

PART 24 MEASUREMENT REPORT

Applicant Name:

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

Date of Testing:

8/23/2023 - 10/18/2023

Test Report Issue Date:

11/7/2023

Test Site/Location:

Element lab., Gyeonggi-do, South Korea

Test Report Serial No.:

1M2308210093-02.A3L

FCC ID:

A3LSMS928B

Applicant Name:

Samsung Electronics Co., Ltd.

Application Type:

Certification

Model:

SM-S928B/DS

Additional Model(s):

SM-S928B

EUT Type:

Portable Handset

FCC Classification:

PCS Licensed Transmitter Held to Ear (PCE)

FCC Rule Part:

24

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

FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 1 of 117

T A B L E O F C O N T E N T S

1.0	INTRODUCTION	5
1.1	Scope	5
1.2	Element Test Location.....	5
1.3	Test Facility / Accreditations.....	5
2.0	PRODUCT INFORMATION.....	6
2.1	Equipment Description	6
2.2	Device Capabilities.....	6
2.3	Test Configuration	6
2.4	Software and Firmware	6
2.5	EMI Suppression Device(s)/Modifications	6
3.0	DESCRIPTION OF TESTS	7
3.1	Evaluation Procedure	7
3.2	Radiated Power and Radiated Spurious Emissions	7
4.0	MEASUREMENT UNCERTAINTY	8
5.0	TEST EQUIPMENT CALIBRATION DATA	9
6.0	SAMPLE CALCULATIONS	10
7.0	TEST RESULTS	11
7.1	Summary.....	11
7.2	Conducted Output Power Data	12
7.3	Occupied Bandwidth	15
7.4	Spurious and Harmonic Emissions at Antenna Terminal	44
7.5	Band Edge Emissions at Antenna Terminal	59
7.6	Peak-Average Ratio	81
7.7	Radiated Power (EIRP).....	92
7.8	Radiated Spurious Emissions Measurements	97
7.9	Frequency Stability / Temperature Variation	112
8.0	CONCLUSION.....	117

FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 2 of 117

PART 24 MEASUREMENT REPORT

Antenna-0						
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
GSM/GPRS	N/A	GMSK	1850.2 - 1909.8	1.167	30.67	245KGXW
EDGE	N/A	8-PSK	1850.2 - 1909.8	0.470	26.72	244KG7W
WCDMA	N/A	Spread Spectrum	1852.4 - 1907.6	0.221	23.45	4M17F9W
LTE Band 25/2	20 MHz	QPSK	1860 - 1905	0.207	23.17	18M0G7D
		16QAM	1860 - 1905	0.162	22.10	18M0W7D
	15 MHz	QPSK	1857.5 - 1907.5	0.206	23.13	13M6G7D
		16QAM	1857.5 - 1907.5	0.159	22.02	13M5W7D
	10 MHz	QPSK	1855 - 1910	0.207	23.17	9M07G7D
		16QAM	1855 - 1910	0.168	22.25	9M04W7D
	5 MHz	QPSK	1852.5 - 1912.5	0.206	23.13	4M54G7D
		16QAM	1852.5 - 1912.5	0.162	22.10	4M55W7D
	3 MHz	QPSK	1851.5 - 1913.5	0.209	23.20	2M73G7D
		16QAM	1851.5 - 1913.5	0.162	22.08	2M73W7D
	1.4 MHz	QPSK	1850.7 - 1914.3	0.210	23.21	1M11G7D
		16QAM	1850.7 - 1914.3	0.163	22.13	1M12W7D
NR Band n25/2	20 MHz	$\pi/2$ BPSK	1860 - 1905	0.176	22.45	17M9G7D
		QPSK	1860 - 1905	0.174	22.41	19M0G7D
		16QAM	1860 - 1905	0.131	21.17	19M0W7D
	15 MHz	$\pi/2$ BPSK	1857.5 - 1907.5	0.185	22.67	13M5G7D
		QPSK	1857.5 - 1907.5	0.182	22.60	14M2G7D
		16QAM	1857.5 - 1907.5	0.134	21.27	14M2W7D
	10 MHz	$\pi/2$ BPSK	1855 - 1910	0.175	22.44	8M99G7D
		QPSK	1855 - 1910	0.176	22.46	9M38G7D
		16QAM	1855 - 1910	0.127	21.03	9M35W7D
	5 MHz	$\pi/2$ BPSK	1852.5 - 1912.5	0.161	22.08	4M55G7D
		QPSK	1852.5 - 1912.5	0.159	22.02	4M53G7D
		16QAM	1852.5 - 1912.5	0.123	20.90	4M53W7D

FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 3 of 117

Antenna-7						
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
LTE Band 25/2	20 MHz	QPSK	1860 - 1905	0.212	23.27	18M0G7D
		16QAM	1860 - 1905	0.172	22.35	18M0W7D
	15 MHz	QPSK	1857.5 - 1907.5	0.218	23.39	13M5G7D
		16QAM	1857.5 - 1907.5	0.170	22.31	13M5W7D
	10 MHz	QPSK	1855 - 1910	0.215	23.33	9M03G7D
		16QAM	1855 - 1910	0.169	22.28	9M03W7D
	5 MHz	QPSK	1852.5 - 1912.5	0.220	23.42	4M54G7D
		16QAM	1852.5 - 1912.5	0.176	22.45	4M54W7D
	3 MHz	QPSK	1851.5 - 1913.5	0.220	23.43	2M73G7D
		16QAM	1851.5 - 1913.5	0.180	22.56	2M74W7D
	1.4 MHz	QPSK	1850.7 - 1914.3	0.220	23.43	1M11G7D
		16QAM	1850.7 - 1914.3	0.176	22.46	1M11W7D
NR Band n25/2	20 MHz	$\pi/2$ BPSK	1860 - 1905	0.229	23.59	18M0G7D
		QPSK	1860 - 1905	0.226	23.54	19M0G7D
		16QAM	1860 - 1905	0.186	22.70	19M0W7D
	15 MHz	$\pi/2$ BPSK	1857.5 - 1907.5	0.233	23.68	13M5G7D
		QPSK	1857.5 - 1907.5	0.231	23.64	14M2G7D
		16QAM	1857.5 - 1907.5	0.196	22.91	14M2W7D
	10 MHz	$\pi/2$ BPSK	1855 - 1910	0.229	23.60	8M98G7D
		QPSK	1855 - 1910	0.221	23.44	9M33G7D
		16QAM	1855 - 1910	0.198	22.97	9M32W7D
	5 MHz	$\pi/2$ BPSK	1852.5 - 1912.5	0.220	23.42	4M54G7D
		QPSK	1852.5 - 1912.5	0.222	23.46	4M53G7D
		16QAM	1852.5 - 1912.5	0.194	22.87	4M53W7D

EUT Overview

FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 4 of 117

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 ISSED: 26168

FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 5 of 117

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMS928B**. 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 24.

Test Device Serial No.: 0371M, 0736M, 0747M, 0748M

2.2 Device Capabilities

This device contains the following capabilities:

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

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.

Band	Ant 0	Ant 7
GSM PCS	Ant A	N/A
WCDMA PCS	Ant A	N/A
LTE Band 25/2	Ant A	Ant F
NR Band n25/2	Ant A	Ant F

Table 2-1. Antenna Naming Convention

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.

2.4 Software and Firmware

Testing was performed on device(s) using software/firmware version S928BXXU0AWH9 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.

FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 6 of 117

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:

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

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 $P_g \text{ [dBm]} - \text{cable loss [dB]}$.

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:

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

And

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

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.

FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 7 of 117

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	1.95
Radiated Disturbance (<1GHz)	4.10
Radiated Disturbance (>1GHz)	4.82
Radiated Disturbance (>18GHz)	4.96

FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 8 of 117

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	N9030A	PXA Signal Analyzer	2023-07-04	Annual	2024-07-03	MY49432391
Anritsu	S820E	Cable and Antenna Analyzer	2023-07-05	Annual	2024-07-04	1839097
Anritsu	MA24106A	USB Power Sensor	2023-07-05	Annual	2024-07-04	1244512
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	2022-10-21	Biennial	2024-10-20	10160045
Com-Power	PAM-118A	Preamplifier	2023-07-05	Annual	2024-07-04	551042
Espec	SH-242	Environmental Chamber	2023-07-05	Annual	2024-07-04	93011064
Fairview Microwave	FM2CP1122-10	2.92mm Directional Coupler	2023-07-04	Annual	2024-07-03	1946
Keysight Technologies	N9030B	MXA Signal Analyzer	2023-07-04	Annual	2024-07-03	MY57143276
Mini-Circuits	BW-N10W5+	Attenuator	2023-07-04	Annual	2024-07-03	1607
Mini-Circuits	BW-N10W5+	Attenuator	2023-07-04	Annual	2024-07-03	1607
Rohde & Schwarz	TS-PR18	Preamplifier	2023-07-05	Annual	2024-07-04	102141
Rohde & Schwarz	SMB100A03	Signal Generator	2023-01-17	Annual	2024-01-16	182487
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	2023-02-17	Annual	2024-02-16	131453
Rohde & Schwarz	FSW43	Signal and Spectrum Analyzer	2023-01-13	Annual	2024-01-12	101955
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2023-02-17	Annual	2024-02-16	102131
Rohde & Schwarz	TC-TA18	VIVALDI-ANT	2021-10-22	Biennial	2023-10-21	101097
Rohde & Schwarz	TC-TA18	VIVALDI-ANT	2021-10-22	Biennial	2023-10-21	101098
Schwarzbeck	VULB9162	Broadband TRILOG Antenna	2023-06-01	Biennial	2025-05-31	9162-217
Schwarzbeck	UHA9105	Dipole Antenna	2022-07-19	Biennial	2024-07-18	91052522
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.

FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 9 of 117

6.0 SAMPLE CALCULATIONS

GSM Emission Designator

Emission Designator = 250KGXW

GSM BW = 250 kHz

G = Phase Modulation

X = Cases not otherwise covered

W = Combination (Audio/Data)

EDGE Emission Designator

Emission Designator = 250KG7W

EDGE BW = 250 kHz

G = Phase Modulation

7 = Quantized/Digital Info

W = Combination (Audio/Data)

WCDMA Emission Designator

Emission Designator = 4M16F9W

WCDMA BW = 4.16 MHz

F = Frequency Modulation

9 = Composite Digital Info

W = Combination (Audio/Data)

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.

FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 10 of 117

7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.
 FCC ID: A3LSMS928B
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
 Mode(s): GSM/GPRS/EDGE/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	2.1051, 24.238(a)	> 43 + 10log10(P[Watts]) at Band Edge and for all out-of-band emissions	PASS	Sections 7.4, 7.5
	Peak-to-Average Ratio	24.232(d)	≤ 13 dB	PASS	Section 7.6
	Frequency Stability	2.1055, 24.235	Fundamental emissions stay within authorized frequency block **Carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm	PASS	Section 7.9
RADIATED	Equivalent Isotropic Radiated Power	24.232(c)	< 2 Watts max. EIRP	PASS	Section 7.7
	Radiated Spurious Emissions	2.1053, 24.238(a)	≥ 43 + 10 log (P[Watts]) dB of attenuation below transmitter power **Spurious emissions from receivers shall not exceed the limits detailed in RSS-Gen(7.3)	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**.

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 v1.1.

FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 11 of 117

7.2 Conducted Output Power Data

Test Overview

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

Test Procedure Used

ANSI C63.26-2015 – Section 5.2

Test Settings

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

Test Setup

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

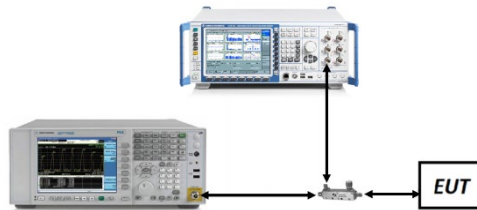


Figure 7-1. Test Instrument & Measurement Setup

Test Notes

1. Conducted power measurements were evaluated using various combinations of RB size, RB offset, modulation, and channel bandwidth. Channel bandwidth data is shown in the tables below based only on the channel bandwidths that were supported in this device.
2. All other conducted power measurements are contained in the RF exposure report for this filing.
3. Conducted power was found to reduce for the higher order QAM modulations when compared to 16QAM. Due to this trend, only the worst-case QAM (16QAM) powers are included in this section.

FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 12 of 117

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
20 MHz	QPSK	26140	1860.0	1 / 0	23.56
		26365	1882.5	1 / 50	23.42
		26590	1905.0	1 / 50	23.44
	16-QAM	26140	1860.0	1 / 0	22.62
15 MHz	QPSK	26115	1857.5	1 / 74	23.59
		26365	1882.5	1 / 74	23.57
		26615	1907.5	1 / 74	23.49
	16-QAM	26615	1907.5	1 / 74	22.65
10 MHz	QPSK	26090	1855.0	1 / 0	23.43
		26365	1882.5	1 / 25	23.50
		26640	1910.0	1 / 25	23.41
	16-QAM	26365	1882.5	1 / 25	22.51
5 MHz	QPSK	26065	1852.5	1 / 12	23.60
		26365	1882.5	1 / 12	23.60
		26665	1912.5	1 / 24	23.40
	16-QAM	26365	1882.5	1 / 12	22.68
3 MHz	QPSK	26055	1851.5	1 / 7	23.64
		26365	1882.5	1 / 7	23.61
		26675	1913.5	1 / 7	23.65
	16-QAM	26365	1882.5	1 / 7	22.78
1.4 MHz	QPSK	26047	1850.7	1 / 0	23.57
		26365	1882.5	1 / 0	23.60
		26683	1914.3	1 / 0	23.52
	16-QAM	26365	1882.5	1 / 0	22.68

Table 7-2. Conducted powers (LTE Band 25/2 – Ant 7)

FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 13 of 117

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
20 MHz	$\pi/2$ BPSK	372000	1860.0	1 / 104	22.65
		376000	1880.0	1 / 53	22.70
		380000	1900.0	1 / 1	22.70
	QPSK	372000	1860.0	1 / 53	22.77
		376000	1880.0	1 / 1	22.69
		380000	1900.0	1 / 1	22.77
	16-QAM	380000	1900.0	1 / 1	21.75
15 MHz	$\pi/2$ BPSK	371500	1857.5	1 / 1	22.62
		376000	1880.0	1 / 77	22.79
		380500	1902.5	1 / 1	22.67
	QPSK	371500	1857.5	1 / 77	22.57
		376000	1880.0	1 / 1	22.77
	16-QAM	380500	1902.5	1 / 1	21.59
10 MHz	$\pi/2$ BPSK	371000	1855.0	1 / 26	22.64
		376000	1880.0	1 / 26	22.77
		381000	1905.0	1 / 1	22.64
	QPSK	371000	1855.0	1 / 50	22.54
		376000	1880.0	1 / 26	22.75
		381000	1905.0	1 / 1	22.81
	16-QAM	381000	1905.0	1 / 1	21.61
5 MHz	$\pi/2$ BPSK	370500	1852.5	1 / 1	23.34
		376000	1880.0	1 / 1	23.11
		381500	1907.5	1 / 1	23.36
	QPSK	370500	1852.5	1 / 1	23.29
		376000	1880.0	1 / 1	23.29
		381500	1907.5	1 / 1	23.46
	16-QAM	381500	1907.5	1 / 1	22.26

Table 7-3. Conducted powers (NR Band n25/2 – Ant 7)

FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 14 of 117

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.

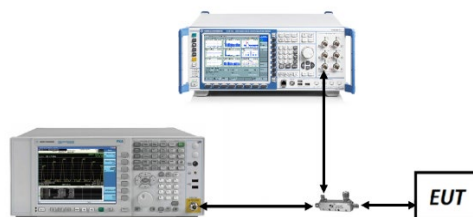


Figure 7-2. Test Instrument & Measurement Setup

Test Notes

None.

FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 15 of 117

Mode	Bandwidth	Modulation	OBW [MHz]
GSM-PCS	N/A	GSMK	0.25
GSM-PCS Edge		8-PSK	0.24
WCDMA-PCS		Spread Spectrum	4.17
LTE-B25-2	20 MHz	QPSK	18.00
		16QAM	18.04
	15 MHz	QPSK	13.58
		16QAM	13.50
	10 MHz	QPSK	9.07
		16QAM	9.04
	5 MHz	QPSK	4.54
		16QAM	4.55
	3 MHz	QPSK	2.73
		16QAM	2.73
NR-n25-2	20 MHz	QPSK	1.11
		16QAM	1.12
		$\pi/2$ BPSK	17.95
	15 MHz	QPSK	19.02
		16QAM	19.00
		$\pi/2$ BPSK	13.49
	10 MHz	QPSK	14.16
		16QAM	14.17
		$\pi/2$ BPSK	8.99
	5 MHz	QPSK	9.38
		16QAM	9.35
		$\pi/2$ BPSK	4.55
		QPSK	4.53
		16QAM	4.53
		$\pi/2$ BPSK	4.53

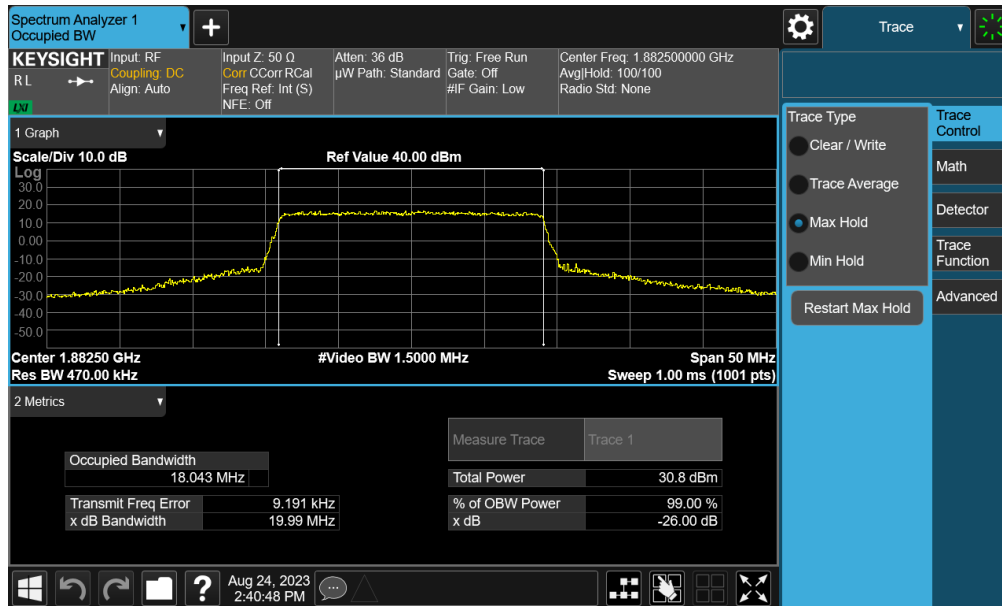
Table 7-4. Occupied Bandwidth Test Results – Ant 0

FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 16 of 117

LTE Band 25/2 – Ant 0

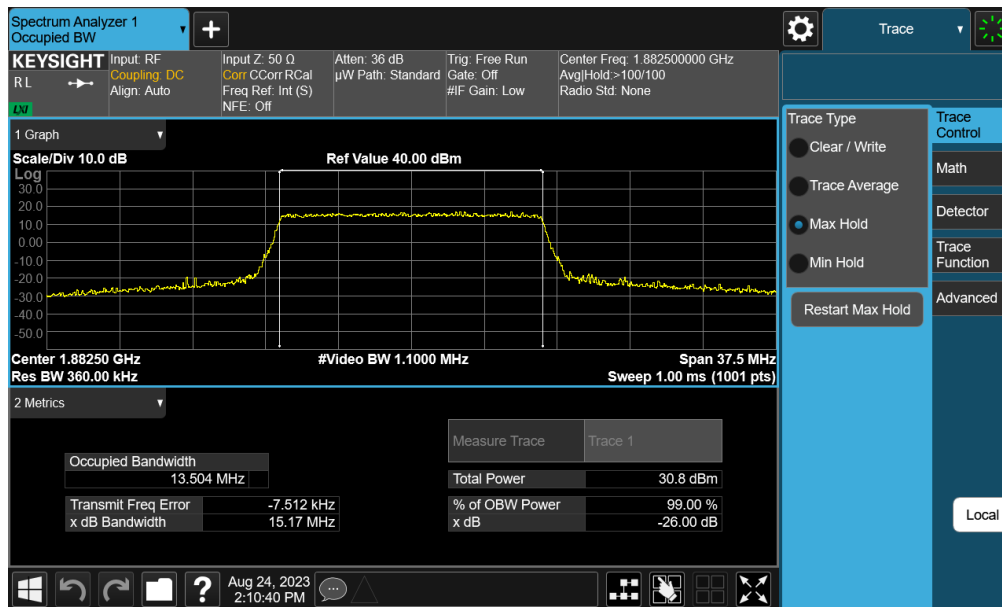
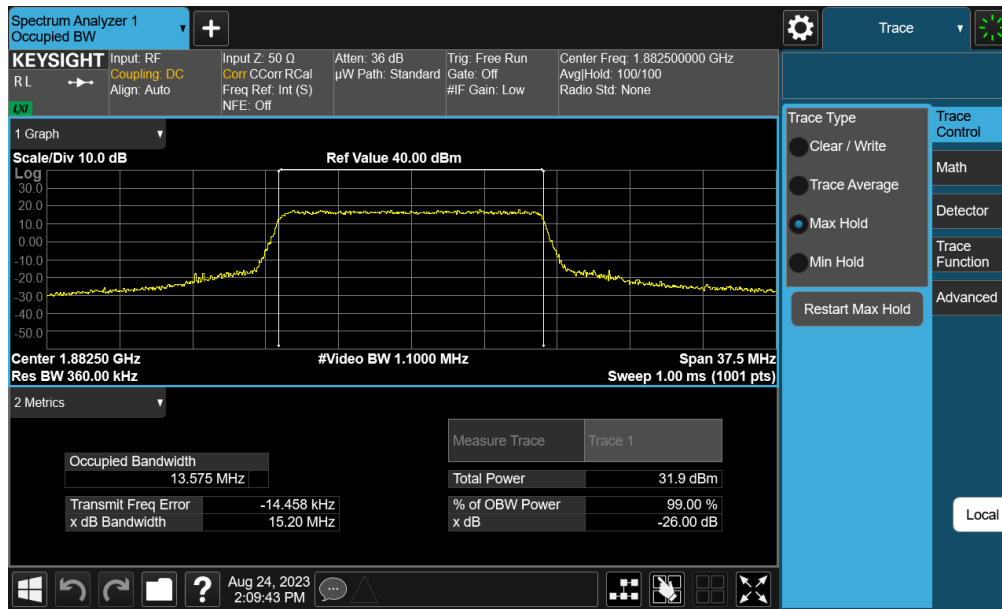


Plot 7-1. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz QPSK - Full RB - Ant 0)

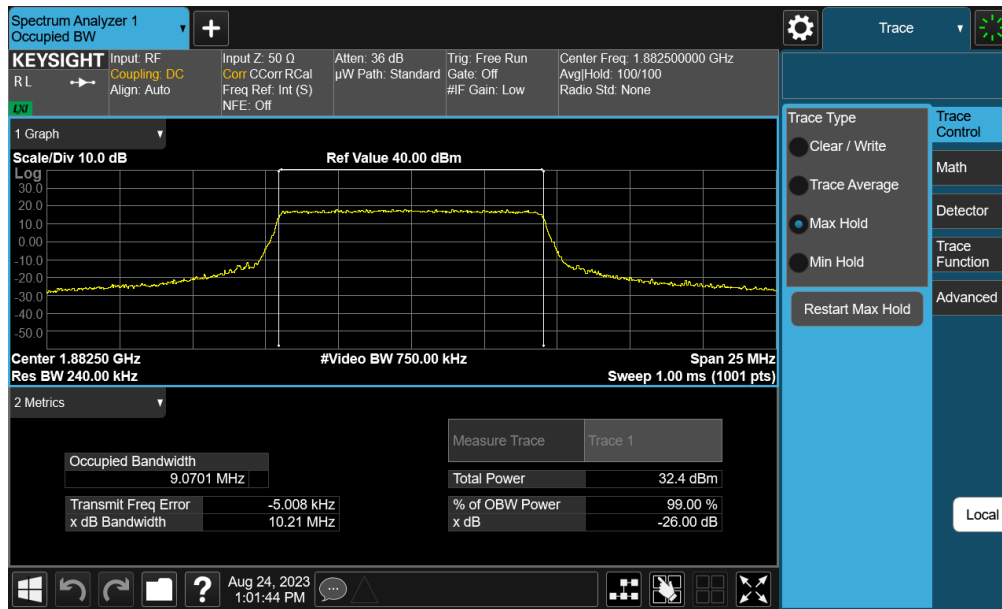


Plot 7-2. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz 16-QAM - Full RB - Ant 0)

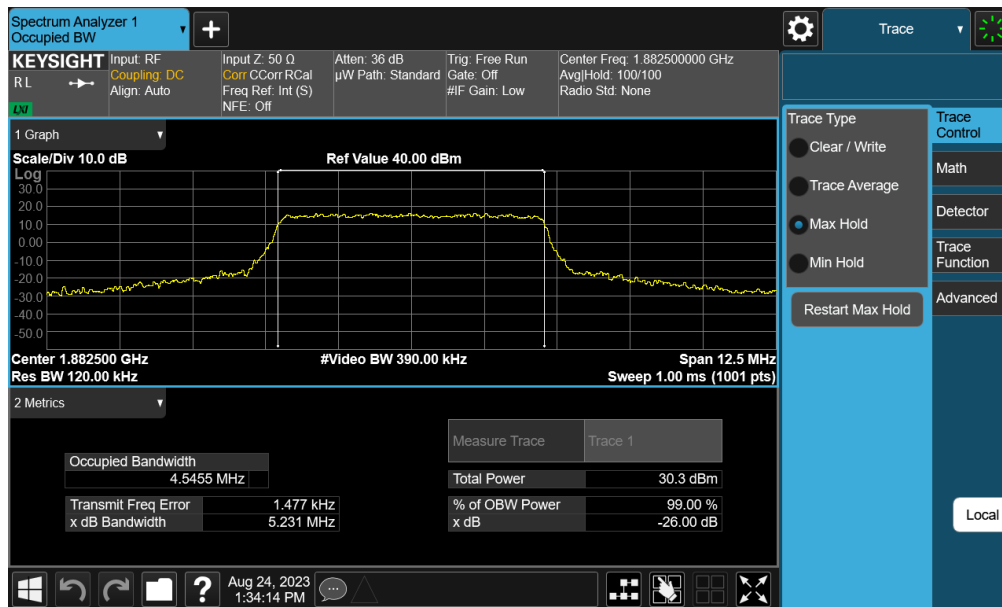
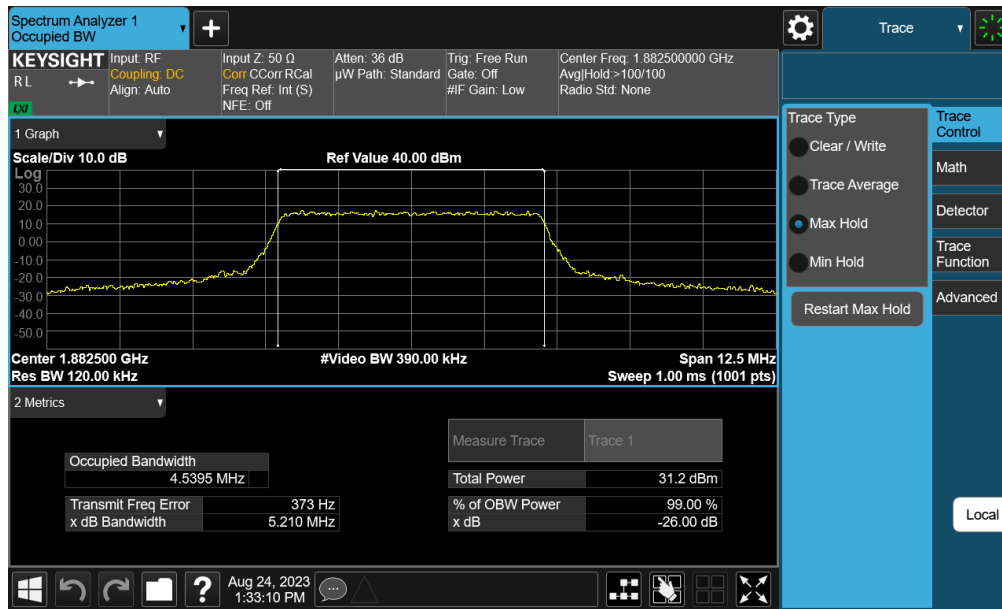
FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 17 of 117



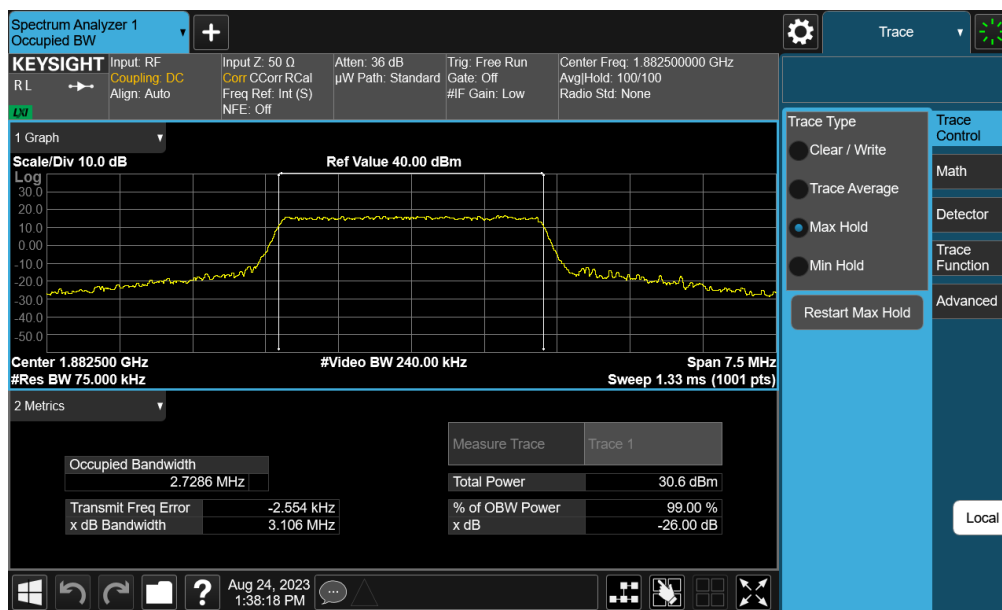
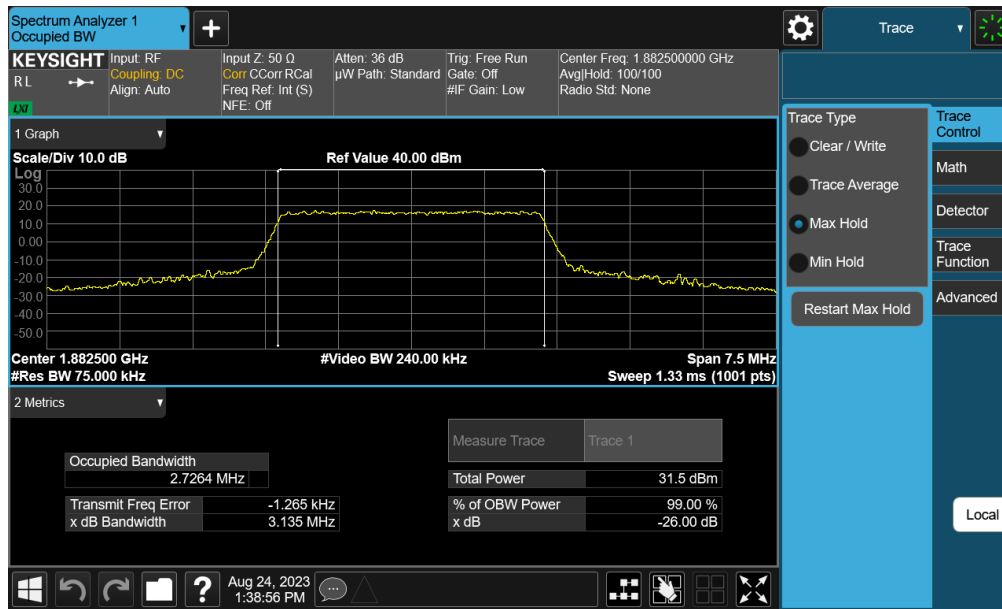
FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 18 of 117



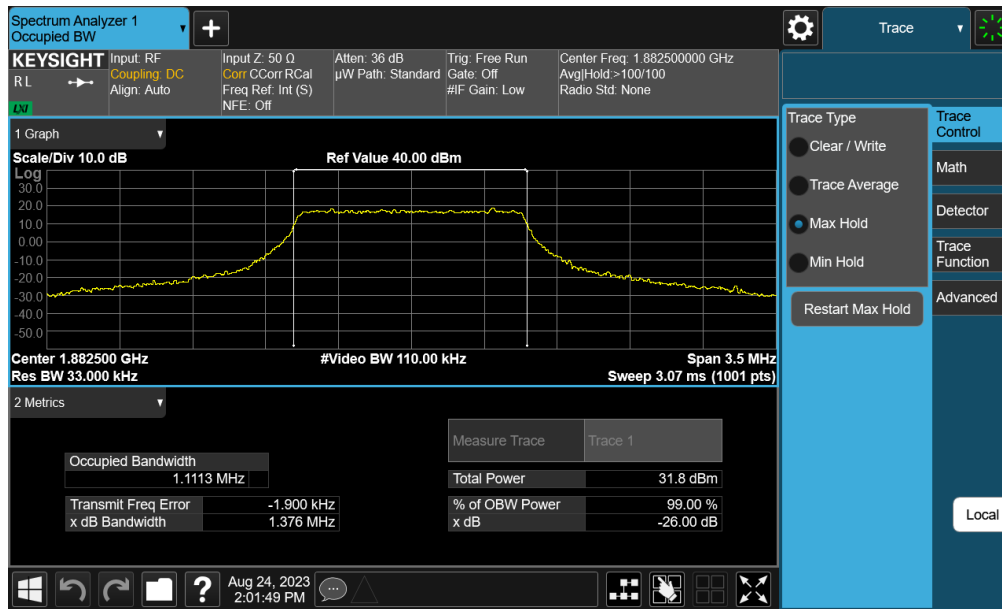
FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 19 of 117



FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 20 of 117

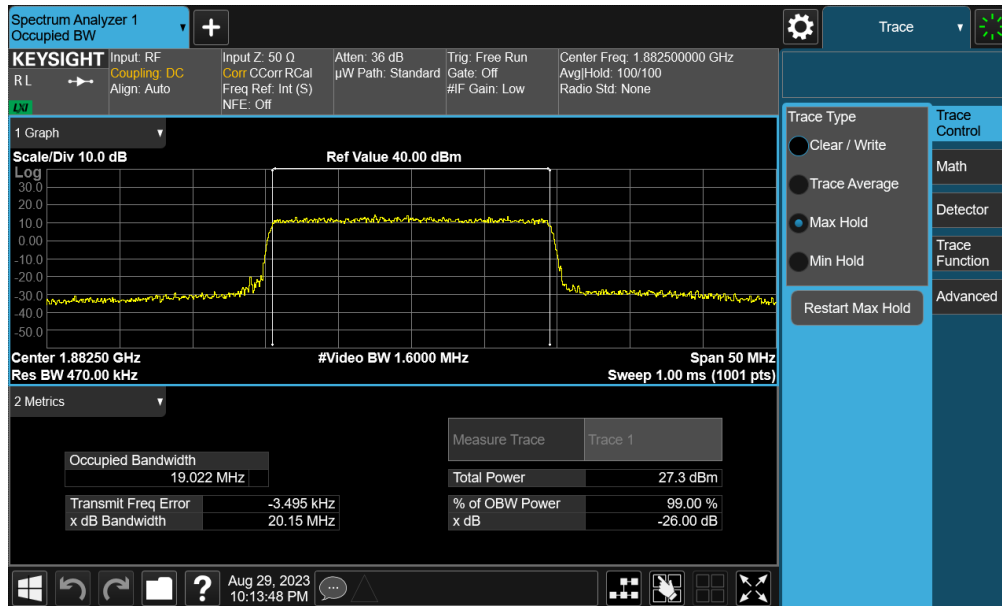


FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 21 of 117

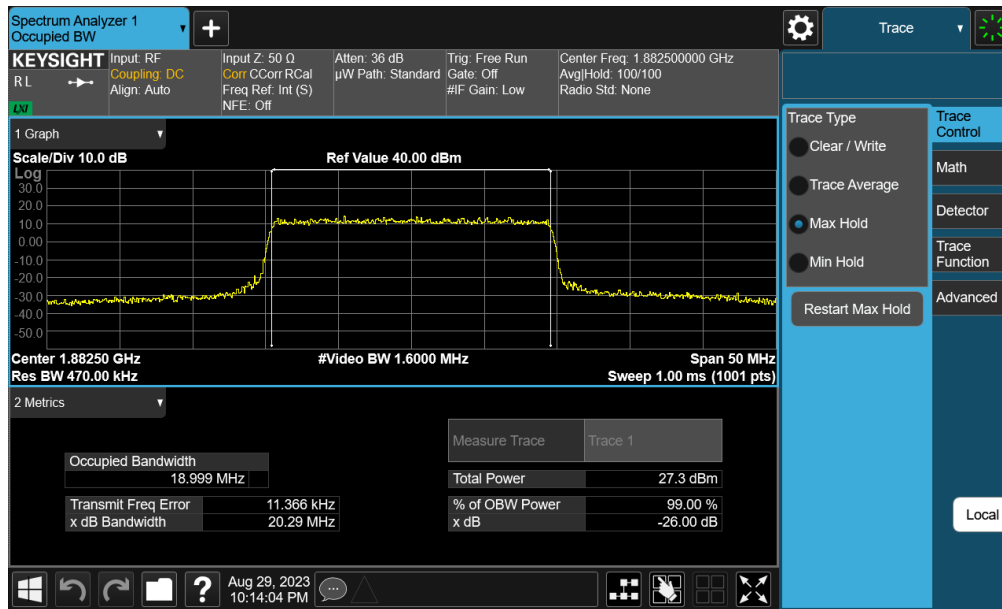


FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 22 of 117

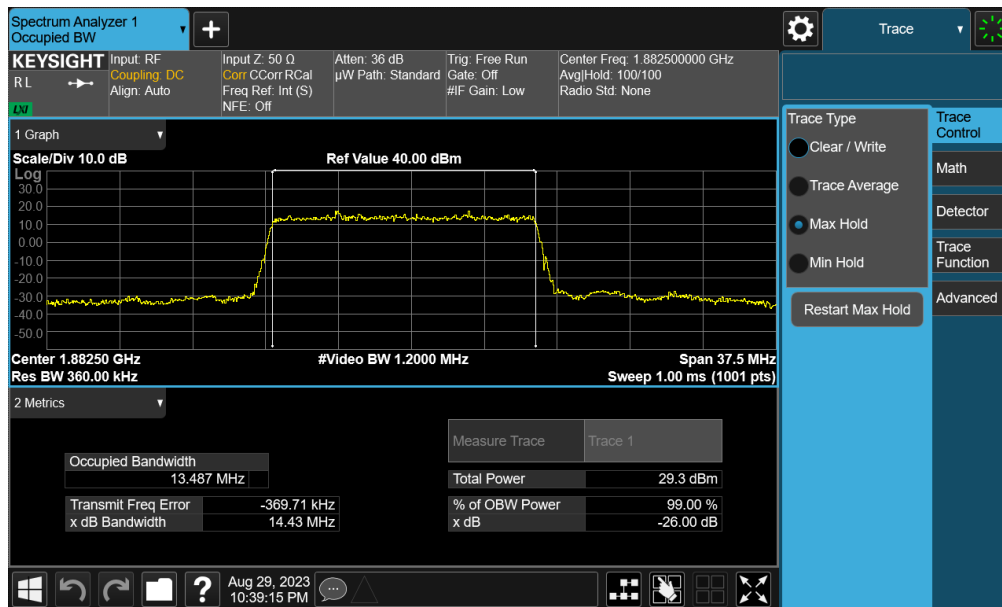
NR Band n25/2 – Ant 0



FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 23 of 117

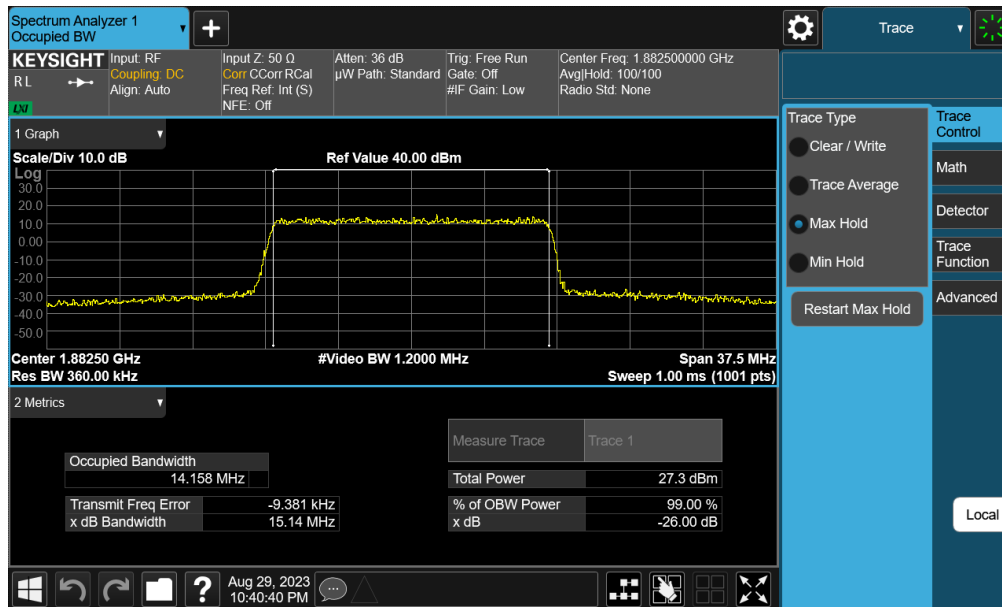


Plot 7-15. Occupied Bandwidth Plot (NR Band n25/2 - 20.0MHz CP-OFDM 16QAM - Full RB - ANT 0)

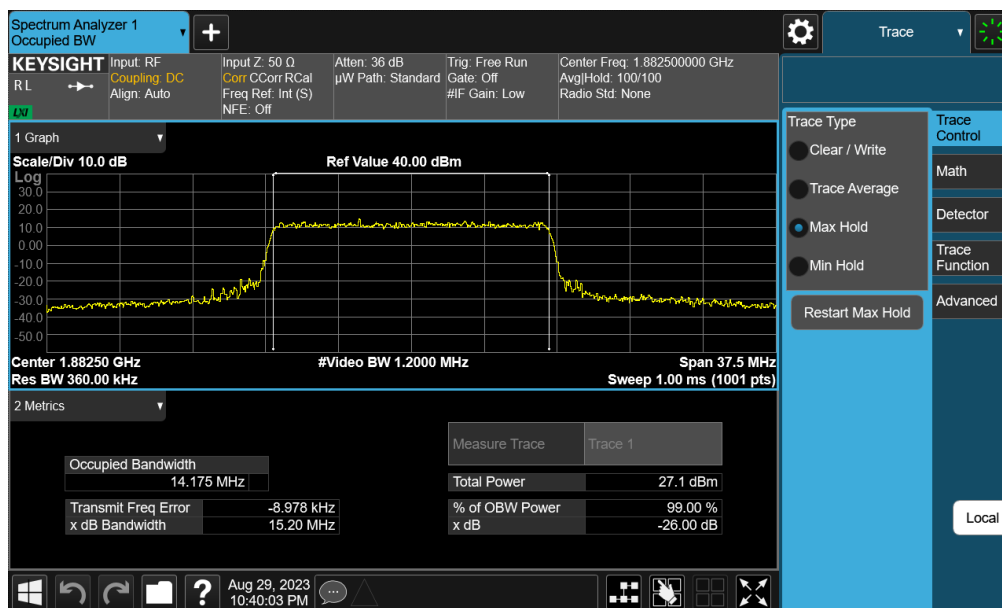


Plot 7-16. Occupied Bandwidth Plot (NR Band n25/2 - 15.0MHz DFT-s-OFDM BPSK - Full RB - ANT 0)

FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 24 of 117

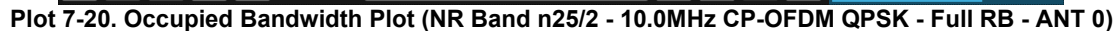


Plot 7-17. Occupied Bandwidth Plot (NR Band n25/2 - 15.0MHz CP-OFDM QPSK - Full RB - ANT 0)



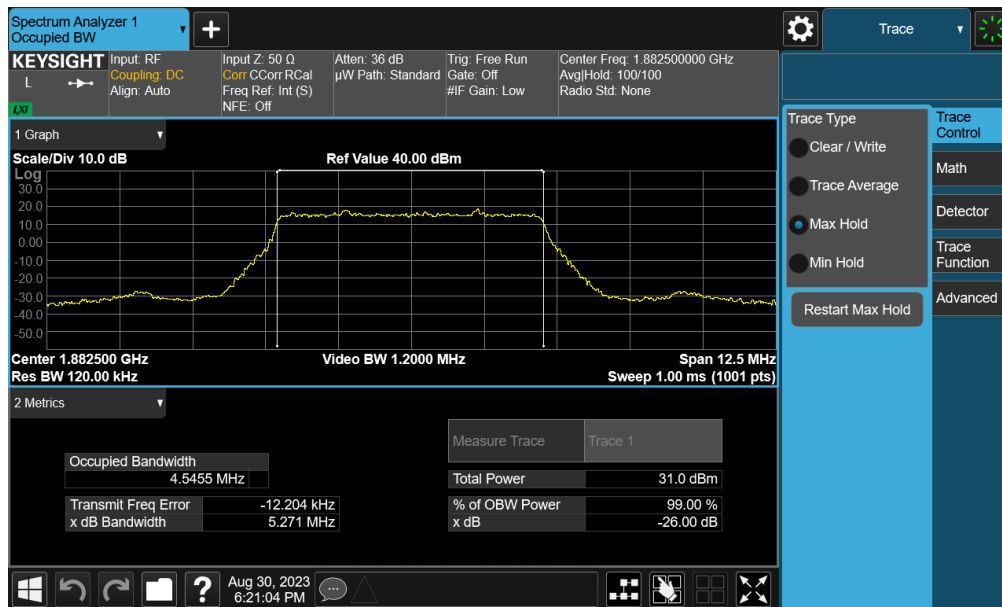
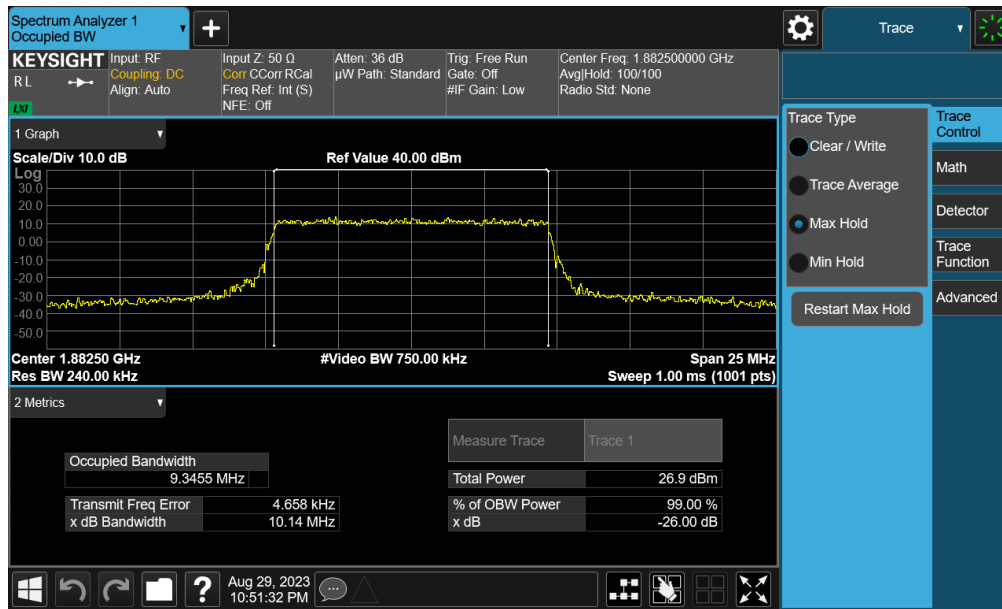
Plot 7-18. Occupied Bandwidth Plot (NR Band n25/2 - 15.0MHz CP-OFDM 16QAM - Full RB - ANT 0)

FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 25 of 117

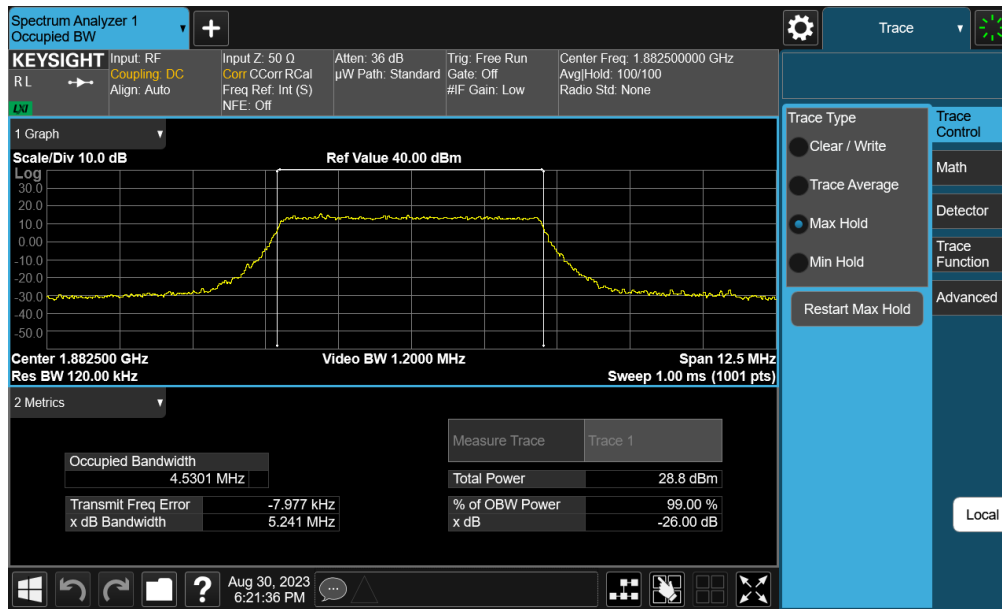


© 2023 ELEMENT V11.0 7/6/2023

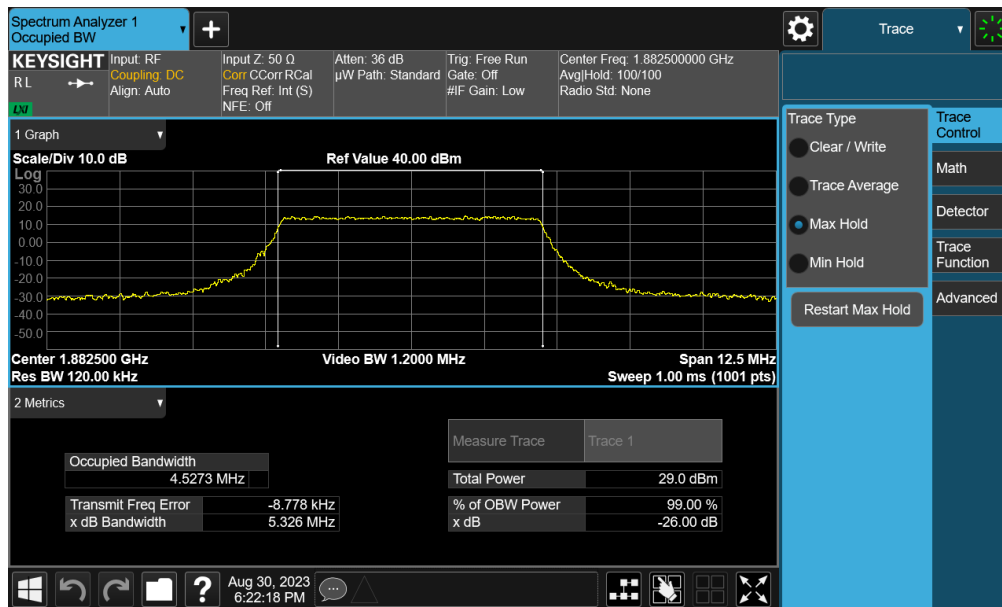
Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from Element. If you have any questions about this or have an inquiry about obtaining additional rights to this report or assembly of contents thereof, please contact ct.info@element.com.



FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 27 of 117



Plot 7-23. Occupied Bandwidth Plot (NR Band n25/2 - 5.0MHz CP-OFDM QPSK - Full RB - ANT 0)



Plot 7-24. Occupied Bandwidth Plot (NR Band n25/2 - 5.0MHz CP-OFDM 16QAM - Full RB - ANT 0)

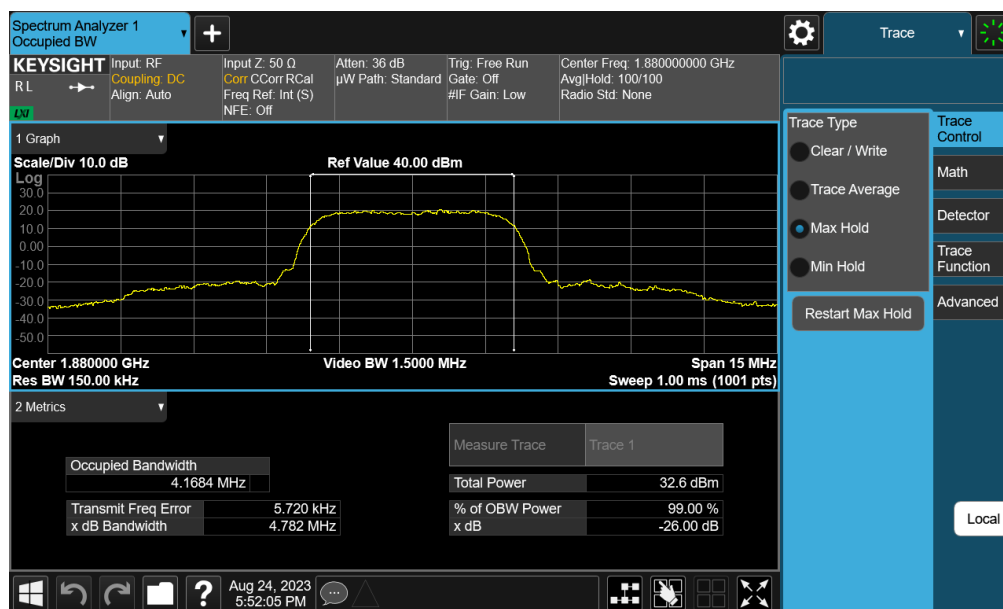
FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 28 of 117

GSM/EDGE PCS – Ant 0



FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 29 of 117

WCDMA PCS – Ant 0



Plot 7-27. Occupied Bandwidth Plot (WCDMA, Ch. 9400 - Ant 0)

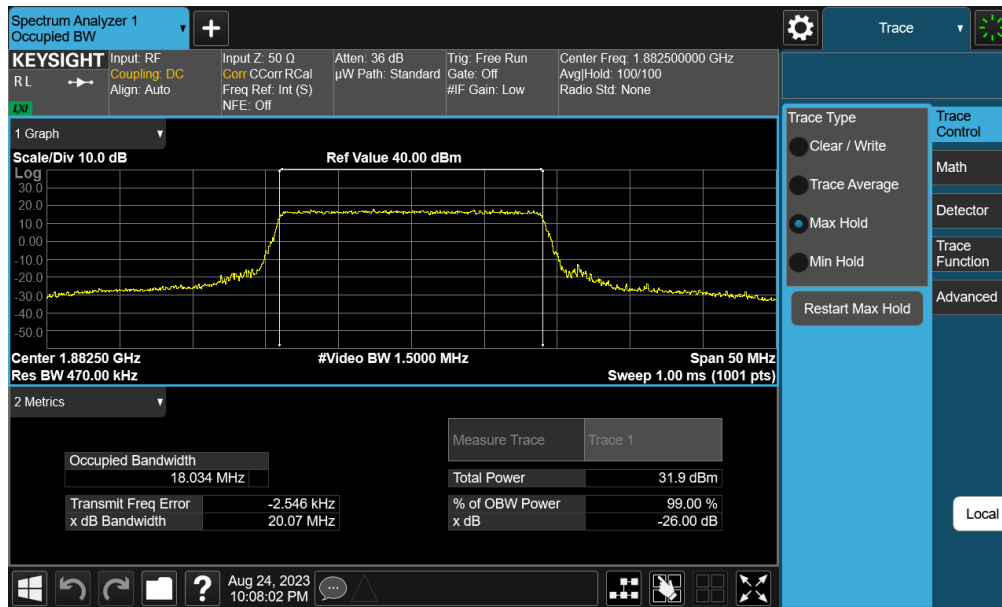
FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 30 of 117

Mode	Bandwidth	Modulation	OBW [MHz]
LTE-B25-2	20 MHz	QPSK	18.03
		16QAM	18.01
	15 MHz	QPSK	13.54
		16QAM	13.53
	10 MHz	QPSK	9.03
		16QAM	9.03
	5 MHz	QPSK	4.54
		16QAM	4.54
	3 MHz	QPSK	2.73
		16QAM	2.74
	1.4 MHz	QPSK	1.11
		16QAM	1.11
NR-n25/2	20 MHz	$\pi/2$ BPSK	18.00
		QPSK	19.00
		16QAM	19.00
	15 MHz	$\pi/2$ BPSK	13.47
		QPSK	14.18
		16QAM	14.18
	10 MHz	$\pi/2$ BPSK	8.98
		QPSK	9.33
		16QAM	9.32
	5 MHz	$\pi/2$ BPSK	4.54
		QPSK	4.53
		16QAM	4.53

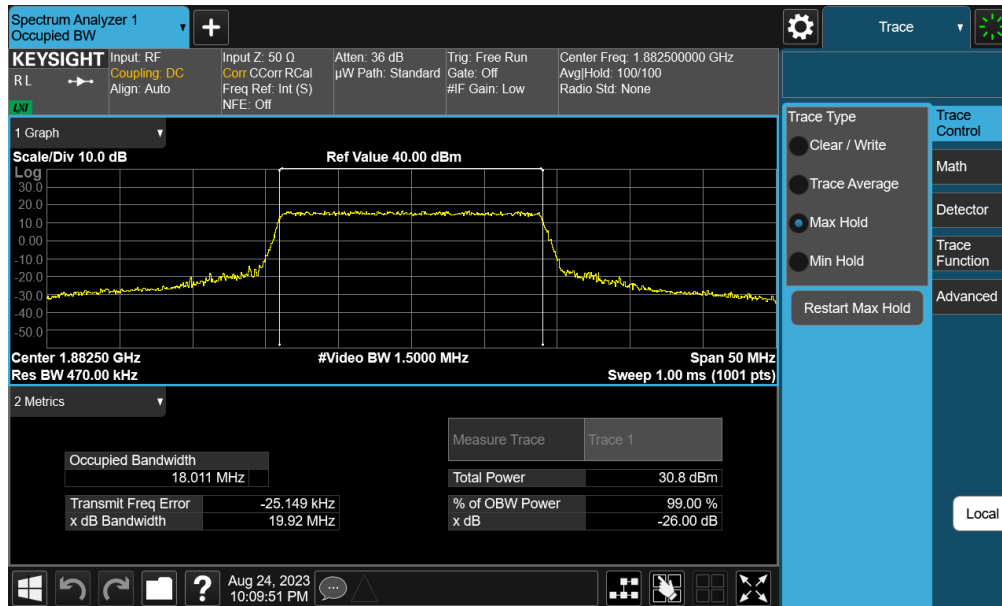
Table 7-5. Occupied Bandwidth Test Results – Ant 7

FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 31 of 117

LTE Band 25/2 – Ant 7

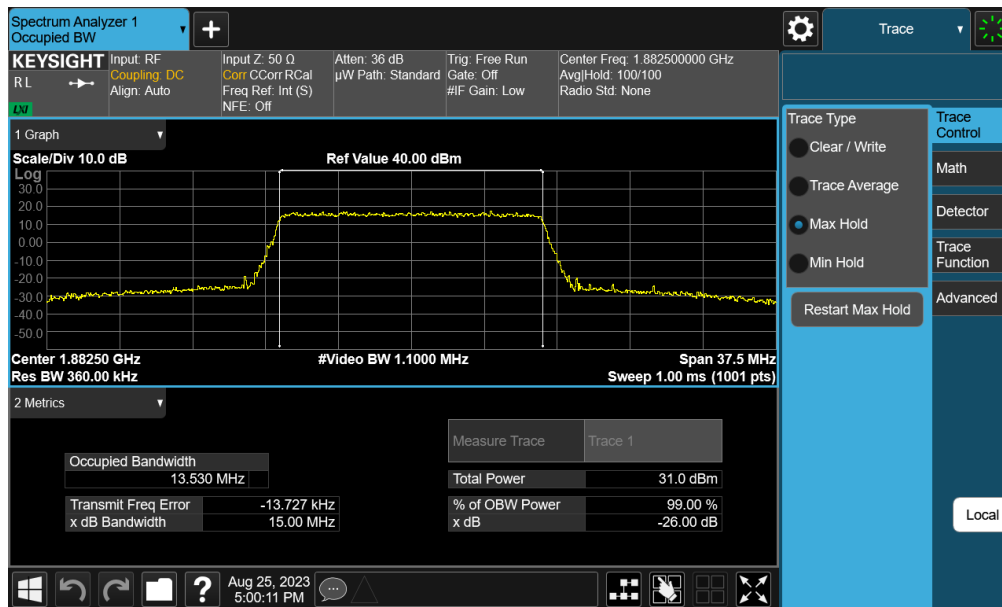
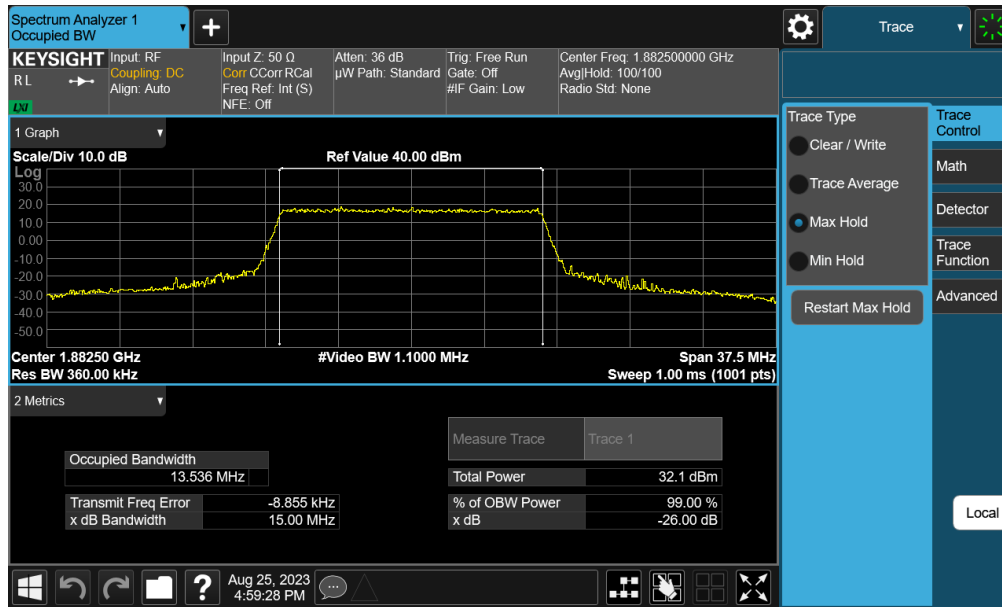


Plot 7-28. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz QPSK - Full RB - Ant 7)

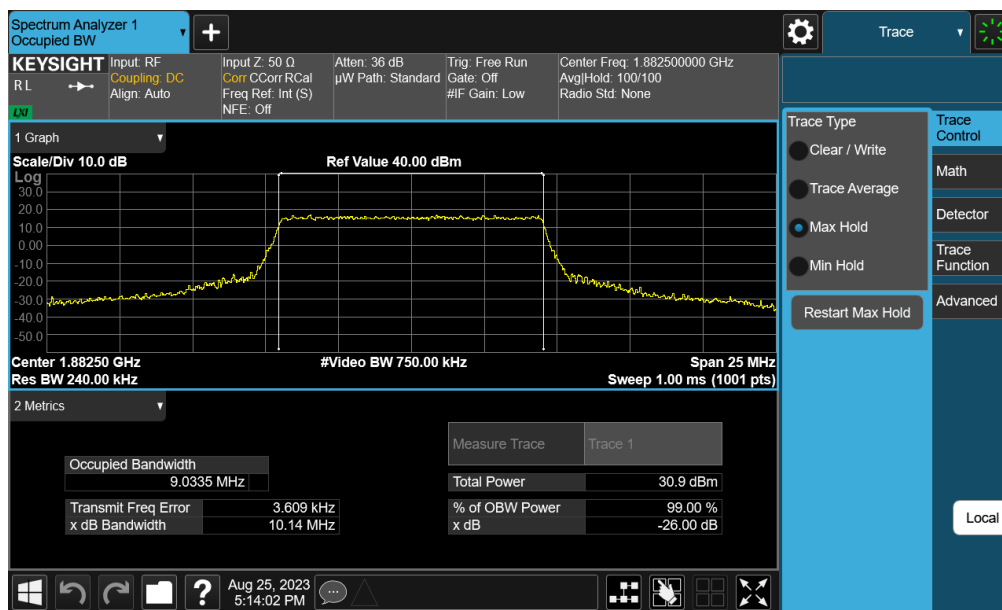
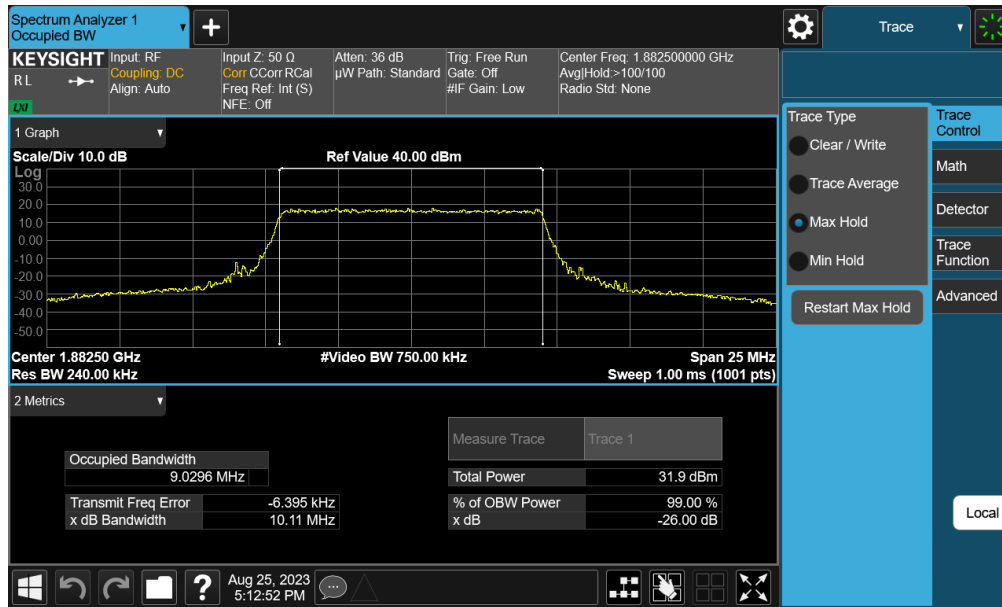


Plot 7-29. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz 16-QAM - Full RB - Ant 7)

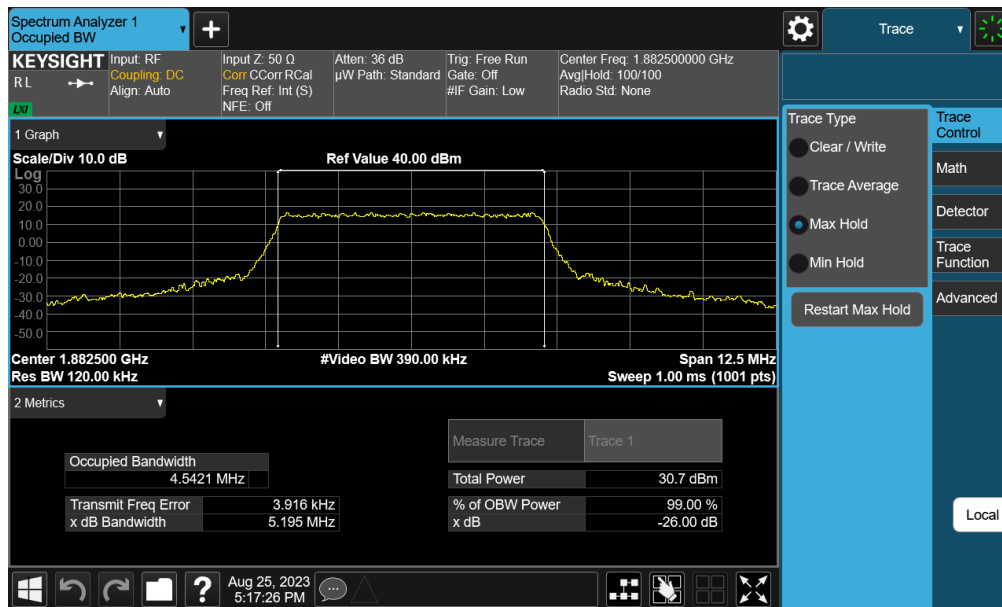
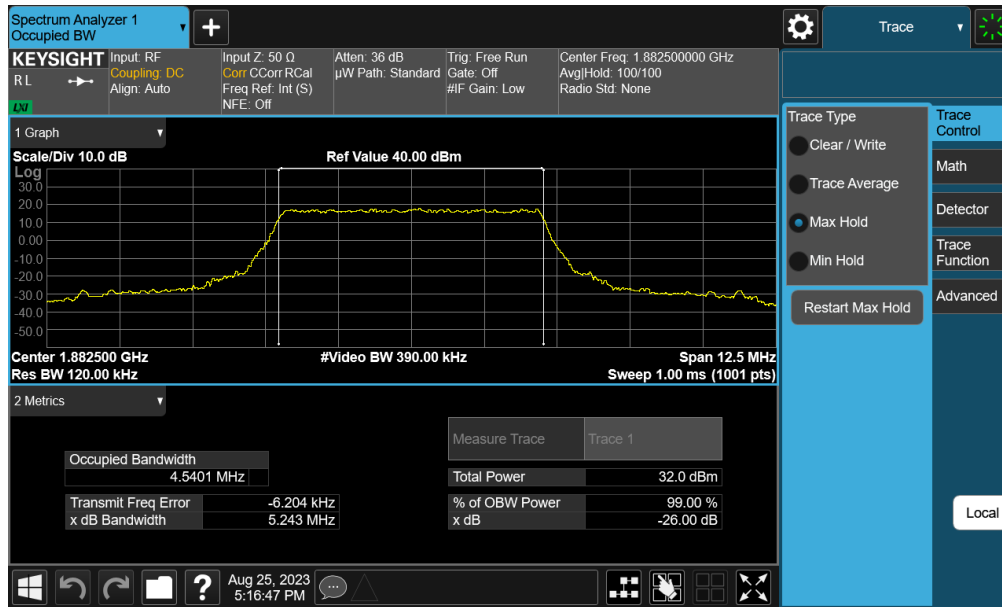
FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 32 of 117



FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 33 of 117



FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 34 of 117



FCC ID: A3LSMS928B	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-02.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 35 of 117



© 2023 ELEMENT V11.0 7/6/2023

Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from Element. If you have any questions about this or have an inquiry about obtaining additional rights to this report or assembly of contents thereof, please contact ct.info@element.com.