

PART 27 MEASUREMENT REPORT**Applicant Name:**

Samsung Electronics Co., Ltd.
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Yeongtong-gu, Suwon-si
Gyeonggi-do, 16677, Korea

Date of Testing:

4/8/2022 - 6/23/2022

Test Report Issue Date:

6/28/2022

Test Site/Location:

Element Lab., Columbia, MD, USA

Test Report Serial No.:

1M2204080051-04.A3L

FCC ID:

A3LSMF721U

APPLICANT:

Samsung Electronics Co., Ltd.

Application Type:

Certification

Model:

SM-F721U

Additional Model(s):

SM-F721U1

EUT Type:

Portable Handset

FCC Classification:

PCS Licensed Transmitter Held to Ear (PCE)

FCC Rule Part:

27

Test Procedure(s):

ANSI C63.26-2015, KDB 648474 D03 v01r04

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

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



RJ Ortanez
Executive Vice President



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MEASUREMENT REPORT

FCC Part 27

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	ERP		EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	Max. Power [W]	Max. Power [dBm]	
LTE Band 71	20 MHz	QPSK	673.0 - 688.0	0.060	17.81	0.099	19.96	18M0G7D
		16QAM	673.0 - 688.0	0.049	16.87	0.080	19.02	17M9W7D
	15 MHz	QPSK	670.5 - 690.5	0.061	17.88	0.101	20.03	13M5G7D
		16QAM	670.5 - 690.5	0.049	16.92	0.081	19.07	13M5W7D
	10 MHz	QPSK	668.0 - 693.0	0.062	17.92	0.102	20.07	9M07G7D
		16QAM	668.0 - 693.0	0.049	16.92	0.081	19.07	9M03W7D
LTE Band 12	10 MHz	QPSK	704.0 - 711.0	0.064	18.04	0.104	20.19	9M02G7D
		16QAM	704.0 - 711.0	0.052	17.12	0.085	19.27	9M02W7D
	5 MHz	QPSK	701.5 - 713.5	0.065	18.10	0.106	20.25	4M53G7D
		16QAM	701.5 - 713.5	0.051	17.08	0.084	19.23	4M53W7D
	3 MHz	QPSK	700.5 - 714.5	0.065	18.12	0.106	20.27	2M72G7D
		16QAM	700.5 - 714.5	0.052	17.18	0.086	19.33	2M73W7D
LTE Band 13	10 MHz	QPSK	782.0	0.078	18.92	0.128	21.07	9M01G7D
		16QAM	782.0	0.063	17.97	0.103	20.12	9M00W7D
	5 MHz	QPSK	779.5 - 784.5	0.079	18.96	0.129	21.11	4M55G7D
		16QAM	779.5 - 784.5	0.064	18.08	0.105	20.23	4M54W7D

EUT Overview (LTE)

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
LTE Band 66/4	20 MHz	QPSK	1720.0 - 1770.0	0.259	24.13	18M1G7D
		16QAM	1720.0 - 1770.0	0.215	23.32	18M0W7D
	15 MHz	QPSK	1717.5 - 1772.5	0.257	24.10	13M6G7D
		16QAM	1717.5 - 1772.5	0.227	23.56	13M6W7D
	10 MHz	QPSK	1715.0 - 1775.0	0.265	24.23	9M06G7D
		16QAM	1715.0 - 1775.0	0.225	23.51	9M03W7D
	5 MHz	QPSK	1712.5 - 1777.5	0.269	24.29	4M54G7D
		16QAM	1712.5 - 1777.5	0.232	23.65	4M53W7D
	3 MHz	QPSK	1711.5 - 1778.5	0.268	24.28	2M73G7D
		16QAM	1711.5 - 1778.5	0.234	23.70	2M72W7D
	1.4 MHz	QPSK	1710.7 - 1779.3	0.273	24.35	1M11G7D
		16QAM	1710.7 - 1779.3	0.228	23.59	1M11W7D

EUT Overview (LTE)

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Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
WCDMA1700	N/A	Spread Spectrum	1712.4 - 1752.6	0.222	23.46	4M16F9W

EUT Overview (WCDMA)

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	ERP		EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	Max. Power [W]	Max. Power [dBm]	
NR Band n71	20 MHz	$\pi/2$ BPSK	673.0 - 688.0	0.055	17.44	0.091	19.59	17M9G7D
		QPSK	673.0 - 688.0	0.053	17.23	0.087	19.38	18M9G7D
		16QAM	673.0 - 688.0	0.044	16.41	0.072	18.56	19M0W7D
	15 MHz	$\pi/2$ BPSK	670.5 - 690.5	0.056	17.46	0.091	19.61	13M5G7D
		QPSK	670.5 - 690.5	0.052	17.18	0.086	19.33	14M2G7D
		16QAM	670.5 - 690.5	0.044	16.47	0.073	18.62	14M1W7D
	10 MHz	$\pi/2$ BPSK	668.0 - 693.0	0.057	17.54	0.093	19.69	9M00G7D
		QPSK	668.0 - 693.0	0.052	17.18	0.086	19.33	9M34G7D
		16QAM	668.0 - 693.0	0.045	16.54	0.074	18.69	9M34W7D
	5 MHz	$\pi/2$ BPSK	665.5 - 695.5	0.056	17.46	0.091	19.61	4M53G7D
		QPSK	665.5 - 695.5	0.054	17.29	0.088	19.44	4M53G7D
		16QAM	665.5 - 695.5	0.046	16.64	0.076	18.79	4M51W7D
NR Band n12	15 MHz	$\pi/2$ BPSK	706.5 - 708.5	0.058	17.66	0.096	19.81	13M5G7D
		QPSK	706.5 - 708.5	0.059	17.69	0.096	19.84	14M2G7D
		16QAM	706.5 - 708.5	0.047	16.75	0.078	18.90	14M1W7D
	10 MHz	$\pi/2$ BPSK	704.0 - 711.0	0.059	17.69	0.096	19.84	8M99G7D
		QPSK	704.0 - 711.0	0.059	17.68	0.096	19.83	9M32G7D
		16QAM	704.0 - 711.0	0.047	16.77	0.078	18.92	9M32W7D
	5 MHz	$\pi/2$ BPSK	701.5 - 713.5	0.058	17.64	0.095	19.79	4M54G7D
		QPSK	701.5 - 713.5	0.059	17.70	0.097	19.85	4M53G7D
		16QAM	701.5 - 713.5	0.046	16.65	0.076	18.80	4M52W7D

Overview Table (NR Bands)

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Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
NR Band n66	40 MHz	$\pi/2$ BPSK	1730.0 - 1760.0	0.188	22.74	38M7G7D
		QPSK	1730.0 - 1760.0	0.189	22.77	38M8G7D
		16QAM	1730.0 - 1760.0	0.156	21.92	38M8W7D
	30 MHz	$\pi/2$ BPSK	1725.0 - 1765.0	0.223	23.48	28M8G7D
		QPSK	1725.0 - 1765.0	0.211	23.24	28M8G7D
		16QAM	1725.0 - 1765.0	0.183	22.63	28M7W7D
	20 MHz	$\pi/2$ BPSK	1720.0 - 1770.0	0.212	23.27	18M0G7D
		QPSK	1720.0 - 1770.0	0.203	23.07	19M0G7D
		16QAM	1720.0 - 1770.0	0.181	22.57	19M1W7D
	15 MHz	$\pi/2$ BPSK	1717.5 - 1772.5	0.219	23.40	13M5G7D
		QPSK	1717.5 - 1772.5	0.211	23.24	14M2G7D
		16QAM	1717.5 - 1772.5	0.178	22.50	14M2W7D
	10 MHz	$\pi/2$ BPSK	1715.0 - 1775.0	0.209	23.21	9M02G7D
		QPSK	1715.0 - 1775.0	0.191	22.82	9M36G7D
		16QAM	1715.0 - 1775.0	0.177	22.48	9M35W7D
	5 MHz	$\pi/2$ BPSK	1712.5 - 1777.5	0.196	22.92	4M54G7D
		QPSK	1712.5 - 1777.5	0.190	22.79	4M54G7D
		16QAM	1712.5 - 1777.5	0.173	22.37	4M51W7D

Overview Table (NR Band n66 ANT A)

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
NR Band n66	40 MHz	$\pi/2$ BPSK	1730.0 - 1760.0	0.035	15.41	38M8G7D
		QPSK	1730.0 - 1760.0	0.036	15.54	38M8G7D
		16QAM	1730.0 - 1760.0	0.034	15.29	38M8W7D
	30 MHz	$\pi/2$ BPSK	1725.0 - 1765.0	0.035	15.46	28M8G7D
		QPSK	1725.0 - 1765.0	0.036	15.59	28M7G7D
		16QAM	1725.0 - 1765.0	0.033	15.23	28M7W7D
	20 MHz	$\pi/2$ BPSK	1720.0 - 1770.0	0.035	15.49	18M0G7D
		QPSK	1720.0 - 1770.0	0.036	15.62	19M0G7D
		16QAM	1720.0 - 1770.0	0.033	15.15	19M1W7D
	15 MHz	$\pi/2$ BPSK	1717.5 - 1772.5	0.035	15.45	13M5G7D
		QPSK	1717.5 - 1772.5	0.036	15.53	14M2G7D
		16QAM	1717.5 - 1772.5	0.032	15.03	14M2W7D
	10 MHz	$\pi/2$ BPSK	1715.0 - 1775.0	0.034	15.28	9M04G7D
		QPSK	1715.0 - 1775.0	0.035	15.45	9M36G7D
		16QAM	1715.0 - 1775.0	0.030	14.83	9M36W7D
	5 MHz	$\pi/2$ BPSK	1712.5 - 1777.5	0.034	15.31	4M55G7D
		QPSK	1712.5 - 1777.5	0.035	15.48	4M53G7D
		16QAM	1712.5 - 1777.5	0.031	14.93	4M51W7D

Overview Table (NR Band n66 ANT I)

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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 Element Test Location

These measurement tests were conducted at the Element laboratory 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 Element lab located in Columbia, MD 21046, U.S.A.

- Element Washington DC LLC is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- Element Washington DC LLC TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).
- Element Washington DC LLC facility is a registered (2451B) test laboratory with the site description on file with ISED.
- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreement.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMF721U**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitters that operate under the provisions of Part 27.

Test Device Serial No.: 0834M, 0860M, 1150M, 0294M, 0904M, 1134M, 1159M, 0209M, 0665M, 1122M, 0270M, 0670M, 0660M, 0672M

2.2 Device Capabilities

This device contains the following capabilities:

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

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

2.3 Test Configuration

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

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

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

2.4 Software and Firmware

Testing was performed on device(s) using software/firmware version F721USQU0AVED installed on the EUT.

2.5 EMI Suppression Device(s)/Modifications

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

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the “American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services” (ANSI C63.26-2015) were used in the measurement of the EUT.

Deviation from Measurement Procedure.....None

3.2 Radiated Power and Radiated Spurious Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. For measurements below 1GHz, the absorbers are removed. A raised turntable is used for radiated measurement. The turn table is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm tall test table made of Styrodur is placed on top of the turn table. A Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

The equipment under test was transmitting while connected to its integral antenna and is placed on a turntable 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer.

For radiated power measurements, substitution method is used per the guidance of ANSI C63.26-2015. For emissions below 1GHz, a half-wave dipole is substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

$$P_d [dBm] = P_g [dBm] - \text{cable loss} [dB] + \text{antenna gain} [dBd/dBi];$$

where P_d is the dipole equivalent power, P_g is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_g [dBm] - \text{cable loss} [dB]$.

For radiated spurious emissions measurements, the field strength conversion method is used per the formulas in Section 5.2.7 of ANSI C63.26-2015. Field Strength (EIRP) is calculated using the following formulas:

$$E_{[dB\mu V/m]} = \text{Measured amplitude level}_{[dBm]} + 107 + \text{Cable Loss}_{[dB]} + \text{Antenna Factor}_{[dB/m]}$$

And

$$\text{EIRP}_{[dBm]} = E_{[dB\mu V/m]} + 20\log D - 104.8; \text{ where } D \text{ is the measurement distance in meters.}$$

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 414788 D01 v01r01.

Radiated power and radiated spurious emission levels are investigated with the receive antenna horizontally and vertically polarized per ANSI C63.26-2015.

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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 (\pm 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	EMC Cable and Switch System	1/4/2022	Annual	1/4/2023	AP2
-	AP1	EMC Cable and Switch System	12/12/2021	Annual	12/12/2022	AP1
-	ETS	EMC Cable and Switch System	12/9/2021	Annual	12/9/2022	ETS
-	LTx4	Licensed Transmitter Cable Set	12/19/2021	Annual	12/19/2022	LTx4
-	LTx5	Licensed Transmitter Cable Set	12/19/2021	Annual	12/19/2022	LTx5
Anritsu	MT8821C	Radio Communication Analyzer	N/A			6201525694
Emco	3115	Horn Antenna (1-18GHz)	6/18/2020	Biennial	6/18/2022	9704-5182
Emco	3116	Horn Antenna (18 - 40GHz)	7/20/2021	Biennial	7/20/2023	9203-2178
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	4/20/2021	Biennial	4/20/2023	00125518
Keysight Technologies	N9020A	MXA Signal Analyzer	3/15/2022	Annual	3/15/2023	MY54500644
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	7/21/2021	Annual	7/21/2022	MY49430494
Keysight Technologies	N9038A	MXE EMI Receiver	1/21/2022	Annual	1/21/2023	MY51210133
Keysight Technologies	E7515B	UXM 5G Wireless Test Platform	1/12/2022	Annual	1/12/2023	MY59150289
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			112347
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	8/3/2021	Annual	8/3/2022	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	5/25/2021	Annual	5/25/2022	100348
Rohde & Schwarz	ESW44	EMI Test Receiver 2Hz to 44 GHz	3/28/2022	Annual	3/28/2023	101716
Rohde & Schwarz	FSW26	2Hz-26.5GHz Signal and Spectrum Analyzer	4/14/2022	Annual	4/14/2023	103187
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	7/27/2020	Biennial	7/27/2022	A051107

Table 5-1. Test Equipment

Notes:

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

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 analyzer. 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).

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7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.
 FCC ID: A3LSMF721U
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
 Mode(s): WCDMA/LTE/NR

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Transmitter Conducted Output Power*	2.1046(a), 2.1046(c)	N/A	PASS	Section 7.2
	Occupied Bandwidth	2.1049(h)	N/A	PASS	Section 7.3
	Conducted Band Edge / Spurious Emissions (LTE Band 13)	2.1051, 27.53(c), 27.53(f)	Undesirable emissions must meet the limits detailed in sections 27.53(c) and 27.53(f)	PASS	Sections 7.4, 7.5
	Conducted Band Edge / Spurious Emissions (LTE Band 12, 17, 71; NR Band n12, n71)	2.1051, 27.53(g)	$\geq 43 + 10 \log (P[\text{Watts}])$ dB of attenuation below transmitter power	PASS	Sections 7.4, 7.5
	Conducted Band Edge / Spurious Emissions (WCDMA AWS; LTE Band 4, 66; NR Band n66)	2.1051, 27.53(h)	$\geq 43 + 10 \log (P[\text{Watts}])$ dB of attenuation below transmitter power	PASS	Sections 7.4, 7.5
	Peak-to-Average Ratio (WCDMA AWS; LTE Band 4, 66; NR Band n66)	27.50(d)(5)	≤ 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 (LTE Band 13)	27.50(b)(10)	≤ 3 Watts max. ERP	PASS	Section 7.7
	Effective Radiated Power (LTE Band 12, 17, 71; NR Band n12, n71)	27.50(c)(10)	≤ 3 Watts max. ERP	PASS	Section 7.7
	Equivalent Isotropic Radiated Power (WCDMA AWS; LTE Band 4, 66; NR Band n66)	27.50(d)(4)	≤ 1 Watt max. EIRP	PASS	Section 7.7
	Radiated Spurious Emissions (LTE Band 13)	2.1053, 27.53(c), 27.53(f)	Undesirable emissions must meet the limits detailed in sections 27.53(c) and 27.53(f)	PASS	Section 7.8
	Radiated Spurious Emissions (LTE Band 12, 17, 71; NR Band n12, n71)	2.1053, 27.53(g)	$\geq 43 + 10 \log (P[\text{Watts}])$ dB of attenuation below transmitter power	PASS	Section 7.8
	Radiated Spurious Emissions (WCDMA AWS; LTE Band 4, 66; NR Band n66)	2.1053, 27.53(h)(1)	$\geq 43 + 10 \log (P[\text{Watts}])$ dB of attenuation below transmitter power	PASS	Section 7.8

* The only transmitter output conducted powers included in this report are those where the Pmax value, per the tune-up document, is higher than any of the DSI power levels. For the remaining conducted power measurements, see the **RF Exposure Report**.

Notes:

- 1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots shown in Section 7.0 were taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
- 4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is EMC Software Tool v1.0.

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7.2 Conducted Output Power Data

Test Overview

All emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst-case configuration. All modes of operation were investigated and the worst-case configuration results are reported in this section.

Test Procedure Used

ANSI C63.26-2015 – Section 5.2

Test Settings

1. Detector = RMS
2. Trace mode = trace average for continuous emissions, max hold for pulse emissions
3. Sweep time = auto couple
4. The trace was allowed to stabilize
5. Please see test notes below for RBW and VBW settings

Test Setup

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

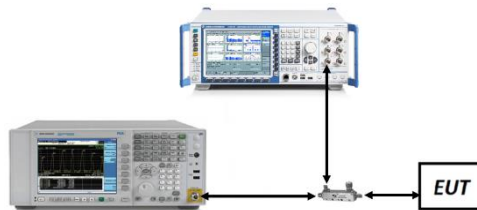


Figure 7-1. Test Instrument & Measurement Setup

Test Notes

1. Conducted power measurements were evaluated using various combinations of RB size, RB offset, modulation, and channel bandwidth. Channel bandwidth data is shown in the tables below based only on the channel bandwidths that were supported in this device.
2. All other conducted power measurements are contained in the RF exposure report for this filing.

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Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
40 MHz	$\pi/2$ BPSK	346000	1730.0	1 / 161	23.79
		349000	1745.0	1 / 108	23.95
		352000	1760.0	1 / 108	23.73
	QPSK	346000	1730.0	1 / 161	23.78
		349000	1745.0	1 / 108	23.74
		352000	1760.0	1 / 54	23.75
	16-QAM	346000	1730.0	1 / 161	23.08
30 MHz	$\pi/2$ BPSK	345000	1725.0	1 / 119	23.84
		349000	1745.0	1 / 80	23.74
		353000	1765.0	1 / 80	23.71
	QPSK	345000	1725.0	1 / 119	23.82
		349000	1745.0	1 / 80	23.78
		353000	1765.0	1 / 80	23.74
	16-QAM	345000	1725.0	1 / 119	23.02
20 MHz	$\pi/2$ BPSK	344000	1720.0	1 / 79	23.86
		349000	1745.0	1 / 79	23.69
		354000	1770.0	1 / 26	23.66
	QPSK	344000	1720.0	1 / 79	23.85
		349000	1745.0	1 / 79	23.75
		354000	1770.0	1 / 26	23.64
	16-QAM	344000	1720.0	1 / 79	22.94
15 MHz	$\pi/2$ BPSK	343500	1717.5	1 / 58	23.83
		349000	1745.0	1 / 58	23.77
		354500	1772.5	1 / 20	23.81
	QPSK	343500	1717.5	1 / 58	23.76
		349000	1745.0	1 / 58	23.89
		354500	1772.5	1 / 20	23.69
	16-QAM	343500	1717.5	1 / 58	22.82
10 MHz	$\pi/2$ BPSK	343000	1715.0	1 / 26	23.66
		349000	1745.0	1 / 13	23.68
		355000	1775.0	1 / 13	23.54
	QPSK	343000	1715.0	1 / 26	23.68
		349000	1745.0	1 / 13	23.56
		355000	1775.0	1 / 13	23.59
	16-QAM	343000	1715.0	1 / 26	22.62
5 MHz	$\pi/2$ BPSK	342500	1712.5	1 / 18	23.69
		349000	1745.0	1 / 6	23.59
		355500	1777.5	1 / 18	23.51
	QPSK	342500	1712.5	1 / 18	23.71
		349000	1745.0	1 / 6	23.53
		355500	1777.5	1 / 18	23.48
	16-QAM	342500	1712.5	1 / 18	22.72

Table 7-1. Conducted Power Data (NR Band 66 – Ant I)

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Power State	Band	Bandwidth (PCC + SCC)	PCC					SCC					ULCA Tx. Power [dBm]
			Modulation	UL Channel	UL Frequency	UL # RB	UL RB Offset	Modulation	UL Channel	UL Frequency	UL # RB	UL RB Offset	
Max	LTE B66	20MHz + 20MHz	QPSK	132072	1720.0	1	99	QPSK	132270	1739.8	1	0	24.37
				132322	1745.0	1	99		132520	1764.8	1	0	24.38
				132572	1770.0	1	0		132374	1750.2	1	99	24.31
			QPSK	132322	1745	100	0	QPSK	132520	1764.8	100	0	22.93
			16-QAM	132322	1745	100	0	16-QAM	132520	1764.8	100	0	22.18
			64-QAM	132322	1745	100	0	64-QAM	132520	1764.8	100	0	21.35
			256-QAM	132322	1745	100	0	256-QAM	132520	1764.8	100	0	19.48

Table 7-2. Conducted Power Data (ULCA Band 66)

NR (SCS 15kHz)						LTE						NR Conducted Power [dBm]	LTE Conducted Power [dBm]	EN-DC Total Tx. Power [dBm]
NR Band	NR Bandwidth [MHz]	NR Channel	NR Frequency [MHz]	Mod.	NR RB#/Offset	LTE Band	LTE Bandwidth [MHz]	LTE Channel	LTE Frequency [MHz]	Mod.	LTE RB#/Offset			
n71	20	Mid	680.5	QPSK	100/0	66	20	Mid	1745	QPSK	100/0	23.48	21.07	25.45
				QPSK	100/0					QPSK	1/50	22.35	22.51	25.44
				QPSK	1/53					QPSK	100/0	23.52	21.14	25.50
				QPSK	1/53					QPSK	1/50	22.41	22.52	25.48
				16Q	1/53					16Q	100/0	23.38	21.15	25.42

Table 7-3. EN-DC Conducted Power Data (EN-DC: NR Band n71 – LTE Band 66)

NR (SCS 15kHz)						LTE						NR Conducted Power [dBm]	LTE Conducted Power [dBm]	EN-DC Total Tx. Power [dBm]
NR Band	NR Bandwidth [MHz]	NR Channel	NR Frequency [MHz]	Mod.	NR RB#/Offset	LTE Band	LTE Bandwidth [MHz]	LTE Channel	LTE Frequency [MHz]	Mod.	LTE RB#/Offset			
n71	20	Mid	680.5	QPSK	100/0	48	20	Mid	3625	QPSK	100/0	23.44	22.09	25.83
				QPSK	100/0					QPSK	1/50	22.37	22.89	25.65
				QPSK	1/53					QPSK	100/0	23.32	22.06	25.75
				QPSK	1/53					QPSK	1/50	23.10	22.37	25.76
				16Q	100/0					16Q	100/0	22.51	21.50	25.04

Table 7-4. EN-DC Conducted Power Data (EN-DC: NR Band n71 – LTE Band 48)

NR (SCS 15kHz)						LTE						NR Conducted Power [dBm]	LTE Conducted Power [dBm]	EN-DC Total Tx. Power [dBm]
NR Band	NR Bandwidth [MHz]	NR Channel	NR Frequency [MHz]	Mod.	NR RB#/Offset	LTE Band	LTE Bandwidth [MHz]	LTE Channel	LTE Frequency [MHz]	Mod.	LTE RB#/Offset			
n12	15	Mid	707.5	QPSK	75/0	66	20	Mid	1745	QPSK	100/0	20.79	21.28	24.05
				QPSK	75/0					QPSK	1/50	17.43	22.52	23.69
				QPSK	1/39					QPSK	100/0	20.61	21.15	23.90
				QPSK	1/39					QPSK	1/50	17.53	22.51	23.71
				16Q	75/0					16Q	100/0	20.82	21.05	23.95

Table 7-5. EN-DC Conducted Power Data (EN-DC: NR Band n12 – LTE Band 66)

NR (SCS 15kHz)						LTE						NR Conducted Power [dBm]	LTE Conducted Power [dBm]	EN-DC Total Tx. Power [dBm]
NR Band	NR Bandwidth [MHz]	NR Channel	NR Frequency [MHz]	Mod.	NR RB#/Offset	LTE Band	LTE Bandwidth [MHz]	LTE Channel	LTE Frequency [MHz]	Mod.	LTE RB#/Offset			
n12	15	Mid	707.5	QPSK	75/0	B48	20	Mid	3625	QPSK	100/0	23.41	22.37	25.93
				QPSK	75/0					QPSK	1/50	22.89	22.46	25.69
				QPSK	1/39					QPSK	100/0	23.48	21.59	25.65
				QPSK	1/39					QPSK	1/50	23.37	22.36	25.90
				16Q	75/0					16Q	100/0	21.85	20.76	24.35

Table 7-6. EN-DC Conducted Power Data (EN-DC: NR Band n12 – LTE Band 48)

NR (SCS 15kHz)						LTE						NR Conducted Power [dBm]	LTE Conducted Power [dBm]	EN-DC Total Tx. Power [dBm]
NR Band	NR Bandwidth [MHz]	NR Channel	NR Frequency [MHz]	Mod.	NR RB#/Offset	LTE Band	LTE Bandwidth [MHz]	LTE Channel	LTE Frequency [MHz]	Mod.	LTE RB#/Offset			
n66	40	Mid	1745	QPSK	216/0	B5	10	Mid	836.5	QPSK	50/0	21.44	20.09	23.83
				QPSK	216/0					QPSK	1/25	21.51	19.66	23.69
				QPSK	1/108					QPSK	50/0	21.50	20.32	23.96
				QPSK	1/108					QPSK	1/25	21.62	19.38	23.65
				16Q	1/108					16Q	50/0	21.25	20.43	23.87

Table 7-7. EN-DC Conducted Power Data (EN-DC: NR Band n66 (ANT A) – LTE Band 5)

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NR (SCS 15kHz)						LTE						NR	LTE	EN-DC
NR Band	NR Bandwidth [MHz]	NR Channel	NR Frequency [MHz]	Mod.	NR RB#/Offset	LTE Band	LTE Bandwidth [MHz]	LTE Channel	LTE Frequency [MHz]	Mod.	LTE RB#/Offset	Conducted Power [dBm]	Conducted Power [dBm]	Total Tx. Power [dBm]
n66	40	Mid	1745	QPSK	216/0	B2	20	Mid	1880	QPSK	100/0	22.67	20.74	24.82
				QPSK	216/0					QPSK	1/50	22.69	21.22	25.03
				QPSK	1/108					QPSK	100/0	22.78	20.85	24.93
				QPSK	1/108					QPSK	1/50	22.80	21.16	25.07
				16Q	1/108					16Q	1/50	22.80	21.05	25.02

Table 7-8. EN-DC Conducted Power Data (EN-DC: NR Band n66 (ANT I)– LTE Band 2)

NR (SCS 15kHz)						LTE						NR	LTE	EN-DC
NR Band	NR Bandwidth [MHz]	NR Channel	NR Frequency [MHz]	Mod.	NR RB#/Offset	LTE Band	LTE Bandwidth [MHz]	LTE Channel	LTE Frequency [MHz]	Mod.	LTE RB#/Offset	Conducted Power [dBm]	Conducted Power [dBm]	Total Tx. Power [dBm]
n66	40	Mid	1745	QPSK	216/0	B30	10	Mid	2310	QPSK	50/0	21.96	21.02	24.53
				QPSK	216/0					QPSK	1/25	22.29	22.43	25.37
				QPSK	1/108					QPSK	50/0	22.54	21.06	24.87
				QPSK	1/108					QPSK	1/25	22.45	22.54	25.51
				16Q	1/108					16Q	1/25	22.40	22.38	25.40

Table 7-9. EN-DC Conducted Power Data (EN-DC: NR Band n66 (ANT I) – LTE Band 30)

NR (SCS 15kHz)						LTE						NR	LTE	EN-DC
NR Band	NR Bandwidth [MHz]	NR Channel	NR Frequency [MHz]	Mod.	NR RB#/Offset	LTE Band	LTE Bandwidth [MHz]	LTE Channel	LTE Frequency [MHz]	Mod.	LTE RB#/Offset	Conducted Power [dBm]	Conducted Power [dBm]	Total Tx. Power [dBm]
n66	40	Mid	1745	QPSK	216/0	48	20	Mid	3625	QPSK	100/0	22.42	22.56	25.50
				QPSK	216/0					QPSK	1/50	22.33	23.45	25.94
				QPSK	1/108					QPSK	100/0	22.58	22.43	25.52
				QPSK	1/108					QPSK	1/50	22.51	23.13	25.84
				16Q	216/0					16Q	1/50	21.55	22.99	25.34

Table 7-10. EN-DC Conducted Power Data (EN-DC: NR Band n66 (ANT A) – LTE Band 48)

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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

ANSI C63.26-2015 – Section 5.4.4

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW $\geq 3 \times$ RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

Test Setup

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

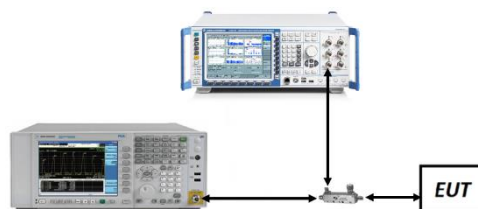


Figure 7-2. Test Instrument & Measurement Setup

Test Notes

None.

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LTE Band 71



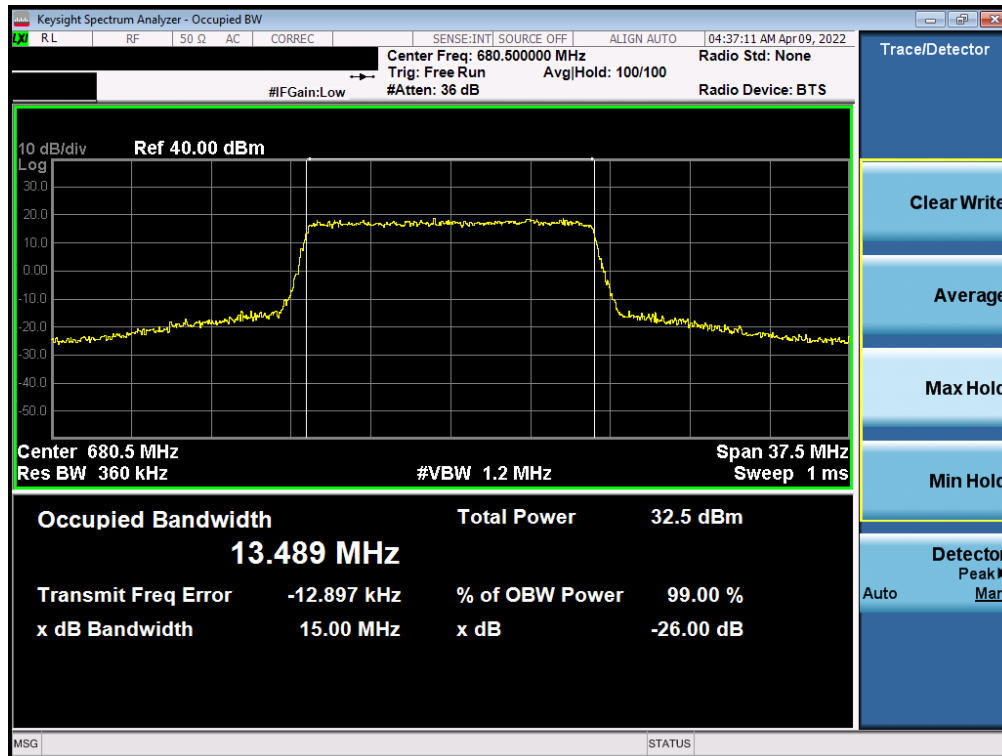
Plot 7-1. Occupied Bandwidth Plot (LTE Band 71 - 20MHz QPSK - Full RB)



Plot 7-2. Occupied Bandwidth Plot (LTE Band 71 - 20MHz 16-QAM - Full RB)

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Plot 7-3. Occupied Bandwidth Plot (LTE Band 71 - 15MHz QPSK - Full RB)

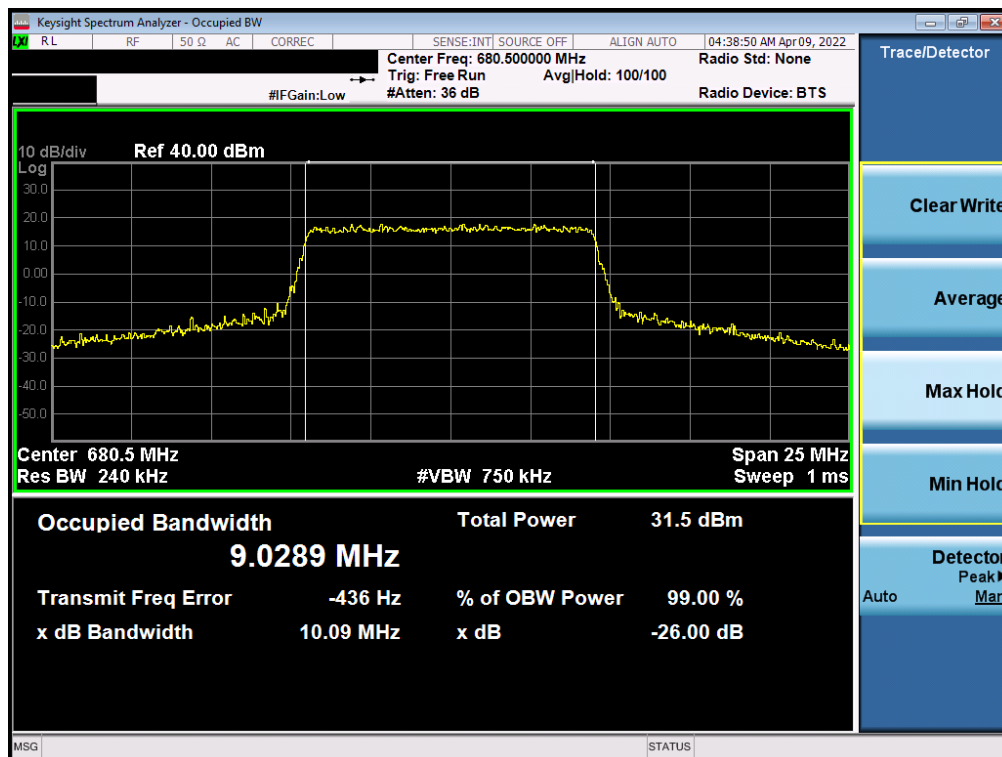


Plot 7-4. Occupied Bandwidth Plot (LTE Band 71 - 15MHz 16-QAM - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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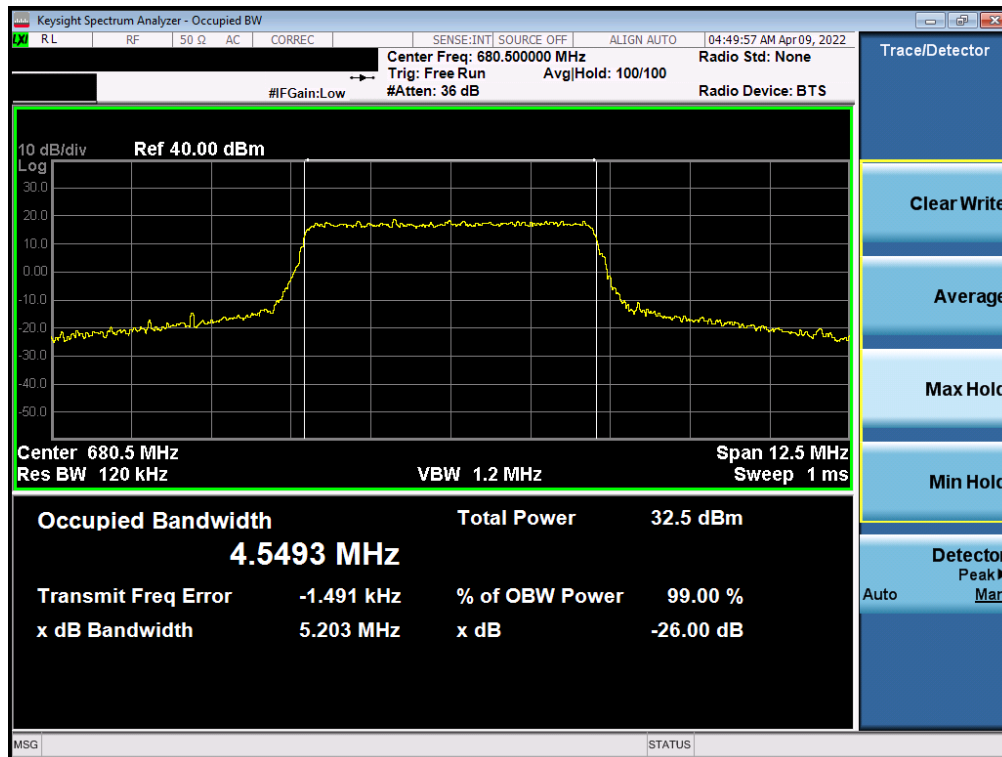


Plot 7-5. Occupied Bandwidth Plot (LTE Band 71 - 10MHz QPSK - Full RB)

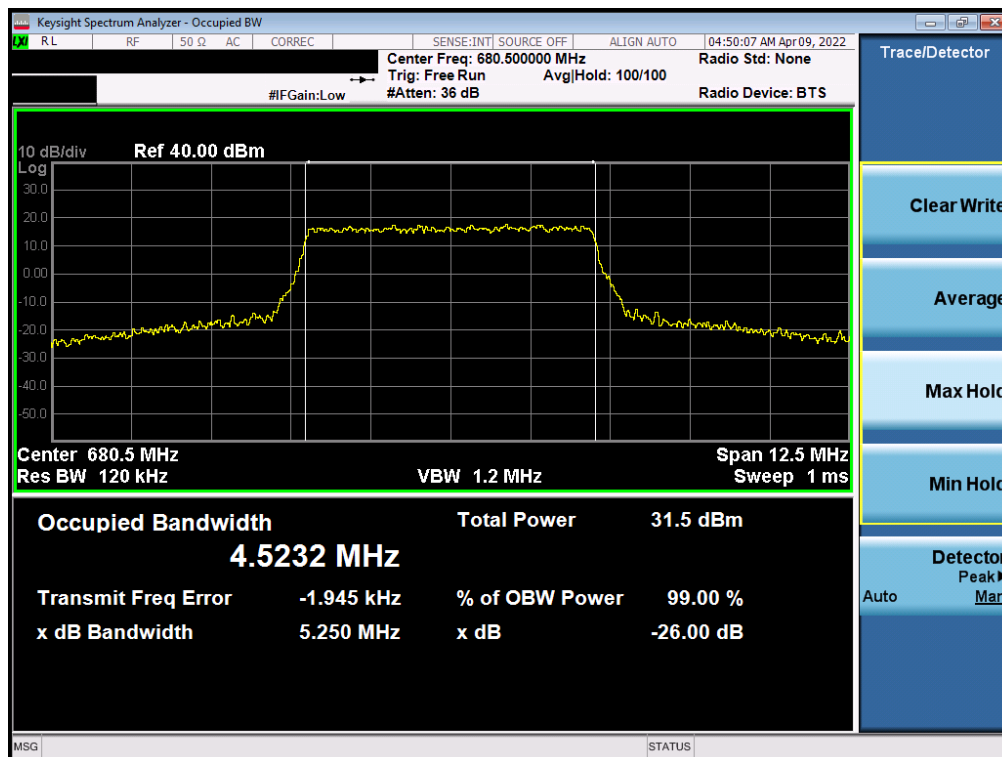


Plot 7-6. Occupied Bandwidth Plot (LTE Band 71 - 10MHz 16-QAM - Full RB)

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Plot 7-7. Occupied Bandwidth Plot (LTE Band 71 - 5MHz QPSK - Full RB)



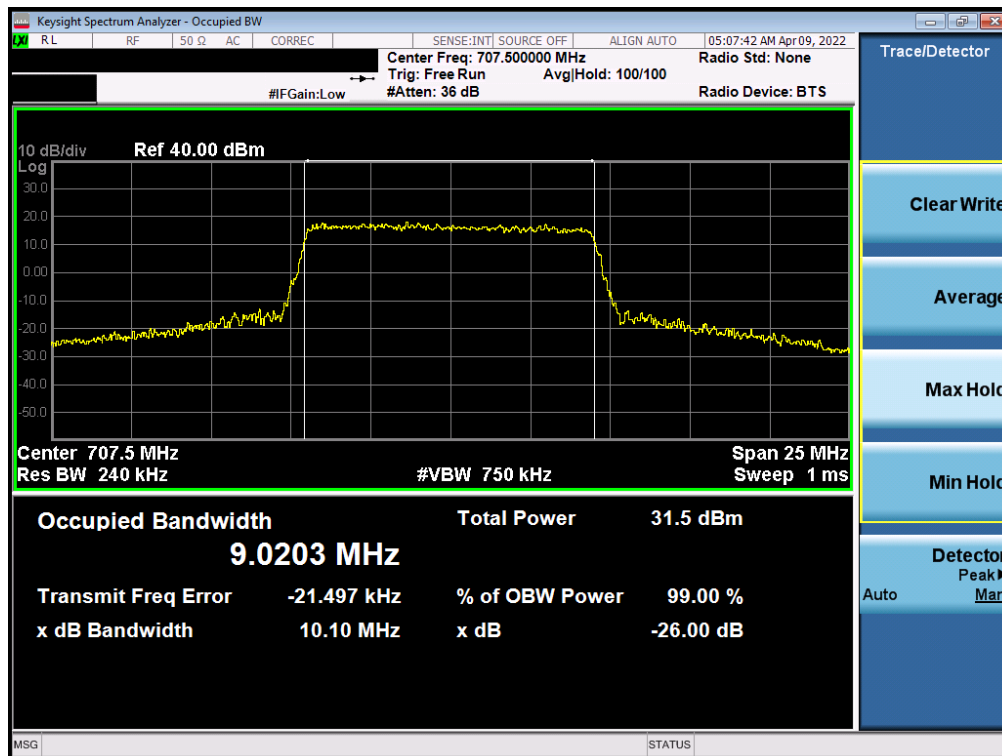
Plot 7-8. Occupied Bandwidth Plot (LTE Band 71 - 5MHz 16-QAM - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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LTE Band 12



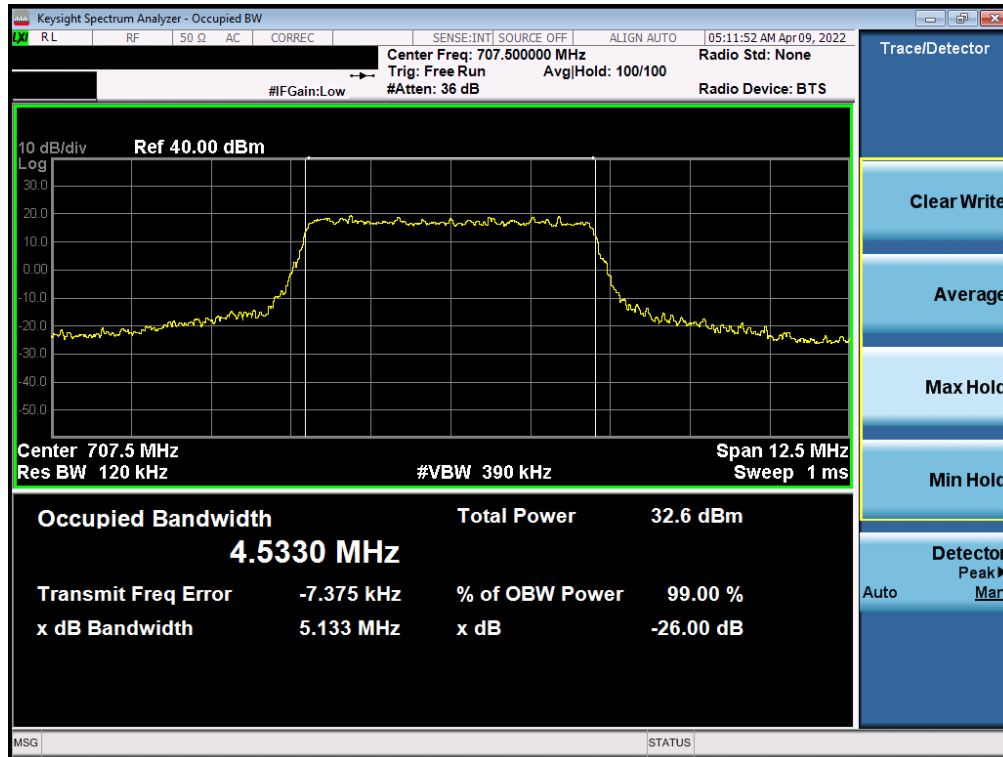
Plot 7-9. Occupied Bandwidth Plot (LTE Band 12 - 10MHz QPSK - Full RB)



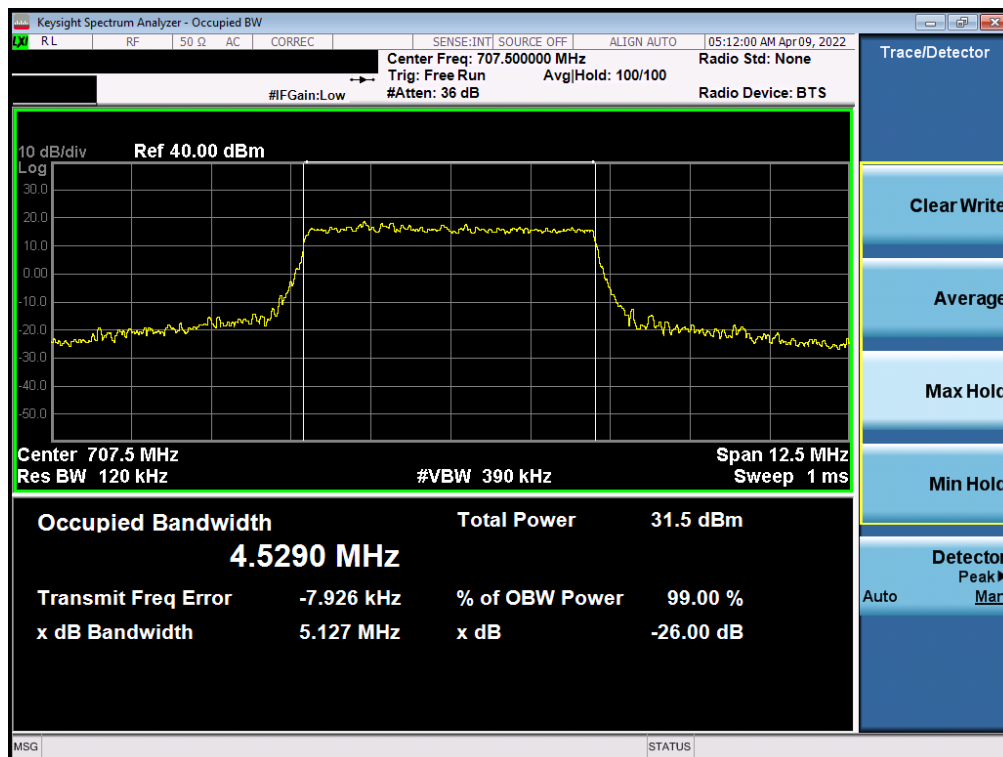
Plot 7-10. Occupied Bandwidth Plot (LTE Band 12 - 10MHz 16-QAM - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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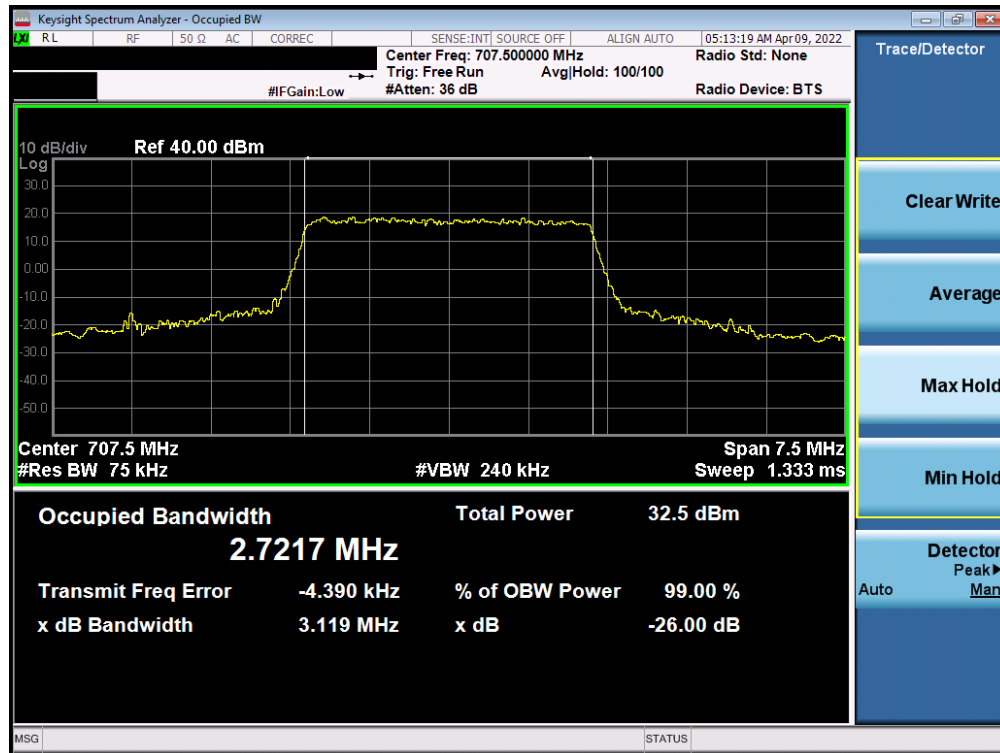


Plot 7-11. Occupied Bandwidth Plot (LTE Band 12 - 5MHz QPSK - Full RB)

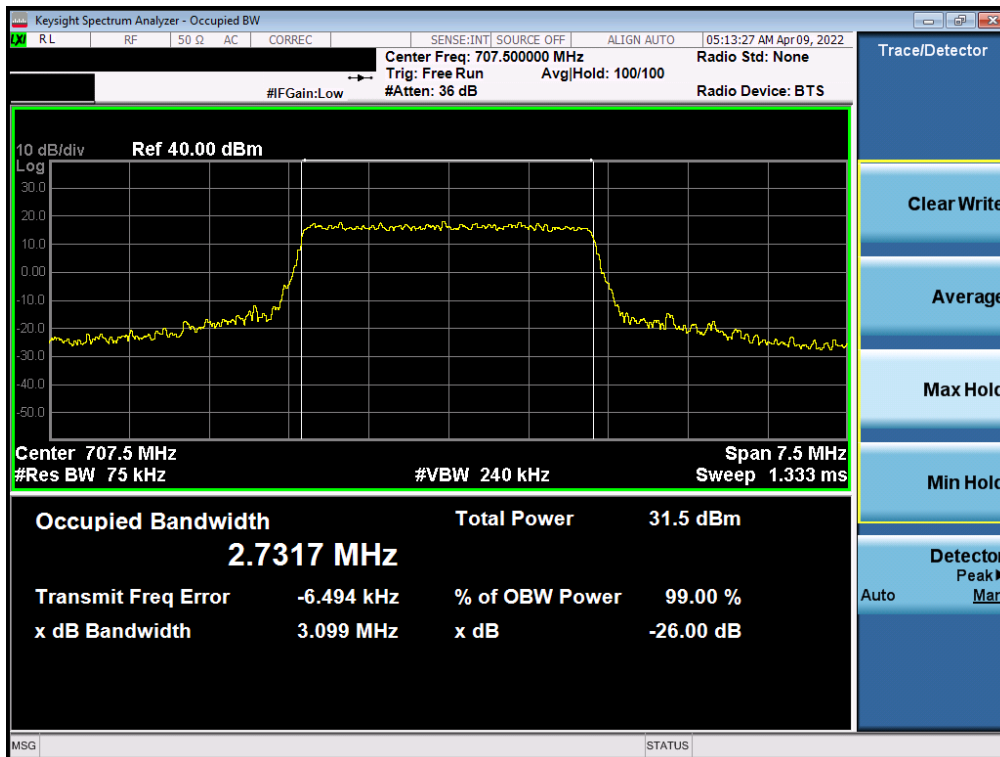


Plot 7-12. Occupied Bandwidth Plot (LTE Band 12 - 5MHz 16-QAM - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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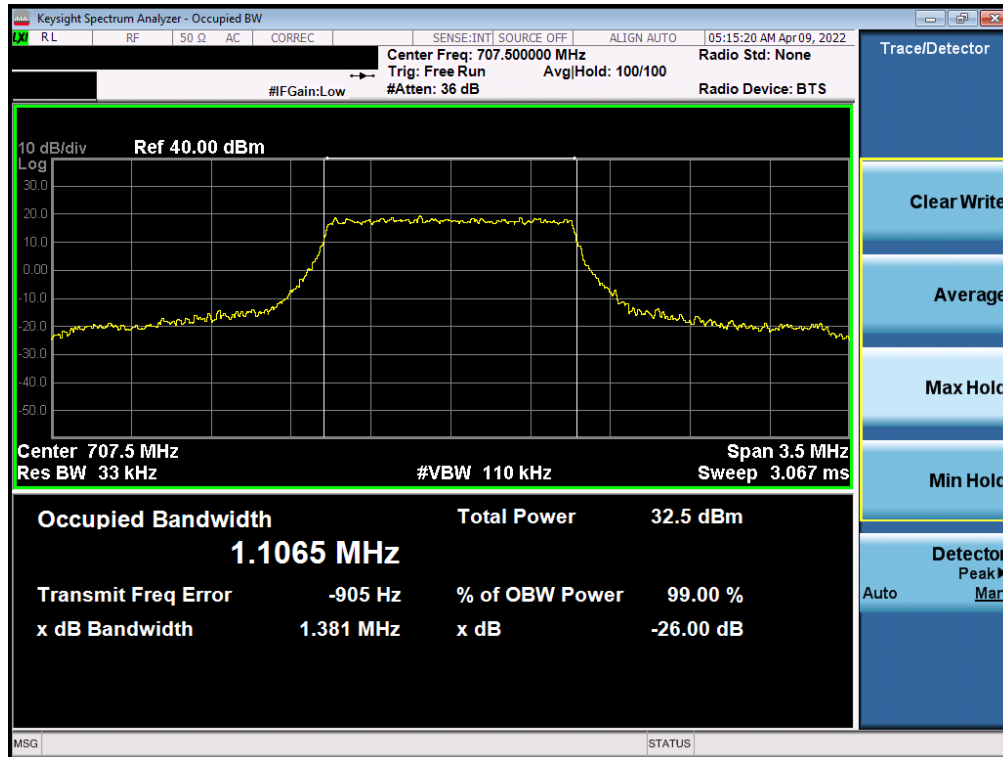


Plot 7-13. Occupied Bandwidth Plot (LTE Band 12 - 3MHz QPSK - Full RB)

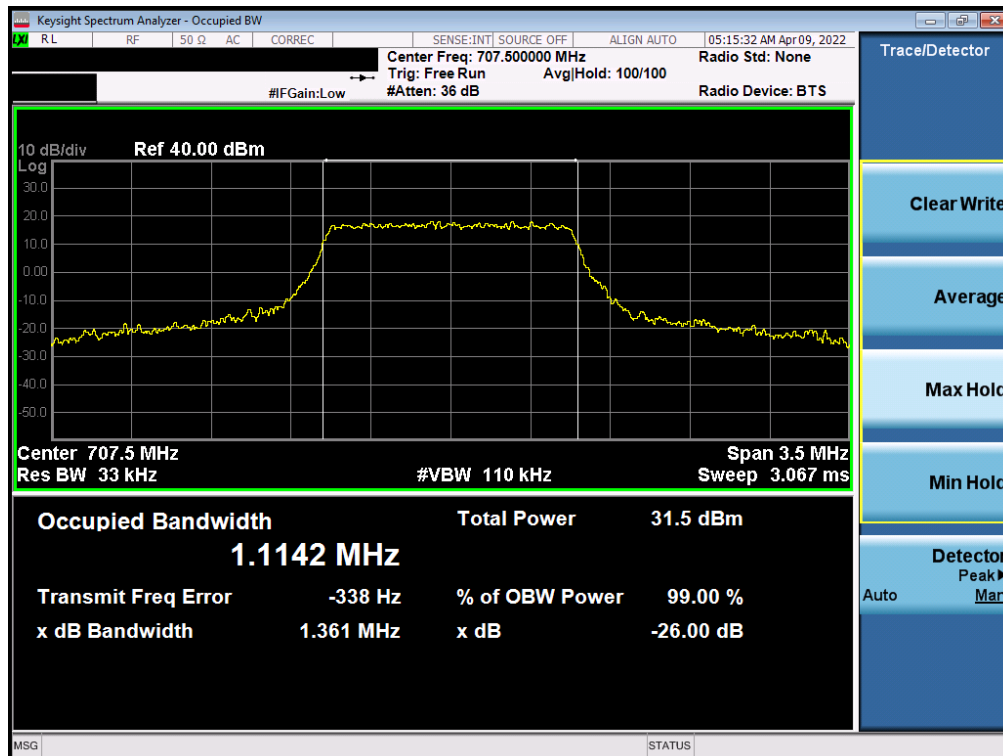


Plot 7-14. Occupied Bandwidth Plot (LTE Band 12 - 3MHz 16-QAM - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-15. Occupied Bandwidth Plot (LTE Band 12 – 1.4MHz QPSK - Full RB)



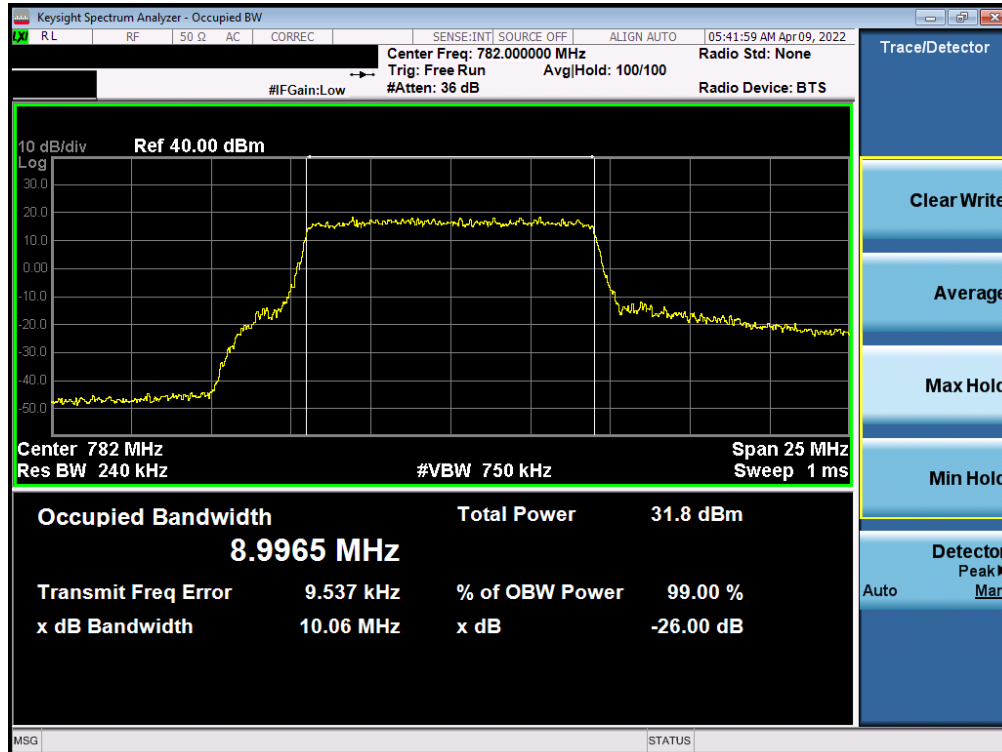
Plot 7-16. Occupied Bandwidth Plot (LTE Band 12 – 1.4MHz 16-QAM - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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LTE Band 13

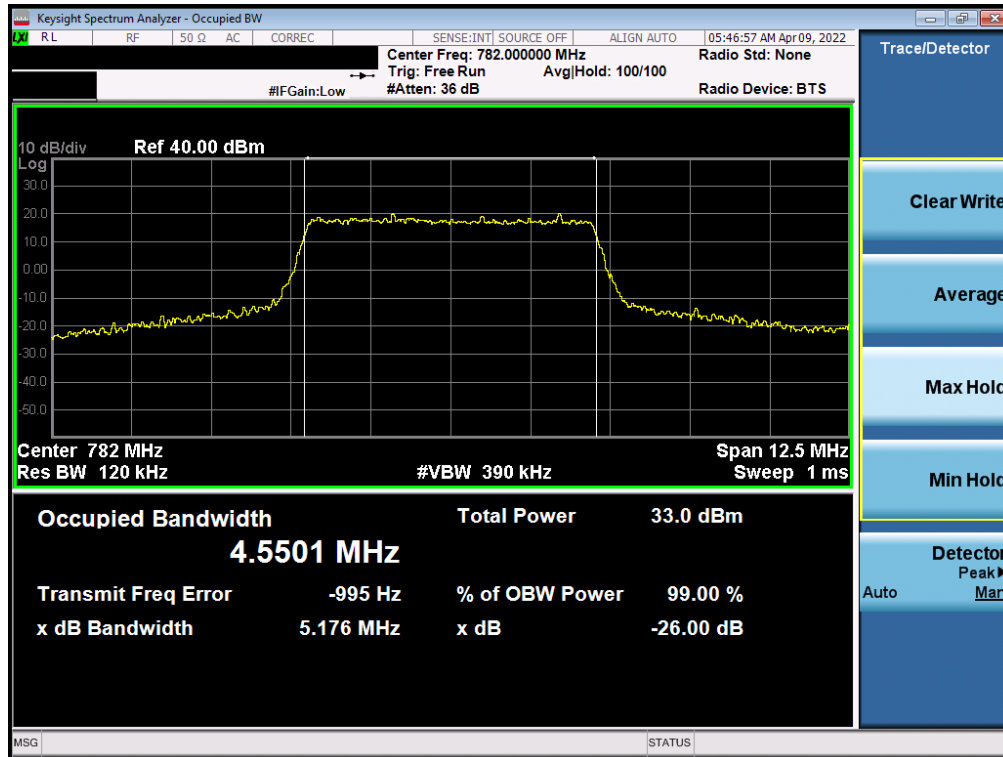


Plot 7-17. Occupied Bandwidth Plot (LTE Band 13 - 10MHz QPSK - Full RB)

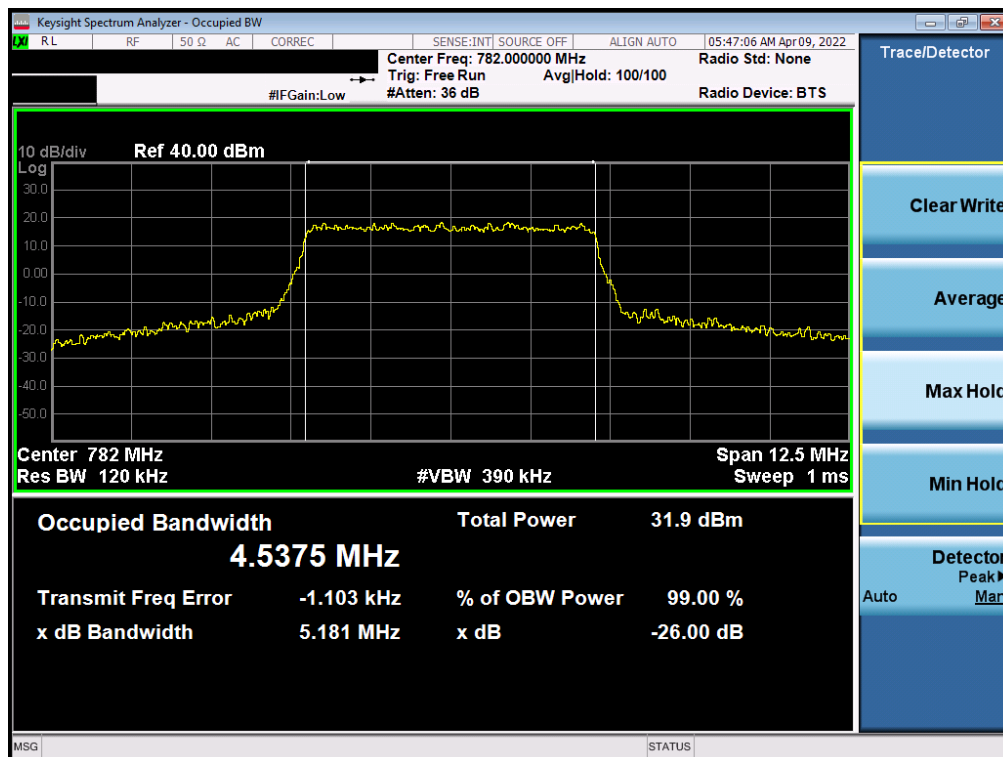


Plot 7-18. Occupied Bandwidth Plot (LTE Band 13 - 10MHz 16-QAM - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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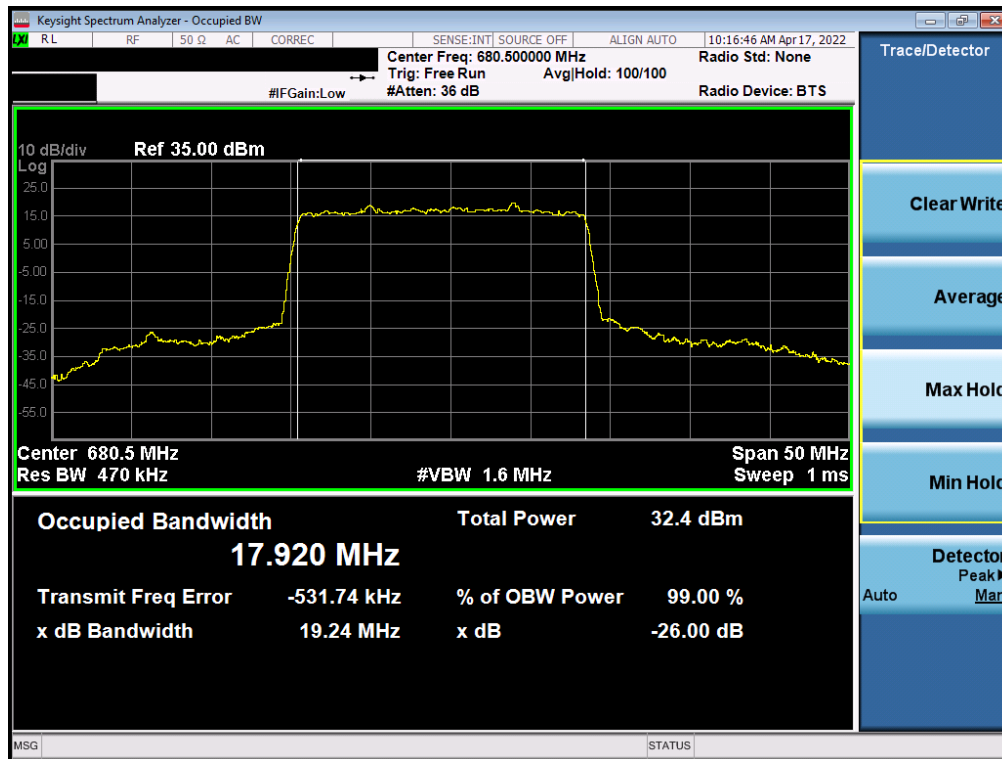
Plot 7-19. Occupied Bandwidth Plot (LTE Band 13 - 5MHz QPSK - Full RB)



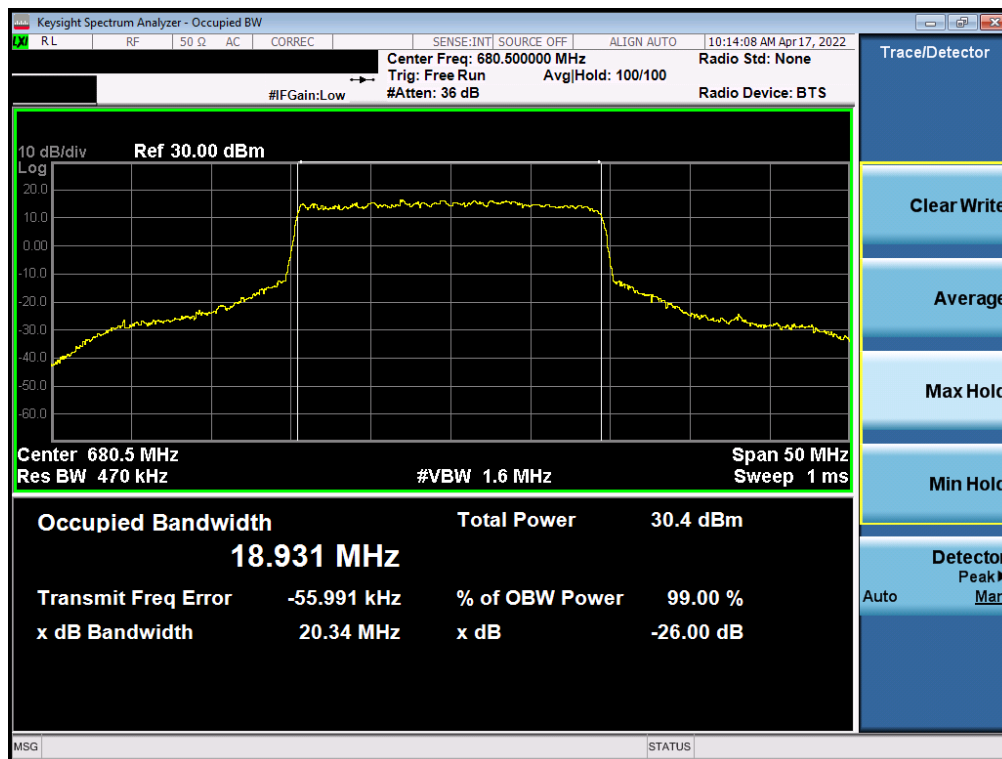
Plot 7-20. Occupied Bandwidth Plot (LTE Band 13 - 5MHz 16-QAM - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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NR Band n71

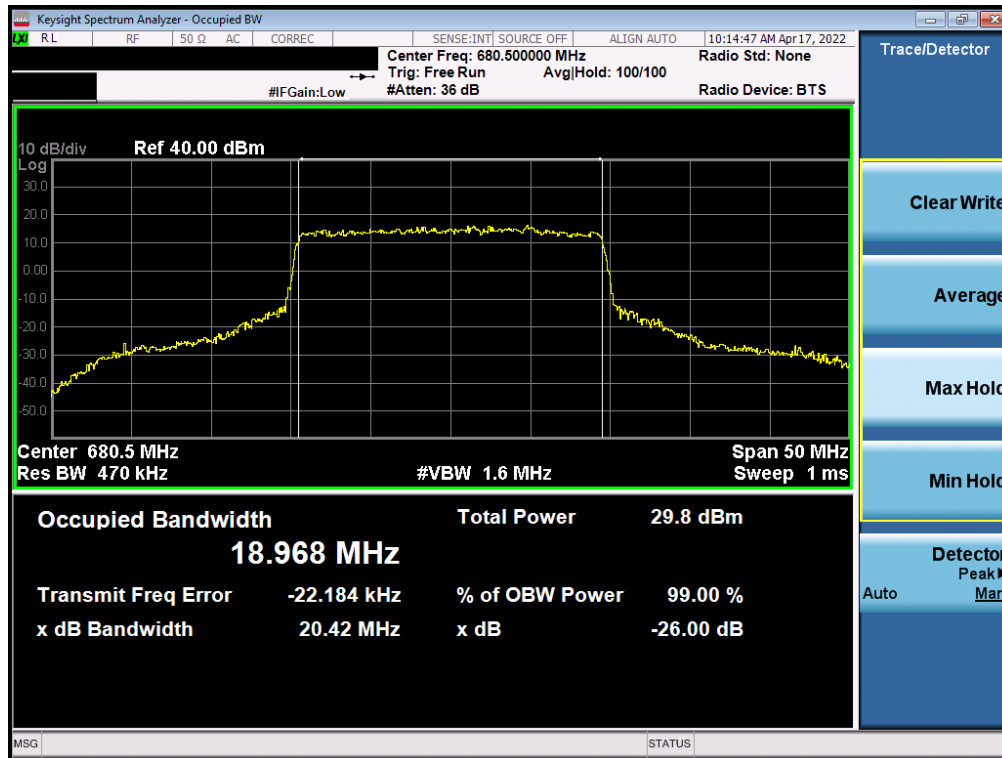


Plot 7-21. Occupied Bandwidth Plot (NR Band n71 - 20MHz DFT-s-OFDM BPSK - Full RB)

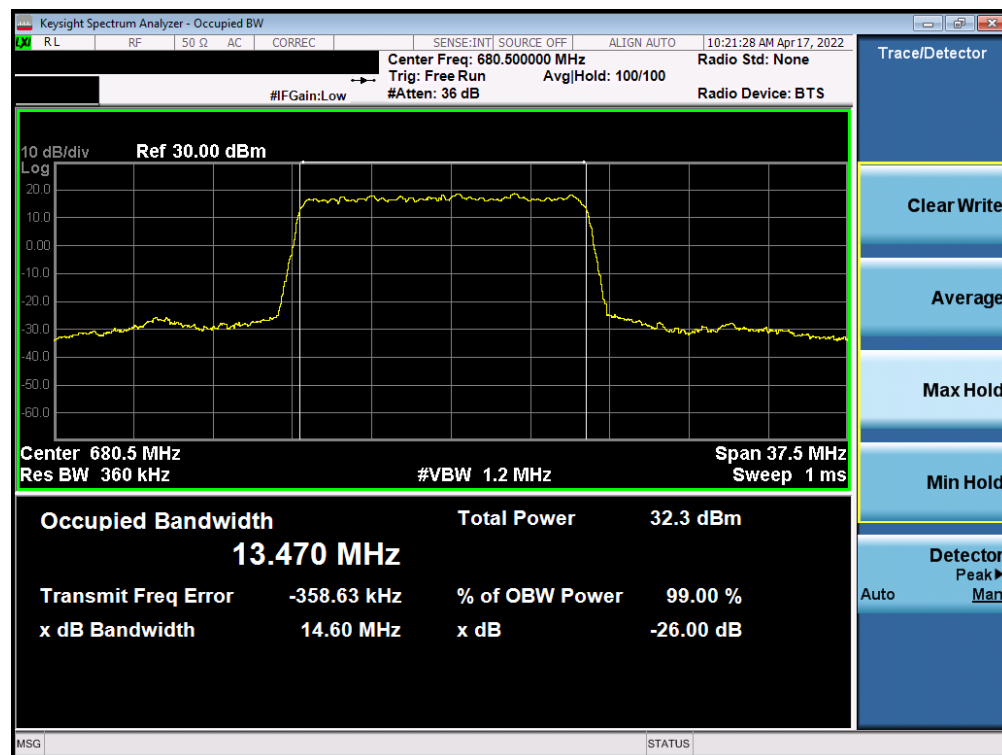


Plot 7-22. Occupied Bandwidth Plot (NR Band n71 - 20MHz CP-OFDM QPSK - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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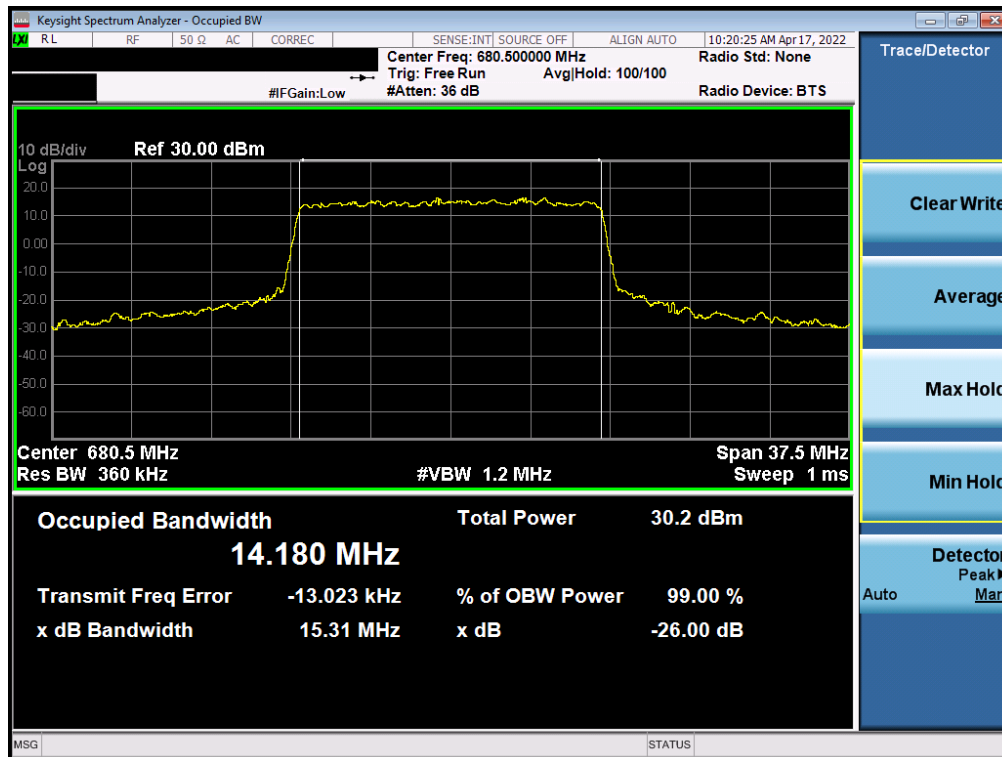


Plot 7-23. Occupied Bandwidth Plot (NR Band n71 - 20MHz CP-OFDM 16-QAM - Full RB)

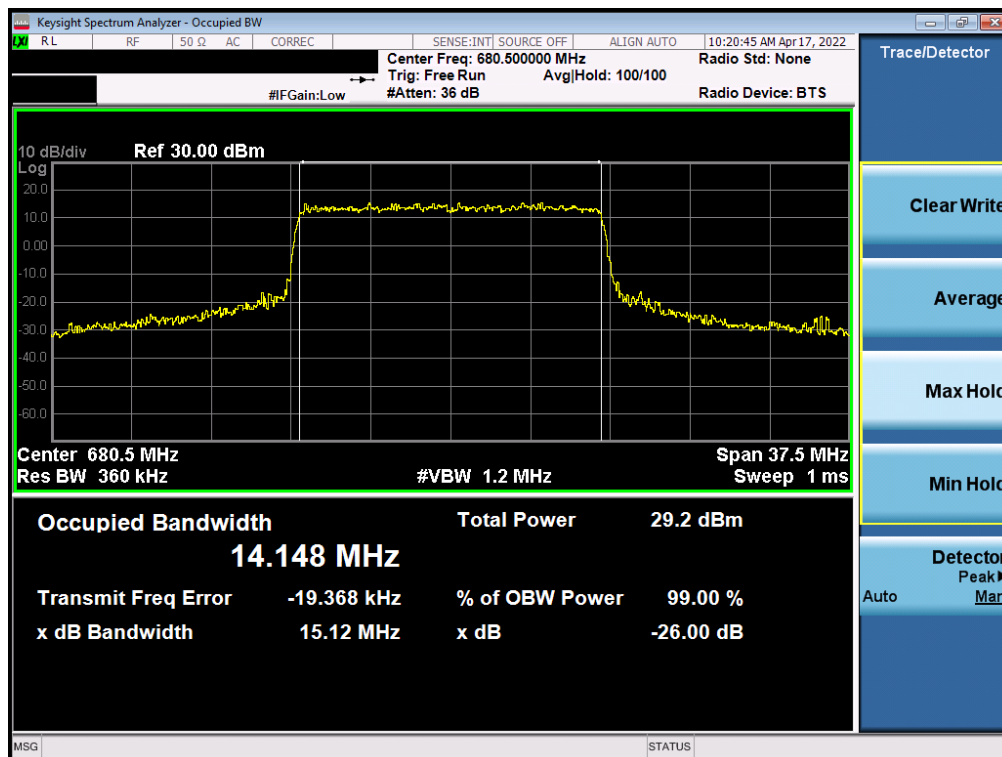


Plot 7-24. Occupied Bandwidth Plot (NR Band n71 - 15MHz DFT-s-OFDM BPSK - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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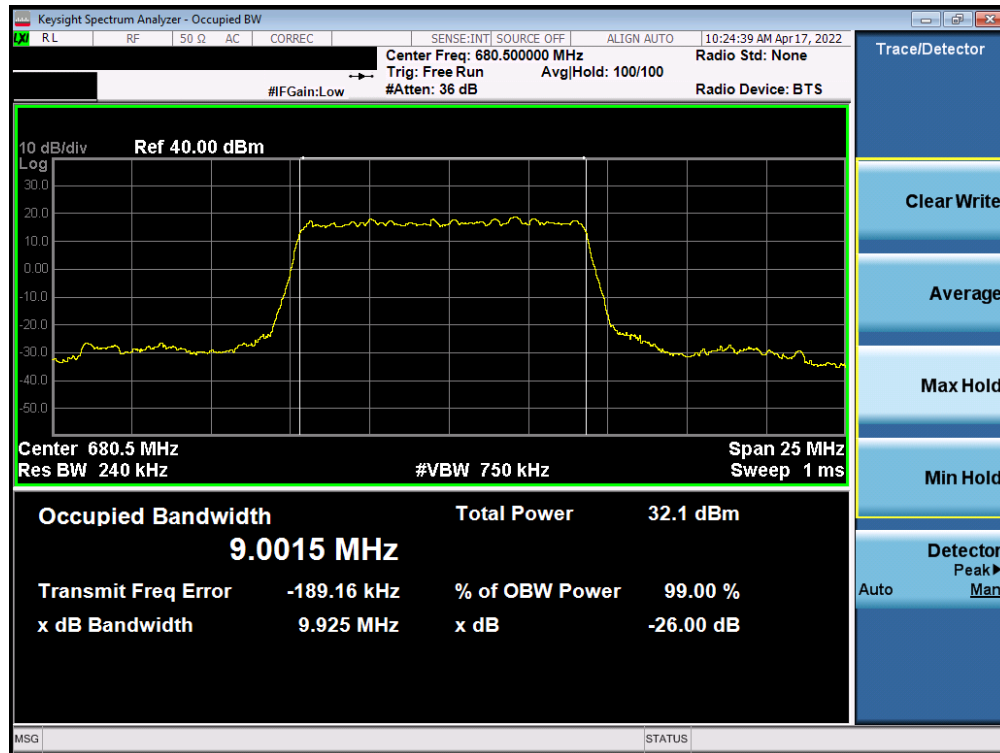


Plot 7-25. Occupied Bandwidth Plot (NR Band n71 - 15MHz CP-OFDM QPSK - Full RB)

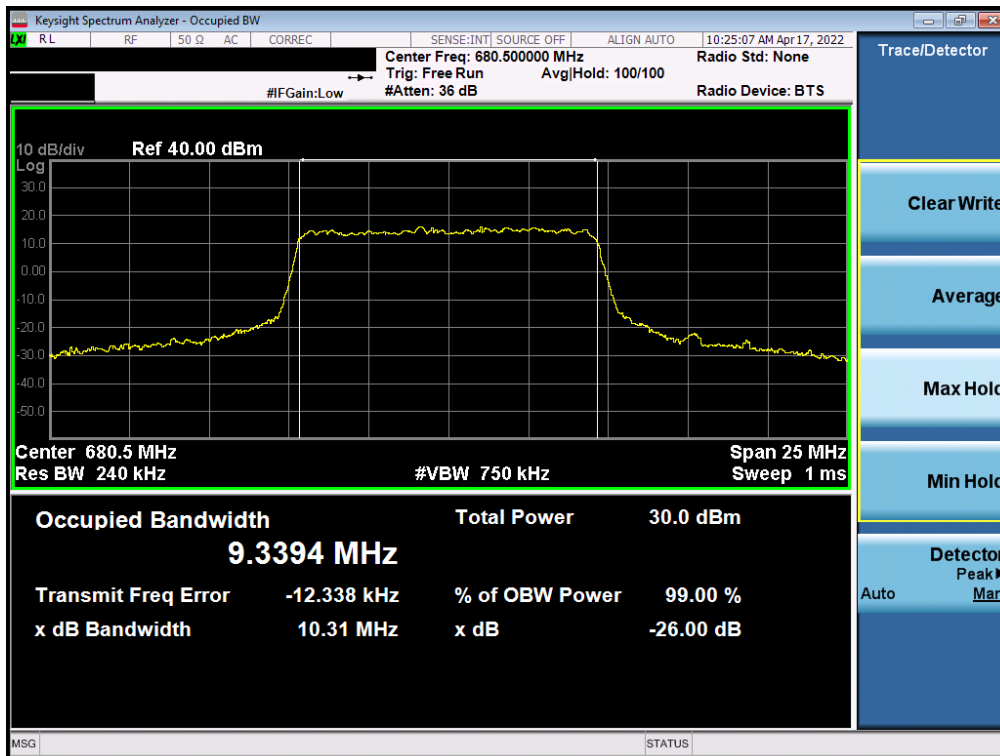


Plot 7-26. Occupied Bandwidth Plot (NR Band n71 - 15MHz CP-OFDM 16-QAM - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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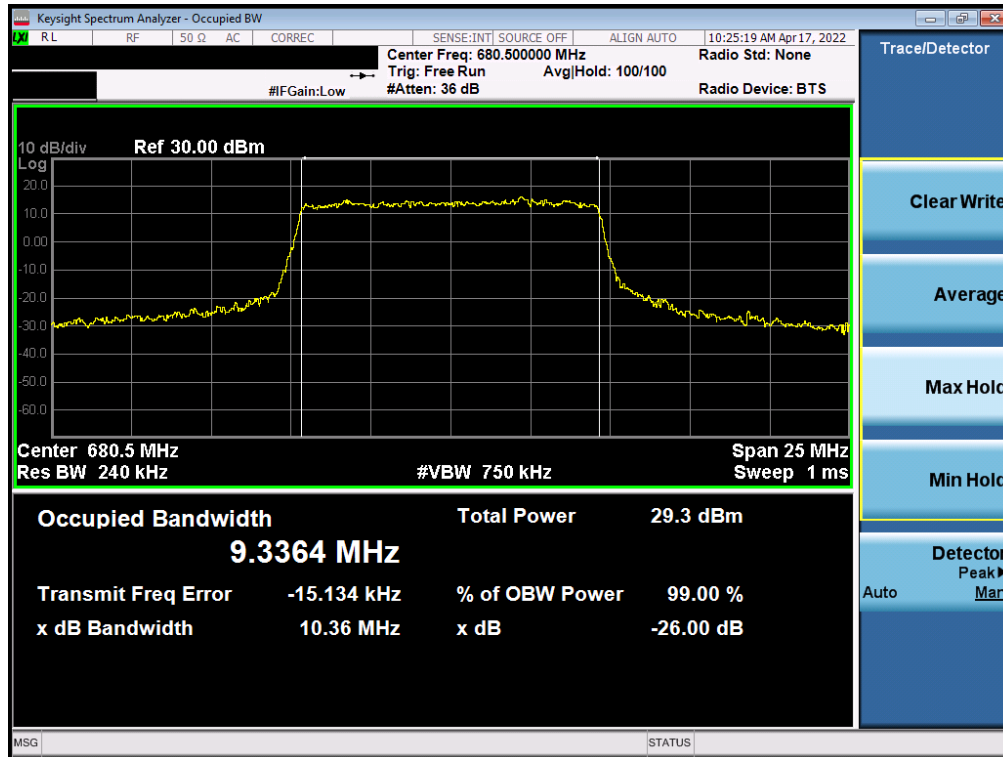


Plot 7-27. Occupied Bandwidth Plot (NR Band n71 - 10MHz DFT-s-OFDM BPSK - Full RB)

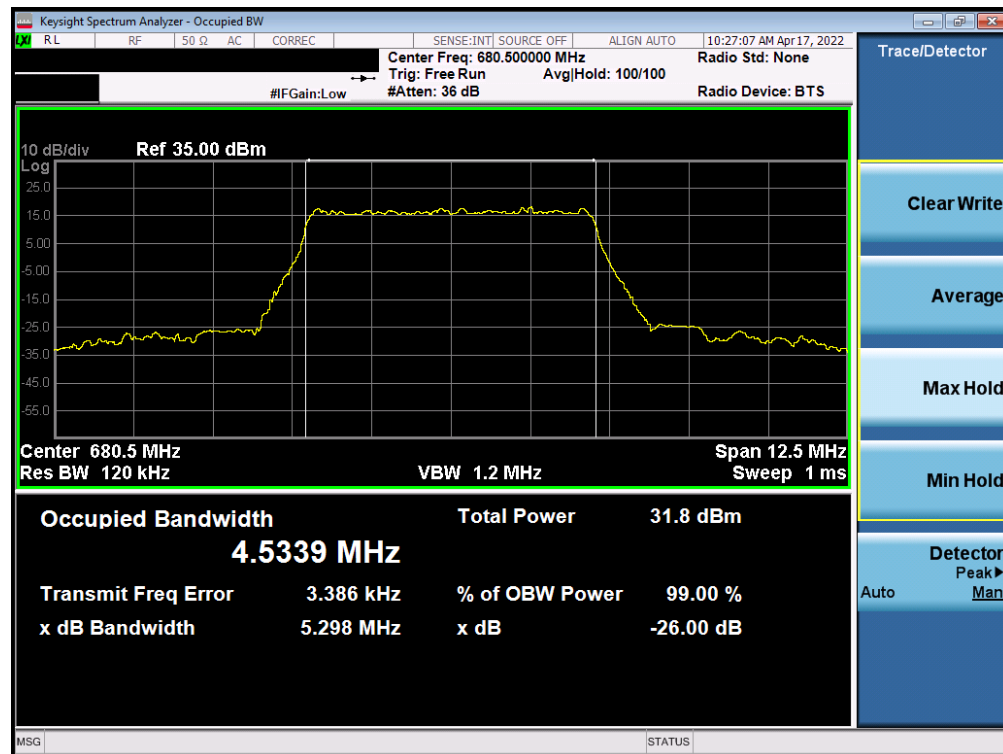


Plot 7-28. Occupied Bandwidth Plot (NR Band n71 - 10MHz CP-OFDM QPSK - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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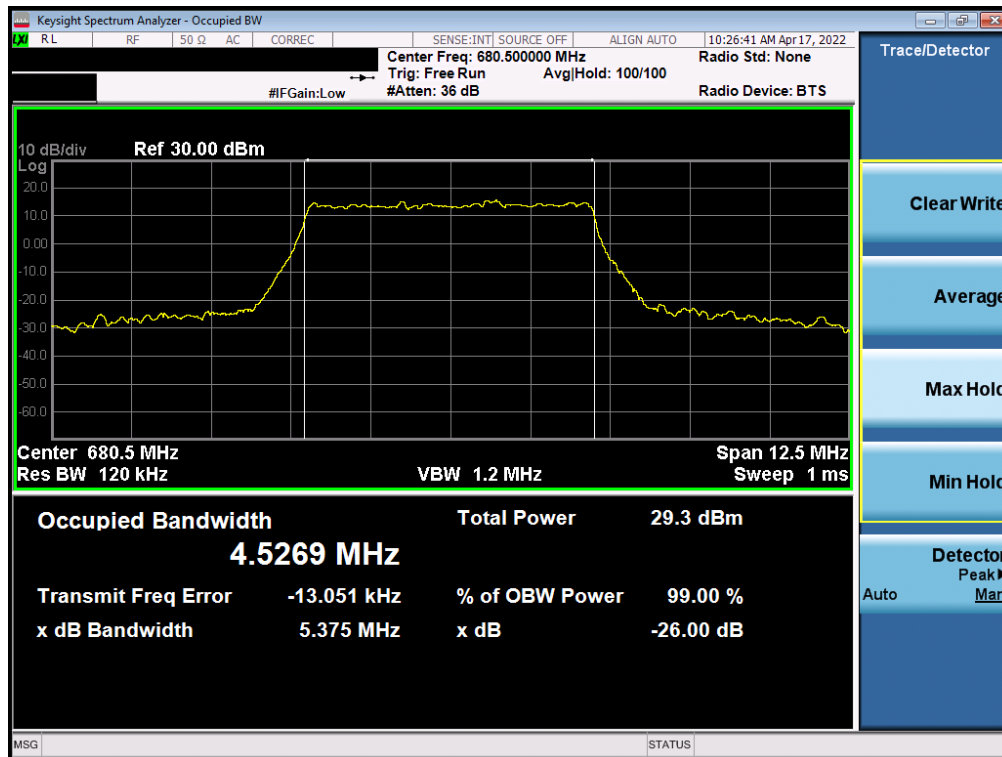


Plot 7-29. Occupied Bandwidth Plot (NR Band n71 - 10MHz CP-OFDM 16-QAM - Full RB)

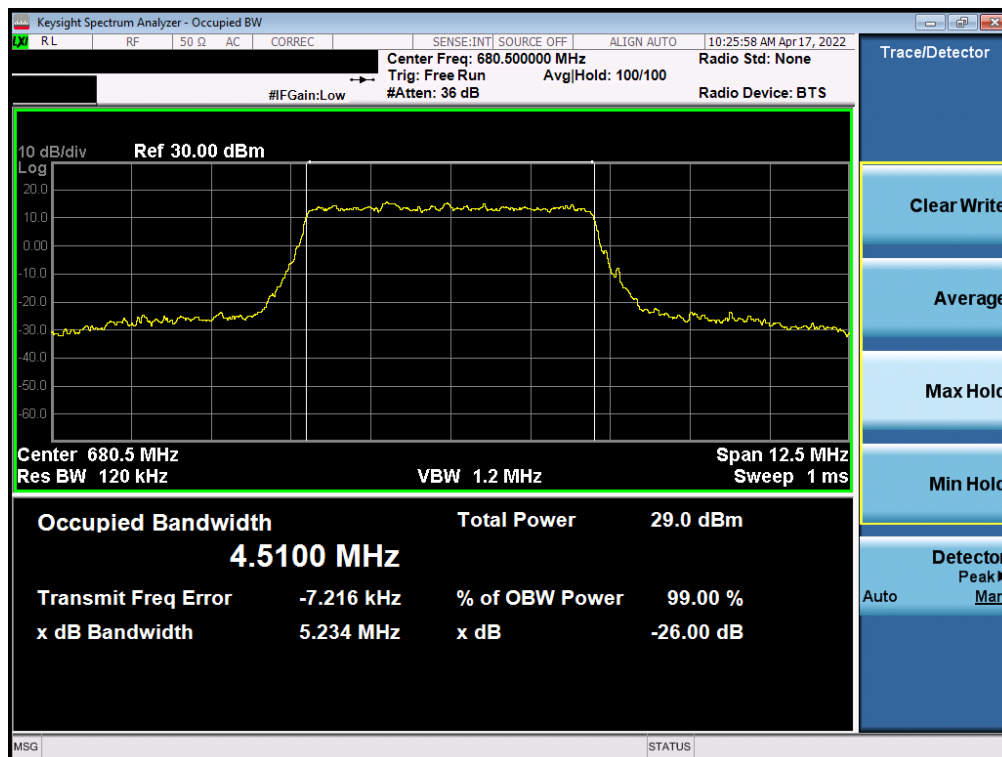


Plot 7-30. Occupied Bandwidth Plot (NR Band n71 - 5MHz DFT-s-OFDM BPSK - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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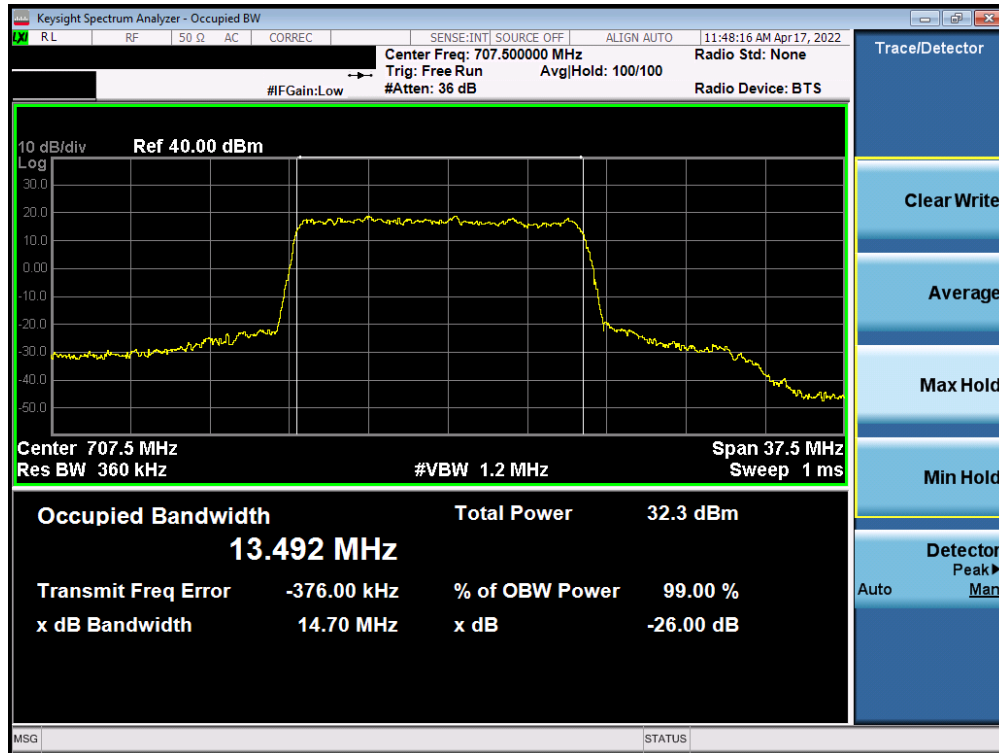
Plot 7-31. Occupied Bandwidth Plot (NR Band n71 - 5MHz CP-OFDM QPSK - Full RB)



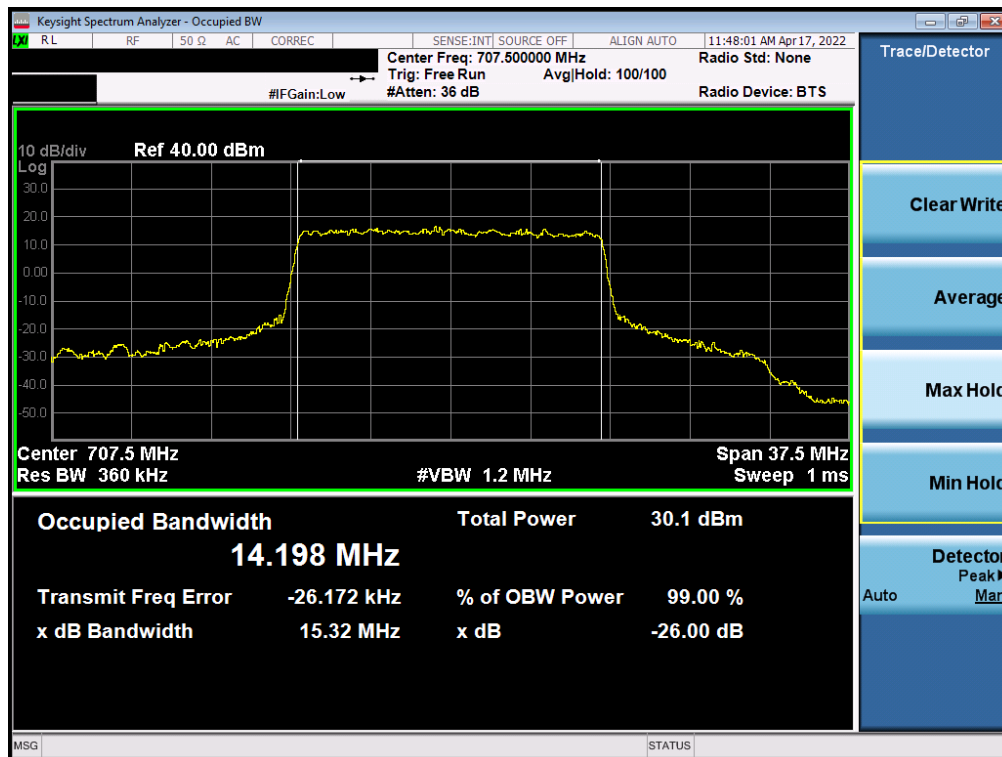
Plot 7-32. Occupied Bandwidth Plot (NR Band n71 - 5MHz CP-OFDM 16-QAM - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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NR Band n12

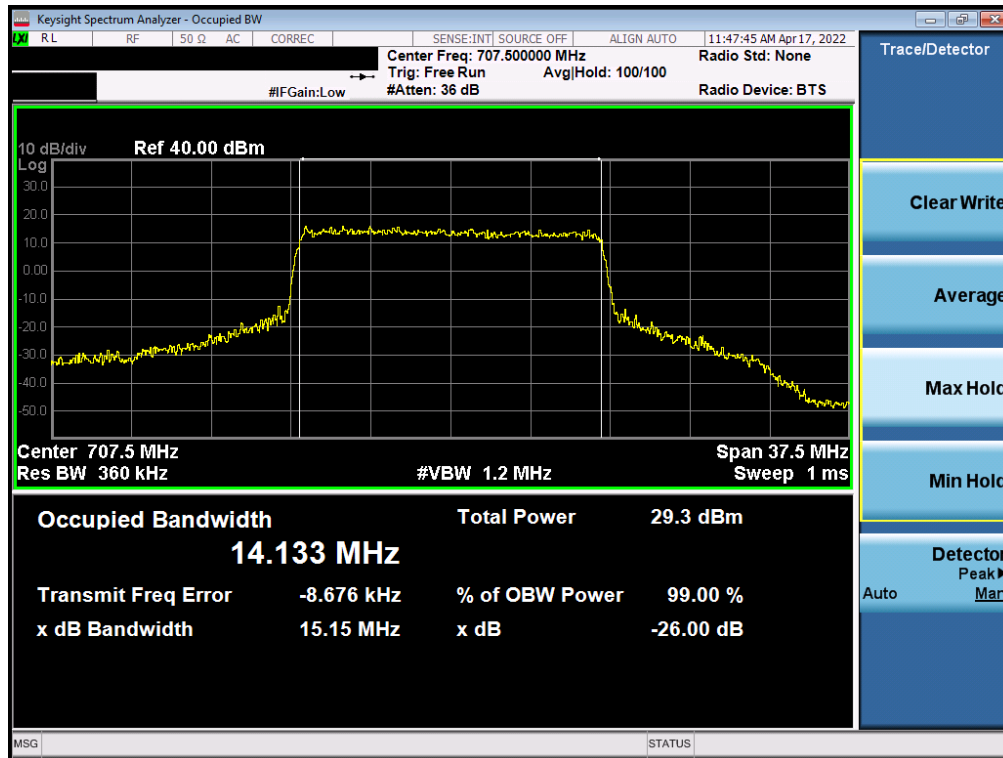


Plot 7-33. Occupied Bandwidth Plot (NR Band n12 - 15MHz DFT-s-OFDM BPSK - Full RB)

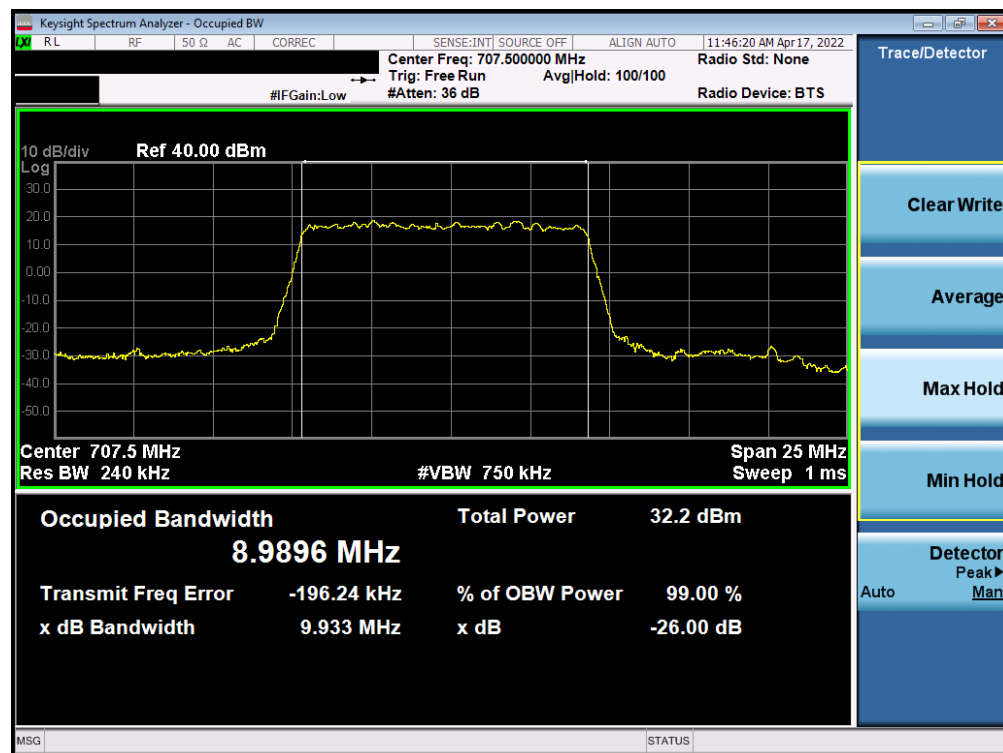


Plot 7-34. Occupied Bandwidth Plot (NR Band n12 - 15MHz CP-OFDM QPSK - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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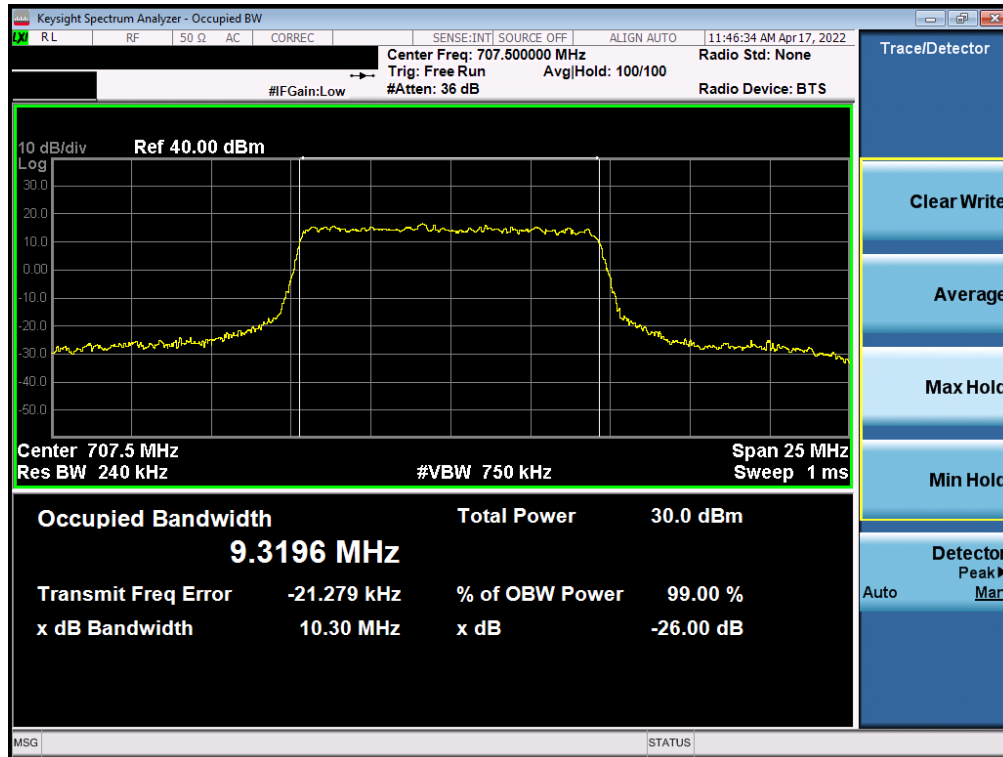


Plot 7-35. Occupied Bandwidth Plot (NR Band n12 - 15MHz CP-OFDM 16-QAM - Full RB)

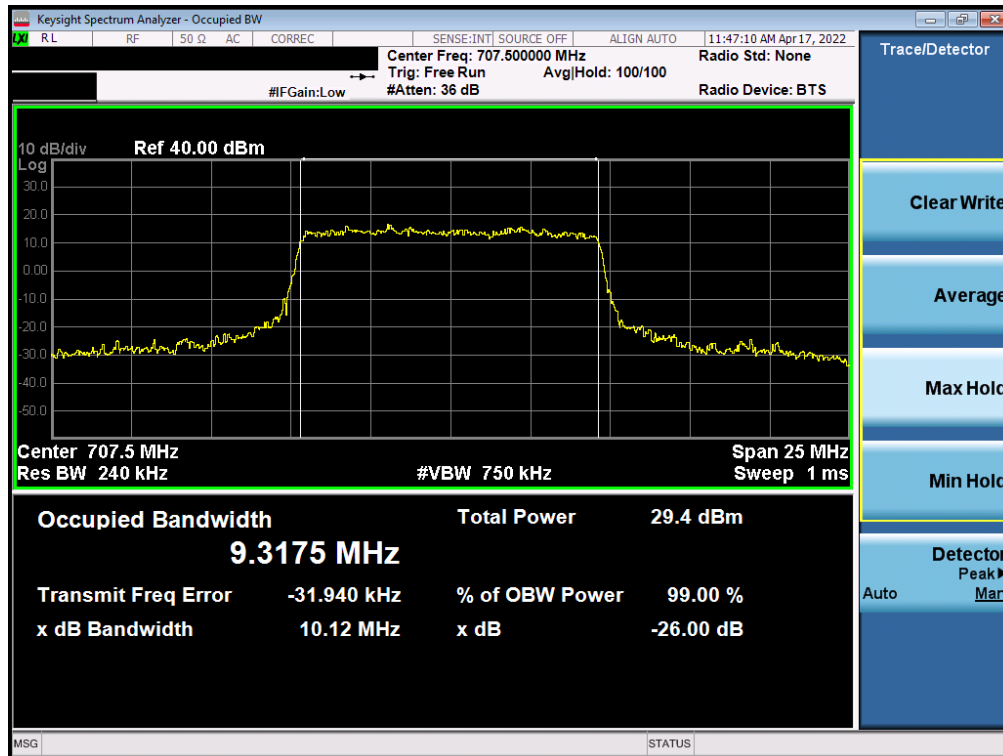


Plot 7-36. Occupied Bandwidth Plot (NR Band n12- 10MHz DFT-s-OFDM BPSK - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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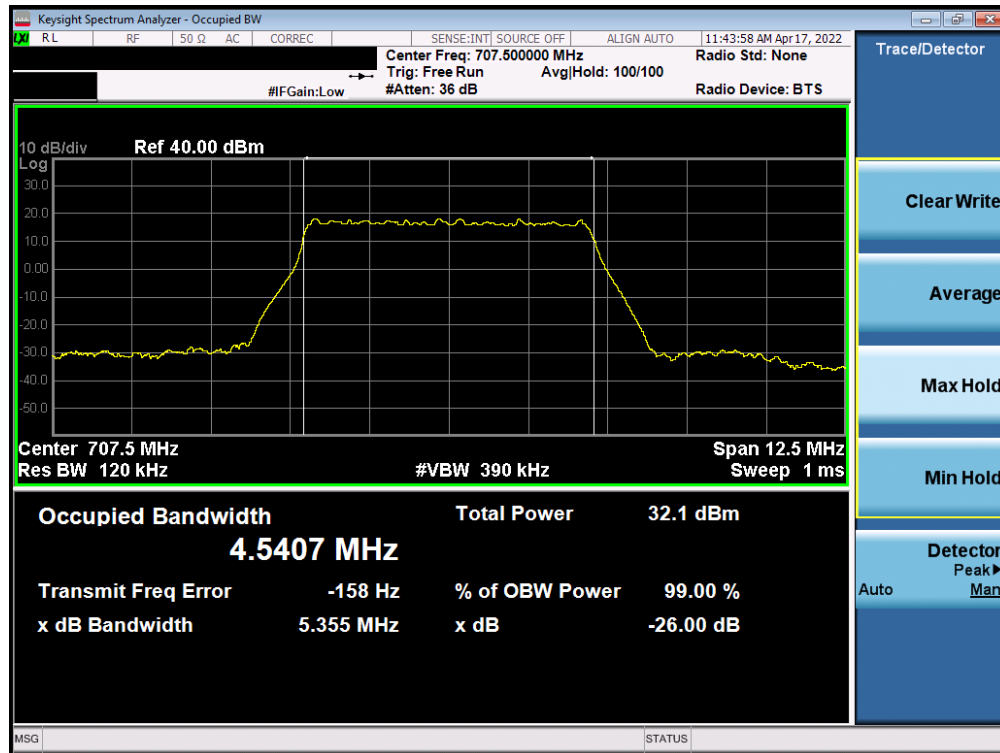


Plot 7-37. Occupied Bandwidth Plot (NR Band n12 - 10MHz CP-OFDM QPSK - Full RB)

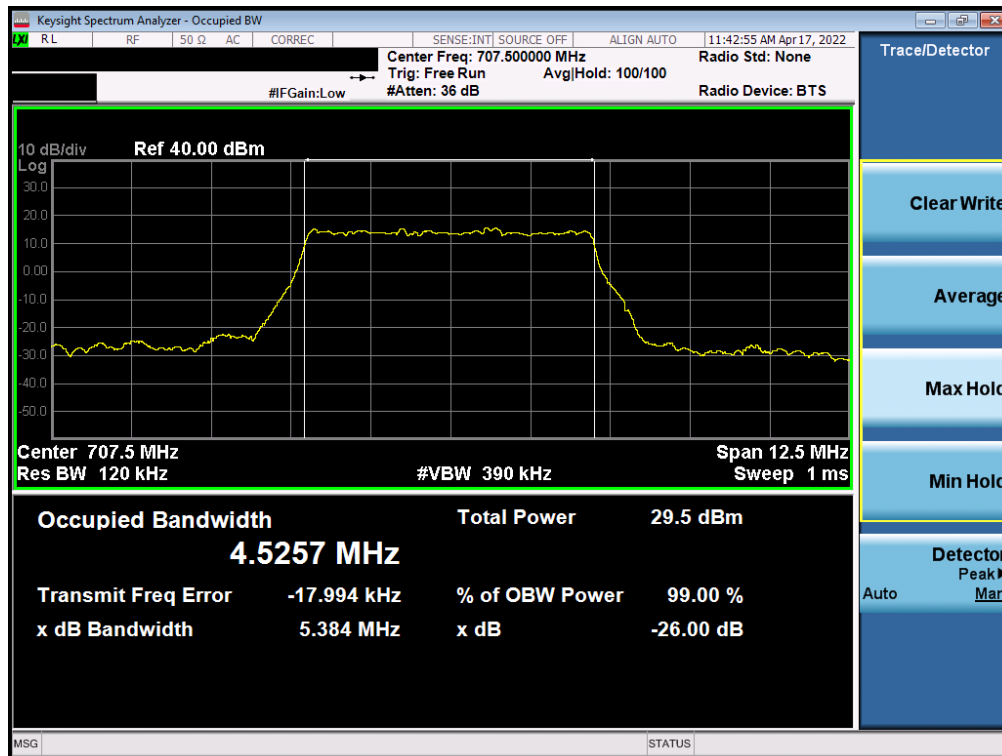


Plot 7-38. Occupied Bandwidth Plot (NR Band n12 - 10MHz CP-OFDM 16-QAM - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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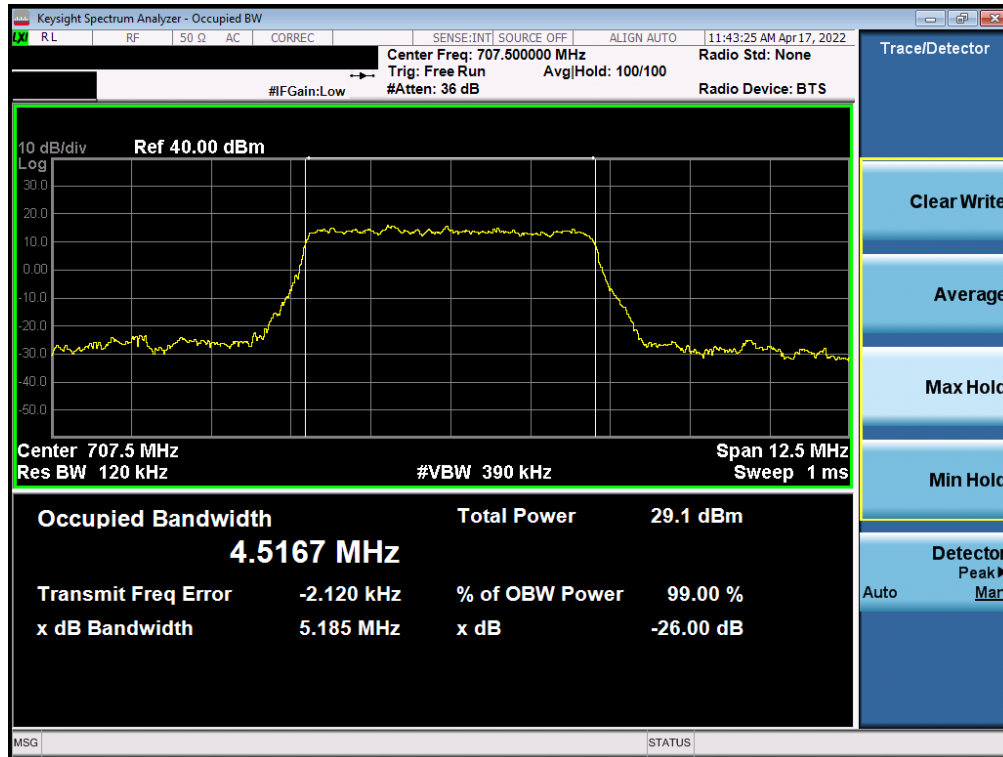


Plot 7-39. Occupied Bandwidth Plot (NR Band n12- 5MHz DFT-s-OFDM BPSK - Full RB)



Plot 7-40. Occupied Bandwidth Plot (NR Band n12 - 5MHz CP-OFDM QPSK - Full RB)

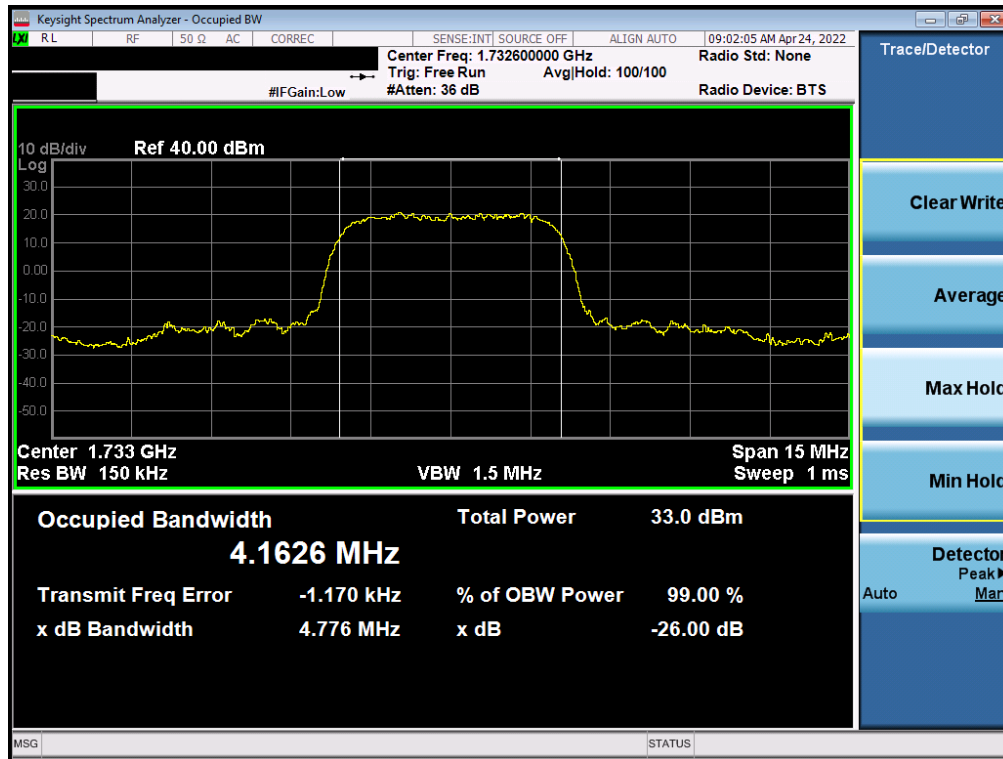
FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-41. Occupied Bandwidth Plot (NR Band n12 - 5MHz CP-OFDM 16-QAM - Full RB)

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WCDMA AWS

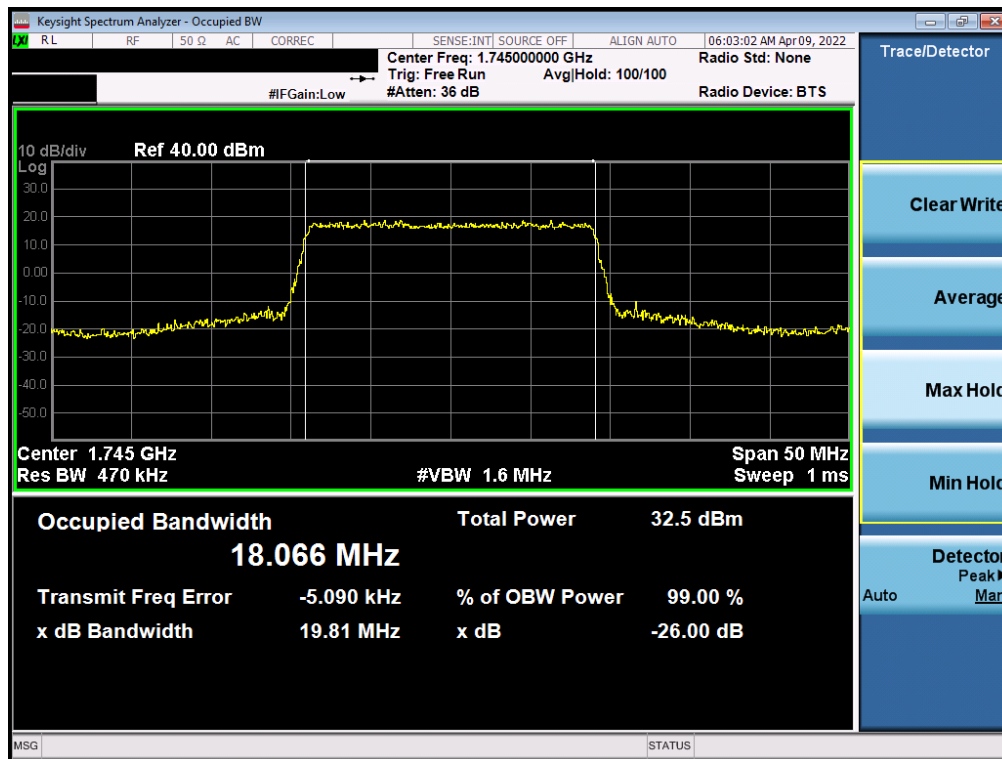


Plot 7-42. Occupied Bandwidth Plot (WCDMA, Ch. 1413)

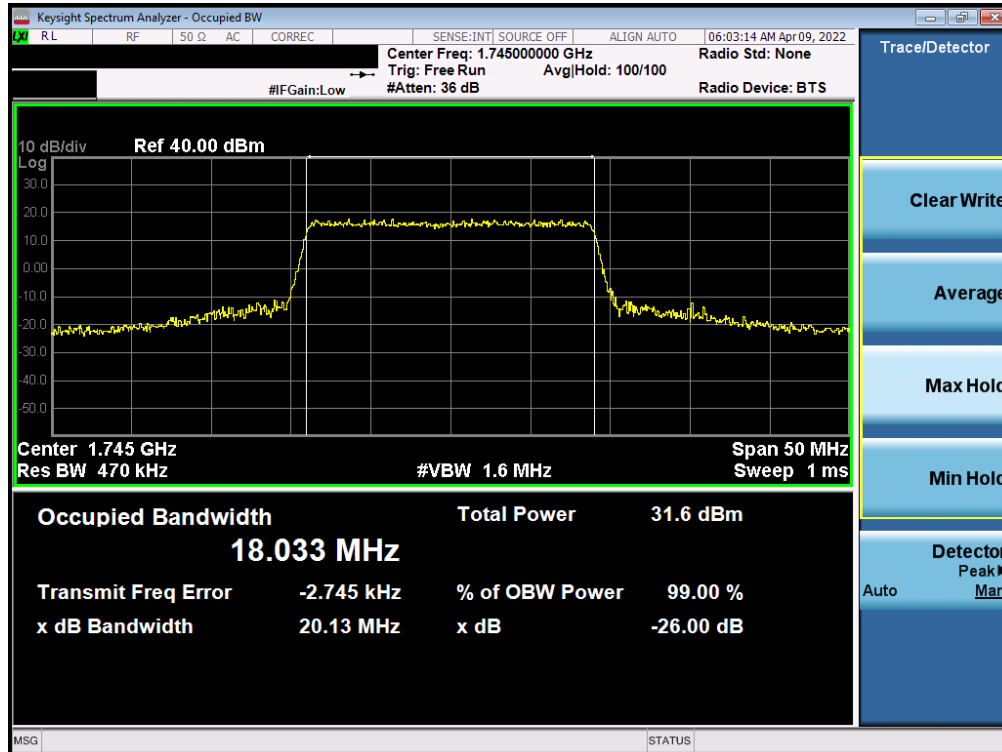
FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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LTE Band 66/4

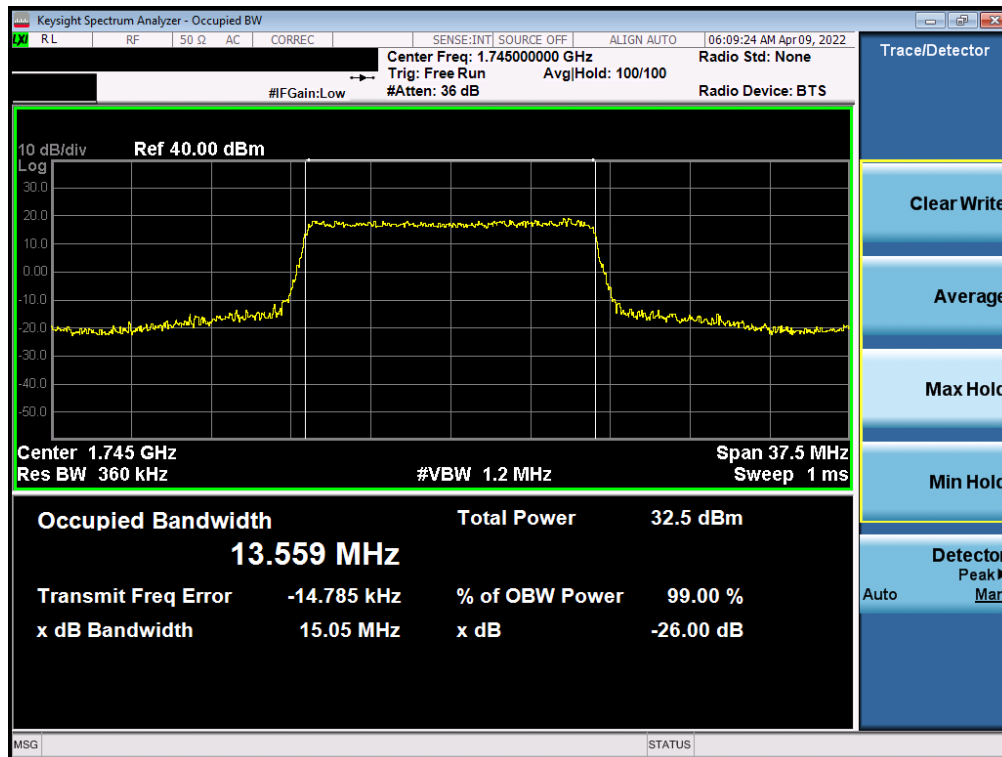


Plot 7-43. Occupied Bandwidth Plot (LTE Band 66/4 - 20MHz QPSK - Full RB)



Plot 7-44. Occupied Bandwidth Plot (LTE Band 66/4 - 20MHz 16-QAM - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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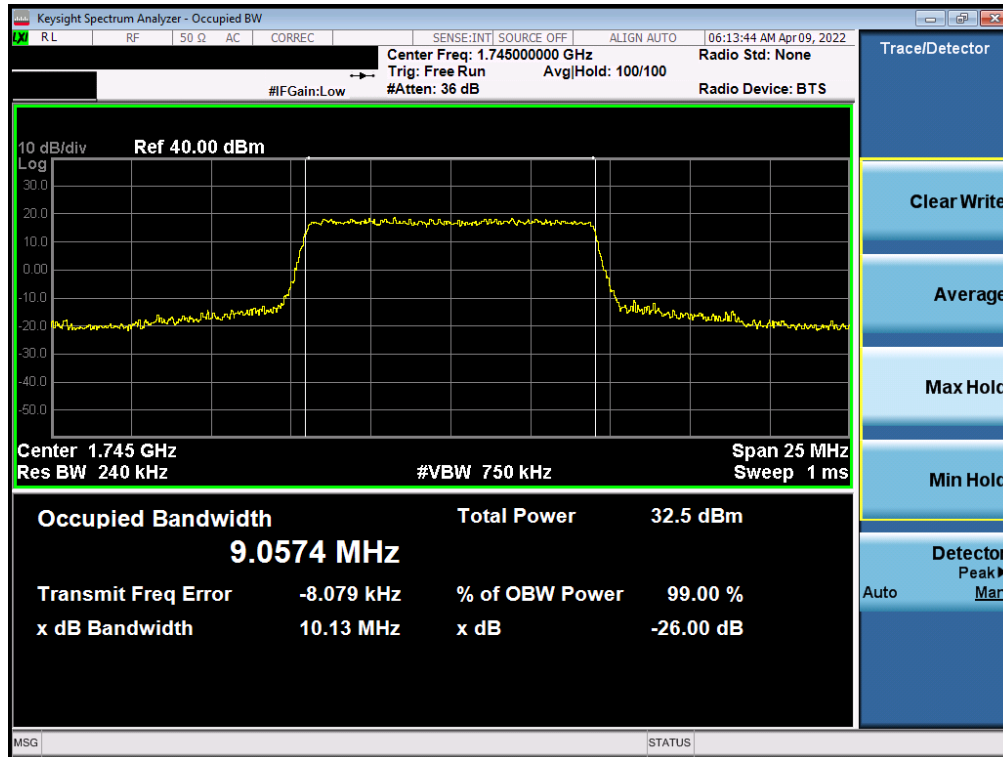


Plot 7-45. Occupied Bandwidth Plot (LTE Band 66/4 - 15MHz QPSK - Full RB)

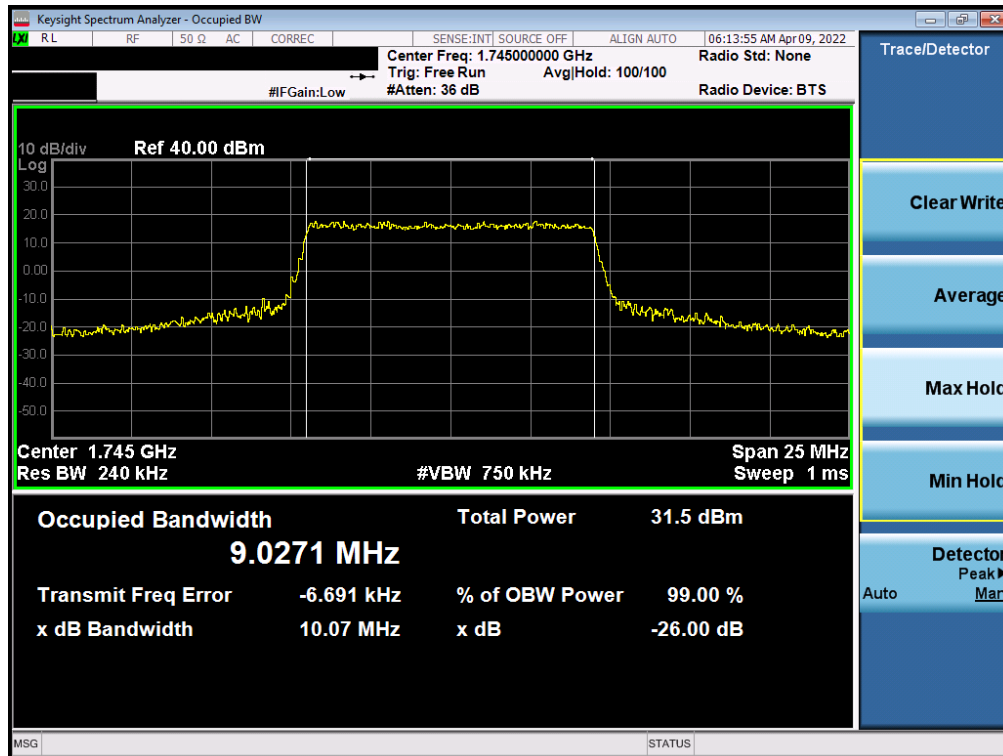


Plot 7-46. Occupied Bandwidth Plot (LTE Band 66/4 - 15MHz 16-QAM - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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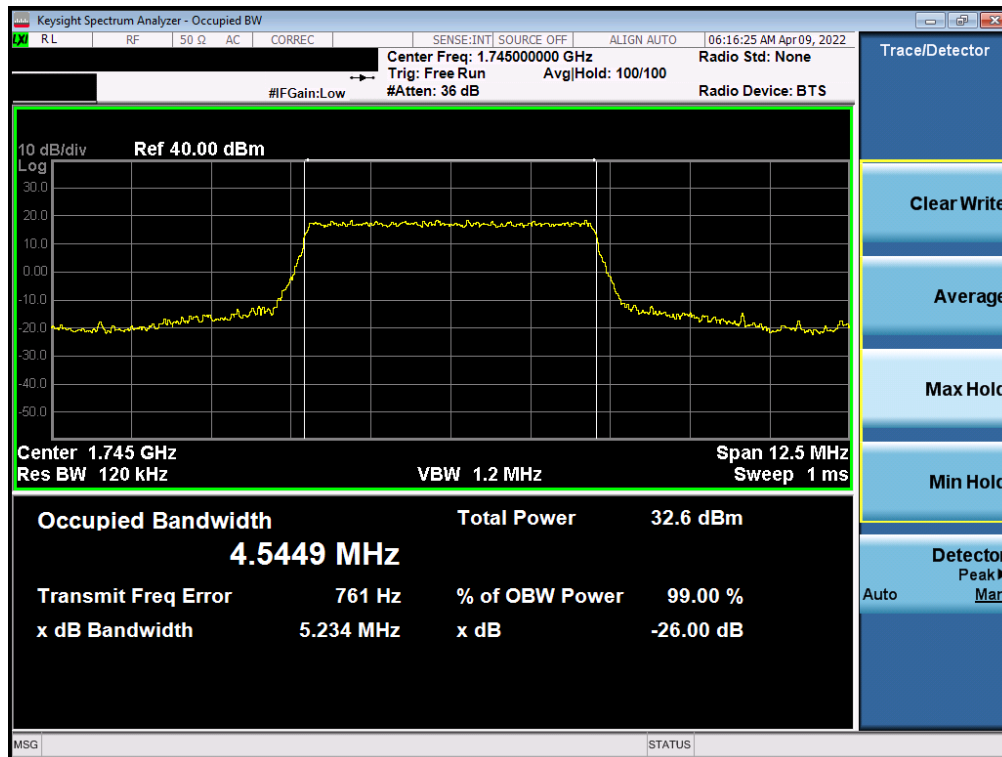


Plot 7-47. Occupied Bandwidth Plot (LTE Band 66/4 - 10MHz QPSK - Full RB)

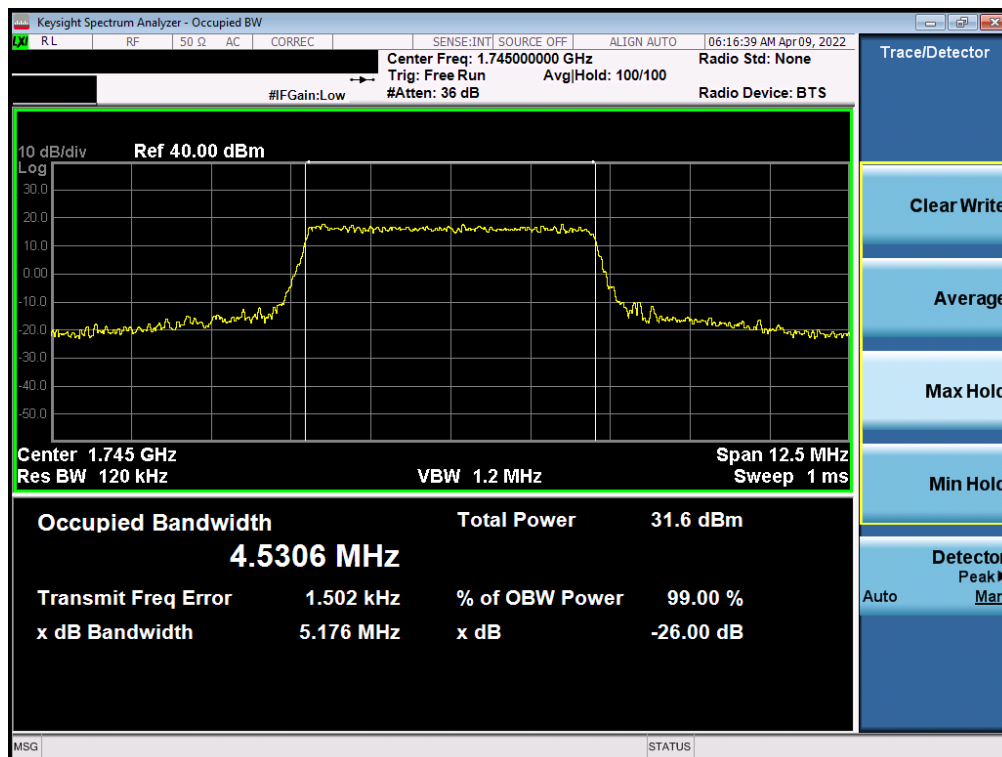


Plot 7-48. Occupied Bandwidth Plot (LTE Band 66/4 - 10MHz 16-QAM - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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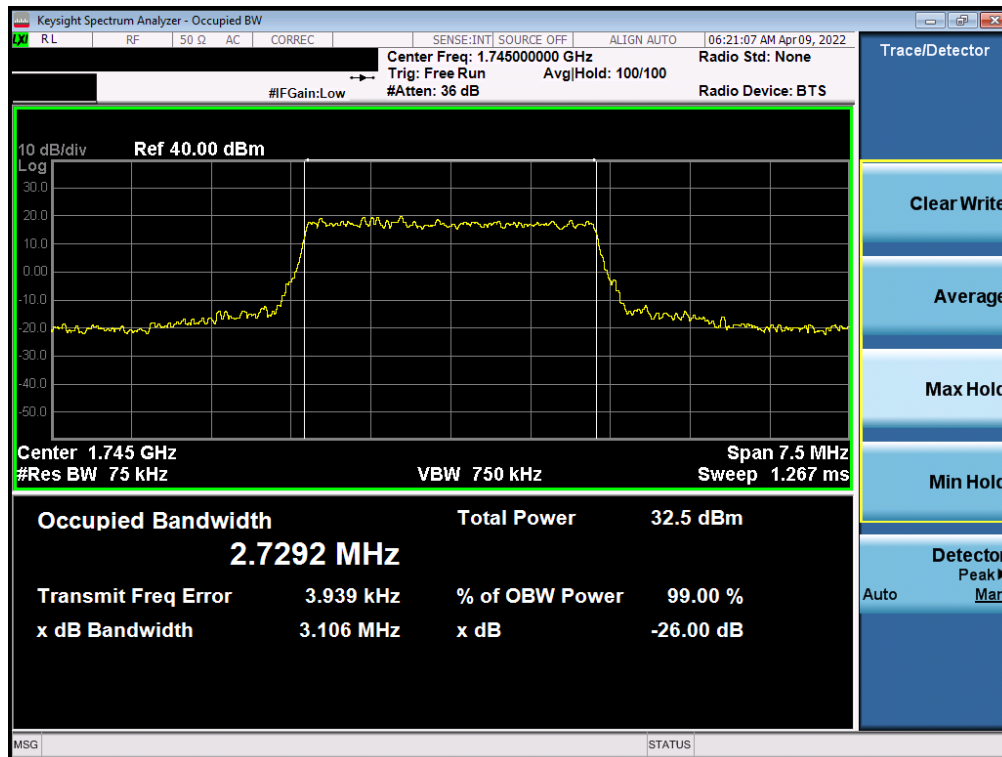


Plot 7-49. Occupied Bandwidth Plot (LTE Band 66/4 - 5MHz QPSK - Full RB)

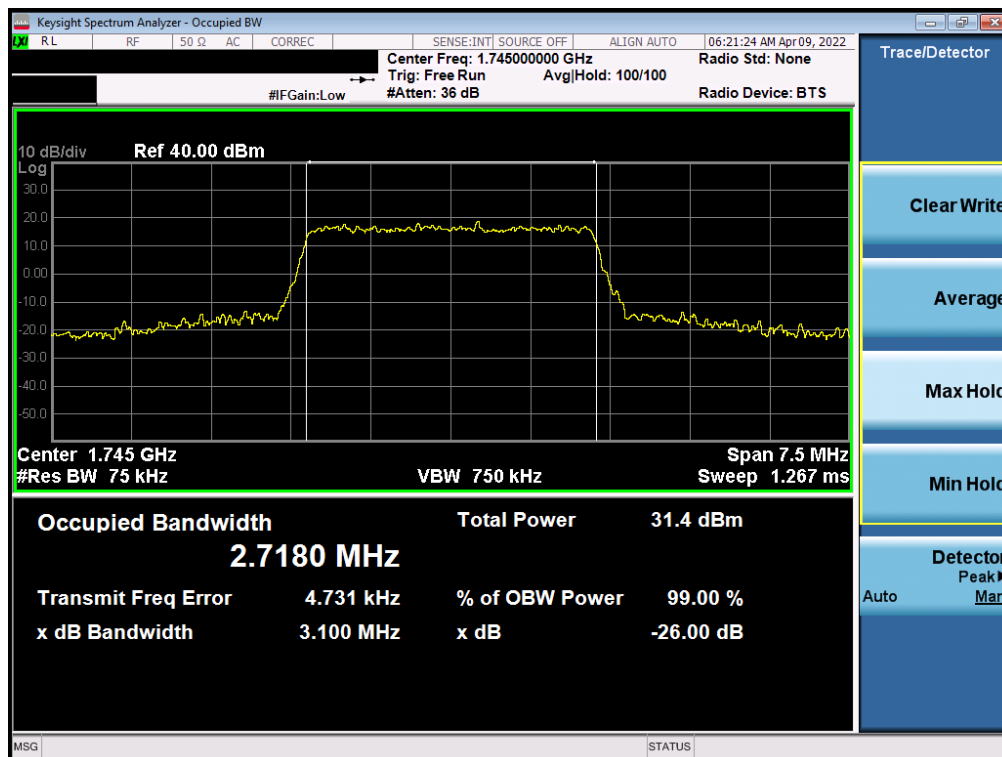


Plot 7-50. Occupied Bandwidth Plot (LTE Band 66/4 - 5MHz 16-QAM - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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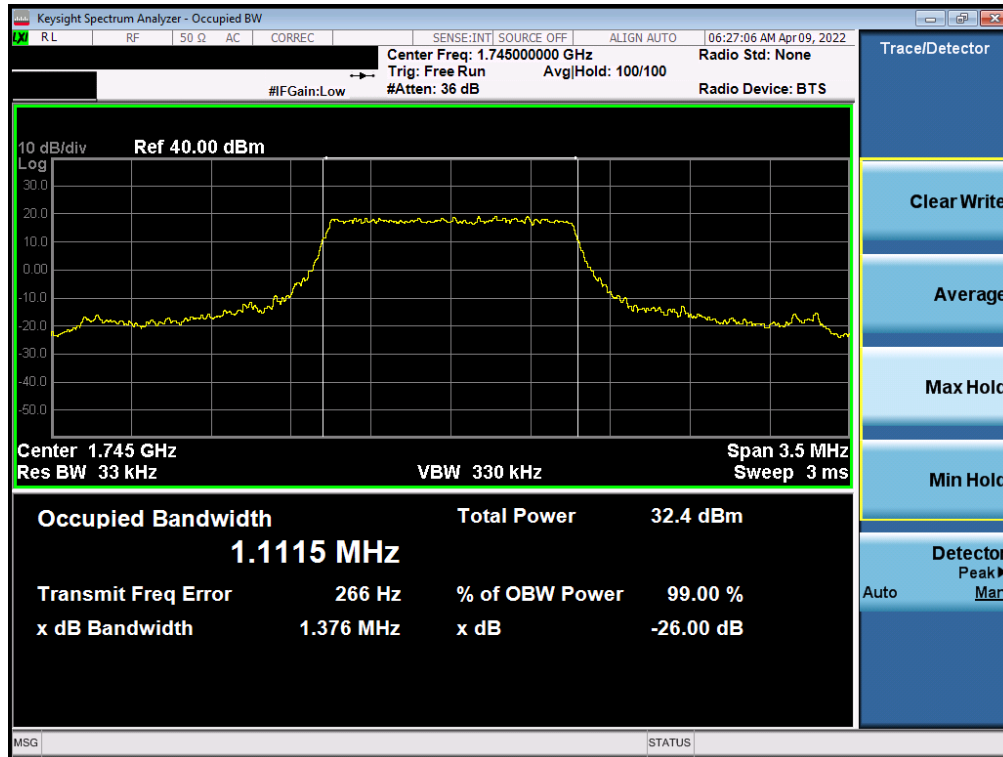


Plot 7-51. Occupied Bandwidth Plot (LTE Band 66/4 - 3MHz QPSK - Full RB)

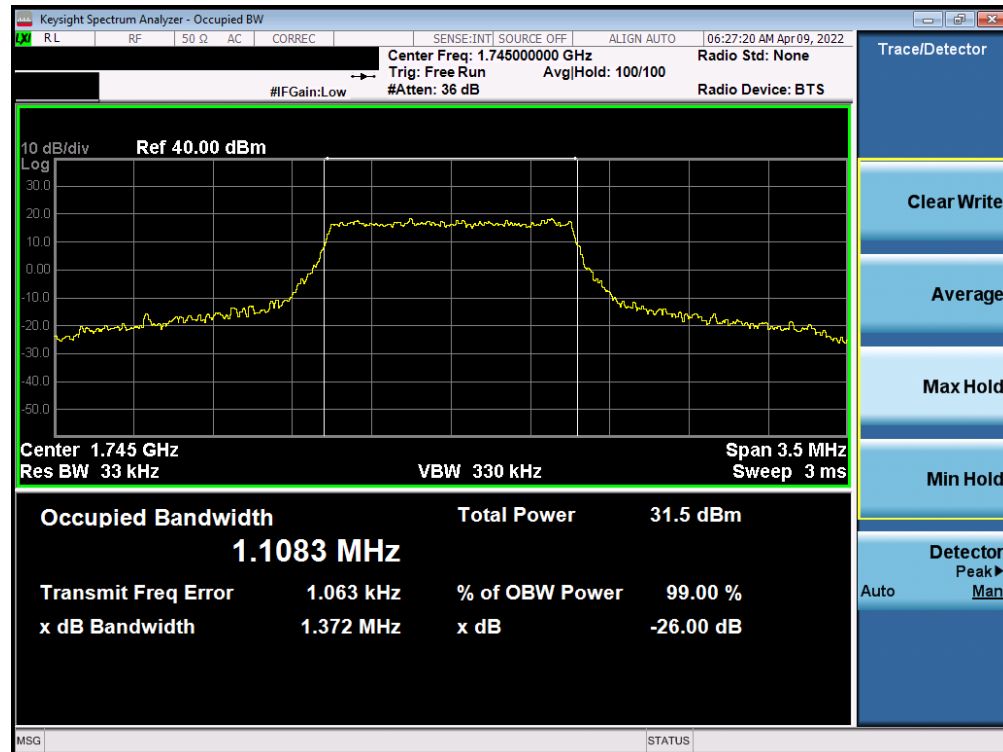


Plot 7-52. Occupied Bandwidth Plot (LTE Band 66/4 - 3MHz 16-QAM - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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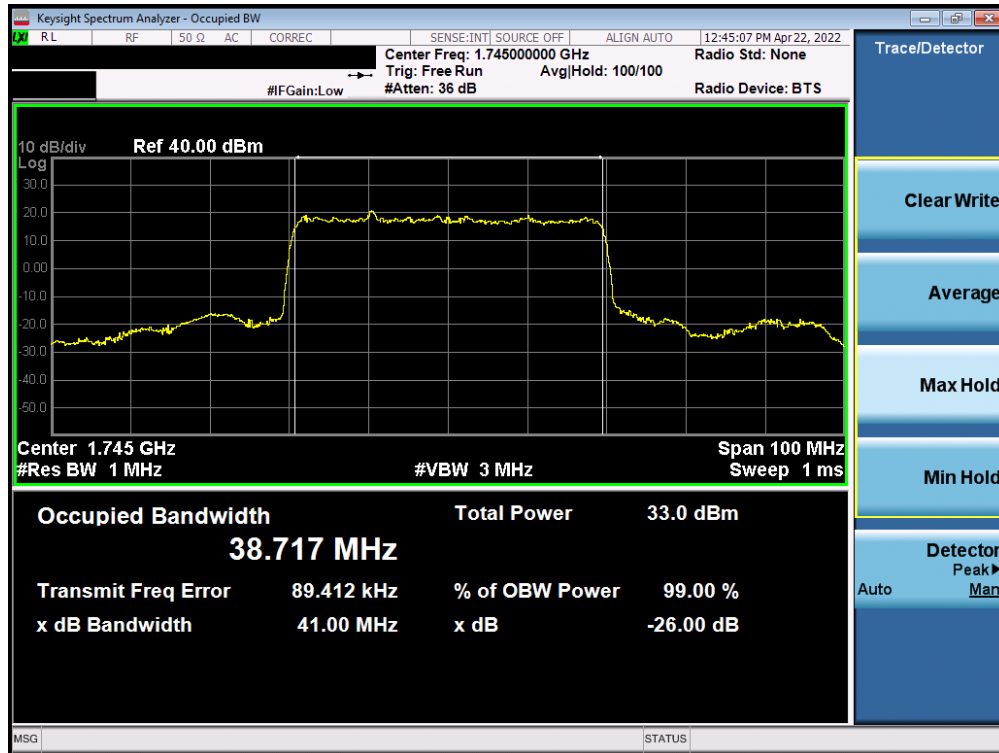
Plot 7-53. Occupied Bandwidth Plot (LTE Band 66/4 - 1.4MHz QPSK - Full RB)



Plot 7-54. Occupied Bandwidth Plot (LTE Band 66/4 - 1.4MHz 16-QAM - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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NR Band n66 ANT A

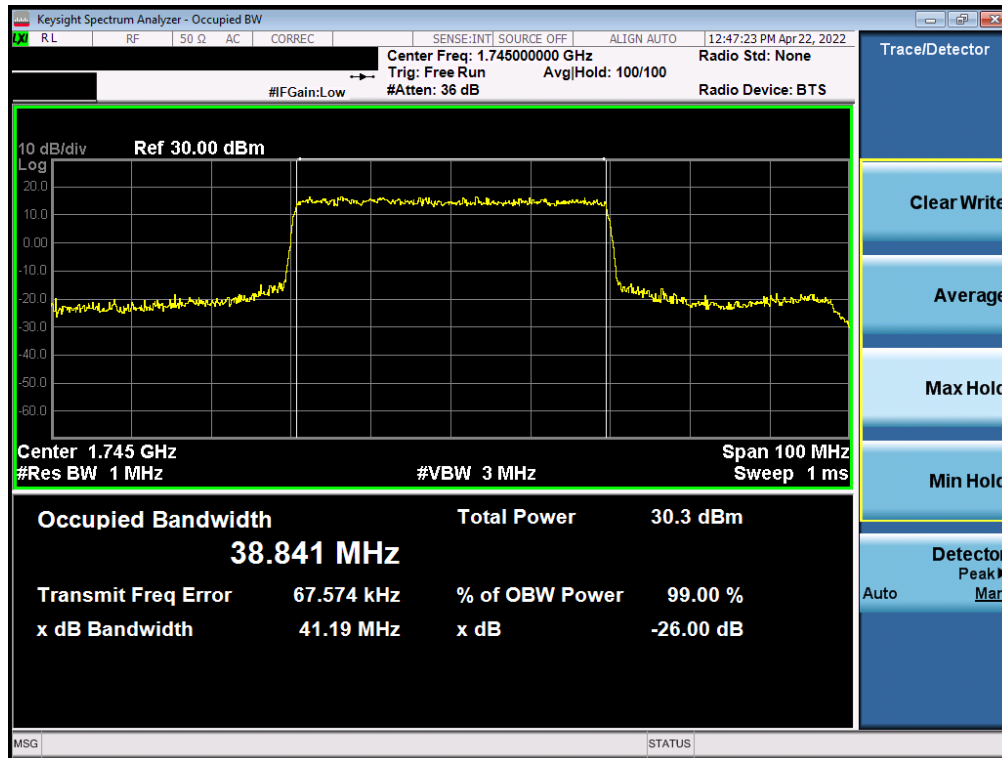


Plot 7-55. Occupied Bandwidth Plot (NR Band n66- 40MHz DFT-s-OFDM BPSK - Full RB)

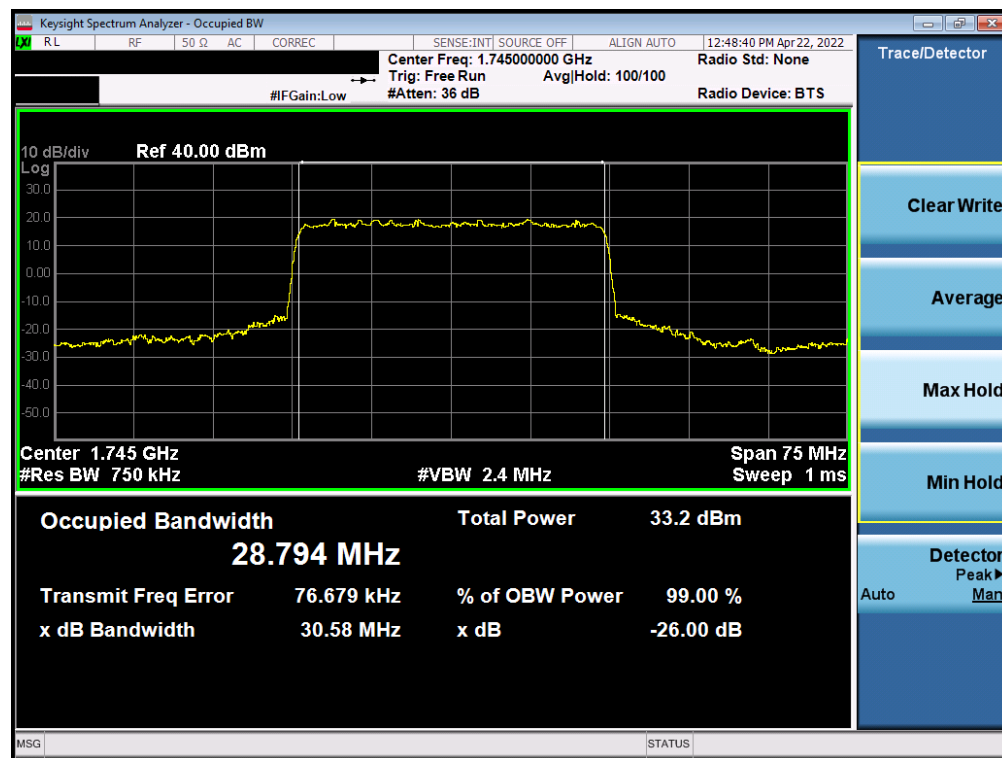


Plot 7-56. Occupied Bandwidth Plot (NR Band n66 - 40.0MHz CP-OFDM QPSK - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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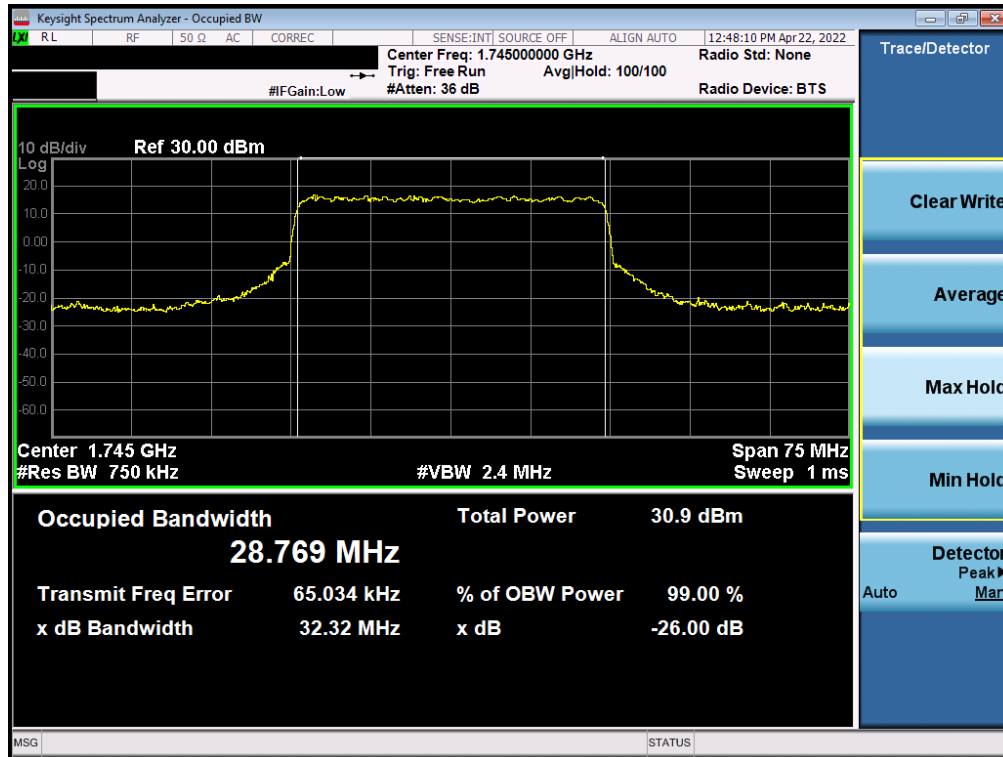


Plot 7-57. Occupied Bandwidth Plot (NR Band n66 - 40.0MHz CP-OFDM 16QAM - Full RB)

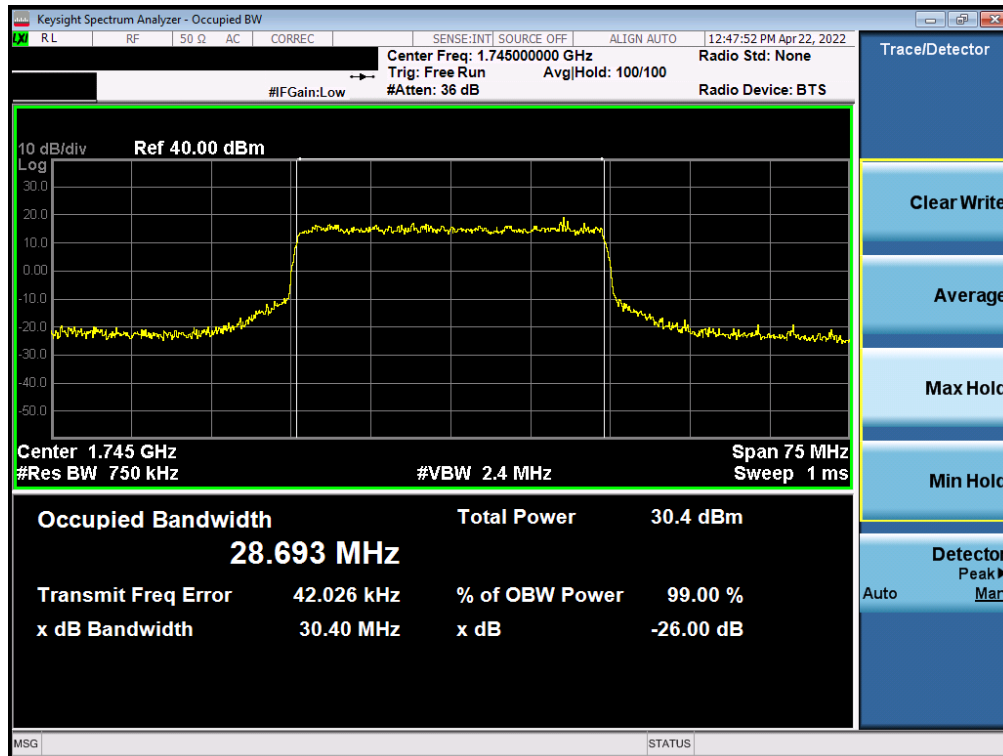


Plot 7-58. Occupied Bandwidth Plot (NR Band n66- 30MHz DFT-s-OFDM BPSK - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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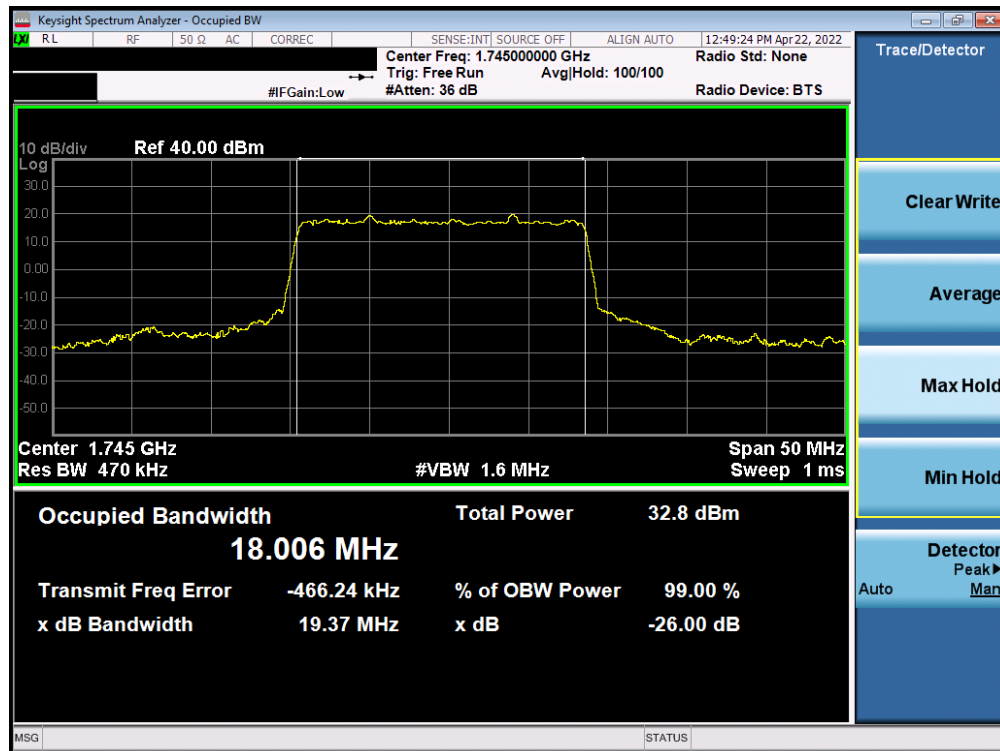


Plot 7-59. Occupied Bandwidth Plot (NR Band n66 - 30.0MHz CP-OFDM QPSK - Full RB)

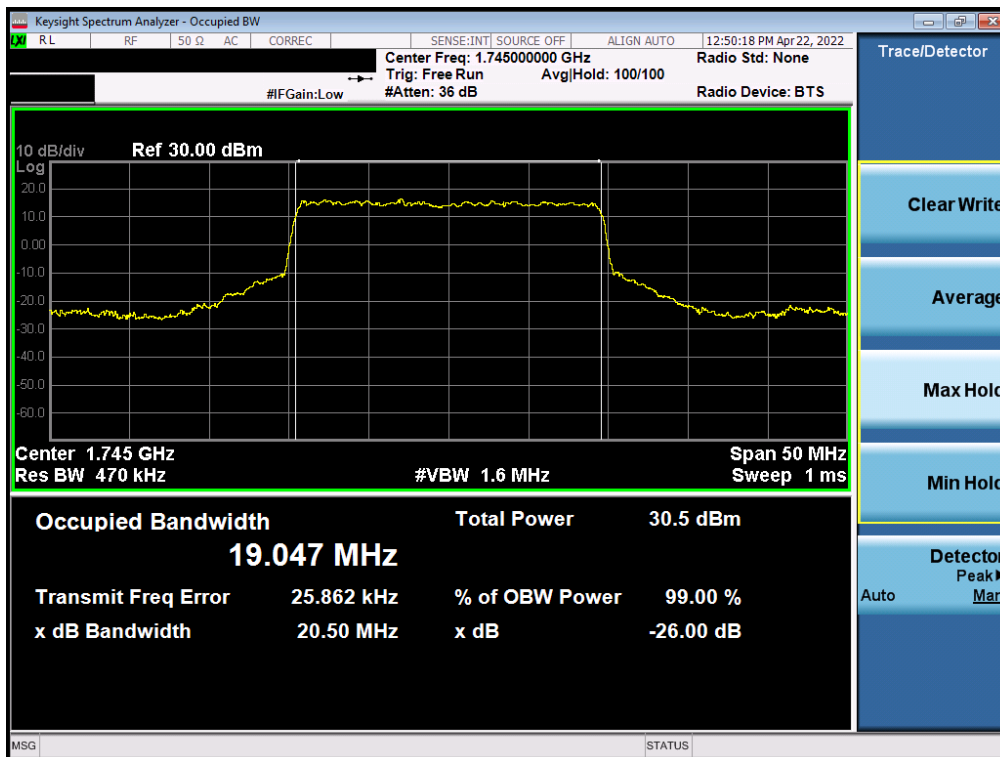


Plot 7-60. Occupied Bandwidth Plot (NR Band n66 - 30.0MHz CP-OFDM 16QAM - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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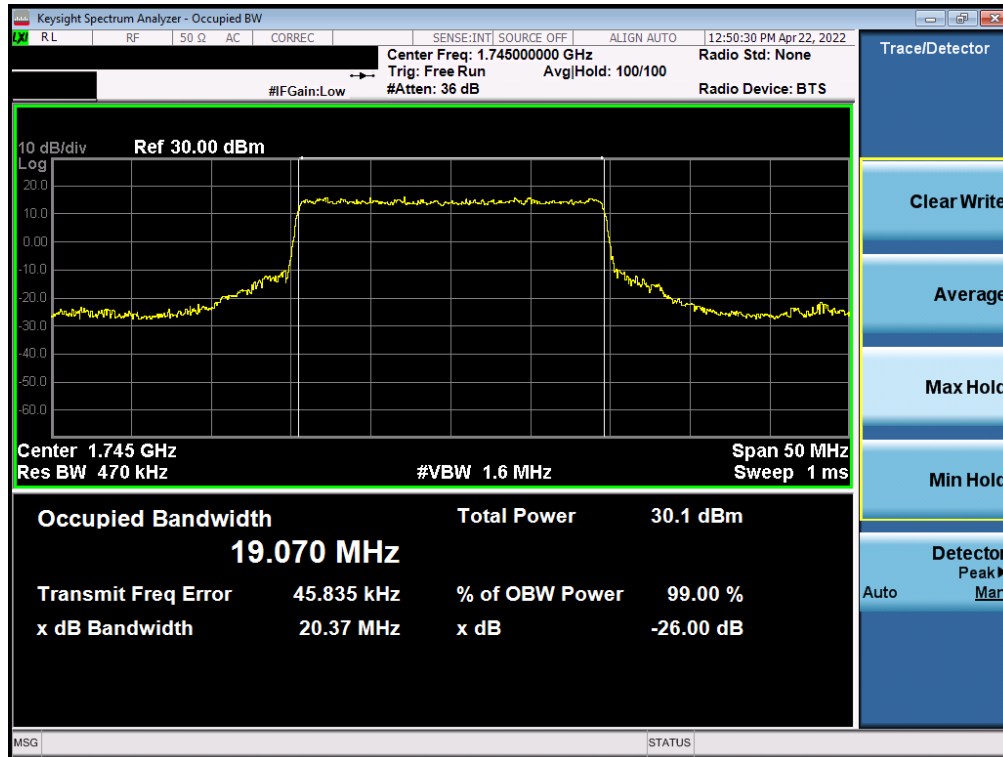


Plot 7-61. Occupied Bandwidth Plot (NR Band n66- 20MHz DFT-s-OFDM BPSK - Full RB)

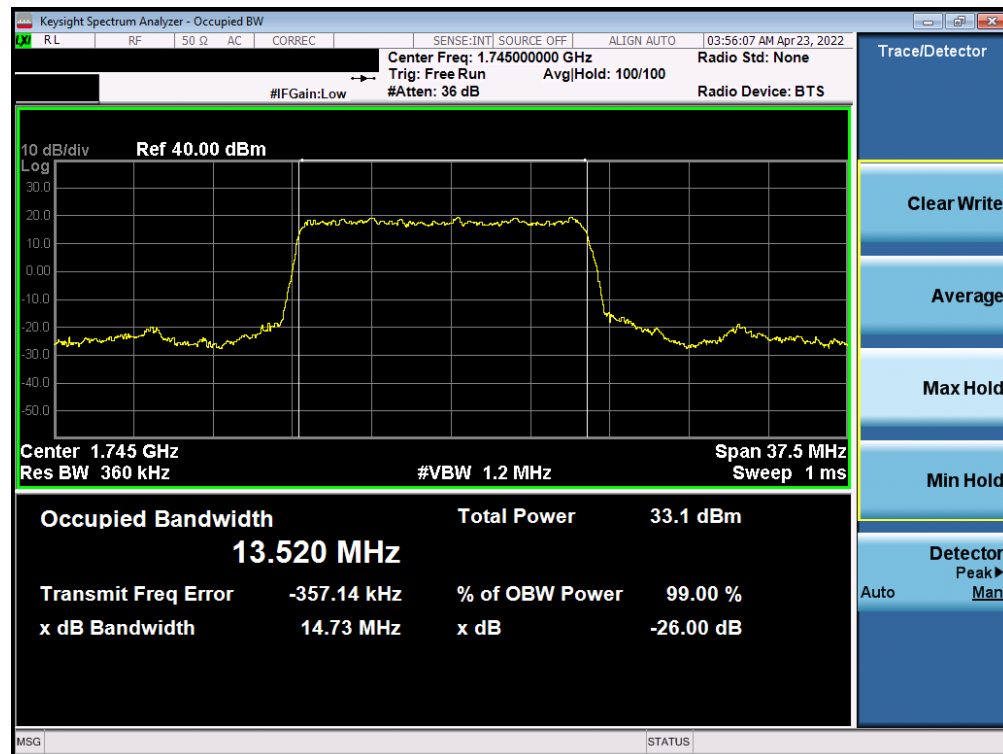


Plot 7-62. Occupied Bandwidth Plot (NR Band n66 - 20.0MHz CP-OFDM QPSK - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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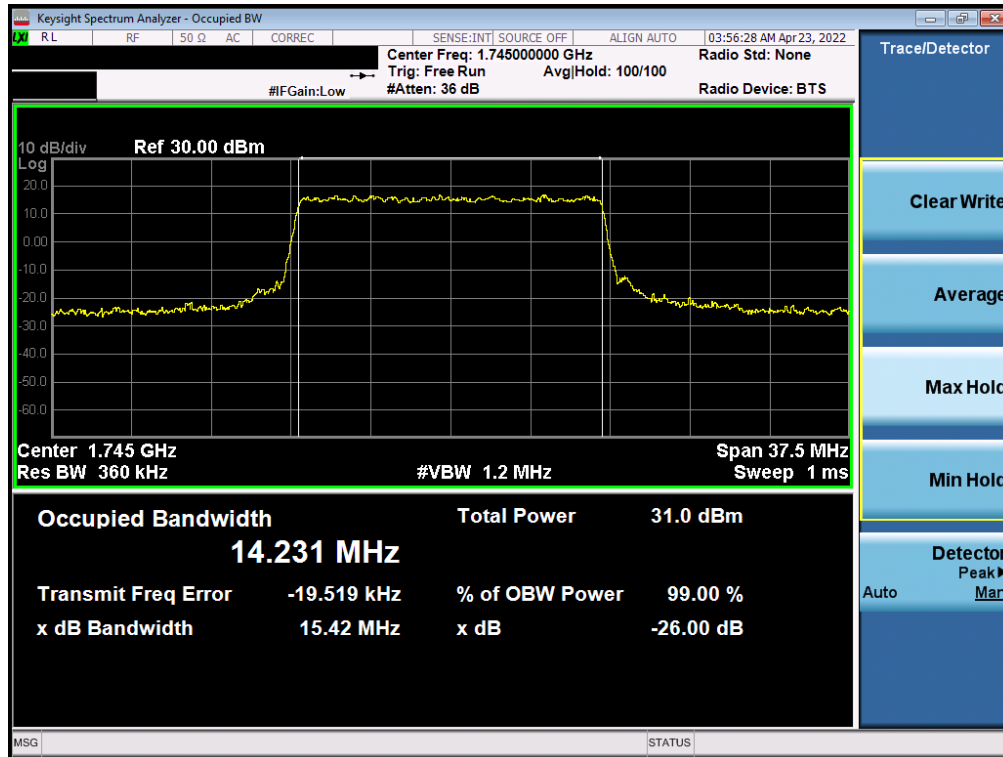


Plot 7-63. Occupied Bandwidth Plot (NR Band n66 - 20.0MHz CP-OFDM 16QAM - Full RB)

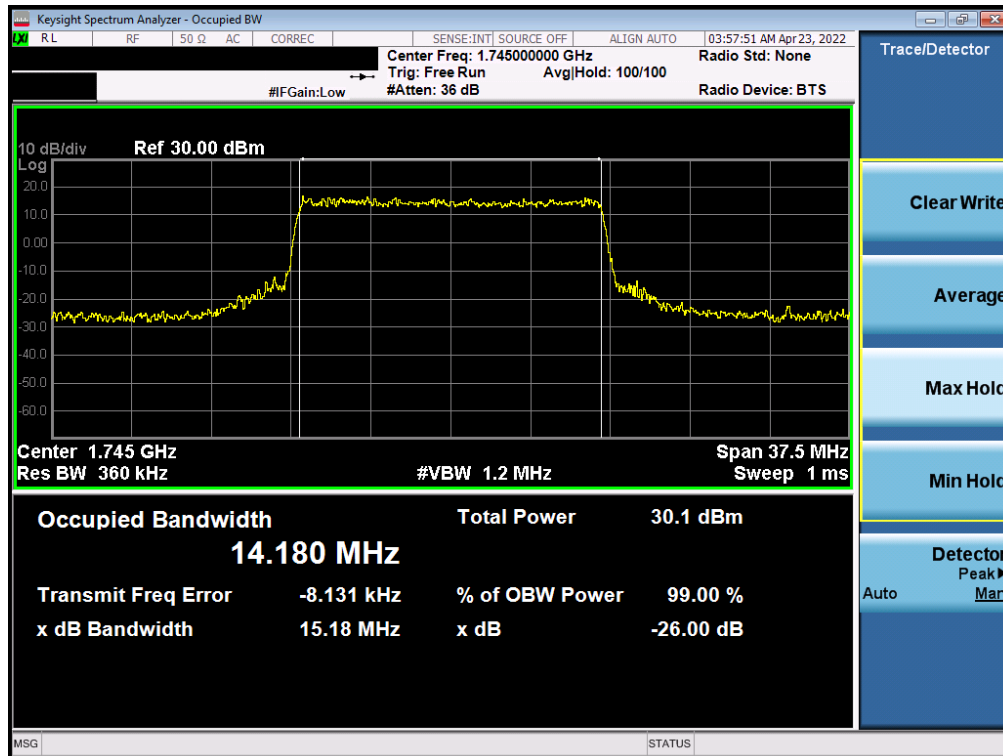


Plot 7-64. Occupied Bandwidth Plot (NR Band n66- 15MHz DFT-s-OFDM BPSK - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2204080051-04.A3L	Test Dates: 4/8/2022 - 6/23/2022	EUT Type: Portable Handset	Page 50 of 275

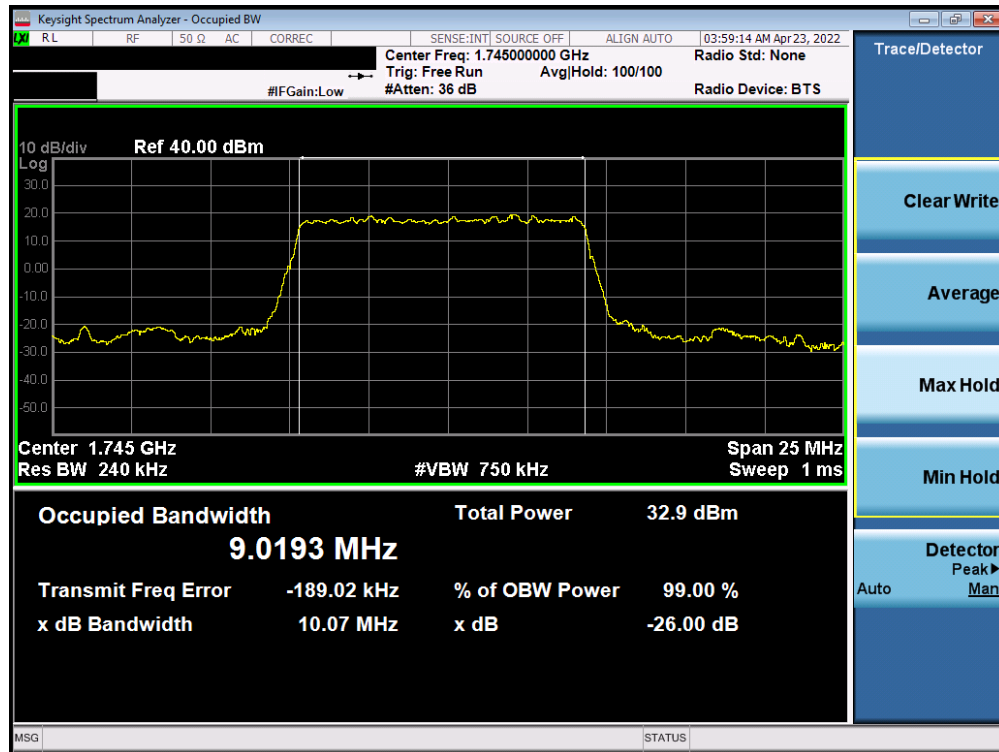


Plot 7-65. Occupied Bandwidth Plot (NR Band n66 - 15.0MHz CP-OFDM QPSK - Full RB)

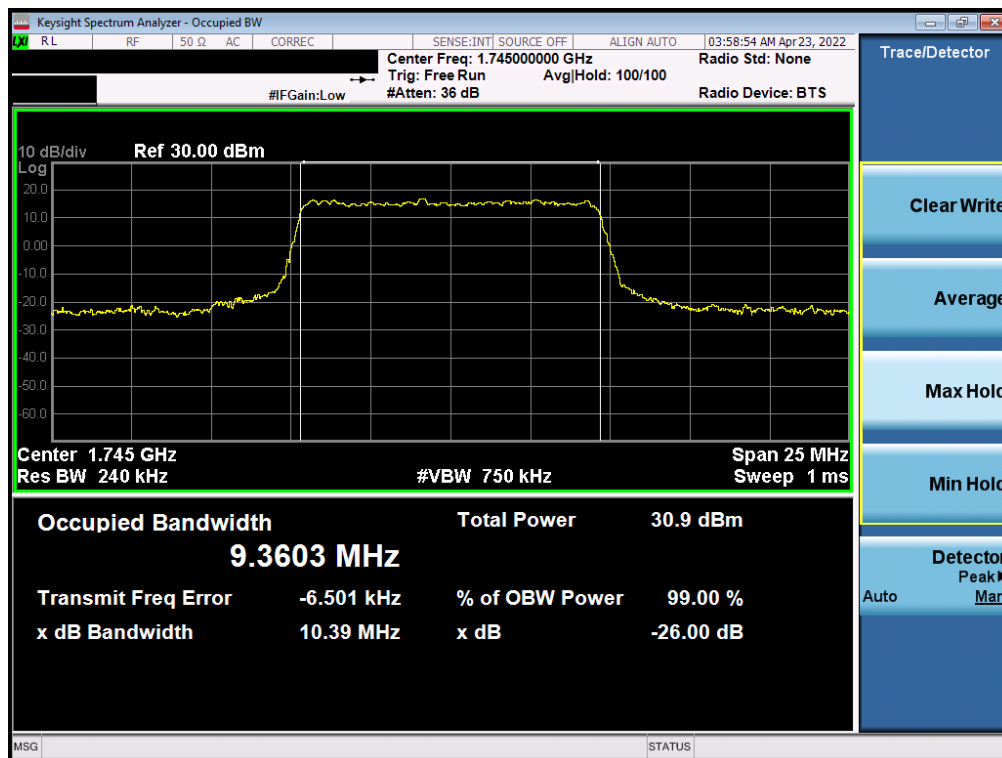


Plot 7-66. Occupied Bandwidth Plot (NR Band n66 - 15.0MHz CP-OFDM 16QAM - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2204080051-04.A3L	Test Dates: 4/8/2022 - 6/23/2022	EUT Type: Portable Handset	Page 51 of 275

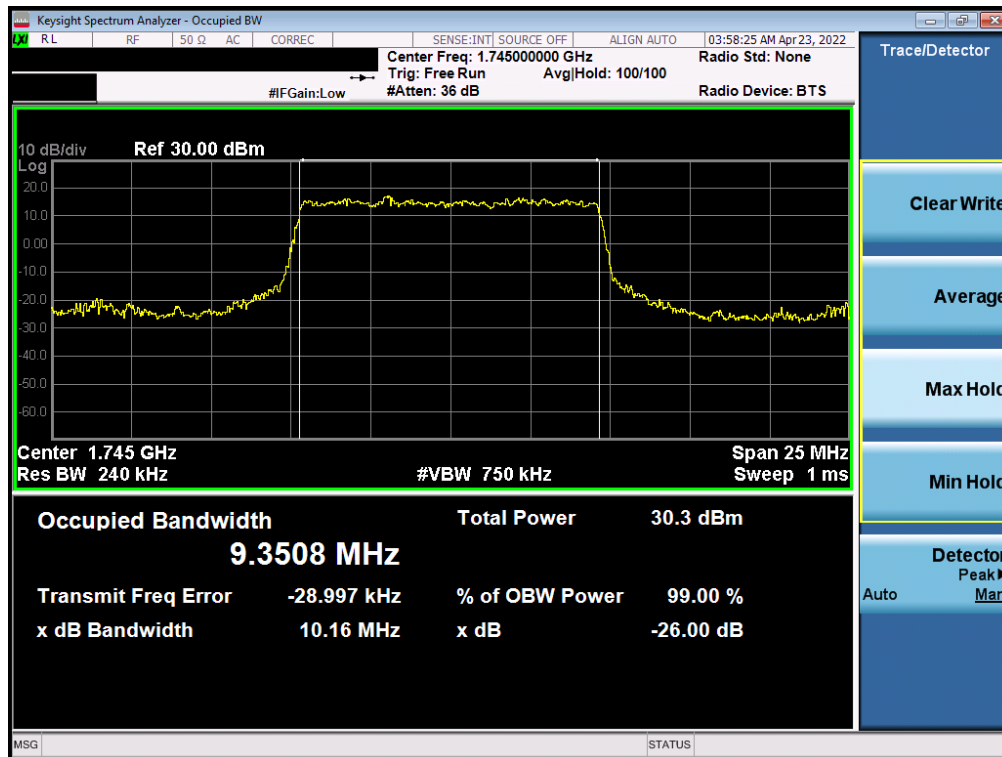


Plot 7-67. Occupied Bandwidth Plot (NR Band n66- 10MHz DFT-s-OFDM BPSK - Full RB)

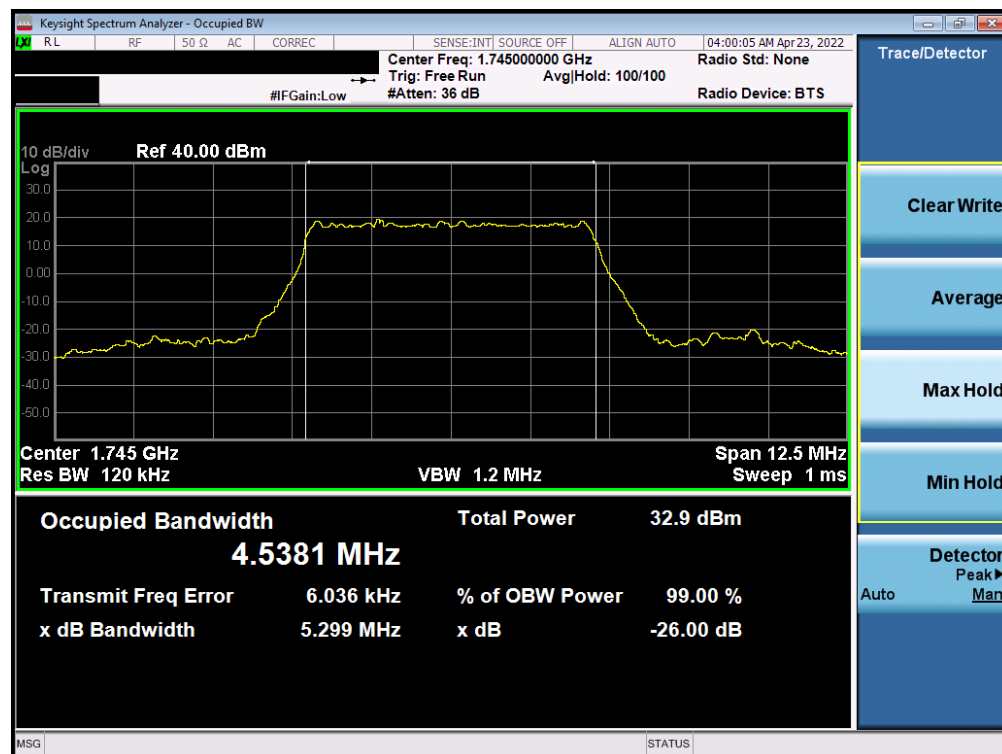


Plot 7-68. Occupied Bandwidth Plot (NR Band n66 - 10.0MHz CP-OFDM QPSK - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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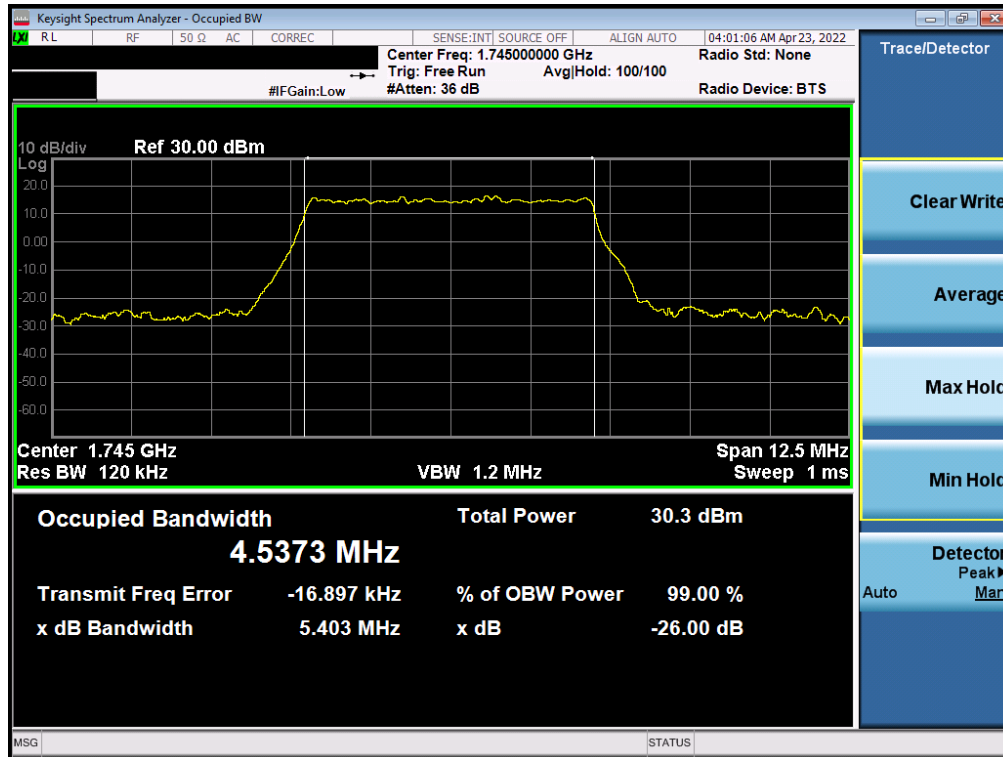


Plot 7-69. Occupied Bandwidth Plot (NR Band n66 - 10.0MHz CP-OFDM 16QAM - Full RB)

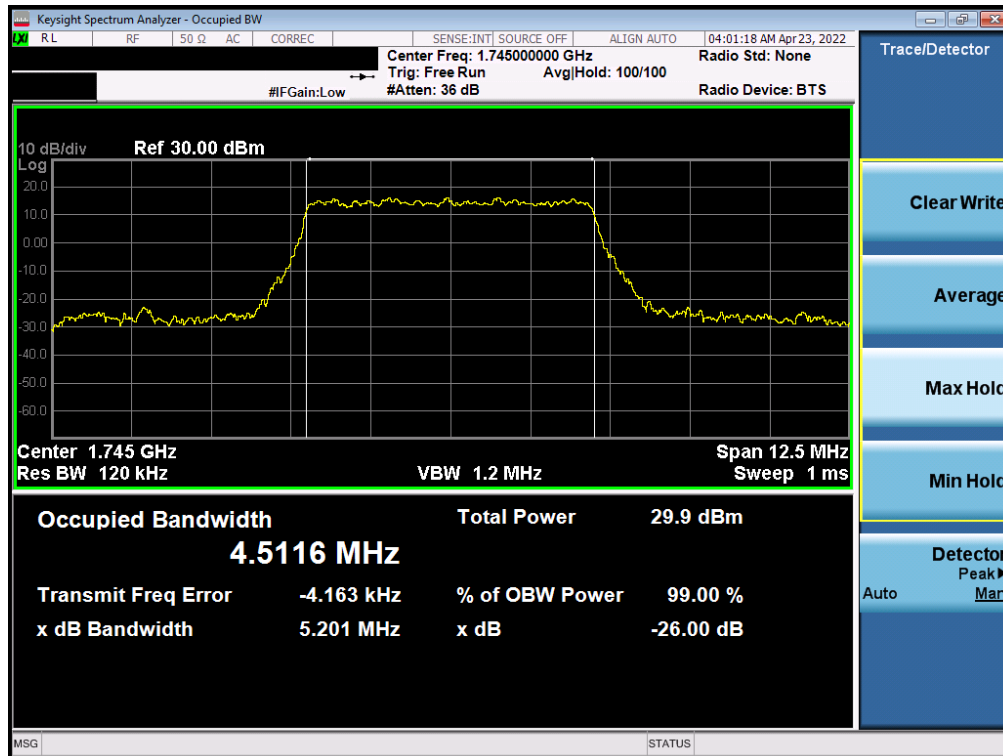


Plot 7-70. Occupied Bandwidth Plot (NR Band n66- 5MHz DFT-s-OFDM BPSK - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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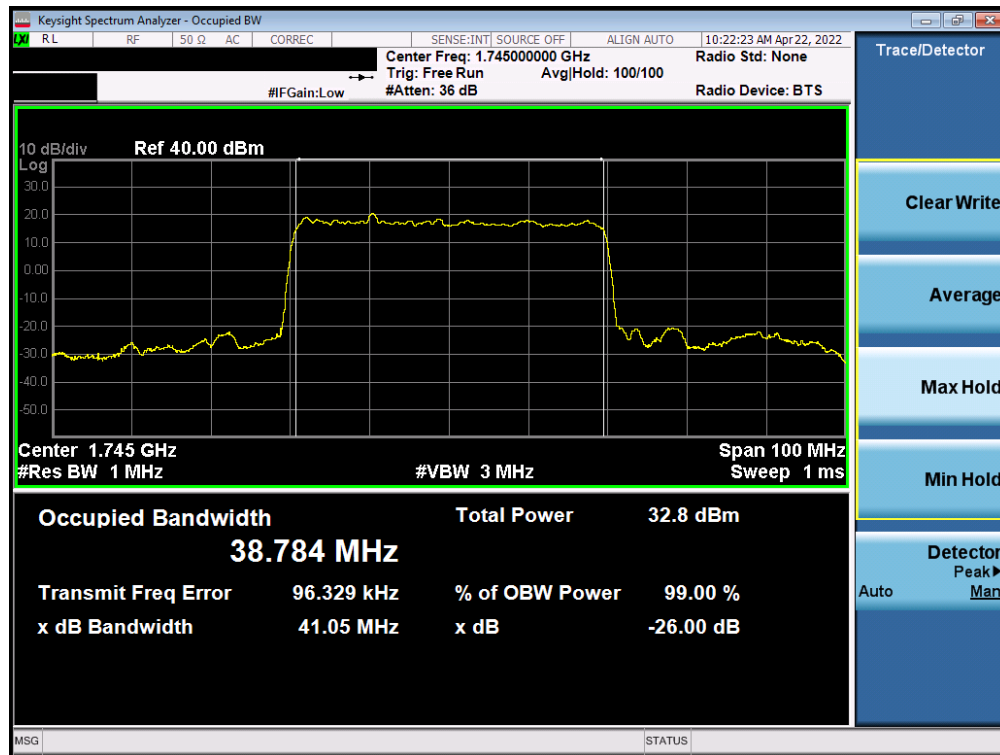
Plot 7-71. Occupied Bandwidth Plot (NR Band n66 - 5.0MHz CP-OFDM QPSK - Full RB)



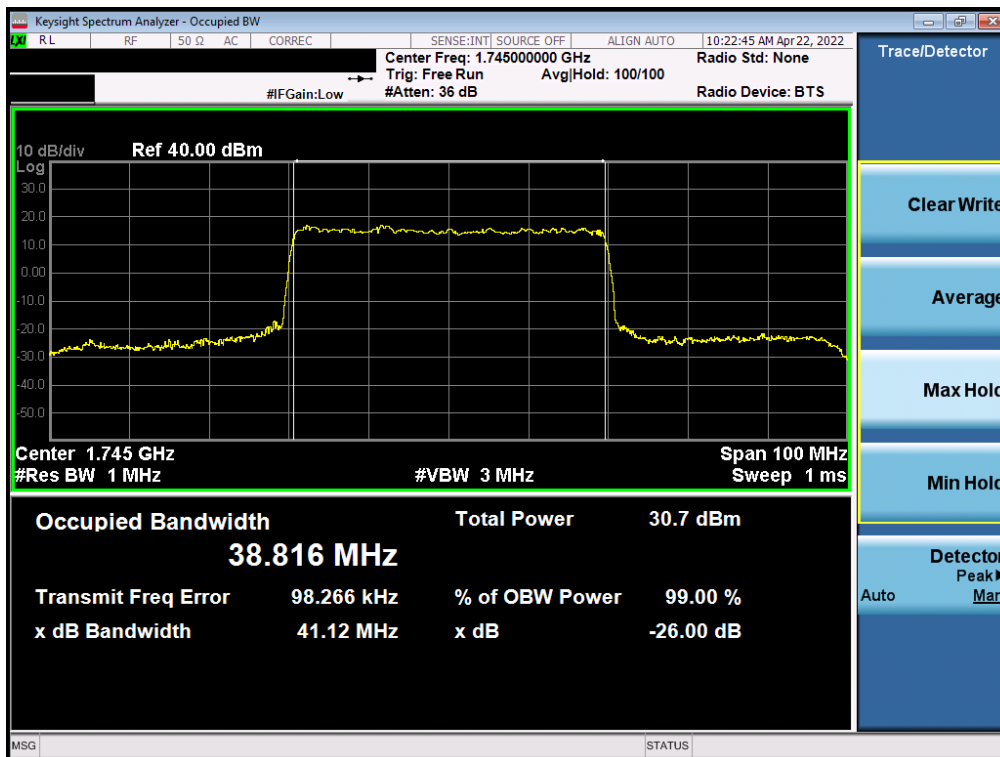
Plot 7-72. Occupied Bandwidth Plot (NR Band n66 - 5.0MHz CP-OFDM 16QAM - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2204080051-04.A3L	Test Dates: 4/8/2022 - 6/23/2022	EUT Type: Portable Handset	Page 54 of 275

NR Band n66 ANT I



Plot 7-73. Occupied Bandwidth Plot (NR Band n66- 40MHz DFT-s-OFDM BPSK - Full RB)

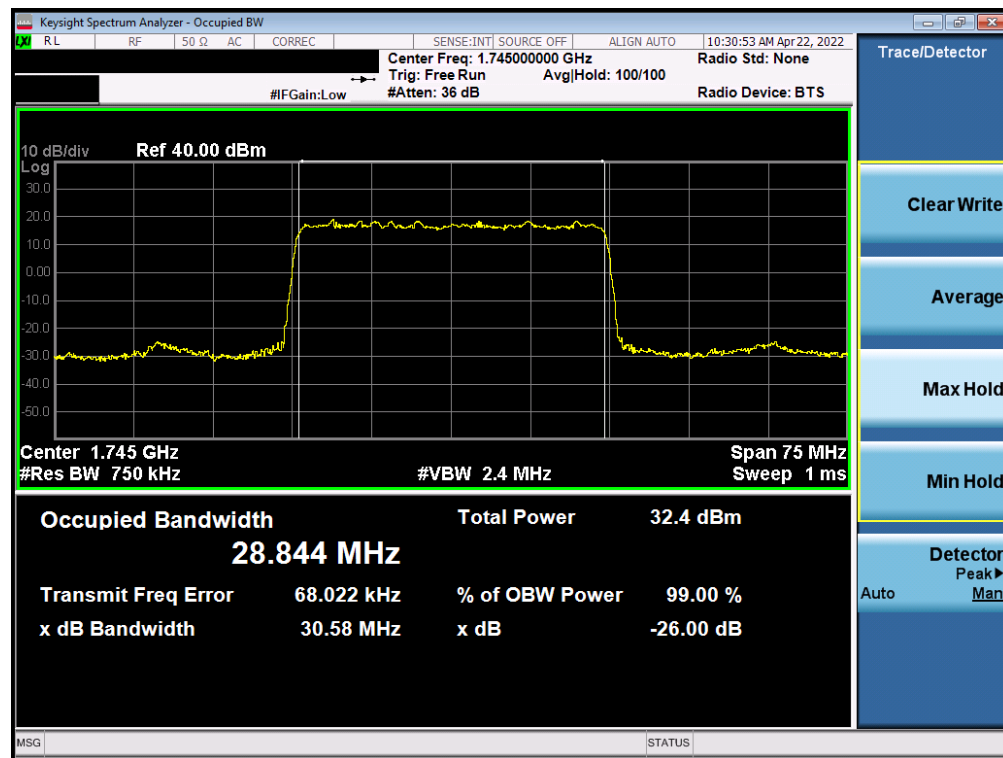


Plot 7-74. Occupied Bandwidth Plot (NR Band n66 - 40.0MHz CP-OFDM QPSK - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2204080051-04.A3L	Test Dates: 4/8/2022 - 6/23/2022	EUT Type: Portable Handset	Page 55 of 275

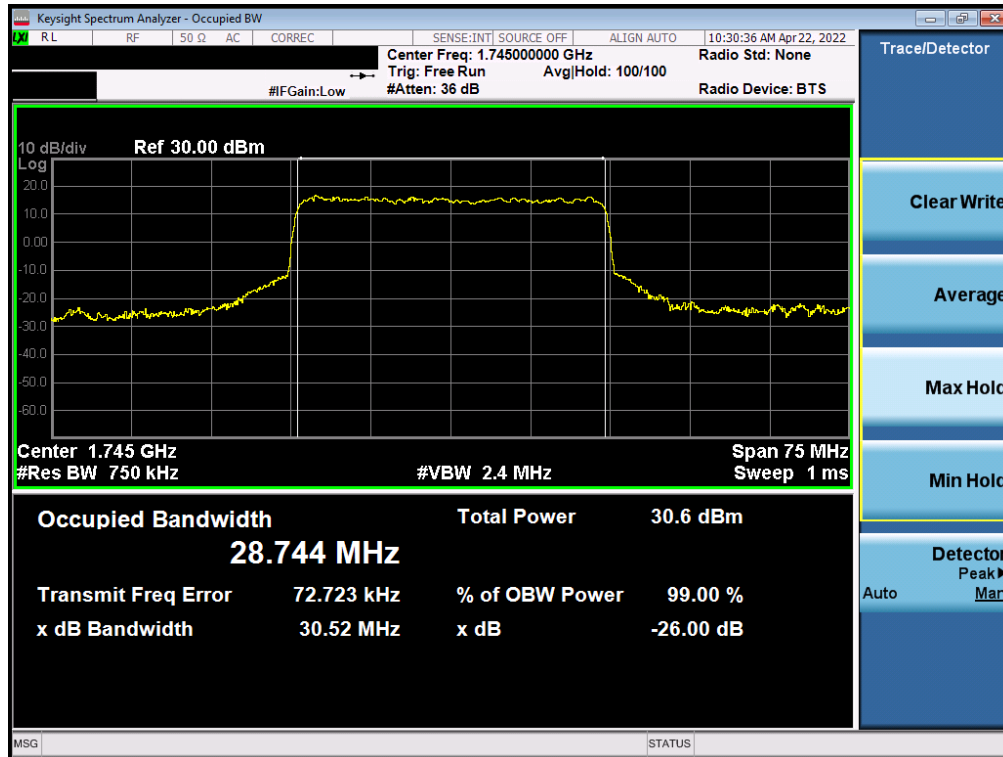


Plot 7-75. Occupied Bandwidth Plot (NR Band n66 - 40.0MHz CP-OFDM 16QAM - Full RB)

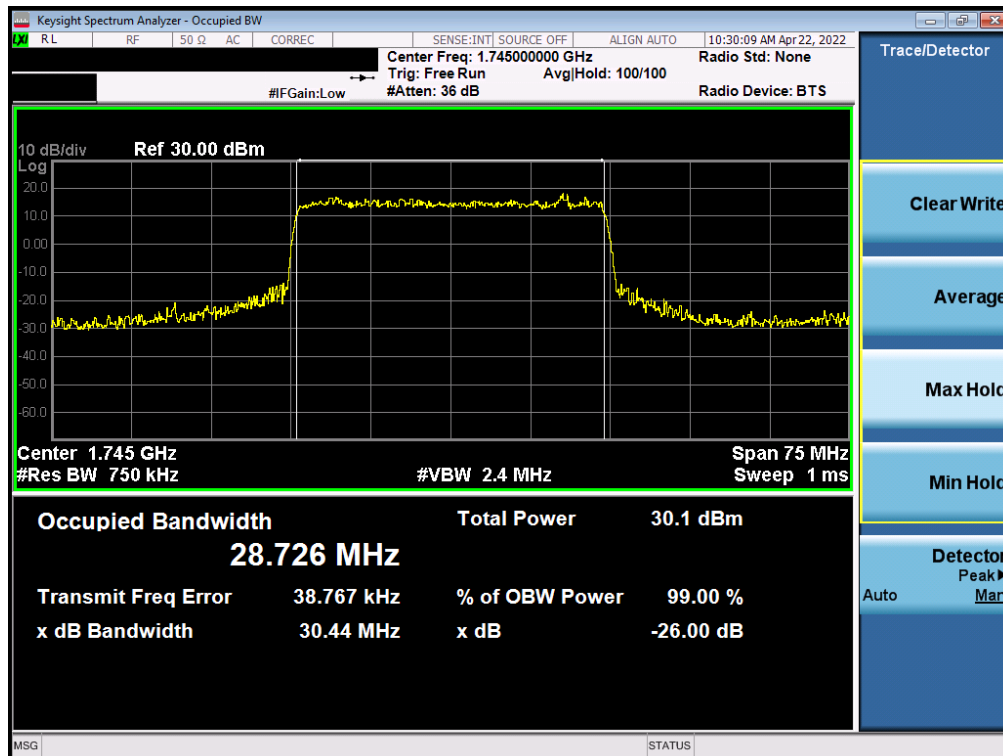


Plot 7-76. Occupied Bandwidth Plot (NR Band n66- 30MHz DFT-s-OFDM BPSK - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2204080051-04.A3L	Test Dates: 4/8/2022 - 6/23/2022	EUT Type: Portable Handset	Page 56 of 275

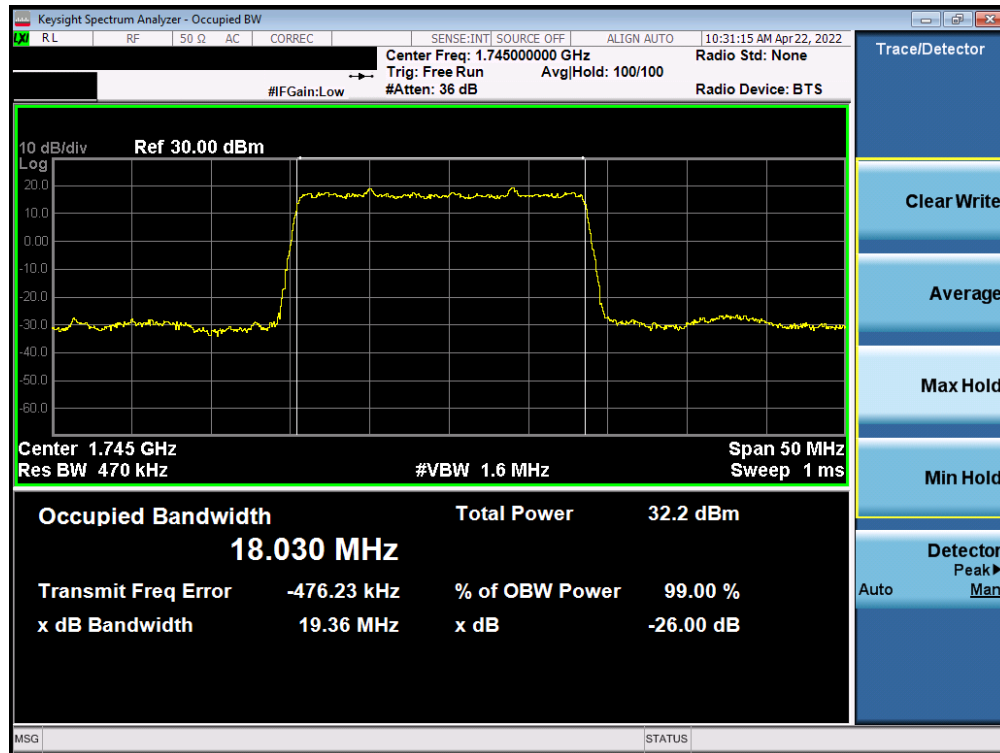


Plot 7-77. Occupied Bandwidth Plot (NR Band n66 - 30.0MHz CP-OFDM QPSK - Full RB)

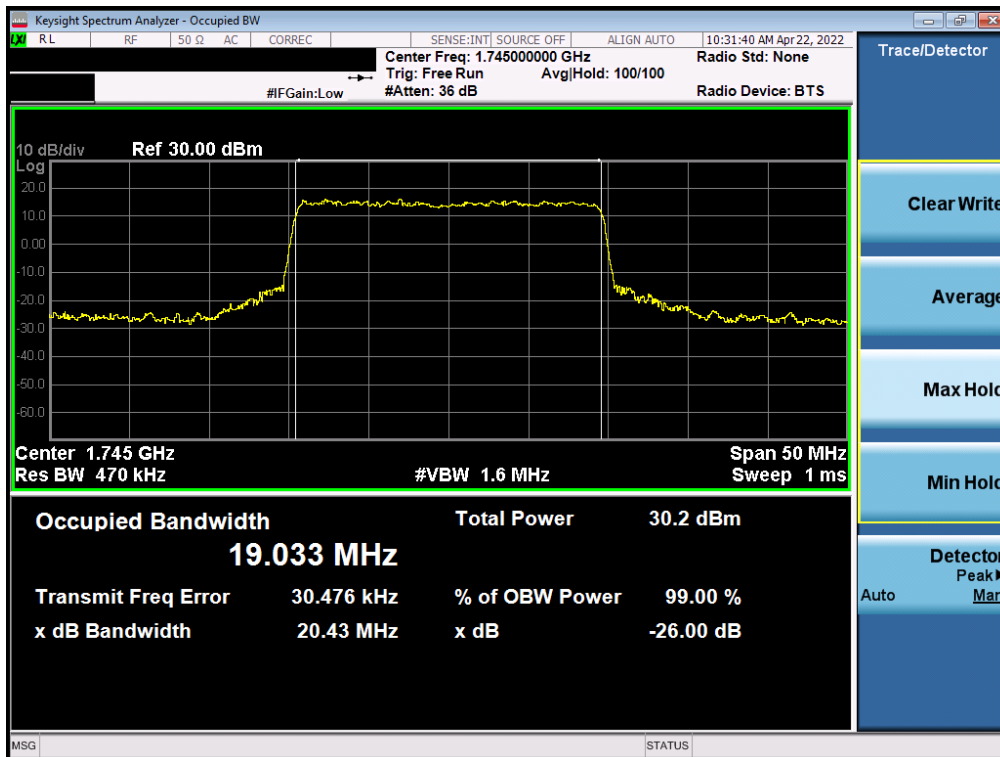


Plot 7-78. Occupied Bandwidth Plot (NR Band n66 - 30.0MHz CP-OFDM 16QAM - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2204080051-04.A3L	Test Dates: 4/8/2022 - 6/23/2022	EUT Type: Portable Handset	Page 57 of 275

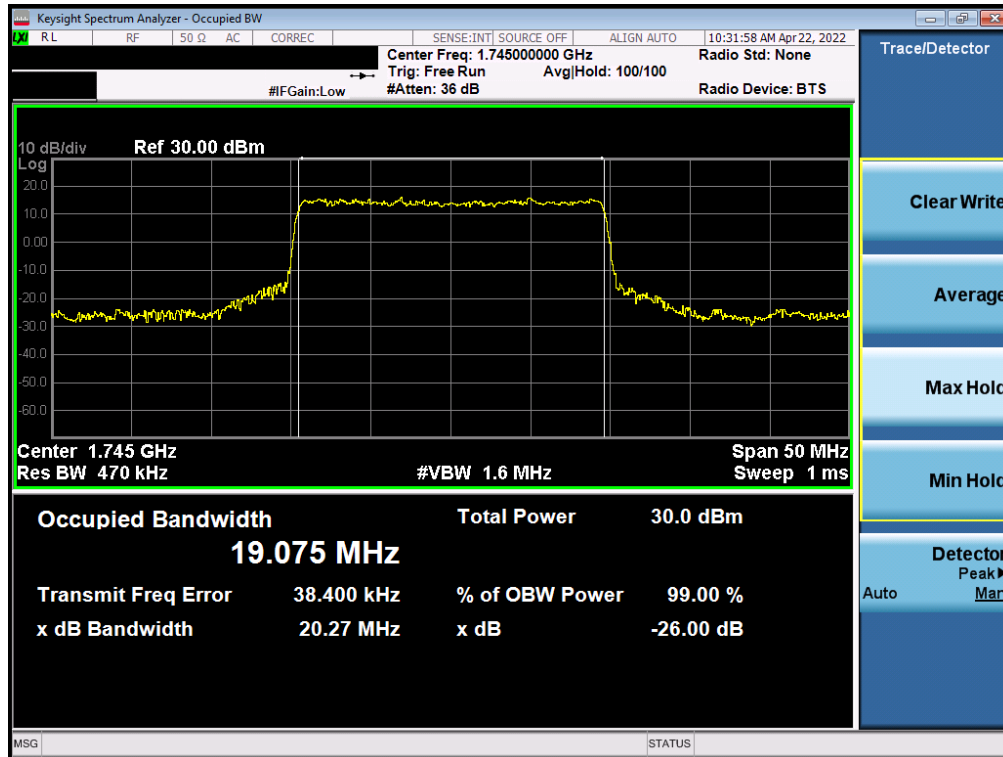


Plot 7-79. Occupied Bandwidth Plot (NR Band n66- 20MHz DFT-s-OFDM BPSK - Full RB)

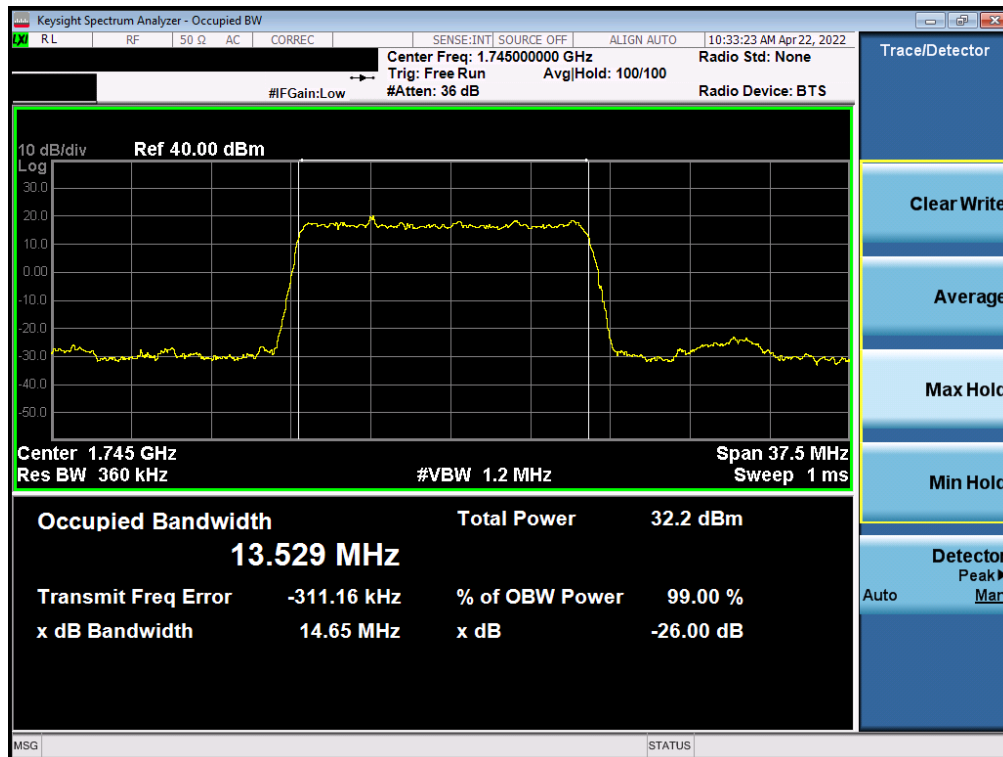


Plot 7-80. Occupied Bandwidth Plot (NR Band n66 - 20.0MHz CP-OFDM QPSK - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2204080051-04.A3L	Test Dates: 4/8/2022 - 6/23/2022	EUT Type: Portable Handset	Page 58 of 275

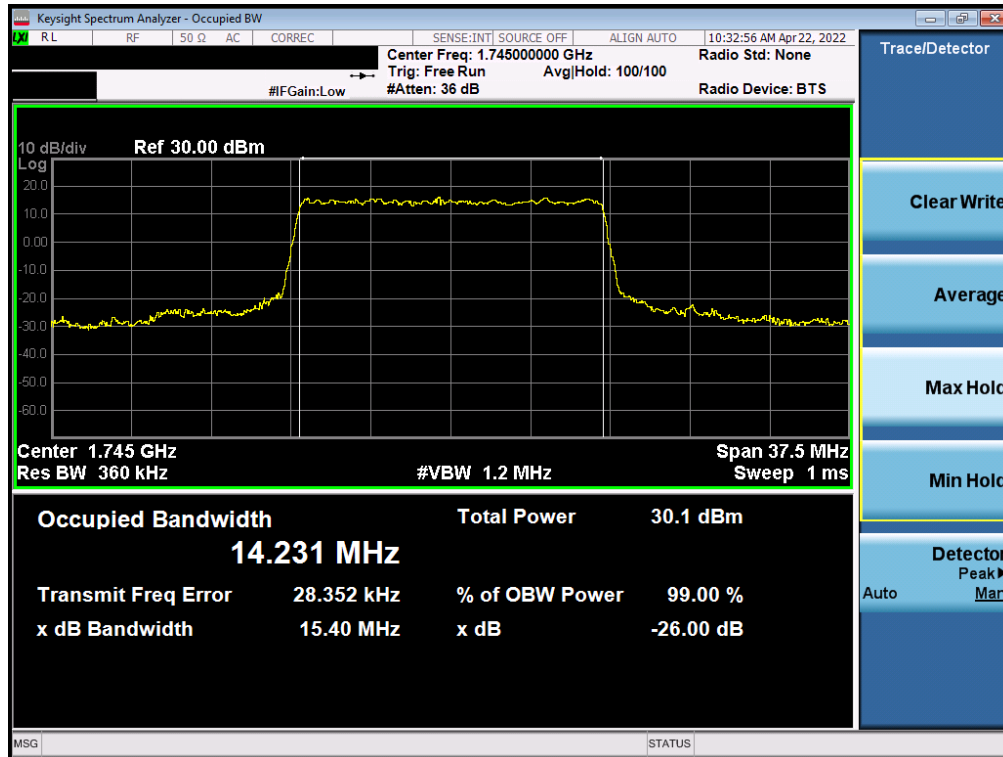


Plot 7-81. Occupied Bandwidth Plot (NR Band n66 - 20.0MHz CP-OFDM 16QAM - Full RB)

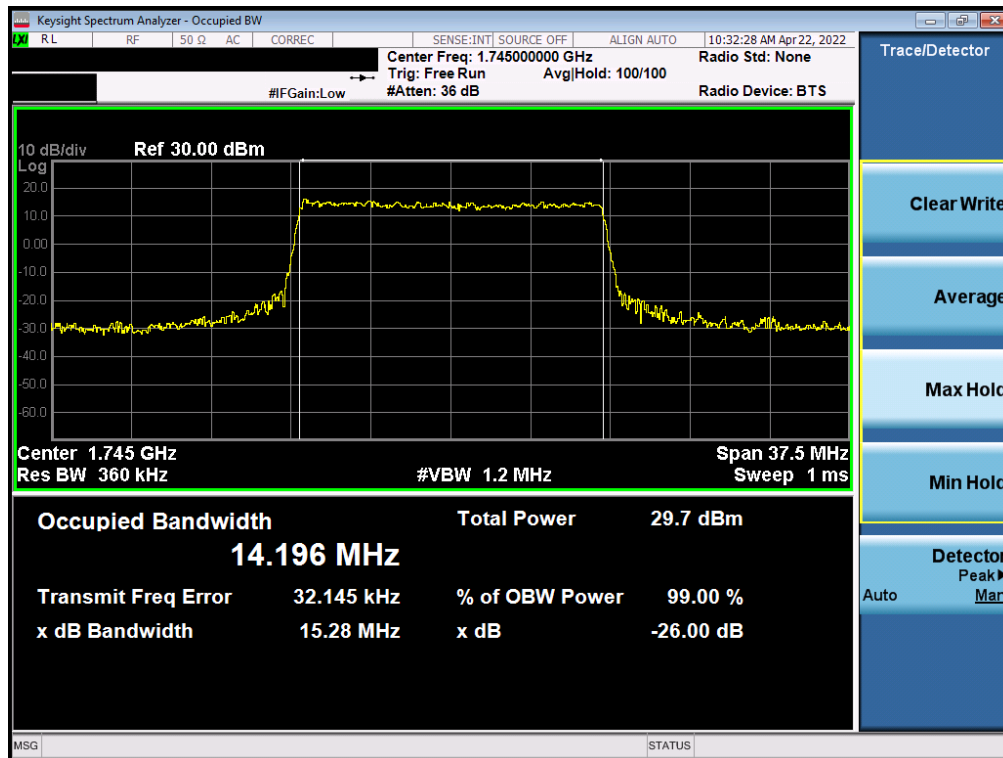


Plot 7-82. Occupied Bandwidth Plot (NR Band n66 - 15.0MHz DFT-s-OFDM BPSK - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2204080051-04.A3L	Test Dates: 4/8/2022 - 6/23/2022	EUT Type: Portable Handset	Page 59 of 275

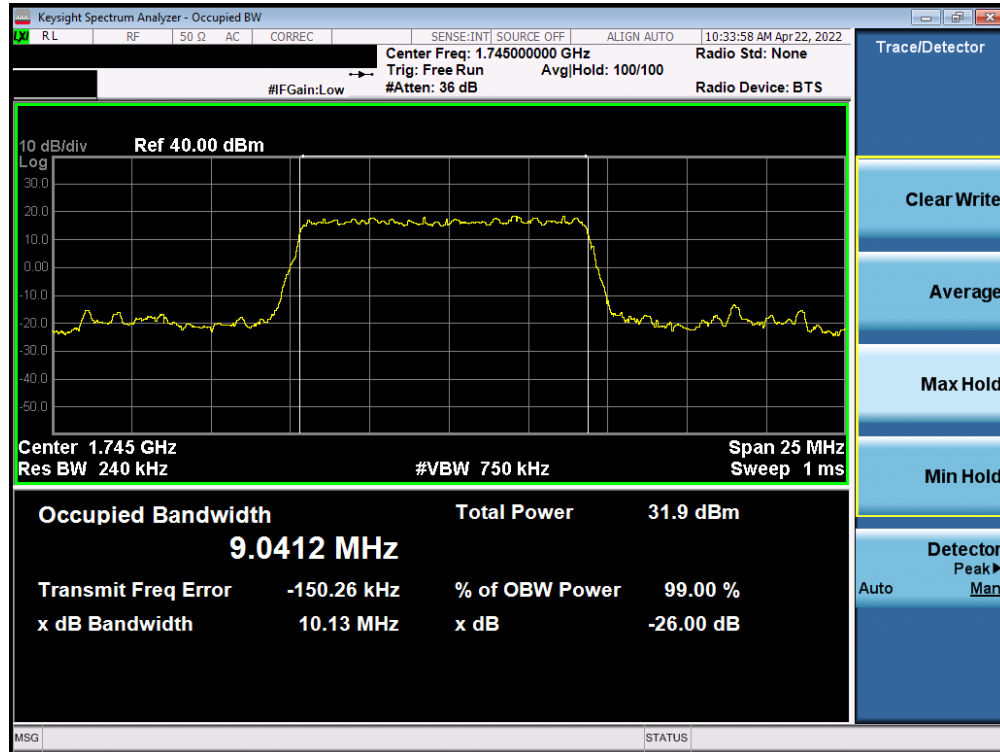


Plot 7-83. Occupied Bandwidth Plot (NR Band n66 - 15.0MHz CP-OFDM QPSK - Full RB)

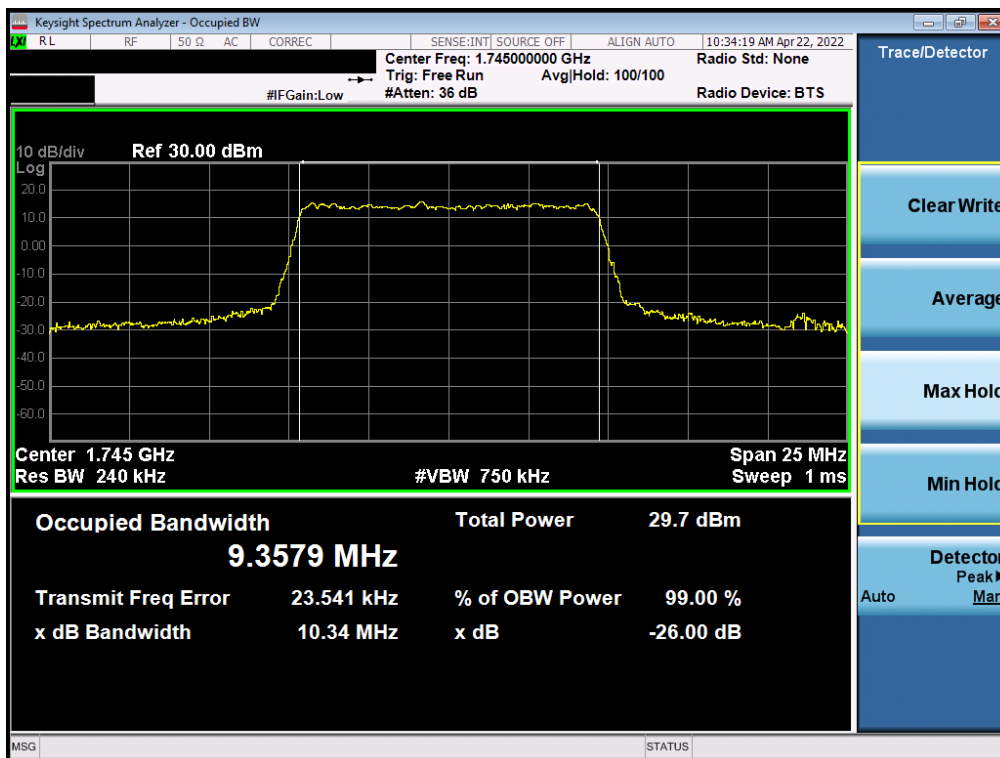


Plot 7-84. Occupied Bandwidth Plot (NR Band n66 - 15.0MHz CP-OFDM 16QAM - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2204080051-04.A3L	Test Dates: 4/8/2022 - 6/23/2022	EUT Type: Portable Handset	Page 60 of 275

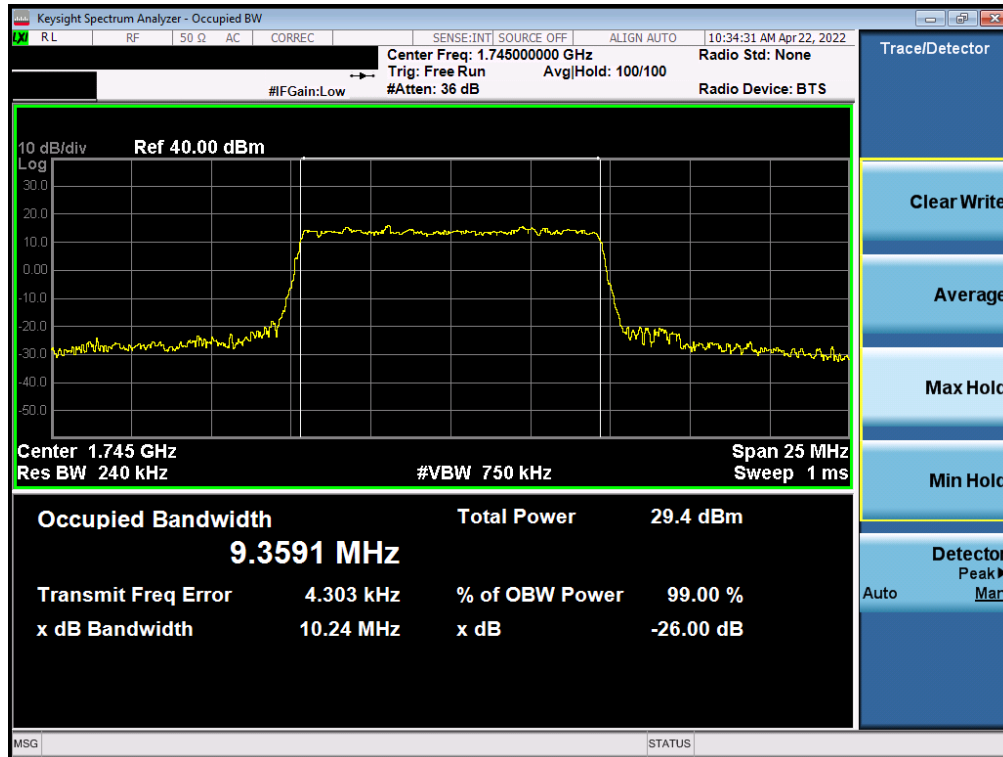


Plot 7-85. Occupied Bandwidth Plot (NR Band n66- 10MHz DFT-s-OFDM BPSK - Full RB)

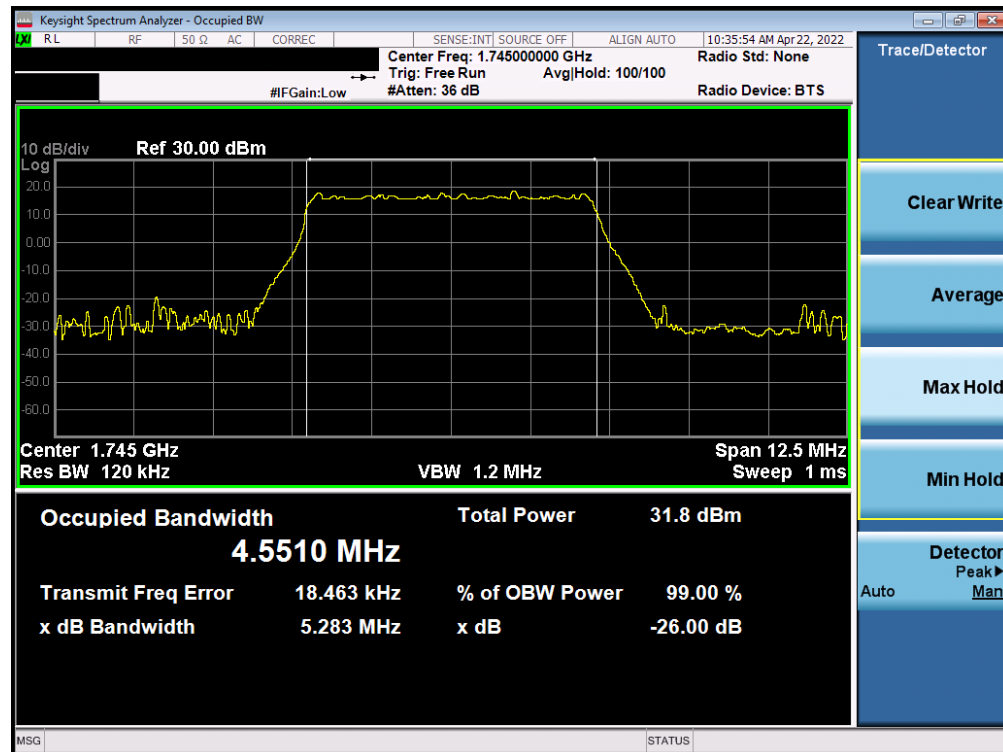


Plot 7-86. Occupied Bandwidth Plot (NR Band n66 - 10.0MHz CP-OFDM QPSK - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2204080051-04.A3L	Test Dates: 4/8/2022 - 6/23/2022	EUT Type: Portable Handset	Page 61 of 275

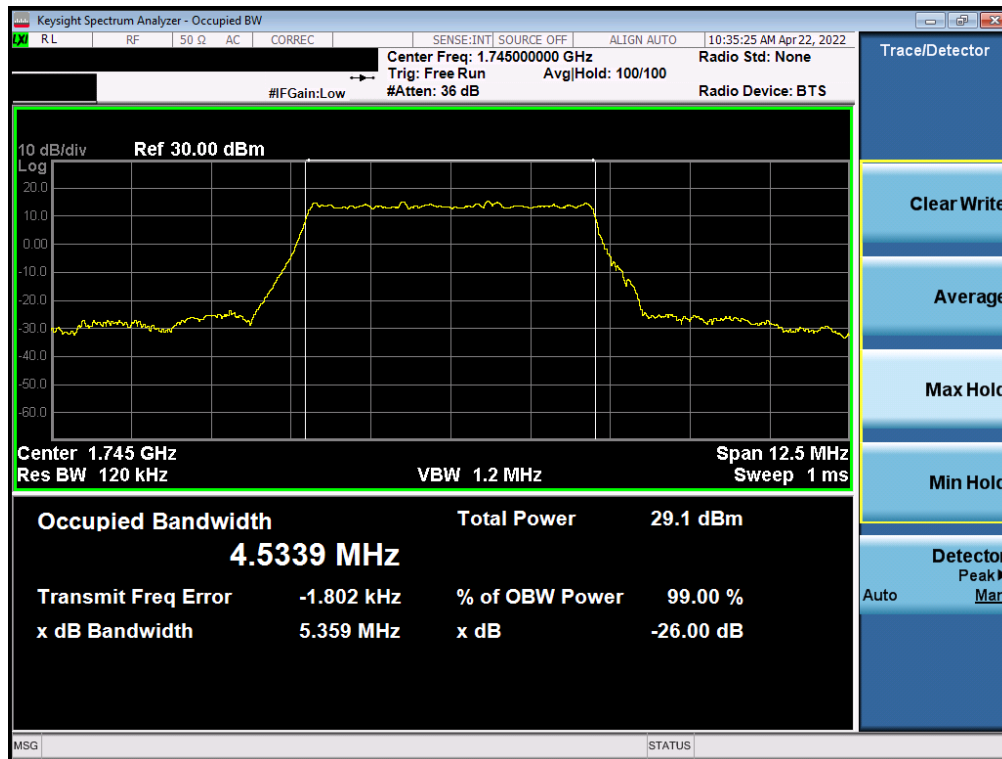


Plot 7-87. Occupied Bandwidth Plot (NR Band n66 - 10.0MHz CP-OFDM 16QAM - Full RB)

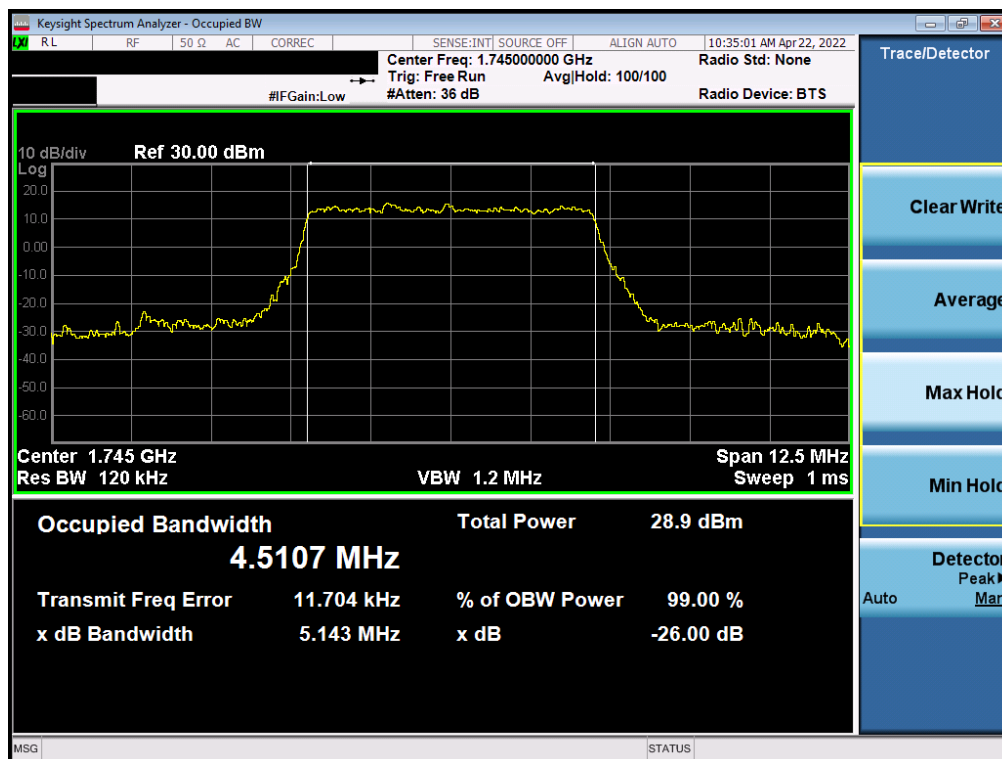


Plot 7-88. Occupied Bandwidth Plot (NR Band n66- 5MHz DFT-s-OFDM BPSK - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-89. Occupied Bandwidth Plot (NR Band n66 - 5.0MHz CP-OFDM QPSK - Full RB)



Plot 7-90. Occupied Bandwidth Plot (NR Band n66 - 5.0MHz CP-OFDM 16QAM - Full RB)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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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 minimum permissible attenuation level of any spurious emission is $43 + 10 \log_{10}(P_{\text{Watts}})$, where P is the transmitter power in Watts.

Test Procedure Used

ANSI C63.26-2015 – Section 5.7.4

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 18GHz (separated into at least two plots per channel)
2. RBW \geq 100kHz
3. VBW \geq 3 x RBW
4. Detector = RMS
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

Test Setup

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

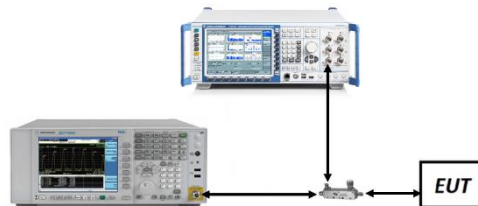


Figure 7-3. Test Instrument & Measurement Setup

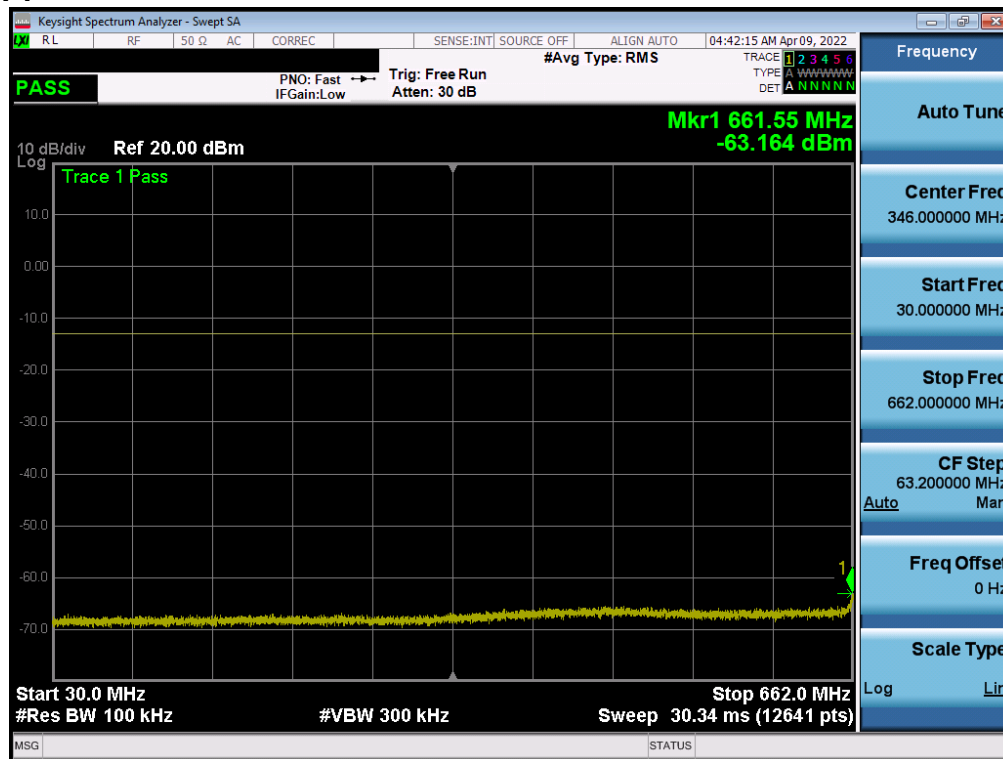
Test Notes

1. Per Part 27 and RSS-139, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth 100 kHz or greater for measurements below 1GHz.
2. For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

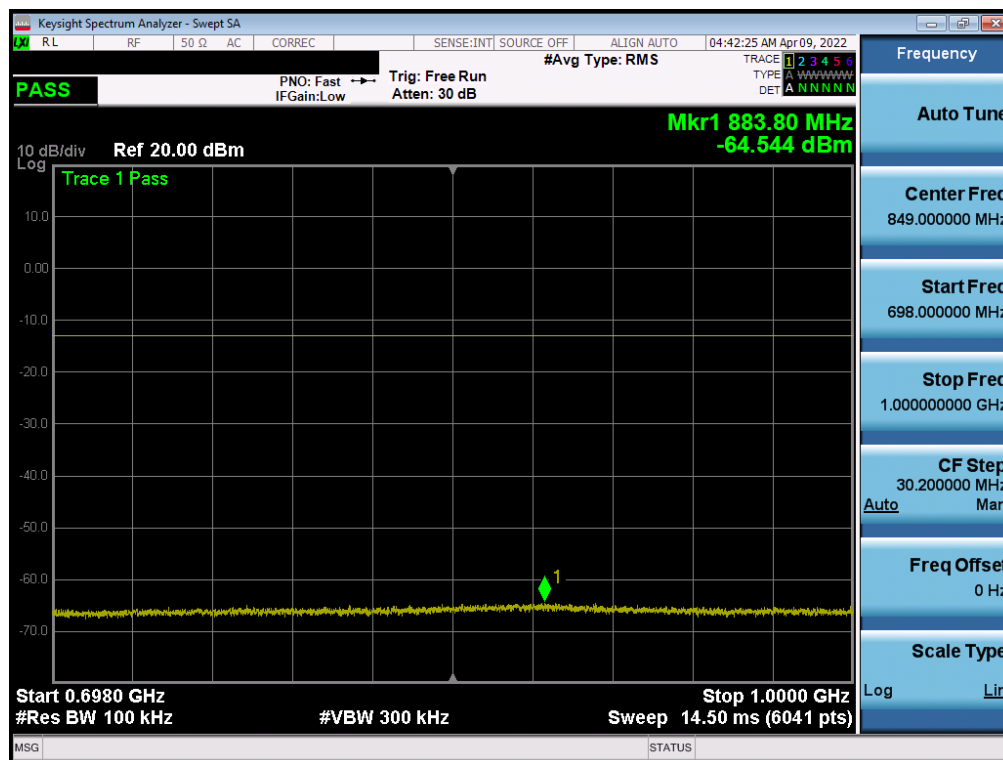
FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2204080051-04.A3L	Test Dates: 4/8/2022 - 6/23/2022	EUT Type: Portable Handset	Page 64 of 275

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LTE Band 71



Plot 7-91. Conducted Spurious Plot (LTE Band 71 - 20MHz QPSK - 1 RB - Low Channel)

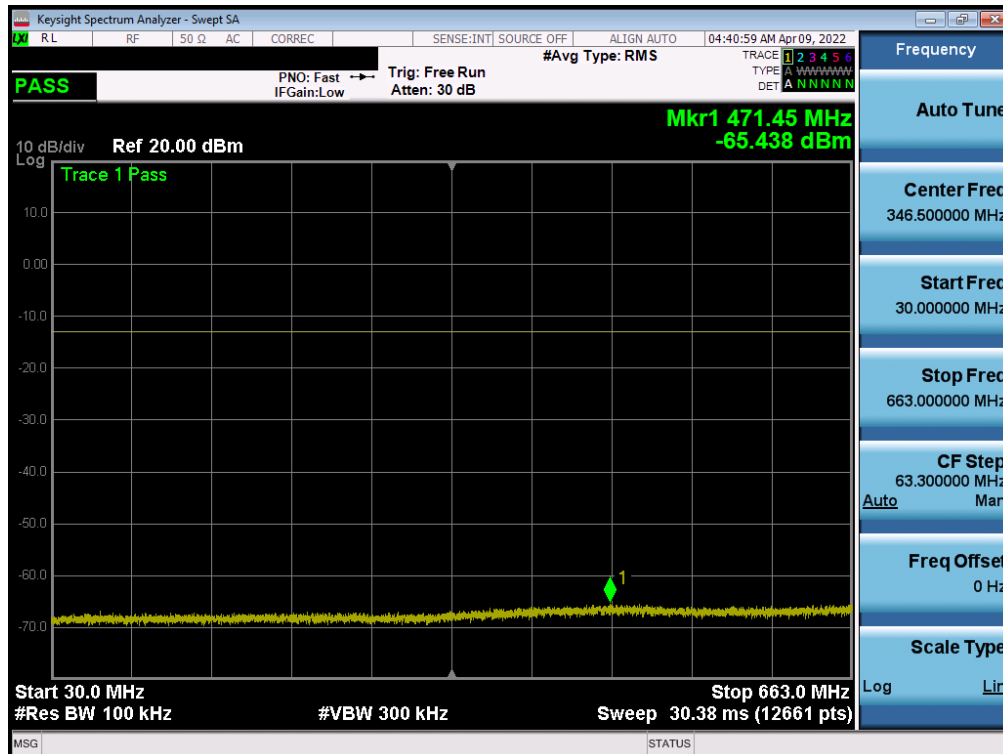


Plot 7-92. Conducted Spurious Plot (LTE Band 71 - 20MHz QPSK - 1 RB - Low Channel)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2204080051-04.A3L	Test Dates: 4/8/2022 - 6/23/2022	EUT Type: Portable Handset	Page 65 of 275

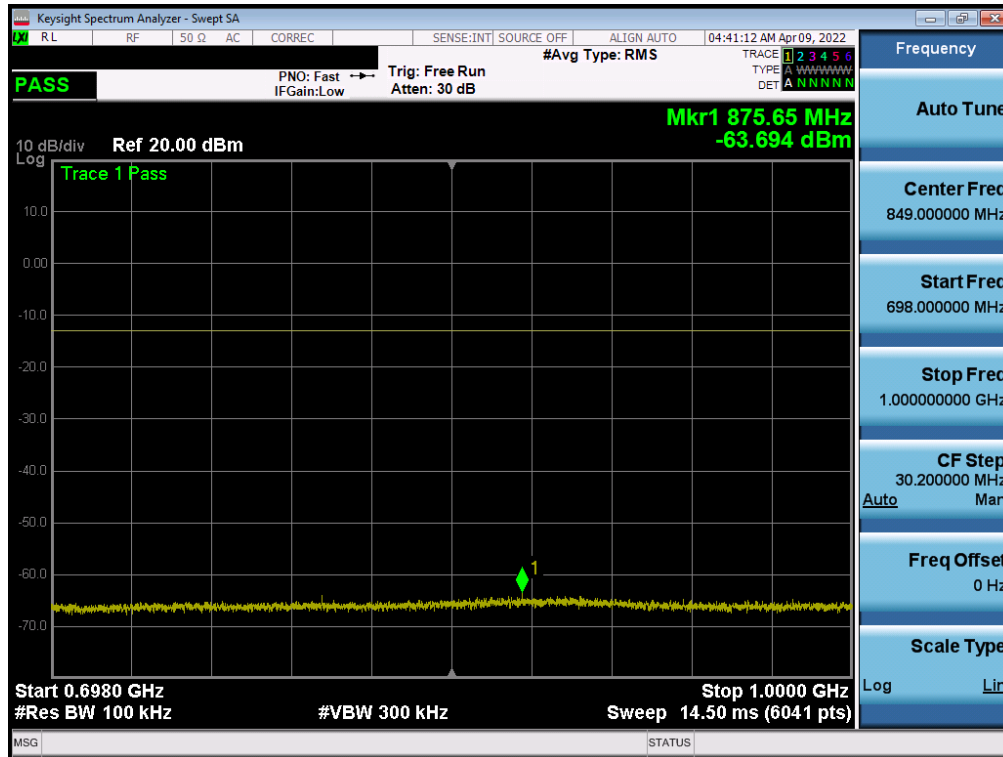


Plot 7-93. Conducted Spurious Plot (LTE Band 71 - 20MHz QPSK - 1 RB - Low Channel)

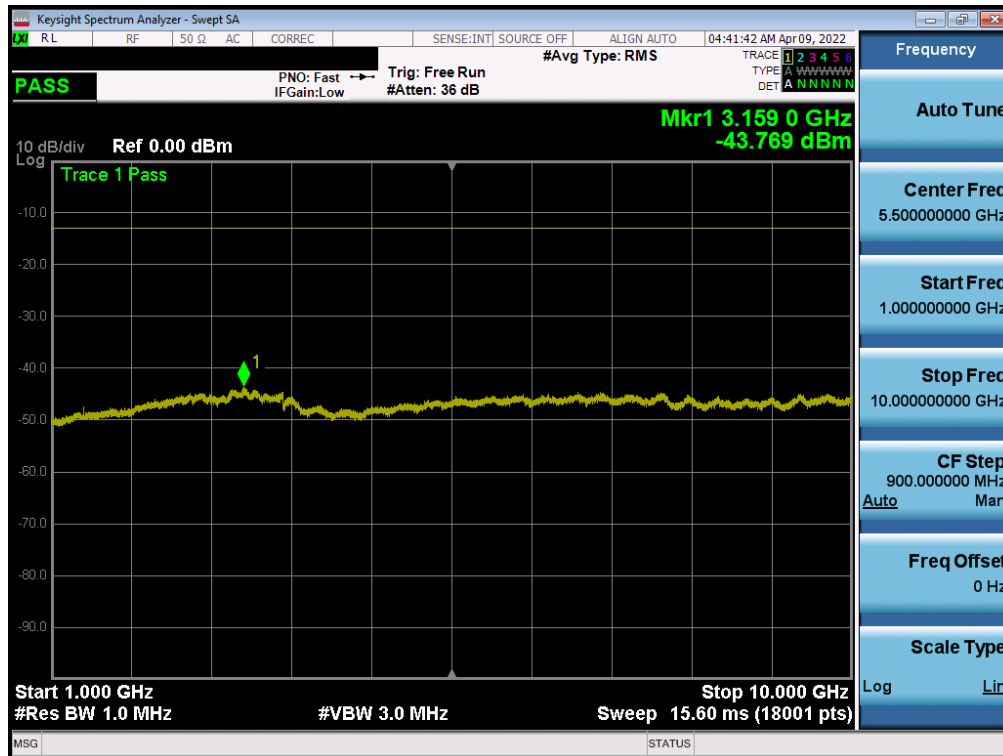


Plot 7-94. Conducted Spurious Plot (LTE Band 71 - 20MHz QPSK - 1 RB - Mid Channel)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2204080051-04.A3L	Test Dates: 4/8/2022 - 6/23/2022	EUT Type: Portable Handset	Page 66 of 275

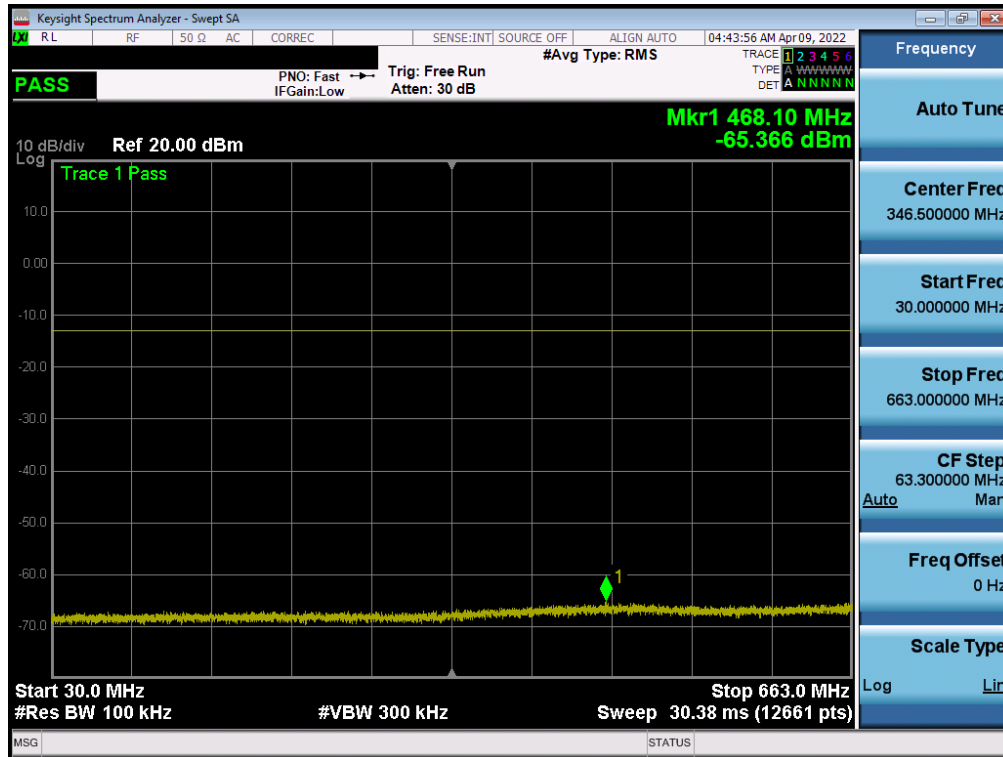


Plot 7-95. Conducted Spurious Plot (LTE Band 71 - 20MHz QPSK - 1 RB - Mid Channel)

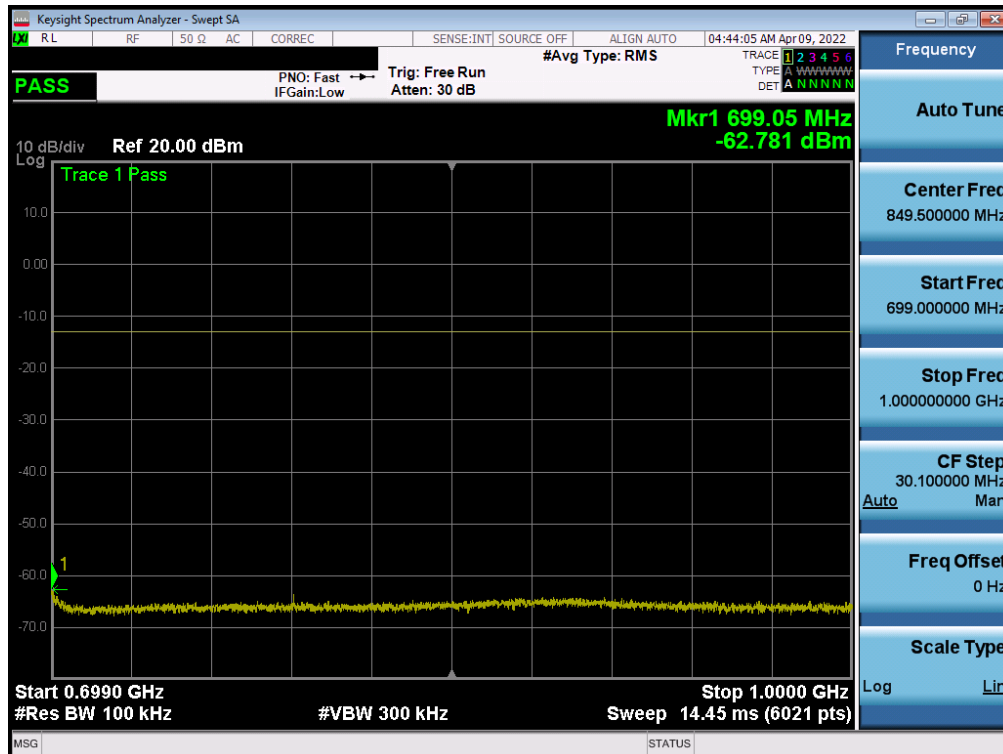


Plot 7-96. Conducted Spurious Plot (LTE Band 71 - 20MHz QPSK - 1 RB - Mid Channel)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2204080051-04.A3L	Test Dates: 4/8/2022 - 6/23/2022	EUT Type: Portable Handset	Page 67 of 275

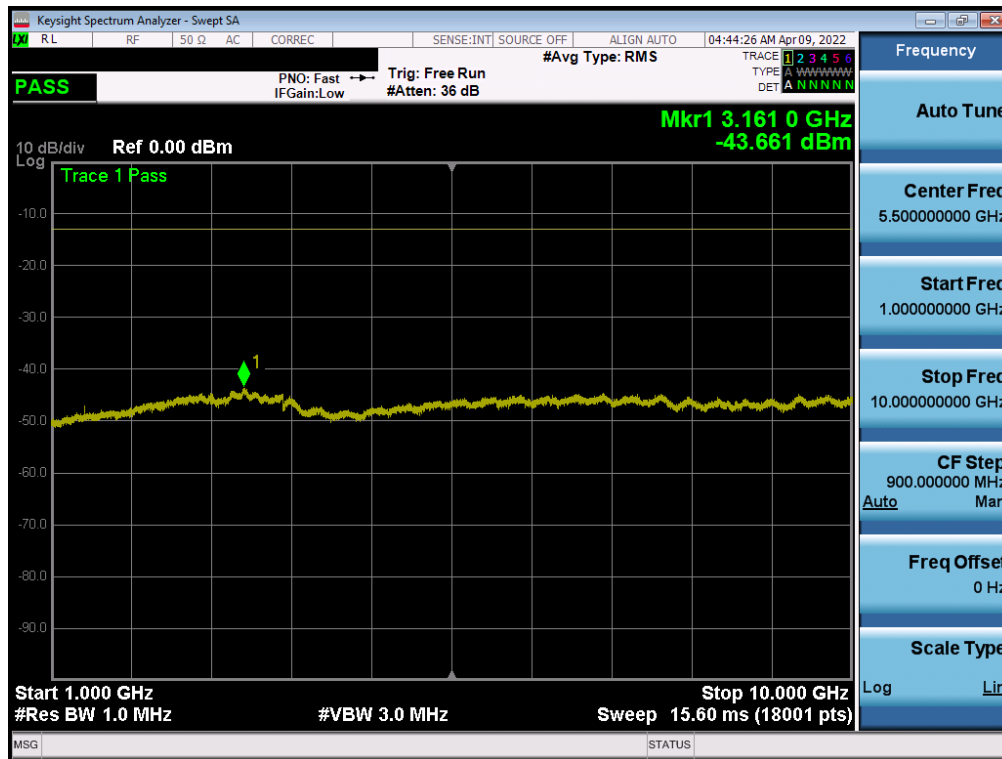


Plot 7-97. Conducted Spurious Plot (LTE Band 71 - 20MHz QPSK - 1 RB - High Channel)



Plot 7-98. Conducted Spurious Plot (LTE Band 71 - 20MHz QPSK - 1 RB - High Channel)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2204080051-04.A3L	Test Dates: 4/8/2022 - 6/23/2022	EUT Type: Portable Handset	Page 68 of 275

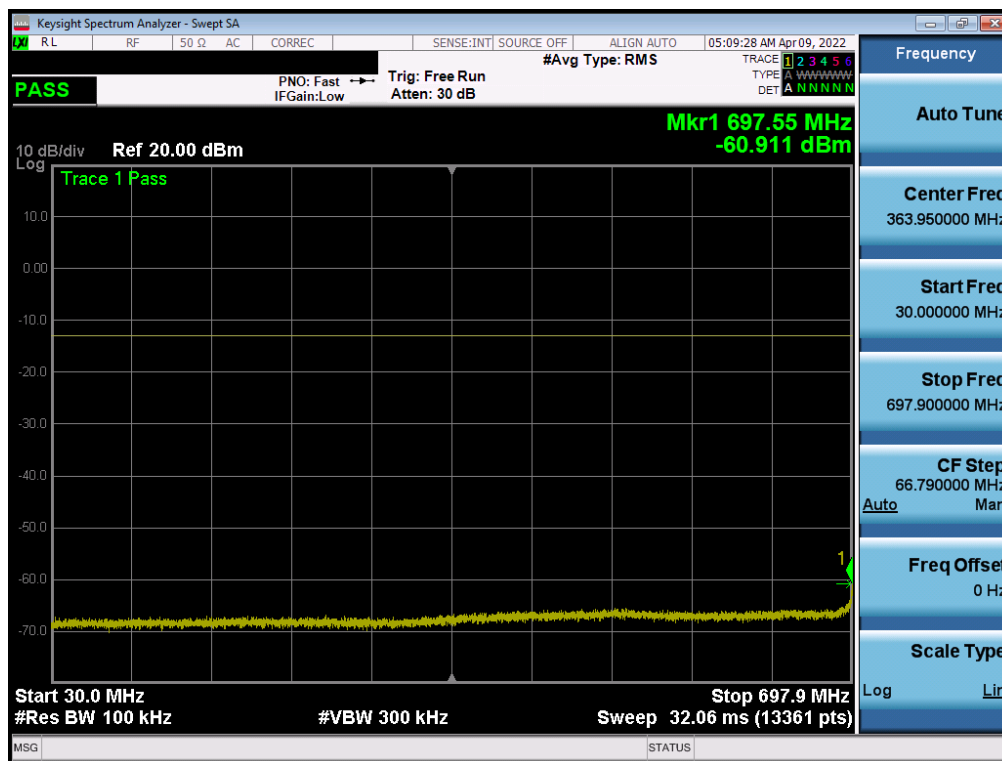


Plot 7-99. Conducted Spurious Plot (LTE Band 71 - 20MHz QPSK - 1 RB - High Channel)

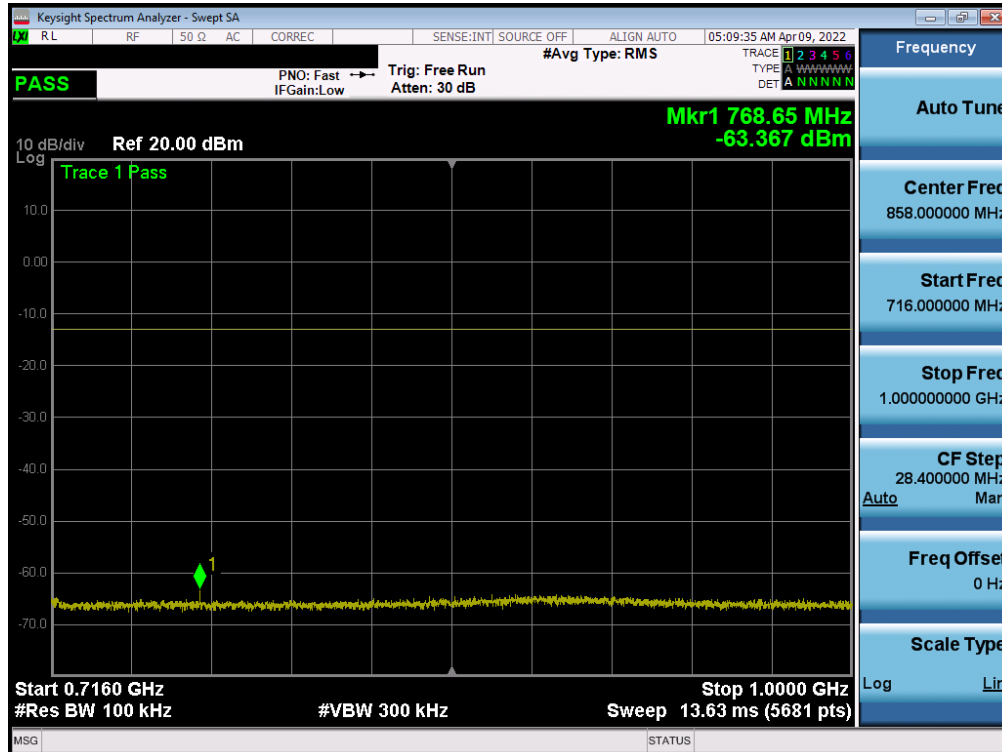
FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2204080051-04.A3L	Test Dates: 4/8/2022 - 6/23/2022	EUT Type: Portable Handset	Page 69 of 275

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LTE Band 12

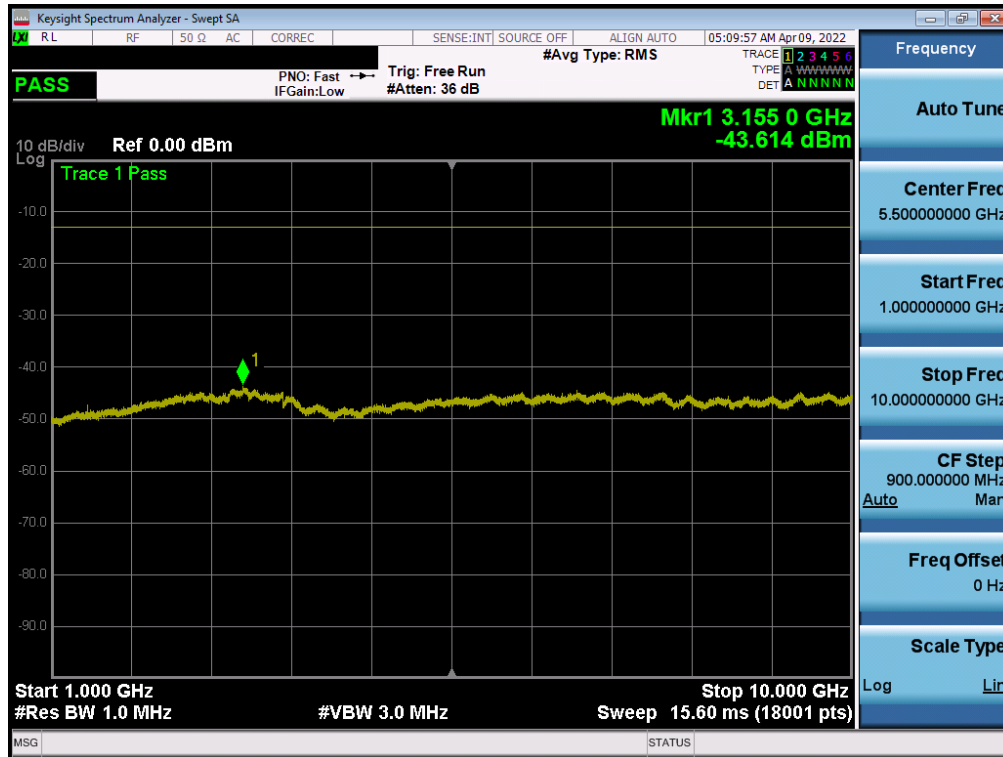


Plot 7-100. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - 1 RB - Low Channel)

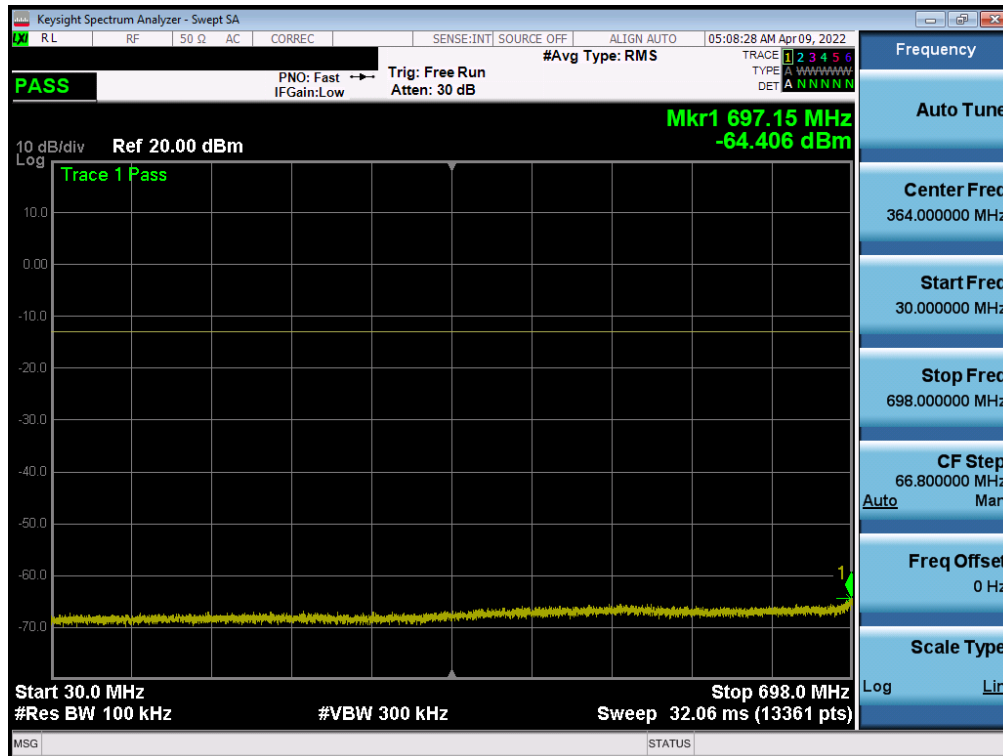


Plot 7-101. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - 1 RB - Low Channel)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2204080051-04.A3L	Test Dates: 4/8/2022 - 6/23/2022	EUT Type: Portable Handset	Page 70 of 275

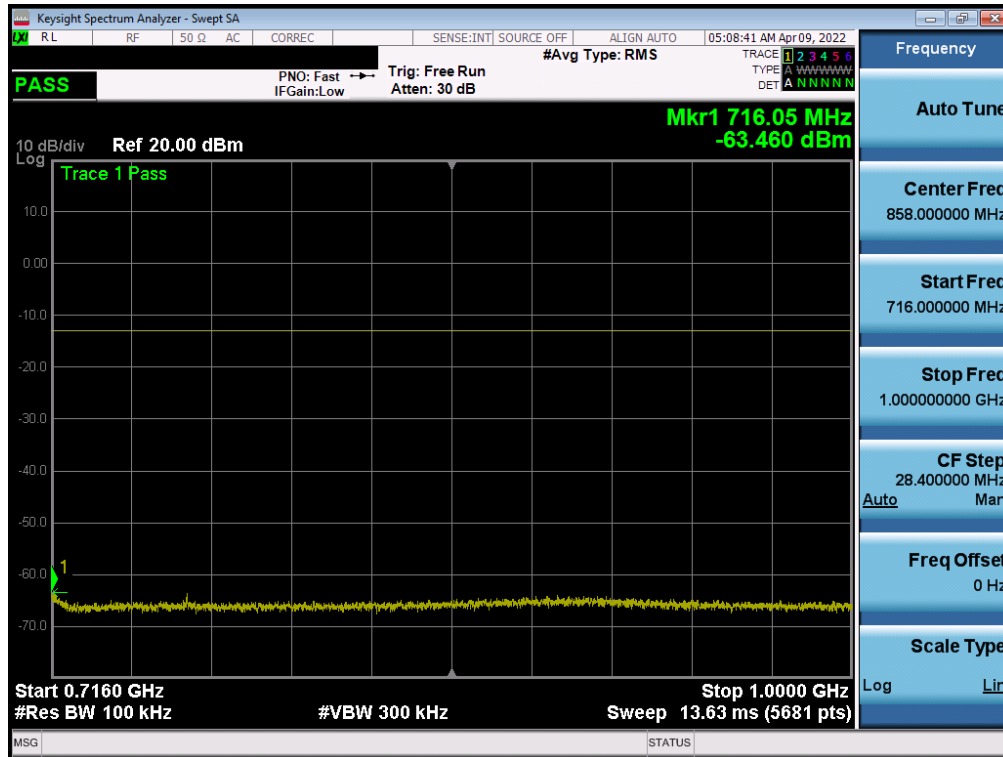


Plot 7-102. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - 1 RB - Low Channel)



Plot 7-103. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - 1 RB - Mid Channel)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2204080051-04.A3L	Test Dates: 4/8/2022 - 6/23/2022	EUT Type: Portable Handset	Page 71 of 275

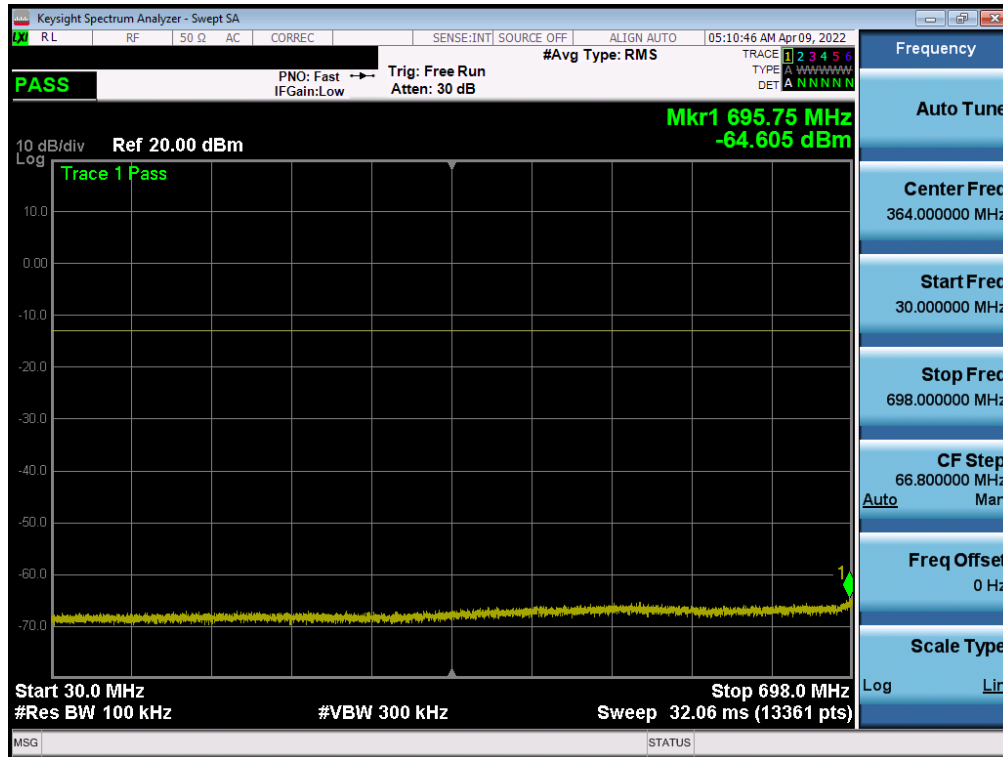


Plot 7-104. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - 1 RB - Mid Channel)

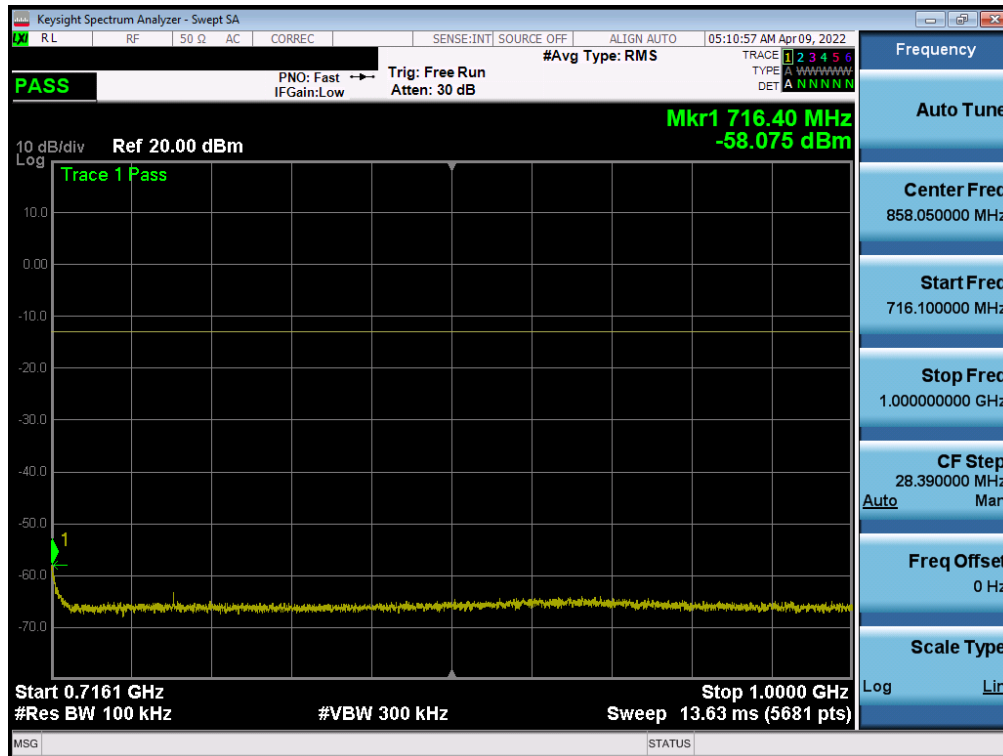


Plot 7-105. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - 1 RB - Mid Channel)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2204080051-04.A3L	Test Dates: 4/8/2022 - 6/23/2022	EUT Type: Portable Handset	Page 72 of 275

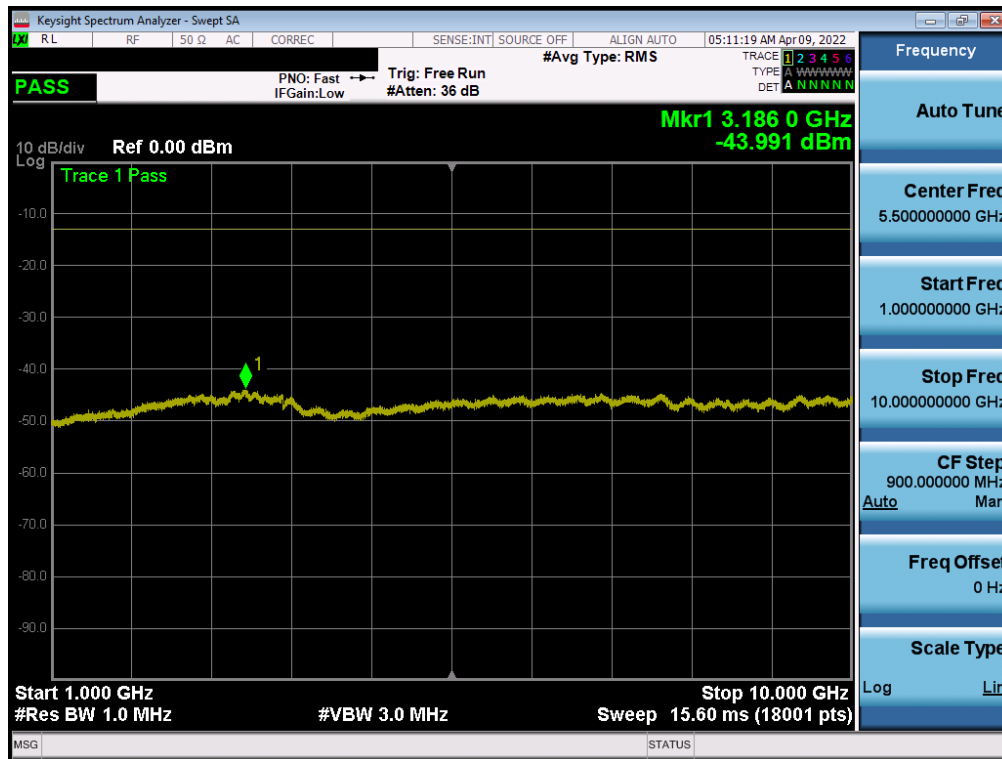


Plot 7-106. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - 1 RB - High Channel)



Plot 7-107. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - 1 RB - High Channel)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-108. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - 1 RB - High Channel)

FCC ID: A3LSMF721U	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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