

# TEST REPORT

**Report Number.:** 14516849-E7V4

**Applicant :** SONOS INC.  
614 CHAPALA ST.  
SANTA BARBARA, CA, 93101, U.S.A.

**Model :** S44

**Brand :** SONOS

**FCC ID :** SBVRM044

**IC :** 5373A-RM044

**EUT Description :** 802.11 a/b/g/n/ac/ax 2x2 Client Device with BT and BLE

**Test Standard(s) :** FCC 47 CFR PART 15 SUBPART E  
ISED RSS-248 ISSUE 2  
ISED RSS-GEN ISSUE 5 + A1 +A2

**Date Of Issue:**

2023-05-25

**Prepared by:**

UL Verification Services Inc.  
47173 Benicia Street  
Fremont, CA 94538 U.S.A.  
TEL: (510) 319-4000  
FAX: (510) 661-0888



## REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2023-04-18	Initial Issue	---
V2	2023-05-05	Updated Cover page, Section 1, 3,6.7,10 and 10.2	Kiya Kedida
V3	2023-05-17	Updated Section 6.7	Kiya Kedida
V4	2023-05-25	Section 6.7 updated the setup diagram and the description of test setup cable #3	Glenn Escano

## TABLE OF CONTENTS

<b>REPORT REVISION HISTORY .....</b>	<b>2</b>
<b>TABLE OF CONTENTS .....</b>	<b>3</b>
<b>1. ATTESTATION OF TEST RESULTS.....</b>	<b>6</b>
<b>2. TEST RESULT SUMMARY.....</b>	<b>8</b>
<b>3. TEST METHODOLOGY .....</b>	<b>9</b>
<b>4. FACILITIES AND ACCREDITATION.....</b>	<b>10</b>
<b>5. DECISION RULES AND MEASUREMENT UNCERTAINTY.....</b>	<b>11</b>
5.1. METROLOGICAL TRACEABILITY .....	11
5.2. DECISION RULES .....	11
5.3. MEASUREMENT UNCERTAINTY .....	11
<b>6. EQUIPMENT UNDER TEST .....</b>	<b>13</b>
6.1. EUT DESCRIPTION.....	13
6.2. EUT DEVICE CLASS .....	13
6.3. MAXIMUM OUTPUT POWER.....	13
6.4. DESCRIPTION OF AVAILABLE ANTENNAS.....	14
6.5. SOFTWARE AND FIRMWARE.....	14
6.6. WORST-CASE CONFIGURATION AND MODE FOR FINAL TEST.....	14
6.7. DESCRIPTION OF TEST SETUP.....	15
TEST SETUP.....	16
SETUP DIAGRAM .....	16
<b>7. MEASUREMENT METHOD .....</b>	<b>17</b>
<b>8. TEST AND MEASUREMENT EQUIPMENT .....</b>	<b>18</b>
<b>9. ANTENNA PORT TEST RESULTS .....</b>	<b>19</b>
9.1. ON TIME AND DUTY CYCLE .....	19
9.2. 26 dB BANDWIDTH .....	20
9.2.1. 802.11a MODE 2TX IN THE UNII-5 BAND .....	21
2TX Antenna 1 + Antenna 4 CDD MODE:.....	21
9.2.2. 802.11a MODE 2TX IN THE UNII-6 BAND .....	23
2TX Antenna 3 + Antenna 4 CDD MODE:.....	23
9.2.3. 802.11a MODE 2TX IN THE UNII-7 BAND .....	25
2TX Antenna 3 + Antenna 4 CDD MODE:.....	25

9.2.4.	802.11a MODE 2TX IN THE UNII-8 BAND .....	27
	2TX Antenna 3 + Antenna 4 CDD MODE: .....	27
9.3.	99% BANDWIDTH.....	29
9.3.1.	802.11a MODE 2TX IN THE UNII-5 BAND .....	30
	2TX Antenna 1 + Antenna 4 CDD MODE: .....	30
9.3.2.	802.11a MODE 2TX IN THE UNII-6 BAND .....	32
	2TX Antenna 3 + Antenna 4 CDD MODE: .....	32
9.3.3.	802.11a MODE 2TX IN THE UNII-7 BAND .....	34
	2TX Antenna 3 + Antenna 4 CDD MODE: .....	34
9.3.4.	802.11a MODE 2TX IN THE UNII-8 BAND .....	36
	2TX Antenna 3 + Antenna 4 CDD MODE: .....	36
9.4.	OUTPUT POWER AND PSD .....	38
9.4.1.	802.11a MODE 2TX IN THE UNII-5 BAND .....	39
	2TX Antenna 1 + Antenna 4 CDD MODE: .....	39
9.4.2.	802.11a MODE 2TX IN THE UNII-6 BAND .....	41
	2TX Antenna 3 + Antenna 4 CDD MODE: .....	41
9.4.3.	802.11a MODE 2TX IN THE UNII-7 BAND .....	43
	2TX Antenna 3 + Antenna 4 CDD MODE: .....	43
9.4.4.	802.11a MODE 2TX IN THE UNII-8 BAND .....	45
	2TX Antenna 3 + Antenna 4 CDD MODE: .....	45
9.5.	SPURIOUS EMISSIONS IN-BAND – EMISSION MASK .....	47
9.5.1.	802.11a MODE 2TX IN THE UNII-5 BAND .....	48
	2TX Antenna 1 + Antenna 4 CDD MODE: .....	48
9.5.2.	802.11a MODE 2TX IN THE UNII-6 BAND .....	49
	2TX Antenna 3 + Antenna 4 CDD MODE: .....	49
9.5.3.	802.11a MODE 2TX IN THE UNII-7 BAND .....	50
	2TX Antenna 3 + Antenna 4 CDD MODE: .....	50
9.5.4.	802.11a MODE 2TX IN THE UNII-8 BAND .....	52
	2TX Antenna 3 + Antenna 4 CDD MODE: .....	52
<b>10.</b>	<b>RADIATED TEST RESULTS .....</b>	<b>53</b>
10.1.	TRANSMITTER OUTSIDE 5.925-7.125 GHz , 1- 18GHz.....	55
10.1.1.	TX ABOVE 1 GHz 802.11a MODE IN THE UNII-5 BAND .....	55
	2TX Antenna 1 + Antenna 4 CDD MODE: .....	55
10.1.2.	TX ABOVE 1 GHz 802.11a MODE IN THE UNII-6 BAND .....	63
	2TX Antenna 3 + Antenna 4 CDD MODE: .....	63
10.1.3.	TX ABOVE 1 GHz 802.11a MODE IN THE UNII-7 BAND .....	69
	2TX Antenna 3 + Antenna 4 CDD MODE: .....	69
10.1.4.	TX ABOVE 1 GHz 802.11a MODE IN THE UNII-8 BAND .....	77
	2TX Antenna 3 + Antenna 4 CDD MODE: .....	77
10.2.	WORST CASE BELOW 30MHz .....	85

10.3. WORST CASE BELOW 1 GHz..... 87

10.4. WORST CASE 18-26 GHz ..... 89

10.5. WORST CASE 26-40 GHz ..... 91

**11. AC POWER LINE CONDUCTED EMISSIONS ..... 93**

    RESULTS..... 93

**12. SETUP PHOTOS..... 96**

    ANTENNA PORT AND AC LINE CONDUCTED SETUP ..... 96

    RADIATED RF MEASUREMENT SETUP ..... 97

# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** SONOS INC.  
614 Chapala St.  
Santa Barbara, CA, 93101, U.S.A.

**EUT DESCRIPTION:** 802.11 a/b/g/n/ac/ax 2x2 Client Device with BT and BLE

**MODEL:** S44

**BRAND:** SONOS

**SERIAL NUMBER:** Radiated Sample: A100 2301WC C4-38-75-00-0F-40-9 and  
A100 2301WC C4-38-75-00-0E-E0-F  
Conducted Sample: A100 2301WC C4-38-75-00-0E-7C-0

**DATE TESTED:** 2023-03-06 to 2023-04-03

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC 47 CFR Part 15 Subpart E	Complies
ISED RSS-248 Issue 2	Complies
ISED RSS-GEN Issue 5 + A1 + A2	Complies

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by A2LA, NIST, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released For  
UL Verification Services Inc. By:



---

Dan Corona  
Staff Engineer  
Consumer Technology Division  
UL Verification Services Inc.

Prepared By:



---

Gerardo Abrego  
Senior Test Engineer  
Consumer Technology Division  
UL Verification Services Inc.

1<sup>st</sup> Reviewed By:



---

Vien Tran  
Senior Laboratory Engineer  
Consumer Technology Division  
UL Verification Services Inc.

2<sup>nd</sup> Reviewed By:



---

Kiya Kedida  
Senior Project Engineer  
Consumer Technology Division  
UL Verification Services Inc.

## 2. TEST RESULT SUMMARY

This report contains data provided by the customer which can impact the validity of results. UL Verification Services Inc. is only responsible for the validity of results after the integration of the data provided by the customer.

FCC Clause	ISED Clause	Requirement	Result	Comment
See Comment		Duty Cycle	Reporting purposes only	ANSI C63.10 Section 12.2 ...
See Comment	RSS-GEN 6.7	99% BW	Reporting purposes only	ANSI C63.10 Section 6.9.3
§15.407 (a) (10)	---	26dB BW	Compliant	None.
§15.407 (a) (8)	RSS-248 4.6.3	Output Power e.i.r.p.	Compliant	Indoor Client.
§15.407 (a) (8)	RSS-248 4.6.3	PSD e.i.r.p	Compliant	Indoor Client.
§15.407 (b) (6)	RSS-248 4.7.2(a)	Emissions outside 5.925-7.125 GHz band	Compliant	None
§15.407 (b) (7)	RSS-248 4.7.2(b)	Emissions within 5.925-7.125 GHz Band(Emissions Mask)	Compliant	None
§15.205	RSS-GEN 8.10	Unwanted emissions in restricted bands	Compliant	None
§15.209	RSS-GEN 8.9	Radiated Spurious Emissions	Compliant	None
§15.207	RSS-GEN 8.8	AC Mains Conducted Emissions	Compliant	None



### 3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with.

- FCC 47 CFR Part 2
- FCC 47 CFR Part 15
- FCC KDB 662911 D01 v02r01
- FCC KDB 789033 D01 v01r03
- FCC KDB 789033 D02 v02r01
- FCC KDB 987594 D01 General Requirements v01r03
- FCC KDB 987594 D02 EMC Measurement v01r01
- ANSI C63.10-2013
- RSS-GEN Issue 5 + A1 + A2
- RSS-248 Issue 2

## 4. FACILITIES AND ACCREDITATION

UL Verification Services Inc. is accredited by A2LA, Certificate Number #0751.05, for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	ISED CABID	ISED Company Number	FCC Registration
<input checked="" type="checkbox"/>	Building 1: 47173 Benicia Street Fremont, CA 94538, U.S.A	US0104	2324A	550739
<input type="checkbox"/>	Building 2: 47266 Benicia Street Fremont, CA 94538, U.S.A	US0104	22541	550739
<input checked="" type="checkbox"/>	Building 4: 47658 Kato Rd Fremont, CA 94538, U.S.A	US0104	2324B	550739

## 5. DECISION RULES AND MEASUREMENT UNCERTAINTY

### 5.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

### 5.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

### 5.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	U <sub>Lab</sub>
Radio Frequency (Spectrum Analyzer)	141.16 Hz
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	1.22%
Power Spectral Density	2.47 dB
RF Power Measurement Direct Method Using Power Meter	1.3 dB (PK) / 0.45 dB (AV)
Unwanted Emissions, Conducted	1.94dB
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.78 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.40 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.87 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	6.01 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.73 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.51 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.29 dB
Time Domain Measurements	3.39%
Temperature	0.57
Humidity	3.39%
DC Supply Voltages	0.57%

Uncertainty figures are valid to a confidence level of 95%.

### **RADIATED EMISSIONS**

Where relevant, the following sample calculation is provided:

$$\text{Field Strength (dBuV/m)} = \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Preamp Gain (dB)}$$
$$36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$$

### **MAINS CONDUCTED EMISSIONS**

Where relevant, the following sample calculation is provided:

$$\text{Final Voltage (dBuV)} = \text{Measured Voltage (dBuV)} + \text{Cable Loss (dB)} + \text{Limiter Factor (dB)} + \text{LISN Insertion Loss}$$
$$36.5 \text{ dBuV} + 0 \text{ dB} + 10.1 \text{ dB} + 0 \text{ dB} = 46.6 \text{ dBuV}$$

## 6. EQUIPMENT UNDER TEST

### 6.1. EUT DESCRIPTION

The EUT is an 802.11 a/b/g/n/ac/ax 2x2 Client Device with BT and BLE.

This report covers non-ax 6E Wifi radio.

### 6.2. EUT DEVICE CLASS

EUT is of the following device class:

	U-NII Bands of Operation			
	5	6	7	8
Indoor Client (6XD)	☒	☒	☒	☒

### 6.3. MAXIMUM OUTPUT POWER

The transmitter has a maximum e.i.r.p. output power as follows:

Frequency Range (MHz)	Mode	Output Power EIRP	Output Power EIRP (mW)
<b>UNII-5 band, 2TX</b>			
5955-6415	802.11a	9.29	8.49
<b>UNII-6 band, 2TX</b>			
6435-6515	802.11a	8.40	6.92
<b>UNII-7 band, 2TX</b>			
6535-6875	802.11a	9.39	8.69
<b>UNII-8 band, 2TX</b>			
6895-7115	802.11a	8.49	7.06

## 6.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a Monopole antenna, with a maximum gain as below table:

Frequency Range (MHz)	Peak Antenna Gain (dBi)			
	CHAIN 0		CHAIN 1	
	ANT1 (dBi)	ANT3 (dBi)	ANT2 (dBi)	ANT4 (dBi)
5925 – 6425	4.6	3.9	3.3	4.1
6425 – 6525	3.3	4.2	2.4	3.5
6525 – 6875	3.5	5.5	2.4	3.8
6875 – 7125	3.9	5.3	1.8	3.2

## 6.5. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was 74.0-39150-1-41.  
The test utility software installed during testing was PrimaComplianceGUIInstaller\_TESTBUILD3\_17Nov22.

## 6.6. WORST-CASE CONFIGURATION AND MODE FOR FINAL TEST

Radiated emissions below 1GHz, above 18GHz, and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

The EUT can only be setup in desktop orientation; therefore, all radiated testing was performed with the EUT in desktop orientation.

The fundamental of the EUT was investigated in the antenna combinations, it was determined that:

ANT1 and ANT4 was the worst case in the UNII 5 band.

ANT3 and ANT4 was the worst case in the UNII 6,7 and 8 band.

Therefore, all final testing was performed with ANT1 and ANT4 and ANT3 and ANT4 as stated above.

Worst-case data rate as provided by the manufacturer was:  
802.11a mode: 6 Mbps

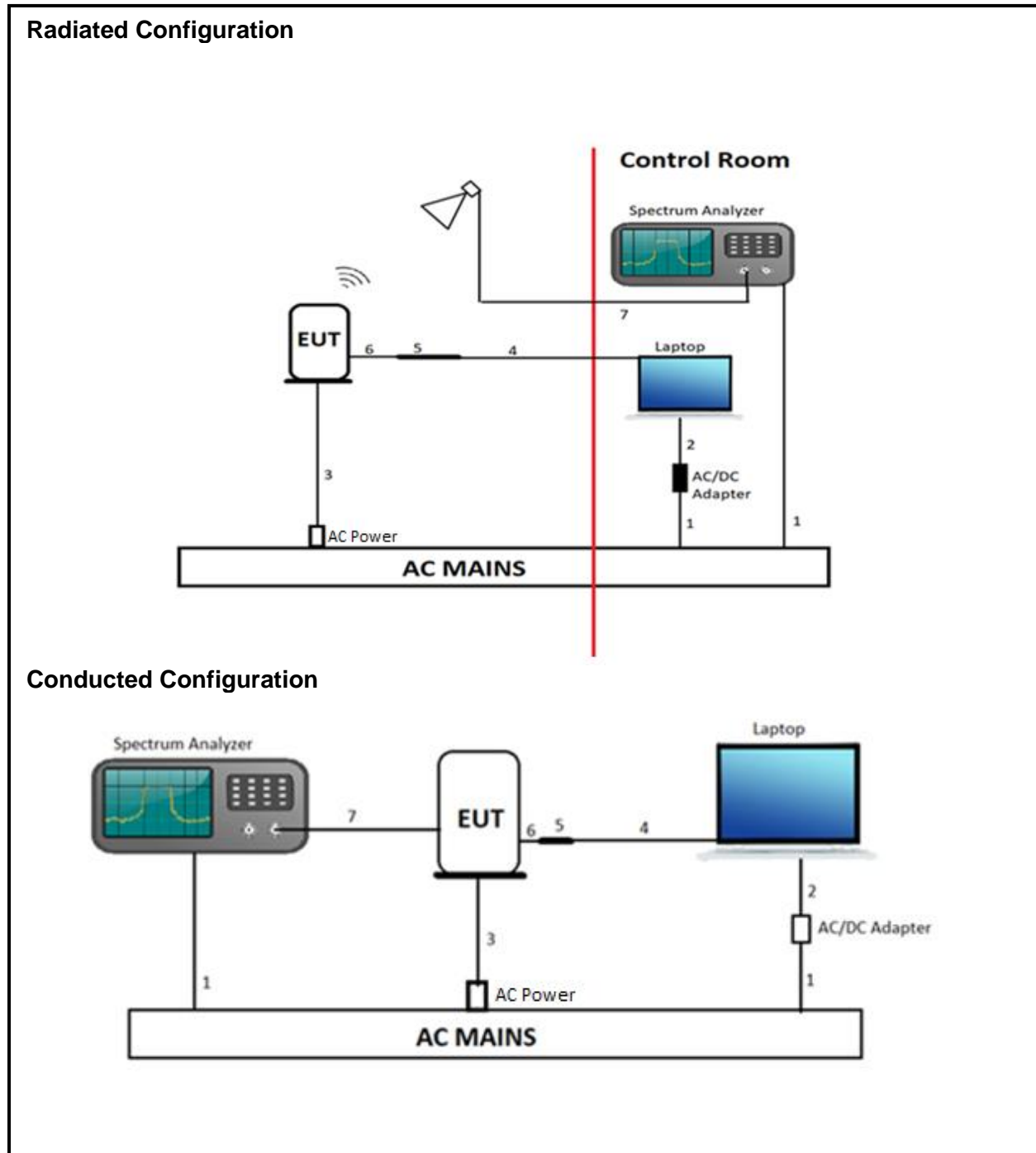
## 6.7. DESCRIPTION OF TEST SETUP

SUPPORT TEST EQUIPMENT						
Description	Manufacturer	Model	Serial Number	FCC ID/ DoC		
Laptop	Lenovo	T460s	PC0JMBF8	Doc		
Laptop AC/DC Adapter	Lenovo	ADLX90NLC2A	11S45N0247Z1ZSHH448JEY	Doc		
AC Power	Sonos	CPS045180250U	N/A	Doc		
Power Supply	Sonos	EC2Y5EB	N/A	Doc		
USB-A to Ethernet Adapter	Plugable	USB2-E100	8CAE4CE46AFA	Doc		
USB-C to USB-A Female Adapter	Amazon Basics	L6LUC160-CS-R	N/A	Doc		
I/O CABLES (CONDUCTED TEST)						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	3	AC	Un-shielded	1.25	AC Mains to Spectrum Analyzer/AC/DC Adapter
2	DC	1	DC	Un-shielded	1.0	AC/DC Adapter to Laptop
3	USB-C	1	USB-C	Un-shielded	1.5	EUT to AC Power
4	Ethernet	1	RJ45	Un-shielded	1.5	Laptop to USB Ethernet Adapter
5	USB-A	1	USB-A	Shielded	0.05	USB Ethernet Adapter to USB
6	USB-C	1	USB-C	Shielded	0.05	EUT to USB-C/USB-A Female Adapter
7	SMA Cable	1	SMA	Un-Shielded	1.0	EUT to Spectrum Analyzer
I/O CABLES (RADIATED TEST)						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	3	AC	Un-shielded	1.25	AC Mains to Spectrum Analyzer/AC/DC Adapter
2	DC	1	DC	Un-shielded	1.0	AC/DC Adapter to Laptop
3	USB-C	1	USB-C	Un-shielded	1.5	EUT to AC Power
4	Ethernet	1	RJ45	Un-shielded	10	Laptop to USB Ethernet Adapter
5	USB-A	1	USB-A	Shielded	0.05	USB Ethernet Adapter to USB
6	USB-C	1	USB-C	Shielded	0.05	EUT to USB-C/USB-A Female Adapter
7	SMA Cable	1	SMA	Un-Shielded	10	EUT to Horn Antenna

## TEST SETUP

The EUT is a stand-alone unit, and the radio is exercised by Sonos Compliance GUI test utility software via ethernet.

## SETUP DIAGRAM





## 7. MEASUREMENT METHOD

On Time and Duty Cycle: KDB 789033 D02 v02r01, Section II B.

26 dB Emission BW: KDB 789033 D02 v02r01, Section II C.1

99% Occupied Bandwidth: KDB 789033 D02 v02r01, Section II-D

Conducted Output Power: KDB 789033 D02 v02r01, Section II E.2.d (Method SA-2).  
(Output Power (e.i.r.p): Radiated EIRP + DCCF = EIRP)  
Radiated method made in lieu of conducted measurements

Power Spectral Density (PSD): KDB 789033 D02 v02r01, Section F  
Radiated method made in lieu of conducted measurements

Spurious emissions within 5.925-7.125 GHz Band (Emissions Mask): KDB 987594 D02 EMC  
Measurement Section II-J

Unwanted emissions in restricted bands: KDB 789033 D02 v02r01, Sections G.3, G.4, G.5, and G.6.

Unwanted emissions in non-restricted bands: KDB 789033 D02 v02r01, Sections G.3, G.4, and G.5.

AC Power Line Conducted Emissions: ANSI C63.10-2013, Section 6.2.

Radiated Spurious Emissions Below 30MHz: ANSI C63.10-2013 Section 6.4

## 8. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST					
Description	Manufacturer	Model	ID Num	Cal Due	Last Cal
Antenna, Broadband Hybrid, 30MHz to 2GHz	Sunol Sciences Corp.	JB1	80293	2023-08-09	2022-08-09
Amplifier, 9KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	175953	2023-04-24	2022-04-24
Antenna, Horn 1-18GHz	ETS-Lindgren (Cedar Park, Texas)	3117	80404	2023-08-08	2022-08-08
RF Filter Box, 1-18GHz, 8 Port	UL-FR1	SAC 8 port rf box 1	197920	2023-04-19	2022-04-19
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	225688	2024-11-09	2023-11-09
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826/B	199659	2023-12-06	2022-12-06
Amplifier 18-26.5GHz, +5Vdc, 60dB min	AMPLICAL	AMP18G26.5-60	234683	2024-03-29	2023-03-18
Antenna, Passive Loop 30Hz - 1MHz	ELECTRO METRICS	EM-6871	170014	2023-07-19	2022-07-19
Antenna, Passive Loop 100KHz - 30MHz	ELECTRO METRICS	EM-6872	170015	2023-07-28	2022-07-28
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent Technologies	N9030A	80396	2024-01-31	2023-01-27
Power Meter, P-series single channel	Keysight Technologies Inc	N1911A	90718	2024-01-31	2023-01-26
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight Technologies Inc	N1921A	90419	2024-01-31	2023-01-26
AC Line Conducted					
LISN	Fischer Custom Communications, Inc`	FCC-LISN-50/250-25-2-01-480V	175765	2024-01-31	2023-01-31
EMI TEST RECEIVER	Rohde & Schwarz	ESR	171646	2024-02-29	2023-02-29
Transient Limiter	TE	TBFL1	207996	2023-07-15	2022-07-15
UL TEST SOFTWARE LIST					
Radiated Software	UL	UL EMC	Rev 2015-12-29, 2020-04-15 & 2023-01-18		
Antenna Port Software	UL	UL RF	Ver 2022-08-16		
AC Line Conducted Software	UL	UL EMC	Rev 2022-02-17		

## 9. ANTENNA PORT TEST RESULTS

### 9.1. ON TIME AND DUTY CYCLE

#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

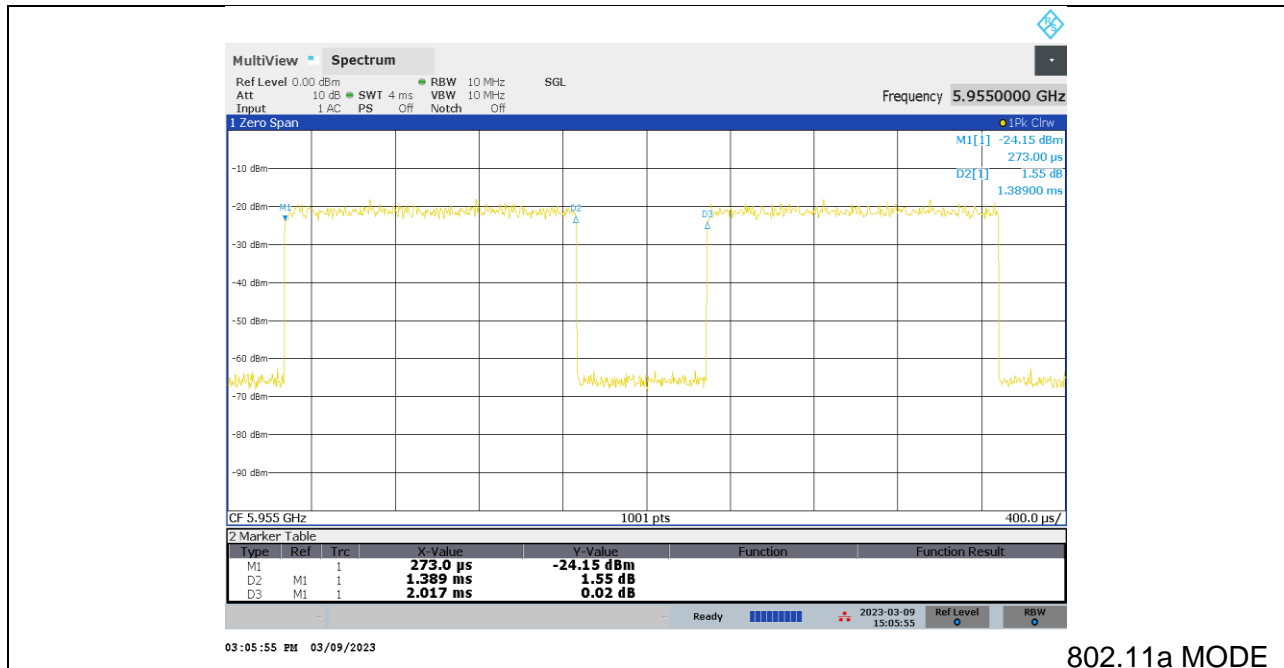
KDB 789033 Zero-Span Spectrum Analyzer Method.

<b>Test Engineer:</b>	45256 JB
<b>Test Date:</b>	2023-03-09

### RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
802.11a	1.389	2.017	0.689	68.86%	1.62	0.720

### DUTY CYCLE PLOTS



## **9.2. 26 dB BANDWIDTH**

### **LIMITS**

§15.407 (a) (10)

The maximum transmitter channel bandwidth for U-NII devices in the 5.925-7.125 GHz band is 320 megahertz.

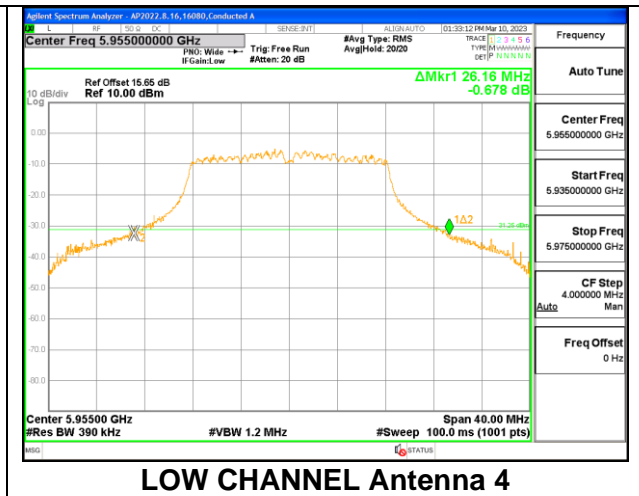
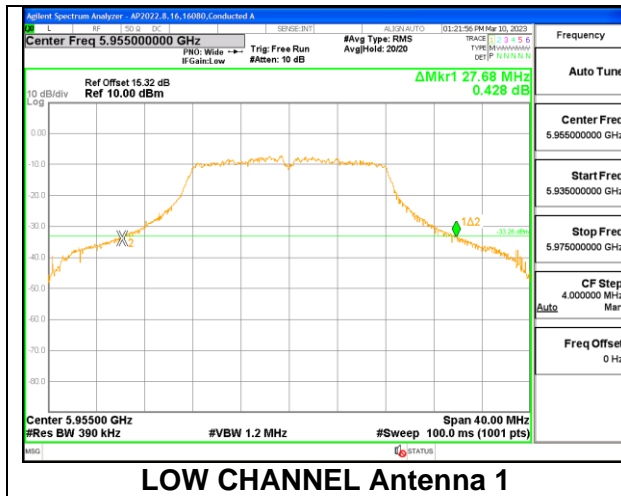
### **RESULTS**

### 9.2.1. 802.11a MODE 2TX IN THE UNII-5 BAND

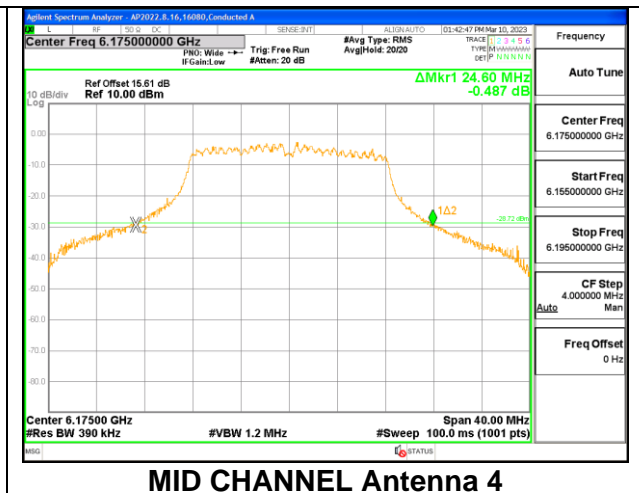
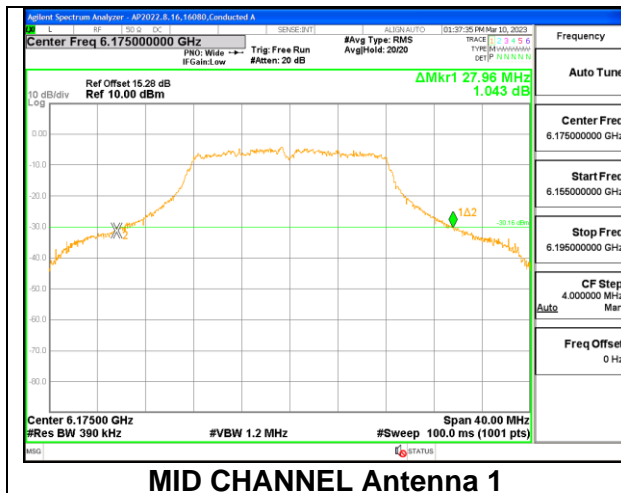
#### 2TX Antenna 1 + Antenna 4 CDD MODE:

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 1 (MHz)	26 dB Bandwidth Antenna 4 (MHz)
Low	5955	27.68	26.16
Mid	6175	27.96	24.60
High	6415	27.84	25.60

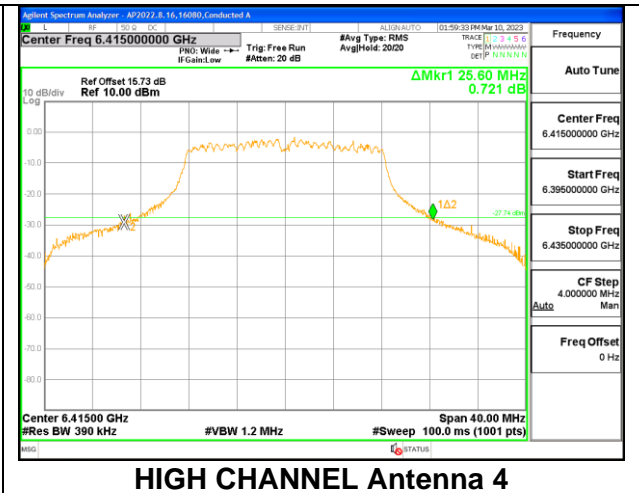
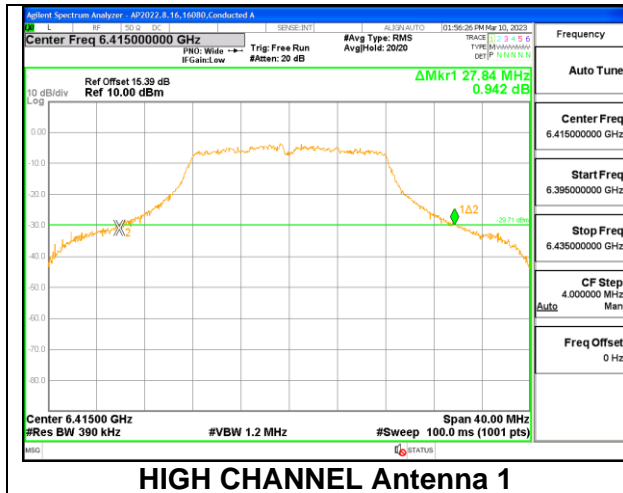
#### LOW CHANNEL



#### MID CHANNEL



### HIGH CHANNEL

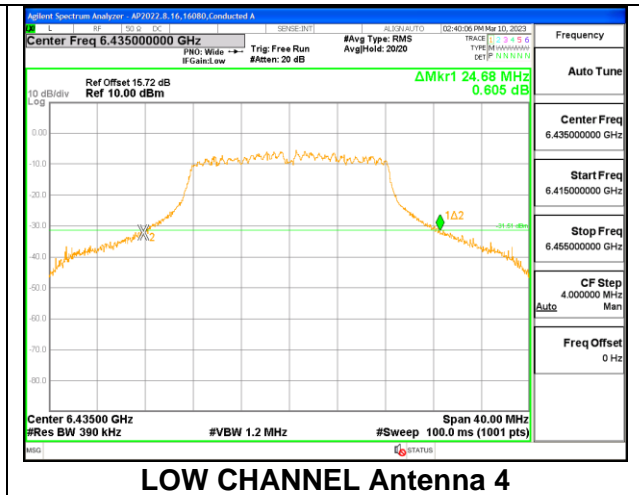
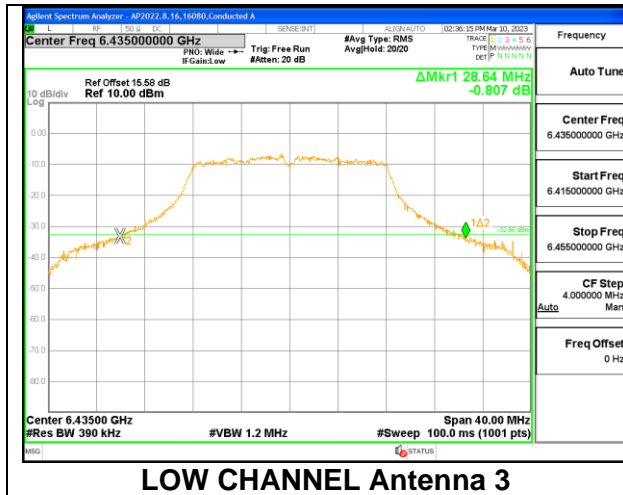


### 9.2.2. 802.11a MODE 2TX IN THE UNII-6 BAND

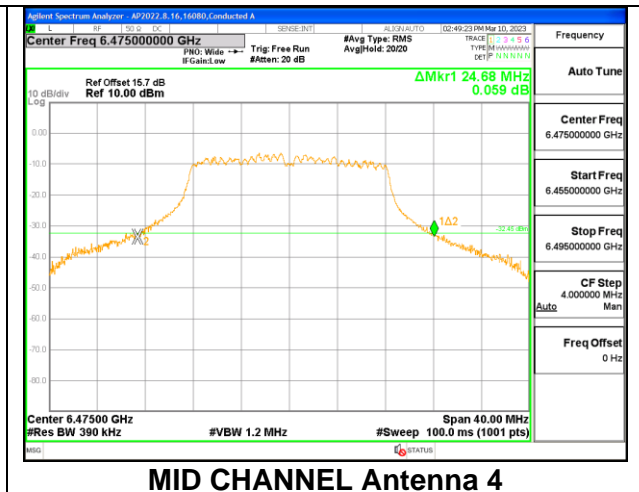
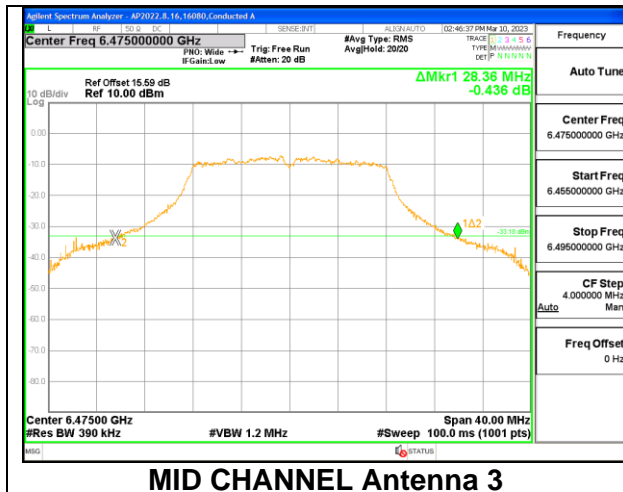
#### 2TX Antenna 3 + Antenna 4 CDD MODE:

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 3 (MHz)	26 dB Bandwidth Antenna 4 (MHz)
Low	6435	28.64	24.68
Mid	6475	28.36	24.68
High	6515	27.92	25.32

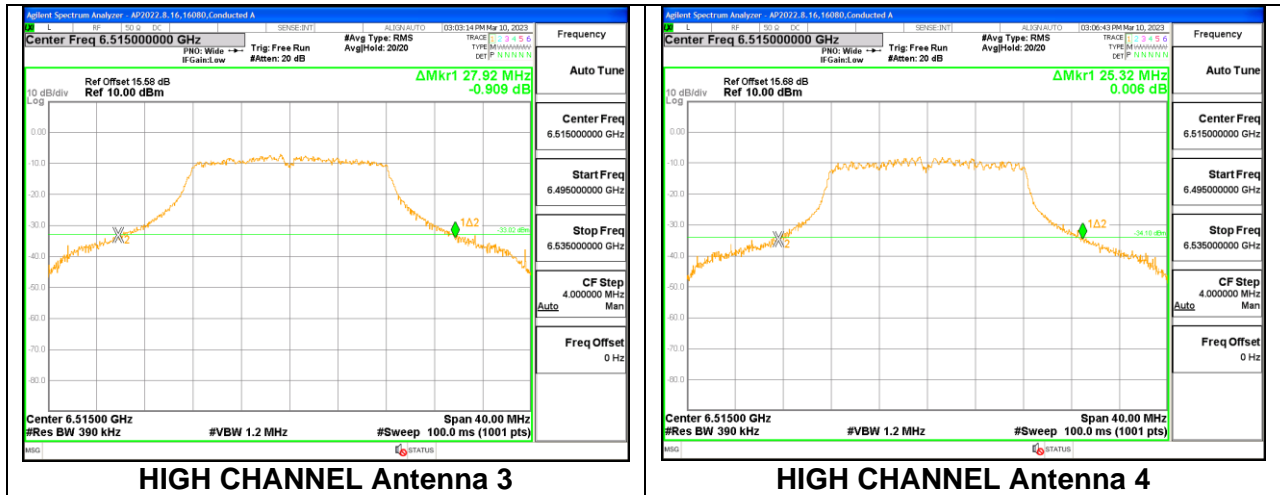
#### LOW CHANNEL



#### MID CHANNEL



### HIGH CHANNEL



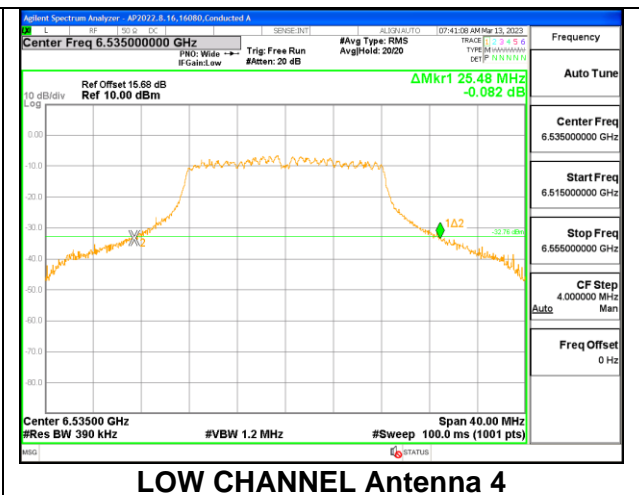
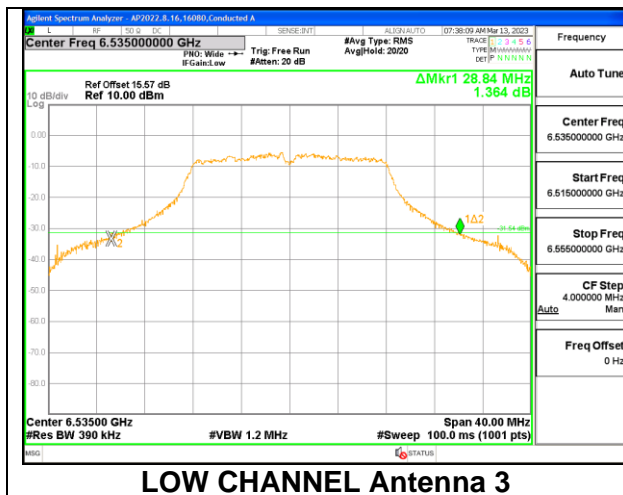


### 9.2.3. 802.11a MODE 2TX IN THE UNII-7 BAND

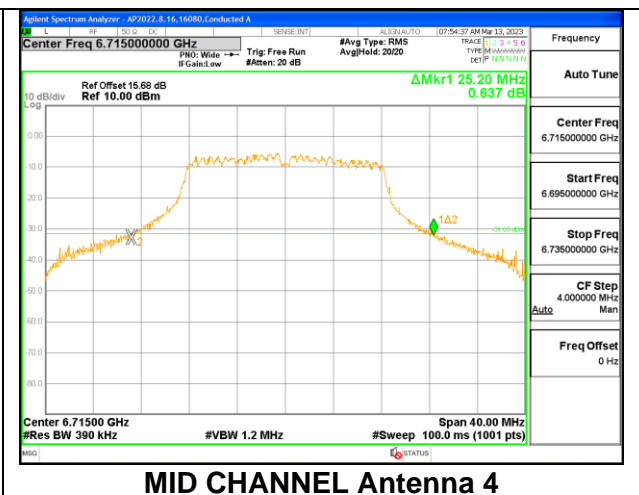
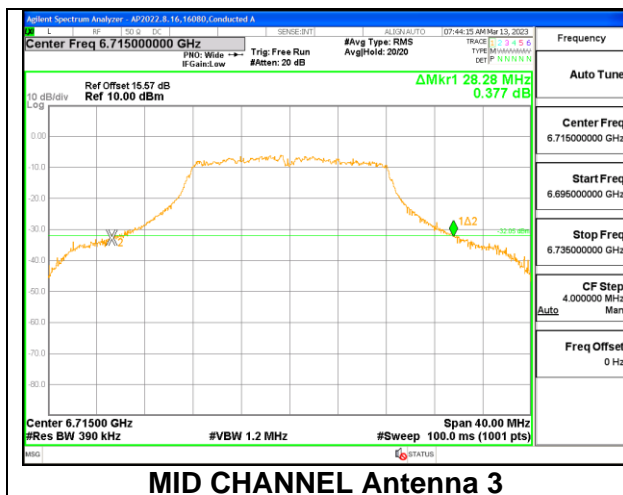
#### 2TX Antenna 3 + Antenna 4 CDD MODE:

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 3 (MHz)	26 dB Bandwidth Antenna 4 (MHz)
Low	6535	28.84	25.48
Mid	6715	28.28	25.20
High	6855	27.80	25.00
Straddle	6875	28.12	25.60

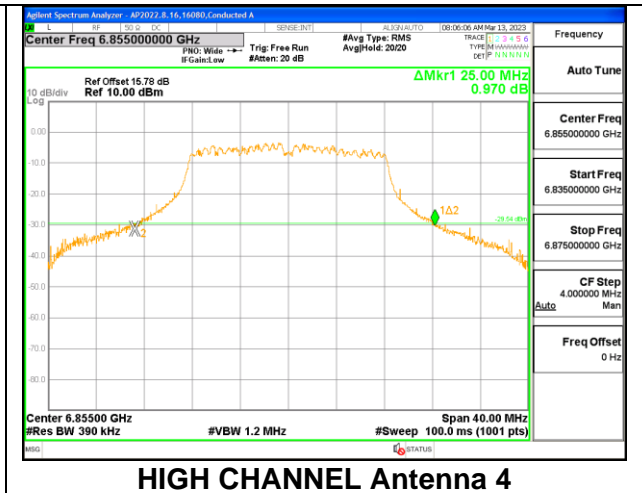
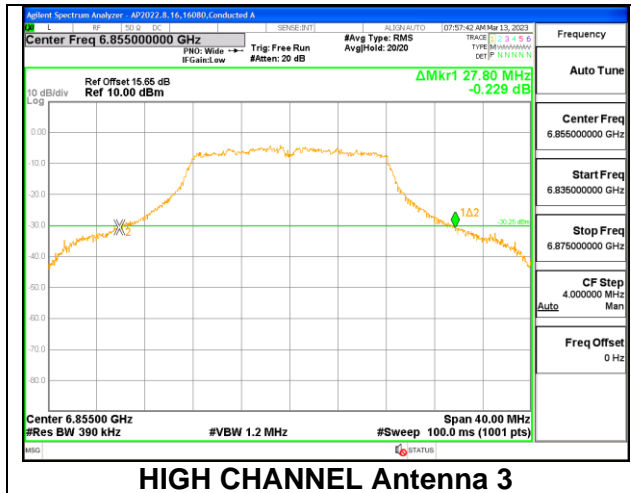
#### LOW CHANNEL



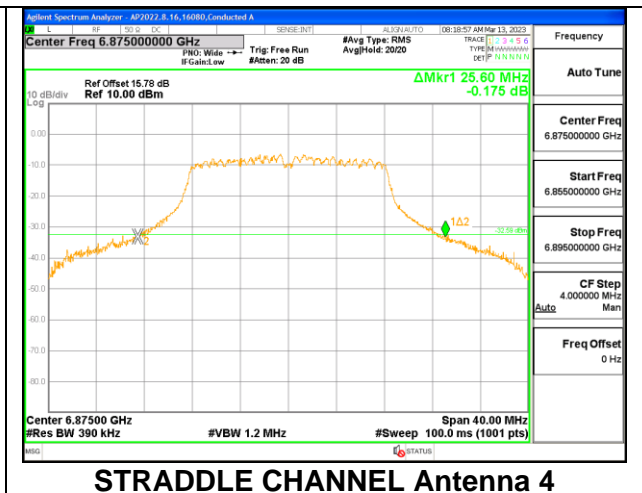
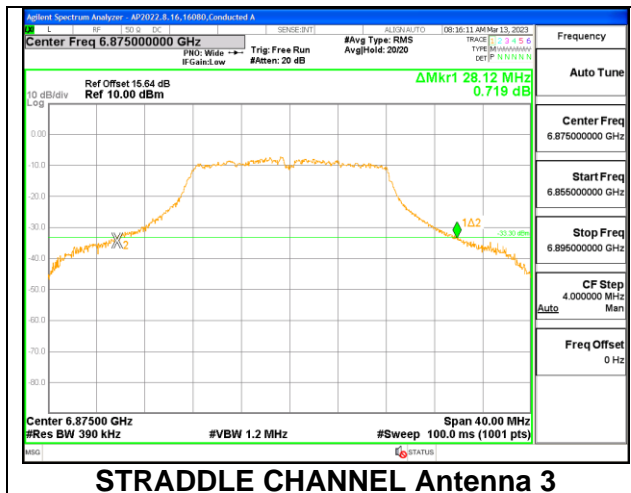
#### MID CHANNEL



### HIGH CHANNEL



### STRADDLE CHANNEL

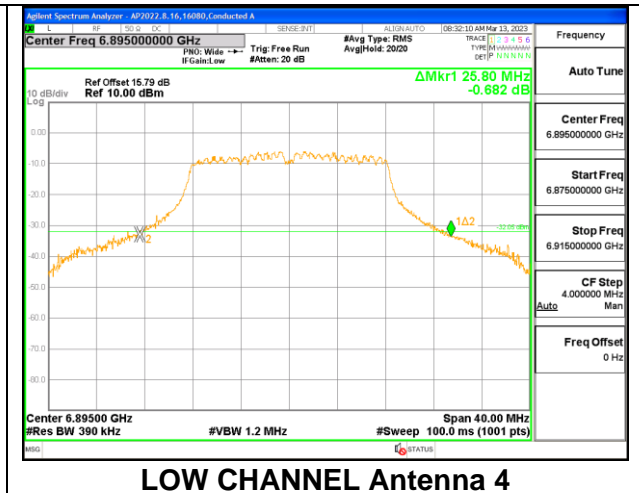
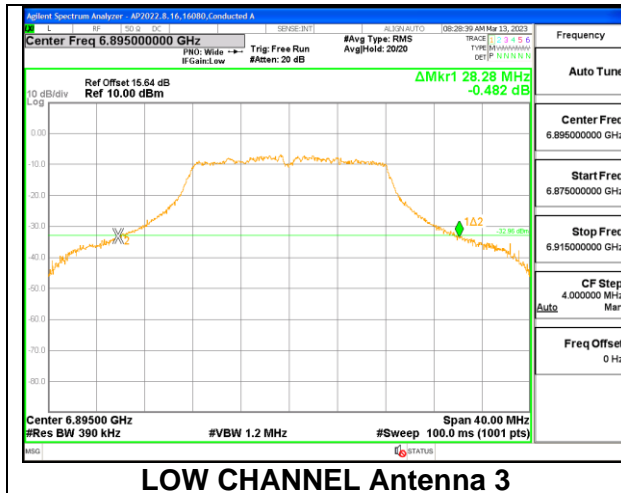


### 9.2.4. 802.11a MODE 2TX IN THE UNII-8 BAND

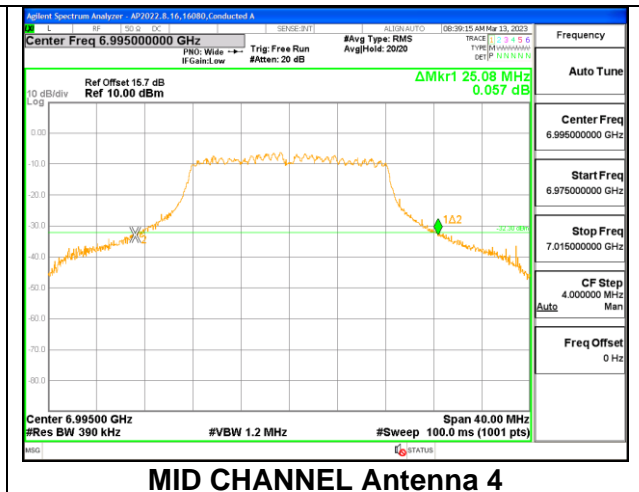
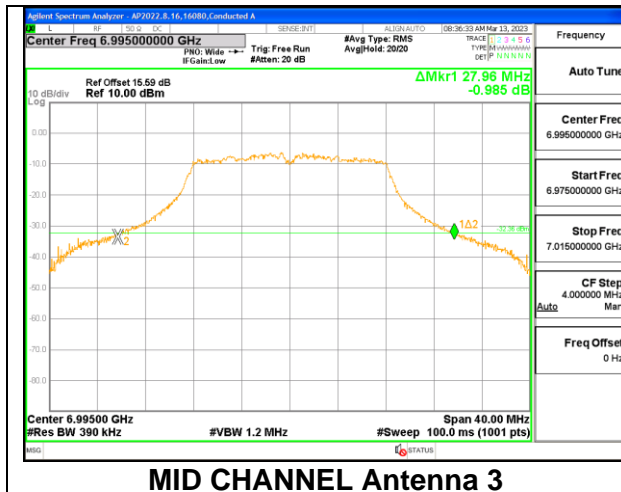
#### 2TX Antenna 3 + Antenna 4 CDD MODE:

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 3 (MHz)	26 dB Bandwidth Antenna 4 (MHz)
Low	6895	28.28	25.80
Mid	6995	27.96	25.08
High	7115	28.72	25.52

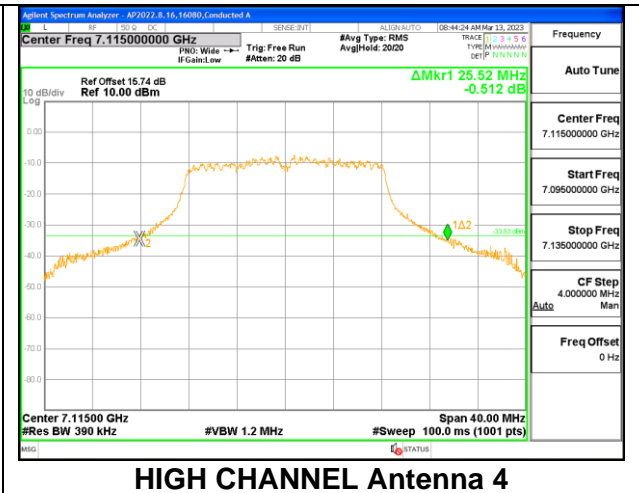
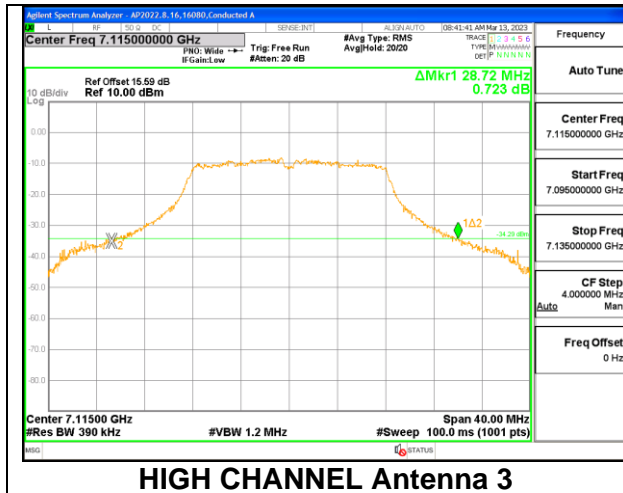
#### LOW CHANNEL



#### MID CHANNEL



### HIGH CHANNEL



### **9.3. 99% BANDWIDTH**

#### **LIMITS**

FCC -None; for reporting purposes only.

#### **RSS-248 4.4**

The occupied bandwidth shall not exceed 320 MHz.

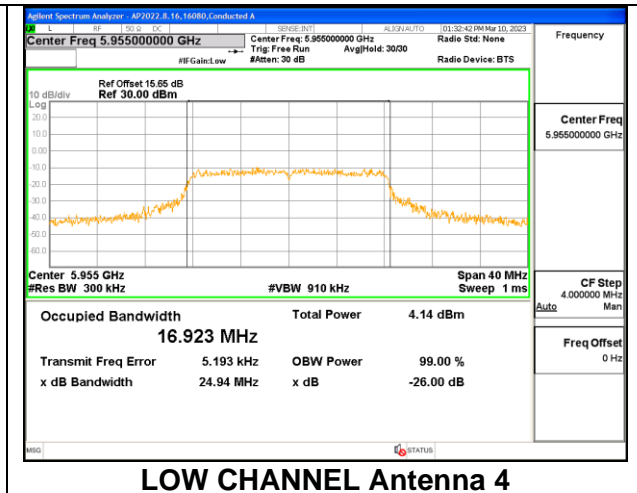
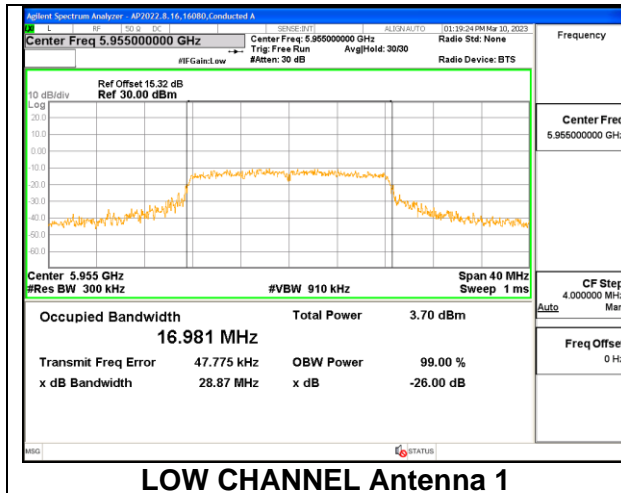
#### **RESULTS**

### 9.3.1. 802.11a MODE 2TX IN THE UNII-5 BAND

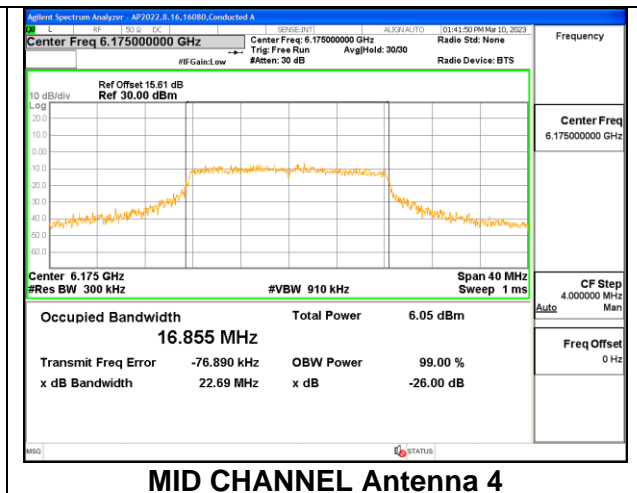
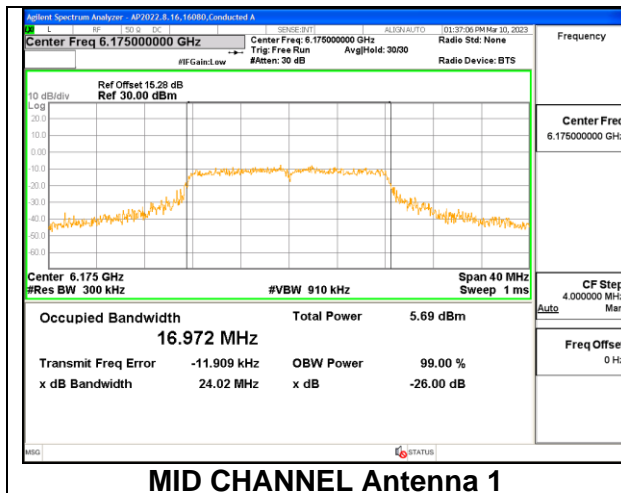
#### 2TX Antenna 1 + Antenna 4 CDD MODE:

Channel	Frequency (MHz)	99% Bandwidth Antenna 1 (MHz)	99% Bandwidth Antenna 4 (MHz)
Low	5955	16.981	16.923
Mid	6175	16.972	16.855
High	6415	17.136	16.847

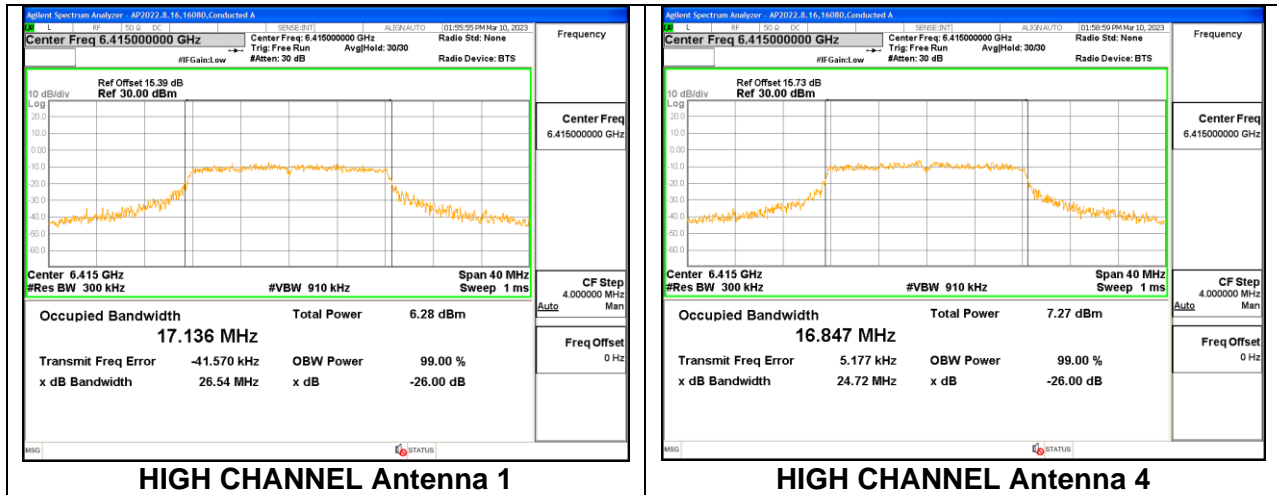
#### LOW CHANNEL



#### MID CHANNEL



### HIGH CHANNEL

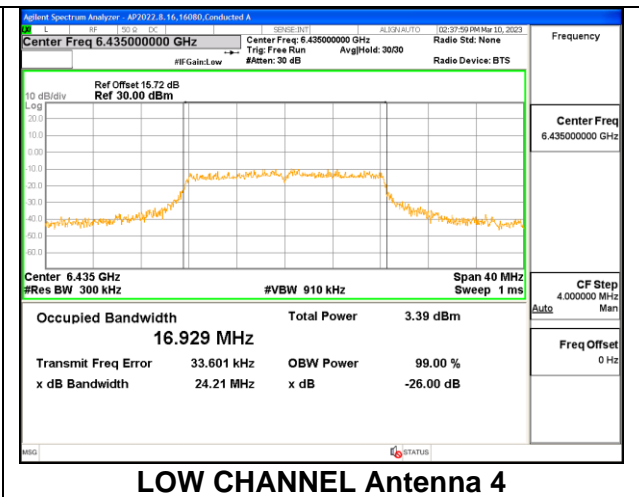
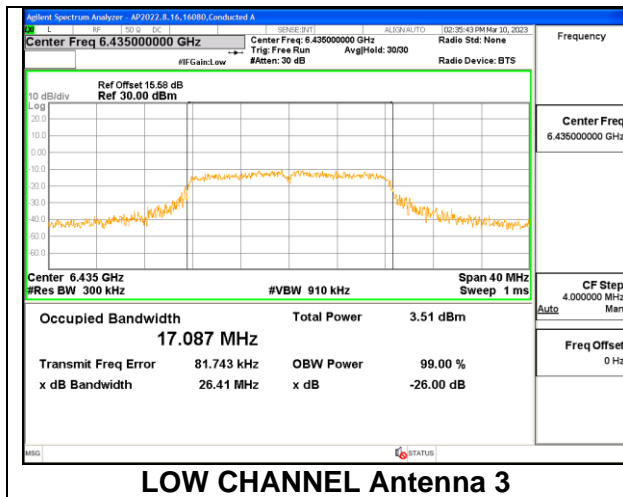


### 9.3.2. 802.11a MODE 2TX IN THE UNII-6 BAND

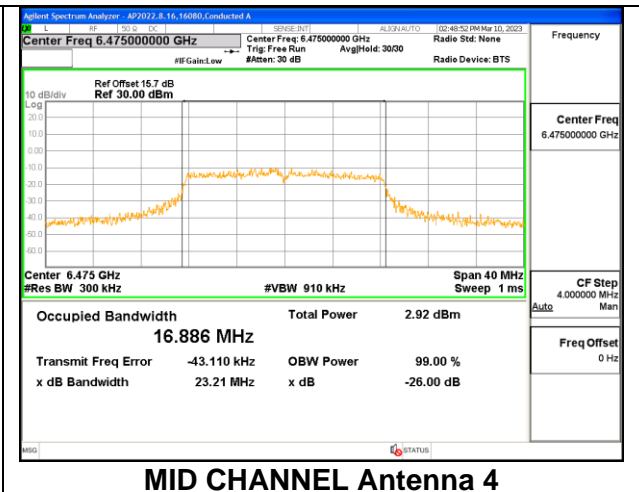
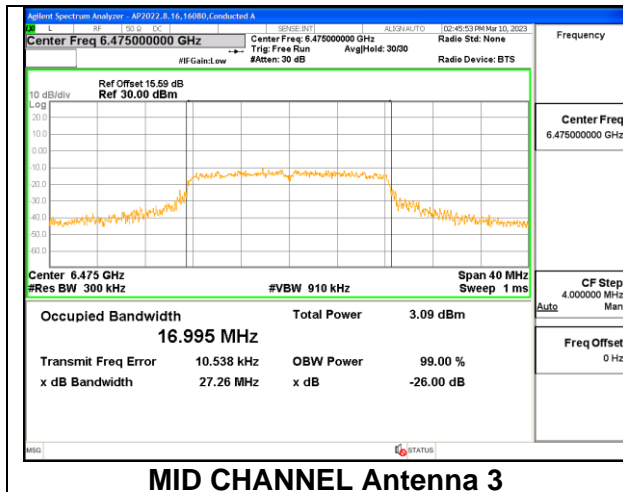
#### 2TX Antenna 3 + Antenna 4 CDD MODE:

Channel	Frequency (MHz)	99% Bandwidth Antenna 3 (MHz)	99% Bandwidth Antenna 4 (MHz)
Low	6435	17.087	16.929
Mid	6475	16.995	16.886
High	6515	17.097	17.012

#### LOW CHANNEL

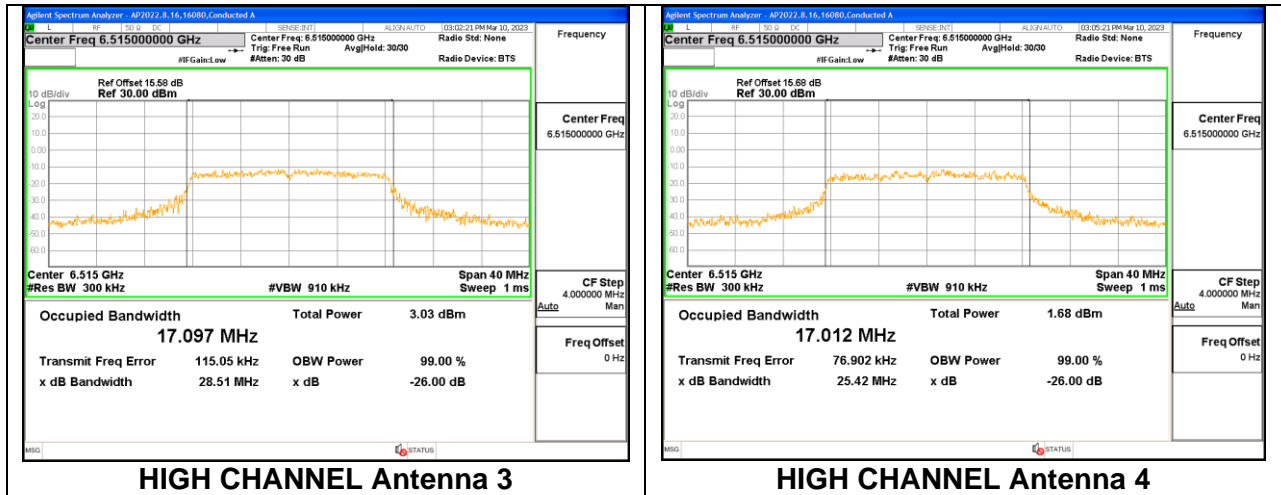


#### MID CHANNEL





### HIGH CHANNEL

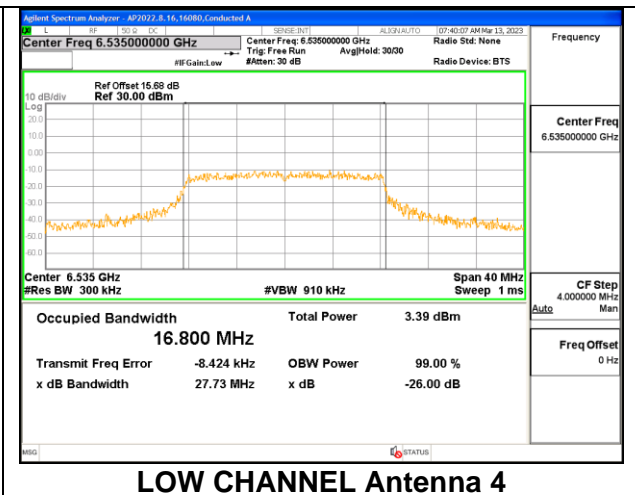
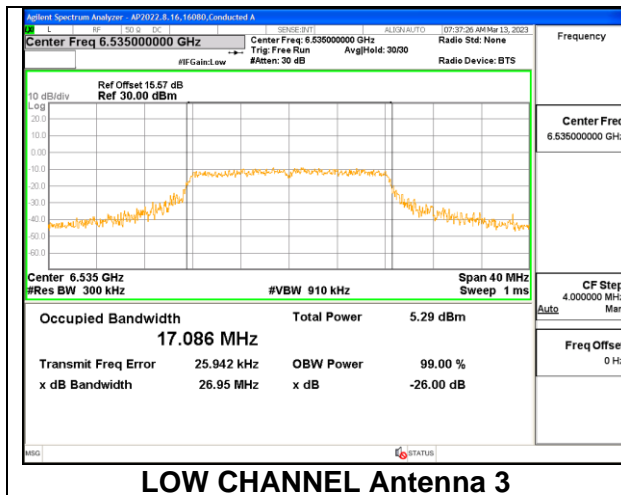


### 9.3.3. 802.11a MODE 2TX IN THE UNII-7 BAND

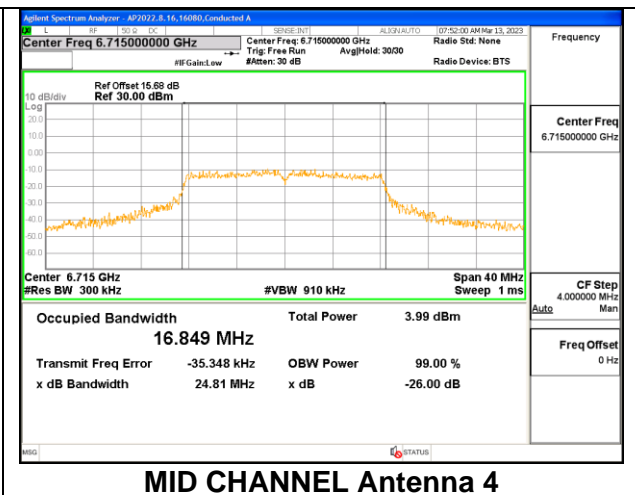
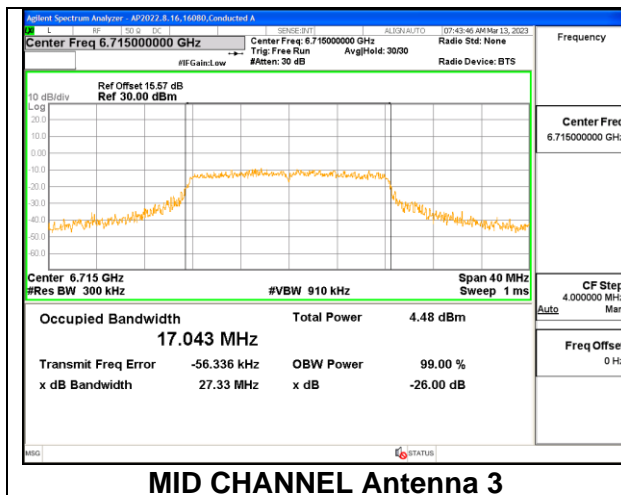
#### 2TX Antenna 3 + Antenna 4 CDD MODE:

Channel	Frequency (MHz)	99% Bandwidth Antenna 3 (MHz)	99% Bandwidth Antenna 4 (MHz)
Low	6535	17.086	16.800
Mid	6715	17.043	16.849
High	6855	16.897	16.850
Straddle	6875	17.001	16.988

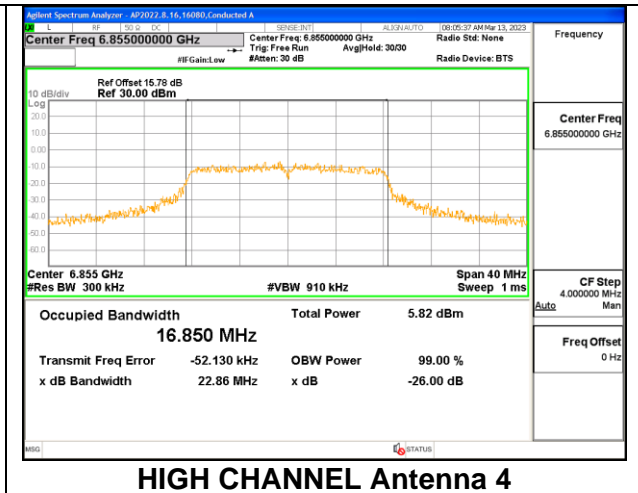
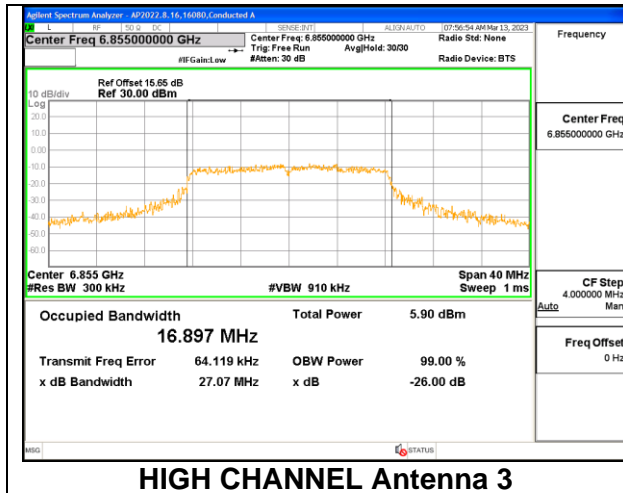
#### LOW CHANNEL



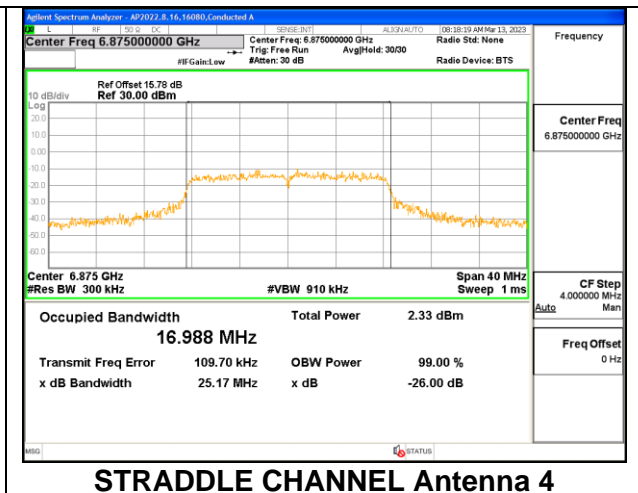
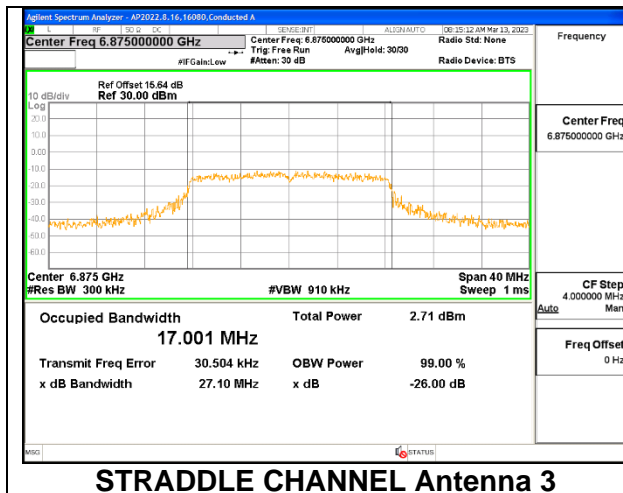
#### MID CHANNEL



### HIGH CHANNEL



### STRADDLE CHANNEL

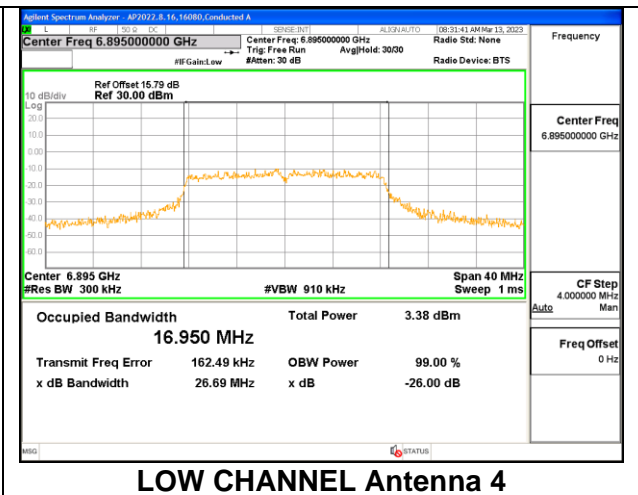
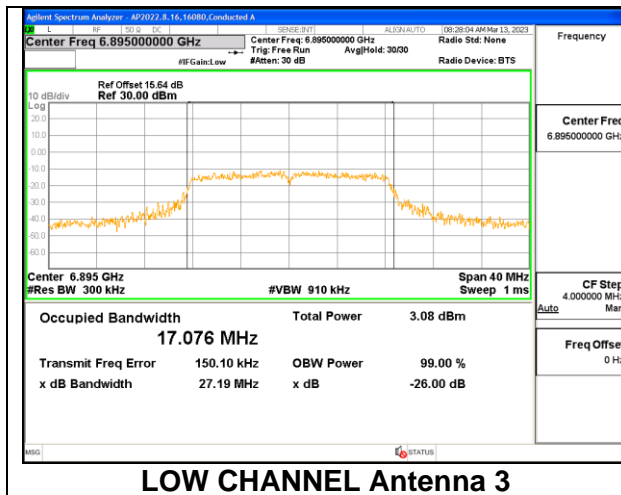


### 9.3.4. 802.11a MODE 2TX IN THE UNII-8 BAND

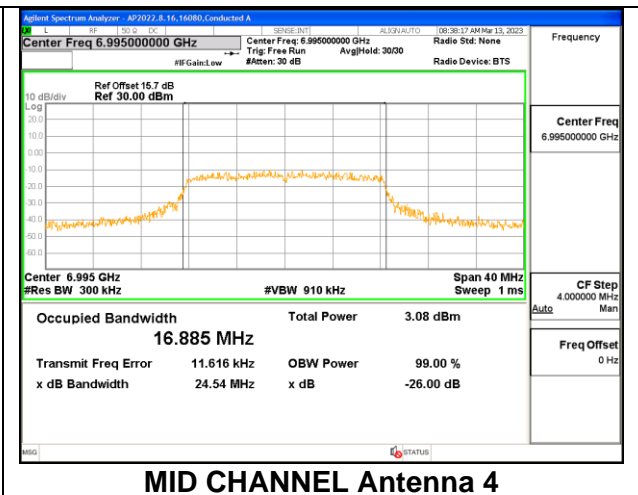
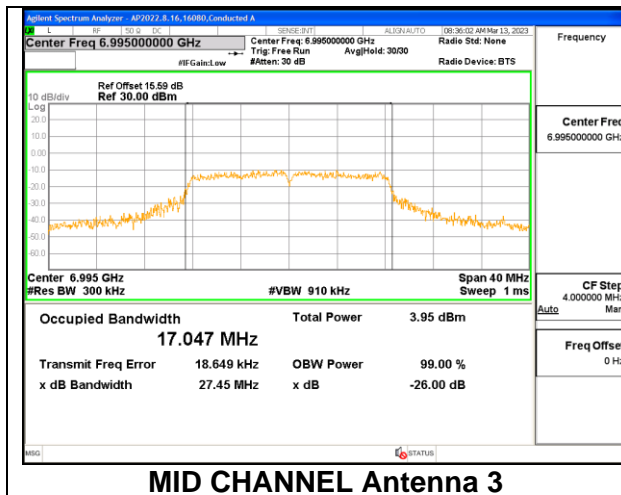
#### 2TX Antenna 3 + Antenna 4 CDD MODE:

Channel	Frequency (MHz)	99% Bandwidth Antenna 3 (MHz)	99% Bandwidth Antenna 4 (MHz)
Low	6895	17.076	16.950
Mid	6995	17.047	16.885
High	7115	17.103	16.889

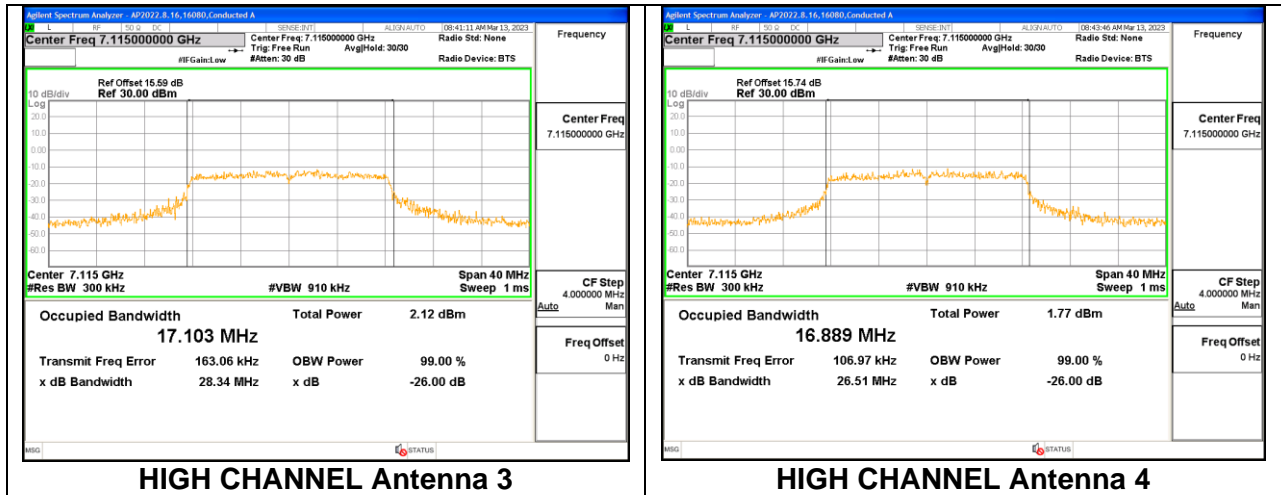
#### LOW CHANNEL



#### MID CHANNEL



### HIGH CHANNEL



## 9.4. OUTPUT POWER AND PSD

### LIMITS

#### FCC §15.407(a)

Band 5.925-7.125 GHz

(8) For client devices operating under the control of an indoor access point in the 5.925-7.125 GHz bands, the maximum power spectral density must not exceed  $-1$  dBm e.i.r.p. in any 1-megahertz band, and the maximum e.i.r.p. over the frequency band of operation must not exceed 24 dBm.

#### RSS 248

4.6.3. Power limits for client devices

The following limits shall apply to client devices:

- a. the maximum e.i.r.p. spectral density shall not exceed  $-1$  dBm/MHz; and
- b. the maximum e.i.r.p. shall not exceed 24 dBm/occupied bandwidth.

### TEST PROCEDURE

The measurement method used for output power is KDB 789033 D02 v02r01, Section E.2.d (Method SA-2) was used.

The measurement method used for power spectral density is KDB 789033 D02 v02r01, Section F.

The output power and power density were measured by radiated method in lieu of conducted measurements. Turn table, antenna and polarization were maximized for this method.

#### Effective Isotropic Radiated Power Calculated as follows:

Measured Transmitter Power (dBm) + Free Space Path Loss at 3 Meter (dB) + Measurement Antenna Gain (dBi) + Preamp Gain (dB) + Duty Cycle Correction Factor (dB) = EIRP (dBm)

Sample Calculation:  $-36.09$  dBm +  $57.48$  dB –  $10.337$  dBi –  $5.46$  dB +  $1.03$  dB =  $6.62$  dBm

Note: Same calculation is used for both total channel power and power spectral density measurements. The only difference is the measurement bandwidths.

**RESULTS**

**9.4.1. 802.11a MODE 2TX IN THE UNII-5 BAND**

**2TX Antenna 1 + Antenna 4 CDD MODE:**

<b>Test Engineer:</b>	45256 JB
<b>Test Date:</b>	2023-03-09

(NOTE: **POWER** and **PSD** were tested by radiated method)

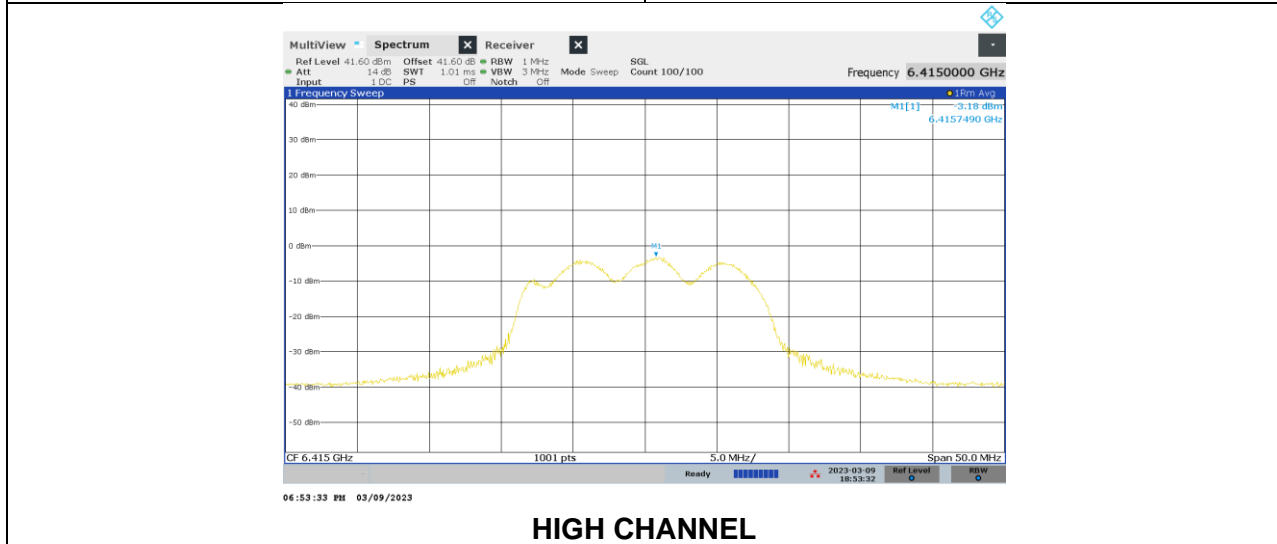
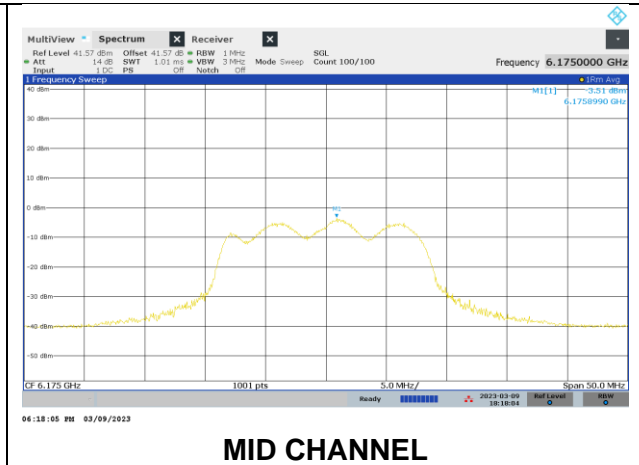
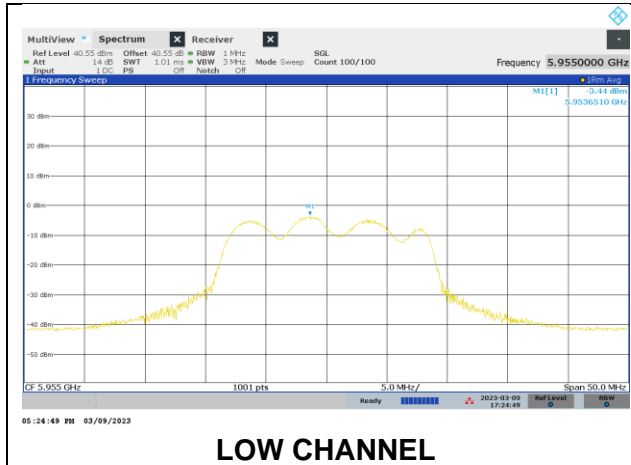
<b>Duty Cycle CF (dB)</b>	1.62	<b>Included in Calculations of Corr'd Power &amp; PSD</b>
---------------------------	------	---

**Output Power Results**

Channel	Frequency (MHz)	Meas EIRP Power (dBm)	Total Corr'd EIRP (dBm)	Power Limit EIRP (dBm)	Power Margin (dB)
Low	5955	7.35	8.97	24.00	-15.03
Mid	6175	7.16	8.78	24.00	-15.22
High	6415	7.67	9.29	24.00	-14.71

**PSD Results**

Channel	Frequency (MHz)	Meas EIRP PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5955	-3.44	-1.82	-1.00	-0.82
Mid	6175	-3.51	-1.89	-1.00	-0.89
High	6415	-3.18	-1.56	-1.00	-0.56





### 9.4.2. 802.11a MODE 2TX IN THE UNII-6 BAND

**2TX Antenna 3 + Antenna 4 CDD MODE:**

<b>Test Engineer:</b>	JB 45256
<b>Test Date:</b>	2023-03-07

(NOTE: **POWER** and **PSD** were tested by radiated method)

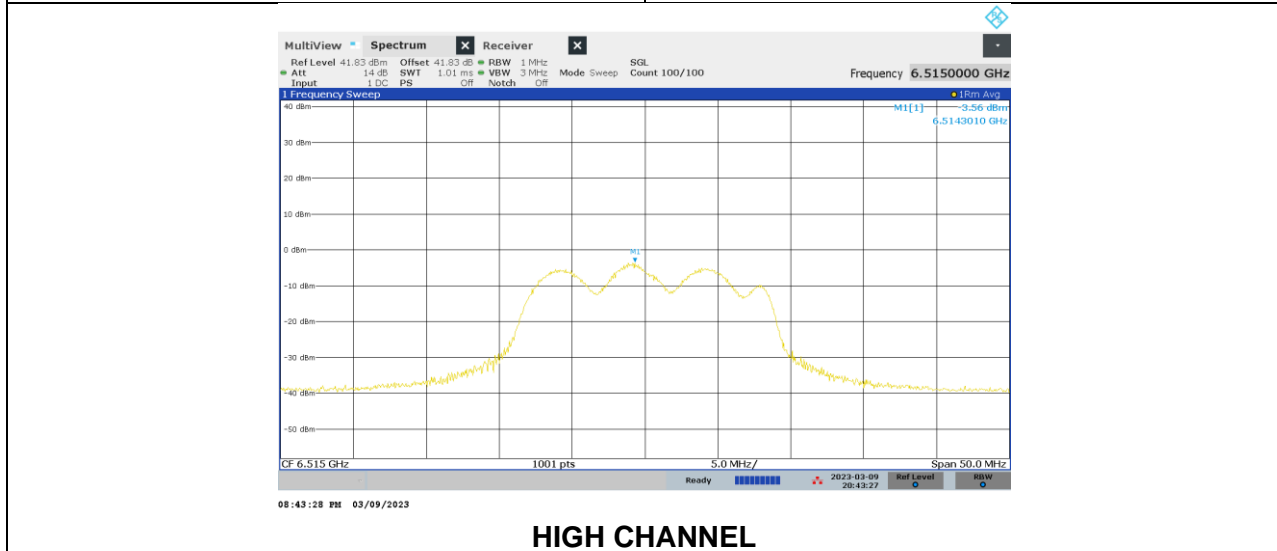
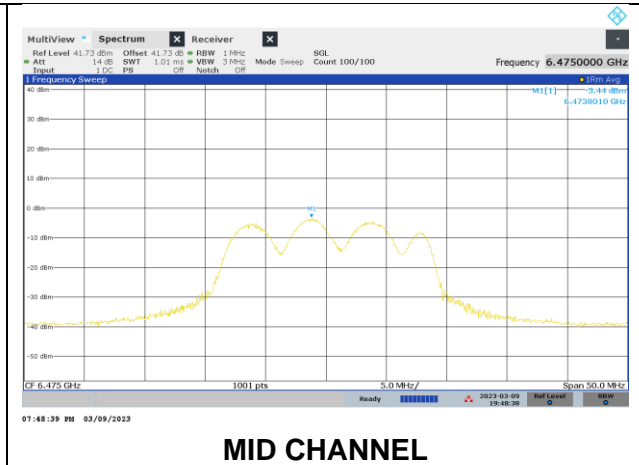
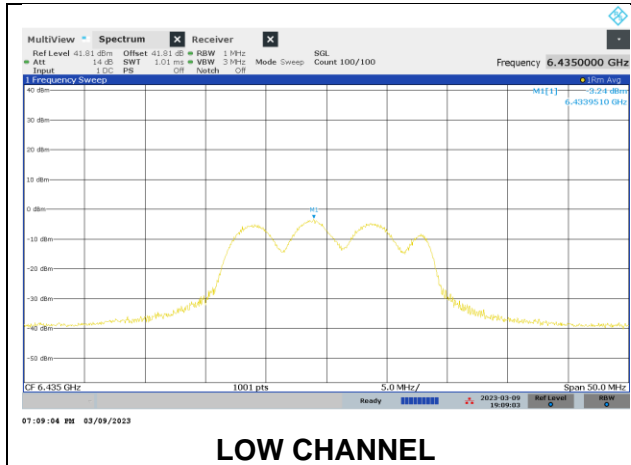
<b>Duty Cycle CF (dB)</b>	1.62	<b>Included in Calculations of Corr'd Power &amp; PSD</b>
---------------------------	------	---

**Output Power Results**

Channel	Frequency (MHz)	Meas EIRP Power (dBm)	Total Corr'd EIRP (dBm)	Power Limit EIRP (dBm)	Power Margin (dB)
Low	6435	6.71	8.33	24.00	-15.67
Mid	6475	6.69	8.31	24.00	-15.69
High	6515	6.78	8.40	24.00	-15.60

**PSD Results**

Channel	Frequency (MHz)	Meas EIRP PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	6435	-3.24	-1.62	-1.00	-0.62
Mid	6475	-3.44	-1.82	-1.00	-0.82
High	6515	-3.56	-1.94	-1.00	-0.94



### 9.4.3. 802.11a MODE 2TX IN THE UNII-7 BAND

**2TX Antenna 3 + Antenna 4 CDD MODE:**

<b>Test Engineer:</b>	CW 20756
<b>Test Date:</b>	2023-03-29

(NOTE: POWER and PSD were tested by radiated method)

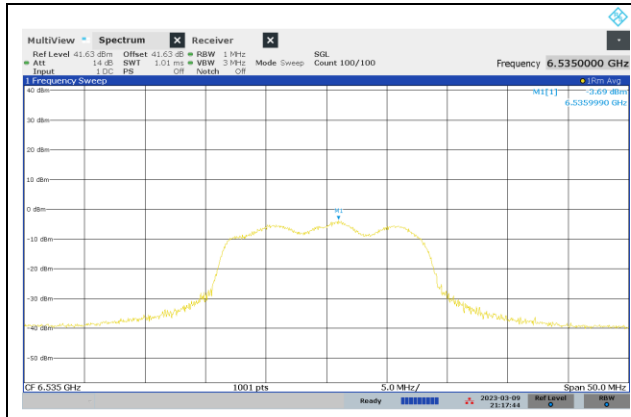
<b>Duty Cycle CF (dB)</b>	1.62	<b>Included in Calculations of Corr'd Power &amp; PSD</b>
---------------------------	------	---

**Output Power Results**

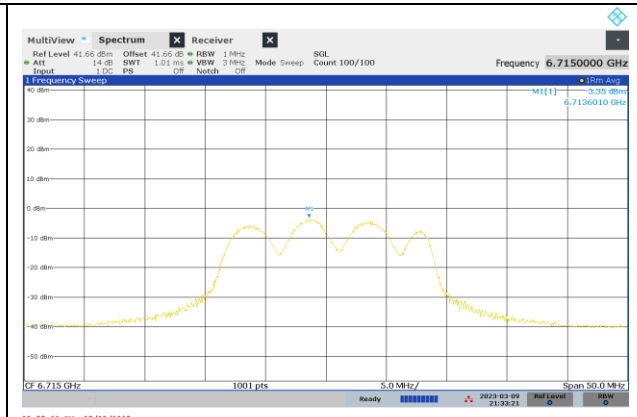
Channel	Frequency (MHz)	Meas EIRP Power (dBm)	Total Corr'd EIRP (dBm)	Power Limit EIRP (dBm)	Power Margin (dB)
Low	6535	7.66	9.28	24.00	-14.72
Mid	6715	6.78	8.40	24.00	-15.60
High	6855	7.77	9.39	24.00	-14.61
Straddle	6875	6.31	7.93	24.00	-16.07

**PSD Results**

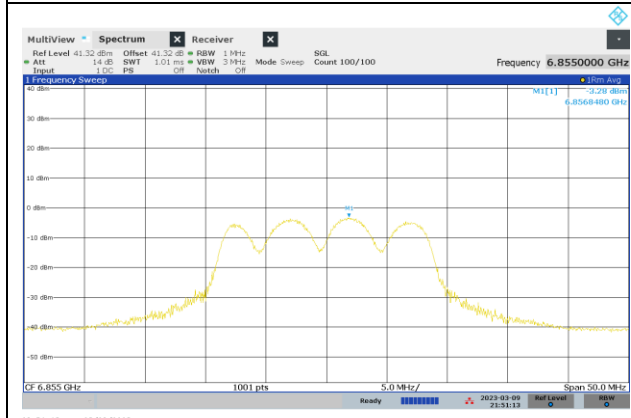
Channel	Frequency (MHz)	Meas EIRP PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	6535	-3.69	-2.07	-1.00	-1.07
Mid	6715	-3.35	-1.73	-1.00	-0.73
High	6855	-3.28	-1.66	-1.00	-0.66
Straddle	6875	-3.53	-1.91	-1.00	-0.91



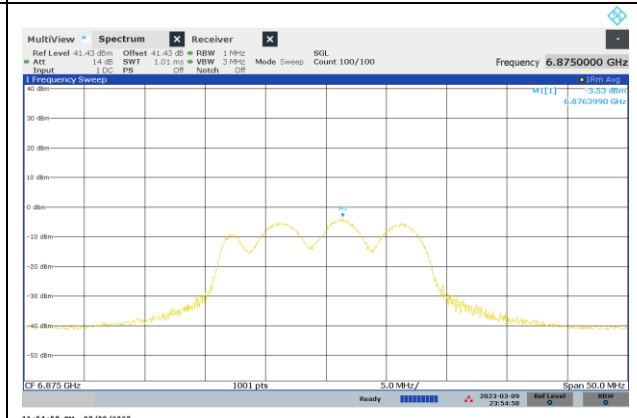
**LOW CHANNEL**



**MID CHANNEL**



**HIGH CHANNEL**



**STRADDLE CHANNEL**

### 9.4.4. 802.11a MODE 2TX IN THE UNII-8 BAND

**2TX Antenna 3 + Antenna 4 CDD MODE:**

<b>Test Engineer:</b>	CW 20756
<b>Test Date:</b>	2023-03-29

(NOTE: **POWER** and **PSD** were tested by radiated method)

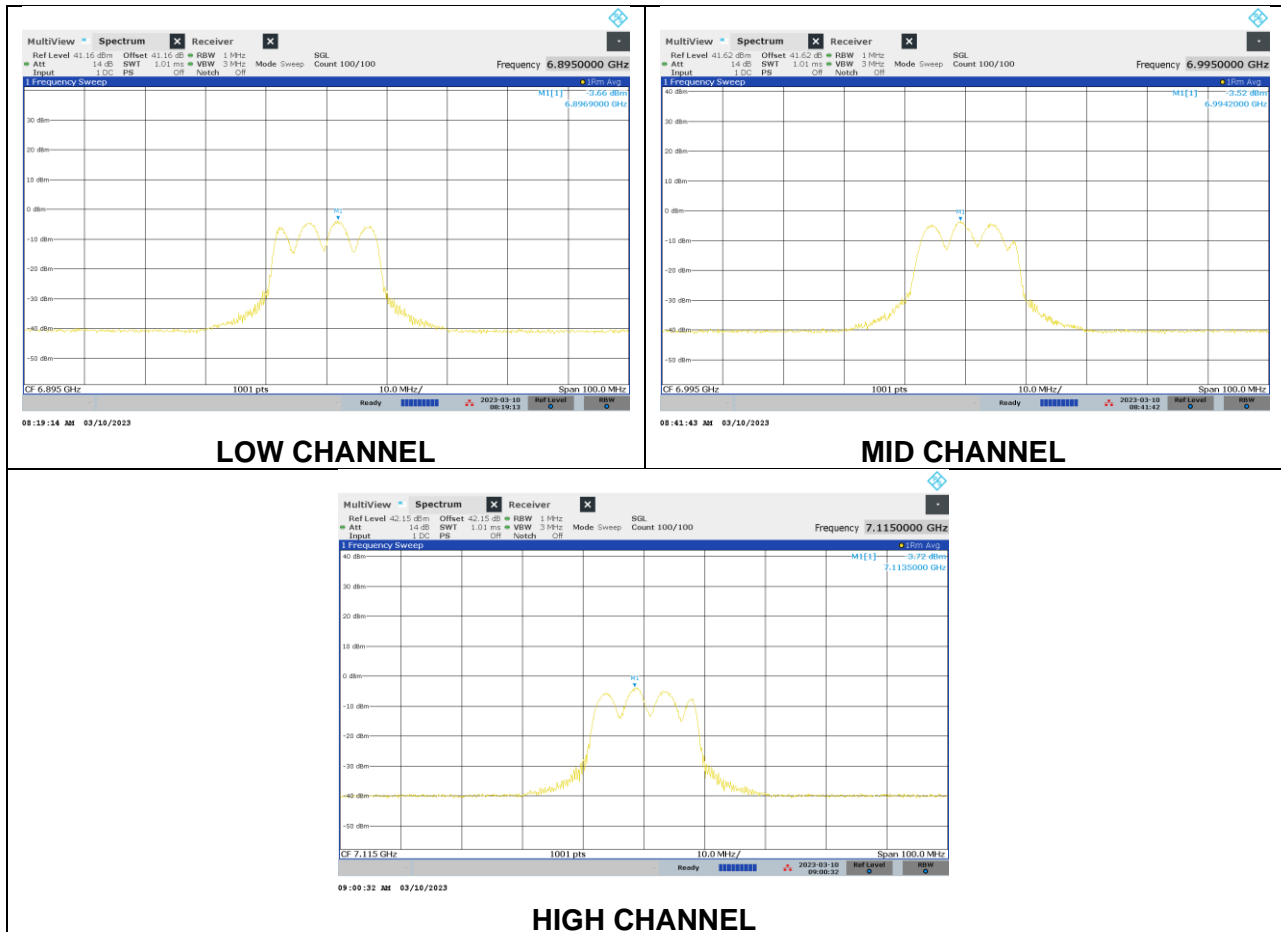
<b>Duty Cycle CF (dB)</b>	1.62	<b>Included in Calculations of Corr'd Power &amp; PSD</b>
---------------------------	------	---

**Output Power Results**

Channel	Frequency (MHz)	Meas EIRP Power (dBm)	Total Corr'd EIRP (dBm)	Power Limit EIRP (dBm)	Power Margin (dB)
Low	6895	6.71	8.33	24.00	-15.67
Mid	6995	6.87	8.49	24.00	-15.51
High	7115	5.88	7.50	24.00	-16.50

**PSD Results**

Channel	Frequency (MHz)	Meas EIRP PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	6895	-3.66	-2.04	-1.00	-1.04
Mid	6995	-3.52	-1.90	-1.00	-0.90
High	7115	-3.72	-2.10	-1.00	-1.10



## 9.5. SPURIOUS EMISSIONS IN-BAND – EMISSION MASK

### **LIMITS**

#### **FCC §15.407**

(b)(7) For transmitters operating within the 5.925-7.125 GHz bands: power spectral density must be suppressed by 20 dB at 1 MHz outside of channel edge, by 28 dB at one channel bandwidth from the channel center, and by 40 dB at one- and one-half times the channel bandwidth away from channel center. At frequencies between one megahertz outside an unlicensed device's channel edge and one channel bandwidth from the center of the channel, the limits must be linearly interpolated between 20 dB and 28 dB suppression, and at frequencies between one and one- and one-half times an unlicensed device's channel bandwidth, the limits must be linearly interpolated between 28 dB and 40 dB suppression. Emissions removed from the channel center by more than one- and one-half times the channel bandwidth must be suppressed by at least 40 dB.

#### **RSS-248**

4.7.2 b. e.i.r.p. spectral density of unwanted emissions falling into the 5925-7125 MHz band shall be attenuated (in dB) below the reference power spectral density by:

- i. 20 dB at 1 MHz away from the channel edge; and
- ii. a linearly interpolated value between 20 dB and 28 dB at frequencies between 1 MHz outside of channel edge and one (1) channel bandwidth from the operating channel centre, respectively; and
- iii. 28 dB at one (1) channel bandwidth away from the operating channel centre; and
- iv. a linearly interpolated value between 28 dB and 40 dB at frequencies between one (1) channel bandwidth from the channel centre and one- and one-half (1.5) times the channel bandwidth away from the operating channel centre, respectively; and
- v. 40 dB at one- and one-half (1.5) times the channel bandwidth away from the channel centre; and
- vi. a minimum of 40 dB at frequencies that are further away than one and one-half (1.5) times the channel bandwidth from the channel centre.

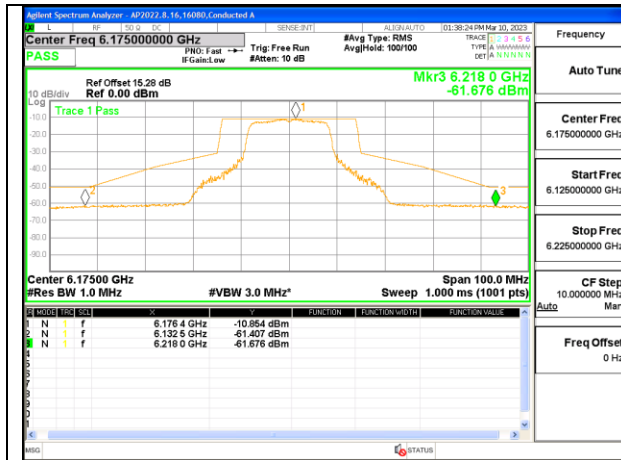
### **TEST PROCEDURE**

Per KDB 987594 D02 v01r01, Section J

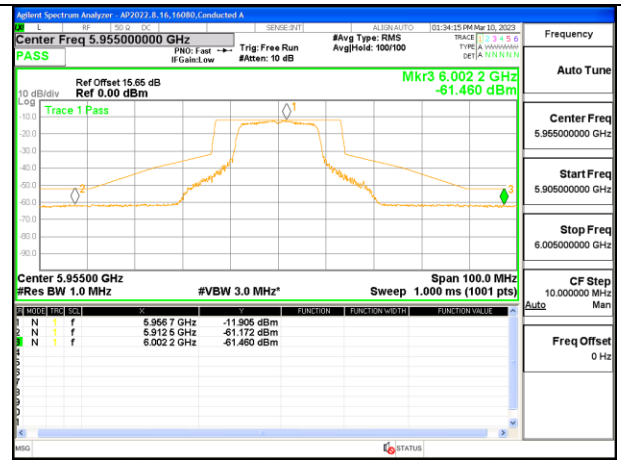
### **RESULTS**

### 9.5.1. 802.11a MODE 2TX IN THE UNII-5 BAND

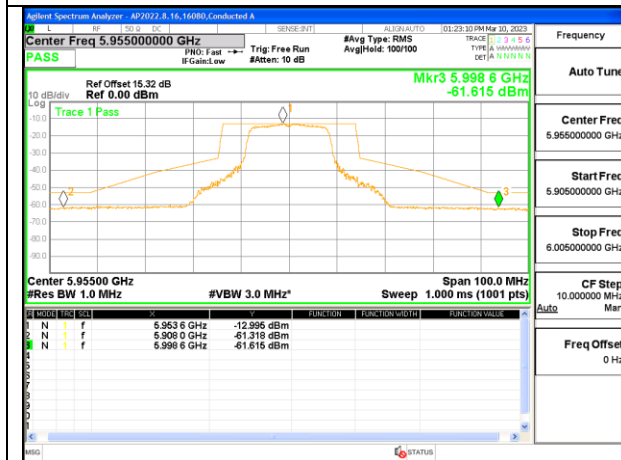
#### 2TX Antenna 1 + Antenna 4 CDD MODE:



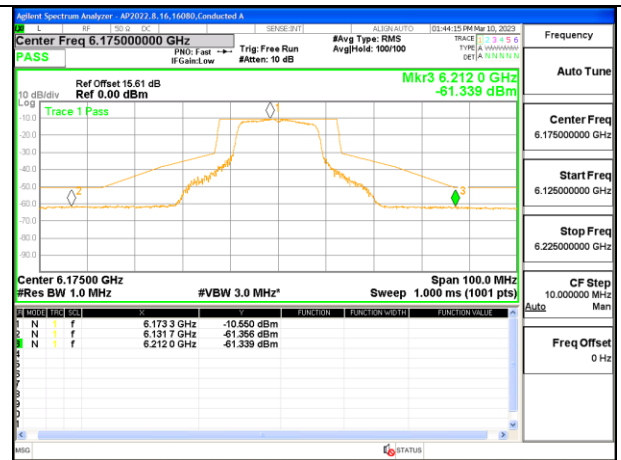
LOW CHANNEL Antenna 1



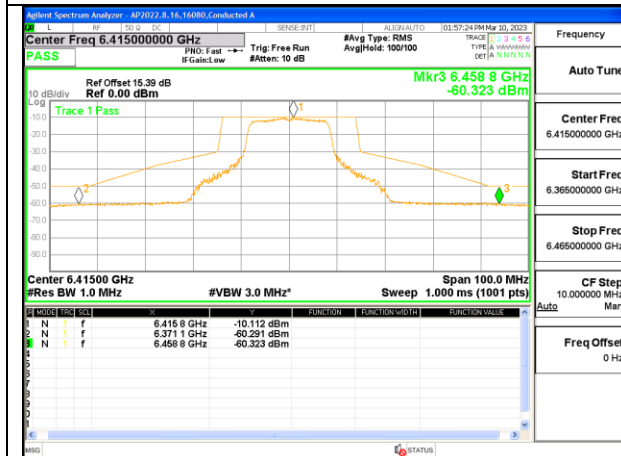
LOW CHANNEL Antenna 4



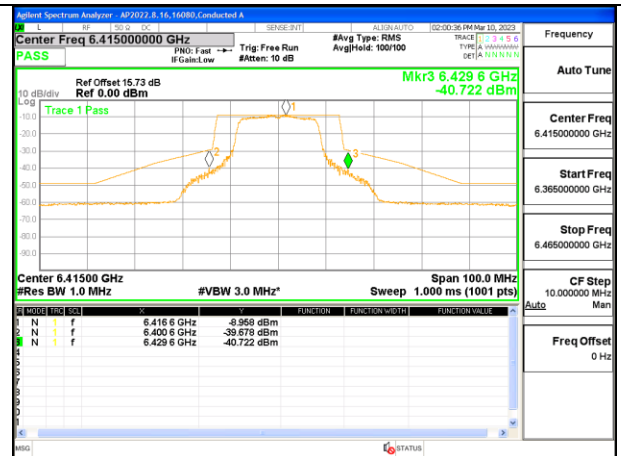
MID CHANNEL Antenna 1



MID CHANNEL Antenna 4



HIGH CHANNEL Antenna 1



HIGH CHANNEL Antenna 4