

PART 22 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:

11/14/2023

Test Site/Location:

Element lab., Gyeonggi-do, South Korea

Test Report Serial No.:

1M2308210093-01-R1.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:

22

Test Procedure(s):

ANSI C63.26-2015, KDB 648474 D03 v01r04

Note: This revised Test Report (S/N: 1M2308210093-01-R1.A3L) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

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-0								
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	ERP		EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	Max. Power [W]	Max. Power [dBm]	
GSM/GPRS	N/A	GMSK	824.2 - 848.8	0.426	26.29	0.698	28.44	243KGXW
EDGE	N/A	8-PSK	824.2 - 848.8	0.086	19.32	0.140	21.47	242KG7W
WCDMA	N/A	Spread Spectrum	826.4 - 846.6	0.075	18.74	0.123	20.89	4M16F9W
LTE Band 26/5	15MHz (Band 26 only)	QPSK	831.5 - 841.5	0.081	19.07	0.132	21.22	13M6G7D
		16QAM	831.5 - 841.5	0.067	18.24	0.109	20.39	13M6W7D
	10 MHz	QPSK	829.0 - 844.0	0.091	19.58	0.149	21.73	9M04G7D
		16QAM	829.0 - 844.0	0.078	18.94	0.128	21.09	9M02W7D
	5 MHz	QPSK	826.5 - 846.5	0.096	19.83	0.158	21.98	4M55G7D
		16QAM	826.5 - 846.5	0.079	18.97	0.130	21.12	4M53W7D
	3 MHz	QPSK	825.5 - 847.5	0.090	19.52	0.147	21.67	2M72G7D
		16QAM	825.5 - 847.5	0.076	18.80	0.125	20.95	2M72W7D
	1.4 MHz	QPSK	824.7 - 848.3	0.089	19.51	0.146	21.66	1M11G7D
		16QAM	824.7 - 848.3	0.078	18.90	0.127	21.05	1M11W7D
	20 MHz	TT/2 BPSK	834.0 - 839.0	0.085	19.27	0.139	21.42	18M0G7D
		QPSK	834.0 - 839.0	0.086	19.35	0.141	21.50	19M0G7D
NR Band n5	20 MHz	16QAM	834.0 - 839.0	0.067	18.29	0.111	20.44	19M0W7D
		QPSK	834.0 - 839.0	0.086	19.35	0.141	21.50	19M0G7D
	15 MHz	TT/2 BPSK	831.5 - 841.5	0.083	19.19	0.136	21.34	13M5G7D
		QPSK	831.5 - 841.5	0.087	19.40	0.143	21.55	14M2G7D
	15 MHz	16QAM	831.5 - 841.5	0.069	18.42	0.114	20.57	14M2W7D
		TT/2 BPSK	829.0 - 844.0	0.082	19.15	0.135	21.30	8M99G7D
	10 MHz	QPSK	829.0 - 844.0	0.085	19.31	0.140	21.46	9M36G7D
		16QAM	829.0 - 844.0	0.065	18.15	0.107	20.30	9M35W7D
	5 MHz	TT/2 BPSK	826.5 - 846.5	0.081	19.11	0.134	21.26	4M54G7D
		QPSK	826.5 - 846.5	0.084	19.22	0.137	21.37	4M56G7D
		16QAM	826.5 - 846.5	0.071	18.53	0.117	20.68	4M53W7D

Antenna-6								
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	ERP		EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	Max. Power [W]	Max. Power [dBm]	
GSM/GPRS	N/A	GMSK	824.2 - 848.8	1.762	32.46	2.890	34.61	246KGXW
EDGE	N/A	8-PSK	824.2 - 848.8	0.303	24.82	0.498	26.97	247KG7W
WCDMA	N/A	Spread Spectrum	826.4 - 846.6	0.330	25.18	0.541	27.33	4M17F9W
LTE Band 26/5	15MHz (Band 26 only)	QPSK	831.5 - 841.5	0.288	24.59	0.472	26.74	13M5G7D
		16QAM	831.5 - 841.5	0.230	23.62	0.378	25.77	13M5W7D
	10 MHz	QPSK	829.0 - 844.0	0.306	24.86	0.503	27.01	9M02G7D
		16QAM	829.0 - 844.0	0.240	23.81	0.394	25.96	9M02W7D
	5 MHz	QPSK	826.5 - 846.5	0.298	24.75	0.489	26.90	4M54G7D
		16QAM	826.5 - 846.5	0.230	23.61	0.377	25.76	4M52W7D
	3 MHz	QPSK	825.5 - 847.5	0.290	24.62	0.475	26.77	2M71G7D
		16QAM	825.5 - 847.5	0.223	23.48	0.366	25.63	2M71W7D
	1.4 MHz	QPSK	824.7 - 848.3	0.280	24.48	0.460	26.63	1M11G7D
		16QAM	824.7 - 848.3	0.229	23.59	0.375	25.74	1M11W7D
	20 MHz	TT/2 BPSK	834.0 - 839.0	0.282	24.51	0.463	26.66	17M9G7D
		QPSK	834.0 - 839.0	0.273	24.36	0.447	26.51	19M0G7D
NR Band n5	20 MHz	16QAM	834.0 - 839.0	0.206	23.15	0.339	25.30	19M0W7D
		QPSK	834.0 - 839.0	0.273	24.36	0.447	26.51	19M0G7D
	15 MHz	TT/2 BPSK	831.5 - 841.5	0.278	24.44	0.456	26.59	13M5G7D
		QPSK	831.5 - 841.5	0.274	24.38	0.450	26.53	14M2G7D
	15 MHz	16QAM	831.5 - 841.5	0.226	23.55	0.371	25.70	14M2W7D
		TT/2 BPSK	829.0 - 844.0	0.278	24.44	0.456	26.59	9M00G7D
	10 MHz	QPSK	829.0 - 844.0	0.273	24.37	0.449	26.52	9M33G7D
		16QAM	829.0 - 844.0	0.233	23.68	0.383	25.83	9M37W7D
	5 MHz	TT/2 BPSK	826.5 - 846.5	0.284	24.53	0.466	26.68	4M50G7D
		QPSK	826.5 - 846.5	0.264	24.22	0.433	26.37	4M52G7D
		16QAM	826.5 - 846.5	0.214	23.31	0.351	25.46	4M52W7D

EUT Overview

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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 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

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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 22.

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.

Mode	Ant0	Ant6
GSM/GPRS/EDGE Cell	AntA	N/A
WCDMA B5	AntA	N/A
LTE B26/5	AntA	AntE
NR n5	AntA	AntE

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.

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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:

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

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:

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

And

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

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.

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

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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
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.

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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.

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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	See RF Exposure Report
	Occupied Bandwidth	2.1049(h)	N/A	PASS	Section 7.2
	Conducted Band Edge / Spurious Emissions	2.1051, 22.917(a)	$\geq 43 + 10 \log (P[\text{Watts}])$ dB of attenuation below transmitter power	PASS	Sections 7.3, 7.4
	Frequency Stability	2.1055, 22.355	The carrier frequency of the transmitter must be maintained within the 2.5ppm	PASS	Section 7.7
RADIATED	Effective Radiated Power / Equivalent Isotropic Radiated Power	22.913(a)(5)	< 7 Watts max. ERP	PASS	Section 7.5
	Radiated Spurious Emissions	2.1053, 22.917(a)	$> 43 + 10 \log_{10} (P[\text{Watts}])$ for all out-of-band emissions	PASS	Section 7.6

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.

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7.2 Occupied Bandwidth

Test Overview

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

Test Procedure Used

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.

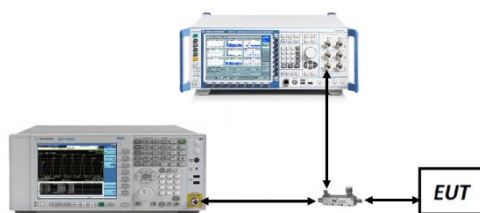


Figure 7-1. Test Instrument & Measurement Setup

Test Notes

None.

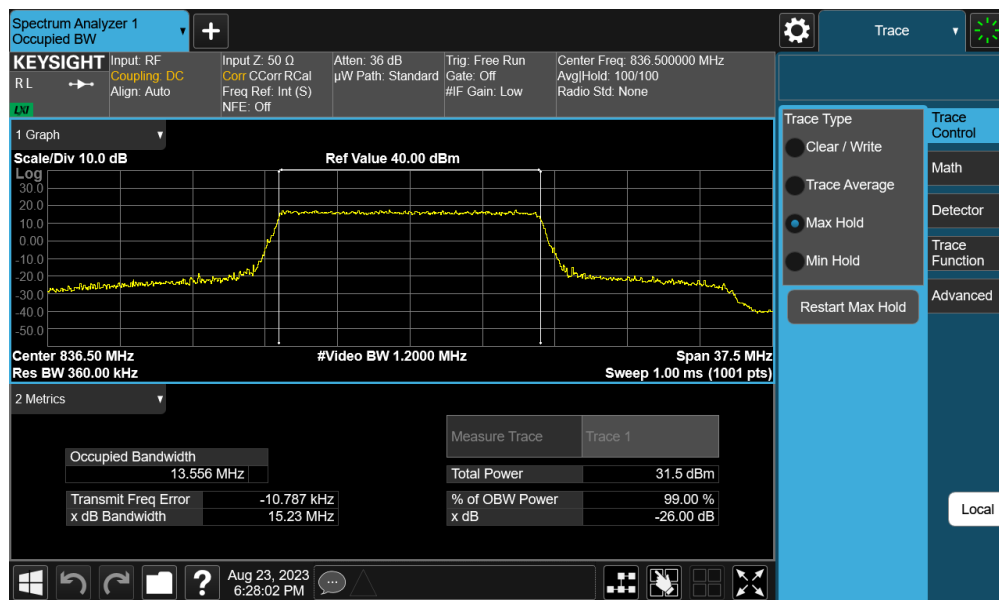
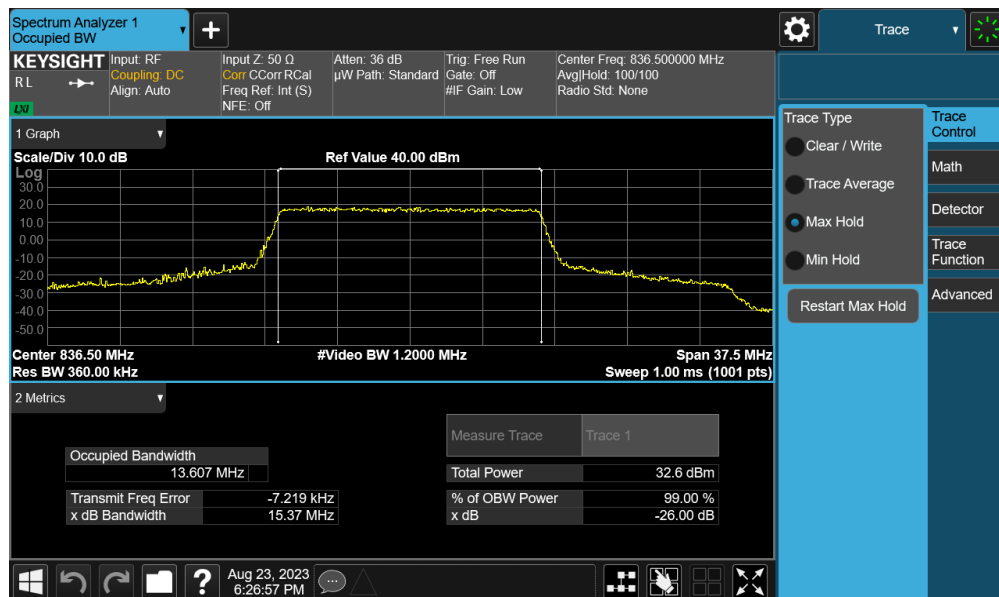
FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 11 of 101

Mode	Bandwidth	Modulation	OBW [MHz]
GSM-Cell	N/A	GMSK	0.243
GSM-Cell Edge		8-PSK	0.242
WCDMA-Cell		Spread Spectrum	4.16
LTE-B26-5	15MHz (B26 Only)	QPSK	13.61
		16QAM	13.56
	10MHz	QPSK	9.04
		16QAM	9.02
	5 MHz	QPSK	4.55
		16QAM	4.53
	3 MHz	QPSK	2.72
		16QAM	2.72
	1.4 MHz	QPSK	1.11
		16QAM	1.11
NR-n5	20 MHz	$\pi/2$ BPSK	17.99
		QPSK	19.01
		16QAM	19.04
	15 MHz	$\pi/2$ BPSK	13.54
		QPSK	14.23
		16QAM	14.18
	10 MHz	$\pi/2$ BPSK	8.99
		QPSK	9.36
		16QAM	9.35
	5 MHz	$\pi/2$ BPSK	4.54
		QPSK	4.56
		16QAM	4.53

Table 7-2. Occupied Bandwidth Test Results – Ant 0

FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 12 of 101

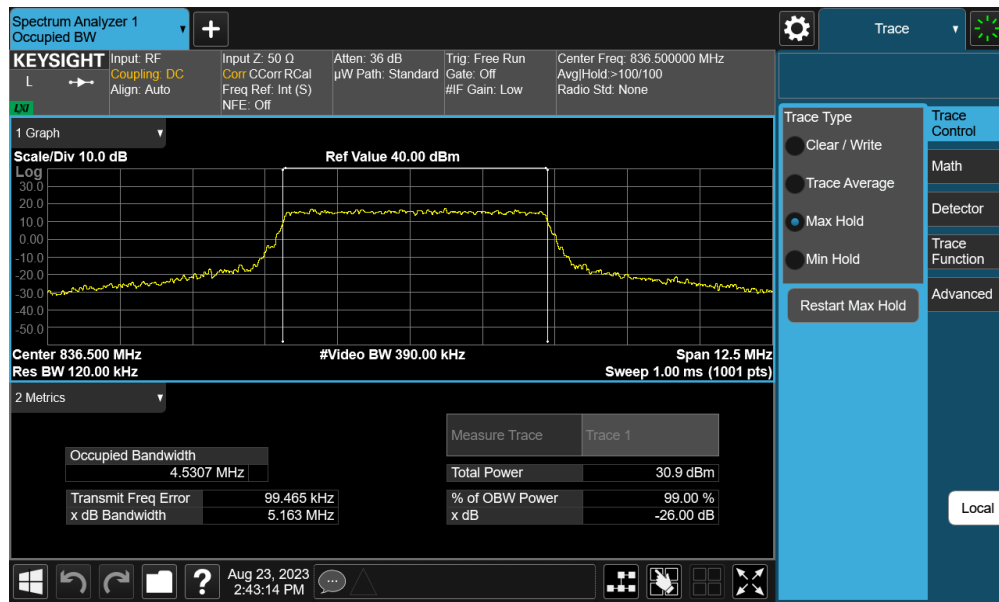
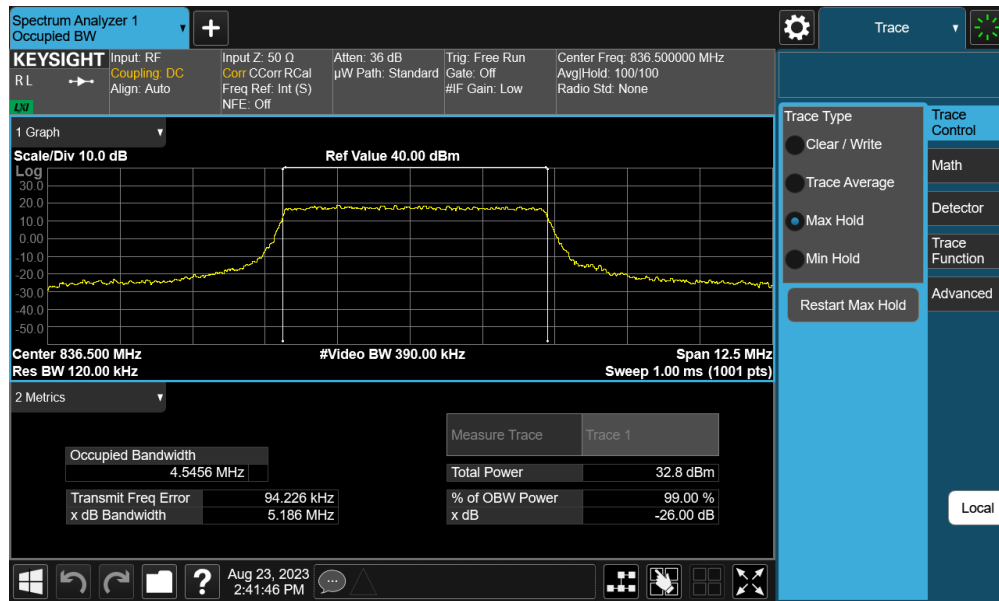
LTE Band 26/5 – Ant 0



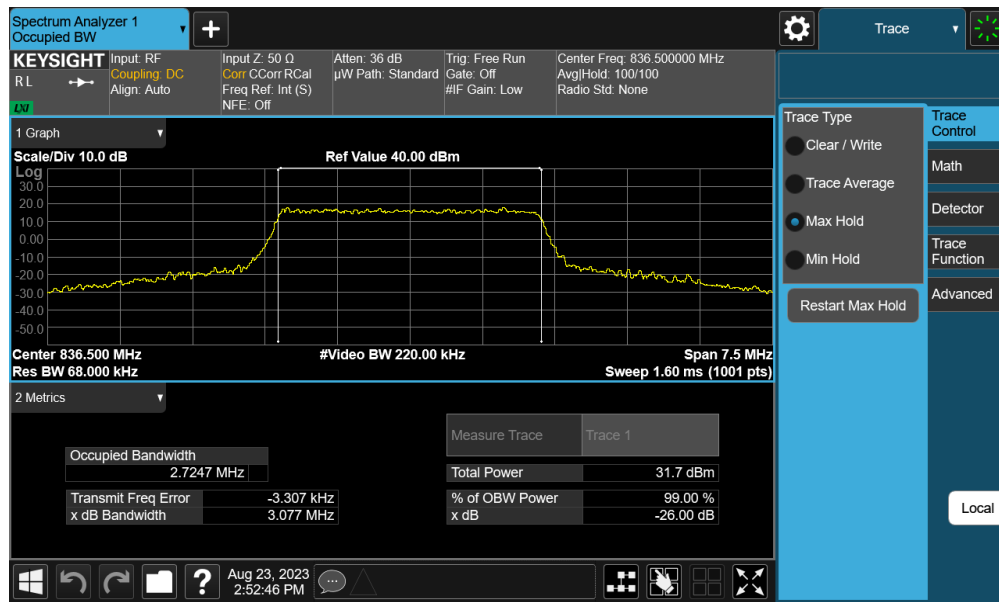
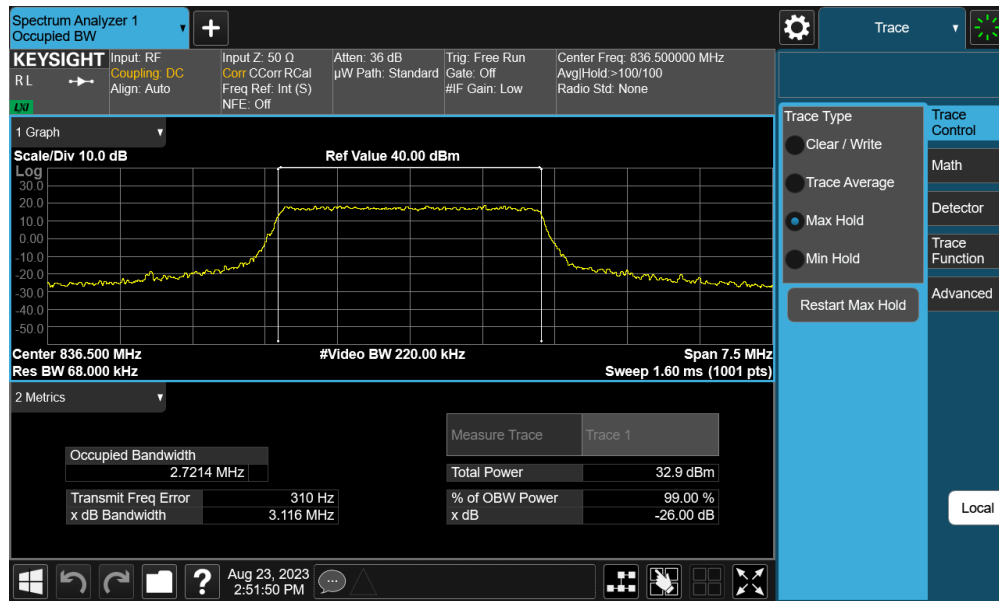
FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 13 of 101



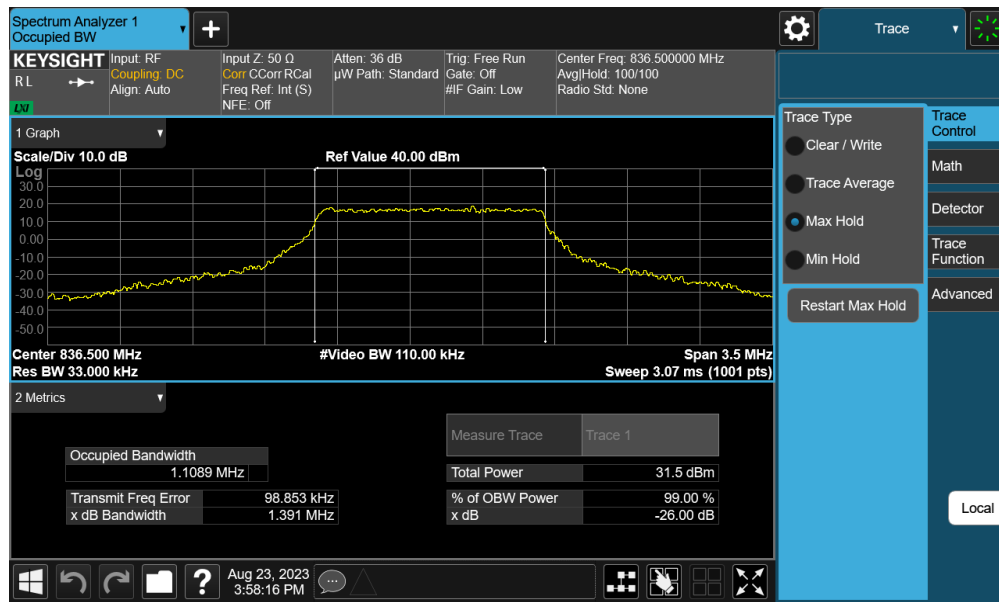
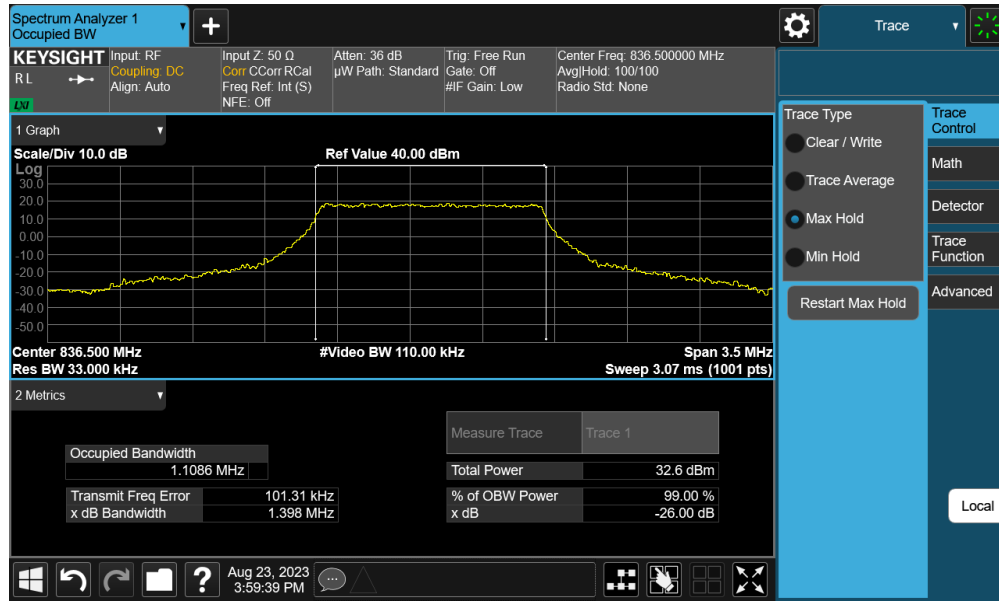
FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 14 of 101



FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 15 of 101

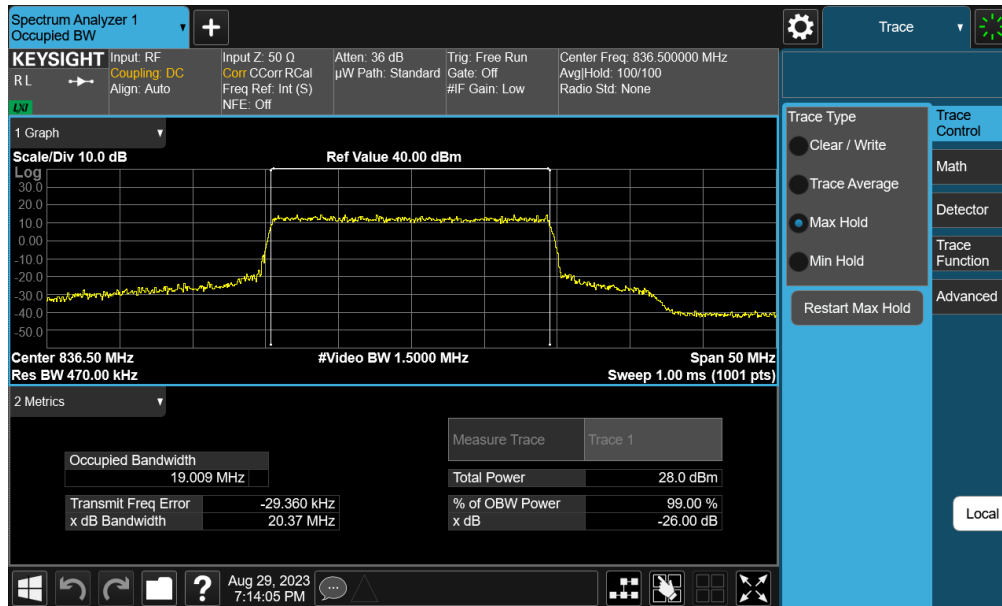
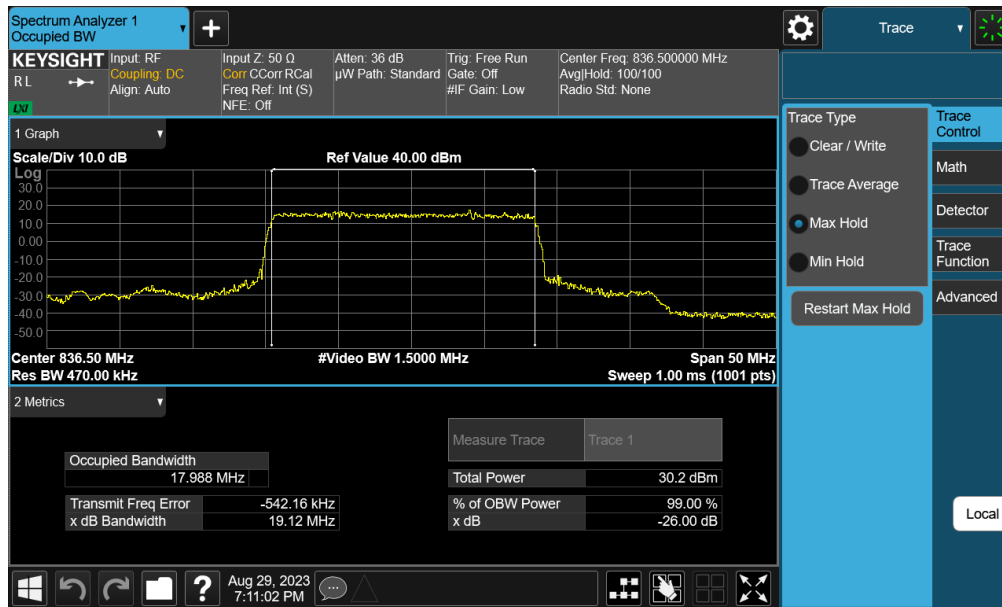


FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 16 of 101

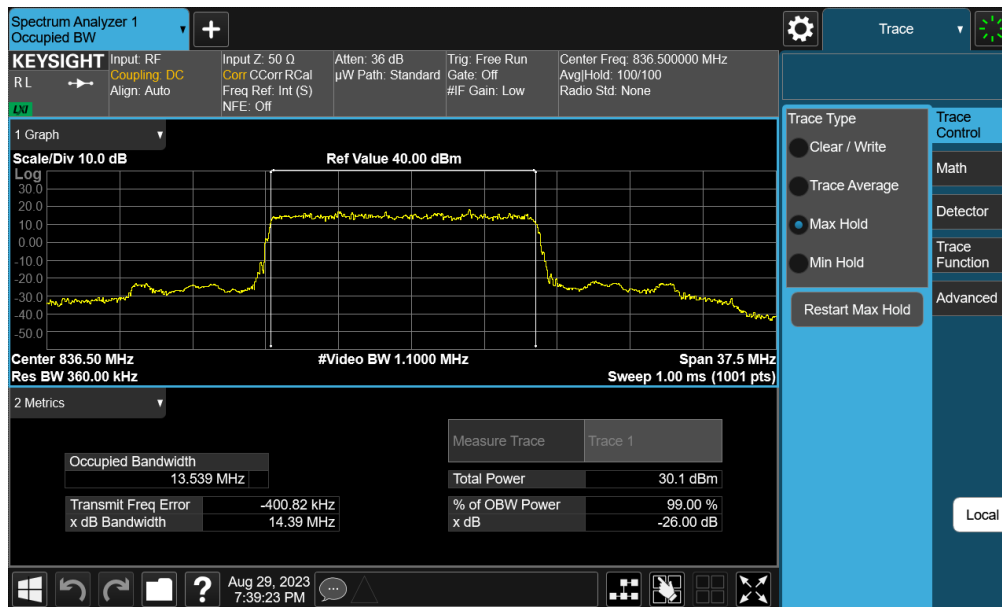
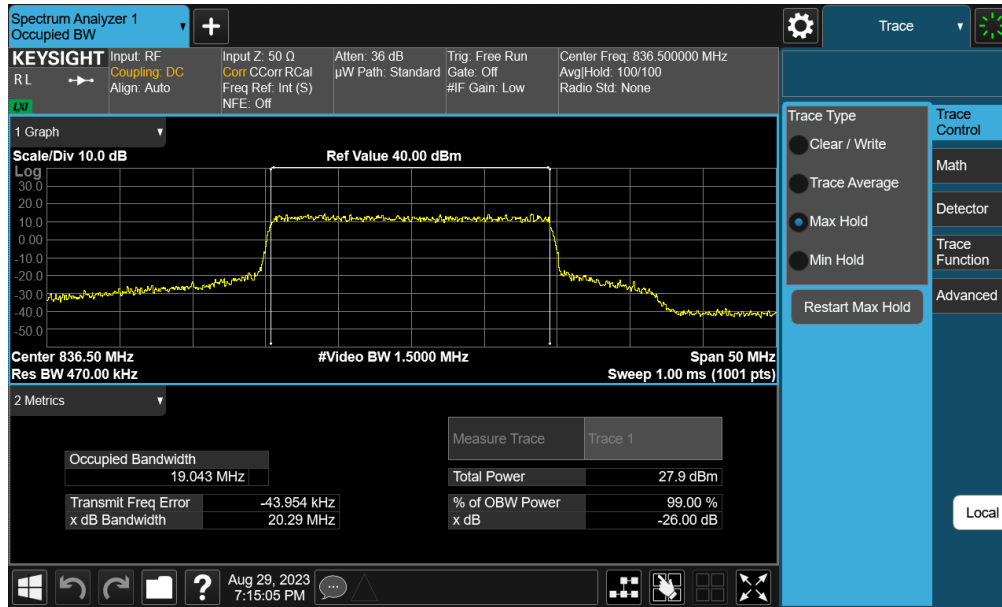


FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 17 of 101

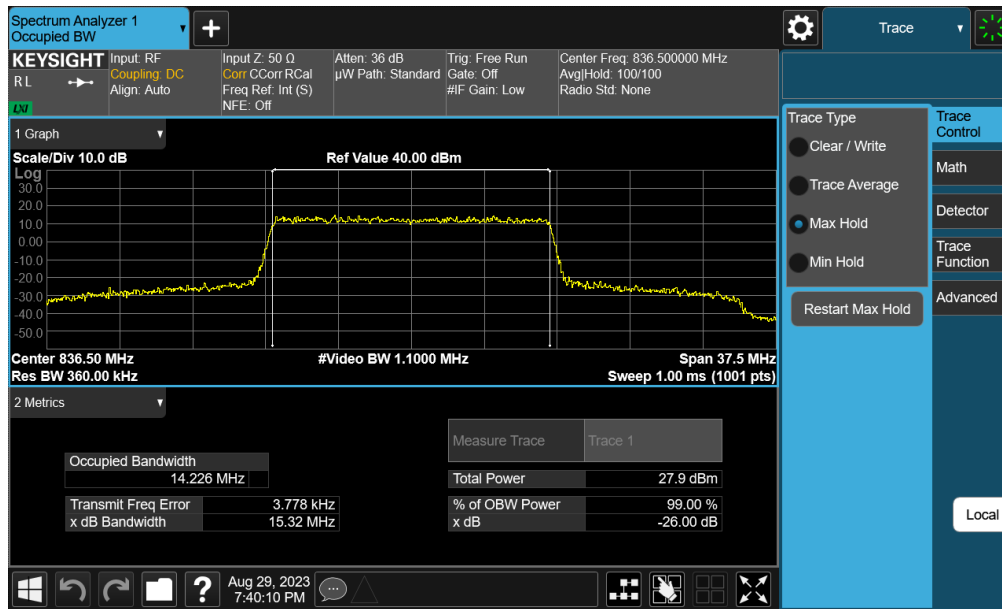
NR Band n5 – Ant 0



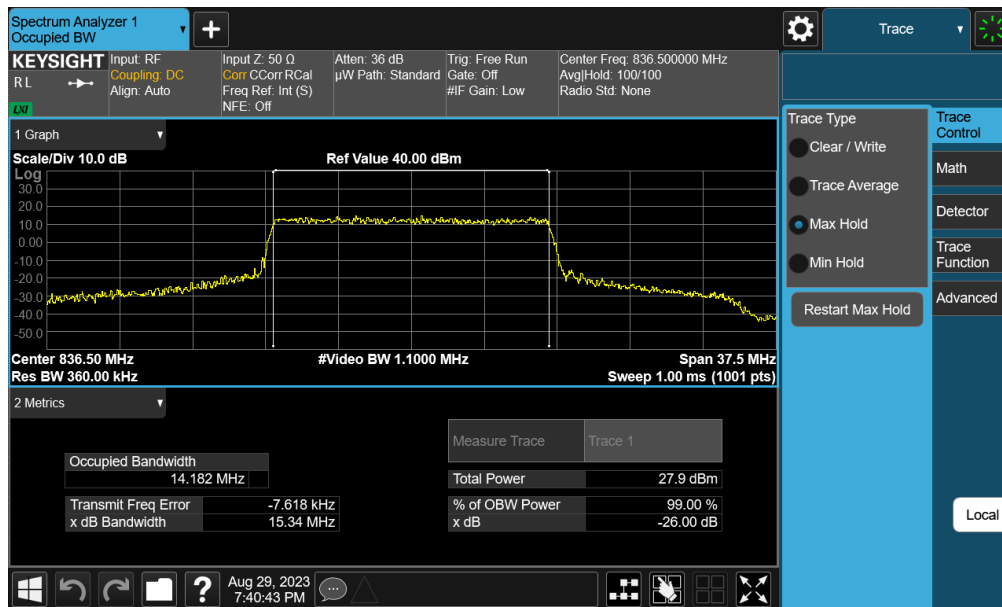
FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 18 of 101



FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 19 of 101

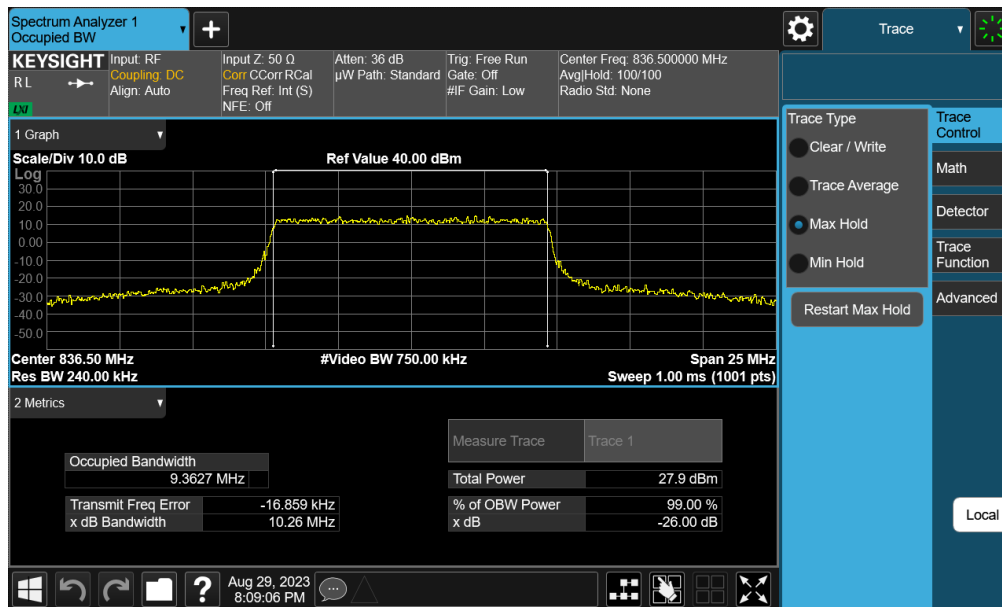
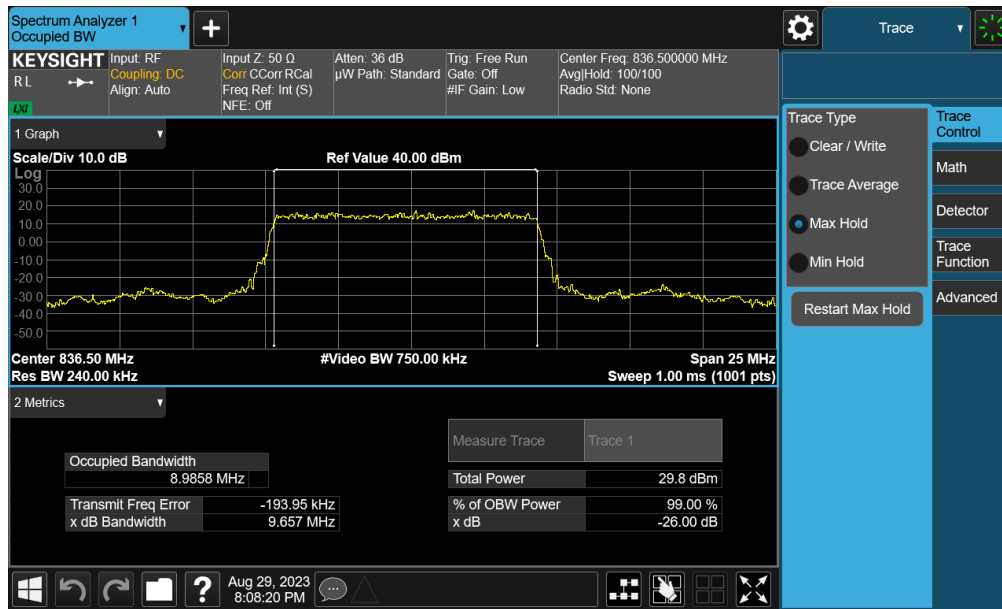


Plot 7-15. Occupied Bandwidth Plot (NR Band n5 - 15MHz QPSK - Full RB - Ant 0)

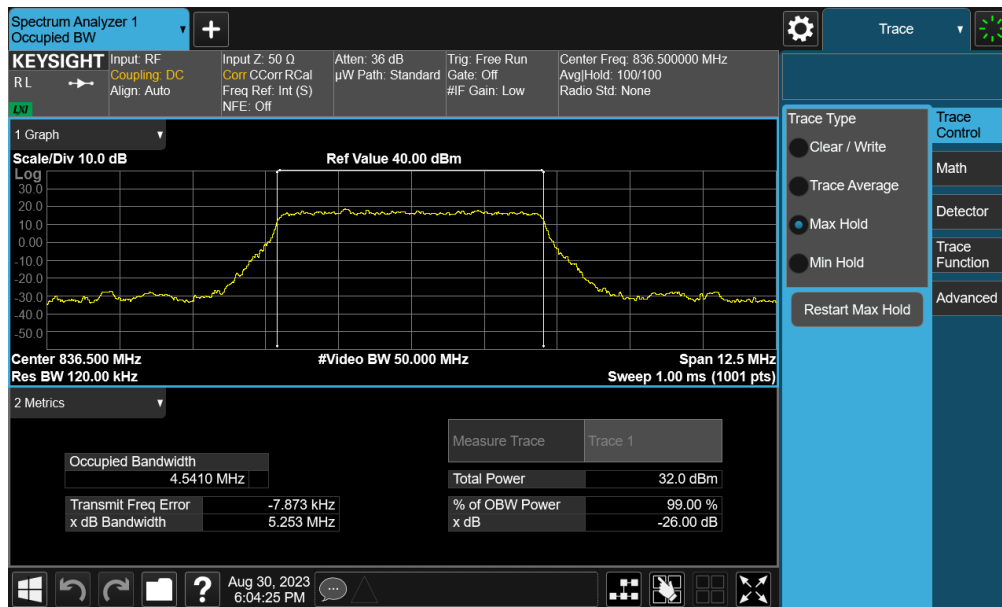
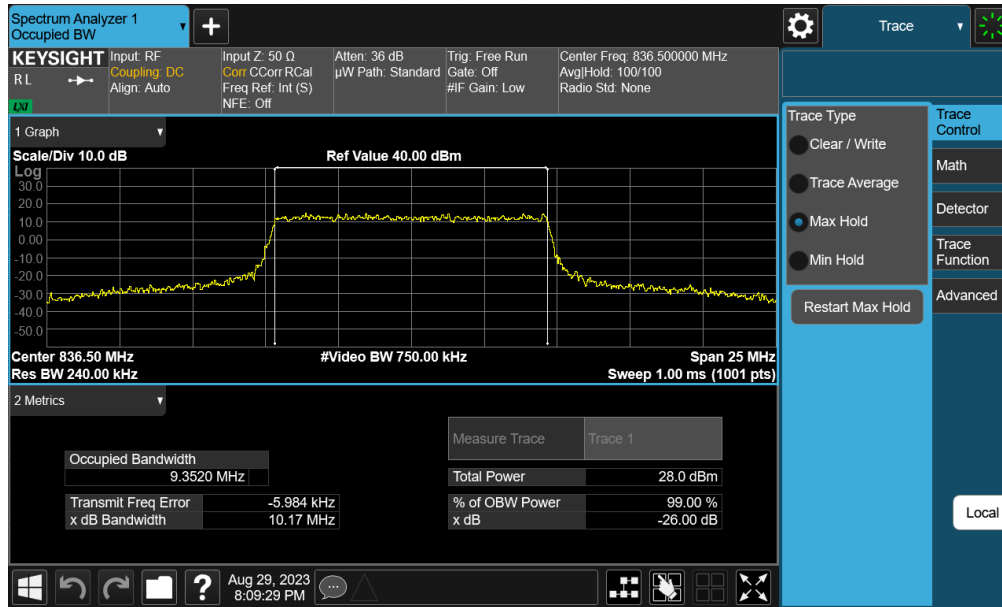


Plot 7-16. Occupied Bandwidth Plot (NR Band n5 - 15MHz 16-QAM - Full RB - Ant 0)

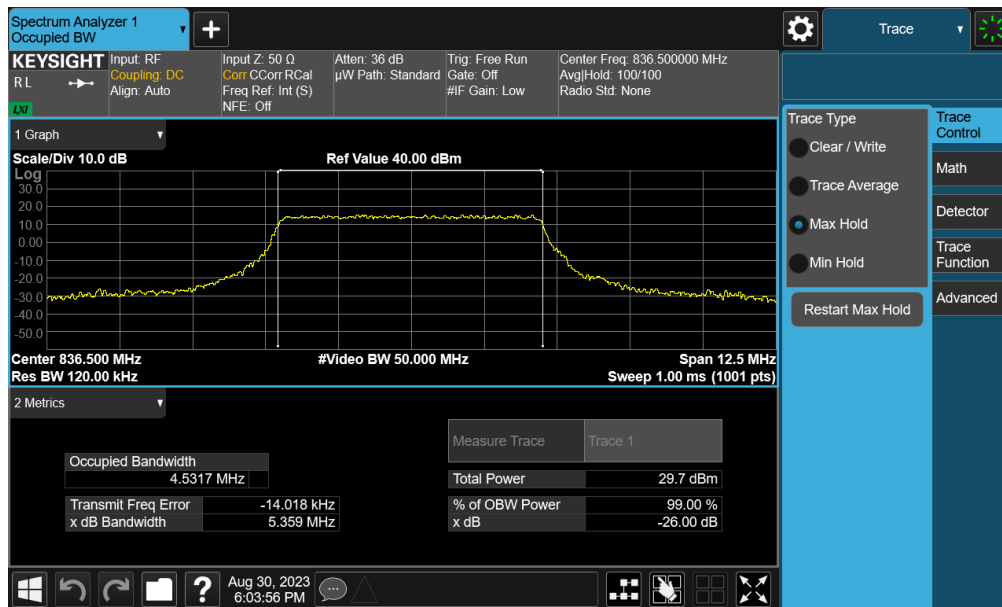
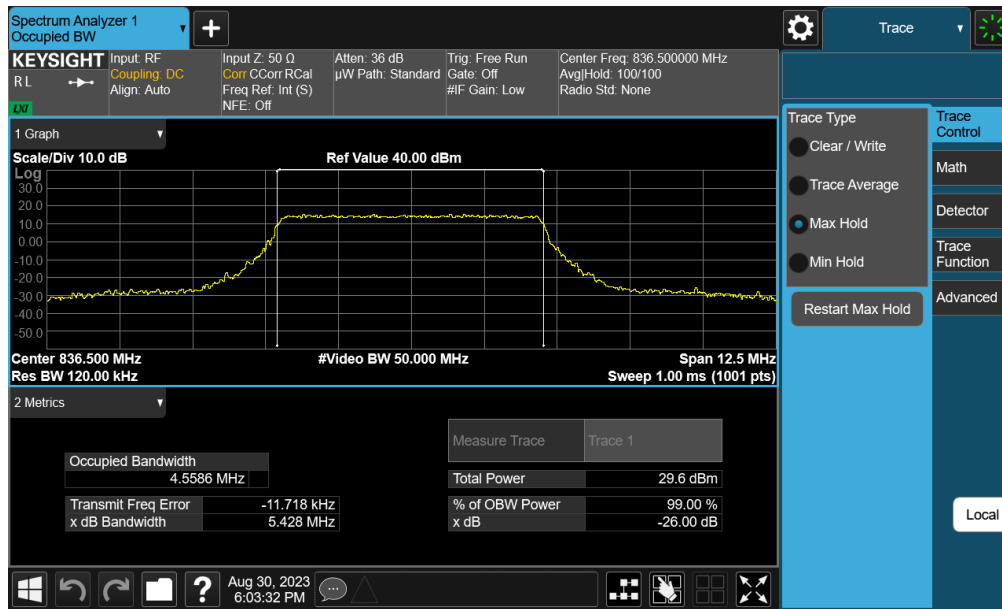
FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 20 of 101



FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 21 of 101



FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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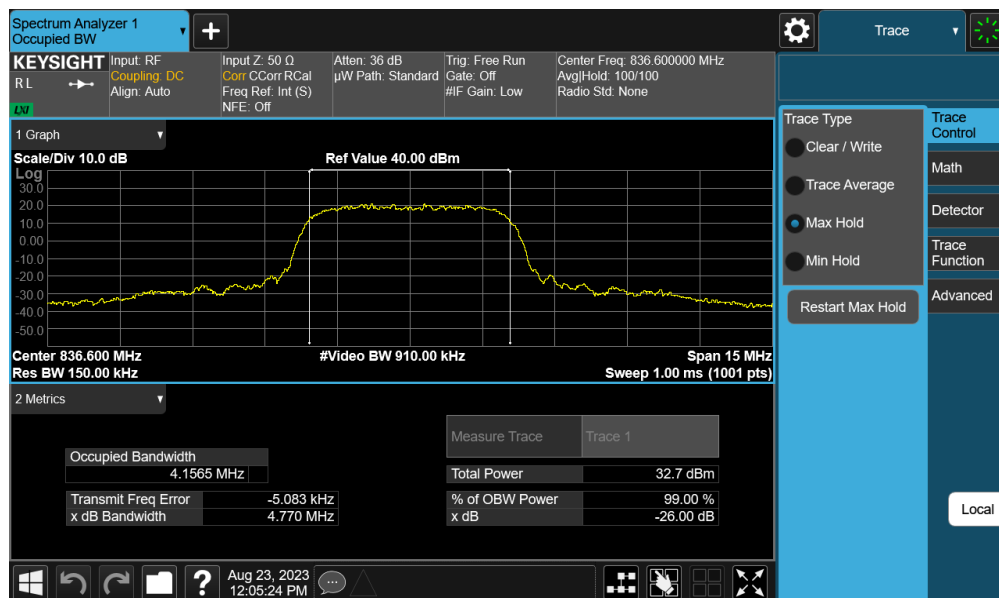
FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 23 of 101

GP RS Cell – Ant 0



FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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WCDMA Cell – Ant 0



Plot 7-25. Occupied Bandwidth Plot (WCDMA, Ch. 4183 – Ant 0)

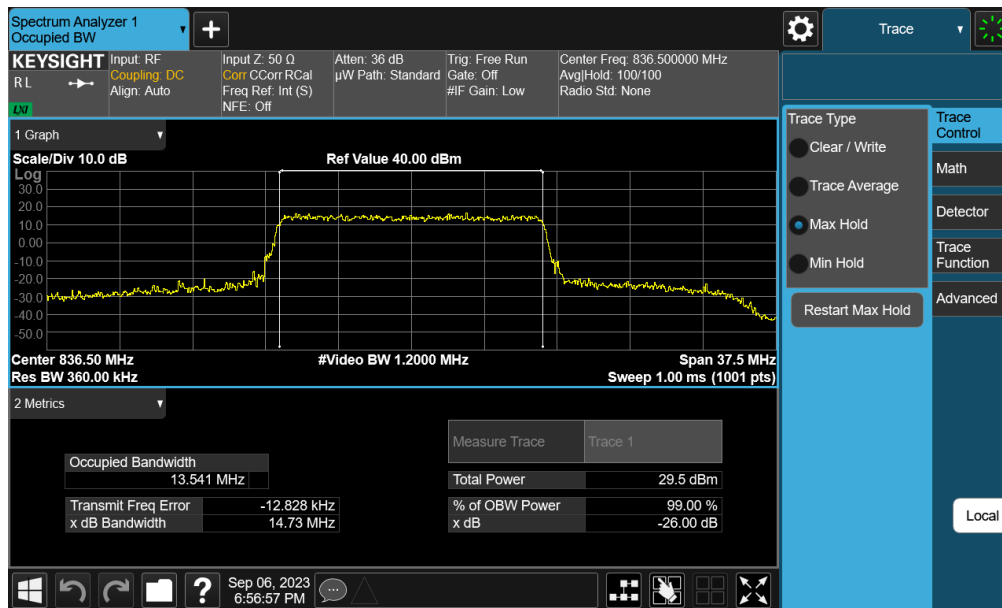
FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 25 of 101

Mode	Bandwidth	Modulation	OBW [MHz]
GSM-Cell	N/A	GMSK	0.246
GSM-Cell Edge		8-PSK	0.247
WCDMA-Cell		Spread Spectrum	4.17
LTE-B26-5	15MHz (B26 Only)	QPSK	13.51
		16QAM	13.54
	10MHz	QPSK	9.02
		16QAM	9.02
	5 MHz	QPSK	4.54
		16QAM	4.52
	3 MHz	QPSK	2.71
		16QAM	2.71
	1.4 MHz	QPSK	1.11
		16QAM	1.11
NR-n5	20 MHz	$\pi/2$ BPSK	17.95
		QPSK	19.04
		16QAM	19.00
	15 MHz	$\pi/2$ BPSK	13.45
		QPSK	14.19
		16QAM	14.22
	10 MHz	$\pi/2$ BPSK	9.00
		QPSK	9.33
		16QAM	9.37
	5 MHz	$\pi/2$ BPSK	4.50
		QPSK	4.52
		16QAM	4.52

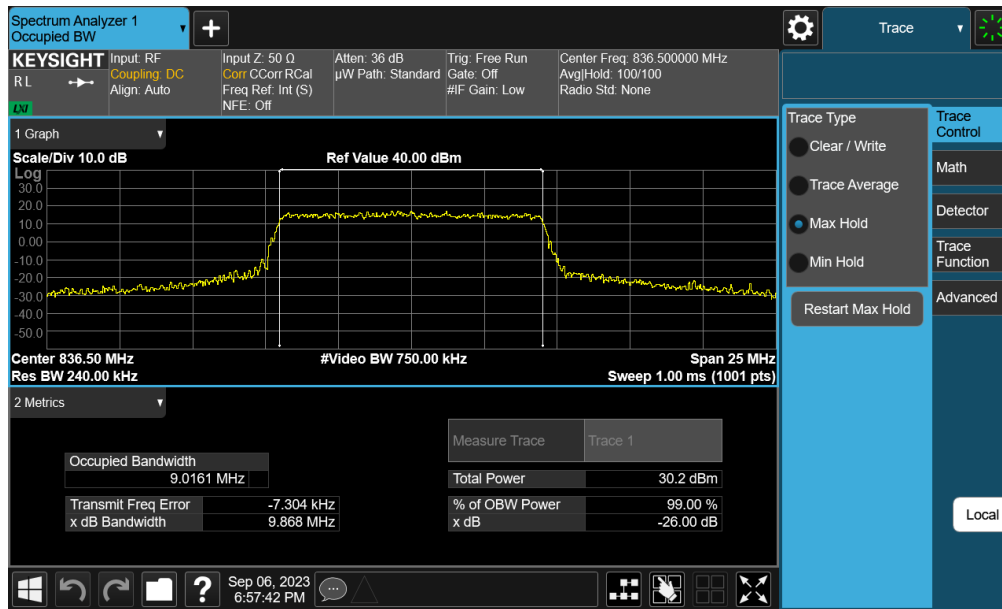
Table 7-3. Occupied Bandwidth Test Results – Ant 6

FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 26 of 101

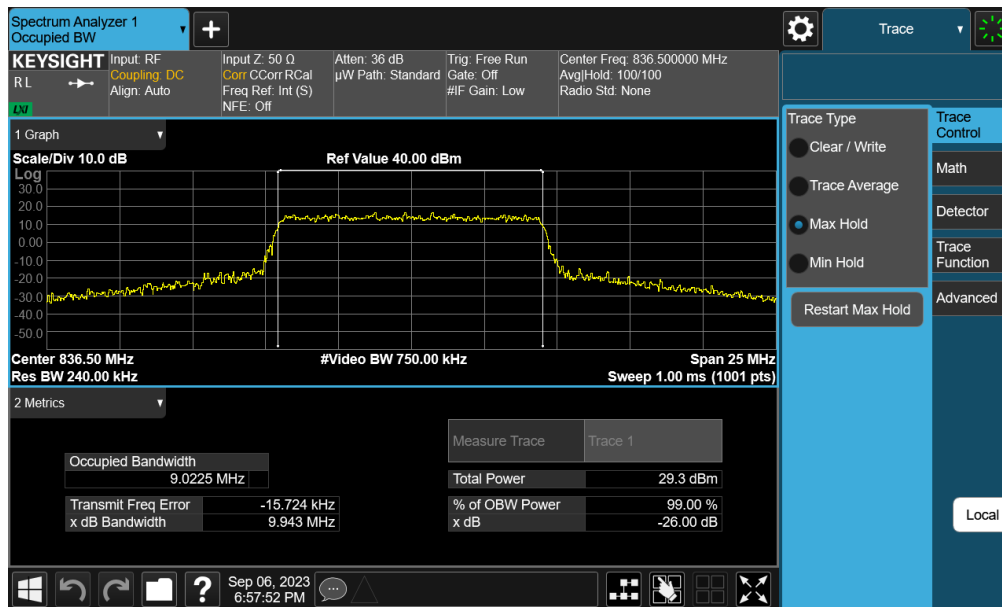
LTE Band 26/5 – Ant 6



FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 27 of 101

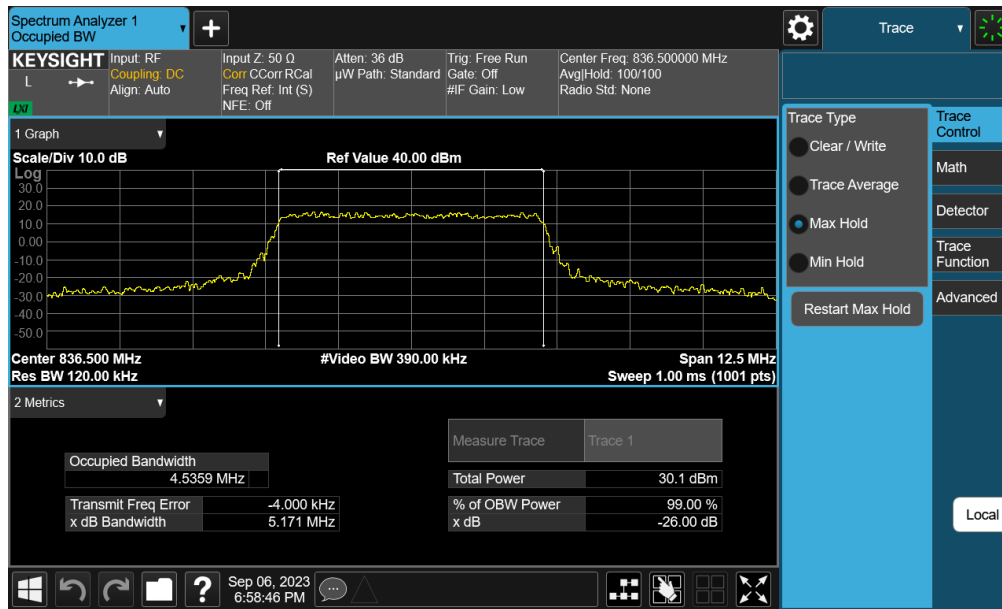


Plot 7-28. Occupied Bandwidth Plot (LTE Band 26/5 - 10MHz QPSK - Full RB - Ant 6)

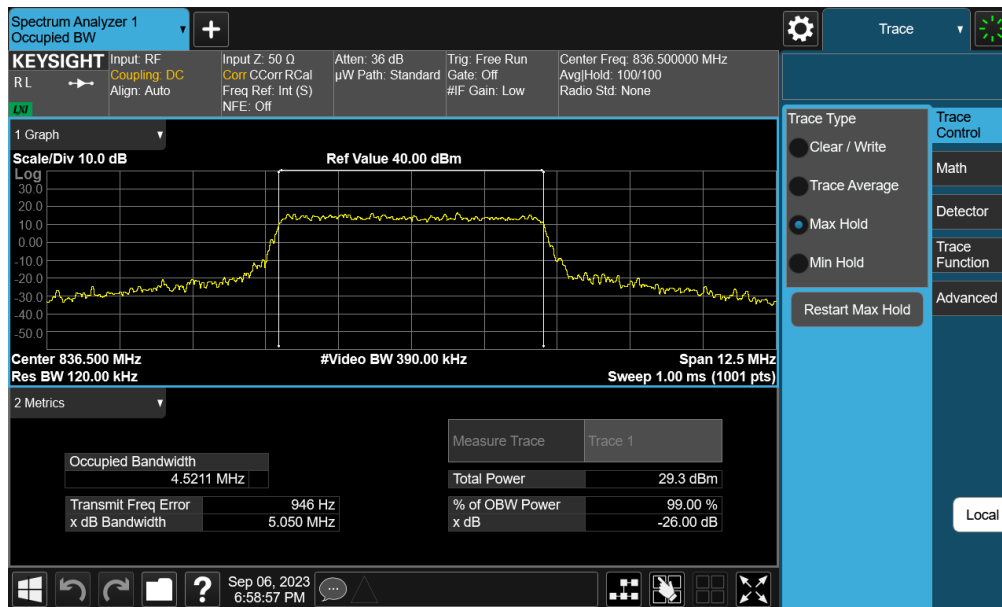


Plot 7-29. Occupied Bandwidth Plot (LTE Band 26/5 - 10MHz 16-QAM - Full RB - Ant 6)

FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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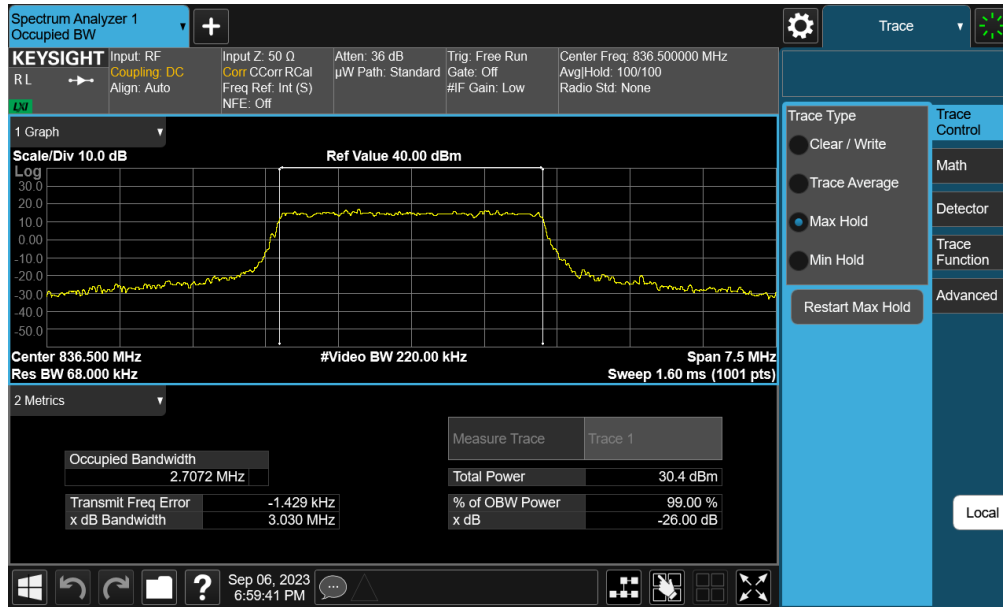


Plot 7-30. Occupied Bandwidth Plot (LTE Band 26/5 - 5MHz QPSK - Full RB - Ant 6)

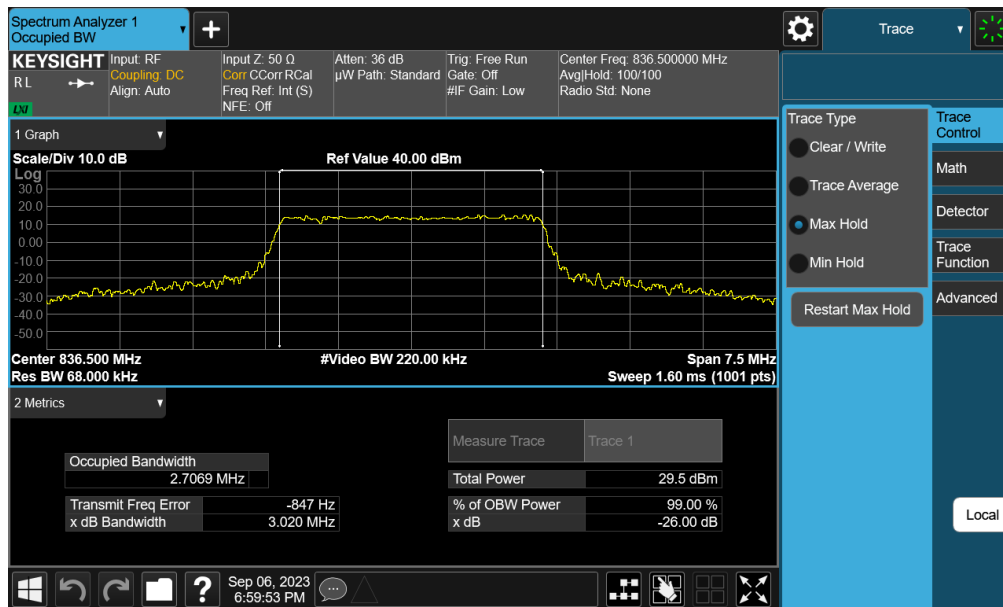


Plot 7-31. Occupied Bandwidth Plot (LTE Band 26/5 - 5MHz 16-QAM - Full RB - Ant 6)

FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 29 of 101

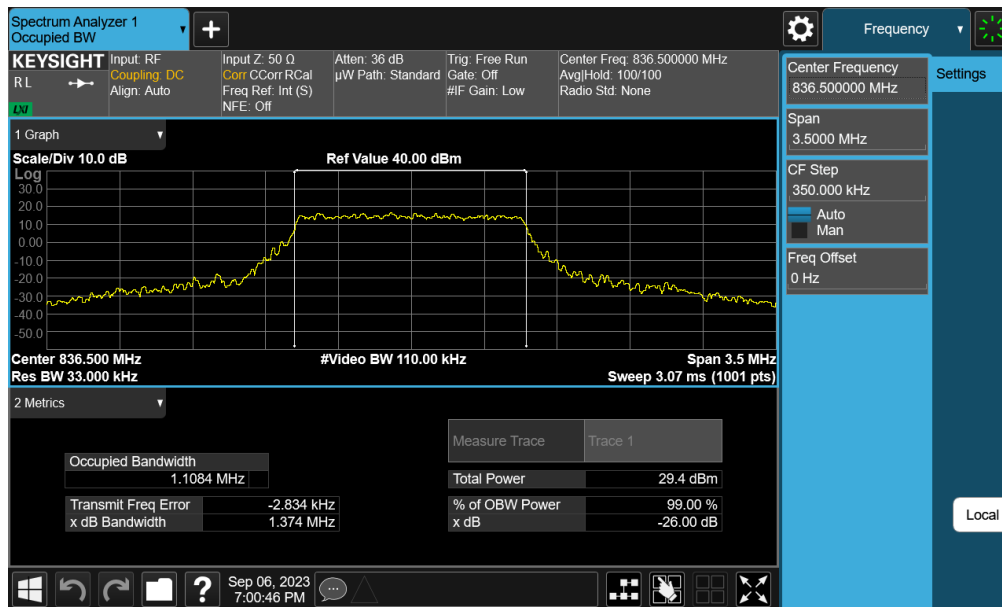
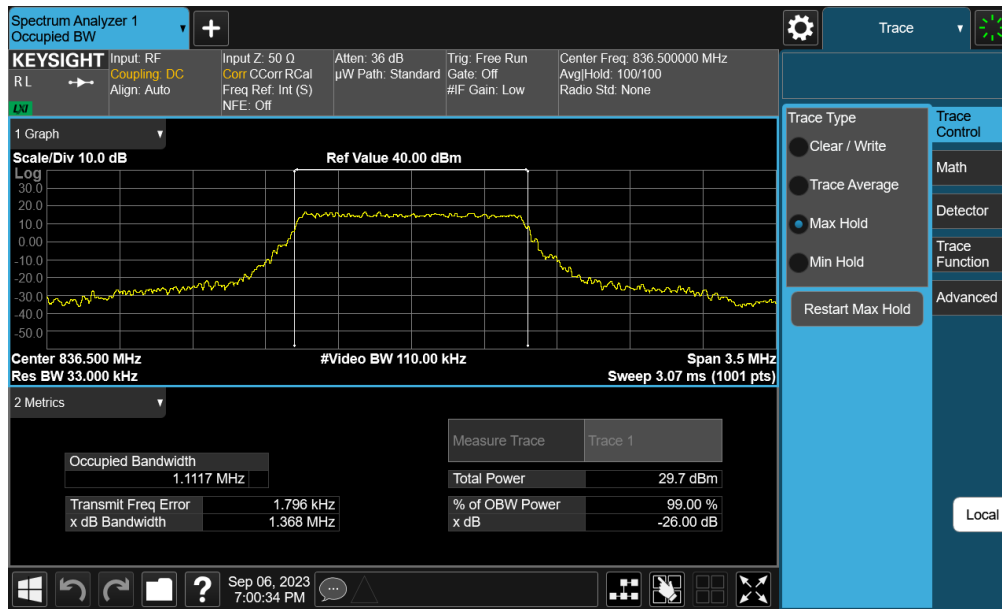


Plot 7-32. Occupied Bandwidth Plot (LTE Band 26/5 - 3MHz QPSK - Full RB - Ant 6)



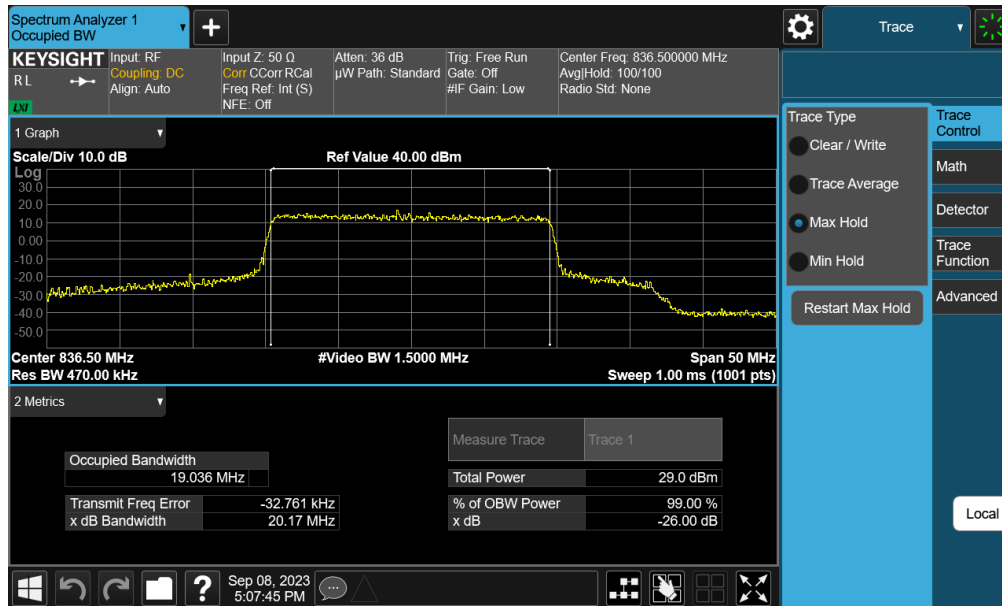
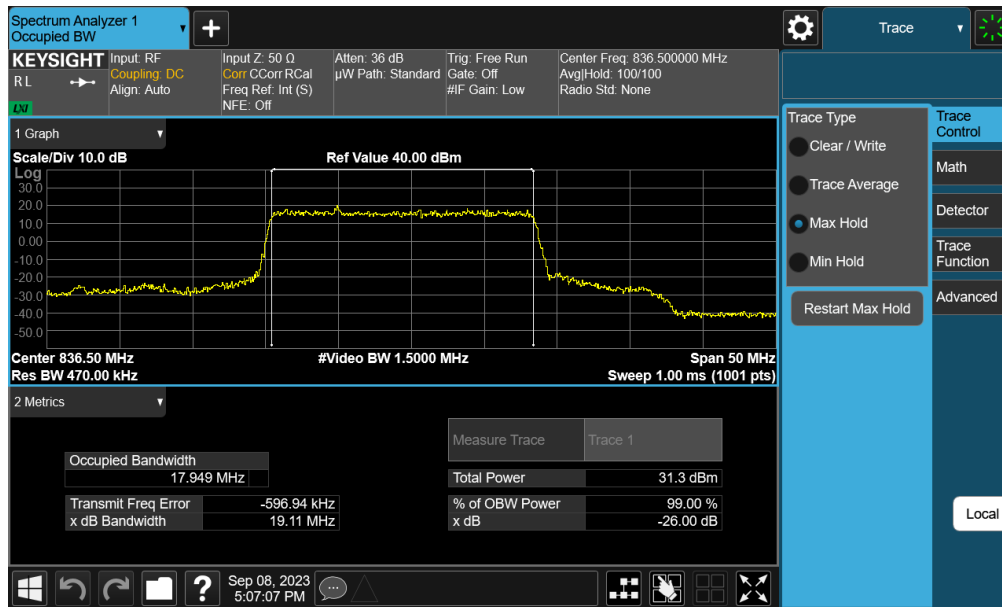
Plot 7-33. Occupied Bandwidth Plot (LTE Band 26/5 - 3MHz 16-QAM - Full RB - Ant 6)

FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 30 of 101

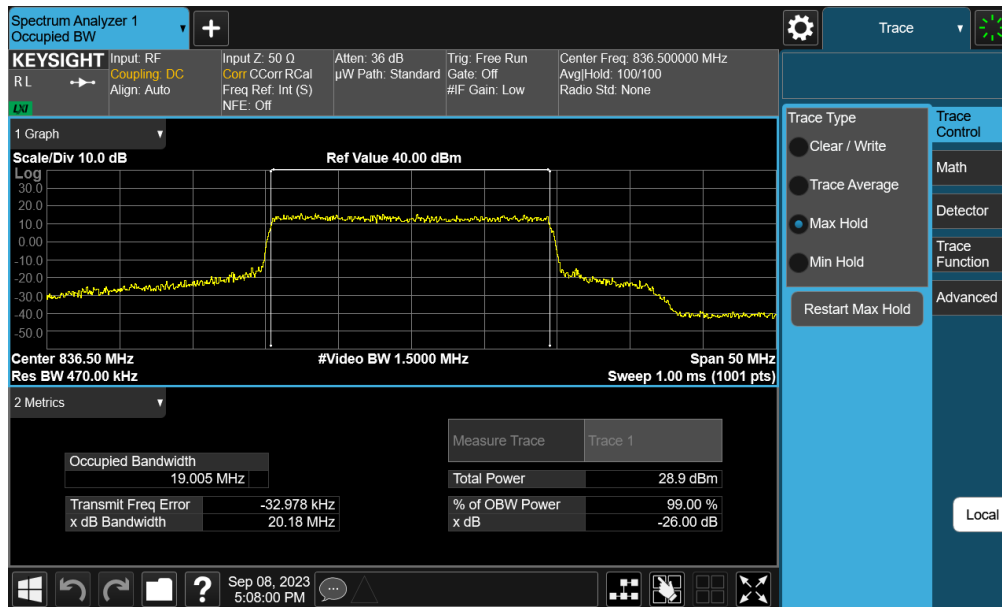


FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 31 of 101

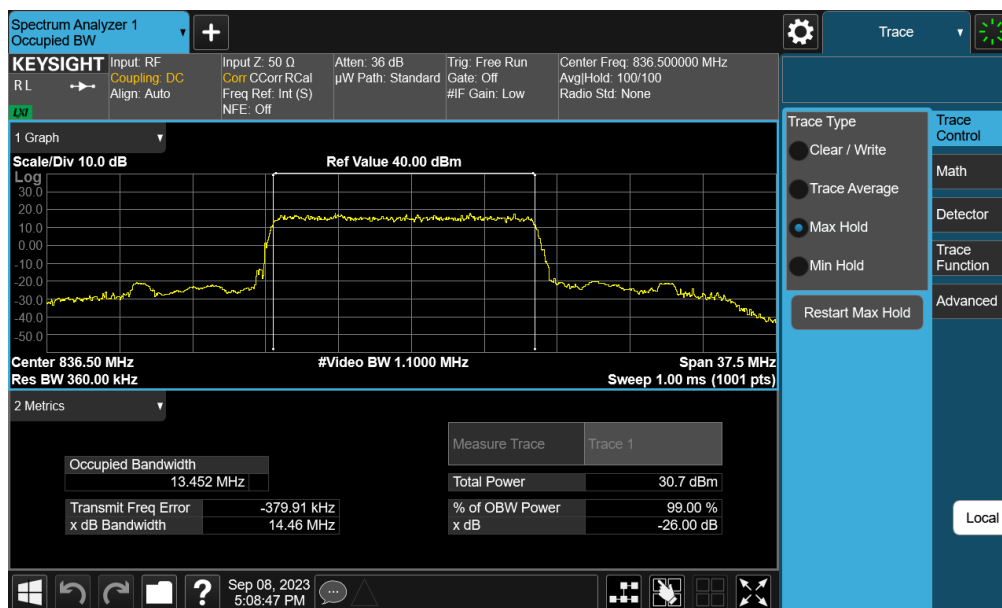
NR Band n5 – Ant 6



FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 32 of 101

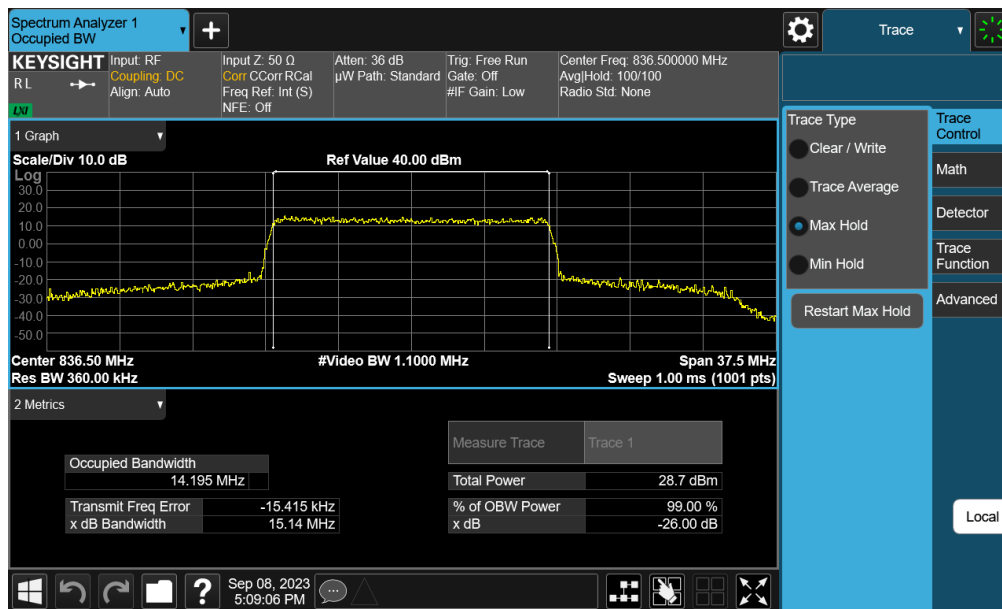


Plot 7-38. Occupied Bandwidth Plot (NR Band n5 - 20MHz 16-QAM - Full RB - Ant 6)

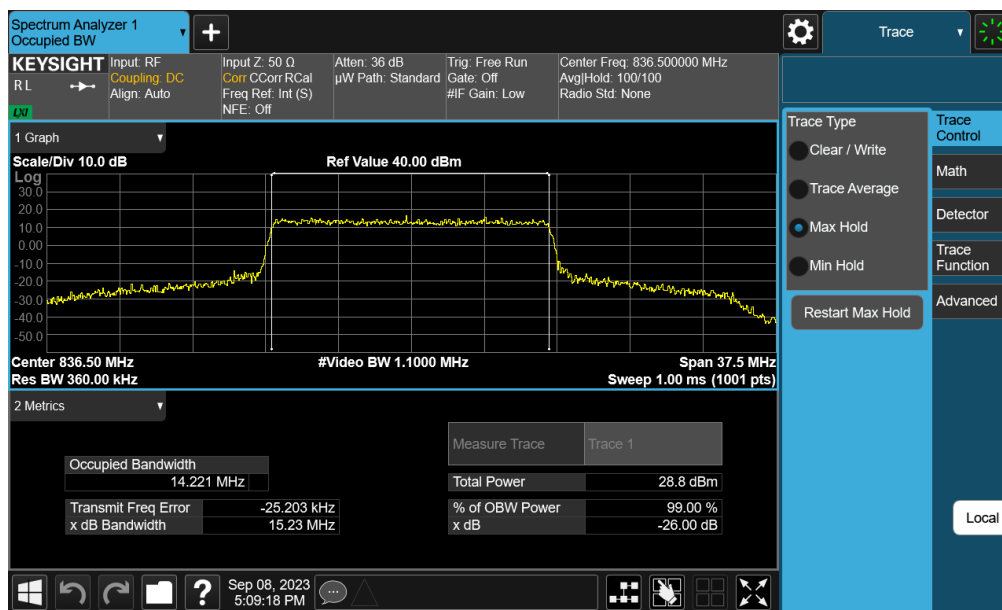


Plot 7-39. Occupied Bandwidth Plot (NR Band n5 - 15MHz $\pi/2$ BPSK - Full RB - Ant 6)

FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 33 of 101

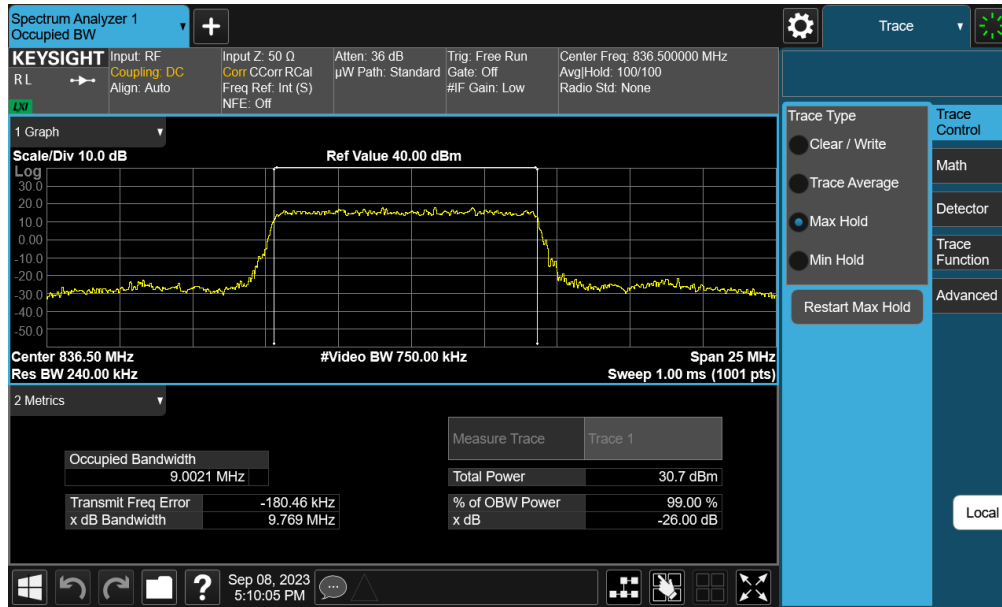


Plot 7-40. Occupied Bandwidth Plot (NR Band n5 - 15MHz QPSK - Full RB - Ant 6)

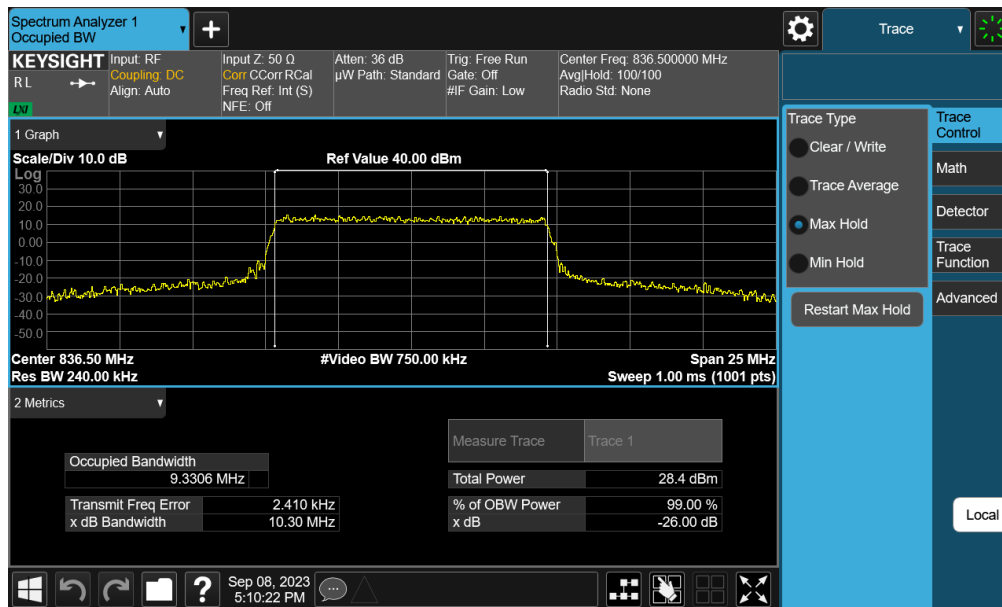


Plot 7-41. Occupied Bandwidth Plot (NR Band n5 - 15MHz 16-QAM - Full RB - Ant 6)

FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 34 of 101

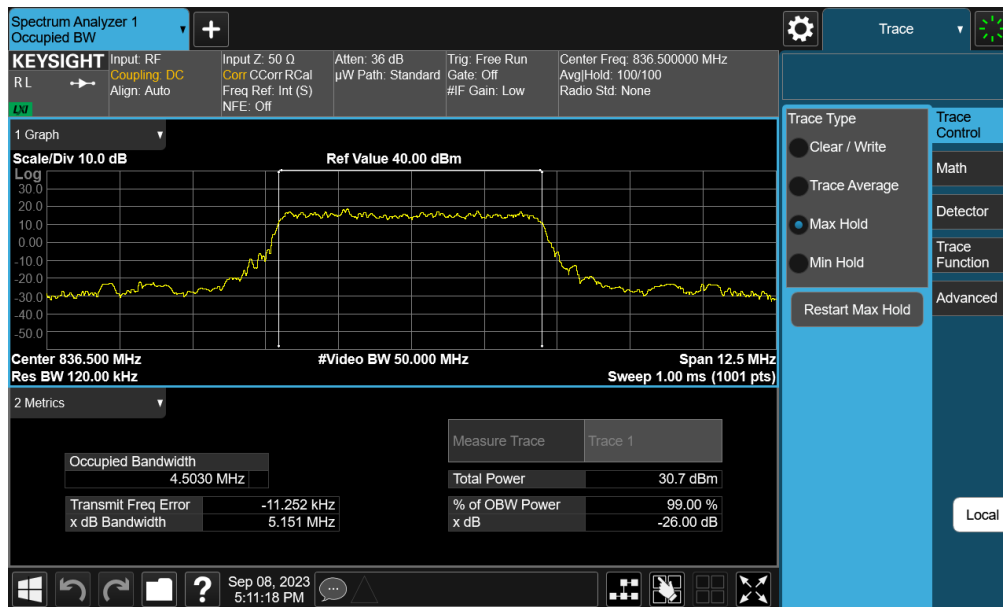
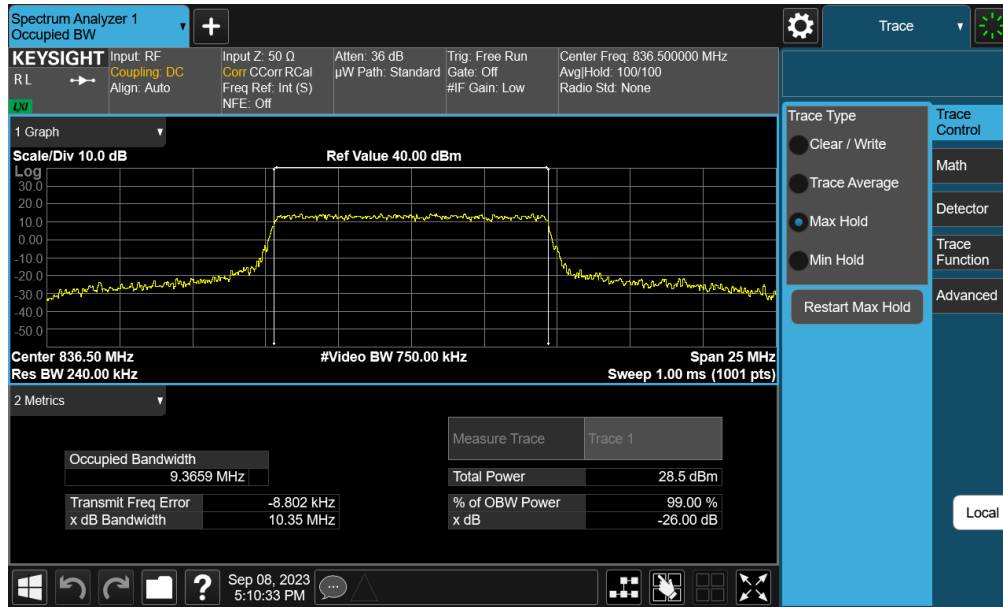


Plot 7-42. Occupied Bandwidth Plot (NR Band n5 - 10MHz $\pi/2$ BPSK - Full RB - Ant 6)

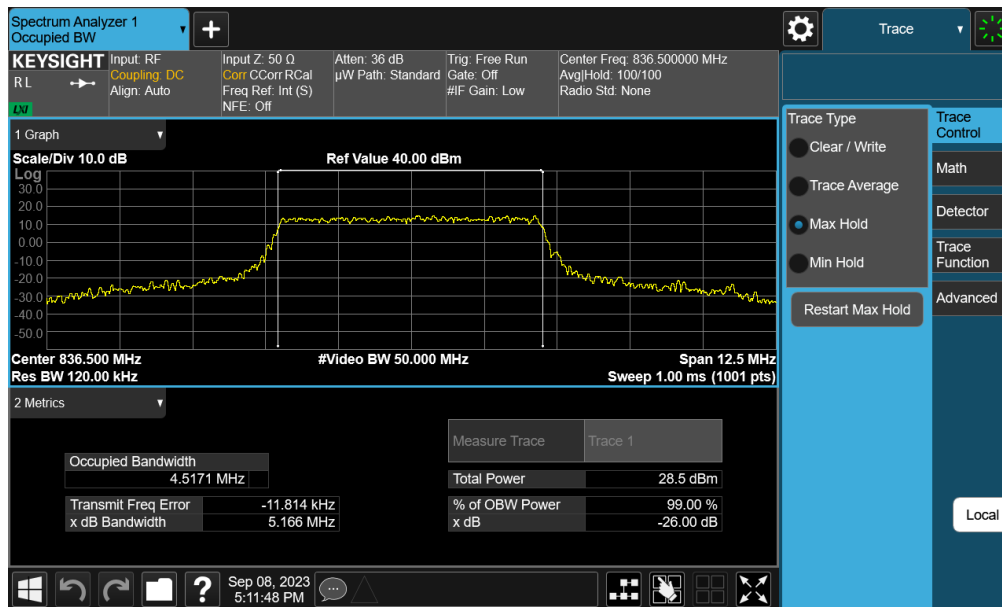
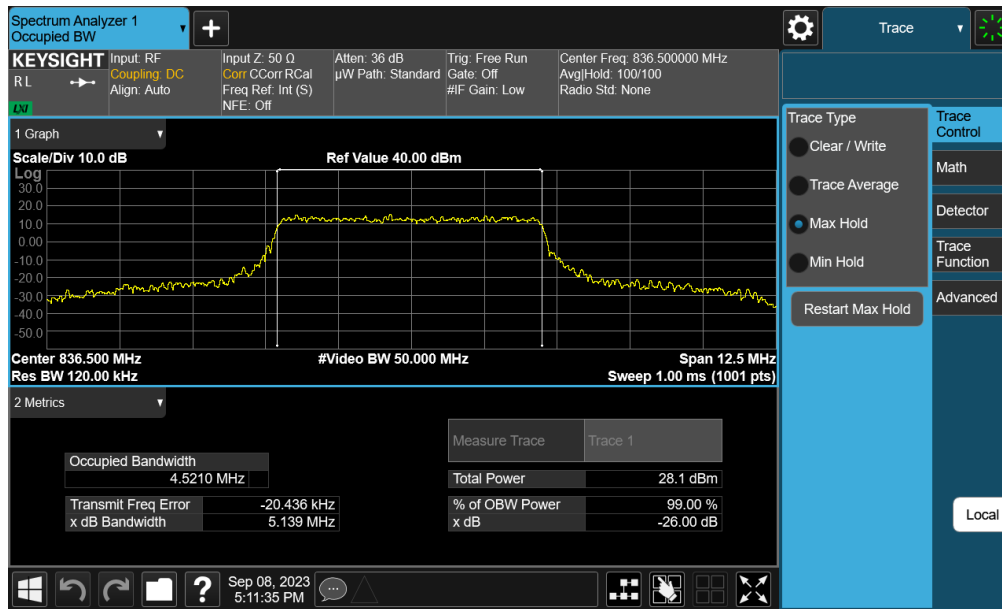


Plot 7-43. Occupied Bandwidth Plot (NR Band n5 - 10MHz QPSK - Full RB - Ant 6)

FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 35 of 101



FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 36 of 101



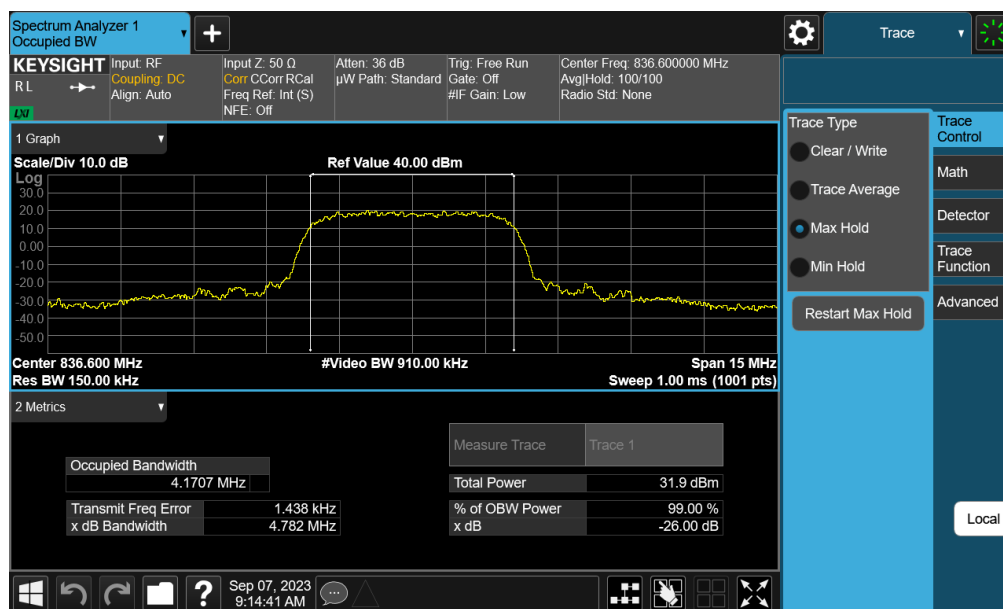
FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 37 of 101

GPRS Cell – Ant 6



FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 38 of 101

WCDMA Cell – Ant 6



Plot 7-50. Occupied Bandwidth Plot (WCDMA, Ch. 4183 – Ant 6)

FCC ID: A3LSMS928B	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2308210093-01-R1.A3L	Test Dates: 8/23/2023 - 10/18/2023	EUT Type: Portable Handset	Page 39 of 101

7.3 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 10GHz (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

Test Setup

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

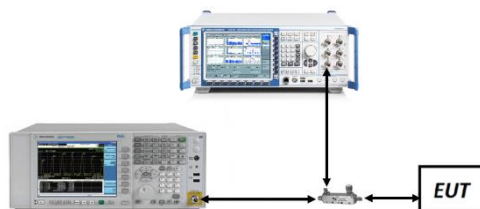


Figure 7-2. Test Instrument & Measurement Setup

Test Notes

1. Per Part 22, 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. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.
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.

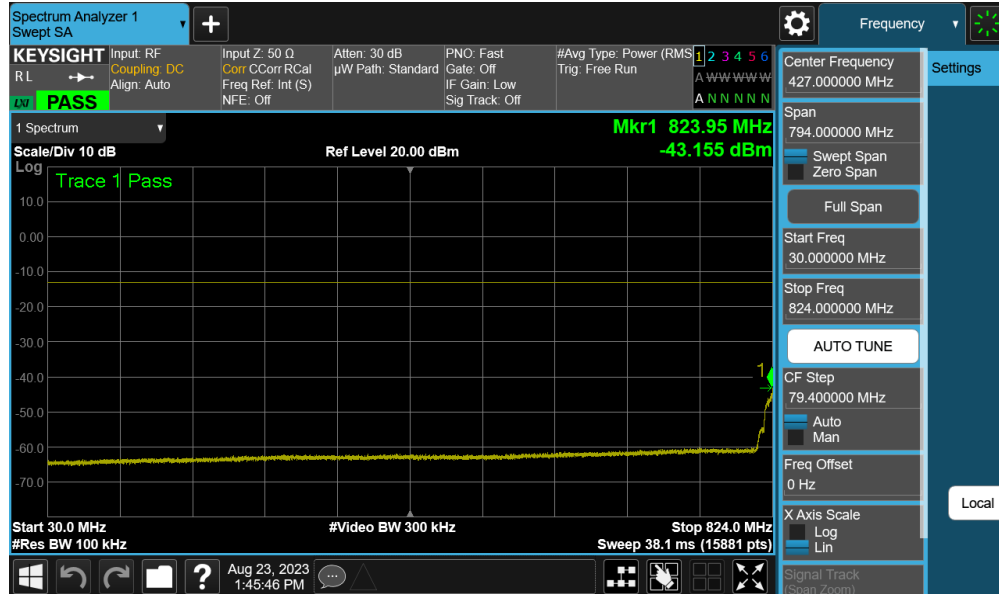
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Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
GSM-Cell	250kHz	Low	30.0 - 823.0	-30.96	-13.0	-17.96
		Low	849.0 - 1000.0	-50.92	-13.0	-37.92
		Low	1000.0 - 10000.0	-52.18	-13.0	-39.18
		Mid	30.0 - 824.0	-50.33	-13.0	-37.33
		Mid	849.0 - 1000.0	-50.75	-13.0	-37.75
		Mid	1000.0 - 10000.0	-52.32	-13.0	-39.32
		High	30.0 - 824.0	-51.08	-13.0	-38.08
		High	850.0 - 1000.0	-30.60	-13.0	-17.59
		High	1000.0 - 10000.0	-52.14	-13.0	-39.14
WCDMA-Cell	5MHz	Low	30.0 - 823.0	-31.46	-13.0	-18.46
		Low	849.0 - 1000.0	-57.77	-13.0	-44.77
		Low	1000.0 - 10000.0	-60.45	-13.0	-47.45
		Mid	30.0 - 824.0	-53.26	-13.0	-40.26
		Mid	849.0 - 1000.0	-54.33	-13.0	-41.33
		Mid	1000.0 - 10000.0	-60.03	-13.0	-47.03
		High	30.0 - 824.0	-54.53	-13.0	-41.53
		High	850.0 - 1000.0	-34.88	-13.0	-21.88
		High	1000.0 - 10000.0	-60.21	-13.0	-47.21
LTE-B26-5	10MHz	Low	30.0 - 823.0	-31.60	-13.0	-18.60
		Low	849.0 - 1000.0	-49.61	-13.0	-36.60
		Low	1000.0 - 10000.0	-39.82	-13.0	-26.81
		Mid	30.0 - 824.0	-43.16	-13.0	-30.16
		Mid	849.0 - 1000.0	-43.41	-13.0	-30.41
		Mid	1000.0 - 10000.0	-39.95	-13.0	-26.95
		High	30.0 - 824.0	-47.94	-13.0	-34.94
		High	850.0 - 1000.0	-32.74	-13.0	-19.74
		High	1000.0 - 10000.0	-40.13	-13.0	-27.13
NR-n5	20MHz	Low	30.0 - 824.0	-59.20	-13.0	-46.20
		Low	849.0 - 1000.0	-60.05	-13.0	-47.05
		Low	1000.0 - 10000.0	-39.82	-13.0	-26.82
		Mid	30.0 - 824.0	-58.81	-13.0	-45.81
		Mid	849.0 - 1000.0	-60.14	-13.0	-47.14
		Mid	1000.0 - 10000.0	-39.92	-13.0	-26.92
		High	30.0 - 824.0	-59.96	-13.0	-46.96
		High	849.0 - 1000.0	-60.13	-13.0	-47.13
		High	1000.0 - 10000.0	-39.81	-13.0	-26.81

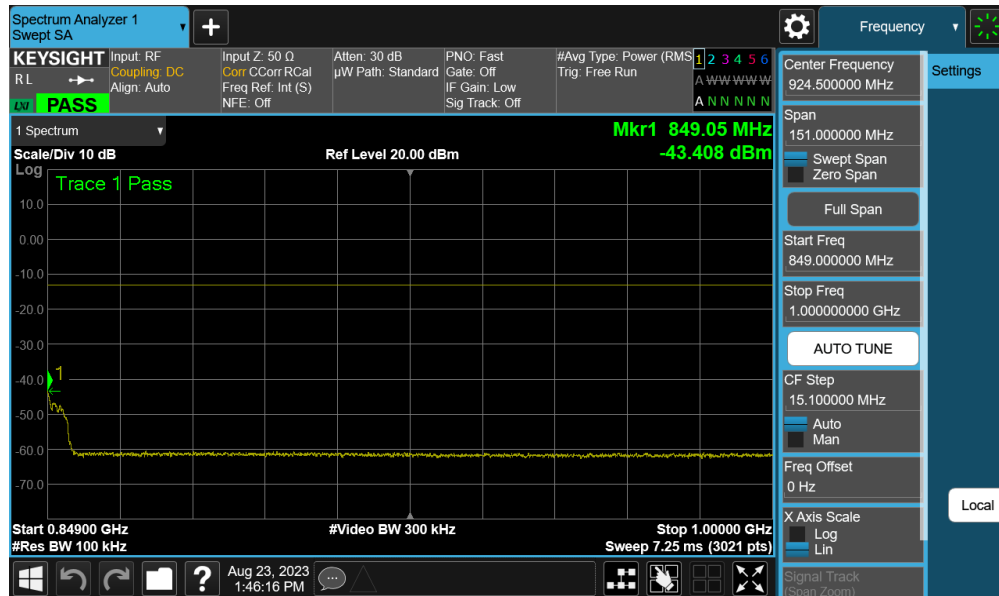
Table 7-4. Conducted Spurious Emission Results – Ant 0

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LTE Band 26/5 – Ant 0

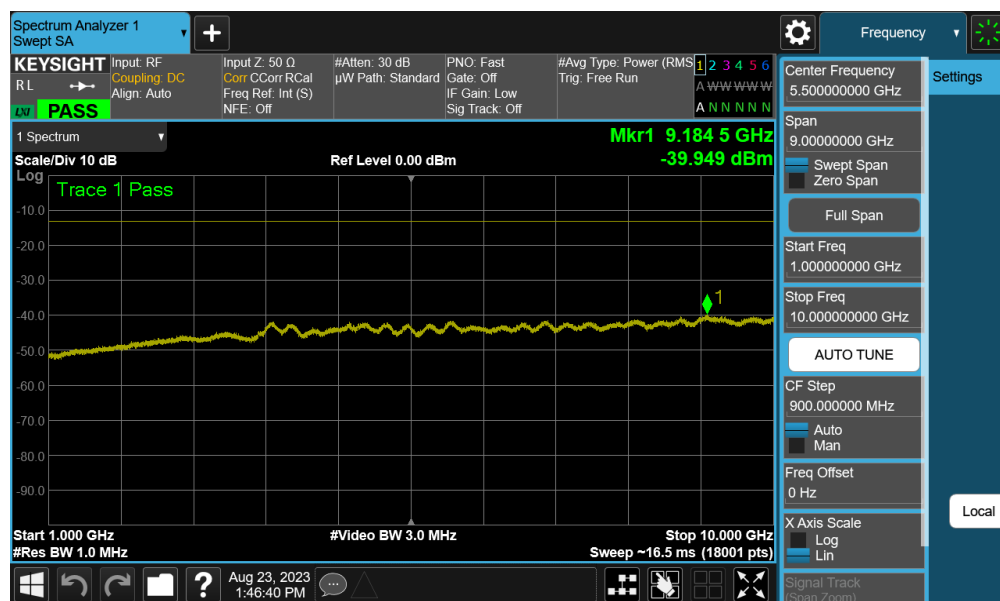


Plot 7-51. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB - Mid Channel – Ant 0)



Plot 7-52. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB - Mid Channel – Ant 0)

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Plot 7-53. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB - Mid Channel – Ant 0)

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