

PCTEST

7185 Oakland Mills Road, Columbia, MD 21046 USA Tel. 410.290.6652 / Fax 410.290.6654 http://www.pctest.com



MEASUREMENT REPORT WLAN OFDMA

Applicant Name:

Samsung Electronics Co., Ltd. 129, Samsung-ro, Yeongtong-gu, Suwon-si Gyeonggi-do, 16677, Korea Date of Testing: 9/14/2021 - 12/8/2021 Test Report Issue Date: 12/15/2021 Test Site/Location: PCTEST Lab. Columbia, MD USA Test Report Serial No.: 1M2109220110-08.A3L

FCC ID:

A3LSMS908E

Certification

APPLICANT:

Samsung Electronics Co., Ltd.

Application Type:
Model:
Additional Model(s):
EUT Type:
Frequency Range:
Modulation Type:
FCC Classification:
FCC Rule Part(s):
Test Procedure(s):

SM-S908E/DS SM-S908E Portable Handset 2412 – 2472MHz CCK/DSSS/OFDMA Digital Transmission System (DTS) Part 15 Subpart C (15.247) ANSI C63.10-2013, KDB 558074 D01 v05r02, KDB 662911 D01 v02r01, 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 ANSI C63.10-2013 and KDB 558074 D01 v05r02. 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: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dege 1 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 1 of 77
© 2021 PCTEST	· ·			V 9.0 02/01/2019

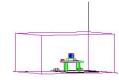


TABLE OF CONTENTS

1.0	INTR	ODUC	TION	4
	1.1	Scop	е	4
	1.2	PCTE	ST Test Location	4
	1.3	Test	Facility / Accreditations	4
2.0	PRO	DUCT	INFORMATION	5
	2.1	Equip	ment Description	5
	2.2	Devic	e Capabilities	5
	2.3	Test	Configuration	6
	2.4	Anter	na Description	6
	2.5	Softw	are and Firmware	6
	2.6	EMI S	Suppression Device(s)/Modifications	7
3.0	DESC	RIPTI	ON OF TESTS	8
	3.1	Evalu	ation Procedure	8
	3.2	Radia	ated Emissions	8
	3.3	Envir	onmental Conditions	8
4.0	ANTE	INNA I	REQUIREMENTS	9
5.0	MEAS	SURE	IENT UNCERTAINTY	10
6.0	TEST	EQUI	PMENT CALIBRATION DATA	11
7.0	TEST	RESU	JLTS	12
	7.1	Sumr	nary	.12
	7.2	6dB E	Bandwidth Measurement	.13
	7.3	Outpu	ut Power Measurement	.22
	7.4	Powe	r Spectral Density	.27
	7.5	Cond	ucted Emissions at the Band Edge	.35
	7.6	Cond	ucted Spurious Emissions	.48
	7.7	Radia	ted Spurious Emission Measurements – Above 1 GHz	.62
		7.7.1	MIMO Radiated Spurious Emission Measurements	. 65
		7.7.2	MIMO Radiated Restricted Band Edge Measurements	. 71
8.0	CON	CLUSI	ON	77

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 2 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 2 of 77
© 2021 PCTEST	•	•		V 9.0 02/01/2019





MEASUREMENT REPORT



				MI	MO			
			Avg Conducted Peak Co		onducted			
Mode	Tones	Tx Frequency [MHz]	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)		
802.11ax OFDMA	26T	2412 - 2472	77.948	18.92	978.694	29.91		
802.11ax OFDMA	52T	2412 - 2472	79.104	18.98	990.408	29.96		
802.11ax OFDMA	106T	2412 - 2472	95.947	19.82	941.649	29.74		
802.11ax OFDMA	242T	2412 - 2472	140.605	21.48	957.194	29.81		

EUT Overview

FCC ID: A3LSMS908E	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: Test Dates:		EUT Type:	Dogo 2 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 3 of 77
© 2021 PCTEST			V 9.0 02/01/2019



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 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 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: A3LSMS908E	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Daga 4 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 4 of 77
© 2021 PCTEST	•		V 9.0 02/01/2019



2.0 **PRODUCT INFORMATION**

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMS908E**. The test data contained in this report pertains only to the emissions due to the EUT's WLAN (DTS) transmitter.

Test Device Serial No.: 0501M, 0958M, 0545M, 1570M, 2680M

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

Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	12	2467
6	2437	13	2472
7	2442		

Table 2-1. Frequency/ Channel Operations

Note: The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = peak per the guidance of Section 6.0 b) of ANSI C63.10-2013 and KDB 558074 D01 v05r02. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Mode	Antenna	Tones	Duty Cycle (%)
	ΜΙΜΟ	26T	98.5
802.11ax		52T	97.9
DTS RU		106T	97.2
		242T	91.7

Table 2-2. Measured Duty Cycles

FCC ID: A3LSMS908E	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 5 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 5 of 77
© 2021 PCTEST	·			V 9.0 02/01/2019



The device employs MIMO technology. Below are the possible configurations.

WiFi Configurations		SIS	SO	SE	DM	C	DD
WIFI COIII	igurations	ANT1	ANT2	ANT1	ANT2	ANT1	ANT2
2.4GHz	11ax	×	×	✓	✓	\checkmark	✓

Table 2-3. Frequency / Channel Operations

 \checkmark = Support ; ***** = NOT Support SISO = Single Input Single Output SDM = Spatial Diversity Multiplexing – MIMO function CDD = Cyclic Delay Diversity - 2Tx Function

This device supports simultaneous transmission operation, which allows for two SISO channels to operate independent of one another in the 2.4GHz and 5GHz bands simultaneously on each antenna. The following tables show the worst case configurations determined during testing. The data for these configurations is contained in the UNII test report.

Description	2.4 GHz Emission	5 GHz Emission
Antenna	1, 2	1, 2
Channel	6	100
Operating Frequency (MHz)	2437	5500
Data Rate (Mbps)	1	6
Mode	802.11b	802.11a

Configuration 1: ANT1 and ANT2 both transmitting in 2.4GHz and 5GHz modes simultaneously

Table 2-4. Config-3 (ANT1 MIMO & ANT2 MIMO)

2.3 Test Configuration

The EUT was tested per the guidance of KDB 558074 D01 v05r02. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing. See Sections 3.2 for radiated emissions test setups, and 7.2, 7.3, 7.4, 7.5, and 7.6 for antenna port conducted emissions test setups.

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) EP-NG930 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 Antenna Description

Following antenna was used for the testing.

Frequency [GHz]	Antenna Gain 1 [dBi]	Antenna Gain 2 [dBi]
2.4	-6.23	-5.76

Table 2-5. Antenna Peak Gain

2.5 Software and Firmware

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo C of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 6 of 77
© 2021 PCTEST	•			V 9.0 02/01/2019



The test was conducted with firmware version S908WVLU0AUI8 installed on the EUT.

2.6 EMI Suppression Device(s)/Modifications

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

FCC ID: A3LSMS908E	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 7 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 7 of 77
© 2021 PCTEST	•		V 9.0 02/01/2019



3.0 **DESCRIPTION OF TESTS**

3.1 Evaluation Procedure

The measurement procedures described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) and the guidance provided in KDB 558074 D01 v05r02 were used in the measurement of the EUT.

Deviation from measurement procedure.....None

3.2 Radiated 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. An 80cm tall test table made of Styrodur is placed on top of the turn table. For measurements above 1GHz, an additional Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33 depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions.

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 474788 D01.

3.3 Environmental Conditions

The temperature is controlled within range of 15°C to 35°C. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 9 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 8 of 77
© 2021 PCTEST		·		V 9.0 02/01/2019



4.0 ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

- The antennas of the EUT are **permanently attached**.
- There are no provisions for connections to an external antenna.

Conclusion:

The EUT unit complies with the requirement of §15.203.

FCC ID: A3LSMS908E	PCTEST* Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 0 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 9 of 77
© 2021 PCTEST				V 9.0 02/01/2019



5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013. 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
Line Conducted Disturbance	3.09
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

FCC ID: A3LSMS908E	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 10 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 10 of 77
© 2021 PCTEST			V 9.0 02/01/2019



6.0 **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
-	WL25-1	Conducted Cable Set (25GHz)	9/7/2021	Annual	9/7/2022	WL25-1
-	WL25-2	Conducted Cable Set (25GHz)	9/7/2021	Annual	9/7/2022	WL25-2
-	WL25-3	Conducted Cable Set (25GHz)	9/7/2021	Annual	9/7/2022	WL25-3
-	WL40-1	Conducted Cable Set (40GHz)	9/10/2021	Annual	9/10/2022	WL40-1
Agilent	N9038A	MXE EMI Receiver	8/11/2020	Annual	12/1/2021	MY51210133
Agilent	N9030A	PXA Signal Analyzer (44GHz)	7/21/2021	Annual	7/21/2022	MY49430494
Anritsu	ML2495A	Power Meter	1/18/2021	Annual	1/18/2022	941001
Anritsu	MA2411B	Pulse Power Sensor	3/8/2021	Annual	3/8/2022	1339007
Emco	3115	Horn Antenna (1-18GHz)	6/18/2020	Biennial	6/18/2022	9704-5182
Emco	3116C	Horn Antenna (18 - 40GHz)	5/112021	Biennial	5/11/2023	218893
ETS-Lindgren	3816/2NM	Line Impedance Stabilization Network	7/9/2020	Biennial	7/9/2022	114451
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	8/17/2020	Annual	12/17/2021	MY52350166
Pasternack	NMLC-2	Line Conducted Emissions Cable (NM)	9/10/2021	Annual	9/10/2022	NMLC-2
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	7/21/2021	Annual	7/12/2022	MY49430494
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	8/3/2021	Annual	8/3/2022	100342
Rohde & Schwarz	ESW44	EMI Test Receiver 2Hz to 44GHz	1/21/2021	Annual	1/21/2022	101716
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	8/25/2021	Annual	8/25/2022	103200
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	9/3/2021	Annual	9/3/2022	102138
Solar Electronics	8012-50-R-24-BNC	Line Impedance Stabilization Network	9/21/2021	Biennial	9/21/2023	310233
Schwarzbeck	VULB9162	Bilog Antenna	4/17/2020	Biennial	4/17/2022	00301

Table 6-1. Annual Test Equipment Calibration Schedule

Note:

For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 11 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 11 of 77
© 2021 PCTEST	·			V 9.0 02/01/2019



7.0 **TEST RESULTS**

7.1 Summary

Company Name:	Samsung Electronics Co., Ltd.
FCC ID:	A3LSMS908E
FCC Classification:	Digital Transmission System (DTS)

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(2)	RSS-247 [5.2]	6dB Bandwidth	> 500kHz		PASS	Section 7.2
15.247(b)(3)	RSS-247 [5.4]	Transmitter Output Power	< 1 Watt		PASS	Sections 7.3
15.247(e)	RSS-247 [5.2]	Transmitter Power Spectral Density	< 8dBm / 3kHz Band	CONDUCTED	PASS	Section 7.4
15.247(d)	RSS-247 [5.5]	Band Edge / Out-of-Band Emissions	≥ 20dBc		PASS	Sections 7.5, 7.6
15.205 15.209	RSS-Gen [8.9]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-Gen [8.9])	RADIATED	PASS	Sections 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 this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer 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 and attenuators.
- 4) 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 "WLAN Automation," Version 3.5.
- 5) For radiated band edge, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "Chamber Automation," Version 1.3.1.
- 802.11ax OFDMA testing was performed for all signal tone configurations as specified by the 802.11ax standard. Worst case results are determined and reported per the guidance provided at the October 2018 TCB Workshop.

FCC ID: A3LSMS908E	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 10 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 12 of 77
© 2021 PCTEST			V 9.0 02/01/2019



7.2 6dB Bandwidth Measurement

§15.247(a.2); RSS-247 [5.2]

Test Overview and Limit

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the transmitter 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 and the worst case configuration results are reported in this section.

The minimum permissible 6dB bandwidth is 500 kHz.

Test Procedure Used

ANSI C63.10-2013 – Section 11.8.2 Option 2 KDB 558074 D01 v05r02 – Section 8.2

Test Settings

- The signal analyzer's automatic bandwidth measurement capability was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 6. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
- 2. RBW = 100kHz
- 3. VBW \ge 3 x RBW
- 4. Detector = Peak
- 5. Trace mode = max hold
- 6. Sweep = 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 7-1. Test Instrument & Measurement Setup

Test Notes

- 1. Based on preliminary measurements, it was determined that, of all the tone configurations, the 26T configuration produced the worst case 6dB Bandwidth measurement. Only the worst case data is included in this section.
- 2. The 6dB bandwidth for each channel was measured with the RU index showing the highest conducted power.

FCC ID: A3LSMS908E	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dega 12 of 77	
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 13 of 77	
© 2021 PCTEST V 9.0 02/01/2019				



MIMO Antenna-1 6 dB Bandwidth Measurements

Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
2412	1	ax	26T	MCS0	2.136	0.500
2437	6	ax	26T	MCS0	2.118	0.500
2462	11	ax	26T	MCS0	2.088	0.500
2412	1	ax	242T	MCS0	19.07	0.500
2437	6	ax	242T	MCS0	19.08	0.500
2462	11	ax	242T	MCS0	19.03	0.500

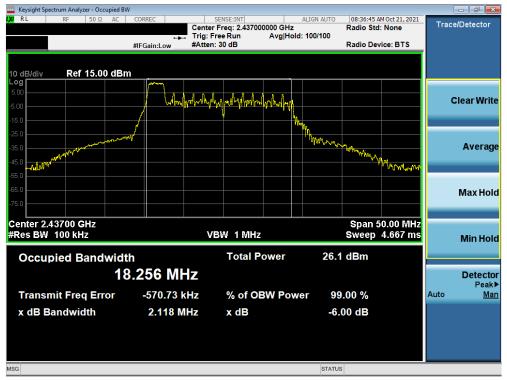
Table 7-2. Conducted Bandwidth Measurements MIMO ANT1



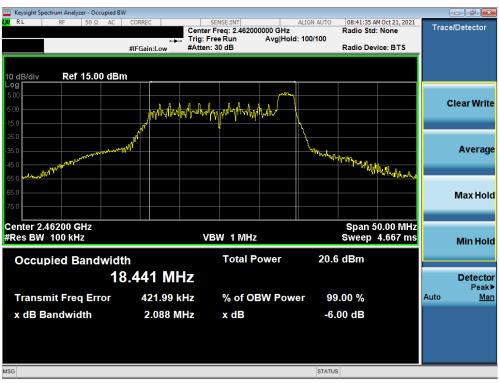
Plot 7-1. 6dB Bandwidth Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 1)

FCC ID: A3LSMS908E	PCTEST* Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	est Dates: EUT Type:	
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 14 of 77
© 2021 PCTEST	·		V 9.0 02/01/2019





Plot 7-2. 6dB Bandwidth Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 6)



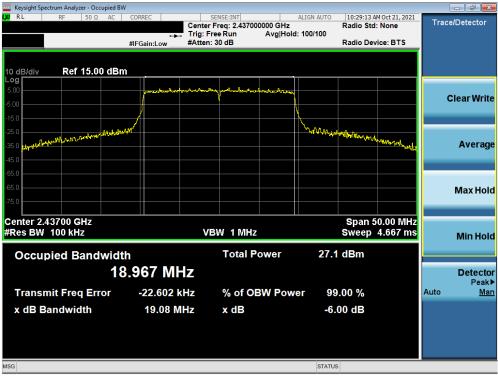
Plot 7-3. 6dB Bandwidth Plot MIMO ANT1 (802.11ax OFDMA - 26 Tones - Ch. 11)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 15 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 15 of 77
© 2021 PCTEST	•			V 9.0 02/01/2019



Keysight Spectrum Analyzer - Occupied B					
LXVIRL RF 50Ω AC	CORREC	SENSE:INT er Freg: 2.412000000 GH	ALIGN AUTO	10:22:36 AM Oct 21 Radio Std: None	
	Trig:	Free Run Avg H	old: 100/100		
	#IFGain:Low #Atte	en: 30 dB		Radio Device: B1	rs
10 dB/div Ref 15.00 dBr	n		_		
5.00					
-5.00	www. fest anno	her with house have been been	N/1		Clear Write
-15.0					
-25.0			\		
-35.0	N ^N		<u>}</u>		Average
-45.0	η«		mm	- stan	
-55.0 att 1000				and a strange value	Mm
-65.0					Max Hold
-75.0					
Center 2.41200 GHz				Span 50.00	
#Res BW 100 kHz		VBW 1 MHz		Sweep 4.667	ms Min Hold
Occupied Bandwid	th	Total Power	18.2	2 dBm	
	 3.937 MHz				Detector
10	5.93/ WINZ				Detector Peak
Transmit Freq Error	-3.890 kHz	% of OBW Po	wer 99	9.00 %	Auto <u>Mar</u>
x dB Bandwidth	19.07 MHz	x dB	-6.	00 dB	
MSG			STATU	8	
			STATU		

Plot 7-4. 6dB Bandwidth Plot MIMO ANT1 (802.11ax OFDMA - 242 Tones - Ch. 1)



Plot 7-5. 6dB Bandwidth Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 6)

FCC ID: A3LSMS908E	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)		r ed by: cal Manager
Test Report S/N:	Test Dates:	EUT Type:	Dama 44	0 - 4 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 16	1 1 10 0
© 2021 PCTEST V 9.0 02/01/2019				



www.www.www.www.www.www.www.www.www.ww	BW				
<mark>.,X/</mark> RL RF 50Ω AC		SENSE:INT Freq: 2.462000000 GHz	ALIGN AUTO	10:32:40 AM Oct 21, 2021 Radio Std: None	Trace/Detector
	+++ Trig:	Free Run Avg Hold	d:>100/100		
	#IFGain:Low #Atte	n: 30 dB		Radio Device: BTS	
10 dB/div Ref 15.00 dE	3m				
5.00					
-5.00	an mounter have me	along marken hand maken the source			Clear Write
-15.0					
-25.0			λ		
-35.0	/		$\left \right\rangle$		Average
			Mu ann a		J
-45.0 -55.0			i a çəriyy	man senderson of	
-65.0					
-75.0					Max Hold
-73.0					
Center 2.46200 GHz				Span 50.00 MHz	
#Res BW 100 kHz		/BW 1 MHz		Sweep 4.667 ms	Min Hold
Occupied Bandwig	ith	Total Power	20.4	dBm	
			20.4		
1	8.926 MHz				Detector Peak►
Transmit Freq Error	-31.351 kHz	% of OBW Pow	er 99	.00 %	Auto <u>Man</u>
x dB Bandwidth	19.03 MHz	x dB	-6 (00 dB	
	13.03 1112	X UD	-0.0		
100			074-715		
MSG			STATUS		

Plot 7-6. 6dB Bandwidth Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 11)

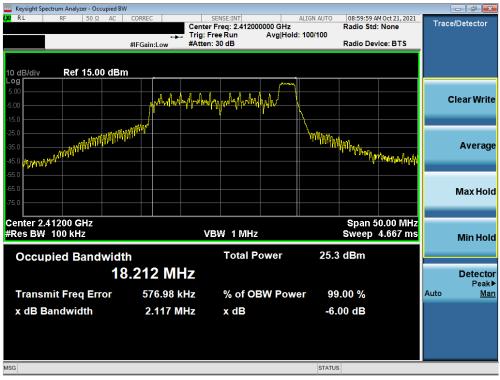
FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dego 17 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 17 of 77
© 2021 PCTEST	<u>.</u>			V 9.0 02/01/2019



MIMO Antenna-2 6 dB Bandwidth Measurements

Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
2412	1	ax	26T	MCS0	2.117	0.500
2437	6	ax	26T	MCS0	2.126	0.500
2462	11	ax	26T	MCS0	2.120	0.500
2412	1	ax	242T	MCS0	19.05	0.500
2437	6	ax	242T	MCS0	18.99	0.500
2462	11	ax	242T	MCS0	19.10	0.500

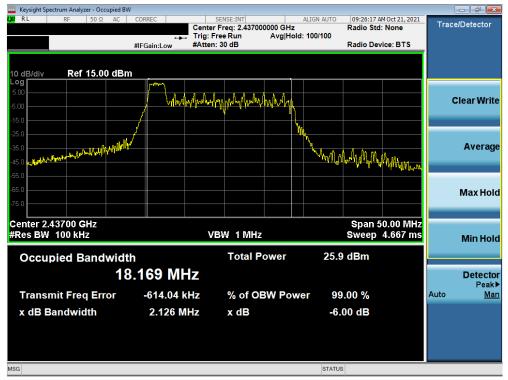
Table 7-3. Conducted Bandwidth Measurements SISO ANT2



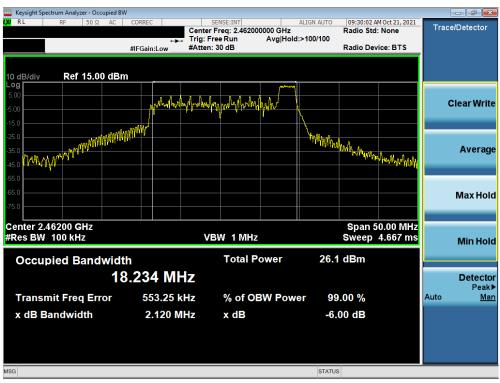
Plot 7-7. 6dB Bandwidth Plot MIMO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 1)

FCC ID: A3LSMS908E	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dega 19 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 18 of 77
© 2021 PCTEST			V 9.0 02/01/2019





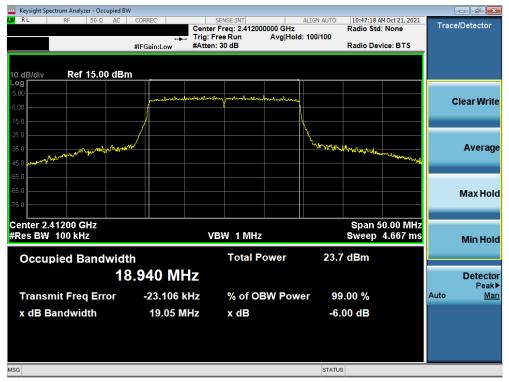
Plot 7-8. 6dB Bandwidth Plot MIMO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 6)



Plot 7-9. 6dB Bandwidth Plot MIMO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 11)

FCC ID: A3LSMS908E	PCTEST° Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dama 40 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 19 of 77
© 2021 PCTEST		•		V 9.0 02/01/2019





Plot 7-10. 6dB Bandwidth lot MIMO ANT2 (802.11ax OFDMA - 242 Tones - Ch. 1)



Plot 7-11. 6dB Bandwidth Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 6)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dama 00 of 77	
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 20 of 77	
© 2021 PCTEST V 9.0 02/01/2019					



Keysight Spectrum Analyzer - Occupied BV	V				
KI RF 50Ω AC	CORREC	SENSE:INT nter Freg: 2.462000	ALIGN AUTO	11:00:18 AM Oct 21, 2021 Radio Std: None	Trace/Detector
	tri	g: Free Run	Avg Hold: 100/100	Radio Stu. None	
	#IFGain:Low #A	tten: 30 dB		Radio Device: BTS	
10 dB/div Ref 15.00 dBn	n				
5.00					
	malententen	money marine	- Auglann		Clear Write
-5.00					
-15.0					
-25.0			— <u> </u>		
-35.0	00		william	h	Average
-35.0 -45.0			الملايية		
-55.0				The Product	
-65.0					Max Hold
-75.0					Maxitola
Center 2.46200 GHz				Span 50.00 MHz	
#Res BW 100 kHz		VBW 1 MHz		Sweep 4.667 ms	Min Hold
Occupied Bandwidt	h	Total Po	wer 20.2	2 dBm	
		i otari i o	2012		
18	3.947 MHz				Detector Peak►
Transmit Freq Error	-36.188 kHz	% of OB	W Power 99	.00 %	Auto Man
•					
x dB Bandwidth	19.10 MHz	x dB	-0.	00 dB	
MSG			STATUS	3	

Plot 7-12. 6dB Bandwidth Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 11)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 01 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 21 of 77
© 2021 PCTEST	•			V 9.0 02/01/2019



7.3 Output Power Measurement §15.247(b.3); RSS-247 [5.4]

Test Overview and Limits

A transmitter antenna terminal of EUT is connected to the input of an RF power sensor. Measurement is made using a broadband power meter capable of making peak and average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

The maximum permissible conducted output power is 1 Watt.

Test Procedure Used

ANSI C63.10-2013 – Section 11.9.1.3 PKPM1 Peak Power Method KDB 558074 D01 v05r02 – Section 8.3.1.3 PKPM1 Peak-reading Power Meter Method ANSI C63.10-2013 – Section 11.9.2.3.2 Method AVGPM-G KDB 558074 D01 v05r02 – Section 8.3.2.3 Measurement using a Power Meter (PM) ANSI C63.10-2013 – Section 14.2 Measure-and-Sum Technique KDB 662911 D01 v02r01 – Section E)1) Measure-and-Sum Technique

Test Settings

Method PKPM1 (Peak Power Measurement)

Peak power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The pulse sensor employs a VBW = 50MHz so this method was only used for signals whose DTS bandwidth was less than or equal to 50MHz.

Method AVGPM-G (Average Power Measurement)

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter. The trace was averaged over 100 traces to obtain the final measured average power.

Test Setup

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



Figure 7-2. Test Instrument & Measurement Setup for Power Meter Measurements

Test Notes

None

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Da
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 22 of 77
© 2021 PCTEST		·		V 9.0 02/01/2019



	Freq [MHz]	Channel	Tones	RU Index	Detector	Cond	lucted Power [dBm]	Conducted Power Limit	Conducted Power		
						ANT1	ANT2	MIMO	[dBm]	Margin [dB]		
				0	AVG	15.60	15.72	18.67	30.00	-11.33		
				0	PEAK	25.53	24.37	28.00	30.00	-2.00		
	2412	1	26T	4	AVG	16.07	15.73	18.92	30.00	-11.08		
	2412		201	4	PEAK	26.99	24.26	28.85	30.00	-1.15		
				8	AVG	16.08	15.31	18.72	30.00	-11.28		
				0	PEAK	27.17	25.79	29.54	30.00	-0.46		
				0	AVG	16.06	15.75	18.92	30.00	-11.08		
				0	PEAK	27.05	24.87	29.11	30.00	-0.89		
	2437	6	26T	4	AVG	15.30	15.38	18.35	30.00	-11.65		
	2407	U		4	PEAK	26.49	25.43	29.00	30.00	-1.00		
N						8	AVG	15.13	15.01	18.08	30.00	-11.92
Î						0	PEAK	26.29	25.73	29.03	30.00	-0.97
2.4GHz				0	AVG	15.33	15.35	18.35	30.00	-11.65		
4				Ŭ	PEAK	27.51	26.04	29.85	30.00	-0.15		
Ň	2462	11	26T	6T 4	AVG	15.32	15.07	18.21	30.00	-11.79		
	2402		201		PEAK	27.37	25.71	29.63	30.00	-0.37		
				8	AVG	15.68	15.68	18.69	30.00	-11.31		
				Ŭ	PEAK	27.54	26.14	29.91	30.00			
				0	AVG	8.52	7.84	11.20	30.00	-18.80		
					PEAK	16.34	15.77	19.07	30.00	-10.93		
	2467	12	26T	4	AVG	8.94	8.73	11.85	30.00	-18.15		
	2101		201		PEAK	16.72	16.60	19.67	30.00	-10.33		
				8	AVG	8.66	8.65	11.67	30.00	-18.33		
				Ŭ.	PEAK	16.52	17.05	19.80	30.00			
				0	AVG	6.58	5.45	9.06	30.00	-20.94		
					PEAK	14.32	13.56	16.97	30.00	00 -2.00 00 -11.08 00 -11.28 00 -0.46 00 -0.46 00 -11.08 00 -0.46 00 -11.08 00 -0.89 00 -11.65 00 -11.65 00 -0.97 00 -0.15 00 -11.79 00 -0.37 00 -11.31 00 -0.09 00 -18.80 00 -10.23 00 -10.33 00 -10.20 00 -13.03 00 -13.03 00 -20.94 00 -12.55 00 -20.52		
	2472	13	26T	4	AVG	6.55	5.86	9.23	30.00			
			_0.		PEAK	14.81	14.03	17.45	30.00			
				8	AVG	6.73	6.19	9.48	30.00			
					PEAK	14.85	14.21	17.55	30.00	-12.45		

Table 7-4. Conducted Output Power Measurements MIMO (26 Tones)

FCC ID: A3LSMS908E	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dogo 22 of 77	
1M2109220110-08.A3L	L 9/14/2021 - 12/8/2021 Portable Handset		Page 23 of 77	
© 2021 PCTEST			V 9.0 02/01/2019	



	Freq [MHz]	Channel	Tones	RU Index	Detector	Cond	ducted Power [dBm]	Conducted Power Limit	Conducted Power		
						ANT1	ANT2	MIMO	[dBm]	Margin [dB]		
				37	AVG	16.09	15.85	18.98	30.00	-11.02		
				57	PEAK	27.24	25.87	29.62	30.00	-0.38		
	2412	1	52T	38	AVG	15.98	15.26	18.65	30.00	-11.35		
	2412	1	521	50	PEAK	27.07	25.86	29.52	30.00	-0.48		
				40	AVG	15.68	15.01	18.37	30.00	-11.63		
				40	PEAK	27.91	25.71	29.96	30.00	-0.04		
				37	AVG	15.69	15.03	18.38	30.00	-11.62		
				57	PEAK	26.51	25.51	29.05	30.00	-0.95		
	2437	6	52T	38	AVG	16.05	15.77	18.92	30.00	-11.08		
	2437	0	521	50	PEAK	27.06	26.03	29.59	30.00	-0.41		
						40	AVG	15.57	15.13	18.37	30.00	-11.63
N				-10	PEAK	27.14	25.96	29.60	30.00	-0.40		
2.4GHz				37	AVG	15.89	15.71	18.81	30.00	-11.19		
Q					PEAK	27.54	26.03	29.86	30.00	-0.14		
7	2462	11	52T	38	AVG	15.31	15.45	18.39	30.00	-11.61		
N	2402		021	40	PEAK	26.99	25.45	29.30	30.00	-0.70		
					AVG	15.93	15.85	18.90	30.00	-11.10		
				-10	PEAK	27.33	26.19	29.81	30.00	-0.19		
				37	AVG	8.64	8.04	11.36	30.00	-18.64		
					PEAK	16.83	16.26	19.56	30.00	-10.44		
	2467	12	52T	38	AVG	9.10	8.77	11.95	30.00	-18.05		
	2101		021		PEAK	16.82	17.25	20.05	30.00	-9.95		
				40	AVG	8.65	8.94	11.81	30.00	-18.19		
					PEAK	16.92	17.40	20.18	30.00	-9.82		
				37	AVG	6.70	5.62	9.20	30.00			
	2472 1				PEAK	14.92	13.66	17.35	30.00	0.00 -0.38 0.00 -11.35 0.00 -0.48 0.00 -0.48 0.00 -11.63 0.00 -0.04 0.00 -0.04 0.00 -0.04 0.00 -0.04 0.00 -0.04 0.00 -0.04 0.00 -0.04 0.00 -11.62 0.00 -0.41 0.00 -0.41 0.00 -0.40 0.00 -0.163 0.00 -0.14 0.00 -0.14 0.00 -0.19 0.00 -0.19 0.00 -18.64 0.00 -18.40 0.00 -9.95 0.00 -9.82 0.00 -20.80 0.00 -12.65 0.00 -19.95 0.00 -20.25 0.00 -11.95		
		13	52T	38	AVG	7.16	6.27	9.75	30.00			
				50	PEAK	15.26	14.80	18.05	30.00			
				40	AVG	7.22	6.69	9.97	30.00			
					PEAK	15.59	15.16	18.39	30.00	-11.61		

Table 7-5. Conducted Output Power Measurements MIMO (52 Tones)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dama 04 at 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 24 of 77
© 2021 PCTEST		·	V 9.0 02/01/2019



	Freq [MHz]	Channel	Tones	RU Index	Detector	Conc	lucted Power [dBm]	Conducted Power Limit	Conducted Power		
						ANT1	ANT2	MIMO	[dBm]	Margin [dB]		
				53	AVG	16.28	16.02	19.16	30.00	-10.84		
	2412	1	106T	- 55	PEAK	27.41	25.92	29.74	30.00	-0.26		
	2412	1	1001	54	AVG	16.90	16.14	19.55	30.00	-10.45		
				54	PEAK	26.04	24.81	28.48	30.00	-1.52		
				53	AVG	16.66	16.46	19.57	30.00	-10.43		
	2437	6	106T	- 55	PEAK	26.59	25.18	28.95	30.00	-1.05		
N	2437	0	1001	1001	1001	54	AVG	16.72	16.40	19.57	30.00	-10.43
I							54	PEAK	26.29	25.21	28.79	30.00
2.4G			53	AVG	16.81	16.81	19.82	30.00	-10.18			
7	2462	11	106T		PEAK	26.52	25.10	28.88	30.00	-1.12		
N	2402		1001		54	AVG	16.85	16.64	19.76	30.00	-10.24	
				54	PEAK	26.03	25.16	28.63	30.00	-1.37		
				53	AVG	8.77	8.25	11.53	30.00	-18.47		
	2467	12	106T		PEAK	17.85	17.55	20.71	30.00	-9.29		
	2407	12	1001	54	AVG	8.42	8.23	11.34	30.00	-18.66		
				54	PEAK	17.18	17.14	20.17	30.00	-9.83		
				53	AVG	6.82	5.86	9.38	30.00	-20.62		
	2472 13	106T	- 33	PEAK	15.68	14.60	18.18	30.00	-11.82			
	2412	15	1001	54	AVG	7.09	6.51	9.82	30.00	-20.18		
				54	PEAK	15.76	15.06	18.43	30.00	-11.57		

Table 7-6. Conducted Output Power Measurements MIMO (106 Tones)

	Freq [MHz]	Channel	Tones	RU Index	Detector	Cond	lucted Power [dBm]	Conducted Power Limit	Conducted Power		
						ANT1	ANT2	MIMO	[dBm]	Margin [dB]		
	2412	1	1 242T	61	AVG	15.29	14.71	18.02	30.00	-11.98		
	2412	1		01	PEAK	27.40	25.49	29.56	30.00	-0.44		
	2417	2	242T	61	AVG	17.48	16.97	20.24	30.00	-9.76		
	2417	2	2421	01	PEAK	28.01	25.13	29.81	30.00	-0.19		
<u>N</u>	2422	3	242T	242T	61	AVG	18.60	18.28	21.45	30.00	-8.55	
I I	2422	5		01	PEAK	26.87	25.68	29.33	30.00	-0.67		
4 4	2437	6	242T	242T	242T	61	AVG	18.47	18.31	21.40	30.00	-8.60
-	2407	U		2421 01	PEAK	26.78	25.26	29.10	30.00	-0.90		
2	2457	10	242T	242T	242T	61	AVG	18.37	18.56	21.48	30.00	-8.52
	2407	10	2721	01	PEAK	26.58	25.43	29.05	30.00	-0.95		
	2462	11	242T	61	AVG	15.37	15.58	18.49	30.00	-11.51		
	2402		2721	01	PEAK	26.67	25.13	28.98	30.00	-1.02		
	2467	12	242T	61	AVG	8.74	8.35	11.56	30.00	-18.44		
	2-101	12	2421	01	PEAK	17.58	17.12	20.37	30.00	-9.63		
	2472	13	242T	61	AVG	6.58	5.69	9.17	30.00	-20.83		
	2412	10	2721	51	PEAK	15.54	14.89	18.24	30.00	-11.76		

Table 7-7. Conducted Output Power Measurements MIMO (242 Tones)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dage 25 of 77	
1M2109220110-08.A3L 9/14/2021 - 12/8/2021		Portable Handset	Page 25 of 77	
© 2021 PCTEST			V 9.0 02/01/2019	



Note:

Per ANSI C63.10-2013 and KDB 662911 D01 v02r01 Section E)1), the conducted powers at Antenna 1 and Antenna 2 were first measured separately during MIMO transmission as shown in the section above. The measured values were then summed in linear power units then converted back to dBm.

Sample MIMO Calculation:

At 2412MHz the average conducted output power was measured to be 18.17 dBm for Antenna-1 and 18.42 dBm for Antenna-2.

Antenna 1 + Antenna 2 = MIMO

(18.17 dBm + 18.42 dBm) = (65.5871 mW + 69.4178 mW) = 134.99 mW = 21.30 dBm

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 20 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 26 of 77
© 2021 PCTEST		•	V 9.0 02/01/2019



7.4 Power Spectral Density

§15.247(e); RSS-247 [5.2]

Test Overview and Limit

The peak power density is 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, tones configurations, and RU indices were investigated and the worst case configuration results are reported in this section.

The maximum permissible power spectral density is 8 dBm in any 3 kHz band.

Test Procedure Used

ANSI C63.10-2013 – Section 11.10.2 Method PKPSD KDB 558074 D01 v05r02 – Section 8.4 DTS Maximum Power Spectral Density level in the fundamental emission ANSI C63.10-2013 – Section 14.3.2.2 Measure-and-Sum Technique KDB 662911 D01 v02r01 – Section E)2) Measure-and-Sum Technique

Test Settings

- 1. Analyzer was set to the center frequency of the DTS channel under investigation
- 2. Span = 1.5 times the DTS channel bandwidth
- 3. RBW = 10kHz
- 4. VBW = 3kHz
- 5. Detector = peak
- 6. Sweep time = auto couple
- 7. Trace mode = max hold
- 8. Trace was allowed to stabilize

Test Setup

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



Figure 7-3. Test Instrument & Measurement Setup

Test Notes

- 1. Based on preliminary measurements, it was determined that, of all of the tone configurations, the 26T configuration produced the worst case power spectral density measurement for partial loaded case. Therefore, only the 26 Tone configuration and 242 Tone data is included in this section.
- 2. The power spectral density for each channel was measured with the RU index showing the highest conducted power.

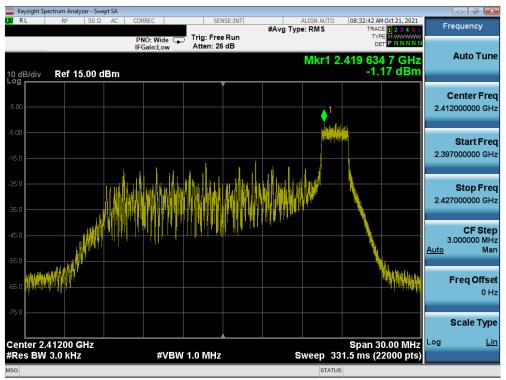
FCC ID: A3LSMS908E	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 27 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 27 of 77
© 2021 PCTEST			V 9.0 02/01/2019



MIMO Power Spectral Density Measurements

Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	ANT 1 Power Spectral Density [dBm]	ANT 2 Power Spectral Density [dBm]	Summed MIMO Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]	Pass / Fail
2412	1	ax	26T	MCS0	-1.17	-1.05	1.90	8.00	-6.10	Pass
2437	6	ax	26T	MCS0	-1.76	-0.15	2.13	8.00	-5.87	Pass
2462	11	ax	26T	MCS0	-0.09	-0.56	2.69	8.00	-5.31	Pass
2412	1	ax	242T	MCS0	-10.37	-10.08	-7.21	8.00	-15.21	Pass
2437	6	ax	242T	MCS0	-6.74	-6.83	-3.78	8.00	-11.78	Pass
2462	11	ax	242T	MCS0	-13.87	-12.98	-10.39	8.00	-18.39	Pass

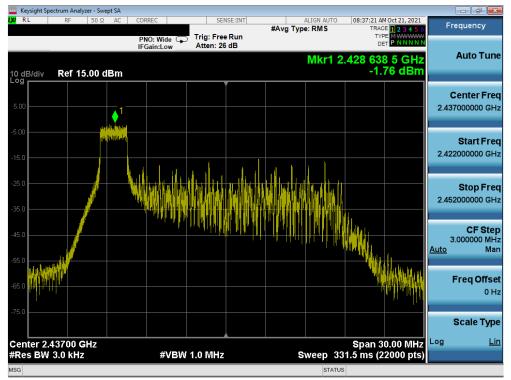
Table 7-8.MIMO Conducted Power Density Measurements



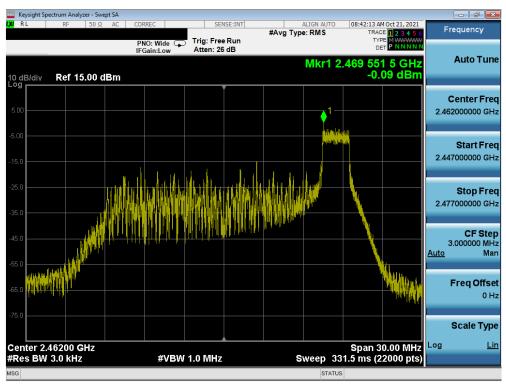
Plot 7-13. Power Spectral Density Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 1)

FCC ID: A3LSMS908E	PCTEST* Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager			
Test Report S/N:	Test Dates:	EUT Type:	Dage 29 of 77			
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 28 of 77			
© 2021 PCTEST V 9.0 02/01/2019						





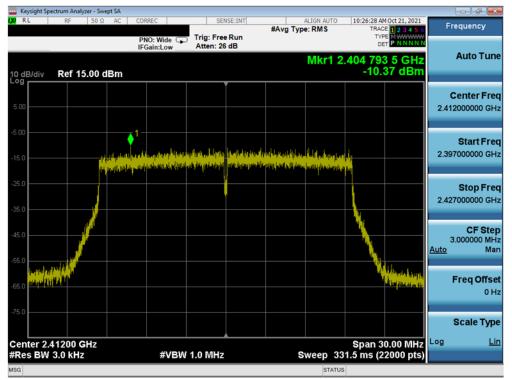
Plot 7-14. Power Spectral Density Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 6)



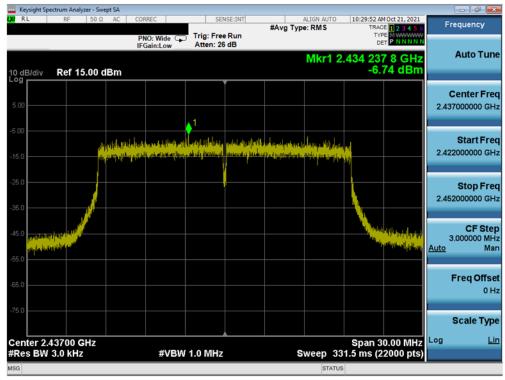
Plot 7-15. Power Spectral Density Plot MIMO ANT1 (802.11ax OFDMA - 26 Tones - Ch. 11)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: Test Dates:		EUT Type:	Dage 20 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 29 of 77
© 2021 PCTEST			V 9.0 02/01/2019





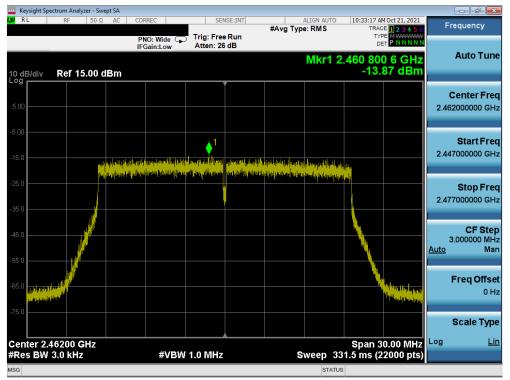
Plot 7-16. Power Spectral Density Plot MIMO ANT1 (802.11ax OFDMA - 242 Tones - Ch. 1)



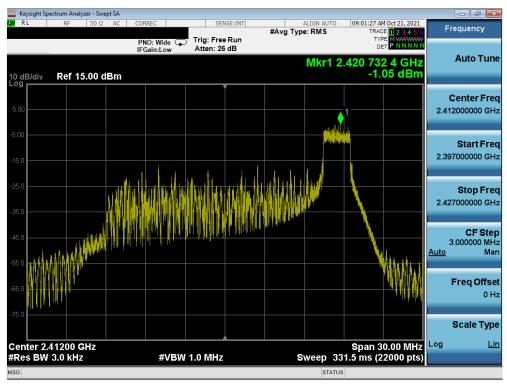
Plot 7-17. Power Spectral Density Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 6)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	G	Approved by: Technical Manager
Test Report S/N: Test Dates:		EUT Type:		Dage 20 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 30 of 77
© 2021 PCTEST	•			V 9.0 02/01/2019





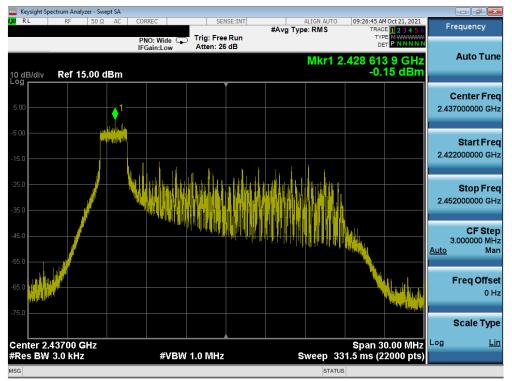
Plot 7-18. Power Spectral Density Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 11)



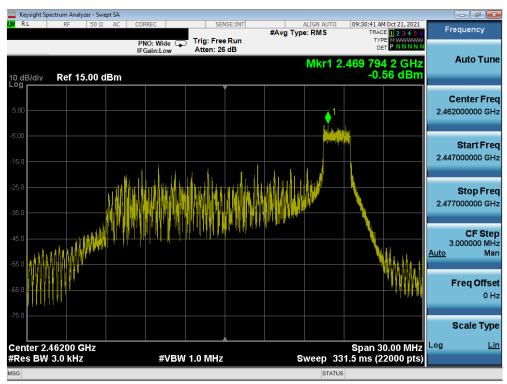
Plot 7-19. Power Spectral Density Plot MIMO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 1)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: Test Dates:		EUT Type:	Dogo 24 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 31 of 77
© 2021 PCTEST			V 9.0 02/01/2019





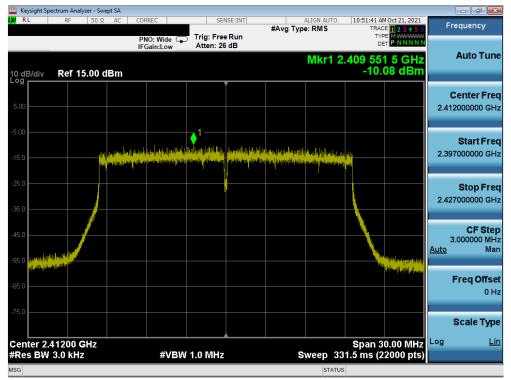
Plot 7-20. Power Spectral Density Plot MIMO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 6)



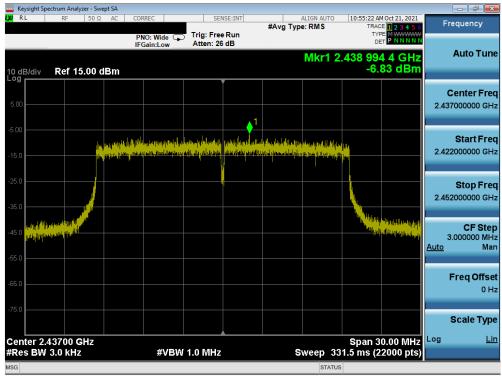
Plot 7-21. Power Spectral Density Plot MIMO ANT2 (802.11ax OFDMA - 26 Tones - Ch. 11)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: Test Dates:		EUT Type:	Demo 22 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 32 of 77
© 2021 PCTEST			V 9.0 02/01/2019





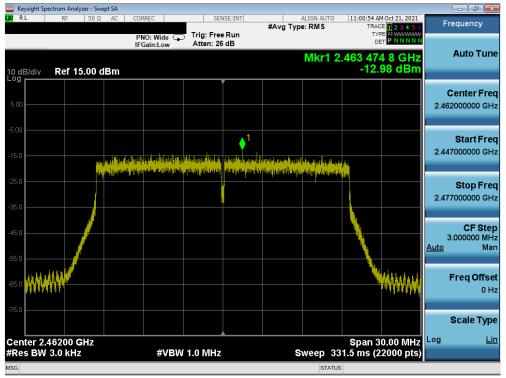
Plot 7-22. Power Spectral Density Plot MIMO ANT2 (802.11ax OFDMA - 242 Tones - Ch. 1)



Plot 7-23. Power Spectral Density Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 6)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: Test Dates:		EUT Type:	Dage 22 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 33 of 77
© 2021 PCTEST	•		V 9.0 02/01/2019





Plot 7-24. Power Spectral Density Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 11)

Note:

Per ANSI C63.10-2013 Section 14.3.2.2 and KDB 662911 D01 v02r01 Section E)2), the power spectral density at Antenna 1 and Antenna 2 were first measured separately as shown in the section above. The measured values were then summed in linear power units then converted back to dBm.

Sample MIMO Calculation:

At 2412MHz the average conducted power spectral density was measured to be -2.27 dBm for Antenna-1 and -1.36 dBm for Antenna-2.

Antenna 1 + Antenna 2 = MIMO

(-2.27 dBm + -1.36 dBm) = (0.59 mW + 0.73 mW) = 1.32 mW = 1.22 dBm

FCC ID: A3LSMS908E	PCTEST° Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: Test Dates:		EUT Type:		Dage 24 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 34 of 77
© 2021 PCTEST	V 9.0 02/01/2019			



7.5 Conducted Emissions at the Band Edge §15.247(d); RSS-247 [5.5]

Test Overview and Limit

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 its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates, tone configurations, and RU indices were investigated to determine the worst case configuration. For the following out of band conducted emissions plots at the band edge, the EUT was set to a data rate of MCS0 in 802.11ax mode as this setting produced the worst-case emissions.

The limit for out-of-band spurious emissions at the band edge is 30dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100kHz bandwidth per the PSD procedure (Section 7.4).

Test Procedure Used

ANSI C63.10-2013 – Section 11.11.3 KDB 558074 D01 v05r02 – Section 8.7.2

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 = 100kHz
- 4. VBW = 1MHz
- 5. Detector = Peak
- 6. Number of sweep points $\geq 2 \times \text{Span/RBW}$
- 7. Trace mode = max hold
- 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.



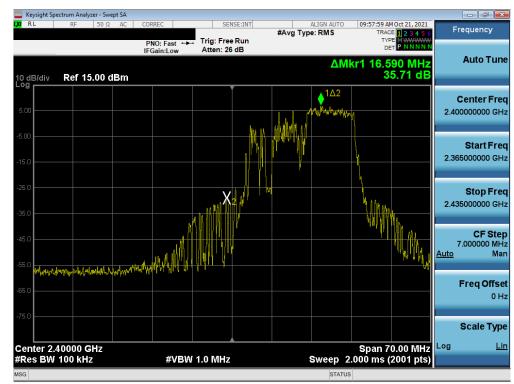
Figure 7-4. Test Instrument & Measurement Setup

Test Notes

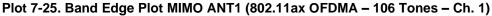
None

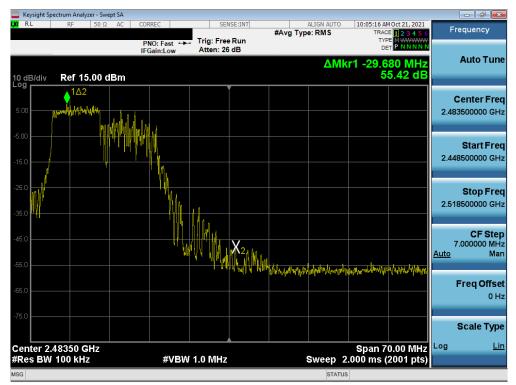
FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager			
Test Report S/N:	Test Dates:	EUT Type:	Dage 25 of 77			
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 35 of 77			
© 2021 PCTEST V 9.0 02/01/2019						





MIMO Antenna-1 Conducted Emissions at the Band Edge



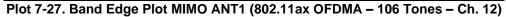


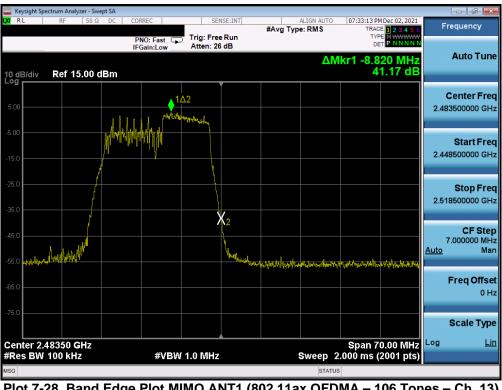
Plot 7-26. Band Edge Plot MIMO ANT1 (802.11ax OFDMA – 106 Tones – Ch. 11)

FCC ID: A3LSMS908E	PCTEST° Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: Test Dates:		EUT Type:		Dage 26 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 36 of 77
© 2021 PCTEST	•			V 9.0 02/01/2019



	Spectrum Analyze										_	
L <mark>XI</mark> RL	RF	50 Ω DC	CORRI	EC	SEN	ISE:INT	#Avg Typ	ALIGN AUTO		PM Dec 02, 2021	Fr	equency
			PNC IFGa):Fast 🖵 iin:Low	Trig: Free Atten: 26				T			
10 dB/div Log	Ref 15.0	00 dBm	า					ΔM	kr1 -12.	705 MHz 55.23 dB		Auto Tune
5.00		1.1.1.1		<u>1∆2</u>								enter Freq 500000 GHz
-5.00											2.448	Start Freq 500000 GHz
-25.0											2.518	Stop Freq 500000 GHz
-45.0 -55.0	AMM				WHAN A	K-2-Marton Mart	tour and the second	uphaliphically	wystamphicita	1	7 <u>Auto</u>	CF Step .000000 MHz Man
-65.0											i	F req Offset 0 Hz
	0.40050.01										Log	Scale Type Lin
	2.48350 GH W 100 kHz	Z		#VBW	1.0 MHz			Sweep	Span 2.000 ms	70.00 MHz (2001 pts)	Log	<u></u>
MSG								STAT				



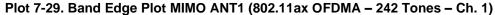


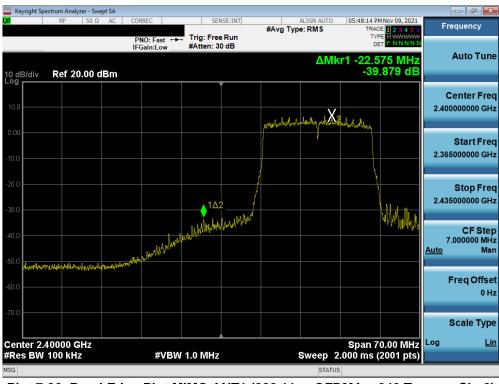
Plot 7-28. Band Edge Plot MIMO ANT1 (802.11ax OFDMA – 106 Tones – Ch. 13)

FCC ID: A3LSMS908E	PCTEST* Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dage 07 of 77	
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 37 of 77	
© 2021 PCTEST				V 9.0 02/01/2019	





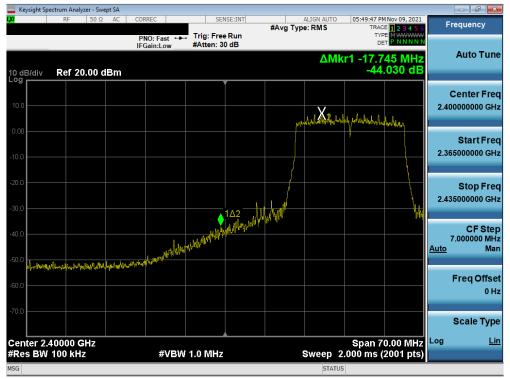


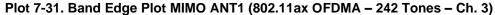


Plot 7-30. Band Edge Plot MIMO ANT1 (802.11ax OFDMA - 242 Tones - Ch. 2)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager	
Test Report S/N: Test Dates:		EUT Type:		
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 38 of 77	
© 2021 PCTEST		•	V 9.0 02/01/2019	







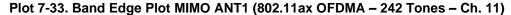


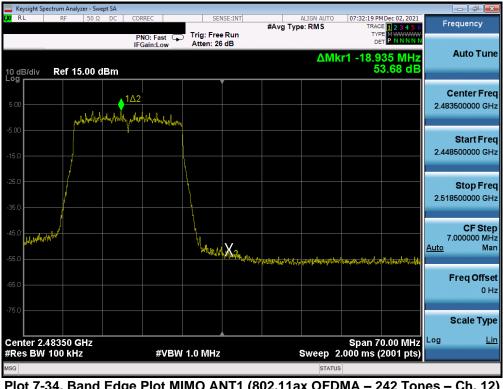
Plot 7-32. Band Edge Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 10)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager	
Test Report S/N: Test Dates:		EUT Type:	Dage 20 of 77	
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 39 of 77	
© 2021 PCTEST		•	V 9.0 02/01/2019	



Keysight Spectrum Analyzer - Swept SA								
LXX RL RF 50Ω AC	CORREC		ISE:INT	#Avg Typ	ALIGN AUTO e: RMS	TRAC	E 1 2 3 4 5 6	Frequency
	PNO: Fast ++ IFGain:Low	 Trig: Free Atten: 26 				TYP		
					ΔΜ	(r1 -55.4	40 MHz	Auto Tune
10 dB/div Ref 15.00 dBm						54	4.51 dB	
		· · · · · · · · · · · · · · · · · · ·						Center Freq
5.00 1 <u>Δ</u> 2								2.483500000 GHz
-5.00 minhalkinghinghingh	ي. ايان							
	IN THE OWN							Start Freq
-15.0								2.448500000 GHz
-25.0								Stop Freq
-35.0								2.518500000 GHz
/								
-45.0		1						CF Step 7.000000 MHz
	- W.	Willian Are .					V.	<u>Auto</u> Man
-55.0		- mar-qay	hampilita and	elsephelisepheriod	144 Martin Antonio Martin	i ⁿ e, hjoreskillerskepper	har that a feat	
-65.0								Freq Offset 0 Hz
								0 Hz
-75.0								Scale Type
Center 2.48350 GHz #Res BW 100 kHz	#\/B\/	1.0 MHz			Sween	Span 7 (2.000 ms		Log <u>Lin</u>
#Res DW TOO KHZ	#VDVV				oweeu 4		200 F DLSJ	





Plot 7-34. Band Edge Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 12)

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager	
Test Report S/N: Test Dates:		EUT Type:		Dage 40 of 77	
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 40 of 77	
© 2021 PCTEST		·		V 9.0 02/01/2019	

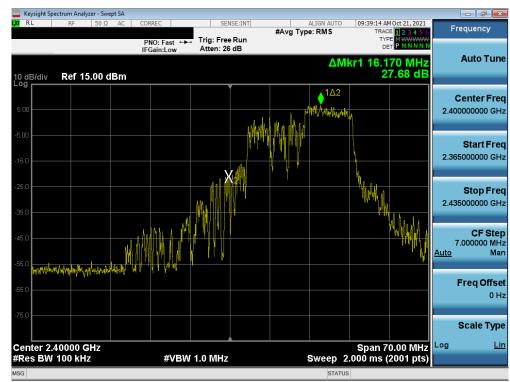


	pectrum Analyzer -										
L <mark>XI</mark> RL	RF 50	Ω DC	CORREC	SE	NSE:INT	#Avg Typ	ALIGN AUTO		M Dec 02, 2021	F	requency
			PNO: Fast 🕞	Trig: Fre				T			
			IFGain:Low	Atten: 20	6 dB		_	-			Auto Tune
							ΔΜ	lkr1 -17.	/45 MHZ 2.28 dB		Auto Func
10 dB/div Log	Ref 15.00	dBm			-			4	2.20 UB		
											Center Freq
5.00		_	1Δ2								3500000 GHz
-5.00		moulu	developenting settleters	hulphan							
0.00											Start Freq
-15.0										2.44	8500000 GHz
		- {									
-25.0		/									Stop Freq
				\ \						2.51	8500000 GHz
-35.0										2.01	000000000112
				, v	X ₂						
-45.0					<u>^2</u>						CF Step
1	and a standard				b					<u>Auto</u>	Man
-55.0					White the	hill and have the	Villandoph	10.14.19.49.49.49.	-		
											Freq Offset
-65.0											0 Hz
-75.0											
											Scale Type
Center 2	.48350 GHz							Span 7	0.00 MHz	Log	Lin
	100 kHz		#VBW	/ 1.0 MHz			Sweep	2.000 ms	(2001 pts)		
MSG							STAT	US			

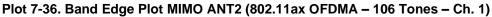
Plot 7-35. Band Edge Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 13)

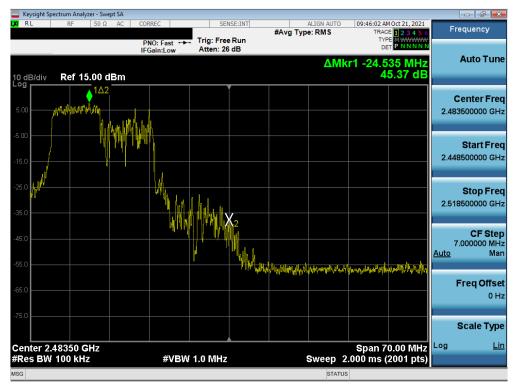
FCC ID: A3LSMS908E	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager	
Test Report S/N: Test Dates:		EUT Type:	Dage 41 of 77	
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 41 of 77	
© 2021 PCTEST			V 9.0 02/01/2019	





MIMO Antenna-2 Conducted Emissions at the Band Edge

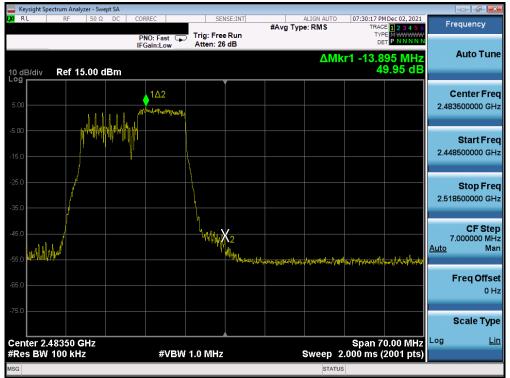


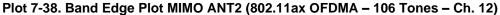


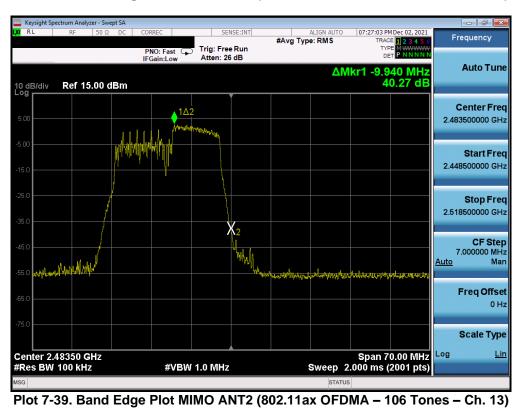
Plot 7-37. Band Edge Plot MIMO ANT2 (802.11ax OFDMA – 106 Tones – Ch. 11)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dage 42 of 77	
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 42 of 77	
© 2021 PCTEST				V 9.0 02/01/2019	



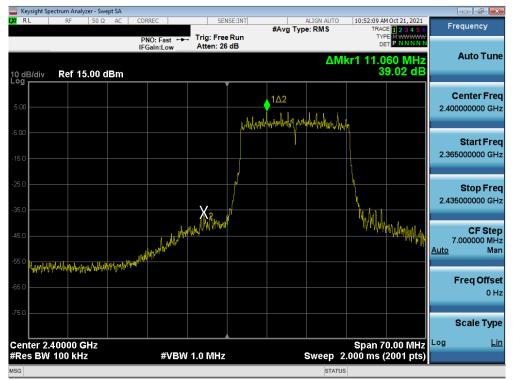


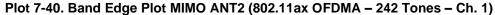




PCTEST Approved by: (fr MEASUREMENT REPORT SAMSUNG FCC ID: A3LSMS908E (CERTIFICATION) **Technical Manager** be part of 🚗 EUT Type: Test Report S/N: Test Dates: Page 43 of 77 1M2109220110-08.A3L 9/14/2021 - 12/8/2021 Portable Handset © 2021 PCTEST V 9.0 02/01/2019





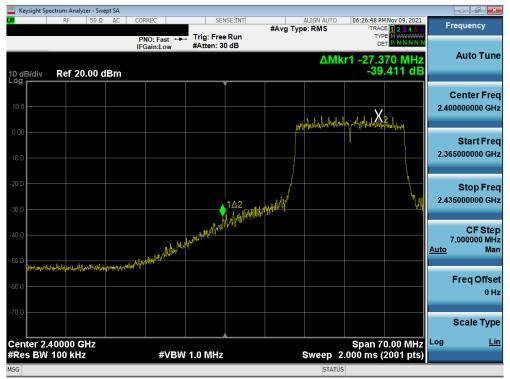


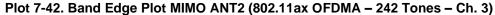


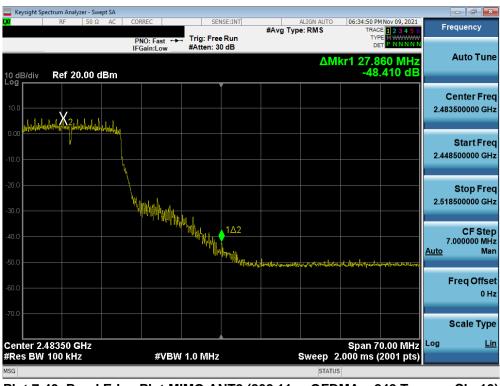
Plot 7-41. Band Edge Plot MIMO ANT2 (802.11ax OFDMA - 242 Tones - Ch. 2)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager	
Test Report S/N: Test Dates:		EUT Type:	Daga 44 of 77	
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 44 of 77	
© 2021 PCTEST	-	•	V 9.0 02/01/2019	





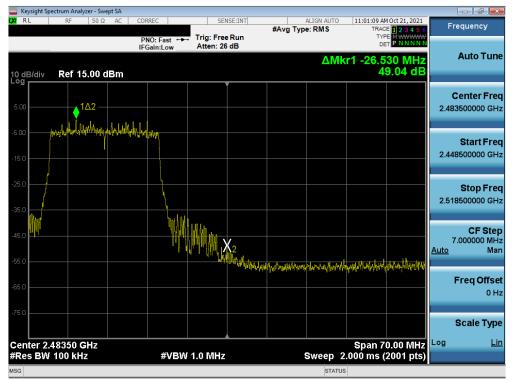


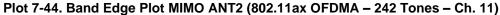


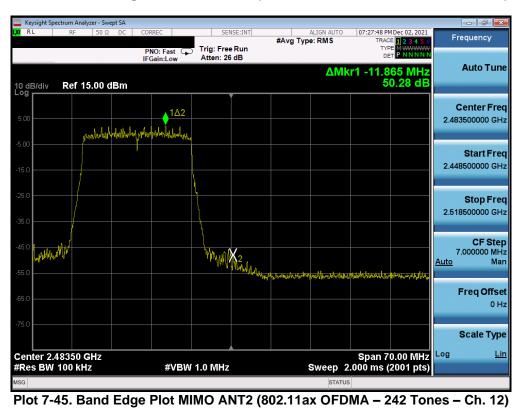
Plot 7-43. Band Edge Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 10)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: Test Dates:		EUT Type:	Dago 45 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 45 of 77
© 2021 PCTEST			V 9.0 02/01/2019









PCTEST Approved by: (fr MEASUREMENT REPORT SAMSUNG FCC ID: A3LSMS908E (CERTIFICATION) **Technical Manager** be part of 🚗 EUT Type: Test Report S/N: Test Dates: Page 46 of 77 1M2109220110-08.A3L 9/14/2021 - 12/8/2021 Portable Handset © 2021 PCTEST V 9.0 02/01/2019



	pectrum Analyzer - S										
LXI RL	RF 50	ΩDC	CORREC	SE	NSE:INT	#Avg Typ	ALIGN AUTO		M Dec 02, 2021	F	requency
			PNO: Fast 🔾	Trig: Fre				TY	PE MWWWWW		
			IFGain:Low	Atten: 20	ав			-			Auto Tune
10 dB/div	Ref 15.00	dBm					Δι	4 WIKE'T -8.5	995 MHz 13.02 dB		
	10.00				Y						
											Center Freq
5.00			\ 1′	∆2						2.48	3500000 GHz
-5.00		Ner MIL	boliohertun palwelpeig	water as							
-5.00											Start Freq
-15.0										2.44	8500000 GHz
-25.0		∮									Stop Freq
										2.51	8500000 GHz
-35.0										2.01	000000000112
				,							OF Otem
-45.0					12						CF Step 7.000000 MHz
. And all	soundary				Hundres.					<u>Auto</u>	Man
-55.0					win siel die se	sidhum hitshidadada	- And marker	Marcharlan Adaparti	n marter and a start		
05.0											Freq Offset
-65.0											0 Hz
-75.0											
											Scale Type
										1.00	Lin
	.48350 GHz / 100 kHz		#\/B\A	1.0 MHz			Swoon	Span 7	70.00 MHz (2001 pts)	Log	Lin
#Res DW			#VDV						(2001 pts)		
MSG							STAT	15			

Plot 7-46. Band Edge Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 13)

FCC ID: A3LSMS908E	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 47 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 47 of 77
© 2021 PCTEST			V 9.0 02/01/2019



7.6 Conducted Spurious Emissions §15.247(d); RSS-247 [5.5]

Test Overview and Limit

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 its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates, tone configurations, and RU indices were investigated to determine the worst case configuration. For the following out of band conducted emissions plots, the EUT was set to a data rate of MCS0 in 802.11ax mode as this setting produced the worst-case emissions.

The limit for out-of-band spurious emissions at the band edge is 30dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100kHz bandwidth per the procedure in Section 11.1 of ANSI C63.10-2013 and KDB 558074 D01 v05r02.

Test Procedure Used

ANSI C63.10-2013 – Section 11.11.3 KDB 558074 D01 v05r02 – Section 8.5 ANSI C63.10-2013 – Section 14.3.3 KDB 662911 D01 v02r01 – Section E)3)b)

Test Settings

- 1. Start frequency was set to 30MHz and stop frequency was set to 25GHz (separated into two plots per channel)
- 2. RBW = 1MHz
- 3. VBW = 3MHz
- 4. Detector = Peak
- 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 7-5. Test Instrument & Measurement Setup

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 49 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 48 of 77
© 2021 PCTEST			V 9.0 02/01/2019

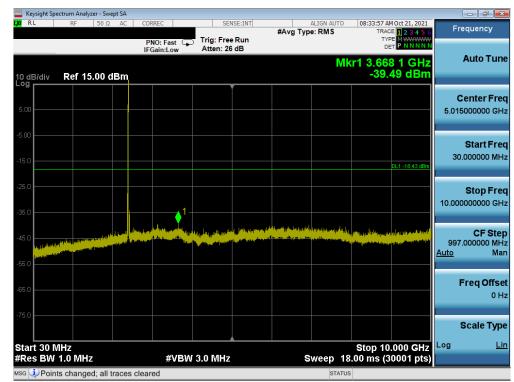


Test Notes

- 1. RBW was set to 1MHz rather than 100kHz in order to increase the measurement speed.
- 2. The display line shown in the following plots denotes the limit at 30dB below the fundamental emission level measured in a 100kHz bandwidth. However, since the traces in the following plots are measured with a 1MHz RBW, the display line may not necessarily appear to be 30dB below the level of the fundamental in a 1MHz bandwidth.
- 3. For plots showing conducted spurious emissions near the limit, the frequencies were investigated with a reduced RBW to ensure that no emissions were present.
- 4. The conducted spurious emissions were measured to relative limits. Therefore, in accordance with ANSI C63.10-2013 and KDB 662911 D01 v02r01 Section E)3)b), it was unnecessary to show compliance through the summation of test results of the individual outputs.

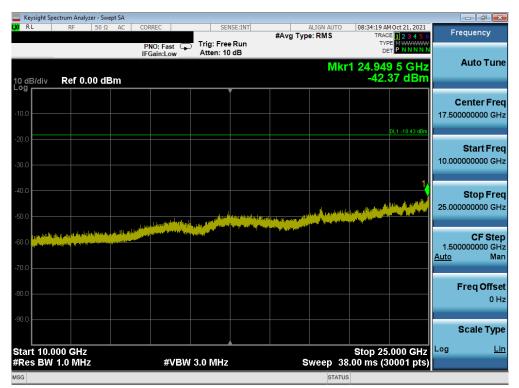
FCC ID: A3LSMS908E	PCTEST° Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 40 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 49 of 77
© 2021 PCTEST				V 9.0 02/01/2019





MIMO Antenna-1 Conducted Spurious Emission





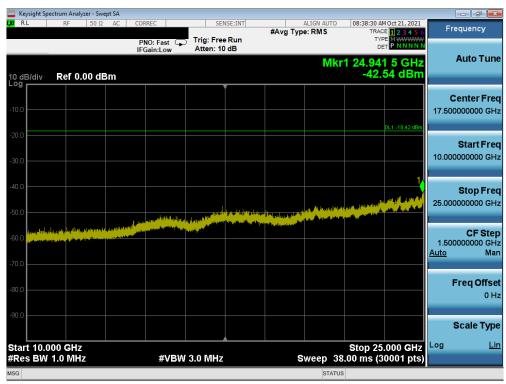
Plot 7-48. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 1)

FCC ID: A3LSMS908E	PCTEST° Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 50 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 50 of 77
© 2021 PCTEST				V 9.0 02/01/2019



No. Jose and Control Jose and Control Jose and Control Frequency PNO: Fast IFGain:Low Trig: Free Run Atten: 26 dB Mkr1 3.045 3 GHz -39.44 dBm Auto Tune 0 dB/div Ref 15.00 dBm -39.44 dBm -39.44 dBm -39.44 dBm 0 dB/div Ref 15.00 dBm -39.44 dBm -39.44 dBm -39.44 dBm 0 dB/div Ref 15.00 dBm -39.44 dBm -39.44 dBm -39.44 dBm 0 dB/div Ref 15.00 dBm -39.44 dBm -39.44 dBm -39.44 dBm 0 dB/div Ref 15.00 dBm -39.44 dBm -39.44 dBm -39.44 dBm 0 dB/div Ref 15.00 dBm -39.44 dBm -39.44 dBm -39.44 dBm 0 dB/div Ref 15.00 dBm -39.44 dBm -39.44 dBm -39.44 dBm 0 dB/div Ref 15.00 dBm -39.44 dBm -39.44 dBm -39.44 dBm 10 dV Ref 15.00 dBm -39.44 dBm -39.44 dBm -39.44 dBm 20 dV Ref 15.00 dBm -39.44 dBm -30.00000 MHz -30.00000 MHz 20 dV Ref 15.00 dBm -39.44 dBm -39.44 dBm -39.44 dBm -39.44 dBm 10 dV		ectrum Analyzer - Swe										×
Atten: 26 dB Mkr1 3.045 3 GHz -39.44 dBm Center Freq 5.01500000 GHz 5.01500000 GHz 5.0150000 GHz 5.015000 GHz 5.0150000 GHz 5.015000 GHz 5.01500	LXU RL	RF 50 Ω	AC (TRAC	E 1 2 3 4 5 6	Frequency	У
Order of the second demonstration of the second demonst				PNO: Fast IFGain:Low					DE		Auto T	Fune
5.00 Image: Conter Freq	10 dB/div Log	Ref 15.00 d	Bm					IVIP	-39.	44 dBm		
500 500 500 500 500 500 500 500												
15.0 0.1	5.00										5.015000000	GHz
1 1	-5.00										Start I	Freq
Stop Freq Stop Freq Stop Treq Stop Freq Stop Treq Stop Treq	-15.0									DL1 -18.42 dBm	30.000000	MHz
35.0 1	-25.0										Stop I	Freq
45 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	-35.0			1							10.00000000	GHz
Auto Man Auto Man Auto Man Freq Offset 0 0 75.0 0 0 0	.45.0	العاملين أحمر	THE REAL PROPERTY.	A CONTRACTOR OF STREET	Menanta Matalat	and the second se	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		Dentifickenter	Antiker and the state of the		
65.0 75.0 Comparison of the second	and the state of the											
75.0 The second											Freq Of	ffset
Start 30 MHz Stop 10.000 GHz	-65.0											0 Hz
	-75.0										Scale 1	Гуре
Res BW 1.0 MHz #VBW 3.0 MHz Sween 18.00 ms (30001 nts)					<u> </u>				Stop 10	.000 0112	Log	Lin
	#Res BW	1.0 MHz		#VBW	3.0 MHz		8	weep 18	.00 ms (3	0001 pts)		

Plot 7-49. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 6)



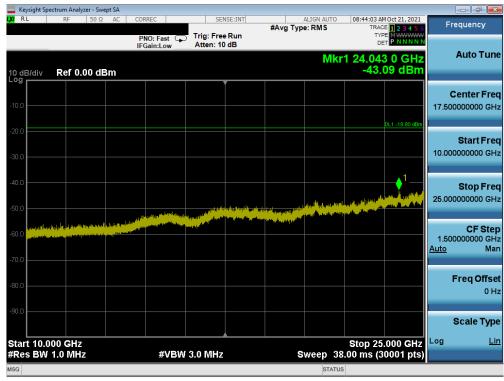
Plot 7-50. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA - 26 Tones - Ch. 6)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga E1 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 51 of 77
© 2021 PCTEST				V 9.0 02/01/2019



	ectrum Analyzer - Swep									
LX/IRL	RF 50 Ω		RREC		NSE:INT	#Avg Typ	ALIGN AUTO e: RMS	TRAC	4 Oct 21, 2021 E 1 2 3 4 5 6 E M WWWW	Frequency
10 dB/div Log	Ref 15.00 dl	IF	NO: Fast 🕞 Gain:Low	Atten: 26			М	DE kr1 6.48		Auto Tune
5.00										Center Freq 5.015000000 GHz
-5.00									DL1 -18.80 dBm	Start Freq 30.000000 MHz
-25.0						1				Stop Freq 10.000000000 GHz
-45.0						in an	Manifest Information	halan daring selah bilan gang Manana Maganana Marianga		CF Step 997.000000 MHz <u>Auto</u> Man
-65.0										Freq Offset 0 Hz
-75.0 Start 30 M								Stop 10	OVO GITZ	Scale Type Log <u>Lin</u>
#Res BW	1.0 MHz		#VBW	3.0 MHz		S	weep 1	8.00 ms (3	0001 pts)	
MSG							STATU	JS		

Plot 7-51. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 11)



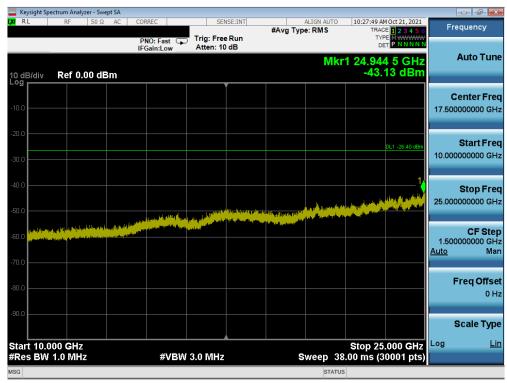
Plot 7-52. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 11)

FCC ID: A3LSMS908E	PCTEST° Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dama 50 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 52 of 77
© 2021 PCTEST		·		V 9.0 02/01/2019



Keysight Spectrum Analyzer - Swept SA				- d ×
RL RF 50 Ω AC	PNO: Fast 😱 Trig: Fr	#Avg Type: ee Run	LIGN AUTO 10:27:28 AM Oct 21 : RMS TRACE 22 TYPE MW DET P N	Frequency
0 dB/div Ref 15.00 dBm	IFGain:Low Atten: :	26 dB	Mkr1 3.648 4 0 -39.04 d	Hz Auto Tune
5.00				Center Freq 5.015000000 GHz
5.00				Start Freq 30.000000 MHz
36.0	1		0L1-26	40.66m Stop Freq 10.000000000 GHz
		n na stan je zaslu, na konstanti se sta stani se sta	والمتكال لاعترا براي والترا الالتجاري والأنتها والمتحا المتحا والمتحا	997.000000 MHz Auto Man
65.0				Freq Offset 0 Hz
75.0 Start 30 MHz	#UDW 0.6 MIL		Stop 10.000	GHz Log Lin
Res BW 1.0 MHz	#VBW 3.0 MH	z sv	veep 18.00 ms (30001	pts)

Plot 7-53. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA - 242 Tones - Ch. 1)



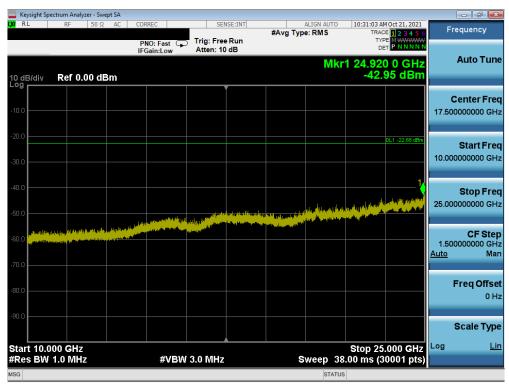
Plot 7-54. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA - 242 Tones - Ch. 1)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dege 52 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 53 of 77
© 2021 PCTEST				V 9.0 02/01/2019



	ectrum Analyzer - Sw									
X/RL	RF 50 Ω		NO: Fast			#Avg Typ	ALIGN AUTO e: RMS	TRAC	M Oct 21, 2021 DE 1 2 3 4 5 6 PE M WWWWW	Frequency
10 dB/div Log	Ref 15.00	IF	Gain:Low	Atten: 26			M	(r1 6.04	4 6 GHz 51 dBm	Auto Tune
5.00										Center Freq 5.015000000 GHz
-5.00										Start Freq 30.000000 MHz
-25.0						.1			DL1 -22.88 dBm	Stop Freq 10.000000000 GHz
-45.0		i telly have all			a an	allen og som	ana ang ang ang ang ang ang ang ang ang	lyn fellyn ffernan fry L. Yn ôffer oarte fferferen yn o	a di pogla posta di stata da posta di 19 den posta di stata	CF Step 997.000000 MHz <u>Auto</u> Man
-65.0										Freq Offset 0 Hz
-75.0 Start 30 N	1Hz							Stop <u>10</u>	.000 GHz	Scale Type
#Res BW	1.0 MHz		#VBW	3.0 MHz		s	weep 18	.00 ms (3	0001 pts)	
usg 칮 Poin	ts changed; all	traces clea	red				STATU	5		

Plot 7-55. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 6)



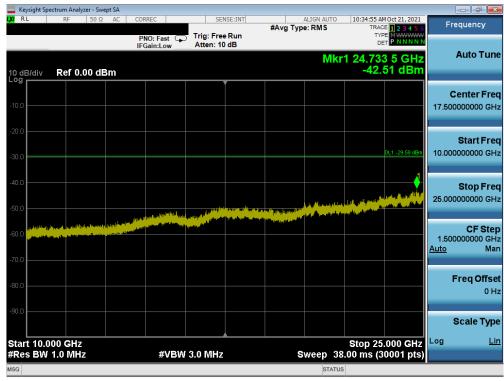
Plot 7-56. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA - 242 Tones - Ch. 6)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Daga 54 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 54 of 77
© 2021 PCTEST			V 9.0 02/01/2019



M RE SO Q AC CORREC SENSE.INT ALIGN AUTO 10:34:34 MUD G21,2021 PNO: Fast PNO: Fast Trig: Free Run Heatin: 26 dB Trace Dest Trace Dest Auto Tune 0 dB/div Ref 15.00 dBm Trig: Free Run Heatin: 26 dB Mikr1 6, 942 9 GHz -39.10 dBm Auto Tune 500 Start Freq 30.000000 GHz 500 Start 30 MHz WEW 3.0 MHz Stop Freq 30.00000 GHz Stop 10.000 GHz Stop 10.000 GHz Start Freq 30.000000 GHz		pectrum Analyzer - Sw								
PROF Past Atten: 26 dB Dert ENNNN Mikr1 6.942 9 GHz -39.10 dBm -39.10 dBm -39.10 dBm -500 -39.10 dBm -500 -30.00000 GHz -500 -30.0000 GHz -500	L <mark>XI</mark> RL	RF 50 Ω	AC C	ORREC				TRAC	E 1 2 3 4 5 6	Frequency
Log Center Freq 500 Center Freq 500 Start Stop Freq 600 Start Stop Fre	10 dB/div	Ref 15.00	1				M	or 1 6.94 2	PNNNN 29GHz	Auto Tur
150 Image: Start Freq 150 Image: S										
-450 -500							1		DL1 -29.58 dBm	•
465.0 -7	March 199						najyiliyi yilay asayo Madila asayo ta	an a dhan y dhatha ta an pagt An ta an		997.000000 MH
Start 30 MHz #Res BW 1.0 MHz #VBW 3.0 MHz Sweep 18.00 ms (30001 pts)	-65.0									
	Start 30							Stop 10	.000 GHz	Log <u>L</u>
			tunnen et -		3.0 MHz	s			0001 pts)	

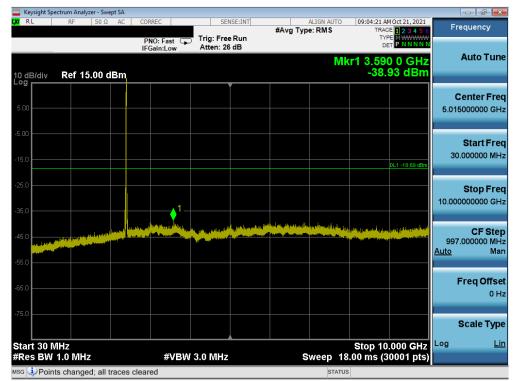
Plot 7-57. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 11)



Plot 7-58. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 11)

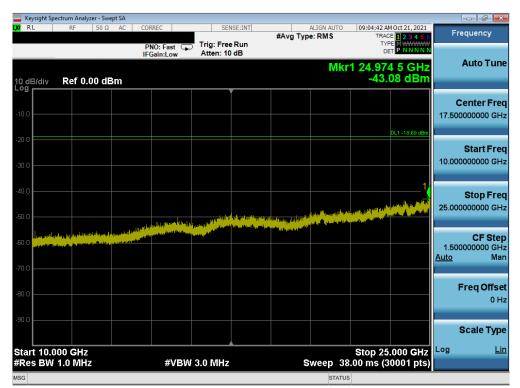
FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 55 of 77
© 2021 PCTEST		·		V 9.0 02/01/2019





MIMO Antenna-2 Conducted Spurious Emissions





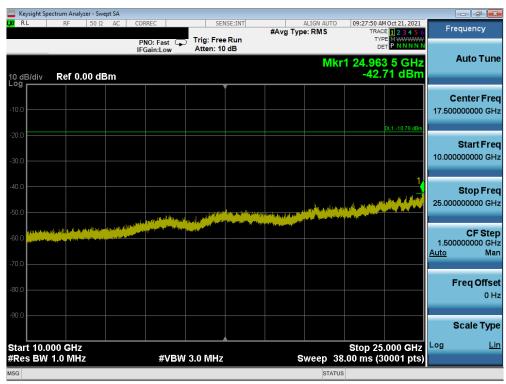
Plot 7-60. Conducted Spurious Plot MIMO ANT2 (802.11ax OFDMA - 26 Tones - Ch. 1)

FCC ID: A3LSMS908E		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dege EC of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 56 of 77
© 2021 PCTEST				V 9.0 02/01/2019



RL RF 50 Ω AC	CORREC	SEN						
	PNO: Fast 🗔		Run	#Avg Type	ALIGN AUTO E: RMS	TRAC	I Oct 21, 2021 E 1 2 3 4 5 6 E M WWWWWW	Frequency
) dB/div Ref 15.00 dBm	IFGain:Low	Atten: 26			Mk	r1 3.154	^{P NNNNN} 19 GHz 19 dBm	Auto Tune
5.00								Center Freq 5.015000000 GHz
5.0							DL1 -18.78 dBm	Start Freq 30.000000 MHz
5.0	1							Stop Freq 10.000000000 GHz
	riger part of the Design of the Stage And the State of the Stage of the Stage And the State of the	¹⁰ 192 March (100000)		l gana gal a dag kasa. Kasaliga Majara ana		¹⁹³⁴ ay go ⁿ loci a gang g A ^{dil} a ya kanaleta kana a	ne <mark>je plati ne stanova stanova</mark> Na na stanova st	CF Step 997.000000 MHz <u>Auto</u> Man
.5.0								Freq Offset 0 Hz
tart 30 MHz						Stop 10	000 0112	Scale Type
Res BW 1.0 MHz		3.0 MHz		S	status		0001 pts)	

Plot 7-61. Conducted Spurious Plot MIMO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 6)



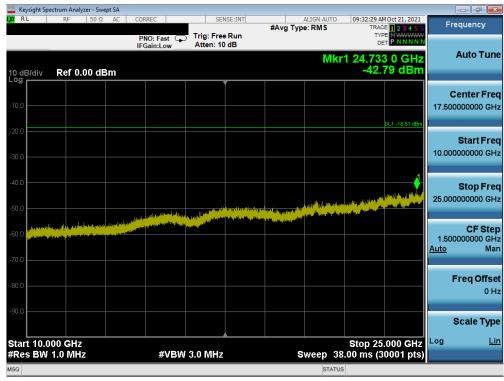
Plot 7-62. Conducted Spurious Plot MIMO ANT2 (802.11ax OFDMA - 26 Tones - Ch. 6)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 57 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 57 of 77
© 2021 PCTEST	·		V 9.0 02/01/2019



	pectrum Analyzer - Swep									
LXI RL	RF 50 Ω		RREC	Trig: Free		#Avg Typ	ALIGN AUTO e: RMS	TRAC	M Oct 21, 2021 CE 1 2 3 4 5 6 DE M	Frequency
10 dB/div Log	Ref 15.00 dl	IF	Gain:Low	Atten: 26	dB		Mk		6 1 GHz 78 dBm	Auto Tune
5.00										Center Freq 5.015000000 GHz
-5.00									DL1 -18.51 dBm	Start Freq 30.000000 MHz
-25.0			1 -							Stop Freq 10.000000000 GHz
-45.0	n y stal (d) in spranging (ny stalo y stalo y st ny stalo (d) in spranging (ny stalo y st			P _{rocenting} polynym Synthesis (sentr	n beland bereiten. Neutropolen egent	lagh-laint fair faige tha na ann ag 20 a tha ann ann	nyyystäänyö Mansterpynä (yy maattiinine pääkyökyökyökyö		, Jahr, posta seri (n programmi posta	CF Step 997.000000 MHz <u>Auto</u> Man
-65.0										Freq Offset 0 Hz
-75.0 Start 30 I								Stop 10		Scale Type
#Res BW				3.0 MHz		S			0001 pts)	
MSG 🥹 Poir	nts changed; all tr	aces clear	ed				STATUS			

Plot 7-63. Conducted Spurious Plot MIMO ANT2 (802.11ax OFDMA - 26 Tones - Ch. 11)



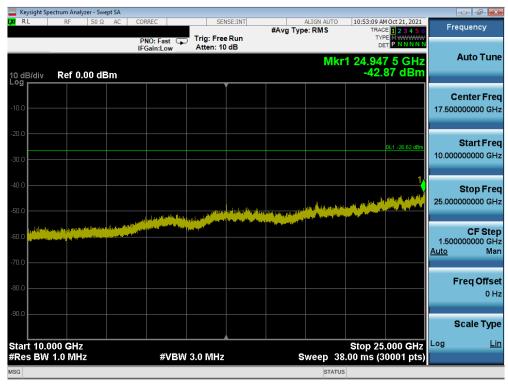
Plot 7-64. Conducted Spurious Plot MIMO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 11)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dege 50 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 58 of 77
© 2021 PCTEST		•		V 9.0 02/01/2019



	ectrum Analyzer - Swe									
L <mark>XI</mark> RL	RF 50 Ω		RREC		ISE:INT	#Avg Typ	ALIGN AUTO e: RMS	TRAC	Oct 21, 2021	Frequency
10 dB/div Log	Ref 15.00 c	IF	NO: Fast 🖵 Gain:Low	Atten: 26	dB		MI	₀ cr1 3.134		Auto Tun
5.00										Center Fre 5.015000000 GH
-5.00										Start Fre 30.000000 MH
-25.0			<u>1</u>						DL1-26.62 dBm	Stop Fre 10.000000000 GH
-45.0	A Market Research and the state of the	alesta Traditionality				hallangi Melapida Malangi Melapida Malangi Melapida	actificana horag		<mark>d Agos Darman Leisenna</mark> Alexan an an Anna Airtean Airtean Alexan an Airtean Airtean Airtean	CF St e 997.000000 MH <u>Auto</u> Ma
-65.0										Freq Offse 0 H
-75.0 Start 30 M	ЛНz							Stop 10.	000 GHz	Scale Typ
#Res BW			#VBW	3.0 MHz		S	weep 18	3.00 ms (3	0001 pts)	
мsg 횢 Poin	ts changed; all t	traces clear	ed				STATU	S		

Plot 7-65. Conducted Spurious Plot MIMO ANT2 (802.11ax OFDMA - 242 Tones - Ch. 1)



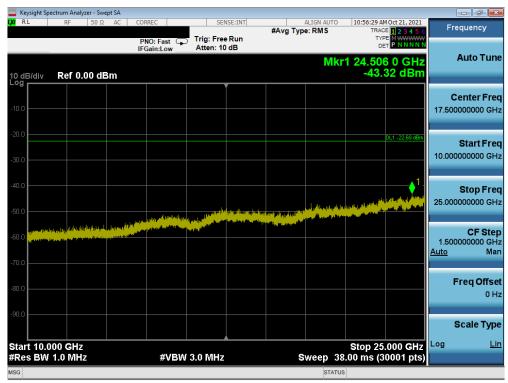
Plot 7-66. Conducted Spurious Plot MIMO ANT2 (802.11ax OFDMA - 242 Tones - Ch. 1)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga EQ of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 59 of 77
© 2021 PCTEST	·			V 9.0 02/01/2019



	pectrum Analyzer - Swe									- đ ×
L <mark>XI</mark> RL	RF 50 Ω	P	RREC	Trig: Free		#Avg Typ	ALIGN AUTO e: RMS	TRAC	4 Oct 21, 2021 E 1 2 3 4 5 6 PE M WWWWW T P N N N N N	Frequency
10 dB/div Log	Ref 15.00 d		Gain:Low	Atten: 26	dB		Mk	(r1 3.59)	2 3 GHz 45 dBm	Auto Tune
5.00										Center Freq 5.015000000 GHz
-5.00									DL1 -22.68 dBm	Start Freq 30.000000 MHz
-25.0										Stop Freq 10.000000000 GHz
-45.0						an Diraya (Aydynya) n Tayatan ji Mana ayatin	and the second sec	hal ^{dal} a hora an Ungers La Magyan Madalan a	Latiparting in state (1716 anna gunarang instatané	CF Step 997.000000 MHz <u>Auto</u> Man
-65.0										Freq Offset 0 Hz
-75.0 Start 30 F								Stop 10	UND OFIZ	Scale Type Log <u>Lin</u>
#Res BW				3.0 MHz		S			0001 pts)	
MSG 🤍 Poir	nts changed; all tr	aces clear	ed				STATUS	6		

Plot 7-67. Conducted Spurious Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 6)



Plot 7-68. Conducted Spurious Plot MIMO ANT2 (802.11ax OFDMA - 242 Tones - Ch. 6)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage C0 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 60 of 77
© 2021 PCTEST			V 9.0 02/01/2019



	ectrum Analyzer - Sw									
LX/IRL	RF 50 Ω	AC	CORREC		NSE:INT	#Avg Typ	ALIGN AUTO e: RMS	TRAC	1 Oct 21, 2021 E 1 2 3 4 5 6	Frequency
			PNO: Fast (IFGain:Low	Trig: Fre Atten: 20				DE		Auto Tur
10 dB/div Log	Ref 15.00 o	dBm					Mł	kr1 5.67 -38.9	1 0 GHz 96 dBm	Auto Tur
					Ĭ					Center Fre
5.00										5.015000000 GH
-5.00										Start Fre
-15.0										30.000000 MH
-25.0									DL1 -29.74 dBm	Stop Fre
-35.0					1					10.000000000 GH
-45.0		silster d		an an baryan baran		Average And spects		ويودونه المعرور والعرو	and the set of the second	CF Ste
-55.0				and the second se						997.000000 MH <u>Auto</u> Ma
-33.0										Freq Offs
-65.0										01
-75.0										Scale Typ
Start 30 N	1Hz							Stop 10	.000 GHz	Log <u>L</u>
#Res BW			#VB	W 3.0 MHz		s	weep 18	3.00 ms (3	0001 pts)	
мsg 連 Poin	ts changed; all	traces c	leared				STATUS	5		

Plot 7-69. Conducted Spurious Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 11)



Plot 7-70. Conducted Spurious Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 11)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dege 61 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 61 of 77
© 2021 PCTEST		•		V 9.0 02/01/2019



7.7 Radiated Spurious Emission Measurements – Above 1 GHz §15.247(d) §15.205 & §15.209; RSS-Gen [8.9]

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR and Table 6 of RSS-Gen (8.10) must not exceed the limits shown in Table 7-9 per Section 15.209 and RSS-Gen (8.9).

Frequency	Field Strength [µV/m]	Measured Distance [Meters]		
Above 960.0 MHz	500	3		

Table 7-9. Radiated Limits

Test Procedures Used

ANSI C63.10-2013 – Section 6.6.4.3 KDB 558074 D01 v05r02 – Sections 8.6, 8.7

Test Settings

Average Field Strength Measurements

- 1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
- 2. RBW = 1MHz
- 3. VBW = 3MHz
- 4. Detector = power average (RMS)
- 5. Number of measurement points = 1001 (Number of points must be $\geq 2 \times \text{span/RBW}$)
- 6. Sweep time = auto
- 7. Trace (RMS) averaging was performed over at least 100 traces

Peak Field Strength Measurements

- 1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
- 2. RBW = 1MHz
- 3. VBW = 3MHz
- 4. Detector = peak
- 5. Sweep time = auto couple
- 6. Trace mode = max hold
- 7. Trace was allowed to stabilize

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 62 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 62 of 77
© 2021 PCTEST				V 9.0 02/01/2019



Test Setup

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

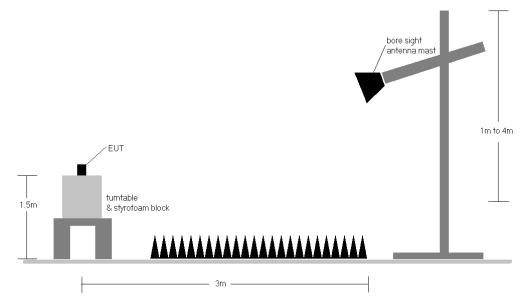


Figure 7-6. Test Instrument & Measurement Setup

Test Notes

- The optional test procedures for antenna port conducted measurements of unwanted emissions per the guidance of KDB 558074 D01 v05r02 were not used to evaluate this device for compliance to radiated limits. All radiated spurious emissions levels were measured in a radiated test setup.
- 2. All emissions lying in restricted bands specified in Section 15.205 and Section 8.10 of RSS-Gen are below the limit shown in Table 7-9.
- 3. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
- 4. This unit was tested with its standard battery.
- 5. The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1GHz. Above 1 GHz, average and peak measurements were taken using linearly polarized horn antennas. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
- 6. 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.
- 7. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. Any emissions found to be within 20dB of the limit are fully investigated and the results are shown in this section.
- 8. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: Test Dates:		EUT Type:		Dogo 62 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 63 of 77
© 2021 PCTEST	-	·		V 9.0 02/01/2019



- 9. Some band edge measurements were performed using a channel integration method to determine compliance with the out of band average radiated spurious emissions limit in the 2483.5 2500MHz band. Per KDB 558074 D01 v05r02 Section 13.3, a measurement was performed using a RBW of 100kHz at the frequency with highest emission outside of band edge. For integration that does not start at 2483.5MHz, consideration was taken to ensure the worst case emission is in the 1MHz spectrum. The results were integrated up to the 1MHz reference bandwidth to show compliance with the 15.209 radiated limit for emissions greater than 1GHz.
- 10. For radiated measurements, emissions were investigated for the fully-loaded RU configuration and for all the partially-loaded RU configurations. Among all of the available partially-loaded RU configurations, only the configuration with the worst case emissions is reported.

Sample Calculations

Determining Spurious Emissions Levels

- Field Strength Level [dBµV/m] = Analyzer Level [dBm] + 107 + AFCL [dB/m]
- AFCL [dB/m] = Antenna Factor [dB/m] + Cable Loss [dB]
- Margin [dB] = Field Strength Level $[dB\mu V/m]$ Limit $[dB\mu V/m]$

Radiated Band Edge Measurement Offset

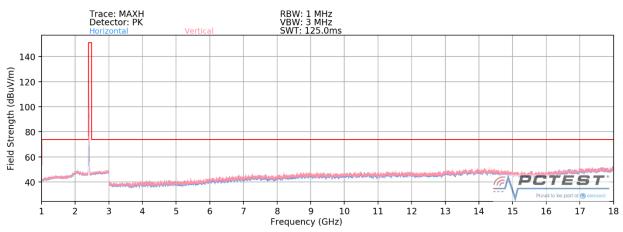
• The amplitude offset shown in the radiated restricted band edge plots in Section 7.7 was calculated using the formula:

Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

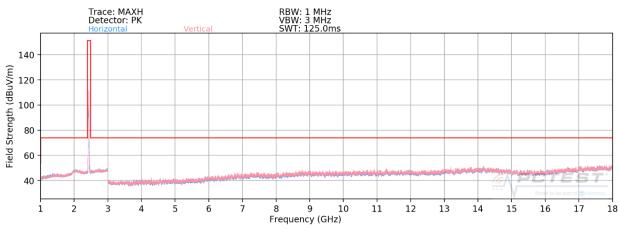
FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 64 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 64 of 77
© 2021 PCTEST	•		V 9.0 02/01/2019



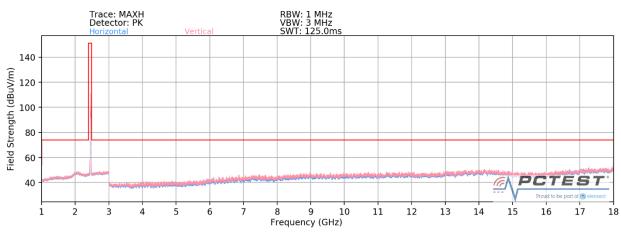
7.7.1 MIMO Radiated Spurious Emission Measurements §15.247(d) §15.205 & §15.209; RSS-Gen [8.9]



Plot 7-71. Radiated Spurious Plot above 1GHz MIMO (802.11ax OFDMA – 26 Tones – Ch. 1)



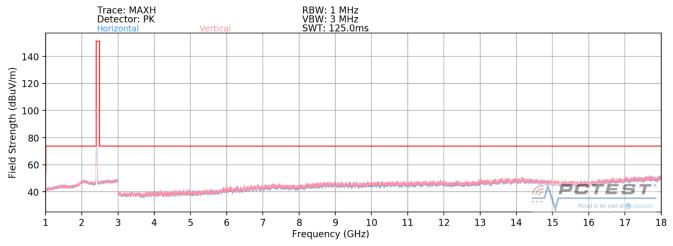
Plot 7-72. Radiated Spurious Plot above 1GHz MIMO (802.11ax OFDMA – 26 Tones – Ch. 6)



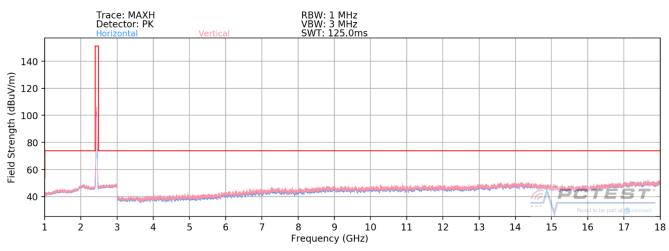
Plot 7-73. Radiated Spurious Plot above 1GHz MIMO (802.11ax OFDMA - 26 Tones - Ch. 11)

FCC ID: A3LSMS908E	PCTEST° Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dege (E of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 65 of 77
© 2021 PCTEST		·		V 9.0 02/01/2019

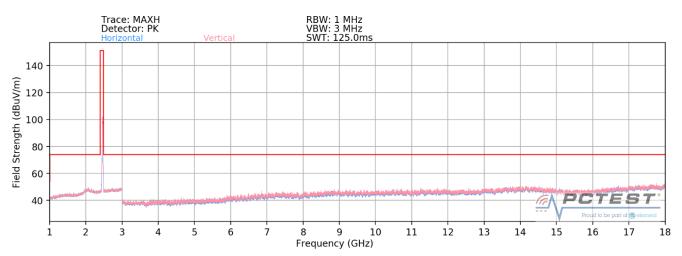












Plot 7-76. Radiated Spurious Plot above 1GHz MIMO (802.11ax OFDMA - 242 Tones - Ch. 11)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dege CC of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 66 of 77
© 2021 PCTEST				V 9.0 02/01/2019



MIMO Radiated Spurious Emissions Measurements (Above 18GHz) §15.209; RSS-Gen [8.9]



Plot 7-78. Radiated Spurious Plot above 18GHz MIMO (802.11ax OFDMA – 242 Tones)

Frequency (MHz)

FCC ID: A3LSMS908E	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 67 of 77
© 2021 PCTEST			V 9.0 02/01/2019



MIMO Radiated Spurious Emission Measurements §15.247(d) §15.205 & §15.209; RSS-Gen [8.9]

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS0
RU Index:	4
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	01

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4824.00	Avg	V	-	-	-77.80	-0.47	28.73	53.98	-25.25
4824.00	Peak	V	-	-	-64.59	-0.47	41.94	73.98	-32.04
12060.00	Avg	V	-	-	-81.90	10.37	35.47	53.98	-18.51
12060.00	Peak	V	-	-	-69.95	10.37	47.42	73.98	-26.56

Table 7-10. Radiated Measurements MIMO (26 Tones)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS0
RU Index:	0
Distance of Measurements:	3 Meters
Operating Frequency:	2437MHz
Channel:	06

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4874.00	Avg	V	-	-	-77.04	-0.27	29.69	53.98	-24.29
4874.00	Peak	V	-	-	-65.14	-0.27	41.59	73.98	-32.39
7311.00	Avg	V	-	-	-78.89	6.70	34.81	53.98	-19.17
7311.00	Peak	V	-	-	-67.37	6.70	46.33	73.98	-27.65
12185.00	Avg	V	-	-	-79.24	9.58	37.34	53.98	-16.64
12185.00	Peak	V	-	-	-69.10	9.58	47.48	73.98	-26.50

Table 7-11. Radiated Measurements MIMO (26 Tones)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: Test Dates:		EUT Type:		Dogo 69 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021 Portable Handset		Page 68 of 77	
© 2021 PCTEST	<u>.</u>			V 9.0 02/01/2019



Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS0
RU Index:	8
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4924.00	Avg	V	-	-	-76.87	-0.38	29.75	53.98	-24.23
4924.00	Peak	V	-	-	-65.00	-0.38	41.62	73.98	-32.36
7386.00	Avg	V	-	-	-77.92	6.00	35.08	53.98	-18.90
7386.00	Peak	V	-	-	-66.39	6.00	46.61	73.98	-27.37
12310.00	Avg	V	-	-	-80.26	9.77	36.51	53.98	-17.47
12310.00	Peak	V	-	-	-68.29	9.77	48.48	73.98	-25.50

Table 7-12. Radiated Measurements MIMO (26 Tones)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS0
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	01

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4824.00	Avg	V	-	-	-75.50	-0.47	31.03	53.98	-22.95
4824.00	Peak	V	-	-	-63.26	-0.47	43.27	73.98	-30.71
12060.00	Avg	V	-	-	-79.89	10.37	37.48	53.98	-16.50
12060.00	Peak	V	-	-	-67.86	10.37	49.51	73.98	-24.47

Table 7-13. Radiated Measurements MIMO (242 Tones)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: Test Dates:		EUT Type:	Dage CO of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 69 of 77
© 2021 PCTEST			V 9.0 02/01/2019



Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS0
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2437MHz
Channel:	06

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4874.00	Avg	V	-	-	-77.94	-0.27	28.79	53.98	-25.19
4874.00	Peak	V	-	-	-65.82	-0.27	40.91	73.98	-33.07
7311.00	Avg	V	-	-	-79.64	6.70	34.06	53.98	-19.92
7311.00	Peak	V	-	-	-67.76	6.70	45.94	73.98	-28.04
12185.00	Avg	V	-	-	-81.53	9.58	35.05	53.98	-18.93
12185.00	Peak	V	-	-	-68.89	9.58	47.69	73.98	-26.29

Table 7-14. Radiated Measurements MIMO (242 Tones)

802 11ax OFDMA Worst Case Mode: Worst Case Transfer Rate: RU Index: **Distance of Measurements: Operating Frequency:** Channel:

802.TTax OFDIMA	
MCS0	
61	
3 Meters	
2462MHz	
11	

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4924.00	Avg	V	-	-	-76.96	-0.38	29.66	53.98	-24.32
4924.00	Peak	V	-	-	-64.19	-0.38	42.43	73.98	-31.55
7386.00	Avg	V	-	-	-79.31	6.00	33.69	53.98	-20.29
7386.00	Peak	V	-	-	-66.76	6.00	46.24	73.98	-27.74
12310.00	Avg	V	-	-	-80.53	9.77	36.24	53.98	-17.74
12310.00	Peak	V	-	-	-68.63	9.77	48.14	73.98	-25.84

Table 7-15. Radiated Measurements MIMO (242 Tones)

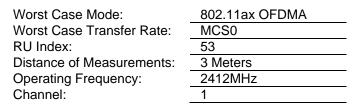
FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 70 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 70 of 77
© 2021 PCTEST	•			V 9.0 02/01/2019

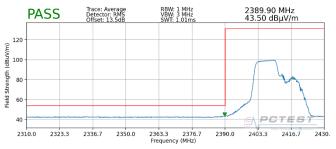


7.7.2 MIMO Radiated Restricted Band Edge Measurements

§15.205 §15.209; RSS-Gen [8.9]

The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting.

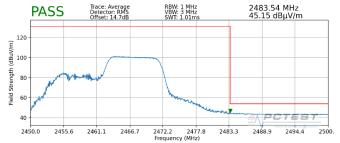




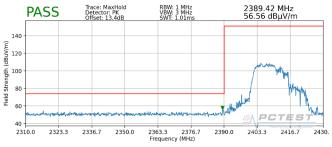
Plot 7-79. Radiated Restricted Lower Band Edge Measurement MIMO (Average – 106 Tones)

Worst Case Mode:8Worst Case Transfer Rate:MRU Index:5Distance of Measurements:3Operating Frequency:2Channel:1

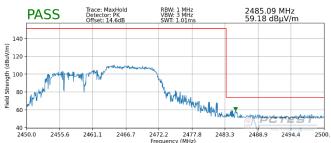
	802.11ax OFDMA
Rate:	MCS0
	53
ments:	3 Meters
:	2462MHz
	11



Plot 7-81. Radiated Restricted Upper Band Edge Measurement MIMO (Average – 106 Tones)



Plot 7-80. Radiated Restricted Lower Band Edge Measurement MIMO (Peak – 106 Tones)



Plot 7-82. Radiated Restricted Upper Band Edge Measurement MIMO (Peak – 106 Tones)

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 71 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 71 of 77
© 2021 PCTEST	<u>.</u>	·		V 9.0 02/01/2019

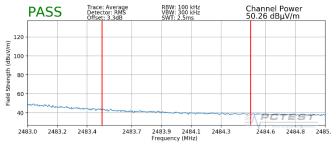


802.11ax OFDMA
MCS0
53
3 Meters
2467MHz
12

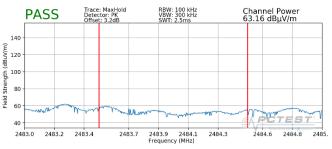


Plot 7-83. Radiated Restricted Upper Band Edge Measurement MIMO (Average – 106 Tones)

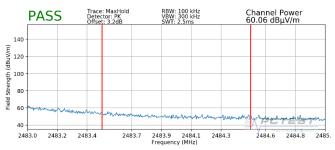
Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS0
RU Index:	53
Distance of Measurements:	3 Meters
Operating Frequency:	2472MHz
Channel:	13



Plot 7-85. Radiated Restricted Upper Band Edge Measurement MIMO (Average – 106 Tones)



Plot 7-84. Radiated Restricted Upper Band Edge Measurement MIMO (Peak – 106 Tones)

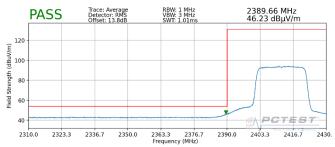


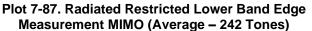
Plot 7-86. Radiated Restricted Upper Band Edge Measurement MIMO (Peak – 106 Tones)

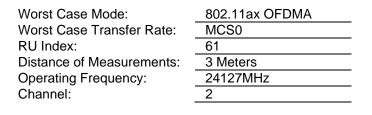
FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dega 70 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 72 of 77
© 2021 PCTEST	<u>.</u>	·		V 9.0 02/01/2019

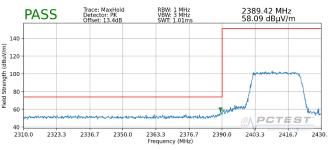


Worst Case Mode:802.11ax OFDMAWorst Case Transfer Rate:MCS0RU Index:61Distance of Measurements:3 MetersOperating Frequency:2412MHzChannel:1



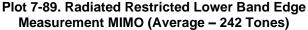


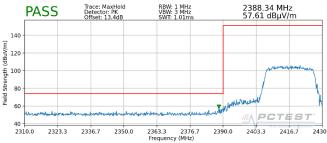




Plot 7-88. Radiated Restricted Lower Band Edge Measurement MIMO (Peak – 242 Tones)





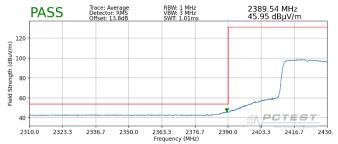


Plot 7-90. Radiated Restricted Lower Band Edge Measurement MIMO (Peak – 242 Tones)

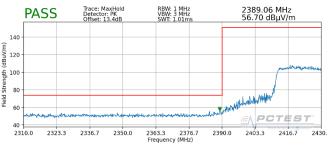
FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 70 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 73 of 77
© 2021 PCTEST	-	•		V 9.0 02/01/2019



Worst Case Mode:	802.11ax OFDMA	
Worst Case Transfer Rate:	MCS0	
RU Index:	61	
Distance of Measurements:	3 Meters	
Operating Frequency:	2422MHz	
Channel:	3	







Plot 7-92. Radiated Restricted Lower Band Edge Measurement MIMO (Peak – 242 Tones)

RBW: 1 MHz VBW: 3 MHz SWT: 1.01ms

2472.2 2477.8 Frequency (MHz)

2484.19 MHz 66.49 dBµV/m

With Margan and the Margan Bran Bran

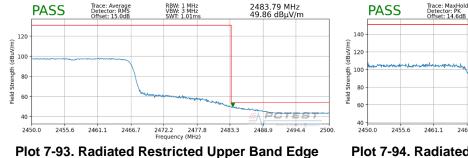
2483.3

2488.9

2494.4

2500

Worst Case Mode:	802.11ax OFDMA	
Worst Case Transfer Rate:	MCS0	
RU Index:	61	
Distance of Measurements:	3 Meters	
Operating Frequency:	2457MHz	
Channel:	10	





2466.7

FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dana 74 af 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset	Page 74 of 77
© 2021 PCTEST		·	V 9.0 02/01/2019



Worst Case Mode:	802.11ax OFDMA	
Worst Case Transfer Rate:	MCS0	
RU Index:	61	
Distance of Measurements:	3 Meters	
Operating Frequency:	2462MHz	
Channel:	11	

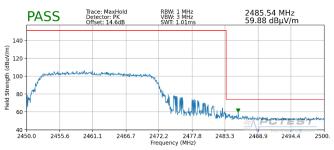


Plot 7-95. Radiated Restricted Upper Band Edge Measurement MIMO (Average – 242 Tones)

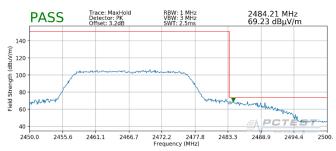
Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS0
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2467MHz
Channel:	12







Plot 7-96. Radiated Restricted Upper Band Edge Measurement MIMO (Peak – 242 Tones)

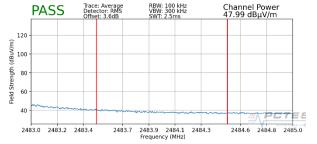


Plot 7-98. Radiated Restricted Upper Band Edge Measurement MIMO (Peak – 242 Tones)

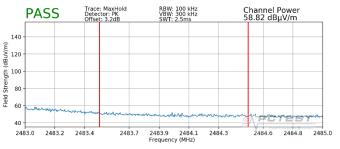
FCC ID: A3LSMS908E	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 75 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 75 of 77
© 2021 PCTEST	-	•		V 9.0 02/01/2019

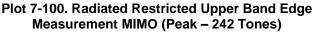


Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS0
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2472MHz
Channel:	13









FCC ID: A3LSMS908E	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	MSUNG	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:		Daga 76 of 77	
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 76 of 77	
© 2021 PCTEST				V 9.0 02/01/2019	



8.0 **CONCLUSION**

The data collected relate only the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMS908E** is in compliance with Part 15 Subpart C (15.247) of the FCC Rules.

FCC ID: A3LSMS908E	Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Dega 77 of 77
1M2109220110-08.A3L	9/14/2021 - 12/8/2021	Portable Handset		Page 77 of 77
© 2021 PCTEST	•			V 9.0 02/01/2019