

Part 96 MEASUREMENT REPORT

Applicant Name:
 Samsung Electronics Co., Ltd.
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 Gyeonggi-do, 16677, Korea

Date of Testing:
 9/6/2023 - 10/22/2023
Test Report Issue Date:
 10/28/2023
Test Site/Location:
 Element lab., Columbia, MD, USA
Test Report Serial No.:
 1M2308210092-08.A3L

FCC ID:	A3LSMS928U
APPLICANT:	Samsung Electronics Co., Ltd.

Application Type: Certification
Model: SM-S928U
Additional Models: SM-S928U1
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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Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
LTE Band 48 (2CC ULCA)	40 MHz	QPSK	3570.0 - 3680.0	0.088	19.47	37M7G7D
		16QAM	3570.0 - 3680.0	0.075	18.73	37M8W7D
	35 MHz	QPSK	3567.5 - 3682.5	0.087	19.42	32M7G7D
		16QAM	3567.5 - 3682.5	0.075	18.73	32M8W7D
	30 MHz	QPSK	3565.0 - 3685.0	0.087	19.41	27M8G7D
		16QAM	3565.0 - 3685.0	0.075	18.78	27M8W7D
	25 MHz	QPSK	3562.5 - 3687.5	0.088	19.47	23M0G7D
		16QAM	3562.5 - 3687.5	0.076	18.82	23M0W7D
LTE Band 48	20 MHz	QPSK	3560.0 - 3690.0	0.092	19.64	18M1G7D
		16QAM	3560.0 - 3690.0	0.068	18.32	18M1W7D
	15 MHz	QPSK	3557.5 - 3692.5	0.086	19.34	13M6G7D
		16QAM	3557.5 - 3692.5	0.063	17.99	13M5W7D
	10 MHz	QPSK	3555.0 - 3695.0	0.093	19.67	9M05G7D
		16QAM	3555.0 - 3695.0	0.063	18.02	9M03W7D
	5 MHz	QPSK	3552.5 - 3697.5	0.089	19.49	4M54G7D
		16QAM	3552.5 - 3697.5	0.063	17.99	4M53W7D

EUT Overview

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
NR Band n48	40 MHz	$\pi/2$ BPSK	3570.0 - 3680.0	0.112	20.51	36M0G7D
		QPSK	3570.0 - 3680.0	0.114	20.57	38M1G7D
		16QAM	3570.0 - 3680.0	0.085	19.32	38M2W7D
	30 MHz	$\pi/2$ BPSK	3565.0 - 3685.0	0.114	20.58	27M1G7D
		QPSK	3565.0 - 3685.0	0.113	20.55	28M0G7D
		16QAM	3565.0 - 3685.0	0.085	19.32	28M0W7D
	20 MHz	$\pi/2$ BPSK	3560.0 - 3690.0	0.110	20.43	18M0G7D
		QPSK	3560.0 - 3690.0	0.109	20.39	18M4G7D
		16QAM	3560.0 - 3690.0	0.083	19.20	18M4W7D
	15 MHz	$\pi/2$ BPSK	3557.5 - 3692.5	0.111	20.46	13M1G7D
		QPSK	3557.5 - 3692.5	0.110	20.42	13M7G7D
		16QAM	3557.5 - 3692.5	0.079	18.99	13M7W7D
	10 MHz	$\pi/2$ BPSK	3555.0 - 3695.0	0.113	20.53	8M71G7D
		QPSK	3555.0 - 3695.0	0.112	20.49	8M74G7D
		16QAM	3555.0 - 3695.0	0.080	19.03	8M70W7D

EUT Overview

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Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP	
				Max. Power [W]	Max. Power [dBm]
NR Band n48 Ant C	40 MHz	$\pi/2$ BPSK	3570.0 - 3680.0	0.074	18.71
		QPSK	3570.0 - 3680.0	0.073	18.66
		16QAM	3570.0 - 3680.0	0.056	17.46
NR Band n48 Ant I	40 MHz	$\pi/2$ BPSK	3565.0 - 3685.0	0.116	20.65
		QPSK	3565.0 - 3685.0	0.117	20.68
		16QAM	3565.0 - 3685.0	0.091	19.60
NR Band n48 Ant D	40 MHz	$\pi/2$ BPSK	3560.0 - 3690.0	0.028	14.48
		QPSK	3560.0 - 3690.0	0.027	14.34
		16QAM	3560.0 - 3690.0	0.022	13.35

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: A3LSMS928U**. 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.: 0088M, 0170M, 0147M, 0230M, 1161M, 0023M,1267M, 0164M

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/be WLAN, 802.11a/n/ac/ax/be UNII (5GHz and 6GHz), Bluetooth (1x, EDR, LE), NFC, Wireless Power Transfer, UWB

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-P2400 while operating under normal conditions in a simulated call or data transmission configuration. 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 S928USQU0AWIA 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_{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
-	AP1	EMC Cable and Switch System	1/11/2023	Annual	1/11/2024	AP1-002
-	ETS	EMC Cable and Switch System	1/11/2023	Annual	1/11/2024	ETS-001
-	ETS	EMC Cable and Switch System	1/11/2023	Annual	1/11/2024	ETS-002
-	1M Site	EMC Cable and Switch System	1/11/2023	Annual	1/11/2024	MD 1M 18-40
-	LTx4	Licensed Transmitter Cable Set	1/12/2023	Annual	1/12/2024	LTx4
-	LTx6-40	Licensed Transmitter Cable Set	1/12/2023	Annual	1/12/2024	LTx6-40
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	3/15/2023	Annual	3/15/2024	MY52350166
Keysight Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	8/29/2023	Annual	8/29/2024	MY49430494
Keysight Technologies	N9030B	PXA Signal Analyzer, Multi-touch	9/7/2023	Annual	9/7/2024	MY57141001
Keysight Technologies	N9030A	PXA Signal Analyzer	1/31/2023	Annual	1/31/2024	MY55410501
ETS-Lindgren	3116C	DRG Horn Antenna	2/27/2023	Biennial	2/27/2025	00218893
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Test Antenna	9/28/2022	Biennial	9/28/2024	00218893
Rohde & Schwarz	FSW26	2Hz-26.5GHz Signal and spectrum analyzer	11/6/2022	Annual	11/6/2023	103187
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/11/2023	Annual	9/11/2024	100348
ETS-Lindgren	3116C	DRG Horn Antenna	2/27/2023	Biennial	2/27/2025	00218893
Espec	SCP-220	Temp. Chamber	5/25/2022	Biennial	5/25/2024	OCP55H0612K05
ETS-Lindgren	3115	Double Ridged Guide Horn	4/12/2022	Biennial	4/12/2024	82333
Sunol Sciences	JB6	JB6 Antenna	3/2/2023	Biennial	3/2/2025	82322
Anritsu	MT8000A	Radio Communication Test Station	1/5/2023	Annual	1/5/2024	83821

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 (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: A3LSMS928U
 FCC Classification: Citizens Band End User Devices (CBE)
 Mode(s): LTE/ULCA/NR

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
CONDUCTED	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)(i)	-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
	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
RADIATED	Equivalent Isotropic Radiated Power (EIRP) (EUD)	96.41(b)	23 dBm/10MHz	PASS	Section 7.6
	Uplink Carrier Aggregation	96.41(e)	> 43 + 10log(P[Watts]) at Band Edge and for all out-of-band emissions	PASS	Section 7.7
	Radiated Spurious Emissions	2.1053, 96.41(e)	-40 dBm/MHz	PASS	Section 7.7

Table 7-1. Summary of 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.

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- 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.

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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.

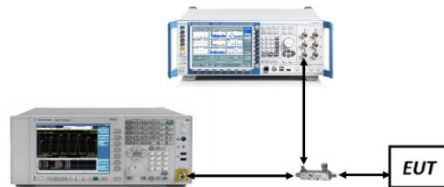


Figure 7-1. Test Instrument & Measurement Setup

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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.
6. Conducted power was found to reduce for the higher order QAM modulations when compared to 16QAM. Due to this trend, only the worst-case QAM (16QAM) powers are included in this section.

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Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
20 MHz	QPSK	55340	3560.0	1 / 1	21.88
		55990	3625.0	1 / 1	21.76
		56640	3690.0	1 / 49	21.71
	16-QAM	55340	3560.0	1 / 1	21.09
15 MHz	QPSK	55315	3557.5	1 / 19	21.88
		55990	3625.0	1 / 1	21.46
		56665	3692.5	1 / 36	21.69
	16-QAM	55315	3557.5	1 / 19	21.22
10 MHz	QPSK	55290	3555.0	1 / 1	22.16
		55990	3625.0	1 / 1	21.79
		56690	3695.0	1 / 22	21.98
	16-QAM	55290	3555.0	1 / 1	21.28
5 MHz	QPSK	55265	3552.5	1 / 5	22.15
		55990	3625.0	1 / 1	21.61
		56715	3697.5	1 / 9	21.96
	16-QAM	55265	3552.5	1 / 5	21.34

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	21.84
		20	3625.0	1 / 99	20	3644.8	1 / 0	21.43
		20	3690.0	1 / 0	20	3670.2	1 / 99	21.64
	16-QAM	20	3560.0	1 / 99	20	3579.8	1 / 0	21.44
35 MHz	QPSK	20	3560.0	1 / 99	15	3577.1	1 / 0	21.80
		20	3625.0	1 / 99	15	3642.1	1 / 0	21.38
		20	3690.0	1 / 0	15	3672.9	1 / 74	21.65
	16-QAM	20	3560.0	1 / 99	15	3577.1	1 / 0	21.44
30 MHz	QPSK	20	3560.0	1 / 99	10	3574.4	1 / 0	21.84
		20	3625.0	1 / 99	10	3639.4	1 / 0	21.37
		20	3690.0	1 / 0	10	3675.6	1 / 49	21.68
	16-QAM	20	3560.0	1 / 99	10	3574.4	1 / 0	21.42
25 MHz	QPSK	20	3560.0	1 / 99	5	3571.7	1 / 0	21.90
		20	3625.0	1 / 99	5	3636.7	1 / 0	21.43
		20	3690.0	1 / 0	5	3678.3	1 / 24	21.67
	16-QAM	20	3560.0	1 / 99	5	3571.7	1 / 0	21.50

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_10	310	910	20 + 20	3560	100	0	3579.8	100	0	≤ 11	QPSK	0	22.50	10.93
												16-QAM	1	21.50	10.98
2				20 + 20	3560	1	99	3579.8	1	0	≤ 11	QPSK	0	22.50	16.67
												16-QAM	1	21.50	17.23
3				20 + 20	3605.1	100	0	3624.9	100	0	≤ 4.5	QPSK	0	22.50	17.17
												16-QAM	1	21.50	17.25
4	20 + 20	3605.1	1	99	3624.9	1	0	≤ 4.5	QPSK	0	22.50	19.91			
									16-QAM	1	21.50	20.38			
5	20 + 20	3670.1	100	0	3689.9	100	0	≤ 11	QPSK	0	22.50	10.91			
									16-QAM	1	21.50	10.91			
6	20 + 20	3670.1	1	99	3689.9	1	0	≤ 11	QPSK	0	22.50	16.58			
									16-QAM	1	21.50	17.05			

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

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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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	22.87
		641666	3625.0	1 / 1	22.91
		645332	3680.0	1 / 1	22.78
	QPSK	638000	3570.0	1 / 1	22.82
		641666	3625.0	1 / 1	22.97
		645332	3680.0	1 / 1	22.71
16-QAM	641666	3625.0	1 / 1	22.05	
30 MHz	π/2 BPSK	637666	3565.0	1 / 1	23.04
		641666	3625.0	1 / 1	22.98
		645666	3685.0	1 / 1	22.86
	QPSK	637666	3565.0	1 / 1	22.99
		641666	3625.0	1 / 1	22.95
		645666	3685.0	1 / 1	22.84
16-QAM	641666	3625.0	1 / 1	22.05	
20 MHz	π/2 BPSK	637334	3560.0	1 / 1	22.75
		641666	3625.0	1 / 1	22.83
		646000	3690.0	1 / 1	22.51
	QPSK	637334	3560.0	1 / 1	22.74
		641666	3625.0	1 / 1	22.79
		646000	3690.0	1 / 1	22.53
16-QAM	641666	3625.0	1 / 1	21.93	
15 MHz	π/2 BPSK	637166	3557.5	1 / 1	22.79
		641666	3625.0	1 / 36	22.86
		646166	3692.5	1 / 36	22.63
	QPSK	637166	3557.5	1 / 1	22.75
		641666	3625.0	1 / 36	22.82
		646166	3692.5	1 / 36	22.56
16-QAM	641666	3625.0	1 / 36	21.72	
10 MHz	π/2 BPSK	637000	3555.0	1 / 1	22.74
		641666	3625.0	1 / 22	22.93
		646332	3695.0	1 / 22	22.67
	QPSK	637000	3555.0	1 / 1	22.71
		641666	3625.0	1 / 22	22.89
		646332	3695.0	1 / 22	22.63
16-QAM	641666	3625.0	1 / 22	21.76	

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

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
40 MHz	π/2 BPSK	638000	3570.0	1 / 104	17.20
		641666	3625.0	1 / 53	17.21
		645332	3680.0	1 / 1	17.37
	QPSK	638000	3570.0	1 / 104	17.20
		641666	3625.0	1 / 104	17.30
		645332	3680.0	1 / 1	17.35
	16-QAM	645332	3680.0	1 / 1	16.22

Table 7-6. Conducted Power Output Data (NR Band n48 Ant C)

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
40 MHz	π/2 BPSK	638000	3570.0	1 / 53	21.46
		641666	3625.0	1 / 53	21.34
		645332	3680.0	1 / 104	21.47
	QPSK	638000	3570.0	1 / 53	21.42
		641666	3625.0	1 / 53	21.39
		645332	3680.0	1 / 104	21.47
	16-QAM	645332	3680.0	1 / 104	20.28

Table 7-7. Conducted Power Output Data (NR Band n48 Ant I)

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
40 MHz	π/2 BPSK	638000	3570.0	1 / 104	17.22
		641666	3625.0	1 / 1	17.59
		645332	3680.0	1 / 1	17.67
	QPSK	638000	3570.0	1 / 104	17.10
		641666	3625.0	1 / 1	17.54
		645332	3680.0	1 / 1	17.71
	16-QAM	645332	3680.0	1 / 1	16.42

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

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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 $\geq 3 \times$ RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

Test Setup

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

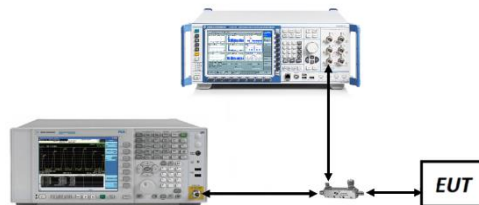


Figure 7-2. Test Instrument & Measurement Setup

Test Notes

None

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ULCA LB48

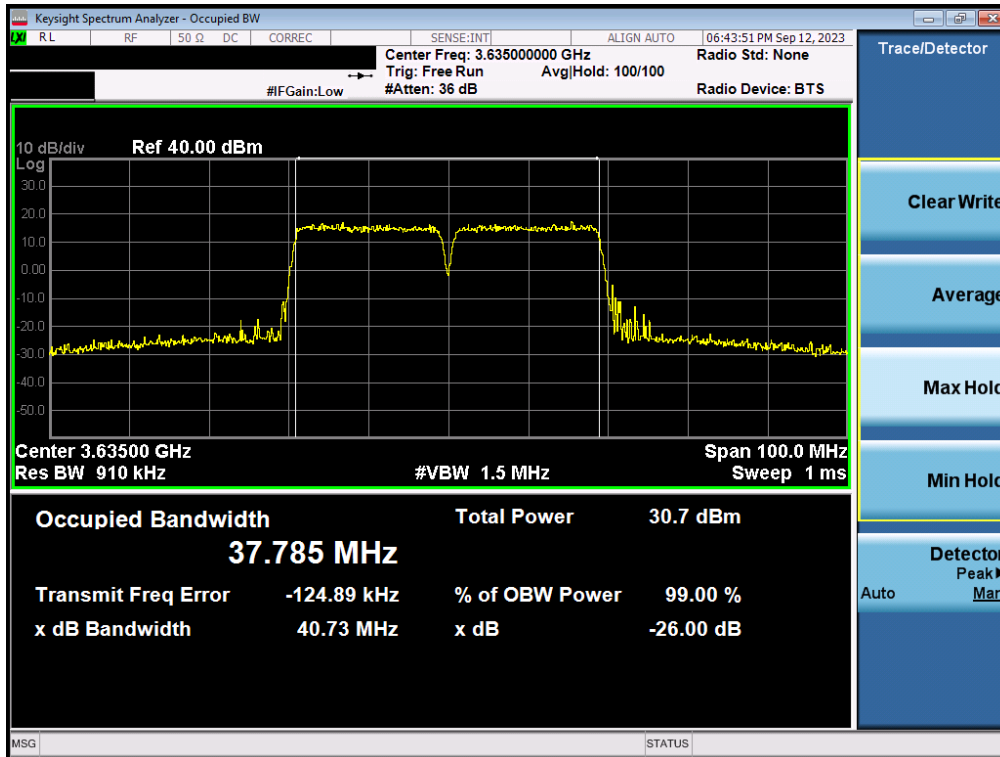
Mode	Bandwidth	Modulation	OBW [MHz]
LTE Band 48 (2CC ULCA)	40 MHz	QPSK	37.74
		16QAM	37.79
	35 MHz	QPSK	32.75
		16QAM	32.78
	30 MHz	QPSK	27.83
		16QAM	27.79
	25 MHz	QPSK	23.04
		16QAM	23.02

Table 7-9. Occupied Bandwidth Test Results (ULCA LB48)

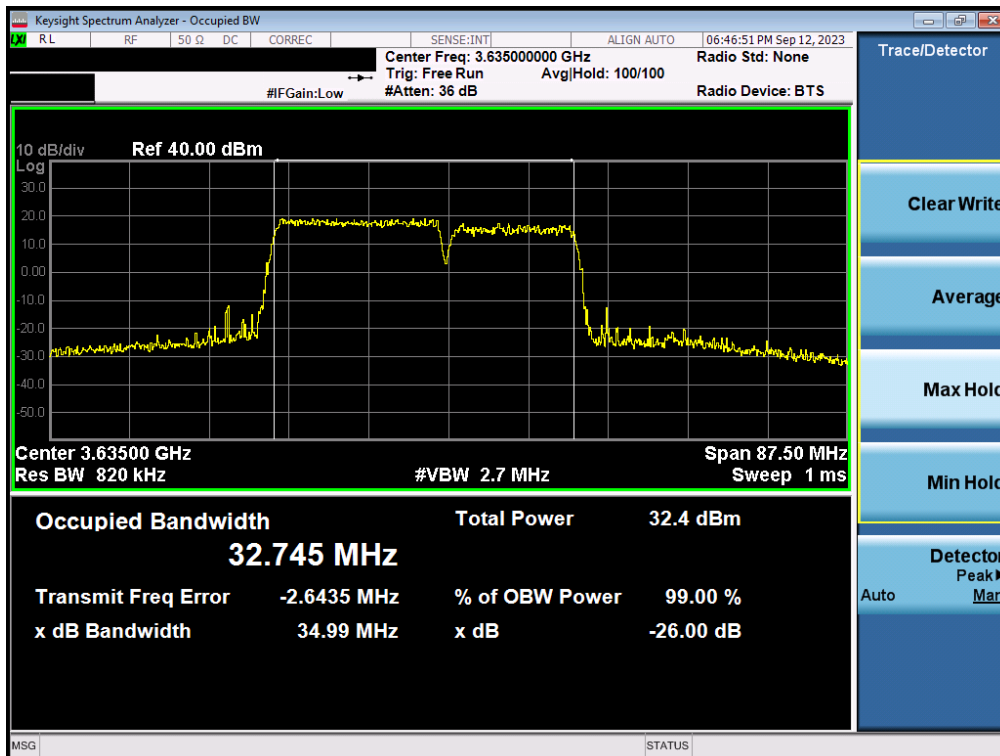


Plot 7-1. Occupied Bandwidth Plot (ULCA LB48 - 20+20MHz QPSK - Full RB Configuration)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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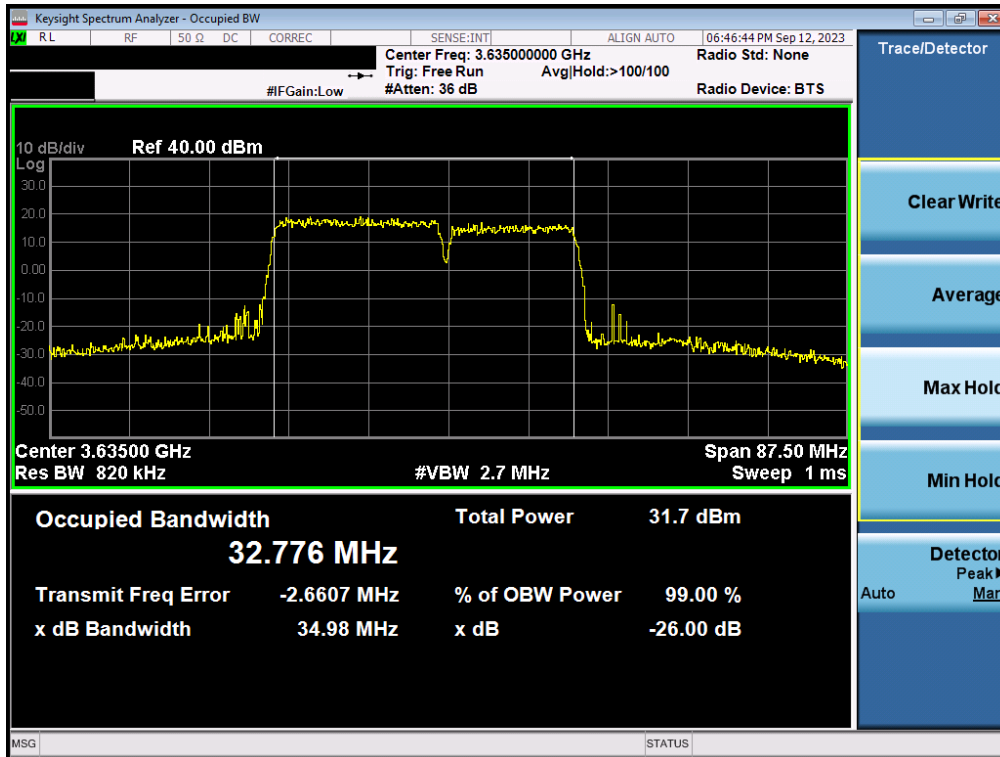


Plot 7-2. Occupied Bandwidth Plot (ULCA LB48 - 20+20MHz 16-QAM - Full RB Configuration)

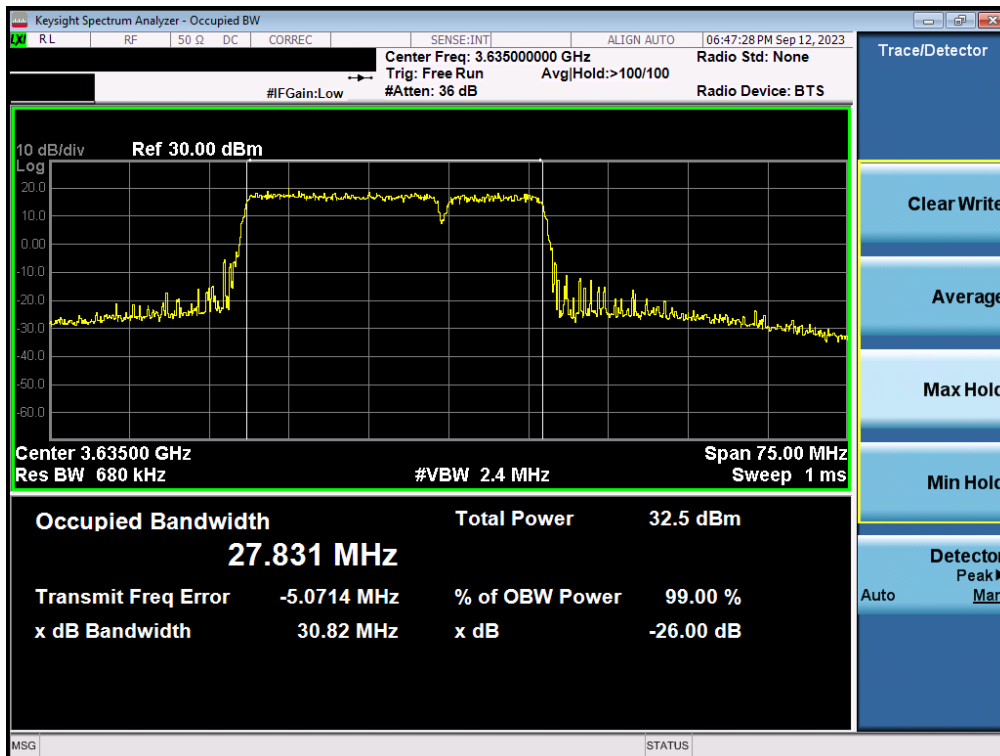


Plot 7-3. Occupied Bandwidth Plot (ULCA LB48 - 20+15MHz QPSK - Full RB Configuration)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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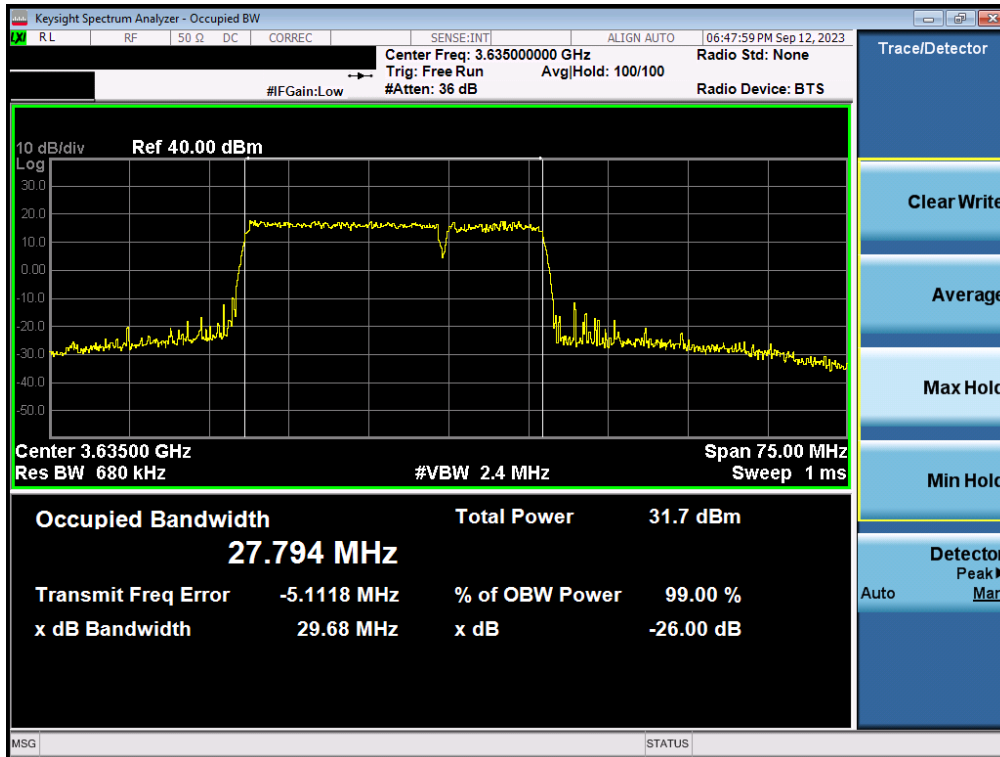


Plot 7-4. Occupied Bandwidth Plot (ULCA LB48 - 20+15MHz 16-QAM - Full RB Configuration)

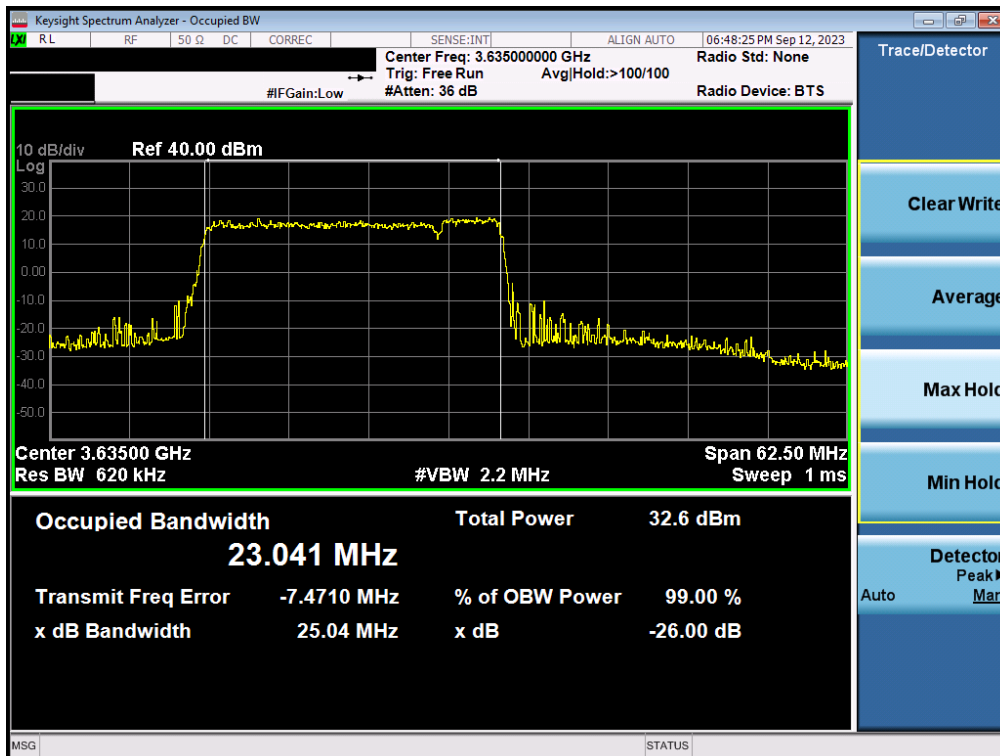


Plot 7-5. Occupied Bandwidth Plot (ULCA LB48 - 20+10MHz QPSK - Full RB Configuration)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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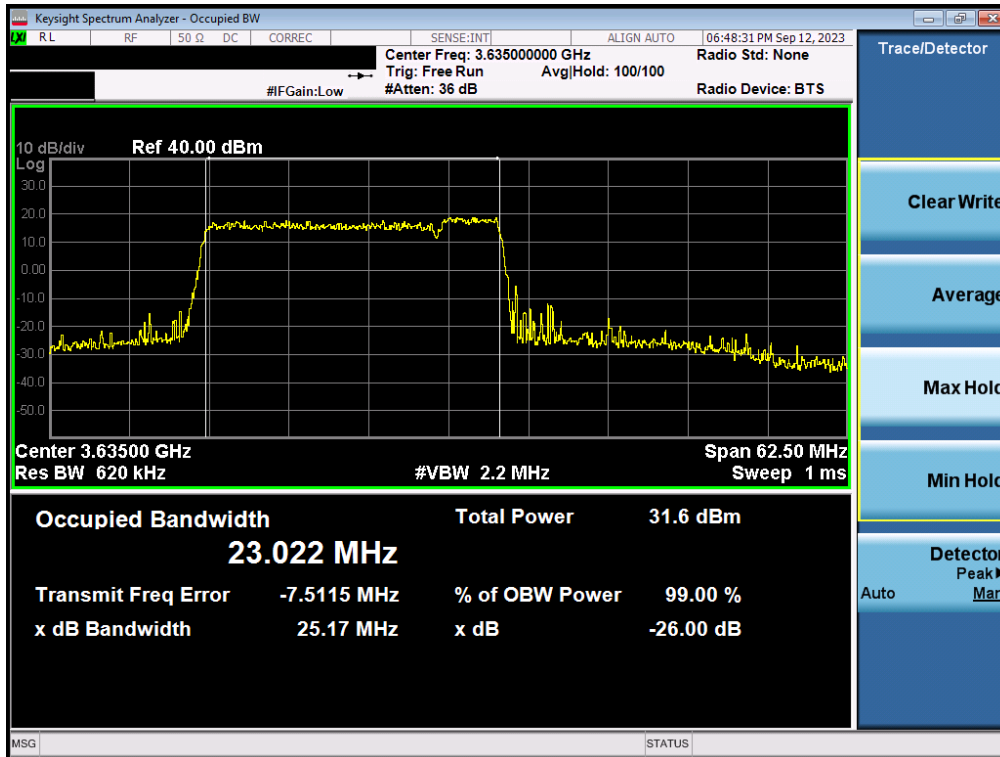


Plot 7-6. Occupied Bandwidth Plot (ULCA LB48 - 20+10MHz 16-QAM - Full RB Configuration)



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

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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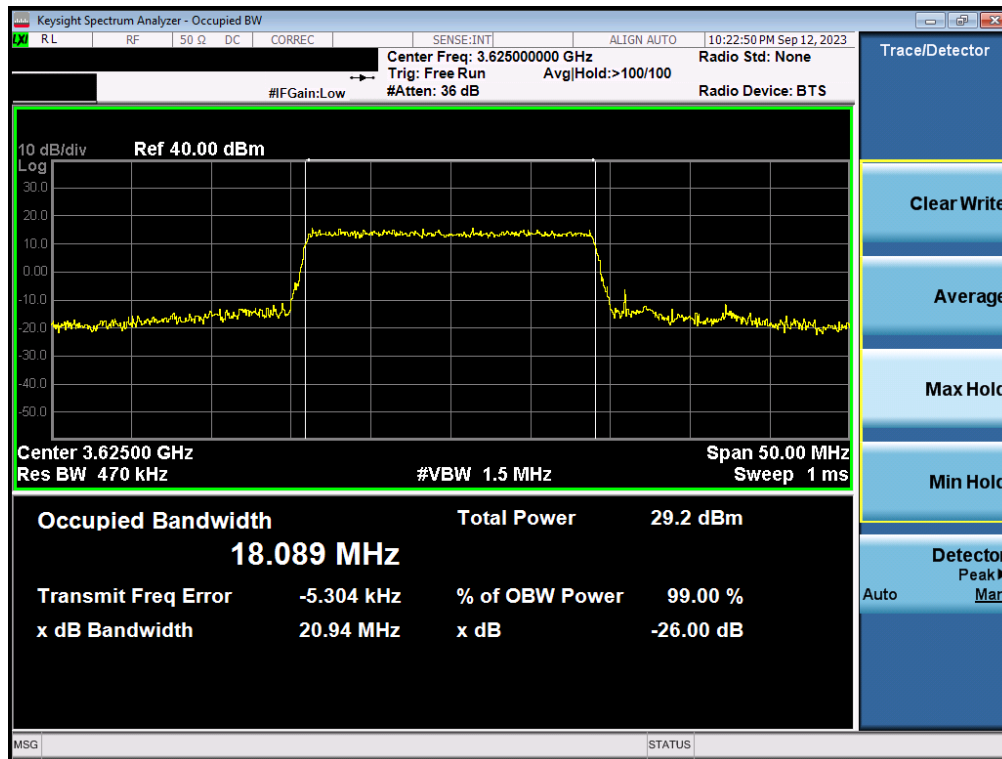
Plot 7-8. Occupied Bandwidth Plot (ULCA LB48 - 20+5MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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LTE Band 48

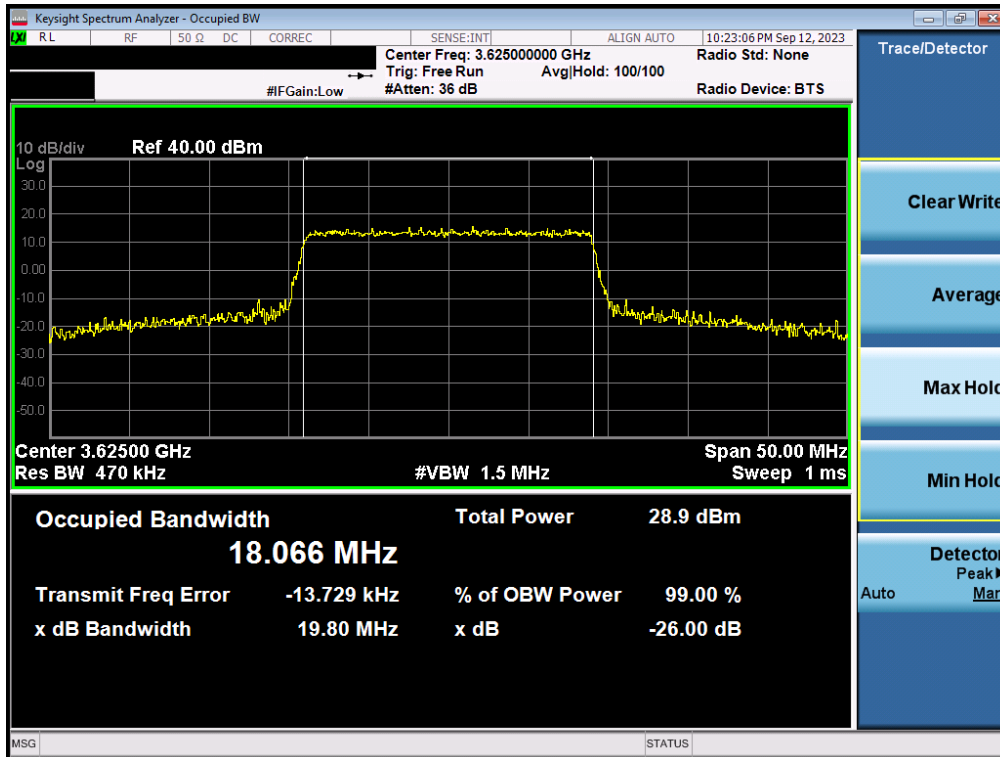
Mode	Bandwidth	Modulation	OBW [MHz]
LTE Band 48	20 MHz	QPSK	18.09
		16QAM	18.07
	15 MHz	QPSK	13.56
		16QAM	13.51
	10 MHz	QPSK	9.05
		16QAM	9.03
5 MHz	QPSK	4.54	
	16QAM	4.53	

Table 7-10. Occupied Bandwidth Test Results (LTE Band 48)

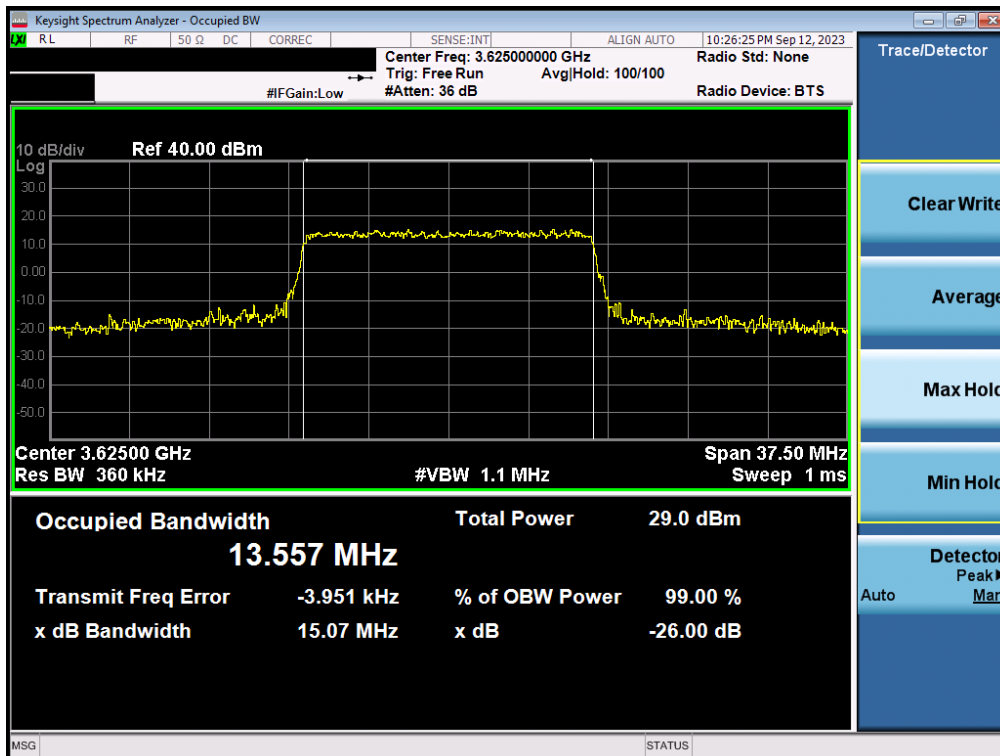


Plot 7-9. Occupied Bandwidth Plot (LTE Band 48 - 20MHz QPSK - Full RB Configuration)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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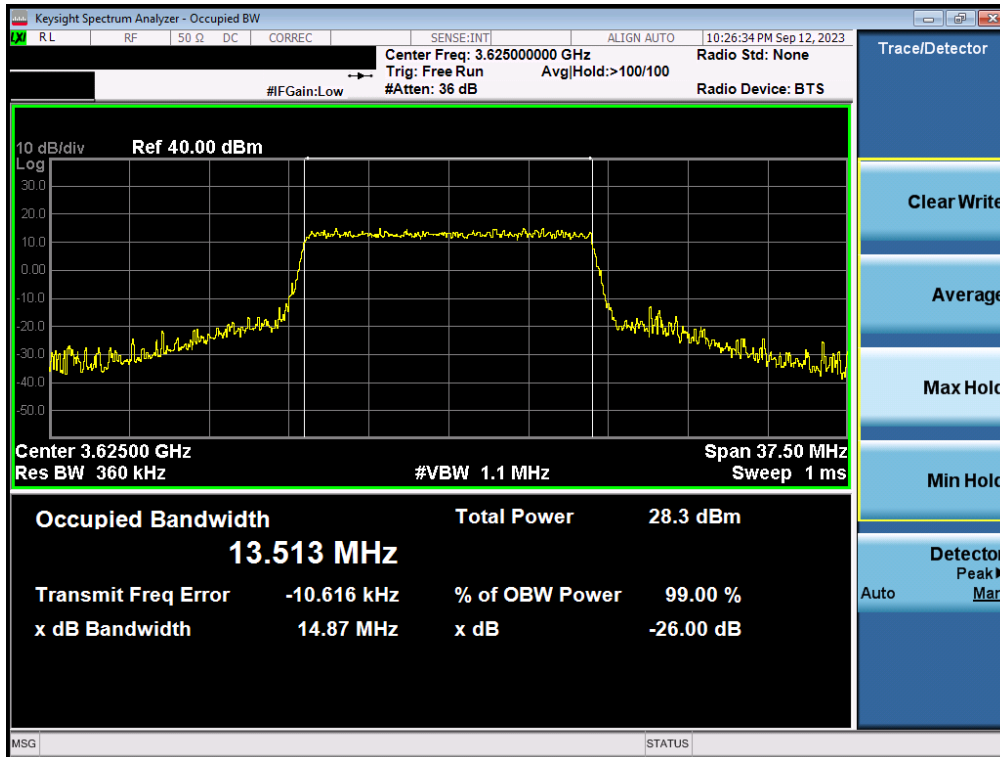


Plot 7-10. Occupied Bandwidth Plot (LTE Band 48 - 20MHz 16-QAM - Full RB Configuration)

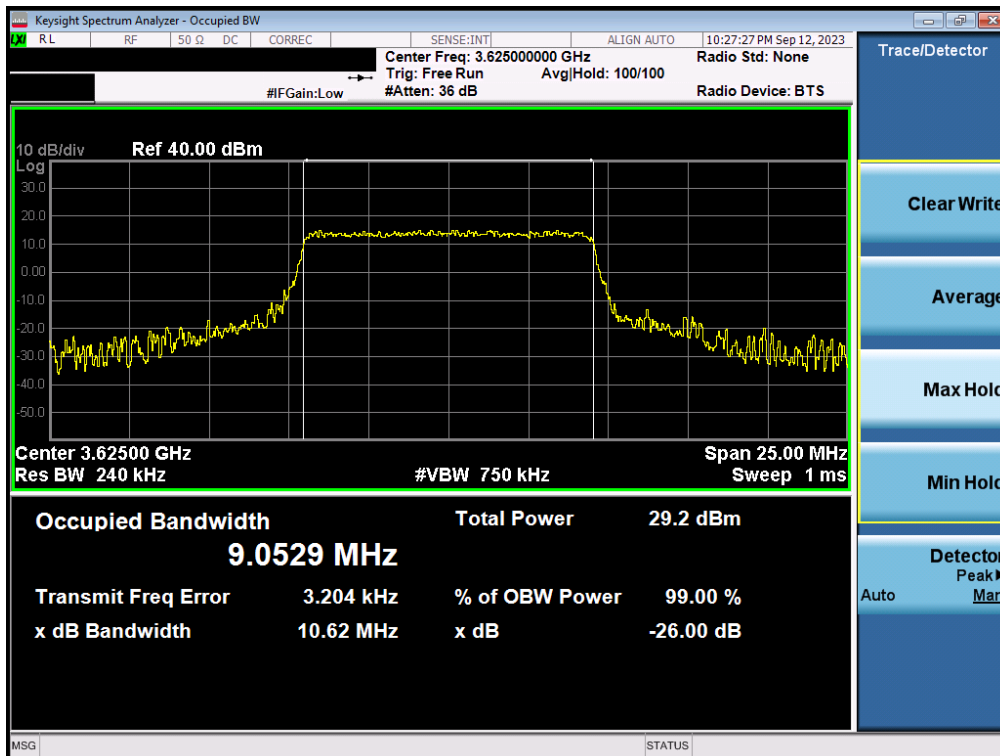


Plot 7-11. Occupied Bandwidth Plot (LTE Band 48 - 15MHz QPSK - Full RB Configuration)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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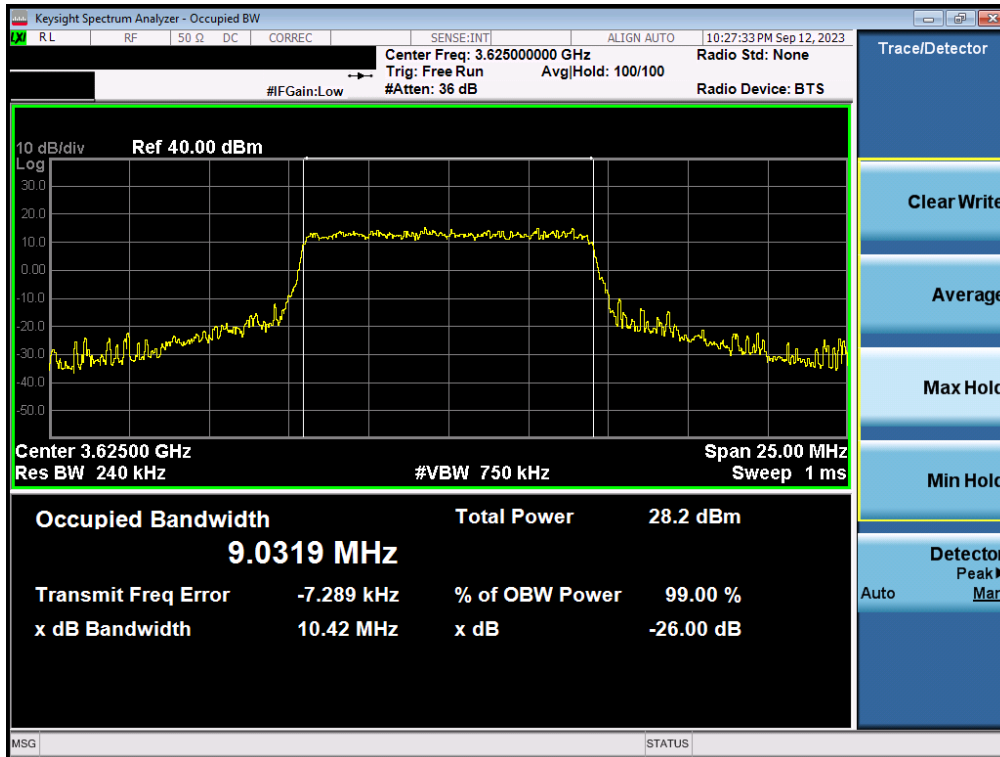


Plot 7-12. Occupied Bandwidth Plot (LTE Band 48 - 15MHz 16-QAM - Full RB Configuration)

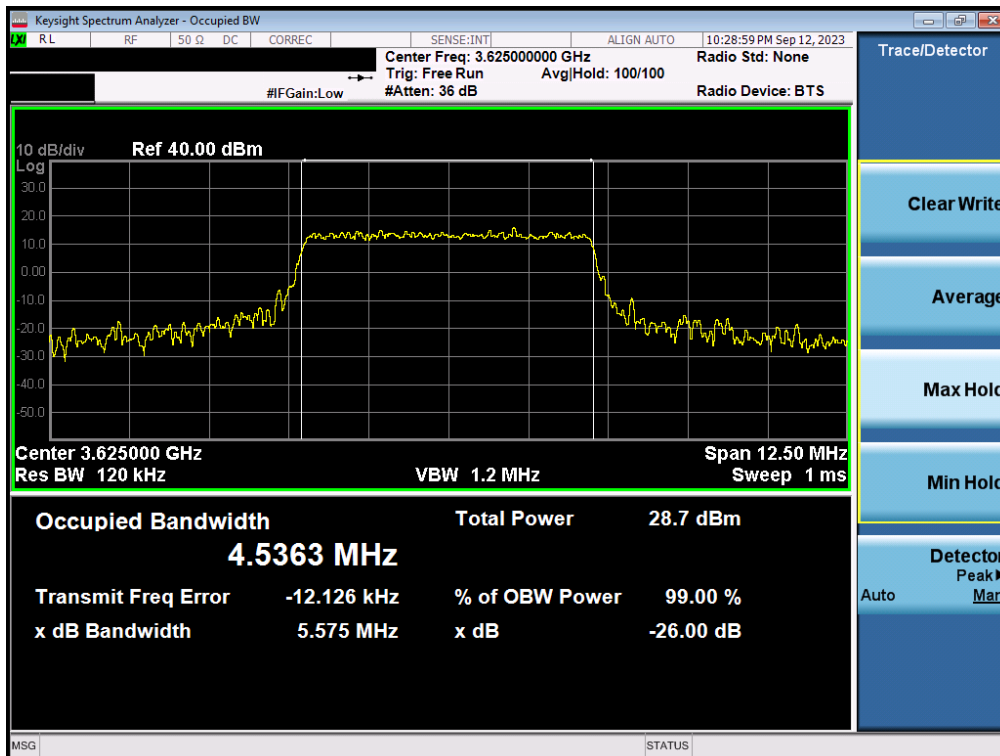


Plot 7-13. Occupied Bandwidth Plot (LTE Band 48 - 10MHz QPSK - Full RB Configuration)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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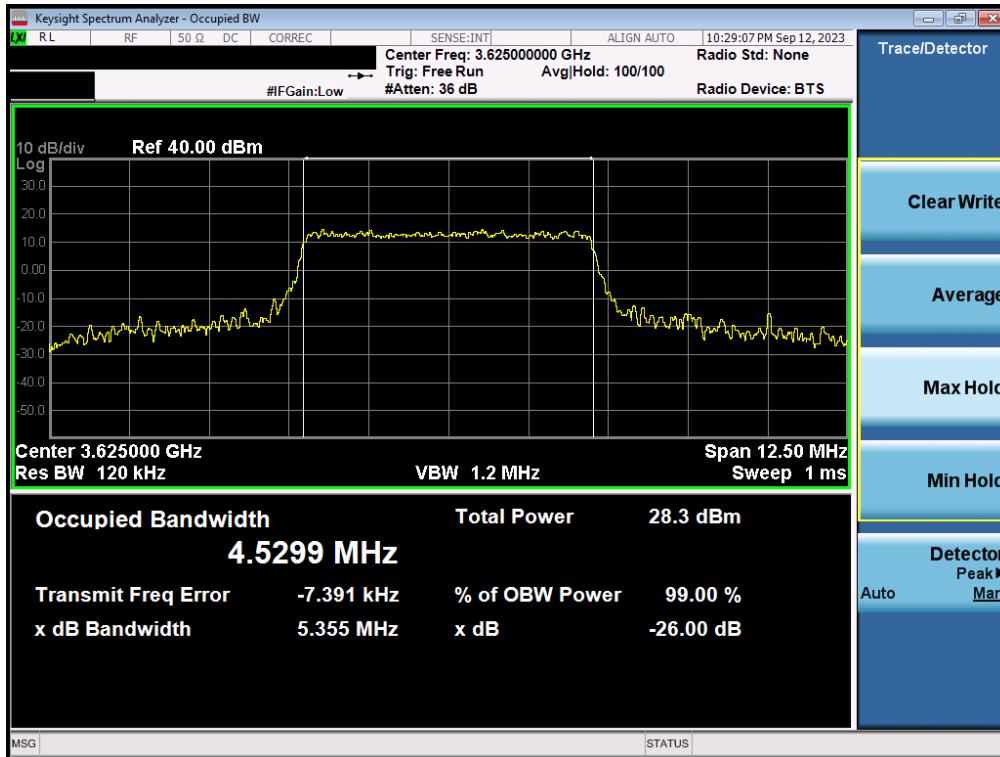


Plot 7-14. Occupied Bandwidth Plot (LTE Band 48 - 10MHz 16-QAM - Full RB Configuration)



Plot 7-15. Occupied Bandwidth Plot (LTE Band 48 - 5MHz QPSK - Full RB Configuration)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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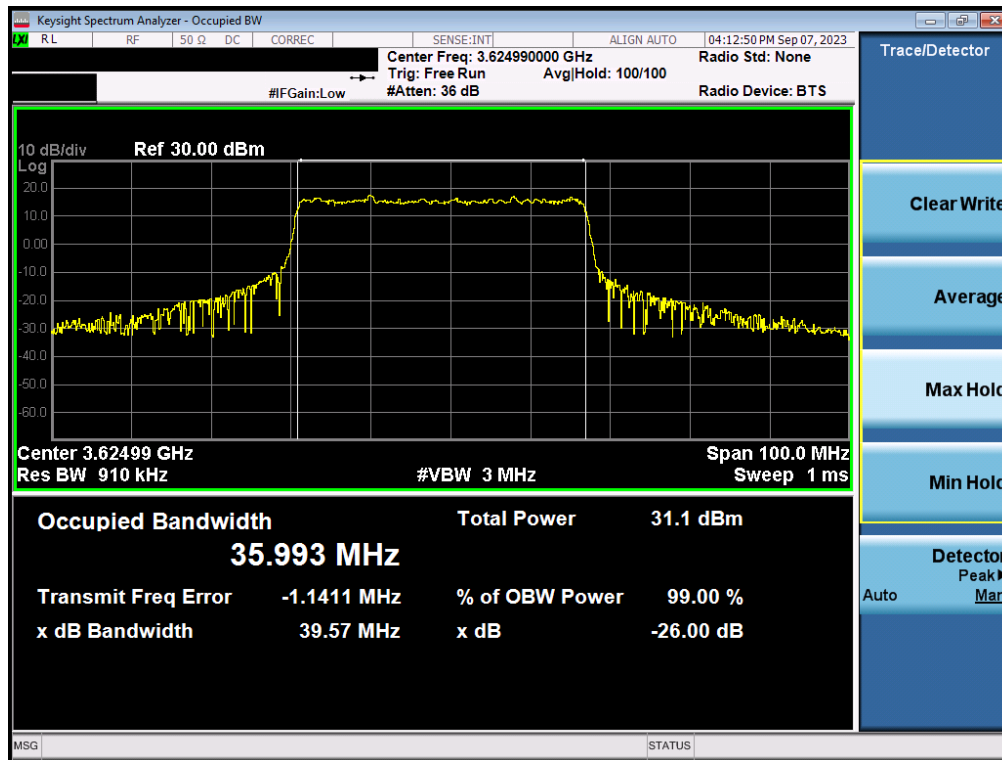
Plot 7-16. Occupied Bandwidth Plot (LTE Band 48 - 5MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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NR Band n48 Ant F

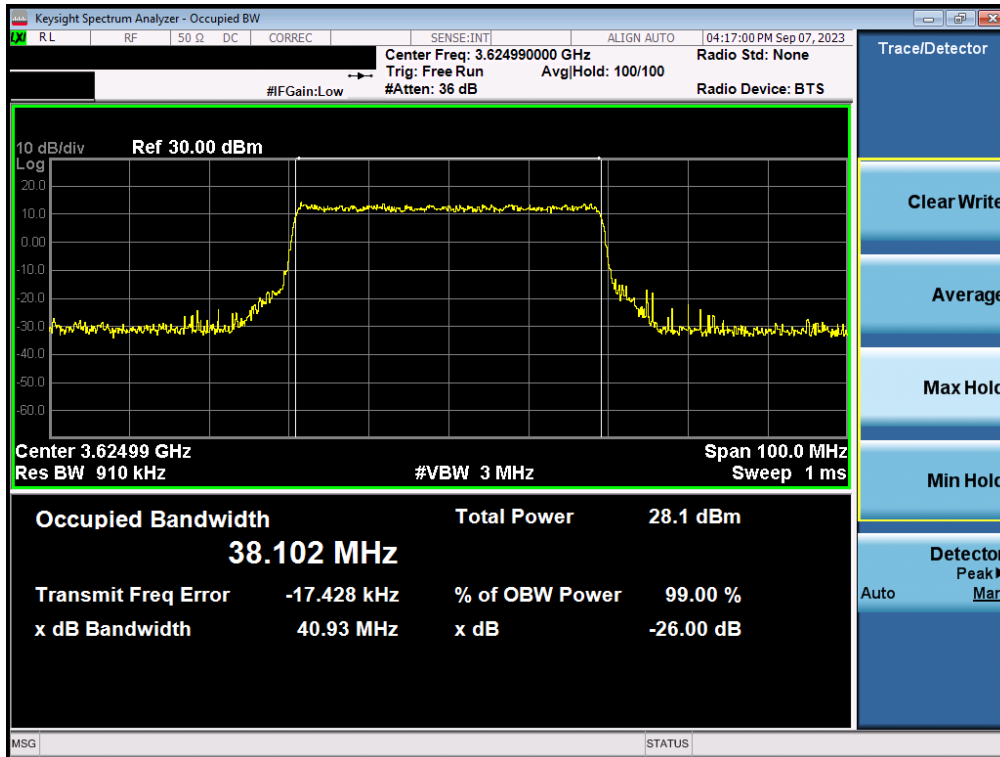
Mode	Bandwidth	Modulation	OBW [MHz]
NR Band n48	40 MHz	$\pi/2$ BPSK	35.99
		QPSK	38.10
		16QAM	38.21
	30 MHz	$\pi/2$ BPSK	27.08
		QPSK	28.00
		16QAM	28.03
	20 MHz	$\pi/2$ BPSK	18.03
		QPSK	18.42
		16QAM	18.41
	15 MHz	$\pi/2$ BPSK	13.09
		QPSK	13.74
		16QAM	13.73
10 MHz	$\pi/2$ BPSK	8.71	
	QPSK	8.74	
	16QAM	8.70	

Table 7-11 Occupied Bandwidth Test Results (NR Band n48 Ant F)

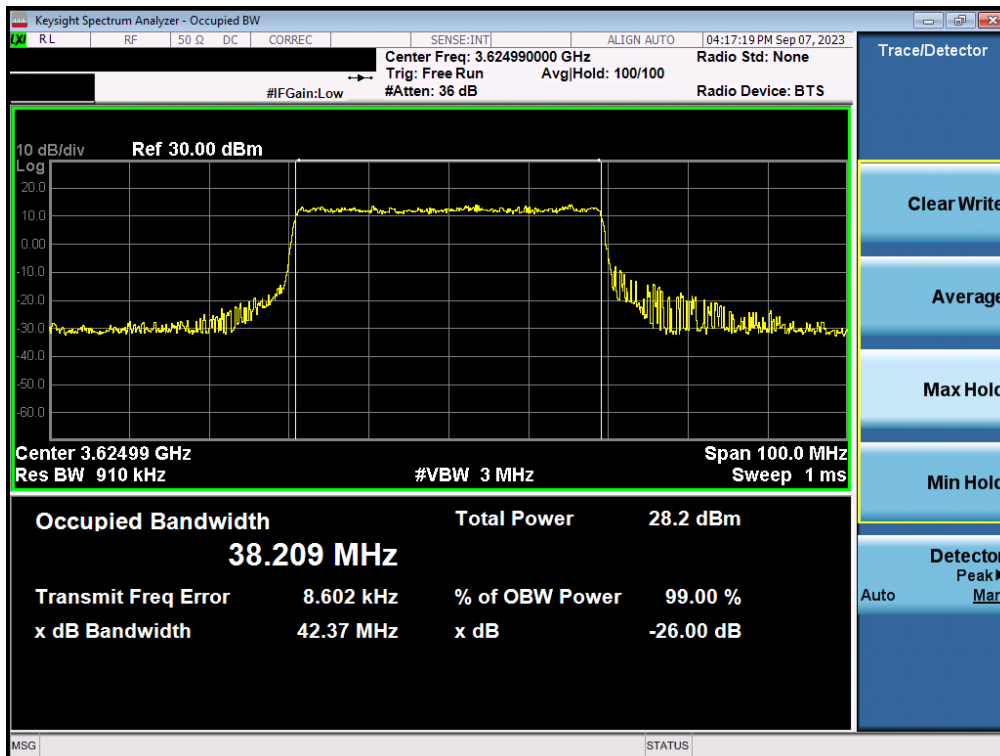


Plot 7-17. Occupied Bandwidth Plot (NR Band n48 - 40MHz $\pi/2$ BPSK - Full RB Configuration)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210092-08.A3L	Test Dates: 9/6/2023 - 10/22/2023	EUT Type: Portable Handset	Page 30 of 110

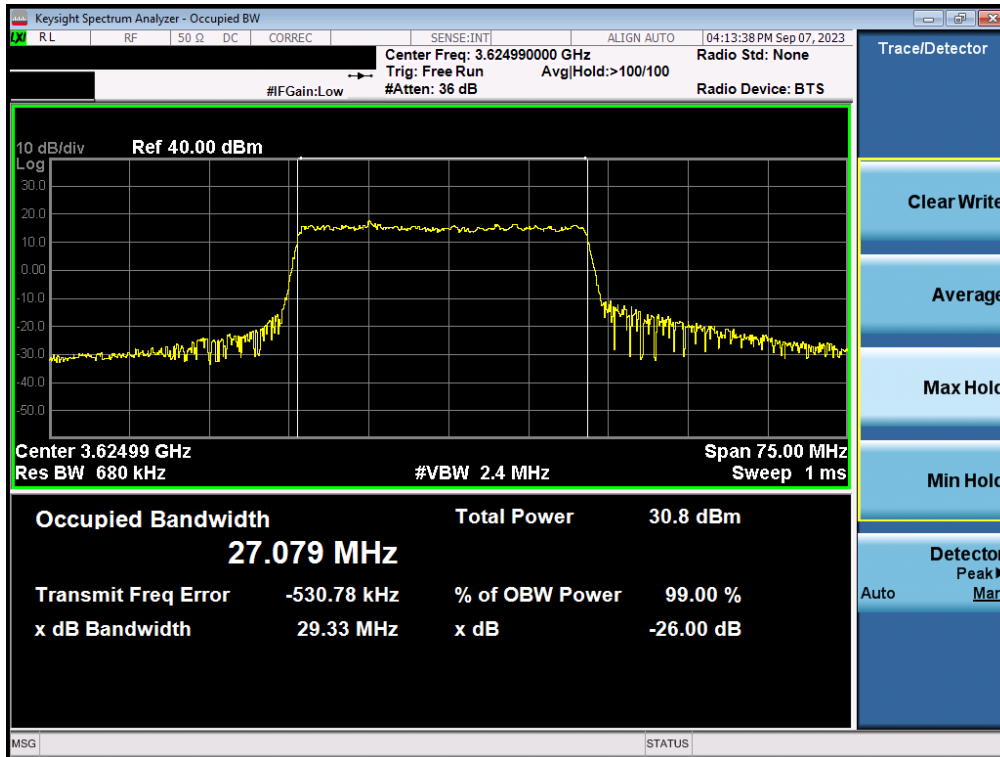


Plot 7-18. Occupied Bandwidth Plot (NR Band n48 - 40MHz QPSK - Full RB Configuration)

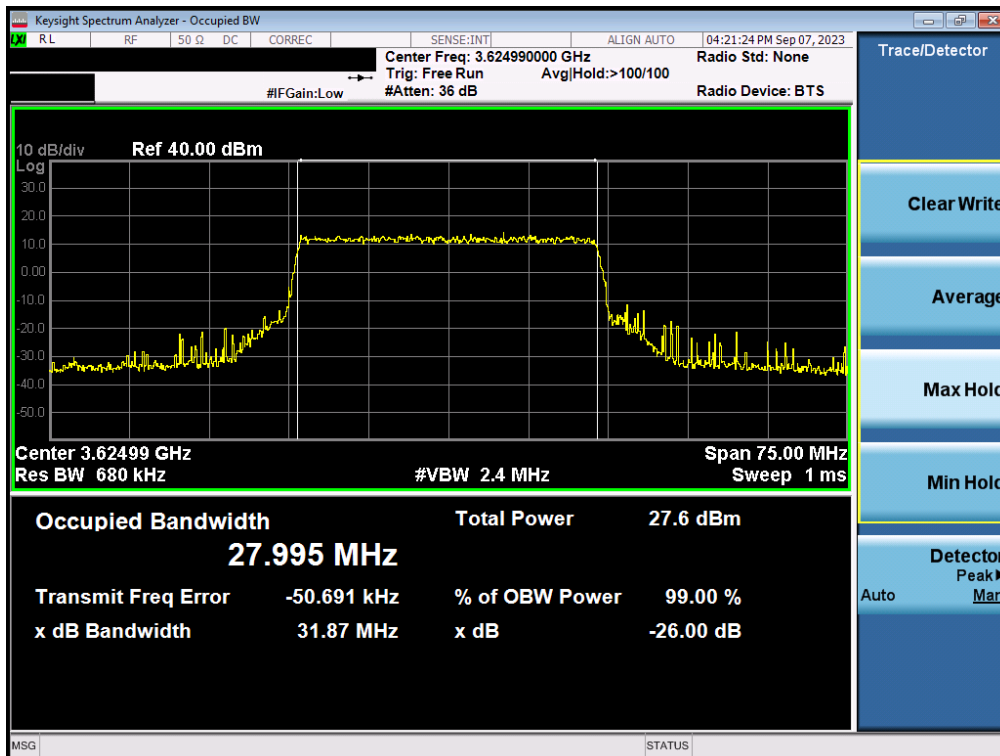


Plot 7-19. Occupied Bandwidth Plot (NR Band n48 - 40MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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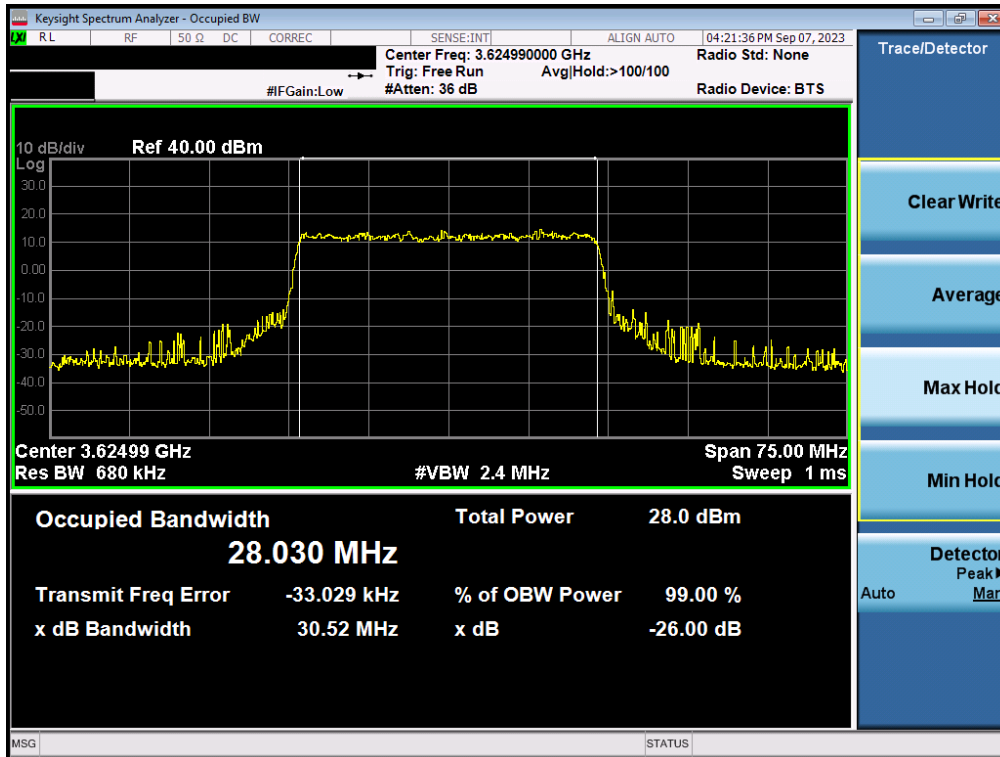


Plot 7-20. Occupied Bandwidth Plot (NR Band n48 - 30MHz $\pi/2$ BPSK - Full RB Configuration)

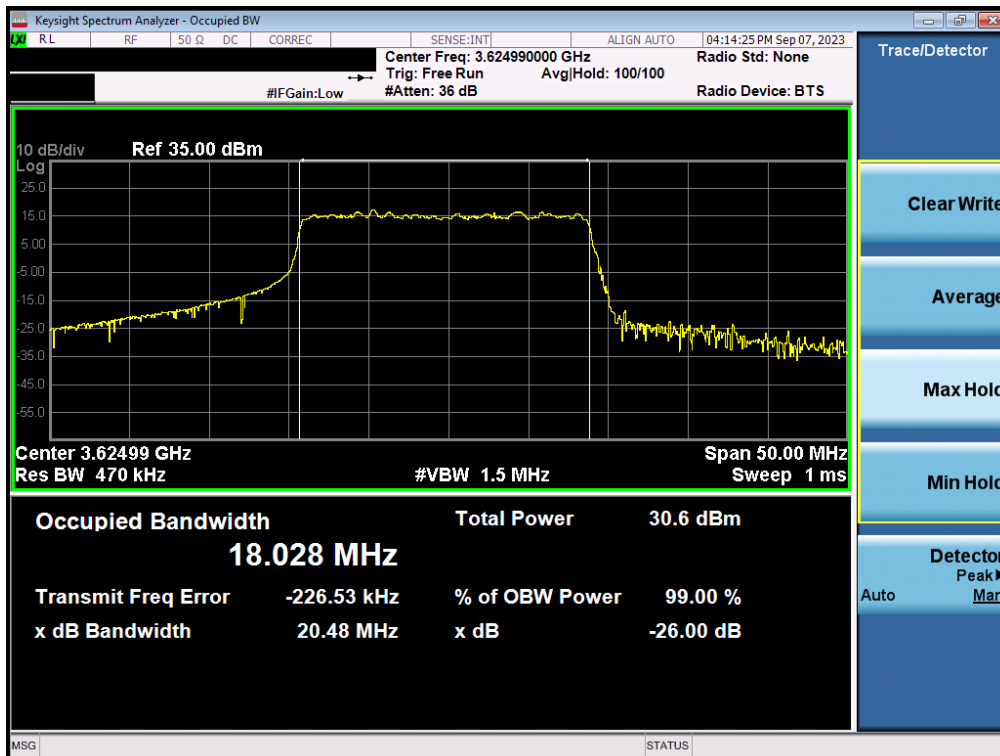


Plot 7-21. Occupied Bandwidth Plot (NR Band n48 - 30MHz QPSK - Full RB Configuration)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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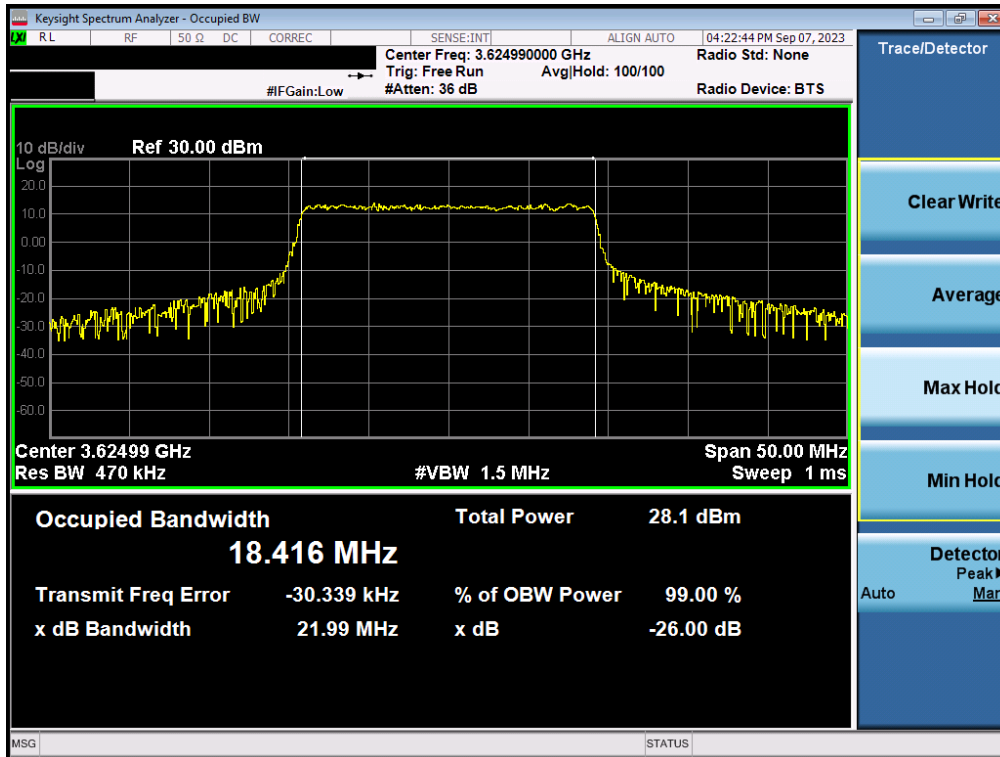


Plot 7-22. Occupied Bandwidth Plot (NR Band n48 - 30MHz 16-QAM - Full RB Configuration)

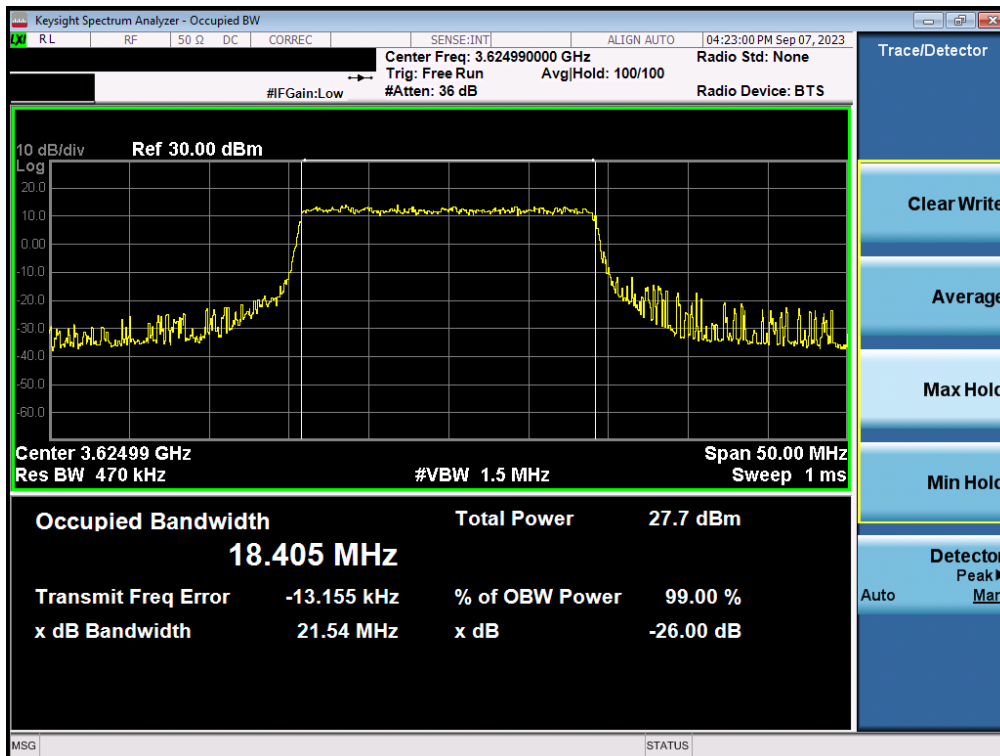


Plot 7-23. Occupied Bandwidth Plot (NR Band n48 - 20MHz $\pi/2$ BPSK - Full RB Configuration)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210092-08.A3L	Test Dates: 9/6/2023 - 10/22/2023	EUT Type: Portable Handset	Page 33 of 110

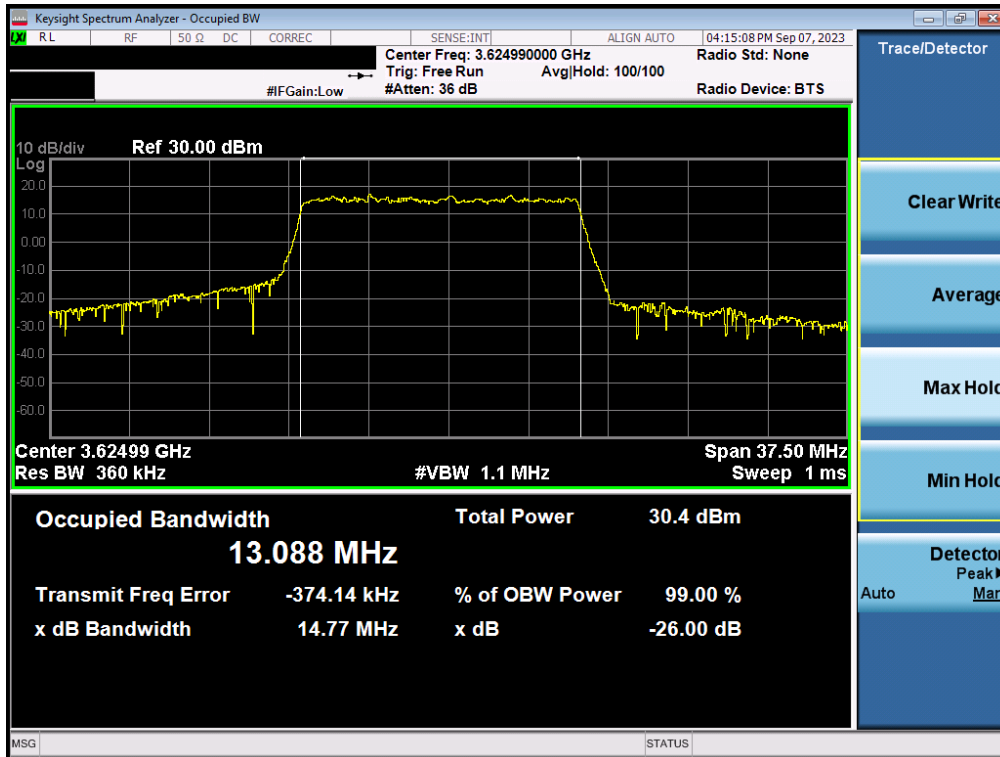


Plot 7-24. Occupied Bandwidth Plot (NR Band n48 - 20MHz QPSK - Full RB Configuration)

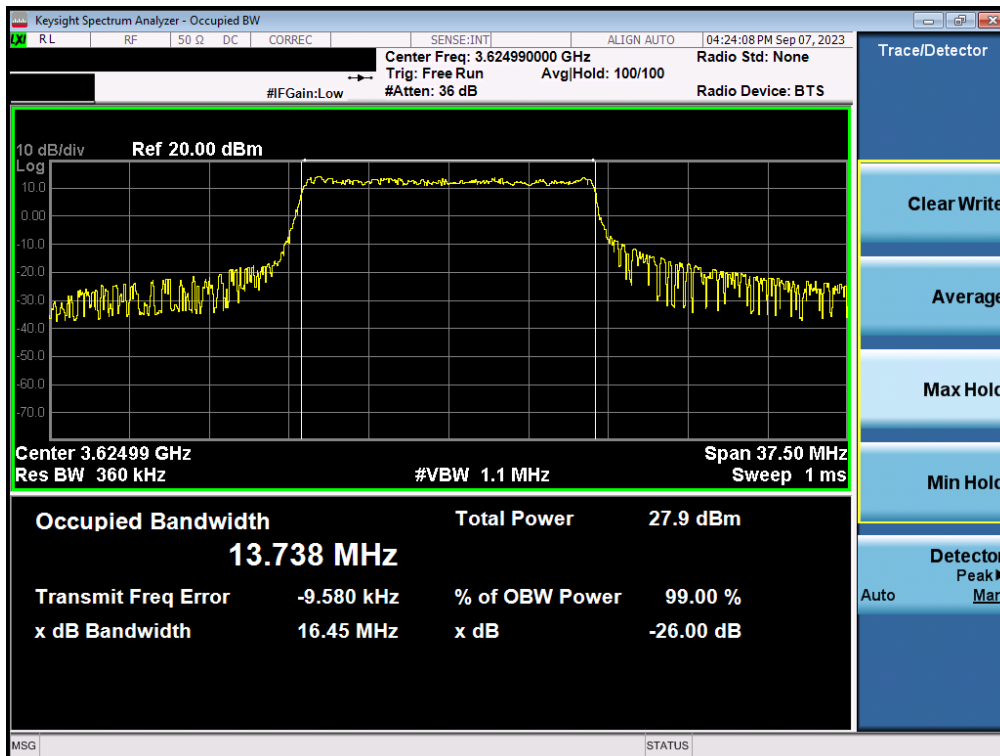


Plot 7-25. Occupied Bandwidth Plot (NR Band n48 - 20MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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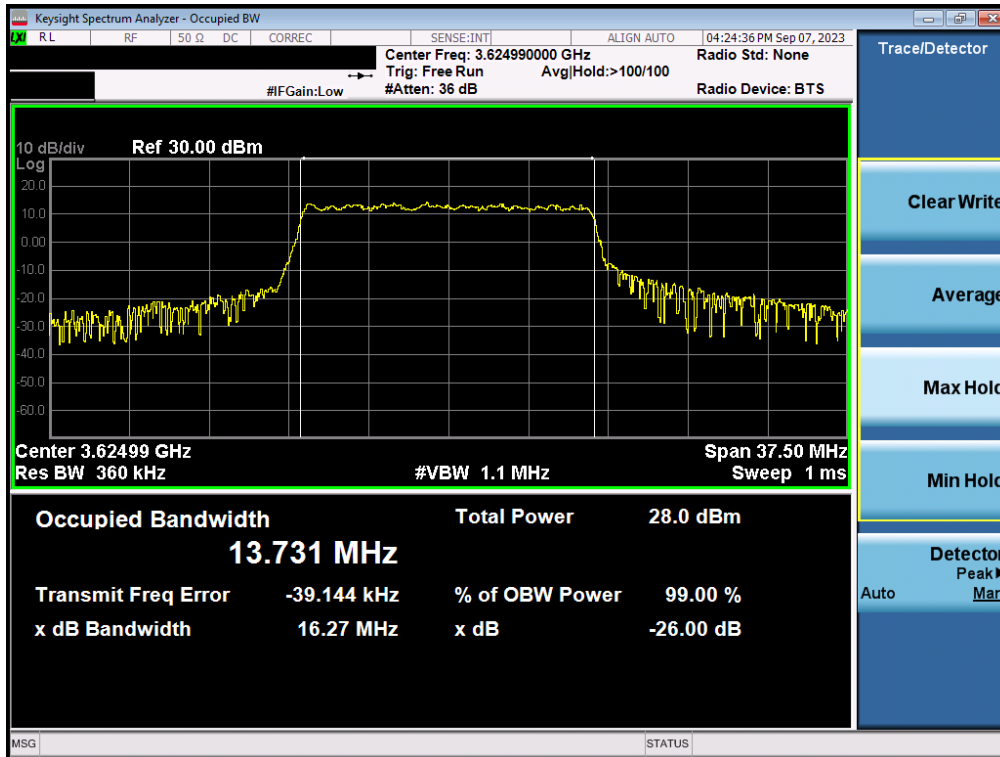


Plot 7-26. Occupied Bandwidth Plot (NR Band n48 - 15MHz $\pi/2$ BPSK - Full RB Configuration)

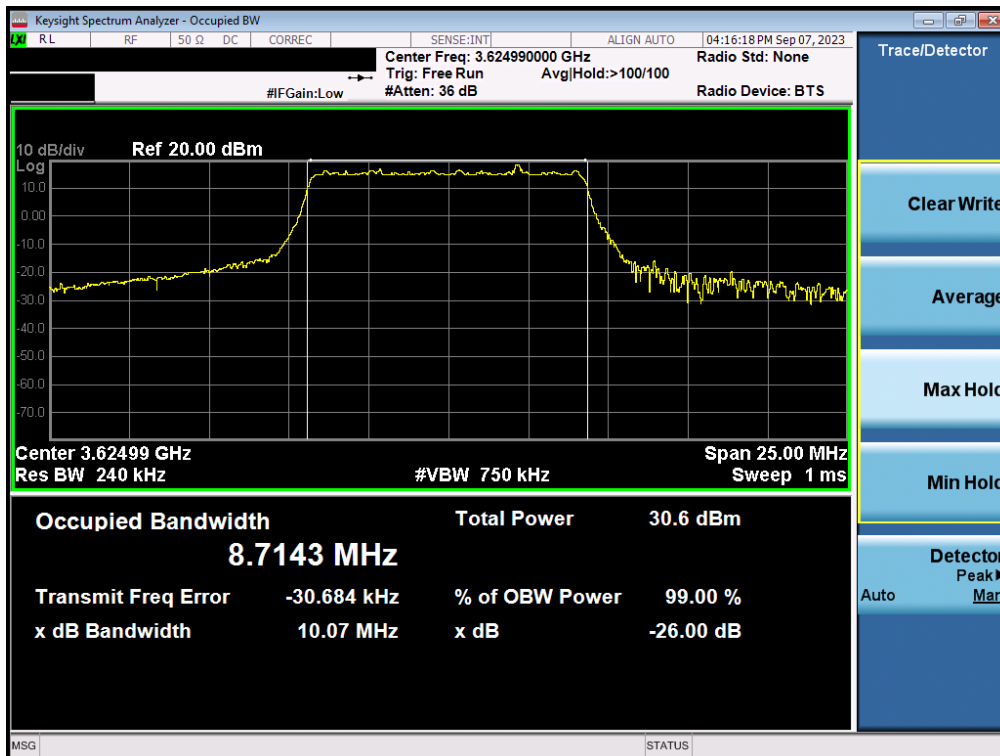


Plot 7-27. Occupied Bandwidth Plot (NR Band n48 - 15MHz QPSK - Full RB Configuration)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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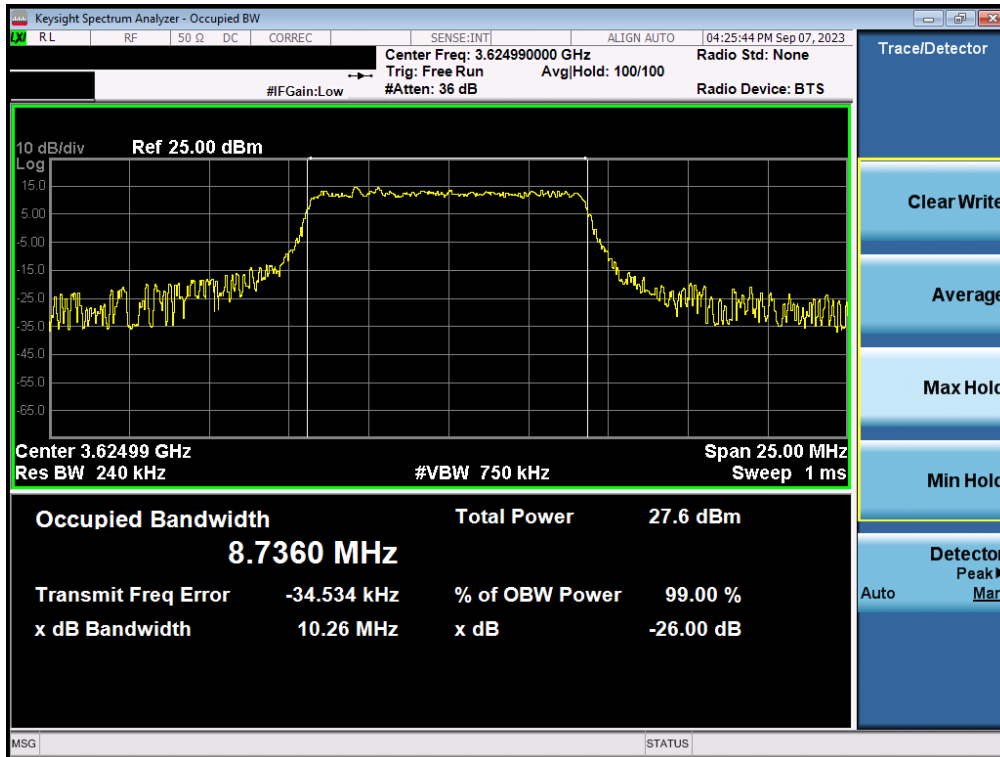


Plot 7-28. Occupied Bandwidth Plot (NR Band n48 - 15MHz 16-QAM - Full RB Configuration)

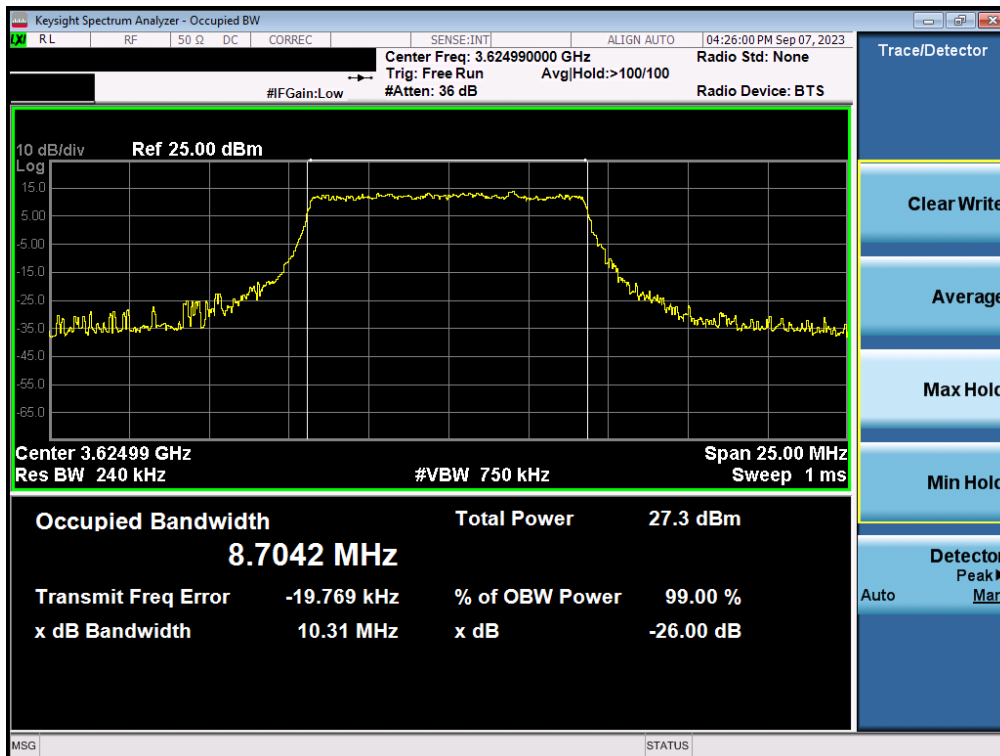


Plot 7-29. Occupied Bandwidth Plot (NR Band n48 - 10MHz $\pi/2$ BPSK - Full RB Configuration)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-30. Occupied Bandwidth Plot (NR Band n48 - 10MHz QPSK - Full RB Configuration)



Plot 7-31. Occupied Bandwidth Plot (NR Band n48 - 10MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMS928U	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 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

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.

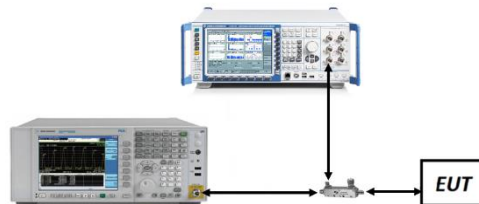


Figure 7-3. Test Instrument & Measurement Setup

Test Notes

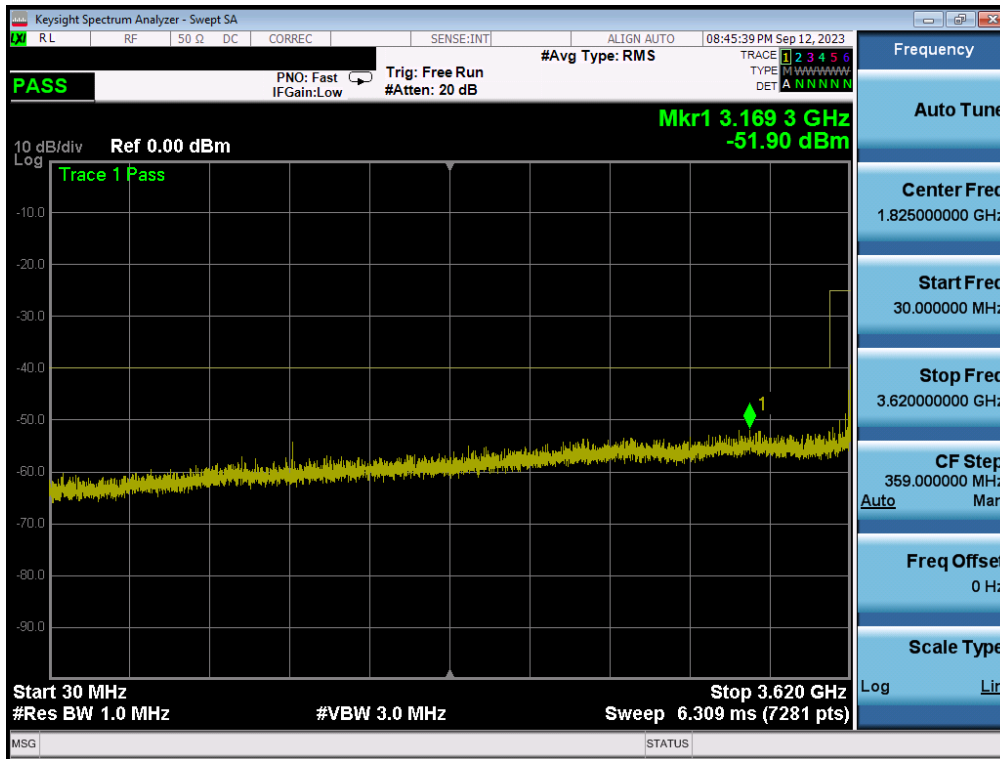
1. Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz.
2. For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst-case configuration. All modes of operation were investigated and the worst-case configuration results are reported in this section.

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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ULCA LB48

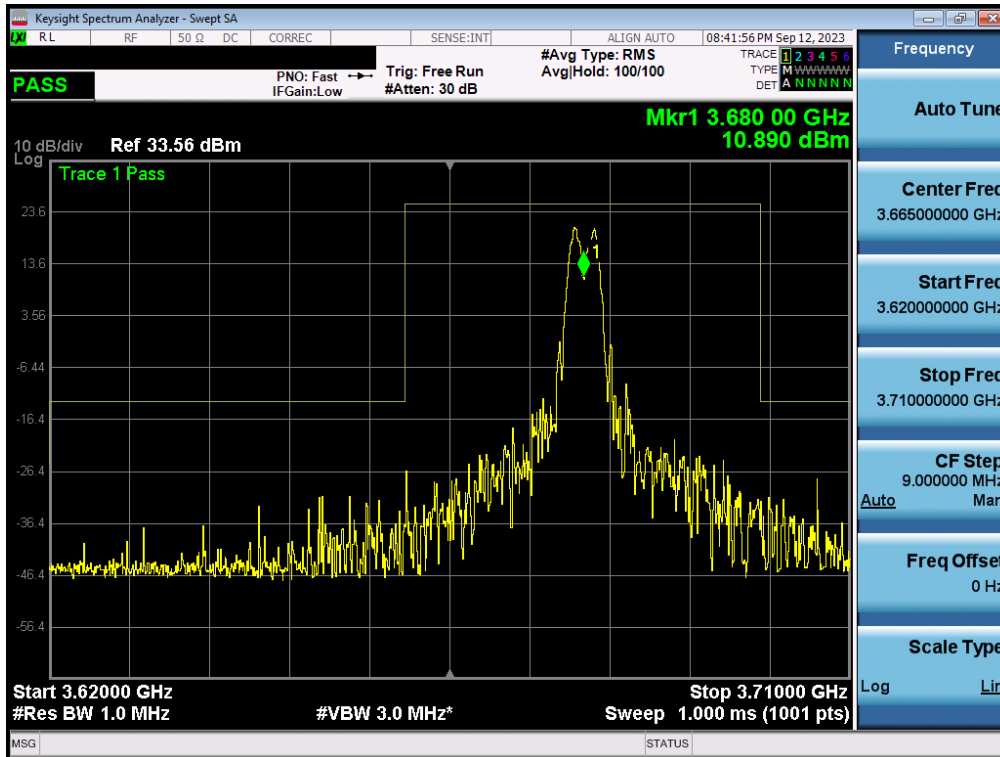
Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
LTE Band 48 ULCA	40 MHz MHz	Low	30.0 - 3,510.0	-47.13	-40	-7.13
		Low	3,540.0 - 3,630.0	12.16	-	-
		Low	3630.0 - 15,000.0	-46.60	-40	-6.60
		Low	15,000.0 - 27,000.0	-48.98	-40	-8.98
		Low	27,000.0 - 37,000.0	-46.37	-40	-6.37
		Mid	30.0 - 3,575.0	-47.16	-40	-7.16
		Mid	3,575.0 - 3,725.0	-12.01	-	-
		Mid	3695.0 - 15,000.0	-44.45	-40	-4.45
		Mid	15,000.0 - 27,000.0	-49.66	-40	-9.66
		Mid	27,000.0 - 37,000.0	-46.32	-40	-6.32
		High	30.0 - 3,620.0	-51.90	-40	-11.90
		High	3,620.0 - 3,710.0	10.89	-	-
		High	3740.0 - 15,000.0	-43.88	-40	-3.88
		High	15,000.0 - 27,000.0	-49.61	-40	-9.61
High	27,000.0 - 37,000.0	-44.86	-40	-4.86		

Table 7-12. Conducted Spurious Emission Results (ULCA LB48)

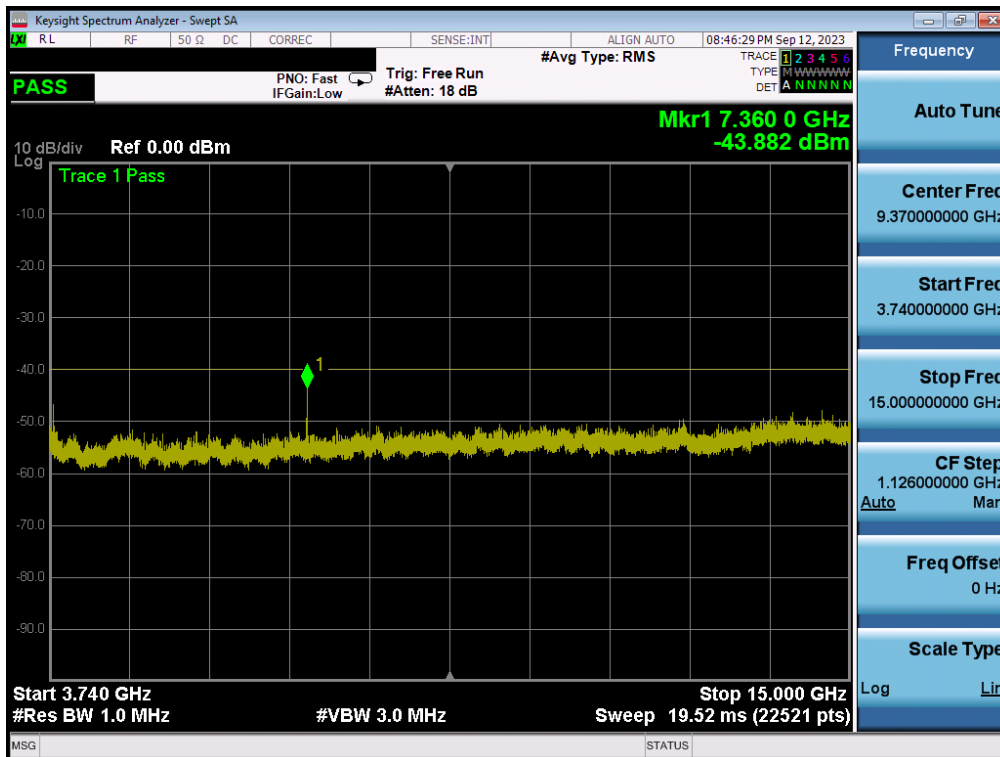


Plot 7-32. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - High Channel)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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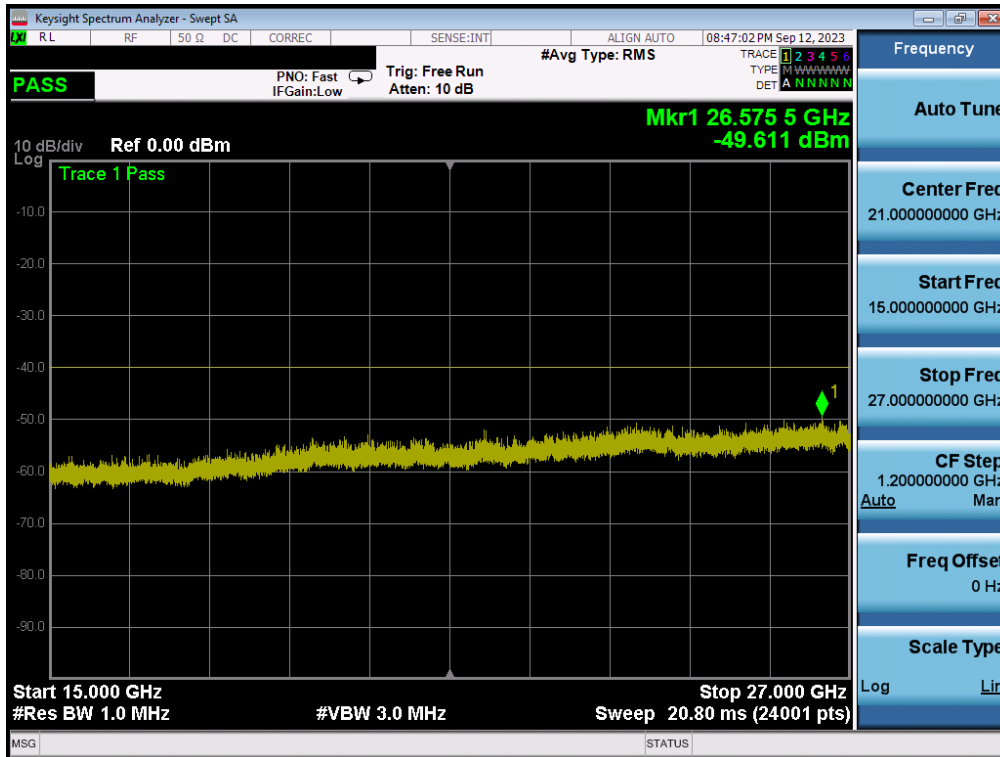


Plot 7-33. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - High Channel)

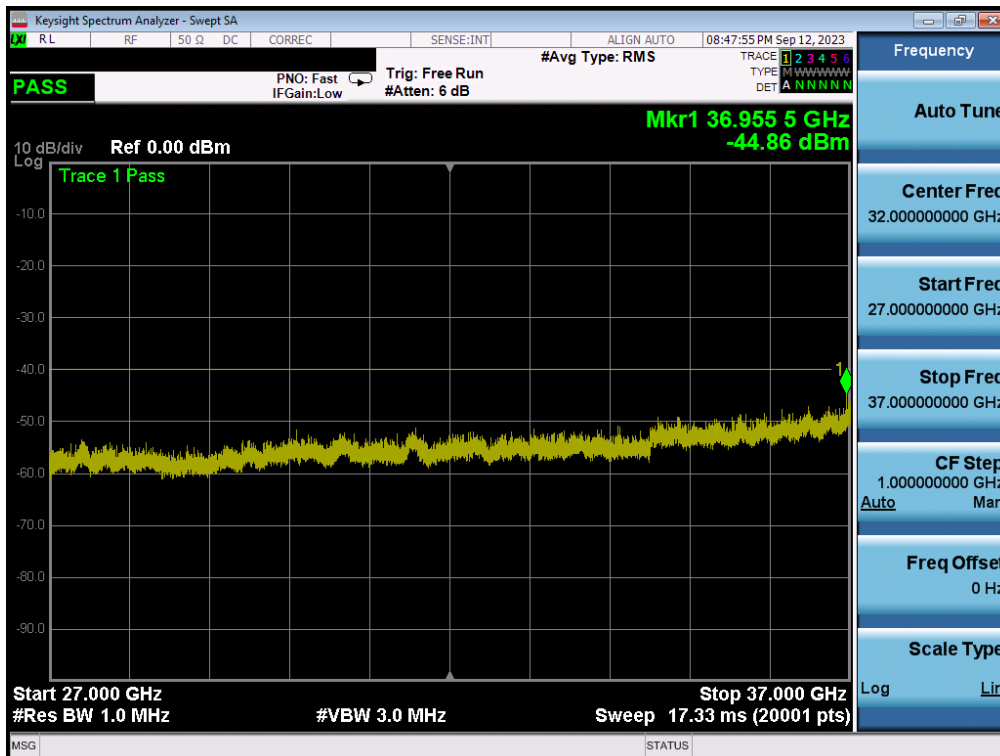


Plot 7-34. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - High Channel)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-35. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - High Channel)



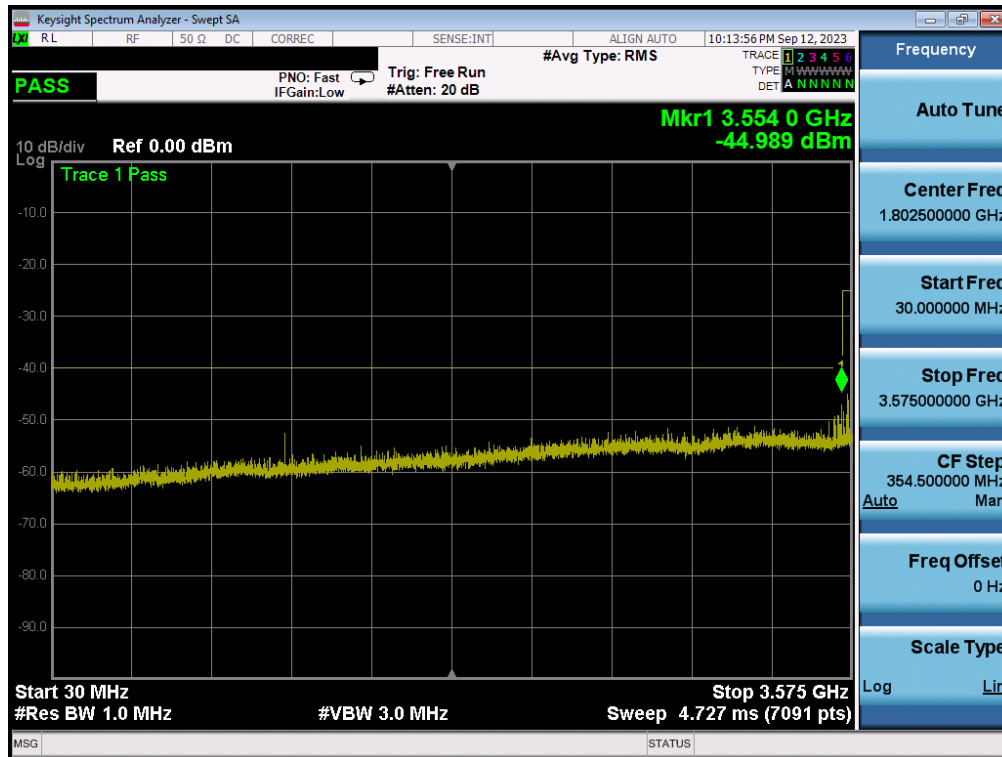
Plot 7-36. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - High Channel)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210092-08.A3L	Test Dates: 9/6/2023 - 10/22/2023	EUT Type: Portable Handset	Page 41 of 110

LTE Band 48

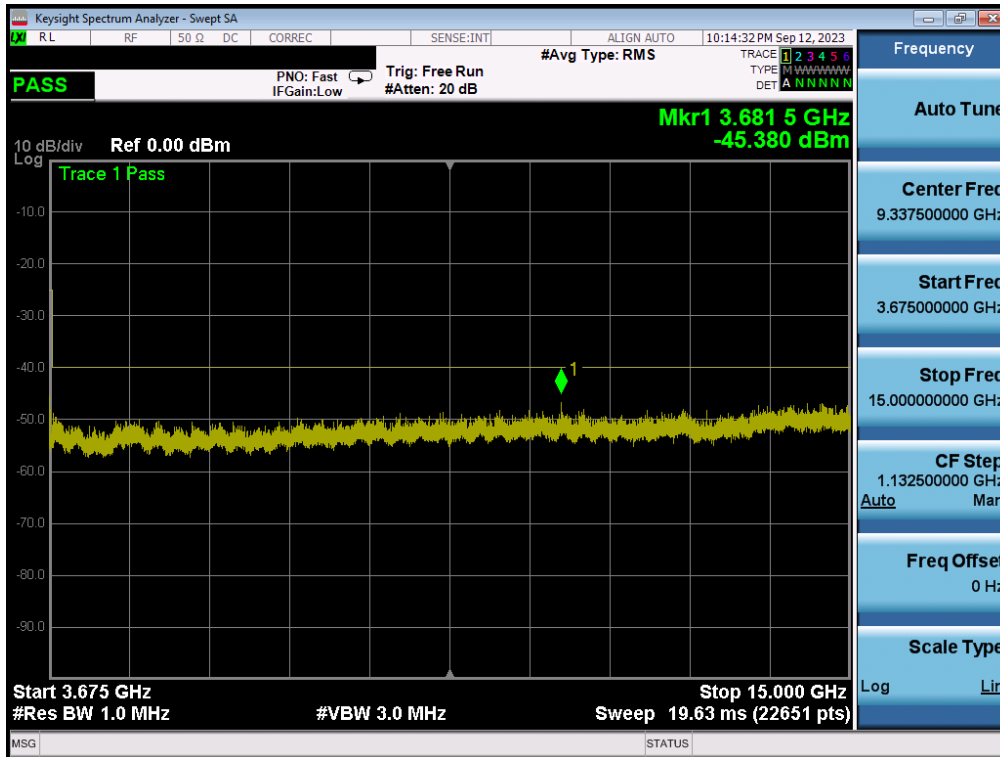
Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
LTE Band 48	20 MHz	Low	30.0 - 3,510.0	-46.96	-40	-6.96
		Low	3610.0 - 15,000.0	-46.96	-40	-6.96
		Low	15,000.0 - 27,000.0	-49.57	-40	-9.57
		Low	27,000.0 - 37,000.0	-46.83	-40	-6.83
		Mid	30.0 - 3,575.0	-44.99	-40	-4.99
		Mid	3675.0 - 15,000.0	-45.38	-40	-5.38
		Mid	15,000.0 - 27,000.0	-49.81	-40	-9.81
		Mid	27,000.0 - 37,000.0	-46.19	-40	-6.19
		High	30.0 - 3,640.0	-50.76	-40	-10.76
		High	3740.0 - 15,000.0	-46.55	-40	-6.55
		High	15,000.0 - 27,000.0	-50.17	-40	-10.17
		High	27,000.0 - 37,000.0	-45.02	-40	-5.02

Table 7-13. Conducted Spurious Emission Results (LTE Band 48)

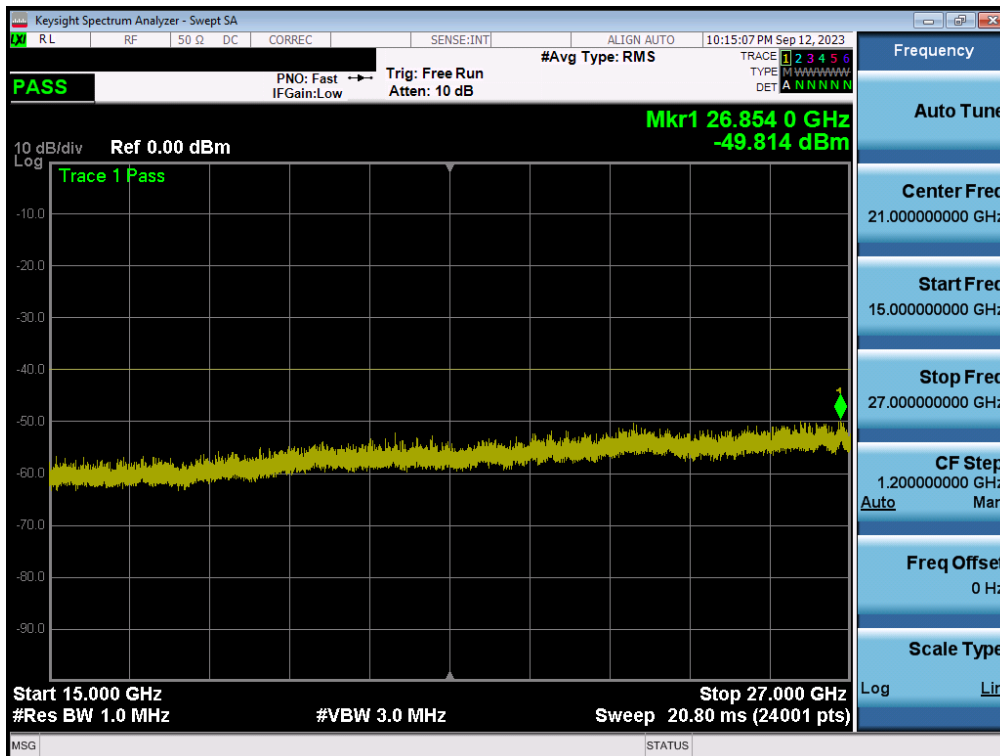


Plot 7-37. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - Mid Channel)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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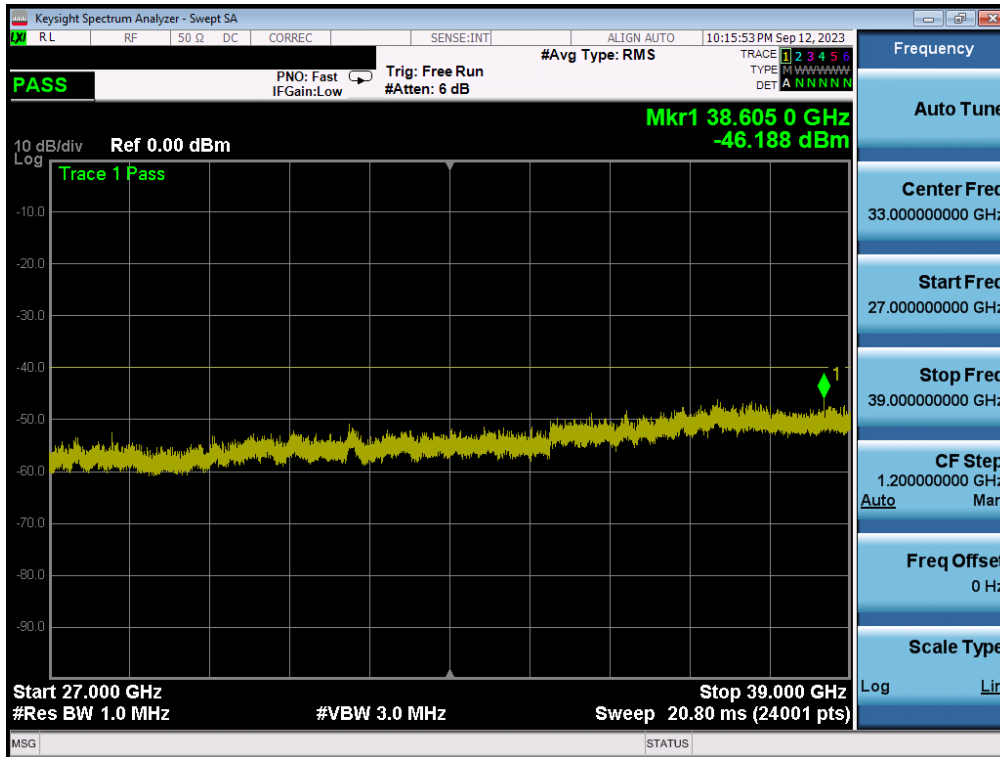


Plot 7-38. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - Mid Channel)



Plot 7-39. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - Mid Channel)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210092-08.A3L	Test Dates: 9/6/2023 - 10/22/2023	EUT Type: Portable Handset	Page 43 of 110



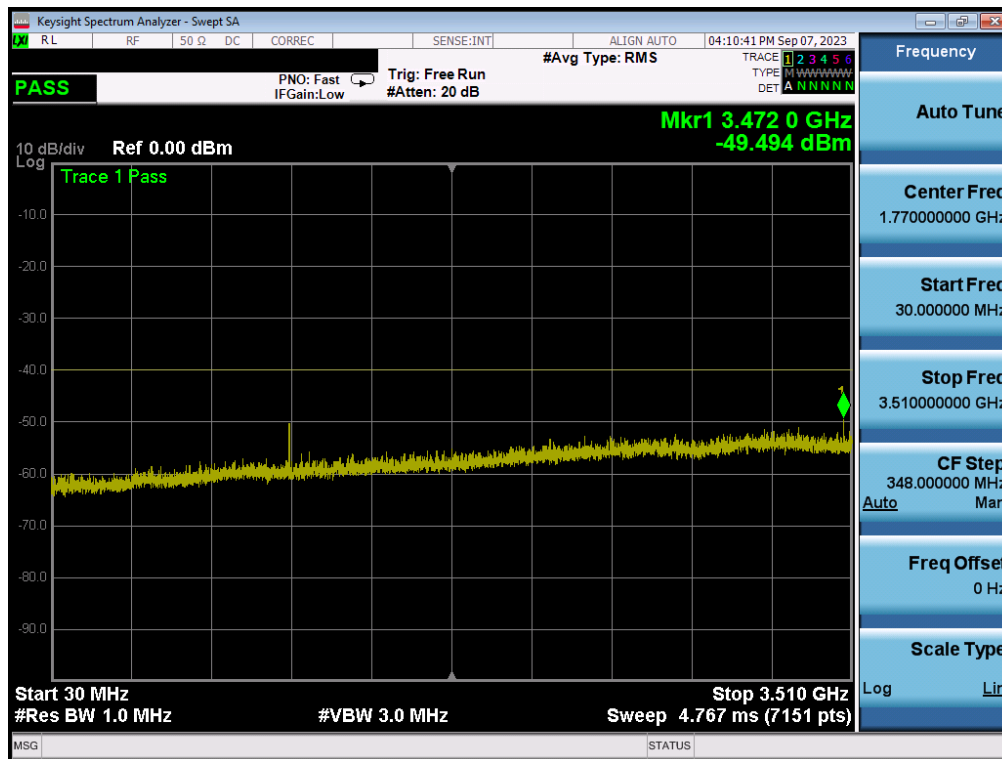
Plot 7-40. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - Mid Channel)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210092-08.A3L	Test Dates: 9/6/2023 - 10/22/2023	EUT Type: Portable Handset	Page 44 of 110

NR Band n48 Ant F

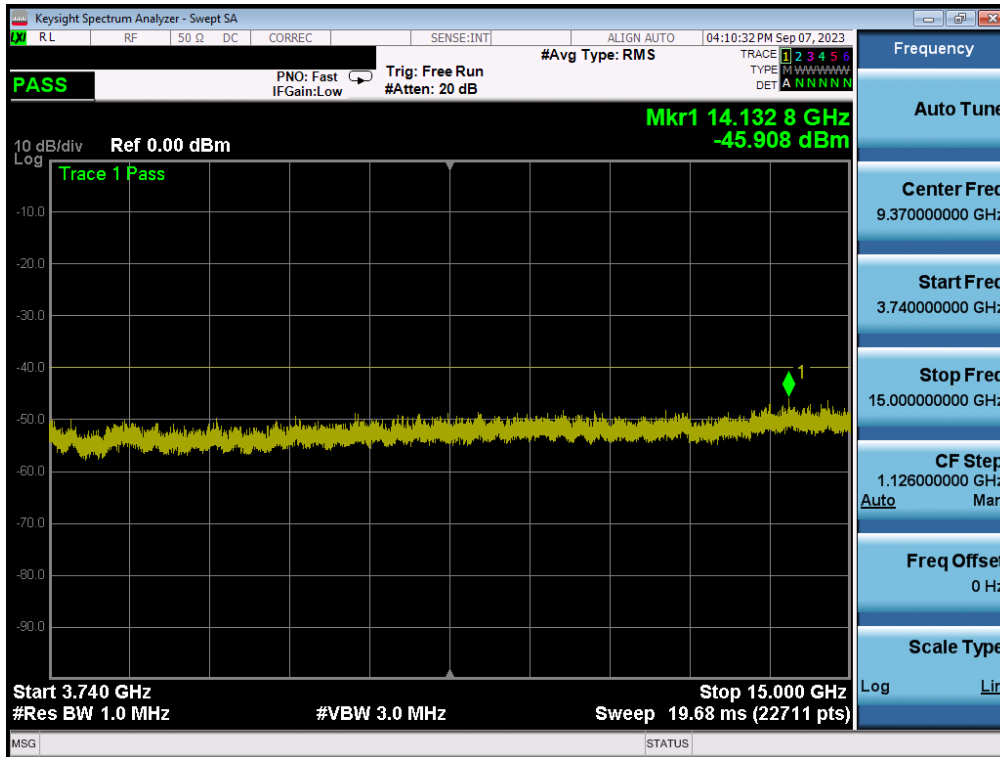
Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
NR Band n48	40 MHz	Low	30.0 - 3,510.0	-50.19	-40	-10.19
		Low	3610.0 - 15,000.0	-45.91	-40	-5.91
		Low	15,000.0 - 27,000.0	-50.05	-40	-10.05
		Low	27,000.0 - 37,000.0	-46.90	-40	-6.90
		Mid	30.0 - 3,510.0	-49.49	-40	-9.49
		Mid	3740.0 - 15,000.0	-45.91	-40	-5.91
		Mid	15,000.0 - 27,000.0	-49.25	-40	-9.25
		Mid	27,000.0 - 37,000.0	-45.71	-40	-5.71
		High	30.0 - 3,640.0	-51.25	-40	-11.25
		High	3740.0 - 15,000.0	-46.89	-40	-6.89
		High	15,000.0 - 27,000.0	-49.89	-40	-9.89
		High	27,000.0 - 37,000.0	-46.27	-40	-6.27

Table 7-14. Conducted Spurious Emission Results (NR Band n48 Ant F)

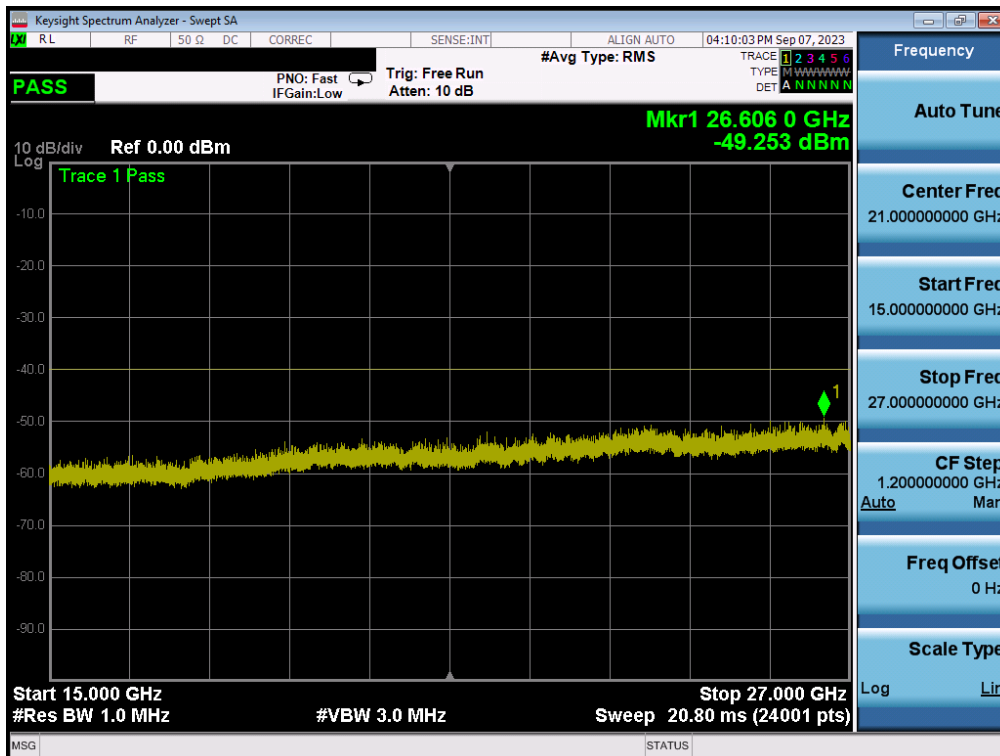


Plot 7-41. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - Mid Channel)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210092-08.A3L	Test Dates: 9/6/2023 - 10/22/2023	EUT Type: Portable Handset	Page 45 of 110

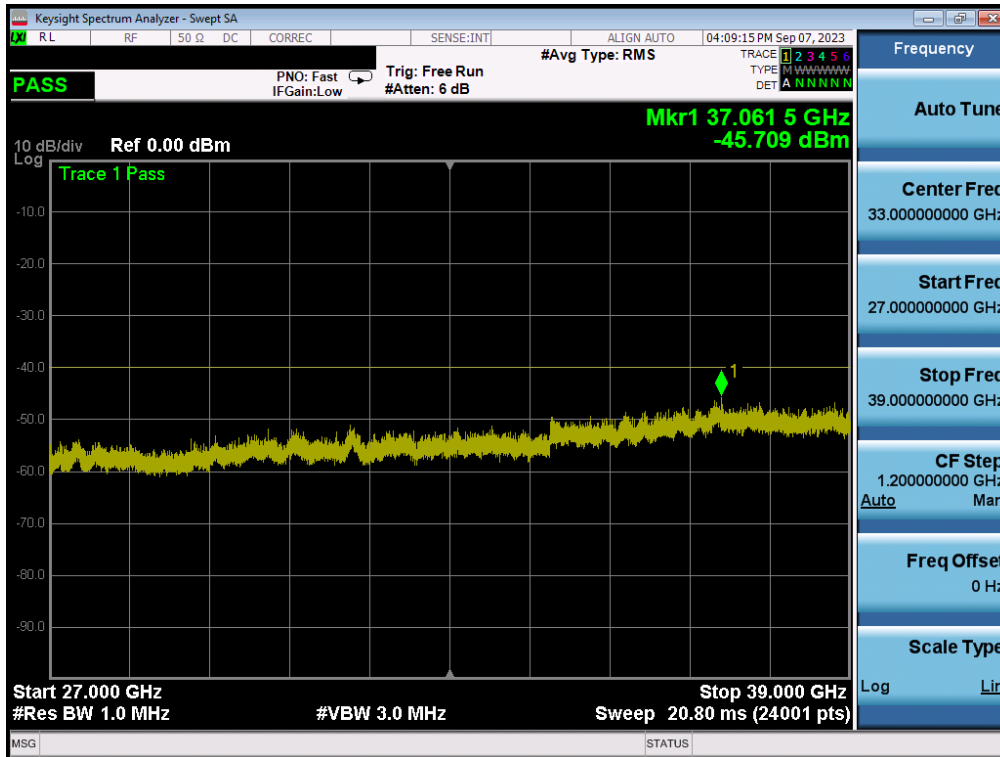


Plot 7-42. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - Mid Channel)



Plot 7-43. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - Mid Channel)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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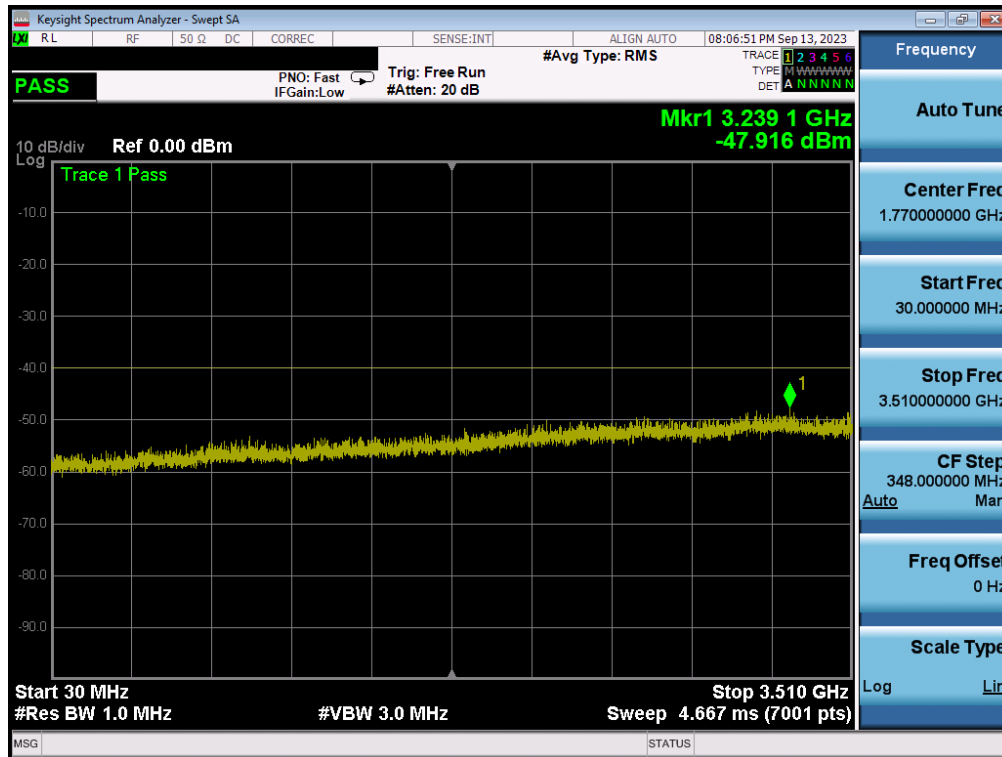
Plot 7-44. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - Mid Channel)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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NR Band n48 - Ant C

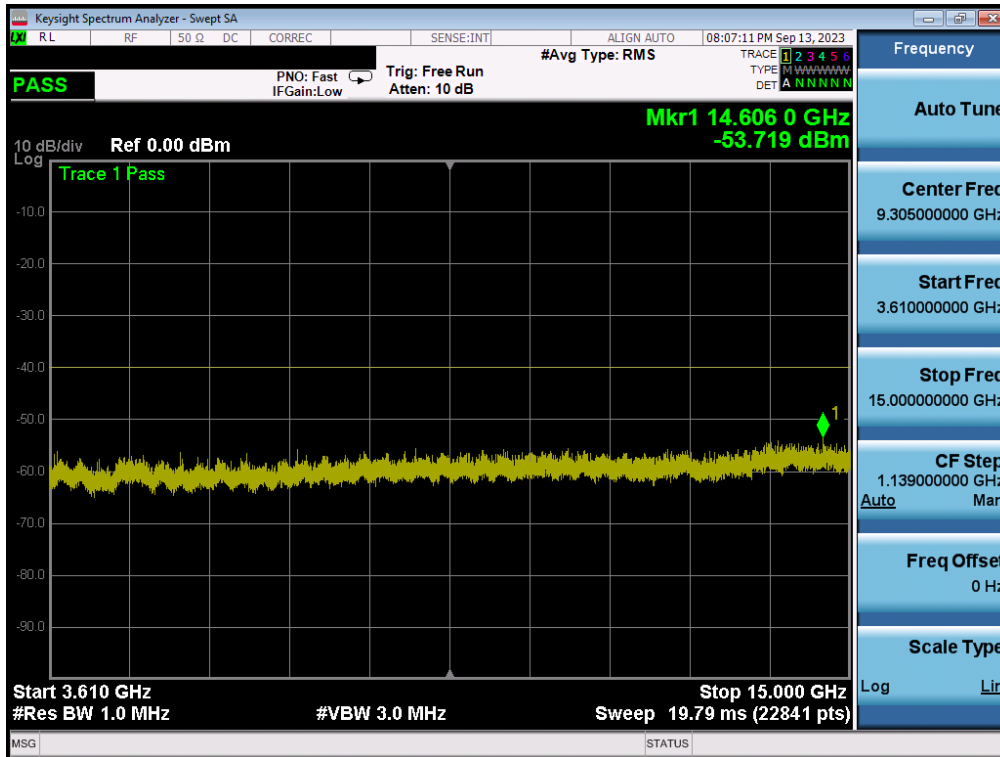
Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
NR Band n48 Ant C	40 MHz	Low	30.0 - 3,510.0	-47.92	-40	-7.92
		Low	3610.0 - 15,000.0	-53.72	-40	-13.72
		Low	15,000.0 - 27,000.0	-47.34	-40	-7.34
		Low	27,000.0 - 37,000.0	-45.86	-40	-5.86
		Mid	30.0 - 3,510.0	-47.79	-40	-7.79
		Mid	3740.0 - 15,000.0	-52.27	-40	-12.27
		Mid	15,000.0 - 27,000.0	-47.96	-40	-7.96
		Mid	27,000.0 - 37,000.0	-46.45	-40	-6.45
		High	30.0 - 3,640.0	-47.72	-40	-7.72
		High	3740.0 - 15,000.0	-52.22	-40	-12.22
		High	15,000.0 - 27,000.0	-47.17	-40	-7.17
		High	27,000.0 - 37,000.0	-46.27	-40	-6.27

Table 7-15. Conducted Spurious Emission Results (NR Band n48 Ant C)

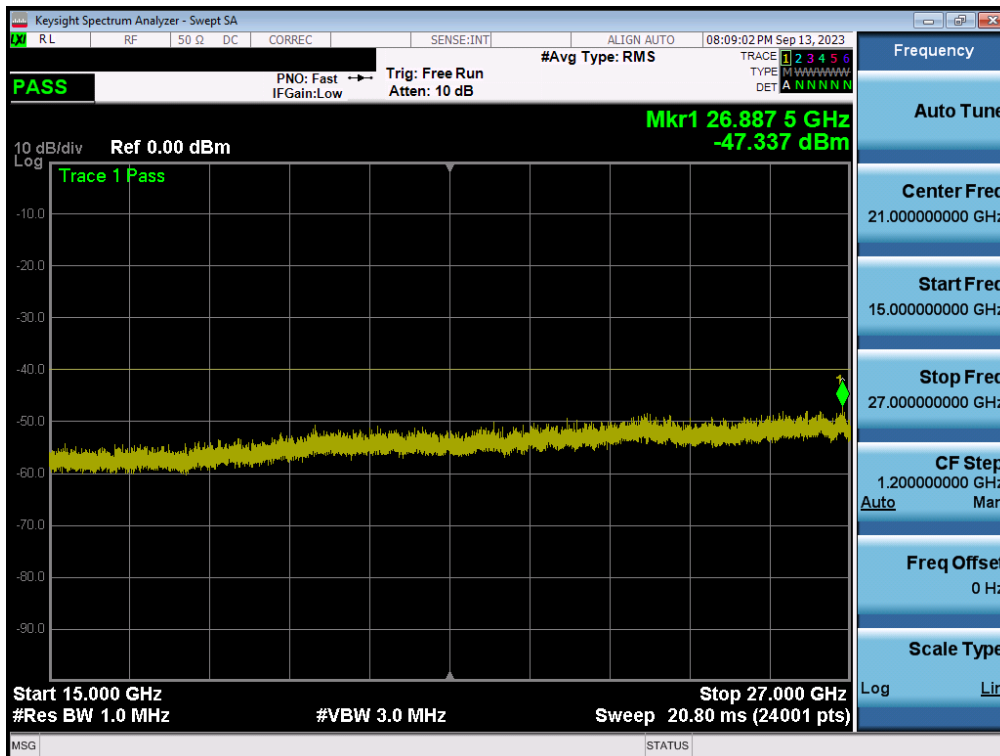


Plot 7-45. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - Low Channel - Ant C)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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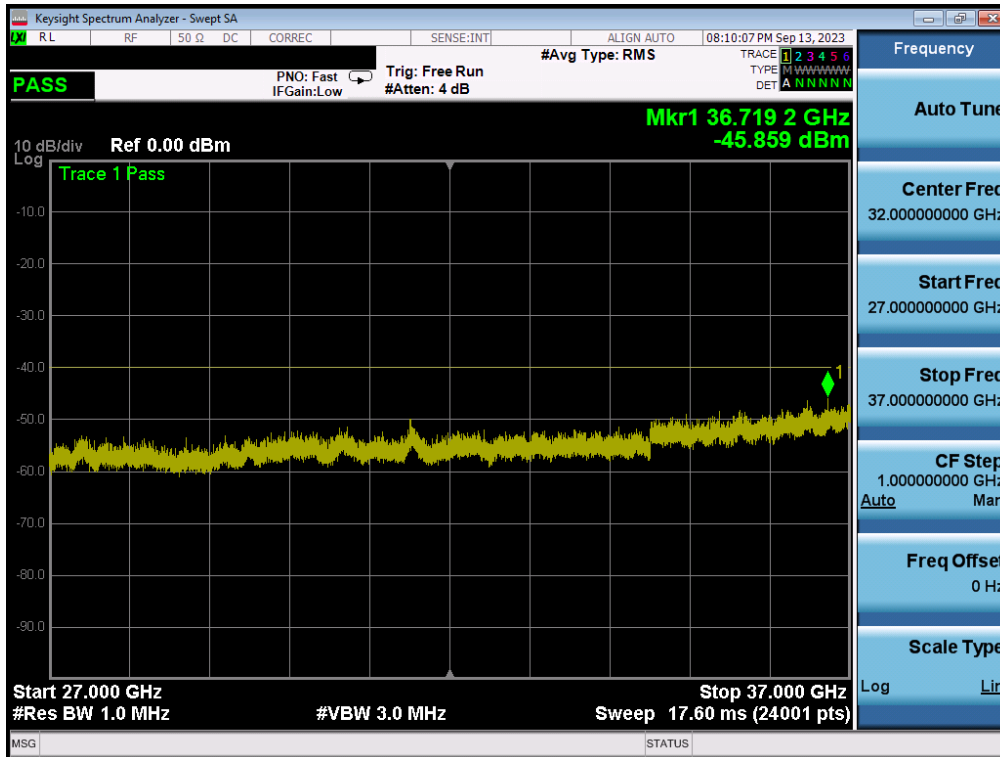


Plot 7-46. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - Low Channel - Ant C)



Plot 7-47. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - Low Channel - Ant C)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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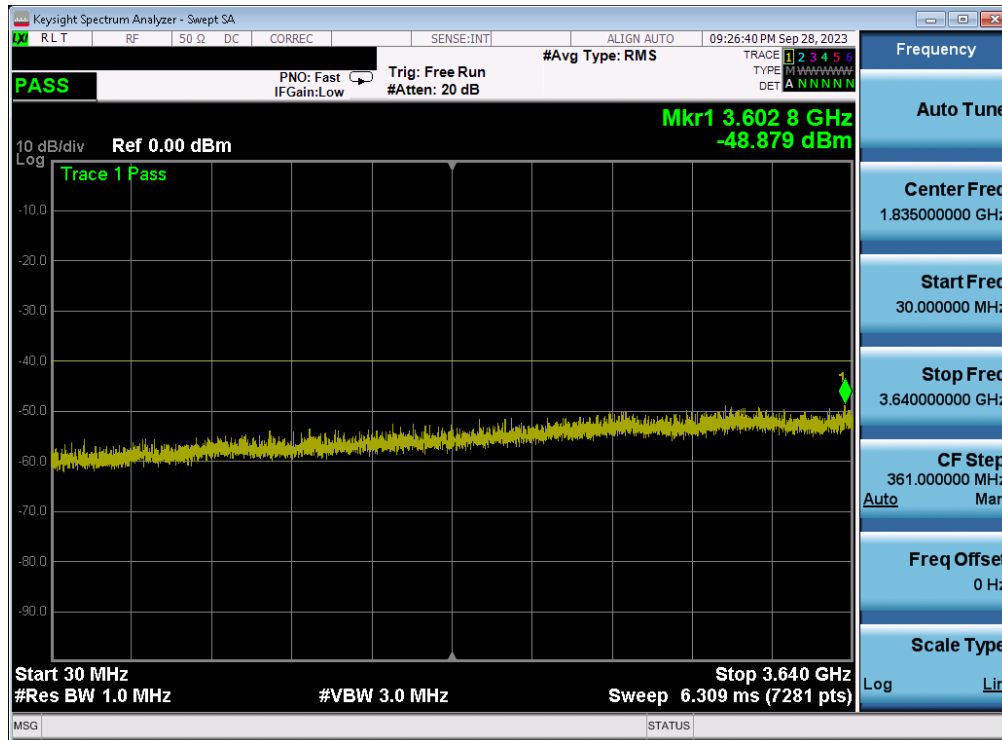
Plot 7-48. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - Low Channel - Ant C)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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NR Band n48 – Ant I

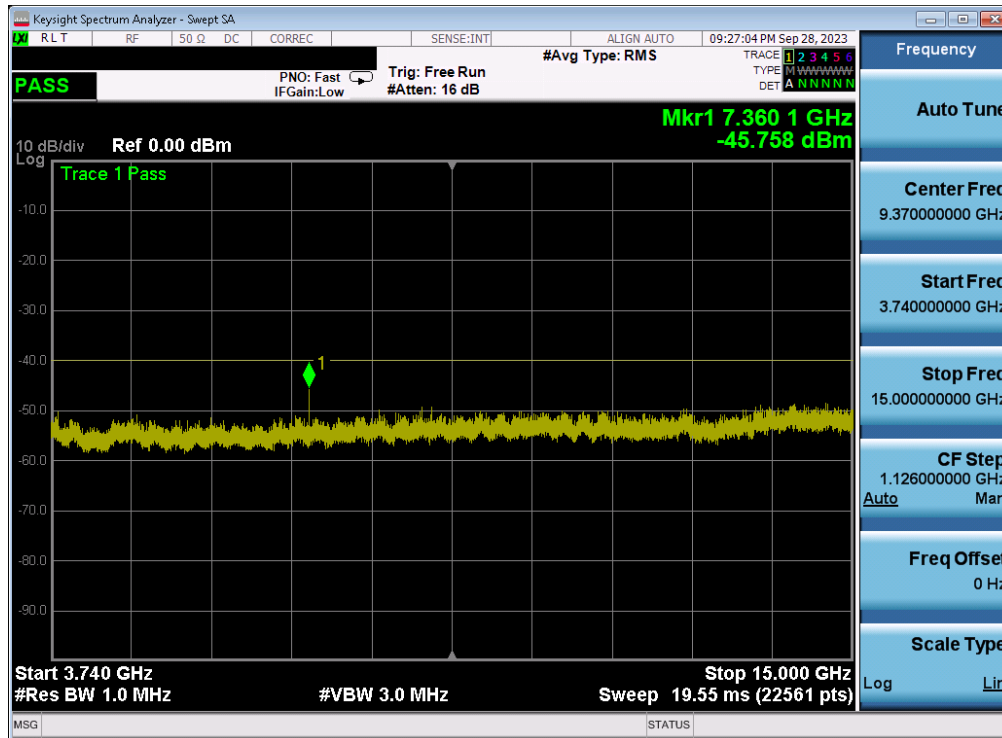
Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
NR Band n48 Ant I	40 MHz	Low	30.0 - 3,510.0	-48.26	-40	-8.26
		Low	3610.0 - 15,000.0	-48.20	-40	-8.20
		Low	15,000.0 - 27,000.0	-48.17	-40	-8.17
		Low	27,000.0 - 37,000.0	-51.03	-40	-11.03
		Mid	30.0 - 3,510.0	-47.46	-40	-7.46
		Mid	3740.0 - 15,000.0	-48.15	-40	-8.15
		Mid	15,000.0 - 27,000.0	-47.89	-40	-7.89
		Mid	27,000.0 - 37,000.0	-51.14	-40	-11.14
		High	30.0 - 3,640.0	-48.88	-40	-8.88
		High	3740.0 - 15,000.0	-45.76	-40	-5.76
		High	15,000.0 - 27,000.0	-48.29	-40	-8.29
		High	27,000.0 - 37,000.0	-51.13	-40	-11.13

Table 7-16. Conducted Spurious Emission Results (NR Band n48 Ant I)

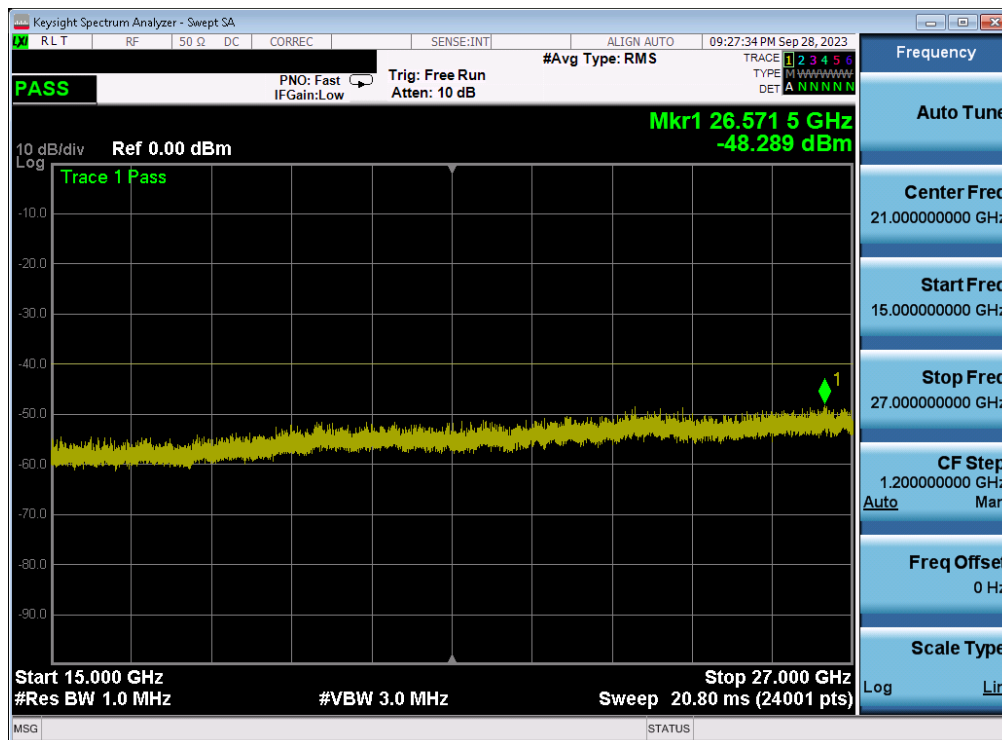


Plot 7-49. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - High Channel - Ant I)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-50. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - High Channel - Ant I)



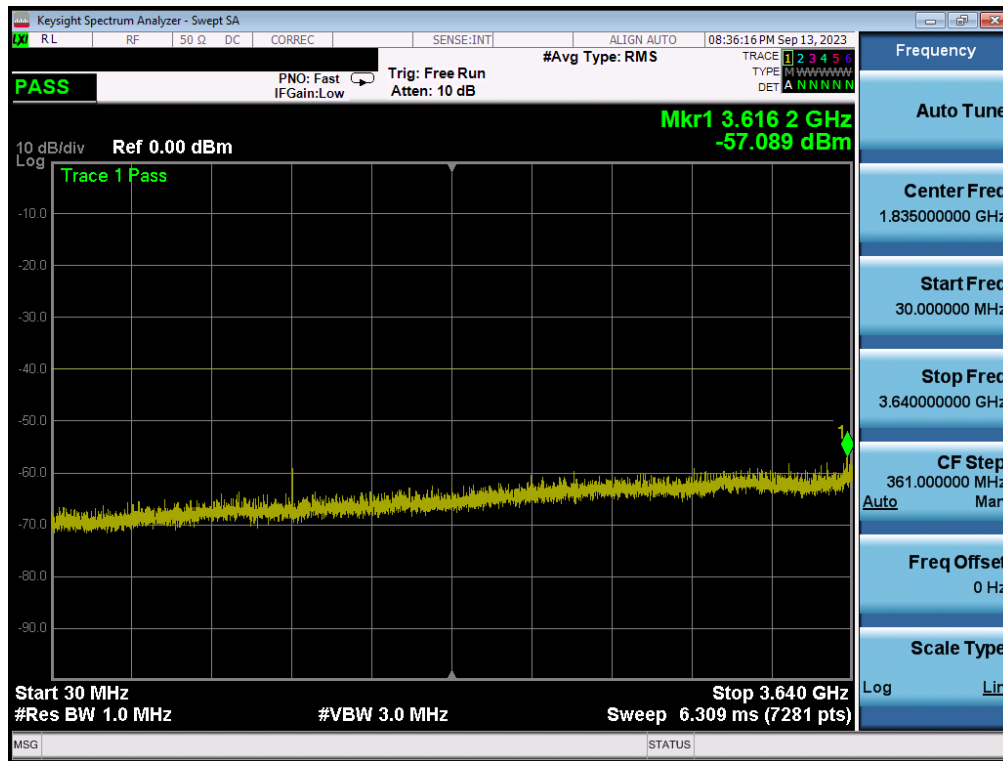
Plot 7-51. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - High Channel - Ant I)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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NR Band n48 – Ant D

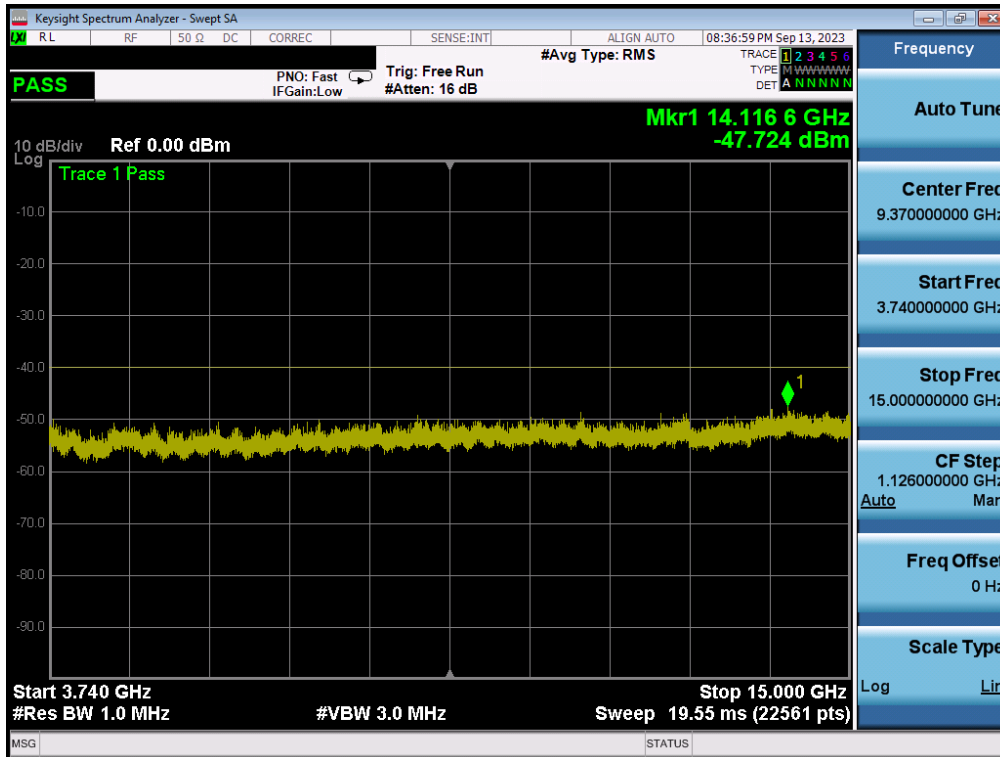
Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
NR Band n48 Ant D	40 MHz	Low	30.0 - 3,510.0	-52.25	-40	-12.25
		Low	3610.0 - 15,000.0	-53.54	-40	-13.54
		Low	15,000.0 - 27,000.0	-47.79	-40	-7.79
		Low	27,000.0 - 37,000.0	-46.18	-40	-6.18
		Mid	30.0 - 3,510.0	-52.02	-40	-12.02
		Mid	3740.0 - 15,000.0	-53.49	-40	-13.49
		Mid	15,000.0 - 27,000.0	-47.34	-40	-7.34
		Mid	27,000.0 - 37,000.0	-46.27	-40	-6.27
		High	30.0 - 3,640.0	-57.09	-40	-17.09
		High	3740.0 - 15,000.0	-47.72	-40	-7.72
		High	15,000.0 - 27,000.0	-47.93	-40	-7.93
		High	27,000.0 - 37,000.0	-45.48	-40	-5.48

Table 7-17. Conducted Spurious Emission Results (NR Band n48 Ant D)

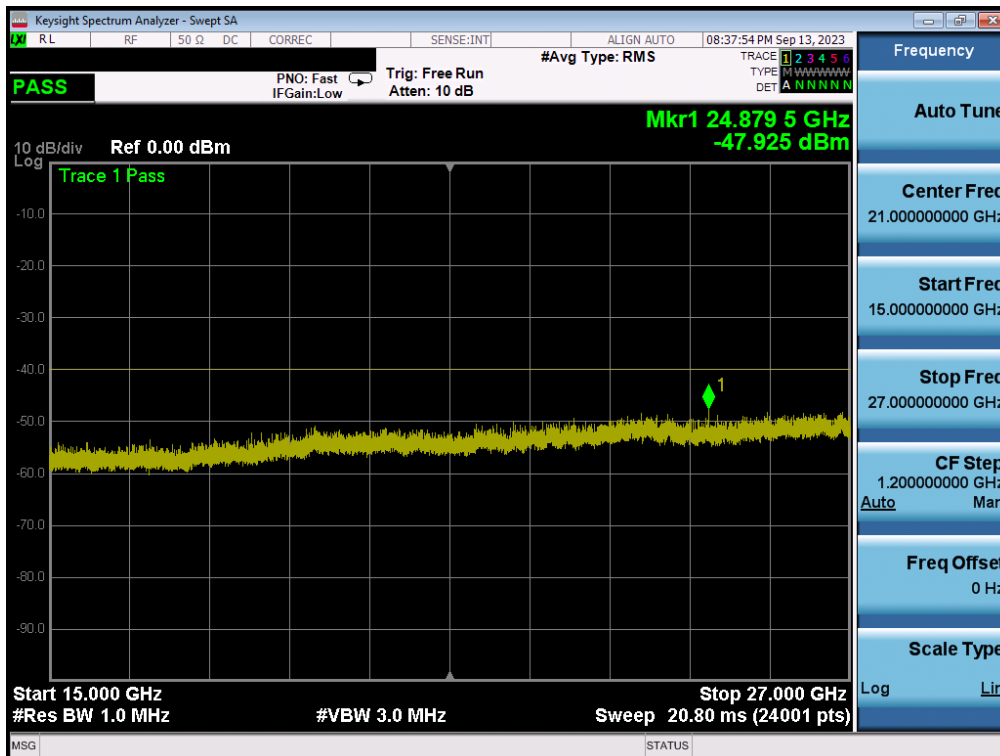


Plot 7-53. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - High Channel - Ant D)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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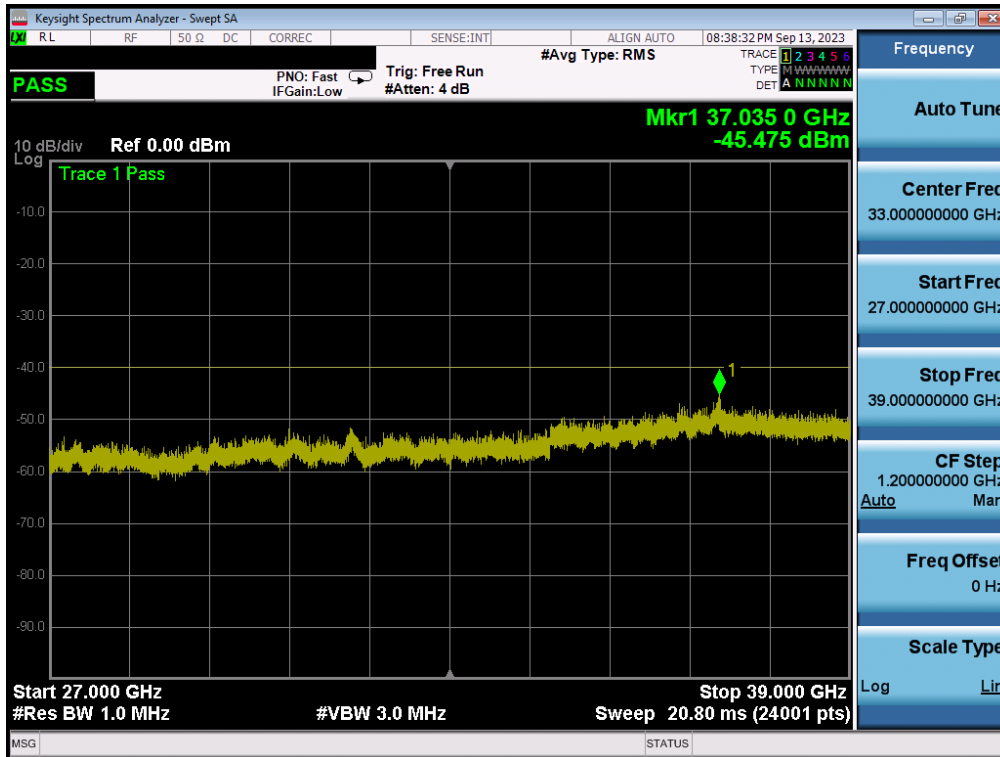


Plot 7-54. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - High Channel - Ant D)



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

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-56. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - High Channel - Ant D)

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7.5 Band Edge Emissions at Antenna Terminal

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.

For an End User Device, 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 to B MHz (where B is the bandwidth in MHz of the assigned channel or multiple contiguous channels of the End User Device) above the upper CBSD-assigned channel edge and within 0 to B MHz below the lower CBSD-assigned channel edge. At all frequencies greater than B MHz above the upper CBSD assigned channel edge and less than B MHz below the lower CBSD-assigned channel edge, the conducted power of any end user device emission shall not exceed -25 dBm/MHz. The conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/MHz.

Test Procedure Used

ANSI C63.26-2015 – Section 5.7.3

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.

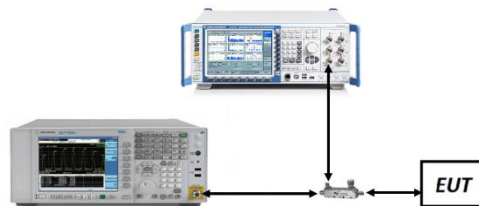


Figure 7-4. Test Instrument & Measurement Setup

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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Test Notes

1. Per 96.41(e)(3)(i), compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's authorized frequency channel, a resolution bandwidth of no less than one percent of the fundamental emission bandwidth may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full reference bandwidth (i.e., 1 MHz or 1 percent of emission bandwidth, as specified). The fundamental 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 emissions are attenuated at least 26 dB below the transmitter power.

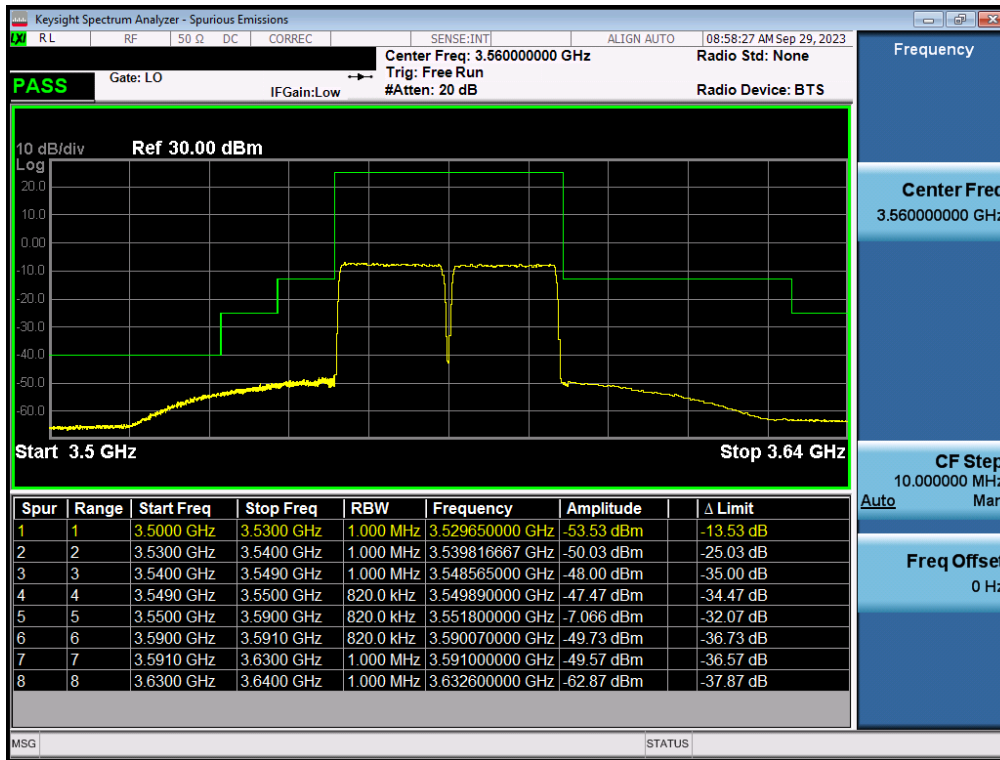
2. For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst-case configuration. All modes of operation were investigated and the worst-case configuration results are reported in this section.

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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ULCA LB48

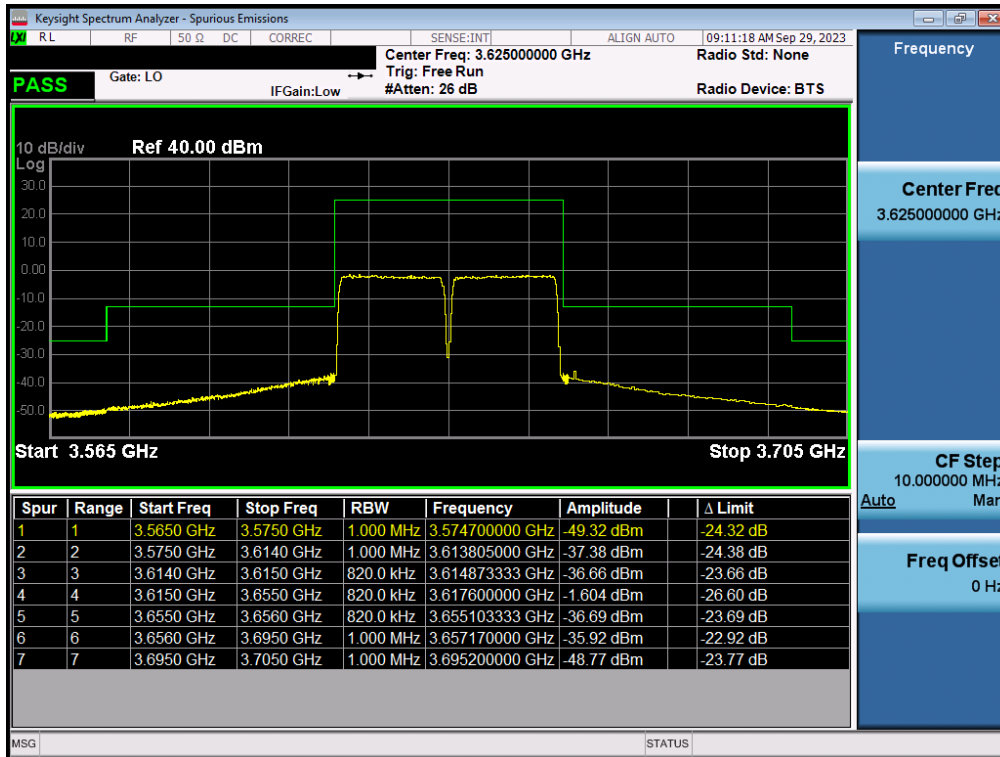
Mode	Bandwidth	Channel	Test Cases	Level [dBm]	Limit [dBm]	Margin [dB]
LTE Band 48 (2CC ULCA)	40 MHz	Low	Band Edge	-53.53	-40	-13.53
		Mid	Band Edge	-35.92	-13	-22.92
		High	Band Edge	-52.02	-40	-12.02

Table 7-18. Conducted Band Edge Emission Results (ULCA LB48)

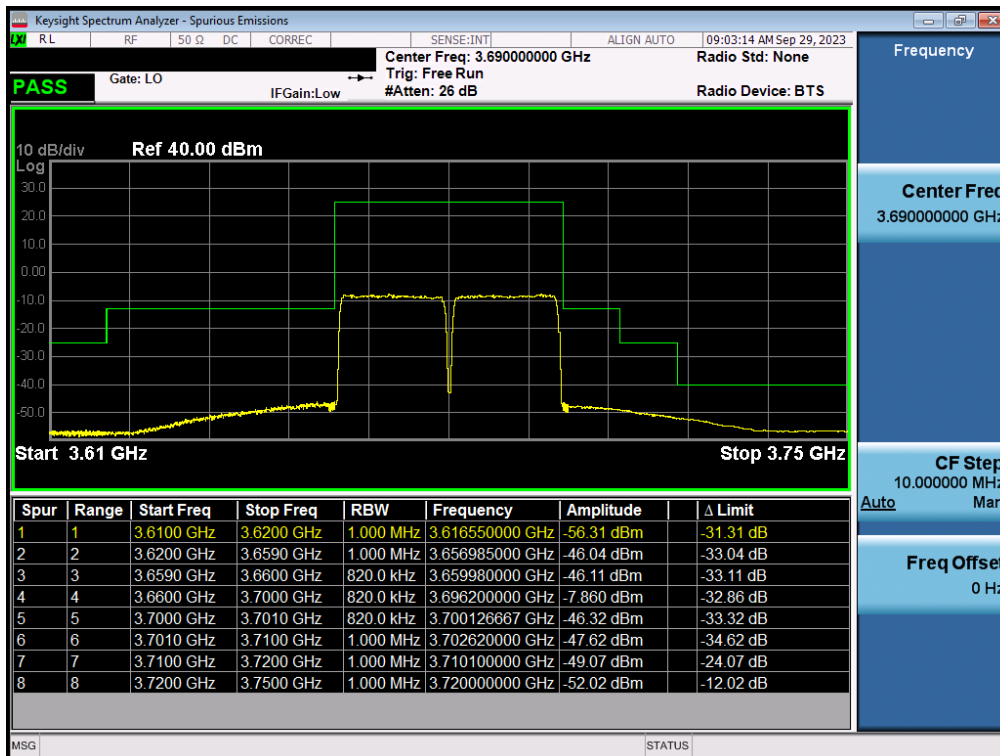


Plot 7-57. Channel - Ant1 Edge Plot (LTE Band 48 – 20+20MHz QPSK - Low Channel)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-58. Channel - Ant1 Edge Plot (LTE Band 48 – 20+20MHz QPSK - Mid Channel)



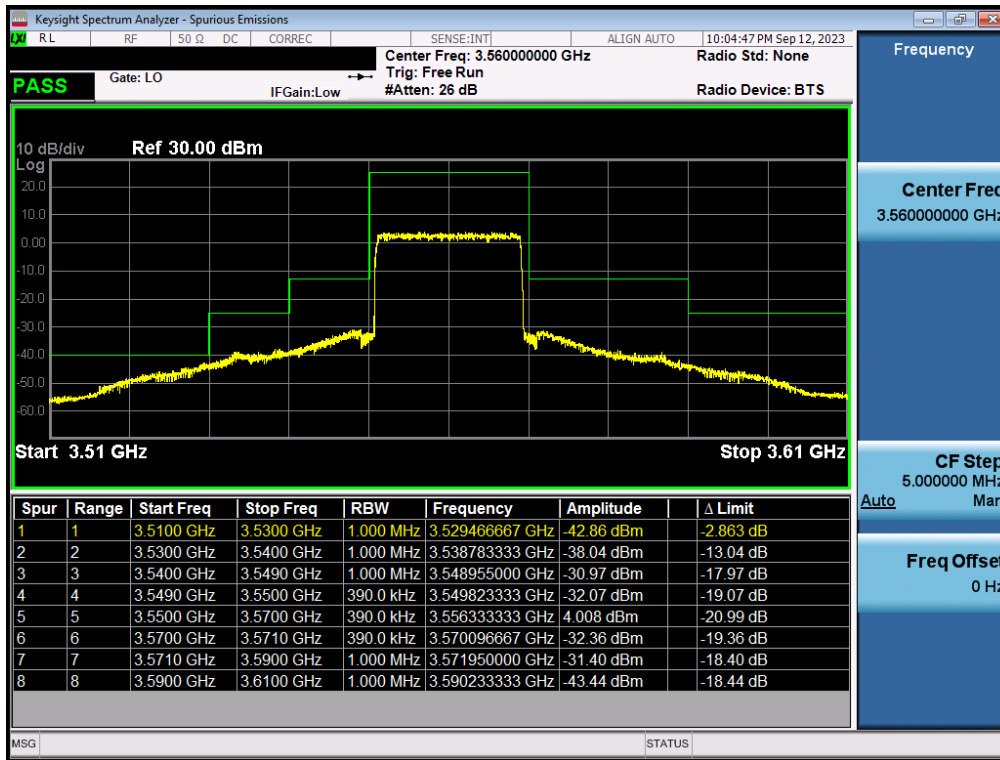
Plot 7-59. Channel - Ant1 Edge Plot (LTE Band 48 – 20+20MHz QPSK - High Channel)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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LTE Band 48

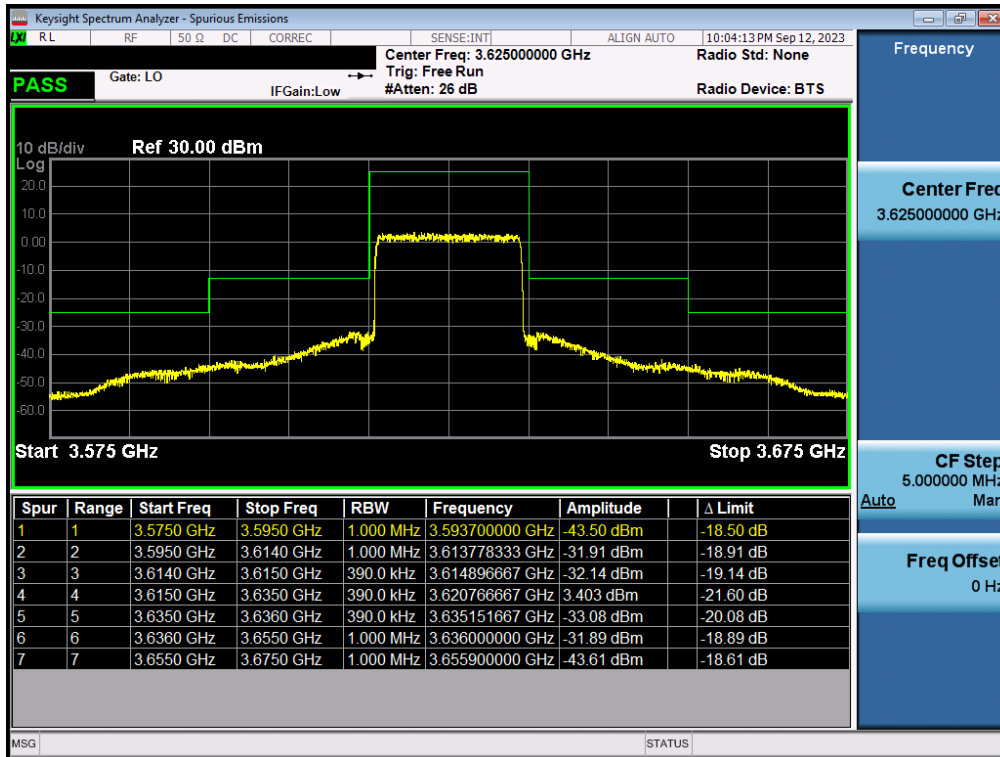
Mode	Bandwidth	Channel	Test Cases	Level [dBm]	Limit [dBm]	Margin [dB]
LTE Band 48	20 MHz	Low	Band Edge	-42.86	-40	-2.86
		Mid	Band Edge	-43.50	-25	-18.50
		High	Band Edge	-42.32	-40	-2.32
	15 MHz	Low	Band Edge	-46.18	-40	-6.18
		Mid	Band Edge	-31.25	-13	-18.25
		High	Band Edge	-43.72	-40	-3.72
	10MHz	Low	Band Edge	-54.82	-40	-14.82
		Mid	Band Edge	-29.37	-13	-16.37
		High	Band Edge	-49.24	-40	-9.24
	5 MHz	Low	Band Edge	-27.59	-13	-14.59
		Mid	Band Edge	-24.83	-13	-11.83
		High	Band Edge	-27.74	-13	-14.74

Table 7-19. Conducted Band Edge Emission Results (ULCA LB48)

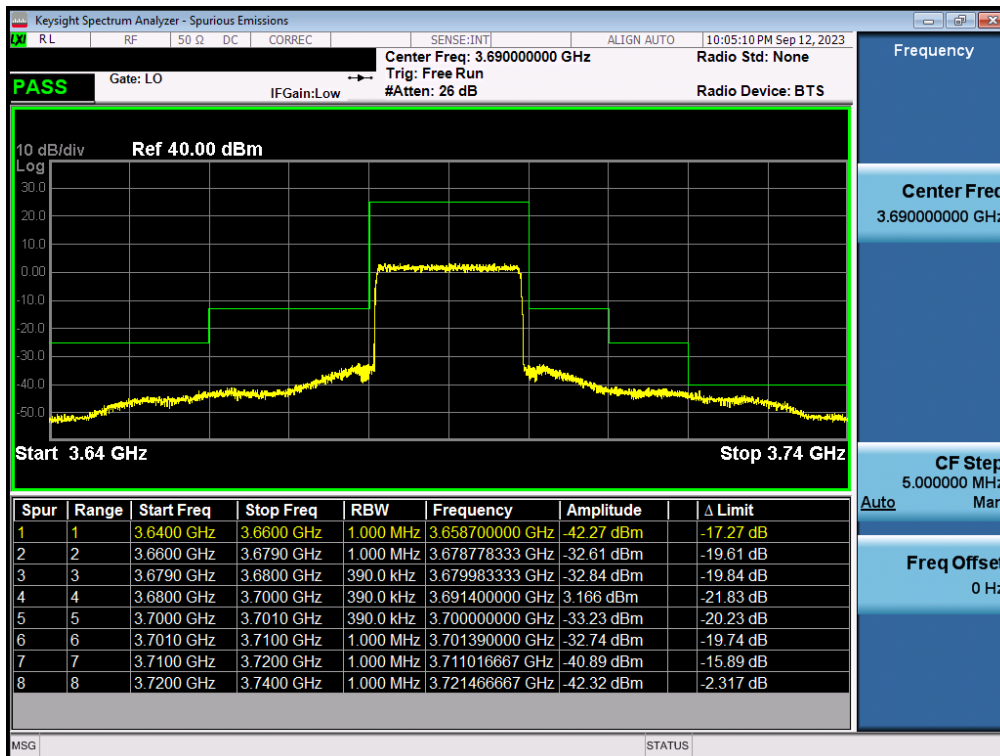


Plot 7-60. Channel - Ant1 Edge Plot (LTE Band 48 - 20MHz QPSK - Low Channel)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-61. Channel - Ant1 Edge Plot (LTE Band 48 - 20MHz QPSK - Mid Channel)



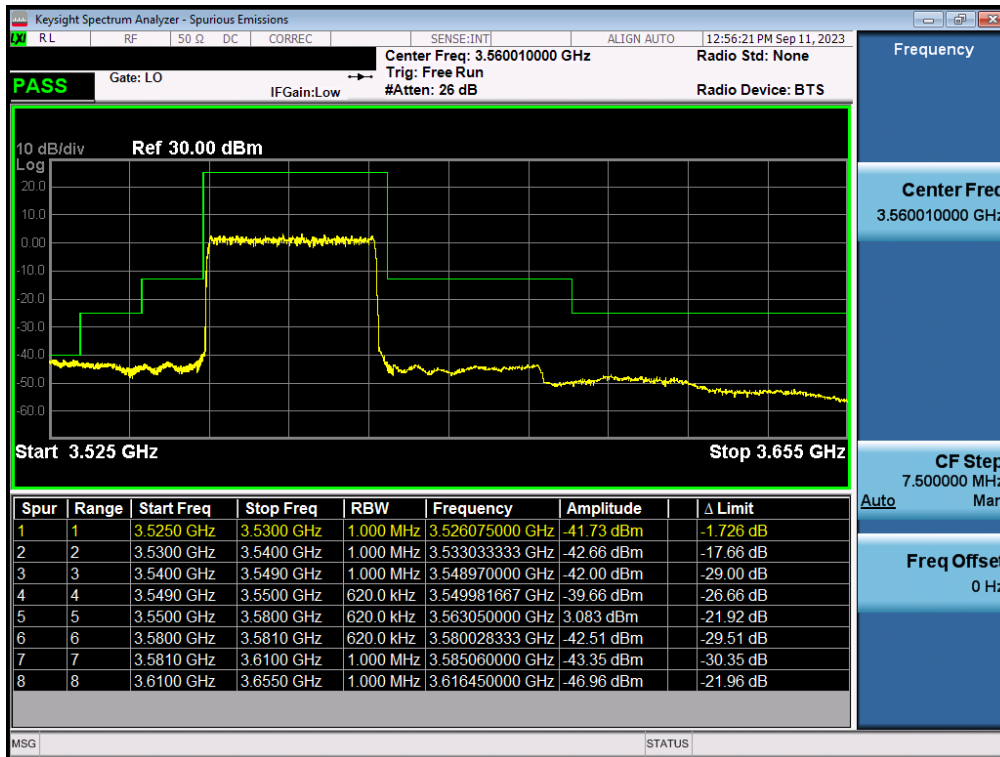
Plot 7-62. Channel - Ant1 Edge Plot (LTE Band 48 - 20MHz QPSK - High Channel)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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NR Band n48 Ant F

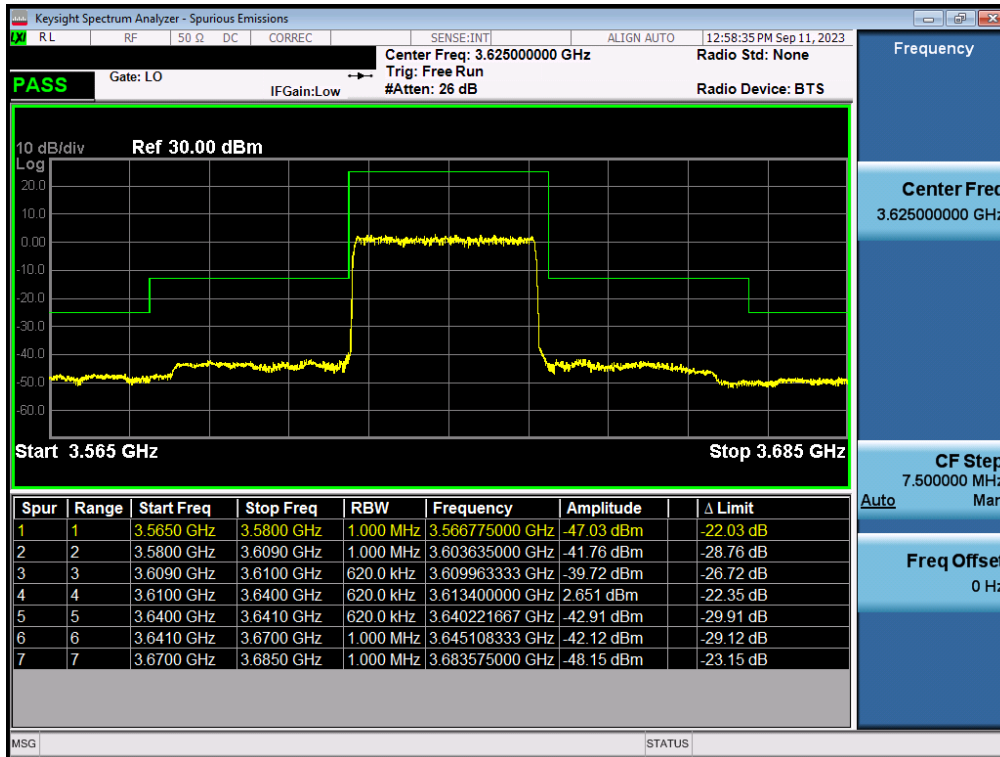
Mode	Bandwidth	Channel	Test Cases	Level [dBm]	Limit [dBm]	Margin [dB]
NR Band n48	40 MHz	Low	Band Edge	-42.07	-40	-2.07
		Mid	Band Edge	-44.97	-25	-19.97
		High	Band Edge	-44.16	-40	-4.16
	30 MHz	Low	Band Edge	-41.73	-40	-1.73
		Mid	Band Edge	-47.03	-25	-22.03
		High	Band Edge	-44.52	-40	-4.52
	20 MHz	Low	Band Edge	-43.35	-40	-3.35
		Mid	Band Edge	-42.73	-25	-17.73
		High	Band Edge	-42.87	-40	-2.87
	15MHz	Low	Band Edge	-44.53	-40	-4.53
		Mid	Band Edge	-44.09	-25	-19.09
		High	Band Edge	-42.93	-40	-2.93
10 MHz	Low	Band Edge	-49.35	-40	-9.35	
	Mid	Band Edge	-41.15	-25	-16.15	
	High	Band Edge	-46.57	-40	-6.57	

Table 7-20. Conducted Band Edge Emission Results (NR Band n48 Ant F)

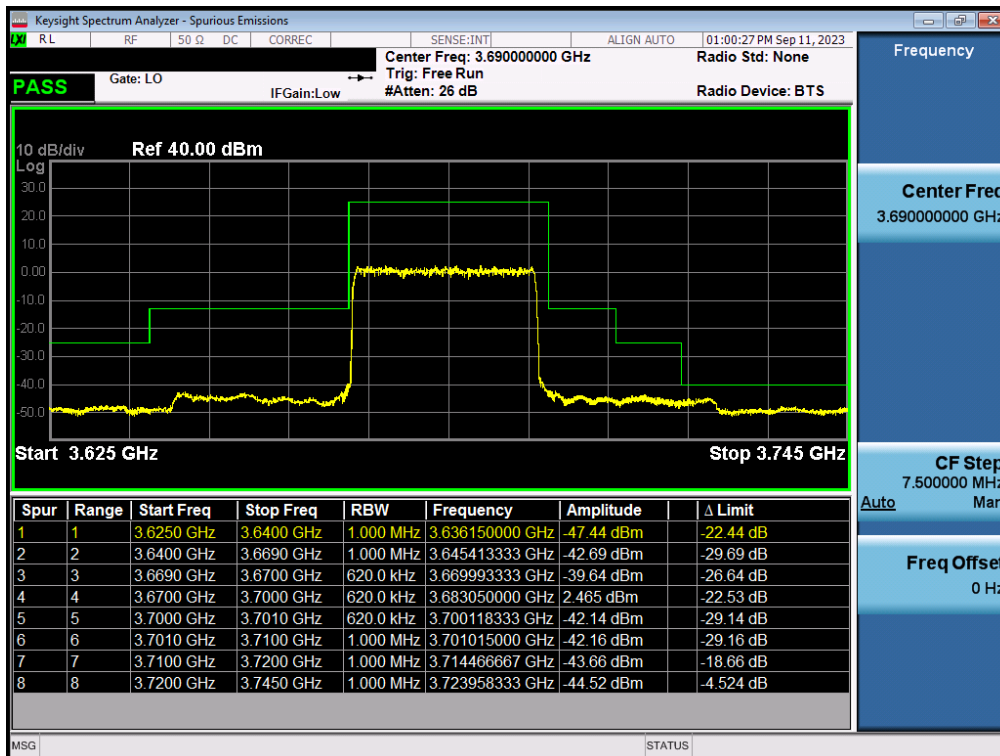


Plot 7-63. Channel Edge Plot (NR Band n48 - 30MHz QPSK - Low Channel)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-64. Channel Edge Plot (NR Band n48 - 30MHz QPSK - Mid Channel)



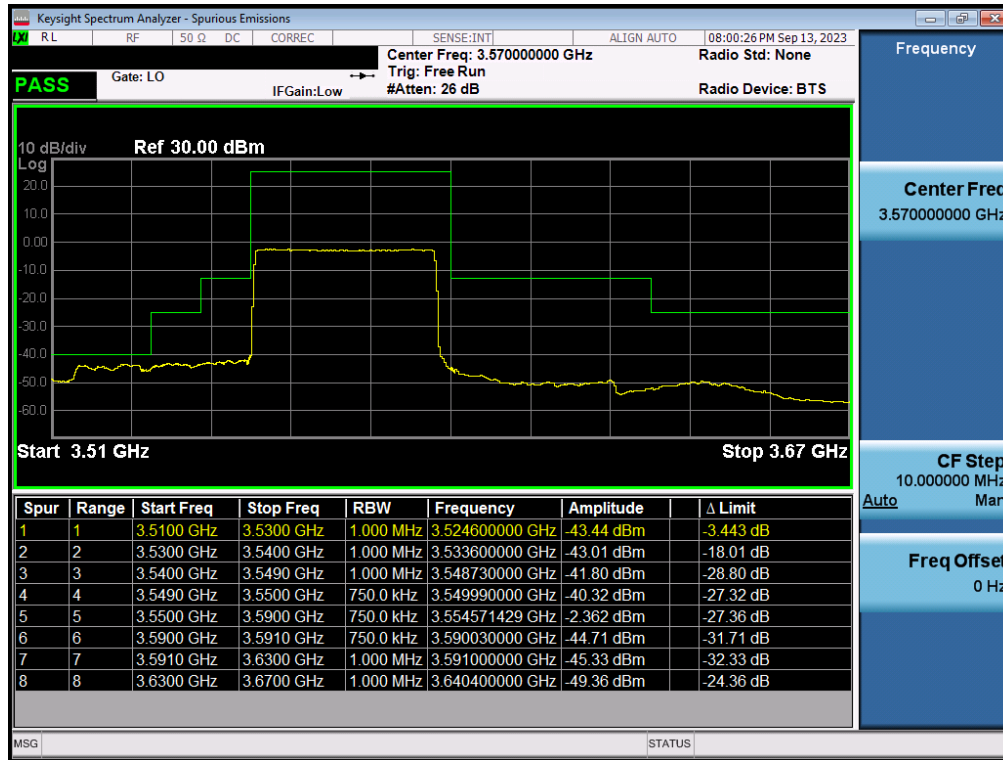
Plot 7-65. Channel Edge Plot (NR Band n48 - 30MHz QPSK - High Channel)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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NR Band n48 Ant C

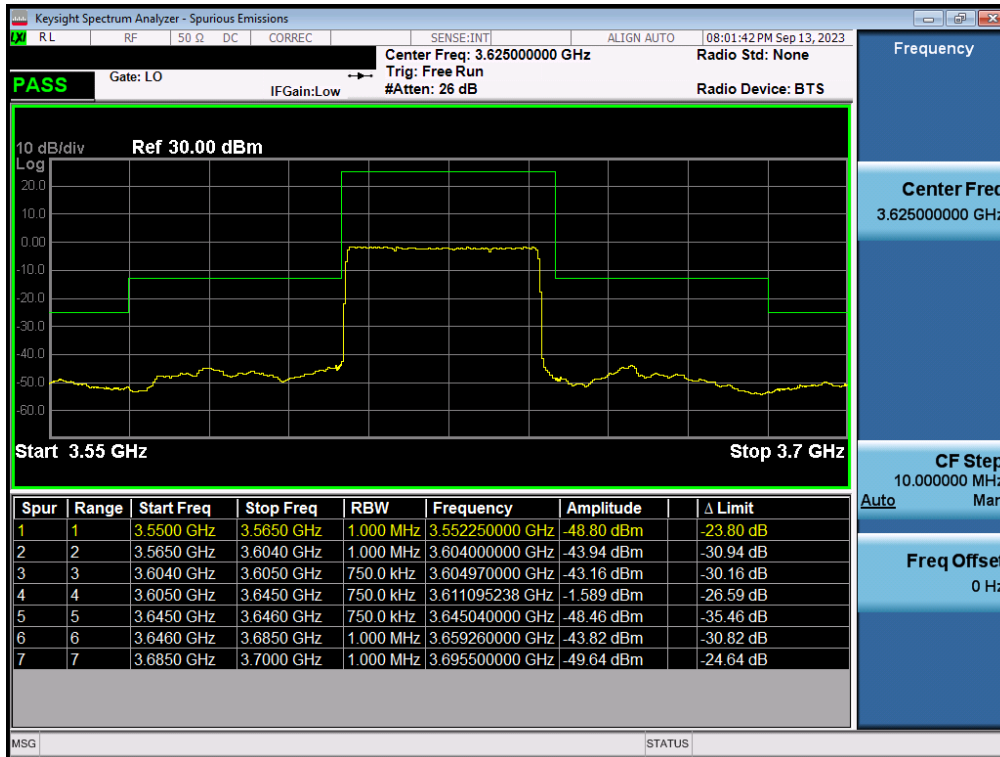
Mode	Bandwidth	Channel	Test Cases	Level [dBm]	Limit [dBm]	Margin [dB]
NR Band n48 Ant C	40 MHz	Low	Band Edge	-43.44	-40	-3.44
		Mid	Band Edge	-48.8	-25	-23.8
		High	Band Edge	-44.66	-40	-4.66

Table 7-21. Conducted Band Edge Emission Results (NR Band n48 Ant C)

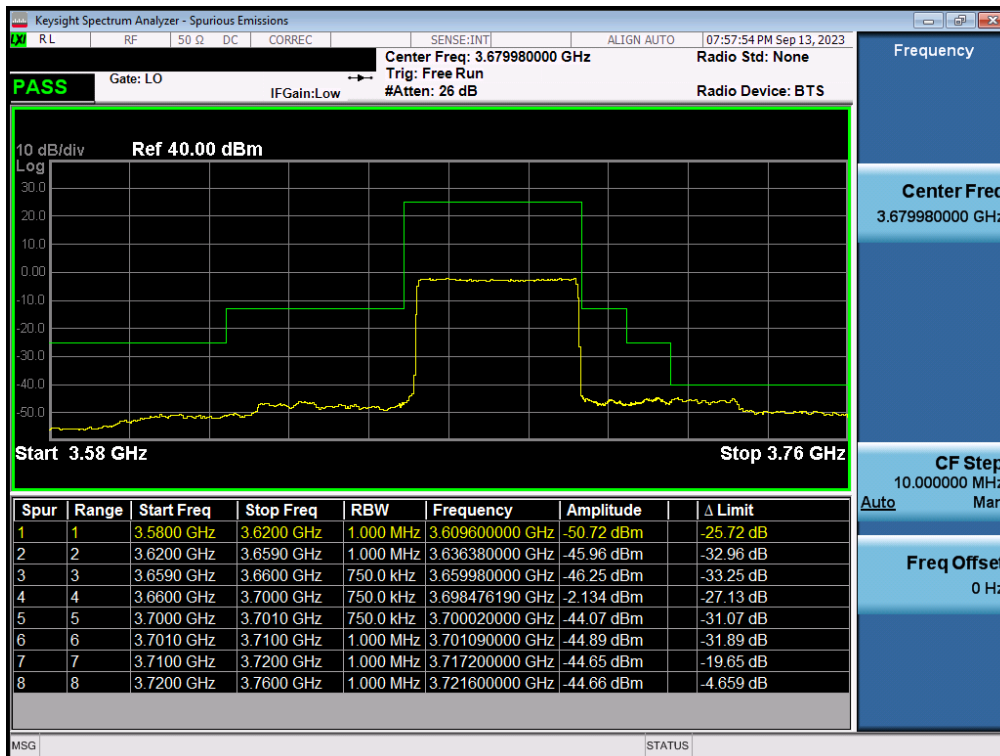


Plot 7-66. Channel Edge Plot (NR Band n48 - 40MHz QPSK - Low Channel – Ant C)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-67. Channel Edge Plot (NR Band n48 - 40MHz QPSK - Mid Channel – Ant C)



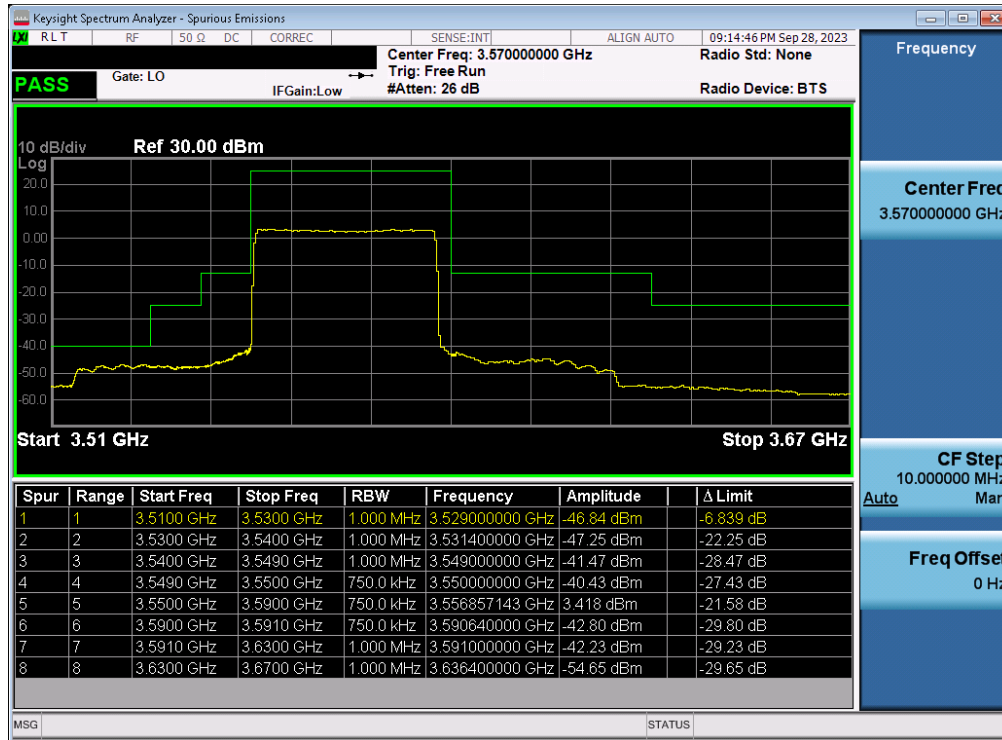
Plot 7-68. Channel Edge Plot (NR Band n48 - 40MHz QPSK - High Channel – Ant C)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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NR Band n48 Ant I

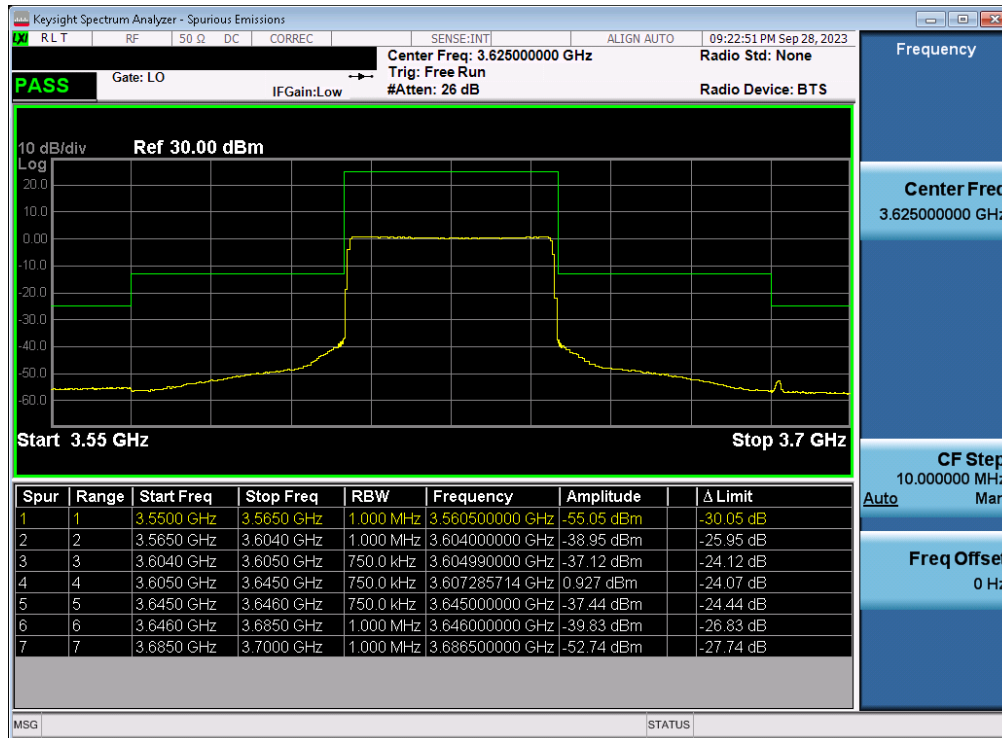
Mode	Bandwidth	Channel	Test Cases	Level [dBm]	Limit [dBm]	Margin [dB]
NR Band n48 Ant I	40 MHz	Low	Band Edge	-46.84	-40	-6.84
		Mid	Band Edge	-38.95	-13	-25.95
		High	Band Edge	-48.86	-40	-8.86

Table 7-22. Conducted Band Edge Emission Results (NR Band n48 Ant I)

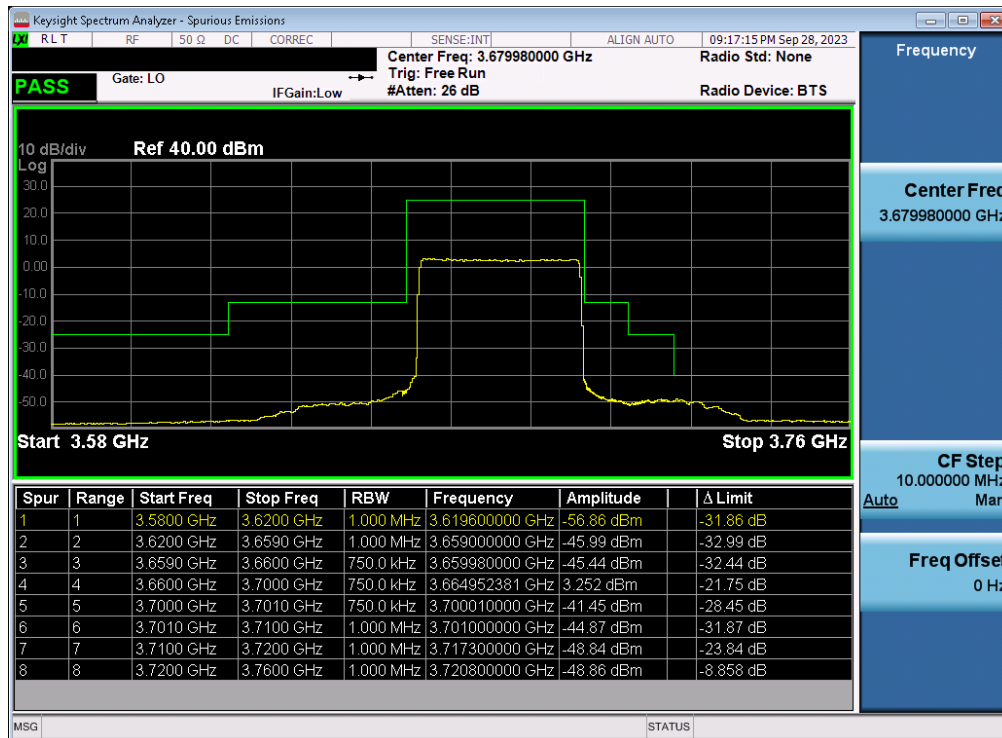


Plot 7-69. Channel Edge Plot (NR Band n48 - 40MHz QPSK - Low Channel - Ant I)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-70. Channel Edge Plot (NR Band n48 - 40MHz QPSK - Mid Channel – Ant I)



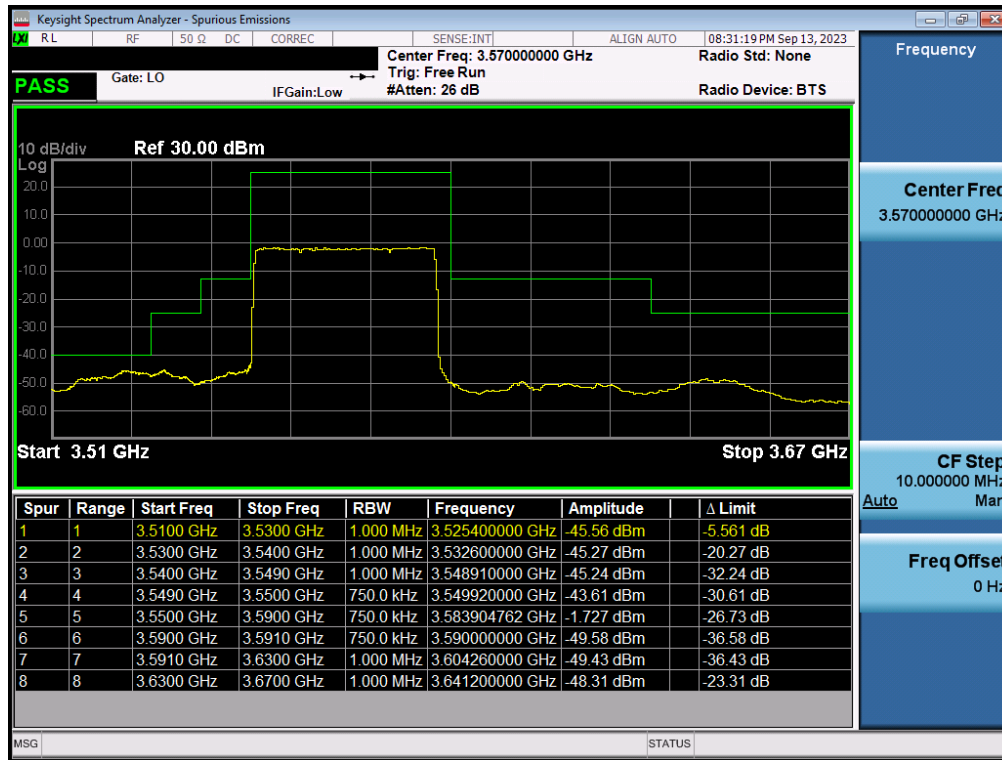
Plot 7-71. Channel Edge Plot (NR Band n48 - 40MHz QPSK - High Channel – Ant I)

FCC ID: A3LSMS928U	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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NR Band n48 Ant D

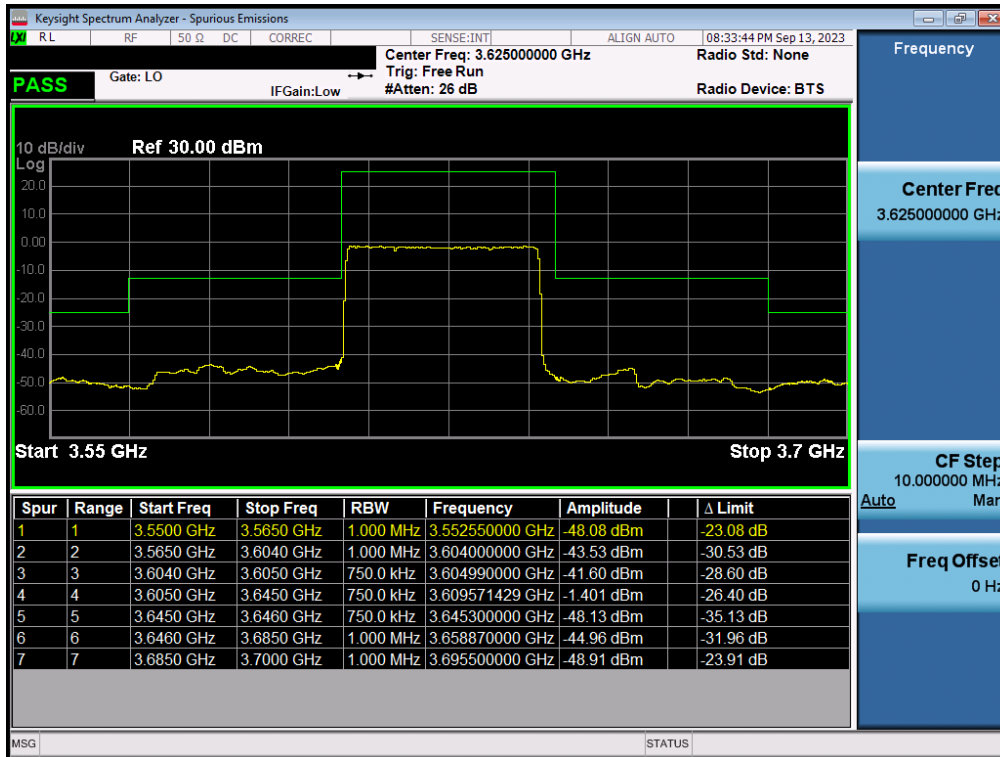
Mode	Bandwidth	Channel	Test Cases	Level [dBm]	Limit [dBm]	Margin [dB]
NR Band n48 Ant D	40 MHz	Low	Band Edge	-45.56	-40	-5.56
		Mid	Band Edge	-48.08	-25	-23.08
		High	Band Edge	-44.85	-40	-4.85

Table 7-23. Conducted Band Edge Emission Results (NR Band n48 Ant I)

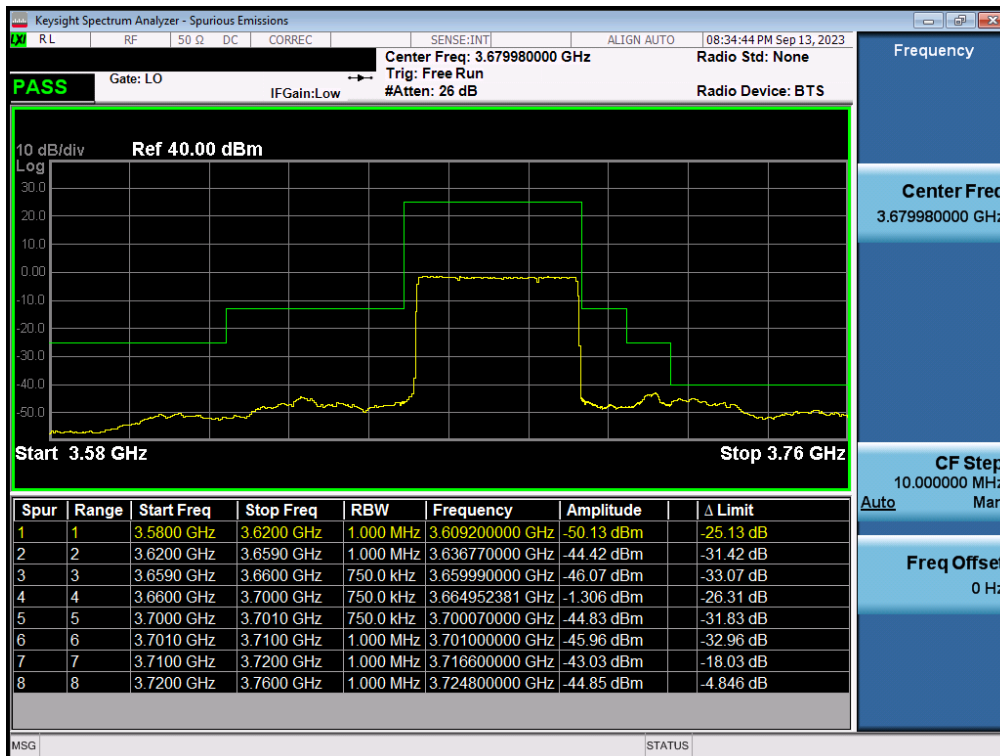


Plot 7-72. Channel Edge Plot (NR Band n48 - 40MHz QPSK - Low Channel – Ant D)

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Plot 7-73. Channel Edge Plot (NR Band n48 - 40MHz QPSK - Mid Channel - Ant D)



Plot 7-74. Channel Edge Plot (NR Band n48 - 40MHz QPSK - High Channel - Ant D)

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7.6 Radiated Power (EIRP)

Test Overview

Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI C63.26-2015 with the EUT transmitting into an integral antenna. Measurements are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

Test Procedures Used

ANSI C63.26-2015 – Section 5.2.4.4

Test Settings

1. Radiated power measurements are performed using the signal analyzer’s “channel power” measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW
3. VBW \geq 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points \geq 2 x span / RBW
6. Detector = RMS
7. Trigger is set to “free run” for signals with continuous operation with the sweep times set to “auto”. Trigger is set to enable triggering only on full power bursts with the sweep time set less than or equal to the transmission burst duration.
8. The integration bandwidth was set equal to 10MHz. For signals with burst transmission, the “gating” function was enabled to ensure that measurements are performed during times in which the transmitter is operating at its maximum power.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize.

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Test Setup

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

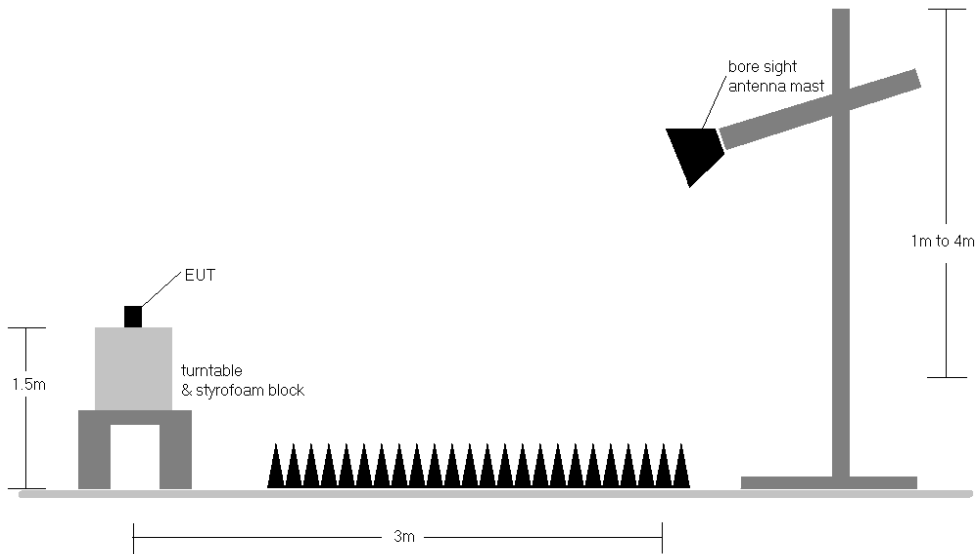


Figure 7-5. Radiated Test Setup >1GHz

Test Notes

- 1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested with its standard battery.
- 3) 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.
- 4) The worst case EIRP shown in this section is found with LTE operating only using 1RB. As such, the EIRP/10MHz and full channel EIRP values will be identical since 1RB is fully contained within all available channel bandwidths for LTE Band 48 (i.e. 5, 10, 15, 20MHz).

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Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm/10MHz]	EIRP [Watts/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
20 MHz	QPSK	3560.00	H	151	342	6.51	1 / 50	12.17	18.68	0.074	23.00	-4.32
	QPSK	3625.00	H	136	336	6.70	1 / 50	12.94	19.64	0.092	23.00	-3.36
	QPSK	3690.00	H	143	334	6.86	1 / 50	11.57	18.43	0.070	23.00	-4.57
	16-QAM	3625.00	H	136	336	6.70	1 / 50	11.62	18.32	0.068	23.00	-4.68
15 MHz	QPSK	3557.50	H	151	342	6.51	1 / 19	12.18	18.68	0.074	23.00	-4.32
	QPSK	3625.00	H	136	336	6.70	1 / 1	12.64	19.34	0.086	23.00	-3.66
	QPSK	3692.50	H	143	334	6.86	1 / 36	11.55	18.41	0.069	23.00	-4.59
	16-QAM	3625.00	H	136	336	6.70	1 / 1	11.29	17.99	0.063	23.00	-5.01
10 MHz	QPSK	3555.00	H	151	342	6.50	1 / 1	12.46	18.96	0.079	23.00	-4.04
	QPSK	3625.00	H	136	336	6.70	1 / 1	12.97	19.67	0.093	23.00	-3.33
	QPSK	3695.00	H	143	334	6.86	1 / 22	11.83	18.70	0.074	23.00	-4.30
	16-QAM	3625.00	H	136	336	6.70	1 / 1	11.32	18.02	0.063	23.00	-4.98
5 MHz	QPSK	3552.50	H	151	342	6.50	1 / 5	12.46	18.95	0.079	23.00	-4.05
	QPSK	3625.00	H	136	336	6.70	1 / 1	12.79	19.49	0.089	23.00	-3.51
	QPSK	3697.50	H	143	334	6.87	1 / 9	11.81	18.68	0.074	23.00	-4.32
	16-QAM	3625.00	H	136	336	6.70	1 / 1	11.29	17.99	0.063	23.00	-5.01
20 MHz	QPSK (WCP)	3625.00	H	190	326	6.70	1 / 50	12.40	19.10	0.081	23.00	-3.90

Table 7-24. EIRP Data (LTE Band 48)

Bandwidth	Modulation	PCC			SCC			Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degrees]	Ant. Gain [dBi]	Substitute Level [dBm]	EIRP [dBm/10MHz]	EIRP [Watts/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
		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	H	108	346	6.51	11.36	17.87	0.061	23.00	-5.13
		20	3625.0	1 / 99	20	3644.8	1 / 0	H	106	335	6.70	12.77	19.47	0.088	23.00	-3.53
		20	3690.0	1 / 0	20	3670.2	1 / 99	H	104	333	6.86	11.32	18.18	0.066	23.00	-4.82
		16-QAM	20	3625.0	1 / 99	20	3644.8	1 / 0	H	106	335	6.70	12.03	18.73	0.075	23.00
35 MHz	QPSK	20	3557.5	1 / 99	15	3577.1	1 / 0	H	108	346	6.51	11.33	17.83	0.061	23.00	-5.17
		20	3625.0	1 / 99	15	3642.1	1 / 0	H	106	335	6.70	12.72	19.42	0.087	23.00	-3.58
		20	3692.5	1 / 0	15	3672.9	1 / 74	H	104	333	6.86	11.33	18.19	0.066	23.00	-4.81
		16-QAM	20	3625.0	1 / 99	15	3642.1	1 / 0	H	106	335	6.70	12.03	18.73	0.075	23.00
30 MHz	QPSK	20	3555.0	1 / 99	10	3574.4	1 / 0	H	108	346	6.50	11.37	17.87	0.061	23.00	-5.13
		20	3625.0	1 / 99	10	3639.4	1 / 0	H	106	335	6.70	12.71	19.41	0.087	23.00	-3.59
		20	3695.0	1 / 0	10	3678.3	1 / 49	H	104	333	6.86	11.35	18.22	0.066	23.00	-4.78
		16-QAM	20	3625.0	1 / 99	10	3639.4	1 / 0	H	106	335	6.70	12.08	18.78	0.075	23.00
25 MHz	QPSK	20	3552.5	1 / 99	5	3571.7	1 / 0	H	108	346	6.50	11.44	17.93	0.062	23.00	-5.07
		20	3625.0	1 / 99	5	3636.7	1 / 0	H	106	335	6.70	12.77	19.47	0.088	23.00	-3.53
		20	3697.5	1 / 0	5	3678.3	1 / 24	H	104	333	6.87	11.34	18.21	0.066	23.00	-4.79
		16-QAM	20	3625.0	1 / 99	5	3636.7	1 / 0	H	106	335	6.70	12.12	18.82	0.076	23.00

Table 7-25. EIRP Data (LTE Band 48)

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Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm/10MHz]	EIRP [Watts/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
40 MHz	$\pi/2$ BPSK	3570.00	H	154	330	6.53	1 / 53	12.14	18.67	0.074	23.00	-4.33
	$\pi/2$ BPSK	3625.00	H	139	339	6.70	1 / 53	13.81	20.51	0.112	23.00	-2.49
	$\pi/2$ BPSK	3680.00	H	165	337	6.84	1 / 53	13.33	20.17	0.104	23.00	-2.83
	QPSK	3570.00	H	154	330	6.53	1 / 53	12.07	18.60	0.072	23.00	-4.40
	QPSK	3625.00	H	139	339	6.70	1 / 53	13.87	20.57	0.114	23.00	-2.43
	QPSK	3680.00	H	165	337	6.84	1 / 53	13.32	20.16	0.104	23.00	-2.84
30 MHz	16-QAM	3625.00	H	139	339	6.70	1 / 53	12.62	19.32	0.085	23.00	-3.68
	$\pi/2$ BPSK	3565.00	H	154	330	6.52	1 / 1	12.32	18.84	0.077	23.00	-4.16
	$\pi/2$ BPSK	3625.00	H	139	339	6.70	1 / 1	13.88	20.68	0.114	23.00	-2.42
	$\pi/2$ BPSK	3685.00	H	165	337	6.85	1 / 1	13.40	20.25	0.106	23.00	-2.75
	QPSK	3565.00	H	154	330	6.52	1 / 1	12.25	18.77	0.075	23.00	-4.23
	QPSK	3625.00	H	139	339	6.70	1 / 1	13.85	20.55	0.113	23.00	-2.45
20 MHz	QPSK	3685.00	H	165	337	6.85	1 / 1	13.44	20.29	0.107	23.00	-2.71
	16-QAM	3625.00	H	139	339	6.70	1 / 1	12.62	19.32	0.085	23.00	-3.68
	$\pi/2$ BPSK	3560.00	H	154	330	6.51	1 / 1	12.04	18.55	0.072	23.00	-4.45
	$\pi/2$ BPSK	3625.00	H	139	339	6.70	1 / 1	13.73	20.43	0.110	23.00	-2.57
	$\pi/2$ BPSK	3690.00	H	165	337	6.86	1 / 1	13.05	19.90	0.098	23.00	-3.10
	QPSK	3560.00	H	154	330	6.51	1 / 1	12.01	18.52	0.071	23.00	-4.48
15 MHz	QPSK	3625.00	H	139	339	6.70	1 / 1	13.69	20.39	0.109	23.00	-2.61
	QPSK	3690.00	H	165	337	6.86	1 / 1	13.13	19.98	0.100	23.00	-3.02
	16-QAM	3625.00	H	139	339	6.70	1 / 1	12.50	19.20	0.083	23.00	-3.80
	$\pi/2$ BPSK	3557.50	H	154	330	6.51	1 / 1	12.09	18.59	0.072	23.00	-4.41
	$\pi/2$ BPSK	3625.00	H	139	339	6.70	1 / 36	13.76	20.46	0.111	23.00	-2.54
	$\pi/2$ BPSK	3692.50	H	165	337	6.86	1 / 36	13.16	20.02	0.101	23.00	-2.98
10 MHz	QPSK	3557.50	H	154	330	6.51	1 / 1	12.03	18.53	0.071	23.00	-4.47
	QPSK	3625.00	H	139	339	6.70	1 / 36	13.72	20.42	0.110	23.00	-2.58
	QPSK	3692.50	H	165	337	6.86	1 / 36	13.15	20.01	0.100	23.00	-2.99
	16-QAM	3625.00	H	139	339	6.70	1 / 36	12.29	18.99	0.079	23.00	-4.01
	$\pi/2$ BPSK	3555.00	H	154	330	6.50	1 / 1	12.04	18.54	0.072	23.00	-4.46
	$\pi/2$ BPSK	3625.00	H	139	339	6.70	1 / 22	13.83	20.53	0.113	23.00	-2.47
40 MHz	$\pi/2$ BPSK	3695.00	H	165	337	6.86	1 / 22	13.20	20.06	0.101	23.00	-2.94
	QPSK	3555.00	H	154	330	6.50	1 / 1	11.99	18.49	0.071	23.00	-4.51
	QPSK	3625.00	H	139	339	6.70	1 / 22	13.79	20.49	0.112	23.00	-2.51
	QPSK	3695.00	H	165	337	6.86	1 / 22	13.22	20.08	0.102	23.00	-2.92
	16-QAM	3625.00	H	139	339	6.70	1 / 22	12.33	19.03	0.080	23.00	-3.97
	QPSK (CP-OFDM)	3625.00	H	139	339	6.70	1 / 53	12.49	19.19	0.083	23.00	-3.81
40 MHz	QPSK (WCP)	3625.00	H	215	324	6.70	1 / 53	13.41	20.11	0.103	23.00	-2.89

Table 7-26. EIRP Data (NR Band n48 Ant F)

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm/10MHz]	EIRP [Watts/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
40 MHz	$\pi/2$ BPSK	3570.00	H	101	319	6.53	1 / 104	11.61	18.14	0.065	23.00	-4.86
	$\pi/2$ BPSK	3625.00	H	118	320	6.70	1 / 53	12.01	18.71	0.074	23.00	-4.29
	$\pi/2$ BPSK	3680.00	H	107	321	6.84	1 / 1	11.33	18.17	0.066	23.00	-4.83
	QPSK	3570.00	H	101	319	6.53	1 / 104	11.63	18.16	0.066	23.00	-4.84
	QPSK	3625.00	H	118	320	6.70	1 / 53	11.96	18.66	0.073	23.00	-4.34
	QPSK	3680.00	H	107	321	6.84	1 / 1	11.26	18.10	0.065	23.00	-4.90
40 MHz	16-QAM	3625.00	H	118	320	6.70	1 / 53	10.76	17.46	0.056	23.00	-5.54
40 MHz	QPSK (CP-OFDM)	3625.00	H	116	323	6.70	1 / 53	10.41	17.11	0.051	23.00	-5.89

Table 7-27. EIRP Data (NR Band n48 - Ant C)

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm/10MHz]	EIRP [Watts/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
40 MHz	$\pi/2$ BPSK	3570.00	H	219	307	6.53	1 / 1	13.28	19.81	0.096	23.00	-3.19
	$\pi/2$ BPSK	3625.00	H	205	309	6.70	1 / 104	13.36	20.06	0.101	23.00	-2.94
	$\pi/2$ BPSK	3680.00	H	226	311	6.84	1 / 53	13.81	20.65	0.116	23.00	-2.35
	QPSK	3570.00	H	219	307	6.53	1 / 1	13.36	19.89	0.098	23.00	-3.11
	QPSK	3625.00	H	205	309	6.70	1 / 104	13.30	20.00	0.100	23.00	-3.00
	QPSK	3680.00	H	226	311	6.84	1 / 53	13.84	20.68	0.117	23.00	-2.32
40 MHz	16-QAM	3680.00	H	226	311	6.84	1 / 53	12.76	19.60	0.091	23.00	-3.40
40 MHz	QPSK (CP-OFDM)	3680.00	H	215	311	6.84	1 / 53	12.37	19.21	0.083	23.00	-3.79

Table 7-28. EIRP Data (NR Band n48 - Ant I)

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Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm/10MHz]	EIRP [Watts/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
40 MHz	$\pi/2$ BPSK	3570.00	V	104	357	6.60	1 / 53	7.66	14.26	0.027	23.00	-8.74
	$\pi/2$ BPSK	3625.00	V	100	0	6.68	1 / 53	7.80	14.48	0.028	23.00	-8.52
	$\pi/2$ BPSK	3680.00	V	114	1	6.94	1 / 1	6.96	13.90	0.025	23.00	-9.10
	QPSK	3570.00	V	104	357	6.60	1 / 53	7.58	14.18	0.026	23.00	-8.82
	QPSK	3625.00	V	100	0	6.68	1 / 53	7.66	14.34	0.027	23.00	-8.66
	QPSK	3680.00	V	114	1	6.94	1 / 1	6.95	13.89	0.024	23.00	-9.11
	16-QAM	3625.00	V	100	0	6.68	1 / 53	6.67	13.35	0.022	23.00	-9.65
40 MHz	QPSK (CP-OFDM)	3625.00	V	100	0	6.68	1 / 53	6.27	12.95	0.020	23.00	-10.05

Table 7-29. EIRP Data (NR Band n48 – Ant D)

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7.7 Radiated Spurious Emissions Measurements

Test Overview

Radiated spurious emissions measurements are performed using the field strength conversion method described in ANSI C63.26-2015 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using hybrid (biconical/log) antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

Test Procedures Used

ANSI C63.26-2015 – Section 5.5.4

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW $\geq 3 \times$ RBW
3. Span = 1.5 times the OBW
4. No. of sweep points $\geq 2 \times$ span / RBW
5. Detector = RMS
6. Trace mode = Max Hold (In cases where the level is within 2dB of the limit, the final measurement is taken using triggering/gating and trace averaging.)
7. The trace was allowed to stabilize

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Test Setup

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

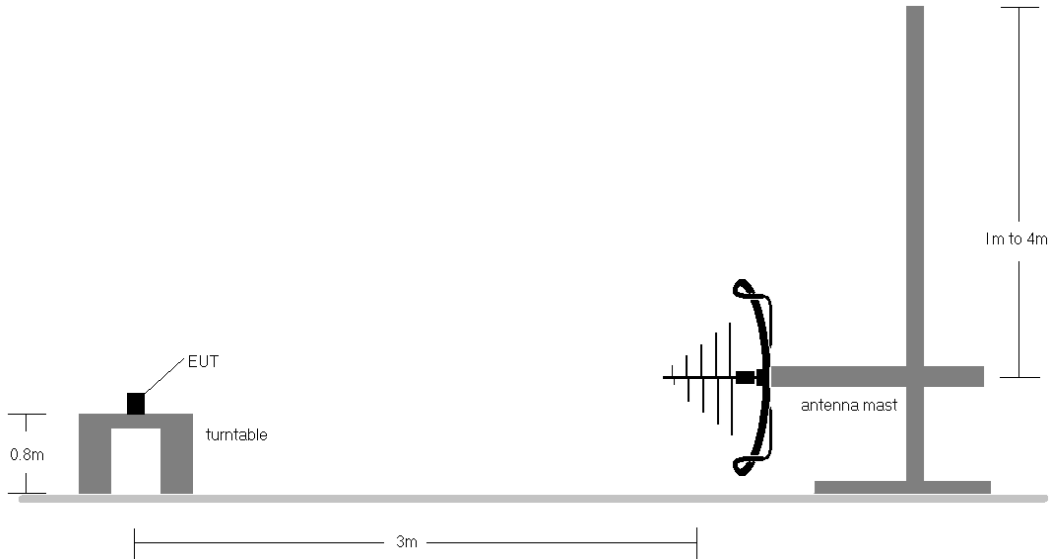


Figure 7-6. Test Instrument & Measurement Setup < 1GHz

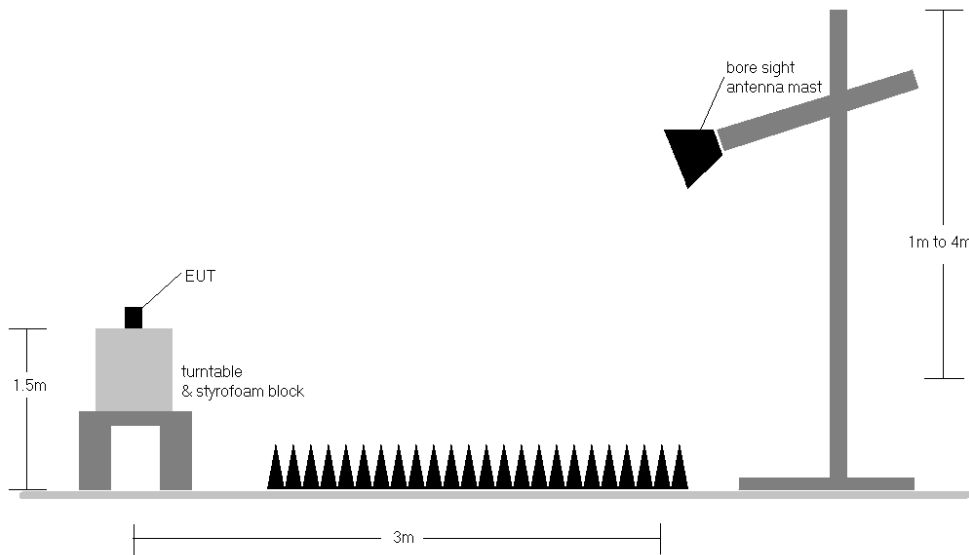


Figure 7-7. Test Instrument & Measurement Setup >1 GHz

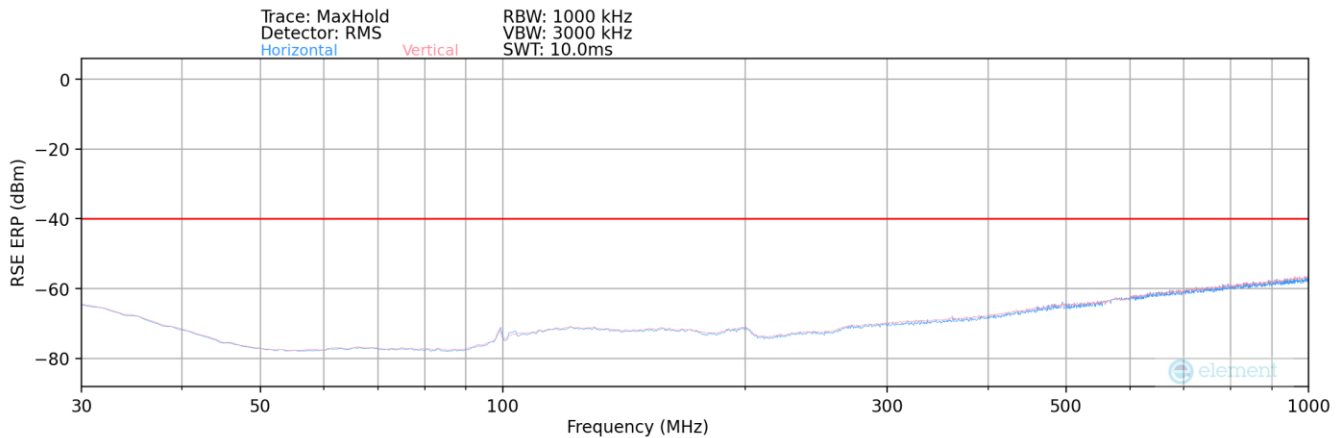
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Test Notes

- 1) Field strengths are calculated using the Measurement quantity conversions in ANSI C63.26-2015 Section 5.2.7:
 - a) $E(\text{dB}\mu\text{V}/\text{m}) = \text{Measured amplitude level (dBm)} + 107 + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$
 - b) $\text{EIRP (dBm)} = E(\text{dB}\mu\text{V}/\text{m}) + 20\log D - 104.8$; where D is the measurement distance in meters.
- 2) 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.
- 3) This unit was tested with its standard battery.
- 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) The "-" shown in the following RSE tables are used to denote a noise floor measurement.
- 7) 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.
- 8) Spurious emission in EN-DC Operating mode with Sub 6GHz NR carrier as well as an LTE carrier (anchor) has been checked and was found to not to be the worst case. Spurious emissions from the NR carrier device are subject to the rules under which the NR carrier operates. Spurious emissions caused by the LTE carrier must meet the requirements of the rules under which the LTE carrier operates."

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LTE Band 48



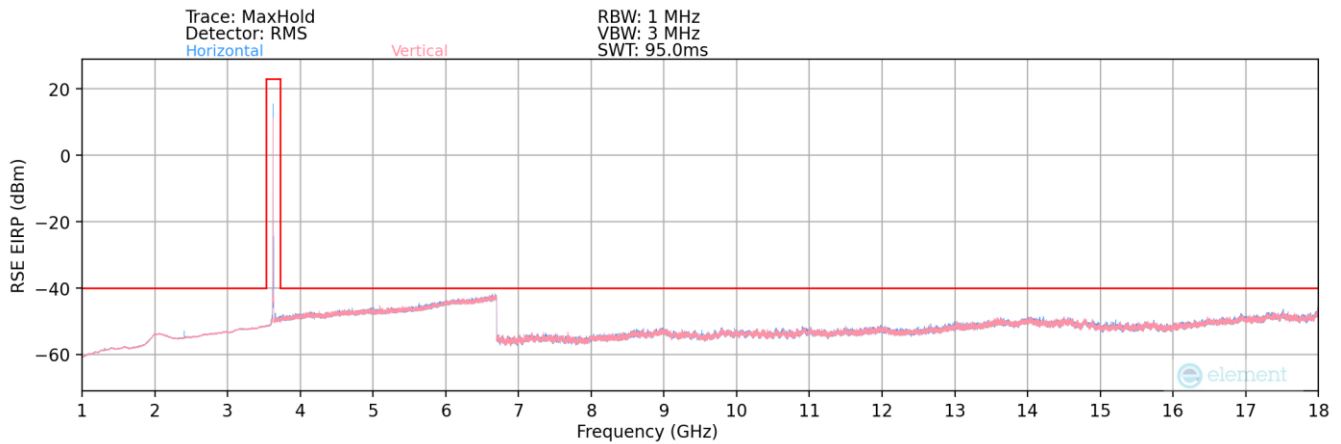
Plot 7-75. Radiated Spurious – Below 1GHz Plot (LTE Band 48)

Bandwidth (MHz):	20
Frequency (MHz):	3625.0
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 50

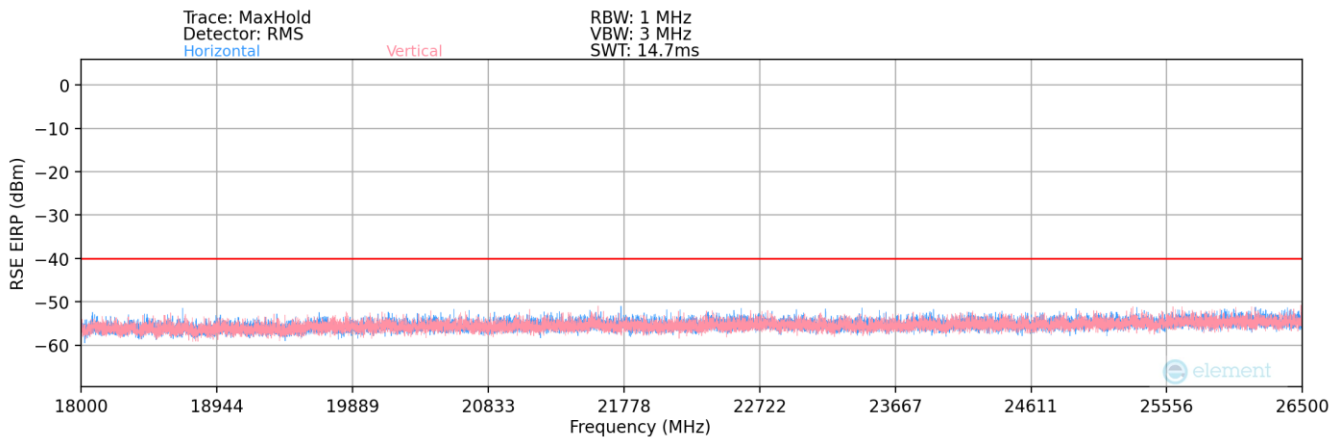
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dB μ V/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
784.66	V	-	-	-98.36	29.48	38.12	-59.29	-40.00	-19.29

Table 7-30. Radiated Spurious Data (LTE Band 48 – Mid Channel)

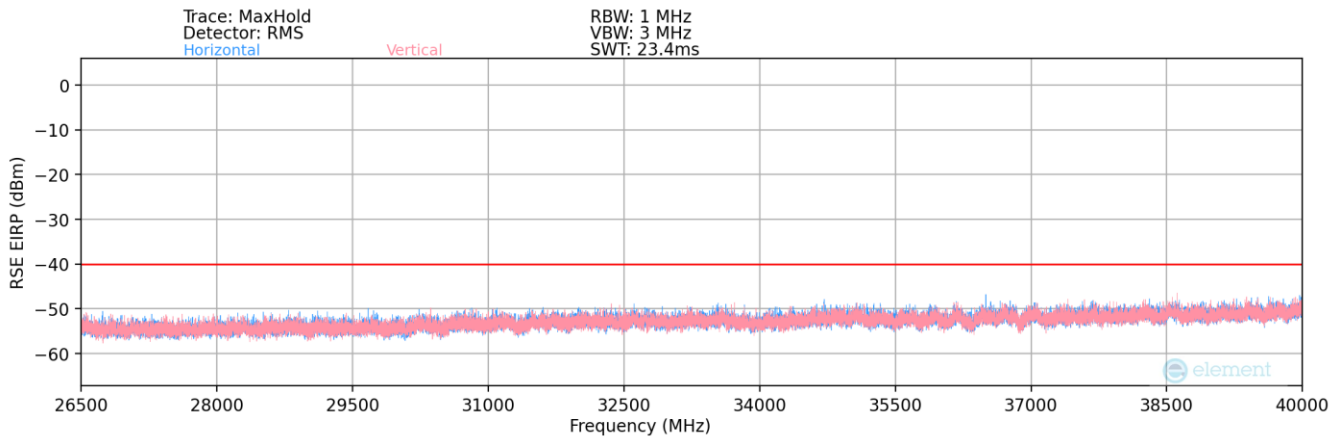
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Plot 7-76. Radiated Spurious Plot – 1GHz - 18GHz (LTE Band 48)



Plot 7-77. Radiated Spurious Plot – 18GHz - 26.5GHz (LTE Band 48)



Plot 7-78. Radiated Spurious Plot – 26GHz - 40GHz (LTE Band 48)

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Bandwidth (MHz):	20
Frequency (MHz):	3560.0
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
7120.00	V	-	-	-76.78	9.26	39.48	-55.77	-40.00	-15.77
10680.00	V	-	-	-77.84	12.33	41.49	-53.76	-40.00	-13.76
14240.00	V	-	-	-77.64	16.01	45.37	-49.89	-40.00	-9.89
17800.00	V	-	-	-78.45	17.28	45.83	-49.43	-40.00	-9.43
21360.00	V	-	-	-59.17	3.99	51.82	-52.98	-40.00	-12.98

Table 7-31. Radiated Spurious Data (LTE Band 48 – Low Channel)

Bandwidth (MHz):	20
Frequency (MHz):	3625.0
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
7250.00	V	113	217	-72.72	9.18	43.46	-51.80	-40.00	-11.80
10875.00	V	-	-	-77.65	11.95	41.30	-53.96	-40.00	-13.96
14500.00	V	-	-	-78.25	15.94	44.69	-50.56	-40.00	-10.56
18125.00	V	-	-	-57.02	1.60	51.58	-53.22	-40.00	-13.22

Table 7-32. Radiated Spurious Data (LTE Band 48 – Mid Channel)

Bandwidth (MHz):	20
Frequency (MHz):	3690.0
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
7380.00	V	-	-	-76.94	9.82	39.88	-55.38	-40.00	-15.38
11070.00	V	-	-	-77.76	12.05	41.29	-53.96	-40.00	-13.96
14760.00	V	-	-	-78.87	15.62	43.75	-51.51	-40.00	-11.51
18450.00	V	-	-	-57.88	1.82	50.94	-53.86	-40.00	-13.86

Table 7-33. Radiated Spurious Data (LTE Band 48 – High Channel)

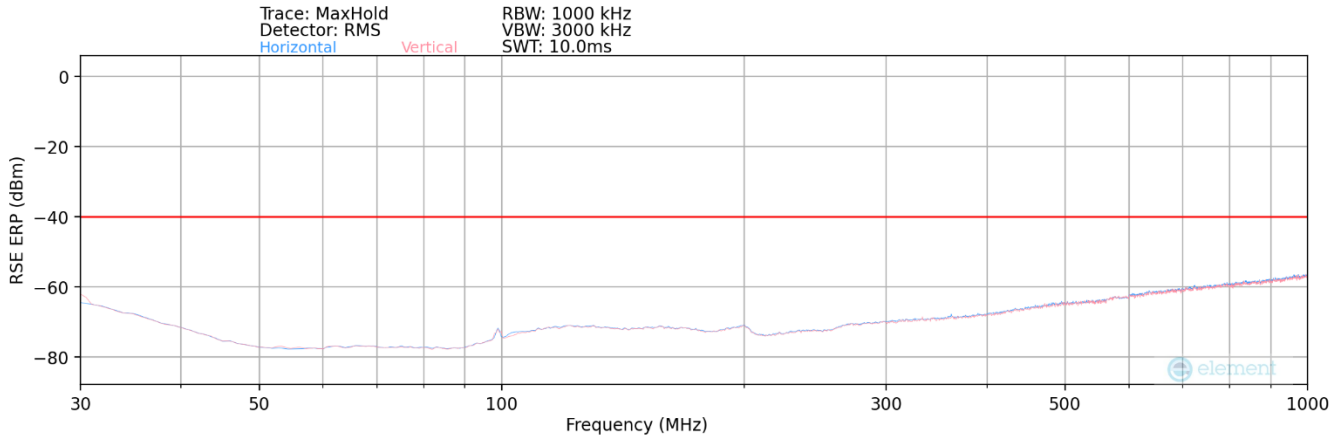
Case:	w/ Wireless Charging Pad
Bandwidth (MHz):	20
Frequency (MHz):	3625.0
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
7250.00	V	-	-	-75.56	9.18	40.62	-54.64	-40.00	-14.64
10875.00	V	-	-	-77.25	11.95	41.70	-53.56	-40.00	-13.56
14500.00	V	-	-	-78.33	15.94	44.61	-50.64	-40.00	-10.64

Table 7-34. Radiated Spurious Data with WCP (LTE Band 48)

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ULCA LB48



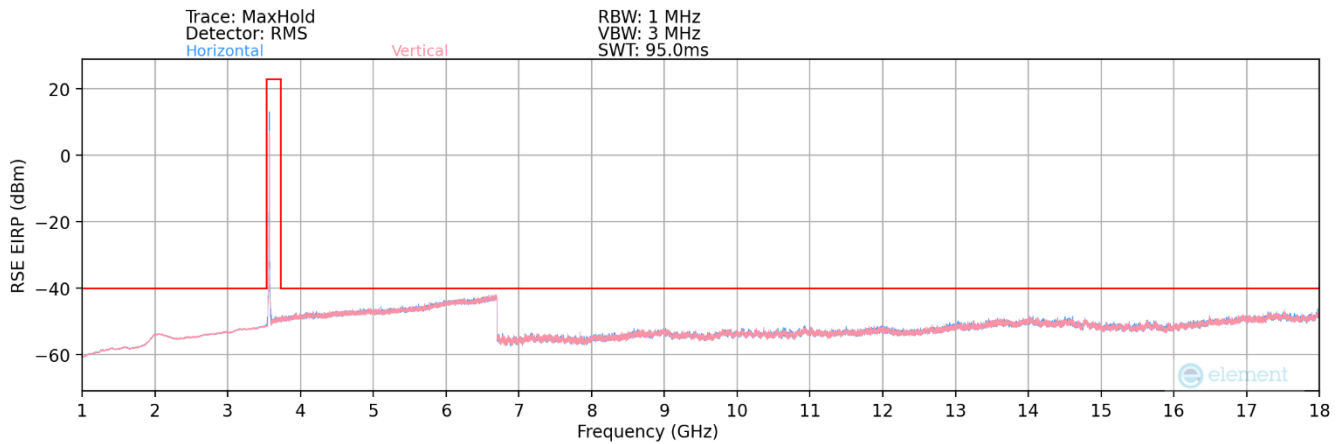
Plot 7-79. Radiated Spurious Plot – Below 1GHz (ULCA LB48 – Mid Channel)

PCC Bandwidth (MHz):	20
PCC Frequency (MHz):	3625.0
PCC RB / Offset:	1 / 99
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	3644.8
SCC RB / Offset:	1 / 0

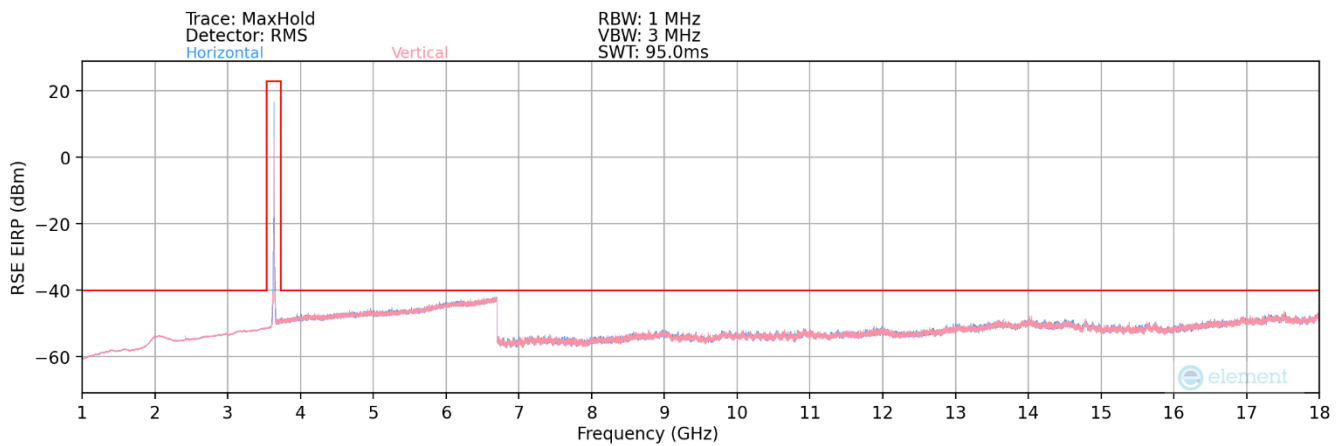
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
794.60	V	-	-	-97.14	30.33	40.19	-57.22	-40.00	-17.22

Table 7-35. Radiated Spurious Data (ULCA LB48 – Mid Channel)

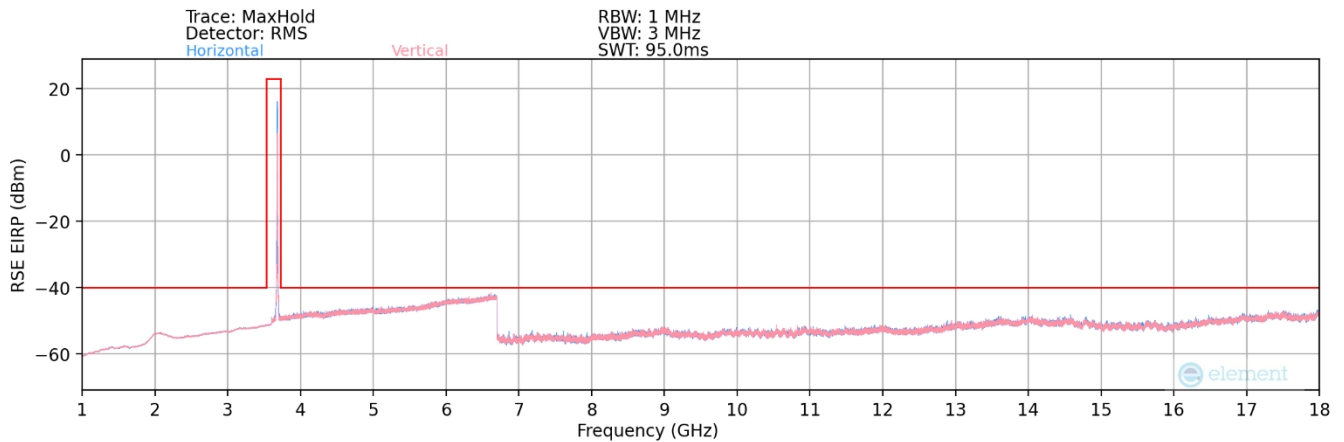
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Plot 7-80. Radiated Spurious Plot – 1GHz - 18GHz (ULCA LB48 – Low Channel)



Plot 7-81. Radiated Spurious Plot – 1GHz - 18GHz (ULCA LB48 – Mid Channel)



Plot 7-82. Radiated Spurious Plot – 1GHz - 18GHz (ULCA LB48 – High Channel)

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