

MEASUREMENT REPORT LTE

Applicant Name:
Netcomm Wireless Limited
18-20 Orion Road
Lane Cove NSW 2066
Sydney Australia


Date of Testing:
3/31 - 7/23/2020
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M2006290101-01.XIA

FCC ID:	XIA-CFW2182
APPLICANT:	Netcomm Wireless Limited

Application Type: Certification
Model: CFW-2182
EUT Type: Outdoor LTE Router
FCC Classification: Citizens Band End User Device (CBE)
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.

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

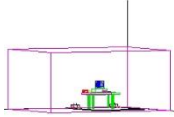


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T A B L E O F C O N T E N T S

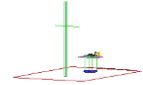
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FCC Part 96



Mode	FCC Rule Part	Tx Frequency (MHz)	EIRP		Emission Designator	Modulation
			Max. Power (W)	Max. Power (dBm)		
LTE Band 48	96	3552.5 - 3697.5	0.172	22.35	4M54G7D	QPSK
LTE Band 48	96	3552.5 - 3697.5	0.178	22.51	4M51W7D	16QAM
LTE Band 48	96	3552.5 - 3697.5	0.173	22.37	4M52W7D	64QAM
LTE Band 48	96	3555 - 3695	0.191	22.80	9M00G7D	QPSK
LTE Band 48	96	3555 - 3695	0.187	22.71	8M99W7D	16QAM
LTE Band 48	96	3555 - 3695	0.176	22.45	9M02W7D	64QAM
LTE Band 48	96	3557.5 - 3692.5	0.173	22.39	13M5G7D	QPSK
LTE Band 48	96	3557.5 - 3692.5	0.138	21.40	13M5W7D	16QAM
LTE Band 48	96	3557.5 - 3692.5	0.172	22.36	13M5W7D	64QAM
LTE Band 48	96	3560 - 3690	0.195	22.90	18M0G7D	QPSK
LTE Band 48	96	3560 - 3690	0.191	22.82	18M0W7D	16QAM
LTE Band 48	96	3560 - 3690	0.175	22.43	17M9W7D	64QAM

EUT Overview (LTE B48)

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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 ISED Standards (RSS).
- PCTEST facility is a registered (2451B) test laboratory with the site description on file with ISED.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Netcomm Outdoor LTE Router FCC ID: XIA-CFW2182**. 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 an end user device.

Test Device Serial No.: 00266, 00274, 00290

2.2 Device Capabilities

This device contains the following capabilities:

LTE B48

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.

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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 $43 + 10\log_{10}(\text{Power}_{\text{[Watts]}})$.

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.

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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_{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

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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
-	LTx1	Licensed Transmitter Cable Set	6/4/2019	Annual	6/4/2020	LTx1
-	LTx2	Licensed Transmitter Cable Set	10/30/2019	Annual	10/30/2020	LTx2
Agilent	N9038A	MXE EMI Receiver	7/17/2019	Annual	7/17/2020	MY51210133
Agilent	N9030A	PXA Signal Analyzer (44GHz)	6/12/2019	Annual	6/12/2020	MY52350166
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	10/10/2019	Biennial	10/10/2021	121034
Espec	ESX-2CA	Environmental Chamber	6/13/2019	Annual	6/13/2020	17620
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	2/22/2019	Biennial	2/22/2021	128338
Mini Circuits	TVA-11-422	RF Power Amp	N/A			QA1317001
Mini Circuits	PWR-SEN-4GHS	USB Power Sensor	4/19/2019	Annual	4/19/2020	11401010036
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A			11403100002
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			100976
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	6/5/2019	Annual	6/5/2020	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/23/2019	Annual	9/23/2020	100348
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	7/11/2019	Annual	7/11/2020	102134
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	7/8/2019	Annual	7/8/2020	102133
Sunol	DRH-118	Horn Antenna (1-18GHz)	10/3/2019	Biennial	10/3/2021	A050307
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	4/19/2018	Biennial	4/19/2020	A051107
Sunol	DRH-118	Horn Antenna (1-18 GHz)	8/27/2019	Biennial	8/27/2021	A042511

Table 5-1. Test Equipment

Notes:

1. 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.
2. Equipment with a calibration date of "N/A" shown in this list was not used to make direct calibrated measurements.

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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 2nd 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).

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7.0 TEST RESULTS

7.1 Summary

Company Name: Netcomm Wireless Limited

FCC ID: XIA-CFW2182

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, 96.41(b)	Transmitter Conducted Output Power (Calculated EIRP)	23dBm / 10MHz EIRP (average)		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(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 7.6
2.1055	Frequency Stability	Fundamental emissions stay within authorized frequency block		PASS	Section 7.11

Table 7-1. Summary of Conducted Test Results

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FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1053 96.41(e)	Undesirable Emissions	-40 dBm/MHz	RADIATED	PASS	Section 7.8
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.

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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 x 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.

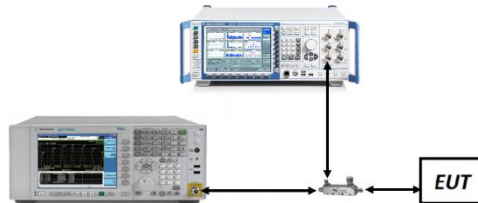




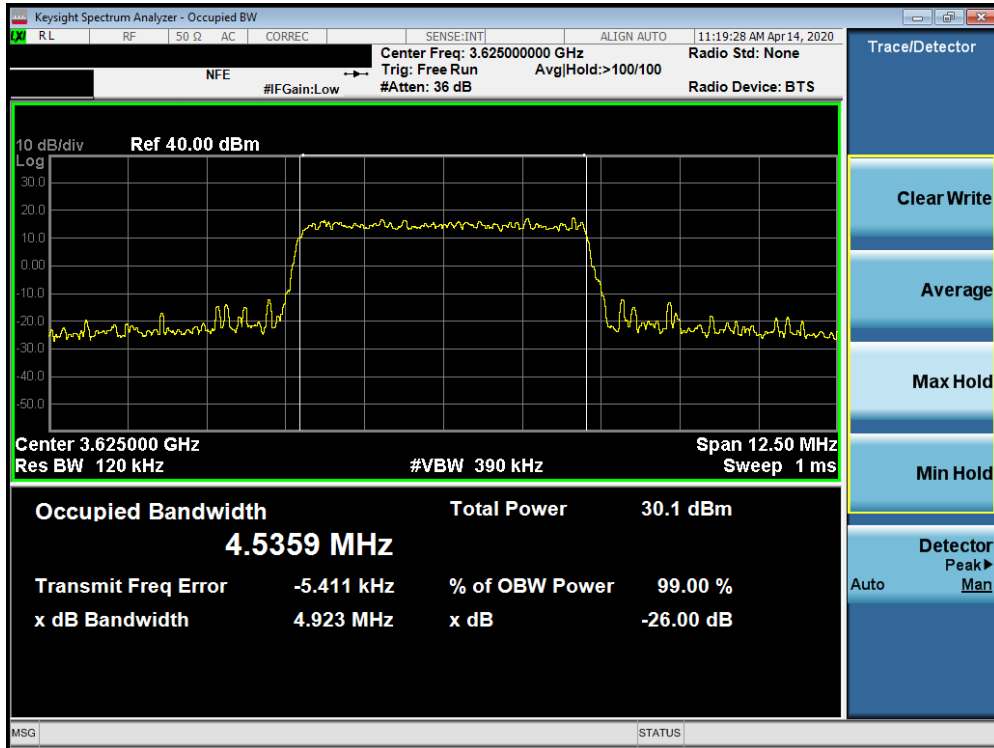
Figure 7-1. Test Instrument & Measurement Setup

Test Notes

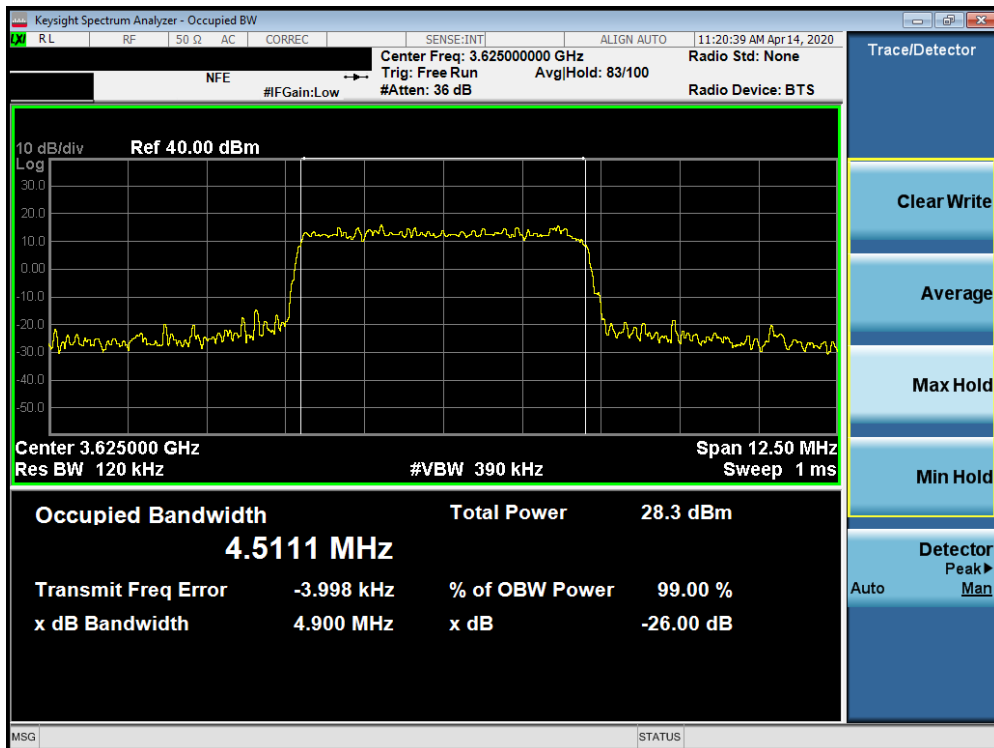
None.

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Band 48

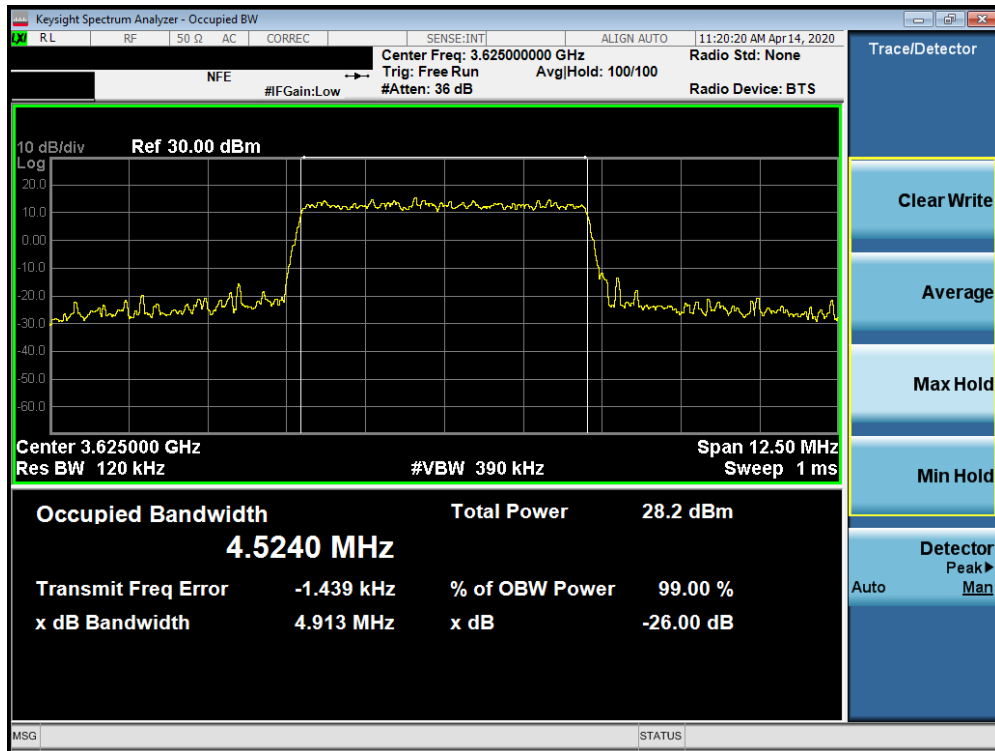


Plot 7-1. Occupied Bandwidth Plot (Band 48 - 5.0MHz QPSK - Full RB Configuration)

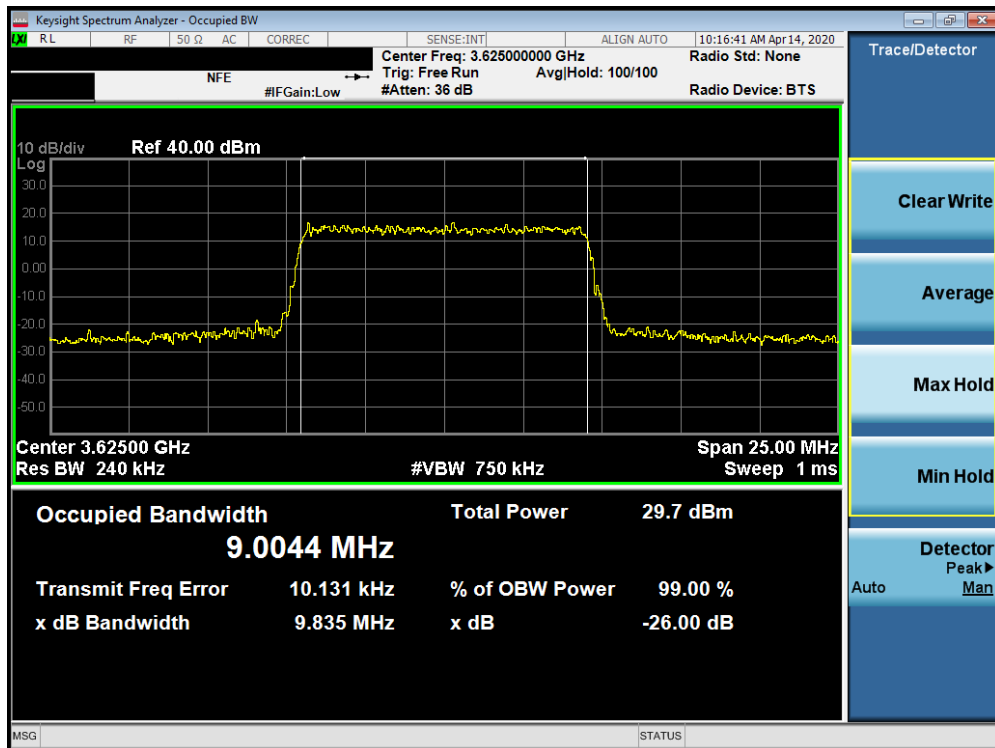


Plot 7-2. Occupied Bandwidth Plot (Band 48 - 5.0MHz 16-QAM - Full RB Configuration)




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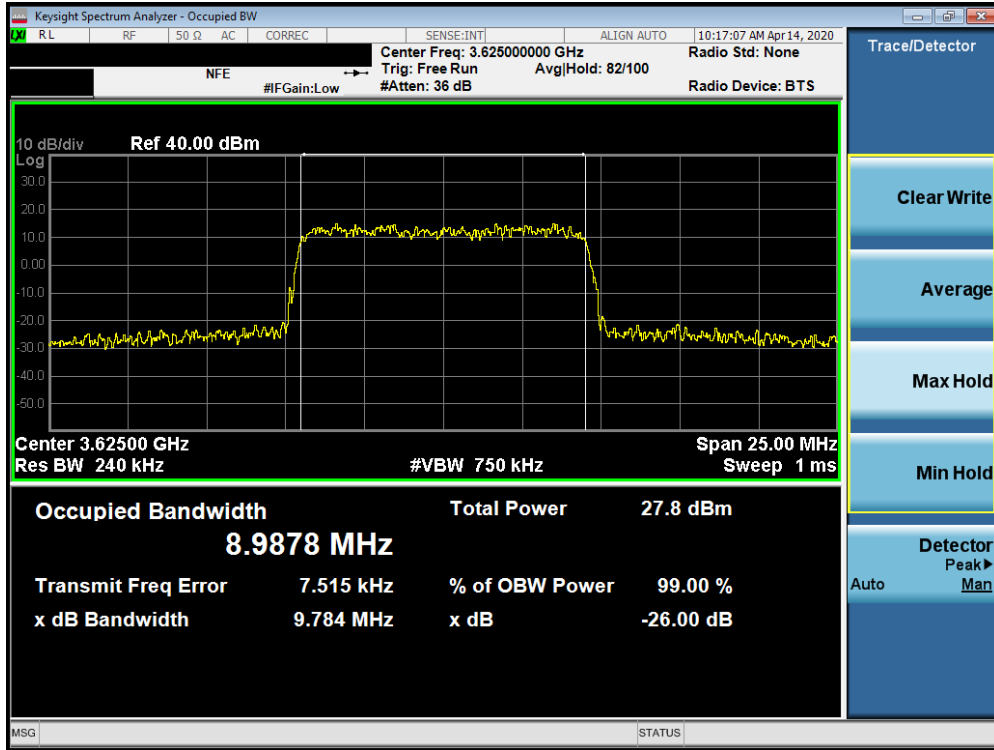


Plot 7-3. Occupied Bandwidth Plot (Band 48 - 5.0MHz 64-QAM - Full RB Configuration)

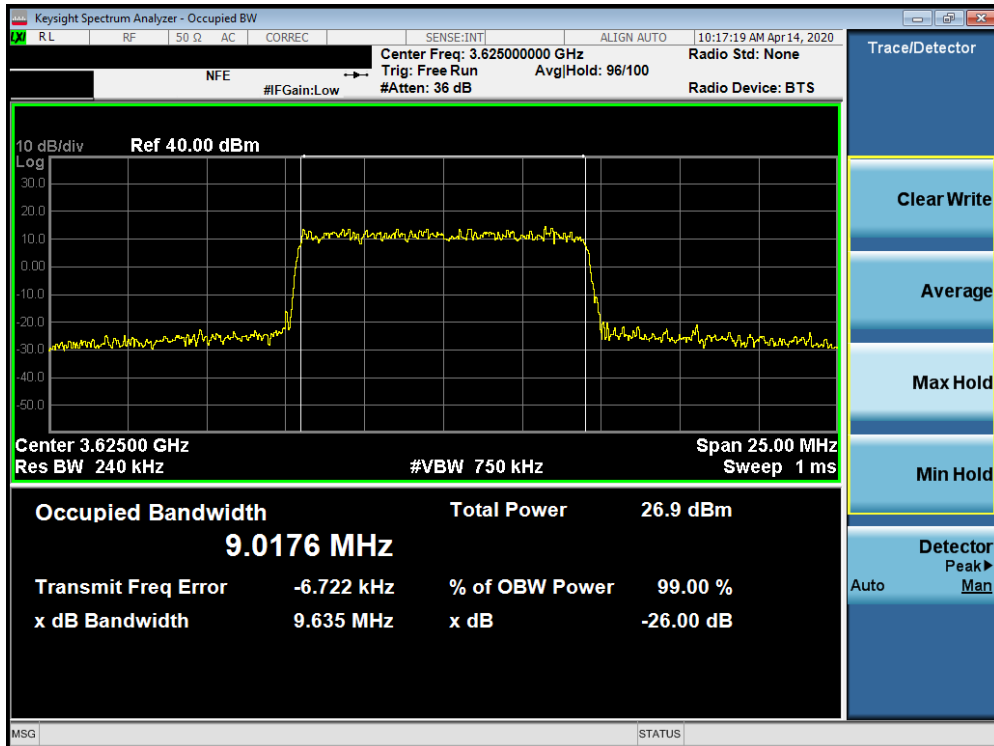


Plot 7-4. Occupied Bandwidth Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)



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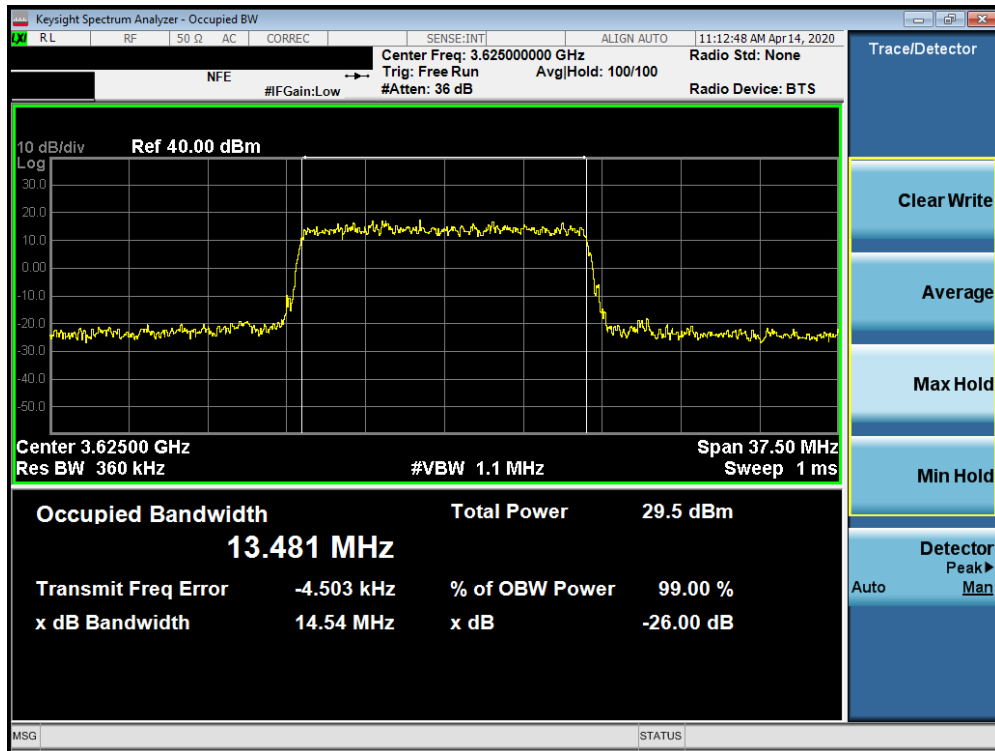


Plot 7-5. Occupied Bandwidth Plot (Band 48 - 10.0MHz 16-QAM - Full RB Configuration)

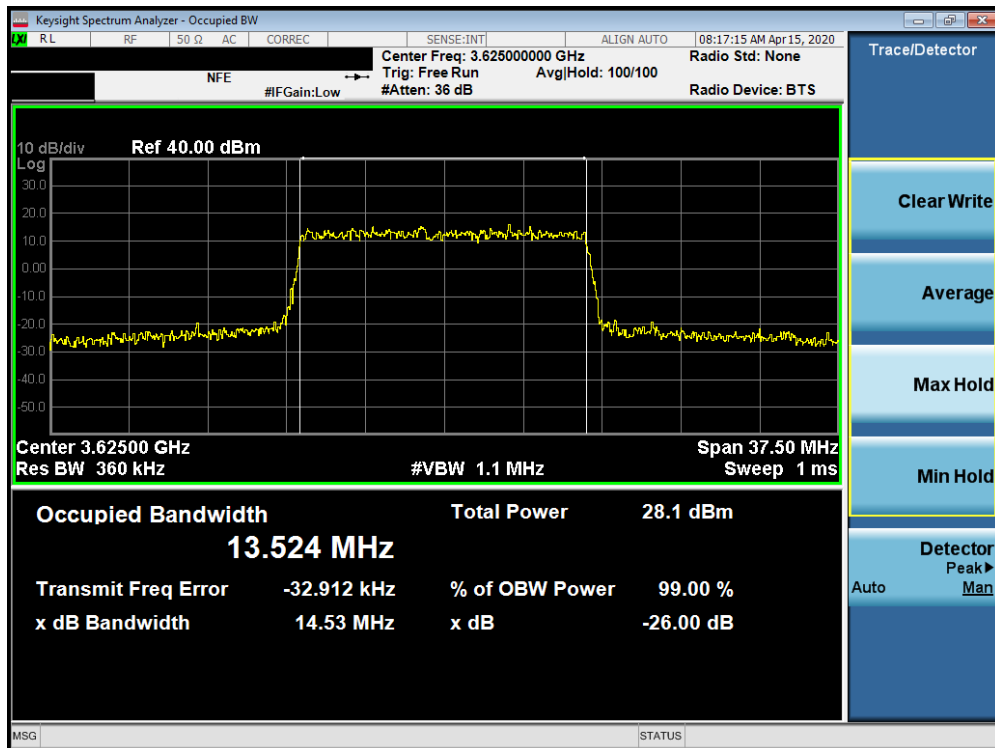


Plot 7-6. Occupied Bandwidth Plot (Band 48 - 10.0MHz 64-QAM - Full RB Configuration)



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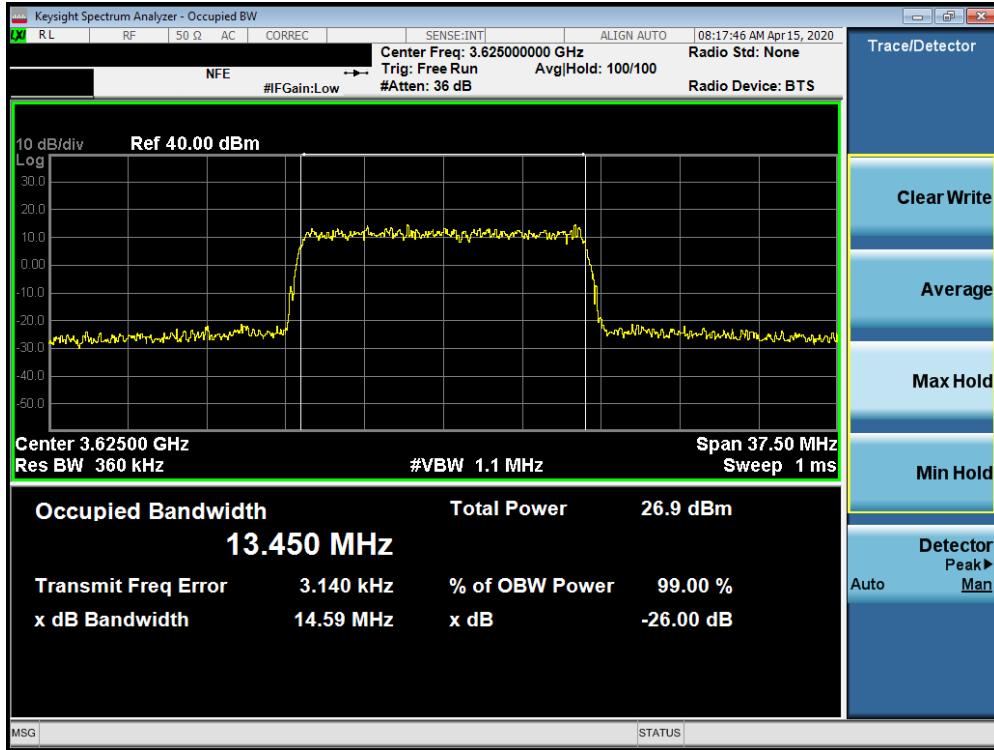


Plot 7-7. Occupied Bandwidth Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)

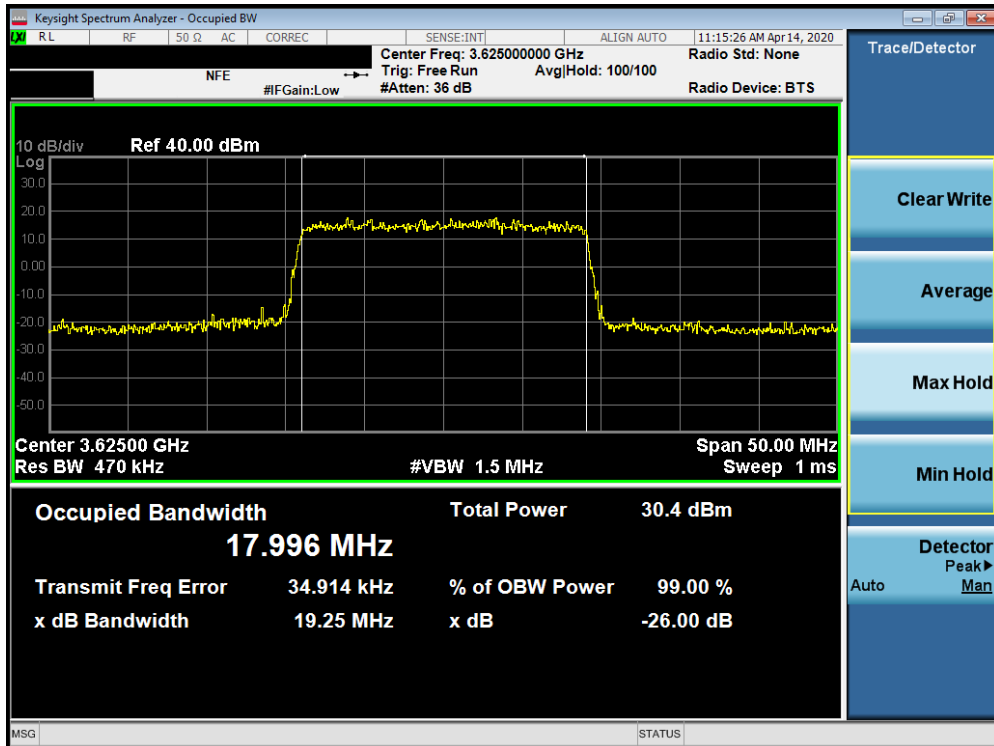


Plot 7-8. Occupied Bandwidth Plot (Band 48 - 15.0MHz 16-QAM - Full RB Configuration)



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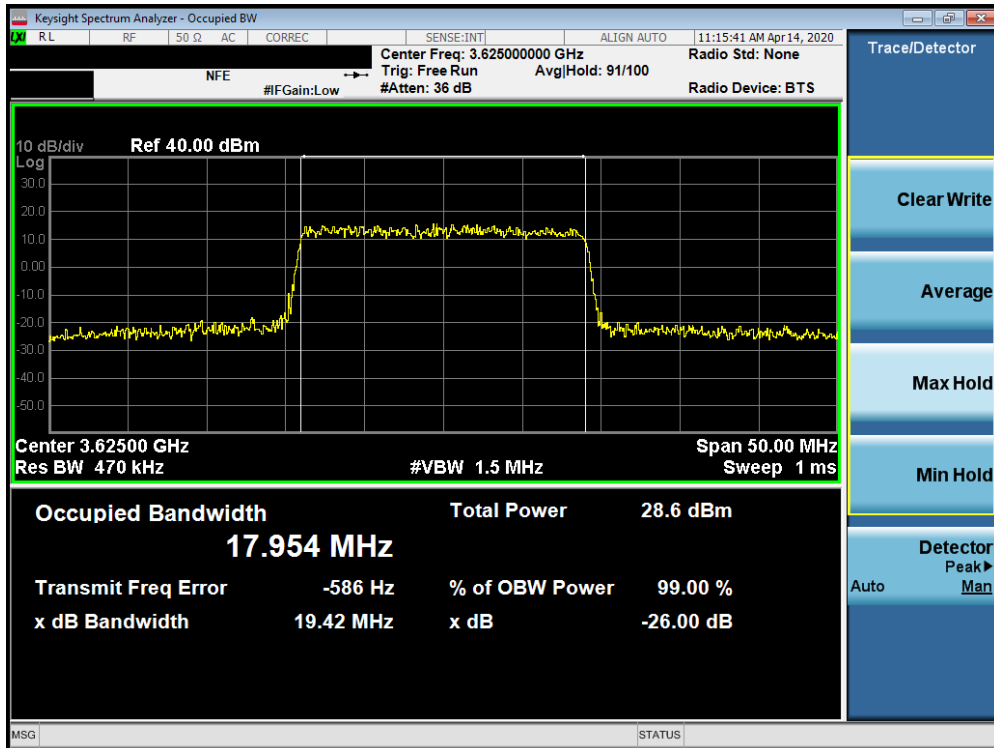


Plot 7-9. Occupied Bandwidth Plot (Band 48 - 15.0MHz 64-QAM - Full RB Configuration)

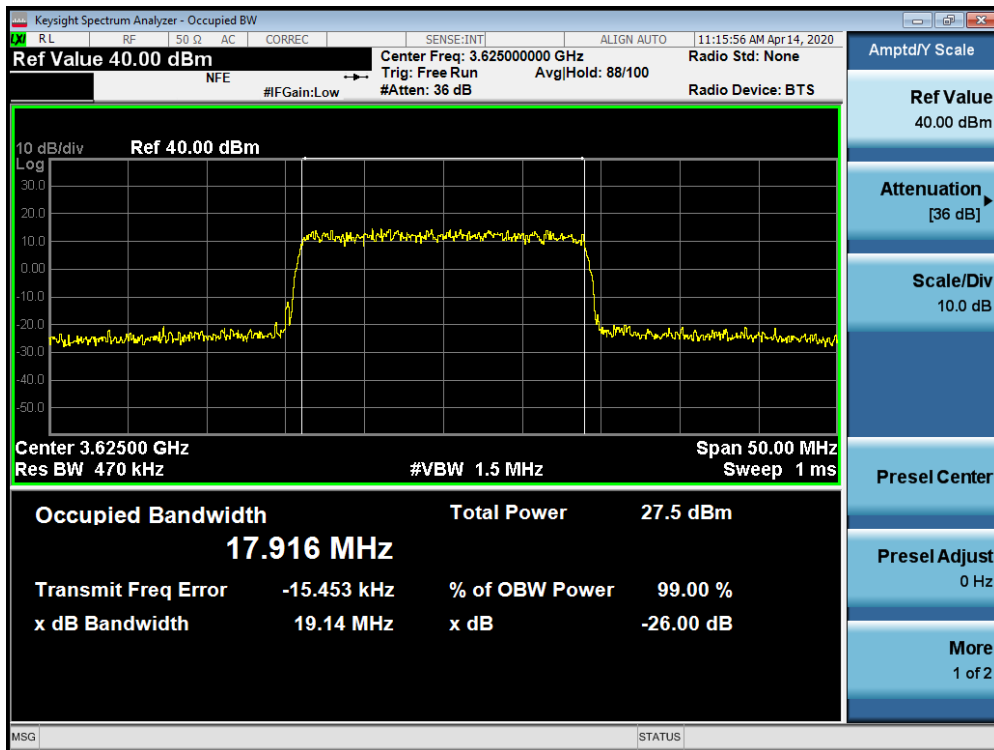


Plot 7-10. Occupied Bandwidth Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)




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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-CFW2182	 Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	 NetCommWireless	Approved by: Quality Manager
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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 10th 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.

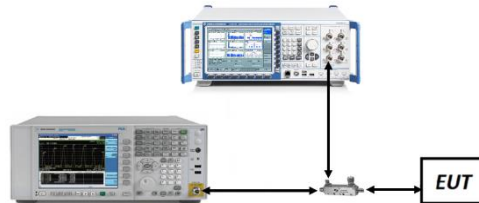



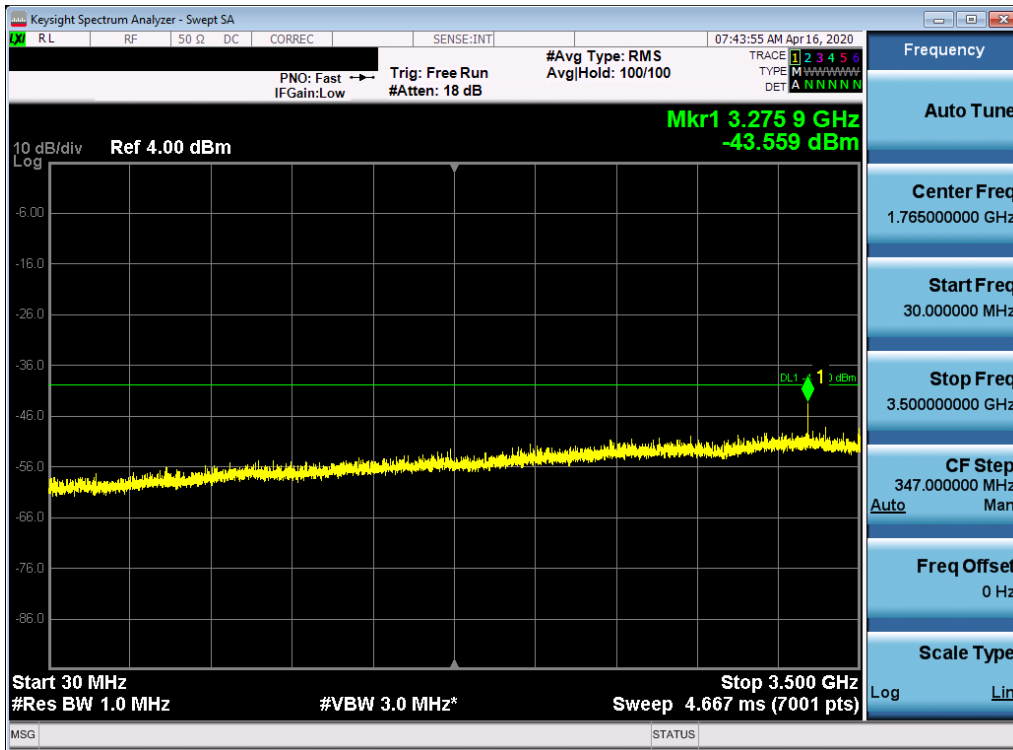
Figure 7-2. Test Instrument & Measurement Setup

Test Notes

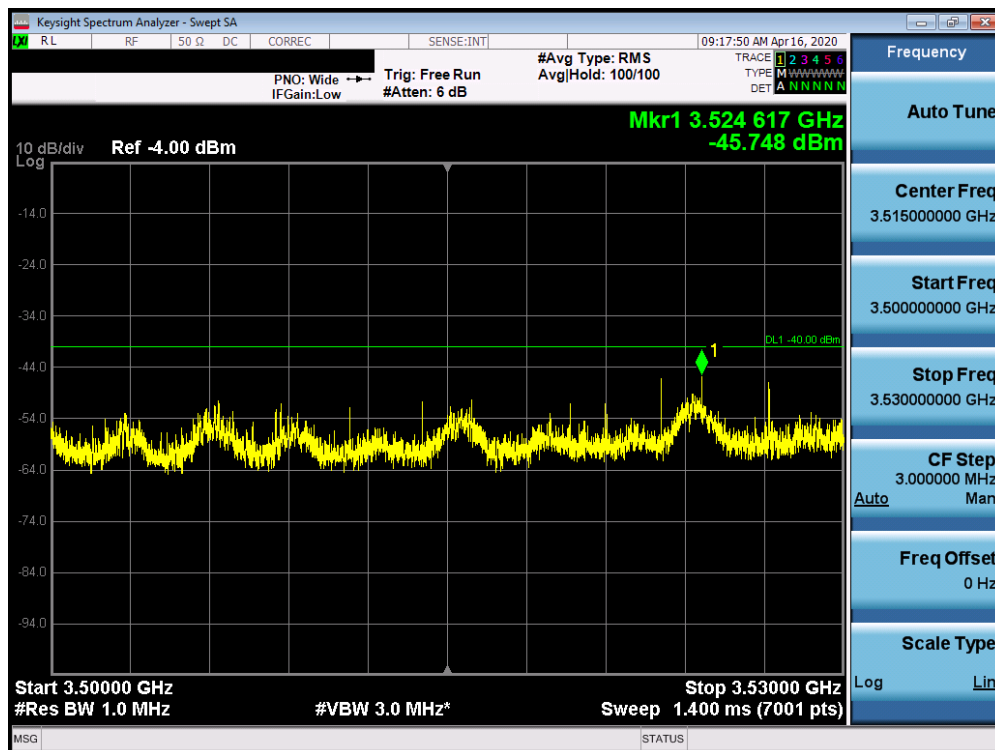
Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the 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-CFW2182		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Band 48

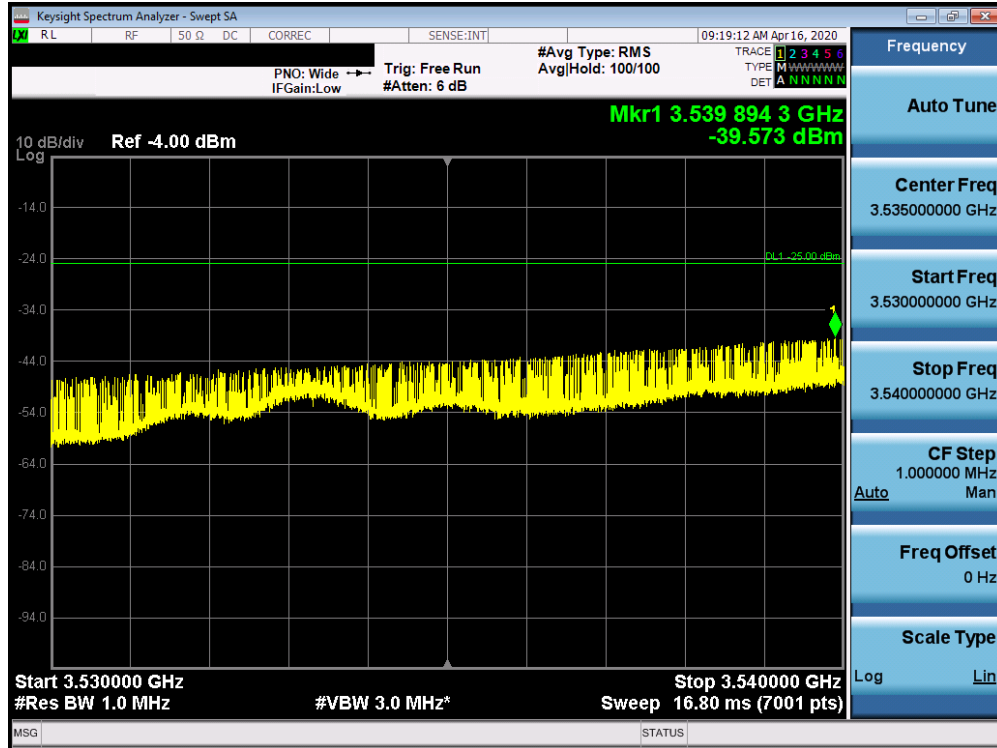


Plot 7-13. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

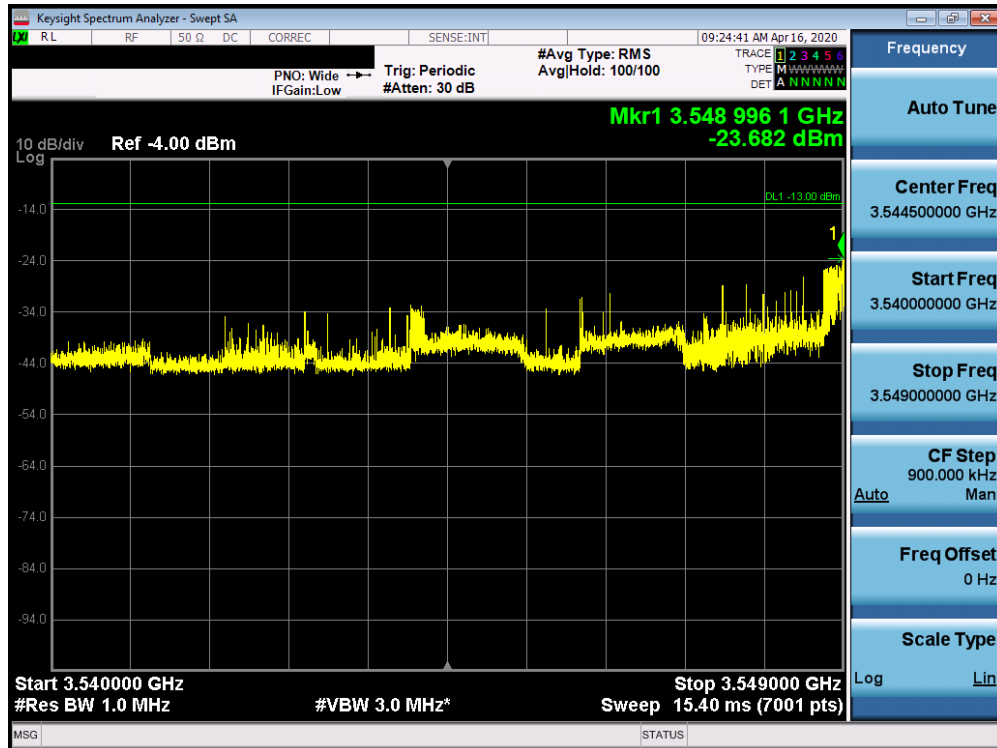


Plot 7-14. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: XIA-CFW2182	 PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	 NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 20 of 76

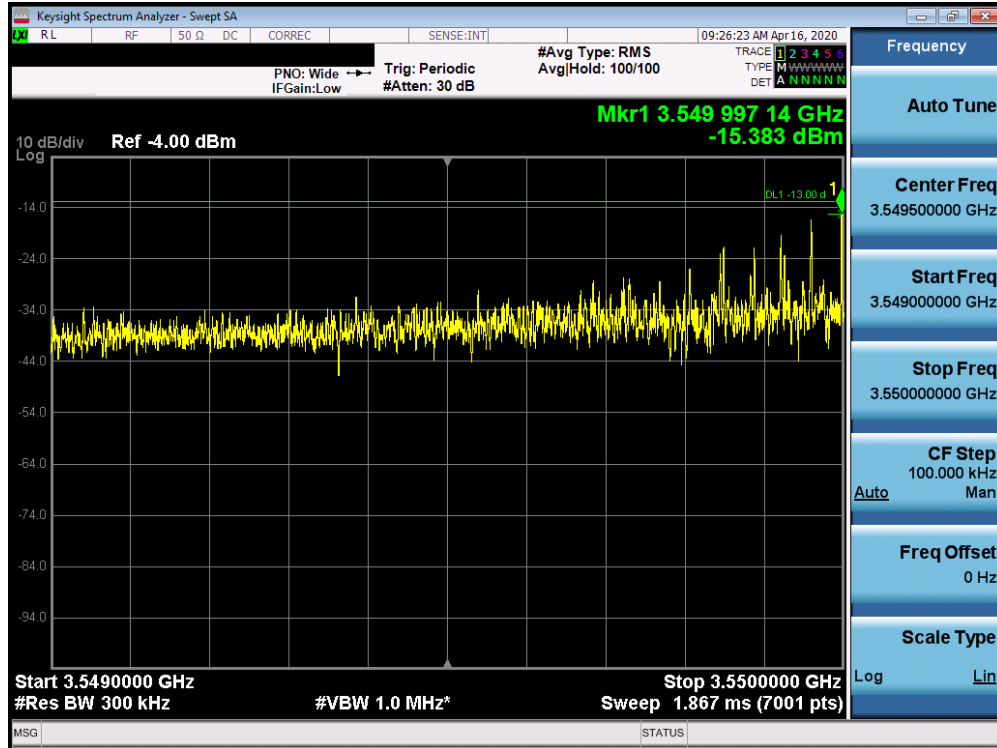


Plot 7-15. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

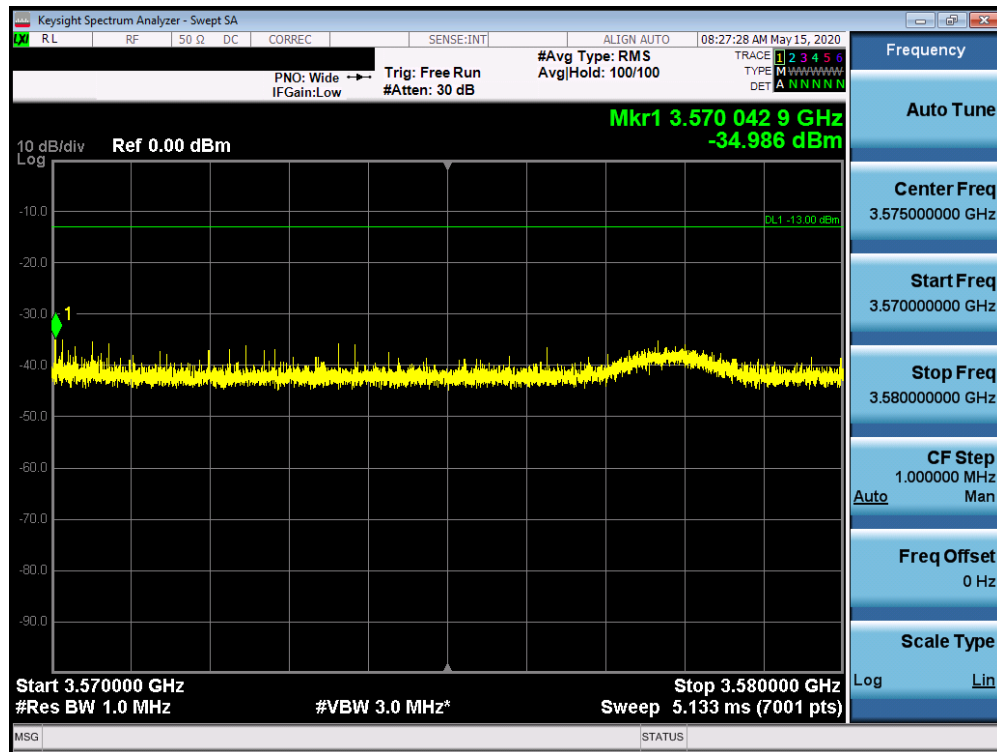


Plot 7-16. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



FCC ID: XIA-CFW2182	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 21 of 76

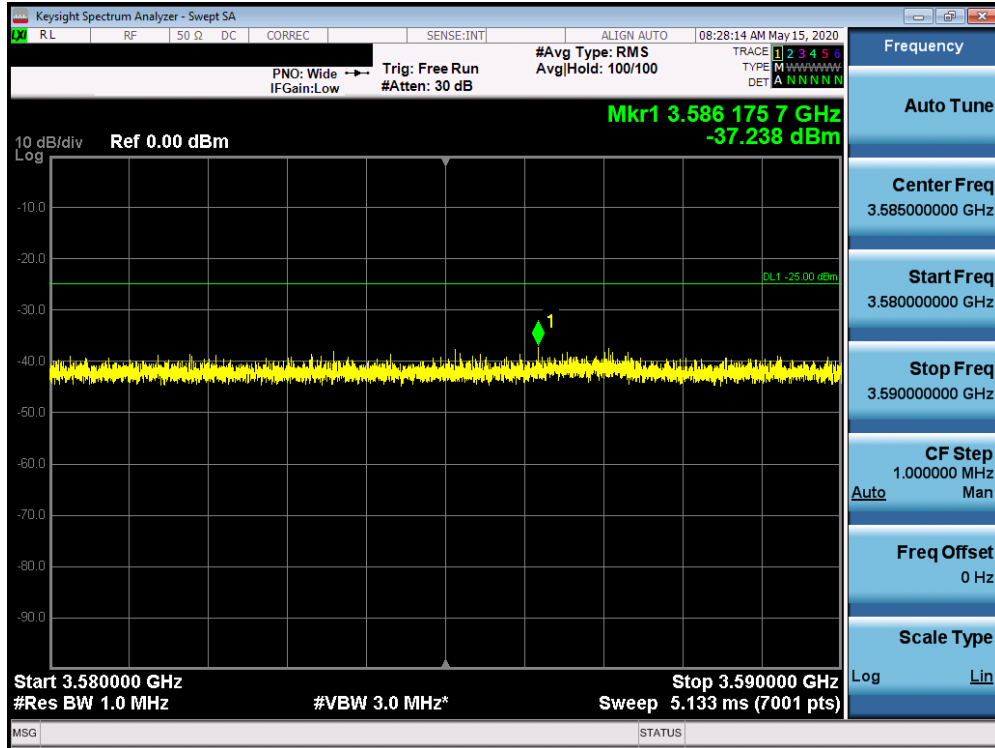


Plot 7-17. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

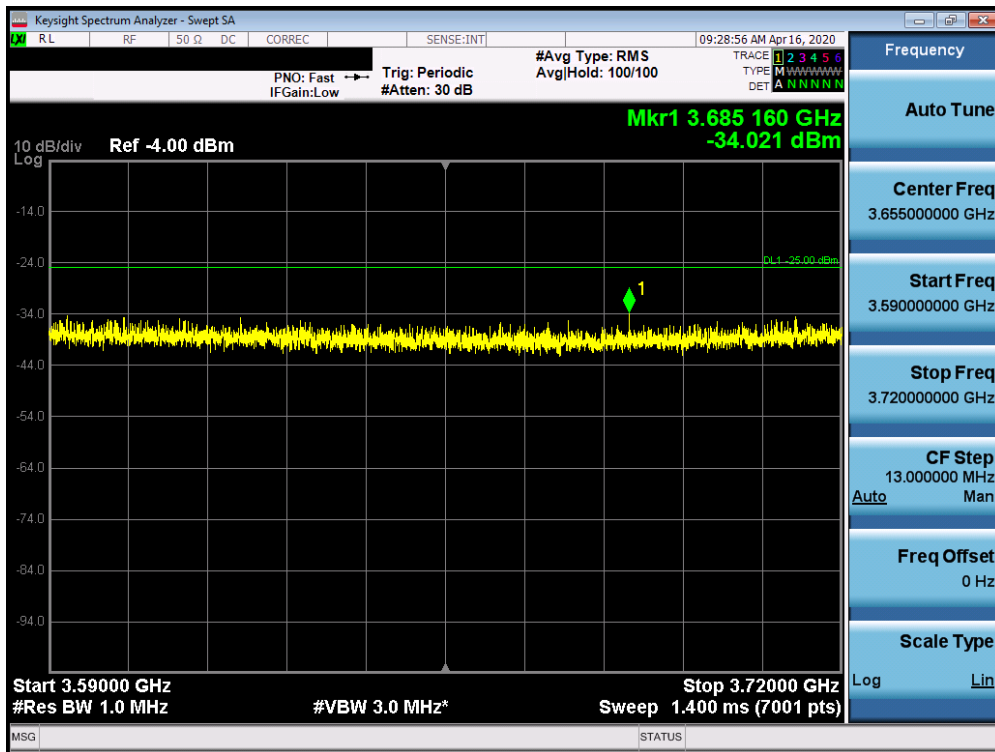


Plot 7-18. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: XIA-CFW2182		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 22 of 76

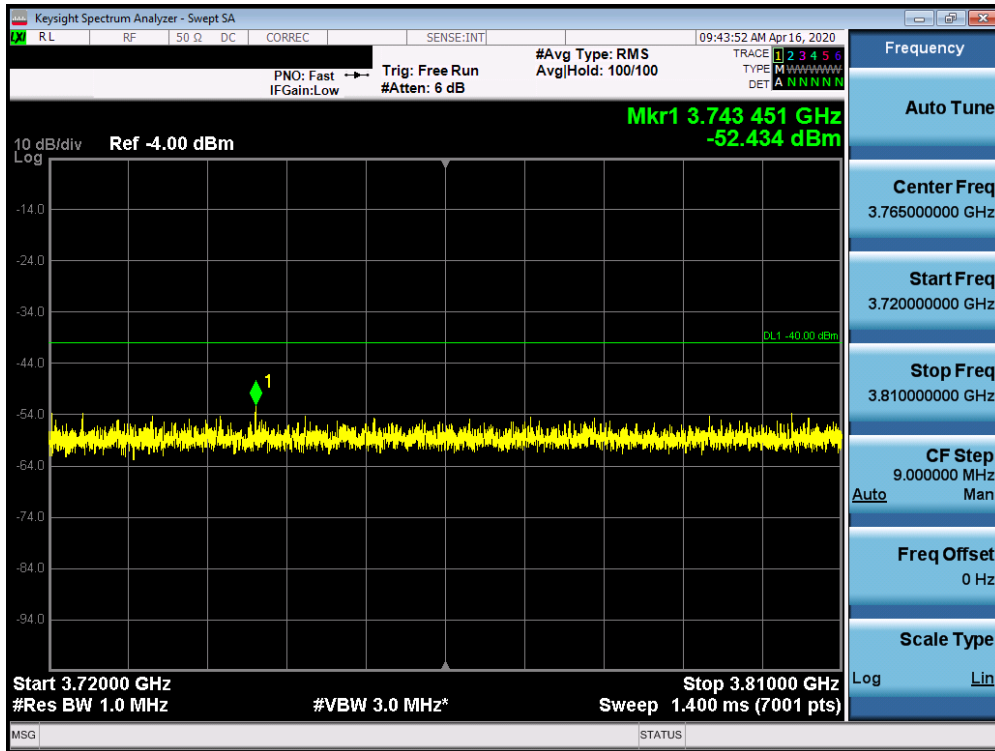


Plot 7-19. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

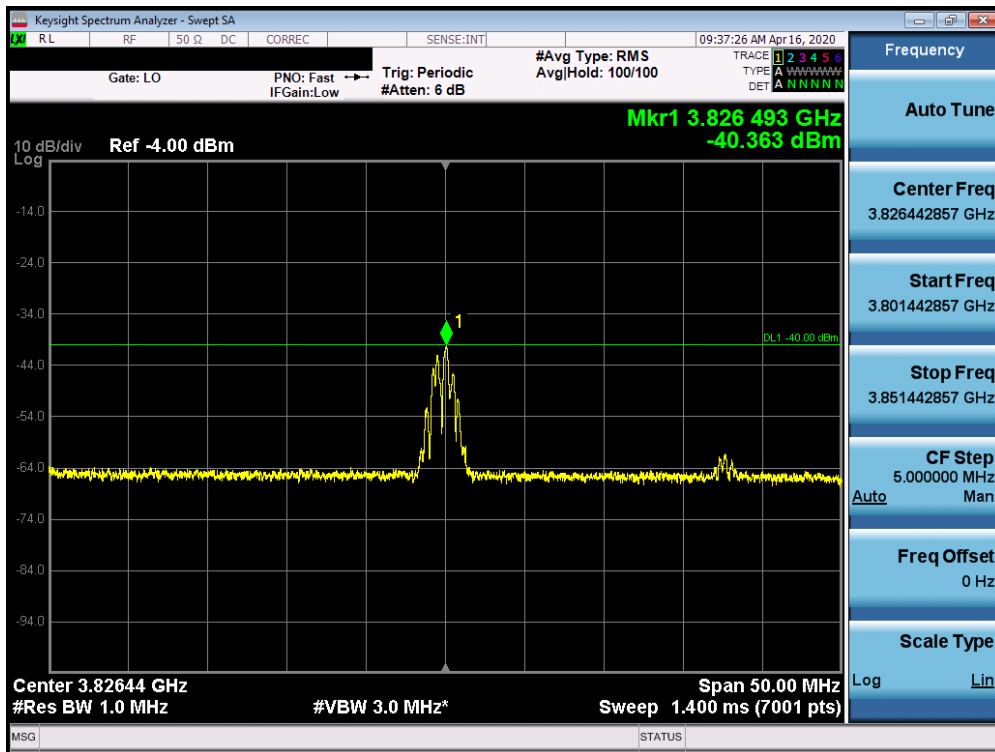


Plot 7-20. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: XIA-CFW2182	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 23 of 76

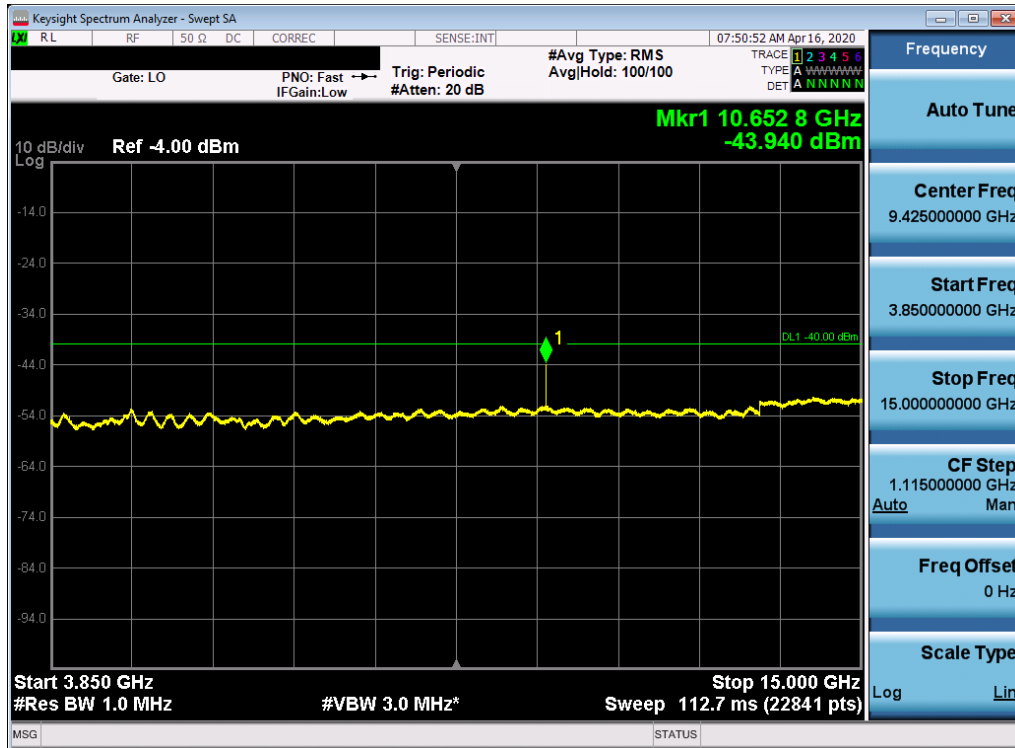


Plot 7-21. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

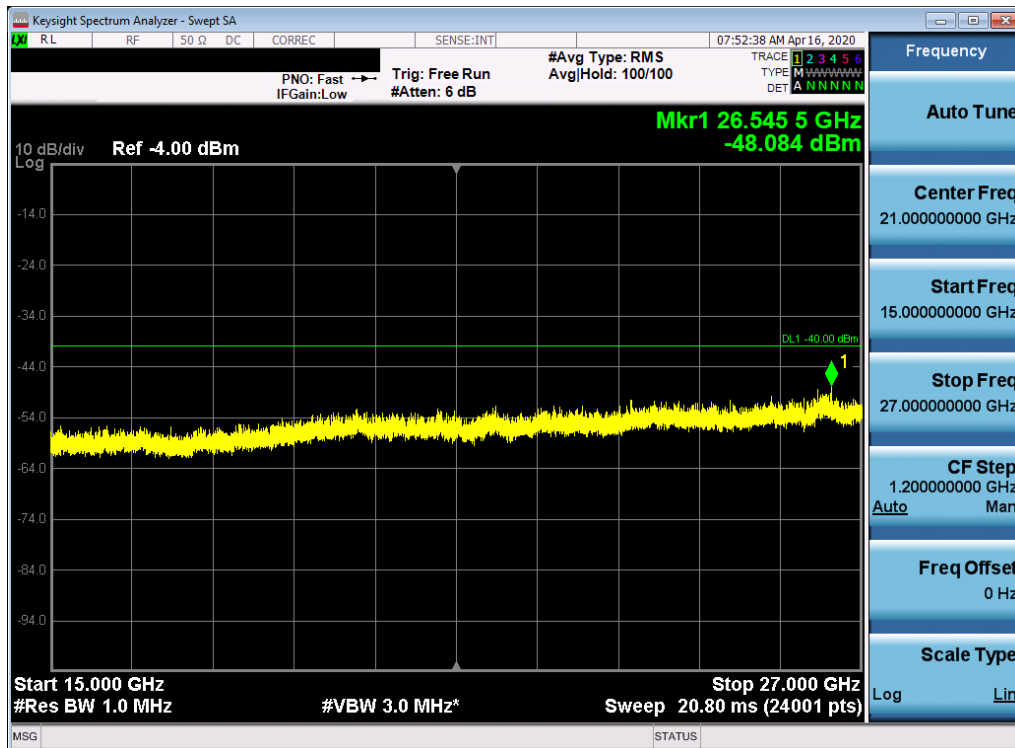


Plot 7-22. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



FCC ID: XIA-CFW2182	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 24 of 76

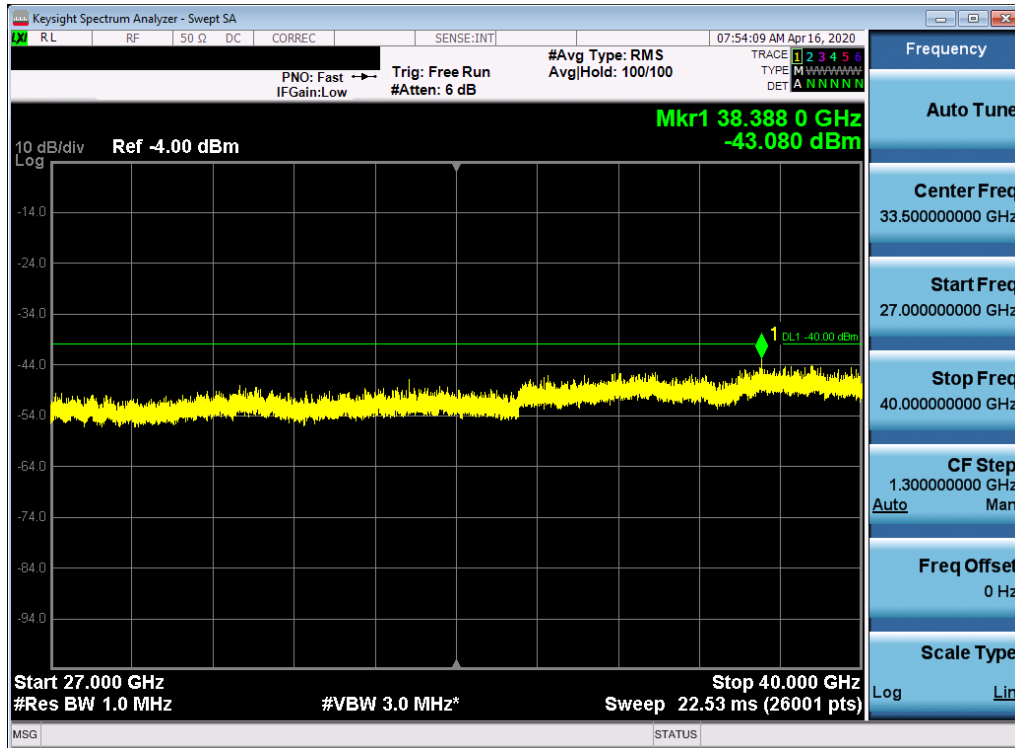


Plot 7-23. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

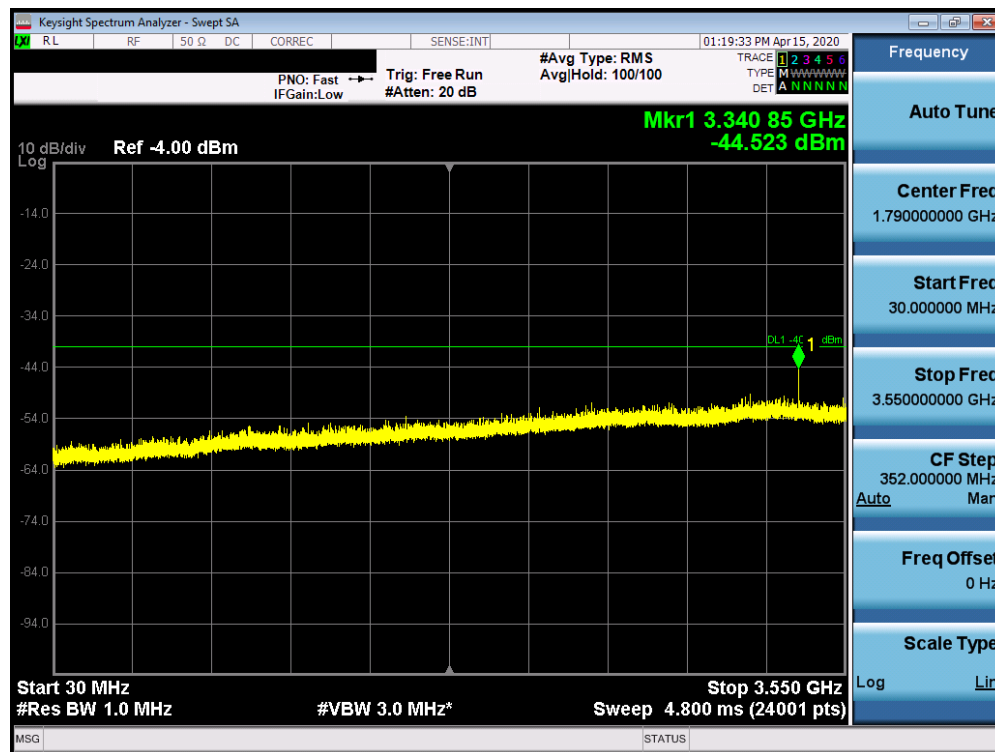


Plot 7-24. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: XIA-CFW2182	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	 NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 25 of 76

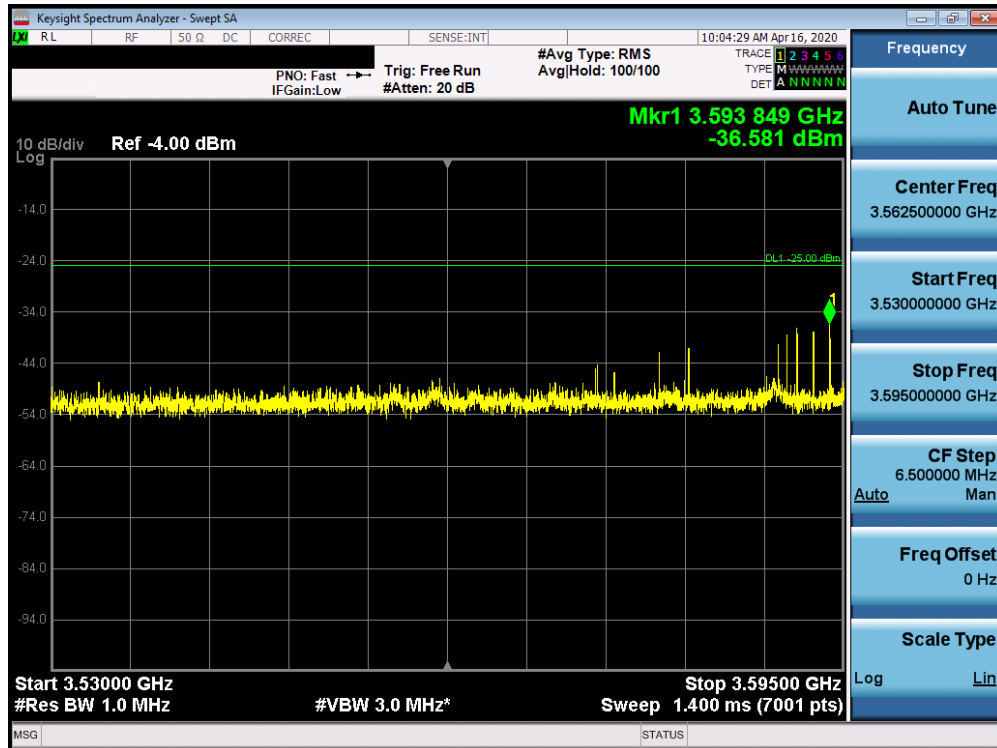


Plot 7-25. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

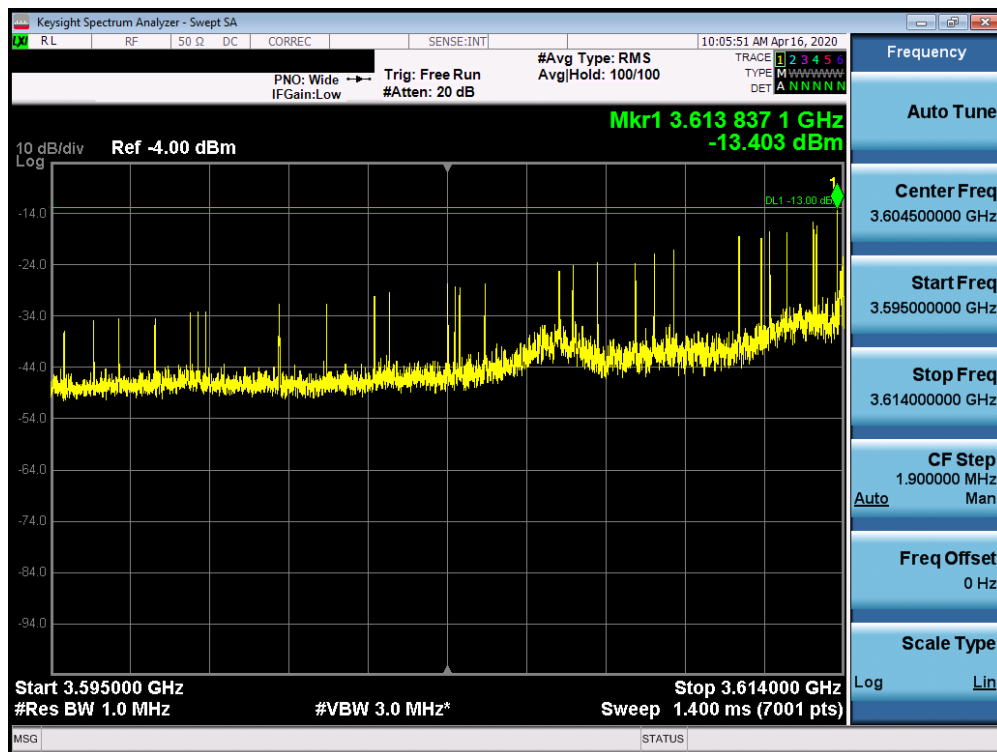


Plot 7-26. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



FCC ID: XIA-CFW2182	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 26 of 76

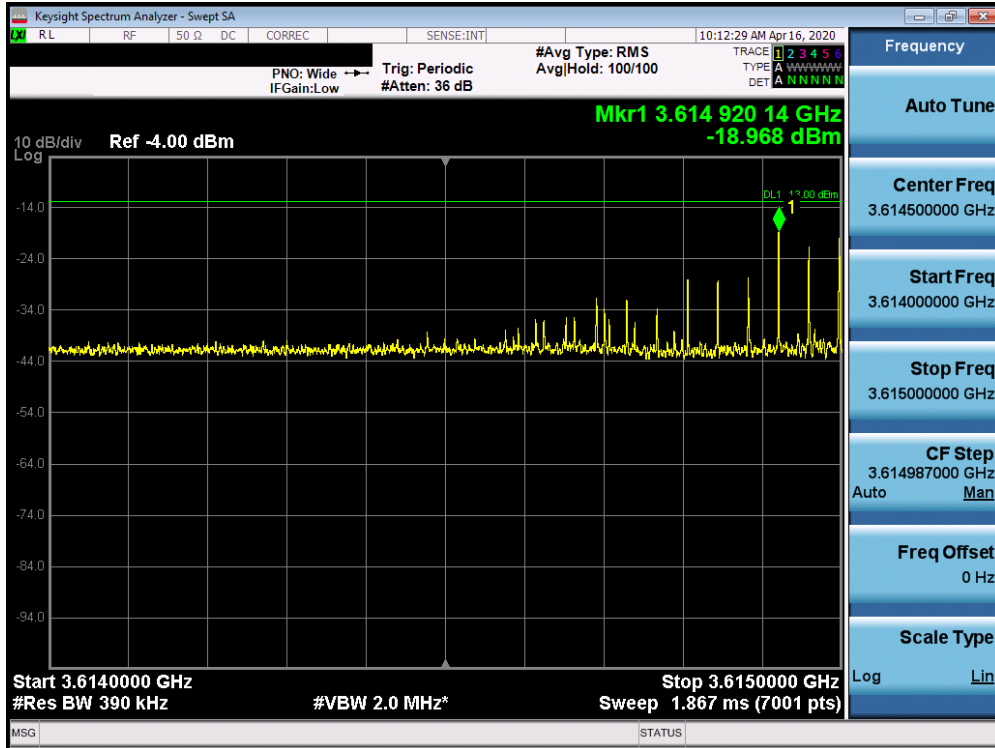


Plot 7-27. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

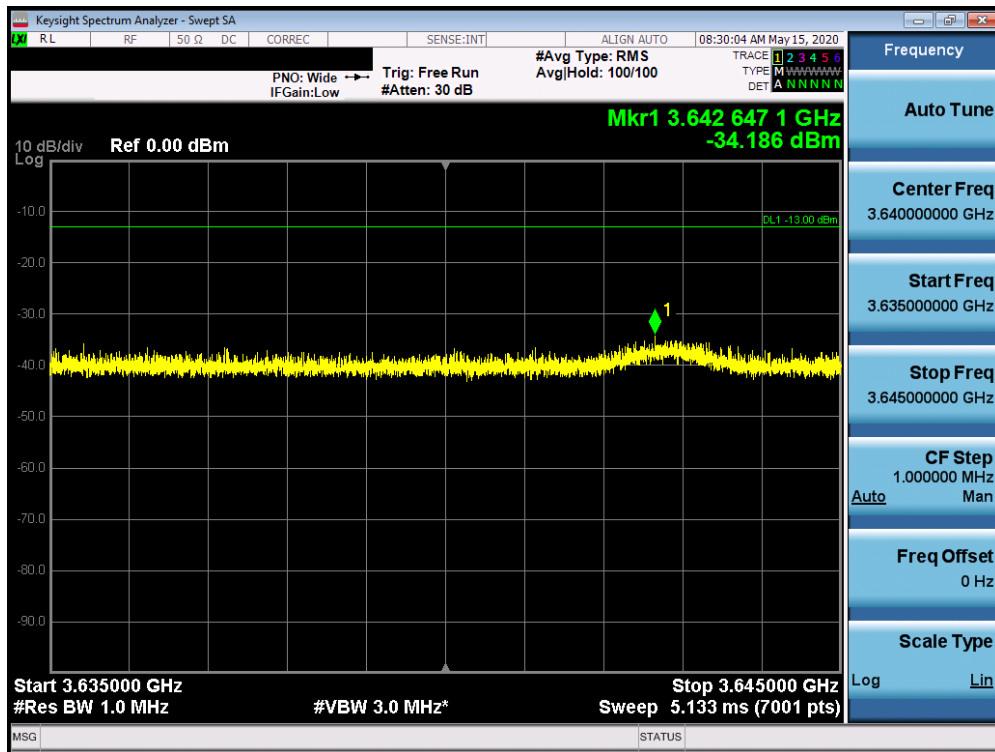


Plot 7-28. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



FCC ID: XIA-CFW2182	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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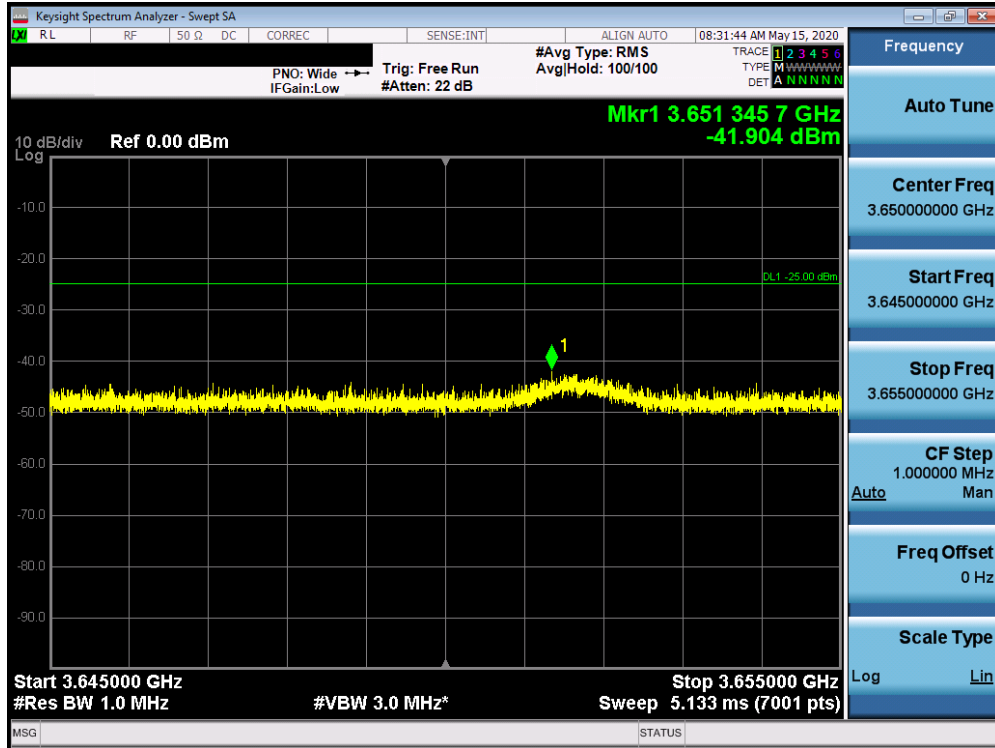


Plot 7-29. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

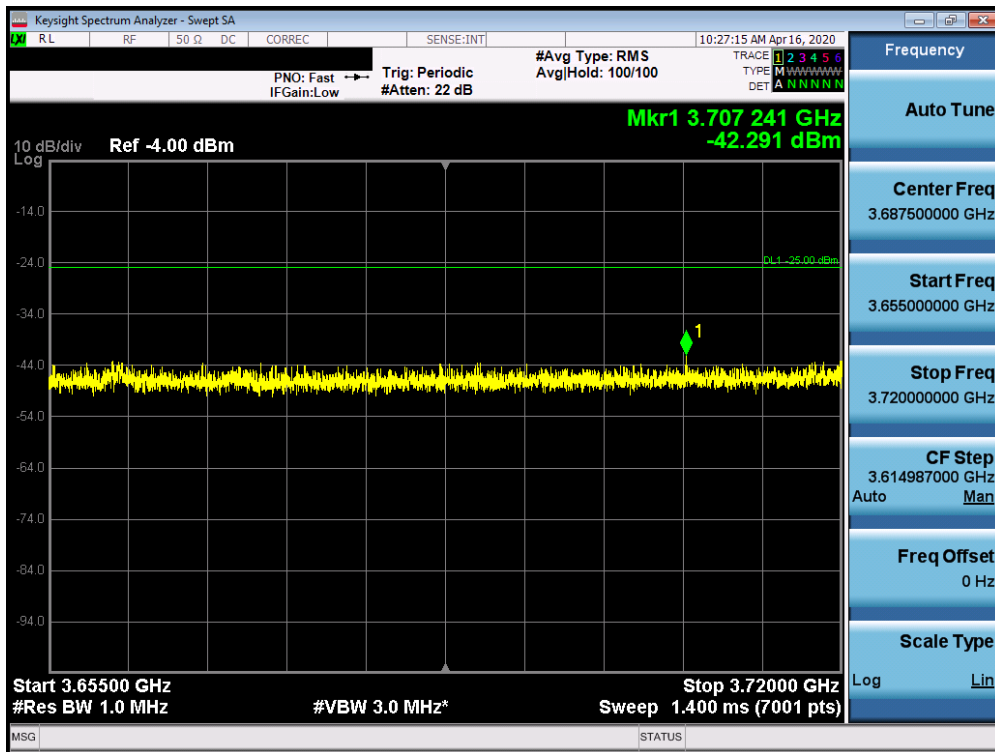


Plot 7-30. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: XIA-CFW2182		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 28 of 76

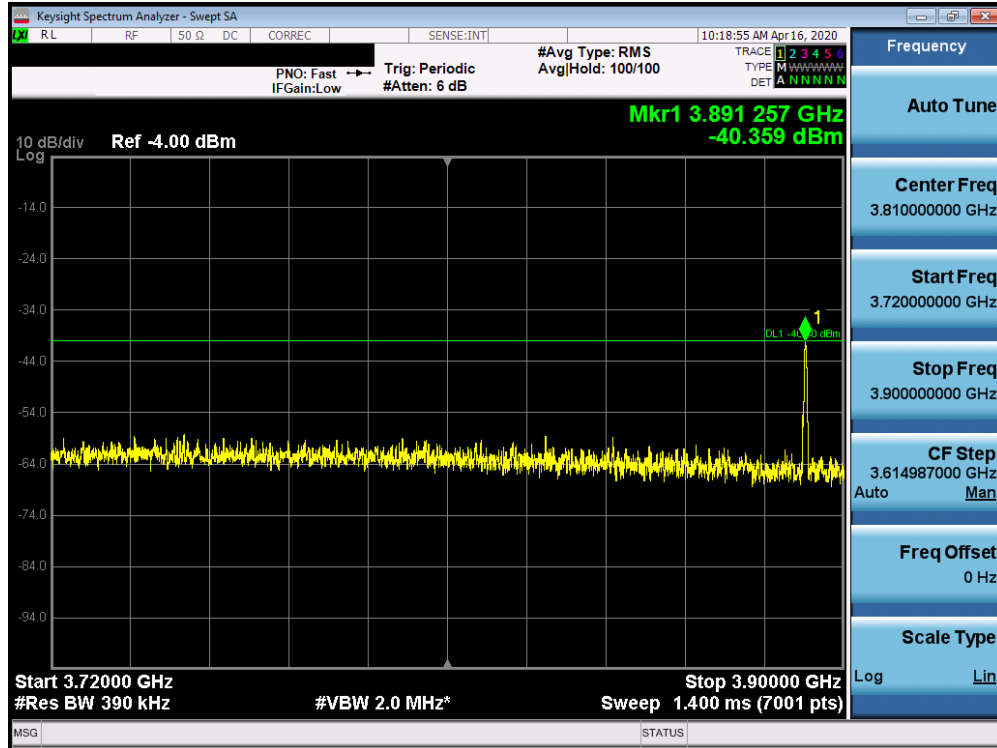


Plot 7-31. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

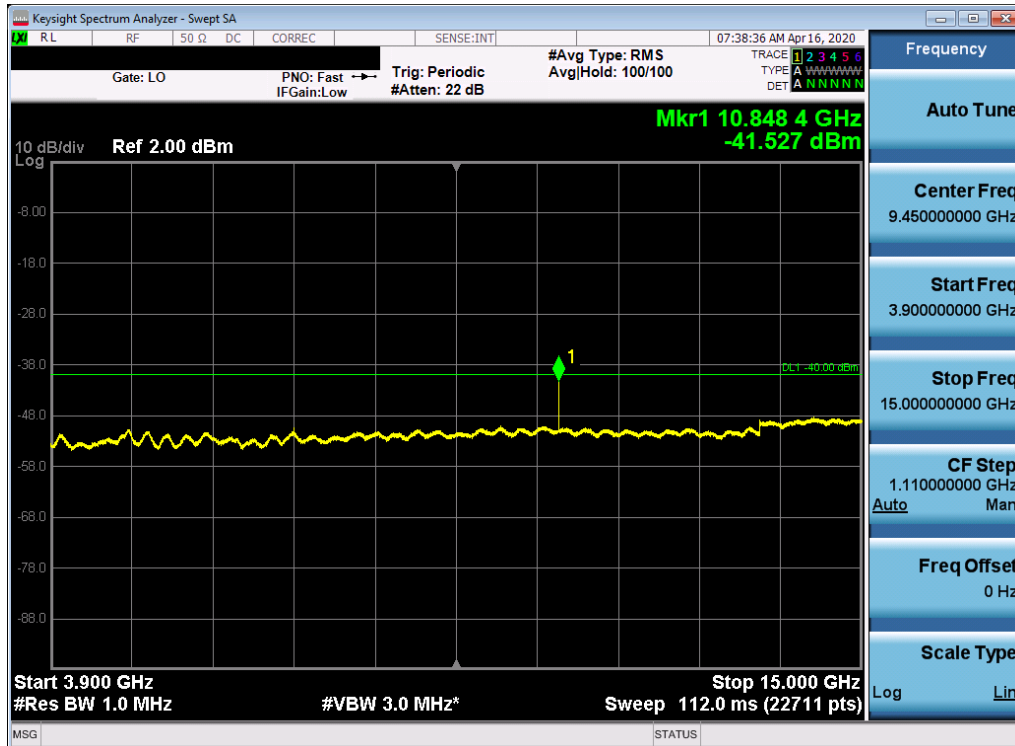


Plot 7-32. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: XIA-CFW2182	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 29 of 76

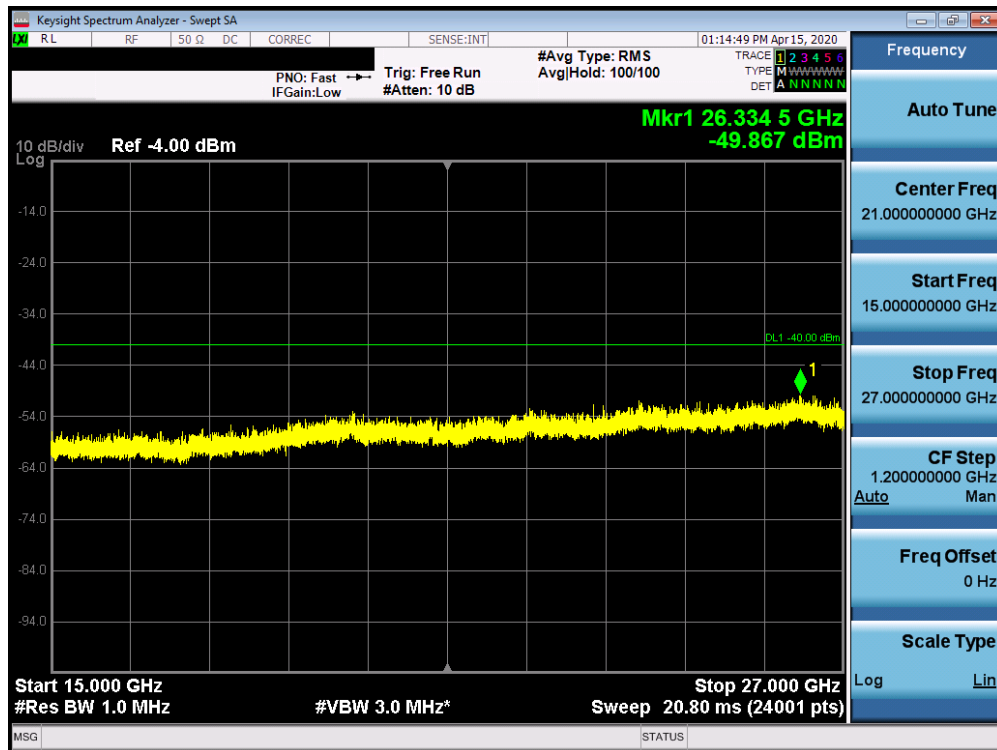


Plot 7-33. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

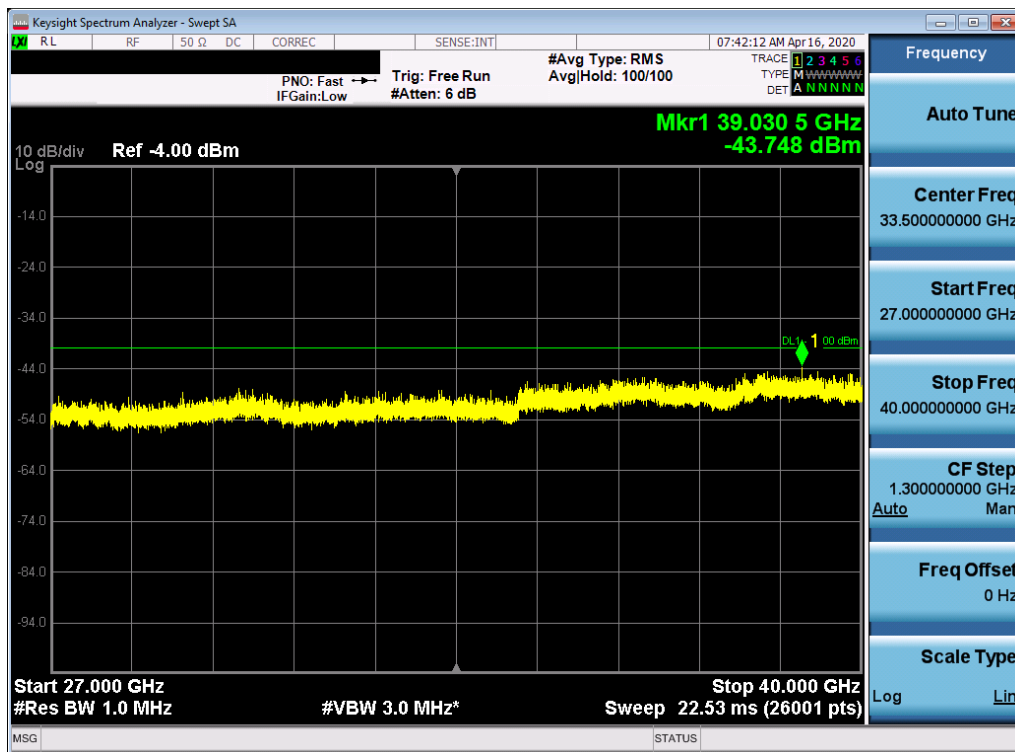


Plot 7-34. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: XIA-CFW2182	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 30 of 76

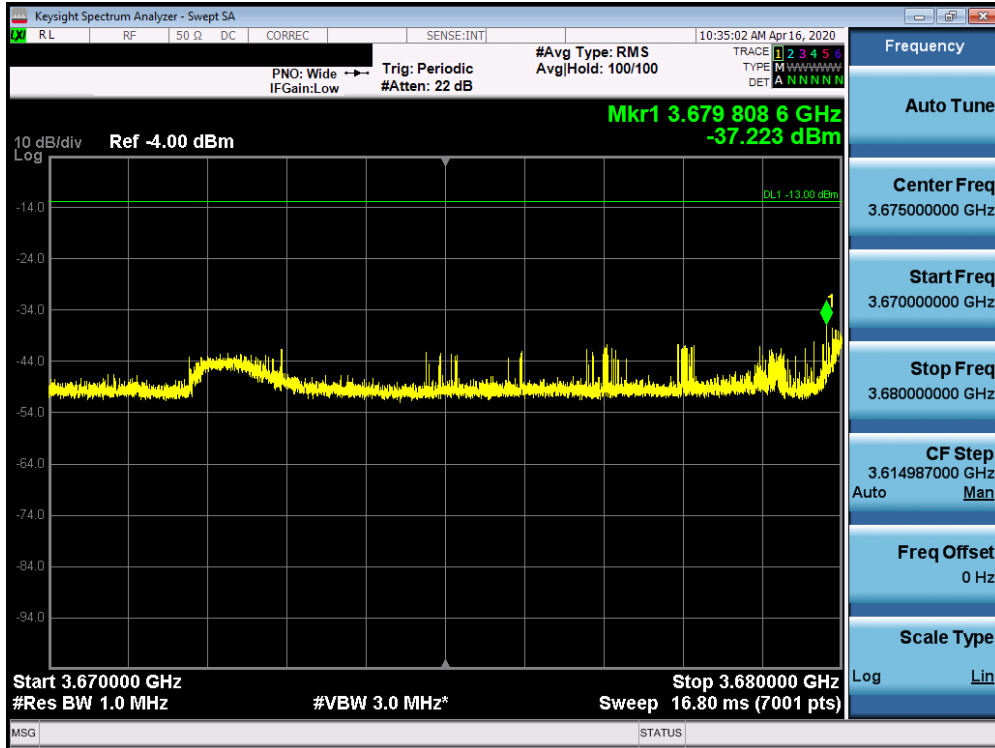


Plot 7-35. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

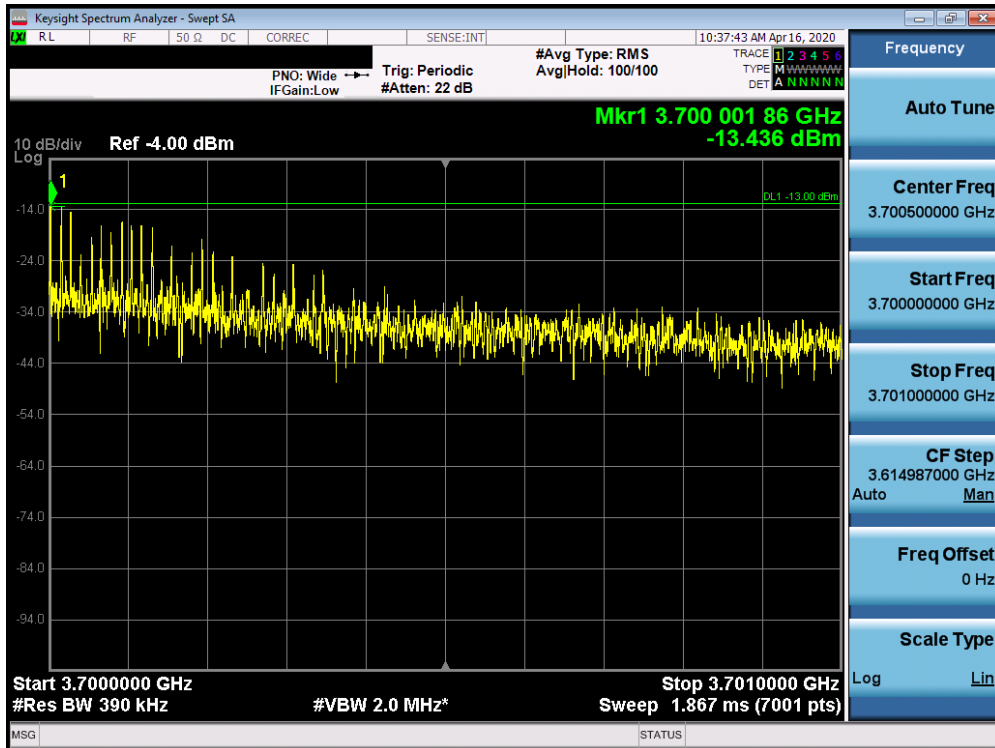


Plot 7-36. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: XIA-CFW2182	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 31 of 76

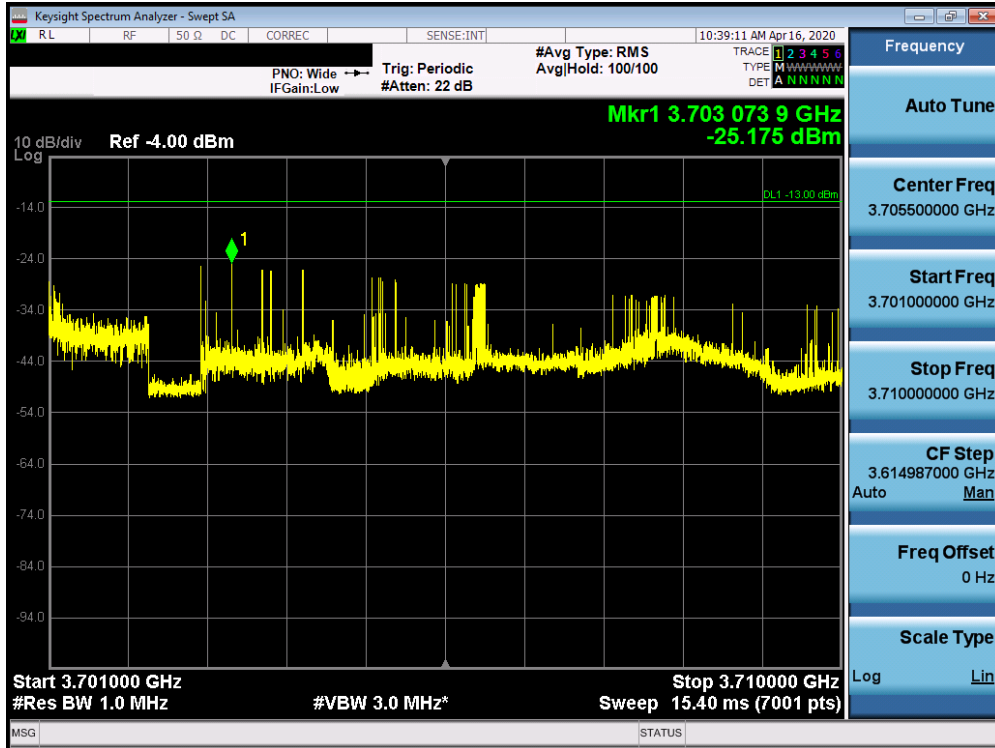


Plot 7-39. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)

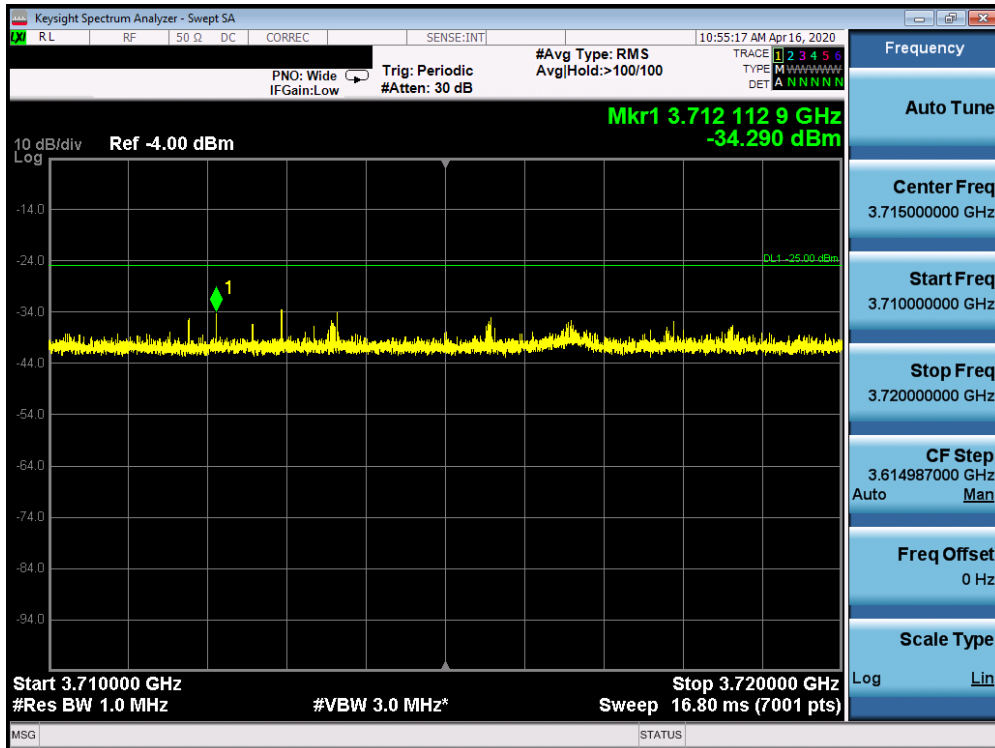


Plot 7-40. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)

FCC ID: XIA-CFW2182	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 33 of 76

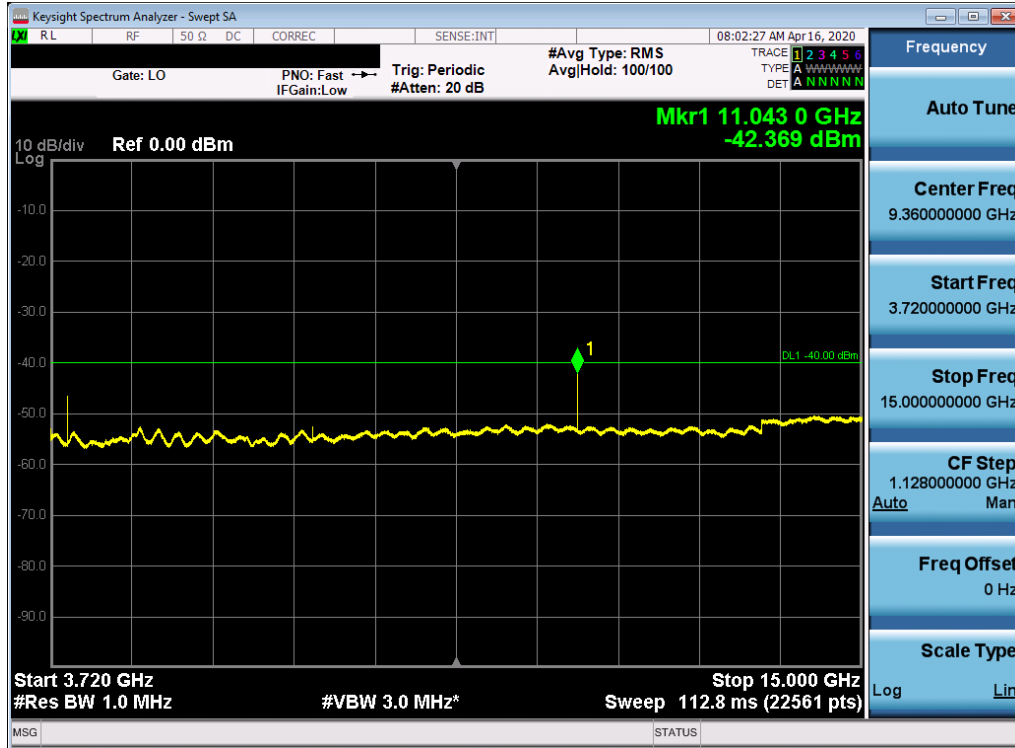


Plot 7-41. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)

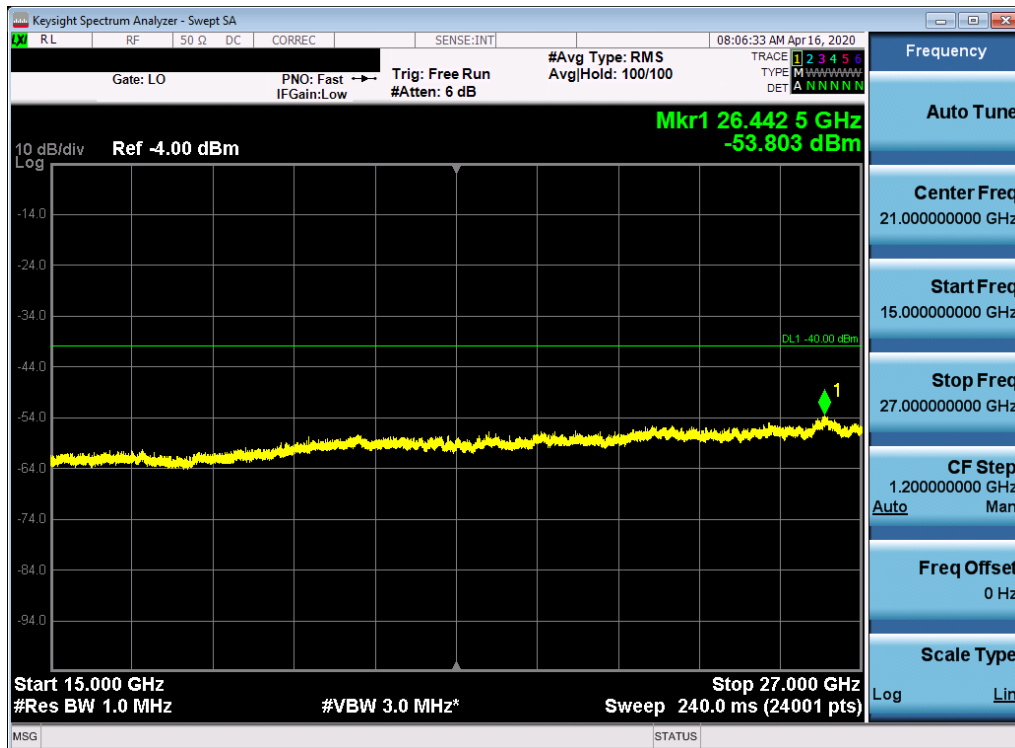


Plot 7-42. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)

FCC ID: XIA-CFW2182	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 34 of 76

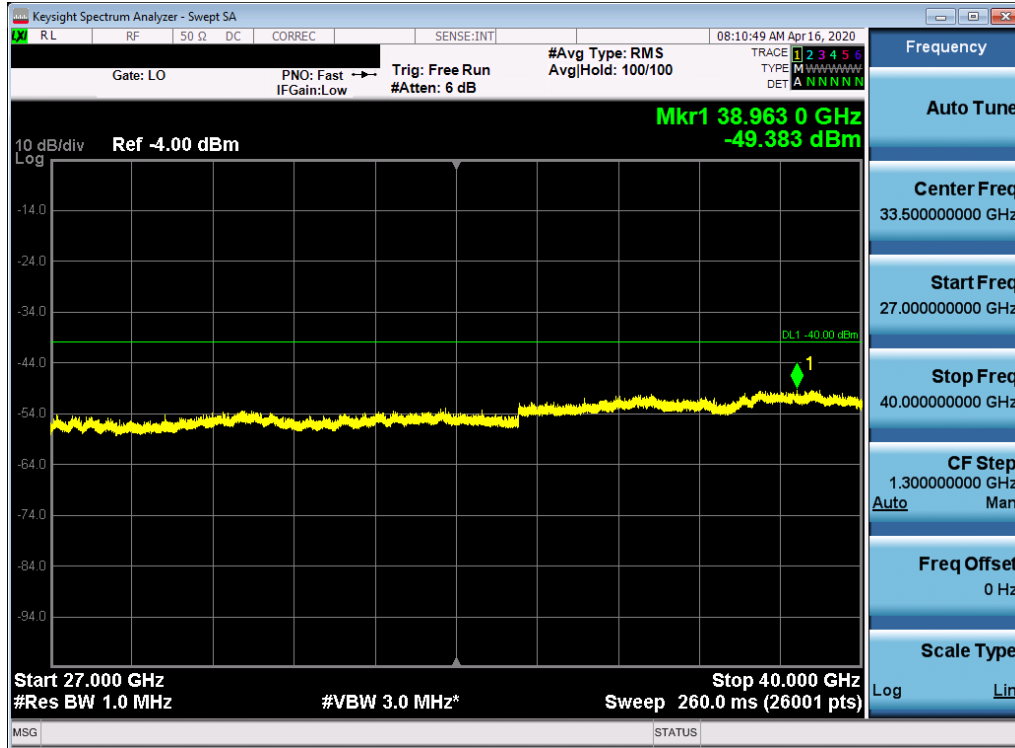


Plot 7-43. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)






Plot 7-44. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)

FCC ID: XIA-CFW2182	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 35 of 76



Plot 7-45. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)

FCC ID: XIA-CFW2182	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	 NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 36 of 76

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.

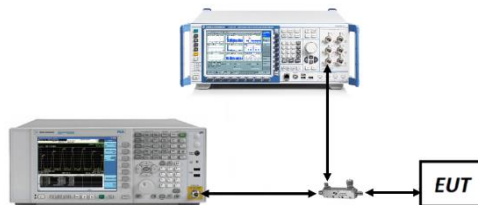


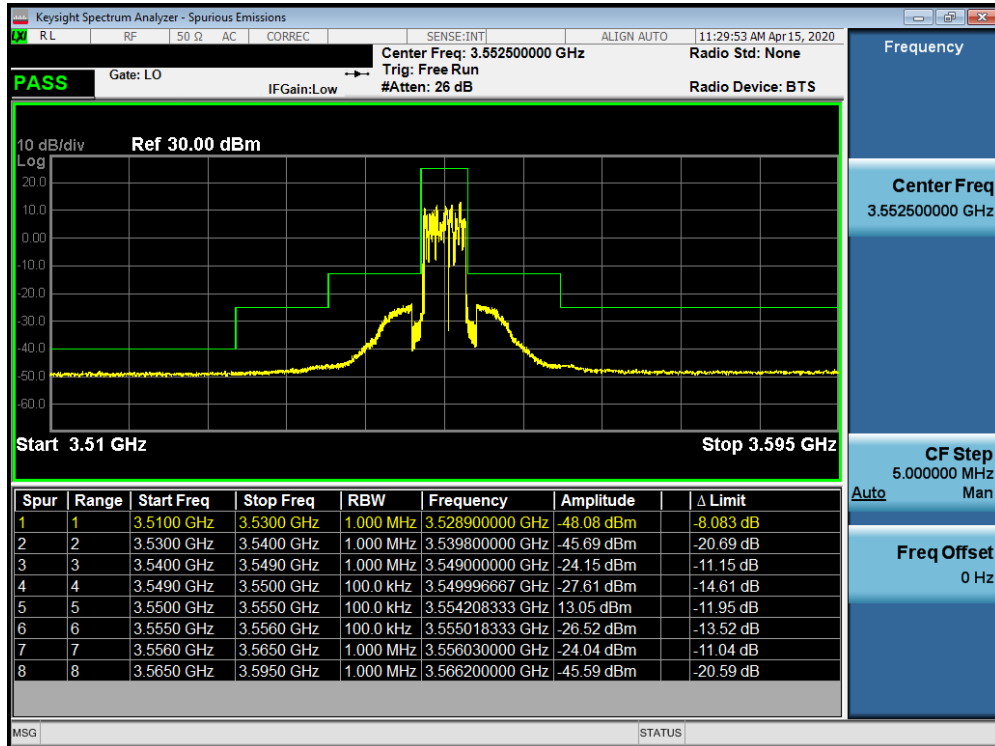
Figure 7-3. Test Instrument & Measurement Setup

Test Notes

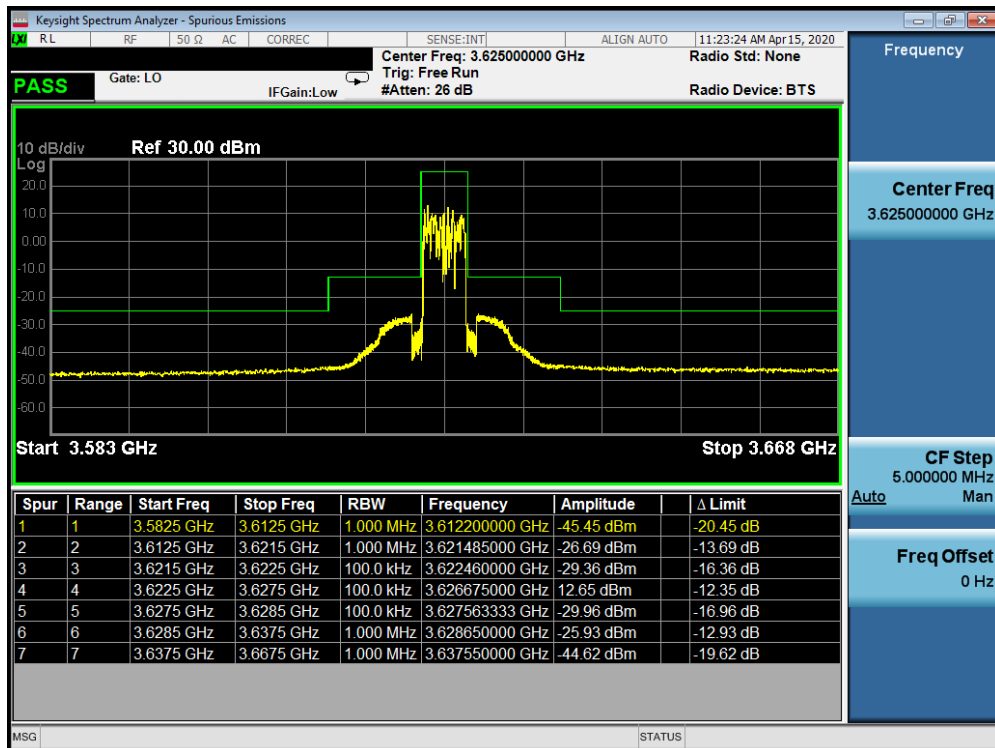
N/A

FCC ID: XIA-CFW2182		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 37 of 76

Band 48

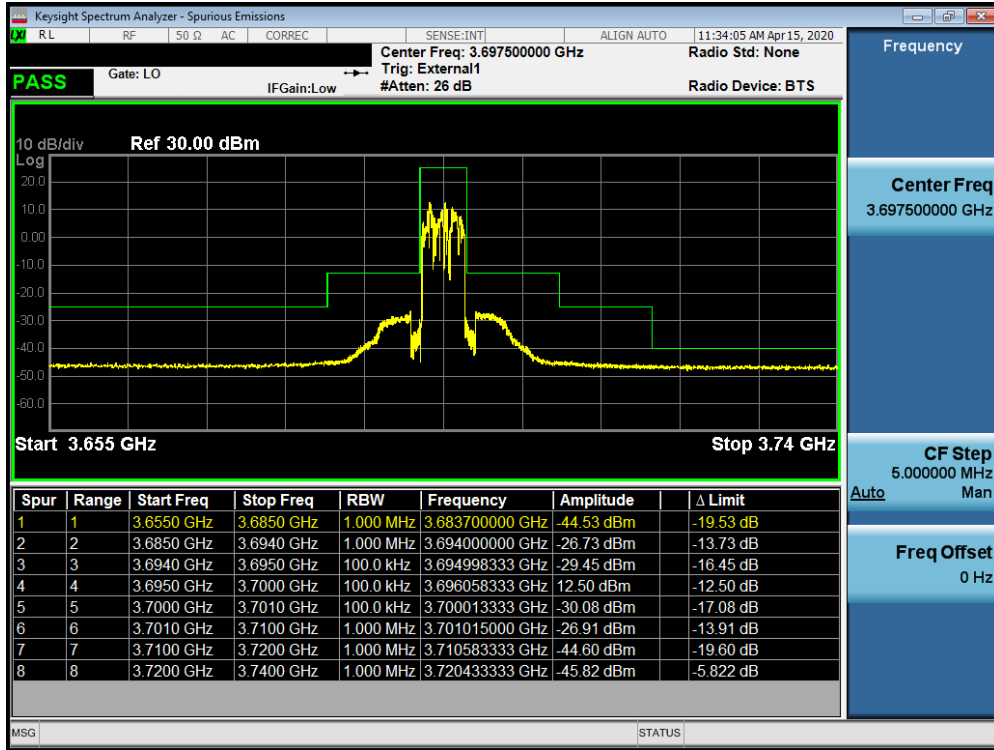


Plot 7-46. Lower Channel Edge Plot (Band 48 - 5.0MHz QPSK - Full RB Configuration)

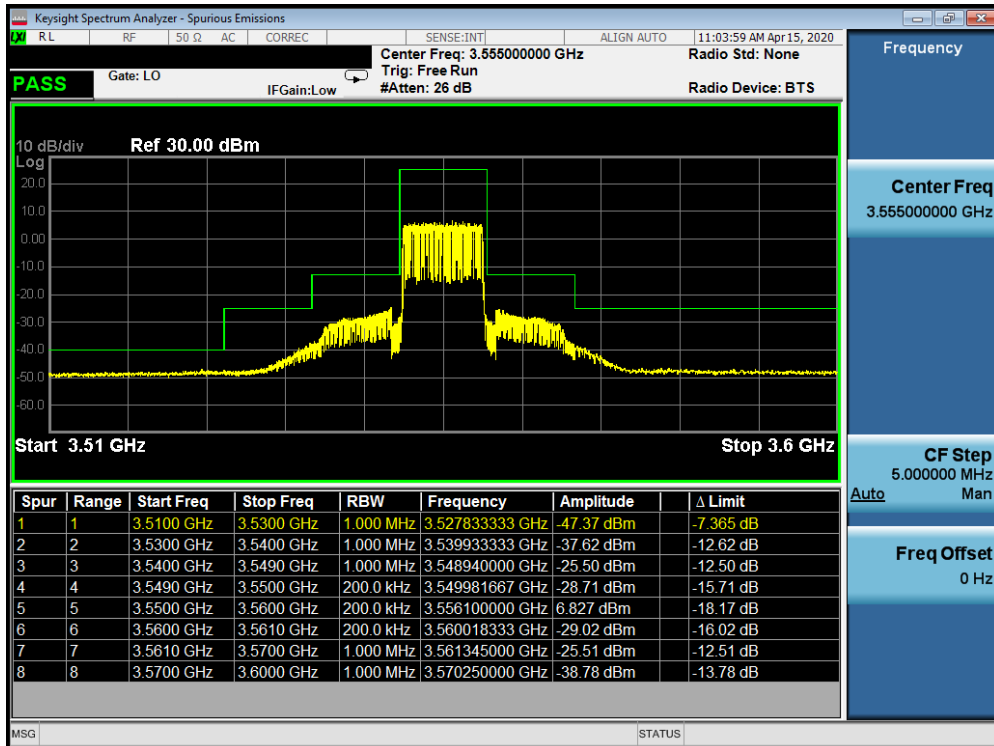


Plot 7-47. Mid Channel Edge Plot (Band 48 - 5.0MHz QPSK - Full RB Configuration)



FCC ID: XIA-CFW2182	 PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	 NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 38 of 76

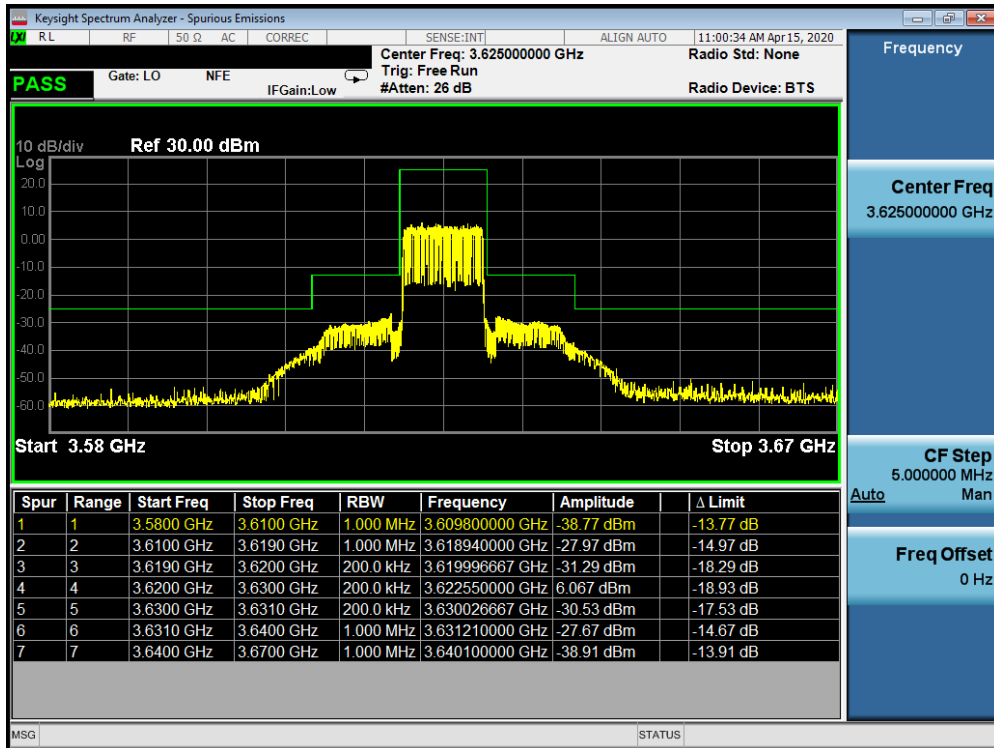


Plot 7-48. Upper Channel Edge Plot (Band 48 - 5.0MHz QPSK - Full RB Configuration)

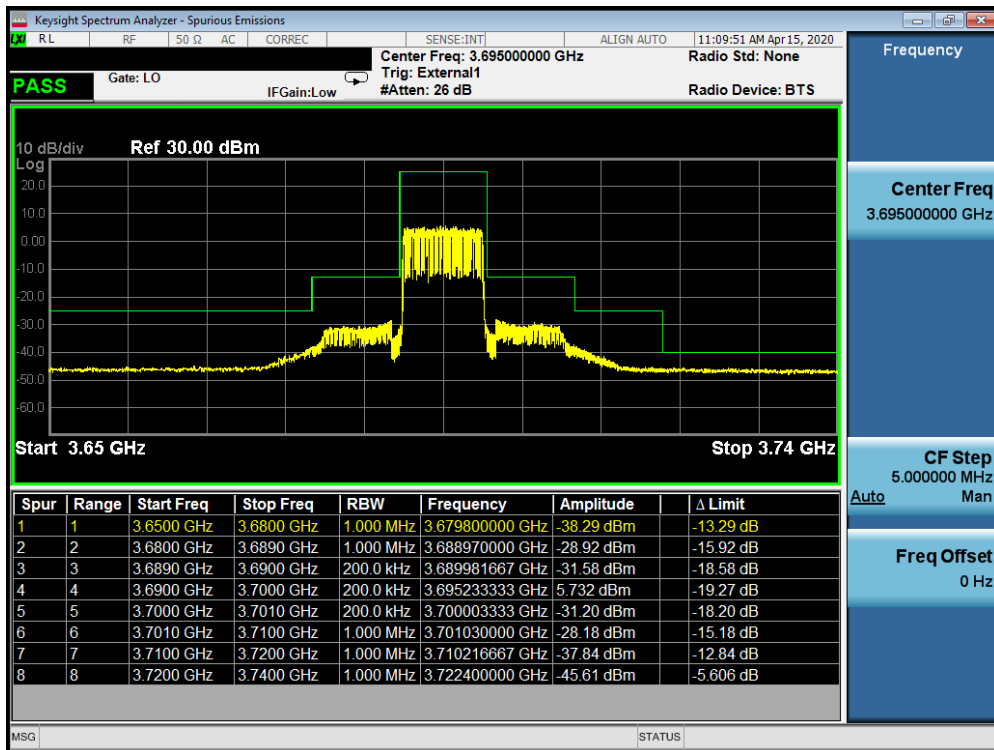


Plot 7-49. Lower Channel Edge Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)



FCC ID: XIA-CFW2182	 Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 39 of 76

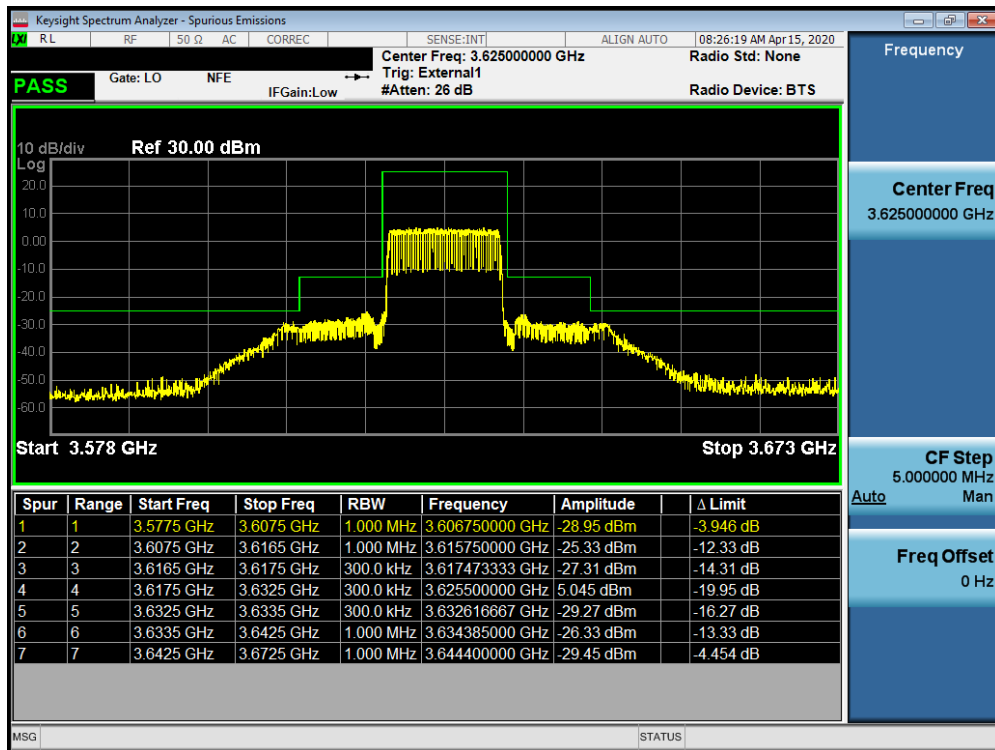


Plot 7-50. Mid Channel Edge Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)

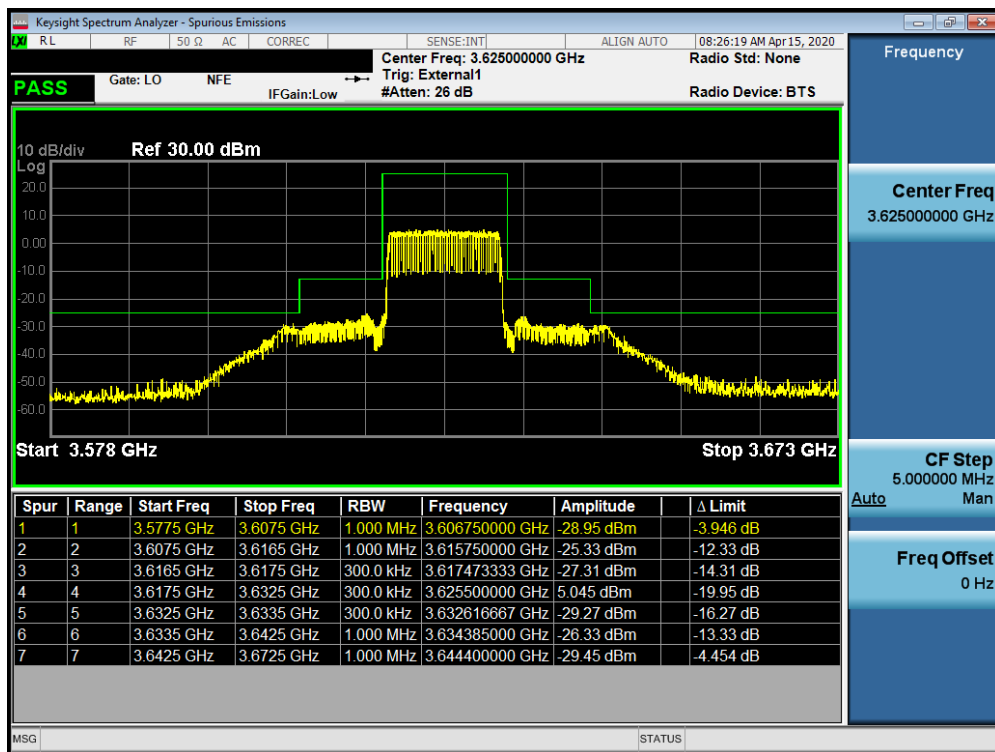


Plot 7-51. Upper Channel Edge Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)



FCC ID: XIA-CFW2182	 Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 40 of 76

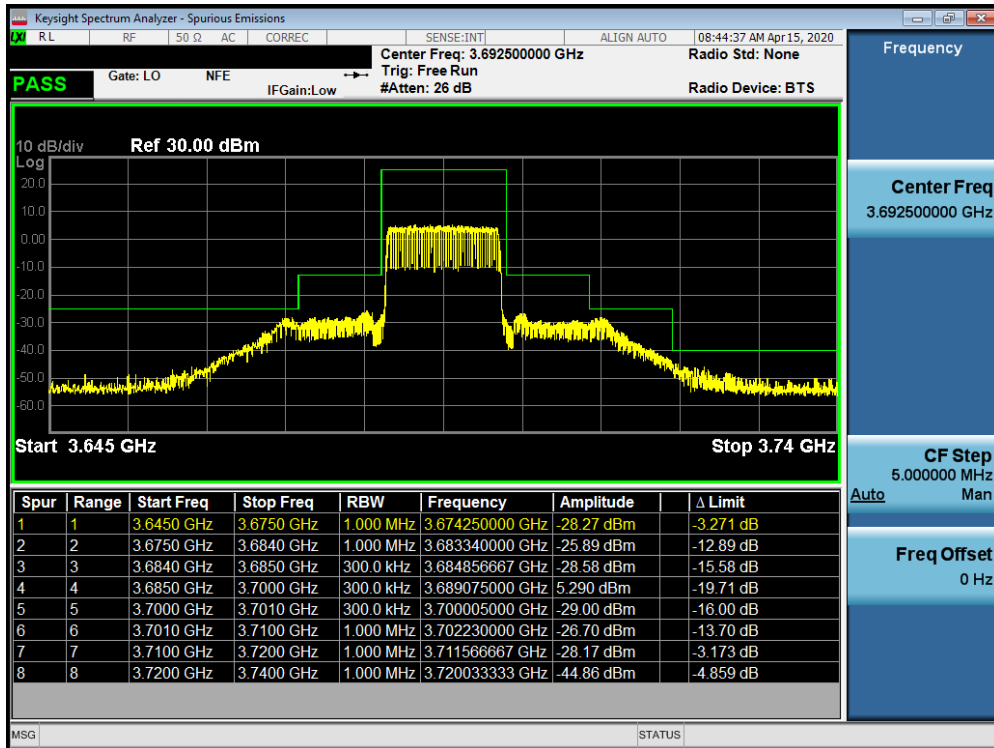


Plot 7-52. Lower Channel Edge Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)

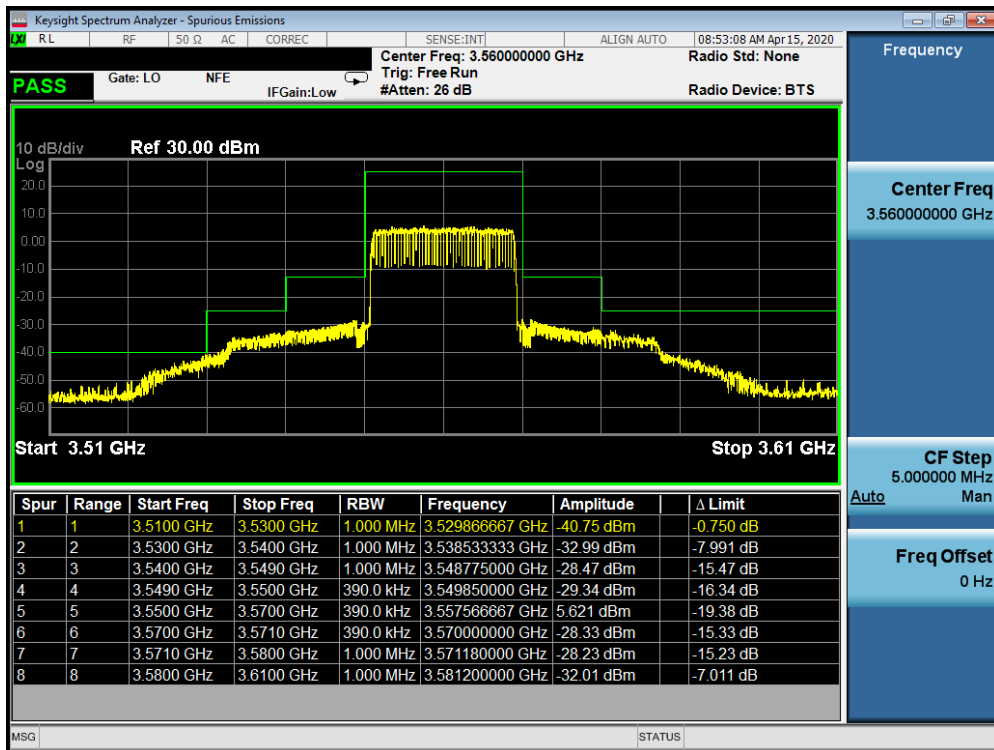


Plot 7-53. Mid Channel Edge Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)



FCC ID: XIA-CFW2182	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router	Page 41 of 76

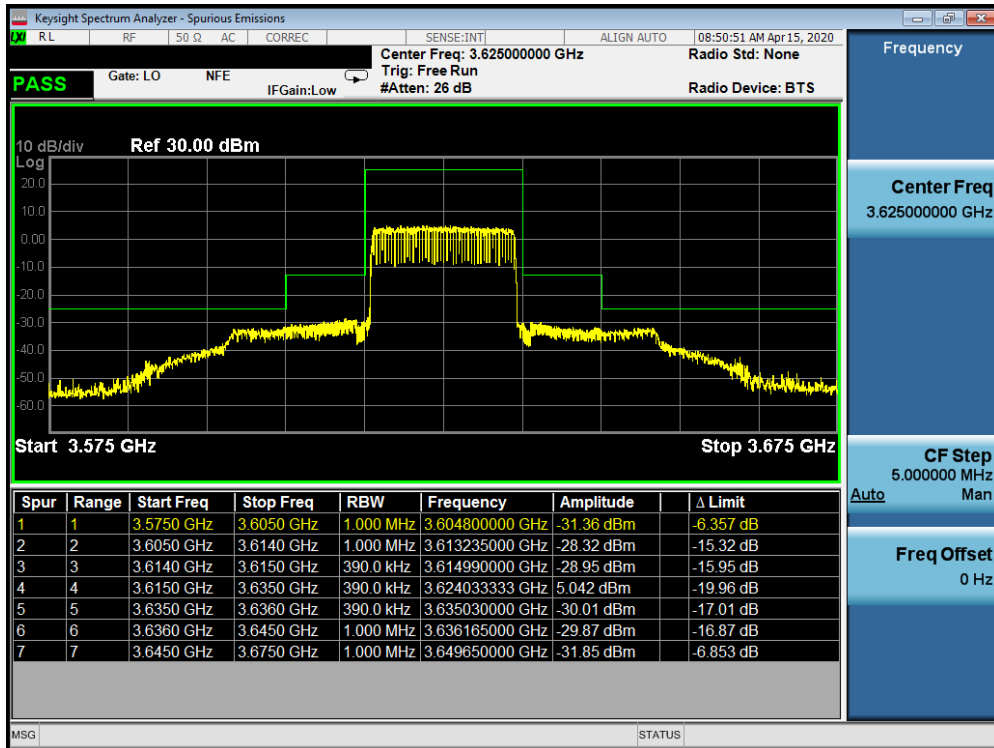


Plot 7-54. Upper Channel Edge Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)

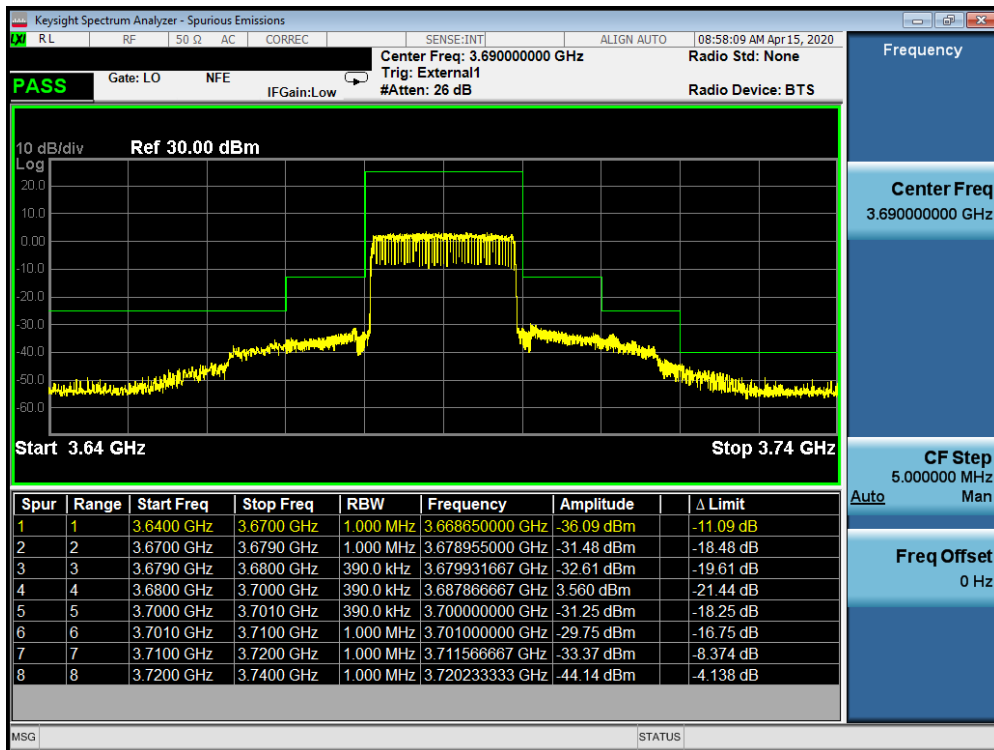


Plot 7-55. Lower Channel Edge Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)



FCC ID: XIA-CFW2182		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 42 of 76



Plot 7-56. Mid Channel Edge Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-57. Upper Channel Edge Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)

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7.5 Peak-Average Ratio §96.41(g)

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 v03r01 – Section 5.7

Test Settings

1. The signal analyzer’s CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW \geq OBW or specified reference bandwidth
4. The signal analyzer was set to collect two million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed.
6. An RF-Burst triggering method ensured measurement in the on time of the signal.

Test Setup

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

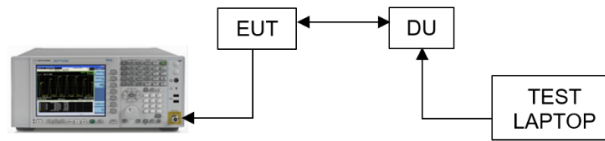
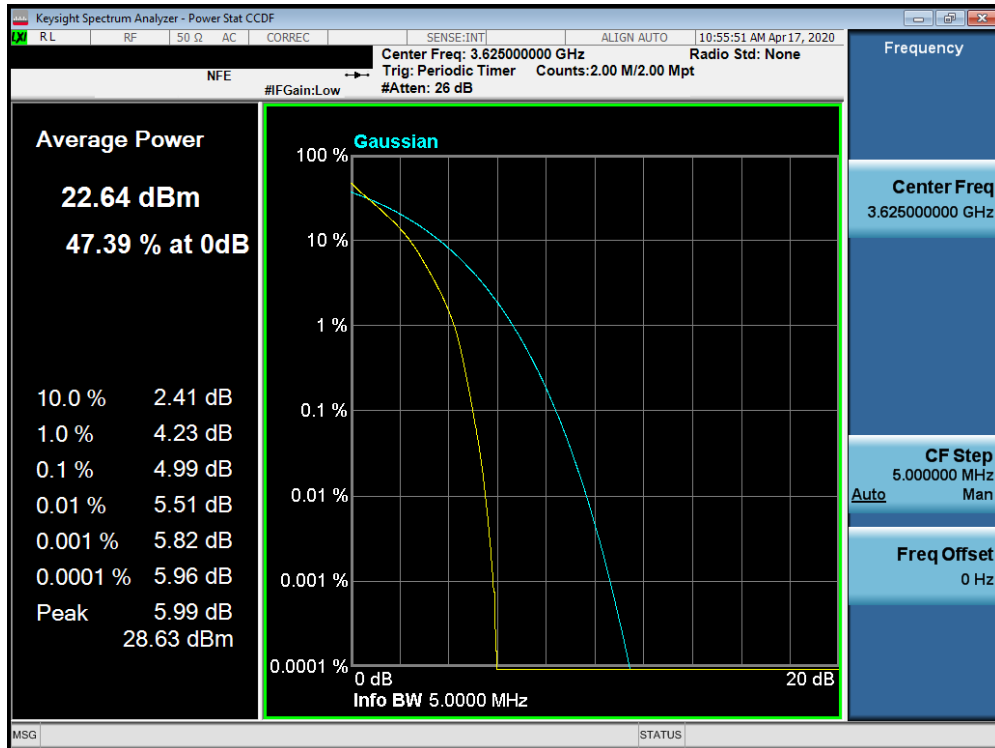


Figure 7-4. Test Instrument & Measurement Setup

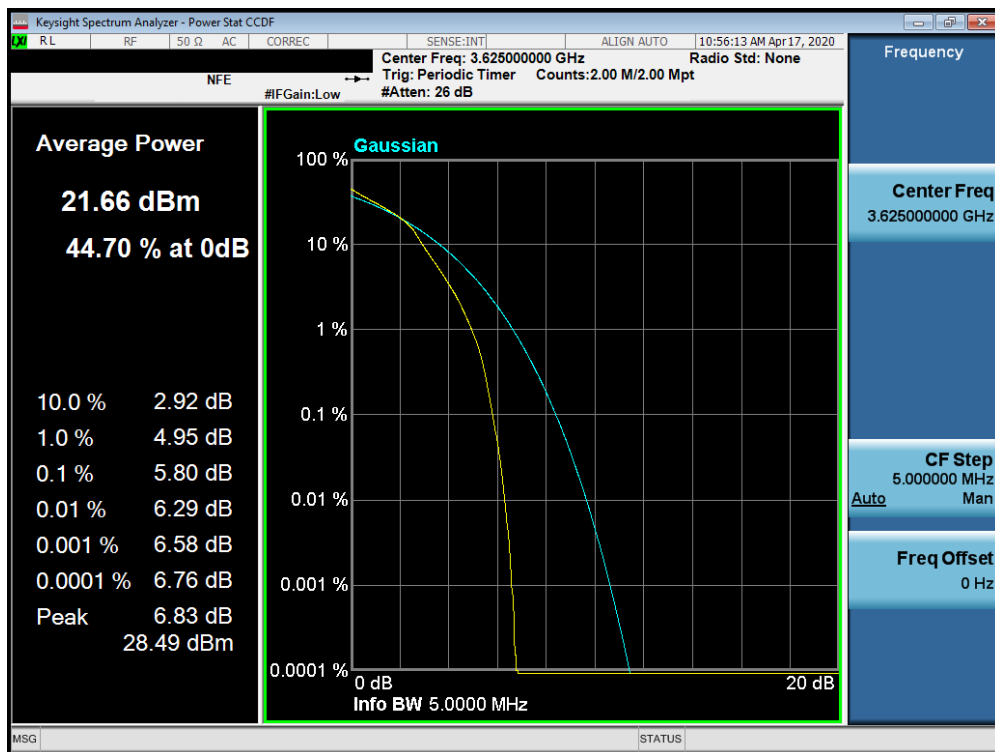
Test Notes

None



FCC ID: XIA-CFW2182	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 44 of 76

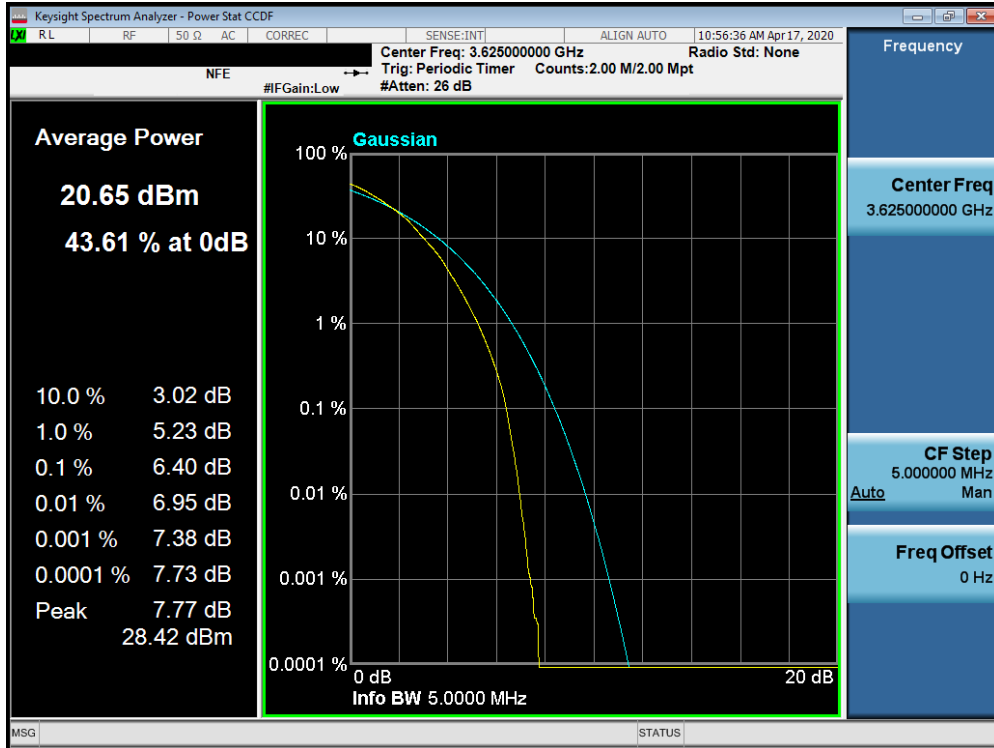


Plot 7-58. PAR Plot (Band 48 – 5.0MHz QPSK – Full RB Configuration)

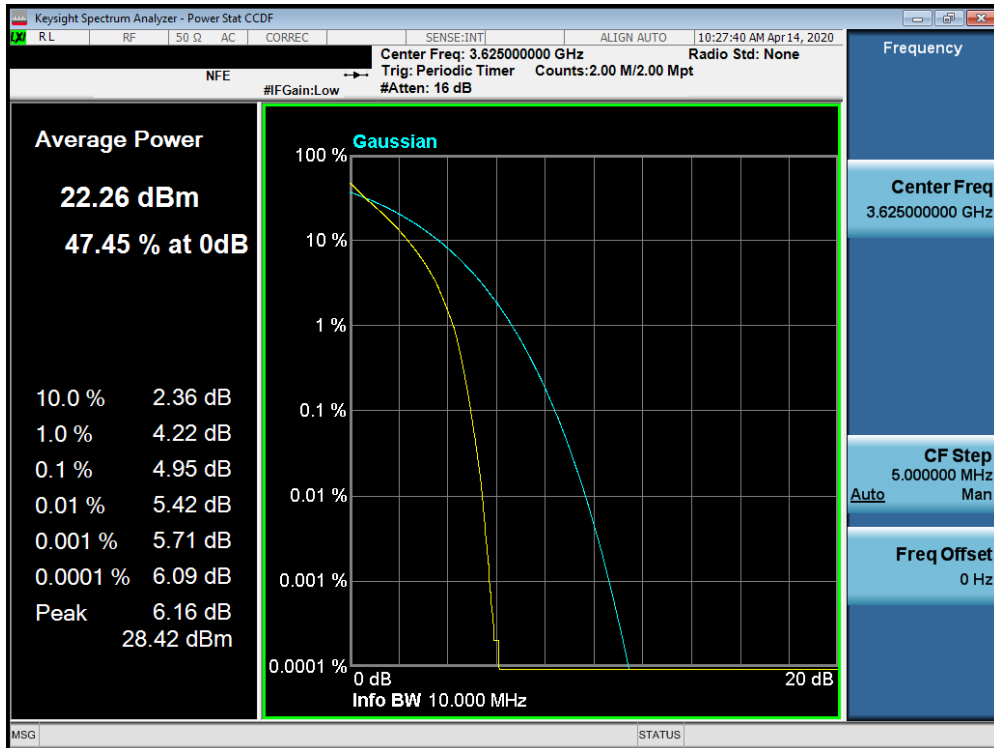


Plot 7-59. PAR Plot (Band 48 – 5.0MHz 16-QAM – Full RB Configuration)

FCC ID: XIA-CFW2182		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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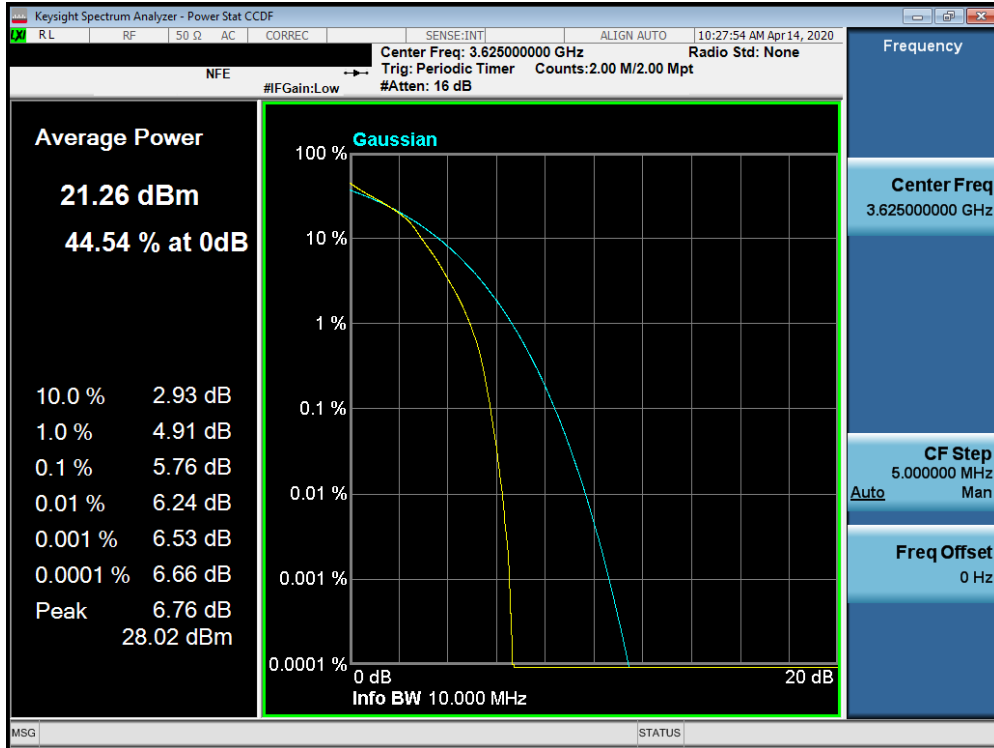


Plot 7-60. PAR Plot (Band 48 – 5.0MHz 64-QAM – Full RB Configuration)

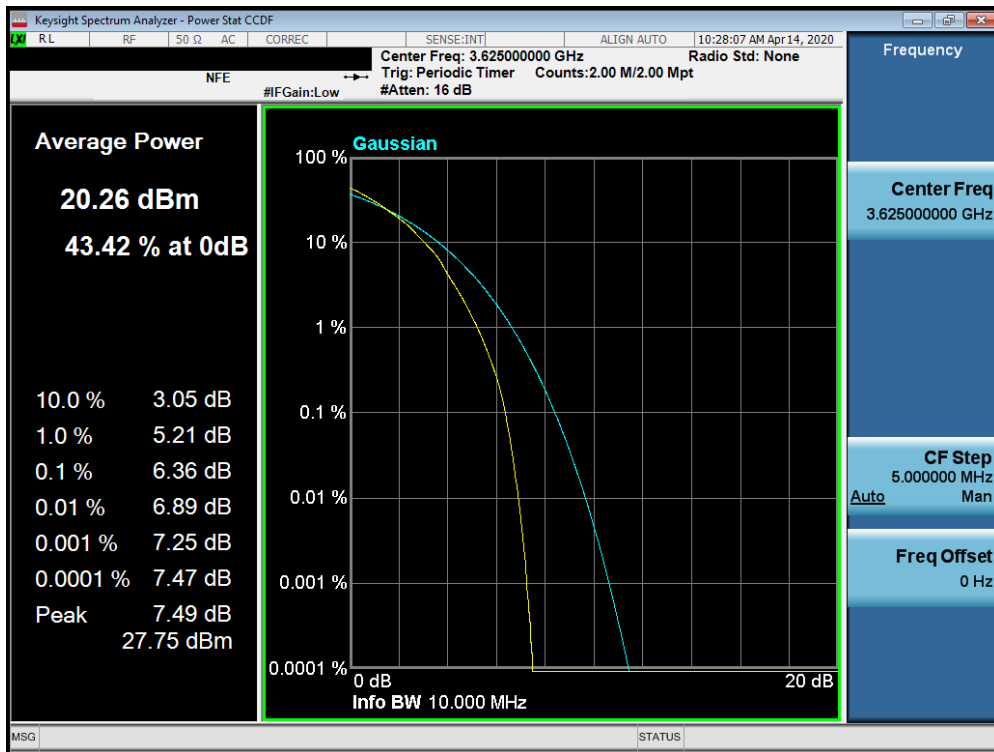


Plot 7-61. PAR Plot (Band 48 – 10.0MHz QPSK – Full RB Configuration)

FCC ID: XIA-CFW2182	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
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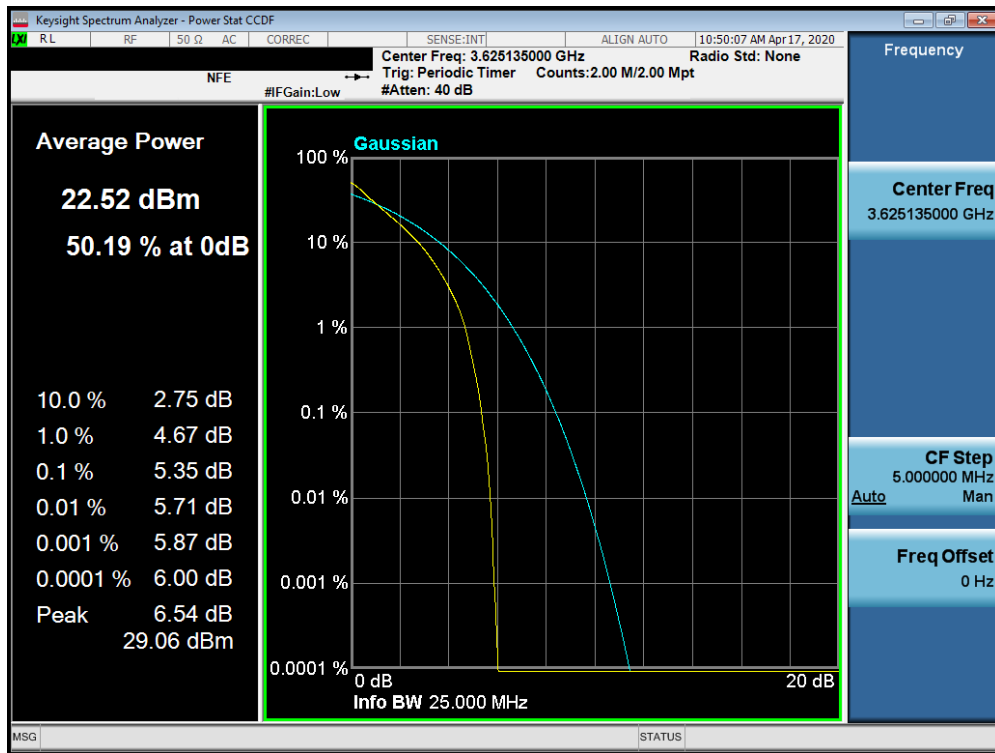


Plot 7-62. PAR Plot (Band 48 – 10.0MHz 16-QAM – Full RB Configuration)

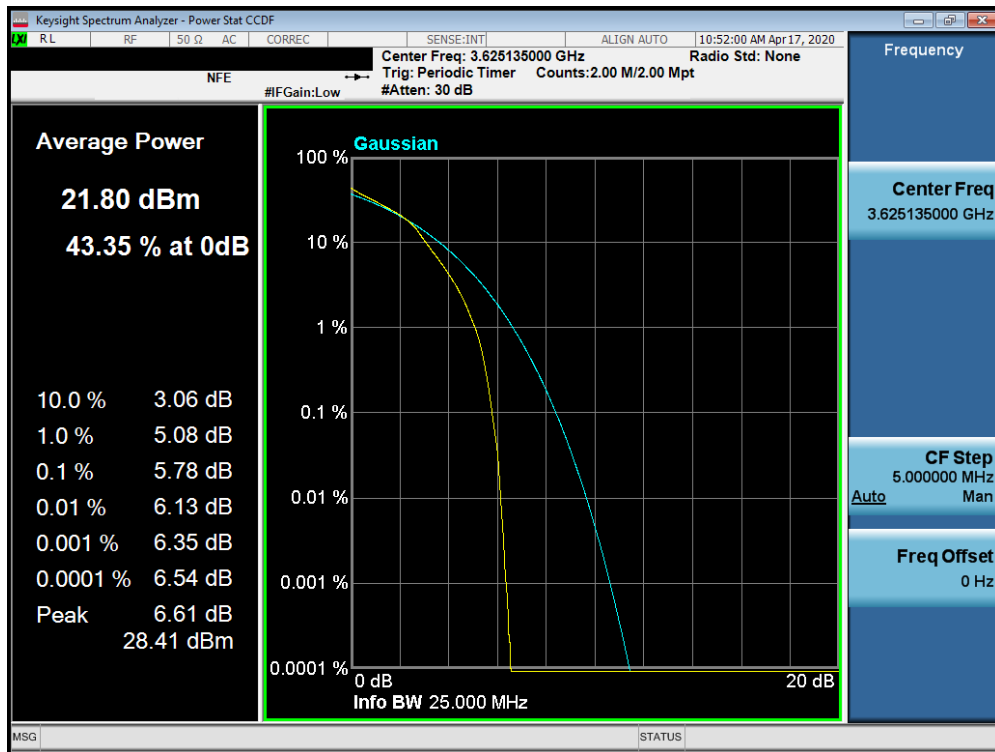


Plot 7-63. PAR Plot (Band 48 – 10.0MHz 64-QAM – Full RB Configuration)



FCC ID: XIA-CFW2182	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
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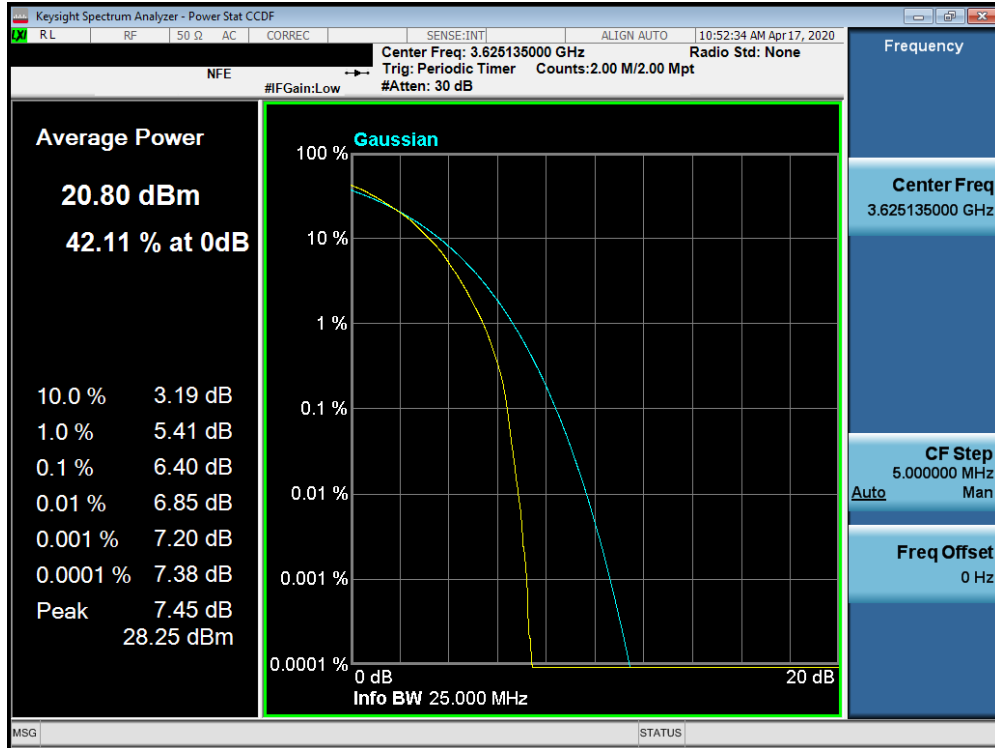


Plot 7-64. PAR Plot (Band 48 – 15.0MHz QPSK – Full RB Configuration)

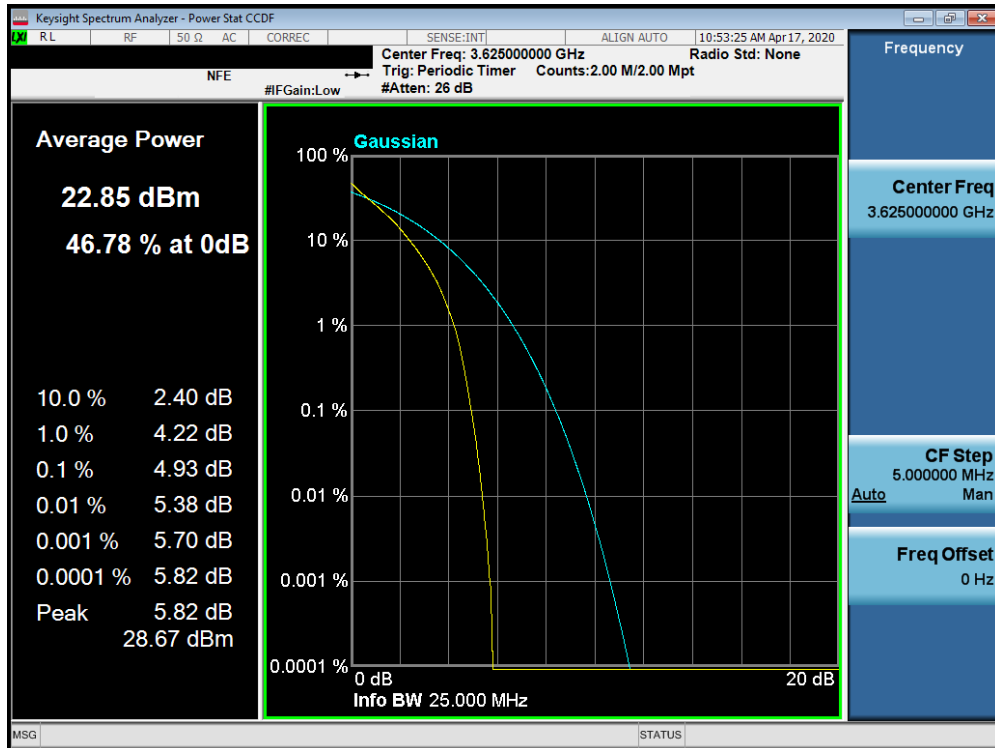


Plot 7-65. PAR Plot (Band 48 – 15.0MHz 16-QAM – Full RB Configuration)



FCC ID: XIA-CFW2182		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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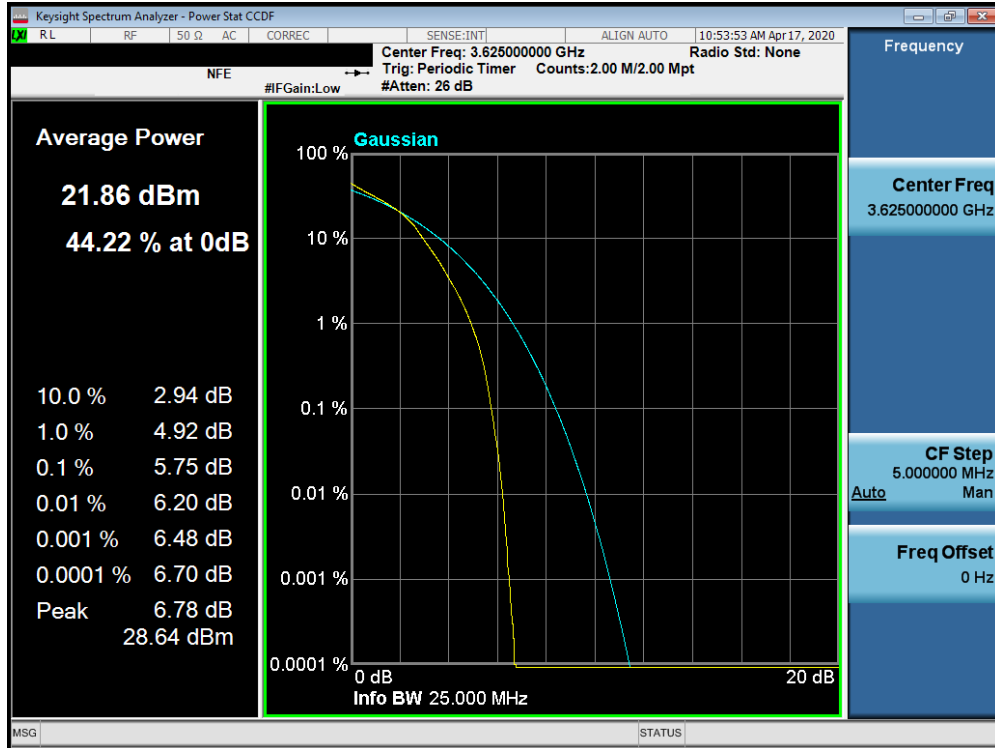


Plot 7-66. PAR Plot (Band 48 – 15.0MHz 64-QAM – Full RB Configuration)

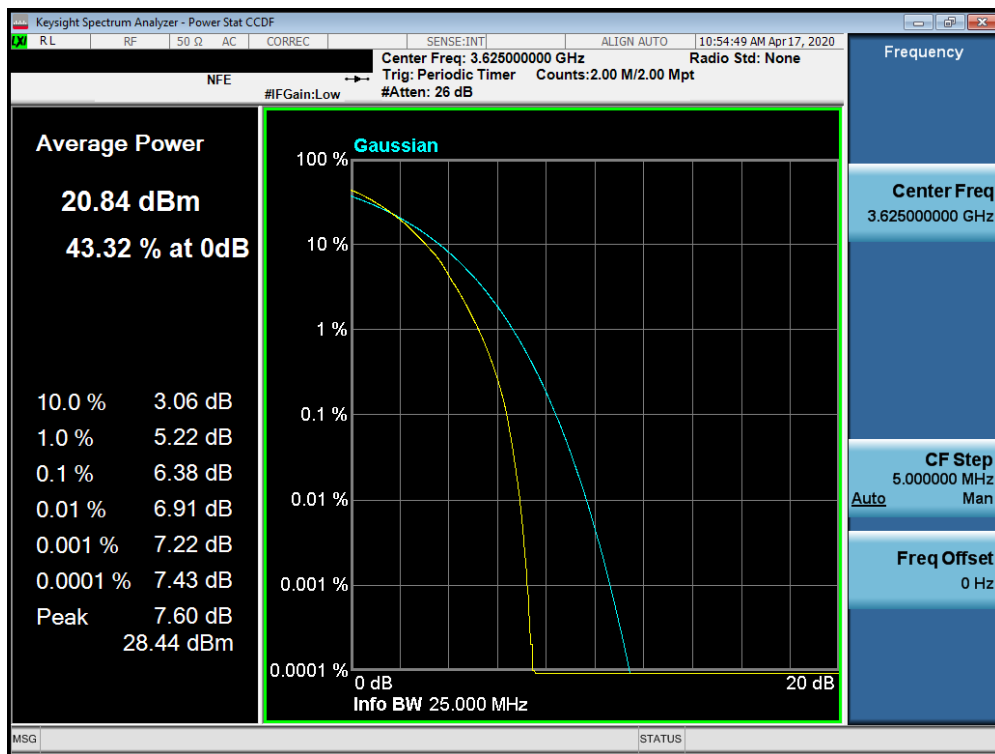


Plot 7-67. PAR Plot (Band 48 – 20.0MHz QPSK – Full RB Configuration)

FCC ID: XIA-CFW2182		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Plot 7-68. PAR Plot (Band 48 – 20.0MHz 16-QAM – Full RB Configuration)



Plot 7-69. PAR Plot (Band 48 – 20.0MHz 64-QAM – Full RB Configuration)

FCC ID: XIA-CFW2182	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 50 of 76

7.6 Uplink Carrier Aggregation

\$96.41(e)

Test Overview

The EUT is set up to transmit two contiguous LTE channels. The power level of both carriers 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 10th 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 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 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 = trace average for continuous emissions, max hold for pulse emissions
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.

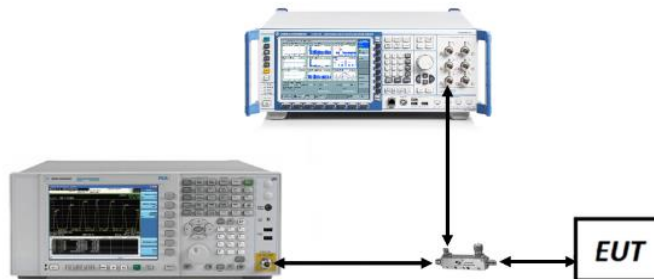



Figure 7-5. Test Instrument & Measurement Setup

FCC ID: XIA-CFW2182		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Test Notes

1. Conducted power and spurious emissions measurements were evaluated for the two contiguous channels using various combinations of RB size, RB offset, modulation, and channel bandwidth. Channel bandwidth data is shown in the tables below based only on the channel bandwidths that were supported in this device. The worst case (highest) powers were found while operating with QPSK modulation, as shown in Table 7-3 and 7-4 below, with both carriers set to transmit using 1RB.

2. 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.

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Band 48

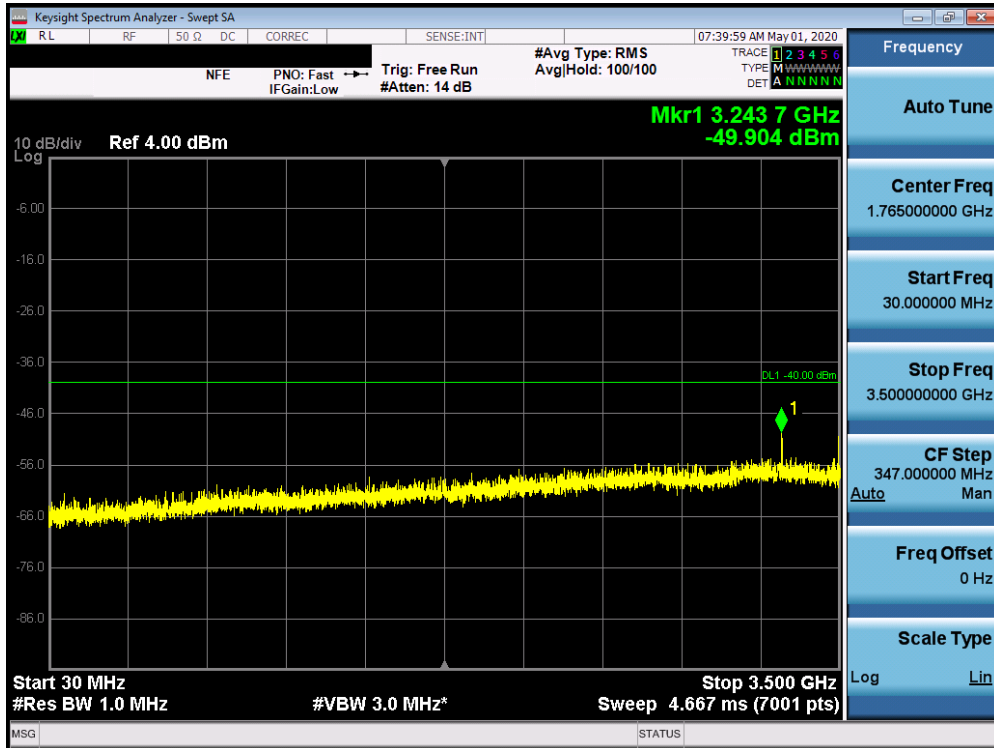
Power State	PCC							SCC							Power
	PCC Band	PCC Bandwidth [MHz]	PCC (UL) Channel	PCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	SCC Band	SCC Bandwidth [MHz]	SCC (UL) Channel	SCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	ULCA Tx.Power (dBm)
Max	LTE B48	5	55265	3552.5	QPSK	1	0	LTE B48	20	55382	3564.2	QPSK	1	0	12.05
Max	LTE B48	10	55290	3555	QPSK	1	0	LTE B48	20	55434	3569.4	QPSK	1	0	11.32
Max	LTE B48	15	55315	3557.5	QPSK	1	0	LTE B48	20	55486	3574.6	QPSK	1	0	12.09
Max	LTE B48	20	55340	3560	QPSK	1	0	LTE B48	20	55538	3579.8	QPSK	1	0	11.91
Max	LTE B48	5	55990	3625	QPSK	1	0	LTE B48	20	56107	3636.7	QPSK	1	0	11.58
Max	LTE B48	10	55990	3625	QPSK	1	0	LTE B48	20	56134	3639.4	QPSK	1	0	10.62
Max	LTE B48	15	55990	3625	QPSK	1	0	LTE B48	20	56161	3642.1	QPSK	1	0	11.87
Max	LTE B48	20	55990	3625	QPSK	1	0	LTE B48	20	56188	3644.8	QPSK	1	0	12.00
Max	LTE B48	20	56640	3690	QPSK	1	0	LTE B48	5	56523	3678.3	QPSK	1	0	10.61
Max	LTE B48	20	56640	3690	QPSK	1	0	LTE B48	10	56496	3675.6	QPSK	1	0	10.25
Max	LTE B48	20	56640	3690	QPSK	1	0	LTE B48	15	56469	3672.9	QPSK	1	0	10.78
Max	LTE B48	20	56640	3690	QPSK	1	0	LTE B48	20	56442	3670.2	QPSK	1	0	10.05

Table 7-3. Conducted Powers (B48 – Left Carrier: RB Size 1 Offset 0 Right Carrier: RB Size 1 Offset 0)

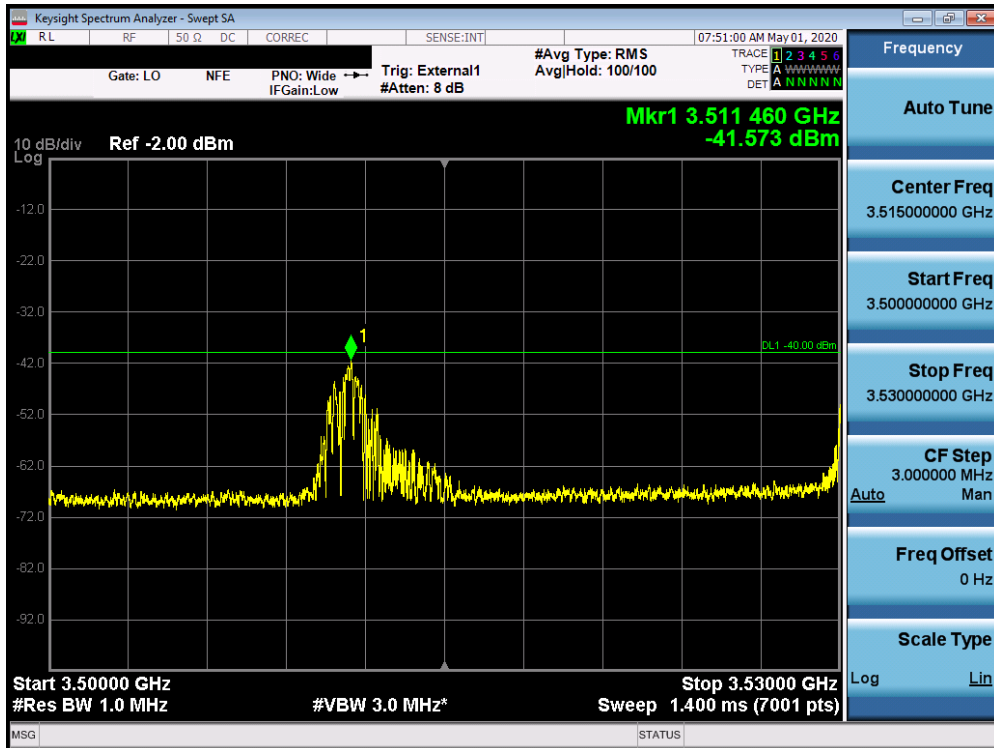
Power State	PCC							SCC							Power
	PCC Band	PCC Bandwidth [MHz]	PCC (UL) Channel	PCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	SCC Band	SCC Bandwidth [MHz]	SCC (UL) Channel	SCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	ULCA Tx.Power (dBm)
Max	LTE B48	20	55340	3560	QPSK	1	0	LTE B48	20	55538	3579.8	QPSK	1	0	12.45
Max	LTE B48	20	55340	3560	QPSK	1	99	LTE B48	20	55538	3579.8	QPSK	1	99	11.90
Max	LTE B48	20	55340	3560	QPSK	1	0	LTE B48	20	55538	3579.8	QPSK	1	99	11.68
Max	LTE B48	20	55340	3560	QPSK	1	50	LTE B48	20	55538	3579.8	QPSK	1	50	11.75
Max	LTE B48	20	55340	3560	QPSK	1	99	LTE B48	20	55538	3579.8	QPSK	1	0	11.53
Max	LTE B48	20	55340	3560	QPSK	100	0	LTE B48	20	55142	3540.2	QPSK	100	0	11.90
Max	LTE B48	20	55340	3560	16-QAM	100	0	LTE B48	20	55142	3540.2	16-QAM	100	0	11.86
Max	LTE B48	20	55340	3560	64-QAM	100	0	LTE B48	20	55142	3540.2	64-QAM	100	0	12.09

Table 7-4. Conducted Powers (B48 with Various Combinations for 20MHz Channel Bandwidth)




FCC ID: XIA-CFW2182		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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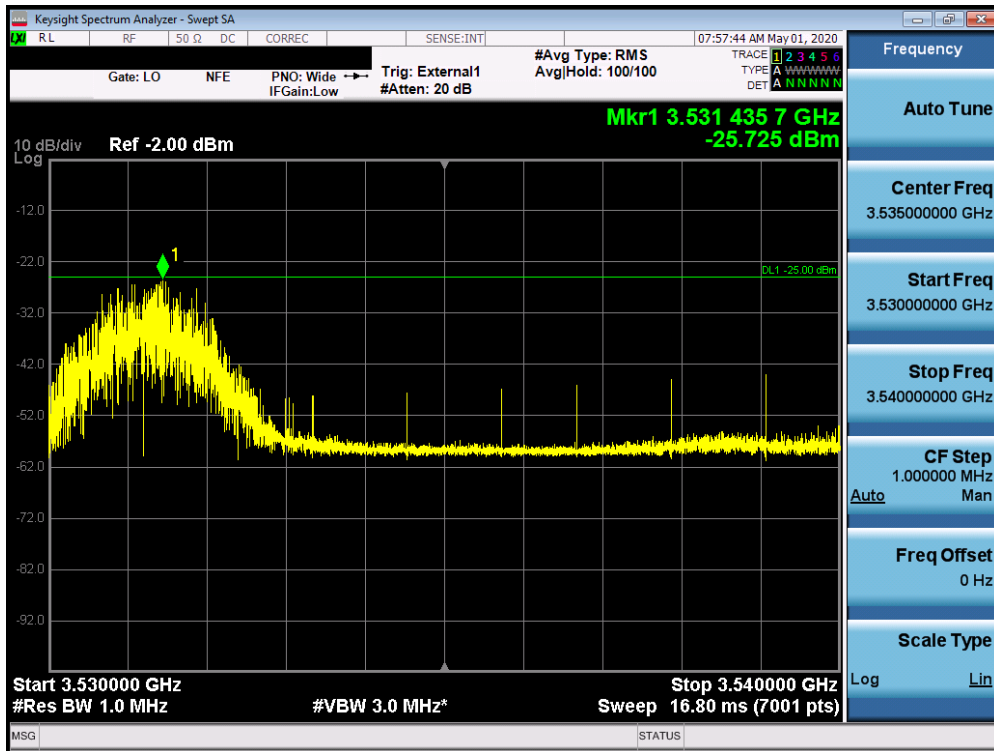


Plot 7-70. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)

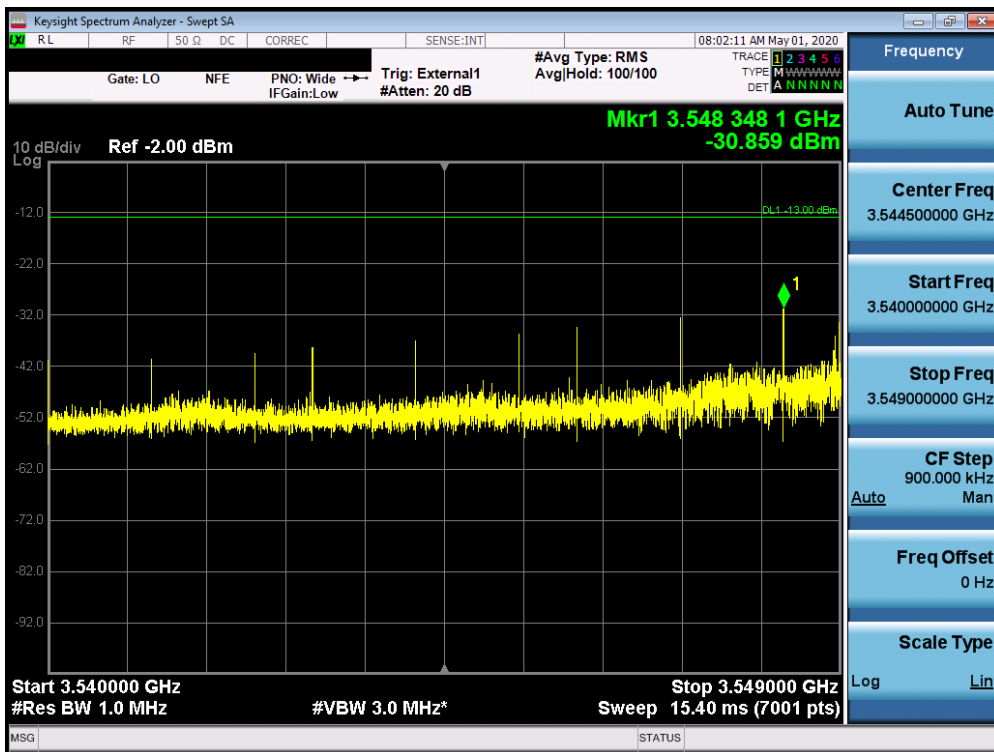


Plot 7-71. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)

FCC ID: XIA-CFW2182	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	 NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 54 of 76

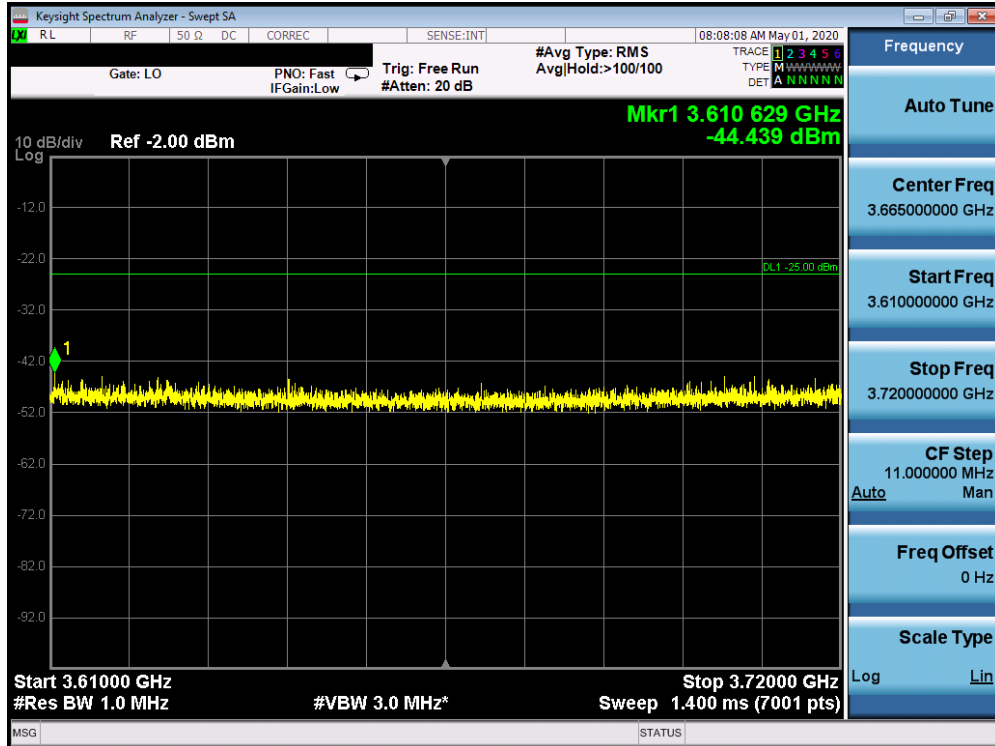


Plot 7-72. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)

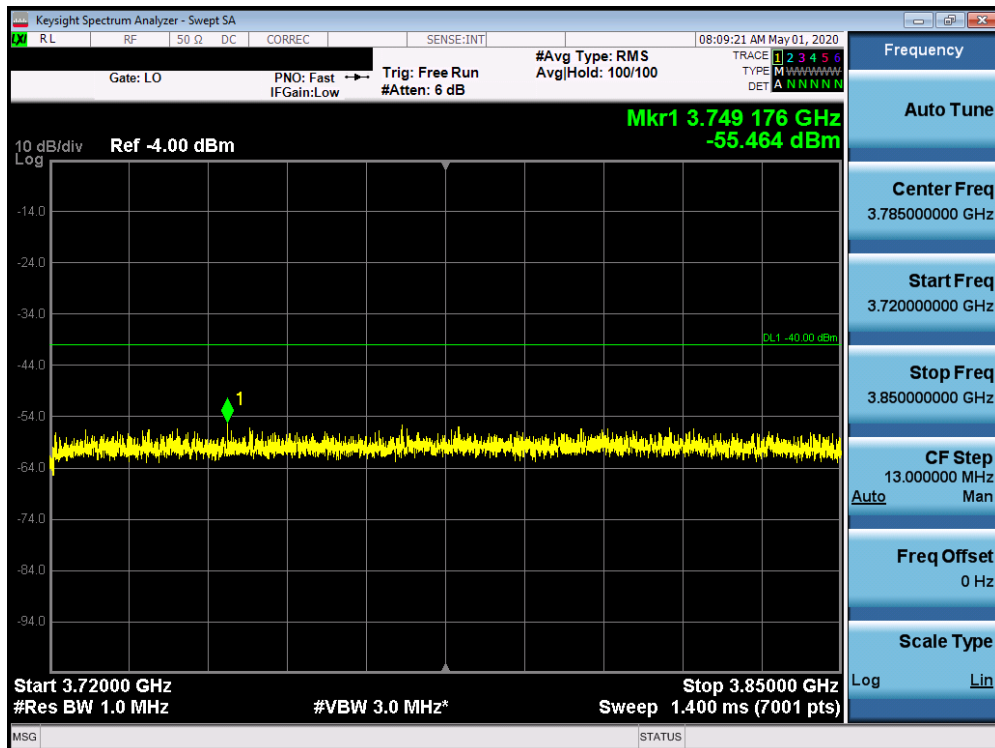


Plot 7-73. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)

FCC ID: XIA-CFW2182	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 55 of 76

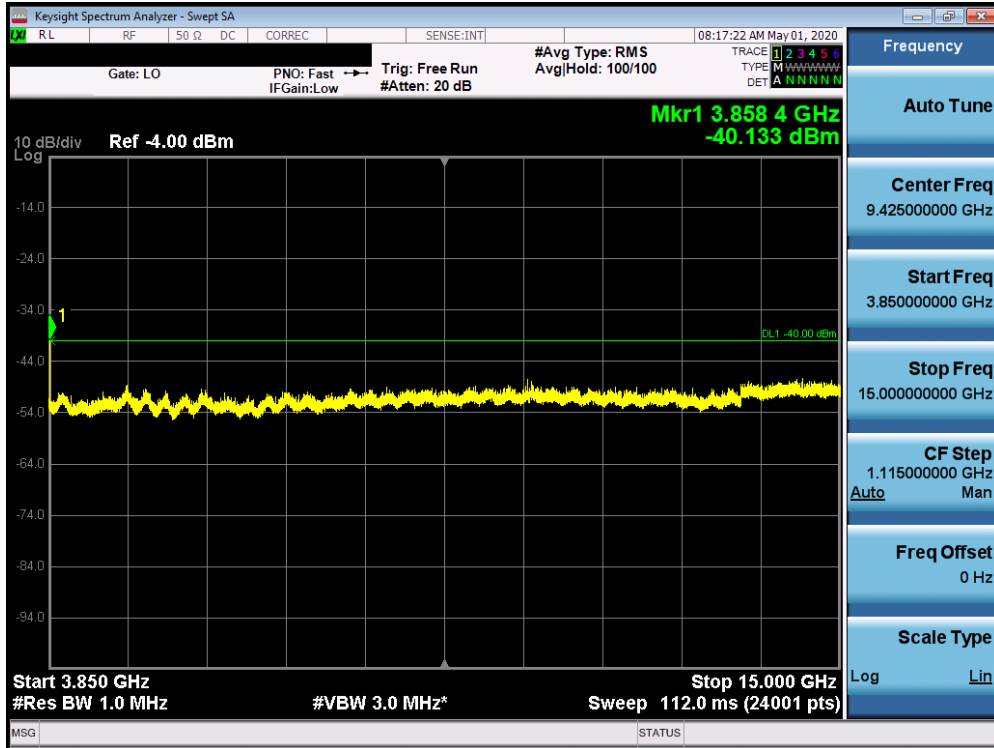


Plot 7-76. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)

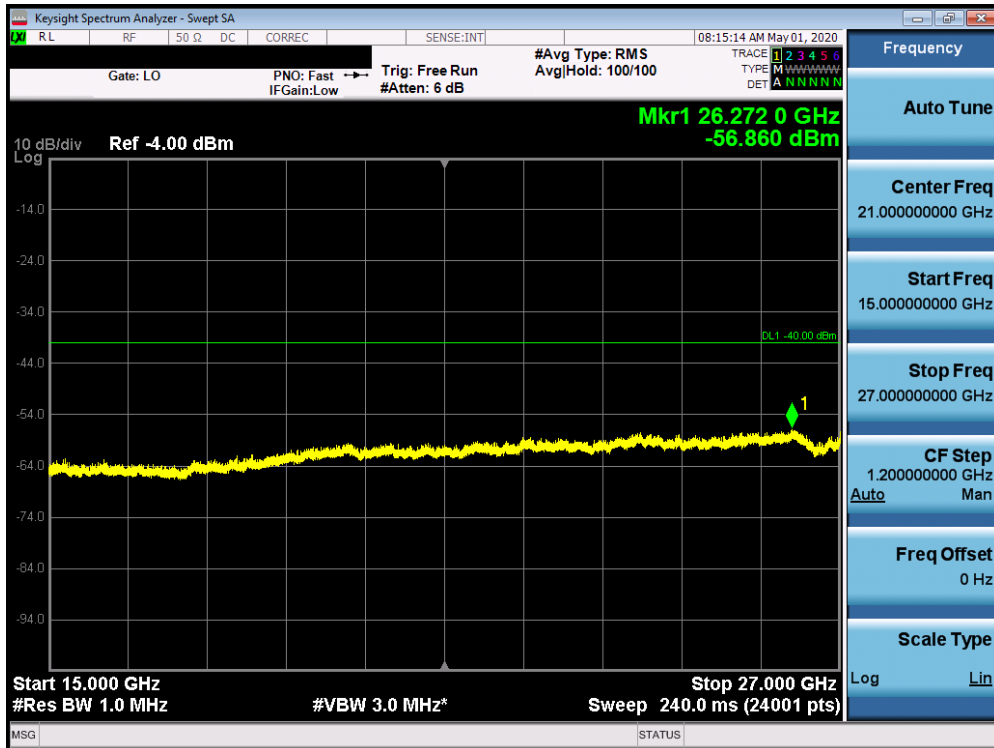


Plot 7-77. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)



FCC ID: XIA-CFW2182	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 57 of 76

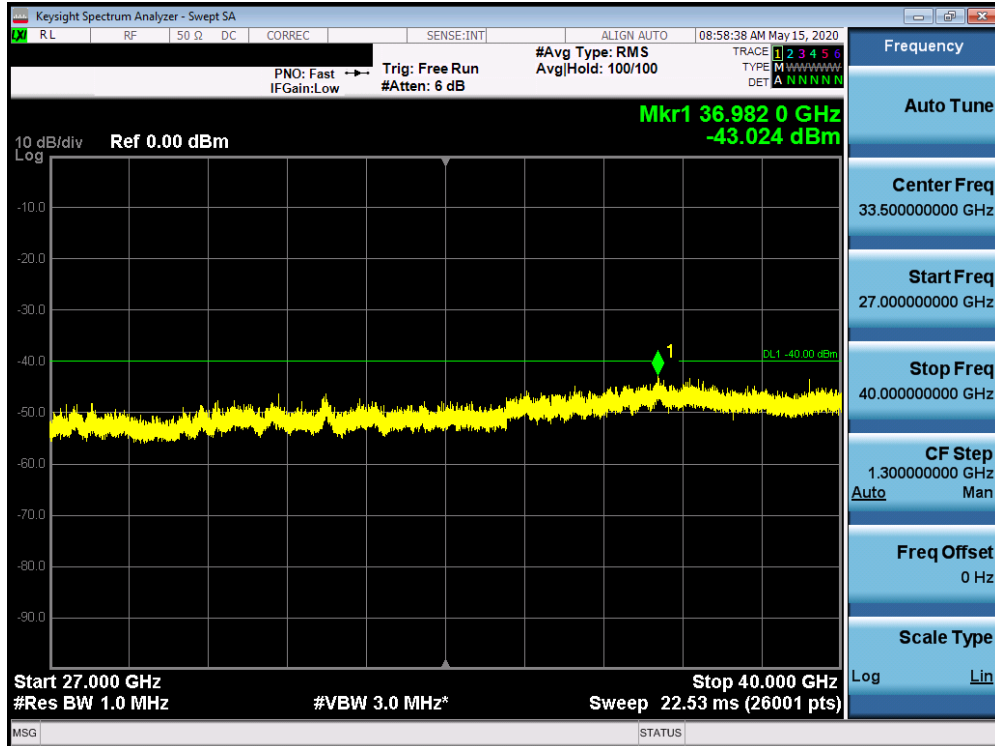


Plot 7-78. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)

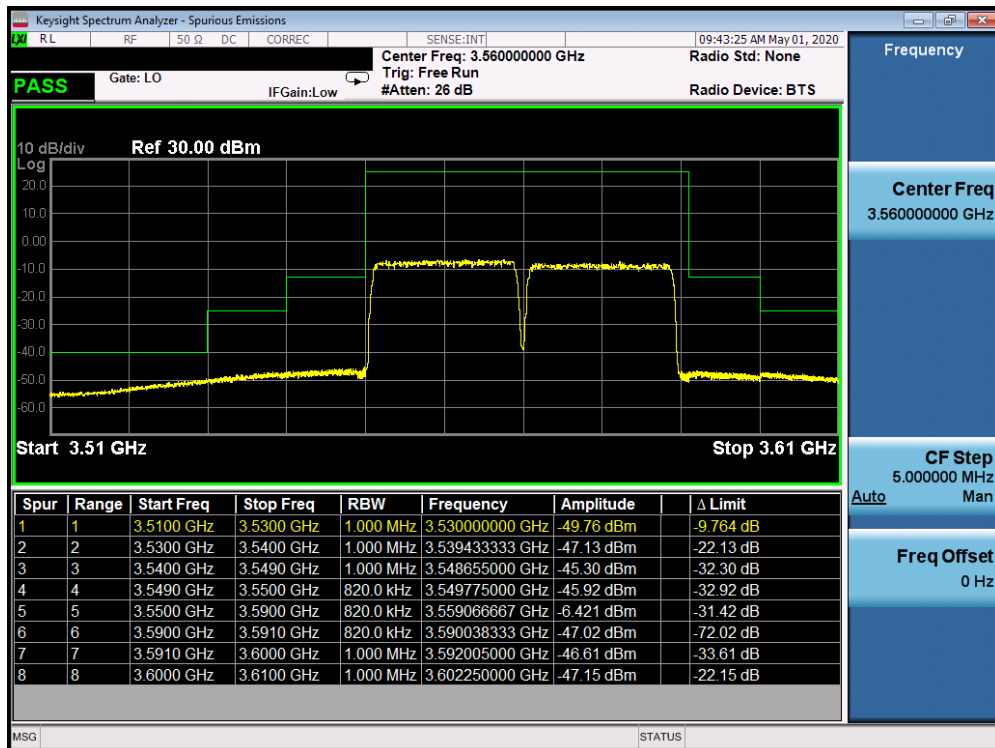


Plot 7-79. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)

FCC ID: XIA-CFW2182		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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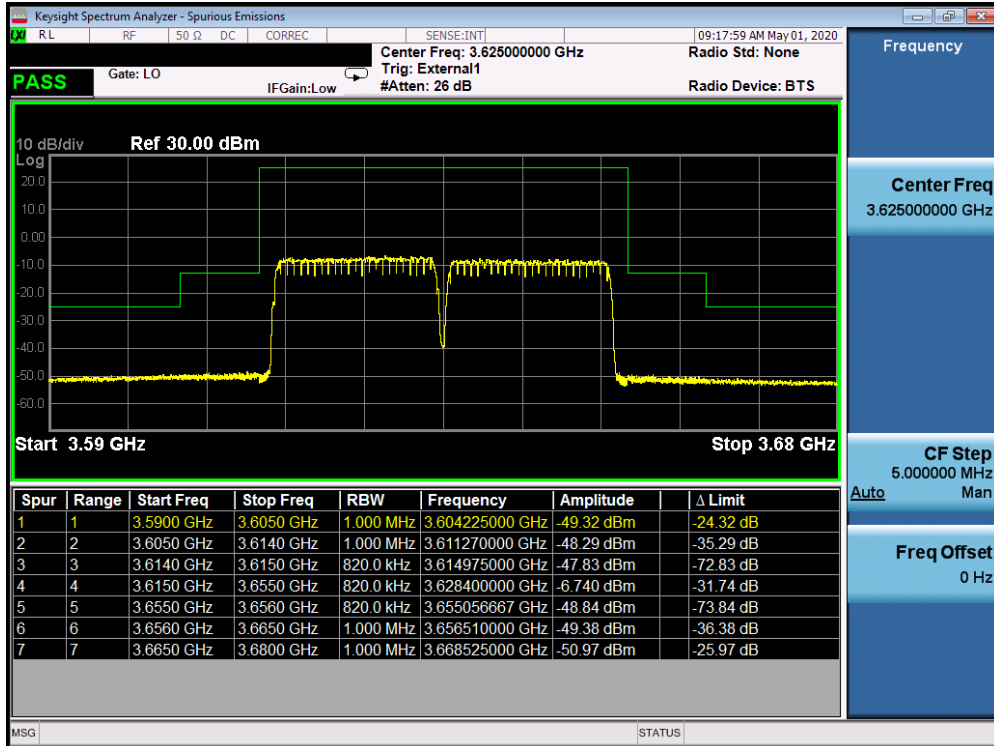


Plot 7-80. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)

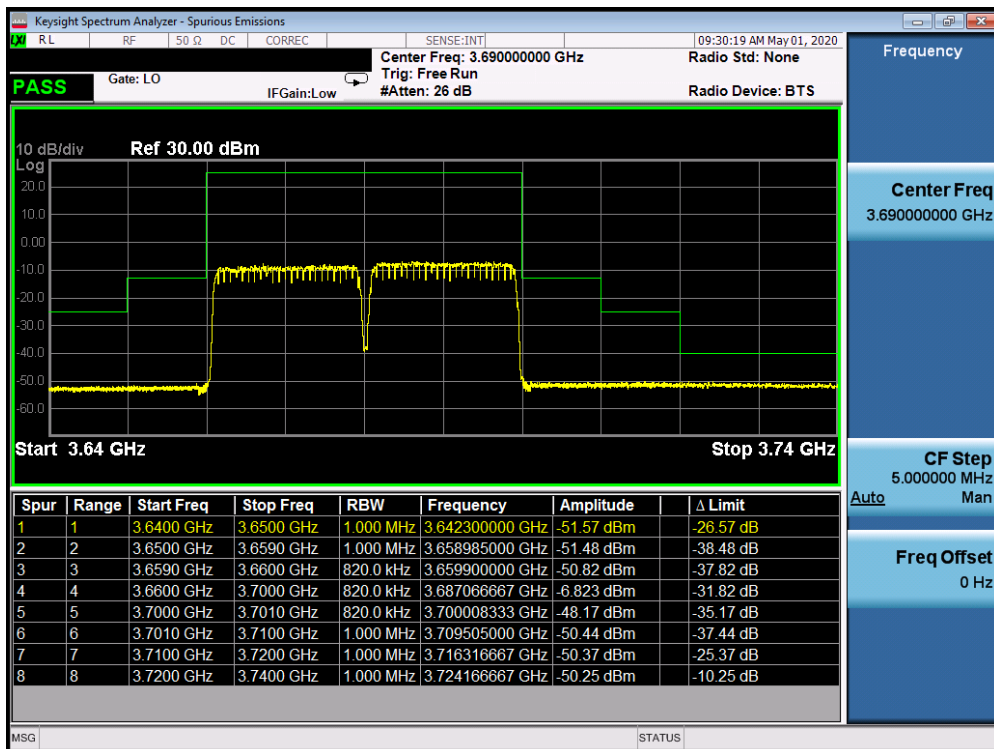


Plot 7-81. Lower ACP Plot (Band 48 QPSK – Left Carrier: 20 MHz Right Carrier: 20 MHz – Full RB)

FCC ID: XIA-CFW2182	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
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Plot 7-82. Mid ACP Plot (Band 48 QPSK – Left Carrier: 20 MHz Right Carrier: 20 MHz – Full RB)



Plot 7-83. Upper ACP Plot (Band 48 QPSK – Left Carrier: 20 MHz Right Carrier: 20 MHz – Full RB)

FCC ID: XIA-CFW2182	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 60 of 76

7.7 Radiated Power (EIRP)

§96.41(b)

Test Overview

Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the method described in KDB 971168. 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 v03r01 – Section 5.2.1

Test Settings

The relevant equation for determining the ERP or EIRP from the conducted RF output power measured is:

$$ERP/EIRP = P_{Meas} - LC + GT$$

Where:

ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as P_{Meas} , typically dBW or dBm)

P_{Meas} = measured transmitter output power or PSD, in dBW or dBm

LC = signal attenuation in the connecting cable between the transmitter and antenna in dB

GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

Test Setup

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

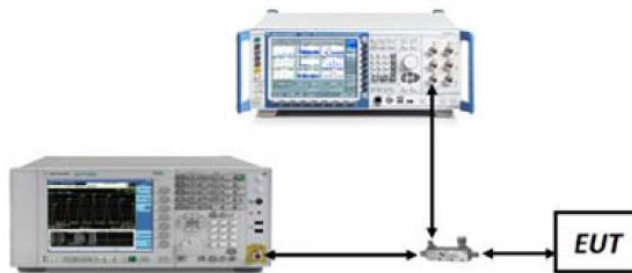


Figure 7-6. ERP/EIRP Measurement Setup


FCC ID: XIA-CFW2182	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
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Test Notes

- 1) The worst case emissions are reported with the EUT modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested while powered by an Power Over Ethernet (POE) power source.
- 3) The worst case EIRP shown in the section below is found with LTE operating in the RB configuration listed.

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	RB Size/Offset	Conducted Power [dBm/10MHz]	Ant. Gain [dBi]	EIRP [dBm/10MHz]	EIRP [Watts/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
3552.50	5	QPSK	25 / 0	4.85	17.50	22.35	0.172	23.00	-0.65
3625.00	5	QPSK	25 / 0	4.85	17.50	22.35	0.172	23.00	-0.65
3697.50	5	QPSK	25 / 0	3.76	17.50	21.26	0.134	23.00	-1.74
3552.50	5	16-QAM	25 / 0	5.01	17.50	22.51	0.178	23.00	-0.49
3552.50	5	64-QAM	25 / 0	4.87	17.50	22.37	0.173	23.00	-0.63
3555.00	10	QPSK	1 / 0	5.30	17.50	22.80	0.191	23.00	-0.20
3625.00	10	QPSK	1 / 0	4.80	17.50	22.30	0.170	23.00	-0.70
3695.00	10	QPSK	1 / 0	4.64	17.50	22.14	0.164	23.00	-0.86
3555.00	10	16-QAM	1 / 0	5.21	17.50	22.71	0.187	23.00	-0.29
3555.00	10	64-QAM	1 / 0	4.95	17.50	22.45	0.176	23.00	-0.55
3557.50	15	QPSK	36 / 18	4.89	17.50	22.39	0.173	23.00	-0.61
3625.00	15	QPSK	36 / 18	4.75	17.50	22.25	0.168	23.00	-0.75
3692.50	15	QPSK	36 / 18	4.12	17.50	21.62	0.145	23.00	-1.38
3557.50	15	16-QAM	36 / 18	3.90	17.50	21.40	0.138	23.00	-1.60
3557.50	15	64-QAM	36 / 18	4.86	17.50	22.36	0.172	23.00	-0.64
3560.00	20	QPSK	1 / 0	5.23	17.50	22.73	0.187	23.00	-0.27
3625.00	20	QPSK	1 / 0	5.40	17.50	22.90	0.195	23.00	-0.10
3690.00	20	QPSK	1 / 0	5.30	17.50	22.80	0.191	23.00	-0.20
3560.00	20	16-QAM	1 / 0	5.32	17.50	22.82	0.191	23.00	-0.18
3560.00	20	64-QAM	1 / 0	4.93	17.50	22.43	0.175	23.00	-0.57

Table 7-5. LTE Band 48 EIRP Data

FCC ID: XIA-CFW2182	 PCTEST [®] Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	 NetCommWireless	Approved by: Quality Manager
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7.8 Radiated Spurious Emissions Measurements

§2.1053 §96.41(e)

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 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.


Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.8

ANSI/TIA-603-E-2016 – Section 2.2.12

Test Settings

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

FCC ID: XIA-CFW2182		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 63 of 76

Test Setup

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

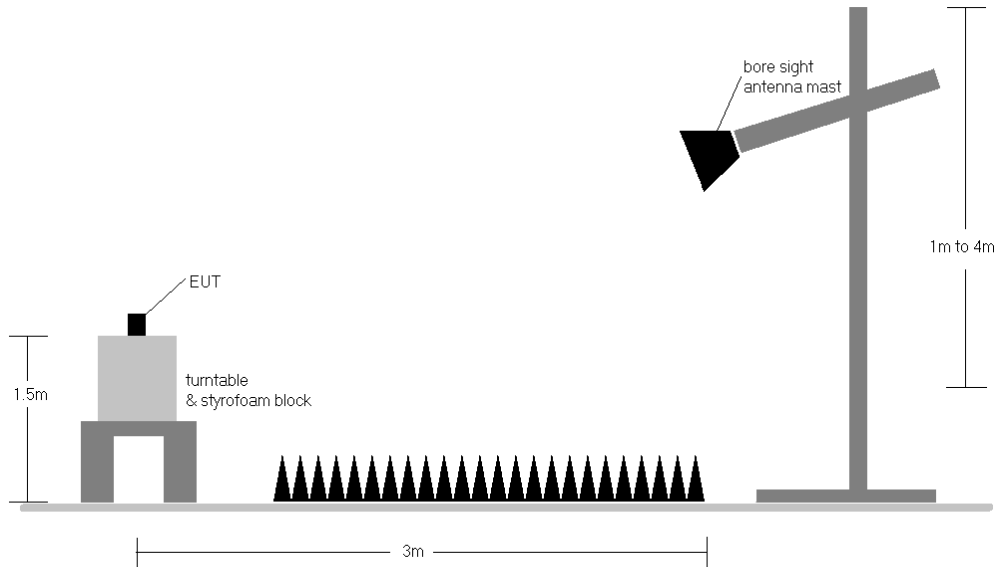


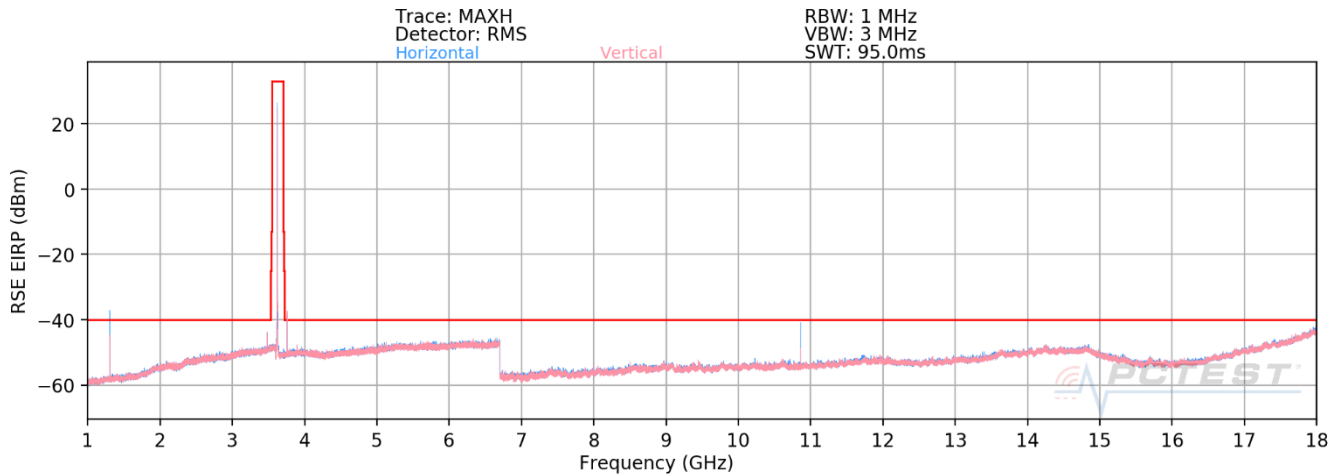
Figure 7-7. Test Instrument & Measurement Setup

Test Notes

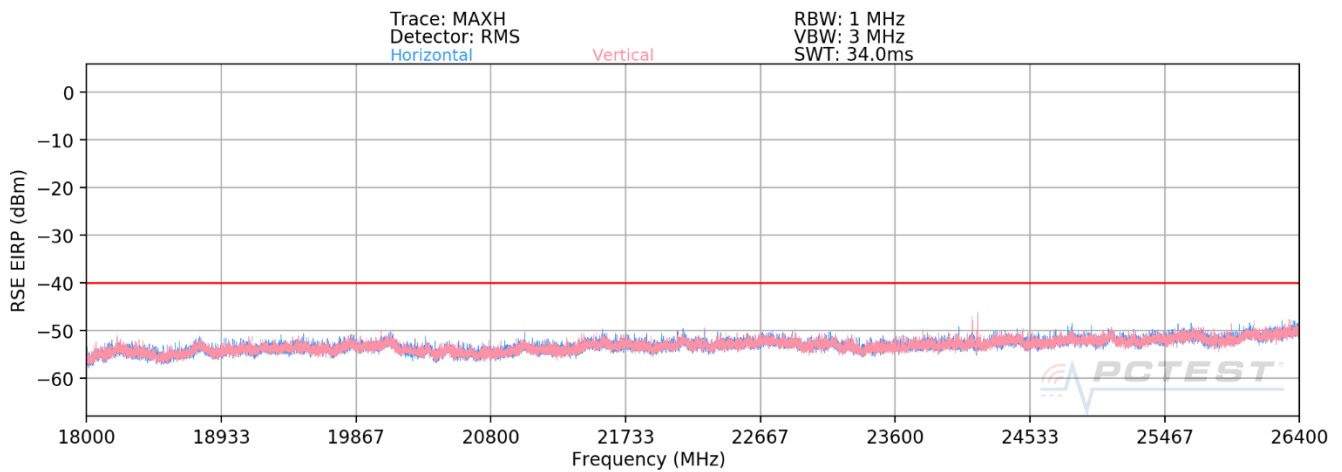
- 1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested while powered by an Power Over Ethernet (POE) power source.
- 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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Band 48

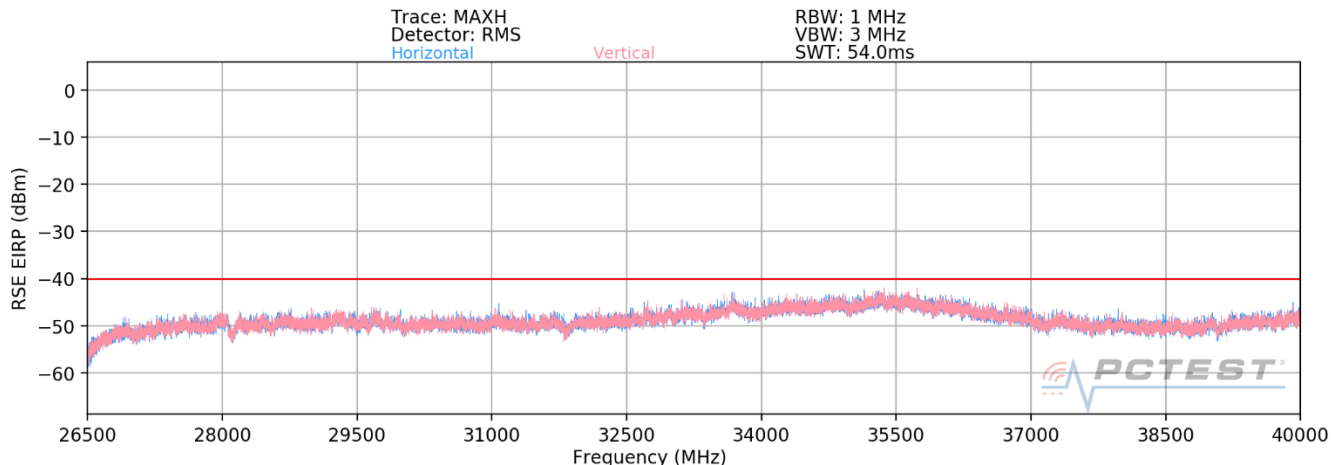


Plot 7-84. Radiated Spurious Plot 1 - 18GHz (Band 48)



Plot 7-85. Radiated Spurious Plot 18 - 26.5GHz (Band 48)

FCC ID: XIA-CFW2182	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	 NetCommWireless	Approved by: Quality Manager
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Plot 7-86. Radiated Spurious Plot 26.5 - 40GHz (Band 48)

Note:


The emission that is above the limit for plot 7-120 was investigated using a notch filter (Sangshin Cavity Filter, Model NF3625), and the result is given below

- Noise floor for emission around 1300 MHz

Operating Frequency [MHz]	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]	Margin [dB]
3555.00	1236.24	H	-	-	-81.78	6.87	-74.91	-34.9
3625.00	1306.30	H	-	-	-81.51	7.25	-74.27	-34.3
3695.00	1376.60	H	-	-	-81.88	7.49	-74.39	-34.4

- Before and after the LTE Band 48 frequency band were found out to be passing the limit.

Operating Frequency [MHz]	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]	Margin [dB]
3555.00	3413.46	H	205	3	-72.14	9.84	-62.29	-22.3
3555.00	3687.80	H	-	-	-121.08	9.68	-111.39	-71.4
3625.00	3483.60	H	213	1	-71.16	9.93	-61.22	-21.2
3625.00	3758.17	H	201	7	-66.27	9.40	-56.87	-16.9
3695.00	3553.13	H	-	-	-112.75	9.92	-102.83	-62.8
3695.00	3828.14	H	195	6	-65.05	9.34	-55.71	-15.7

FCC ID: XIA-CFW2182	 PCTEST® Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	 NetCommWireless	Approved by: Quality Manager
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OPERATING FREQUENCY: 3555.00 MHz
 CHANNEL: 3625
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 10.0 MHz
 DISTANCE: 3 meters
 LIMIT: -40 dBm


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]	Margin [dB]
7110.00	H	396	252	-63.81	11.76	-52.05	-12.1
10665.00	H	154	52	-56.76	12.61	-44.15	-4.2
14220.00	H	-	-	-57.64	11.41	-46.23	-6.2

Table 7-6. Radiated Spurious Data (Band 48 – Low Channel)

OPERATING FREQUENCY: 3625.00 MHz
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 10.0 MHz
 DISTANCE: 3 meters
 LIMIT: -40 dBm

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]	Margin [dB]
7250.00	H	380	247	-62.84	11.35	-51.49	-11.5
10875.00	H	153	51	-55.74	12.77	-42.97	-3.0
14500.00	H	-	-	-61.58	11.64	-49.93	-9.9

Table 7-7. Radiated Spurious Data (Band 48 – Mid Channel)

FCC ID: XIA-CFW2182	 PCTEST [®] Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	 NetCommWireless	Approved by: Quality Manager
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OPERATING FREQUENCY: 3695.00 MHz

MODULATION SIGNAL: QPSK

BANDWIDTH: 10.0 MHz

DISTANCE: 3 meters

LIMIT: -40 dBm

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]	Margin [dB]
7390.00	H	388	349	-63.72	10.98	-52.73	-12.7
11085.00	H	237	73	-53.74	12.78	-40.96	-1.0
14780.00	H	-	-	-60.21	12.15	-48.06	-8.1

Table 7-8. Radiated Spurious Data (Band 48 – High Channel)

FCC ID: XIA-CFW2182	 PCTEST Proud to be part of  element	MEASUREMENT REPORT (CERTIFICATION)	 NetCommWireless	Approved by: Quality Manager
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7.9 Uplink Carrier Aggregation Radiated Measurements

§2.1053, §96.41(e)

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-D-2010 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as peak measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v02r02 – Section 5.8

ANSI/TIA-603-D-2010 – Section 2.2.12

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW \geq 3 x RBW
3. No. of sweep points \geq 2 x span / RBW
4. Detector = RMS
5. Trace mode = trace average for continuous emissions, max hold for pulse emissions
6. The trace was allowed to stabilize

FCC ID: XIA-CFW2182	 PCTEST [®] Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	 NetCommWireless	Approved by: Quality Manager
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Test Setup

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

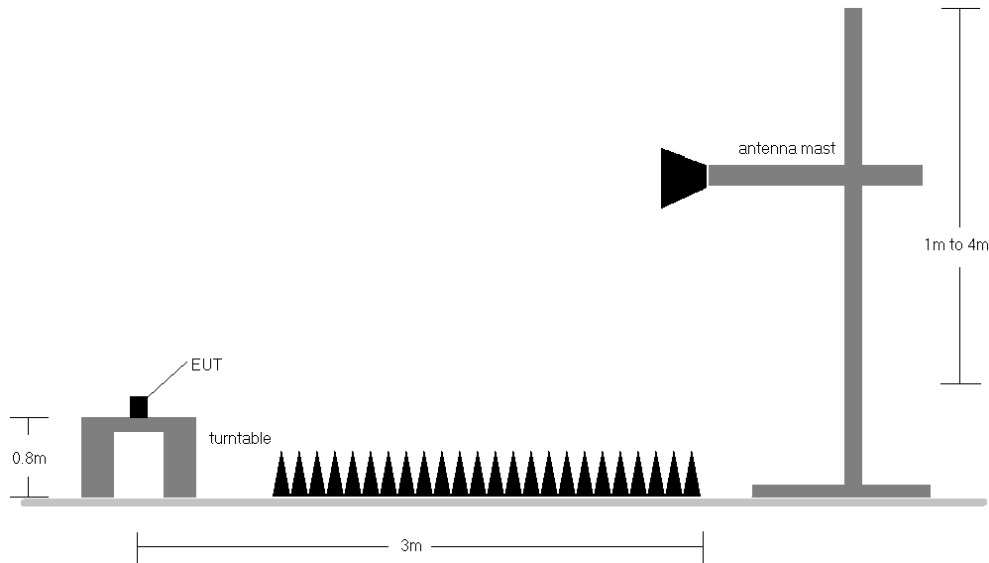


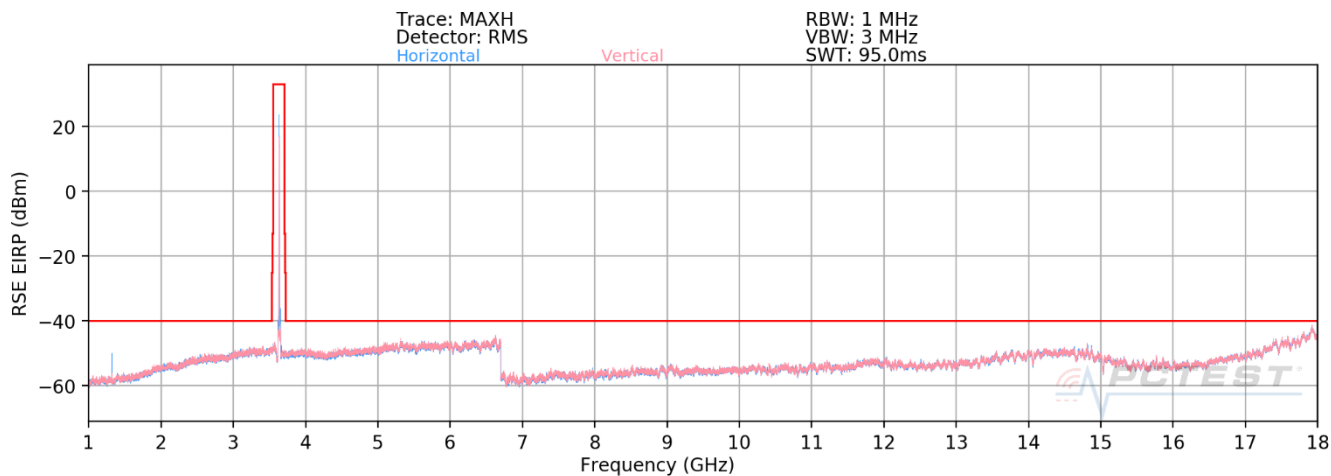
Figure 7-8. Test Instrument & Measurement Setup

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 while powered by an Power Over Ethernet (POE) power source.
- 3) Radiated spurious emissions measurements were evaluated for the two contiguous channels using various combinations of RB size, RB offset, modulation, and channel bandwidth. The worst case (highest) emissions were found while operating with QPSK modulation with both carriers set to transmit using 1RB.
- 4) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 5) 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.
- 6) No significant emissions were found as a result of two uplink carriers operating contiguously.

FCC ID: XIA-CFW2182		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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ULCA Band 48



Plot 7-87. Radiated Spurious Plot 1GHz - 18GHz (ULCA Band 48 Mid Channel – PCC/SCC: 1RB)

OPERATING FREQUENCY (PCC): 3560.00 MHz
 OPERATING FREQUENCY (SCC): 3579.80 MHz
 CHANNEL (PCC): 55340
 CHANNEL (SCC): 55538
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 20.0 MHz
 DISTANCE: 3 meters
 LIMIT: -40 dBm

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]	Margin [dB]
7120.00	H	400	349	-69.32	11.71	-57.62	-17.6
10680.00	H	379	285	-64.65	12.55	-52.10	-12.1
14240.00	H	-	-	-60.02	11.35	-48.66	-8.7
17800.00	H	-	-	-53.25	10.01	-43.24	-3.2

Plot 7-9. Radiated Spurious Data (ULCA BAND 48 PCC: RB 1 Offset 99, SCC: RB 1 Offset 0 – Low Channel)

FCC ID: XIA-CFW2182	 PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	 NetCommWireless	Approved by: Quality Manager
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OPERATING FREQUENCY (PCC): _____ 3625.00 MHz
 OPERATING FREQUENCY (SCC): _____ 3644.80 MHz
 CHANNEL (PCC): _____ 55990
 CHANNEL (SCC): _____ 56188
 MODULATION SIGNAL: _____ QPSK
 BANDWIDTH: _____ 20.0 MHz
 DISTANCE: _____ 3 meters
 LIMIT: _____ -40 dBm



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]	Margin [dB]
7250.00	H	-	-	-67.26	11.32	-55.94	-15.9
10875.00	H	130	283	-65.51	12.71	-52.80	-12.8
14500.00	H	-	-	-59.78	11.61	-48.16	-8.2

Plot 7-10. Radiated Spurious Data (ULCA BAND 48 PCC: RB 1 Offset 99, SCC: RB 1 Offset 0 – Mid Channel)

OPERATING FREQUENCY (PCC): _____ 3690.00 MHz
 OPERATING FREQUENCY (SCC): _____ 3670.20 MHz
 CHANNEL (PCC): _____ 56640
 CHANNEL (SCC): _____ 56442
 MODULATION SIGNAL: _____ QPSK
 BANDWIDTH: _____ 20.0 MHz
 DISTANCE: _____ 3 meters
 LIMIT: _____ -40 dBm

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]	Margin [dB]
7380.00	H	400	343	-66.42	10.96	-55.47	-15.5
11070.00	H	400	298	-66.94	12.72	-54.22	-14.2
14760.00	H	-	-	-61.64	12.02	-49.61	-9.6

Plot 7-11. Radiated Spurious Data (ULCA BAND 48 PCC: RB 1 Offset 0, SCC: RB 1 Offset 99 – High Channel)

FCC ID: XIA-CFW2182	 PCTEST® Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	 NetCommWireless	Approved by: Quality Manager
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7.10 Frequency Stability / Temperature Variation

§2.1055

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-E-2016. 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 96, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure Used

ANSI/TIA-603-E-2016

Test Settings

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

Test Setup

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

Test Notes

None

FCC ID: XIA-CFW2182	 PCTEST [®] Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	 NetCommWireless	Approved by: Quality Manager
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Band 48 Frequency Stability Measurements

OPERATING FREQUENCY: 3,625,000,000 Hz
 CHANNEL: 55990
 REFERENCE VOLTAGE: 48.00 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	48.00	- 30	3,624,999,824	-176	-0.0000049
100 %		- 20	3,625,000,010	10	0.0000003
100 %		- 10	3,624,999,960	-40	-0.0000011
100 %		0	3,624,999,951	-49	-0.0000014
100 %		+ 10	3,625,000,320	320	0.0000088
100 %		+ 20	3,624,999,894	-106	-0.0000029
100 %		+ 30	3,624,999,724	-276	-0.0000076
100 %		+ 40	3,625,000,122	122	0.0000034
100 %		+ 50	3,625,000,200	200	0.0000055

Table 7-12. Frequency Stability Data (Band 48)

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 48 Frequency Stability Measurements

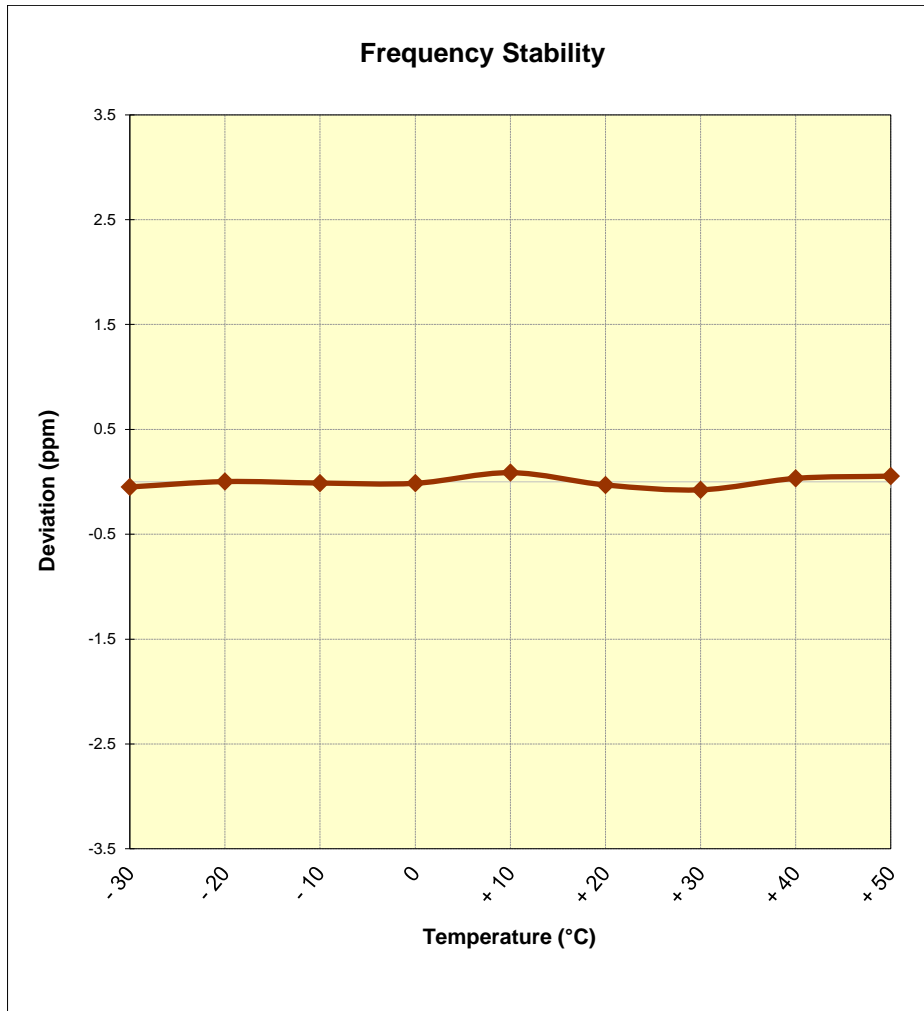




Figure 7-9. Frequency Stability Graph (Band 48)

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Netcomm Outdoor LTE Router FCC ID: XIA-CFW2182** complies with all of the requirements of Part 96 of the FCC Rules for LTE operation only.

FCC ID: XIA-CFW2182		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2006290101-01.XIA	Test Dates: 3/31 - 7/23/2020	EUT Type: Outdoor LTE Router		Page 76 of 76