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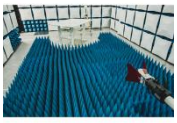

PART 27 MEASUREMENT REPORT

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

Date of Testing:
4/16/2021 - 6/9/2021
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M2107290086-20.A3L

FCC ID:	**A3LSMF711U1**
Applicant Name:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model:	SM-F711U
Additional Model(s):	SM-F711U1
EUT Type:	Portable Handset
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part:	27
Test Procedure(s):	ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01, 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.

Randy Ortanez
President

ACCREDITED
CERT #2041.01

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Antenna SRS-1						
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
NR Band n77 (3700 - 3980MHz)	100 MHz	π/2 BPSK	3750.0 - 3930.0	0.296	24.71	96M8G7D
		QPSK	3750.0 - 3930.0	0.292	24.65	97M9G7D
		16QAM	3750.0 - 3930.0	0.225	23.52	97M9W7D
	90 MHz	π/2 BPSK	3745.0 - 3935.0	0.305	24.84	87M3G7D
		QPSK	3745.0 - 3935.0	0.300	24.77	88M2G7D
		16QAM	3745.0 - 3935.0	0.226	23.55	88M0W7D
	80 MHz	π/2 BPSK	3740.0 - 3940.0	0.334	25.23	77M2G7D
		QPSK	3740.0 - 3940.0	0.316	25.00	77M9G7D
		16QAM	3740.0 - 3940.0	0.248	23.95	77M8W7D
	70 MHz	π/2 BPSK	3735.0 - 3945.0	0.327	25.15	64M7G7D
		QPSK	3735.0 - 3945.0	0.331	25.20	68M0G7D
		16QAM	3735.0 - 3945.0	0.214	23.31	68M0W7D
	60 MHz	π/2 BPSK	3730.0 - 3950.0	0.276	24.41	58M2G7D
		QPSK	3730.0 - 3950.0	0.301	24.78	58M2G7D
		16QAM	3730.0 - 3950.0	0.210	23.22	58M2W7D
	50 MHz	π/2 BPSK	3725.0 - 3955.0	0.290	24.63	46M1G7D
		QPSK	3725.0 - 3955.0	0.284	24.54	47M7G7D
		16QAM	3725.0 - 3955.0	0.204	23.09	47M8W7D
	40 MHz	π/2 BPSK	3720.0 - 3960.0	0.330	25.18	35M8G7D
		QPSK	3720.0 - 3960.0	0.301	24.79	38M0G7D
		16QAM	3720.0 - 3960.0	0.201	23.02	38M1W7D
	30 MHz	π/2 BPSK	3715.0 - 3965.0	0.315	24.98	27M1G7D
		QPSK	3715.0 - 3965.0	0.310	24.91	28M1G7D
		16QAM	3715.0 - 3965.0	0.213	23.28	28M1W7D
	20 MHz	π/2 BPSK	3710.0 - 3970.0	0.338	25.29	17M9G7D
		QPSK	3710.0 - 3970.0	0.340	25.32	18M4G7D
		16QAM	3710.0 - 3970.0	0.245	23.88	18M4W7D

Overview Table (n77 PC2 – C-Band)

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Antenna SRS-1						
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
NR Band n77 (3450 - 3550MHz)	100 MHz	π/2 BPSK	3500.0	0.112	20.50	96M4G7D
		QPSK	3500.0	0.122	20.86	97M7G7D
		16QAM	3500.0	0.083	19.20	97M8W7D
	90 MHz	π/2 BPSK	3495.0 - 3505.0	0.117	20.66	87M1G7D
		QPSK	3495.0 - 3505.0	0.113	20.52	87M8G7D
		16QAM	3495.0 - 3505.0	0.081	19.10	87M7W7D
	80 MHz	π/2 BPSK	3490.0 - 3510.0	0.105	20.21	77M3G7D
		QPSK	3490.0 - 3510.0	0.120	20.79	77M9G7D
		16QAM	3490.0 - 3510.0	0.083	19.21	78M1W7D
	70 MHz	π/2 BPSK	3485.0 - 3515.0	0.115	20.59	64M4G7D
		QPSK	3485.0 - 3515.0	0.127	21.03	67M8G7D
		16QAM	3485.0 - 3515.0	0.083	19.20	67M8W7D
	60 MHz	π/2 BPSK	3480.0 - 3520.0	0.107	20.30	58M0G7D
		QPSK	3480.0 - 3520.0	0.116	20.63	58M1G7D
		16QAM	3480.0 - 3520.0	0.096	19.81	58M1W7D
	50 MHz	π/2 BPSK	3475.0 - 3525.0	0.120	20.80	45M9G7D
		QPSK	3475.0 - 3525.0	0.109	20.38	47M6G7D
		16QAM	3475.0 - 3525.0	0.078	18.93	47M6W7D
	40 MHz	π/2 BPSK	3470.0 - 3530.0	0.119	20.77	35M9G7D
		QPSK	3470.0 - 3530.0	0.123	20.90	37M9G7D
		16QAM	3470.0 - 3530.0	0.086	19.34	38M1W7D
	30 MHz	π/2 BPSK	3465.0 - 3535.0	0.116	20.64	27M0G7D
		QPSK	3465.0 - 3535.0	0.113	20.52	28M0G7D
		16QAM	3465.0 - 3535.0	0.089	19.49	28M0W7D
	20 MHz	π/2 BPSK	3460.0 - 3540.0	0.120	20.78	18M0G7D
		QPSK	3460.0 - 3540.0	0.125	20.98	18M4G7D
		16QAM	3460.0 - 3540.0	0.093	19.71	18M4W7D

Overview Table (n77 PC2 – DoD-Band)

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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 Engineering Lab located in Columbia, MD 21046, U.S.A.

- PCTEST 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.

- 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.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID:A3LSMF711U1**. This device has n77 operation over four total antennas in both the C-Band (3.7 – 3.98GHz) and the DoD Band (3.45 – 3.55GHz). The test data contained in this report pertains to both supported n77 bands and all four antennas.

Test Device Serial No.: 0151M, 0641M, 0647M, 0800M, 0811M, 0834M, 0859M, 0880M

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 CDMA/EvDO Rev0/A, 1x Advanced (BC0, BC1), 850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 5G NR (n71, n12, n5, n66, n2, n25, n30, n41, n77, n260, n261), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII (5GHz), Bluetooth (1x, EDR, LE), NFC, Wireless Power Transfer.

This device can transmit in the 5G NR Band n77 over four separate antennas labelled SRS-1, SRS-2, SRS-3, and SRS-4. The test data contained in this report covers transmission in the n77 band via these four antennas. The test data is marked to indicate the specific antenna transmitting in the n77 band.

Each of the transmission antennas investigated in this report may have an alternate labelling in other exhibits and filings. The correlation between these labelling schemes is displayed in the following table.

Antenna SRS-label	Alternate Label
SRS-1	Ant F
SRS-2	Ant I
SRS-3	Ant E
SRS-4	Ant C

Table 2-1. Antenna Labelling Scheme Correlation

2.3 Test Configuration

The EUT was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01 v03r01. See Section 3.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

This device supports two configurations: one is with screen open, and one is with screen closed. Both configurations are tested, and the worst case radiated emissions data is shown in this report.

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

2.4 EMI Suppression Device(s)/Modifications

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

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2.5 Software and Firmware

The test was conducted with firmware version 711USQU0AUEF installed on the EUT.

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the "Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards" (ANSI/TIA-603-E-2016) and "Measurement Guidance for Certification of Licensed Digital Transmitters" (KDB 971168 D01 v03r01) 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/TIA-603-E-2016. 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 Pd is the dipole equivalent power, Pg 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:

$$P_{g\,[dBm]} - \text{cable loss}_{\,[dB]}.$$

For radiated spurious emissions measurements and calculations, conversion method is used per the formulas in KDB 971168 Section 5.8.4. 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.

Radiated power and radiated spurious emission levels are investigated with the receive antenna horizontally and vertically polarized per ANSI/TIA-603-E-2016.

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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

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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
-	AP2-002	EMC Cable and Switch System	3/4/2021	Annual	3/4/2022	AP2-002
-	ETS-002	EMC Cable and Switch System	3/4/2021	Annual	3/4/2022	ETS-002
Emco	3115	Horn Antenna (1-18GHz)	6/18/2020	Biennial	6/18/2022	9704-5182
Espec	ESX-2CA	Environmental Chamber	8/27/2020	Annual	8/27/2022	17620
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	8/17/2020	Annual	8/17/2021	MY52350166
Keysight Technologies	N9030B	PXA Signal Analyzer, Multi-touch	9/17/2020	Annual	9/17/2021	MY57141001
Keysight Technologies	N9038A	MXE EMI Receiver	8/11/2020	Annual	8/11/2021	MY51210133
Rohde & Schwarz	ESW44	EMI Test Receiver 2Hz to 44 GHz	1/21/2021	Annual	1/21/2022	101716
Rohde & Schwarz	FSW26	2Hz-26.5GHz Signal and Spectrum Analyzer	2/10/2021	Annual	2/10/2022	103187
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Test Antenna	8/13/2020	Biennial	8/13/2022	101073
Sunol	DRH-118	Horn Antenna (1-18GHz)	10/3/2019	Biennial	10/3/2021	A050307

Table 5-1. Test Equipment

Notes:

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

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

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6.0 SAMPLE CALCULATIONS

QPSK Modulation

Emission Designator = 8M62G7D
LTE BW = 8.62 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 8M45W7D
LTE BW = 8.45 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

Spurious Radiated Emission

Example: Spurious emission at 3700.40 MHz

The receive spectrum analyzer reading at 3 meters with the EUT on the turntable was –81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of –81.0 dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 3700.40 MHz. So 6.1 dB is added to the signal generator reading of –30.9 dBm yielding –24.80 dBm. The fundamental EIRP was 25.50 dBm so this harmonic was 25.50 dBm – (-24.80) = 50.3 dBc.

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7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.

FCC ID: A3LSMF711U1

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

Mode(s): NR

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Transmitter Conducted Output Power	2.1046	N/A	PASS	Section 7.2
	Occupied Bandwidth	2.1049	N/A	PASS	Section 7.3
	Conducted Band Edge / Spurious Emissions (NR Band n77)	2.1051, 27.53(l), 27.53(n)	Undesirable emissions must meet the limits detailed in 27.53(l) and 27.53(n)	PASS	Sections 7.4, 7.5
	Peak-to-Average Ratio	27.50(j)(4), 27.50(k)(4)	≤ 13 dB	PASS	Section 7.6
	Frequency Stability	2.1055, 27.54	Fundamental emissions stay within authorized frequency block	PASS	Section 7.9
RADIATED	Effective Radiated Power / Equivalent Isotropic Radiated Power (NR Band n77)	27.50(j)(3), 27.50(k)(3)	< 1 Watts max. EIRP	PASS	Section 7.7
	Radiated Spurious Emissions (NR Band n77)	2.1053, 27.53(l), 27.53(n)	Undesirable emissions must meet the limits detailed in 27.53(l) in 27.53 (n)	PASS	Section 7.8

Table 7-1. Summary of Test Results

Notes:

1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
4) All conducted emissions measurements are performed with automated test software to capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST EMC Software Tool v1.0.
5) This device operates in the n77 band on four different transmission antennas. The main antenna (label: SRS-1) operates at the highest transmit power. The three additional antennas each operate at a lower power compared to the main antenna. Therefore, to demonstrate compliance for each antenna, a complete set of test data is shown for antenna SRS-1 and only a subset of test data is included for the additional three antennas.

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7.2 Conducted Power Output Data

Test Overview

The EUT is set up to transmit at maximum power for NR channels. All power levels 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 modes of operation were investigated and the worst case configuration results are reported in this section.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 5.2

Test Settings

1. The signal analyzer's channel power measurement capability was used to perform power output measurement at the RF terminal.
2. Integration BW was set greater or equal to the expected channel bandwidth of the emission
3. RBW = 1-5% of the Integration BW
4. VBW ≥ 3 x RBW
5. Trigger Mode = Free Run for continuous emissions, RF Burst for pulsed emissions
6. Gating = Off for continuous emissions, On only during transmission for pulsed emissions
7. Detector = RMS
8. Trace mode = trace averaging
9. Sweep time = auto couple
10. The trace was allowed to stabilize

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.

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Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	π/2 BPSK	650000	3750.00	1 / 68	26.25
	QPSK	650000	3750.00	1 / 68	26.25
		656000	3840.00	1 / 136	25.59
		662000	3930.00	1 / 68	25.54
	16-QAM	650000	3750.00	1 / 68	25.51
	64-QAM	650000	3750.00	1 / 68	23.98
	256-QAM	650000	3750.00	1 / 68	22.04
90 MHz	π/2 BPSK	649668	3745.02	1 / 61	26.23
	QPSK	649668	3745.02	1 / 61	26.00
	16-QAM	649668	3745.02	1 / 61	25.55
	64-QAM	649668	3745.02	1 / 61	24.64
	256-QAM	649668	3745.02	1 / 61	22.43
80 MHz	π/2 BPSK	656000	3840.00	1 / 162	26.39
	QPSK	656000	3840.00	1 / 162	25.94
	16-QAM	656000	3840.00	1 / 162	25.43
	64-QAM	656000	3840.00	1 / 162	23.94
	256-QAM	656000	3840.00	1 / 162	21.25
70 MHz	π/2 BPSK	656000	3840.00	1 / 141	26.31
	QPSK	656000	3840.00	1 / 141	26.13
	16-QAM	656000	3840.00	1 / 141	24.80
	64-QAM	656000	3840.00	1 / 141	23.26
	256-QAM	656000	3840.00	1 / 141	22.49
60 MHz	π/2 BPSK	648668	3730.02	1 / 81	26.13
	QPSK	648668	3730.02	1 / 81	26.25
	16-QAM	648668	3730.02	1 / 81	25.14
	64-QAM	648668	3730.02	1 / 81	23.37
	256-QAM	648668	3730.02	1 / 81	21.15
50 MHz	π/2 BPSK	648334	3725.01	1 / 33	26.34
	QPSK	648334	3725.01	1 / 33	26.31
	16-QAM	648334	3725.01	1 / 33	24.56
	64-QAM	648334	3725.01	1 / 33	23.49
	256-QAM	648334	3725.01	1 / 33	21.17
40 MHz	π/2 BPSK	648000	3720.00	1 / 79	26.36
	QPSK	648000	3720.00	1 / 79	25.75
	16-QAM	648000	3720.00	1 / 79	25.13
	64-QAM	648000	3720.00	1 / 79	23.12
	256-QAM	648000	3720.00	1 / 79	22.29
30 MHz	π/2 BPSK	664332	3964.98	1 / 58	26.47
	QPSK	664332	3964.98	1 / 58	26.25
	16-QAM	664332	3964.98	1 / 58	24.55
	64-QAM	664332	3964.98	1 / 58	23.20
	256-QAM	664332	3964.98	1 / 58	22.18
20 MHz	π/2 BPSK	656000	3840.00	1 / 13	26.45
	QPSK	656000	3840.00	1 / 13	26.25
	16-QAM	656000	3840.00	1 / 13	25.37
	64-QAM	656000	3840.00	1 / 13	24.10
	256-QAM	656000	3840.00	1 / 13	22.01

Table 7-2. Conducted Power Data (NR Band n77 PC2 – C-Band – SRS-1)

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Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	π/2 BPSK	633334	3500.01	1 / 204	26.07
	QPSK	633334	3500.01	1 / 204	26.25
	16-QAM	633334	3500.01	1 / 204	25.21
	64-QAM	633334	3500.01	1 / 204	23.80
	256-QAM	633334	3500.01	1 / 204	21.53
90 MHz	π/2 BPSK	633000	3495.00	1 / 122	25.91
		633334	3500.01	1 / 122	26.24
		633666	3504.99	1 / 122	26.21
	QPSK	633334	3500.01	1 / 122	25.91
	16-QAM	633000	3495.00	1 / 122	25.12
	64-QAM	633334	3500.01	1 / 122	23.88
	256-QAM	633000	3495.00	1 / 122	21.56
80 MHz	π/2 BPSK	632668	3490.02	1 / 54	25.79
		633334	3500.01	1 / 54	25.64
		634000	3510.00	1 / 54	25.76
	QPSK	633334	3500.01	1 / 54	26.18
	16-QAM	634000	3510.00	1 / 54	25.23
	64-QAM	634000	3510.00	1 / 54	23.18
	256-QAM	634000	3510.00	1 / 54	21.62
70 MHz	π/2 BPSK	632334	3485.01	1 / 141	26.01
		633334	3500.01	1 / 141	26.00
		634332	3514.98	1 / 141	26.17
	QPSK	632334	3485.01	1 / 141	26.40
		633334	3500.01	1 / 141	26.37
		634332	3514.98	1 / 141	26.43
	16-QAM	634332	3514.98	1 / 141	25.22
	64-QAM	634332	3514.98	1 / 141	23.45
	256-QAM	633334	3500.01	1 / 141	19.98
60 MHz	π/2 BPSK	632000	3480.00	1 / 40	25.88
		633334	3500.01	1 / 40	25.81
		634666	3519.99	1 / 121	25.85
	QPSK	632000	3480.00	1 / 40	26.02
	16-QAM	634666	3519.99	1 / 121	25.83
	64-QAM	634666	3519.99	1 / 121	24.20
	256-QAM	632000	3480.00	1 / 40	21.36
50 MHz	π/2 BPSK	631668	3475.02	1 / 66	26.18
		633334	3500.01	1 / 66	26.37
		635000	3525.00	1 / 66	26.25
	QPSK	633334	3500.01	1 / 66	25.77
	16-QAM	633334	3500.01	1 / 66	24.95
	64-QAM	633334	3500.01	1 / 66	23.82
	256-QAM	633334	3500.01	1 / 66	21.91
40 MHz	π/2 BPSK	631334	3470.01	1 / 53	26.35
		633334	3500.01	1 / 53	26.17
		635332	3529.98	1 / 53	25.95
	QPSK	631334	3470.01	1 / 53	26.29
	16-QAM	631334	3470.01	1 / 53	25.36
	64-QAM	631334	3470.01	1 / 53	21.94
	256-QAM	631334	3470.01	1 / 53	21.83
30 MHz	π/2 BPSK	631000	3465.00	1 / 39	26.02
		633334	3500.01	1 / 39	25.94
		635666	3534.99	1 / 58	26.22
	QPSK	631000	3465.00	1 / 39	25.92
	16-QAM	633334	3500.01	1 / 39	25.51
	64-QAM	635666	3534.99	1 / 58	23.23
	256-QAM	631000	3465.00	1 / 39	22.64
20 MHz	π/2 BPSK	630668	3460.02	1 / 37	26.36
		633334	3500.01	1 / 37	26.31
		636000	3540.00	1 / 37	26.22
	QPSK	630668	3460.02	1 / 37	26.37
	16-QAM	630668	3460.02	1 / 37	25.73
	64-QAM	636000	3540.00	1 / 37	23.05
	256-QAM	630668	3460.02	1 / 37	22.80

Table 7-3. Conducted Power Data (NR Band n77 PC2 – DoD-Band – SRS-1)

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Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	QPSK	650000	3750.00	1 / 68	**21.58**
		656000	3840.00	1 / 68	20.50
		662000	3930.00	1 / 68	20.99

Table 7-4. Conducted Power Data (NR Band n77 PC2 – C-Band – SRS-2)

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	QPSK	633334	3500.01	1 / 136	**22.27**

Table 7-5. Conducted Power Data (NR Band n77 PC2 – DoD-Band – SRS-2)

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	QPSK	650000	3750.00	1 / 136	21.98
		656000	3840.00	1 / 204	22.11
		662000	3930.00	1 / 68	**22.33**

Table 7-6. Conducted Power Data (NR Band n77 PC2 – C-Band – SRS-3)

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	QPSK	633334	3500.01	1 / 68	**22.04**

Table 7-7. Conducted Power Data (NR Band n77 PC2 – DoD-Band – SRS-3)

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Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	QPSK	650000	3750.00	1 / 68	16.53
		656000	3840.00	1 / 68	16.63
		662000	3930.00	1 / 136	**17.18**

Table 7-8. Conducted Power Data (NR Band n77 PC2 – C-Band – SRS-4)

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	QPSK	63334	3500.01	1 / 136	**18.00**

Table 7-9. Conducted Power Data (NR Band n77 PC2 – DoD-Band – SRS-4)

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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

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 7-2. Test Instrument & Measurement Setup

Test Notes

1) The Occupied Bandwidth was only measured on the antenna with the highest power for each band (SRS-1).

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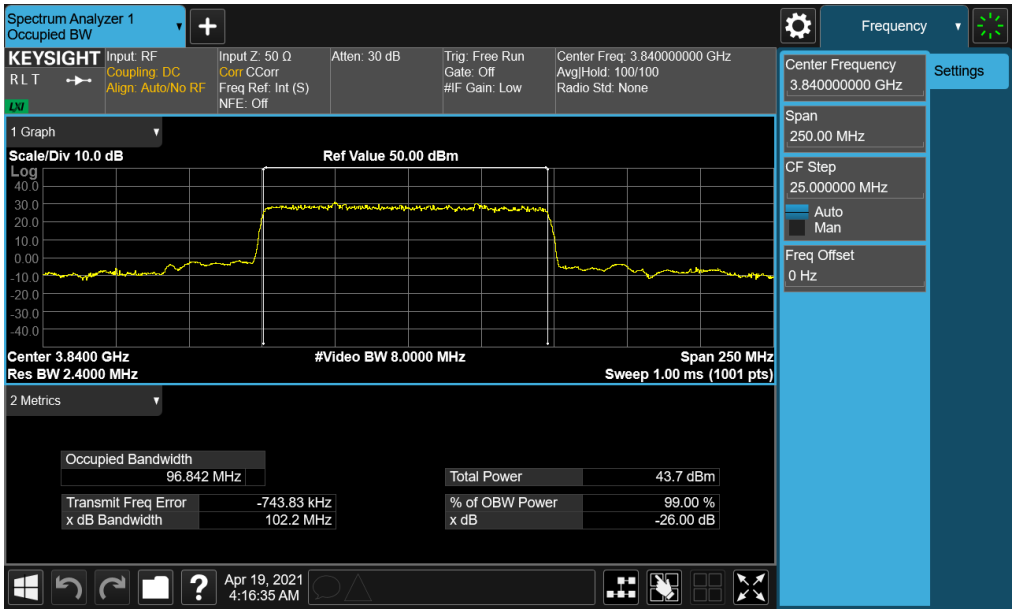
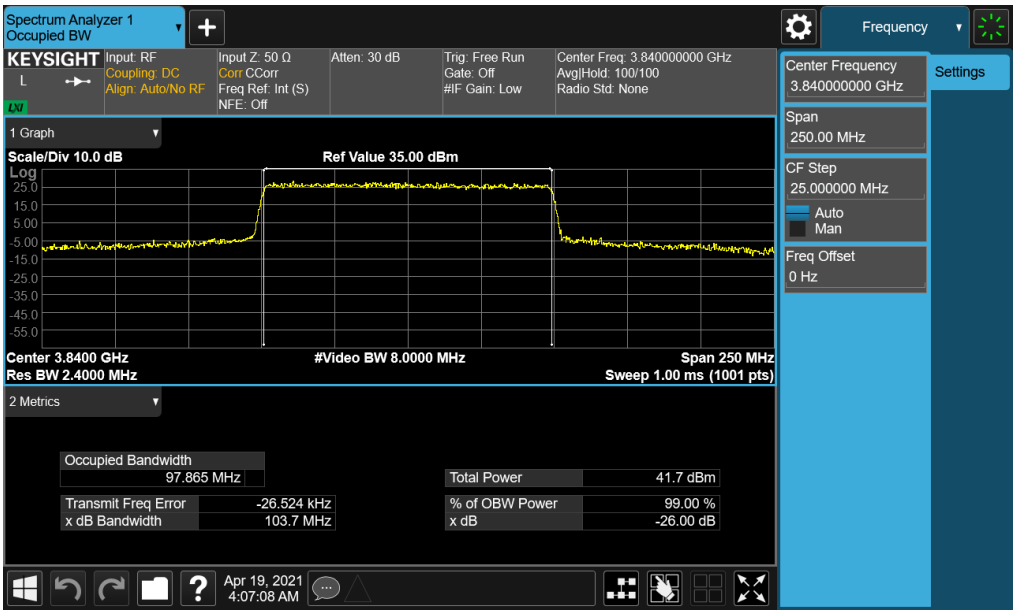
NR Band n77 (PC2) – C-Band – SRS-1



Plot 7-1. Occupied Bandwidth Plot (NR Band n77 PC2 - 100MHz π/2 BPSK - Full RB)



Plot 7-2. Occupied Bandwidth Plot (NR Band n77 PC2 - 100MHz CP-OFDM QPSK - Full RB)

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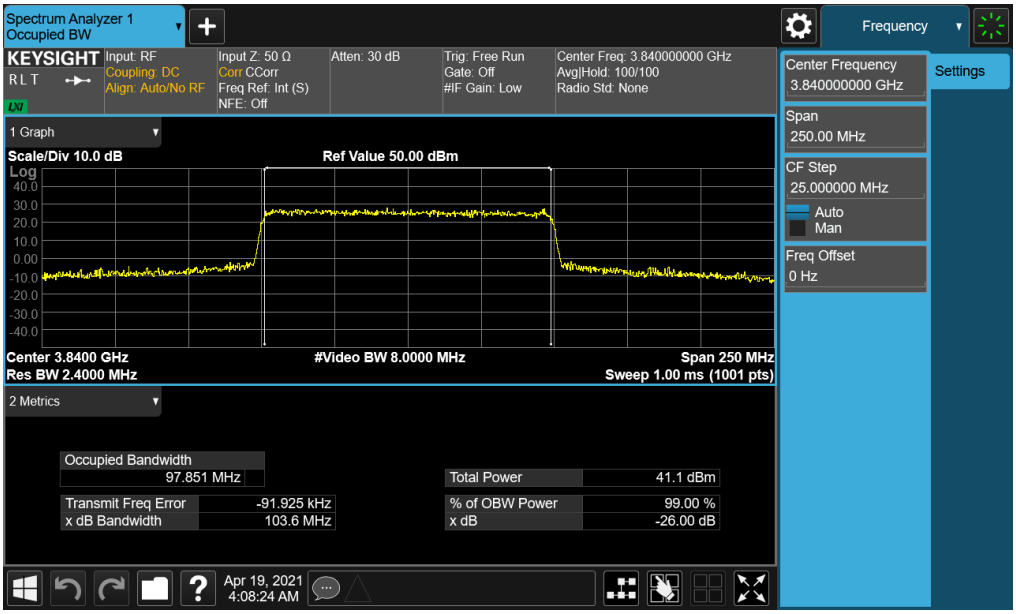
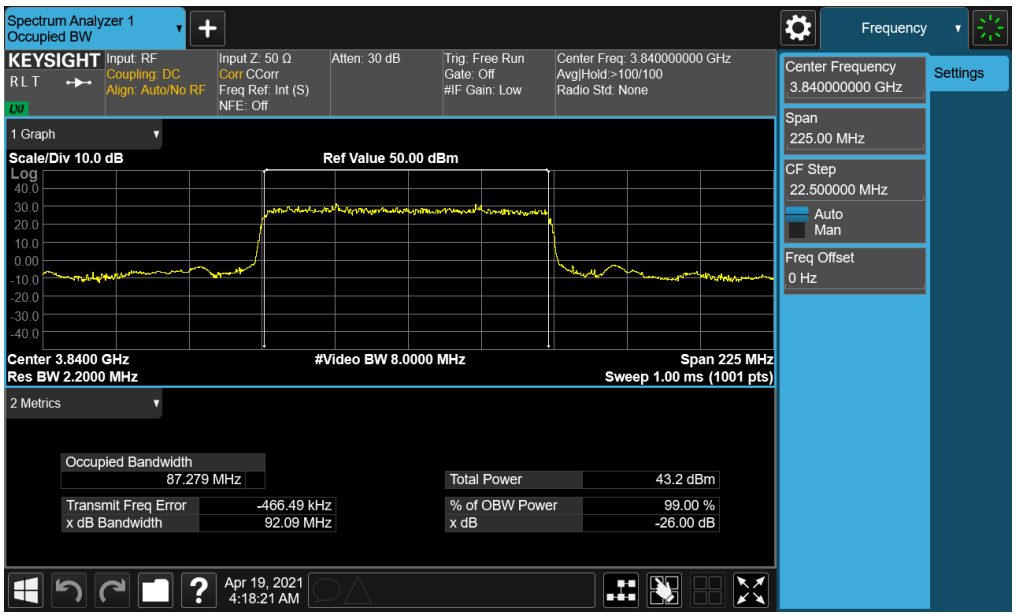


Plot 7-3. Occupied Bandwidth Plot (NR Band n77 PC2 - 100MHz CP-OFDM 16-QAM - Full RB)



Plot 7-4. Occupied Bandwidth Plot (NR Band n77 PC2 - 90MHz π/2 BPSK - Full RB)

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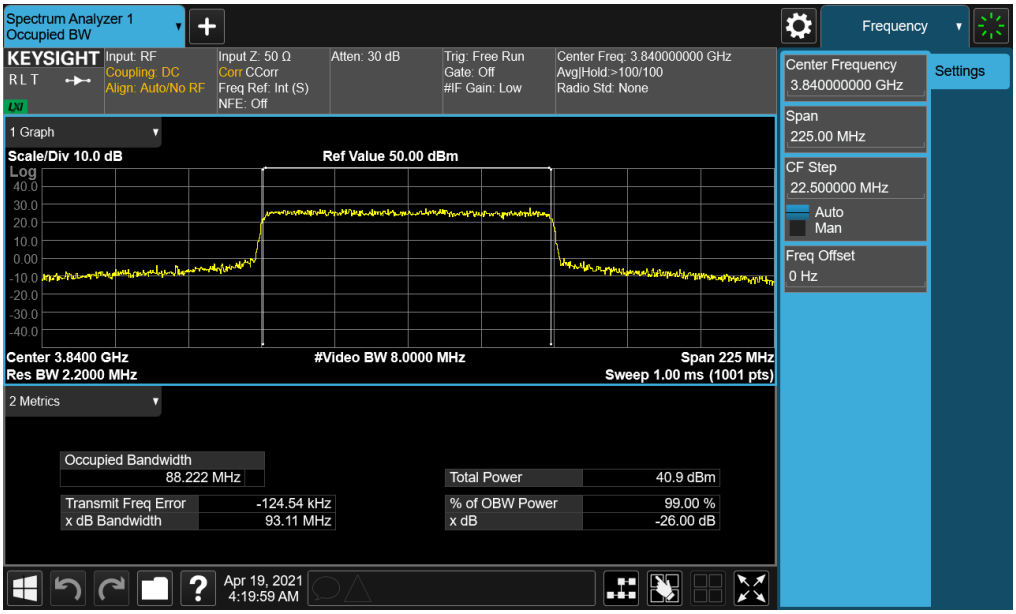

Plot 7-5. Occupied Bandwidth Plot (NR Band n77 PC2 - 90MHz CP-OFDM QPSK - Full RB)

Plot 7-6. Occupied Bandwidth Plot (NR Band n77 PC2 - 90MHz CP-OFDM 16-QAM - Full RB)

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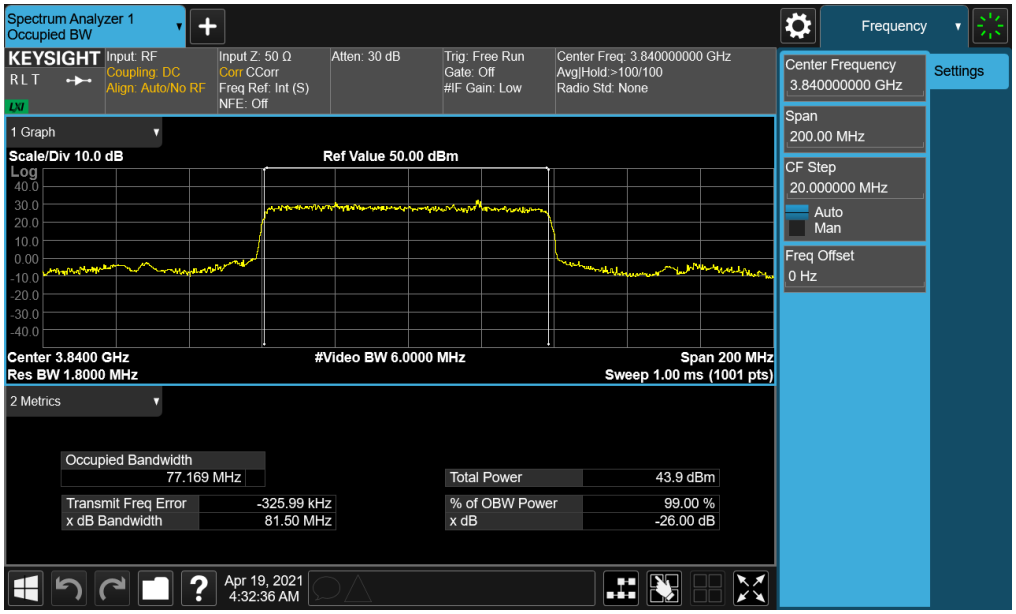

Plot 7-7. Occupied Bandwidth Plot (NR Band n77 PC2 - 80MHz π/2 BPSK - Full RB)

Plot 7-8. Occupied Bandwidth Plot (NR Band n77 PC2 - 80MHz CP-OFDM QPSK - Full RB)

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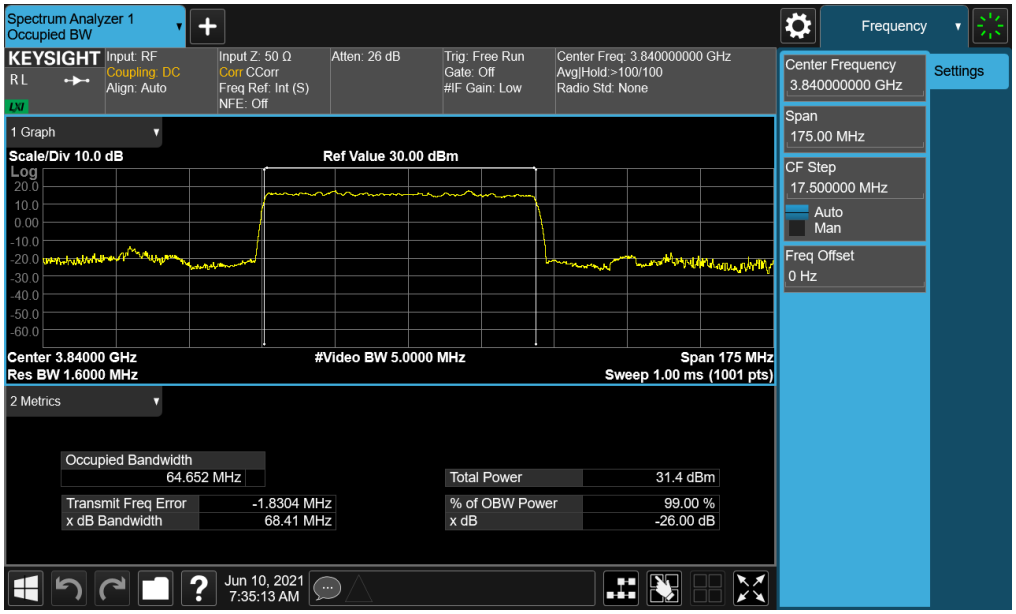
Plot 7-9. Occupied Bandwidth Plot (NR Band n77 PC2 - 80MHz CP-OFDM 16-QAM - Full RB)



Plot 7-10. Occupied Bandwidth Plot (NR Band n77 PC2 - 70MHz π/2 BPSK - Full RB)

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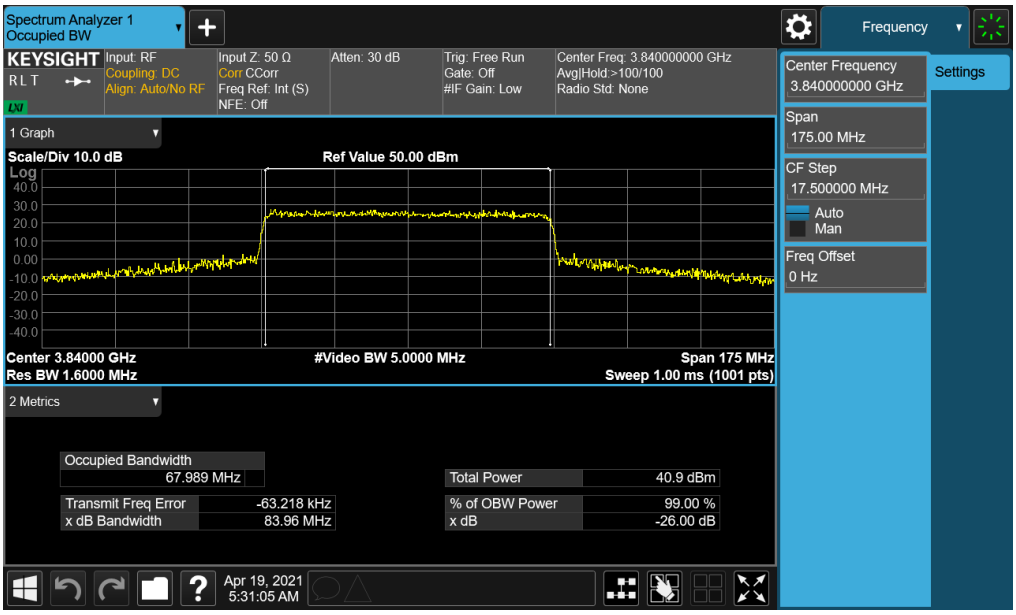
Plot 7-11. Occupied Bandwidth Plot (NR Band n77 PC2 - 70MHz CP-OFDM QPSK - Full RB)



Plot 7-12. Occupied Bandwidth Plot (NR Band n77 PC2 - 70MHz CP-OFDM 16-QAM - Full RB)

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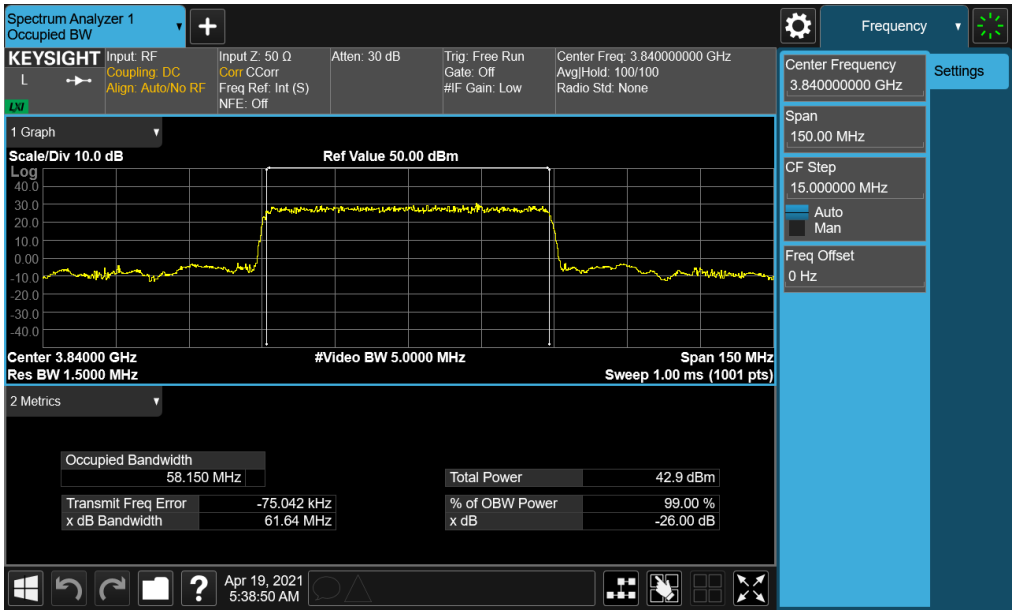

Plot 7-13. Occupied Bandwidth Plot (NR Band n77 PC2 - 60MHz π/2 BPSK - Full RB)

Plot 7-14. Occupied Bandwidth Plot (NR Band n77 PC2 - 60MHz CP-OFDM QPSK - Full RB)

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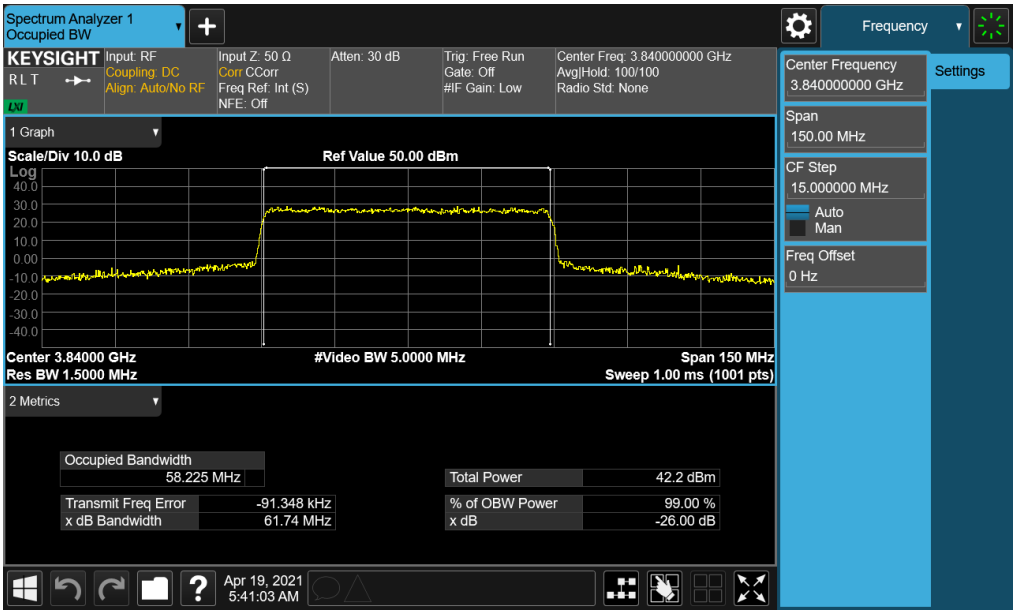

Plot 7-15. Occupied Bandwidth Plot (NR Band n77 PC2 - 60MHz CP-OFDM 16-QAM - Full RB)

Plot 7-16. Occupied Bandwidth Plot (NR Band n77 PC2 - 50MHz π/2 BPSK - Full RB)

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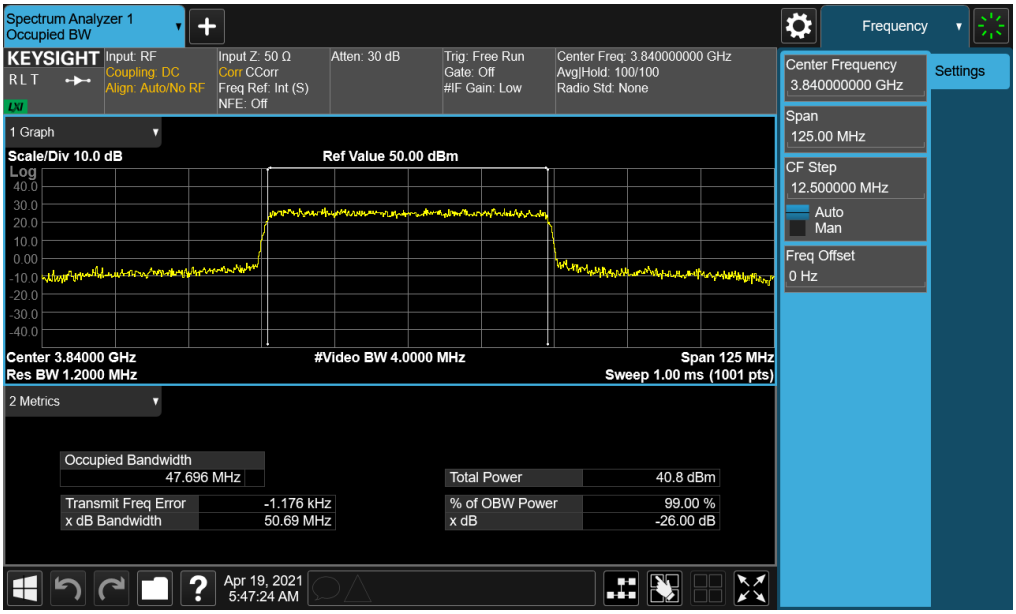
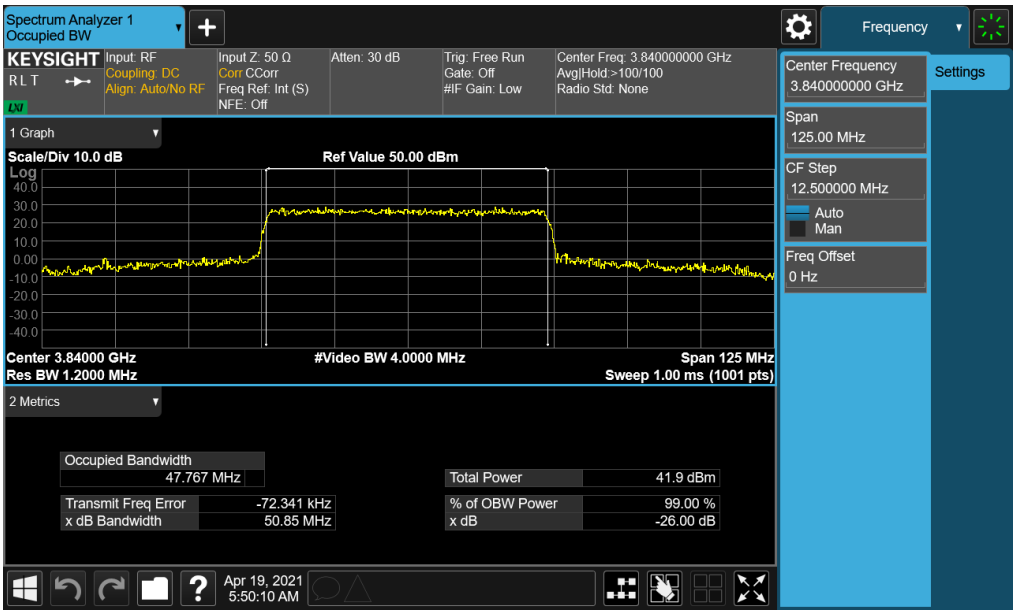


Plot 7-17. Occupied Bandwidth Plot (NR Band n77 PC2 - 50MHz CP-OFDM QPSK - Full RB)



Plot 7-18. Occupied Bandwidth Plot (NR Band n77 PC2 - 50MHz CP-OFDM 16-QAM - Full RB)

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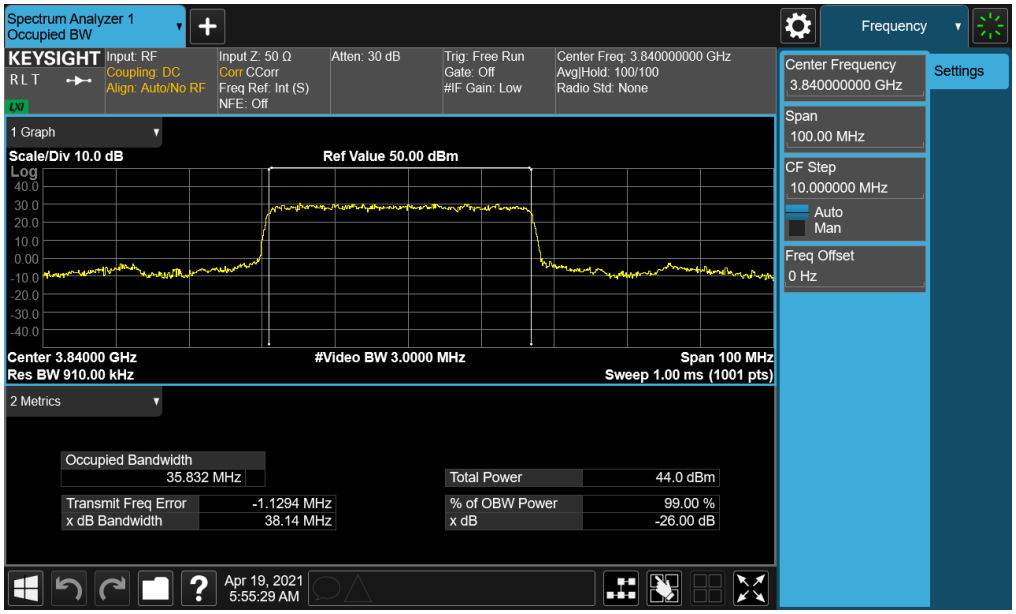

Plot 7-19. Occupied Bandwidth Plot (NR Band n77 PC2 - 40MHz π/2 BPSK - Full RB)

Plot 7-20. Occupied Bandwidth Plot (NR Band n77 PC2 - 40MHz CP-OFDM QPSK - Full RB)

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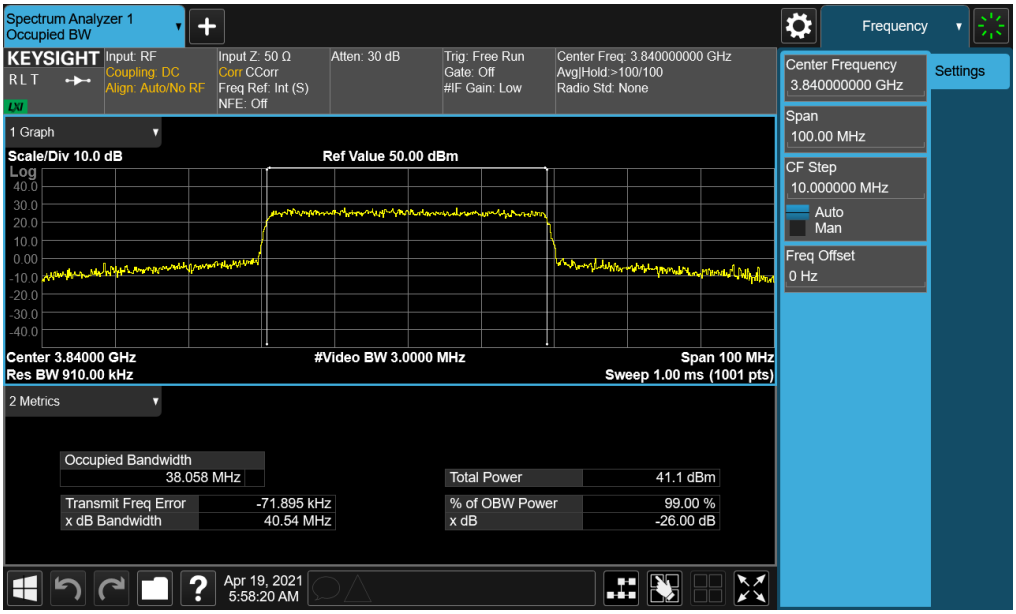
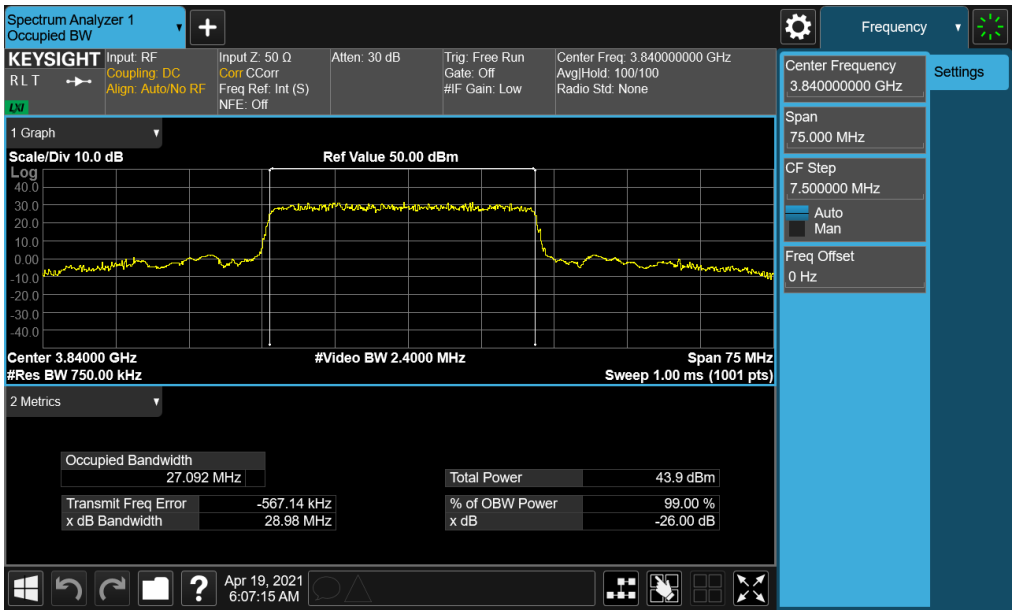


Plot 7-21. Occupied Bandwidth Plot (NR Band n77 PC2 - 40MHz CP-OFDM 16-QAM - Full RB)



Plot 7-22. Occupied Bandwidth Plot (NR Band n77 PC2 - 30MHz π/2 BPSK - Full RB)

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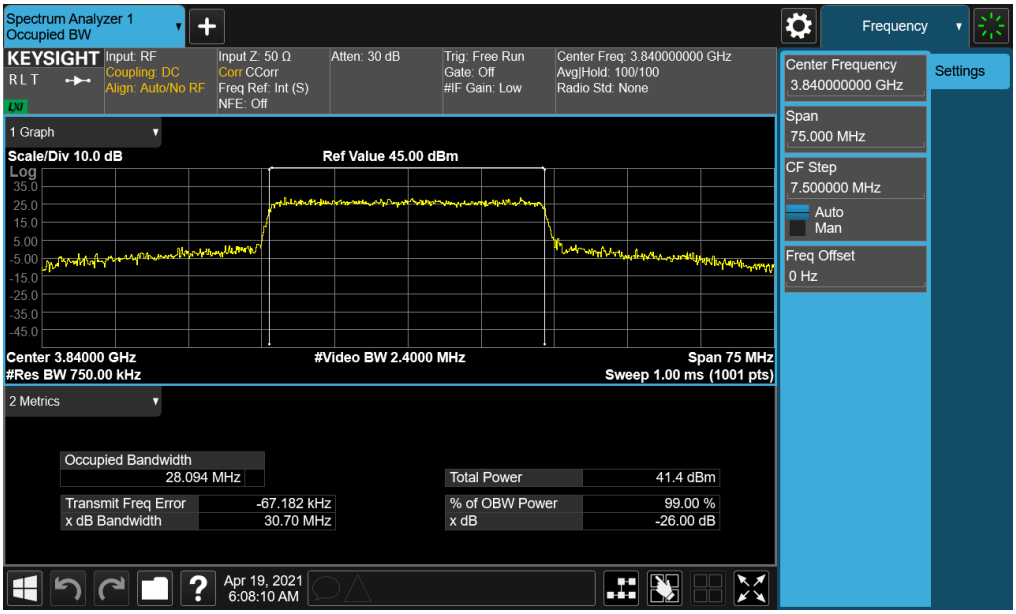

Plot 7-23. Occupied Bandwidth Plot (NR Band n77 PC2 - 30MHz CP-OFDM QPSK - Full RB)

Plot 7-24. Occupied Bandwidth Plot (NR Band n77 PC2 - 30MHz CP-OFDM 16-QAM - Full RB)

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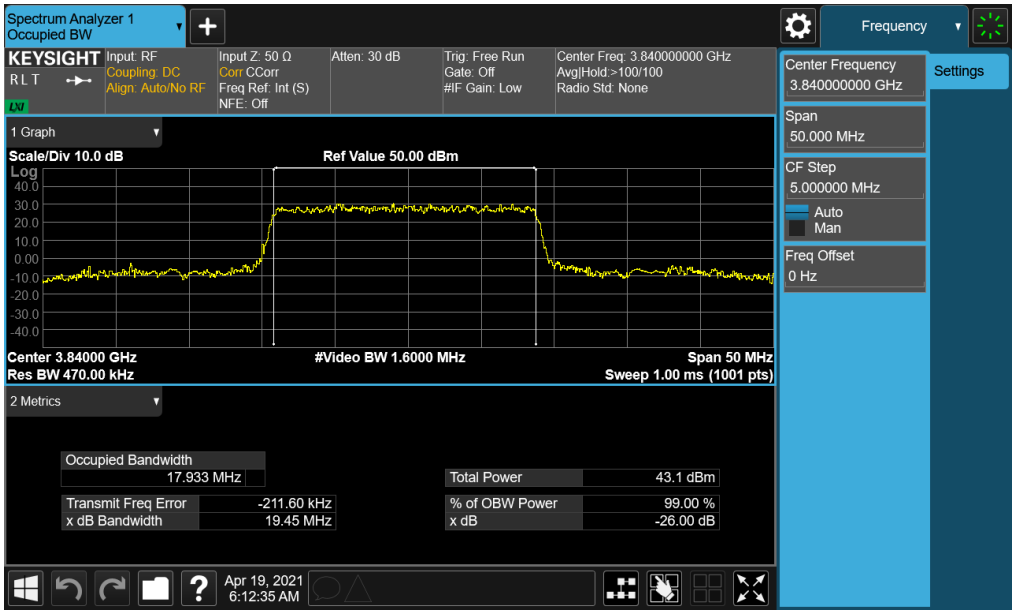

Plot 7-25. Occupied Bandwidth Plot (NR Band n77 PC2 - 20MHz π/2 BPSK - Full RB)

Plot 7-26. Occupied Bandwidth Plot (NR Band n77 PC2 - 20MHz CP-OFDM QPSK - Full RB)

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Plot 7-27. Occupied Bandwidth Plot (NR Band n77 PC2 - 20MHz CP-OFDM 16-QAM - Full RB)

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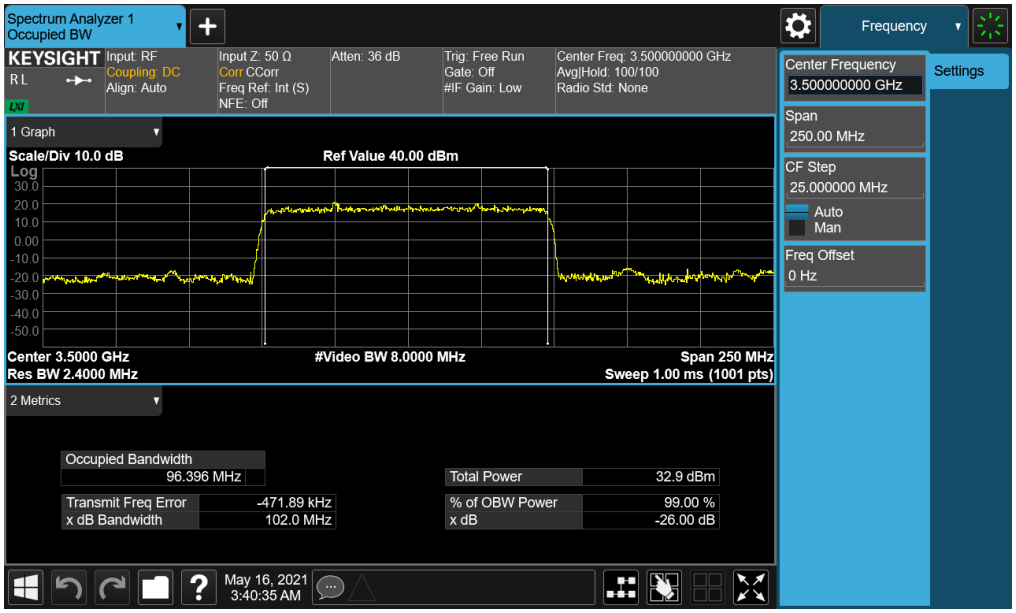
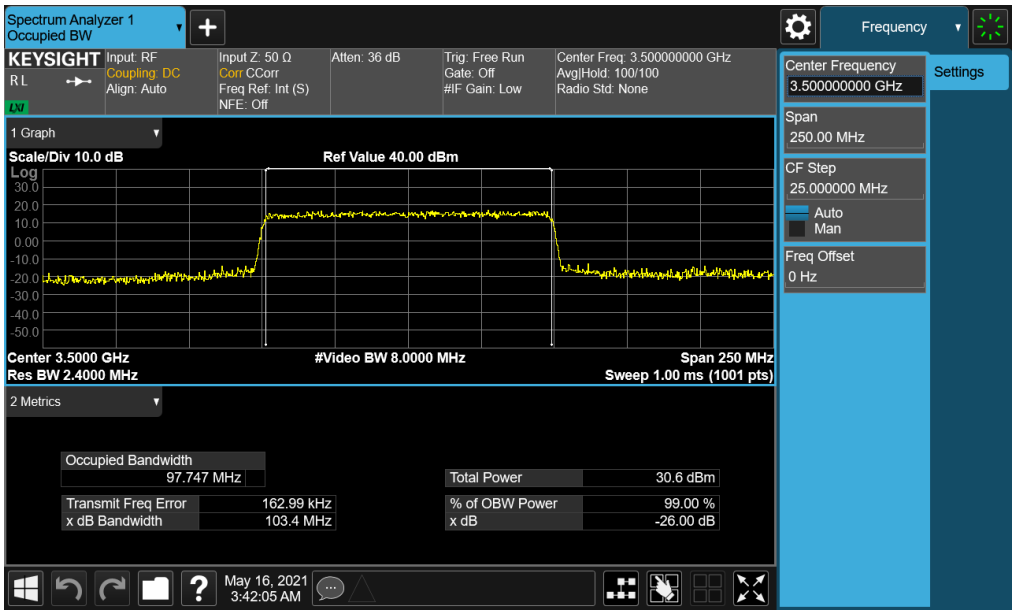
NR Band n77 (PC2) – DoD-Band – SRS-1



Plot 7-28. Occupied Bandwidth Plot (NR Band n77 PC2 - 100MHz π/2 BPSK - Full RB)



Plot 7-29. Occupied Bandwidth Plot (NR Band n77 PC2 - 100MHz CP-OFDM QPSK - Full RB)

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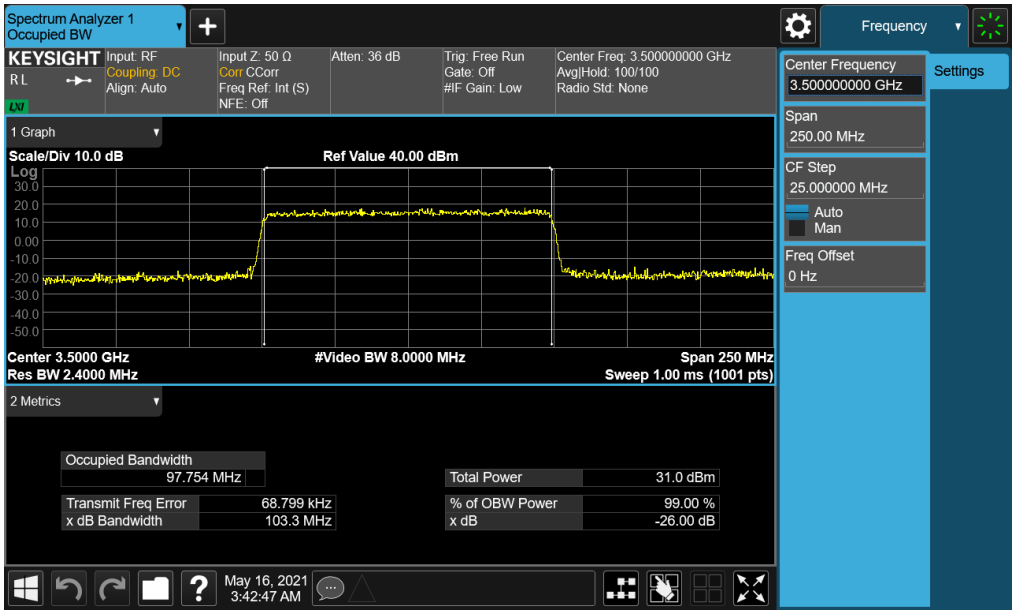
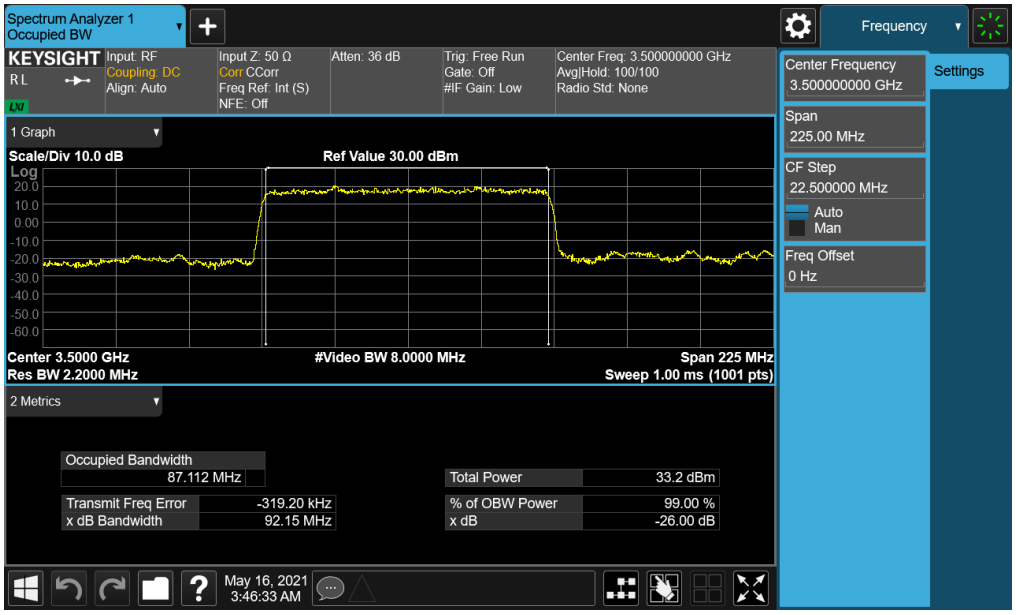


Plot 7-30. Occupied Bandwidth Plot (NR Band n77 PC2 - 100MHz CP-OFDM 16-QAM - Full RB)



Plot 7-31. Occupied Bandwidth Plot (NR Band n77 PC2 - 90MHz π/2 BPSK - Full RB)

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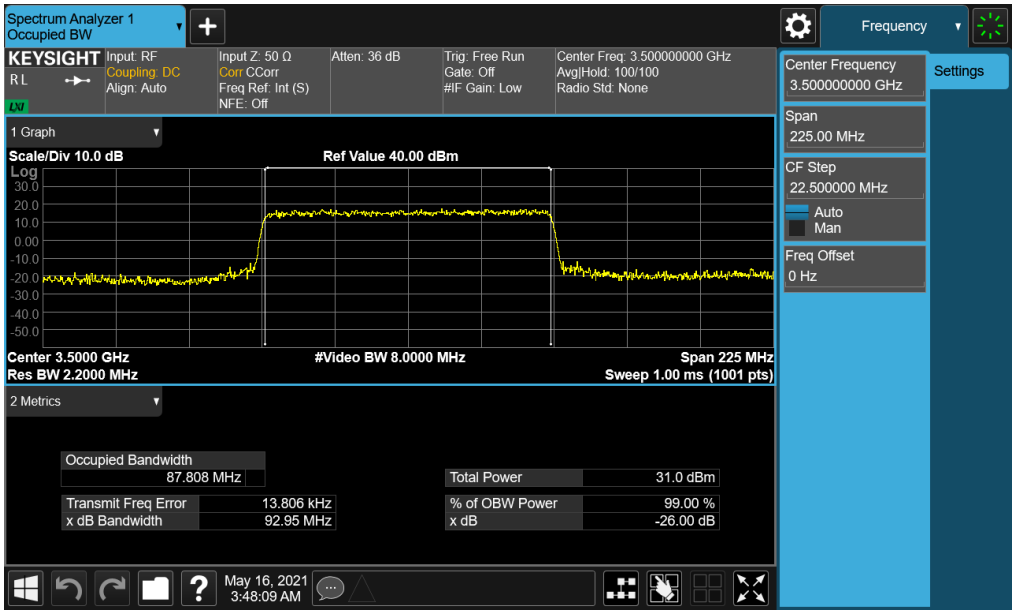
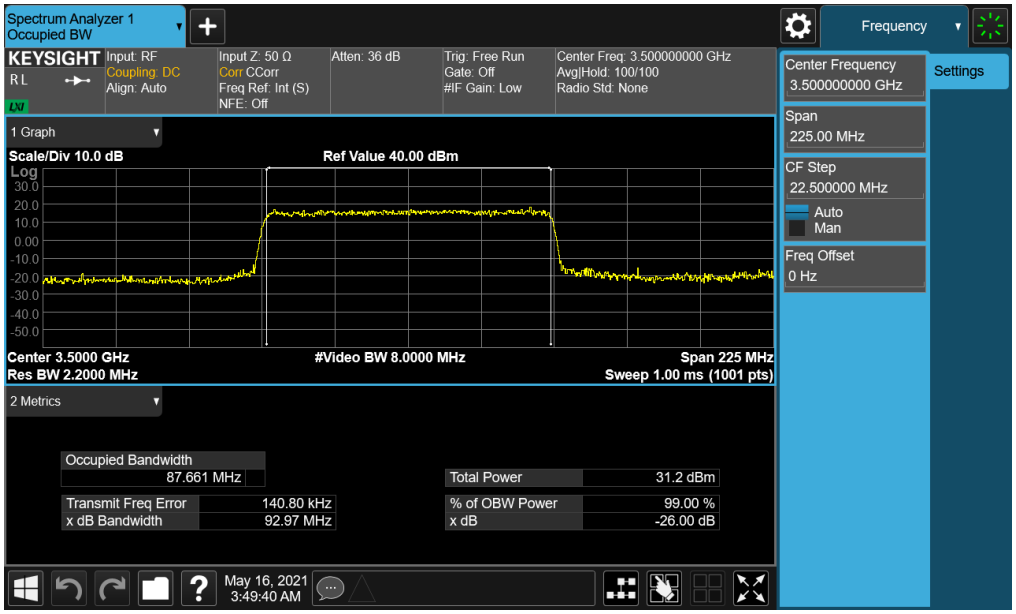


Plot 7-32. Occupied Bandwidth Plot (NR Band n77 PC2 - 90MHz CP-OFDM QPSK - Full RB)



Plot 7-33. Occupied Bandwidth Plot (NR Band n77 PC2 - 90MHz CP-OFDM 16-QAM - Full RB)

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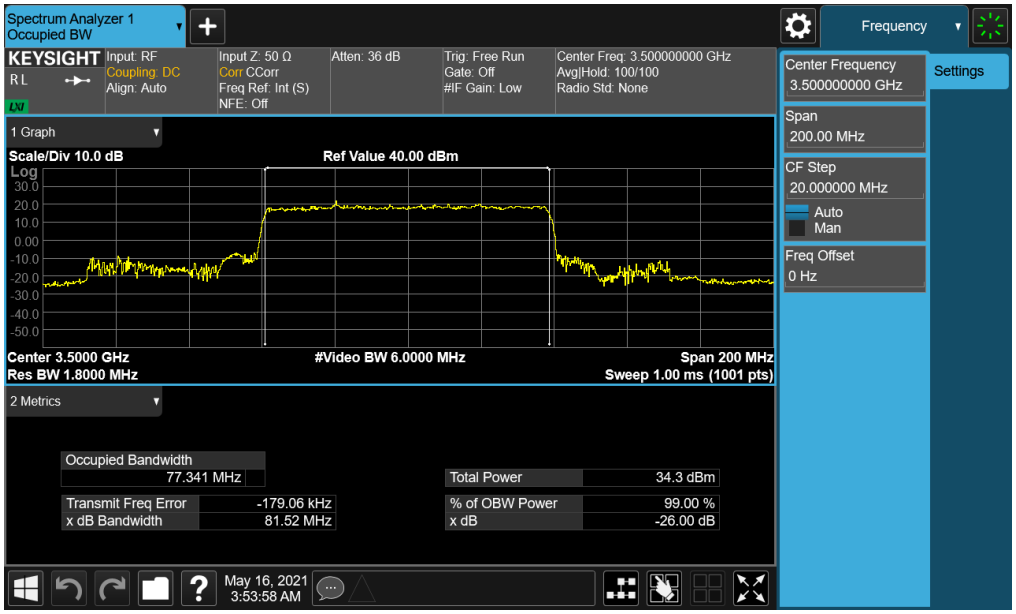
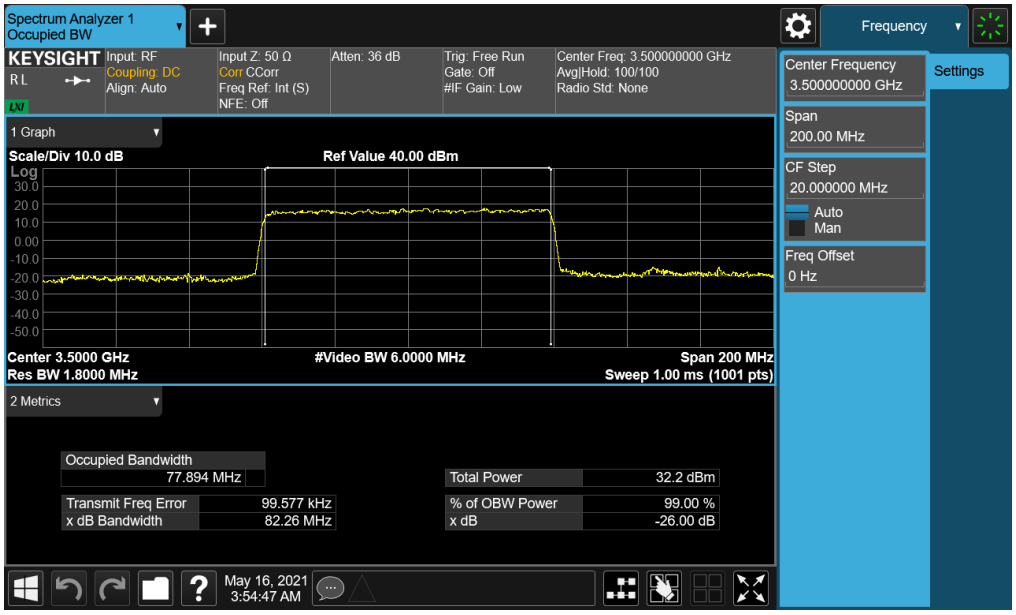


Plot 7-34. Occupied Bandwidth Plot (NR Band n77 PC2 - 80MHz π/2 BPSK - Full RB)



Plot 7-35. Occupied Bandwidth Plot (NR Band n77 PC2 - 80MHz CP-OFDM QPSK - Full RB)

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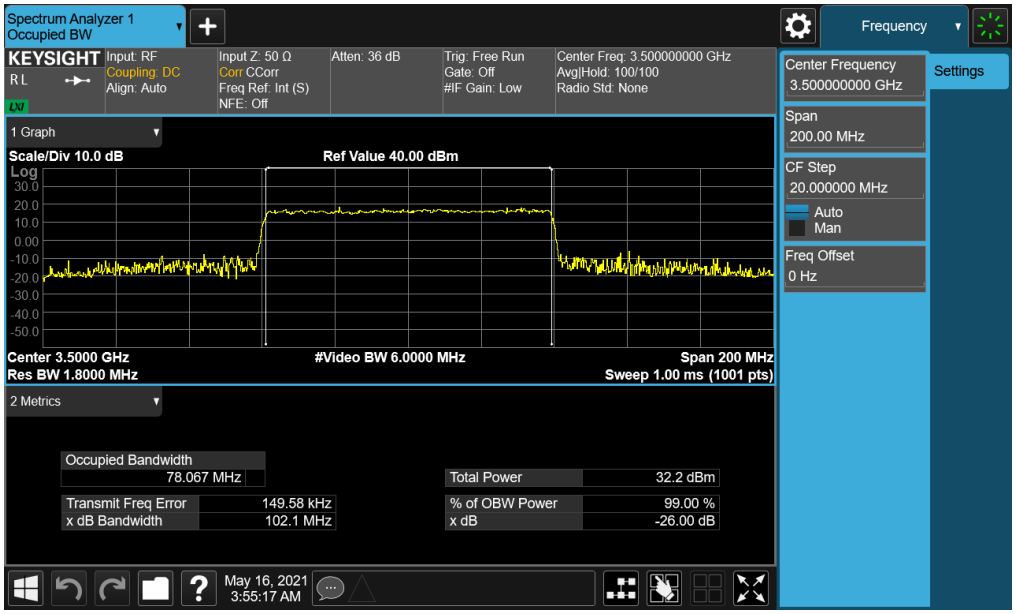

Plot 7-36. Occupied Bandwidth Plot (NR Band n77 PC2 - 80MHz CP-OFDM 16-QAM - Full RB)

Plot 7-37. Occupied Bandwidth Plot (NR Band n77 PC2 - 70MHz π/2 BPSK - Full RB)

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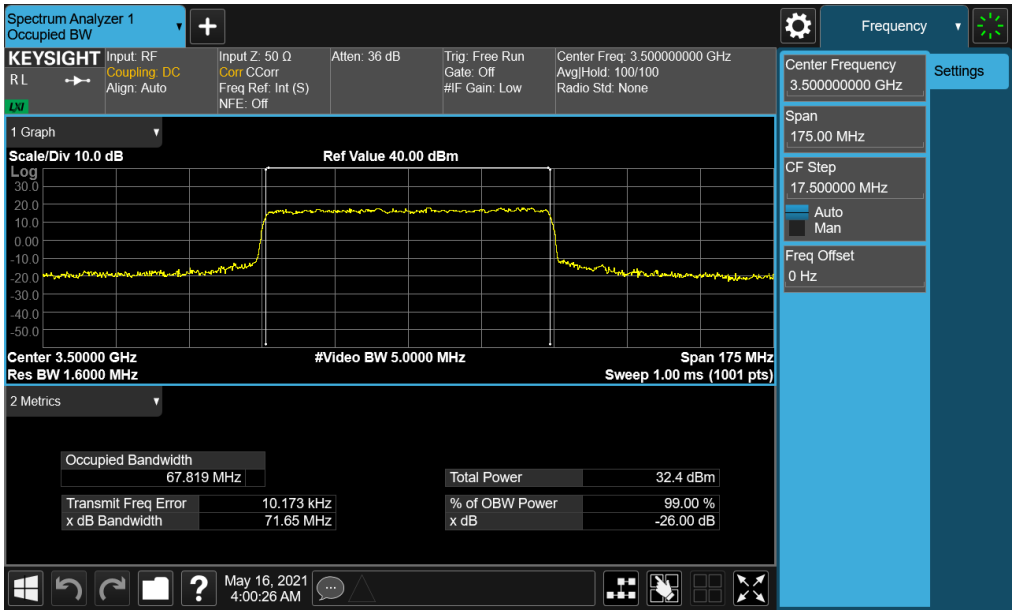
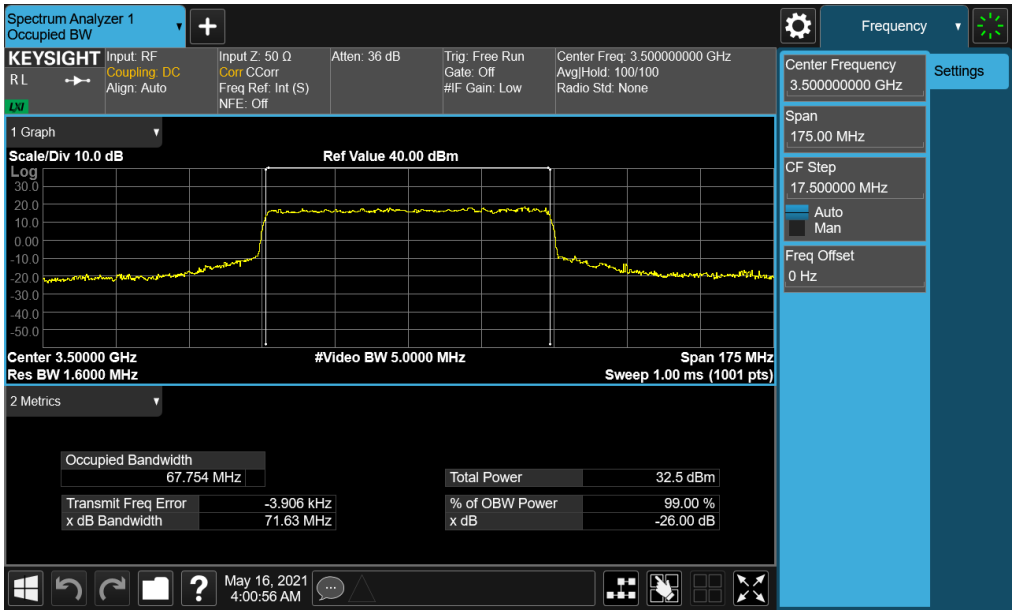


Plot 7-38. Occupied Bandwidth Plot (NR Band n77 PC2 - 70MHz CP-OFDM QPSK - Full RB)



Plot 7-39. Occupied Bandwidth Plot (NR Band n77 PC2 - 70MHz CP-OFDM 16-QAM - Full RB)

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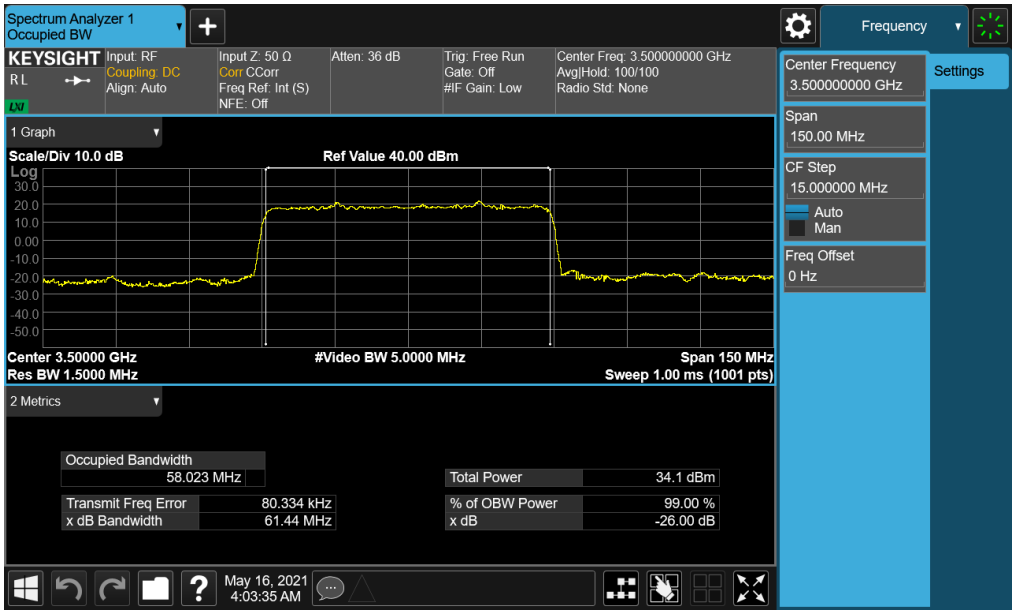
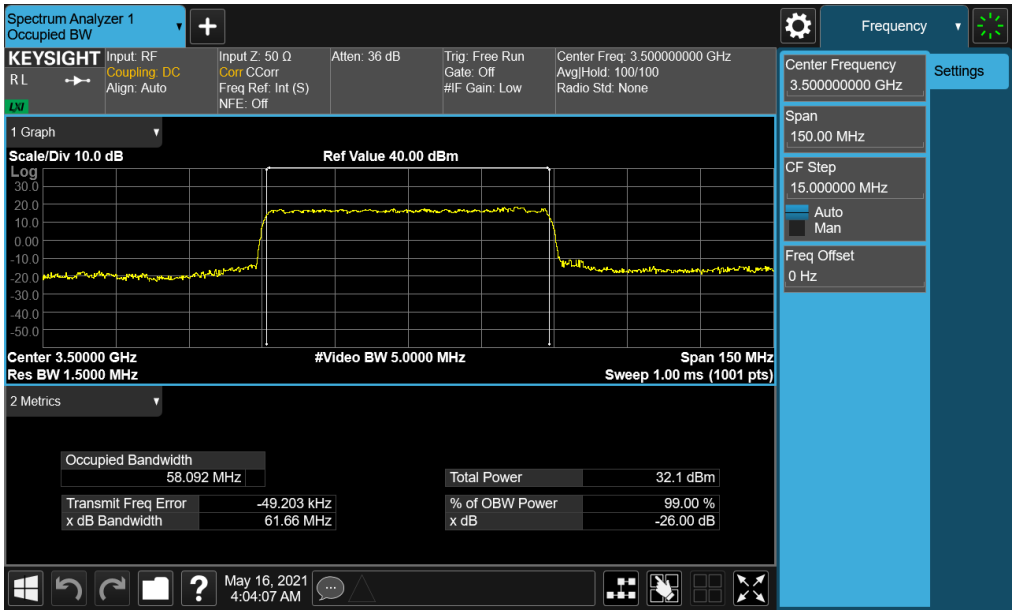


Plot 7-40. Occupied Bandwidth Plot (NR Band n77 PC2 - 60MHz π/2 BPSK - Full RB)



Plot 7-41. Occupied Bandwidth Plot (NR Band n77 PC2 - 60MHz CP-OFDM QPSK - Full RB)

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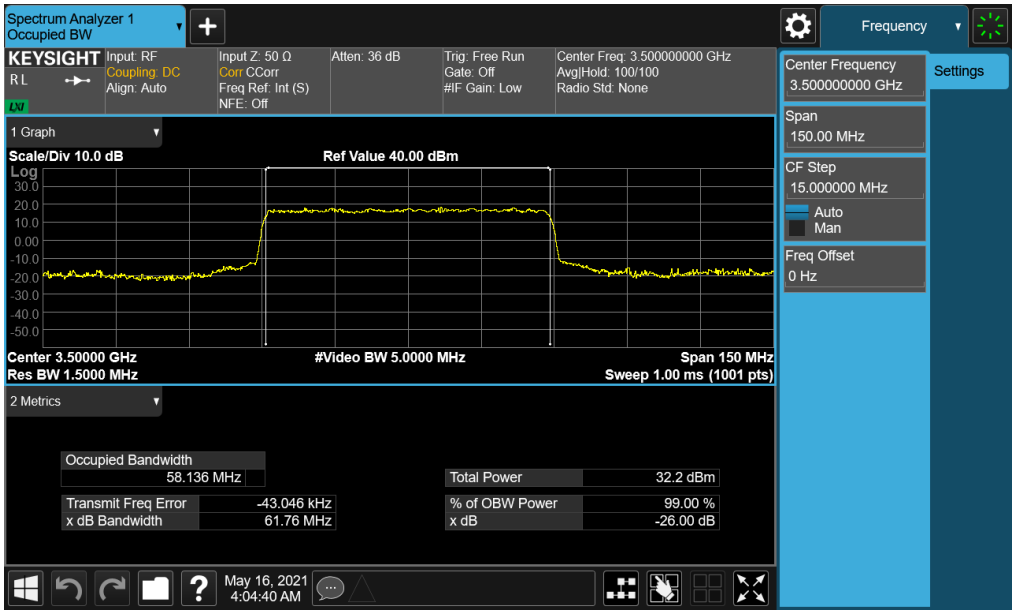

Plot 7-42. Occupied Bandwidth Plot (NR Band n77 PC2 - 60MHz CP-OFDM 16-QAM - Full RB)

Plot 7-43. Occupied Bandwidth Plot (NR Band n77 PC2 - 50MHz π/2 BPSK - Full RB)

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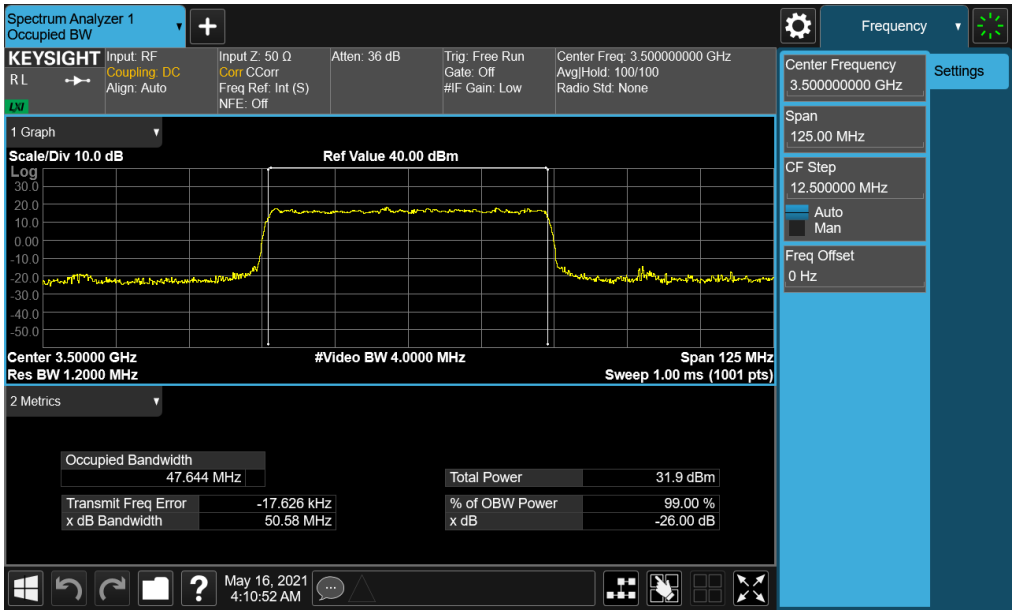
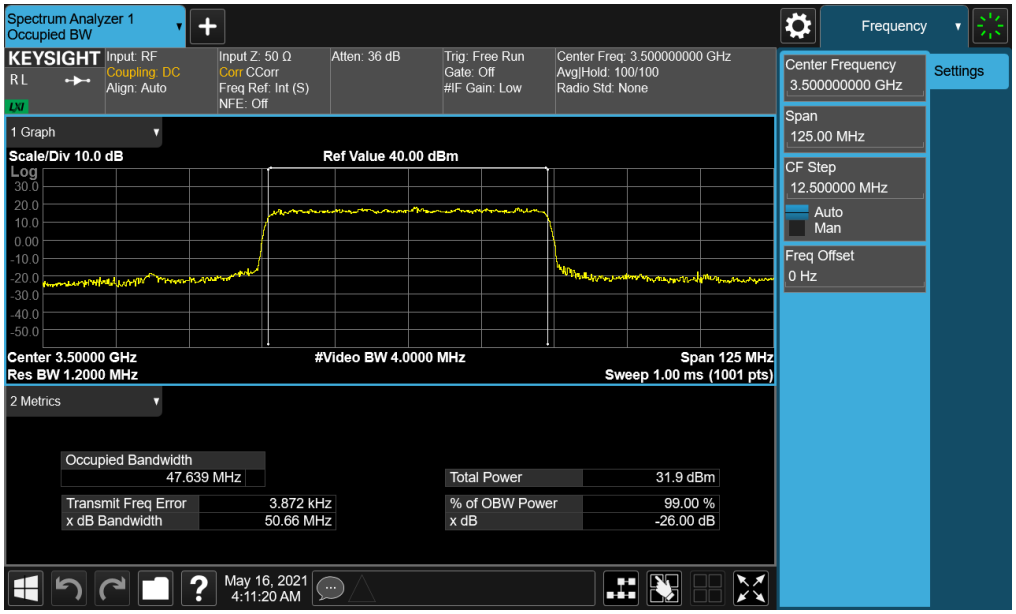


Plot 7-44. Occupied Bandwidth Plot (NR Band n77 PC2 - 50MHz CP-OFDM QPSK - Full RB)



Plot 7-45. Occupied Bandwidth Plot (NR Band n77 PC2 - 50MHz CP-OFDM 16-QAM - Full RB)

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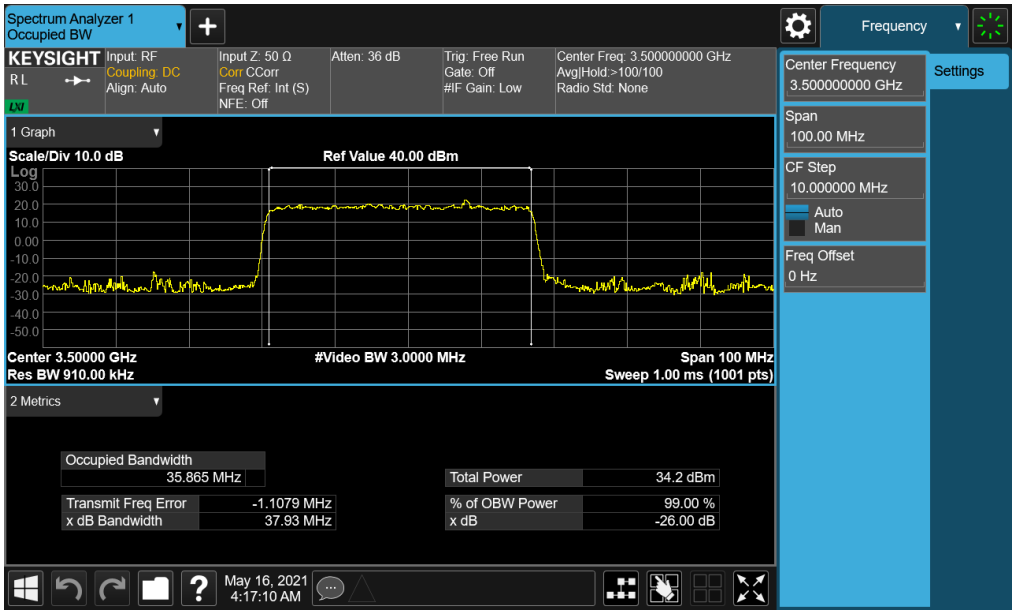
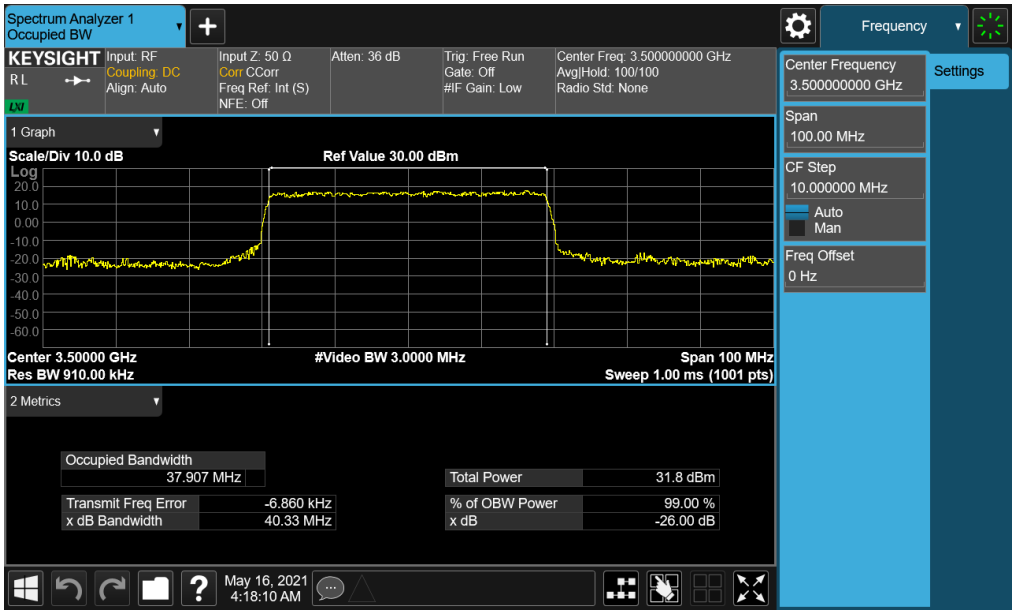


Plot 7-46. Occupied Bandwidth Plot (NR Band n77 PC2 - 40MHz π/2 BPSK - Full RB)



Plot 7-47. Occupied Bandwidth Plot (NR Band n77 PC2 - 40MHz CP-OFDM QPSK - Full RB)

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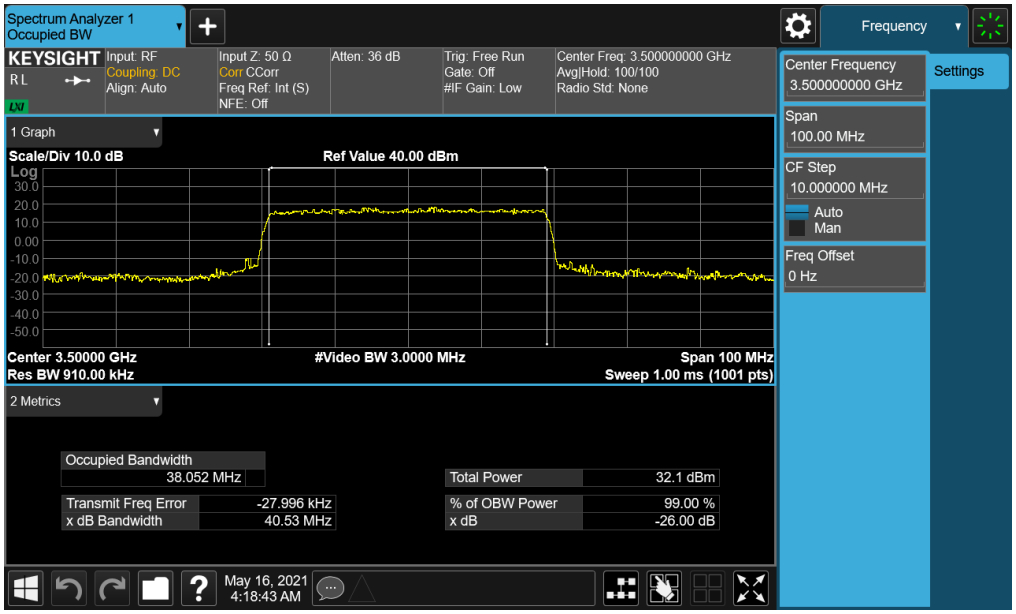
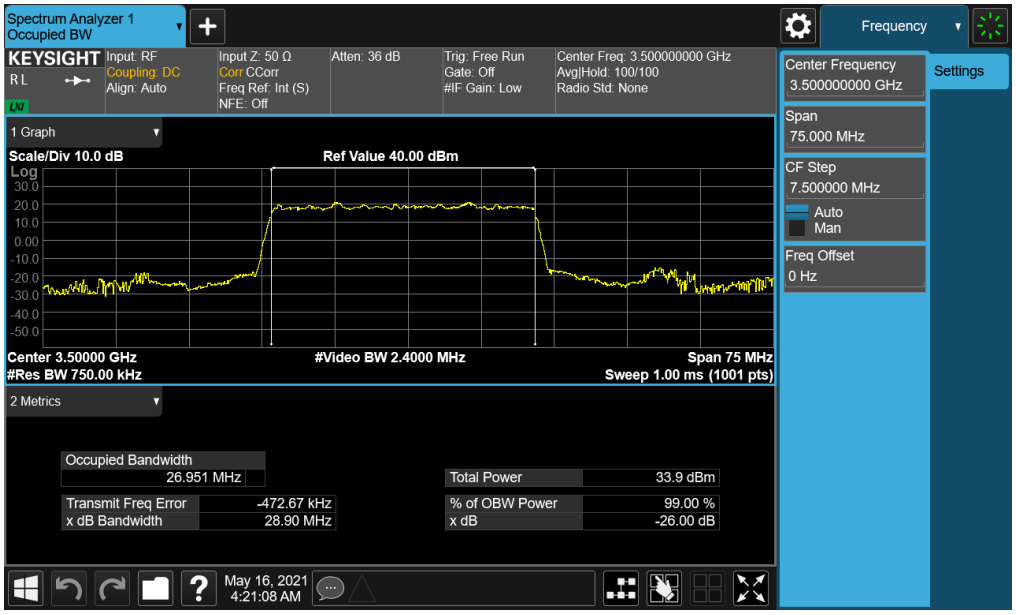


Plot 7-48. Occupied Bandwidth Plot (NR Band n77 PC2 - 40MHz CP-OFDM 16-QAM - Full RB)



Plot 7-49. Occupied Bandwidth Plot (NR Band n77 PC2 - 30MHz π/2 BPSK - Full RB)

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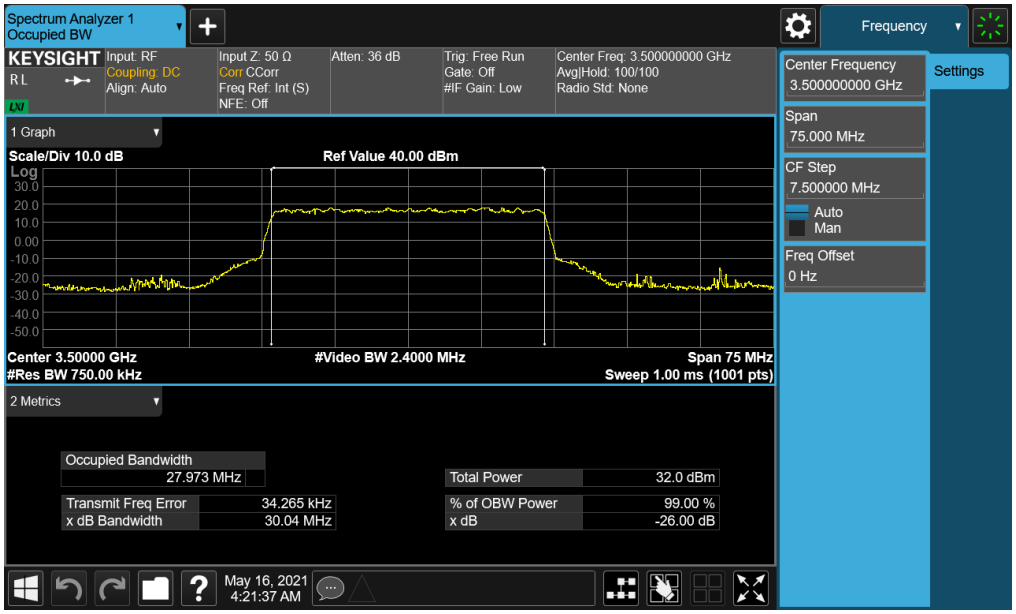
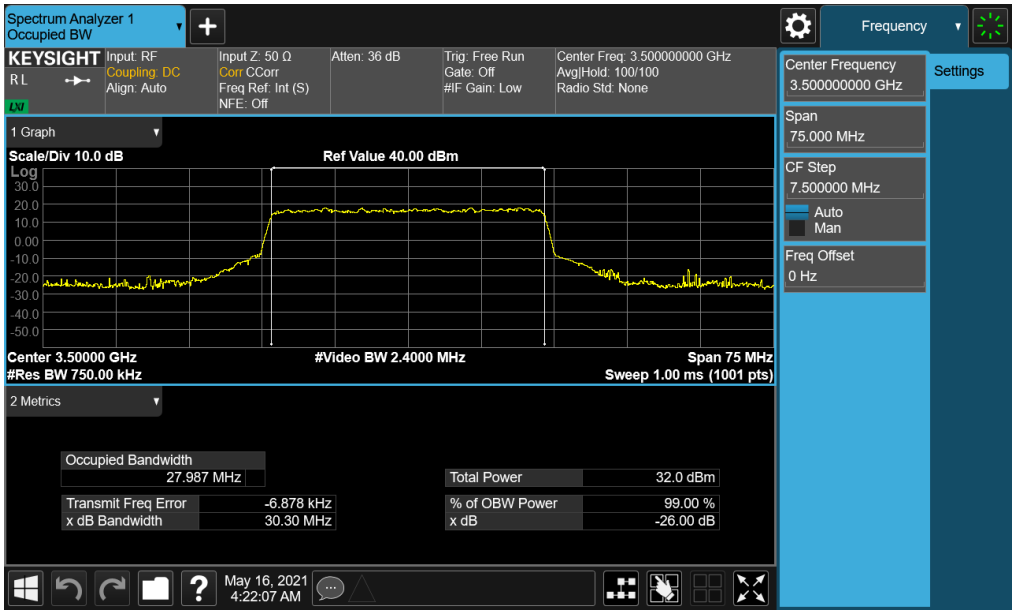


Plot 7-50. Occupied Bandwidth Plot (NR Band n77 PC2 - 30MHz CP-OFDM QPSK - Full RB)



Plot 7-51. Occupied Bandwidth Plot (NR Band n77 PC2 - 30MHz CP-OFDM 16-QAM - Full RB)

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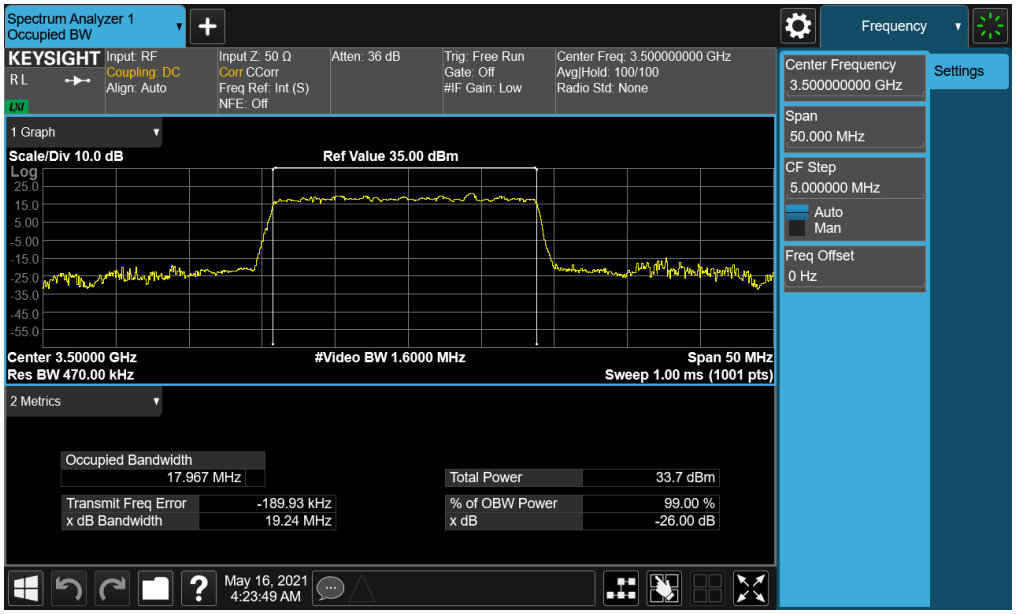

Plot 7-52. Occupied Bandwidth Plot (NR Band n77 PC2 - 20MHz π/2 BPSK - Full RB)

Plot 7-53. Occupied Bandwidth Plot (NR Band n77 PC2 - 20MHz CP-OFDM QPSK - Full RB)

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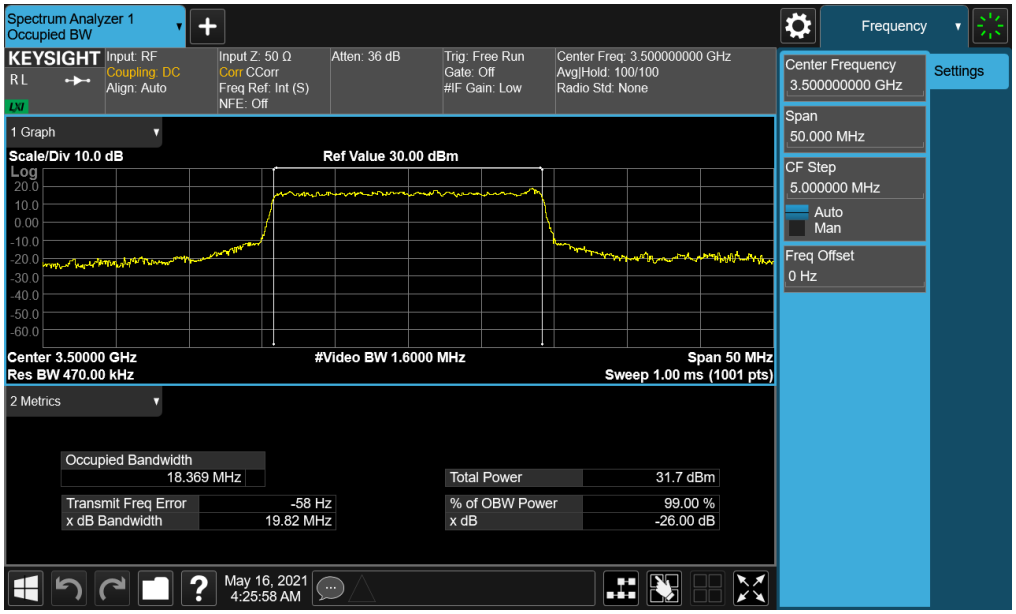

Plot 7-54. Occupied Bandwidth Plot (NR Band n77 PC2 - 20MHz CP-OFDM 16-QAM - Full RB)

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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 conducted power of any emission outside the licensee's authorized bandwidth shall not exceed −13 dBm/MHz.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 40GHz (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

Test Setup

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

Figure 7-3. Test Instrument & Measurement Setup

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Test Notes

1. For 3700-3980 MHz operation, per 27.53(l)(2), in the 1 MHz bands immediately outside and adjacent to the frequency block, a minimum resolution bandwidth of either one percent of the emission bandwidth of the fundamental emission of the transmitter or 350 kHz may be employed to demonstrate compliance with the out-of-band emissions limit. In the bands between 1 and 5 MHz removed from the frequency block, the minimum resolution bandwidth for the measurement shall be 500 kHz. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

2. For 3450-3550 MHz operation, per 27.53(n)(2), in the 1 MHz bands immediately outside and adjacent to the frequency block, a minimum resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter, but limited to a maximum of 200 kHz, may be employed to demonstrate compliance with the out-of-band emissions limit. In the bands between 1 and 5 MHz removed from the frequency block, the minimum resolution bandwidth for the measurement shall be 500 kHz. The emission bandwidth is defined as in Test Note #1 above.

3. 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 were determined to occur with the DFT-s-OFDM transmission scheme. These results from this worst case configuration are reported in this section.

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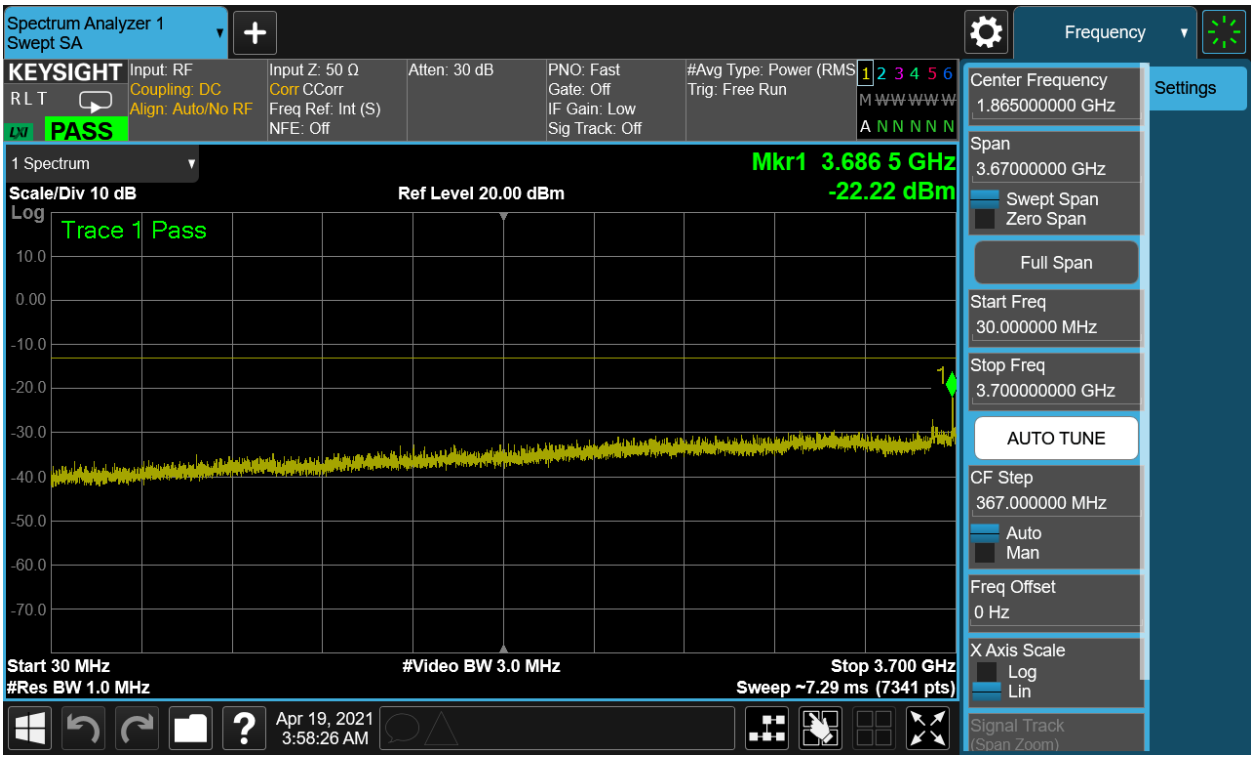
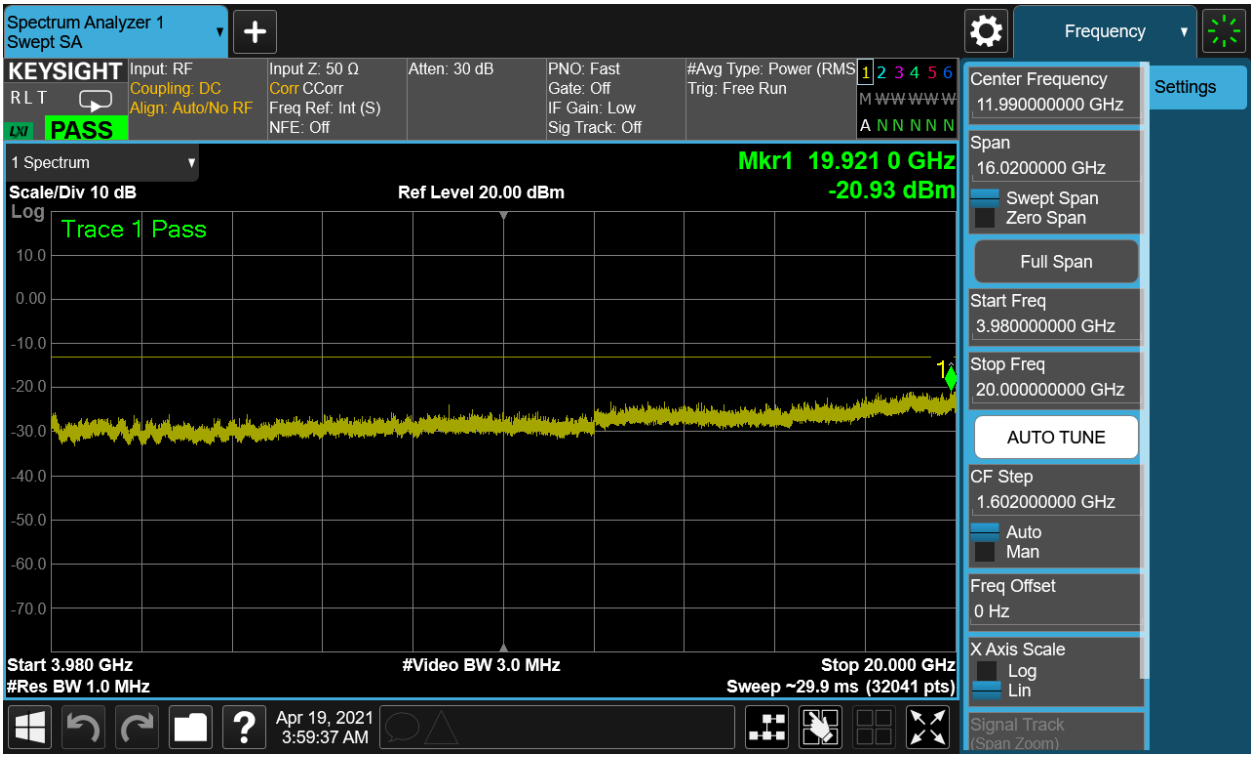
NR Band n77 (PC2) – C-Band – SRS-1



Plot 7-55. Conducted Spurious Plot (NR Band n77 PC2 - 100MHz DFT-s-OFDM π/2 BPSK - RB Size 1, RB Offset 136 - Low Channel)



Plot 7-56 Conducted Spurious Plot (NR Band n77 PC2 - 100MHz DFT-s-OFDM π/2 BPSK - RB Size 1, RB Offset 136 - Low Channel)

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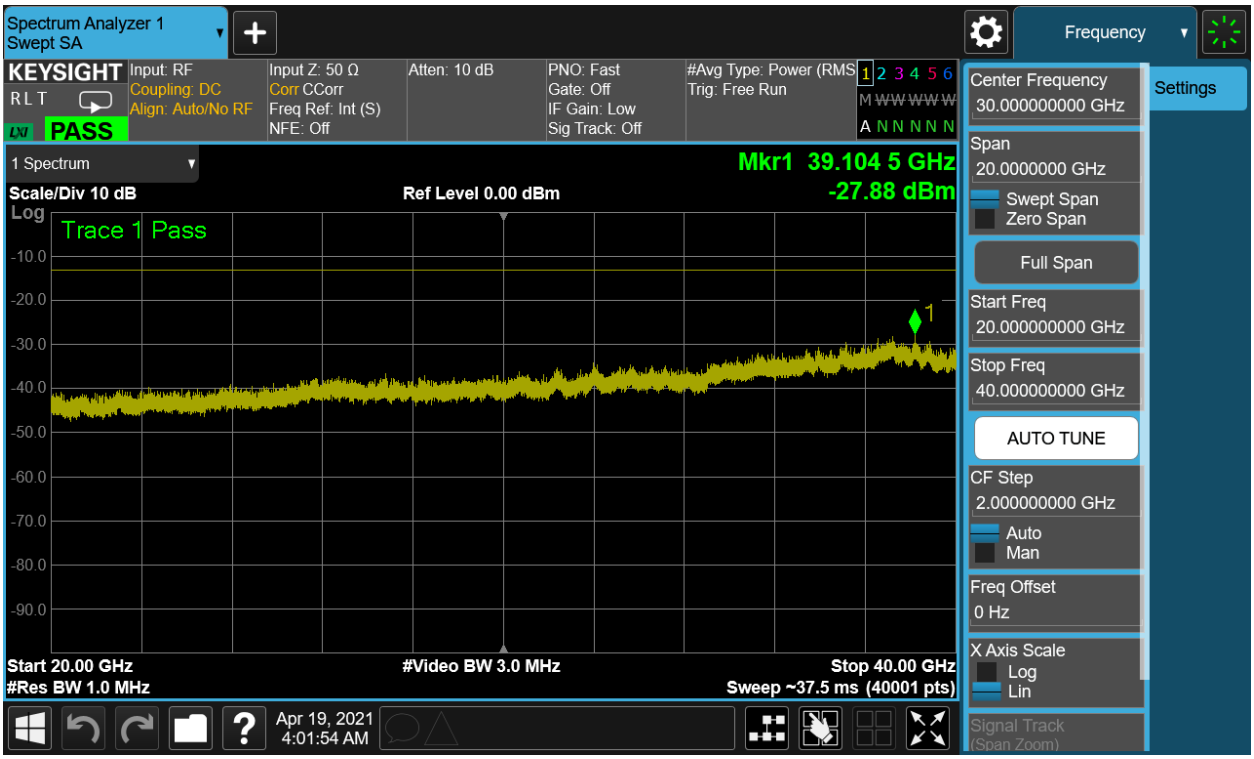
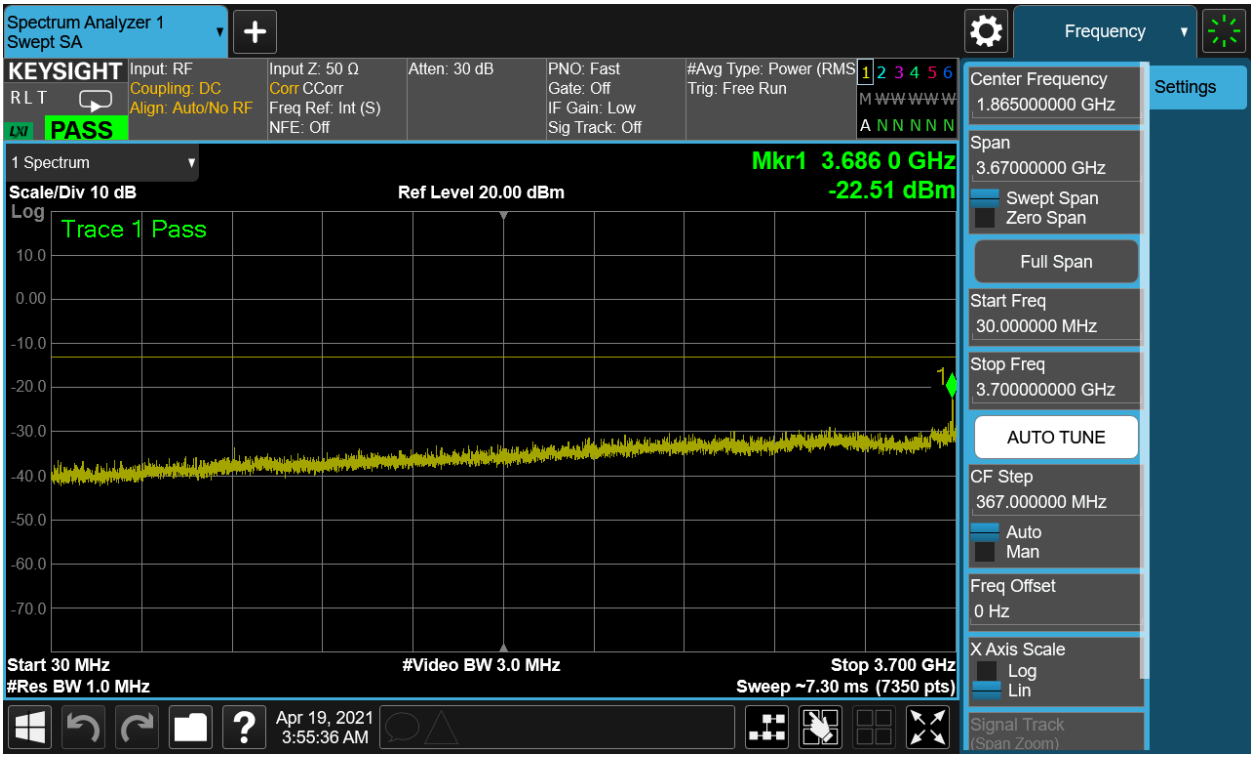


Plot 7-57 Conducted Spurious Plot (NR Band n77 PC2 - 100MHz DFT-s-OFDM π/2 BPSK - RB Size 1, RB Offset 136 - Low Channel)



Plot 7-58 Conducted Spurious Plot (NR Band n77 PC2 - 100MHz DFT-s-OFDM π/2 BPSK - RB Size 1, RB Offset 136 - Mid Channel)

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