



# PCTEST ENGINEERING LABORATORY, INC.

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<http://www.pctest.com>



## MEASUREMENT REPORT

### Part 96 LTE

**Applicant Name:**

Netcomm Wireless Limited

18-20 Orion Road

Lane Cove NSW 2066

Sydney Australia

**Date of Testing:**

7/31-10/2/2019

**Test Site/Location:**

PCTEST Lab. Columbia, MD, USA

**Test Report Serial No.:**

1M1907090120-2-R2.XIA

**FCC ID:**

XIA-IFWA661

**APPLICANT:**

Netcomm Wireless Limited

**Application Type:**

Certification

**Model:**

IFWA-661, OWAR1-35

**EUT Type:**

Outdoor LTE Router

**FCC Classification:**

Citizens Band Category A and B Devices (CBD)

**FCC Rule Part(s):**

96


**Test Procedure(s):**

ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. Test results reported herein relate only to the item(s) tested.

This revised Test Report (S/N: 1M1907090120-2-R2.XIA) supersedes and replaces the previously issued test report (S/N: 1M1907090120-2-R1.XIA) on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

  
Randy Ortanez  
President



FCC ID: XIA-IFWA661		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 1 of 144

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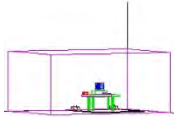
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V1.0 12/17/2018

## T A B L E O F C O N T E N T S

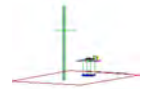
1.0	INTRODUCTION .....	4
1.1	Scope .....	4
1.2	PCTEST Test Location .....	4
1.3	Test Facility / Accreditations .....	4
2.0	PRODUCT INFORMATION .....	5
2.1	Equipment Description .....	5
2.2	Device Capabilities .....	5
2.3	Test Configuration .....	5
2.4	EMI Suppression Device(s)/Modifications .....	5
3.0	DESCRIPTION OF TESTS .....	6
3.1	Measurement Procedure .....	6
3.2	Radiated Power and Radiated Spurious Emissions .....	6
4.0	MEASUREMENT UNCERTAINTY .....	7
5.0	TEST EQUIPMENT CALIBRATION DATA .....	8
6.0	SAMPLE CALCULATIONS .....	9
7.0	TEST RESULTS .....	10
7.1	Summary .....	10
7.2	Occupied Bandwidth .....	12
7.3	Spurious and Harmonic Emissions at Antenna Terminal .....	25
7.4	Band Edge Emissions at Antenna Terminal .....	44
7.5	Peak Power Spectral Density Measurement .....	57
7.6	Peak-Average Ratio .....	96
7.7	Uplink Carrier Aggregation .....	109
7.8	Radiated Power (EIRP) .....	121
7.9	Radiated Spurious Emissions Measurements .....	124
7.10	Uplink Carrier Aggregation Radiated Measurements .....	131
7.11	Frequency Stability / Temperature Variation .....	141
8.0	CONCLUSION .....	144

<b>FCC ID:</b> XIA-IFWA661		<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M1907090120-2-R2.XIA	<b>Test Dates:</b> 7/31-10/2/2019	<b>EUT Type:</b> Outdoor LTE Router		Page 2 of 144



# MEASUREMENT REPORT

## FCC Part 96



Mode	FCC Rule Part	Tx Frequency (MHz)	EIRP		Emission Designator	Modulation
			Max. Power (W)	Max. Power (dBm)		
LTE Band 48 - Main	96	3552.5 - 3697.5	15.596	41.93	4M52G7D	QPSK
LTE Band 48 - Main	96	3552.5 - 3697.5	12.764	41.06	4M51W7D	16QAM
LTE Band 48 - Main	96	3552.5 - 3697.5	9.977	39.99	4M51W7D	64QAM
LTE Band 48 - Main	96	3555 - 3695	15.849	42.00	9M04G7D	QPSK
LTE Band 48 - Main	96	3555 - 3695	12.474	40.96	9M00W7D	16QAM
LTE Band 48 - Main	96	3555 - 3695	9.954	39.98	8M98W7D	64QAM
LTE Band 48 - Main	96	3557.5 - 3692.5	15.922	42.02	13M5G7D	QPSK
LTE Band 48 - Main	96	3557.5 - 3692.5	12.445	40.95	13M5W7D	16QAM
LTE Band 48 - Main	96	3557.5 - 3692.5	9.795	39.91	13M5W7D	64QAM
LTE Band 48 - Main	96	3560 - 3690	16.331	42.13	17M9G7D	QPSK
LTE Band 48 - Main	96	3560 - 3690	13.459	41.29	18M0W7D	16QAM
LTE Band 48 - Main	96	3560 - 3690	10.233	40.10	17M9W7D	64QAM
LTE Band 48 - Diversity	96	3552.5 - 3697.5	15.031	41.77	4M52G7D	QPSK
LTE Band 48 - Diversity	96	3552.5 - 3697.5	12.359	40.92	4M53W7D	16QAM
LTE Band 48 - Diversity	96	3552.5 - 3697.5	9.162	39.62	4M50W7D	64QAM
LTE Band 48 - Diversity	96	3555 - 3695	14.825	41.71	8M99G7D	QPSK
LTE Band 48 - Diversity	96	3555 - 3695	12.560	40.99	8M98W7D	16QAM
LTE Band 48 - Diversity	96	3555 - 3695	9.683	39.86	9M04W7D	64QAM
LTE Band 48 - Diversity	96	3557.5 - 3692.5	15.136	41.80	13M5G7D	QPSK
LTE Band 48 - Diversity	96	3557.5 - 3692.5	12.531	40.98	13M5W7D	16QAM
LTE Band 48 - Diversity	96	3557.5 - 3692.5	9.638	39.84	13M5W7D	64QAM
LTE Band 48 - Diversity	96	3560 - 3690	15.382	41.87	18M0G7D	QPSK
LTE Band 48 - Diversity	96	3560 - 3690	12.882	41.10	18M0W7D	16QAM
LTE Band 48 - Diversity	96	3560 - 3690	9.772	39.90	18M0W7D	64QAM

### EUT Overview (LTE B48)

FCC ID: XIA-IFWA661	 <b>MEASUREMENT REPORT (CERTIFICATION)</b> 		Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router	Page 3 of 144

## 1.0 INTRODUCTION

### 1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

### 1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

### 1.3 Test Facility / Accreditations

**Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21046, U.S.A.**

- PCTEST is a CBRS Alliance (OnGo) Approved Test Lab
- PCTEST is a WinnForum Approved Test Lab
- PCTEST is an ISO 17025-2005 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for CBRS Alliance Certification Test Plan and WinnForum Conformance and Performance Test Technical Standard.
- PCTEST is an ISO 17025-2005 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISSED Standards (RSS).
- PCTEST facility is a registered (2451B) test laboratory with the site description on file with ISSED.

FCC ID: XIA-IFWA661		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 4 of 144

## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Netcomm Outdoor LTE Router FCC ID: XIA-IFWA661**. The test data contained in this report pertains only to the emissions due to the EUT's LTE Band 48 operation in the CBRS band. This device is a Category B CBSD.

**Test Device Serial No.:** 05909

### 2.2 Device Capabilities

This device contains the following capabilities:


Multi-band LTE

### 2.3 Test Configuration

The EUT was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01 v03r01. See Section 7.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

### 2.4 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

FCC ID: XIA-IFWA661		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 5 of 144

## 3.0 DESCRIPTION OF TESTS

### 3.1 Measurement Procedure

The measurement procedures described in the document titled “Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards” (ANSI/TIA-603-E-2016) and “Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems” (KDB 971168 D01 v03r01) were used in the measurement of the EUT.

### 3.2 Radiated Power and Radiated Spurious Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. For measurements below 1GHz, the absorbers are removed. A raised turntable is used for radiated measurement. The turn table is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm tall test table made of Styrodur is placed on top of the turn table. A Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

The equipment under test was transmitting while connected to its integral antenna and is placed on a turntable 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. Radiated power levels are also investigated with the receive antenna horizontally and vertically polarized. The maximized power level is recorded using the spectrum analyzer “Channel Power” function with the integration band set to the emissions’ occupied bandwidth, a RMS detector, RBW = 100kHz, VBW = 300kHz, and a 1 second sweep time over a minimum of 10 sweeps, per the guidelines of KDB 971168 D01 v03r01.

Per the guidance of ANSI/TIA-603-E-2016, a half-wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

$$P_d \text{ [dBm]} = P_g \text{ [dBm]} - \text{cable loss [dB]} + \text{antenna gain [dBd/dBi]}$$

Where,  $P_d$  is the dipole equivalent power,  $P_g$  is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to  $P_g \text{ [dBm]} - \text{cable loss [dB]}$ .

The calculated  $P_d$  levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of  $43 + 10\log_{10}(\text{Power [Watts]})$ .

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 474788 D01.

FCC ID: XIA-IFWA661		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 6 of 144

## 4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of  $k = 2$  to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty ( $\pm$ dB)
Conducted Bench Top Measurements	1.13
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

FCC ID: XIA-IFWA661		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 7 of 144

## 5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	LTX2	Licensed Transmitter Cable Set	6/3/2019	Annual	6/3/2020	LTX2
Agilent	N9020A	MXA Signal Analyzer	4/20/2019	Annual	4/20/2020	US46470561
Agilent	N9030A	PXA Signal Analyzer (44GHz)	6/12/2019	Annual	6/12/2020	MY52350166
Anritsu	MT8821C	Radio Communication Analyzer	3/6/2019	Annual	3/6/2020	6201381794
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	10/10/2017	Biennial	10/10/2019	121034
Com-Power	PAM-103	Pre-Amplifier (1-1000MHz)	9/17/2018	Annual	9/17/2019	441119
Emco	3115	Horn Antenna (1-18GHz)	3/28/2018	Biennial	3/28/2020	9704-5182
Emco	3116	Horn Antenna (18 - 40GHz)	6/7/2018	Triennial	6/7/2021	9203-2178
Espec	ESX-2CA	Environmental Chamber	6/13/2019	Annual	6/13/2020	17620
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	3/28/2018	Biennial	3/28/2020	128337
Huber + Suhner	Sucoflex 102A	40GHz Radiated Cable Set	9/23/2018	Annual	9/23/2019	251425001
Mini Circuits	PWR-SEN-4GHS	USB Power Sensor	4/19/2019	Annual	4/19/2020	11401010036
Mini Circuits	TVA-11-422	RF Power Amp	N/A			QA1317001
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator				11208010032
Rohde & Schwarz	CMW500	Radio Communication Tester	9/25/2018	Annual	9/25/2019	102060
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	6/5/2019	Annual	6/5/2020	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	10/9/2018	Annual	10/9/2019	100348
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	5/6/2019	Annual	5/6/2020	103200
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	7/11/2019	Annual	10/11/2019	102134
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	7/11/2019	Annual	10/11/2019	102133
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	10/9/2018	Annual	10/9/2019	100040
Seekonk	NC-100	Torque Wrench	5/9/2018	Biennial	5/9/2020	22217

**Table 5-1. Test Equipment**

### Notes:

- For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.
- Equipment with a calibration date of "N/A" shown in this list was not used to make direct calibrated measurements.

FCC ID: XIA-IFWA661		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router	Page 8 of 144	



## 6.0 SAMPLE CALCULATIONS

### Emission Designator

#### QPSK Modulation

**Emission Designator = 8M62G7D**

LTE BW = 8.62 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

#### QAM Modulation

**Emission Designator = 8M45W7D**

LTE BW = 8.45 MHz

W = Amplitude/Angle Modulated



7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

### Spurious Radiated Emission – LTE Band

#### **Example: Middle Channel LTE Mode 2<sup>nd</sup> Harmonic (1564 MHz)**

The average spectrum analyzer reading at 3 meters with the EUT on the turntable was –81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of –81.0 dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 1564 MHz. So 6.1 dB is added to the signal generator reading of –30.9 dBm yielding –24.80 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm – (-24.80).

FCC ID: XIA-IFWA661		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 9 of 144

## 7.0 TEST RESULTS

### 7.1 Summary

Company Name: Netcomm Wireless Limited  
 FCC ID: XIA-IFWA661  
 FCC Classification: Citizens Band Category A and B Devices (CBD)  
 Mode(s): LTE

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1049	Occupied Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
2.1046	Transmitter Conducted Output Power	N/A		PASS	Section 7.8
2.1051 96.41(e)	Out of Band Emissions	-13 dBm/MHz at frequencies within 0-10MHz of channel edge -25 dBm/MHz at frequencies greater than 10MHz above and below channel edge -40 dBm/MHz at frequencies below 3530 MHz and above 3720 MHz		PASS	Section 7.3, 7.4
96.41(b)	Peak Power Spectral Density	37 dBm/MHz		PASS	Section 7.5
96.41(g)	Peak-Average Ratio	< 13 dB		PASS	Section 7.6
96.41(e)	Uplink Carrier Aggregation Out of Band Emissions	-13 dBm/MHz at frequencies within 0-10MHz of channel edge -25 dBm/MHz at frequencies greater than 10MHz above and below channel edge -40 dBm/MHz at frequencies below 3530 MHz and above 3720 MHz		PASS	Section 7.7
2.1055	Frequency Stability	Fundamental emissions stay within authorized frequency block		PASS	Section 7.11

Table 7-1. Summary of Conducted Test Results

FCC ID: XIA-IFWA661		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router	Page 10 of 144	

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
96.41(b)	Equivalent Isotropic Radiated Power (EIRP)	47 dBm/10MHz	RADIATED	PASS	Section 7.8
2.1053 96.41(e)	Undesirable Emissions	-40 dBm/MHz		PASS	Section 7.9
96.41(e)	Uplink Carrier Aggregation	Undesirable emissions must meet the limits detailed in 96.41(e)		PASS	Section 7.10

**Table 7-2. Summary of Radiated Test Results**

**Notes:**

- 1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
- 4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "LTE Automation," Version 5.1.

FCC ID: XIA-IFWA661		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router	Page 11 of 144	

## 7.2 Occupied Bandwidth

**\$2.1049**

### Test Overview

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. All modes of operation were investigated and the worst case configuration results are reported in this section.

### Test Procedure Used

KDB 971168 D01 v03r01 – Section 4.2

### Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW  $\geq 3 \times$  RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

### Test Setup

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



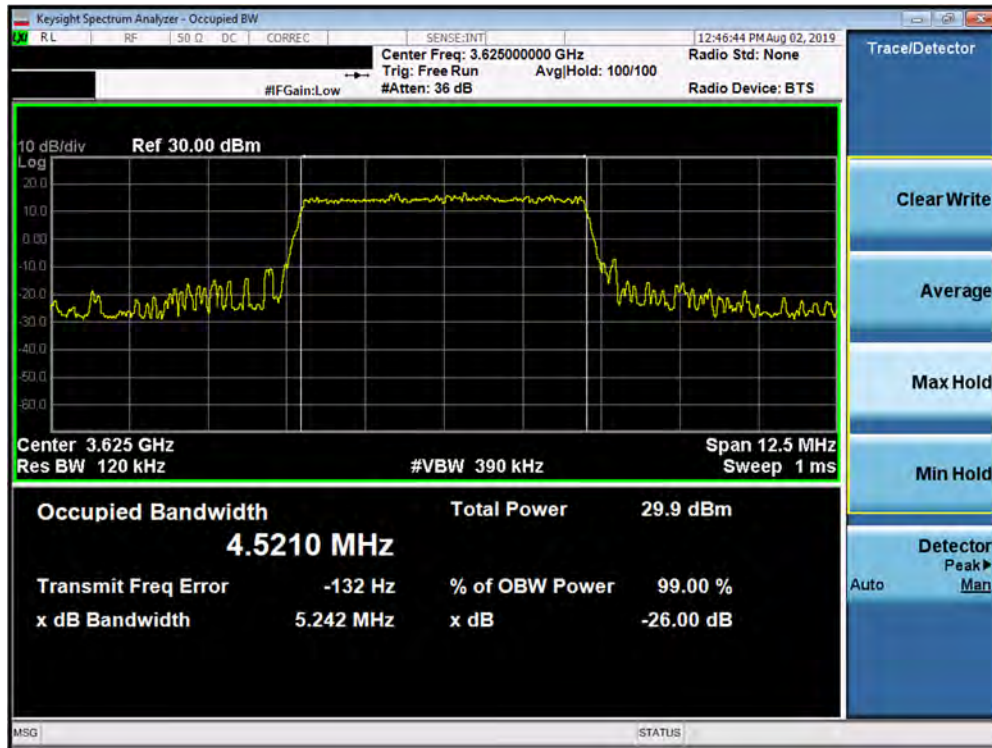
**Figure 7-1. Test Instrument & Measurement Setup**

### Test Notes

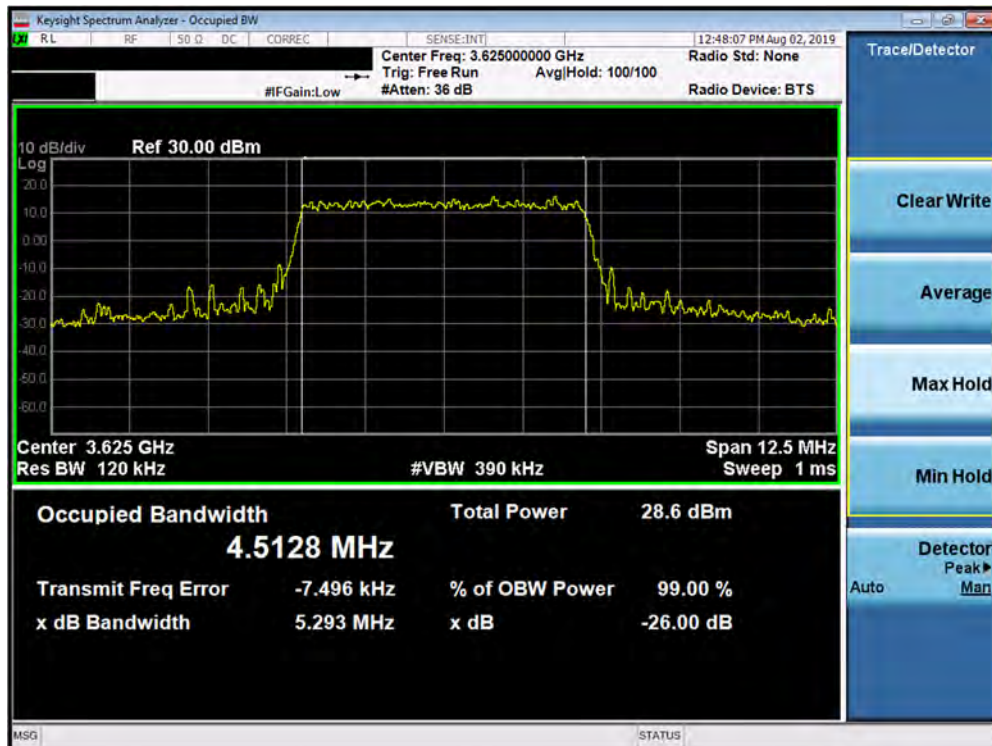
None.

FCC ID: XIA-IFWA661		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 12 of 144

## Band 48 – Main Antenna



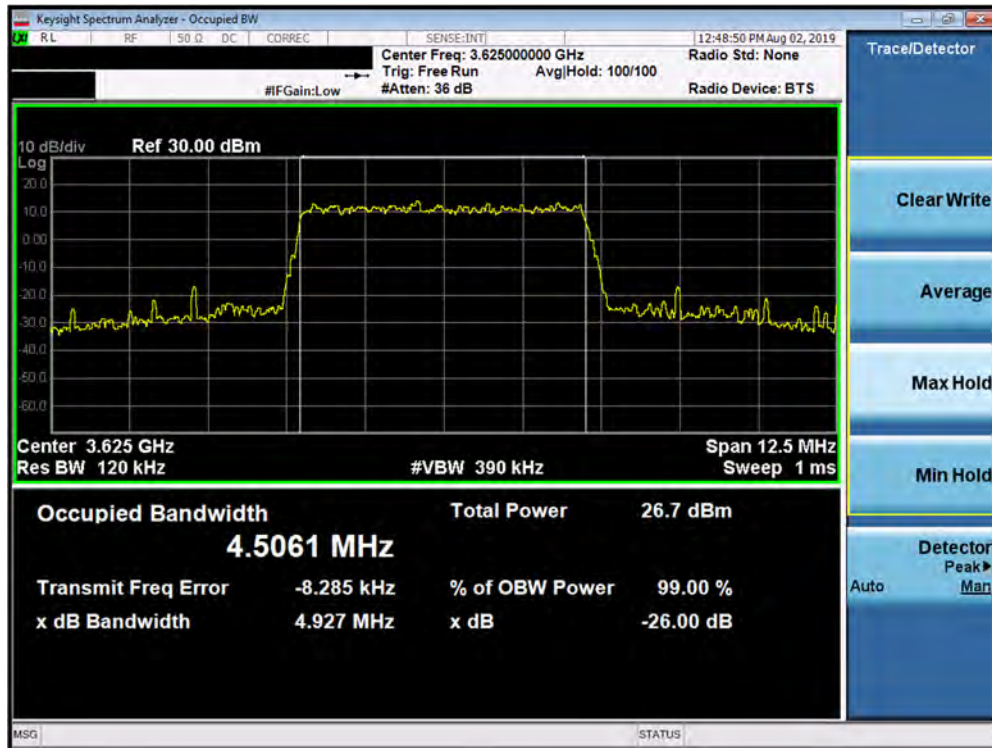
Plot 7-1. Occupied Bandwidth Plot (Band 48 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-2. Occupied Bandwidth Plot (Band 48 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>NetCommWireless</b>	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 13 of 144



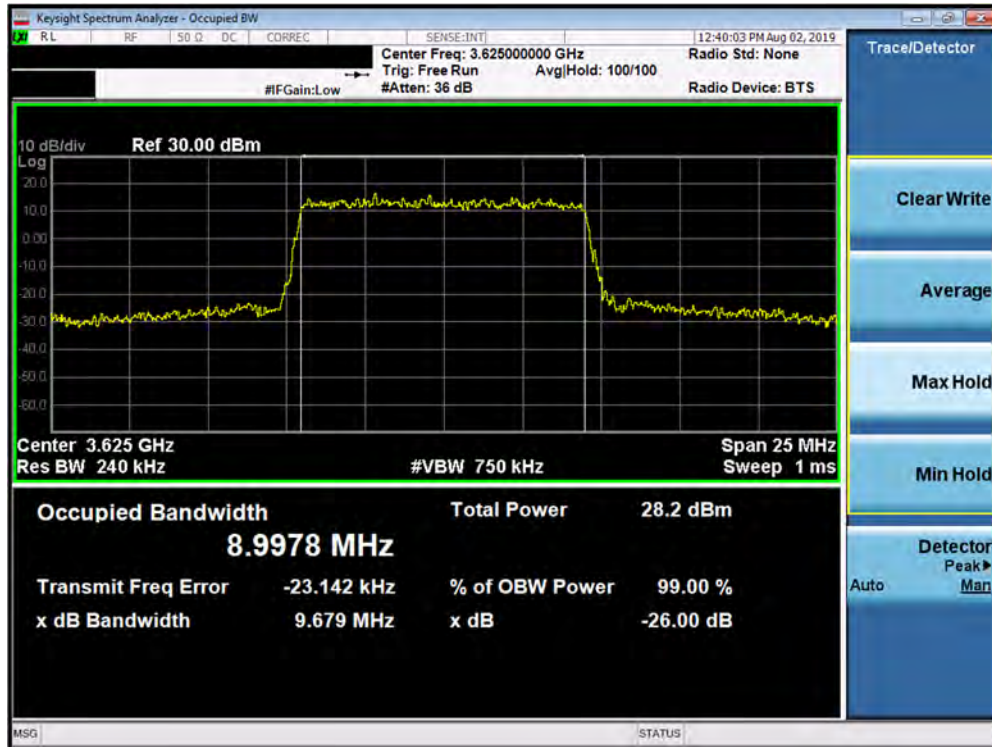


Plot 7-3. Occupied Bandwidth Plot (Band 48 - 5.0MHz 64-QAM - Full RB Configuration)



Plot 7-4. Occupied Bandwidth Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 14 of 144

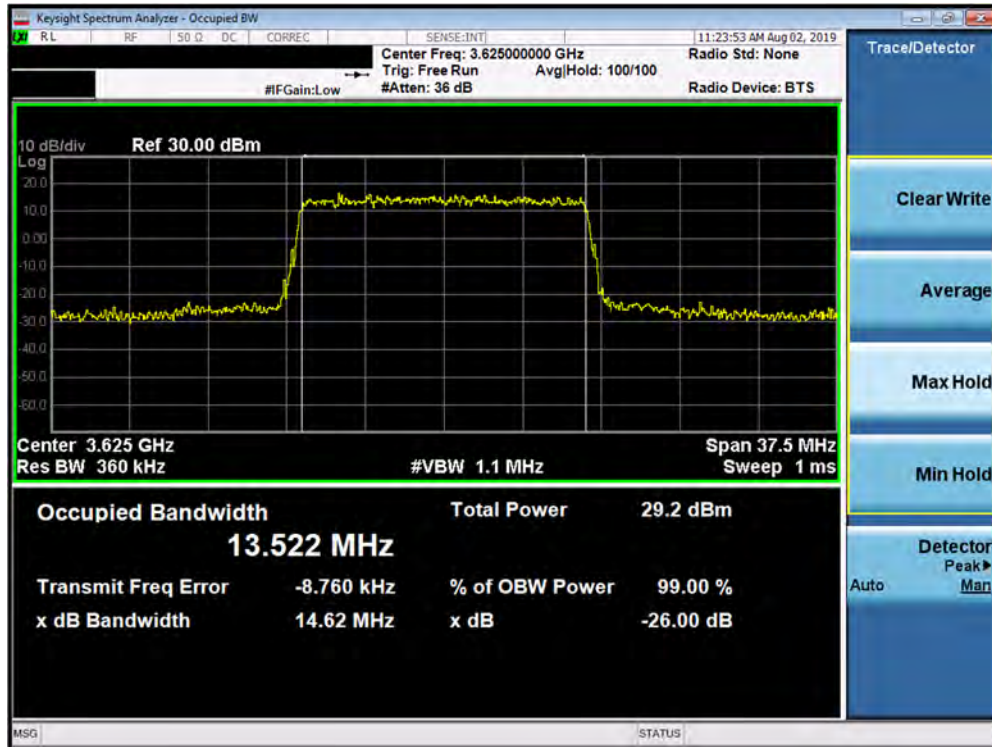


Plot 7-5. Occupied Bandwidth Plot (Band 48 - 10.0MHz 16-QAM - Full RB Configuration)



Plot 7-6. Occupied Bandwidth Plot (Band 48 - 10.0MHz 64-QAM - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 15 of 144



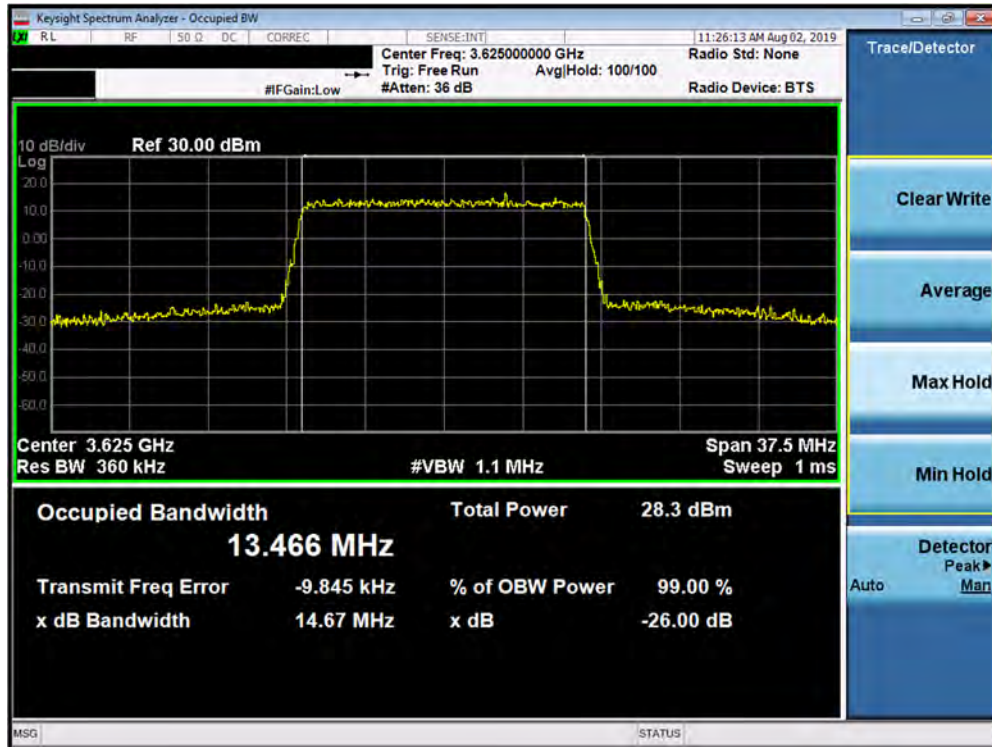
Plot 7-7. Occupied Bandwidth Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)



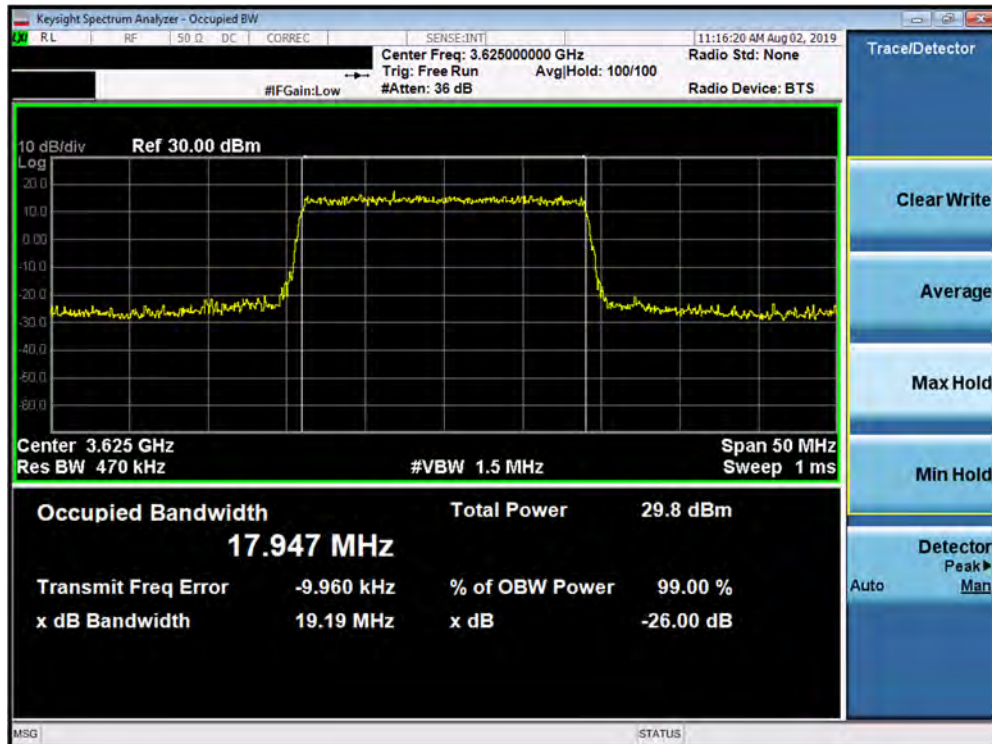
Plot 7-8. Occupied Bandwidth Plot (Band 48 - 15.0MHz 16-QAM - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 16 of 144



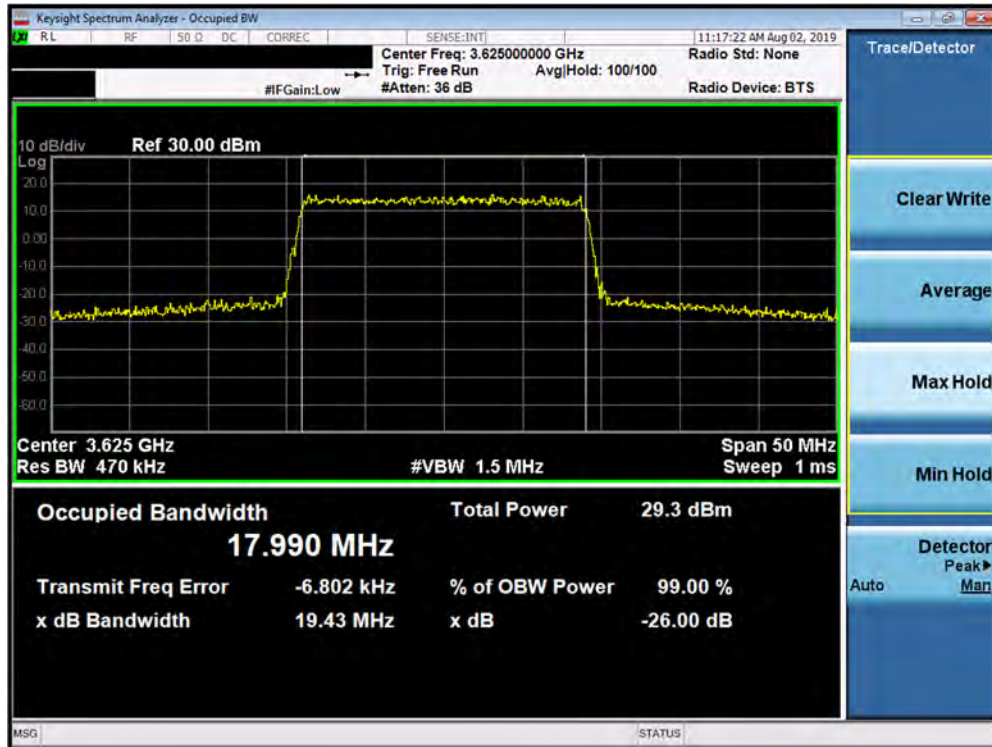


Plot 7-9. Occupied Bandwidth Plot (Band 48 - 15.0MHz 64-QAM - Full RB Configuration)

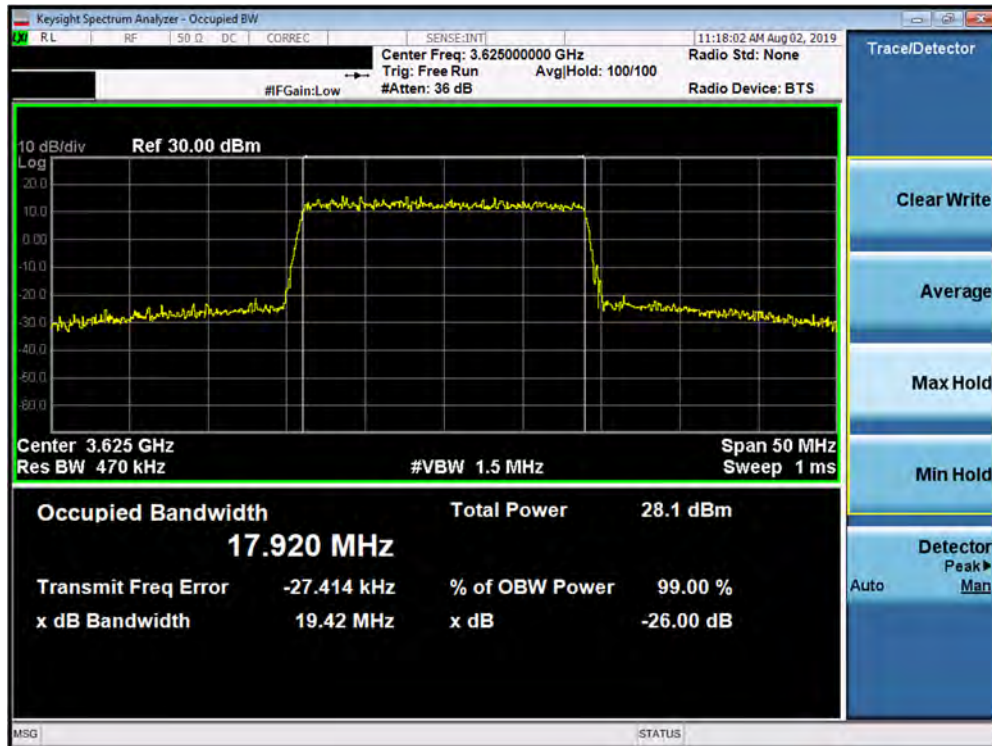


Plot 7-10. Occupied Bandwidth Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	<b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>NetCommWireless</b>	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 17 of 144



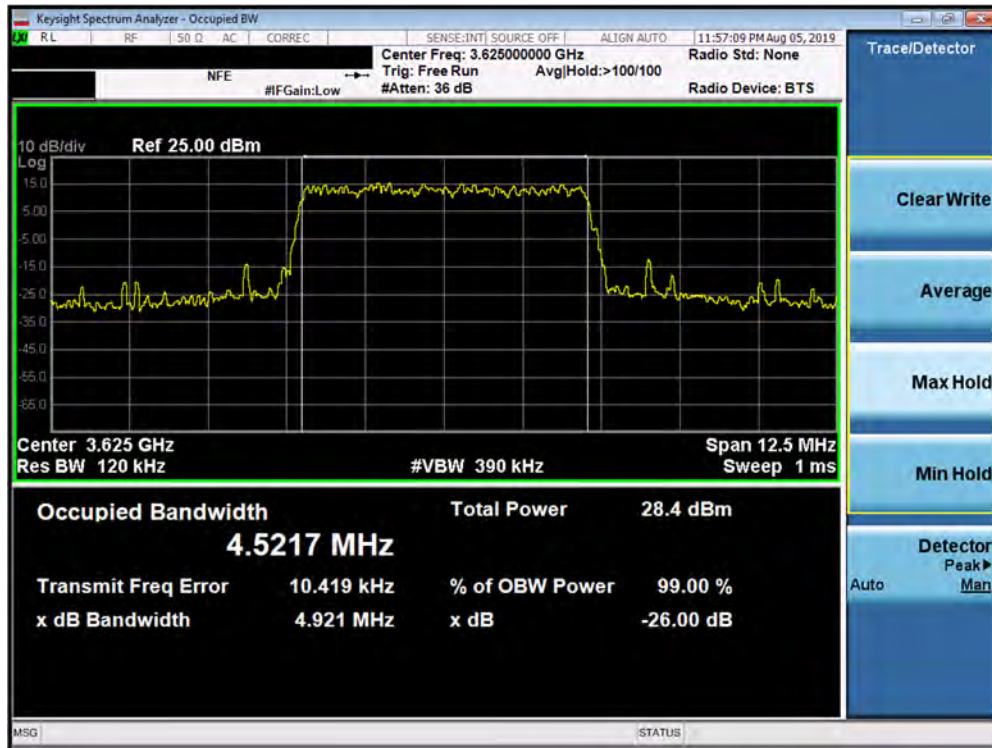
Plot 7-11. Occupied Bandwidth Plot (Band 48 - 20.0MHz 16-QAM - Full RB Configuration)



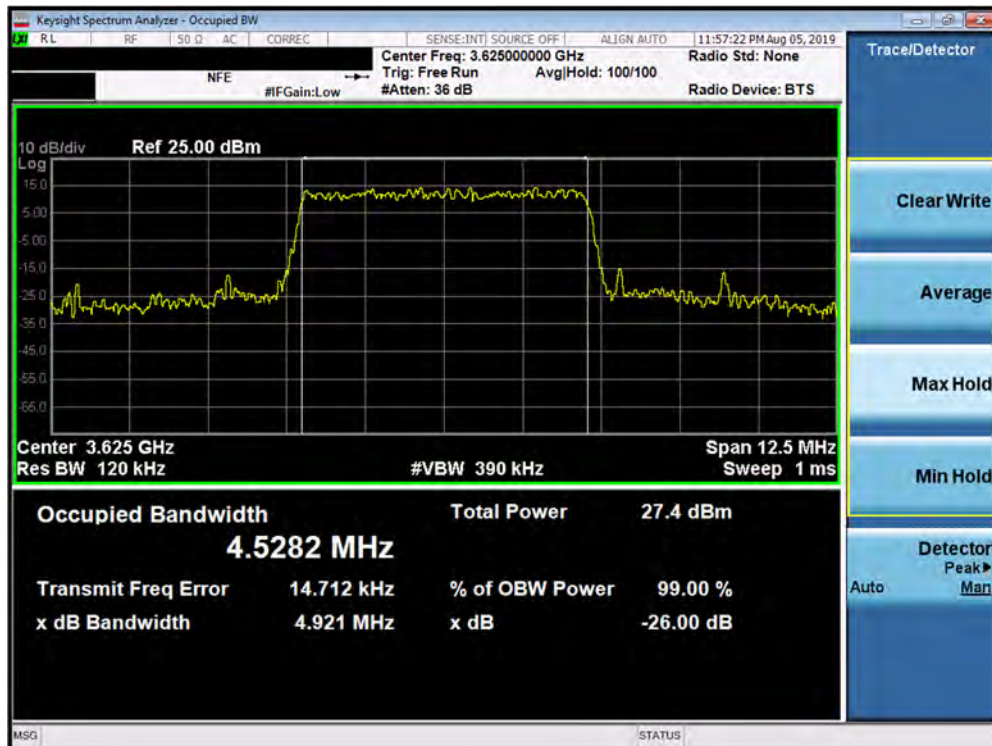
Plot 7-12. Occupied Bandwidth Plot (Band 48 - 20.0MHz 64-QAM - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 18 of 144

## Band 48 – Diversity Antenna



Plot 7-13. Occupied Bandwidth Plot (Band 48 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-14. Occupied Bandwidth Plot (Band 48 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 19 of 144



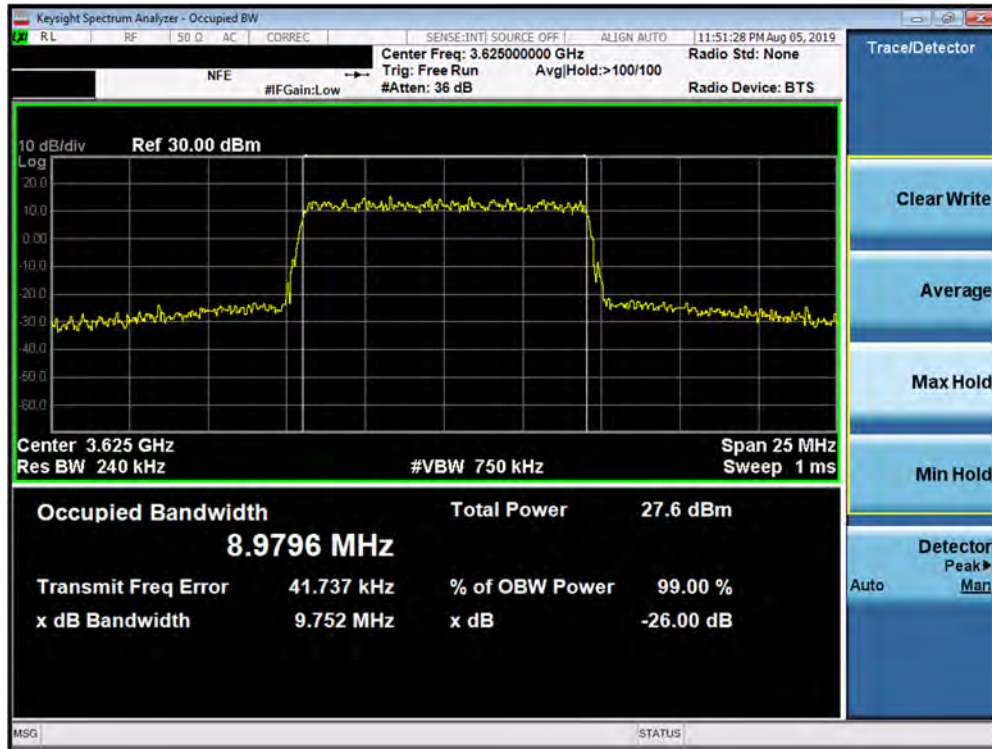


Plot 7-15. Occupied Bandwidth Plot (Band 48 - 5.0MHz 64-QAM - Full RB Configuration)

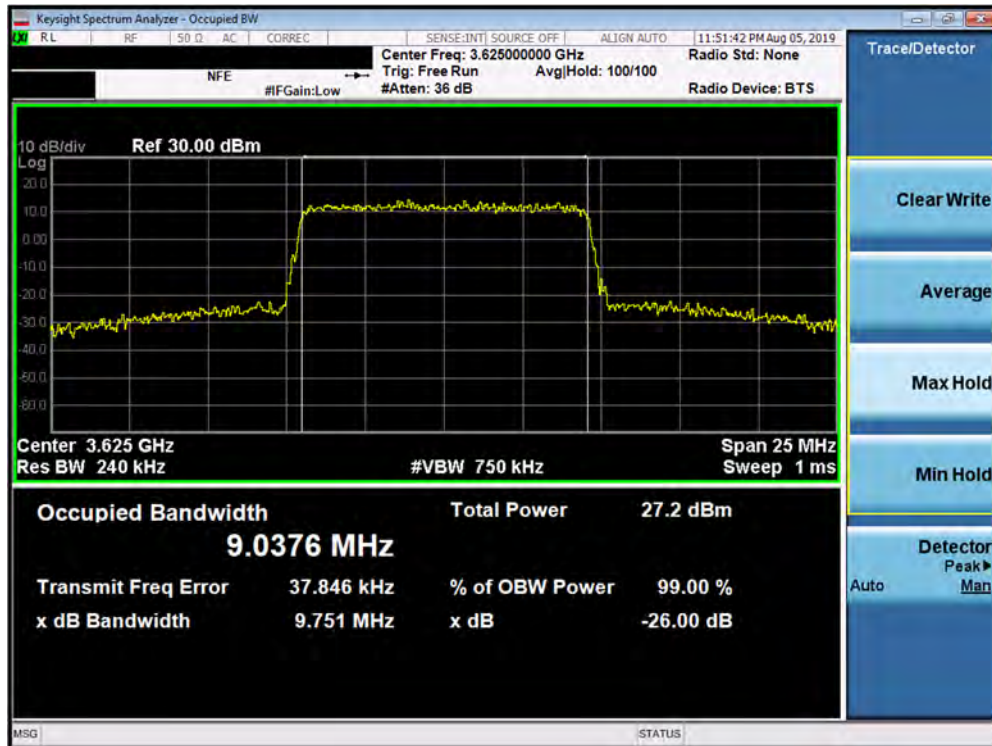


Plot 7-16. Occupied Bandwidth Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 20 of 144

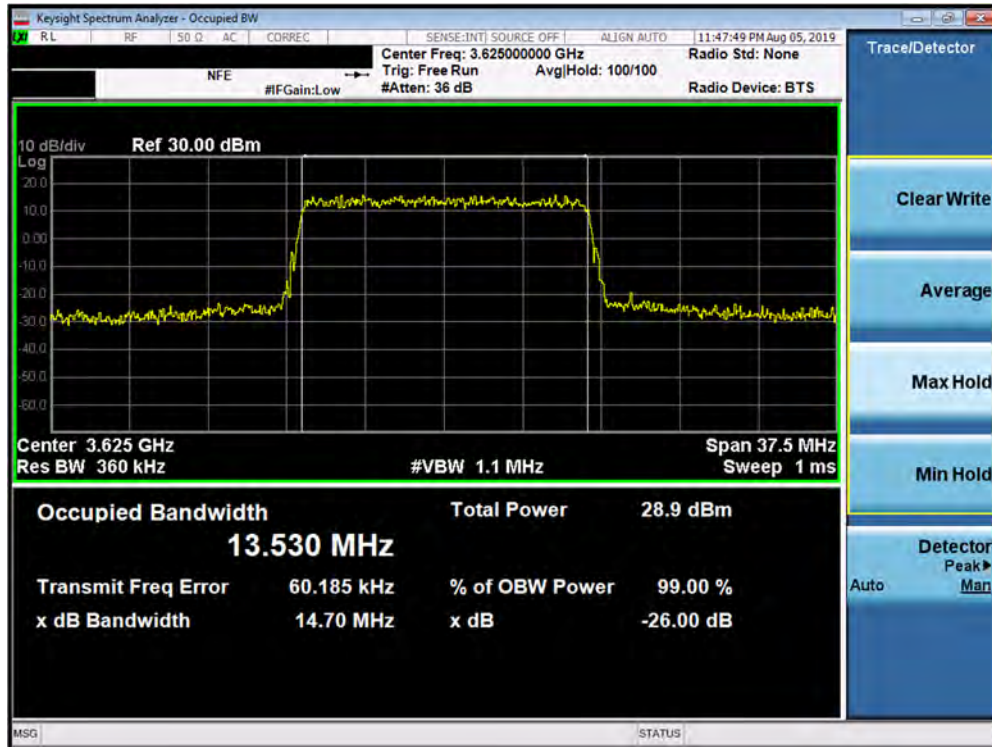


Plot 7-17. Occupied Bandwidth Plot (Band 48 - 10.0MHz 16-QAM - Full RB Configuration)



Plot 7-18. Occupied Bandwidth Plot (Band 48 - 10.0MHz 64-QAM - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 21 of 144



Plot 7-19. Occupied Bandwidth Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)



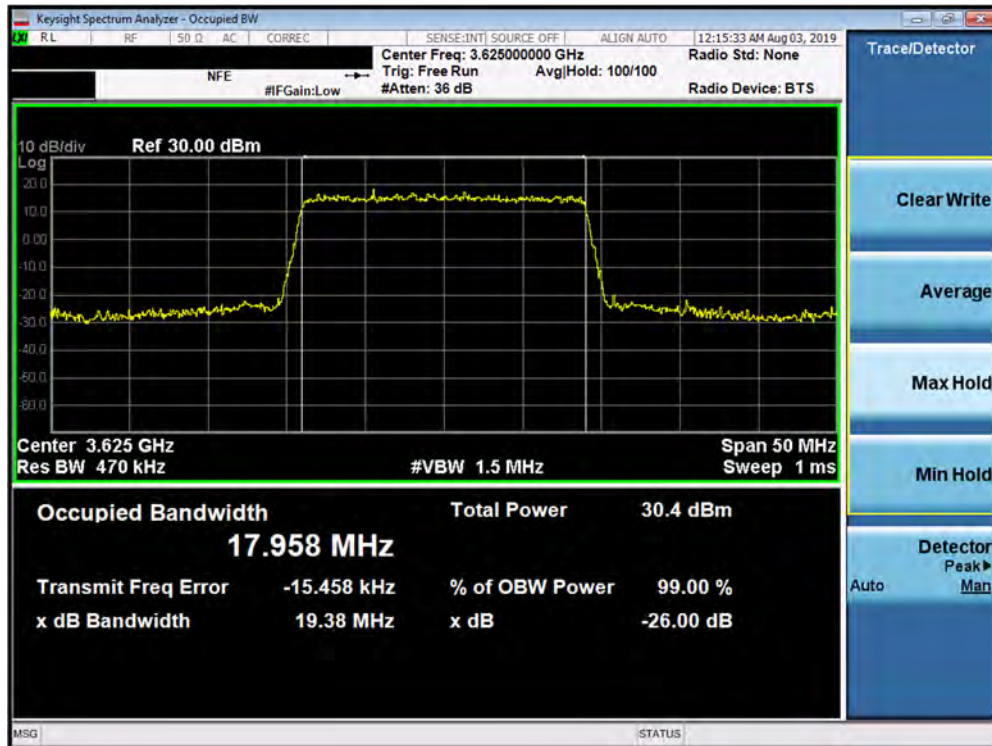
Plot 7-20. Occupied Bandwidth Plot (Band 48 - 15.0MHz 16-QAM - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 22 of 144





Plot 7-21. Occupied Bandwidth Plot (Band 48 - 15.0MHz 64-QAM - Full RB Configuration)

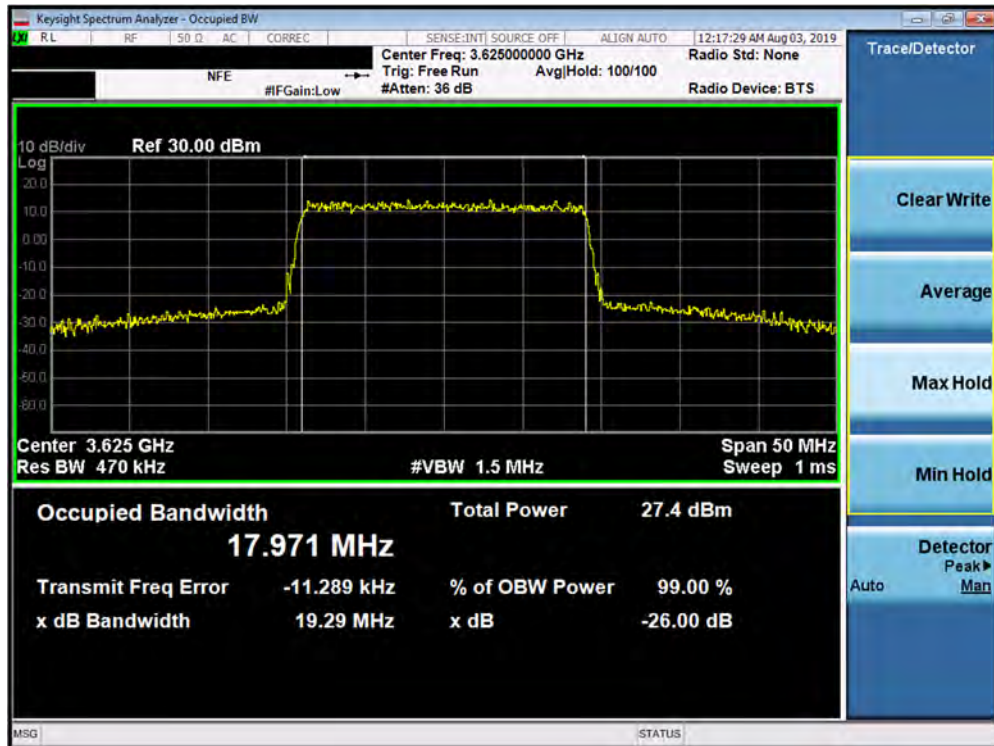


Plot 7-22. Occupied Bandwidth Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 23 of 144



Plot 7-23. Occupied Bandwidth Plot (Band 48 - 20.0MHz 16-QAM - Full RB Configuration)



Plot 7-24. Occupied Bandwidth Plot (Band 48 - 20.0MHz 64-QAM - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 24 of 144



### 7.3 Spurious and Harmonic Emissions at Antenna Terminal §2.1051 §96.41(e)

#### Test Overview

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10<sup>th</sup> harmonic. 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 conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/Mhz.***

#### Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

#### Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to at least 10 \* the fundamental frequency (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = Max Hold
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

#### Test Setup

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



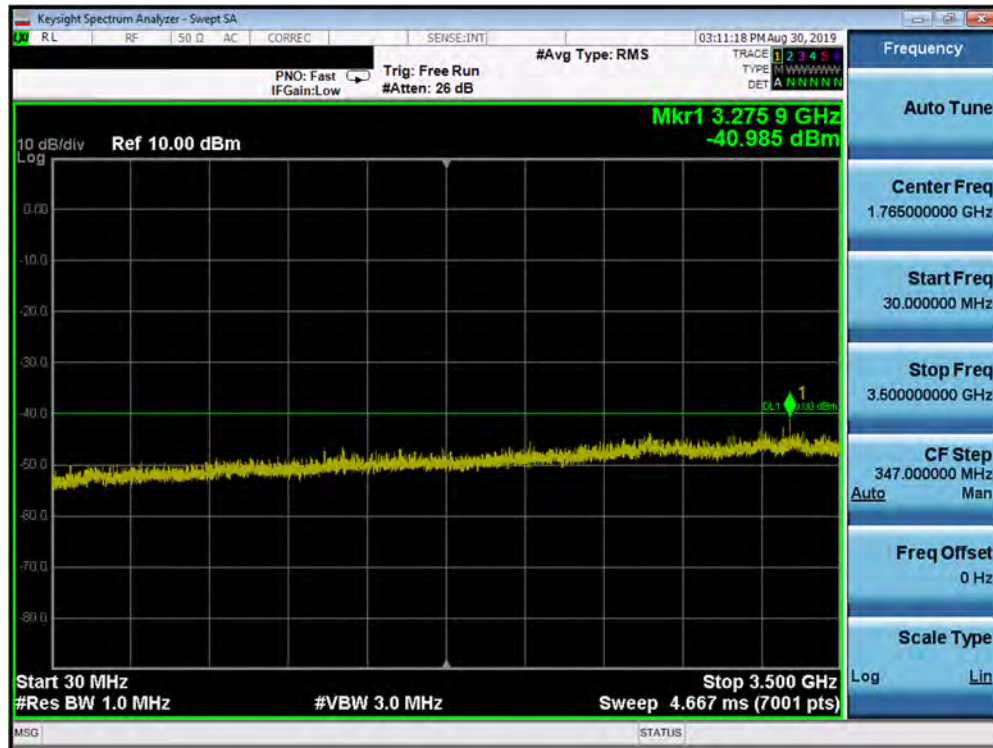
**Figure 7-2. Test Instrument & Measurement Setup**

#### Test Notes

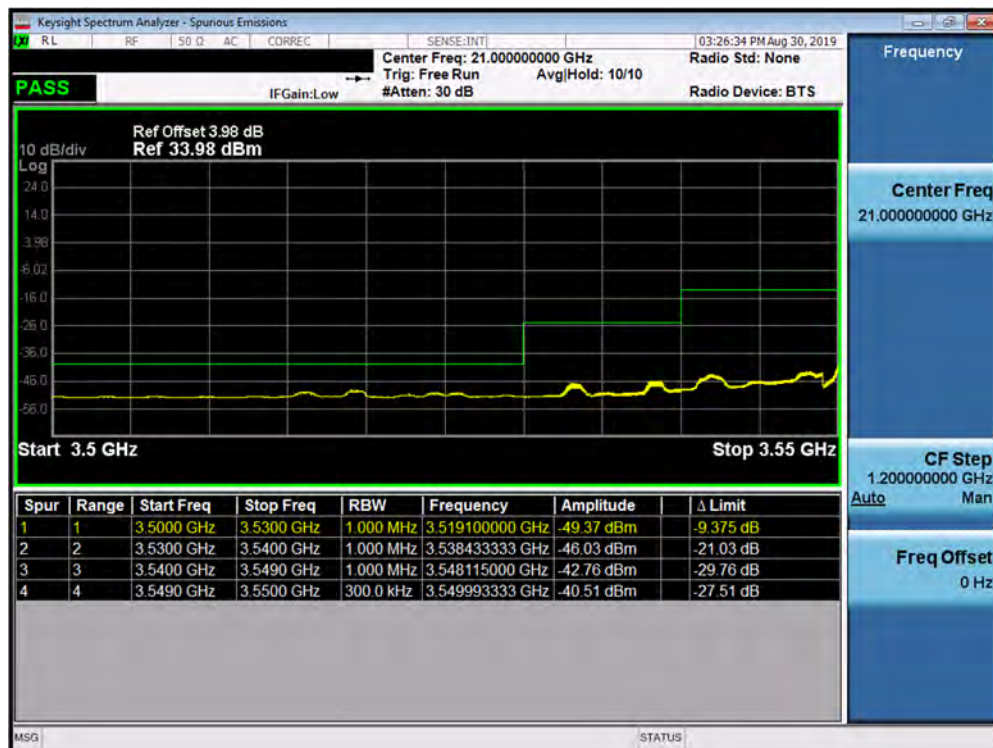
Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. 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.

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	<b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>NetCommWireless</b>	<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M1907090120-2-R2.XIA	<b>Test Dates:</b> 7/31-10/2/2019	<b>EUT Type:</b> Outdoor LTE Router		Page 25 of 144

## Band 48 – Main Antenna

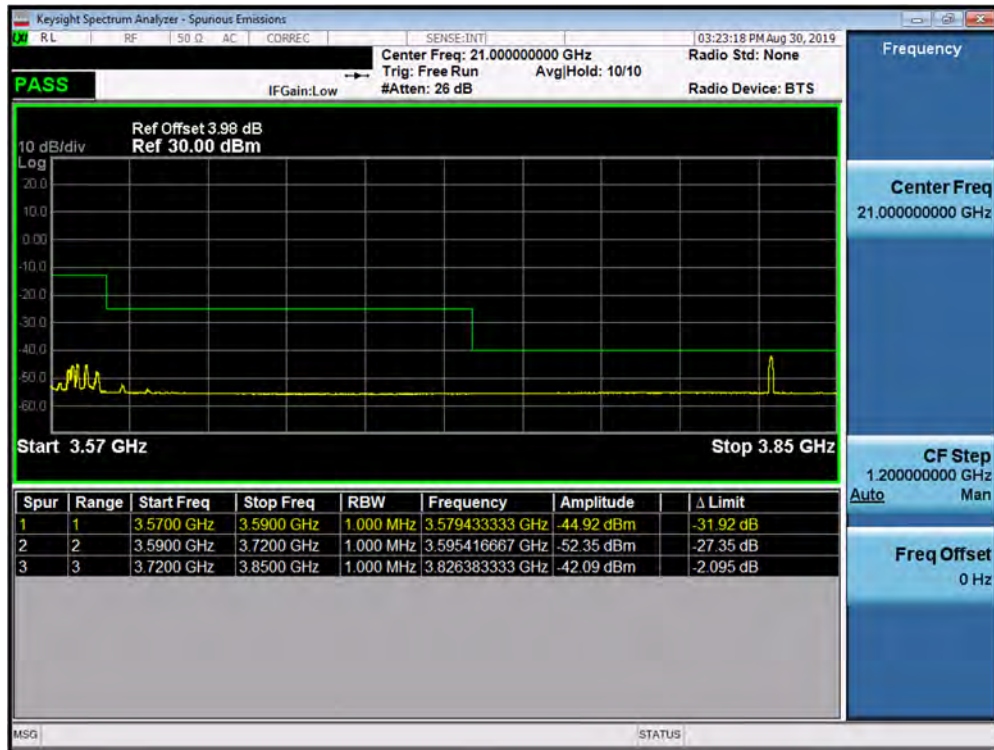


Plot 7-25. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

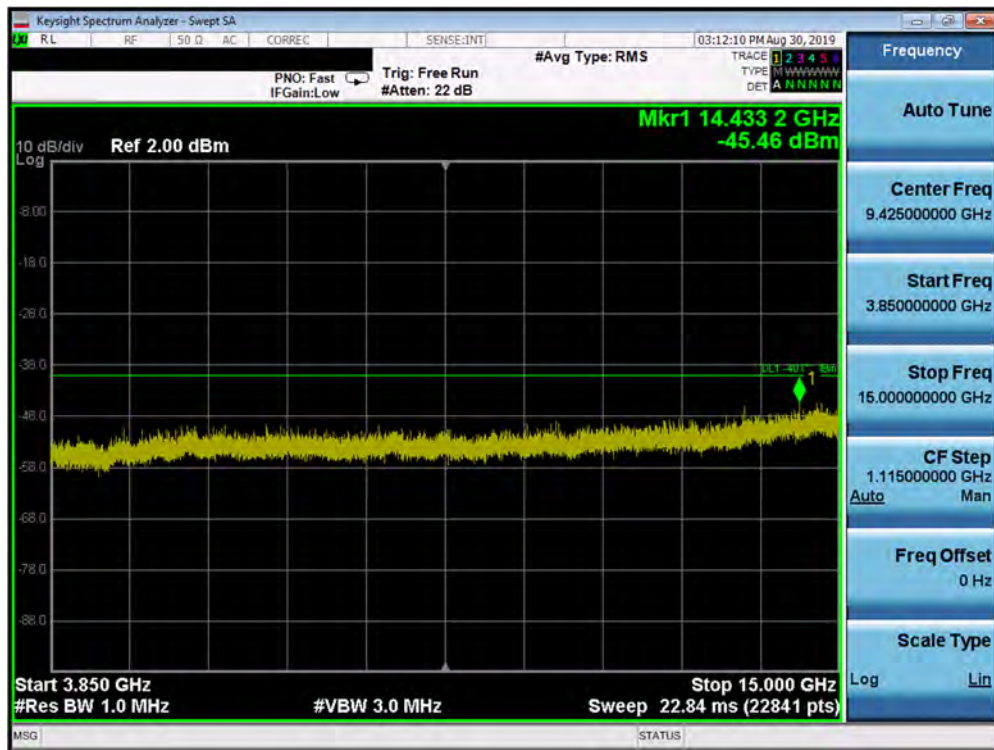


Plot 7-26. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 26 of 144



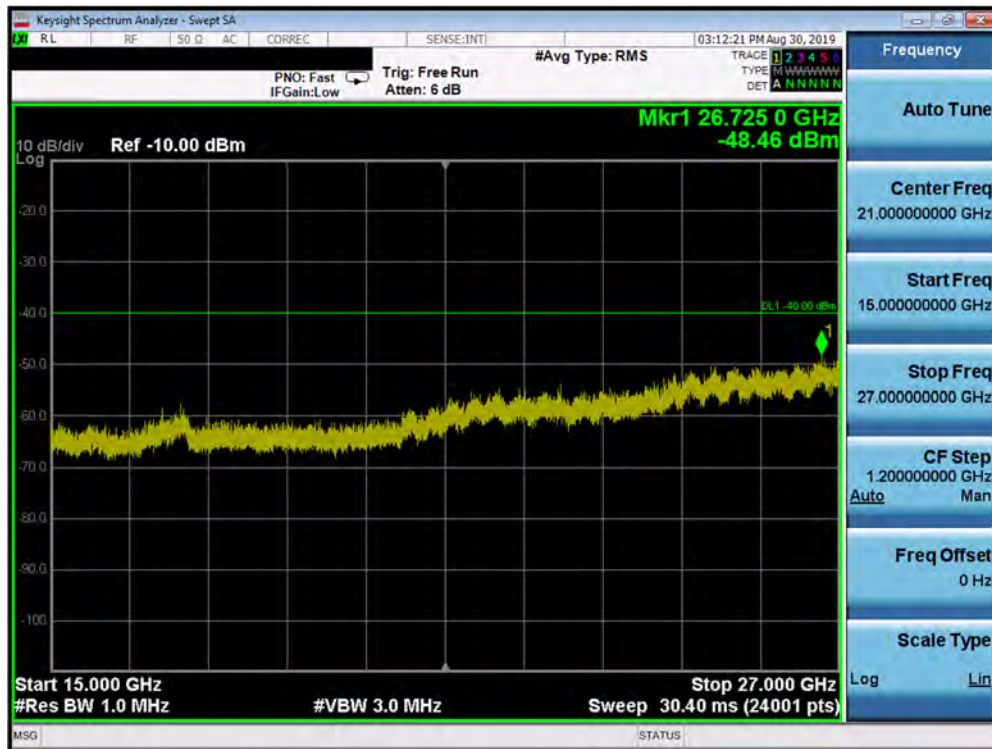
Plot 7-27. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



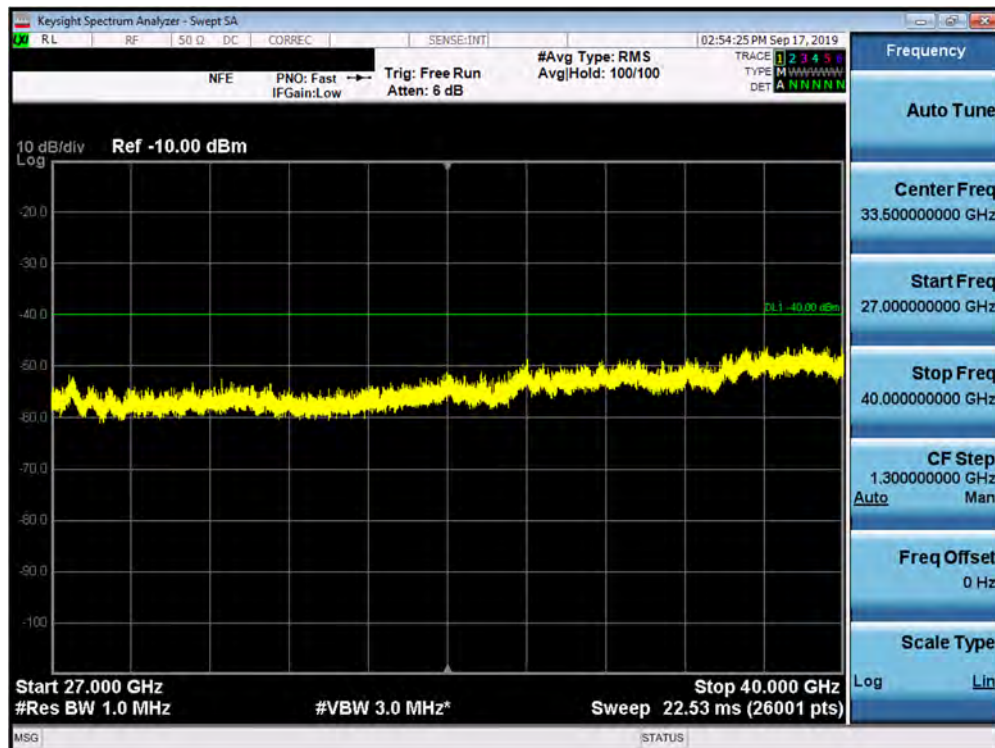
Plot 7-28. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: XIA-IFWA661	<b>MEASUREMENT REPORT</b> (CERTIFICATION)			Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 27 of 144



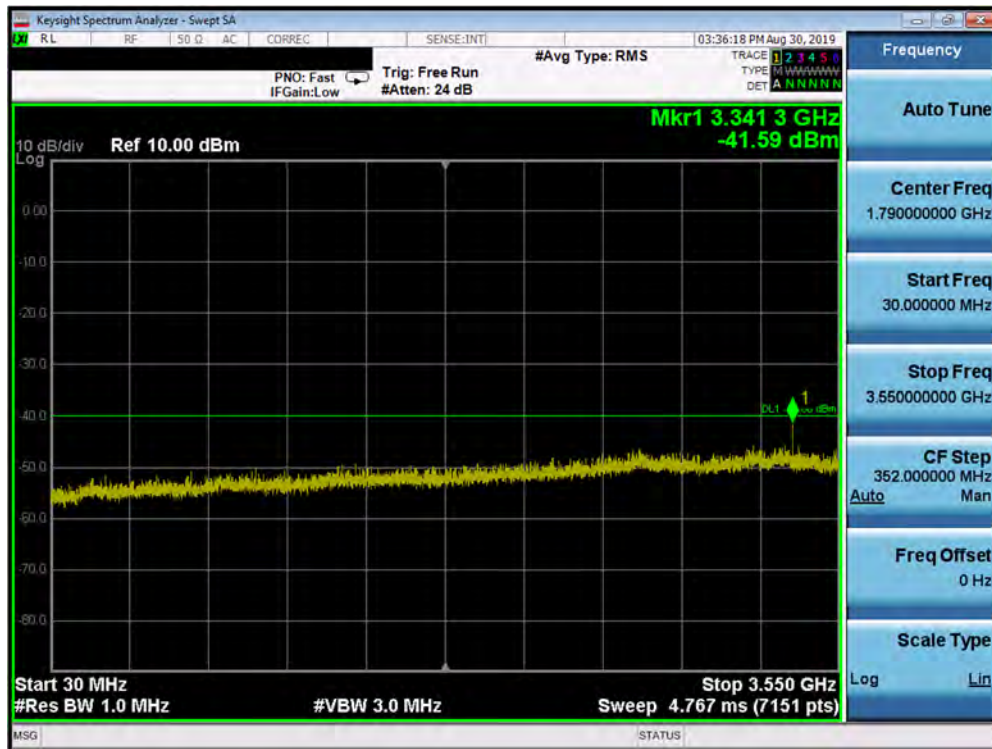


Plot 7-29. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

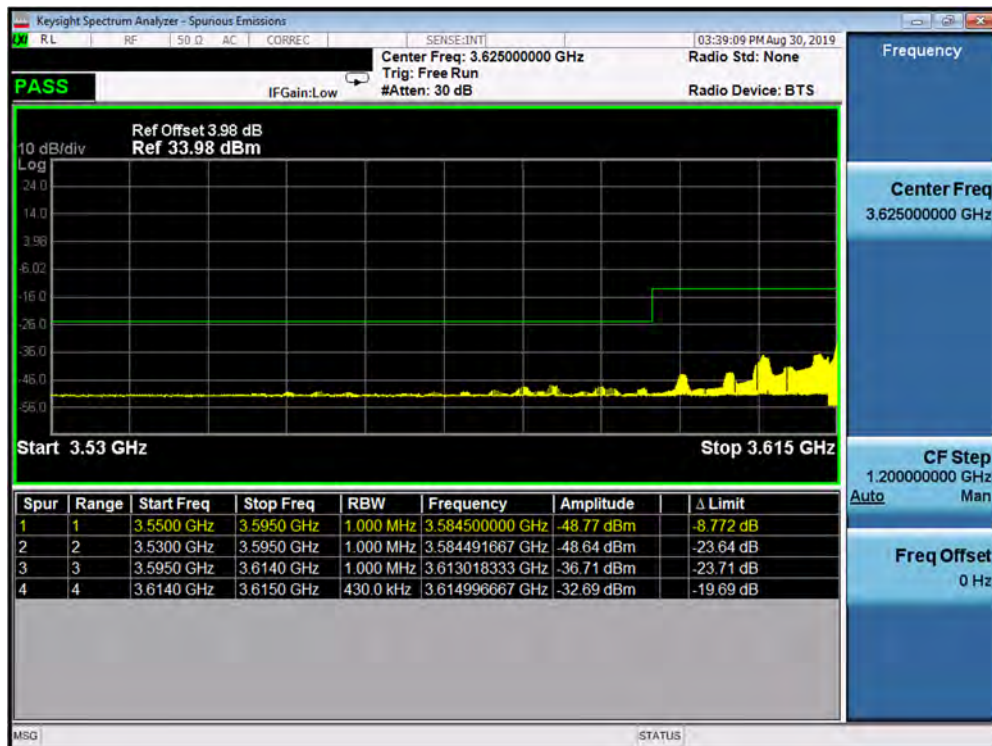


Plot 7-30. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 28 of 144

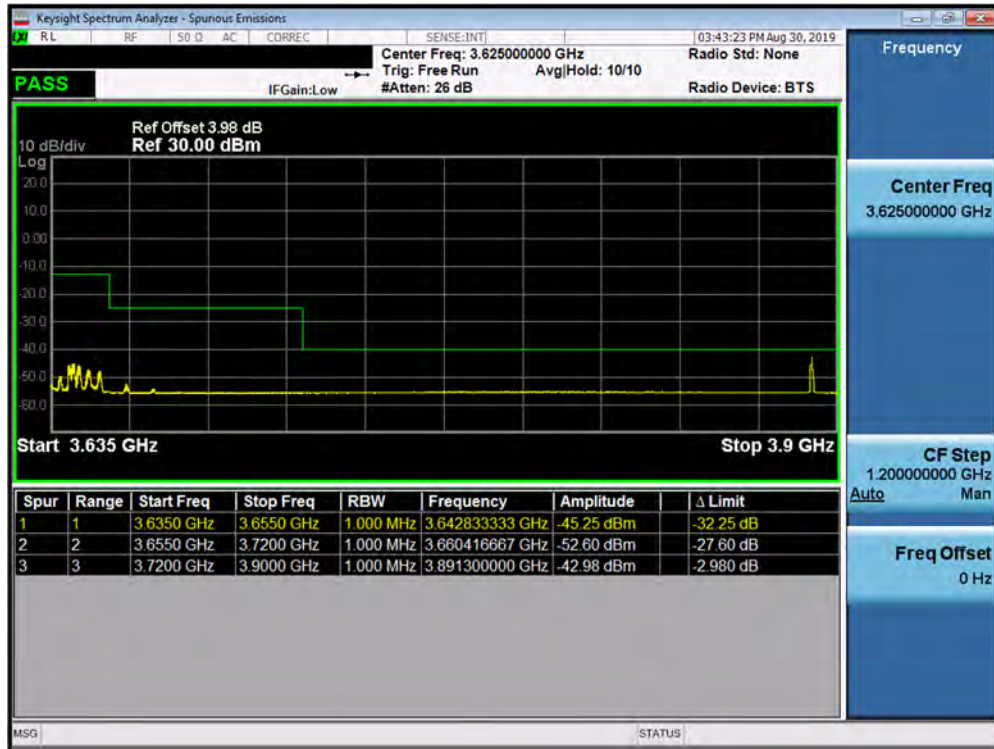


Plot 7-31. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

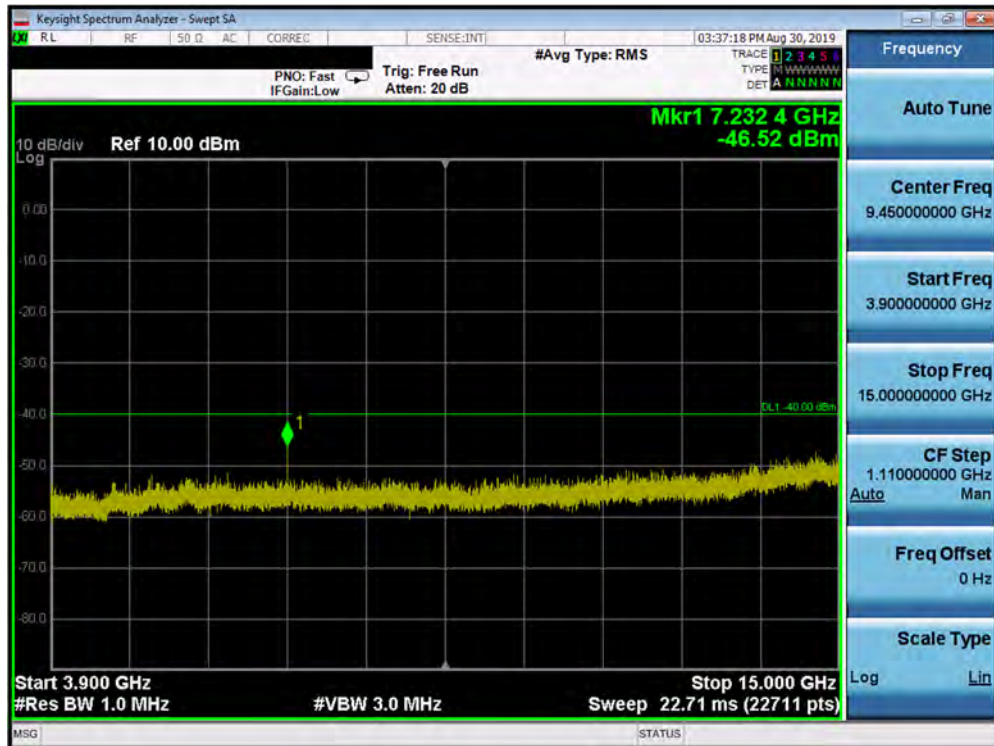


Plot 7-32. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 29 of 144



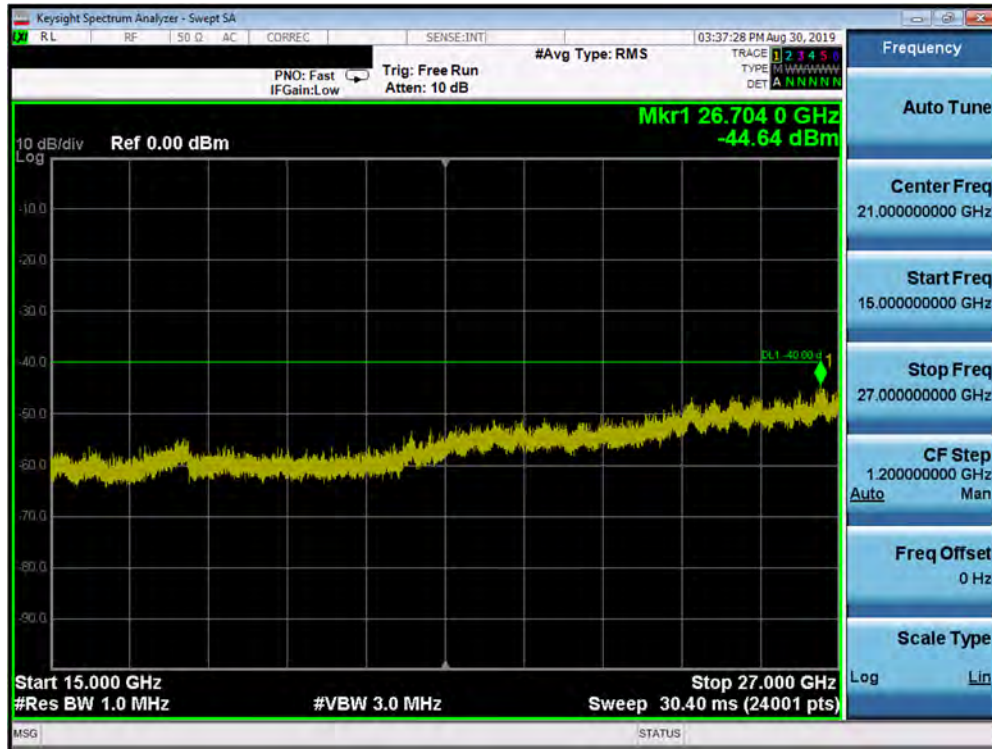
Plot 7-33. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



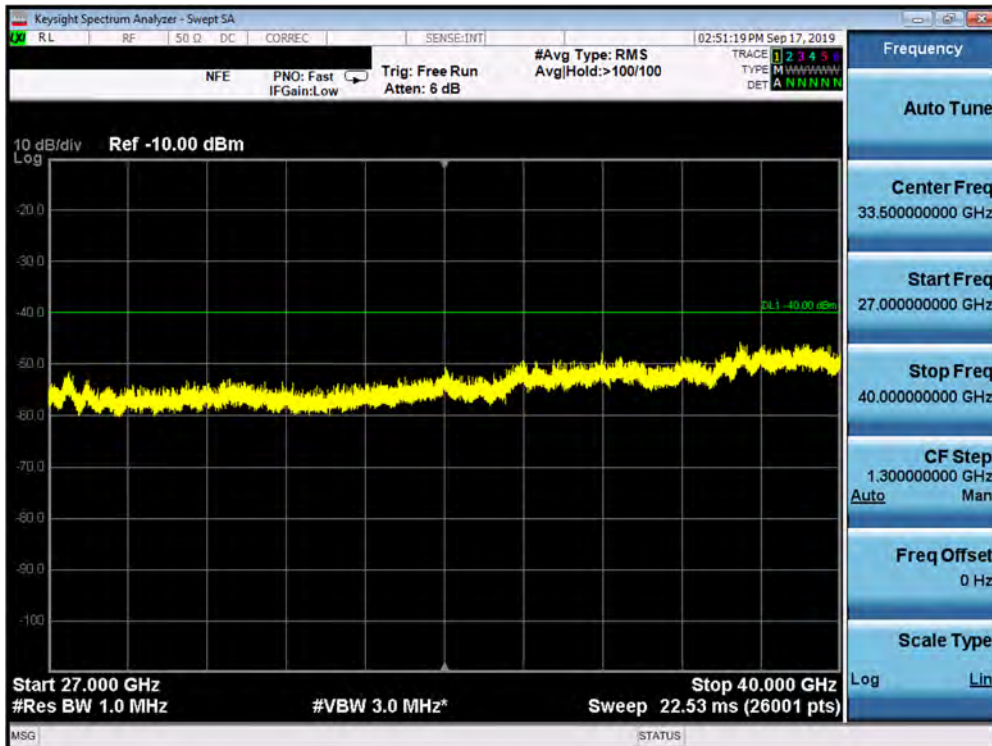
Plot 7-34. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 30 of 144



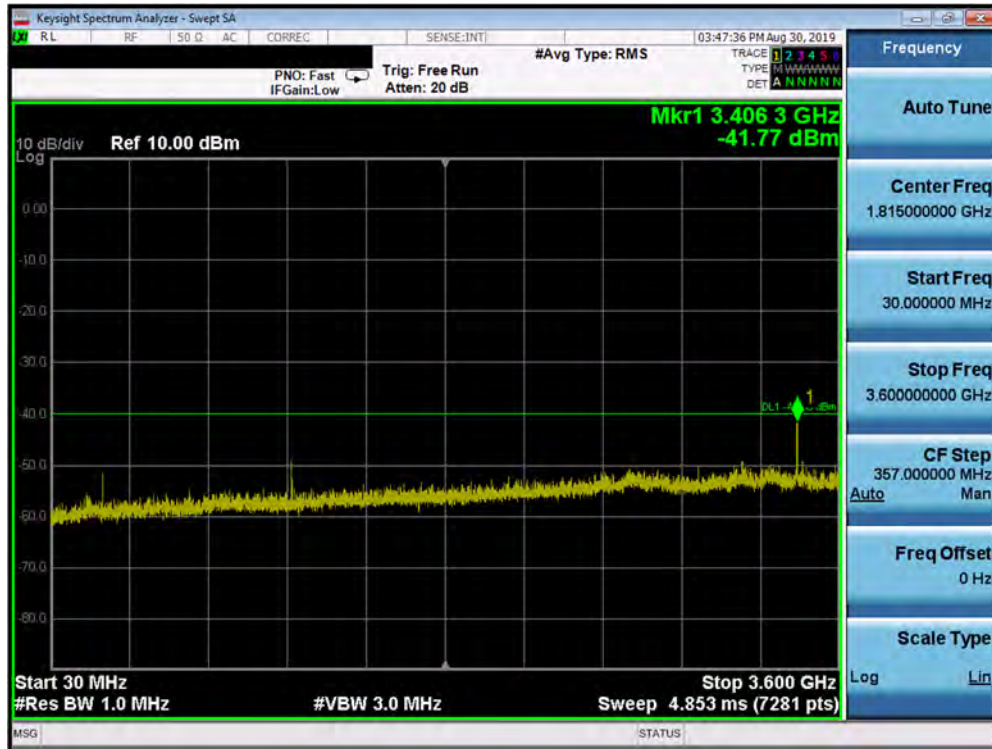


Plot 7-35. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

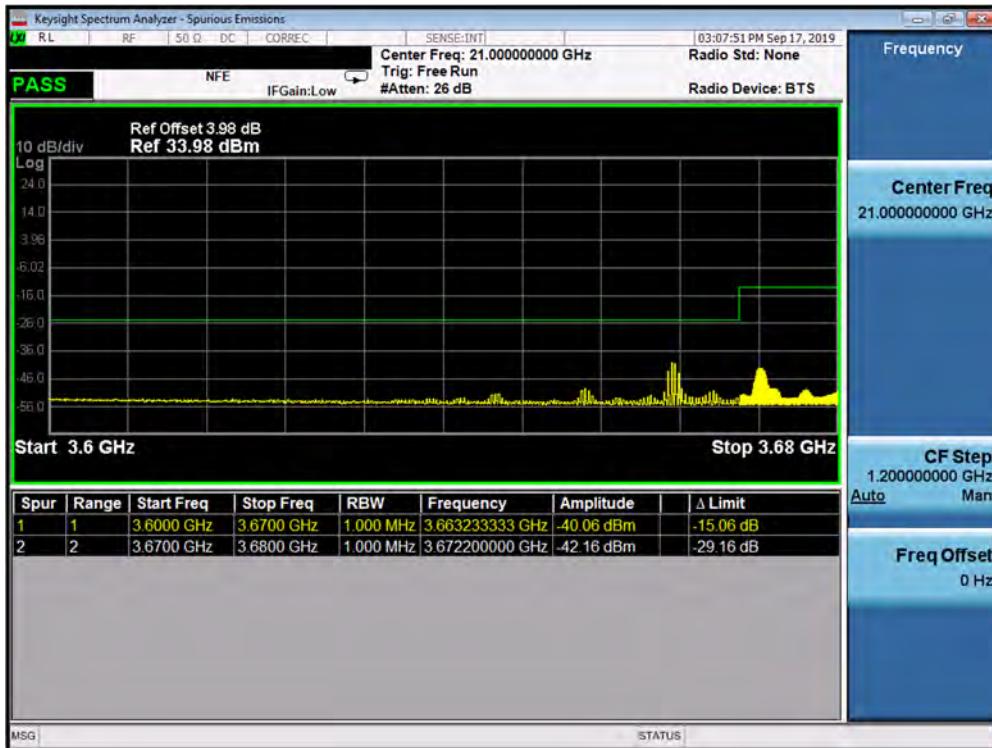


Plot 7-36. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 31 of 144



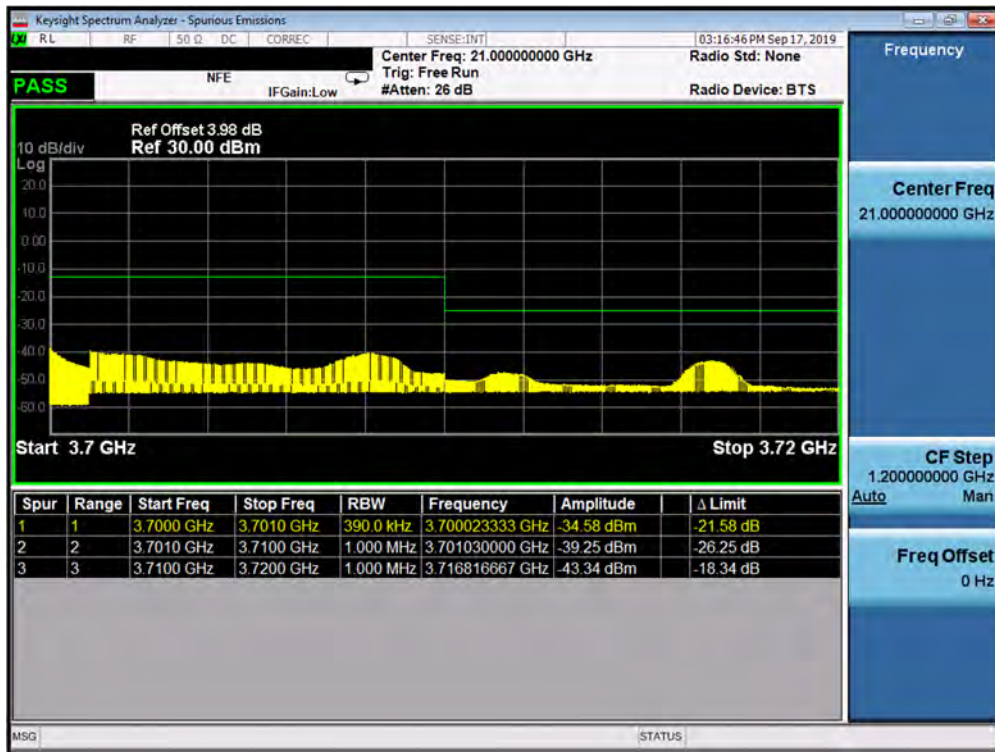
Plot 7-37. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)



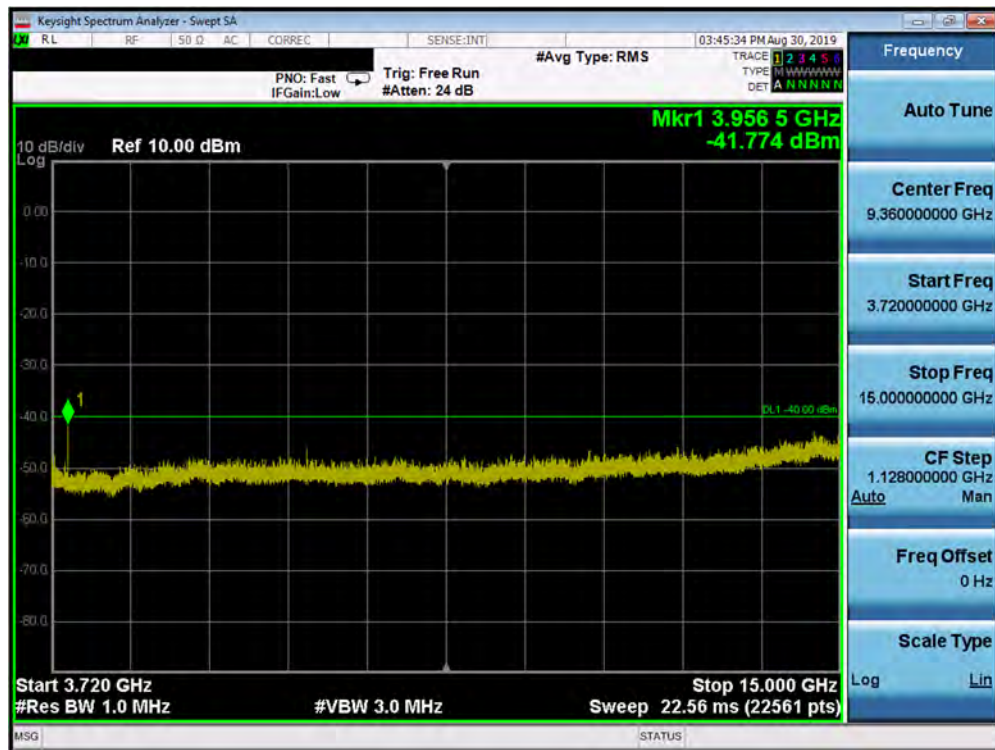
Plot 7-38. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 32 of 144



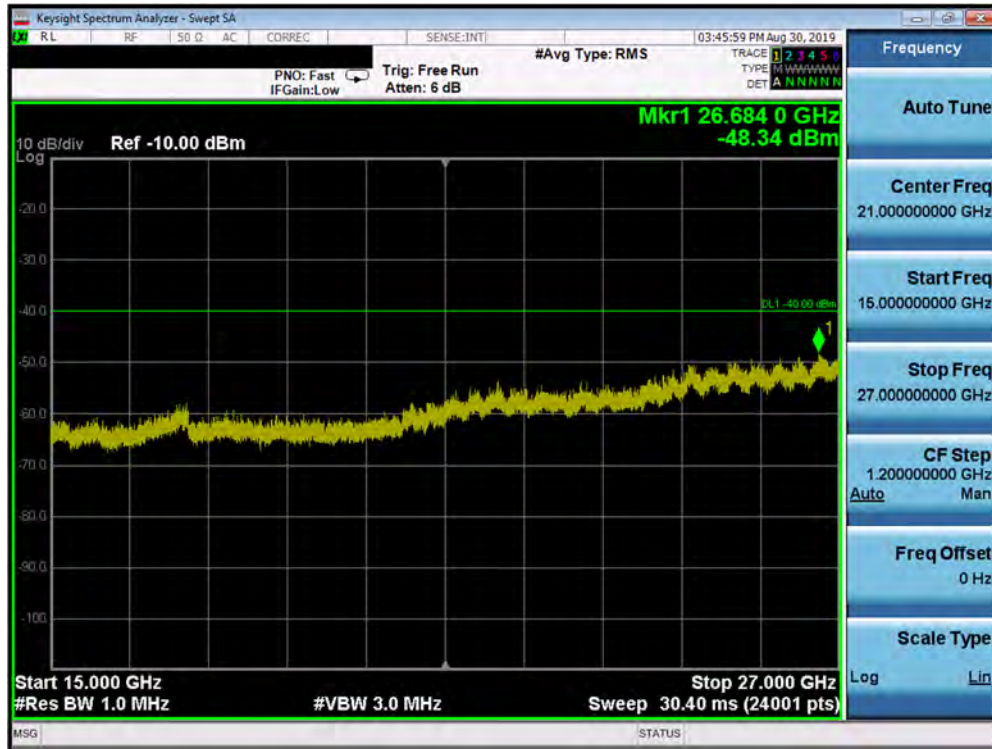


Plot 7-39. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 – High Channel)

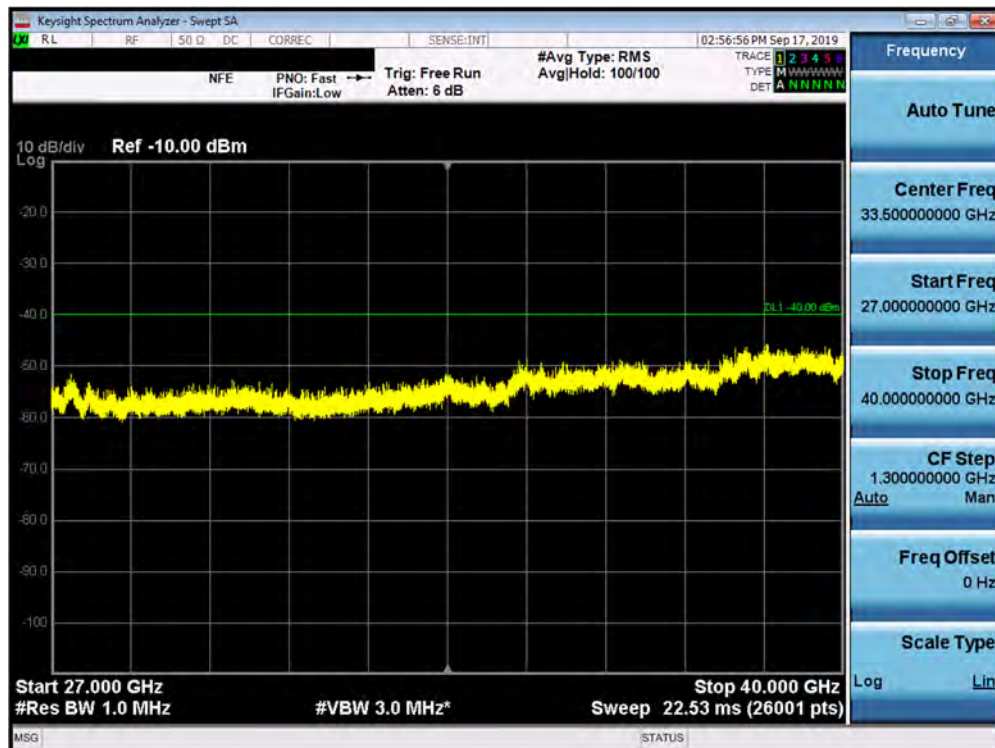


Plot 7-40. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 33 of 144



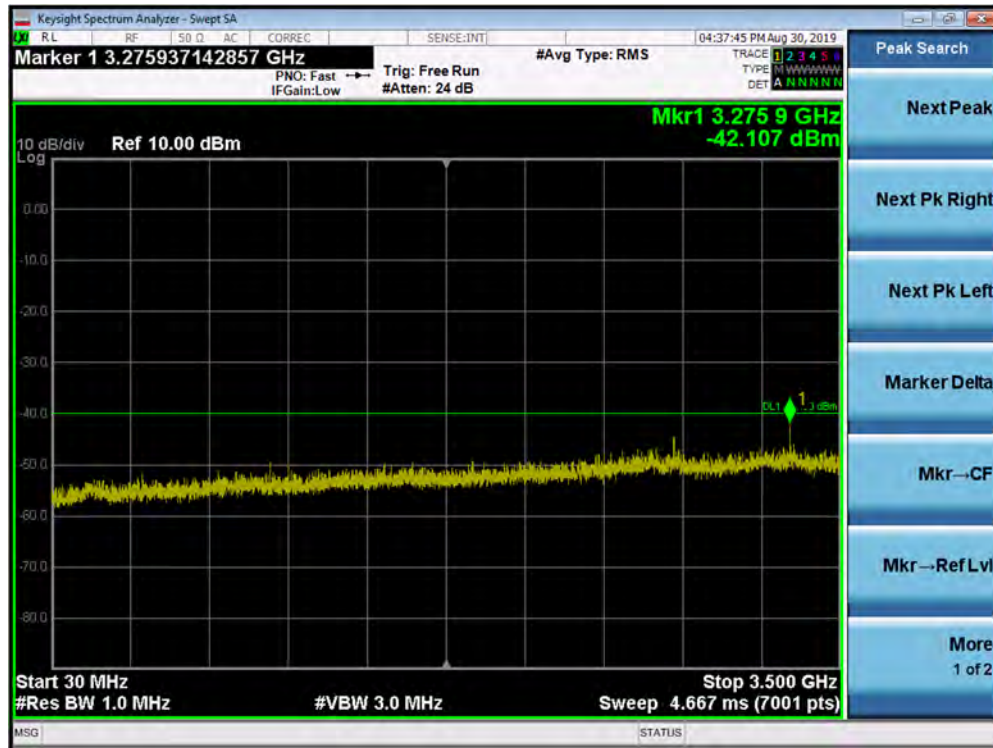
Plot 7-41. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)



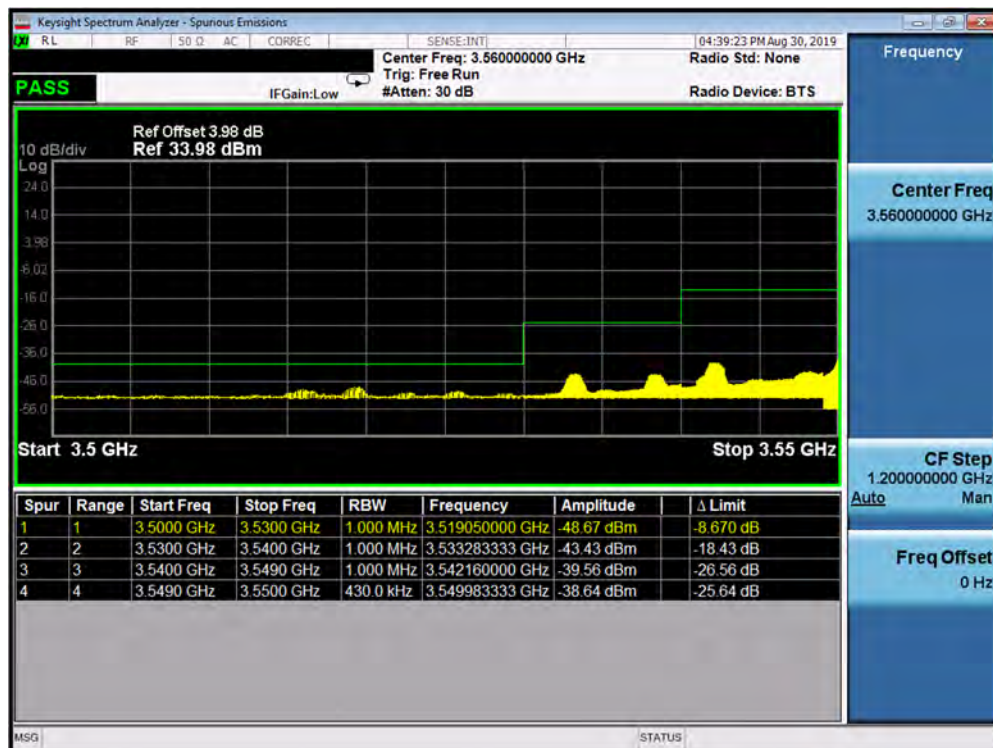
Plot 7-42. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 34 of 144

## Band 48 – Diversity Antenna



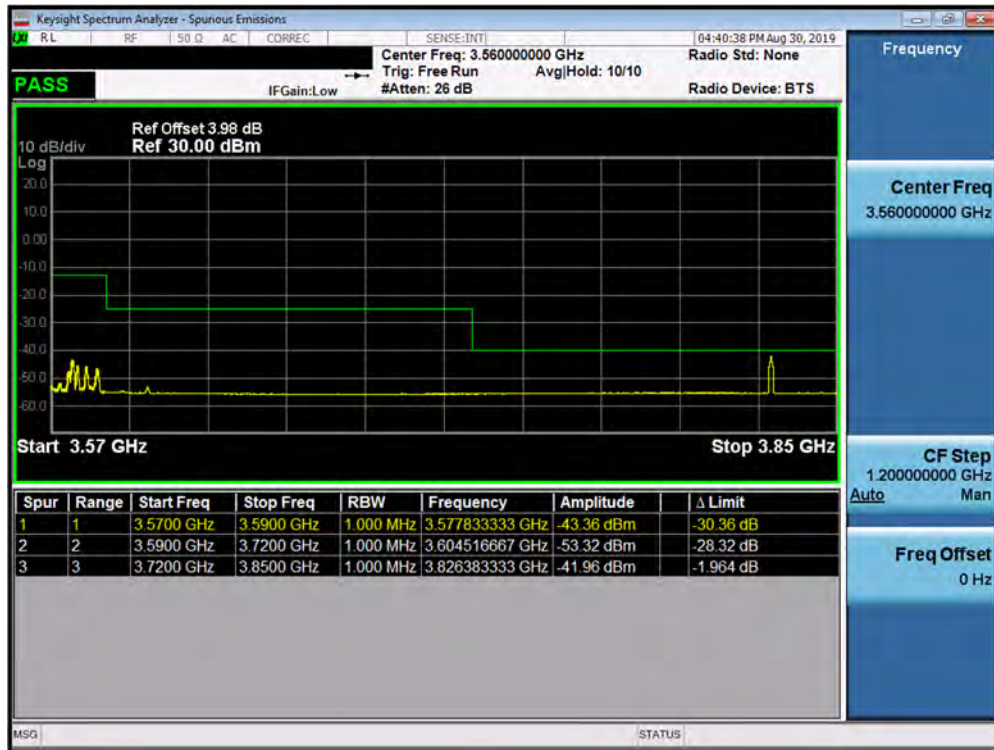
Plot 7-43. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



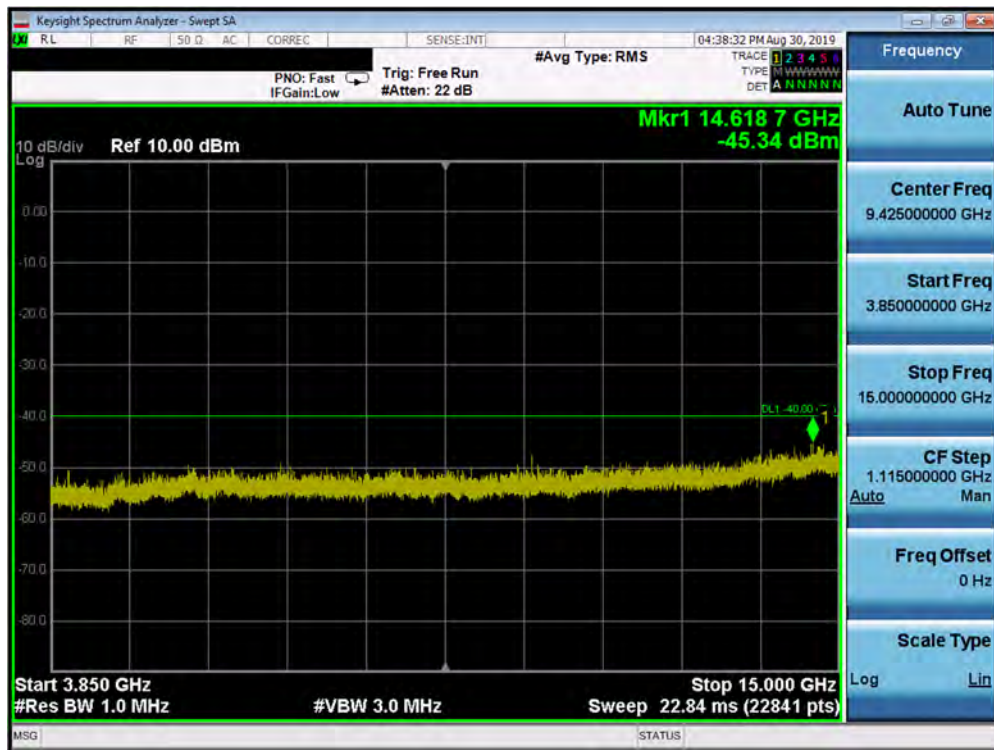
Plot 7-44. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 35 of 144



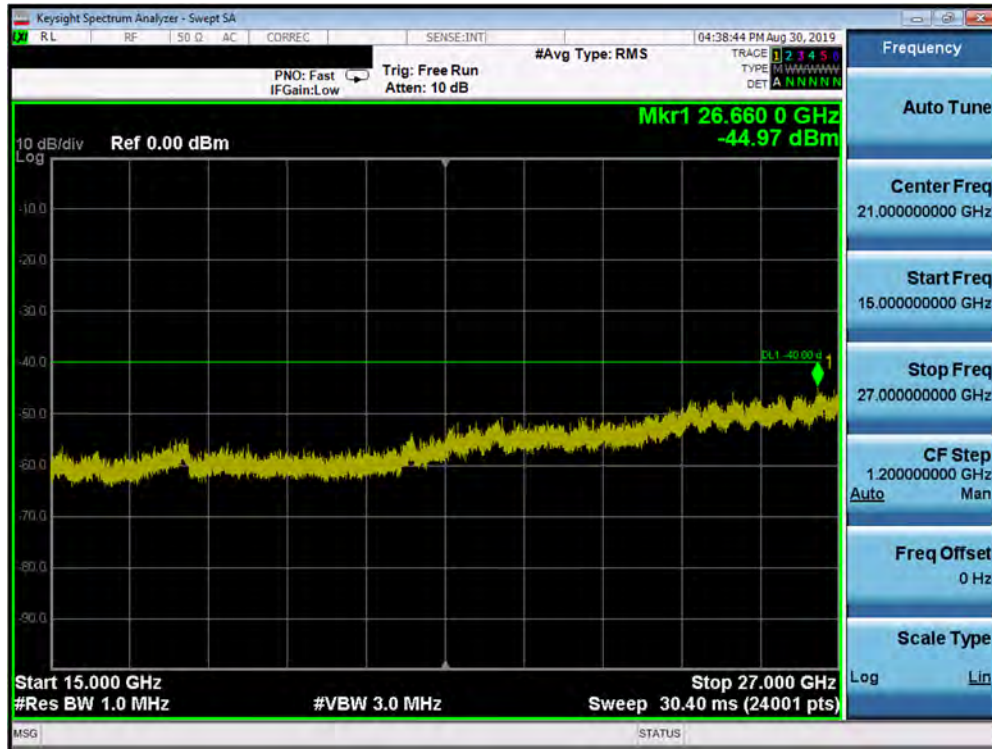


Plot 7-45. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

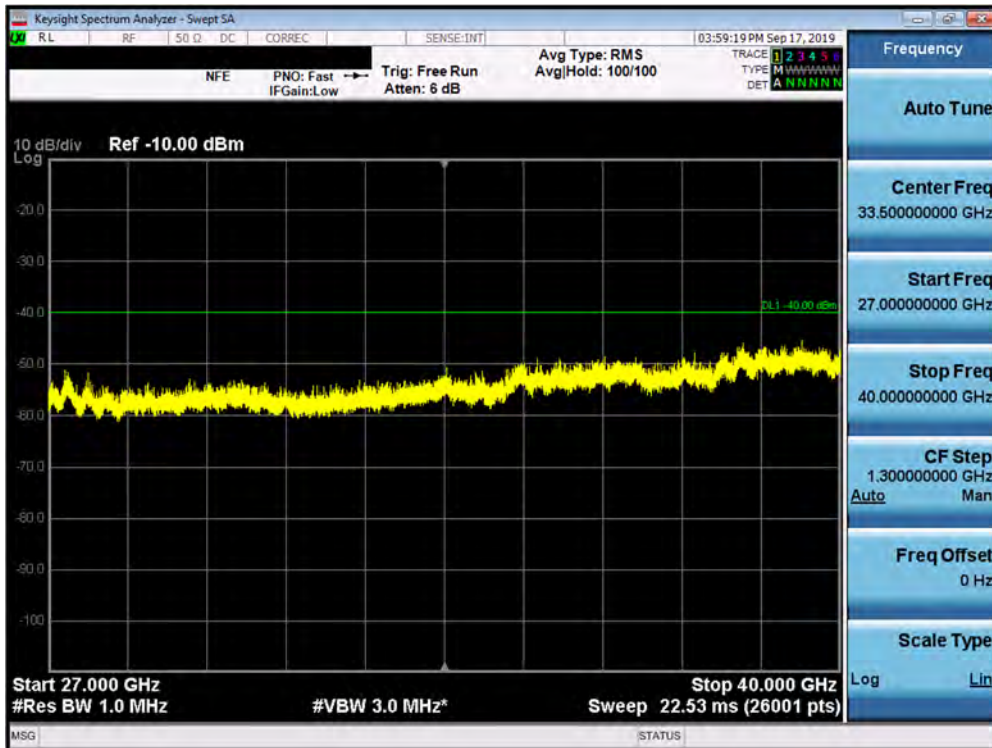


Plot 7-46. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 36 of 144

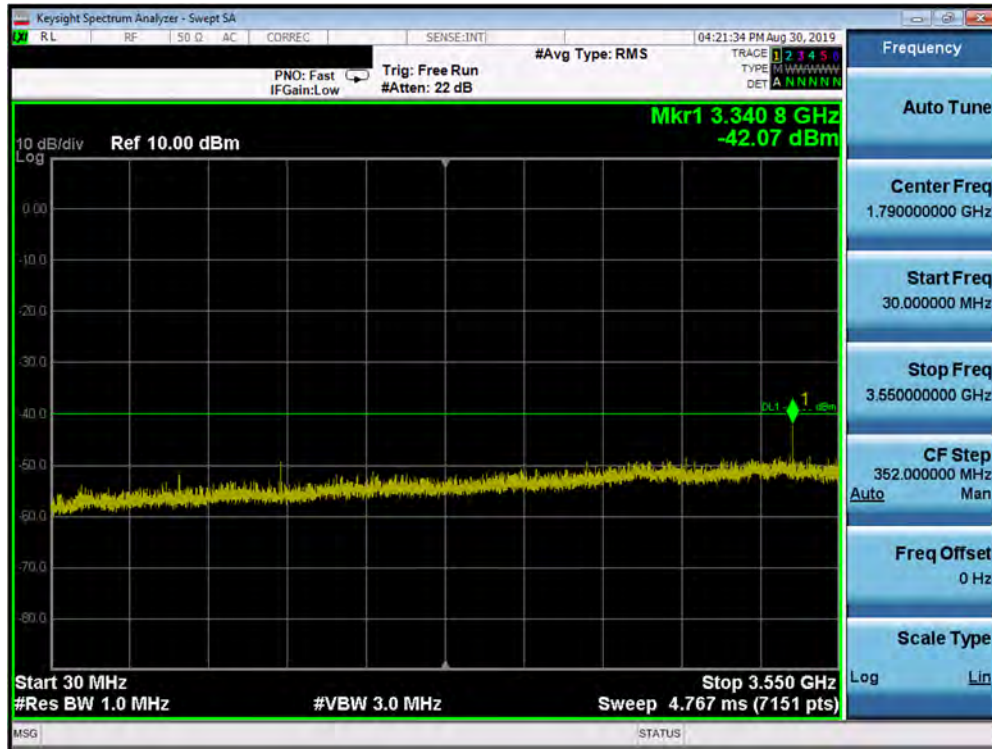


Plot 7-47. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

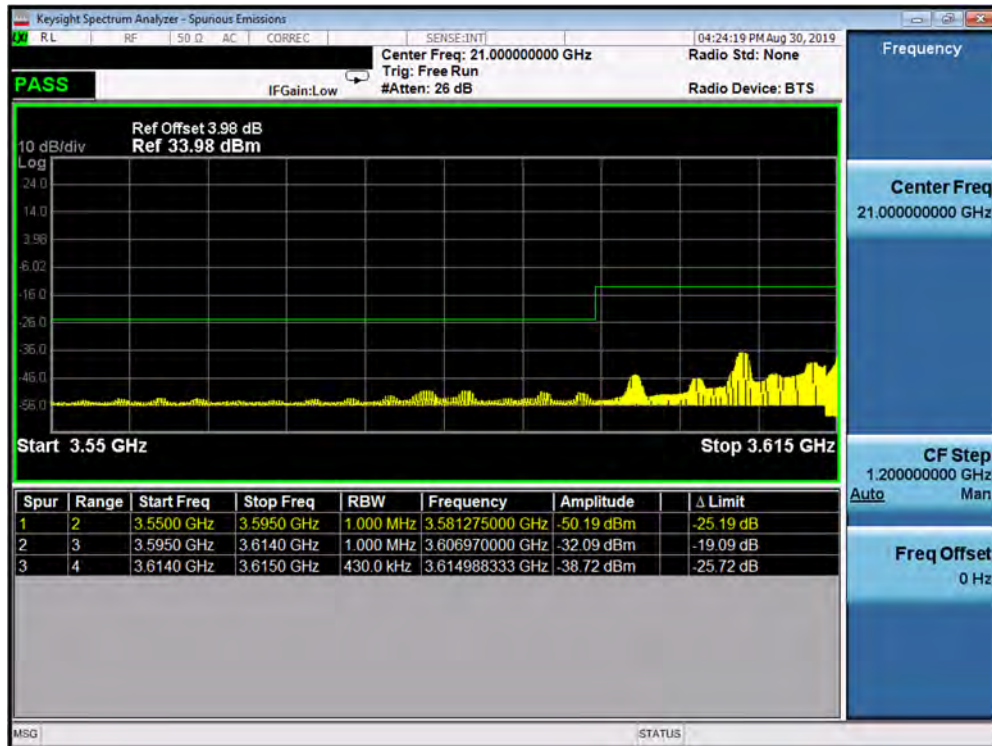


Plot 7-48. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 37 of 144



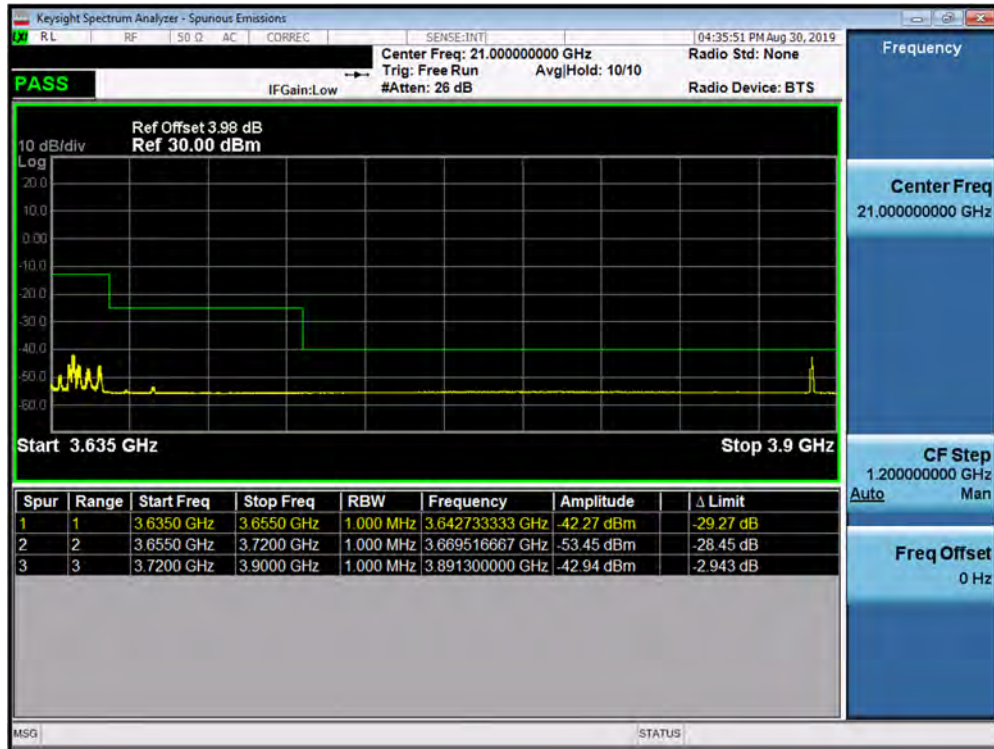
Plot 7-49. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



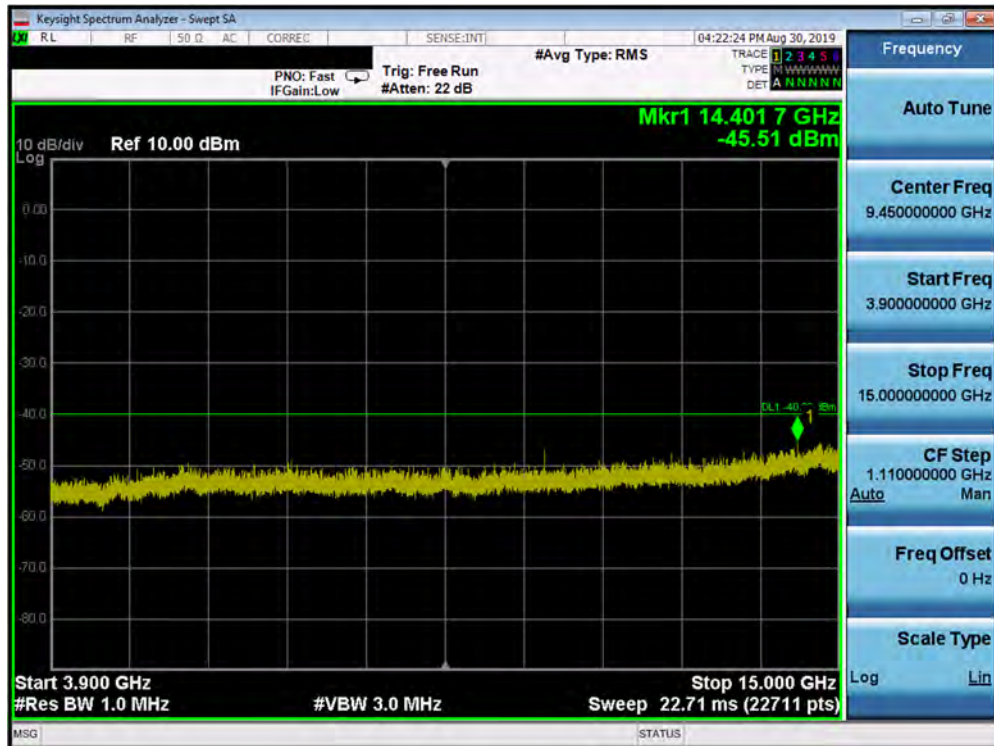
Plot 7-50. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: XIA-IFWA661	<b>MEASUREMENT REPORT</b> (CERTIFICATION)			Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 38 of 144



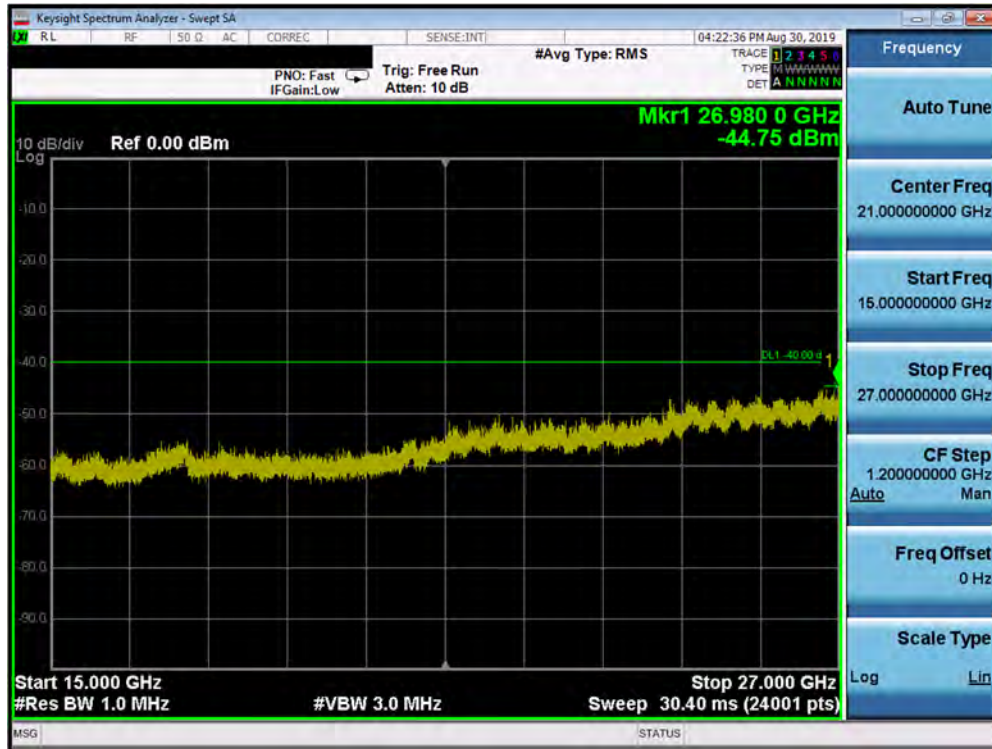


Plot 7-51. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

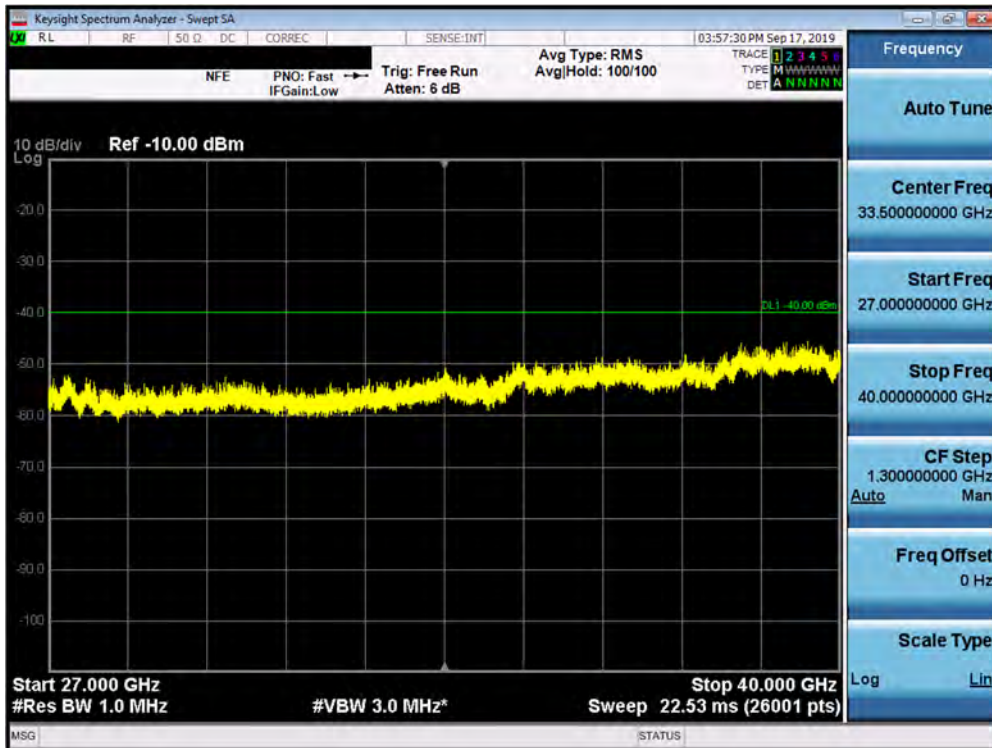


Plot 7-52. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 39 of 144



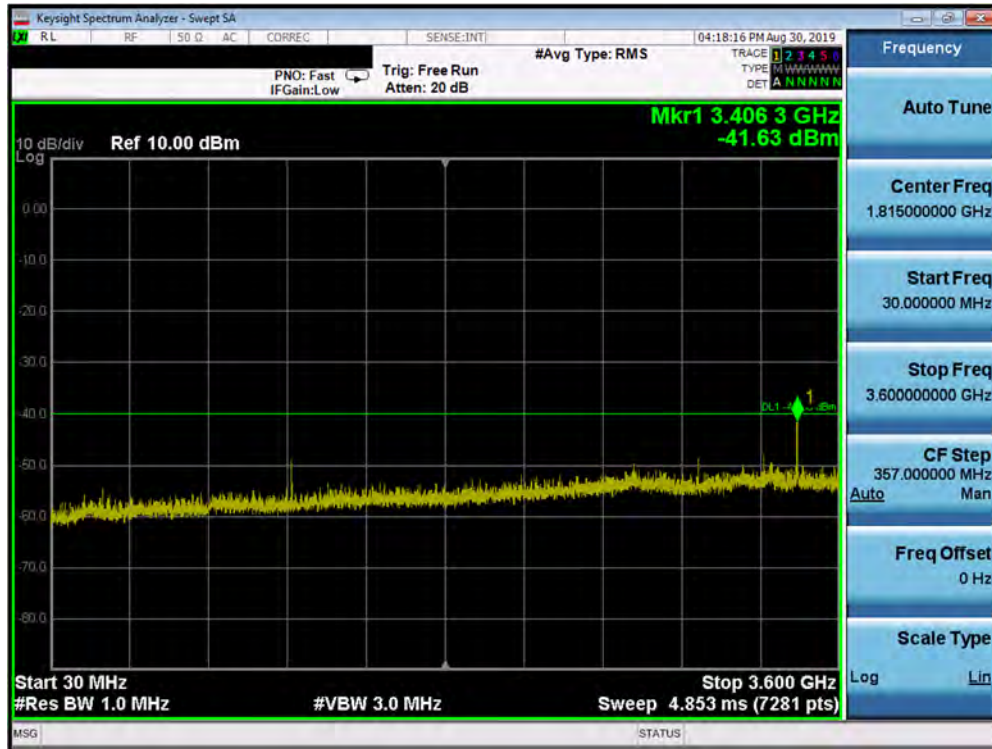
Plot 7-53. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



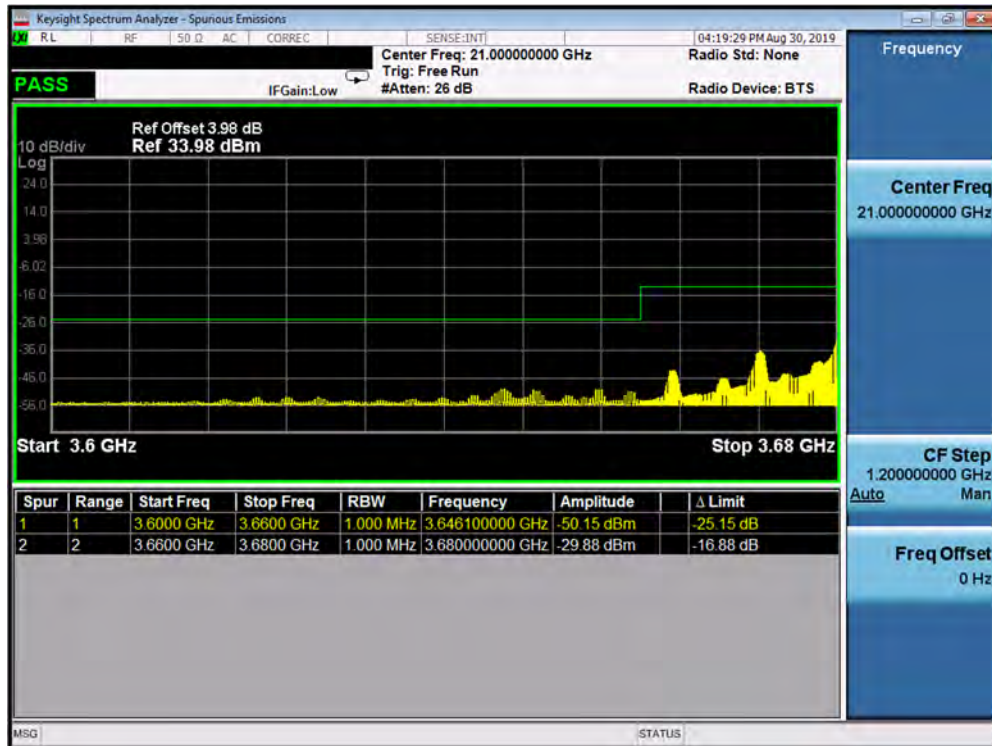
Plot 7-54. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 40 of 144



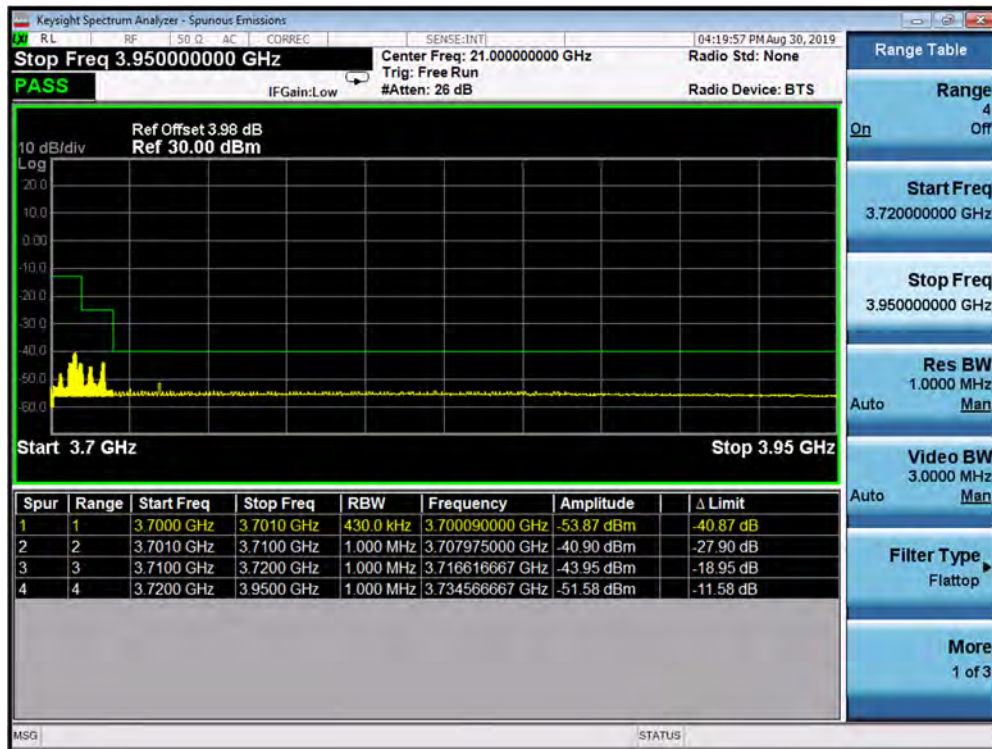


Plot 7-55. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)

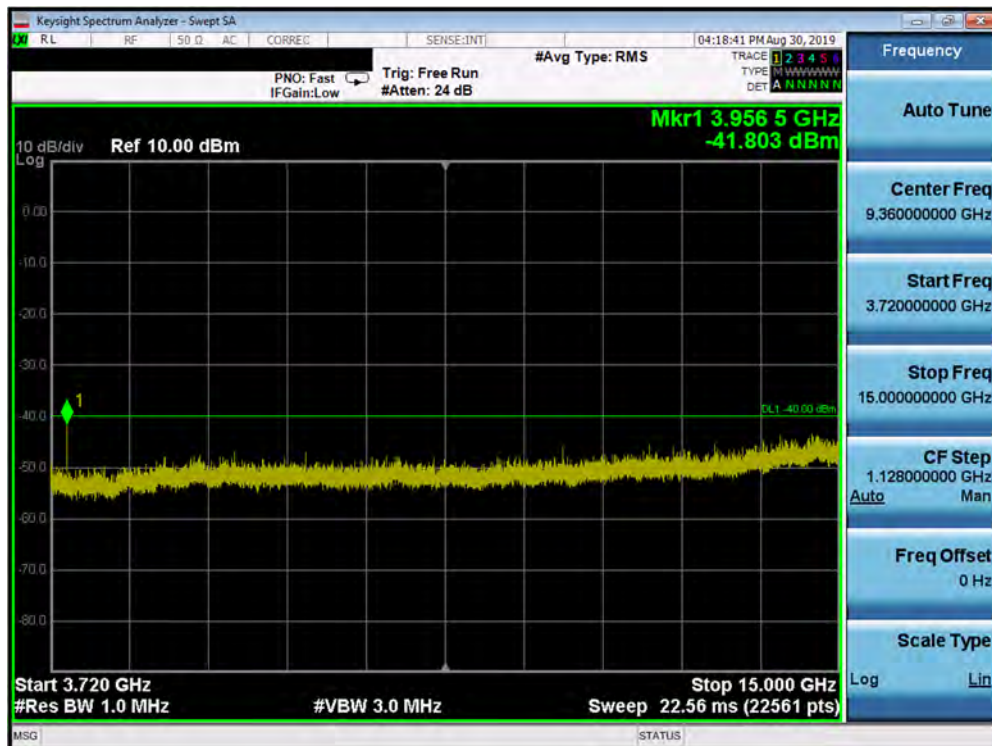


Plot 7-56. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 41 of 144

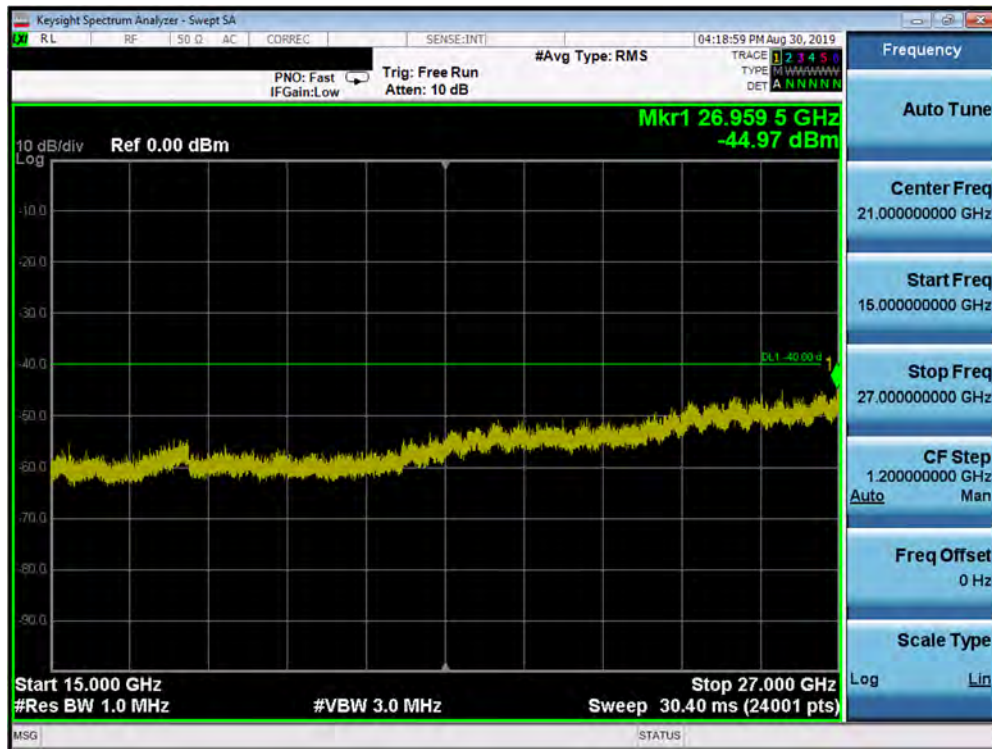


Plot 7-57. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 – High Channel)

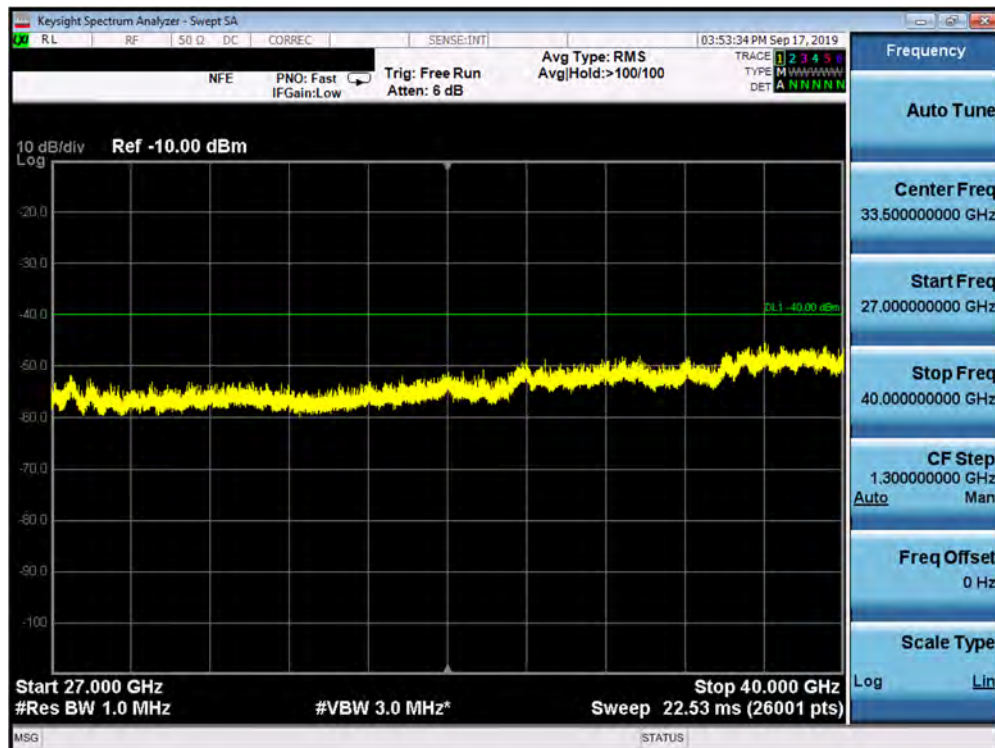


Plot 7-58. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 42 of 144



Plot 7-59. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)



Plot 7-60. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 43 of 144



## 7.4 Band Edge Emissions at Antenna Terminal

**\$2.1051 \$96.41(e)**

### 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 conducted power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any emission shall not exceed -25 dBm/MHz.***

***The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/MHz.***

### Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

### Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW  $\geq$  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.

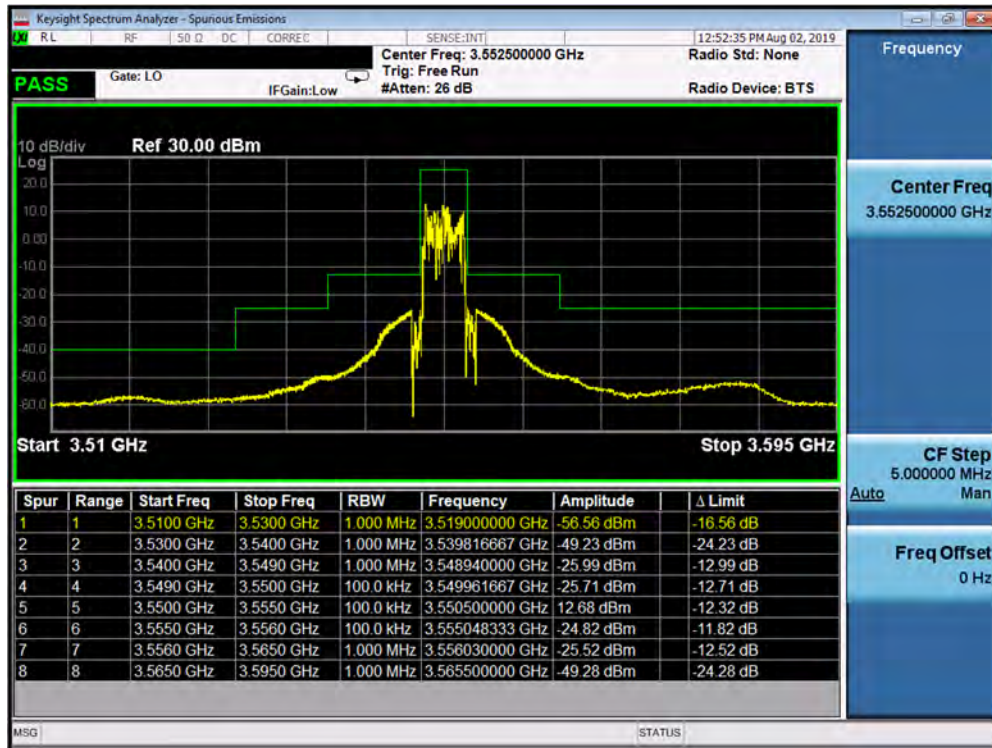


**Figure 7-3. Test Instrument & Measurement Setup**

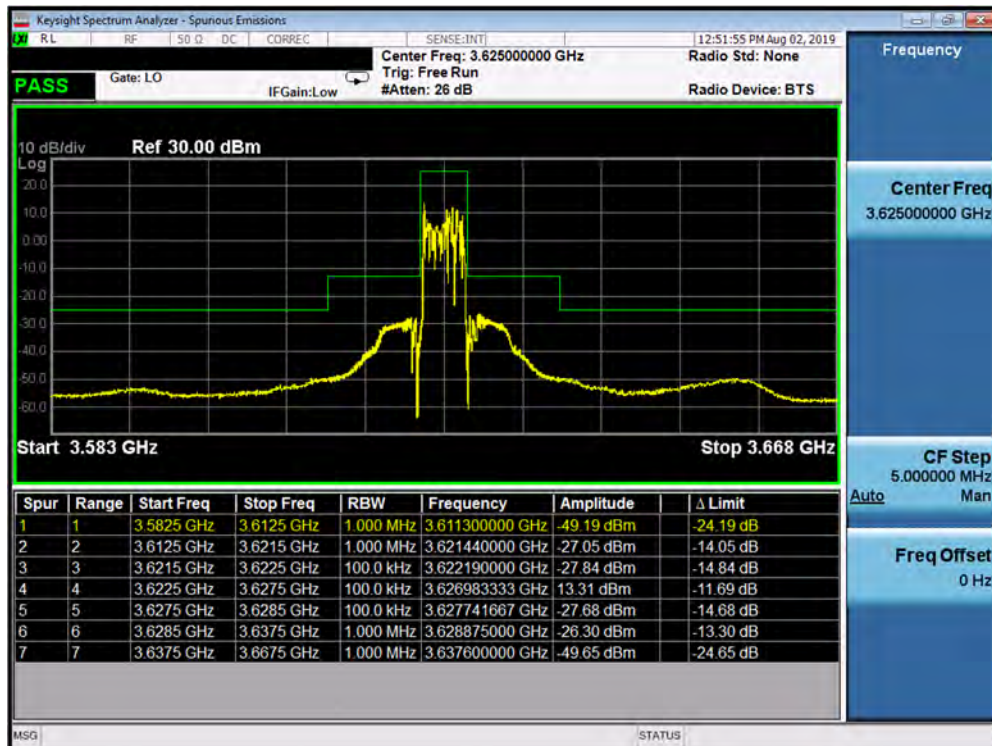
### Test Notes

FCC ID: XIA-IFWA661		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 44 of 144

## Band 48 – Main Antenna

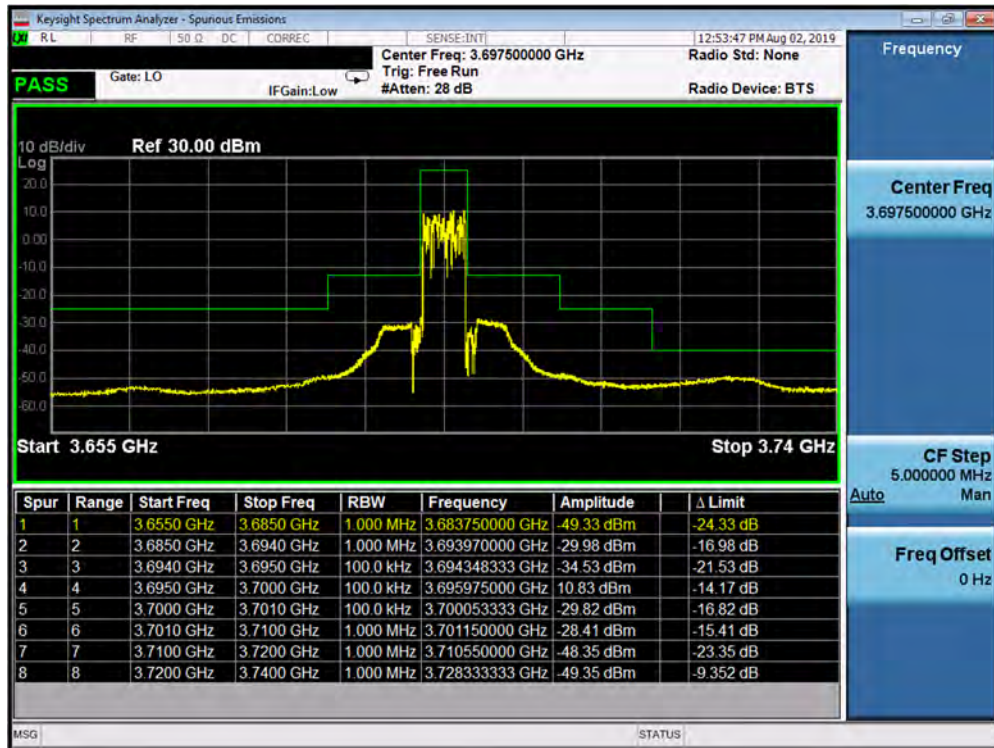


Plot 7-61. Lower Channel Edge Plot (Band 48 - 5.0MHz QPSK - Full RB Configuration)

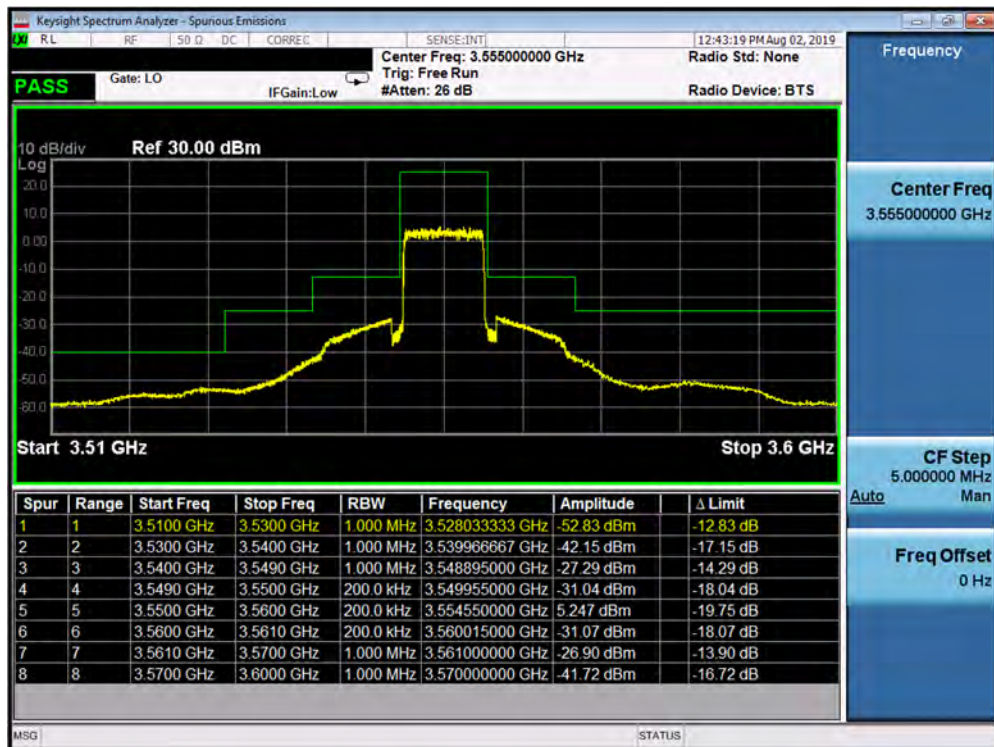


Plot 7-62. Mid Channel Edge Plot (Band 48 - 5.0MHz QPSK - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 45 of 144



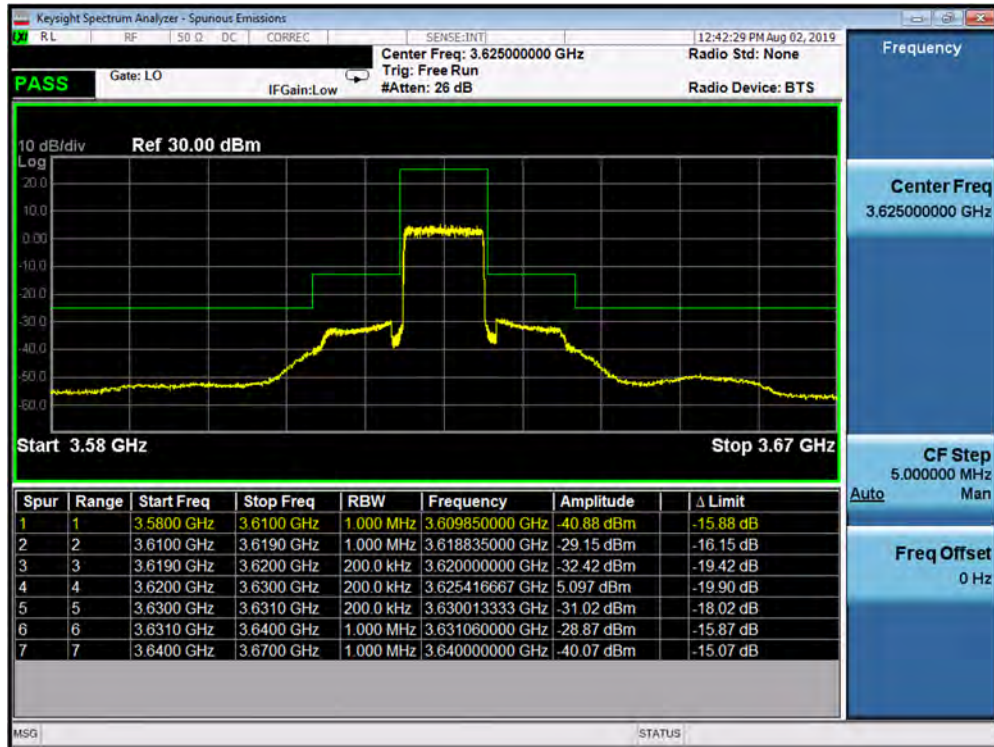
Plot 7-63. Upper Channel Edge Plot (Band 48 - 5.0MHz QPSK - Full RB Configuration)



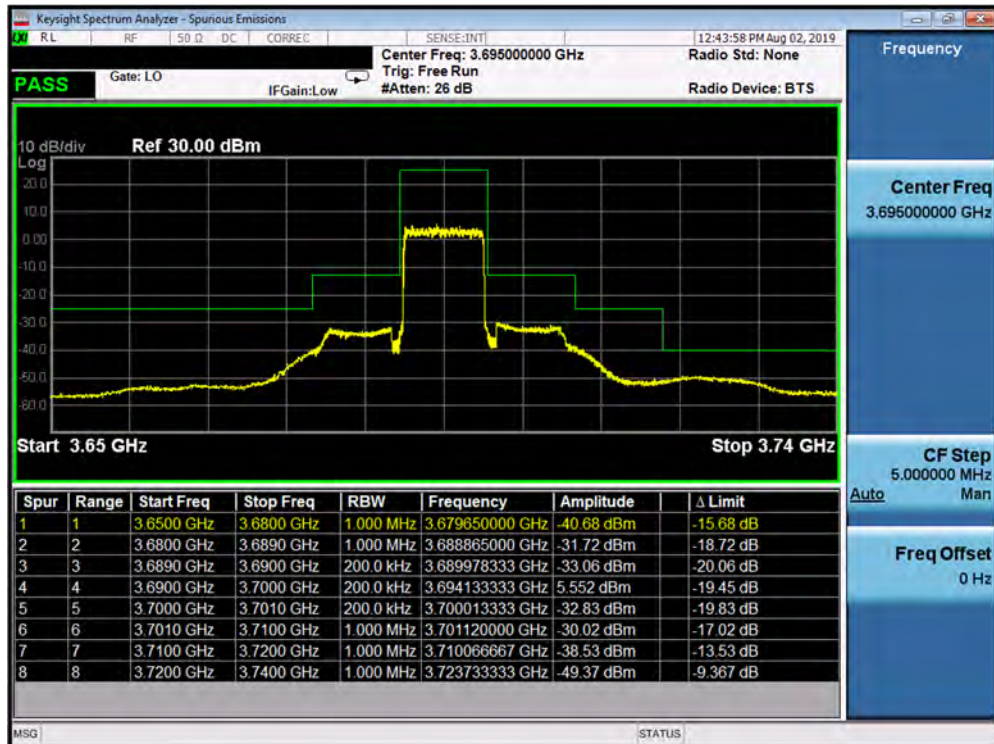
Plot 7-64. Lower Channel Edge Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 46 of 144



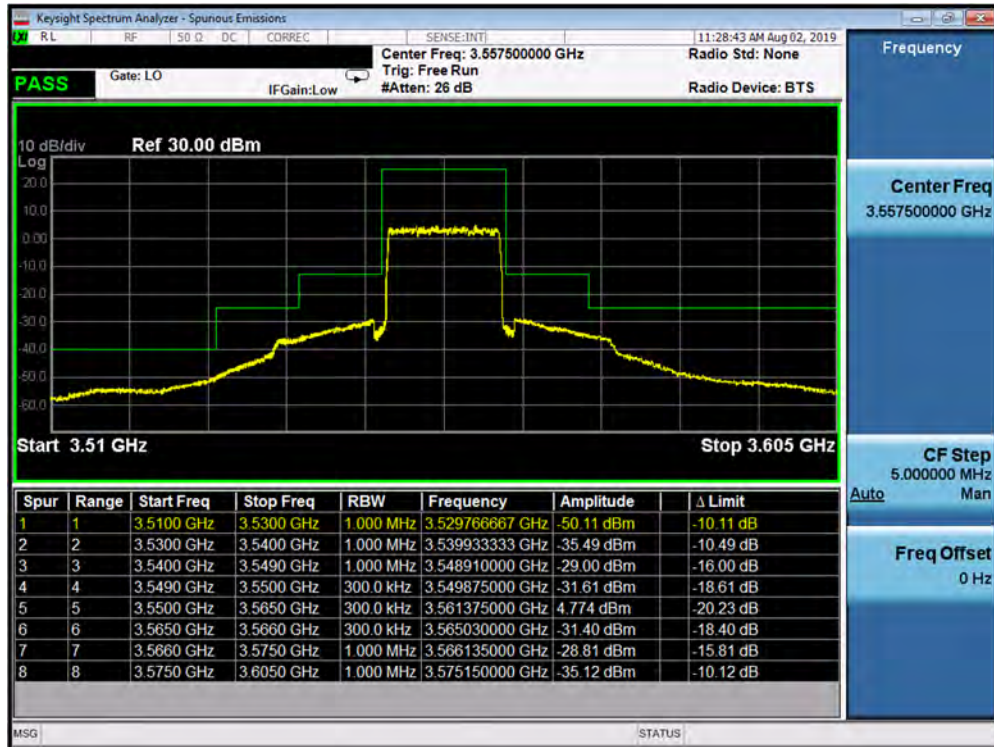


Plot 7-65. Mid Channel Edge Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)

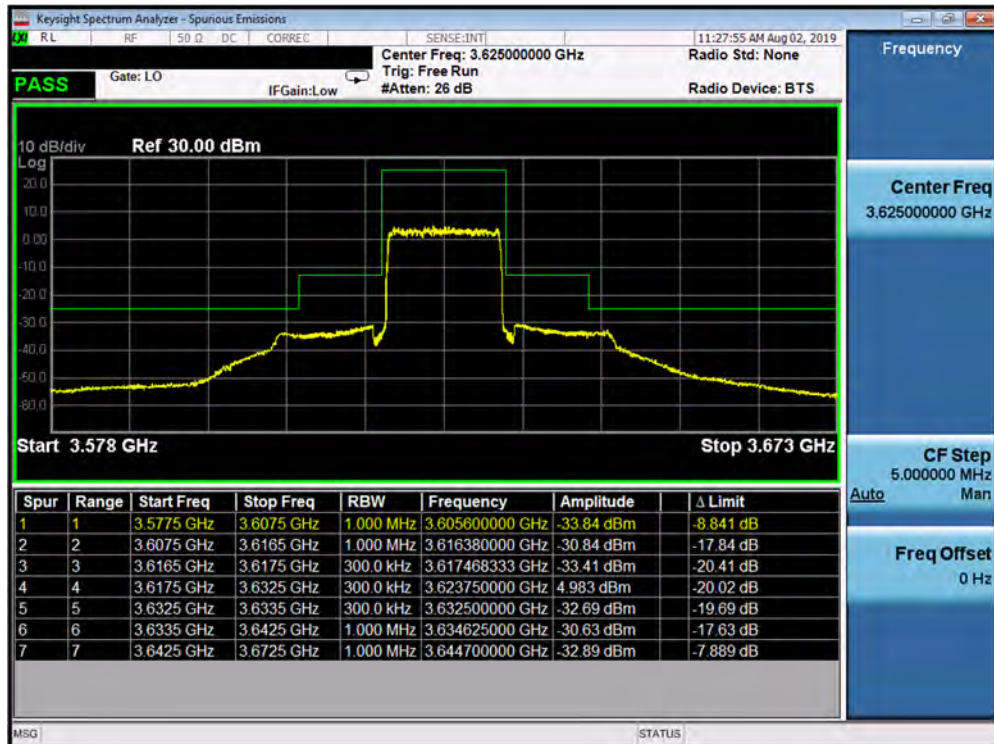


Plot 7-66. Upper Channel Edge Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 47 of 144



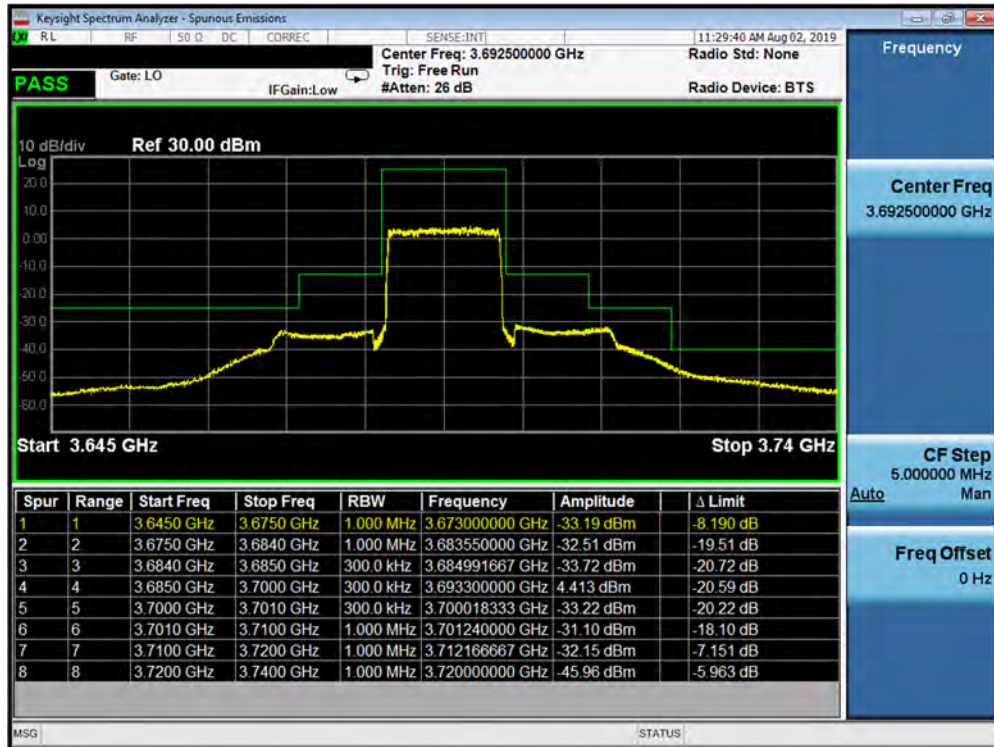
Plot 7-67. Lower Channel Edge Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)



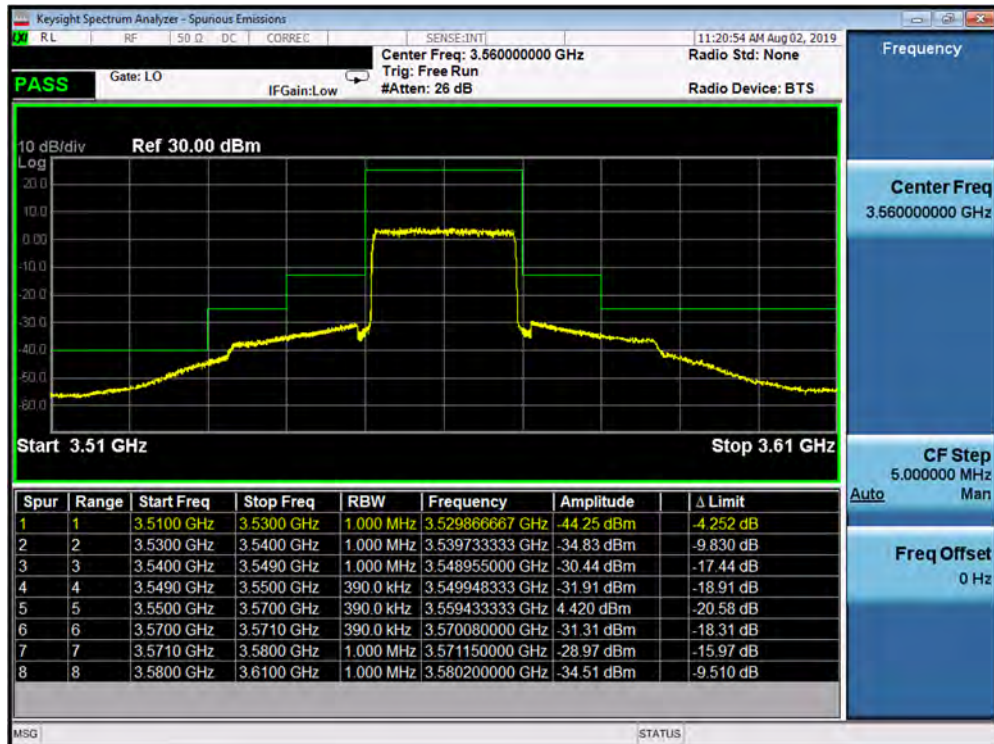
Plot 7-68. Mid Channel Edge Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 48 of 144





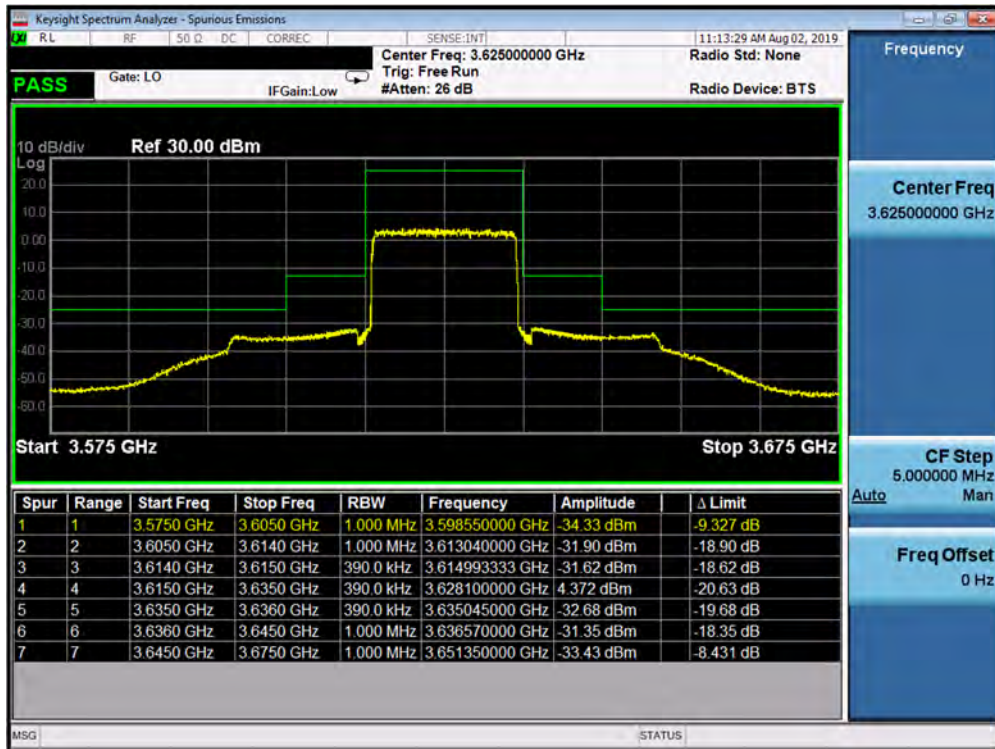
Plot 7-69. Upper Channel Edge Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)



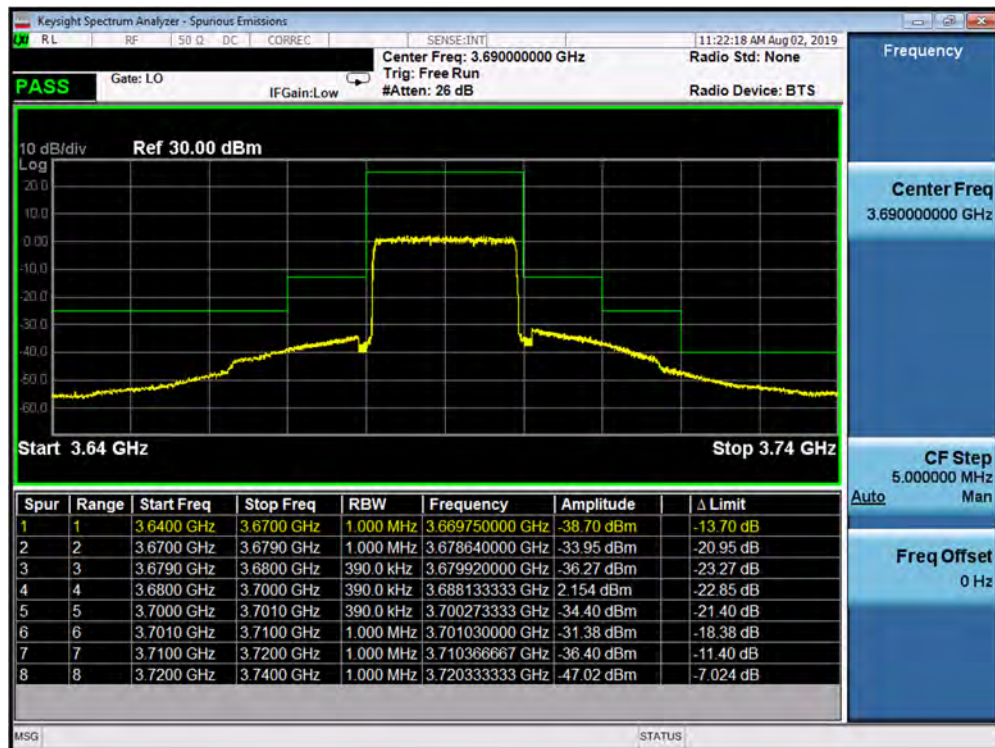
Plot 7-70. Lower Channel Edge Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 49 of 144





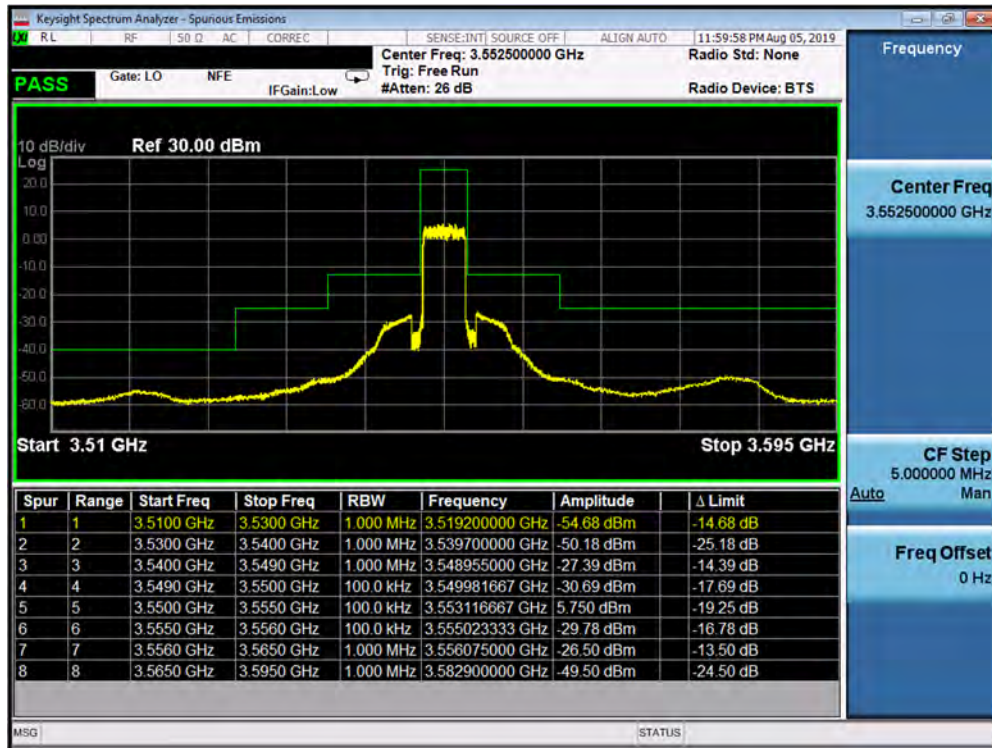
Plot 7-71. Mid Channel Edge Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)



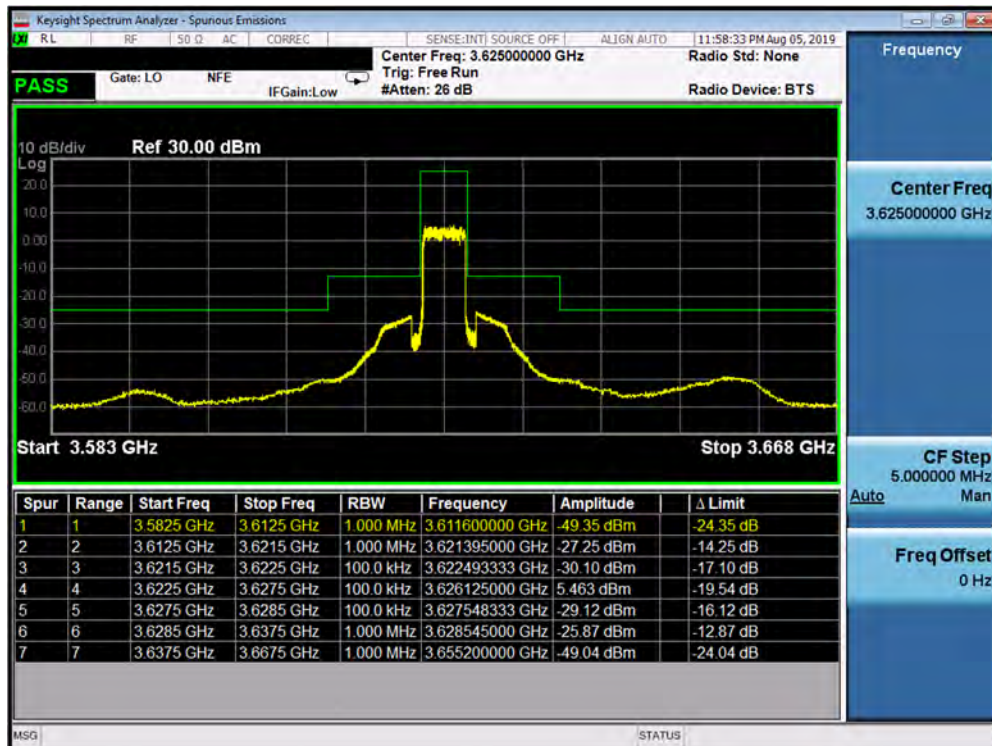
Plot 7-72. Upper Channel Edge Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 50 of 144

## Band 48 – Diversity Antenna



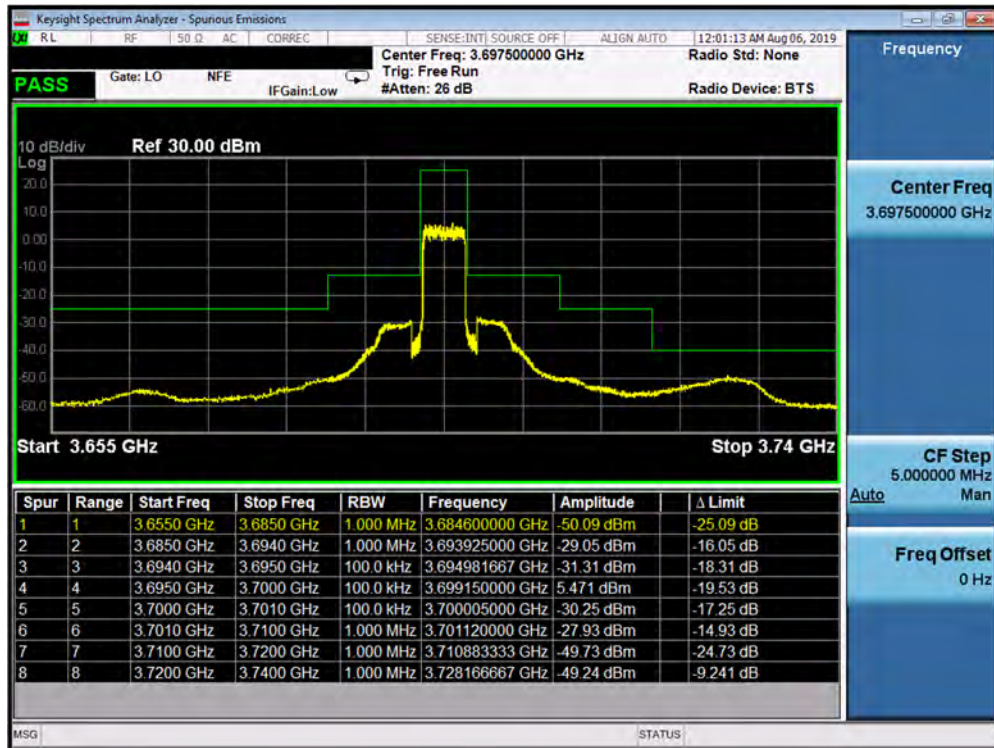
Plot 7-73. Lower Channel Edge Plot (Band 48 - 5.0MHz QPSK - Full RB Configuration)



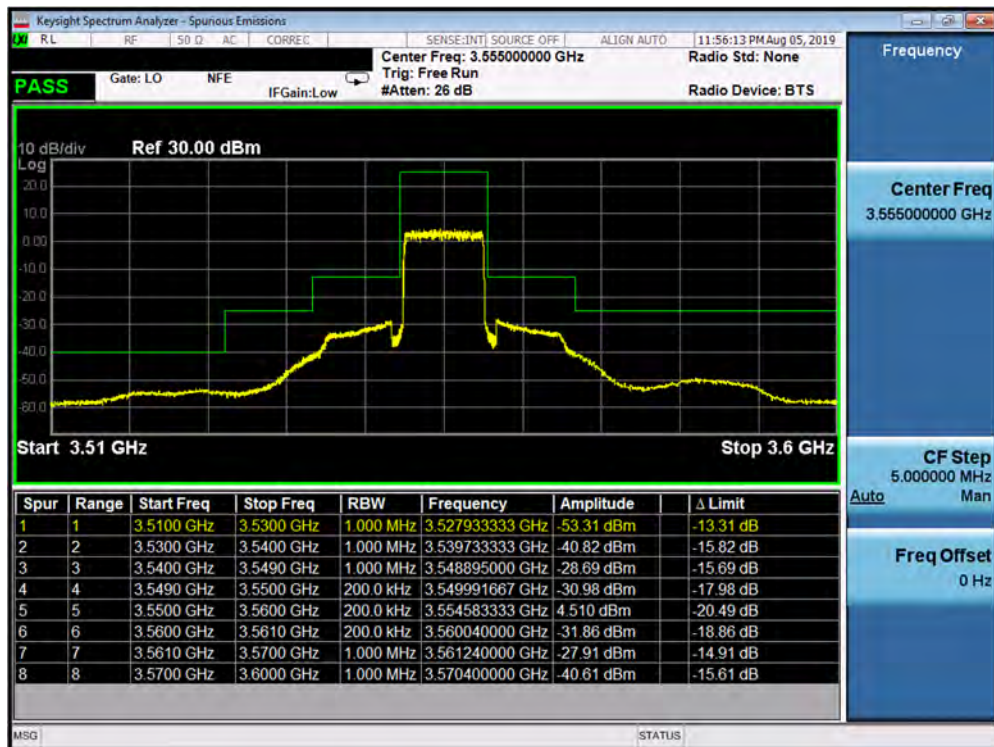
Plot 7-74. Mid Channel Edge Plot (Band 48 - 5.0MHz QPSK - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 51 of 144





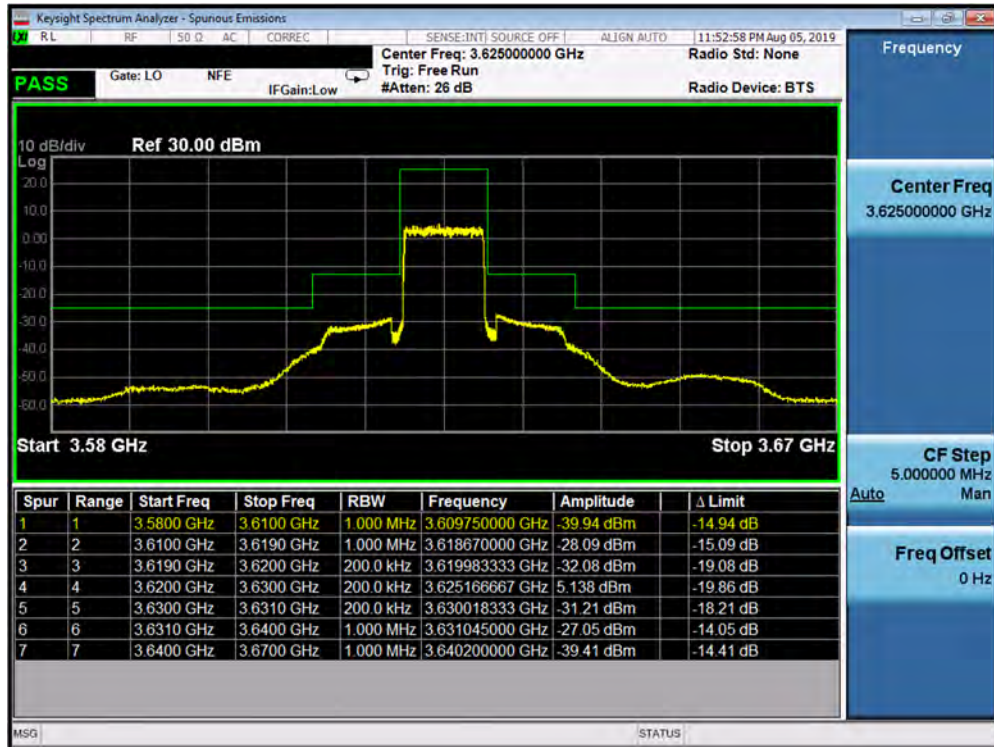
Plot 7-75. Upper Channel Edge Plot (Band 48 - 5.0MHz QPSK - Full RB Configuration)



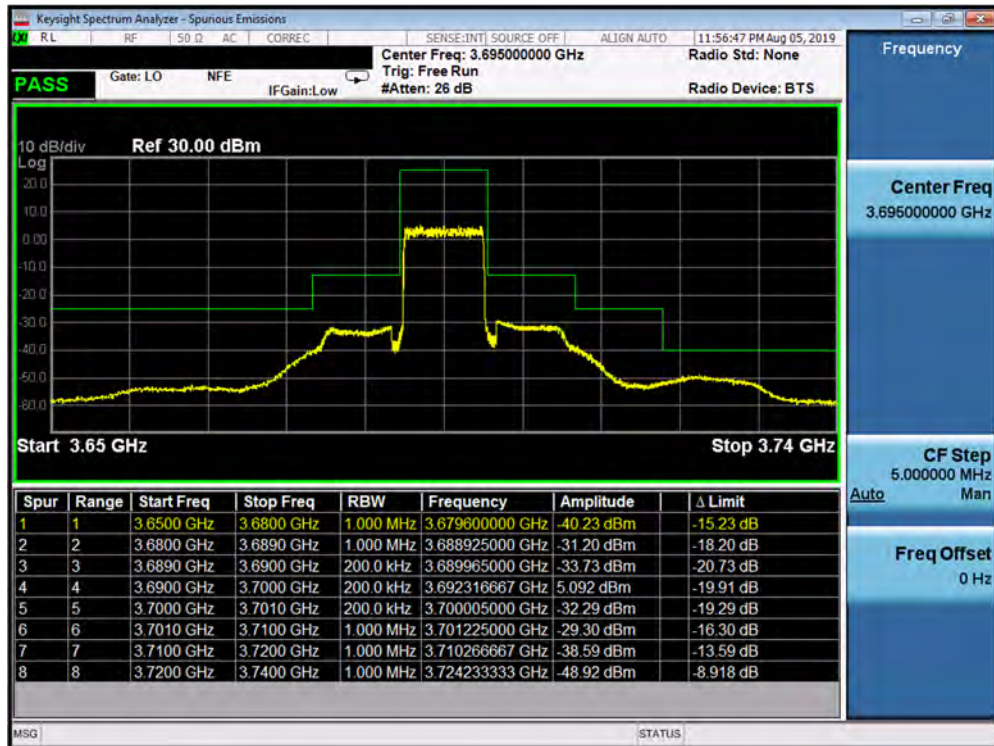
Plot 7-76. Lower Channel Edge Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 52 of 144



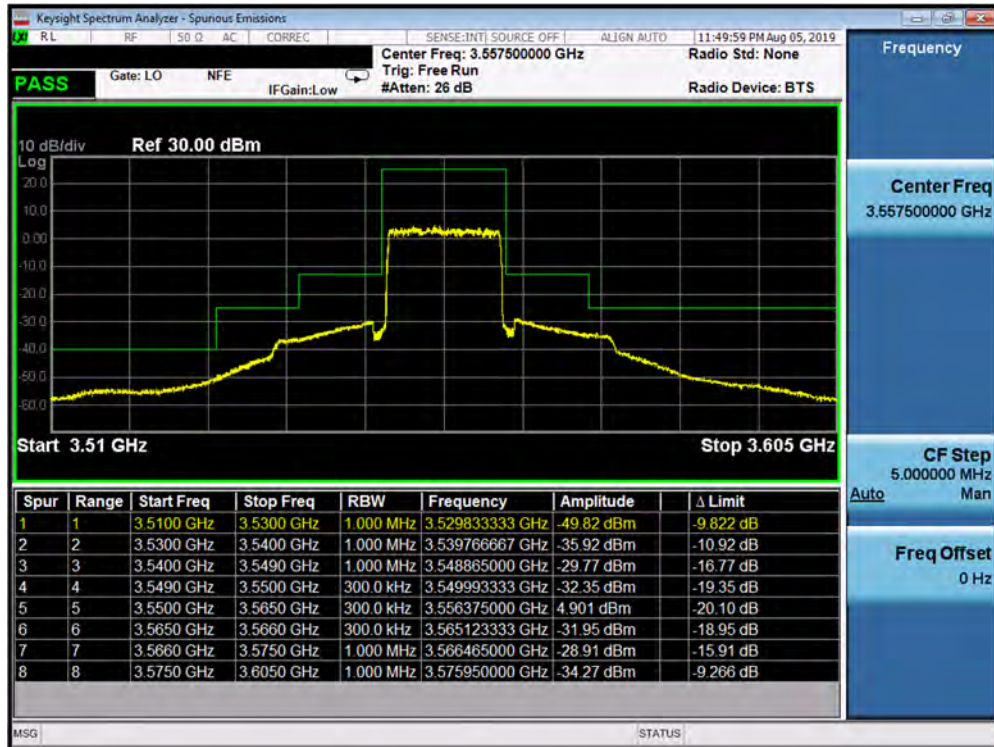


Plot 7-77. Mid Channel Edge Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)

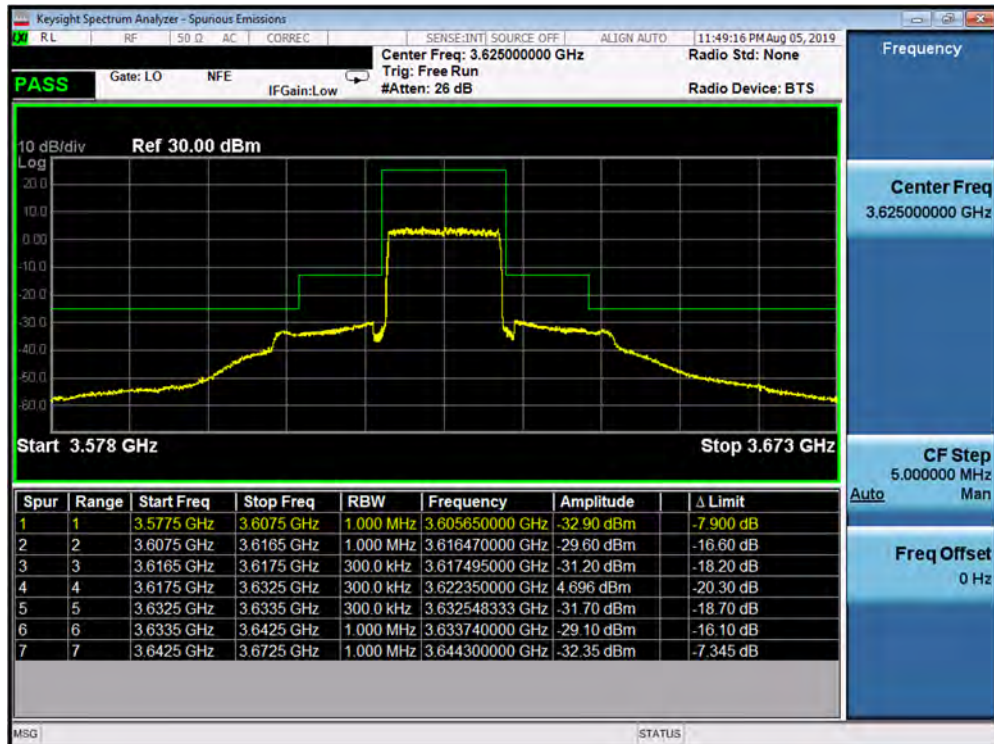


Plot 7-78. Upper Channel Edge Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 53 of 144



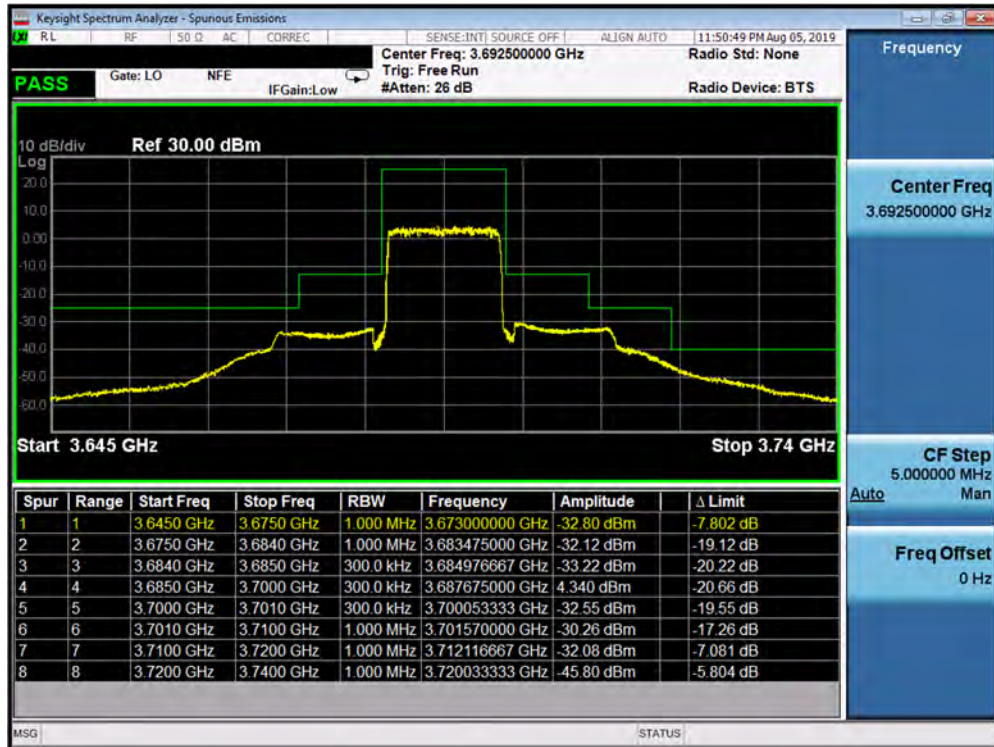
Plot 7-79. Lower Channel Edge Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)



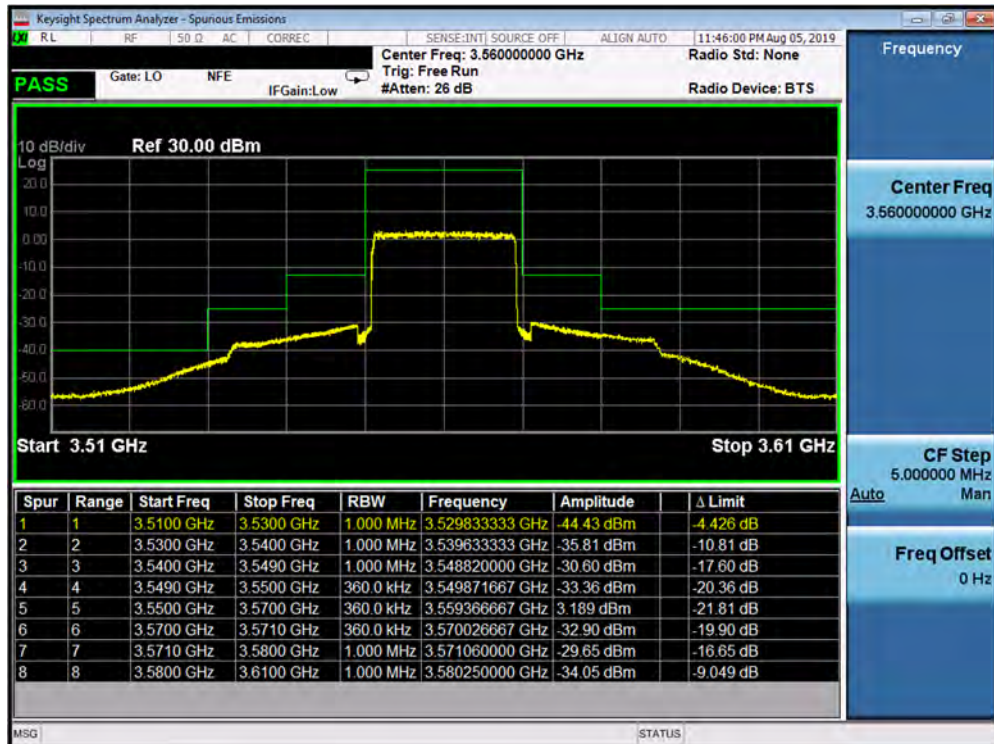
Plot 7-80. Mid Channel Edge Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 54 of 144





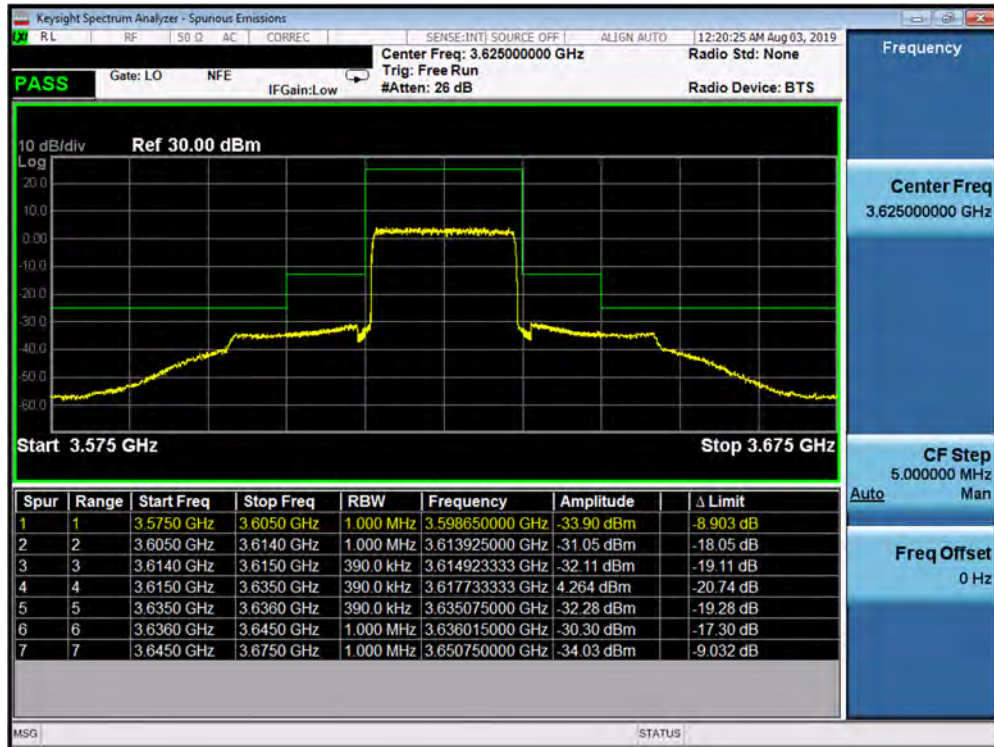
Plot 7-81. Upper Channel Edge Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)



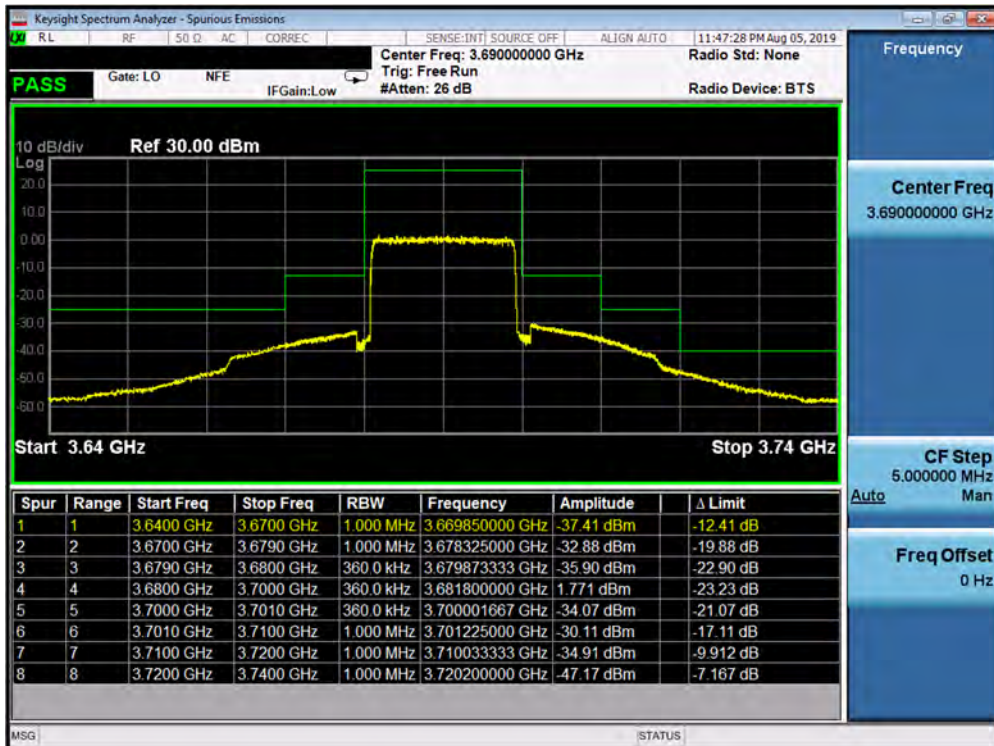
Plot 7-82. Lower Channel Edge Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 55 of 144





Plot 7-83. Mid Channel Edge Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-84. High Channel Edge Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 56 of 144

## 7.5 Peak Power Spectral Density Measurement

**\$96.41(b)**

### Test Overview and Limit

The peak power density is 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 and the worst case configuration results are reported in this section.

***The maximum permissible power spectral density is 37 dBm in any 1 MHz band.***

### Test Procedure Used

KDB 971168 D01 v03r01 – Section 5.2.2

ANSI/TIA-603-E-2016 – Section 2.2.17

### Test Settings

1. Analyzer was set to center frequency of the B48 Channel.
2. RBW = 1 MHz
3. VBW = 3 MHz
4. Detector = Average (RMS) and Trace mode = Clear write
5. Sweep time = 1 second.
6. Number of points > 2\*Span/RBW
7. The trace was allowed to stabilize

### Test Setup


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



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

### Test Notes

1. Antenna Gains (dBi) are provided by the client.

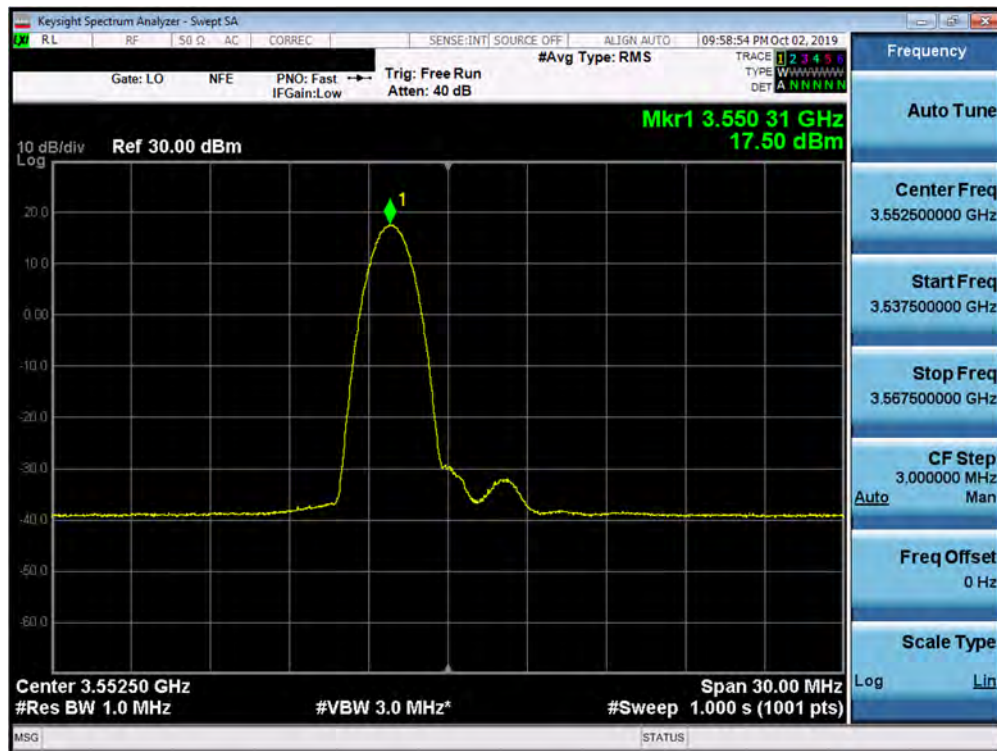
FCC ID: XIA-IFWA661		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 57 of 144

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	RB Size/Offset	Conducted PSD [dBm/MHz]	Ant. Gain [dBi]	PSD [dBm/MHz]	PSD [Watts/MHz]	PSD Limit [dBm/MHz]	Margin [dB]
3552.50	5	QPSK	1/0	17.50	19.00	<b>36.50</b>	4.467	37.00	-0.50
3625.00	5	QPSK	1/0	16.87	19.00	35.87	3.864	37.00	-1.13
3697.50	5	QPSK	1/0	17.03	19.00	36.03	4.009	37.00	-0.97
3552.50	5	16-QAM	1/0	17.74	19.00	<b>36.74</b>	4.721	37.00	-0.26
3625.00	5	16-QAM	1/0	17.42	19.00	36.42	4.385	37.00	-0.58
3697.50	5	16-QAM	1/0	17.28	19.00	36.28	4.246	37.00	-0.72
3552.50	5	64-QAM	1/0	17.49	19.00	<b>36.49</b>	4.457	37.00	-0.51
3625.00	5	64-QAM	1/0	17.38	19.00	36.38	4.345	37.00	-0.62
3697.50	5	64-QAM	1/0	17.42	19.00	36.42	4.385	37.00	-0.58
3555.00	10	QPSK	1/0	17.21	19.00	<b>36.21</b>	4.178	37.00	-0.79
3625.00	10	QPSK	1/0	17.02	19.00	36.02	3.999	37.00	-0.98
3695.00	10	QPSK	1/0	17.01	19.00	36.01	3.990	37.00	-0.99
3555.00	10	16-QAM	1/0	17.59	19.00	<b>36.59</b>	4.560	37.00	-0.41
3625.00	10	16-QAM	1/0	17.37	19.00	36.37	4.335	37.00	-0.63
3695.00	10	16-QAM	1/0	17.42	19.00	36.42	4.385	37.00	-0.58
3555.00	10	64-QAM	1/0	17.80	19.00	<b>36.80</b>	4.786	37.00	-0.20
3625.00	10	64-QAM	1/0	17.31	19.00	36.31	4.276	37.00	-0.69
3695.00	10	64-QAM	1/0	17.20	19.00	36.20	4.169	37.00	-0.80
3557.50	15	QPSK	1/0	17.30	19.00	<b>36.30</b>	4.266	37.00	-0.70
3625.00	15	QPSK	1/0	17.06	19.00	36.06	4.036	37.00	-0.94
3692.50	15	QPSK	1/0	17.05	19.00	36.05	4.027	37.00	-0.95
3557.50	15	16-QAM	1/0	17.90	19.00	<b>36.90</b>	4.898	37.00	-0.10
3625.00	15	16-QAM	1/0	17.74	19.00	36.74	4.721	37.00	-0.26
3692.50	15	16-QAM	1/0	17.75	19.00	36.75	4.732	37.00	-0.25
3557.50	15	64-QAM	1/0	17.78	19.00	<b>36.78</b>	4.764	37.00	-0.22
3625.00	15	64-QAM	1/0	17.70	19.00	36.70	4.677	37.00	-0.30
3692.50	15	64-QAM	1/0	17.70	19.00	36.70	4.677	37.00	-0.30
3560.00	20	QPSK	1/0	17.40	19.00	<b>36.40</b>	4.365	37.00	-0.60
3625.00	20	QPSK	1/0	17.21	19.00	36.21	4.178	37.00	-0.79
3690.00	20	QPSK	1/0	17.19	19.00	36.19	4.159	37.00	-0.81
3560.00	20	16-QAM	1/0	17.93	19.00	<b>36.93</b>	<b>4.932</b>	37.00	-0.07
3625.00	20	16-QAM	1/0	17.83	19.00	36.83	4.819	37.00	-0.17
3690.00	20	16-QAM	1/0	17.51	19.00	36.51	4.477	37.00	-0.49
3560.00	20	64-QAM	1/0	17.91	19.00	<b>36.91</b>	4.909	37.00	-0.09
3625.00	20	64-QAM	1/0	17.89	19.00	36.89	4.887	37.00	-0.11
3690.00	20	64-QAM	1/0	17.62	19.00	36.62	4.592	37.00	-0.38

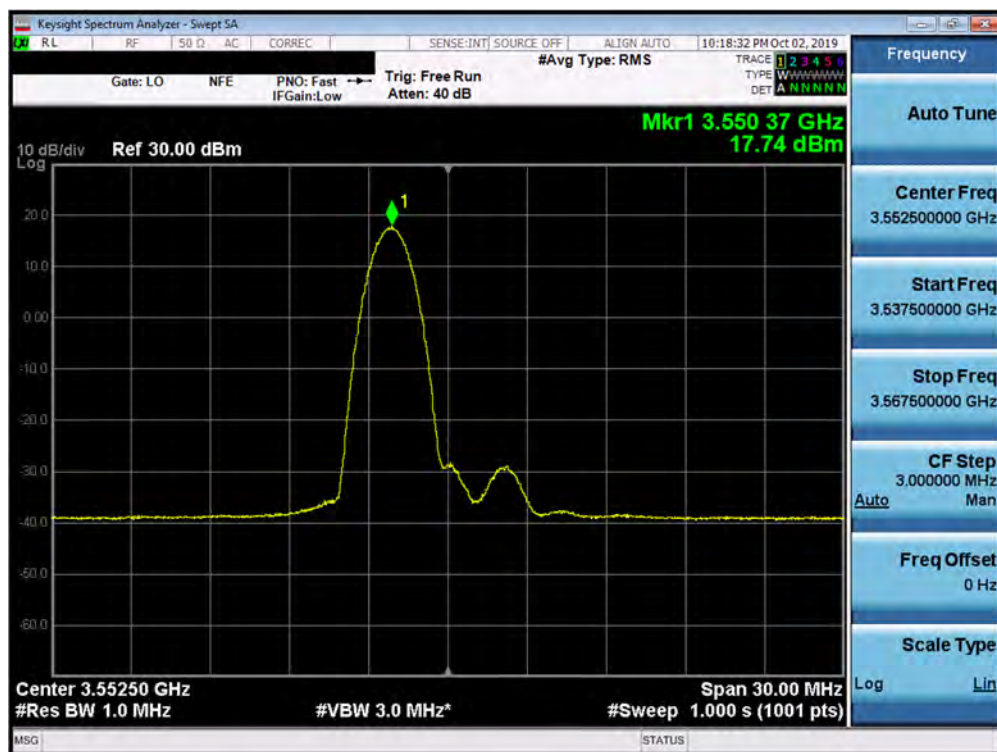
**Table 7-3. Peak Power Spectral Density (Band 48 – Main Antenna)**

FCC ID: XIA-IFWA661		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 58 of 144



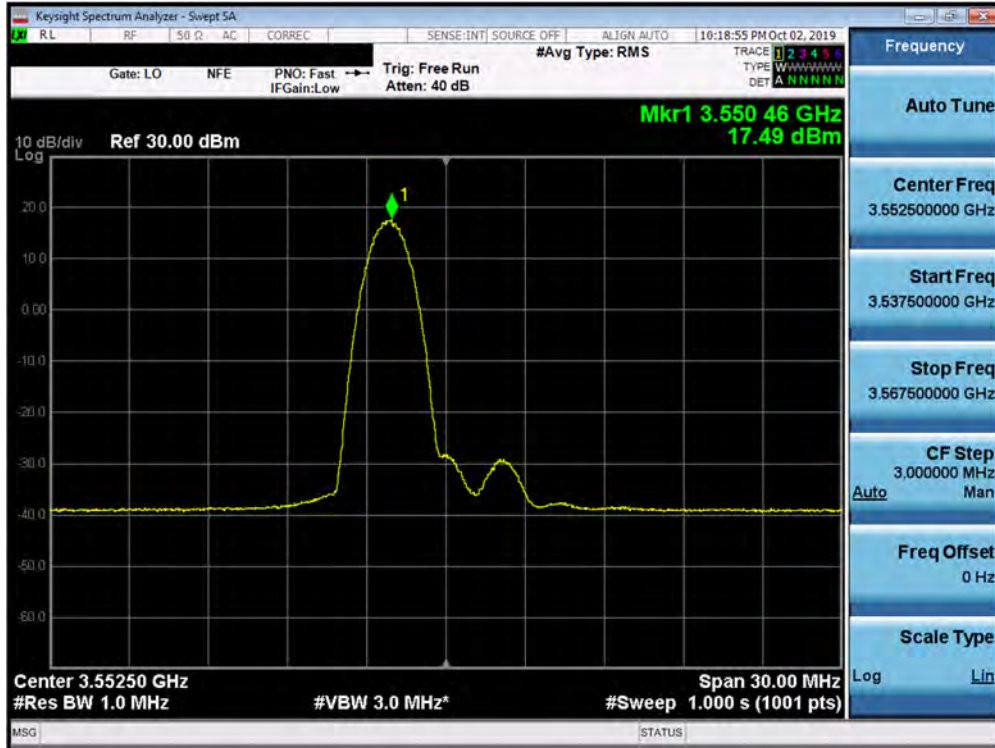


Plot 7-85. Peak Power Spectral Density Plot (B48 – 5.0MHz QPSK – Low Channel RB: 1 RB, Offset: 0 – Main Antenna)

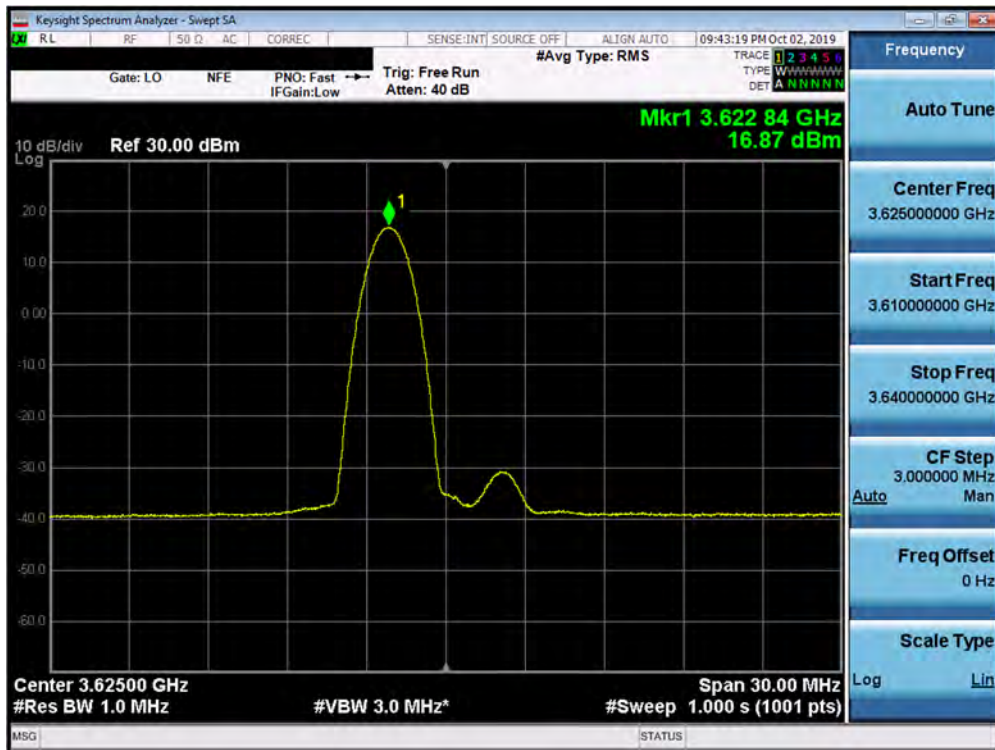


Plot 7-86. Peak Power Spectral Density Plot (B48 – 5.0MHz 16-QAM – Low Channel RB: 1 RB, Offset: 0 – Main Antenna)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 59 of 144

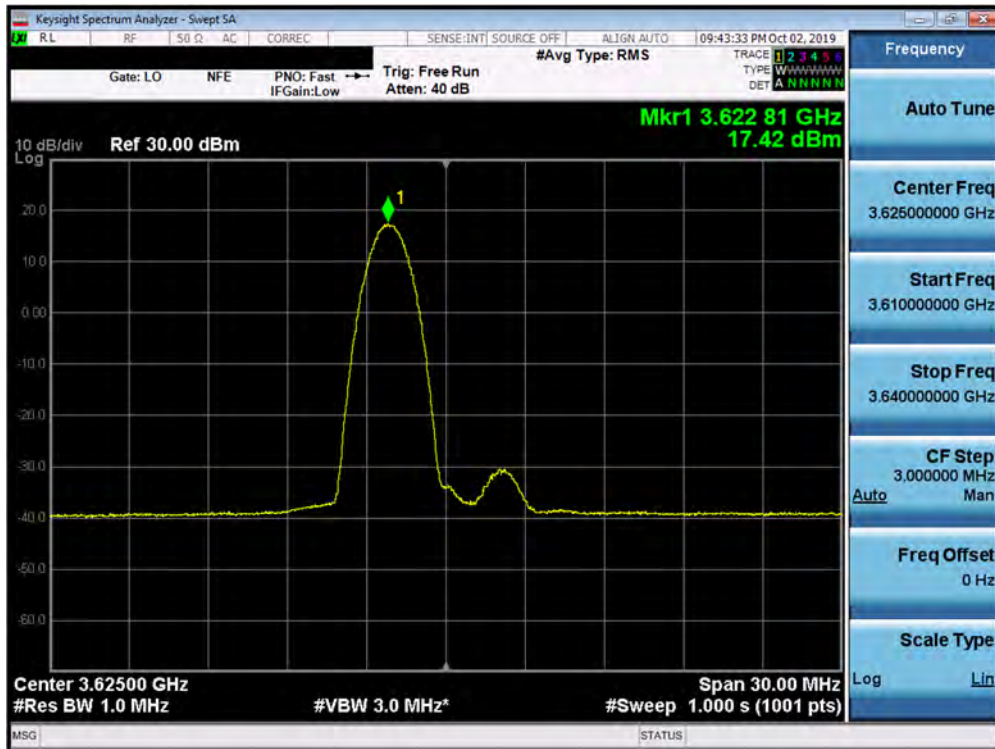


Plot 7-87. Peak Power Spectral Density Plot (B48 – 5.0MHz 64-QAM – Low Channel RB: 1 RB, Offset: 0 – Main Antenna)

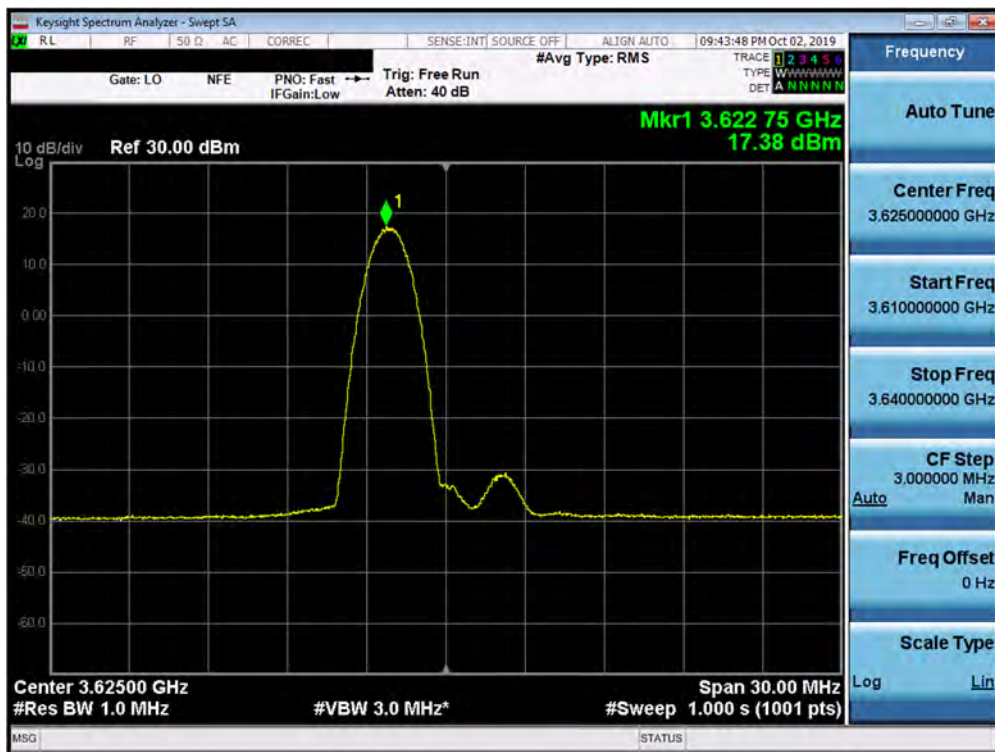


Plot 7-88. Peak Power Spectral Density Plot (B48 – 5.0MHz QPSK – Mid Channel RB: 1 RB, Offset: 0 – Main Antenna)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 60 of 144



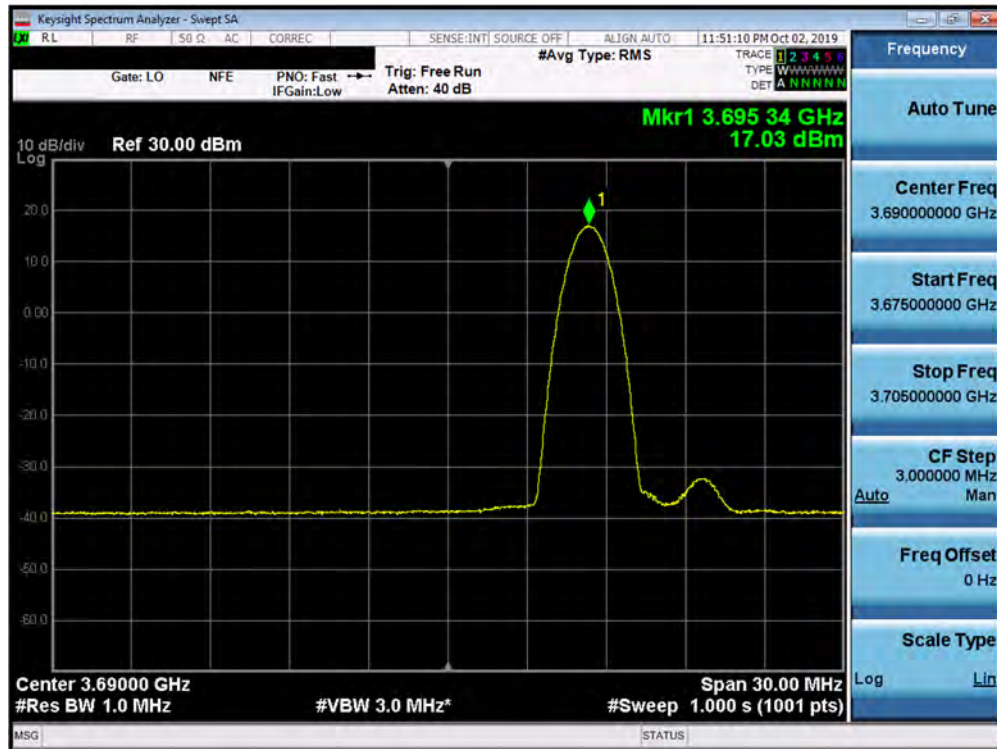
Plot 7-89. Peak Power Spectral Density Plot (B48 – 5.0MHz 16-QAM – Mid Channel RB: 1 RB, Offset: 0 – Main Antenna)



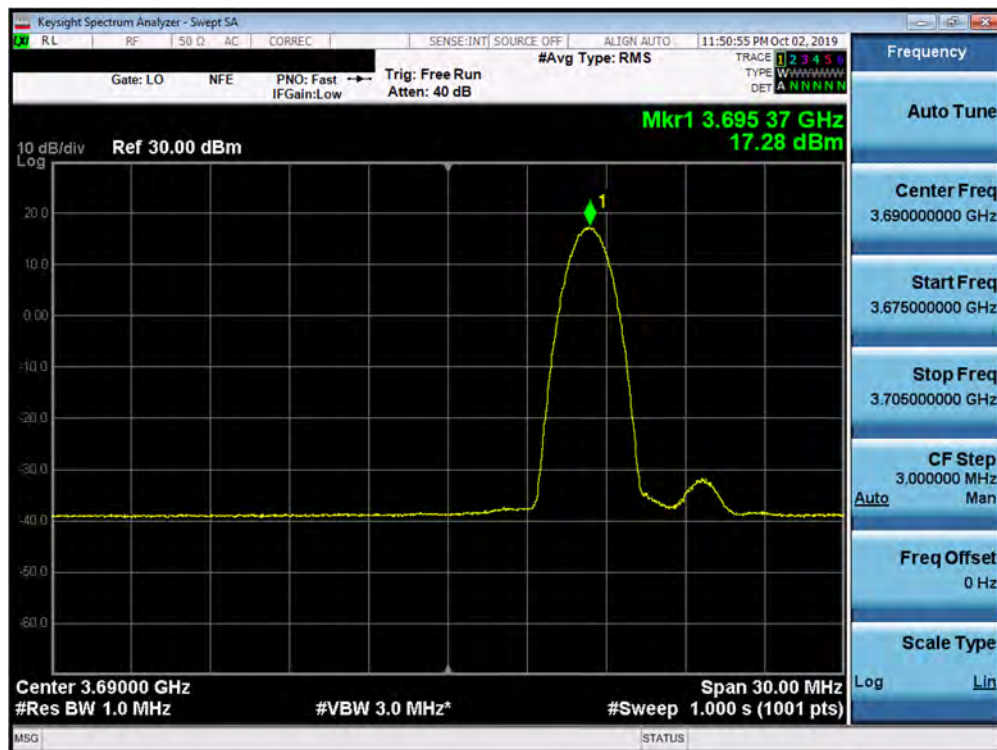
Plot 7-90. Peak Power Spectral Density Plot (B48 – 5.0MHz 64-QAM – Mid Channel RB: 1 RB, Offset: 0 – Main Antenna)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 61 of 144



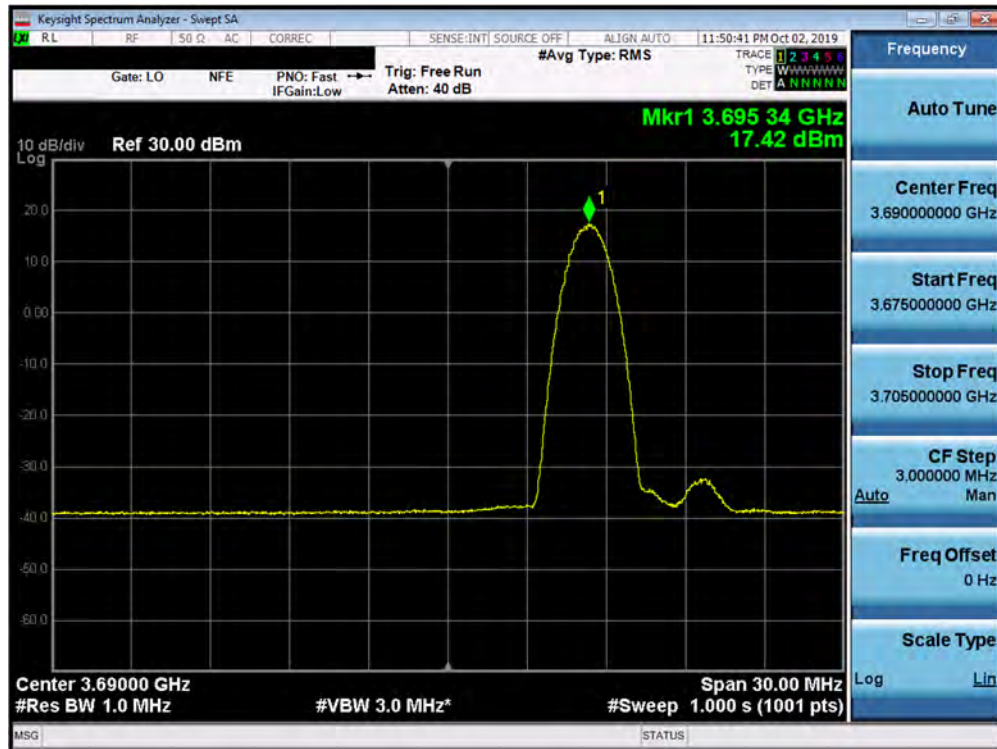


Plot 7-91. Peak Power Spectral Density Plot (B48 – 5.0MHz QPSK – High Channel RB: 1 RB, Offset: 0 – Main Antenna)

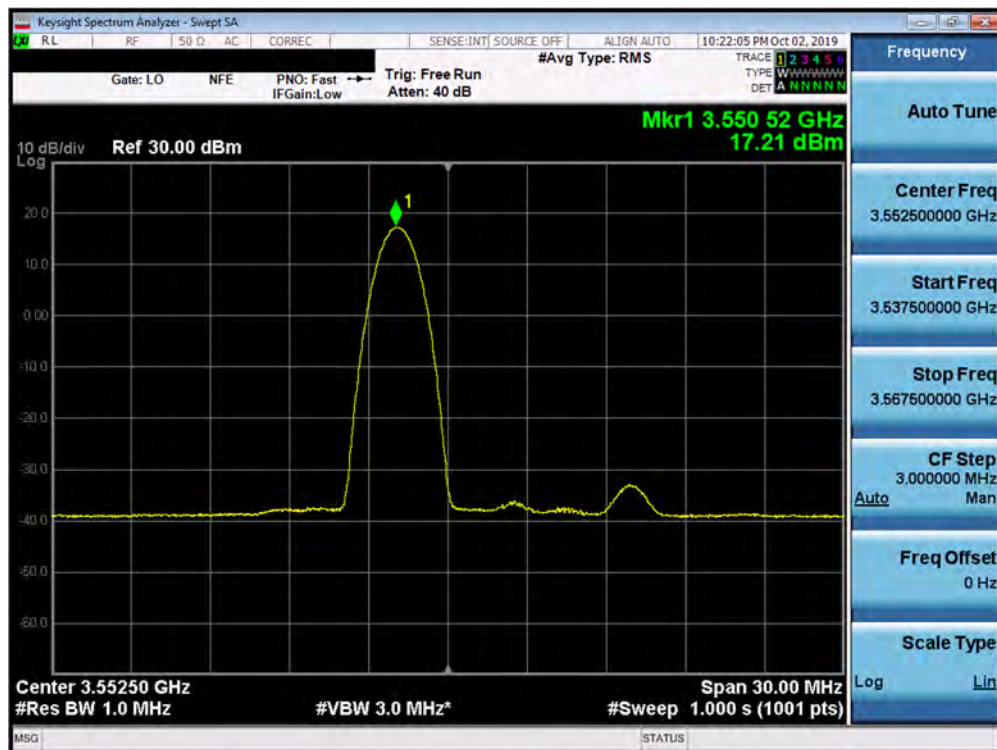


Plot 7-92. Peak Power Spectral Density Plot (B48 – 5.0MHz 16-QAM – High Channel RB: 1 RB, Offset: 0 – Main Antenna)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 62 of 144

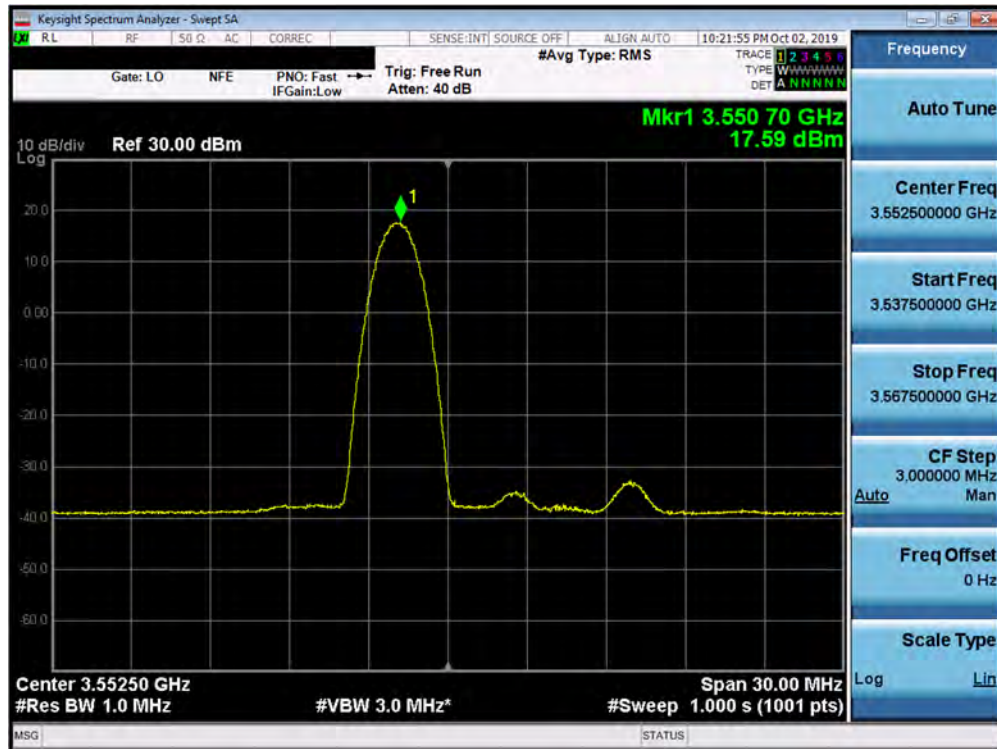


Plot 7-93. Peak Power Spectral Density Plot (B48 – 5.0MHz 64-QAM – High Channel RB: 1 RB, Offset: 0 – Main Antenna)

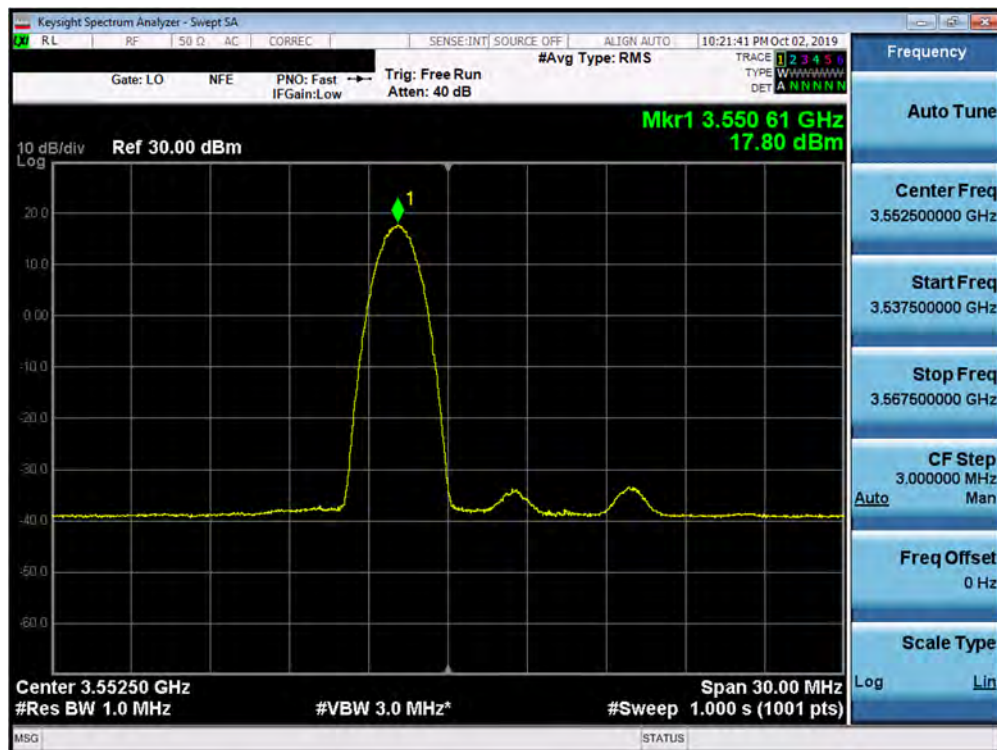


Plot 7-94. Peak Power Spectral Density Plot (B48 – 10.0MHz QPSK – Low Channel RB: 1 RB, Offset: 0 – Main Antenna)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 63 of 144



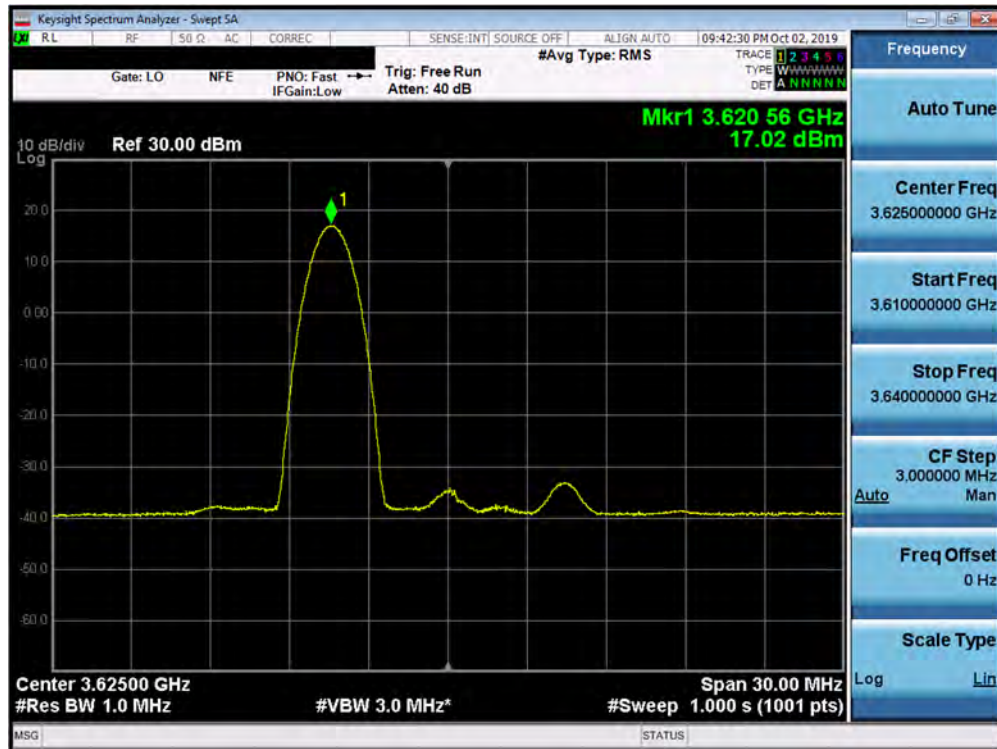
Plot 7-95. Peak Power Spectral Density Plot (B48 – 10.0MHz 16-QAM – Low Channel RB: 1 RB, Offset: 0 – Main Antenna)



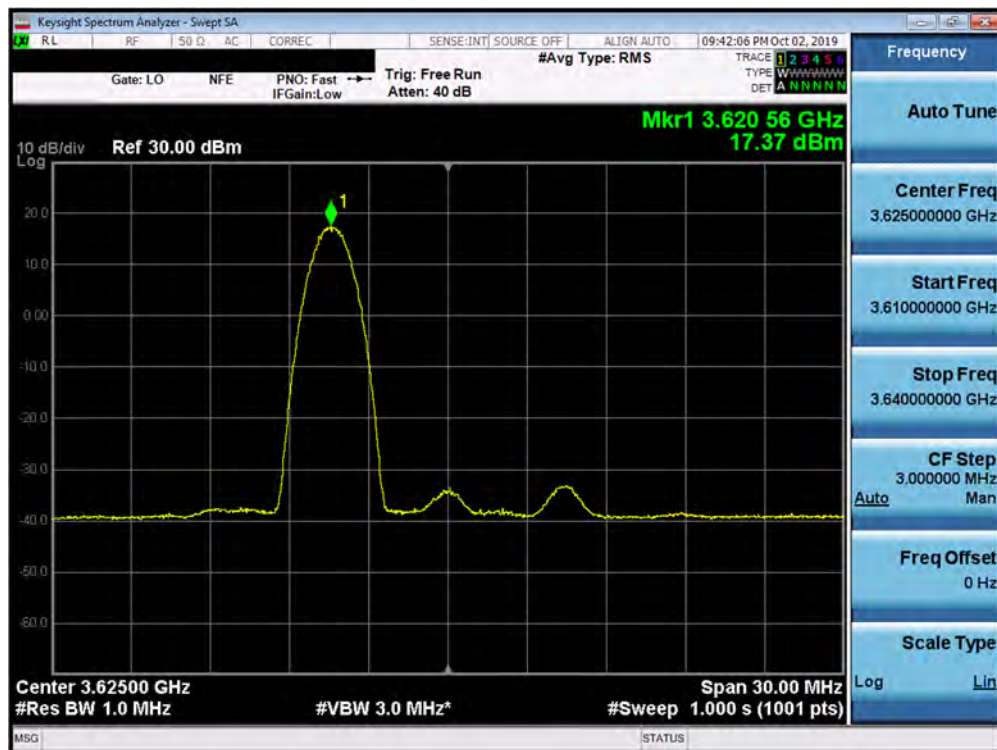
Plot 7-96. Peak Power Spectral Density Plot (B48 – 10.0MHz 64-QAM – Low Channel RB: 1 RB, Offset: 0 – Main Antenna)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 64 of 144



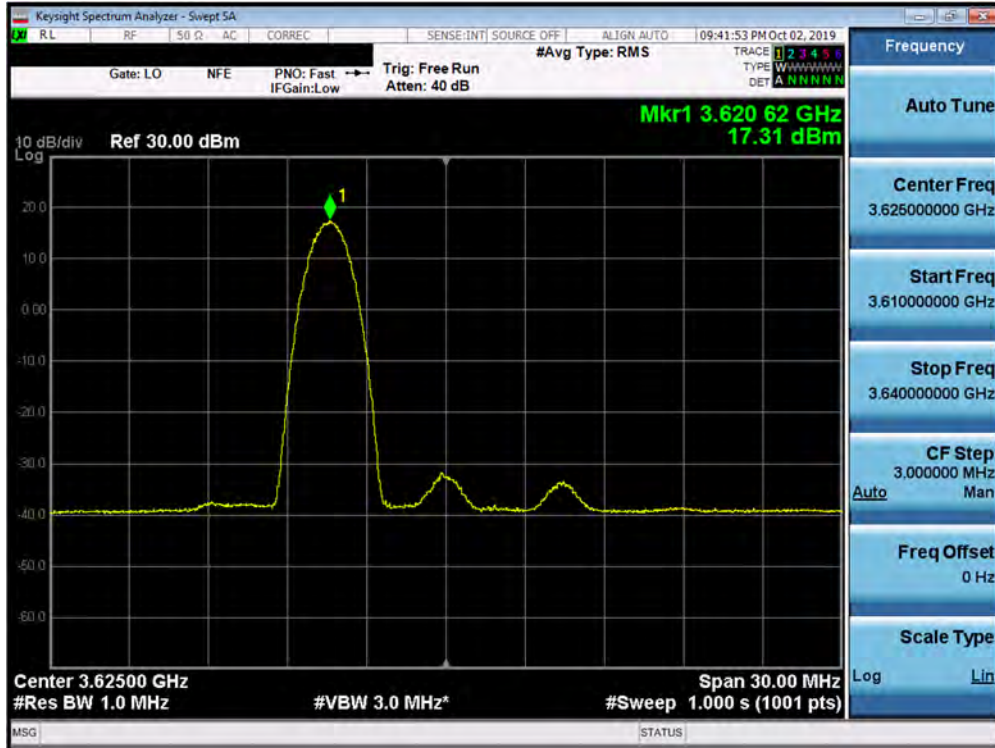


Plot 7-97. Peak Power Spectral Density Plot (B48 – 10.0MHz QPSK – Mid Channel RB: 1 RB, Offset: 0 – Main Antenna)

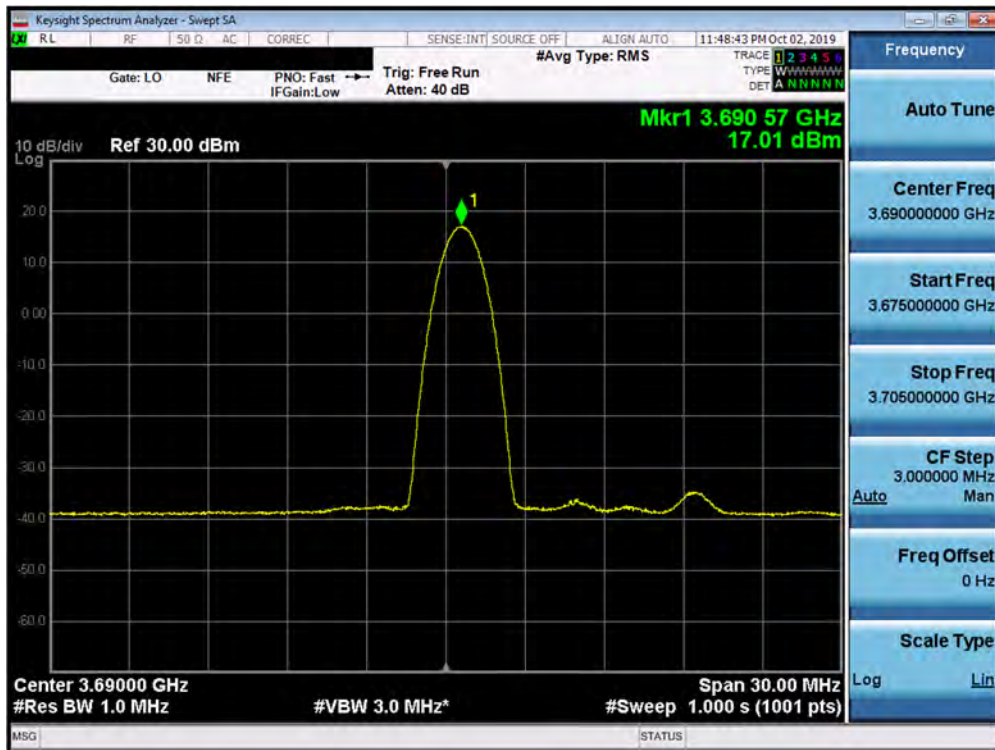


Plot 7-98. Peak Power Spectral Density Plot (B48 – 10.0MHz 16-QAM – Mid Channel RB: 1 RB, Offset: 0 – Main Antenna)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 65 of 144

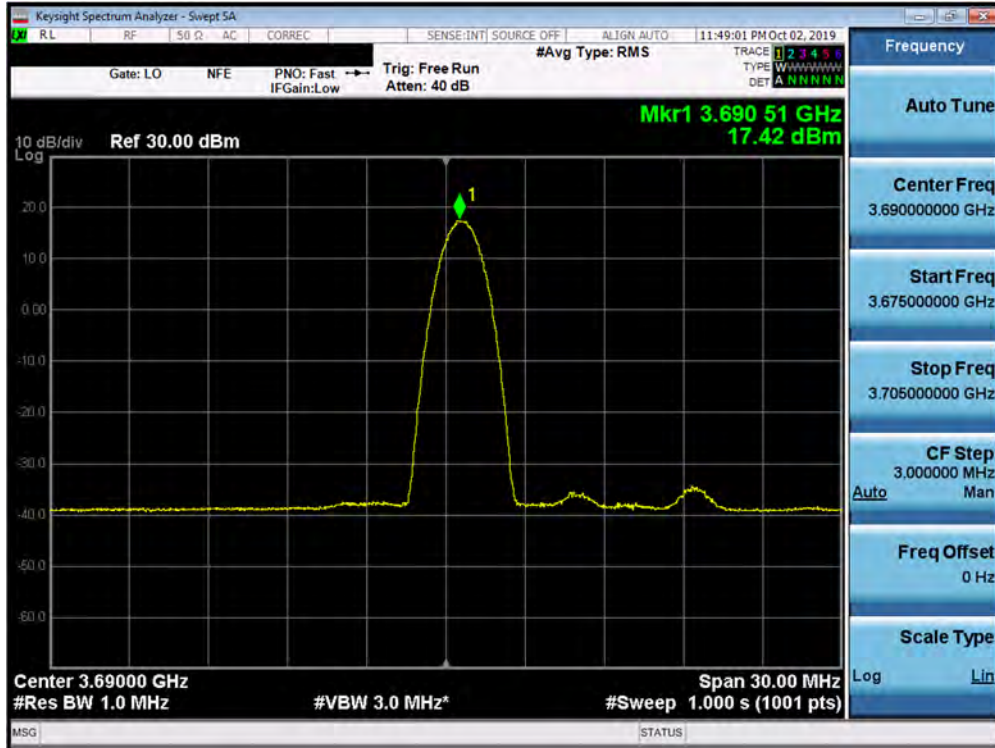


Plot 7-99. Peak Power Spectral Density Plot (B48 – 10.0MHz 64-QAM – Mid Channel RB: 1 RB, Offset: 0 – Main Antenna)

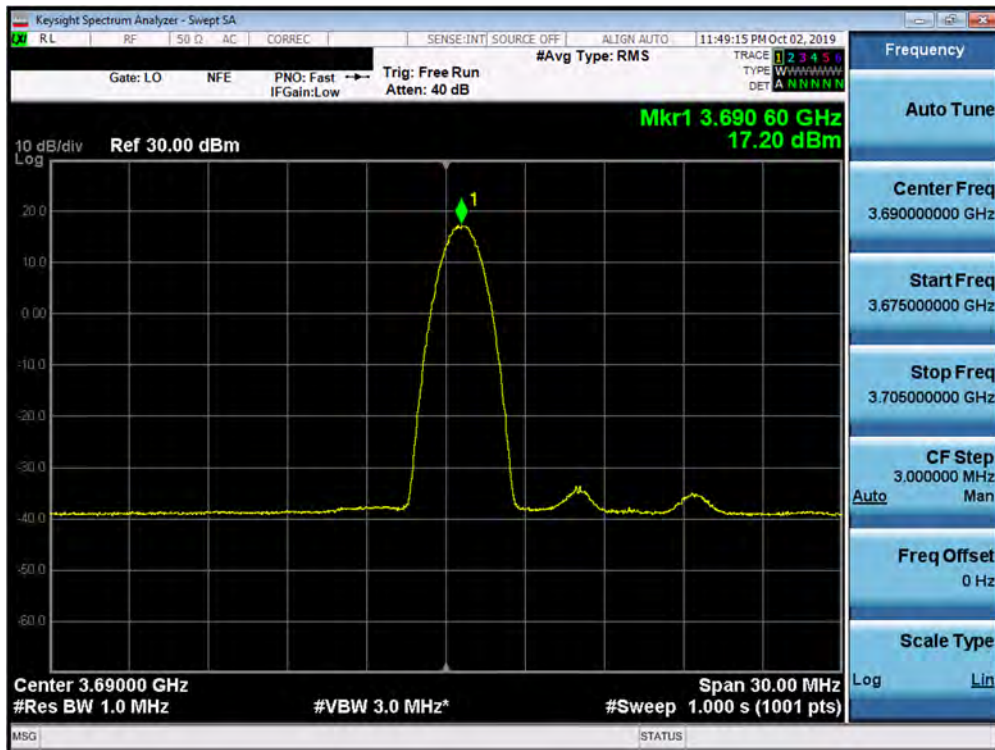


Plot 7-100. Peak Power Spectral Density Plot (B48 – 10.0MHz QPSK – High Channel RB: 1 RB, Offset: 0 – Main Antenna)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 66 of 144



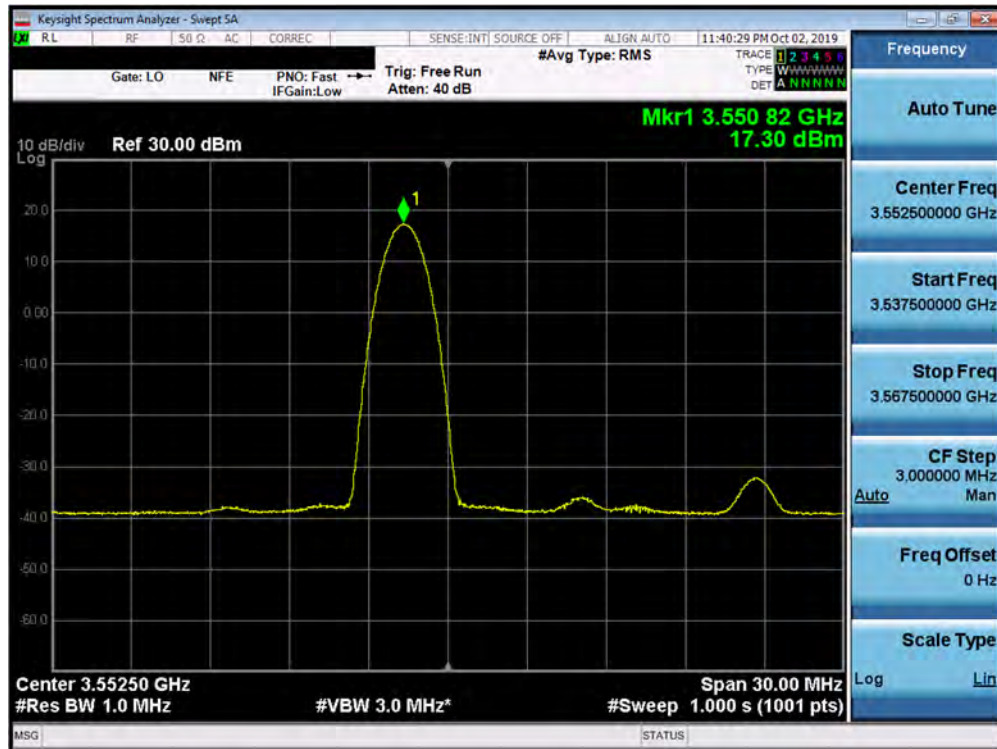
Plot 7-101. Peak Power Spectral Density Plot (B48 – 10.0MHz 16-QAM – High Channel RB: 1 RB, Offset: 0 – Main Antenna)



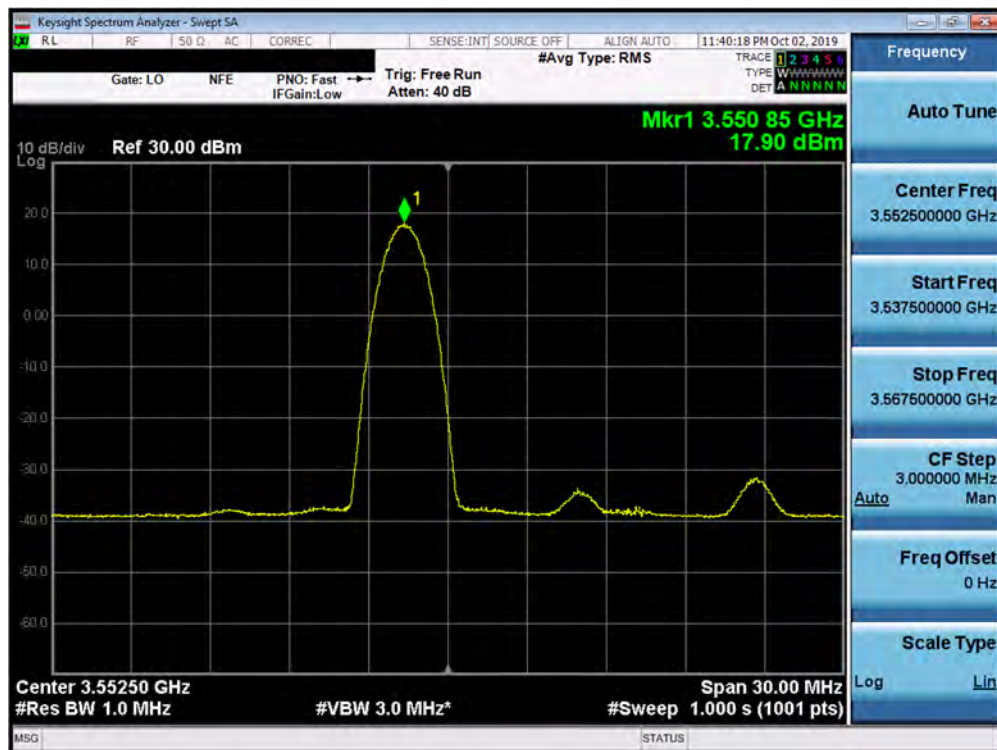
Plot 7-102. Peak Power Spectral Density Plot (B48 – 10.0MHz 64-QAM – High Channel RB: 1 RB, Offset: 0 – Main Antenna)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 67 of 144



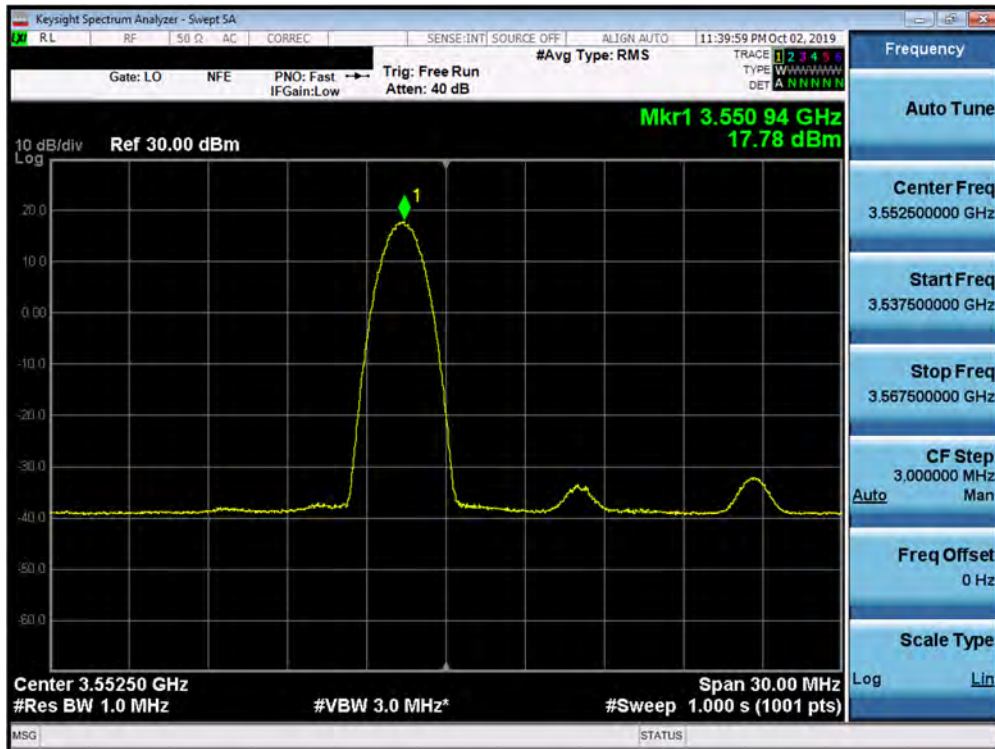


Plot 7-103. Peak Power Spectral Density Plot (B48 – 15.0MHz QPSK – Low Channel RB: 1 RB, Offset: 0 – Main Antenna)

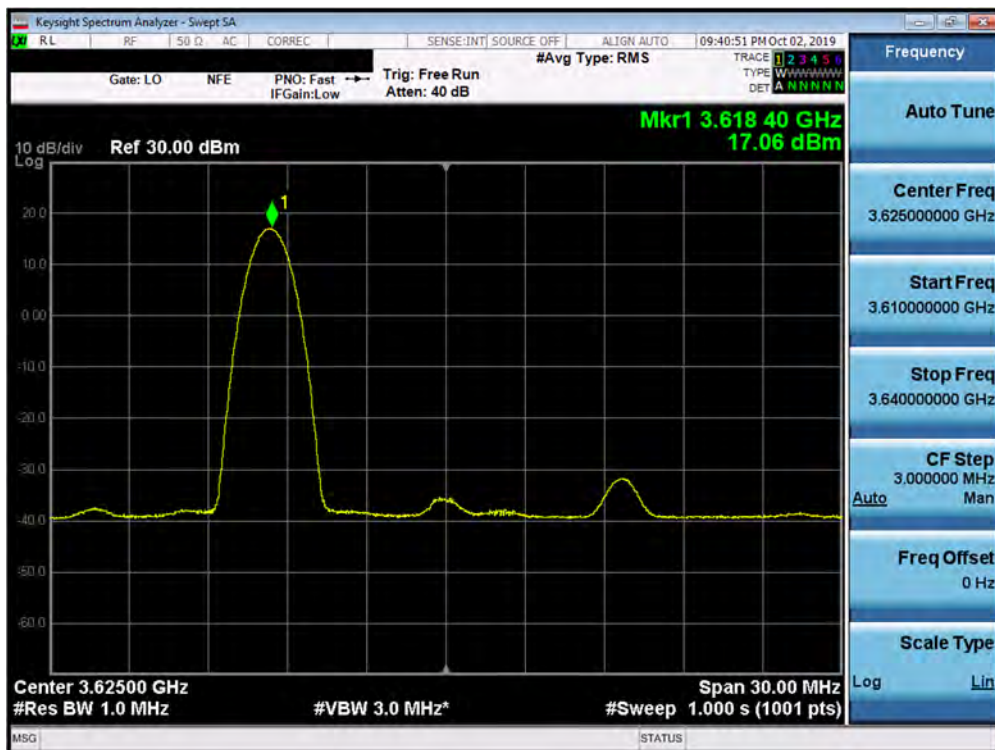


Plot 7-104. Peak Power Spectral Density Plot (B48 – 15.0MHz 16-QAM – Low Channel RB: 1 RB, Offset: 0 – Main Antenna)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 68 of 144

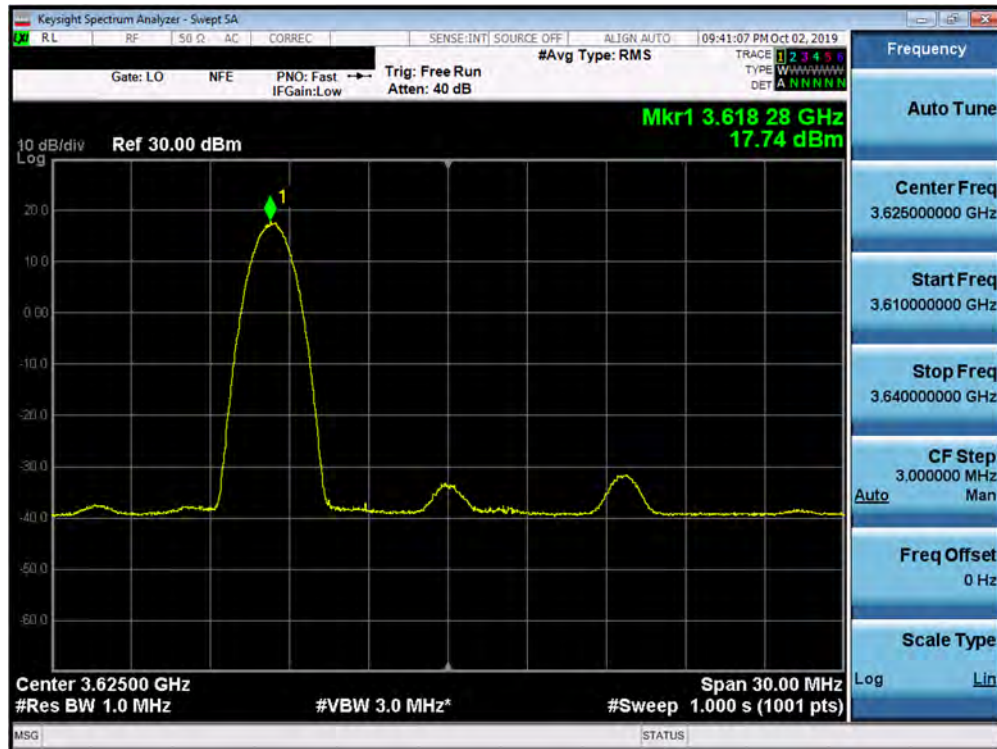


Plot 7-105. Peak Power Spectral Density Plot (B48 – 15.0MHz 64-QAM – Low Channel RB: 1 RB, Offset: 0 – Main Antenna)

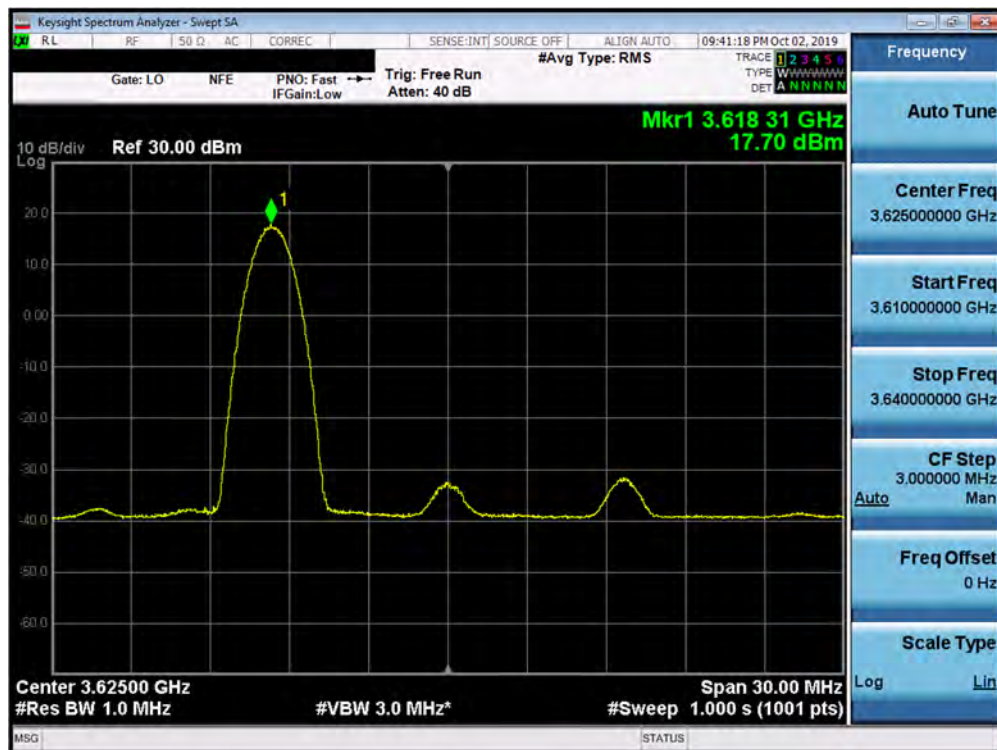


Plot 7-106. Peak Power Spectral Density Plot (B48 – 15.0MHz QPSK – Mid Channel RB: 1 RB, Offset: 0 – Main Antenna)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 69 of 144



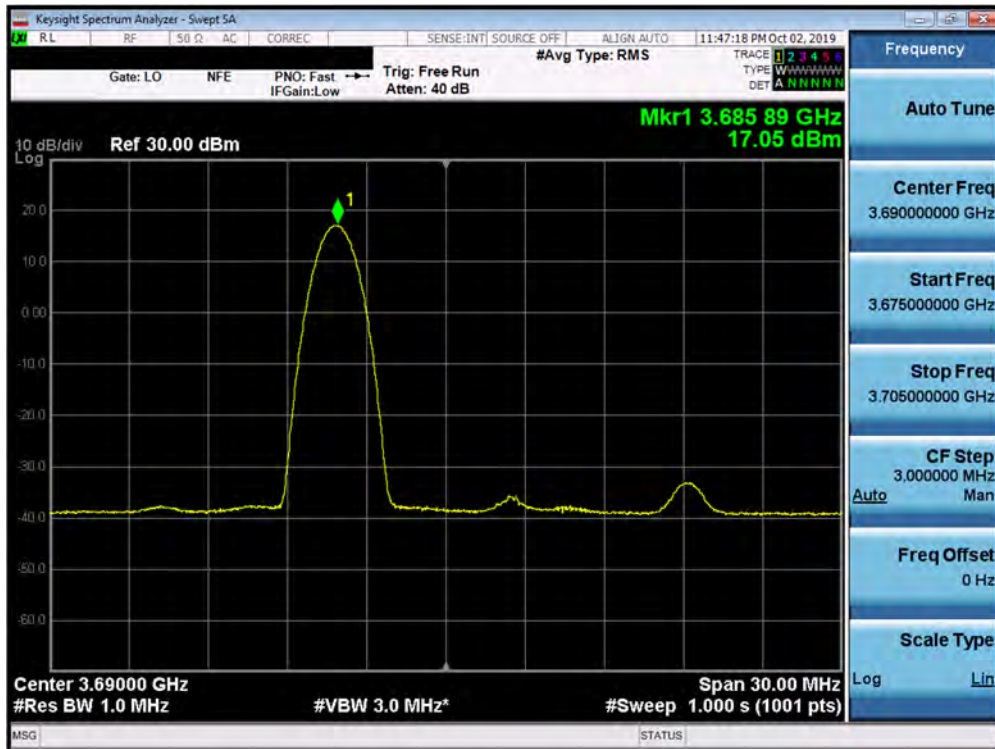
Plot 7-107. Peak Power Spectral Density Plot (B48 – 15.0MHz 16-QAM – Mid Channel RB: 1 RB, Offset: 0 – Main Antenna)



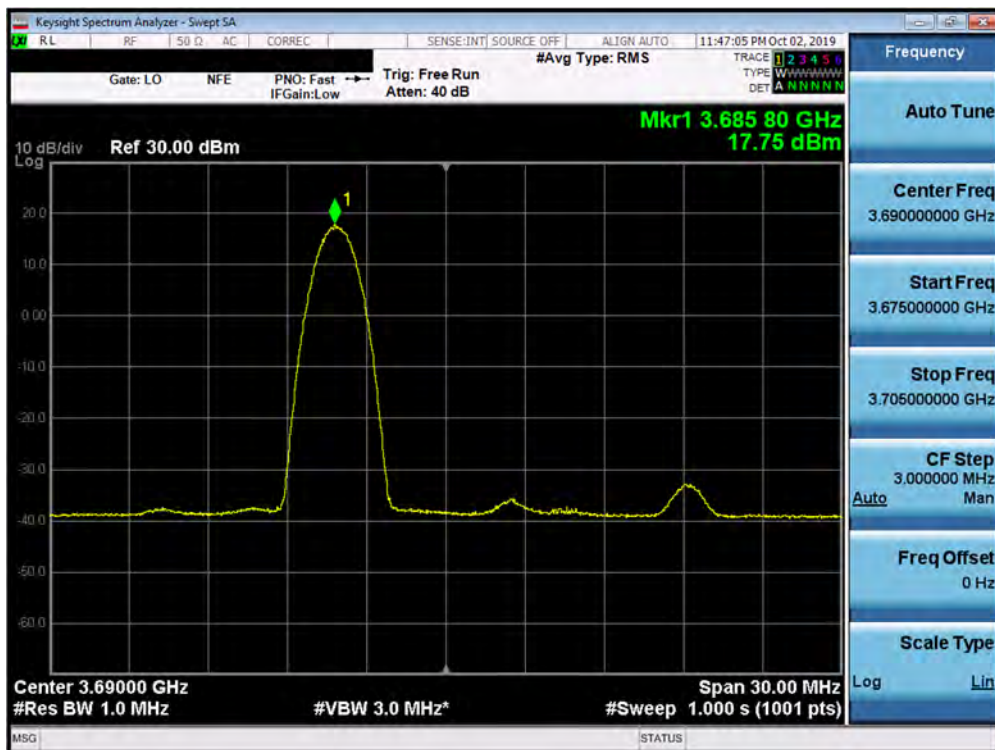
Plot 7-108. Peak Power Spectral Density Plot (B48 – 15.0MHz 64-QAM – Mid Channel RB: 1 RB, Offset: 0 – Main Antenna)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 70 of 144



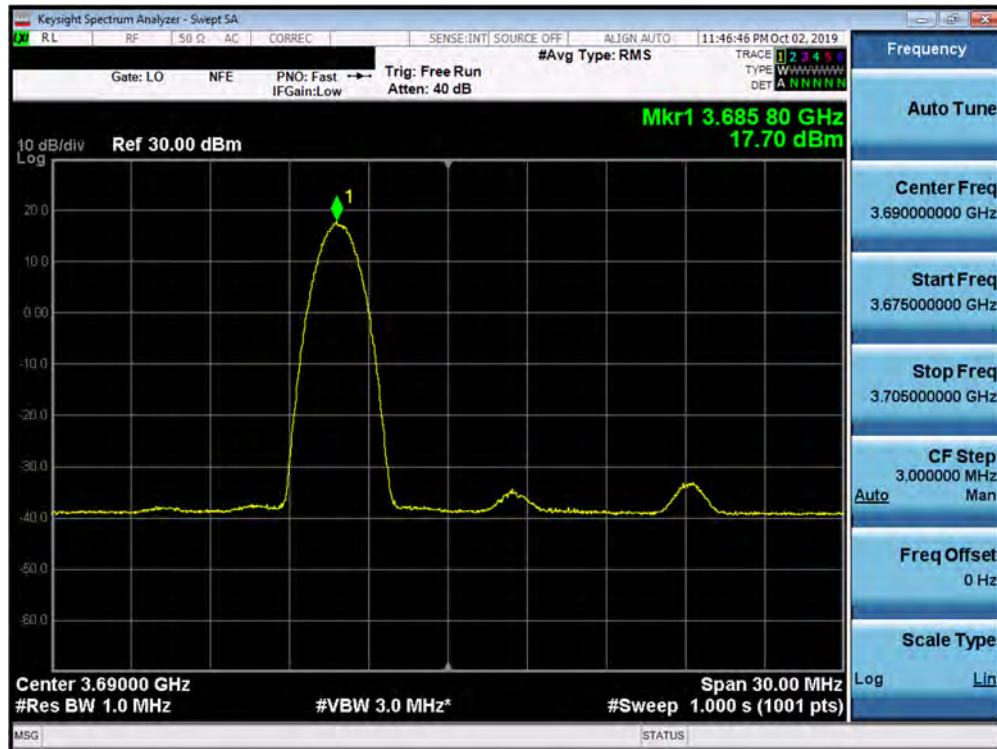


Plot 7-109. Peak Power Spectral Density Plot (B48 – 15.0MHz QPSK – High Channel RB: 1 RB, Offset: 0 – Main Antenna)

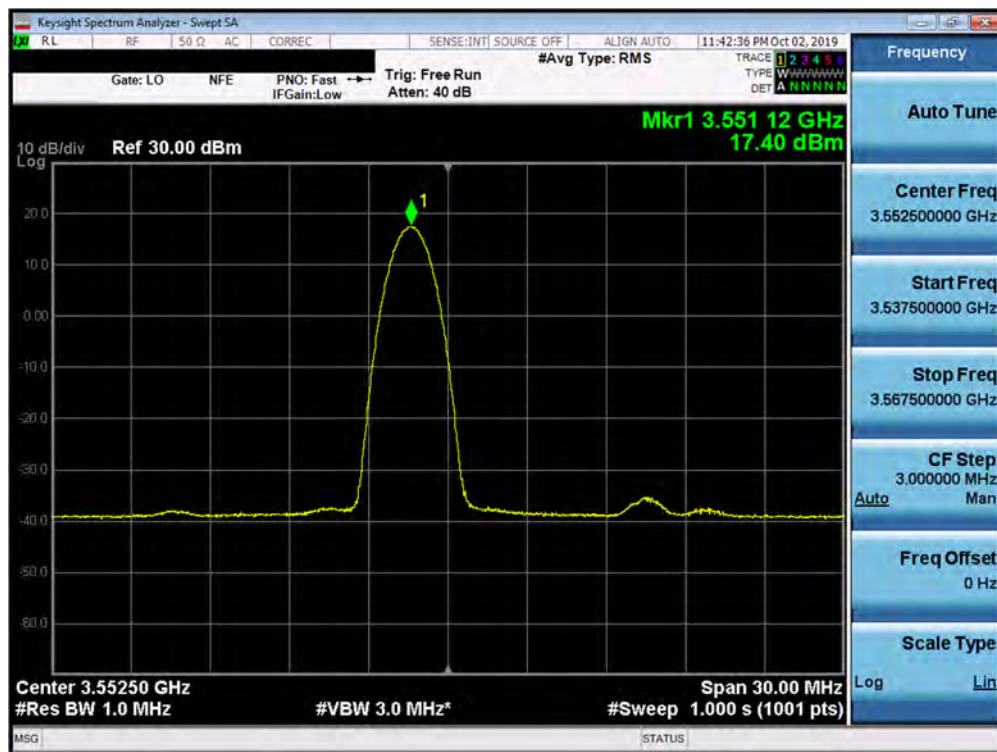


Plot 7-110. Peak Power Spectral Density Plot (B48 – 15.0MHz 16-QAM – High Channel RB: 1 RB, Offset: 0 – Main Antenna)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 71 of 144



Plot 7-111. Peak Power Spectral Density Plot (B48 – 15.0MHz 64-QAM – High Channel RB: 1 RB, Offset: 0 – Main Antenna)



Plot 7-112. Peak Power Spectral Density Plot (B48 – 20.0MHz QPSK – Low Channel RB: 1 RB, Offset: 0 – Main Antenna)

FCC ID: XIA-IFWA661	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M1907090120-2-R2.XIA	Test Dates: 7/31-10/2/2019	EUT Type: Outdoor LTE Router		Page 72 of 144