TEST REPORT

Report Number.: 14093504-E7V4

Applicant	:	SONOS INC. 614 CHAPALA ST. SANTA BARBARA, CA, 93101, U.S.A.
Model	:	S39
Brand	:	SONOS
FCC ID	:	SBVRM039
IC	:	5373A-RM039
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 1 ISED RSS-GEN ISSUE 5 + A1 +A2

Date Of Issue:
2022-10-17

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

CERT #0751.05

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2022-09-23	Initial Issue	---
V2	2022-10-03	Updated Section 6.4 and 9.4	K.Kedida
V3	2022-10-11	Updated Section 9.4	K.Kedida
V4	2022-10-17	Updated Section 9.4	K.Kedida

UL VERIFICATION SERVICES
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

TABLE OF CONTENTS

UL VERIFICATION SERVICES
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

UL VERIFICATION SERVICES
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

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:	S39
BRAND:	SONOS
SERIAL NUMBER:	Radiated Sample: A100 2207CP F0-F6-C1-A0-0D-80:1 and A100 2207CP F0-F6-C1-A0-0D-CC:9 Conducted Sample: 7885B
DATE TESTED:	2022-08-01 to 09-08

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart E	Complies
ISED RSS-248 Issue 1	Complies
ISED RSS-GEN Issue 5 + A1 + A2	Complies

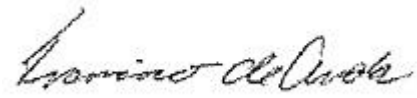
UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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.

UL VERIFICATION SERVICES
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

Approved & Released For
UL Verification Services Inc. By:



Franciso de Anda
Staff Engineer
Consumer Technology Division
UL Verification Services Inc.

Prepared By:

Glenn Escano
Senior Test Engineer
Consumer Technology Division
UL Verification Services Inc.

1st Reviewed By:

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

2nd 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

UL VERIFICATION SERVICES
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

3. TEST METHODOLOGY

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

- FCC CFR 47 Part 2
- FCC CFR 47 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 Issue1

UL VERIFICATION SERVICES
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

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
☒	Building 1: 47173 Benicia Street Fremont, CA 94538, U.S.A	US0104	2324A	550739
☐	Building 2: 47266 Benicia Street Fremont, CA 94538, U.S.A	US0104	22541	550739
☒	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_{Lab}
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

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

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:
Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:
Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.
36.5 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV

UL VERIFICATION SERVICES
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

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

	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)
UNII-5 band, 2TX			
5955-6415	802.11a	8.77	7.53
UNII-6 band, 2TX			
6435-6515	802.11a	8.97	7.89
UNII-7 band, 2TX			
6535-6875	802.11a	8.65	7.33
UNII-8 band, 2TX			
6895-7115	802.11a	8.76	7.52

6.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PCB (onboard) antennas, with a maximum gain as follows.

Frequency Range (MHz)	Peak Antenna Gain (dBi)			
	CHAIN 0		CHAIN 1	
	ANT1 (LOB) (dBi)	ANT2 (LRM) (dBi)	ANT3 (RRM) (dBi)	ANT4 (ROB (dBi)
5925 – 6425	4.9	4.4	4.7	5.5
6425 – 6525	4.5	2.7	3.3	5.2
6525 – 6875	4.4	3	3.5	4.6
6875 – 7125	4.1	3.9	3.5	3.7

6.5. SOFTWARE AND FIRMWARE

The EUT software used during testing was 70.1-29190-diag.

The test utility software used during testing was GUI_V8.

6.6. WORST-CASE CONFIGURATION AND MODE

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

The EUT can only be set up 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 on all bands. Therefore, all final testing was performed with ANT1 and ANT4.

The 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
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 EUT/Spectrum Analyzer/AC/DC Adapter
2	DC	1	DC	Un-shielded	1	AC/DC Adapter to Laptop
3	Ethernet	1	RJ45	Un-shielded	1.5	Laptop to USB Ethernet Adapter
4	USB-A	1	USB-A	Shielded	0.05	USB EthernetAdapter to USB
5	USB-C	1	USB-C	Shielded	0.05	EUT to USB-C/USB-A Female Adapter
6	SMA Cable	1	SMA	Un-Shielded	0.1	EUT to Spectrum Analyzer

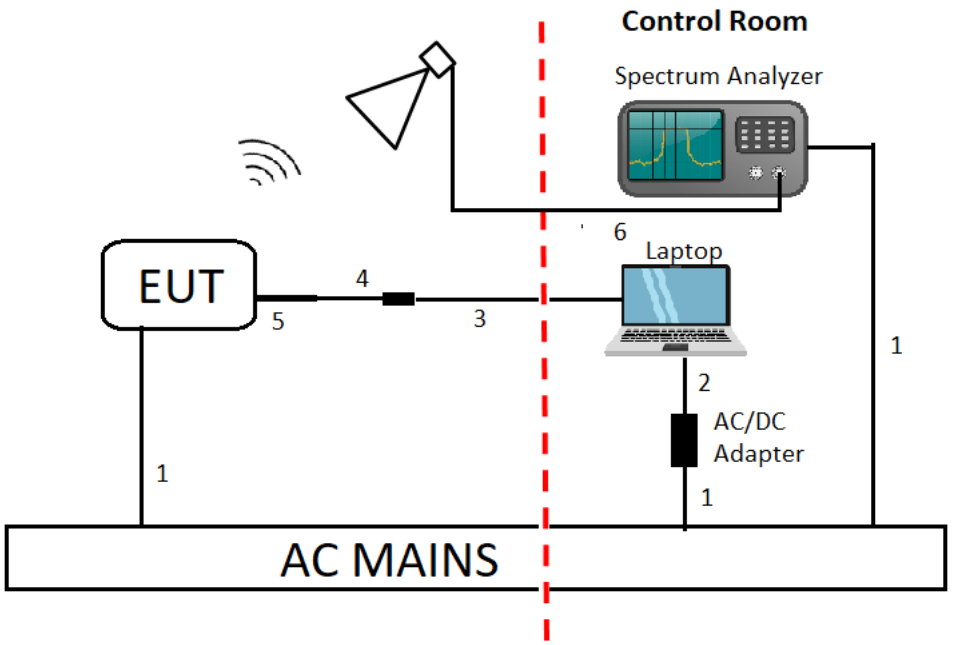
I/O CABLES (RADIATED TEST)						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC	3	AC	Un-shielded	1.25	AC Mains to EUT/Spectrum Analyzer/AC/DC Adapter
2	DC	1	DC	Un-shielded	1	AC/DC Adapter to Laptop
3	Ethernet	1	RJ45	Un-shielded	10	Laptop to USB Ethernet Adapter
4	USB-A	1	USB-A	Shielded	0.05	USB EthernetAdapter to USB
5	USB-C	1	USB-C	Shielded	0.05	EUT to USB-C/USB-A Female Adapter
6	SMA Cable	1	SMA	Un-Shielded	10	EUT to Horn Antenna

TEST SETUP

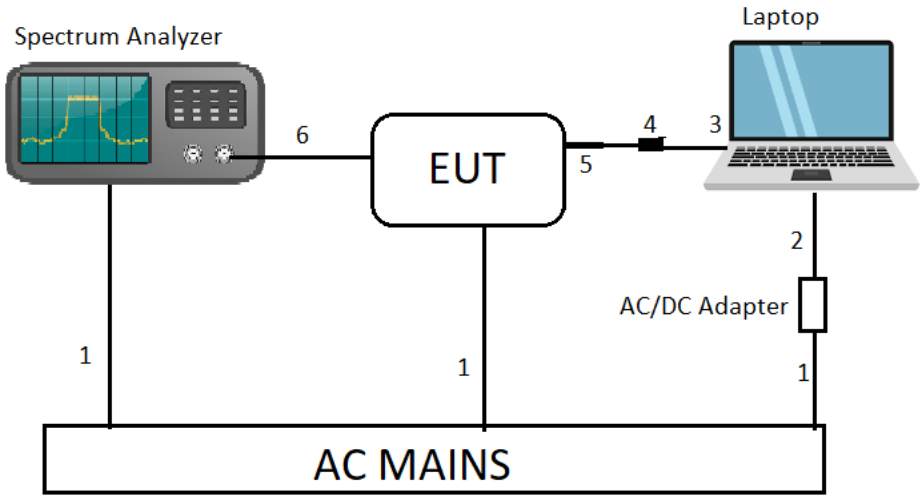
The EUT is a stand-alone unit, and the radio is exercised by Sonos Compliance GUI test utility software via ethernet.

SETUP DIAGRAM

Radiated Configuration



Conducted Configuration



UL VERIFICATION SERVICES
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

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

UL VERIFICATION SERVICES
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

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	82258	2022-10-01	2021-10-01
Amplifier, 10KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	175953	2023-02-08	2022-02-08
Amplifier, 10KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310N	29654	2023-04-24	2022-04-24
Antenna, Horn 1-18GHz	ETS-Lindgren (Cedar Park, Texas)	3117	80402	2023-07-05	2022-07-05
RF Filter Box, 1-18GHz	UL-FR1 (CTECH)	SAC 8 port rf box 1	197920	2023-04-19	2022-04-19
EMI TEST RECEIVER, with B8 option	Rohde & Schwarz	ESW44	169937	2023-02-20	2022-02-20
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	169927	2023-02-16	2022-02-16
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826/B	81138	2022-10-13	2021-10-13
Amplifier 18-26.5GHz, +5Vdc, 60dB min	AMPLICAL	AMP18G26.5-60	215705	2023-02-26	2022-02-26
Antenna, Horn 26 to 40GHz	ARA	MWH-2640/B	81104	2022-10-14	2021-10-14
Amplifier 26-40GHz +5Vdc, -62dBm P1dB	AMPLICAL	AMP26G40-65	172345	2023-06-22	2022-06-22
Antenna, Passive Loop 30Hz - 1MHz	ELECTRO METRICS	EM-6871	219909	2023-05-10	2022-05-10
Antenna, Passive Loop 100KHz - 30MHz	ELECTRO METRICS	EM-6872	219911	2023-05-10	2022-05-10
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent Technologies	N9030A	80396	2023-01-02	2022-01-02
Power Meter, P-series single channel	Keysight Technologies Inc	N1911A	T1268	2023-02-03	2022-02-03
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight Technologies Inc	N1921A	90419	2023-03-02	2022-03-02
AC Line Conducted					
LISN	Fischer Custom Communications, Inc	FCC-LISN-50/250-25-2-01-480V	175765	2023-01-26	2022-01-26
EMI TEST RECEIVER	Rohde & Schwarz	ESR	93091	2023-02-21	2022-02-21
Transient Limiter	Com-Power	LIT-930	127455	2023-02-02	2022-02-02
UL TEST SOFTWARE LIST					
Radiated Software	UL	UL EMC	Ver 2014-07-15, 2014-07-15, 2022-03-30, 2022-04-28, 2022-05-18, and 2022-07-06		
Antenna Port Software	UL	UL RF	Ver 2022-05-31		
AC Line Conducted Software	UL	UL EMC	Rev 9.5, 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.

Test Engineer:	CW 20756
Test Date:	8/8/2022

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	1.391	1.781	0.781	78.10	1.07	0.719

DUTY CYCLE PLOTS

802.11a MODE

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

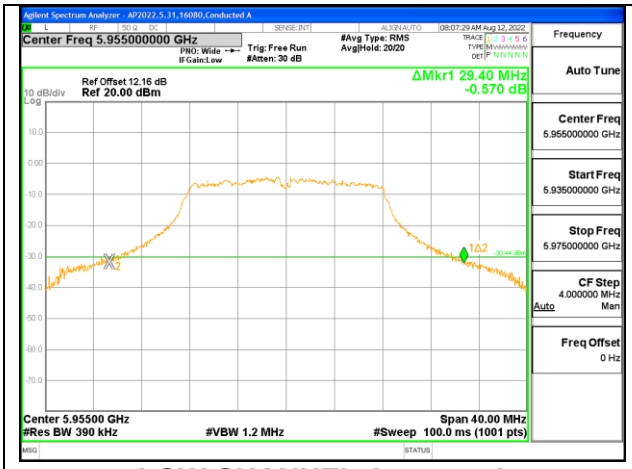
RESULTS

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

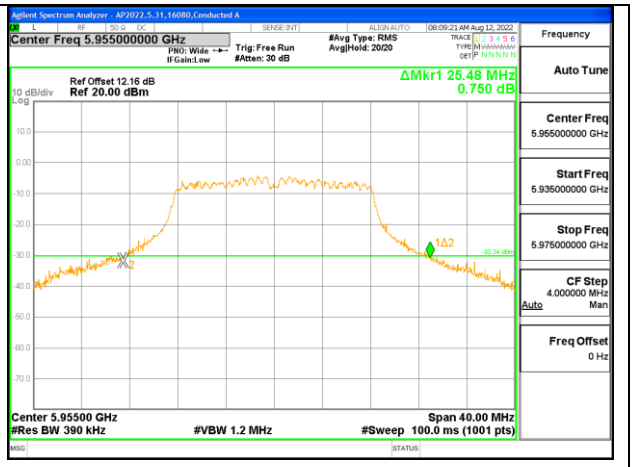
2TX Antenna 1 + Antenna 4 CDD MODE:

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 1 (MHz)	26 dB Bandwidth Antenna 4 (MHz)
Low	5955	29.40	25.48
Mid	6175	29.40	26.92
High	6415	29.00	26.12

LOW CHANNEL

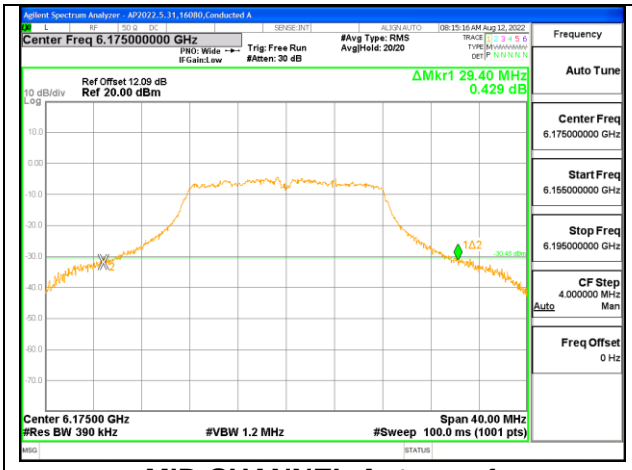


LOW CHANNEL Antenna 1

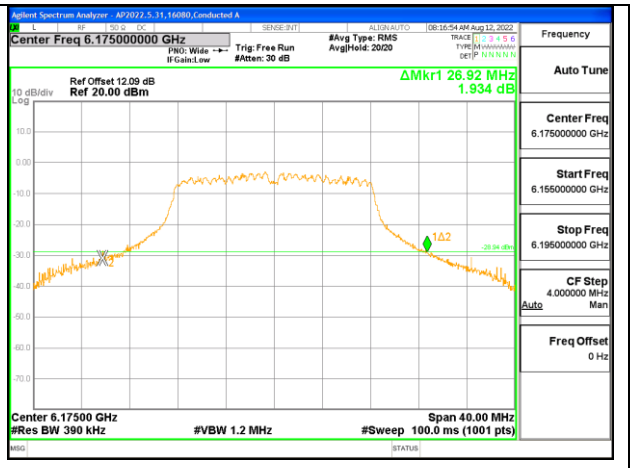


LOW CHANNEL Antenna 4

MID CHANNEL

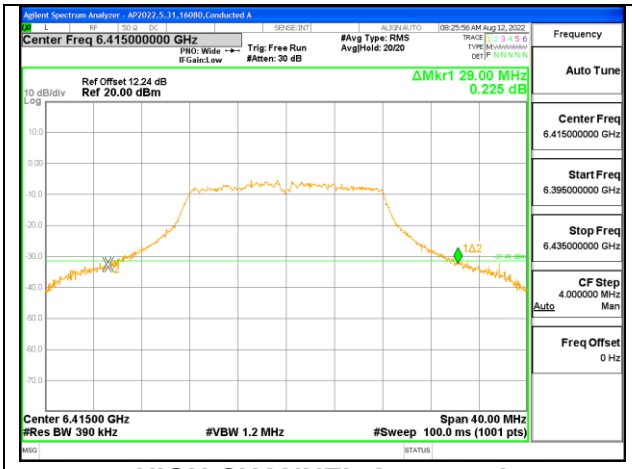


MID CHANNEL Antenna 1

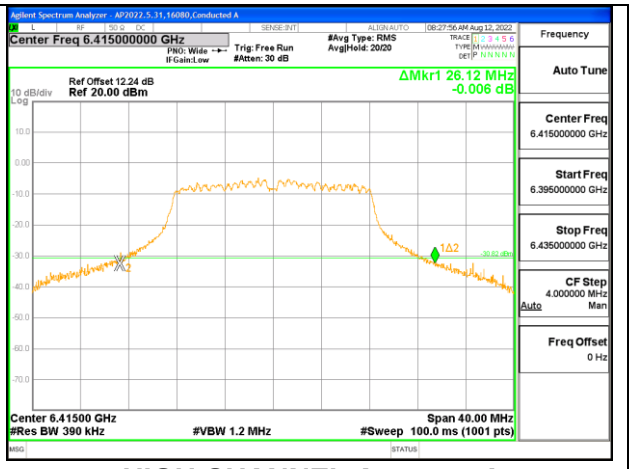


MID CHANNEL Antenna 4

HIGH CHANNEL



HIGH CHANNEL Antenna 1



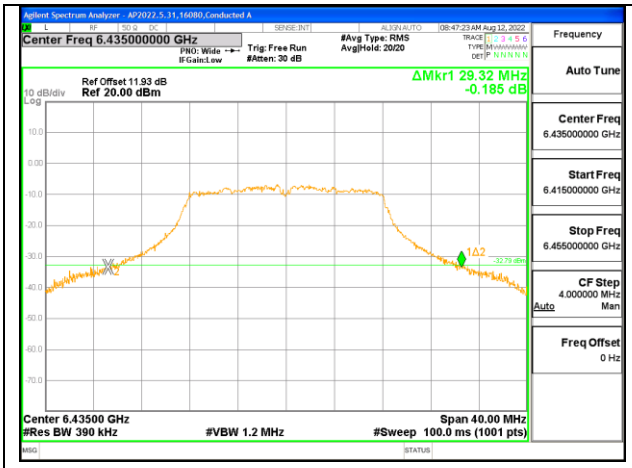
HIGH CHANNEL Antenna 4

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

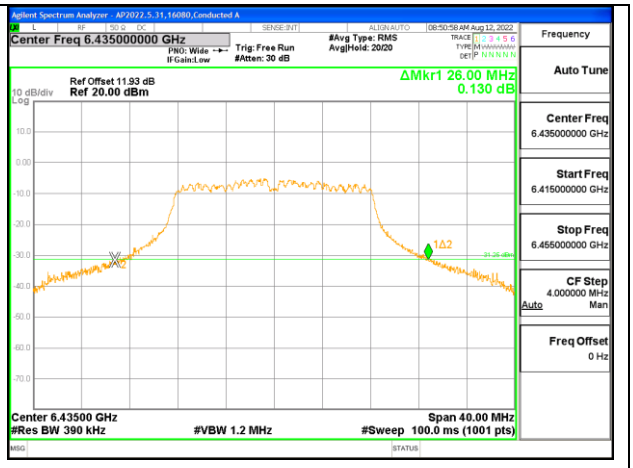
2TX Antenna 1 + Antenna 4 CDD MODE:

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 1 (MHz)	26 dB Bandwidth Antenna 4 (MHz)
Low	6435	29.32	26.00
Mid	6475	28.40	25.80
High	6515	29.04	26.04

LOW CHANNEL

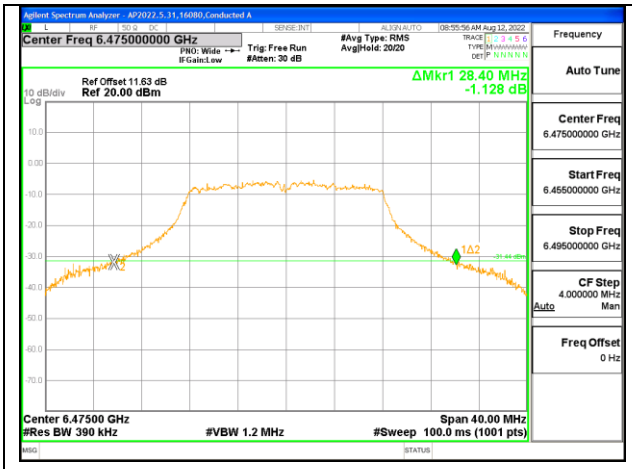


LOW CHANNEL Antenna 1

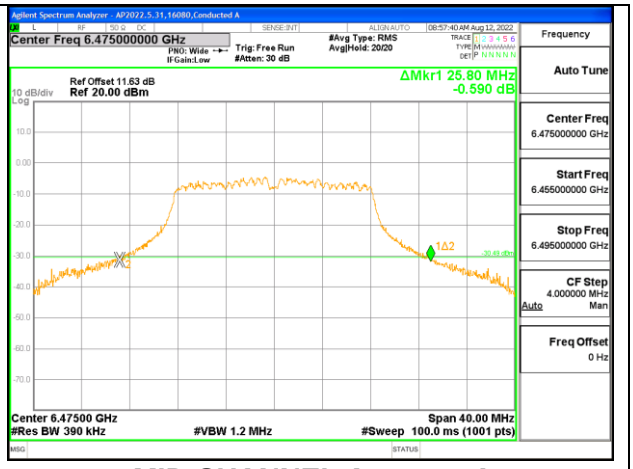


LOW CHANNEL Antenna 4

MID CHANNEL

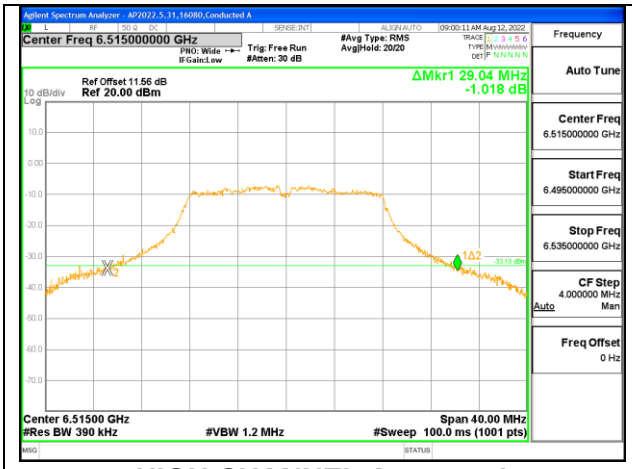


MID CHANNEL Antenna 1

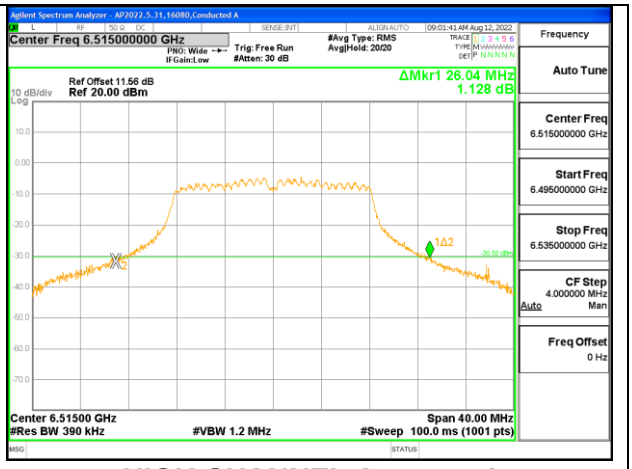


MID CHANNEL Antenna 4

HIGH CHANNEL



HIGH CHANNEL Antenna 1



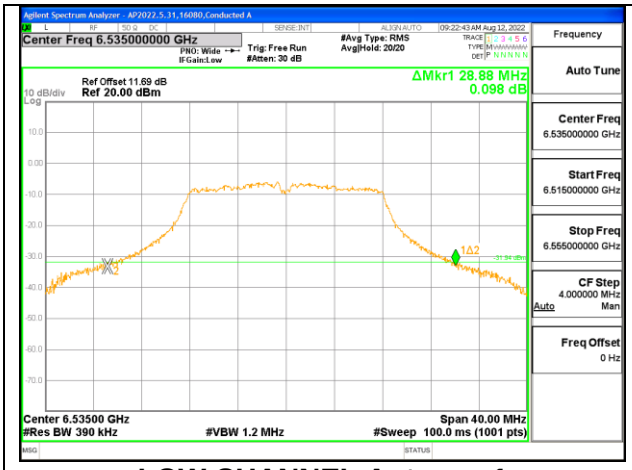
HIGH CHANNEL Antenna 4

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

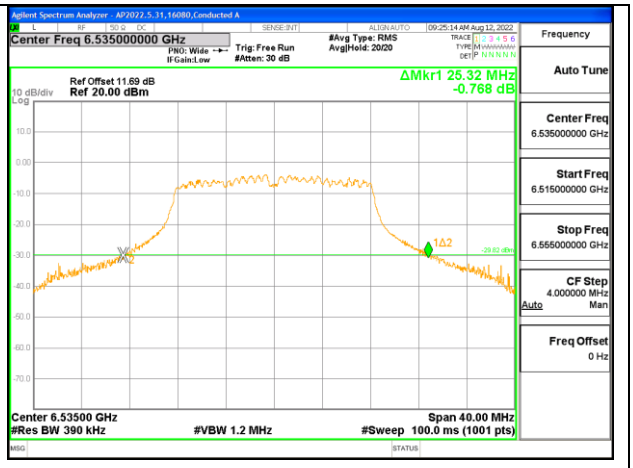
2TX Antenna 1 + Antenna 4 CDD MODE:

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 1 (MHz)	26 dB Bandwidth Antenna 4 (MHz)
Low	6535	28.88	25.32
Mid	6715	28.52	25.68
High	6855	28.84	26.16
Straddle	6875	28.72	26.04

LOW CHANNEL

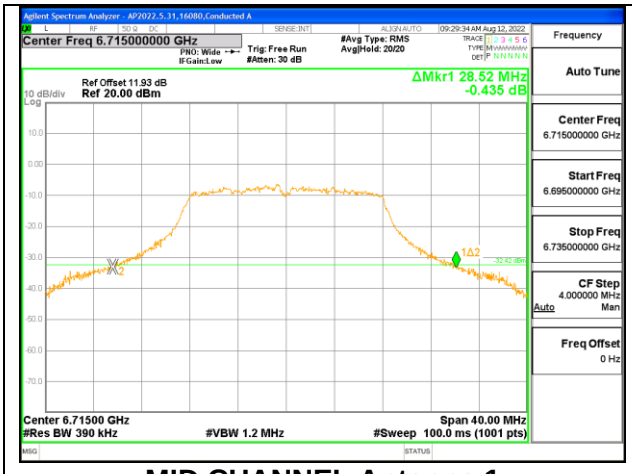


LOW CHANNEL Antenna 1

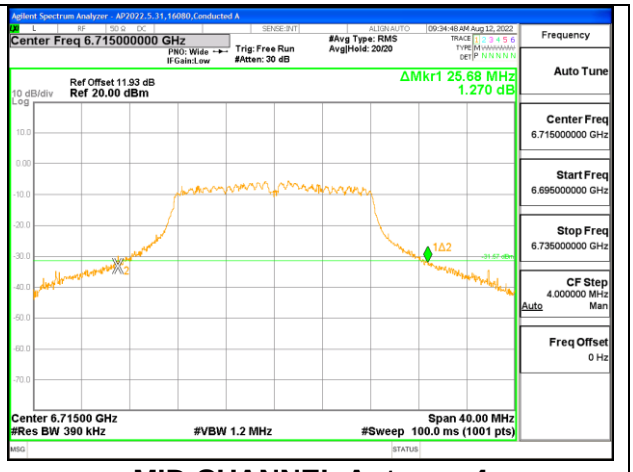


LOW CHANNEL Antenna 4

MID CHANNEL

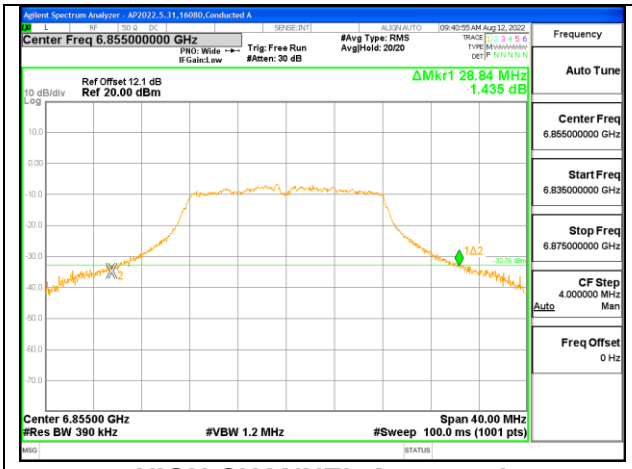


MID CHANNEL Antenna 1

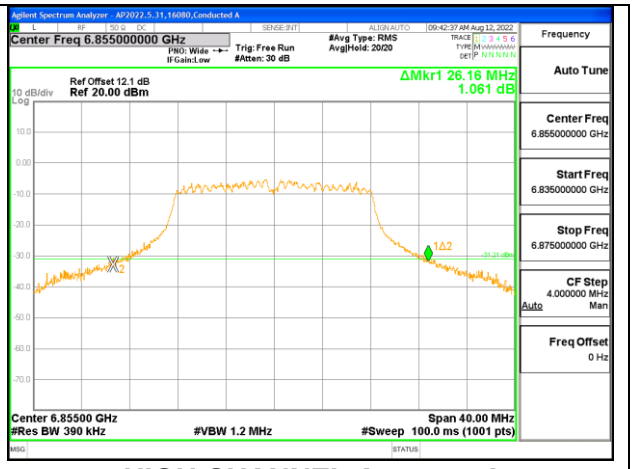


MID CHANNEL Antenna 4

HIGH CHANNEL

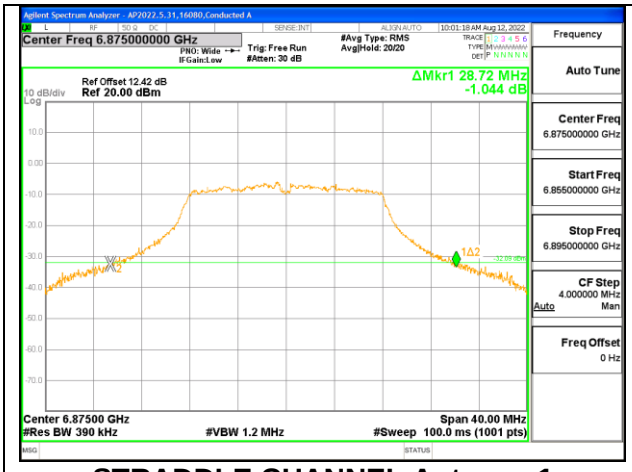


HIGH CHANNEL Antenna 1

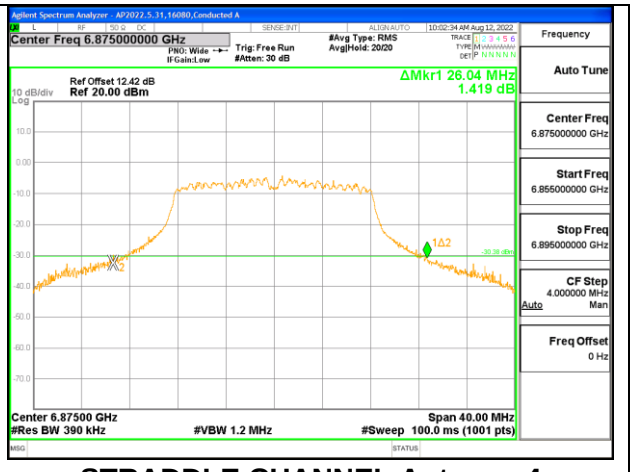


HIGH CHANNEL Antenna 4

STRADDLE CHANNEL



STRADDLE CHANNEL Antenna 1



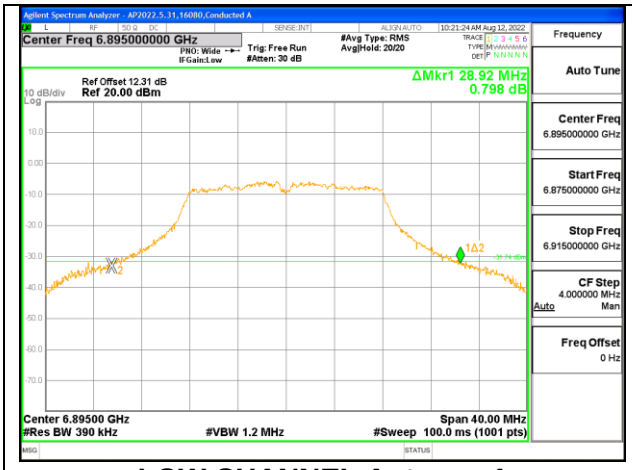
STRADDLE CHANNEL Antenna 4

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

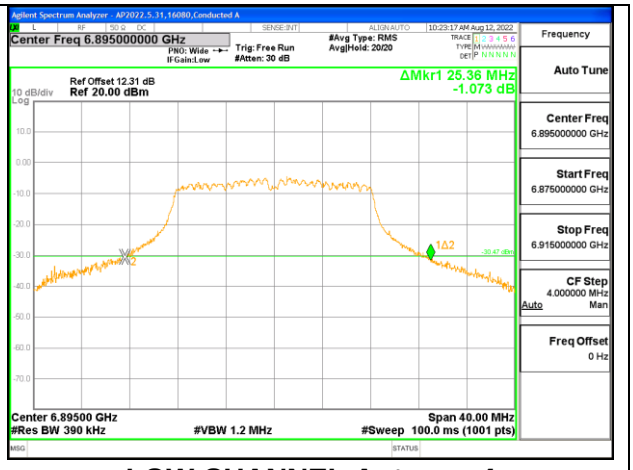
2TX Antenna 1 + Antenna 4 CDD MODE:

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 1 (MHz)	26 dB Bandwidth Antenna 4 (MHz)
Low	6895	28.92	25.36
Mid	6995	29.24	26.12
High	7115	28.96	25.28

LOW CHANNEL

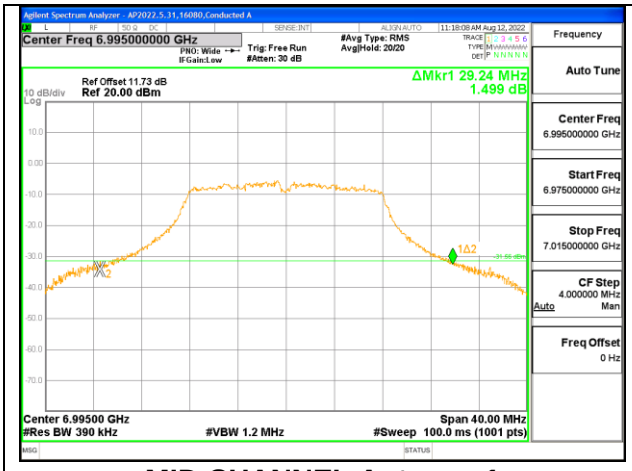


LOW CHANNEL Antenna 1

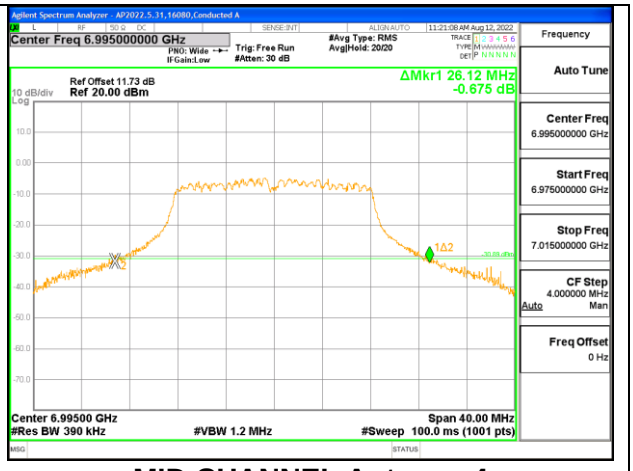


LOW CHANNEL Antenna 4

MID CHANNEL

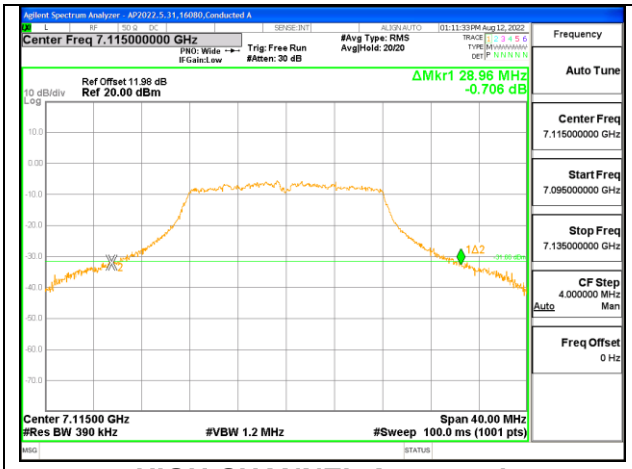


MID CHANNEL Antenna 1

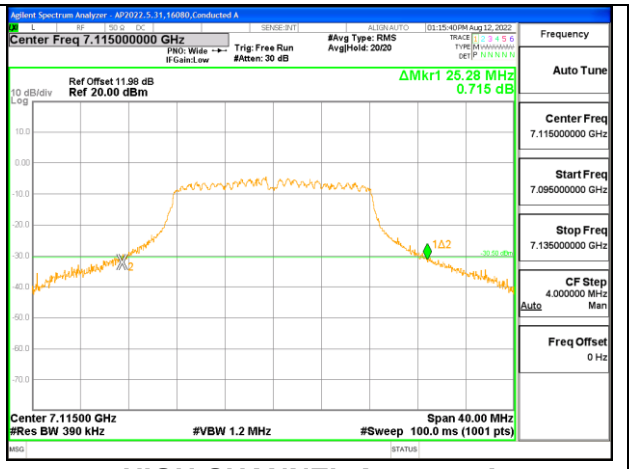


MID CHANNEL Antenna 4

HIGH CHANNEL



HIGH CHANNEL Antenna 1



HIGH CHANNEL Antenna 4

9.3. 99% BANDWIDTH

LIMITS

FCC -None; for reporting purposes only.

RSS-248 4.4

The occupied bandwidth shall not exceed 320 MHz.

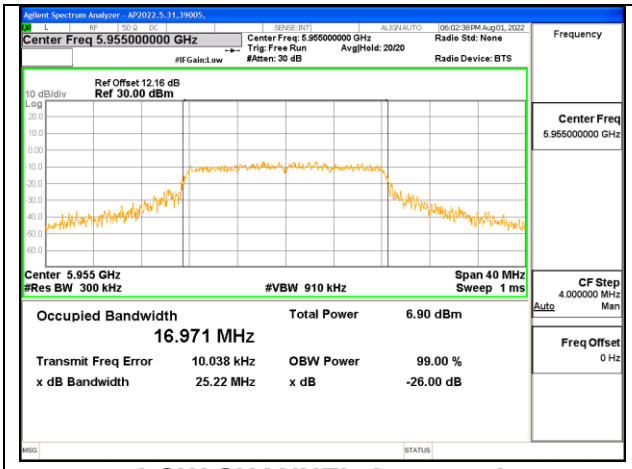
RESULTS

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

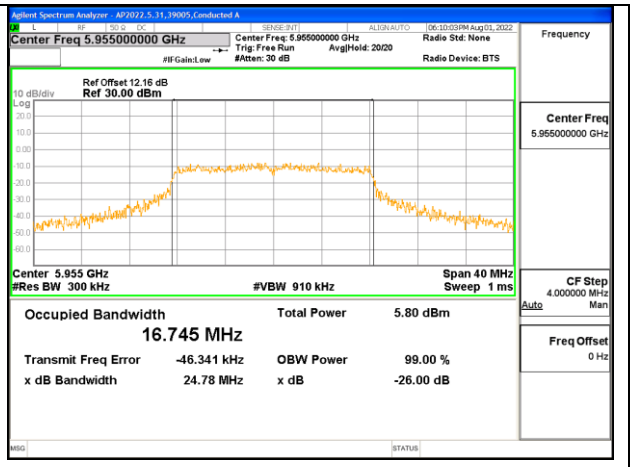
2TX Antenna 1 + Antenna 4 CDD MODE:

Channel	Frequency (MHz)	99% Bandwidth Antenna 1 (MHz)	99% Bandwidth Antenna 4 (MHz)
Low	5955	16.971	16.745
Mid	6175	16.918	16.735
High	6415	16.912	16.829

LOW CHANNEL

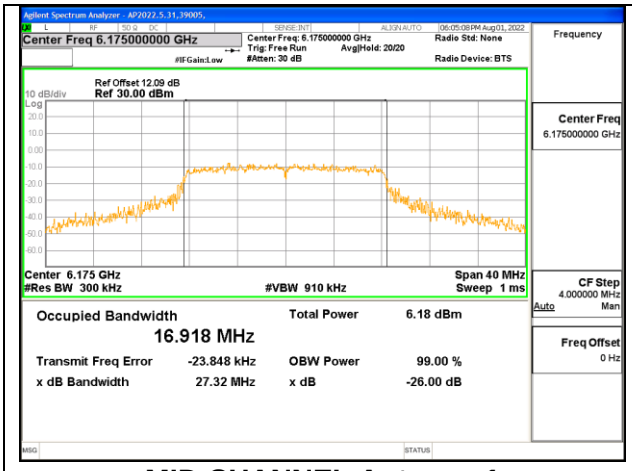


LOW CHANNEL Antenna 1

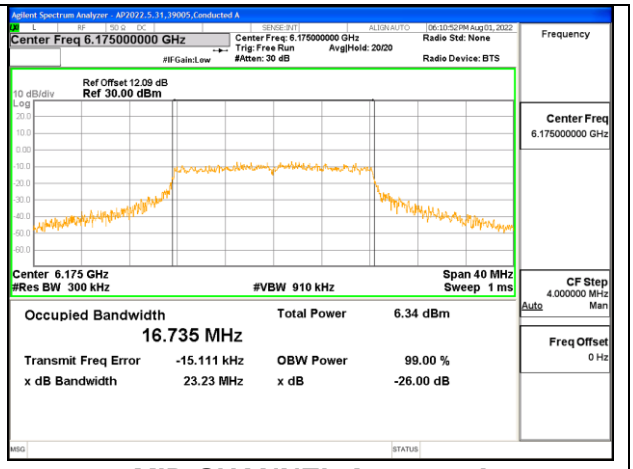


LOW CHANNEL Antenna 4

MID CHANNEL

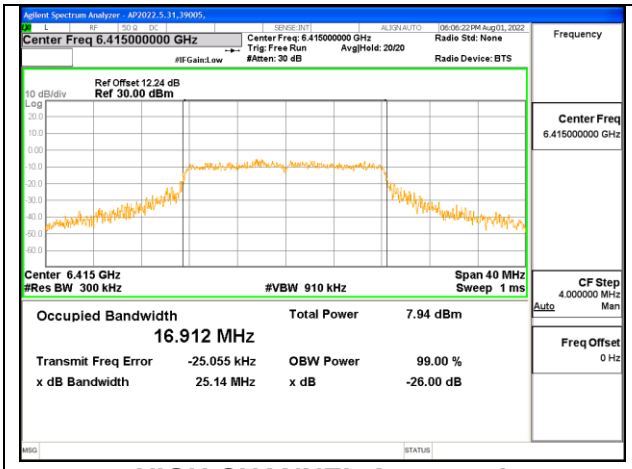


MID CHANNEL Antenna 1

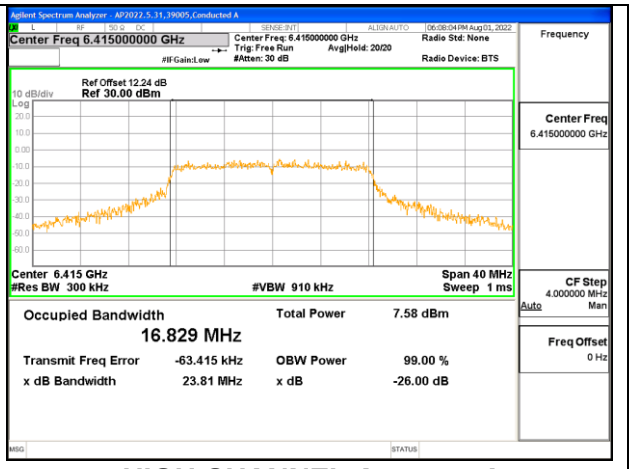


MID CHANNEL Antenna 4

HIGH CHANNEL



HIGH CHANNEL Antenna 1



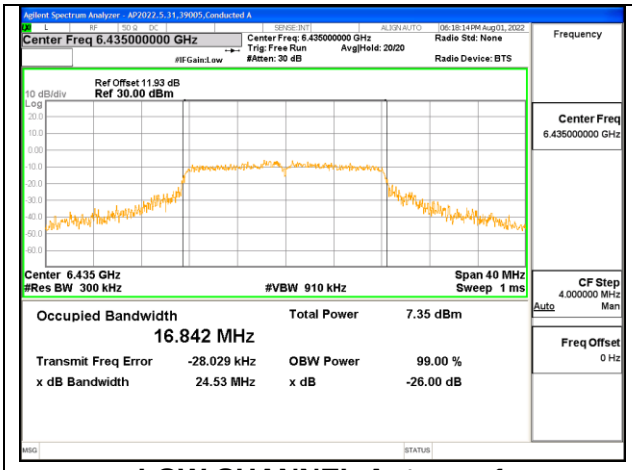
HIGH CHANNEL Antenna 4

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

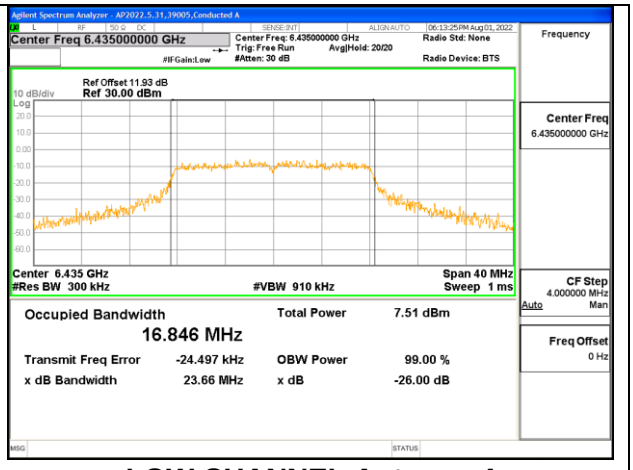
2TX Antenna 1 + Antenna 4 CDD MODE:

Channel	Frequency (MHz)	99% Bandwidth Antenna 1 (MHz)	99% Bandwidth Antenna 4 (MHz)
Low	6435	16.842	16.846
Mid	6475	16.973	16.739
High	6515	16.975	16.735

LOW CHANNEL

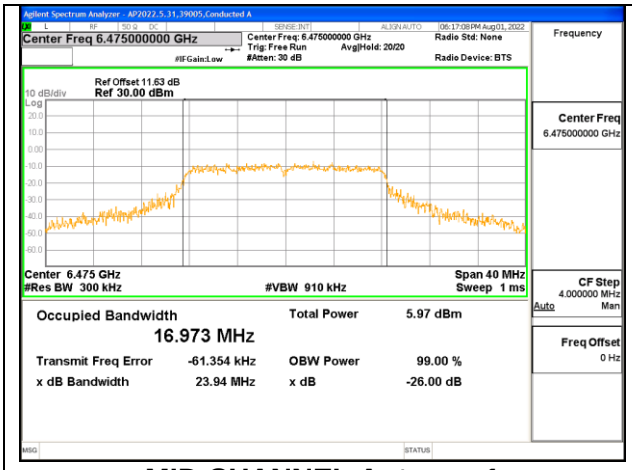


LOW CHANNEL Antenna 1

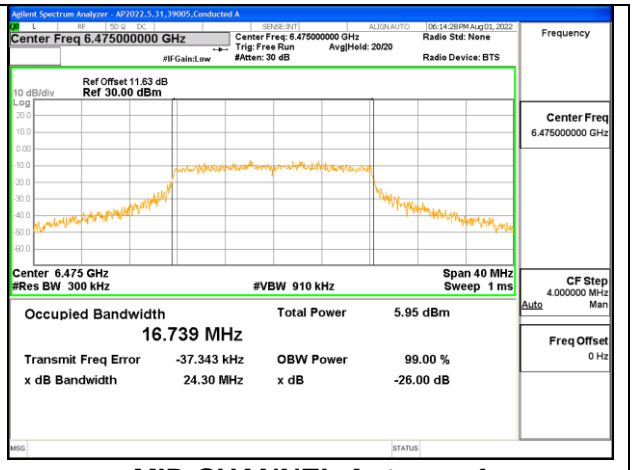


LOW CHANNEL Antenna 4

MID CHANNEL

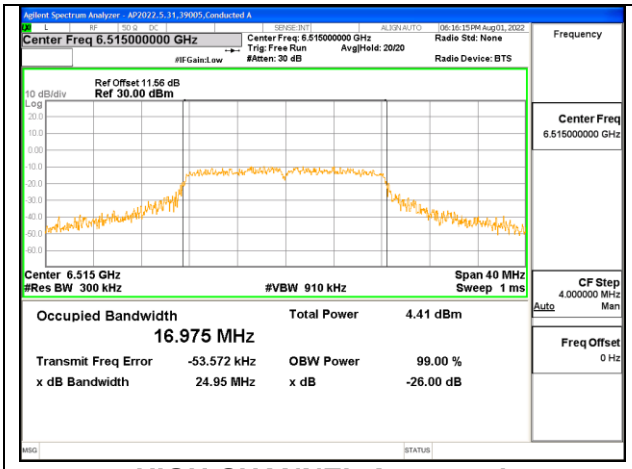


MID CHANNEL Antenna 1

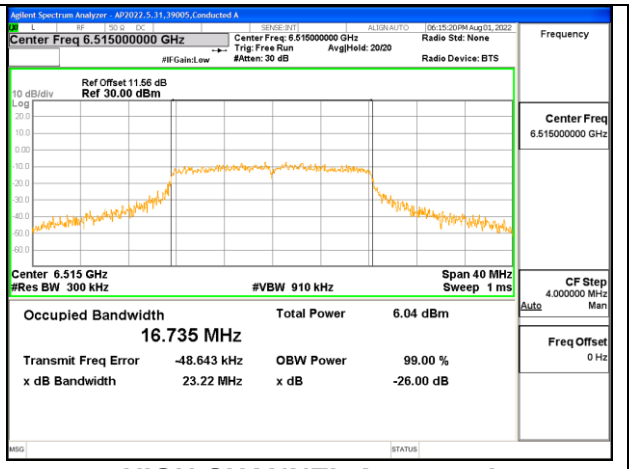


MID CHANNEL Antenna 4

HIGH CHANNEL



HIGH CHANNEL Antenna 1



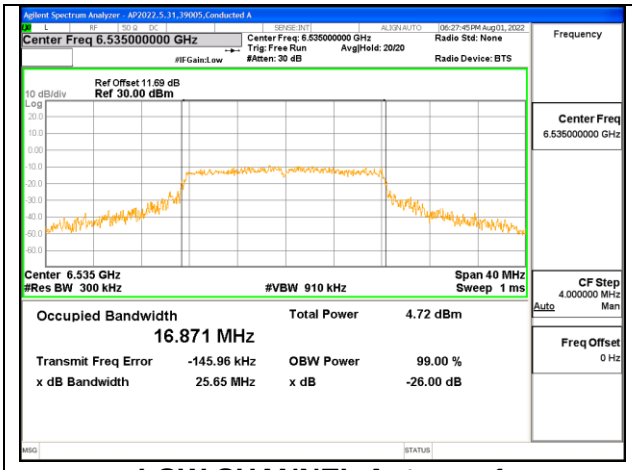
HIGH CHANNEL Antenna 4

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

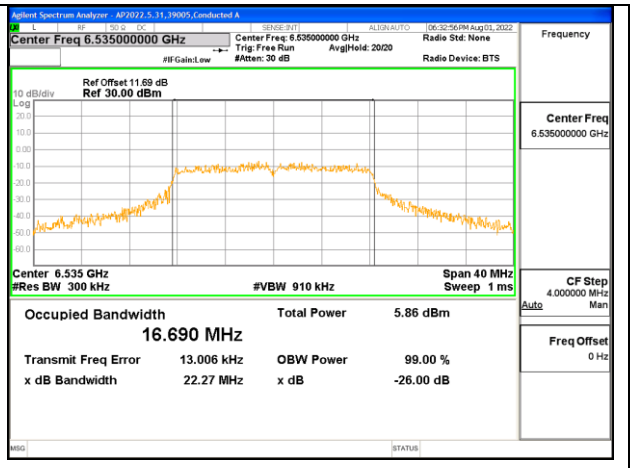
2TX Antenna 1 + Antenna 4 CDD MODE:

Channel	Frequency (MHz)	99% Bandwidth Antenna 1 (MHz)	99% Bandwidth Antenna 4 (MHz)
Low	6535	16.871	16.690
Mid	6715	16.826	16.735
High	6855	17.070	16.703
Straddle	6875	16.898	16.752

LOW CHANNEL

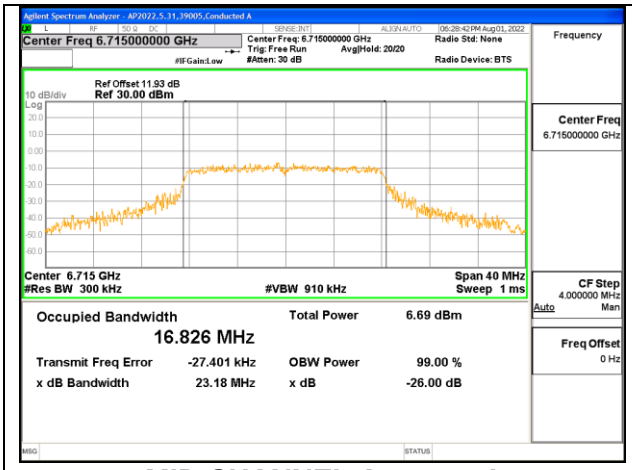


LOW CHANNEL Antenna 1

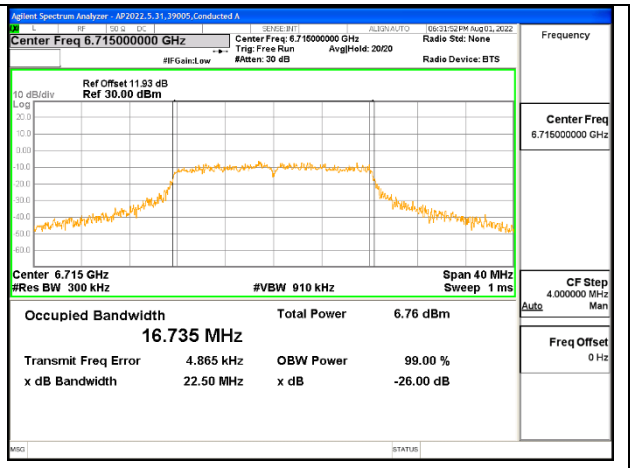


LOW CHANNEL Antenna 4

MID CHANNEL

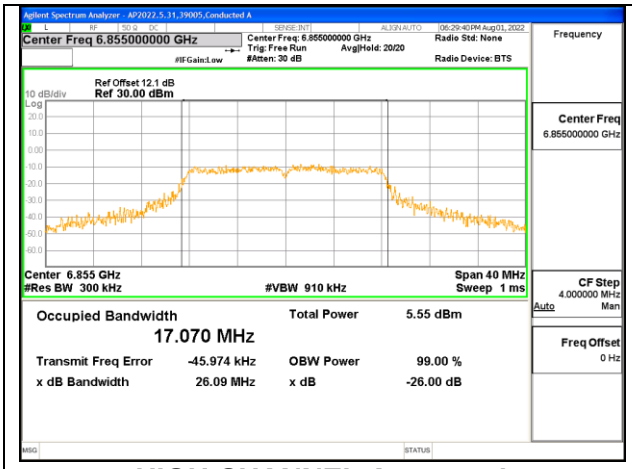


MID CHANNEL Antenna 1

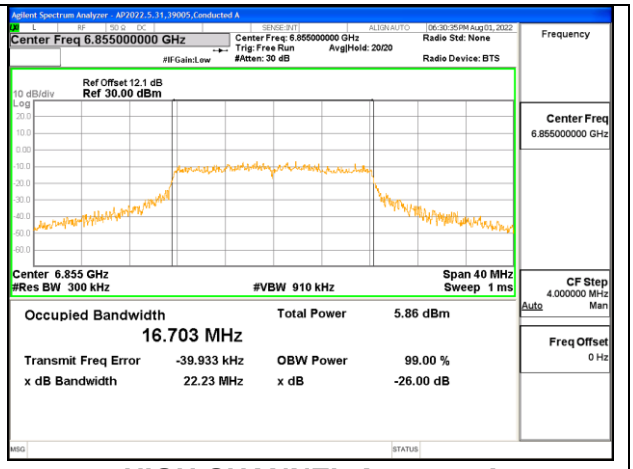


MID CHANNEL Antenna 4

HIGH CHANNEL

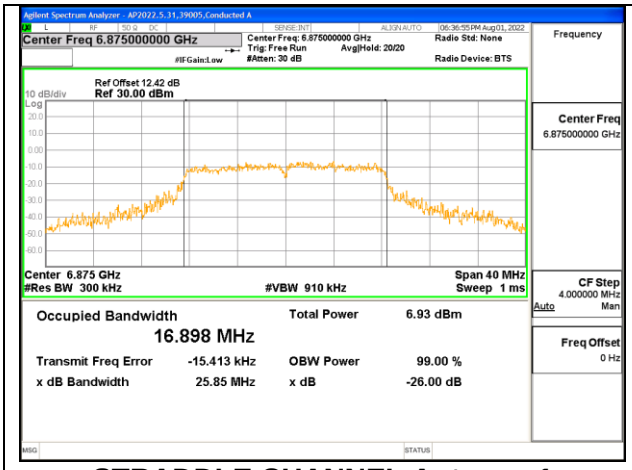


HIGH CHANNEL Antenna 1

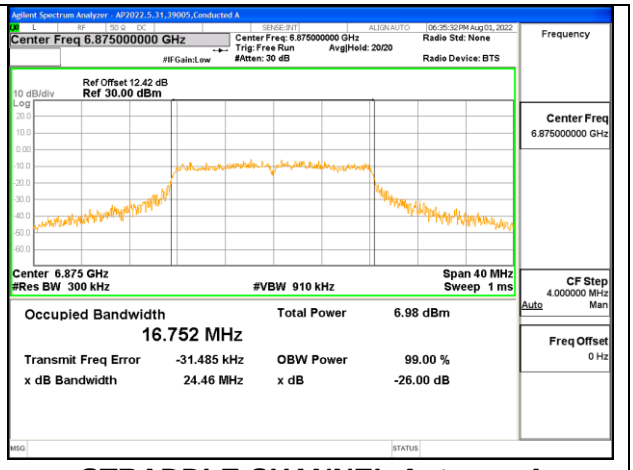


HIGH CHANNEL Antenna 4

STRADDLE CHANNEL



STRADDLE CHANNEL Antenna 1



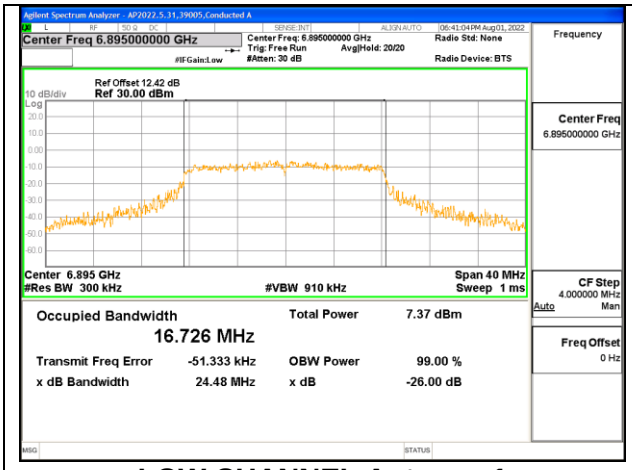
STRADDLE CHANNEL Antenna 4

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

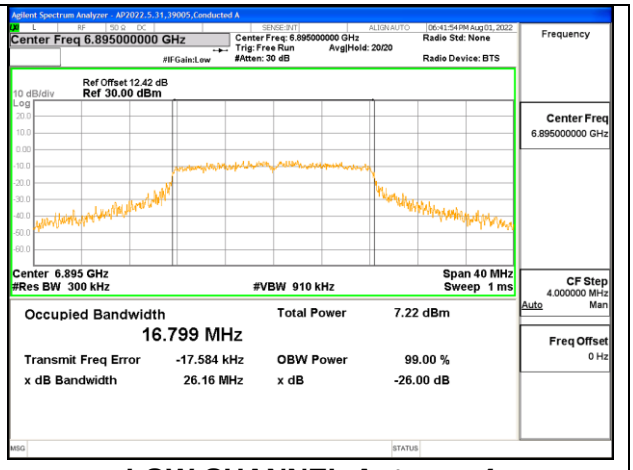
2TX Antenna 1 + Antenna 4 CDD MODE:

Channel	Frequency (MHz)	99% Bandwidth Antenna 1 (MHz)	99% Bandwidth Antenna 4 (MHz)
Low	6895	16.726	16.799
Mid	6995	16.866	16.804
High	7115	16.783	16.788

LOW CHANNEL

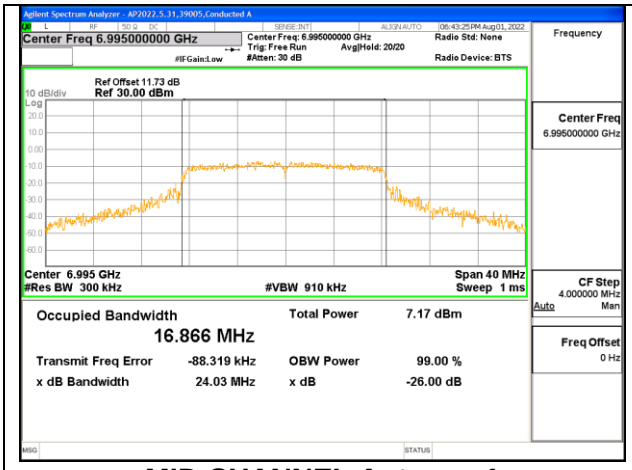


LOW CHANNEL Antenna 1

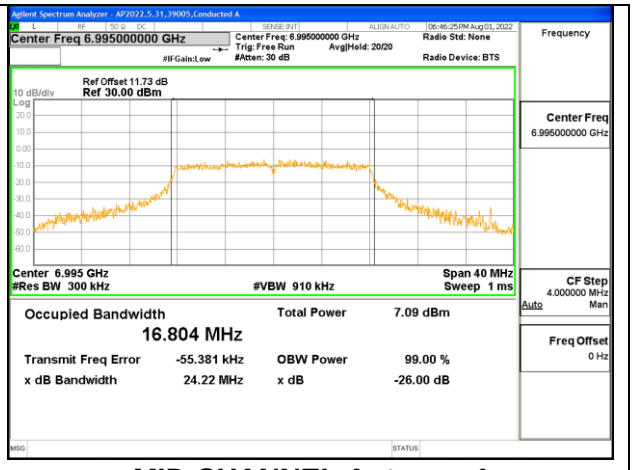


LOW CHANNEL Antenna 4

MID CHANNEL

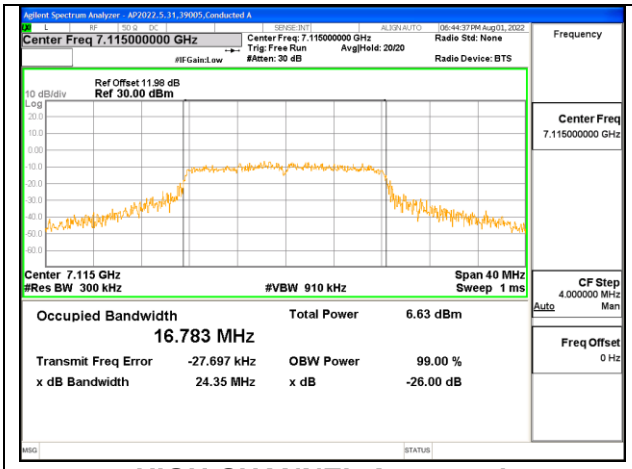


MID CHANNEL Antenna 1

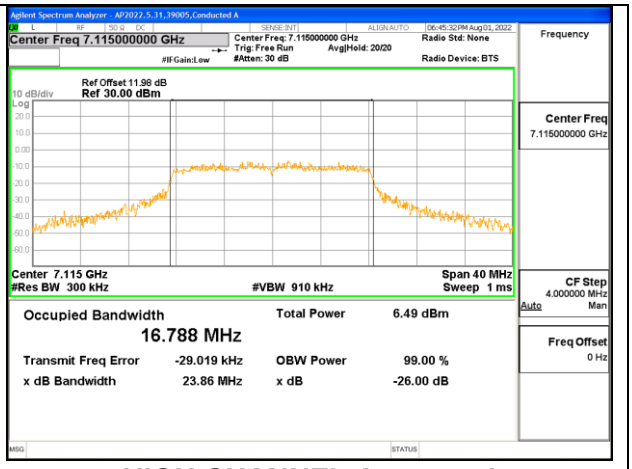


MID CHANNEL Antenna 4

HIGH CHANNEL



HIGH CHANNEL Antenna 1



HIGH CHANNEL Antenna 4

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 power output 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: -33.85 dBm + 57.48 dB – 10.498 dBi – 6.19 dB + 1.07 dB = 8.01 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:

Test Engineer:	SI 23522
2022-08-08	2022-08-08

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

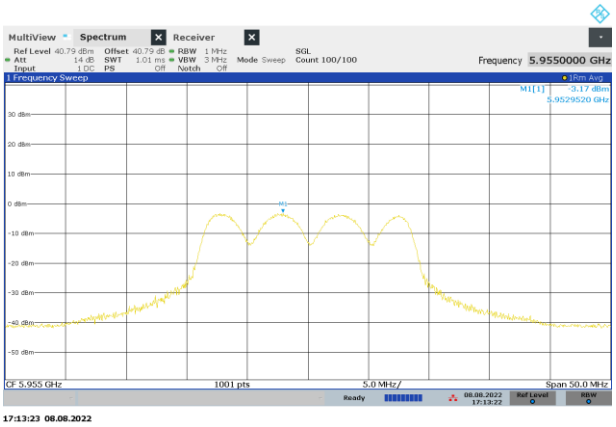
Duty Cycle CF (dB)	1.07	**Included in Calculations of Corr'd Power & PSD**

Output Power Results

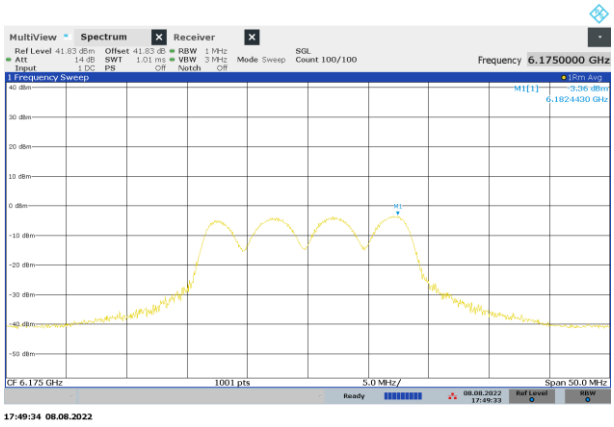
Channel	Frequency (MHz)	Meas EIRP Power (dBm)	Total Corr'd EIRP (dBm)	Power Limit EIRP (dBm)	Power Margin (dB)
Low	5955	6.94	8.01	24.00	-15.99
Mid	6175	7.70	8.77	24.00	-15.23
High	6415	6.66	7.73	24.00	-16.27

PSD Results

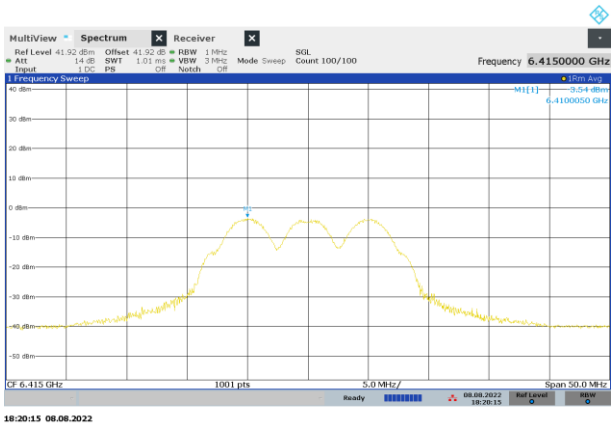
Channel	Frequency (MHz)	Meas EIRP PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5955	-3.17	-2.10	-1.00	-1.10
Mid	6175	-3.36	-2.29	-1.00	-1.29
High	6415	-3.54	-2.47	-1.00	-1.47



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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

2TX Antenna 1 + Antenna 4 CDD MODE:

Test Engineer:	SI 23522
Test Date:	2022-08-08

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

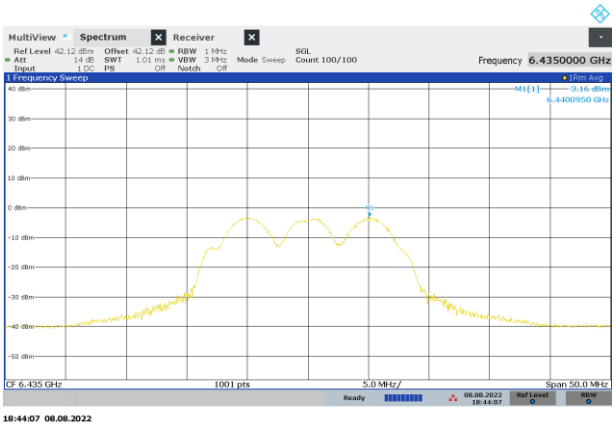
Duty Cycle CF (dB)	1.07	**Included in Calculations of Corr'd Power & PSD**

Output Power Results

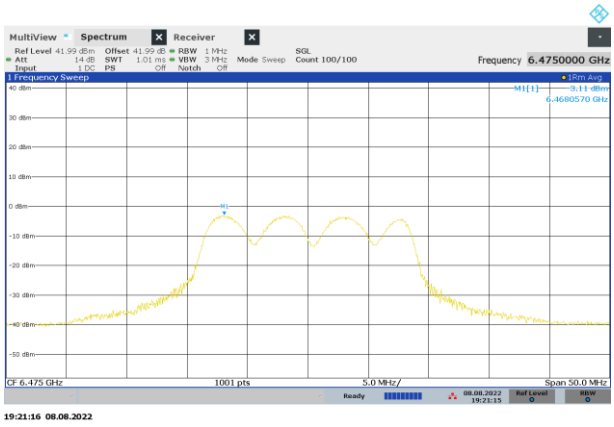
Channel	Frequency (MHz)	Meas EIRP Power (dBm)	Total Corr'd EIRP (dBm)	Power Limit EIRP (dBm)	Power Margin (dB)
Low	6435	6.20	7.27	24.00	-16.73
Mid	6475	7.90	8.97	24.00	-15.04
High	6515	6.54	7.61	24.00	-16.39

PSD Results

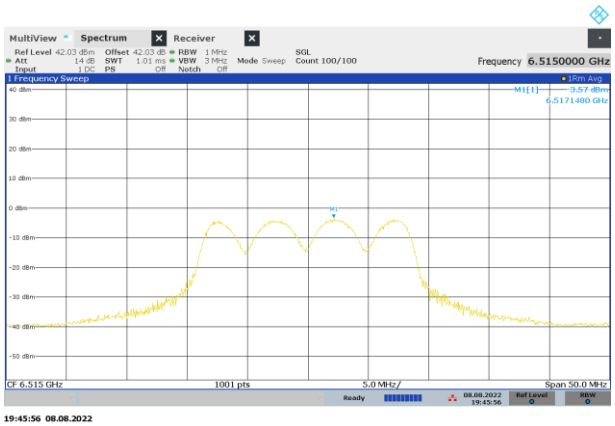
Channel	Frequency (MHz)	Meas EIRP PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	6435	-3.16	-2.09	-1.00	-1.09
Mid	6475	-3.11	-2.04	-1.00	-1.04
High	6515	-3.57	-2.50	-1.00	-1.50



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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

2TX Antenna 1 + Antenna 4 CDD MODE:

Test Engineer:	SI 23522
Test Date:	2022-08-08

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

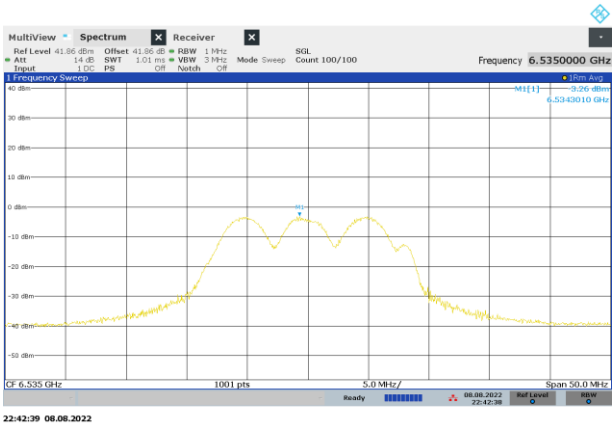
Duty Cycle CF (dB)	1.07	**Included in Calculations of Corr'd Power & PSD**	

Output Power Results

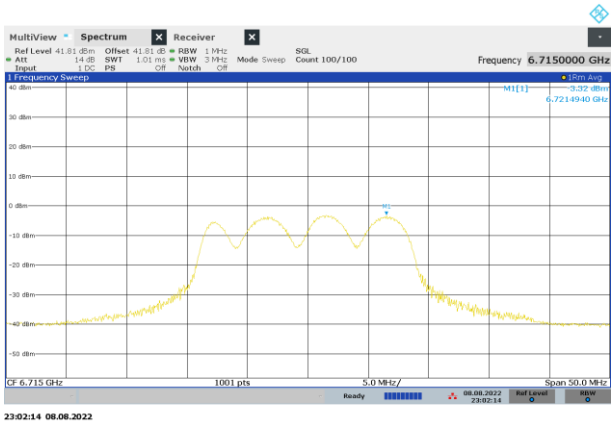
Channel	Frequency (MHz)	Meas EIRP Power (dBm)	Total Corr'd EIRP (dBm)	Power Limit EIRP (dBm)	Power Margin (dB)
Low	6535	7.58	8.65	24.00	-15.35
Mid	6715	6.37	7.44	24.00	-16.56
High	6855	6.36	7.43	24.00	-16.57
Straddle	6875	6.64	7.71	24.00	-16.29

PSD Results

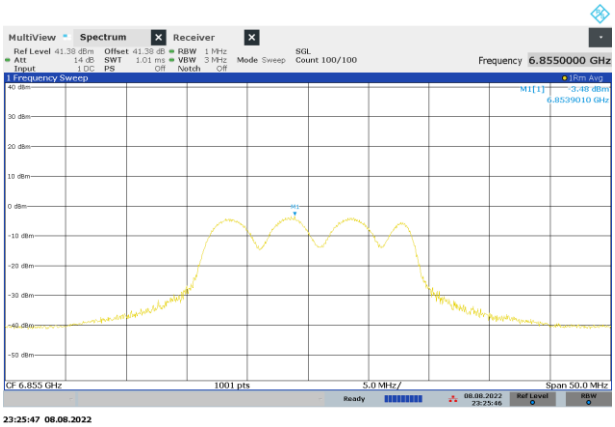
Channel	Frequency (MHz)	Meas EIRP PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	6535	-3.26	-2.19	-1.00	-1.19
Mid	6715	-3.32	-2.25	-1.00	-1.25
High	6855	-3.48	-2.41	-1.00	-1.41
Straddle	6875	-3.18	-2.11	-1.00	-1.11



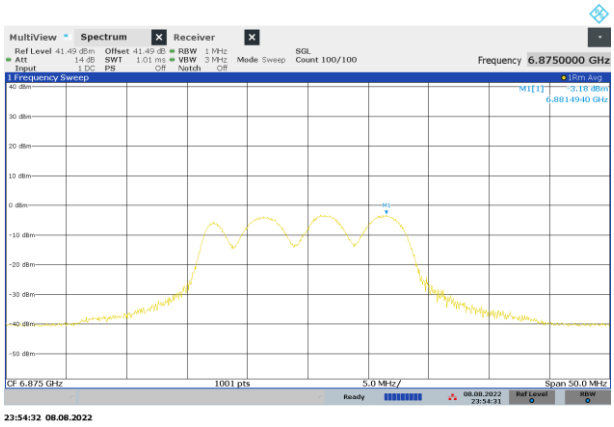
LOW CHANNEL



MID CHANNEL



HIGH CHANNEL



STRADDLE CHANNEL

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

2TX Antenna 1 + Antenna 4 CDD MODE:

Test Engineer:	CW 20756
Test Date:	2022-08-09

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

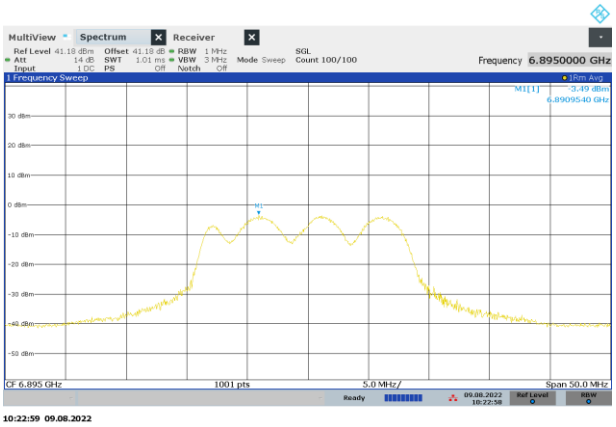
Duty Cycle CF (dB)	1.07	**Included in Calculations of Corr'd Power & PSD**

Output Power Results

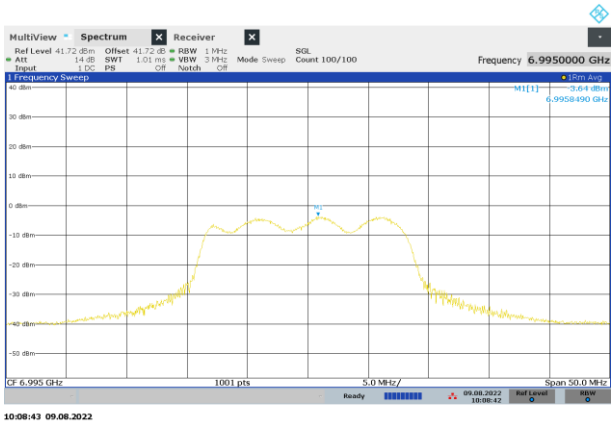
Channel	Frequency (MHz)	Meas EIRP Power (dBm)	Total Corr'd EIRP (dBm)	Power Limit EIRP (dBm)	Power Margin (dB)
Low	6895	7.01	8.08	24.00	-15.92
Mid	6995	7.69	8.76	24.00	-15.24
High	7115	7.33	8.40	24.00	-15.60

PSD Results

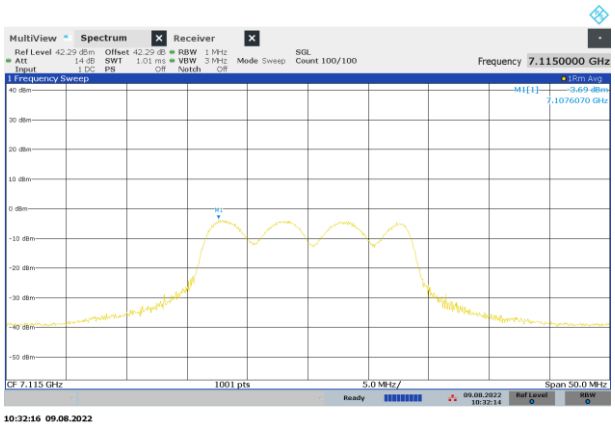
Channel	Frequency (MHz)	Meas EIRP PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	6895	-3.49	-2.42	-1.00	-1.42
Mid	6995	-3.64	-2.57	-1.00	-1.57
High	7115	-3.69	-2.62	-1.00	-1.62



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

9.5. SPURIOUS EMMISSIONS 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.

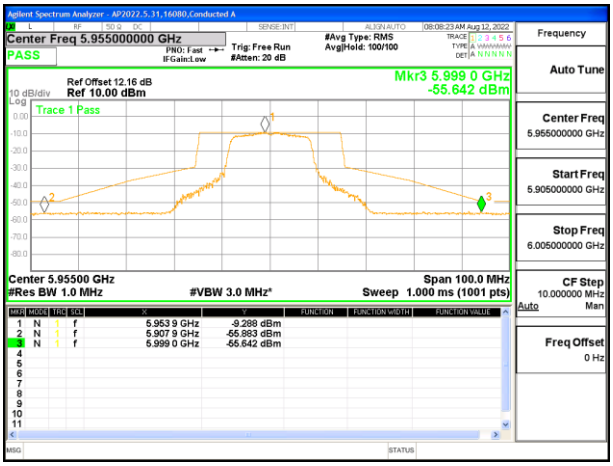
TEST PROCEDURE

Per KDB 987594 D02 v01r01, Section J

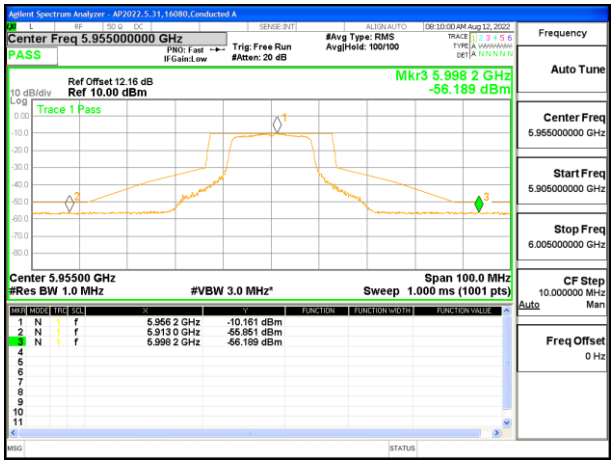
RESULTS

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

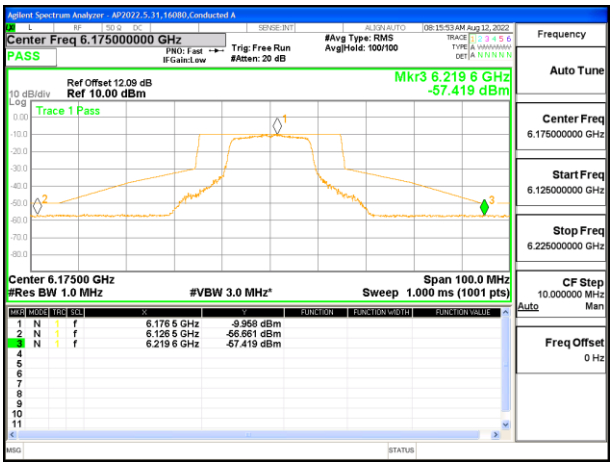
2TX Antenna 1 + Antenna 4 CDD MODE:



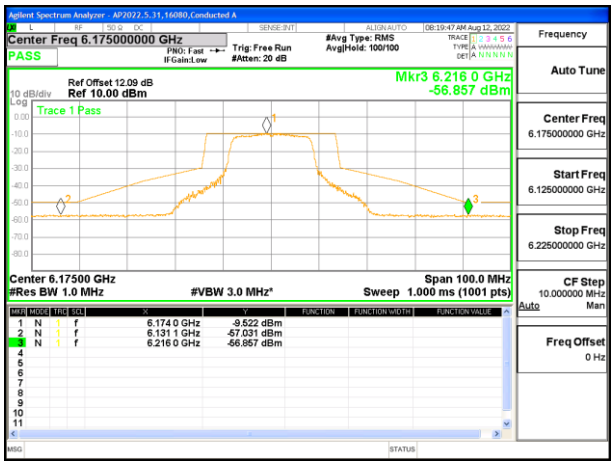
LOW CHANNEL Antenna 1



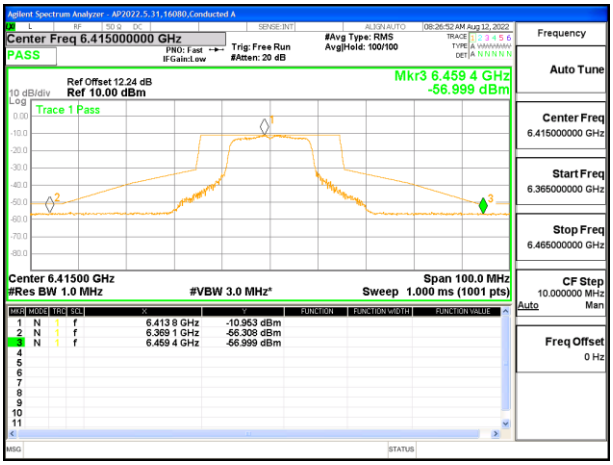
LOW CHANNEL Antenna 4



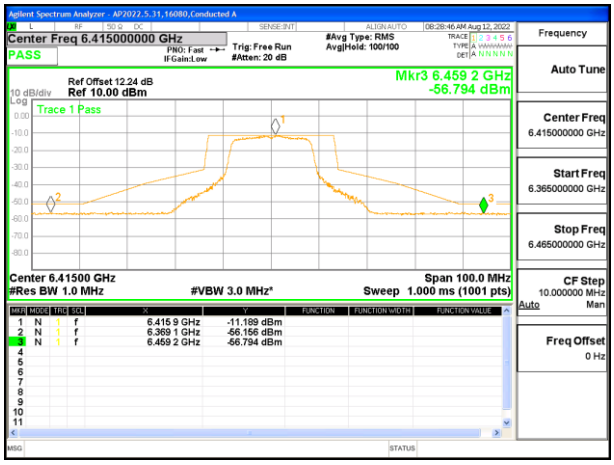
MID CHANNEL Antenna 1



MID CHANNEL Antenna 4



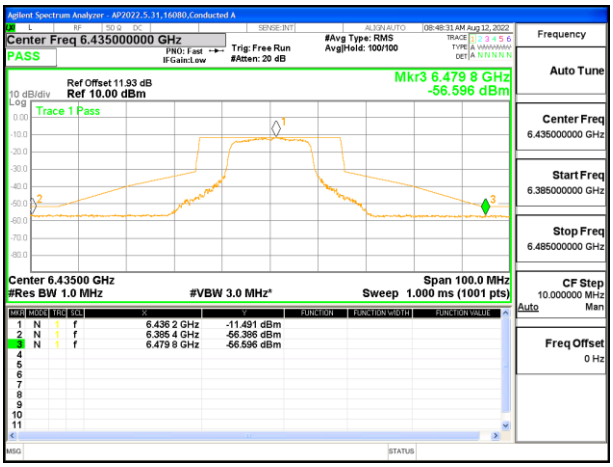
HIGH CHANNEL Antenna 1



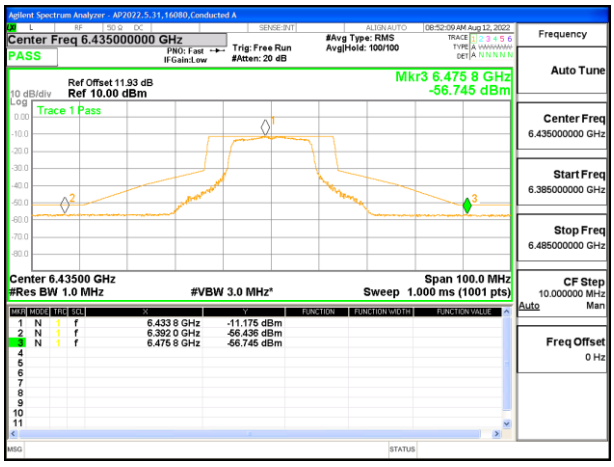
HIGH CHANNEL Antenna 4

9.5.2. 802.11a MODE 2TX IN THE UNII-6 BAND

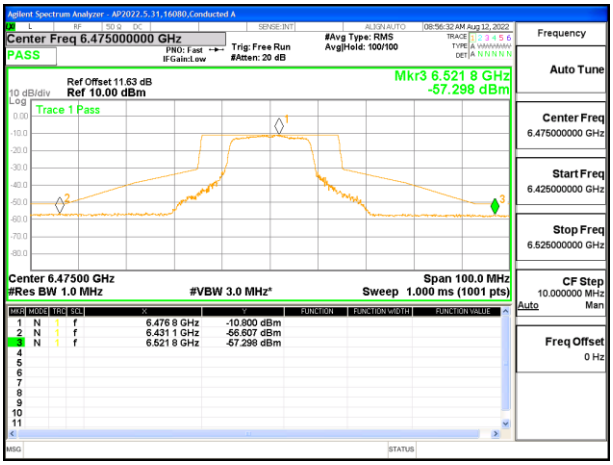
2TX Antenna 1 + Antenna 4 CDD MODE:



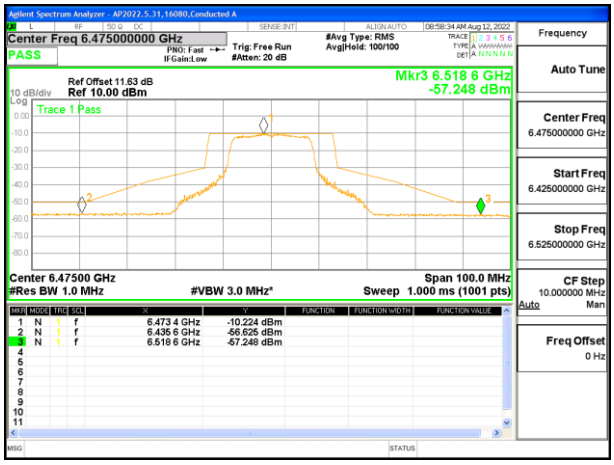
LOW CHANNEL Antenna 1



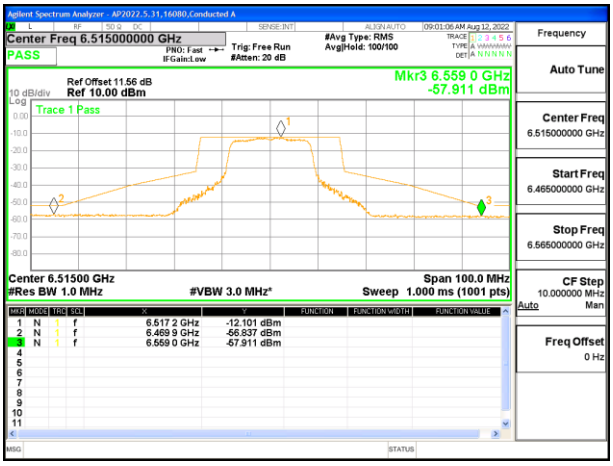
LOW CHANNEL Antenna 4



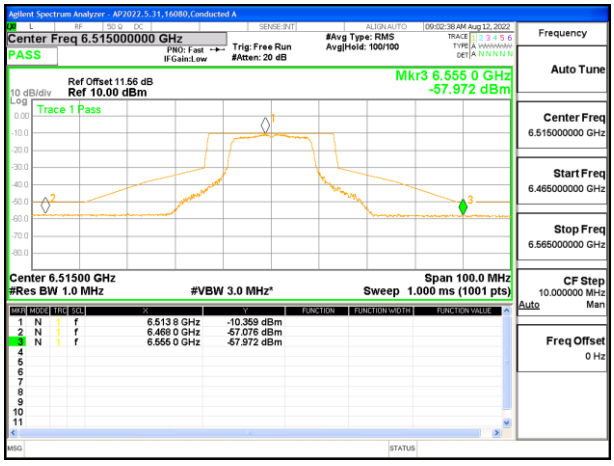
MID CHANNEL Antenna 1



MID CHANNEL Antenna 4



HIGH CHANNEL Antenna 1



HIGH CHANNEL Antenna 4