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PART 27 MEASUREMENT REPORT

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

Date of Testing:
09/05/2024 - 11/13/2024
Test Report Issue Date:
11/14/2024
Test Site/Location:
Element Lab., Columbia, MD, USA
Element Lab., Morgan Hill, CA, USA
Test Report Serial No.:
1M2408260066-08.A3L

FCC ID:	**A3LSMS936B**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model:	SM-S936B/DS
Additional Model(s):	SM-S936B
EUT Type:	Portable Handset
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part:	27
Test Procedure(s):	ANSI C63.26-2015, KDB 648474 D03 v01r04

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

RJ Ortanez
Executive Vice President

ACCREDITED
CERT #2041.01

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FCC Part 27

Antenna-1								
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	ERP		EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	Max. Power [W]	Max. Power [dBm]	
LTE Band 12/17	10 MHz	QPSK	704.0 - 711.0	0.083	19.18	0.136	21.33	8M98G7D
		16QAM	704.0 - 711.0	0.066	18.23	0.109	20.38	8M99W7D
	5 MHz	QPSK	701.5 - 713.5	0.088	19.44	0.144	21.59	4M53G7D
		16QAM	701.5 - 713.5	0.069	18.39	0.113	20.54	4M52W7D
	3 MHz	QPSK	700.5 - 714.5	0.085	19.27	0.139	21.42	2M71G7D
		16QAM	700.5 - 714.5	0.074	18.68	0.121	20.83	2M72W7D
	1.4 MHz	QPSK	699.7 - 715.3	0.082	19.12	0.134	21.27	1M11G7D
		16QAM	699.7 - 715.3	0.067	18.28	0.110	20.43	1M10W7D
LTE Band 13	10 MHz	QPSK	782.0	0.051	17.07	0.083	19.22	9M02G7D
		16QAM	782.0	0.042	16.26	0.069	18.41	9M01W7D
	5 MHz	QPSK	779.5 - 784.5	0.055	17.38	0.090	19.53	4M52G7D
		16QAM	779.5 - 784.5	0.043	16.32	0.070	18.47	4M53W7D

Antenna-1						
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
WCDMA1700	N/A	Spread Spectrum	1712.4 - 1752.6	0.226	23.53	4M16F9W
LTE Band 66/4	20 MHz	QPSK	1720.0 - 1770.0	0.196	22.92	18M1G7D
		16QAM	1720.0 - 1770.0	0.159	22.02	18M1W7D
	15 MHz	QPSK	1717.5 - 1772.5	0.197	22.95	13M6G7D
		16QAM	1717.5 - 1772.5	0.162	22.10	13M5W7D
	10 MHz	QPSK	1715.0 - 1775.0	0.191	22.82	9M02G7D
		16QAM	1715.0 - 1775.0	0.163	22.12	9M04W7D
	5 MHz	QPSK	1712.5 - 1777.5	0.189	22.76	4M53G7D
		16QAM	1712.5 - 1777.5	0.164	22.16	4M53W7D
	3 MHz	QPSK	1711.5 - 1778.5	0.188	22.75	2M72G7D
		16QAM	1711.5 - 1778.5	0.171	22.34	2M73W7D
	1.4 MHz	QPSK	1710.7 - 1779.3	0.192	22.83	1M10G7D
		16QAM	1710.7 - 1779.3	0.157	21.97	1M11W7D

Antenna-1						
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
NR Band n66	45 MHz	π/2 BPSK	1732.5 - 1757.5	0.266	24.25	43M2G7D
		QPSK	1732.5 - 1757.5	0.256	24.08	43M5G7D
		16QAM	1732.5 - 1757.5	0.219	23.40	43M5W7D
	40 MHz	π/2 BPSK	1730.0 - 1760.0	0.264	24.21	38M7G7D
		QPSK	1730.0 - 1760.0	0.249	23.97	38M7G7D
		16QAM	1730.0 - 1760.0	0.207	23.15	38M7W7D
	35 MHz	π/2 BPSK	1727.5 - 1762.5	0.271	24.33	32M3G7D
		QPSK	1727.5 - 1762.5	0.270	24.31	33M8G7D
		16QAM	1727.5 - 1762.5	0.212	23.27	33M8W7D
	30MHz	π/2 BPSK	1725.0 - 1765.0	0.269	24.30	28M7W7D
		QPSK	1725.0 - 1765.0	0.271	24.33	28M7W7D
		16QAM	1725.0 - 1765.0	0.215	23.33	28M7W7D
	25 MHz	π/2 BPSK	1722.5 - 1767.5	0.267	24.26	23M1W7D
		QPSK	1722.5 - 1767.5	0.274	24.37	23M9W7D
		16QAM	1722.5 - 1767.5	0.204	23.09	23M9W7D
	20 MHz	π/2 BPSK	1720.0 - 1770.0	0.263	24.19	18M0G7D
		QPSK	1720.0 - 1770.0	0.254	24.05	19M0G7D
		16QAM	1720.0 - 1770.0	0.207	23.15	19M0W7D
	15 MHz	π/2 BPSK	1717.5 - 1772.5	0.263	24.20	13M5G7D
		QPSK	1717.5 - 1772.5	0.261	24.17	14M2G7D
		16QAM	1717.5 - 1772.5	0.250	23.99	14M2W7D
	10 MHz	π/2 BPSK	1715.0 - 1775.0	0.268	24.28	9M01G7D
		QPSK	1715.0 - 1775.0	0.270	24.31	9M33G7D
		16QAM	1715.0 - 1775.0	0.208	23.18	9M35W7D
	5 MHz	π/2 BPSK	1712.5 - 1777.5	0.269	24.30	4M52G7D
		QPSK	1712.5 - 1777.5	0.262	24.18	4M52G7D
		16QAM	1712.5 - 1777.5	0.212	23.27	4M50W7D

Antenna-2								
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	ERP		EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	Max. Power [W]	Max. Power [dBm]	
LTE Band 12/17	10 MHz	QPSK	704.0 - 711.0	0.096	19.83	0.158	21.98	9M00G7D
		16QAM	704.0 - 711.0	0.083	19.19	0.136	21.34	9M01W7D
	5 MHz	QPSK	701.5 - 713.5	0.097	19.85	0.159	22.00	4M51G7D
		16QAM	701.5 - 713.5	0.081	19.11	0.134	21.26	4M53W7D
	3 MHz	QPSK	700.5 - 714.5	0.097	19.88	0.160	22.03	2M72G7D
		16QAM	700.5 - 714.5	0.084	19.24	0.138	21.39	2M72W7D
	1.4 MHz	QPSK	699.7 - 715.3	0.088	19.45	0.145	21.60	1M10G7D
		16QAM	699.7 - 715.3	0.076	18.79	0.124	20.94	1M11W7D
LTE Band 13	10 MHz	QPSK	782.0	0.050	16.97	0.001	0.00	9M04G7D
		16QAM	782.0	0.042	16.26	0.081	19.07	9M01W7D
	5 MHz	QPSK	779.5 - 784.5	0.054	17.31	0.077	18.87	4M51G7D
		16QAM	779.5 - 784.5	0.047	16.72	0.001	0.00	4M51W7D

Antenna-2						
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
LTE Band 66/4	20 MHz	QPSK	1720.0 - 1770.0	0.158	21.97	18M0G7D
		16QAM	1720.0 - 1770.0	0.142	21.52	18M1W7D
	15 MHz	QPSK	1717.5 - 1772.5	0.152	21.81	13M5G7D
		16QAM	1717.5 - 1772.5	0.144	21.58	13M5W7D
	10 MHz	QPSK	1715.0 - 1775.0	0.156	21.94	9M03G7D
		16QAM	1715.0 - 1775.0	0.143	21.56	9M01W7D
	5 MHz	QPSK	1712.5 - 1777.5	0.152	21.81	4M52G7D
		16QAM	1712.5 - 1777.5	0.143	21.55	4M53W7D
	3 MHz	QPSK	1711.5 - 1778.5	0.159	22.03	2M72G7D
		16QAM	1711.5 - 1778.5	0.144	21.58	2M72W7D
	1.4 MHz	QPSK	1710.7 - 1779.3	0.143	21.56	1M11G7D
		16QAM	1710.7 - 1779.3	0.141	21.49	1M11W7D

Antenna-2						
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
NR Band n66	45 MHz	π/2 BPSK	1732.5 - 1757.5	0.145	21.60	43M2G7D
		QPSK	1732.5 - 1757.5	0.145	21.60	43M3G7D
		16QAM	1732.5 - 1757.5	0.142	21.53	43M4W7D
	40 MHz	π/2 BPSK	1730.0 - 1760.0	0.136	21.34	38M8G7D
		QPSK	1730.0 - 1760.0	0.143	21.55	39M0G7D
		16QAM	1730.0 - 1760.0	0.119	20.75	38M9W7D
	35 MHz	π/2 BPSK	1727.5 - 1762.5	0.138	21.39	32M4G7D
		QPSK	1727.5 - 1762.5	0.147	21.67	32M5G7D
		16QAM	1727.5 - 1762.5	0.118	20.73	32M4W7D
	30 MHz	π/2 BPSK	1725.0 - 1765.0	0.140	21.45	28M8G7D
		QPSK	1725.0 - 1765.0	0.146	21.66	28M8G7D
		16QAM	1725.0 - 1765.0	0.118	20.72	28M8W7D
	25 MHz	π/2 BPSK	1722.5 - 1767.5	0.137	21.36	2M31W7D
		QPSK	1722.5 - 1767.5	0.145	21.61	2M31W7D
		16QAM	1722.5 - 1767.5	0.112	20.50	2M30W7D
	20 MHz	π/2 BPSK	1720.0 - 1770.0	0.131	21.18	18M0G7D
		QPSK	1720.0 - 1770.0	0.143	21.55	18M0G7D
		16QAM	1720.0 - 1770.0	0.110	20.40	18M0W7D
	15 MHz	π/2 BPSK	1717.5 - 1772.5	0.133	21.25	13M5G7D
		QPSK	1717.5 - 1772.5	0.148	21.69	13M5G7D
		16QAM	1717.5 - 1772.5	0.111	20.46	13M5W7D
	10 MHz	π/2 BPSK	1715.0 - 1775.0	0.132	21.19	9M02G7D
		QPSK	1715.0 - 1775.0	0.145	21.62	9M02G7D
		16QAM	1715.0 - 1775.0	0.116	20.64	9M04W7D
	5 MHz	π/2 BPSK	1712.5 - 1777.5	0.134	21.26	4M53G7D
		QPSK	1712.5 - 1777.5	0.147	21.67	4M51G7D
		16QAM	1712.5 - 1777.5	0.116	20.63	4M54W7D

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).

Measurements were performed at Element located in Morgan Hill, CA 95037, U.S.A. ("CA")

- Element is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.02 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 facility is a registered (22831) test laboratory with the site description on file with ISED.

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMS936B**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitters that operate under the provisions of Part 27.

Test Device Serial No.: 2299M, 1268M, 1229M, 1287M, 1385M, 0135M, 1510M, 0129M, 0121M

2.2 Device Capabilities

This device contains the following capabilities:

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

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

2.3 Test Configuration

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

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

Band	Ant1	Ant2
WCDMA	Ant A	-
LTE Band 66/4	Ant A	Ant F
LTE Band B12/17, B13	Ant A	Ant E
NR Band n66	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 S936BXXU0AXJO 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

Contribution	Expanded Uncertainty (±dB)
Conducted Bench Top Measurements	1.65
Line Conducted Disturbance	2.71
Radiated Disturbance (<30MHz)	4.06
Radiated Disturbance (30MHz - 1GHz)	4.30
Radiated Disturbance (1 - 18GHz)	4.78
Radiated Disturbance (>18GHz)	4.79

Table 4-2. Measurement Uncertainty Budget – CA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
ETS-Lindgren	3117	Double Ridged Guide Antenna (1-18 GHz)	4/9/2024	Annual	4/9/2025	218555
Rohde & Schwarz	TS-PR18	Pre-Amplifier (1GHz - 18GHz)	5/29/2024	Annual	11/29/2024	102132
Rohde & Schwarz	TS-PR18	Pre-Amplifier (1GHz - 18GHz)	8/14/2024	Annual	8/15/2025	101648
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	5/29/2024	Annual	5/29/2025	101619
Rohde & Schwarz	ESW44	EMI Test Receiver	5/1/2024	Annual	5/1/2025	101867
Rohde & Schwarz	FSW67	Signal and Spectrum Analyzer (2Hz-67GHz)	7/5/2024	Annual	7/5/2025	101366
Rohde & Schwarz	TS-PR8	Pre-Amplifier (30MHz - 8GHz)	7/3/2024	Annual	7/3/2025	102356
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	11/30/2023	Annual	11/30/2024	161616
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	12/27/2023	Annual	12/27/2024	164715
Schwarzbeck	VULB 9162	Bilog Antenna (30MHz - 6GHz)	4/29/2024	Annual	4/29/2025	304

Table 5-2. Test Equipment Calibration Table – CA

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

Emission Designator

QPSK Modulation

Emission Designator = 8M62G7D

LTE BW = 8.62 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 8M45W7D

LTE BW = 8.45 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.

FCC ID: A3LSMS936B

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

Mode(s): WCDMA/LTE/NR

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference	Test Lab Location
CONDUCTED	Transmitter Conducted Output Power*	2.1046(a), 2.1046(c)	N/A	PASS	Section 7.2	MD
	Occupied Bandwidth	2.1049(h)	N/A	PASS	Section 7.3	MD
	Conducted Band Edge / Spurious Emissions (LTE Band 13)	2.1051, 27.53(c), 27.53(f)	Undesirable emissions must meet the limits detailed in sections 27.53(c) and 27.53(f)	PASS	Sections 7.4, 7.5	MD
	Conducted Band Edge / Spurious Emissions (LTE Band 12, 17)	2.1051, 27.53(g)	≥ 43 + 10 log (P[Watts]) dB of attenuation below transmitter power	PASS	Sections 7.4, 7.5	MD
	Conducted Band Edge / Spurious Emissions (WCDMA AWS; LTE Band 4, 66; NR Band n66)	2.1051, 27.53(h)	≥ 43 + 10 log (P[Watts]) dB of attenuation below transmitter power	PASS	Sections 7.4, 7.5	MD
	Peak-to-Average Ratio (WCDMA AWS; LTE Band 4, 66; NR Band n66)	27.50(d)(5)	≤ 13 dB	PASS	Section 7.6	MD
	Frequency Stability	2.1055, 27.54	Fundamental emissions stay within authorized frequency block	PASS	Section 7.9	MD
RADIATED	Effective Radiated Power (LTE Band 13)	27.50(b)(10)	≤ 3 Watts max. ERP	PASS	Section 7.7	MD
	Effective Radiated Power (LTE Band 12, 17)	27.50(c)(10)	≤ 3 Watts max. ERP	PASS	Section 7.7	MD
	Equivalent Isotropic Radiated Power (WCDMA AWS; LTE Band 4, 66; NR Band n66)	27.50(d)(4)	≤ 1 Watt max. EIRP	PASS	Section 7.7	MD
	Radiated Spurious Emissions (LTE Band 13)	2.1053, 27.53(c), 27.53(f)	Undesirable emissions must meet the limits detailed in sections 27.53(c) and 27.53(f)	PASS	Section 7.8	CA
	Radiated Spurious Emissions (LTE Band 12, 17)	2.1053, 27.53(g)	≥ 43 + 10 log (P[Watts]) dB of attenuation below transmitter power	PASS	Section 7.8	MD
	Radiated Spurious Emissions (WCDMA AWS; LTE Band 4, 66; NR Band n66)	2.1053, 27.53(h)(1)	≥ 43 + 10 log (P[Watts]) dB of attenuation below transmitter power	PASS	Section 7.8	MD/CA

* 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 shown in Section 7.0 were taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.

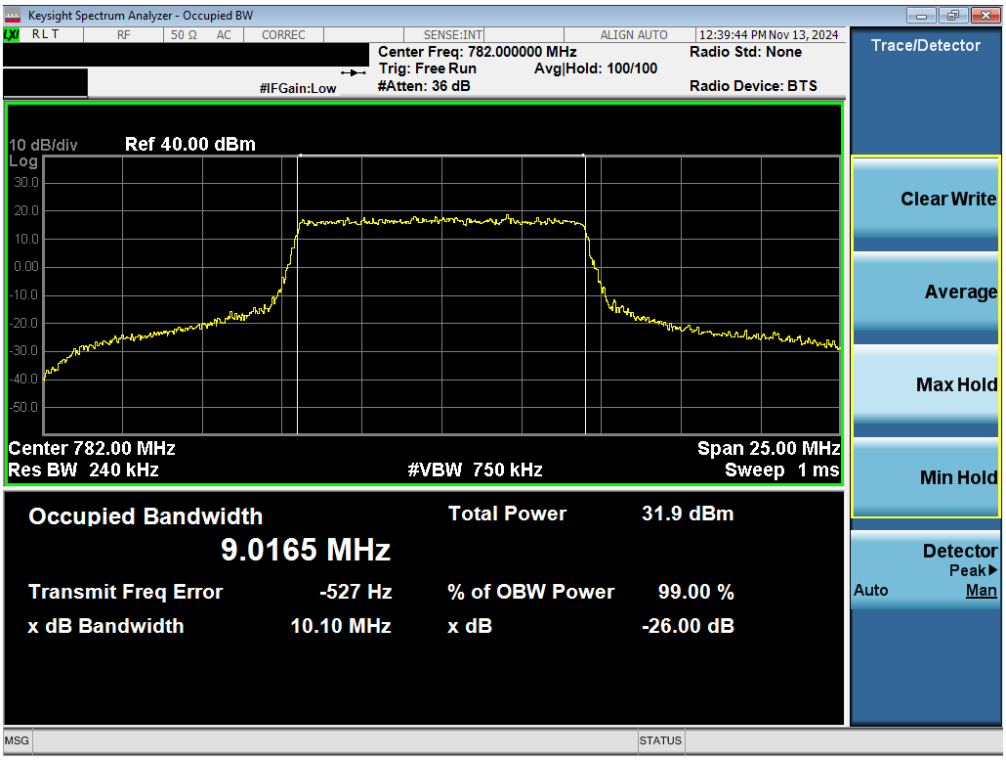
4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is EMC Software Tool v1.2.2.
5) Data was leveraged from model SM-S936U for the certification of SM-S936B/DS. See Table 7-2 for spot-check results.

FCC Rules	Test Item	Test Case	Units	Limit	Reference Model: SM-S936U	Variant Model: SM-S936B	Deviation (dB)	Max Deviation (dB)	Pass/Fail
27	Conducted Output Power	Mid Ch., 10MHz, QPSK, Ant A	dBm	N/A	24.22	23.95	-0.27	1	PASS
	Occupied Bandwidth	Mid Ch., 10MHz, QPSK, Ant A	dBm	N/A	9.0214	9.017	-	N/A	PASS
	ERP	Mid Ch., 10MHz, QPSK, Ant A	dBm	34.77	17.07	17.92	0.85	3	PASS
	RSE	Mid Ch., 10MHz, 1542.7MHz, Ant A	dBm	-40	-68.53	-67.17	1.36	3	PASS

Table 7-2. Summary of Spot-Checks – LTE Band 13

Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
QPSK	23230	782.0	1 / 25	23.96

Table 7-3. Conducted Output Power Measurements (Spot-check) – LTE Band 13



Plot 7-1. Occupied Bandwidth (Spot-check) – LTE Band 13

Mod.	Frequency [MHz]	Ant. Pol. [H/V]	EUT Pol.	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
QPSK	782.00	H	X	159	54	1.39	1 / 25	18.05	**19.44**	0.088	36.99	-17.55	**17.29**	0.054	34.77	-17.48

Table 7-4. ERP Measurements (Spot-check) – LTE Band 13

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]
1564.00	V	-	-	-77.46	-1.45	28.09	-67.17	-40.00	-27.17

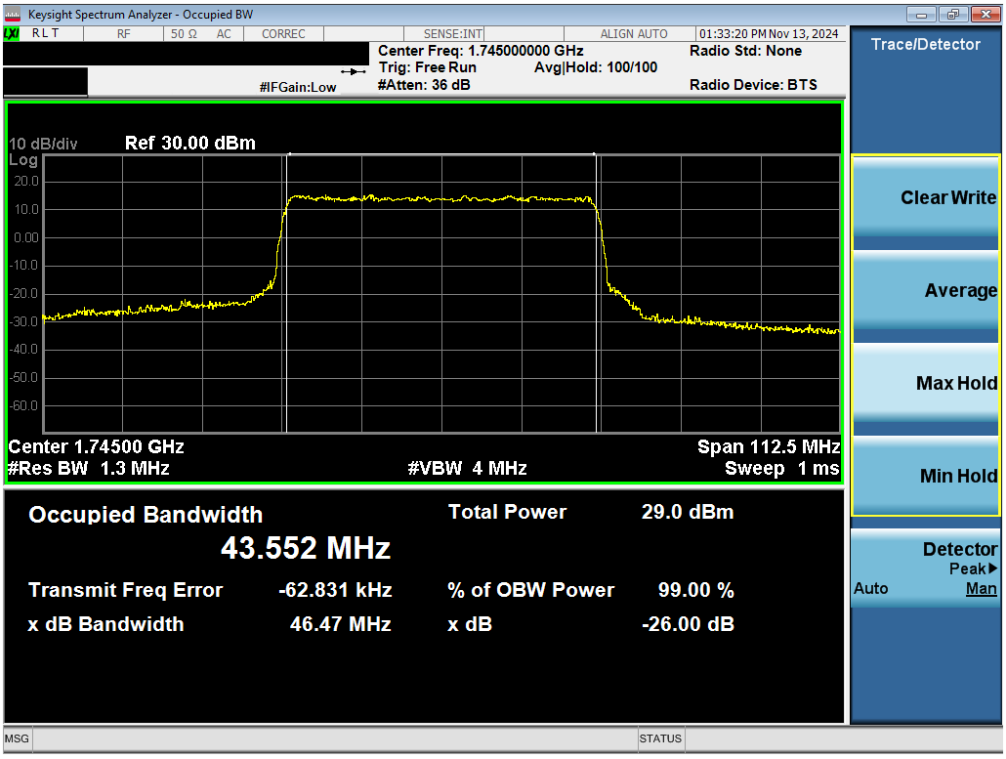
Table 7-5. Radiated Spurious Measurements (Spot-check) – LTE Band 13

FCC Rules	Test Item	Test Case	Units	Limit	Reference Model: SM-S936U	Variant Model: SM-S936B	Deviation (dB)	Max Deviation (dB)	Pass/Fail
27	Conducted Output Power	Mid Ch., 45MHz, DFTs-QPSk, Ant A	dBm	N/A	23.85	23.03	-0.82	1	PASS
	Occupied Bandwidth	Mid Ch., 45MHz, CP-QPSK, Ant A	dBm	N/A	43.504	43.55	-	N/A	PASS
	EIRP	High Ch., 45MHz, BPSk, Ant A	dBm	>30	24.25	22.64	-1.61	3	PASS
	RSE	Mid Ch., 45MHz, 3490MHz, Ant A	dBm	-13	-62.91	-62.47	0.44	3	PASS

Table 7-5. Summary of Spot-Checks – NR Band n66

Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
QPSK	346000	1732.5	1 / 1	23.03

Table 7-6. Conducted Output Power Measurements (Spot-check) – NR Band n66



Plot 7-2. Occupied Bandwidth (Spot-check) – NR Band n66

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	EUT Pol.	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
40 MHz	π/2 BPSK	1760.00	V	Y	115	321	2.99	1 / 214	19.65	**22.64**	0.184	30.00	-7.36

Table 7-7. EIRP Measurements (Spot-check) – NR Band n66

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]
3490.00	V	-	-	-77.53	3.31	32.78	-62.47	-13.00	-49.47

Table 7-8. Radiated Spurious Measurements (Spot-check) – NR Band n66

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 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.

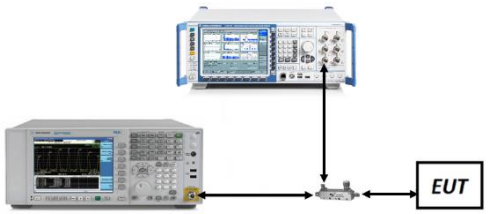


Figure 7-1. Test Instrument & Measurement Setup

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.

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
20 MHz	QPSK	132072	1720.0	1 / 0	22.58
		132322	1745.0	1 / 50	22.14
		132572	1770.0	1 / 50	22.42
	16-QAM	132072	1720.0	1 / 50	21.63
15 MHz	QPSK	132047	1717.5	1 / 37	22.62
		132322	1745.0	1 / 37	22.63
		132597	1772.5	1 / 37	22.57
	16-QAM	132047	1717.5	1 / 0	21.72
10 MHz	QPSK	132022	1715.0	1 / 0	22.48
		132322	1745.0	1 / 0	22.36
		132622	1775.0	1 / 0	22.36
	16-QAM	132022	1715.0	1 / 0	21.73
5 MHz	QPSK	131997	1712.5	1 / 0	22.42
		132322	1745.0	1 / 12	22.33
		132647	1777.5	1 / 12	22.46
	16-QAM	131997	1712.5	1 / 12	21.77
3 MHz	QPSK	131987	1711.5	1 / 14	22.41
		132322	1745.0	1 / 7	22.28
		132657	1778.5	1 / 7	22.24
	16-QAM	131987	1711.5	1 / 7	21.95
1.4 MHz	QPSK	131979	1710.7	1 / 3	22.49
		132322	1745.0	1 / 0	22.21
		132665	1779.3	1 / 3	22.27
	16-QAM	131979	1710.7	1 / 0	21.58

Table 7-6. Max Conducted Power Test Results - LTE 66/4 - Ant2

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
45 MHz	π/2 BPSK	346000	1733.5	1 / 1	23.84
		349000	1745.0	1 / 1	23.68
		352000	1757.5	1 / 1	23.67
	QPSK	346000	1733.5	1 / 1	23.78
		349000	1745.0	1 / 1	23.85
		352000	1757.5	1 / 1	23.57
	16-QAM	352000	1757.5	1 / 1	22.86
40 MHz	π/2 BPSK	346000	1730.0	1 / 108	23.87
		349000	1745.0	1 / 1	23.84
		352000	1760.0	1 / 214	23.62
	QPSK	346000	1730.0	1 / 108	23.81
		349000	1745.0	1 / 1	23.61
		352000	1760.0	1 / 214	23.46
	16-QAM	352000	1760.0	1 / 214	22.60
35 MHz	π/2 BPSK	345000	1725.0	1 / 1	23.97
		349000	1745.0	1 / 94	23.68
		353000	1765.0	1 / 94	23.75
	QPSK	345000	1725.0	1 / 1	24.13
		349000	1745.0	1 / 94	23.59
		353000	1765.0	1 / 94	23.80
	16-QAM	345000	1725.0	1 / 1	23.16
30 MHz	π/2 BPSK	345000	1725.0	1 / 1	24.18
		349000	1745.0	1 / 1	23.93
		353000	1765.0	1 / 1	23.73
	QPSK	345000	1725.0	1 / 1	24.19
		349000	1745.0	1 / 1	23.73
		353000	1765.0	1 / 1	23.57
	16-QAM	345000	1725.0	1 / 1	23.22
25 MHz	π/2 BPSK	344500	1722.5	1 / 1	24.21
		349000	1745.0	1 / 1	23.71
		353500	1767.5	1 / 66	23.68
	QPSK	344500	1722.5	1 / 1	24.21
		349000	1745.0	1 / 1	23.87
		353500	1767.5	1 / 66	23.87
	16-QAM	353500	1767.5	1 / 66	22.56
20 MHz	π/2 BPSK	344000	1720.0	1 / 53	24.05
		349000	1745.0	1 / 1	23.79
		354000	1770.0	1 / 1	23.62
	QPSK	344000	1720.0	1 / 53	23.92
		349000	1745.0	1 / 1	23.62
		354000	1770.0	1 / 1	23.50
	16-QAM	344000	1720.0	1 / 53	23.04
15 MHz	π/2 BPSK	343500	1717.5	1 / 1	24.07
		349000	1745.0	1 / 1	23.64
		354500	1772.5	1 / 1	23.63
	QPSK	343500	1717.5	1 / 1	24.03
		349000	1745.0	1 / 1	23.70
		354500	1772.5	1 / 1	23.63
	16-QAM	343500	1717.5	1 / 1	23.88
10 MHz	π/2 BPSK	343000	1715.0	1 / 50	24.11
		349000	1745.0	1 / 1	23.60
		355000	1775.0	1 / 26	23.70
	QPSK	343000	1715.0	1 / 50	24.17
		349000	1745.0	1 / 1	23.73
		355000	1775.0	1 / 26	23.47
	16-QAM	343000	1715.0	1 / 50	23.07
5 MHz	π/2 BPSK	342500	1712.5	1 / 12	24.30
		349000	1745.0	1 / 12	23.70
		355500	1777.5	1 / 23	23.63
	QPSK	342500	1712.5	1 / 12	24.05
		349000	1745.0	1 / 12	23.51
		355500	1777.5	1 / 23	23.51
	16-QAM	342500	1712.5	1 / 12	23.14

Table 7-7. Max Conducted Power Test Results - NR n66 – Ant1

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
40 MHz	π/2 BPSK	346000	1730.0	1 / 214	23.24
		349000	1745.0	1 / 108	23.14
		352000	1760.0	1 / 108	23.00
	QPSK	346000	1730.0	1 / 214	23.20
		349000	1745.0	1 / 108	23.02
		352000	1760.0	1 / 108	23.05
	16-QAM	349000	1745.0	1 / 108	22.24
35 MHz	π/2 BPSK	345500	1727.5	1 / 186	23.03
		349000	1745.0	1 / 94	22.96
		352500	1762.5	1 / 1	22.96
	QPSK	345500	1727.5	1 / 186	23.09
		349000	1745.0	1 / 94	23.02
		352500	1762.5	1 / 1	22.81
	16-QAM	349000	1745.0	1 / 94	22.14
30 MHz	π/2 BPSK	345000	1725.0	1 / 158	23.09
		349000	1745.0	1 / 1	23.02
		353000	1765.0	1 / 1	22.99
	QPSK	345000	1725.0	1 / 158	23.07
		349000	1745.0	1 / 80	23.00
		353000	1765.0	1 / 1	23.00
	16-QAM	345000	1725.0	1 / 158	21.98
25 MHz	π/2 BPSK	344500	1722.5	1 / 66	22.89
		349000	1745.0	1 / 1	23.07
		353500	1767.5	1 / 1	23.17
	QPSK	344500	1722.5	1 / 66	22.94
		349000	1745.0	1 / 1	22.95
		353500	1767.5	1 / 1	22.56
	16-QAM	344500	1722.5	1 / 66	21.76
		349000	1745.0	1 / 1	22.01
		353500	1767.5	1 / 1	21.85
20 MHz	π/2 BPSK	344000	1720.0	1 / 104	22.82
		349000	1745.0	1 / 104	22.86
		354000	1770.0	1 / 1	22.80
	QPSK	344000	1720.0	1 / 104	22.93
		349000	1745.0	1 / 104	22.89
		354000	1770.0	1 / 1	22.86
	16-QAM	344000	1720.0	1 / 104	21.65
		349000	1745.0	1 / 104	22.01
		354000	1770.0	1 / 1	21.57
15 MHz	π/2 BPSK	343500	1717.5	1 / 1	22.88
		349000	1745.0	1 / 1	22.96
		354500	1772.5	1 / 1	22.82
	QPSK	343500	1717.5	75 / 0	22.75
		349000	1745.0	1 / 1	23.03
		354500	1772.5	1 / 1	22.67
	16-QAM	343500	1717.5	75 / 0	21.71
		349000	1745.0	1 / 1	22.13
		354500	1772.5	1 / 1	21.62
10 MHz	π/2 BPSK	343000	1715.0	1 / 1	22.71
		349000	1745.0	1 / 26	22.90
		355000	1775.0	1 / 1	22.72
	QPSK	343000	1715.0	1 / 1	22.75
		349000	1745.0	1 / 26	22.96
		355000	1775.0	1 / 1	22.53
	16-QAM	343000	1715.0	1 / 1	21.90
		349000	1745.0	1 / 26	21.89
		355000	1775.0	1 / 1	21.53
5 MHz	π/2 BPSK	342500	1712.5	1 / 12	22.66
		349000	1745.0	1 / 12	22.97
		355500	1777.5	1 / 12	22.73
	QPSK	342500	1712.5	1 / 12	22.77
		349000	1745.0	1 / 12	23.01
		355500	1777.5	1 / 12	22.46
	16-QAM	342500	1712.5	1 / 12	21.89
		349000	1745.0	1 / 12	21.95
		355500	1777.5	1 / 12	21.50

Table 7-8. Max Conducted Power Test Results - NR n66 - 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.

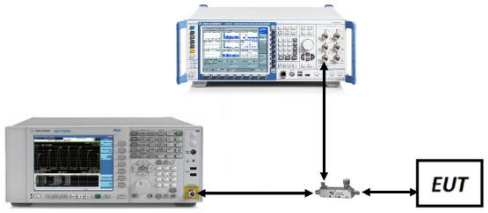


Figure 7-2. Test Instrument & Measurement Setup

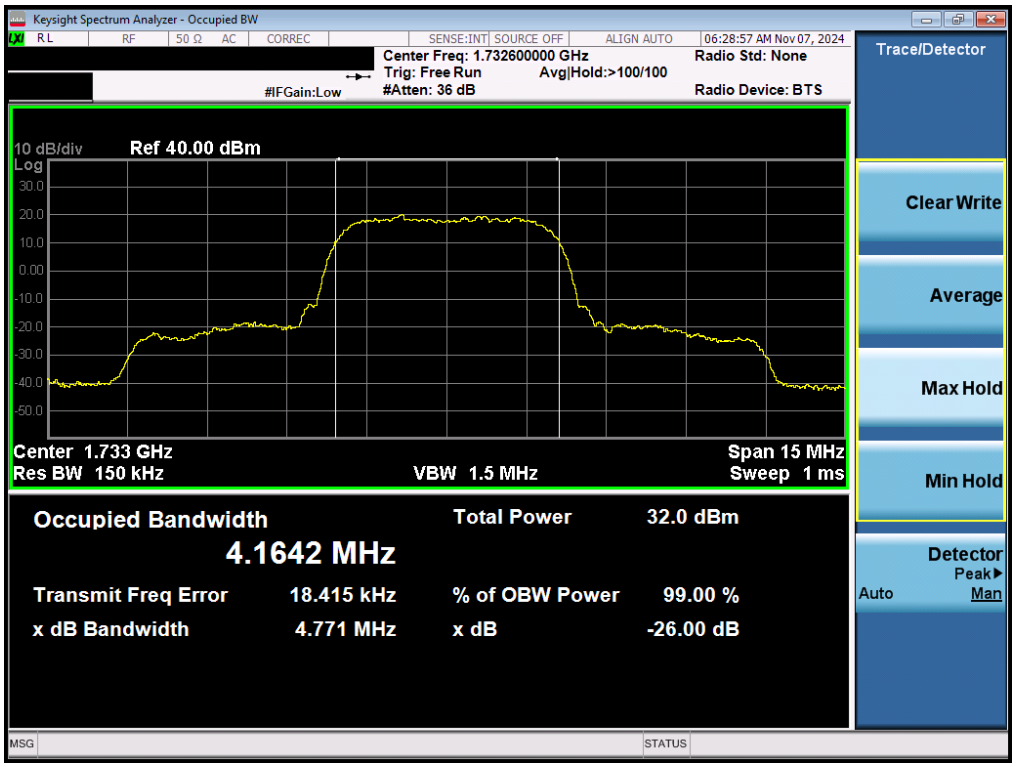
Test Notes

None.

Mode	Bandwidth	Modulation	OBW [MHz]
WCDMA-AWS	5MHz	GMSK	4.164
LTE-B12	10MHz	QPSK	8.98
		16QAM	8.99
	5MHz	QPSK	4.53
		16QAM	4.52
	3MHz	QPSK	2.71
		16QAM	2.72
	1.4MHz	QPSK	1.11
		16QAM	1.10
LTE-B13	10MHz	QPSK	9.02
		16QAM	9.01
	5MHz	QPSK	4.52
		16QAM	4.53
LTE-B66-4	20MHz	QPSK	17.99
		16QAM	18.09
	15MHz	QPSK	13.56
		16QAM	13.53
	10MHz	QPSK	9.02
		16QAM	9.04
	5MHz	QPSK	4.53
		16QAM	4.53
	3MHz	QPSK	2.72
		16QAM	2.73
	1.4MHz	QPSK	1.10
		16QAM	1.11

Table 7-9. Occupied Bandwidth Results – Ant1

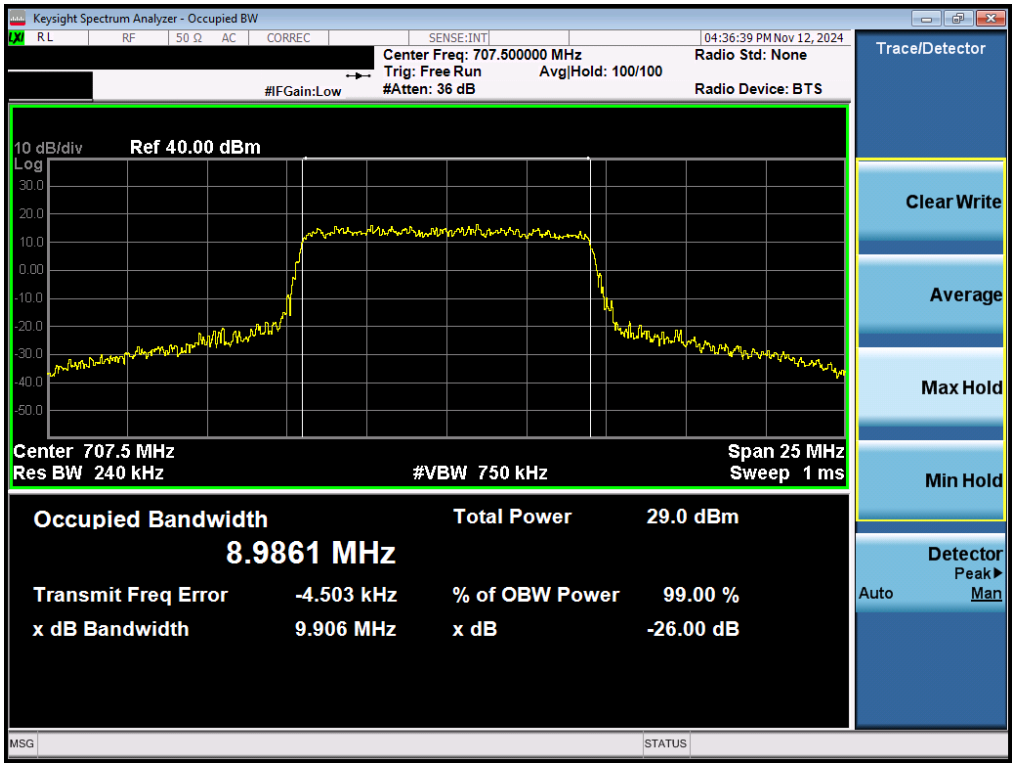
WCDMA AWS – ANT1



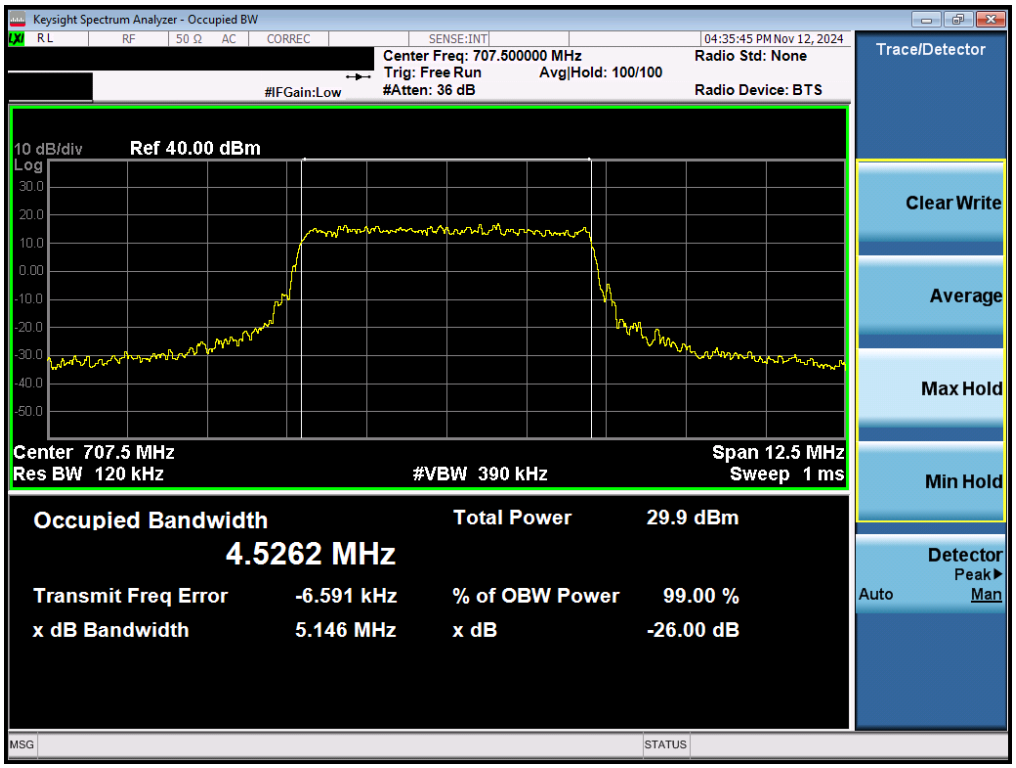
Plot 7-2. Occupied Bandwidth Plot (WCDMA, Ch. 1413 – ANT1)

LTE Band 12/17 – ANT1

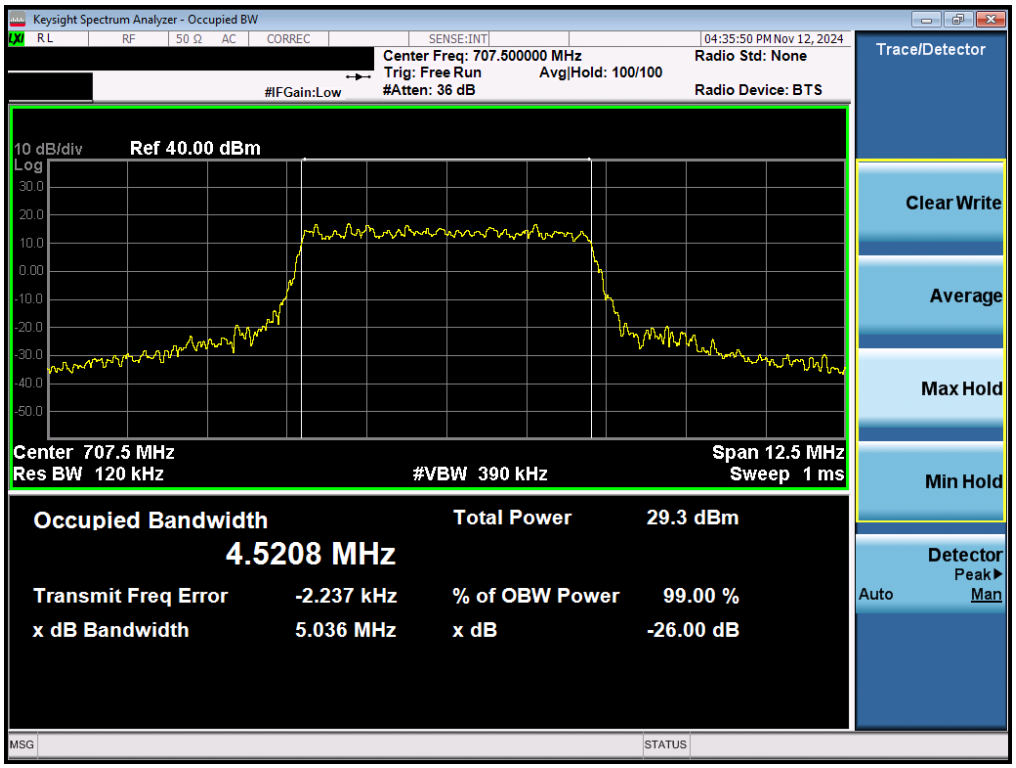
Plot 7-3. Occupied Bandwidth Plot (LTE Band 12/17 - 10MHz QPSK - Full RB – ANT1)



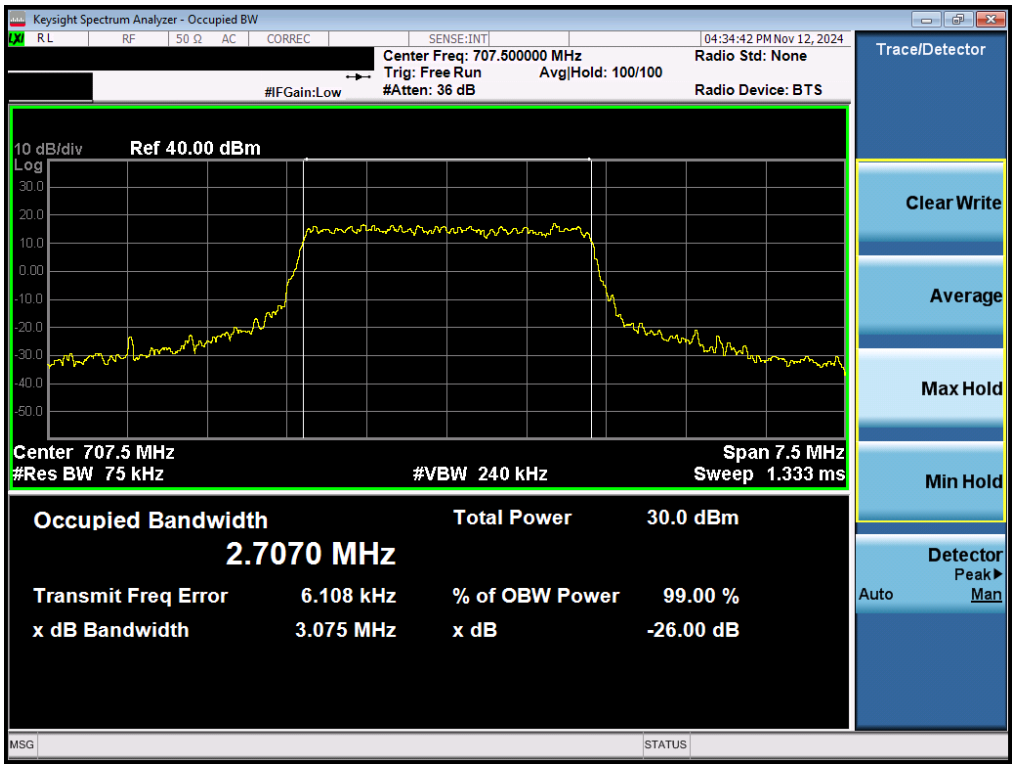
Plot 7-4. Occupied Bandwidth Plot (LTE Band 12/17 - 10MHz 16-QAM - Full RB – ANT1)



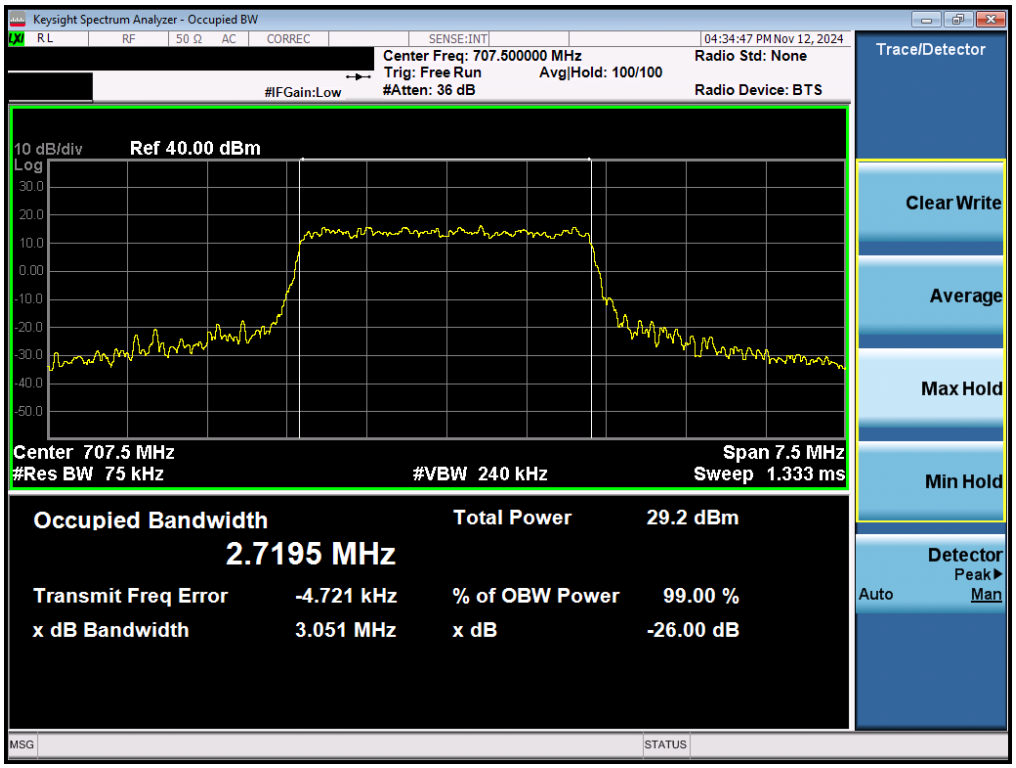
Plot 7-5. Occupied Bandwidth Plot (LTE Band 12/17 - 5MHz QPSK - Full RB – ANT1)



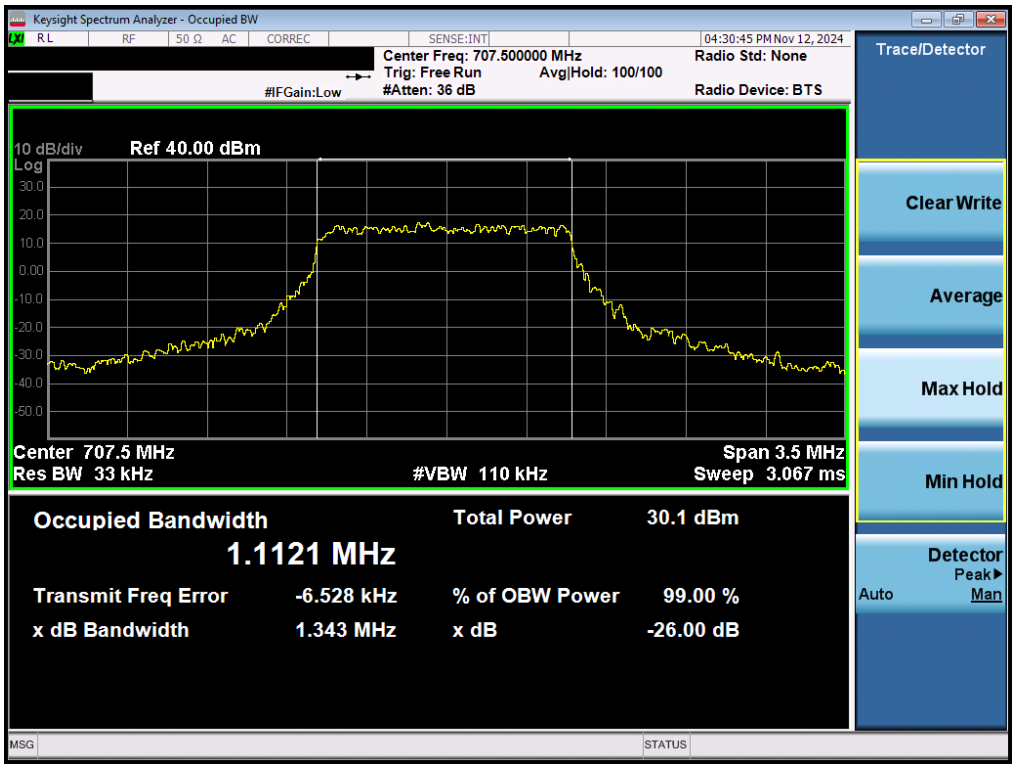
Plot 7-6. Occupied Bandwidth Plot (LTE Band 12/17 - 5MHz 16-QAM - Full RB – ANT1)



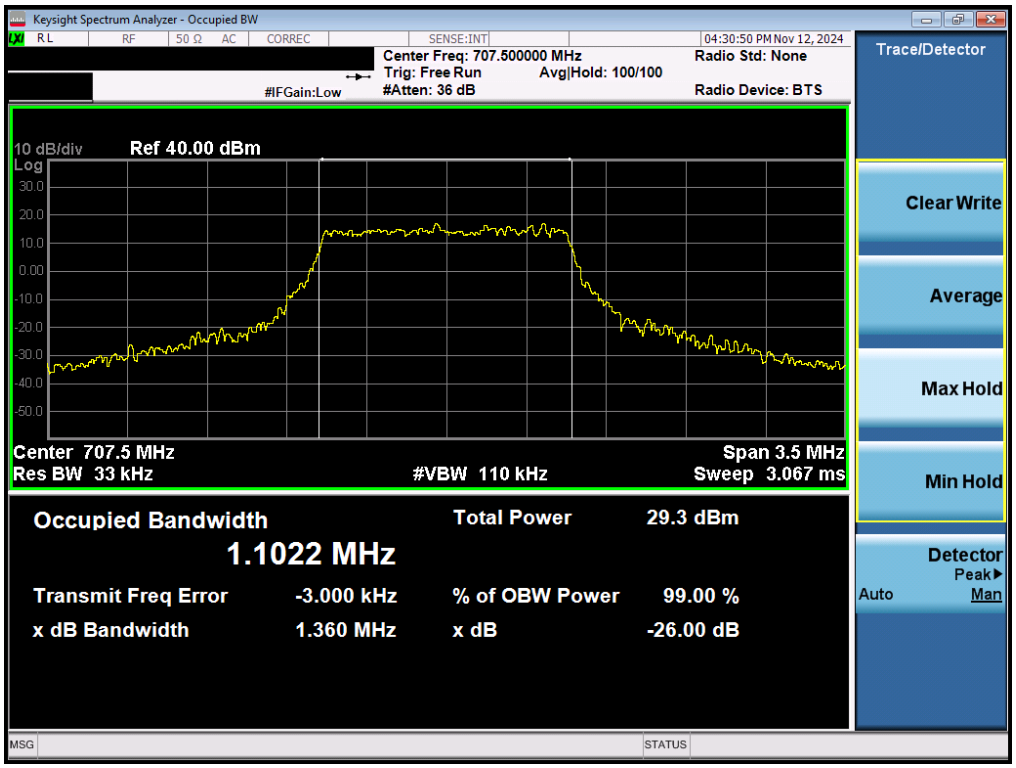
Plot 7-7. Occupied Bandwidth Plot (LTE Band 12/17 - 3MHz QPSK - Full RB – ANT1)



Plot 7-8. Occupied Bandwidth Plot (LTE Band 12/17 - 3MHz 16-QAM - Full RB – ANT1)

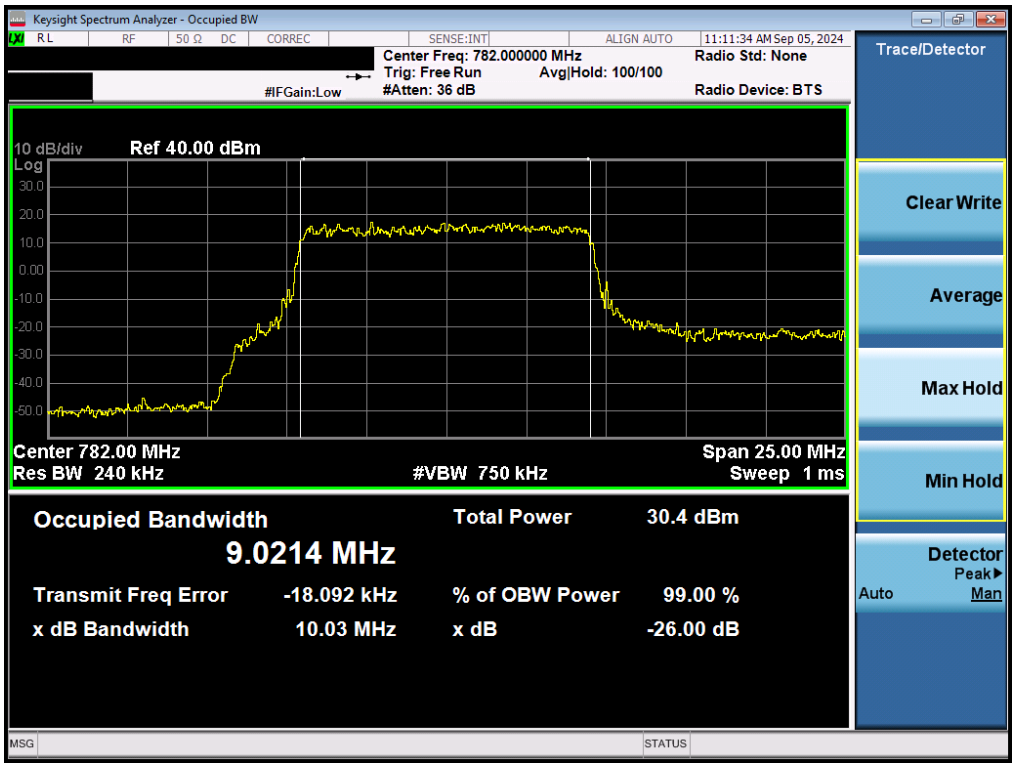


Plot 7-9. Occupied Bandwidth Plot (LTE Band 12/17 – 1.4MHz QPSK - Full RB – ANT1)

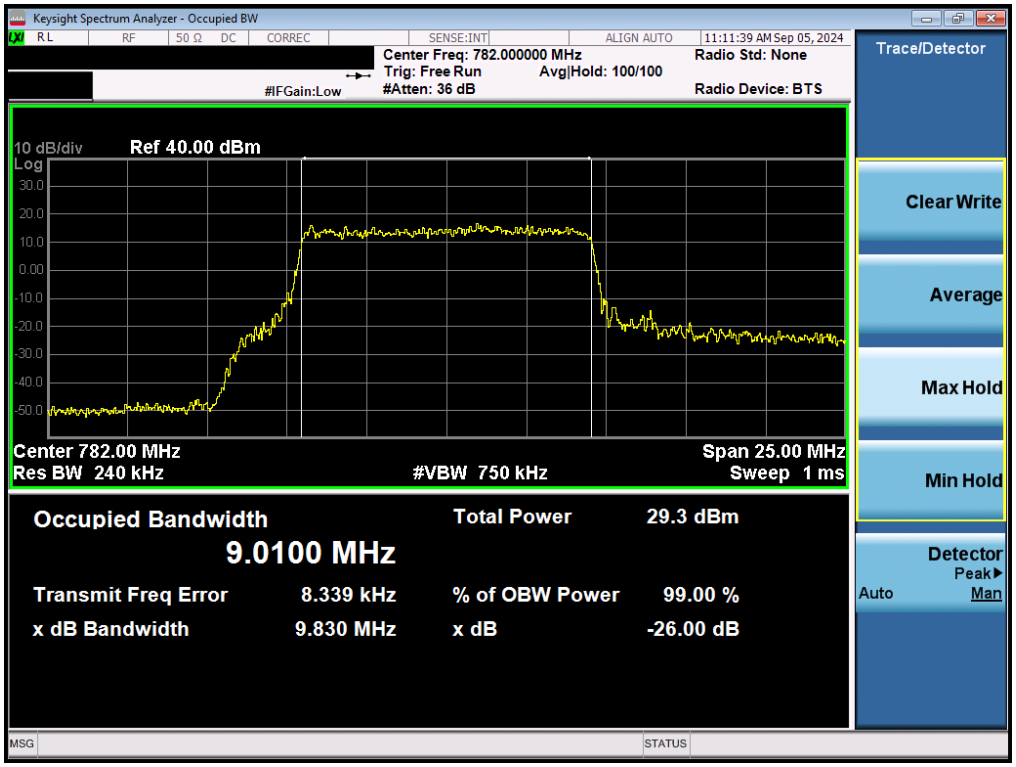


Plot 7-10. Occupied Bandwidth Plot (LTE Band 12/17 – 1.4MHz 16-QAM - Full RB – ANT1)

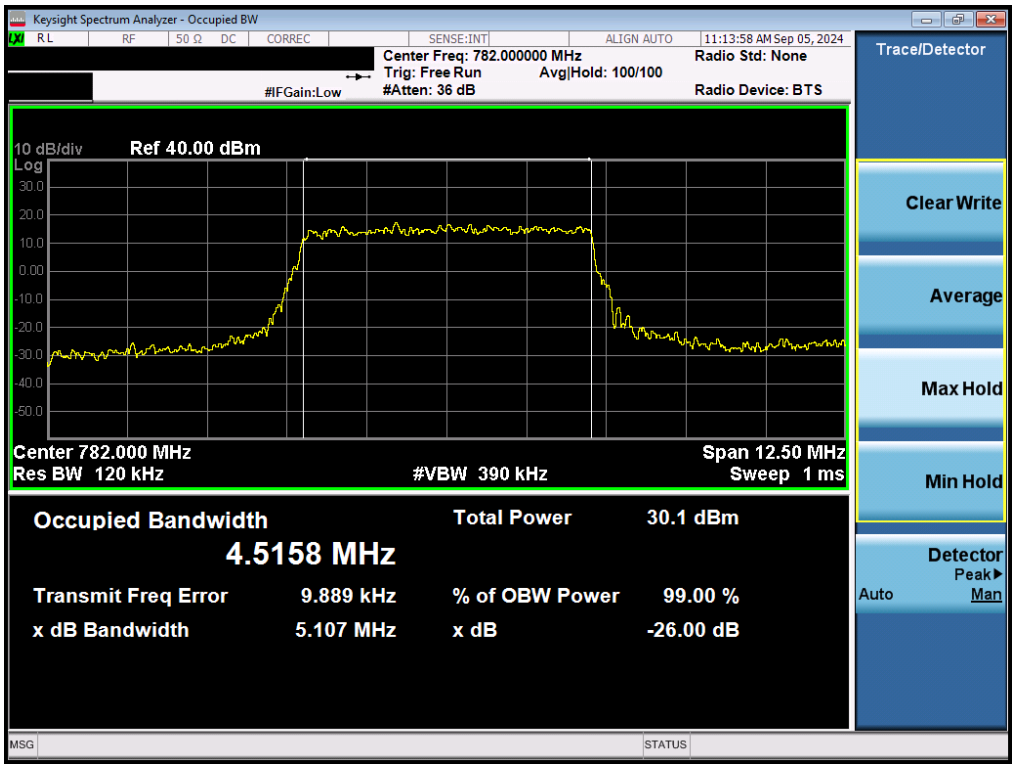
LTE Band 13 – ANT1



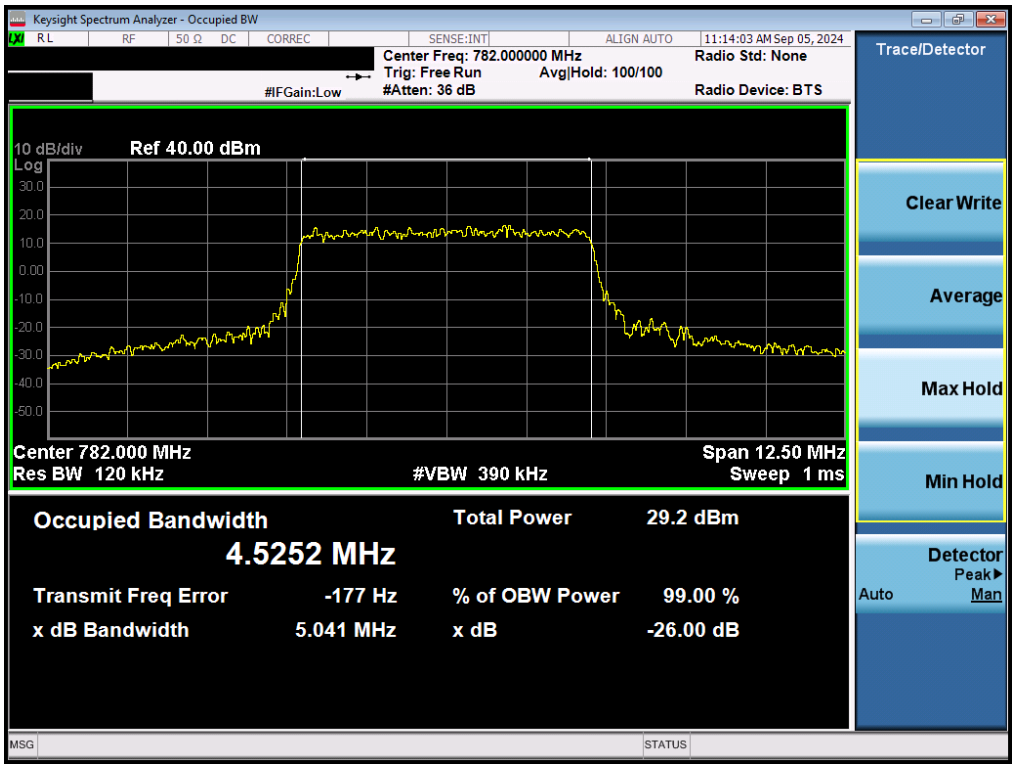
Plot 7-11. Occupied Bandwidth Plot (LTE Band 13 - 10MHz QPSK - Full RB – ANT1)



Plot 7-12. Occupied Bandwidth Plot (LTE Band 13 - 10MHz 16-QAM - Full RB – ANT1)

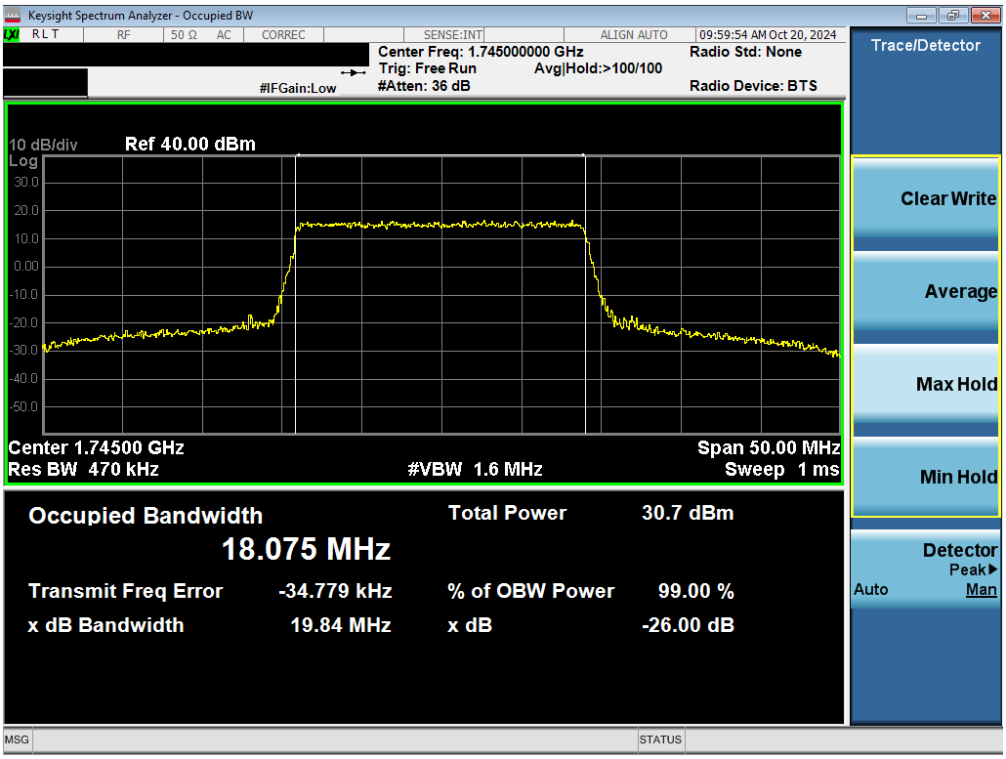


Plot 7-13. Occupied Bandwidth Plot (LTE Band 13 - 5MHz QPSK - Full RB – ANT1)

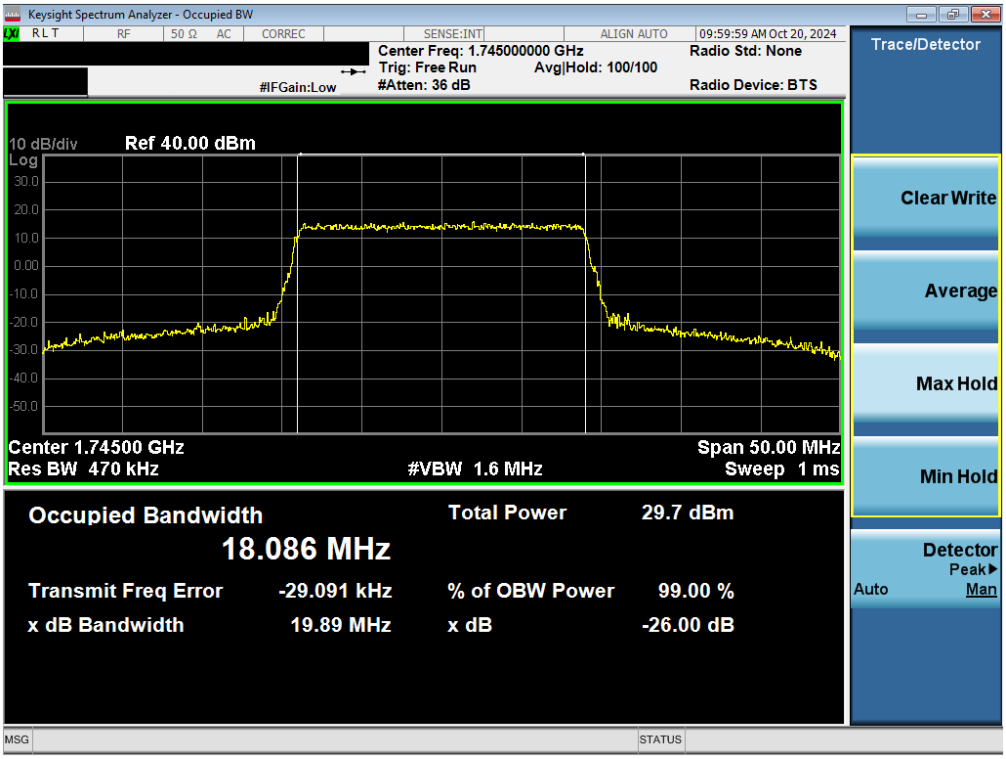


Plot 7-14. Occupied Bandwidth Plot (LTE Band 13 - 5MHz 16-QAM - Full RB – ANT1)

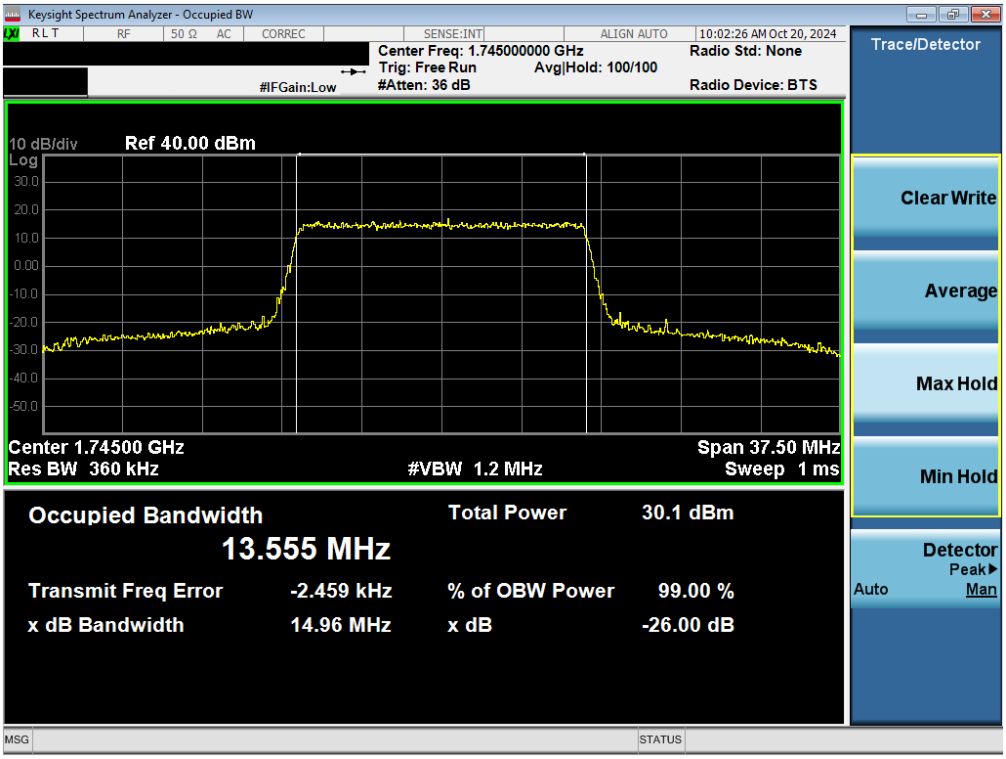
LTE Band 66/4 - ANT1



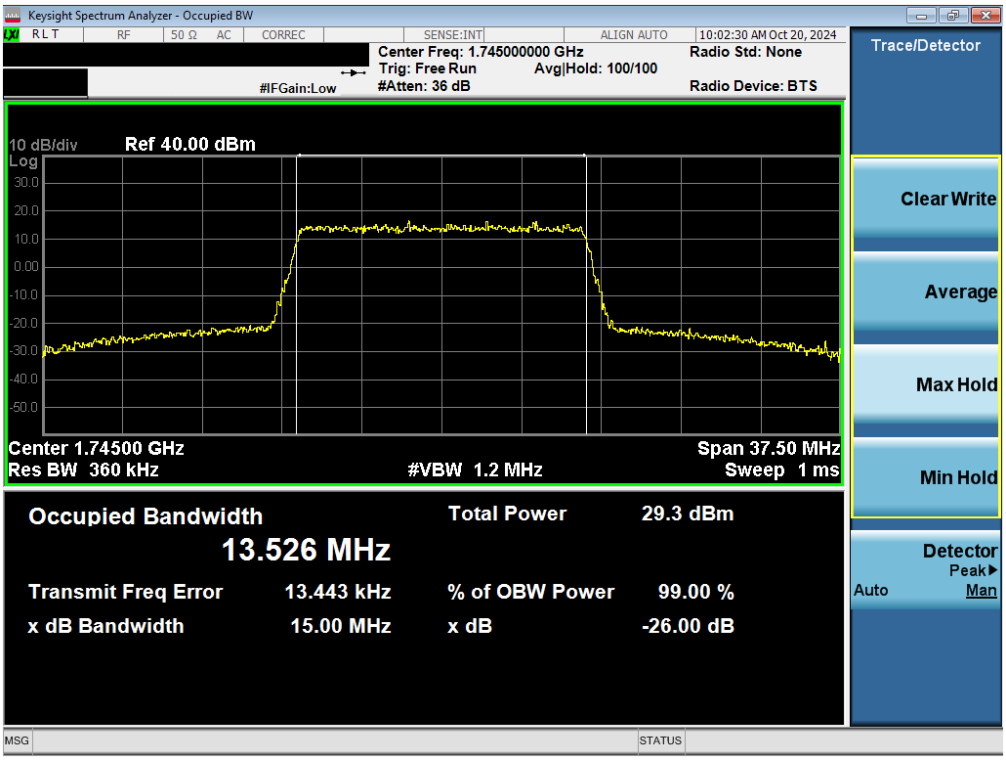
Plot 7-15. Occupied Bandwidth Plot (LTE Band 66/4 - 20MHz QPSK - Full RB - ANT1)



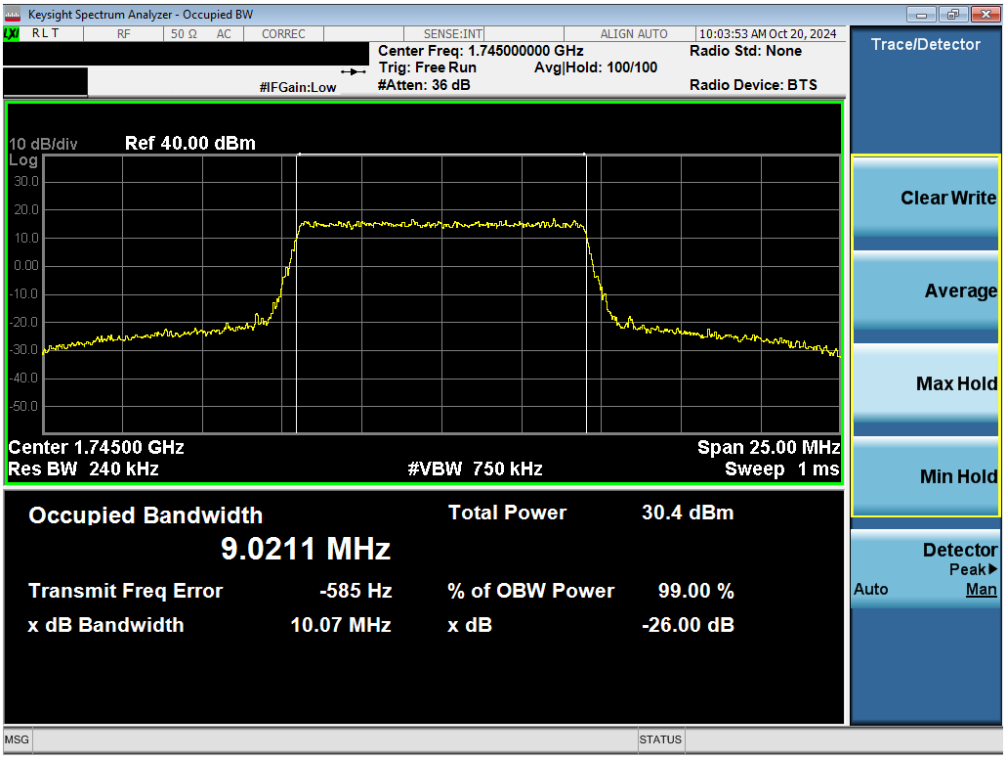
Plot 7-16. Occupied Bandwidth Plot (LTE Band 66/4 - 20MHz 16-QAM - Full RB - ANT1)



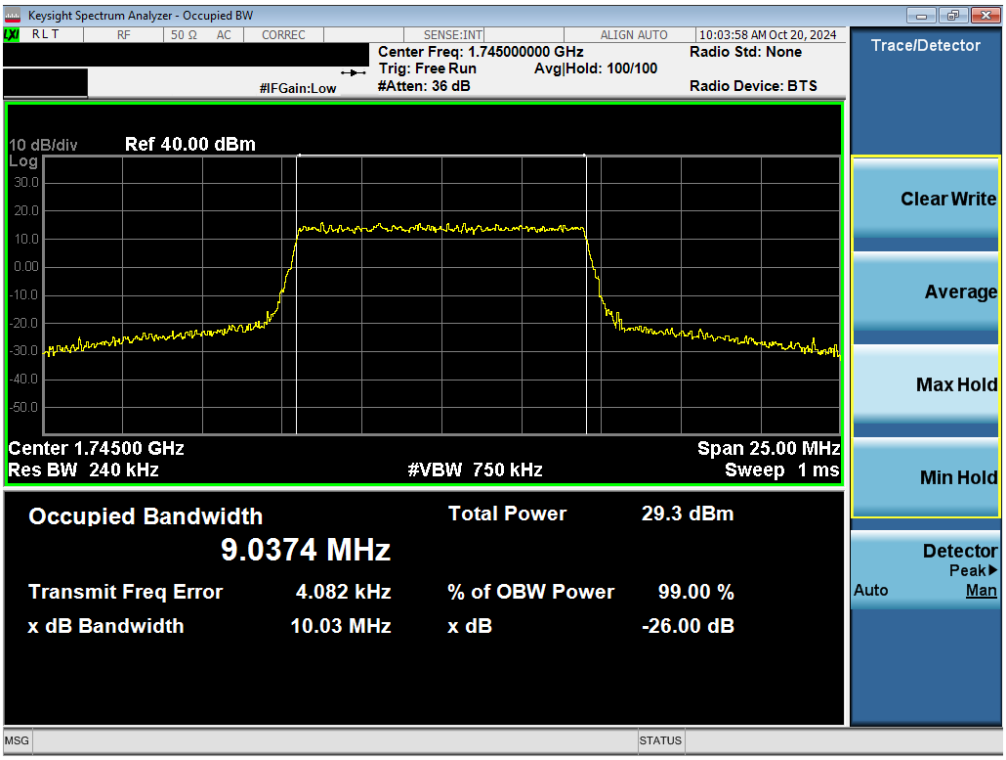
Plot 7-17. Occupied Bandwidth Plot (LTE Band 66/4 - 15MHz QPSK - Full RB - ANT1)



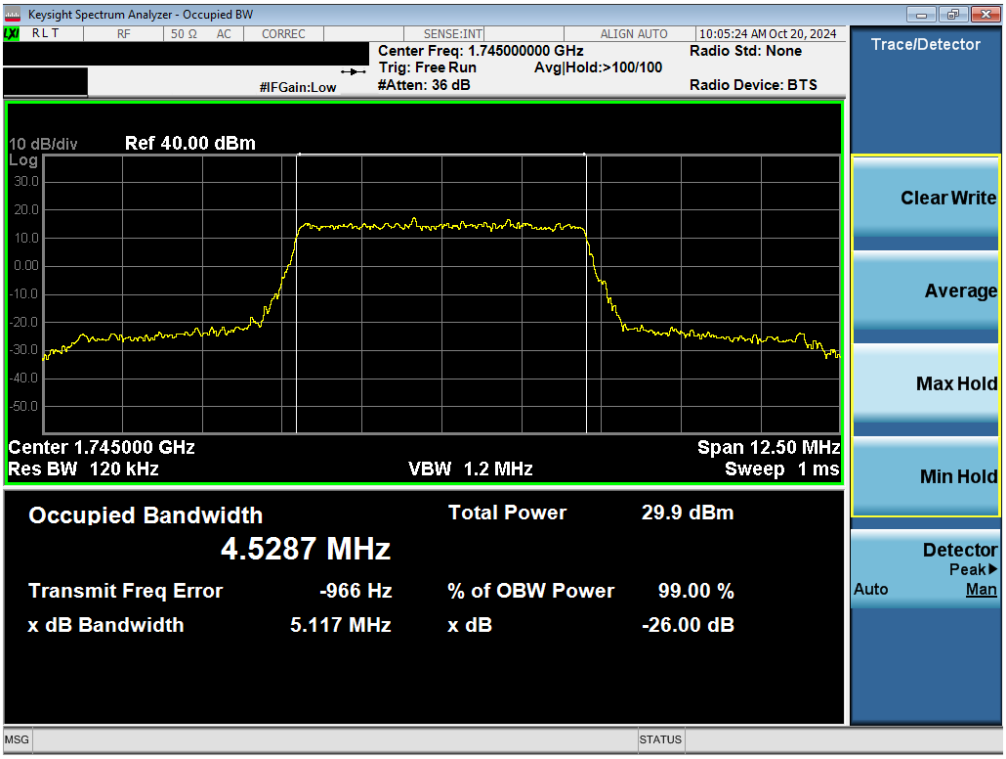
Plot 7-18. Occupied Bandwidth Plot (LTE Band 66/4 - 15MHz 16-QAM - Full RB - ANT1)



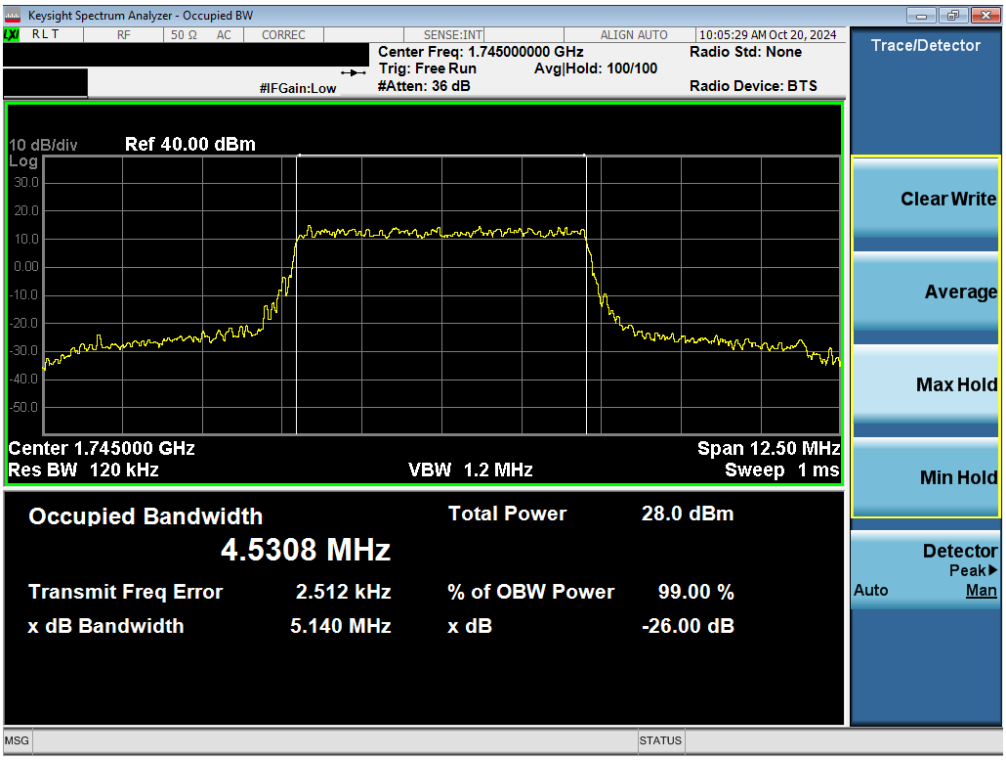
Plot 7-19. Occupied Bandwidth Plot (LTE Band 66/4 - 10MHz QPSK - Full RB - ANT1)



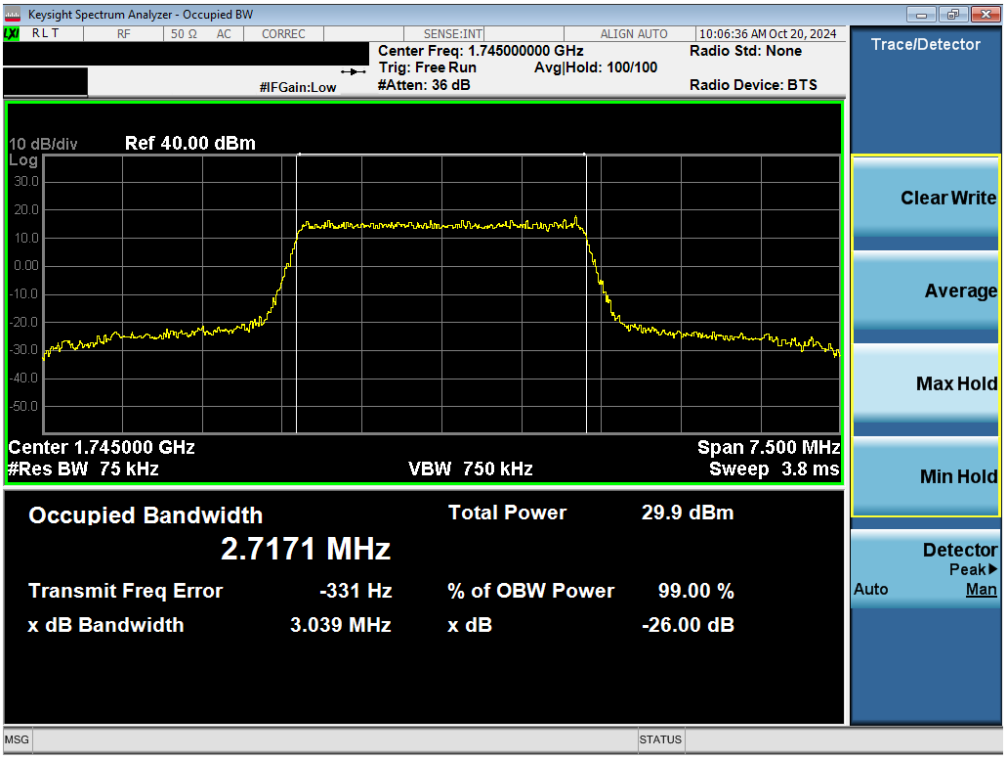
Plot 7-20. Occupied Bandwidth Plot (LTE Band 66/4 - 10MHz 16-QAM - Full RB - ANT1)



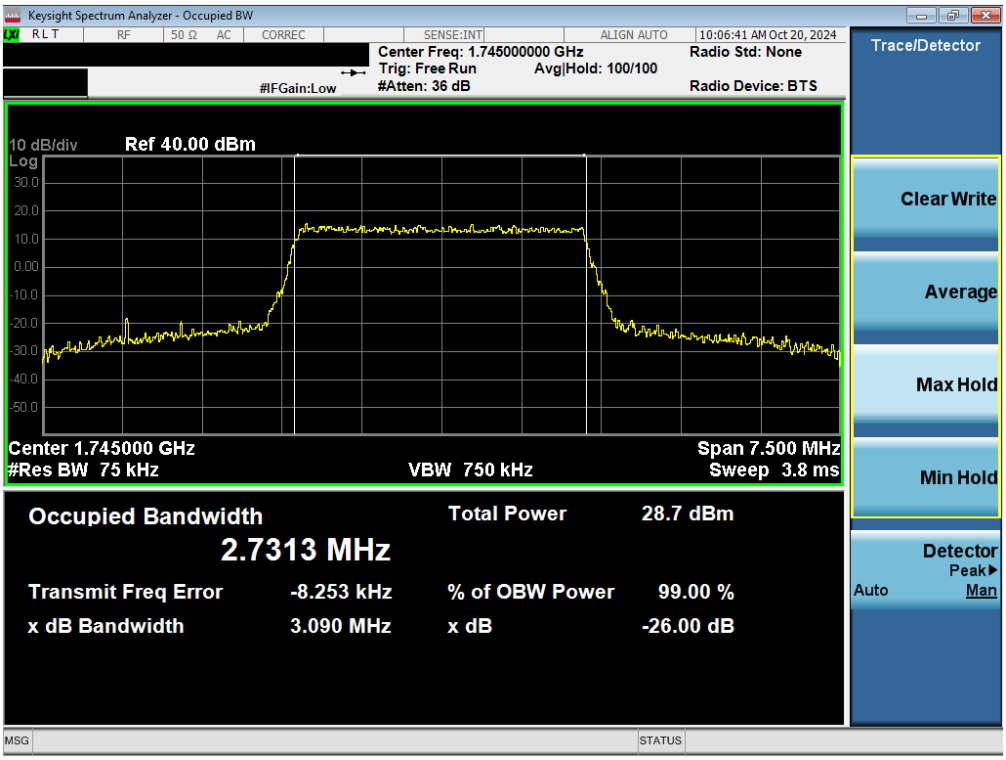
Plot 7-21. Occupied Bandwidth Plot (LTE Band 66/4 - 5MHz QPSK - Full RB - ANT1)



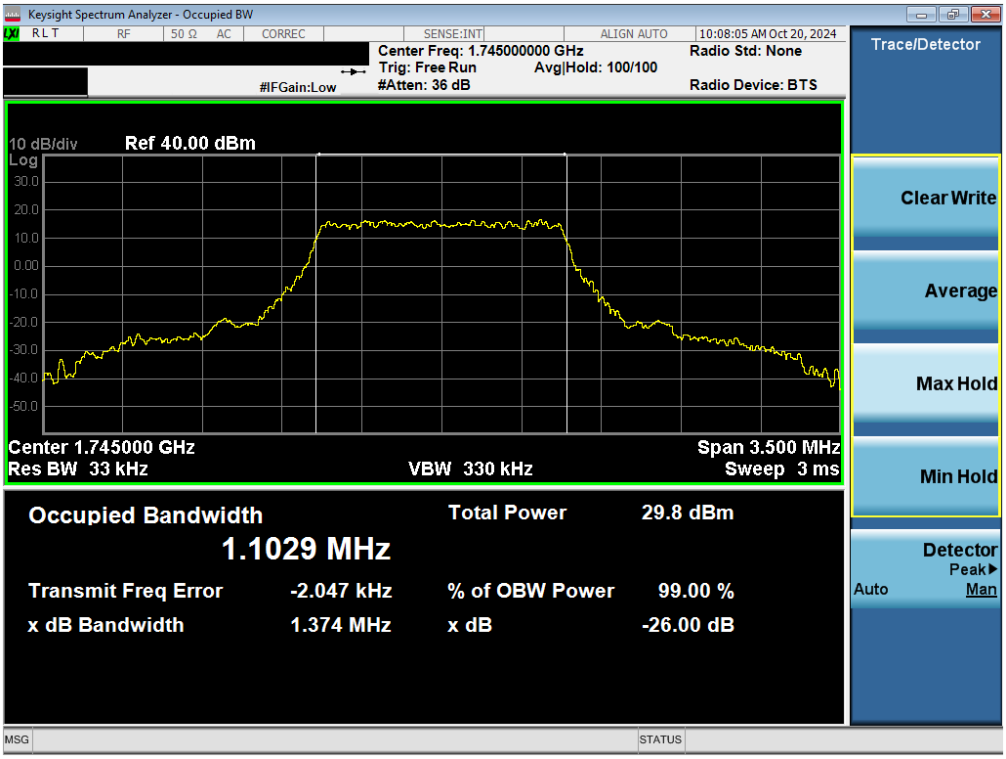
Plot 7-22. Occupied Bandwidth Plot (LTE Band 66/4 - 5MHz 16-QAM - Full RB - ANT1)



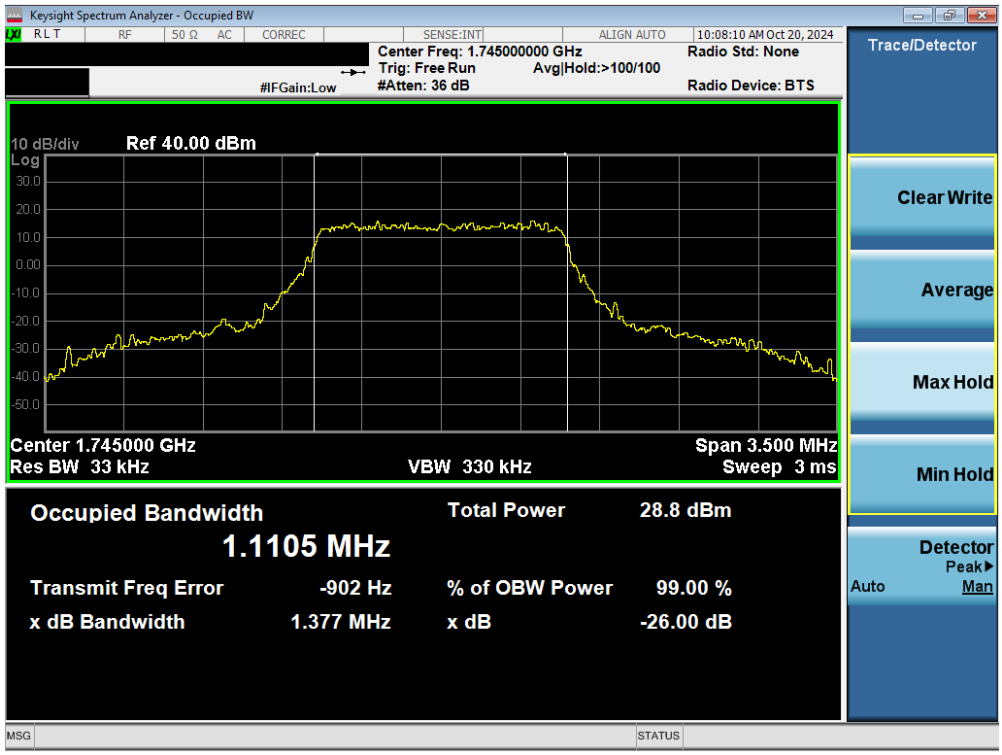
Plot 7-23. Occupied Bandwidth Plot (LTE Band 66/4 - 3MHz QPSK - Full RB - ANT1)



Plot 7-24. Occupied Bandwidth Plot (LTE Band 66/4 - 3MHz 16-QAM - Full RB - ANT1)



Plot 7-25. Occupied Bandwidth Plot (LTE Band 66/4 - 1.4MHz QPSK - Full RB - ANT1)

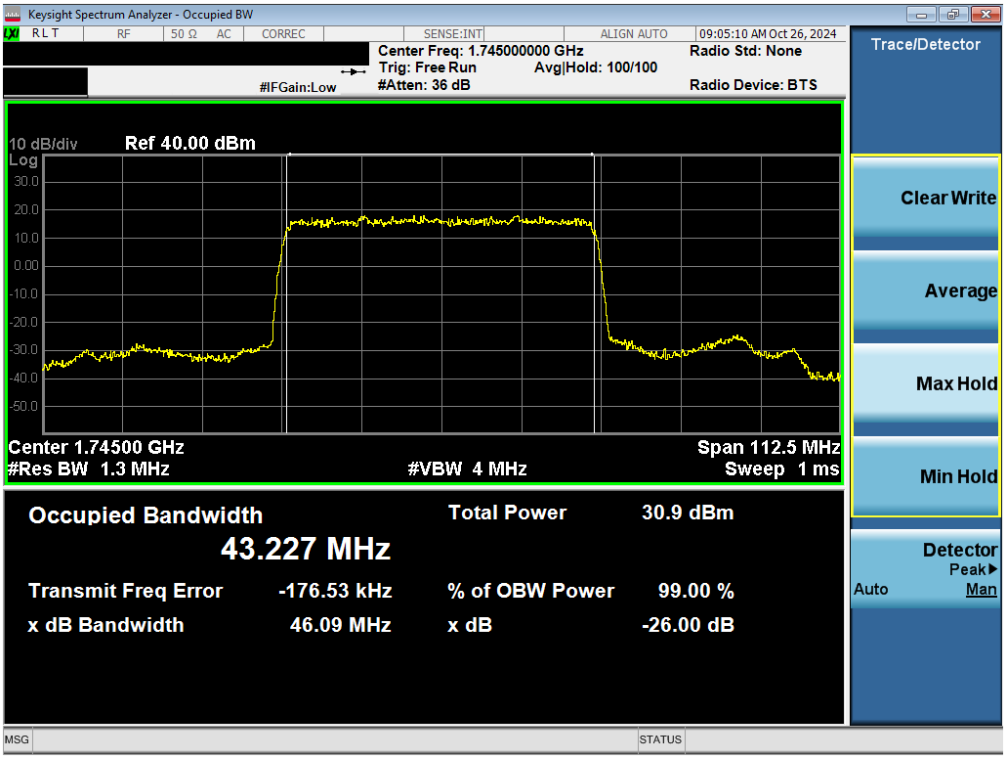


Plot 7-26. Occupied Bandwidth Plot (LTE Band 66/4 - 1.4MHz 16-QAM - Full RB - ANT1)

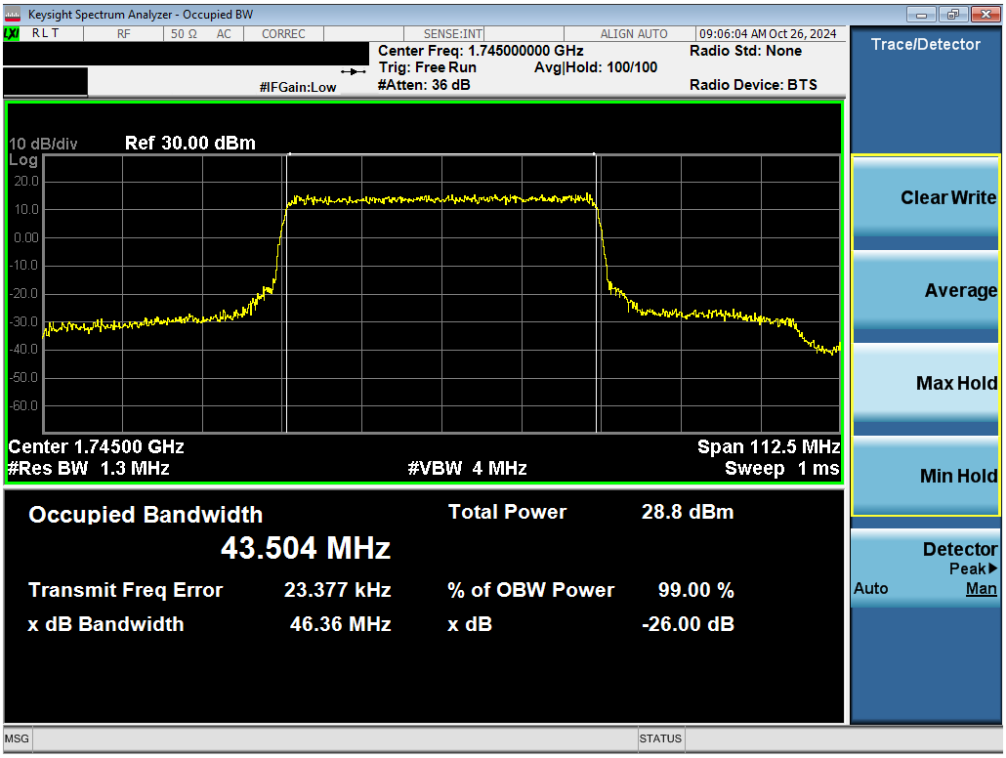
Mode	Bandwidth	Modulation	OBW [MHz]
NR-n66	45MHz	π/2 BPSK	43.23
		QPSK	43.50
		16QAM	43.53
	40MHz	π/2 BPSK	38.69
		QPSK	38.70
		16QAM	38.67
	35MHz	π/2 BPSK	32.32
		QPSK	33.76
		16QAM	33.79
	30MHz	π/2 BPSK	28.69
		QPSK	28.72
		16QAM	28.73
	25MHz	π/2 BPSK	23.12
		QPSK	23.86
		16QAM	23.90
	20MHz	π/2 BPSK	17.96
		QPSK	19.00
		16QAM	19.00
	15MHz	π/2 BPSK	13.52
		QPSK	14.21
		16QAM	14.18
	10MHz	π/2 BPSK	9.01
		QPSK	9.33
		16QAM	9.35
	5MHz	π/2 BPSK	4.52
		QPSK	4.52
		16QAM	4.50

Table 7-10. Occupied Bandwidth Results – Ant1

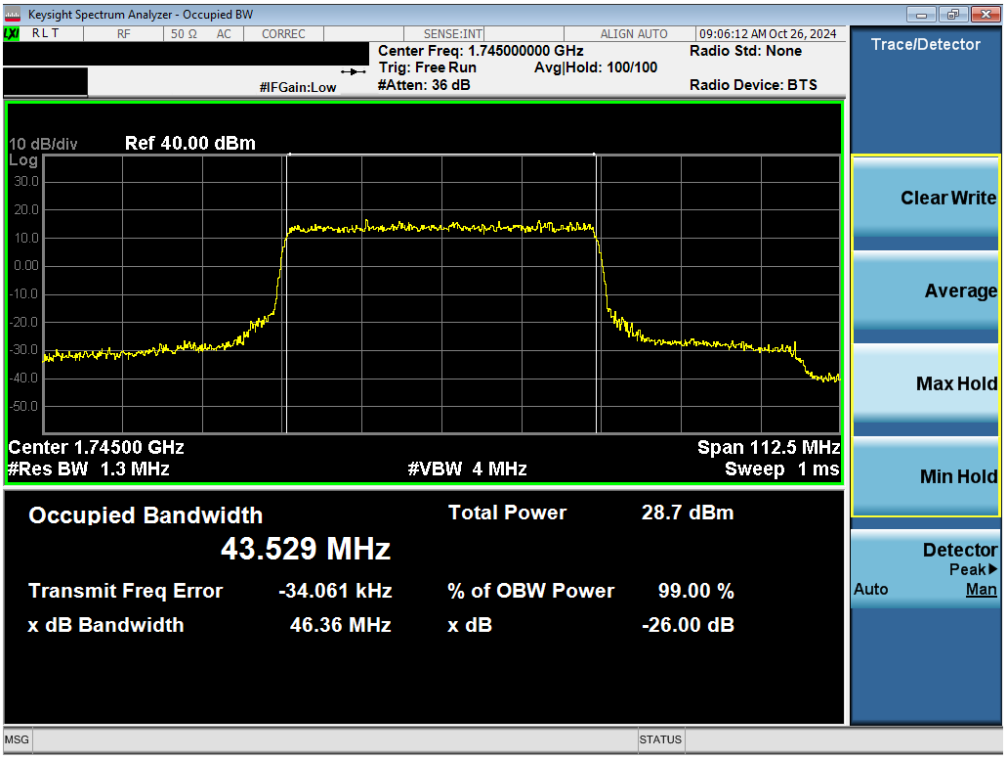
NR Band n66 – ANT1



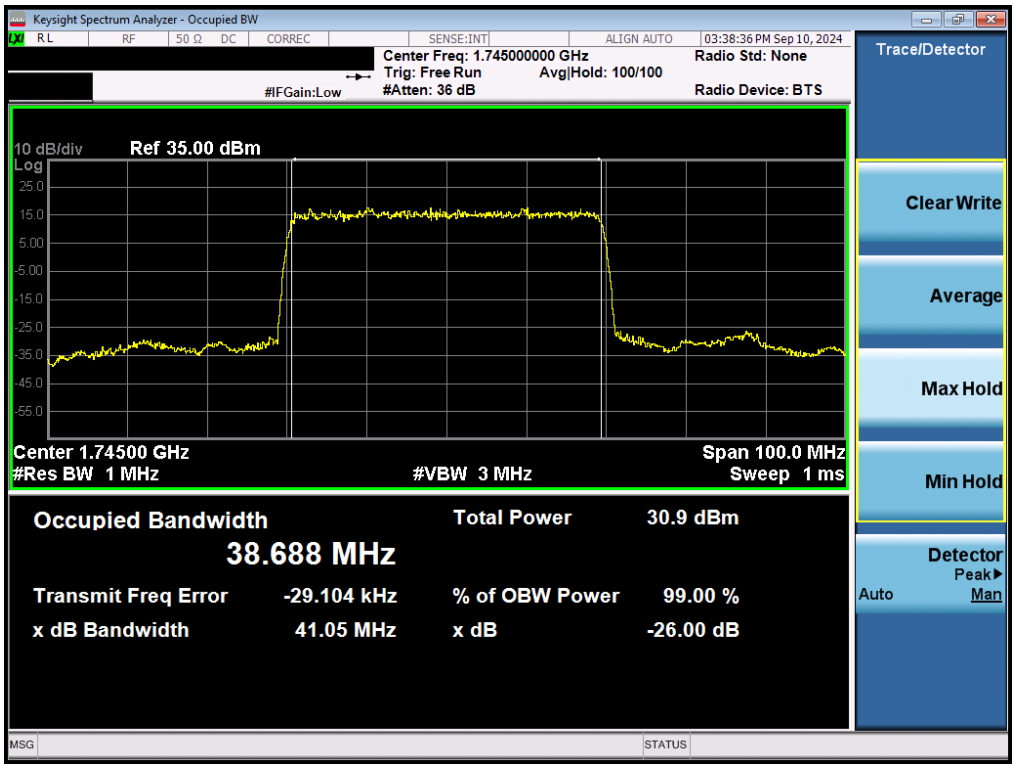
Plot 7-27. Occupied Bandwidth Plot (NR Band n66 - 45.0MHz DFT-s-OFDM BPSK - Full RB – ANT1)



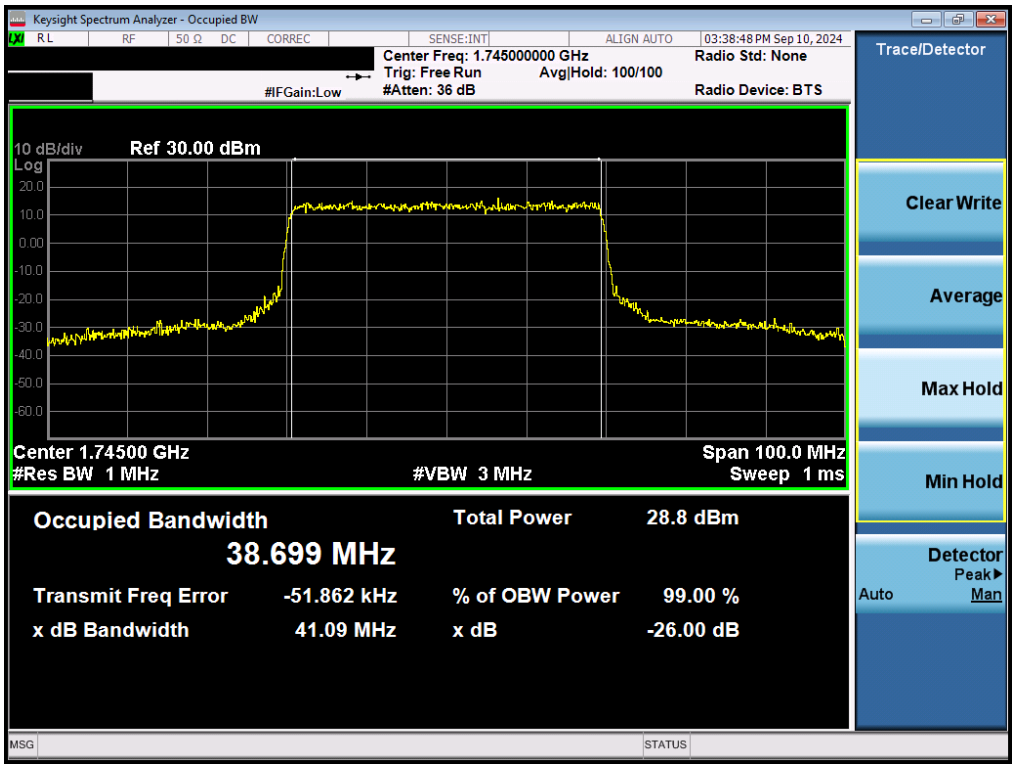
Plot 7-28. Occupied Bandwidth Plot (NR Band n66 - 45.0MHz CP-OFDM QPSK - Full RB – ANT1)



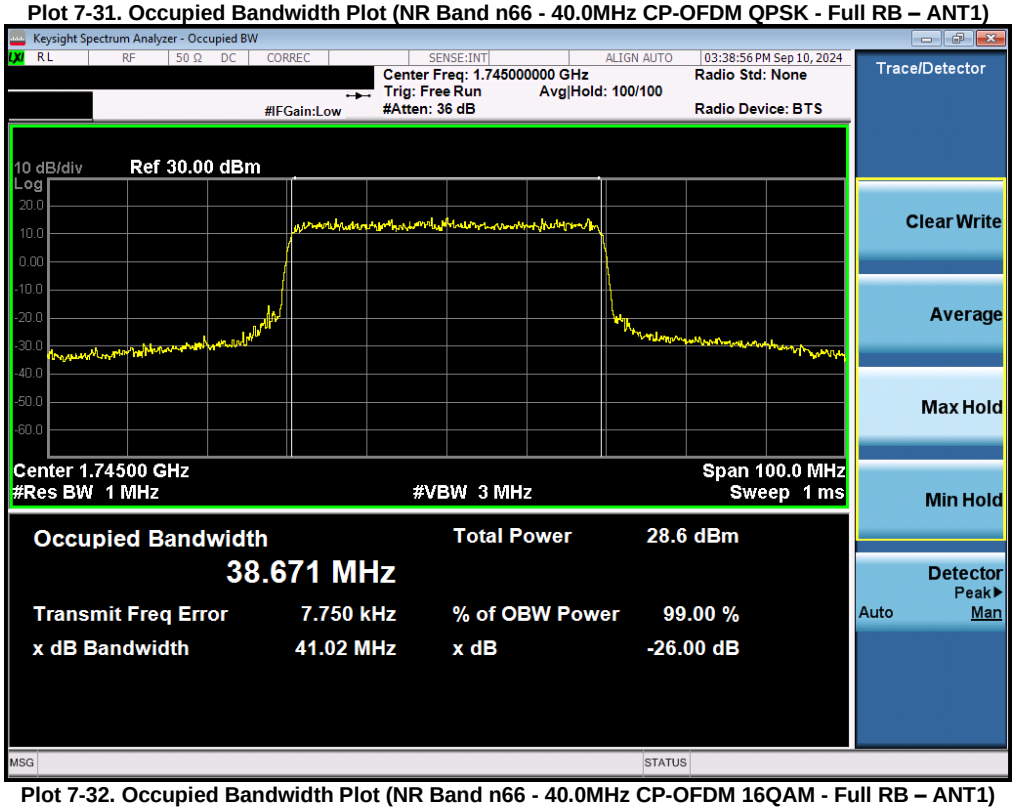
Plot 7-29. Occupied Bandwidth Plot (NR Band n66 - 45.0MHz CP-OFDM 16QAM - Full RB – ANT1)



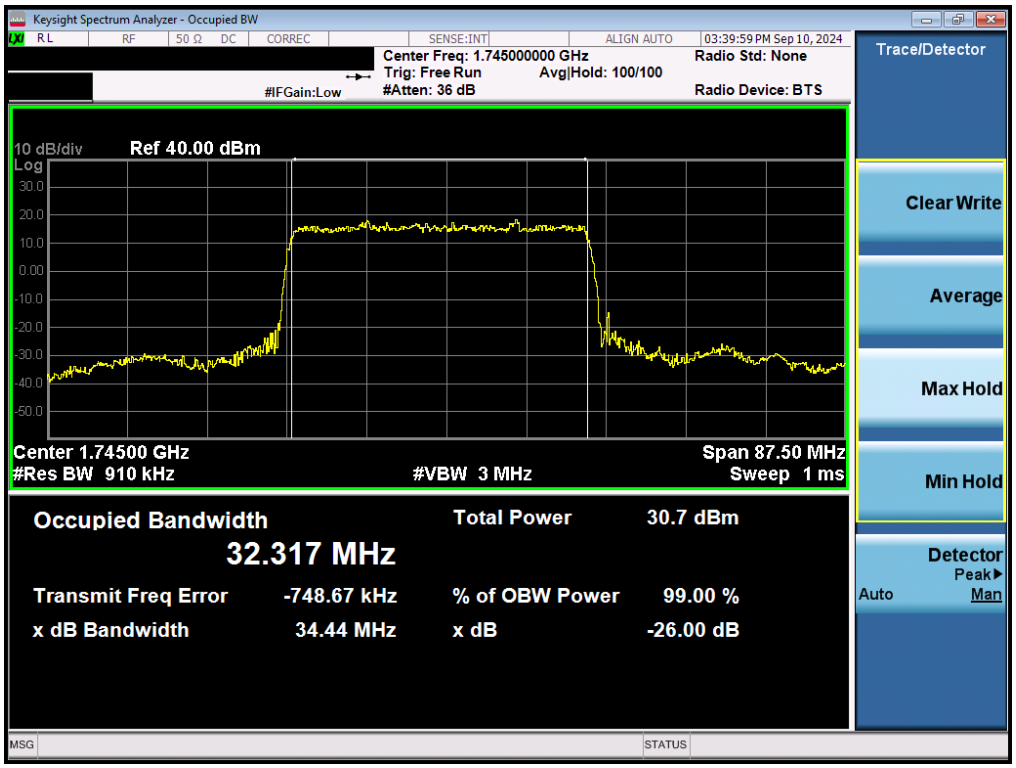
Plot 7-30. Occupied Bandwidth Plot (NR Band n66 - 40.0MHz DFT-s-OFDM BPSK - Full RB – ANT1)



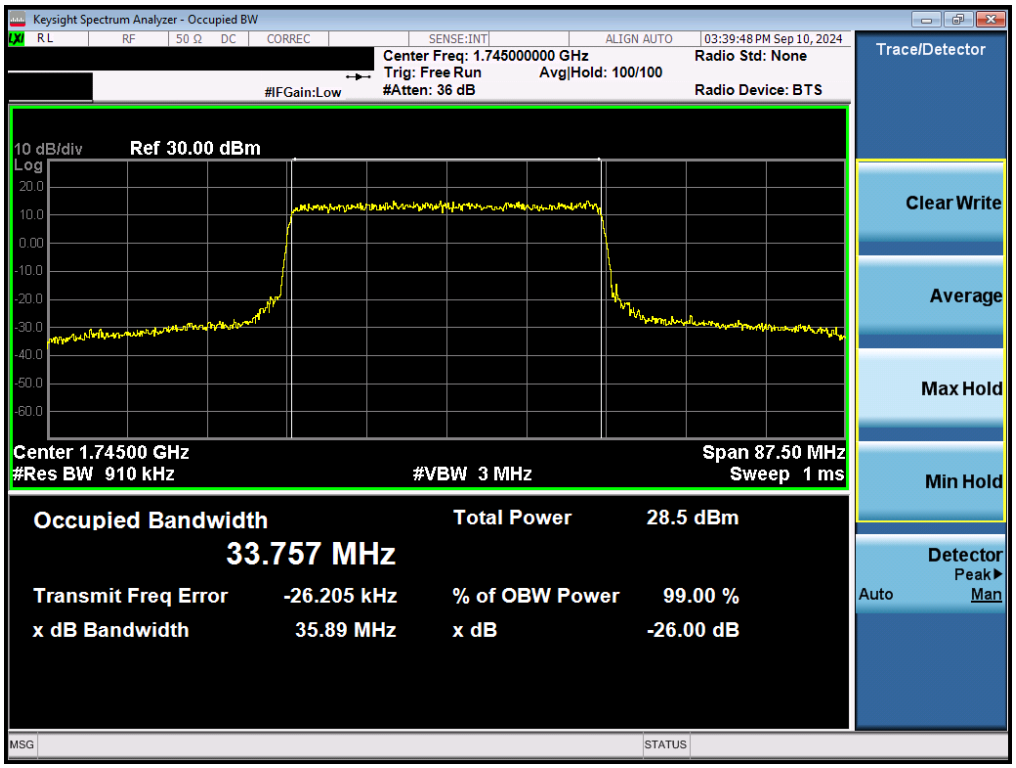
Plot 7-31. Occupied Bandwidth Plot (NR Band n66 - 40.0MHz CP-OFDM QPSK - Full RB – ANT1)



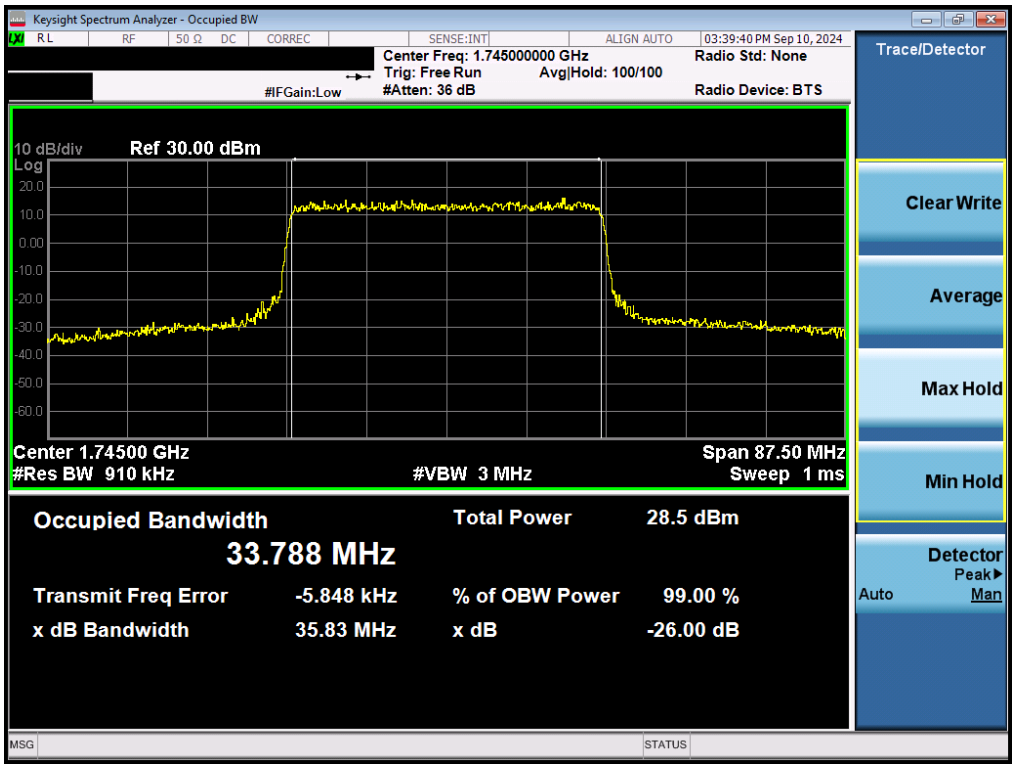
Plot 7-32. Occupied Bandwidth Plot (NR Band n66 - 40.0MHz CP-OFDM 16QAM - Full RB – ANT1)



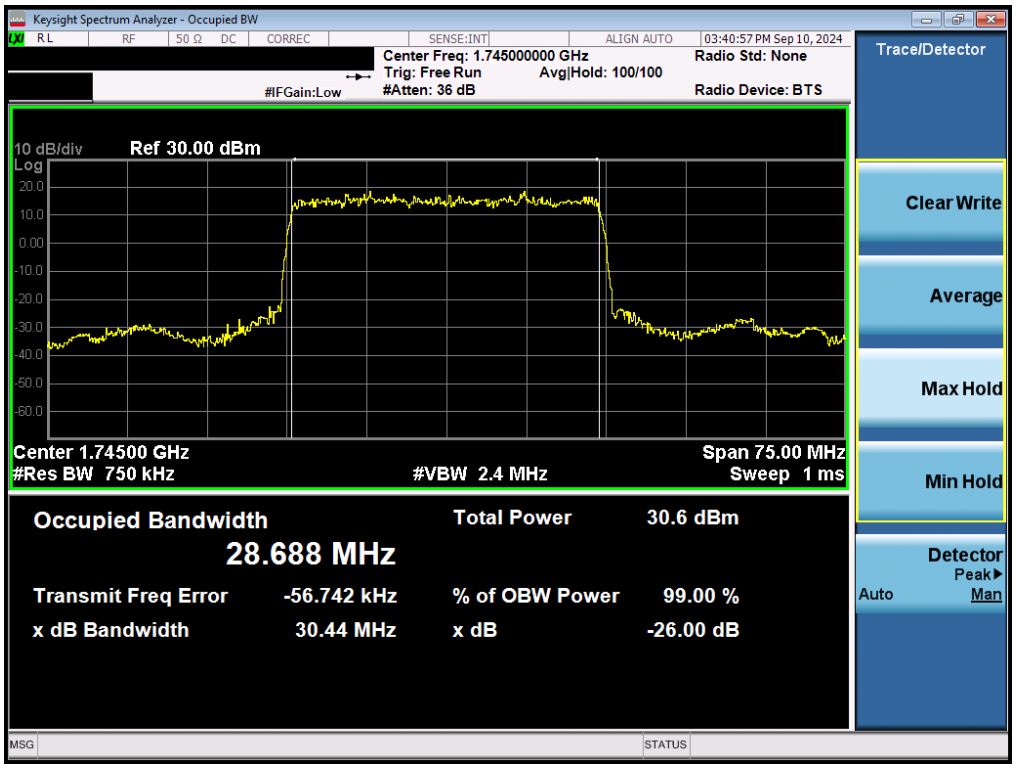
Plot 7-33. Occupied Bandwidth Plot (NR Band n66 - 35.0MHz DFT-s-OFDM BPSK - Full RB – ANT1)



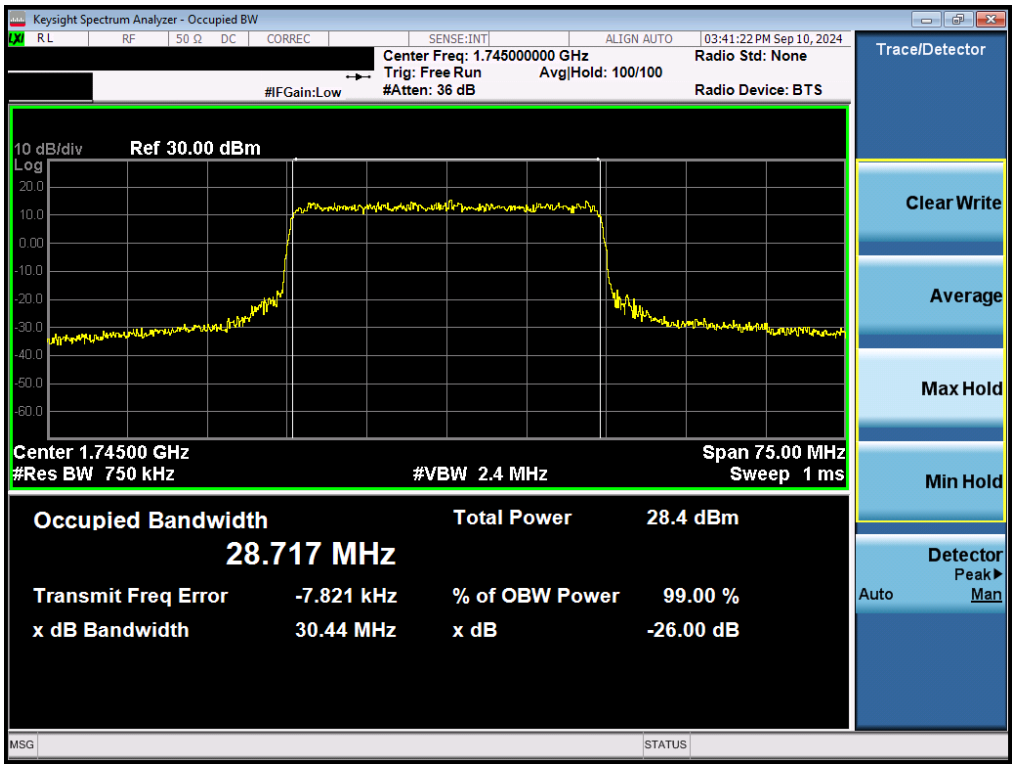
Plot 7-34. Occupied Bandwidth Plot (NR Band n66 - 35.0MHz CP-OFDM QPSK - Full RB – ANT1)



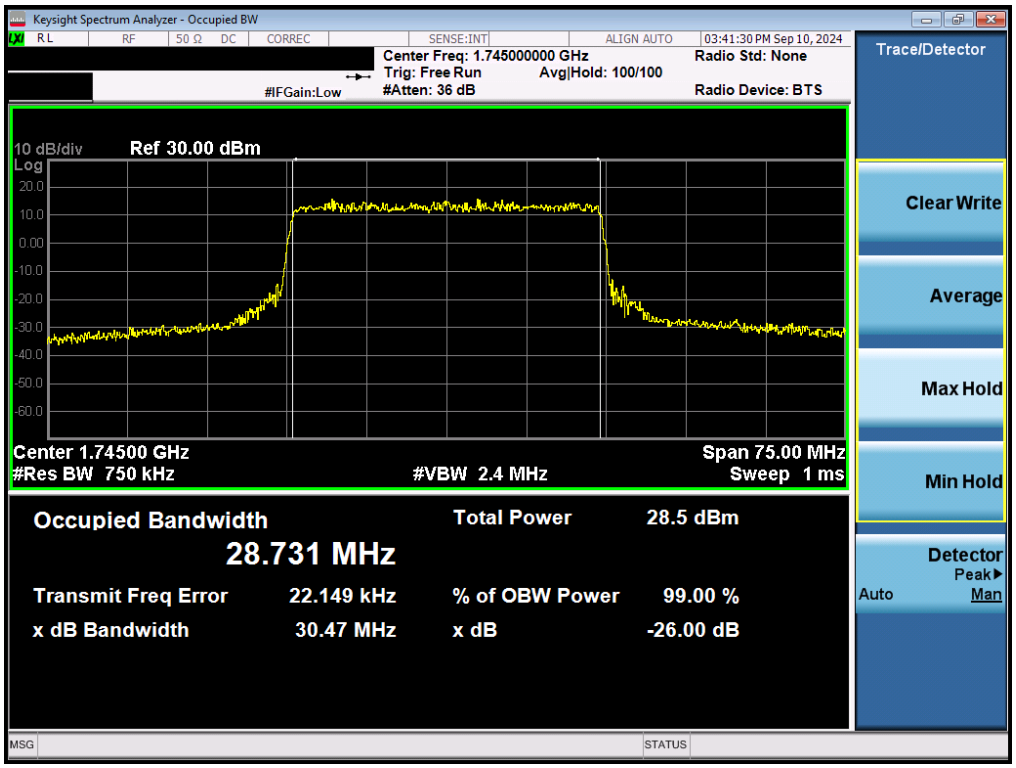
Plot 7-35. Occupied Bandwidth Plot (NR Band n66 - 35.0MHz CP-OFDM 16QAM - Full RB – ANT1)



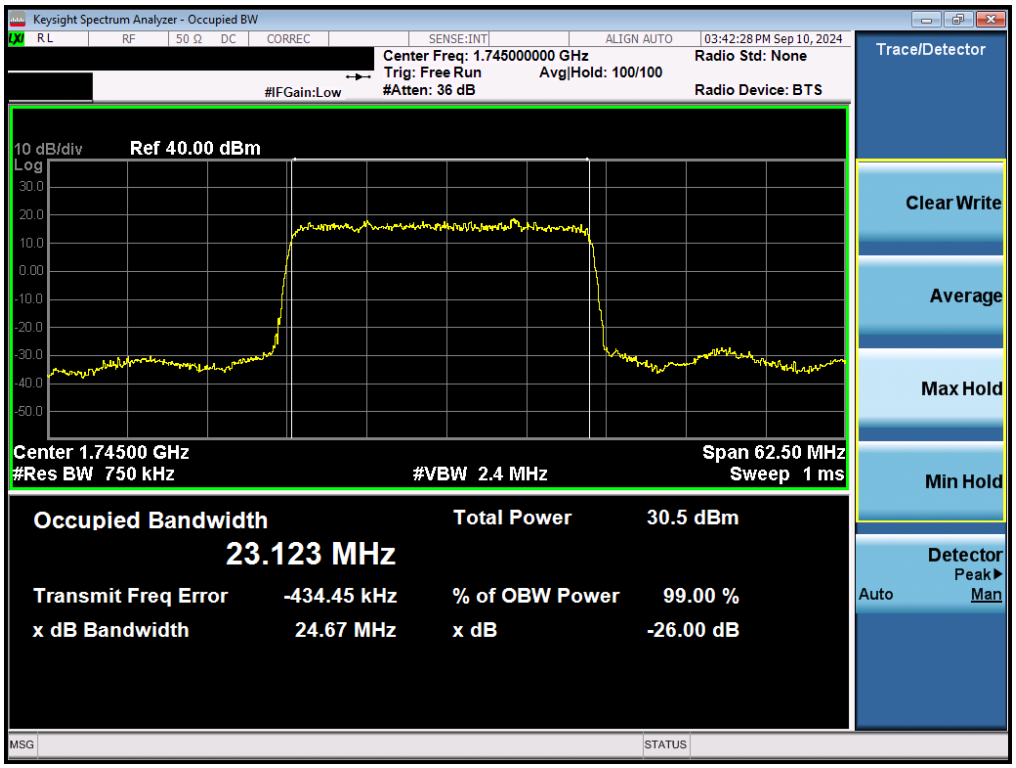
Plot 7-36. Occupied Bandwidth Plot (NR Band n66 - 30.0MHz DFT-s-OFDM BPSK - Full RB – ANT1)



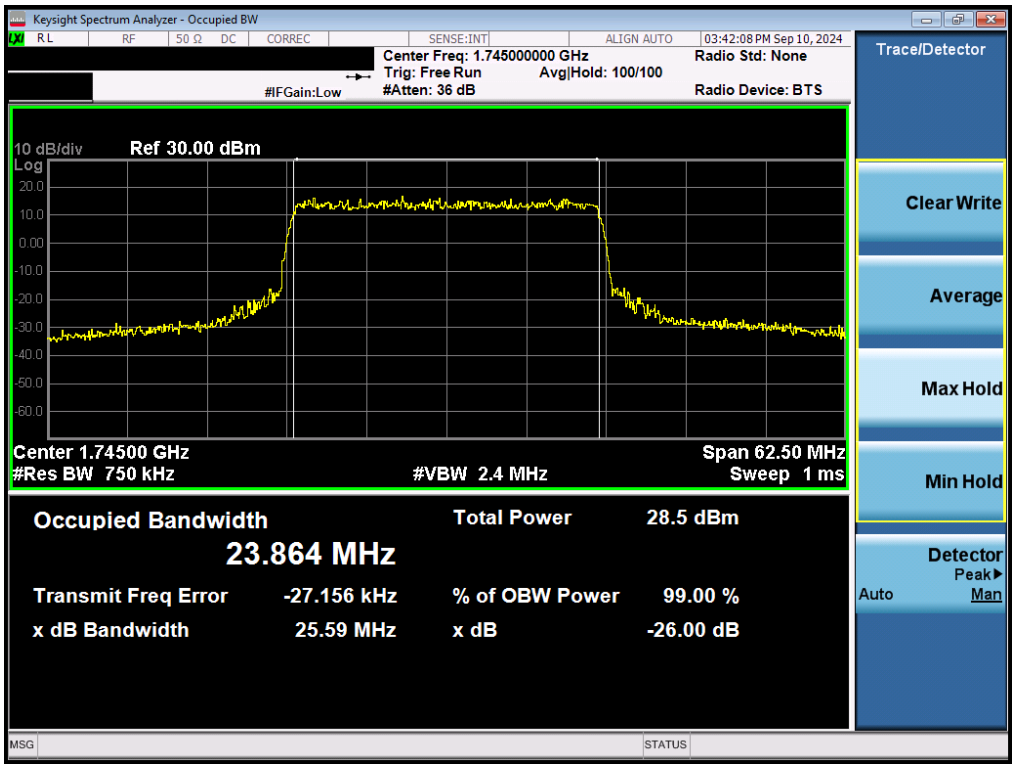
Plot 7-37. Occupied Bandwidth Plot (NR Band n66 - 30.0MHz CP-OFDM QPSK - Full RB – ANT1)



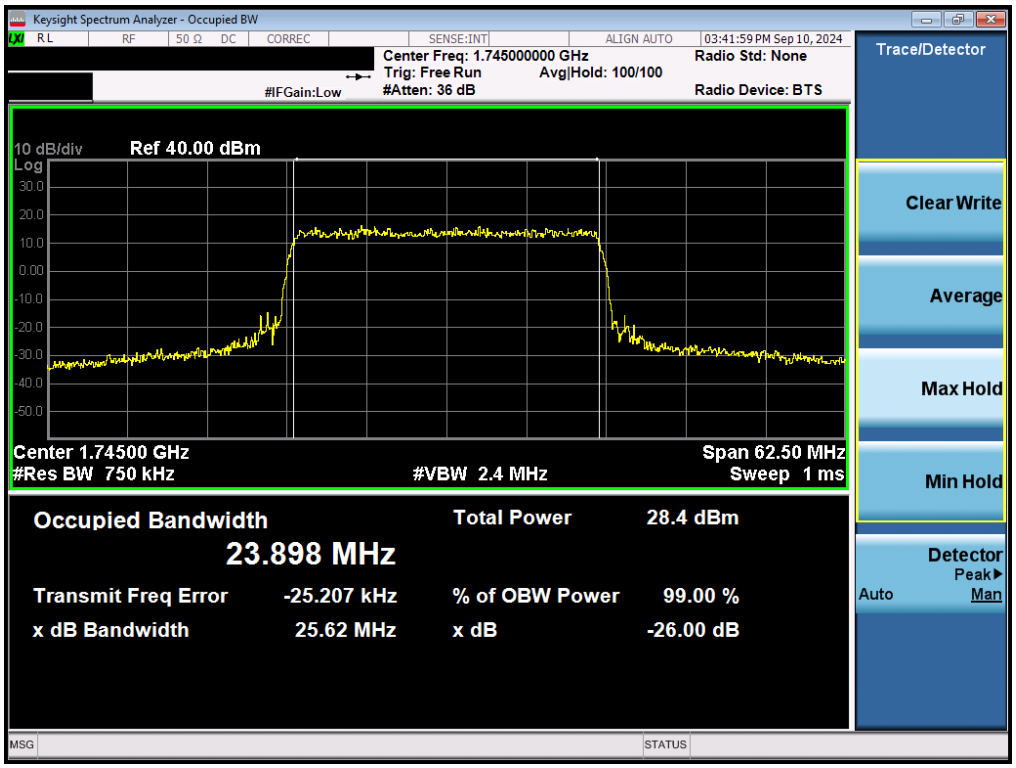
Plot 7-38. Occupied Bandwidth Plot (NR Band n66 - 30.0MHz CP-OFDM 16QAM - Full RB – ANT1)



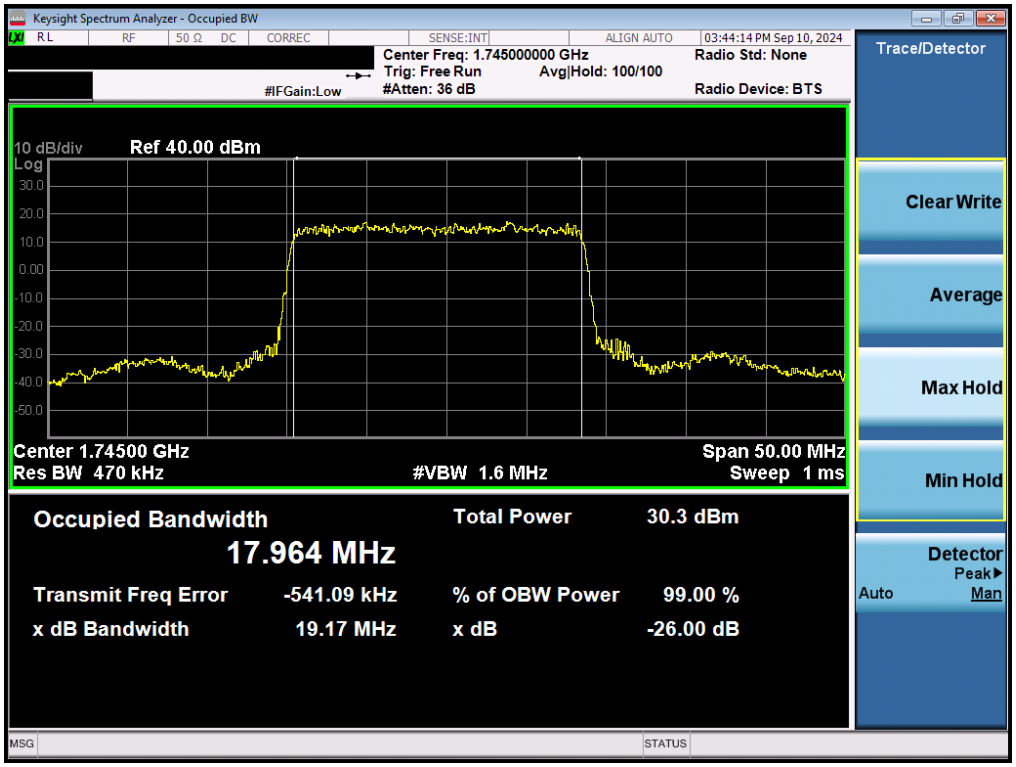
Plot 7-39. Occupied Bandwidth Plot (NR Band n66 - 25.0MHz DFT-s-OFDM BPSK - Full RB – ANT1)



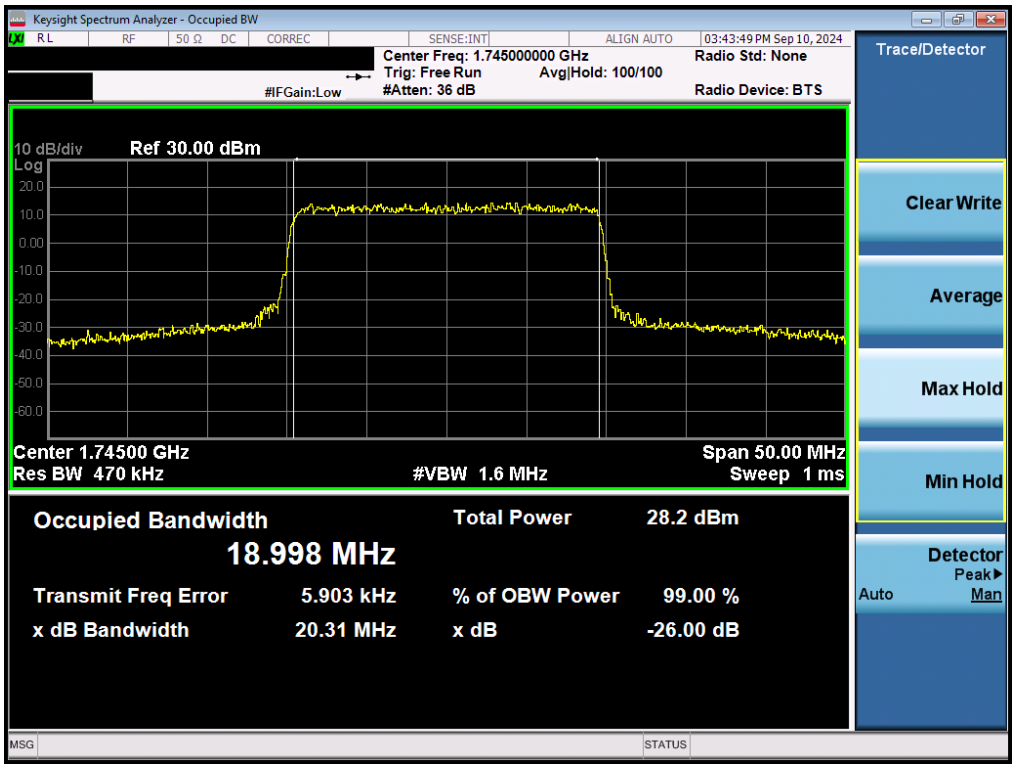
Plot 7-40. Occupied Bandwidth Plot (NR Band n66 - 25.0MHz CP-OFDM QPSK - Full RB – ANT1)



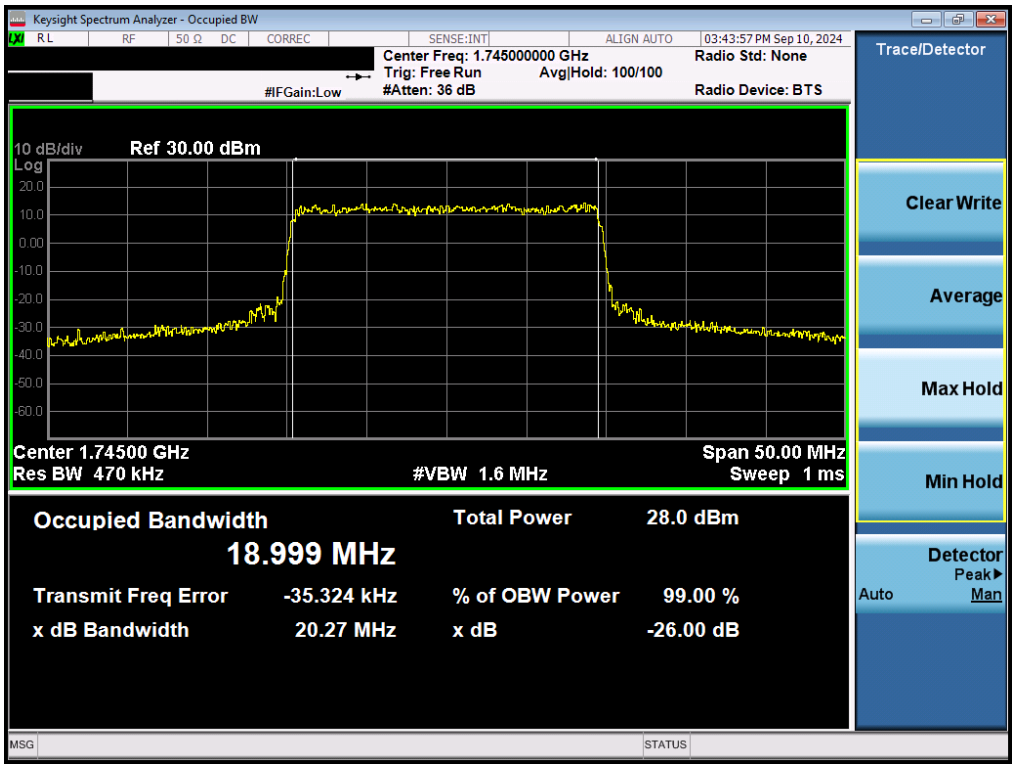
Plot 7-41. Occupied Bandwidth Plot (NR Band n66 - 25.0MHz CP-OFDM 16QAM - Full RB – ANT1)



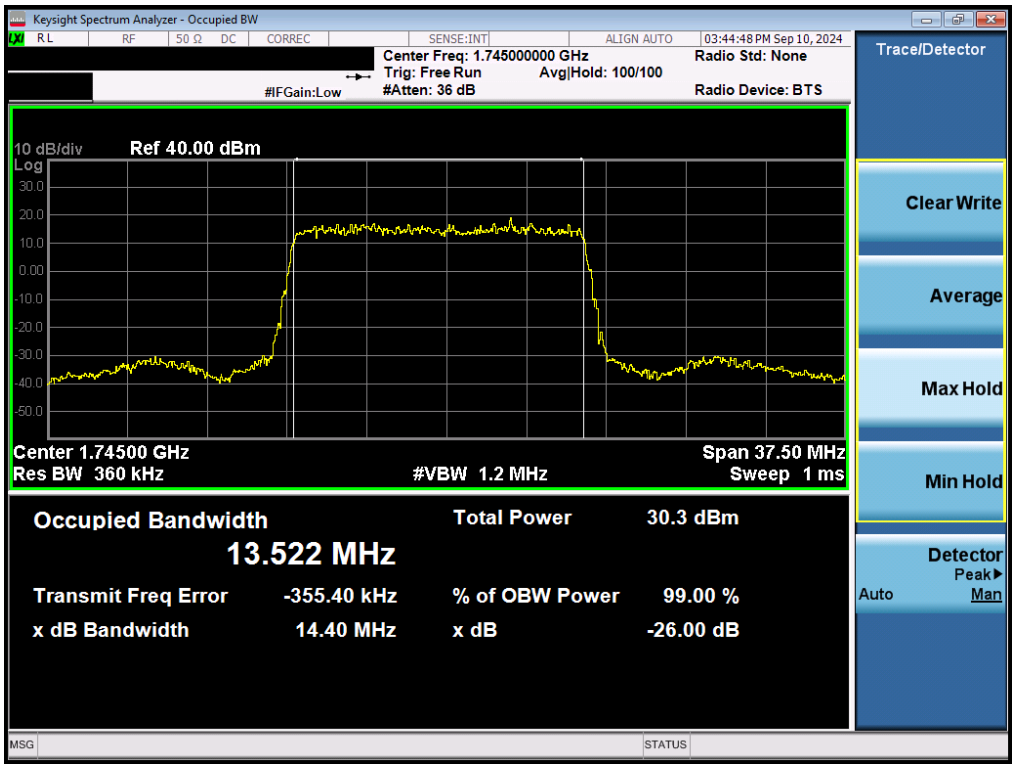
Plot 7-42. Occupied Bandwidth Plot (NR Band n66 - 20.0MHz DFT-s-OFDM BPSK - Full RB – ANT1)



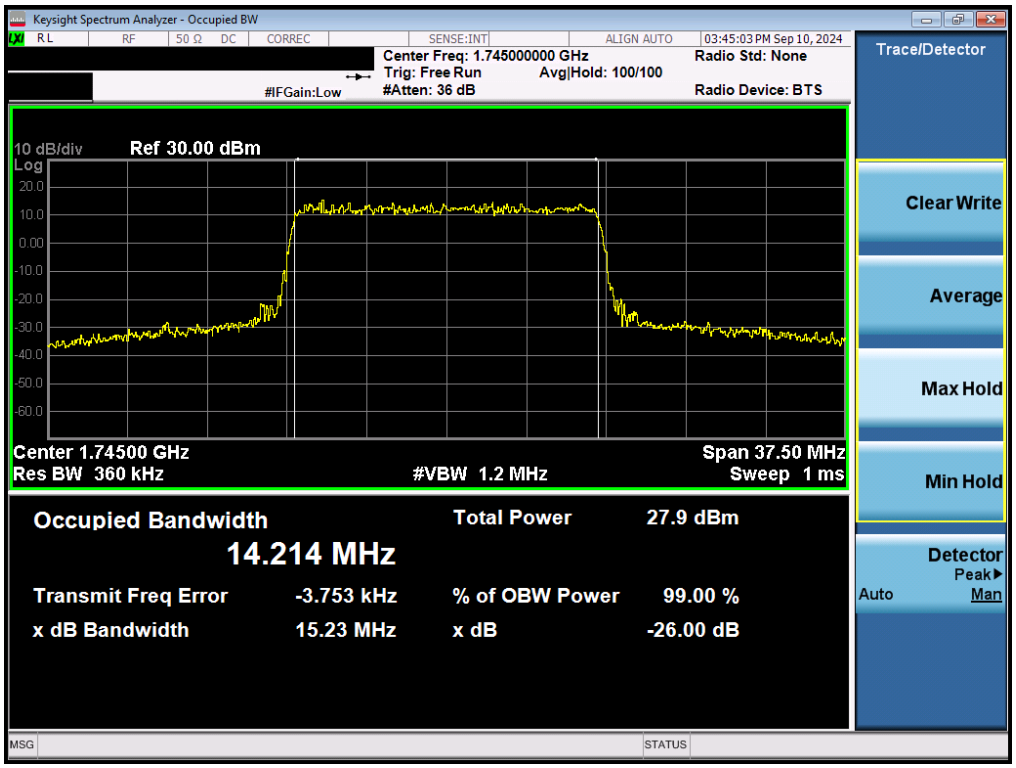
Plot 7-43. Occupied Bandwidth Plot (NR Band n66 - 20.0MHz CP-OFDM QPSK - Full RB – ANT1)



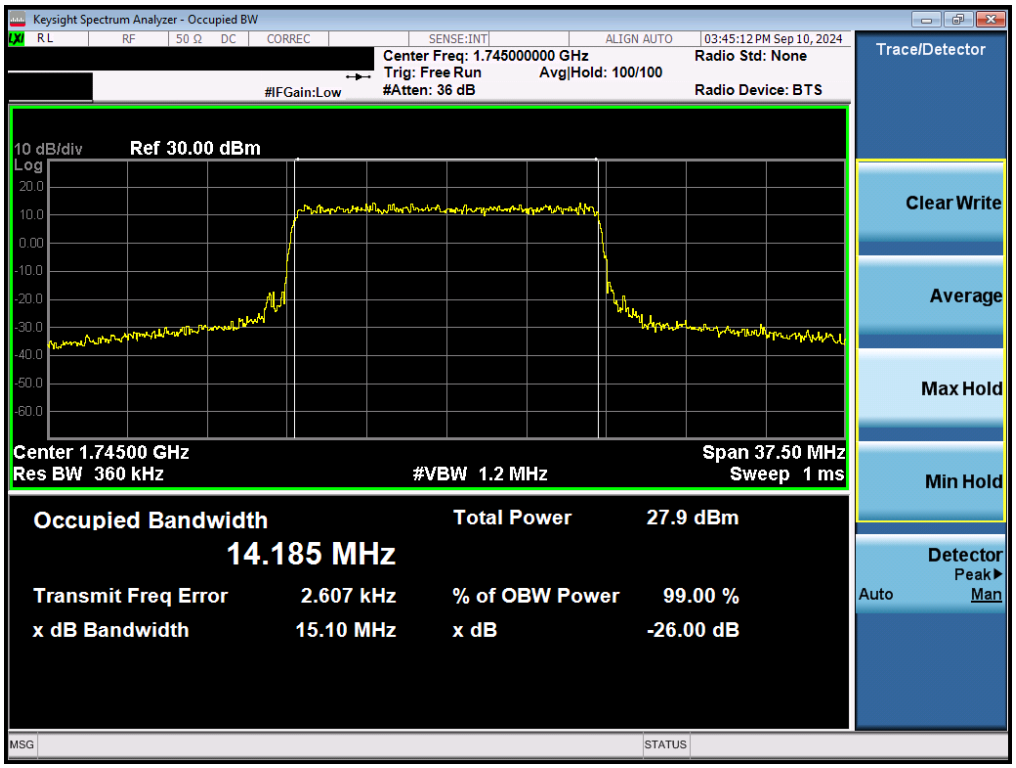
Plot 7-44. Occupied Bandwidth Plot (NR Band n66 - 20.0MHz CP-OFDM 16QAM - Full RB – ANT1)



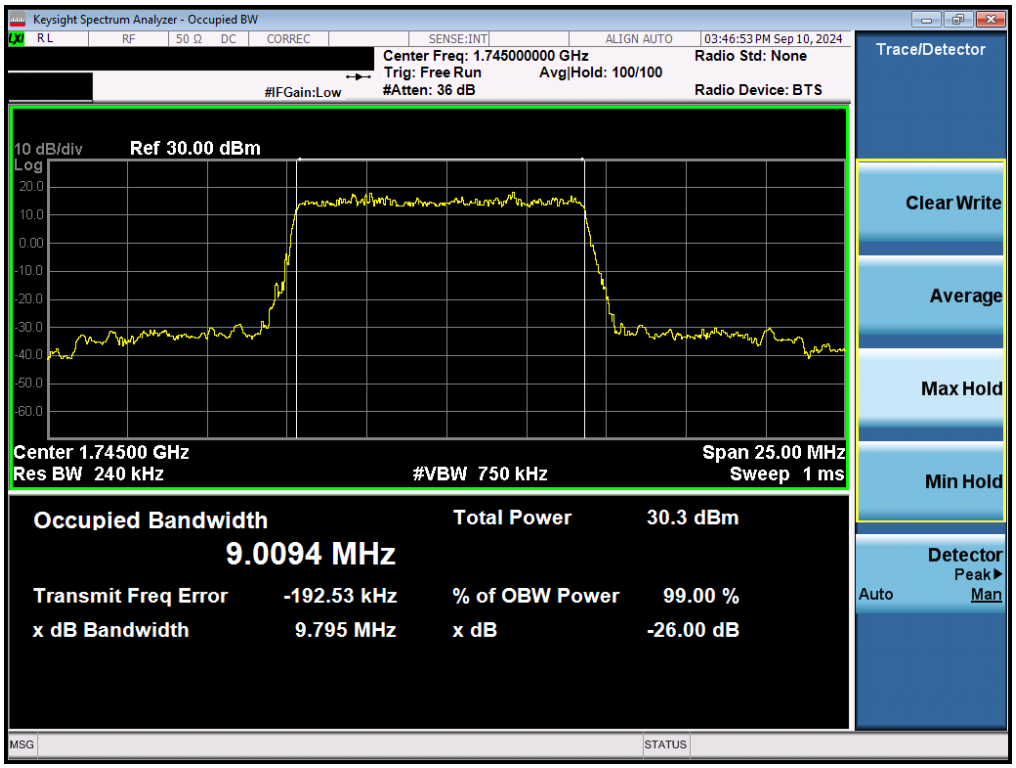
Plot 7-45. Occupied Bandwidth Plot (NR Band n66 - 15.0MHz DFT-s-OFDM BPSK - Full RB – ANT1)



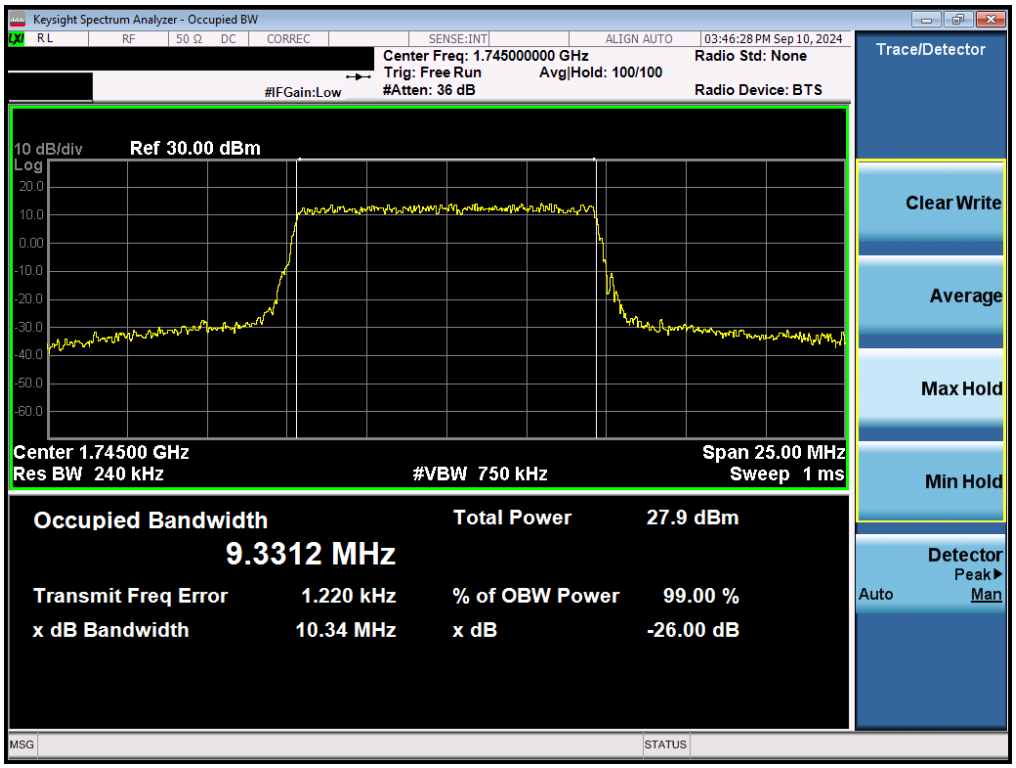
Plot 7-46. Occupied Bandwidth Plot (NR Band n66 - 15.0MHz CP-OFDM QPSK - Full RB – ANT1)



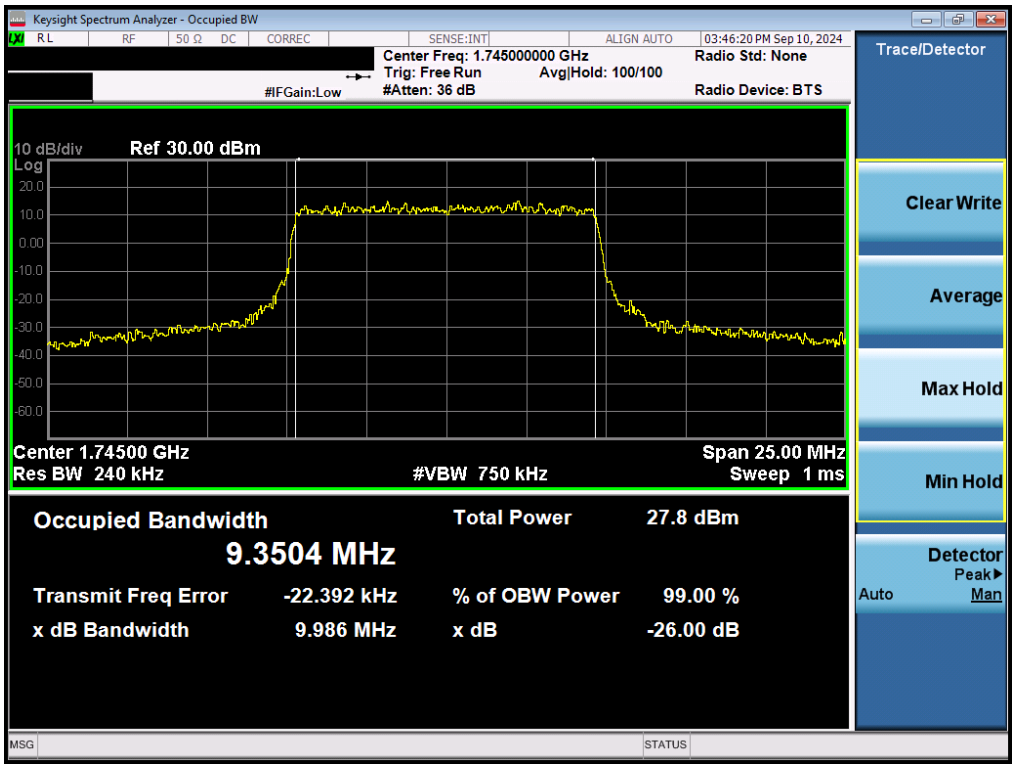
Plot 7-47. Occupied Bandwidth Plot (NR Band n66 - 15.0MHz CP-OFDM 16QAM - Full RB – ANT1)



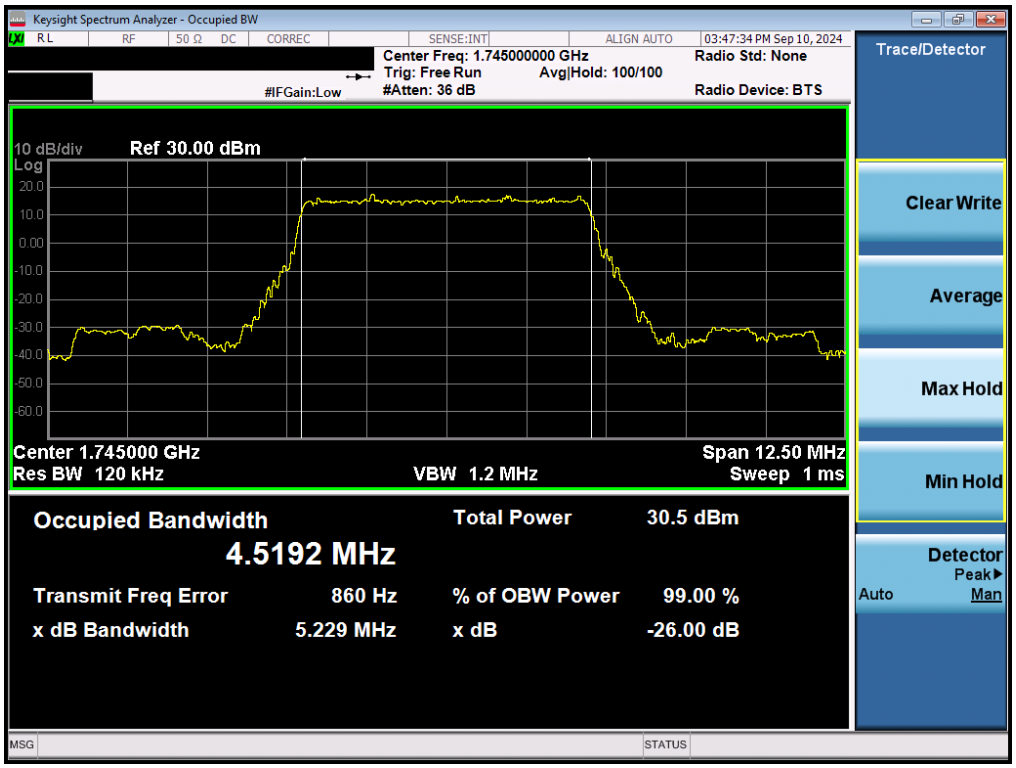
Plot 7-48. Occupied Bandwidth Plot (NR Band n66 - 10.0MHz DFT-s-OFDM BPSK - Full RB – ANT1)



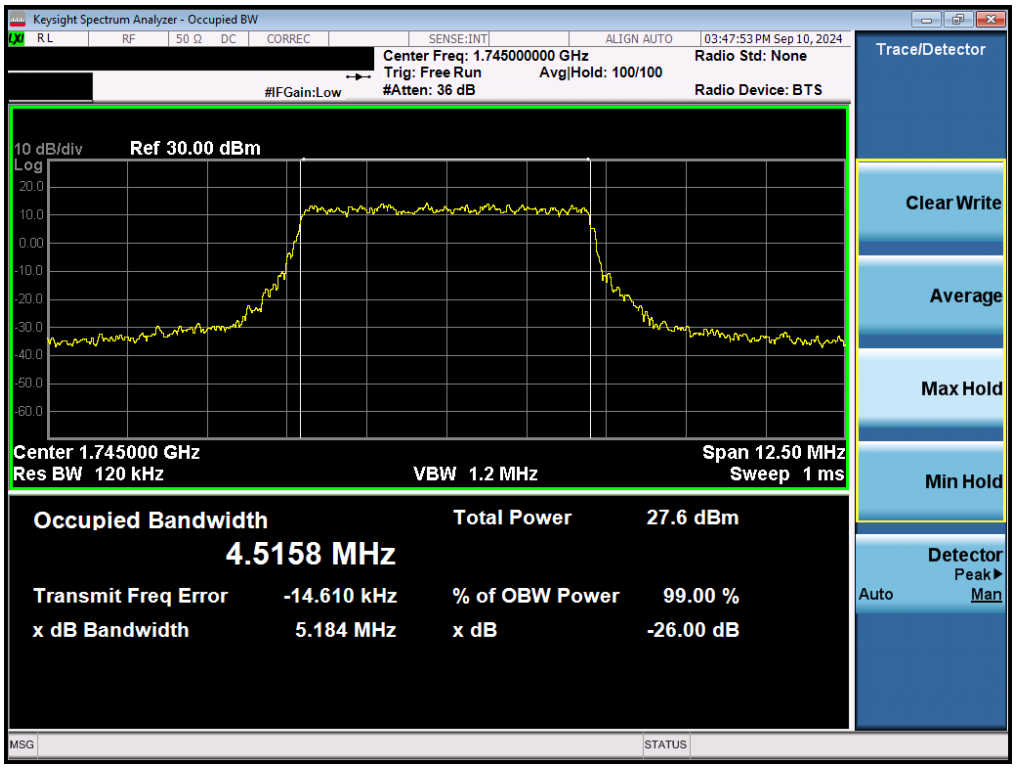
Plot 7-49. Occupied Bandwidth Plot (NR Band n66 - 10.0MHz CP-OFDM QPSK - Full RB – ANT1)



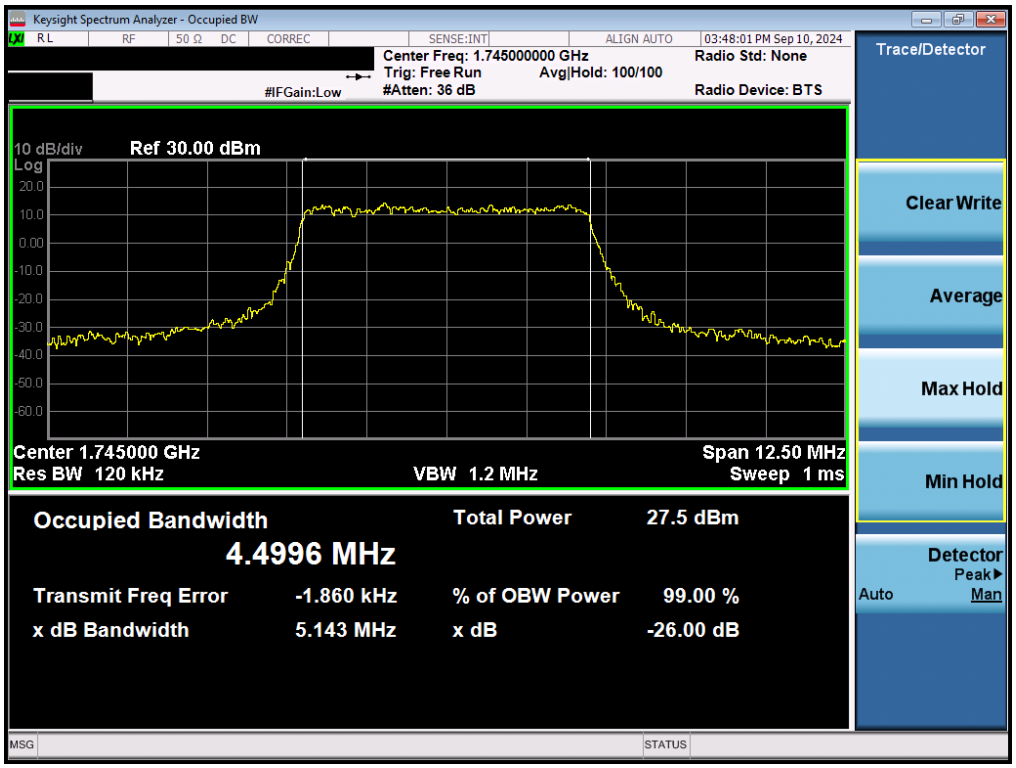
Plot 7-50. Occupied Bandwidth Plot (NR Band n66 - 10.0MHz CP-OFDM 16QAM - Full RB – ANT1)



Plot 7-51. Occupied Bandwidth Plot (NR Band n66 - 5.0MHz DFT-s-OFDM BPSK - Full RB – ANT1)



Plot 7-52. Occupied Bandwidth Plot (NR Band n66 - 5.0MHz CP-OFDM QPSK - Full RB – ANT1)

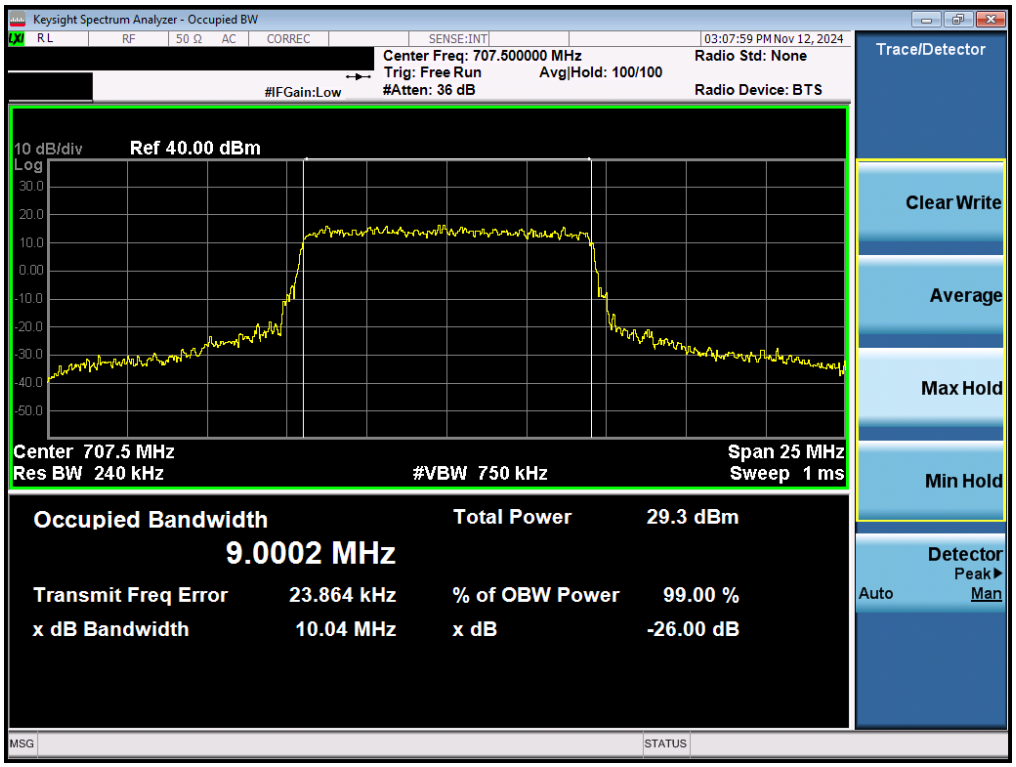


Plot 7-53. Occupied Bandwidth Plot (NR Band n66 - 5.0MHz CP-OFDM 16QAM - Full RB – ANT1)

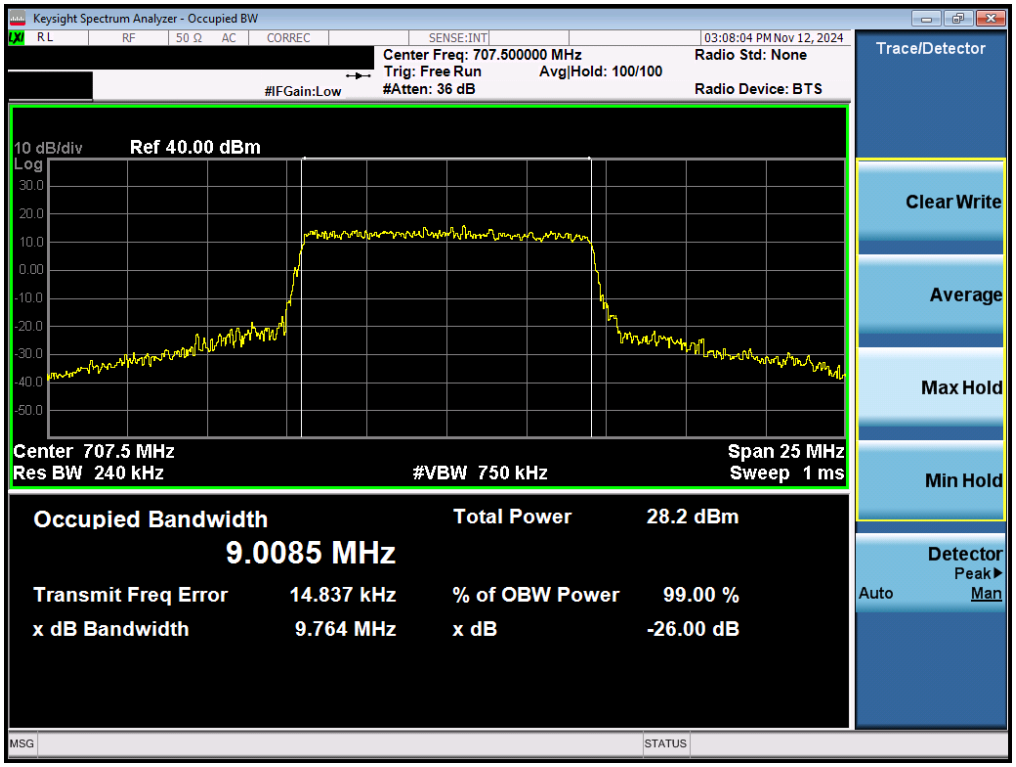
Mode	Bandwidth	Modulation	OBW [MHz]
LTE-B12	10MHz	QPSK	9.00
		16QAM	9.01
	5MHz	QPSK	4.51
		16QAM	4.53
	3MHz	QPSK	2.72
		16QAM	2.72
	1.4MHz	QPSK	1.10
		16QAM	1.11
LTE-B13	10MHz	QPSK	9.04
		16QAM	9.01
	5MHz	QPSK	4.51
		16QAM	4.51
LTE-B66-4	20MHz	QPSK	18.04
		16QAM	18.07
	15MHz	QPSK	13.52
		16QAM	13.53
	10MHz	QPSK	9.03
		16QAM	9.01
	5MHz	QPSK	4.52
		16QAM	4.53
	3MHz	QPSK	2.72
		16QAM	2.72
	1.4MHz	QPSK	1.11
		16QAM	1.11

Table 7-11. Occupied Bandwidth Results – Ant2

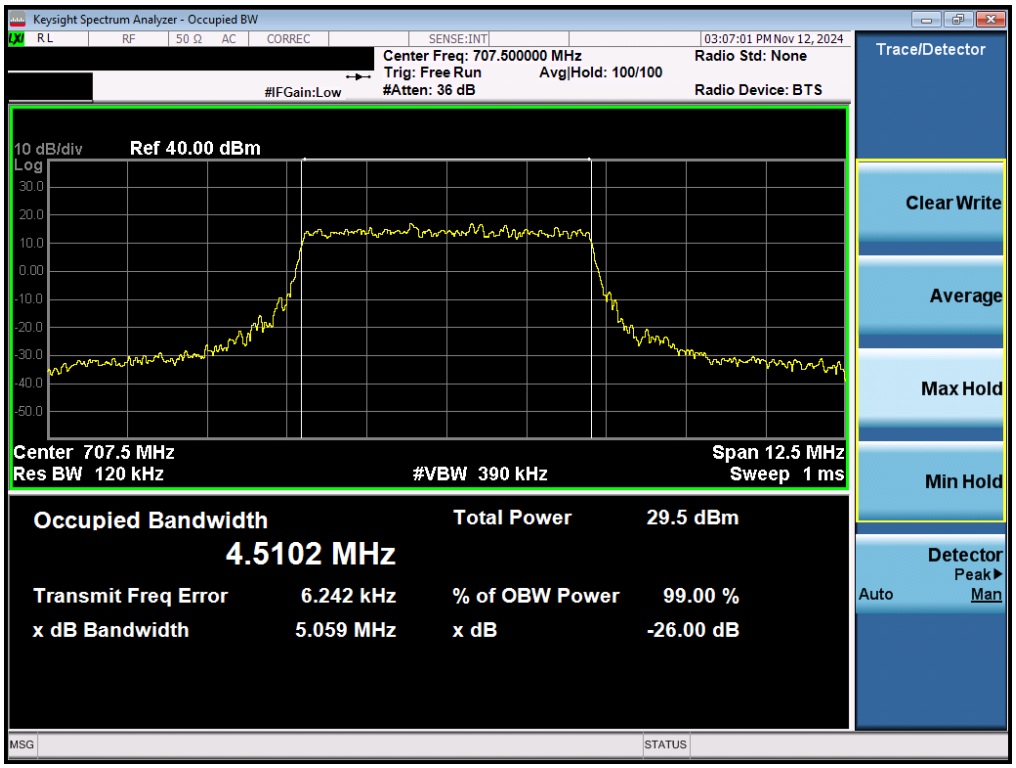
LTE Band 12/17 – ANT2



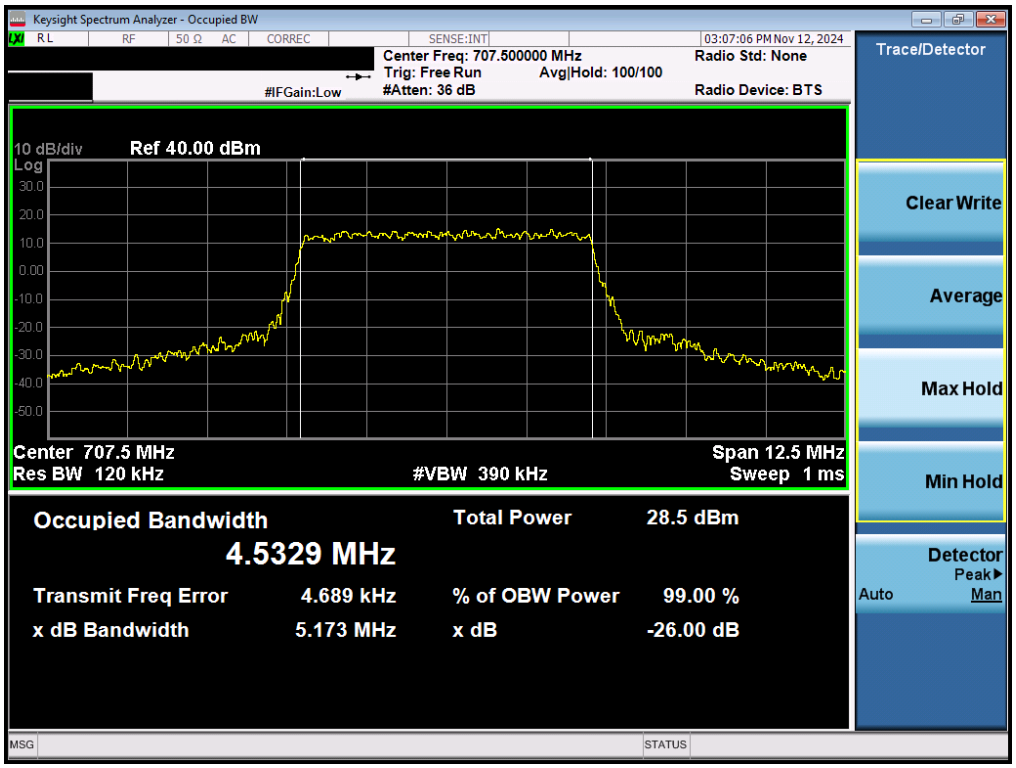
Plot 7-54. Occupied Bandwidth Plot (LTE Band 12/17 - 10MHz QPSK - Full RB – ANT2)



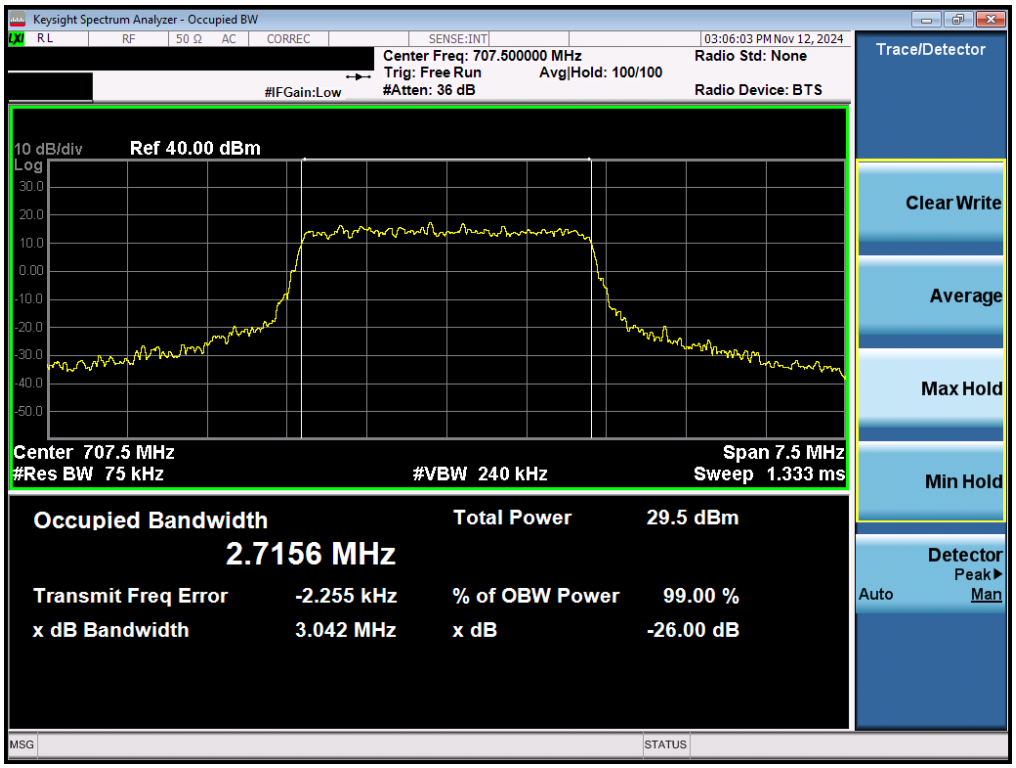
Plot 7-55. Occupied Bandwidth Plot (LTE Band 12/17 - 10MHz 16-QAM - Full RB – ANT2)



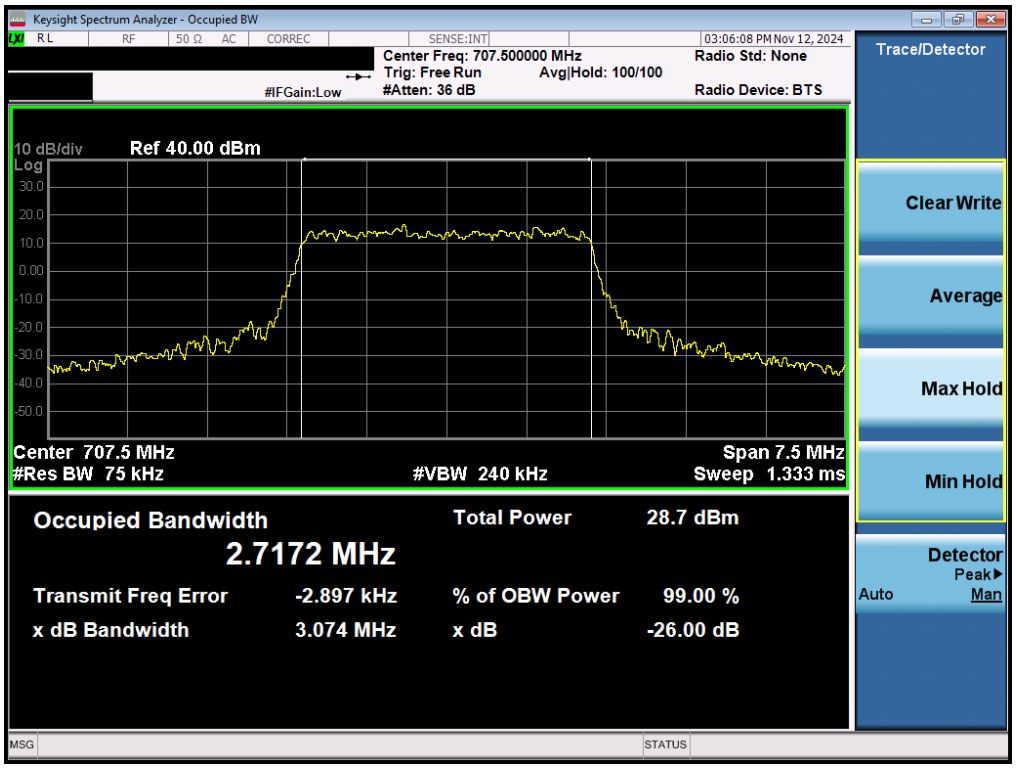
Plot 7-56. Occupied Bandwidth Plot (LTE Band 12/17 - 5MHz QPSK - Full RB – ANT2)



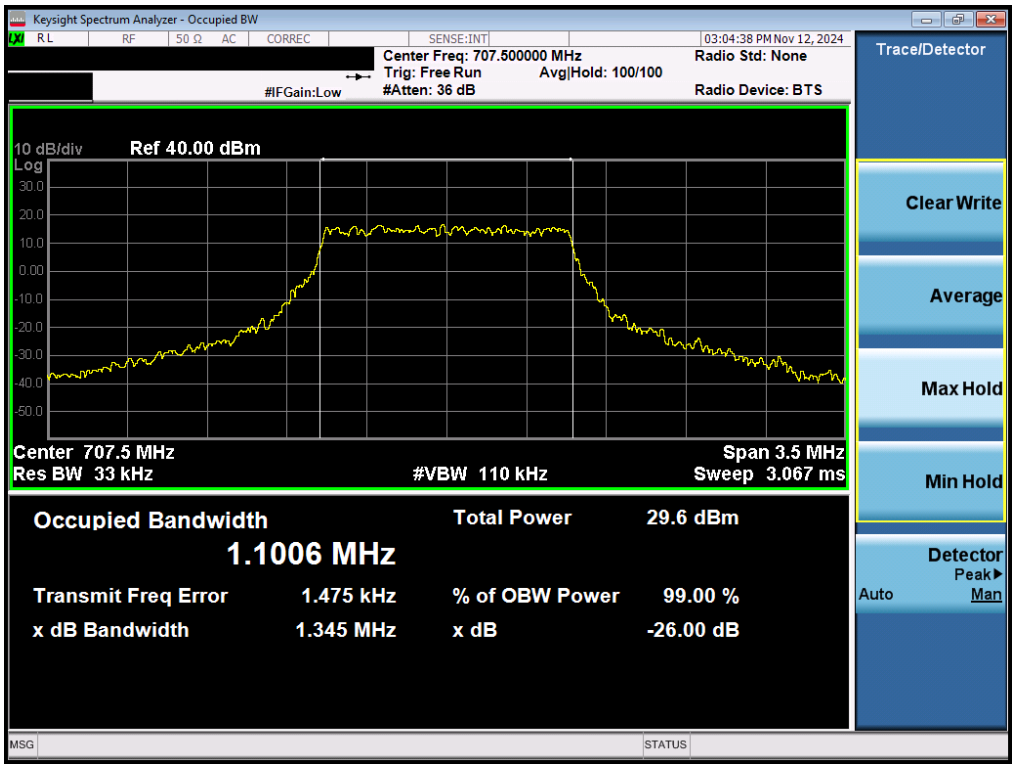
Plot 7-57. Occupied Bandwidth Plot (LTE Band 12/17 - 5MHz 16-QAM - Full RB – ANT2)



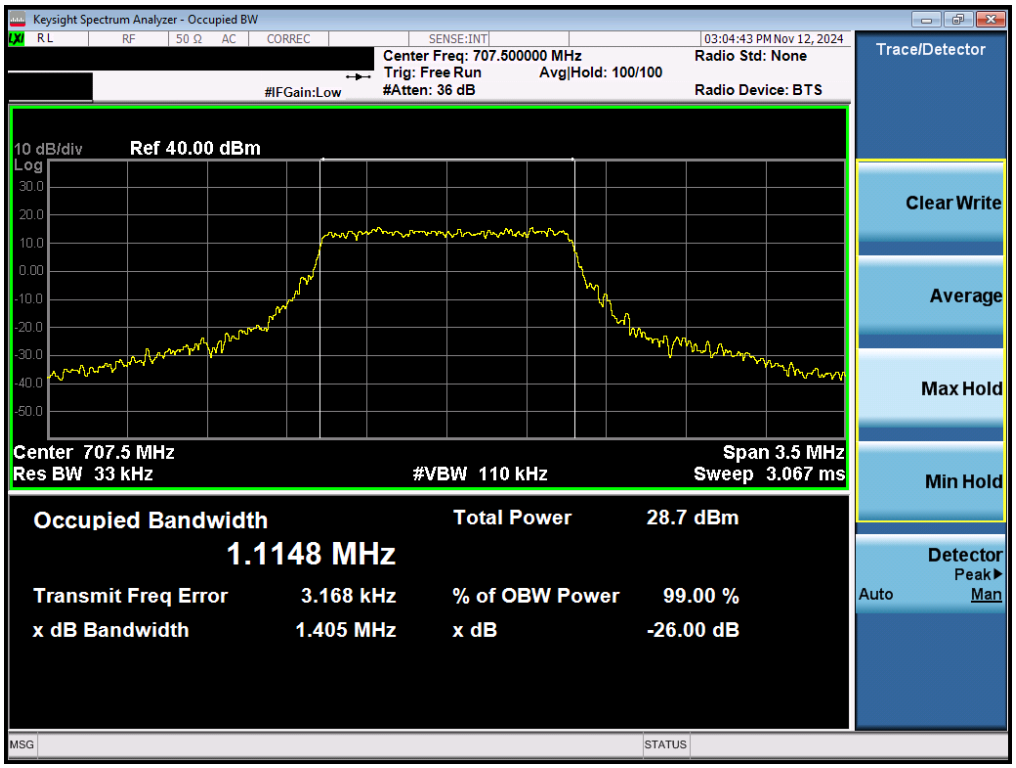
Plot 7-58. Occupied Bandwidth Plot (LTE Band 12/17 - 3MHz QPSK - Full RB – ANT2)



Plot 7-59. Occupied Bandwidth Plot (LTE Band 12/17 - 3MHz 16-QAM - Full RB – ANT2)

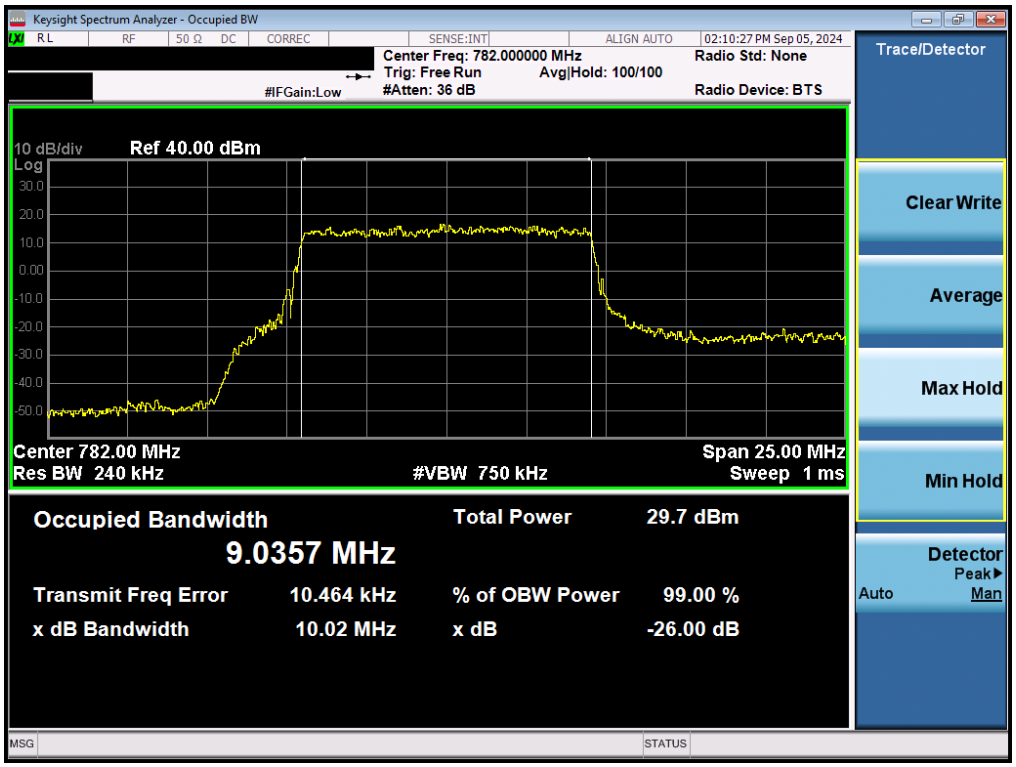


Plot 7-60. Occupied Bandwidth Plot (LTE Band 12/17 – 1.4MHz QPSK - Full RB – ANT2)

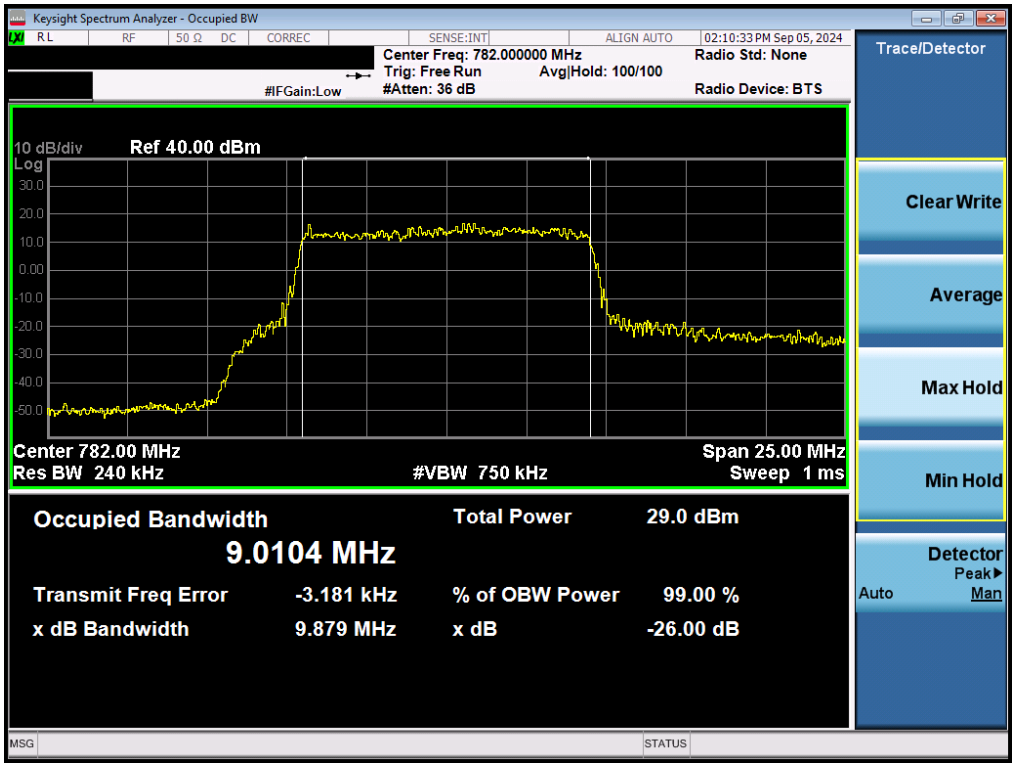


Plot 7-61. Occupied Bandwidth Plot (LTE Band 12/17 – 1.4MHz 16-QAM - Full RB – ANT2)

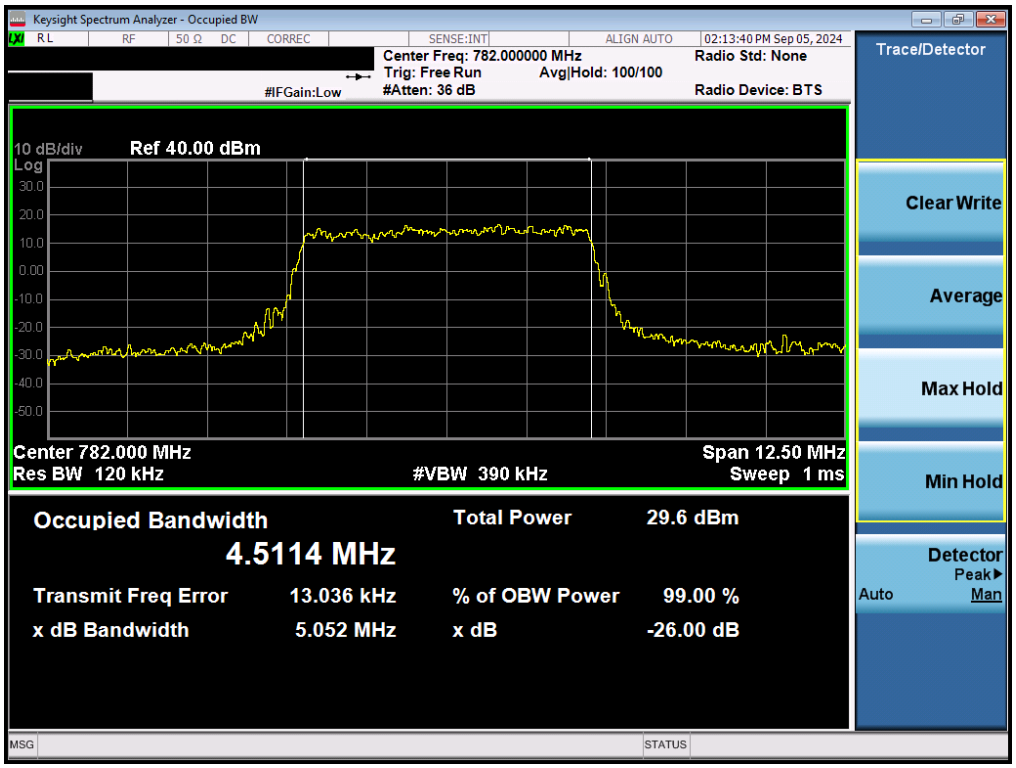
LTE Band 13 – ANT2



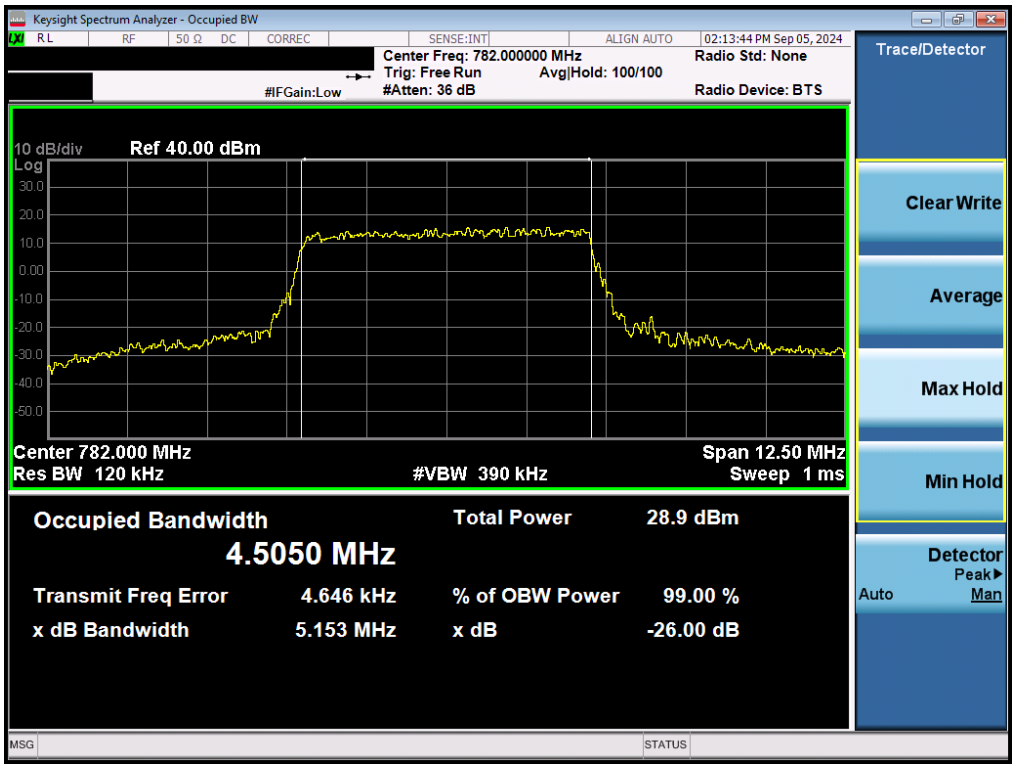
Plot 7-62. Occupied Bandwidth Plot (LTE Band 13 - 10MHz QPSK - Full RB – ANT2)



Plot 7-63. Occupied Bandwidth Plot (LTE Band 13 - 10MHz 16-QAM - Full RB – ANT2)

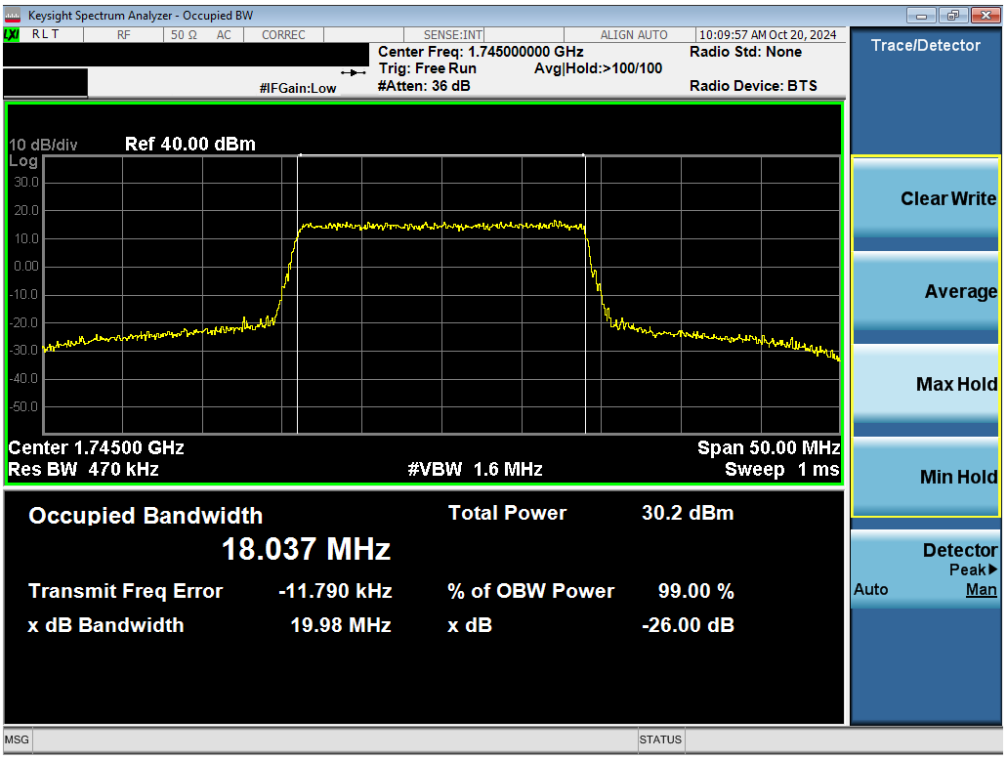


Plot 7-64. Occupied Bandwidth Plot (LTE Band 13 - 5MHz QPSK - Full RB – ANT2)

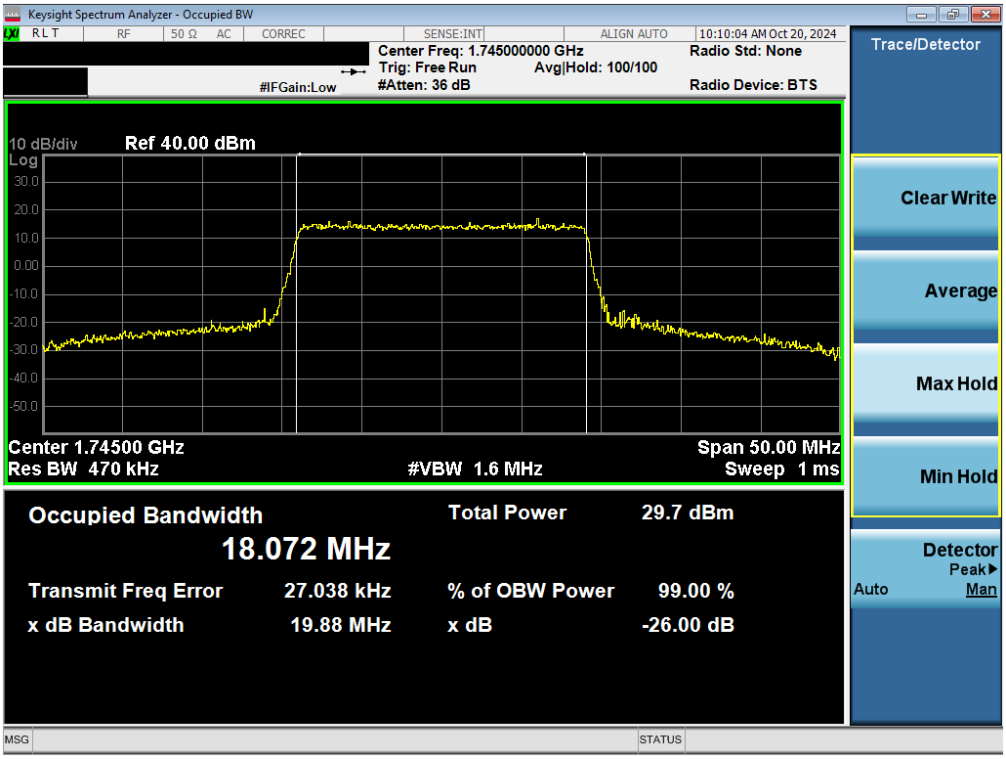


Plot 7-65. Occupied Bandwidth Plot (LTE Band 13 - 5MHz 16-QAM - Full RB – ANT2)

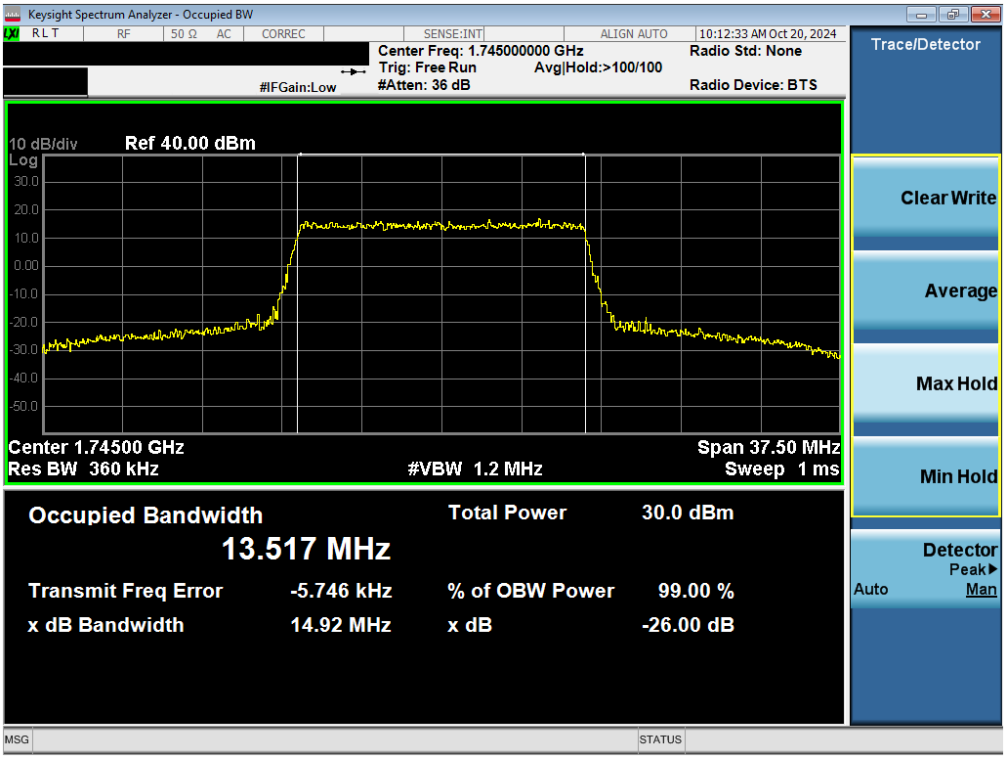
LTE Band 66/4 - ANT2



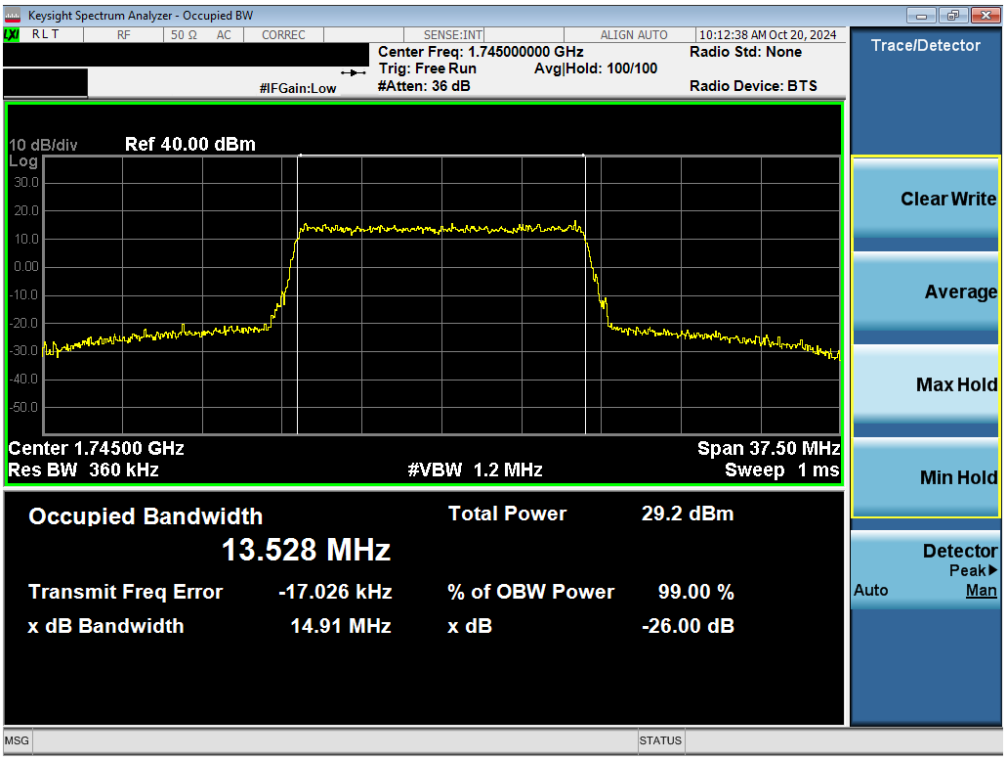
Plot 7-66. Occupied Bandwidth Plot (LTE Band 66/4 - 20MHz QPSK - Full RB - ANT2)



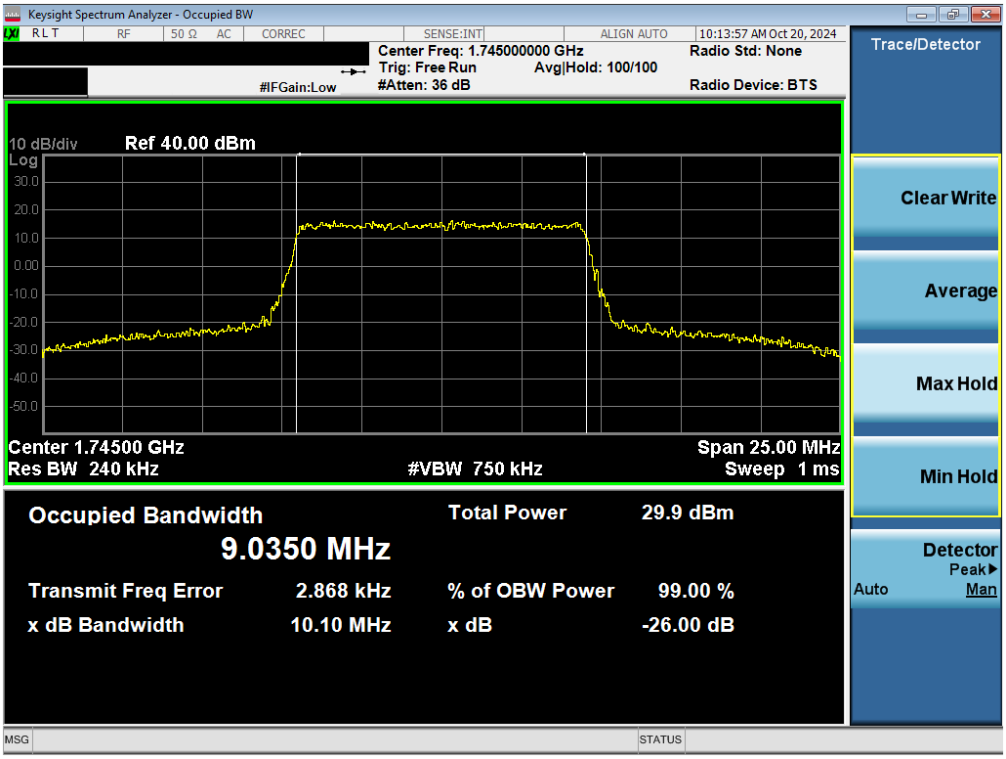
Plot 7-67. Occupied Bandwidth Plot (LTE Band 66/4 - 20MHz 16-QAM - Full RB - ANT2)



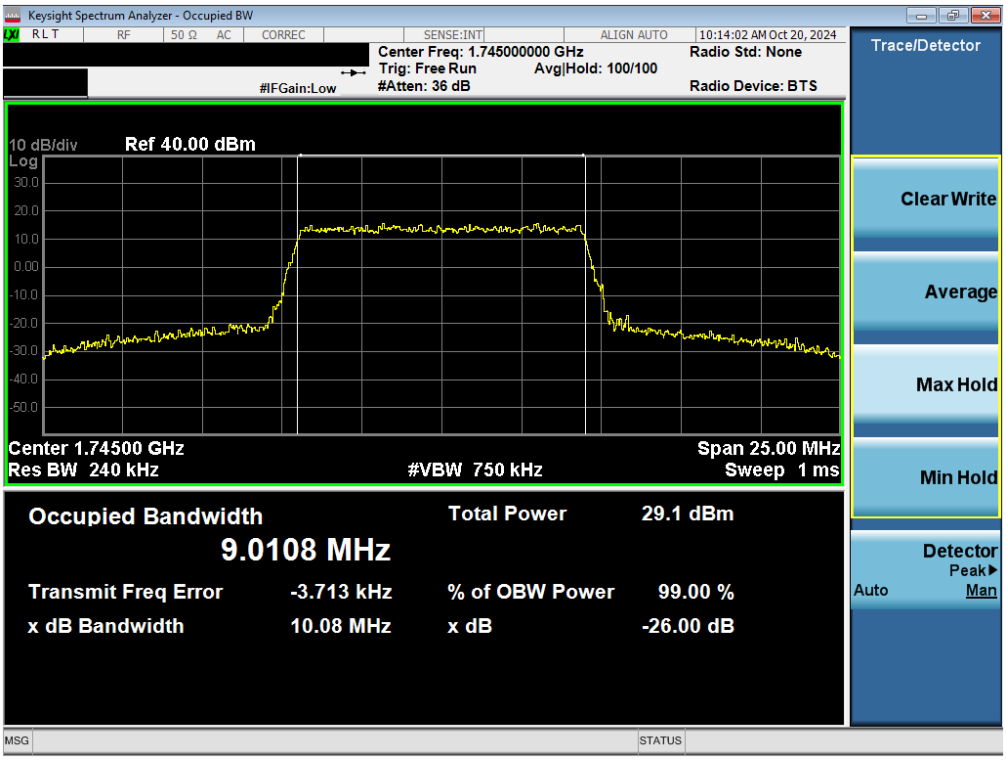
Plot 7-68. Occupied Bandwidth Plot (LTE Band 66/4 - 15MHz QPSK - Full RB - ANT2)



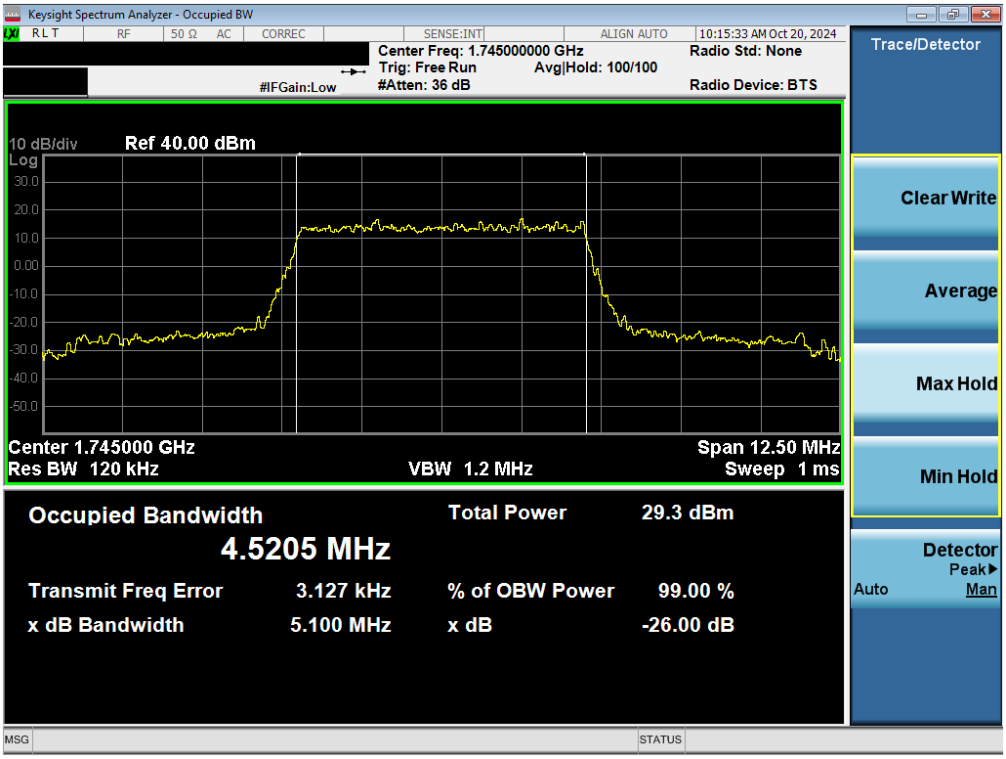
Plot 7-69. Occupied Bandwidth Plot (LTE Band 66/4 - 15MHz 16-QAM - Full RB - ANT2)



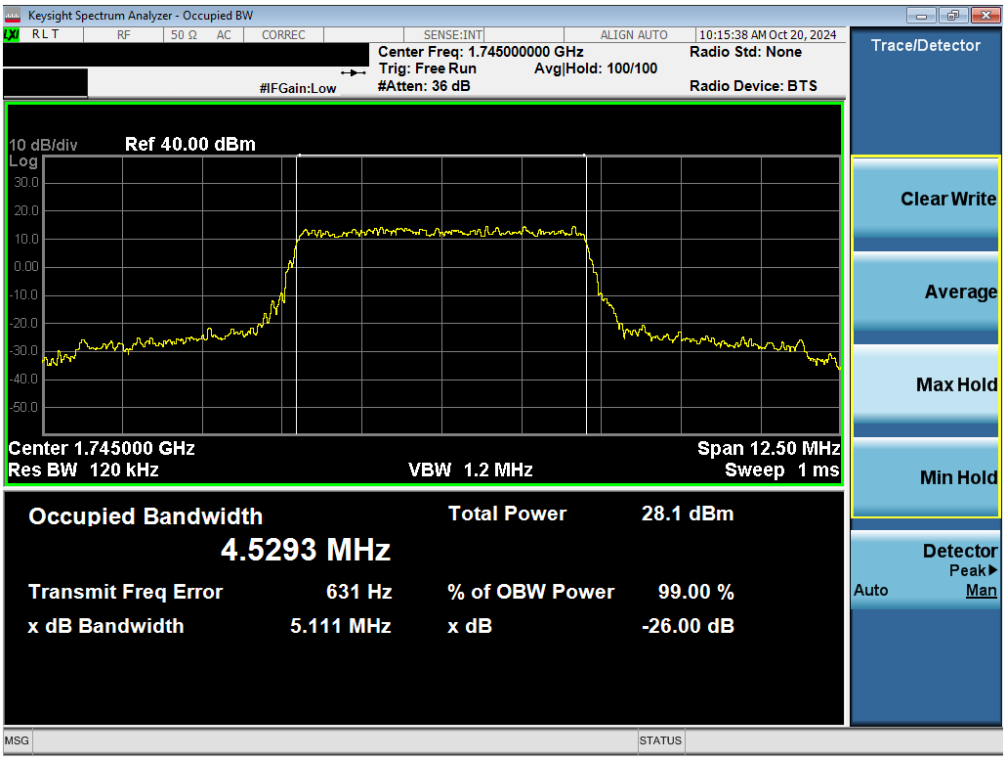
Plot 7-70. Occupied Bandwidth Plot (LTE Band 66/4 - 10MHz QPSK - Full RB - ANT2)



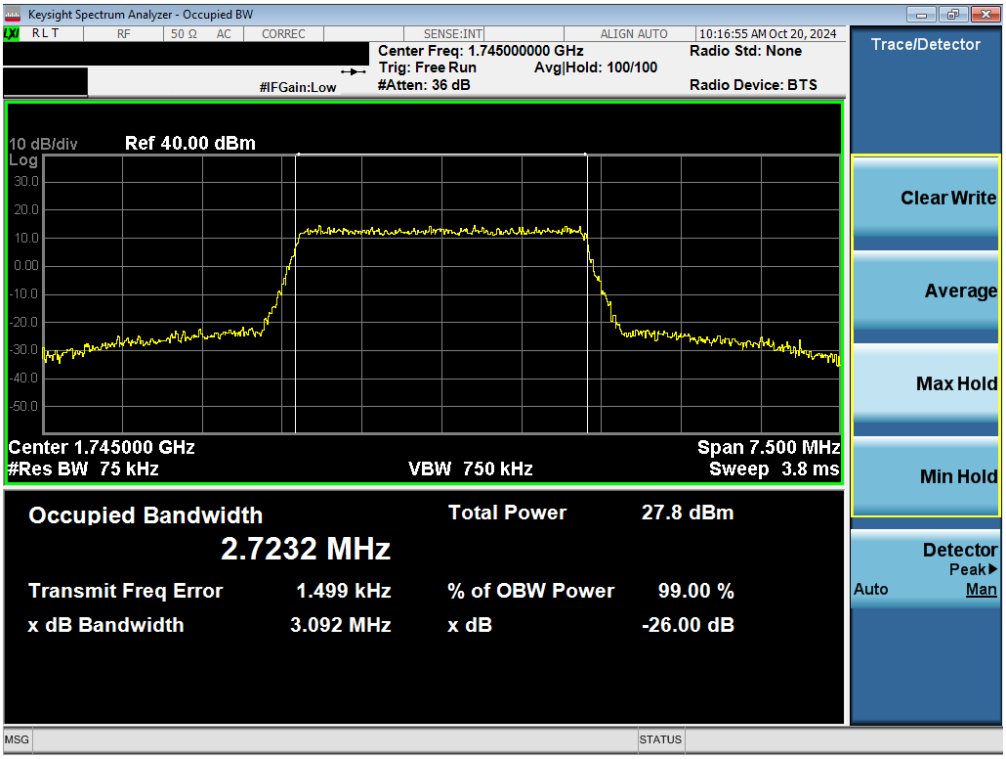
Plot 7-71. Occupied Bandwidth Plot (LTE Band 66/4 - 10MHz 16-QAM - Full RB - ANT2)



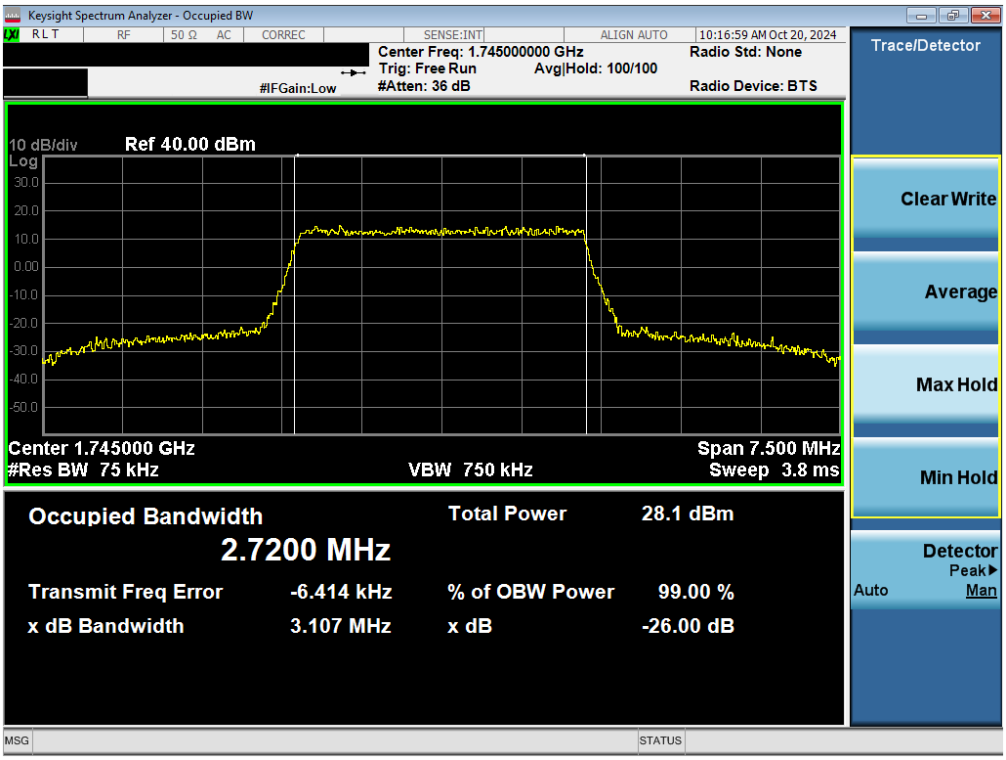
Plot 7-72. Occupied Bandwidth Plot (LTE Band 66/4 - 5MHz QPSK - Full RB - ANT2)



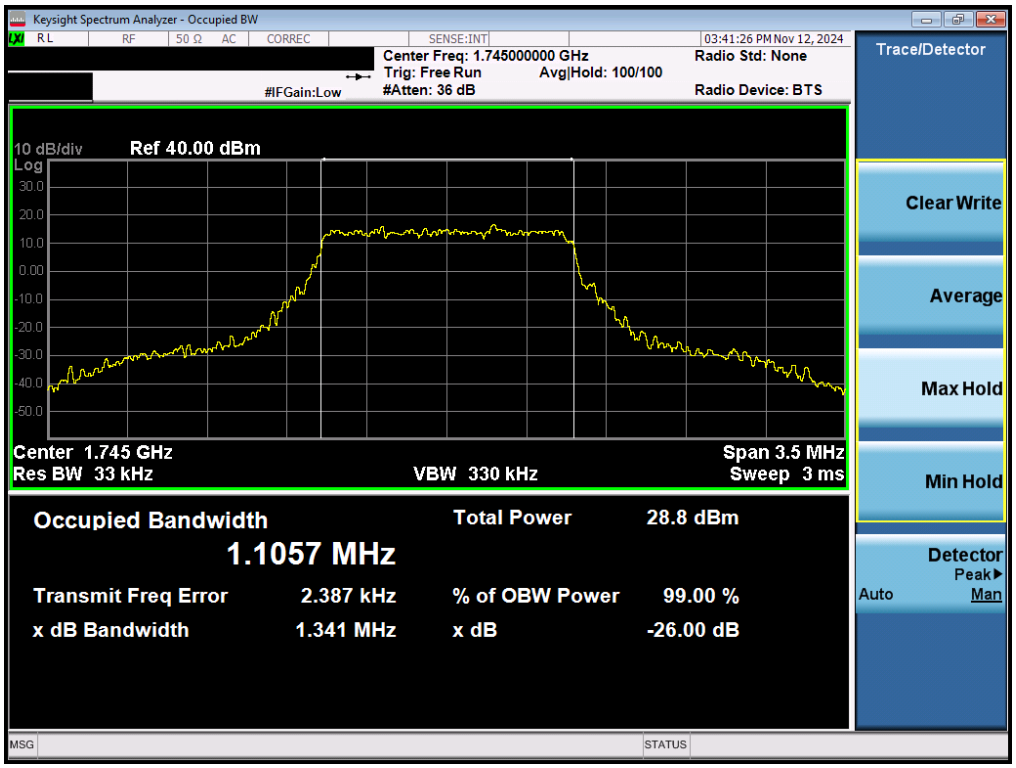
Plot 7-73. Occupied Bandwidth Plot (LTE Band 66/4 - 5MHz 16-QAM - Full RB - ANT2)



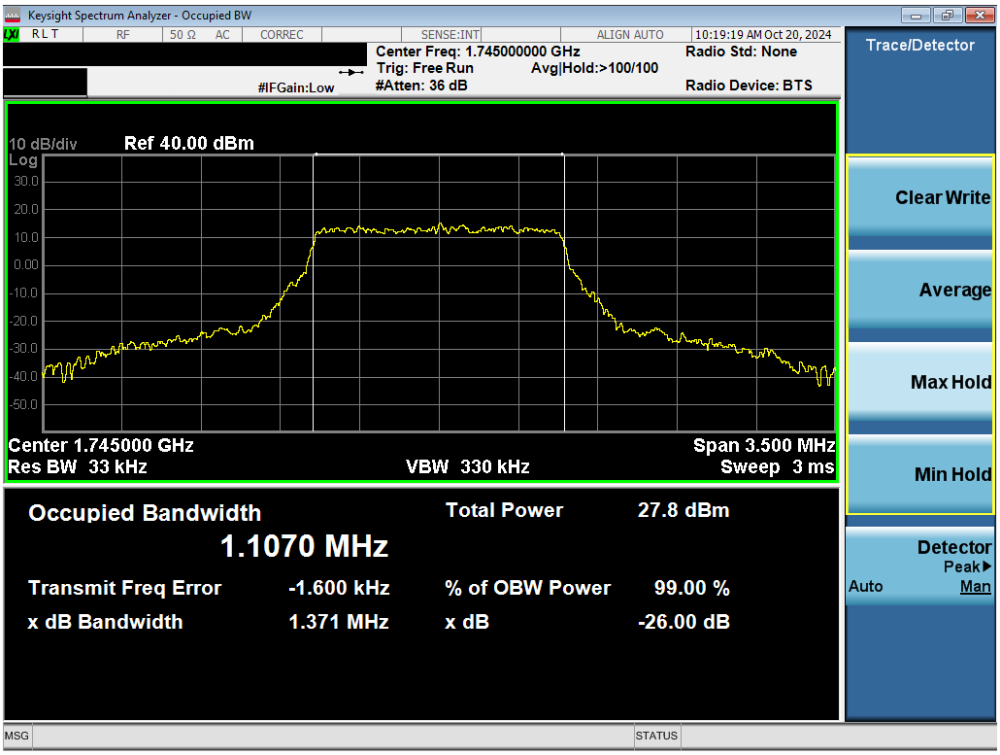
Plot 7-74. Occupied Bandwidth Plot (LTE Band 66/4 - 3MHz QPSK - Full RB - ANT2)



Plot 7-75. Occupied Bandwidth Plot (LTE Band 66/4 - 3MHz 16-QAM - Full RB - ANT2)



Plot 7-76. Occupied Bandwidth Plot (LTE Band 66/4 - 1.4MHz QPSK - Full RB - ANT2)

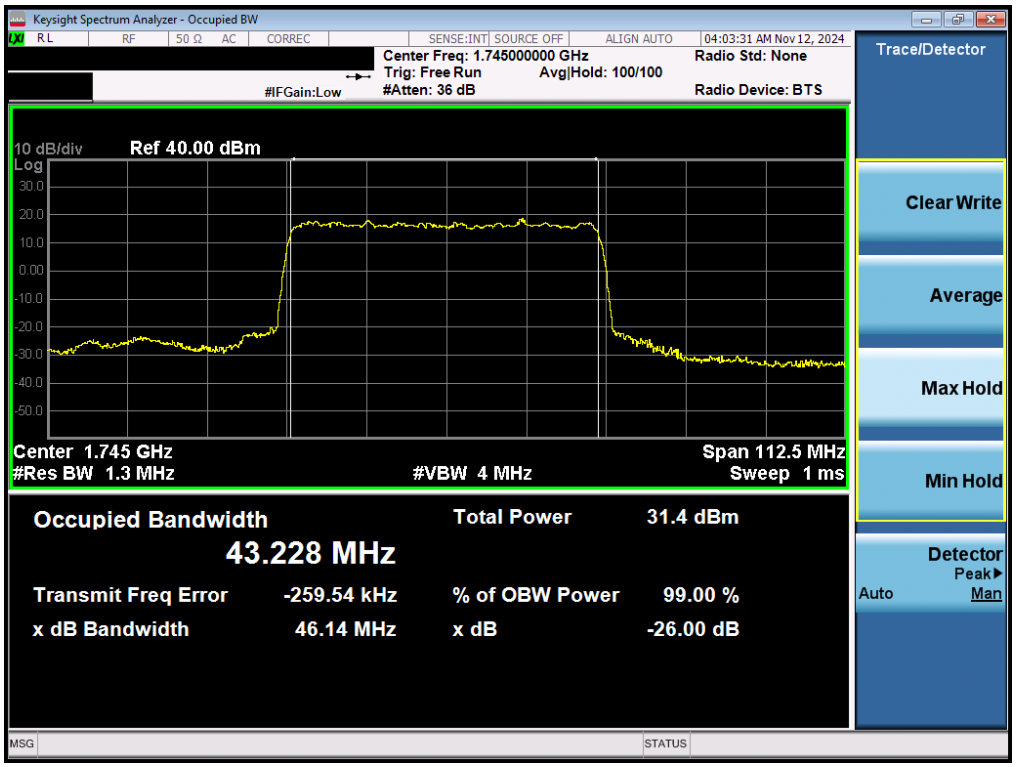


Plot 7-77. Occupied Bandwidth Plot (LTE Band 66/4 - 1.4MHz 16-QAM - Full RB - ANT2)

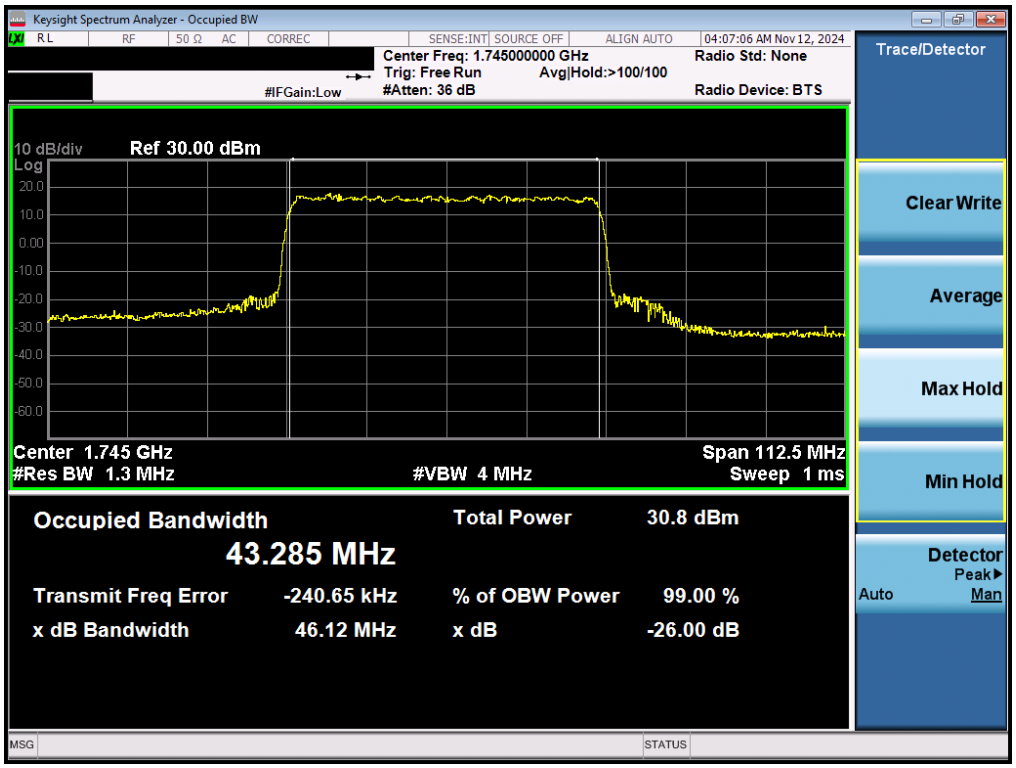
Mode	Bandwidth	Modulation	OBW [MHz]
NR-n66	45MHz	π/2 BPSK	43.23
		QPSK	43.29
		16QAM	43.42
	40MHz	π/2 BPSK	38.77
		QPSK	39.02
		16QAM	38.85
	35MHz	π/2 BPSK	32.44
		QPSK	32.50
		16QAM	32.40
	30MHz	π/2 BPSK	28.80
		QPSK	28.80
		16QAM	28.79
	25MHz	π/2 BPSK	23.07
		QPSK	23.11
		16QAM	23.02
	20MHz	π/2 BPSK	17.97
		QPSK	17.97
		16QAM	17.97
	15MHz	π/2 BPSK	13.51
		QPSK	13.53
		16QAM	13.53
	10MHz	π/2 BPSK	9.02
		QPSK	9.02
		16QAM	9.04
	5MHz	π/2 BPSK	4.53
		QPSK	4.51
		16QAM	4.54

Table 7-12. Occupied Bandwidth Results – Ant2

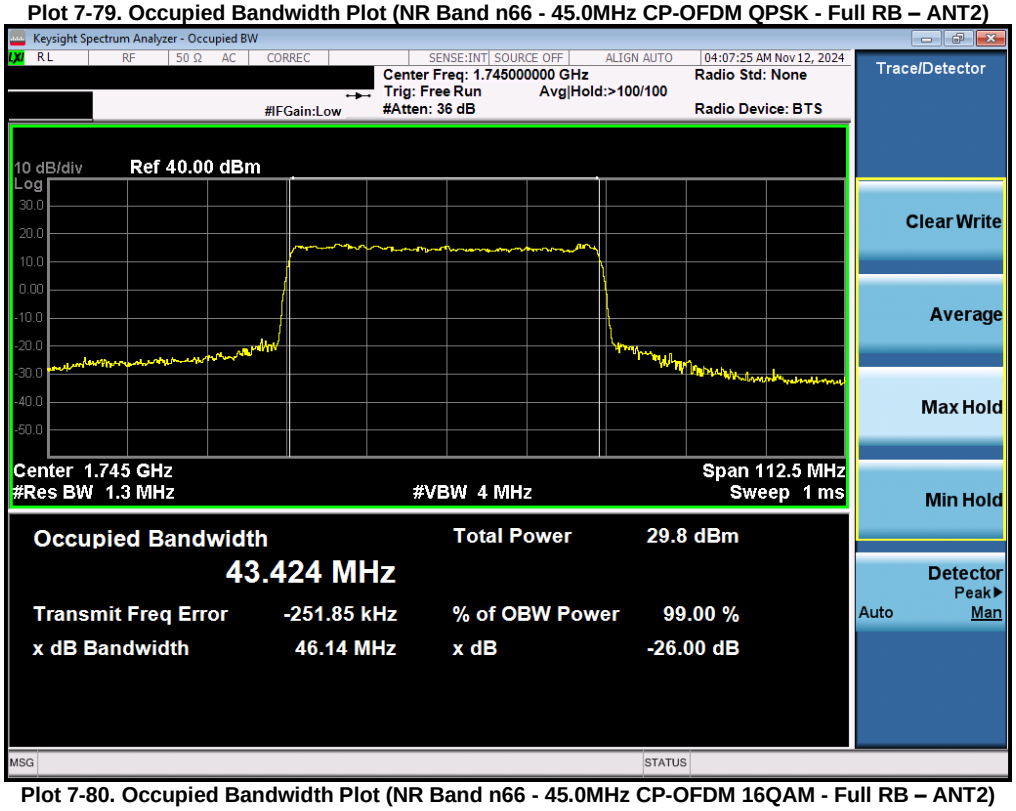
NR Band n66 – ANT2



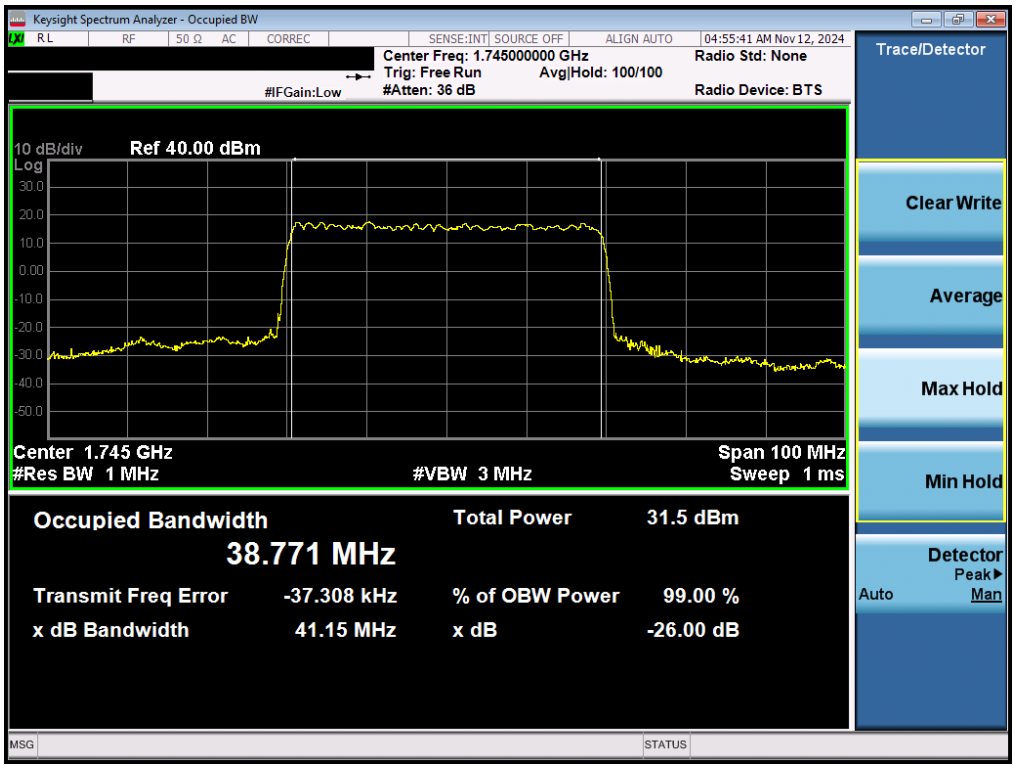
Plot 7-78. Occupied Bandwidth Plot (NR Band n66 - 45.0MHz DFT-s-OFDM BPSK - Full RB – ANT2)



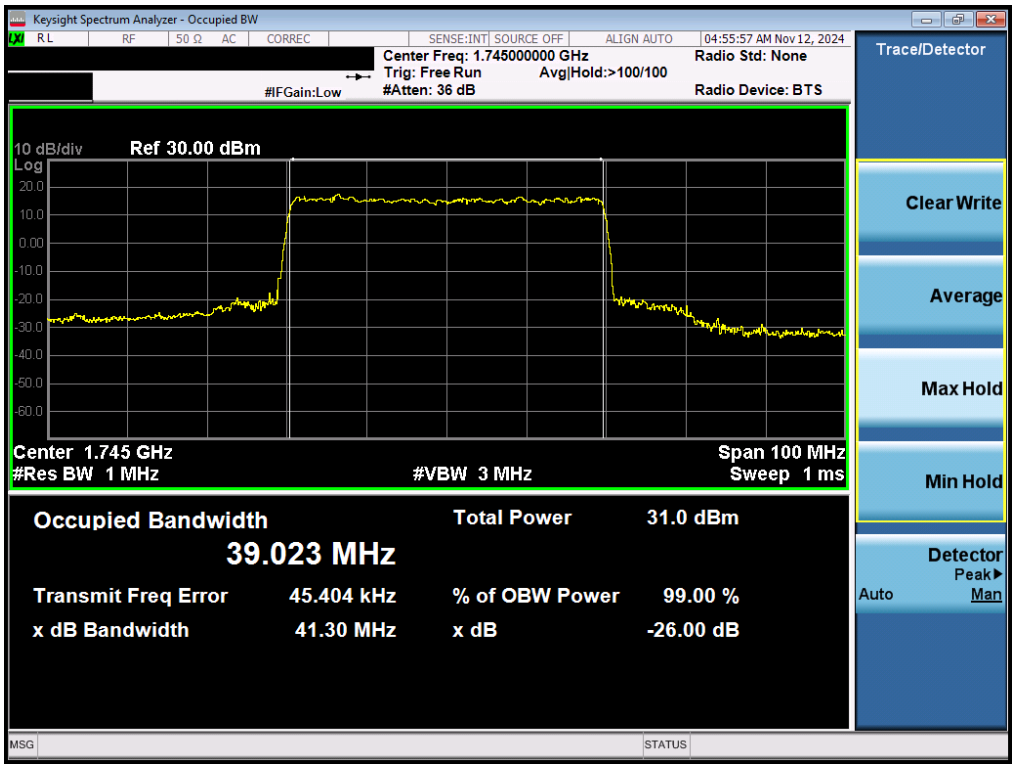
Plot 7-79. Occupied Bandwidth Plot (NR Band n66 - 45.0MHz CP-OFDM QPSK - Full RB – ANT2)



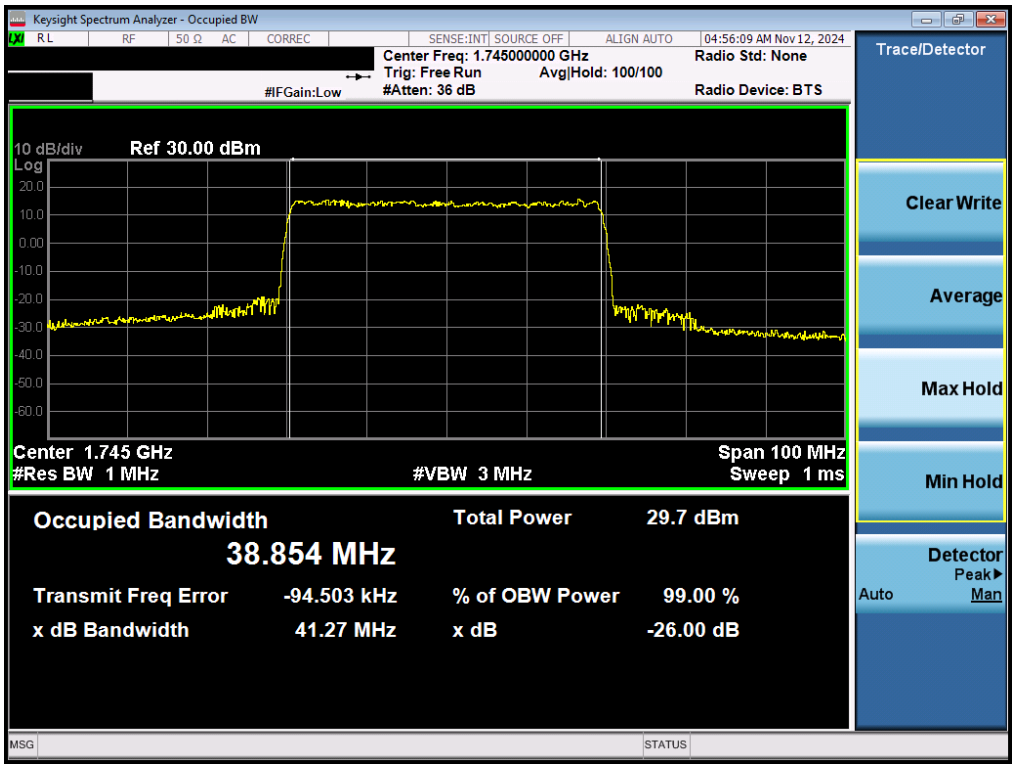
Plot 7-80. Occupied Bandwidth Plot (NR Band n66 - 45.0MHz CP-OFDM 16QAM - Full RB – ANT2)



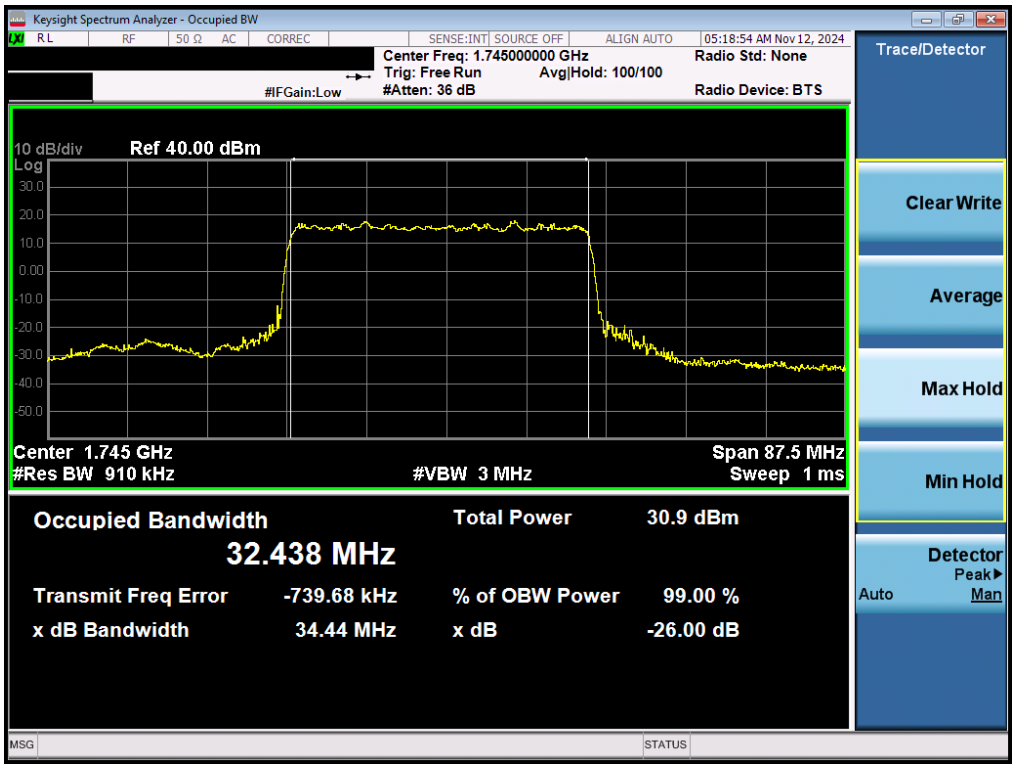
Plot 7-81. Occupied Bandwidth Plot (NR Band n66 - 40.0MHz DFT-s-OFDM BPSK - Full RB – ANT2)



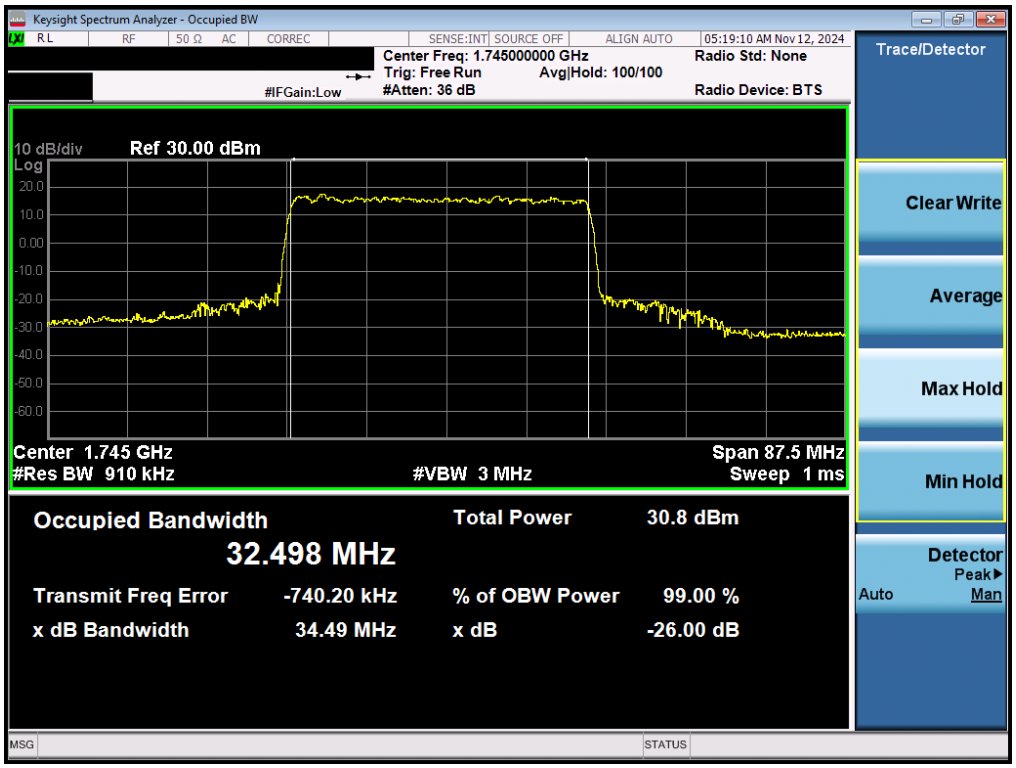
Plot 7-82. Occupied Bandwidth Plot (NR Band n66 - 40.0MHz CP-OFDM QPSK - Full RB – ANT2)



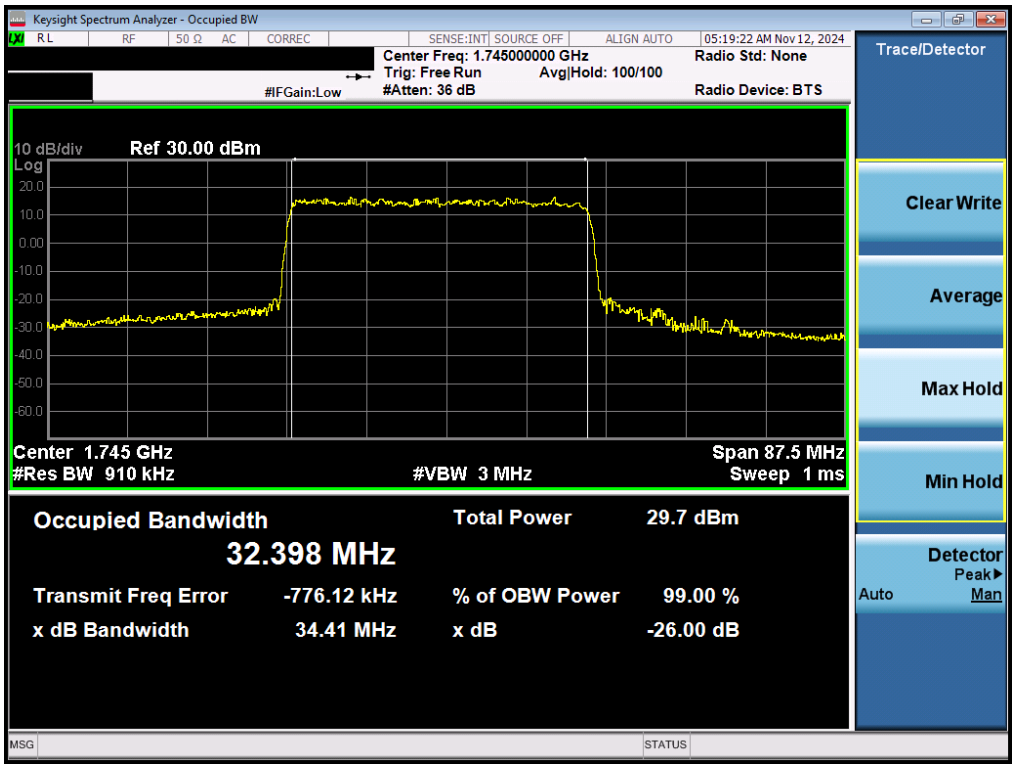
Plot 7-83. Occupied Bandwidth Plot (NR Band n66 - 40.0MHz CP-OFDM 16QAM - Full RB – ANT2)



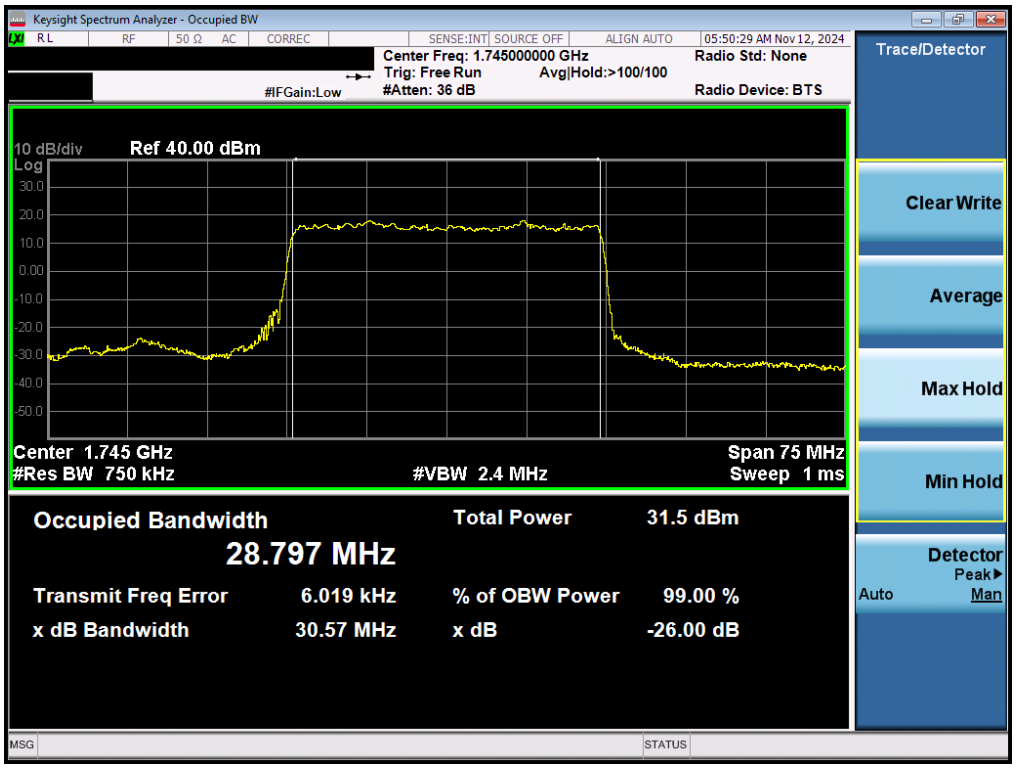
Plot 7-84. Occupied Bandwidth Plot (NR Band n66 - 35.0MHz DFT-s-OFDM BPSK - Full RB – ANT2)



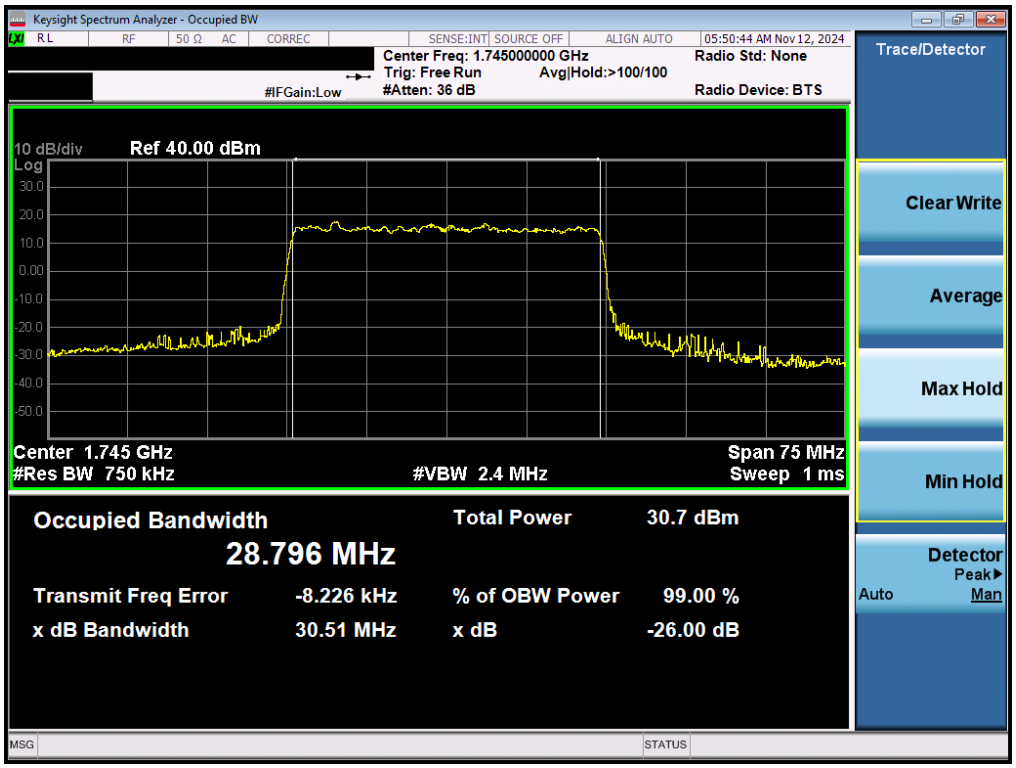
Plot 7-85. Occupied Bandwidth Plot (NR Band n66 - 35.0MHz CP-OFDM QPSK - Full RB – ANT2)



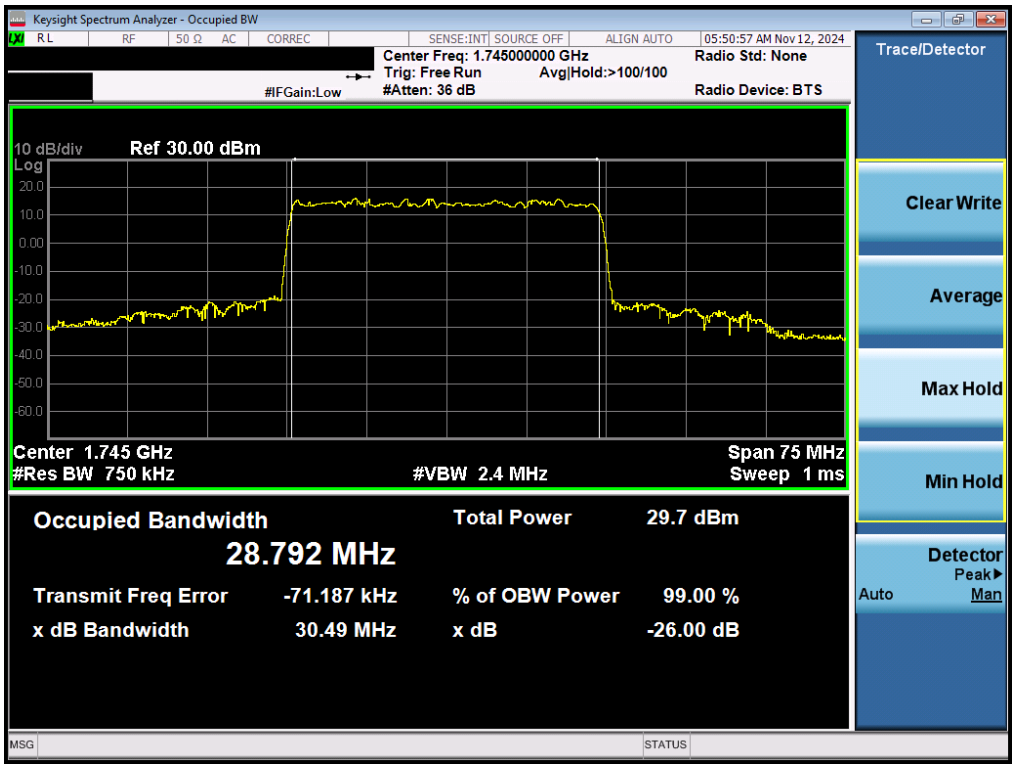
Plot 7-86. Occupied Bandwidth Plot (NR Band n66 - 35.0MHz CP-OFDM 16QAM - Full RB – ANT2)



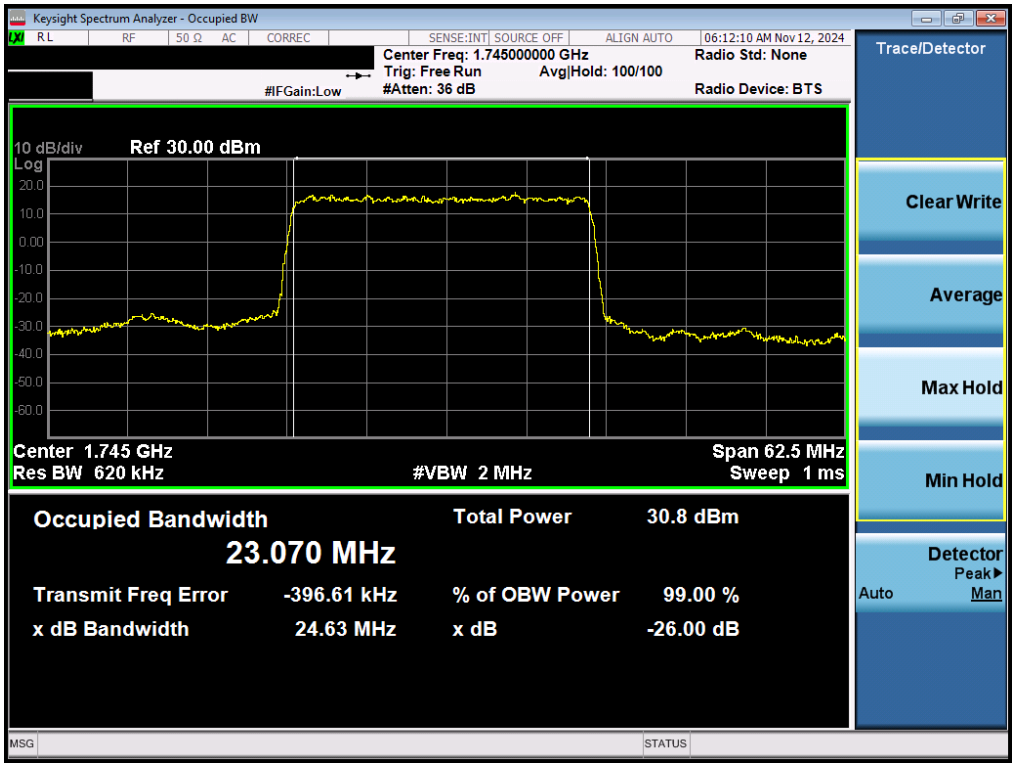
Plot 7-87. Occupied Bandwidth Plot (NR Band n66 - 30.0MHz DFT-s-OFDM BPSK - Full RB – ANT2)



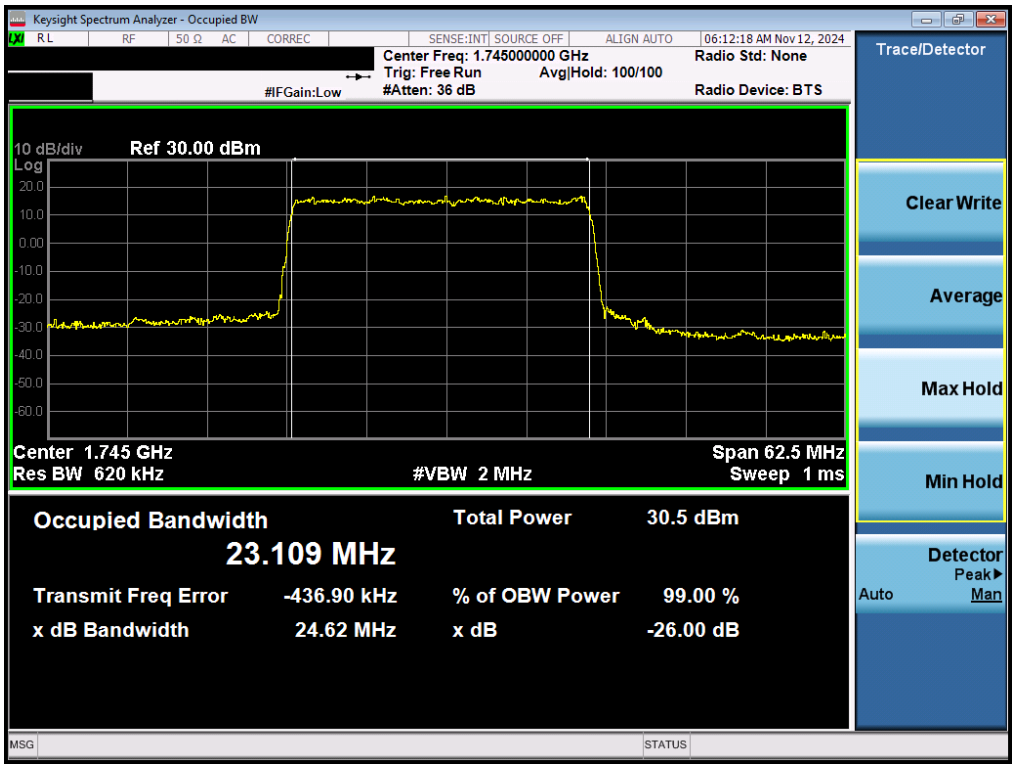
Plot 7-88. Occupied Bandwidth Plot (NR Band n66 - 30.0MHz CP-OFDM QPSK - Full RB – ANT2)



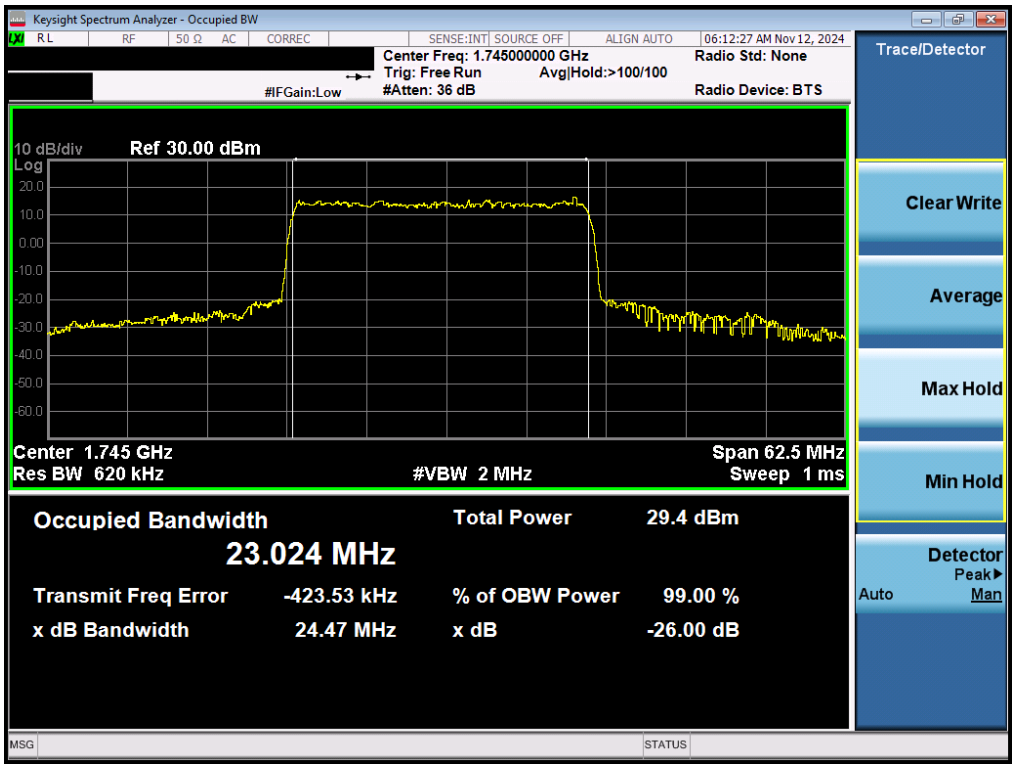
Plot 7-89. Occupied Bandwidth Plot (NR Band n66 - 30.0MHz CP-OFDM 16QAM - Full RB – ANT2)



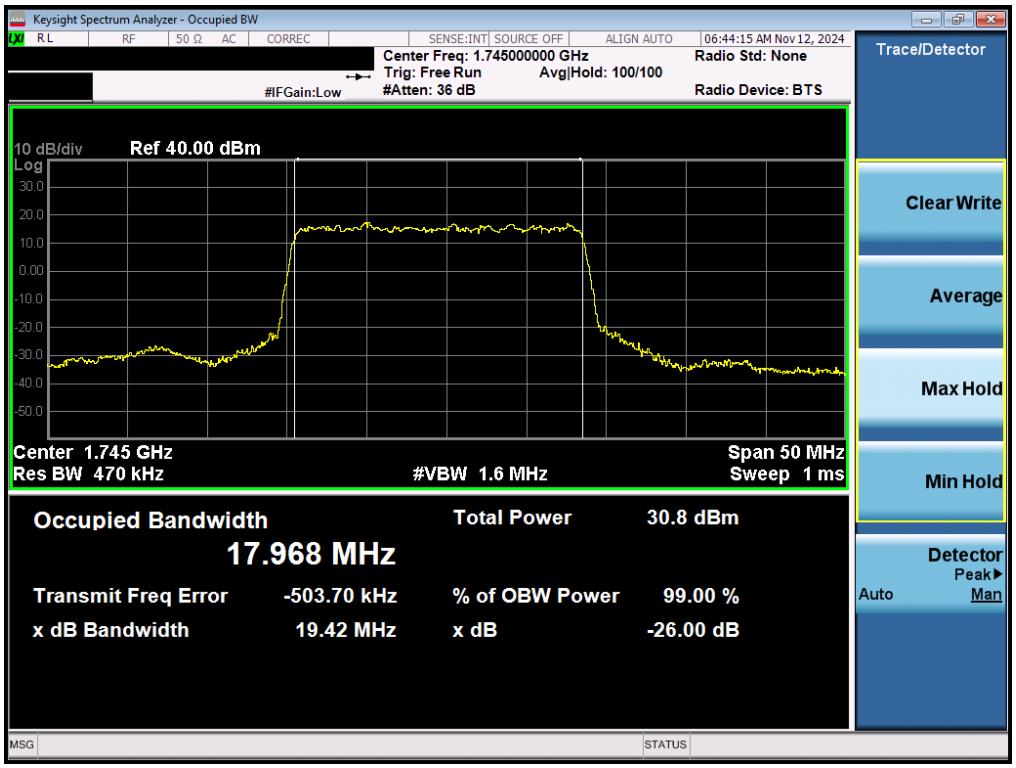
Plot 7-90. Occupied Bandwidth Plot (NR Band n66 - 25.0MHz DFT-s-OFDM BPSK - Full RB – ANT2)



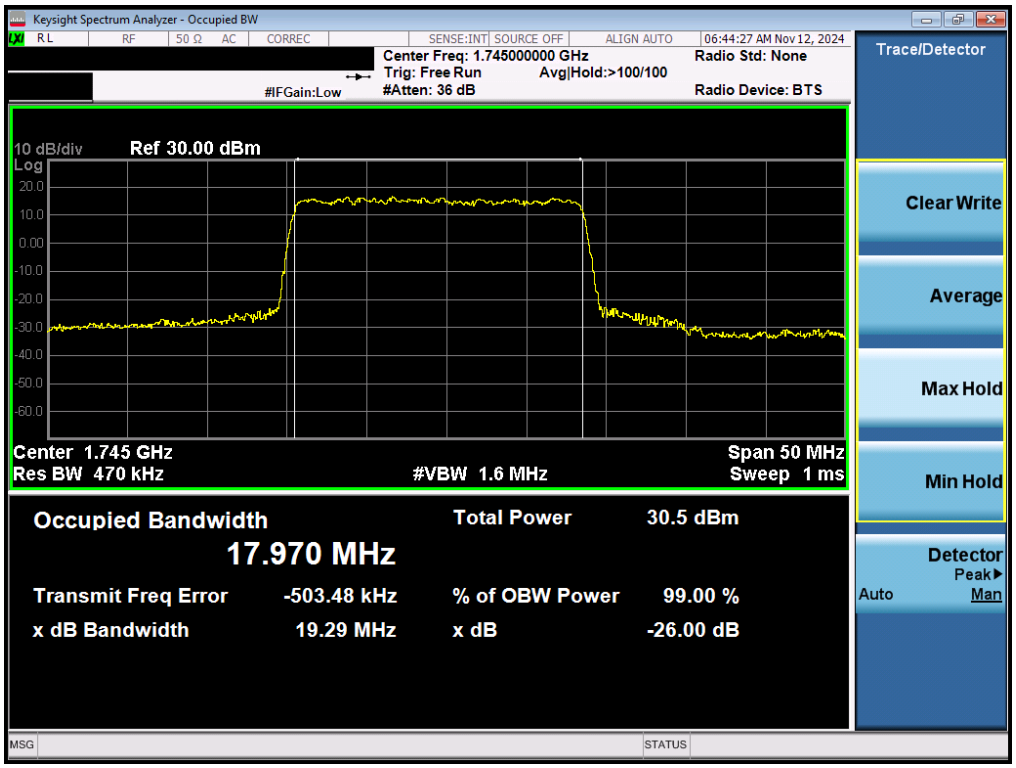
Plot 7-91. Occupied Bandwidth Plot (NR Band n66 - 25.0MHz CP-OFDM QPSK - Full RB – ANT2)



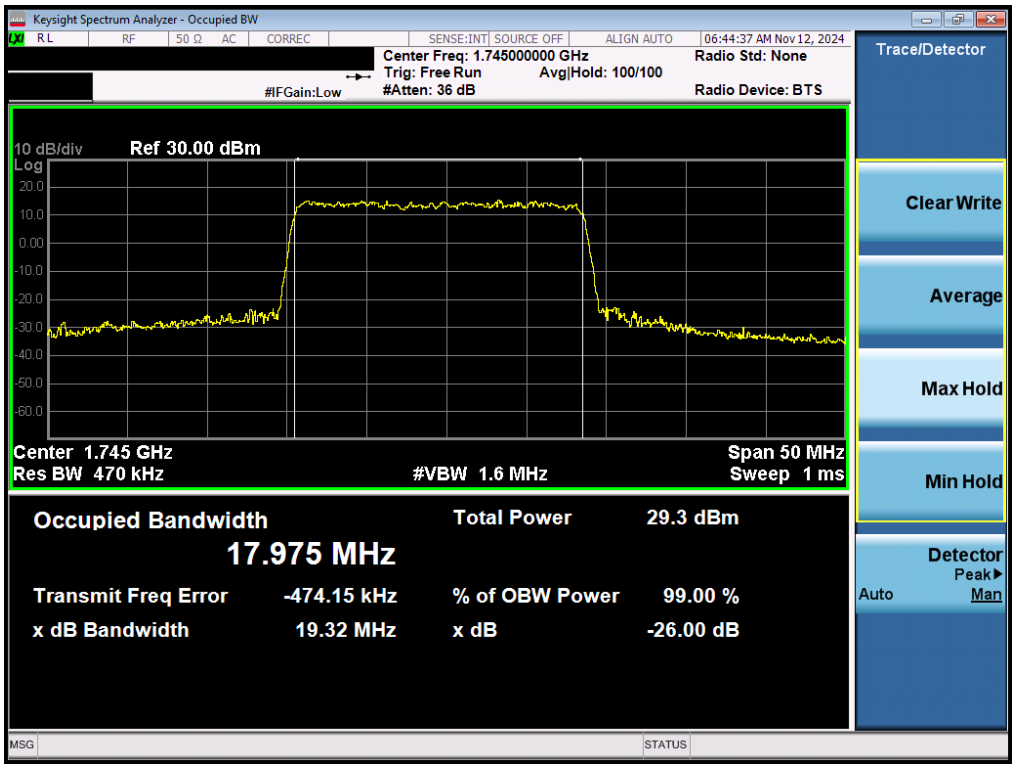
Plot 7-92. Occupied Bandwidth Plot (NR Band n66 - 25.0MHz CP-OFDM 16QAM - Full RB – ANT2)



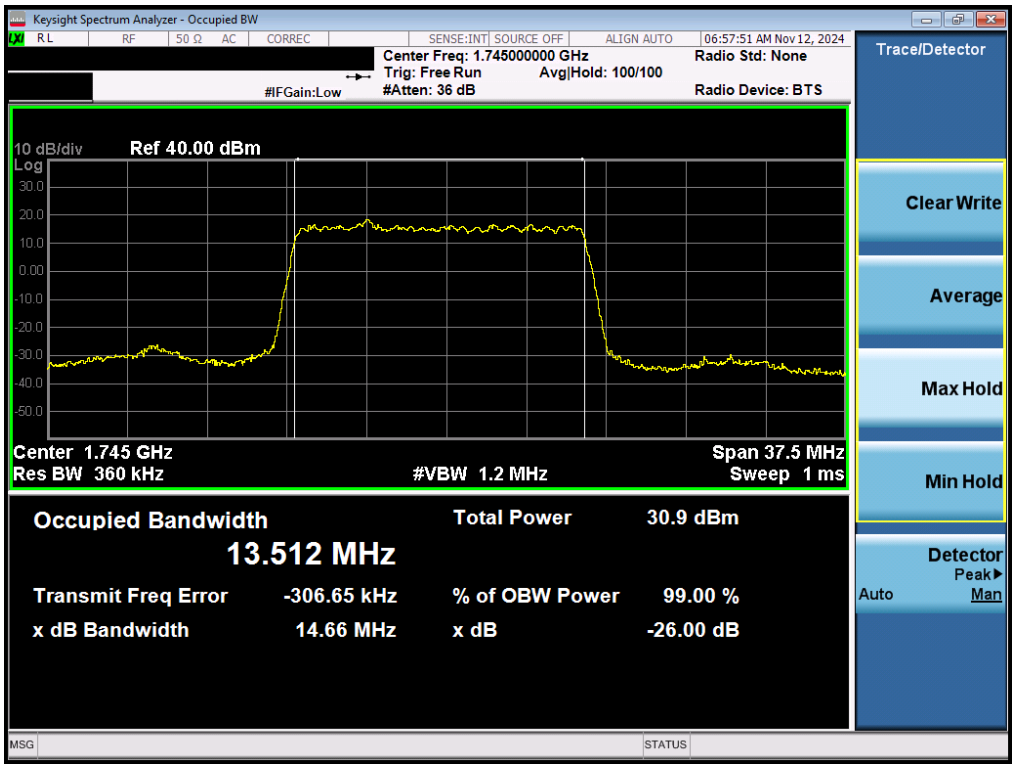
Plot 7-93. Occupied Bandwidth Plot (NR Band n66 - 20.0MHz DFT-s-OFDM BPSK - Full RB – ANT2)



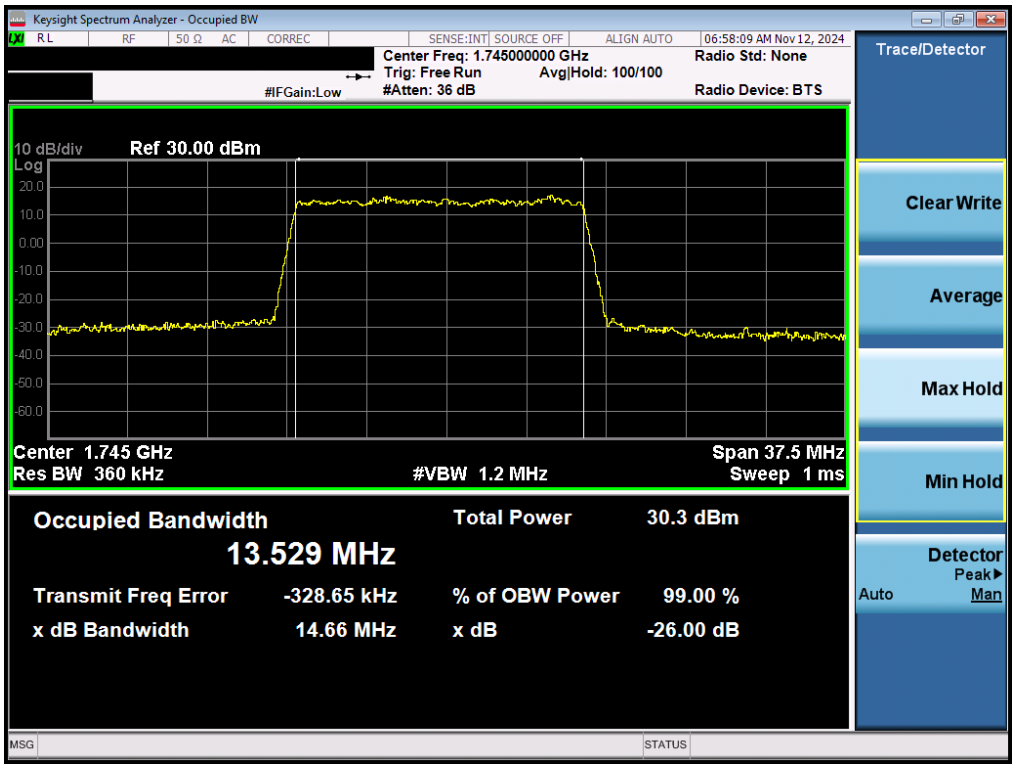
Plot 7-94. Occupied Bandwidth Plot (NR Band n66 - 20.0MHz CP-OFDM QPSK - Full RB – ANT2)



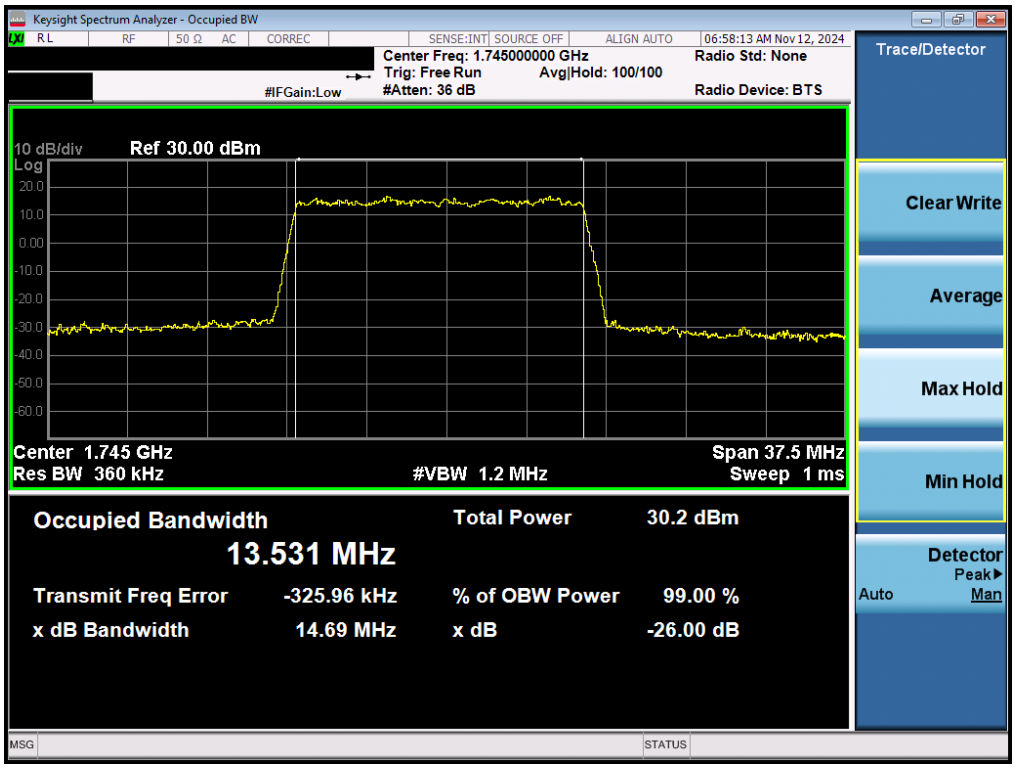
Plot 7-95. Occupied Bandwidth Plot (NR Band n66 - 20.0MHz CP-OFDM 16QAM - Full RB – ANT2)



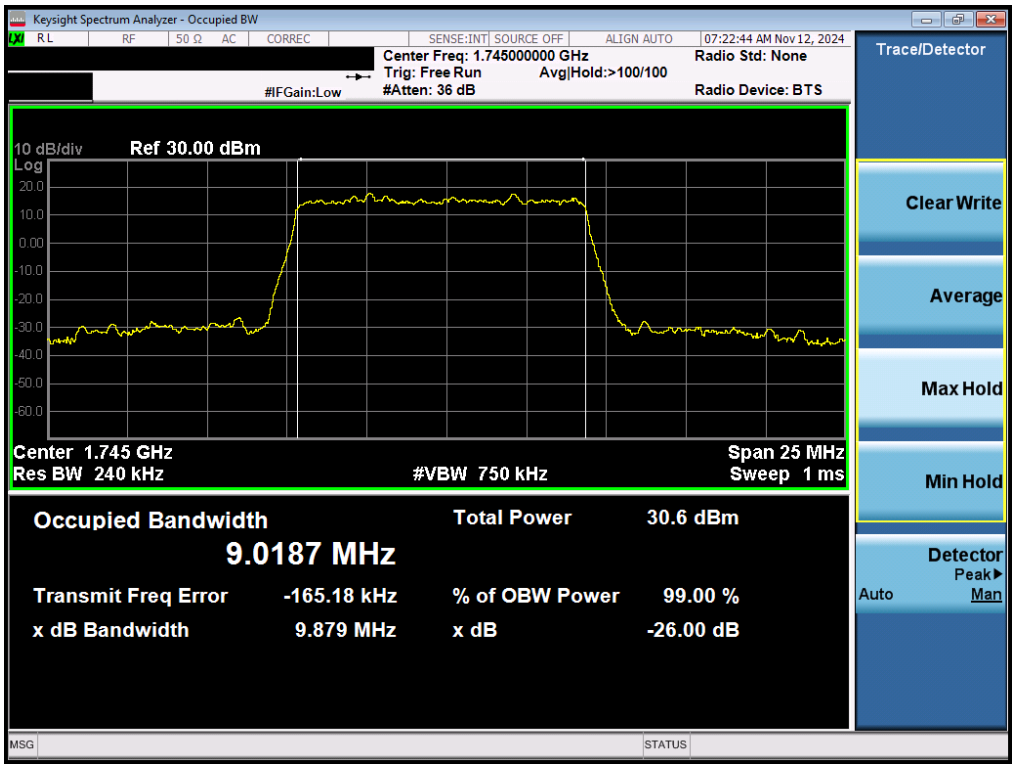
Plot 7-96. Occupied Bandwidth Plot (NR Band n66 - 15.0MHz DFT-s-OFDM BPSK - Full RB – ANT2)



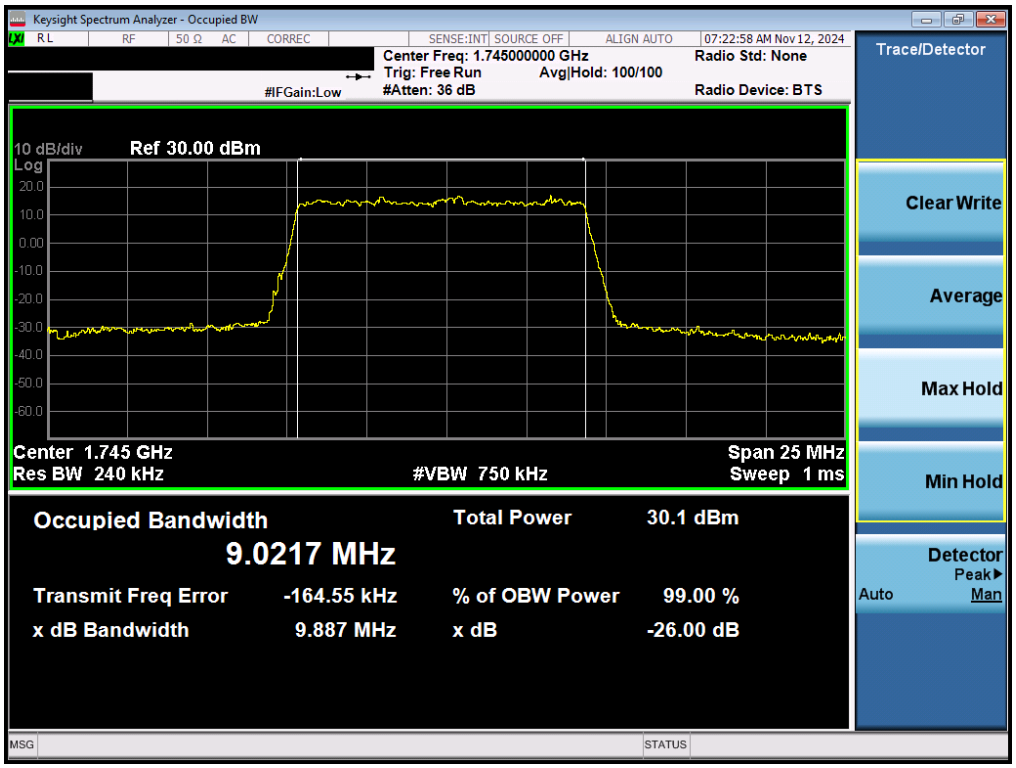
Plot 7-97. Occupied Bandwidth Plot (NR Band n66 - 15.0MHz CP-OFDM QPSK - Full RB – ANT2)



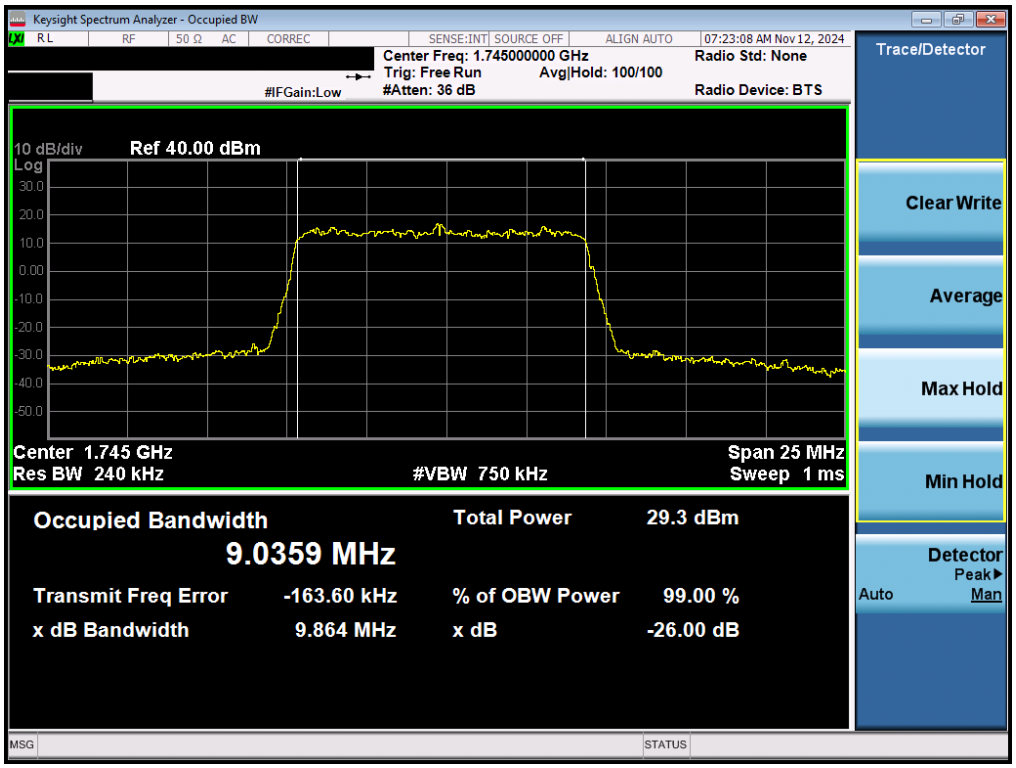
Plot 7-98. Occupied Bandwidth Plot (NR Band n66 - 15.0MHz CP-OFDM 16QAM - Full RB – ANT2)



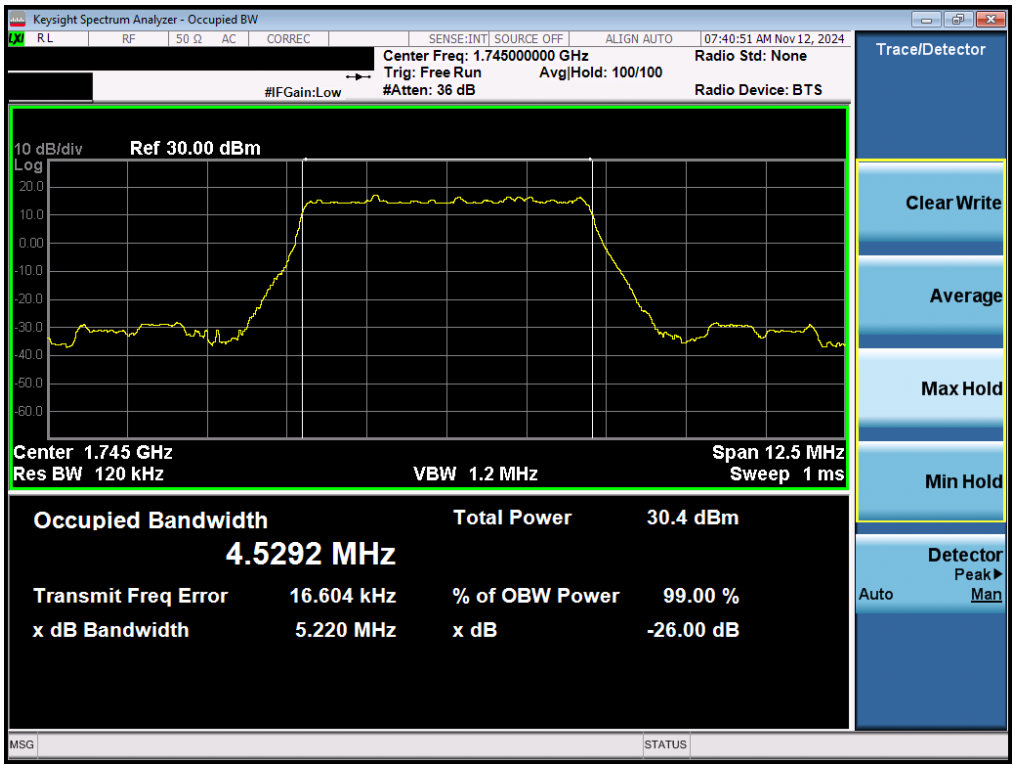
Plot 7-99. Occupied Bandwidth Plot (NR Band n66 - 10.0MHz DFT-s-OFDM BPSK - Full RB – ANT2)



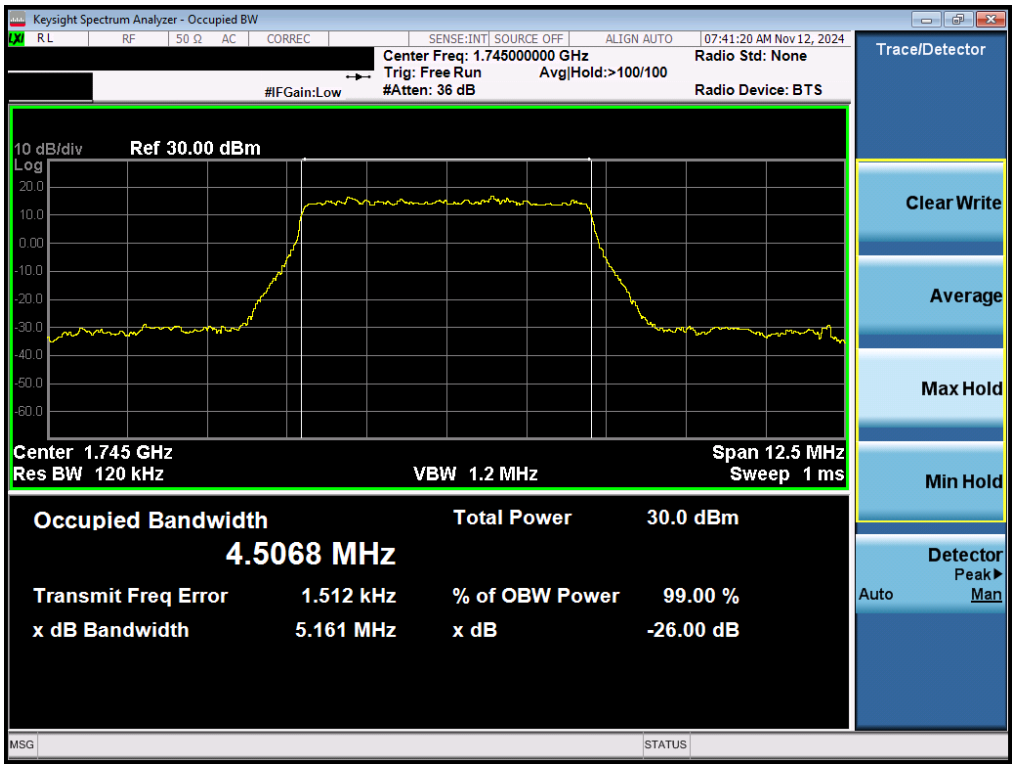
Plot 7-100. Occupied Bandwidth Plot (NR Band n66 - 10.0MHz CP-OFDM QPSK - Full RB – ANT2)



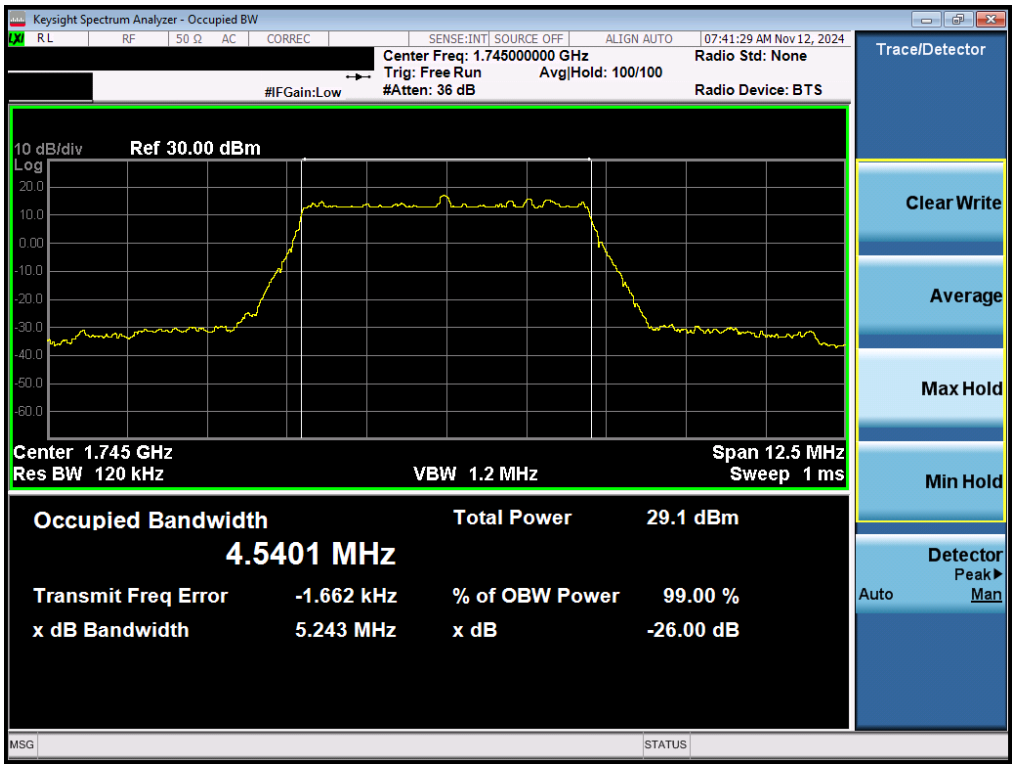
Plot 7-101. Occupied Bandwidth Plot (NR Band n66 - 10.0MHz CP-OFDM 16QAM - Full RB – ANT2)



Plot 7-102. Occupied Bandwidth Plot (NR Band n66 - 5.0MHz DFT-s-OFDM BPSK - Full RB – ANT2)



Plot 7-103. Occupied Bandwidth Plot (NR Band n66 - 5.0MHz CP-OFDM QPSK - Full RB – ANT2)



Plot 7-104. Occupied Bandwidth Plot (NR Band n66 - 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 18GHz (separated into at least two plots per channel)
2. RBW ≥ 100kHz
3. VBW ≥ 3 x RBW
4. Detector = RMS
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

Test Setup

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

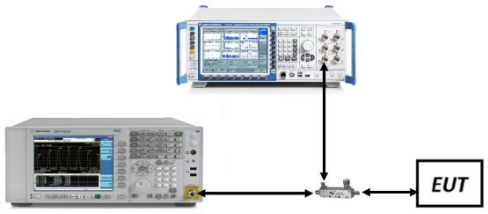


Figure 7-3. Test Instrument & Measurement Setup

Test Notes

1. Per Part 27 and RSS-139, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth 100 kHz or greater for measurements below 1GHz.

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.

Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
LTE Band 12/17	10 MHz	Low	30.0 - 697.9	-62.17	-13	-49.17
		Low	716.0 - 1000.0	-63.92	-13	-50.92
		Low	1000.0 - 10000.0	-49.22	-13	-36.22
		Mid	30.0 - 698.0	-63.30	-13	-50.30
		Mid	716.0 - 1000.0	-63.81	-13	-50.81
		Mid	1000.0 - 10000.0	-47.39	-13	-34.39
		High	30.0 - 697.9	-63.43	-13	-50.43
		High	716.1 - 1000.0	-61.23	-13	-48.23
		High	1000.0 - 10000.0	-48.10	-13	-35.10
LTE Band 13	10 MHz	Mid	30.0 - 777.0	-65.65	-35	-30.65
		Mid	787.0 - 1000.0	-65.34	-13	-52.34
		Mid	1000.0 - 20000.0	-46.99	-13	-33.99

Table 7-13. Conducted Spurious Emissions Results – Ant1

Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
WCDMA1700	N/A	Low	30.0 - 1705.0	-44.43	-13	-31.43
		Low	1755.0 - 10000.0	-46.18	-13	-33.18
		Low	10000.0 - 20000.0	-58.91	-13	-45.91
		Mid	30.0 - 1710.0	-49.41	-13	-36.41
		Mid	1755.0 - 10000.0	-45.91	-13	-32.91
		Mid	10000.0 - 20000.0	-59.32	-13	-46.32
		High	30.0 - 1710.0	-49.34	-13	-36.34
		High	1760.0 - 10000.0	-39.47	-13	-26.47
		High	10000.0 - 20000.0	-59.02	-13	-46.02
LTE-B66-4	20 MHz	Low	30.0 - 663.0	-52.77	-13	-39.77
		Low	698.0 - 1000.0	-47.95	-13	-34.95
		Low	1000.0 - 10000.0	-60.49	-13	-47.49
		Mid	30.0 - 663.0	-53.15	-13	-40.15
		Mid	698.0 - 1000.0	-48.02	-13	-35.02
		Mid	1000.0 - 10000.0	-60.44	-13	-47.44
		High	30.0 - 663.0	-53.15	-13	-40.15
		High	698.0 - 1000.0	-47.41	-13	-34.41
		High	1000.0 - 10000.0	-60.74	-13	-47.74
NR Band n66	45 MHz	Low	30.0 - 1710.0	-53.00	-13	-40.00
		Low	1780.0 - 10000.0	-48.08	-13	-35.08
		Low	10000.0 - 20000.0	-61.23	-13	-48.23
		Mid	30.0 - 1710.0	-53.32	-13	-40.32
		Mid	1780.0 - 10000.0	-48.86	-13	-35.86
		Mid	10000.0 - 20000.0	-61.71	-13	-48.71
		High	30.0 - 1710.0	-53.12	-13	-40.12
		High	1780.0 - 10000.0	-48.93	-13	-35.93
		High	10000.0 - 20000.0	-61.63	-13	-48.63

Table 7-14. Conducted Spurious Emissions Results – Ant1

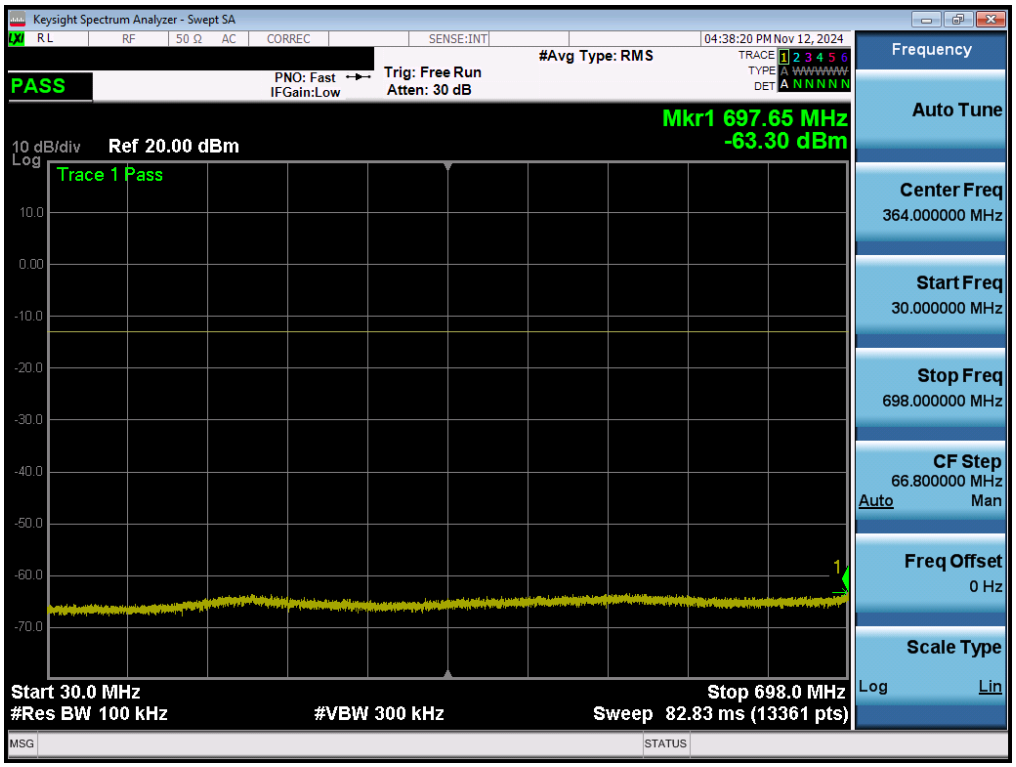
WCDMA-AWS – ANT1

Plot 7-105. Conducted Spurious Plot (WCDMA-AWS - 5MHz QPSK - 1 RB – Low Channel)

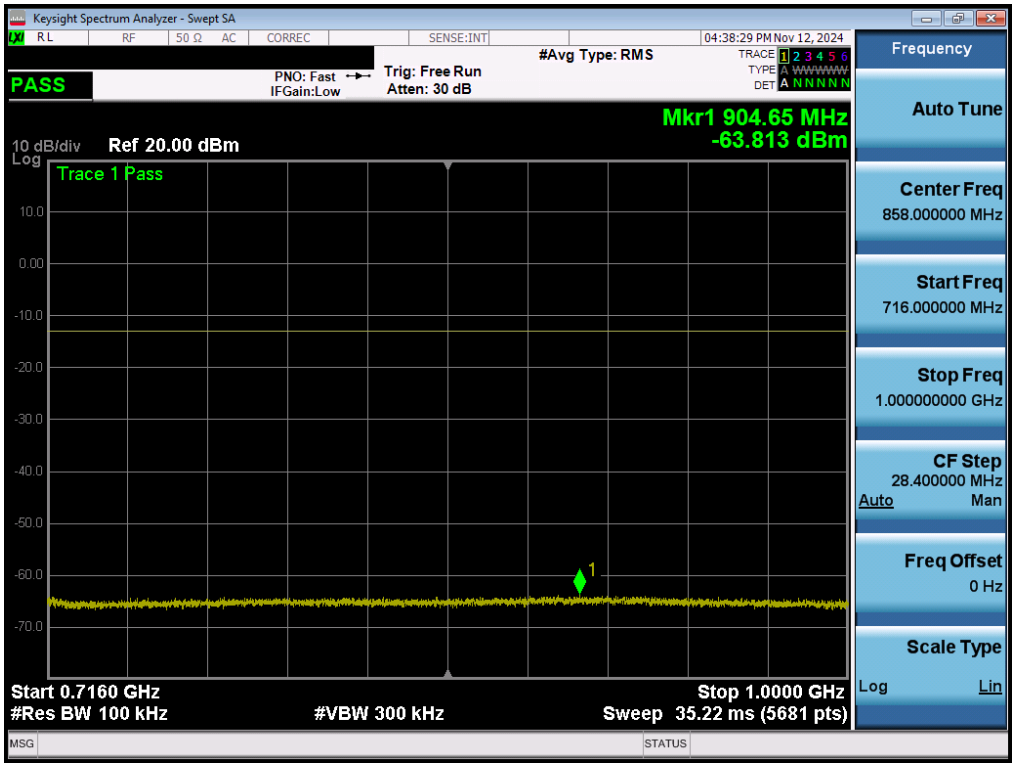
Plot 7-106. Conducted Spurious Plot (WCDMA-AWS - 5MHz QPSK - 1 RB – Low Channel)

Plot 7-107. Conducted Spurious Plot (WCDMA-AWS - 5MHz QPSK - 1 RB – Low Channel)

LTE Band 12/17 – ANT1



Plot 7-108. Conducted Spurious Plot (LTE Band 12/17 - 10MHz QPSK - 1 RB - Mid Channel - ANT1)



Plot 7-109. Conducted Spurious Plot (LTE Band 12/17 - 10MHz QPSK - 1 RB - Mid Channel - ANT1)

Plot 7-110. Conducted Spurious Plot (LTE Band 12/17 - 10MHz QPSK - 1 RB - Mid Channel - ANT1)