

### PCTEST

13, Heungdeok 1-ro, Giheung-gu, Yongin-si, Gyeonggi-do, 16954 South Korea Tel. 031.660.7319 / Fax 031.660.7318 http://www.pctest.com



# PART 90 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 – 12/8/2021 **Test Report Issue Date:** 12/17/2021 **Test Site/Location:** PCTEST Lab. Yongin-Si, Gyeonggi-do, South Korea **Test Report Serial No.:** 1M2110010116-06.A3L

# FCC ID:

**APPLICANT:** 

### A3LSMS906E

Samsung Electronics Co., Ltd.

Application Type: Model: Additional Model(s): EUT Type: FCC Classification: FCC Rule Part: Test Procedure(s): Certification SM-S906E/DS SM-S906E Portable Handset PCS Licensed Transmitter Held to Ear (PCE) §2.1049, §22(H), §90(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

N

Reviewed by

FCC ID: A3LSMS906E	PCTEST° Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:		Page 1 of 34	
1M2110010116-06.A3L	10/14/2021 - 12/8/2021	Portable Handset	table Handset		
© 2020 PCTEST	-			V2.0 4/7/2021	



# TABLE OF CONTENTS

1.0	INTR	ODUCTION	4
	1.1	Scope	4
	1.2	PCTEST Test Location	4
	1.3	Test Facility / Accreditations	4
2.0	PRO	DUCT 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	DESC	CRIPTION OF TESTS	6
	3.1	Evaluation Procedure	6
	3.2	Radiated Power and Radiated Spurious Emissions	6
4.0	MEAS	SUREMENT UNCERTAINTY	7
5.0	TEST	EQUIPMENT CALIBRATION DATA	8
6.0	SAM	PLE CALCULATIONS	9
7.0	TEST	RESULTS	10
	7.1	Summary	10
	7.2	Occupied Bandwidth	11
	7.3	Spurious and Harmonic Emissions at Antenna Terminal	17
	7.4	Band Edge Emissions at Antenna Terminal	20
	7.5	Conducted Power Output Data	25
	7.6	Radiated Power (ERP)	26
	7.7	Radiated Spurious Emissions Measurements	29
	7.8	Frequency Stability / Temperature Variation	32
8.0	CON	CLUSION	34

FCC ID: A3LSMS906E	PCTEST° Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dage 2 of 24	
1M2110010116-06.A3L	10/14/2021 - 12/8/2021	Portable Handset	Page 2 of 34	
© 2020 PCTEST V2.0 4/7/2021				





# MEASUREMENT REPORT FCC Part 22 & 90



Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	Measurement	Max. Power [W]	Max. Power [dBm]	Emission Designator
	15 MHz	QPSK	821.5	ERP	0.073	18.61	13M6G7D
		16QAM	821.5	ERP	0.060	17.76	13M6W7D
	15 MHz	QPSK	821.5	Conducted	0.263	24.20	13M6G7D
		16QAM	821.5	Conducted	0.220	23.42	13M6W7D
	10 MHz	QPSK	819.0	Conducted	0.286	24.56	9M04G7D
LTE Band 26		16QAM	819.0	Conducted	0.240	23.79	9M05W7D
LTE Ballu 20	5 MHz	QPSK	816.5 - 821.5	Conducted	0.275	24.39	4M56G7D
		16QAM	816.5 - 821.5	Conducted	0.237	23.74	4M56W7D
	2 MU	QPSK	815.5 - 822.5	Conducted	0.274	24.37	2M73G7D
3 MH	3 MHz	16QAM	815.5 - 822.5	Conducted	0.238	23.77	2M73W7D
	1.4 MHz	QPSK	814.7 - 823.3	Conducted	0.282	24.50	1M11G7D
	1.4 IVI⊓Z	16QAM	814.7 - <mark>8</mark> 23.3	Conducted	0.237	23.75	1M11W7D

**EUT Overview** 

FCC ID: A3LSMS906E	Proved to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Page 3 of 34
1M2110010116-06.A3L	10/14/2021 - 12/8/2021	Portable Handset	Fage 3 01 34
© 2020 PCTEST			V2.0 4/7/2021



# **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 ISED Standards (RSS).
- PCTEST facility is a registered (26168) test laboratory with the site description on file with ISED.

FCC ID: A3LSMS906E	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: Test Dates:		EUT Type:	Dage 4 of 24
1M2110010116-06.A3L	10/14/2021 - 12/8/2021	Portable Handset	Page 4 of 34
© 2020 PCTEST		•	V2.0 4/7/2021



# 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMS906E**. 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.

Test Device Serial No.: 1457M, 2321M

### 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, Ultra Wideband

### 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: A3LSMS906E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dago E of 24	
1M2110010116-06.A3L	10/14/2021 – 12/8/2021	Portable Handset	Page 5 of 34	
© 2020 PCTEST		·	V2.0 4/7/2021	



# 3.0 DESCRIPTION OF TESTS

### 3.1 Evaluation Procedure

The measurement procedures described in the document titled "Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards" (ANSI/TIA-603-E-2016) and "Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems" (KDB 971168 D01 v03r01) were used in the measurement of the EUT.

### 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 wooden turntable 80cm above the ground plane and 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. Radiated power levels are also investigated with the receive antenna horizontally and vertically polarized. The maximized power level is recorded using the spectrum analyzer "Channel Power" function with the integration band set to the emissions' occupied bandwidth, a RMS detector, RBW = 100kHz, VBW = 300kHz, and a 1 second sweep time over a minimum of 10 sweeps, per the guidelines of KDB 971168 D01 v03r01.

Per the guidance of ANSI/TIA-603-E-2016, a half-wave dipole is then 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:

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

For fundamental radiated power measurements, the guidance of KDB 971168 D01 v03r01 is used to record the EUT power level that is subsequently matched via the aforementioned substitution method given in ANSI/TIA-603-E-2016.

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.

FCC ID: A3LSMS906E	PCTEST° Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dama 6 of 24	
1M2110010116-06.A3L	10/14/2021 - 12/8/2021	Portable Handset		Page 6 of 34	
© 2020 PCTEST	•			V2.0 4/7/2021	



# 4.0 MEASUREMENT UNCERTAINTY

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

Contribution	Expanded Uncertainty (±dB)
Conducted Bench Top Measurements	1.20
Radiated Disturbance (<1GHz)	3.01
Radiated Disturbance (>1GHz)	5.56
Radiated Disturbance (>18GHz)	3.16

FCC ID: A3LSMS906E	PCTEST* Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 7 of 24
1M2110010116-06.A3L	10/14/2021 – 12/8/2021	Portable Handset	Page 7 of 34
© 2020 PCTEST	·	•	V2.0 4/7/2021



# 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
Anritsu	MA24106A	USB Power Sensor	2/19/2021	Annual	2/18/2022	1344557
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	10/29/2020	Biennial	10/28/2022	10160045
Com-Power	PAM-118A	Preamplifier	7/7/2021	Annual	7/6/2022	551042
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:

- 1. 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.
- 2. Equipment with a calibration date of "N/A" shown in this list was not used to make direct calibrated measurements.

FCC ID: A3LSMS906E	PCTEST Proof to be part of @ element MEASUREMENT REPORT (CERTIFICATION)		SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		
1M2110010116-06.A3L	10/14/2021 - 12/8/2021	Portable Handset		Page 8 of 34
© 2020 PCTEST				V2.0 4/7/2021



# 6.0 SAMPLE CALCULATIONS

### **Emission Designator**

#### **QPSK Modulation**

#### Emission Designator = 8M62G7D

LTE BW = 8.62 MHz G = Phase Modulation 7 = Quantized/Digital Info D = Data transmission, telemetry, telecommand

#### **QAM Modulation**

#### Emission Designator = 8M45W7D

LTE BW = 8.45 MHz W = Amplitude/Angle Modulated 7 = Quantized/Digital Info D = Data transmission, telemetry, telecommand

### Spurious Radiated Emission – LTE Band

#### Example: Middle Channel LTE Mode 2<sup>nd</sup> Harmonic (1564 MHz)

The average spectrum analyzer reading at 3 meters with the EUT on the turntable was -81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of -81.0 dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 1564 MHz. So 6.1 dB is added to the signal generator reading of -30.9 dBm yielding -24.80 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm - (-24.80).

FCC ID: A3LSMS906E	PCTEST° Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 9 of 34
1M2110010116-06.A3L	10/14/2021 - 12/8/2021	Portable Handset		Page 9 01 34
© 2020 PCTEST	V2.0 4/7/2021			



# 7.0 TEST RESULTS

### 7.1 Summary

Company Name:	Samsung Electronics Co., Ltd.
FCC ID:	A3LSMS906E
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
Mode(s):	<u>LTE</u>

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
	Occupied Bandwidth	2.1049	N/A	PASS	Section 7.2
3	Conducted Band Edge / Spurious Emissions (LTE Band 26)	2.1051, 90.691(a)	<ul> <li>&gt; 43 + 10 log10(P[Watts]) for all out-of-band emissions except emissions beyond 37.5kHz from the block edge</li> <li>&gt; 50 + 10 log10(P[Watts]) at Band Edge and for all out-</li> </ul>	PASS	Sections 7.3, 7.4
CONE	Frequency Stability	2.1055, 90.213	< 2.5 ppm	PASS	Section 7.8
	Conducted Power	2.1046, 90.635	< 100 Watts	PASS	Section 7.5
ED	Effective Radiated Power (LTE Band 26)	22.913(a)(2)	< 7 Watts max. ERP	PASS	Section 7.6
-	Radiated Spurious Emissions (LTE Band 26)	2.1053, 90.691(a)	<ul> <li>&gt; 43 + 10 log10(P[Watts]) for all out-of-band emissions except emissions beyond 37.5kHz from the block edge</li> <li>&gt; 50 + 10 log10(P[Watts]) at Band Edge and for all out- of-band emissions within 37.5kHz of Block Edge</li> </ul>	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 shown in Section 7.0 were taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
- For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST EMC Software Tool v1.0.

FCC ID: A3LSMS906E	PCTEST° Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dega 10 of 24
1M2110010116-06.A3L	10/14/2021 - 12/8/2021	Portable Handset		Page 10 of 34
© 2020 PCTEST	•			V2.0 4/7/2021



## 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 x RBW
- 4. Detector = Peak
- 5. Trace mode = max hold
- 6. Sweep = auto couple
- 7. The trace was allowed to stabilize
- 8. If necessary, steps 2 7 were repeated after changing the RBW such that it would be within
  - 1-5% of the 99% occupied bandwidth observed in Step 7

#### Test Setup

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



Figure 7-1. Test Instrument & Measurement Setup

#### Test Notes

None.

FCC ID: A3LSMS906E	PCTEST° Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager		
Test Report S/N:	Test Dates:	EUT Type:		Dage 11 of 24		
1M2110010116-06.A3L	10/14/2021 - 12/8/2021	21 – 12/8/2021 Portable Handset		Page 11 of 34		
© 2020 PCTEST V2.0 4/7/2021						



# LTE Band 26



Plot 7-1. Occupied Bandwidth Plot (LTE Band 26 - 15MHz QPSK - Full RB)

Spectrum Analy Occupied BW KEYSIGHT RLT	, i l	+ Input Z: 50 Corr CCorr Freq Ref: Ir NFE: Off	RCal µ'	tten: 36 dB W Path: Standa	rd Gate:	iree Run Off ain: Low	A	enter Freq: vg Hold:>10 adio Std: N		) MHz	Trace Type Clear / V	Trace Vrite	Trace Control
1 Graph	<b>v</b>										Trace Av	/erade	Detector
Scale/Div 10.0	dB		Re	f Value 40.00	dBm								
Log 30.0											Max Hol	d	
20.0		r	and and an and an a	Madelinann	مربداسيروي	••••••	5				Min Hold	j	
0.00 -10.0 -20.0	allow and showing by	- more port					Z	-lynger		Munarallara	Restart N	1ax Hold	
-30.0	J. Constanting and the second second	40401							مريوا مرياميا المريح المريح	Munnouthour			
-40.0 -50.0	<i>y</i>												
Center 821.50 I Res BW 360.00			#Vic	ieo BW 1.200	0 MHz			Swe		an 37.5 MHz ns (1001 pts)			
2 Metrics	•							0					
Occup	bied Bandwidth	64 MHz			Total	Power			31.0 d	IBm			
Transi	mit Freg Error		211 kHz			OBW Pow	/er		99.0				
	Bandwidth		.07 MHz		x dB				-26.00				
<b>۲</b>		Nov 03, 2 4:49:45	2021 PM										

Plot 7-2. Occupied Bandwidth Plot (LTE Band 26 - 15MHz 16-QAM - Full RB)

FCC ID: A3LSMS906E	PCTEST° Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dega 12 of 24
1M2110010116-06.A3L	10/14/2021 - 12/8/2021	Portable Handset		Page 12 of 34
© 2020 PCTEST		·		V2.0 4/7/2021



Coupled BW KEYSIGHT RLT ↔ XI	Input Z: 50 Ω         Atten: 36 d           Corr CCorr RCal         μW Path: S           Freq Ref: Int (S)         NFE: Off	tandard Gate: Off Avg	nter Freq: 819.000000 MHz giHold: 100/100 dio Std: None	Trace Type Clear / Write	Trace Control
l Graph ▼ Scale/Div 10.0 dB	Ref Value 4	0.00 dBm		Trace Average	Detector
-og 30.0				Max Hold	
20.0		summer and the second s		Min Hold	
0.00 10.0 20.0 30.0	arow -		Hermon Andrew war war war	Restart Max Hold	
40.0					
enter 819.00 MHz es BW 240.00 kHz	#Video BW	750.00 kHz	Span 25 MH Sweep 1.00 ms (1001 pts		
Metrics v					
9.0396	6 MHz	Total Power	32.0 dBm		
Transmit Freq Error x dB Bandwidth	5.982 kHz 10.15 MHz	% of OBW Power x dB	99.00 % -26.00 dB		
5 C C ?	Nov 03, 2021 4:51:29 PM				

Plot 7-3. Occupied Bandwidth Plot (LTE Band 26 - 10MHz QPSK - Full RB)



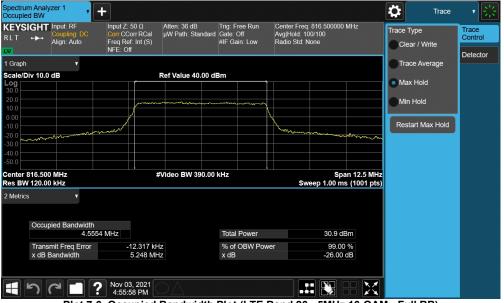
Plot 7-4. Occupied Bandwidth Plot (LTE Band 26 - 10MHz 16-QAM - Full RB)

FCC ID: A3LSMS906E	PCTEST° Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dega 12 of 24
1M2110010116-06.A3L	10/14/2021 - 12/8/2021	Portable Handset		Page 13 of 34
© 2020 PCTEST				V2.0 4/7/2021



Spectrur Occupie	m Analyzer 1 d BW	+				<b>C</b> Trace	- * 読
RLT	IGHT Input: RF Coupling: DC Align: Auto	Input Z: 50 Ω Corr CCorr RCal Freq Ref: Int (S) NFE: Off	Atten: 36 dB µW Path: Standard	Trig: Free Run Gate: Off #IF Gain: Low	Center Freq: 816.500000 MHz Avg Hold: 100/100 Radio Std: None	Trace Type Clear / Write	Trace Control
1 Graph		NFE. UII				Trace Average	Detector
Scale/D Log 30.0 20.0	iv 10.0 dB		Ref Value 40.00 dl	Bm		Max Hold	
10.0 0.00 -10.0				mannan		Min Hold Restart Max Hold	
-20.0 -30.0 -40.0	······································						
	316.500 MHz / 120.00 kHz		Video BW 390.00	kHz	Span 12.5 MH Sweep 1.00 ms (1001 pts		
2 Metrics							
	Occupied Bandwidth 4.55	77 MHz		Total Power	31.9 dBm		
	Transmit Freq Error x dB Bandwidth	4.860 kH 5.219 MH		% of OBW Pow x dB	er 99.00 % -26.00 dB		
	560	Nov 03, 2021 4:54:33 PM					

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



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

FCC ID: A3LSMS906E	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	B	Approved by: Technical Manager		
Test Report S/N:	Test Dates:	EUT Type:		Dage 14 of 24		
1M2110010116-06.A3L	10/14/2021 – 12/8/2021	Portable Handset		Page 14 of 34		
© 2020 PCTEST V2.0 4/7/2021						



Spectrum Analyzer 1				<b>Č</b> Trace	- * ※
KEYSIGHT         Input RF         Input Z: 51           R L T         ↔         Coupling: DC         Corr CCor           Align: Auto         Freq Ref:         NFE: Off	rr RCal µW Path: Standard	Gate: Off	Center Freq: 815.500000 MHz Avg Hold:>100/100 Radio Std: None	Trace Type Clear / Write	Trace Control
1 Graph v				Trace Average	Detector
Scale/Div 10.0 dB	Ref Value 40.00 di	Bm		Max Hold	
Log 30.0					
20.0		munnin		Min Hold	
0.00		<u> </u>		Restart Max Hold	
-10.0			present and and have been a	Restart Max Hold	
-30.0			· · · · · · · · · · · · · · · · · · ·		
-40.0					
Center 815.500 MHz	#Video BW 240.00	kHz	Span 7.5 MHz		
#Res BW 75.000 kHz			Sweep 1.33 ms (1001 pts)		
2 Metrics v					
Occupied Bandwidth 2.7338 MHz		Total Power	31.9 dBm		
	1.477 kHz	% of OBW Power			
	.096 MHz	x dB	-26.00 dB		

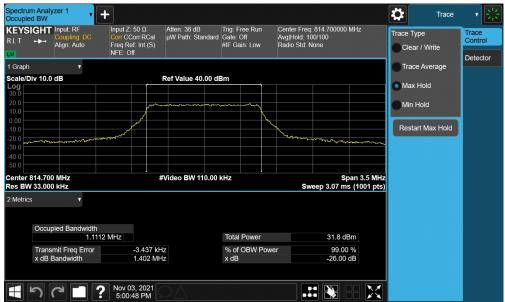
Plot 7-7. Occupied Bandwidth Plot (LTE Band 26 - 3MHz QPSK - Full RB)



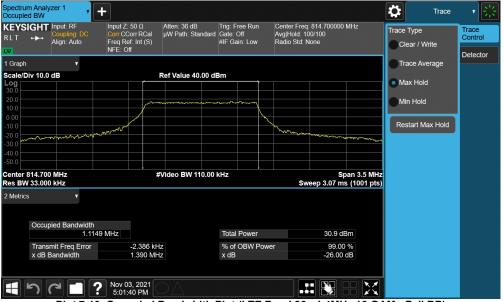
Plot 7-8. Occupied Bandwidth Plot (LTE Band 26 - 3MHz 16-QAM - Full RB)

FCC ID: A3LSMS906E	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 15 of 24
1M2110010116-06.A3L	10/14/2021 - 12/8/2021	Portable Handset	Page 15 of 34
© 2020 PCTEST	*	•	V2.0 4/7/2021





Plot 7-9. Occupied Bandwidth Plot (LTE Band 26 - 1.4MHz QPSK - Full RB)



Plot 7-10. Occupied Bandwidth Plot (LTE Band 26 - 1.4MHz 16-QAM - Full RB)

FCC ID: A3LSMS906E	PCTEST° Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 16 of 24
1M2110010116-06.A3L	10/14/2021 - 12/8/2021	Portable Handset		Page 16 of 34
© 2020 PCTEST		•		V2.0 4/7/2021



## 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 10<sup>th</sup> 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 $43 + 10 \log_{10}(P_{[Watts]})$ , 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 10GHz (separated into at least two plots per channel)
- 2. RBW ≥ 100kHz
- 3. VBW  $\geq$  3 x RBW
- 4. Detector = RMS
- 5. Trace mode = max hold
- 6. Sweep time = auto couple
- 7. The trace was allowed to stabilize

#### Test Setup

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



Figure 7-2. Test Instrument & Measurement Setup

FCC ID: A3LSMS906E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:		Page 17 of 34	
1M2110010116-06.A3L	10/14/2021 - 12/8/2021	Portable Handset		Page 17 01 34	
© 2020 PCTEST		•		V2.0 4/7/2021	



# LTE Band 26



Plot 7-11. Conducted Spurious Plot (LTE Band 26 - 15MHz QPSK - RB Size 1, RB Offset 0)

Spectrum Analyzer 1 Swept SA	+					Frequency	y <b>v</b> 212
KEYSIGHT       Input: RF         RLT       Coupling: DC         Align: Auto       Align: Auto	Input Z: 50 Ω Corr CCorr RCal Freq Ref: Int (S) NFE: Off	Atten: 30 dB µW Path: Standard	PNO: Fast Gate: Off IF Gain: Low Sig Track: Off	#Avg Type: Powe Trig: Free Run	er (RMS <mark>123456</mark> A <del>WWWWW</del> A N N N N N	Center Frequency 912.000000 MHz	Settings
1 Spectrum v Scale/Div 10 dB		Ref Level 20.00 dE	-	Mkr1	824.176 MHz -34.484 dBm	Span 176.000000 MHz	
Log Trace 1 Pass			5111		-34.404 dBm	Swept Span Zero Span	
10.0						Full Span	
-10.0						Start Freq 824.000000 MHz	
-20.0						Stop Freq 1.000000000 GHz	
-30.0 1						AUTO TUNE	
-40.0						CF Step 17.600000 MHz	
-60.0		al initial bound of the state of the state		an a francisco de la constante		Auto Man	
-70.0						Freq Offset 0 Hz	
Start 0.82400 GHz #Res BW 100 kHz		#Video BW 300 kl	Hz	Sweep	Stop 1.00000 GHz 8.53 ms (4001 pts)	X Axis Scale Log Lin	Local
<b>1</b> 22	Nov 01, 2021 10:49:01 AM					Signal Track (Span Zoom)	

Plot 7-12. Conducted Spurious Plot (LTE Band 26 - 15MHz QPSK - RB Size 1, RB Offset 0)

FCC ID: A3LSMS906E	PCTEST° Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dage 19 of 24	
1M2110010116-06.A3L	10/14/2021 - 12/8/2021	Portable Handset		Page 18 of 34	
© 2020 PCTEST	•	·		V2.0 4/7/2021	



L T       Imput: RF         Coupling: DC       Align: Auto         PASS       Align: Auto	Input Z: 50 Ω Corr CCorr RCal Freq Ref: Int (S) NFE: Off	#Atten: 36 dB μW Path: Standard	PNO: Fast Gate: Off IF Gain: Low Sig Track: Off	#Avg Type: Power Trig: Free Run	(RMS 1 2 3 4 5 6 A WW WW W A N N N N N	Center Frequency 5.500000000 GHz Span	Settings
Spectrum v scale/Div 10 dB		Ref Level 0.00 dE	łm		9.996 5 GHz -35.401 dBm	9.00000000 GHz	
Trace 1 Pass           10.0           20.0						Full Span Start Freq 1.00000000 GHz	
40.0	<u> </u>		~~~~~			Stop Freq 10.000000000 GHz	
50.0 50.0						AUTO TUNE CF Step 900.000000 MHz	
30.0						Auto Man Freq Offset	
tart 1.000 GHz Res BW 1.0 MHz		#Video BW 3.0 M	Hz	Sween ~16	Stop 10.000 GHz i.5 ms (18001 pts)		Loc

Plot 7-13. Conducted Spurious Plot (LTE Band 26 - 15MHz QPSK - RB Size 1, RB Offset 0)

FCC ID: A3LSMS906E	PCTEST° Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:		Page 19 of 34	
1M2110010116-06.A3L	10/14/2021 - 12/8/2021	Portable Handset		Page 19 01 34	
© 2020 PCTEST	<u>.</u>			V2.0 4/7/2021	