

PCTEST

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PART 22 MEASUREMENT REPORT

Applicant Name:

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

Date of Testing:

11/15/2021 - 12/03/2021 Test Site/Location: PCTEST Lab. Columbia, MD, USA Test Report Serial No.: 1M2110010116-02.A3L

FCC ID:

Applicant Name:

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) 22 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.

Randy Ortanez President



FCC ID: A3LSMS906E	PCTEST Proud to be part of @ element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 1 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 1 of 46
© 2021 PCTEST	·	·		V2.0 3/15/2021



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	DES	CRIPTION OF TESTS	6
	3.1	Evaluation Procedure	6
	3.2	Radiated Power and Radiated Spurious Emissions	6
4.0	MEA	SUREMENT UNCERTAINTY	7
5.0	TEST	FEQUIPMENT CALIBRATION DATA	8
6.0	SAM	PLE CALCULATIONS	9
7.0	TEST	RESULTS	10
	7.1	Summary	10
	7.2	ULCA Conducted Output Power	11
	7.3	Occupied Bandwidth	13
	7.4	Spurious and Harmonic Emissions at Antenna Terminal	20
	7.5	Band Edge Emissions at Antenna Terminal	28
	7.6	Radiated Power (ERP)	34
	7.7	Radiated Spurious Emissions Measurements	37
	7.8	Frequency Stability / Temperature Variation	44
8.0	CON	CLUSION	46

FCC ID: A3LSMS906E	PCTEST* Proud to be part of @element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 2 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 2 01 46
© 2021 PCTEST	·	·		V2.0 3/15/2021





PART 22 MEASUREMENT REPORT



			Tx Frequency	EF	RP	EI	RP	Emission
Mode	Bandwidth	Modulation	Range [MHz]	Max. Power [W]	Max. Power [dBm]	Max. Power [W]	Max. Power [dBm]	Designator
		π/2 BPSK	834.0 - 839.0	0.064	18.08	0.106	20.23	18M0G7D
	20 MHz	QPSK	834.0 - 839.0	0.064	18.09	0.106	20.24	19M0G7D
		16QAM	834.0 - 839.0	0.053	17.26	0.087	19.41	19M0W7D
		π/2 BPSK	831.5 - 841.5	0.063	18.02	0.104	20.17	13M5G7D
	15 MHz	QPSK	831.5 - 841.5	0.063	17.96	0.103	20.11	14M2G7D
NR Band n5		16QAM	831.5 - 841.5	0.058	17.62	0.095	19.77	14M2W7D
NK Banu no		π/2 BPSK	829.0 - 844.0	0.062	17.93	0.102	20.08	9M02G7D
	10 MHz	QPSK	829.0 - 844.0	0.058	17.64	0.095	19.79	9M38G7D
		16QAM	829.0 - 844.0	0.047	16.73	0.077	18.88	9M37W7D
		π/2 BPSK	826.5 - 846.5	0.064	18.09	0.106	20.24	4M53G7D
	5 MHz	QPSK	826.5 - 846.5	0.061	17.85	0.100	20.00	4M51G7D
		16QAM	826.5 - 846.5	0.062	17.93	0.102	20.08	4M51W7D

FCC ID: A3LSMS906E	Poud to be part of element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 2 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 3 of 46
© 2021 PCTEST				V2 0 3/15/2021



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 Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. 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 Engineering Lab located in Columbia, MD 21046, U.S.A.

- PCTEST is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, 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 (2451B) test laboratory with the site description on file with ISED.

FCC ID: A3LSMS906E	Poud to be part of @ element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 4 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Fage 4 01 40

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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 22.

Test Device Serial No.: 3715R, 3723R, 3892R

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 (5 & 6GHz), Bluetooth (1x, EDR, LE), NFC, Wireless Power Transfer, UWB

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		PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dege E of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 5 of 46
© 2021 PCTEST				V2.0 3/15/2021



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 halfwave dipole is substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

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

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

For radiated spurious emissions measurements 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:

$$\begin{split} E_{[dB\mu V/m]} &= Measured \ amplitude \ level_{[dBm]} + 107 + Cable \ Loss_{[dB]} + Antenna \ Factor_{[dB/m]} \\ And \\ EIRP_{[dBm]} &= E_{[dB\mu V/m]} + 20logD - 104.8; \ where \ D \ is the measurement \ distance \ in \ meters. \end{split}$$

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

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

FCC ID: A3LSMS906E		PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 6 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 6 of 46
© 2021 PCTEST				\/2.0.3/15/2021



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	1.13
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

FCC ID: A3LSMS906E	PCTEST. Proud to be part of @ element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dago 7 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 7 of 46
© 2021 PCTEST	•	·		V2.0 3/15/2021



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
-	AP2	EMC Cable and Switch System	3/4/2021	Annual	3/4/2022	AP2
	AP1	EMC Cable and Switch System	3/9/2021	Annual	3/9/2022	AP1
-	ETS	EMC Cable and Switch System	3/4/2021	Annual	3/4/2022	ETS
-	LTx1	Licensed Transmitter Cable Set	3/12/2021	Annual	3/12/2022	LTx1
-	LTx2	Licensed Transmitter Cable Set	3/12/2021	Annual	3/12/2022	LTx2
Agilent	N9030A	50GHz PXA Signal Analyzer	1/20/2021	Annual	1/20/2022	US51350301
Anritsu	MT8821C	Radio Communication Analyzer		N/A		6201381794
Emco	3115	Horn Antenna (1-18GHz)	6/18/2020	Biennial	6/18/2022	9704-5182
Espec	ESX-2CA	Environmental Chamber	8/27/2020	Annual	8/27/2022	17620
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	4/20/2021	Biennial	4/20/2023	00125518
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	3/12/2020	Biennial	3/12/2022	128337
Keysight Technologies	N9020A	MXA Signal Analyzer	12/22/2020	Annual	12/22/2021	MY54500644
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	7/21/2021	Annual	7/21/2022	MY49430494
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator		N/A		11208010032
Rohde & Schwarz	CMW500	Radio Communication Tester		N/A		100976
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	8/3/2021	Annual	8/3/2022	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	4/30/2021	Annual	4/30/2022	100348
Rohde & Schwarz	ESW44	EMI Test Receiver 2Hz to 44 GHz	1/21/2021	Annual	1/21/2022	101716
Rohde & Schwarz	FSW26	2Hz-26.5GHz Signal and Spectrum Analyze	2/10/2021	Annual	2/10/2022	103187
Sunol	JB6	LB6 Antenna	11/13/2020	Biennial	11/13/2022	A082816

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. Proud to be part of @element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 9 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 8 of 46
© 2021 PCTEST	·	·		V2 0 3/15/2021



6.0 SAMPLE CALCULATIONS

QPSK Modulation

Emission Designator = 8M62G7D LTE BW = 8.62 MHz G = Phase Modulation 7 = Quantized/Digital Info D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 8M45W7D LTE BW = 8.45 MHz W = Amplitude/Angle Modulated 7 = Quantized/Digital Info D = Data transmission, telemetry, telecommand

Spurious Radiated Emission

Example: Spurious emission at 3700.40 MHz

The receive spectrum analyzer reading at 3 meters with the EUT on the turntable was -81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of -81.0 dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 3700.40 MHz. So 6.1 dB is added to the signal generator reading of -30.9 dBm yielding -24.80 dBm. The fundamental EIRP was 25.50 dBm so this harmonic was 25.50 dBm -(-24.80) = 50.3 dBc

FCC ID: A3LSMS906E	Pout to be part of the element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	es: EUT Type:		Dogo 0 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 9 of 46
© 2021 PCTEST		•		V2 0 3/15/2021



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>NR/LTE</u>

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
	Transmitter Conducted Output Power	2.1046	N/A	PASS	See RF Exposure Report
TED	ULCA Conducted Output Power	2.1046	N/A	PASS	Section 7.2
CONDUCTED	Occupied Bandwidth	2.1049	N/A	PASS	Section 7.3
CO	Conducted Band Edge / Spurious Emissions	2.1051, 22.917(a)	> 43 + 10log10(P[Watts]) at Band Edge and for all out-of- band emissions	PASS	Sections 7.4, 7.5
	Frequency Stability	2.1055, 22.355	Fundamental emissions stay within authorized frequency block	PASS	Section 7.8
RADIATED	Effective Radiated Power / Equivalent Isotropic Radiated Power	22.913(a)(5)	< 7 Watts max. ERP	PASS	Section 7.6
RADI	Radiated Spurious Emissions	2.1053, 22.917(a)	> 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.
- 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: A3LSMS906E	PCTEST Proud to be part of @ element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 10 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Fage 10 01 40
© 2021 PCTEST				V2 0 3/15/2021



7.2 ULCA Conducted Output Power §2.1046

Test Overview

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

Test Procedure Used

KDB 971168 D01 v03r01 - Section 6.0

Test Settings

- 1. Span = $2 \times OBW$ to $3 \times OBW$
- 2. RBW = 1% to 5% of the OBW
- 3. Number of measurement points in sweep \geq 2 x span / RBW
- 4. Sweep = auto-couple (less than transmission burst duration)
- 5. Detector = RMS (power)
- 6. Trigger was set to enable power measurements only on full power bursts
- 7. Trace was allowed to stabilize
- 8. Spectrum analyzer's "Channel Power" function was used to compute the power by integrating the spectrum across the OBW of the signal

Test Setup

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



Figure 7-1. Test Instrument & Measurement Setup

FCC ID: A3LSMS906E	PCTEST. Proud to be part of @element	PART 22 MEASUREMENT REPORT	SAMSUNE	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 11 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Fage 11 01 40
© 2021 PCTEST				V2 0 3/15/2021



		PCC					SCC						
PCC Band	PCC Bandwidth [MHz]	PCC (UL) channel	Mod.	PCC UL RB#/Offset	SCC Band	SCC Bandwidth [MHz]	SCC (UL) channel	Mod.	SCC UL RB#/Offset	Power	SCC Conducted Power [dBm]	Inter-Band ULCA Total Tx. Power (dBm)	
			QPSK	50/0				QPSK	100 / 0	23.75	22.10	26.01	
			QPSK	1/0				QPSK	1/0	24.67	22.76	26.83	
		Low	QPSK	1/25			Low	QPSK	1/50	24.76	22.23	26.69	
			QPSK	1/49				QPSK	1/99	24.66	22.80	26.84	
			16Q	1/25				16Q	1/99	24.17	21.67	26.11	
			QPSK	50/0				QPSK	100/0	23.56	22.02	25.87	
			QPSK	1/0				QPSK	1/0	24.70	22.19	26.63	
B5	10	Mid	QPSK	1/25	B66	20	Mid	QPSK	1/50	24.67	22.61	26.77	
			QPSK	1/49					QPSK	1/99	24.51	22.36	26.58
			16Q	1/0				16Q	1/50	24.31	21.92	26.29	
			QPSK	50/0				QPSK	100/0	23.52	22.04	25.85	
			QPSK	1/0				QPSK	1/0	24.55	22.63	26.71	
		High	QPSK	1/25			High	QPSK	1/50	24.51	22.54	26.65	
			QPSK	1/49				QPSK	1/99	24.54	22.81	26.77	
			16Q	1/0				16Q	1/99	24.18	21.87	26.19	

Table 7-2. Conducted Power Output Data (ULCA LTE Band 5 – Band 66)

FCC ID: A3LSMS906E	POLIEST. Poul to be part of @element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 12 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Fage 12 01 40
© 2021 PCTEST				V2 0 3/15/2021



7.3 Occupied Bandwidth

Test Overview

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

Test Procedure Used

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 7-2. Test Instrument & Measurement Setup

Test Notes

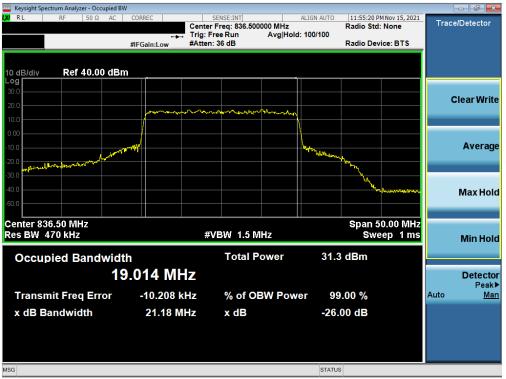
None.

FCC ID: A3LSMS906E		PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 13 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 13 01 46
© 2021 PCTEST		•		V2.0 3/15/2021



Keysight Spectrum Analyz										(- 7 🛛
CRL RF	50 Ω	AC O	ORREC		ENSE:INT Freq: 836.500	000 MH-	ALIGN AUTO	11:53:47 P Radio Std	MNov 15, 2021	Trace	e/Detector
			+				d:>100/100	Raulo Stu	. None		
		#1	FGain:Low	#Atten:	36 dB			Radio Dev	ice: BTS		
10 dB/div Ref	40.00	dBm									
og											
30.0											lear Writ
20.0			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	m	m				``	
10.0			-			<u> </u>					
0.00											
10.0			1								Averag
20.0		الممسمعهم	¢				WBAY IRAN WALLAND				
30.0 montant	Mar and							man non			
40.0											
									a galan ang ang ang ang ang ang ang ang ang a		Max Hol
-50.0										_	_
Center 836.50 MH	lz					·		Span 5	0.00 MHz		
Res BW 470 kHz				#V	BW 1.5 M	Hz		Swe	eep 1 ms		Min Hol
Occupied B	andv				Total P	ower	33.3	3 dBm			
		18.0	027 M	Hz							Detecto
	_										Peak
Transmit Free	q Erro	or	-589.53	kHz	% of O	3W Pov	ver 99	0.00 %		Auto	Ma
x dB Bandwid	lth		19.24	MHz	x dB		-26.	00 dB			
5G							STATU	2			
0							STATUS	2			

Plot 7-1. Occupied Bandwidth Plot (NR Band n5 - 20MHz π/2 BPSK - Full RB)

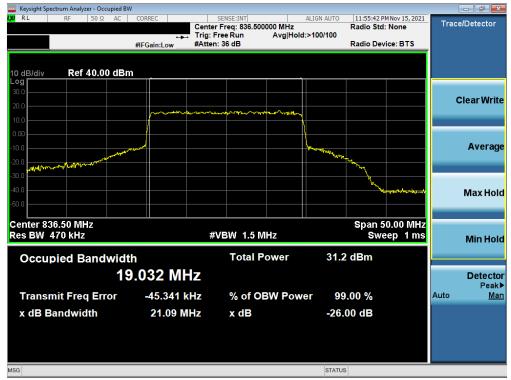


Plot 7-2. Occupied Bandwidth Plot (NR Band n5 - 20MHz QPSK - Full RB)

FCC ID: A3LSMS906E		PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	st Dates: EUT Type:		Dage 14 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 14 of 46
© 2021 PCTEST	•			V2.0 3/15/2021

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Plot 7-3. Occupied Bandwidth Plot (NR Band n5 - 20MHz 16-QAM - Full RB)



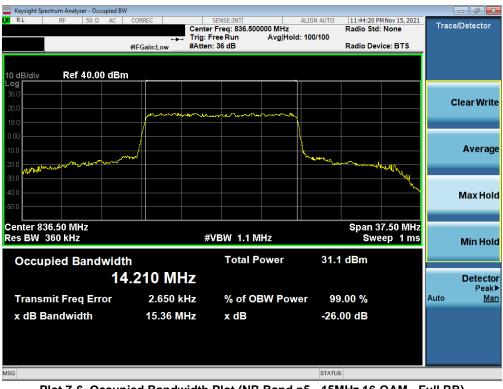
Plot 7-4. Occupied Bandwidth Plot (NR Band n5 - 15MHz π/2 BPSK - Full RB)

FCC ID: A3LSMS906E	Portest.	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 15 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 15 of 46
© 2021 PCTEST	·			V2.0 3/15/2021



Keysight Spectrum Analyzer								
RL RF 5	50Ω AC	CORREC	SENSE:INT Center Freq: 836 ► Trig: Free Run #Atten: 36 dB	.500000 MHz Avg Hold: 100/10	Radio Std:		Trace/E)etector
0 dB/div Ref 40	0.00 dB	m						
		punnu	The former of the mer	m			Cle	ear Writ
0.0 0.0 0.0 0.0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Jpnor l			el Capitone and and an			Avera
D.0 D.0 D.0							N	/lax Ho
enter 836.50 MHz es BW 360 kHz			#VBW 1.	1 MHz		7.50 MHz ep 1 ms		Vin Ho
Occupied Ba	ndwid	lth	Tota	I Power 3	0.8 dBm			_
	1	4.228 M	Hz					Detect Peal
Transmit Freq	Error	-1.296	kHz % of	OBW Power	99.00 %		Auto	<u>M</u>
x dB Bandwidtl	h	15.46	MHz xdB	÷	26.00 dB			
G				ST	TATUS			_

Plot 7-5. Occupied Bandwidth Plot (NR Band n5 - 15MHz QPSK - Full RB)



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

FCC ID: A3LSMS906E	PCTEST. Proud to be part of @element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:		Page 16 of 46	
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	11/15/2021 - 12/03/2021 Portable Handset			
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Keysight Spectrum Analyzer - Oc											
<mark>X/</mark> RL RF 50Ω	2 AC COF	RREC		NSE:INT eq: 836.50	0000 MHz	ļ	ALIGN AUTO	11:34:18 P Radio Std	MNov 15, 2021	Trac	e/Detector
		• •	, Trig: Free	Run		old:	100/100				
	#IF(Gain:Low	#Atten: 3	6 dB				Radio Dev	vice: BTS		
10 dB/div Ref 40.0	0 dBm	_				_					
Log 30.0											
20.0										(Clear Write
10.0			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~						
0.00		/				l					
						Ι					Average
-10.0	mont						work and				Average
-20.0								and the second s	m		
-30.0											
-40.0											Max Hold
-50.0											
Center 836.50 MHz								Span 2	5.00 MHz		
Res BW 240 kHz			#VB	W 750	kHz				eep 1 ms		Min Hold
											Millinoid
Occupied Banc				Total F	ower		34.1	dBm			
	9.01	89 MH	ΗZ								Detector
T		240.241		0/ -50			- 00	00.0/		Auto	Peak►
Transmit Freq Er	ror	-218.31	(HZ	% of O	BW PO	we	r 99	.00 %		Auto	Man
x dB Bandwidth		9.933 M	IHz	x dB			-26.	00 dB			
ISG							STATUS				

Plot 7-7. Occupied Bandwidth Plot (NR Band n5 - 10MHz π/2 BPSK - Full RB)



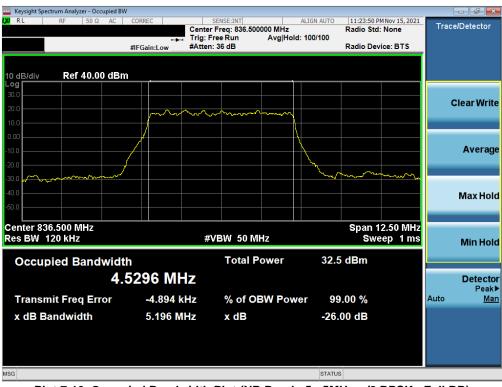
Plot 7-8. Occupied Bandwidth Plot (NR Band n5 - 10MHz QPSK - Full RB)

FCC ID: A3LSMS906E	PCTEST. Proud to be part of @element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dogo 17 of 46	
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 17 of 46	
© 2021 PCTEST	· · · · ·	·		V2.0 3/15/2021	



Keysight Spectrum Analyzer							
KURL RF	50 Ω AC	CORREC	SENSE:INT Center Freq: 836.5	ALIGN AUT	0 11:34:43 PM Nov Radio Std: No		Trace/Detector
			🕂 Trig: Free Run	Avg Hold: 100/100	Ruulo Stu. No		
		#IFGain:Low	#Atten: 36 dB		Radio Device:	BTS	
10 dB/div Ref 4	0.00 dB	m					
Log							
30.0							Clear Writ
20.0			and a sourceby				Cical With
10.0							
0.00				\			
10.0							Averag
20.0	and phone	when		hangen	Mannahurnahur		
20.0 30.0					a start and the start of the	m hund	
40.0							Max Ho
50.0							
Center 836.50 MHz	7				Span 25.0	0 MHz	_
Res BW 240 kHz	i ,		#VBW 750	kHz	Sweep		Min Ho
							MITHO
Occupied Ba	ndwid	th	Total	Power 30).7 dBm		
	9	.3671 M	Hz				Detecto
			112				Peak
Transmit Freq	Error	-1.778	kHz % of C	DBW Power	99.00 %	/	Auto <u>Ma</u>
x dB Bandwidt	h –	10.24 I	MHz xdB	2	6.00 dB		
		10.241					
SG				STA	TUS		

Plot 7-9. Occupied Bandwidth Plot (NR Band n5 - 10MHz 16-QAM - Full RB)



Plot 7-10. Occupied Bandwidth Plot (NR Band n5 - 5MHz π/2 BPSK - Full RB)

FCC ID: A3LSMS906E		PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager		
Test Report S/N:	Test Dates:	EUT Type:		Page 18 of 46		
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset	le Handset			
© 2021 PCTEST	·	•		V2.0 3/15/2021		



Keysight Spectrum Analyzer - Occupied					
XIRL RF 50Ω AC	CORREC	SENSE:INT ter Freq: 836.50000	ALIGN AUTO	11:24:05 PM Nov 15, 2021 Radio Std: None	Trace/Detector
	Trig	: Free Run	Avg Hold: 100/100		
	#IFGain:Low #Att	ten: 36 dB		Radio Device: BTS	
10 dB/div Ref 40.00 dB	sm				
Log 30.0					
20.0					Clear Write
	mm	Amore and a company	~~~~~		
10.0					
0.00					
-10.0	<u>م</u> ر ا		- Cru		Average
-20.0	v~1		Mary	alow www.	
-30.0					
-40.0					Max Hold
-50.0					
Center 836.500 MHz				Span 12.50 MHz	
Res BW 120 kHz		#VBW 50 MHz		Sweep 1 ms	Min Hold
Occupied Bandwid	lth	Total Pov	wer 29.9	9 dBm	
4	.5070 MHz				Detector
					Peak▶
Transmit Freq Error	-8.140 kHz	% of OBV	V Power 99	9.00 %	Auto <u>Man</u>
x dB Bandwidth	5.217 MHz	x dB	-26	00 dB	
MSG			STATU	s	

Plot 7-11. Occupied Bandwidth Plot (NR Band n5 - 5MHz QPSK - Full RB)



Plot 7-12. Occupied Bandwidth Plot (NR Band n5 - 5MHz 16-QAM - Full RB)

FCC ID: A3LSMS906E		PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager		
Test Report S/N:	Test Dates:	EUT Type:		Page 19 of 46		
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset	Handset			
© 2021 PCTEST	-			V2.0 3/15/2021		



7.4 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 $43 + 10 \log_{10}(P_{[Watts]})$, 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. 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 7-3. Test Instrument & Measurement Setup

Test Notes

- Per Part 22 and RSS-132, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth 100 kHz or greater for measurements below 1GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.
- 2. For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

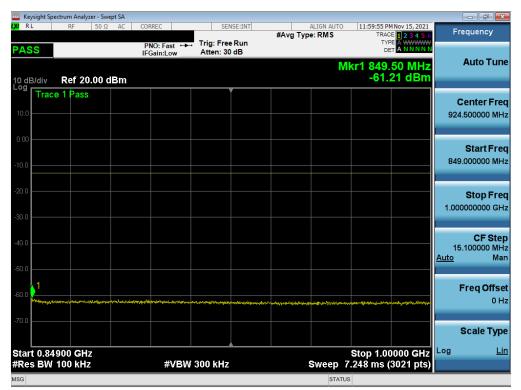
FCC ID: A3LSMS906E	PCTEST* Preud to be part of @element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 20 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 20 of 46
© 2021 PCTEST				V2 0 3/15/2021



NR Band n5

SS PNO: Fast +++ Trig: Free Run Atten: 30 dB #Avg Type: RMS TRACE TYPE D.23 4 5 6 OPERATION NOT DETATION NOT Auto T Center I 427.00000 SS PNO: Fast +++ Trig: Free Run Atten: 30 dB Mkr1 820.70 MHz -60.50 dBm Auto T GB/div Ref 20.00 dBm Center I 427.00000 Center I 427.00000 Center I 427.00000 G Stop B S24.00000 Stop B S24.00000 Stop B S24.00000 G Stop B S24.00000 Stop F S24.00000 Freq Of Stop B G Stop B S24.00000 Trig: Freq Of Stop B Freq Of Stop B		ctrum Analyz												
SS PNO: Fast IFGain:Low Trig: Free Run Atten: 30 dB Mikr1 820.70 MHz -60.50 dBm Center I 427.00000 Start F 30.000000 Start F 30.000000 Start F 30.000000 Start F 30.000000 Start F 30.000000 Start F 30.000000 Start F 30.000000 Start F S24.00000 CF S 79.400000 Atto	RL	RF	50 Ω A	AC C	ORREC	SEI	ISE:INT	#Ava			TRAC	E 1 2 3 4 5 6	F	Frequency
Center I Start F Image: Start F Image: Start F	ASS								,		TYP DE			
Trace 1 Pass Center 1 Conter 1 Center 1 C) dB/div	Ref 20	.00 dBı	m						Mkı	1 820. -60.	70 MHz 50 dBm		Auto Tui
0	Trace	e 1 Pass												Center Fr
Image: Start F Start F Star F Start F	0.0												42	
Image: Start F Start F Star F Start F														
0	.00													Start Fr
0).0												3	80.000000 M
0														
Image: state).0													Stop Fr
0													82	-
0).0													
Image: Constraint of the second of the se).0													CF St
														9.400000 M N
).0													
												1		Freq Offs
		un al in the animal												0
Scale T	1.0													
														Scale Ty
art 30.0 MHz Stop 824.0 MHz Log	art 30.0	MHz									Stop 8	24.0 MHz	Log	
es BW 100 kHz #VBW 300 kHz Sweep 38.11 ms (15881 pts)					#VBW	/ 300 kHz			Sweep	38.1	1 ms (1	5881 pts)		

Plot 7-13. Conducted Spurious Plot (NR Band n5 - 20.0MHz - 1 RB - Low Channel)



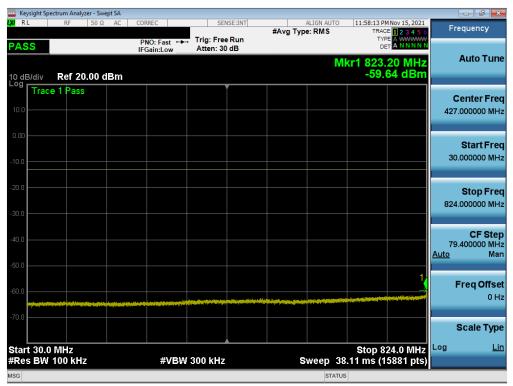
Plot 7-14. Conducted Spurious Plot (NR Band n5 - 20.0MHz - 1 RB - Low Channel)

FCC ID: A3LSMS906E		PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 21 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset	Page 21 01 46	
© 2021 PCTEST				V2.0 3/15/2021



	pectrum Analy:												X
XI RL	RF	50 Ω	AC	CORREC		SEN	ISE:INT	#Avg Ty	ALIGN AU pe: RMS		IO AM Nov 16, 2021	Frequency	y .
PASS				PNO: Fa	ow_	Trig: Free #Atten: 3		C ,				Auto T	une
10 dB/div Log	Ref 0.		sm							MKF1 9.3 -4	989 5 GHz 4.59 dBm		
Tra	ce 1 Pass											Center F	Frec
-10.0												5.500000000	GH:
-20.0													_
												Start F 1.000000000	
-30.0												1.000000000	GH
-40.0											1	Stop F	Fred
-50.0				~~	\sim	~~~~				~~~~~		10.000000000	
												CFS	Ptor
-60.0												900.000000	
-70.0													
-80.0												Freq Of	ffse 0 Hi
													011
-90.0												Scale T	Гуре
Start 1.0										Stop	10.000 GHz	Log	Lir
#Res BN	/ 1.0 MHz	2		#	VBW	3.0 MHz			Sweep	15.60 ms	(18001 pts)		
ISG									ST	ATUS			

Plot 7-15. Conducted Spurious Plot (NR Band n5 - 20.0MHz - 1 RB - Low Channel)



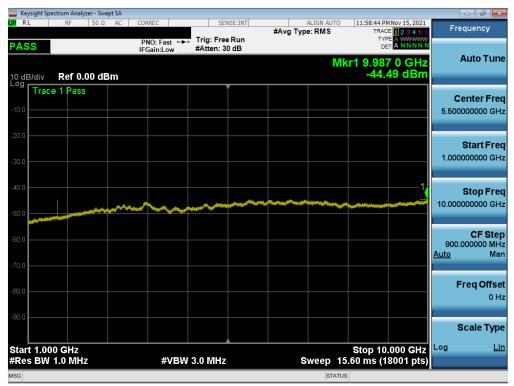
Plot 7-16. Conducted Spurious Plot (NR Band n5 - 20.0MHz - 1 RB - Mid Channel)

FCC ID: A3LSMS906E		PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 22 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset	Page 22 of 46	
© 2021 PCTEST	•	·		V2.0 3/15/2021



	ectrum Analy	zer - Swep	t SA										
X/RL	RF	50 Ω	AC	CORREC		SEI	ISE:INT	#Avg Typ	ALIGN AUTO e: RMS		MNov 15, 2021	Fr	equency
PASS				PNO: I IFGain	Fast ↔ :Low	Trig: Free Atten: 30		• ,,		TY			
10 dB/div	Ref 20).00 di	Зm						N	lkr1 850 -60.	.00 MHz 38 dBm		Auto Tune
Log 10.0	e 1 Pass	;											Center Freq .500000 MHz
-10.0												849	Start Freq
-20.0												1.00	Stop Freq 0000000 GHz
-40.0												15 <u>Auto</u>	CF Step 5.100000 MHz Mar
-60.0	yertes, Netates	ويترجع والمراس	al management	rfnja tive pe	م ەردىكى ب ەردىكى بەر	ะฟรูะ _{เการ} ์ปรูปแจ้งรูป _{ระเ} กรุ่	- Andrew - A	**** *** *****************************	مىرىنى يەرىكى ئەرىپىر مەرىپىر مەرىپىر	n an aige an	alarihati katendarikan katendarikan katendarikan katendarikan katendarikan katendarikan katendarikan katendarik		Freq Offset 0 Hz
-70.0													Scale Type
Start 0.84 #Res BW					#VBW	300 kHz			Sweep	Stop 1.0	0000 GHz (3021 pts)	Log	Lin
MSG									STATU		provide provid		





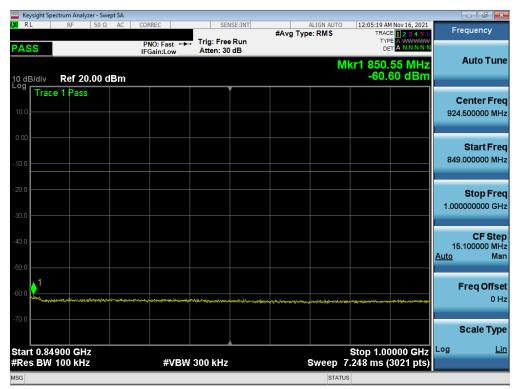
Plot 7-18. Conducted Spurious Plot (NR Band n5 - 20.0MHz - 1 RB - Mid Channel)

FCC ID: A3LSMS906E	Portest.	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 22 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 23 of 46
© 2021 PCTEST	·			V2.0 3/15/2021



	ctrum Analyze													
LXIRL	RF	50Ω A0	c cc	RREC			NSE:INT	#Avg Typ	ALIGN AUT e: RMS	TO 12	TRAC	HNOV 16, 2021	F	requency
PASS				PNO: Fast Gain:Low		Trig: Free Atten: 30					TYP			
										Mkr1	823.	65 MHz		Auto Tune
10 dB/div Log	Ref 20.	00 dBn	n							-	60.1	79 dBm		
Trace	e 1 Pass													Center Freq
10.0														7.000000 MHz
0.00														Start Freq
-10.0													30	0.000000 MHz
-20.0														Stop Freq
-30.0													824	4.000000 MHz
-40.0													79	CF Step 9.400000 MHz
-50.0													<u>Auto</u>	Man
-50.0												1,		
-60.0														Freq Offset 0 Hz
						ang balan sa					Let also a solution	a and the second se		0 H2
-70.0														Scale Type
Start 30.0 #Res BW				#VI	BW 3	00 kHz		s	ween	S 38.11	itop 8 ms (1	24.0 MHz 5881 pts)	Log	<u>Lin</u>
MSG										ATUS		or of the prov		





Plot 7-20. Conducted Spurious Plot (NR Band n5 - 20.0MHz - 1 RB - High Channel)

FCC ID: A3LSMS906E		PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 24 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 24 of 46
© 2021 PCTEST	·	•		V2.0 3/15/2021



	ctrum Analyzer - Swe									7 ×
L XI RL	RF 50 Ω	ORREC			#Avg Typ	ALIGN AUTO e: RMS	TRACI	Nov 16, 2021	Frequen	су
10 dB/div	Ref 0.00 dE	FGain:Low	#Atten: 3) dB		M	(r1 6.928	5 GHz 2 dBm	Auto	Tune
-10.0	e 1 Pass								Center 5.50000000	
-20.0									Start 1.00000000	t Freq 10 GHz
-40.0		 ~~~				-			Stop 10.00000000	Freq 10 GHz
-60.0									CF 900.00000 <u>Auto</u>	Step 0 MHz Man
-80.0									FreqC	Offset 0 Hz
-90.0 Start 1.00							Stop 10		Scale	Type Lin
#Res BW		#VBV	/ 3.0 MHz		S	weep 1	5.60 ms (1	000 GHZ	9	<u></u>
MSG						STATU	5			

Plot 7-21. Conducted Spurious Plot (NR Band n5 - 20.0MHz - 1 RB - High Channel)

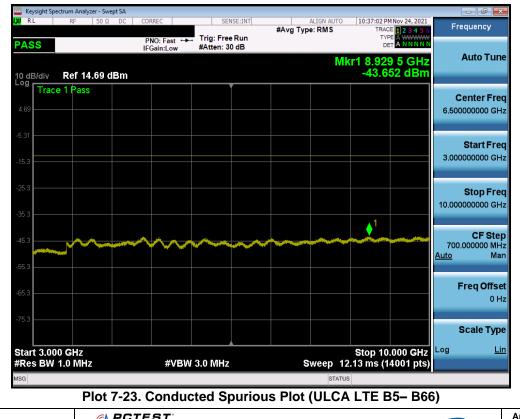
FCC ID: A3LSMS906E	Post to be part of @element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 25 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Fage 25 01 40
© 2021 PCTEST				V2 0 3/15/2021



ULCA LTE Band 5 – Band 66

	rum Analyzer - Spuriou							
X/RL	RF 50 Ω [DC CORREC	Cente	SENSE:INT er Freq: 836.500000	ALIGN AUTO	D 10:36:15 PM Radio Std:	Nov 24, 2021 None	Frequency
PASS		IEC similar	-	Free Run en: 30 dB		Radio Devi	ce: BTS	
		IFGain:Lov	w #Atte	en. 30 uB		Radio Devi	ce. B13	
10 dB/div Log	Ref 30.00 c	dBm						
20.0		<mark> </mark>		<u> </u>				Center Freq
10.0								836.500000 MHz
0.00								
-10.0								
-20.0								
-30.0								
-40.0				<mark>_</mark>				
-50.0								
-50.0								
-60.0								
							op 3 GHz	CF Step
-60.0					n an an Albert Albert an Albert		op 3 GHz	183.300000 MHz
-60.0	Hz	Stop Freq	RBW		Amplitude		op 3 GHz	183.300000 MHz
60.0 Start 30 M	HZ je Start Freq 30.000 MHz	Stop Freq 824.00 MHz	RBW 1.000 MHz	Frequency 821.500000 MHz	Amplitude	Sto ∆ Limit -41.11 dB	op 3 GHz	183.300000 MHz
60.0 Start 30 M Spur Rang 1 1 2 2	Hz Start Freq 30.000 MHz 824.00 MHz	Stop Freq 824.00 MHz 849.00 MHz	RBW 1.000 MHz 1.000 MHz	Frequency 821.50000 MHz 836.50000 MHz	Amplitude -54.11 dBm 23.49 dBm	Sto Δ Limit -41.11 dB -1.511 dB	op 3 GHz	183.300000 MHz <u>Auto</u> Man
Start 30 M	Hz 30.000 MHz 824.00 MHz 849.00 MHz	Stop Freq 824.00 MHz 849.00 MHz 1.7100 GHz	RBW 1.000 MHz 1.000 MHz 1.000 MHz	Frequency 821.500000 MHz 836.500000 MHz 1.673000000 GH;	Amplitude -54.11 dBm 23.49 dBm z -51.24 dBm	Sto Δ Limit -41.11 dB -1.511 dB -38.24 dB	op 3 GHz	183.300000 MHz <u>Auto</u> Man Freq Offset
-60.0 Start 30 M Start 30 M 5 Pur Rang 1 1 2 2 3 3 4 4	HZ 30.000 MHz 824.00 MHz 849.00 MHz 1.7100 GHz	Stop Freq 824.00 MHz 849.00 MHz 1.7100 GHz 1.7800 GHz	RBW 1.000 MHz 1.000 MHz 1.000 MHz 1.000 MHz	Frequency 821.500000 MHz 836.500000 MHz 1.67300000 GHz 1.744883333 GHz	Amplitude -54.11 dBm 23.49 dBm z -51.24 dBm z 12.36 dBm	Sto Δ Limit -41.11 dB -1.511 dB -38.24 dB -12.64 dB	op 3 GHz	CF Step 183.300000 MHz <u>Auto</u> Man Freq Offset 0 Hz
Start 30 M	Hz 30.000 MHz 824.00 MHz 849.00 MHz	Stop Freq 824.00 MHz 849.00 MHz 1.7100 GHz	RBW 1.000 MHz 1.000 MHz 1.000 MHz 1.000 MHz	Frequency 821.500000 MHz 836.500000 MHz 1.673000000 GH;	Amplitude -54.11 dBm 23.49 dBm z -51.24 dBm z 12.36 dBm	Sto Δ Limit -41.11 dB -1.511 dB -38.24 dB	op 3 GHz	183.300000 MHz <u>Auto</u> Man Freq Offset
-60.0 Start 30 M Start 30 M 5 Pur Rang 1 1 2 2 3 3 4 4	HZ 30.000 MHz 824.00 MHz 849.00 MHz 1.7100 GHz	Stop Freq 824.00 MHz 849.00 MHz 1.7100 GHz 1.7800 GHz	RBW 1.000 MHz 1.000 MHz 1.000 MHz 1.000 MHz	Frequency 821.500000 MHz 836.500000 MHz 1.67300000 GHz 1.744883333 GHz	Amplitude -54.11 dBm 23.49 dBm z -51.24 dBm z 12.36 dBm	Sto Δ Limit -41.11 dB -1.511 dB -38.24 dB -12.64 dB	op 3 GHz	183.300000 MHz <u>Auto</u> Man Freq Offset
-60.0 Start 30 M Start 30 M 5 Pur Rang 1 1 2 2 3 3 4 4	HZ 30.000 MHz 824.00 MHz 849.00 MHz 1.7100 GHz	Stop Freq 824.00 MHz 849.00 MHz 1.7100 GHz 1.7800 GHz	RBW 1.000 MHz 1.000 MHz 1.000 MHz 1.000 MHz	Frequency 821.500000 MHz 836.500000 MHz 1.67300000 GHz 1.744883333 GHz	Amplitude -54.11 dBm 23.49 dBm z -51.24 dBm z 12.36 dBm	Sto Δ Limit -41.11 dB -1.511 dB -38.24 dB -12.64 dB	op 3 GHz	183.300000 MHz <u>Auto</u> Man Freq Offset
-60.0 Start 30 M Start 30 M 5pur Rang 1 1 2 2 3 3 4 4	HZ 30.000 MHz 824.00 MHz 849.00 MHz 1.7100 GHz	Stop Freq 824.00 MHz 849.00 MHz 1.7100 GHz 1.7800 GHz	RBW 1.000 MHz 1.000 MHz 1.000 MHz 1.000 MHz	Frequency 821.500000 MHz 836.500000 MHz 1.67300000 GHz 1.744883333 GHz	Amplitude -54.11 dBm 23.49 dBm z -51.24 dBm z 12.36 dBm	Sto Δ Limit -41.11 dB -1.511 dB -38.24 dB -12.64 dB	op 3 GHz	183.300000 MHz <u>Auto</u> Man Freq Offset
60.0 Start 30 M Start 30 M 5 2 2 3 3 4 4	HZ 30.000 MHz 824.00 MHz 849.00 MHz 1.7100 GHz	Stop Freq 824.00 MHz 849.00 MHz 1.7100 GHz 1.7800 GHz	RBW 1.000 MHz 1.000 MHz 1.000 MHz 1.000 MHz	Frequency 821.500000 MHz 836.500000 MHz 1.67300000 GHz 1.744883333 GHz	Amplitude -54.11 dBm 23.49 dBm z -51.24 dBm z 12.36 dBm	Sta <u>A Limit</u> <u>41.11 dB</u> -18.24 dB -12.64 dB -37.32 dB	op 3 GHz	183.300000 MHz <u>Auto</u> Man Freq Offset

Plot 7-22. Conducted Spurious Plot (ULCA LTE B5 – B66)



FCC ID: A3LSMS906E		PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 26 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Fage 20 01 40
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ASS PNO: Fast \rightarrow Trig: Free Run #Avg Type: RMS Trace D 23 4 37 PASS PNO: Fast \rightarrow Trig: Free Run #Atten: 10 dB Mkr1 19.526 GHz -60.013 dBm Center Free 15.00000000 GHz Center Free 15.000000000 GHz Start Free 10.00000000 GHz CF Step 1.00000000 GHz CF Step 0.00000000 GHz	SG			STATUS		
PNO: Fast Trig: Free Run #Avg Type: RMS Trace I 23 4 so Frequency 0 dB/div Ref 14.69 dBm Mkr1 19.526 GHz Auto Tune 0 dB/div Ref 14.69 dBm Center Freq 15.00000000 GHz 15.3 Image: Start Frequency Start Frequency 15.3 Image: Start Frequency Image: Start Frequency	tart 10.000 GHz Res BW 1.0 MHz	#VBW 3	.0 MHz	Sweep 16	3100 20.000 3112	
PNO: Fast Trig: Free Run #Avg Type: RMS TRACE 2 3 4 5 model Frequency ASS PNO: Fast						
ASS PNO: Fast IFGain:Low Trig: Free Run #Atten: 10 dB Trace I 2:3:4:5 Trace I 2:3:4:5 Det ANNNNN Auto Tune Trace I 2:3:4:5 Trace I 2:3:4:5 Det ANNNNN Auto Tune 0 dB/div Ref 14.69 dBm Center Free 15:000000000 GH2 Center Free 15:000000000 GH2 5:3 Image: Start Free 10:000000000 GH2 Image: Start Free 10:00000000 GH2 Image: Start Free 10:000000000 GH2 5:3 Image: Start Free 10:000000000 GH2 Image: Start Free 10:000000000 GH2 Image: Start Free 10:000000000 GH2 5:3 Image: Start Free 10:000000000 GH2 Image: Start Free 10:000000000 GH2 Image: Start Free 10:000000000 GH2 5:3 Image: Start Free 10:000000000 GH2 Image: Start Free 10:000000000 GH2 Image: Start Free 10:000000000 GH2 5:3 Image: Start Free 10:000000000 GH2 Image: Start Free 10:000000000 GH2 Image: Start Free 10:000000000 GH2 5:3 Image: Start Free 10:000000000 GH2 Image: Start Free 10:000000000 GH2 Image: Start Free 10:000000000 GH2 5:3 Image: Start Free 10:00000000 GH2 Image: Start Free 10:000000000 GH2 Image: Start Free 10:000000000 GH2 5:3 Image: Start Free 10:00000000 GH2 Image: Start Free 10:000000000 GH2 Image: Start Free 10:000000000 GH2 5:3 Image: Start Free 10:000000000 GH2 Image: Start Free 10:000000000	75.3					
PNO: Fast Trig: Free Run #Avg Type: RMS TRACE 2.3.4.5 Frequency VASS PNO: Fast	65.3	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~				
PNO: Fast Trig: Free Run #Avg Type: RMS TRACE 2.3.4.5 Frequency VASS PNO: Fast Ifigi: Free Run WKr1 19.526 GHz Auto Tun 0 dB/div Ref 14.69 dBm Center Free 15.00000000 GH 0 dB/div Ifigi: Free Run Ifigi: Free Run Ifigi: Free Run 0 dB/div Ref 14.69 dBm Center Free 15.00000000 GH 0 dB/div Ifigi: Free Run Ifigi: Free Run Ifigi: Free Run 0 dB/div Ref 14.69 dBm Center Free 15.000000000 GH 0 dB/div Ifigi: Free Run Ifigi: Free Run Ifigi: Free Run 0 dB/div Ref 14.69 dBm Ifigi: Free Run Ifigi: Free Run 0 dB/div Ref 14.69 dBm Ifigi: Free Run Ifigi: Free Run 0 dB/div Ref 14.69 dBm Ifigi: Free Run Ifigi: Free Run 0 dB/div Ifigi: Free Run Ifigi: Free Run Ifigi: Free 10 div Ifigi: Free Run Ifigi: Free Ifigi: Free 10 div Ifigi: Free Ifigi: Free Ifigi: Free 10 div Ifigi: Free Ifigi: Free Ifigi: Free	55.3				1	
PNO: Fast Trig: Free Run IFGain:Low Trig: Free Run #Atten: 10 dB #Avg Type: RMS TRACE 2 3 4 5 6 Trace Frequency 0 dB/div Ref 14.69 dBm 0	45.3					1.000000000 GH
PNO: Fast Trig: Free Run IFGain:Low Trig: Free Run #Atten: 10 dB TRACE 2 3 4 5 5 TYPE Frequency Mkr1 19.526 GHz -60.013 dBm 0 dB/div Ref 14.69 dBm Center Free 0 dB/div Center Free 0 dB/div Ref 14.69 dBm 0 dB/div Start Free 0 dB/div Start Free 1 data 0 dB/div Ref 14.69 dBm 1 data 1 data <td>35.3</td> <td></td> <td></td> <td></td> <td></td> <td>05.04</td>	35.3					05.04
PNO: Fast Trig: Free Run IFGain:Low Trig: Free Run #Atten: 10 dB TRACE 2 3 4 5 6 TYPE Frequency Mkr1 19.526 GHz 0 dB/div Ref 14.69 dBm -60.013 dBm Auto Tun 0 dB/div Ref 14.69 dBm -60.013 dBm Center Fre 531						
PNO: Fast Trig: Free Run IFGain:Low Trig: Free Run #Atten: 10 dB #Avg Type: RMS TRACE 2 3 4 5 6 TYPE Frequency Mkr1 19.526 GHz 0 dB/div Ref 14.69 dBm -60.013 dBm Auto Tun 0 dB/div Ref 14.69 dBm -60.013 dBm -60.013 dBm -60.013 dBm 0 dB/div Ref 14.69 dBm -60.013 dBm -60.013 dBm -60.013 dBm 0 dB/div Ref 14.69 dBm -60.013 dBm -60.013 dBm -60.013 dBm 0 dB/div Ref 14.69 dBm -60.013 dBm -60.013 dBm -60.013 dBm 0 dB/div -60.013 dBm -60.013 dBm -60.013 dBm -60.013 dBm -60.013 dBm 0 dB/div -60.013 dBm -60.013 dBm -60.013 dBm -60.013 dBm -60.013 dBm -60.013 dBm 0 dB/div -60.013 dBm -60.013 dBm </td <td>75 0</td> <td></td> <td></td> <td></td> <td></td> <td></td>	75 0					
Auto Tun PNO: Fast PNO: Fast PNO: Fast PNO: Fast PRO: Fa	15.3					
PNO: Fast + Trig: Free Run IFGain:Low HAtten: 10 dB 0 dB/div Ref 14.69 dBm -60.013 dBm O Trace 1 Pass Center Free	5.31					Start Era
PNO: Fast ++ Trig: Free Run IFGain:Low #Avg Type: RMS TRACE 2 3 4 5 6 TYPE A WWWWW DET A NNNN Mkr1 19.526 GHz -60.013 dBm -60.013 dBm	4.69					
ASS PNO: Fast + Trig: Free Run IFGain:Low #Atten: 10 dB #Avg Type: RMS TRACE 23456 TYPE ANNNNN Mkr1 19.526 GHz -60.013 dBm -60.013 dBm	Trace 1 Pass		Ĭ			Center Fre
ASS PNO: Fast ++ IFGain:Low #Atten: 10 dB #Avg Type: RMS TRACE 123456 Type Avg Type RMS TRACE 123456				M	kr1 19.526 GHz -60.013 dBm	Auto Tun
#Avg Type: RMS TRACE 123456 Frequency	ASS					Auto Tur
	RL RF 50Ω DC	CORREC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	10:37:38 PM Nov 24, 2021 TRACE 1 2 3 4 5 6	Frequency

Plot 7-24. Conducted Spurious Plot (ULCA LTE B5 – B66)

FCC ID: A3LSMS906E	POLIEST. Poul to be part of @element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 27 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Fage 27 01 40
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7.5 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 $43 + 10 \log_{10}(P_{[Watts]})$, 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. RBW \geq 1% of the emission bandwidth
- 4. VBW \geq 3 x RBW
- 5. Detector = RMS
- 6. Number of sweep points $\geq 2 \times \text{Span/RBW}$
- 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 7-4. Test Instrument & Measurement Setup

FCC ID: A3LSMS906E	PCTEST. Proud to be part of @element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 28 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Fage 20 01 40
© 2021 PCTEST				V2 0 3/15/2021



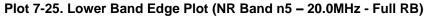
- 1. Per 22.917(b) and RSS-132(5.5), in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions 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.
- 2. For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

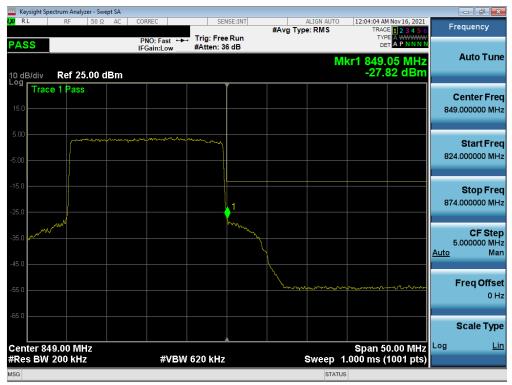
FCC ID: A3LSMS906E	Proved to be post of the element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 20 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 29 of 46
© 2021 PCTEST		•		V2.0 3/15/2021



NR Band n5

	ectrum Analyz		t SA											
XI RL	RF	50 Ω	AC C	ORREC		SEI	SE:INT	#Avc		ALIGN AUTO e: RMS		M Nov 16, 2021	F	requency
PASS				PNO: Fast FGain:Low		rig: Free Atten: 3			5 . 7 .		TY			
10 dB/div	Ref 25.	.00 dE	3m							N	lkr1 823 -28.	.75 MHz 32 dBm		Auto Tune
Log Trac	e 1 Pass													Center Fred 4.000000 MHz
5.00														4.000000 Millin
-5.00								~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	****		mennen		79	Start Fred 9.000000 MH:
-15.0							-							Stop Free
-25.0						- Mark	1					work	84	9.000000 MH
-35.0		المرسم	wwwww	nen min halene	hours								<u>Auto</u>	CF Stej 5.000000 MH Ma
-55.0	m	ſ												Freq Offse
-65.0														Scale Typ
Center 82											Span 5	0.00 MHz	Log	Scale Type
#Res BW	200 kHz			#V	BW 62	20 kHz						(1001 pts)		
ASG										STATU	JS			





Plot 7-26. Upper Band Edge Plot (NR Band n5 – 20.0MHz - Full RB)

FCC ID: A3LSMS906E		PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 30 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Fage 30 01 40
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🔤 Keysight Sp												
L <mark>XI</mark> RL	RF	50 Ω	AC (CORREC	SEI	NSE:INT	#Avg Typ	ALIGN AUTO e: RMS	TRAC	MNov 15, 2021	Fr	equency
PASS				PNO: Wide 🕶 IFGain:Low	. Trig: Free #Atten: 3				DE	A P N N N N		Auto Tune
10 dB/div Log	Ref 2	5.00 d	Bm					MKr1	824.00 -25.	49 dBm		
Trac	e 1 Pas	S									c	enter Freq
15.0											824	.000000 MHz
5.00						mm	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	many			
5.00											805	Start Freq 250000 MHz
-5.00						ľ						
-15.0						- /						Stop Freq
-25.0						1					842	.750000 MHz
-35.0				A	m					\sim		CF Step
-45.0		m n	m		· •					~	3 <u>Auto</u>	.750000 MHz Man
-45.0												
-55.0											ſ	Freq Offset 0 Hz
-65.0												
											;	Scale Type
Center 82	24.00 M	Hz						_	Span 3	7.50 MHz	Log	<u>Lin</u>
#Res BW	160 kH	Z		#VBW	510 kHz			Sweep Statu	1.000 ms (1001 pts)		
//SG								STATU	5			

Plot 7-27. Lower Band Edge Plot (NR Band n5 – 15.0MHz - Full RB)



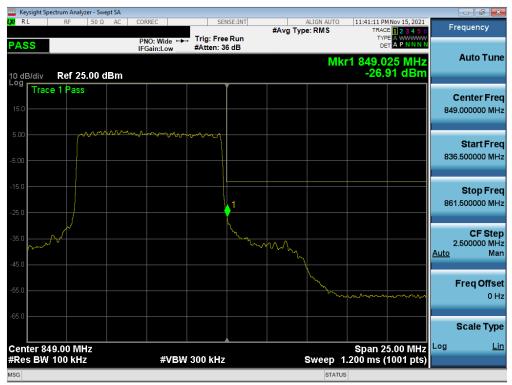
Plot 7-28. Upper Band Edge Plot (NR Band n5 – 15.0MHz - Full RB)

FCC ID: A3LSMS906E		PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 31 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 31 01 46
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	ectrum Analyzer	- Swept SA									
LXVI RL	RF 5	50 Ω AC	CORREC	SEI	ISE:INT	#Avg Typ	ALIGN AUTO e: RMS	TRAC	MNov 15, 2021	Fr	equency
PASS			PNO: Wide ++ IFGain:Low	. Trig: Free #Atten: 3			841				Auto Tune
10 dB/div Log	Ref 25.0	0 dBm						-28.	19 dBm		
Trac	e 1 Pass									c	enter Freq
15.0										824	.000000 MHz
5.00					mm	m	$\sim\sim\sim\sim$	manan			
										011	Start Freq .500000 MHz
-5.00										011	.500000 MHZ
-15.0											Stop Freq
					} ₀1					836	.500000 MHz
-25.0											
-35.0			m					/	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	2	CF Step .500000 MHz
-45.0	Nor	mm	~~~~						· /~· ·	<u>Auto</u>	Man
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~											Erro er Officiat
-55.0											F <b>req Offset</b> 0 Hz
-65.0											
											Scale Type
Center 8	24.00 MHz							Span 2	5.00 MHz	Log	<u>Lin</u>
#Res BW	100 kHz		#VBW	300 kHz			Sweep	1.200 ms (	1001 pts)		
MSG							STATU	IS			

Plot 7-29. Lower Band Edge Plot (NR Band n5 – 10.0MHz - Full RB)



Plot 7-30. Upper Band Edge Plot (NR Band n5 – 10.0MHz - Full RB)

FCC ID: A3LSMS906E	PCTEST Proud to be part of @ element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 22 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 32 of 46
© 2021 PCTEST	-	·		V2.0 3/15/2021



Keysight Spectrum Analyzer - Swept SA					
X RL RF 50Ω AC	CORREC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	11:28:52 PM Nov 15, 2021 TRACE 1 2 3 4 5 6	Frequency
PASS	PNO: Wide ↔ IFGain:Low	Trig: Free Run #Atten: 36 dB		TYPE A WWWW DET A P N N N N	
10 dB/div Ref 25.00 dBm			Mkr1	824.000 0 MHz -22.47 dBm	Auto Tune
_og Trace 1 Pass		Ĭ			Center Fred
15.0					824.000000 MHz
5.00				m	Otert Fred
-5.00					Start Fred 817.750000 MH;
-15.0		↓ 1			Stop Free 830.250000 MH
-25.0					CF Step
35.0	~~~~~				1.250000 MH Auto Mar
45.0					
-55.0					Freq Offse
65.0					
					Scale Type
Center 824.000 MHz #Res BW 100 kHz	#\/R\M	300 kHz	Sweep 1	Span 12.50 MHz .000 ms (1001 pts)	Log <u>Lir</u>
ISG	# V D V V	500 MH2	SWEEP		

Plot 7-31. Lower Band Edge Plot (NR Band n5 – 5.0MHz - Full RB)



Plot 7-32. Upper Band Edge Plot (NR Band n5 – 5.0MHz - Full RB)

FCC ID: A3LSMS906E	PCTEST Pread to be part of @element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 33 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 33 01 46
© 2021 PCTEST		·		V2.0 3/15/2021



# 7.6 Radiated Power (ERP)

#### **Test Overview**

Effective Radiated Power (ERP) 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

- 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 x RBW
- 4. Span = 1.5 times the OBW
- 5. No. of sweep points  $\geq 2 \times \text{span} / \text{RBW}$
- 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: A3LSMS906E	Portest. Proud to be part of @ element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 24 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 34 of 46
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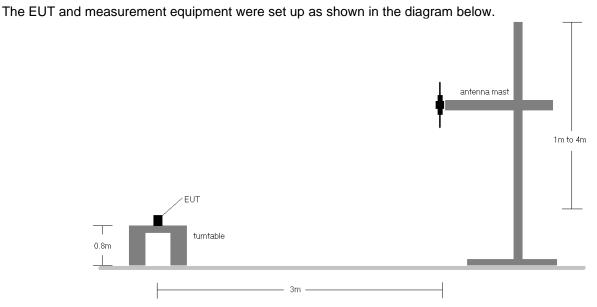


Figure 7-5. Radiated Test Setup <1GHz

### Test Notes

- 1) 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.
- 2) This unit was tested with its standard battery.
- 3) For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

FCC ID: A3LSMS906E	PCTEST* Proud to be part of @viernest	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 25 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 35 of 46
© 2021 PCTEST	-	•		V2.0 3/15/2021

(cel	PCTEST
	Proud to be part of 🔵 element

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
	π/2 BPSK	834.0	V	138	259	6.15	1 / 79	14.08	18.08	0.064	38.45	-20.37	20.23	0.106	40.61	-20.37
	π/2 BPSK	836.5	V	149	252	6.18	1 / 53	13.92	17.95	0.062	38.45	-20.50	20.10	0.102	40.61	-20.51
	π/2 BPSK	839.0	V	145	282	6.30	1 / 53	13.82	17.97	0.063	38.45	-20.48	20.12	0.103	40.61	-20.48
20 MHz	QPSK	834.0	V	138	259	6.15	1 / 79	14.09	18.09	0.064	38.45	-20.36	20.24	0.106	40.61	-20.36
	QPSK	836.5	V	149	252	6.18	1 / 53	13.83	17.86	0.061	38.45	-20.59	20.01	0.100	40.61	-20.60
	QPSK	839.0	V	145	282	6.30	1 / 53	13.90	18.05	0.064	38.45	-20.40	20.20	0.105	40.61	-20.40
	16-QAM	834.0	V	138	259	6.15	1 / 79	13.26	17.26	0.053	38.45	-21.19	19.41	0.087	40.61	-21.19
	π/2 BPSK	831.5	V	138	259	6.13	1/0	14.05	18.02	0.063	38.45	-20.43	20.17	0.104	40.61	-20.44
	π/2 BPSK	836.5	V	149	252	6.18	1/0	13.87	17.90	0.062	38.45	-20.55	20.05	0.101	40.61	-20.55
	π/2 BPSK	841.5	V	145	282	6.33	1/0	13.71	17.89	0.061	38.45	-20.56	20.04	0.101	40.61	-20.57
15 MHz	QPSK	831.5	V	138	259	6.13	1/0	13.99	17.96	0.063	38.45	-20.49	20.11	0.103	40.61	-20.49
	QPSK	836.5	V	149	252	6.18	1/0	13.79	17.82	0.061	38.45	-20.63	19.97	0.099	40.61	-20.64
	QPSK	841.5	V	145	282	6.33	1/0	13.77	17.95	0.062	38.45	-20.50	20.10	0.102	40.61	-20.50
	16-QAM	831.5	V	138	259	6.13	1/0	13.64	17.62	0.058	38.45	-20.83	19.77	0.095	40.61	-20.84
	π/2 BPSK	829.0	V	138	259	6.10	25 / 0	13.98	17.93	0.062	38.45	-20.52	20.08	0.102	40.61	-20.53
	π/2 BPSK	836.5	V	149	252	6.18	25 / 0	13.62	17.65	0.058	38.45	-20.80	19.80	0.095	40.61	-20.81
	π/2 BPSK	844.0	V	145	282	6.36	1/0	13.55	17.76	0.060	38.45	-20.70	19.91	0.098	40.61	-20.70
10 MHz	QPSK	829.0	V	138	259	6.10	25 / 0	13.42	17.37	0.055	38.45	-21.08	19.52	0.090	40.61	-21.08
	QPSK	836.5	V	149	252	6.18	25 / 0	12.90	16.93	0.049	38.45	-21.52	19.08	0.081	40.61	-21.53
	QPSK	844.0	V	145	282	6.36	1/0	13.43	17.64	0.058	38.45	-20.81	19.79	0.095	40.61	-20.82
	16-QAM	844.0	V	145	282	6.36	1/0	12.53	16.73	0.047	38.45	-21.72	18.88	0.077	40.61	-21.72
	π/2 BPSK	829.0	V	138	259	6.07	1/0	14.17	18.09	0.064	38.45	-20.36	20.24	0.106	40.61	-20.36
	π/2 BPSK	836.5	V	149	252	6.18	1/0	13.85	17.88	0.061	38.45	-20.57	20.03	0.101	40.61	-20.58
	π/2 BPSK	844.0	V	145	282	6.38	1 / 24	13.45	17.68	0.059	38.45	-20.77	19.83	0.096	40.61	-20.78
5 MHz	QPSK	829.0	V	138	259	6.07	1/0	13.92	17.85	0.061	38.45	-20.61	20.00	0.100	40.61	-20.61
	QPSK	836.5	V	149	252	6.18	1/0	13.72	17.75	0.060	38.45	-20.70	19.90	0.098	40.61	-20.71
	QPSK	844.0	V	145	282	6.38	1 / 24	13.52	17.75	0.060	38.45	-20.70	19.90	0.098	40.61	-20.70
	16-QAM	829.0	V	138	259	6.07	1/0	14.00	17.93	0.062	38.45	-20.52	20.08	0.102	40.61	-20.53
	QPSK (CP-OFDM)	834.0	V	138	235	6.15	1 / 79	12.52	16.52	0.045	38.45	-21.93	18.67	0.074	40.61	-21.93
20 MHz	QPSK (Opposite Pol.)	834.0	Н	217	279	6.73	1 / 26	13.34	17.92	0.062	38.45	-20.53	20.07	0.102	40.61	-20.54
	QPSK (WCP)	834.0	V	134	309	6.15	1 / 26	10.38	14.38	0.027	38.45	-24.07	16.53	0.045	40.61	-24.07

Table 7-3. ERP Data (NR Band n5)

FCC ID: A3LSMS906E	PCTEST. Proud to be part of @witersend	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 36 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Fage 30 01 40
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## 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 RMS 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 x RBW
- 3. Span = 1.5 times the OBW
- 4. No. of sweep points > 2 x span / RBW
- 5. Detector = RMS
- 6. Trace mode = Average (Max Hold for pulsed emissions)
- 7. The trace was allowed to stabilize

FCC ID: A3LSMS906E	PCTEST Proud to be part of @element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 37 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 37 01 46
© 2021 PCTEST	•	•		V2.0 3/15/2021



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

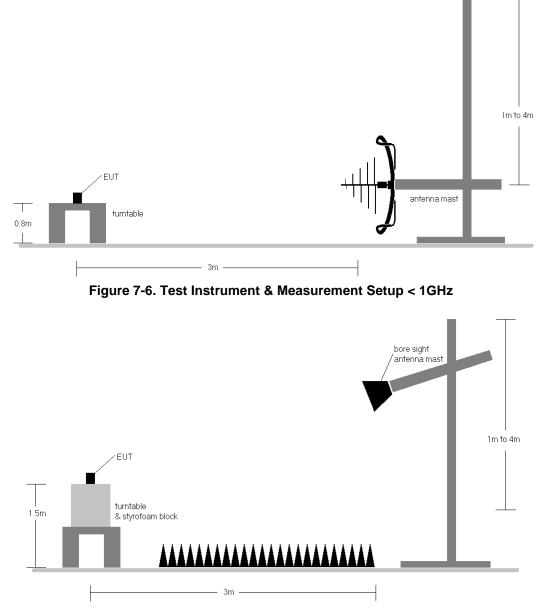


Figure 7-7. Test Instrument & Measurement Setup >1 GHz

FCC ID: A3LSMS906E	PCTEST. Proud to be part of @ element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 38 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 38 01 46
© 2021 PCTEST	•	•		V2.0 3/15/2021

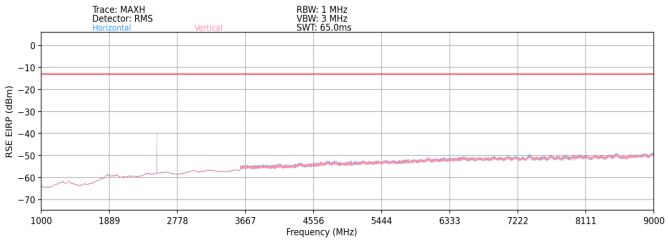


- Field strengths are calculated using the Measurement quantity conversions in KDB 971168 Section 5.8.4.
  a) E(dBµV/m) = Measured amplitude level (dBm) + 107 + Cable Loss (dB) + Antenna Factor (dB/m)
  b) EIRP (dBm) = E(dBµV/m) + 20logD 104.8; where D is the measurement distance in meters.
- 2) The 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.
- 3) This unit was tested with its standard battery.
- 4) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 5) 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.
- 6) The "-" shown in the following RSE tables are used to denote a noise floor measurement.
- 7) ULCA spurious emissions measurements were evaluated for the two contiguous channels using various combinations of RB size, RB offset, modulation, and channel bandwidth. Channel bandwidth data is shown in the tables below based only on the channel bandwidths that were supported in this device.
- 8) For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.
- 9) Spurious emissions shown in this section are measured while operating in EN-DC mode with Sub 6GHz NR carrier as well as an LTE carrier (anchor). Spurious emissions from the NR carrier device, is subject to the rules under which the NR carrier operates. Spurious emission caused by the LTE carrier must meet the requirements of the rules under which the LTE carrier operates.

FCC ID: A3LSMS906E		PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 20 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 39 of 46
© 2021 PCTEST	•			V2.0 3/15/2021



# NR Band n5



### Plot 7-33. Radiated Spurious Plot (NR Band n5)

Bandwidth (MHz):	20
Frequency (MHz):	834
RB / Offset:	1 / 53
Mode:	Stand Alone

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]
1668.00	Н	-	-	-76.79	-2.27	27.94	-67.31	-13.00	-54.31
2502.00	Н	116	18	-51.65	2.15	57.50	-37.76	-13.00	-24.76
3336.00	Н	-	-	-78.08	3.27	32.19	-63.07	-13.00	-50.07
4170.00	Н	-	-	-78.87	4.36	32.49	-62.77	-13.00	-49.77
5004.00	Н	-	-	-79.20	5.77	33.57	-61.69	-13.00	-48.69

Table 7-4. Radiated Spurious Data (NR Band n5 – Low Channel)

Bandwidth (MHz):	20
Frequency (MHz):	836.5
RB / Offset:	1 / 53
Mode:	Stand Alone

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]
1673.00	Н	-	-	-76.06	-2.16	28.78	-66.48	-13.00	-53.48
2509.50	Н	122	17	-50.12	2.23	59.11	-36.15	-13.00	-23.15
3346.00	Н	-	-	-77.89	3.26	32.37	-62.89	-13.00	-49.89
4182.50	Н	-	-	-79.52	4.46	31.94	-63.32	-13.00	-50.32
5019.00	Н	-	-	-79.50	5.89	33.39	-61.87	-13.00	-48.87

Table 7-5. Radiated Spurious Data (NR Band n5 – Mid Channel)

FCC ID: A3LSMS906E	PCTEST. Proud to be part of @ element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 40 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Fage 40 01 40
© 2021 PCTEST				V2 0 3/15/2021



Bandwidth (MHz):	20
Frequency (MHz):	839
RB / Offset:	1 / 53
Mode:	Stand Alone

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]
1678.00	н	-	-	-77.05	-2.04	27.91	-67.35	-13.00	-54.35
2517.00	н	163	19	-49.30	2.41	60.11	-35.15	-13.00	-22.15
3356.00	Н	-	-	-77.59	3.22	32.63	-62.63	-13.00	-49.63
4195.00	Н	-	-	-77.90	4.31	33.41	-61.84	-13.00	-48.84
5034.00	Н	-	-	-79.41	5.87	33.46	-61.80	-13.00	-48.80

Table 7-6. Radiated Spurious Data (NR Band n5 – High Channel)

Case:	w/ Wireless Charging Pad
Bandwidth (MHz):	20
Frequency (MHz):	839
RB / Offset:	1 / 53
	.,

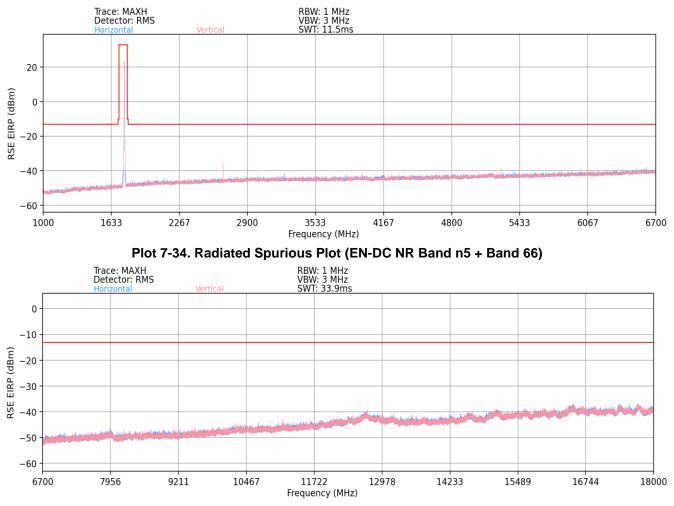
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1678.00	Н	-	-	-80.24	-0.82	25.94	-69.31	-13.00	-56.31
2517.00	Н	339	56	-54.06	3.20	56.14	-39.12	-13.00	-26.12
3356.00	Н	-	-	-76.16	5.00	35.84	-59.42	-13.00	-46.42
4195.00	Н	-	-	-76.73	5.70	35.97	-59.28	-13.00	-46.28
5034.00	Н	-	-	-79.18	6.86	34.68	-60.58	-13.00	-47.58

Table 7-7. Radiated Spurious Data with WCP (NR Band n5)

FCC ID: A3LSMS906E	Poul to be part of the element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 41 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 41 of 46
© 2021 PCTEST	·			V2.0 3/15/2021



# EN-DC NR Band n5 + Band 66



Plot 7-35. Radiated Spurious Plot (EN-DC NR Band n5 + Band 66)

20/20
836.5MHz & 1745
1/53 & 1/50
EN-DC
LTE Band 66

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]
2407.63	V	-	-	-79.56	11.83	39.27	-55.99	-13.00	-42.99
2673.50	V	153	317	-64.09	12.68	55.59	-39.67	-13.00	-26.67
2797.50	V	-	-	-79.35	12.82	40.47	-54.79	-13.00	-41.79
5265.24	V	102	354	-75.31	17.55	49.24	-46.02	-13.00	-33.02
6287.50	V	-	-	-81.28	19.07	44.79	-50.46	-13.00	-37.46
6431.50	V	-	-	-81.50	19.55	45.05	-50.21	-13.00	-37.21

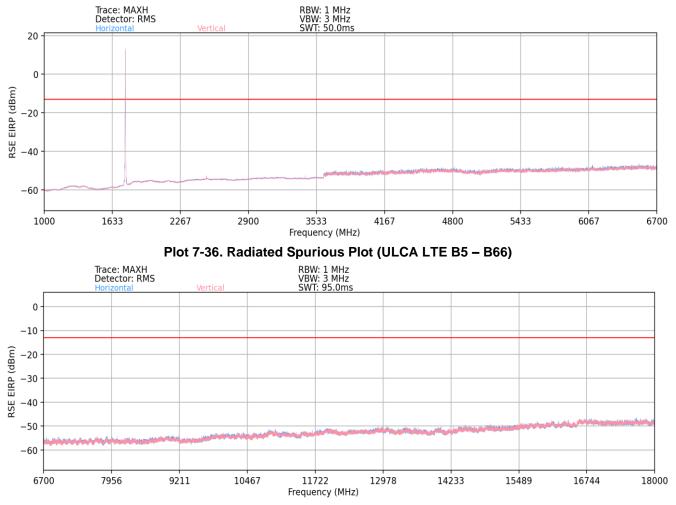
Table 7-8. Radiated Spurious Data (EN-DC NR Band n5 + Band 66)

FCC ID: A3LSMS906E		PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 42 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Fage 42 01 40
© 2021 PCTEST		·		V2.0 3/15/2021

#### 2021 PCTEST



# LTE ULCA: Band 5 – Band 66



#### Plot 7-37. Radiated Spurious Plot (ULCA LTE B5 - B66)

PCC Bandwidth (MHz):	10
PCC Frequency (MHz):	707.5
PCC RB / Offset:	1/25
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	1745.0
SCC 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]
1037.50	V	-	-	-68.73	6.00	44.27	-50.99	-13.00	-37.99
2075.00	V	-	-	-69.33	12.77	50.44	-44.82	-13.00	-31.82
2452.50	V	-	-	-69.99	14.03	51.04	-44.22	-13.00	-31.22
3490.00	V	-	-	-70.71	16.21	52.50	-42.76	-13.00	-29.76
4197.50	V	-	-	-71.93	17.30	52.37	-42.89	-13.00	-29.89

#### Table 7-9. Radiated Spurious Data (ULCA LTE B12 – B66)

FCC ID: A3LSMS906E	Proved to be post of the element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 42 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 43 of 46
© 2021 PCTEST		-		V2.0 3/15/2021



## 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.

For Part 22 and RSS-132, the frequency stability of the transmitter shall be maintained within  $\pm 0.00025\%$  ( $\pm 2.5$  ppm) of the center frequency.

#### 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

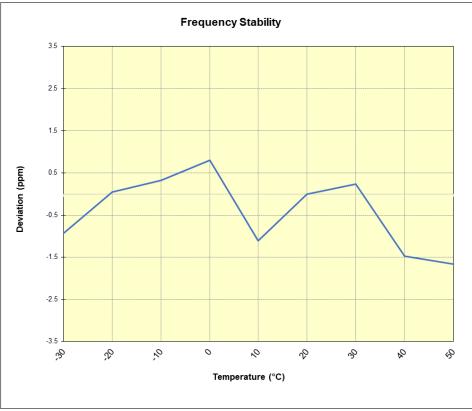
None

FCC ID: A3LSMS906E	Poul to be post of & element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 44 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Fage 44 01 40
© 2021 PCTEST				V2.0 3/15/2021



NR Band n5								
	Operating F	requency (Hz):	836,50	00,000				
	Ref.	Voltage (VDC):	4.	43				
		Deviation Limit:	± 0.00025%	o or 2.5 ppm				
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)			
		- 30	836,588,660	-783	-0.0000936			
		- 20	836,589,482	38	0.0000046			
		- 10	836,589,710	266	0.0000319			
		0	836,590,113	670	0.0000801			
100 %	4.43	+ 10	836,588,515	-928	-0.0001110			
		+ 20 (Ref)	836,589,443	0	0.0000000			
		+ 30	836,589,636	193	0.0000230			
		+ 40	836,588,206	-1,238	-0.0001479			
		+ 50	836,588,050	-1,394	-0.0001666			
Battery Endpoint	3.36	+ 20	836,589,022	-421	-0.0000503			

Table 7-10. NR Band n5 Frequency Stability Data



Plot 7-38. NR Band n5 Frequency Stability Chart

FCC ID: A3LSMS906E	Proved to be post of the element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 45 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Page 45 of 46
© 2021 PCTEST	•	-		V2.0 3/15/2021



# 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the Samsung **Portable Handset FCC ID: A3LSMS906E** complies with all the requirements of Part 22 of the FCC rules.

FCC ID: A3LSMS906E		PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 46 of 46
1M2110010116-02.A3L	11/15/2021 - 12/03/2021	Portable Handset		Fage 40 01 40
© 2021 PCTEST	·	·		V2.0 3/15/2021