

**ELEMENT WASHINGTON DC LLC** 

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

## MEASUREMENT REPORT FCC PART 15.247 WLAN OFDMA

#### **Applicant Name:**

Samsung Electronics Co., Ltd. 129, Samsung-ro, Yeongtong-gu, Suwon-si Gyeonggi-do, 16677, Korea Date of Testing: 09/02/2022-11/08/2022 Test Report Issue Date: 11/18/2022 Test Site/Location: Element lab. Columbia, MD, USA Test Report Serial No.: 1M2209010097-12.A3L

## FCC ID:

#### A3LSMS916U

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-S916U SM-S916U1 Portable Handset 2412 – 2462MHz 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.

RJ Ortanez Executive Vice President



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# **MEASUREMENT REPORT**

			ANT2				MIMO			
		Т. Г.	Avg Conducted		Peak Conducted		Avg Conducted		Peak Conducted	
Mode	Tones	Tx Frequency [MHz]	Max. Power (mW)	Max. Power (dBm)						
802.11ax OFDMA	26T	2412 - 2462	24.378	13.87	168.655	22.27	49.835	16.98	414.541	26.18
802.11ax OFDMA	52T	2412 - 2462	31.477	14.98	219.280	23.41	62.934	17.99	517.768	27.14
802.11ax OFDMA	106T	2412 - 2462	38.905	15.90	303.389	24.82	77.988	18.92	546.261	27.37
802.11ax OFDMA	242T	2412 - 2462	39.719	15.99	299.226	24.76	77.262	18.88	606.909	27.83

**EUT Overview** 

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## 1.0 **INTRODUCTION**

### 1.1 Scope

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

### **1.2 Element Test Location**

These measurement tests were conducted at the Element laboratory 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 Element Lab located in Columbia, MD 21046, U.S.A.

- Element Washington DC LLC 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.
- Element Washington DC LLC 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).
- Element Washington DC LLC facility is a registered (2451B) test laboratory with the site description on file with ISED.
- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreements (MRAs).

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## 2.0 **PRODUCT INFORMATION**

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMS916U**. The test data contained in this report pertains only to the emissions due to the EUT's WLAN (DTS) transmitter.

Test Device Serial No.: 0610M, 0638M, 2666M, 2622M, 2610M

### 2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, Multi-band 5G NR (FR1 and FR2), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII (5GHz and 6GHz), Bluetooth (1x, EDR, LE), NFC, UWB, Wireless Power Transfer

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

#### 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
		26T	99.6%
	2	52T	99.6%
	Z MIMO SDM	106T	99.6%
802.11ax		242T	99.6%
DTS RU		26T	99.2%
		52T	99.2%
		106T	99.2%
		242T	99.1%

 Table 2-2. Measured Duty Cycles

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

WiFi Configurations		SI	SO	SE	DM	C	DD
		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.

**Configuration 1:** MIMO transmitting in 2.4GHz mode and MIMO in 5GHz mode

Description	2.4 GHz Emission	5 GHz Emission
Antenna	1	2
Channel	11	120
Operating Frequency (MHz)	2462	5600
Data Rate (Mbps)	1Mbps	6Mbps
Mode	802.11b	802.11a

Table 2-4. Config-1 (MIMO 2.4GHz & MIMO 5GHz)

**Configuration 2:** MIMO transmitting in 5GHz mode and MIMO in 2.4GHz mode

Description	2.4 GHz Emission	6 GHz Emission
Antenna	1	2
Channel	6	25
Operating Frequency (MHz)	2462	6075
Data Rate (Mbps)	1Mbps	6Mbps
Mode	802.11b	802.11a

Table 2-5. Config-2 (MIMO 2.4GHz & MIMO 6GHz)

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## 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 7.7, 7.8 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) Model: 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 1 Gain [dBi]	Antenna 2 Gain [dBi]	
2.4	-0.61	-5.94	
Table 2.6 Antenna Book Cain			

Table 2-6. Antenna Peak Gain

### 2.5 Software and Firmware

The test was conducted with software/firmware version S916USQU0AVJS 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.

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## 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 v01r01.

## 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).

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# 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.

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## 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

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## 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)	7/29/2022	Annual	7/29/2023	WL25-1
-	WL25-2	Conducted Cable Set (25GHz)	7/29/2022	Annual	7/29/2023	WL25-2
-	WL25-3	Conducted Cable Set (25GHz)	7/29/2022	Annual	7/29/2023	WL25-3
Agilent	N9038A	MXE EMI Receiver	1/21/2022	Annual	1/21/2023	MY51210133
Agilent	N9020A	MXA Signal Analyzer	3/15/2022	Annual	3/15/2023	US46470561
Agilent	N9030A	PXA Signal Analyzer (44GHz)	8/18/2022	Annual	8/18/2023	MY49430494
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	1/19/2022	Biennial	1/19/2024	121034
Emco	3115	Horn Antenna (1-18GHz)	8/8/2022	Biennial	8/8/2024	9704-5182
Emco	3116	Horn Antenna (18 - 40GHz)	7/20/2021	Biennial	7/202023	9203-2178
ETS-Lindgren	3816/2NM	Line Impedance Stabilization Network	8/11/2022	Biennial	8/11/2024	114451
Pasternack	NMLC-2	Line Conducted Emissions Cable (NM)	12/19/2021	Annual	12/19/2022	NMLC-2
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	8/29/2022	Annual	8/29/2023	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	8/25/2022	Annual	8/25/2023	100348
Solar Electronics	8012-50-R-24-BNC	Line Impedance Stabilization Network	9/21/2021	Biennial	9/21/2023	310233
Sunol	DRH-118	Horn Antenna (1-18GHz)	1/14/2022	Biennial	1/14/2024	A050307

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.

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## 7.0 **TEST RESULTS**

### 7.1 Summary

Company Name:	Samsung Electronics Co., Ltd.
FCC ID:	A3LSMS916U
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 "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 "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.

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## 7.2 6dB Bandwidth Measurement

<u>§15.247(a.2); RSS-247 [5.2]</u>

#### **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  $\geq$  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.

C. sur some West, 201	na Gideliei	EEE C	
TANA			
the star low rol and			
			EUT

Figure 7-1. Test Instrument & Measurement Setup

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## 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.

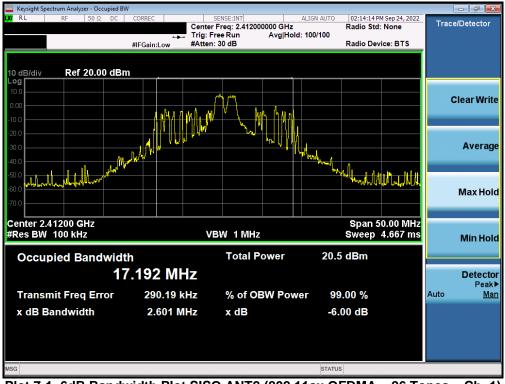
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## SISO Antenna-2 6 dB Bandwidth Measurements

Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
2412	1	ax	26T	MCS0	2.763	0.500
2437	6	ax	26T	MCS0	2.126	0.500
2462	11	ax	26T	MCS0	2.725	0.500
2412	1	ax	242T	MCS0	19.08	0.500
2437	6	ax	242T	MCS0	19.10	0.500
2462	11	ax	242T	MCS0	19.08	0.500

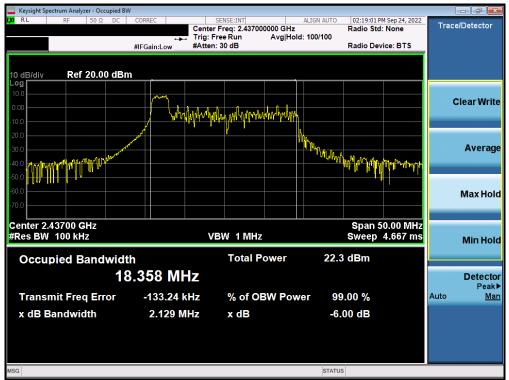
Table 7-2. Conducted Bandwidth Measurements SISO ANT2



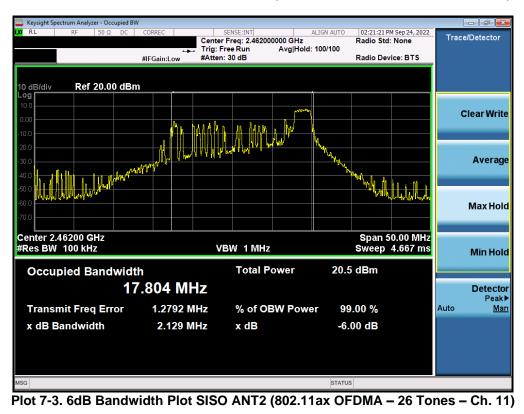
Plot 7-1. 6dB Bandwidth Plot SISO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 1)

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Plot 7-2. 6dB Bandwidth Plot SISO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 6)

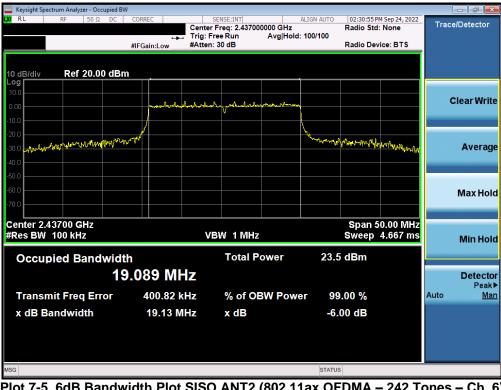


FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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Keysight Spectrum Analyzer - Occupied BW					
KL RF 50Ω DC	CORREC	SENSE:INT ter Freg: 2.412000000 GHz		PM Sep 24, 2022	Trace/Detector
			old: 100/100	a. None	
	#IFGain:Low #Att	en: 30 dB	Radio De	vice: BTS	
10 dB/div Ref 20.00 dBm					
Log					
10.0					Clear Write
0.00	montestadiated	Solution and solution the section of			Clear write
-10.0		<b>`</b>			
-20.0					
	where a second se		What has a second		Average
ath a way to your your your your your your your you			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	an hair have have	Average
-40.0					
-50.0					
-60.0					Max Hold
-70.0					
Center 2.41200 GHz				50.00 MHz	
#Res BW 100 kHz		VBW 1 MHz	Sweep	4.667 ms	Min Hold
		Total Power	23.4 dBm		
Occupied Bandwidth		Total Fower	ZJ.4 UDIII		
19	.002 MHz				Detector
					Peak►
Transmit Freq Error	383.07 kHz	% of OBW Por	wer 99.00 %		Auto <u>Man</u>
x dB Bandwidth	19.07 MHz	x dB	-6.00 dB		
· · · · ·			1		
MSG			STATUS		

Plot 7-4. 6dB Bandwidth Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 1)



Plot 7-5. 6dB Bandwidth Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 6)

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🔤 Keysight Spectrum Analyzer - Occupied BW							
KL RF 50Ω DC	CORREC	SENSE:INT	ALIGN AUTO	02:33:36 PM Radio Std:	1 Sep 24, 2022	Trace	e/Detector
			u GHz .vg Hold: 100/100	Radio Sta:	None		
		ten: 30 dB		Radio Devi	ice: BTS		
10 dB/div Ref 20.00 dBm							
Log							
10.0							lear Write
0.00	montestastastastastastast	alongilana Arabaraharahara	have have				lear write
-10.0							
-20.0							
-30.0 and when the short any with	Reve Contraction of the Contract		white the state of	the stant			Average
-40.0				and which the state	- Whyter whyter		
-50.0							
-60.0							Max Hold
-70.0							
				<b>6</b>			
Center 2.46200 GHz #Res BW 100 kHz		VBW 1 MHz			0.00 MHz 4.667 ms		
#Res BW 100 KH2				Sweep	4.007 1115		Min Hold
Occupied Bandwidth	h	Total Pow	ver 23.1	dBm			
							-
19	.018 MHz						Detector Peak▶
Transmit Freq Error	362.95 kHz	% of OBW	Power 99	.00 %		Auto	Man
x dB Bandwidth	18.99 MHz	x dB	-6.	00 dB			
			1				
MSG			STATUS	5			

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

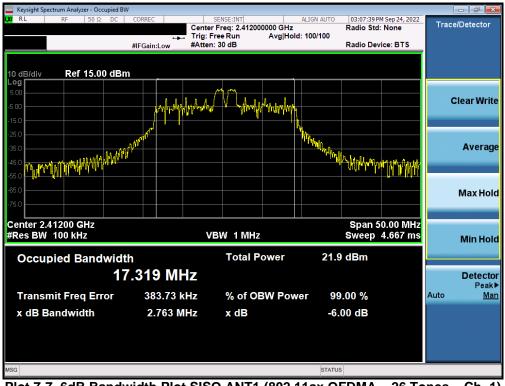
FCC ID: A3LSMS916U	element MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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## MIMO Antenna-1 6 dB Bandwidth Measurements

Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
2412	1	ax	26T	MCS0	2.763	0.500
2437	6	ax	26T	MCS0	2.126	0.500
2462	11	ax	26T	MCS0	2.725	0.500
2412	1	ax	242T	MCS0	19.08	0.500
2437	6	ax	242T	MCS0	19.10	0.500
2462	11	ax	242T	MCS0	19.08	0.500

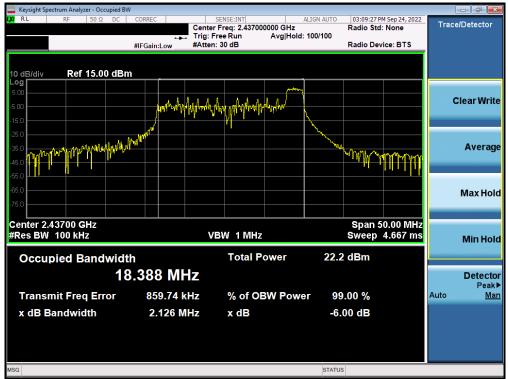
Table 7-3. Conducted Bandwidth Measurements MIMO ANT1



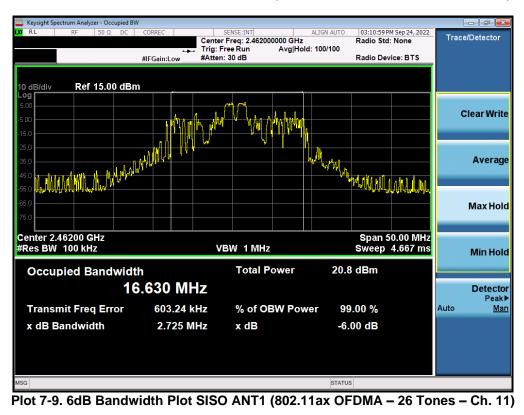
Plot 7-7. 6dB Bandwidth Plot SISO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 1)

FCC ID: A3LSMS916U	element	element MEASUREMENT REPORT (CERTIFICATION)	
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Plot 7-8. 6dB Bandwidth Plot SISO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 6)

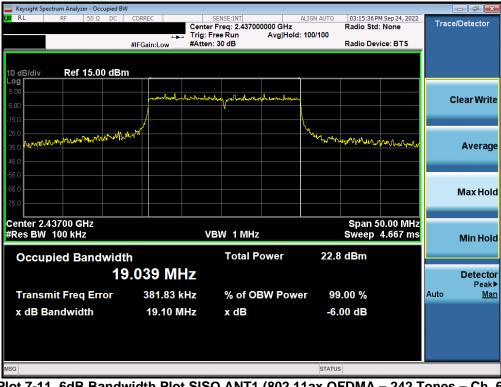


FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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Plot 7-10. 6dB Bandwidth Plot SISO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 1)



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

FCC ID: A3LSMS916U	element	element MEASUREMENT REPORT (CERTIFICATION)	
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Keysight Spectrum Analyzer - Occupied B <sup>1</sup>					
LXI RL RF 50Ω DC	CORREC	SENSE:INT r Freq: 2.462000000 GHz	ALIGN AUTO 03:20:18 P Radio Std	M Sep 24, 2022	Trace/Detector
	Trig: F	Free Run Avg Hold	1:>100/100		
	#IFGain:Low #Atten	n: 30 dB	Radio Dev	/ice: BTS	
10 dB/div Ref 15.00 dBr	m				
Log 5.00					
	moundation	Nory more about a for the second			Clear Write
-5.00		¥.			
-15.0					
-25.0	Mut		Mr. 10		
-25.0 -35.0 yr martin			"Www.Whallowww.	mound	Average
-45.0				· • • • • • •	
-55.0					
-65.0					Max Hold
-75.0					IVIAX HUIU
Center 2.46200 GHz				50.00 MHz	
#Res BW 100 kHz	v	BW 1 MHz	Sweep	4.667 ms	Min Hold
	41-	Total Power	22.9 dBm		
Occupied Bandwid		Total Power	22.9 UBIII		
18	8.992 MHz				Detector
Transmit From Freez	395.05 kHz	% of OBW Pow	er 99.00 %		Peak▶ Auto Man
Transmit Freq Error		% OF OBW FOW			
x dB Bandwidth	19.08 MHz	x dB	-6.00 dB		
MSG			STATUS		

Plot 7-12. 6dB Bandwidth Plot SISO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 11)

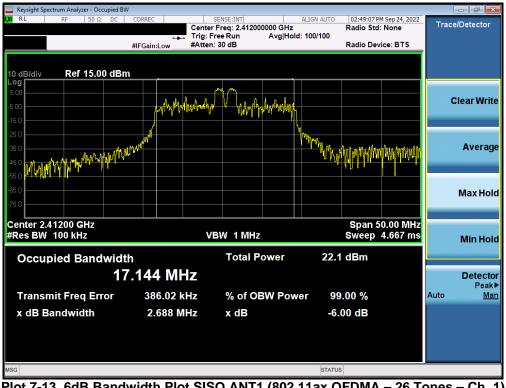
FCC ID: A3LSMS916U	element MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dage 22 of 05	
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## MIMO Antenna-2 6 dB Bandwidth Measurements

Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
2412	1	ax	26T	MCS0	2.688	0.500
2437	6	ax	26T	MCS0	2.104	0.500
2462	11	ax	26T	MCS0	2.693	0.500
2412	1	ax	242T	MCS0	19.12	0.500
2437	6	ax	242T	MCS0	18.98	0.500
2462	11	ax	242T	MCS0	18.98	0.500

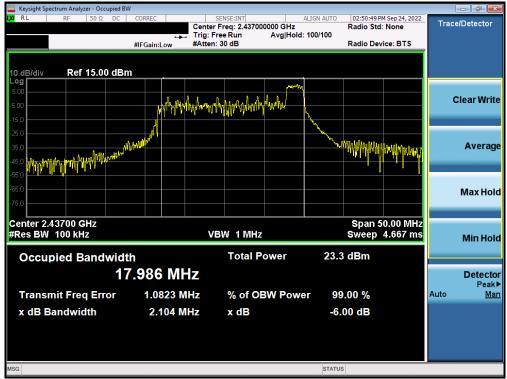
Table 7-4. Conducted Bandwidth Measurements MIMO ANT2



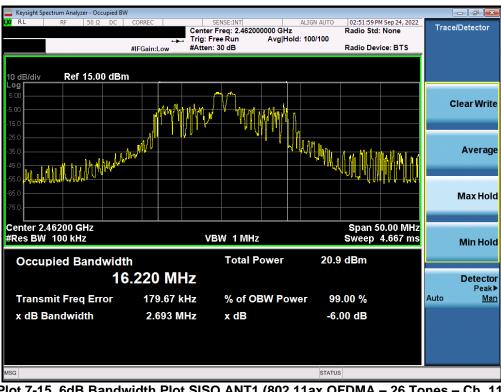
Plot 7-13. 6dB Bandwidth Plot SISO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 1)

FCC ID: A3LSMS916U	element	element MEASUREMENT REPORT (CERTIFICATION)	
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Plot 7-14. 6dB Bandwidth Plot SISO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 6)

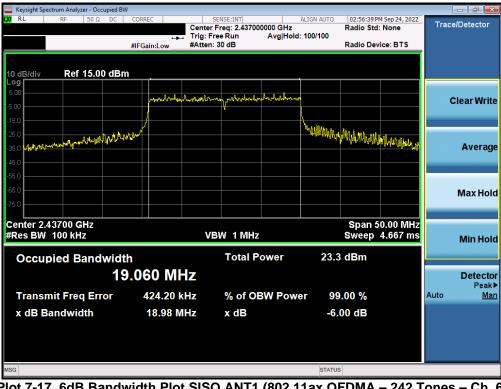


Plot 7-15. 6dB Bandwidth Plot SISO ANT1 (802.11ax OFDMA - 26 Tones - Ch. 11)

FCC ID: A3LSMS916U	element	element MEASUREMENT REPORT (CERTIFICATION)	
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Plot 7-16. 6dB Bandwidth Plot SISO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 1)



Plot 7-17. 6dB Bandwidth Plot SISO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 6)

FCC ID: A3LSMS916U	element	element MEASUREMENT REPORT (CERTIFICATION)	
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Keysight Spectrum Analyzer - Occupied BW							
X RL RF 50Ω DC		VSE:INT reg: 2.462000000 GHz		03:01:25 PM	Sep 24, 2022	Trace	/Detector
	Trig: Free	eRun Avg∣Hold		auto stu.	None		
	#IFGain:Low #Atten: 3	0 dB	R	adio Devi	ce: BTS		
10 dB/div Ref 15.00 dBm							
Log							
5.00	margurhanhunhunhun	a mound monor forman				c	lear Write
-5.00							
-15.0			<u> </u>				
-25.0	word		"Manually in	h i Milliuris	. 4		
-25.0 -36.0 mma/12.10/10/10/10/10/10/10/10/10/10/10/10/10/1			WL-MANALA	Manahar (14.1	Colores My Jon		Average
-45.0							
-55.0							
-65.0							
-75.0							Max Hold
-/5.0						_	
Center 2.46200 GHz				Span 5	0.00 MHz		
#Res BW 100 kHz	VBV	V 1 MHz			4.667 ms		Min Hold
Occupied Bandwidth	า	Total Power	22.6 d	IBm			
19	.023 MHz						Detector
							Peak►
Transmit Freq Error	378.46 kHz	% of OBW Powe	er 99.0	0 %		Auto	<u>Man</u>
x dB Bandwidth	18.98 MHz	x dB	-6.00	dB			
MSG			STATUS				

Plot 7-18. 6dB Bandwidth Plot SISO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 11)

FCC ID: A3LSMS916U	element MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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# 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

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	Freq [MHz]	Channel	Tones	RU Index	Detector	Conducted Powers (dBm)	Conducted Power Limit [dBm]	Conducted Power Margin [dB]
				0	AVG	13.61	30.00	-16.39
				0	PEAK	21.93	30.00	-8.07
	2412	1	26T	4	AVG	13.66	30.00	-16.34
	2412	I	201	4	PEAK	21.91	30.00	-8.09
N				8	AVG	13.55	30.00	-16.45
Î				0	PEAK	20.89	30.00	-9.11
2.4GHz				0	AVG	13.76	30.00	-16.24
4				0	PEAK	21.62	30.00	-8.38
Ň	2437	6	26T	4	AVG	13.75	30.00	-16.25
	2437	0	201	4	PEAK	21.67	30.00	-8.33
				8	AVG	13.74	30.00	-16.26
				0	PEAK	22.27	30.00	-7.73
				0	AVG	13.86	30.00	-16.14
				0	PEAK	21.82	30.00	-8.18
	2462	11	26T	4	AVG	13.55	30.00	-16.45
		11	201	4	PEAK	21.19	30.00	-8.81
				8	AVG	13.87	30.00	-16.13
			0	PEAK	21.46	30.00	-8.54	

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	Freq [MHz]	Channel	Tones	RU Index	Detector	Conducted Powers (dBm)	Conducted Power Limit [dBm]	Conducted Power Margin [dB]
				37	AVG	14.54	30.00	-15.46
				57	PEAK	23.41	30.00	-6.59
	2412	1	52T	38	AVG	14.68	30.00	-15.32
	2412	I	521		PEAK	23.21	30.00	-6.79
				40	AVG	14.42	30.00	-15.58
N				0	PEAK	22.76	30.00	-7.24
2.4GHz				37	AVG	14.92	30.00	-15.08
Ŭ				57	PEAK	22.91	30.00	-7.09
<u> </u>	2437	6	52T	38	AVG	14.74	30.00	-15.26
N	2-07	U	521		PEAK	22.52	30.00	-7.48
				40	AVG	14.98	30.00	-15.02
					PEAK	23.15	30.00	-6.85
				37	AVG	14.73	30.00	-15.27
					PEAK	23.34	30.00	-6.66
	2462 1	11	52T	38	AVG	14.98	30.00	-15.02
			021		PEAK	23.18	30.00	-6.82
				40	AVG	14.32	30.00	-15.68
				-10	PEAK	22.19	30.00	-7.81

Table 7-6. Conducted Output Power Measurements SISO ANT2 (52 Tones)

	Freq [MHz]	Channel	Tones	RU Index	Detector	Conducted Powers (dBm)	Conducted Power Limit [dBm]	Conducted Power Margin [dB]			
				53	AVG	15.70	30.00	-14.30			
	2412	1	106T	- 55	PEAK	24.82	30.00	-5.18			
N	2412	I	1001	54	AVG	15.62	30.00	Margin [dB] -14.30			
2.4GHz				- 54	PEAK	24.06	30.00	-5.94			
Ģ				53	AVG	15.90	30.00	-14.10			
4	2437	6	106T	- 55	PEAK	23.57	30.00	-6.43			
N	2437	0	1001	54	AVG	15.71	30.00	-14.29			
				- 54	PEAK	24.13	30.00	-5.87			
				53	AVG	15.60	30.00	-14.40			
	2462	11	106T	- 55	PEAK	24.42	30.00	-5.58			
	2402	11	1001	54	AVG	15.57	30.00	-14.43			
				- 34	PEAK	23.71	30.00	-6.29			

Table 7-7. Conducted Output Power Measurements SISO ANT2 (106 Tones)

FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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N	Freq [MHz]	Channel	Tones	RU Index	Detector	Conducted Powers (dBm)	Conducted Power Limit [dBm]	Conducted Power Margin [dB]
2.4GHz	2412	1	242T	61	AVG	15.73	30.00	-14.27
Ū Ū	2412	I		01	PEAK	24.76	30.00	-5.24
4	2437	6	242T	61	AVG	15.99	30.00	-14.01
N	2437	0	2421	01	PEAK	23.99	30.00	-6.01
	2462	11	242T	61	AVG	15.58	30.00	-14.42
	2402	11	2421	01	PEAK	24.43	30.00	-5.57

Table 7-8. Conducted Output Power Measurements SISO ANT2 (242 Tones)

FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager	
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			10000000000000	



	Freq [MHz]	Channel	Tones	RU Index	Index Detector Conducted Power [dBm]				Conducted Power Limit	Conducted Power	
						ANT1	ANT2	MIMO	[dBm]	Margin [dB]	
				0	AVG	13.43	13.77	16.61	30.00	-13.39	
				0	PEAK	21.94	24.12	26.18	30.00	-3.82	
	2412	1	26T	4	AVG	13.98	13.95	16.98	30.00	-13.02	
	2412	I	201	4	PEAK	21.98	22.16	25.08	30.00	-4.92	
N				8	AVG	14.02	13.57	16.81	30.00	-13.19	
Î				0	PEAK	22.19	22.28	25.25	30.00	-4.75	
Ū				0	AVG	13.62	13.69	16.67	30.00	-13.33	
2.4G					PEAK	21.48	22.49	25.02	30.00	-4.98	
N.	2437	6	26T	26T	4	AVG	13.24	13.75	16.51	30.00	-13.49
	2407	Ŭ	201	-	PEAK	21.35	22.08	24.74	30.00	-5.26	
				8	AVG	12.97	14.32	16.71	30.00	-13.29	
					PEAK	21.03	23.14	25.22	30.00	-4.78	
				0	AVG	13.28	14.37	16.87	30.00	-13.13	
					PEAK	21.42	23.47	25.58	30.00	-4.42	
	2462 11	26T	4	AVG	13.91	13.88	16.91	30.00	Power           Margin [dB]           -13.39           -3.82           -13.02           -4.92           -13.19           -4.75           -13.33           -4.98           -13.49           -5.26           -13.29           -4.78           -13.13		
	2-102	20	201	-	PEAK	22.59	23.06	25.84	30.00	-4.16	
				8	AVG	14.34	13.41	16.91	30.00	-13.09	
				0	PEAK	22.20	22.27	25.25	30.00	-4.75	

Table 7-9. Conducted Output Power Measurements MIMO (26 Tones)

	Freq [MHz]	Channel	Tones	RU Index	Detector	Cond	lucted Power [	dBm]	Conducted Power Limit	Conducted Power
						ANT1	ANT2	MIMO	[dBm]	Margin [dB]
				37	AVG	14.48	15.29	17.91	30.00	-12.09
				- 57	PEAK	23.17	24.17	26.71	30.00	-3.29
	2412	1	52T	38	AVG	14.80	15.15	17.99	30.00	-12.01
	2412	1	521	- 30	PEAK	23.81	24.43	27.14	30.00	-2.86
				40	AVG	15.03	14.30	17.69	30.00	-12.31
N				40	PEAK	23.35	23.11	26.24	30.00	-3.76
I				37	AVG	14.93	15.02	17.99	30.00	-12.01
2.4G				57	PEAK	23.64	23.21	26.44	30.00	-3.56
4	2437	6	52T	52T 38	AVG	14.57	14.89	17.74	30.00	-12.26
N	2437	0	521	- 50	PEAK	23.32	23.25	26.30	30.00	-3.70
				40	AVG	14.26	15.59	17.99	30.00	-12.01
				40	PEAK	23.08	24.39	26.79	30.00	-3.21
				37	AVG	14.16	15.27	17.76	30.00	-12.24
				57	PEAK	23.08	24.08	26.62	30.00	-3.38
	2462	2462 11 5	52T	38	AVG	14.31	14.82	17.58	30.00	-12.42
	2402		521	30	PEAK	23.56	23.98	26.79	30.00	-3.21
				40	AVG	15.28	14.31	17.83	30.00	-12.17
				40	PEAK	24.06	22.85	26.51	30.00	-3.49

Table 7-10. Conducted Output Power Measurements MIMO (52 Tones)

FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 21 of 05
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	Freq [MHz] Channel Tones			RU Index [	Detector	Conducted Power [dBm]			Conducted Power Limit	Conducted Power			
						ANT1	ANT2	MIMO	[dBm]	Margin [dB]			
				53	AVG	15.53	16.09	18.83	30.00	-11.17			
	2412	1	106T	- 55	PEAK	24.08	24.63	27.37	30.00	-2.63			
N	2412	I	1001	54	AVG	15.92	15.56	18.75	30.00	-11.25			
I				54	PEAK	24.64	23.95	27.32	30.00	-2.68			
Ċ			6 106T	53	AVG	15.91	15.91	18.92	30.00	-11.08			
4	2437	6		106T		PEAK	23.95	23.54	26.76	30.00	-3.24		
2	2437	0		1001	1001	1001	54	AVG	15.33	16.36	18.89	30.00	-11.11
							54	PEAK	23.45	24.51	27.02	30.00	-2.98
		2 11	1 106T			53	AVG	15.36	16.15	18.78	30.00	-11.22	
	2462			55	PEAK	23.65	24.64	27.18	30.00	-2.82			
	2402			54	AVG	16.27	15.48	18.90	30.00	-11.10			
				54	PEAK	24.71	23.80	27.29	30.00	-2.71			

Table 7-11. Conducted Output Power Measurements MIMO (106 Tones)

	Freq [MHz]	Channel	Tones	RU Index	dex Detector Conducted Power [di		dBm]	Conducted Power Limit	Conducted Power	
N						ANT1	ANT2	MIMO	[dBm]	Margin [dB]
L I	2412	1	242T	61	AVG	15.87	15.81	18.85	30.00	-11.15
Ģ	2412	1	2421	01	PEAK	24.91	24.73	27.83	30.00	-2.17
4	2437	6	242T	61	AVG	15.67	16.06	18.88	30.00	-11.12
2	2437	0	2421		PEAK	24.04	23.89	26.98	30.00	-3.02
	2462	11	242T	2T 61	AVG	15.10	15.12	18.12	30.00	-11.88
	2402	11	2421	01	PEAK	24.22	23.98	27.11	30.00	-2.89

Table 7-12. Conducted Output Power Measurements MIMO (242 Tones)

FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Page 32 of 95
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			1000000000000



#### 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 17.89 dBm for Antenna 1 and 17.69 dBm for Antenna 2.

Antenna 1 + Antenna 2 = MIMO

(17.89 dBm + 17.69 dBm) = (61.52 mW + 58.75 mW) = 120.27 mW = 20.80 dBm

FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dage 22 of 05	
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# 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 = 3kHz
- 4. VBW = 1MHz
- 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.

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FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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#### 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.

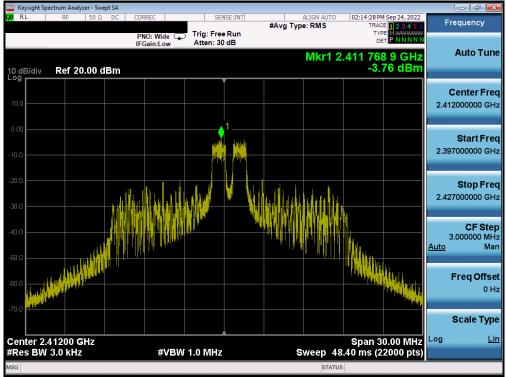
FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dage 25 of 05	
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## SISO Antenna-2 Power Spectral Density Measurements

Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]	Pass / Fail
2412	1	ax	26T	MCS0	-3.76	8.00	-11.76	Pass
2437	6	ax	26T	MCS0	-3.49	8.00	-11.49	Pass
2462	11	ax	26T	MCS0	-4.05	8.00	-12.05	Pass
2412	1	ax	242T	MCS0	-9.25	8.00	-17.25	Pass
2437	6	ax	242T	MCS0	-8.89	8.00	-16.89	Pass
2462	11	ax	242T	MCS0	-9.02	8.00	-17.02	Pass

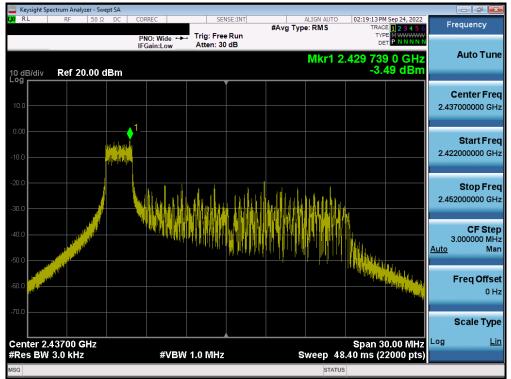
Table 7-13. Conducted Power Density Measurements SISO ANT2



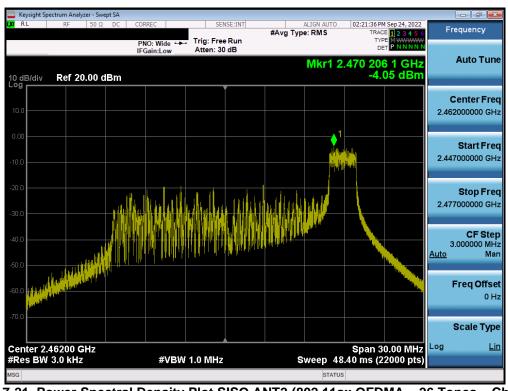
Plot 7-19. Power Spectral Density Plot SISO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 1)

FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dage 26 of 05	
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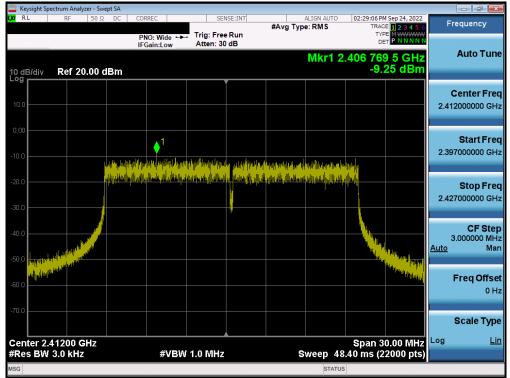
Plot 7-20. Power Spectral Density Plot SISO ANT2 (802.11ax OFDMA - 26 Tones - Ch. 6)



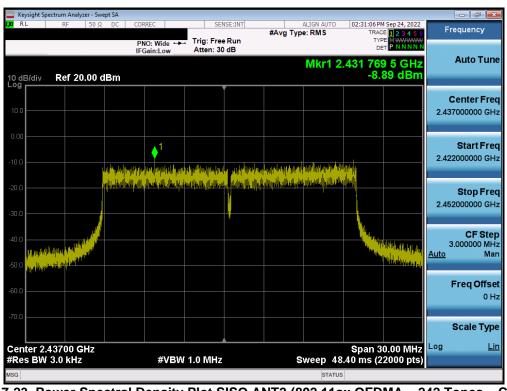
Plot 7-21. Power Spectral Density Plot SISO ANT2 (802.11ax OFDMA - 26 Tones - Ch. 11)

FCC ID: A3LSMS916U	element	element MEASUREMENT REPORT (CERTIFICATION)	
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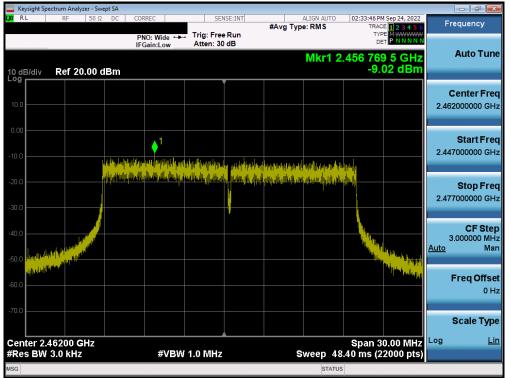
Plot 7-22. Power Spectral Density Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 1)



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

FCC ID: A3LSMS916U	element	element MEASUREMENT REPORT (CERTIFICATION)	
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Plot 7-24. Power Spectral Density Plot SISO ANT2 (802.11ax OFDMA - 242 Tones - Ch. 11)

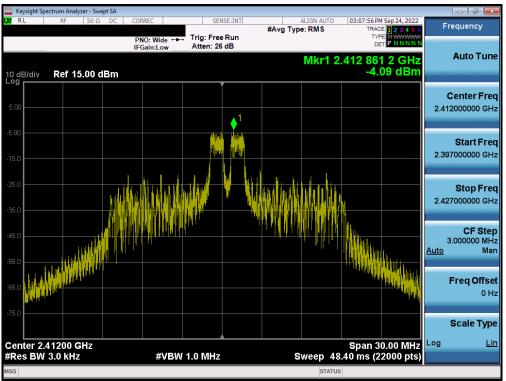
FCC ID: A3LSMS916U	element	element MEASUREMENT REPORT (CERTIFICATION)	
Test Report S/N:	Test Dates:	EUT Type:	Daga 20 of 05
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# **MIMO Power Spectral Density Measurements**

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	-4.09	-3.71	-0.89	8.00	-8.89	Pass
2437	6	ax	26T	MCS0	-4.21	-2.08	-0.01	8.00	-8.01	Pass
2462	11	ax	26T	MCS0	-3.69	-3.76	-0.71	8.00	-8.71	Pass
2412	1	ax	242T	MCS0	-10.31	-9.86	-7.07	8.00	-15.07	Pass
2437	6	ax	242T	MCS0	-10.10	-9.42	-6.73	8.00	-14.73	Pass
2462	11	ax	242T	MCS0	-10.07	-9.55	-6.79	8.00	-14.79	Pass

Table 7-14.MIMO Conducted Power Density Measurements

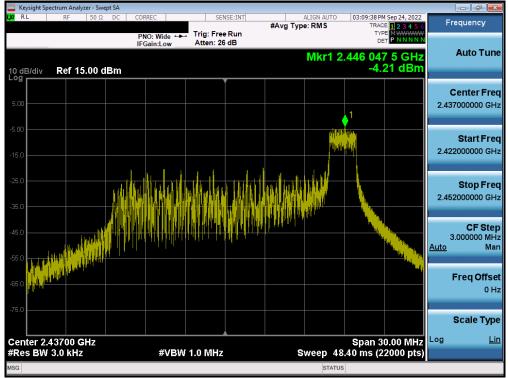


Plot 7-25. Power Spectral Density Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 1)

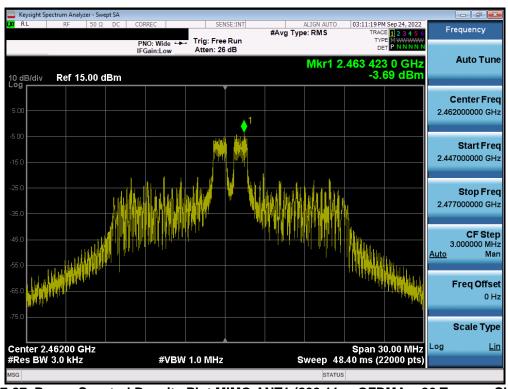
FCC ID: A3LSMS916U	element	element MEASUREMENT REPORT (CERTIFICATION)	
Test Report S/N:	Test Dates:	Test Dates: EUT Type:	
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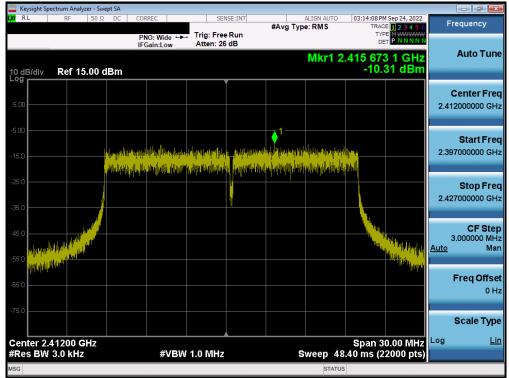
Plot 7-26. Power Spectral Density Plot MIMO ANT1 (802.11ax OFDMA - 26 Tones - Ch. 6)



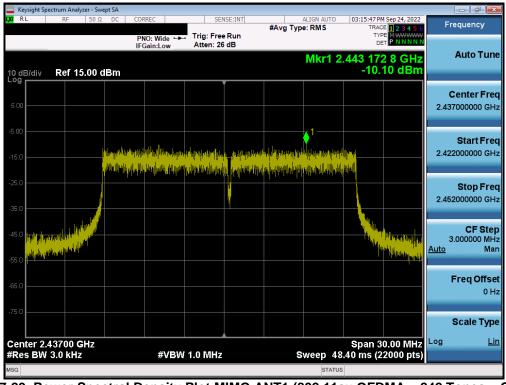
Plot 7-27. Power Spectral Density Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 11)

FCC ID: A3LSMS916U	element	element MEASUREMENT REPORT (CERTIFICATION)	
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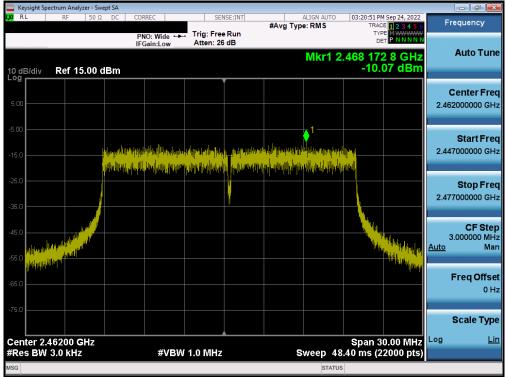
Plot 7-28. Power Spectral Density Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 1)



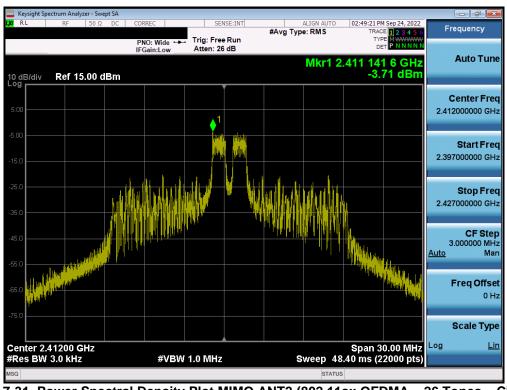
Plot 7-29. Power Spectral Density Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 6)

FCC ID: A3LSMS916U	element	element MEASUREMENT REPORT (CERTIFICATION)	
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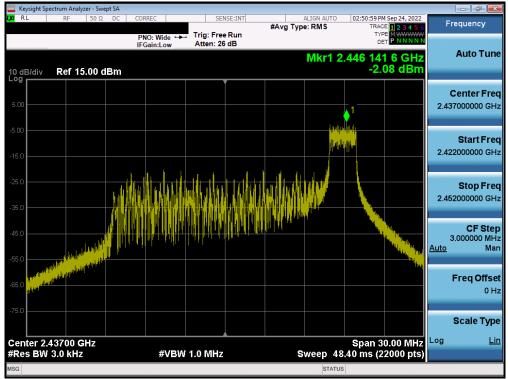
Plot 7-30. Power Spectral Density Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 11)



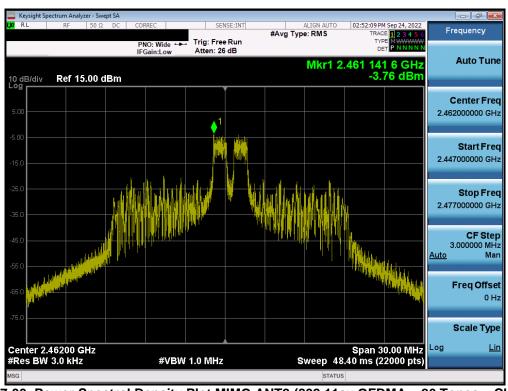
Plot 7-31. Power Spectral Density Plot MIMO ANT2 (802.11ax OFDMA - 26 Tones - Ch. 1)

FCC ID: A3LSMS916U	element	element MEASUREMENT REPORT (CERTIFICATION)	
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1M2209010097-12.A3L	09/02/2022-11/08/2022	Portable Handset	Page 43 of 95
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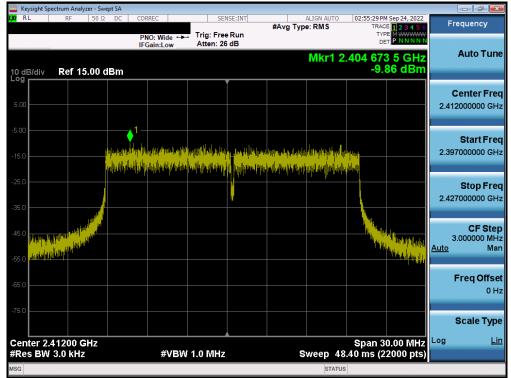
Plot 7-32. Power Spectral Density Plot MIMO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 6)



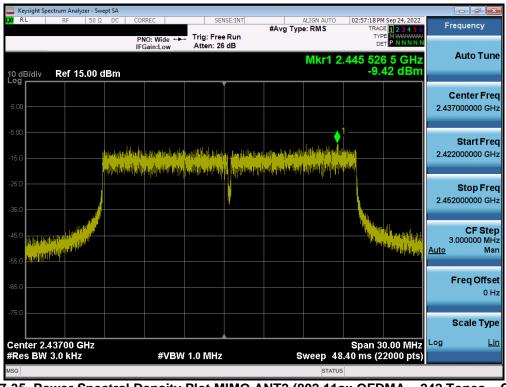
Plot 7-33. Power Spectral Density Plot MIMO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 11)

FCC ID: A3LSMS916U	element	element MEASUREMENT REPORT (CERTIFICATION)	
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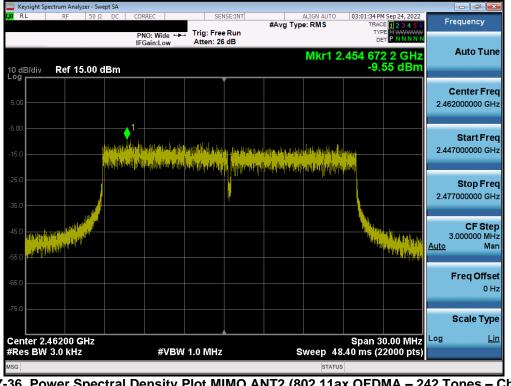
Plot 7-34. Power Spectral Density Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 1)



Plot 7-35. Power Spectral Density Plot MIMO ANT2 (802.11ax OFDMA - 242 Tones - Ch. 6)

FCC ID: A3LSMS916U	element	element MEASUREMENT REPORT (CERTIFICATION)	
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Plot 7-36. 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 -2.53 dBm for Antenna 1 and -1.52 dBm for Antenna 2.

Antenna 1 + Antenna 2 = MIMO

(-2.53 dBm + -1.52 dBm) = (0.56 mW + 0.70 mW) = 1.26 mW = 1.01 dBm

FCC ID: A3LSMS916U	element	element MEASUREMENT REPORT (CERTIFICATION)	
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# 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: A3LSMS916U	element	element MEASUREMENT REPORT (CERTIFICATION)	
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#### Keysight Spectrum Analyzer - Swept SA 08:25:53 AM Oct 23, 2022 N AUTO Frequency #Avg Type: RMS Trig: Free Run PNO: Fast IFGain:Low Atten: 26 dB Auto Tune ΔMkr1 8.750 MHz 31.55 dE Ref 15.00 dBm 10 dB/div ▲1∆2 **Center Freq** 2.40000000 GHz Start Freq 2.365000000 GHz Stop Freq 2.435000000 GHz Mum CF Step 7.000000 MHz <u>Auto</u> Man Whiteh M (lPm **Freq Offset** 0 Hz Scale Type Span 70.00 MHz Log Sweep 2.000 ms (2001 pts) Lin Center 2.40000 GHz #Res BW 100 kHz #VBW 1.0 MHz Plot 7-37. Band Edge Plot SISO ANT2 (802.11ax OFDMA - 106 Tones - Ch. 1)

# SISO Antenna-2 Conducted Emissions at the Band Edge



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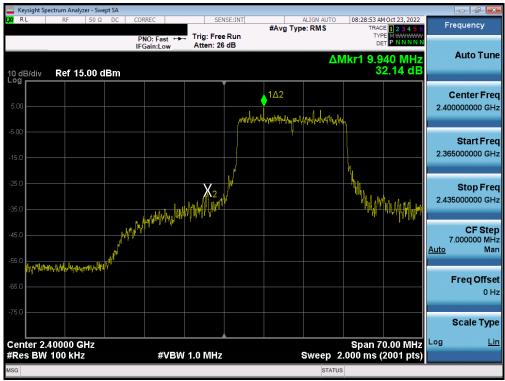
Portable Handset

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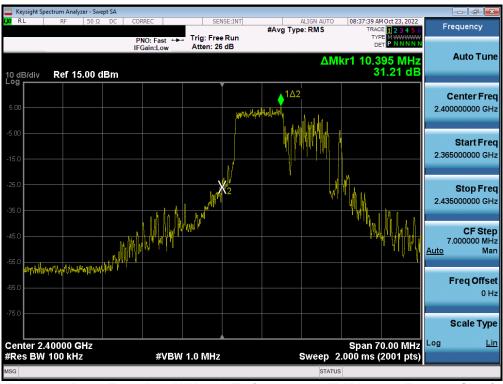
Plot 7-39. Band Edge Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 1)

Plot 7-40. Band Edge Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 11)

FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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# MIMO Antenna-1 Conducted Emissions at the Band Edge

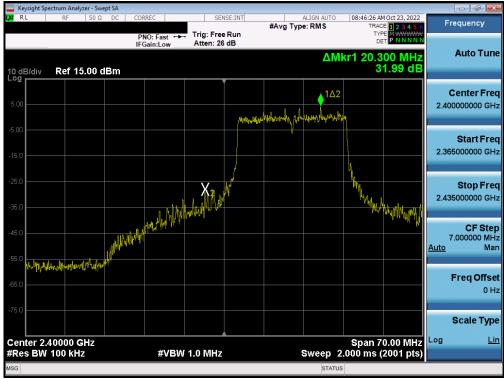


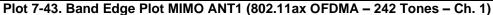
Plot 7-41. Band Edge Plot MIMO ANT1 (802.11ax OFDMA - 106 Tones - Ch. 1)

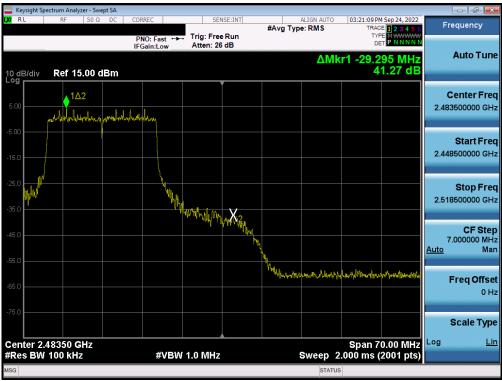


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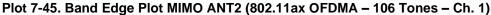
Plot 7-44. Band Edge Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 11)

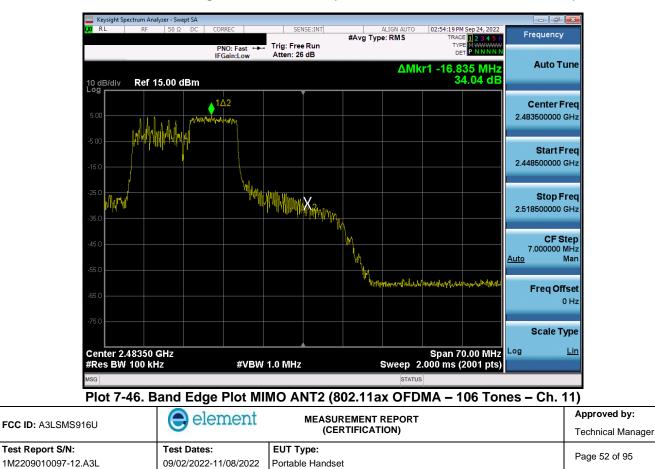
FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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# MIMO Antenna-2 Conducted Emissions at the Band Edge



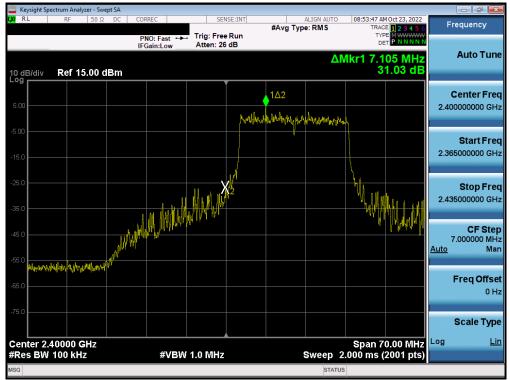


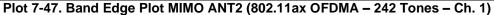


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Plot 7-48. Band Edge Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 11)

FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Page 53 of 95
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# 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: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dage E4 of 05	
1M2209010097-12.A3L	09/02/2022-11/08/2022	Portable Handset	Page 54 of 95	
	· · ·	•	V9.0 02/01/2019	

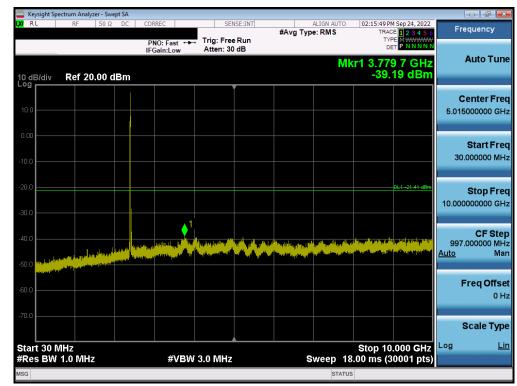


# Test Notes

- 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.

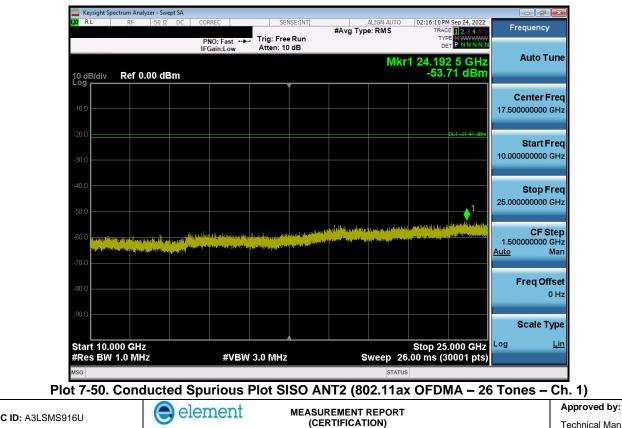
FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Daga EE at OE
1M2209010097-12.A3L	09/02/2022-11/08/2022	Portable Handset	Page 55 of 95
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# SISO Antenna-2 Conducted Spurious Emissions





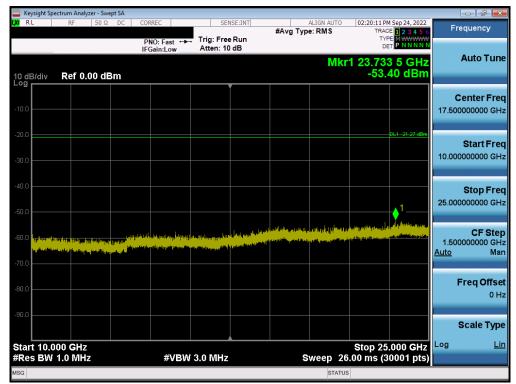
FCC ID: A3LSMS9160	0	(CERTIFICATION)	Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Page 56 of 95
1M2209010097-12.A3L	09/02/2022-11/08/2022	Portable Handset	Fage 50 01 95

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RL	RF	50 Ω	DC	CORREC		SEI	NSE:INT		ALIGN AUTO		M Sep 24, 2022	Frequ	ency
					ast 🔸	Trig: Free		#Avg Typ	De: RMS	TY	DE 123456 PE MWWWW ET P NNNNN	rioqu	oney
				IFGain:	Low	Atten: 30	dB		ML	-	9 9 GHz	Au	to Tun
0 dB/div	Ref 2	0.00 d	Bm							-38.	93 dBm		
												Cen	ter Fre
10.0												5.015000	)000 GI
0.00													
													art Fr
10.0												30.000	
20.0											DL1 -21.27 dBm	St	op Fr
												10.000000	
30.0								1					
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70.0													
												Sca	ale Ty
tart 30 I	MHz									Stop 10	.000 GHz	Log	<u>L</u>
Res BW		z			#VBW	3.0 MHz		S	Sweep 18	.00 ms (3	.000 GHz 80001 pts)		

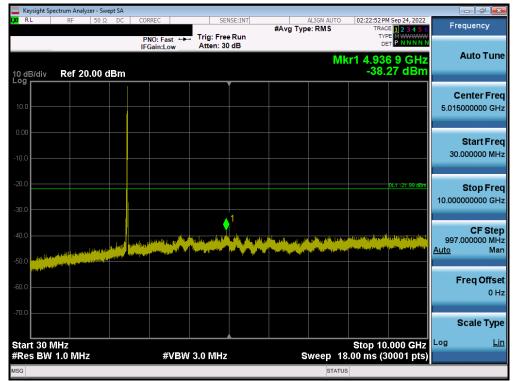
Plot 7-51. Conducted Spurious Plot SISO ANT2 (802.11ax OFDMA - 26 Tones - Ch. 6)



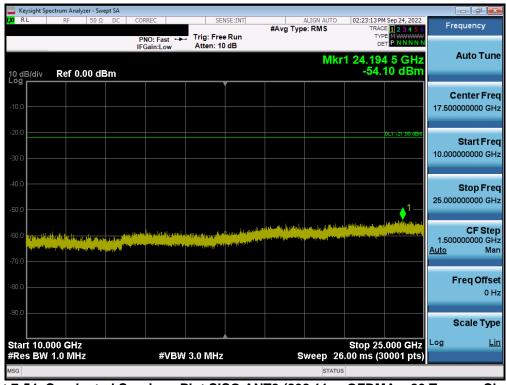
Plot 7-52. Conducted Spurious Plot SISO ANT2 (802.11ax OFDMA - 26 Tones - Ch. 6)

FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dogo EZ of OE
1M2209010097-12.A3L	09/02/2022-11/08/2022	Portable Handset	Page 57 of 95
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Plot 7-53. Conducted Spurious Plot SISO ANT2 (802.11ax OFDMA - 26 Tones - Ch. 11)



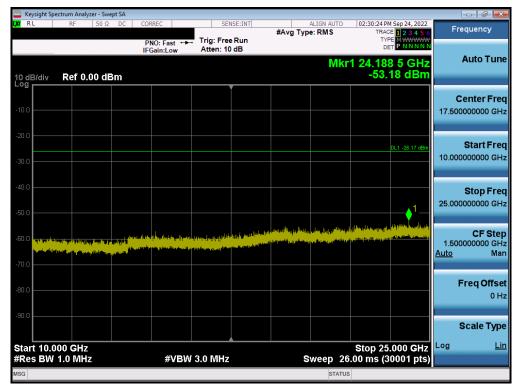
Plot 7-54. Conducted Spurious Plot SISO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 11)

FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 50 of 05
1M2209010097-12.A3L	09/02/2022-11/08/2022	Portable Handset	Page 58 of 95
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α RL RF 50Ω	DC CO	RREC	SENSE	INT	ALIGN AUT	02:30:02 PM Sep 24, 2022	
	P	NO: Fast ↔ Gain:Low	Trig: Free F Atten: 30 d	#An tun	vg Type: RMS	TRACE 1 2 3 4 5 6 TYPE MWWWW DET P N N N N	
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10.0							Center Fre 5.015000000 GH
10.0							Start Fre 30.000000 MH
20.0						DL1 -26.17 dBm	<b>Stop Fre</b> 10.000000000 Gł
40.0	n politika Seren al	a lation for participation of the second s				n gja f y senera gy "Piget Sugar Constant ywe'r ros 19 ga f yn gwlang y Piget Sugar Constant frwy dd ywe'r ros	<b>CF Ste</b> 997.000000 Mi <u>Auto</u> Ma
60.0							Freq Offs 0 I
70.0							Scale Typ
Start 30 MHz #Res BW 1.0 MHz		#VBW	3.0 MHz		Sweep	Stop 10.000 GHz 18.00 ms (30001 pts)	Log <u>L</u>

Plot 7-55. Conducted Spurious Plot SISO ANT2 (802.11ax OFDMA - 242 Tones - Ch. 1)



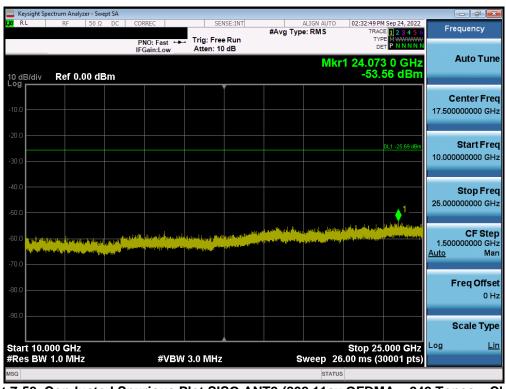
Plot 7-56. Conducted Spurious Plot SISO ANT2 (802.11ax OFDMA - 242 Tones - Ch. 1)

FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Daga E0 of 0E
1M2209010097-12.A3L	09/02/2022-11/08/2022	Portable Handset	Page 59 of 95
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🚾 Keysight Spectrum Analyzer - Swept SA 🚽				
IXI RL RF 50Ω DC		#Avg Typ	e: RMS TRAC	I Sep 24, 2022         Frequency           E         1 2 3 4 5 6
	PNO: Fast +++ Trig: Fr IFGain:Low Atten: 3			
			Mkr1 3.82	19GHz Auto Tune
10 dB/div Ref 20.00 dBm			-38.	48 dBm
		Ĭ		Center Fred
10.0				5.015000000 GH
0.00				Start Free
-10.0				30.000000 MH:
-20.0				Stop Free
-30.0				DL1 -25.69 dBm 10.000000000 GH:
-30.0	<u> </u>			
-40.0		<b>.</b>	المرافعة فعاقب أتشار ومعرور والمراجع	CF Step 997.000000 MH
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-50.0 -Antonio and a strength of the second s	distantia in the set	an tan dan nan in dan tita		
-60.0				Freq Offse
-80.0				0 H:
-70.0				
				Scale Type
Start 30 MHz			Stop 10	.000 GHz
#Res BW 1.0 MHz	#VBW 3.0 MH	z S	weep 18.00 ms (3	0001 pts)
MSG			STATUS	

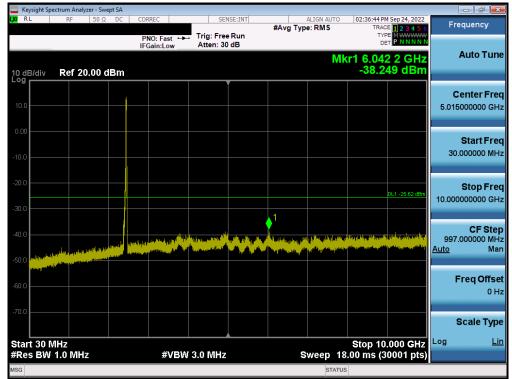
Plot 7-57. Conducted Spurious Plot SISO ANT2 (802.11ax OFDMA - 242 Tones - Ch. 6)



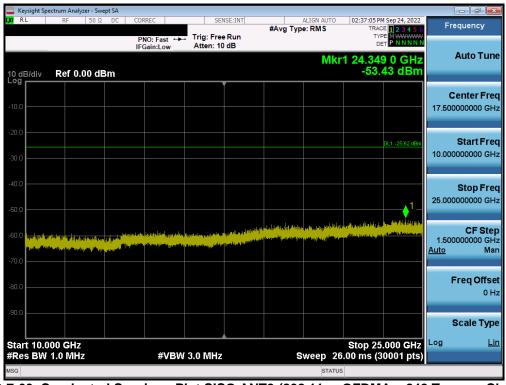
Plot 7-58. Conducted Spurious Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 6)

FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 60 of 05
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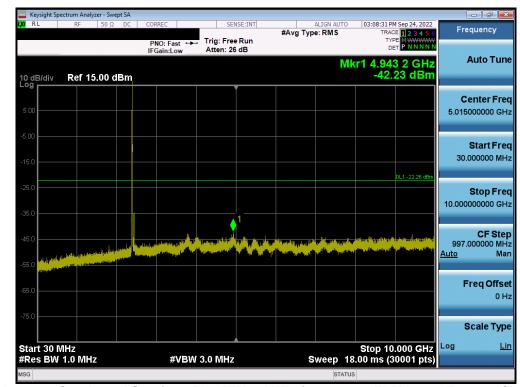
Plot 7-59. Conducted Spurious Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 11)



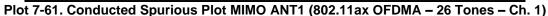
Plot 7-60. Conducted Spurious Plot SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 11)

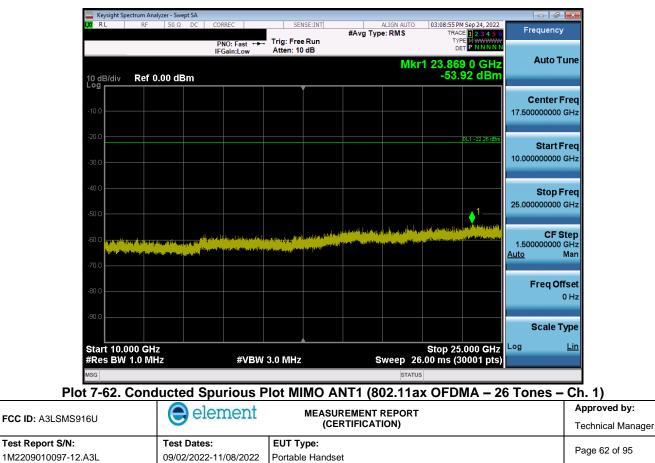
FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 61 of 05
1M2209010097-12.A3L	09/02/2022-11/08/2022	Portable Handset	Page 61 of 95
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# **MIMO Antenna-1 Conducted Spurious Emission**



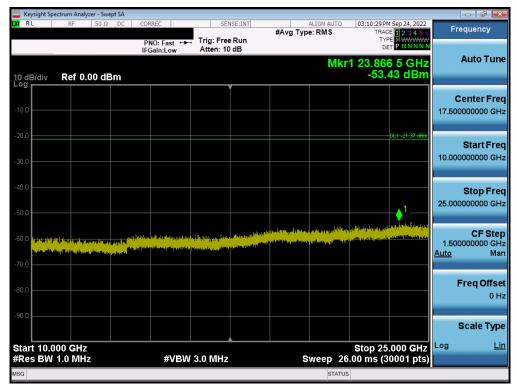


V9.0 02/01/2019



U RL	RF	50 Ω	DC	CORREC	SEN	ISE:INT		ALIGN AUTO		M Sep 24, 2022	Frequ	0001
				PNO: Fast 🕶	, Trig: Free	Run	#Avg Typ	e:RMS	TY	DE 123456 PE MWWWW	Fiequ	ency
				IFGain:Low	Atten: 26	dB			DI			_
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											Cen	ter Fre
5.00											5.015000	)000 GI
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25.0											St	op Fr
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											Sca	ale Ty
	0 MHz W 1.0 MH	7		#\/B\/	/ 3.0 MHz			ween 19	Stop 10	.000 GHz 0001 pts)	Log	<u>L</u>
SG		12		#404	7 <b>3.</b> 0 Winz		3	STATUS		ooo r prs)		

Plot 7-63. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA - 26 Tones - Ch. 6)



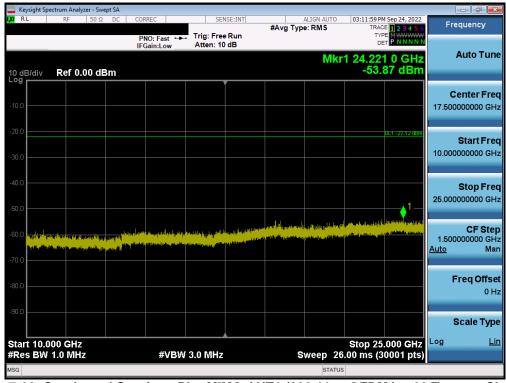
Plot 7-64. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA - 26 Tones - Ch. 6)

FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dega 62 of 05	
1M2209010097-12.A3L	09/02/2022-11/08/2022	Portable Handset	Page 63 of 95	
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	pectrum Analyzer - Sv									
(X) RL	RF 50 S	2 DC	CORREC		NSE:INT	#Avg Typ	ALIGN AUTO e: RMS	TRAC	4 Sep 24, 2022 E 1 2 3 4 5 6	Frequency
10 dB/div	Ref 15.00	dBm	PNO: Fast ↔ IFGain:Low	Atten: 26			М	DE kr1 4.97	™	Auto Tune
5.00										Center Freq 5.015000000 GHz
-5.00									DL1 -22.12 dBm	Start Freq 30.000000 MHz
-25.0										<b>Stop Freq</b> 10.000000000 GHz
-45.0	ang	, Lakes the	legiserber gestellter National at Managemeiller	A STREEMEN DATE		an Managaran Salah Managaran Salah Managaran Salah Sa		ويور سرويده فيجب يورد ال	ng f <sup>ar</sup> itynsi (fynsis) i sys Iwreferwysiae <sub>n</sub> silwyf	CF Step 997.000000 MHz <u>Auto</u> Mar
-65.0	ej, lietrok (rajd dinati									Freq Offset 0 Hz
-75.0 Start 30	МЦэ							Stop 10	.000 GHz	Scale Type
	₩HZ / 1.0 MHz		#VBW	3.0 MHz		s	weep 1	8.00 ms (3	.VVV GI12	
MSG							STATU	JS		

Plot 7-65. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 11)



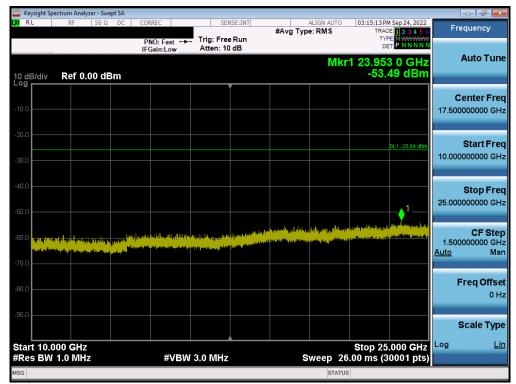
Plot 7-66. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 26 Tones – Ch. 11)

FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 64 of 05
1M2209010097-12.A3L	09/02/2022-11/08/2022	Portable Handset	Page 64 of 95
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Keysight Spectrum Analyzer - Swe RL RF 50 Ω	•	SENSE:INT	ALIGN AUTO	03:14:48 PM Sep 24, 2022	
10 2012	PNO: Fast ↔→	Trig: Free Run Atten: 26 dB	#Avg Type: RMS	TRACE 1 2 3 4 5 6 TYPE MWWWW DET P N N N N N	Frequency
0 dB/div Ref 15.00 d			Mk	r1 4.935 6 GHz -43.00 dBm	Auto Tur
<b>°g</b> 5.00					Center Fre 5.015000000 GH
15.0					Start Fre 30.000000 Mi
35.0				DI 125.84.dBm	<b>Stop Fre</b> 10.000000000 GF
45.0 55.0 <mark>/ http://www.standard.com/actives/actives/</mark>			Nily Consequences in South Spirit Republic	t i spjeringen filjer filsen og på tilste for attende attende attende attende attende attende attende attende a	<b>CF St</b> e 997.000000 MI <u>Auto</u> Mi
55.0 1999 1997 1997 1997 1997 1997 1997 199					<b>Freq Offs</b> 0 F
75.0					Scale Ty
Start 30 MHz Res BW 1.0 MHz	#VBW	3.0 MHz	Sweep 18	Stop 10.000 GHz .00 ms (30001 pts)	Log <u>L</u>

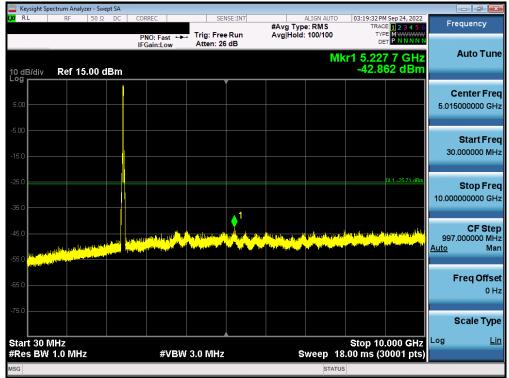
Plot 7-67. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 1)



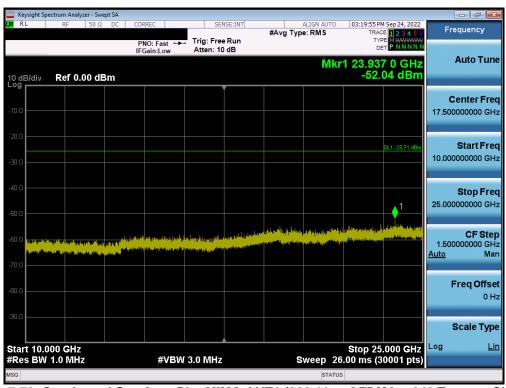
Plot 7-68. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA - 242 Tones - Ch. 1)

FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dage 65 of 05	
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Plot 7-69. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA - 242 Tones - Ch. 6)



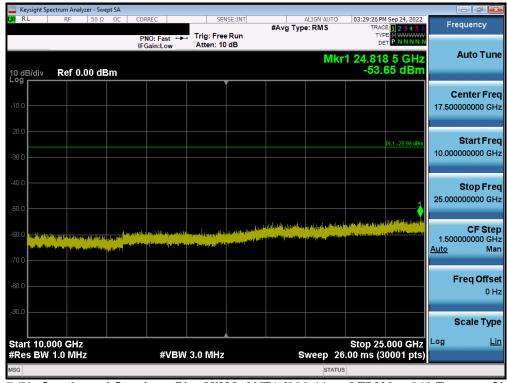
Plot 7-70. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA - 242 Tones - Ch. 6)

FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dege CC of OF	
1M2209010097-12.A3L	09/02/2022-11/08/2022	Portable Handset	Page 66 of 95	
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	trum Analyzer - Sw									
LXI RL	RF 50 Ω	DC	CORREC		NSE:INT	#Avg Typ	ALIGN AUTO e: RMS	TRAC	M Sep 24, 2022	Frequency
10 dB/div Log	Ref 15.00	dBm	PNO: Fast ↔ IFGain:Low	. Trig: Free Atten: 26			М	bi kr1 3.72	<sup>™</sup>	Auto Tune
5.00										Center Freq 5.015000000 GHz
-5.00										Start Fred 30.000000 MHz
-25.0			.1						DL1 -25.99 dBm	Stop Fred 10.000000000 GHz
-45.0	nd Albert Aug Charles and Archite	Kalinadan.		Free and a first sector			and and the second second	n <mark>ng <sup>k</sup>ungan san san san san san san san san san s</mark>		CF Step 997.000000 MH Auto Mar
-65.0										Freq Offse 0 Ha
Start 30 M			#VBW	3.0 MHz			weep_1	Stop 10 8.00 ms (3		Scale Type
MSG			<i>"•</i>	0.0 10112			STATU		acor proj	

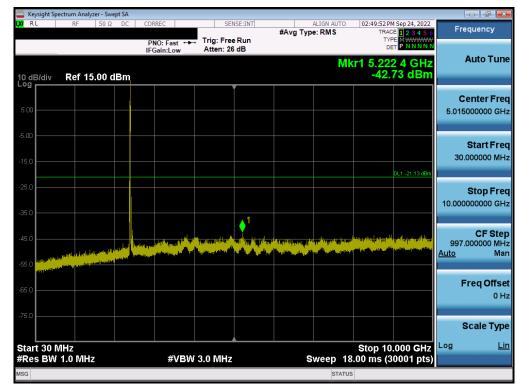
Plot 7-71. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 11)



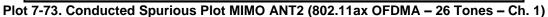
Plot 7-72. Conducted Spurious Plot MIMO ANT1 (802.11ax OFDMA – 242 Tones – Ch. 11)

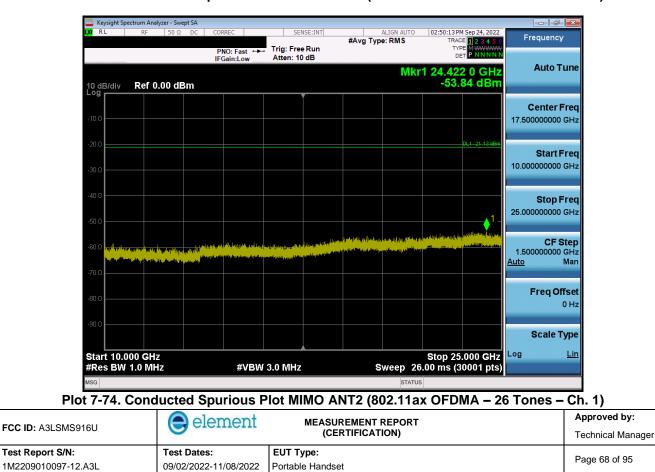
FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dama 67 of 05
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# **MIMO Antenna-2 Conducted Spurious Emissions**



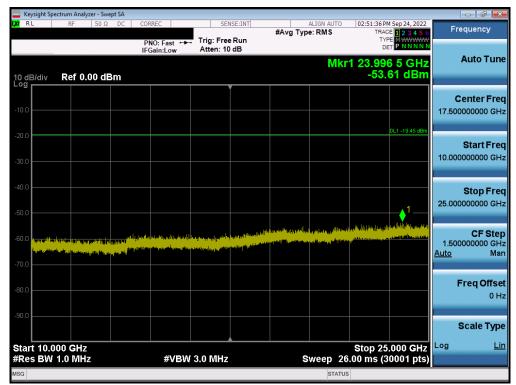


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RL	t Spectrum Ana	50 Ω	DC	CORREC	SEI	NSE:INT		ALIGN AUTO	02:51:15 PM	4 Sep 24, 2022	_	- 6
					Trig: Fre	Dun	#Avg Typ	e:RMS	TRAC		Fre	quency
				PNO: Fast ↔ IFGain:Low	Atten: 20				DE			
								M	(r1 4.95)	0 2 GHz		Auto Tur
0 dB/di	Ref 1	5.00 di	Bm						-43.	65 dBm		
.""						Ĭ					C.	enter Fro
5.00												000000 GI
											0.010	00000 G
5.00												
												Start Fr
15.0											30.0	000000 M
										DL1 -19,45 dBm		
25.0			i									Stop Fr
												000000 G
35.0						1						
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tart 3									Stop 40	.000 GHz	Log	L
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SG								STATUS	`	, <i>i</i>		

Plot 7-75. Conducted Spurious Plot MIMO ANT2 (802.11ax OFDMA - 26 Tones - Ch. 6)



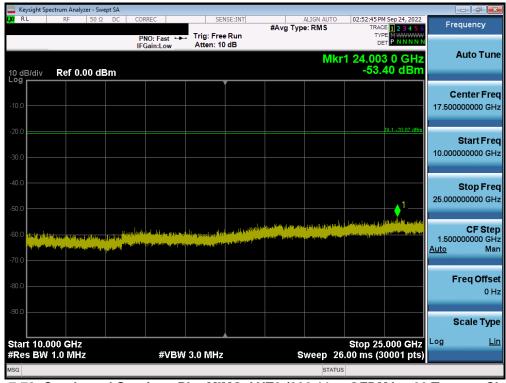
Plot 7-76. Conducted Spurious Plot MIMO ANT2 (802.11ax OFDMA - 26 Tones - Ch. 6)

FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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	pectrum Analyzer - Sw									
L <mark>XI</mark> RL	RF 50 S	2 DC (	CORREC		NSE:INT	#Avg Typ	ALIGN AUTO e: RMS	TRAC	M Sep 24, 2022	Frequency
			PNO: Fast ++- IFGain:Low	. Trig: Free Atten: 26					ET P NNNN	
10 dB/div Log	Ref 15.00	dBm					М	kr1 9.79 -42.	5 6 GHz 65 dBm	Auto Tune
5.00										Center Freq 5.015000000 GHz
-5.00									DL1 -20.87 dBm	Start Freq 30.000000 MHz
-25.0										<b>Stop Freq</b> 10.000000000 GHz
-45.0	a galaka mangana kang kang kang kang kang kang kan		uppe Dealberray (Station	<sup>19</sup> Colomo De Transford Transford (1997) - Colombia Colombia (1997)		<sup>1</sup> Added yn y Nyw Dynasta Yn Gweither, yw synasta	1 A	el si severi a sere su det si ted si contratio	i ti n ti	CF Step 997.000000 MHz Auto Man
-65.0										Freq Offset 0 Hz
-75.0 Start 30	MHz							Stop_10	.000 GHz	Scale Type
	1.0 MHz		#VBW	3.0 MHz		\$	weep 1	8.00 ms (3	0001 pts)	
MSG							STATU	IS		

Plot 7-77. Conducted Spurious Plot MIMO ANT2 (802.11ax OFDMA - 26 Tones - Ch. 11)



Plot 7-78. Conducted Spurious Plot MIMO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 11)

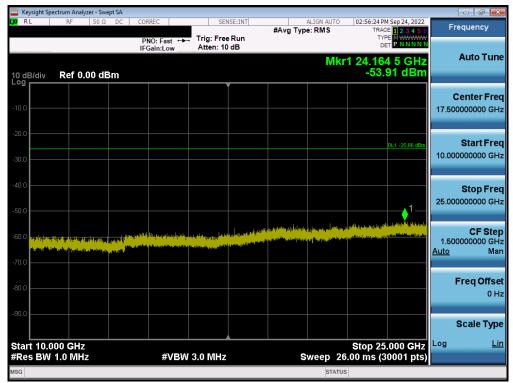
FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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α RL RF 50 Ω	DC CORREC	SENSE:INT	ALIGN AUTO	02:56:03 PM Sep 24, 2022	
10 5032	PNO: Fast ↔ IFGain:Low		#Avg Type: RMS	TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P N N N N N	Frequency
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5.00					Center Fre 5.015000000 GH
15.0					Start Fre 30.000000 Mi
35.0				DL 1 - 25.86 dBm.	<b>Stop Fr</b> 10.000000000 GI
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65.0					Freq Offs 01
75.0					Scale Typ
Start 30 MHz Res BW 1.0 MHz	#VBW	3.0 MHz	Sweep 18	Stop 10.000 GHz .00 ms (30001 pts)	Log <u>L</u>

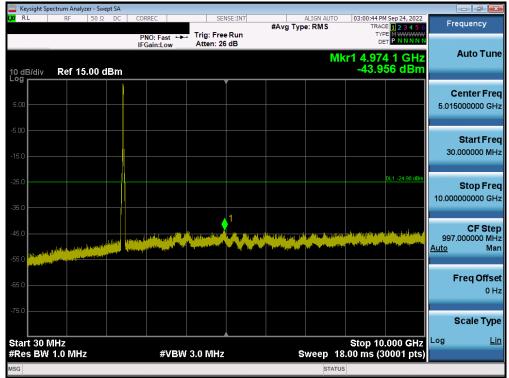
Plot 7-79. Conducted Spurious Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 1)



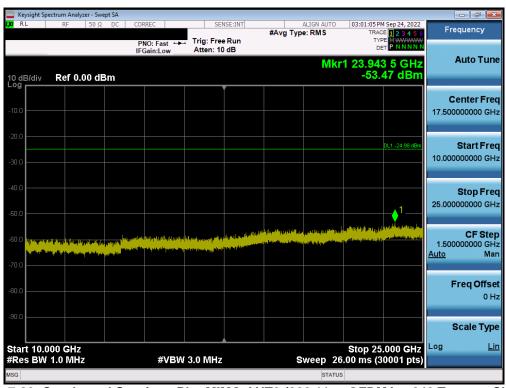
Plot 7-80. Conducted Spurious Plot MIMO ANT2 (802.11ax OFDMA - 242 Tones - Ch. 1)

FCC ID: A3LSMS916U	element	element MEASUREMENT REPORT (CERTIFICATION)	
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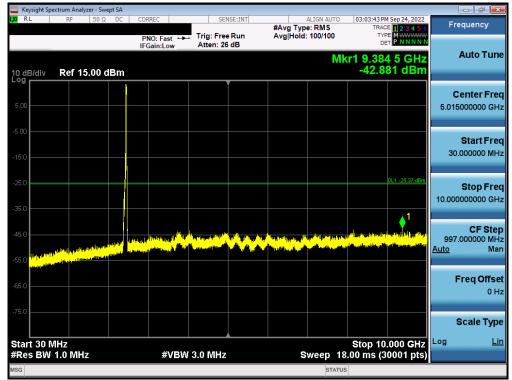
Plot 7-81. Conducted Spurious Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 6)



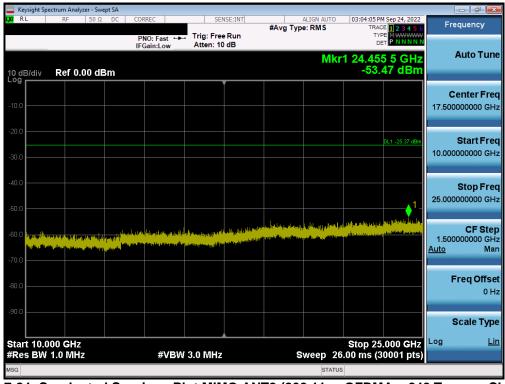
Plot 7-82. Conducted Spurious Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 6)

FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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Plot 7-83. Conducted Spurious Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 11)



Plot 7-84. Conducted Spurious Plot MIMO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 11)

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# 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 7-15 per Section 15.209 and RSS-Gen (8.9).

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

Table 7-15. 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

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

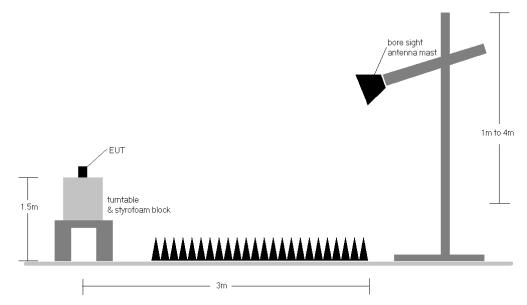


Figure 7-6. Test Instrument & Measurement Setup

## 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 7-15.
- 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.

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- 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:

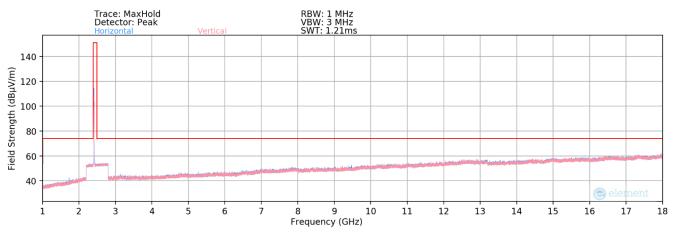
Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

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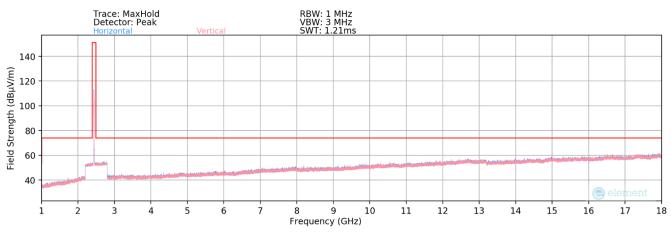
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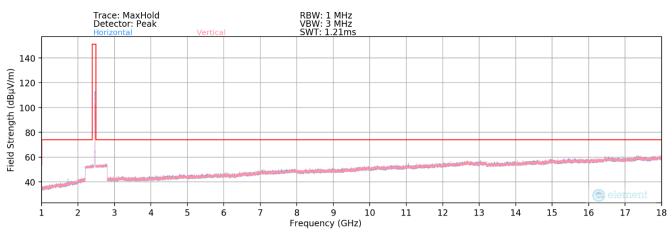
# 7.7.1 SISO Antenna-2 Radiated Spurious Emission Measurements §15.247(d) §15.205 & §15.209; RSS-Gen [8.9]



Plot 7-85. Radiated Spurious Plot above 1GHz SISO ANT2 (802.11ax OFDMA - 26 Tones - Ch. 1)



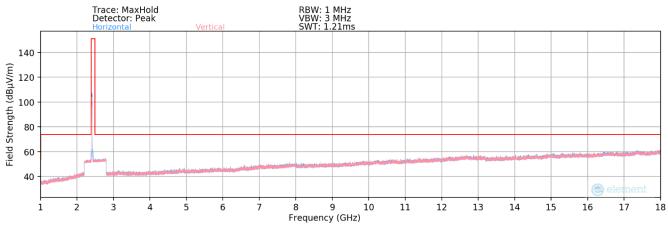
Plot 7-86. Radiated Spurious Plot above 1GHz SISO ANT2 (802.11ax OFDMA - 26 Tones - Ch. 6)



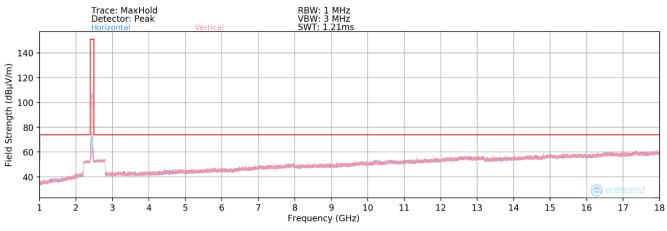
Plot 7-87. Radiated Spurious Plot above 1GHz SISO ANT2 (802.11ax OFDMA – 26 Tones – Ch. 11)

FCC ID: A3LSMS916U	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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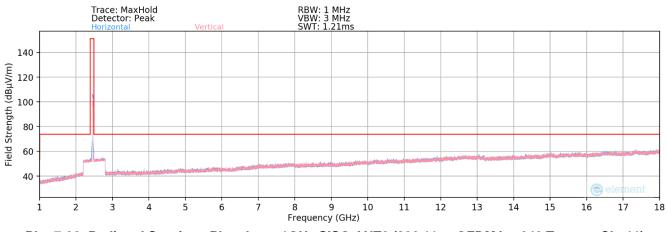




Plot 7-88. Radiated Spurious Plot above 1GHz SISO ANT2 (802.11ax OFDMA - 242 Tones - Ch. 1)







Plot 7-90. Radiated Spurious Plot above 1GHz SISO ANT2 (802.11ax OFDMA – 242 Tones – Ch. 11)

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