TEST REPORT

Report Number: 15126863-E4V2

Applicant	:	Sonos, Inc. 301 Coromar Dr. Goleta, CA 93117 USA
Model	:	S55
Brand	:	Sonos
FCC ID	:	SBVRM055
IC	:	5373A-RM055
EUT Description	:	Wireless Smart Speaker
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART E ISED RSS-247 ISSUE 3 ISED RSS-GEN ISSUE 5 + A1 + A2

Date Of Issue:
2024-06-13

Prepared by:
UL VERIFICATION SERVICES
47173 Benicia Street
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CERT #0751.05

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2024-05-30	Initial Issue	---
V2	2024-06-13	Section 9.2.12 updated	Henry Lau

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Sonos, Inc.
301 Coromar Dr
Goleta, CA 93117 USA

EUT DESCRIPTION: Wireless Smart Speaker

MODEL: S55

BRAND: Sonos

SERIAL NUMBER: Radiated: 000E58BF9FD11
Conducted: 000E58661EF23

SAMPLE RECEIPT DATE: 2024-04-01

DATE TESTED: 2024-04-01 to 2024-05-13

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart E	Complies
ISED RSS-247 Issue 3	Complies
ISED RSS-GEN Issue 5 + A1	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.

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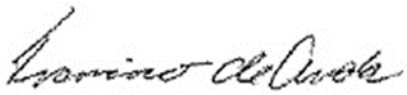
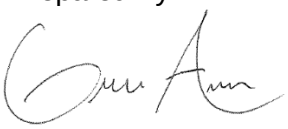
Approved & Released For
UL Verification Services Inc. By:



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

Prepared By:



Gerardo Abrego
Test Engineer
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UL Verification Services Inc.

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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 correctly integrating customer-provided data with measurements performed by UL Verification Services Inc..

FCC Clause	ISED Clause	Requirement	Result	Comment
See Comment		Duty Cycle	Reporting purposes only	Per ANSI C63.10, Section 12.2.
See Comment	RSS-GEN 6.7	26dB BW/99% OBW	Reporting purposes only	Per ANSI C63.10 Sections 6.9.2 and 6.9.3
15.407 (e)	RSS-247 6.2.4.2	6 dB BW	Complies	None.
15.407 (a) (1-3), (h) (1)	RSS-247 6.2	Output Power	Complies	None.
15.407 (a) (1-3)	RSS-247 6.2	PSD	Complies	None.
15.209, 15.205, 15.407 (b)	RSS-GEN 8.9, 8.10, RSS-247 6.2	Radiated Emissions	Complies	None.
15.207	RSS-Gen 8.8	AC Mains Conducted Emissions	Complies	None.

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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,
- FCC KDB 905462 D02 /D03 /D06
- FCC KDB 789033 D02,
- FCC KDB 414788 D01 Radiated Test Site
- ANSI C63.10-2013,
- RSS-GEN Issue 5 + A1
- RSS-247 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
☒	Building 1: 47173 Benicia Street, Fremont, CA 94538, USA	US0104	2324A	550739
☐	Building 2: 47266 Benicia Street, Fremont, CA 94538, USA			
☐	Building 3: 843 Auburn Court, Fremont, CA 94538, USA			
☒	Building 4: 47658 Kato Rd, Fremont, CA 94538, USA			
☐	Building 5: 47670 Kato Rd, Fremont, CA 94538, USA			

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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}
Radio Frequnecy (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
Relative Humidity	3.39%
DC Supply Voltages	0.57%

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

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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

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6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a Wireless Smart Speaker

.

This report covers non-ax 5GHz Wifi radio

6.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

FCC+IC)

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.2 GHz band, 2TX			
5180-5240	802.11a	10.68	11.69
5180-5240	802.11n HT20	11.04	12.71
5190-5230	802.11n HT40	12.92	19.59
5210	802.11ac VHT80	16.28	42.46
5.3 GHz band, 2TX			
5260-5320	802.11a	17.60	57.54
5260-5320	802.11n HT20	17.53	56.62
5270-5310	802.11n HT40	18.02	63.39
5290	802.11ac VHT80	14.37	27.35
5.6 GHz band, 2TX			
5500 - 5700	802.11a	17.34	54.20
5500 - 5700	802.11n HT20	17.27	53.33
5510 - 5670	802.11n HT40	18.70	74.13
5530 - 5610	802.11ac VHT80	20.09	102.09
5.8 GHz band, 2TX			
5745 - 5825	802.11a	25.24	334.20
5745 - 5825	802.11n HT20	25.17	328.85
5755 -5795	802.11n HT40	24.73	297.17
5775	802.11ac VHT80	21.07	127.94

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6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes 4 antennas for diversity, chain 0 connects ANT 1 and ANT2, chain 1 connects to ANT3 and ANT 4. Manufacturer has declared that Antenna 1 and Antenna 3 are worst-case combination for the 5.2GHz, 5.3GHz, & 5.6GHz bands and Antenna 2 and Antenna 4 for the 5.8GHz band and result in worst-case antenna gains

The antenna(s) gain and type, as provided by the manufacturer' are as follows:

Frequency Range (MHz)	Type	Declared Uncorrelated Gain (dBi)	Declared correlated Gain (dBi)
5150 – 5250	PCB	6.1	9.1
5250 – 5350		6.0	9.0
5500 – 5700		6.1	8.7
5725 - 5850		5.8	8.0

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was 78.1-48130-diag-jaws-dev-woosung-202312211600.

6.5. WORST-CASE CONFIGURATION AND MODE

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.

Band edge and radiated emissions between 1GHz and 18GHz were performed with the EUT set to transmit at the highest power on low, middle, and high channels.

Note: 802.11ac VHT20 and VHT40 has the same power as 802.11n HT20 and 802.11n HT40 so 802.1n HT20 and 802.11n HT40 were tested asworst case.

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

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The fundamental of the EUT was investigated in the antenna combinations, it was determined that:
ANT1 and ANT3 was the worst case in the 5.2GHz, 5.3GHz, & 5.6GHz bands.
ANT2 and ANT4 was the worst case in the 5.8GHz band.
Therefore, all final testing was performed with ANT1 and ANT3 and ANT2 and ANT4 as stated above.

Worst-case data rates as provided by the client were:

802.11a mode: 6 Mbps
802.11n HT20 mode: MCS0
802.11n HT40 mode: MCS0
802.11ac VHT80 mode: MCS0

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6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

SUPPORT TEST EQUIPMENT				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID/ DoC**
Laptop	Lenovo	X1 Carbon	R90HKAXZ	Doc
Laptop AC/DC AC/DC Adapter	Lenovo	ADLX90NLC2A	11S45N0247Z1ZS9B54B8EJ	Doc
USB-A to Ethernet Adapter	Plugable	USB2-E100	8CAE4CEBE0D9	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	AC/DC Adapter to Laptop
3	USB-A to Ethernet Adapter	1	USB-A	Shielded	0.5	Laptop to EUT
4	Ethernet	1	RJ45	Un-shielded	1	Laptop to USB Ethernet Adapter
5	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	AC/DC Adapter to Laptop
3	USB-A to Ethernet Adapter	1	USB-A	Shielded	0.5	Laptop to EUT
4	Ethernet	1	RJ45	Un-shielded	1	Laptop to USB Ethernet Adapter
5	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 remotely by Sonos Compliance GUI test utility software via ethernet.

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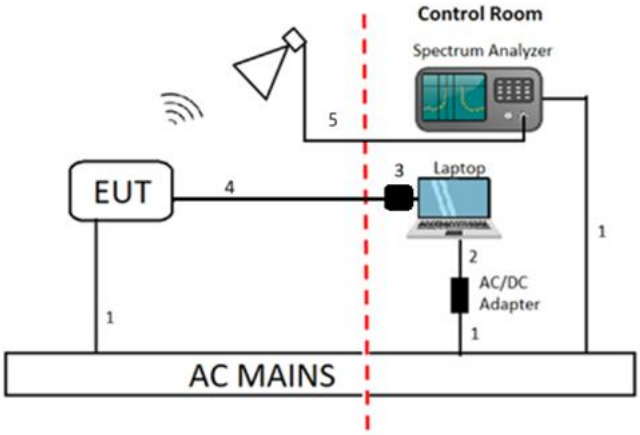
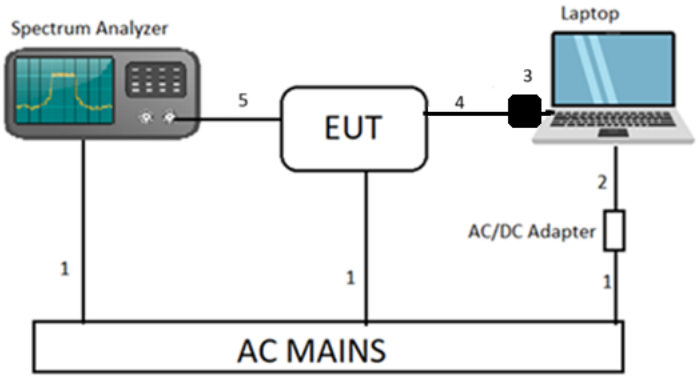
SETUP DIAGRAMS

Radiated Configuration



Conducted/AC Line Configuration



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7. MEASUREMENT METHOD

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

6 dB Emission BW: KDB 789033 D02 v02r01, Section C.2

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

99% Occupied BW: KDB 789033 D02 v02r01, Section D.

Conducted Output Power: KDB 789033 D02 v02r01, Section E.3.b (Method PM-G) and KDB 789033 D02 v02r01, Section E.2.b (Method SA-1)

Power Spectral Density: KDB 789033 D02 v02r01, Section F

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

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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	2025-04-30	2023-04-11
Amplifier, 9KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	213877	2025-03-31	2024-03-25
Antenna, Horn 1-18GHz	ETS-Lindgren (Cedar Park, Texas)	3117	222741	2024-08-31	2022-08-31
Antenna, Horn 1-18GHz	ETS-Lindgren (Cedar Park, Texas)	3117	206805	2024-07-31	2023-07-11
Antenna, Horn 1-18GHz	ETS-Lindgren (Cedar Park, Texas)	3117	80404	2024-08-31	2023-08-31
RF Filter Box, 1-18GHz	FREMONT	6 Port Silver box	171013	2024-05-31	2023-05-04
RF Filter Box, 1-18GHz	FREMONT	n/a	171875	2025-03-31	2024-03-23
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	191429	2025-02-28	2024-02-11
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	230547	2025-02-28	2024-02-11
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	225688 (chamber k)	2025-02-11	2024-02-11
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826/B	199659	2024-12-31	2022-12-06
Amplifier 18-26.5GHz, +5Vdc, 60dB min	AMPLICAL	AMP18G26.5-60	234683	2025-03-31	2024-03-31
Antenna, Passive Loop 30Hz - 1MHz	ELECTRO METRICS	EM-6871	219908	2024-09-30	2023-09-13
Antenna, Passive Loop 100KHz - 30MHz	ELECTRO METRICS	EM-6872	219910	2024-05-31	2023-05-31
Spectrum Analyzer, PXA, 2Hz to 26.5GHz	Keysight Technologies Inc	N9030B	245121	2025-02-07	2024-02-07
Power Meter, P-series single channel	Keysight Technologies Inc	N1911A	90718	2025-01-31	2024-01-25
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight Technologies Inc	N1921A	90388	2024-06-30	2023-06-23
AC Line Conducted					
LISN	Fischer Custom Communications, Inc`	FCC-LISN-50/250-25-2-01-480V	175765	2025-01-31	2024-01-26
EMI TEST RECEIVER	Rohde & Schwarz	ESR	171646	2025-02-28	2024-02-27
Transient Limiter	TE	TBFL1	127455	2025-02-28	2024-02-27
UL TEST SOFTWARE LIST					
Radiated Software	UL	UL EMC	Ver 2023-05-01		
Antenna Port Software	UL	UL RF	Ver 2022-08-16		
AC Line Conducted Software	UL	UL EMC	Rev 9.5, 2023-03-03		

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9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

Test Engineer:	ZS 16080
Test Date:	2024-04-01

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	2.756	3.421	0.806	80.56	0.94	0.363
802.11n HT20	5.084	5.832	0.872	87.17	0.60	0.197
802.11n HT40	2.467	3.205	0.770	76.97	1.14	0.405
802.11ac VHT80	1.164	1.919	0.607	60.66	2.17	0.859

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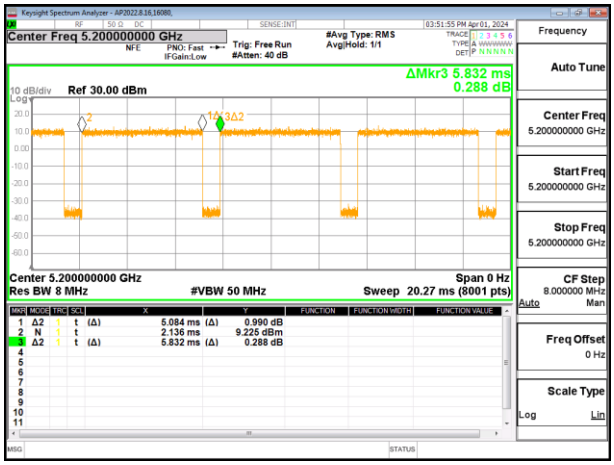
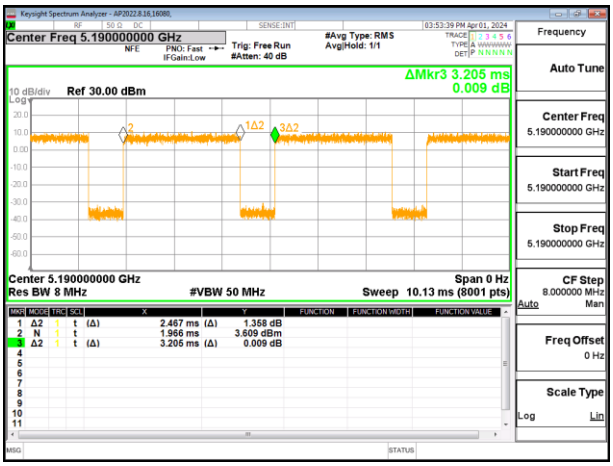
DUTY CYCLE PLOTS

DUTY CYCLE 802.11a MODE



DUTY CYCLE 802.11n HT20 MODE



DUTY CYCLE 802.11n HT40 MODE

DUTY CYCLE 802.11ac VHT80 MODE

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9.2. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

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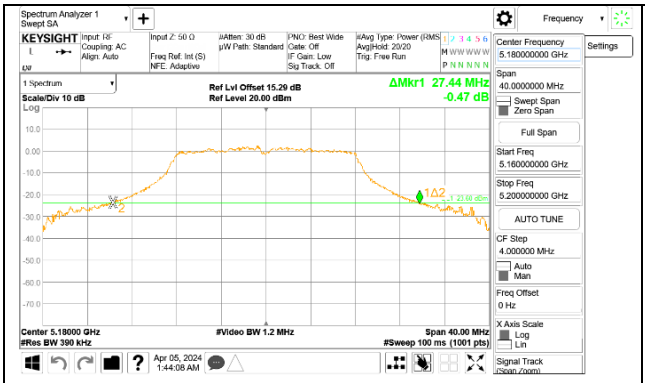
9.2.1. 802.11a MODE IN THE 5.2 GHz BAND

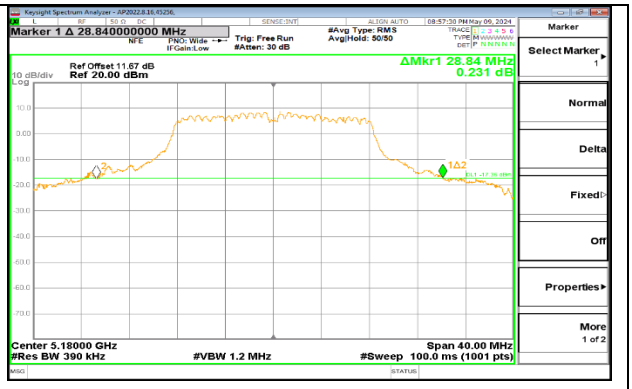
2TX Antenna 1 + Antenna 3 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 1 (MHz)	26 dB Bandwidth Antenna 3 (MHz)
Low	5180	27.44	28.84
Mid	5200	27.92	26.28
High	5240	28.24	26.08

LOW CHANNEL



LOW CHANNEL ANT 1



LOW CHANNEL ANT 3

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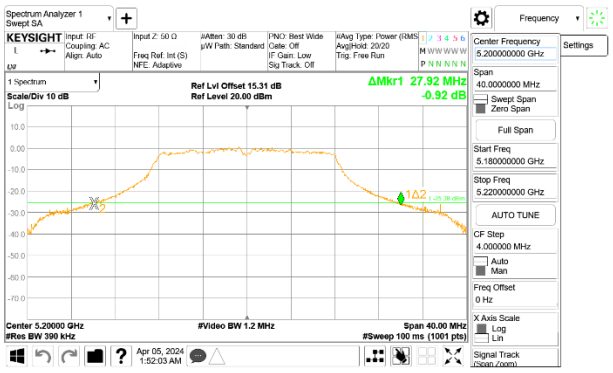
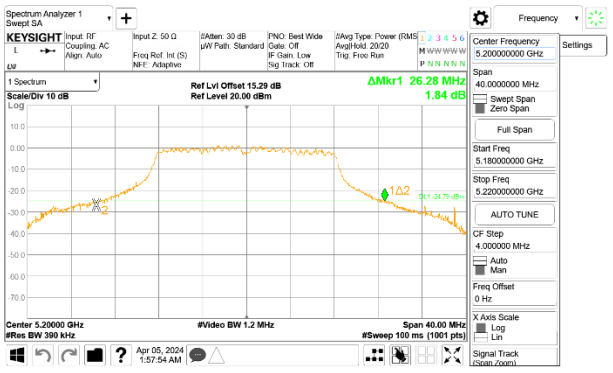
MID CHANNEL



MID CHANNEL ANT 1



MID CHANNEL ANT 3

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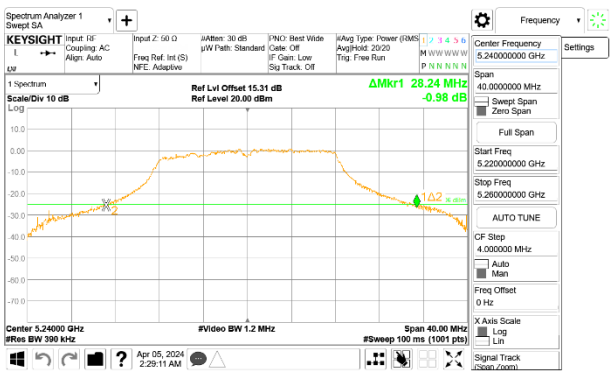
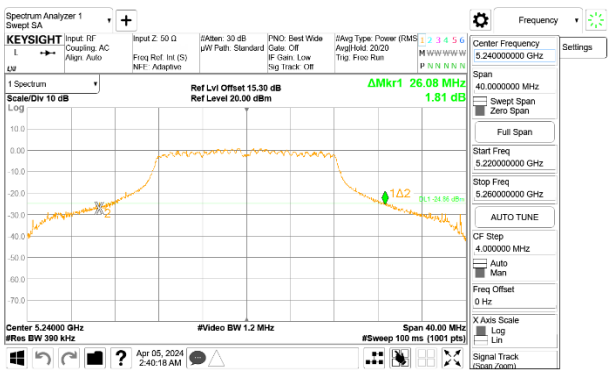
HIGH CHANNEL



HIGH CHANNEL ANT 1



HIGH CHANNEL ANT 3

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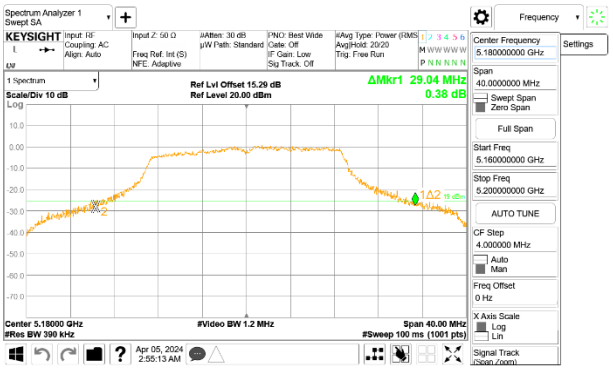
9.2.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND

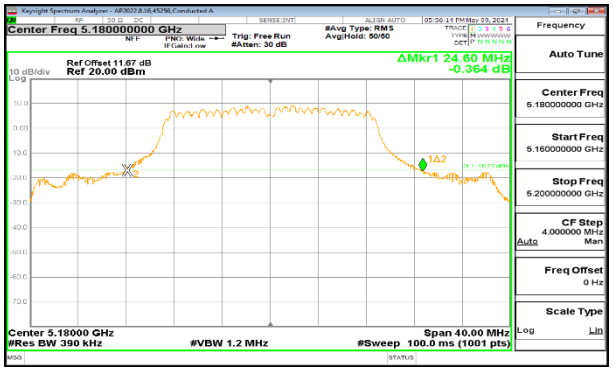
2TX Antenna 1 + Antenna 3 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 1 (MHz)	26 dB Bandwidth Antenna 3 (MHz)
Low	5180	29.04	24.60
Mid	5200	28.64	24.68
High	5240	29.16	24.64

LOW CHANNEL



LOW CHANNEL ANT 1



LOW CHANNEL ANT 3

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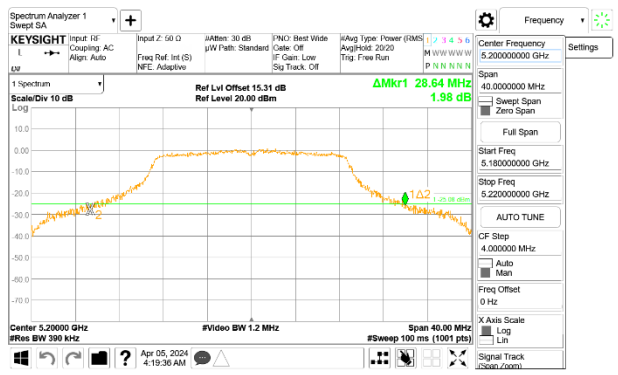
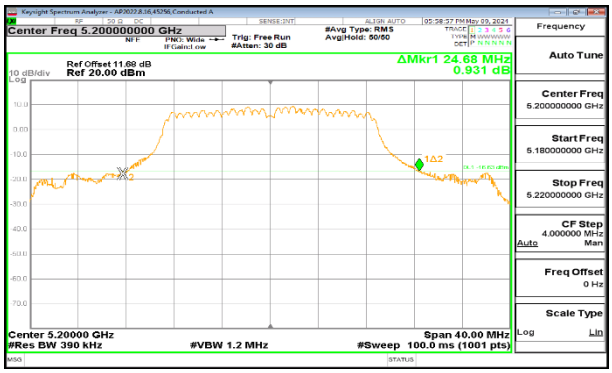
MID CHANNEL



MID CHANNEL ANT 1



MID CHANNEL ANT 3

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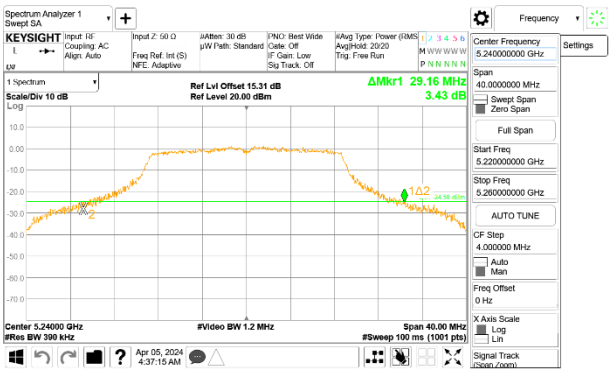
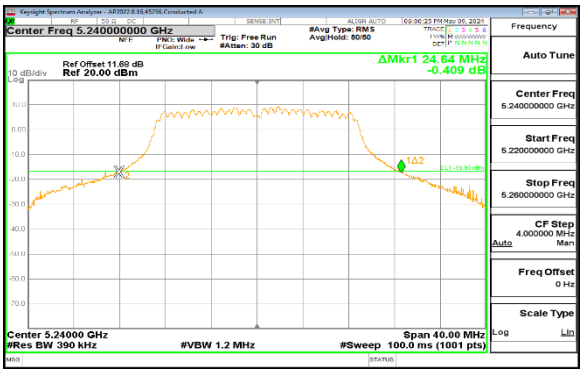
HIGH CHANNEL



HIGH CHANNEL ANT 1



HIGH CHANNEL ANT 3

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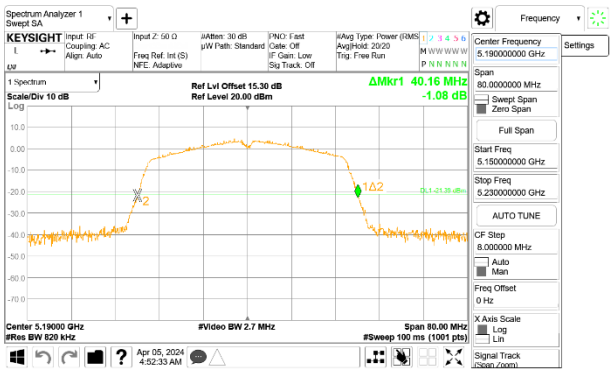
9.2.3. 802.11n HT40 MODE IN THE 5.2 GHz BAND

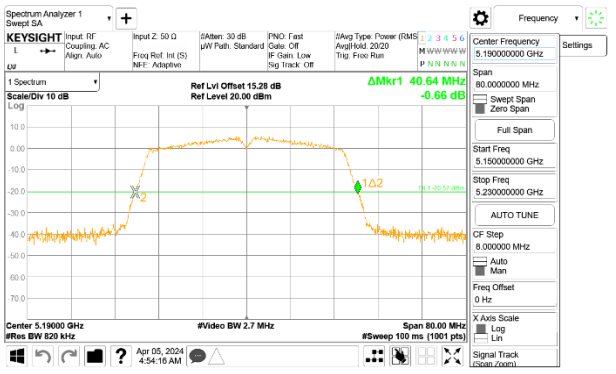
2TX Antenna 1 + Antenna 3 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 1 (MHz)	26 dB Bandwidth Antenna 3 (MHz)
Low	5190	40.16	40.64
High	5230	41.28	40.96

LOW CHANNEL



LOW CHANNEL ANT 1



LOW CHANNEL ANT 3

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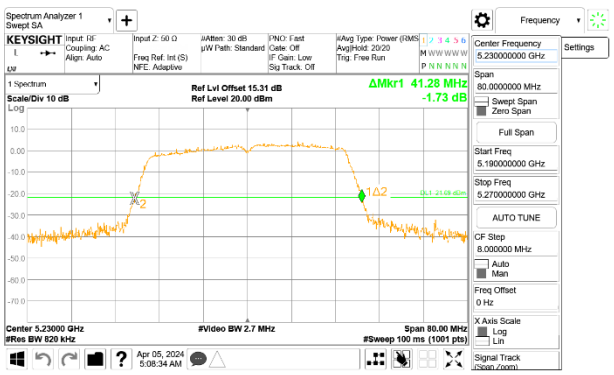
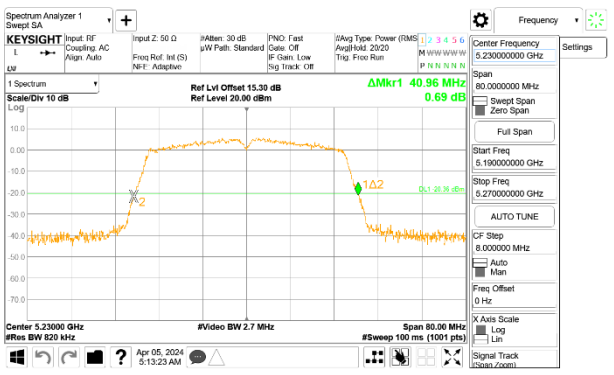
HIGH CHANNEL



HIGH CHANNEL ANT 1



HIGH CHANNEL ANT 3

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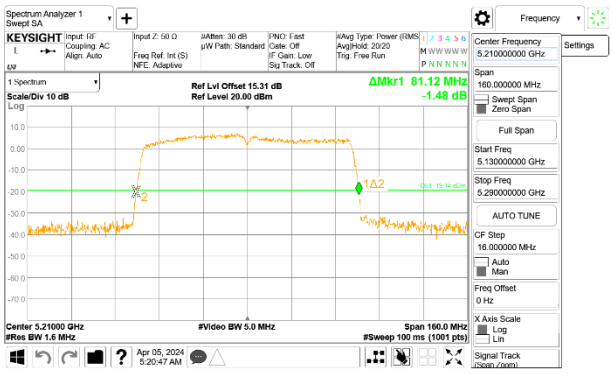
9.2.4. 802.11ac VHT80 MODE IN THE 5.2 GHz BAND

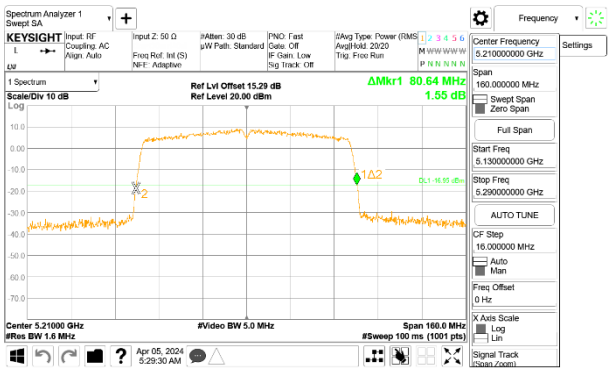
2TX Antenna 1 + Antenna 3 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 1 (MHz)	26 dB Bandwidth Antenna 3 (MHz)
Mid	5210	81.12	80.64

MID CHANNEL



MID CHANNEL ANT 1



MID CHANNEL ANT3

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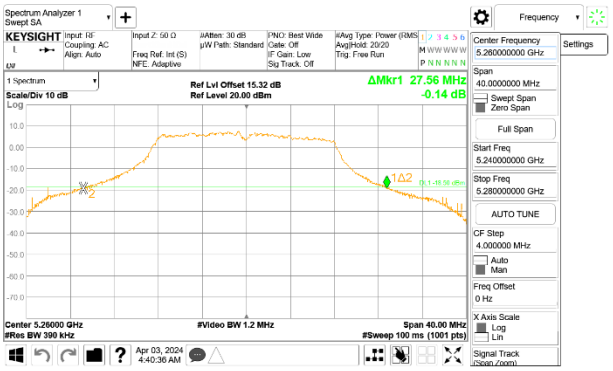
9.2.5. 802.11a MODE IN THE 5.3 GHz BAND

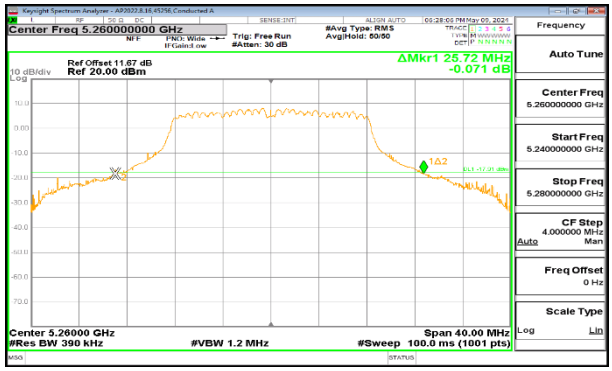
2TX Antenna 1 + Antenna 3 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 1 (MHz)	26 dB Bandwidth Antenna 3 (MHz)
Low	5260	27.56	25.72
Mid	5300	27.64	25.52
High	5320	27.92	25.72

LOW CHANNEL



LOW CHANNEL ANT 1



LOW CHANNEL ANT 3

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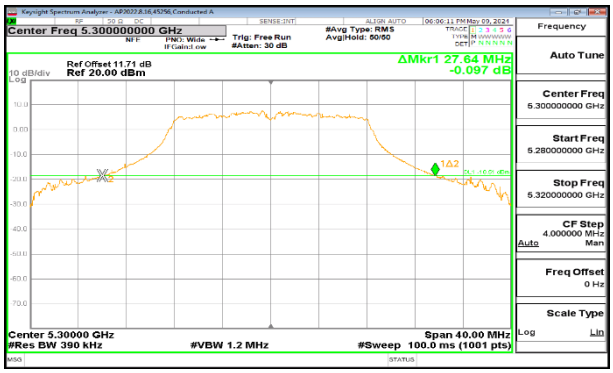
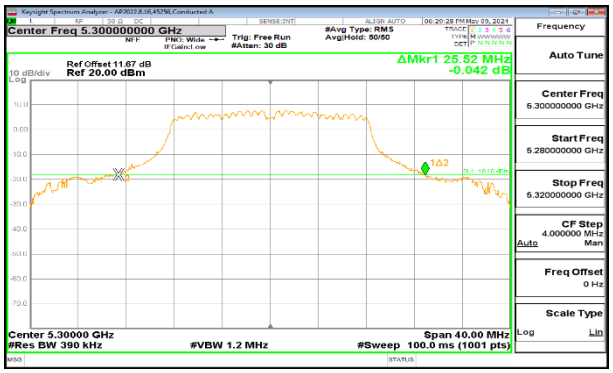
MID CHANNEL



MID CHANNEL ANT 1



MID CHANNEL ANT 3

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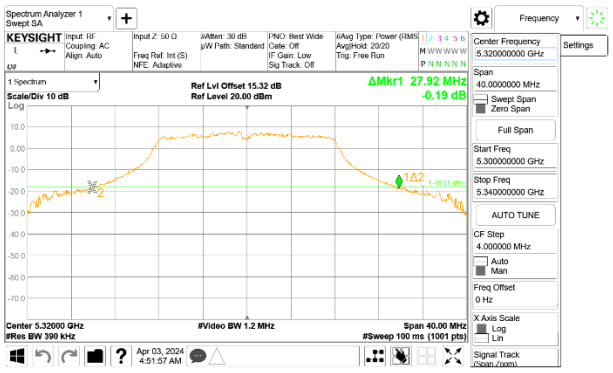
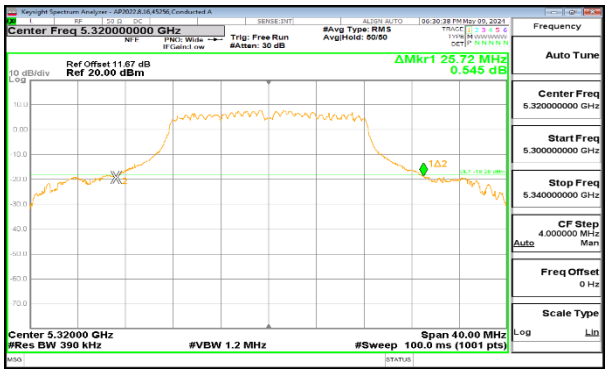
HIGH CHANNEL



HIGH CHANNEL ANT 1



HIGH CHANNEL ANT 3

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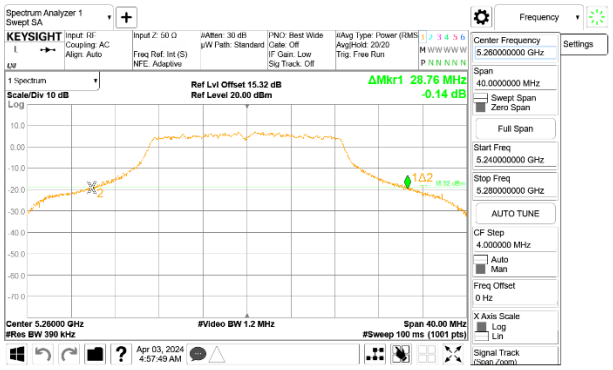
9.2.6. 802.11n HT20 MODE IN THE 5.3 GHz BAND

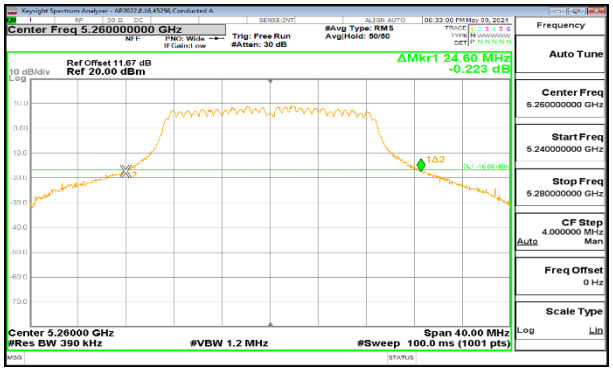
2TX Antenna 1 + Antenna 3 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 1 (MHz)	26 dB Bandwidth Antenna 3 (MHz)
Low	5260	28.76	24.60
Mid	5300	27.24	24.48
High	5320	28.44	24.44

LOW CHANNEL



LOW CHANNEL ANT 1



LOW CHANNEL ANT 3

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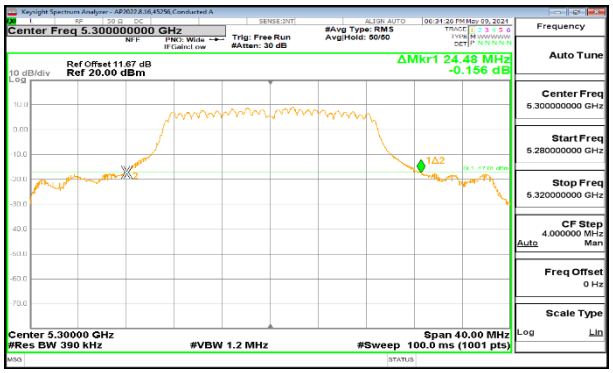
MID CHANNEL

MID CHANNEL ANT 1



MID CHANNEL ANT 3

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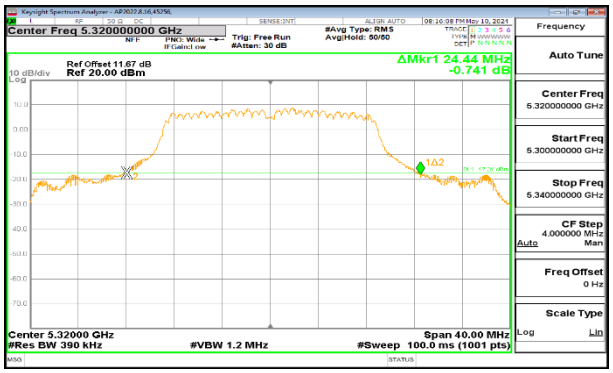
HIGH CHANNEL

HIGH CHANNEL ANT 1



HIGH CHANNEL ANT 3

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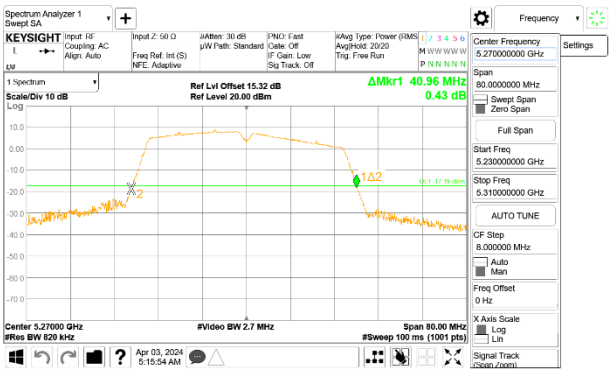
9.2.7. 802.11n HT40 MODE IN THE 5.3 GHz BAND

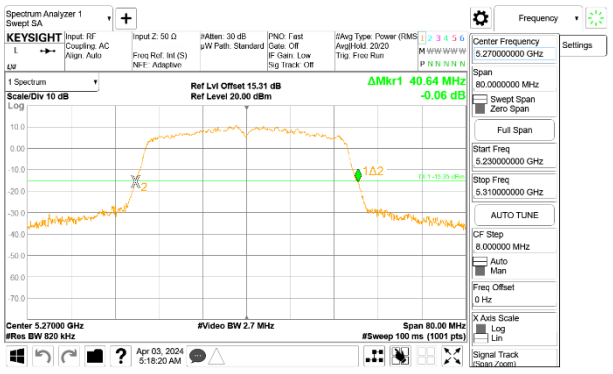
2TX Antenna 1 + Antenna 3 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 1 (MHz)	26 dB Bandwidth Antenna 3 (MHz)
Low	5270	40.96	40.64
High	5310	40.40	40.56

LOW CHANNEL



LOW CHANNEL ANT 1



LOW CHANNEL ANT 3

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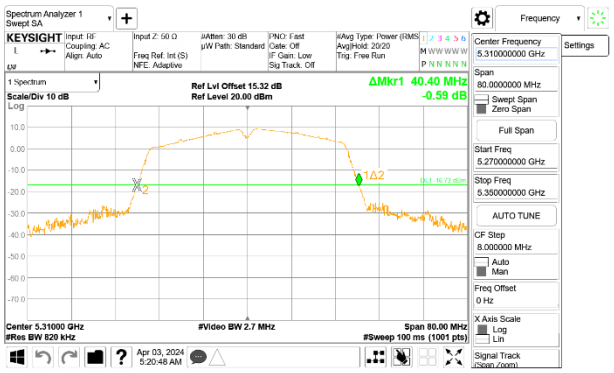
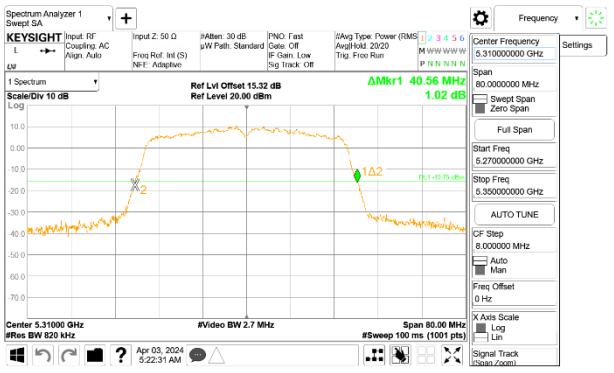
HIGH CHANNEL



HIGH CHANNEL ANT 1



HIGH CHANNEL ANT 3

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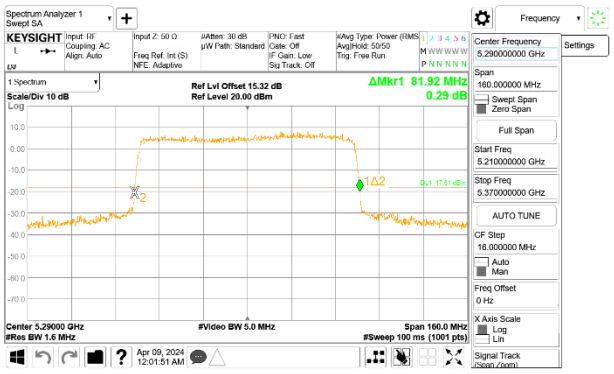
9.2.8. 802.11ac VHT80 MODE IN THE 5.3 GHz BAND

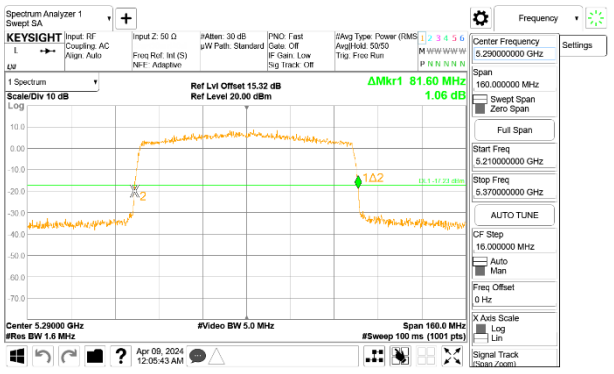
2TX Antenna 1 + Antenna 3 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 1 (MHz)	26 dB Bandwidth Antenna 3 (MHz)
Mid	5290	81.92	81.60

MID CHANNEL



MID CHANNEL ANT 1



MID CHANNEL ANT 3

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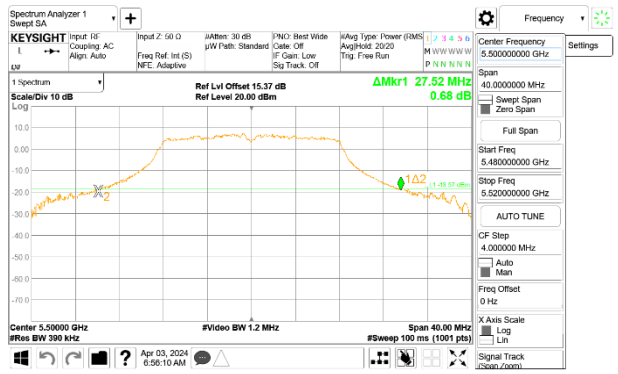
9.2.9. 802.11a MODE IN THE 5.6 GHz BAND

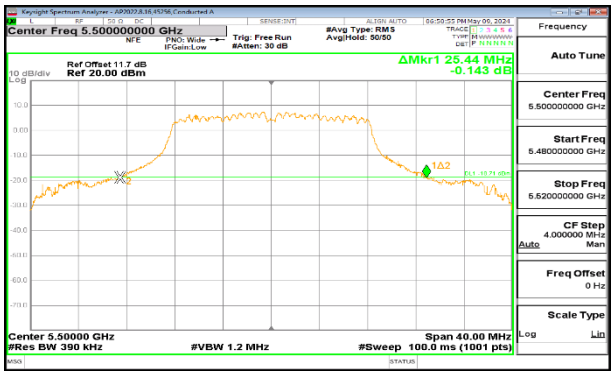
2TX Antenna 1 + Antenna 3 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 1 (MHz)	26 dB Bandwidth Antenna 3 (MHz)
Low	5500	27.52	25.44
Mid	5580	28.04	24.84
High	5700	27.48	25.48

LOW CHANNEL



LOW CHANNEL ANT 1



LOW CHANNEL ANT 3

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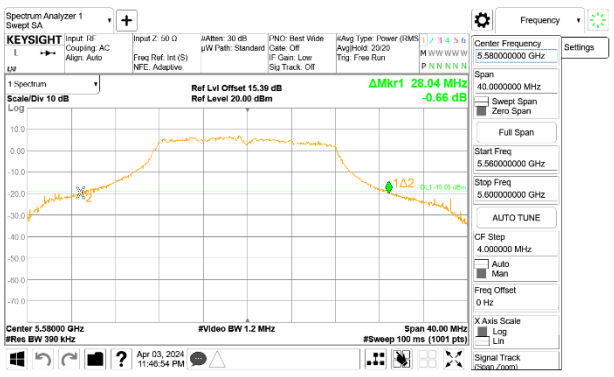
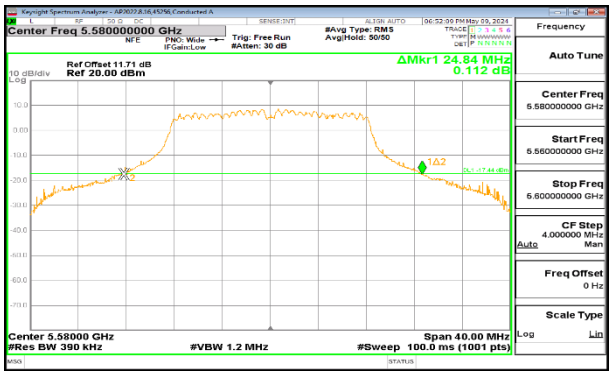
MID CHANNEL



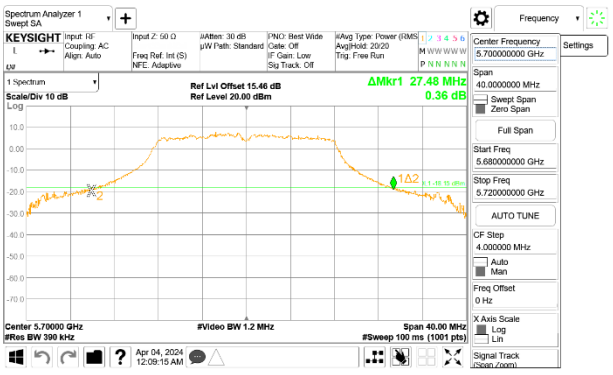
MID CHANNEL ANT 1



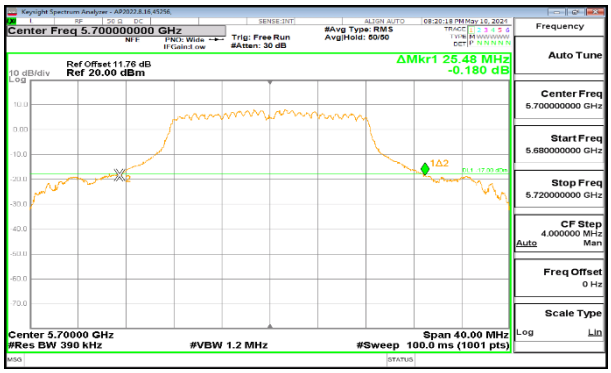
MID CHANNEL ANT 3

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

HIGH CHANNEL



HIGH CHANNEL ANT 1



HIGH CHANNEL ANT 3

UL VERIFICATION SERVICES
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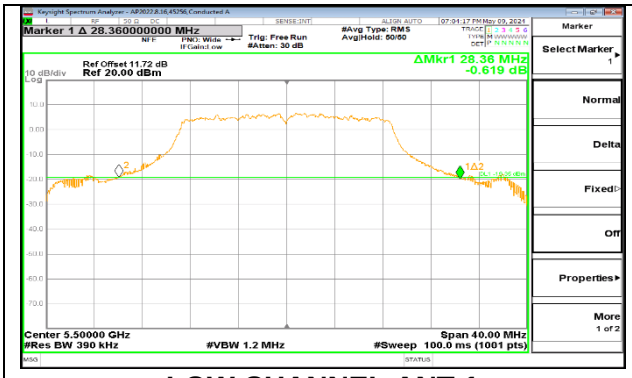
9.2.10. 802.11n HT20 MODE IN THE 5.6 GHz BAND

2TX Antenna 1 + Antenna 3 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 1 (MHz)	26 dB Bandwidth Antenna 3 (MHz)
Low	5500	28.36	24.72
Mid	5580	28.84	24.52
High	5700	28.56	25.12

LOW CHANNEL



LOW CHANNEL ANT 1

LOW CHANNEL ANT 3

UL VERIFICATION SERVICES
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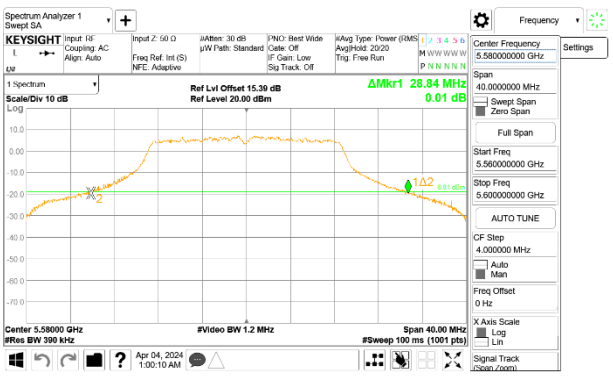
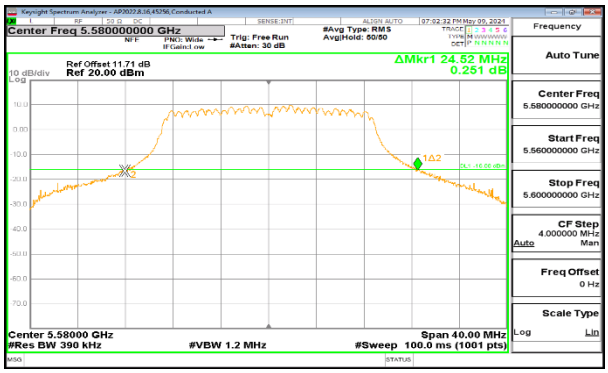
MID CHANNEL



MID CHANNEL ANT 1



MID CHANNEL ANT 3

UL VERIFICATION SERVICES
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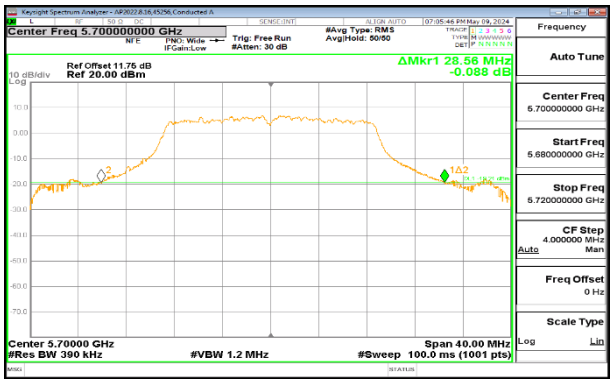
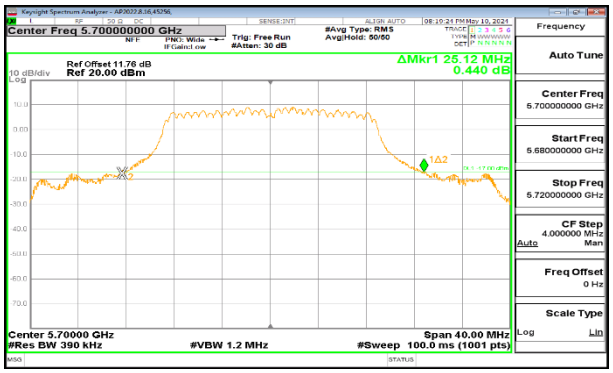
HIGH CHANNEL



HIGH CHANNEL ANT 1



HIGH CHANNEL ANT 3

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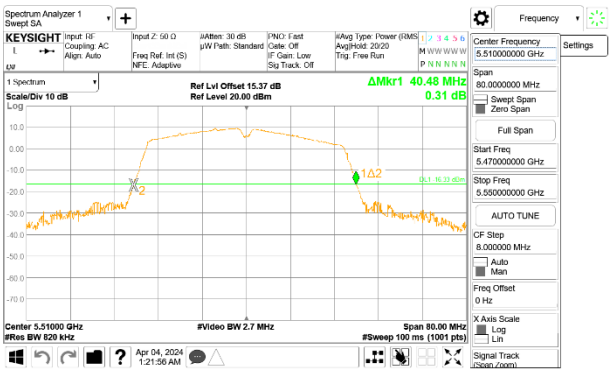
9.2.11. 802.11n HT40 MODE IN THE 5.6 GHz BAND

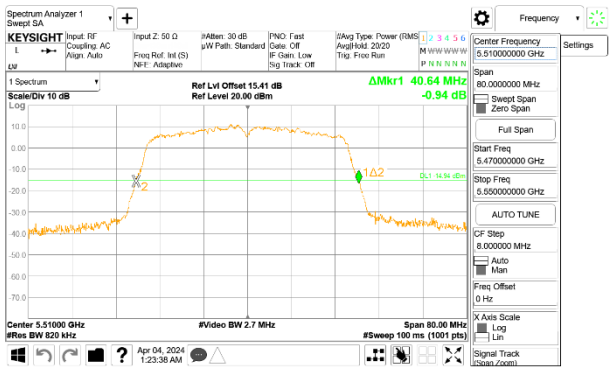
2TX Antenna 1 + Antenna 3 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 1 (MHz)	26 dB Bandwidth Antenna 3 (MHz)
Low	5510	40.48	40.64
Mid	5550	41.04	39.76
High	5670	41.04	40.56

LOW CHANNEL



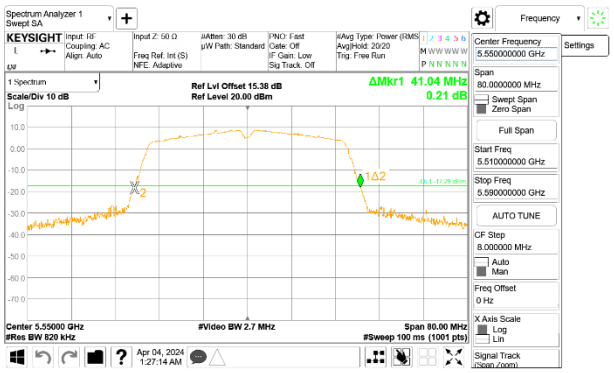
LOW CHANNEL ANT 1



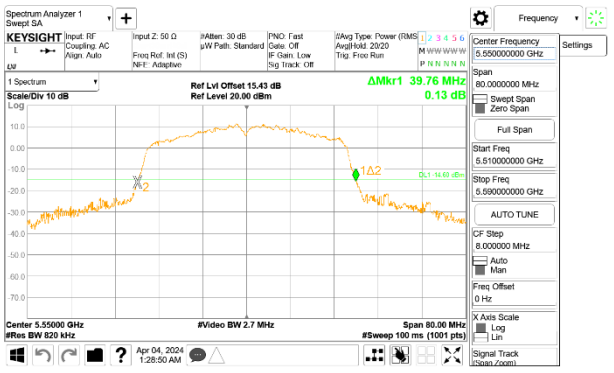
LOW CHANNEL ANT 3

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

MID CHANNEL



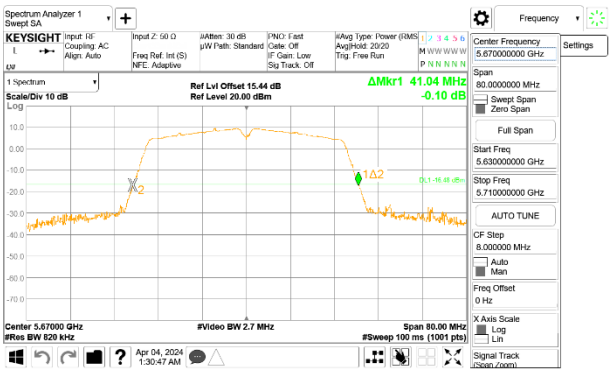
MID CHANNEL ANT 1



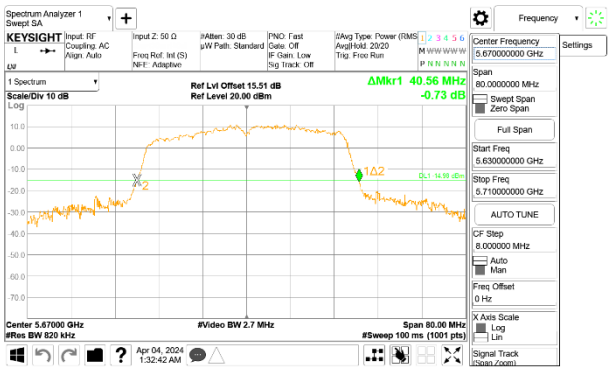
MID CHANNEL ANT 3

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

HIGH CHANNEL



HIGH CHANNEL ANT 1



HIGH CHANNEL ANT 3

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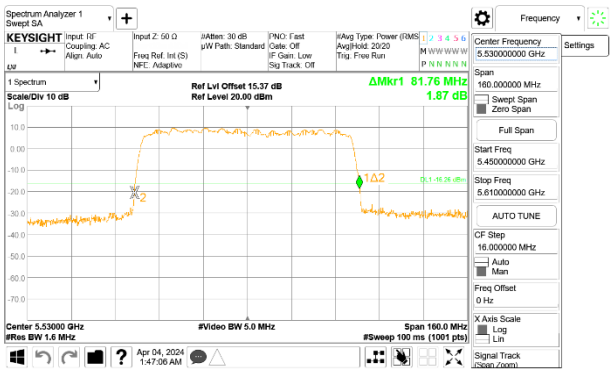
9.2.12. 802.11ac VHT80 MODE IN THE 5.6 GHz BAND

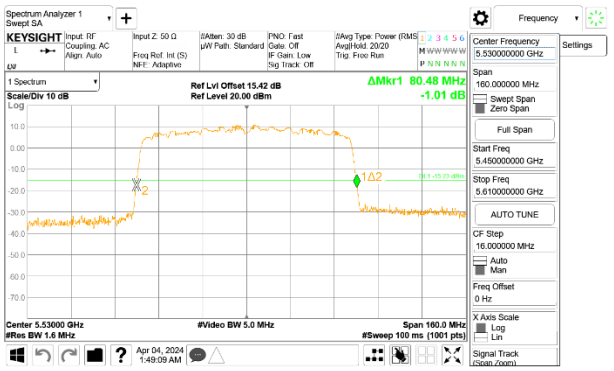
2TX Antenna 1 + Antenna 3 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 1 (MHz)	26 dB Bandwidth Antenna 3 (MHz)
Low	5530	81.76	80.48
High	5610	81.12	80.00

LOW CHANNEL



LOW CHANNEL ANT 1



LOW CHANNEL ANT 3

UL VERIFICATION SERVICES
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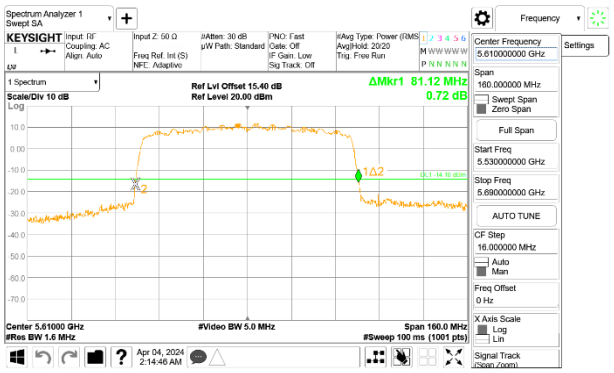
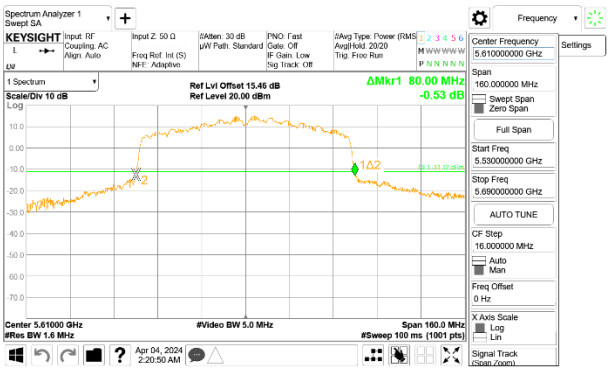
HIGH CHANNEL



HIGH CHANNEL ANT 1



HIGH CHANNEL ANT 3

UL VERIFICATION SERVICES
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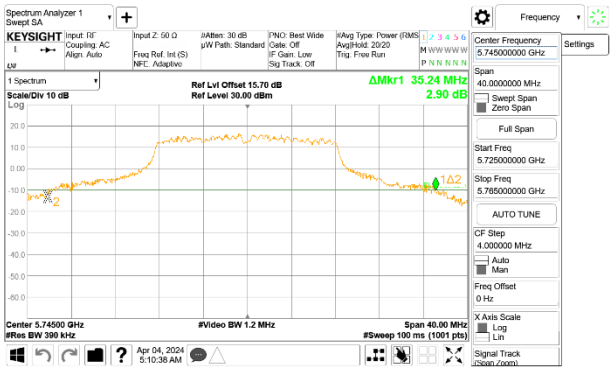
9.2.13. 802.11a MODE IN THE 5.8 GHz BAND

2TX Antenna 2 + Antenna 4 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 2 (MHz)	26 dB Bandwidth Antenna 4 (MHz)
Low	5745	35.24	36.56
Mid	5785	34.52	36.20
High	5825	35.20	35.40

LOW CHANNEL



LOW CHANNEL ANT 2

LOW CHANNEL ANT 4

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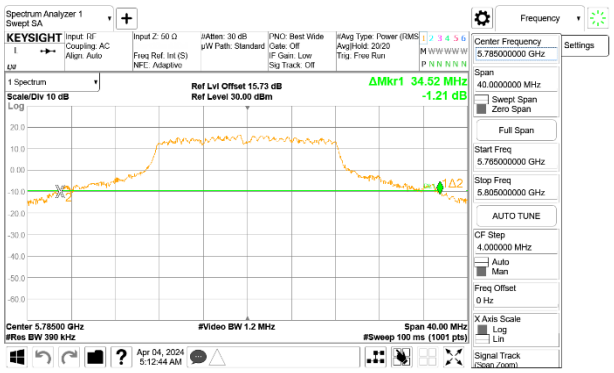
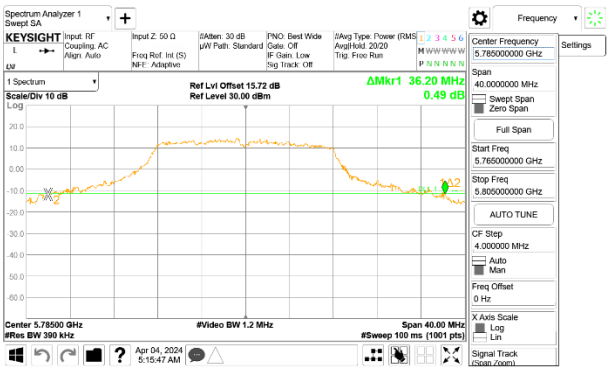
MID CHANNEL



MID CHANNEL ANT 2



MID CHANNEL ANT 4

UL VERIFICATION SERVICES
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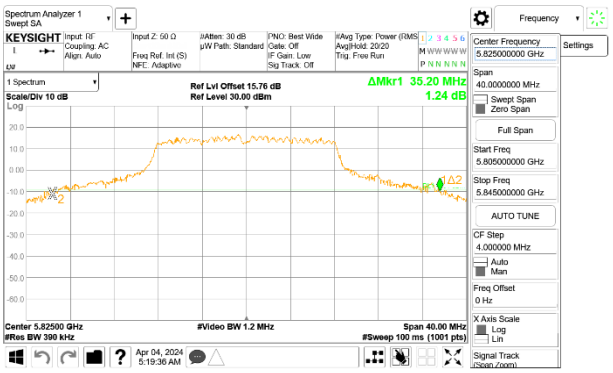
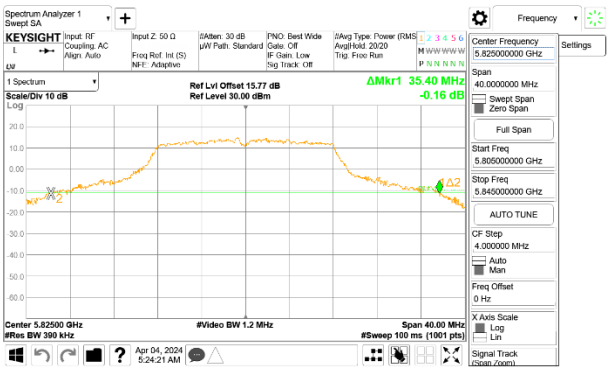
HIGH CHANNEL



HIGH CHANNEL ANT 2



HIGH CHANNEL ANT 4

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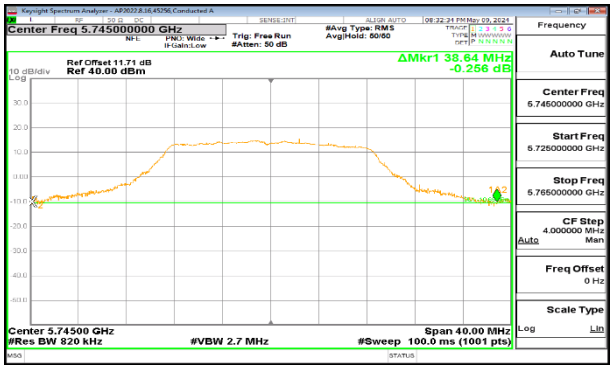
9.2.14. 802.11n HT20 MODE IN THE 5.8 GHz BAND

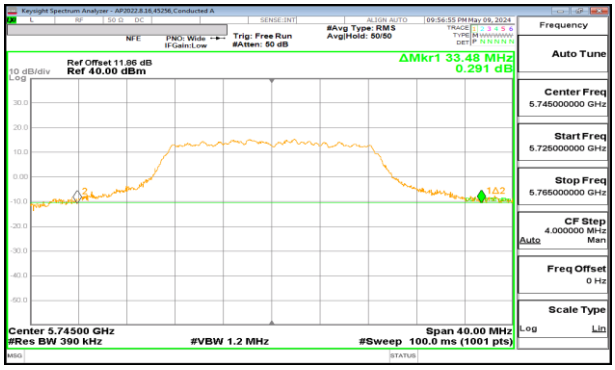
2TX Antenna 2 + Antenna 4 CDD MODE

Frequency (MHz)	26 dB Bandwidth Antenna 2 (MHz)	26 dB Bandwidth Antenna 4 (MHz)
5745	38.64	33.48
5785	32.56	34.12
5825	32.04	35.56

LOW CHANNEL



LOW CHANNEL ANT 2



LOW CHANNEL ANT 4

UL VERIFICATION SERVICES
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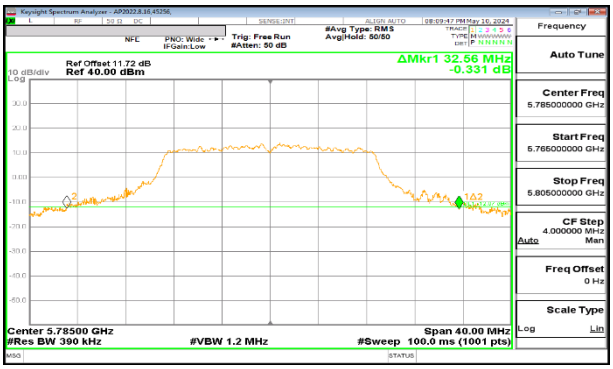
MID CHANNEL



MID CHANNEL ANT 2

MID CHANNEL ANT 4

UL VERIFICATION SERVICES
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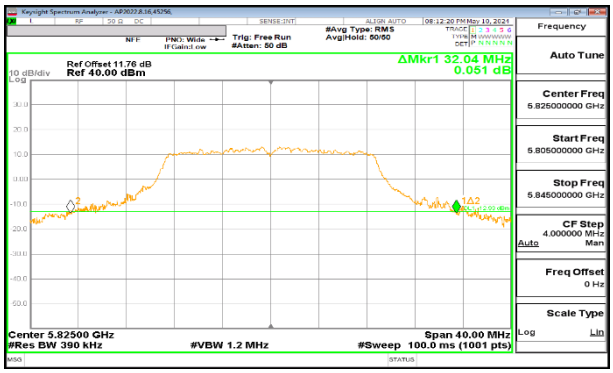
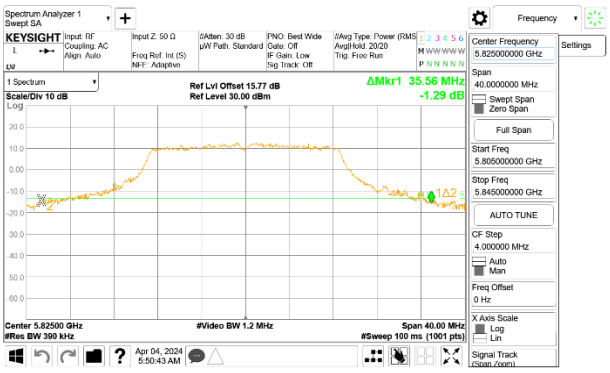
HIGH CHANNEL



HIGH CHANNEL ANT 2



HIGH CHANNEL ANT 4

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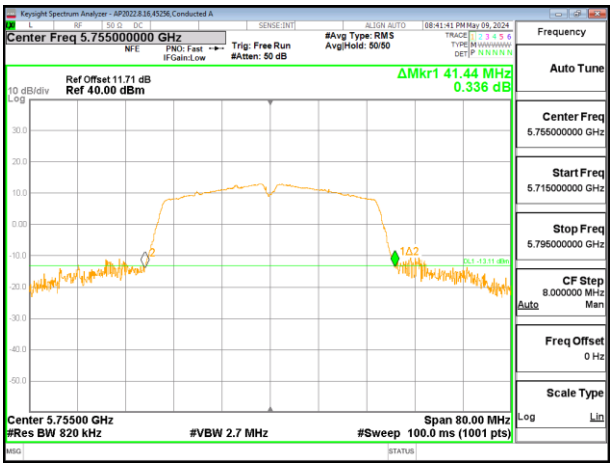
9.2.15. 802.11n HT40 MODE IN THE 5.8 GHz BAND

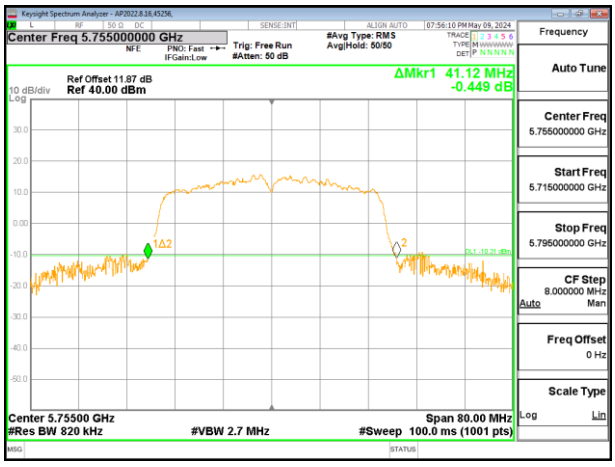
2TX Antenna 2 + Antenna 4 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Antenna 2 (MHz)	26 dB Bandwidth Antenna 4 (MHz)
Low	5755	41.44	41.12
High	5795	41.68	40.96

LOW CHANNEL



LOW CHANNEL ANT 2



LOW CHANNEL ANT 4

UL VERIFICATION SERVICES
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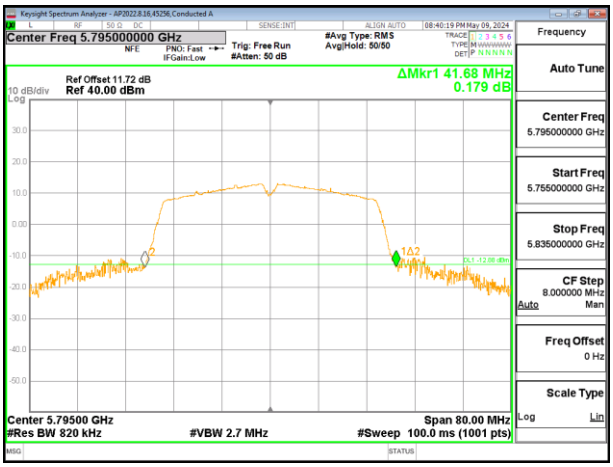
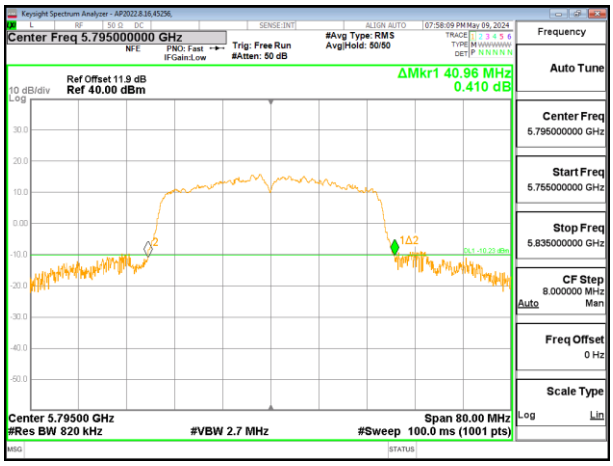
HIGH CHANNEL



HIGH CHANNEL ANT 2



HIGH CHANNEL ANT 4

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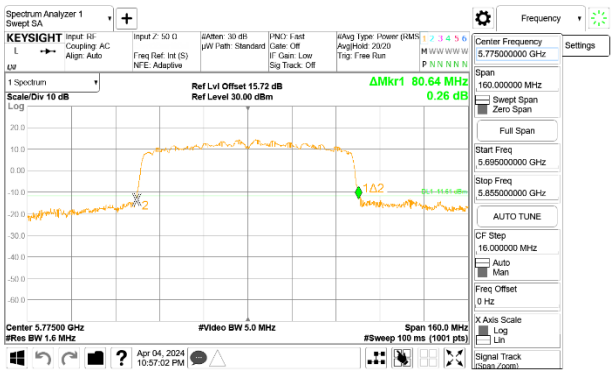
9.2.16. 802.11ac VHT80 MODE IN THE 5.8 GHz BAND

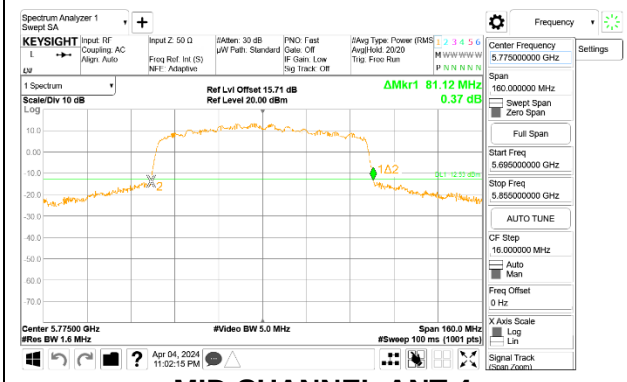
2TX Antenna 2 + Antenna 4 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Antenn 2 (MHz)	26 dB Bandwidth Antenna 4 (MHz)
Mid	5775	80.64	81.12

MID CHANNEL



MID CHANNEL ANT 2



MID CHANNEL ANT 4

UL VERIFICATION SERVICES
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9.3. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

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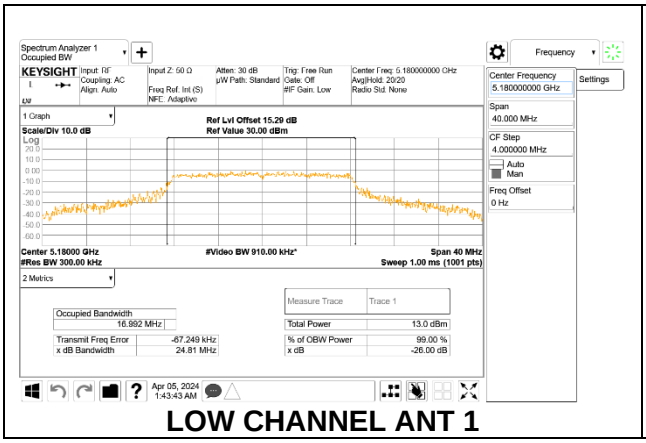
9.3.1. 802.11a MODE IN THE 5.2 GHz BAND

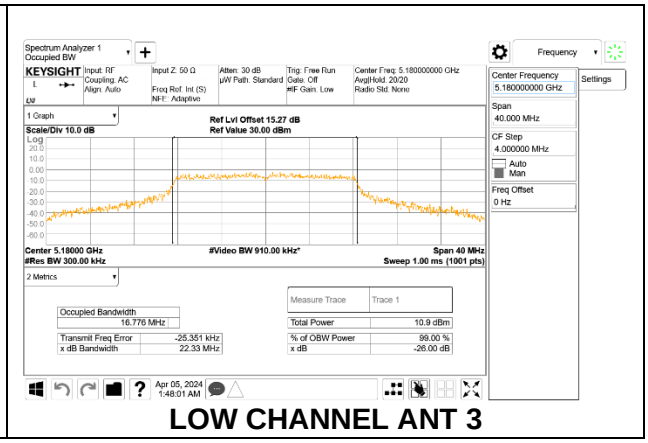
2TX Antenna 1 + Antenna 3 CDD MODE

Channel	Frequency (MHz)	99% Bandwidth Antenna 1 (MHz)	99% Bandwidth Antenna 3 (MHz)
Low	5180	16.992	16.776
Mid	5200	16.975	16.888
High	5240	17.011	16.752

LOW CHANNEL



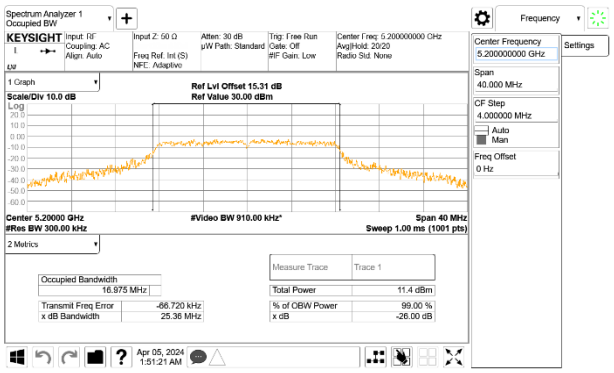
LOW CHANNEL ANT 1



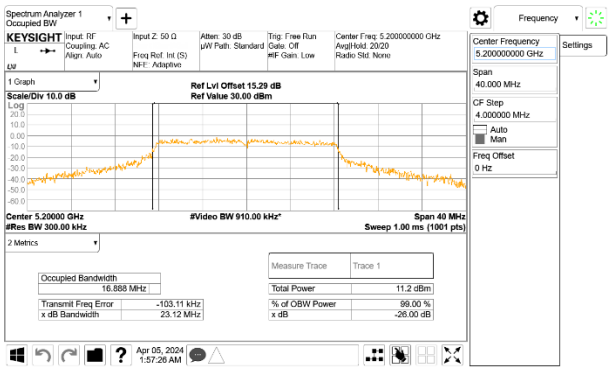
LOW CHANNEL ANT 3

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

MID CHANNEL



MID CHANNEL ANT 1



MID CHANNEL ANT 3

UL VERIFICATION SERVICES
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