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# PART 24 MEASUREMENT REPORT

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

**Date of Testing:**
09/06/2024 - 11/08/2024
**Test Report Issue Date:**
11/10/2024
**Test Site/Location:**
Element Lab., Columbia, MD, USA
**Test Report Serial No.:**
1M2408260069-05.A3L

| | |
|---|---|
| **FCC ID:** | **A3LSMS938B** |
| **APPLICANT:** | **Samsung Electronics Co., Ltd.** |

| | |
|---|---|
| **Application Type:** | Certification |
| **Model:** | SM-S938B/DS |
| **Additional Model:** | SM-S938B |
| **EUT Type:** | Portable Handset |
| **FCC Classification:** | PCS Licensed Transmitter Held to Ear (PCE) |
| **FCC Rule Part:** | 24 |
| **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

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# PART 24 MEASUREMENT REPORT

| Antenna-1 | | | | | | |
|---|---|---|---|---|---|---|
| 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 | 0.817 | 29.12 | 245KGXW |
| EDGE | N/A | 8-PSK | 1850.2 - 1909.8 | 0.320 | 25.05 | 242KG7W |
| WCDMA | N/A | Spread Spectrum | 1852.4 - 1907.6 | 0.212 | 23.26 | 4M18F9W |
| LTE Band 25/2 | 20 MHz | QPSK | 1860 - 1905 | 0.280 | 24.47 | 18M0G7D |
| | | 16QAM | 1860 - 1905 | 0.235 | 23.72 | 18M0W7D |
| | 15 MHz | QPSK | 1857.5 - 1907.5 | 0.282 | 24.50 | 13M5G7D |
| | | 16QAM | 1857.5 - 1907.5 | 0.226 | 23.55 | 13M6W7D |
| | 10 MHz | QPSK | 1855 - 1910 | 0.289 | 24.61 | 9M03G7D |
| | | 16QAM | 1855 - 1910 | 0.240 | 23.79 | 9M02W7D |
| | 5 MHz | QPSK | 1852.5 - 1912.5 | 0.289 | 24.60 | 4M53G7D |
| | | 16QAM | 1852.5 - 1912.5 | 0.241 | 23.83 | 4M52W7D |
| | 3 MHz | QPSK | 1851.5 - 1913.5 | 0.283 | 24.51 | 2M73G7D |
| | | 16QAM | 1851.5 - 1913.5 | 0.232 | 23.65 | 2M72W7D |
| | 1.4 MHz | QPSK | 1850.7 - 1914.3 | 0.280 | 24.48 | 1M11G7D |
| | | 16QAM | 1850.7 - 1914.3 | 0.226 | 23.54 | 1M11W7D |
| NR Band n25/2 | 40 MHz | π/2 BPSK | 1870 - 1895 | 0.208 | 23.19 | 38M7G7D |
| | | QPSK | 1870 - 1895 | 0.209 | 23.21 | 38M7G7D |
| | | 16QAM | 1870 - 1895 | 0.177 | 22.47 | 38M8W7D |
| | 35 MHz | π/2 BPSK | 1867.5 - 1897.5 | 0.218 | 23.39 | 32M4G7D |
| | | QPSK | 1867.5 - 1897.5 | 0.213 | 23.28 | 33M7G7D |
| | | 16QAM | 1867.5 - 1897.5 | 0.185 | 22.68 | 33M8W7D |
| | 30 MHz | π/2 BPSK | 1865 - 1900 | 0.214 | 23.31 | 28M8G7D |
| | | QPSK | 1865 - 1900 | 0.228 | 23.59 | 28M7G7D |
| | | 16QAM | 1865 - 1900 | 0.183 | 22.63 | 28M7W7D |
| | 25 MHz | π/2 BPSK | 1862.5 - 1902.5 | 0.219 | 23.40 | 23M0G7D |
| | | QPSK | 1862.5 - 1902.5 | 0.222 | 23.46 | 23M9G7D |
| | | 16QAM | 1862.5 - 1902.5 | 0.177 | 22.47 | 23M9W7D |
| | 20 MHz | π/2 BPSK | 1860 - 1905 | 0.211 | 23.24 | 18M0G7D |
| | | QPSK | 1860 - 1905 | 0.218 | 23.38 | 19M0G7D |
| | | 16QAM | 1860 - 1905 | 0.183 | 22.63 | 19M0W7D |
| | 15 MHz | π/2 BPSK | 1857.5 - 1907.5 | 0.220 | 23.42 | 13M5G7D |
| | | QPSK | 1857.5 - 1907.5 | 0.219 | 23.41 | 14M2G7D |
| | | 16QAM | 1857.5 - 1907.5 | 0.179 | 22.53 | 14M2W7D |
| | 10 MHz | π/2 BPSK | 1855 - 1910 | 0.211 | 23.24 | 9M01G7D |
| | | QPSK | 1855 - 1910 | 0.217 | 23.36 | 9M33G7D |
| | | 16QAM | 1855 - 1910 | 0.173 | 22.37 | 9M34W7D |
| | 5 MHz | π/2 BPSK | 1852.5 - 1912.5 | 0.214 | 23.30 | 4M52G7D |
| | | QPSK | 1852.5 - 1912.5 | 0.212 | 23.27 | 4M53G7D |
| | | 16QAM | 1852.5 - 1912.5 | 0.179 | 22.53 | 4M50W7D |

| Antenna-2 | | | | | | |
|---|---|---|---|---|---|---|
| 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 | 0.159 | 22.01 | 18M0G7D |
| | | 16QAM | 1860 - 1905 | 0.131 | 21.18 | 18M0W7D |
| | 15 MHz | QPSK | 1857.5 - 1907.5 | 0.160 | 22.04 | 13M6G7D |
| | | 16QAM | 1857.5 - 1907.5 | 0.129 | 21.09 | 13M5W7D |
| | 10 MHz | QPSK | 1855 - 1910 | 0.162 | 22.11 | 9M02G7D |
| | | 16QAM | 1855 - 1910 | 0.134 | 21.26 | 9M03W7D |
| | 5 MHz | QPSK | 1852.5 - 1912.5 | 0.165 | 22.18 | 4M52G7D |
| | | 16QAM | 1852.5 - 1912.5 | 0.134 | 21.27 | 4M54W7D |
| | 3 MHz | QPSK | 1851.5 - 1913.5 | 0.163 | 22.11 | 2M72G7D |
| | | 16QAM | 1851.5 - 1913.5 | 0.130 | 21.14 | 2M72W7D |
| | 1.4 MHz | QPSK | 1850.7 - 1914.3 | 0.159 | 22.01 | 1M10G7D |
| | | 16QAM | 1850.7 - 1914.3 | 0.133 | 21.23 | 1M11W7D |
| NR Band n25/2 | 40 MHz | π/2 BPSK | 1870 - 1895 | 0.133 | 21.23 | 38M7G7D |
| | | QPSK | 1870 - 1895 | 0.136 | 21.32 | 38M7G7D |
| | | 16QAM | 1870 - 1895 | 0.111 | 20.44 | 38M8W7D |
| | 35 MHz | π/2 BPSK | 1867.5 - 1897.5 | 0.133 | 21.24 | 32M3G7D |
| | | QPSK | 1867.5 - 1897.5 | 0.140 | 21.45 | 33M7G7D |
| | | 16QAM | 1867.5 - 1897.5 | 0.115 | 20.59 | 33M8W7D |
| | 30 MHz | π/2 BPSK | 1865 - 1900 | 0.138 | 21.39 | 28M7G7D |
| | | QPSK | 1865 - 1900 | 0.139 | 21.43 | 28M7G7D |
| | | 16QAM | 1865 - 1900 | 0.110 | 20.41 | 28M7W7D |
| | 25 MHz | π/2 BPSK | 1862.5 - 1902.5 | 0.133 | 21.25 | 23M0G7D |
| | | QPSK | 1862.5 - 1902.5 | 0.137 | 21.36 | 23M9G7D |
| | | 16QAM | 1862.5 - 1902.5 | 0.112 | 20.47 | 23M9W7D |
| | 20 MHz | π/2 BPSK | 1860 - 1905 | 0.133 | 21.23 | 18M0G7D |
| | | QPSK | 1860 - 1905 | 0.136 | 21.33 | 19M0G7D |
| | | 16QAM | 1860 - 1905 | 0.109 | 20.38 | 19M0W7D |
| | 15 MHz | π/2 BPSK | 1857.5 - 1907.5 | 0.131 | 21.17 | 13M5G7D |
| | | QPSK | 1857.5 - 1907.5 | 0.136 | 21.33 | 14M2G7D |
| | | 16QAM | 1857.5 - 1907.5 | 0.110 | 20.40 | 14M2W7D |
| | 10 MHz | π/2 BPSK | 1855 - 1910 | 0.129 | 21.12 | 9M01G7D |
| | | QPSK | 1855 - 1910 | 0.137 | 21.35 | 9M32G7D |
| | | 16QAM | 1855 - 1910 | 0.108 | 20.35 | 9M34W7D |
| | 5 MHz | π/2 BPSK | 1852.5 - 1912.5 | 0.133 | 21.25 | 4M50G7D |
| | | QPSK | 1852.5 - 1912.5 | 0.131 | 21.18 | 4M53G7D |
| | | 16QAM | 1852.5 - 1912.5 | 0.117 | 20.69 | 4M50W7D |

# 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

Measurements were conducted at the Element laboratory(ies) indicated in Section 1.3 below. All measurement facilities are compliant with the test site requirements specified in ANSI C63.4-2014 and KDB 414788 D01 v01r01.

## 1.3 Test Facility / Accreditations

**Measurements were performed at Element lab located in Columbia, MD 21046, U.S.A. ("MD")**

- 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 Agreements (MRAs).

# 2.0 PRODUCT INFORMATION

## 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMS938B**. 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.:** 0675R, 0670R, 0741M, 0734M, 0286M, 0334M, 0099M, 0084M, 0081M

## 2.2 Device Capabilities

This device contains the following capabilities:

800/1900 GSM/GPRS/EDGE, GSM/GPRS/EDGE, WCDMA/HSPA, Multi-band LTE, Multi-band 5G NR, WLAN, UNII, Bluetooth (1x, EDR, LE), NFC, WPT, 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.

| Band | Ant 1 | Ant 2 |
|---|---|---|
| GSM/GPRS PCS | Ant A | N/A |
| WCDMA PCS | Ant A | N/A |
| LTE Band 25/2 | Ant A | Ant F |
| NR Band 25/2 | Ant A | Ant F |

**Table 2-1. Antenna Naming Convention**

## 2.4 Software and Firmware

Testing was performed on device(s) using software/firmware version S938BXXU0AXHN 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 |

**Table 4-1. Measurement Uncertainty Budget – MD**

# 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 | EMC Cable and Switch System | 4/2/2024 | Annual | 4/2/2025 | AP2 |
| - | AP1 | EMC Cable and Switch System | 4/2/2024 | Annual | 4/2/2025 | AP1 |
| - | ETS | EMC Cable and Switch System | 4/2/2024 | Annual | 4/2/2025 | ETS |
| - | LTx1 | Licensed Transmitter Cable Set | 4/2/2024 | Annual | 4/2/2025 | LTx1 |
| - | LTx4 | Licensed Transmitter Cable Set | 4/2/2024 | Annual | 4/2/2025 | LTx4 |
| - | LTx5 | LIcensed Transmitter Cable Set | 4/2/2024 | Annual | 4/2/2025 | LTx5 |
| Agilent | N9030A | 50GHz PXA Signal Analyzer | 4/23/2024 | Annual | 4/23/2025 | US51350301 |
| Anritsu | MT8821C | Radio Communication Analyzer | N/A | | | 6201381794 |
| Emco | 3116 | Horn Antenna (18 - 40GHz) | 7/5/2023 | Triennial | 7/5/2025 | 9203-2178 |
| Espec | ESX-2CA | Environmental Chamber | 9/26/2024 | Annual | 9/26/2026 | 17620 |
| ETS Lindgren | 3164-08 | Quad Ridge Horn Antenna | 3/29/2023 | Biennial | 3/29/2025 | 128337 |
| ETS Lindgren | 3164-10 | Quad Ridge Horn 400MHz - 10000MHz | 7/13/2023 | Biennial | 7/13/2025 | 00166283 |
| Keysight Technologies | N9020A | MXA Signal Analyzer | 4/11/2024 | Annual | 4/11/2025 | MY54500644 |
| Keysight Technologies | N9030A | PXA Signal Analyzer | 2/29/2024 | Annual | 3/1/2025 | MY55410501 |
| Mini-Circuits | SSG-4000HP | Synthesized Signal Generator | N/A | | | 11208010032 |
| Mini-Circuits | SSG-4000HP | Synthesized Signal Generator | N/A | | | 11403100002 |
| Rohde & Schwarz | CMW500 | Radio Communication Tester | N/A | | | 112347 |
| Rohde & Schwarz | ESU26 | EMI Test Receiver (26.5GHz) | 10/16/2024 | Annual | 10/16/2025 | 100342 |
| Rohde & Schwarz | FSW26 | 2Hz-26.5GHz Signal and Spectrum Analyzer | 3/8/2024 | Annual | 3/8/2025 | 103187 |
| Sunol | JB6 | LB6 Antenna | 3/2/2023 | Biennial | 3/2/2025 | A082816 |

**Table 5-1. Test Equipment Calibration Table – MD**

**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 EMISSION DESIGNATORS

## 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

# 7.0 TEST RESULTS

## 7.1 Summary

Company Name: Samsung Electronics Co., Ltd.

FCC ID: A3LSMS938B

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

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 | See RF Exposure Report |
| | Occupied Bandwidth | 2.1049(h) | RSS-Gen(6.7) | N/A | PASS | Section 7.2 |
| | 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 7.3, 7.4 |
| | Peak-to-Average Ratio | 24.232(d) | RSS-133(6.4) | ≤ 13 dB | PASS | Section 7.5 |
| | Frequency Stability | 2.1055, 24.235 | RSS-Gen(6.11), RSS-133(6.3) | Fundamental emissions stay within authorized frequency block<br>**Carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm | PASS | Section 7.8 |
| RADIATED | Equivalent Isotropic Radiated Power | 24.232(c) | RSS-Gen(6.12), RSS-133(6.4) | < 2 Watts max. EIRP | PASS | Section 7.6 |
| | 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<br>**Spurious emissions from receivers shall not exceed the limits detailed in RSS-Gen(7.3) | PASS | Section 7.7 |

* 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 v2.3.0.
5) Data was leveraged from model SM-S938U for the certification of SM-S938B/DS. See Table 7-2 for spotcheck results.

| FCC Rules | Test Item | Test Case | Units | Limit | Reference Model: SM-S938U | Variant Model: SM-S938B | Deviation (dB) | Max Deviation (dB) | Pass/Fail |
|---|---|---|---|---|---|---|---|---|---|
| 24 | Conducted Output Power | Mid Ch., 1880MHz, Ant A | dBm | N/A | 23.15 | 22.57 | -0.58 | 1 | PASS |
| | Occupied Bandwidth | Mid Ch., 1880MHz, Ant A | dBm | 8 | 4.177 | 4.173 | - | N/A | PASS |
| | EIRP | Low Ch., 1852.40MHz, Ant A | dBm | N/A | 23.26 | 22.68 | -0.58 | 3 | PASS |
| | RSE | Mid Ch., 3760MHz, Ant A | dBm | -13 | -58.50 | -59.17 | -0.67 | 3 | PASS |

**Table 7-2. Summary of Spot-Checks – WCDMA 1900**

| 3GPP Release Version | Mode | 3GPP 34.121 Subtest | PCS Band [dBm] |
|---|---|---|---|
| | | | 9400 |
| 99 | WCDMA | 12.2 kbps RMC | 22.57 |

**Table 7-3. Conducted Output Power Measurements (Spot-check)**


**Plot 7-1. Occupied Bandwidth (Spot-check)**

| Frequency [MHz] | Mode | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Substitute Level [dBm] | Ant. Gain [dBi] | EIRP [dBm] | EIRP [Watts] | EIRP Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1852.40 | WCDMA1900 | V | 179 | 332 | 20.08 | 2.60 | **22.68** | **0.186** | 33.01 | -10.33 |

**Table 7-4. EIRP Measurements (Spot-check)**

| 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] |
|---|---|---|---|---|---|---|---|---|---|
| 3760.00 | V | - | - | -77.93 | 7.02 | 36.09 | -59.17 | -13.00 | -46.17 |

**Table 7-8. Radiated Spurious Measurements (Spot-check)**

1. Each spot check test on the EUT was performed using the same procedure and setting that were used to perform the test on the corresponding reference device.

2. All test cases were performed to verify the variant EUT is still in compliance with the spot checked results to the reference device and was performed using the guidance of ANSI C63.26-2015.

## 7.2 Conducted Power

**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.

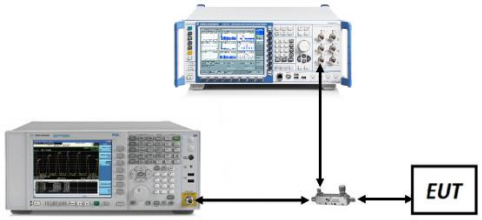



**Figure 7-1. Test Instrument & Measurement Setup**

**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.

| Bandwidth | Modulation | Channel | Frequency [MHz] | RB Size/Offset | Conducted Power [dBm] |
|---|---|---|---|---|---|
| 20 MHz | QPSK | 26140 | 1860.0 | 1 / 0 | 23.43 |
| | | 26365 | 1882.5 | 1 / 99 | 23.60 |
| | | 26590 | 1905.0 | 1 / 50 | 23.58 |
| | 16-QAM | 26590 | 1905.0 | 1 / 50 | 22.82 |
| 15 MHz | QPSK | 26115 | 1857.5 | 1 / 37 | 23.46 |
| | | 26365 | 1882.5 | 1 / 74 | 23.47 |
| | | 26615 | 1907.5 | 1 / 37 | 23.41 |
| | 16-QAM | 26115 | 1857.5 | 1 / 37 | 22.75 |
| 10 MHz | QPSK | 26090 | 1855.0 | 1 / 25 | 23.36 |
| | | 26365 | 1882.5 | 1 / 25 | 23.70 |
| | | 26640 | 1910.0 | 1 / 0 | 23.46 |
| | 16-QAM | 26640 | 1910.0 | 1 / 0 | 22.90 |
| 5 MHz | QPSK | 26065 | 1852.5 | 1 / 0 | 23.45 |
| | | 26365 | 1882.5 | 1 / 24 | 23.77 |
| | | 26665 | 1912.5 | 1 / 24 | 23.55 |
| | 16-QAM | 26365 | 1882.5 | 1 / 24 | 23.14 |
| 3 MHz | QPSK | 26055 | 1851.5 | 1 / 7 | 23.45 |
| | | 26365 | 1882.5 | 1 / 7 | 23.70 |
| | | 26675 | 1913.5 | 1 / 14 | 23.48 |
| | 16-QAM | 26055 | 1851.5 | 1 / 7 | 22.80 |
| 1.4 MHz | QPSK | 26047 | 1850.7 | 1 / 5 | 23.43 |
| | | 26365 | 1882.5 | 1 / 3 | 23.53 |
| | | 26683 | 1914.3 | 1 / 3 | 23.51 |
| | 16-QAM | 26683 | 1914.3 | 1 / 0 | 22.87 |

**Table 7-2. Conducted Powers – LTE Band 25/2 – Ant2**

| Bandwidth | Modulation | Channel | Frequency [MHz] | RB Size/Offset | Conducted Power [dBm] |
|---|---|---|---|---|---|
| 40 MHz | π/2 BPSK | 374000 | 1870.0 | 1 / 214 | 22.67 |
| | | 376500 | 1882.5 | 1 / 214 | 22.76 |
| | | 379000 | 1895.0 | 1 / 214 | 22.71 |
| | QPSK | 374000 | 1870.0 | 1 / 214 | 22.64 |
| | | 376500 | 1882.5 | 1 / 214 | 22.70 |
| | | 379000 | 1895.0 | 1 / 214 | 22.47 |
| | 16-QAM | 376500 | 1882.5 | 1 / 214 | 21.69 |
| 35 MHz | π/2 BPSK | 373500 | 1867.5 | 1 / 186 | 22.68 |
| | | 376500 | 1882.5 | 1 / 94 | 22.71 |
| | | 379500 | 1897.5 | 1 / 94 | 22.85 |
| | QPSK | 373500 | 1867.5 | 1 / 186 | 22.47 |
| | | 376500 | 1882.5 | 1 / 94 | 22.83 |
| | | 379500 | 1897.5 | 1 / 94 | 22.76 |
| | 16-QAM | 376500 | 1882.5 | 1 / 94 | 21.84 |
| 30 MHz | π/2 BPSK | 372000 | 1865.0 | 1 / 158 | 22.83 |
| | | 376500 | 1882.5 | 1 / 158 | 22.74 |
| | | 381000 | 1900.0 | 1 / 158 | 22.81 |
| | QPSK | 372000 | 1865.0 | 1 / 158 | 22.59 |
| | | 376500 | 1882.5 | 1 / 158 | 22.81 |
| | | 381000 | 1900.0 | 1 / 158 | 22.83 |
| | 16-QAM | 376500 | 1882.5 | 1 / 158 | 21.65 |
| 25 MHz | π/2 BPSK | 372000 | 1862.5 | 1 / 66 | 22.67 |
| | | 376500 | 1882.5 | 1 / 131 | 22.78 |
| | | 381000 | 1902.5 | 1 / 66 | 22.81 |
| | QPSK | 372000 | 1862.5 | 1 / 66 | 22.62 |
| | | 376500 | 1882.5 | 1 / 131 | 22.74 |
| | | 381000 | 1902.5 | 1 / 66 | 22.69 |
| | 16-QAM | 372000 | 1862.5 | 1 / 66 | 21.51 |
| 20 MHz | π/2 BPSK | 372000 | 1860.0 | 1 / 53 | 22.52 |
| | | 376500 | 1882.5 | 1 / 53 | 22.76 |
| | | 381000 | 1905.0 | 1 / 104 | 22.70 |
| | QPSK | 372000 | 1860.0 | 1 / 53 | 22.45 |
| | | 376500 | 1882.5 | 1 / 53 | 22.71 |
| | | 381000 | 1905.0 | 1 / 104 | 22.47 |
| | 16-QAM | 372000 | 1860.0 | 1 / 53 | 21.42 |
| 15 MHz | π/2 BPSK | 371500 | 1857.5 | 1 / 1 | 22.58 |
| | | 376500 | 1882.5 | 1 / 77 | 22.70 |
| | | 381500 | 1907.5 | 1 / 77 | 22.84 |
| | QPSK | 371500 | 1857.5 | 1 / 1 | 22.76 |
| | | 376500 | 1882.5 | 1 / 77 | 22.57 |
| | | 381500 | 1907.5 | 1 / 77 | 22.51 |
| | 16-QAM | 371500 | 1857.5 | 1 / 1 | 21.44 |
| 10 MHz | π/2 BPSK | 371000 | 1855.0 | 1 / 50 | 22.51 |
| | | 376500 | 1882.5 | 1 / 1 | 22.65 |
| | | 382000 | 1910.0 | 1 / 26 | 22.69 |
| | QPSK | 371000 | 1855.0 | 1 / 50 | 22.37 |
| | | 376500 | 1882.5 | 1 / 1 | 22.73 |
| | | 382000 | 1910.0 | 1 / 26 | 22.72 |
| | 16-QAM | 371000 | 1855.0 | 1 / 50 | 21.39 |
| 5 MHz | π/2 BPSK | 370500 | 1852.5 | 1 / 23 | 22.61 |
| | | 376500 | 1882.5 | 1 / 1 | 22.78 |
| | | 382500 | 1912.5 | 1 / 1 | 22.73 |
| | QPSK | 370500 | 1852.5 | 1 / 23 | 22.62 |
| | | 376500 | 1882.5 | 1 / 1 | 22.55 |
| | | 382500 | 1912.5 | 1 / 1 | 22.46 |
| | 16-QAM | 370500 | 1852.5 | 1 / 23 | 21.73 |

**Table 7-3. Conducted Powers – NR Band n25/2 – Ant2**

## 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.

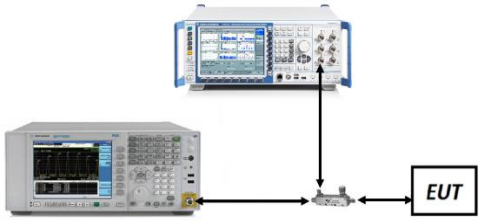



**Figure 7-2. Test Instrument & Measurement Setup**

**Test Notes**

None.

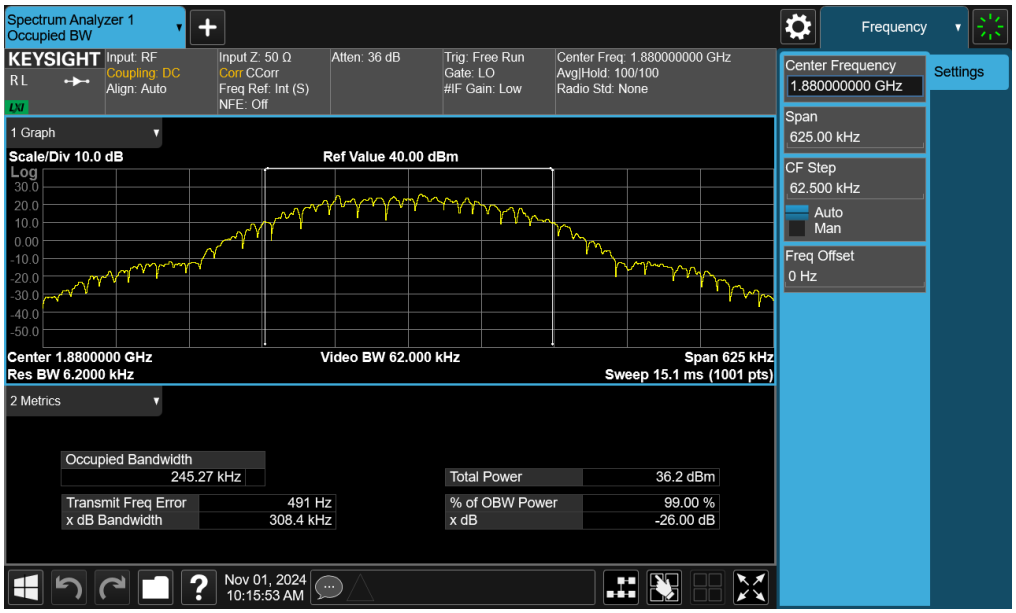
| Mode | Bandwidth | Modulation | OBW [MHz] |
|---|---|---|---|
| GSM-PCS | N/A | GMSK | 0.245 |
| GSM-PCS EDGE | | 8-PSK | 0.242 |
| WCDMA-PCS | | Spread Spectrum | 4.177 |
| LTE-B25-2 | 20MHz | QPSK | 18.03 |
| | | 16QAM | 18.00 |
| | 15MHz | QPSK | 13.50 |
| | | 16QAM | 13.55 |
| | 10MHz | QPSK | 9.03 |
| | | 16QAM | 9.02 |
| | 5MHz | QPSK | 4.53 |
| | | 16QAM | 4.52 |
| | 3MHz | QPSK | 2.73 |
| | | 16QAM | 2.72 |
| | 1.4MHz | QPSK | 1.11 |
| | | 16QAM | 1.11 |

**Table 7-4. Occupied Bandwidth Test Results – Ant1**

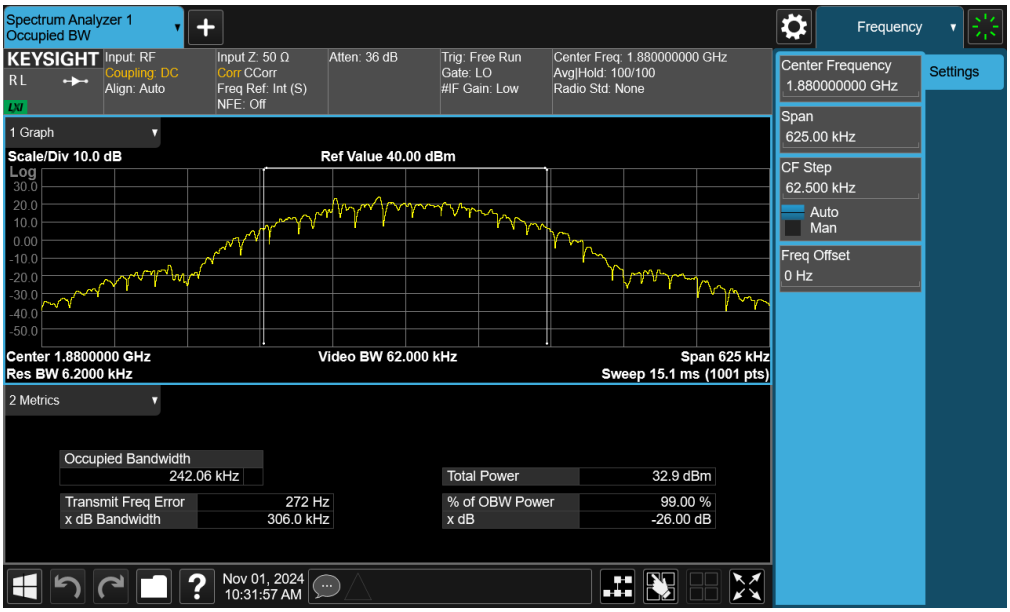
| Mode | Bandwidth | Modulation | OBW [MHz] |
|---|---|---|---|
| NR-n25-2 | 40MHz | BPSK | 38.70 |
| | | QPSK | 38.71 |
| | | 16QAM | 38.76 |
| | 35MHz | BPSK | 32.41 |
| | | QPSK | 33.72 |
| | | 16QAM | 33.76 |
| | 30MHz | BPSK | 28.80 |
| | | QPSK | 28.71 |
| | | 16QAM | 28.74 |
| | 25MHz | BPSK | 23.04 |
| | | QPSK | 23.93 |
| | | 16QAM | 23.86 |
| | 20MHz | BPSK | 17.98 |
| | | QPSK | 18.99 |
| | | 16QAM | 19.05 |
| | 15MHz | BPSK | 13.53 |
| | | QPSK | 14.19 |
| | | 16QAM | 14.17 |
| | 10MHz | BPSK | 9.01 |
| | | QPSK | 9.33 |
| | | 16QAM | 9.34 |
| | 5MHz | BPSK | 4.52 |
| | | QPSK | 4.53 |
| | | 16QAM | 4.50 |

**Table 7-5. Occupied Bandwidth Test Results – Ant1**

## GSM/GPRS PCS – Ant1

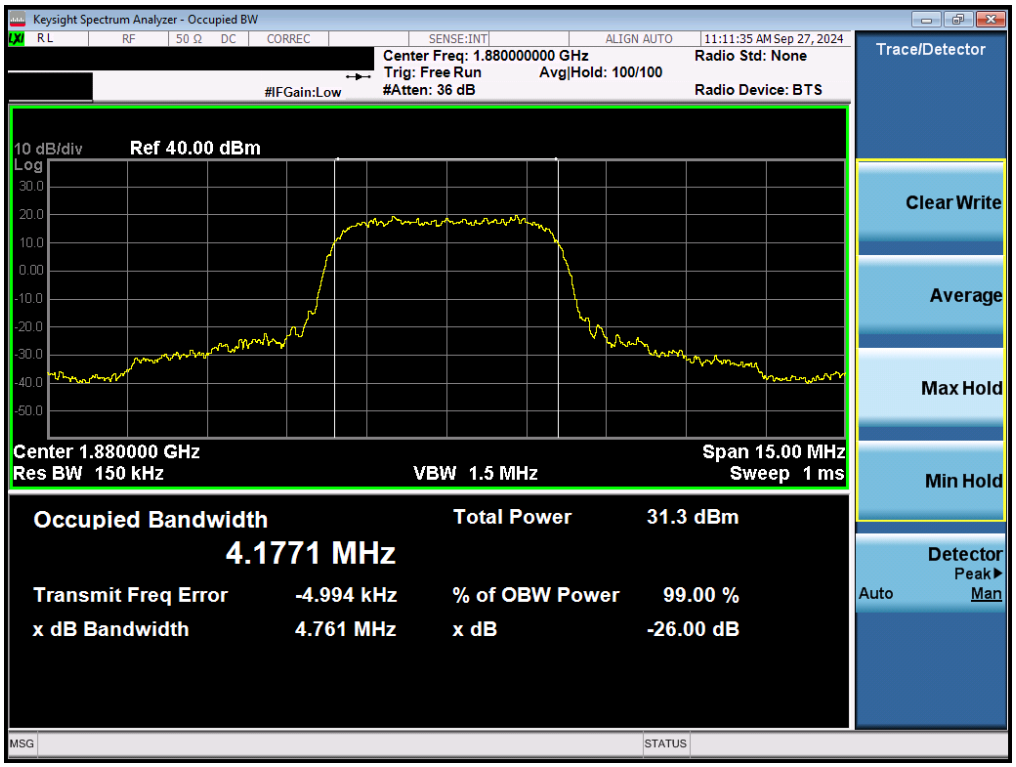



**Plot 7-1. Occupied Bandwidth Plot (GPRS, Ch. 661 - Ant1)**



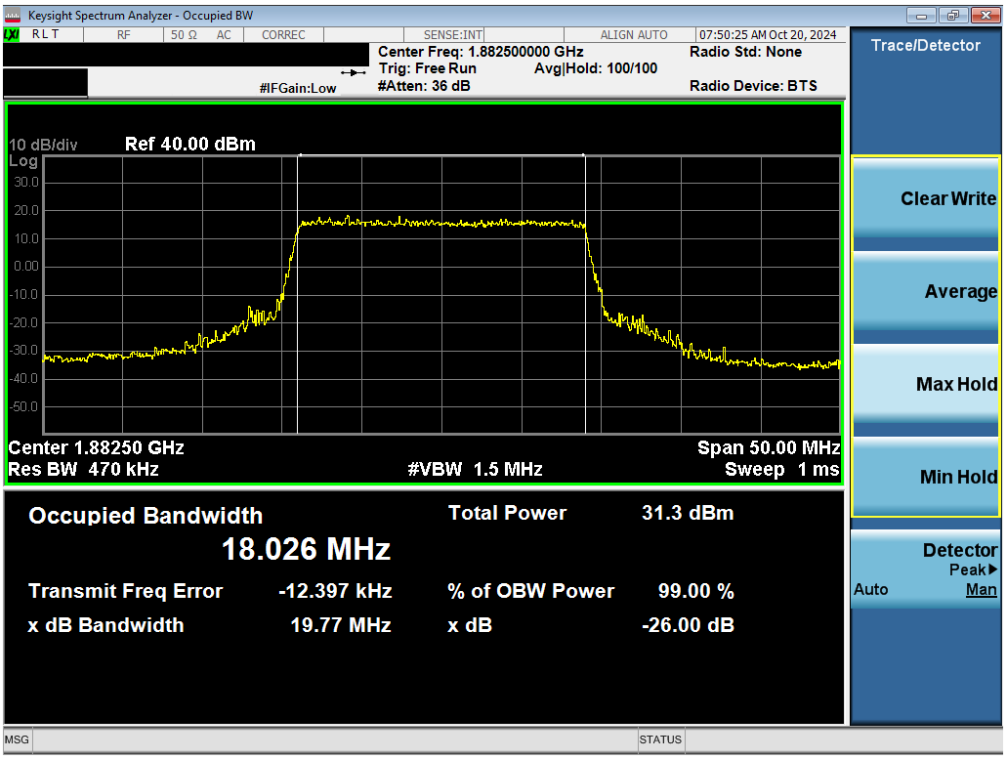

**Plot 7-2. Occupied Bandwidth Plot (EDGE, Ch. 661 - Ant1)**

## WCDMA PCS – Ant1

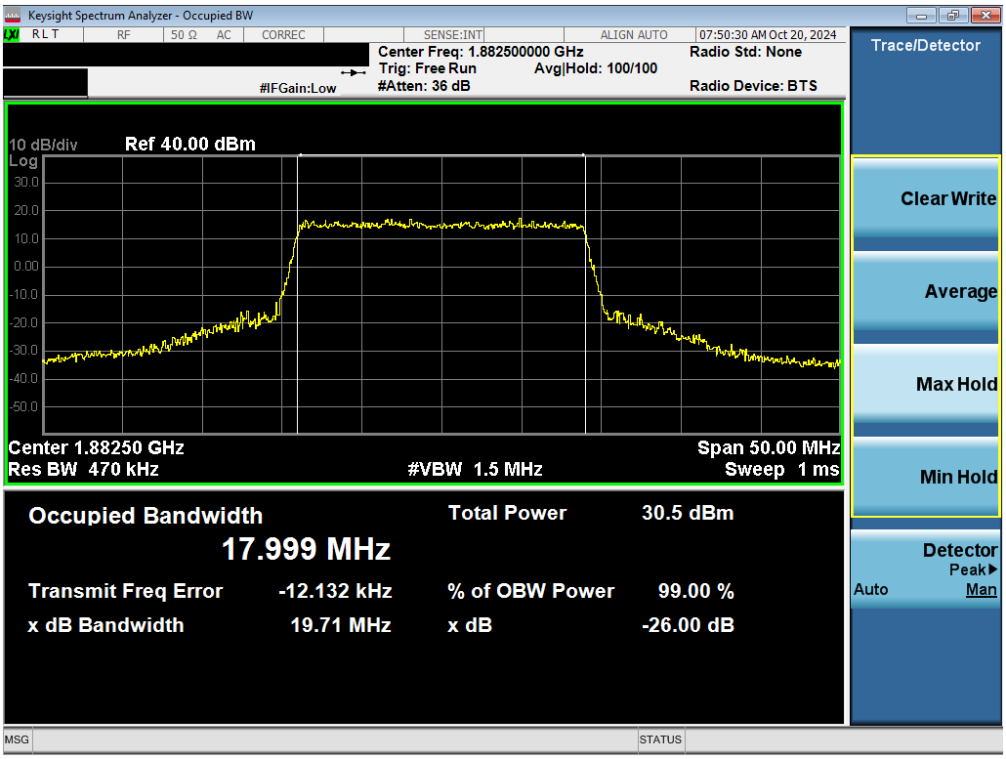



**Plot 7-3. Occupied Bandwidth Plot (WCDMA, Ch. 9400 - Ant1)**

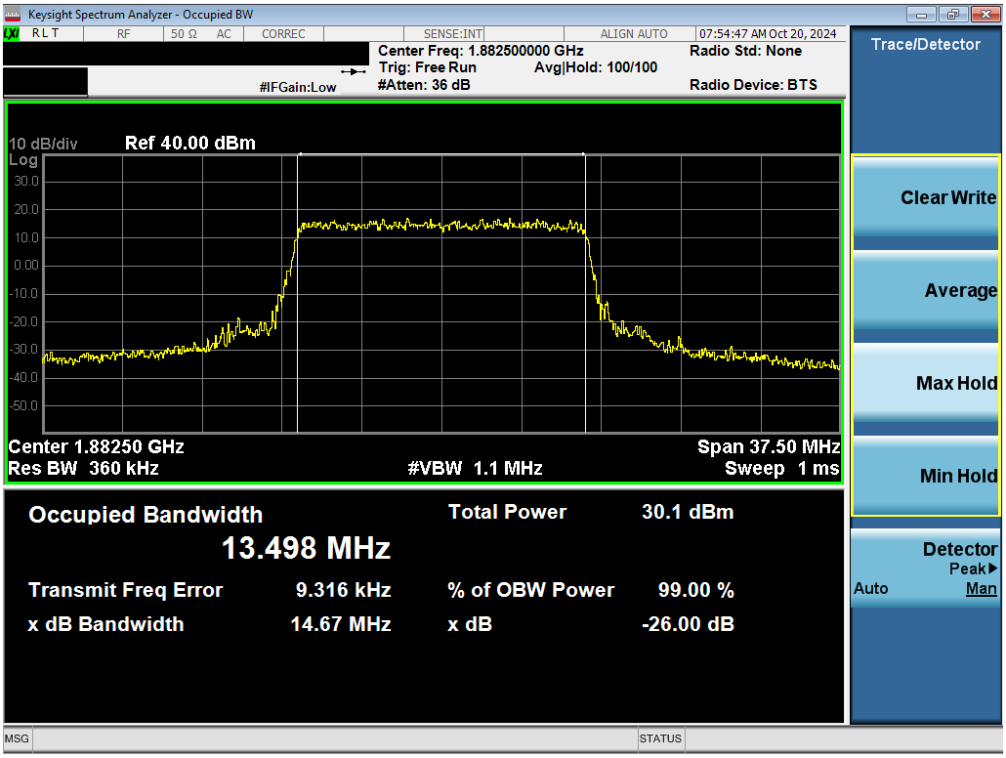
## LTE Band 25/2 – Ant1



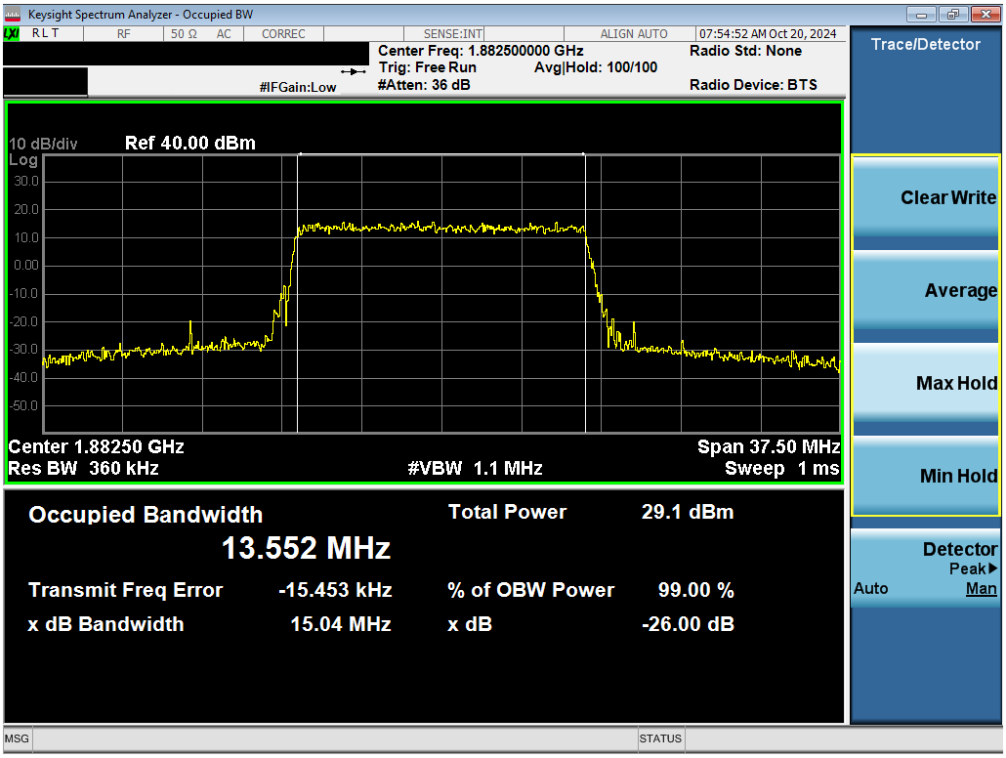

**Plot 7-4. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz QPSK - Full RB - Ant1)**



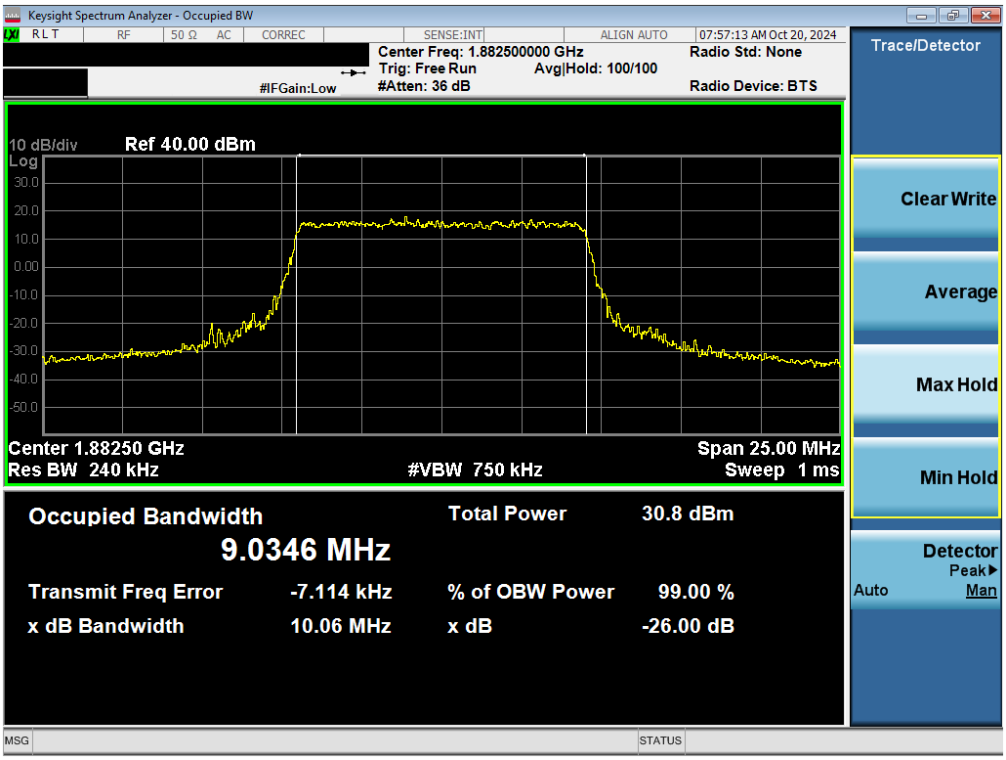

**Plot 7-5. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz 16-QAM - Full RB - Ant1)**



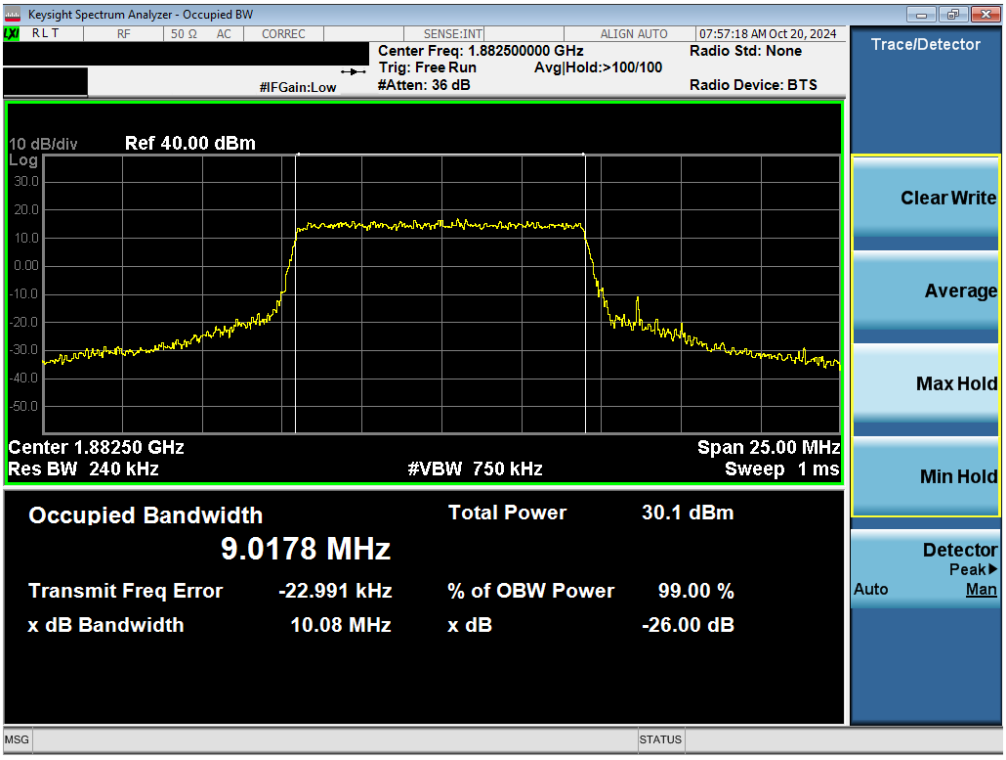

**Plot 7-6. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz QPSK - Full RB - Ant1)**



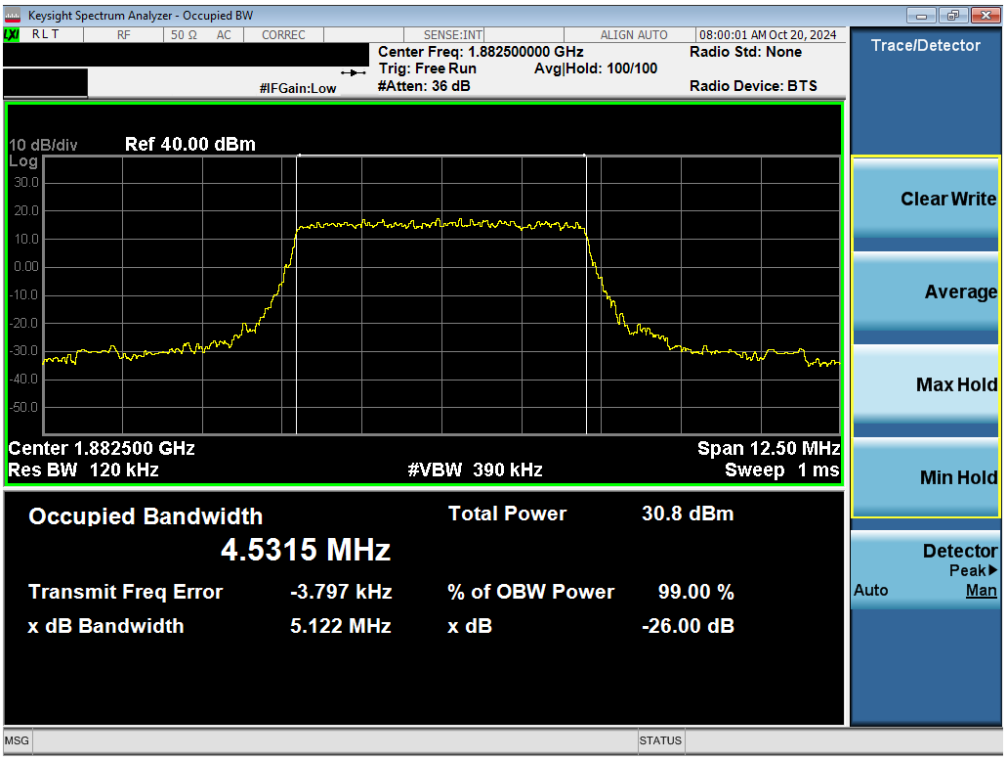

**Plot 7-7. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz 16-QAM - Full RB - Ant1)**



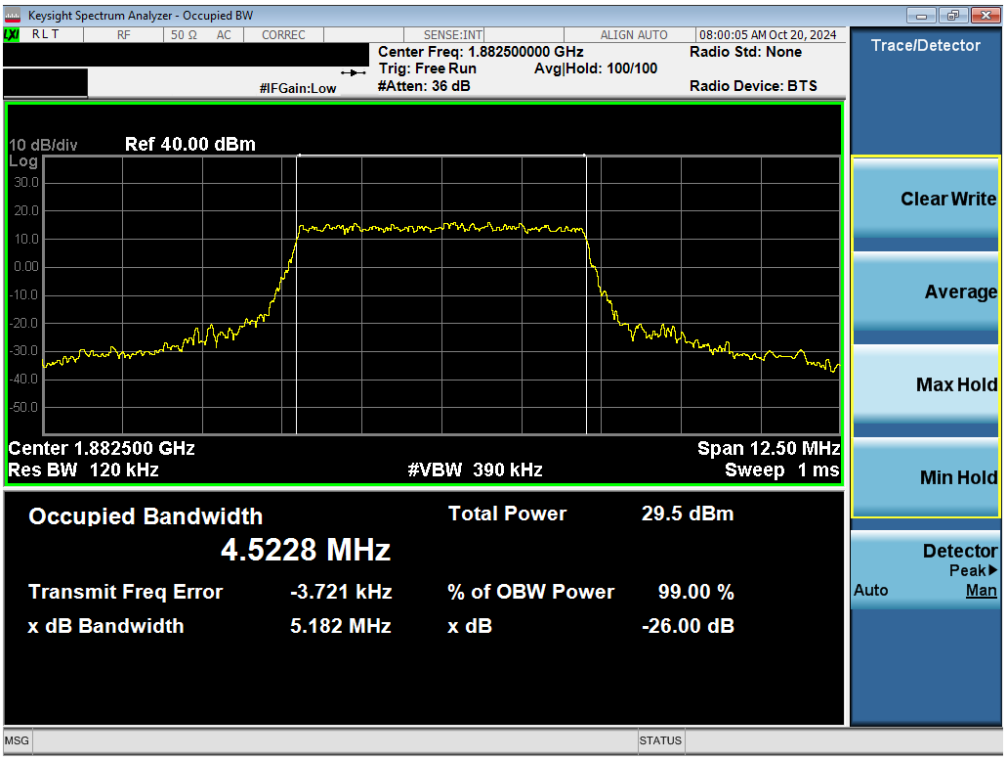

**Plot 7-8. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz QPSK - Full RB - Ant1)**



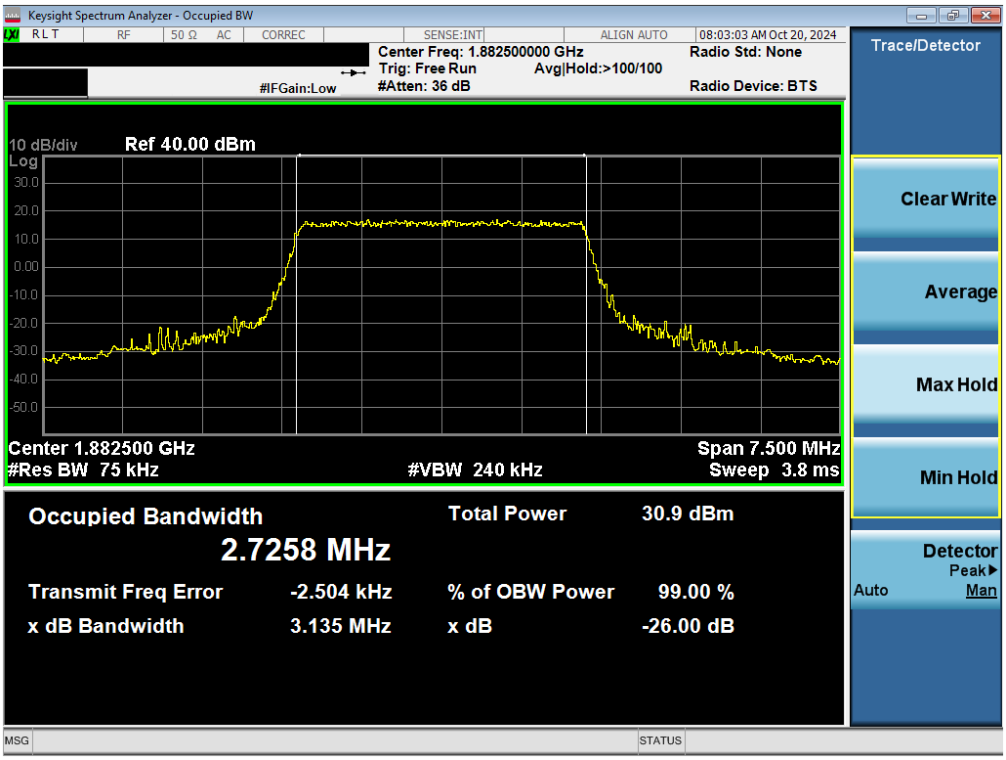

**Plot 7-9. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz 16-QAM - Full RB - Ant1)**



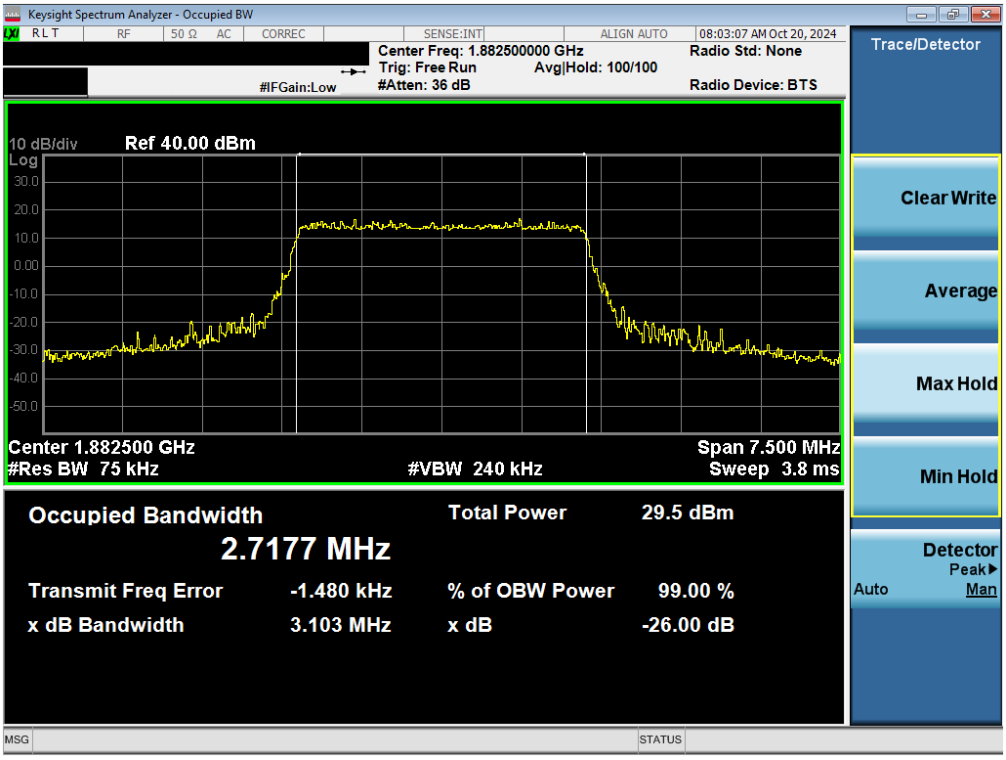

**Plot 7-10. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz QPSK - Full RB - Ant1)**



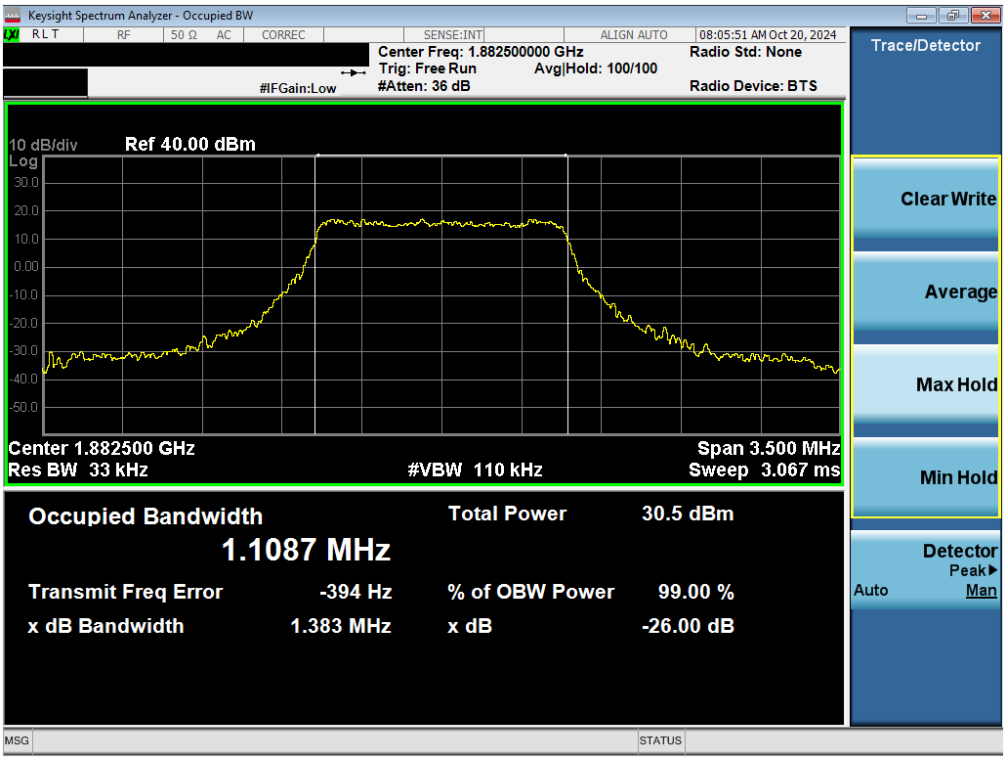

**Plot 7-11. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz 16-QAM - Full RB - Ant1)**



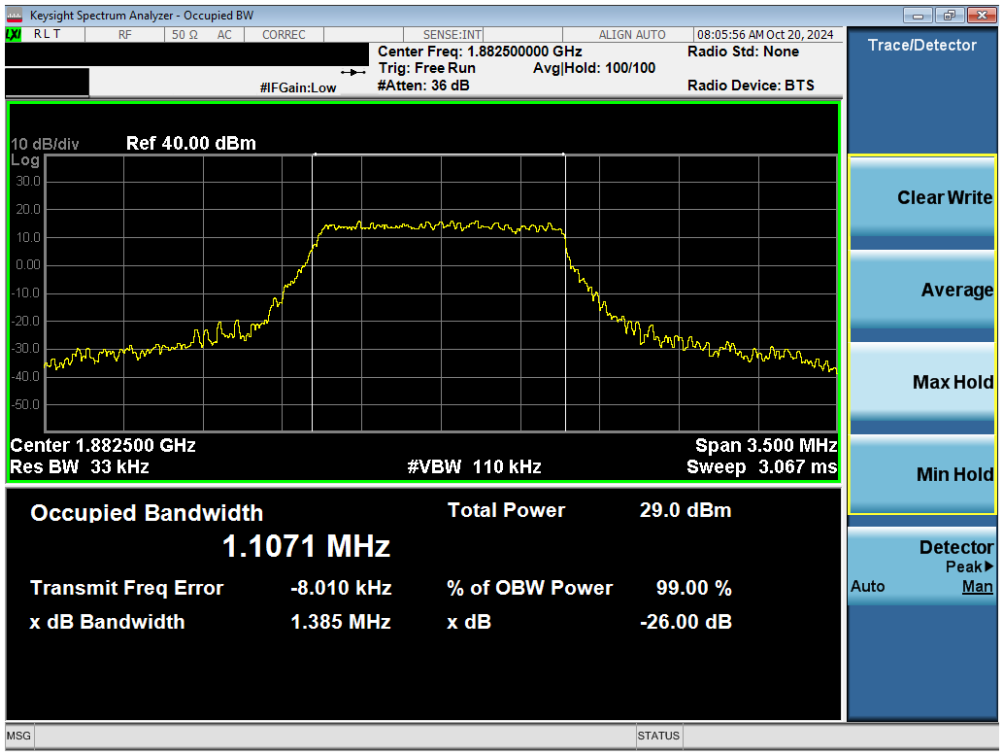

**Plot 7-12. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz QPSK - Full RB - Ant1)**




**Plot 7-13. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz 16-QAM - Full RB - Ant1)**



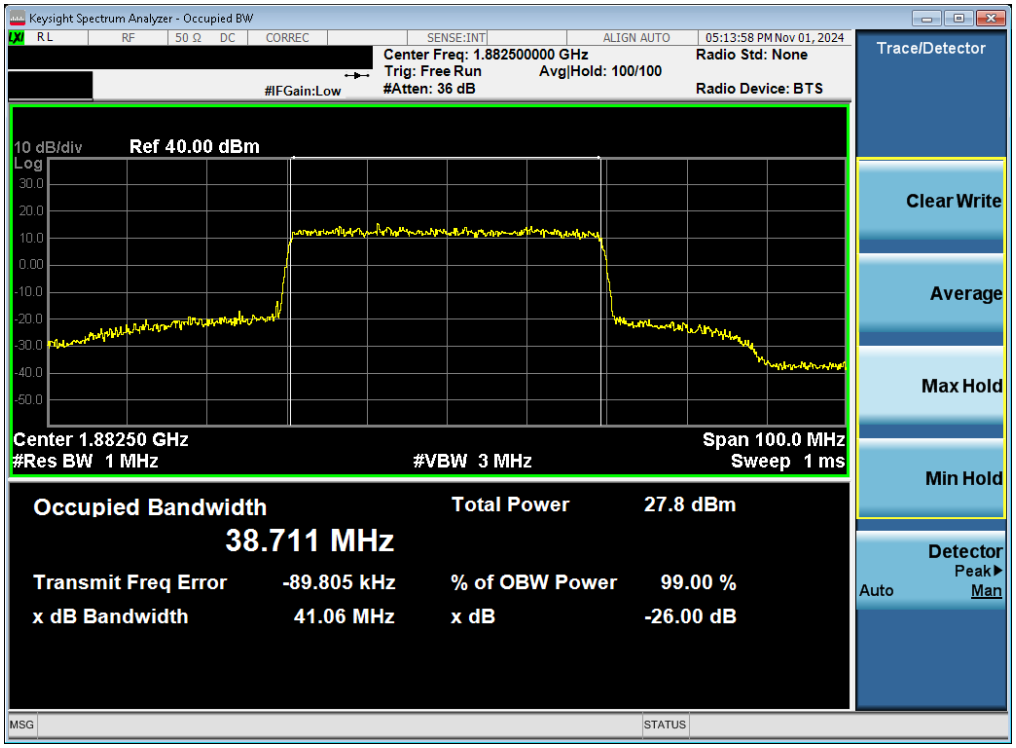

**Plot 7-14. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz QPSK - Full RB - Ant1)**




**Plot 7-15. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz 16-QAM - Full RB - Ant1)**

## NR Band n25/2 – Ant1


**Plot 7-16. Occupied Bandwidth Plot (NR Band n25/2 - 40.0MHz DFT-s-OFDM BPSK - Full RB - ANT1)**



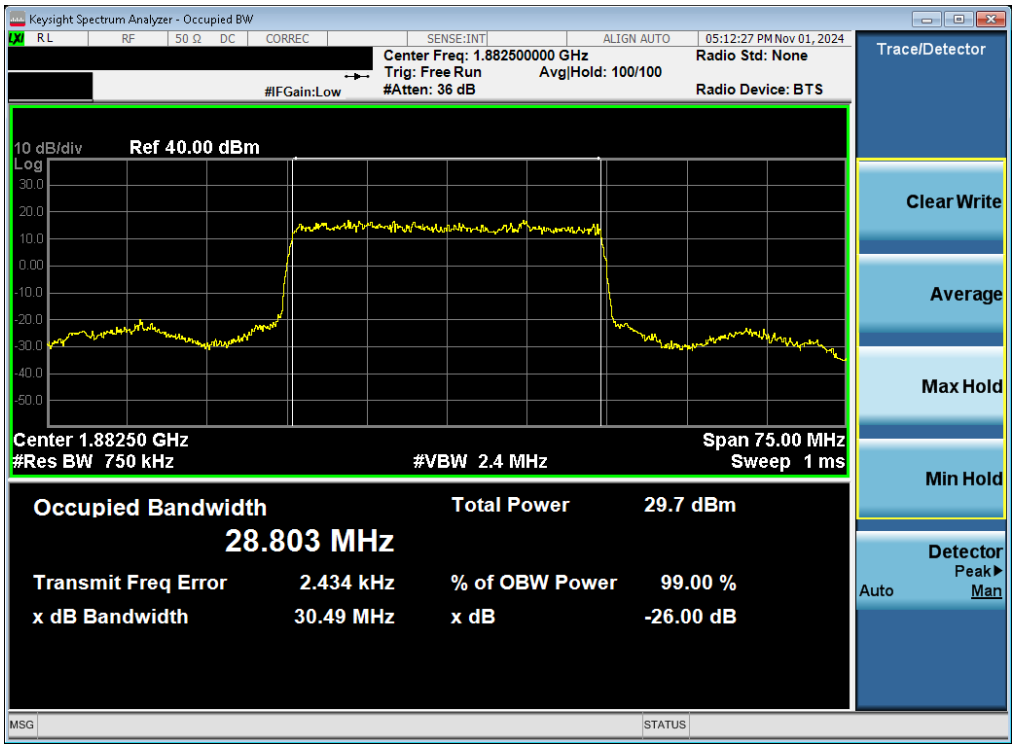

**Plot 7-17. Occupied Bandwidth Plot (NR Band n25/2 - 40.0MHz CP-OFDM QPSK - Full RB - ANT1)**


**Plot 7-18. Occupied Bandwidth Plot (NR Band n25/2 - 40.0MHz CP-OFDM 16QAM - Full RB - ANT1)**

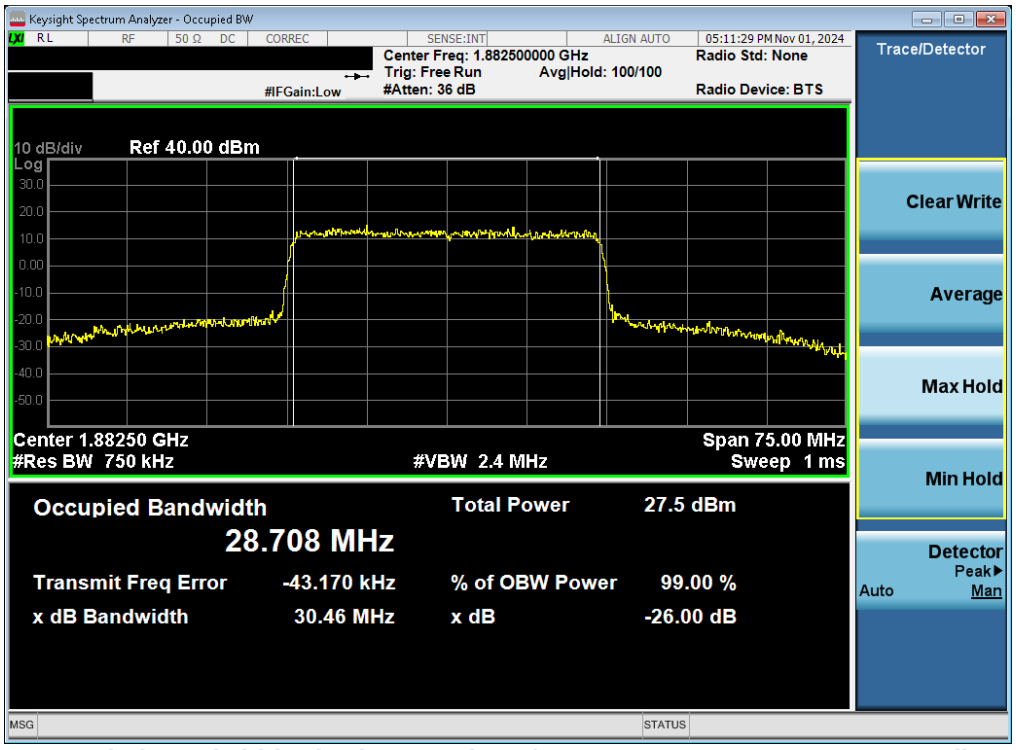

**Plot 7-19. Occupied Bandwidth Plot (NR Band n25/2 - 35.0MHz DFT-s-OFDM BPSK - Full RB - ANT1)**


**Plot 7-20. Occupied Bandwidth Plot (NR Band n25/2 - 35.0MHz CP-OFDM QPSK - Full RB - ANT1)**

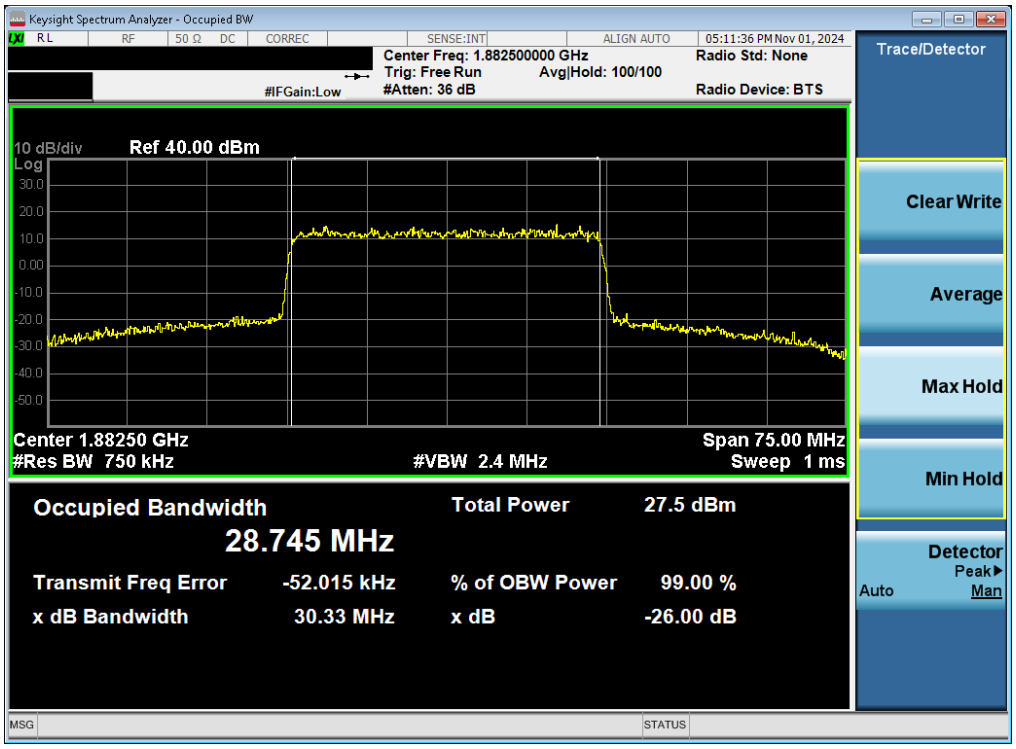

**Plot 7-21. Occupied Bandwidth Plot (NR Band n25/2 - 35.0MHz CP-OFDM 16QAM - Full RB - ANT1)**



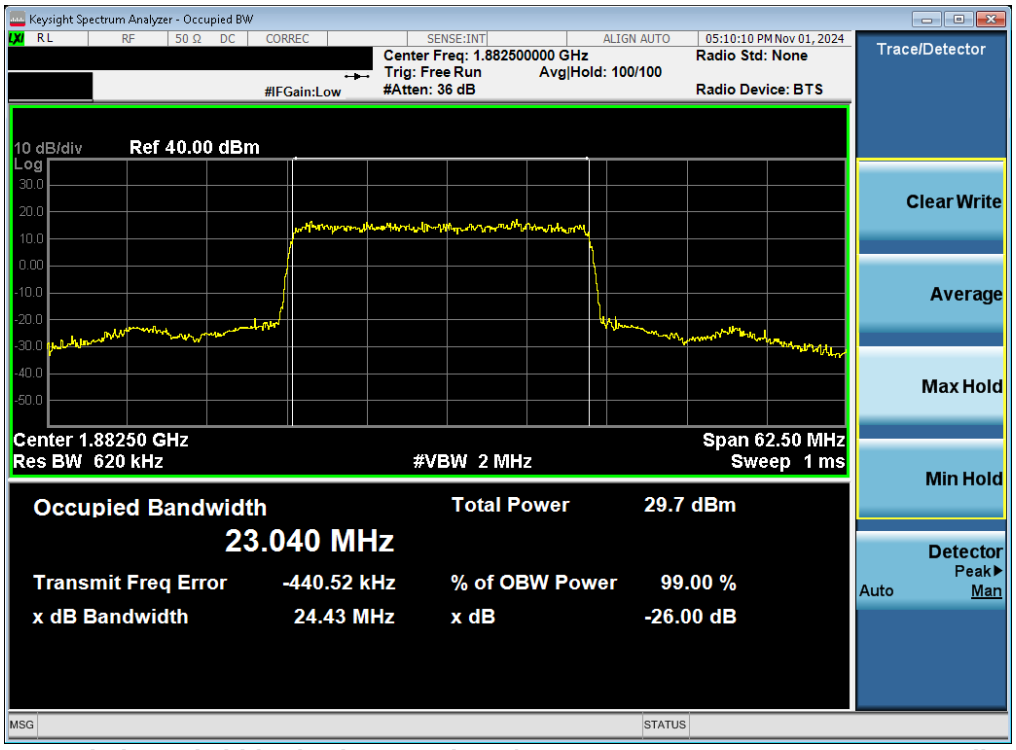

**Plot 7-22. Occupied Bandwidth Plot (NR Band n25/2 - 30.0MHz DFT-s-OFDM BPSK - Full RB - ANT1)**



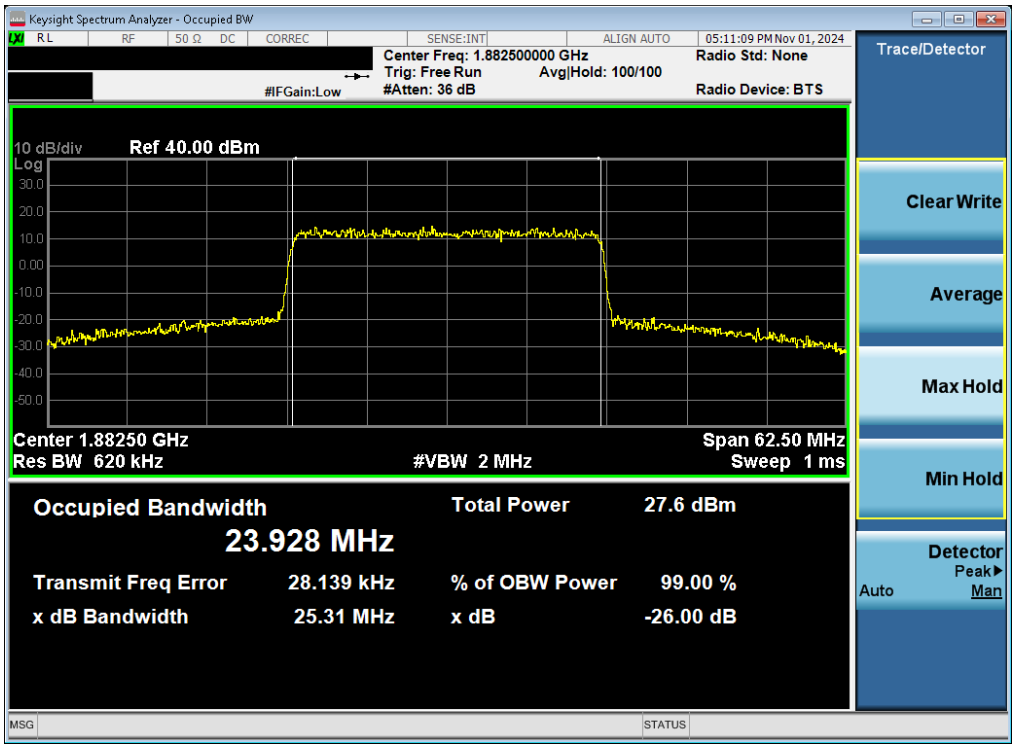

**Plot 7-23. Occupied Bandwidth Plot (NR Band n25/2 - 30.0MHz CP-OFDM QPSK - Full RB - ANT1)**



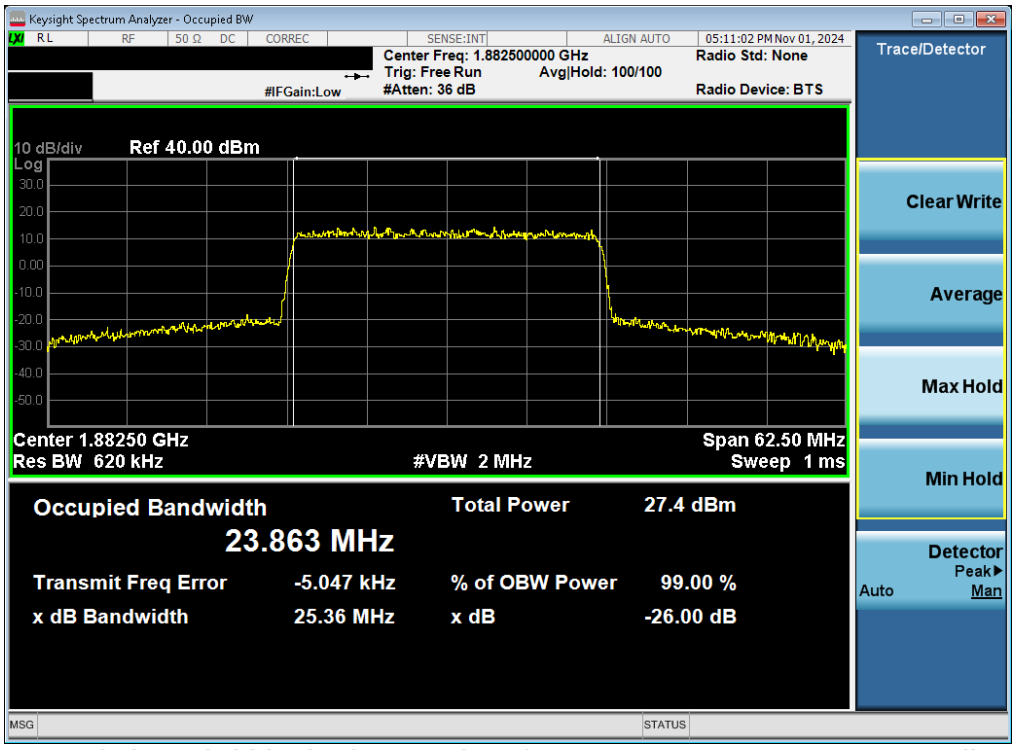

**Plot 7-24. Occupied Bandwidth Plot (NR Band n25/2 - 30.0MHz CP-OFDM 16QAM - Full RB - ANT1)**



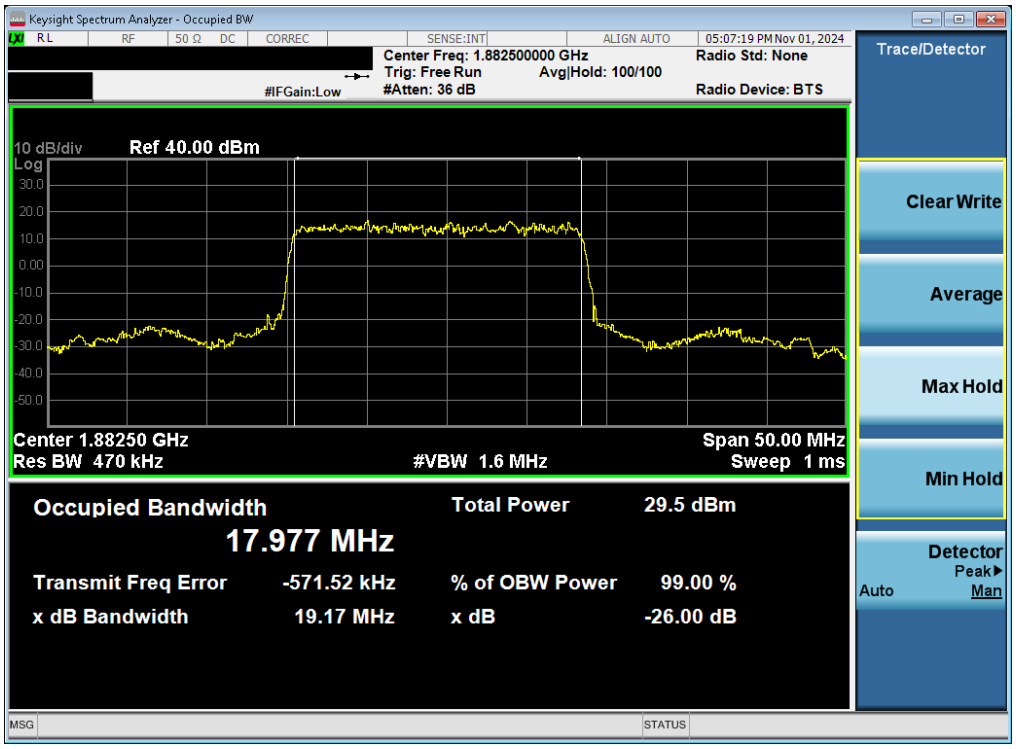

**Plot 7-25. Occupied Bandwidth Plot (NR Band n25/2 - 25.0MHz DFT-s-OFDM BPSK - Full RB - ANT1)**



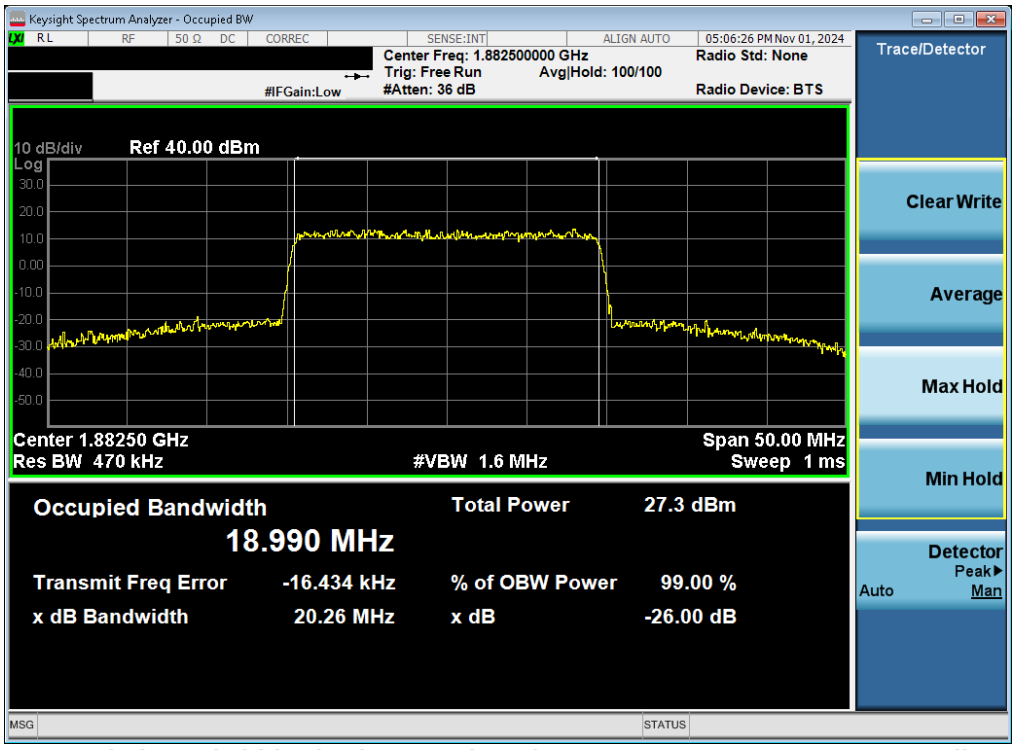

**Plot 7-26. Occupied Bandwidth Plot (NR Band n25/2 - 25.0MHz CP-OFDM QPSK - Full RB - ANT1)**



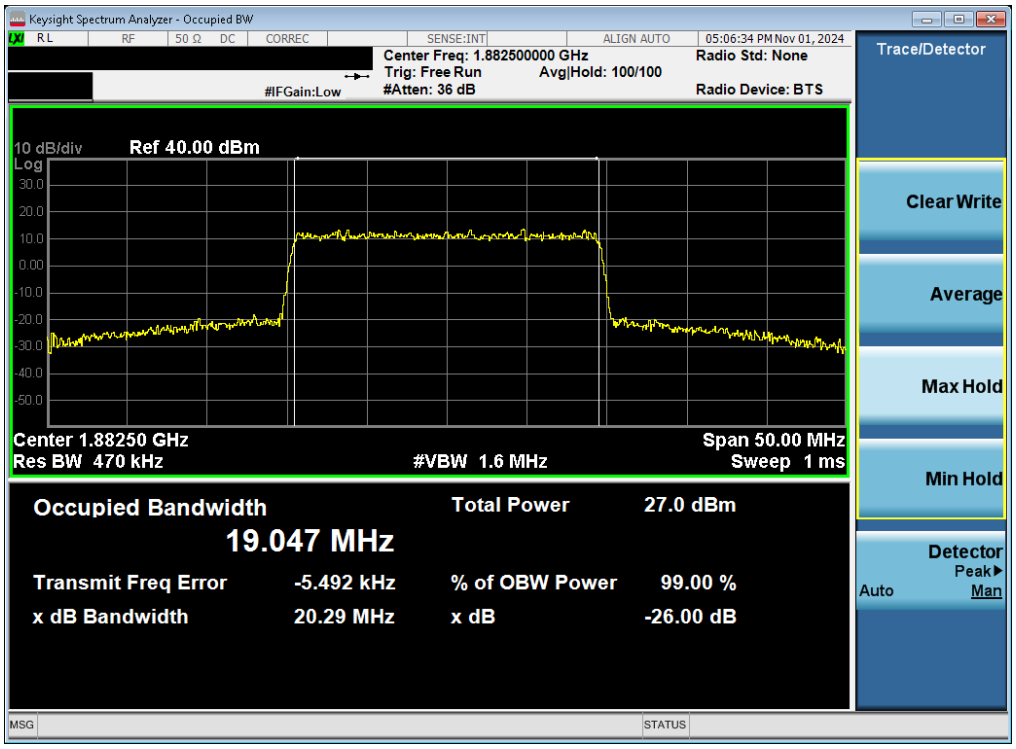

**Plot 7-27. Occupied Bandwidth Plot (NR Band n25/2 - 25.0MHz CP-OFDM 16QAM - Full RB - ANT1)**



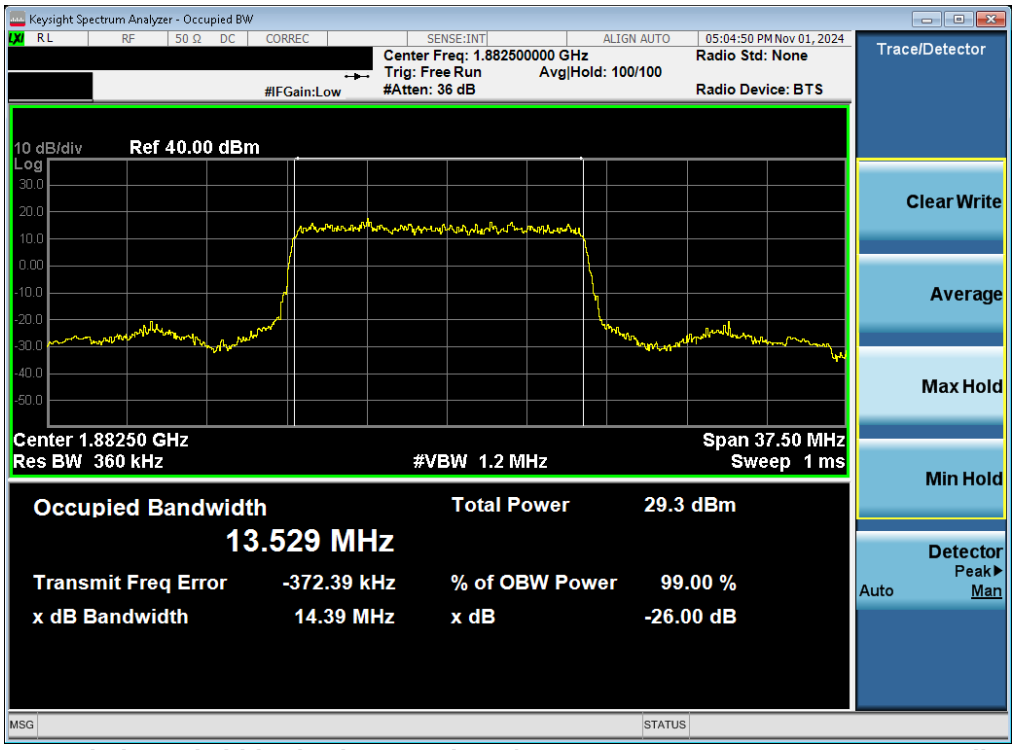

**Plot 7-28. Occupied Bandwidth Plot (NR Band n25/2 - 20.0MHz DFT-s-OFDM BPSK - Full RB - ANT1)**



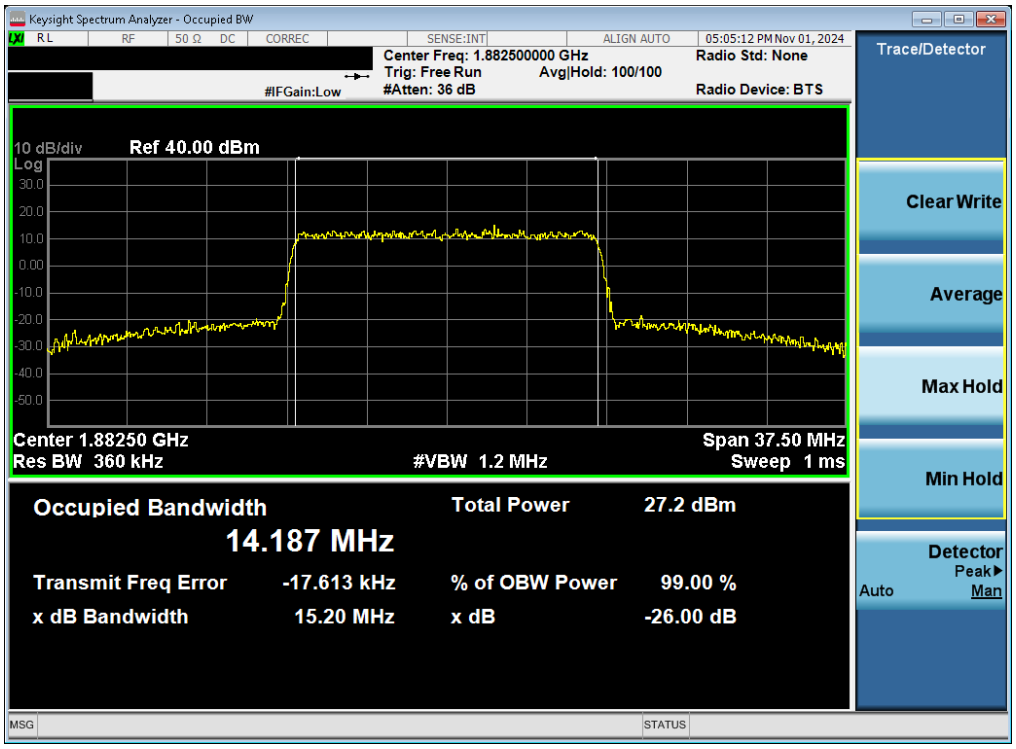

**Plot 7-29. Occupied Bandwidth Plot (NR Band n25/2 - 20.0MHz CP-OFDM QPSK - Full RB - ANT1)**



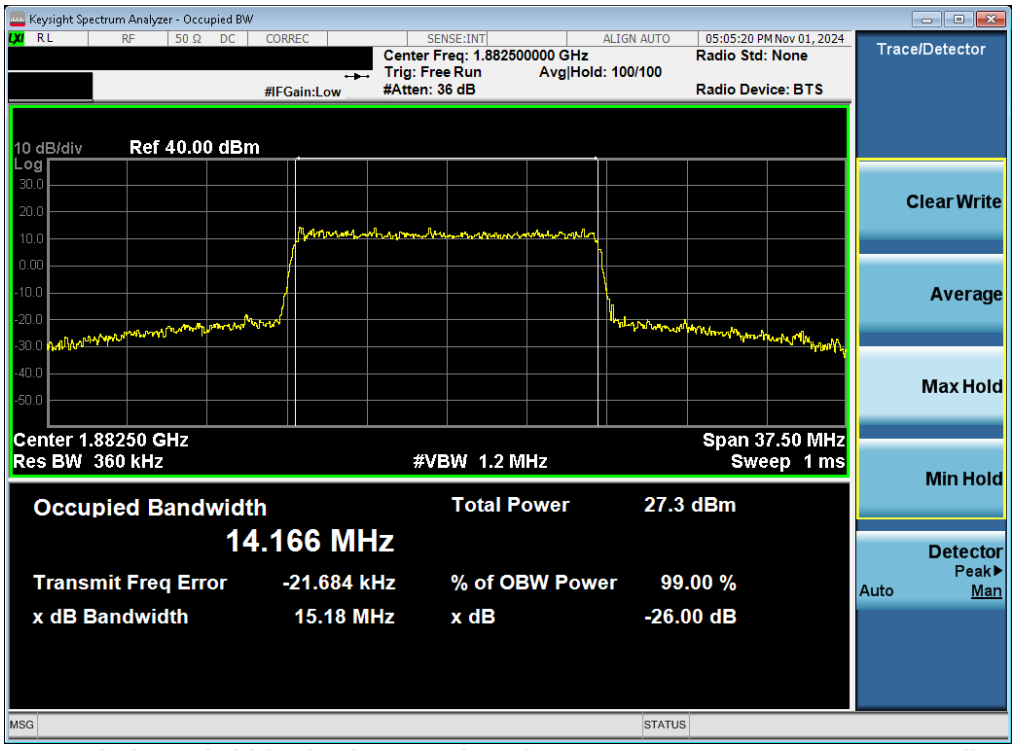

**Plot 7-30. Occupied Bandwidth Plot (NR Band n25/2 - 20.0MHz CP-OFDM 16QAM - Full RB - ANT1)**




**Plot 7-31. Occupied Bandwidth Plot (NR Band n25/2 - 15.0MHz DFT-s-OFDM BPSK - Full RB - ANT1)**

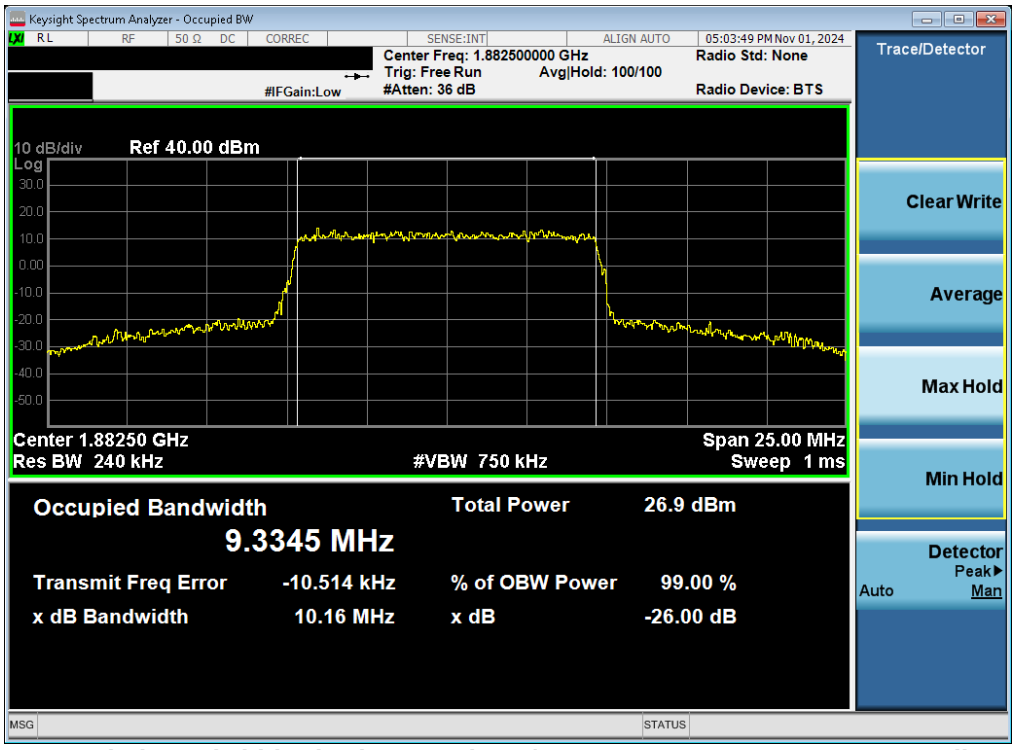



**Plot 7-32. Occupied Bandwidth Plot (NR Band n25/2 - 15.0MHz CP-OFDM QPSK - Full RB - ANT1)**

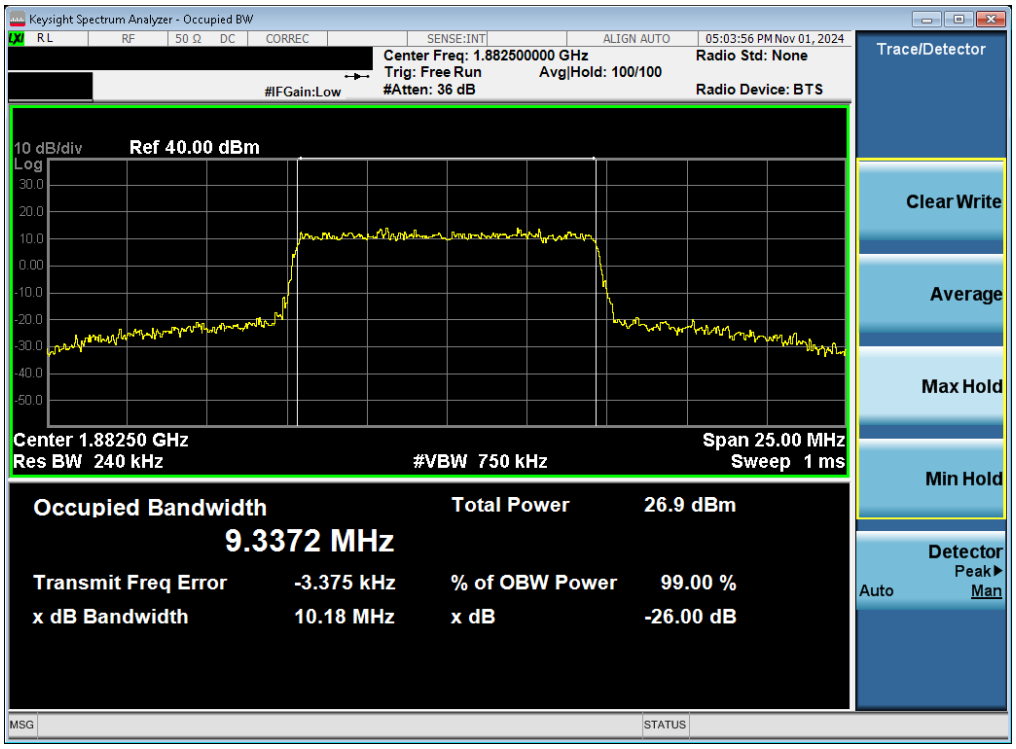



**Plot 7-33. Occupied Bandwidth Plot (NR Band n25/2 - 15.0MHz CP-OFDM 16QAM - Full RB - ANT1)**

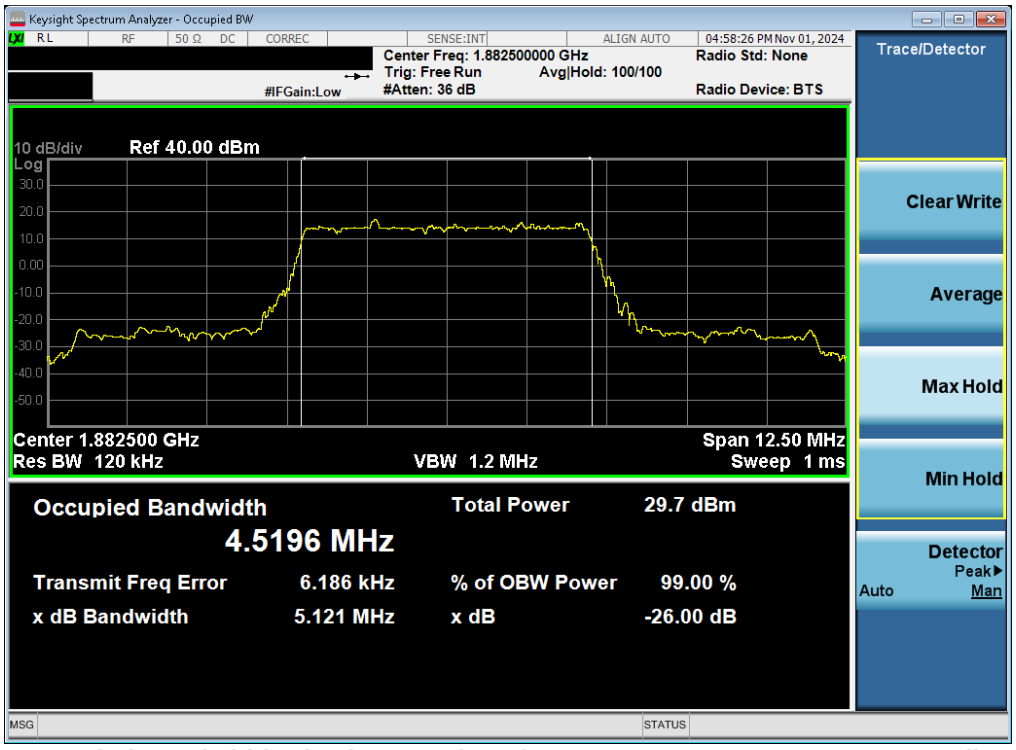

**Plot 7-34. Occupied Bandwidth Plot (NR Band n25/2 - 10.0MHz DFT-s-OFDM BPSK - Full RB - ANT1)**



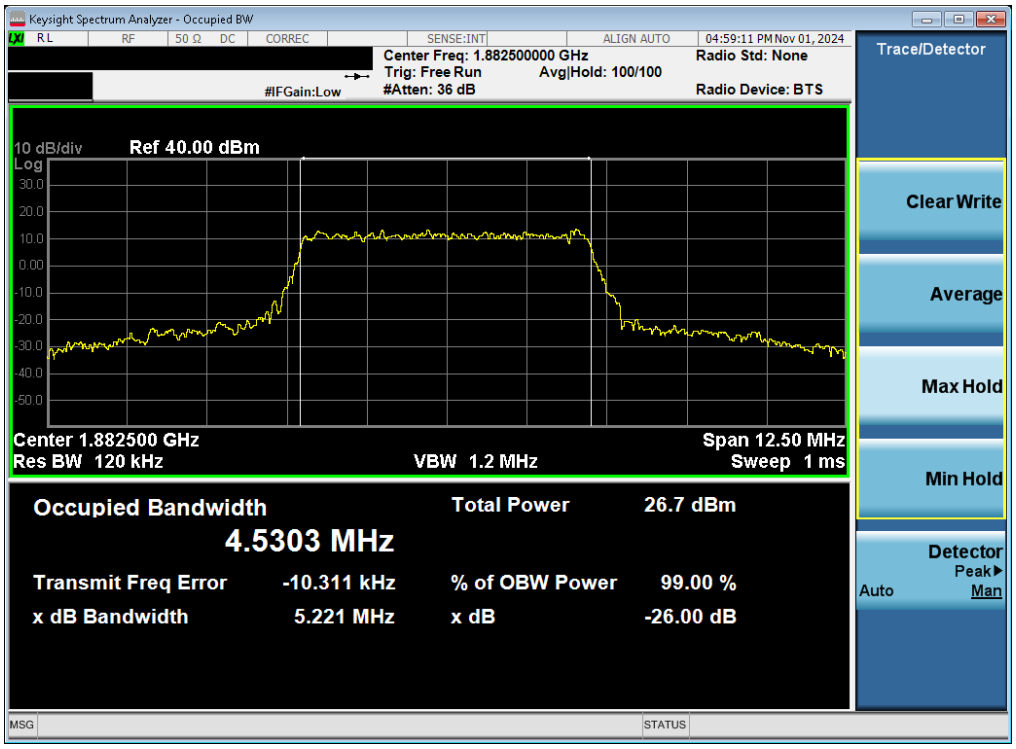

**Plot 7-35. Occupied Bandwidth Plot (NR Band n25/2 - 10.0MHz CP-OFDM QPSK - Full RB - ANT1)**



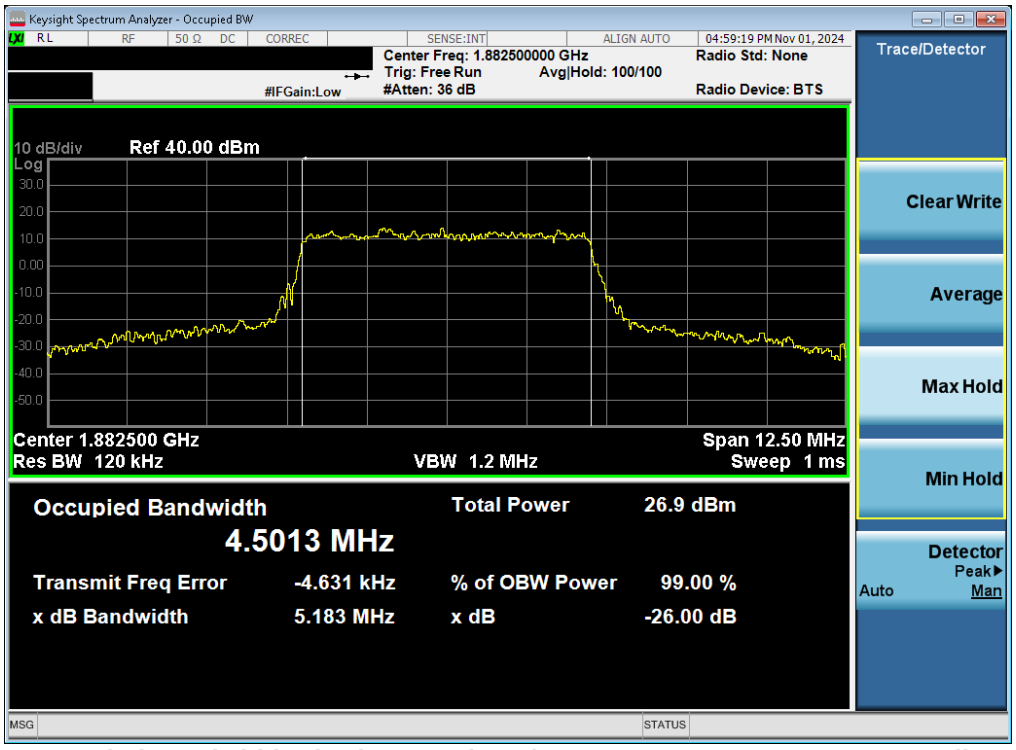

**Plot 7-36. Occupied Bandwidth Plot (NR Band n25/2 - 10.0MHz CP-OFDM 16QAM - Full RB - ANT1)**




**Plot 7-37. Occupied Bandwidth Plot (NR Band n25/2 - 5.0MHz DFT-s-OFDM BPSK - Full RB - ANT1)**




**Plot 7-38. Occupied Bandwidth Plot (NR Band n25/2 - 5.0MHz CP-OFDM QPSK - Full RB - ANT1)**




**Plot 7-39. Occupied Bandwidth Plot (NR Band n25/2 - 5.0MHz CP-OFDM 16QAM - Full RB - ANT1)**

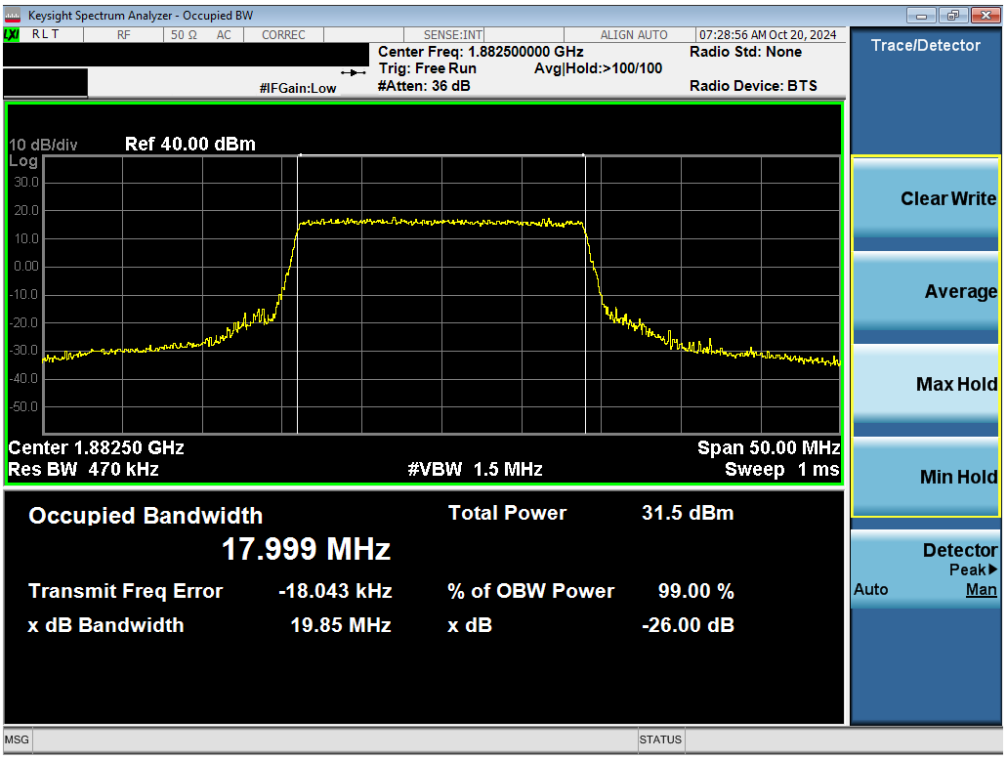
| Mode | Bandwidth | Modulation | OBW [MHz] |
|---|---|---|---|
| LTE-B25-2 | 20MHz | QPSK | 18.00 |
| | | 16QAM | 17.97 |
| | 15MHz | QPSK | 13.56 |
| | | 16QAM | 13.53 |
| | 10MHz | QPSK | 9.02 |
| | | 16QAM | 9.03 |
| | 5MHz | QPSK | 4.52 |
| | | 16QAM | 4.54 |
| | 3MHz | QPSK | 2.72 |
| | | 16QAM | 2.72 |
| | 1.4MHz | QPSK | 1.10 |
| | | 16QAM | 1.11 |

**Table 7-6. Occupied Bandwidth Test Results – Ant2**

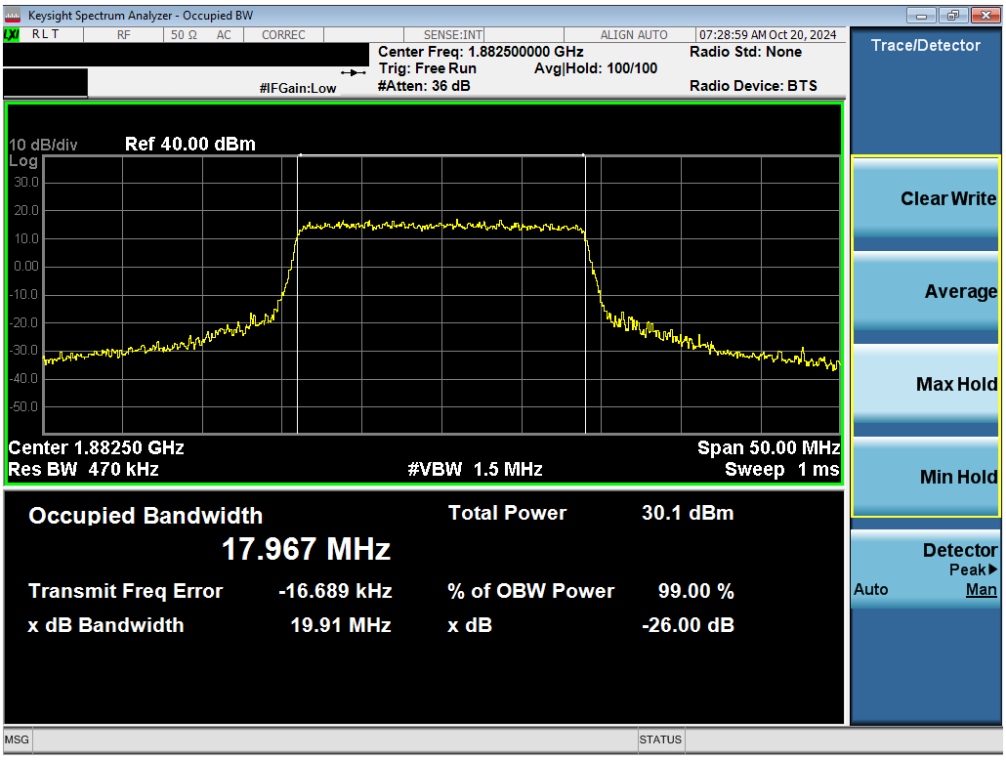
| Mode | Bandwidth | Modulation | OBW [MHz] |
|---|---|---|---|
| NR-n25-2 | 40MHz | BPSK | 38.74 |
| | | QPSK | 38.74 |
| | | 16QAM | 38.83 |
| | 35MHz | BPSK | 32.34 |
| | | QPSK | 33.69 |
| | | 16QAM | 33.77 |
| | 30MHz | BPSK | 28.69 |
| | | QPSK | 28.75 |
| | | 16QAM | 28.68 |
| | 25MHz | BPSK | 23.02 |
| | | QPSK | 23.95 |
| | | 16QAM | 23.86 |
| | 20MHz | BPSK | 18.00 |
| | | QPSK | 18.98 |
| | | 16QAM | 19.00 |
| | 15MHz | BPSK | 13.52 |
| | | QPSK | 14.18 |
| | | 16QAM | 14.16 |
| | 10MHz | BPSK | 9.01 |
| | | QPSK | 9.32 |
| | | 16QAM | 9.34 |
| | 5MHz | BPSK | 4.50 |
| | | QPSK | 4.53 |
| | | 16QAM | 4.50 |

**Table 7-7. Occupied Bandwidth Test Results – Ant2**

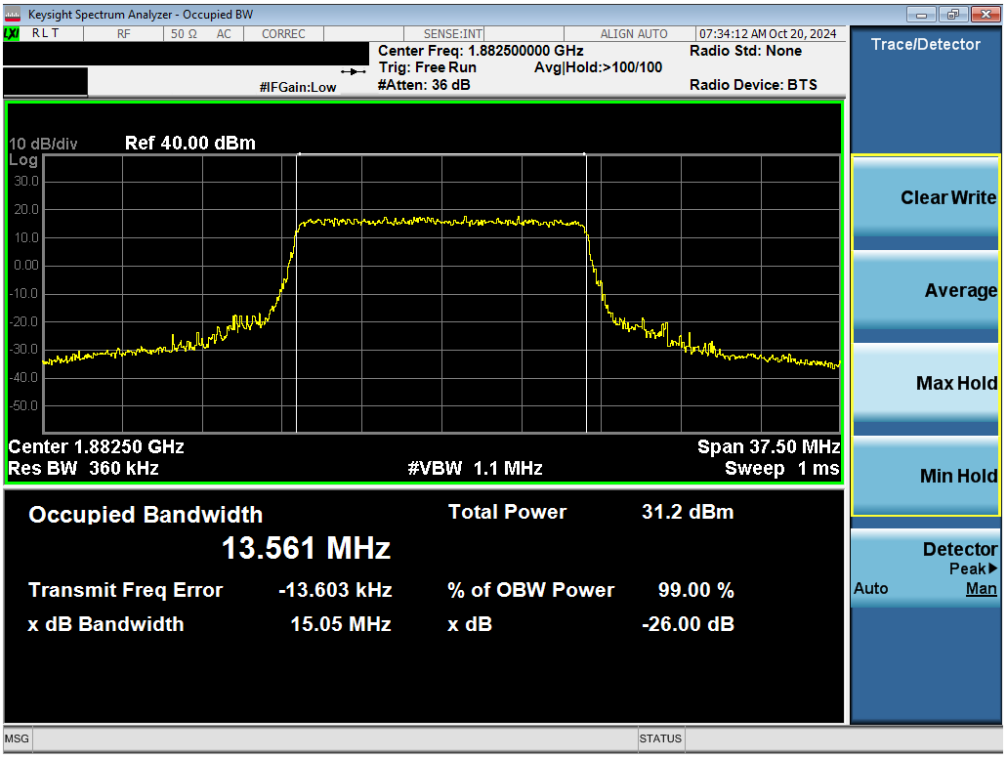
## LTE Band 25/2 – Ant2



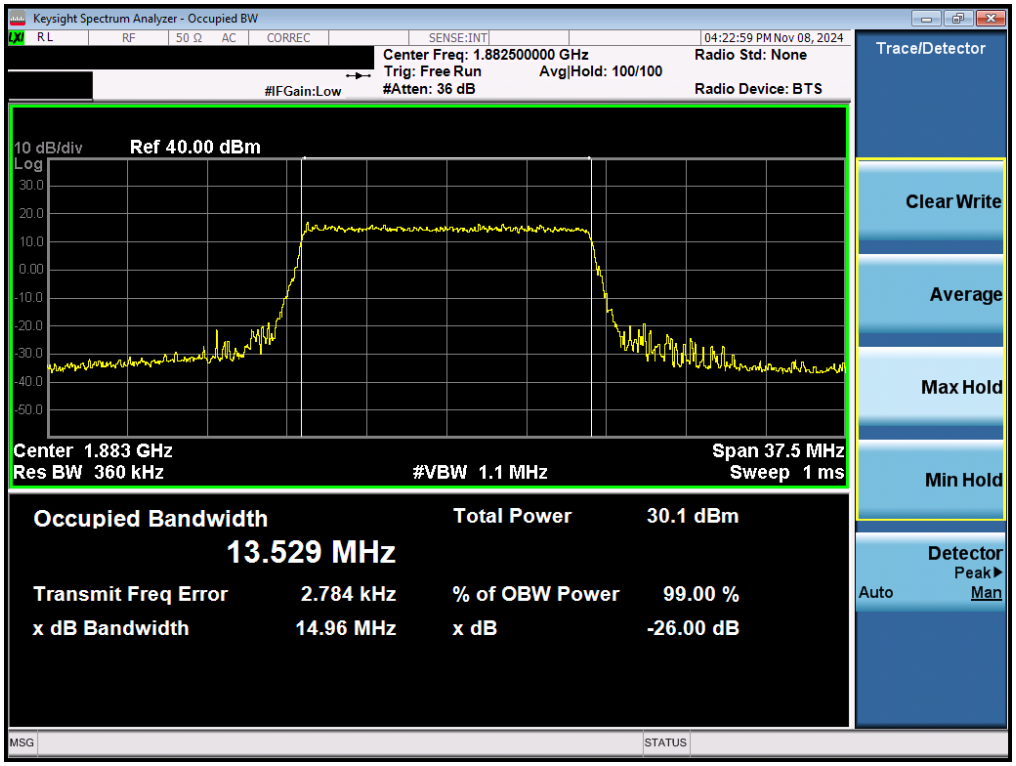

**Plot 7-40. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz QPSK - Full RB - Ant2)**



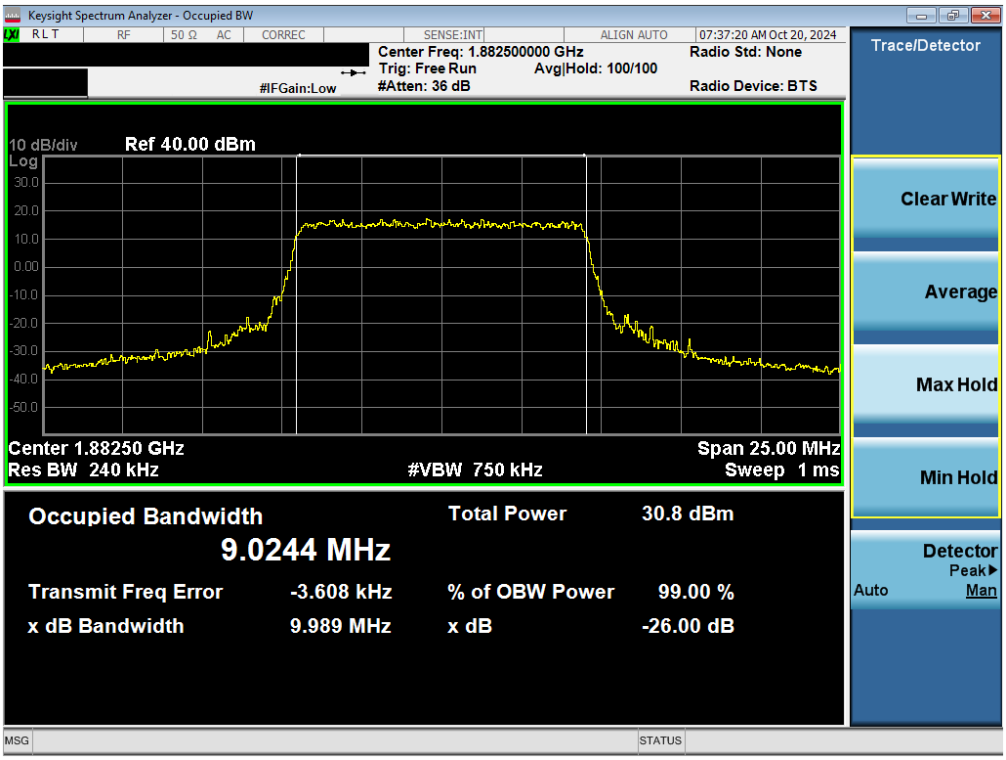

**Plot 7-41. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz 16-QAM - Full RB - Ant2)**



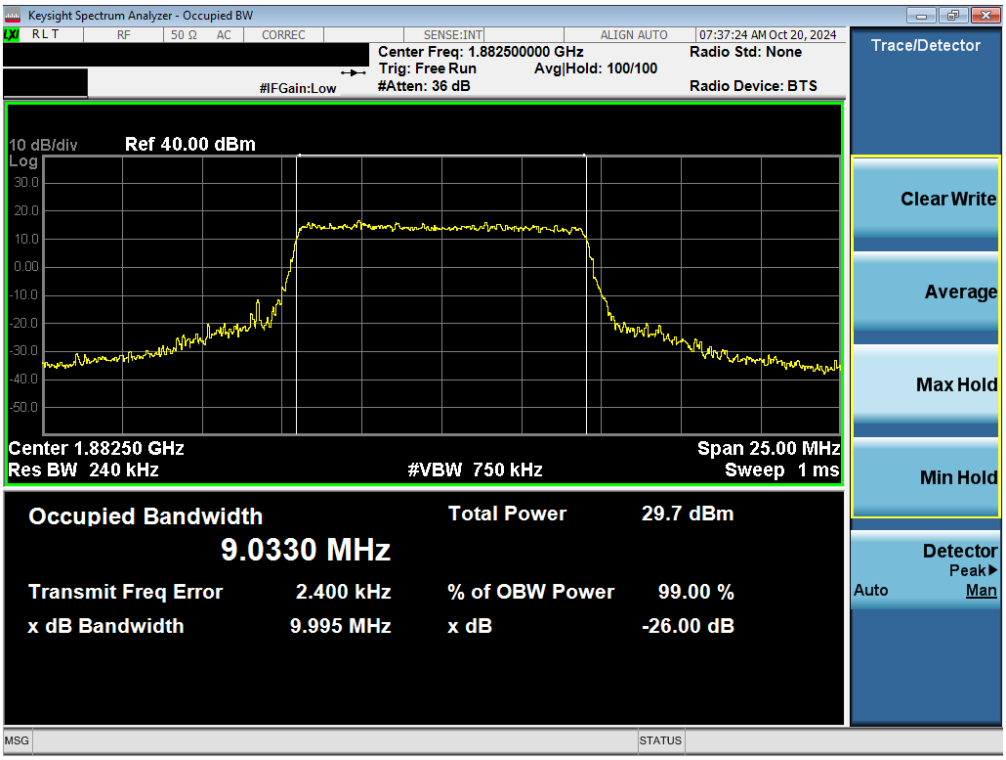

**Plot 7-42. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz QPSK - Full RB - Ant2)**



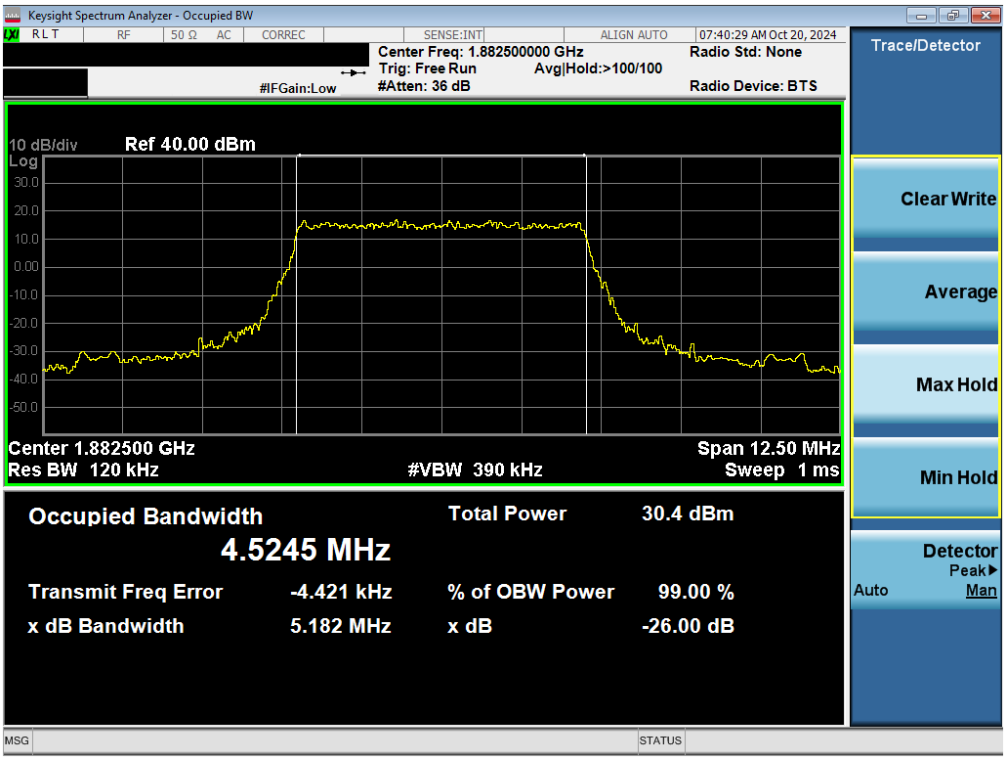

**Plot 7-43. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz 16-QAM - Full RB - Ant2)**



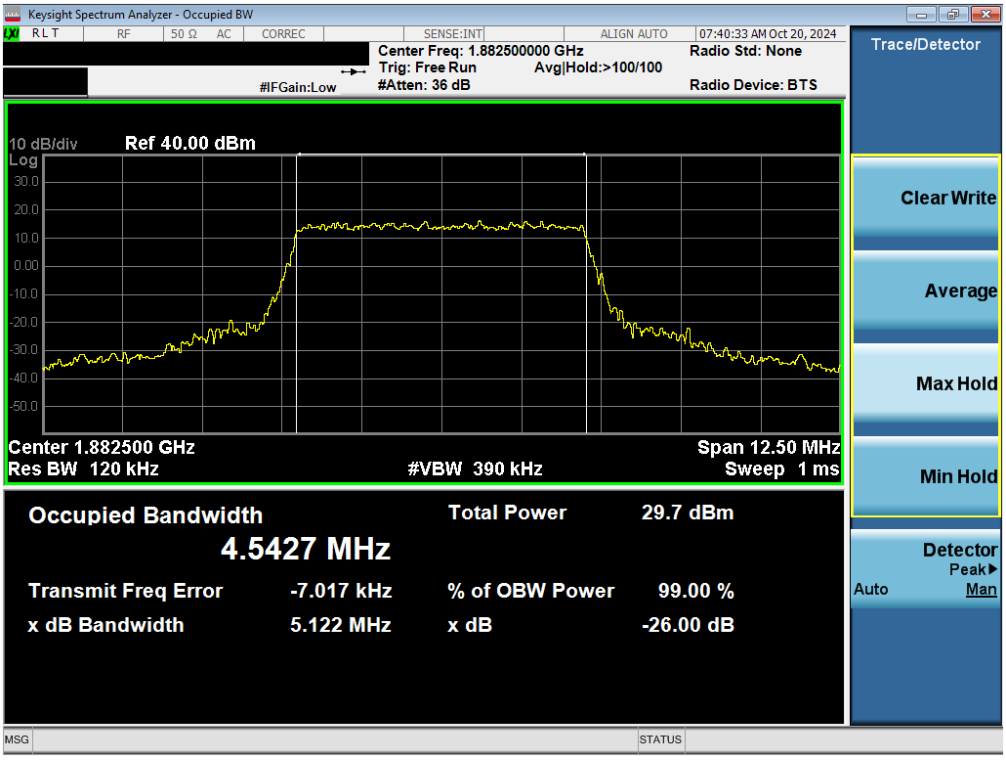

**Plot 7-44. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz QPSK - Full RB - Ant2)**



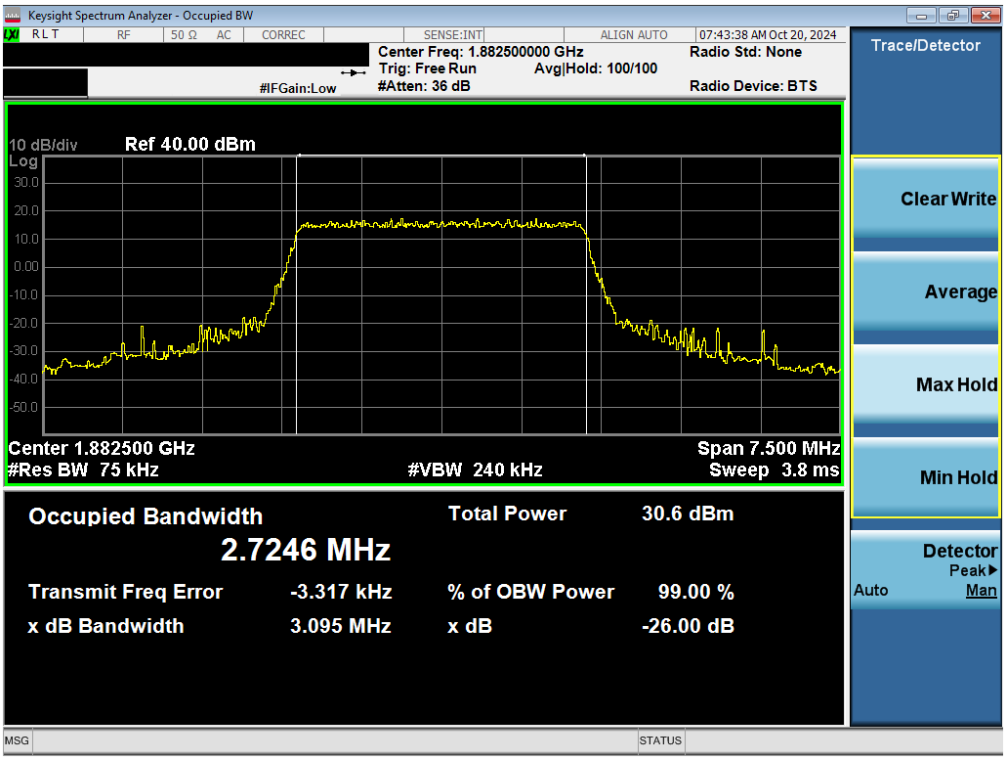

**Plot 7-45. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz 16-QAM - Full RB - Ant2)**



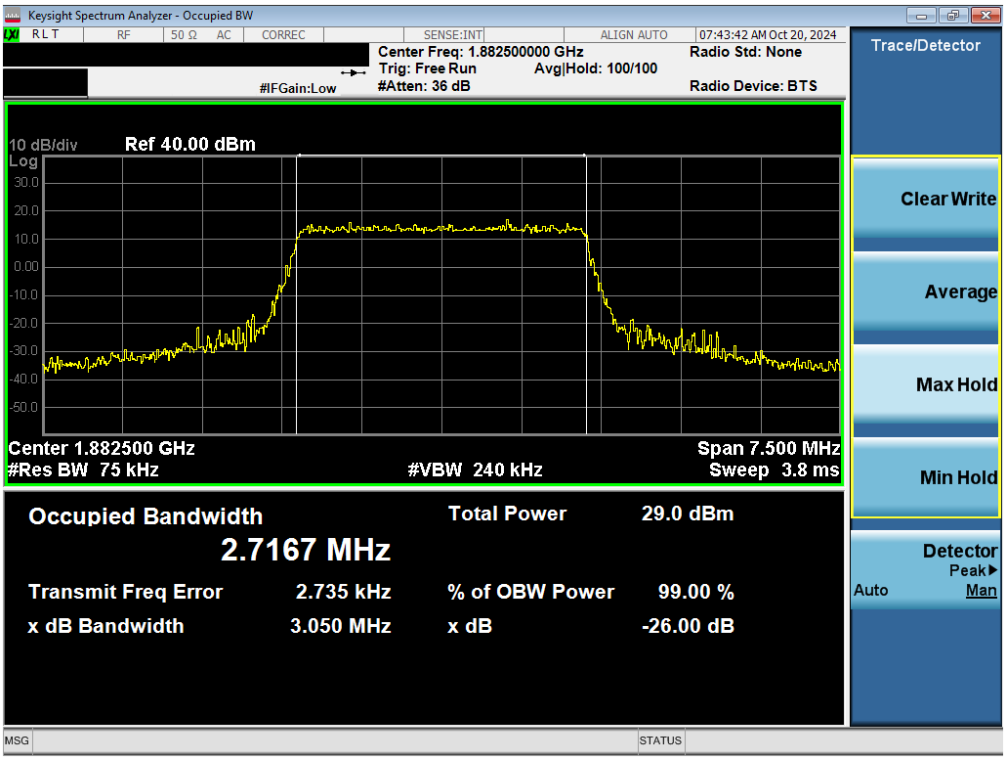

**Plot 7-46. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz QPSK - Full RB - Ant2)**



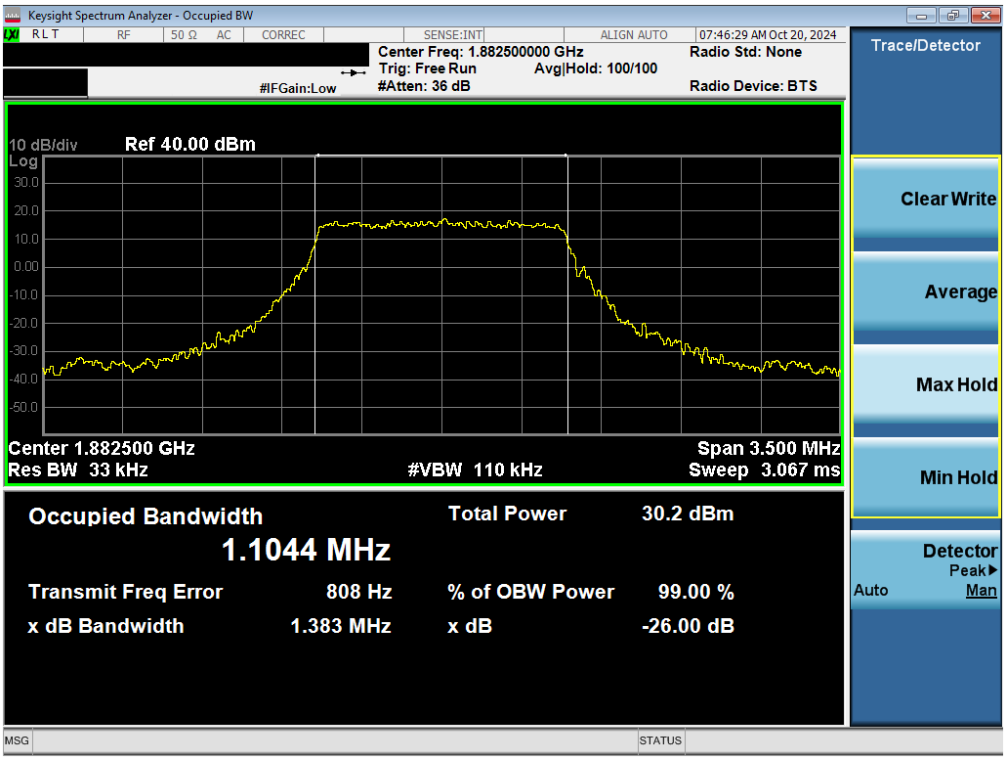

**Plot 7-47. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz 16-QAM - Full RB - Ant2)**



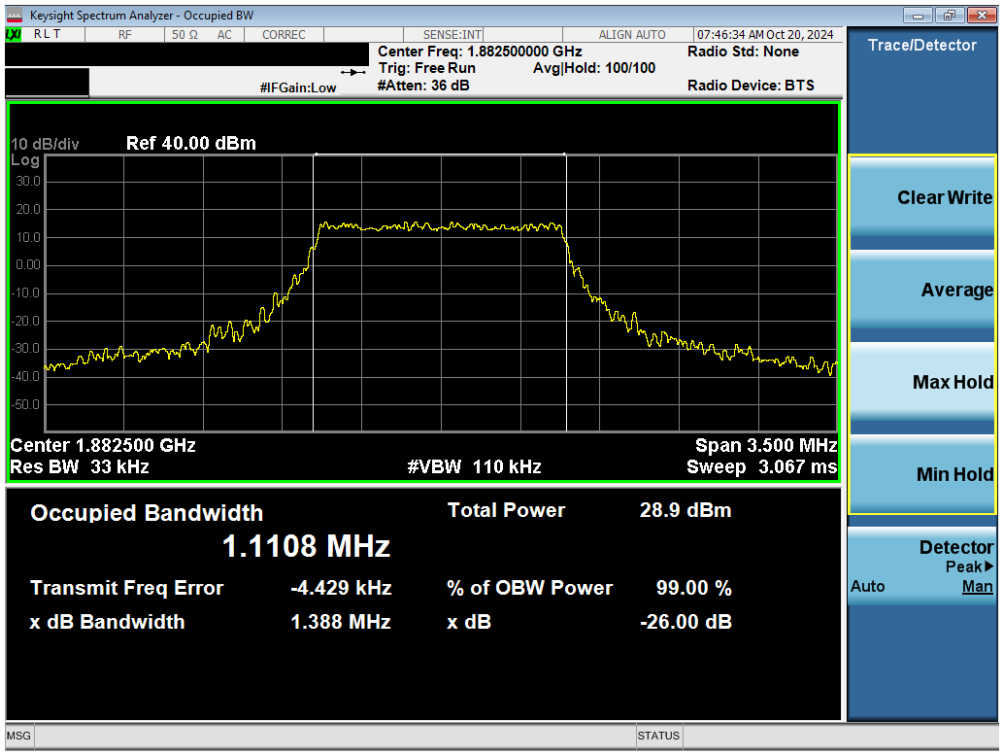

**Plot 7-48. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz QPSK - Full RB - Ant2)**




**Plot 7-49. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz 16-QAM - Full RB - Ant2)**

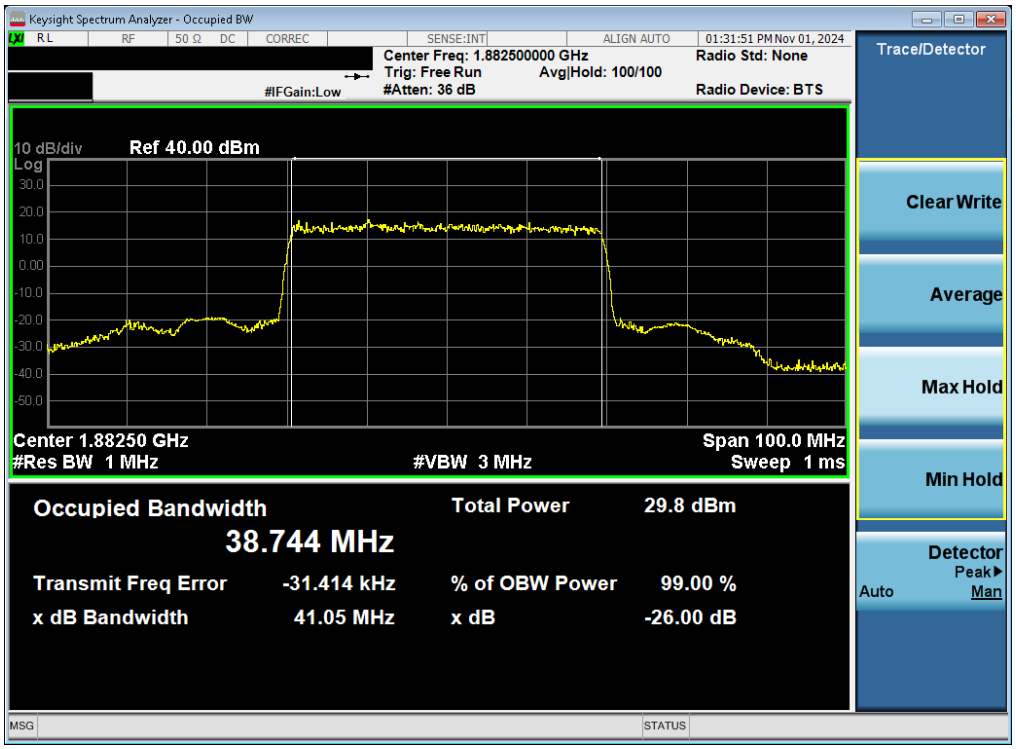



**Plot 7-50. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz QPSK - Full RB - Ant2)**

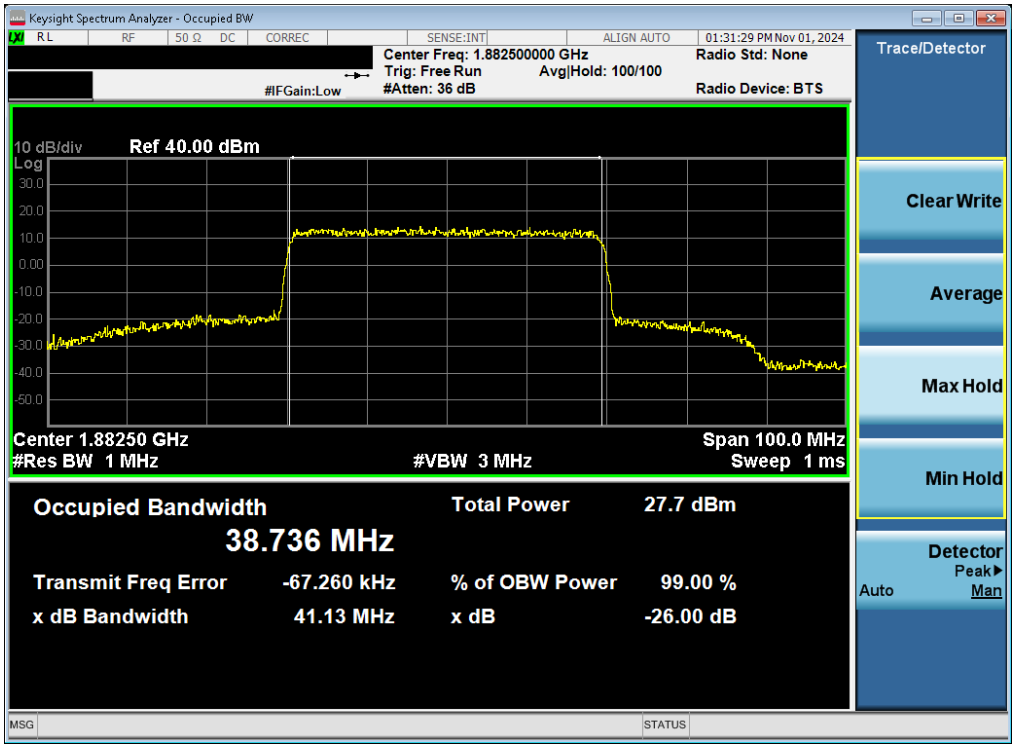



**Plot 7-51. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz 16-QAM - Full RB - Ant2)**

## NR Band n25/2 – Ant2

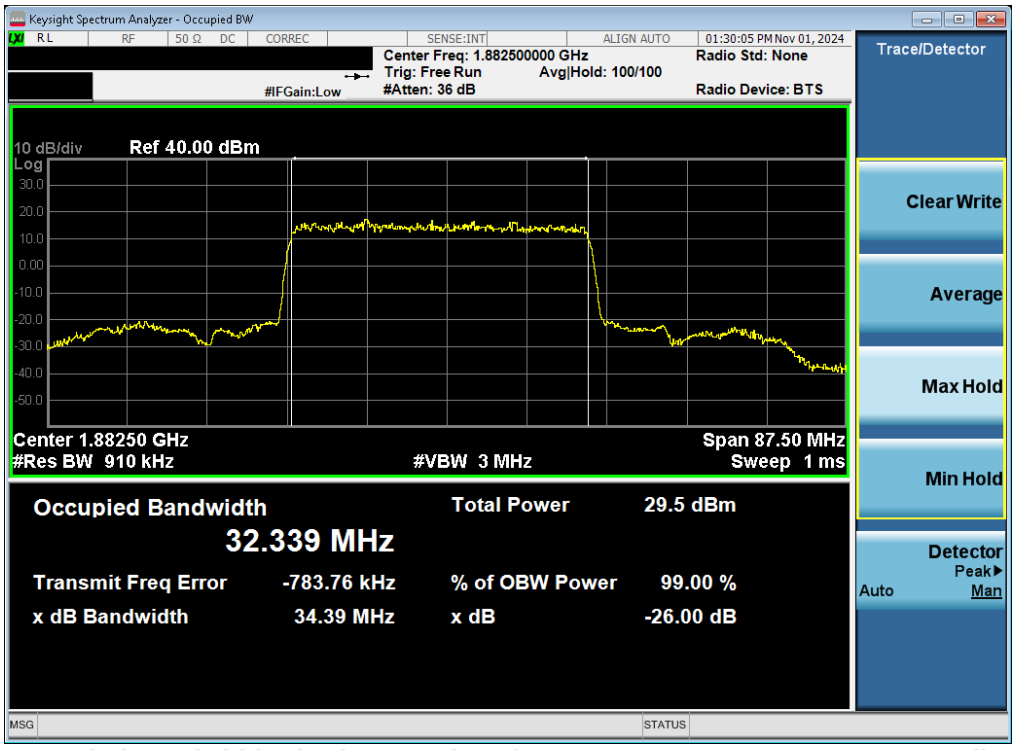



**Plot 7-52. Occupied Bandwidth Plot (NR Band n25/2 - 40.0MHz DFT-s-OFDM BPSK - Full RB - ANT2)**

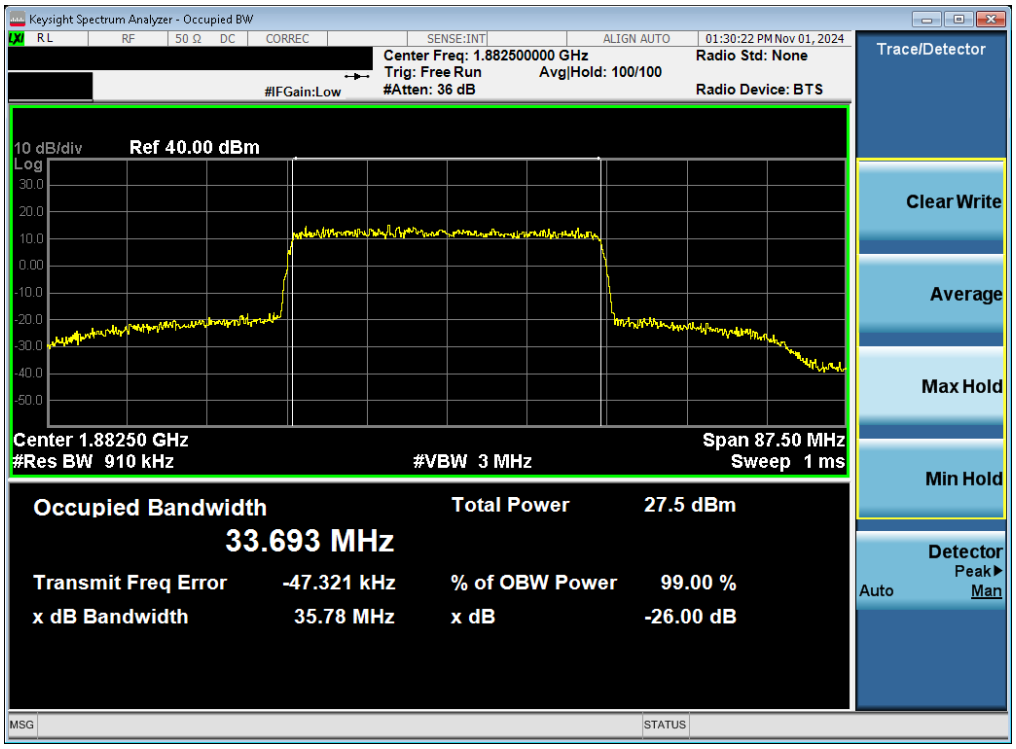



**Plot 7-53. Occupied Bandwidth Plot (NR Band n25/2 - 40.0MHz CP-OFDM QPSK - Full RB - ANT2)**


**Plot 7-54. Occupied Bandwidth Plot (NR Band n25/2 - 40.0MHz CP-OFDM 16QAM - Full RB - ANT2)**

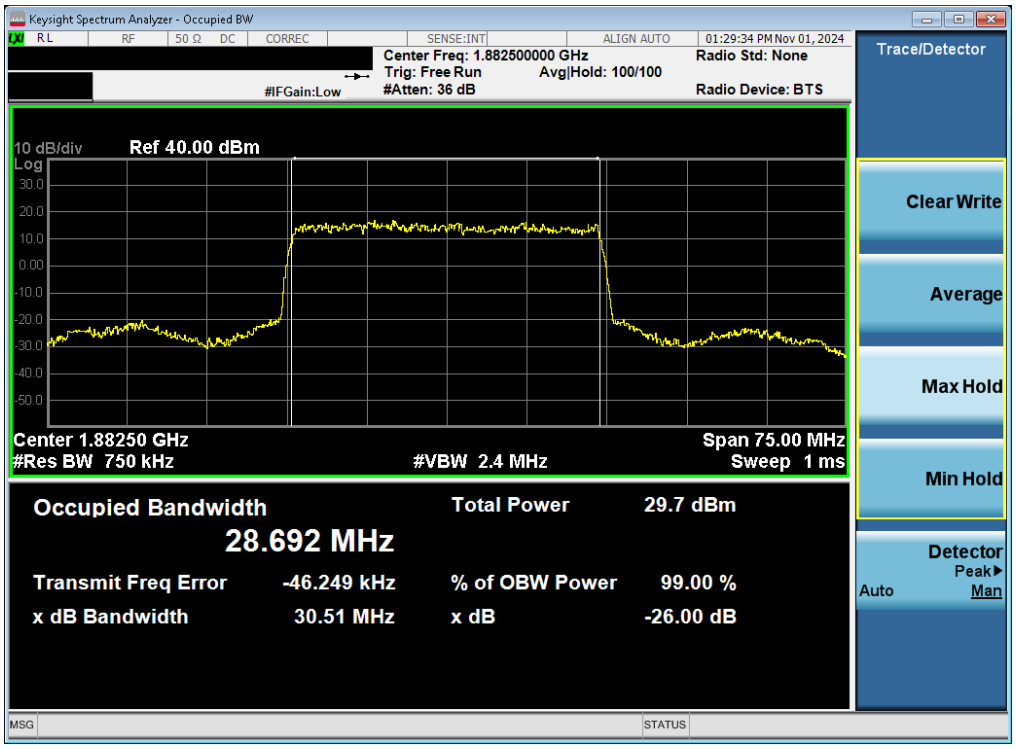



**Plot 7-55. Occupied Bandwidth Plot (NR Band n25/2 - 35.0MHz DFT-s-OFDM BPSK - Full RB - ANT2)**

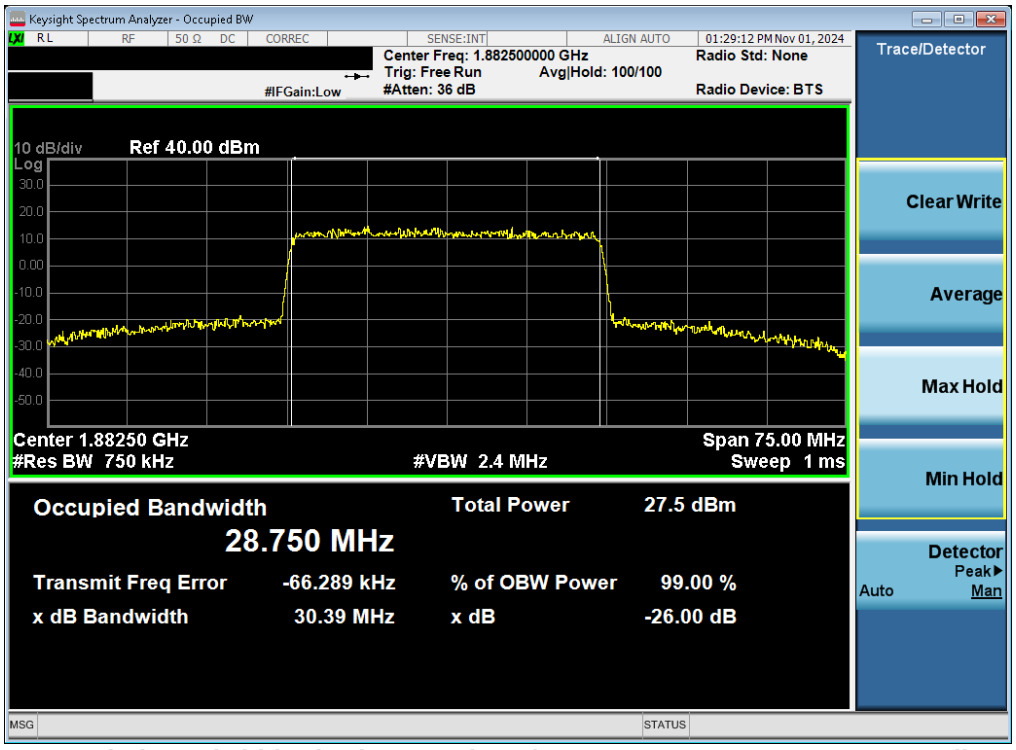



**Plot 7-56. Occupied Bandwidth Plot (NR Band n25/2 - 35.0MHz CP-OFDM QPSK - Full RB - ANT2)**

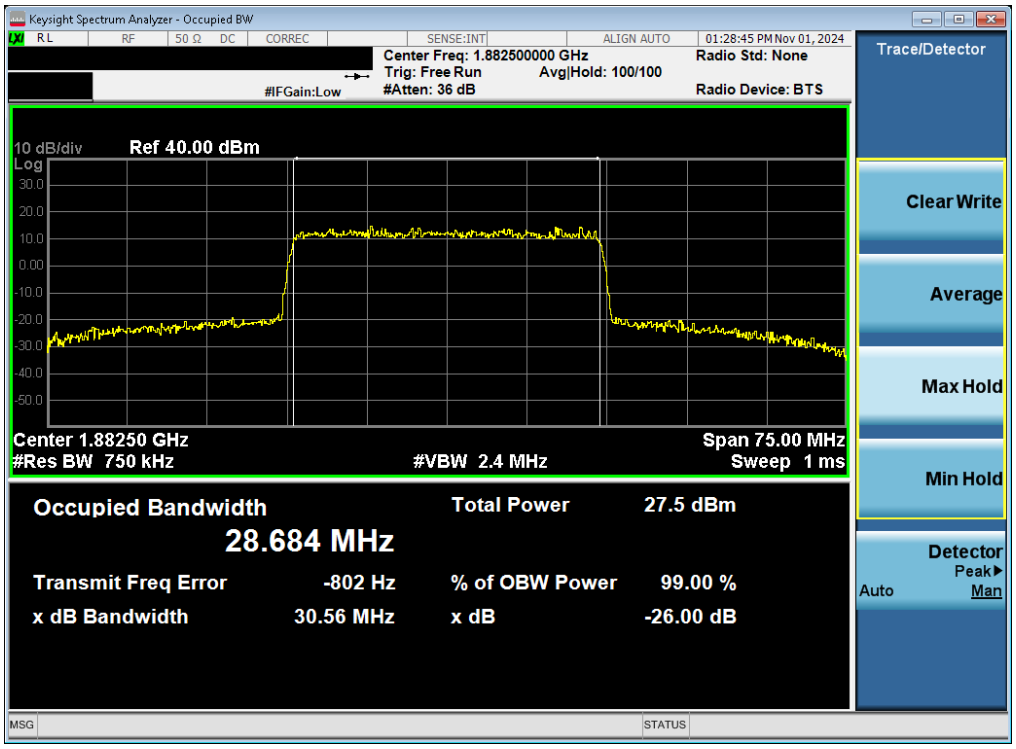

**Plot 7-57. Occupied Bandwidth Plot (NR Band n25/2 - 35.0MHz CP-OFDM 16QAM - Full RB - ANT2)**



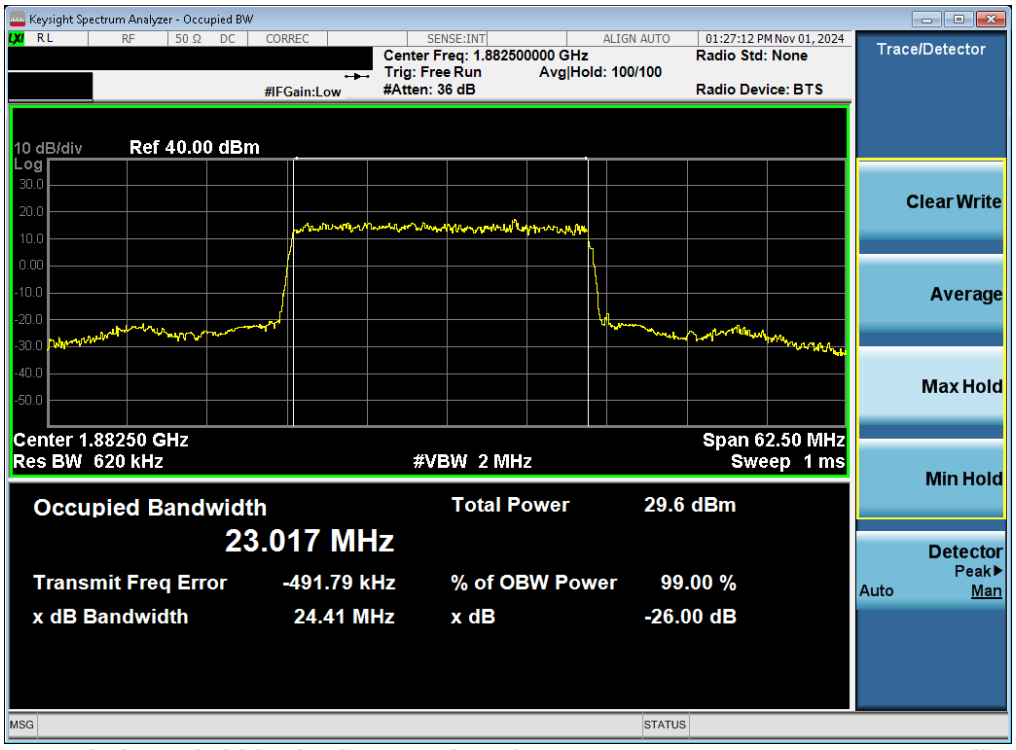

**Plot 7-58. Occupied Bandwidth Plot (NR Band n25/2 - 30.0MHz DFT-s-OFDM BPSK - Full RB - ANT2)**



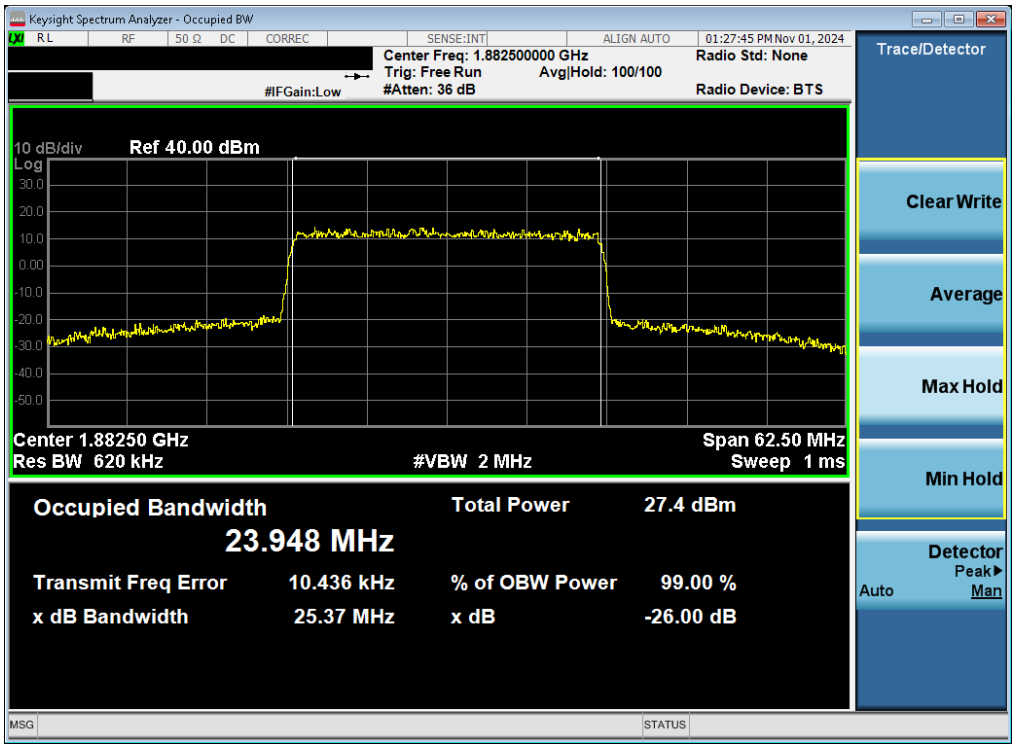

**Plot 7-59. Occupied Bandwidth Plot (NR Band n25/2 - 30.0MHz CP-OFDM QPSK - Full RB - ANT2)**



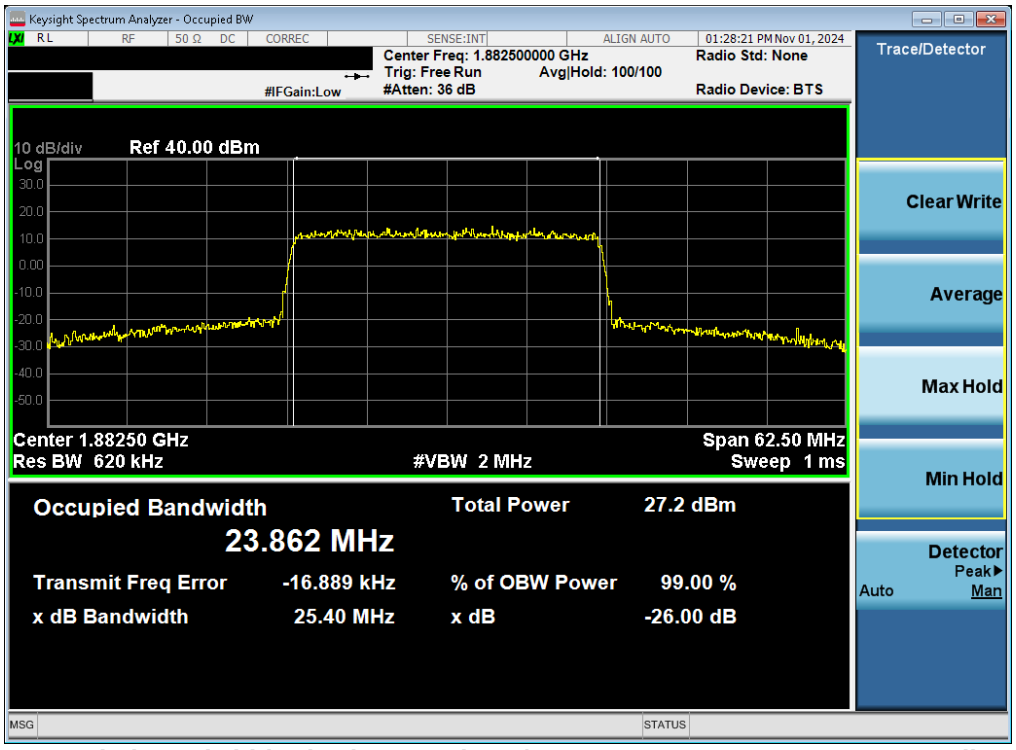

**Plot 7-60. Occupied Bandwidth Plot (NR Band n25/2 - 30.0MHz CP-OFDM 16QAM - Full RB - ANT2)**



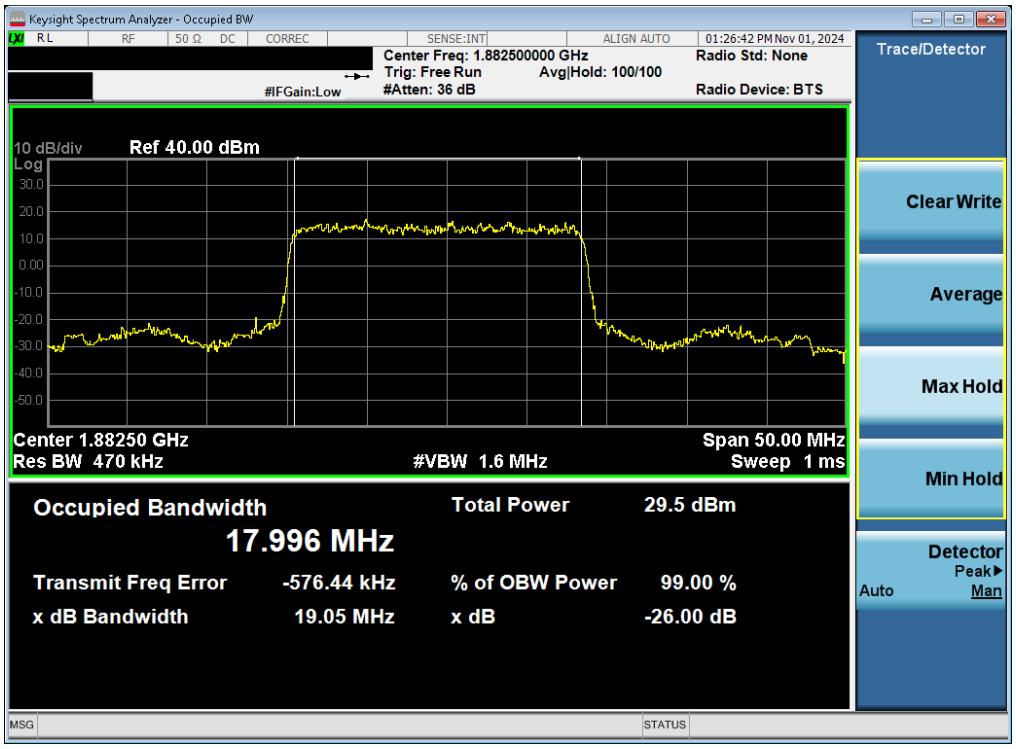

**Plot 7-61. Occupied Bandwidth Plot (NR Band n25/2 - 25.0MHz DFT-s-OFDM BPSK - Full RB - ANT2)**




**Plot 7-62. Occupied Bandwidth Plot (NR Band n25/2 - 25.0MHz CP-OFDM QPSK - Full RB - ANT2)**

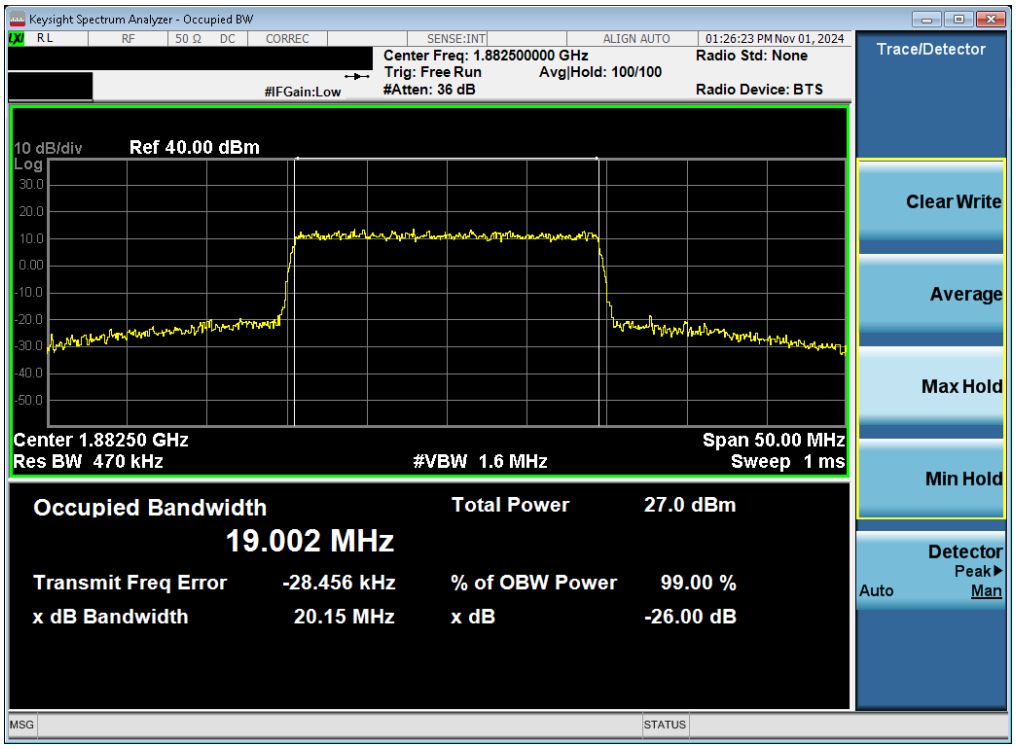



**Plot 7-63. Occupied Bandwidth Plot (NR Band n25/2 - 25.0MHz CP-OFDM 16QAM - Full RB - ANT2)**

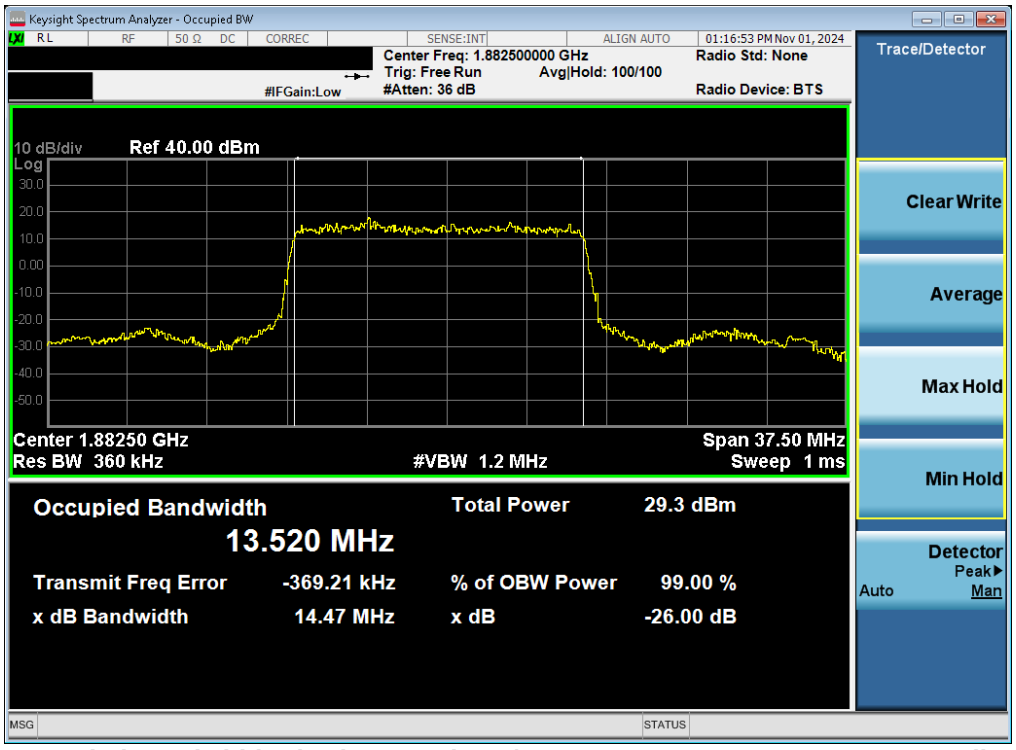



**Plot 7-64. Occupied Bandwidth Plot (NR Band n25/2 - 20.0MHz DFT-s-OFDM BPSK - Full RB - ANT2)**

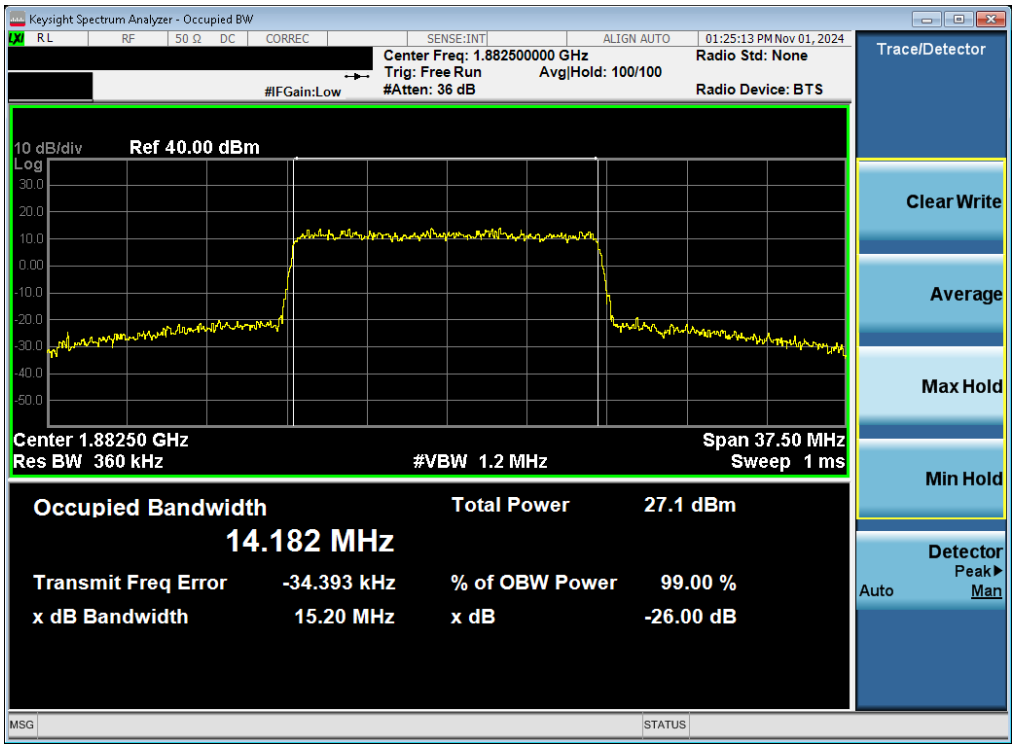

**Plot 7-65. Occupied Bandwidth Plot (NR Band n25/2 - 20.0MHz CP-OFDM QPSK - Full RB - ANT2)**



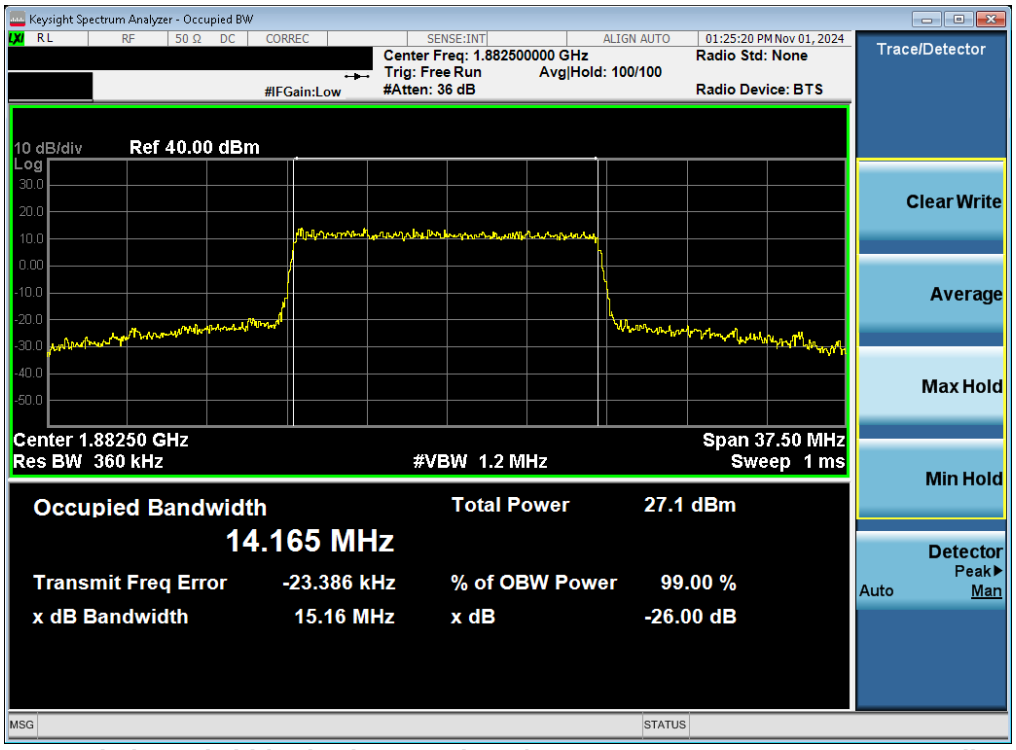

**Plot 7-66. Occupied Bandwidth Plot (NR Band n25/2 - 20.0MHz CP-OFDM 16QAM - Full RB - ANT2)**




**Plot 7-67. Occupied Bandwidth Plot (NR Band n25/2 - 15.0MHz DFT-s-OFDM BPSK - Full RB - ANT2)**

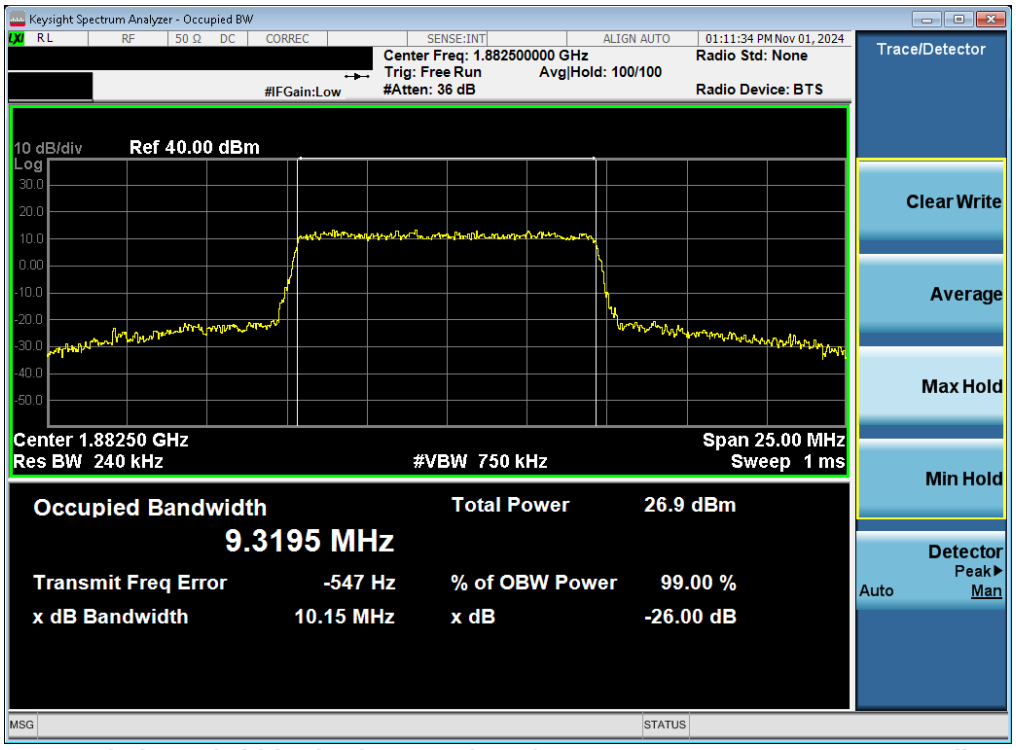



**Plot 7-68. Occupied Bandwidth Plot (NR Band n25/2 - 15.0MHz CP-OFDM QPSK - Full RB - ANT2)**

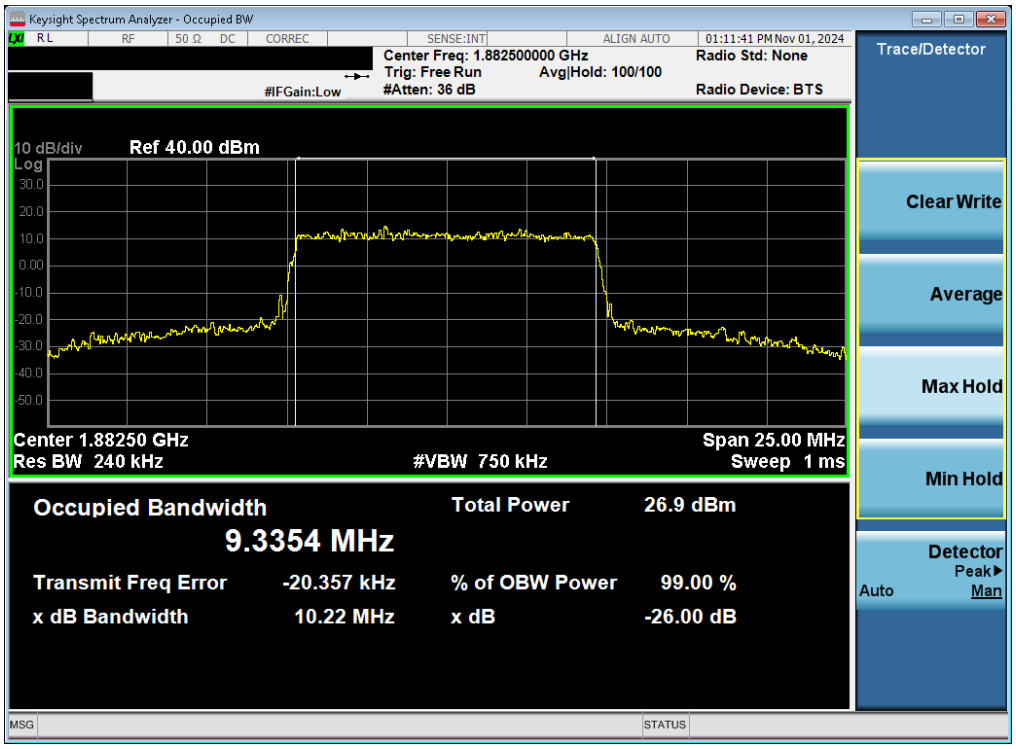



**Plot 7-69. Occupied Bandwidth Plot (NR Band n25/2 - 15.0MHz CP-OFDM 16QAM - Full RB - ANT2)**

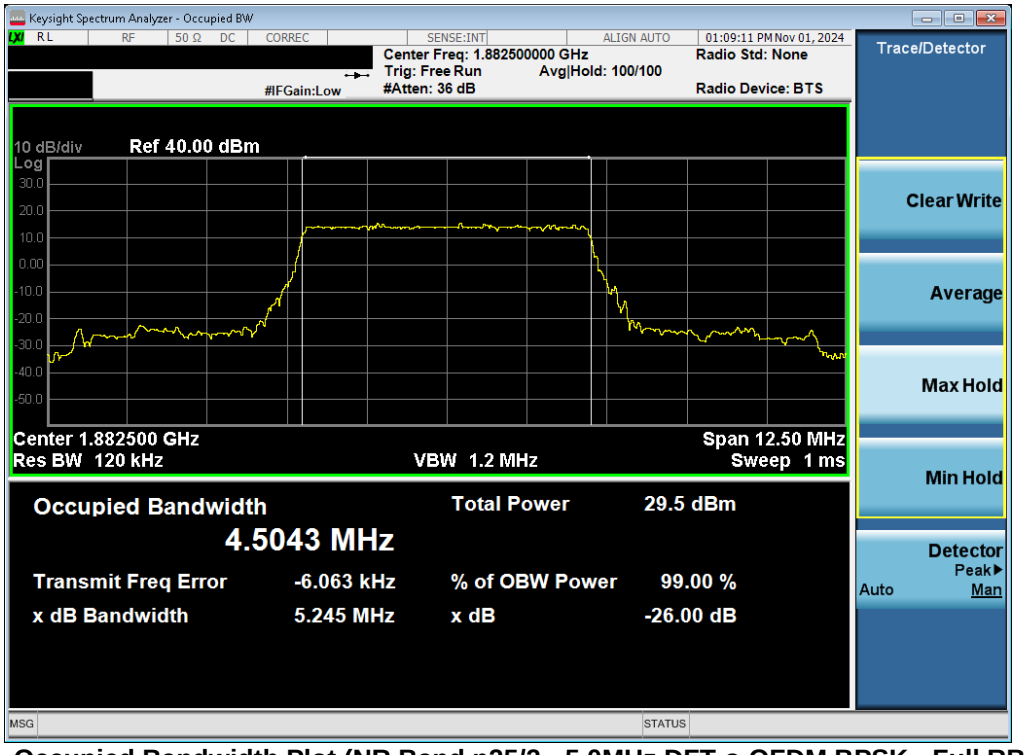

**Plot 7-70. Occupied Bandwidth Plot (NR Band n25/2 - 10.0MHz DFT-s-OFDM BPSK - Full RB - ANT2)**



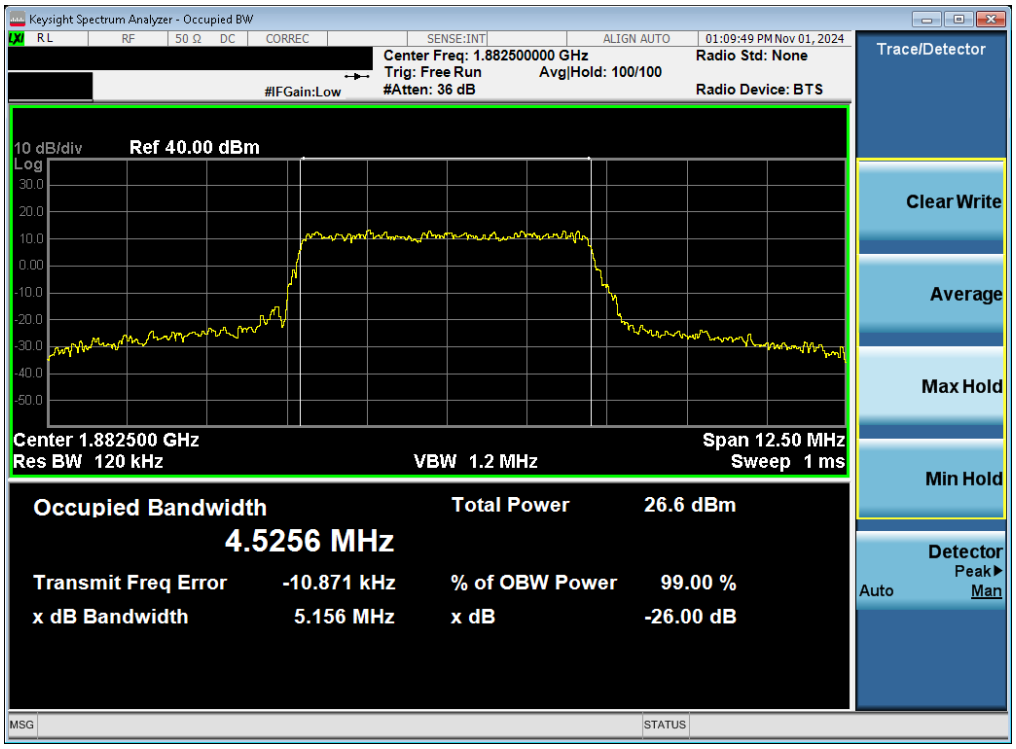

**Plot 7-71. Occupied Bandwidth Plot (NR Band n25/2 - 10.0MHz CP-OFDM QPSK - Full RB - ANT2)**



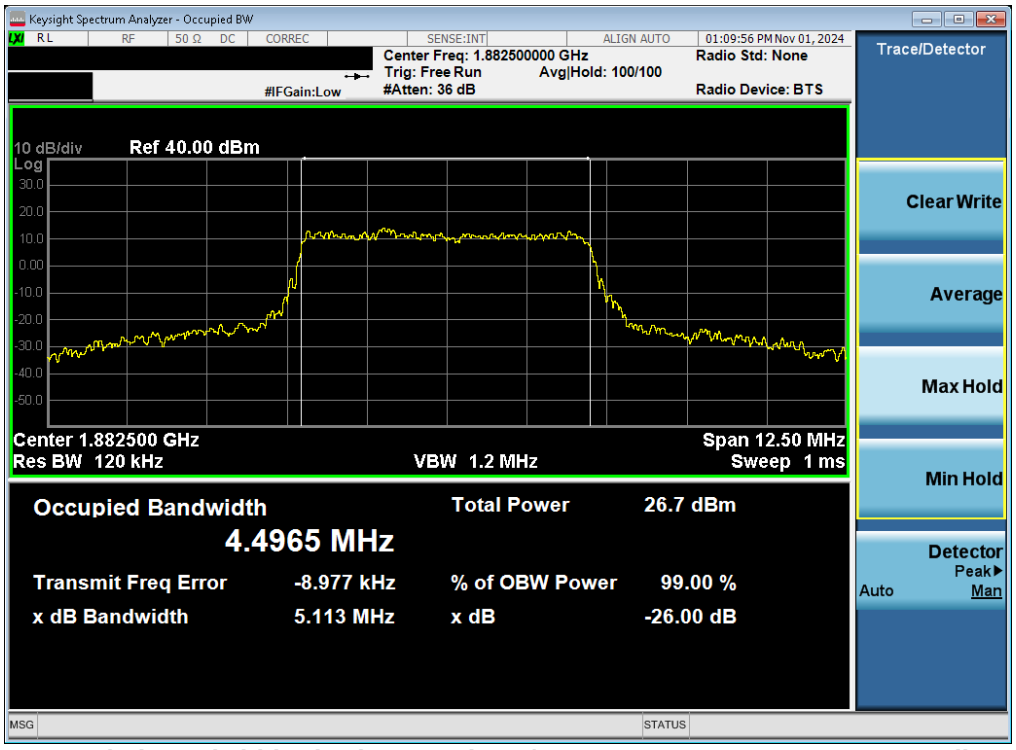

**Plot 7-72. Occupied Bandwidth Plot (NR Band n25/2 - 10.0MHz CP-OFDM 16QAM - Full RB - ANT2)**




**Plot 7-73. Occupied Bandwidth Plot (NR Band n25/2 - 5.0MHz DFT-s-OFDM BPSK - Full RB - ANT2)**




**Plot 7-74. Occupied Bandwidth Plot (NR Band n25/2 - 5.0MHz CP-OFDM QPSK - Full RB - ANT2)**




**Plot 7-75. Occupied Bandwidth Plot (NR Band n25/2 - 5.0MHz CP-OFDM 16QAM - Full RB - ANT2)**

## 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 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 minimum permissible attenuation level of any spurious emission is 43 + 10 $log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.***

**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 20GHz (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

**Test Setup**

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

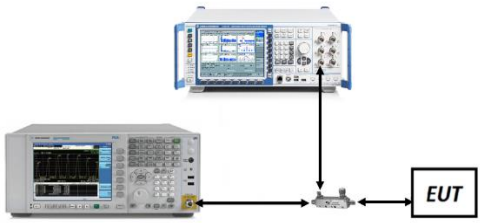


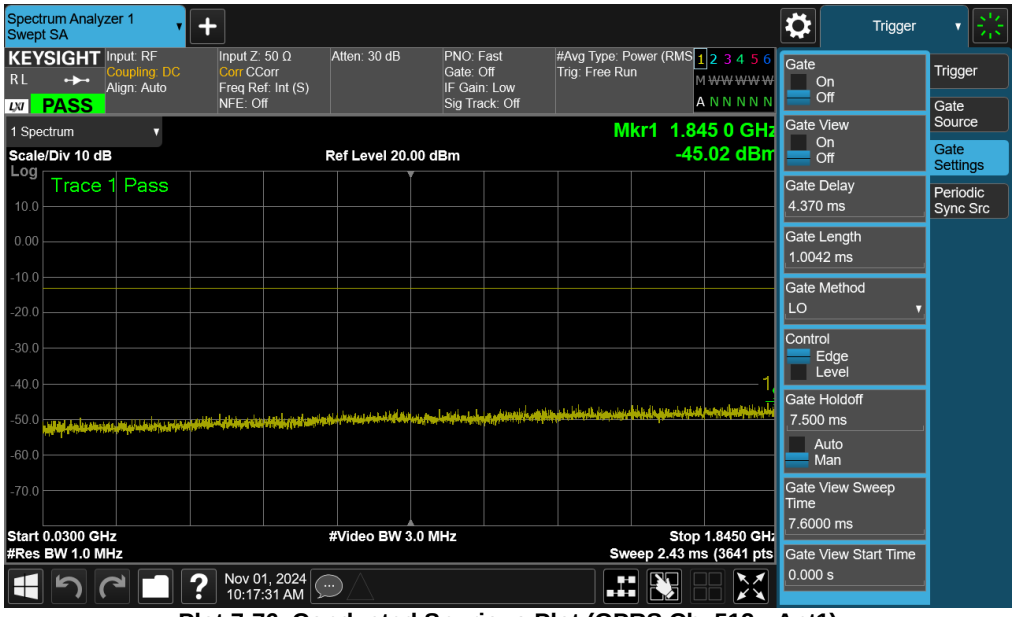

**Figure 7-3. Test Instrument & Measurement Setup**

**Test Notes**

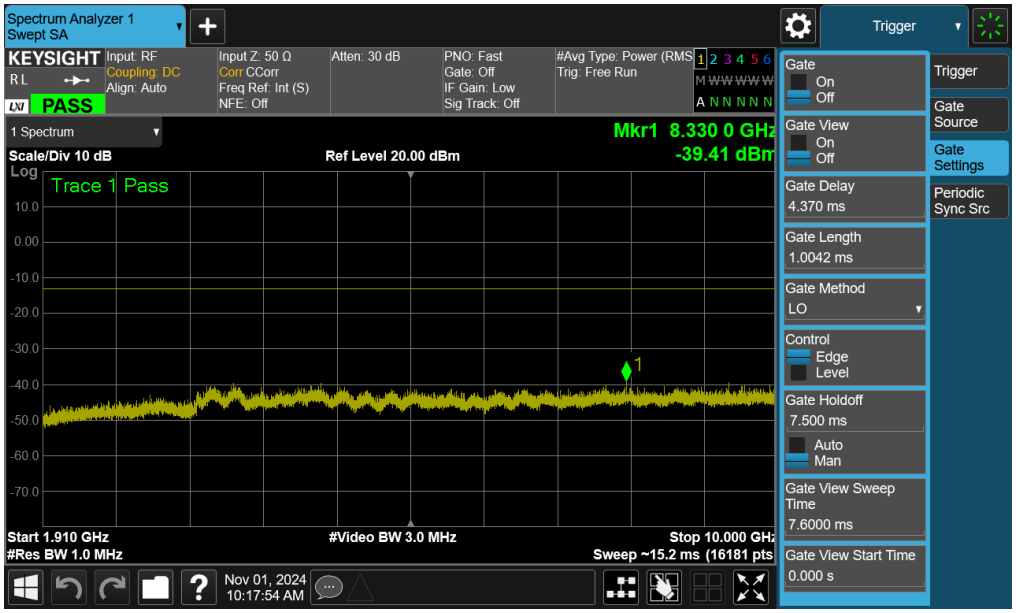
1. Per Part 24 and RSS-133, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz.

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.

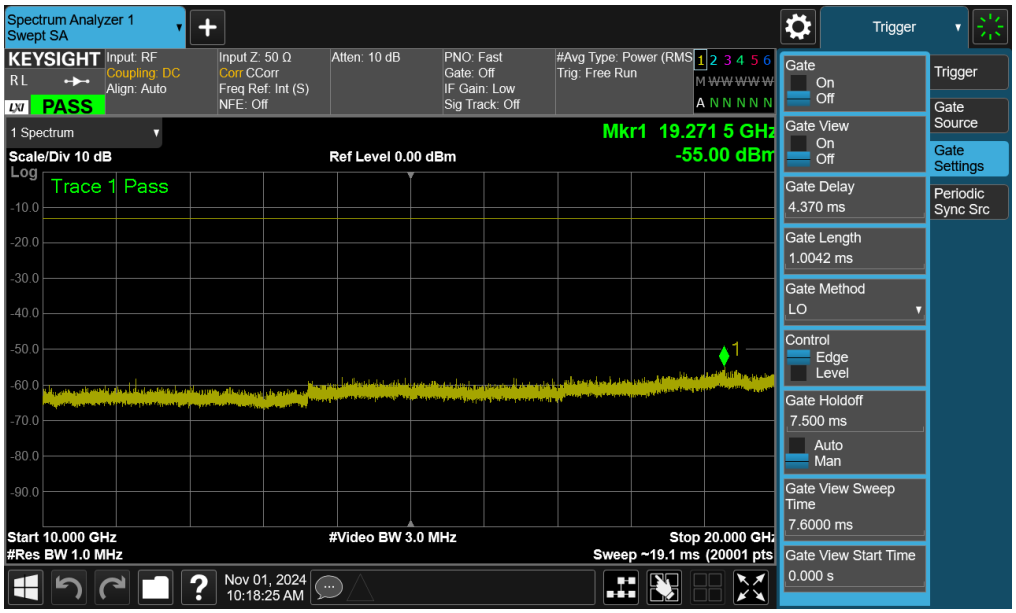
## GSM/GPRS PCS – Ant1



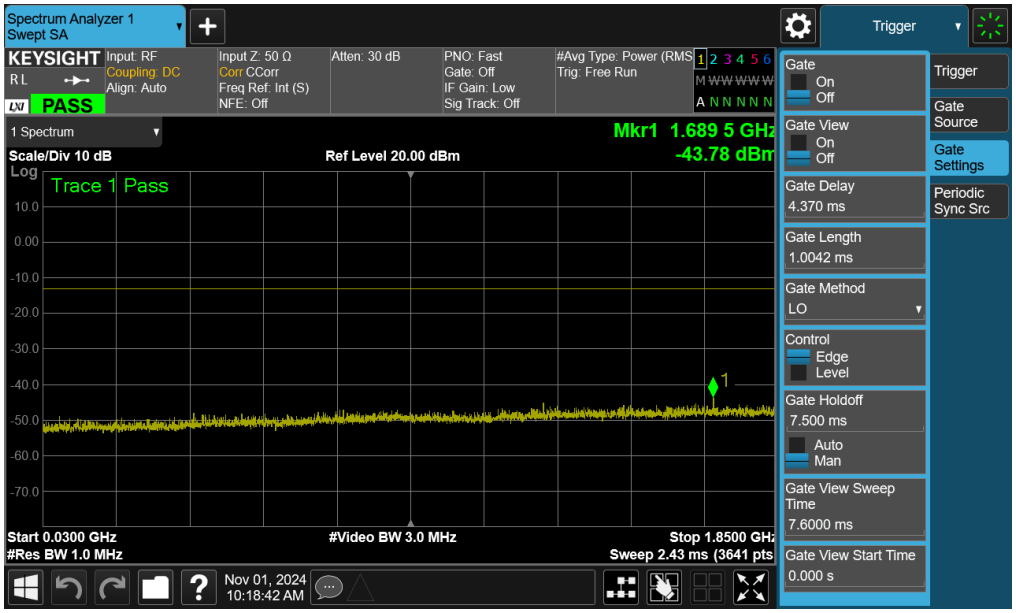

**Plot 7-76. Conducted Spurious Plot (GPRS Ch. 512 - Ant1)**



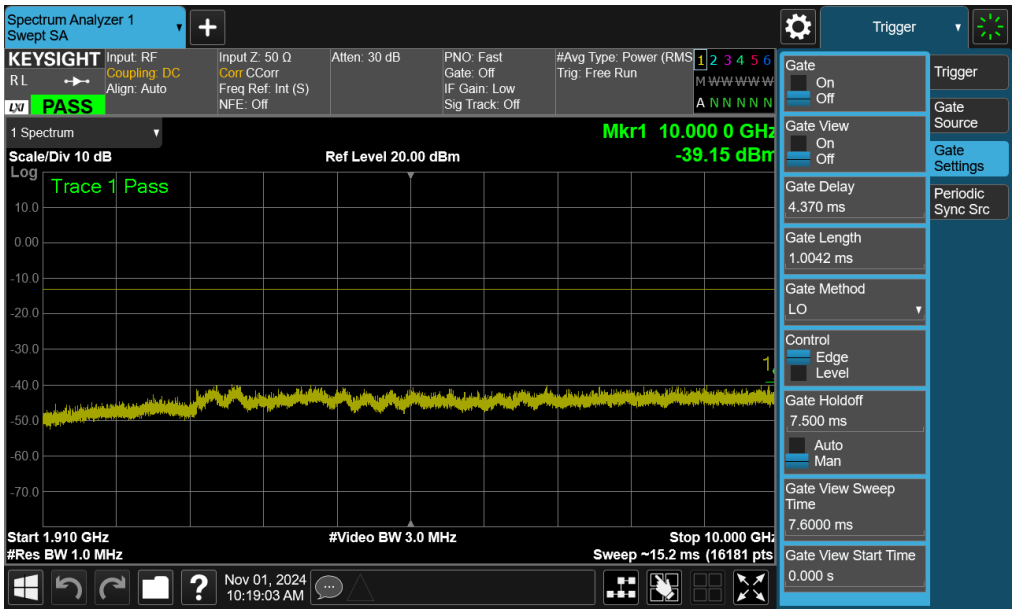

**Plot 7-77. Conducted Spurious Plot (GPRS Ch. 512 - Ant1)**



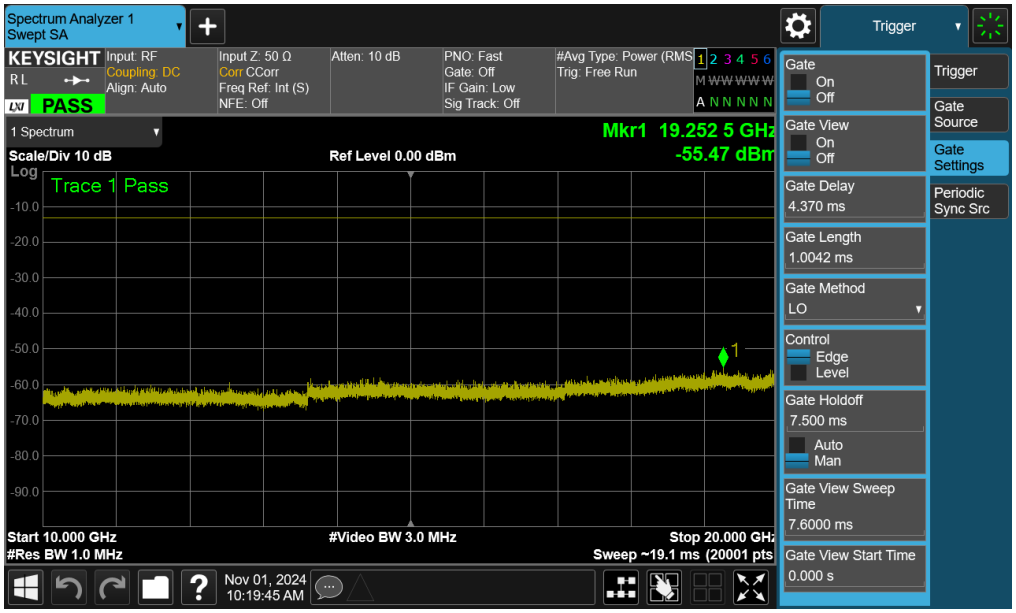

**Plot 7-78. Conducted Spurious Plot (GPRS Ch. 512 - Ant1)**



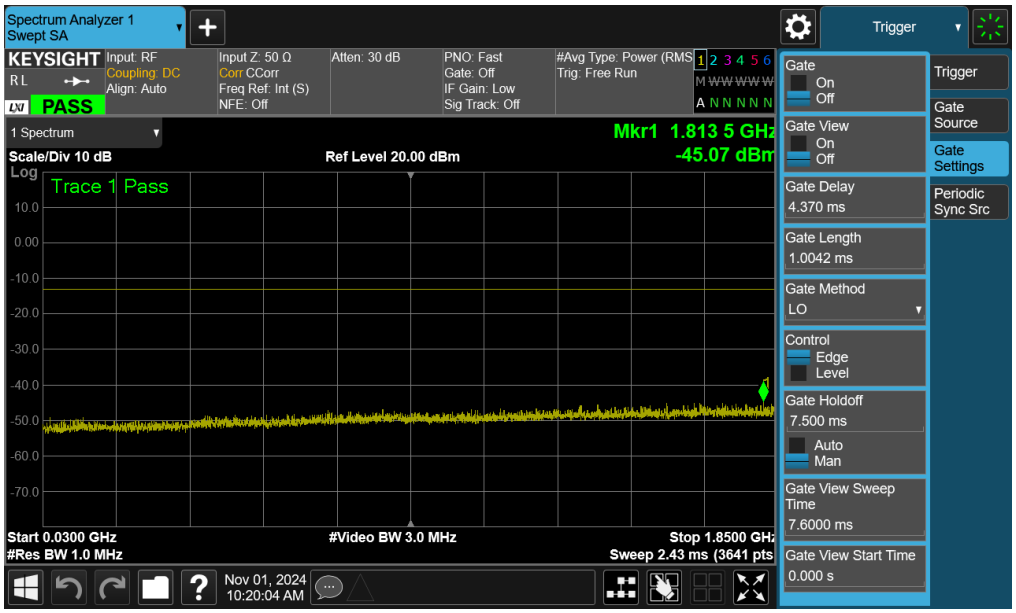

**Plot 7-79. Conducted Spurious Plot (GPRS Ch. 661 - Ant1)**



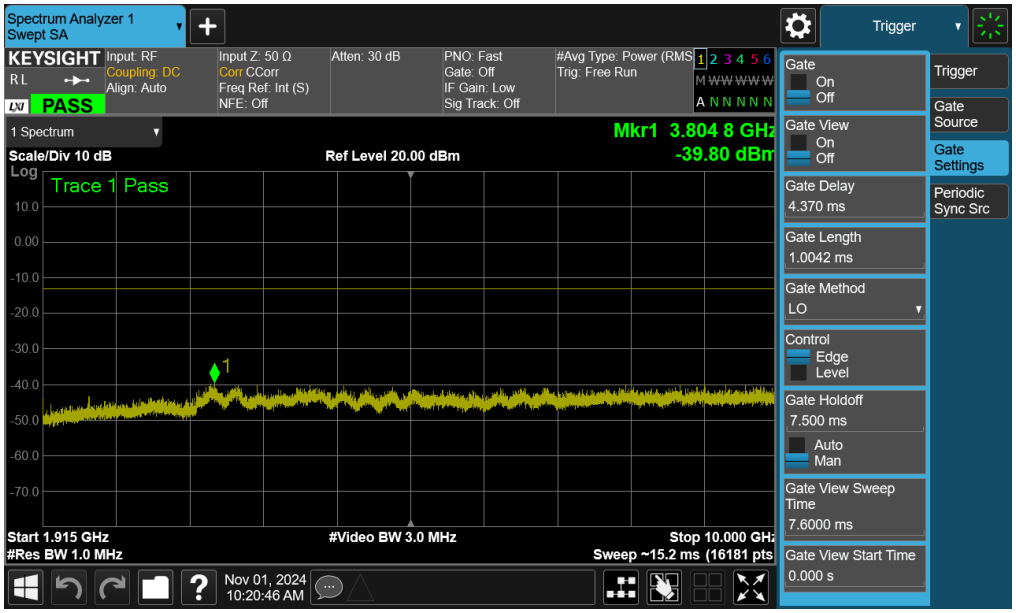

**Plot 7-80. Conducted Spurious Plot (GPRS Ch. 661 - Ant1)**



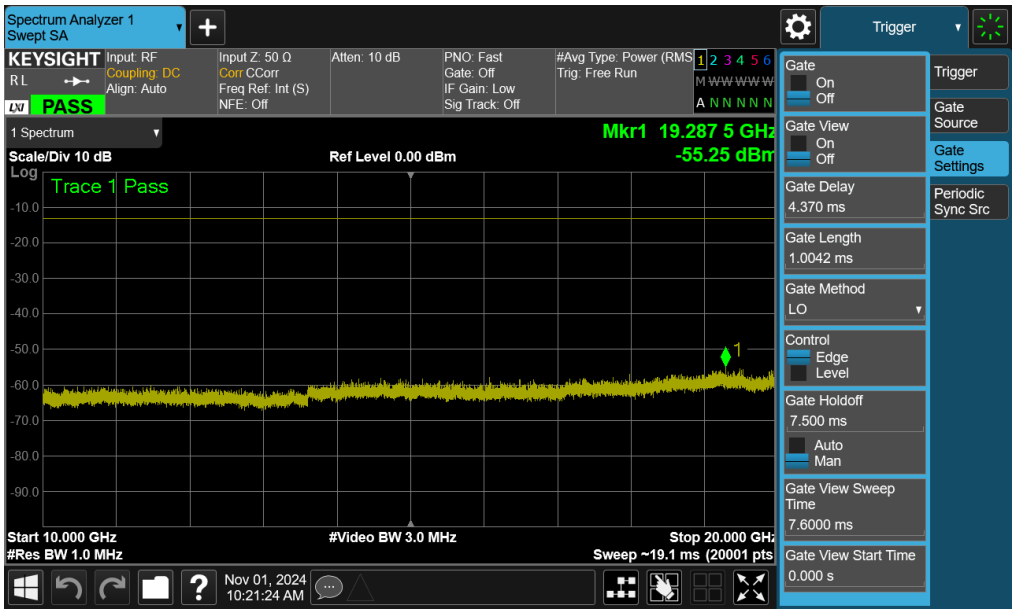

**Plot 7-81. Conducted Spurious Plot (GPRS Ch. 661 - Ant1)**




**Plot 7-82. Conducted Spurious Plot (GPRS Ch. 810 - Ant1)**

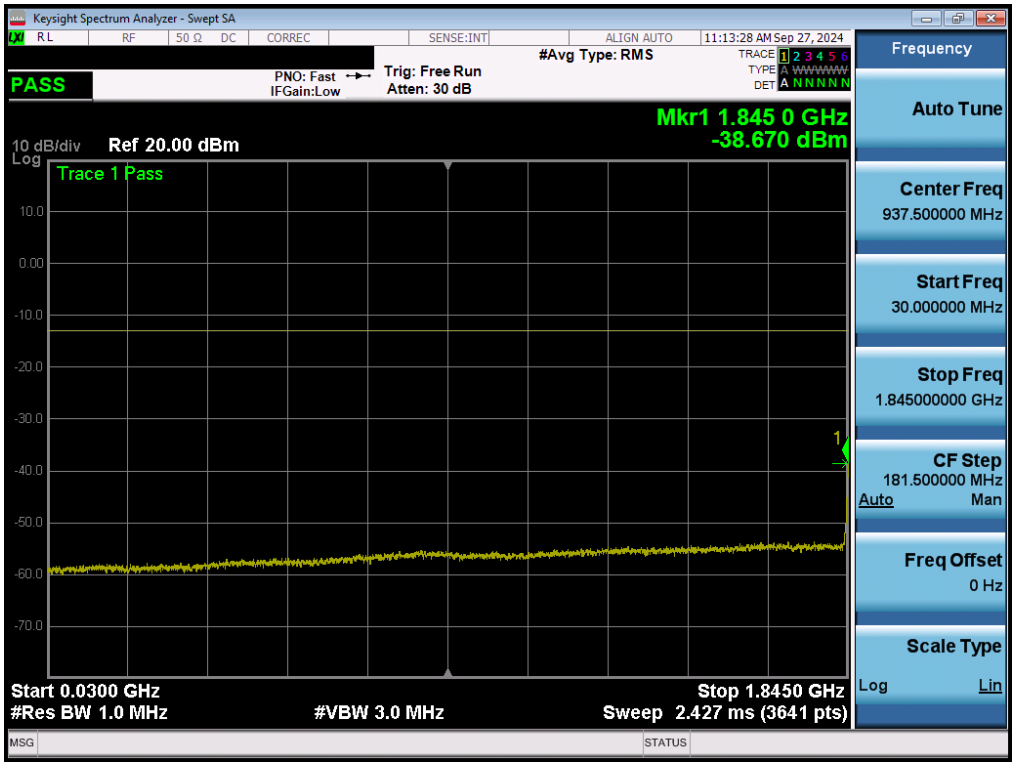



**Plot 7-83. Conducted Spurious Plot (GPRS Ch. 810 - Ant1)**

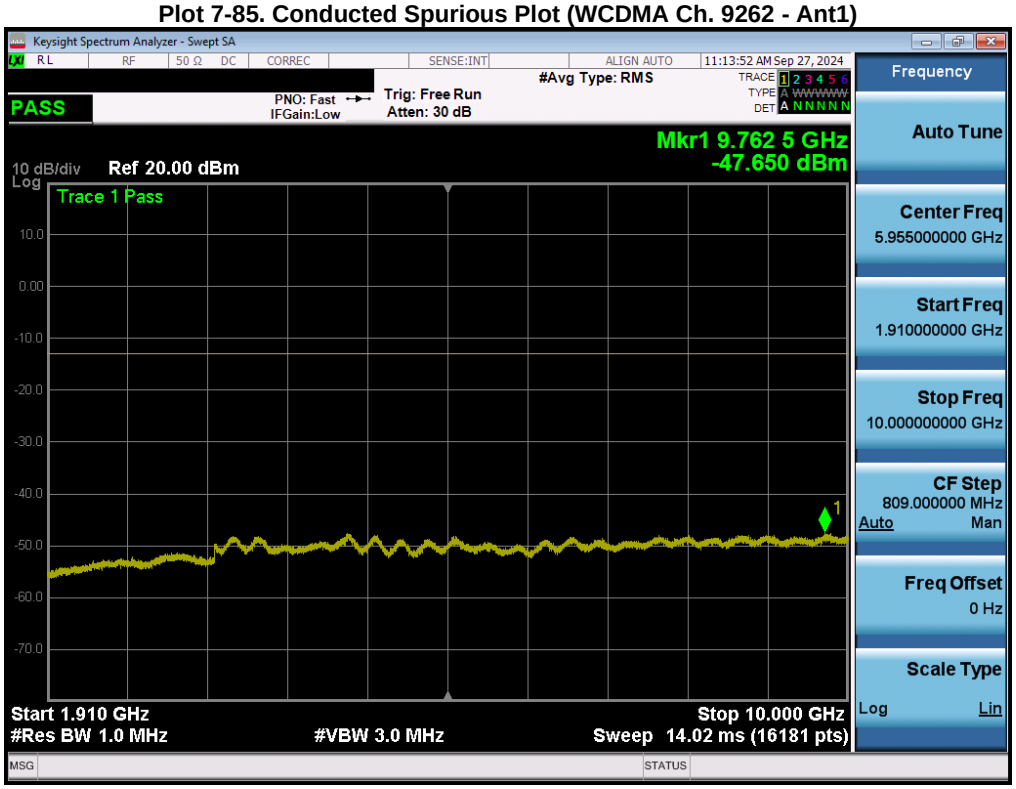



**Plot 7-84. Conducted Spurious Plot (GPRS Ch. 810 - Ant1)**

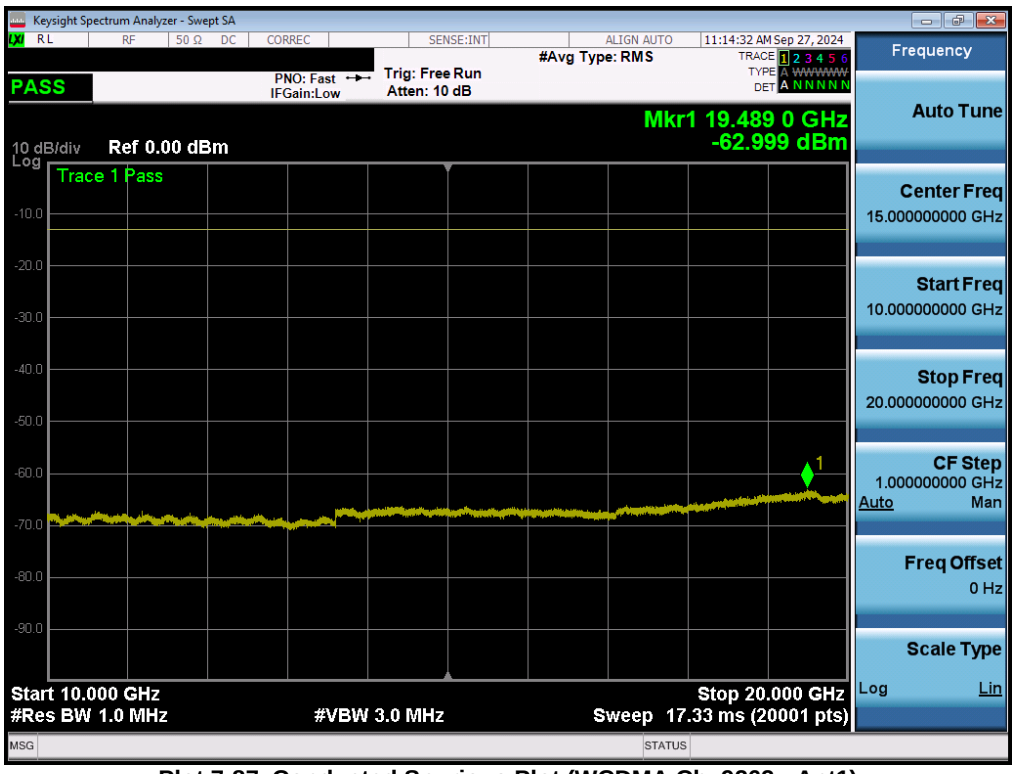
## WCDMA PCS – Ant1




**Plot 7-85. Conducted Spurious Plot (WCDMA Ch. 9262 - Ant1)**

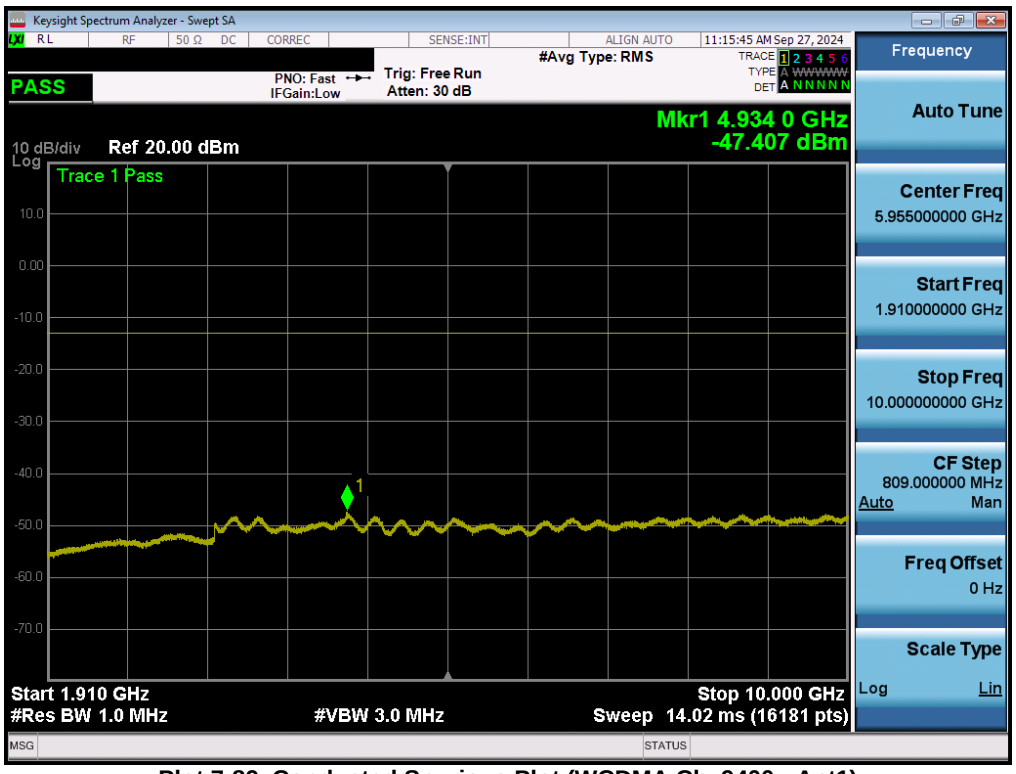



**Plot 7-86. Conducted Spurious Plot (WCDMA Ch. 9262 - Ant1)**

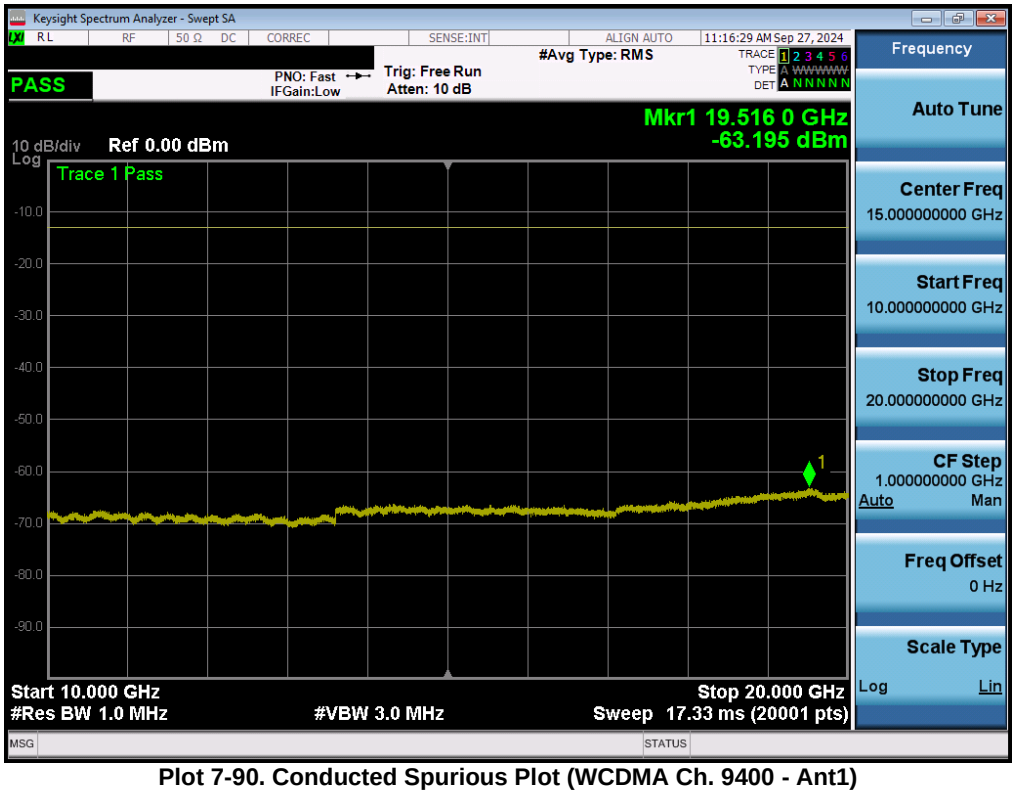



**Plot 7-87. Conducted Spurious Plot (WCDMA Ch. 9262 - Ant1)**

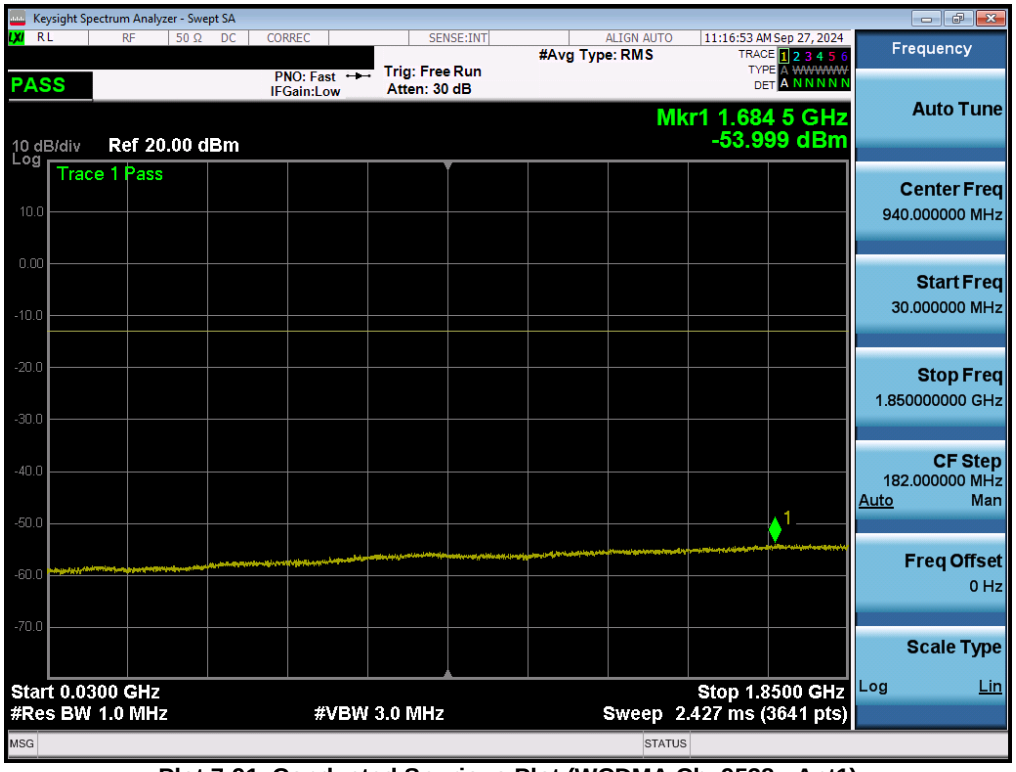

**Plot 7-88. Conducted Spurious Plot (WCDMA Ch. 9400 - Ant1)**



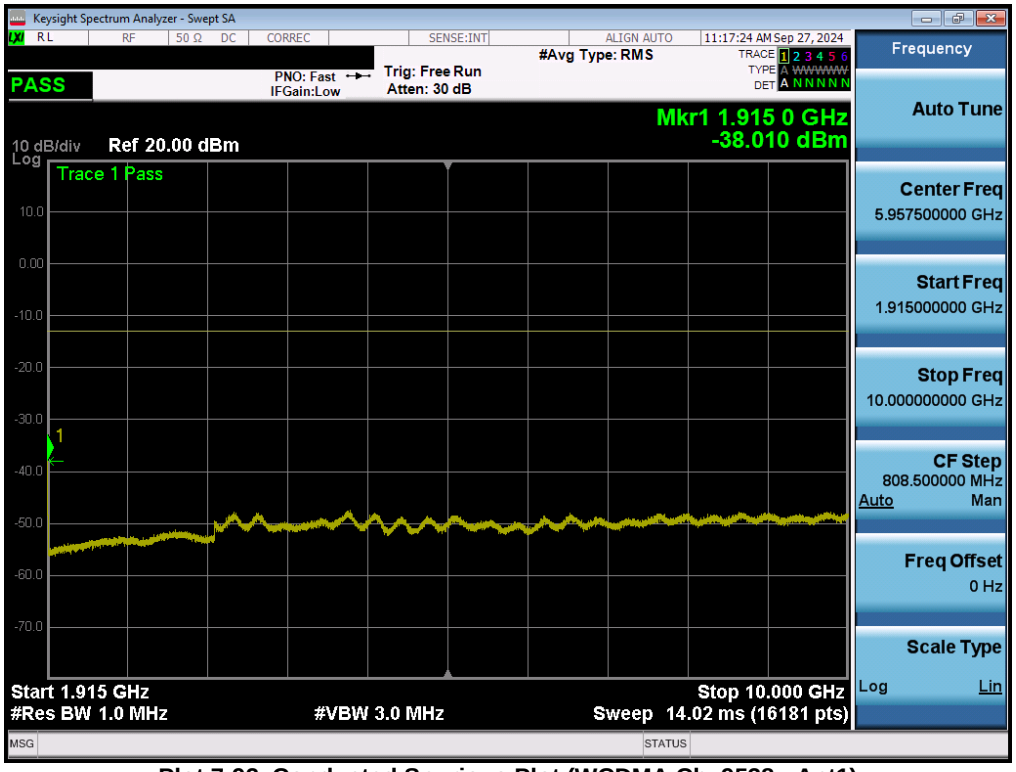

**Plot 7-89. Conducted Spurious Plot (WCDMA Ch. 9400 - Ant1)**



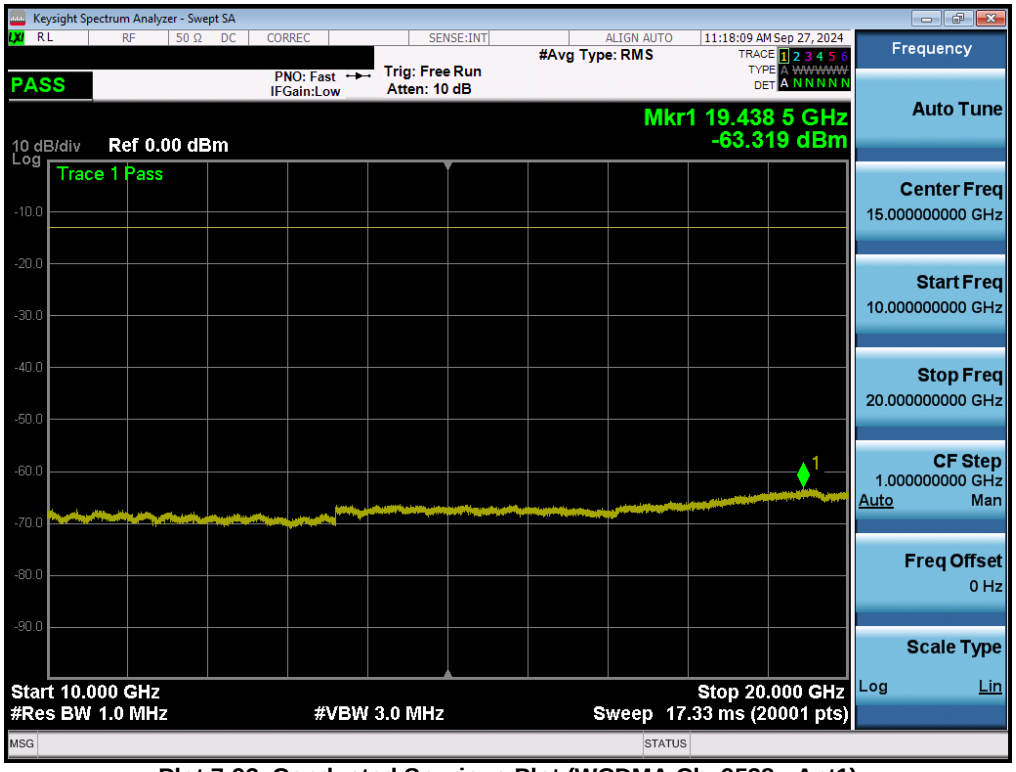

**Plot 7-90. Conducted Spurious Plot (WCDMA Ch. 9400 - Ant1)**




**Plot 7-91. Conducted Spurious Plot (WCDMA Ch. 9538 - Ant1)**

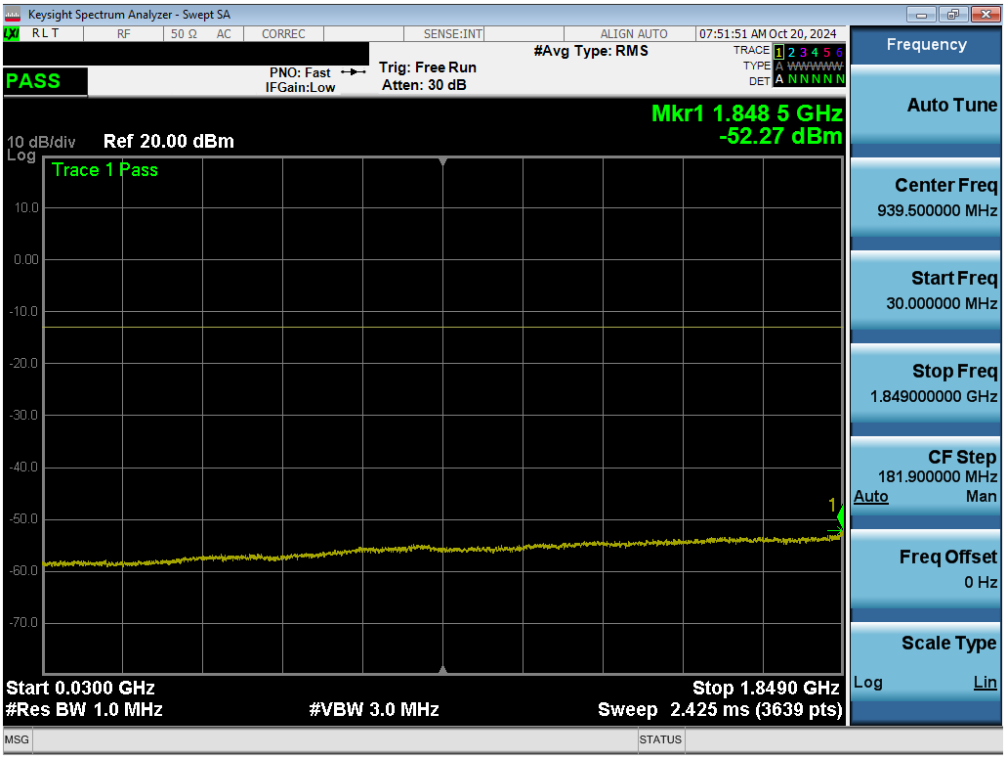



**Plot 7-92. Conducted Spurious Plot (WCDMA Ch. 9538 - Ant1)**

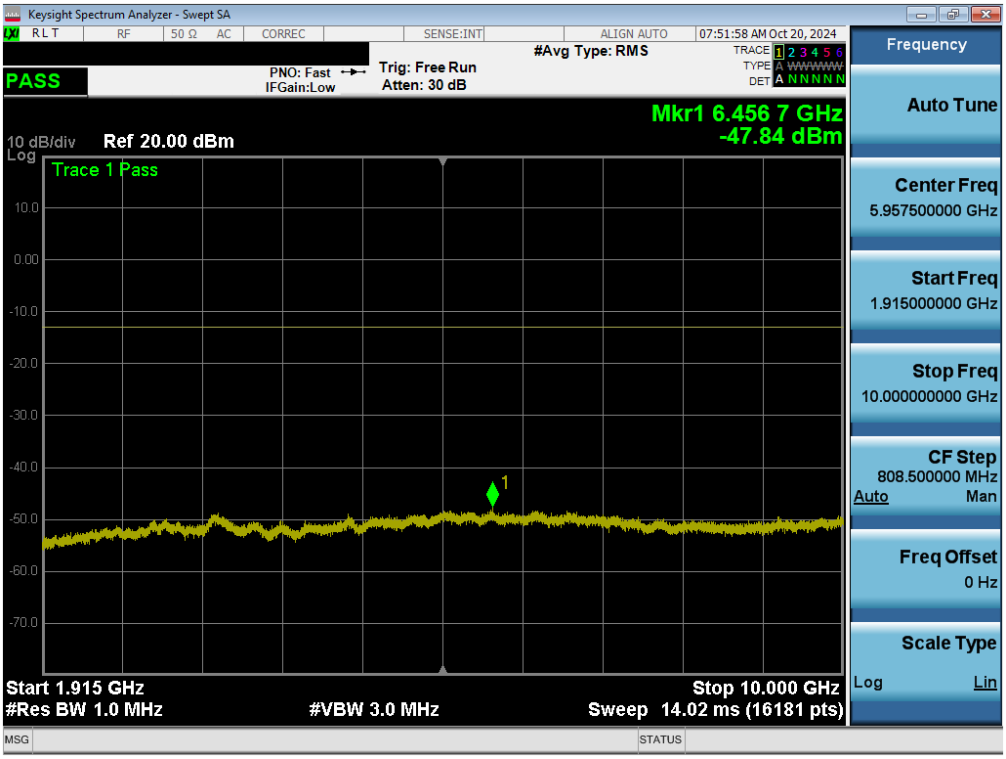



**Plot 7-93. Conducted Spurious Plot (WCDMA Ch. 9538 - Ant1)**

## LTE Band 25/2 – Ant1




**Plot 7-94. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - Low Channel - Ant1)**




**Plot 7-95. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - Low Channel - Ant1)**