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PART 27 MEASUREMENT REPORT

Applicant Name:
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Date of Testing:
06/10/2024 – 08/02/2024
Test Report Issue Date:
08/02/2024
Test Site/Location:
Element lab., Gyeonggi-do, South Korea
Test Report Serial No.:
1M2405140039-04.A3L

FCC ID:	**A3LSMX828U**
Applicant Name:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model:	SM-X828U
EUT Type:	Portable Tablet
FCC Classification:	PCS Licensed Transmitter (PCB)
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.

Prepared by

Reviewed by

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Antenna-1						
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
LTE Band 30	10 MHz	QPSK	2310.0	0.198	22.97	8M99G7D
		16QAM	2310.0	0.162	22.10	9M07W7D
	5 MHz	QPSK	2307.5 - 2312.5	0.197	22.95	4M52G7D
		16QAM	2307.5 - 2312.5	0.168	22.26	4M53W7D
LTE Band 7	20 MHz	QPSK	2510.0 - 2560.0	0.370	25.68	17M9G7D
		16QAM	2510.0 - 2560.0	0.304	24.83	18M0W7D
	15 MHz	QPSK	2507.5 - 2562.5	0.364	25.61	13M5G7D
		16QAM	2507.5 - 2562.5	0.305	24.84	13M5W7D
	10 MHz	QPSK	2505.0 - 2565.0	0.363	25.60	9M03G7D
		16QAM	2505.0 - 2565.0	0.303	24.81	9M02W7D
	5 MHz	QPSK	2502.5 - 2567.5	0.369	25.67	4M52G7D
		16QAM	2502.5 - 2567.5	0.309	24.90	4M52W7D
LTE Band 41(PC2)	20 MHz	QPSK	2506.0 - 2680.0	0.533	27.27	18M0G7D
		16QAM	2506.0 - 2680.0	0.450	26.54	18M0W7D
	15 MHz	QPSK	2503.5 - 2682.5	0.543	27.35	13M5G7D
		16QAM	2503.5 - 2682.5	0.484	26.85	13M5W7D
	10 MHz	QPSK	2501.0 - 2685.0	0.528	27.23	9M02G7D
		16QAM	2501.0 - 2685.0	0.430	26.34	9M01W7D
	5 MHz	QPSK	2498.5 - 2687.5	0.566	27.53	4M55G7D
		16QAM	2498.5 - 2687.5	0.473	26.75	4M53W7D
LTE Band 41(PC3)/38	20 MHz	QPSK	2506.0 - 2680.0	0.356	25.52	18M0G7D
		16QAM	2506.0 - 2680.0	0.292	24.66	17M9W7D
	15 MHz	QPSK	2503.5 - 2682.5	0.355	25.50	13M5G7D
		16QAM	2503.5 - 2682.5	0.291	24.64	13M5W7D
	10 MHz	QPSK	2501.0 - 2685.0	0.363	25.60	9M02G7D
		16QAM	2501.0 - 2685.0	0.272	24.35	9M00W7D
	5 MHz	QPSK	2498.5 - 2687.5	0.362	25.59	4M53G7D
		16QAM	2498.5 - 2687.5	0.275	24.40	4M52W7D

Antenna-1						
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
NR Band n30	10 MHz	π/2 BPSK	2310.0	0.195	22.89	9M00G7D
		QPSK	2310.0	0.192	22.84	9M33G7D
		16QAM	2310.0	0.159	22.02	9M33W7D
	5 MHz	π/2 BPSK	2307.5 - 2312.5	0.194	22.88	4M48G7D
		QPSK	2307.5 - 2312.5	0.194	22.88	4M51G7D
		16QAM	2307.5 - 2312.5	0.162	22.09	4M50W7D
NR Band n7	40MHz	π/2 BPSK	2520.0 - 2550.0	0.188	22.74	38M9G7D
		QPSK	2520.0 - 2550.0	0.001	0.00	38M1G7D
		16QAM	2520.0 - 2550.0	0.001	0.00	38M0W7D
	30MHz	π/2 BPSK	2515.0 - 2555.0	0.385	25.86	28M6G7D
		QPSK	2515.0 - 2555.0	0.371	25.69	27M9G7D
		16QAM	2515.0 - 2555.0	0.297	24.73	28M0W7D
	25MHz	π/2 BPSK	2512.5 - 2557.5	0.378	25.78	23M0G7D
		QPSK	2512.5 - 2557.5	0.367	25.65	23M4G7D
		16QAM	2512.5 - 2557.5	0.292	24.65	23M3W7D
	20MHz	π/2 BPSK	2510.0 - 2560.0	0.377	25.77	18M0G7D
		QPSK	2510.0 - 2560.0	0.494	26.94	18M3G7D
		16QAM	2510.0 - 2560.0	0.290	24.62	18M3W7D
	15 MHz	π/2 BPSK	2507.5 - 2562.5	0.384	25.85	13M4G7D
		QPSK	2507.5 - 2562.5	0.371	25.70	13M7G7D
		16QAM	2507.5 - 2562.5	0.296	24.72	13M6W7D
	10MHz	π/2 BPSK	2505.0 - 2565.0	0.377	25.76	9M00G7D
		QPSK	2505.0 - 2565.0	0.365	25.62	8M65G7D
		16QAM	2505.0 - 2565.0	0.291	24.64	8M62W7D
	5 MHz	π/2 BPSK	2502.5 - 2567.5	0.366	25.64	4M48G7D
		QPSK	2502.5 - 2567.5	0.357	25.53	4M50G7D
		16QAM	2502.5 - 2567.5	0.282	24.51	4M50W7D
NR Band n41(PC2)	100 MHz	π/2 BPSK	2546.0 - 2640.0	0.626	27.97	96M9G7D
		QPSK	2546.0 - 2640.0	0.622	27.94	97M9G7D
		16QAM	2546.0 - 2640.0	0.450	26.54	97M9W7D
	90 MHz	π/2 BPSK	2541.0 - 2645.0	0.623	27.95	87M2G7D
		QPSK	2541.0 - 2645.0	0.613	27.88	88M0G7D
		16QAM	2541.0 - 2645.0	0.440	26.44	88M0W7D
	80 MHz	π/2 BPSK	2536.0 - 2650.0	0.620	27.93	77M7G7D
		QPSK	2536.0 - 2650.0	0.605	27.82	77M8G7D
		16QAM	2536.0 - 2650.0	0.433	26.37	78M0W7D
	70 MHz	π/2 BPSK	2531.0 - 2655.0	0.630	28.00	64M7G7D
		QPSK	2531.0 - 2655.0	0.624	27.96	67M4G7D
		16QAM	2531.0 - 2655.0	0.457	26.60	67M2W7D
	60 MHz	π/2 BPSK	2526.0 - 2660.0	0.646	28.11	64M4G7D
		QPSK	2526.0 - 2660.0	0.629	27.99	58M3G7D
		16QAM	2526.0 - 2660.0	0.496	26.96	58M3W7D
	50 MHz	π/2 BPSK	2521.0 - 2665.0	0.651	28.14	46M0G7D
		QPSK	2521.0 - 2665.0	0.655	28.17	47M6G7D
		16QAM	2521.0 - 2665.0	0.504	27.03	48M0W7D
	40 MHz	π/2 BPSK	2516.0 - 2670.0	0.646	28.11	45M6G7D
		QPSK	2516.0 - 2670.0	0.668	28.25	38M0G7D
		16QAM	2516.0 - 2670.0	0.490	26.90	38M0W7D
	30 MHz	π/2 BPSK	2511.0 - 2675.0	0.633	28.02	26M9G7D
		QPSK	2511.0 - 2675.0	0.654	28.16	27M7G7D
		16QAM	2511.0 - 2675.0	0.404	26.06	28M1W7D
	20 MHz	π/2 BPSK	2506.0 - 2680.0	0.701	28.46	18M0G7D
		QPSK	2506.0 - 2680.0	0.665	28.23	18M2G7D
		16QAM	2506.0 - 2680.0	0.444	26.47	18M2W7D
	15 MHz	π/2 BPSK	2550.0 - 2640.0	0.685	28.36	12M9G7D
		QPSK	2550.0 - 2640.0	0.675	28.29	13M5G7D
		16QAM	2550.0 - 2640.0	0.459	26.62	13M6W7D
	10 MHz	π/2 BPSK	2545.0 - 2645.0	0.659	28.19	8M60G7D
		QPSK	2545.0 - 2645.0	0.653	28.15	8M58G7D
		16QAM	2545.0 - 2645.0	0.468	26.70	8M56W7D

Antenna- S2						
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
LTE Band 30	10 MHz	QPSK	2310.0	0.079	18.98	9M02G7D
		16QAM	2310.0	0.065	18.10	9M00W7D
	5 MHz	QPSK	2307.5 - 2312.5	0.082	19.16	4M52G7D
		16QAM	2307.5 - 2312.5	0.067	18.27	4M51W7D
LTE Band 7	20 MHz	QPSK	2510.0 - 2560.0	0.127	21.04	18M0G7D
		16QAM	2510.0 - 2560.0	0.098	19.91	18M0W7D
	15 MHz	QPSK	2507.5 - 2562.5	0.131	21.16	13M5G7D
		16QAM	2507.5 - 2562.5	0.100	20.02	13M5W7D
	10 MHz	QPSK	2505.0 - 2565.0	0.134	21.26	8M99G7D
		16QAM	2505.0 - 2565.0	0.104	20.19	8M99W7D
	5 MHz	QPSK	2502.5 - 2567.5	0.134	21.26	4M51G7D
		16QAM	2502.5 - 2567.5	0.098	19.90	4M51W7D

Antenna- S2					
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP	
				Max. Power [W]	Max. Power [dBm]
NR Band n41(PC2)	100 MHz	π/2 BPSK	2546.0 - 2640.0	0.116	20.65
		QPSK	2546.0 - 2640.0	0.115	20.60
		16QAM	2546.0 - 2640.0	0.106	20.24

Antenna-S4					
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP	
				Max. Power [W]	Max. Power [dBm]
NR Band n41(PC2)	100 MHz	π/2 BPSK	2546.0 - 2640.0	0.294	24.68
		QPSK	2546.0 - 2640.0	0.290	24.63
		16QAM	2546.0 - 2640.0	0.293	24.67

Antenna-S1					
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP	
				Max. Power [W]	Max. Power [dBm]
NR Band n41(PC2)	100 MHz	π/2 BPSK	2546.0 - 2640.0	0.184	22.65
		QPSK	2546.0 - 2640.0	0.193	22.86
		16QAM	2546.0 - 2640.0	0.184	22.64

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 Suwon Laboratory located at 13, Heungdeok 1-ro, Giheung-gu, Yongin-si, Gyeonggi-do, 16954, South Korea. 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 Materials Technology Suwon, Ltd. located in Yongin-si, Gyeonggi-do, 16954, South Korea.

- Element Materials Technology Suwon, Ltd. is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation(A2LA) with Certificate number 2041.04 for Specific Absorption Rate (SAR), and Electromagnetic Compatibility (EMC) & Telecommunications testing for FCC and Innovation, Science, and Economic Development Canada rules.

- Element Materials Technology Suwon, Ltd. facility is accredited, designated, and recognized in accordance with the provision of Radio Wave Act and International Standard ISO/IEC 17025:2017 under the National Radio Research Agency.

  - Designation Number / CABID: KR0169
  - Test Firm Registration Number of FCC: 417945
  - Test Firm Registration Number of ISED: 26168

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Tablet FCC ID: A3LSMX828U**. 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.: 0172M, 0377M, 0393M, 2004M, 2052M

2.2 Device Capabilities

This device contains the following capabilities:

850/1700/1900 WCDMA/HSPA, Multi-band LTE, Multi-band 5G NR (FR1 and FR2), 802.11b/g/n/ac/ax WLAN, 802.11a/n/ac/ax UNII (5GHz and 6GHz), Bluetooth (1x, EDR, LE)

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.

2.4 Software and Firmware

Testing was performed on device(s) using software/firmware version X828USQU0AXFE installed on the EUT.

2.5 EMI Suppression Device(s)/Modifications

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

3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

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

Deviation from Measurement Procedure……..……..……..……..……..……..None

3.2 Radiated Power and Radiated Spurious Emissions

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

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

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

$$P_{d\ [dBm]} = P_{g\ [dBm]} - \text{cable loss}_{\ [dB]} + \text{antenna gain}_{\ [dBd/dBi]};$$

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

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

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

And

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

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

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

4.0 MEASUREMENT UNCERTAINTY

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

Contribution	Expanded Uncertainty (±dB)
Conducted Bench Top Measurements	1.95
Radiated Disturbance (<1GHz)	4.10
Radiated Disturbance (>1GHz)	4.82
Radiated Disturbance (>18GHz)	4.96

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
Agilent	N9030B	PXA Signal Analyzer	2024-07-08	Annual	2025-07-08	MY57143278
Anritsu	S820E	Cable and Antenna Analyzer	2024-07-09	Annual	2025-07-08	1839097
Anritsu	MA24106A	USB Power Sensor	2024-07-09	Annual	2025-07-08	1244512
Anritsu	MT8000A	Radio Communication Test Station	2023-09-04	Annual	2024-09-04	6272337405
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	2022-10-21	Biennial	2024-10-20	10160045
Espec	SH-242	Environmental Chamber	2024-07-09	Annual	2025-07-08	93011064
Fairview Microwave	FM2CP1122-10	2.92mm Directional Coupler	2024-07-09	Annual	2025-07-08	1946
Keysight Technologies	N9030B	MXA Signal Analyzer	2024-07-09	Annual	2025-07-08	MY57143276
Mini-Circuits	BW-N10W5+	Attenuator	2024-04-08	Annual	2025-04-07	TEMPNO.01-151
Mini-Circuits	BW-N10W5+	Attenuator	2024-04-08	Annual	2025-04-07	TEMPNO.01-150
NARDA	180-442A-KF	Horn Antenna (small)	2024-01-16	Annual	2025-01-15	T058701-03
Rohde & Schwarz	SMB100A03	Signal Generator	2024-01-11	Annual	2025-01-10	182487
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	2024-01-11	Annual	2025-01-10	171075
Rohde & Schwarz	FSW43	Signal and Spectrum Analyzer	2024-01-11	Annual	2025-01-10	101955
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2024-01-11	Annual	2025-01-10	102131
Schwarzbeck	VULB9162	Broadband TRILOG Antenna	2023-06-01	Biennial	2025-05-31	9162-217
Sunol	DRH-118	Horn Antenna	2023-01-26	Biennial	2025-01-25	A060215

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.

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.

7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.

FCC ID: A3LSMX828U

FCC Classification: PCS Licensed Transmitter (PCB)

Mode(s): LTE/NR/ULCA

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 30; NR Band n30)	2.1051, 27.53(a)(4)	Undesirable emissions must meet the limits detailed in 27.53(a)(4)	PASS	Sections 7.4, 7.5
	Conducted Band Edge / Spurious Emissions (LTE Band 7, 38, 41; NR Band n7, n38, n41)	2.1051, 27.53(m)(4)	Undesirable emissions must meet the limits detailed in 27.53(m)(4)	PASS	Sections 7.4, 7.5
	Frequency Stability	2.1055, 27.54	Fundamental emissions stay within authorized frequency block	PASS	Section 7.8
RADIATED	Equivalent Isotropic Radiated Power (LTE Band 30; NR Band n30)	27.50(a)(3)	≤ 250mW / 5MHz max. EIRP	PASS	Section 7.6
	Equivalent Isotropic Radiated Power (LTE Band 7, 38, 41; NR Band n7, n38, n41)	27.50(h)(2)	≤ 2 Watts max. EIRP	PASS	Section 7.6
	Radiated Spurious Emissions (LTE Band 30; NR Band n30)	2.1053, 27.53(a)(4)	Undesirable emissions must meet the limits detailed in 27.53(a)(4)	PASS	Section 7.7
	Radiated Spurious Emissions (LTE Band 7, 38, 41; NR Band n7, n38, n41)	2.1053, 27.53(m)	Undesirable emissions must meet the limits detailed in 27.53(m)	PASS	Section 7.7

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

Table 7-1. Summary of Test Results

Notes:

1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
4) All conducted emissions measurements are performed with automated test software to capture the corresponding plots necessary to show compliance. The measurement software utilized is EMC Software Tool v1.2.2.

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.

A-MPR is implemented in this device when operating at Power Class 2 in LTE Band 41 per the A-MPR specification in 3GPP TS 36.101. The conducted powers are shown herein to cover the different A-MPR levels specified in the standard. Measurement equipment was set up with triggering/gating on the spectrum analyzer such that powers were measured only during the on-time of the signal.

Test Procedure Used

ANSI C63.26-2015 – Section 5.2

Test Settings

1. Span = 2 x OBW to 3 x OBW
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.

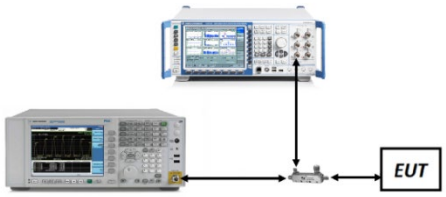


Figure 7-1. Test Instrument & Measurement Setup

Test Notes

1. Conducted power measurements were evaluated using various combinations of RB size, RB offset, modulation, and channel bandwidth. Channel bandwidth data is shown in the tables below based only on the channel bandwidths that were supported in this device.

2. All other conducted power measurements are contained in the RF exposure report for this filing.

3. Conducted power was found to reduce for the higher order QAM modulations when compared to 16QAM. Due to this trend, only the worst-case QAM (16QAM) powers are included in this section.

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
40 MHz	π/2 BPSK	504000	2520.0	1 / 108	24.73
		507000	2535.0	1 / 108	24.79
		510000	2550.0	1 / 1	24.67
	QPSK	504000	2520.0	1 / 108	24.68
		507000	2535.0	1 / 108	24.77
		510000	2550.0	1 / 1	24.60
	16-QAM	507000	2535.0	1 / 108	23.55
30 MHz	π/2 BPSK	503000	2515.0	1 / 80	24.65
		507000	2535.0	1 / 80	24.83
		511000	2555.0	1 / 1	24.64
	QPSK	503000	2515.0	1 / 158	24.64
		507000	2535.0	1 / 80	24.80
		511000	2555.0	1 / 1	24.63
	16-QAM	507000	2535.0	1 / 80	23.47
25 MHz	π/2 BPSK	502500	2512.5	1 / 131	24.64
		507000	2535.0	1 / 66	24.69
		511500	2557.5	1 / 1	24.51
	QPSK	502500	2512.5	1 / 131	24.67
		507000	2535.0	1 / 1	26.64
		511500	2557.5	1 / 1	24.47
	16-QAM	507000	2535.0	1 / 66	23.40
20 MHz	π/2 BPSK	502000	2510.0	1 / 104	24.72
		507000	2535.0	1 / 1	24.67
		512000	2560.0	1 / 1	24.56
	QPSK	502000	2510.0	1 / 104	24.69
		507000	2535.0	1 / 53	24.66
		512000	2560.0	1 / 1	24.48
	16-QAM	502000	2510.0	1 / 104	23.43
15 MHz	π/2 BPSK	501500	2507.5	1 / 77	24.63
		507000	2535.0	1 / 39	24.74
		512500	2562.5	1 / 1	24.39
	QPSK	501500	2507.5	1 / 77	24.61
		507000	2535.0	1 / 1	24.70
		512500	2562.5	1 / 1	24.42
	16-QAM	507000	2535.0	1 / 39	23.43
10 MHz	π/2 BPSK	501000	2505.0	1 / 26	24.51
		507000	2535.0	1 / 26	24.63
		513000	2565.0	1 / 1	24.39
	QPSK	501000	2505.0	1 / 26	24.52
		507000	2535.0	1 / 26	24.66
		513000	2565.0	1 / 1	24.42
	16-QAM	507000	2535.0	1 / 26	23.43
5 MHz	π/2 BPSK	500500	2502.5	1 / 1	24.55
		507000	2535.0	1 / 12	24.70
		513500	2567.5	1 / 12	24.32
	QPSK	500500	2502.5	1 / 12	24.64
		507000	2535.0	1 / 12	24.70
		513500	2567.5	1 / 12	24.33
	16-QAM	500500	2502.5	1 / 12	23.37

Table 7-1. Conducted Power Data (NR Band n7)

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	π/2 BPSK	509202	2546.01	1 / 136	27.16
		518598	2592.99	1 / 136	26.72
		528000	2640.00	1 / 136	26.98
	QPSK	509202	2546.01	1 / 136	27.23
		518598	2592.99	1 / 271	26.84
		528000	2640.00	1 / 136	26.99
	16-QAM	509202	2546.01	1 / 136	26.36
90 MHz	π/2 BPSK	508200	2541.00	1 / 122	27.14
		518598	2592.99	1 / 243	26.71
		528996	2644.98	1 / 243	26.84
	QPSK	508200	2541.00	1 / 122	27.17
		518598	2592.99	1 / 243	26.90
		528996	2644.98	1 / 243	26.99
	16-QAM	508200	2541.00	1 / 122	26.26
80 MHz	π/2 BPSK	507204	2536.02	1 / 108	27.12
		518598	2592.99	1 / 1	26.87
		529998	2649.99	1 / 215	27.07
	QPSK	507204	2536.02	1 / 108	27.11
		518598	2592.99	1 / 215	26.90
		529998	2649.99	1 / 215	27.18
	16-QAM	507204	2536.02	1 / 108	26.19
70 MHz	π/2 BPSK	506202	2531.01	1 / 94	27.11
		518598	2592.99	1 / 187	27.10
		531000	2655.00	1 / 187	27.19
	QPSK	506202	2531.01	1 / 187	26.95
		518598	2592.99	1 / 187	27.09
		531000	2655.00	1 / 187	27.39
	16-QAM	531000	2655.00	1 / 187	26.45
60 MHz	π/2 BPSK	505200	2526.00	1 / 1	27.13
		518598	2592.99	1 / 160	27.21
		531996	2659.98	1 / 81	27.18
	QPSK	505200	2526.00	1 / 1	27.24
		518598	2592.99	1 / 160	27.12
		531996	2659.98	1 / 81	27.19
	16-QAM	505200	2526.00	1 / 1	26.78
50 MHz	π/2 BPSK	504204	2521.02	1 / 1	27.15
		518598	2592.99	1 / 131	27.24
		532998	2664.99	1 / 131	27.23
	QPSK	504204	2521.02	1 / 1	27.37
		518598	2592.99	1 / 131	27.30
		532998	2664.99	1 / 131	27.11
	16-QAM	504204	2521.02	1 / 1	26.85
40 MHz	π/2 BPSK	503202	2516.01	1 / 1	27.23
		518598	2592.99	1 / 104	27.21
		534000	2670.00	1 / 53	27.26
	QPSK	503202	2516.01	1 / 1	27.54
		518598	2592.99	1 / 104	27.12
		534000	2670.00	1 / 1	27.29
	16-QAM	503202	2516.01	1 / 1	26.72
30 MHz	π/2 BPSK	502200	2511.00	1 / 1	27.16
		518598	2592.99	1 / 39	27.12
		534996	2674.98	1 / 39	27.37
	QPSK	502200	2511.00	1 / 1	27.40
		518598	2592.99	1 / 76	27.29
		534996	2674.98	1 / 39	27.43
	16-QAM	534996	2674.98	1 / 39	26.18
20 MHz	π/2 BPSK	501204	2506.02	1 / 1	27.66
		518598	2592.99	1 / 49	27.45
		535998	2679.99	1 / 49	27.51
	QPSK	501204	2506.02	1 / 49	27.17
		518598	2592.99	1 / 49	27.36
		535998	2679.99	1 / 1	27.76
	16-QAM	501204	2506.02	1 / 1	26.29
15 MHz	π/2 BPSK	501204	2506.02	1 / 25	27.55
		518598	2592.99	1 / 1	27.08
		535998	2679.99	1 / 25	27.31
	QPSK	501204	2506.02	1 / 25	27.58
		518598	2592.99	1 / 1	27.04
		535998	2679.99	1 / 25	27.39
	16-QAM	501204	2506.02	1 / 25	26.44
10 MHz	π/2 BPSK	501204	2506.02	1 / 1	27.38
		518598	2592.99	1 / 25	27.01
		535998	2679.99	1 / 1	27.27
	QPSK	501204	2506.02	1 / 1	27.44
		518598	2592.99	1 / 1	27.02
		535998	2679.99	1 / 25	27.08
	16-QAM	501204	2506.02	1 / 1	26.52

Table 7-2. Conducted Power Data (NR Band n41 – Ant M1)

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	π/2 BPSK	509202	2546.01	1 / 1	21.12
		518598	2592.99	1 / 271	20.51
		528000	2640.00	1 / 136	20.45
	QPSK	509202	2546.01	1 / 1	21.06
		518598	2592.99	1 / 1	20.62
		528000	2640.00	1 / 136	20.49
	16-QAM	528000	2640.00	1 / 136	20.66

Table 7-3. Conducted Power Data (NR Band n41 – Ant S2)

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	π/2 BPSK	509202	2546.01	1 / 1	26.23
		518598	2592.99	1 / 136	26.19
		528000	2640.00	1 / 136	25.94
	QPSK	509202	2546.01	1 / 1	26.25
		518598	2592.99	1 / 136	26.29
		528000	2640.00	1 / 136	25.97
	16-QAM	509202	2546.01	1 / 1	25.79

Table 7-4. Conducted Power Data (NR Band n41 – Ant S4)

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	π/2 BPSK	509202	2546.01	1 / 1	19.72
		518598	2592.99	1 / 1	18.68
		528000	2640.00	1 / 136	18.28
	QPSK	509202	2546.01	1 / 1	19.73
		518598	2592.99	1 / 1	18.83
		528000	2640.00	1 / 136	18.32
	16-QAM	509202	2546.01	1 / 1	19.23

Table 7-5. Conducted Power Data (NR Band n41 – Ant S1)

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	
LTE B7	20MHz + 20MHz	QPSK	20850	2510.0	1	99	QPSK	21048	2529.8	1	0	23.51
			21001	2525.1	1	99		21197	2544.9	1	0	23.56
			21350	2560.0	1	0		21152	2540.2	1	99	23.47
		QPSK	21001	2525.1	100	0	QPSK	21197	2544.9	100	0	21.77
		16-QAM	21001	2525.1	100	0	16-QAM	21197	2544.9	100	0	20.78
		64-QAM	21001	2525.1	100	0	64-QAM	21197	2544.9	100	0	20.74
		256-QAM	21001	2525.1	100	0	256-QAM	21197	2544.9	100	0	19.04

Table 7-6. Conducted Power Data (ULCA LTE Band 7)

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	
LTE B41 (PC2)	20MHz + 20MHz	QPSK	39750	2506.0	1	99	QPSK	39948	2525.8	1	0	25.31
			40620	2593.0	1	99		40818	2612.8	1	0	25.39
			41490	2680.0	1	0		41292	2660.2	1	99	25.50
		QPSK	41490	2680	100	0	QPSK	41292	2660.2	100	0	23.66
		16-QAM	41490	2680	100	0	16-QAM	41292	2660.2	100	0	22.64
		64-QAM	41490	2680	100	0	64-QAM	41292	2660.2	100	0	22.64
		256-QAM	41490	2680	100	0	256-QAM	41292	2660.2	100	0	25.82

Table 7-7. Conducted Power Data (ULCA LTE Band 41(PC2))

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	
LTE B41 (PC3)	20MHz + 20MHz	QPSK	39750	2506.0	1	99	QPSK	39948	2525.8	1	0	23.49
			40620	2593.0	1	99		40818	2612.8	1	0	23.17
			41490	2680.0	1	0		41292	2660.2	1	99	23.24
		QPSK	39750	2506	100	0	QPSK	39948	2525.8	100	0	21.67
		16-QAM	39750	2506	100	0	16-QAM	39948	2525.8	100	0	20.52
		64-QAM	39750	2506	100	0	64-QAM	39948	2525.8	100	0	20.48
		256-QAM	39750	2506	100	0	256-QAM	39948	2525.8	100	0	18.92

Table 7-8. Conducted Power Data (ULCA LTE Band 41(PC3))

7.3 Occupied Bandwidth

Test Overview

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. All modes of operation were investigated and the worst case configuration results are reported in this section.

Test Procedure Used

ANSI C63.26-2015 – Section 5.4.4

Test Settings

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

Test Setup

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

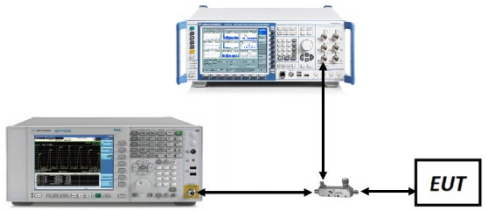


Figure 7-2. Test Instrument & Measurement Setup

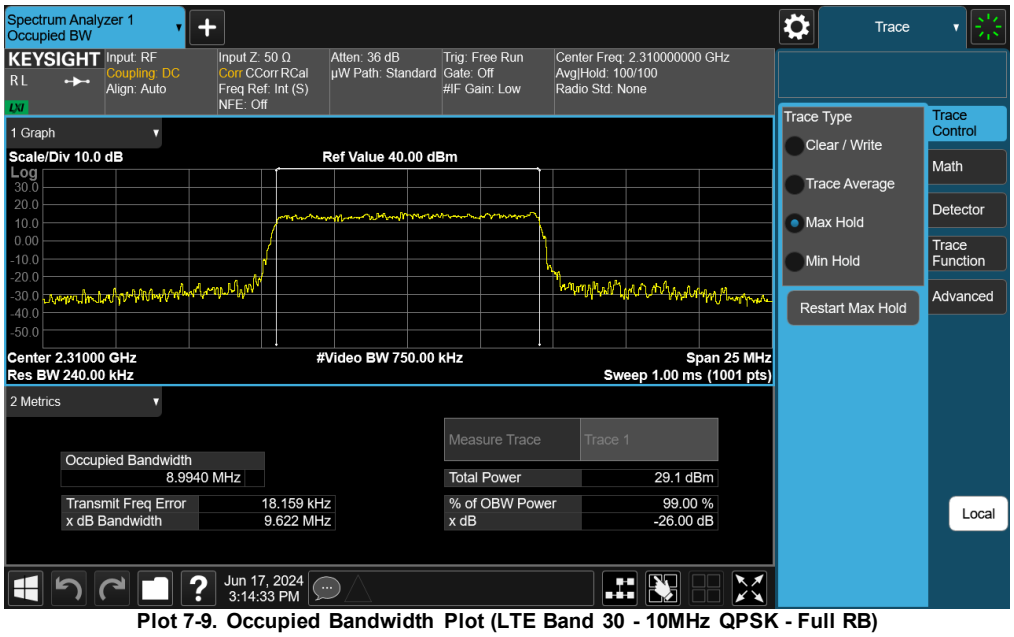
Test Notes

Occupied Bandwidth was only measured on the antenna n41 (Main 1) with the highest power for each band.

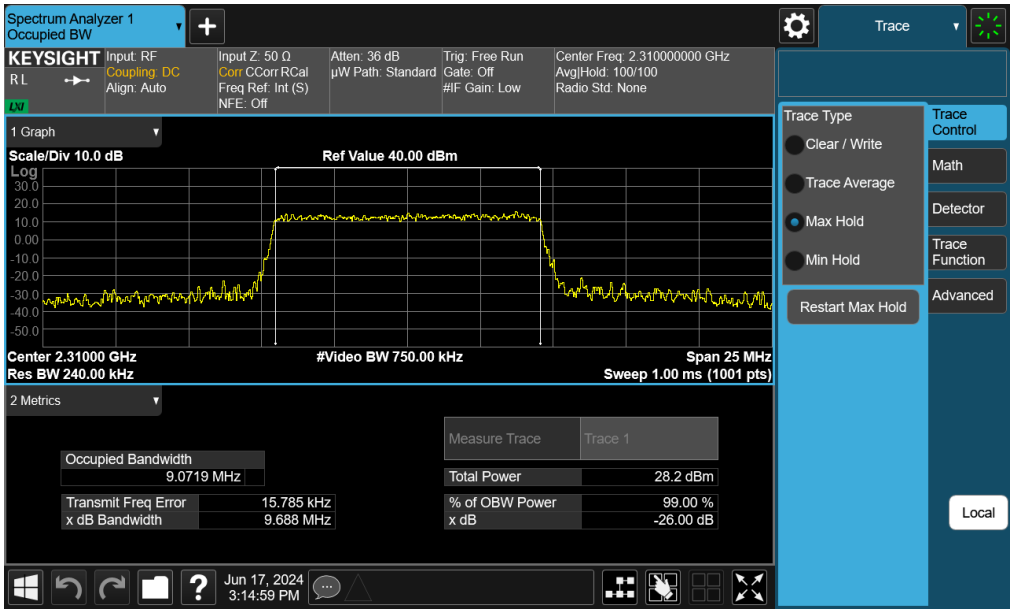
LTE Band 30

Mode	Bandwidth	Modulation	OBW [MHz]
LTE-B30	10MHz	QPSK	8.99
		16QAM	9.07
	5MHz	QPSK	4.52
		16QAM	4.53

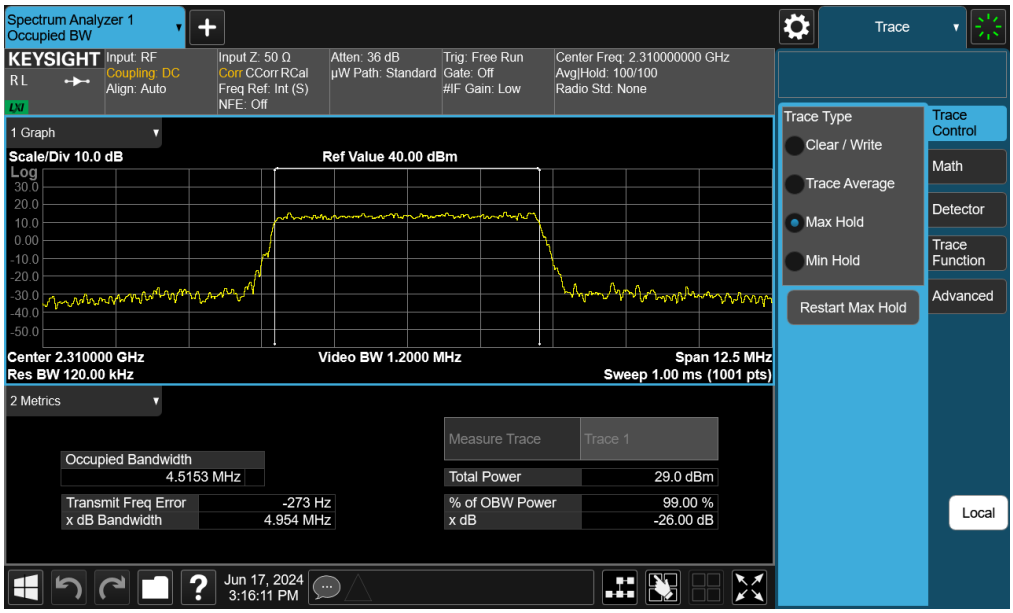
Table 7-2. Occupied Bandwidth Test Results (LTE Band 30)



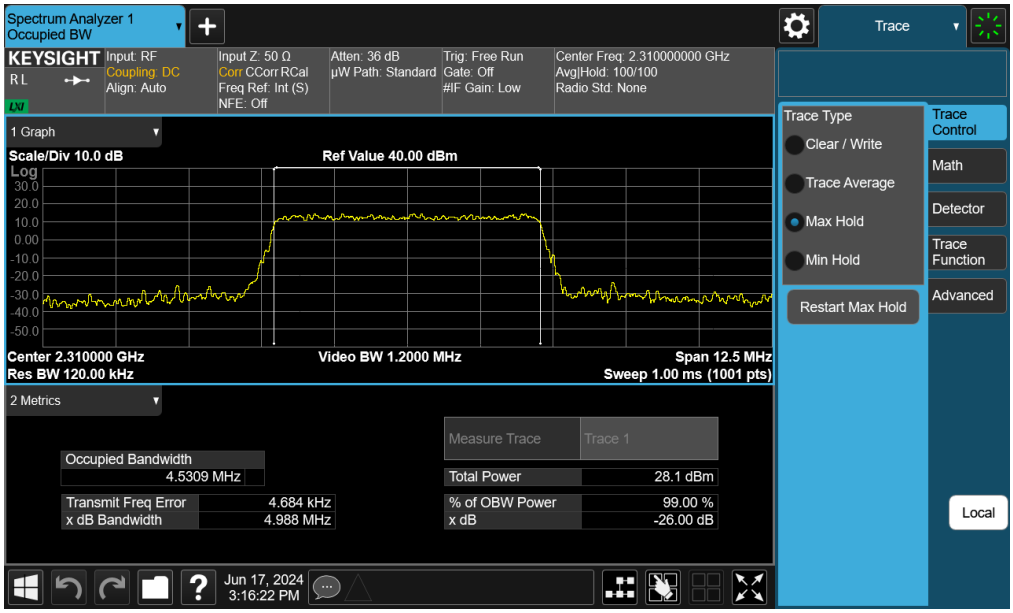
Plot 7-9. Occupied Bandwidth Plot (LTE Band 30 - 10MHz QPSK - Full RB)



Plot 7-10. Occupied Bandwidth Plot (LTE Band 30 - 10MHz 16-QAM - Full RB)



Plot 7-11. Occupied Bandwidth Plot (LTE Band 30 - 5MHz QPSK - Full RB)

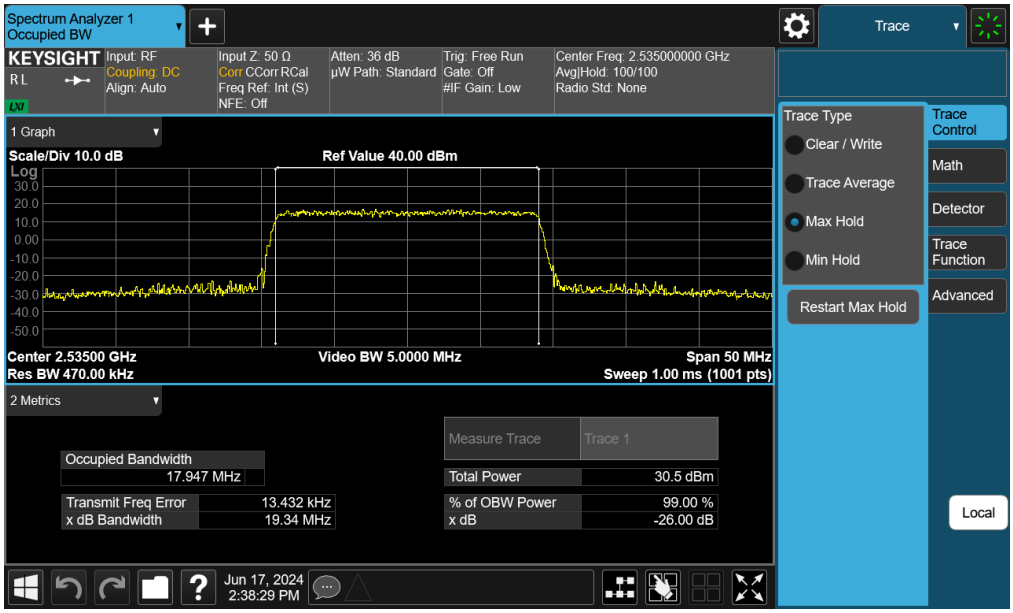


Plot 7-12. Occupied Bandwidth Plot (LTE Band 30 - 5MHz 16-QAM - Full RB)

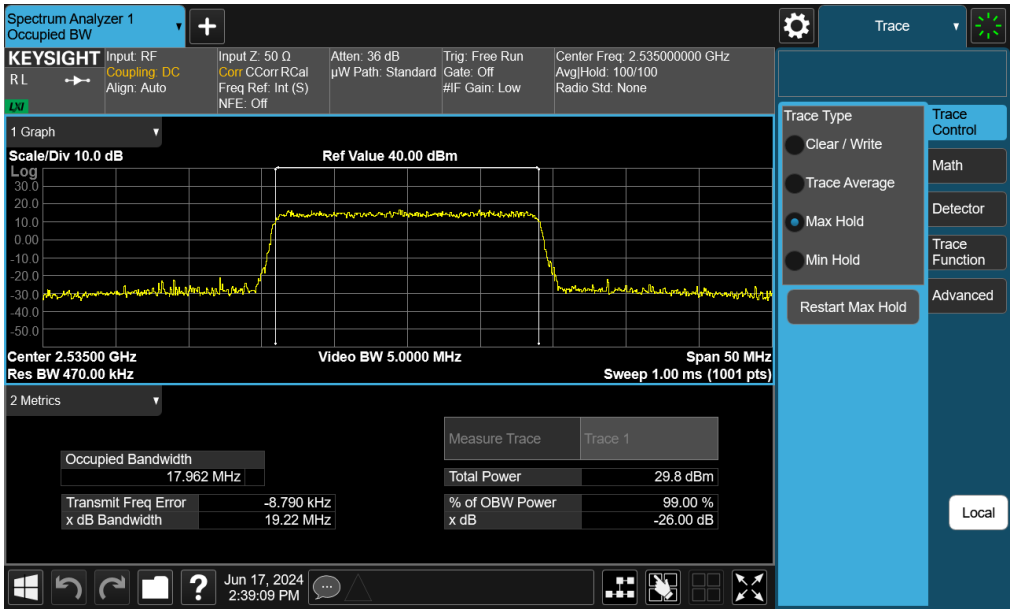
LTE Band 7

Mode	Bandwidth	Modulation	OBW [MHz]
LTE-B7	20MHz	QPSK	17.95
		16QAM	17.96
	15MHz	QPSK	13.47
		16QAM	13.52
	10MHz	QPSK	9.03
		16QAM	9.02
	5MHz	QPSK	4.52
		16QAM	4.52

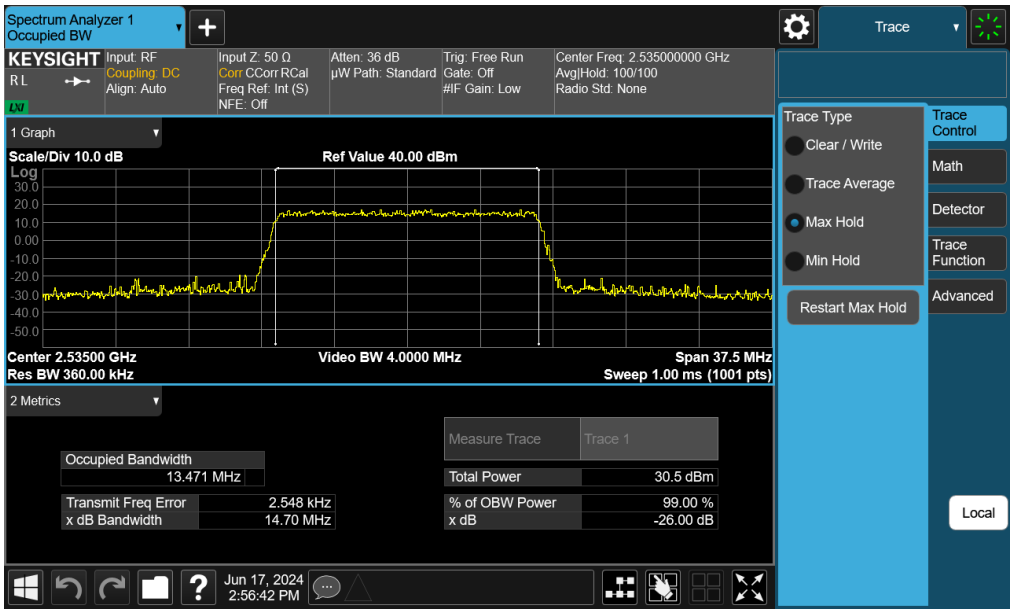
Table 7-3. Occupied Bandwidth Test Results (LTE Band 7)



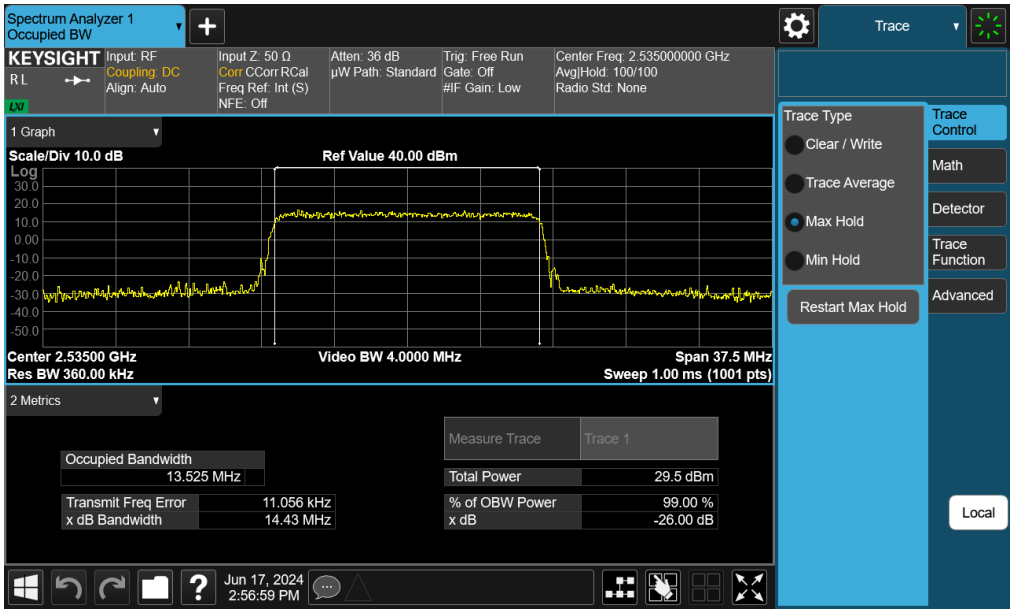
Plot 7-13. Occupied Bandwidth Plot (LTE Band 7 - 20MHz QPSK - Full RB)



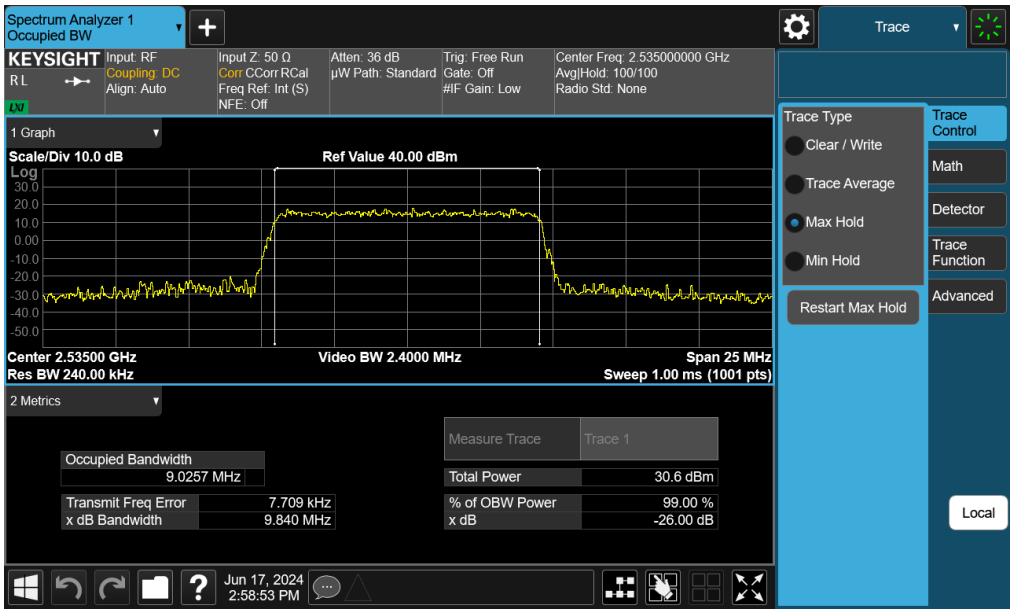
Plot 7-14. Occupied Bandwidth Plot (LTE Band 7 - 20MHz 16-QAM - Full RB)



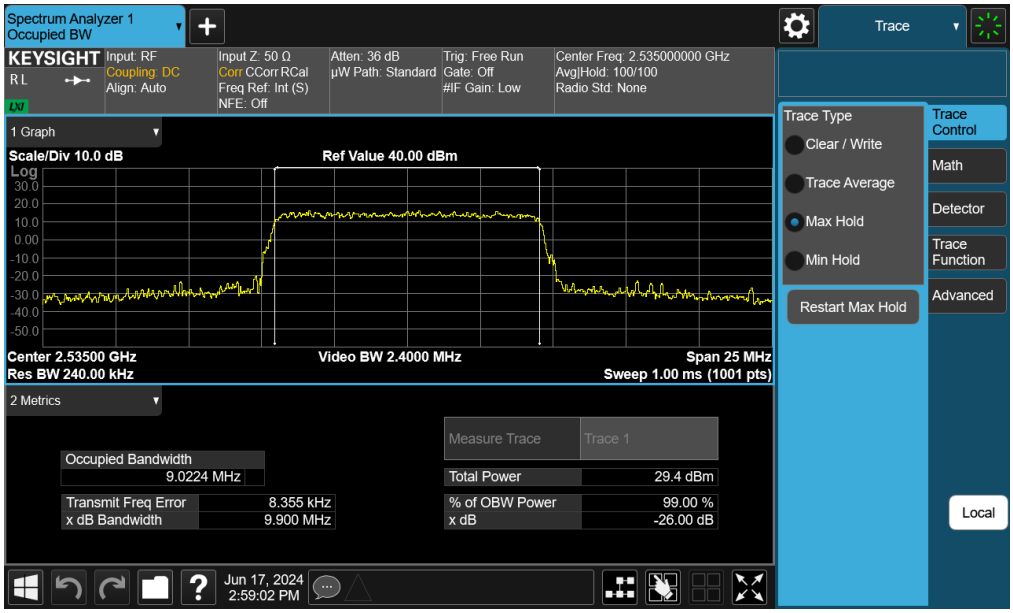
Plot 7-15. Occupied Bandwidth Plot (LTE Band 7 - 15MHz QPSK - Full RB)



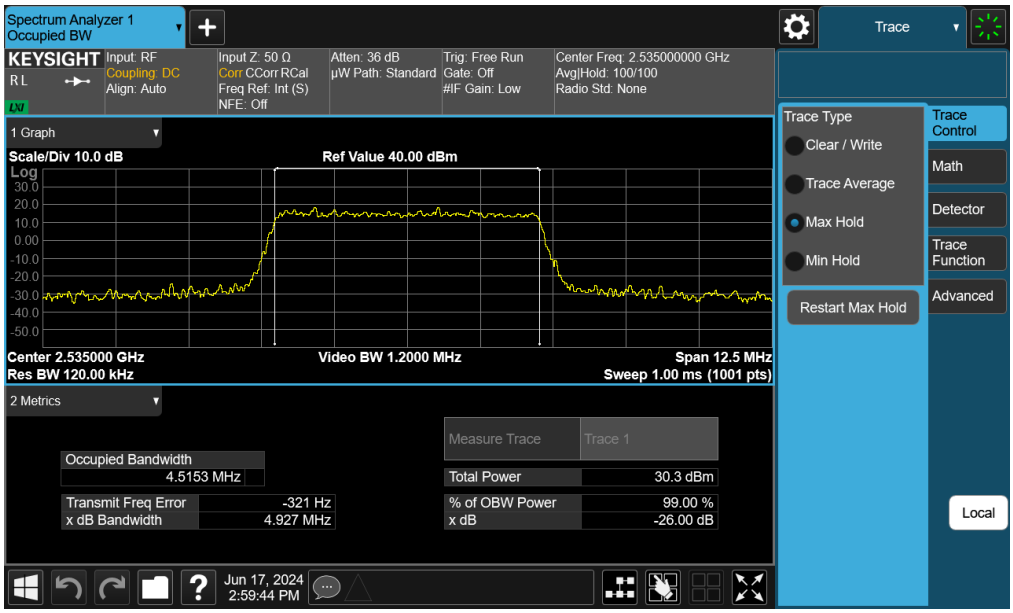
Plot 7-16. Occupied Bandwidth Plot (LTE Band 7 - 15MHz 16-QAM - Full RB)



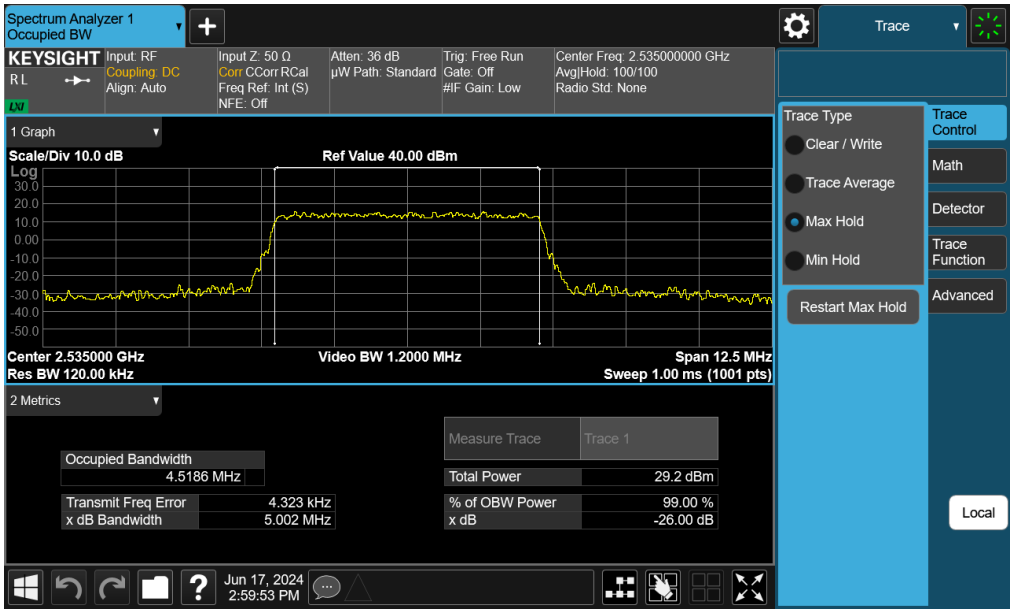
Plot 7-17. Occupied Bandwidth Plot (LTE Band 7 - 10MHz QPSK - Full RB)



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



Plot 7-19. Occupied Bandwidth Plot (LTE Band 7 - 5MHz QPSK - Full RB)

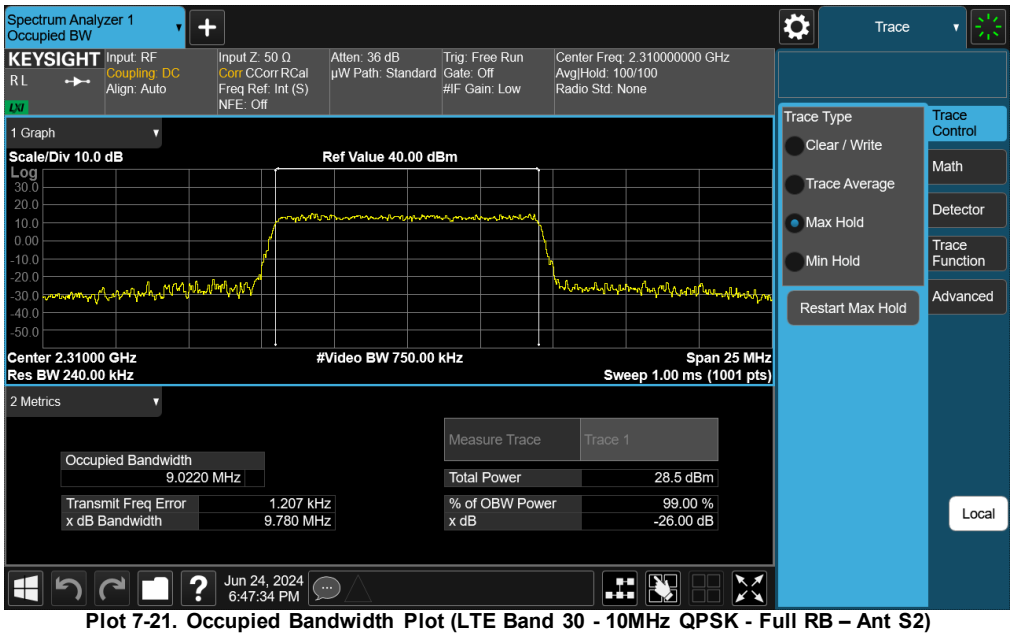


Plot 7-20. Occupied Bandwidth Plot (LTE Band 7 - 5MHz 16-QAM - Full RB)

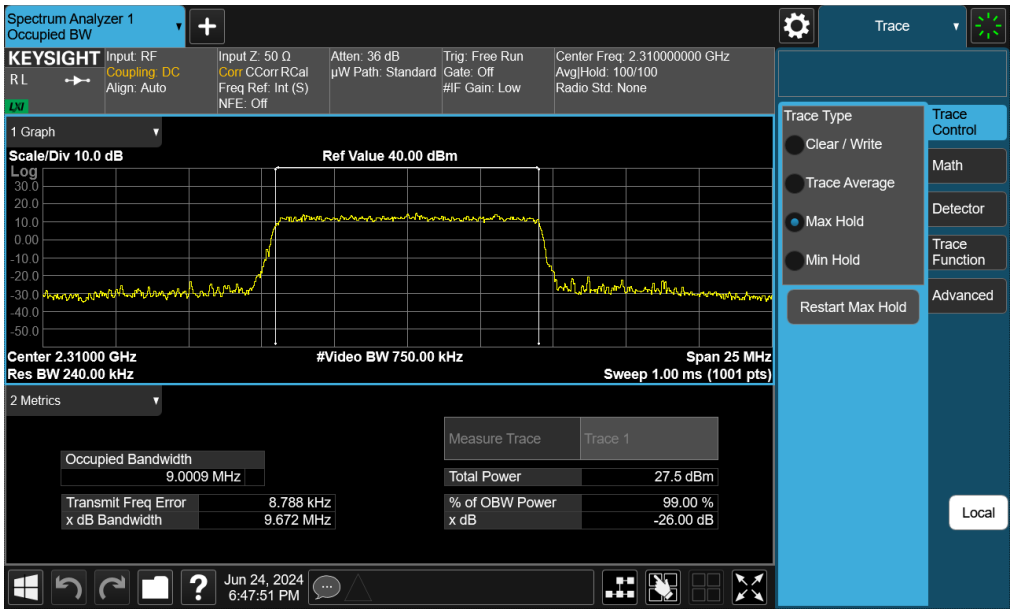
LTE Band 30 – Ant S2

Mode	Bandwidth	Modulation	OBW [MHz]
LTE-B30	10MHz	QPSK	9.02
		16QAM	9.00
	5MHz	QPSK	4.52
		16QAM	4.51

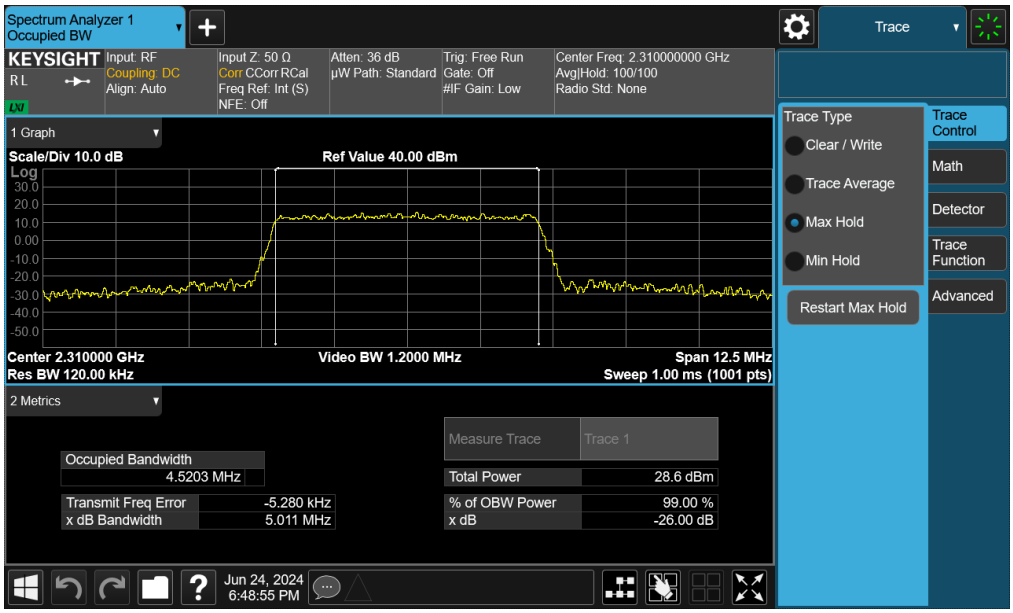
Table 7-4. Occupied Bandwidth Test Results (LTE Band 30 – Ant S2)



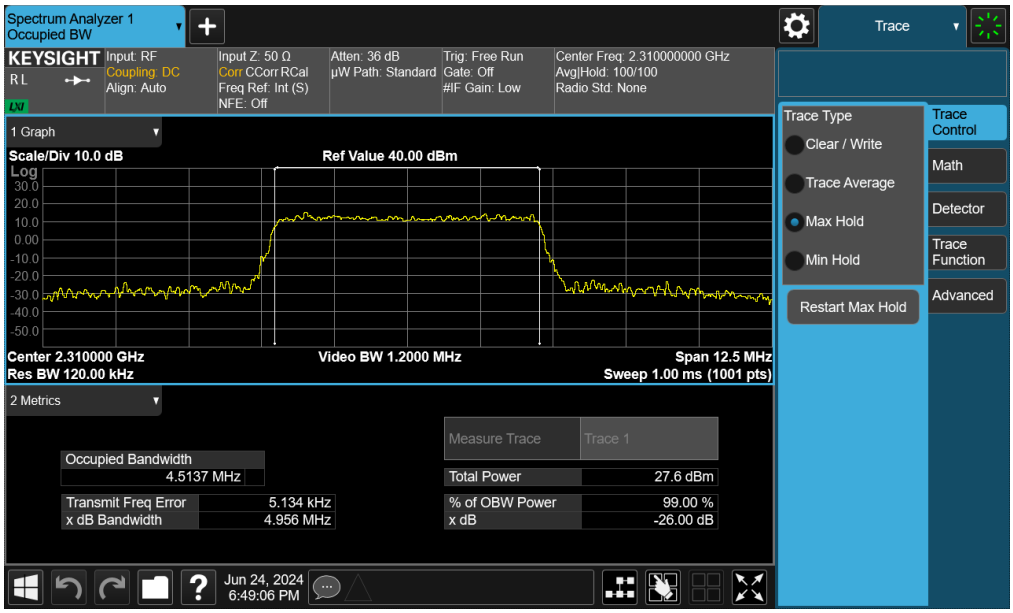
Plot 7-21. Occupied Bandwidth Plot (LTE Band 30 - 10MHz QPSK - Full RB – Ant S2)



Plot 7-22. Occupied Bandwidth Plot (LTE Band 30 - 10MHz 16-QAM - Full RB – Ant S2)



Plot 7-23. Occupied Bandwidth Plot (LTE Band 30 - 5MHz QPSK - Full RB – Ant S2)

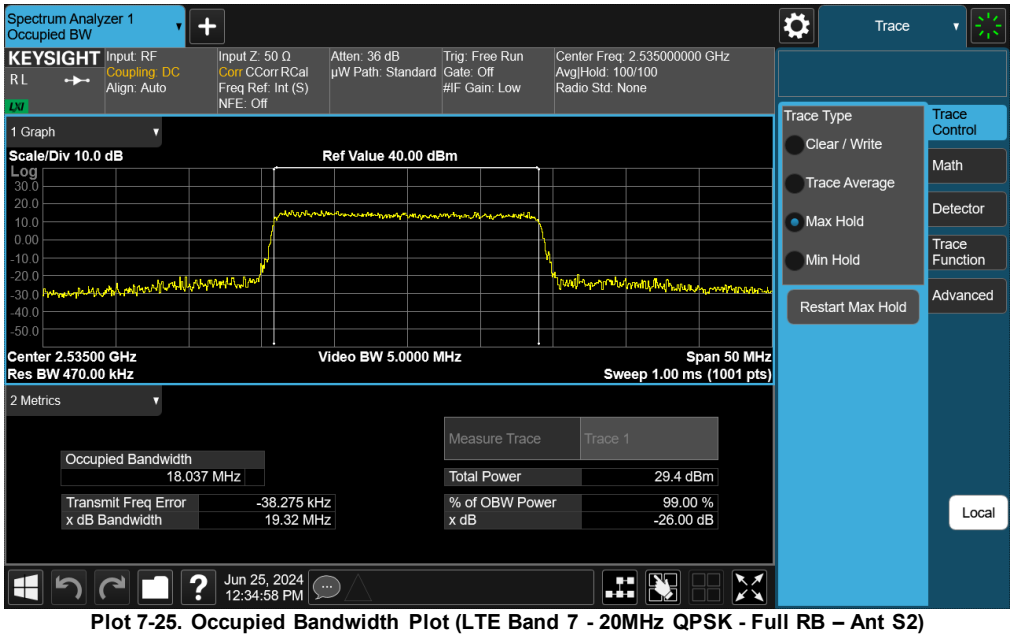


Plot 7-24. Occupied Bandwidth Plot (LTE Band 30 - 5MHz 16-QAM - Full RB – Ant S2)

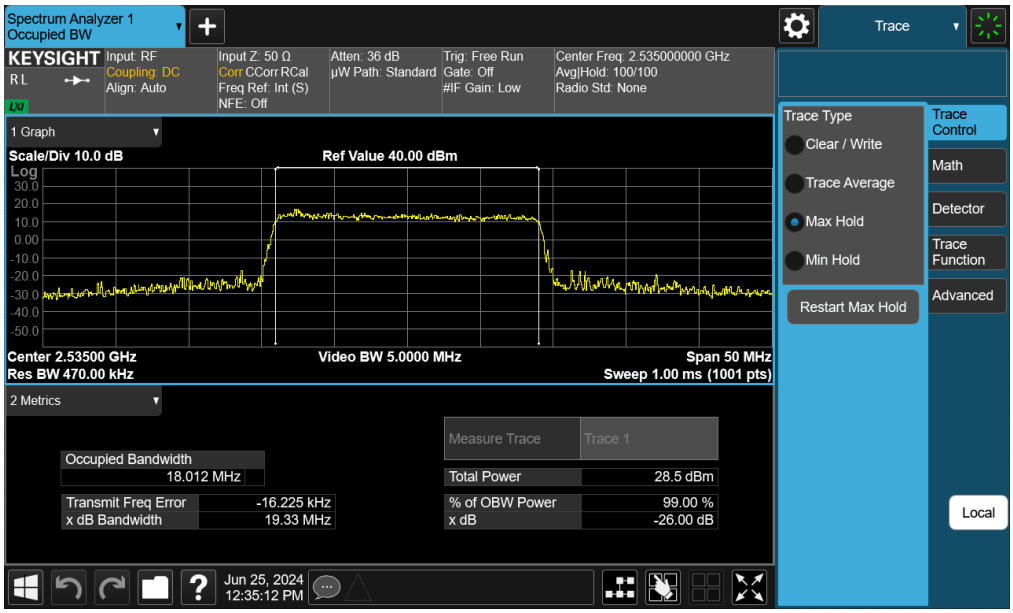
LTE Band 7 – Ant S2

Mode	Bandwidth	Modulation	OBW [MHz]
LTE-B7	20MHz	QPSK	18.04
		16QAM	18.01
	15MHz	QPSK	13.50
		16QAM	13.48
	10MHz	QPSK	8.99
		16QAM	8.99
	5MHz	QPSK	4.51
		16QAM	4.51

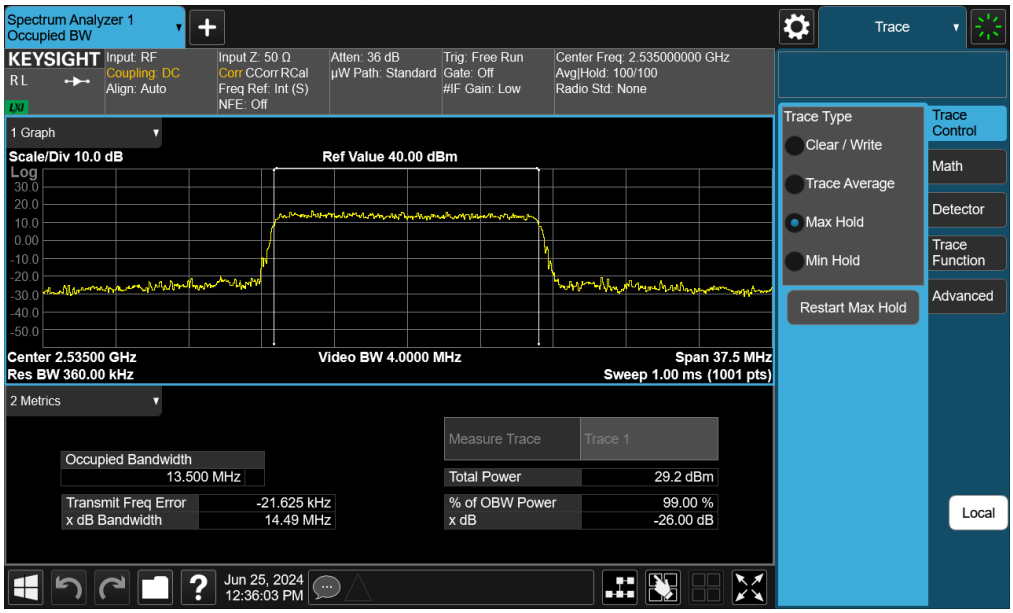
Table 7-5. Occupied Bandwidth Test Results (LTE Band 7 – Ant S2)



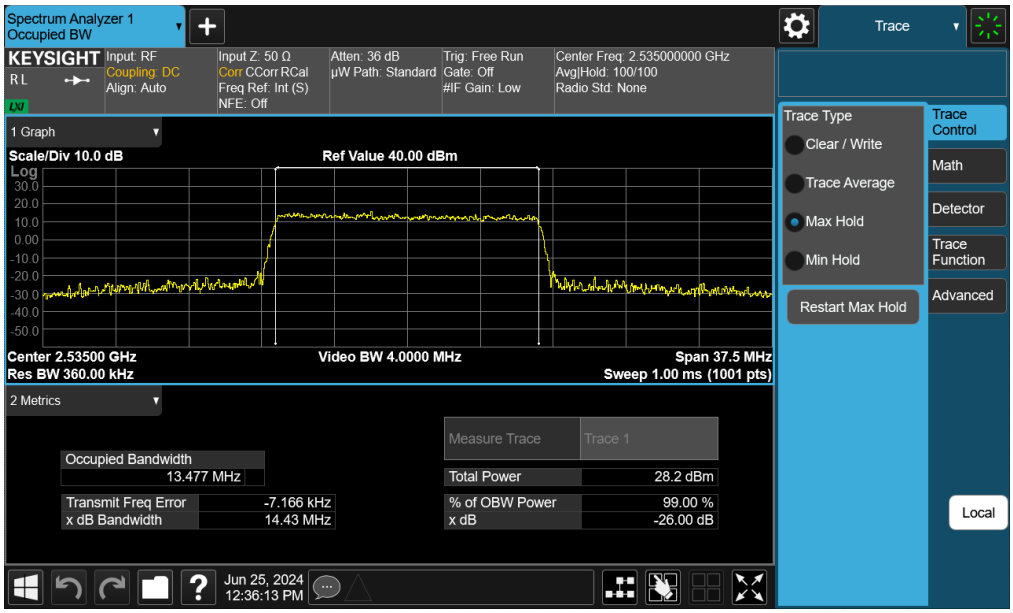
Plot 7-25. Occupied Bandwidth Plot (LTE Band 7 - 20MHz QPSK - Full RB – Ant S2)



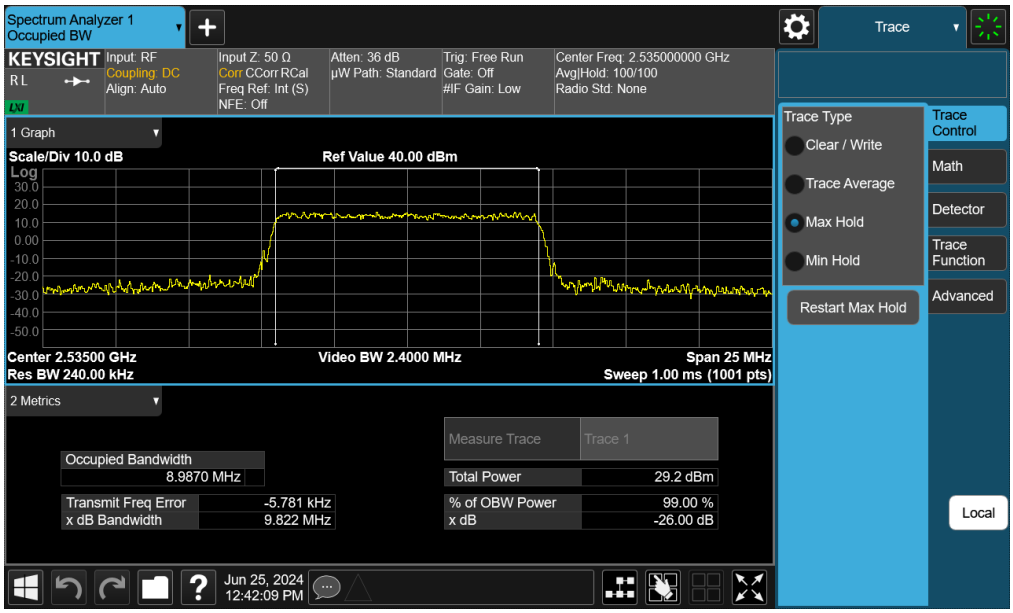
Plot 7-26. Occupied Bandwidth Plot (LTE Band 7 - 20MHz 16-QAM - Full RB – Ant S2)



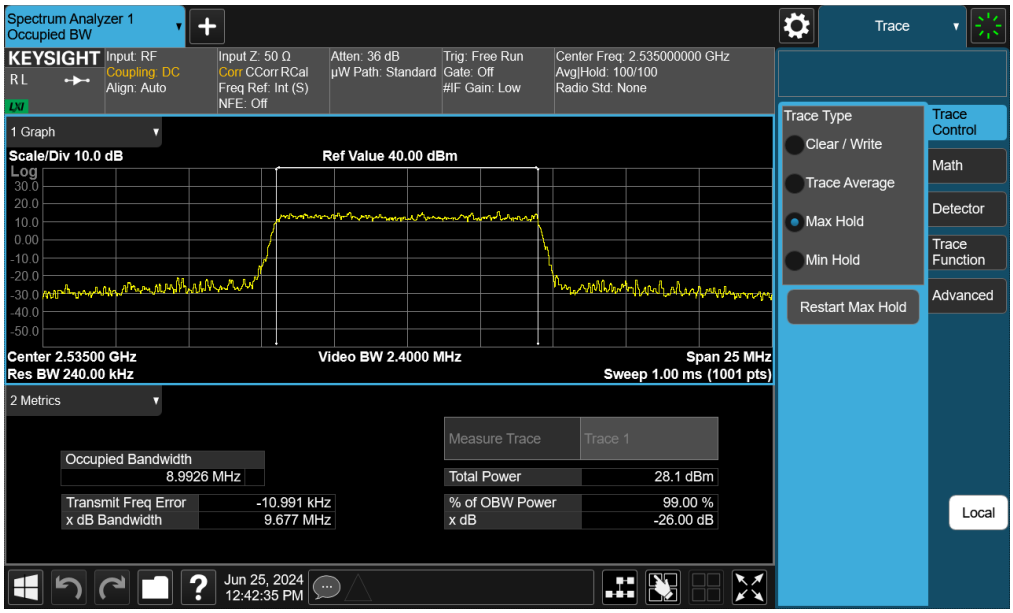
Plot 7-27. Occupied Bandwidth Plot (LTE Band 7 - 15MHz QPSK - Full RB – Ant S2)



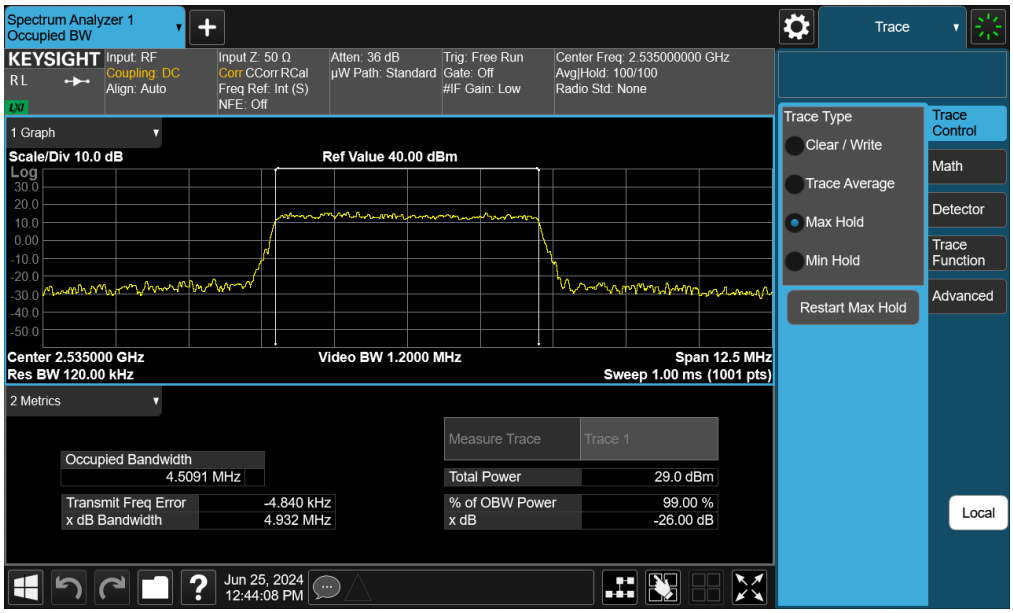
Plot 7-28. Occupied Bandwidth Plot (LTE Band 7 - 15MHz 16-QAM - Full RB – Ant S2)



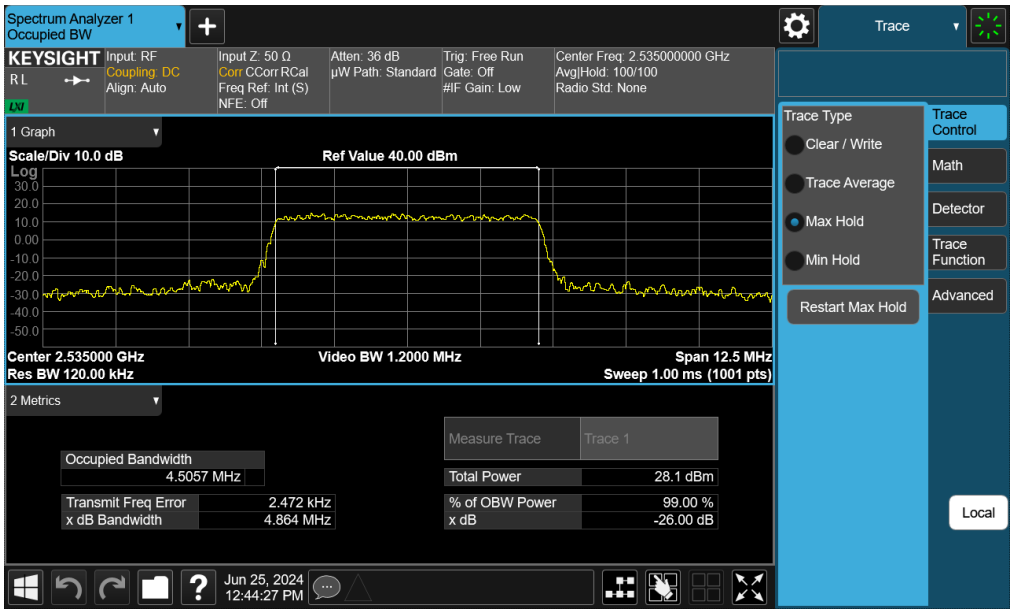
Plot 7-29. Occupied Bandwidth Plot (LTE Band 7 - 10MHz QPSK - Full RB – Ant S2)



Plot 7-30. Occupied Bandwidth Plot (LTE Band 7 - 10MHz 16-QAM - Full RB – Ant S2)



Plot 7-31. Occupied Bandwidth Plot (LTE Band 7 - 5MHz QPSK - Full RB – Ant S2)

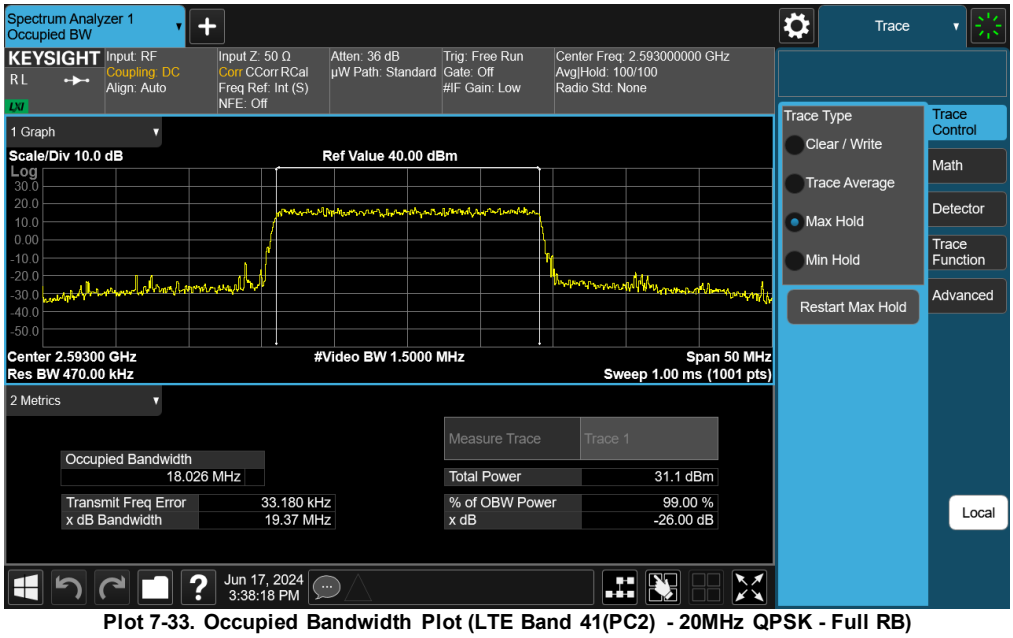


Plot 7-32. Occupied Bandwidth Plot (LTE Band 7 - 5MHz 16-QAM - Full RB – Ant S2)

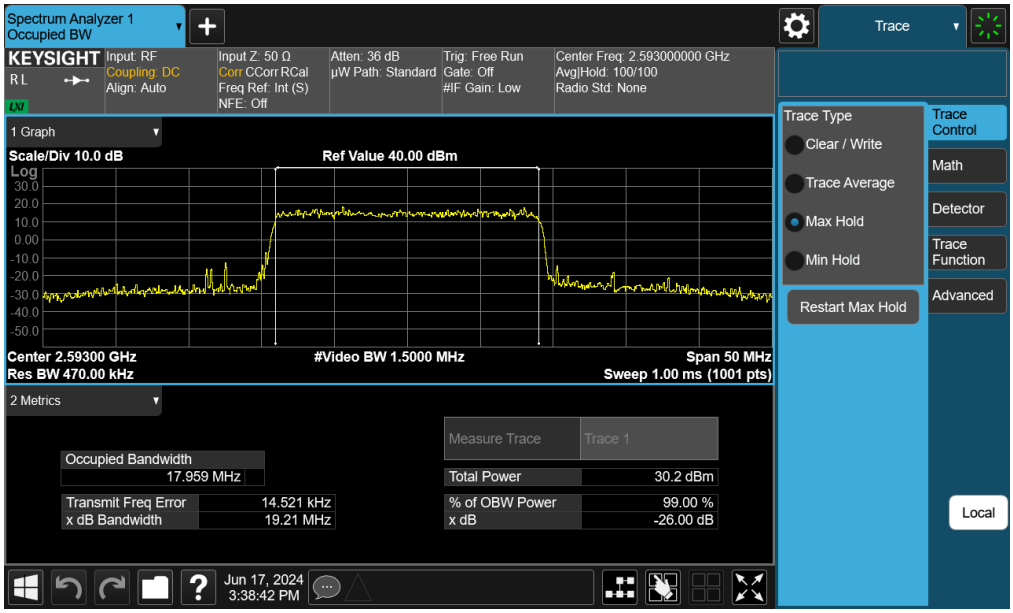
LTE Band 41(PC2)

Mode	Bandwidth	Modulation	OBW [MHz]
LTE-B41PC2	20MHz	QPSK	18.03
		16QAM	17.96
	15MHz	QPSK	13.50
		16QAM	13.50
	10MHz	QPSK	9.02
		16QAM	9.01
	5MHz	QPSK	4.55
		16QAM	4.53

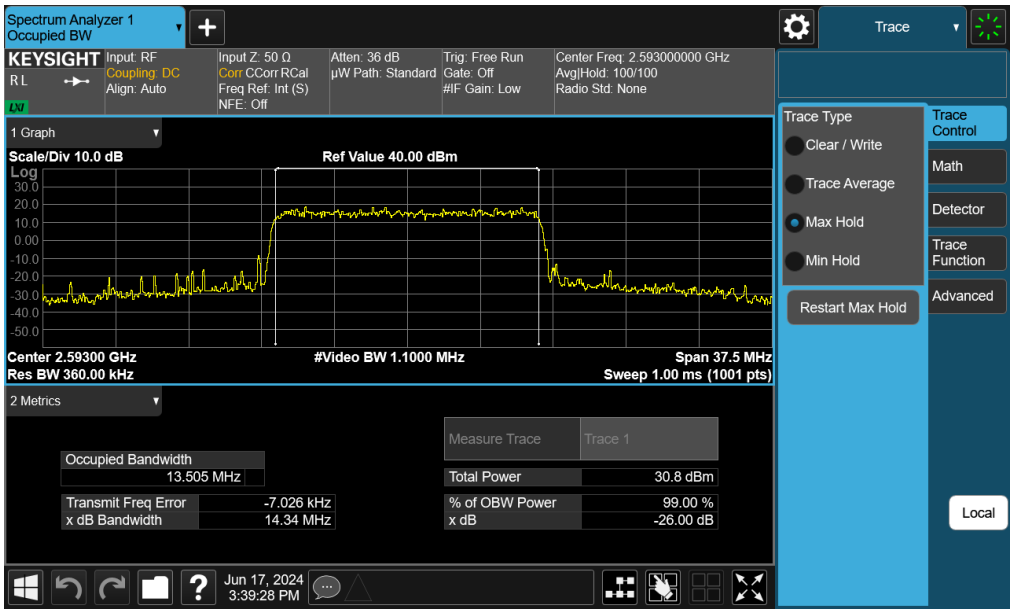
Table 7-6. Occupied Bandwidth Test Results (LTE Band 41(PC2))



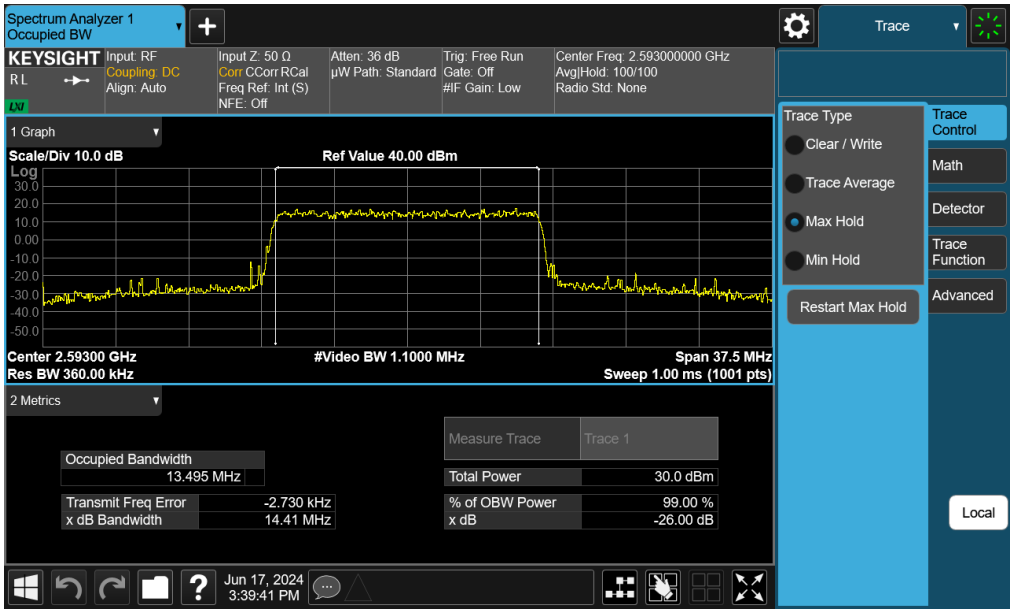
Plot 7-33. Occupied Bandwidth Plot (LTE Band 41(PC2) - 20MHz QPSK - Full RB)



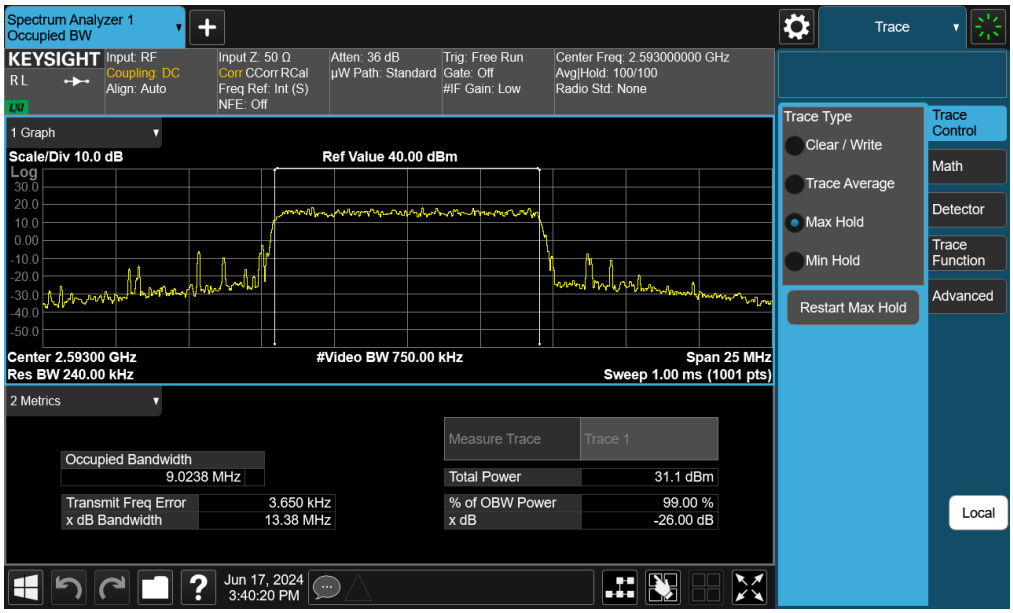
Plot 7-34. Occupied Bandwidth Plot (LTE Band 41(PC2) - 20MHz 16-QAM - Full RB)



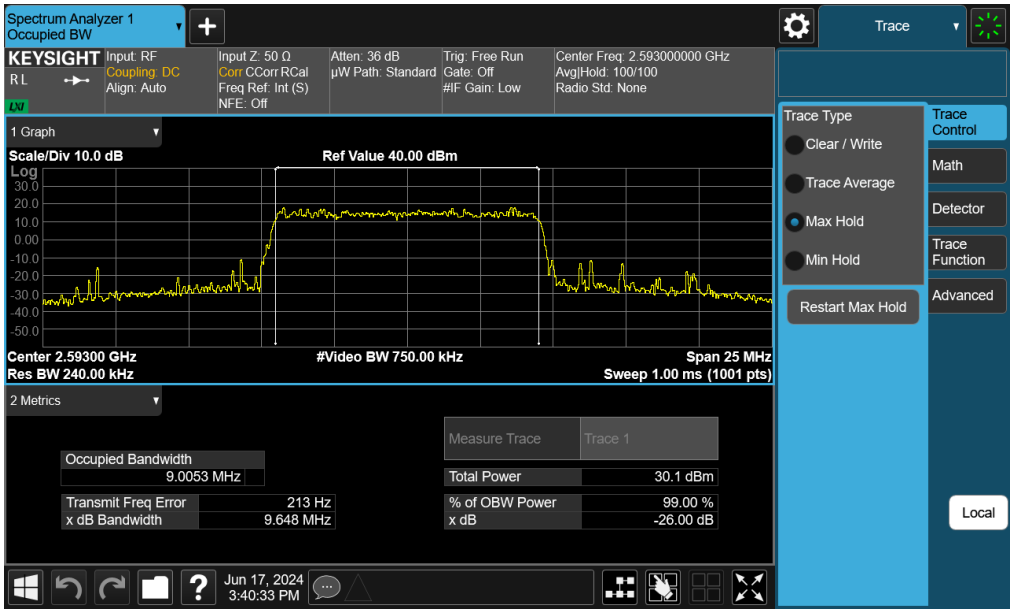
Plot 7-35. Occupied Bandwidth Plot (LTE Band 41(PC2) - 15MHz QPSK - Full RB)



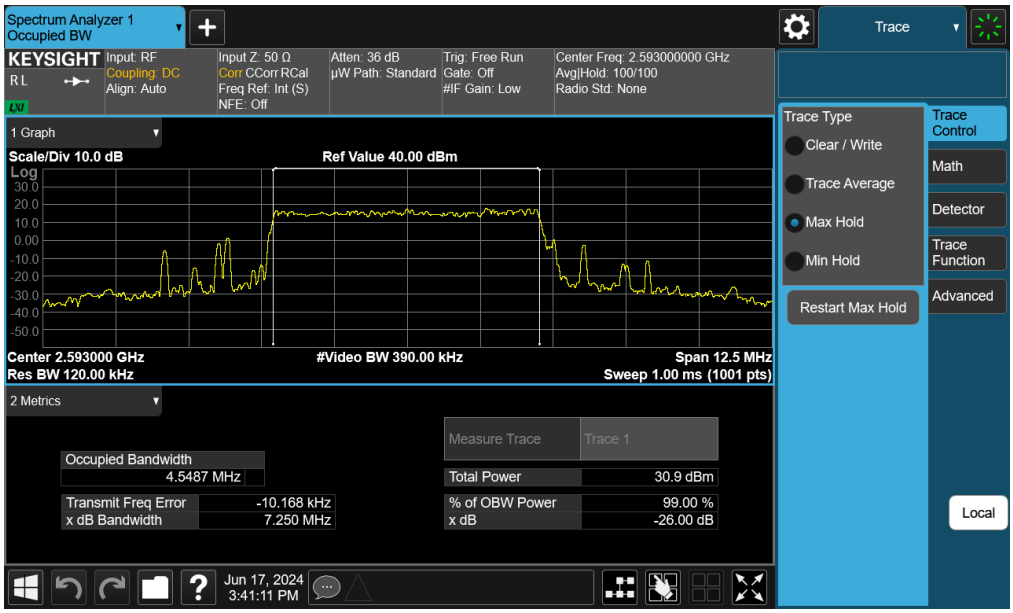
Plot 7-36. Occupied Bandwidth Plot (LTE Band 41(PC2) - 15MHz 16-QAM - Full RB)



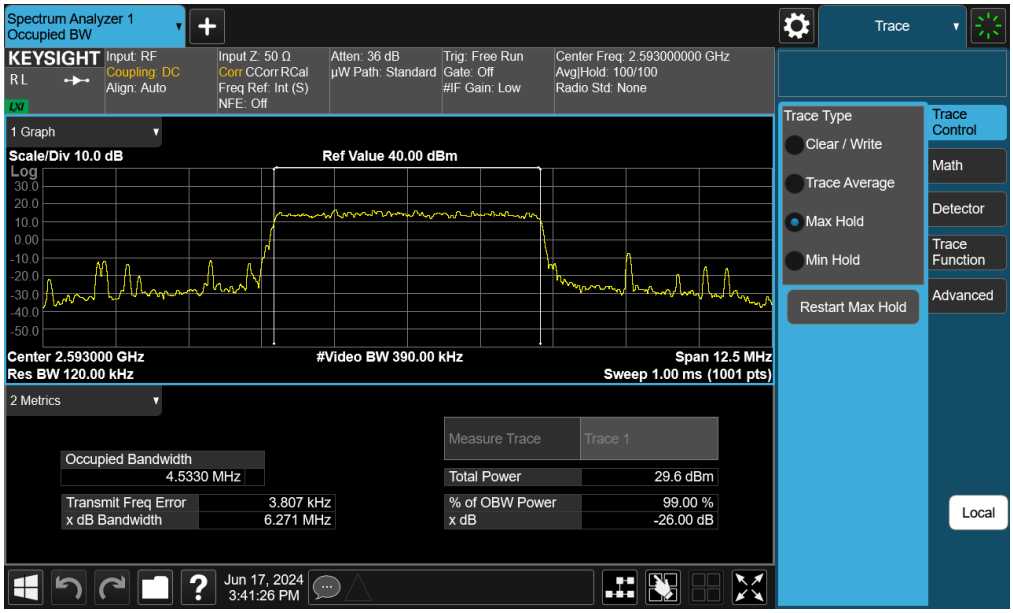
Plot 7-37. Occupied Bandwidth Plot (LTE Band 41(PC2) - 10MHz QPSK - Full RB)



Plot 7-38. Occupied Bandwidth Plot (LTE Band 41(PC2) - 10MHz 16-QAM - Full RB)



Plot 7-39. Occupied Bandwidth Plot (LTE Band 41(PC2) - 5MHz QPSK - Full RB)

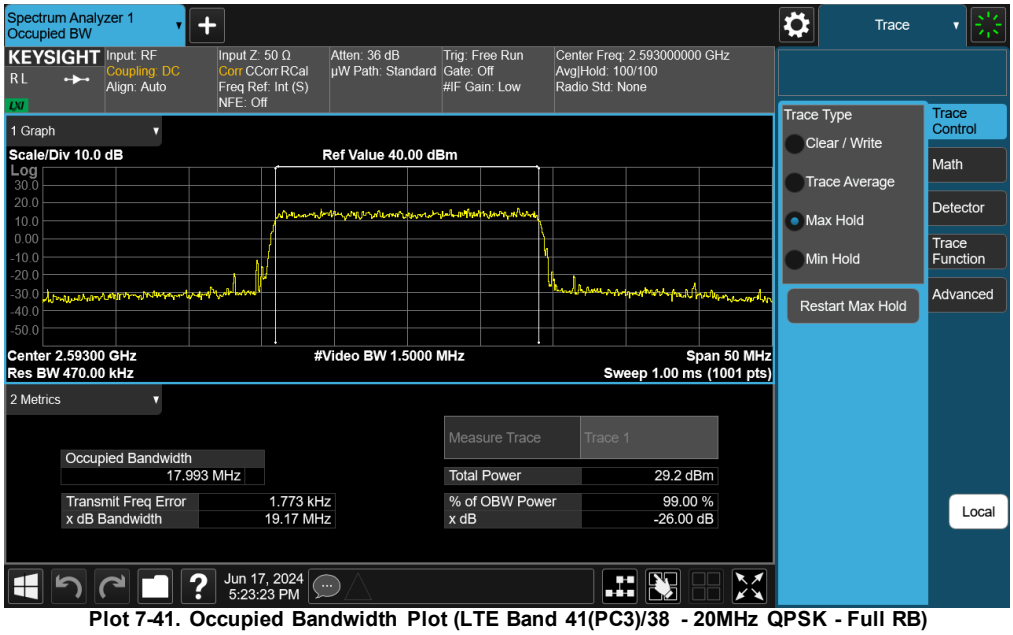


Plot 7-40. Occupied Bandwidth Plot (LTE Band 41(PC2) - 5MHz 16-QAM - Full RB)

LTE Band 41(PC3)/38

Mode	Bandwidth	Modulation	OBW [MHz]
LTE-B41PC3-38	20MHz	QPSK	17.99
		16QAM	17.93
	15MHz	QPSK	13.47
		16QAM	13.51
	10MHz	QPSK	9.02
		16QAM	9.00
	5MHz	QPSK	4.53
		16QAM	4.52

Table 7-7. Occupied Bandwidth Test Results (LTE Band 41(PC3)/38)



Plot 7-41. Occupied Bandwidth Plot (LTE Band 41(PC3)/38 - 20MHz QPSK - Full RB)