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PART 24 MEASUREMENT REPORT

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

Date of Testing:
9/14/2023 – 11/1/2023
Test Report Issue Date:
11/8/2023
Test Site/Location:
Element lab., Gyeonggi-do, South Korea
Test Report Serial No.:
1M2309070100-02.A3L

FCC ID:	**A3LSMA156U**
Applicant Name:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model:	SM-A156U
Additional Model(s):	SM-A156U1/DS, SM-S156V
EUT Type:	Portable Handset
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part:	24
Test Procedure(s):	ANSI C63.26-2015

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.

Prepared by

Reviewed by

TABLE OF CONTENTS

PART 24 MEASUREMENT REPORT

Antenna-M2						
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
GSM/GPRS	N/A	GMSK	1850.2 - 1909.8	0.956	29.80	245KGXW
EDGE	N/A	8-PSK	1850.2 - 1909.8	0.373	25.72	254KG7W
WCDMA	N/A	Spread Spectrum	1852.4 - 1907.6	0.146	21.64	4M19F9W
LTE Band 25/2	20 MHz	QPSK	1860 - 1905	0.269	24.30	18M0G7D
		16QAM	1860 - 1905	0.220	23.43	17M9W7D
	15 MHz	QPSK	1857.5 - 1907.5	0.275	24.40	13M5G7D
		16QAM	1857.5 - 1907.5	0.217	23.37	13M5W7D
	10 MHz	QPSK	1855 - 1910	0.264	24.22	9M03G7D
		16QAM	1855 - 1910	0.229	23.61	9M00W7D
	5 MHz	QPSK	1852.5 - 1912.5	0.261	24.17	4M52G7D
		16QAM	1852.5 - 1912.5	0.221	23.44	4M51W7D
	3 MHz	QPSK	1851.5 - 1913.5	0.261	24.16	2M70G7D
		16QAM	1851.5 - 1913.5	0.213	23.28	2M71W7D
	1.4 MHz	QPSK	1850.7 - 1914.3	0.247	23.92	1M09G7D
		16QAM	1850.7 - 1914.3	0.195	22.89	1M09W7D
NR Band n25/2	40 MHz	π/2 BPSK	1870 - 1895	0.205	23.12	38M9G7D
		QPSK	1870 - 1895	0.206	23.15	38M6G7D
		16QAM	1870 - 1895	0.157	21.96	38M7W7D
	30 MHz	π/2 BPSK	1865 - 1900	0.205	23.13	28M6G7D
		QPSK	1865 - 1900	0.221	23.44	28M6G7D
		16QAM	1865 - 1900	0.159	22.02	28M6W7D
	25 MHz	π/2 BPSK	1862.5 - 1902.5	0.205	23.12	22M9G7D
		QPSK	1862.5 - 1902.5	0.211	23.23	23M8G7D
		16QAM	1862.5 - 1902.5	0.160	22.04	23M8W7D
	20 MHz	π/2 BPSK	1860 - 1905	0.198	22.96	17M9G7D
		QPSK	1860 - 1905	0.215	23.33	19M1G7D
		16QAM	1860 - 1905	0.166	22.21	19M0W7D
	15 MHz	π/2 BPSK	1857.5 - 1907.5	0.205	23.11	13M5G7D
		QPSK	1857.5 - 1907.5	0.212	23.26	14M1G7D
		16QAM	1857.5 - 1907.5	0.153	21.85	14M1W7D
	10 MHz	π/2 BPSK	1855 - 1910	0.199	23.00	9M00G7D
		QPSK	1855 - 1910	0.210	23.22	9M34G7D
		16QAM	1855 - 1910	0.144	21.59	9M35W7D
	5 MHz	π/2 BPSK	1852.5 - 1912.5	0.198	22.96	4M49G7D
		QPSK	1852.5 - 1912.5	0.206	23.15	4M51G7D
		16QAM	1852.5 - 1912.5	0.155	21.89	4M50W7D

Antenna-M3						
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
LTE Band 25/2	20 MHz	QPSK	1860 - 1905	0.079	18.99	18M0G7D
		16QAM	1860 - 1905	0.063	18.00	18M0W7D
	15 MHz	QPSK	1857.5 - 1907.5	0.078	18.95	13M5G7D
		16QAM	1857.5 - 1907.5	0.062	17.89	13M5W7D
	10 MHz	QPSK	1855 - 1910	0.079	18.97	9M01G7D
		16QAM	1855 - 1910	0.062	17.93	9M02W7D
	5 MHz	QPSK	1852.5 - 1912.5	0.078	18.90	4M51G7D
		16QAM	1852.5 - 1912.5	0.063	18.02	4M52W7D
	3 MHz	QPSK	1851.5 - 1913.5	0.078	18.95	2M71G7D
		16QAM	1851.5 - 1913.5	0.064	18.06	2M72W7D
	1.4 MHz	QPSK	1850.7 - 1914.3	0.081	19.07	1M10G7D
		16QAM	1850.7 - 1914.3	0.066	18.21	1M10W7D
NR Band n2	40 MHz	π/2 BPSK	1870 - 1890	0.098	19.92	38M9G7D
		QPSK	1870 - 1890	0.096	19.81	39M0G7D
		16QAM	1870 - 1890	0.075	18.77	38M8W7D
	30 MHz	π/2 BPSK	1865 - 1895	0.100	19.98	28M7G7D
		QPSK	1865 - 1895	0.096	19.83	28M7G7D
		16QAM	1865 - 1895	0.079	18.98	28M7W7D
	25 MHz	π/2 BPSK	1862.5 - 1897.5	0.093	19.67	23M0G7D
		QPSK	1862.5 - 1897.5	0.091	19.58	23M9G7D
		16QAM	1862.5 - 1897.5	0.075	18.75	23M9W7D
	20 MHz	π/2 BPSK	1860 - 1900	0.098	19.87	18M0G7D
		QPSK	1860 - 1900	0.096	19.91	19M0G7D
		16QAM	1860 - 1900	0.075	19.04	19M1W7D
	15 MHz	π/2 BPSK	1857.5 - 1902.5	0.101	19.97	13M5G7D
		QPSK	1857.5 - 1902.5	0.094	19.81	14M2G7D
		16QAM	1857.5 - 1902.5	0.075	19.00	14M2W7D
	10 MHz	π/2 BPSK	1855 - 1905	0.098	19.84	9M02G7D
		QPSK	1855 - 1905	0.094	19.81	9M34G7D
		16QAM	1855 - 1905	0.074	18.94	9M33W7D
	5 MHz	π/2 BPSK	1852.5 - 1907.5	0.093	19.62	4M49G7D
		QPSK	1852.5 - 1907.5	0.085	19.40	4M50G7D
		16QAM	1852.5 - 1907.5	0.067	18.54	4M52W7D

EUT Overview

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 Suwon Laboratory located at 13, Heungdeok 1-ro, Giheung-gu, Yongin-si, Gyeonggi-do, 16954, South Korea. 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 Materials Technology Suwon, Ltd. located in Yongin-si, Gyeonggi-do, 16954, South Korea.

- Element Materials Technology Suwon, Ltd. is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation(A2LA) with Certificate number 2041.04 for Specific Absorption Rate (SAR), and Electromagnetic Compatibility (EMC) & Telecommunications testing for FCC and Innovation, Science, and Economic Development Canada rules.

- Element Materials Technology Suwon, Ltd. facility is accredited, designated, and recognized in accordance with the provision of Radio Wave Act and International Standard ISO/IEC 17025:2017 under the National Radio Research Agency.

  - Designation Number / CABID: KR0169
  - Test Firm Registration Number of FCC: 417945
  - Test Firm Registration Number of ISED: 26168

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMA156U**. 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 24 and RSS-133.

Test Device Serial No.: 0515M, 0528M, 0534M, 0712M, 0736M

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 WLAN, 802.11a/n/ac UNII (5GHz), Bluetooth (1x, EDR, LE), NFC

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.

2.4 Software and Firmware

Testing was performed on device(s) using software/firmware version A156USQU0AWIB 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	1.95
Radiated Disturbance (<1GHz)	4.10
Radiated Disturbance (>1GHz)	4.82
Radiated Disturbance (>18GHz)	4.96

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
Agilent	N9030A	PXA Signal Analyzer	2023-07-04	Annual	2024-07-03	MY49432391
Anritsu	S820E	Cable and Antenna Analyzer	2023-07-05	Annual	2024-07-04	1839097
Anritsu	MA24106A	USB Power Sensor	2023-07-05	Annual	2024-07-04	1244512
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	2022-10-21	Biennial	2024-10-20	10160045
Com-Power	PAM-118A	Preamplifier	2023-07-05	Annual	2024-07-04	551042
Espec	SH-242	Environmental Chamber	2023-07-05	Annual	2024-07-04	93011064
Fairview Microwave	FM2CP1122-10	2.92mm Directional Coupler	2023-07-04	Annual	2024-07-03	1946
Keysight Technologies	N9030B	MXA Signal Analyzer	2023-07-04	Annual	2024-07-03	MY57143276
Mini-Circuits	BW-N10W5+	Attenuator	2023-07-04	Annual	2024-07-03	1607
Mini-Circuits	BW-N10W5+	Attenuator	2023-07-04	Annual	2024-07-03	1607
Rohde & Schwarz	TS-PR18	Preamplifier	2023-07-05	Annual	2024-07-04	102141
Rohde & Schwarz	SMB100A03	Signal Generator	2023-01-17	Annual	2024-01-16	182487
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	2023-02-17	Annual	2024-02-16	131453
Rohde & Schwarz	FSW43	Signal and Spectrum Analyzer	2023-01-13	Annual	2024-01-12	101955
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2023-02-17	Annual	2024-02-16	102131
Rohde & Schwarz	TC-TA18	VIVALDI-ANT	2021-10-22	Biennial	2023-10-21	101097
Rohde & Schwarz	TC-TA18	VIVALDI-ANT	2021-10-22	Biennial	2023-10-21	101098
Schwarzbeck	VULB9162	Broadband TRILOG Antenna	2023-06-01	Biennial	2025-05-31	9162-217
Schwarzbeck	UHA9105	Dipole Antenna	2022-07-19	Biennial	2024-07-18	91052522
Sunol	DRH-118	Horn Antenna	2023-01-26	Biennial	2025-01-25	A060215

Table 5-1. Test Equipment

Notes:

For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

6.0 SAMPLE CALCULATIONS

GSM Emission Designator

Emission Designator = 250KGXW
GSM BW = 250 kHz
G = Phase Modulation
X = Cases not otherwise covered
W = Combination (Audio/Data)

EDGE Emission Designator

Emission Designator = 250KG7W
EDGE BW = 250 kHz
G = Phase Modulation
7 = Quantized/Digital Info
W = Combination (Audio/Data)

WCDMA Emission Designator

Emission Designator = 4M16F9W
WCDMA BW = 4.16 MHz
F = Frequency Modulation
9 = Composite Digital Info
W = Combination (Audio/Data)

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: A3LSMA156U

FCC Classification: Portable Handset

Mode(s): GSM/GPRS/EDGE/WCDMA/LTE/NR

Test Condition	Test Description	FCC Part Section(s)	RSS Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Transmitter Conducted Output Power*	2.1046(a), 2.1046(c)	RSS-Gen(6.12)	N/A	PASS	Section 7.2
	Occupied Bandwidth	2.1049(h)	RSS-Gen(6.7)	N/A	PASS	Section 7.3
	Conducted Band Edge / Spurious Emissions	2.1051, 24.238(a)	RSS-Gen(6.13), RSS-133(6.5)	> 43 + 10log10(P[Watts]) at Band Edge and for all out-of-band emissions	PASS	Sections 7.4, 7.5
	Peak-to-Average Ratio	24.232(d)	RSS-133(6.4)	≤ 13 dB	PASS	Section 7.6
	Frequency Stability	2.1055, 24.235	RSS-Gen(6.11), RSS-133(6.3)	Fundamental emissions stay within authorized frequency block **Carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm	PASS	Section 7.9
RADIATED	Equivalent Isotropic Radiated Power	24.232(c)	RSS-Gen(6.12), RSS-133(6.4)	< 2 Watts max. EIRP	PASS	Section 7.7
	Radiated Spurious Emissions	2.1053, 24.238(a)	RSS-Gen(6.13), RSS-133(6.5)	≥ 43 + 10 log (P[Watts]) dB of attenuation below transmitter power **Spurious emissions from receivers shall not exceed the limits detailed in RSS-Gen(7.3)	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 v1.1.

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. Detector = RMS
2. Trace mode = trace average for continuous emissions, max hold for pulse emissions
3. Sweep time = auto couple
4. The trace was allowed to stabilize
5. 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.

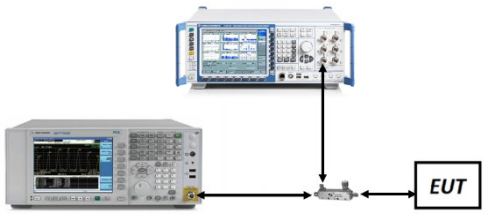


Figure 7-1. Test Instrument & Measurement Setup

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.

3. 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.

Mode	Modulation	Channel	Frequency [MHz]	Conducted Power [dBm]
WCDMA PCS	Spread Spectrum	9262	1852.4	24.77
		9400	1880.0	24.79
		9538	1907.6	24.80

Table 7-2. Conducted powers (WCDMA PCS)

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
20 MHz	QPSK	26140	1860.0	1 / 99	24.53
		26365	1882.5	1 / 50	24.68
		26590	1905.0	1 / 99	24.53
	16-QAM	26590	1905.0	1 / 99	23.68
15 MHz	QPSK	26115	1857.5	1 / 0	24.52
		26365	1882.5	1 / 37	24.76
		26615	1907.5	1 / 74	24.48
	16-QAM	26615	1907.5	1 / 74	23.57
10 MHz	QPSK	26090	1855.0	1 / 0	24.55
		26365	1882.5	1 / 25	24.65
		26640	1910.0	1 / 49	24.51
	16-QAM	26640	1910.0	1 / 49	23.61
5 MHz	QPSK	26065	1852.5	1 / 24	24.52
		26365	1882.5	1 / 12	24.63
		26665	1912.5	1 / 12	24.44
	16-QAM	26665	1912.5	1 / 12	23.70
3 MHz	QPSK	26055	1851.5	1 / 7	24.48
		26365	1882.5	1 / 7	24.70
		26675	1913.5	1 / 14	24.49
	16-QAM	26675	1913.5	1 / 14	23.74
1.4 MHz	QPSK	26047	1850.7	1 / 3	24.32
		26365	1882.5	1 / 0	24.40
		26683	1914.3	1 / 0	24.61
	16-QAM	26683	1914.3	1 / 0	23.89

Table 7-3. Conducted powers (LTE Band 25/2 – Ant M3)

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
40 MHz	π/2 BPSK	374000	1870.00	1 / 1	24.74
		376500	1880.00	1 / 108	24.75
		379000	1890.00	1 / 108	24.75
	QPSK	374000	1870.00	1 / 108	24.75
		376500	1880.00	1 / 108	24.78
		379000	1890.00	1 / 108	24.71
	16-QAM	379000	1890.00	1 / 108	23.35
30 MHz	π/2 BPSK	372000	1865.00	1 / 80	24.84
		376500	1880.00	1 / 80	24.79
		381000	1895.00	1 / 80	24.81
	QPSK	372000	1865.00	1 / 80	24.81
		376500	1880.00	1 / 80	24.77
		381000	1895.00	1 / 80	24.73
	16-QAM	381000	1895.00	1 / 80	23.56
25 MHz	π/2 BPSK	372000	1862.50	1 / 66	24.65
		376500	1880.00	1 / 66	24.62
		381000	1897.50	1 / 131	24.50
	QPSK	372000	1862.50	1 / 66	24.67
		376500	1880.00	1 / 66	24.70
		381000	1897.50	1 / 131	24.48
	16-QAM	381000	1897.50	1 / 131	23.33
20 MHz	π/2 BPSK	372000	1860.00	1 / 104	24.98
		376500	1880.00	1 / 53	24.80
		381000	1900.00	1 / 104	24.70
	QPSK	372000	1860.00	1 / 104	24.83
		376500	1880.00	1 / 53	24.99
		381000	1900.00	1 / 1	24.81
	16-QAM	381000	1900.00	1 / 1	23.63
15 MHz	π/2 BPSK	371500	1857.50	1 / 77	24.85
		376500	1880.00	1 / 1	24.88
		381500	1902.50	1 / 77	24.80
	QPSK	371500	1857.50	1 / 77	24.74
		376500	1880.00	1 / 1	24.85
		381500	1902.50	1 / 77	24.71
	16-QAM	381500	1902.50	1 / 77	23.58
10 MHz	π/2 BPSK	371000	1855.00	1 / 1	24.78
		376500	1880.00	1 / 26	24.88
		382000	1905.00	1 / 50	24.67
	QPSK	371000	1855.00	1 / 1	24.81
		376500	1880.00	1 / 1	24.82
		382000	1905.00	1 / 50	24.70
	16-QAM	382000	1905.00	1 / 50	23.52
5 MHz	π/2 BPSK	370500	1852.50	1 / 12	24.76
		376500	1880.00	1 / 1	24.74
		382500	1907.50	1 / 23	24.45
	QPSK	370500	1852.50	1 / 12	24.54
		376500	1880.00	1 / 12	24.76
		382500	1907.50	1 / 23	24.29
	16-QAM	382500	1907.50	1 / 23	23.12

Table 7-4. Conducted powers (NR Band n2 – Ant M3)

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.

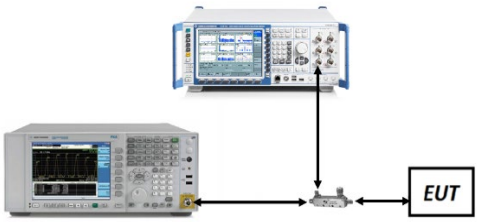


Figure 7-2. Test Instrument & Measurement Setup

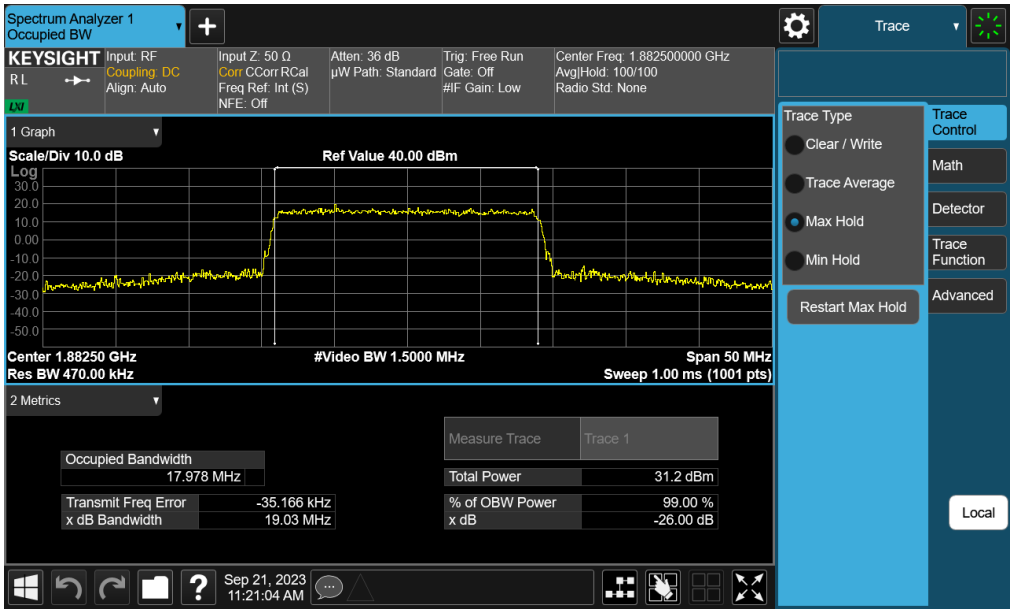
Test Notes

None.

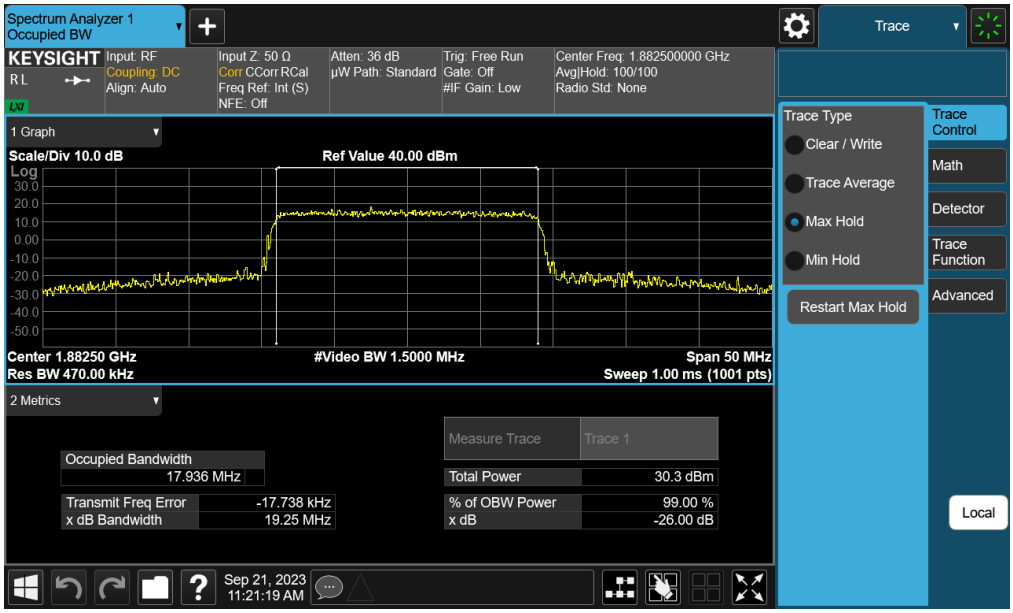
Mode	Bandwidth	Modulation	OBW [MHz]
GSM-PCS	N/A	GSMK	0.25
GSM-PCS Edge		8-PSK	0.25
WCDMA-PCS		Spead Spectrum	4.19
LTE-B25-2	20 MHz	QPSK	17.98
		16QAM	17.94
	15 MHz	QPSK	13.48
		16QAM	13.49
	10 MHz	QPSK	9.03
		16QAM	9.01
	5 MHz	QPSK	4.52
		16QAM	4.51
	3 MHz	QPSK	2.70
		16QAM	2.71
	1.4 MHz	QPSK	1.09
		16QAM	1.09
NR-n25-2	40 MHz	π/2 BPSK	38.89
		QPSK	38.63
		16QAM	38.68
	30 MHz	π/2 BPSK	28.63
		QPSK	28.58
		16QAM	28.61
	25 MHz	π/2 BPSK	22.95
		QPSK	23.85
		16QAM	23.81
	20 MHz	π/2 BPSK	17.92
		QPSK	19.08
		16QAM	18.97
	15 MHz	π/2 BPSK	13.47
		QPSK	14.14
		16QAM	14.15
	10 MHz	π/2 BPSK	9.00
		QPSK	9.34
		16QAM	9.35
	5 MHz	π/2 BPSK	4.49
		QPSK	4.51
		16QAM	4.50

Table 7-5. Occupied Bandwidth Test Results – Ant M2

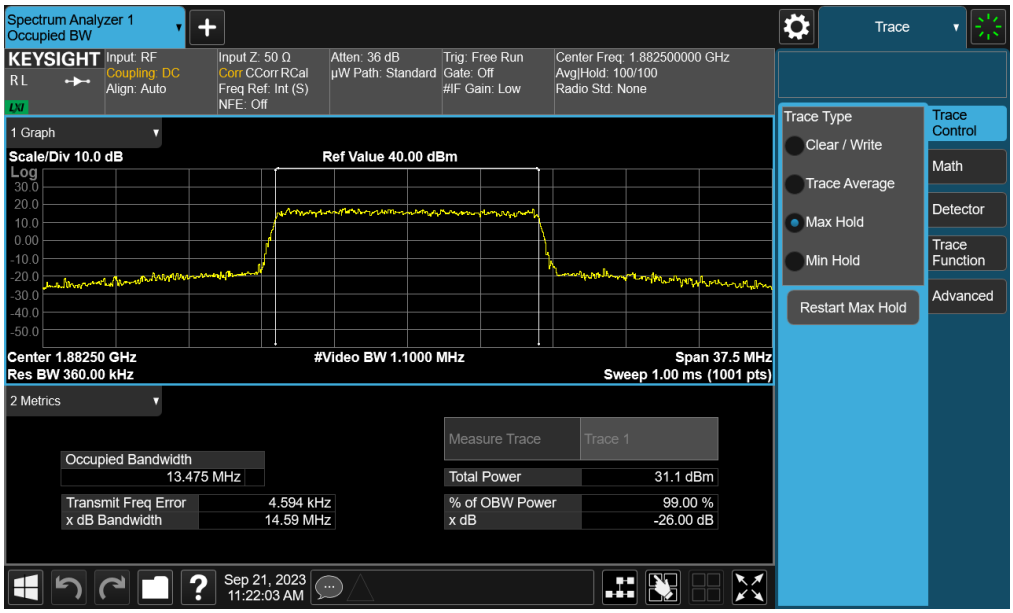
LTE Band 25/2 – Ant M2



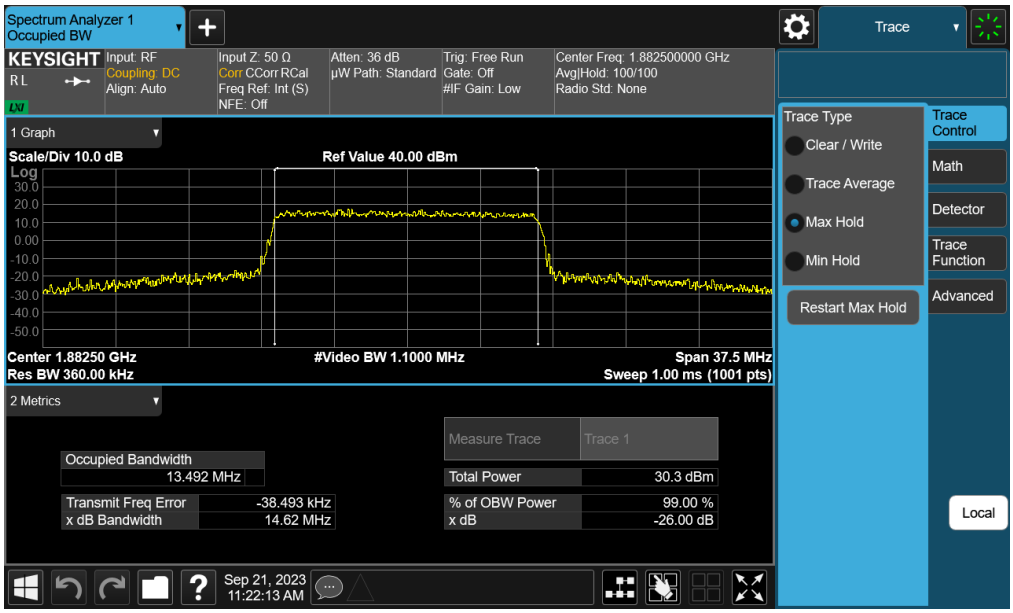
Plot 7-1. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz QPSK - Full RB - Ant M2)



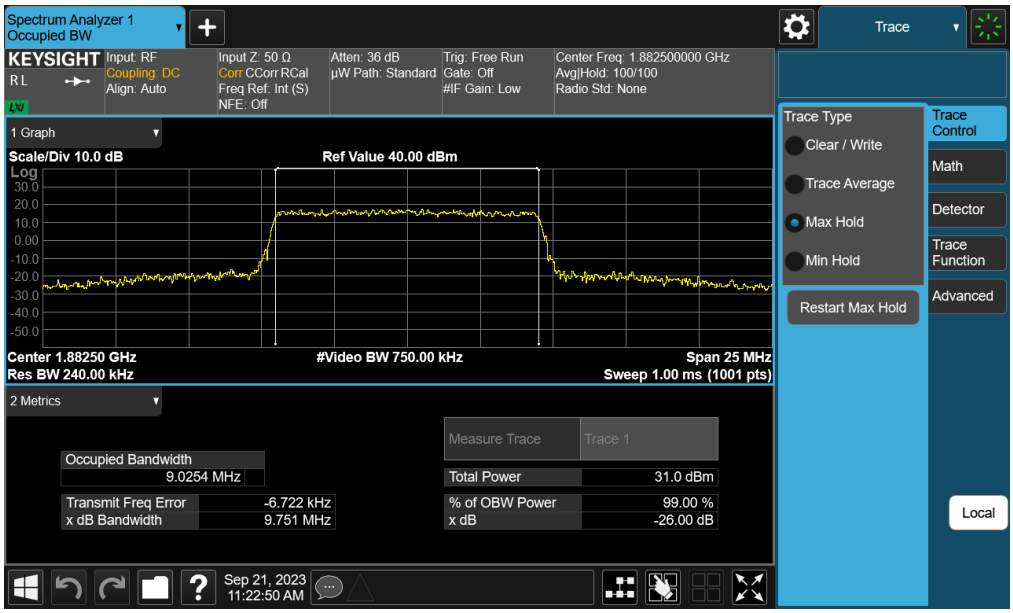
Plot 7-2. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz 16-QAM - Full RB - Ant M2)



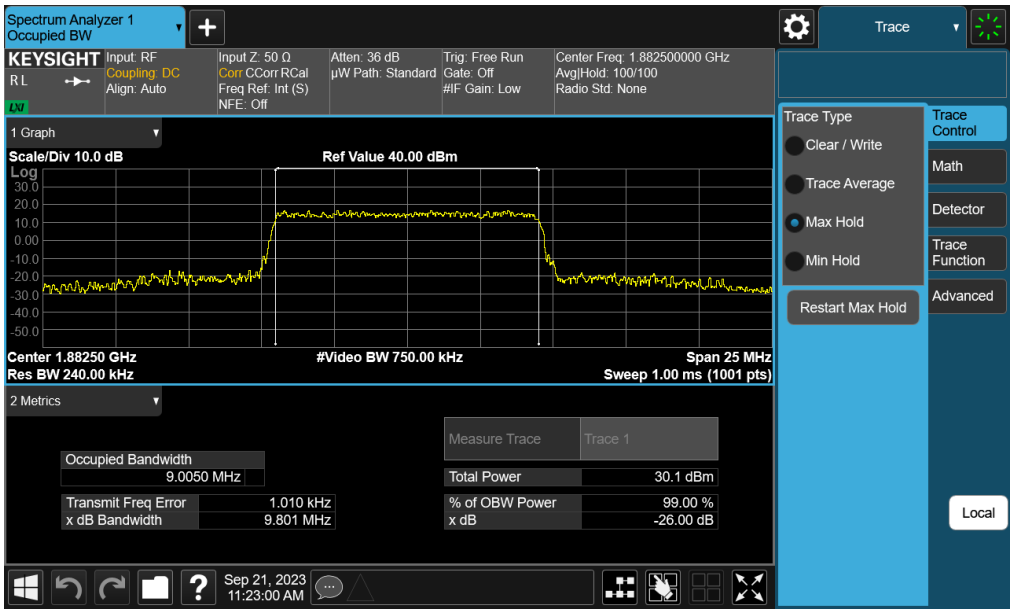
Plot 7-3. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz QPSK - Full RB - Ant M2)



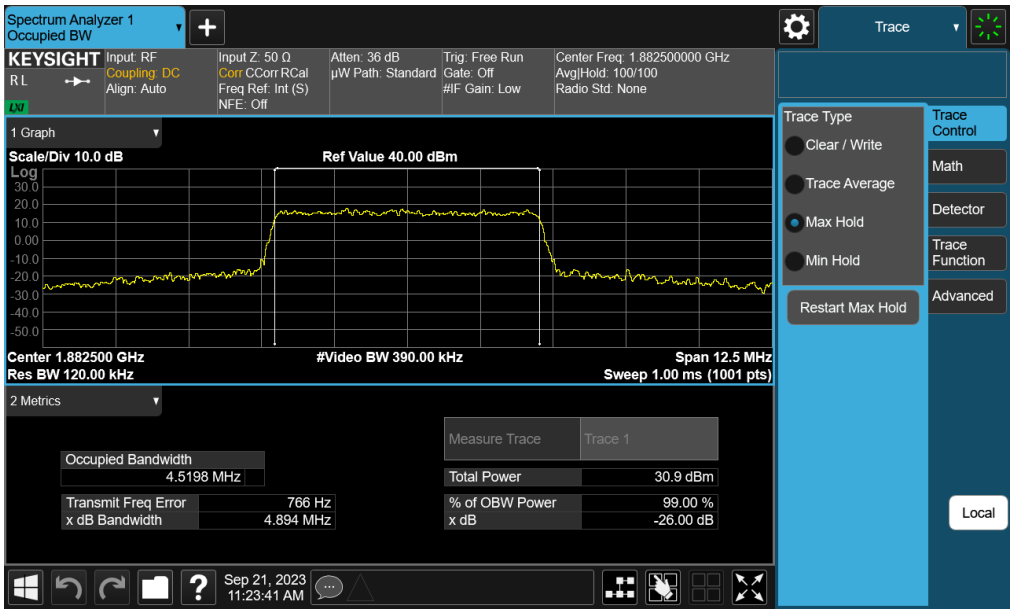
Plot 7-4. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz 16-QAM - Full RB - Ant M2)



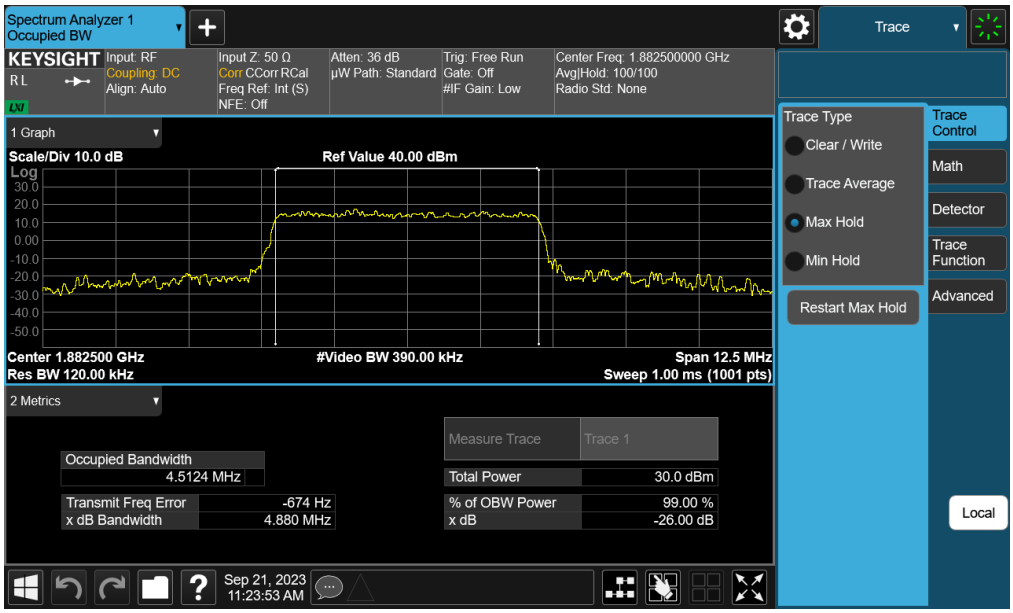
Plot 7-5. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz QPSK - Full RB - Ant M2)



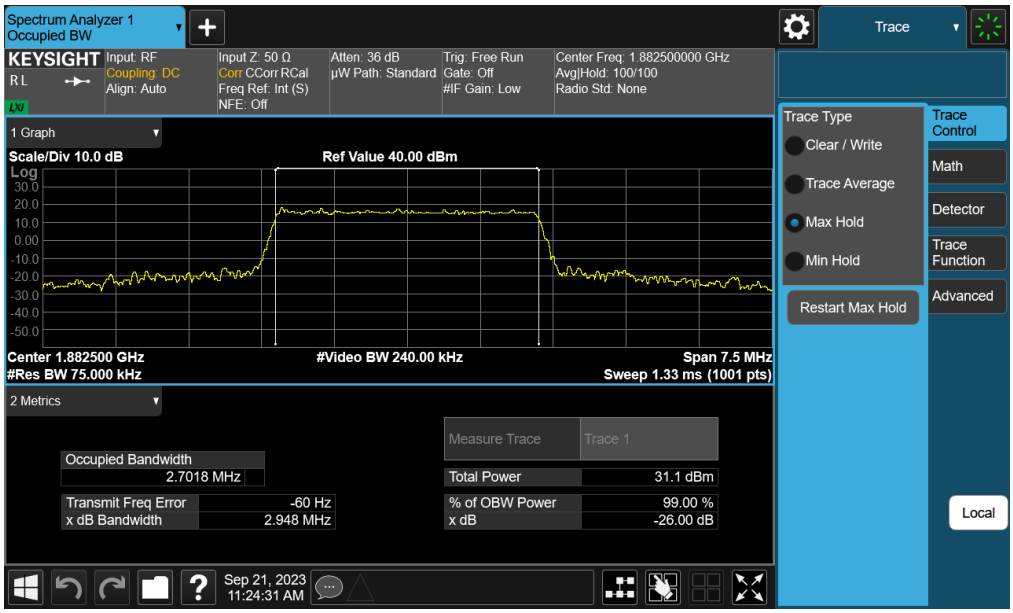
Plot 7-6. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz 16-QAM - Full RB - Ant M2)



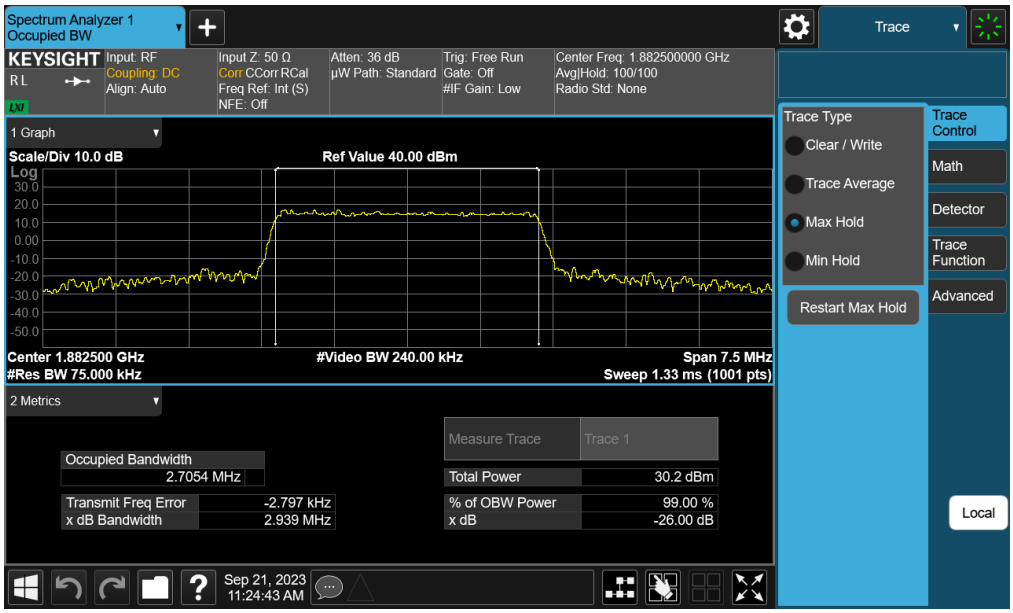
Plot 7-7. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz QPSK - Full RB - Ant M2)



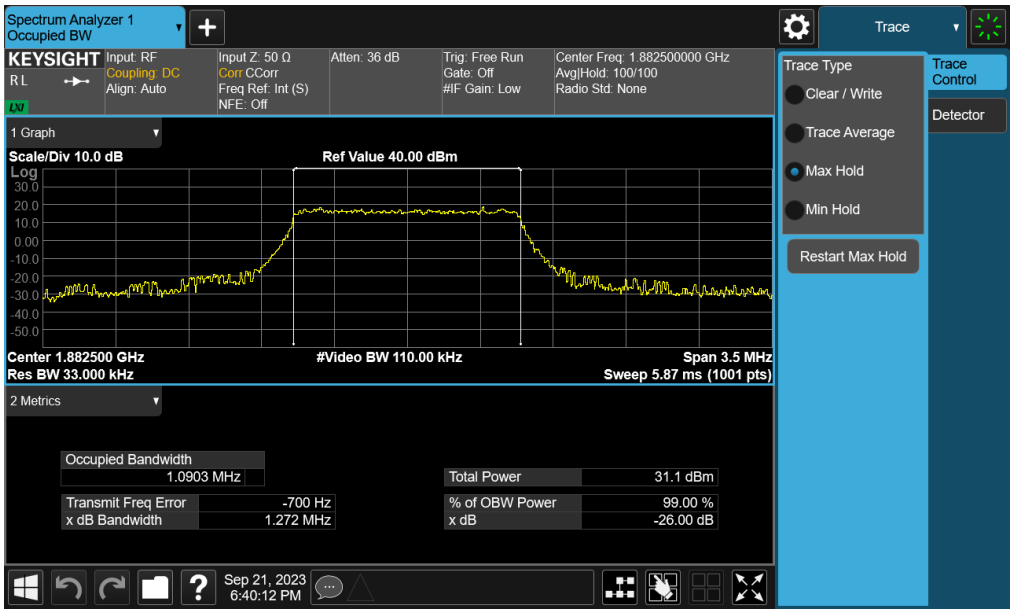
Plot 7-8. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz 16-QAM - Full RB - Ant M2)



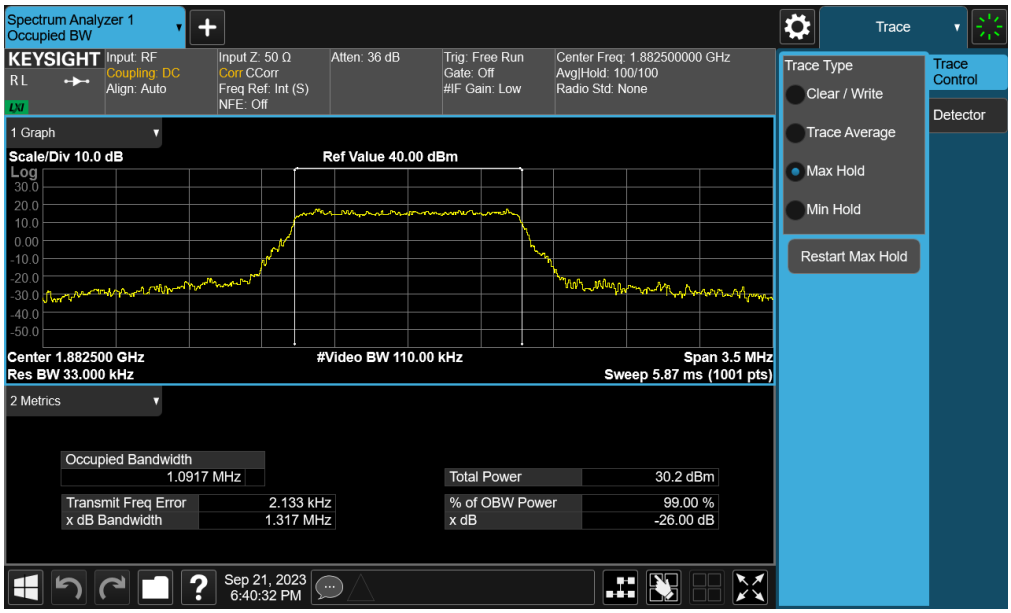
Plot 7-9. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz QPSK - Full RB - Ant M2)



Plot 7-10. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz 16-QAM - Full RB - Ant M2)

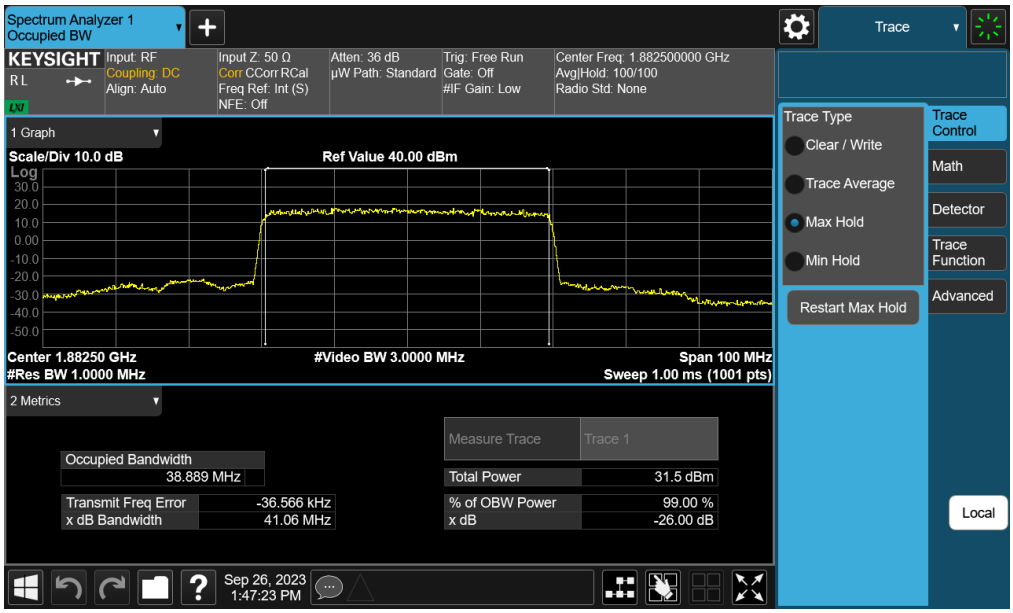


Plot 7-11. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz QPSK - Full RB - Ant M2)



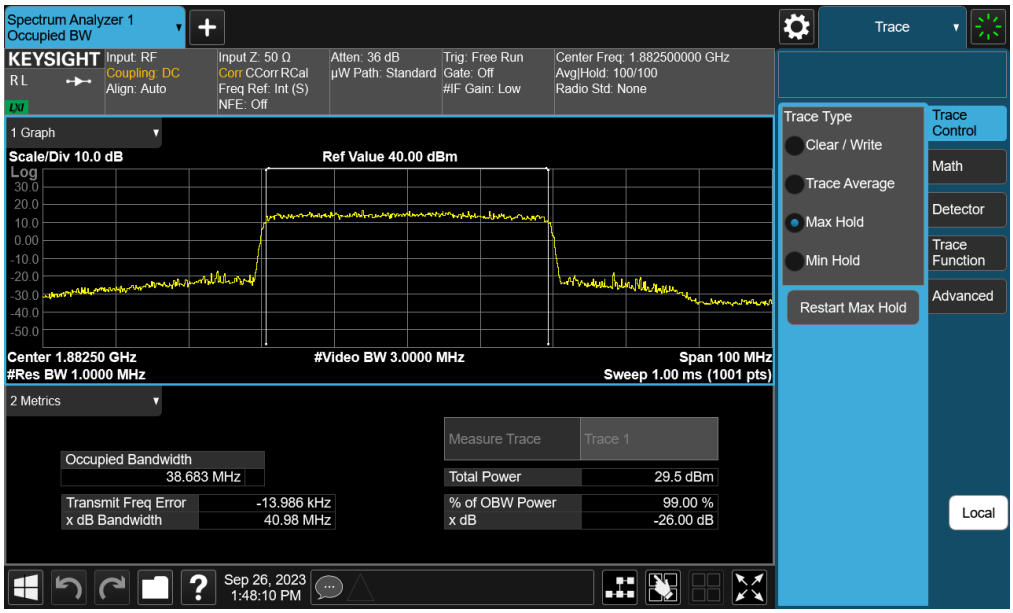
Plot 7-12. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz 16-QAM - Full RB - Ant M2)

NR Band n25/2 – Ant M2

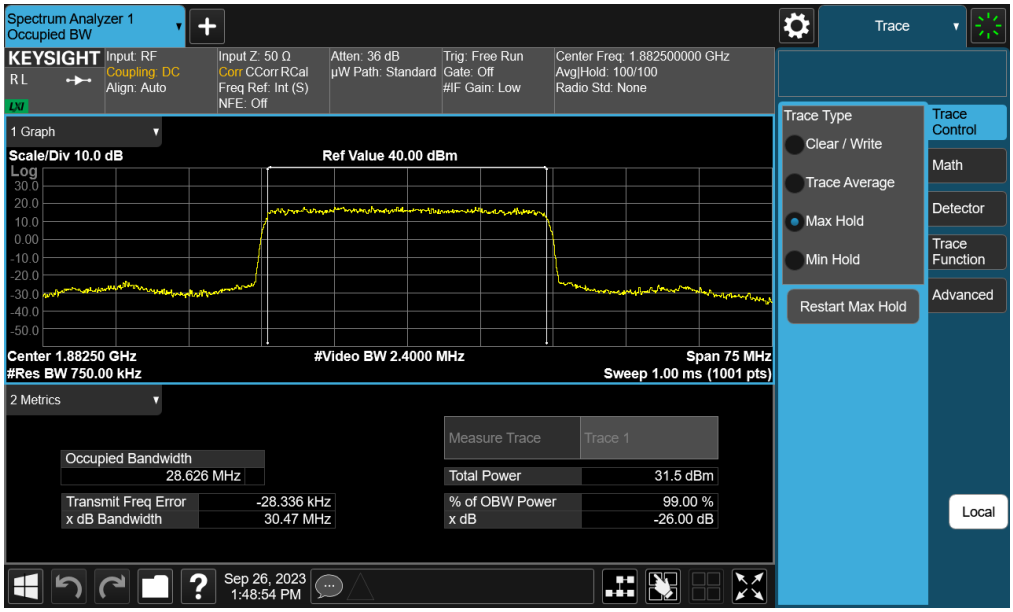


Plot 7-13. Occupied Bandwidth Plot (NR Band n25/2 - 40.0MHz DFT-s-OFDM BPSK - Full RB - ANT M2)

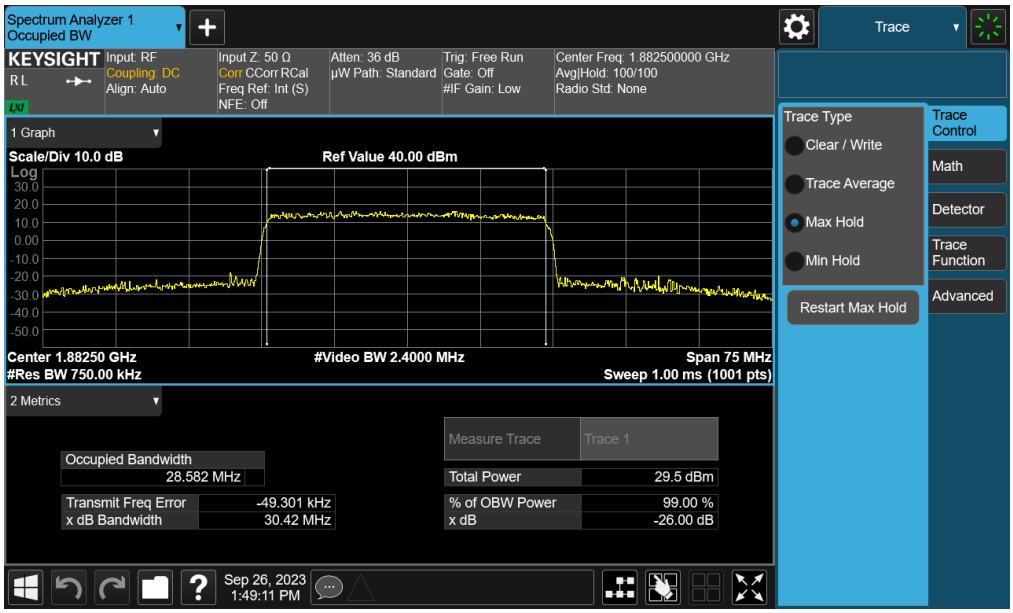
Plot 7-14. Occupied Bandwidth Plot (NR Band n25/2 - 40.0MHz CP-OFDM QPSK - Full RB - ANT M2)



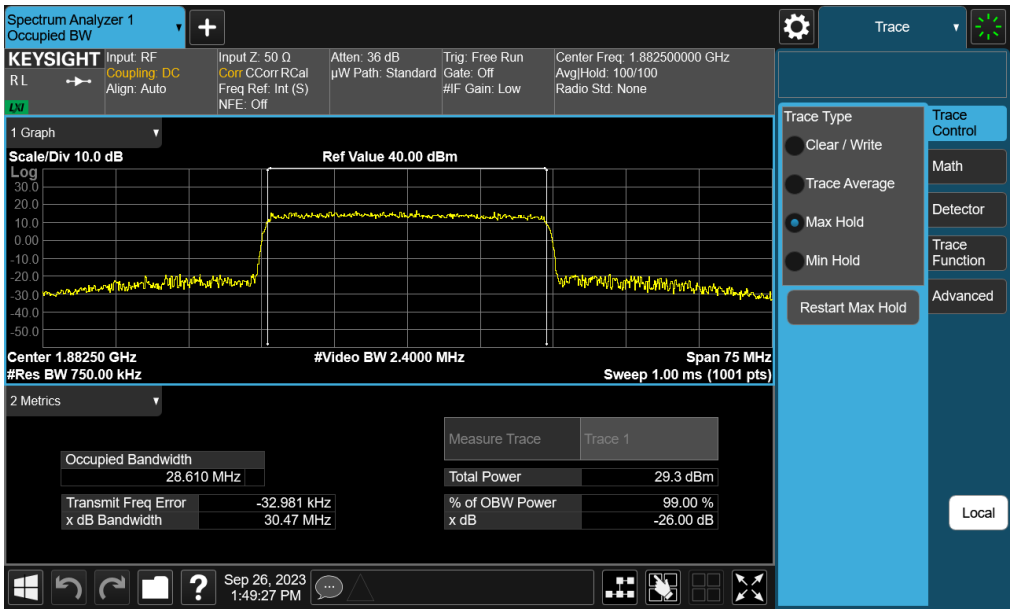
Plot 7-15. Occupied Bandwidth Plot (NR Band n25/2 - 40.0MHz CP-OFDM 16QAM - Full RB - ANT M2)



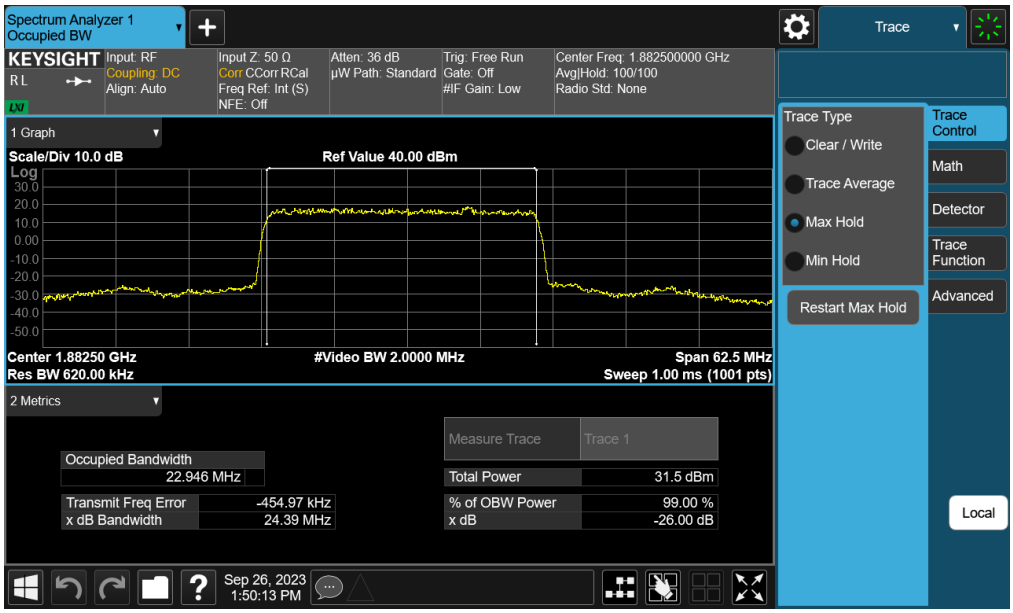
Plot 7-16. Occupied Bandwidth Plot (NR Band n25/2 - 30.0MHz DFT-s-OFDM BPSK - Full RB - ANT M2)



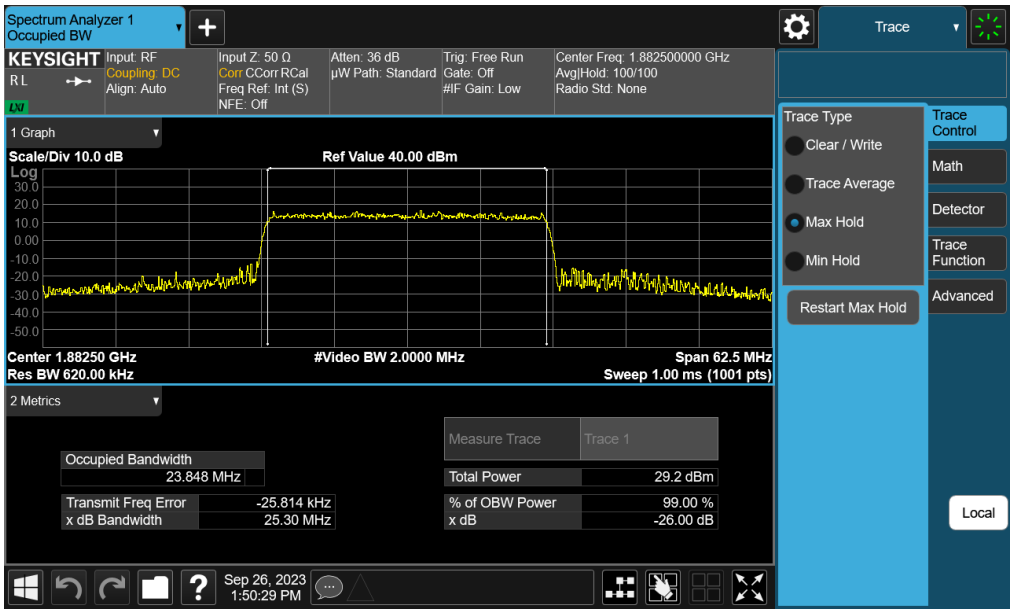
Plot 7-17. Occupied Bandwidth Plot (NR Band n25/2 - 30.0MHz CP-OFDM QPSK - Full RB - ANT M2)



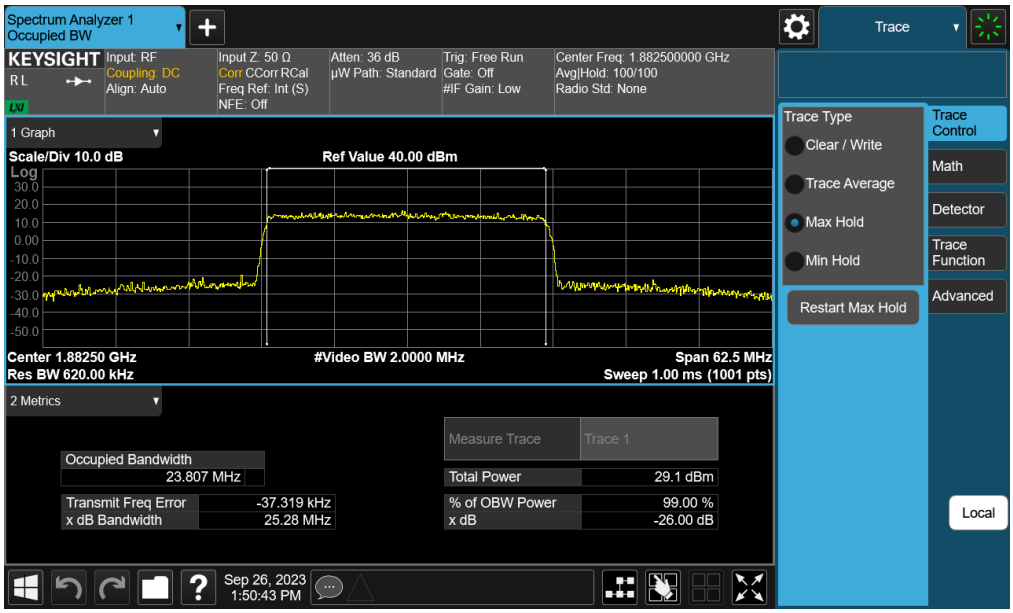
Plot 7-18. Occupied Bandwidth Plot (NR Band n25/2 - 30.0MHz CP-OFDM 16QAM - Full RB - ANT M2)



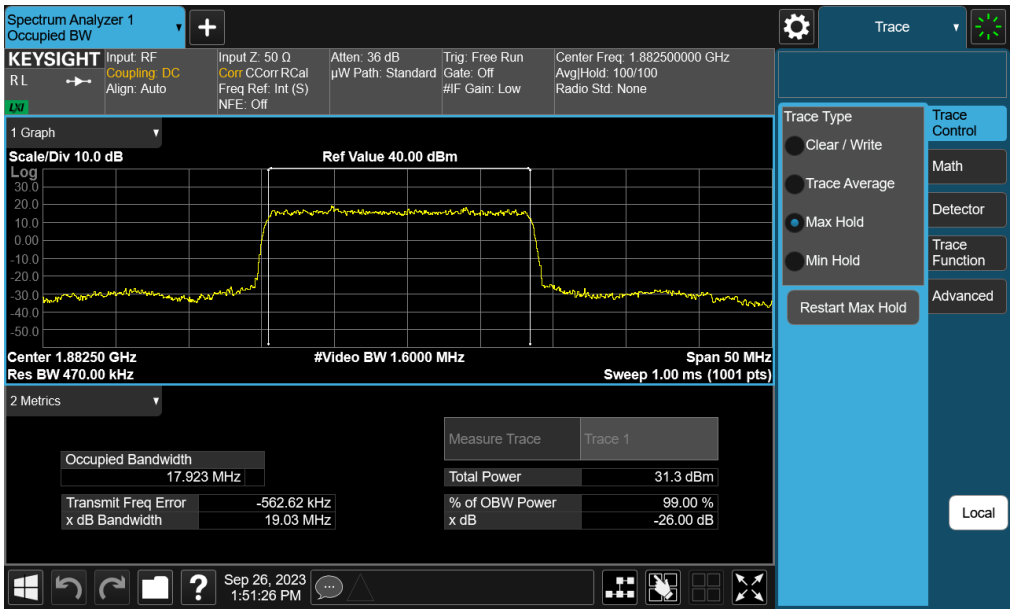
Plot 7-19. Occupied Bandwidth Plot (NR Band n25/2 - 25.0MHz DFT-s-OFDM BPSK - Full RB - ANT M2)



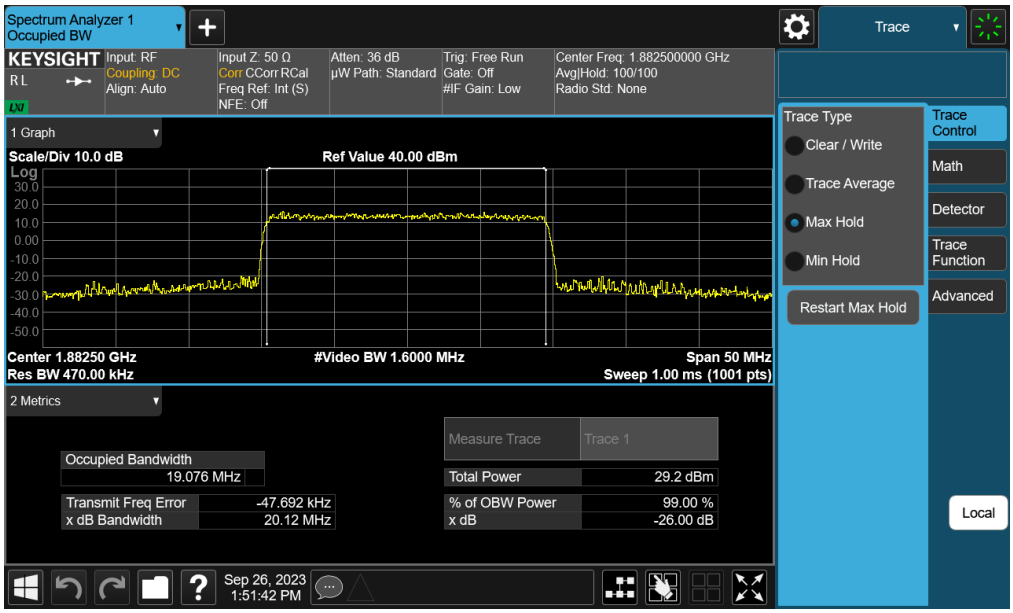
Plot 7-20. Occupied Bandwidth Plot (NR Band n25/2 - 25.0MHz CP-OFDM QPSK - Full RB - ANT M2)



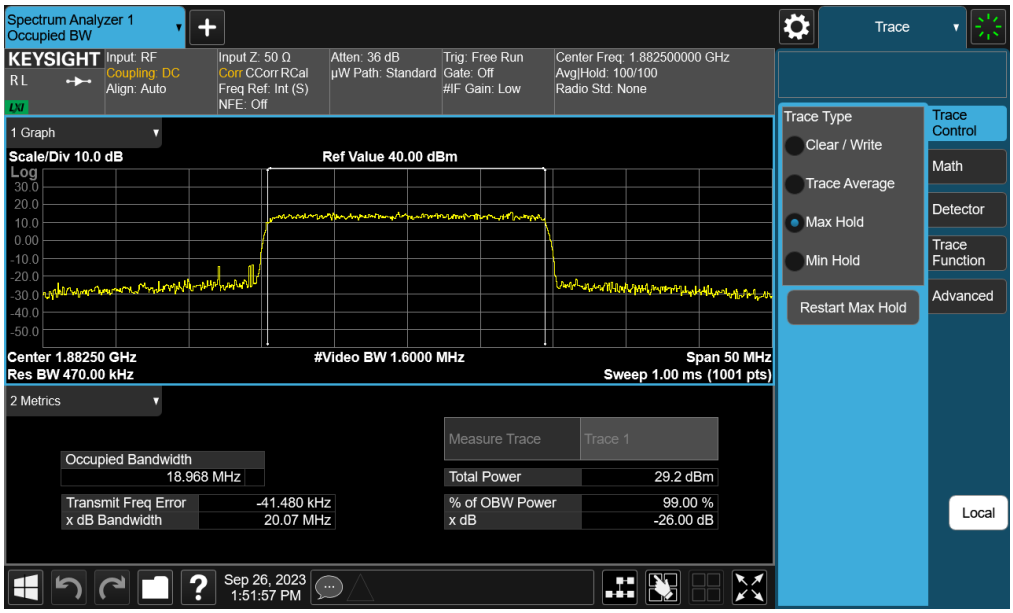
Plot 7-21. Occupied Bandwidth Plot (NR Band n25/2 - 25.0MHz CP-OFDM 16QAM - Full RB - ANT M2)



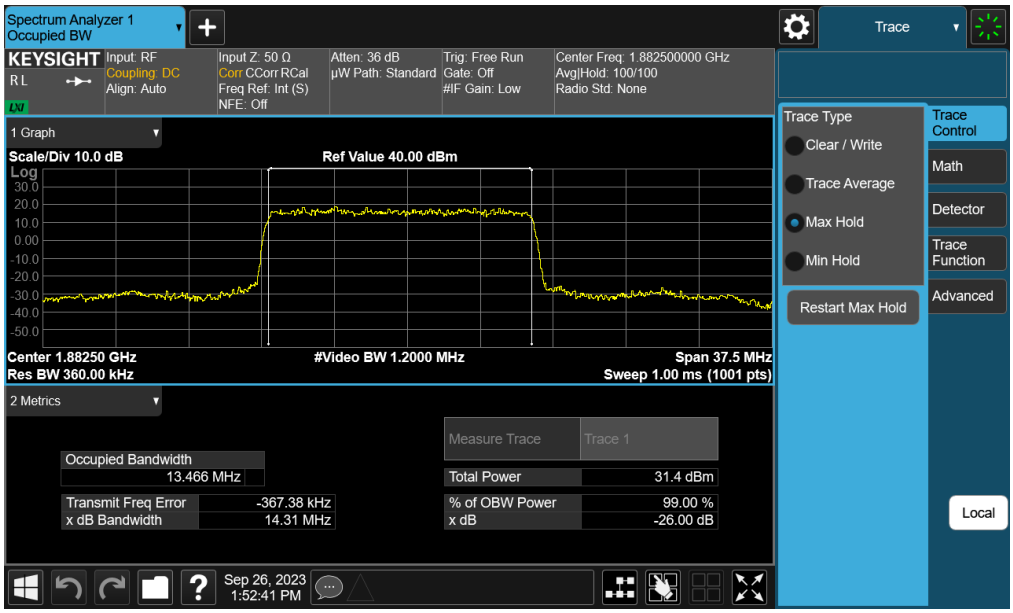
Plot 7-22. Occupied Bandwidth Plot (NR Band n25/2 - 20.0MHz DFT-s-OFDM BPSK - Full RB - ANT M2)



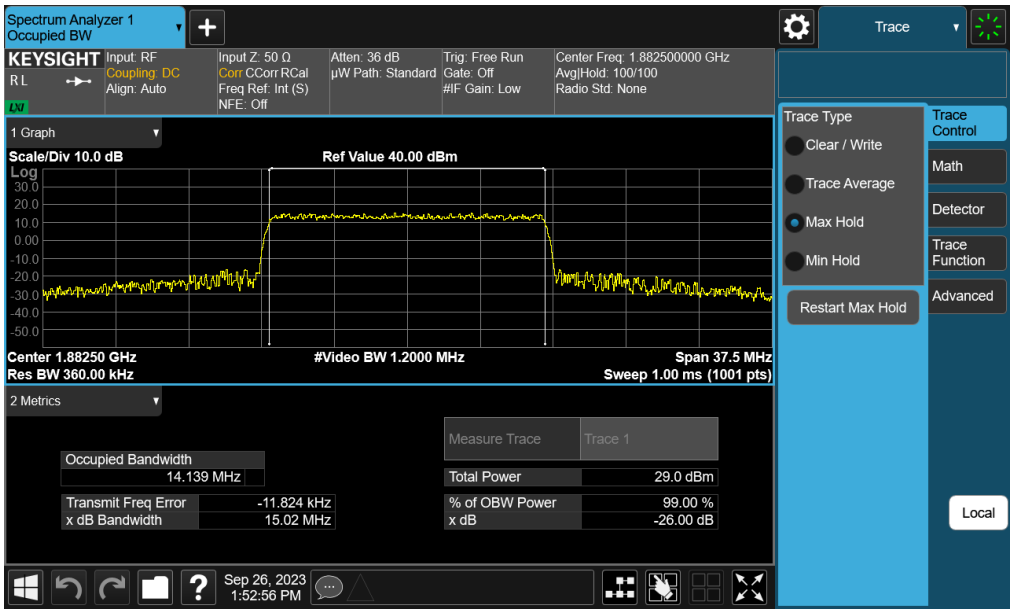
Plot 7-23. Occupied Bandwidth Plot (NR Band n25/2 - 20.0MHz CP-OFDM QPSK - Full RB - ANT M2)



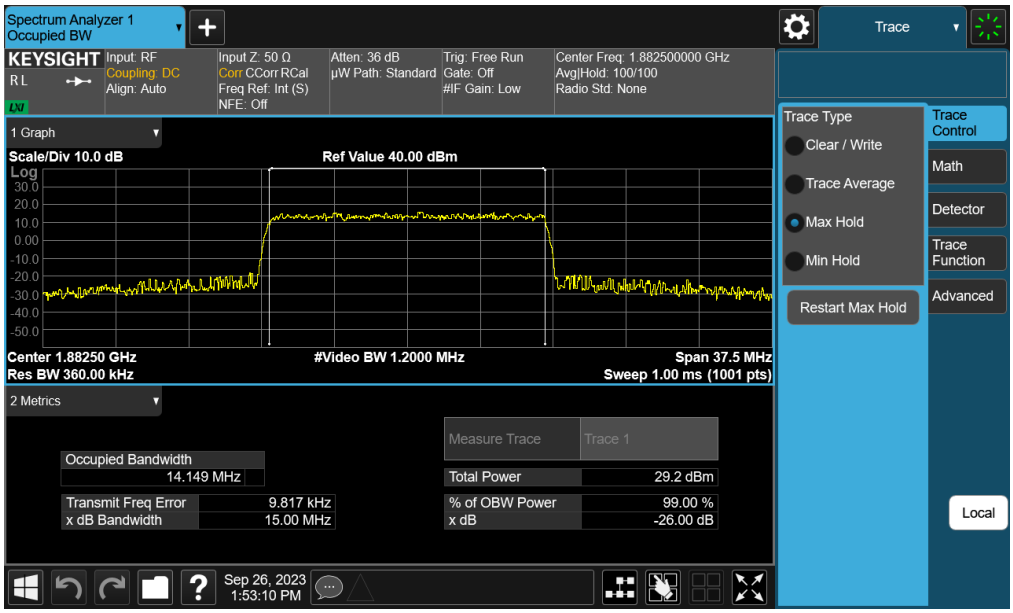
Plot 7-24. Occupied Bandwidth Plot (NR Band n25/2 - 20.0MHz CP-OFDM 16QAM - Full RB - ANT M2)



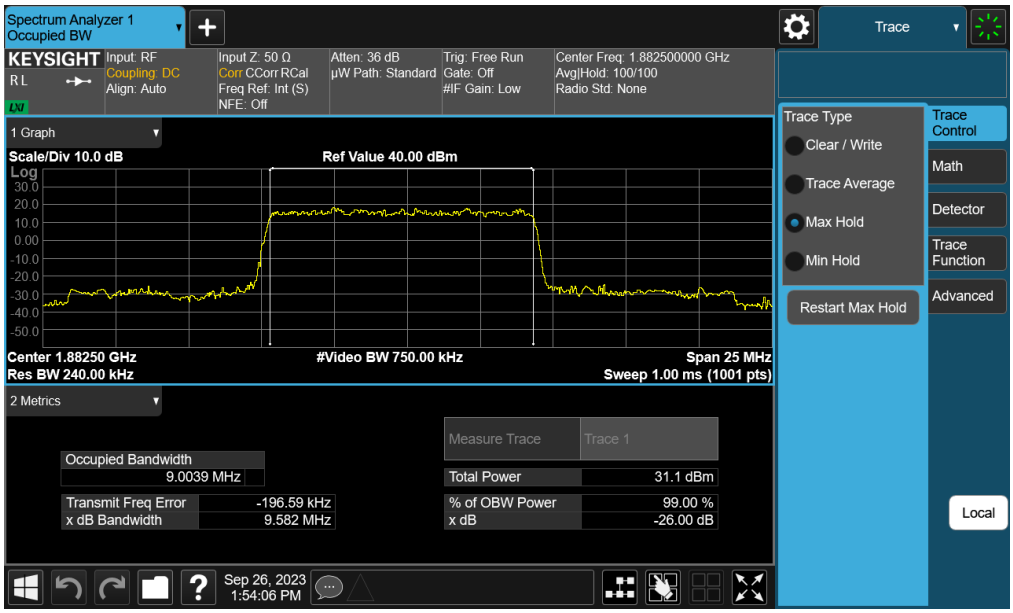
Plot 7-25. Occupied Bandwidth Plot (NR Band n25/2 - 15.0MHz DFT-s-OFDM BPSK - Full RB - ANT M2)



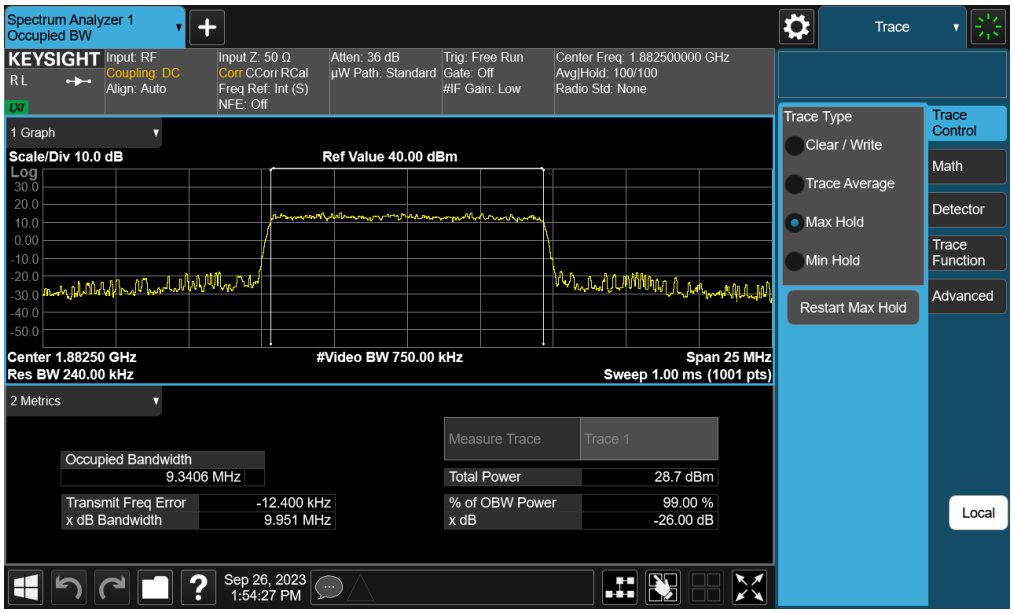
Plot 7-26. Occupied Bandwidth Plot (NR Band n25/2 - 15.0MHz CP-OFDM QPSK - Full RB - ANT M2)



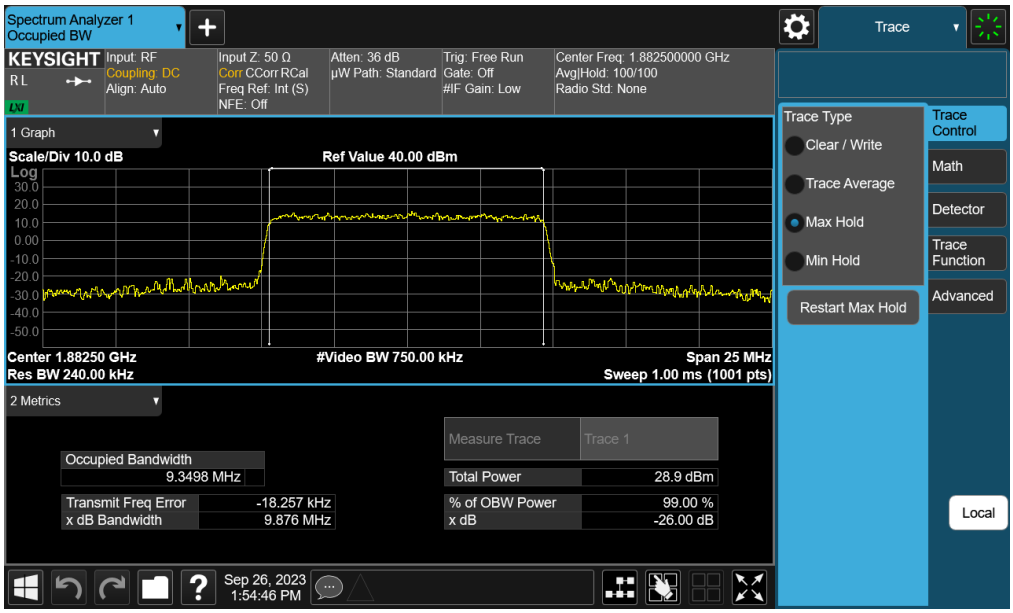
Plot 7-27. Occupied Bandwidth Plot (NR Band n25/2 - 15.0MHz CP-OFDM 16QAM - Full RB - ANT M2)



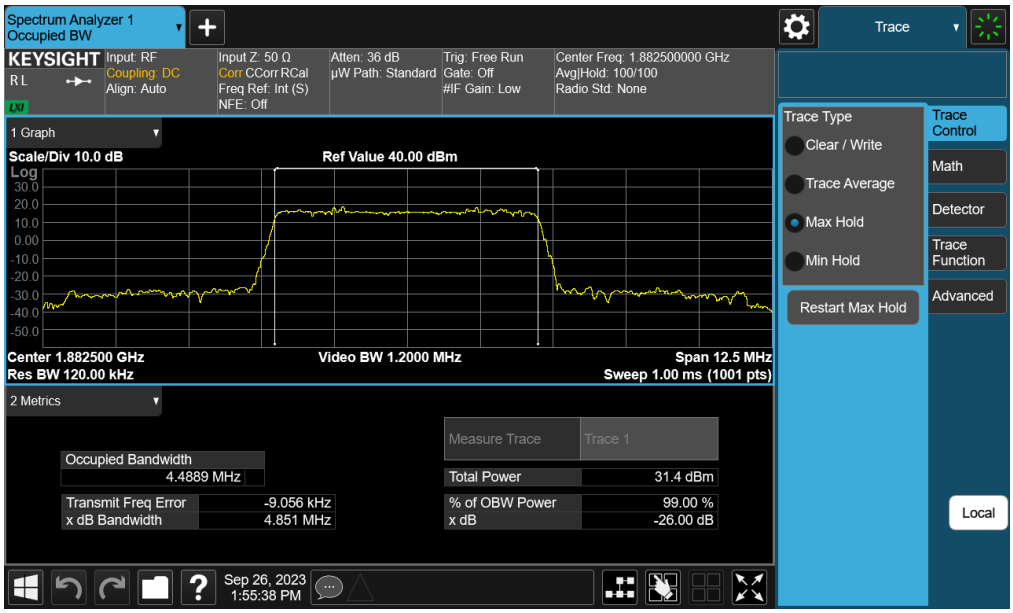
Plot 7-28. Occupied Bandwidth Plot (NR Band n25/2 - 10.0MHz DFT-s-OFDM BPSK - Full RB - ANT M2)



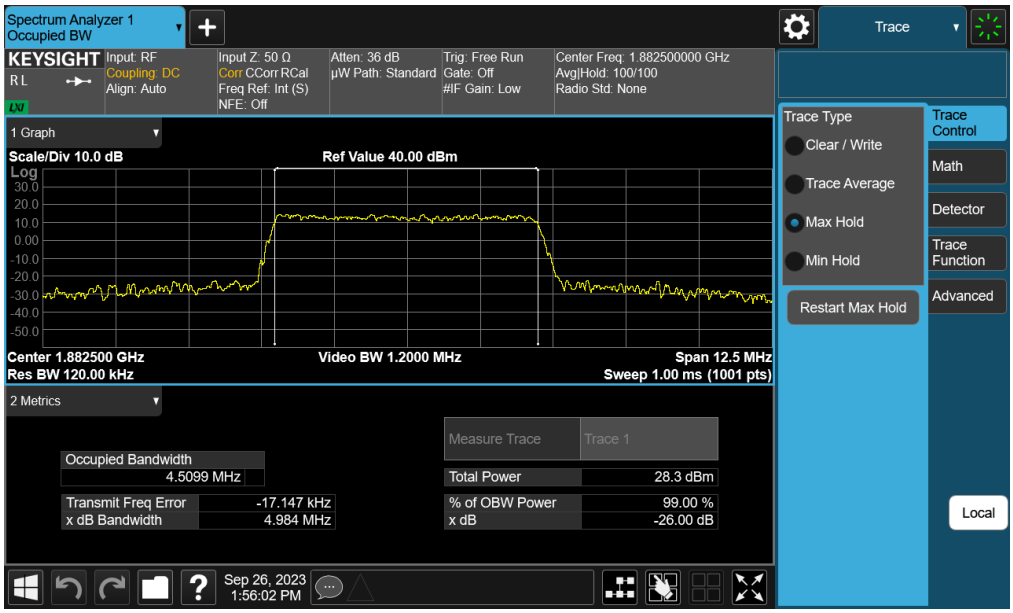
Plot 7-29. Occupied Bandwidth Plot (NR Band n25/2 - 10.0MHz CP-OFDM QPSK - Full RB - ANT M2)



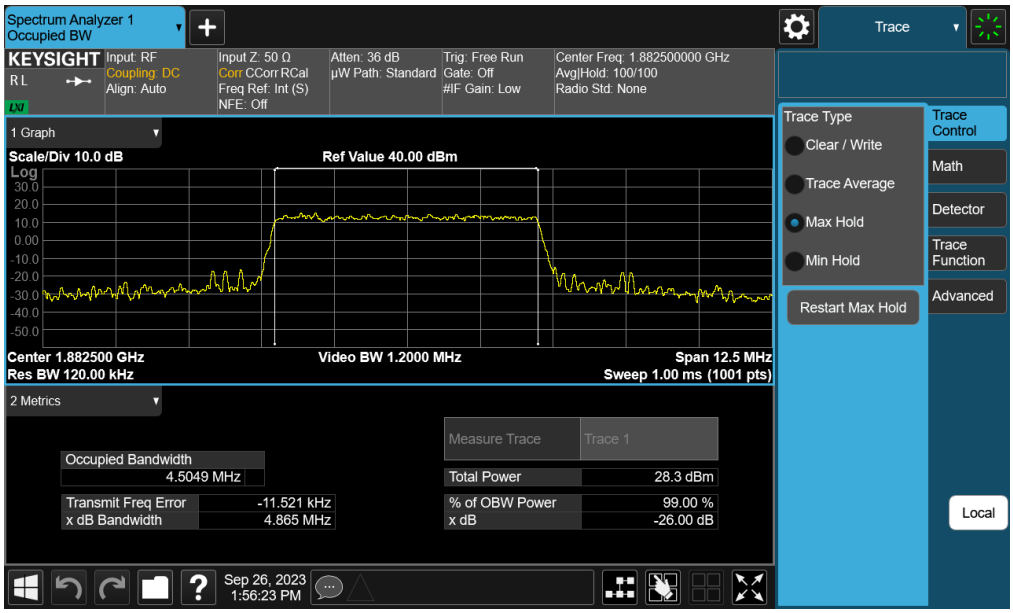
Plot 7-30. Occupied Bandwidth Plot (NR Band n25/2 - 10.0MHz CP-OFDM 16QAM - Full RB - ANT M2)



Plot 7-31. Occupied Bandwidth Plot (NR Band n25/2 - 5.0MHz DFT-s-OFDM BPSK - Full RB - ANT M2)



Plot 7-32. Occupied Bandwidth Plot (NR Band n25/2 - 5.0MHz CP-OFDM QPSK - Full RB - ANT M2)



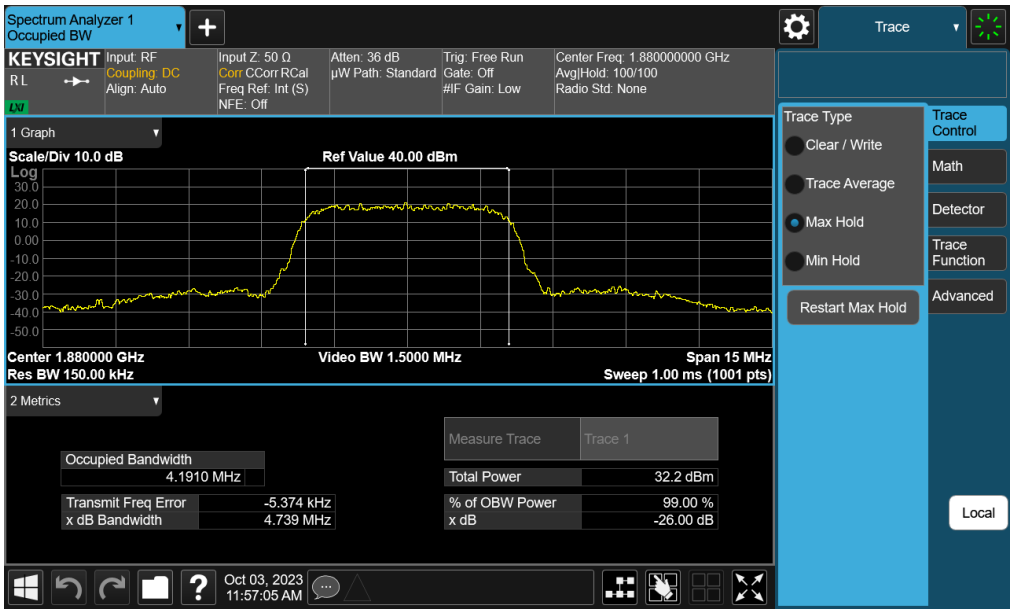
Plot 7-33. Occupied Bandwidth Plot (NR Band n25/2 - 5.0MHz CP-OFDM 16QAM - Full RB - ANT M2)

GSM/GPRS PCS – Ant M2

Plot 7-34. Occupied Bandwidth Plot (GPRS, Ch. 661 - Ant M2)

Plot 7-35. Occupied Bandwidth Plot (EDGE, Ch. 661 - Ant M2)

WCDMA PCS – Ant M2



Plot 7-36. Occupied Bandwidth Plot (WCDMA, Ch. 9400 - Ant M2)

Mode	Bandwidth	Modulation	OBW [MHz]
LTE-B25-2	20 MHz	QPSK	18.02
		16QAM	17.99
	15 MHz	QPSK	13.47
		16QAM	13.51
	10 MHz	QPSK	9.01
		16QAM	9.02
	5 MHz	QPSK	4.51
		16QAM	4.52
	3 MHz	QPSK	2.71
		16QAM	2.72
	1.4 MHz	QPSK	1.10
		16QAM	1.10
NR-n2	40 MHz	π/2 BPSK	38.93
		QPSK	38.98
		16QAM	38.84
	30 MHz	π/2 BPSK	28.67
		QPSK	28.68
		16QAM	28.69
	25 MHz	π/2 BPSK	22.98
		QPSK	23.86
		16QAM	23.94
	20 MHz	π/2 BPSK	17.98
		QPSK	19.03
		16QAM	19.08
	15 MHz	π/2 BPSK	13.50
		QPSK	14.17
		16QAM	14.17
	10 MHz	π/2 BPSK	9.02
		QPSK	9.34
		16QAM	9.33
	5 MHz	π/2 BPSK	4.49
		QPSK	4.50
		16QAM	4.52

Table 7-6. Occupied Bandwidth Test Results – Ant M3