ELEMENT WASHINGTON DC LLC
7185 Oakland Mills Road, Columbia, MD 21046 USA
Tel. 410.290.6652 / Fax 410.290.6654
http://www.element.com

PART 27 MEASUREMENT REPORT

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

Date of Testing:
5/30 - 8/4/2023
Test Report Issue Date:
8/9/2023
Test Site/Location:
Element Lab., Columbia, MD, USA
Test Report Serial No.:
1M2304260063-08.A3L

FCC ID:	**A3LSMS711B**
Applicant Name:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model:	SM-S711B/DS
Additional Model(s):	SM-S711B
EUT Type:	Portable Handset
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part:	27
Test Procedure(s):	ANSI C63.26-2015, 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

ACCREDITED
CERT #2041.01

TABLE OF CONTENTS

PART 27 MEASUREMENT REPORT

Antenna F						
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
NR Band n77 PC3 (3450 - 3550MHz)	100 MHz	π/2 BPSK	3500.0	0.142	21.52	96M9G7D
		QPSK	3500.0	0.136	21.34	97M8G7D
		16QAM	3500.0	0.106	20.23	97M7W7D
	90 MHz	π/2 BPSK	3495.0 - 3505.0	0.146	21.64	87M0G7D
		QPSK	3495.0 - 3505.0	0.161	22.07	87M9G7D
		16QAM	3495.0 - 3505.0	0.104	20.17	87M8W7D
	80 MHz	π/2 BPSK	3490.0 - 3510.0	0.143	21.56	77M2G7D
		QPSK	3490.0 - 3510.0	0.150	21.77	77M9G7D
		16QAM	3490.0 - 3510.0	0.102	20.09	77M9W7D
	70 MHz	π/2 BPSK	3485.0 - 3515.0	0.154	21.88	64M6G7D
		QPSK	3485.0 - 3515.0	0.148	21.70	67M6G7D
		16QAM	3485.0 - 3515.0	0.118	20.70	67M7W7D
	60 MHz	π/2 BPSK	3480.0 - 3520.0	0.154	21.88	58M0G7D
		QPSK	3480.0 - 3520.0	0.147	21.68	58M1G7D
		16QAM	3480.0 - 3520.0	0.111	20.43	58M0W7D
	50 MHz	π/2 BPSK	3475.0 - 3525.0	0.154	21.87	46M0G7D
		QPSK	3475.0 - 3525.0	0.147	21.67	47M8G7D
		16QAM	3475.0 - 3525.0	0.110	20.42	47M6W7D
	40 MHz	π/2 BPSK	3470.0 - 3530.0	0.151	21.78	35M9G7D
		QPSK	3470.0 - 3530.0	0.147	21.66	38M1G7D
		16QAM	3470.0 - 3530.0	0.110	20.39	38M1W7D
	30 MHz	π/2 BPSK	3465.0 - 3535.0	0.149	21.72	27M1G7D
		QPSK	3465.0 - 3535.0	0.144	21.57	28M1G7D
		16QAM	3465.0 - 3535.0	0.106	20.24	28M2W7D
	20 MHz	π/2 BPSK	3460.0 - 3540.0	0.149	21.73	18M0G7D
		QPSK	3460.0 - 3540.0	0.143	21.55	18M4G7D
		16QAM	3460.0 - 3540.0	0.105	20.21	18M3W7D
	15 MHz	π/2 BPSK	3457.5 - 3542.5	0.146	21.63	12M9G7D
		QPSK	3457.5 - 3542.5	0.139	21.42	13M6G7D
		16QAM	3457.5 - 3542.5	0.102	20.07	13M8W7D
	10 MHz	π/2 BPSK	3455.0 - 3545.0	0.145	21.61	8M68G7D
		QPSK	3455.0 - 3545.0	0.141	21.49	8M62G7D
		16QAM	3455.0 - 3545.0	0.104	20.15	8M65W7D
NR Band n77 PC3 (3700 - 3980MHz)	100 MHz	π/2 BPSK	3750.0 - 3930.0	0.213	23.27	96M8G7D
		QPSK	3750.0 - 3930.0	0.204	23.10	97M8G7D
		16QAM	3750.0 - 3930.0	0.190	22.79	97M8W7D
	90 MHz	π/2 BPSK	3745.0 - 3935.0	0.219	23.40	87M3G7D
		QPSK	3745.0 - 3935.0	0.208	23.17	87M9G7D
		16QAM	3745.0 - 3935.0	0.194	22.89	87M7W7D
	80 MHz	π/2 BPSK	3740.0 - 3940.0	0.215	23.32	77M3G7D
		QPSK	3740.0 - 3940.0	0.200	23.01	77M7G7D
		16QAM	3740.0 - 3940.0	0.189	22.77	77M8W7D
	70 MHz	π/2 BPSK	3735.0 - 3945.0	0.227	23.56	64M6G7D
		QPSK	3735.0 - 3945.0	0.218	23.38	67M6G7D
		16QAM	3735.0 - 3945.0	0.212	23.27	67M6W7D
	60 MHz	π/2 BPSK	3730.0 - 3950.0	0.231	23.63	58M0G7D
		QPSK	3730.0 - 3950.0	0.223	23.47	58M2G7D
		16QAM	3730.0 - 3950.0	0.213	23.29	58M1W7D
	50 MHz	π/2 BPSK	3725.0 - 3955.0	0.224	23.49	46M0G7D
		QPSK	3725.0 - 3955.0	0.216	23.34	47M8G7D
		16QAM	3725.0 - 3955.0	0.205	23.11	47M8W7D
	40 MHz	π/2 BPSK	3720.0 - 3960.0	0.217	23.36	36M0G7D
		QPSK	3720.0 - 3960.0	0.208	23.18	37M9G7D
		16QAM	3720.0 - 3960.0	0.204	23.09	38M2W7D
	30 MHz	π/2 BPSK	3715.0 - 3965.0	0.224	23.50	26M9G7D
		QPSK	3715.0 - 3965.0	0.214	23.29	28M0G7D
		16QAM	3715.0 - 3965.0	0.204	23.09	28M0W7D
	20 MHz	π/2 BPSK	3710.0 - 3970.0	0.218	23.39	18M0G7D
		QPSK	3710.0 - 3970.0	0.211	23.23	18M4G7D
		16QAM	3710.0 - 3970.0	0.199	22.99	18M4W7D
	15 MHz	π/2 BPSK	3707.5 - 3972.5	0.216	23.34	13M0G7D
		QPSK	3707.5 - 3972.5	0.209	23.19	13M7G7D
		16QAM	3707.5 - 3972.5	0.199	22.99	13M7W7D
	10 MHz	π/2 BPSK	3705.0 - 3975.0	0.211	23.23	8M62G7D
		QPSK	3705.0 - 3975.0	0.195	22.90	8M67G7D
		16QAM	3705.0 - 3975.0	0.192	22.84	8M70W7D

Antenna C

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
NR Band n77 PC3 (3450 - 3550MHz)	100 MHz	π/2 BPSK	3500.0	0.114	20.58	-
		QPSK	3500.0	0.102	20.09	-
		16QAM	3500.0	0.049	16.89	-
NR Band n77 PC3 (3700 - 3980MHz)	100 MHz	π/2 BPSK	3750.0 - 3930.0	0.147	21.68	-
		QPSK	3750.0 - 3930.0	0.143	21.56	-
		16QAM	3750.0 - 3930.0	0.089	19.49	-

Antenna I

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
NR Band n77 PC3 (3450 - 3550MHz)	100 MHz	π/2 BPSK	3500.0	0.154	21.87	-
		QPSK	3500.0	0.183	22.63	-
		16QAM	3500.0	0.092	19.61	-
NR Band n77 PC3 (3700 - 3980MHz)	100 MHz	π/2 BPSK	3750.0 - 3930.0	0.037	15.65	-
		QPSK	3750.0 - 3930.0	0.048	16.84	-
		16QAM	3750.0 - 3930.0	0.019	12.69	-

Antenna D

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
NR Band n77 PC3 (3450 - 3550MHz)	100 MHz	π/2 BPSK	3500.0	0.051	17.10	-
		QPSK	3500.0	0.061	17.86	-
		16QAM	3500.0	0.037	15.67	-
NR Band n77 PC3 (3700 - 3980MHz)	100 MHz	π/2 BPSK	3750.0 - 3930.0	0.084	19.22	-
		QPSK	3750.0 - 3930.0	0.077	18.87	-
		16QAM	3750.0 - 3930.0	0.061	17.85	-

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 and the Innovation, Science and Economic Development Canada.

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 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.

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMS711B**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitters that operate under the provisions of Part 27.

Test Device Serial No.: 0974M, 1050M

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), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII (5GHz and 6GHz), Bluetooth (1x, EDR, LE), NFC, 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.

This device can transmit in the 5G NR Band n77 over four separate antennas labelled SRS-0 (Ant F), SRS-1 (Ant C), SRS-2, (Ant I) and SRS-3 (Ant D). With SRS operations, any of these four antennas can transmit an SRS signal to check the channel quality for transmission in the n77 Band. However, these antennas cannot simultaneously transmit and only the SRS-0 (Ant F) antenna is capable of data transmission. The test data is marked to indicate the specific antenna transmitting in the n77 band.

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.

2.4 Software and Firmware

Testing was performed on device(s) using software/firmware version S711BXXU0_0627_0900_devFull 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.

3.0 DESCRIPTION OF TESTS

3.1 Evaluation 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:

$$P_{d\ [dBm]} = P_{g\ [dBm]} - \text{cable loss}_{\ [dB]} + \text{antenna gain}_{\ [dBd/dBi]};$$

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 $P_{g\ [dBm]}$ – 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:

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

And

$$EIRP_{[dBm]} = E_{[dB\mu V/m]} + 20\log D - 104.8;$$ where D 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.

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 (±dB)
Conducted Bench Top Measurements	1.13
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

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	1/11/2023	Annual	1/11/2024	AP2-001
-	AP2-002	EMC Cable and Switch System	1/11/2023	Annual	1/11/2024	AP2-002
-	ETS-001	EMC Cable and Switch System	1/11/2023	Annual	1/11/2024	ETS-001
-	ETS-002	EMC Cable and Switch System	1/11/2023	Annual	1/11/2024	ETS-002
-	LTX1	Licensed Transmitter Cable Set	1/12/2023	Annual	1/12/2024	LTX1
-	LTX2	Licensed Transmitter Cable Set	1/12/2023	Annual	1/12/2024	LTX2
-	LTX3	Licensed Transmitter Cable Set	1/12/2023	Annual	1/12/2024	LTX3
-	LTX4	Licensed Transmitter Cable Set	1/12/2023	Annual	1/12/2024	LTX4
-	LTX5	Licensed Transmitter Cable Set	1/12/2023	Annual	1/12/2024	LTX5
Anritsu	MT8821C	Radio Communication Analyzer	N/A			620152694
EMCO	3115	Horn Antenna (1-18GHz)	8/8/2022	Biennial	8/8/2024	9704-5182
EMCO	3116	Horn Antenna (18-40GHz)	7/20/2021	Biennial	8/30/2023	9203-2178
Keysight Technologies	N9030A	PXA Signal Analyzer (3Hz-26.5GHz)	9/6/2022	Annual	9/6/2023	MY54490576
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	3/15/2023	Annual	3/15/2024	MY52350166
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			112347
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Test Antenna	9/28/2022	Biennial	9/28/2024	101058
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	8/29/2022	Annual	8/29/2023	100342
Rohde & Schwarz	ESW44	EMI Test Receiver (2Hz-44GHz)	3/1/2023	Annual	3/1/2024	101716
Rohde & Schwarz	VULB9162	Bi-Log Antenna	2/21/2023	Biennial	2/21/2025	00301
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	8/30/2022	Biennial	8/30/2024	A051107

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.

6.0 SAMPLE CALCULATIONS

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

Example: Spurious emission at 3700.40 MHz

The receive 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 3700.40 MHz. So 6.1 dB is added to the signal generator reading of –30.9 dBm yielding –24.80 dBm. The fundamental EIRP was 25.50 dBm so this harmonic was 25.50 dBm – (-24.80) = 50.3 dBc.

7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.

FCC ID: A3LSMS711B

FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)

Mode(s): NR

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Transmitter Conducted Output 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 (NR Band n77)	2.1051, 27.53(l), 27.53(n)	≤ 13 dBm / MHz	PASS	Sections 7.4, 7.5
	Peak-to-Average Ratio (NR Band n77)	27.53(j)(4), 27.53(k)(4)	≤ 13 dB	PASS	Section 7.6
	Frequency Stability	2.1055, 27.54	Fundamental emissions stay within authorized frequency block.	PASS	Section 7.9
RADIATED	Effective Radiated Power / Equivalent Isotropic Radiated Power (NR Band n77)	27.53(j)(3), 27.53(k)(3)	≤ 1 Watt EIRP	PASS	Section 7.7
	Radiated Spurious Emissions (NR Band n77)	2.1053, 27.53(l), 27.53(n)	≤ 13 dBm / MHz	PASS	Section 7.8

* The only transmitter output conducted powers included in this report are those where the Pmax value, per the tune-up document, is higher than any of the DSI power levels. For the remaining conducted power measurements, see the **RF Exposure Report**.

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.
4) All conducted emissions measurements are performed with automated test software to capture the corresponding plots necessary to show compliance. The measurement software utilized is EMC Software Tool v1.0.

7.2 Conducted Output Power Data

Test Overview

All 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.

Test Procedure Used

ANSI C63.26-2015 – Section 5.2

Test Settings

1. Span = 2 x OBW to 3 x OBW
2. Detector = RMS
3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

Test Setup

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

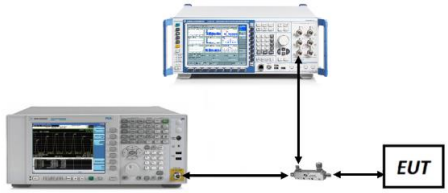


Figure 7-1. Test Instrument & Measurement Setup

Test Notes

1. 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.

2. All other conducted power measurements are contained in the RF exposure report for this filing.

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	π/2 BPSK	650000	3750.00	1 / 68	24.81
		656000	3840.00	1 / 136	24.66
		662000	3930.00	1 / 136	25.03
	QPSK	650000	3750.00	1 / 68	24.80
		656000	3840.00	1 / 136	24.75
		662000	3930.00	1 / 136	25.02
	16-QAM	662000	3930.00	1 / 136	24.05
90 MHz	π/2 BPSK	649668	3745.02	1 / 61	24.75
		656000	3840.00	1 / 122	24.76
		662332	3934.98	1 / 122	25.16
	QPSK	649668	3745.02	1 / 61	24.71
		656000	3840.00	1 / 122	24.75
		662332	3934.98	1 / 122	25.09
	16-QAM	656000	3840.00	1 / 122	23.81
80 MHz	π/2 BPSK	649334	3740.01	1 / 108	24.65
		656000	3840.00	1 / 108	24.74
		662666	3939.99	1 / 108	25.08
	QPSK	649334	3740.01	1 / 108	24.64
		656000	3840.00	1 / 108	24.76
		662666	3939.99	1 / 108	24.93
	16-QAM	662666	3939.99	1 / 108	24.03
70 MHz	π/2 BPSK	649000	3735.00	1 / 47	25.34
		656000	3840.00	1 / 47	25.16
		663000	3945.00	1 / 47	25.32
	QPSK	649000	3735.00	1 / 47	25.29
		656000	3840.00	1 / 47	25.19
		663000	3945.00	1 / 47	25.30
	16-QAM	656000	3840.00	1 / 47	24.19
60 MHz	π/2 BPSK	648668	3730.02	1 / 40	25.23
		656000	3840.00	1 / 40	25.18
		663332	3949.98	1 / 40	25.39
	QPSK	648668	3730.02	1 / 40	25.21
		656000	3840.00	1 / 40	25.17
		663332	3949.98	1 / 40	25.39
	16-QAM	656000	3840.00	1 / 40	24.21
50 MHz	π/2 BPSK	648334	3725.01	1 / 33	25.13
		656000	3840.00	1 / 33	25.03
		663666	3954.99	1 / 33	25.25
	QPSK	648334	3725.01	1 / 33	25.09
		656000	3840.00	1 / 33	25.08
		663666	3954.99	1 / 33	25.26
	16-QAM	656000	3840.00	1 / 33	24.01
40 MHz	π/2 BPSK	648000	3720.00	1 / 26	25.09
		656000	3840.00	1 / 26	25.04
		664000	3960.00	1 / 26	25.12
	QPSK	648000	3720.00	1 / 26	25.05
		656000	3840.00	1 / 26	25.07
		664000	3960.00	1 / 53	25.10
	16-QAM	656000	3840.00	1 / 26	24.01
30 MHz	π/2 BPSK	647668	3715.02	1 / 19	24.48
		656000	3840.00	1 / 19	24.93
		664332	3964.98	1 / 19	25.26
	QPSK	647668	3715.02	1 / 19	24.98
		656000	3840.00	1 / 19	24.98
		664332	3964.98	1 / 19	25.21
	16-QAM	656000	3840.00	1 / 19	24.01
20 MHz	π/2 BPSK	647334	3710.01	1 / 25	24.96
		656000	3840.00	1 / 37	24.92
		664666	3969.99	1 / 13	25.15
	QPSK	647334	3710.01	1 / 13	24.96
		656000	3840.00	1 / 37	24.95
		664666	3969.99	1 / 13	25.15
	16-QAM	656000	3840.00	1 / 37	23.91
15 MHz	π/2 BPSK	647167	3707.51	1 / 9	24.94
		656000	3840.00	1 / 19	24.89
		664499	3972.50	1 / 9	25.10
	QPSK	647167	3707.51	1 / 9	24.93
		656000	3840.00	1 / 28	24.95
		664499	3972.50	1 / 9	25.11
	16-QAM	656000	3840.00	1 / 28	23.91
10 MHz	π/2 BPSK	647000	3705.00	1 / 12	24.89
		656000	3840.00	1 / 17	24.82
		664332	3975.00	1 / 6	24.99
	QPSK	647000	3705.00	1 / 12	24.90
		656000	3840.00	1 / 6	24.82
		664332	3975.00	1 / 6	24.82
	16-QAM	656000	3840.00	1 / 17	23.76

Table 7-2. Conducted Power Measurements – Ant F – C-Band

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	π/2 BPSK	650000	3750.00	1 / 136	24.26
		656000	3840.00	1 / 136	23.31
		662000	3930.00	1 / 136	24.07
	QPSK	650000	3750.00	1 / 68	24.36
		656000	3840.00	1 / 136	23.19
		662000	3930.00	1 / 136	23.91
	16-QAM	650000	3750.00	1 / 68	22.97

Table 7-3. Conducted Power Measurements – Ant C – C-Band

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	π/2 BPSK	650000	3750.00	1 / 136	24.31
		656000	3840.00	1 / 136	24.06
		662000	3930.00	1 / 136	24.68
	QPSK	650000	3750.00	1 / 68	24.48
		656000	3840.00	1 / 136	24.11
		662000	3930.00	1 / 136	24.67
	16-QAM	656000	3840.00	1 / 68	23.44

Table 7-4. Conducted Power Measurements – Ant I – C-Band

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	π/2 BPSK	650000	3750.00	1 / 136	22.23
		656000	3840.00	1 / 136	22.71
		662000	3930.00	1 / 136	22.61
	QPSK	650000	3750.00	1 / 136	22.14
		656000	3840.00	1 / 136	22.60
		662000	3930.00	1 / 136	22.42
	16-QAM	662000	3930.00	1 / 68	21.69

Table 7-5. Conducted Power Measurements – Ant D – C-Band

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	π/2 BPSK	633334	3500.01	1 / 136	25.13
	QPSK	633334	3500.01	1 / 136	25.13
	16-QAM	633334	3500.01	1 / 136	24.37
	64-QAM	633334	3500.01	1 / 136	22.60
	256-QAM	633334	3500.01	1 / 136	20.79
90 MHz	π/2 BPSK	633000	3495.00	1 / 122	25.25
		633334	3500.01	1 / 122	25.19
		633666	3504.99	1 / 122	25.13
	QPSK	633000	3495.00	1 / 122	25.22
		633334	3500.01	1 / 122	25.20
		633666	3504.99	1/122	25.18
	16-QAM	633666	3504.99	1 / 122	23.54
80 MHz	π/2 BPSK	632668	3490.02	1 / 108	25.17
		633334	3500.01	1 / 108	25.14
		634000	3510.00	1 / 108	25.12
	QPSK	632668	3490.02	1 / 162	25.37
		633334	3500.01	1 / 54	24.84
		634000	3510.00	1 / 108	25.12
	16-QAM	632668	3490.02	1 / 108	24.23
70 MHz	π/2 BPSK	632334	3485.01	1 / 47	25.45
		633334	3500.01	1 / 47	25.49
		634332	3514.98	1 / 47	25.48
	QPSK	632334	3485.01	1 / 47	25.48
		633334	3500.01	1 / 47	25.49
		634332	3514.98	1 / 47	25.49
	16-QAM	633334	3500.01	1 / 47	24.84
60 MHz	π/2 BPSK	632000	3480.00	1 / 40	25.42
		633334	3500.01	1 / 40	25.49
		634666	3519.99	1 / 40	25.44
	QPSK	632000	3480.00	1 / 40	25.40
		633334	3500.01	1 / 40	25.47
		634666	3519.99	1 / 40	25.43
	16-QAM	633334	3500.01	1 / 40	24.57
50 MHz	π/2 BPSK	631668	3475.02	1 / 33	25.32
		633334	3500.01	1 / 33	25.48
		635000	3525.00	1 / 33	25.42
	QPSK	631668	3475.02	1 / 33	25.30
		633334	3500.01	1 / 33	25.46
		635000	3525.00	1 / 33	25.40
	16-QAM	633334	3500.01	1 / 33	24.56
40 MHz	π/2 BPSK	631334	3470.01	1 / 26	25.23
		633334	3500.01	1 / 26	25.39
		635332	3529.98	1 / 26	25.25
	QPSK	631334	3470.01	1 / 53	25.45
		633334	3500.01	1 / 26	25.35
		635332	3529.98	1 / 26	25.30
	16-QAM	631334	3470.01	1 / 53	24.53
30 MHz	π/2 BPSK	631000	3465.00	1 / 39	25.33
		633334	3500.01	1 / 19	25.29
		635666	3534.99	1 / 19	25.07
	QPSK	631000	3465.00	1 / 39	25.36
		633334	3500.01	1 / 19	25.28
		635666	3534.99	1 / 19	25.03
	16-QAM	633334	3500.01	1 / 19	24.38
20 MHz	π/2 BPSK	630668	3460.02	1 / 37	25.34
		633334	3500.01	1 / 13	25.22
		636000	3540.00	1 / 13	24.89
	QPSK	630668	3460.02	1 / 37	25.34
		633334	3500.01	1 / 13	25.24
		636000	3540.00	1 / 13	24.90
	16-QAM	630668	3460.02	1 / 37	24.35
15 MHz	π/2 BPSK	630500	3457.50	1 / 28	25.24
		633334	3500.01	1 / 19	25.24
		636166	3542.49	1 / 9	24.88
	QPSK	630500	3457.50	1 / 28	25.20
		633334	3500.01	1 / 19	25.21
		636166	3542.49	1 / 9	24.88
	16-QAM	633334	3500.01	1 / 19	24.21
10 MHz	π/2 BPSK	630334	3455.01	1 / 12	25.11
		633334	3500.01	1 / 12	25.22
		636332	3544.98	1 / 6	24.90
	QPSK	630334	3455.01	1 / 6	25.12
		633334	3500.01	1 / 12	25.28
		636332	3544.98	1 / 6	24.92
	16-QAM	633334	3500.01	1 / 12	24.29

Table 7-6. Conducted Power Measurements – Ant F – DoD-Band

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	π/2 BPSK	633334	3500.01	1 / 136	23.64
	QPSK	633334	3500.01	1 / 136	23.57
	16-QAM	633334	3500.01	1 / 136	22.28

Table 7-7. Conducted Power Measurements – Ant C – DoD-Band

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	π/2 BPSK	633334	3500.01	1 / 136	25.12
	QPSK	633334	3500.01	1 / 136	25.25
	16-QAM	633334	3500.01	1 / 68	24.95

Table 7-8. Conducted Power Measurements – Ant I – DoD -Band

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	π/2 BPSK	633334	3500.01	1 / 136	21.18
	QPSK	633334	3500.01	1 / 68	21.14
	16-QAM	633334	3500.01	1 / 68	20.75

Table 7-9. Conducted Power Measurements – Ant D – DoD -Band

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 ≥ 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.

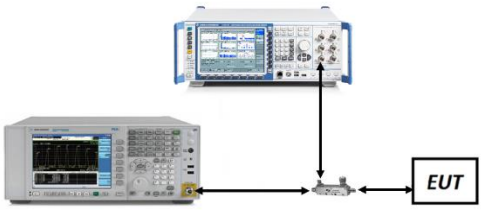


Figure 7-2. Test Instrument & Measurement Setup

Test Notes

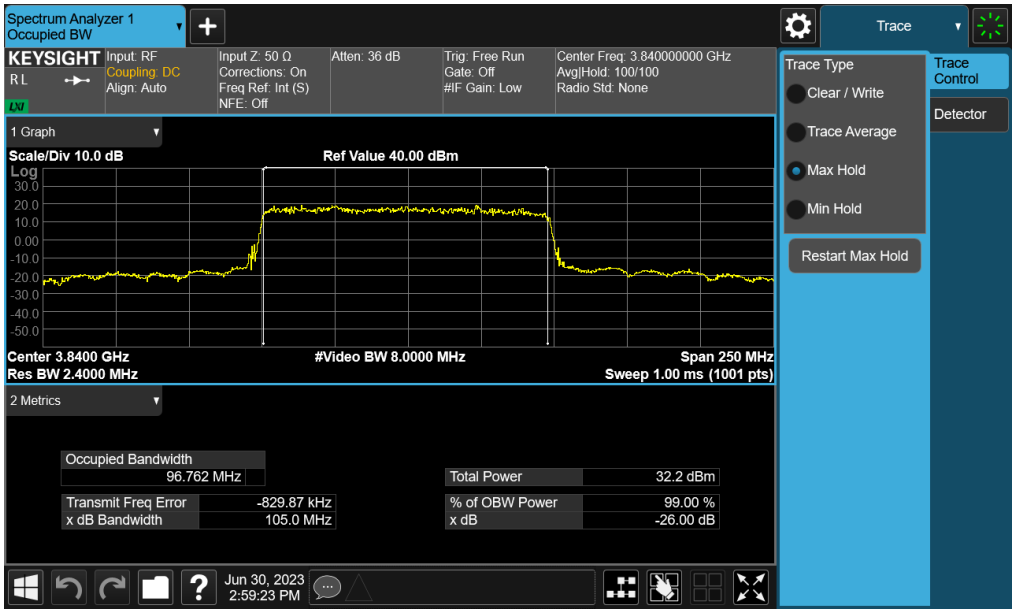
1) Occupied Bandwidth was only measured on the main antenna SRS 0 (Ant F).

2) Only the worst case data for each Modulation/Channel Bandwidth combination is displayed in the following plots.

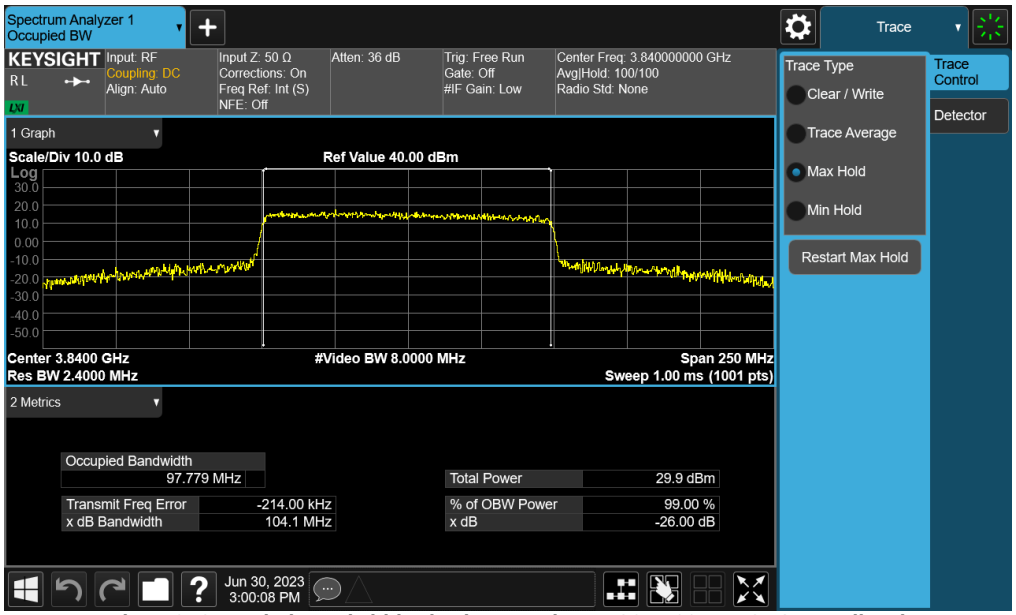
Mode	Bandwidth	Modulation	OBW [MHz]
NR-n77PC3	100MHz	π/2 BPSK	96.76
		QPSK	97.78
		16QAM	97.79
	90MHz	π/2 BPSK	87.30
		QPSK	87.93
		16QAM	87.70
	80MHz	π/2 BPSK	77.32
		QPSK	77.73
		16QAM	77.82
	70MHz	π/2 BPSK	64.56
		QPSK	67.60
		16QAM	67.62
	60MHz	π/2 BPSK	58.01
		QPSK	58.17
		16QAM	58.09
	50MHz	π/2 BPSK	46.01
		QPSK	47.76
		16QAM	47.81
	40MHz	π/2 BPSK	36.00
		QPSK	37.91
		16QAM	38.23
	30MHz	π/2 BPSK	26.94
		QPSK	28.01
		16QAM	27.98
	20MHz	π/2 BPSK	18.01
		QPSK	18.37
		16QAM	18.39
	15MHz	π/2 BPSK	12.95
		QPSK	13.67
		16QAM	13.69
	10 MHz	π/2 BPSK	8.62
		QPSK	8.67
		16QAM	8.70

Table 7-10. Occupied Bandwidth Test Results – C-Band

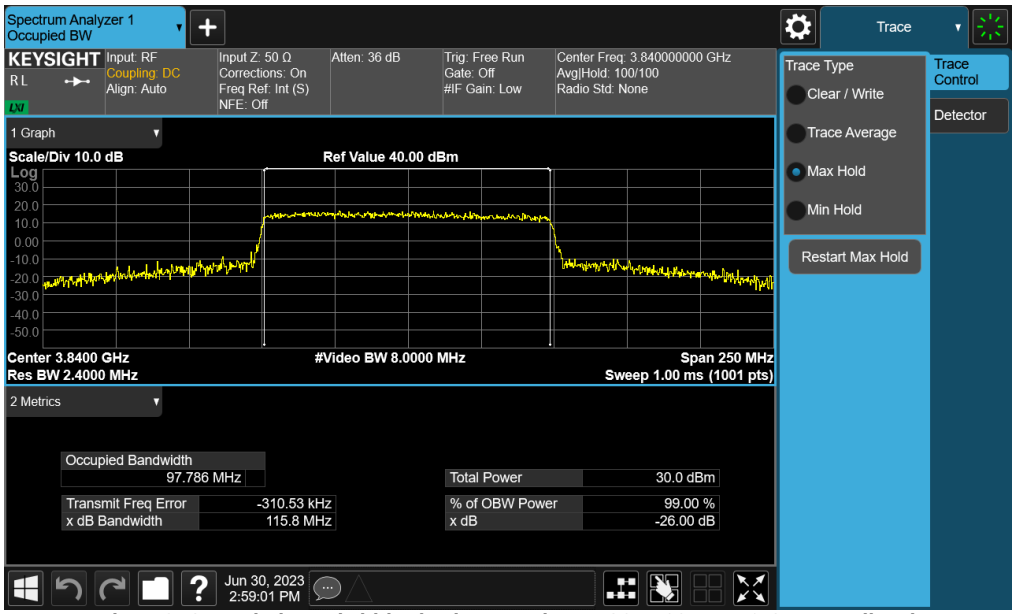
NR Band n77PC3 – C-Band



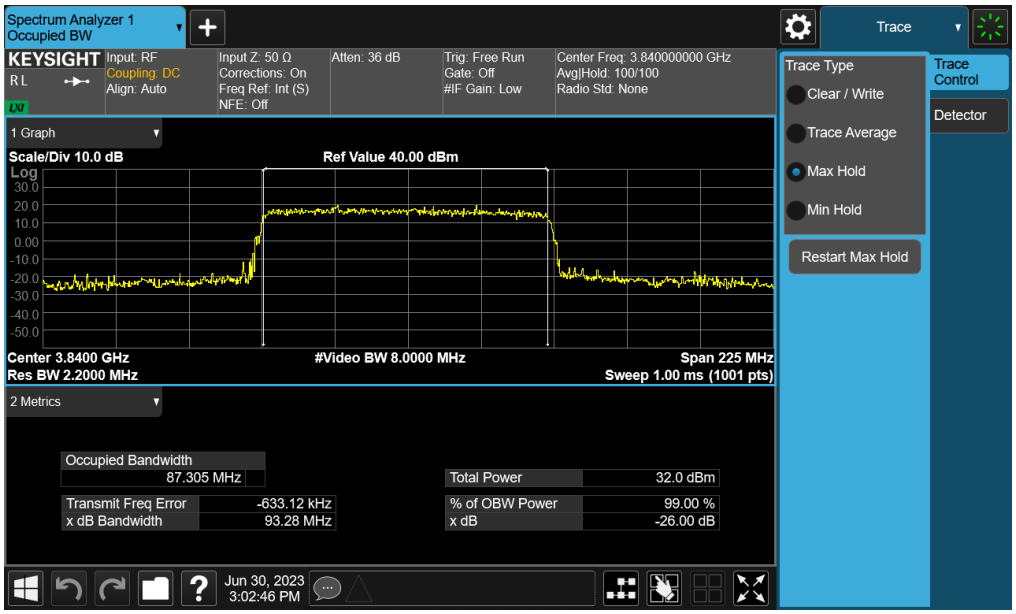
Plot 7-1. Occupied Bandwidth Plot (NR Band n77PC3 - 100MHz π/2 BPSK - Full RB)



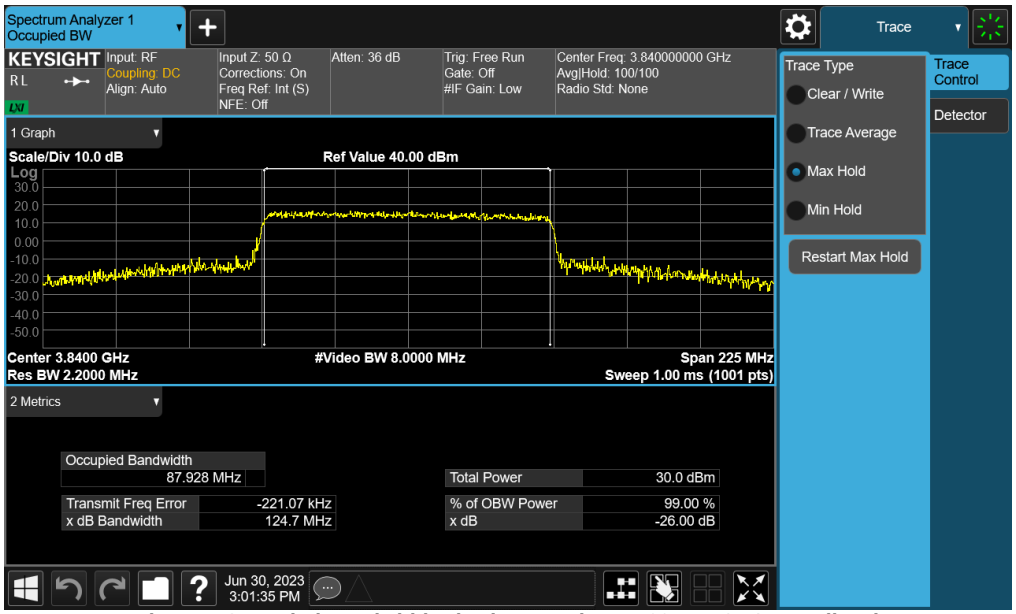
Plot 7-2. Occupied Bandwidth Plot (NR Band n77PC3 - 100MHz QPSK - Full RB)



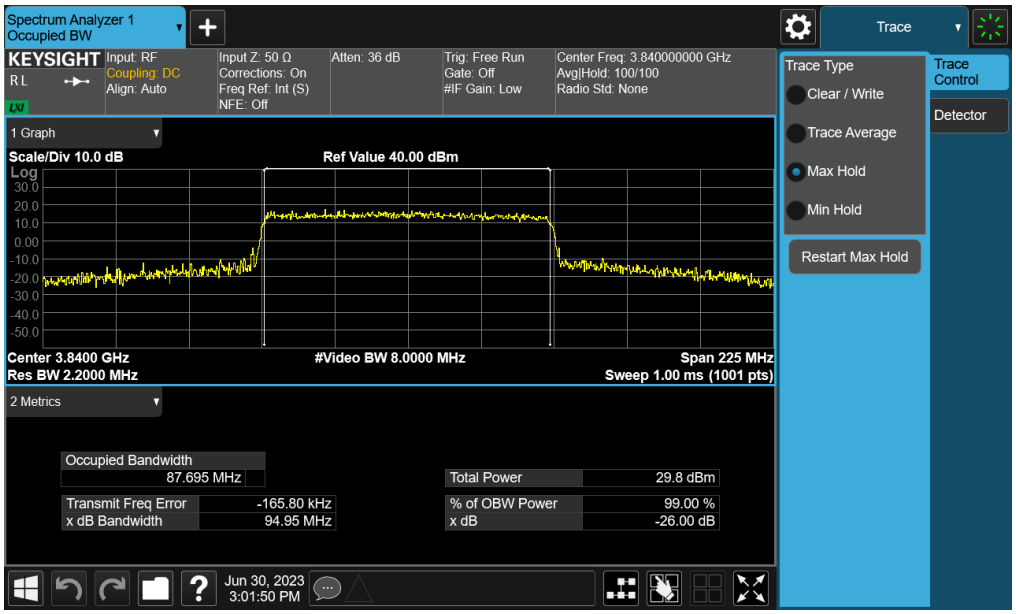
Plot 7-3. Occupied Bandwidth Plot (NR Band n77PC3 - 100MHz 16-QAM - Full RB)



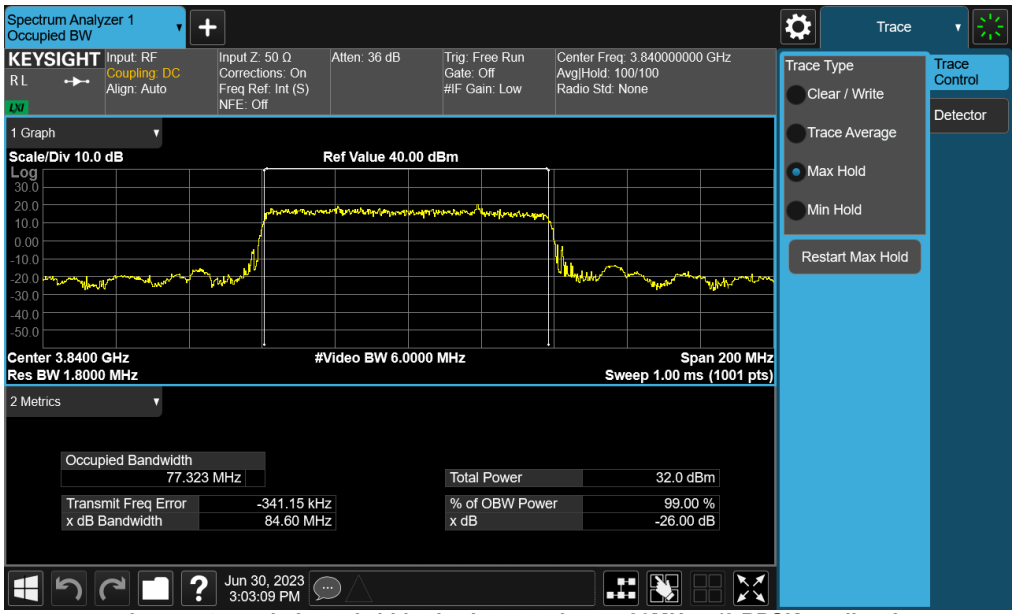
Plot 7-4. Occupied Bandwidth Plot (NR Band n77 - 90MHz π/2 BPSK - Full RB)



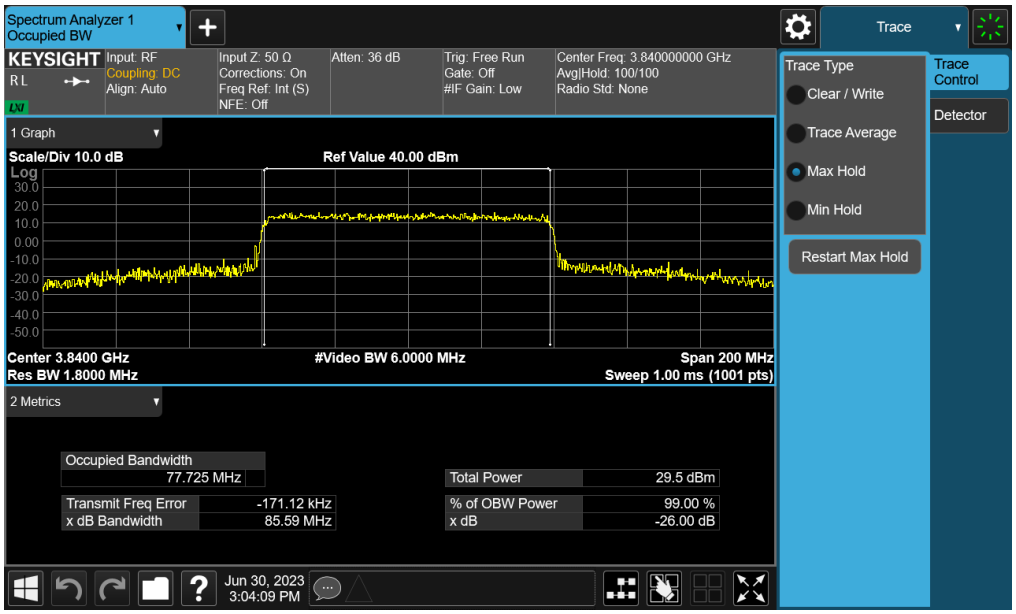
Plot 7-5. Occupied Bandwidth Plot (NR Band n77 - 90MHz QPSK - Full RB)



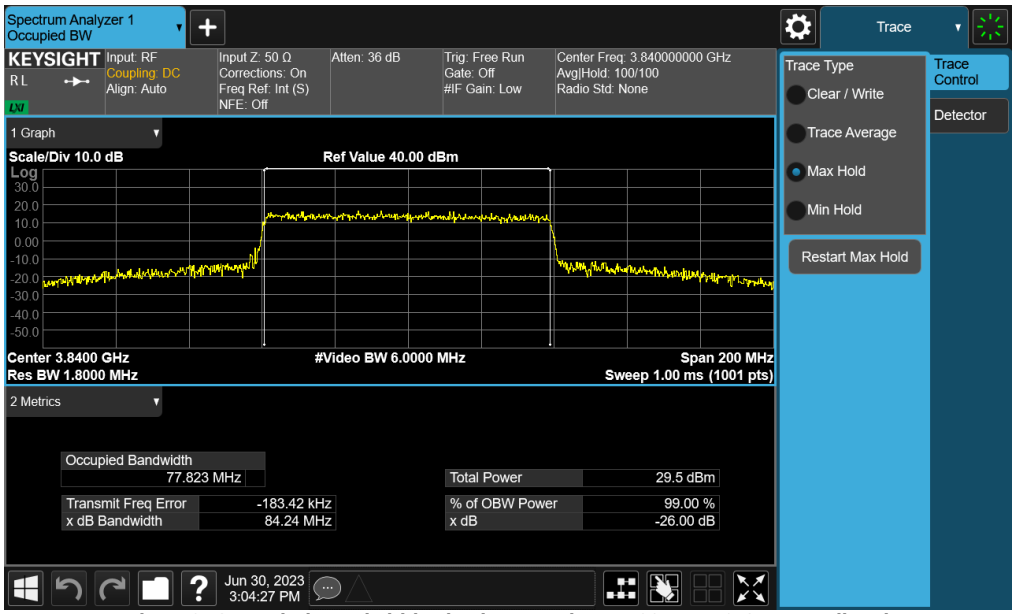
Plot 7-6. Occupied Bandwidth Plot (NR Band n77 - 90MHz 16-QAM - Full RB)



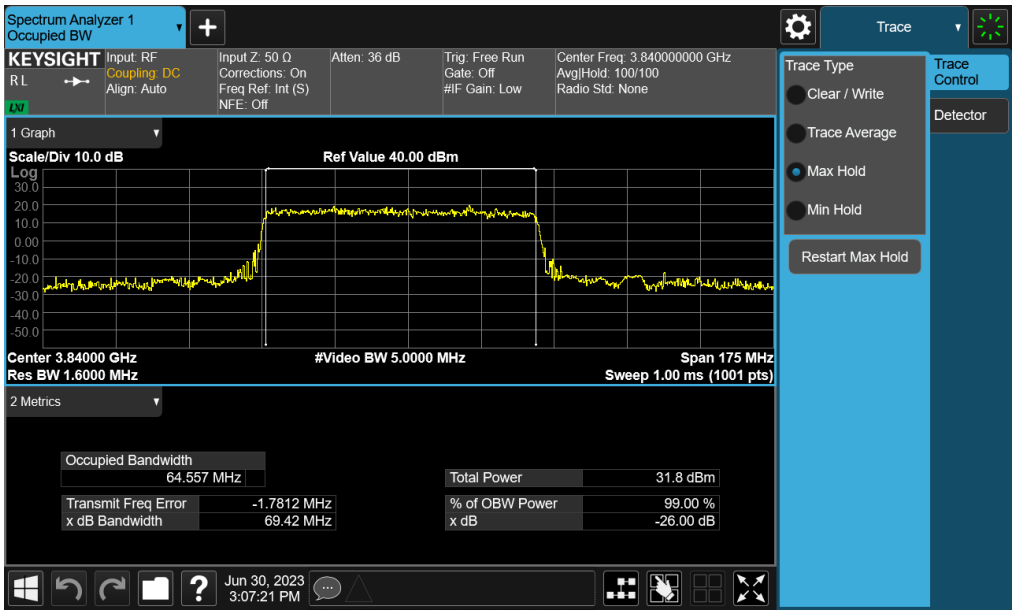
Plot 7-7. Occupied Bandwidth Plot (NR Band n77 - 80MHz π/2 BPSK - Full RB)



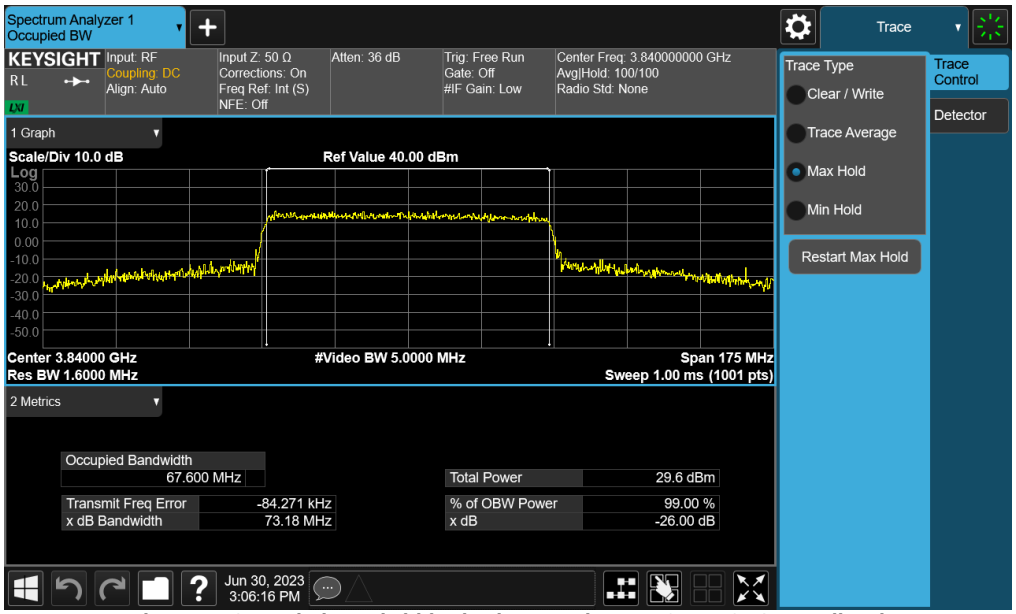
Plot 7-8. Occupied Bandwidth Plot (NR Band n77 - 80MHz QPSK - Full RB)



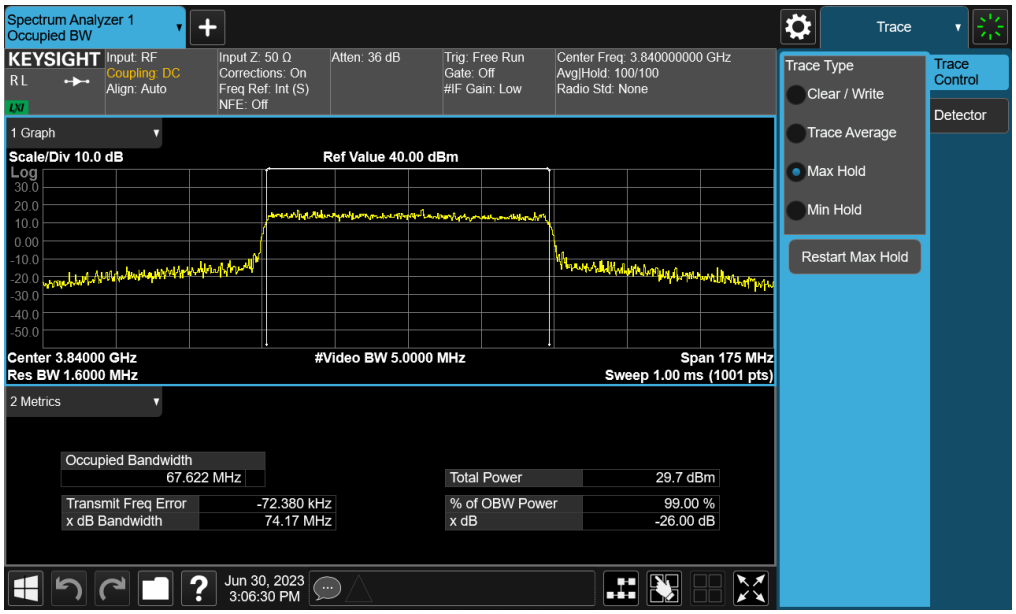
Plot 7-9. Occupied Bandwidth Plot (NR Band n77 - 80MHz 16-QAM - Full RB)



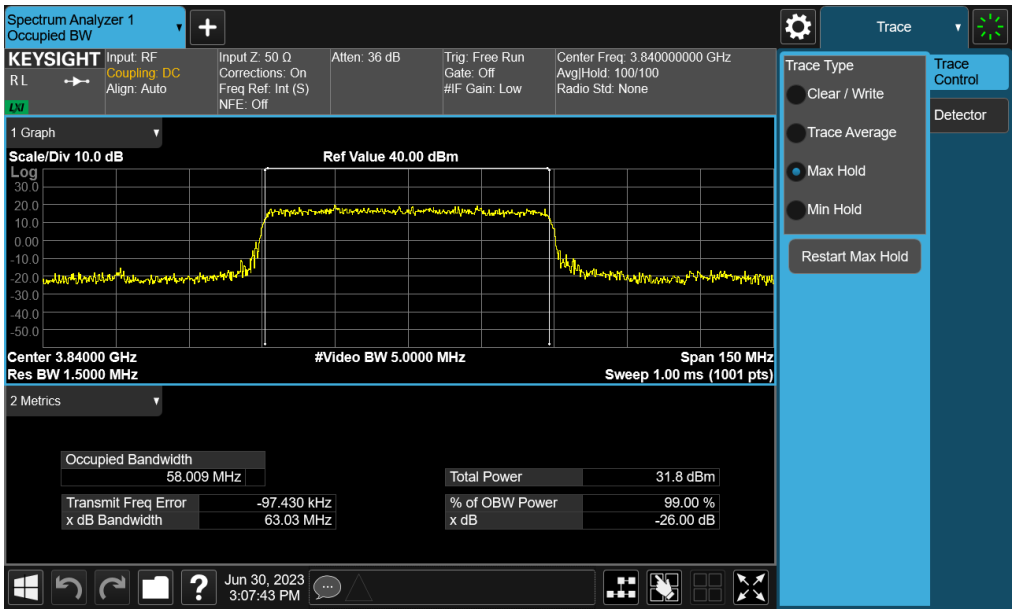
Plot 7-10. Occupied Bandwidth Plot (NR Band n77 - 70MHz π/2 BPSK - Full RB)



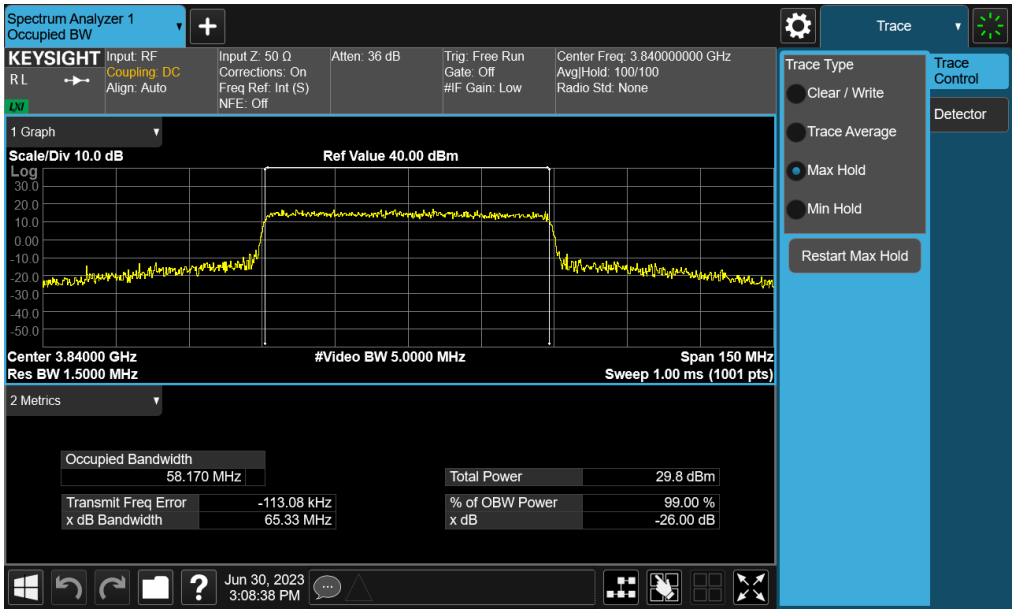
Plot 7-11. Occupied Bandwidth Plot (NR Band n77 - 70MHz QPSK - Full RB)



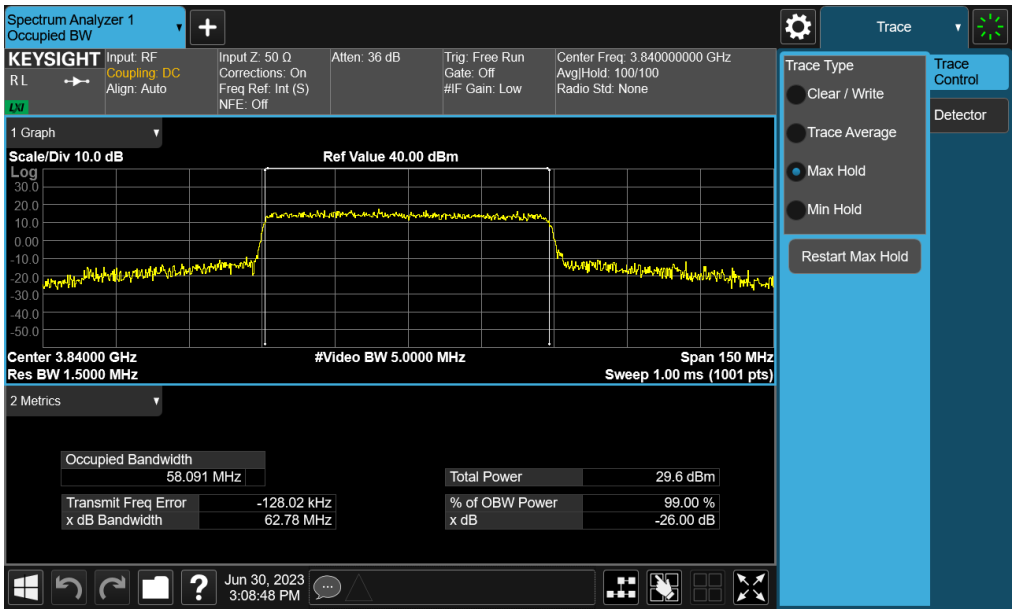
Plot 7-12. Occupied Bandwidth Plot (NR Band n77 - 70MHz 16-QAM - Full RB)



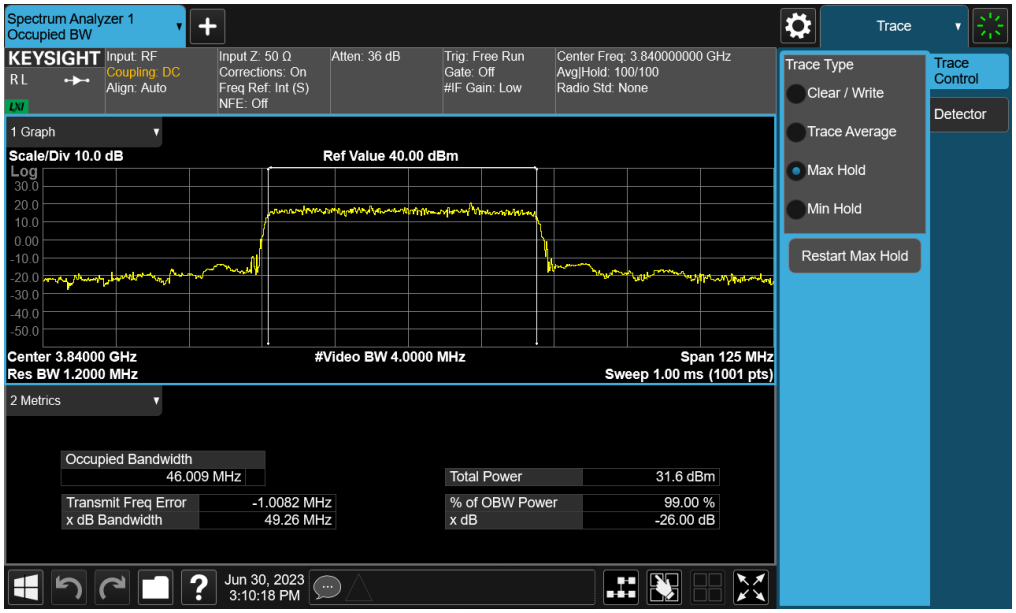
Plot 7-13. Occupied Bandwidth Plot (NR Band n77 - 60MHz π/2 BPSK - Full RB)



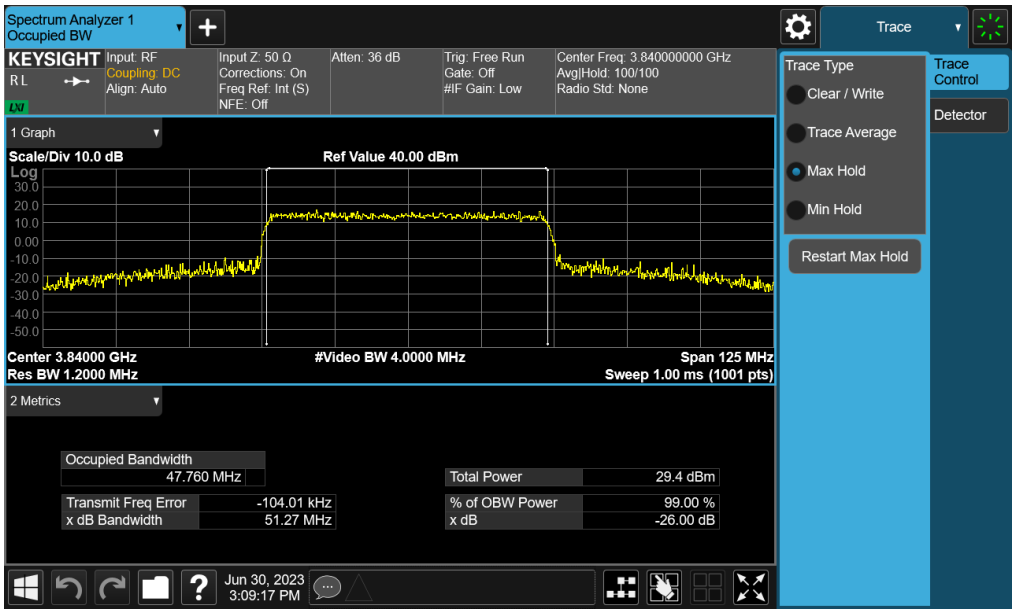
Plot 7-14. Occupied Bandwidth Plot (NR Band n77 - 60MHz QPSK - Full RB)



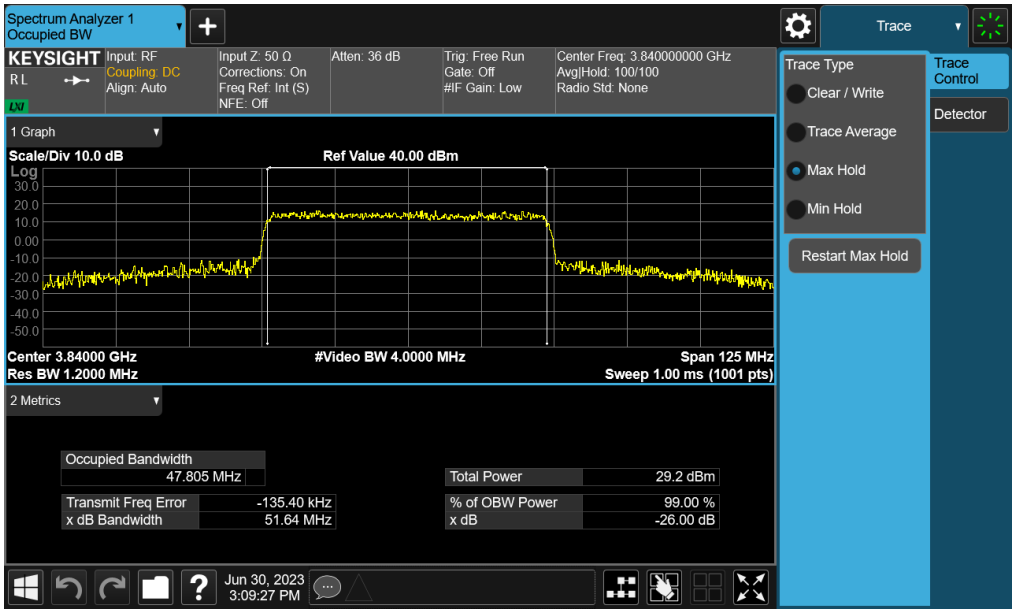
Plot 7-15. Occupied Bandwidth Plot (NR Band n77 - 60MHz 16-QAM - Full RB)



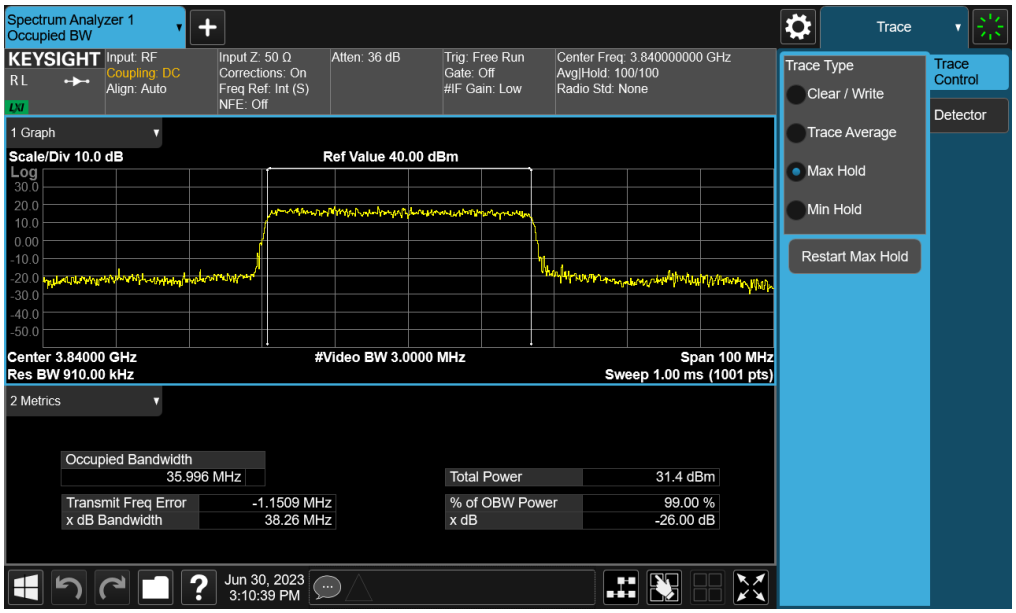
Plot 7-16. Occupied Bandwidth Plot (NR Band n77 - 50MHz π/2 BPSK - Full RB)



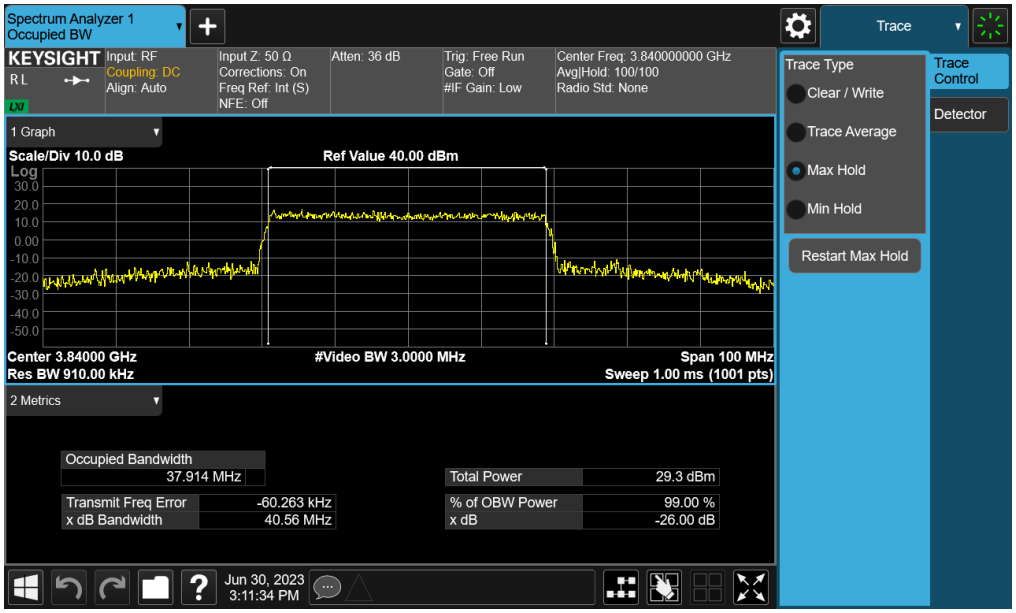
Plot 7-17. Occupied Bandwidth Plot (NR Band n77 - 50MHz QPSK - Full RB)



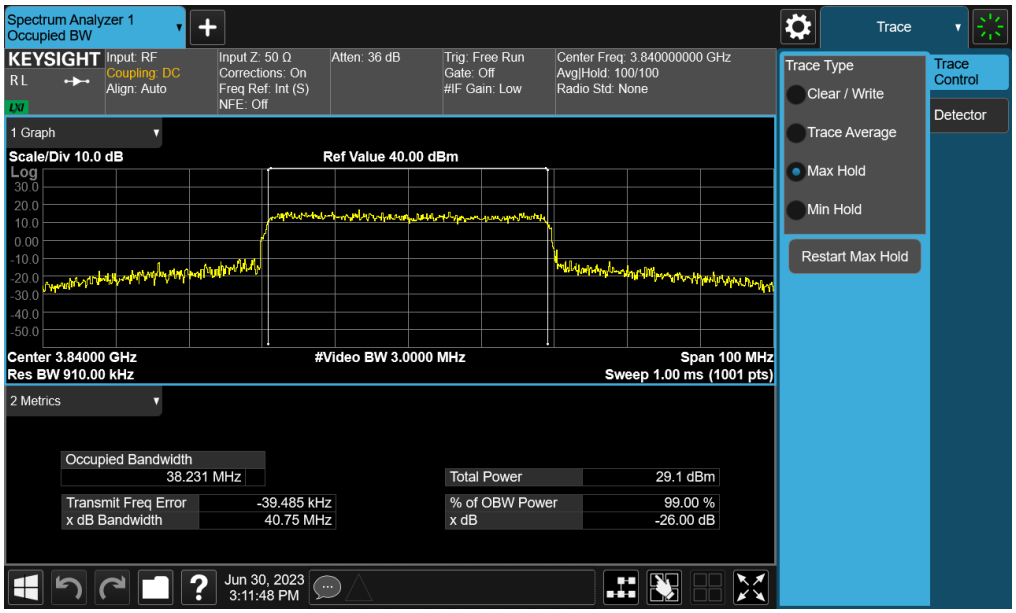
Plot 7-18. Occupied Bandwidth Plot (NR Band n77 - 50MHz 16-QAM - Full RB)



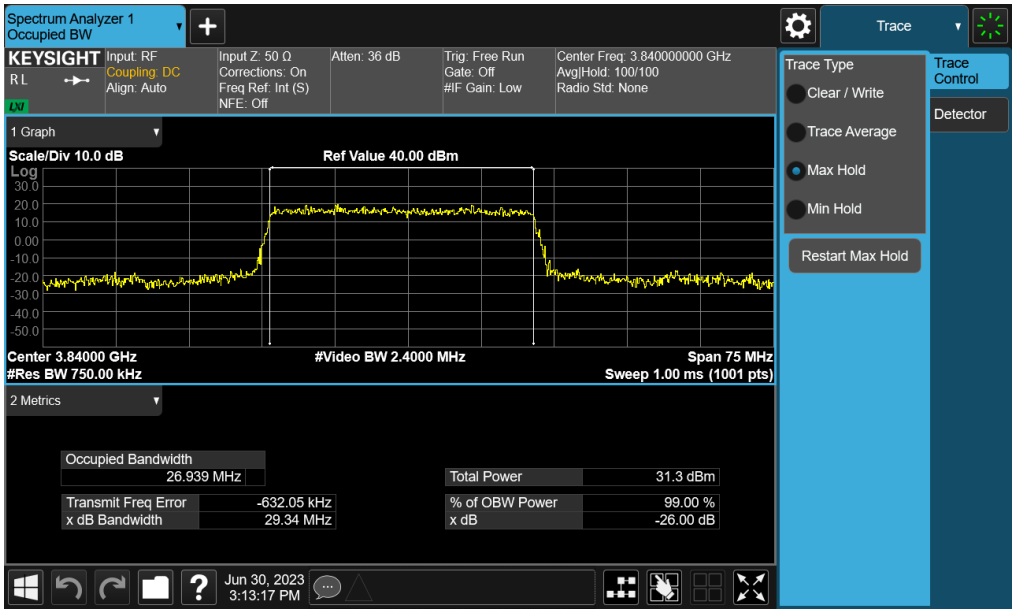
Plot 7-19. Occupied Bandwidth Plot (NR Band n77 - 40MHz π/2 BPSK - Full RB)



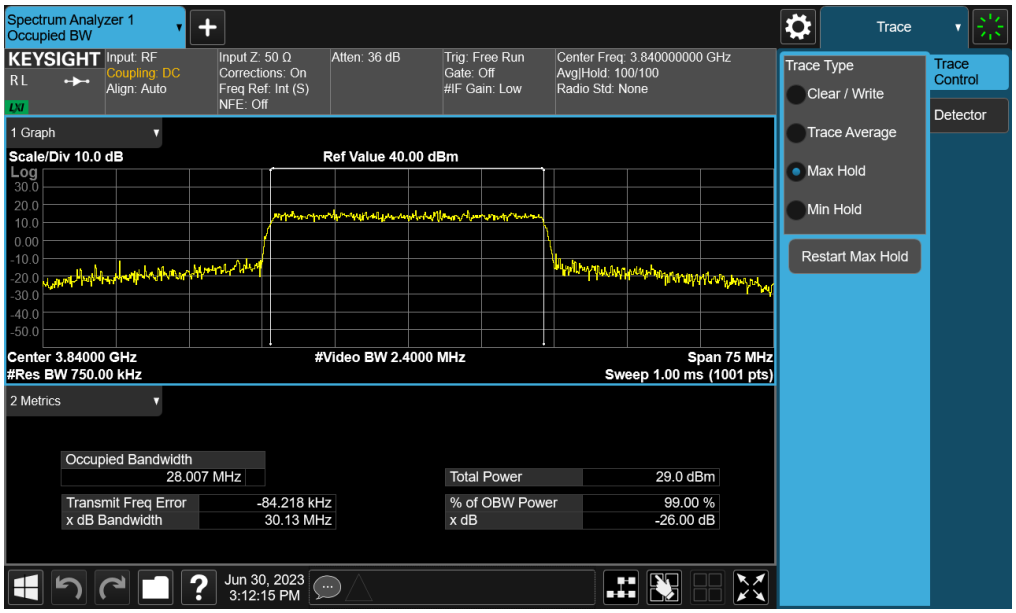
Plot 7-20. Occupied Bandwidth Plot (NR Band n77 - 40MHz QPSK - Full RB)



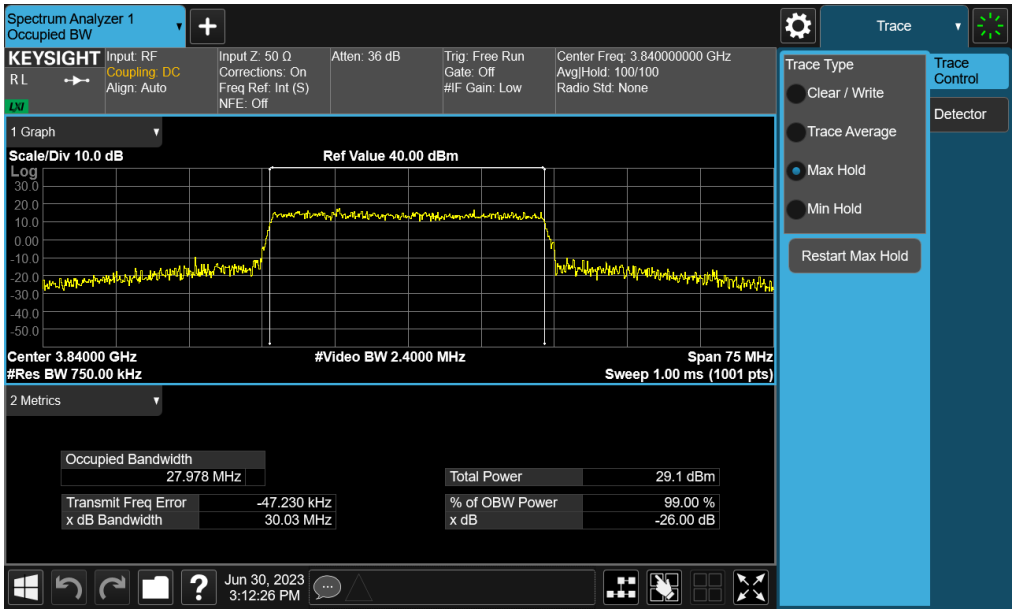
Plot 7-21. Occupied Bandwidth Plot (NR Band n77 - 40MHz 16-QAM - Full RB)



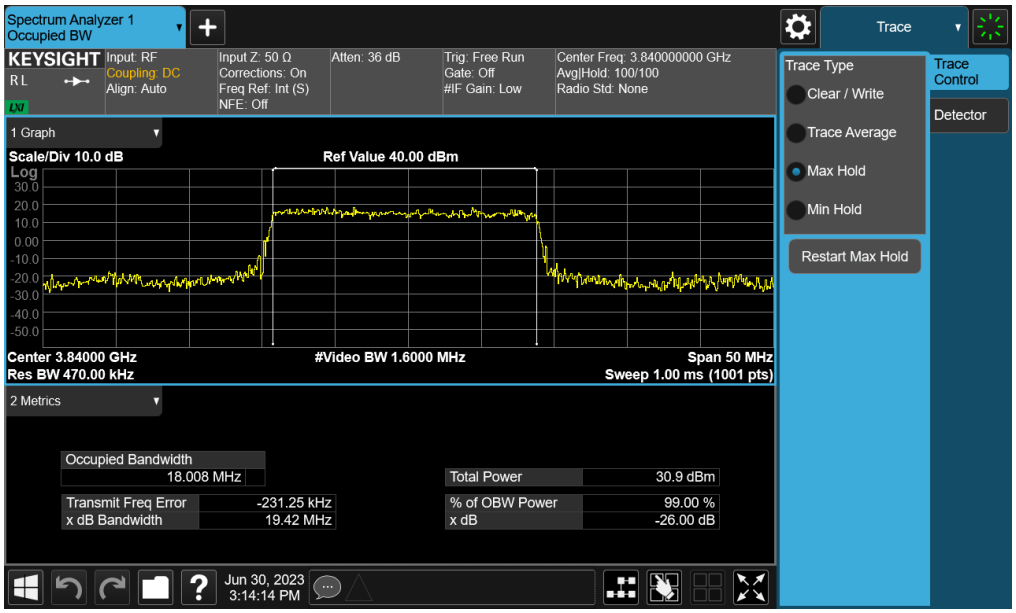
Plot 7-22. Occupied Bandwidth Plot (NR Band n77 - 30MHz π/2 BPSK - Full RB)



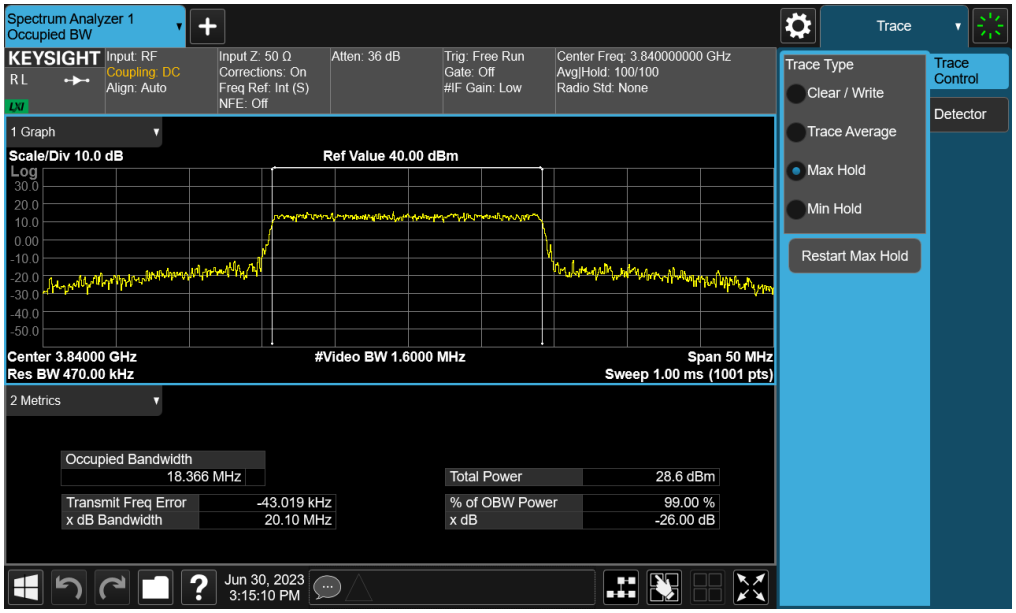
Plot 7-23. Occupied Bandwidth Plot (NR Band n77 - 30MHz QPSK - Full RB)



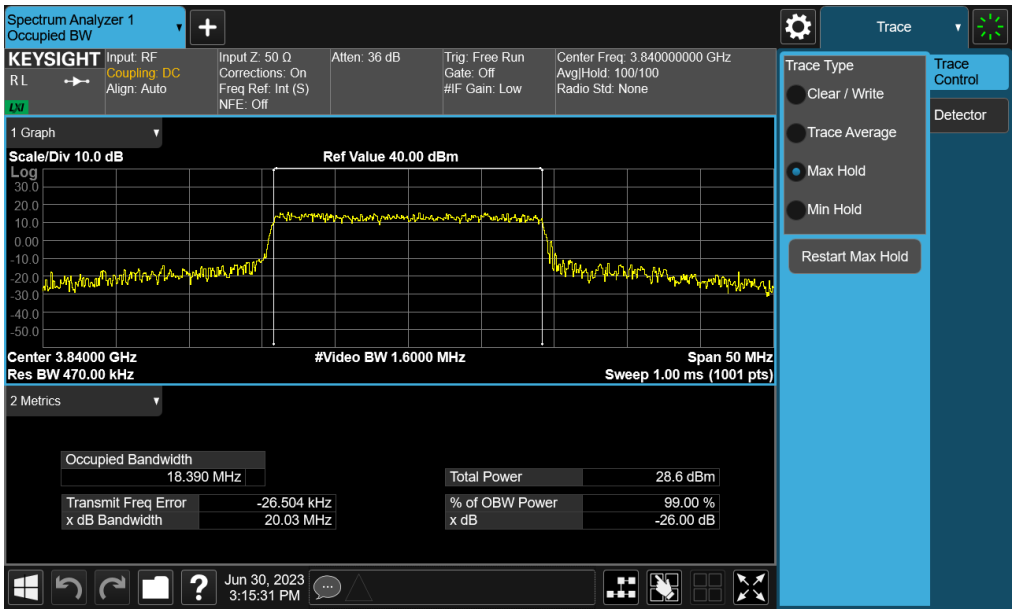
Plot 7-24. Occupied Bandwidth Plot (NR Band n77 - 30MHz 16-QAM - Full RB)



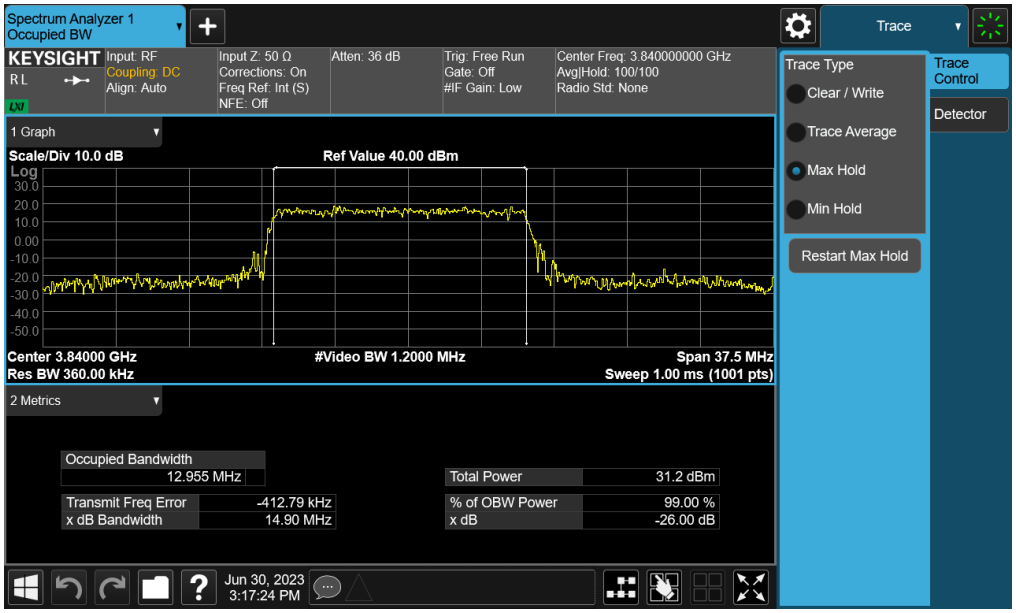
Plot 7-25. Occupied Bandwidth Plot (NR Band n77 - 20MHz π/2 BPSK - Full RB)



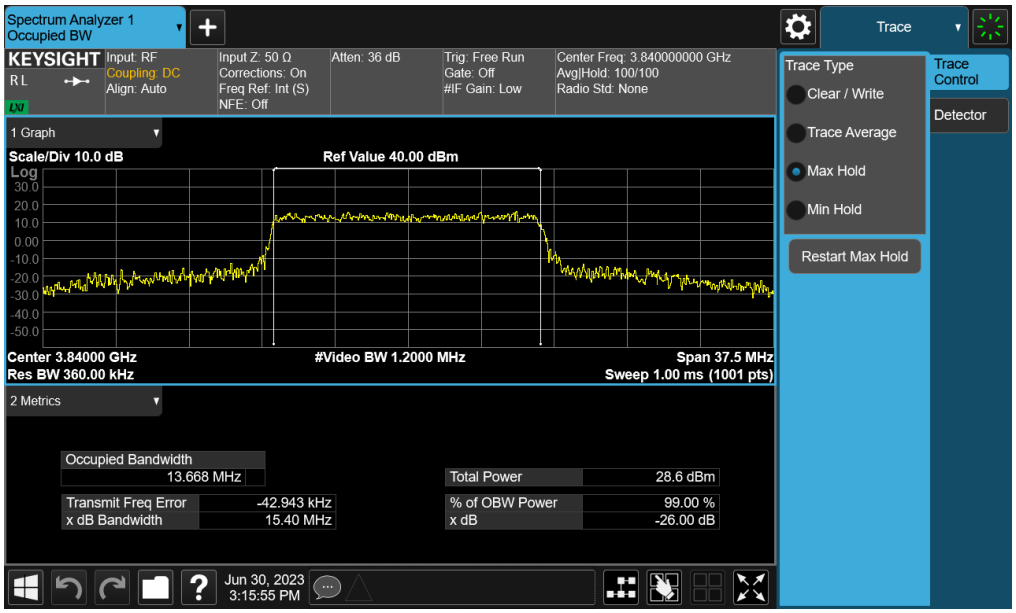
Plot 7-26. Occupied Bandwidth Plot (NR Band n77 - 20MHz QPSK - Full RB)



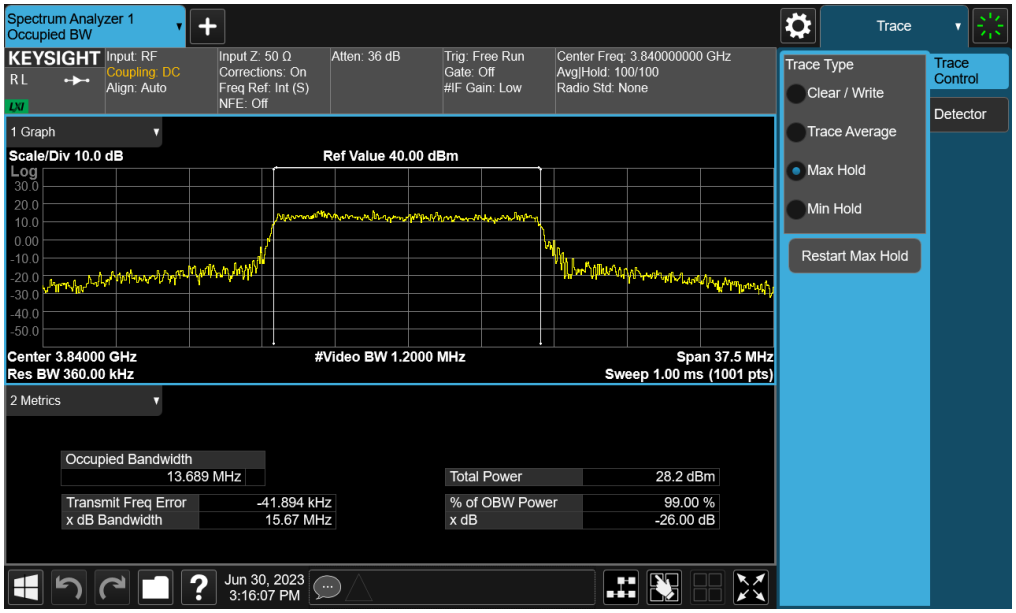
Plot 7-27. Occupied Bandwidth Plot (NR Band n77 - 20MHz 16-QAM - Full RB)



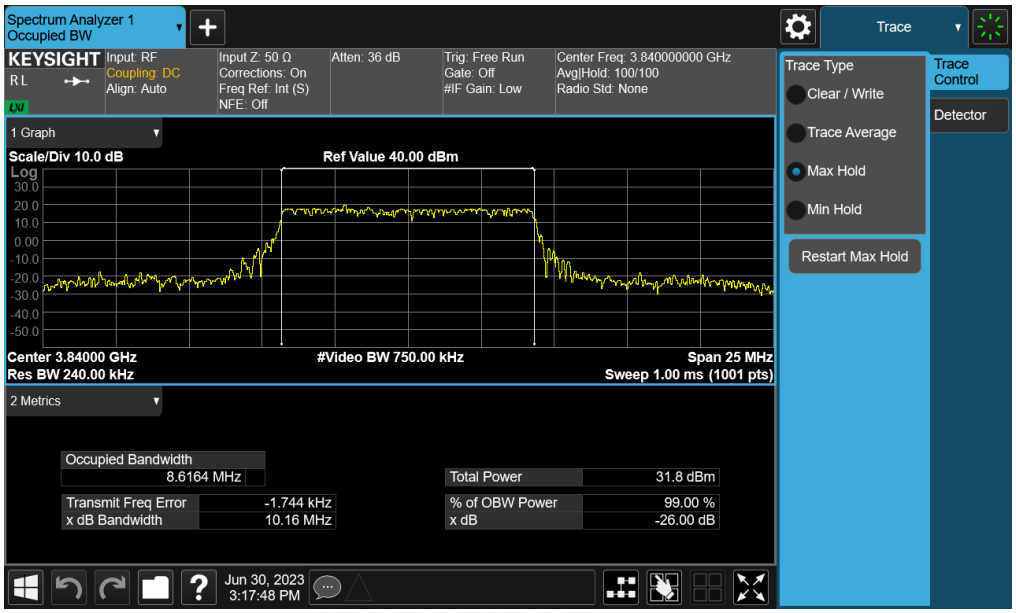
Plot 7-28. Occupied Bandwidth Plot (NR Band n77 - 15MHz π/2 BPSK - Full RB)



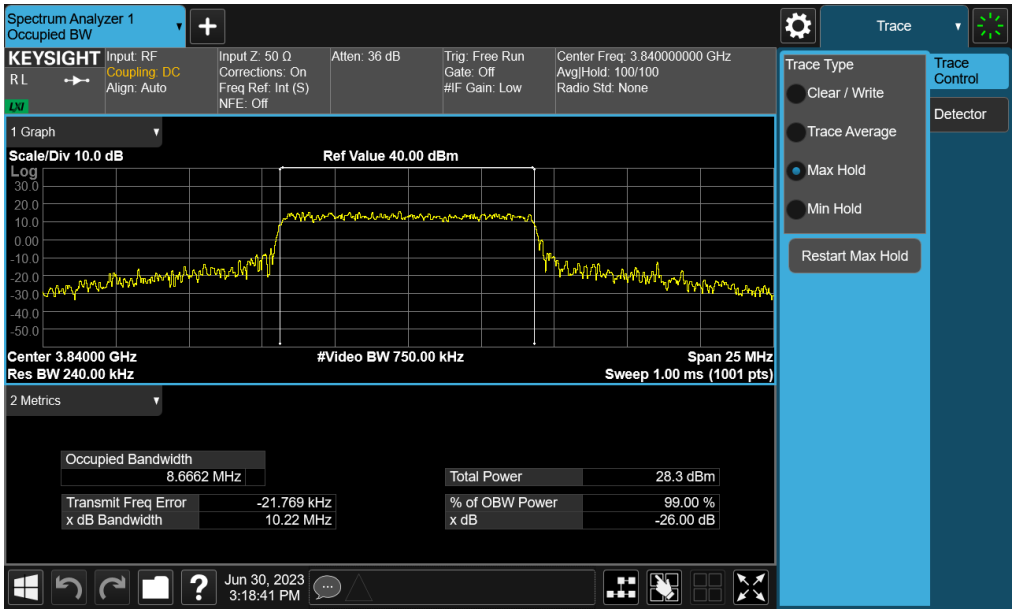
Plot 7-29. Occupied Bandwidth Plot (NR Band n77 - 15MHz QPSK - Full RB)



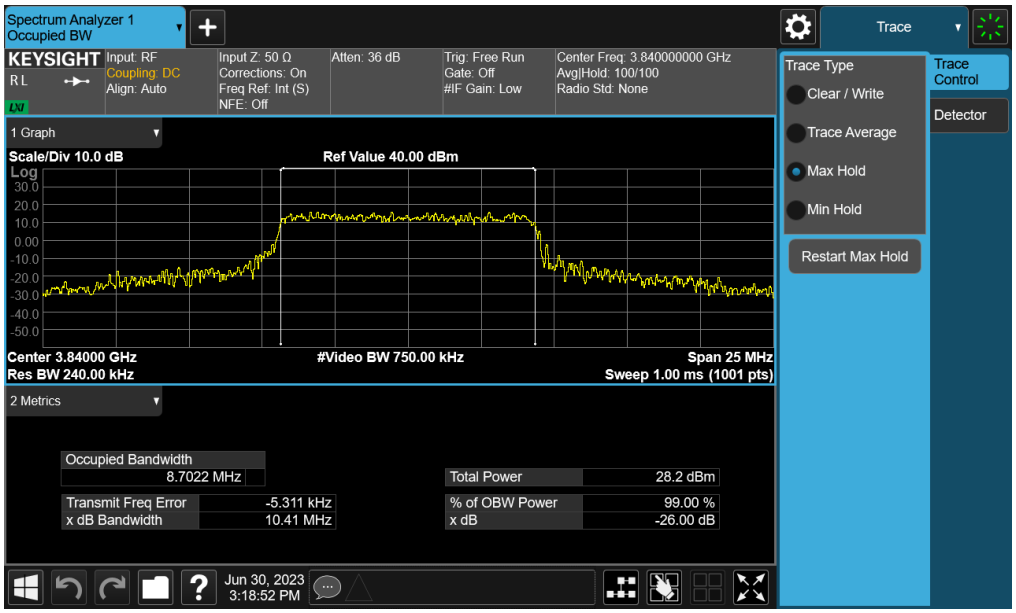
Plot 7-30. Occupied Bandwidth Plot (NR Band n77 - 15MHz 16-QAM - Full RB)



Plot 7-31. Occupied Bandwidth Plot (NR Band n77 - 10MHz π/2 BPSK - Full RB)



Plot 7-32. Occupied Bandwidth Plot (NR Band n77 - 10MHz QPSK - Full RB)

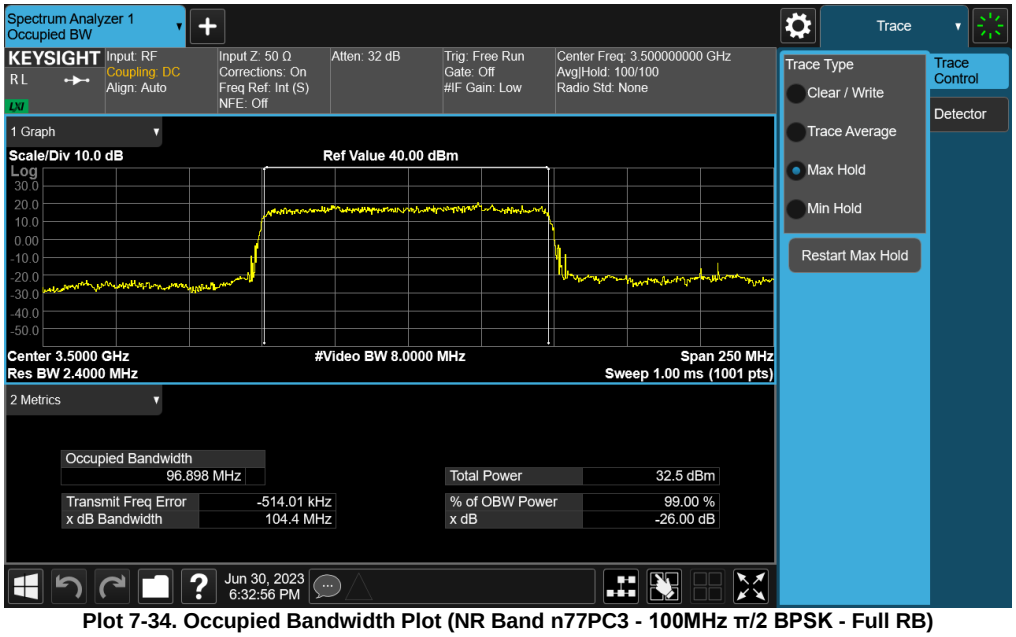


Plot 7-33. Occupied Bandwidth Plot (NR Band n77 - 10MHz 16-QAM - Full RB)

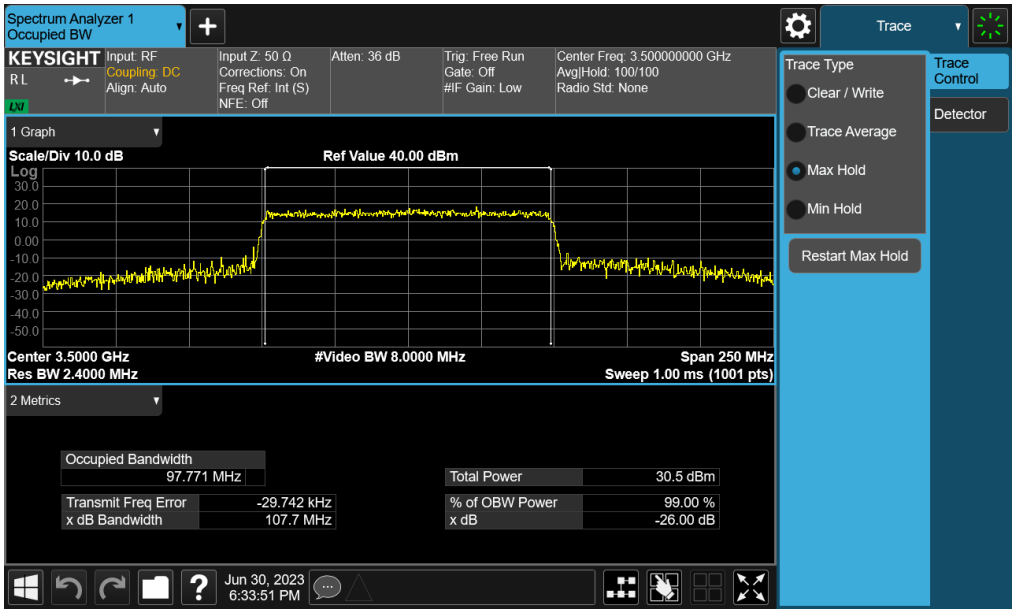
Mode	Bandwidth	Modulation	OBW [MHz]
NR-n77PC3-R1	100MHz	π/2 BPSK	96.90
		QPSK	97.77
		16QAM	97.70
	90MHz	π/2 BPSK	87.02
		QPSK	87.90
		16QAM	87.83
	80MHz	π/2 BPSK	77.20
		QPSK	77.87
		16QAM	77.92
	70MHz	π/2 BPSK	64.61
		QPSK	67.61
		16QAM	67.68
	60MHz	π/2 BPSK	58.01
		QPSK	58.15
		16QAM	58.04
	50MHz	π/2 BPSK	46.01
		QPSK	47.83
		16QAM	47.63
	40MHz	π/2 BPSK	35.93
		QPSK	38.10
		16QAM	38.11
	30MHz	π/2 BPSK	27.07
		QPSK	28.08
		16QAM	28.20
	20MHz	π/2 BPSK	18.03
		QPSK	18.37
		16QAM	18.33
	15MHz	π/2 BPSK	12.94
		QPSK	13.65
		16QAM	13.76
	10MHz	π/2 BPSK	8.68
		QPSK	8.62
		16QAM	8.65

Table 7-11. Occupied Bandwidth Test Results – DoD-Band

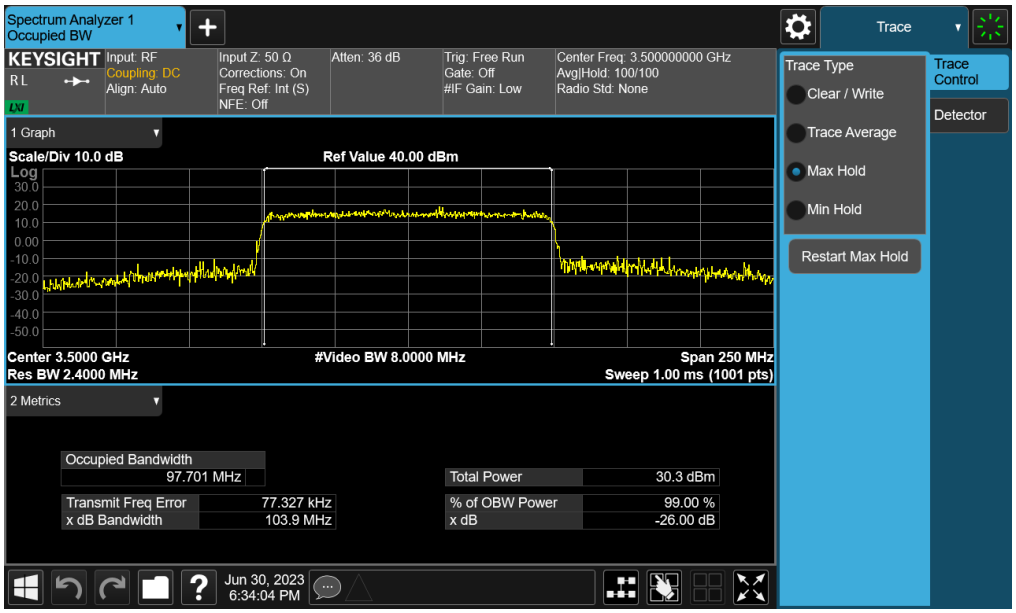
NR Band n77PC3 – DoD – Ant1



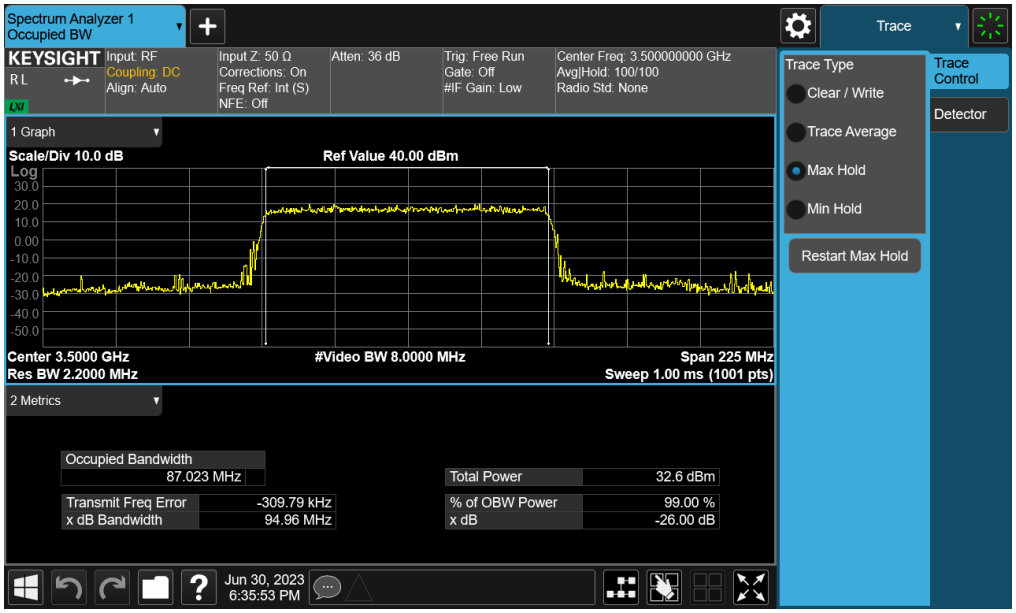
Plot 7-34. Occupied Bandwidth Plot (NR Band n77PC3 - 100MHz π/2 BPSK - Full RB)



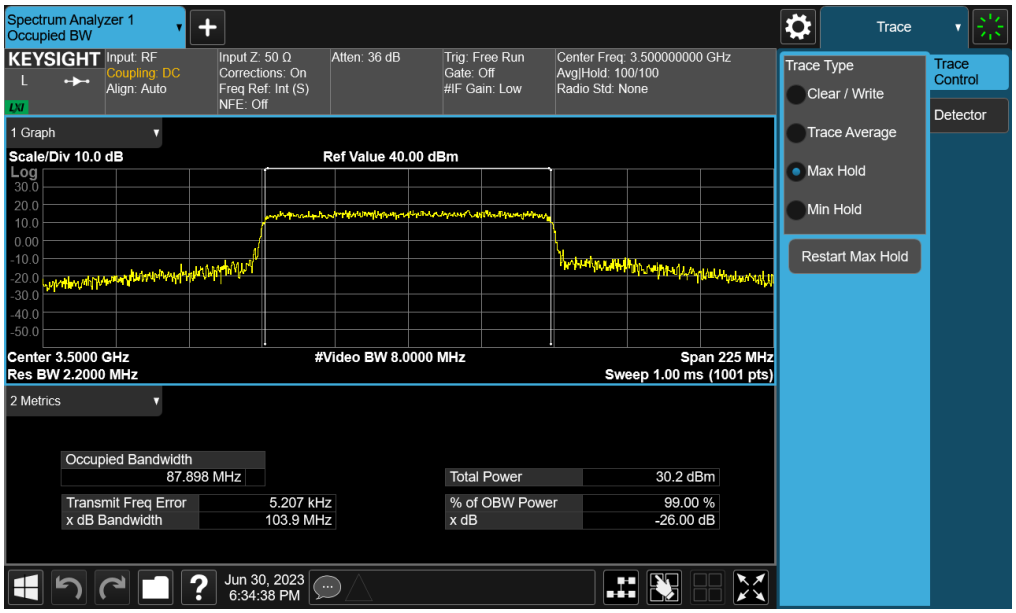
Plot 7-35. Occupied Bandwidth Plot (NR Band n77PC3 - 100MHz QPSK - Full RB)



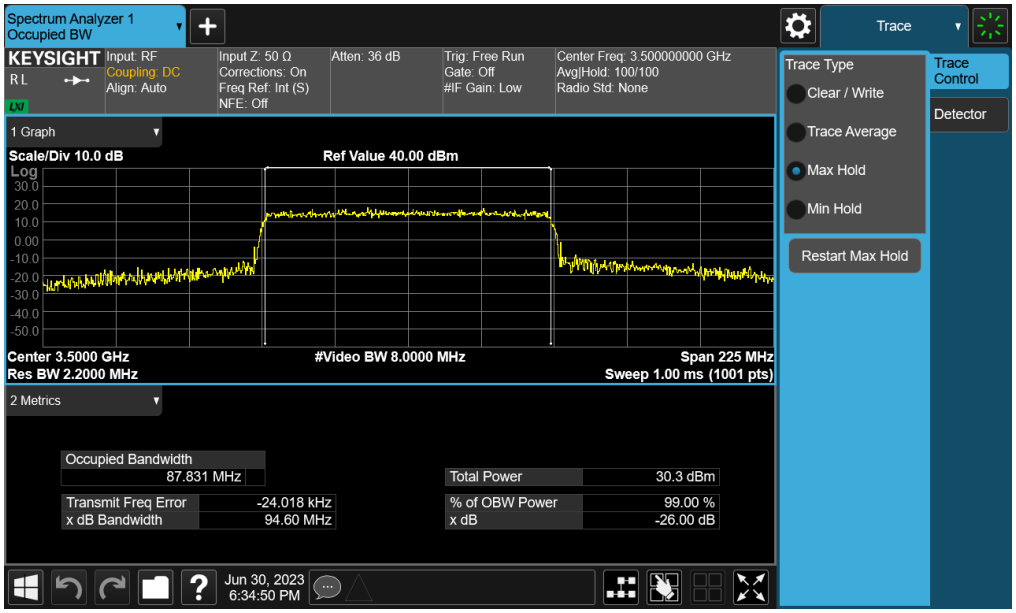
Plot 7-36. Occupied Bandwidth Plot (NR Band n77PC3 - 100MHz 16-QAM - Full RB)



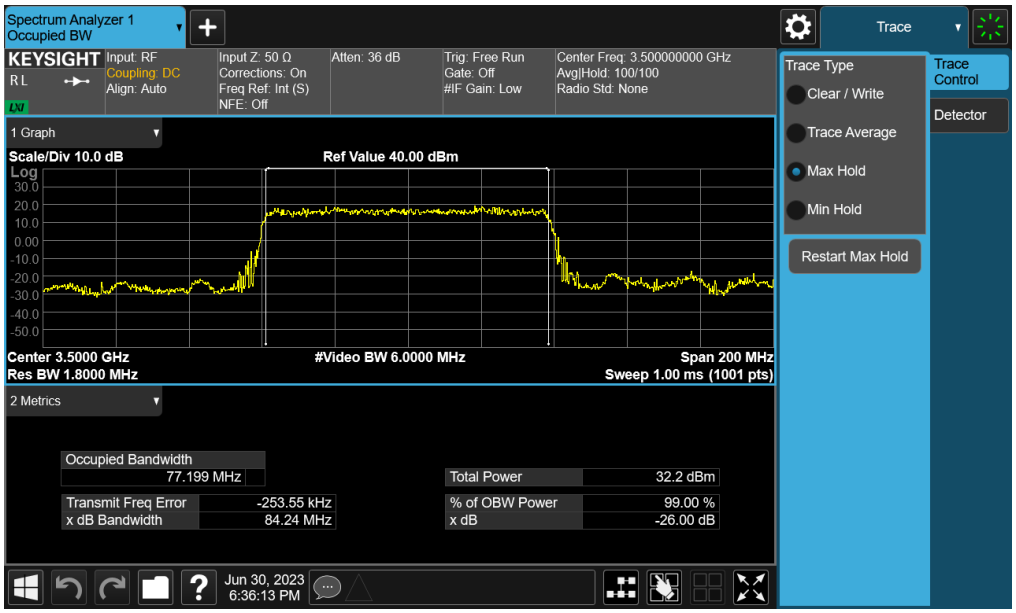
Plot 7-37. Occupied Bandwidth Plot (NR Band n77 - 90MHz π/2 BPSK - Full RB)



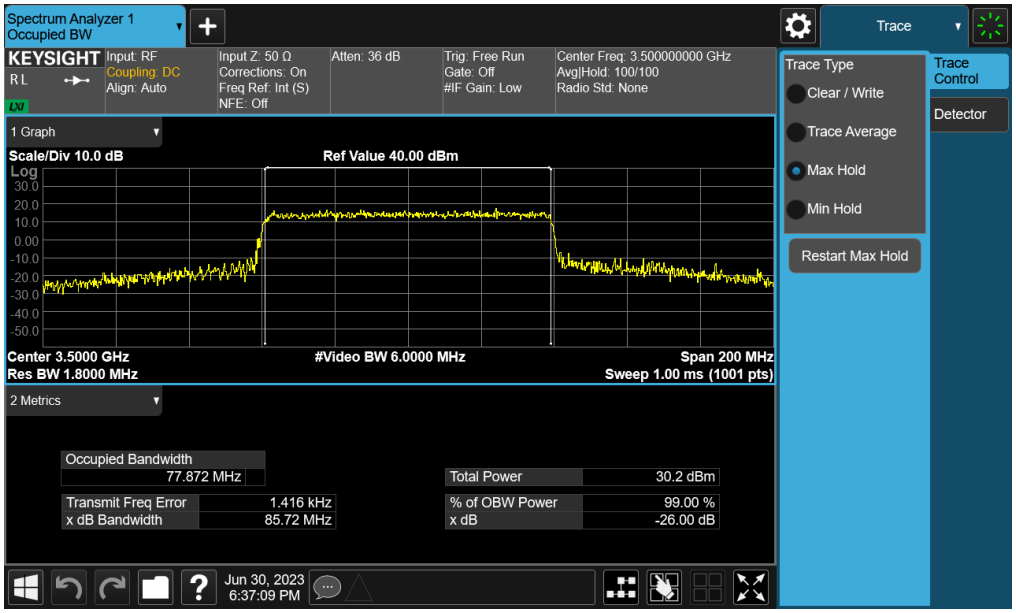
Plot 7-38. Occupied Bandwidth Plot (NR Band n77 - 90MHz QPSK - Full RB)



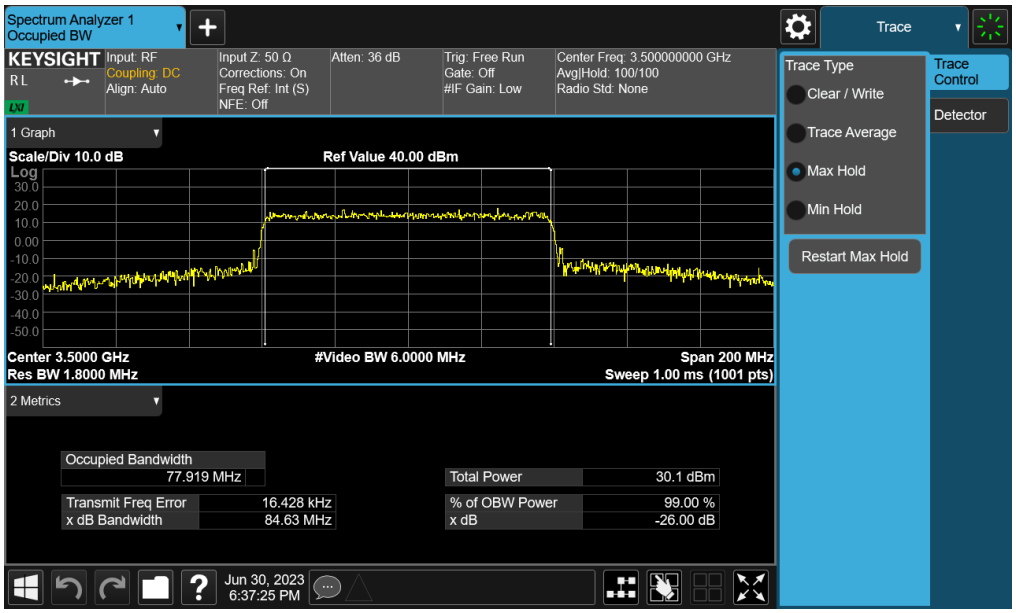
Plot 7-39. Occupied Bandwidth Plot (NR Band n77 - 90MHz 16-QAM - Full RB)



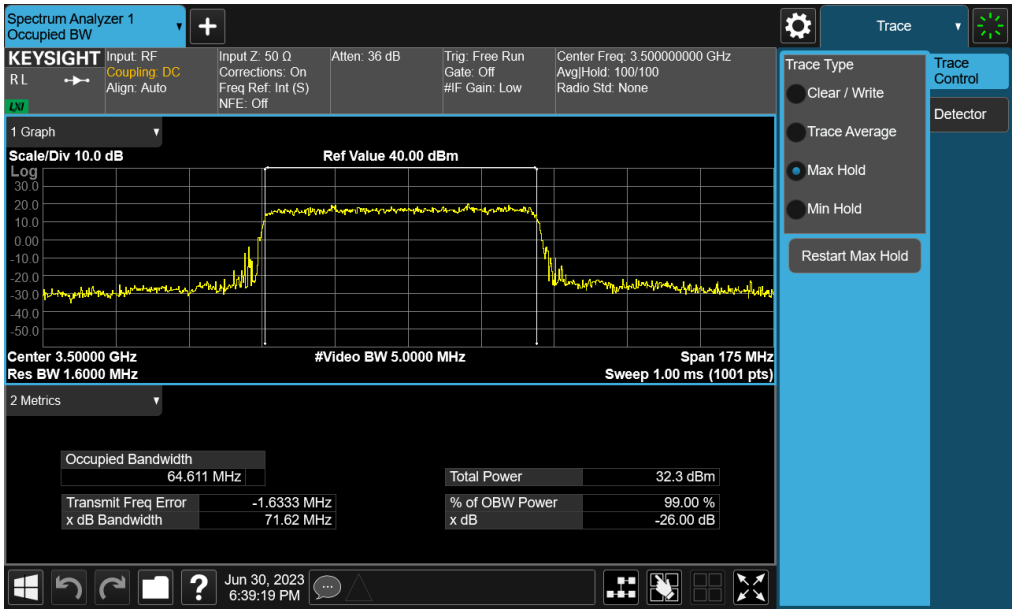
Plot 7-40. Occupied Bandwidth Plot (NR Band n77 - 80MHz π/2 BPSK - Full RB)



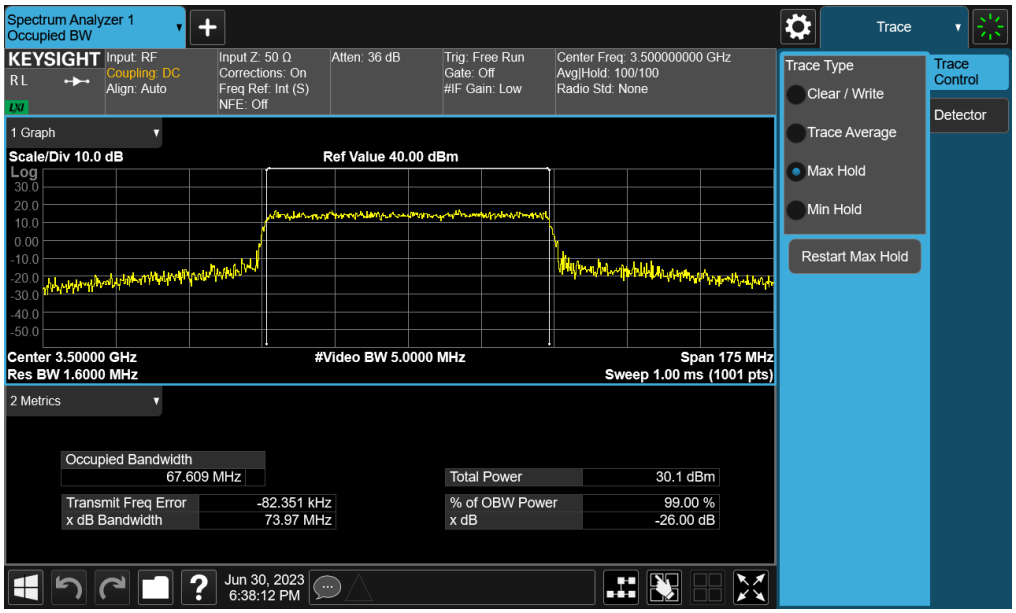
Plot 7-41. Occupied Bandwidth Plot (NR Band n77 - 80MHz QPSK - Full RB)



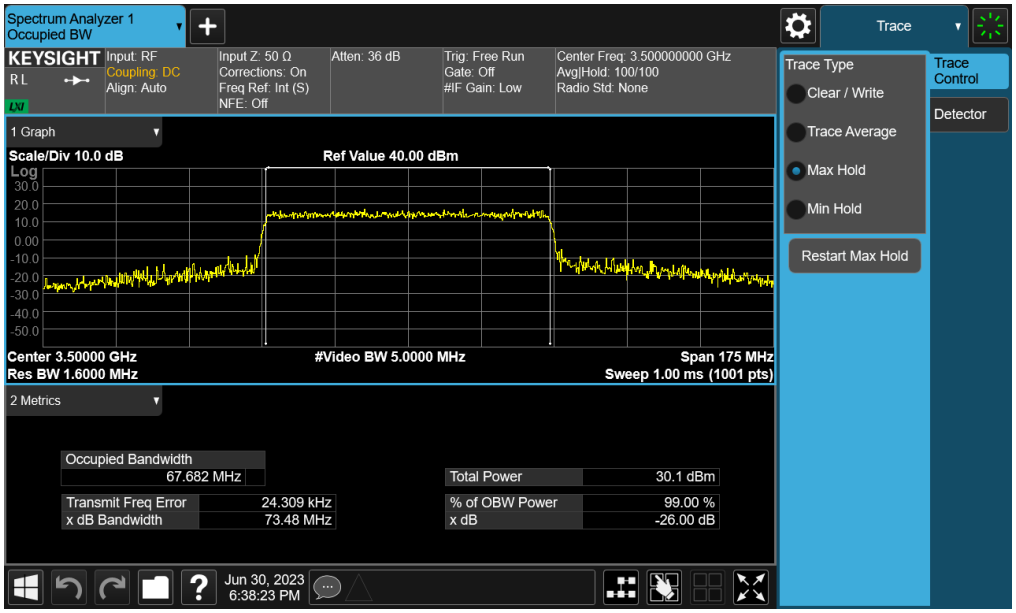
Plot 7-42. Occupied Bandwidth Plot (NR Band n77 - 80MHz 16-QAM - Full RB)



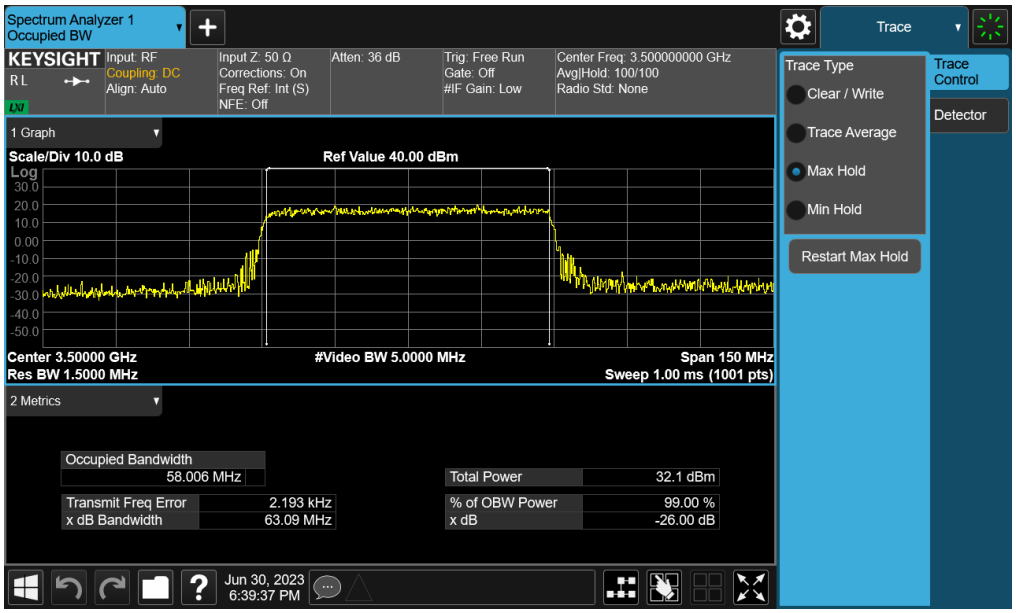
Plot 7-43. Occupied Bandwidth Plot (NR Band n77 - 70MHz π/2 BPSK - Full RB)



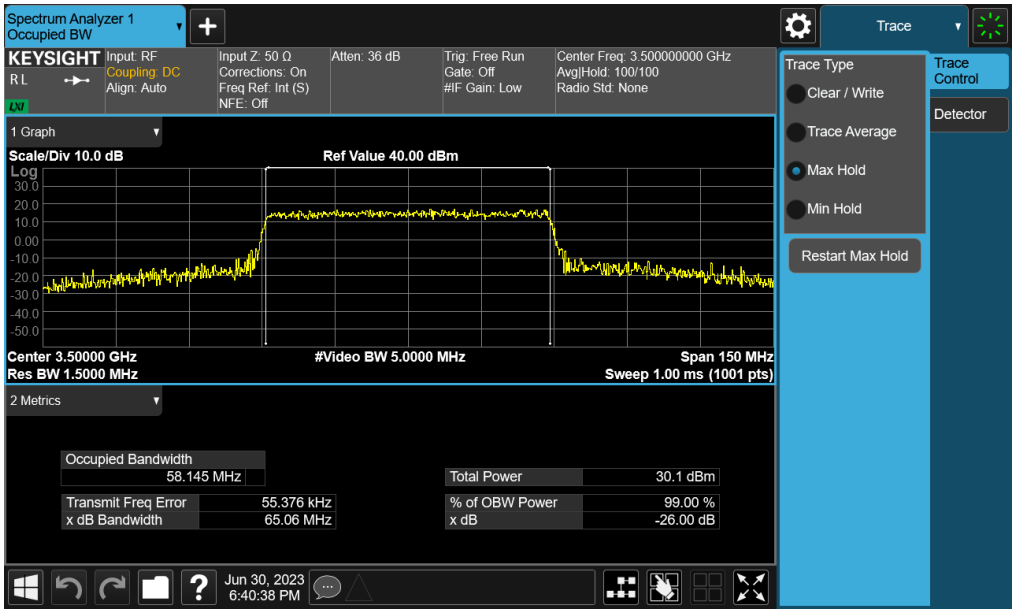
Plot 7-44. Occupied Bandwidth Plot (NR Band n77 - 70MHz QPSK - Full RB)



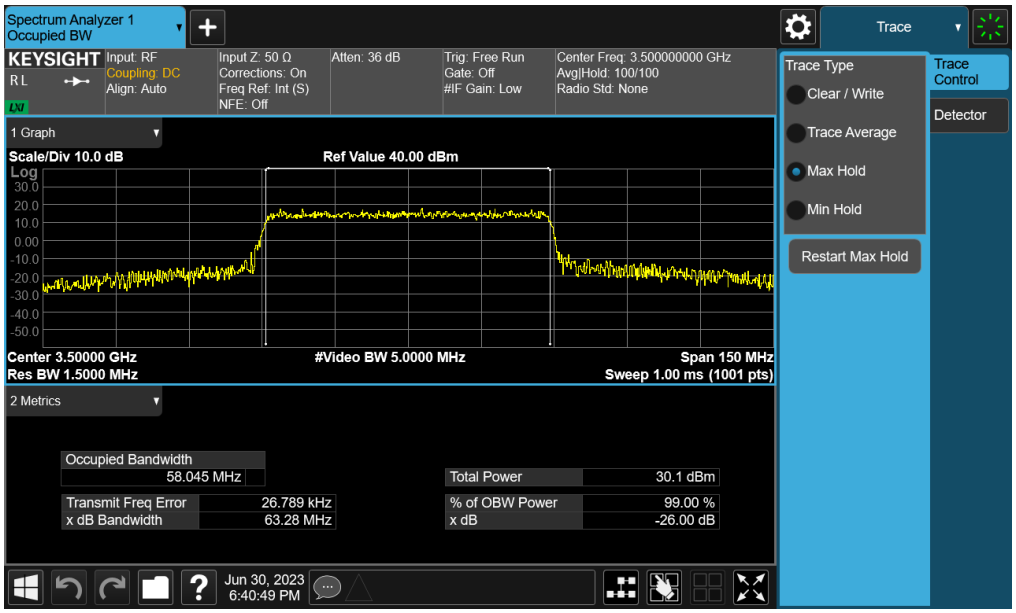
Plot 7-45. Occupied Bandwidth Plot (NR Band n77 - 70MHz 16-QAM - Full RB)



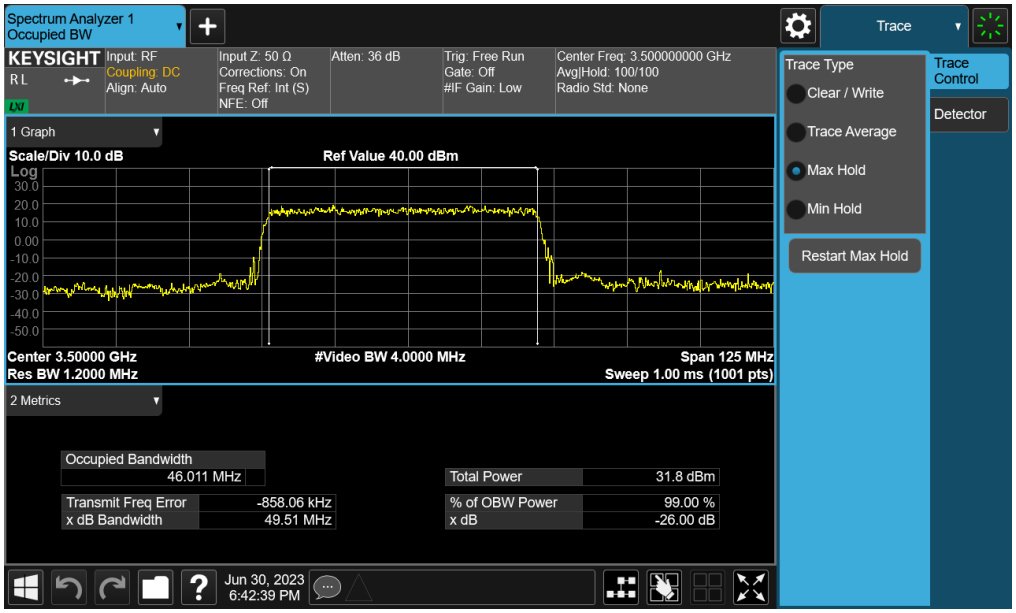
Plot 7-46. Occupied Bandwidth Plot (NR Band n77 - 60MHz π/2 BPSK - Full RB)



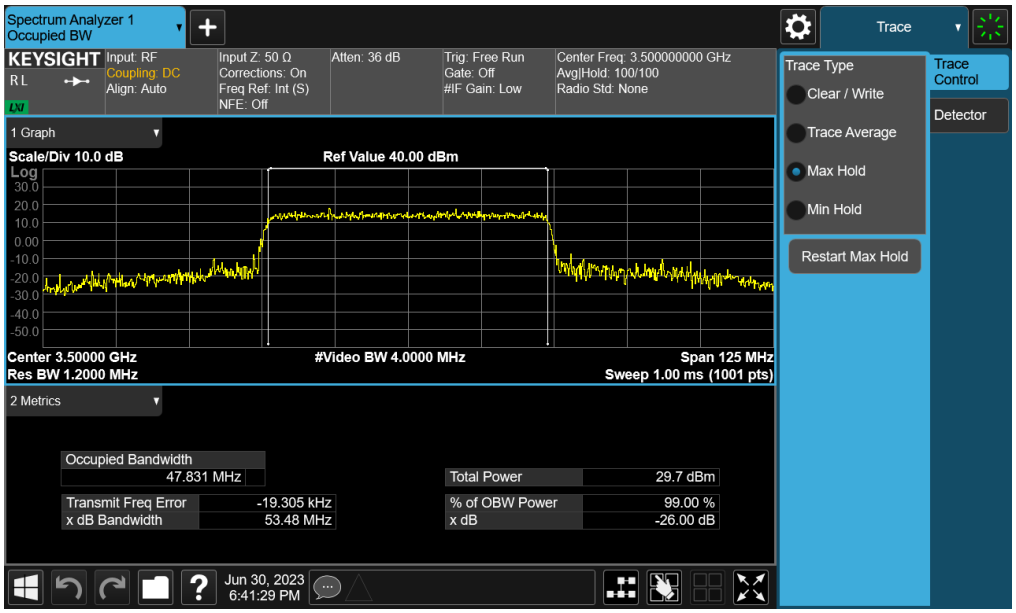
Plot 7-47. Occupied Bandwidth Plot (NR Band n77 - 60MHz QPSK - Full RB)



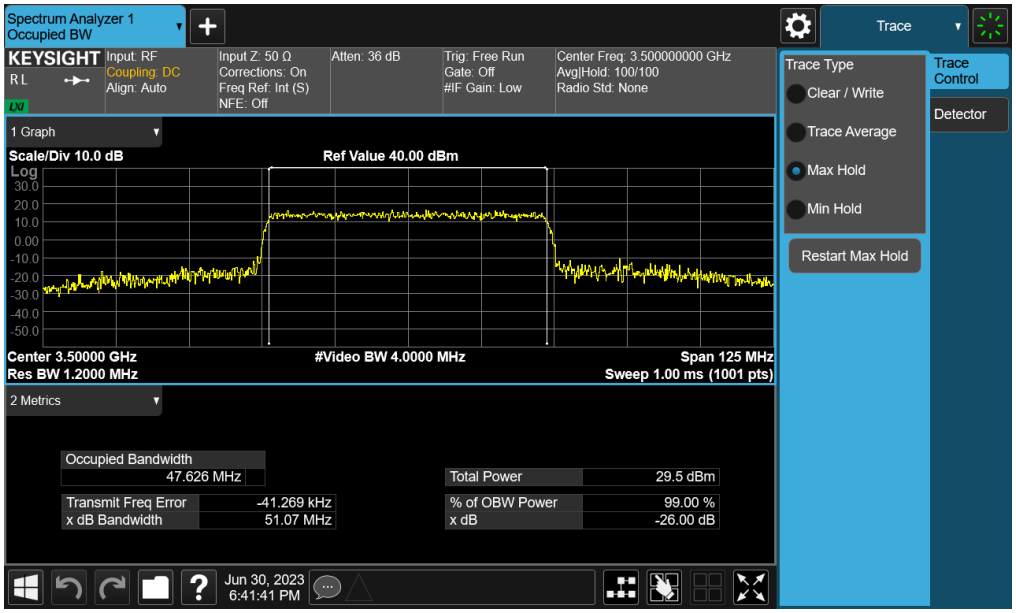
Plot 7-48. Occupied Bandwidth Plot (NR Band n77 - 60MHz 16-QAM - Full RB)



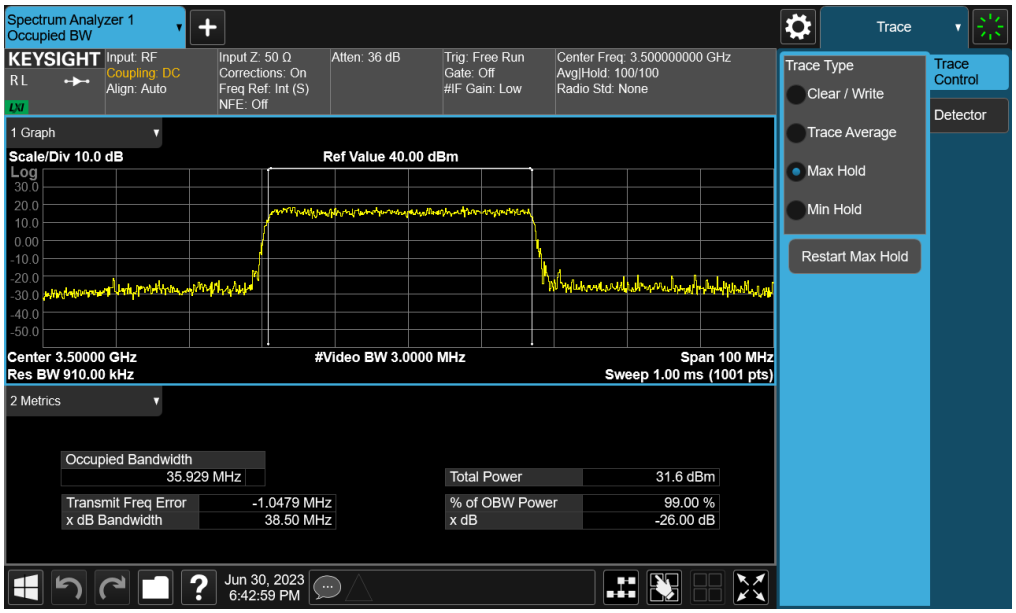
Plot 7-49. Occupied Bandwidth Plot (NR Band n77 - 50MHz π/2 BPSK - Full RB)



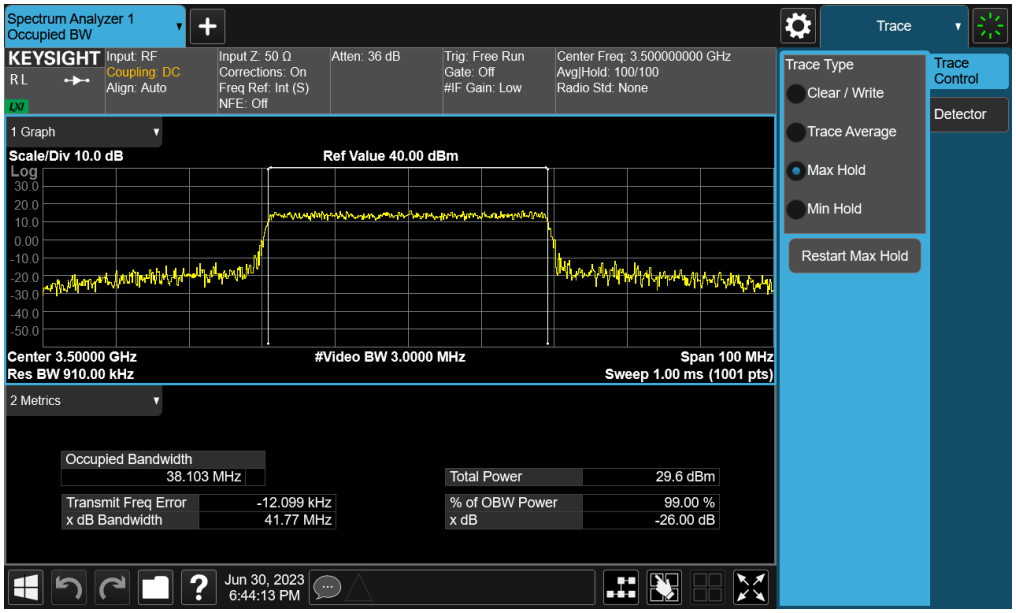
Plot 7-50. Occupied Bandwidth Plot (NR Band n77 - 50MHz QPSK - Full RB)



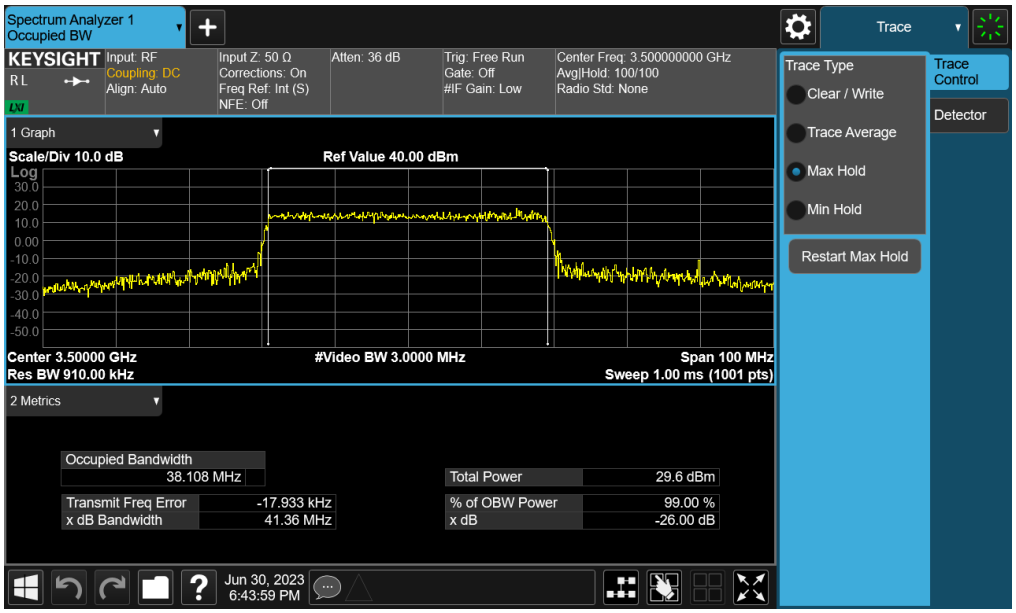
Plot 7-51. Occupied Bandwidth Plot (NR Band n77 - 50MHz 16-QAM - Full RB)



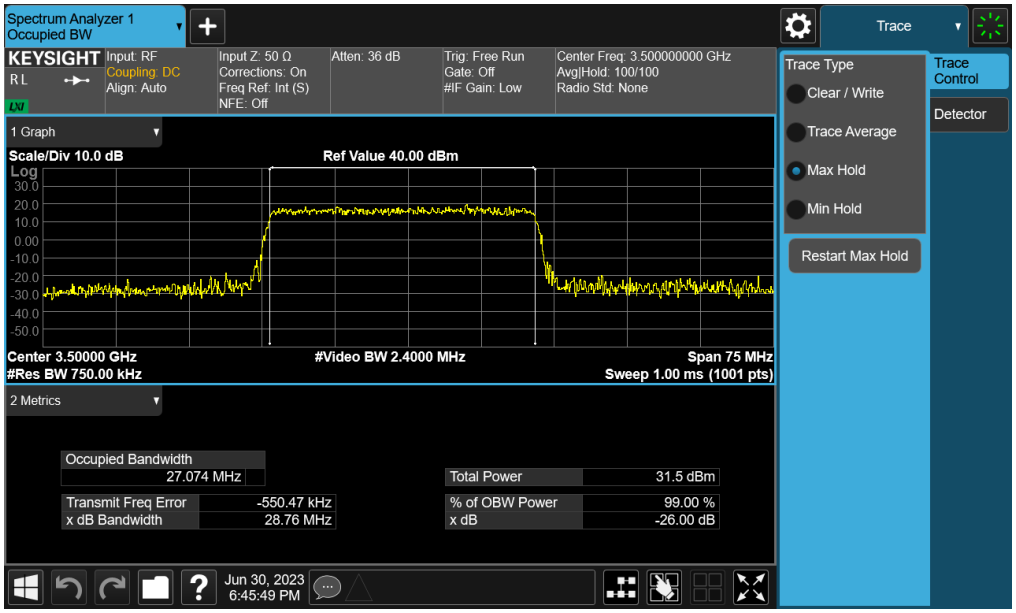
Plot 7-52. Occupied Bandwidth Plot (NR Band n77 - 40MHz π/2 BPSK - Full RB)



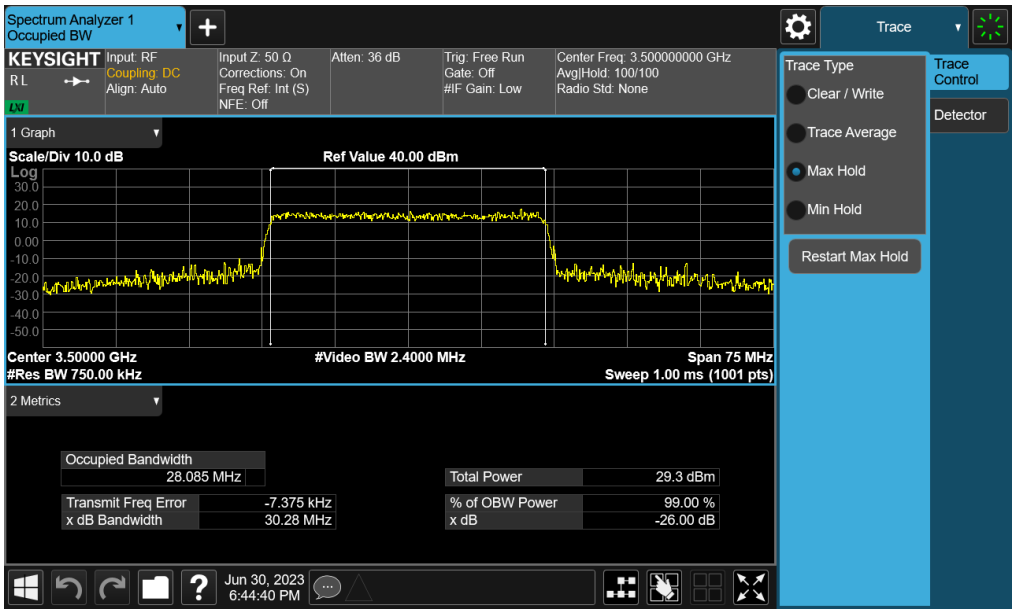
Plot 7-53. Occupied Bandwidth Plot (NR Band n77 - 40MHz QPSK - Full RB)



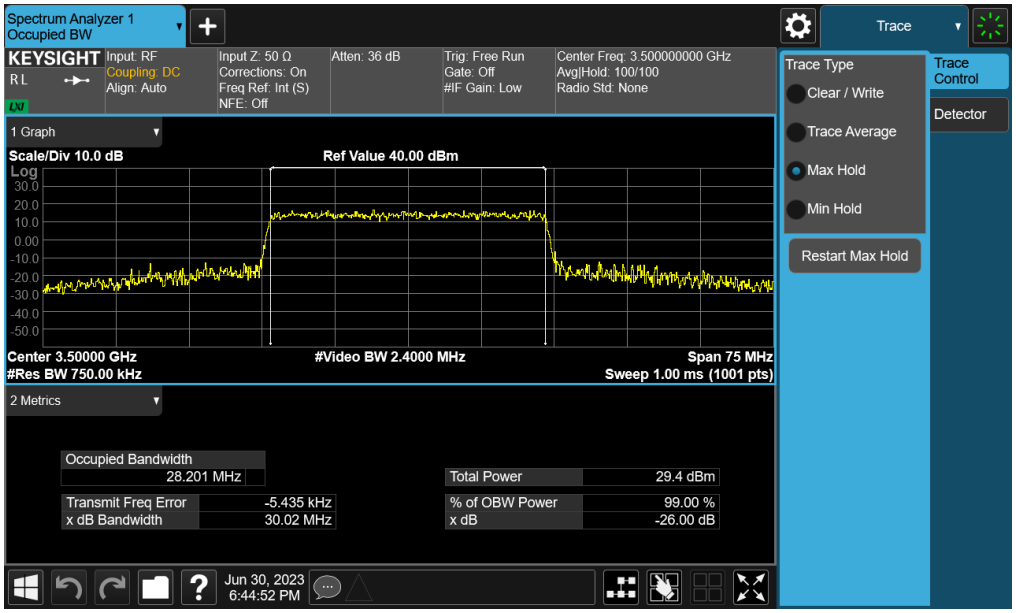
Plot 7-54. Occupied Bandwidth Plot (NR Band n77 - 40MHz 16-QAM - Full RB)



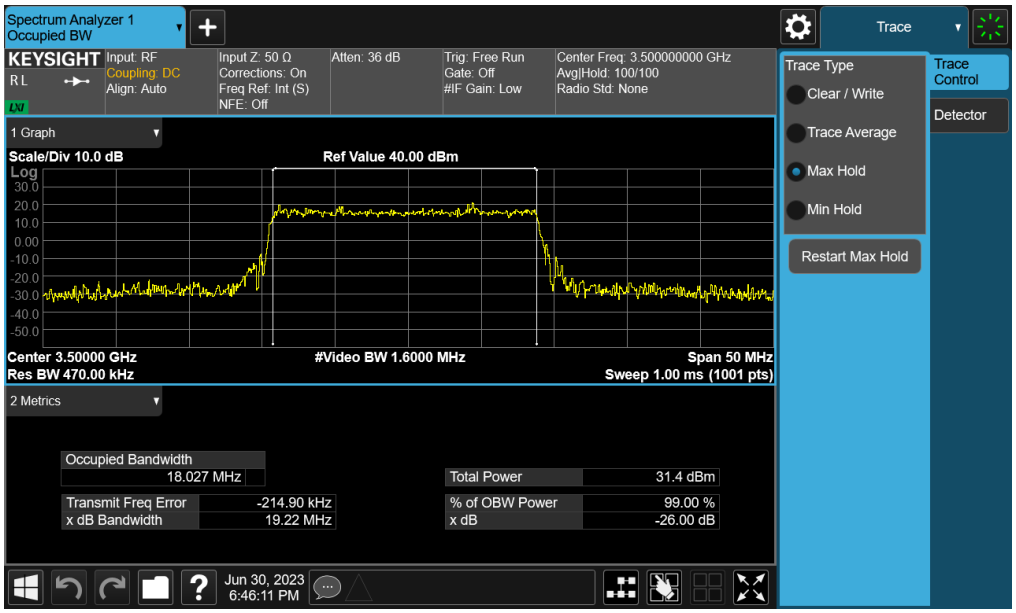
Plot 7-55. Occupied Bandwidth Plot (NR Band n77 - 30MHz π/2 BPSK - Full RB)



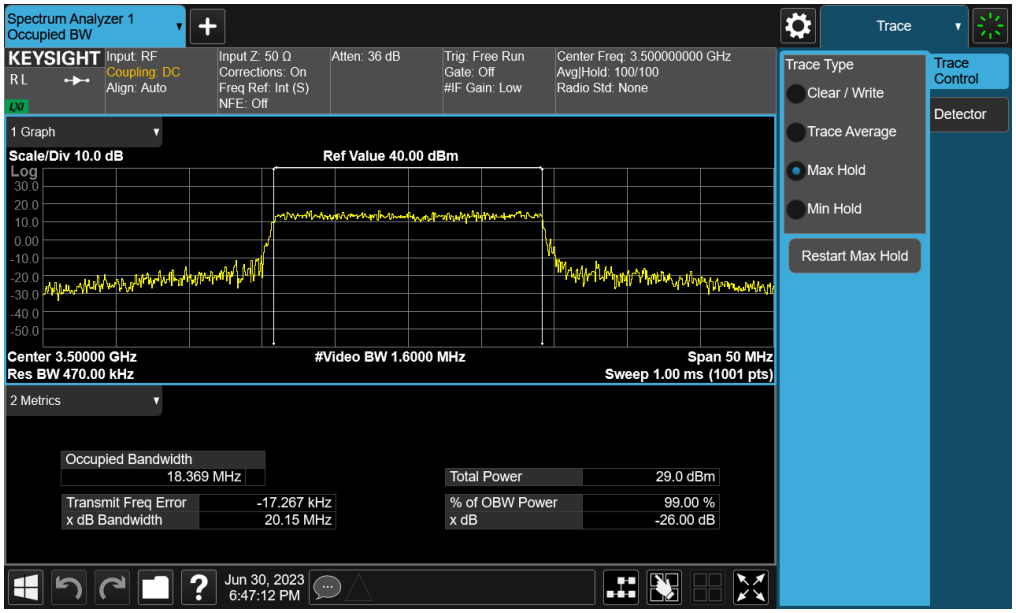
Plot 7-56. Occupied Bandwidth Plot (NR Band n77 - 30MHz QPSK - Full RB)



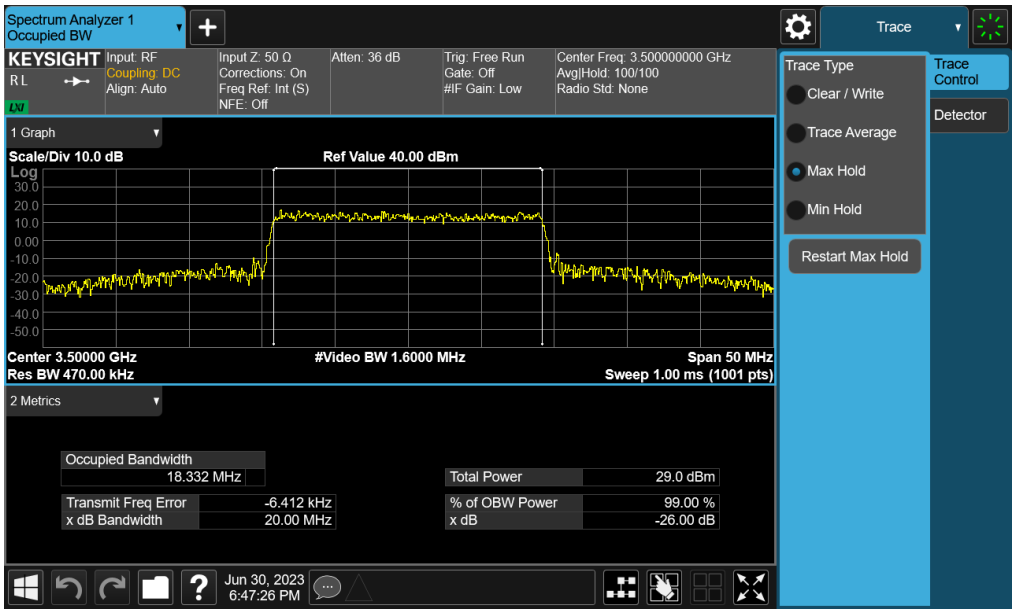
Plot 7-57. Occupied Bandwidth Plot (NR Band n77 - 30MHz 16-QAM - Full RB)



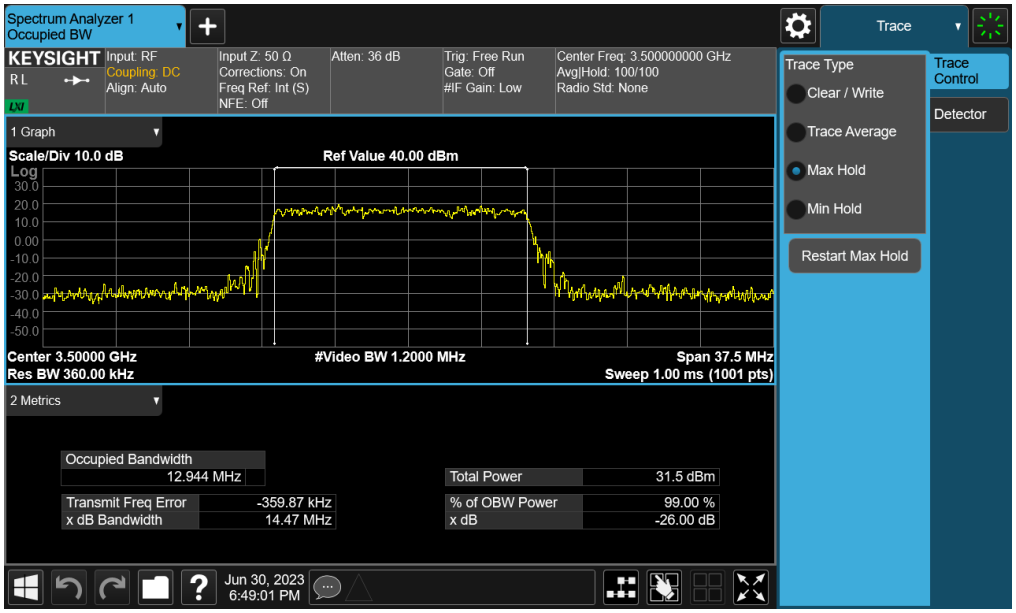
Plot 7-58. Occupied Bandwidth Plot (NR Band n77 - 20MHz π/2 BPSK - Full RB)



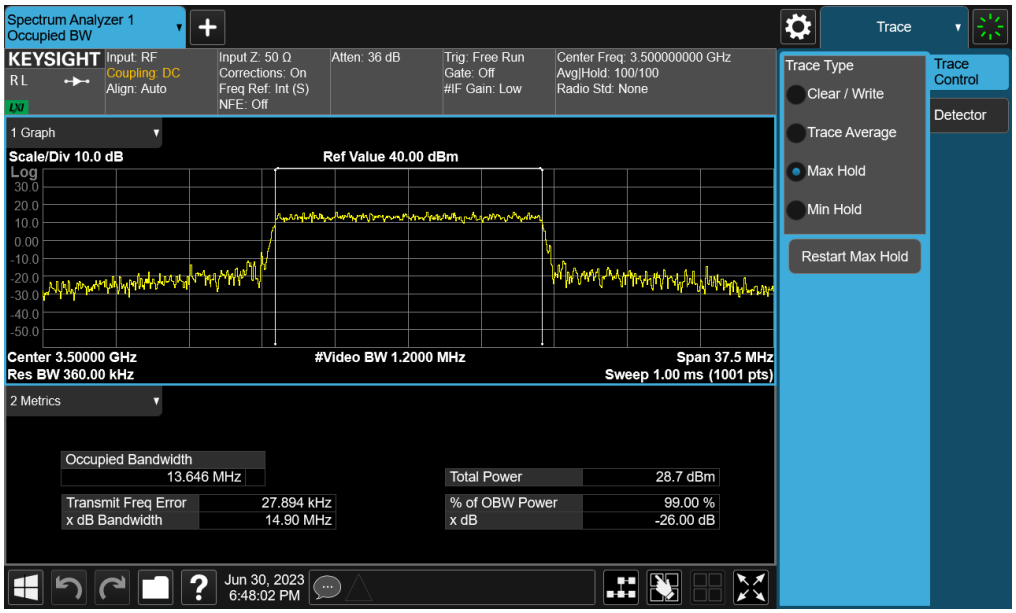
Plot 7-59. Occupied Bandwidth Plot (NR Band n77 - 20MHz QPSK - Full RB)



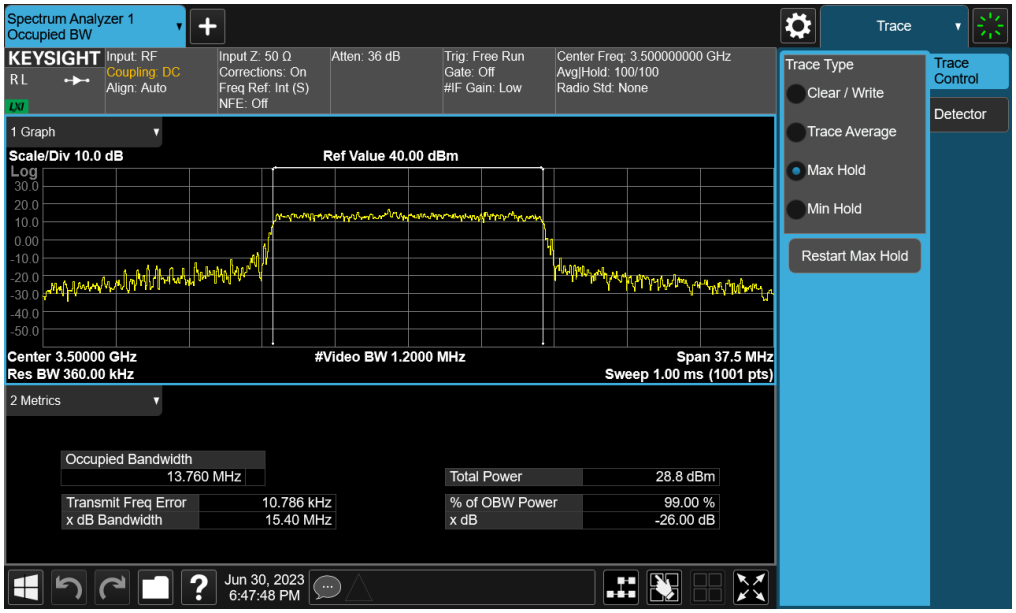
Plot 7-60. Occupied Bandwidth Plot (NR Band n77 - 20MHz 16-QAM - Full RB)



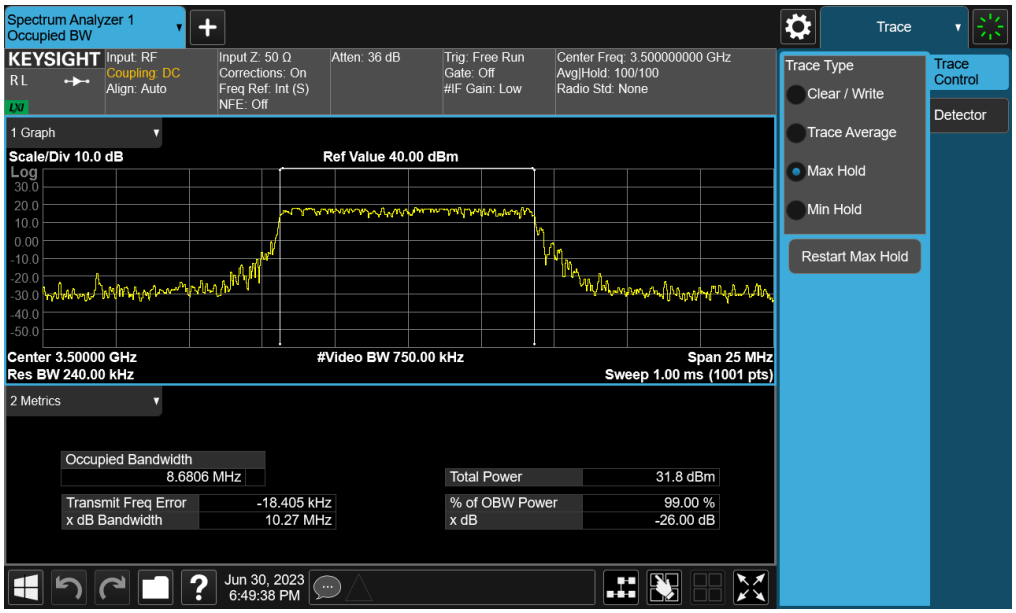
Plot 7-61. Occupied Bandwidth Plot (NR Band n77 - 15MHz π/2 BPSK - Full RB)



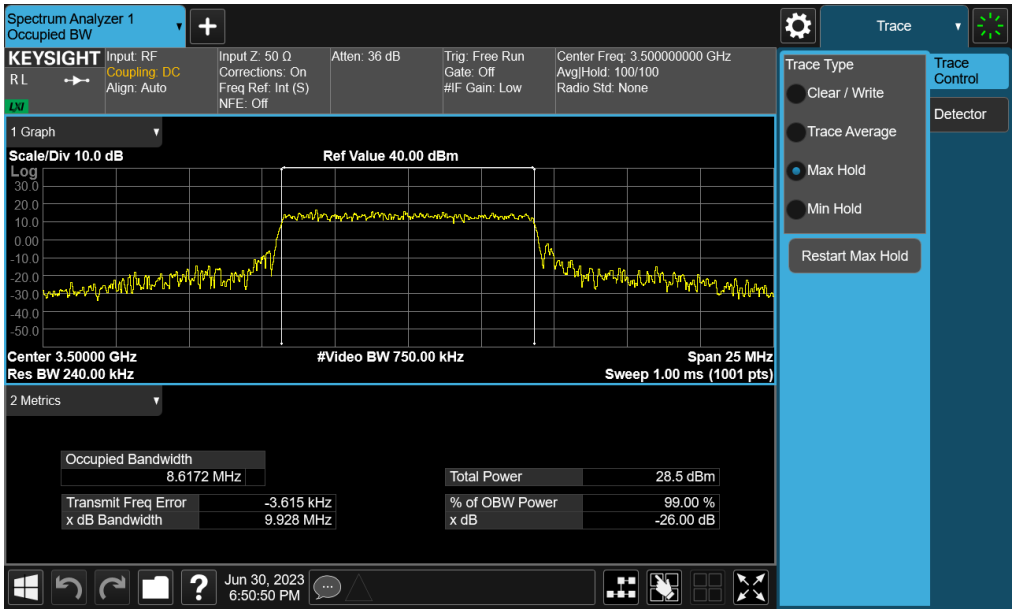
Plot 7-62. Occupied Bandwidth Plot (NR Band n77 - 15MHz QPSK - Full RB)



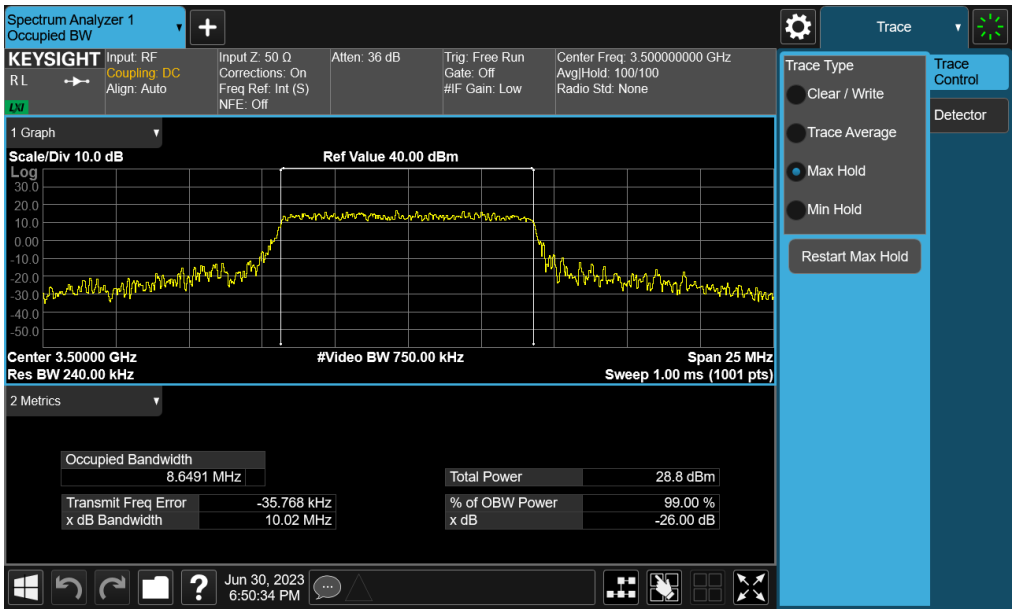
Plot 7-63. Occupied Bandwidth Plot (NR Band n77 - 15MHz 16-QAM - Full RB)



Plot 7-64. Occupied Bandwidth Plot (NR Band n77 - 10MHz π/2 BPSK - Full RB)



Plot 7-65. Occupied Bandwidth Plot (NR Band n77 - 10MHz QPSK - Full RB)



Plot 7-66. Occupied Bandwidth Plot (NR Band n77 - 10MHz 16-QAM - Full RB)