774.ZNF	Test Dates: 11/15 - 11/28/2016	EUT Type: Portable Handset		Page 88 of 123

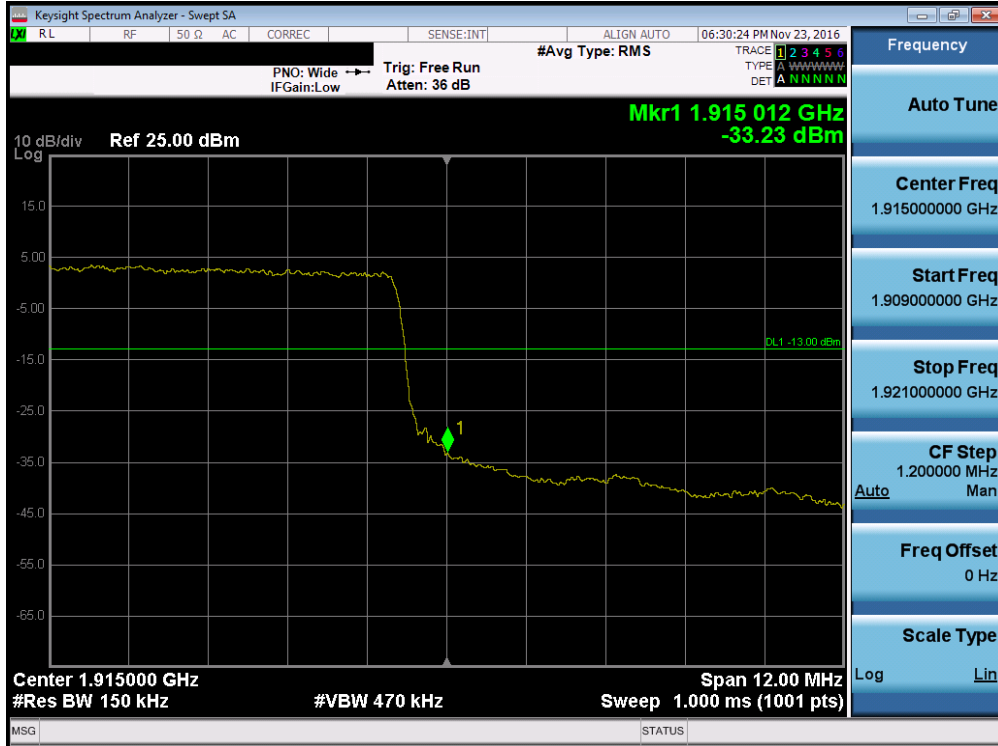


Plot 7-145. Lower Band Edge Plot (Band 2/25 – 15.0MHz QPSK – RB Size 75)

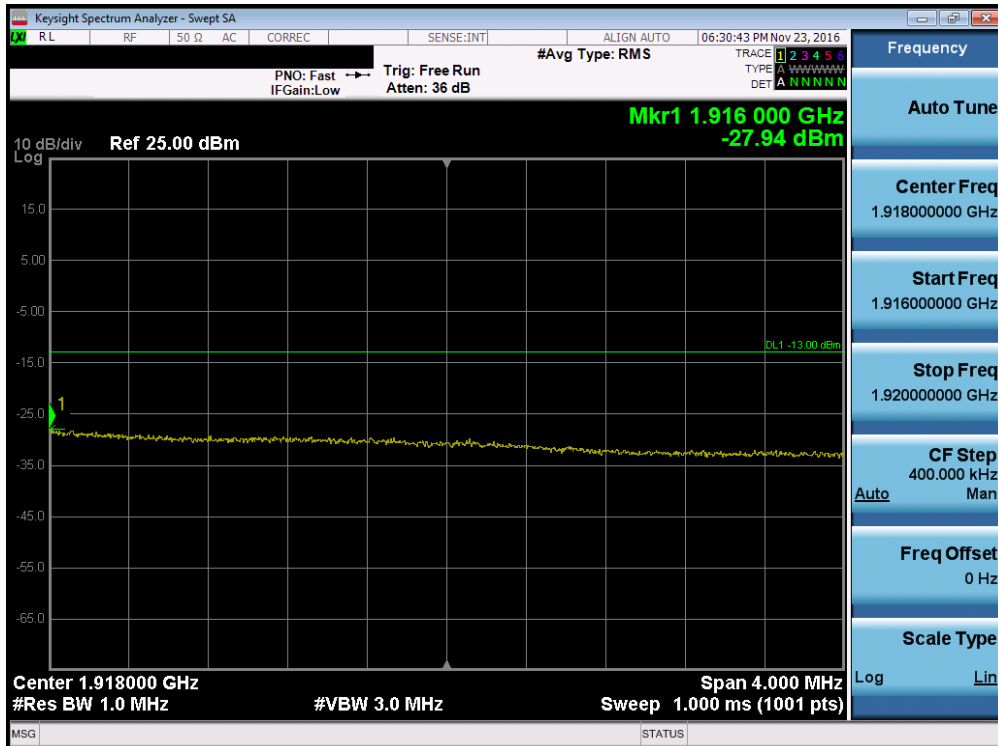


Plot 7-146. Lower Extended Band Edge Plot (Band 2/25 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1611151774.ZNF	Test Dates: 11/15 - 11/28/2016	EUT Type: Portable Handset	Page 89 of 123	

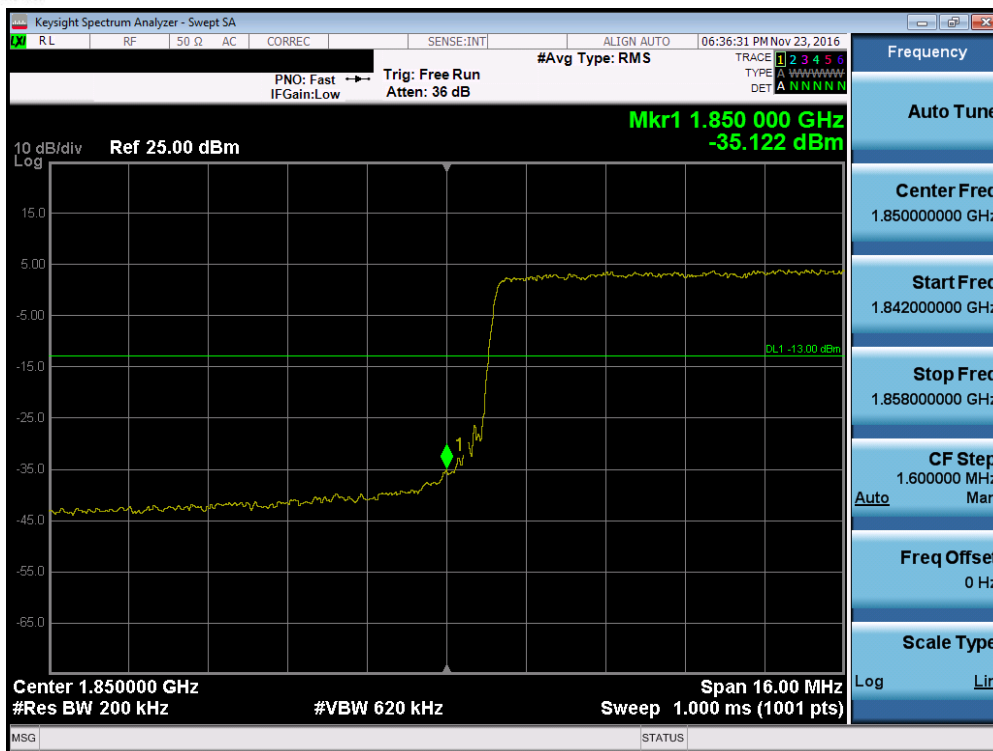


Plot 7-147. Upper Band Edge Plot (Band 2/25 – 15.0MHz QPSK – RB Size 75)

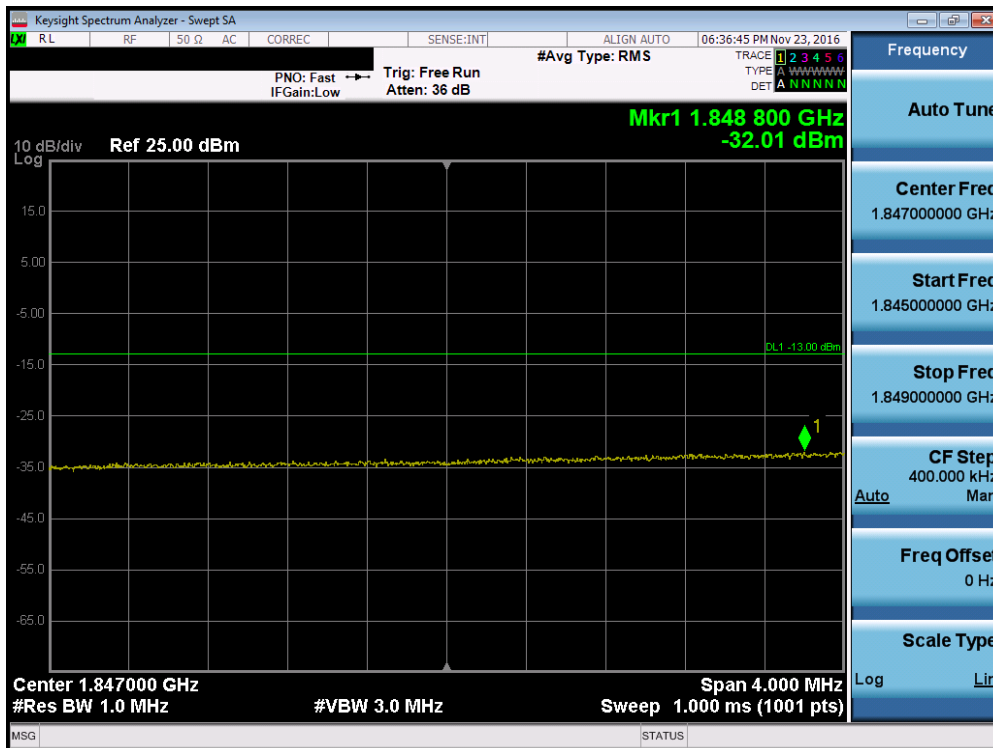


Plot 7-148. Upper Extended Band Edge Plot (Band 2/25 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1611151774.ZNF	Test Dates: 11/15 - 11/28/2016	EUT Type: Portable Handset		Page 90 of 123



Plot 7-149. Lower Band Edge Plot (Band 2/25 – 20.0MHz QPSK – RB Size 100)

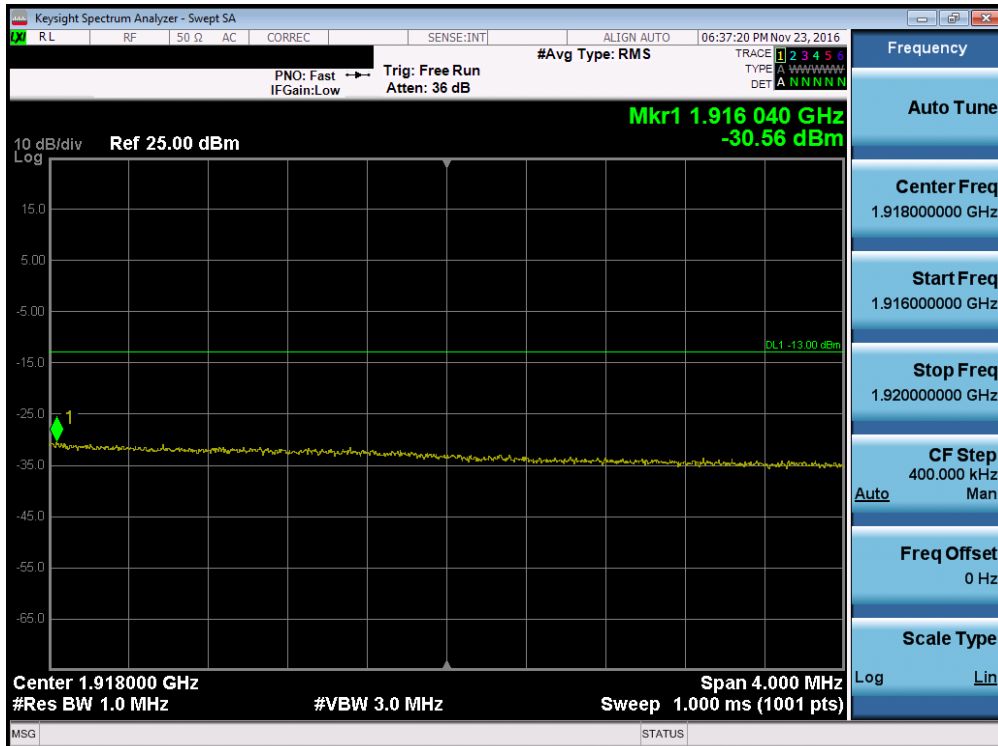


Plot 7-150. Lower Extended Band Edge Plot (Band 2/25 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFUS215		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1611151774.ZNF	Test Dates: 11/15 - 11/28/2016	EUT Type: Portable Handset		Page 91 of 123



Plot 7-151. Upper Band Edge Plot (Band 2/25 – 20.0MHz QPSK – RB Size 100)



Plot 7-152. Upper Extended Band Edge Plot (Band 2/25 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1611151774.ZNF	Test Dates: 11/15 - 11/28/2016	EUT Type: Portable Handset		Page 92 of 123

## 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

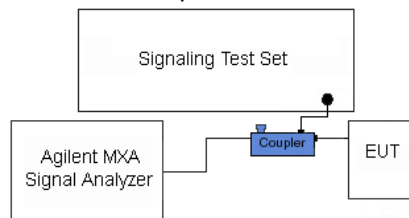
KDB 971168 D01 v02r02 – Section 5.7.1

#### 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.



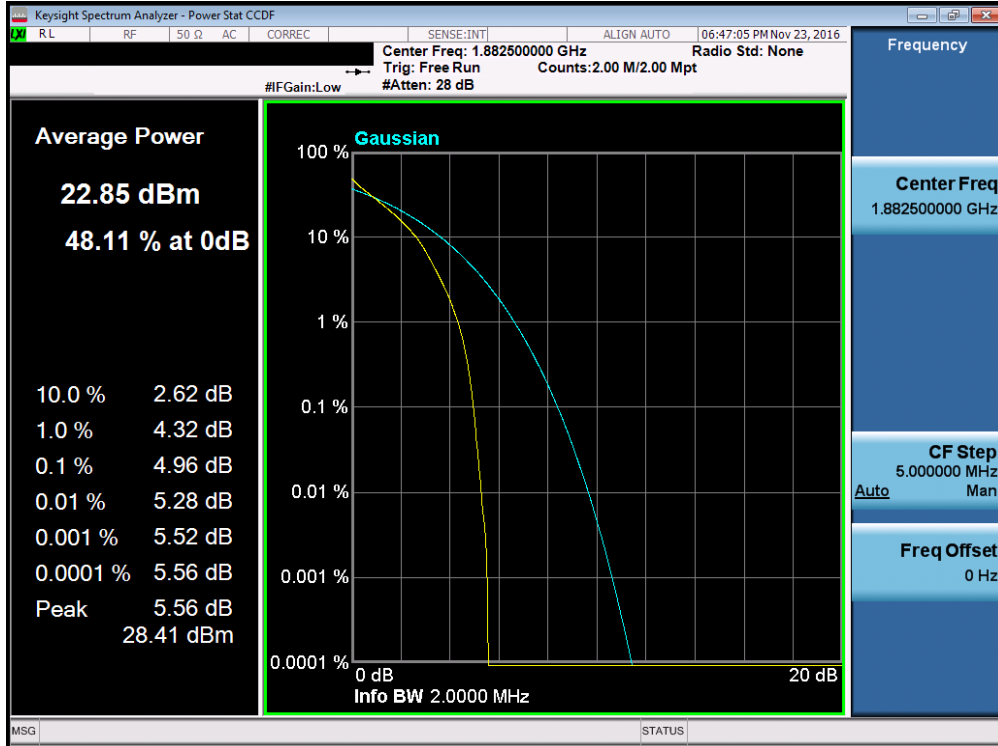
**Figure 7-4. Test Instrument & Measurement Setup**

#### Test Notes

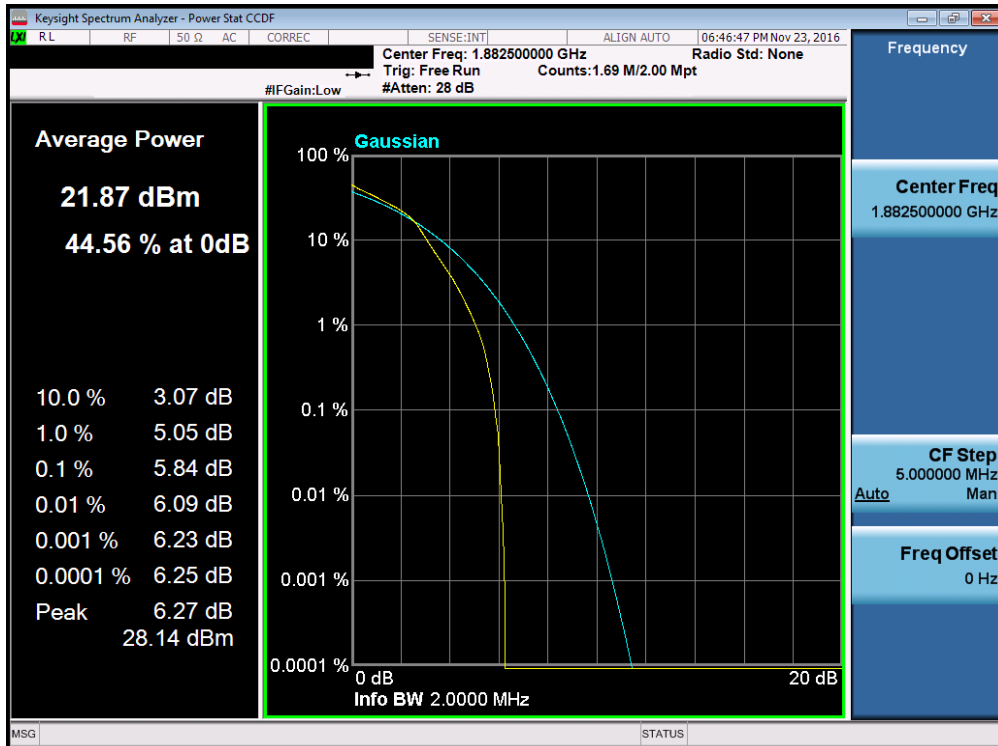
None.

FCC ID: ZNFUS215		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1611151774.ZNF	Test Dates: 11/15 - 11/28/2016	EUT Type: Portable Handset		Page 93 of 123



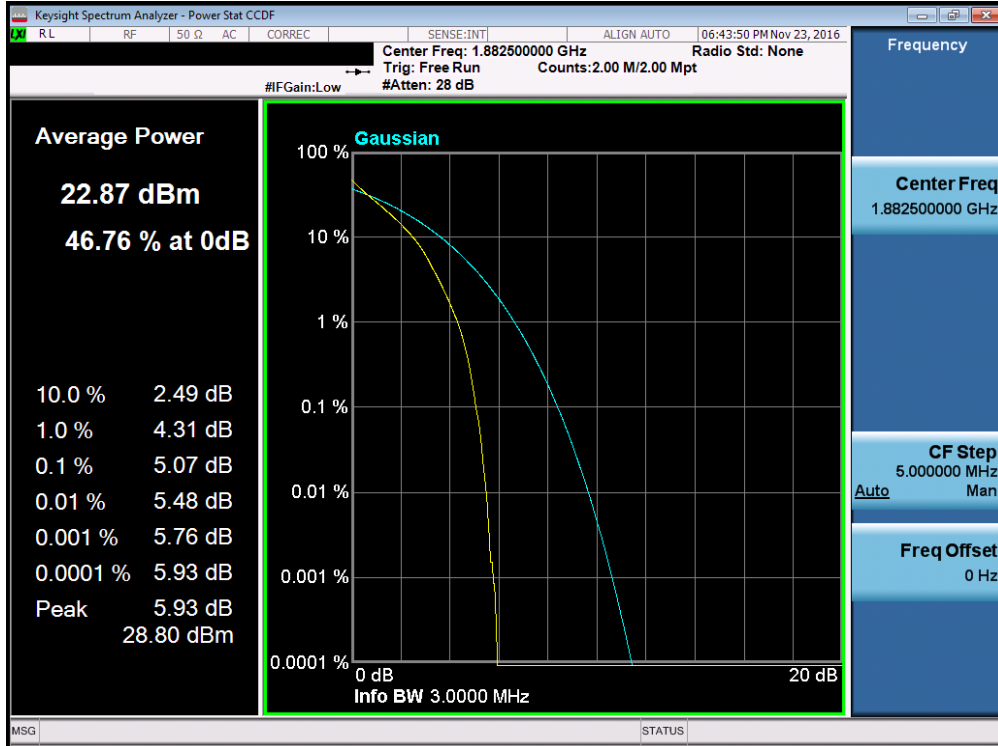


Plot 7-153. PAR Plot (Band 2/25 – 1.4MHz QPSK – RB Size 6)

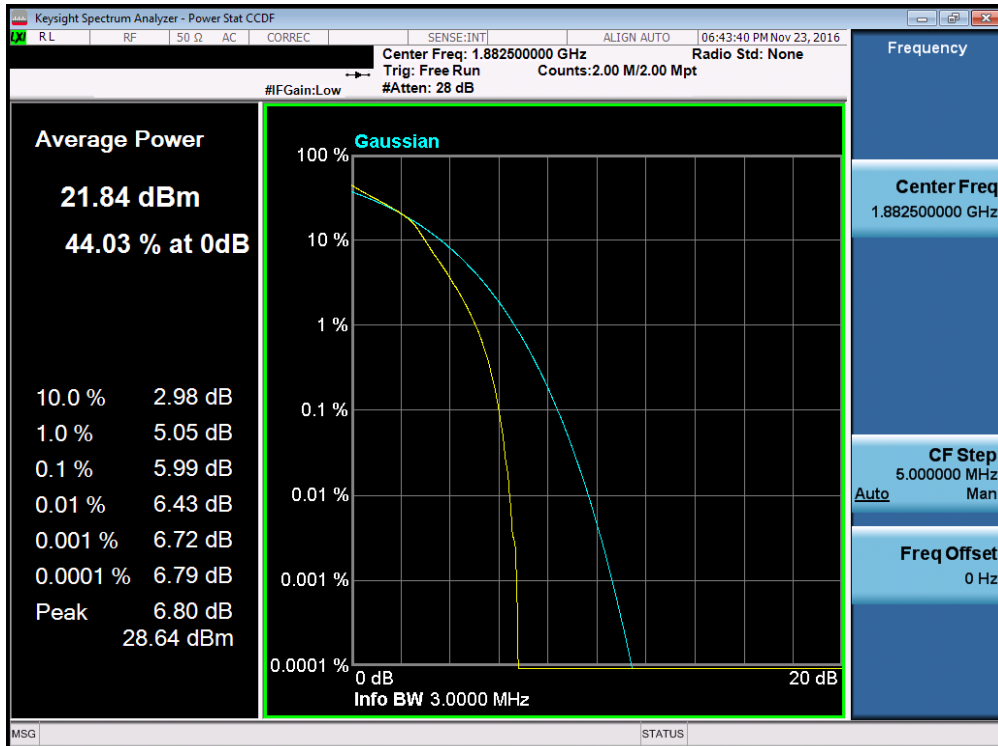


Plot 7-154. PAR Plot (Band 2/25 – 1.4MHz 16-QAM – RB Size 6)

FCC ID: ZNFUS215		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1611151774.ZNF	Test Dates: 11/15 - 11/28/2016	EUT Type: Portable Handset		Page 94 of 123

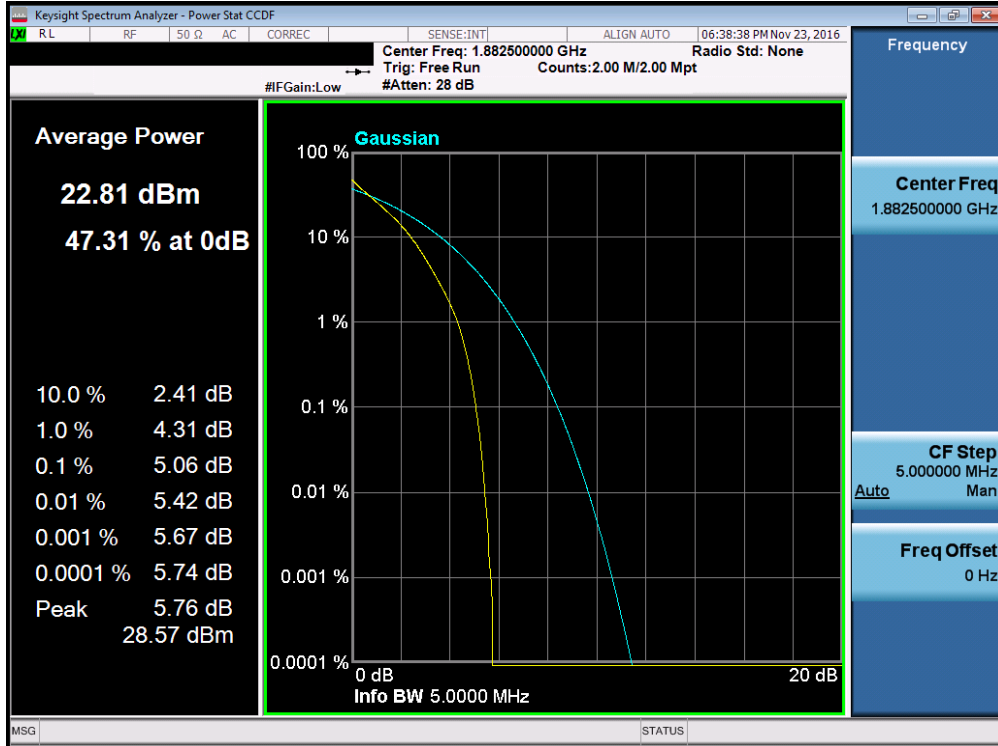


Plot 7-155. PAR Plot (Band 2/25 – 3.0MHz QPSK – RB Size 15)

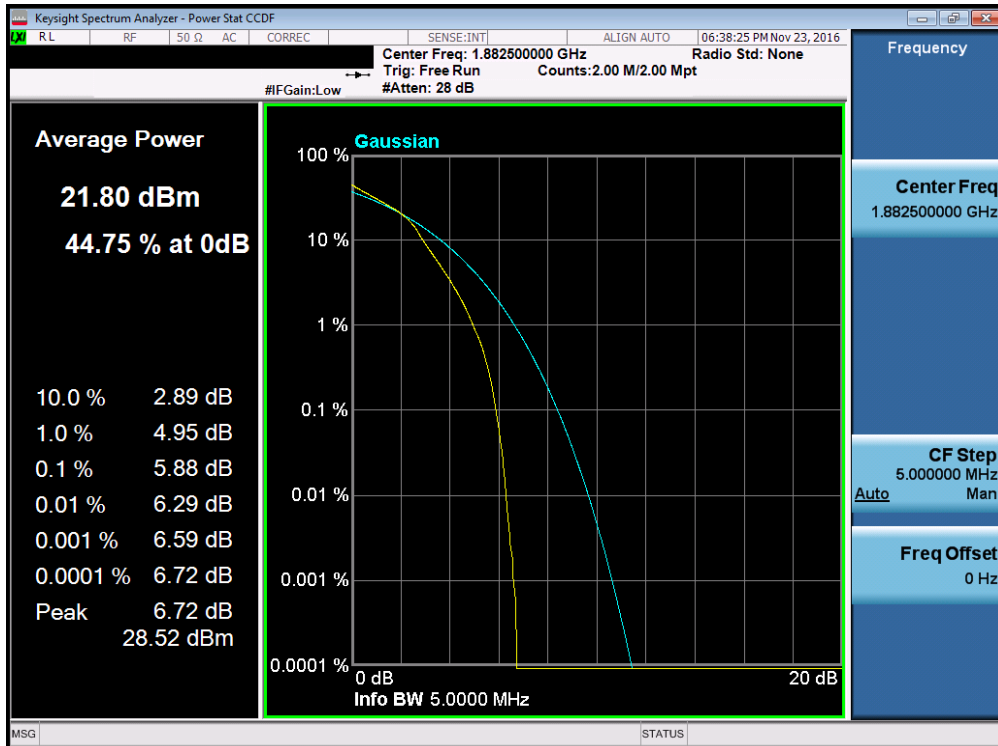


Plot 7-156. PAR Plot (Band 2/25 – 3.0MHz 16-QAM – RB Size 15)

FCC ID: ZNFUS215	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1611151774.ZNF	Test Dates: 11/15 - 11/28/2016	EUT Type: Portable Handset		Page 95 of 123

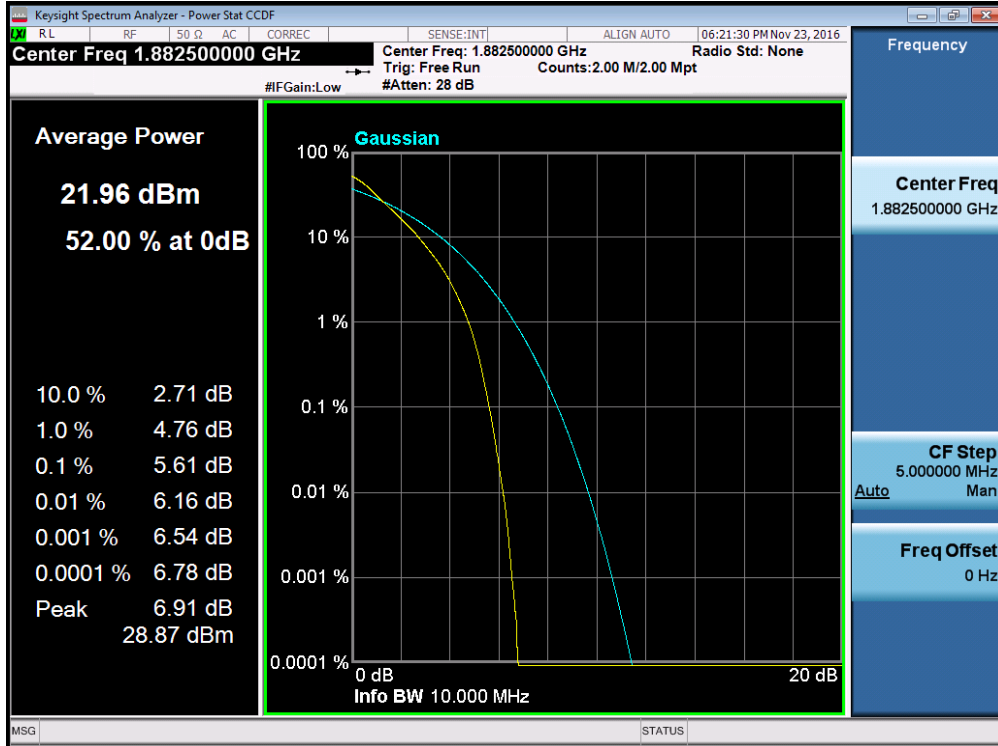


Plot 7-157. PAR Plot (Band 2/25 – 5.0MHz QPSK – RB Size 25)

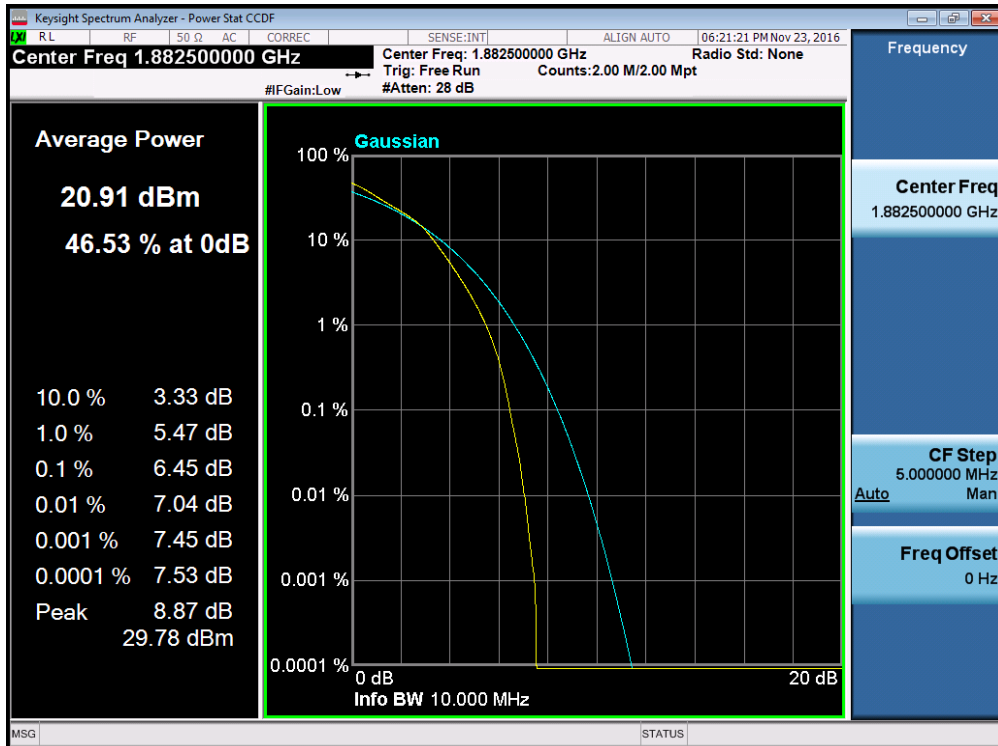


Plot 7-158. PAR Plot (Band 2/25 – 5.0MHz 16-QAM – RB Size 25)

FCC ID: ZNFUS215	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1611151774.ZNF	Test Dates: 11/15 - 11/28/2016	EUT Type: Portable Handset		Page 96 of 123

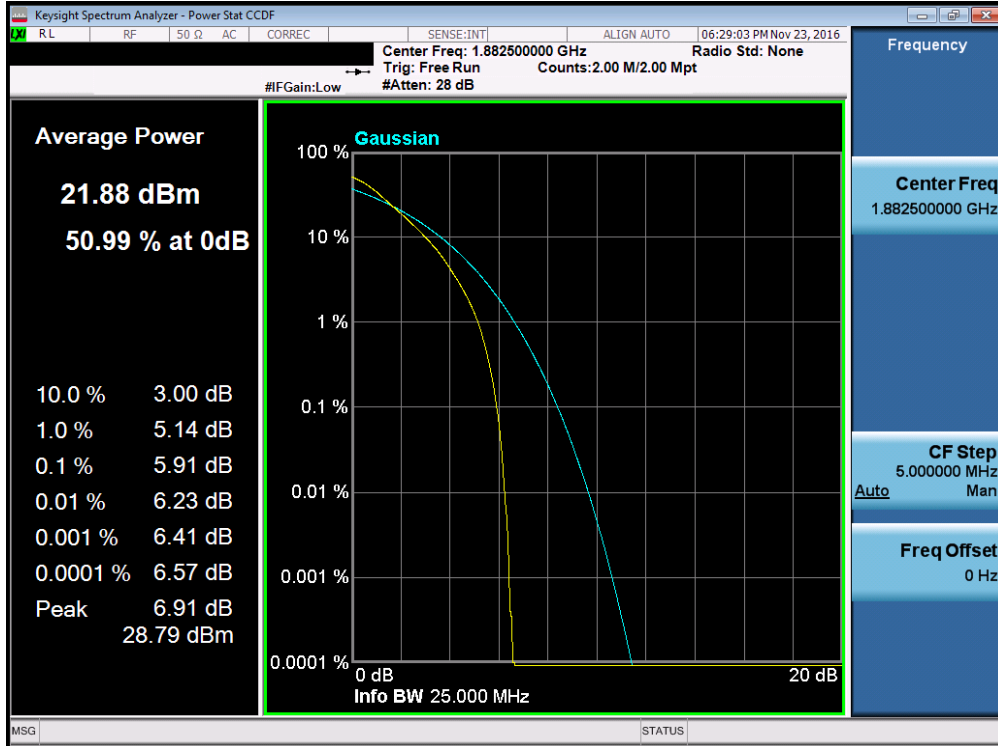


Plot 7-159. PAR Plot (Band 2/25 – 10.0MHz QPSK – RB Size 50)

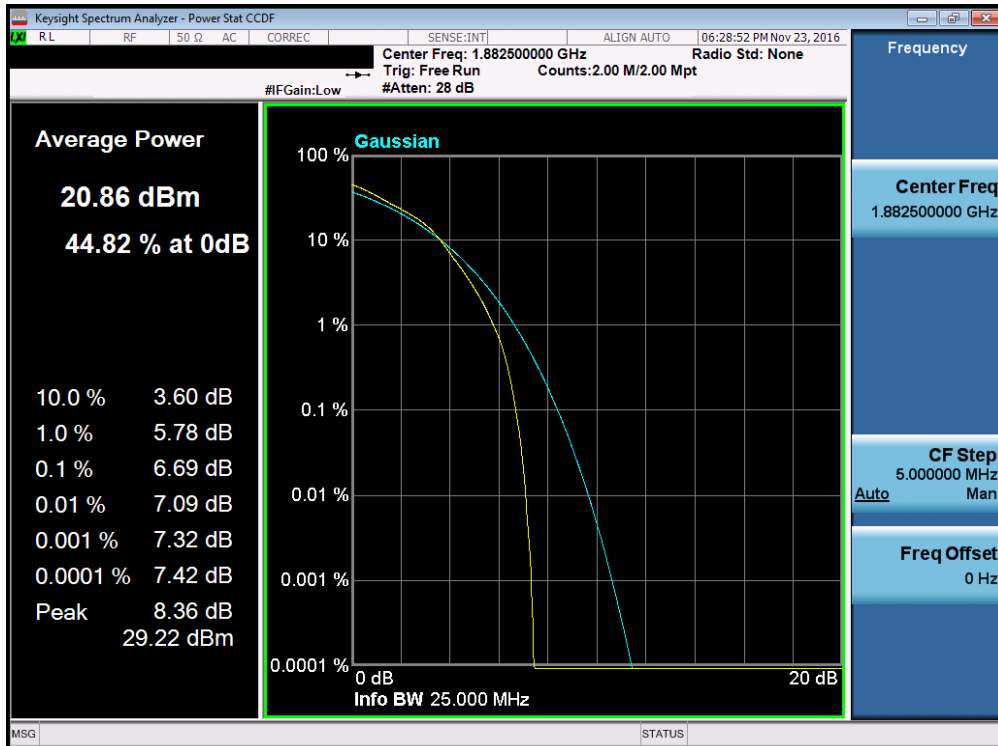


Plot 7-160. PAR Plot (Band 2/25 – 10.0MHz 16-QAM – RB Size 50)

FCC ID: ZNFUS215		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1611151774.ZNF	Test Dates: 11/15 - 11/28/2016	EUT Type: Portable Handset		Page 97 of 123

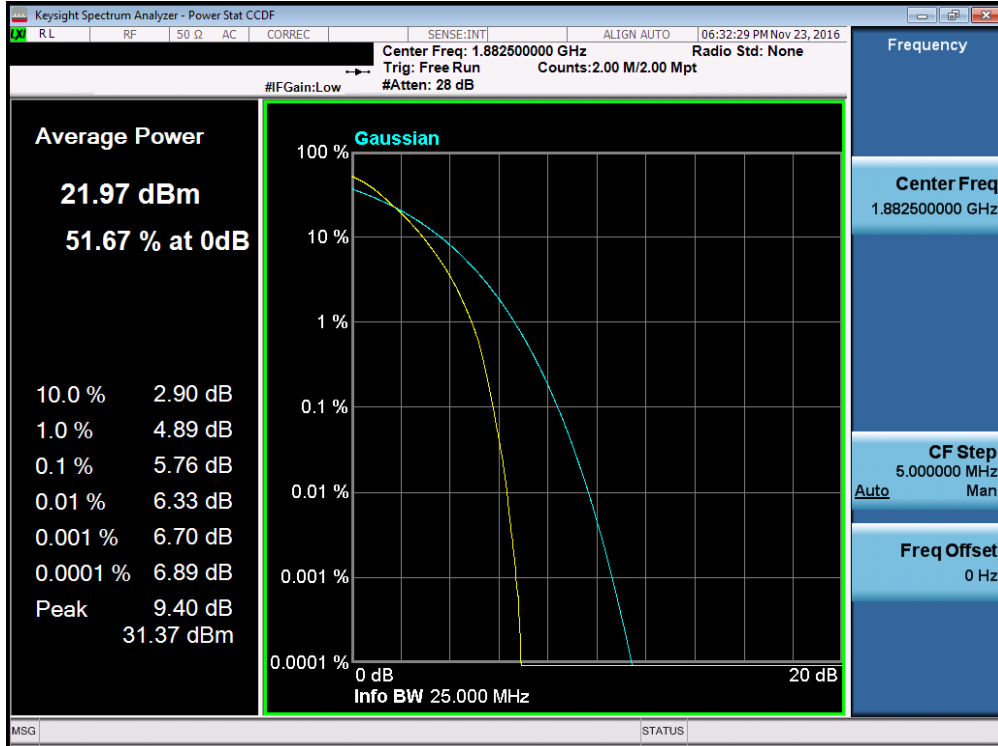


Plot 7-161. PAR Plot (Band 2/25 – 15.0MHz QPSK – RB Size 75)

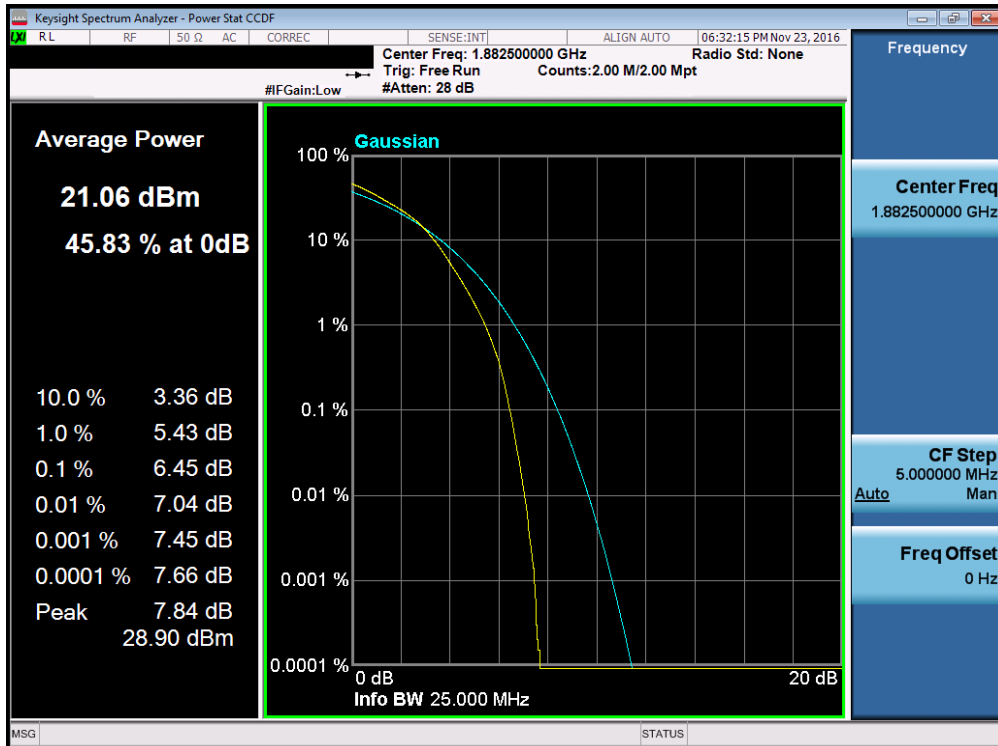


Plot 7-162. PAR Plot (Band 2/25 – 15.0MHz 16-QAM – RB Size 75)

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1611151774.ZNF	Test Dates: 11/15 - 11/28/2016	EUT Type: Portable Handset		Page 98 of 123



Plot 7-163. PAR Plot (Band 2/25 – 20.0MHz QPSK – RB Size 100)



Plot 7-164. PAR Plot (Band 2/25 – 20.0MHz 16-QAM – RB Size 100)

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1611151774.ZNF	Test Dates: 11/15 - 11/28/2016	EUT Type: Portable Handset		Page 99 of 123

**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

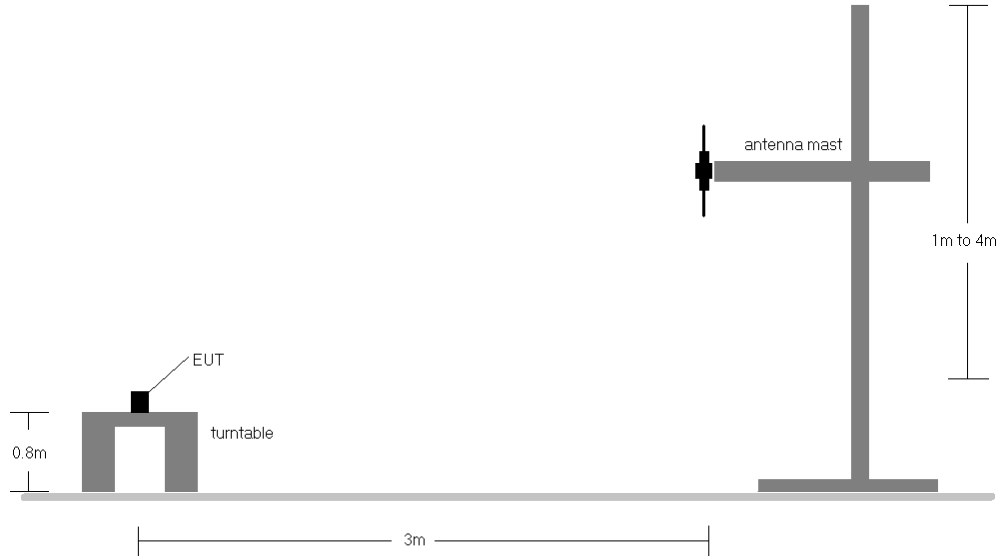
**Test Settings**

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

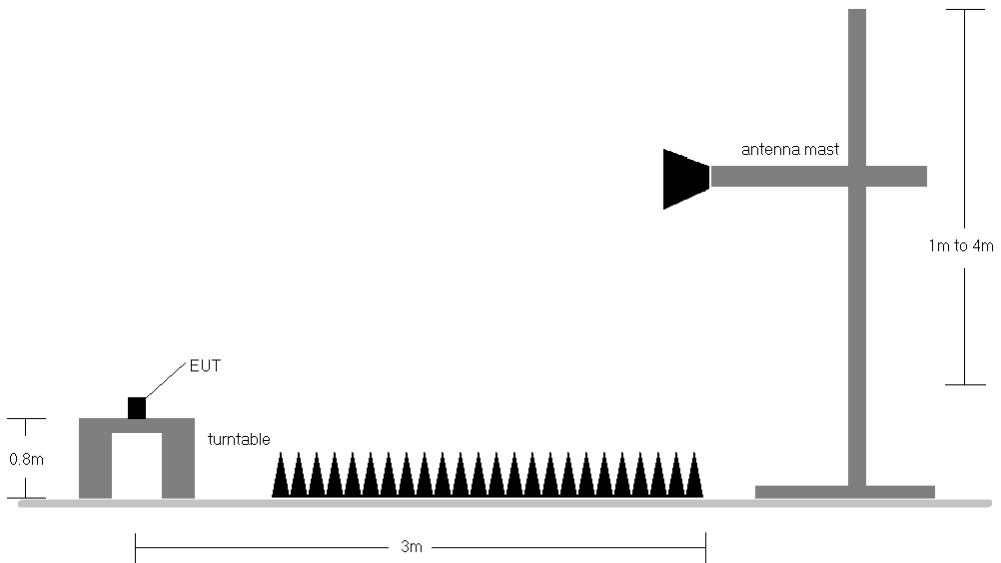
FCC ID: ZNFUS215		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1611151774.ZNF	Test Dates: 11/15 - 11/28/2016	EUT Type: Portable Handset	Page 100 of 123	

**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: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1611151774.ZNF	Test Dates: 11/15 - 11/28/2016	EUT Type: Portable Handset		Page 101 of 123





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	289	281	1 / 5	14.39	2.56	16.95	34.77	-17.82
707.50	1.4	QPSK	H	289	281	3 / 2	14.78	2.56	17.34	34.77	-17.43
715.30	1.4	QPSK	H	287	282	1 / 0	14.60	2.60	17.20	34.77	-17.58
699.70	1.4	16-QAM	H	289	281	1 / 5	13.38	2.56	15.94	34.77	-18.83
707.50	1.4	16-QAM	H	289	281	3 / 2	13.80	2.56	16.36	34.77	-18.41
715.30	1.4	16-QAM	H	287	282	1 / 5	13.66	2.60	16.26	34.77	-18.52
700.50	3	QPSK	H	284	282	1 / 0	14.71	2.48	17.19	34.77	-17.58
707.50	3	QPSK	H	294	283	1 / 14	14.25	2.56	16.81	34.77	-17.96
714.50	3	QPSK	H	284	282	1 / 14	13.95	2.60	16.55	34.77	-18.22
700.50	3	16-QAM	H	284	282	1 / 0	13.82	2.48	16.30	34.77	-18.47
707.50	3	16-QAM	H	294	283	1 / 14	12.96	2.56	15.52	34.77	-19.25
714.50	3	16-QAM	H	284	282	1 / 0	13.22	2.60	15.82	34.77	-18.95
701.50	5	QPSK	H	287	281	1 / 24	14.51	2.49	17.00	34.77	-17.77
707.50	5	QPSK	H	290	292	1 / 24	14.34	2.56	16.90	34.77	-17.87
713.50	5	QPSK	H	281	288	1 / 24	14.34	2.60	16.94	34.77	-17.83
701.50	5	16-QAM	H	287	281	1 / 24	13.64	2.49	16.13	34.77	-18.64
707.50	5	16-QAM	H	290	292	1 / 24	13.33	2.56	15.89	34.77	-18.88
713.50	5	16-QAM	H	281	288	1 / 24	13.37	2.60	15.97	34.77	-18.80
704.00	10	QPSK	H	260	280	1 / 49	14.84	2.51	17.35	34.77	-17.42
707.50	10	QPSK	H	260	280	1 / 49	14.75	2.56	17.31	34.77	-17.46
711.00	10	QPSK	H	266	273	1 / 49	14.89	2.60	17.49	34.77	-17.29
704.00	10	16-QAM	H	260	280	1 / 49	13.70	2.51	16.21	34.77	-18.56
707.50	10	16-QAM	H	260	280	1 / 49	13.81	2.56	16.37	34.77	-18.40
711.00	10	16-QAM	H	266	273	1 / 49	13.59	2.60	16.19	34.77	-18.59
711.00	10	QPSK	V	100	181	1 / 74	14.48	2.96	17.44	34.77	-17.33

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

FCC ID: ZNFUS215		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1611151774.ZNF	Test Dates: 11/15 - 11/28/2016	EUT Type: Portable Handset	Page 102 of 123	



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	400	115	1 / 0	15.63	5.51	21.14	38.45	-17.31
836.50	1.4	QPSK	H	100	294	1 / 5	15.95	5.14	21.09	38.45	-17.36
848.30	1.4	QPSK	H	400	15	1 / 0	14.22	4.68	18.90	38.45	-19.55
824.70	1.4	16-QAM	H	400	115	1 / 0	14.83	5.51	20.34	38.45	-18.11
836.50	1.4	16-QAM	H	100	294	1 / 5	14.92	5.14	20.06	38.45	-18.39
848.30	1.4	16-QAM	H	400	15	1 / 0	13.26	4.68	17.94	38.45	-20.51
825.50	3	QPSK	H	382	287	1 / 14	15.29	5.52	20.81	38.45	-17.64
836.50	3	QPSK	H	382	300	1 / 0	15.70	5.14	20.84	38.45	-17.61
847.50	3	QPSK	H	381	284	1 / 14	16.16	4.67	20.83	38.45	-17.62
825.50	3	16-QAM	H	382	287	1 / 14	14.13	5.52	19.65	38.45	-18.80
836.50	3	16-QAM	H	382	300	1 / 14	15.09	5.14	20.23	38.45	-18.22
847.50	3	16-QAM	H	381	284	1 / 0	15.50	4.67	20.17	38.45	-18.28
826.50	5	QPSK	H	400	86	1 / 24	14.63	5.51	20.14	38.45	-18.31
836.50	5	QPSK	H	366	297	1 / 24	15.90	5.14	21.04	38.45	-17.41
846.50	5	QPSK	H	376	289	1 / 24	16.57	4.66	21.23	38.45	-17.22
826.50	5	16-QAM	H	400	86	1 / 24	13.56	5.51	19.07	38.45	-19.38
836.50	5	16-QAM	H	366	297	1 / 24	14.97	5.14	20.11	38.45	-18.34
846.50	5	16-QAM	H	376	289	1 / 24	15.40	4.66	20.06	38.45	-18.39
829.00	10	QPSK	H	400	86	1 / 0	14.42	5.49	19.91	38.45	-18.54
836.50	10	QPSK	H	100	292	1 / 49	15.87	5.14	21.01	38.45	-17.44
844.00	10	QPSK	H	385	14	1 / 0	14.54	4.70	19.24	38.45	-19.21
829.00	10	16-QAM	H	400	86	1 / 49	13.41	5.49	18.90	38.45	-19.55
836.50	10	16-QAM	H	100	292	1 / 49	15.13	5.14	20.27	38.45	-18.18
844.00	10	16-QAM	H	385	14	1 / 0	13.49	4.70	18.19	38.45	-20.26
846.50	5	QPSK	V	100	329	1 / 0	15.75	5.04	20.79	38.45	-17.66

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

FCC ID: ZNFUS215		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
1710.70	1.4	QPSK	V	100	303	1 / 5	14.86	9.62	24.48	30.00	-5.52
1732.50	1.4	QPSK	V	100	303	1 / 5	13.62	9.50	23.12	30.00	-6.88
1754.30	1.4	QPSK	V	100	300	1 / 5	12.95	9.38	22.33	30.00	-7.67
1710.70	1.4	16-QAM	V	100	303	1 / 0	14.05	9.62	23.67	30.00	-6.33
1732.50	1.4	16-QAM	V	100	303	1 / 5	12.81	9.50	22.31	30.00	-7.69
1754.30	1.4	16-QAM	V	100	300	1 / 0	12.21	9.38	21.59	30.00	-8.41
1711.50	3	QPSK	V	100	271	1 / 14	14.44	9.62	24.06	30.00	-5.94
1732.50	3	QPSK	V	100	276	1 / 14	13.35	9.50	22.85	30.00	-7.15
1753.50	3	QPSK	V	100	277	1 / 14	12.44	9.39	21.83	30.00	-8.17
1711.50	3	16-QAM	V	100	271	1 / 14	13.66	9.62	23.28	30.00	-6.72
1732.50	3	16-QAM	V	100	276	1 / 0	12.58	9.50	22.08	30.00	-7.92
1753.50	3	16-QAM	V	100	277	1 / 14	11.93	9.39	21.32	30.00	-8.68
1712.50	5	QPSK	V	100	298	1 / 0	15.20	9.61	24.81	30.00	-5.19
1732.50	5	QPSK	V	100	300	1 / 0	14.02	9.50	23.52	30.00	-6.48
1752.50	5	QPSK	V	100	270	1 / 24	12.87	9.39	22.26	30.00	-7.74
1712.50	5	16-QAM	V	100	298	1 / 24	14.22	9.61	23.83	30.00	-6.17
1732.50	5	16-QAM	V	100	300	1 / 0	12.89	9.50	22.39	30.00	-7.61
1752.50	5	16-QAM	V	100	270	1 / 24	12.31	9.39	21.70	30.00	-8.30
1715.00	10	QPSK	V	100	303	1 / 0	15.05	9.60	24.65	30.00	-5.35
1732.50	10	QPSK	V	100	303	1 / 0	14.18	9.50	23.68	30.00	-6.32
1750.00	10	QPSK	V	100	300	1 / 49	13.26	9.41	22.67	30.00	-7.33
1715.00	10	16-QAM	V	100	303	1 / 0	14.24	9.60	23.84	30.00	-6.16
1732.50	10	16-QAM	V	100	303	1 / 0	13.29	9.50	22.79	30.00	-7.21
1750.00	10	16-QAM	V	100	300	1 / 49	12.49	9.41	21.90	30.00	-8.10
1717.50	15	QPSK	V	100	301	1 / 0	14.98	9.58	24.56	30.00	-5.44
1732.50	15	QPSK	V	100	302	1 / 0	14.24	9.50	23.74	30.00	-6.26
1747.50	15	QPSK	V	100	300	1 / 0	13.57	9.42	22.99	30.00	-7.01
1717.50	15	16-QAM	V	100	301	1 / 0	14.15	9.58	23.73	30.00	-6.27
1732.50	15	16-QAM	V	100	302	1 / 0	13.39	9.50	22.89	30.00	-7.11
1747.50	15	16-QAM	V	100	300	1 / 0	12.87	9.42	22.29	30.00	-7.71
1720.00	20	QPSK	V	100	299	1 / 0	14.96	9.57	24.53	30.00	-5.47
1732.50	20	QPSK	V	100	299	1 / 0	14.64	9.50	24.14	30.00	-5.86
1745.00	20	QPSK	V	100	300	1 / 0	13.84	9.43	23.27	30.00	-6.73
1720.00	20	16-QAM	V	100	299	1 / 0	14.44	9.57	24.01	30.00	-5.99
1732.50	20	16-QAM	V	100	299	1 / 0	13.67	9.50	23.17	30.00	-6.83
1745.00	20	16-QAM	V	100	300	1 / 0	13.23	9.43	22.66	30.00	-7.34
1712.50	5	QPSK	H	100	283	1 / 99	13.47	9.66	23.13	30.00	-6.87

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

FCC ID: ZNFUS215		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
1850.70	1.4	QPSK	H	100	19	1 / 5	16.73	9.12	25.85	33.01	-7.16
1882.50	1.4	QPSK	H	100	19	1 / 0	16.09	9.10	25.19	33.01	-7.82
1914.30	1.4	QPSK	H	100	20	1 / 0	15.46	9.16	24.62	33.01	-8.39
1850.70	1.4	16-QAM	H	100	19	1 / 5	15.78	9.12	24.90	33.01	-8.11
1882.50	1.4	16-QAM	H	100	19	1 / 5	15.24	9.10	24.34	33.01	-8.67
1914.30	1.4	16-QAM	H	100	20	1 / 0	14.47	9.16	23.63	33.01	-9.38
1851.50	3	QPSK	H	100	18	1 / 0	16.73	9.12	25.85	33.01	-7.16
1882.50	3	QPSK	H	100	18	1 / 0	16.23	9.10	25.33	33.01	-7.68
1913.50	3	QPSK	H	100	21	1 / 14	15.60	9.15	24.75	33.01	-8.26
1851.50	3	16-QAM	H	100	18	1 / 0	16.11	9.12	25.23	33.01	-7.78
1882.50	3	16-QAM	H	100	18	1 / 14	15.22	9.10	24.32	33.01	-8.69
1913.50	3	16-QAM	H	100	21	1 / 14	14.66	9.15	23.81	33.01	-9.20
1852.50	5	QPSK	H	100	18	1 / 0	16.51	9.12	25.63	33.01	-7.38
1882.50	5	QPSK	H	100	19	1 / 0	16.24	9.10	25.34	33.01	-7.67
1912.50	5	QPSK	H	100	23	1 / 24	15.29	9.15	24.44	33.01	-8.57
1852.50	5	16-QAM	H	100	18	1 / 0	15.55	9.12	24.67	33.01	-8.34
1882.50	5	16-QAM	H	100	19	1 / 0	15.20	9.10	24.30	33.01	-8.71
1912.50	5	16-QAM	H	100	23	1 / 24	14.29	9.15	23.44	33.01	-9.57
1855.00	10	QPSK	H	102	19	1 / 49	16.30	9.12	25.42	33.01	-7.59
1882.50	10	QPSK	H	103	20	1 / 0	16.19	9.10	25.29	33.01	-7.72
1910.00	10	QPSK	H	100	21	1 / 49	14.87	9.13	24.00	33.01	-9.01
1855.00	10	16-QAM	H	102	19	1 / 0	15.62	9.12	24.74	33.01	-8.27
1882.50	10	16-QAM	H	103	20	1 / 0	15.53	9.10	24.63	33.01	-8.38
1910.00	10	16-QAM	H	100	21	1 / 49	13.90	9.13	23.03	33.01	-9.98
1857.50	15	QPSK	H	100	18	1 / 74	17.22	9.11	26.33	33.01	-6.68
1882.50	15	QPSK	H	100	19	1 / 0	15.89	9.10	24.99	33.01	-8.02
1907.50	15	QPSK	H	100	22	1 / 0	15.70	9.11	24.81	33.01	-8.20
1857.50	15	16-QAM	H	100	18	1 / 74	15.88	9.11	24.99	33.01	-8.02
1882.50	15	16-QAM	H	100	19	1 / 0	14.97	9.10	24.07	33.01	-8.94
1907.50	15	16-QAM	H	100	22	1 / 0	15.09	9.11	24.20	33.01	-8.81
1860.00	20	QPSK	H	100	18	1 / 99	16.40	9.11	25.51	33.01	-7.50
1882.50	20	QPSK	H	100	19	1 / 0	16.07	9.10	25.17	33.01	-7.84
1905.00	20	QPSK	H	100	18	1 / 0	15.22	9.09	24.31	33.01	-8.70
1860.00	20	16-QAM	H	100	18	1 / 0	15.60	9.11	24.71	33.01	-8.30
1882.50	20	16-QAM	H	100	19	1 / 0	15.14	9.10	24.24	33.01	-8.77
1905.00	20	16-QAM	H	100	18	1 / 0	14.46	9.09	23.55	33.01	-9.46
1857.50	15	QPSK	V	100	92	1 / 0	13.79	9.23	23.02	33.01	-9.99

**Table 7-5. EIRP Data (Band 2/25)**

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## 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

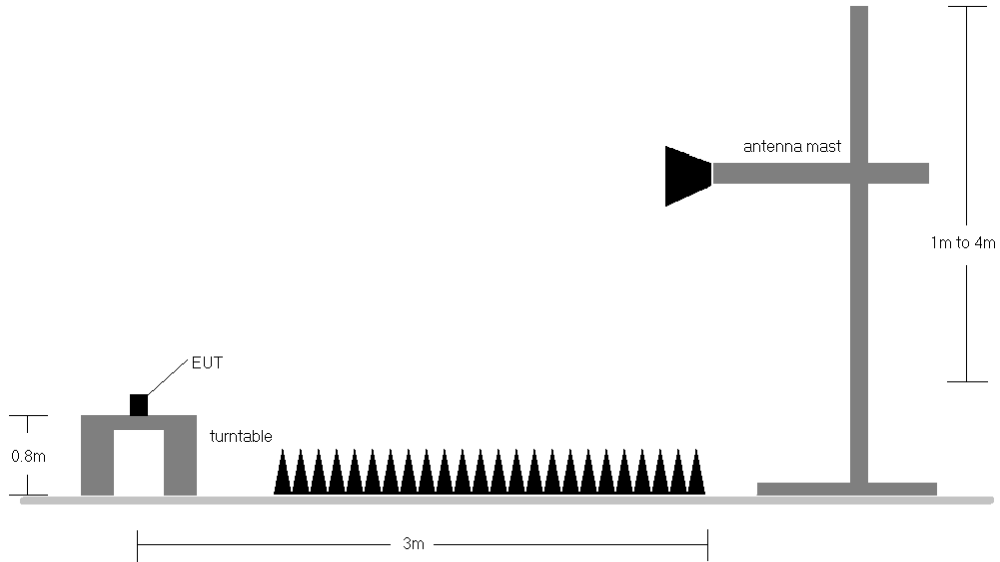
### Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW  $\geq 3 \times$  RBW
3. Span = 1.5 times the OBW
4. No. of sweep points  $\geq 2 \times$  span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

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

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OPERATING FREQUENCY: 704.00 MHz  
 CHANNEL: 23060  
 MEASURED OUTPUT POWER: 17.35 dBm = 0.054 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 10.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  30.35 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]
1408.00	H	100	300	-58.35	5.94	-52.41	69.8
2112.00	H	100	67	-52.29	6.82	-45.47	62.8

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

OPERATING FREQUENCY: 707.50 MHz  
 CHANNEL: 23095  
 MEASURED OUTPUT POWER: 17.31 dBm = 0.054 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 10.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  30.31 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	100	306	-62.60	5.96	-56.63	73.9
2122.50	H	100	60	-52.59	6.84	-45.75	63.1

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

FCC ID: ZNFUS215		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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OPERATING FREQUENCY: 711.00 MHz  
 CHANNEL: 23130  
 MEASURED OUTPUT POWER: 17.49 dBm = 0.056 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 10.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  30.49 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]
1422.00	H	100	304	-58.19	5.99	-52.20	69.7
2133.00	H	100	171	-52.77	6.87	-45.90	63.4

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

OPERATING FREQUENCY: 826.50 MHz  
 CHANNEL: 20425  
 MEASURED OUTPUT POWER: 20.14 dBm = 0.103 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 5.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  33.14 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]
1653.00	H	122	38	-64.80	6.28	-58.51	78.7
2479.50	H	100	40	-52.17	6.84	-45.32	65.5

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

FCC ID: ZNFUS215		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: 21.04 dBm = 0.127 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 5.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  34.04 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	100	127	-65.25	6.21	-59.04	80.1
2509.50	H	100	37	-49.71	6.86	-42.85	63.9

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

OPERATING FREQUENCY: 846.50 MHz  
 CHANNEL: 20625  
 MEASURED OUTPUT POWER: 21.23 dBm = 0.133 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 5.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  34.23 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]
1693.00	H	100	21	-62.14	6.14	-56.00	77.2
2539.50	H	113	42	-48.63	6.95	-41.69	62.9

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

OPERATING FREQUENCY: 1712.50 MHz  
 CHANNEL: 19975  
 MEASURED OUTPUT POWER: 24.81 dBm = 0.303 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 5.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  37.81 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]
3425.00	V	100	79	-56.20	9.65	-46.55	71.4
5137.50	V	100	160	-62.00	10.91	-51.09	75.9

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

OPERATING FREQUENCY: 1732.50 MHz  
 CHANNEL: 20175  
 MEASURED OUTPUT POWER: 23.52 dBm = 0.225 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 5.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  36.52 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	V	100	44	-56.60	9.77	-46.82	70.3
5197.50	V	100	167	-61.52	10.81	-50.71	74.2

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

FCC ID: ZNFUS215		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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OPERATING FREQUENCY: 1752.50 MHz  
 CHANNEL: 20375  
 MEASURED OUTPUT POWER: 22.26 dBm = 0.168 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 5.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  35.26 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]
3505.00	V	100	41	-55.41	9.89	-45.53	67.8
5257.50	V	100	200	-63.68	10.92	-52.76	75.0

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

OPERATING FREQUENCY: 1857.50 MHz  
 CHANNEL: 26115  
 MEASURED OUTPUT POWER: 26.33 dBm = 0.430 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 15.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  39.33 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]
3715.00	H	100	90	-63.29	8.46	-54.83	81.2
5572.50	H	25	25	-60.50	10.54	-49.96	76.3

**Table 7-15. Radiated Spurious Data (Band 2/25 – Low Channel)**

FCC ID: ZNFUS215		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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OPERATING FREQUENCY: 1882.50 MHz  
 CHANNEL: 26365  
 MEASURED OUTPUT POWER: 24.99 dBm = 0.316 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 15.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  37.99 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]
3765.00	H	100	149	-59.32	8.66	-50.66	75.7
5647.50	H	100	4	-61.92	10.62	-51.29	76.3

**Table 7-16. Radiated Spurious Data (Band 2/25 – Mid Channel)**

OPERATING FREQUENCY: 1907.50 MHz  
 CHANNEL: 26615  
 MEASURED OUTPUT POWER: 24.81 dBm = 0.303 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 15.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  37.81 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]
3815.00	H	100	152	-63.06	8.77	-54.29	79.1
5722.50	H	100	0	-62.67	10.71	-51.97	76.8

**Table 7-17. Radiated Spurious Data (Band 2/25 – High Channel)**

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## 7.8 Frequency Stability / Temperature Variation

§2.1055 §22.355 §24.235 §27.54

### Test Overview and Limit

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

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

*For Part 22, the frequency stability of the transmitter shall be maintained within  $\pm 0.00025\%$  ( $\pm 2.5$  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-D-2010

### Test Settings



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

### Test Setup

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

### Test Notes

None

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## Band 12 Frequency Stability Measurements

§2.1055 §27.54

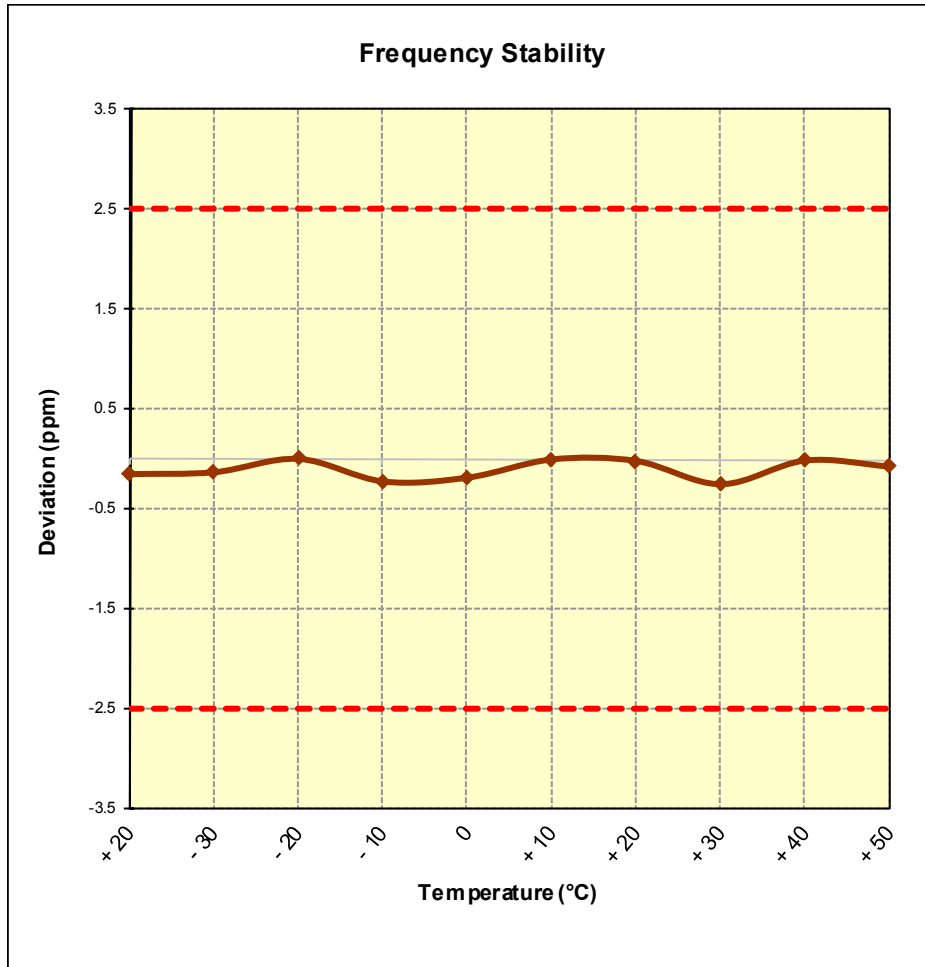
OPERATING FREQUENCY: 707,500,000 Hz  
 CHANNEL: 23790  
 REFERENCE VOLTAGE: 3.85 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	707,499,888	-112	-0.0000158
100 %		- 30	707,499,901	-99	-0.0000140
100 %		- 20	707,499,996	-4	-0.0000006
100 %		- 10	707,499,835	-165	-0.0000233
100 %		0	707,499,863	-137	-0.0000194
100 %		+ 10	707,499,992	-8	-0.0000011
100 %		+ 20	707,499,981	-19	-0.0000027
100 %		+ 30	707,499,816	-184	-0.0000260
100 %		+ 40	707,499,985	-15	-0.0000021
100 %		+ 50	707,499,941	-59	-0.0000083
BATT. ENDPOINT	3.45	+ 20	707,499,914	-86	-0.0000122



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

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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

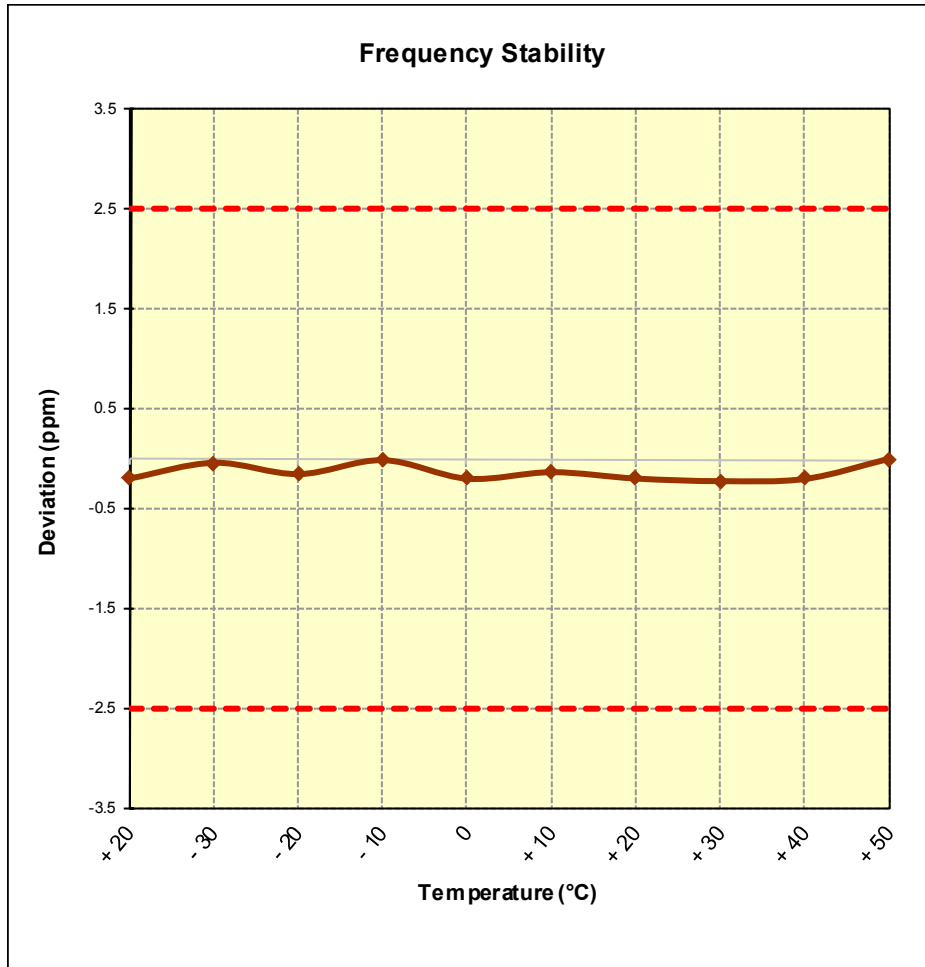
OPERATING FREQUENCY: 836,500,000 Hz  
 CHANNEL: 20525  
 REFERENCE VOLTAGE: 3.85 VDC  
 DEVIATION LIMIT: ± 0.00025 % or 2.5 ppm

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	836,499,831	-169	-0.0000202
100 %		- 30	836,499,958	-42	-0.0000050
100 %		- 20	836,499,866	-134	-0.0000160
100 %		- 10	836,499,980	-20	-0.0000024
100 %		0	836,499,829	-171	-0.0000204
100 %		+ 10	836,499,882	-118	-0.0000141
100 %		+ 20	836,499,830	-170	-0.0000203
100 %		+ 30	836,499,809	-191	-0.0000228
100 %		+ 40	836,499,828	-172	-0.0000206
100 %		+ 50	836,499,992	-8	-0.0000010
BATT. ENDPOINT	3.45	+ 20	836,499,805	-195	-0.0000233

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



**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)	1,732,499,983	-17	-0.0000010
100 %		- 30	1,732,499,962	-38	-0.0000022
100 %		- 20	1,732,499,986	-14	-0.0000008
100 %		- 10	1,732,499,891	-109	-0.0000063
100 %		0	1,732,499,882	-118	-0.0000068
100 %		+ 10	1,732,499,955	-45	-0.0000026
100 %		+ 20	1,732,499,905	-95	-0.0000055
100 %		+ 30	1,732,499,888	-112	-0.0000065
100 %		+ 40	1,732,499,867	-133	-0.0000077
100 %		+ 50	1,732,499,900	-100	-0.0000058
BATT. ENDPOINT	3.45	+ 20	1,732,499,852	-148	-0.0000086

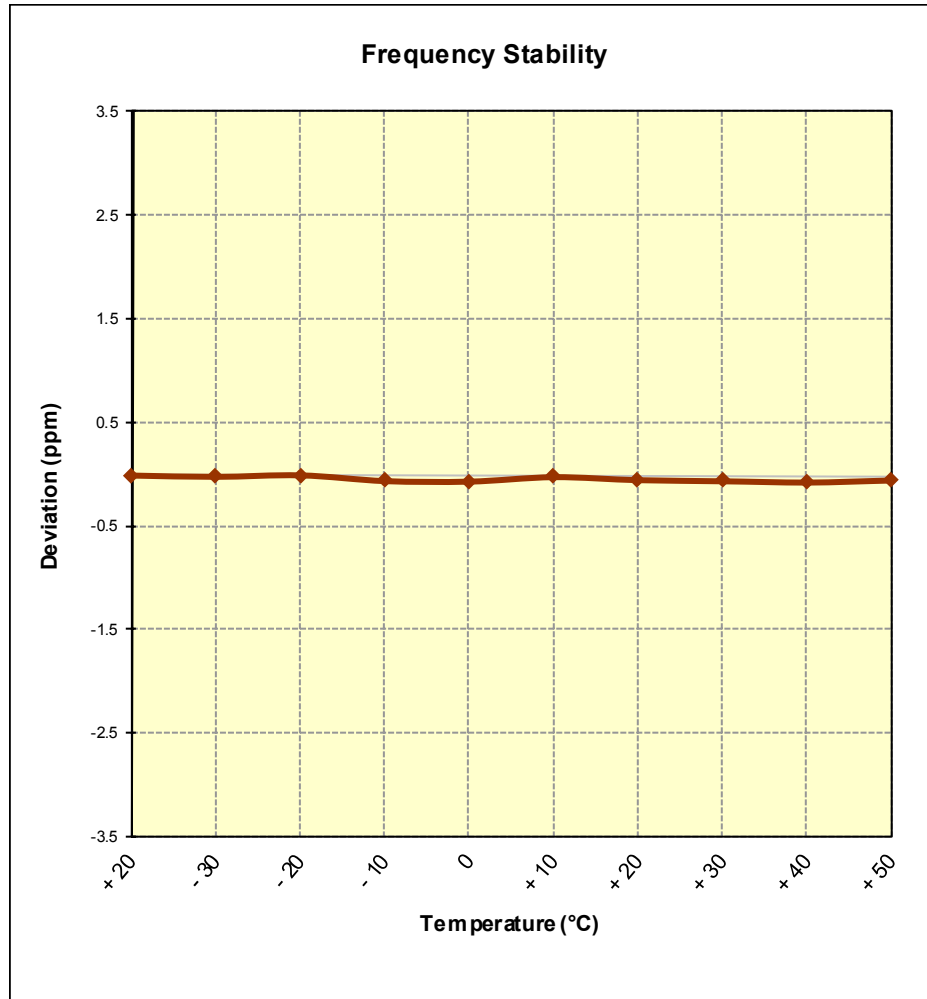
Table 7-20. Frequency Stability Data (Band 4)

**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**  
**§2.1055 §§27.54**



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

FCC ID: ZNFUS215	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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## Band 2/25 Frequency Stability Measurements

§2.1055 §24.235



OPERATING FREQUENCY: 1,882,500,000 Hz  
 CHANNEL: 26365  
 REFERENCE VOLTAGE: 3.85 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	1,882,499,992	-8	-0.0000004
100 %		- 30	1,882,499,975	-25	-0.0000013
100 %		- 20	1,882,499,945	-55	-0.0000029
100 %		- 10	1,882,499,999	-1	-0.0000001
100 %		0	1,882,499,903	-97	-0.0000051
100 %		+ 10	1,882,499,856	-144	-0.0000076
100 %		+ 20	1,882,499,828	-172	-0.0000091
100 %		+ 30	1,882,499,850	-150	-0.0000080
100 %		+ 40	1,882,499,932	-68	-0.0000036
100 %		+ 50	1,882,499,870	-130	-0.0000069
BATT. ENDPOINT	3.45	+ 20	1,882,499,948	-52	-0.0000028

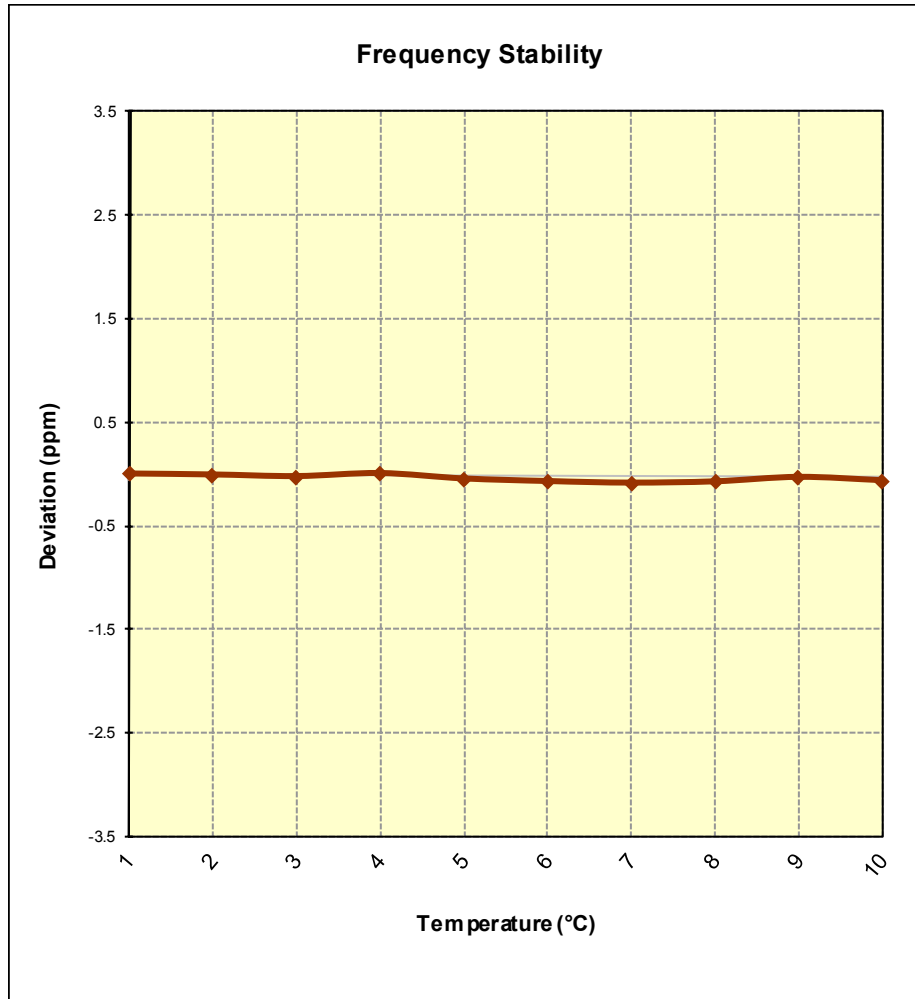
**Table 7-21. Frequency Stability Data (Band 2/25)**

**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 2/25 Frequency Stability Measurements**  
**§2.1055 §24.235**





**Figure 7-11. Frequency Stability Graph (Band 2/25)**

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## 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LGE Portable Handset** **FCC ID: ZNFUS215** complies with all the requirements of Parts 22, 24, & 27 of the FCC rules for LTE operation only.

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