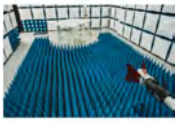
PCTEST
7185 Oakland Mills Road, Columbia, MD 21046 USA
Tel. 410.290.6652 / Fax 410.290.6654
http://www.pctest.com



MEASUREMENT REPORT
LTE / Sub-6GHz NR

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

Date of Testing:
8/22 - 9/12/2020
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M2007010102-02-R1.A3L

FCC ID:	**A3LSMH303V**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model:	SM-H303V
EUT Type:	Outdoor Customer Premises Equipment (CPE)
FCC Classification:	PCS Licensed Transmitter(PCB)
FCC Rule Part(s):	22, 24 & 27
Test Procedure(s):	ANSI C63.26-2015, ANSI/TIA-603-E-2016, ANSI C63.4-2014, KDB 971168 D01 v03r01

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.

This revised Test Report (S/N: 1M2007010102-02-R1.A3L) supersedes and replaces the previously issued test report (S/N: 1M2007010102-02.A3L) on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

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.

Randy Ortanez
President

ACCREDITED
CERT #2041.01

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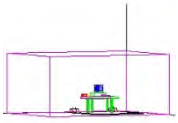
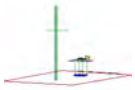


MEASUREMENT REPORT
FCC Part 22, 24 & 27



Mode	FCC Rule Part	Tx Frequency (MHz)	ERP		Emission Designator	Modulation
			Max. Power (W)	Max. Power (dBm)		
LTE Band 13	27	779.5 - 784.5	0.262	24.18	4M52G7D	QPSK
LTE Band 13	27	779.5 - 784.5	0.222	23.47	4M50W7D	16QAM
LTE Band 13	27	779.5 - 784.5	0.175	22.42	4M51W7D	64QAM
LTE Band 13	27	782	0.271	24.32	8M98G7D	QPSK
LTE Band 13	27	782	0.224	23.49	8M97W7D	16QAM
LTE Band 13	27	782	0.190	22.79	8M98W7D	64QAM
LTE Band 5	22H	824.7 - 848.3	0.231	23.63	1M10G7D	QPSK
LTE Band 5	22H	824.7 - 848.3	0.201	23.04	1M09W7D	16QAM
LTE Band 5	22H	824.7 - 848.3	0.153	21.86	1M10W7D	64QAM
LTE Band 5	22H	825.5 - 847.5	0.235	23.72	2M71G7D	QPSK
LTE Band 5	22H	825.5 - 847.5	0.200	23.00	2M70W7D	16QAM
LTE Band 5	22H	825.5 - 847.5	0.157	21.95	2M71W7D	64QAM
LTE Band 5	22H	826.5 - 846.5	0.232	23.65	4M52G7D	QPSK
LTE Band 5	22H	826.5 - 846.5	0.206	23.13	4M51W7D	16QAM
LTE Band 5	22H	826.5 - 846.5	0.161	22.08	4M52W7D	64QAM
LTE Band 5	22H	829 - 844	0.237	23.75	9M01G7D	QPSK
LTE Band 5	22H	829 - 844	0.204	23.10	9M04W7D	16QAM
LTE Band 5	22H	829 - 844	0.157	21.97	9M00W7D	64QAM

EUT LTE Overview (<1 GHz)

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	ERP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
NR Band n5	20 MHz	π/2 BPSK	834.0 - 839.0	0.232	23.66	17M9G7D
		QPSK	834.0 - 839.0	0.211	23.24	19M0G7D
		16QAM	834.0 - 839.0	0.201	23.02	19M0W7D
		64QAM	834.0 - 839.0	0.146	21.66	19M1W7D
		256QAM	834.0 - 839.0	0.088	19.45	18M9W7D
	15 MHz	π/2 BPSK	831.5 - 841.5	0.224	23.50	13M5G7D
		QPSK	831.5 - 841.5	0.206	23.15	14M2G7D
		16QAM	831.5 - 841.5	0.189	22.77	14M2W7D
		64QAM	831.5 - 841.5	0.127	21.04	14M2W7D
		256QAM	831.5 - 841.5	0.084	19.24	14M3W7D
	10 MHz	π/2 BPSK	829.0 - 844.0	0.248	23.95	9M01G7D
		QPSK	829.0 - 844.0	0.238	23.76	9M36G7D
		16QAM	829.0 - 844.0	0.220	23.42	9M36W7D
		64QAM	829.0 - 844.0	0.157	21.96	9M34W7D
		256QAM	829.0 - 844.0	0.126	21.00	9M37W7D
	5 MHz	π/2 BPSK	826.5 - 846.5	0.224	23.49	4M52G7D
		QPSK	826.5 - 846.5	0.222	23.47	4M54G7D
		16QAM	826.5 - 846.5	0.221	23.44	4M57W7D
		64QAM	826.5 - 846.5	0.155	21.91	4M54W7D
		256QAM	826.5 - 846.5	0.096	19.83	4M53W7D

EUT Sub6 Overview (<1 GHz)

Mode	FCC Rule Part	Tx Frequency (MHz)	EIRP		Emission Designator	Modulation
			Max. Power (W)	Max. Power (dBm)		
LTE Band 66/4	27	1710.7 - 1779.3	0.819	29.13	1M09G7D	QPSK
LTE Band 66/4	27	1710.7 - 1779.3	0.664	28.22	1M07W7D	16QAM
LTE Band 66/4	27	1710.7 - 1779.3	0.609	27.85	1M07W7D	64QAM
LTE Band 66/4	27	1711.5 - 1778.5	0.834	29.21	2M70G7D	QPSK
LTE Band 66/4	27	1711.5 - 1778.5	0.728	28.62	2M70W7D	16QAM
LTE Band 66/4	27	1711.5 - 1778.5	0.619	27.91	2M71W7D	64QAM
LTE Band 66/4	27	1712.5 - 1777.5	0.802	29.04	4M45G7D	QPSK
LTE Band 66/4	27	1712.5 - 1777.5	0.703	28.47	4M52W7D	16QAM
LTE Band 66/4	27	1712.5 - 1777.5	0.678	28.31	4M44W7D	64QAM
LTE Band 66/4	27	1715 - 1775	0.776	28.90	9M02G7D	QPSK
LTE Band 66/4	27	1715 - 1775	0.678	28.31	9M00W7D	16QAM
LTE Band 66/4	27	1715 - 1775	0.651	28.14	9M00W7D	64QAM
LTE Band 66/4	27	1717.5 - 1772.5	0.838	29.23	13M5G7D	QPSK
LTE Band 66/4	27	1717.5 - 1772.5	0.718	28.56	13M6W7D	16QAM
LTE Band 66/4	27	1717.5 - 1772.5	0.727	28.61	13M5W7D	64QAM
LTE Band 66/4	27	1720 - 1770	0.847	29.28	18M1G7D	QPSK
LTE Band 66/4	27	1720 - 1770	0.743	28.71	18M1W7D	16QAM
LTE Band 66/4	27	1720 - 1770	0.690	28.39	18M0W7D	64QAM
LTE Band 2	24E	1850.7 - 1909.3	1.324	31.22	1M09G7D	QPSK
LTE Band 2	24E	1850.7 - 1909.3	1.204	30.81	1M10W7D	16QAM
LTE Band 2	24E	1850.7 - 1909.3	0.995	29.98	1M10W7D	64QAM
LTE Band 2	24E	1851.5 - 1908.5	1.313	31.18	2M71G7D	QPSK
LTE Band 2	24E	1851.5 - 1908.5	1.254	30.98	2M71W7D	16QAM
LTE Band 2	24E	1851.5 - 1908.5	0.947	29.76	2M71W7D	64QAM
LTE Band 2	24E	1852.5 - 1907.5	1.358	31.33	4M51G7D	QPSK
LTE Band 2	24E	1852.5 - 1907.5	1.186	30.74	4M51W7D	16QAM
LTE Band 2	24E	1852.5 - 1907.5	0.975	29.89	4M51W7D	64QAM
LTE Band 2	24E	1855 - 1905	1.433	31.56	8M99G7D	QPSK
LTE Band 2	24E	1855 - 1905	1.234	30.91	9M00W7D	16QAM
LTE Band 2	24E	1855 - 1905	0.945	29.75	8M99W7D	64QAM
LTE Band 2	24E	1857.5 - 1902.5	1.419	31.52	13M5G7D	QPSK
LTE Band 2	24E	1857.5 - 1902.5	1.245	30.95	13M5W7D	16QAM
LTE Band 2	24E	1857.5 - 1902.5	1.069	30.29	13M5W7D	64QAM
LTE Band 2	24E	1860 - 1900	1.444	31.60	17M9G7D	QPSK
LTE Band 2	24E	1860 - 1900	1.290	31.11	17M9W7D	16QAM
LTE Band 2	24E	1860 - 1900	0.992	29.97	17M9W7D	64QAM

EUT LTE Overview (Mid Bands)

Overview Table (Above 1G bands)						
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
NR Band n66	20 MHz	π/2 BPSK	1720.0 - 1770.0	0.791	28.98	18M0G7D
		QPSK	1720.0 - 1770.0	0.768	28.85	19M0G7D
		16QAM	1720.0 - 1770.0	0.795	29.00	19M0W7D
		64QAM	1720.0 - 1770.0	0.572	27.57	19M0W7D
		256QAM	1720.0 - 1770.0	0.406	26.08	19M0W7D
	15 MHz	π/2 BPSK	1717.5 - 1772.5	0.962	29.83	13M5G7D
		QPSK	1717.5 - 1772.5	0.936	29.71	14M2G7D
		16QAM	1717.5 - 1772.5	0.960	29.82	14M1W7D
		64QAM	1717.5 - 1772.5	0.720	28.57	14M2W7D
		256QAM	1717.5 - 1772.5	0.464	26.66	14M2W7D
	10 MHz	π/2 BPSK	1715.0 - 1775.0	0.925	29.66	9M04G7D
		QPSK	1715.0 - 1775.0	0.880	29.44	9M31G7D
		16QAM	1715.0 - 1775.0	0.882	29.45	9M31W7D
		64QAM	1715.0 - 1775.0	0.640	28.06	9M35W7D
		256QAM	1715.0 - 1775.0	0.439	26.42	9M35W7D
	5 MHz	π/2 BPSK	1712.5 - 1777.5	0.997	29.99	4M50G7D
		QPSK	1712.5 - 1777.5	0.992	29.97	4M51G7D
		16QAM	1712.5 - 1777.5	0.970	29.87	4M50W7D
		64QAM	1712.5 - 1777.5	0.699	28.45	4M50W7D
		256QAM	1712.5 - 1777.5	0.459	26.62	4M50W7D

EUT Sub6 Overview (NR Band n66)

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
NR Band n2	20 MHz	π/2 BPSK	1860 - 1905	1.694	32.29	18M0G7D
		QPSK	1860 - 1905	1.497	31.75	19M0G7D
		16QAM	1860 - 1905	1.377	31.39	19M0W7D
		64QAM	1860 - 1905	0.946	29.76	19M0W7D
		256QAM	1860 - 1905	0.646	28.10	19M0W7D
	15 MHz	π/2 BPSK	1857.5 - 1907.5	1.608	32.06	13M5G7D
		QPSK	1857.5 - 1907.5	1.582	31.99	14M2G7D
		16QAM	1857.5 - 1907.5	1.446	31.60	14M1W7D
		64QAM	1857.5 - 1907.5	1.003	30.01	14M2W7D
		256QAM	1857.5 - 1907.5	0.675	28.29	14M2W7D
	10 MHz	π/2 BPSK	1855 - 1910	1.613	32.08	9M04G7D
		QPSK	1855 - 1910	1.547	31.90	9M31G7D
		16QAM	1855 - 1910	1.493	31.74	9M31W7D
		64QAM	1855 - 1910	1.028	30.12	9M35W7D
		256QAM	1855 - 1910	0.691	28.40	9M35W7D
	5 MHz	π/2 BPSK	1852.5 - 1912.5	1.682	32.26	4M58G7D
		QPSK	1852.5 - 1912.5	1.640	32.15	4M51G7D
		16QAM	1852.5 - 1912.5	1.400	31.46	4M50W7D
		64QAM	1852.5 - 1912.5	1.007	30.03	4M50W7D
		256QAM	1852.5 - 1912.5	0.676	28.30	4M50W7D

EUT Sub6 Overview (NR Band n2)

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 PCTEST Test Location

These measurement tests were conducted at the PCTEST facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

1.3 Test Facility / Accreditations

Measurements were performed at PCTEST located in Columbia, MD 21046, U.S.A.

- PCTEST is an ISO 17025-2005 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.

- PCTEST 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).

- PCTEST facility is a registered (2451B) 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 Outdoor Customer Premises Equipment (CPE) FCC ID: A3LSMH303V**. The test data contained in this report pertains only to the emissions due to the EUT's LTE function.

Test Device Serial No.: 13812, 14273

2.2 Device Capabilities

This device contains the following capabilities:

Multi-band LTE, 5G NR (n5, n66, n2, n261, n260), Bluetooth (LE)

LTE Band 66 (1710 - 1780 MHz) overlaps the entire frequency range of LTE Band 4 (1710 - 1755 MHz). Therefore, test data provided in this report covers Band 4 as well as Band 66.

2.3 Test Configuration

The EUT was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01 v03r01. See Section 7.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

2.4 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

3.0 DESCRIPTION OF TESTS

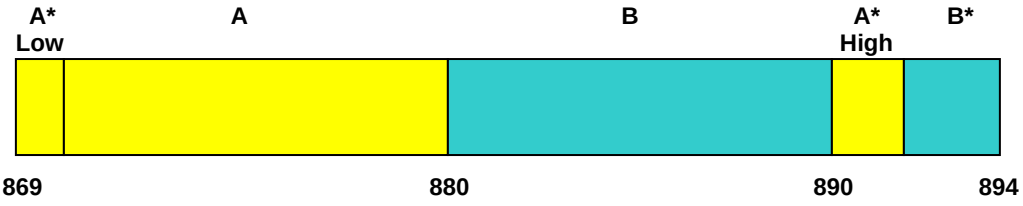
3.1 Measurement Procedure

The measurement procedures described in the document titled "Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards" (ANSI/TIA-603-E-2016) and "Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems" (KDB 971168 D01 v03r01) were used in the measurement of the EUT**.**

3.2 Block C Frequency Range

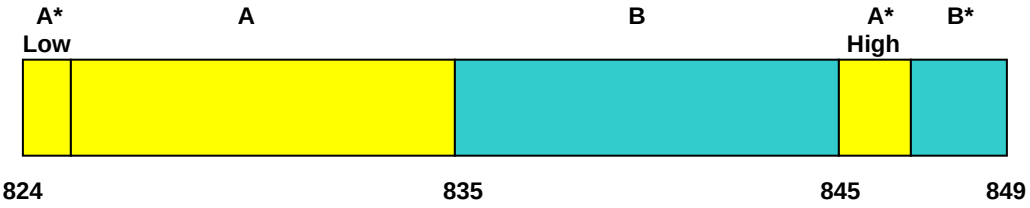
Two paired channels of 11 megahertz each are available for assignment in Block C in the 746-757 MHz and 776-787 MHz bands. In the event that no licenses for two channels in this Block C are assigned based on the results of the first auction in which such licenses were offered because the auction results do not satisfy the applicable reserve price, the spectrum in the 746-757 MHz and 776-787 MHz bands will instead be made available for assignment at a subsequent auction as follows: (i) Two paired channels of 6 megahertz each available for assignment in Block C1 in the 746-752 MHz and 776-782 MHz bands. (ii) Two paired channels of 5 megahertz each available for assignment in Block C2 in the 752-757 MHz and 782-787 MHz bands.

3.3 Cellular - Base Frequency Blocks



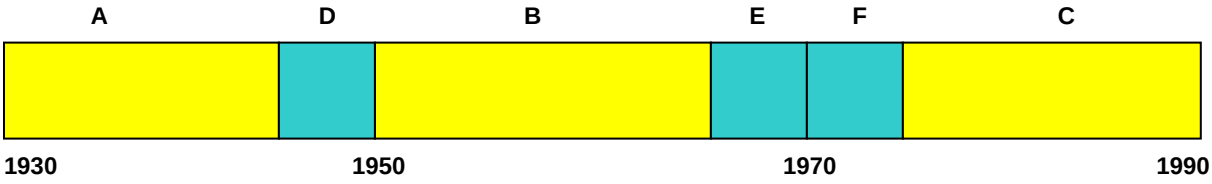
BLOCK 1: 869 – 880 MHz (A* Low + A)
BLOCK 2: 880 – 890 MHz (B)
BLOCK 3: 890 – 891.5 MHz (A* High)
BLOCK 4: 891.5 – 894 MHz (B*)

3.4 Cellular - Mobile Frequency Blocks



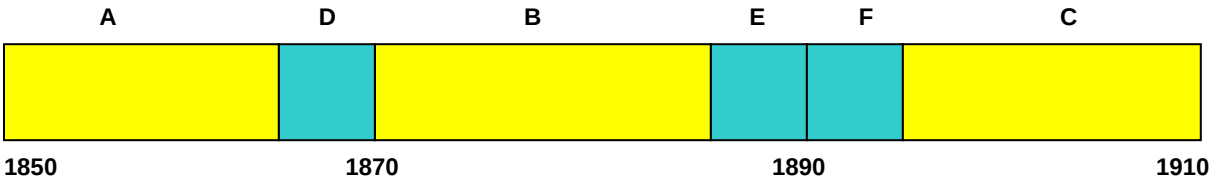
BLOCK 1: 824 – 835 MHz (A* Low + A)
BLOCK 2: 835 – 845 MHz (B)
BLOCK 3: 845 – 846.5 MHz (A* High)
BLOCK 4: 846.5 – 849 MHz (B*)

3.5 PCS - Base Frequency Blocks



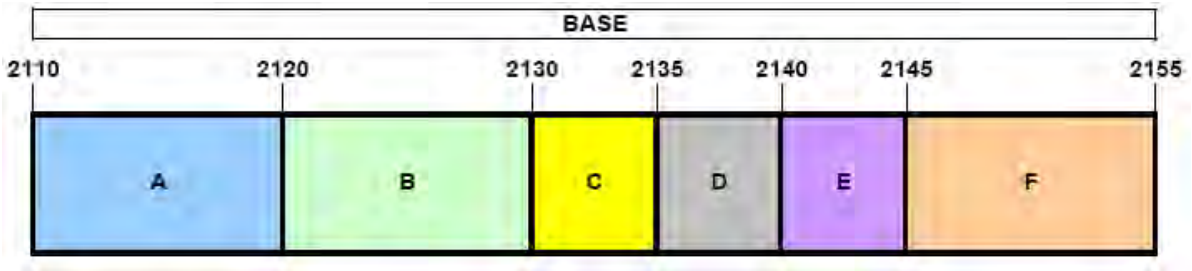
BLOCK 1: 1930 – 1945 MHz (A)
BLOCK 2: 1945 – 1950 MHz (D)
BLOCK 3: 1950 – 1965 MHz (B)
BLOCK 4: 1965 – 1970 MHz (E)
BLOCK 5: 1970 – 1975 MHz (F)
BLOCK 6: 1975 – 1990 MHz (C)

3.6 PCS - Mobile Frequency Blocks



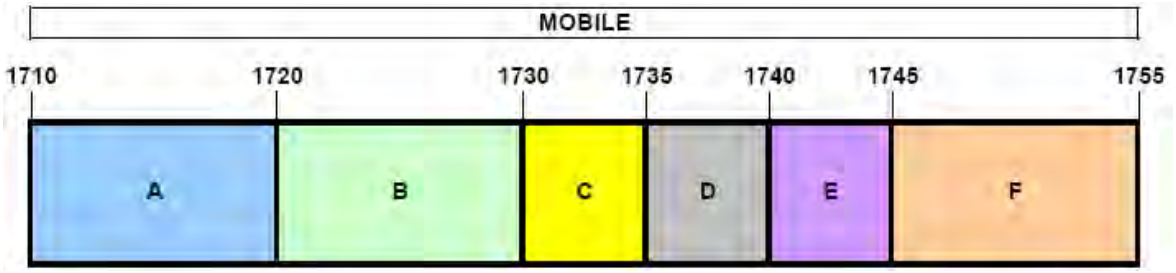
BLOCK 1: 1850 – 1865 MHz (A)
BLOCK 2: 1865 – 1870 MHz (D)
BLOCK 3: 1870 – 1885 MHz (B)
BLOCK 4: 1885 – 1890 MHz (E)
BLOCK 5: 1890 – 1895 MHz (F)
BLOCK 6: 1895 – 1910 MHz (C)

3.7 AWS - Base Frequency Blocks



BLOCK 1: 2110 – 2120 MHz (A)
BLOCK 2: 2120 – 2130 MHz (B)
BLOCK 3: 2130 – 2135 MHz (C)
BLOCK 4: 2135 – 2140 MHz (D)
BLOCK 5: 2140 – 2145 MHz (E)
BLOCK 6: 2145 – 2155 MHz (F)

3.8 AWS - Mobile Frequency Blocks



BLOCK 1: 1710 – 1720 MHz (A)
BLOCK 2: 1720 – 1730 MHz (B)
BLOCK 3: 1730 – 1735 MHz (C)
BLOCK 4: 1735 – 1740 MHz (D)
BLOCK 5: 1740 – 1745 MHz (E)
BLOCK 6: 1745 – 1755 MHz (F)

3.9 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. Radiated power levels are also investigated with the receive antenna horizontally and vertically polarized. The maximized power level is recorded using the spectrum analyzer “Channel Power” function with the integration band set to the emissions’ occupied bandwidth, a RMS detector, RBW = 100kHz, VBW = 300kHz, and a 1 second sweep time over a minimum of 10 sweeps, per the guidelines of KDB 971168 D01 v03r01.

Per the guidance of ANSI/TIA-603-E-2016, a half-wave dipole is then 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 $_{[dB]}$.

The calculated P_d levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of 43 + 10 $\log_{10}$(Power $_{[Watts]}$). For Band 48, the calculated P_d levels are compared to the absolute spurious emission limit of -40dBm which is equivalent to the required minimum attenuation of 70 + 10 $\log_{10}$(Power $_{[Watts]}$).

Per the guidance of ANSI C63.26-2015, field strength method may be performed for both Radiated power and Radiated Spurious Emissions. The filed strength is converted direct from radiated emission measurement.

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 474788 D01.

4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

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

5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	LTx5	Licensed Transmitter Cable Set	4/9/2020	Annual	4/9/2021	LTx5
Agilent	N9030A	PXA Signal Analyzer (44GHz)	8/17/2020	Annual	8/17/2021	MY52350166
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	10/10/2019	Biennial	10/10/2021	121034
Emco	3115	Horn Antenna (1-18GHz)	6/18/2020	Biennial	6/18/2022	9704-5182
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	2/14/2019	Biennial	2/14/2021	125518
Mini Circuits	TVA-11-422	RF Power Amp	N/A			QA1317001
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A			11208010032
Rohde & Schwarz	CMW500	Radio Communication Tester	8/26/2019	Annual	9/26/2020	100976
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	7/15/2020	Annual	7/15/2021	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/23/2019	Annual	9/23/2020	100348
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2/10/2020	Annual	2/10/2021	102134
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2/21/2020	Annual	2/21/2021	102133
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	11/1/2019	Annual	11/1/2020	100040
Sunol	DRH-118	Horn Antenna (1-18GHz)	10/3/2019	Biennial	10/3/2021	A050307
Sunol Science	JB5	Bi-Log Antenna (30M - 5GHz)	7/27/2020	Biennial	7/27/2022	A051107

Table 5-1. Test Equipment

Notes:

Equipment with a calibration date of “N/A” shown in this list was not used to make direct calibrated measurements.

6.0 SAMPLE CALCULATIONS

Emission Designator

QPSK Modulation

Emission Designator = 8M62G7D

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

QAM Modulation

Emission Designator = 8M45W7D

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

Spurious Radiated Emission – LTE Band

Example: Middle Channel LTE Mode 2nd Harmonic (1564 MHz)

The average spectrum analyzer reading at 3 meters with the EUT on the turntable was –81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of –81.0 dBm on the spectrum analzyer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 1564 MHz. So 6.1 dB is added to the signal generator reading of –30.9 dBm yielding –24.80 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm – (-24.80).

7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.

FCC ID: A3LSMH303V

FCC Classification: PCS Licensed Transmitter(PCB)

Mode(s): LTE

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1049	Occupied Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
2.1051 22.917(a) 24.238(a) 27.53(c) 27.53(h)	Out of Band Emissions	> 43 + 10 $\log_{10}$ (P[Watts]) at Band Edge and for all out-of-band emissions			Section 7.3, 7.4
24.232(d)	Peak-Average Ratio	< 13 dB			Section 7.5
2.1046	Transmitter Conducted Output Power	N/A			Section 7.6
22.917(a) 27.53(h)	Uplink Carrier Aggregation	>43 + 10log(P[Watts]) at Band Edge and for all out-of-band emissions			Section 7.9
2.1055 22.355 24.235 27.54	Frequency Stability	< 2.5 ppm (Part 22) and fundamental emissions stay within authorized frequency block (Part 24, 27)			Section 7.11

Table 7-1. Summary of Conducted Test Results

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
22.913(a)(5)	Effective Radiated Power / Equivalent Isotropic Radiated Power (Band 5)	< 7 Watts max. ERP	RADIATED	PASS	Section 7.8
27.50(b)(10)	Effective Radiated Power / Equivalent Isotropic Radiated Power (Band 13)	< 3 Watts max. ERP			Section 7.8
24.232(c)	Equivalent Isotropic Radiated Power (Band 2)	< 2 Watts max. EIRP			Section 7.8
27.50(d)(4)	Equivalent Isotropic Radiated Power (Band 4/66)	< 1 Watts max. EIRP			Section 7.8
2.1053 22.917(a) 24.238(a) 27.53(c) 27.53(h)	Undesirable Emissions (Band 13/5, 66/4/2)	> 43 + 10 $\log_{10}$ (P[Watts]) for all out-of-band emissions			Section 7.9
27.53(f)	Undesirable Emissions (Band 13)	< -70 dBW/MHz (for wideband signals) < -80 dBW (for discrete emissions less than 700Hz BW) For all emissions in the band 1559 – 1610 MHz			Section 7.9

Table 7-2. Summary of Radiated 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 (Sections 7.2, 7.3, 7.4,7.5) 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) 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 PCTEST "LTE Automation," Version 5.3.
5) For 5G NR, both DFT-s and CP-OFDM transmission shcheme were investigated. The worst case test result is incluced.

7.2 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

KDB 971168 D01 v03r01 – Section 4.2

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

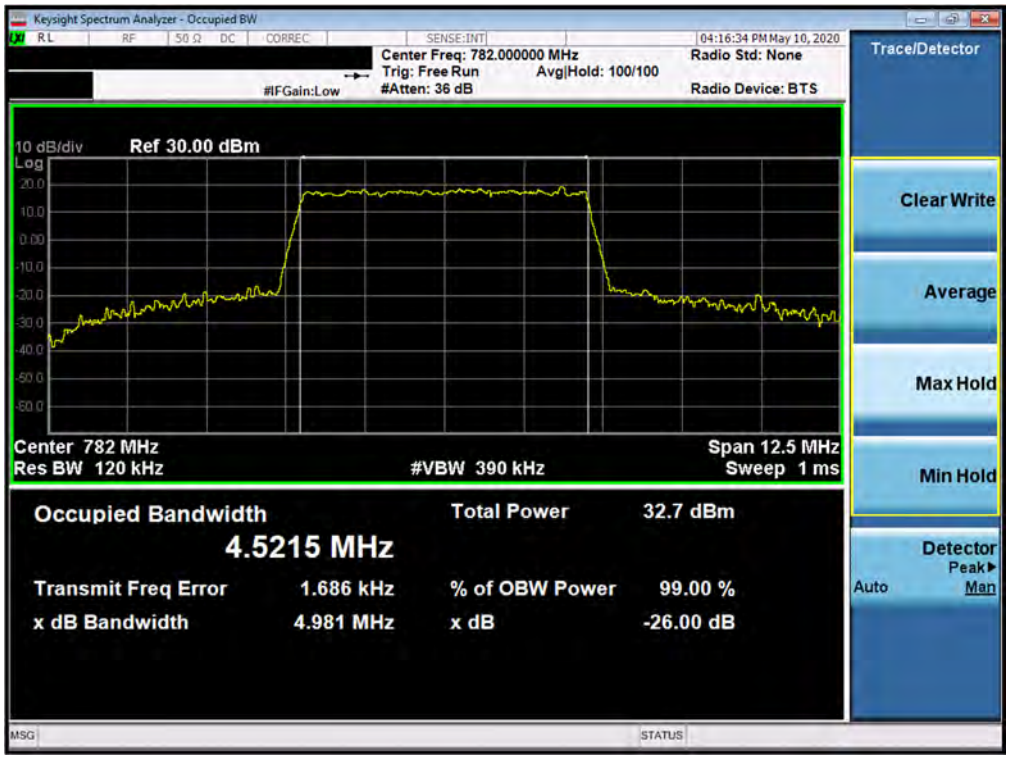
The EUT and measurement equipment were set up as shown in the diagram below.

Figure 7-1. Test Instrument & Measurement Setup

Test Notes

None.

Band 13



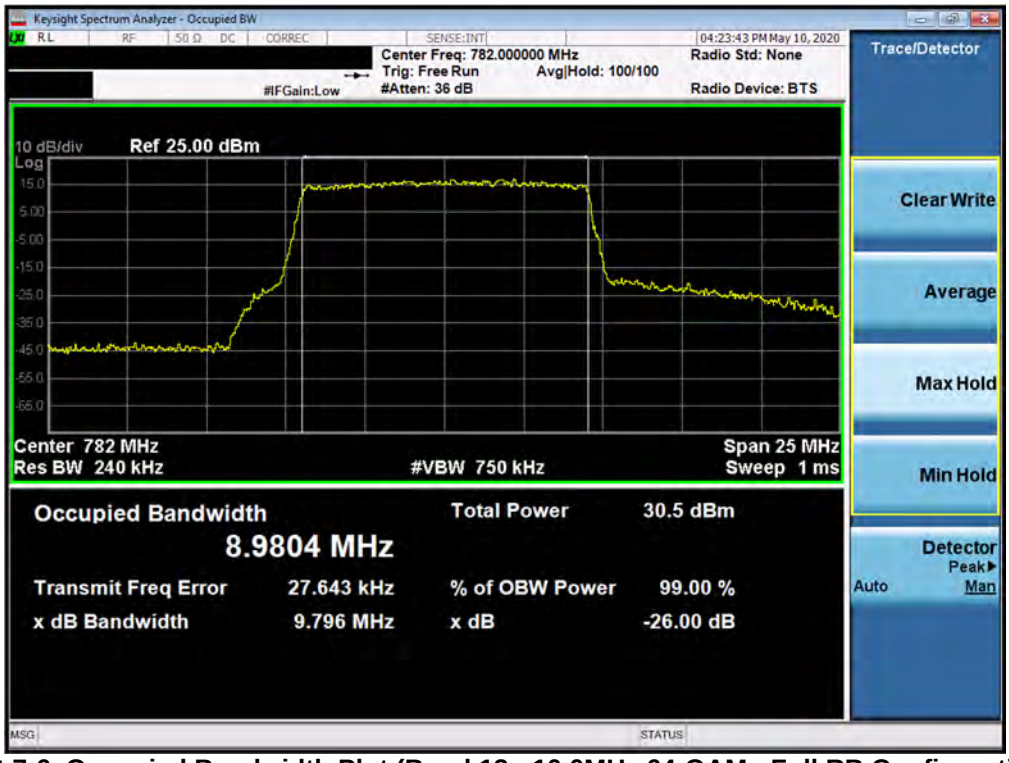
Plot 7-1. Occupied Bandwidth Plot (Band 13 - 5.0MHz QPSK - Full RB Configuration)

Plot 7-2. Occupied Bandwidth Plot (Band 13 - 5.0MHz 16-QAM - Full RB Configuration)

Plot 7-3. Occupied Bandwidth Plot (Band 13 - 5.0MHz 64-QAM - Full RB Configuration)

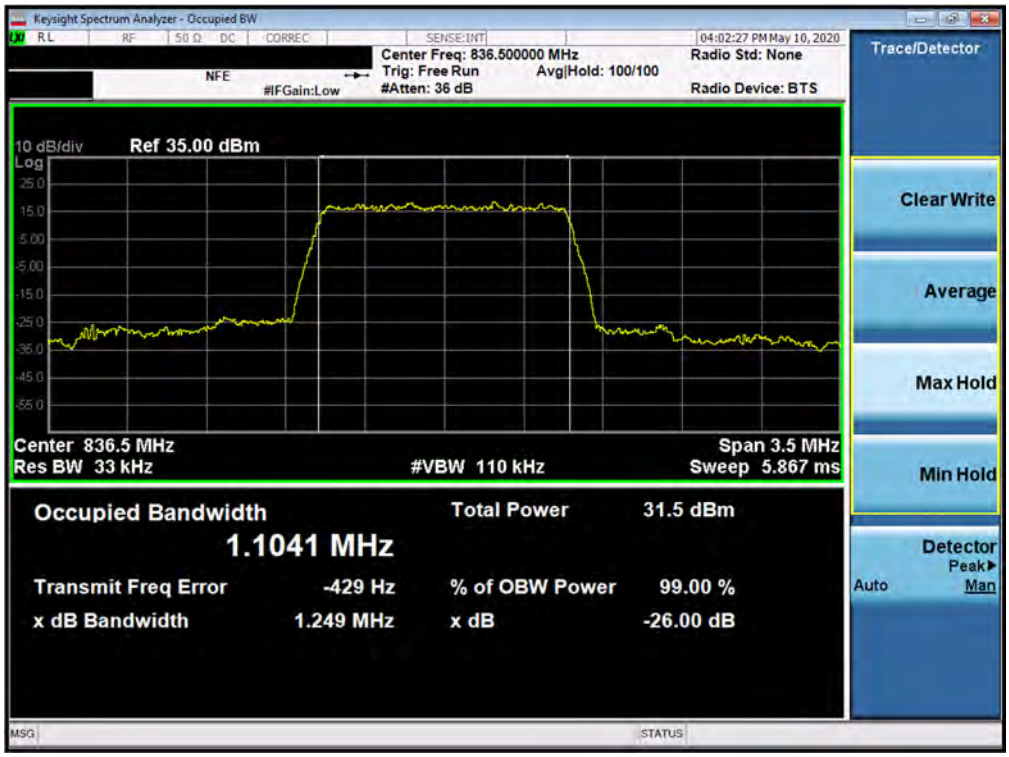
Plot 7-4. Occupied Bandwidth Plot (Band 13 - 10.0MHz QPSK - Full RB Configuration)

Plot 7-5. Occupied Bandwidth Plot (Band 13 - 10.0MHz 16-QAM - Full RB Configuration)



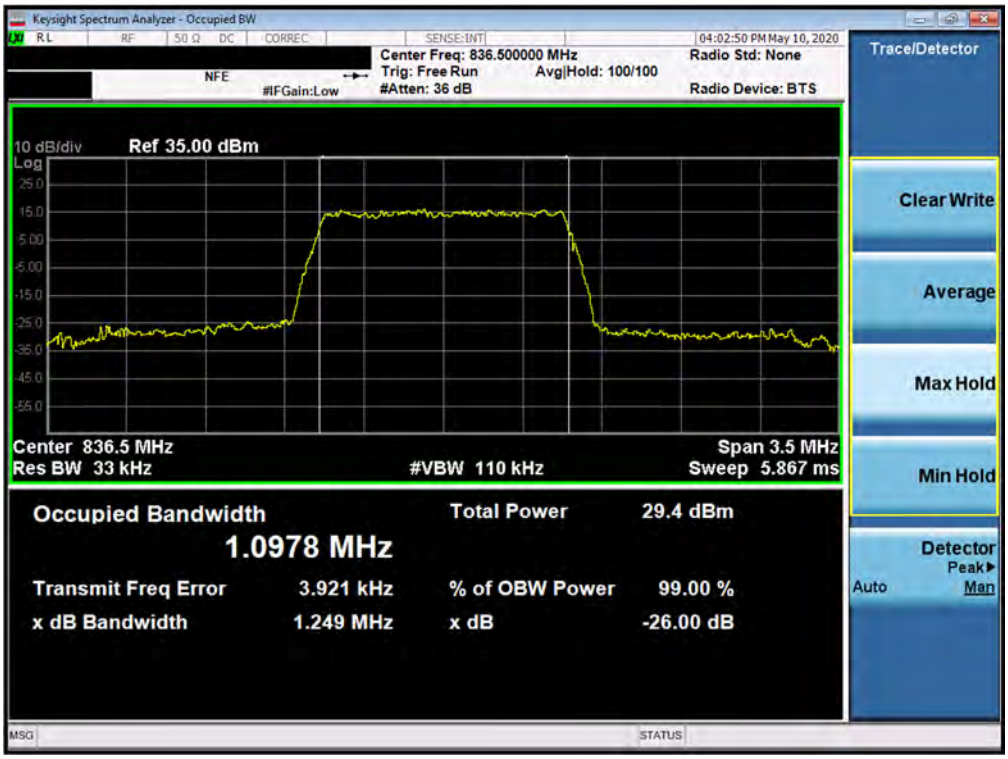
Plot 7-6. Occupied Bandwidth Plot (Band 13 - 10.0MHz 64-QAM - Full RB Configuration)

Band 5

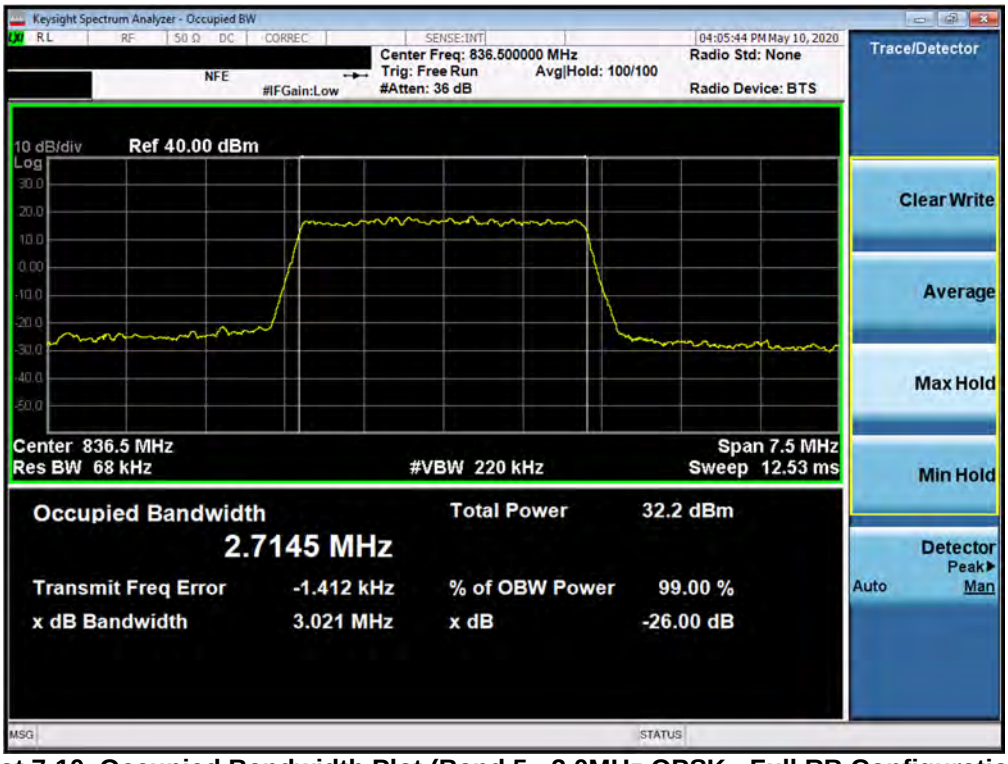


Plot 7-7. Occupied Bandwidth Plot (Band 5 - 1.4MHz QPSK - Full RB Configuration)

Plot 7-8. Occupied Bandwidth Plot (Band 5 - 1.4MHz 16-QAM - Full RB Configuration)



Plot 7-9. Occupied Bandwidth Plot (Band 5 - 1.4MHz 64-QAM - Full RB Configuration)

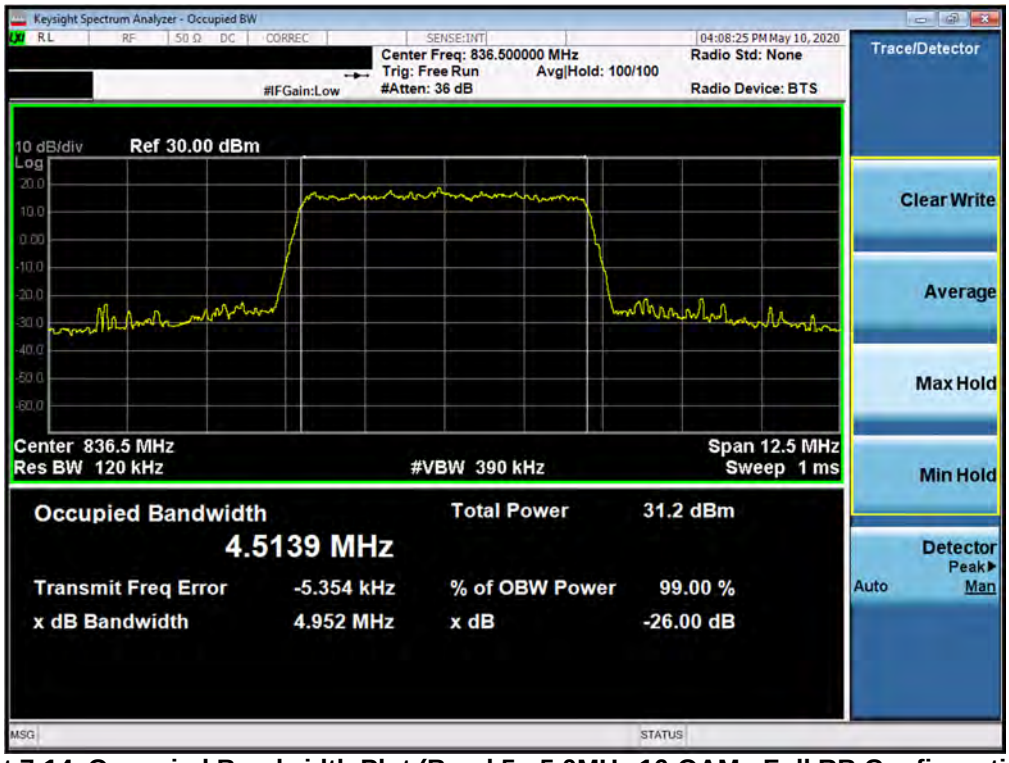


Plot 7-10. Occupied Bandwidth Plot (Band 5 - 3.0MHz QPSK - Full RB Configuration)

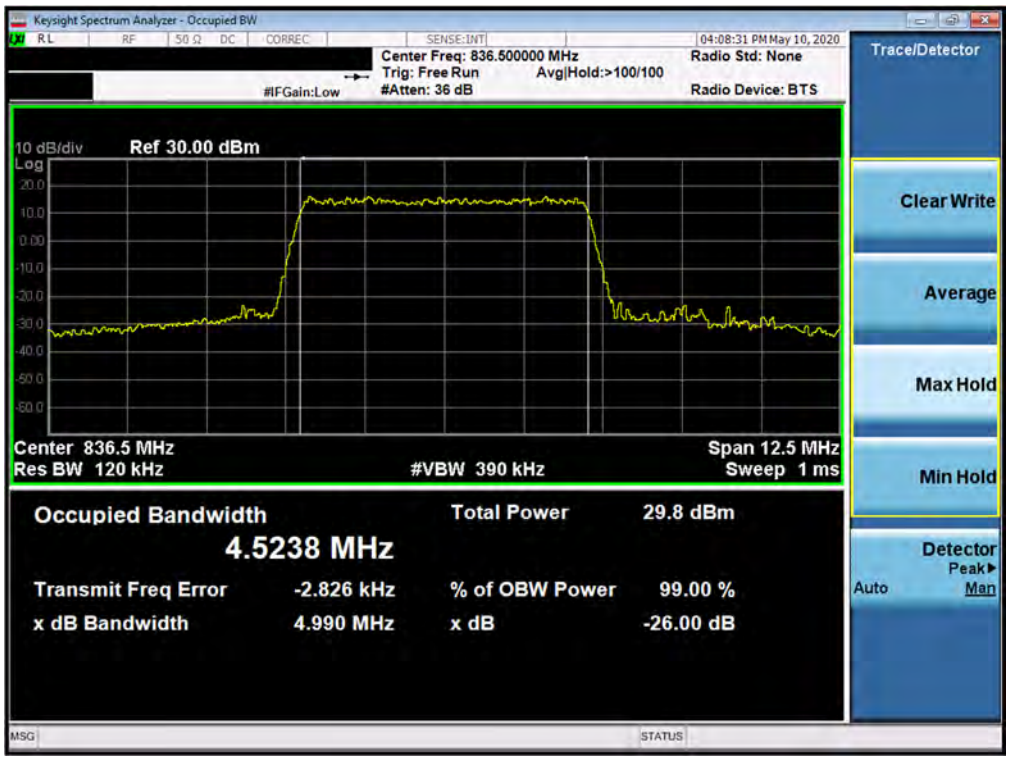
Plot 7-11. Occupied Bandwidth Plot (Band 5 - 3.0MHz 16-QAM - Full RB Configuration)

Plot 7-12. Occupied Bandwidth Plot (Band 5 - 3.0MHz 64-QAM - Full RB Configuration)

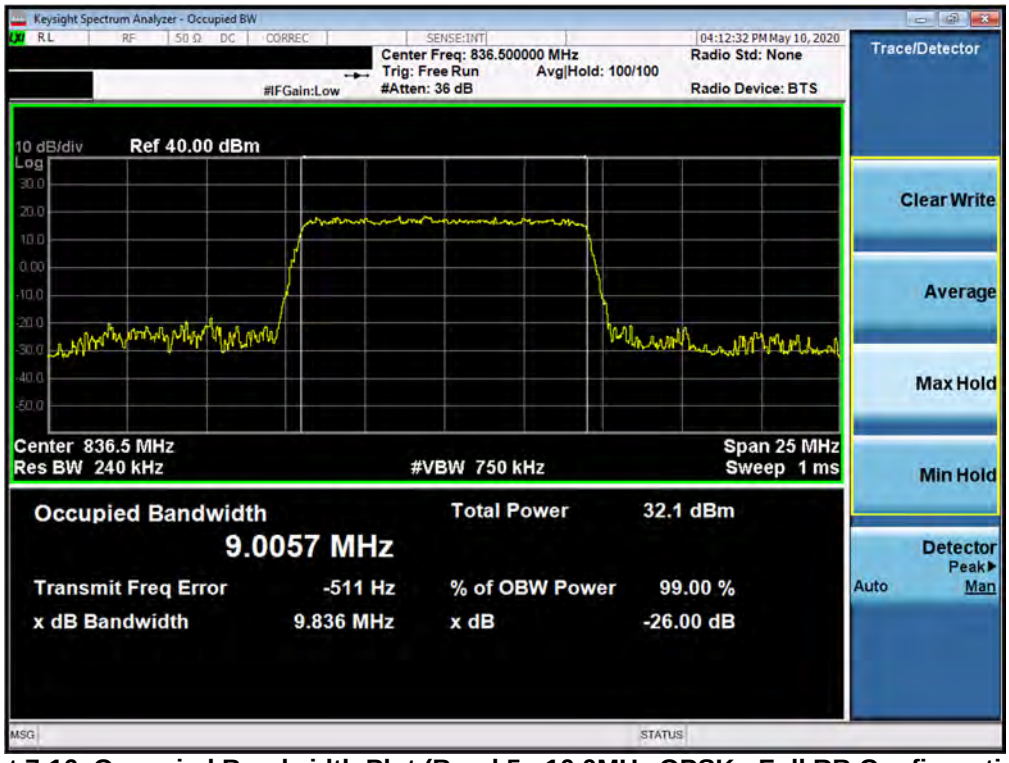
Plot 7-13. Occupied Bandwidth Plot (Band 5 - 5.0MHz QPSK - Full RB Configuration)



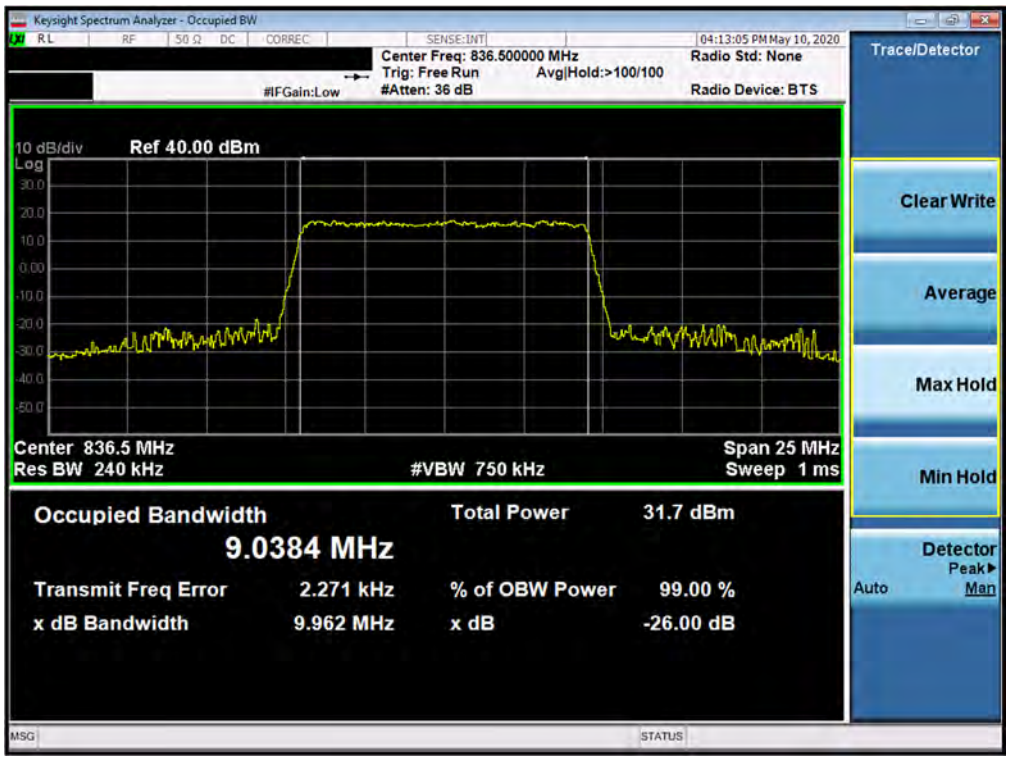
Plot 7-14. Occupied Bandwidth Plot (Band 5 - 5.0MHz 16-QAM - Full RB Configuration)



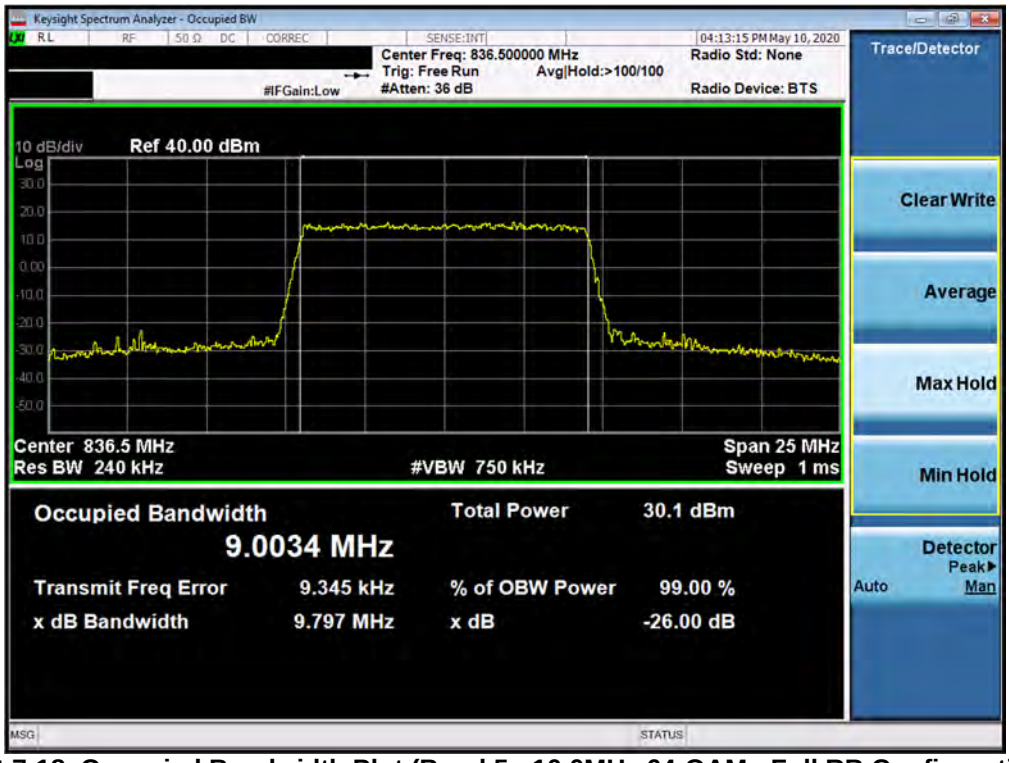
Plot 7-15. Occupied Bandwidth Plot (Band 5 - 5.0MHz 64-QAM - Full RB Configuration)



Plot 7-16. Occupied Bandwidth Plot (Band 5 - 10.0MHz QPSK - Full RB Configuration)

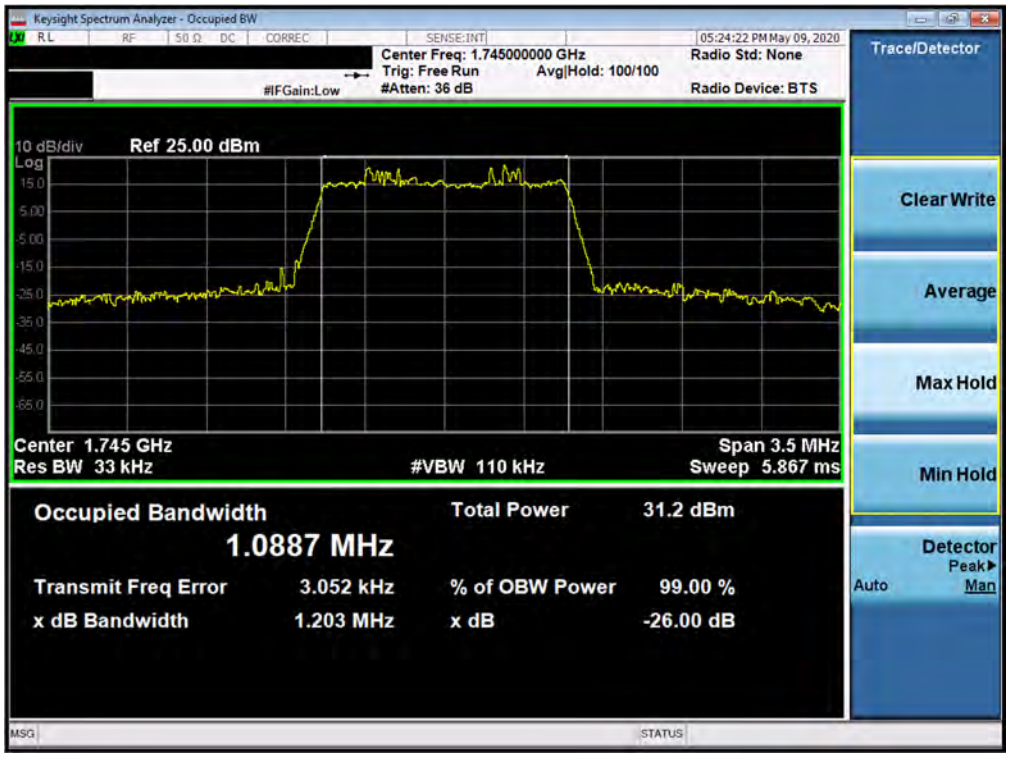


Plot 7-17. Occupied Bandwidth Plot (Band 5 - 10.0MHz 16-QAM - Full RB Configuration)



Plot 7-18. Occupied Bandwidth Plot (Band 5 - 10.0MHz 64-QAM - Full RB Configuration)

Band 66/4

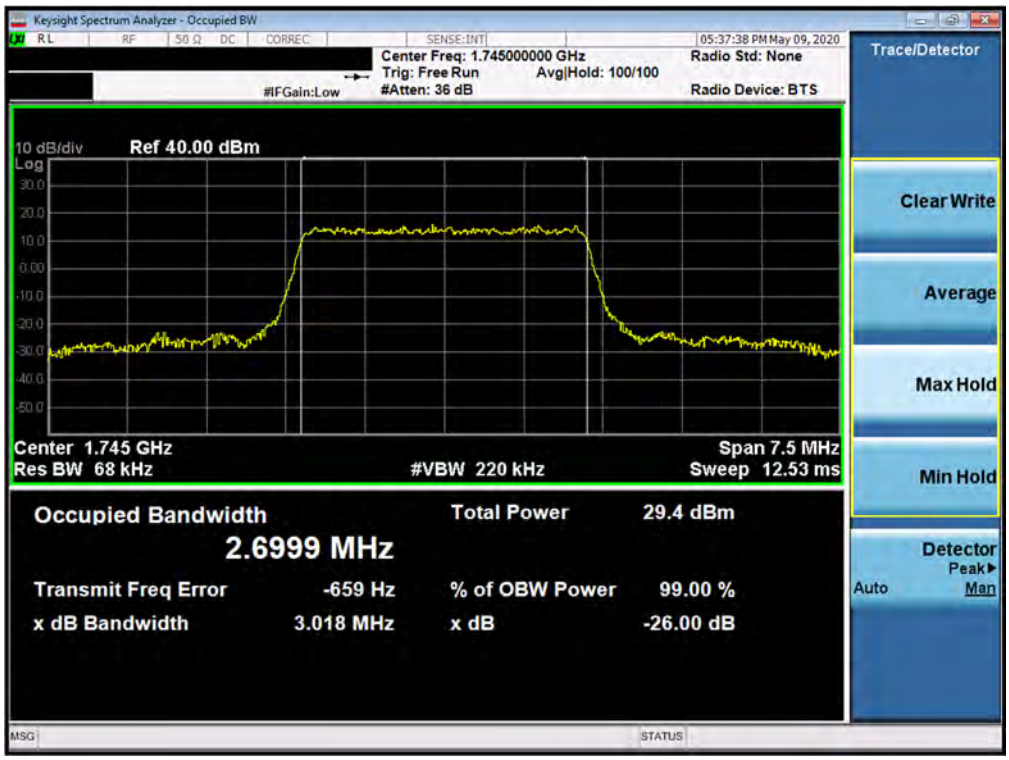


Plot 7-19. Occupied Bandwidth Plot (Band 66/4 - 1.4MHz QPSK - Full RB Configuration)

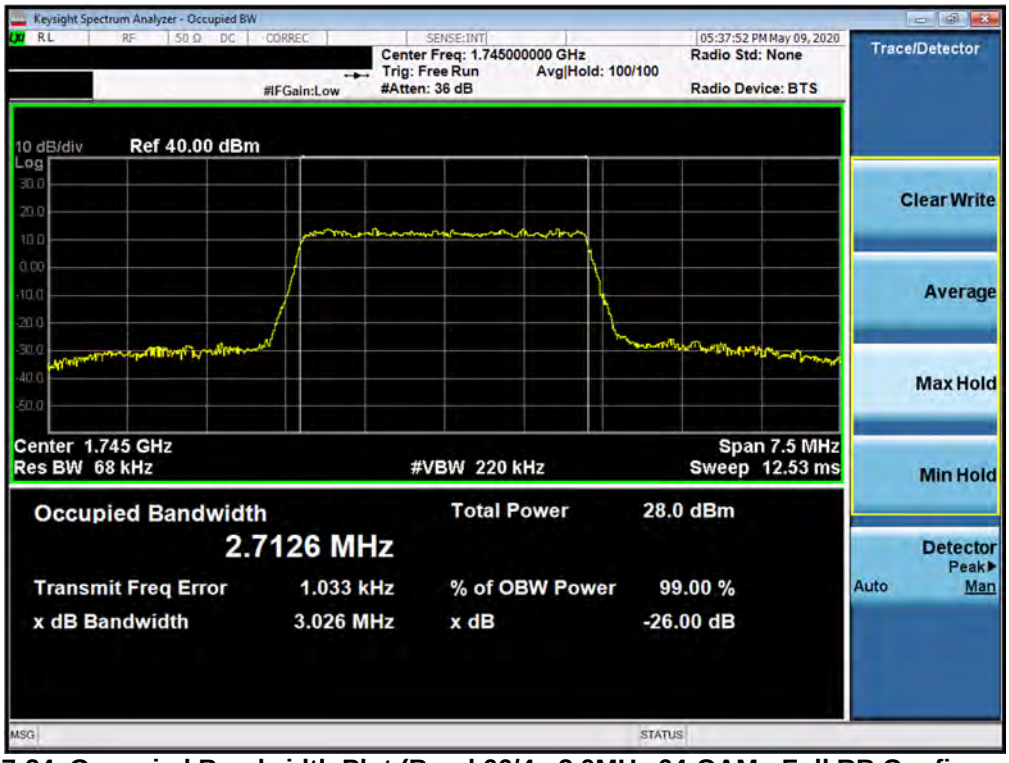
Plot 7-20. Occupied Bandwidth Plot (Band 66/4 - 1.4MHz 16-QAM - Full RB Configuration)

Plot 7-21. Occupied Bandwidth Plot (Band 66/4 - 1.4MHz 64-QAM - Full RB Configuration)

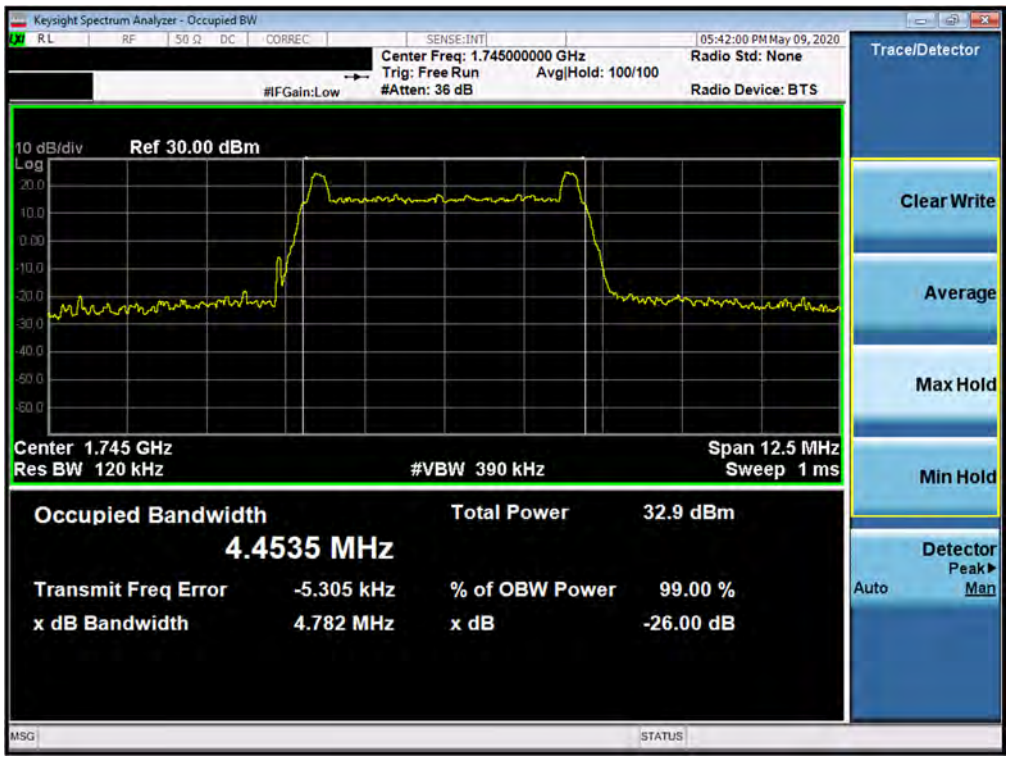
Plot 7-22. Occupied Bandwidth Plot (Band 66/4 - 3.0MHz QPSK - Full RB Configuration)



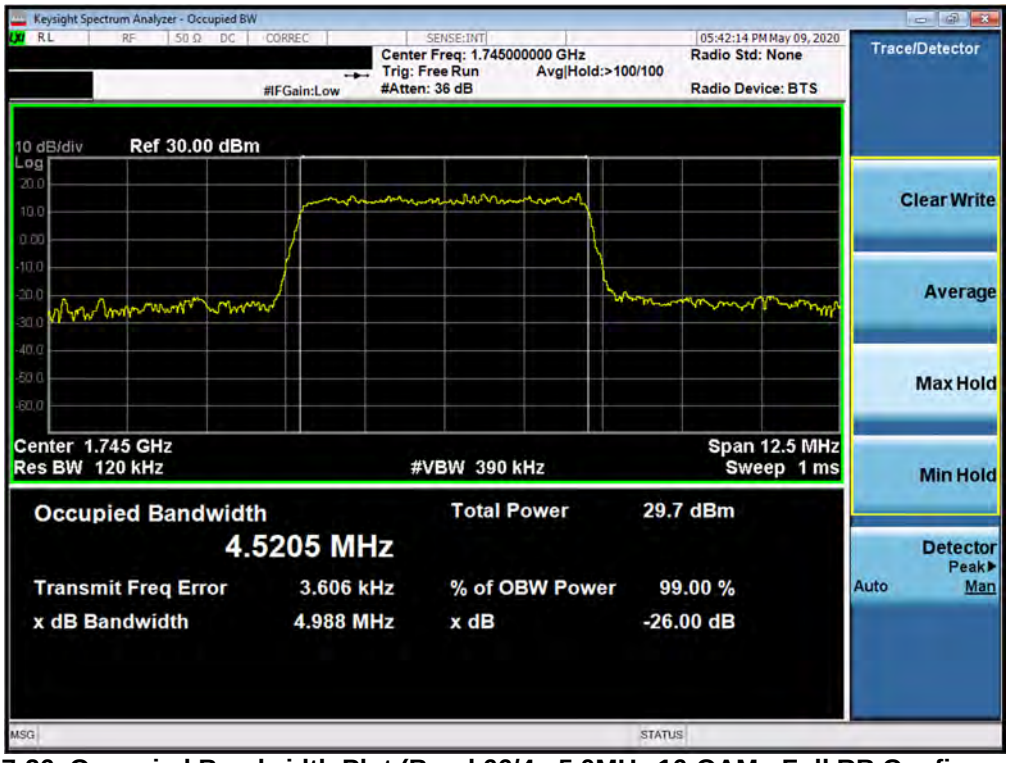
Plot 7-23. Occupied Bandwidth Plot (Band 66/4 - 3.0MHz 16-QAM - Full RB Configuration)



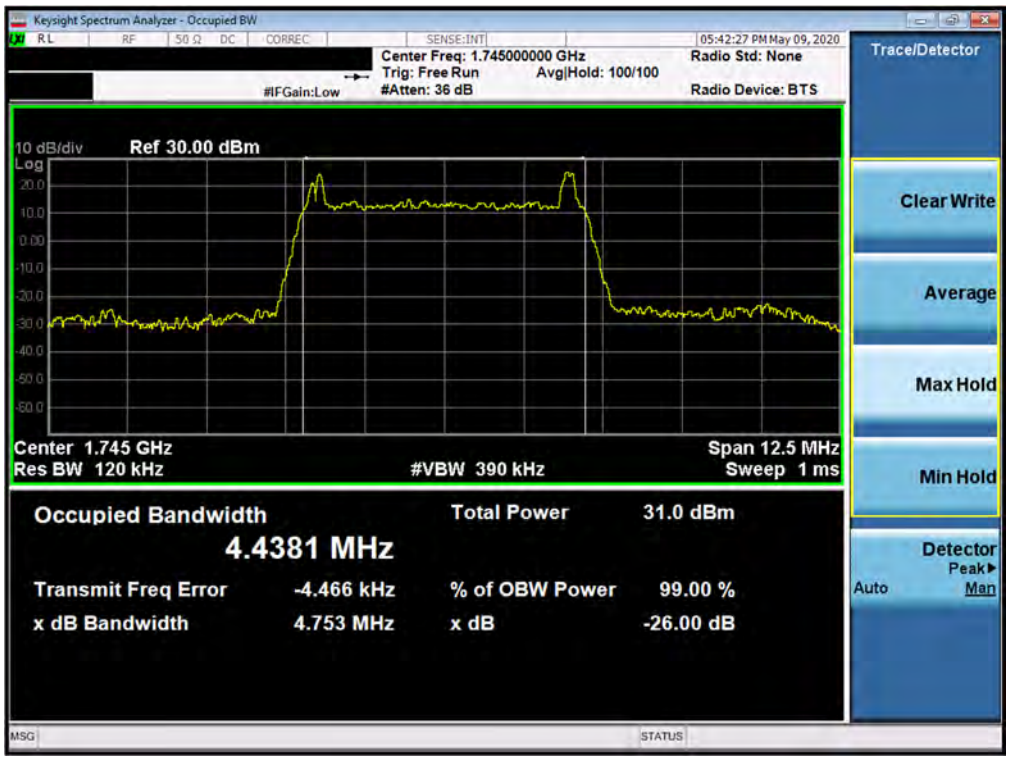
Plot 7-24. Occupied Bandwidth Plot (Band 66/4 - 3.0MHz 64-QAM - Full RB Configuration)



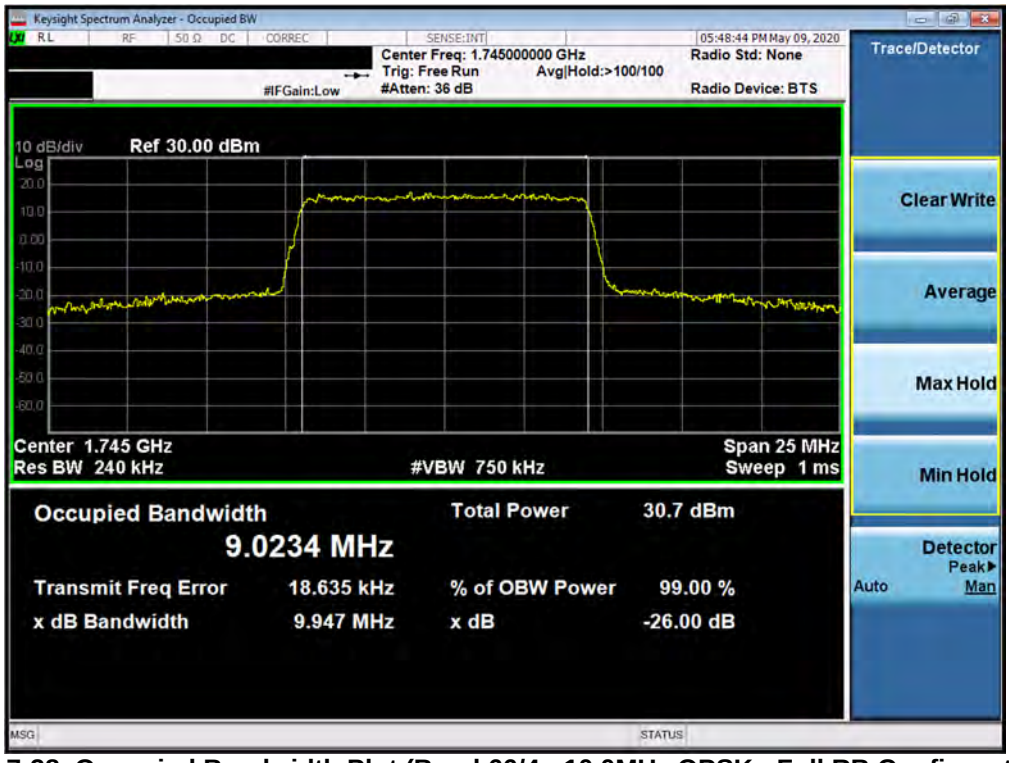
Plot 7-25. Occupied Bandwidth Plot (Band 66/4 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-26. Occupied Bandwidth Plot (Band 66/4 - 5.0MHz 16-QAM - Full RB Configuration)

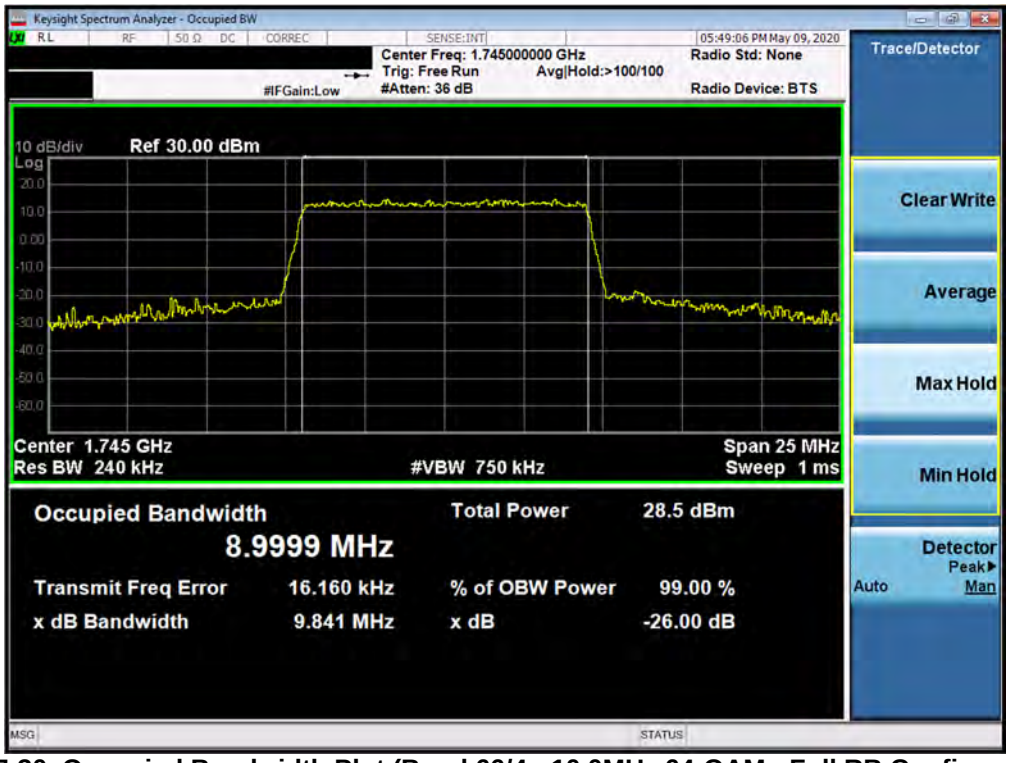


Plot 7-27. Occupied Bandwidth Plot (Band 66/4 - 5.0MHz 64-QAM - Full RB Configuration)



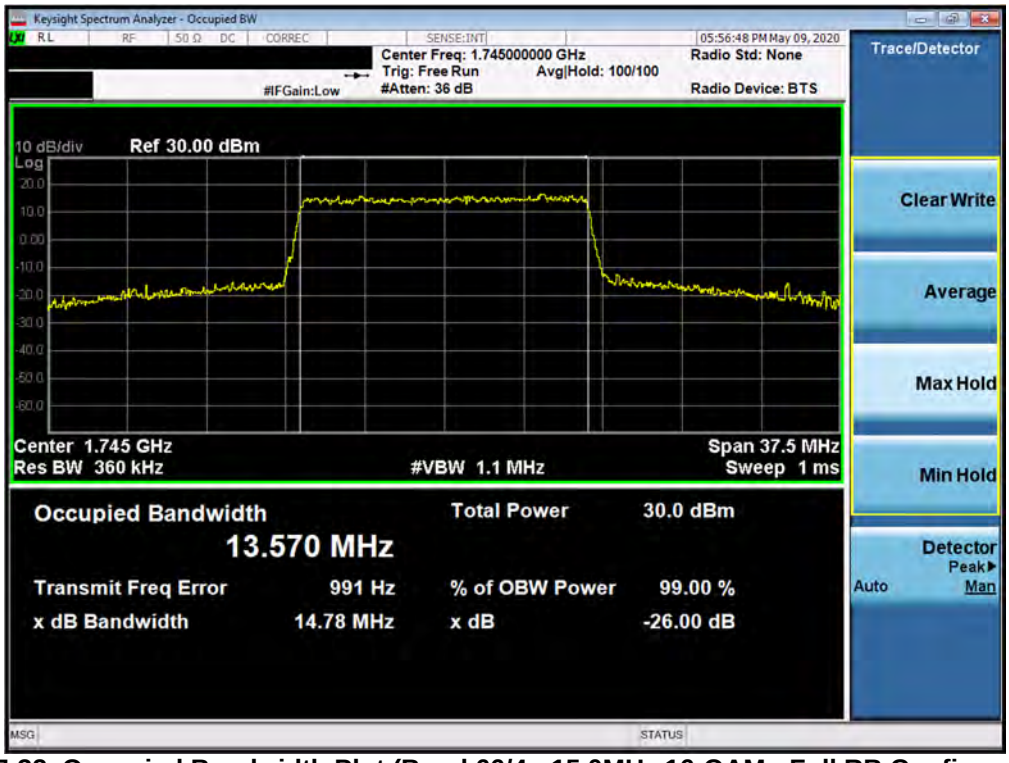
Plot 7-28. Occupied Bandwidth Plot (Band 66/4 - 10.0MHz QPSK - Full RB Configuration)

Plot 7-29. Occupied Bandwidth Plot (Band 66/4 - 10.0MHz 16-QAM - Full RB Configuration)



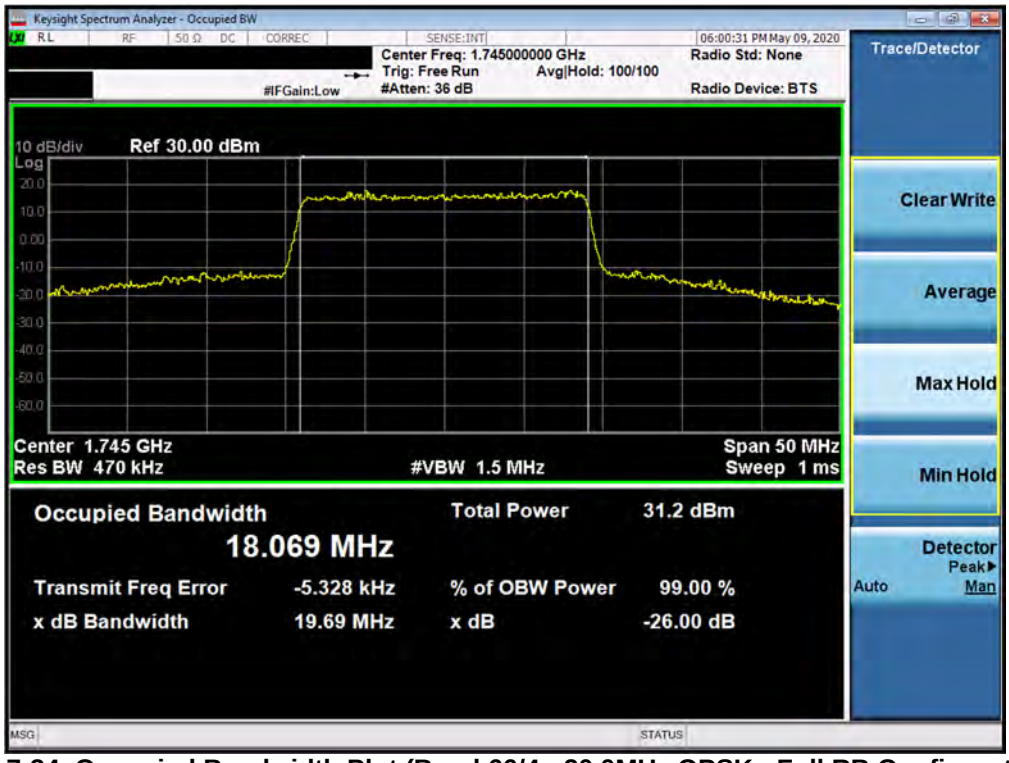
Plot 7-30. Occupied Bandwidth Plot (Band 66/4 - 10.0MHz 64-QAM - Full RB Configuration)

Plot 7-31. Occupied Bandwidth Plot (Band 66/4 - 15.0MHz QPSK - Full RB Configuration)



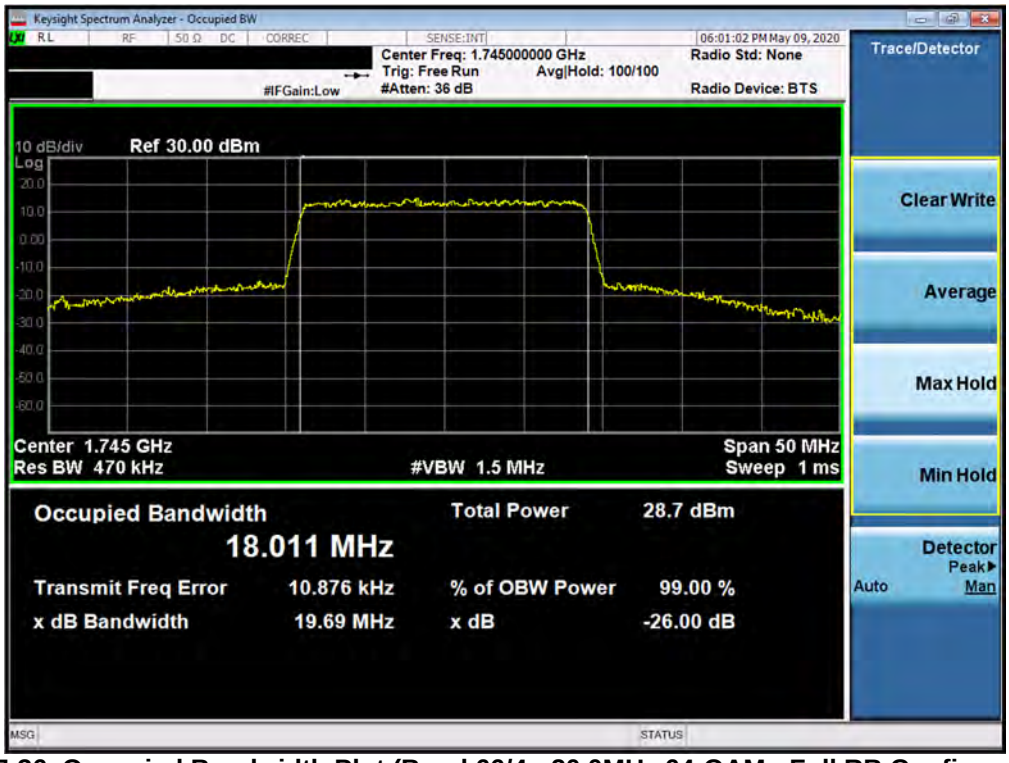
Plot 7-32. Occupied Bandwidth Plot (Band 66/4 - 15.0MHz 16-QAM - Full RB Configuration)

Plot 7-33. Occupied Bandwidth Plot (Band 66/4 - 15.0MHz 64-QAM - Full RB Configuration)



Plot 7-34. Occupied Bandwidth Plot (Band 66/4 - 20.0MHz QPSK - Full RB Configuration)

Plot 7-35. Occupied Bandwidth Plot (Band 66/4 - 20.0MHz 16-QAM - Full RB Configuration)



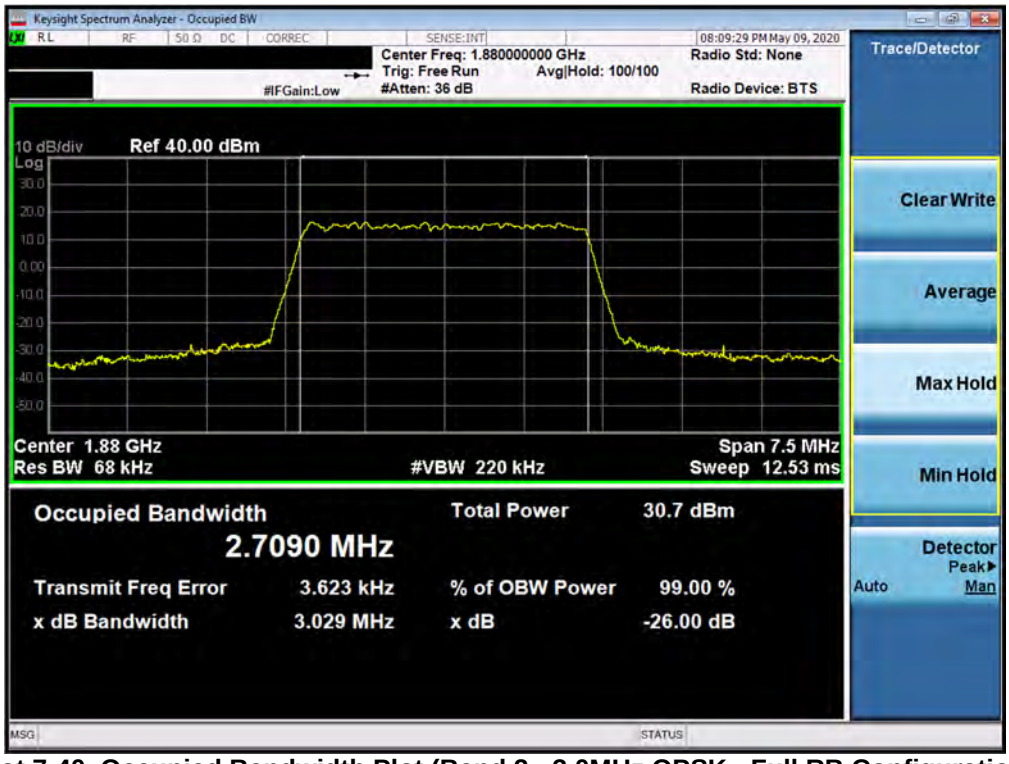
Plot 7-36. Occupied Bandwidth Plot (Band 66/4 - 20.0MHz 64-QAM - Full RB Configuration)

Band 2

Plot 7-37. Occupied Bandwidth Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)

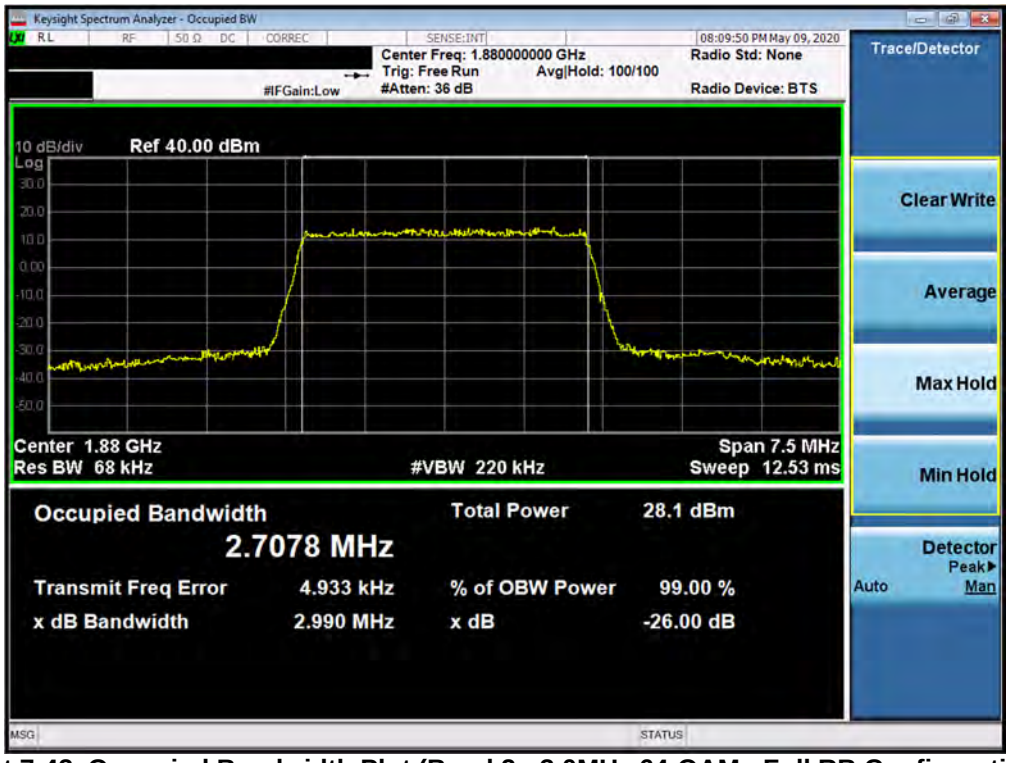
Plot 7-38. Occupied Bandwidth Plot (Band 2 - 1.4MHz 16-QAM - Full RB Configuration)

Plot 7-39. Occupied Bandwidth Plot (Band 2 - 1.4MHz 64-QAM - Full RB Configuration)



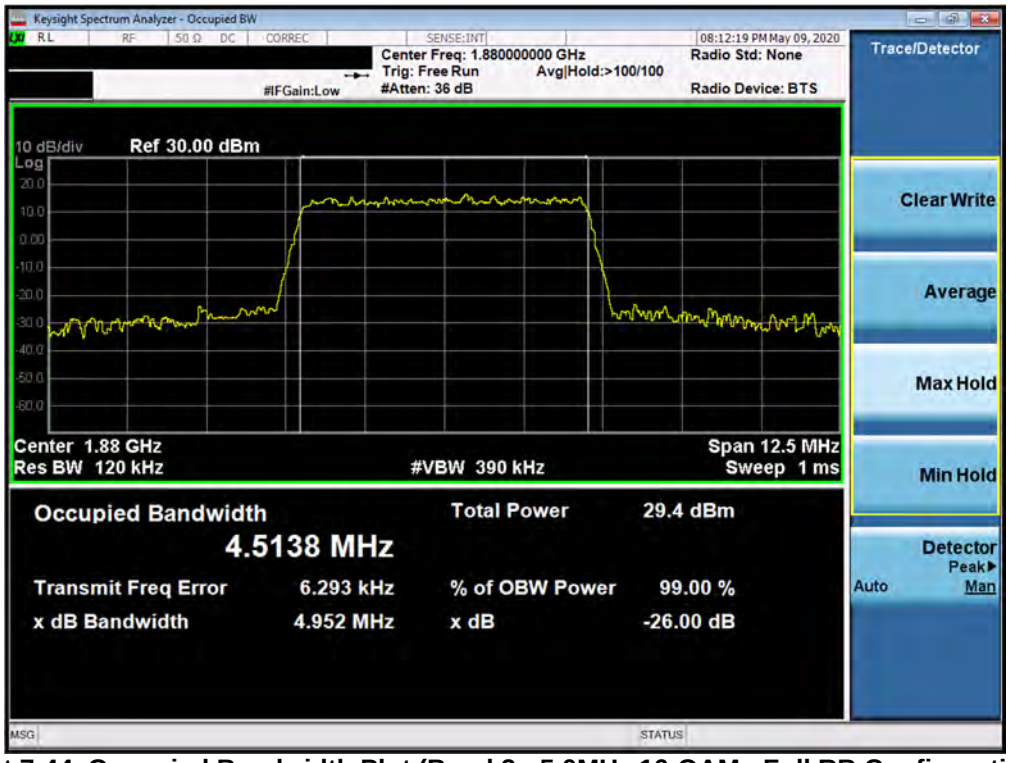
Plot 7-40. Occupied Bandwidth Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)

Plot 7-41. Occupied Bandwidth Plot (Band 2 - 3.0MHz 16-QAM - Full RB Configuration)

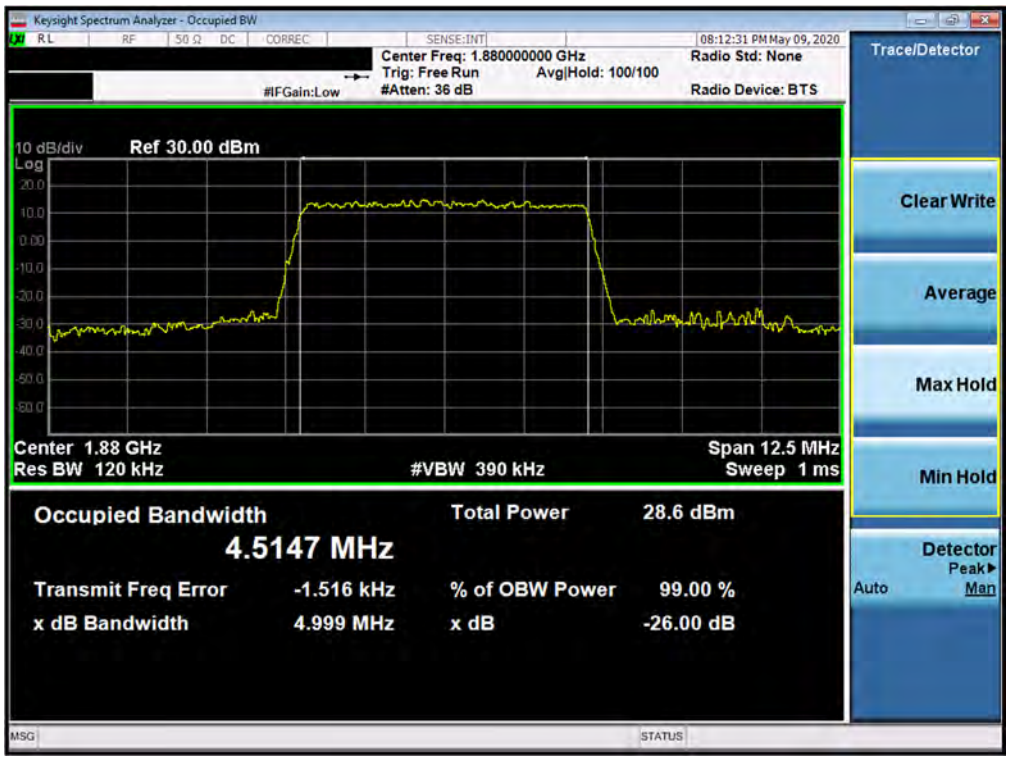


Plot 7-42. Occupied Bandwidth Plot (Band 2 - 3.0MHz 64-QAM - Full RB Configuration)

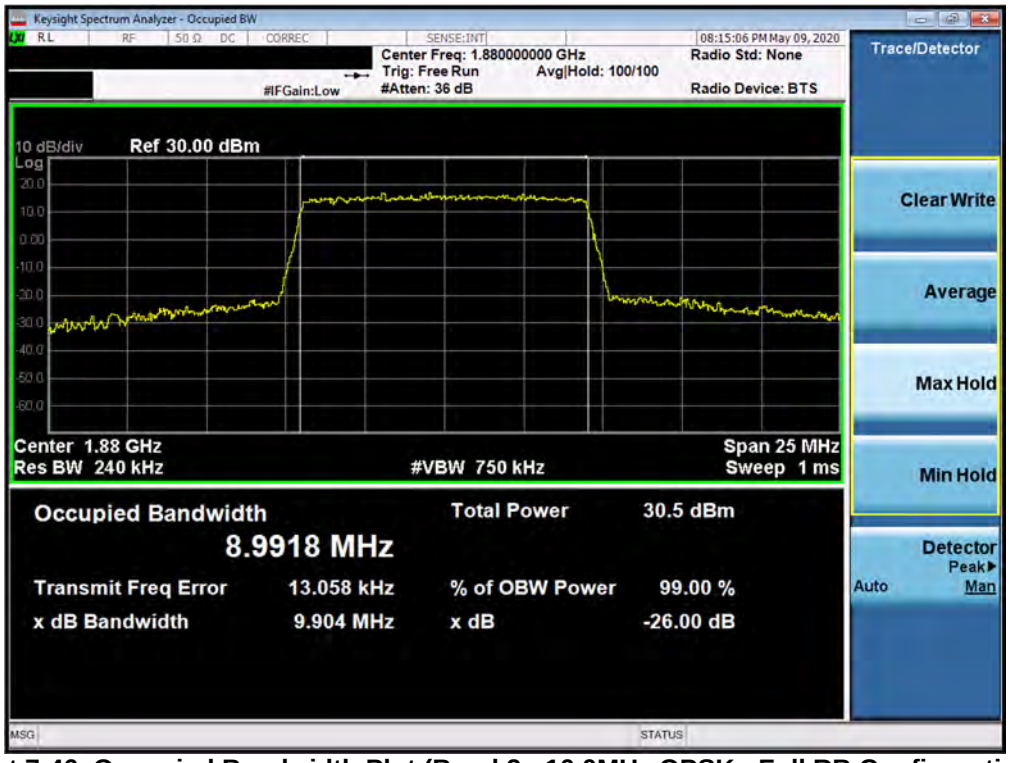
Plot 7-43. Occupied Bandwidth Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-44. Occupied Bandwidth Plot (Band 2 - 5.0MHz 16-QAM - Full RB Configuration)

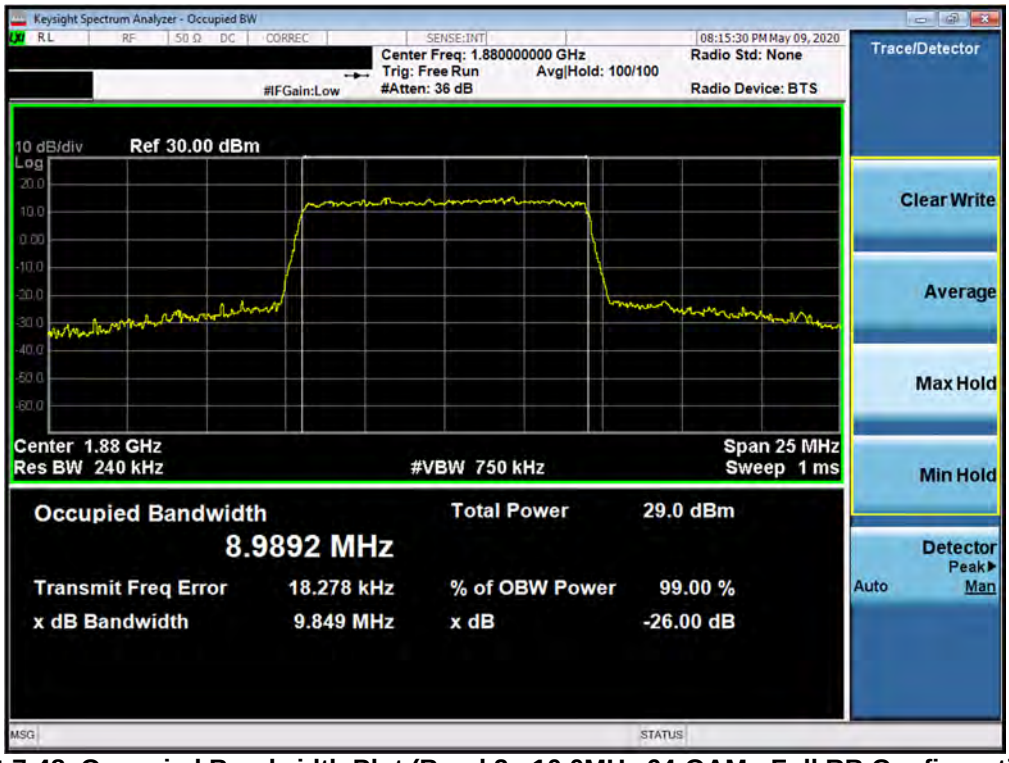


Plot 7-45. Occupied Bandwidth Plot (Band 2 - 5.0MHz 64-QAM - Full RB Configuration)



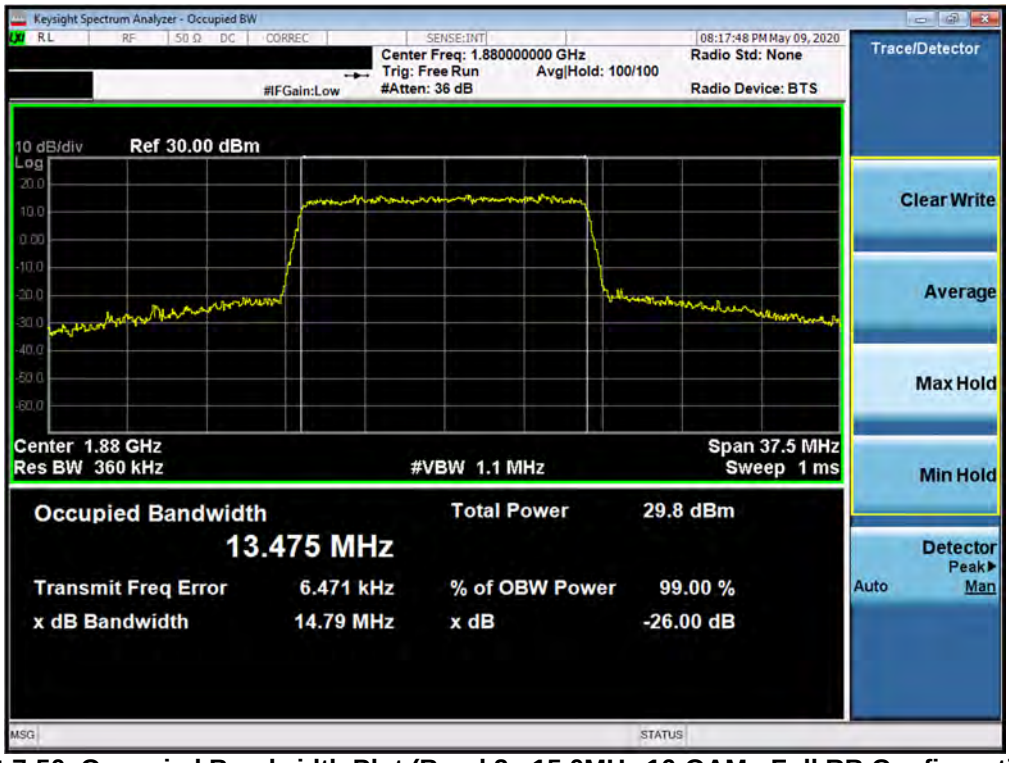
Plot 7-46. Occupied Bandwidth Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)

Plot 7-47. Occupied Bandwidth Plot (Band 2 - 10.0MHz 16-QAM - Full RB Configuration)



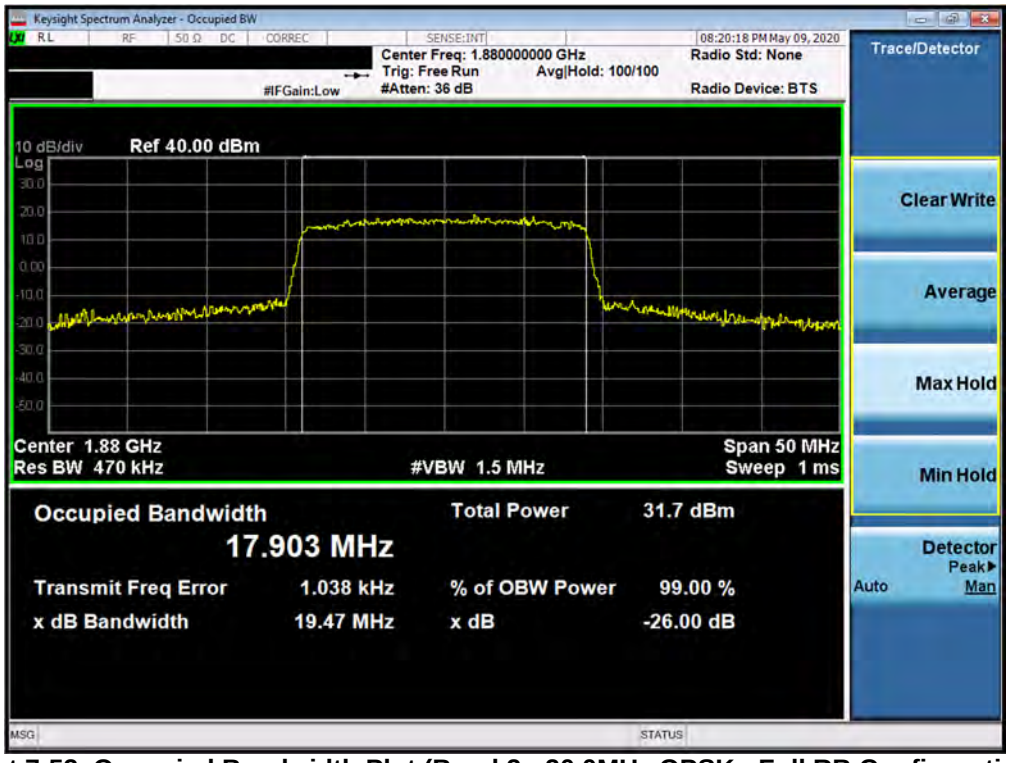
Plot 7-48. Occupied Bandwidth Plot (Band 2 - 10.0MHz 64-QAM - Full RB Configuration)

Plot 7-49. Occupied Bandwidth Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)

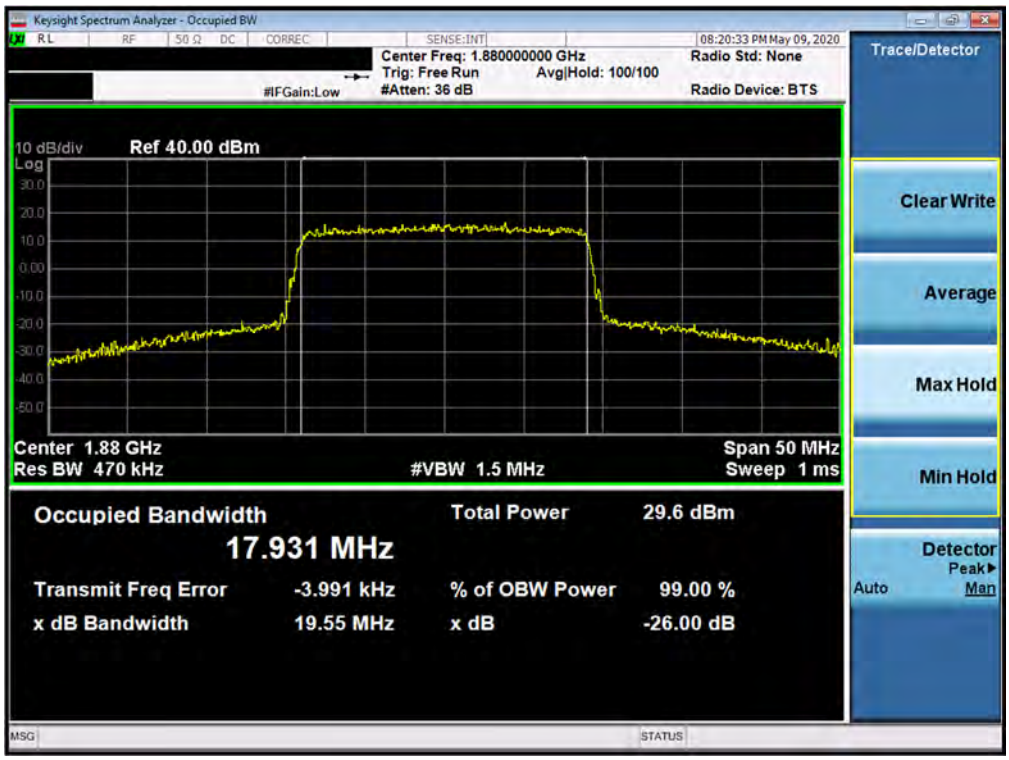


Plot 7-50. Occupied Bandwidth Plot (Band 2 - 15.0MHz 16-QAM - Full RB Configuration)

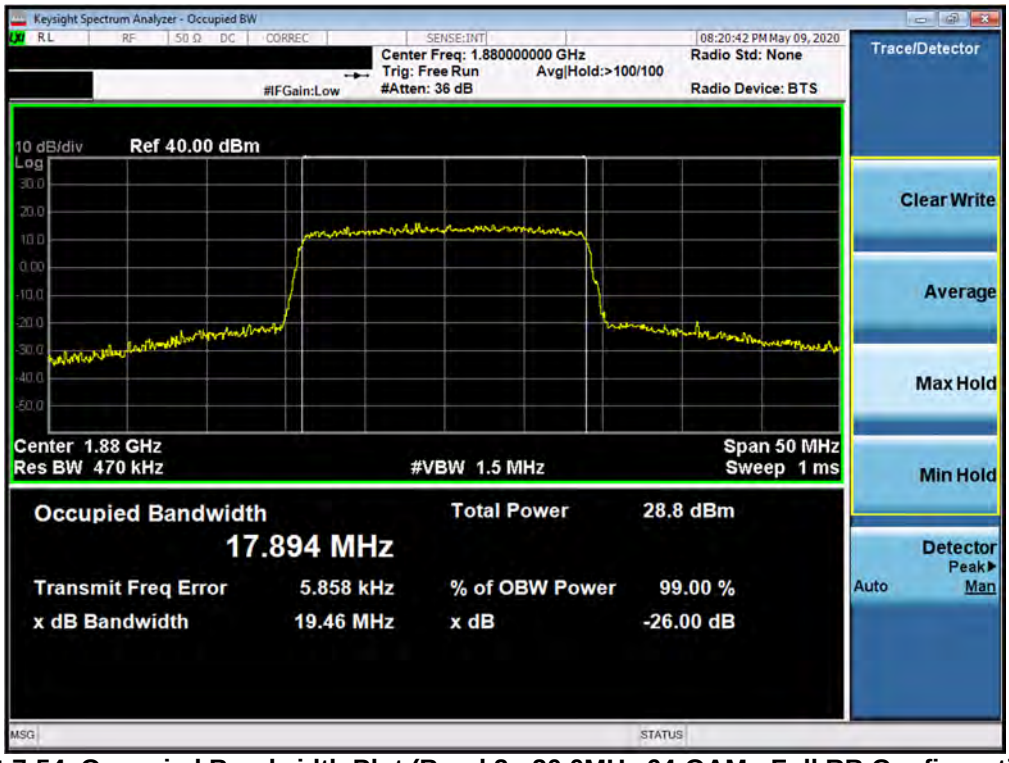
Plot 7-51. Occupied Bandwidth Plot (Band 2 - 15.0MHz 64-QAM - Full RB Configuration)



Plot 7-52. Occupied Bandwidth Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)

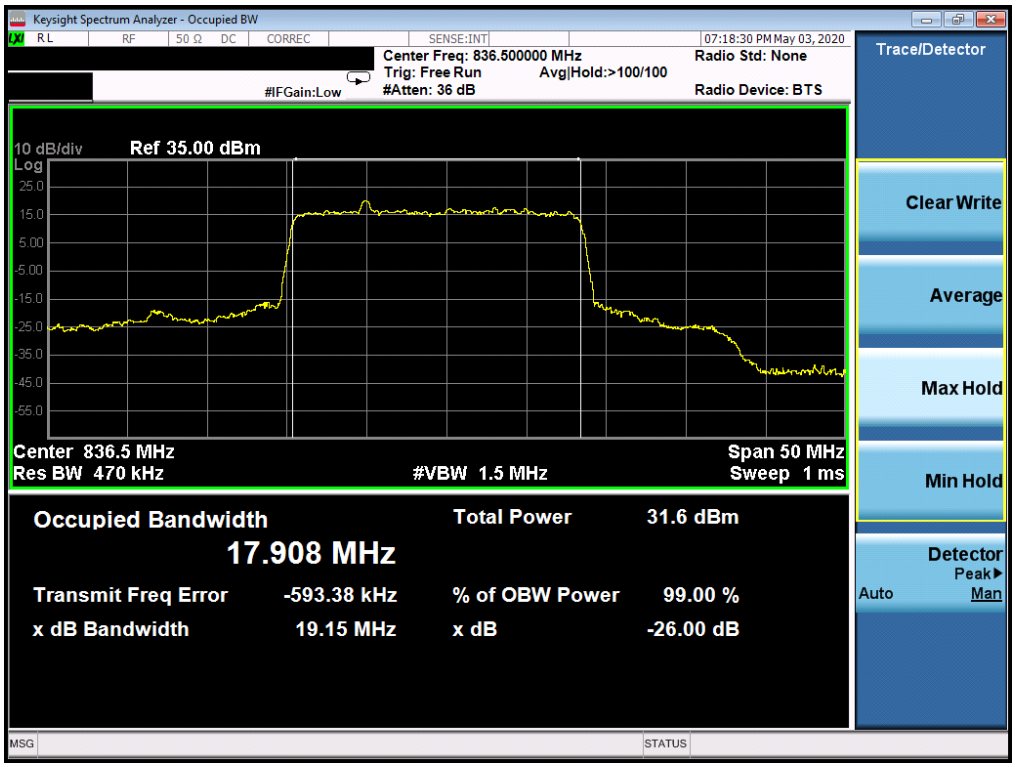


Plot 7-53. Occupied Bandwidth Plot (Band 2 - 20.0MHz 16-QAM - Full RB Configuration)

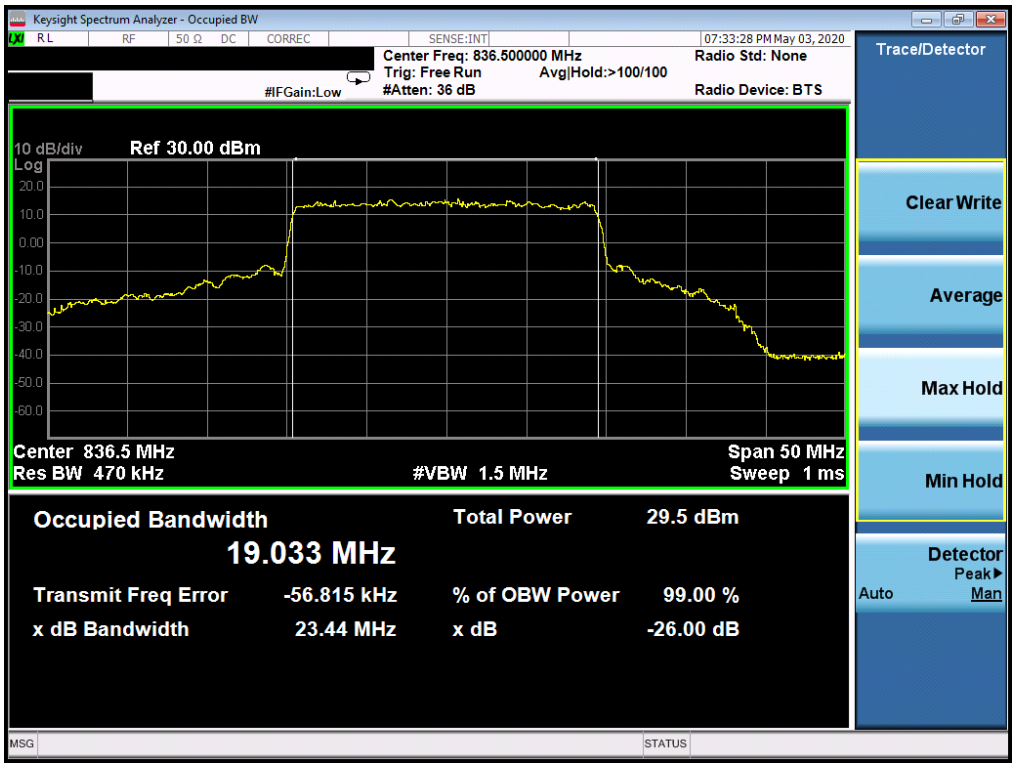


Plot 7-54. Occupied Bandwidth Plot (Band 2 - 20.0MHz 64-QAM - Full RB Configuration)

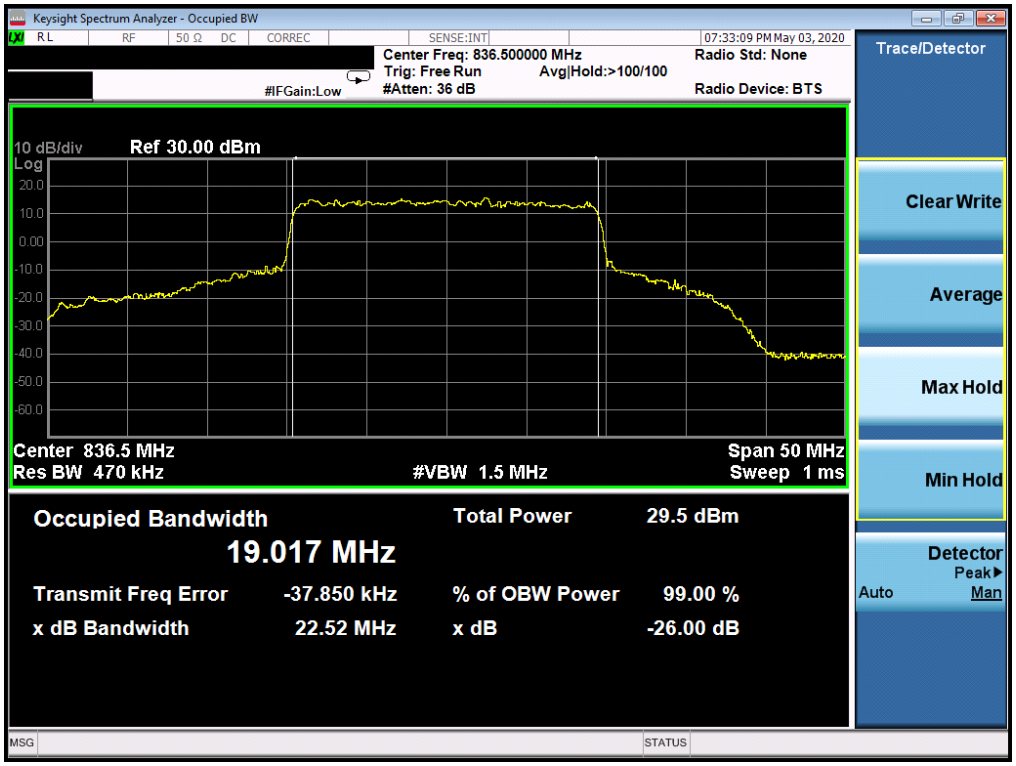
NR Band n5



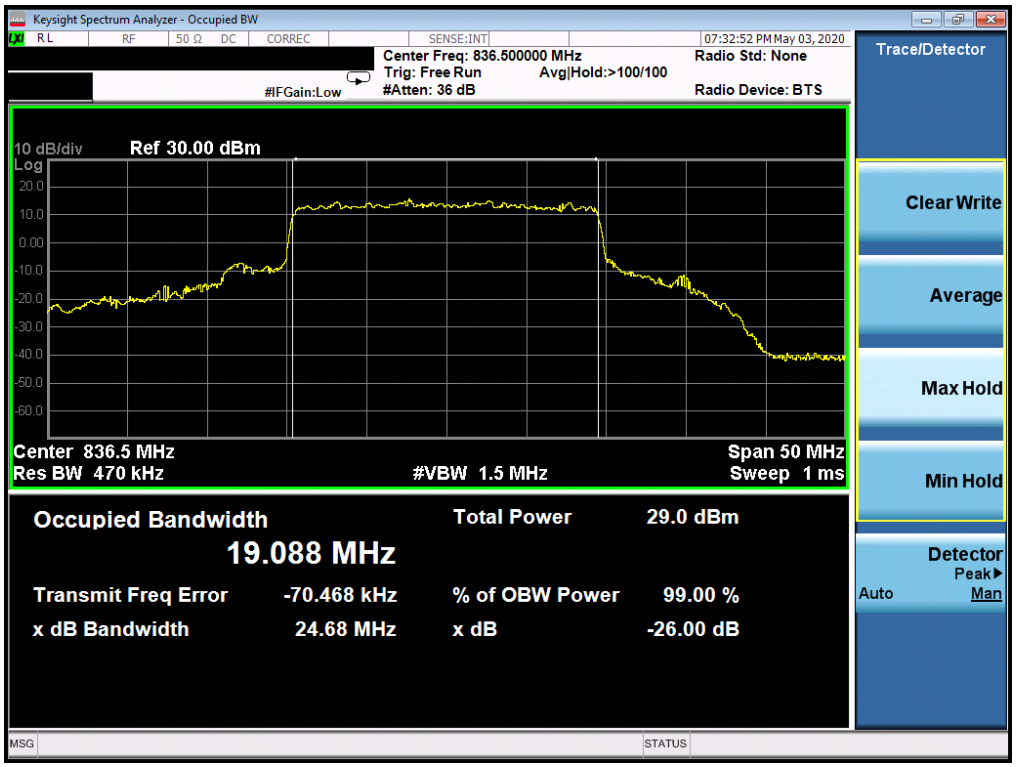
Plot 7-55. Occupied Bandwidth Plot (NR Band n5 - 20MHz DFT-s-OFDM π/2 BPSK - Full RB Configuration)



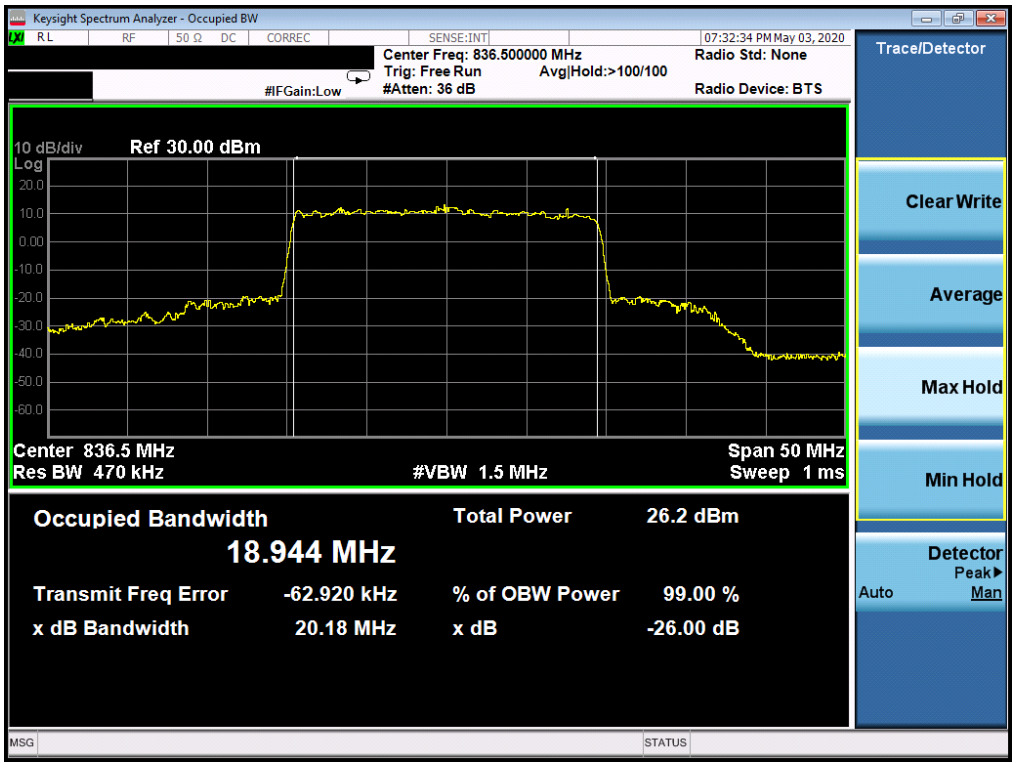
Plot 7-56. Occupied Bandwidth Plot (NR Band n5 - 20MHz CP-OFDM QPSK - Full RB Configuration)



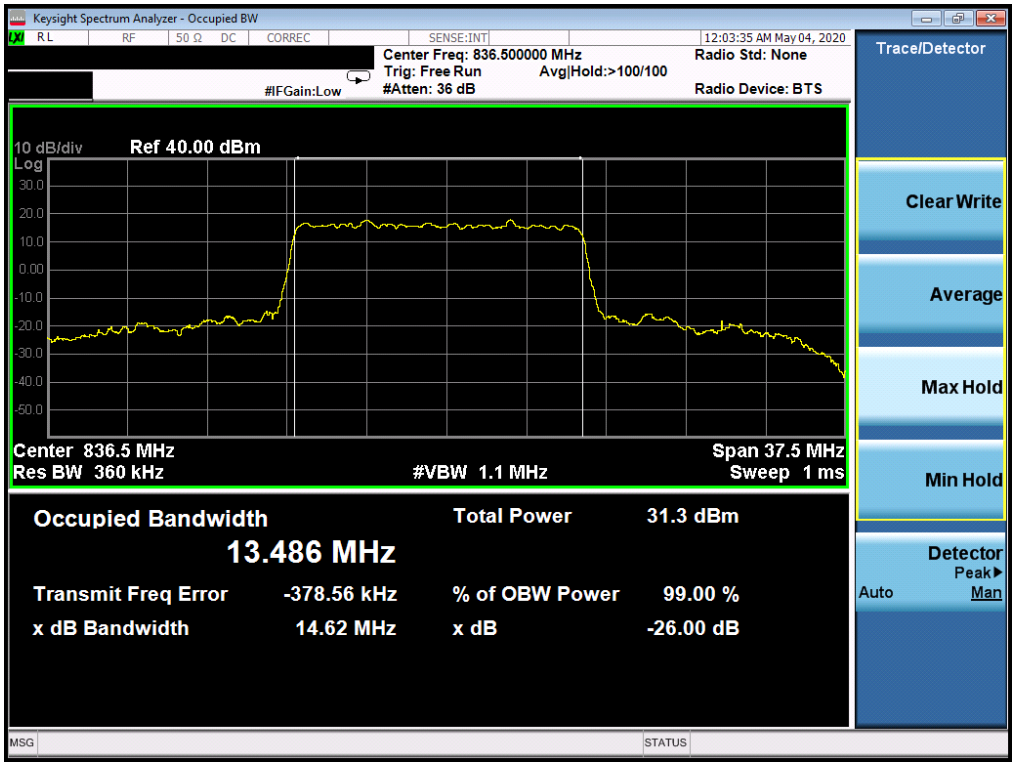
Plot 7-57. Occupied Bandwidth Plot (NR Band n5 – 20MHz CP-OFDM 16-QAM – Full RB Configuration)



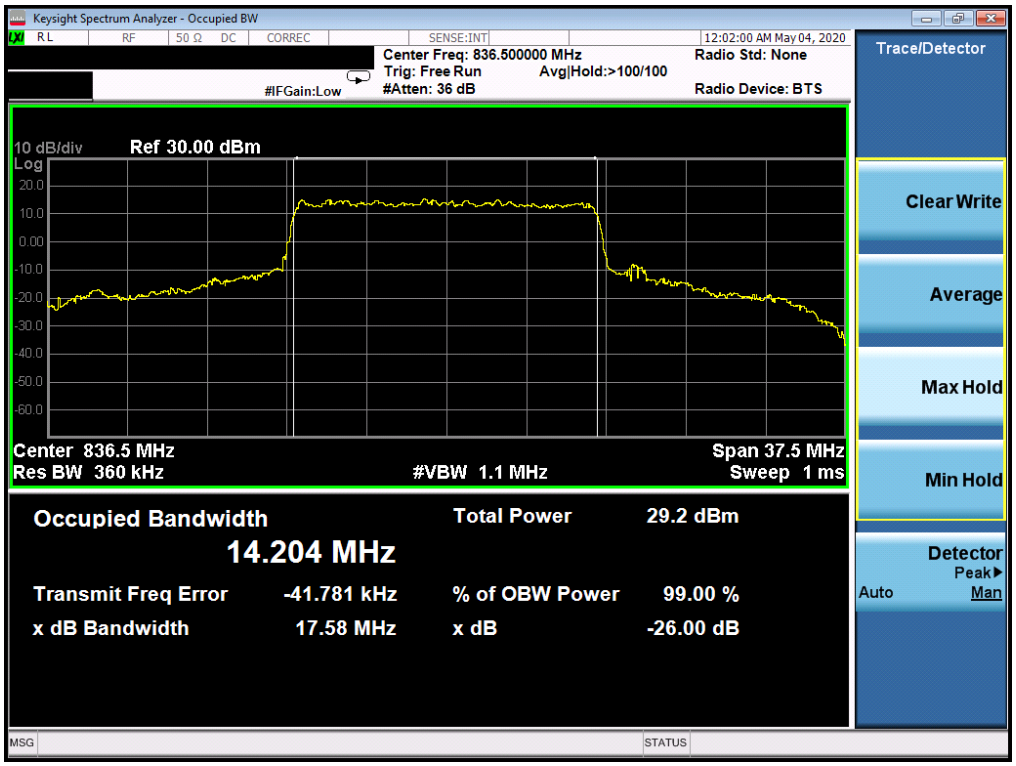
Plot 7-58. Occupied Bandwidth Plot (NR Band n5 - 20MHz CP-OFDM 64-QAM - Full RB Configuration)



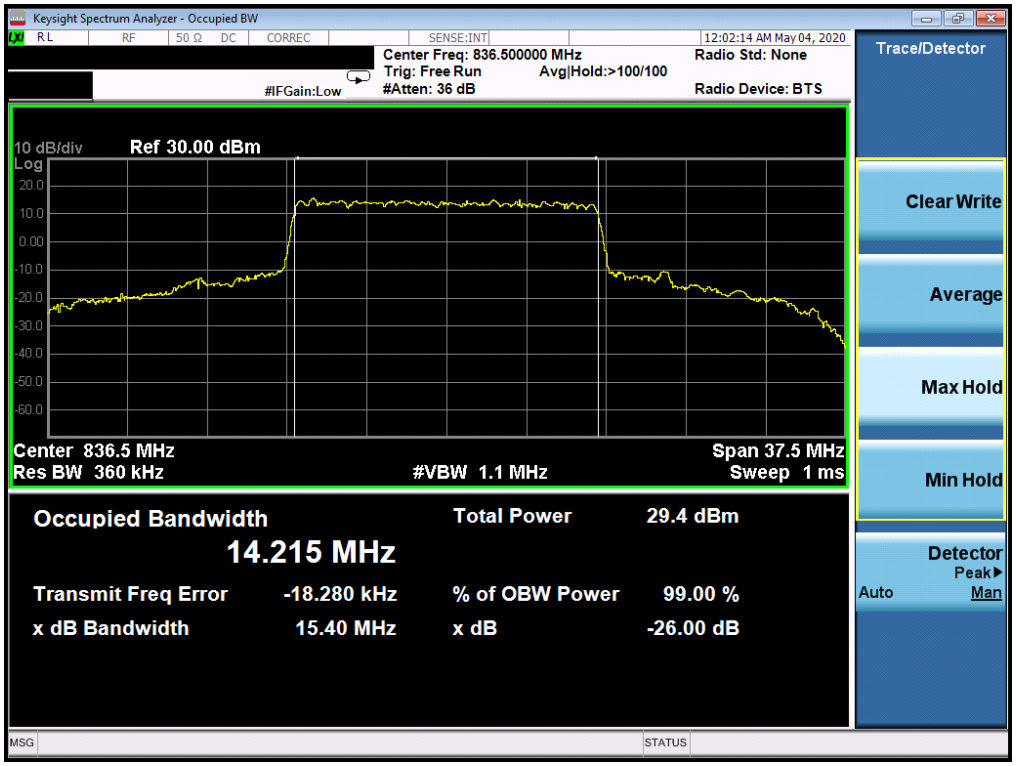
Plot 7-59. Occupied Bandwidth Plot (NR Band n5 - 20MHz CP-OFDM 256-QAM - Full RB Configuration)



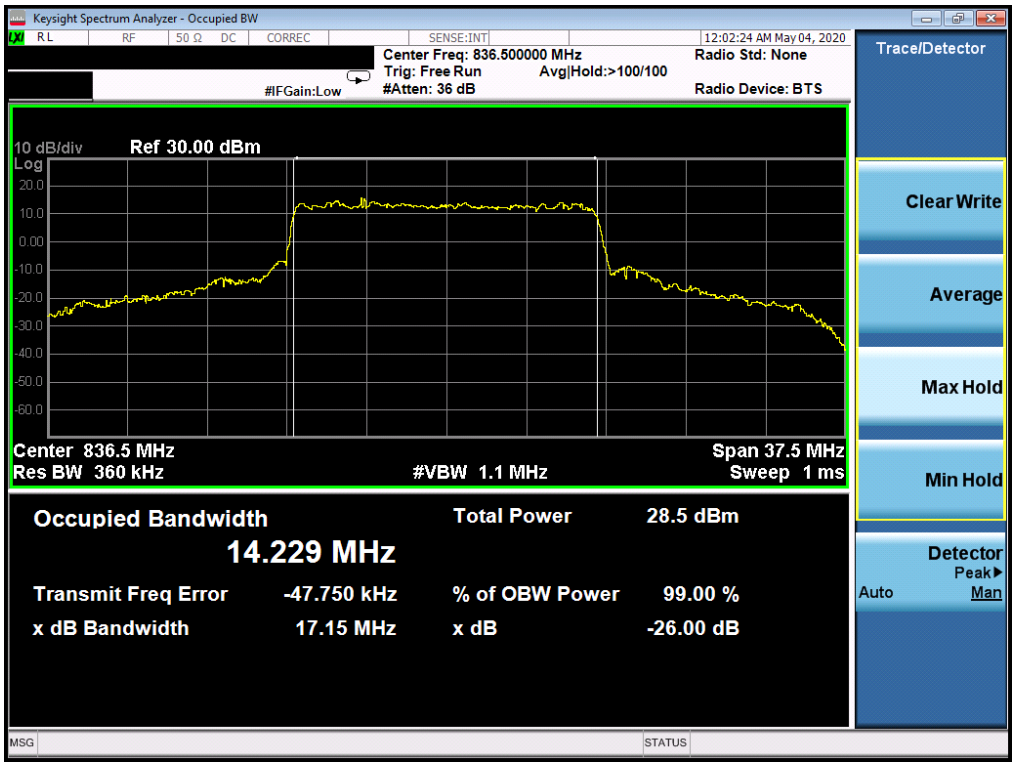
Plot 7-60. Occupied Bandwidth Plot (NR Band n5 - 15MHz DFT-s-OFDM π/2 BPSK - Full RB Configuration)



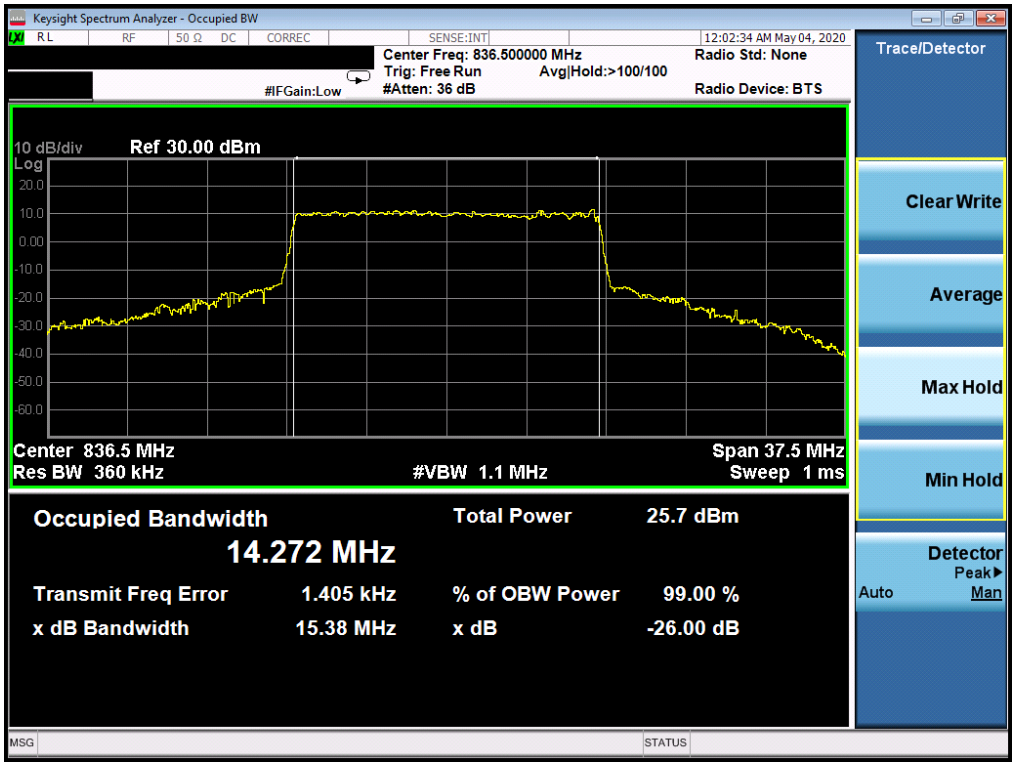
Plot 7-61. Occupied Bandwidth Plot (NR Band n5 - 15MHz CP-OFDM QPSK - Full RB Configuration)



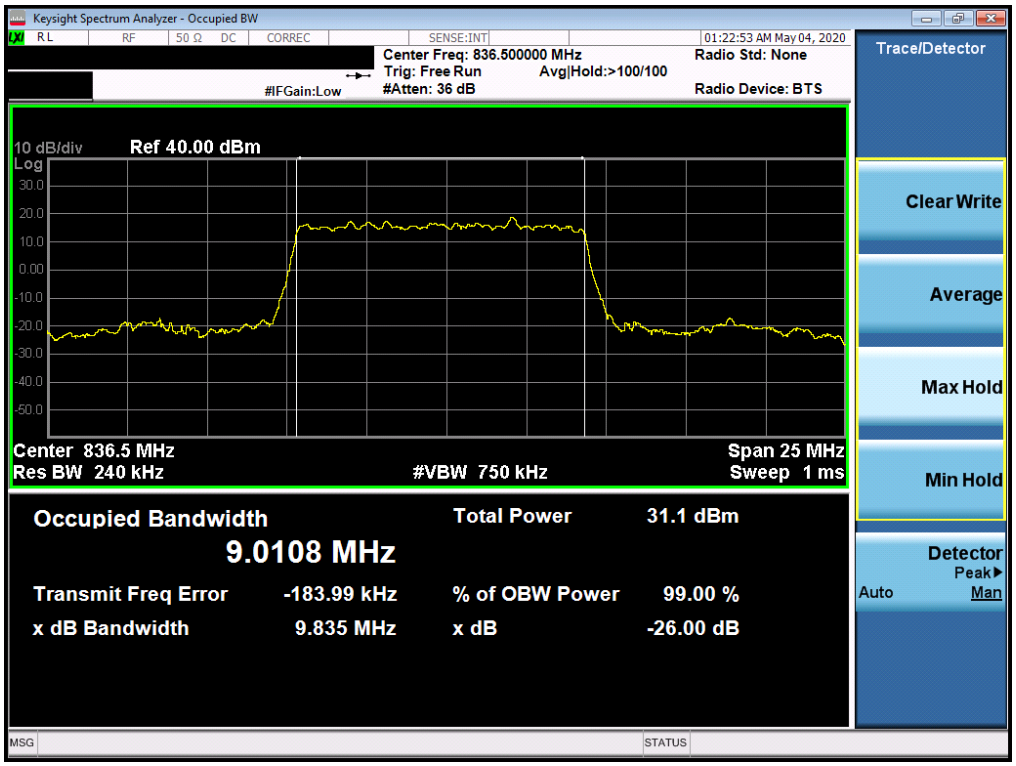
Plot 7-62. Occupied Bandwidth Plot (NR Band n5 – 15MHz CP-OFDM 16-QAM – Full RB Configuration)



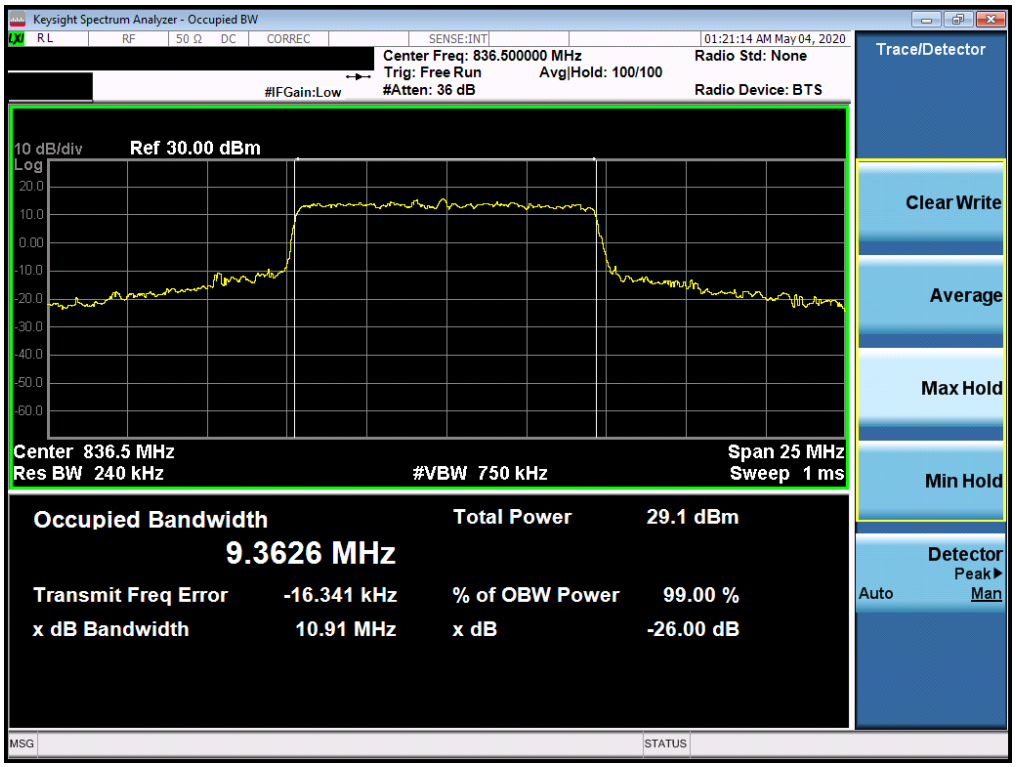
Plot 7-63. Occupied Bandwidth Plot (NR Band n5 - 15MHz CP-OFDM 64-QAM - Full RB Configuration)



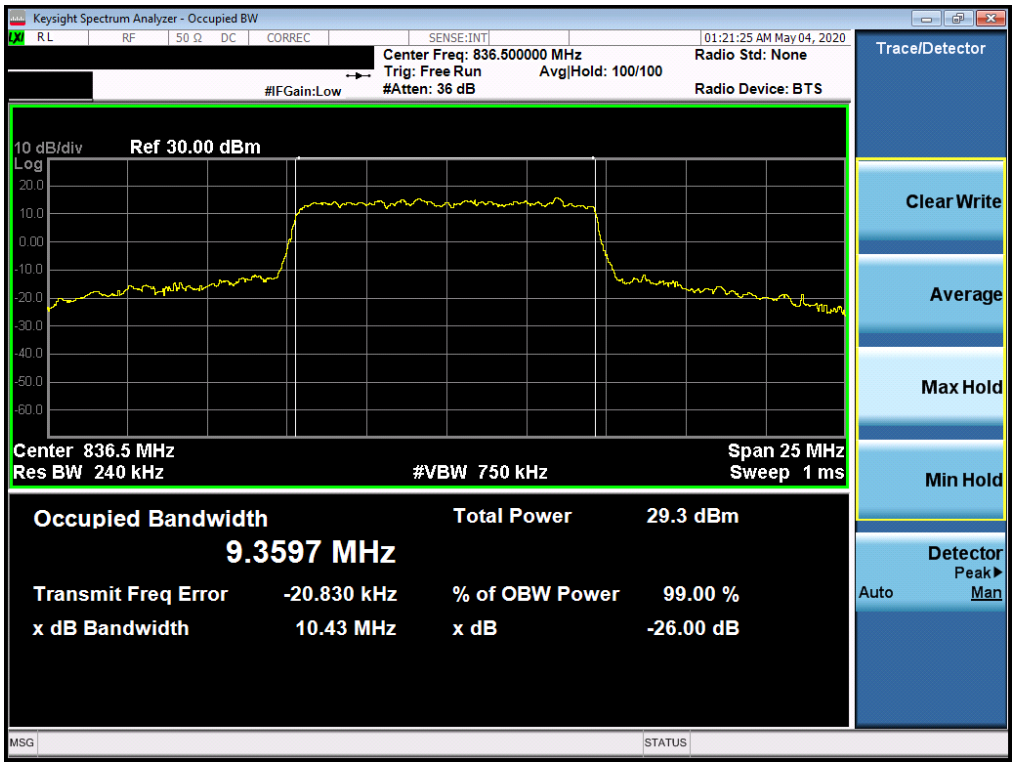
Plot 7-64. Occupied Bandwidth Plot (NR Band n5 - 15MHz CP-OFDM 256-QAM - Full RB Configuration)



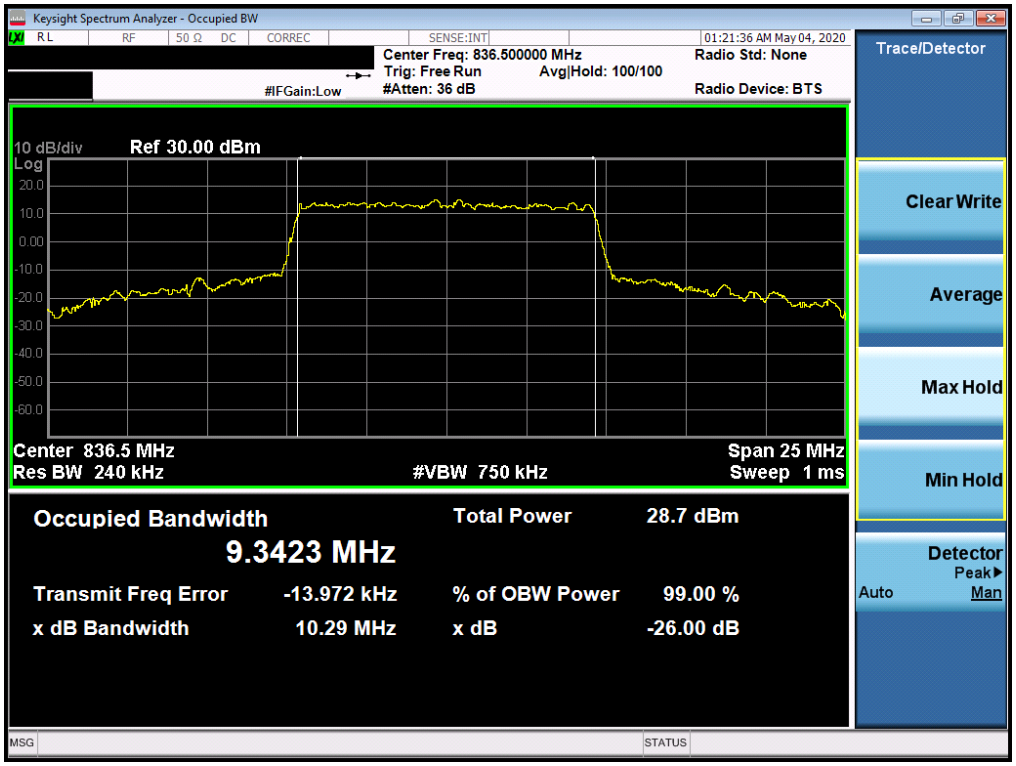
Plot 7-65. Occupied Bandwidth Plot (NR Band n5 - 10MHz DFT-s-OFDM π/2 BPSK - Full RB Configuration)



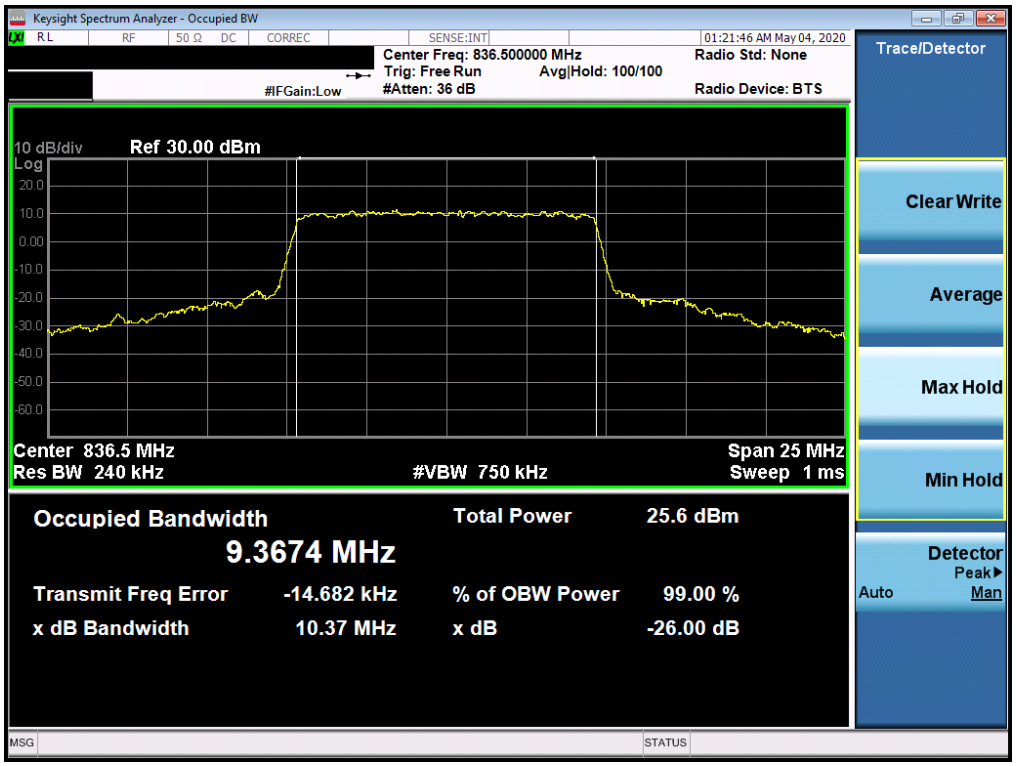
Plot 7-66. Occupied Bandwidth Plot (NR Band n5 - 10MHz CP-OFDM QPSK - Full RB Configuration)



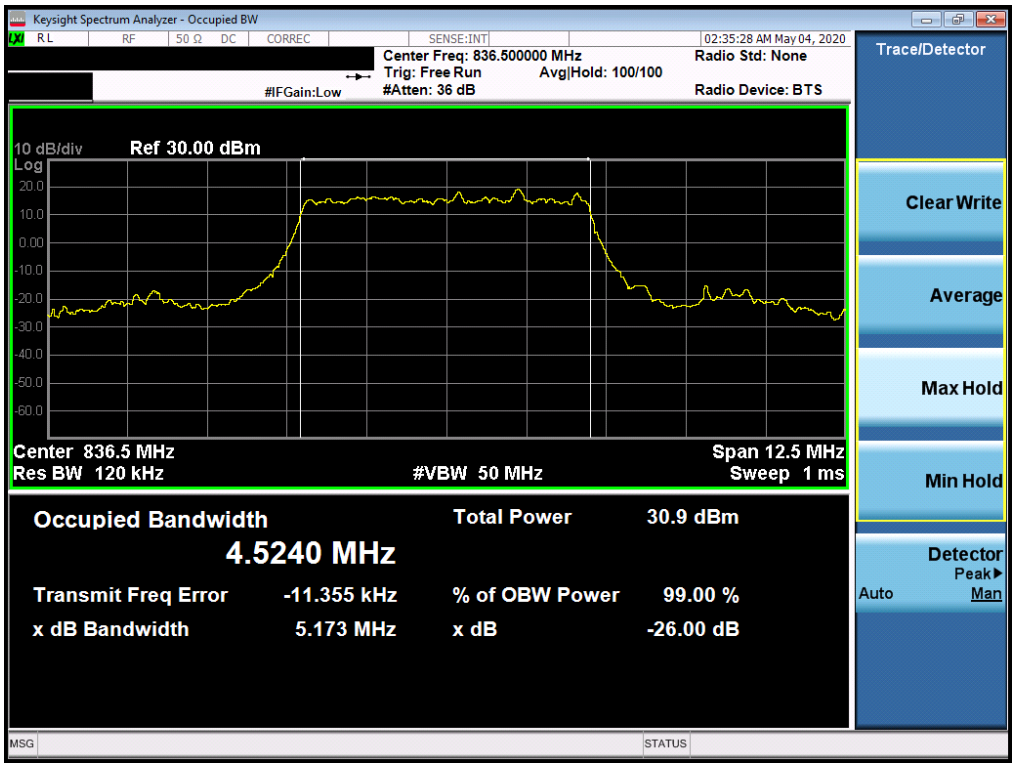
Plot 7-67. Occupied Bandwidth Plot (NR Band n5 – 10MHz CP-OFDM 16-QAM – Full RB Configuration)



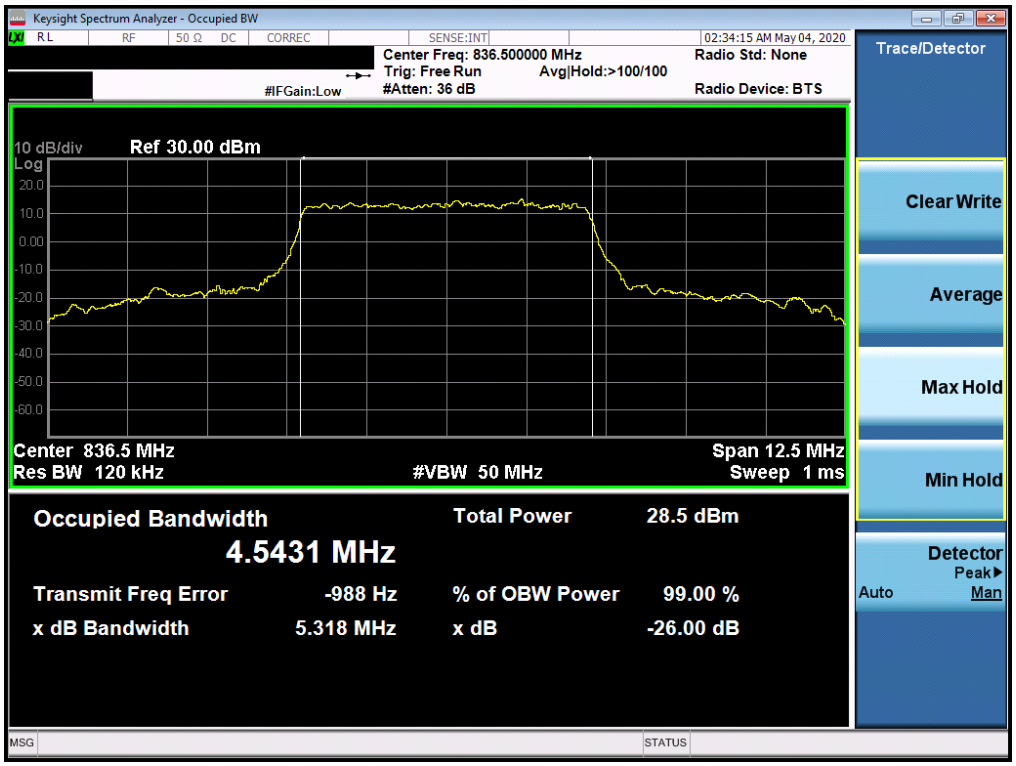
Plot 7-68. Occupied Bandwidth Plot (NR Band n5 - 10MHz CP-OFDM 64-QAM - Full RB Configuration)



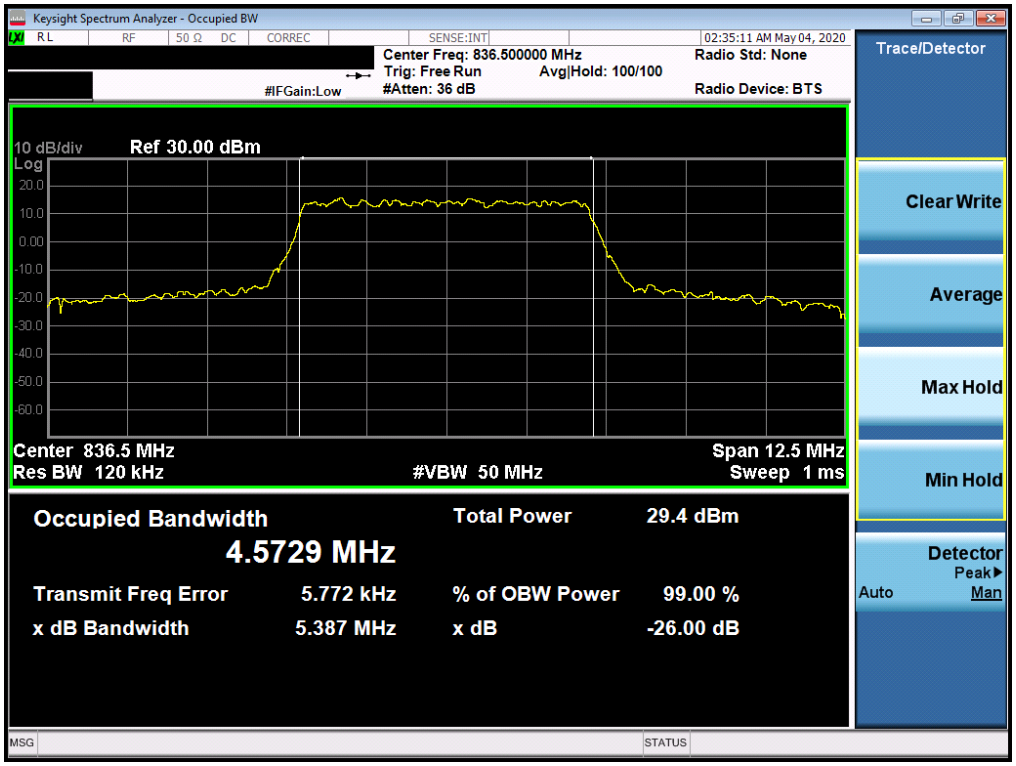
Plot 7-69. Occupied Bandwidth Plot (NR Band n5 - 10MHz CP-OFDM 256-QAM - Full RB Configuration)



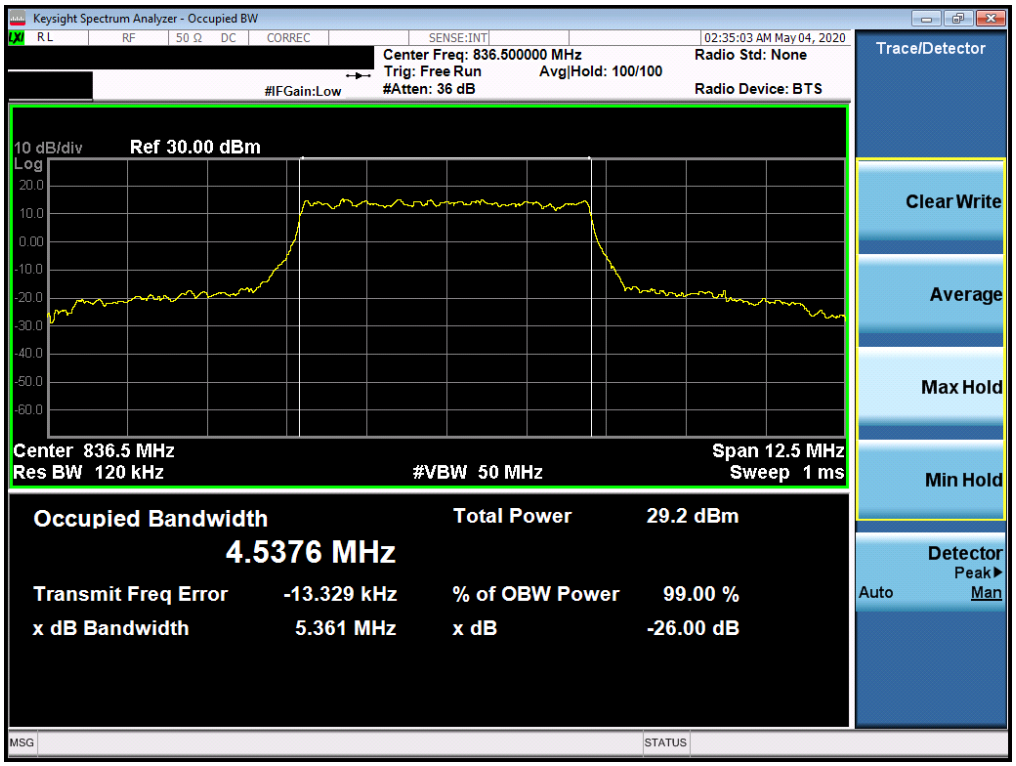
Plot 7-70. Occupied Bandwidth Plot (NR Band n5 - 5MHz DFT-s-OFDM π/2 BPSK - Full RB Configuration)



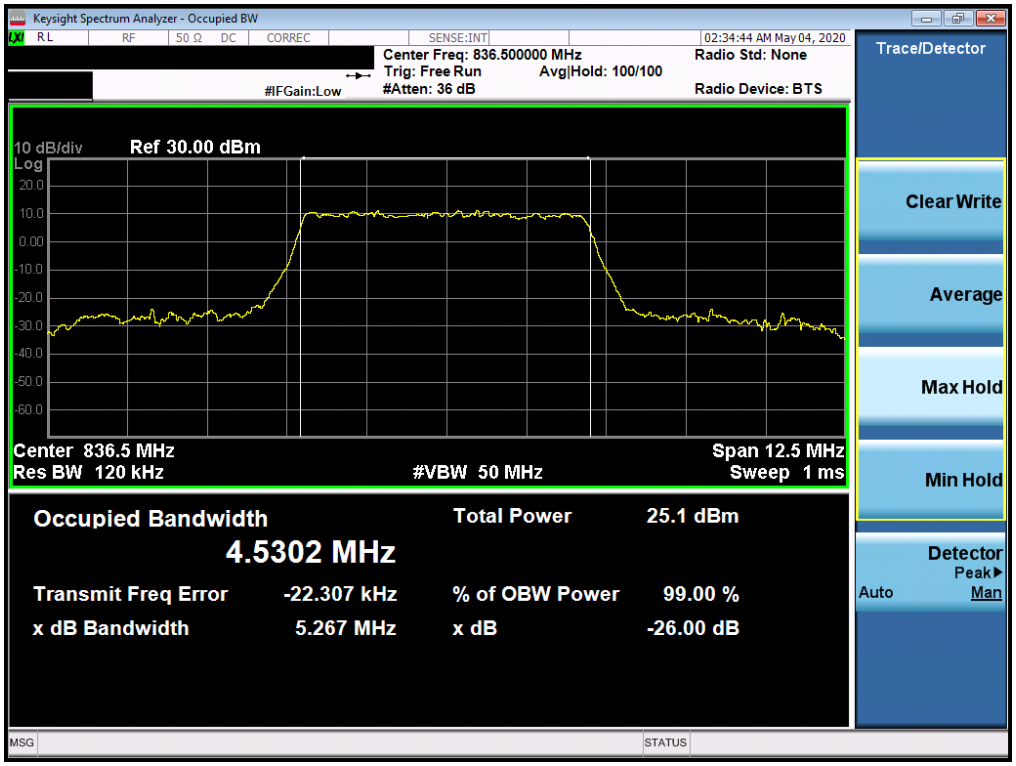
Plot 7-71. Occupied Bandwidth Plot (NR Band n5 - 5MHz CP-OFDM QPSK - Full RB Configuration)



Plot 7-72. Occupied Bandwidth Plot (NR Band n5 – 5MHz CP-OFDM 16-QAM – Full RB Configuration)

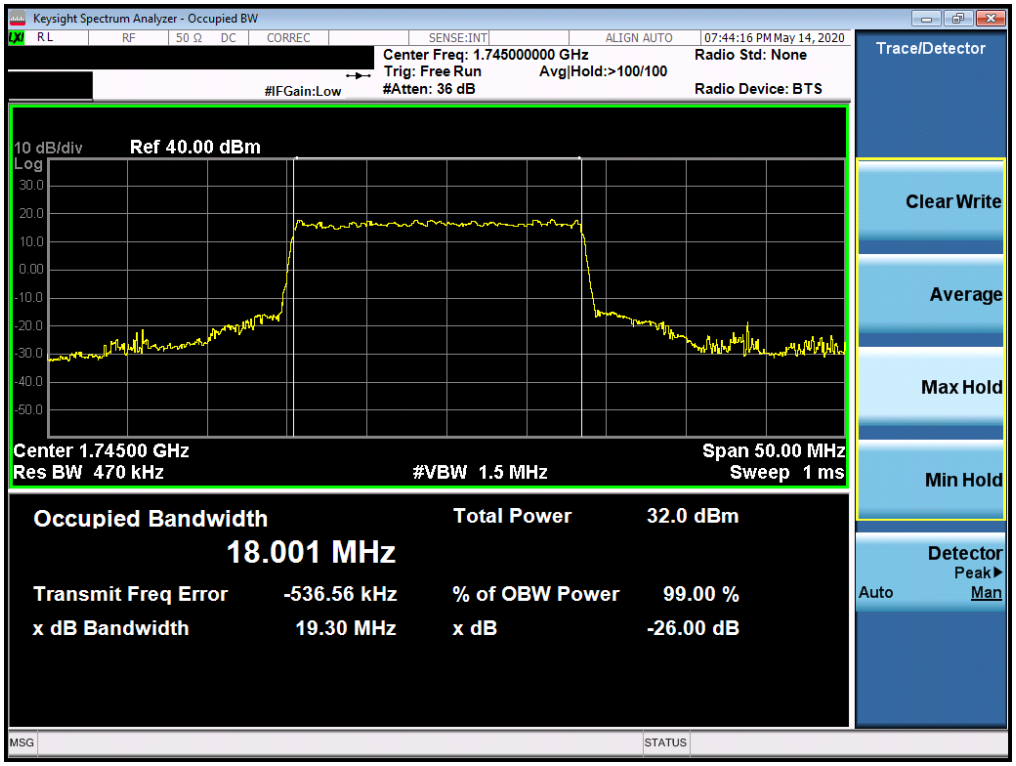


Plot 7-73. Occupied Bandwidth Plot (NR Band n5 - 5MHz CP-OFDM 64-QAM - Full RB Configuration)

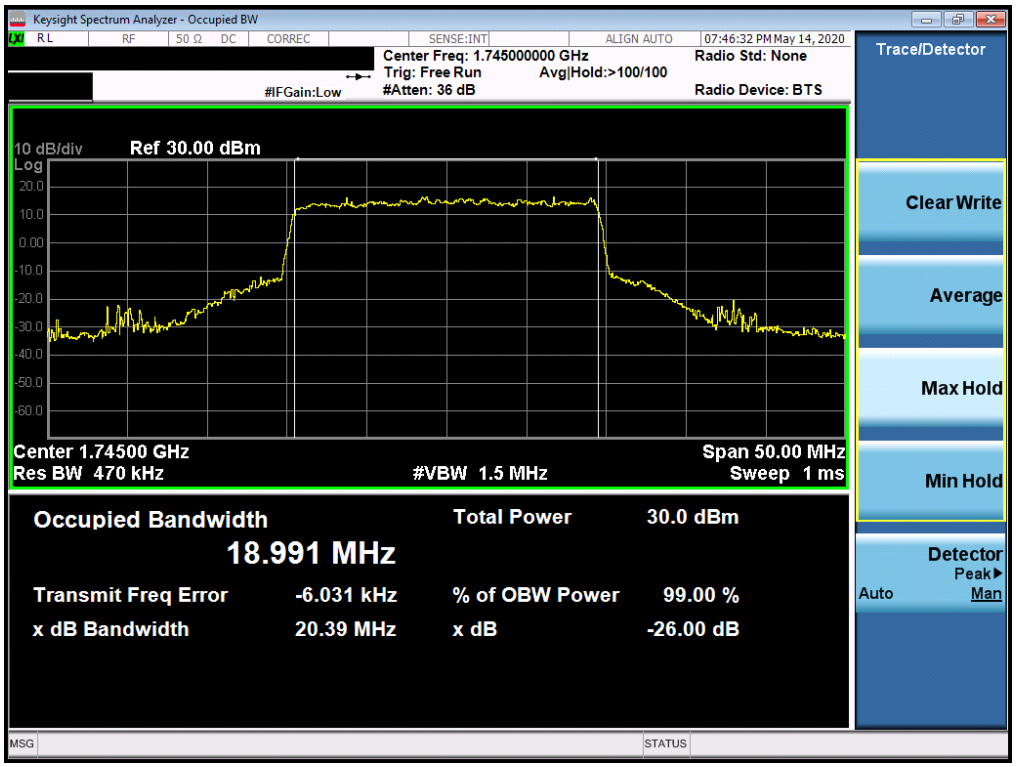


Plot 7-74. Occupied Bandwidth Plot (NR Band n5 - 5MHz CP-OFDM 256-QAM - Full RB Configuration)

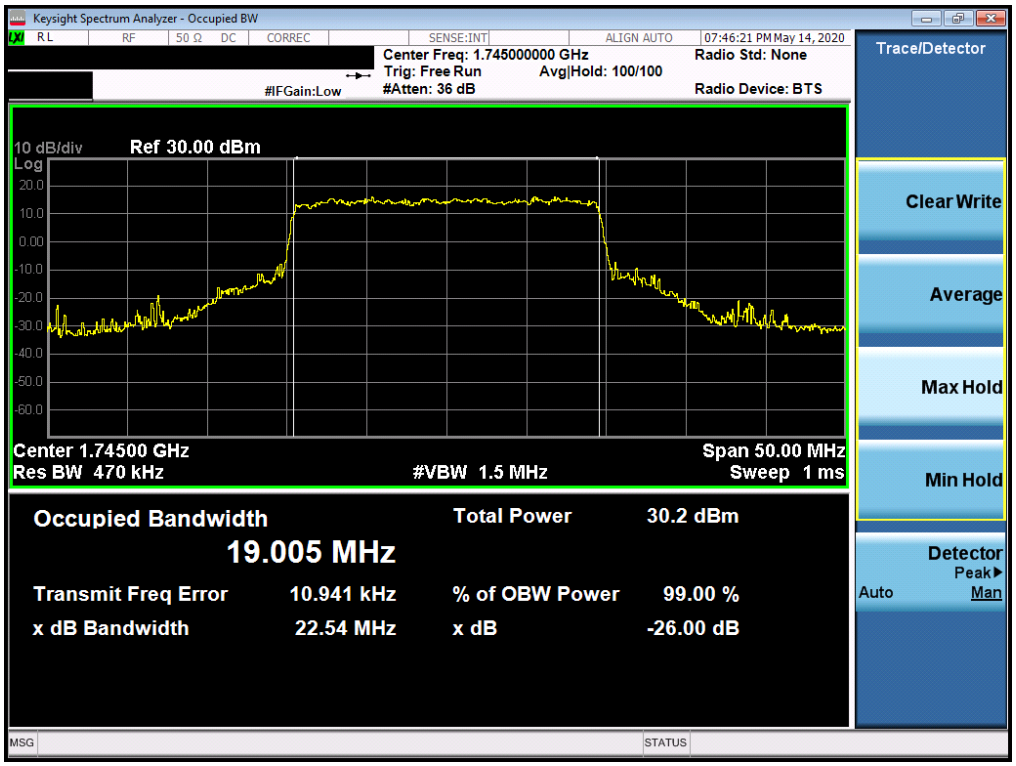
NR Band n66



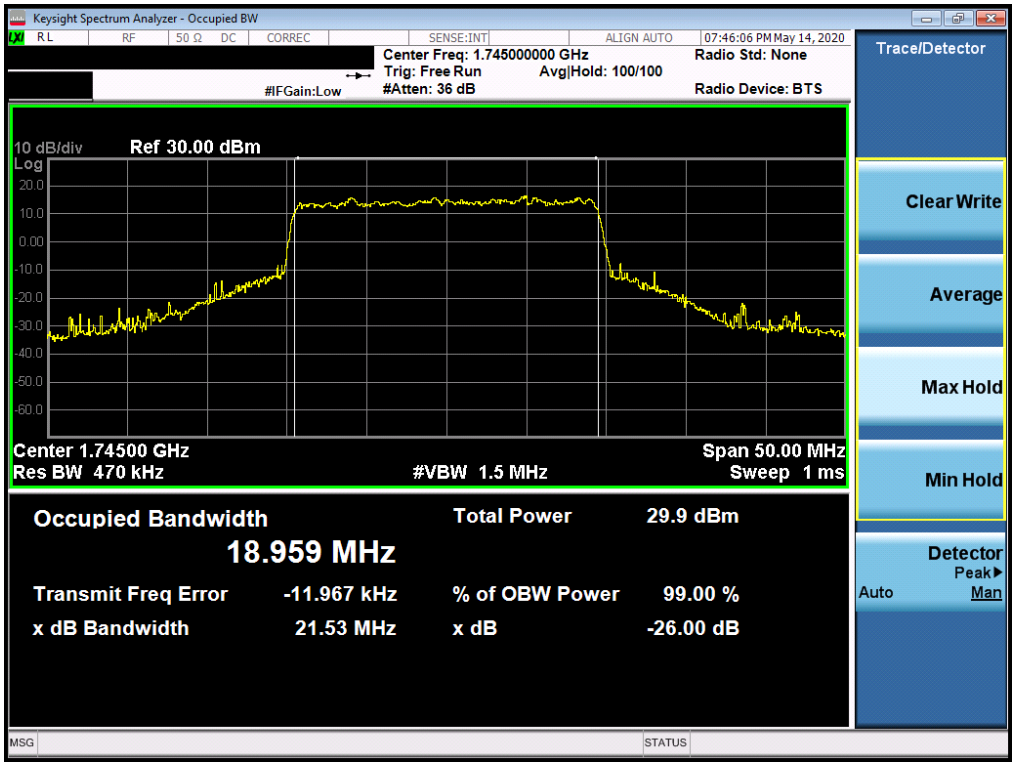
Plot 7-75. Occupied Bandwidth Plot (NR Band n66 - 20MHz DFT-s-OFDM π/2 BPSK - Full RB Configuration)



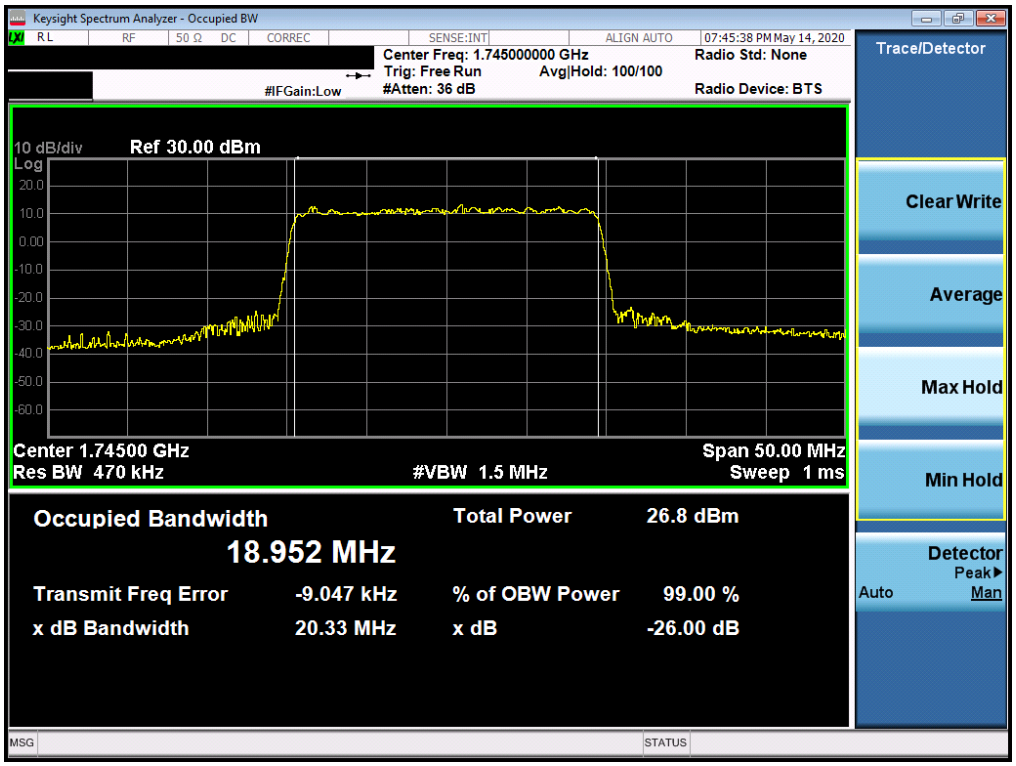
Plot 7-76. Occupied Bandwidth Plot (NR Band n66 - 20MHz CP-OFDM QPSK - Full RB Configuration)



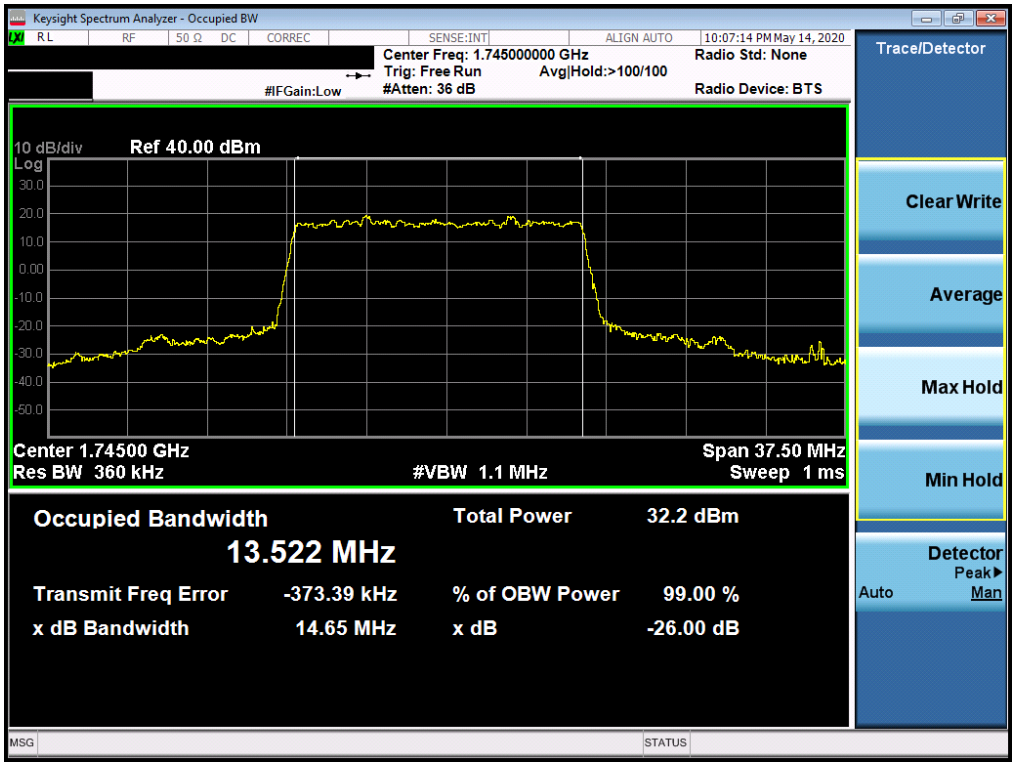
Plot 7-77. Occupied Bandwidth Plot (NR Band n66 - 20MHz CP-OFDM 16-QAM - Full RB Configuration)



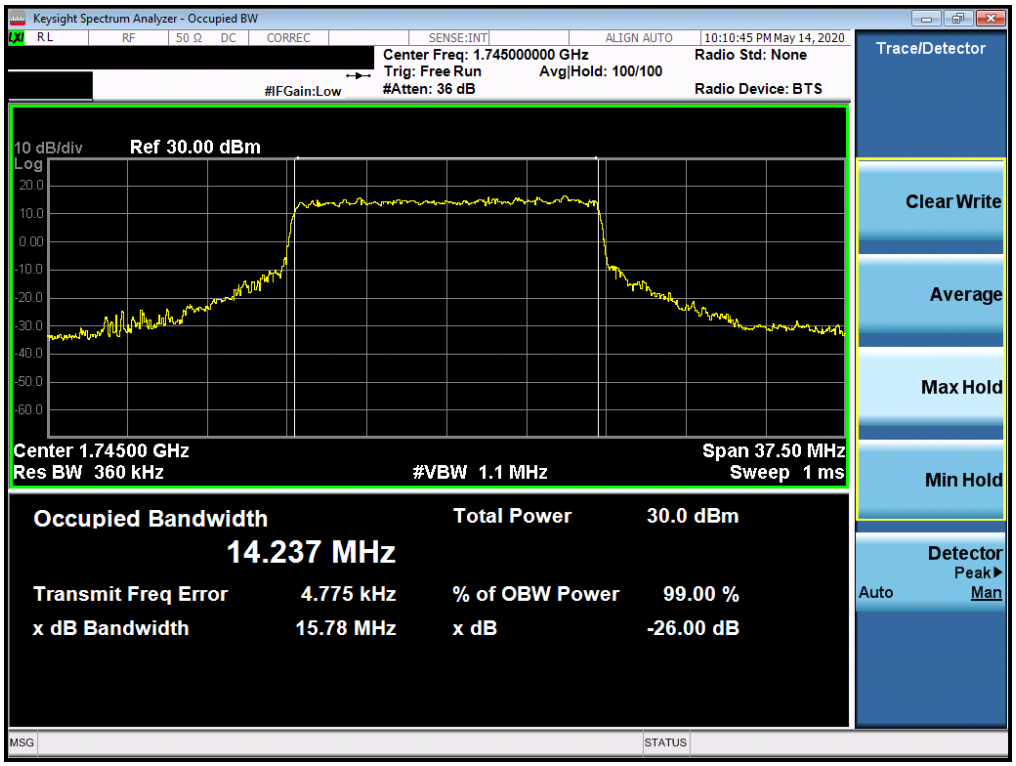
Plot 7-78. Occupied Bandwidth Plot (NR Band n66 - 20MHz CP-OFDM 64-QAM - Full RB Configuration)



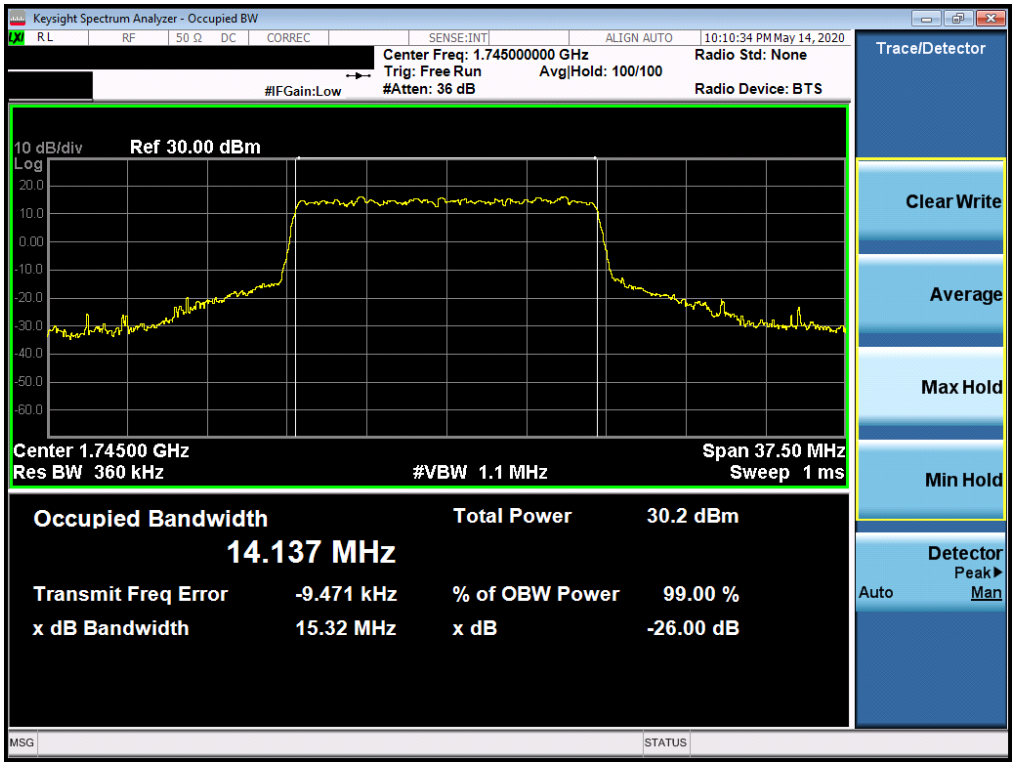
Plot 7-79. Occupied Bandwidth Plot (NR Band n66 - 20MHz CP-OFDM 256-QAM - Full RB Configuration)



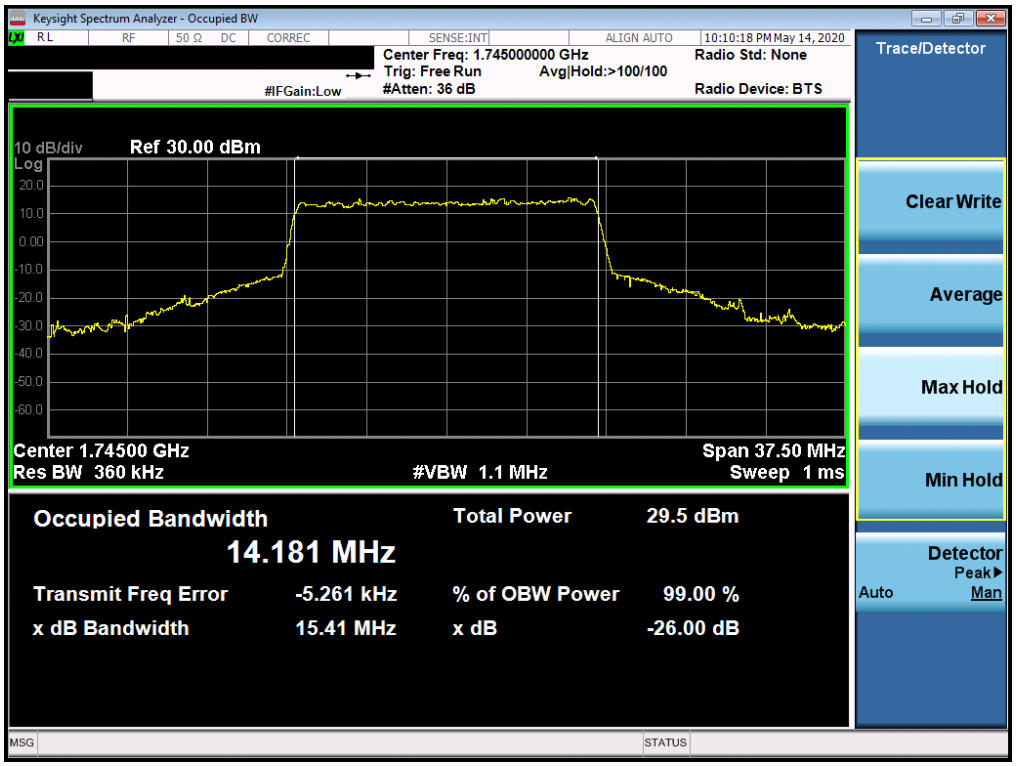
Plot 7-80. Occupied Bandwidth Plot (NR Band n66 - 15MHz DFT-s-OFDM π/2 BPSK - Full RB Configuration)



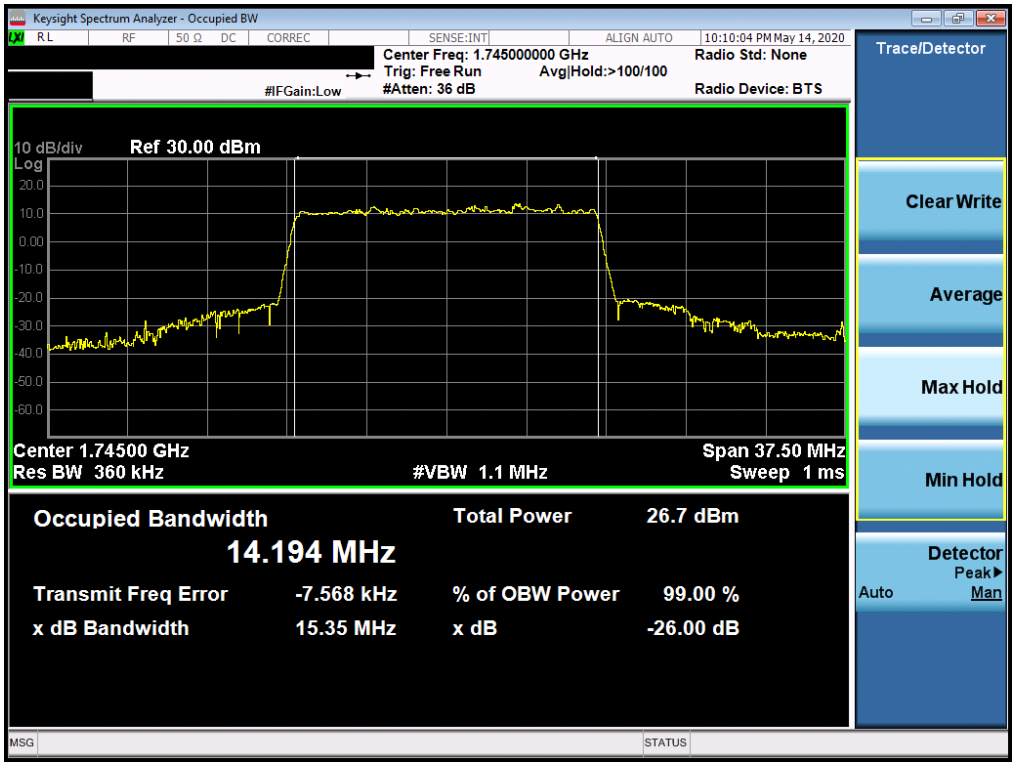
Plot 7-81. Occupied Bandwidth Plot (NR Band n66 - 15MHz CP-OFDM QPSK - Full RB Configuration)



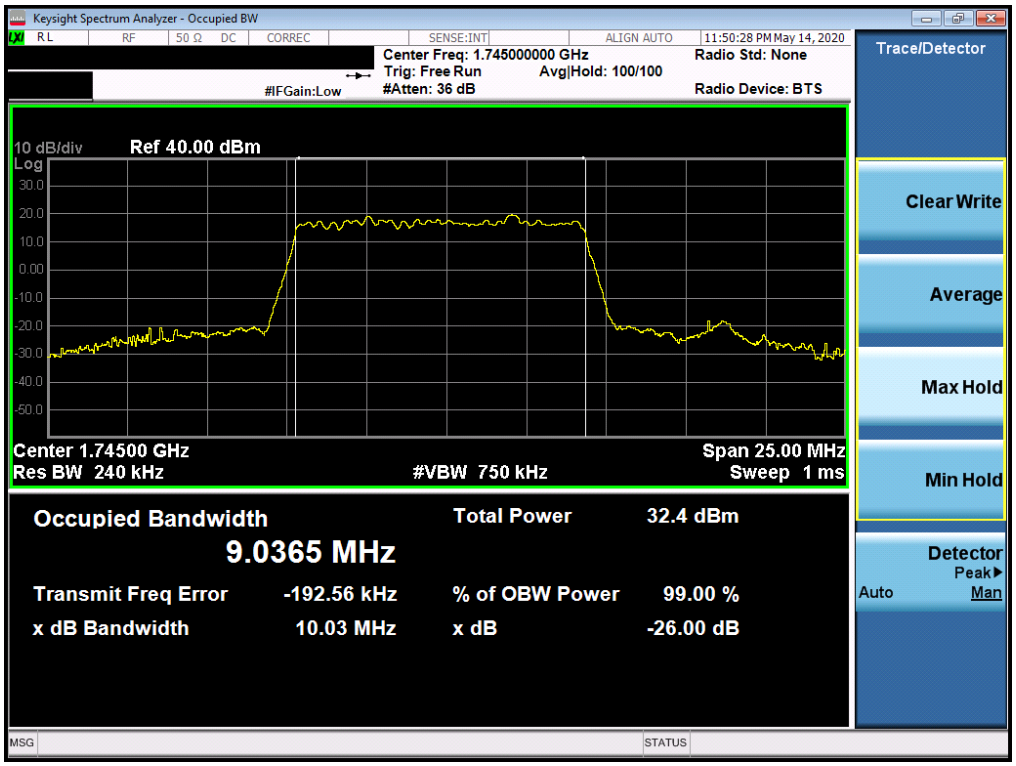
Plot 7-82. Occupied Bandwidth Plot (NR Band n66 - 15MHz CP-OFDM 16-QAM - Full RB Configuration)



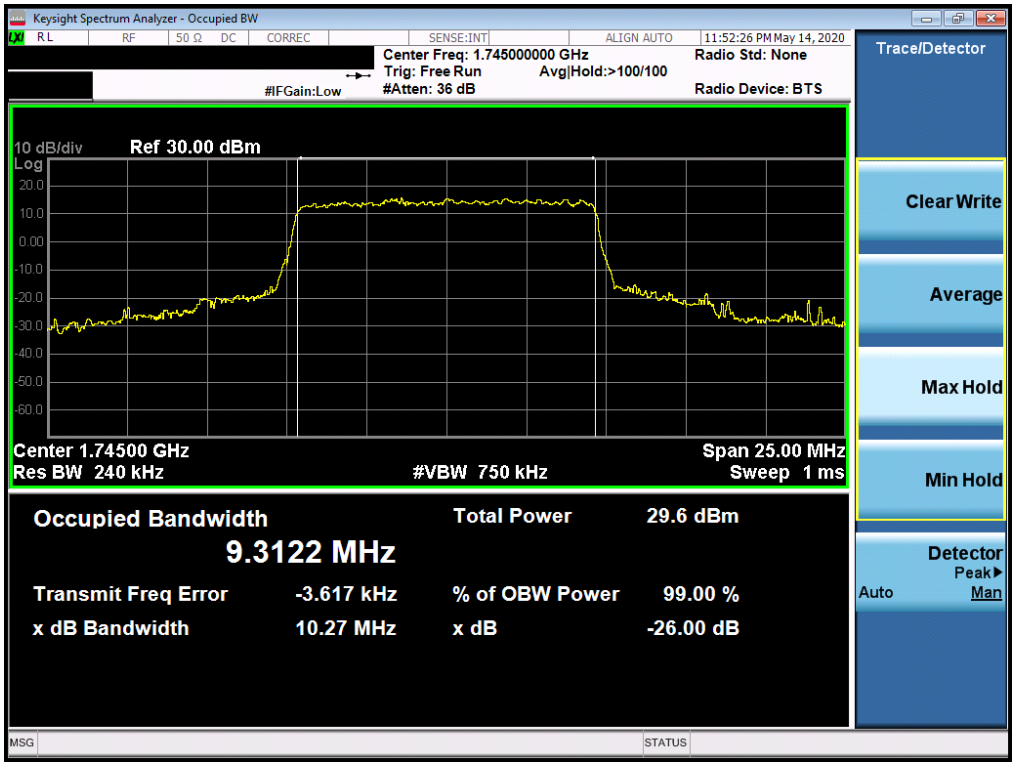
Plot 7-83. Occupied Bandwidth Plot (NR Band n66 - 15MHz CP-OFDM 64-QAM - Full RB Configuration)



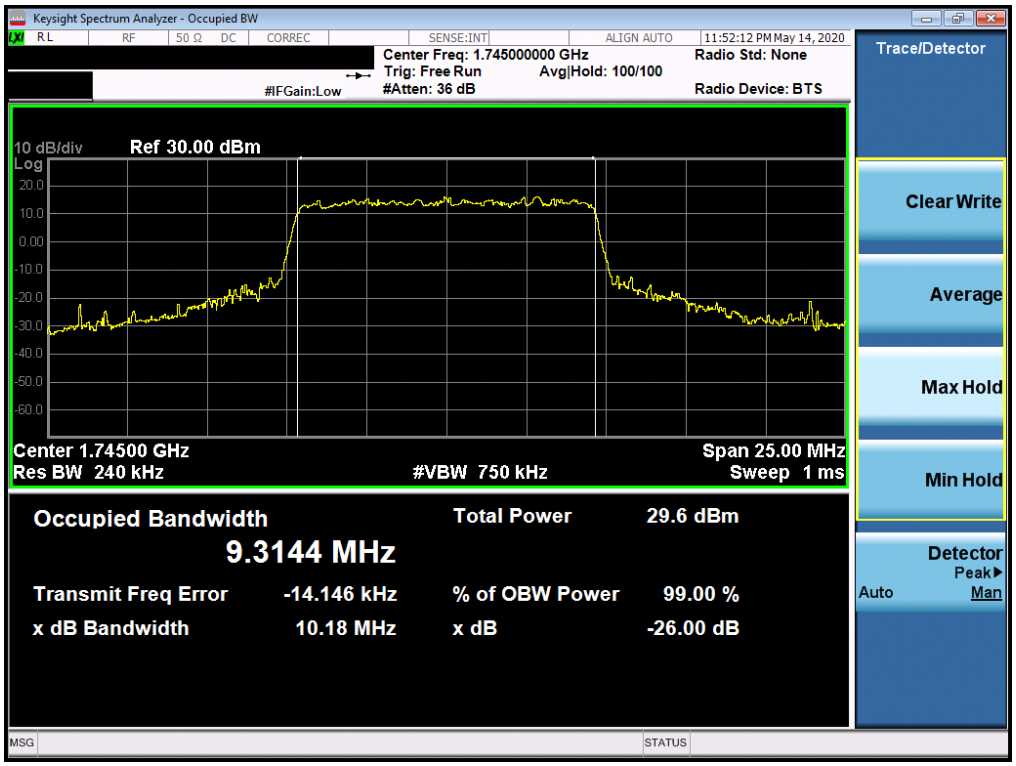
Plot 7-84. Occupied Bandwidth Plot (NR Band n66 - 15MHz CP-OFDM 256-QAM - Full RB Configuration)



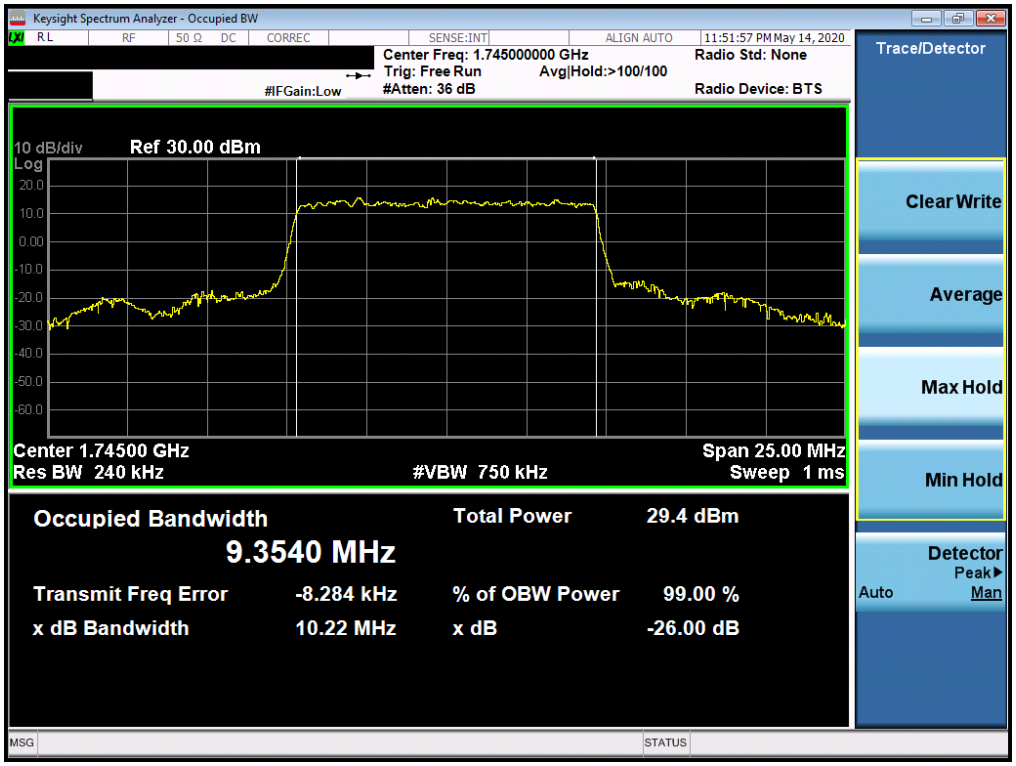
Plot 7-85. Occupied Bandwidth Plot (NR Band n66 - 10MHz DFT-s-OFDM π/2 BPSK - Full RB Configuration)



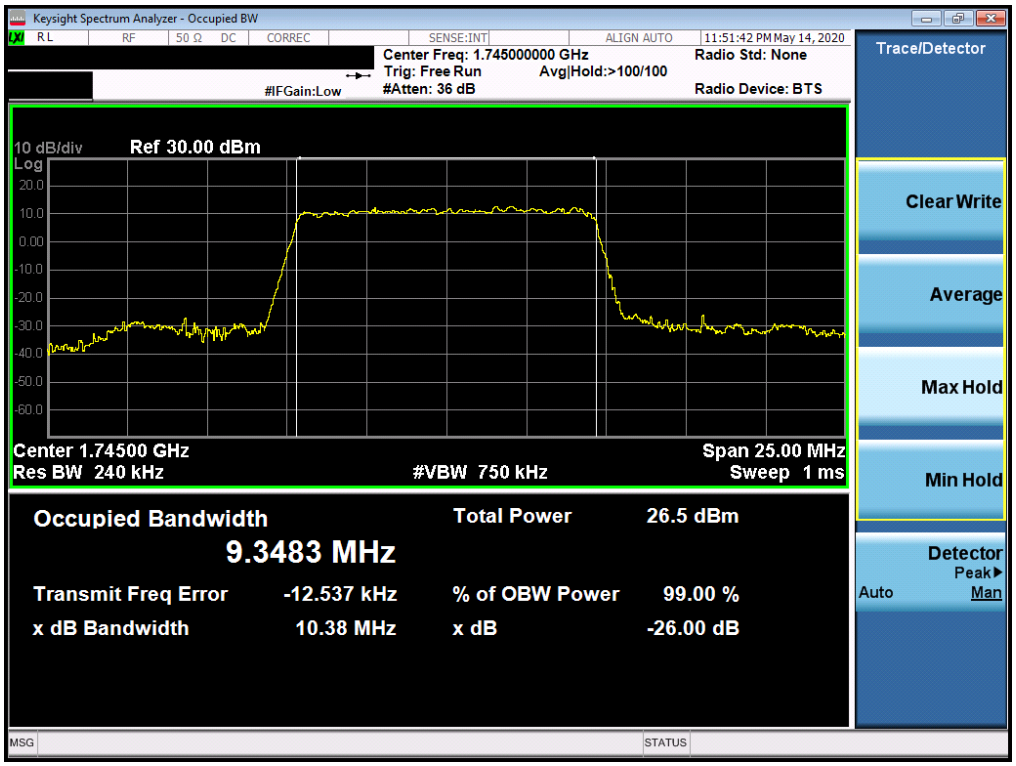
Plot 7-86. Occupied Bandwidth Plot (NR Band n66 - 10MHz CP-OFDM QPSK - Full RB Configuration)



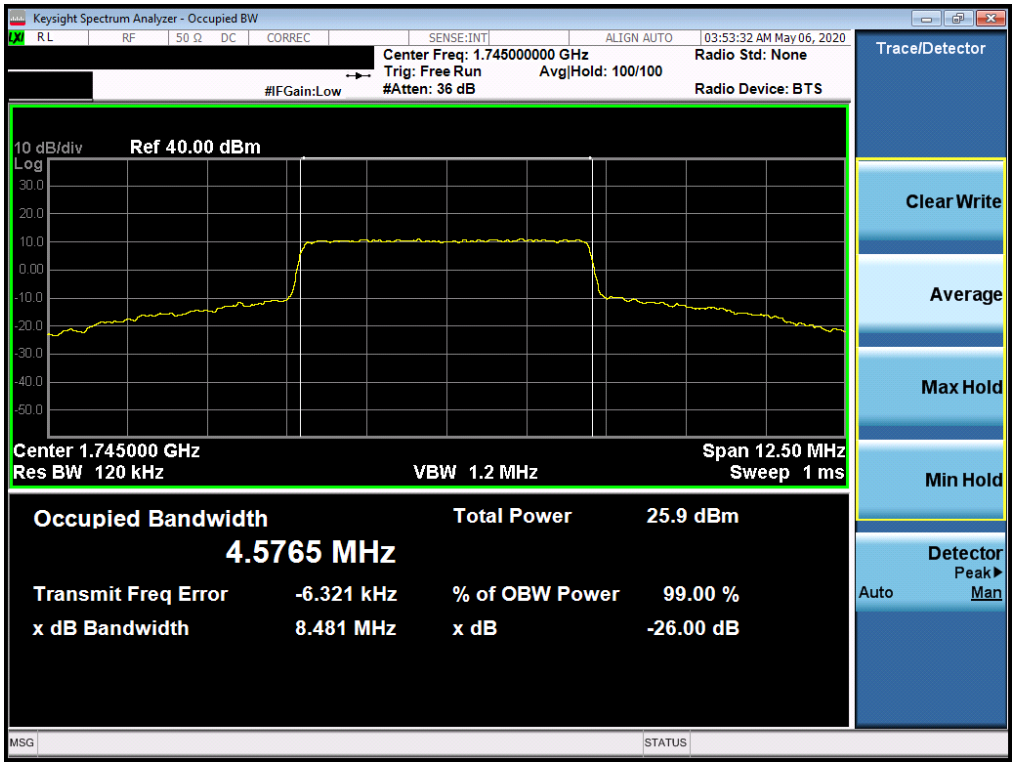
Plot 7-87. Occupied Bandwidth Plot (NR Band n66 - 10MHz CP-OFDM 16-QAM - Full RB Configuration)



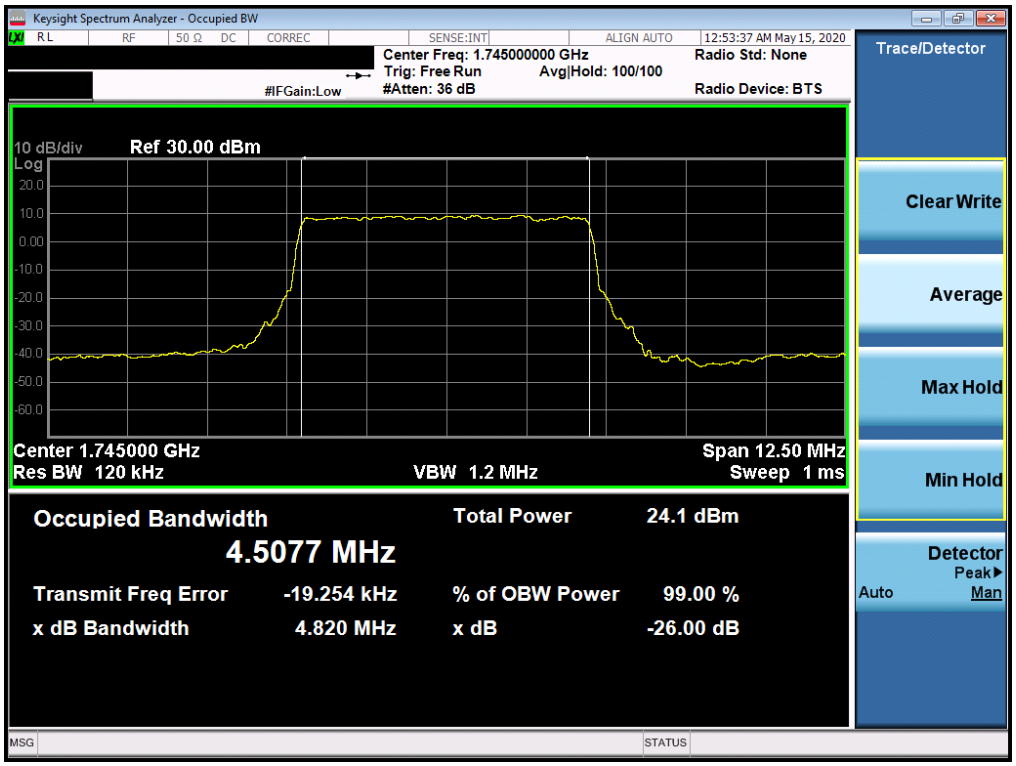
Plot 7-88. Occupied Bandwidth Plot (NR Band n66 - 10MHz CP-OFDM 64-QAM - Full RB Configuration)



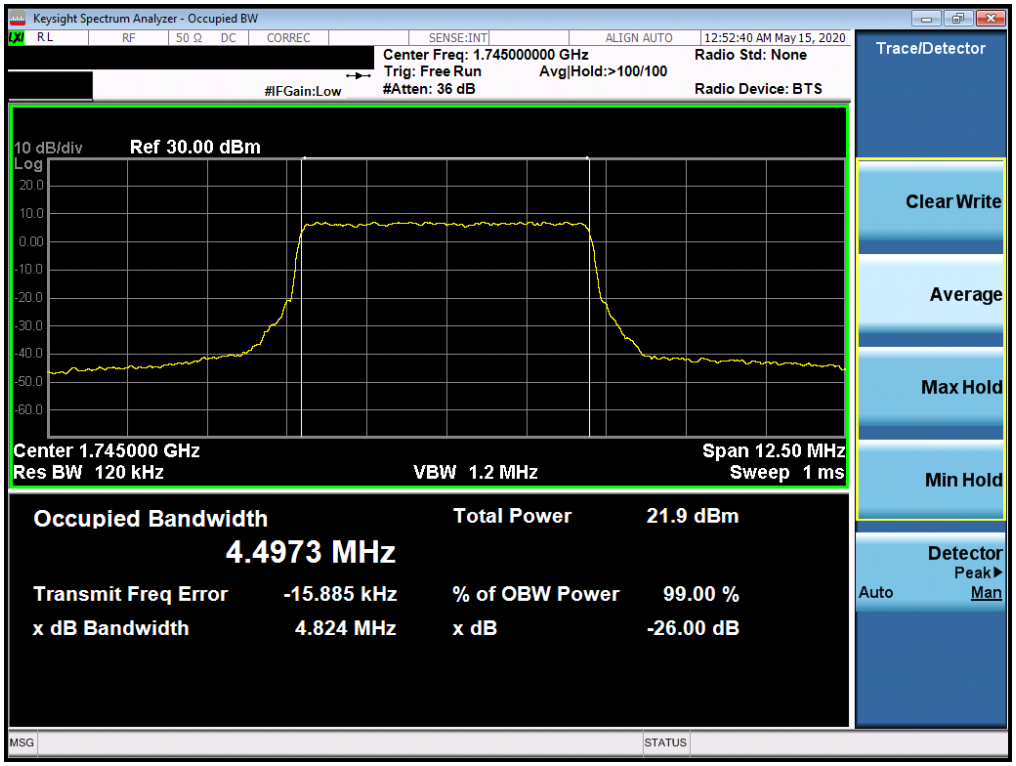
Plot 7-89. Occupied Bandwidth Plot (NR Band n66 - 10MHz CP-OFDM 256-QAM - Full RB Configuration)



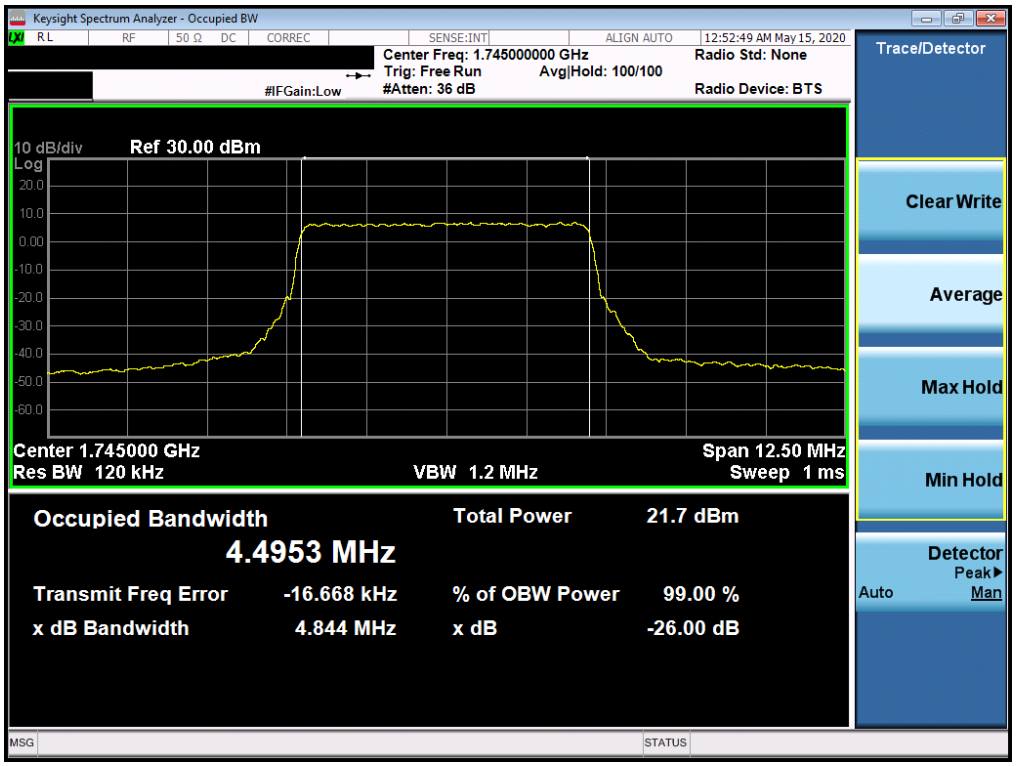
Plot 7-90. Occupied Bandwidth Plot (NR Band n66 - 5MHz DFT-s-OFDM π/2 BPSK - Full RB Configuration)



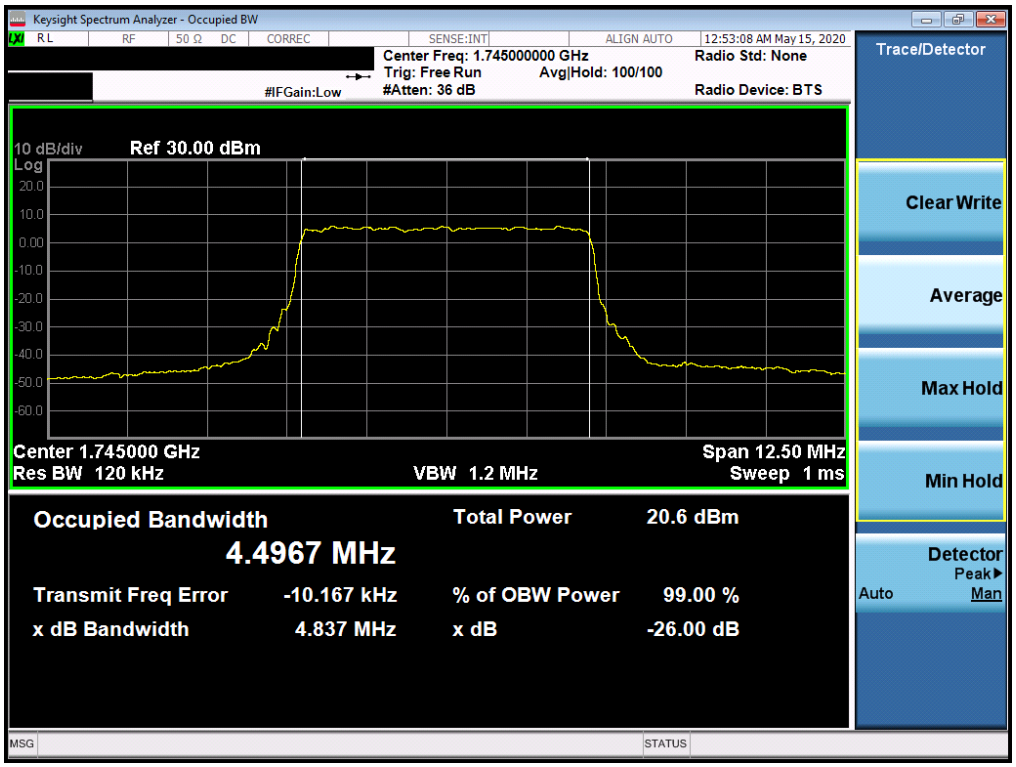
Plot 7-91. Occupied Bandwidth Plot (NR Band n66 - 5MHz CP-OFDM QPSK - Full RB Configuration)



Plot 7-92. Occupied Bandwidth Plot (NR Band n66 - 5MHz CP-OFDM 16-QAM - Full RB Configuration)

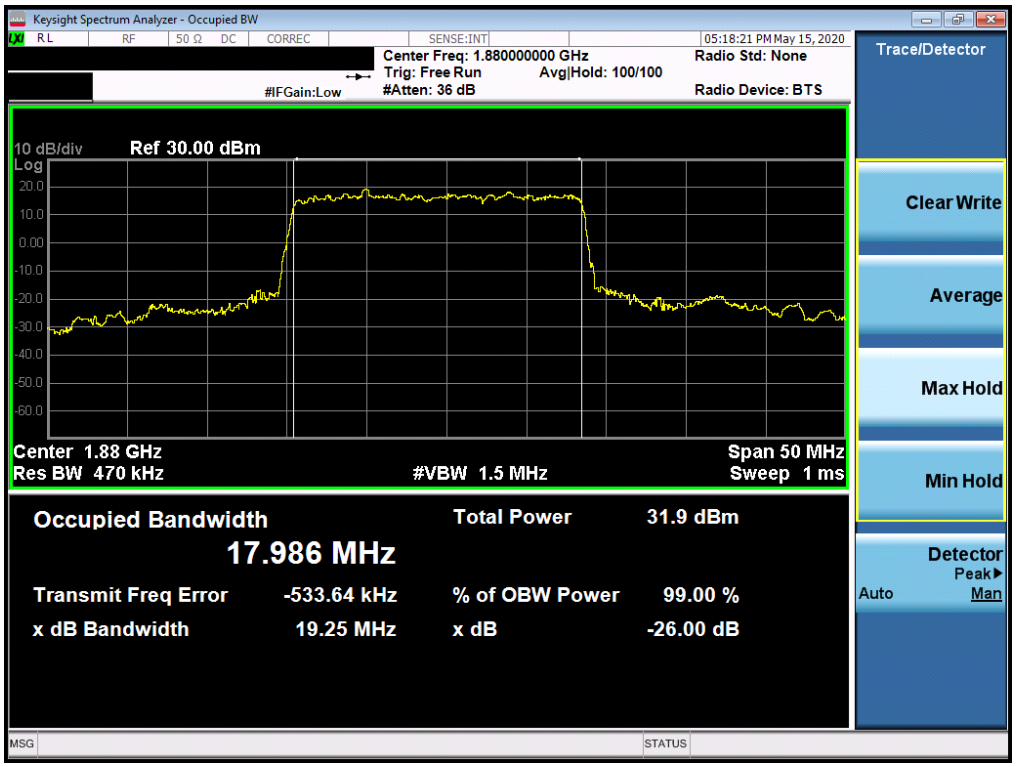


Plot 7-93. Occupied Bandwidth Plot (NR Band n66 - 5MHz CP-OFDM 64-QAM - Full RB Configuration)

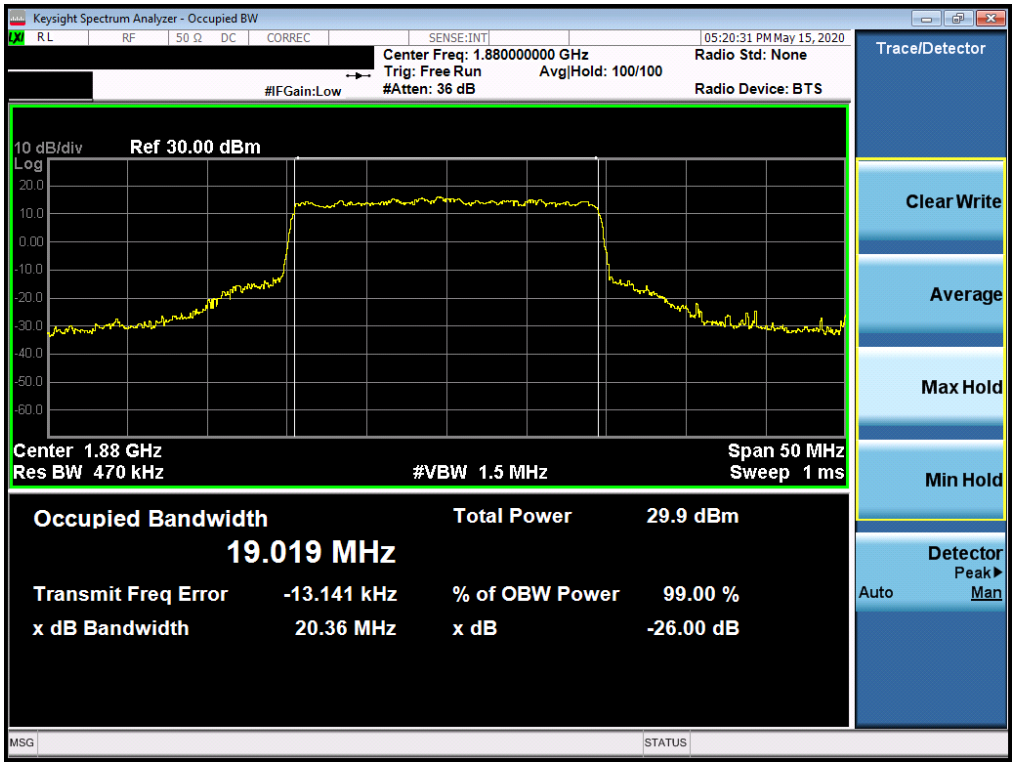


Plot 7-94. Occupied Bandwidth Plot (NR Band n66 - 5MHz CP-OFDM 256-QAM - Full RB Configuration)

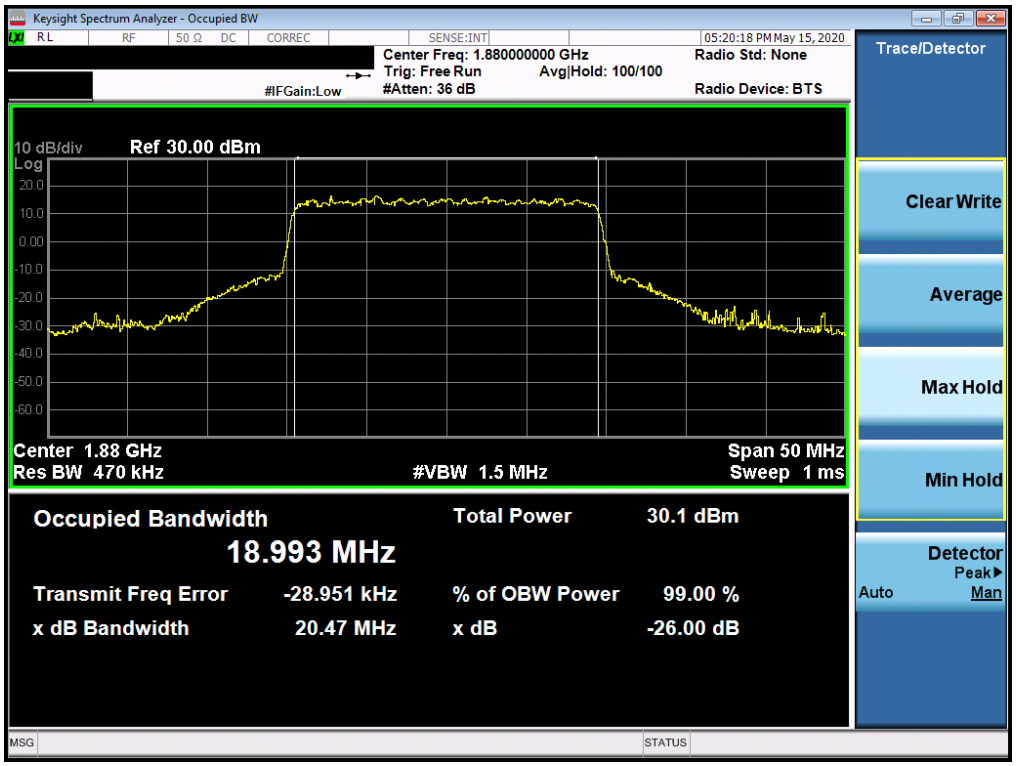
NR Band n2



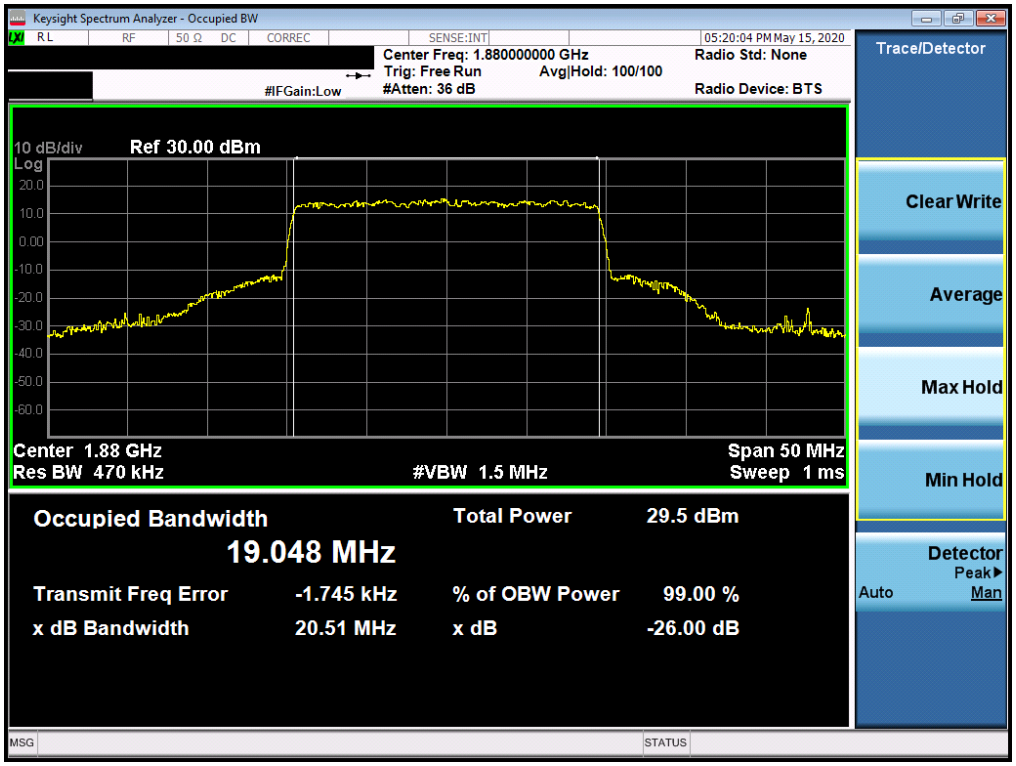
Plot 7-95. Occupied Bandwidth Plot (NR Band n2 - 20MHz DFT-s-OFDM π/2 BPSK - Full RB Configuration)



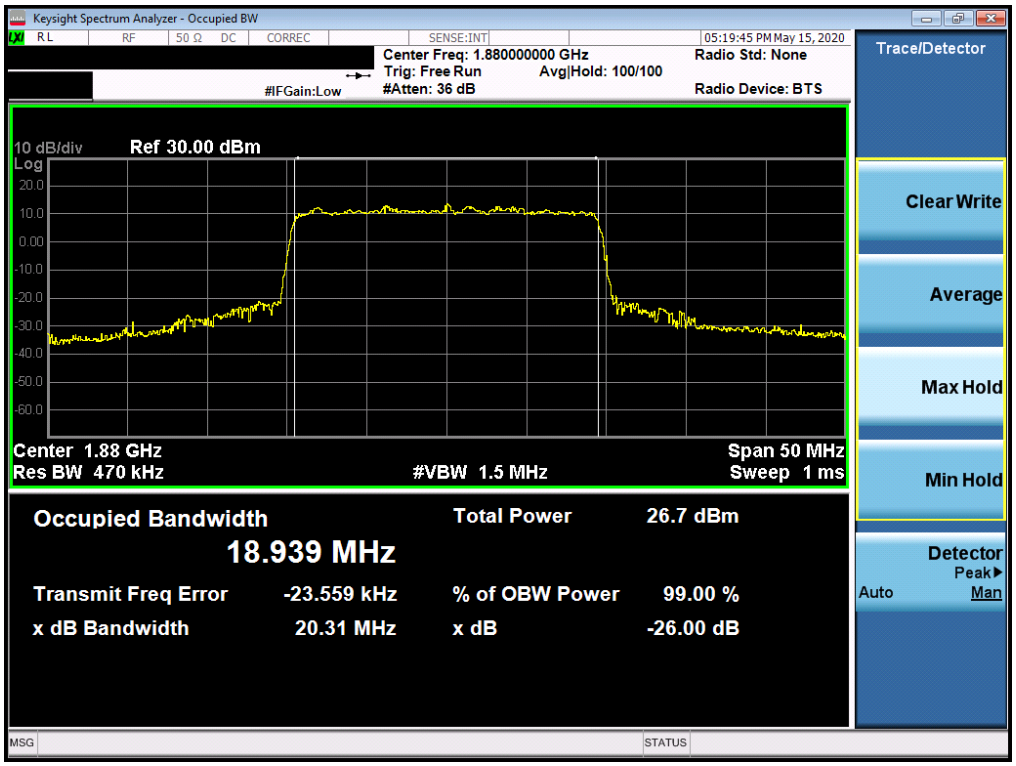
Plot 7-96. Occupied Bandwidth Plot (NR Band n2 - 20MHz CP-OFDM QPSK - Full RB Configuration)



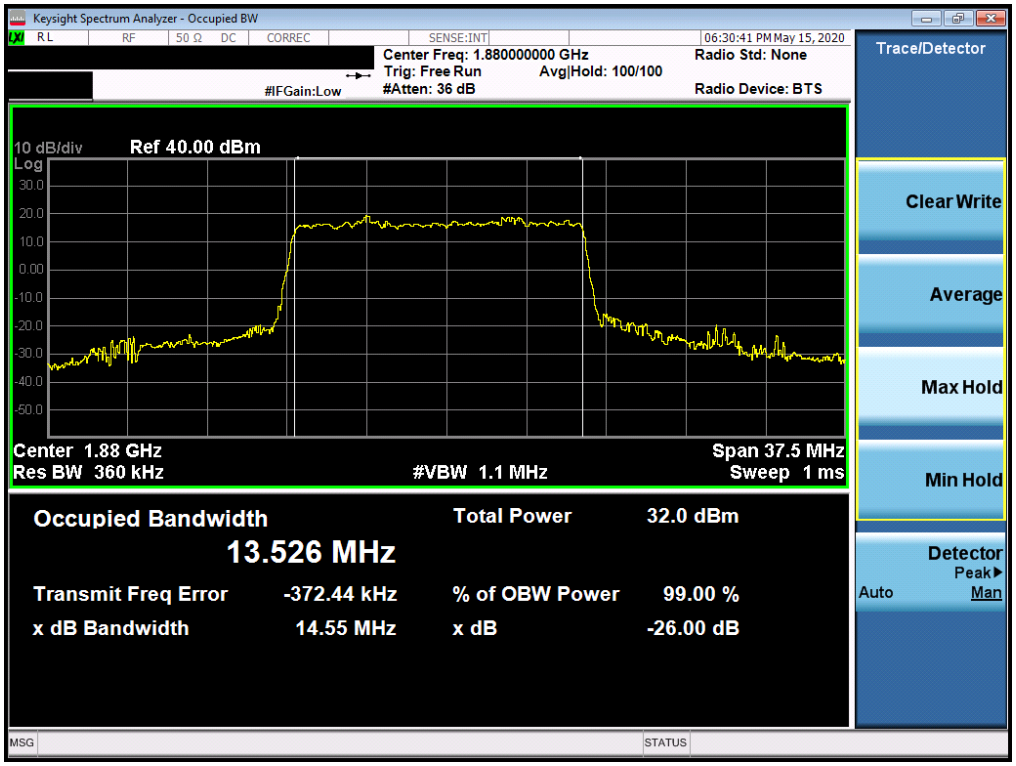
Plot 7-97. Occupied Bandwidth Plot (NR Band n2 - 20MHz CP-OFDM 16-QAM - Full RB Configuration)



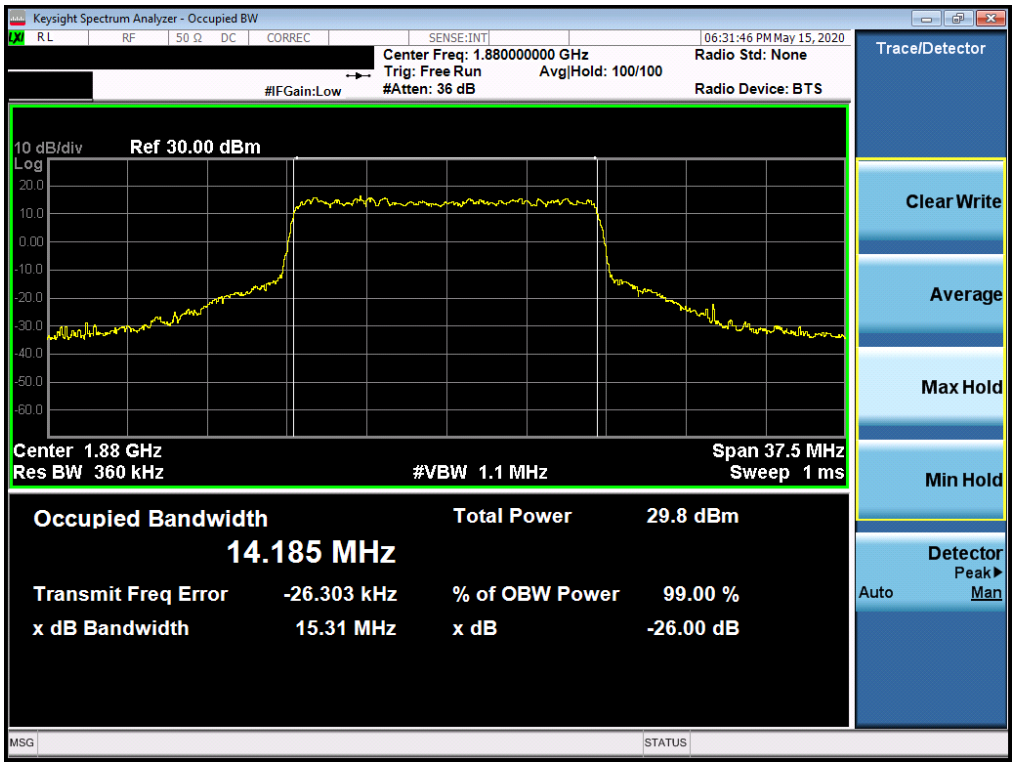
Plot 7-98. Occupied Bandwidth Plot (NR Band n2 - 20MHz CP-OFDM 64-QAM - Full RB Configuration)



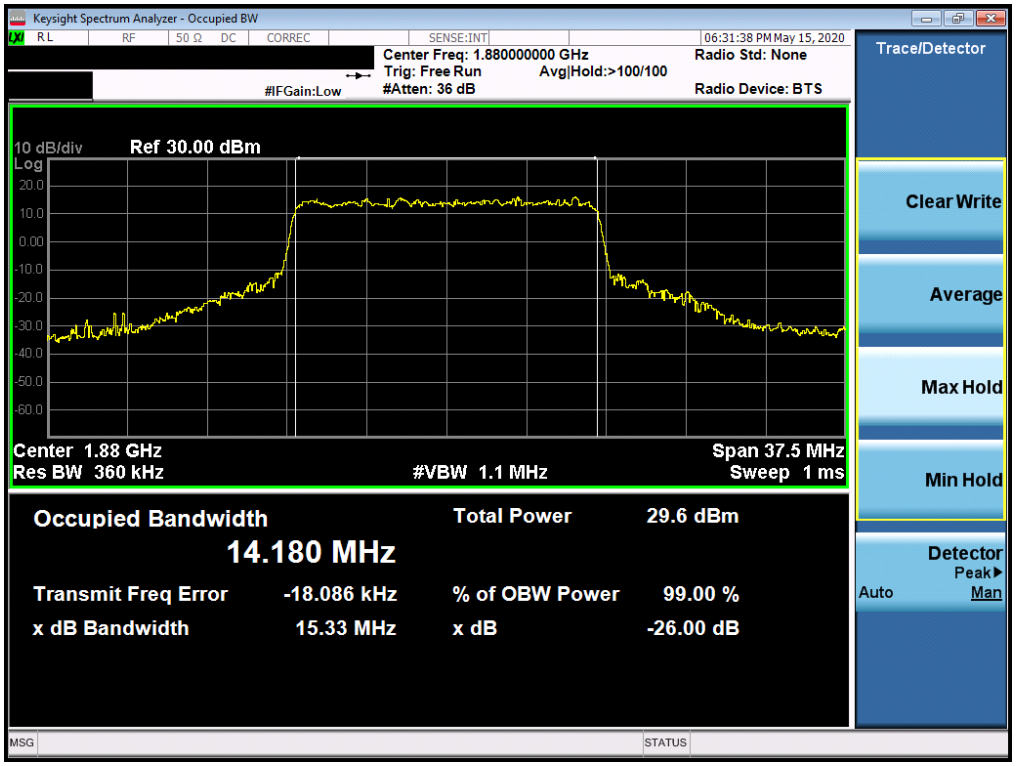
Plot 7-99. Occupied Bandwidth Plot (NR Band n2 - 20MHz CP-OFDM 256-QAM - Full RB Configuration)



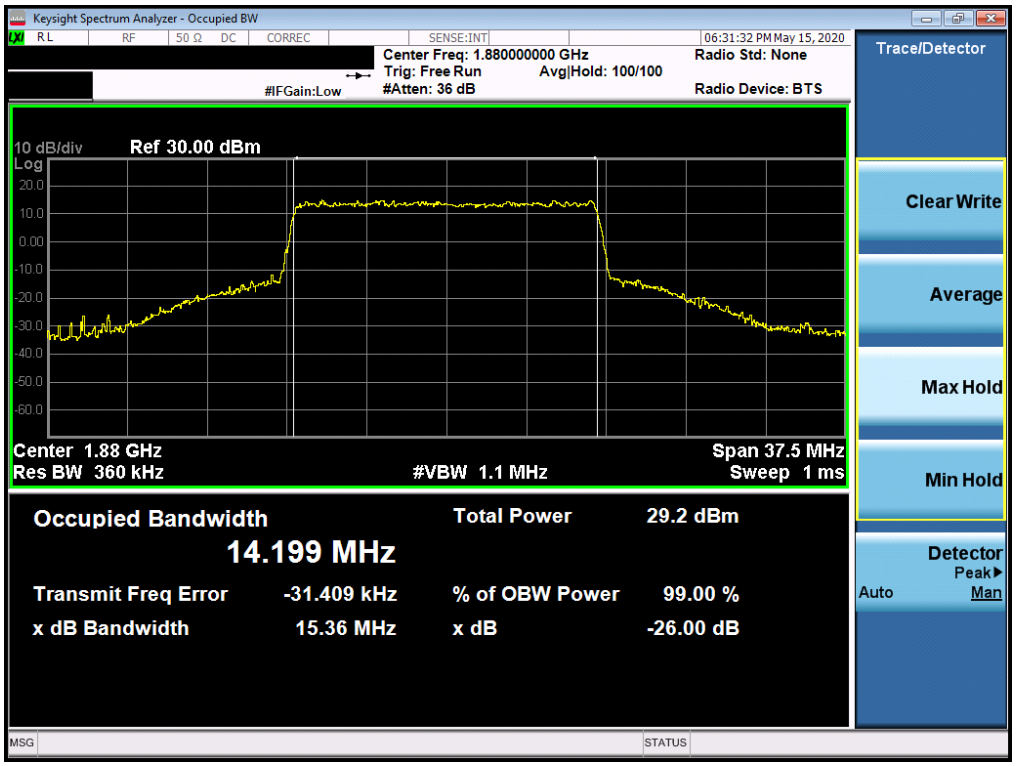
Plot 7-100. Occupied Bandwidth Plot (NR Band n2 - 15MHz DFT-s-OFDM π/2 BPSK - Full RB Configuration)



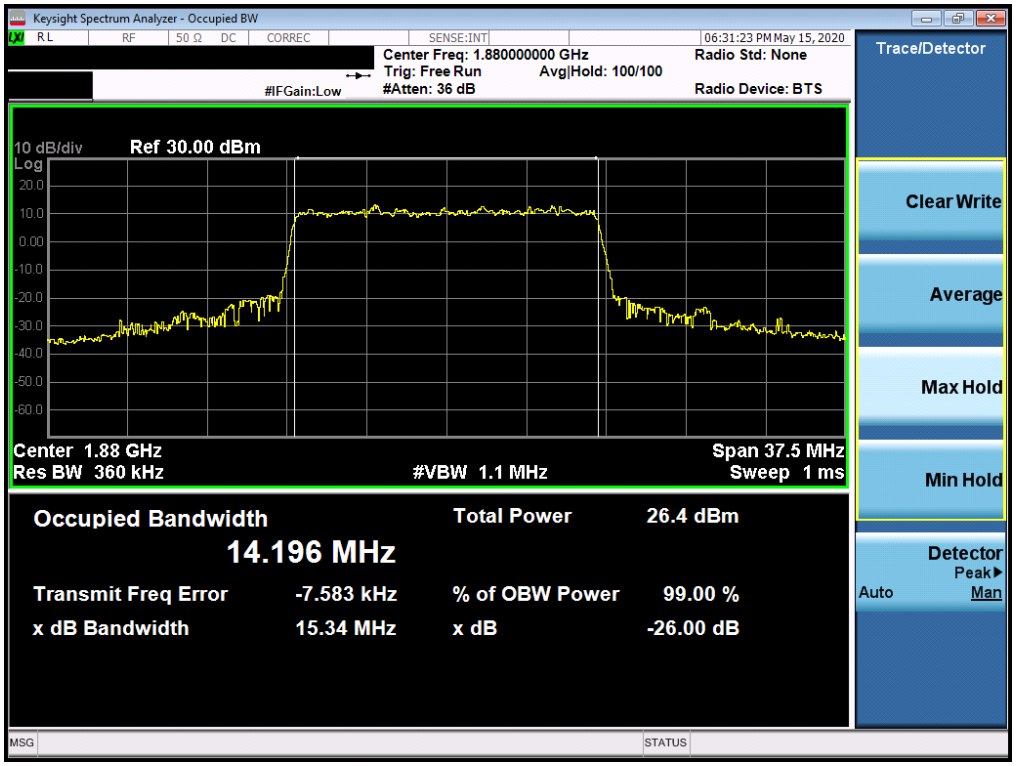
Plot 7-101. Occupied Bandwidth Plot (NR Band n2 - 15MHz CP-OFDM QPSK - Full RB Configuration)



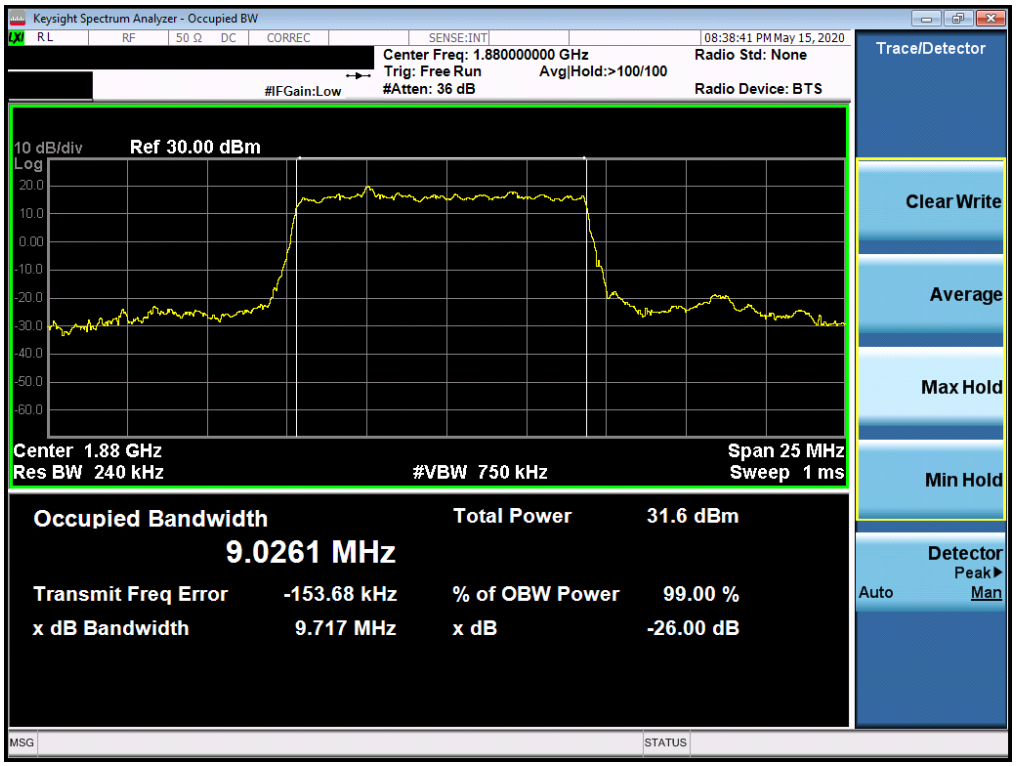
Plot 7-102. Occupied Bandwidth Plot (NR Band n2 - 15MHz CP-OFDM 16-QAM - Full RB Configuration)



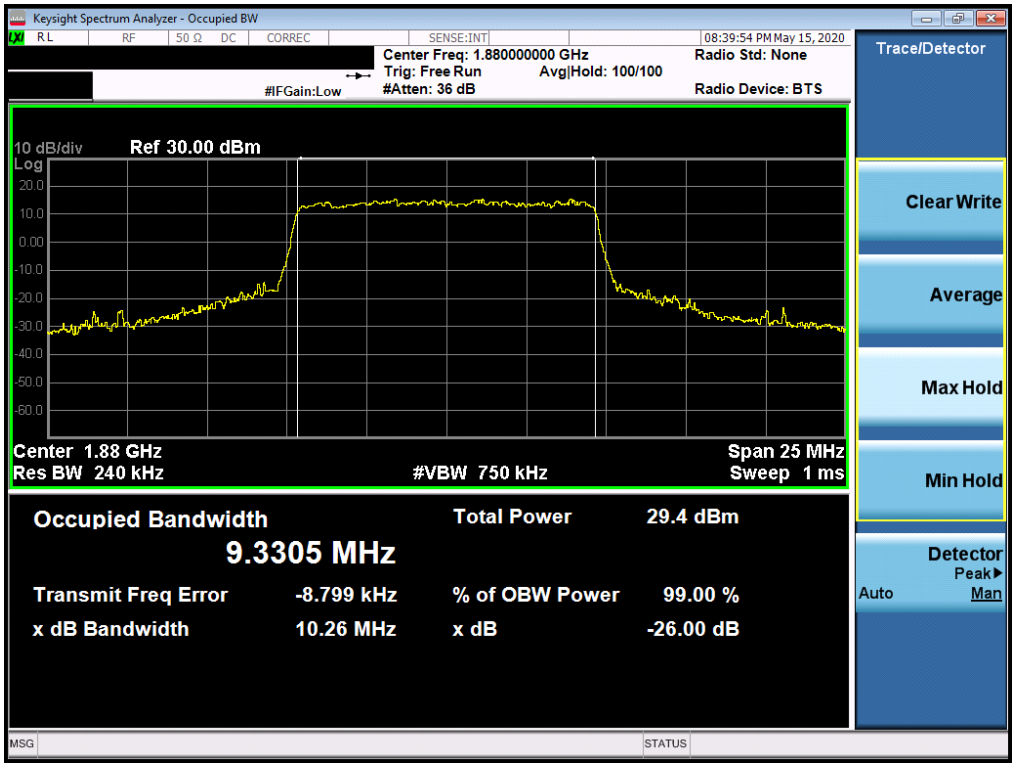
Plot 7-103. Occupied Bandwidth Plot (NR Band n2 - 15MHz CP-OFDM 64-QAM - Full RB Configuration)



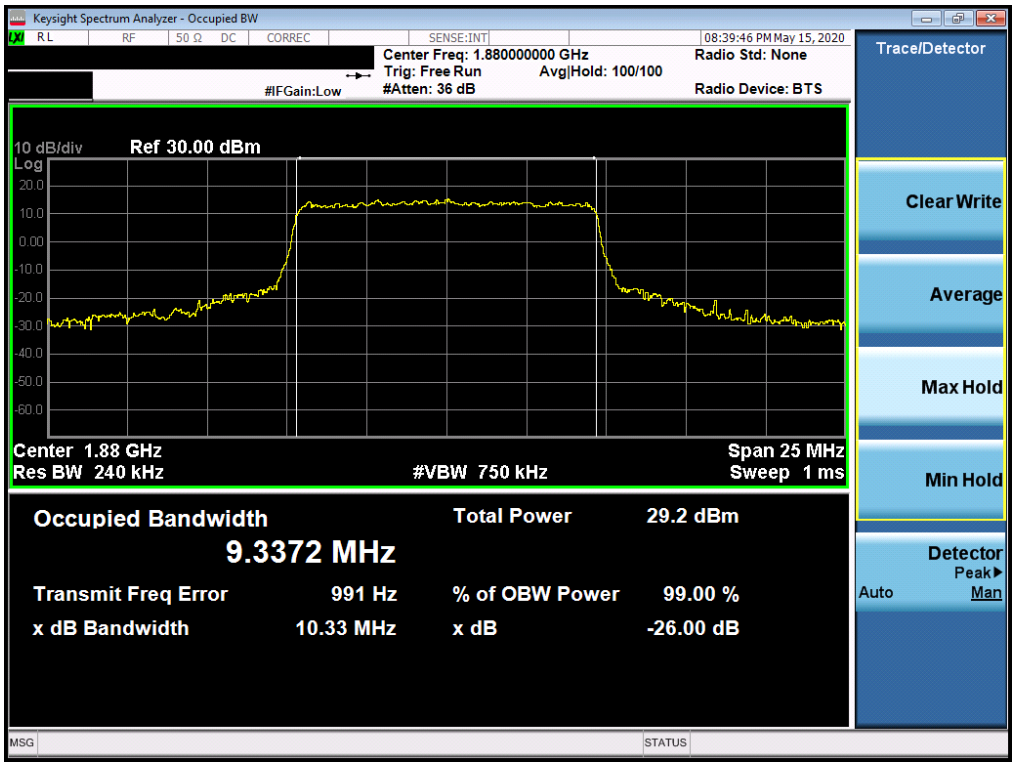
Plot 7-104. Occupied Bandwidth Plot (NR Band n2 - 15MHz CP-OFDM 256-QAM - Full RB Configuration)



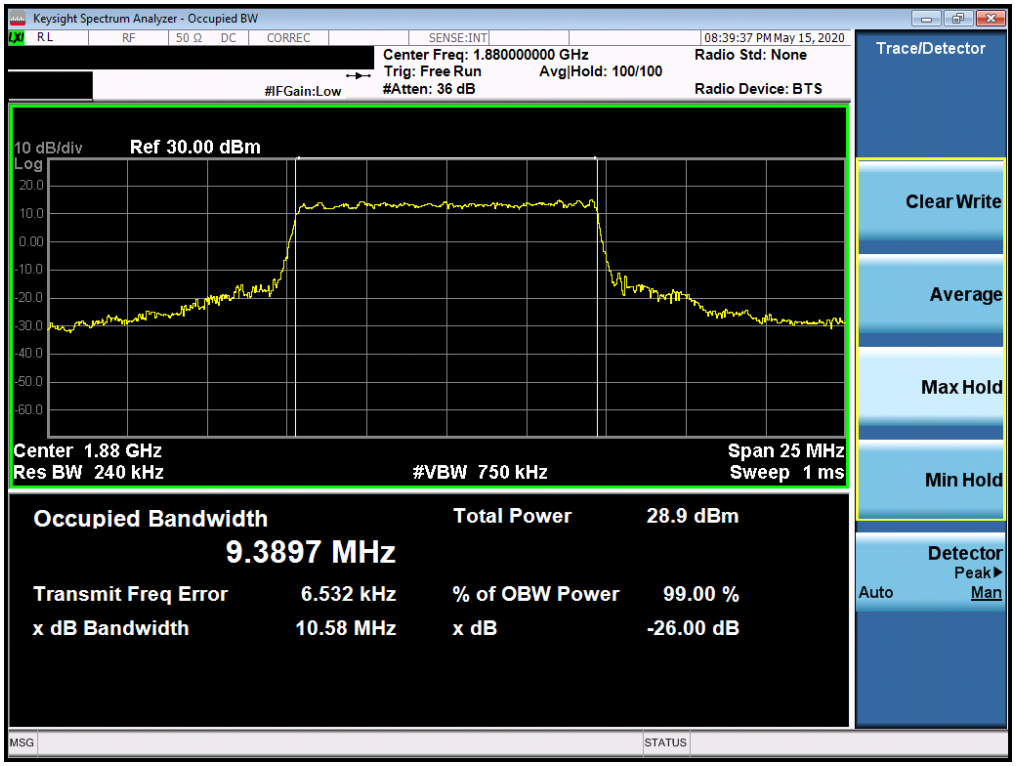
Plot 7-105. Occupied Bandwidth Plot (NR Band n2 - 10MHz DFT-s-OFDM π/2 BPSK - Full RB Configuration)



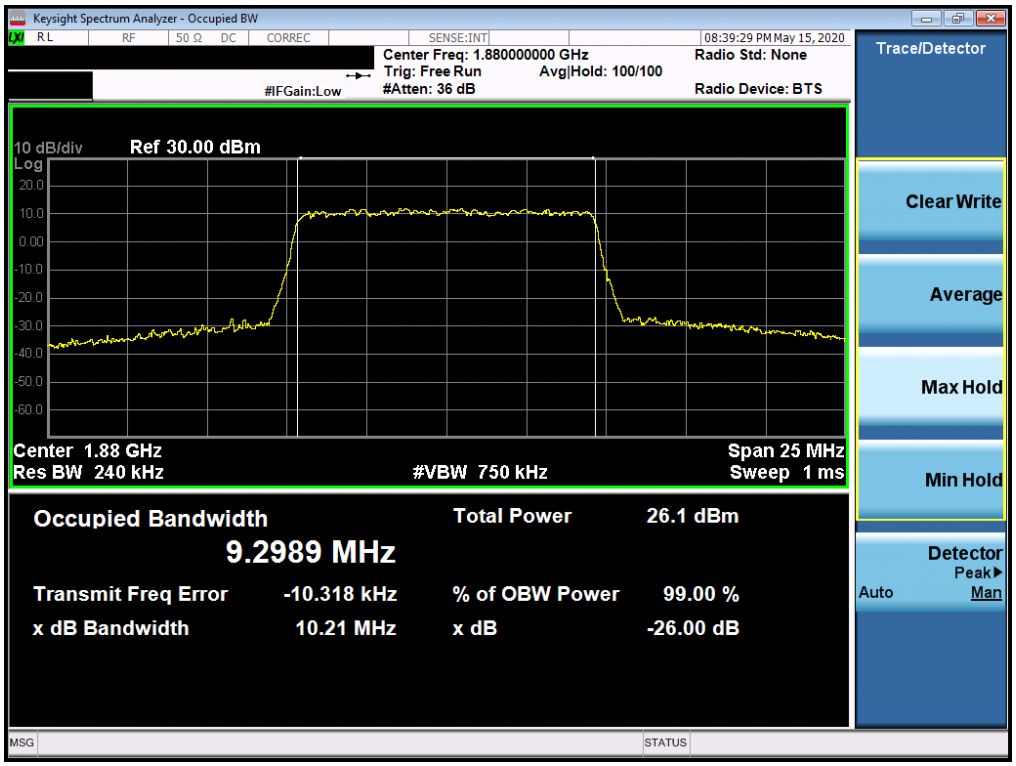
Plot 7-106. Occupied Bandwidth Plot (NR Band n2 - 10MHz CP-OFDM QPSK - Full RB Configuration)



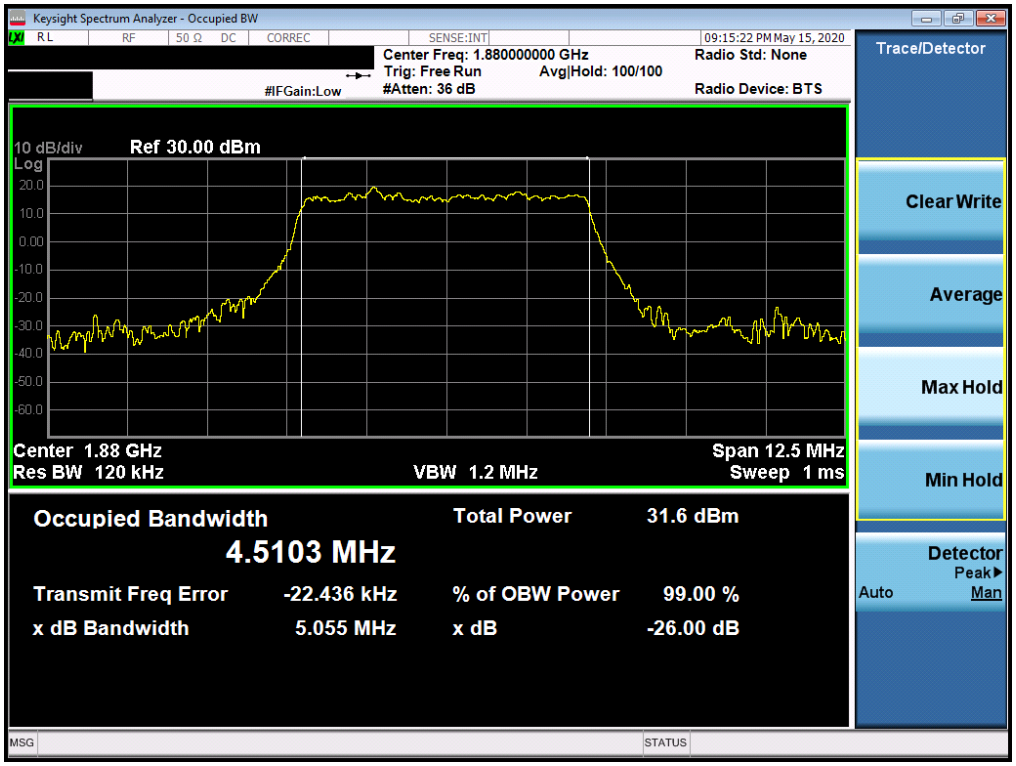
Plot 7-107. Occupied Bandwidth Plot (NR Band n2 - 10MHz CP-OFDM 16-QAM - Full RB Configuration)



Plot 7-108. Occupied Bandwidth Plot (NR Band n2 - 10MHz CP-OFDM 64-QAM - Full RB Configuration)



Plot 7-109. Occupied Bandwidth Plot (NR Band n2 - 10MHz CP-OFDM 256-QAM - Full RB Configuration)



Plot 7-110. Occupied Bandwidth Plot (NR Band n2 - 5MHz π/2 DFT-s-OFDM BPSK - Full RB Configuration)