



# ELEMENT WASHINGTON DC LLC

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## Part 96 MEASUREMENT REPORT

**Applicant Name:**  
Samsung Electronics Co., Ltd.  
129, Samsung-ro,  
Yeongtong-gu, Suwon-si  
Gyeonggi-do, 16677, Korea

**Date of Testing:**  
4/1/2022 - 6/20/2022  
**Test Report Issue Date:**  
6/22/2022  
**Test Site/Location:**  
Element Lab., Columbia, MD, USA  
**Test Report Serial No.:**  
1M2204010046-08.A3L

<b>FCC ID:</b>	<b>A3LSMF936U</b>
<b>APPLICANT:</b>	<b>Samsung Electronics Co., Ltd.</b>

**Application Type:** Certification  
**Model:** SM-F936U  
**Additional Models:** SM-F936U1  
**EUT Type:** Portable Handset  
**FCC Classification:** Citizens Band End User Devices (CBE)  
**FCC Rule Part(s):** 96  
**Test Procedure(s):** ANSI C63.26-2015, KDB 940660 D01 v03,  
 WINNF-TS-0122 v1.0.2, KDB 648474 D03 v01r04

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.

**RJ Ortanez**  
**Executive Vice President**



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### FCC Part 96

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
LTE Band 48	40 MHz	QPSK	3570.0 - 3680.0	0.060	17.81	37M6G7D
		16QAM	3570.0 - 3680.0	0.049	16.92	37M7W7D
	35 MHz	QPSK	3567.5 - 3682.5	0.058	17.64	32M7G7D
		16QAM	3567.5 - 3682.6	0.046	16.67	32M7W7D
	30 MHz	QPSK	3565.0 - 3685.0	0.053	17.24	27M9G7D
		16QAM	3565.0 - 3685.0	0.036	15.56	27M9W7D
	25 MHz	QPSK	3562.5 - 3687.5	0.071	18.51	23M0G7D
		16QAM	3562.5 - 3687.6	0.055	17.37	23M0W7D
	20 MHz	QPSK	3560.0 - 3690.0	0.124	20.94	18M0G7D
		16QAM	3560.0 - 3690.0	0.100	20.01	17M9W7D
	15 MHz	QPSK	3557.5 - 3692.5	0.128	21.06	13M5G7D
		16QAM	3557.5 - 3692.5	0.105	20.19	13M5W7D
	10 MHz	QPSK	3555.0 - 3695.0	0.111	20.46	8M98G7D
		16QAM	3555.0 - 3695.0	0.111	20.45	8M96W7D
	5 MHz	QPSK	3552.5 - 3697.5	0.105	20.23	4M53G7D
		16QAM	3552.5 - 3697.5	0.096	19.81	4M52W7D
NR Band n48 ANT F	40 MHz	$\pi/2$ BPSK	3570.0 - 3680.0	0.101	20.06	35M9G7D
		QPSK	3570.0 - 3680.0	0.111	20.46	37M8G7D
		16QAM	3570.0 - 3680.0	0.091	19.58	37M9W7D
	30 MHz	$\pi/2$ BPSK	3565.0 - 3685.0	0.104	20.17	27M0G7D
		QPSK	3565.0 - 3685.0	0.114	20.56	27M9G7D
		16QAM	3565.0 - 3685.0	0.093	19.70	28M0W7D
	20 MHz	$\pi/2$ BPSK	3560.0 - 3690.0	0.104	20.16	18M0G7D
		QPSK	3560.0 - 3690.0	0.115	20.60	18M3G7D
		16QAM	3560.0 - 3690.0	0.098	19.93	18M3W7D
	10 MHz	$\pi/2$ BPSK	3555.0 - 3695.0	0.102	20.09	8M61G7D
		QPSK	3555.0 - 3695.0	0.114	20.57	8M64G7D
		16QAM	3555.0 - 3695.0	0.094	19.72	8M65W7D

EUT Overview

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP	
				Max. Power [W]	Max. Power [dBm]
NR Band n48 ANT E	40 MHz	$\pi/2$ BPSK	3570.0 - 3680.0	0.016	11.95
		QPSK	3570.0 - 3680.0	0.015	11.87
		16QAM	3570.0 - 3680.0	0.014	11.46

EUT Overview

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Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP	
				Max. Power [W]	Max. Power [dBm]
NR Band n48 ANT G	40 MHz	$\pi/2$ BPSK	3570.0 - 3680.0	0.045	16.55
		QPSK	3570.0 - 3680.0	0.045	16.57
		16QAM	3570.0 - 3680.0	0.043	16.33

EUT Overview

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP	
				Max. Power [W]	Max. Power [dBm]
NR Band n48 ANT D	40 MHz	$\pi/2$ BPSK	3570.0 - 3680.0	0.016	11.92
		QPSK	3570.0 - 3680.0	0.015	11.77
		16QAM	3570.0 - 3680.0	0.012	10.83

EUT Overview

**Note:** EIRP levels shown in the table above are measured over the full channel bandwidth. These values will appear on the Grant of Authorization.

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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 Element Test Location

These measurement tests were conducted at the Element laboratory 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 Element Lab located in Columbia, MD 21046, U.S.A.**

- Element Washington DC LLC is a OnGo Alliance Approved Test Lab (ATL)
- Element Washington DC LLC is a WinnForum Approved Test Lab
- Element Washington DC LLC is an ISO 17025-2017 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.
- Element Washington DC LLC 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).
- Element Washington DC LLC facility is a registered (2451B) test laboratory with the site description on file with ISED.
- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreement.

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## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMF936U**. 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. Per FCC Part 96, this device is evaluated as a Citizens Band End User Devices (CBE).

**Test Device Serial No.:** 0072M, 0047M, 0061M, 0058M, 1777M, 1817M, 1781M, 1799M, 1782M, 3884M, 3890M

### 2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, Multi-band 5G NR (FR1 and FR2), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII (5,6GHz), Bluetooth (1x, EDR, LE), NFC, UWB, Wireless Power Transfer

This device uses a tuner circuit that dynamically updates the antenna impedance parameters to optimize antenna performance for certain bands and modes of operation. The tuner for this device was set to simulate a "free space" condition where the transmit antenna is matched to the medium into which it is transmitting and, thus, the power is at its maximum level.

### 2.3 Test Configuration

The EUT was tested per the guidance of ANSI C63.26-2015. See Section 7.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

This device supports wireless charging capability and, thus, is subject to the test requirements of KDB 648474 D03 v01r04. Additional radiated spurious emission measurements were performed with the EUT lying flat on an authorized wireless charging pad (WCP) Model: EP-N5100 while operating under normal conditions in a simulated call or data transmission configuration. The worst case radiated emissions data is shown in this report.

This device supports two configurations: one is with screen open and one is with screen closed. Open, half open and closed configurations are tested, and the worst case radiated emissions data is shown in this report.

### 2.4 Software and Firmware

Testing was performed on device(s) using software/firmware version F936USQU0AVEC installed on the EUT.

### 2.5 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 “American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services” (ANSI C63.26-2015) were used in the measurement of the EUT.

**Deviation from Measurement Procedure.....None**

### 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.

For radiated power measurements, substitution method is used per the guidance of ANSI C63.26-2015. For emissions below 1GHz, a half-wave dipole is 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  $P_g \text{ [dBm]} - \text{cable loss [dB]}$ .

For radiated spurious emissions measurements, the field strength conversion method is used per the formulas in Section 5.2.7 of ANSI C63.26-2015. Field Strength (EIRP) is calculated using the following formulas:

$$E_{\text{[dB}\mu\text{V/m]}} = \text{Measured amplitude level}_{\text{[dBm]}} + 107 + \text{Cable Loss}_{\text{[dB]}} + \text{Antenna Factor}_{\text{[dB/m]}}$$

And

$$\text{EIRP}_{\text{[dBm]}} = E_{\text{[dB}\mu\text{V/m]}} + 20\log D - 104.8; \text{ where } D \text{ is the measurement distance in meters.}$$

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 414788 D01 v01r01.

Radiated power and radiated spurious emission levels are investigated with the receive antenna horizontally and vertically polarized per ANSI C63.26-2015.

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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  $U_{\text{CISPR}}$  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

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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
-	AP2-001	EMC Cable and Switch System	1/4/2022	Annual	1/4/2023	AP2-001
-	AP2-002	EMC Cable and Switch System	3/11/2022	Annual	3/11/2023	AP2-002
-	ETS-001	EMC Cable and Switch System	12/9/2021	Annual	12/9/2022	ETS-001
-	ETS-002	EMC Cable and Switch System	3/10/2022	Annual	3/10/2023	ETS-002
-	LTx1	Licensed Transmitter Cable Set	12/19/2021	Annual	12/19/2022	LTx1
-	LTx3	Licensed Transmitter Cable Set	8/18/2021	Annual	8/18/2022	LTx3
-	LTx5	Licensed Transmitter Cable Set	12/19/2021	Annual	12/19/2022	LTx5
-	LTx6-40	Licensed Transmitter Cable Set	12/19/2021	Annual	12/19/2022	LTx6-40
-	WL40-1	WLAN Cable Set (40GHz)	12/19/2021	Annual	12/19/2022	WL40-1
Anritsu	MT8000A	Radio Communication Test Station	8/2/2021	Annual	8/2/2022	6272337437
Anritsu	MT8821C	Radio Communication Analyzer	N/A			6201525694
Espec	ESX-2CA	Environmental Chamber	8/27/2020	Annual	8/27/2022	17620
ETS-Lindgren	3116C	DRG Horn Antenna	5/11/2021	Biennial	5/11/2023	218893
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	4/20/2021	Biennial	4/20/2023	00125518
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	7/21/2021	Annual	7/21/2022	MY49430494
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	2/14/2022	Annual	2/14/2023	MY52350166
Keysight Technologies	N9030B	PXA Signal Analyzer, Multi-touch	1/7/2022	Annual	1/7/2023	MY57141001
Keysight Technologies	N9038A	MXE EMI Receiver	1/21/2022	Annual	1/21/2023	MY51210133
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			100976
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			112347
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	5/25/2021	Annual	5/25/2022	100348
Rohde & Schwarz	ESW44	EMI Test Receiver 2Hz to 44 GHz	3/28/2022	Annual	3/28/2023	101716
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Test Antenna	8/13/2020	Biennial	8/13/2022	101073
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	7/27/2020	Biennial	7/27/2022	A051107
Sunol	JB6	LB6 Antenna	11/13/2020	Biennial	11/13/2022	A082816

**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 2<sup>nd</sup> Harmonic (7250 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  $- (-24.80) = 50.3$  dBc.

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## 7.0 TEST RESULTS

### 7.1 Summary

Company Name: Samsung Electronics Co., Ltd.  
 FCC ID: A3LSMF936U  
 FCC Classification: Citizens Band End User Devices (CBE)  
 Mode(s): LTE/NR

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
<b>CONDUCTED</b>	Conducted Power	2.1046(a), 2.1046(c)	N/A	PASS	Section 7.2
	Occupied Bandwidth	2.1049(h)	N/A	PASS	Section 7.3
	Conducted Band Edge / Spurious Emissions (CBSD)	2.1051, 96.41(e)	-13 dBm/MHz at frequencies within 0-10 MHz of above the upper SAS-assigned channel edge and within 0-10MHz below the lower SAS-assigned channel edge -25 dBm/MHz at frequencies greater than 10 MHz above and below channel edge -emissions below 3530 MHz or above 3720 MHz shall not exceed -40dBm/MHz	PASS	Sections 7.4, 7.5
	Additional Maximum Power Reduction (A-MPR)	2.1046	N/A	PASS	Section 7.2
	Frequency Stability	2.1055	Fundamental emissions stay within authorized frequency block	PASS	Section 7.8
	End User Device Additional Requirements (CBSD Protocol)	96.47	End User Devices may operate only if they can positively receive and decode an authorization signal transmitted by a CBSD, including the frequencies and power limits for their operation. An End User Device must discontinue operations, change frequencies, or change its operational power level within 10 seconds of receiving instructions from its associated CBSD.	PASS	Section 7.9
	Uplink Carrier Aggregation	96.41(e)	-13 dBm/MHz at frequencies within 0-10 MHz of above the upper SAS-assigned channel edge and within 0-10MHz below the lower SAS-assigned channel edge -25 dBm/MHz at frequencies greater than 10 MHz above and below channel edge -emissions below 3530 MHz or above 3720 MHz shall not exceed -40dBm/MHz	PASS	Sections 7.4, 7.5
<b>RADIATED</b>	Equivalent Isotropic Radiated Power (EIRP) (EUD)	96.41(b)	23 dBm/10MHz	PASS	Section 7.6
	Radiated Spurious Emissions	2.1053, 96.41(e)	-40 dBm/MHz	PASS	Section 7.7
	Uplink Carrier Aggregation	96.41(e)	-40 dBm/MHz	PASS	Section 7.7

Table 7-1. Summary of Test Results

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**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 EMC Software Tool v1.1, Chamber Control v1.4.1.

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## 7.2 Conducted Output Power Data

### Test Overview

The EUT is set up to transmit at maximum power for LTE. All power levels 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.

A-MPR is implemented in this device per the A-MPR specification in 3GPP TS 36.101. The conducted powers are shown herein to cover the different A-MPR levels specified in the standard. Measurement equipment was set up with triggering/gating on the spectrum analyzer such that powers were measured only during the on-time of the signal.

### Test Procedure Used

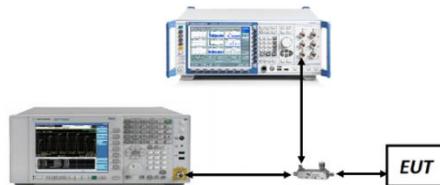
ANSI C63.26-2015 – Section 5.2

### Test Settings

1. Span = 2 x OBW to 3 x OBW
2. RBW = 1% to 5% of the OBW
3. Number of measurement points in sweep  $\geq 2 \times \text{span} / \text{RBW}$
4. Sweep = auto-couple (less than transmission burst duration)
5. Detector = RMS (power)
6. Trigger was set to enable power measurements only on full power bursts
7. Trace was allowed to stabilize
8. Spectrum analyzer's "Channel Power" function was used to compute the power by integrating the spectrum across the OBW of the signal

### Test Setup

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



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

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**Test Notes**

1. A-MPR was only applied for test purposes to the 2CC case since the 1CC case was compliant for all testing at max power.
2. A-MPR was verified to comply with the "CA\_NS\_10" specification in the 3GPP TS 36.101 standard by setting the MCC to a U.S. code and the MNC to a U.S. carrier supporting LTE B48 operation.
3. 256QAM operations does not employ A-MPR.
4. Conducted power measurements were evaluated 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.
5. All other conducted power measurements are contained in the RF exposure report for this filing.

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Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
20 MHz	QPSK	55340	3560.0	1 / 99	24.46
		55990	3625.0	1 / 50	24.94
		56640	3690.0	1 / 50	23.98
	16-QAM	55990	3625.0	1 / 99	24.43
15 MHz	QPSK	55315	3557.5	1 / 0	24.96
		55990	3625.0	1 / 37	24.36
		56665	3692.5	1 / 0	24.62
	16-QAM	55315	3557.5	1 / 37	23.39
10 MHz	QPSK	55290	3555.0	1 / 49	24.36
		55990	3625.0	1 / 25	24.31
		56690	3695.0	1 / 49	23.99
	16-QAM	55290	3555.0	1 / 25	23.65
5 MHz	QPSK	55265	3552.5	1 / 12	24.13
		55990	3625.0	1 / 0	24.19
		56715	3697.5	1 / 24	24.01
	16-QAM	55265	3552.5	1 / 24	23.01

Table 7-2. Conducted Power Output Data (LTE Band 48)

Bandwidth	Modulation	PCC			SCC			Conducted Power [dBm]
		Bandwidth [MHz]	Frequency [MHz]	RB / Offset	Bandwidth [MHz]	Frequency [MHz]	RB / Offset	
40 MHz	QPSK	20	3560.0	1 / 99	20	3579.8	1 / 0	24.54
		20	3625.0	1 / 99	20	3644.8	1 / 0	24.99
		20	3690.0	1 / 0	20	3670.2	1 / 99	23.77
	16-QAM	20	3560.0	1 / 99	20	3579.8	1 / 0	23.97
		20	3625.0	1 / 99	20	3644.8	1 / 0	23.89
		20	3690.0	1 / 0	20	3670.2	1 / 99	23.35
35 MHz	QPSK	20	3560.0	1 / 99	15	3577.1	1 / 0	24.36
		20	3625.0	1 / 99	15	3642.1	1 / 0	24.84
		20	3690.0	1 / 0	15	3672.9	1 / 74	23.88
	16-QAM	20	3560.0	1 / 99	15	3577.1	1 / 0	23.72
		20	3625.0	1 / 99	15	3642.1	1 / 0	24.18
		20	3690.0	1 / 0	15	3672.9	1 / 74	23.24
30 MHz	QPSK	20	3560.0	1 / 99	10	3574.4	1 / 0	23.96
		20	3625.0	1 / 99	10	3639.4	1 / 0	24.27
		20	3690.0	1 / 0	10	3675.6	1 / 49	23.64
	16-QAM	20	3560.0	1 / 99	10	3574.4	1 / 0	22.45
		20	3625.0	1 / 99	10	3639.4	1 / 0	23.18
		20	3690.0	1 / 0	10	3675.6	1 / 49	22.32
25 MHz	QPSK	20	3560.0	1 / 99	5	3571.7	1 / 0	24.41
		20	3625.0	1 / 99	5	3636.7	1 / 0	24.64
		20	3690.0	1 / 0	5	3678.3	1 / 24	23.86
	16-QAM	20	3560.0	1 / 99	5	3571.7	1 / 0	23.68
		20	3625.0	1 / 99	5	3636.7	1 / 0	23.85
		20	3690.0	1 / 0	5	3678.3	1 / 24	22.53

Table 7-3. Conducted Power Output Data (ULCA LB48)

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Test Case	NS	MCC	MNC	Channel BW [MHz]	PCC			SCC			A-MPR [dB]	Modulation	MPR [dB]	Maximum Target Output Power [dBm]	A-MPR Measured Power [dBm]
					Channel Frequency [MHz]	RB Size	RB Offset	Channel Frequency [MHz]	RB Size	RB Offset					
1	NS_01	310	910	20 + 20	3560	100	0	3579.8	100	0	≤ 11	QPSK	0	24.00	13.22
2				20 + 20	3560	1	99	3579.8	1	0	≤ 11	16-QAM	1	23.00	12.20
3				20 + 20	3605.1	100	0	3624.9	100	0	≤ 4.5	QPSK	0	24.00	19.50
4				20 + 20	3605.1	1	99	3624.9	1	0	≤ 4.5	16-QAM	1	23.00	18.88
5				20 + 20	3670.1	100	0	3689.9	100	0	≤ 11	QPSK	0	24.00	22.67
6				20 + 20	3670.1	1	99	3689.9	1	0	≤ 11	16-QAM	1	23.00	21.72

Table 7-4. A-MPR Conducted Power Output Data (ULCA LB48)

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
40 MHz	π/2 BPSK	638000	3570.0	1 / 53	23.77
		641666	3625.0	1 / 79	23.96
		645332	3680.0	1 / 26	23.80
	QPSK	638000	3570.0	1 / 53	23.83
		641666	3625.0	1 / 79	23.99
		645332	3680.0	1 / 26	23.85
16-QAM	638000	3570.0	1 / 26	22.82	
30 MHz	π/2 BPSK	637668	3565.0	1 / 58	23.88
		641666	3625.0	1 / 39	23.93
		645666	3685.0	1 / 19	23.61
	QPSK	637668	3565.0	1 / 58	23.93
		641666	3625.0	1 / 19	23.99
		645666	3685.0	1 / 19	23.62
16-QAM	637668	3565.0	1 / 58	22.94	
20 MHz	π/2 BPSK	637334	3560.0	1 / 25	23.87
		641666	3625.0	1 / 13	23.93
		646000	3690.0	1 / 25	23.61
	QPSK	637334	3560.0	1 / 37	23.97
		641666	3625.0	1 / 37	23.87
		646000	3690.0	1 / 25	23.67
16-QAM	637334	3560.0	1 / 37	23.17	
10 MHz	π/2 BPSK	637000	3555.0	1 / 12	23.80
		641666	3625.0	1 / 6	23.59
		646332	3695.0	1 / 12	23.41
	QPSK	637000	3555.0	1 / 17	23.93
		641666	3625.0	1 / 17	23.63
		646332	3695.0	1 / 6	23.28
16-QAM	637000	3555.0	1 / 17	22.95	

Table 7-5. Conducted Power Output Data (NR n48 – Ant F)

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Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
40 MHz	π/2 BPSK	638000	3570.0	1 / 1	22.03
		641666	3625.0	1 / 1	21.67
		645332	3680.0	1 / 1	20.94
	QPSK	638000	3570.0	1 / 1	22.24
		641666	3625.0	1 / 1	21.74
		645332	3680.0	1 / 1	20.91
	16-QAM	638000	3570.0	1 / 1	21.90

Table 7-6. Conducted Power Output Data (NR n48 – Ant E)

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
40 MHz	π/2 BPSK	638000	3570.0	1 / 26	23.34
		641666	3625.0	1 / 26	23.05
		645332	3680.0	1 / 26	22.01
	QPSK	638000	3570.0	1 / 53	23.32
		641666	3625.0	1 / 26	23.08
		645332	3680.0	1 / 26	22.30
	16-QAM	638000	3570.0	1 / 26	23.52

Table 7-7. Conducted Power Output Data (NR n48 – Ant G)

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
40 MHz	π/2 BPSK	638000	3570.0	1 / 53	16.93
		641666	3625.0	1 / 1	16.58
		645332	3680.0	1 / 1	16.12
	QPSK	638000	3570.0	1 / 53	16.88
		641666	3625.0	1 / 1	16.77
		645332	3680.0	1 / 1	16.44
	16-QAM	638000	3570.0	1 / 53	16.08

Table 7-8. Conducted Power Output Data (NR n48 – Ant D)

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NR (SCS 30kHz)						LTE						NR	LTE	EN-DC
NR Band	NR Bandwidth [MHz]	NR Channel	NR Frequency [MHz]	Mod.	NR RB#/Offset	LTE Band	LTE Bandwidth [MHz]	LTE Channel	LTE Frequency [MHz]	Mod.	LTE RB#/Offset	Conducted Power [dBm]	Conducted Power [dBm]	Total Tx. Power [dBm]
n48	40	Mid	3625	QPSK	100/0	B2	20	Mid	1880	QPSK	100/0	22.98	23.36	26.18
				QPSK	100/0					23.22	24.58	26.96		
				QPSK	1/53					23.45	23.54	26.51		
				QPSK	1/53					23.28	24.73	27.08		
				16Q	1/53					22.92	24.52	26.80		
				16Q	1/53									

Table 7-9. Conducted Max Powers (EN-DC n48 [Ant F] – B2 [Ant B])

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## 7.3 Occupied Bandwidth

### 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

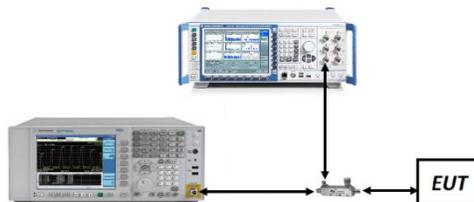
ANSI C63.26-2015 – Section 5.4.4

### 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.



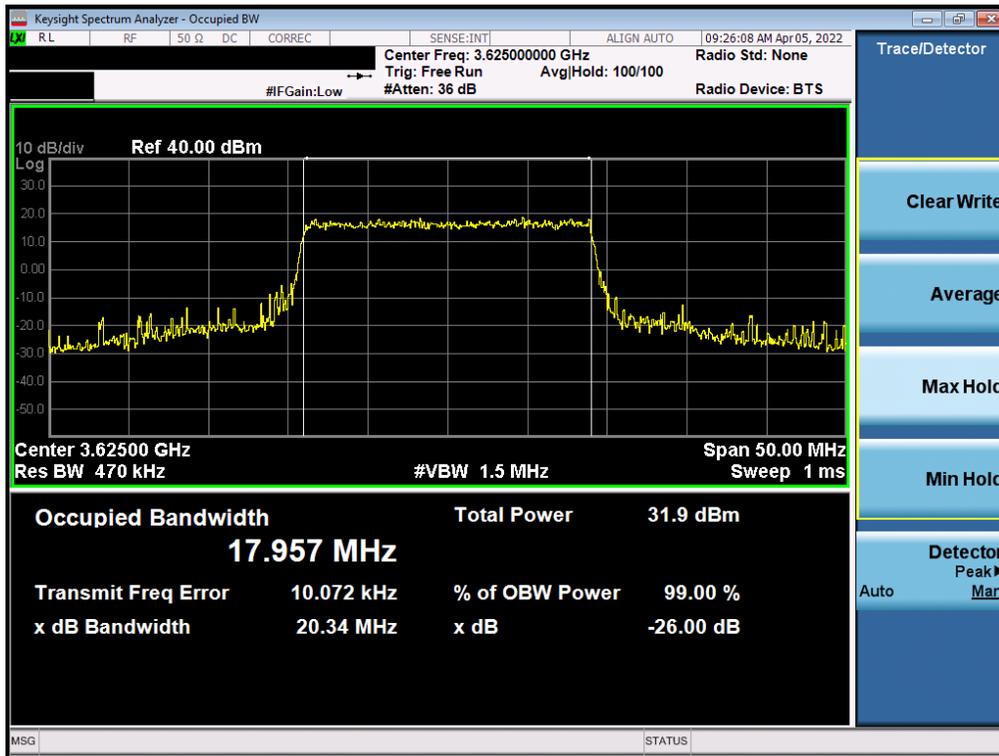
**Figure 7-2. Test Instrument & Measurement Setup**

### Test Notes

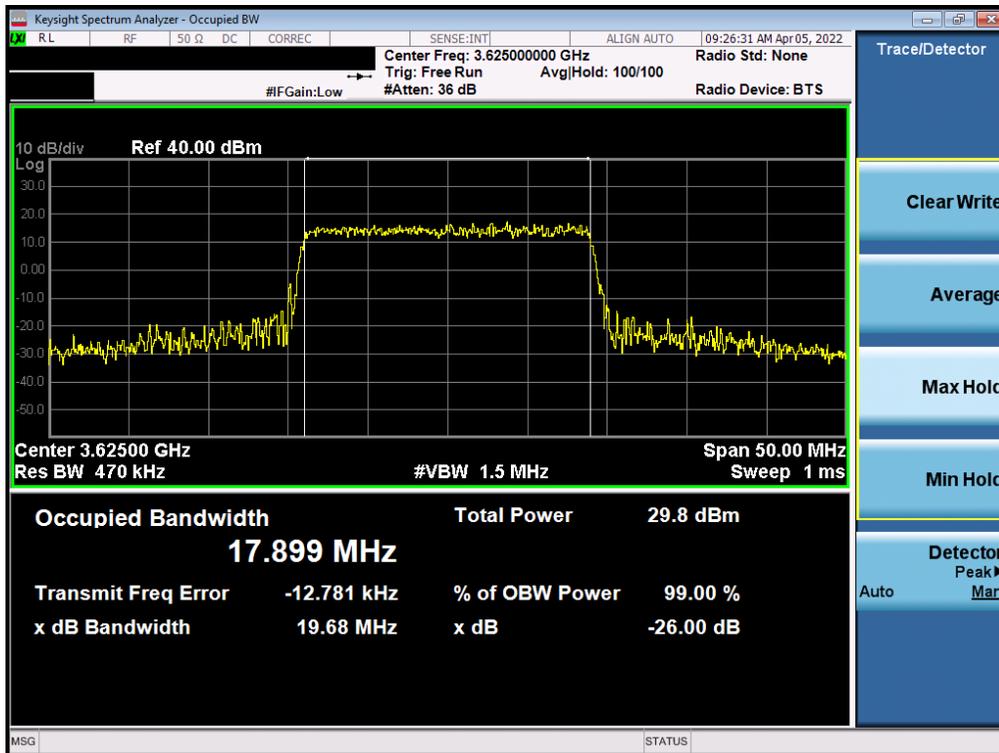
None

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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# LTE Band 48

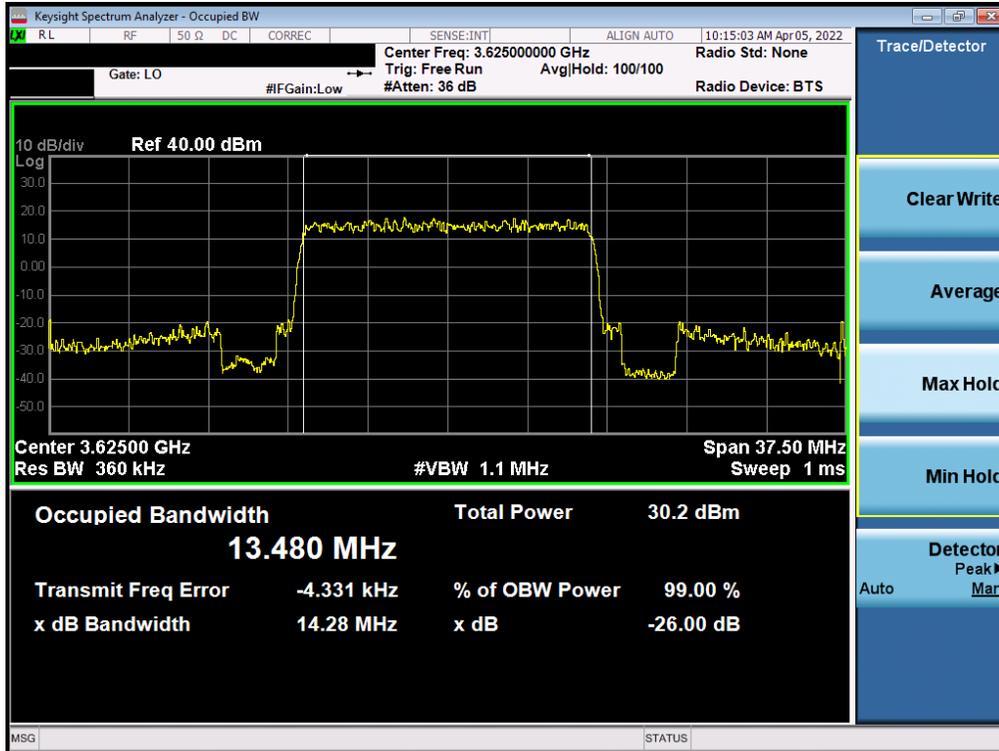


Plot 7-1. Occupied Bandwidth Plot (LTE Band 48 - 20MHz QPSK - Full RB Configuration)

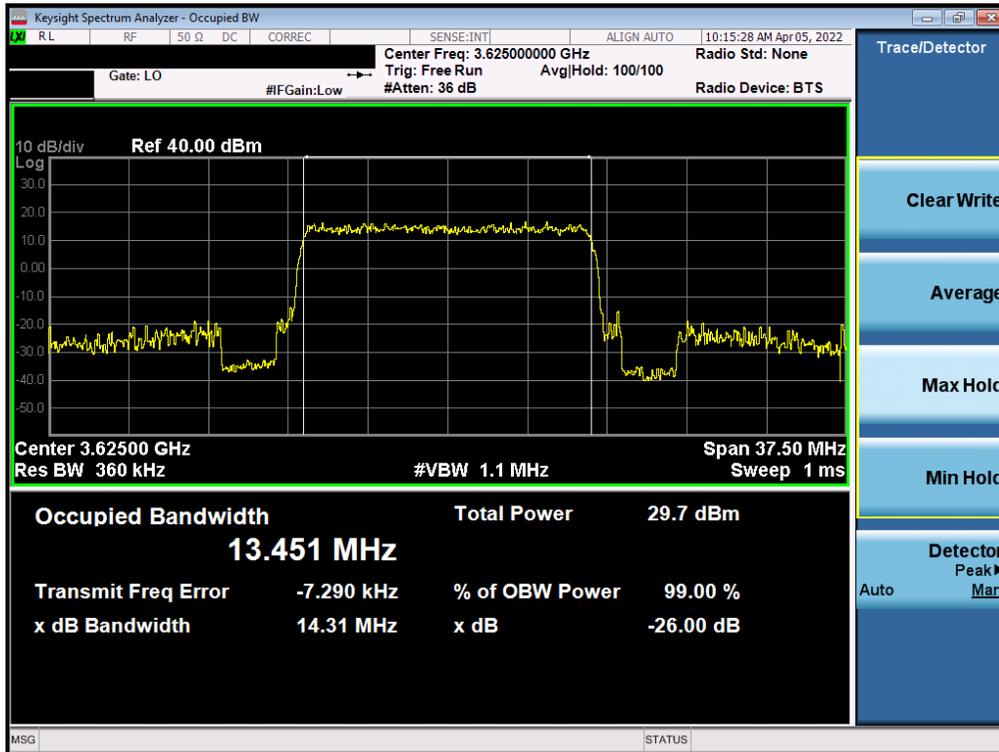


Plot 7-2. Occupied Bandwidth Plot (LTE Band 48 - 20MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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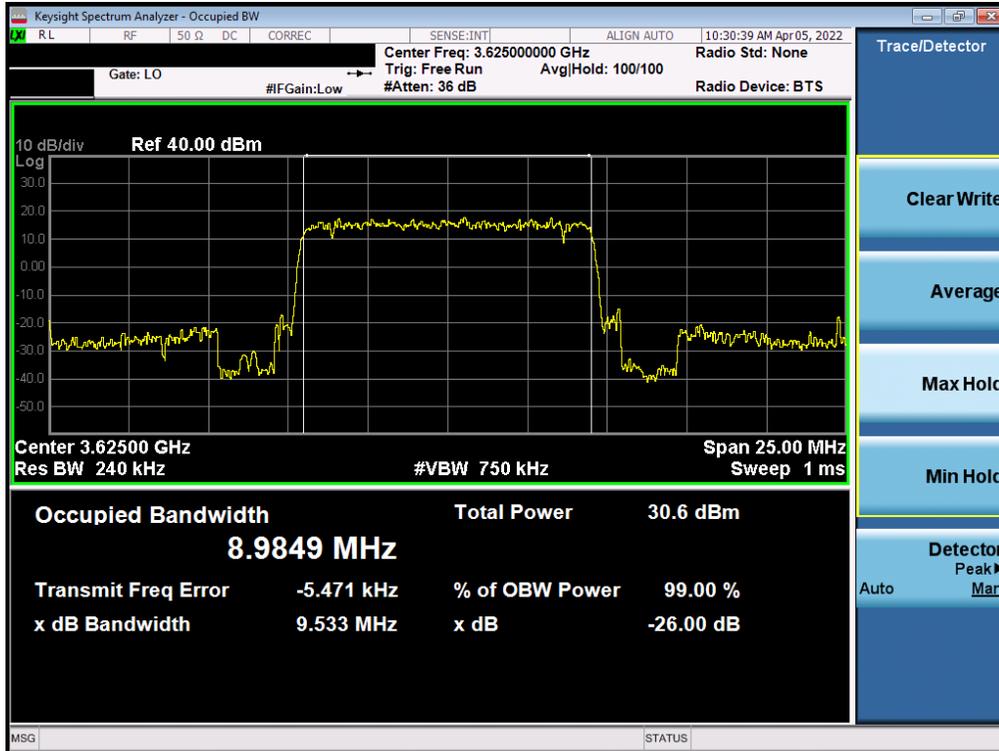


Plot 7-3. Occupied Bandwidth Plot (LTE Band 48 - 15MHz QPSK - Full RB Configuration)

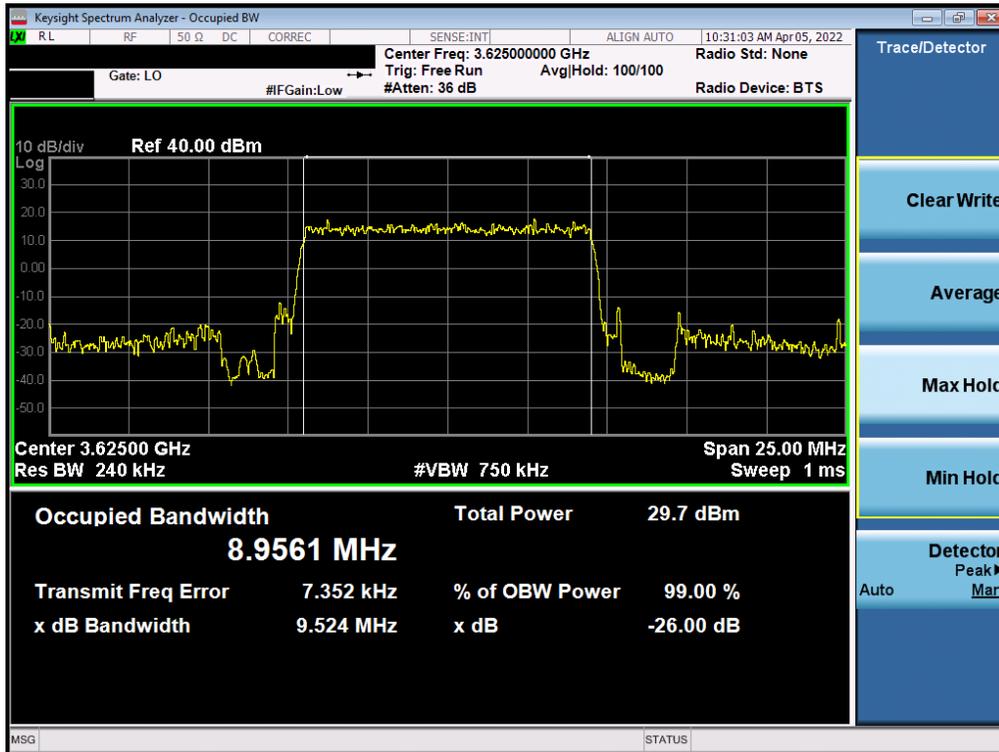


Plot 7-4. Occupied Bandwidth Plot (LTE Band 48 - 15MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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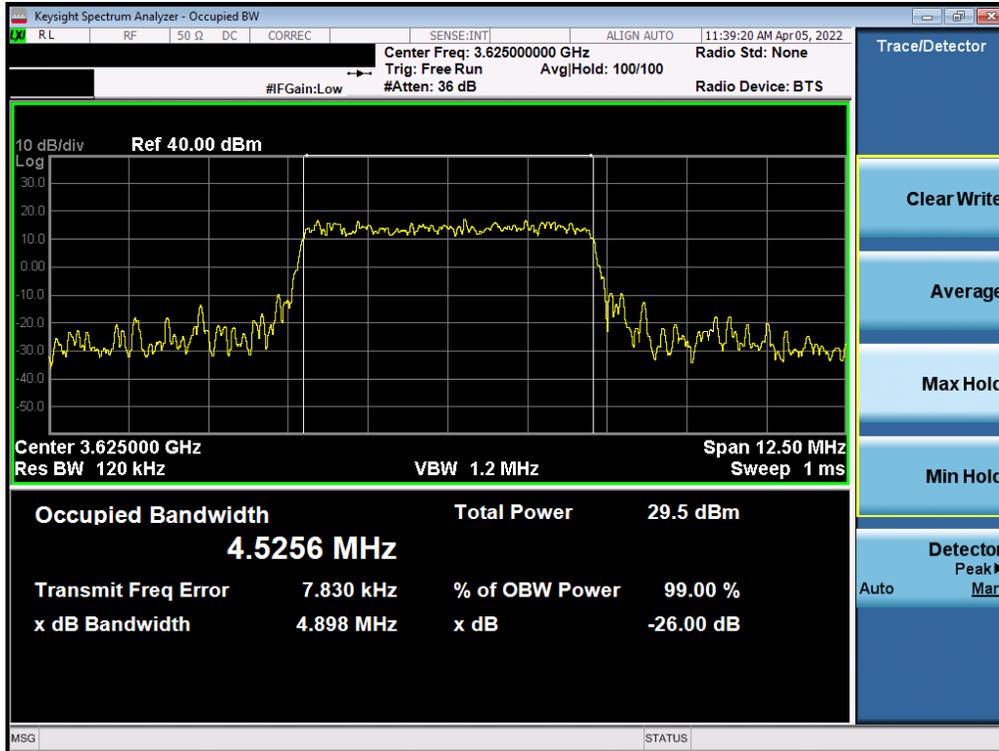


Plot 7-5. Occupied Bandwidth Plot (LTE Band 48 - 10MHz QPSK - Full RB Configuration)

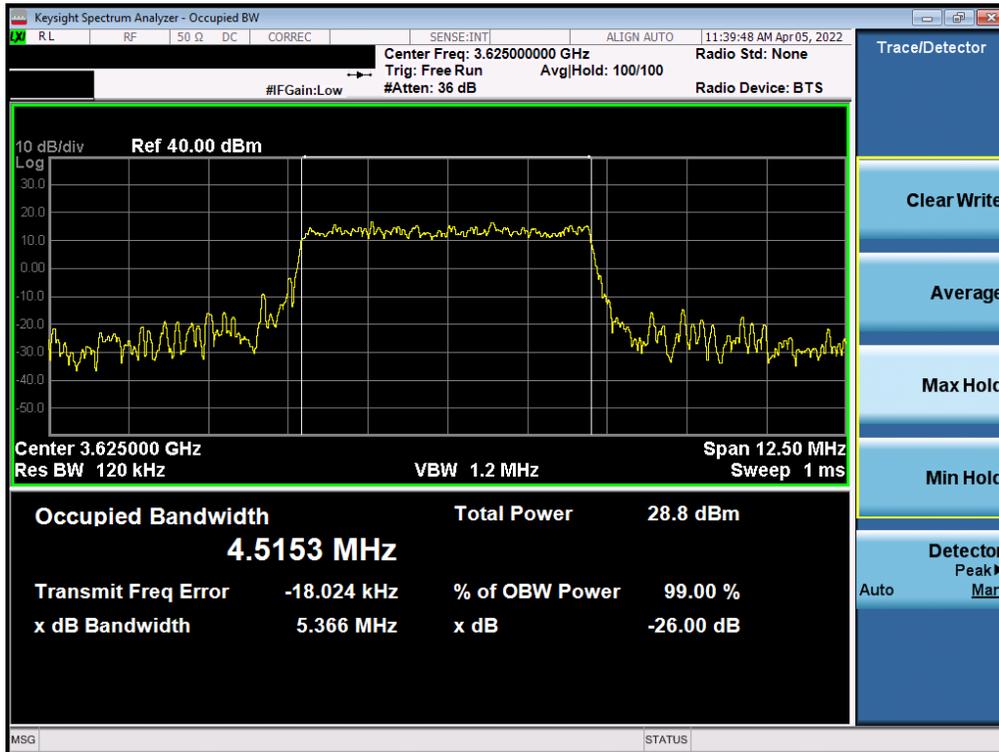


Plot 7-6. Occupied Bandwidth Plot (LTE Band 48 - 10MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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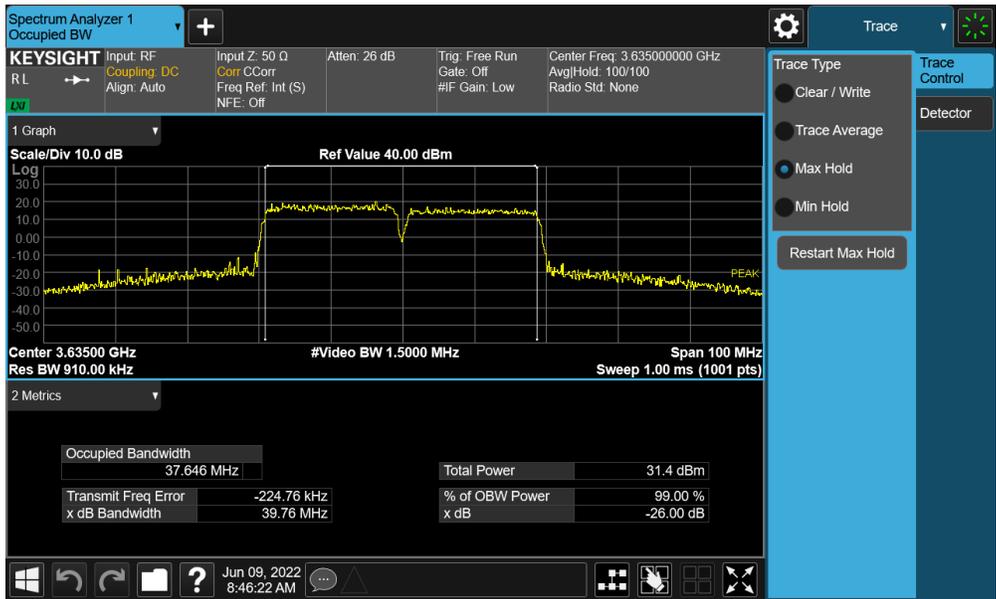
Plot 7-7. Occupied Bandwidth Plot (LTE Band 48 - 5MHz QPSK - Full RB Configuration)



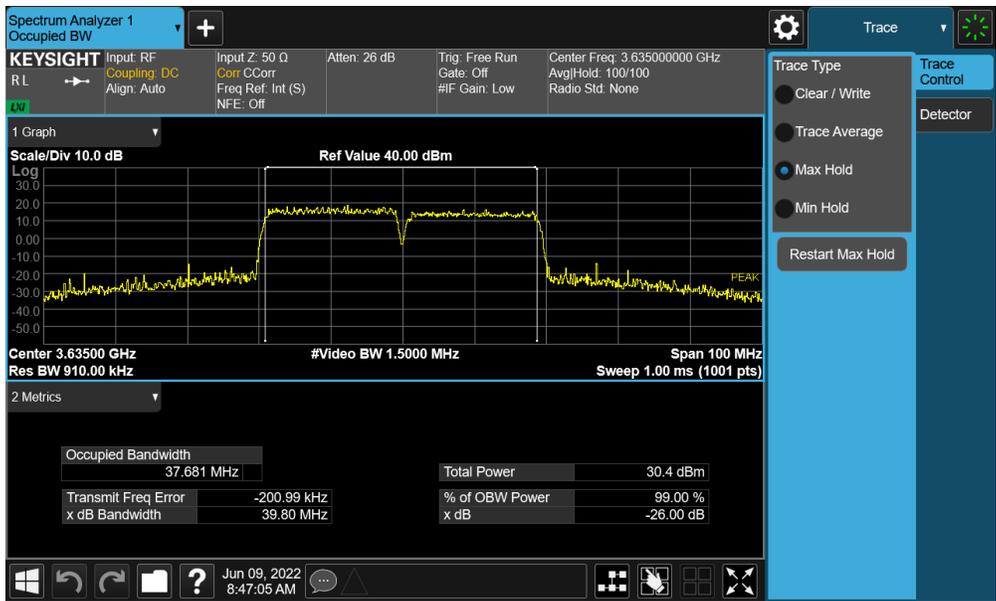
Plot 7-8. Occupied Bandwidth Plot (LTE Band 48 - 5MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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# ULCA LTE Band 48

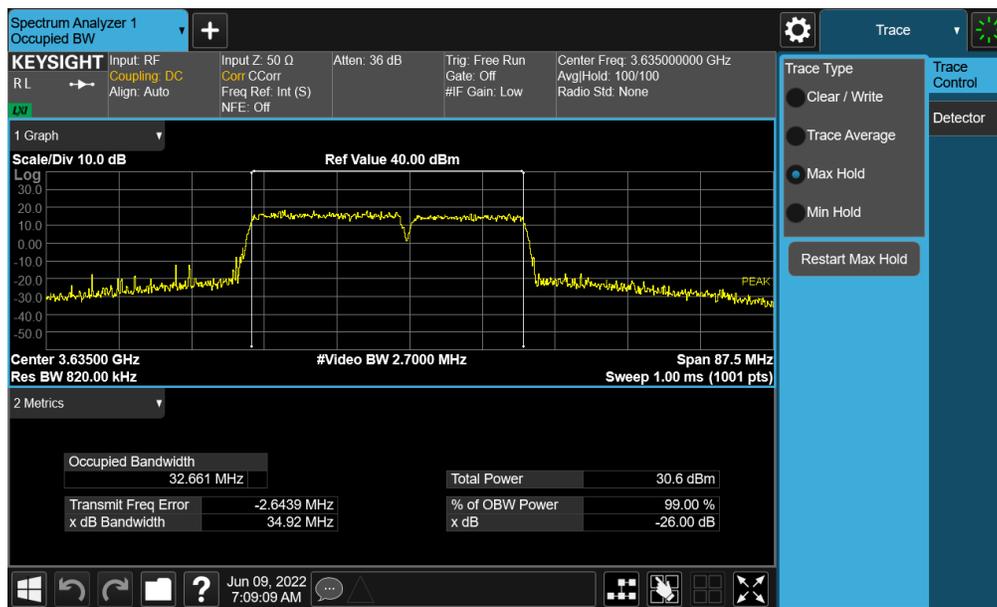
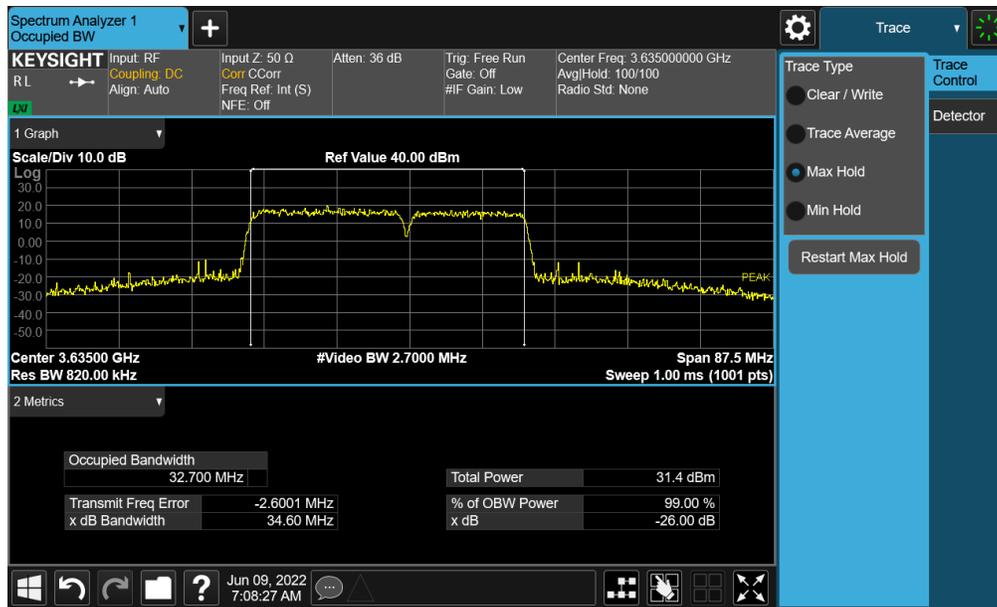


Plot 7-9. Occupied Bandwidth Plot (ULCA LB48 - 20+20MHz QPSK - Full RB Configuration)



Plot 7-10. Occupied Bandwidth Plot (ULCA LB48 - 20+20MHz 16-QAM - Full RB Configuration)

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Plot 7-13. Occupied Bandwidth Plot (ULCA LB48 - 20+10MHz QPSK - Full RB Configuration)



Plot 7-14. Occupied Bandwidth Plot (ULCA LB48 - 20+10MHz 16-QAM - Full RB Configuration)

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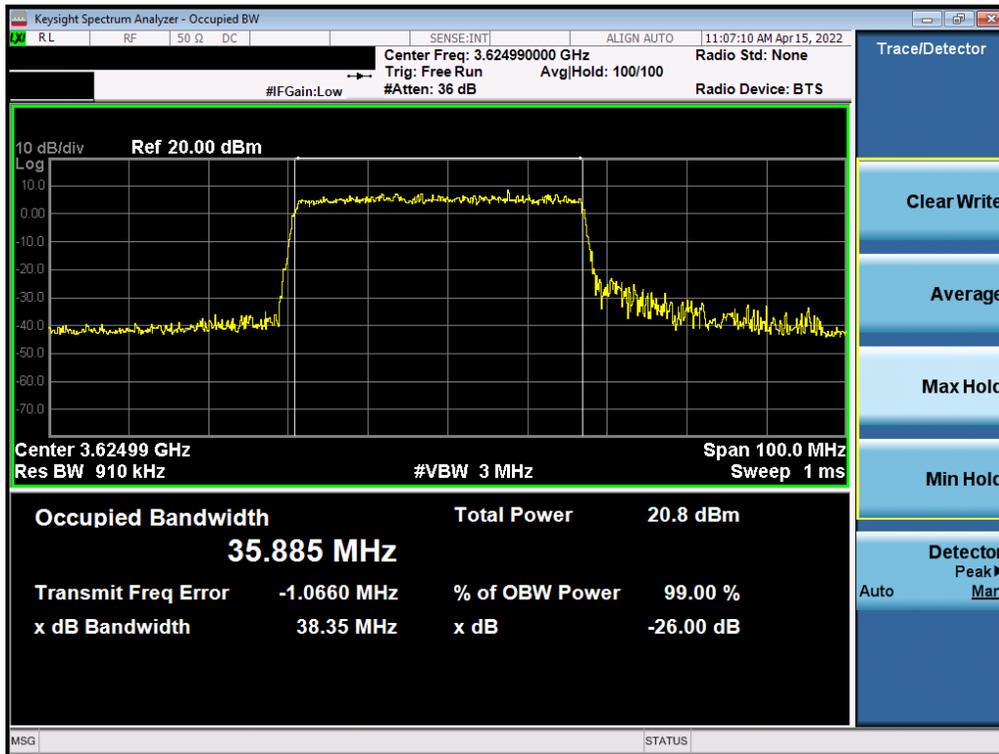
Plot 7-15. Occupied Bandwidth Plot (ULCA LB48 - 20+5MHz QPSK - Full RB Configuration)



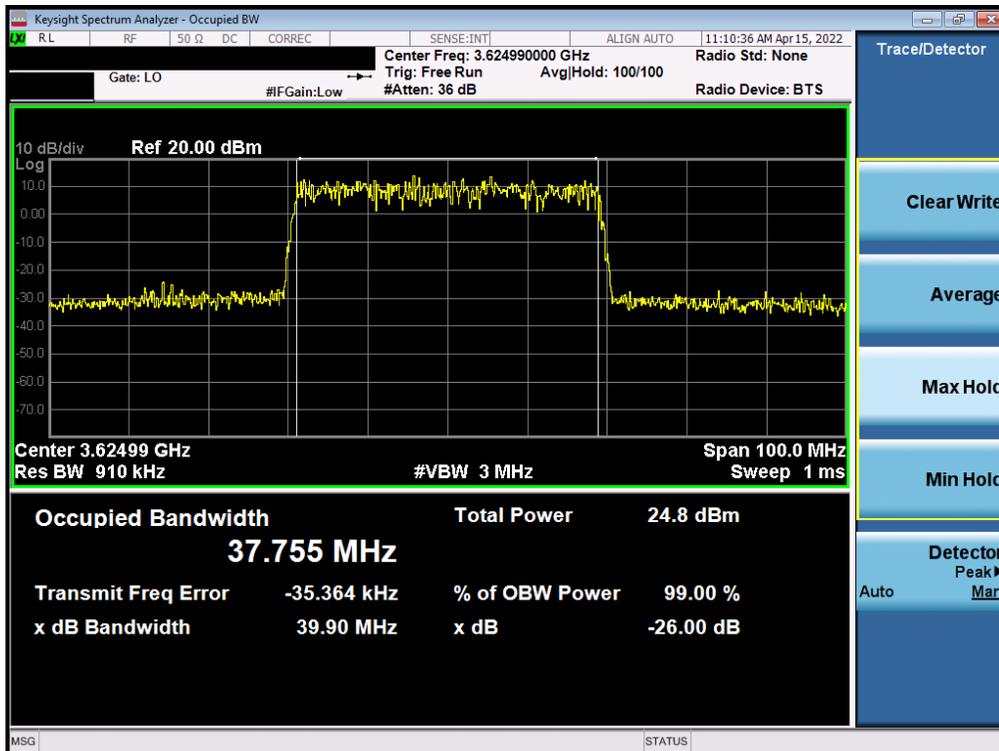
Plot 7-16. Occupied Bandwidth Plot (ULCA LB48 - 20+5MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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# NR Band n48 – Ant F

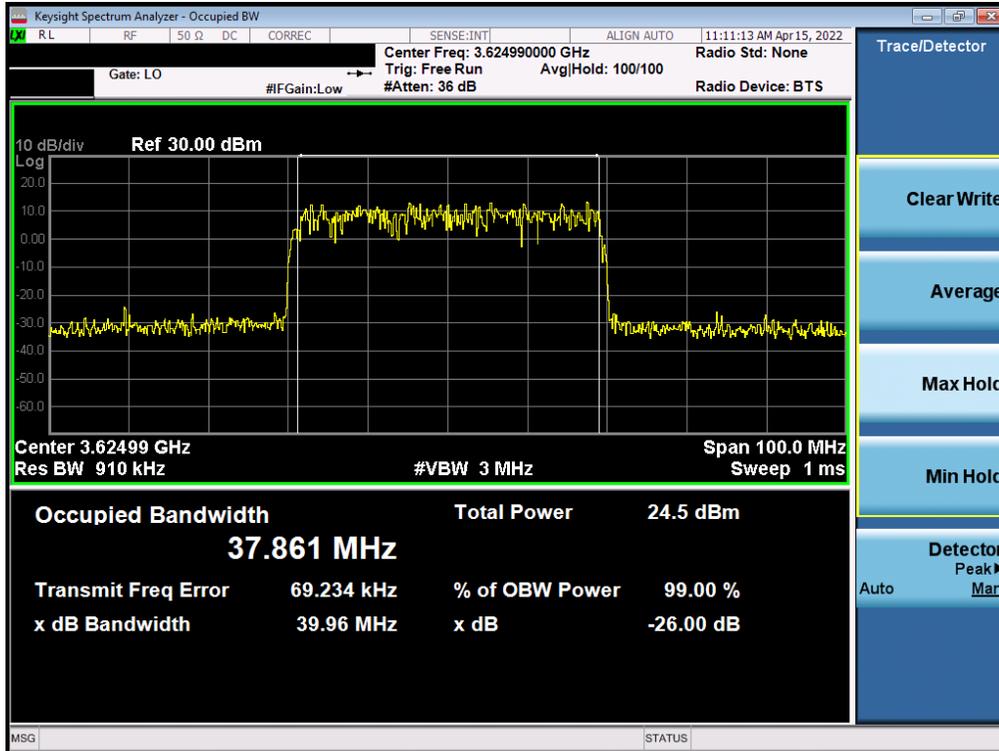


Plot 7-17. Occupied Bandwidth Plot (NR Band n48 - 40MHz  $\pi/2$  BPSK - Full RB Configuration - Ant F)

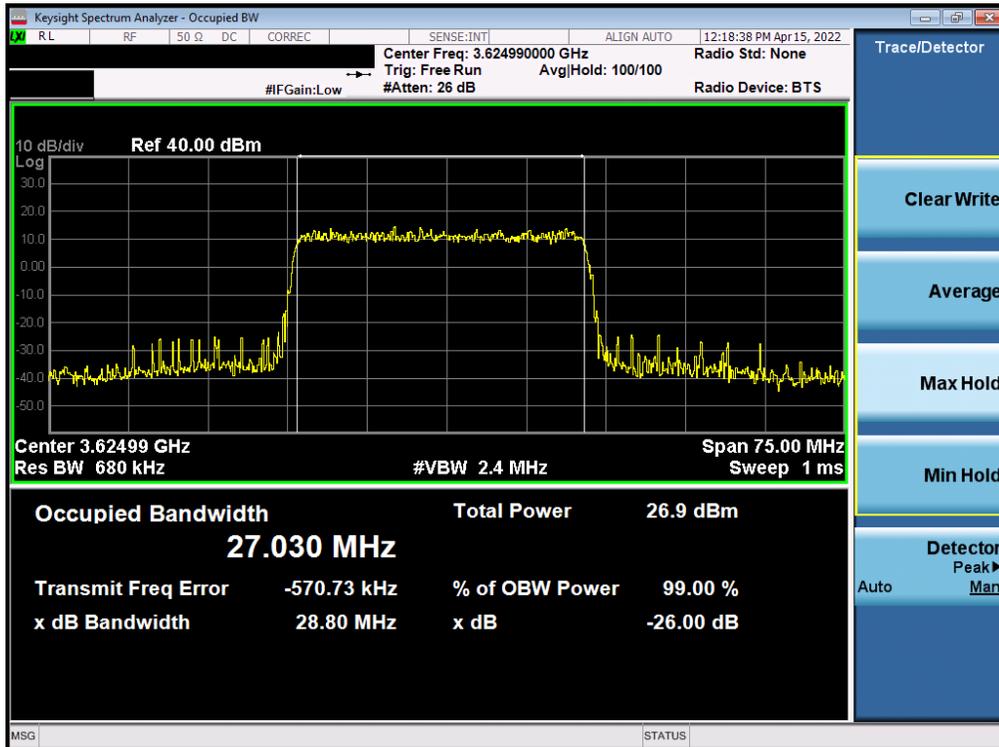


Plot 7-18. Occupied Bandwidth Plot (NR Band n48 - 40MHz QPSK - Full RB Configuration - Ant F)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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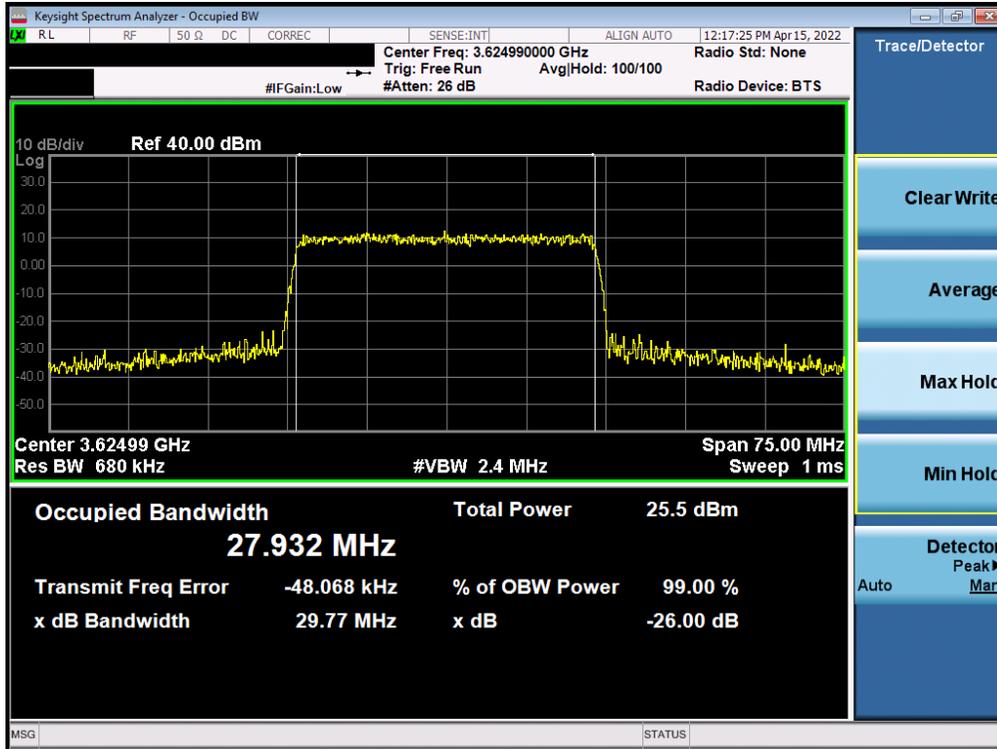


Plot 7-19. Occupied Bandwidth Plot (NR Band n48 - 40MHz 16-QAM - Full RB Configuration - Ant F)

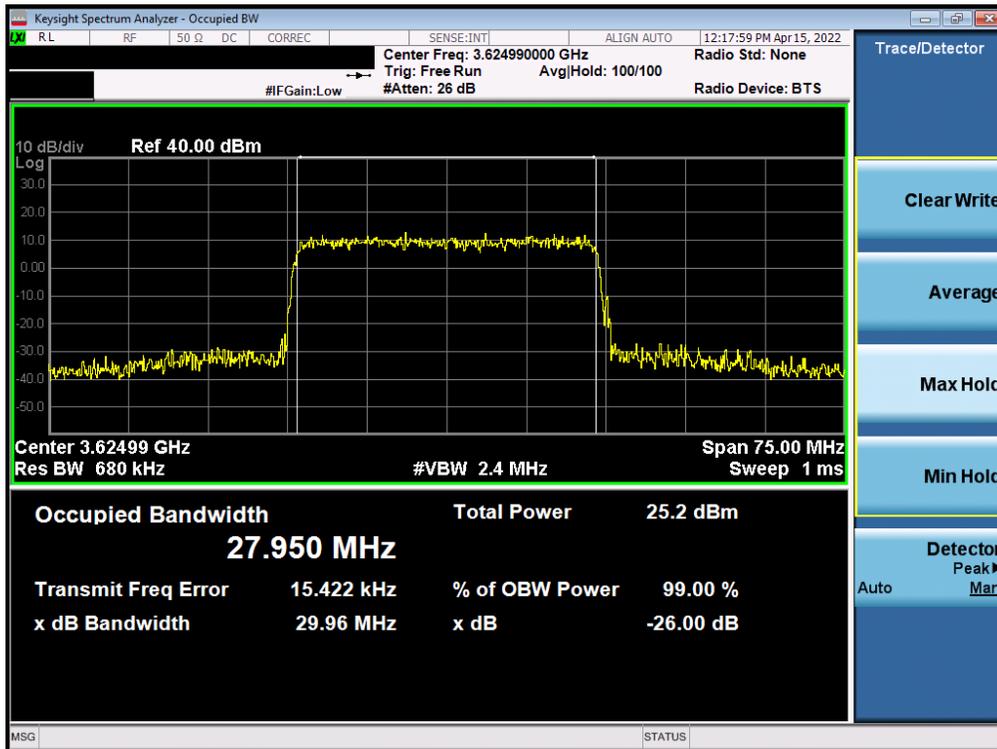


Plot 7-20. Occupied Bandwidth Plot (NR Band n48 - 30MHz  $\pi/2$  BPSK - Full RB Configuration - Ant F)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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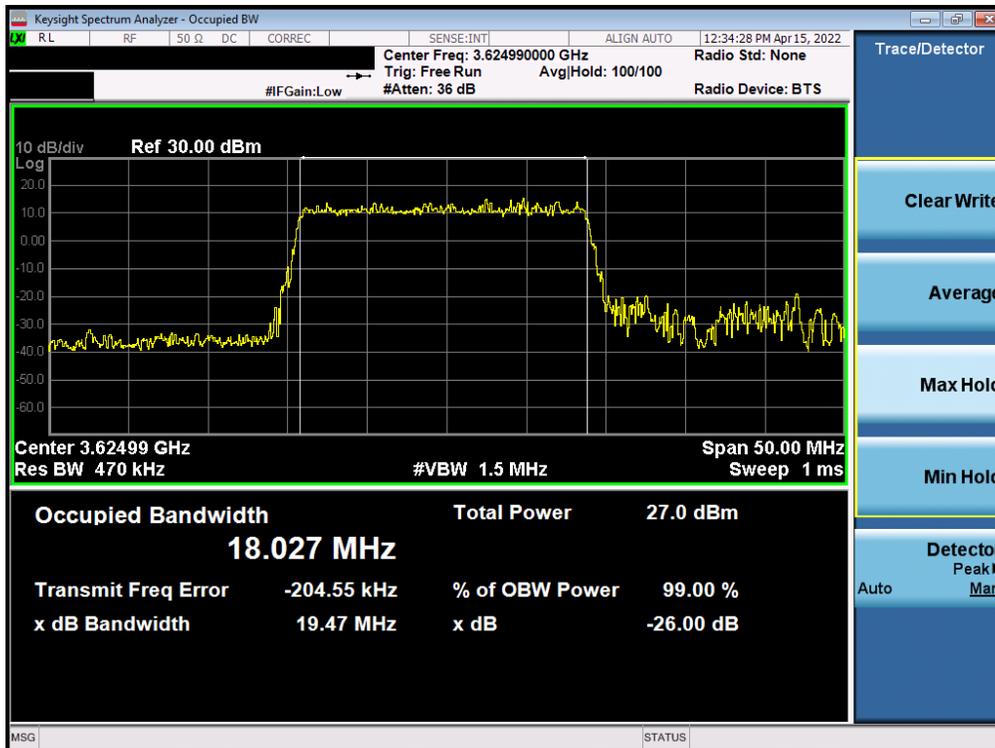


Plot 7-21. Occupied Bandwidth Plot (NR Band n48 - 30MHz QPSK - Full RB Configuration - Ant F)

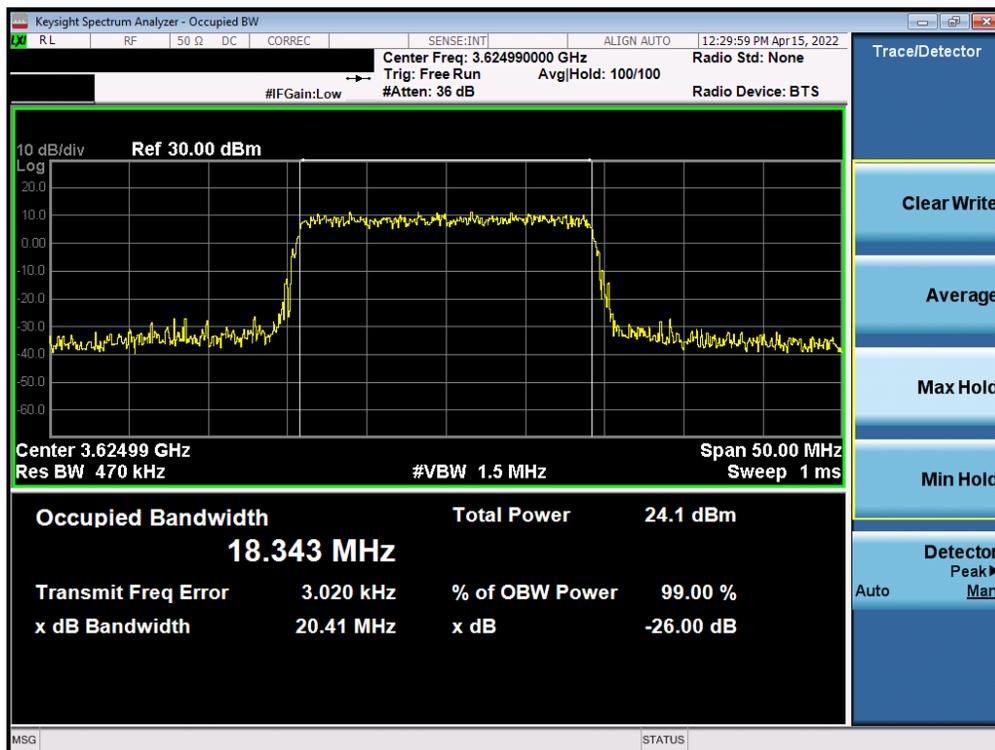


Plot 7-22. Occupied Bandwidth Plot (NR Band n48 - 30MHz 16-QAM - Full RB Configuration - Ant F)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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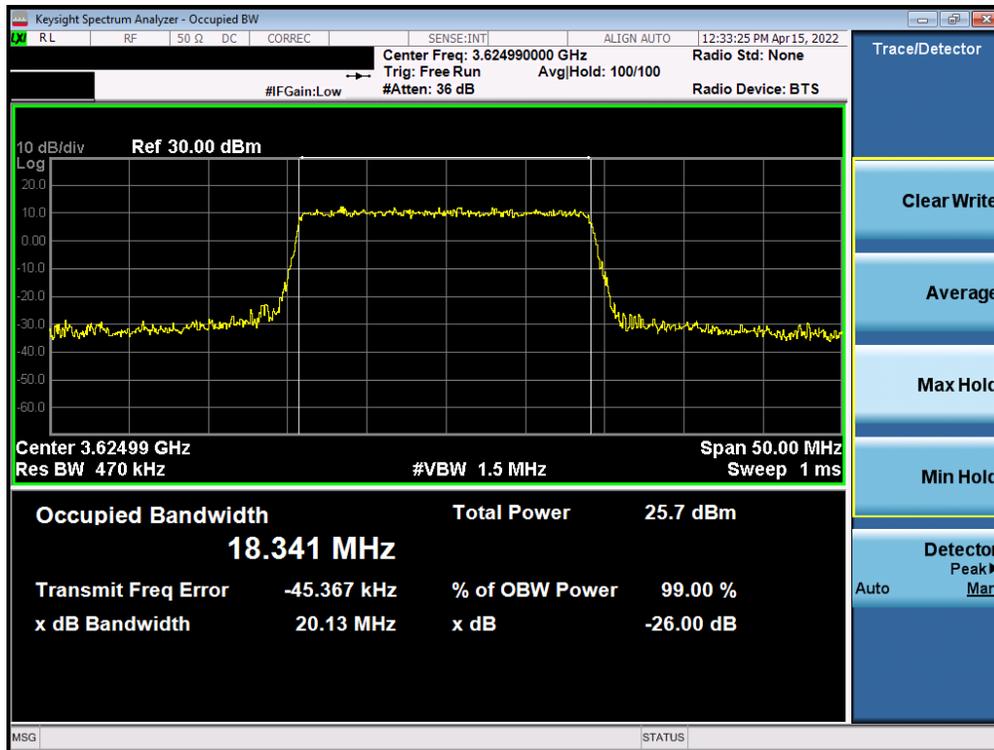


Plot 7-23. Occupied Bandwidth Plot (NR Band n48 - 20MHz  $\pi/2$  BPSK - Full RB Configuration - Ant F)

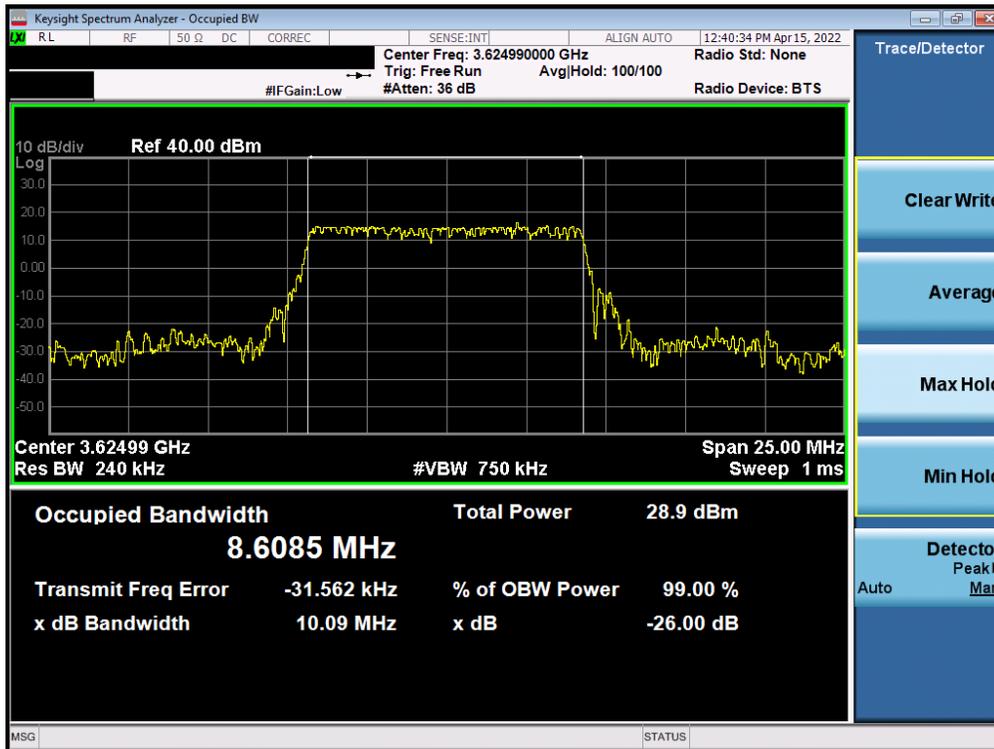


Plot 7-24. Occupied Bandwidth Plot (NR Band n48 - 20MHz QPSK - Full RB Configuration - Ant F)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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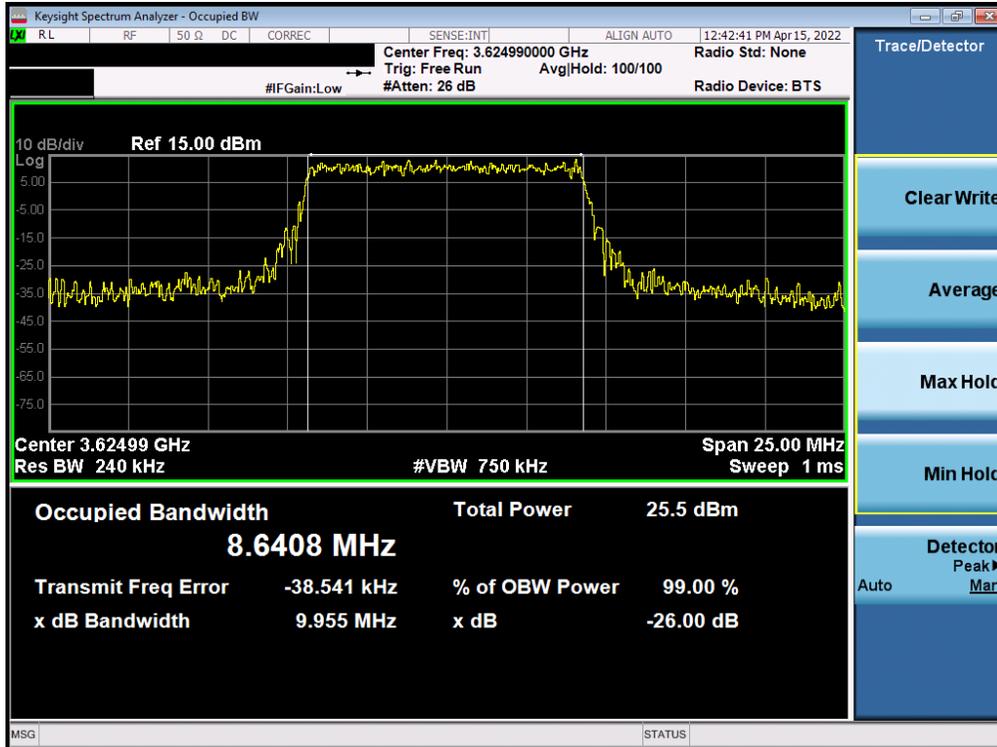


Plot 7-25. Occupied Bandwidth Plot (NR Band n48 - 20MHz 16-QAM - Full RB Configuration - Ant F)

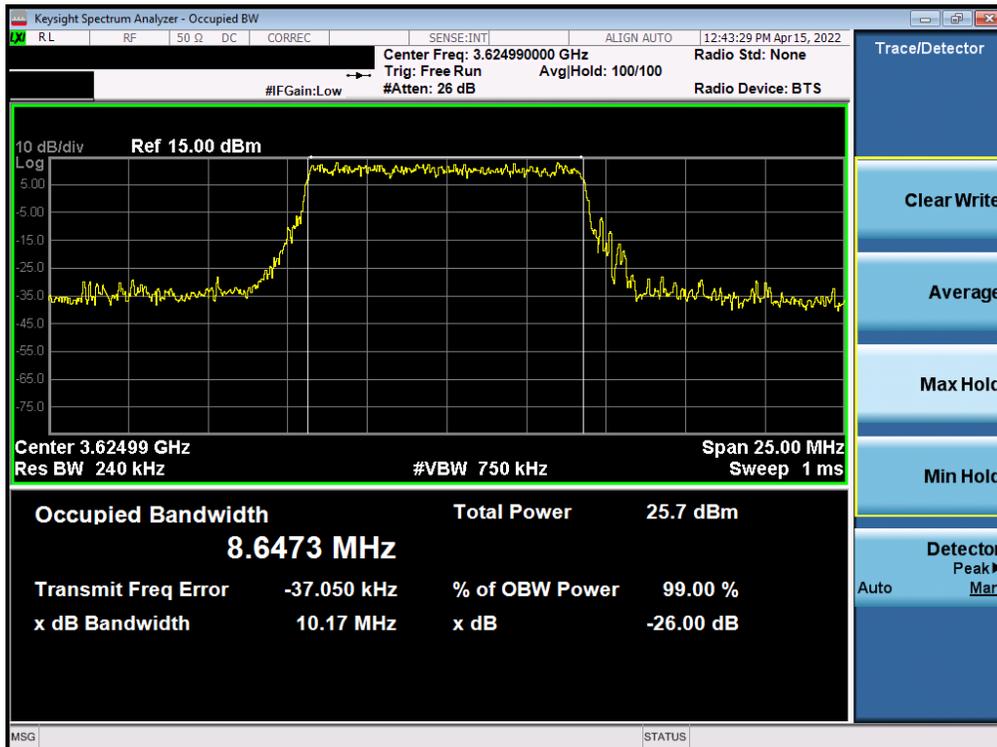


Plot 7-26. Occupied Bandwidth Plot (NR Band n48 - 10MHz  $\pi/2$  BPSK - Full RB Configuration - Ant F)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-27. Occupied Bandwidth Plot (NR Band n48 - 10MHz QPSK - Full RB Configuration - Ant F)



Plot 7-28. Occupied Bandwidth Plot (NR Band n48 - 10MHz 16-QAM - Full RB Configuration - Ant F)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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## 7.4 Spurious and Harmonic Emissions at Antenna Terminal

### 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

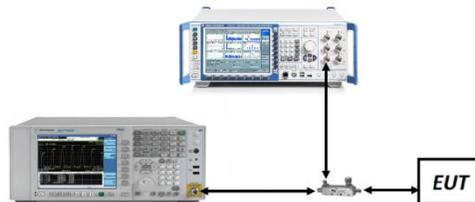
ANSI C63.26-2015 – Section 5.7.4

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

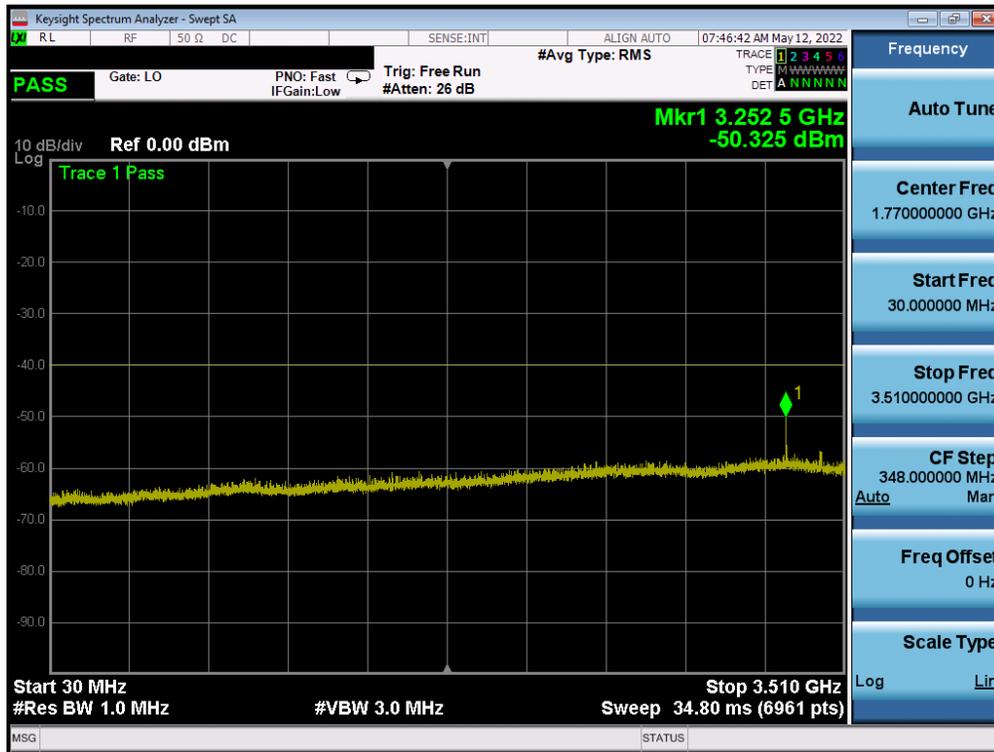
### Test Notes

1. Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz.
2. For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) 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.

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V3.0 1/6/2022

### LTE Band 48

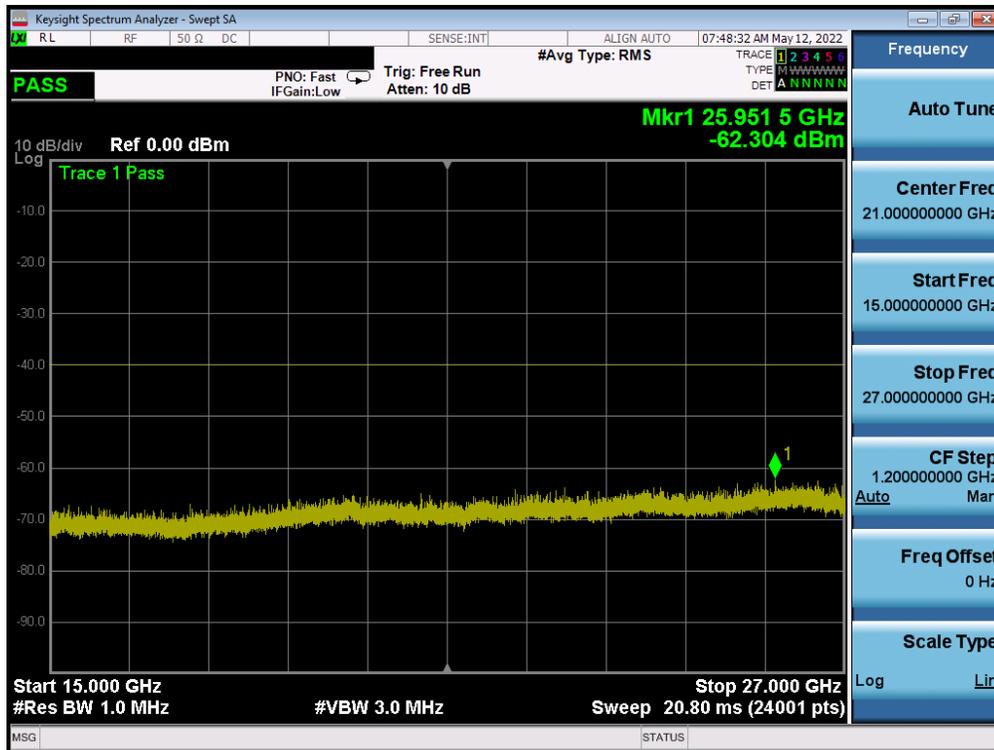


Plot 7-29. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - Low Channel)

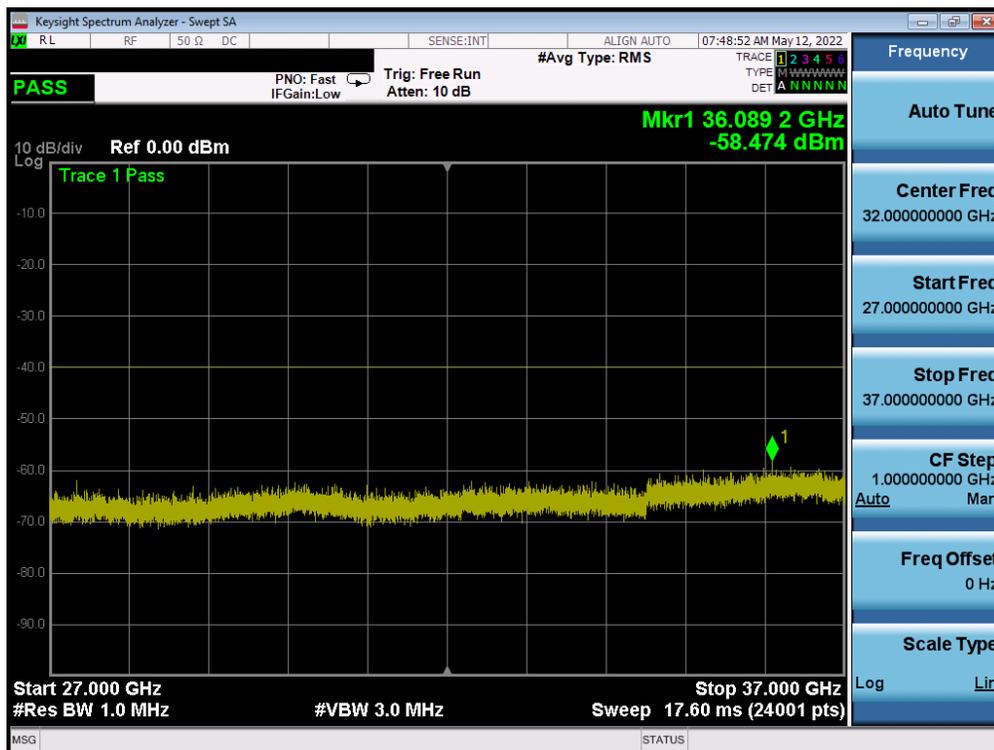


Plot 7-30. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - Low Channel)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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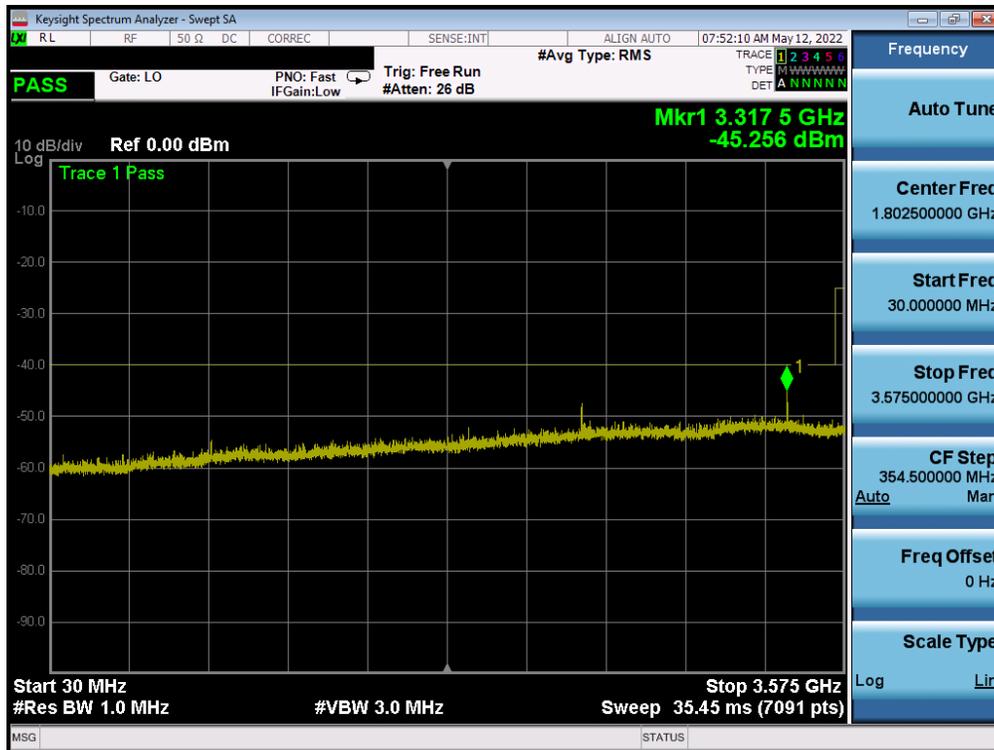


Plot 7-31. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - Low Channel)

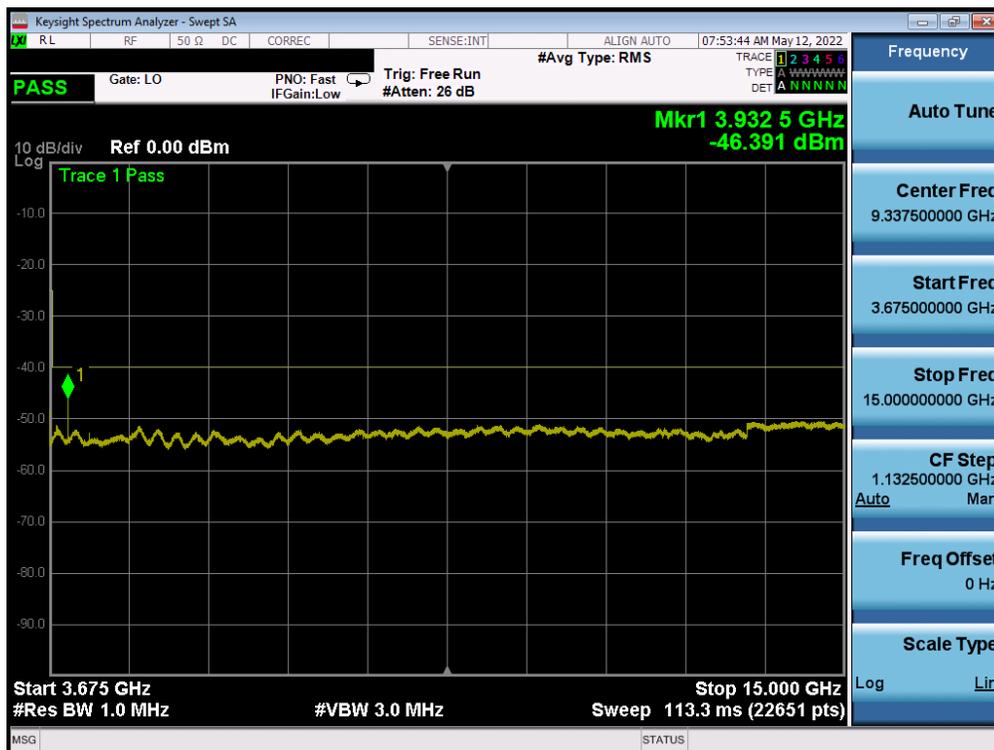


Plot 7-32. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - Low Channel)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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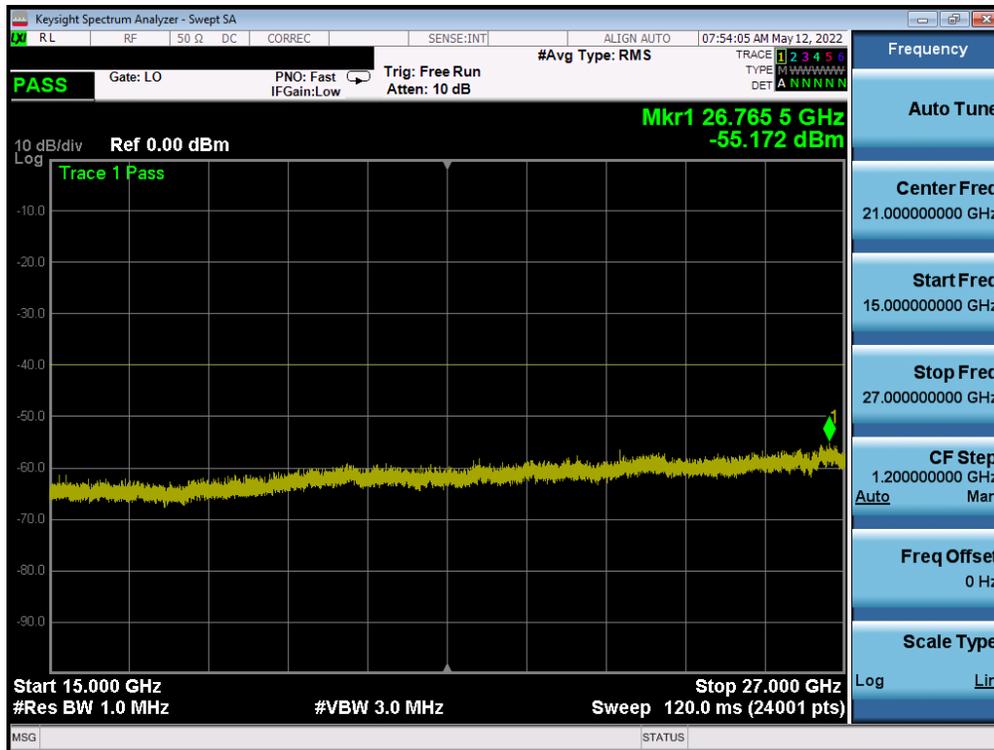


Plot 7-33. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - Mid Channel)

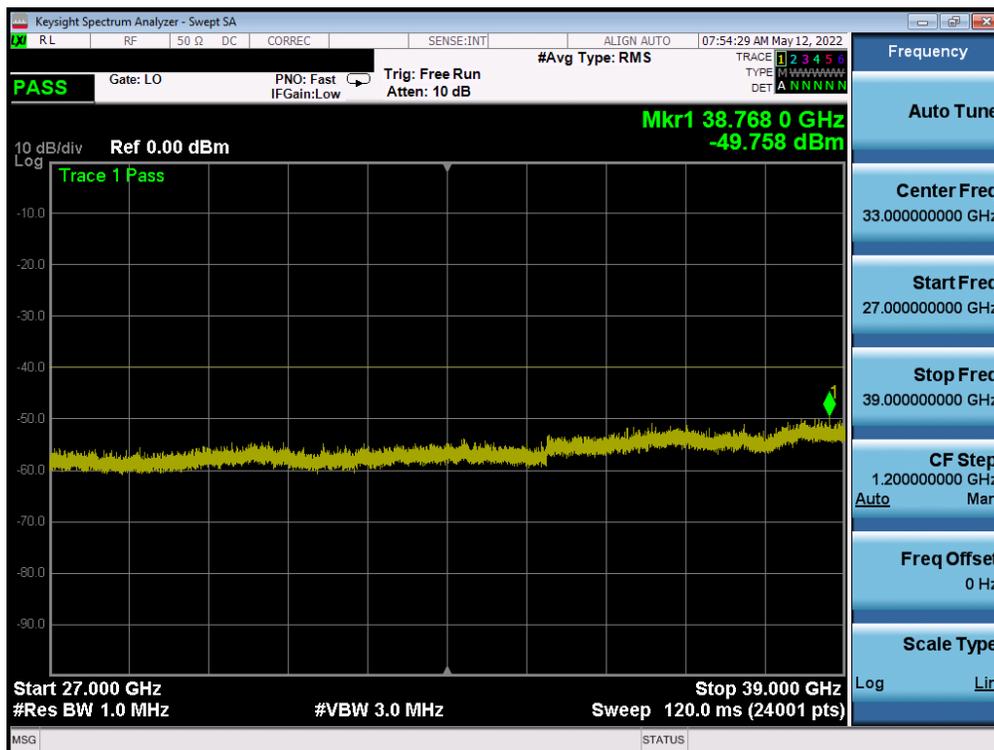


Plot 7-34. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - Mid Channel)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2204010046-08.A3L	Test Dates: 4/1/2022 - 6/20/2022	EUT Type: Portable Handset	Page 37 of 133

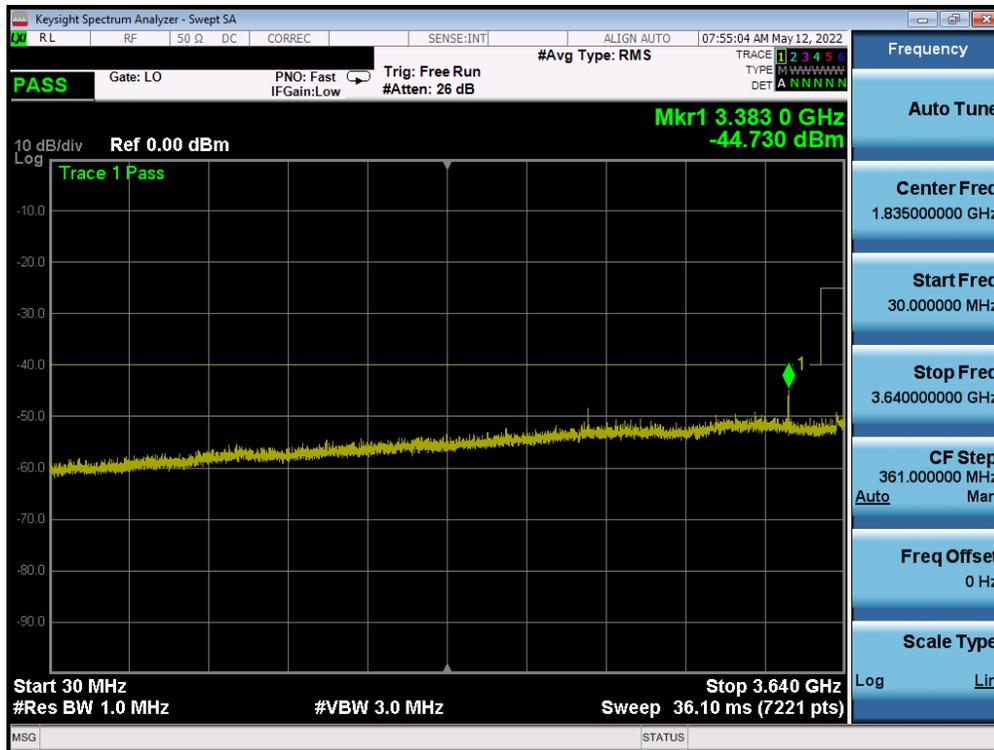


Plot 7-35. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - Mid Channel)

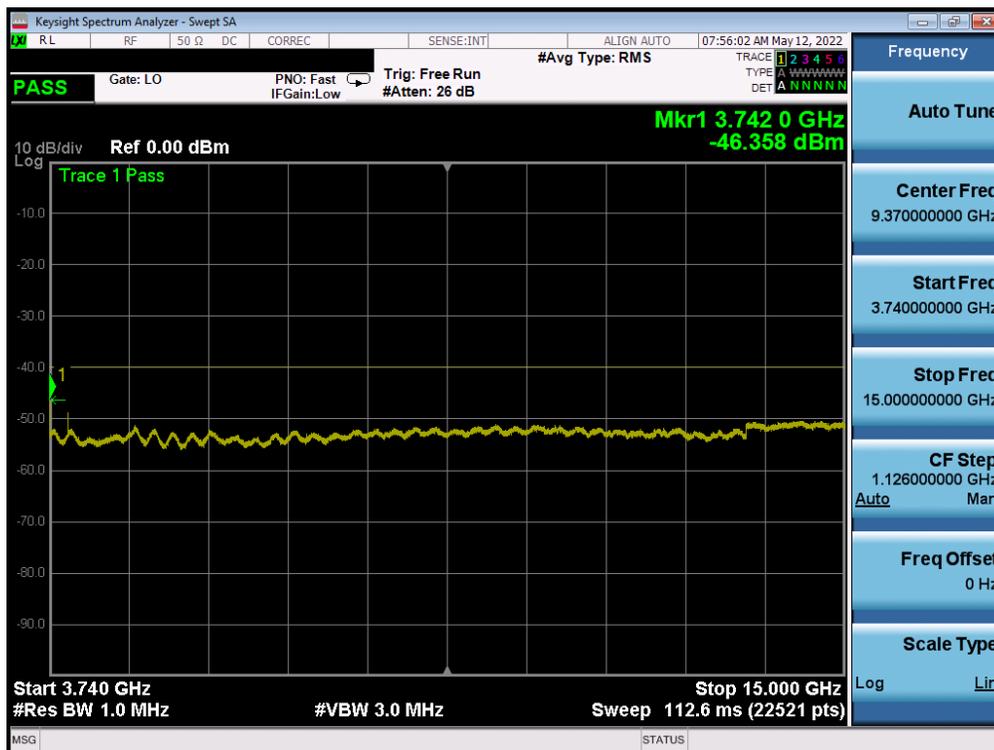


Plot 7-36. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - Mid Channel)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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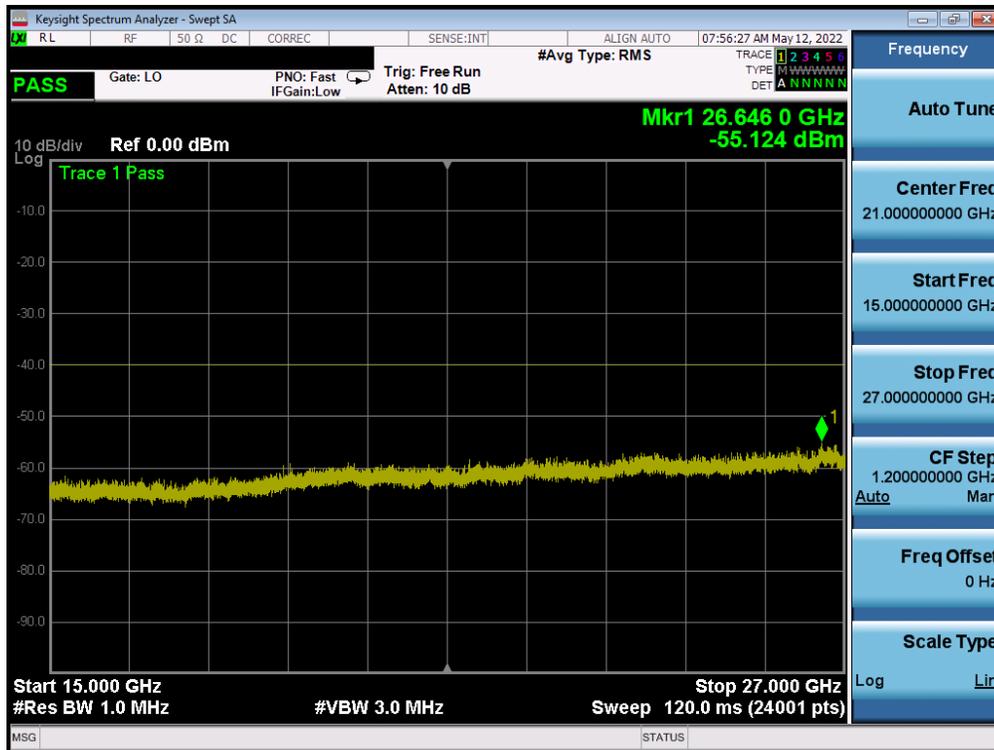


Plot 7-37. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - High Channel)

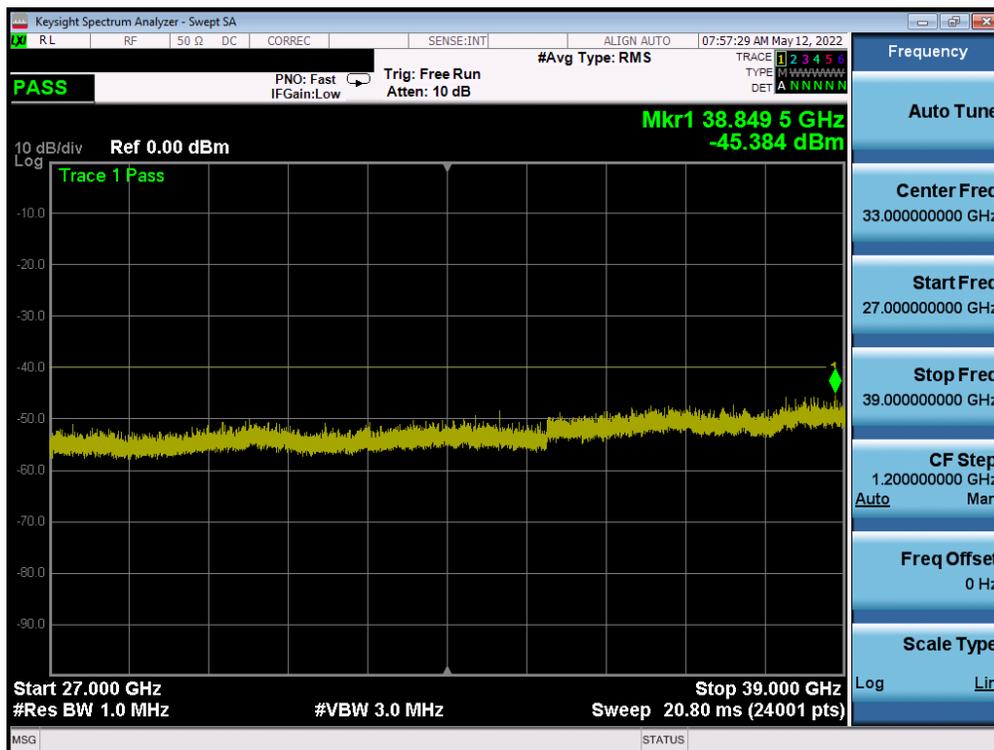


Plot 7-38. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - High Channel)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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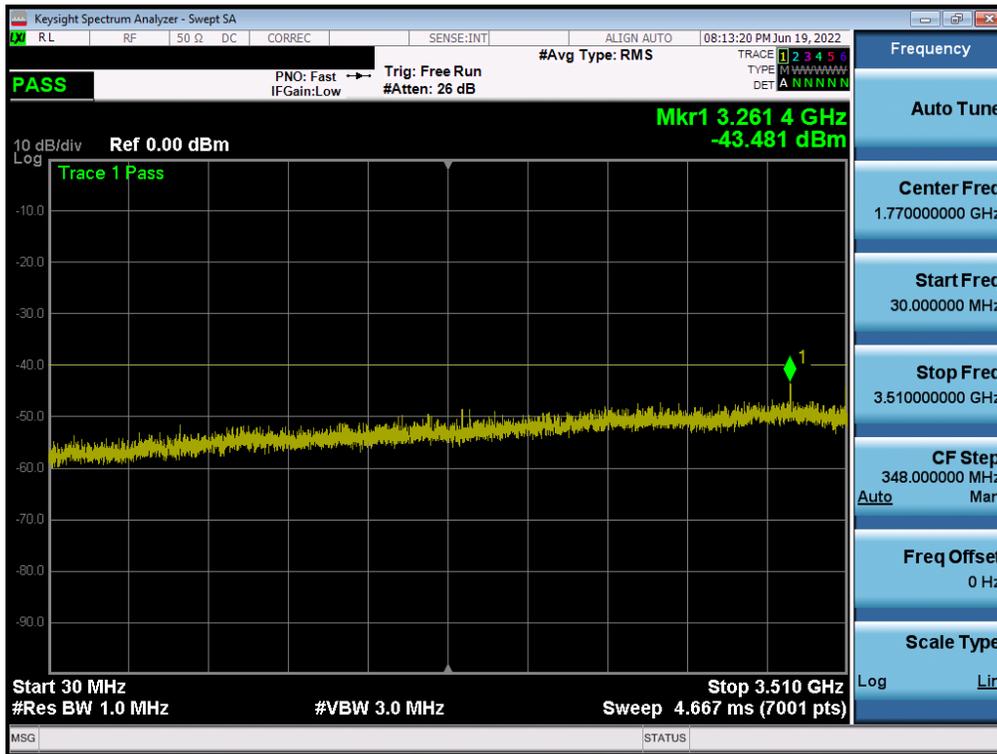
Plot 7-39. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - High Channel)



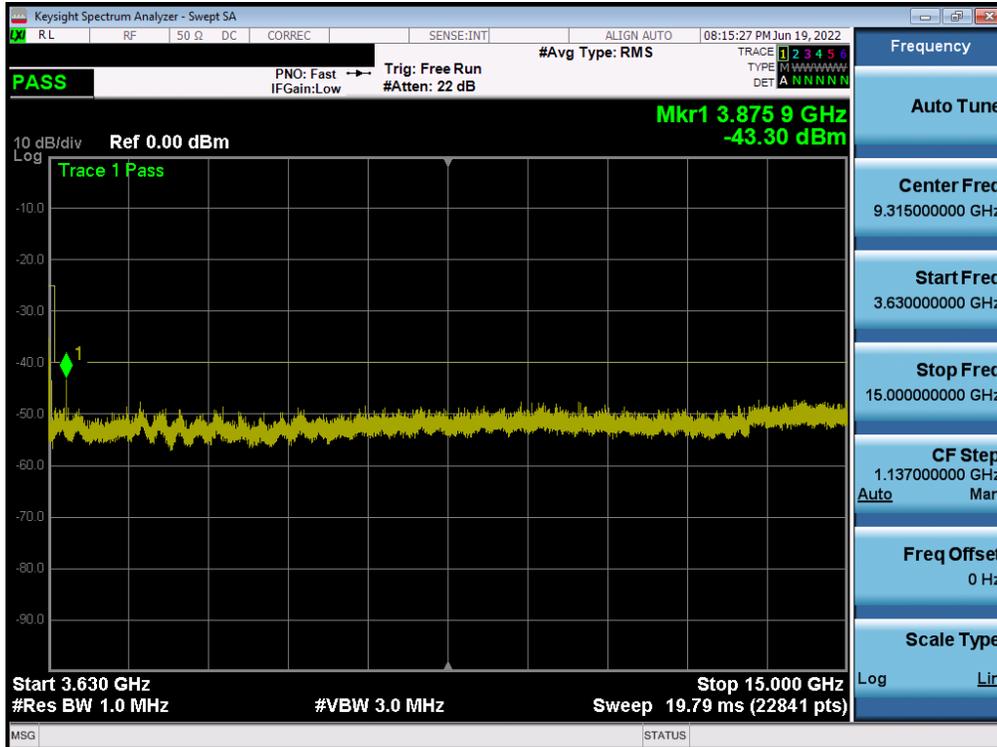
Plot 7-40. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - High Channel)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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# ULCA LB48

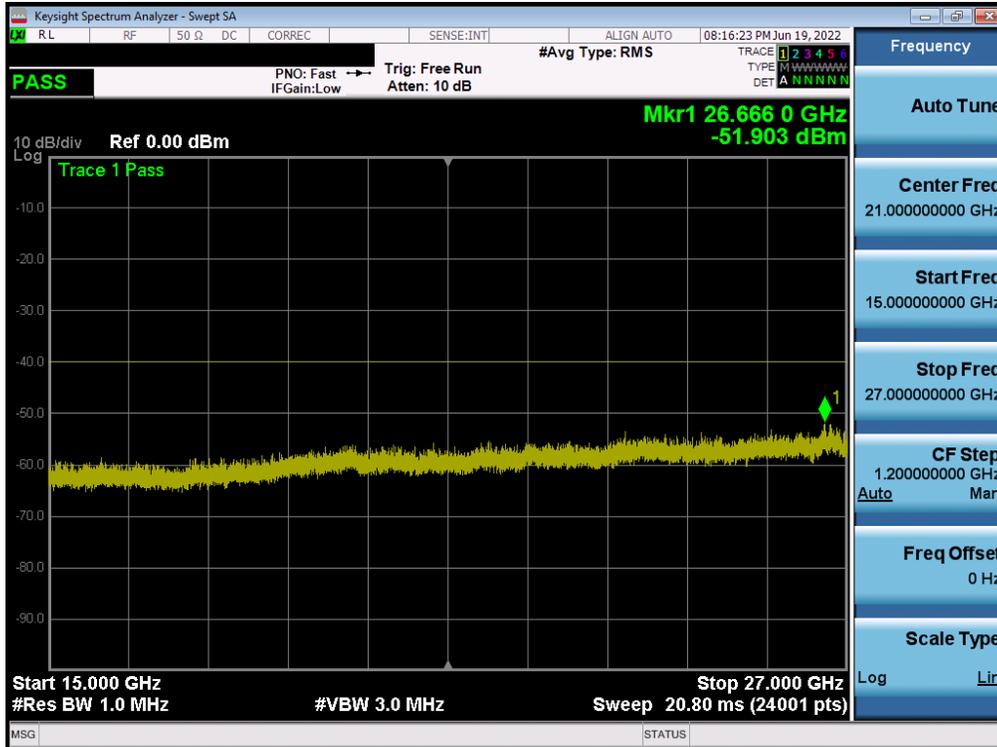


Plot 7-41. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - Low Channel)

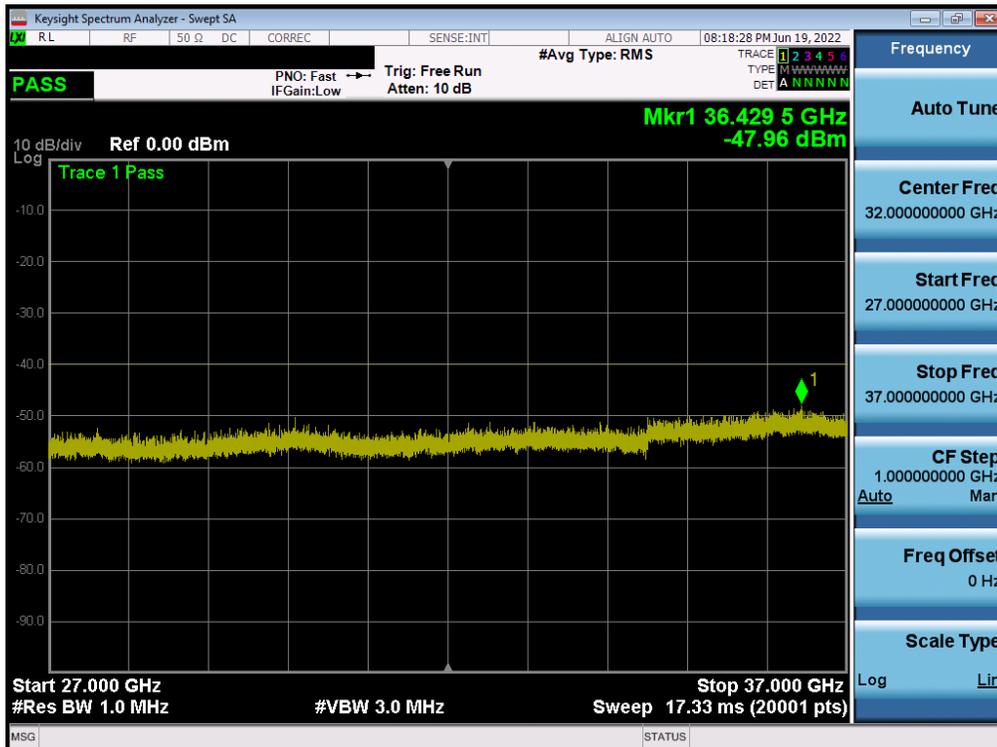


Plot 7-42. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - Low Channel)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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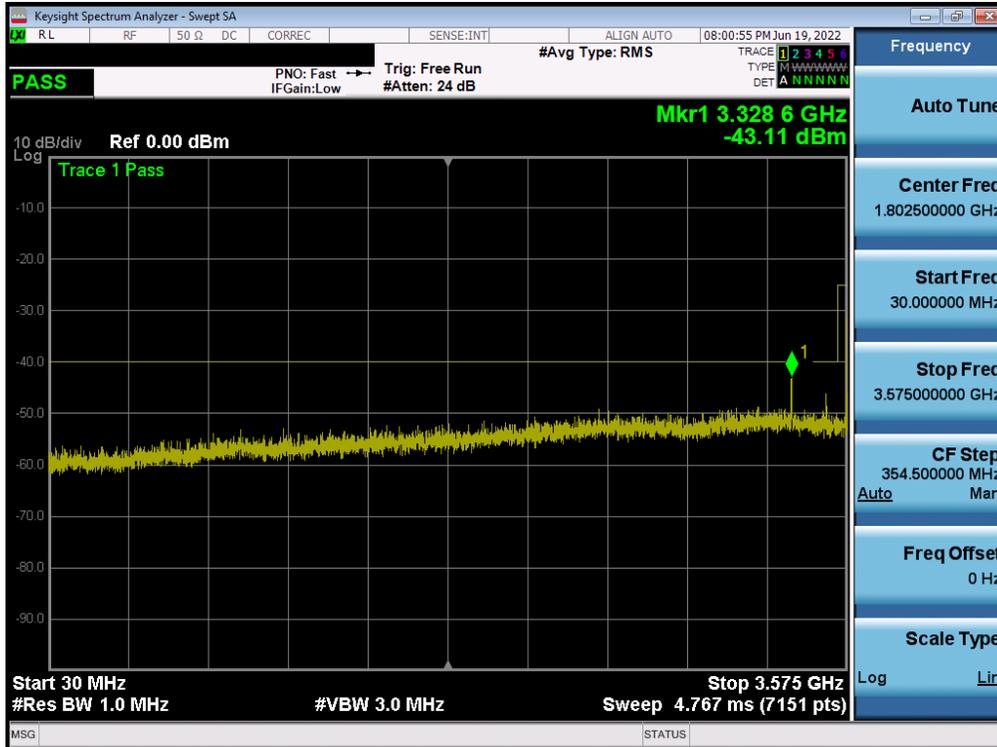


Plot 7-43. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - Low Channel)

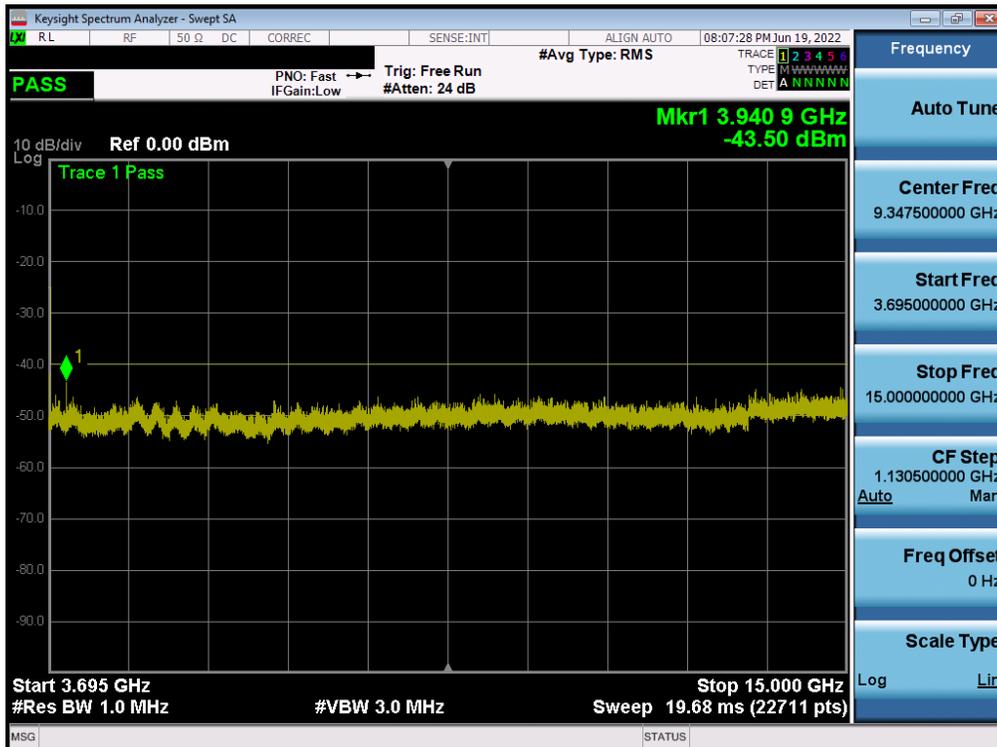


Plot 7-44. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - Low Channel)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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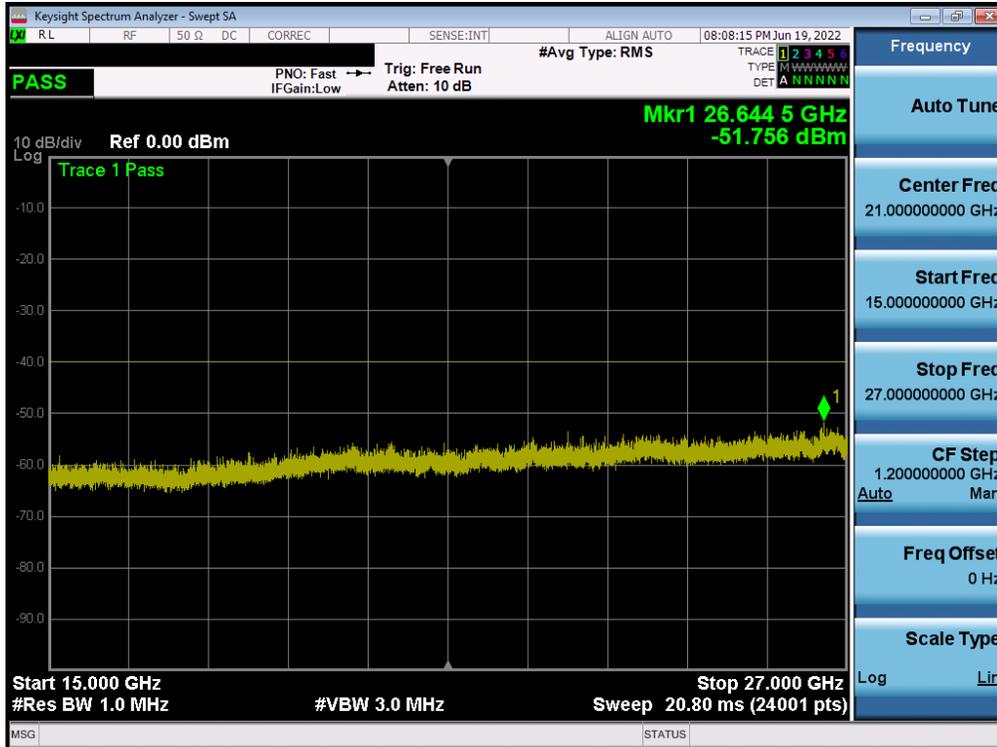


Plot 7-45. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - Mid Channel)

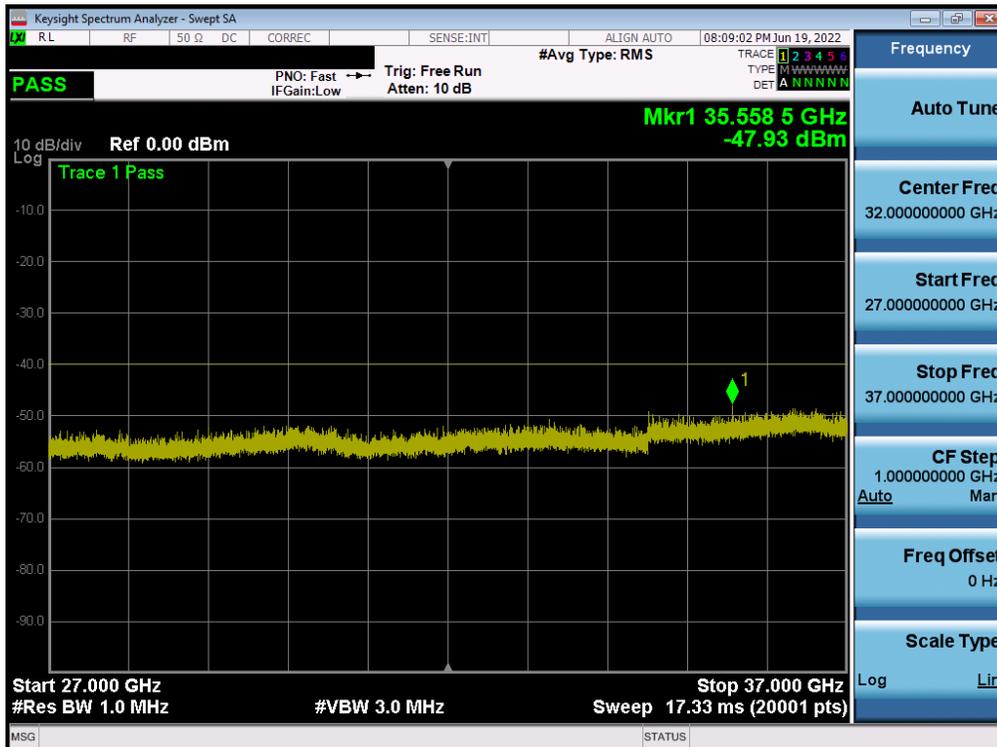


Plot 7-46. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - Mid Channel)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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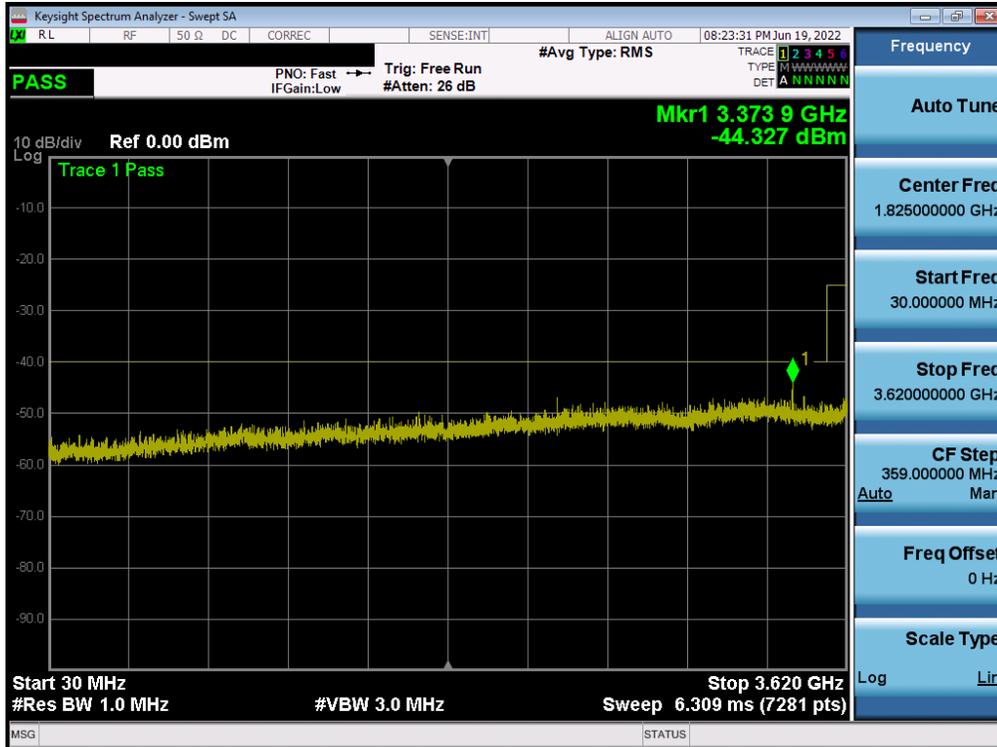


Plot 7-47. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - Mid Channel)

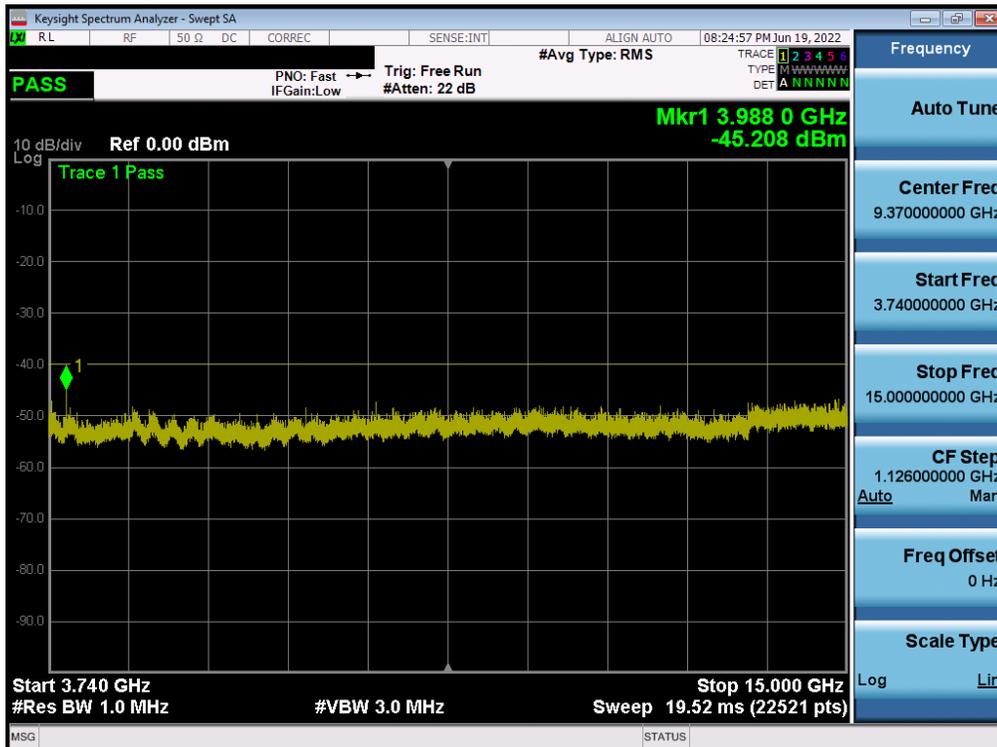


Plot 7-48. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - Mid Channel)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-49. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - High Channel)

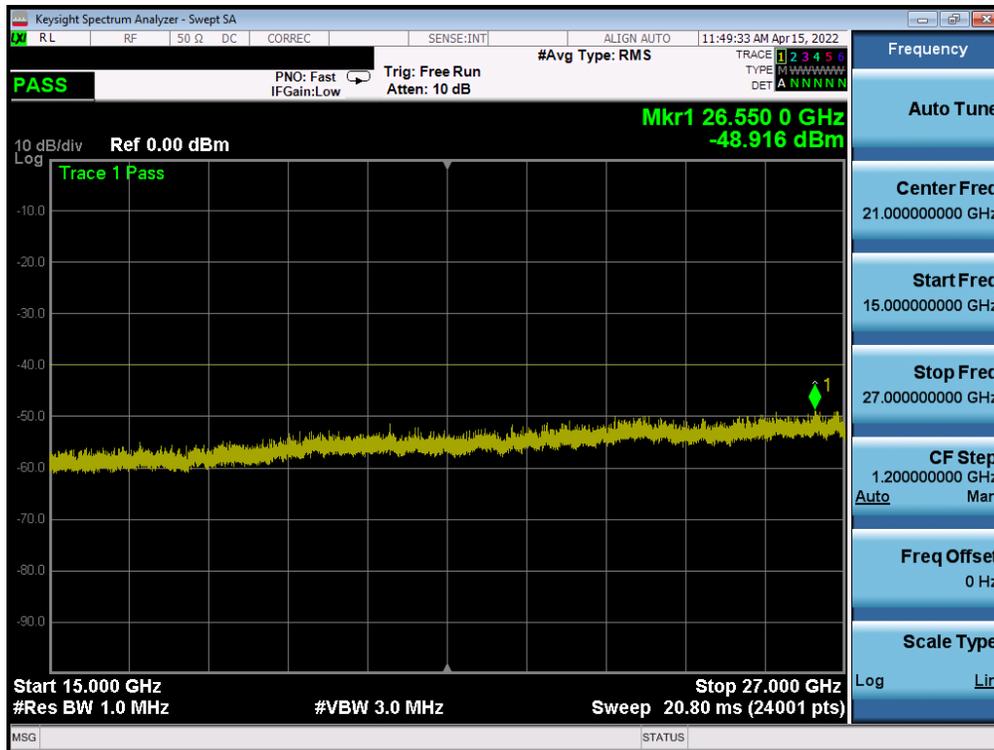


Plot 7-50. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - High Channel)

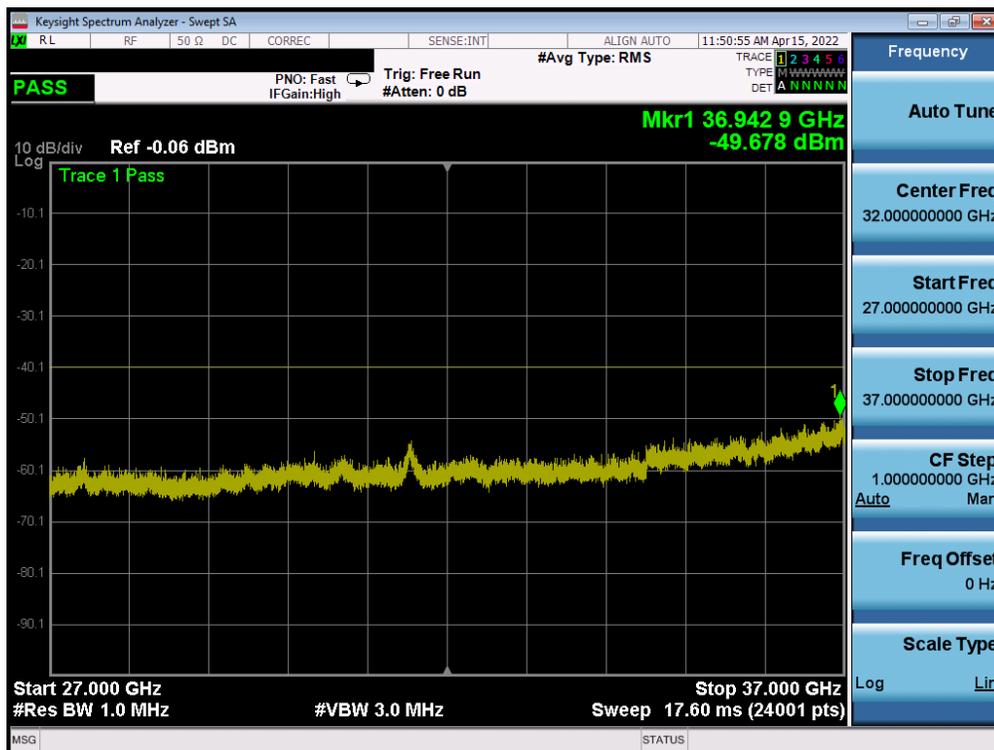
FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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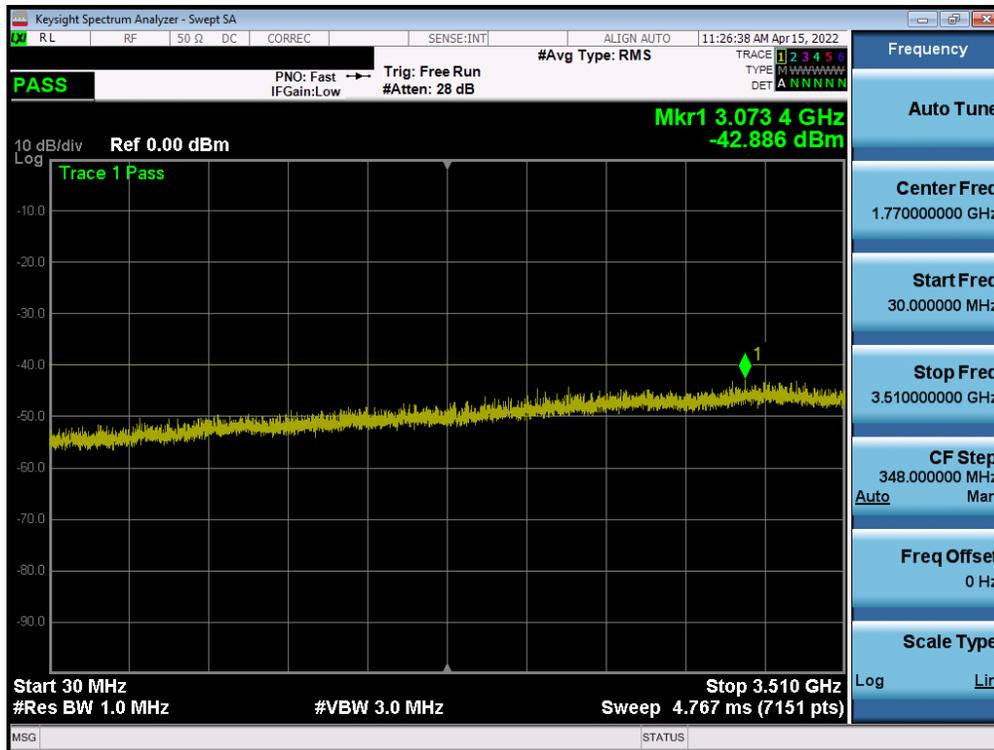


Plot 7-55. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - Low Channel - Ant F)

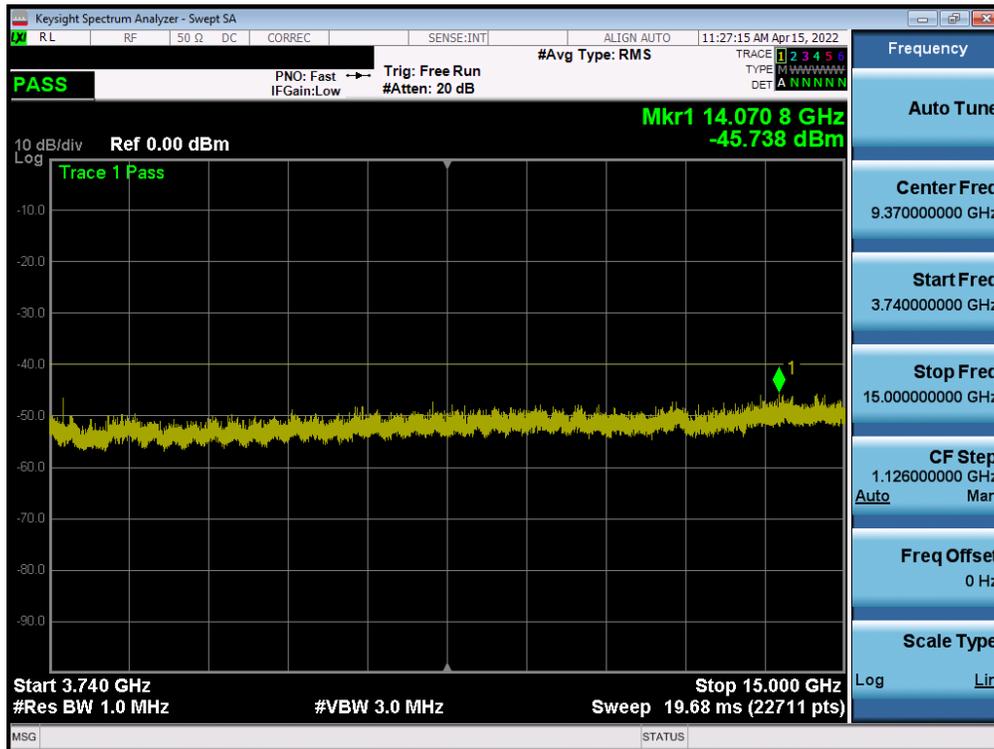


Plot 7-56. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - Low Channel - Ant F)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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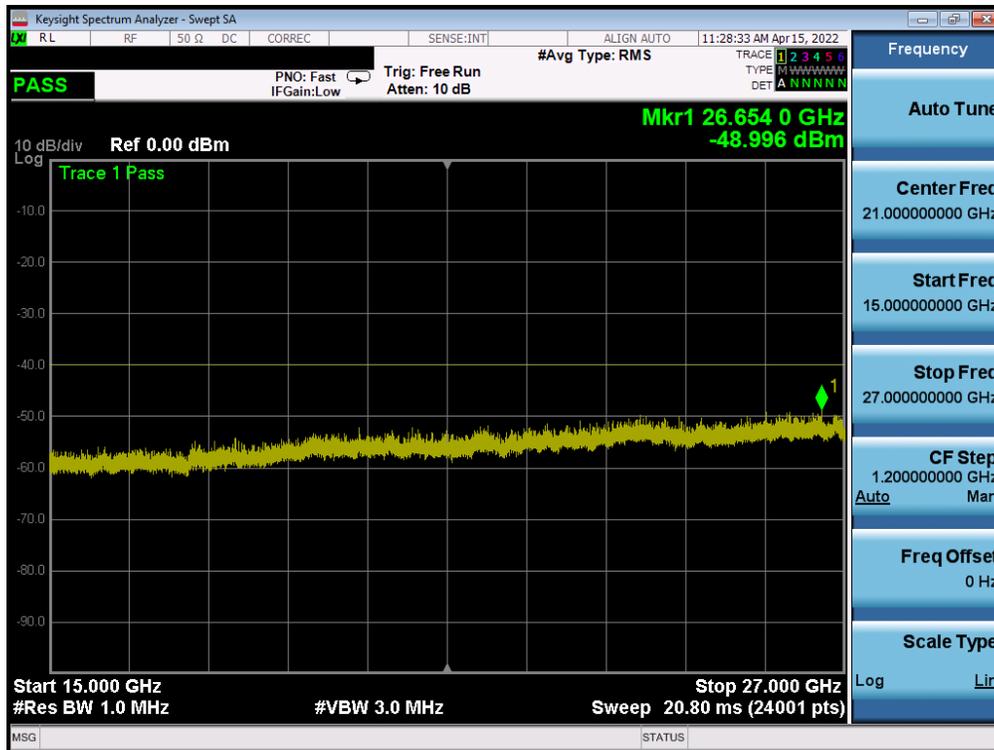


Plot 7-57. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - Mid Channel - Ant F)

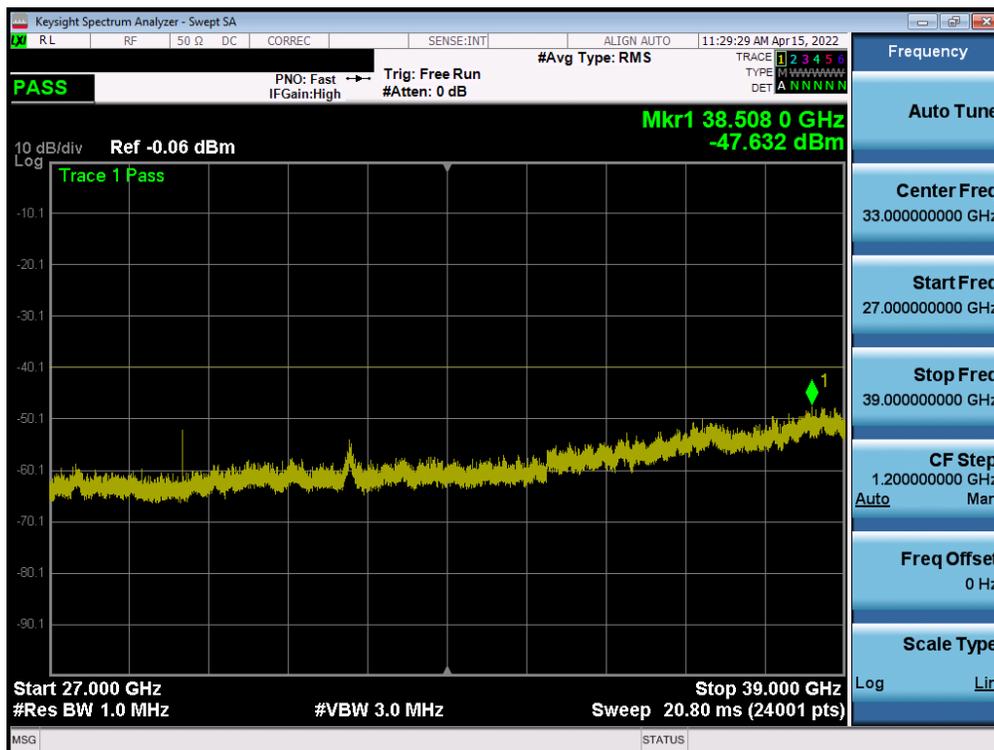


Plot 7-58. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - Mid Channel - Ant F)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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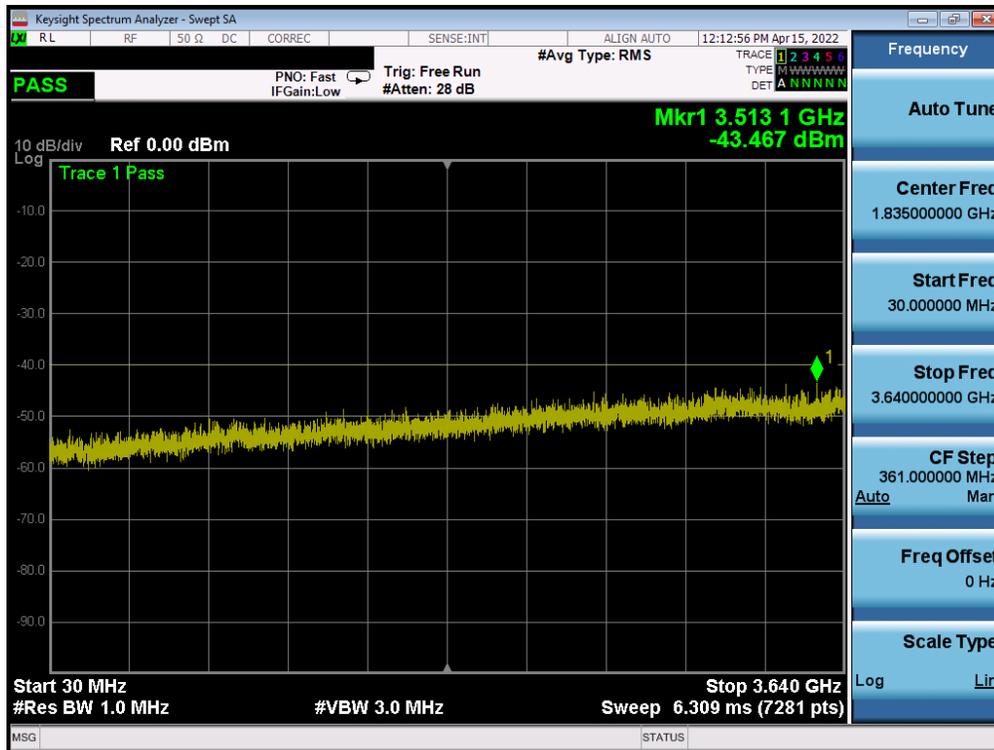


Plot 7-59. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - Mid Channel - Ant F)

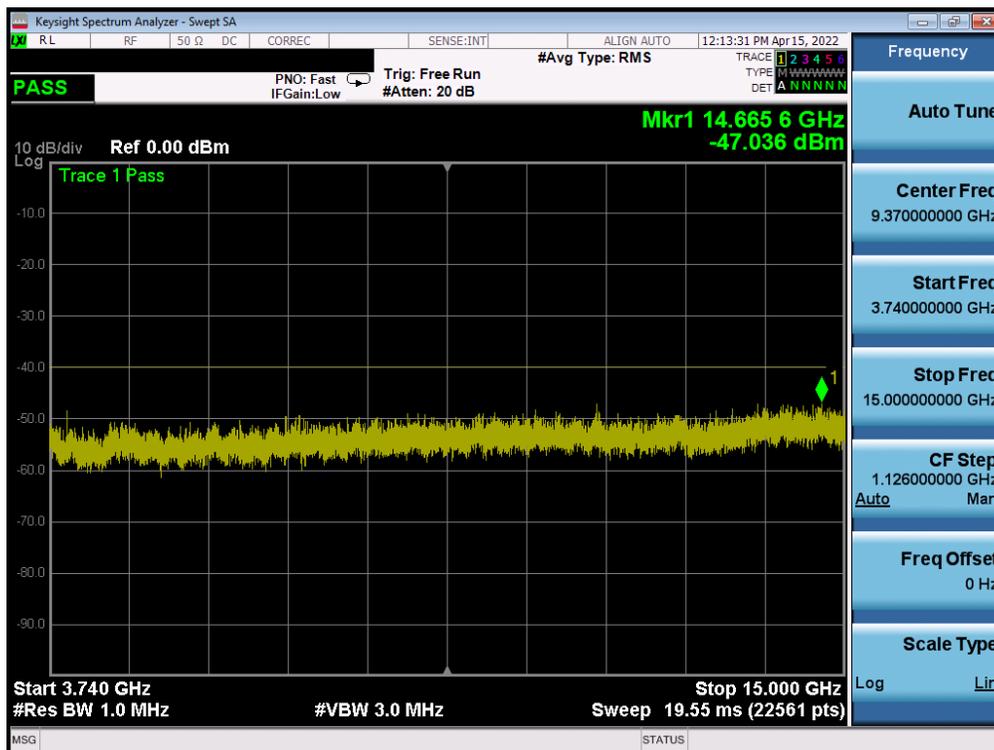


Plot 7-60. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - Mid Channel - Ant F)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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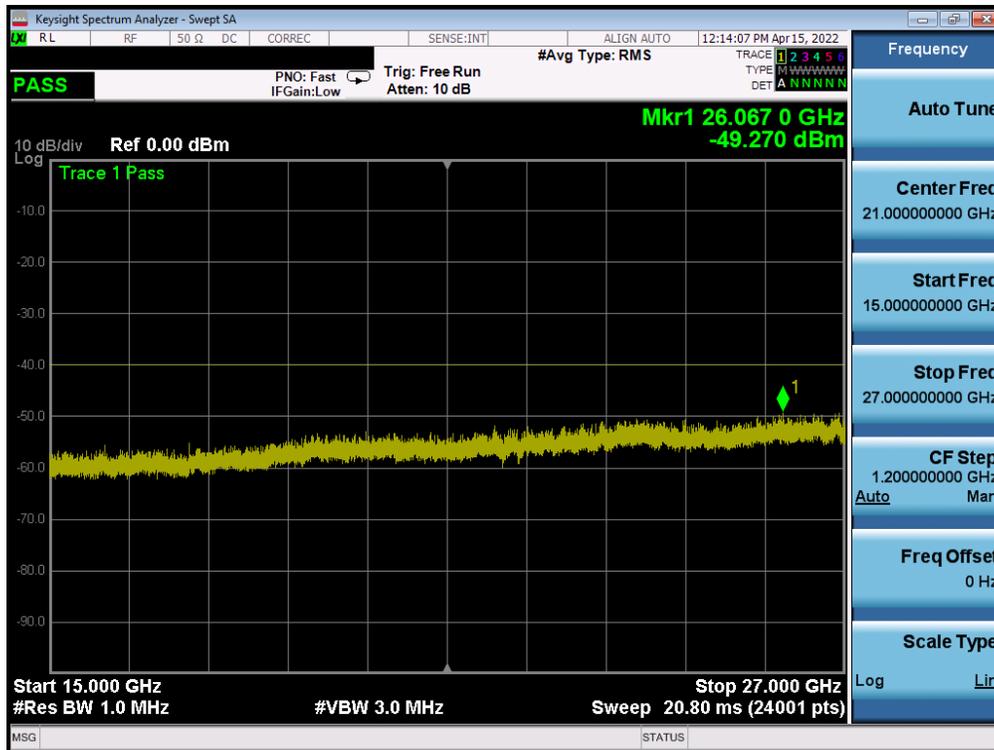


Plot 7-61. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - High Channel - Ant F)

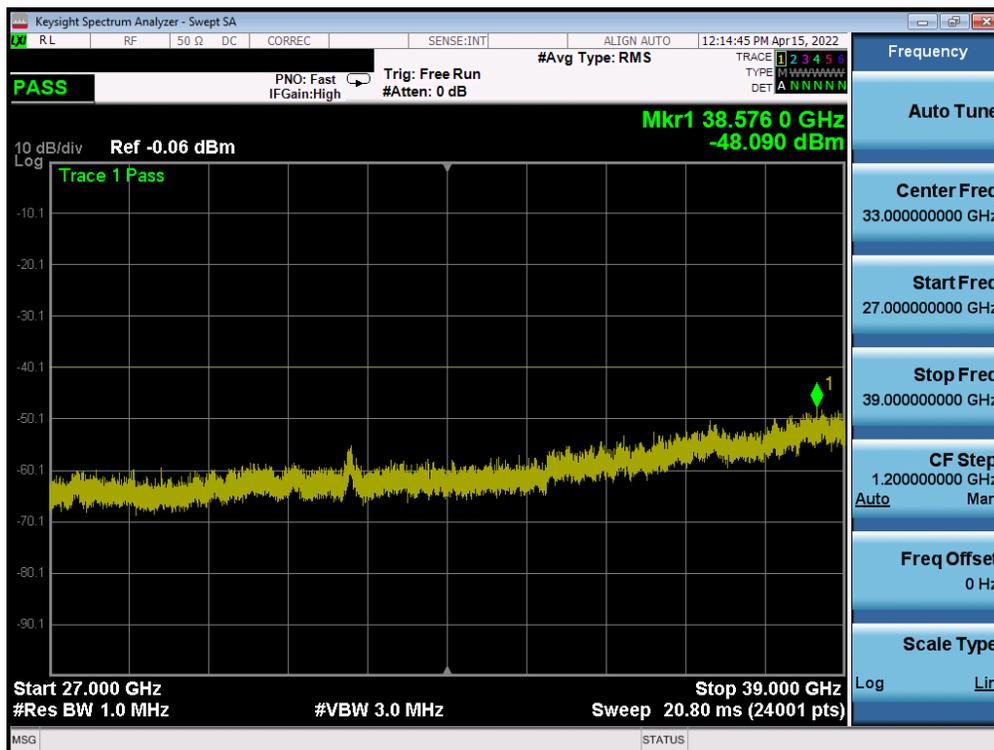


Plot 7-62. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - High Channel - Ant F)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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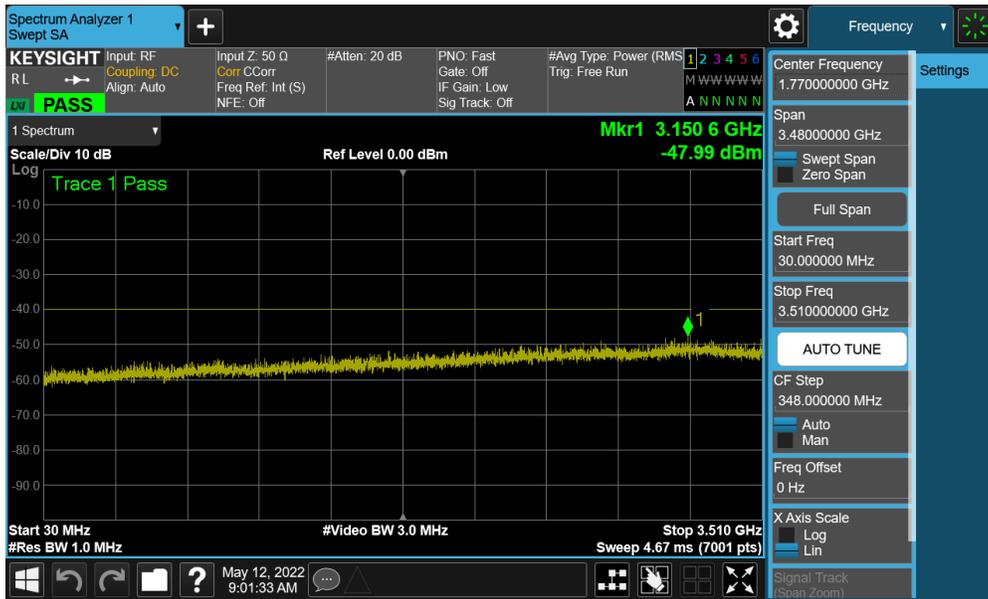
Plot 7-63. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - High Channel - Ant F)



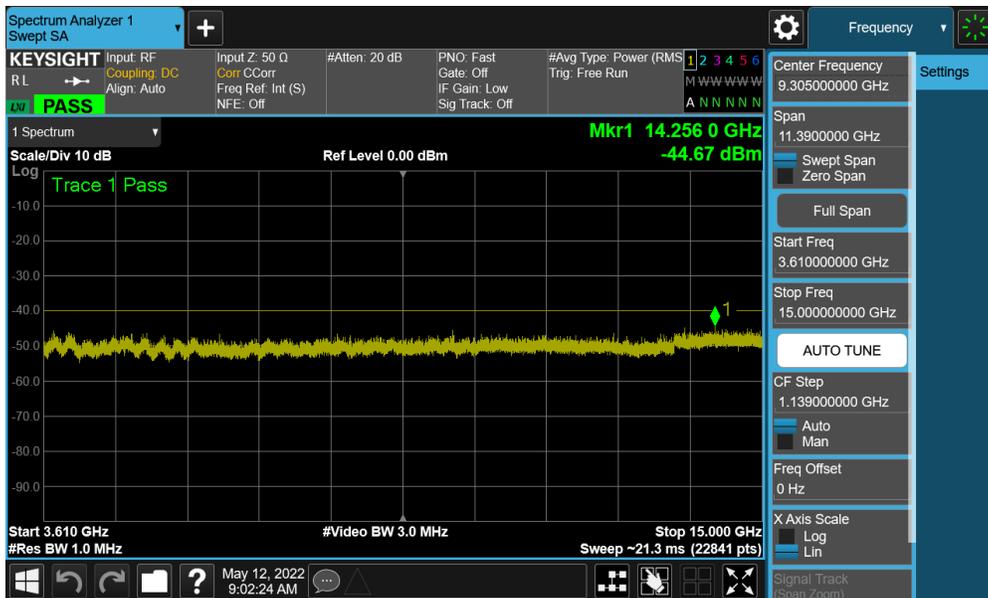
Plot 7-64. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - High Channel - Ant F)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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# NR Band n48 – Ant E



Plot 7-65. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - Low Channel - Ant E)

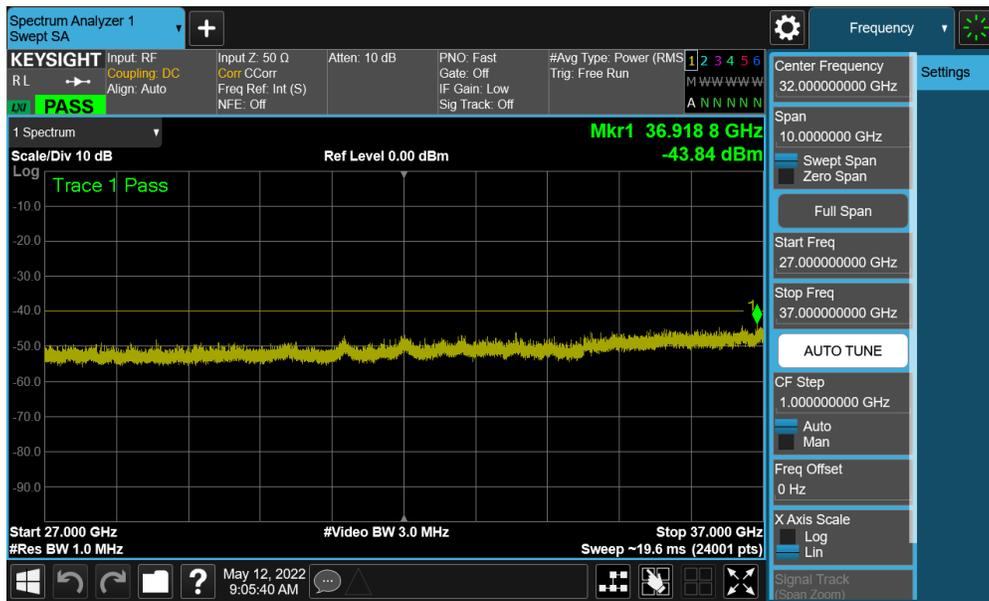


Plot 7-66. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - Low Channel - Ant E)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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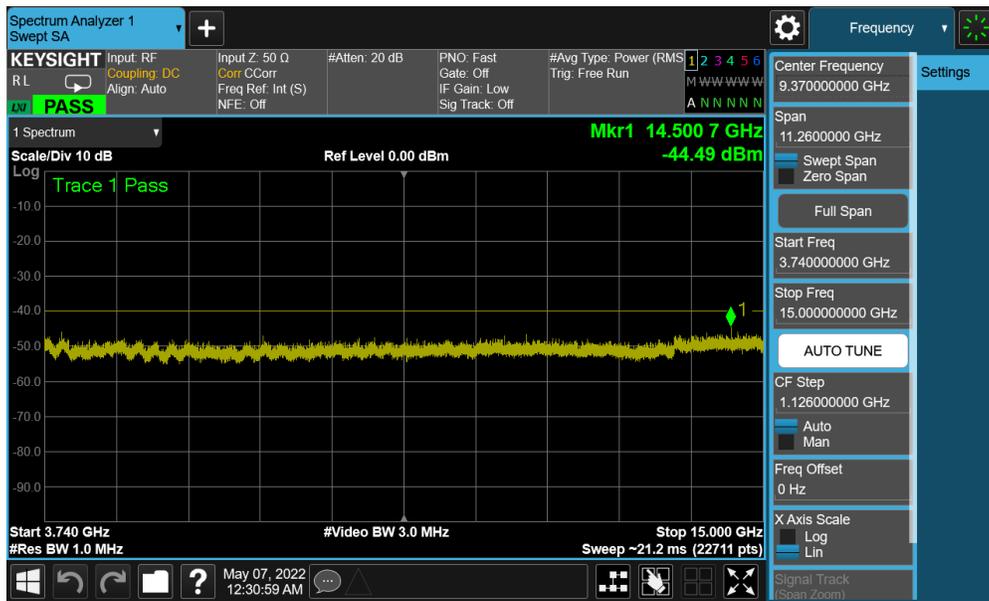
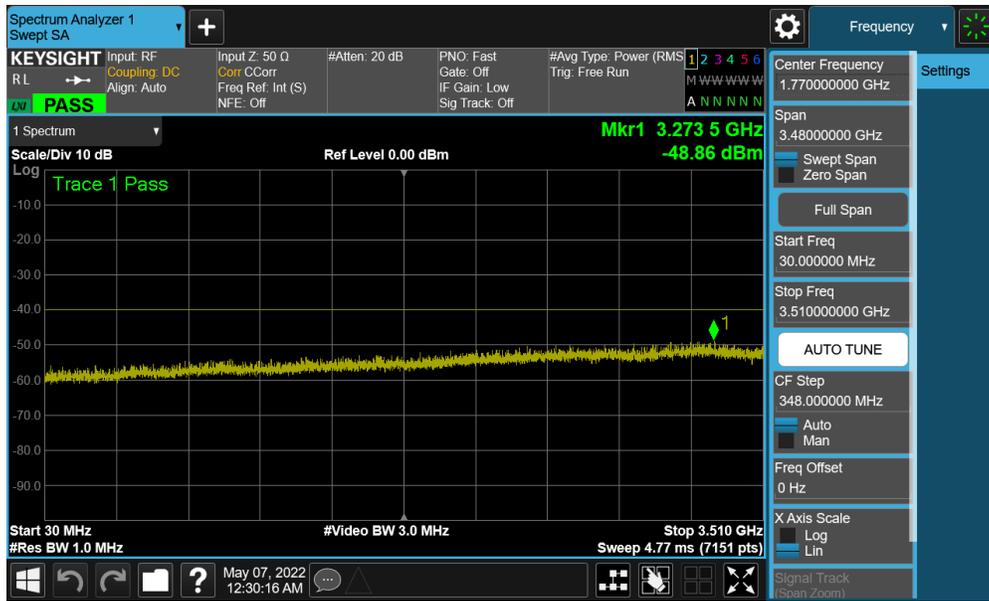


Plot 7-67. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - Low Channel - Ant E)

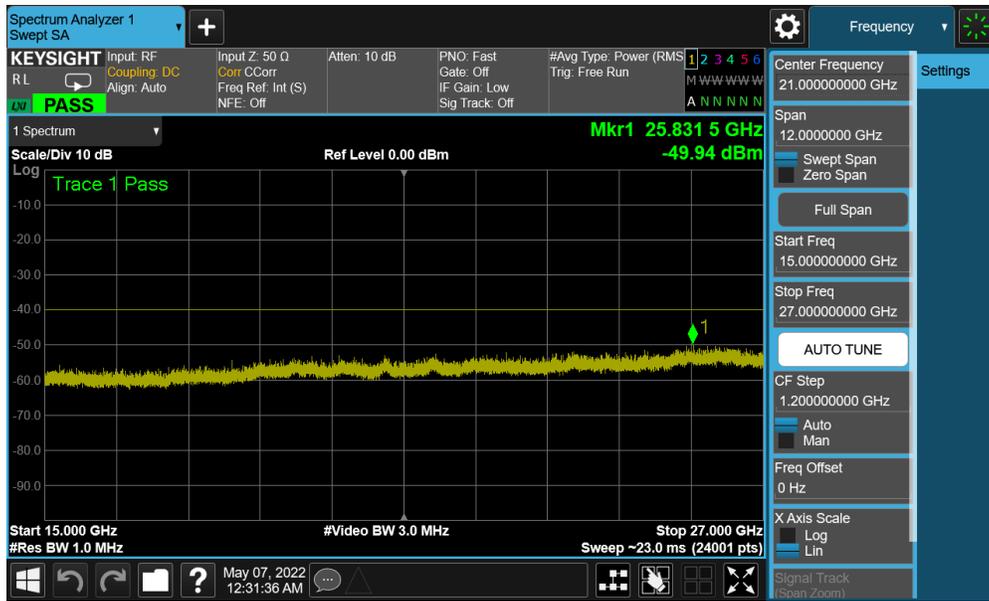


Plot 7-68. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - Low Channel - Ant E)

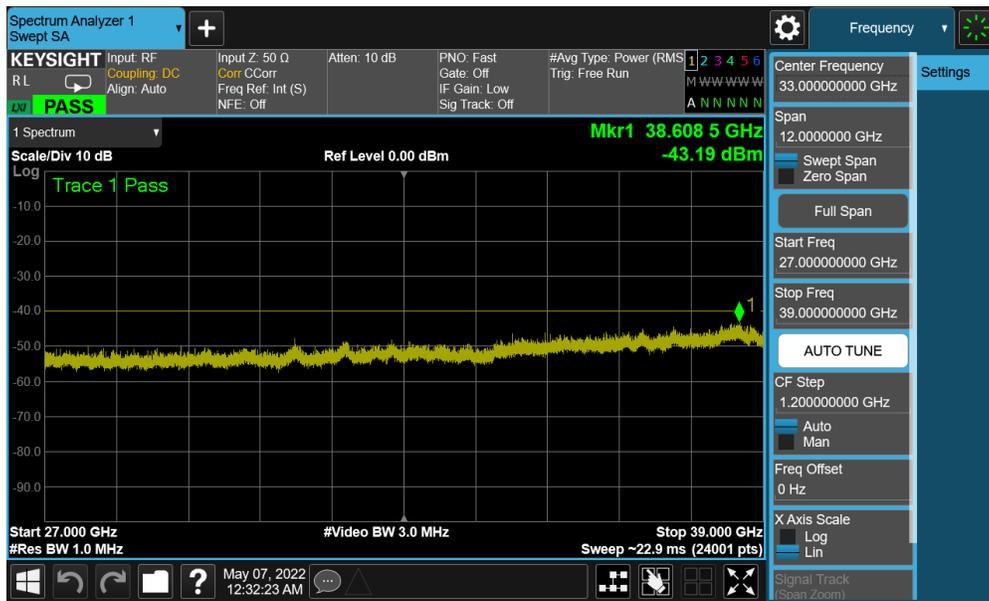
FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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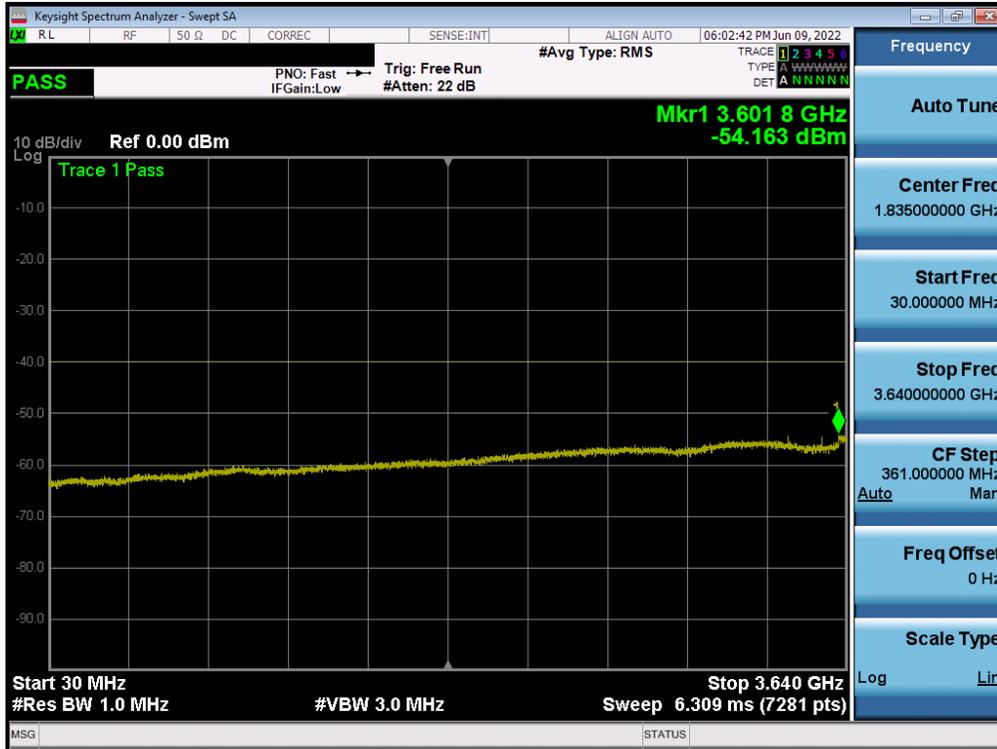


Plot 7-71. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - Mid Channel - Ant E)

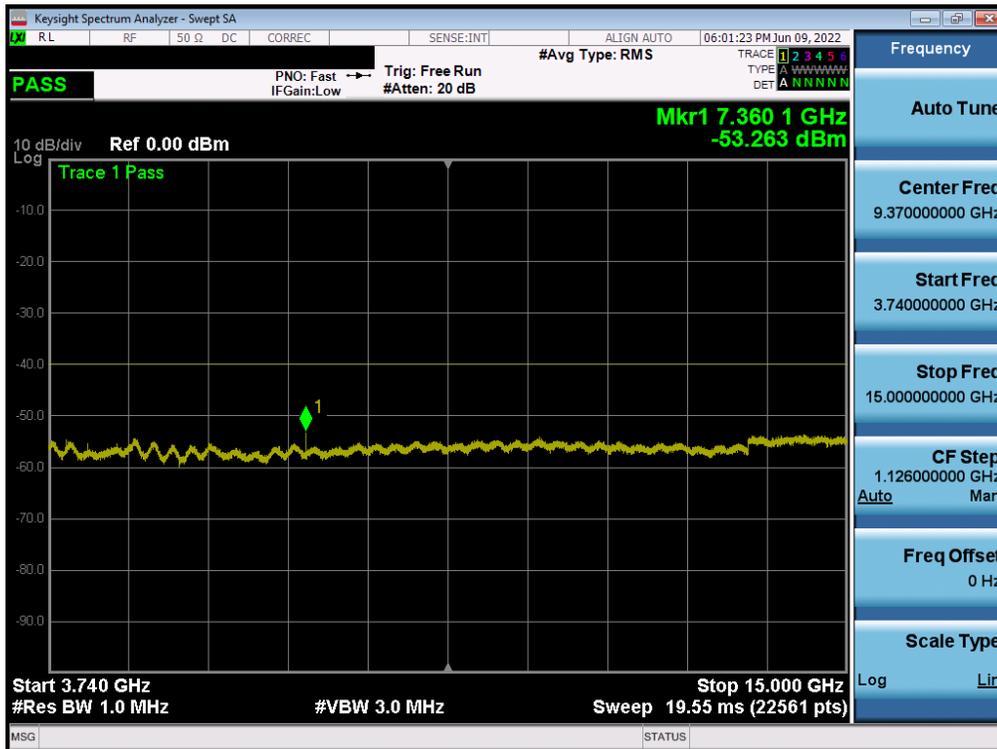


Plot 7-72. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - Mid Channel - Ant E)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-73. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - High Channel - Ant E)



Plot 7-74. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - High Channel - Ant E)

FCC ID: A3LSMF936U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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