



PART 24 MEASUREMENT REPORT

Applicant Name:

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

Date of Testing:

10/14/2021 – 12/7/2021

Test Report Issue Date:

12/17/2021

Test Site/Location:

PCTEST Lab. Yongin-Si, Gyeonggi-do, South Korea

Test Report Serial No.:

1M2109290114-03.A3L

FCC ID:

A3LSMS901E

Applicant Name:

Samsung Electronics Co., Ltd.

Application Type:

Certification

Model:

SM-S901E/DS

Additional Model(s):

SM-S901E

EUT Type:

Portable Handset

FCC Classification:

PCS Licensed Transmitter Held to Ear (PCE)

FCC Rule Part:

24

Test Procedure(s):

ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168
D01 v03r01, KDB 648474 D03 v01r04

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

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



Prepared by



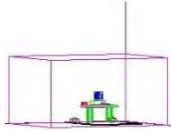
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FCC ID: A3LSMS901E		PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset		Page 1 of 84

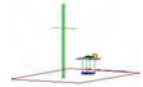
TABLE OF CONTENTS

1.0	INTRODUCTION	4
1.1	Scope	4
1.2	PCTEST Test Location.....	4
1.3	Test Facility / Accreditations.....	4
2.0	PRODUCT INFORMATION.....	5
2.1	Equipment Description	5
2.2	Device Capabilities.....	5
2.3	Test Configuration	5
2.4	EMI Suppression Device(s)/Modifications	5
3.0	DESCRIPTION OF TESTS	6
3.1	Evaluation Procedure	6
3.2	Radiated Power and Radiated Spurious Emissions	6
4.0	MEASUREMENT UNCERTAINTY	7
5.0	TEST EQUIPMENT CALIBRATION DATA	8
6.0	SAMPLE CALCULATIONS	9
7.0	TEST RESULTS	11
7.1	Summary.....	11
7.2	Occupied Bandwidth	12
7.3	Spurious and Harmonic Emissions at Antenna Terminal	21
7.4	Band Edge Emissions at Antenna Terminal	37
7.5	Peak-Average Ratio	59
7.6	Radiated Power (ERP/EIRP).....	68
7.7	Radiated Spurious Emissions Measurements	71
7.8	Frequency Stability / Temperature Variation	80
8.0	CONCLUSION.....	84

FCC ID: A3LSMS901E	 PART 24 MEASUREMENT REPORT 	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
		Page 2 of 84



PART 24 MEASUREMENT REPORT



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	0.586	27.68	246KGXW
EDGE	N/A	8-PSK	1850.2 - 1909.8	0.216	23.34	242KG7W
WCDMA	N/A	Spread Spectrum	1852.4 - 1907.6	0.132	21.20	4M17F9W
LTE Band 25/2	20 MHz	QPSK	1860 - 1905	0.131	21.18	18M1G7D
		16QAM	1860 - 1905	0.095	19.78	18M1W7D
	15 MHz	QPSK	1857.5 - 1907.5	0.126	21.00	13M6G7D
		16QAM	1857.5 - 1907.5	0.090	19.55	13M6W7D
	10 MHz	QPSK	1855 - 1910	0.125	20.98	9M07G7D
		16QAM	1855 - 1910	0.093	19.68	9M06W7D
	5 MHz	QPSK	1852.5 - 1912.5	0.115	20.60	4M56G7D
		16QAM	1852.5 - 1912.5	0.089	19.50	4M55W7D
	3 MHz	QPSK	1851.5 - 1913.5	0.105	20.20	2M74G7D
		16QAM	1851.5 - 1913.5	0.079	18.95	2M74W7D
	1.4 MHz	QPSK	1850.7 - 1914.3	0.107	20.28	1M11G7D
		16QAM	1850.7 - 1914.3	0.085	19.29	1M12W7D

EUT Overview

FCC ID: A3LSMS901E	 PART 24 MEASUREMENT REPORT 		Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	
			Page 3 of 84

1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.

1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST facility located at 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 PCTEST located in Yongin-si, Gyeonggi-do, 16954, South Korea.

- PCTEST is an ISO 17025-2017 accredited test facility under the National Voluntary Laboratory Accreditation Program (NVLAP) with Certificate number 600143-0 for Specific Absorption Rate (SAR), where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISSED Standards (RSS).
- PCTEST facility is a registered (26168) test laboratory with the site description on file with ISSED.

FCC ID: A3LSMS901E		PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset		Page 4 of 84

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID:A3LSMS901E**. 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.: 0403M, 0419M, 0842M

2.2 Device Capabilities

This device contains the following capabilities:

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

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

2.3 Test Configuration

The EUT was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01 v03r01. 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 EMI Suppression Device(s)/Modifications

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

FCC ID: A3LSMS901E		PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset		Page 5 of 84

3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the “Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards” (ANSI/TIA-603-E-2016) and “Measurement Guidance for Certification of Licensed Digital Transmitters” (KDB 971168 D01 v03r01) were used in the measurement of the EUT.

Deviation from Measurement Procedure.....None

3.2 Radiated Power and Radiated Spurious Emissions

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

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

For radiated power measurements, substitution method is used per the guidance of ANSI/TIA-603-E-2016. A half-wave dipole is substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

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

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 and calculations, conversion method is used per the formulas in KDB 971168 Section 5.8.4. Field Strength (EIRP) is calculated using the following formulas:

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

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.

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

FCC ID: A3LSMS901E		PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset		Page 6 of 84

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	1.20
Radiated Disturbance (<1GHz)	3.01
Radiated Disturbance (>1GHz)	5.56
Radiated Disturbance (>18GHz)	3.16

FCC ID: A3LSMS901E	 PART 24 MEASUREMENT REPORT 	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset

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	E5515C	WIRELESS COMMUNICATION TEST SET	2/19/2021	Annual	2/18/2022	MY50262130
Agilent	N9030A	PXA Signal Analyzer	7/6/2021	Annual	7/5/2022	MY49432391
Anritsu	S820E	Cable and Antenna Analyzer	7/7/2021	Annual	7/6/2022	6201300731
Anritsu	MA24106A	USB Power Sensor	7/7/2021	Annual	7/6/2022	1244512
Espec	SH-242	Environmental Chamber	9/15/2021	Annual	9/14/2022	93011064
ETS Lindgren	3110C	Biconical Antenna	7/9/2020	Biennial	7/8/2022	00211248
ETS Lindgren	3110C	Biconical Antenna	7/9/2020	Biennial	7/8/2022	00211250
Fairview Microwave	FM2CP1122-10	Coupler	7/7/2021	Annual	7/6/2022	1946
Keysight Technologies	N9030B	MXA Signal Analyzer	5/11/2021	Annual	5/10/2022	MY57142018
Mini Circuits	ZUDC10-83-S+	Coupler	9/15/2021	Annual	9/14/2022	2111
Mini-Circuits	BW-N10W5+	Attenuator	7/6/2021	Annual	7/5/2022	1607
Mini-Circuits	BW-N10W5+	Attenuator	7/6/2021	Annual	7/5/2022	1607
Rohde & Schwarz	TS-PR18	Preamplifier	7/8/2021	Annual	7/7/2022	102141
Rohde & Schwarz	SMBV100B	Signal Generator	11/4/2021	Annual	11/3/2022	101568
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	7/6/2021	Annual	7/5/2022	116851
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	2/19/2021	Annual	2/18/2022	131453
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	2/19/2021	Annual	2/18/2022	131454
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	2/19/2021	Annual	2/18/2022	150117
Rohde & Schwarz	ESW	EMI Test Receiver	7/6/2021	Annual	7/5/2022	101761
Rohde & Schwarz	FSW43	Signal & Spectrum Analyzer	9/15/2021	Annual	9/14/2022	101250
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2/19/2021	Annual	2/18/2022	102131
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	3/29/2021	Annual	3/28/2022	102151
Schwarzbeck	UHA9105	Dipole Antenna	7/9/2020	Biennial	7/8/2022	91052522
Sunol	DRH-118	Horn Antenna	7/14/2021	Biennial	7/13/2023	A102416-1
Sunol	DRH-118	Horn Antenna	1/12/2021	Biennial	1/11/2023	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.
- Equipment with a calibration date of "N/A" shown in this list was not used to make direct calibrated measurements.

FCC ID: A3LSMS901E	 PART 24 MEASUREMENT REPORT 		Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 8 of 84

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

FCC ID: A3LSMS901E		PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset		Page 9 of 84

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: A3LSMS901E	 PART 24 MEASUREMENT REPORT 	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
		Page 10 of 84

7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.
 FCC ID: A3LSMS901E
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
 Mode(s): GSM/GPRS/EDGE/WCDMA/LTE

Test Condition	Test Description	FCC Part Section(s)	RSS Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Occupied Bandwidth	2.1049	RSS-Gen(6.7)	N/A	PASS	Section 7.2
	Conducted Band Edge / Spurious Emissions	2.1051, 24.238(b)	RSS-133(6.5)	> 43 + 10log10(P[Watts]) at Band Edge and for all out-of-band emissions	PASS	Sections 7.3, 7.4
	Transmitter Conducted Output Power	2.1046	RSS-133(4.1)	N/A	PASS	See RF Exposure Report
	Frequency Stability	2.1055, 24.235	RSS-133(6.3)	Fundamental emissions stay within authorized frequency block	PASS	Section 7.8
RADIATED	Equivalent Isotropic Radiated Power	24.232(c)	RSS-132(5.4)	< 2 Watts max. EIRP	PASS	Section 7.6
	Radiated Spurious Emissions	2.1053, 24.238(b)	RSS-133(6.5)	> 43 + 10 log10 (P[Watts]) for all out-of-band emissions	PASS	Section 7.7

Table 7-1. Summary of Test Results

Notes:

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

FCC ID: A3LSMS901E		PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset		Page 11 of 84

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

KDB 971168 D01 v03r01 – Section 4.2

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW $\geq 3 \times$ 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: A3LSMS901E	 PART 24 MEASUREMENT REPORT 	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
Page 12 of 84		

LTE Band 25/2



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



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

FCC ID: A3LSMS901E	PCTEST PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
Page 13 of 84		

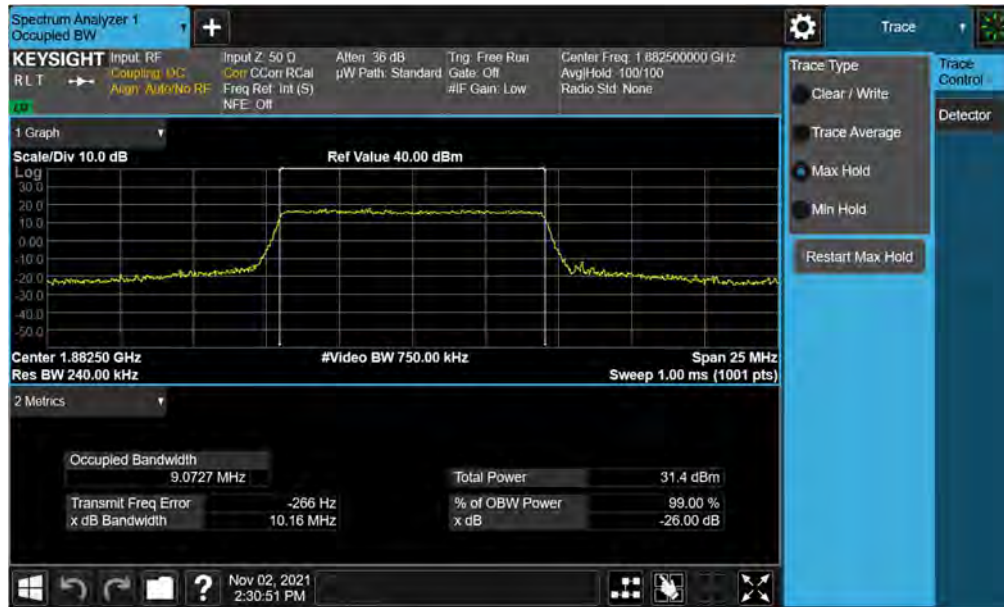


Plot 7-3. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz QPSK - Full RB)



Plot 7-4. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz 16-QAM - Full RB)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 14 of 84

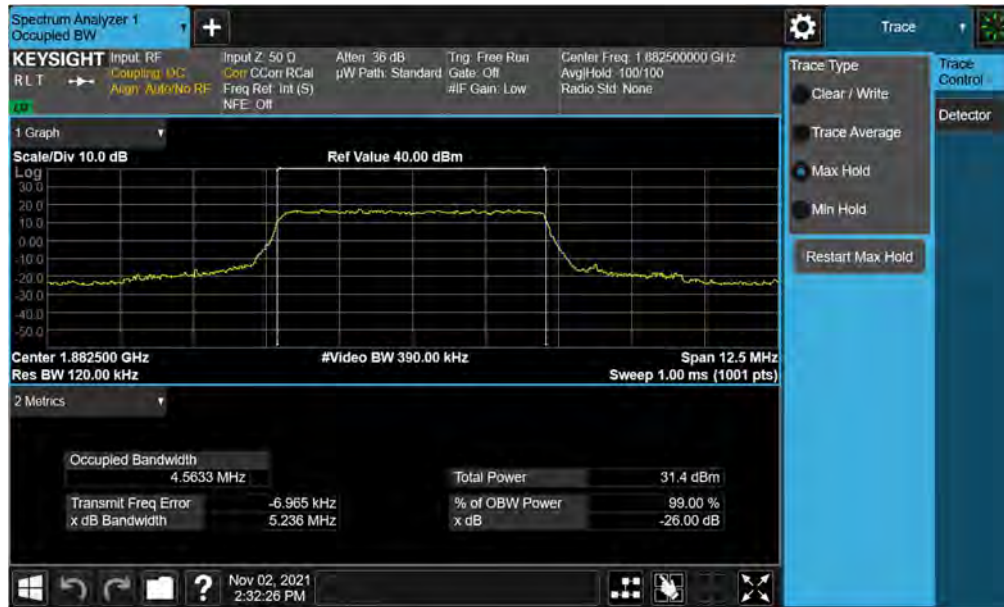


Plot 7-5. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz QPSK - Full RB)



Plot 7-6. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz 16-QAM - Full RB)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset		Page 15 of 84



Plot 7-7. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz QPSK - Full RB)



Plot 7-8. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz 16-QAM - Full RB)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset		Page 16 of 84



Plot 7-9. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz QPSK - Full RB)



Plot 7-10. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz 16-QAM - Full RB)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 17 of 84



Plot 7-11. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz QPSK - Full RB)



Plot 7-12. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz 16-QAM - Full RB)

FCC ID: A3LSMS901E	PCTEST PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	Page 18 of 84
	EUT Type: Portable Handset	

GSM/GPRS PCS



Plot 7-13. Occupied Bandwidth Plot (GPRS, Ch. 661)



Plot 7-14. Occupied Bandwidth Plot (EDGE, Ch. 661)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 19 of 84

WCDMA PCS



Plot 7-15. Occupied Bandwidth Plot (WCDMA, Ch. 9400)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 20 of 84

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

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 20GHz (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

Per Part 24 and RSS-133, 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.

FCC ID: A3LSMS901E		PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset		Page 21 of 84

LTE Band 25/2



Plot 7-16. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - Low Channel)

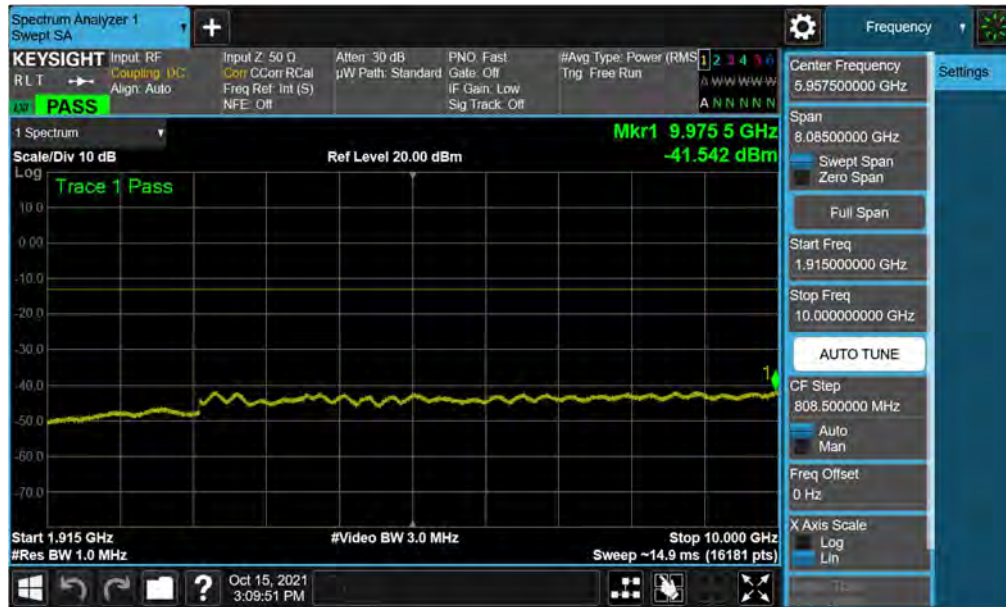


Plot 7-17. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - Low Channel)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset		Page 22 of 84



FCC ID: A3LSMS901E	PCTEST PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	Page 23 of 84
	EUT Type: Portable Handset	



Plot 7-20. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - Mid Channel)

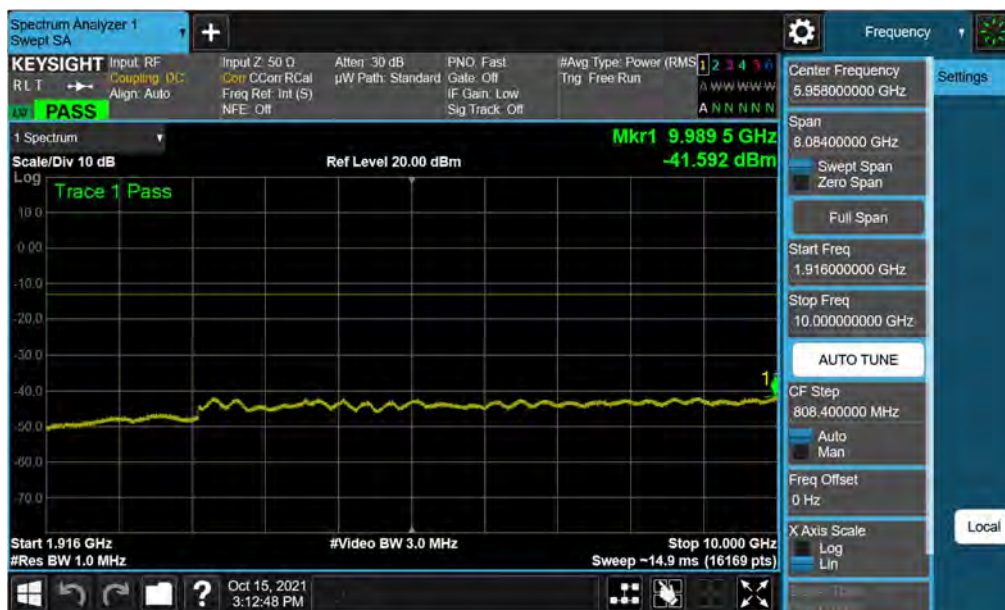


Plot 7-21. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - Mid Channel)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset		Page 24 of 84



Plot 7-22. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - High Channel)



Plot 7-23. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - High Channel)

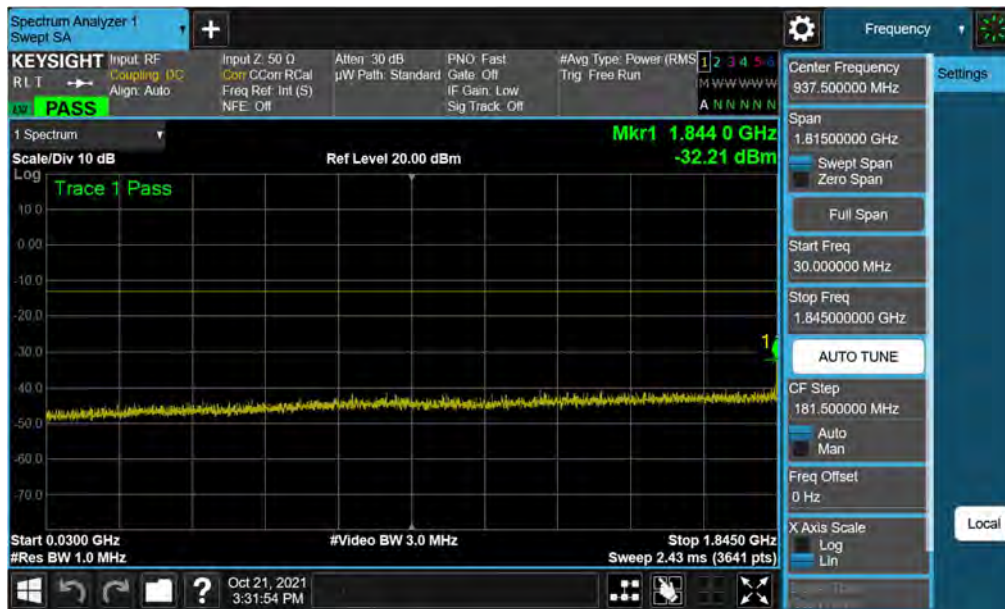
FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset		Page 25 of 84



Plot 7-24. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - High Channel)

FCC ID: A3LSMS901E	PCTEST PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
		Page 26 of 84

GSM/GPRS PCS



Plot 7-25. Conducted Spurious Plot (GPRS Ch. 512)

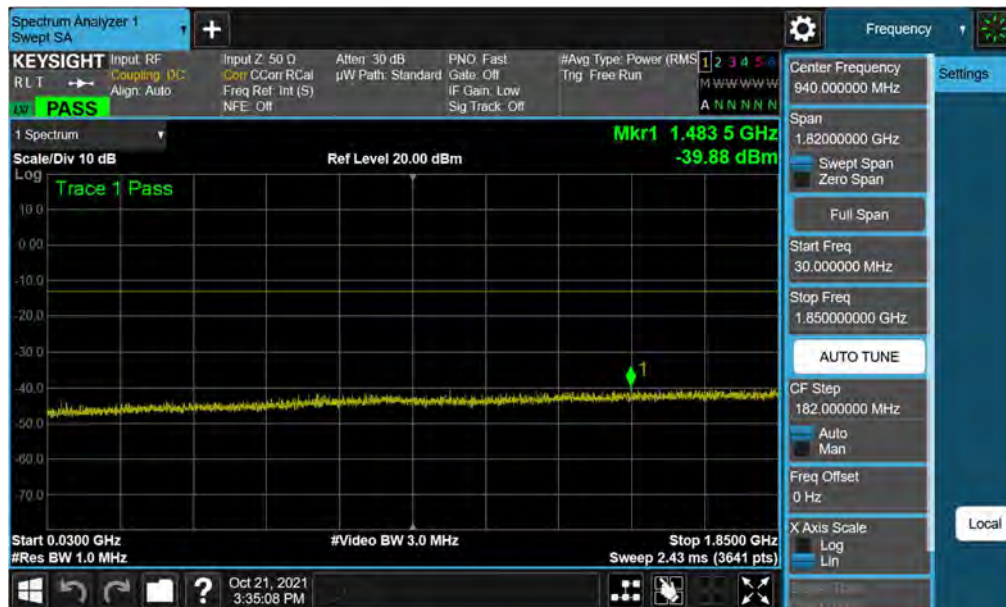


Plot 7-26. Conducted Spurious Plot (GPRS Ch. 512)

FCC ID: A3LSMS901E	PCTEST PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	Page 27 of 84
	EUT Type: Portable Handset	

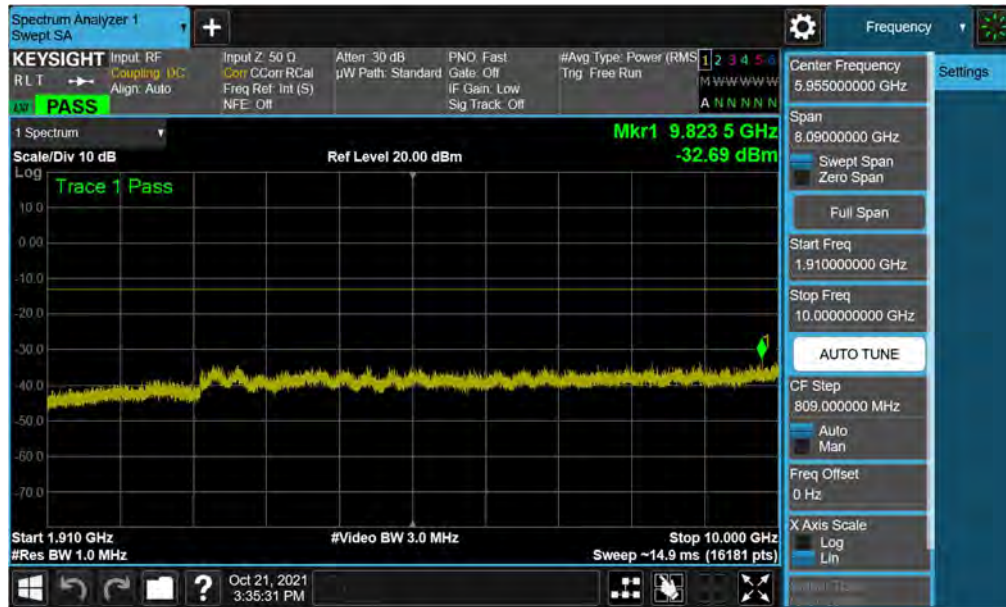


Plot 7-27. Conducted Spurious Plot (GPRS Ch. 512)

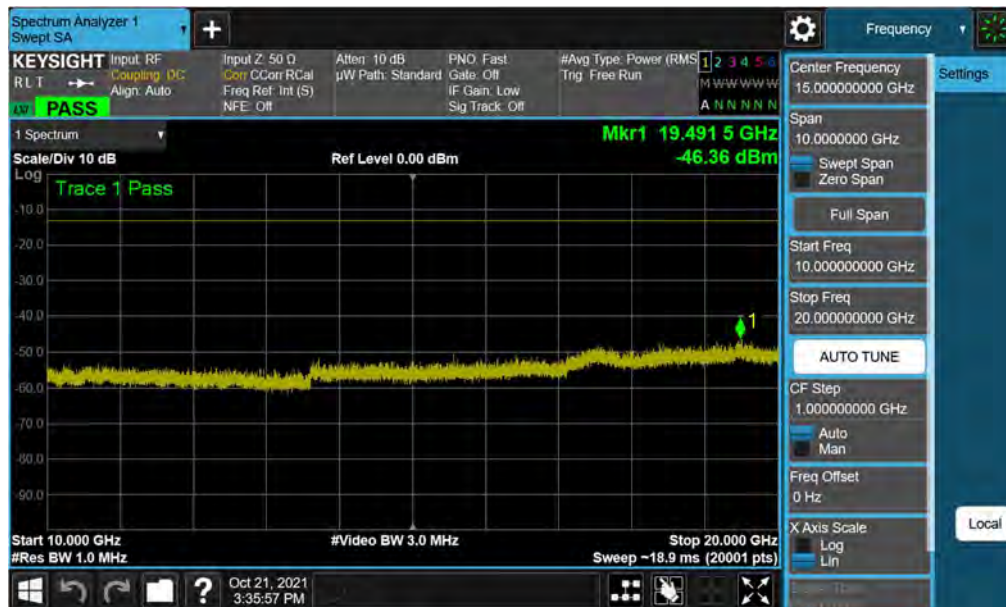


Plot 7-28. Conducted Spurious Plot (GPRS Ch. 661)

FCC ID: A3LSMS901E	PCTEST PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
Page 28 of 84		

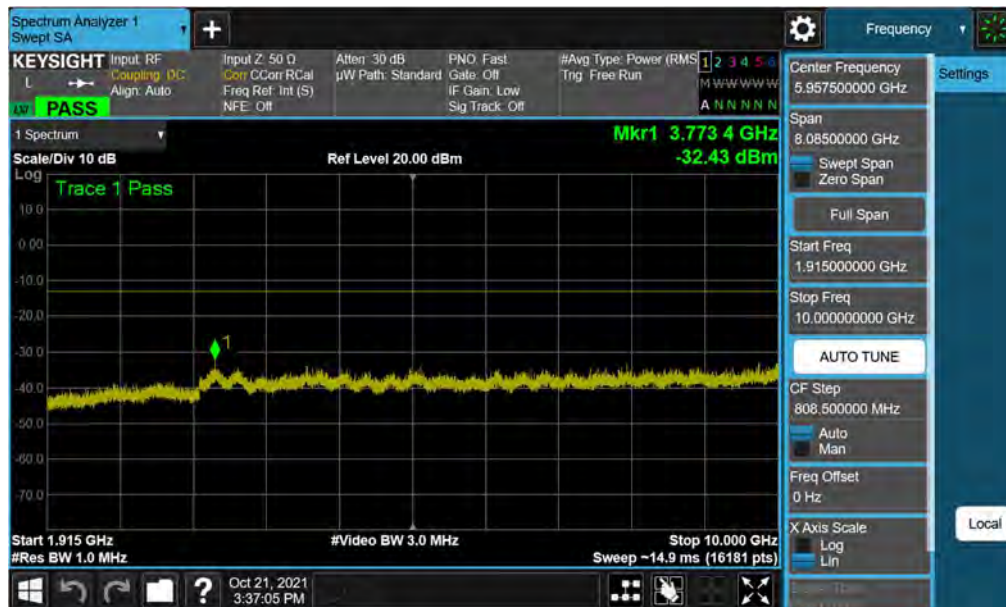
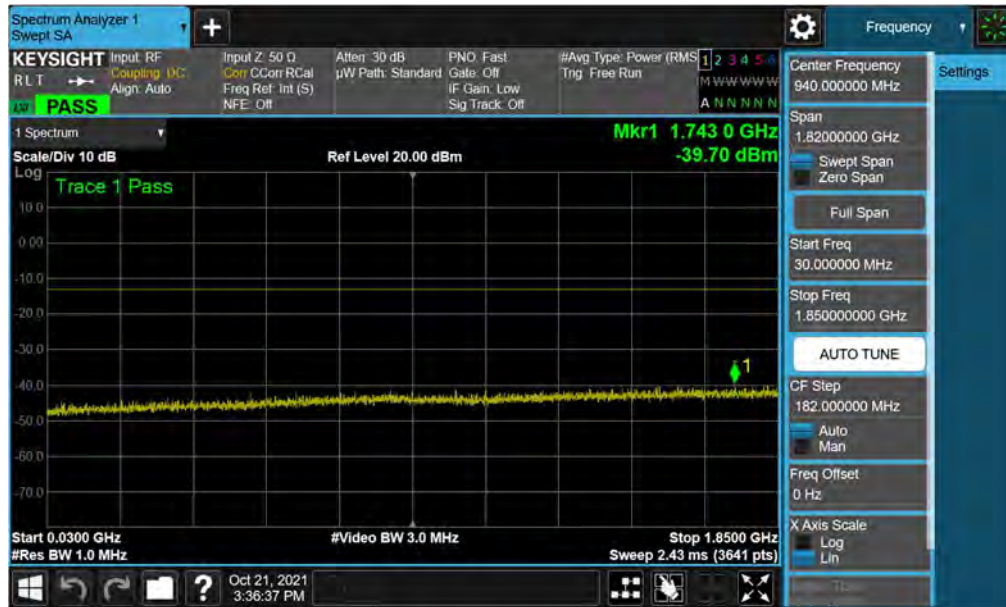


Plot 7-29. Conducted Spurious Plot (GPRS Ch. 661)



Plot 7-30. Conducted Spurious Plot (GPRS Ch. 661)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 29 of 84



FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 30 of 84



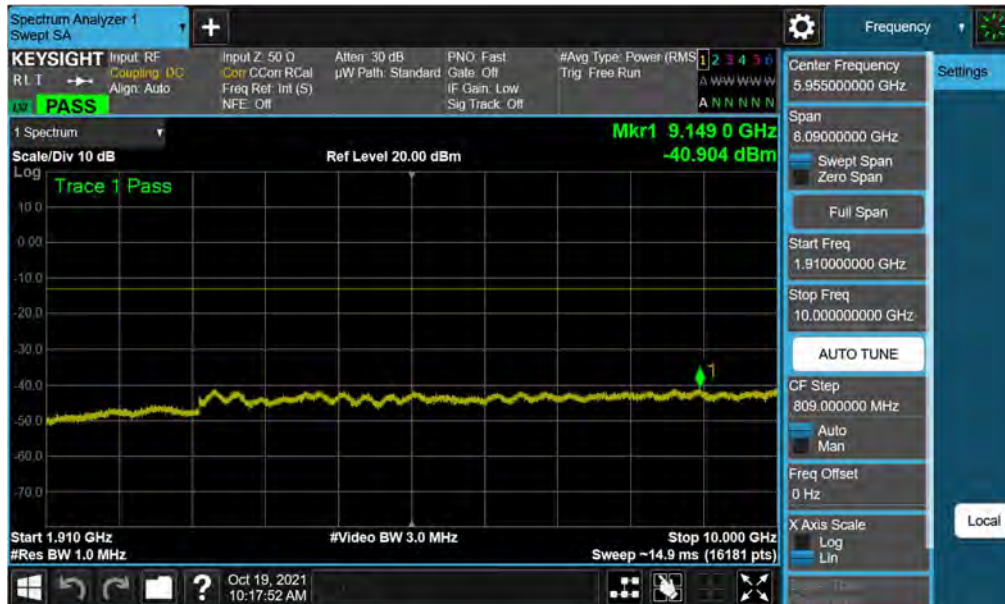
Plot 7-33. Conducted Spurious Plot (GPRS Ch. 810)

FCC ID: A3LSMS901E	PCTEST PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
Page 31 of 84		

WCDMA PCS



Plot 7-34. Conducted Spurious Plot (WCDMA Ch. 9262)



Plot 7-35. Conducted Spurious Plot (WCDMA Ch. 9262)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset		Page 32 of 84



Plot 7-36. Conducted Spurious Plot (WCDMA Ch. 9262)



Plot 7-37. Conducted Spurious Plot (WCDMA Ch. 9400)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 33 of 84



Plot 7-38. Conducted Spurious Plot (WCDMA Ch. 9400)

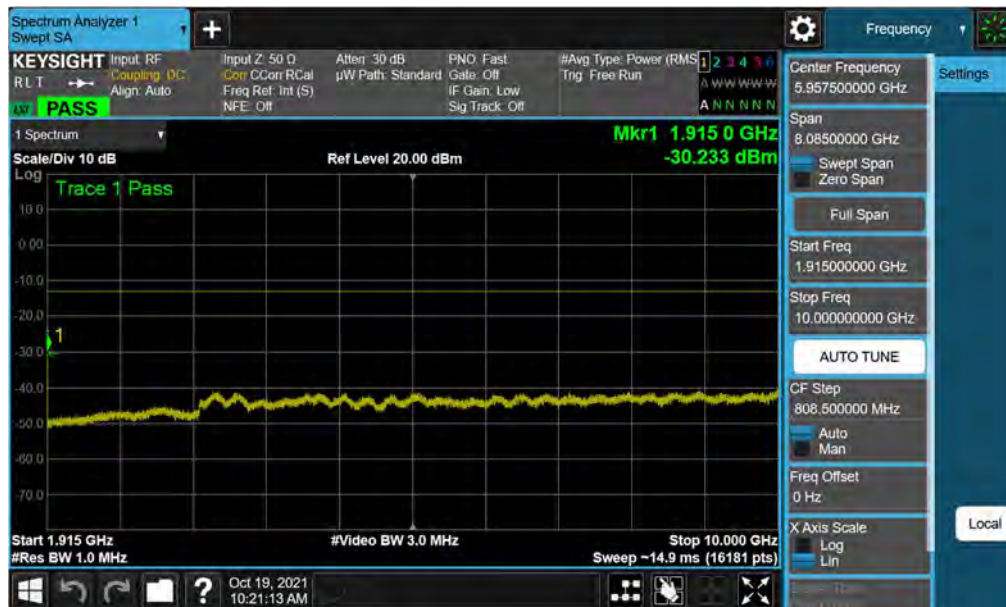


Plot 7-39. Conducted Spurious Plot (WCDMA Ch. 9400)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset		Page 34 of 84



Plot 7-40. Conducted Spurious Plot (WCDMA Ch. 9538)



Plot 7-41. Conducted Spurious Plot (WCDMA Ch. 9538)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 35 of 84



Plot 7-42. Conducted Spurious Plot (WCDMA Ch. 9538)

FCC ID: A3LSMS901E	PCTEST PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
		Page 36 of 84

7.4 Band Edge Emissions at Antenna Terminal

Test Overview

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

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. $\text{RBW} \geq 1\%$ of the emission bandwidth
4. $\text{VBW} \geq 3 \times \text{RBW}$
5. Detector = RMS
6. Number of sweep points $\geq 2 \times \text{Span}/\text{RBW}$
7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Setup

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



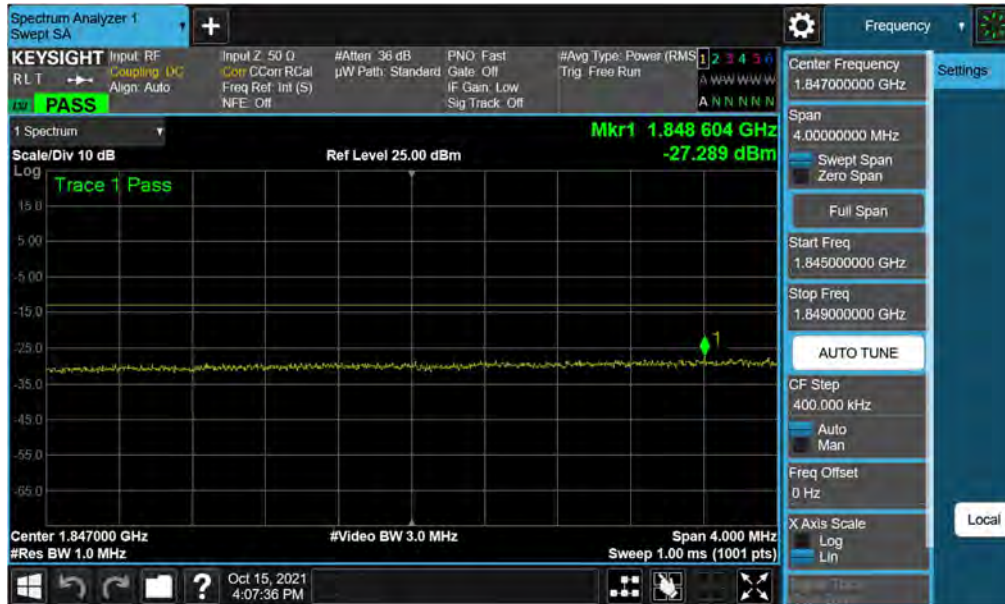
Figure 7-3. Test Instrument & Measurement Setup

Test Notes

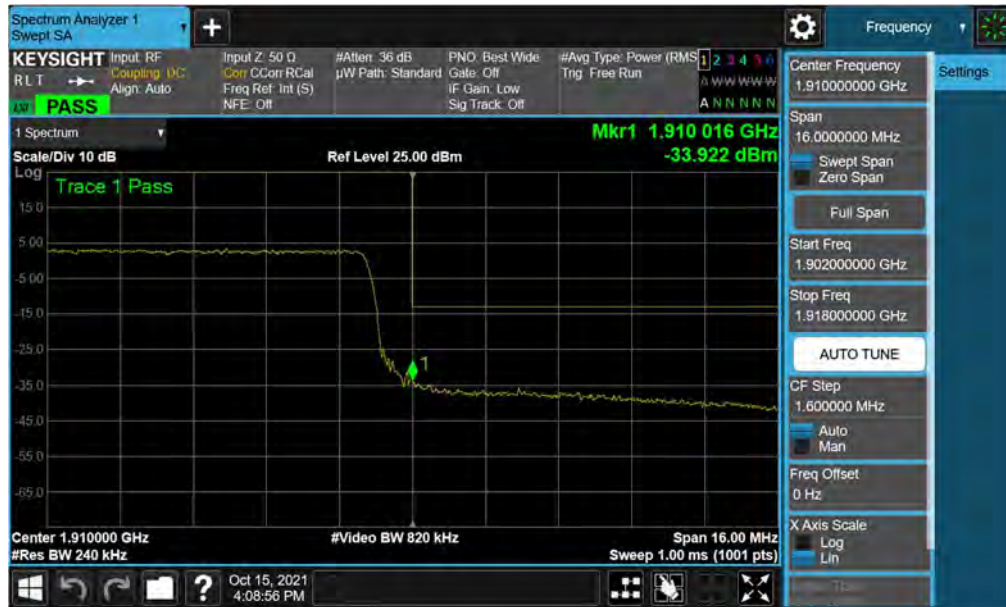
Per 24.238(a) and RSS-133(6.5), in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. 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.

FCC ID: A3LSMS901E	 PART 24 MEASUREMENT REPORT 	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
		Page 37 of 84

LTE Band 25/2



FCC ID: A3LSMS901E	PCTEST PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
Page 38 of 84		



FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 39 of 84



FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 40 of 84



FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 41 of 84



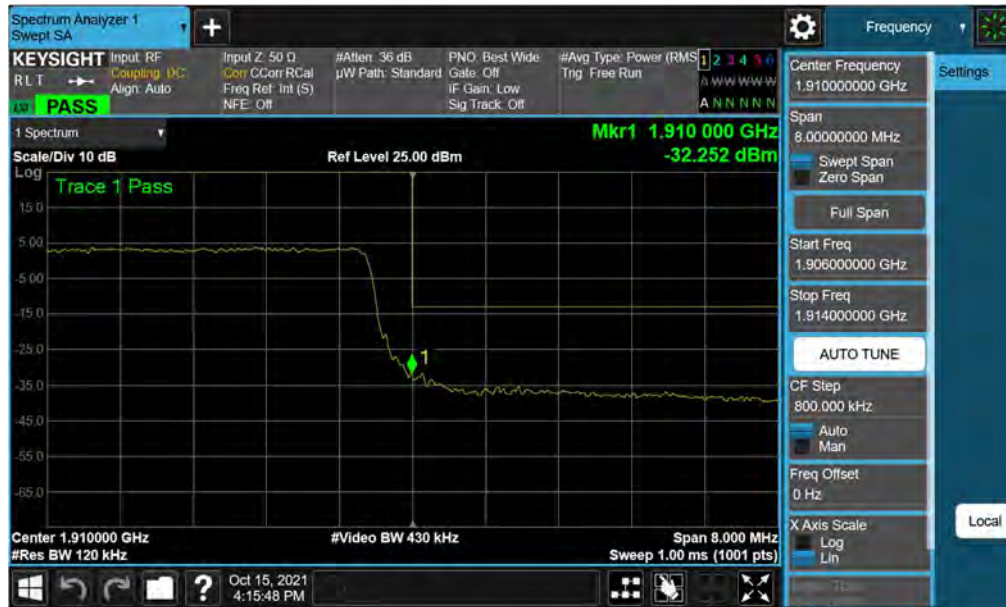
FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 42 of 84



FCC ID: A3LSMS901E	PCTEST PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 - 12/7/2021	EUT Type: Portable Handset
Page 43 of 84		



FCC ID: A3LSMS901E	PCTEST PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
		Page 44 of 84



Plot 7-57. Upper Band Edge Plot (LTE Band 2 - 10MHz QPSK – Full RB)



Plot 7-58. Extended Upper Band Edge Plot (LTE Band 2 - 10MHz QPSK – Full RB)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 45 of 84



FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 46 of 84



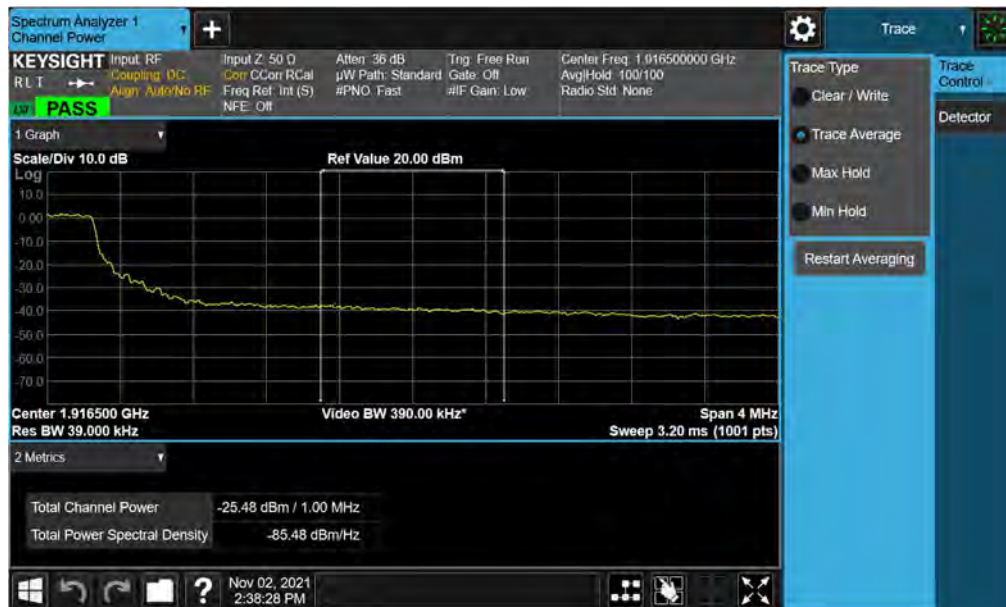
FCC ID: A3LSMS901E	PCTEST PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
		Page 47 of 84



FCC ID: A3LSMS901E	PCTEST PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	Page 48 of 84
	EUT Type: Portable Handset	

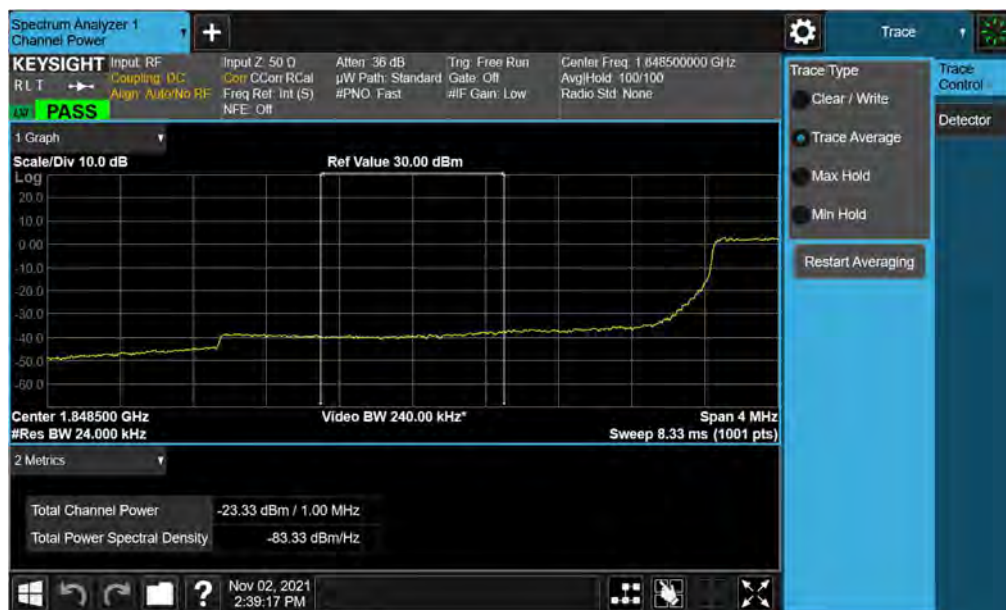
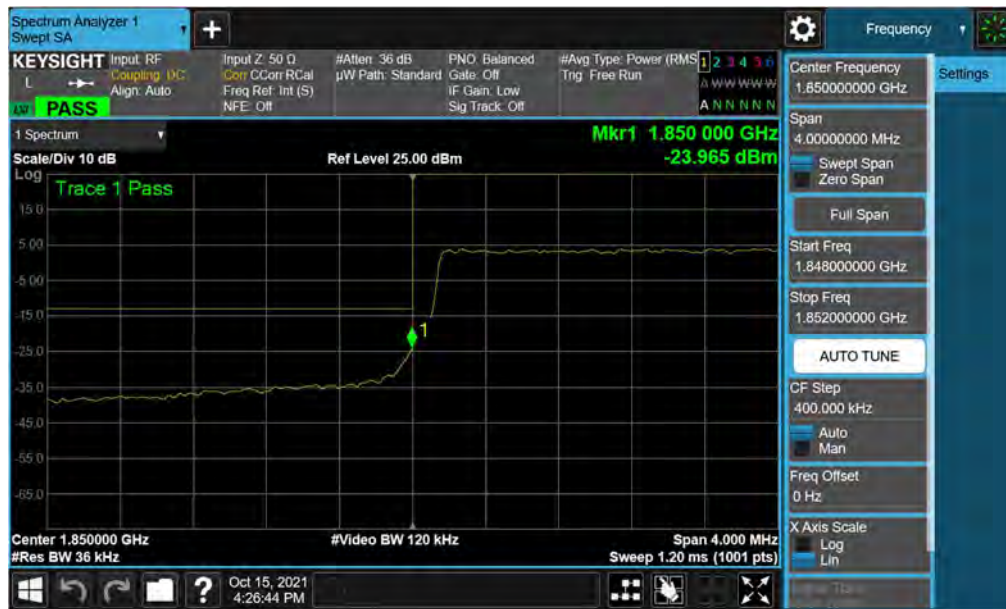


Plot 7-65. Upper Band Edge Plot (LTE Band 25 - 5MHz QPSK – Full RB)



Plot 7-66. Extended Upper Band Edge Plot (LTE Band 25 - 5MHz QPSK – Full RB)

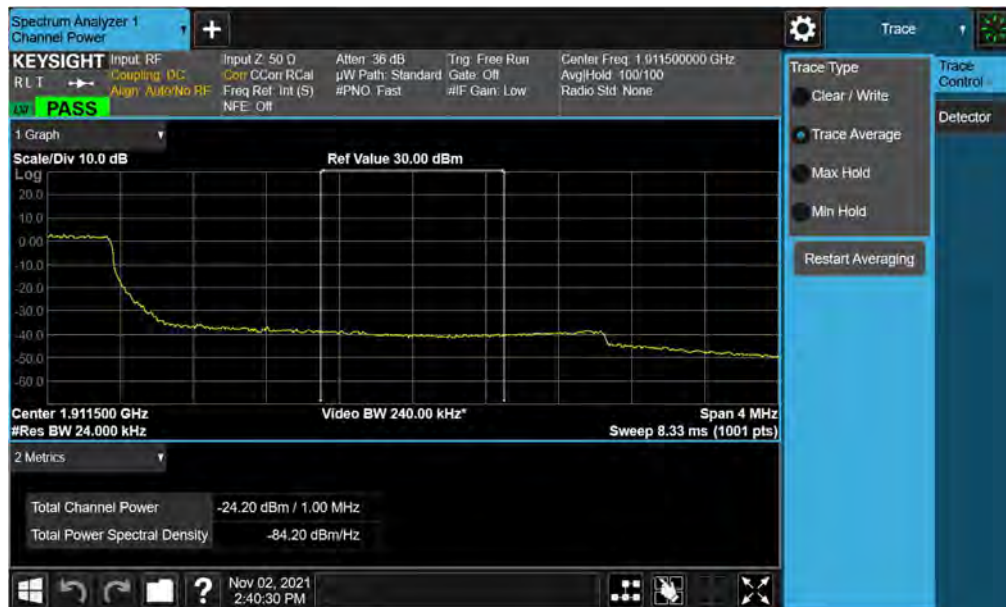
FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 49 of 84



FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 50 of 84



Plot 7-69. Upper Band Edge Plot (LTE Band 2 - 3MHz QPSK – Full RB)

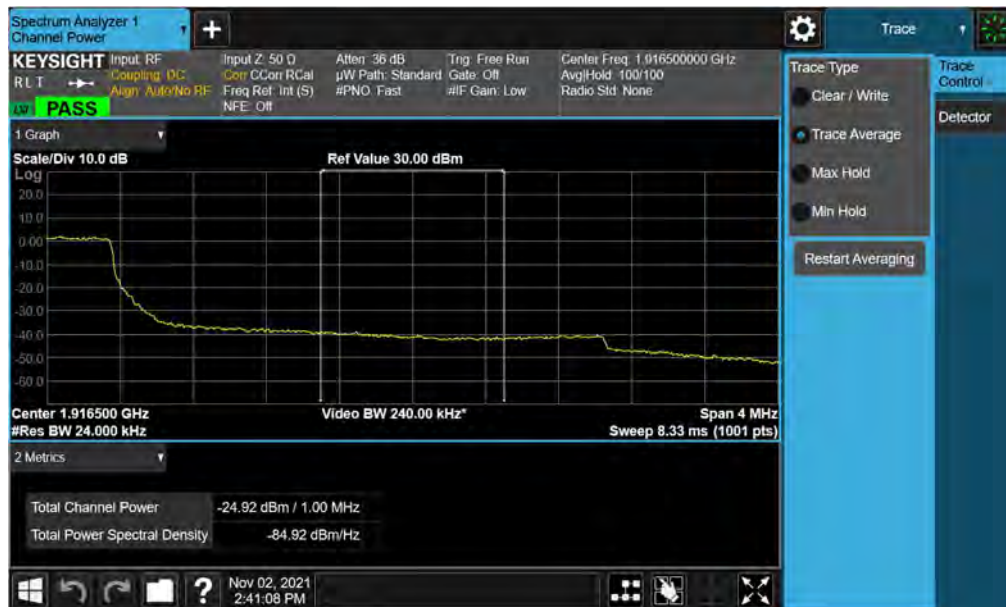


Plot 7-70. Extended Upper Band Edge Plot (LTE Band 2 - 3MHz QPSK – Full RB)

FCC ID: A3LSMS901E	PCTEST PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
Page 51 of 84		



Plot 7-71. Upper Band Edge Plot (LTE Band 25 - 3MHz QPSK – Full RB)



Plot 7-72. Extended Upper Band Edge Plot (LTE Band 25 - 3MHz QPSK – Full RB)

FCC ID: A3LSMS901E	PCTEST PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
Page 52 of 84		



Plot 7-73. Lower Band Edge Plot (LTE Band 25/2 – 1.4MHz QPSK – Full RB)



Plot 7-74. Extended Lower Band Edge Plot (LTE Band 25/2 – 1.4MHz QPSK – Full RB)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 53 of 84



Plot 7-75. Upper Band Edge Plot (LTE Band 2 – 1.4MHz QPSK – Full RB)



Plot 7-76. Extended Upper Band Edge Plot (LTE Band 2 – 1.4MHz QPSK – Full RB)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 54 of 84



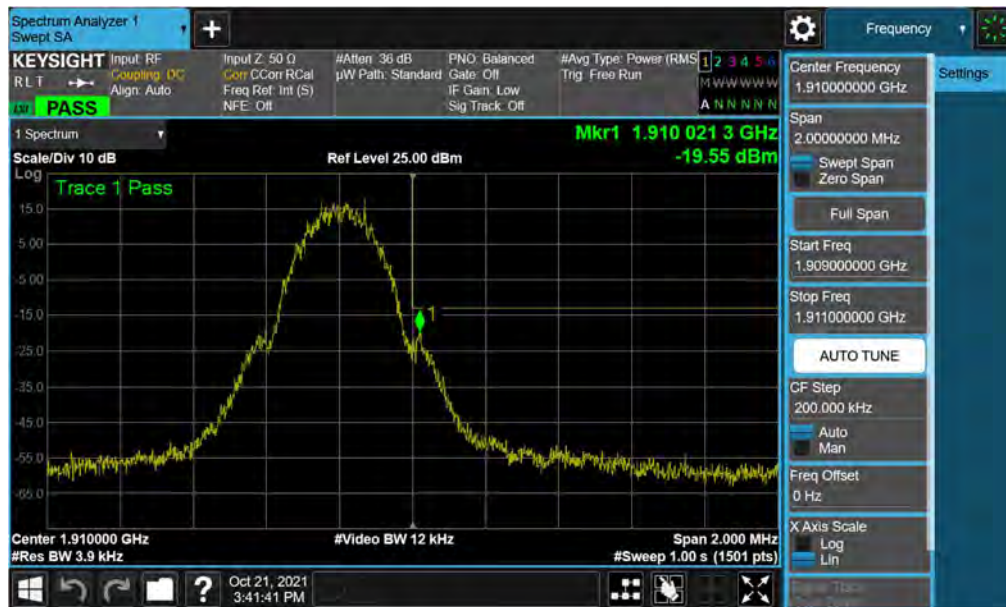
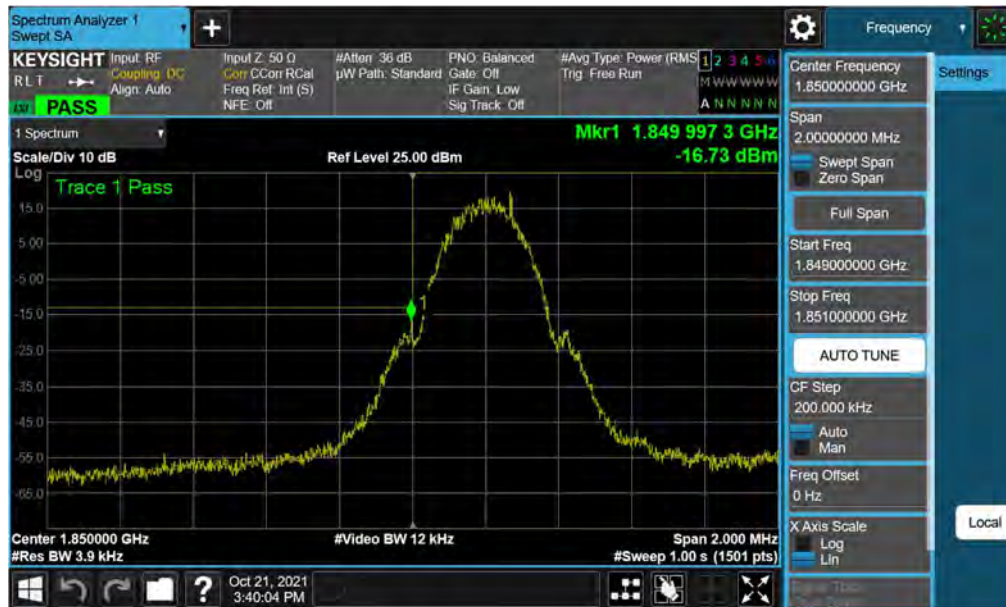
Plot 7-77. Upper Band Edge Plot (LTE Band 25 – 1.4MHz QPSK – Full RB)



Plot 7-78. Extended Upper Band Edge Plot (LTE Band 25 – 1.4MHz QPSK – Full RB)

FCC ID: A3LSMS901E	PCTEST PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
Page 55 of 84		

GSM/GPRS PCS



FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 56 of 84

WCDMA PCS



Plot 7-81. Lower Band Edge Plot (WCDMA PCS – Ch. 9262)



Plot 7-82. Extended Lower Band Edge Plot (WCDMA PCS – Ch. 9262)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset		Page 57 of 84



FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 58 of 84

7.5 Peak-Average Ratio

Test Overview

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 5.7.1

Test Settings

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW $\geq$ OBW or specified reference bandwidth
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

Test Setup

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



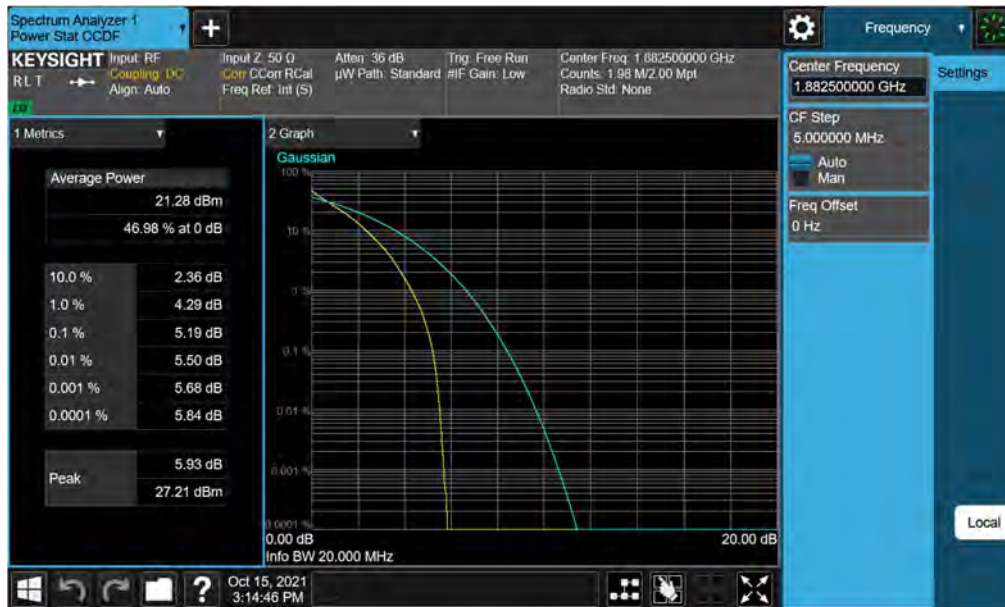
Figure 7-4. Test Instrument & Measurement Setup

Test Notes

None.

FCC ID: A3LSMS901E	 PART 24 MEASUREMENT REPORT 	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
		Page 59 of 84

LTE Band 25/2

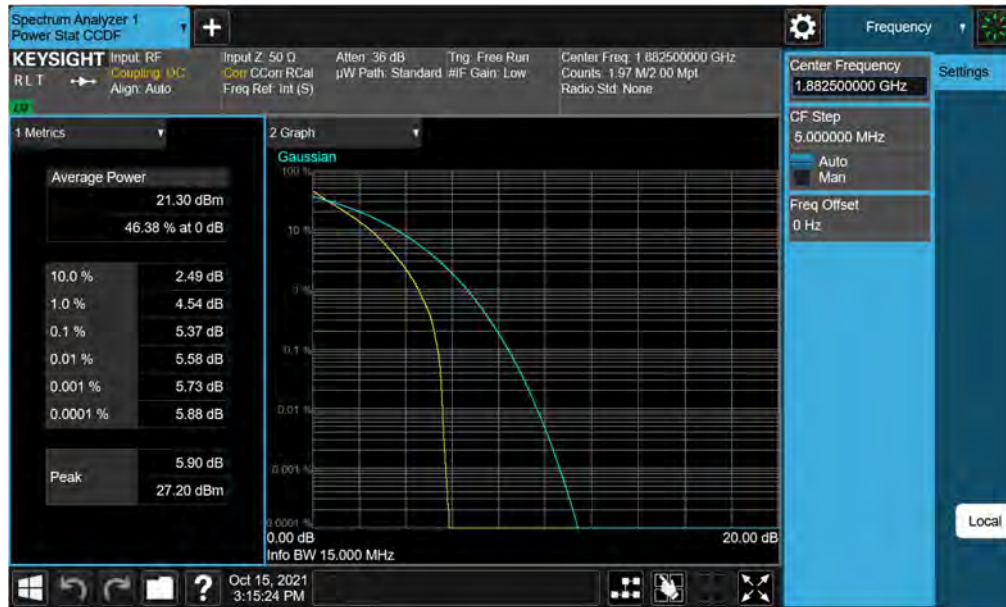


Plot 7-85. PAR Plot (LTE Band 25/2 - 20MHz QPSK - Full RB)

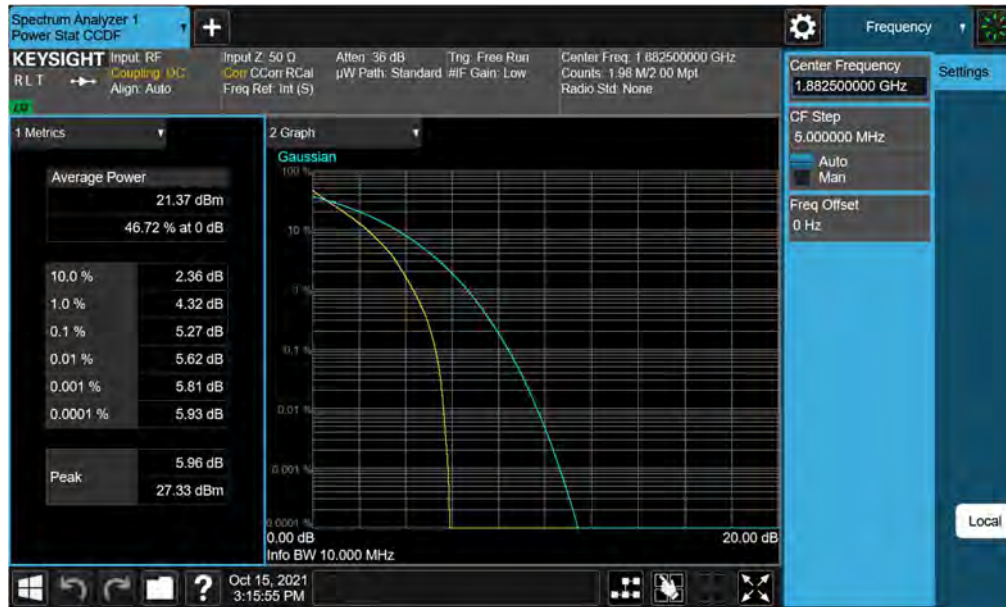


Plot 7-86. PAR Plot (LTE Band 25/2 - 20MHz 256-QAM - Full RB)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 60 of 84



FCC ID: A3LSMS901E	PCTEST PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
		Page 61 of 84

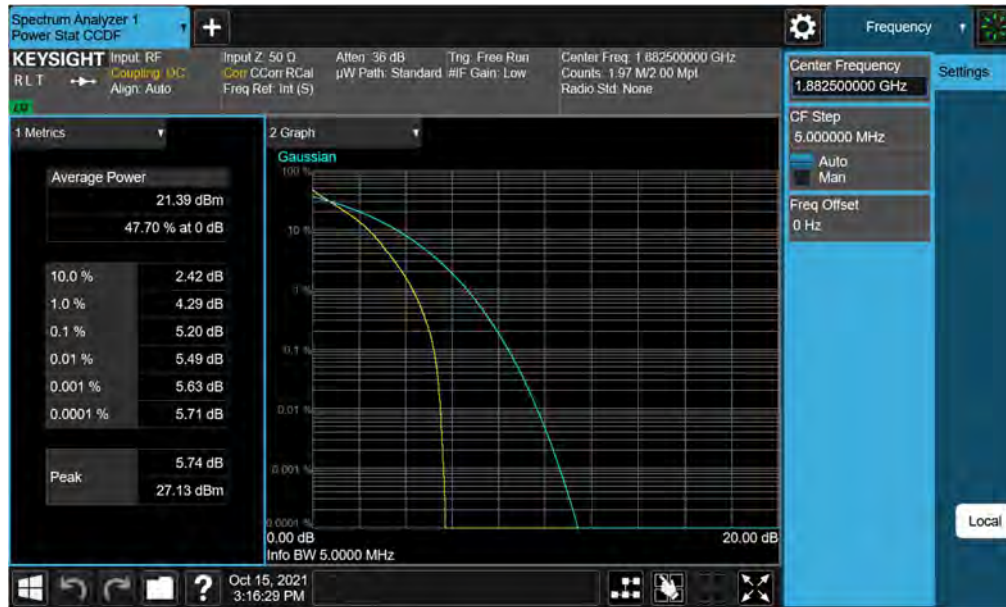


Plot 7-89. PAR Plot (LTE Band 25/2 - 10MHz QPSK - Full RB)



Plot 7-90. PAR Plot (LTE Band 25/2 - 10MHz 256-QAM - Full RB)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 62 of 84

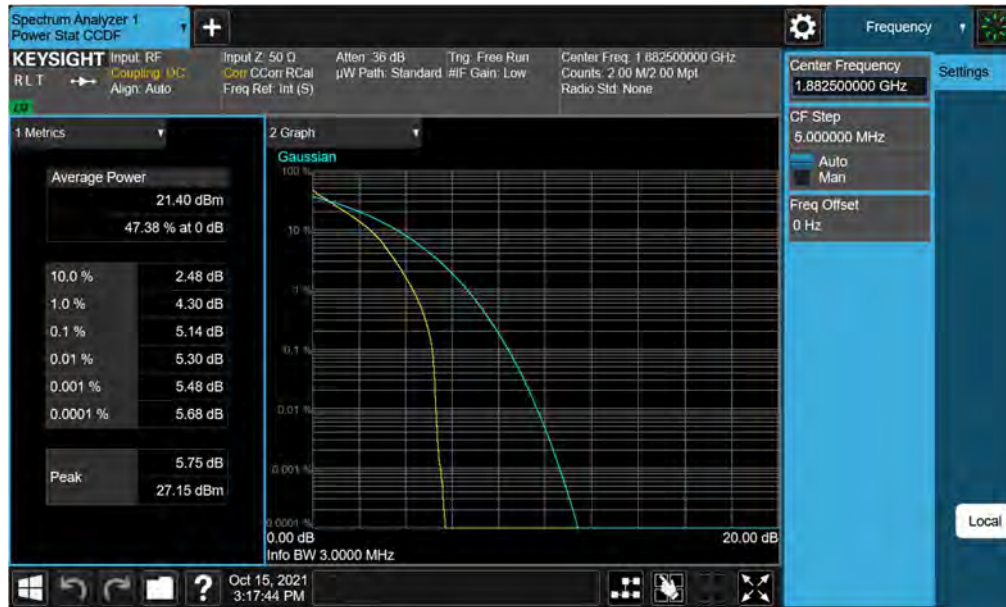


Plot 7-91. PAR Plot (LTE Band 25/2 - 5MHz QPSK - Full RB)



Plot 7-92. PAR Plot (LTE Band 25/2 - 5MHz 256-QAM - Full RB)

FCC ID: A3LSMS901E	PCTEST PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
Page 63 of 84		

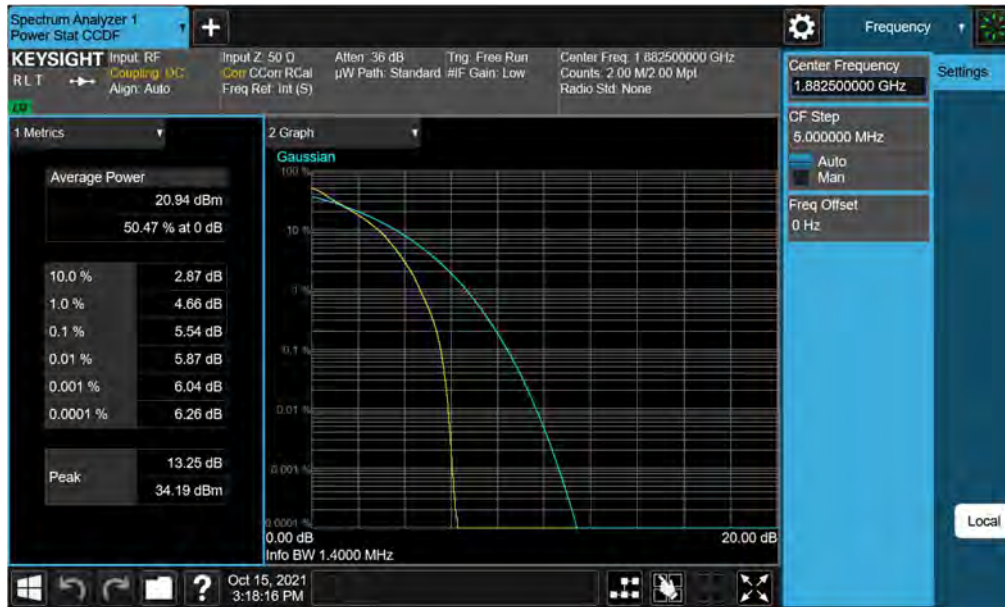


Plot 7-93. PAR Plot (LTE Band 25/2 - 3MHz QPSK - Full RB)

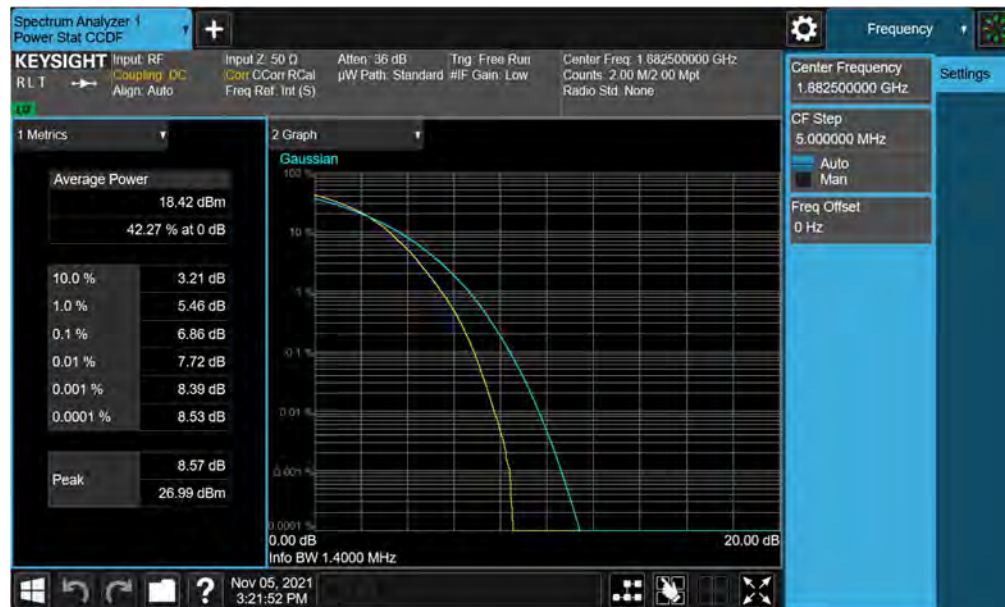


Plot 7-94. PAR Plot (LTE Band 25/2 - 3MHz 256-QAM - Full RB)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 64 of 84



Plot 7-95. PAR Plot (LTE Band 25/2 - 1.4MHz QPSK - Full RB)



Plot 7-96. PAR Plot (LTE Band 25/2 - 1.4MHz 256-QAM - Full RB)

FCC ID: A3LSMS901E	PCTEST PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
		Page 65 of 84

GSM/GPRS PCS



Plot 7-97. PAR Plot (GPRS, Ch. 661)



Plot 7-98. PAR Plot (EDGE, Ch. 661)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 66 of 84

WCDMA PCS



Plot 7-99. PAR Plot (WCDMA, Ch. 9400)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 67 of 84

7.6 Radiated Power (ERP/EIRP)

Test Overview

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.2.1

ANSI/TIA-603-E-2016 – Section 2.2.17

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation. For signals with burst transmission, the signal analyzer's "time domain power" measurement capability is used
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW $\geq 3 \times$ RBW
4. Span = 1.5 times the OBW
5. No. of sweep points $\geq 2 \times$ span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto". Trigger is set to enable triggering only on full power bursts with the sweep time set less than or equal to the transmission burst duration
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation. For signals with burst transmission, the "gating" function was enabled to ensure that measurements are performed during times in which the transmitter is operating at its maximum power
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

FCC ID: A3LSMS901E		PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset		Page 68 of 84

Test Setup

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

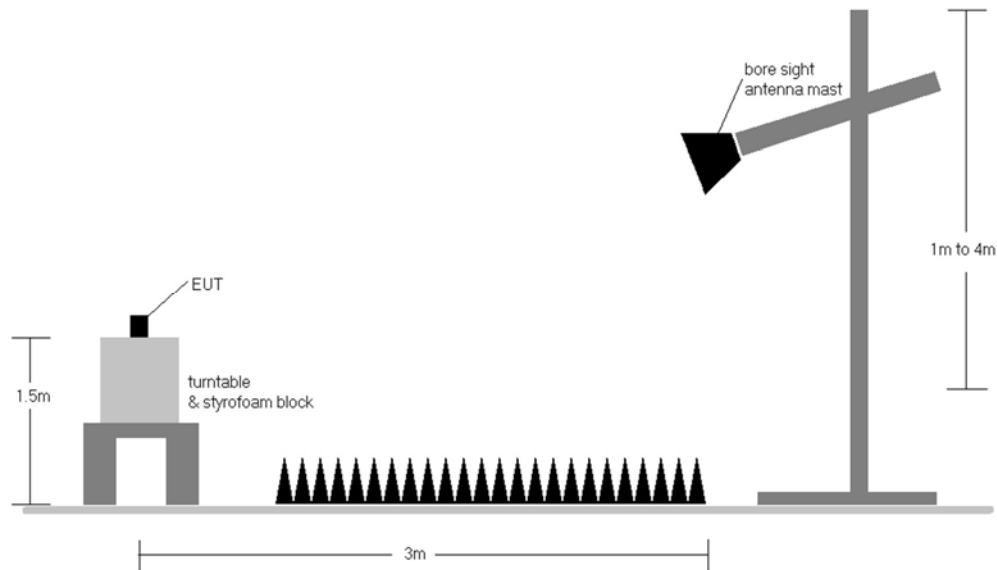


Figure 7-5. Radiated Test Setup >1GHz

Test Notes

- 1) This device employs GSM, GPRS, and EDGE capabilities. The EUT was tested under all configurations and the highest powers is reported in GPRS mode while transmitting with one slot active.
- 2) This device employs UMTS technology with WCDMA (AMR/RMC) and HSDPA capabilities. The EUT was tested under all configurations and the highest power is reported in WCDMA mode with HSDPA Inactive at 12.2 kbps RMC and TPC bits all set to "1".
- 3) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 4) This unit was tested with its standard battery.
- 5) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case setup is reported in the tables below.

FCC ID: A3LSMS901E		PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset		Page 69 of 84

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RE Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
20 MHz	QPSK	1860.0	H	149	162	8.72	1 / 0	12.05	20.77	0.120	33.01	-12.24
	QPSK	1882.5	H	155	165	8.73	1 / 0	12.45	21.18	0.131	33.01	-11.83
	QPSK	1905.0	H	151	188	8.73	1 / 0	11.04	19.77	0.095	33.01	-13.24
	16-QAM	1882.5	H	155	165	8.73	1 / 0	11.05	19.78	0.095	33.01	-13.23
15 MHz	QPSK	1857.5	H	149	162	8.72	1 / 37	12.07	20.79	0.120	33.01	-12.22
	QPSK	1882.5	H	155	165	8.73	1 / 0	12.27	21.00	0.126	33.01	-12.01
	QPSK	1907.5	H	151	188	8.73	1 / 0	10.74	19.47	0.089	33.01	-13.54
	16-QAM	1882.5	H	155	165	8.73	1 / 37	10.82	19.55	0.090	33.01	-13.46
10 MHz	QPSK	1855.0	H	149	162	8.72	1 / 25	12.03	20.75	0.119	33.01	-12.26
	QPSK	1882.5	H	155	165	8.73	1 / 25	12.25	20.98	0.125	33.01	-12.03
	QPSK	1910.0	H	151	188	8.73	1 / 0	10.94	19.67	0.093	33.01	-13.34
	16-QAM	1882.5	H	155	165	8.73	1 / 25	10.95	19.68	0.093	33.01	-13.33
5 MHz	QPSK	1852.5	H	149	162	8.72	1 / 12	11.60	20.32	0.108	33.01	-12.69
	QPSK	1882.5	H	155	165	8.73	1 / 0	11.87	20.60	0.115	33.01	-12.41
	QPSK	1912.5	H	151	188	8.73	1 / 12	10.06	18.79	0.076	33.01	-14.22
	16-QAM	1882.5	H	155	165	8.73	1 / 0	10.77	19.50	0.089	33.01	-13.51
3 MHz	QPSK	1851.5	H	149	162	8.72	1 / 7	11.48	20.20	0.105	33.01	-12.81
	QPSK	1882.5	H	155	165	8.73	1 / 0	11.36	20.09	0.102	33.01	-12.92
	QPSK	1913.5	H	151	188	8.73	1 / 14	10.88	19.61	0.092	33.01	-13.40
	16-QAM	1882.5	H	155	165	8.73	1 / 0	10.22	18.95	0.079	33.01	-14.06
1.4 MHz	QPSK	1850.7	H	149	162	8.72	1 / 3	11.56	20.28	0.107	33.01	-12.73
	QPSK	1882.5	H	155	165	8.73	1 / 0	10.89	19.62	0.092	33.01	-13.39
	QPSK	1914.3	H	151	188	8.73	1 / 3	10.53	19.26	0.084	33.01	-13.75
	16-QAM	1850.7	H	149	162	8.72	1 / 3	10.57	19.29	0.085	33.01	-13.72
20 MHz	Opposite Pol.	1882.5	V	145	317	8.73	1 / 0	11.98	20.71	0.118	33.01	-12.30
	WCP	1882.5	H	112	193	8.73	1 / 0	11.47	20.20	0.105	33.01	-12.81

Table 7-2. EIRP Data (LTE Band 25/2)

Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1850.20	GPRS1900	H	161	163	18.69	8.72	27.41	0.551	33.01	-5.60
1880.00	GPRS1900	H	148	165	18.95	8.73	27.68	0.586	33.01	-5.33
1909.80	GPRS1900	H	144	166	17.73	8.73	26.46	0.443	33.01	-6.55
1880.00	GPRS1900	V	137	319	17.97	8.73	26.70	0.468	33.01	-6.31
1880.00	EDGE1900	H	148	165	14.61	8.73	23.34	0.216	33.01	-9.67
1880.00	GPRS1900 (WCP)	H	143	188	18.02	8.73	26.75	0.473	33.01	-6.26

Table 7-3. EIRP Data (GPRS PCS)

Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1852.40	WCDMA1900	H	154	164	12.01	8.72	20.73	0.118	33.01	-12.28
1880.00	WCDMA1900	H	151	168	12.47	8.73	21.20	0.132	33.01	-11.81
1907.60	WCDMA1900	H	143	194	11.65	8.73	20.38	0.109	33.01	-12.63
1880.00	WCDMA1900	V	142	320	11.18	8.73	19.91	0.098	33.01	-13.10
1880.00	WCDMA1900 (WCP)	H	145	165	12.31	8.73	21.04	0.127	33.01	-11.97

Table 7-4. EIRP Data (WCDMA PCS)

FCC ID: A3LSMS901E	 PART 24 MEASUREMENT REPORT 		Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 70 of 84

7.7 Radiated Spurious Emissions Measurements

Test Overview

Radiated spurious emissions measurements are performed using the field strength conversion method described in KDB 971168 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using horizontally and vertically polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as peak measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.8

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW $\geq 3 \times$ RBW
3. Span = 1.5 times the OBW
4. No. of sweep points $\geq 2 \times$ span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

FCC ID: A3LSMS901E	 PART 24 MEASUREMENT REPORT 	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
Page 71 of 84		

Test Setup

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

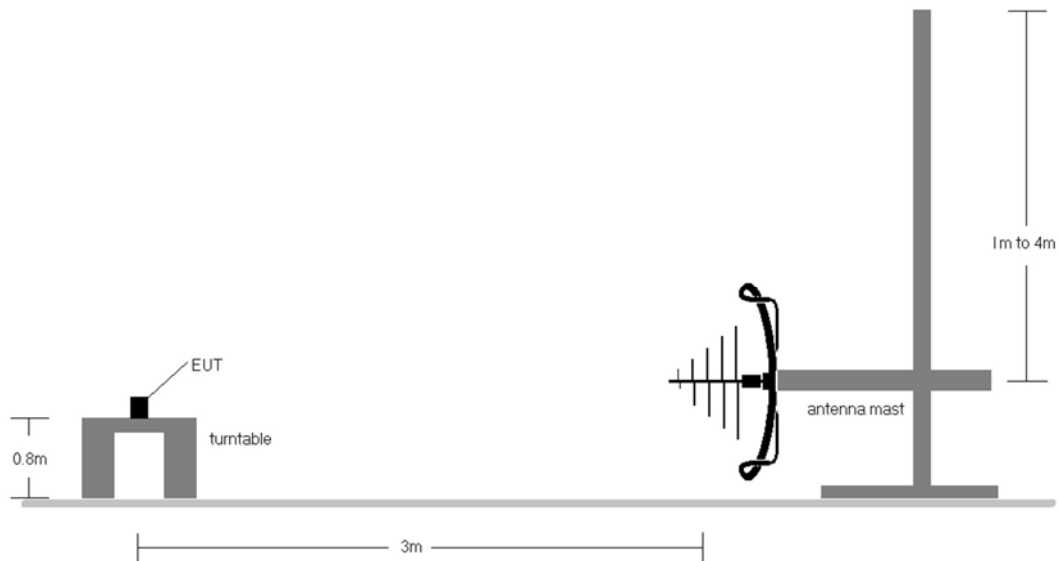


Figure 7-6. Test Instrument & Measurement Setup < 1GHz

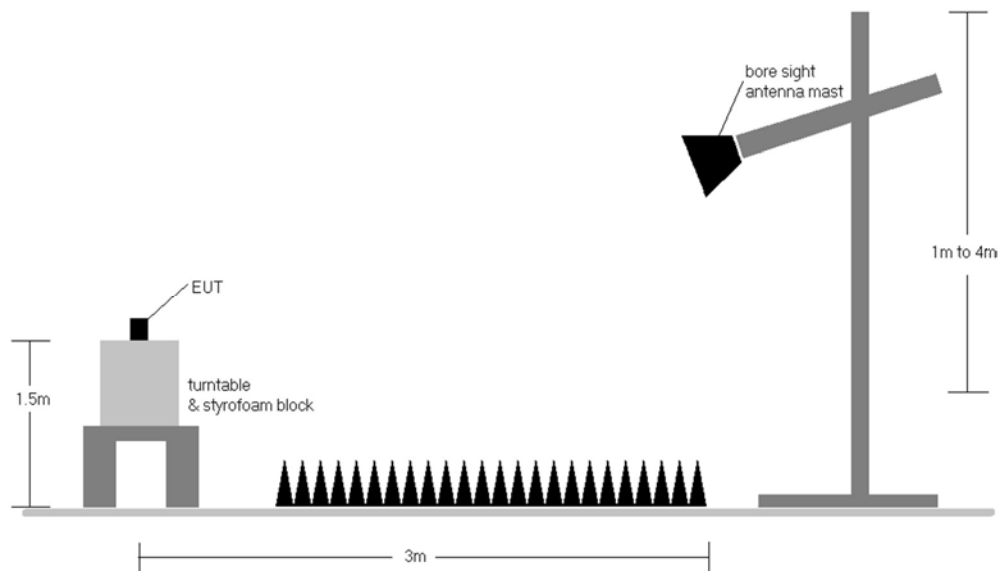


Figure 7-7. Test Instrument & Measurement Setup >1 GHz

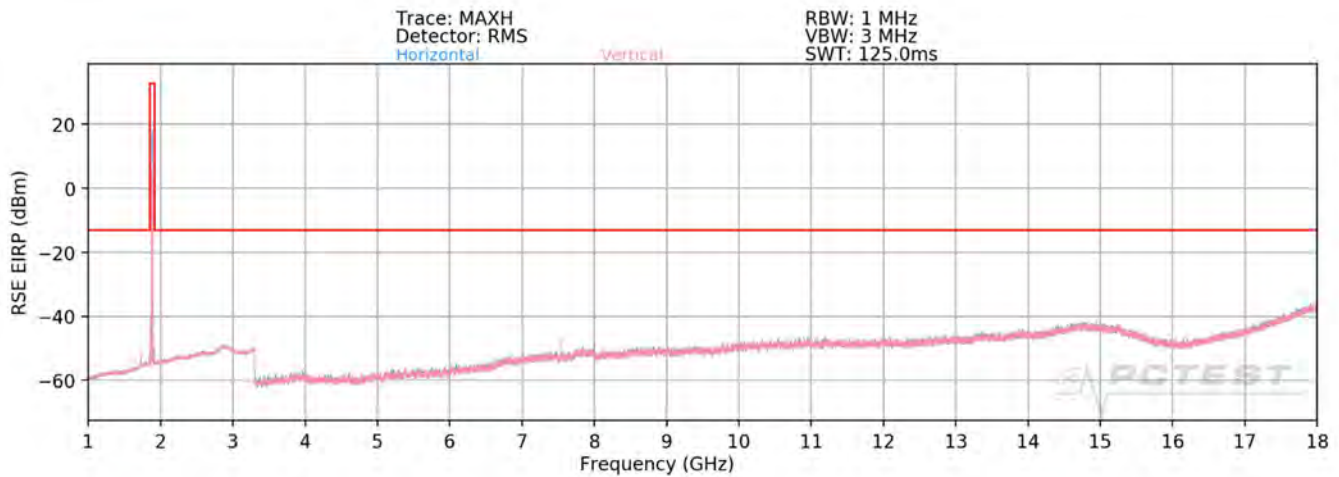
FCC ID: A3LSMS901E		PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset		Page 72 of 84

Test Notes

- 1) Field strengths are calculated using the Measurement quantity conversions in KDB 971168 Section 5.8.4.
 - b) $E(\text{dB}\mu\text{V}/\text{m}) = \text{Measured amplitude level (dBm)} + 107 + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$
 - d) $\text{EIRP (dBm)} = E(\text{dB}\mu\text{V}/\text{m}) + 20\log D - 104.8$; where D is the measurement distance in meters.
- 2) This device employs GSM, GPRS, and EDGE capabilities. The EUT was tested under all configurations and the highest powers is reported in GPRS mode while transmitting with one slot active.
- 3) This device employs UMTS technology with WCDMA (AMR/RMC) and HSDPA capabilities. The EUT was tested under all configurations and the highest power is reported in WCDMA mode with HSDPA Inactive at 12.2 kbps RMC and TPC bits all set to "1".
- 4) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 5) This unit was tested with its standard battery.
- 6) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case setup is reported in the tables below.
- 7) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 8) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
- 9) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

FCC ID: A3LSMS901E	 PART 24 MEASUREMENT REPORT 		Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 73 of 84

LTE Band 25/2



Plot 7-100. Radiated Spurious Plot (LTE Band 25/2)

Bandwidth (MHz):	20
Frequency (MHz):	1860
RB / Offset:	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3720.00	H	-	-	-76.44	3.20	33.76	-61.50	-13.00	-48.50
5580.00	H	-	-	-77.85	6.15	35.30	-59.96	-13.00	-46.96
7440.00	H	128	307	-72.22	9.88	44.66	-50.59	-13.00	-37.59
9300.00	H	-	-	-81.26	10.81	36.55	-58.71	-13.00	-45.71
11160.00	H	-	-	-82.23	12.71	37.48	-57.78	-13.00	-44.78
13020.00	H	-	-	-82.38	15.39	40.01	-55.25	-13.00	-42.25

Table 7-5. Radiated Spurious Data (LTE Band 25/2 – Low Channel)

Bandwidth (MHz):	20
Frequency (MHz):	1882.5
RB / Offset:	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3765.00	H	-	-	-76.74	3.51	33.77	-61.48	-13.00	-48.48
5647.50	H	102	324	-76.95	6.12	36.17	-59.09	-13.00	-46.09
7530.00	H	133	324	-69.36	9.99	47.63	-47.63	-13.00	-34.63
9412.50	H	-	-	-81.49	11.53	37.04	-58.22	-13.00	-45.22
11295.00	H	-	-	-83.10	12.86	36.76	-58.50	-13.00	-45.50
13177.50	H	-	-	-82.47	15.67	40.20	-55.06	-13.00	-42.06

Table 7-6. Radiated Spurious Data (LTE Band 25/2 – Mid Channel)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 74 of 84

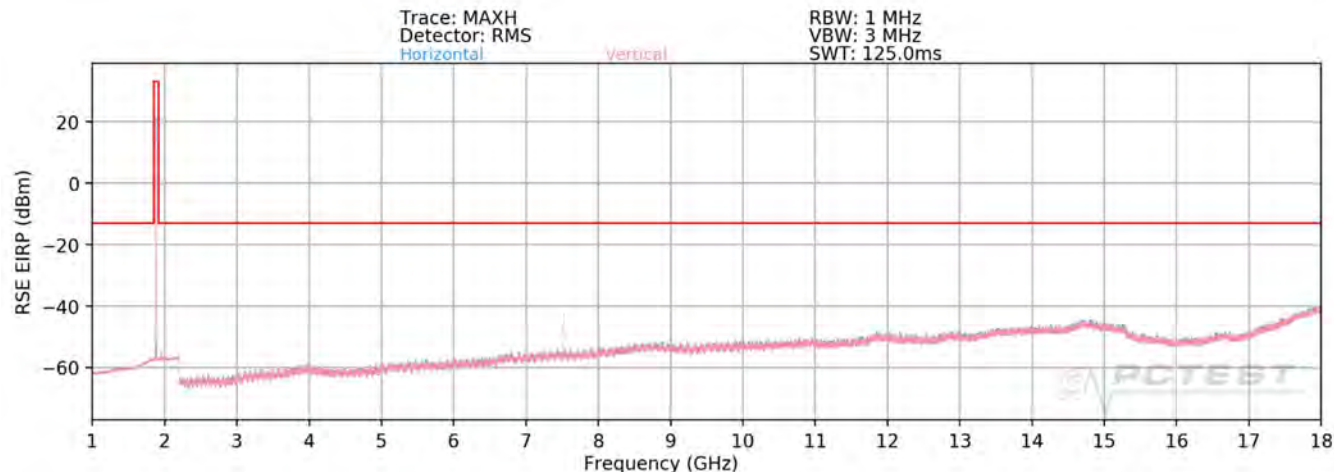
Bandwidth (MHz):	20
Frequency (MHz):	1905
RB / Offset:	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3810.00	H	-	-	-77.73	3.63	32.90	-62.36	-13.00	-49.36
5715.00	H	100	339	-77.66	5.94	35.28	-59.98	-13.00	-46.98
7620.00	H	129	353	-68.90	9.76	47.86	-47.40	-13.00	-34.40
9525.00	H	-	-	-81.51	11.31	36.80	-58.46	-13.00	-45.46
11430.00	H	-	-	-82.49	13.40	37.91	-57.35	-13.00	-44.35
13335.00	H	-	-	-83.30	15.86	39.56	-55.69	-13.00	-42.69

Table 7-7. Radiated Spurious Data (LTE Band 25/2 – High Channel)

FCC ID: A3LSMS901E	 PART 24 MEASUREMENT REPORT 	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
		Page 75 of 84

GSM/GPRS PCS



Plot 7-101. Radiated Spurious Plot (GPRS PCS)

Mode:	GPRS 1 Tx Slot
Channel:	512
Frequency (MHz):	1850.2

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3700.40	V	128	224	-67.84	-0.23	38.93	-56.33	-13.00	-43.33
5550.60	V	111	233	-68.62	3.88	42.26	-53.00	-13.00	-40.00
7400.80	V	100	240	-63.13	8.54	52.41	-42.85	-13.00	-29.85
9251.00	V	-	-	-73.49	11.93	45.44	-49.82	-13.00	-36.82
11101.20	V	-	-	-73.34	13.38	47.04	-48.22	-13.00	-35.22
12951.40	V	-	-	-73.82	16.25	49.43	-45.83	-13.00	-32.83

Table 7-8. Radiated Spurious Data (GPRS PCS – Low Channel)

Mode:	GPRS 1 Tx Slot
Channel:	661
Frequency (MHz):	1880

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3760.00	V	101	200	-67.89	0.35	39.46	-55.80	-13.00	-42.80
5640.00	V	100	228	-66.67	3.16	43.49	-51.77	-13.00	-38.77
7520.00	V	100	235	-60.78	8.45	54.67	-40.59	-13.00	-27.59
9400.00	V	-	-	-72.62	11.95	46.33	-48.93	-13.00	-35.93
11280.00	V	-	-	-74.17	13.41	46.24	-49.02	-13.00	-36.02
13160.00	V	-	-	-74.12	16.25	49.13	-46.12	-13.00	-33.12

Table 7-9. Radiated Spurious Data (GPRS PCS – Mid Channel)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 76 of 84

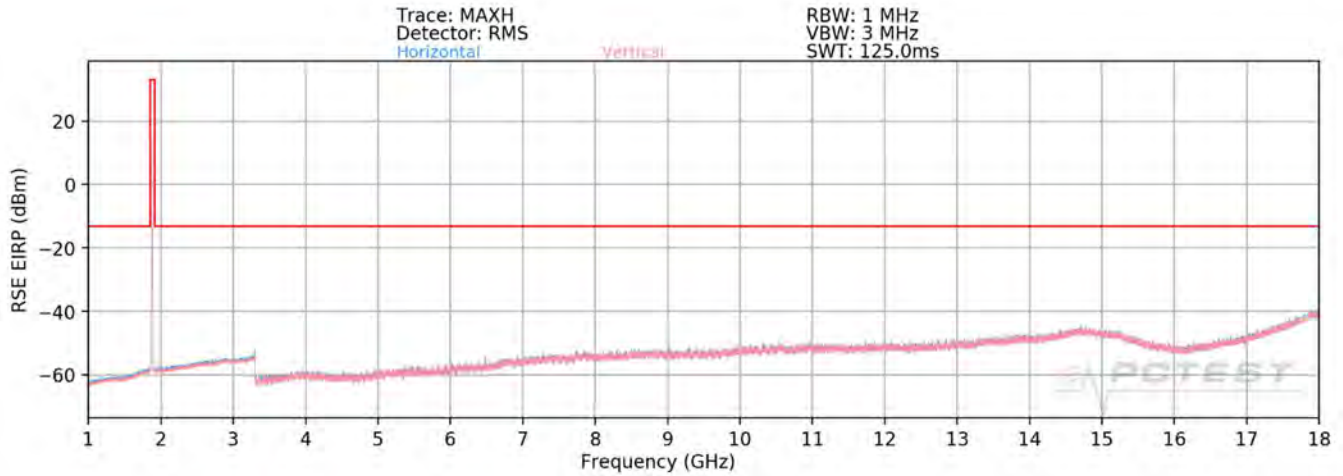
Mode:	GPRS 1 Tx Slot
Channel:	810
Frequency (MHz):	1909.8

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3819.60	V	100	195	-66.23	1.25	42.02	-53.23	-13.00	-40.23
5729.40	V	100	222	-63.52	3.85	47.33	-47.93	-13.00	-34.93
7639.20	V	100	245	-58.50	8.63	57.13	-38.13	-13.00	-25.13
9549.00	V	-	-	-73.64	11.85	45.21	-50.05	-13.00	-37.05
11458.80	V	-	-	-74.72	14.09	46.37	-48.88	-13.00	-35.88
13368.60	V	-	-	-75.18	17.03	48.85	-46.41	-13.00	-33.41

Table 7-10. Radiated Spurious Data (GPRS PCS – High Channel)

FCC ID: A3LSMS901E	 PART 24 MEASUREMENT REPORT 	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
		Page 77 of 84

WCDMA PCS



Plot 7-102. Radiated Spurious Plot (WCDMA PCS)

Mode:	WCDMA RMC
Channel:	9262
Frequency (MHz):	1852.4

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3704.80	H	-	-	-76.98	-0.24	29.78	-65.48	-13.00	-52.48
5557.20	H	-	-	-78.86	3.95	32.09	-63.17	-13.00	-50.17
7409.60	H	-	-	-80.62	8.55	34.93	-60.33	-13.00	-47.33
9262.00	H	-	-	-81.52	11.92	37.40	-57.86	-13.00	-44.86

Table 7-11. Radiated Spurious Data (WCDMA PCS – Low Channel)

Mode:	WCDMA RMC
Channel:	9400
Frequency (MHz):	1880

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3760.00	H	-	-	-77.75	0.35	29.60	-65.66	-13.00	-52.66
5640.00	H	-	-	-78.36	3.16	31.80	-63.46	-13.00	-50.46
7520.00	H	-	-	-80.92	8.45	34.53	-60.73	-13.00	-47.73
9400.00	H	-	-	-81.70	11.95	37.25	-58.01	-13.00	-45.01

Table 7-12. Radiated Spurious Data (WCDMA PCS – Mid Channel)

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 78 of 84

Mode:	WCDMA RMC
Channel:	9538
Frequency (MHz):	1907.6

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3815.20	H	-	-	-77.14	1.21	31.07	-64.18	-13.00	-51.18
5722.80	H	-	-	-78.66	3.66	32.00	-63.26	-13.00	-50.26
7630.40	H	-	-	-80.49	8.50	35.01	-60.25	-13.00	-47.25
9538.00	H	-	-	-81.99	11.86	36.87	-58.39	-13.00	-45.39

Table 7-13. Radiated Spurious Data (WCDMA PCS – High Channel)

FCC ID: A3LSMS901E	 PART 24 MEASUREMENT REPORT 	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
		Page 79 of 84

7.8 Frequency Stability / Temperature Variation

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-E-2016. The frequency stability of the transmitter is measured by:

- a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.
- b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

Test Procedure Used

ANSI/TIA-603-E-2016

Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a "standby" condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Test Setup

The EUT was connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

Test Notes

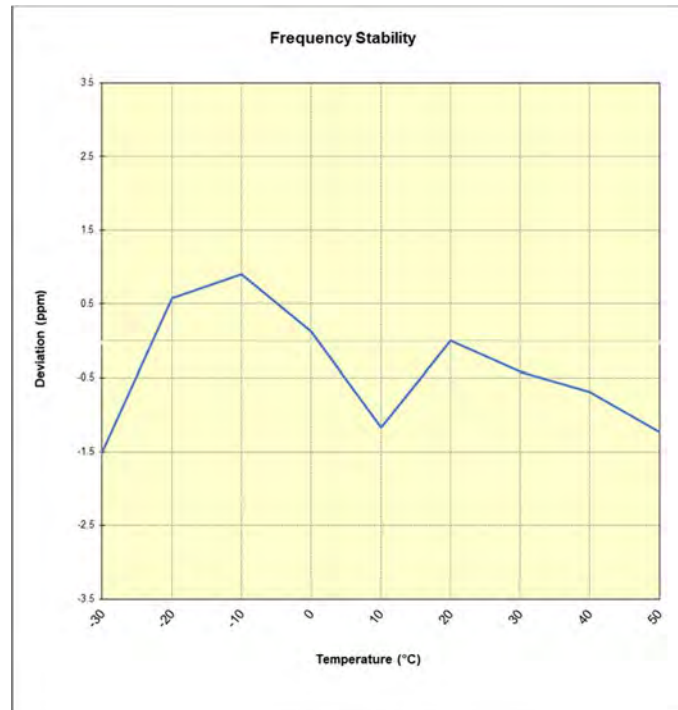
None

FCC ID: A3LSMS901E		PART 24 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset		Page 80 of 84

LTE Band 25/2

LTE Band 25/2					
Operating Frequency (Hz):			1,882,500,000		
Ref. Voltage (VDC):			4.40		
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.40	- 30	1,882,491,364	-2,845	-0.0001511
		- 20	1,882,495,288	1,080	0.0000574
		- 10	1,882,495,910	1,702	0.0000904
		0	1,882,494,445	237	0.0000126
		+ 10	1,882,492,015	-2,193	-0.0001165
		+ 20 (Ref)	1,882,494,208	0	0.0000000
		+ 30	1,882,493,422	-786	-0.0000418
		+ 40	1,882,492,922	-1,286	-0.0000683
		+ 50	1,882,491,879	-2,329	-0.0001237
Battery Endpoint	3.85	+ 20	1,882,493,662	-546	-0.0000290

Table 7-14. LTE Band 25/2 Frequency Stability Data



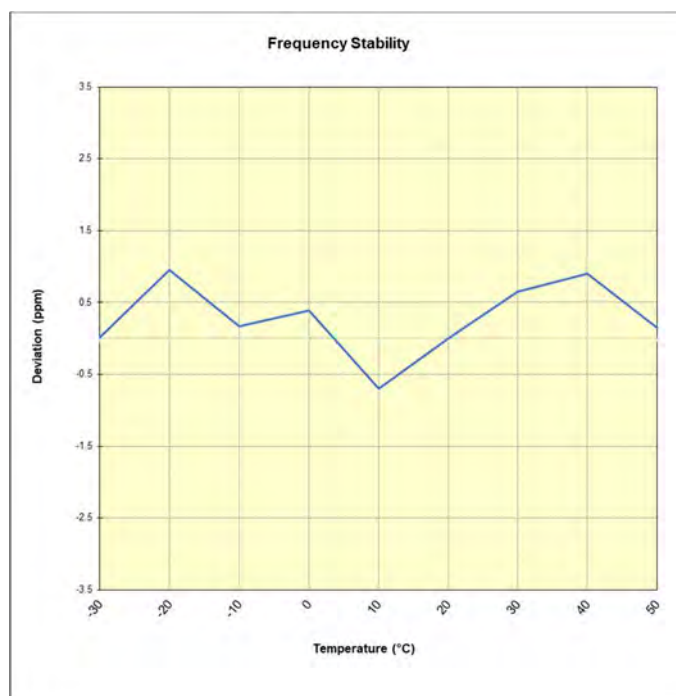
Plot 7-103. LTE Band 25/2 Frequency Stability Chart

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 81 of 84

GSM/GPRS PCS

GSM/GPRS PCS					
Operating Frequency (Hz):			1,880,000,000		
Ref. Voltage (VDC):			4.40		
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.40	- 30	1,879,999,974	24	0.0000013
		- 20	1,880,001,744	1,794	0.0000954
		- 10	1,880,000,268	318	0.0000169
		0	1,880,000,674	724	0.0000385
		+ 10	1,879,998,629	-1,321	-0.0000703
		+ 20 (Ref)	1,879,999,950	0	0.0000000
		+ 30	1,880,001,181	1,231	0.0000655
		+ 40	1,880,001,651	1,701	0.0000905
		+ 50	1,880,000,228	278	0.0000148
Battery Endpoint	3.85	+ 20	1,880,001,091	1,141	0.0000607

Table 7-15. GSM/GPRS PCS Frequency Stability Data



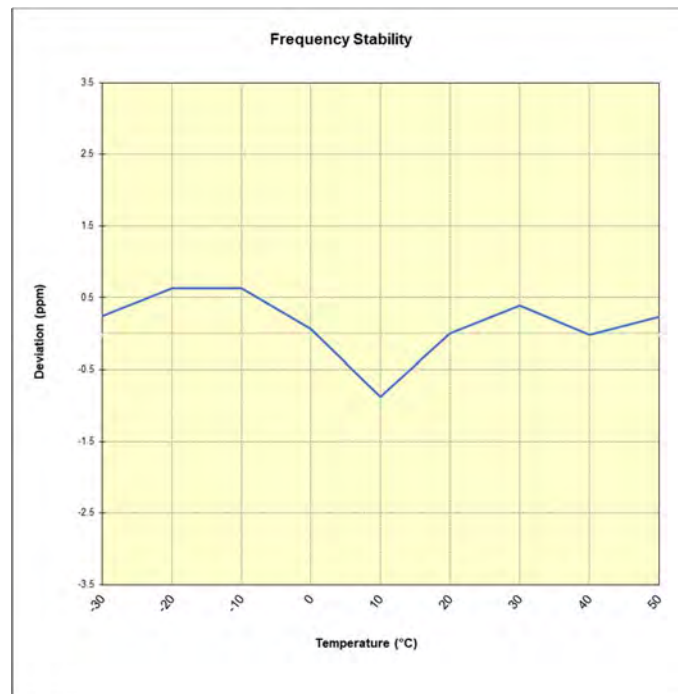
Plot 7-104. GSM/GPRS PCS Frequency Stability Chart

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 82 of 84

WCDMA PCS

WCDMA PCS					
Operating Frequency (Hz):			1,880,000,000		
Ref. Voltage (VDC):			4.40		
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.40	- 30	1,879,990,505	449	0.0000239
		- 20	1,879,991,243	1,187	0.0000631
		- 10	1,879,991,231	1,175	0.0000625
		0	1,879,990,177	121	0.0000064
		+ 10	1,879,988,403	-1,653	-0.0000879
		+ 20 (Ref)	1,879,990,056	0	0.0000000
		+ 30	1,879,990,779	723	0.0000385
		+ 40	1,879,990,012	-44	-0.0000023
		+ 50	1,879,990,490	434	0.0000231
Battery Endpoint	3.85	+ 20	1,879,989,266	-790	-0.0000420

Table 7-16. WCDMA PCS Frequency Stability Data



Plot 7-105. WCDMA PCS Frequency Stability Chart

FCC ID: A3LSMS901E	PCTEST Proud to be part of	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset	Page 83 of 84

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the Samsung **Portable Handset** **FCC ID: A3LSMS901E** complies with all the requirements of Part 24 of the FCC rules.

FCC ID: A3LSMS901E	 PART 24 MEASUREMENT REPORT 	Approved by: Technical Manager
Test Report S/N: 1M2109290114-03.A3L	Test Dates: 10/14/2021 – 12/7/2021	EUT Type: Portable Handset
		Page 84 of 84