TEST REPORT

Report Number : R14896020-E12

Applicant	:	Sonos 301 Coromar Dr Goleta, CA 93117 USA
MODEL	:	S45
FCC ID	:	SBVRM045
IC	:	5373A-RM045
EUT Description	:	Wireless Smart Speaker
Test Standard(s)	:	FCC 47 CFR Part 15 Subpart E:2024 ISED RSS-247 Issue 3:2023 ISED RSS-GEN Issue 5 +A1+A2:2021

Date Of Issue:
2024-06-03

Prepared by:
UL LLC
12 Laboratory Dr.
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CERT #0751.06

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2024-05-03	Initial Issue	B. Kiewra
V2	2024-05-28	Revised plots on p.111. Removed data for channels in 5600-5650MHz band.	B. Kiewra
V3	2024-06-03	Removed mentions of 5600-5650MHz band in section 6.2 Revised section 6.2 to state 3Tx.	B. Kiewra

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1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: Wireless Smart Speaker

MODEL: S45

BRAND: Sonos

SERIAL NUMBER: 000E5828D66C8, 000E58E7E7FB2, 000E58A36F038

SAMPLE RECEIPT DATE: 2024-02-12

DATE TESTED: 2024-02-12 to 2024-05-03

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart E: 2023	Refer to Section 2
ISED RSS-247 Issue 3: 2023	Refer to Section 2
ISED RSS-GEN Issue 5+A1+A2: 2021	Refer to Section 2

UL LLC 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 LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document.

Approved & Released
For UL LLC By:

Michael Antola
Staff Engineer
Consumer, Medical and IT Segment
UL LLC

Prepared By:

Brian Kiewra
Project Engineer
Consumer, Medical and IT Segment
UL LLC

2. TEST RESULT SUMMARY

This report contains data/info provided by the customer which can impact the validity of results. UL LLC is only responsible for the validity of results after the integration of the data provided by the customer. Below is a list of the data/info provided by the customer:

1) Antenna gain and type (see section 6.3)
2) Worst-case data rates (see section 0)

FCC Clause	ISED Clause	Requirement	Result	Comment
See 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 6.2.4.1	6 dB BW	Compliant	None
15.407 (a) (1-3), (h) (1)	RSS-247 6.2	Output Power		
15.407 (a) (1-3)	RSS-247 6.2	PSD		
15.209, 15.205, 15.407 (b)	RSS-GEN 8.9, 8.10, RSS-247 6.2	Radiated Emissions		
15.207	RSS-Gen 8.8	AC Mains Conducted Emissions		

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 D02 v02r01,
- FCC KDB 414788 D01 Radiated Test Site v01r01
- ANSI C63.10-2020

4. FACILITIES AND ACCREDITATION

UL LLC is accredited by A2LA, certification # 0751.06, 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: 12 Laboratory Dr RTP, NC 27709, U.S.A	US0067	2180C	825374
☒	Building: 2800 Perimeter Park Dr. Suite B Morrisville, NC 27560, U.S.A		27265	

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 Frequency (Spectrum Analyzer)	141.2 Hz
Occupied Channel Bandwidth	1.22%
RF output power, conducted	1.3 dB (PK) 0.45 dB (AV)
Power Spectral Density, conducted	2.47 dB
Unwanted Emissions, conducted	1.94 dB
All emissions, radiated	6.01 dB
Mains Conducted Emissions (0.150-30MHz) - LISN	3.40 dB
Temperature	0.57°C
Humidity	3.39%
DC Supply voltages	1.70%

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

5.4. SAMPLE CALCULATION

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 that contains Radio0 and Radio1. Radio0 transmits BT, BLE, 2.4GHz WLAN, 5GHz WLAN, 6GHz WLAN. Radio1 transmits 5GHz and 6GHz WLAN. This report covers testing on Radio1 5GHz WLAN.

6.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

5.2 GHz BAND

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.2GHz Band, 3Tx			
5180-5240	802.11a	15.70	37.15
5180-5240	802.11n HT20	15.67	36.90
5190-5230	802.11n HT40	17.97	62.66
5210	802.11ac VHT80	17.83	60.67
5180-5240	802.11ax HE20	16.40	43.65
5190-5230	802.11ax HE40	18.71	74.30
5210	802.11ax HE80	19.56	90.36

5.3 GHz BAND

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.3GHz Band, 3Tx			
5260-5320	802.11a	21.43	139.00
5260-5320	802.11n HT20	21.88	154.17
5270-5310	802.11n HT40	23.22	209.89
5290	802.11ac VHT80	17.67	58.48
5260-5320	802.11ax HE20	22.59	181.55
5270-5310	802.11ax HE40	23.27	212.32
5290	802.11ax HE80	23.47	222.33

5.6 GHz BAND

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.6GHz Band, 3Tx			
5500-5600, 5650-5720	802.11a	21.85	153.11
5500-5600, 5650-5720	802.11n HT20	21.55	142.89
5510-5600, 5650-5710	802.11n HT40	23.07	202.77
5530-5600, 5650-5690	802.11ac VHT80	19.83	96.16
5500-5600, 5650-5720	802.11ax HE20	21.74	149.28
5510-5600, 5650-5710	802.11ax HE40	23.31	214.29
5500-5600, 5650-5720	802.11ax HE80	23.42	219.79

5.8 GHz BAND

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.8GHz Band, 3Tx			
5745-5825	802.11a	21.94	156.31
5745-5825	802.11n HT20	21.52	141.91
5755-5795	802.11n HT40	22.07	161.06
5775	802.11ac VHT80	21.07	127.94
5745-5825	802.11ax HE20	21.91	155.24
5755-5795	802.11ax HE40	22.24	167.49
5775	802.11ax HE80	20.89	122.74

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes 3 antennas for MIMO, worst-case antenna gains as declared below.

Mode	Type	Declared Correlated Gain (dBi)	Declared Uncorrelated Gain (dBi)
UNII-1	Dual band Monopole (C0,C2) Tri-Band Monopole (C1)	4.80	0.80
UNII-2a		4.90	0.80
UNII-2c		6.10	2.20
UNII-3		5.80	1.80

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was 78.1-45200-diag-lasso-rel-202312282317.

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.

Radiated emissions between 1GHz and 18GHz were performed with the EUT set to transmit at the highest power on low and high channels for bandedge and low, middle and high channels on modes with worst-case power/PSD per band for harmonics and spurious. Additional scans were taken on other modes/channels to ensure compliant.

The EUT is intended to operate in only one orientation, therefore, all final radiated testing was performed with the EUT in this intended orientation of operation.

All testing performed in 3TX mode (NSS=1), where power per chain is equivalent to the 1Tx power on each chain. Based on preliminary testing, this allows 3TX testing to cover all 1Tx testing.

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

802.11a mode: 6 Mbps
802.11n HT20mode: MCS0
802.11n HT40mode: MCS0
802.11ac VHT80 mode: MCS0
802.11ax HE20mode: MCS0 (Nss = 1)
802.11ax HE40mode: MCS0 (Nss = 1)
802.11ax HE80mode: MCS0 (Nss = 1)

Note: Where appropriate only representative plots are included to reduce report size.

6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	Lenovo	T450s	NA	NA
Laptop	Lenovo	T470s	NA	NA
Ethernet Switch	Netgear	GS305v3	5U81385JA2EE6	NA
Switch PSU	Netgear	AD2015F20	332-10727-02	NA

I/O CABLES

I/O Cable List						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	Mains	1	Hardwired	Non-Shielded	>3m	Connects to AC Mains
2	Ethernet	1	Ethernet	Non-Shielded	>3m	Connects to ENET switch

TEST SETUP

The EUT is connected to a test laptop during the tests.

SETUP DIAGRAM

Please refer to R14896020-EP1 for setup diagrams

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

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

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 C63.10-2020, Section 6.2.

Radiated Spurious Emissions: ANSI C63.10-2020 Section 6.3 to 6.6

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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 Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
90410	Spectrum Analyzer	Keysight Technologies	N9030A	2023-06-14	2024-06-14
90416	Spectrum Analyzer	Keysight Technologies	N9030A	2023-06-09	2024-06-30
238710	Environmental Meter	Fisher Scientific	15-077-963	2023-06-27	2024-06-27
SOFTEMI	Antenna Port Software	UL	Version 2021.5.28	NA	NA
SOFTEMI	Antenna Port Software	UL	Version 2022.8.16	NA	NA
SOFTEMI	Antenna Port Software	UL	Version 2023.2.16	NA	NA
SOFTEMI	Antenna Port Software	UL	Version 2024.2.23	NA	NA
Power Software	Boonton Power Analyzer	Boonton	Version 3.0.13.0	NA	NA
245262	Conducted Switch Box	UL	CSB	2024-02-20	2025-02-20
211056	Real-Time Peak Power Sensor 50MHz to 8GHz	Boonton	RTP5000	2023-08-01	2024-08-01
211055	Real-Time Peak Power Sensor 50MHz to 8GHz	Boonton	RTP5000	2023-08-01	2024-08-01
211057	Real-Time Peak Power Sensor 50MHz to 8GHz	Boonton	RTP5000	2023-08-01	2024-08-01
211058	Real-Time Peak Power Sensor 50MHz to 8GHz	Boonton	RTP5000	2023-08-01	2024-08-01
CBL031	SMA Male to SMA Male Cable Using PE-P141 Coax - 12"	Pasternack	Sucoflex 104PEA	2023-06-27	2024-06-27
CBL030	SMA Male to SMA Male Cable Using PE-P141 Coax - 12"	Pasternack	Sucoflex 104PEA	2023-06-27	2024-06-27

Test Equipment Used - Line-Conducted Emissions – Voltage (Morrisville – Conducted 1)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
CBL087	Coax cable, RG223, N-male to BNC-male, 20-ft.	Pasternack	PE3W06143-240	2024-04-04	2025-04-04
179892	Environmental Meter	Fisher Scientific	15-077-963	2023-07-26	2024-06-31
80391	LISN, 50-ohm/50-uH, 250uH 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50/250-25-2-01	2023-07-31	2024-07-31
75141	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2023-08-01	2024-08-01
52859	Transient Limiter, 0.009-100MHz	Electro-Metrics	EM-7600	2024-04-04	2025-04-04
PS214	AC Power Source	Elgar	CW2501M	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
91432	LISN, 50-ohm/50-uH, 2-conductor, 25A (For support gear only.)	Solar Electronics	8012-50-R-24-BNC	NA	NA

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 1)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
1-18 GHz					
135143	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2024-02-07	2026-02-07
Gain-Loss Chains					
91979	Gain-loss string: 1-18GHz	Various	Various	2023-05-16	2024-05-16
Receiver & Software					
206496	Spectrum Analyzer	Rohde & Schwarz	ESW44	2023-07-19	2024-07-19
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
Additional Equipment used					
241205	Environmental Meter	Fisher Scientific	15-077-963	2023-09-05	2025-09-05
170112	10dB Pad, DC-18GHz, 5W	Mini-Circuits	BW-N10W5+	2023-11-09	2024-11-09

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 4)

Equipment ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
0.009-30MHz					
135144	Active Loop Antenna	ETS-Lindgren	6502	2024-01-24	2025-01-24
30-1000 MHz					
90628	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2024-01-02	2026-01-02
1-18 GHz					
89509	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2023-05-23	2025-05-23
18-40 GHz					
204704	Horn Antenna, 18-26.5GHz	Com-Power	AH-826	2023-07-20	2025-07-20
204705	Horn Antenna, 26-40GHz	Com-Power	AH-640	2023-07-20	2025-07-20
Gain-Loss Chains					
207638	Gain-loss string: 0.009-30MHz	Various	Various	2023-09-18	2024-09-18
207639	Gain-loss string: 25-1000MHz	Various	Various	2023-09-18	2024-09-18
207640	Gain-loss string: 1-18GHz	Various	Various	2023-05-17	2024-05-17
225795	Gain-loss string: 18-40GHz	Various	Various	2023-05-17	2024-05-17
Receiver & Software					
197955	Spectrum Analyzer	Rohde & Schwarz	ESW44	2024-04-16	2025-04-16
72823	Spectrum Analyzer	Agilent	E4446A	2023-06-27	2024-06-30
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
Additional Equipment used					
241204	Environmental Meter	Fisher Scientific	15-077-963	2023-09-05	2025-09-05

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 2)

Equipment ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
1-18 GHz					
88761	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2023-06-19	2025-06-19
Gain-Loss Chains					
91977	Gain-loss string: 1-18GHz	Various	Various	2023-06-06	2024-06-06
Receiver & Software					
197954	Spectrum Analyzer	Rohde & Schwarz	ESW44	2024-03-05	2025-03-05
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
Additional Equipment used					
200540	Environmental Meter	Fisher Scientific	15-077-963 s/n 181474409	2023-07-19	2025-07-19

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 789033 D01 Zero-Span Spectrum Analyzer Method.

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	RMS AV DCCF (dB)
802.11a CDD	2.760	2.817	0.980	97.98	0.09
802.11n HT20 CDD	2.311	2.369	0.976	97.55	0.11
802.11n HT40 CDD	2.224	2.285	0.973	97.33	0.12
802.11ac VHT80 CDD	1.052	1.109	0.949	94.86	0.23
802.11be EHT20 SU	3.876	3.932	0.986	98.58	0.00
802.11be EHT40 SU	1.968	2.025	0.972	97.19	0.12
802.11be EHT80 SU	0.971	1.029	0.944	94.35	0.25

DUTY CYCLE 802.11a MODE

DUTY CYCLE 802.11n HT20 MODE

DUTY CYCLE 802.11n HT40 MODE

DUTY CYCLE 802.11ac VHT80 MODE

DUTY CYCLE 802.11ax HE20 SU MODE

DUTY CYCLE 802.11ax HE40 SU MODE

DUTY CYCLE 802.11ax HE80 SU MODE

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9.2. 26 dB BANDWIDTH

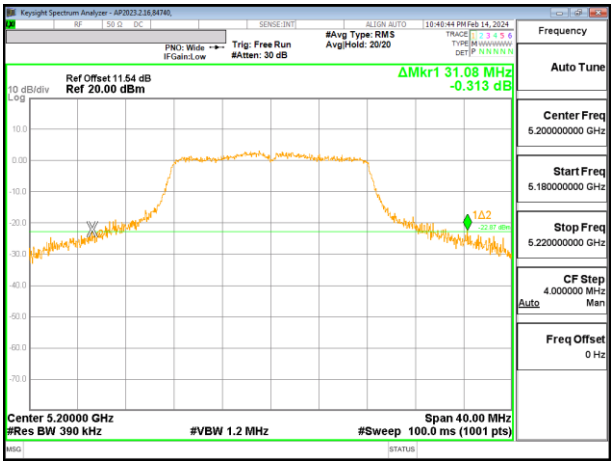
LIMITS

None; for reporting purposes only.

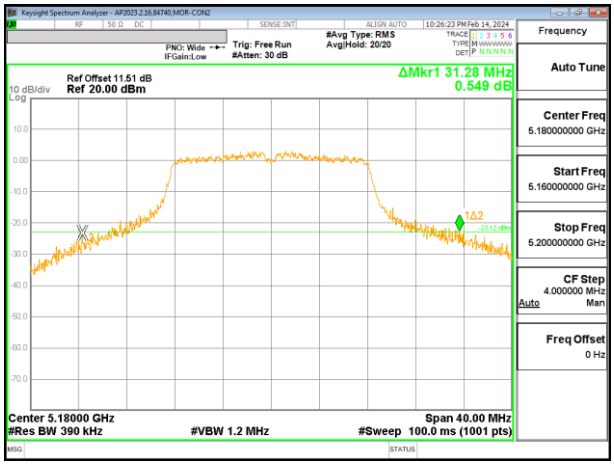
9.2.1. 802.11a MODE IN THE 5.2 GHz BAND

3TX CHAIN 0 + CHAIN 1 + CHAIN 2 CDD MODE

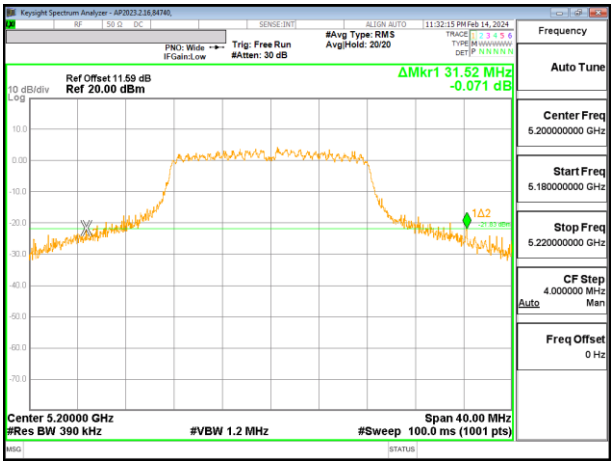
Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)
Low	5180	31.00	31.28	28.76
Mid	5200	31.08	30.00	31.52
High	5240	20.52	20.36	20.36



CHAIN 0



CHAIN 1



CHAIN 2

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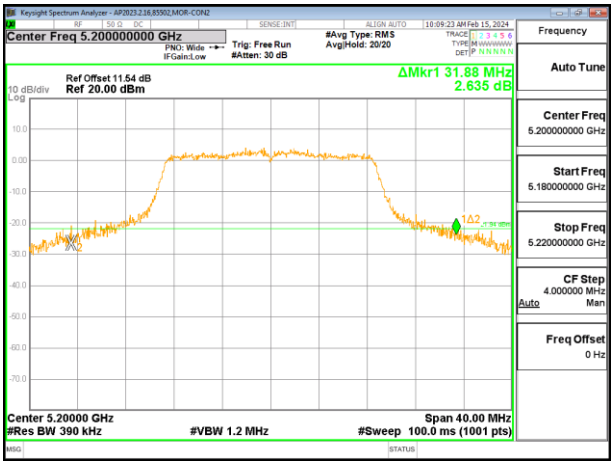
9.2.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND

3TX CHAIN 0 + CHAIN 1 + CHAIN 2 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)
Low	5180	30.48	30.48	29.72
Mid	5200	31.88	31.56	31.20
High	5240	20.84	20.76	20.76



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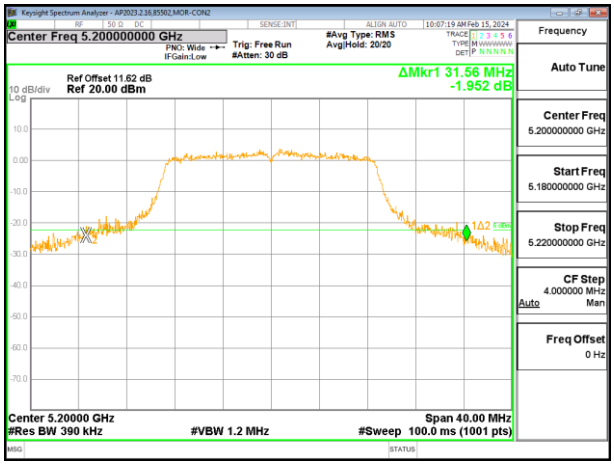

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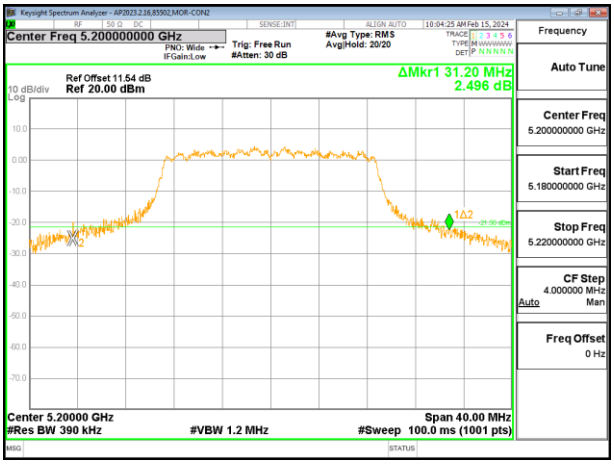

CHAIN 2

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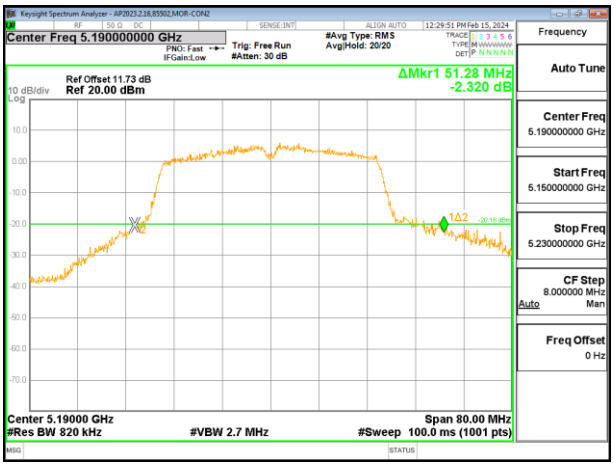
9.2.3. 802.11n HT40 MODE IN THE 5.2 GHz BAND

3TX CHAIN 0 + CHAIN 1 + CHAIN 2 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)
Low	5190	51.28	53.20	49.12
High	5230	41.28	40.96	41.04



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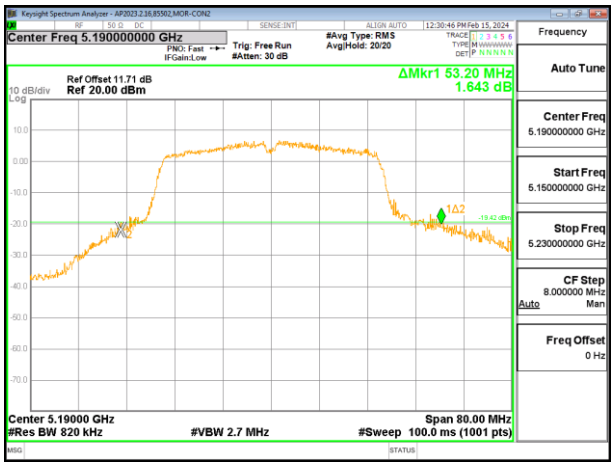

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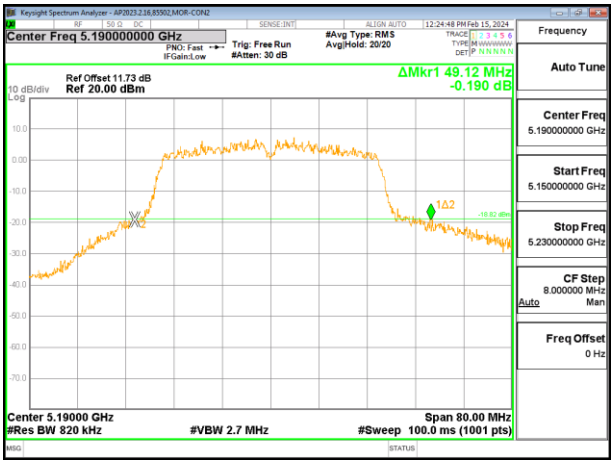

CHAIN 2

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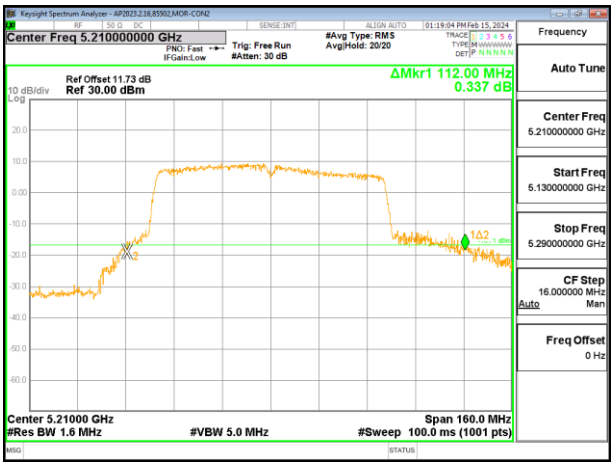
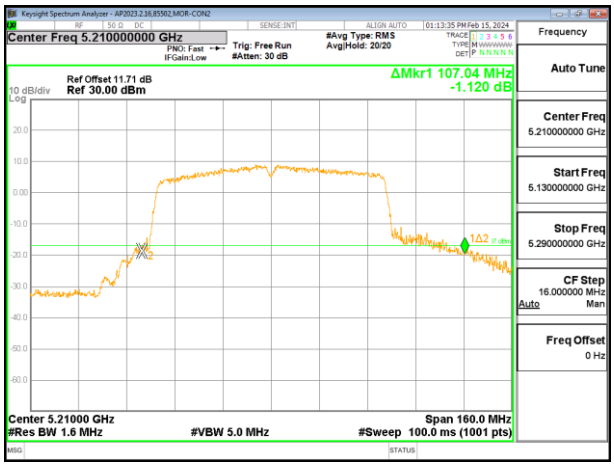
9.2.4. 802.11ac VHT80 MODE IN THE 5.2 GHz BAND

3TX CHAIN 0 + CHAIN 1 + CHAIN 2 CDD MODE

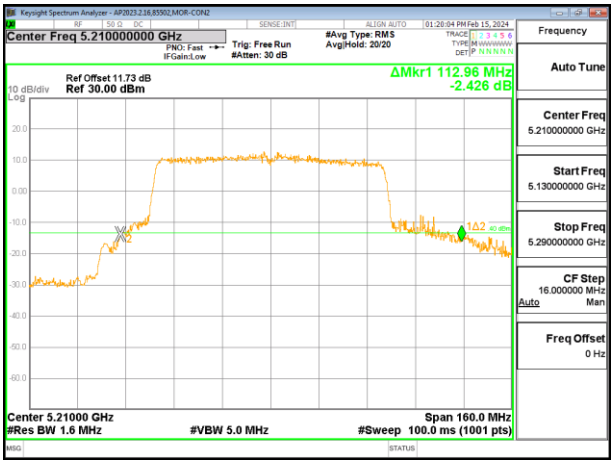
Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)
Mid	5210	112.00	107.04	112.96



CHAIN 0



CHAIN 1



CHAIN 2

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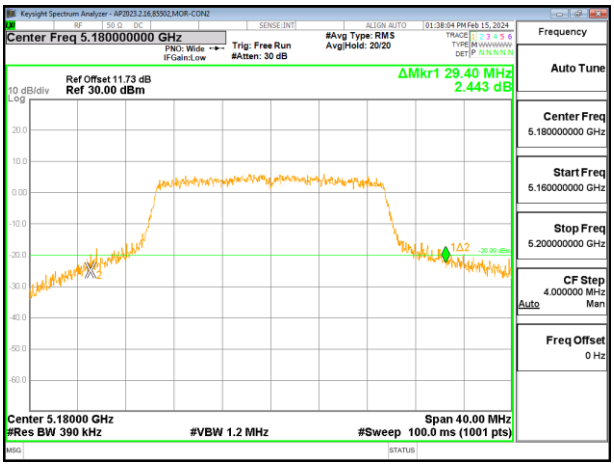
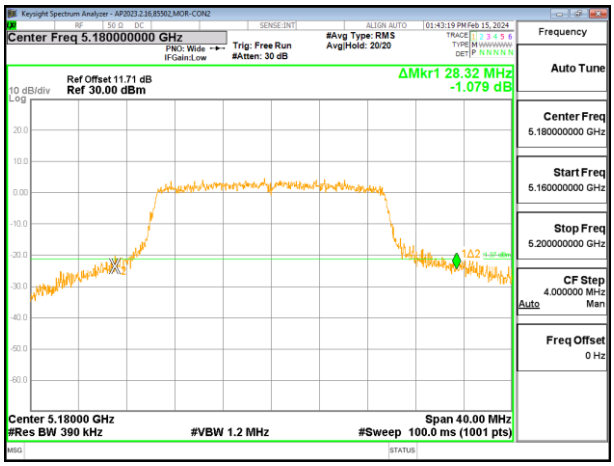
9.2.5. 802.11ax HE20 MODE IN THE 5.2 GHz BAND

3TX CHAIN 0 + CHAIN 1 + CHAIN 2 CDD MODE: SU

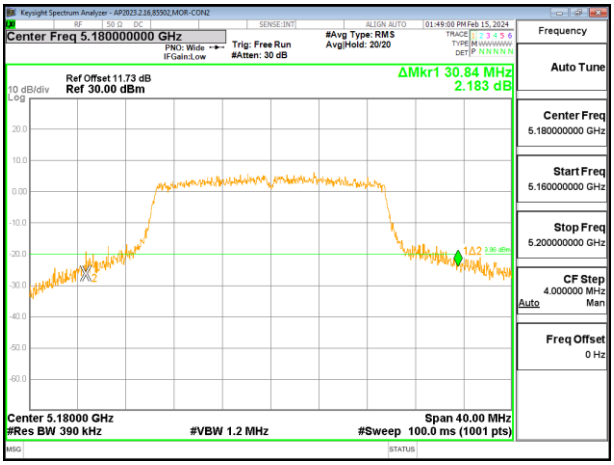
Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5180	29.40	28.32	30.84
Mid	5200	29.48	28.96	30.44
High	5240	20.20	20.20	20.20



CHAIN 0



CHAIN 1



CHAIN 2

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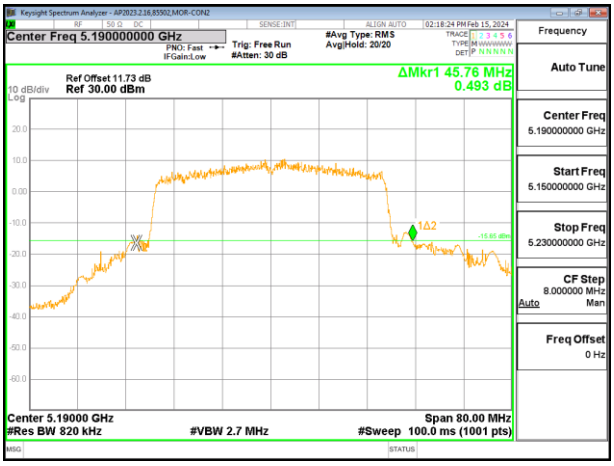
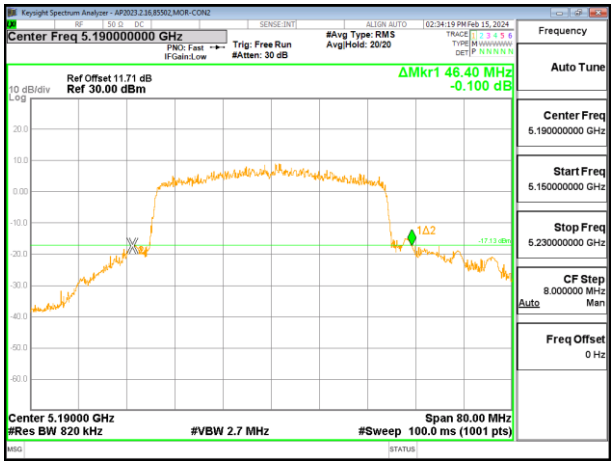
9.2.6. 802.11ax HE40 MODE IN THE 5.2 GHz BAND

3TX CHAIN 0 + CHAIN 1 + CHAIN 2 CDD MODE: SU

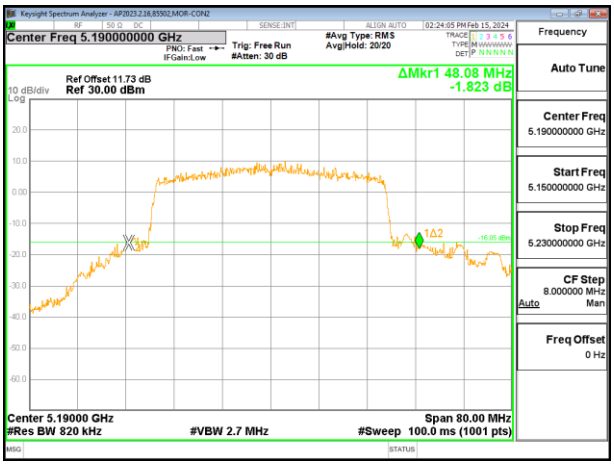
Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)
Low	5190	45.76	46.40	48.08
High	5230	40.16	40.24	40.24



CHAIN 0



CHAIN 1



CHAIN 2

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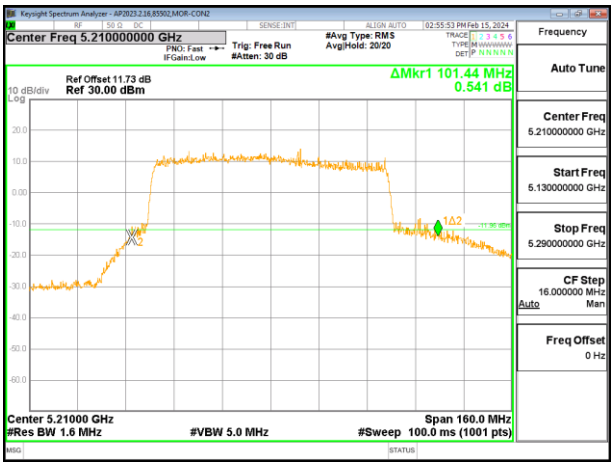
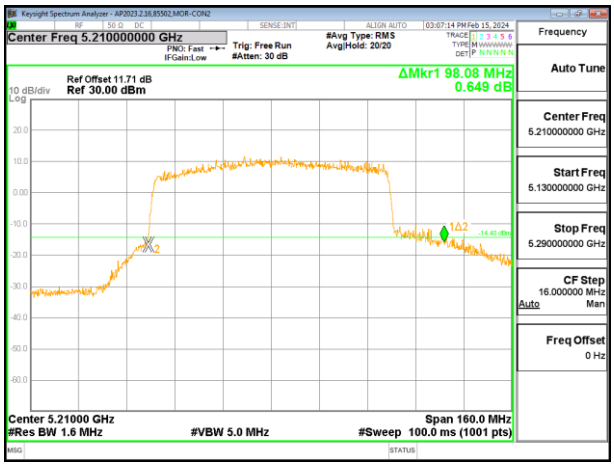
9.2.7. 802.11ax HE80 MODE IN THE 5.2 GHz BAND

3TX CHAIN 0 + CHAIN 1 + CHAIN 2 CDD MODE: SU

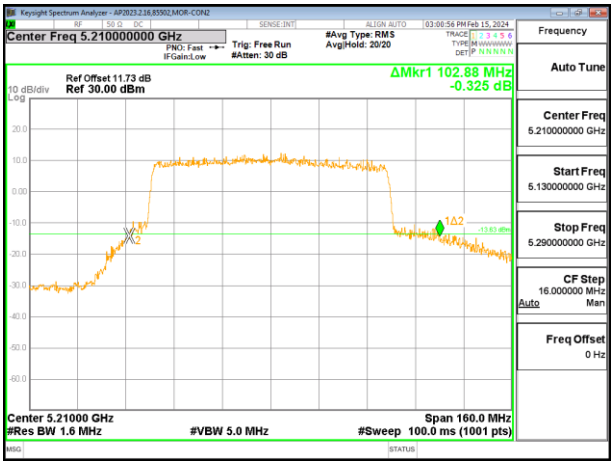
Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)
Mid	5210	101.44	98.08	102.88



CHAIN 0



CHAIN 1



CHAIN 2

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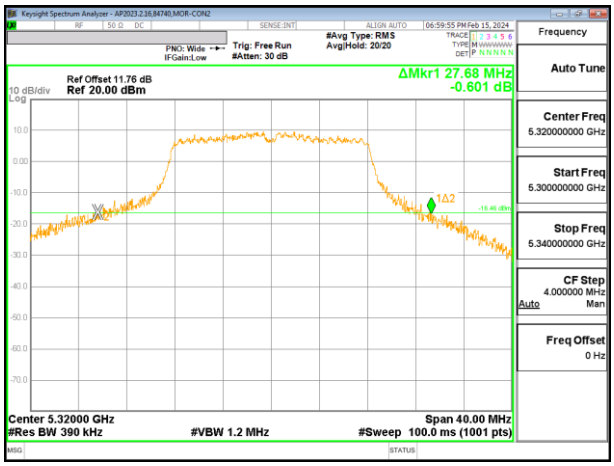
9.2.8. 802.11a MODE IN THE 5.3 GHz BAND

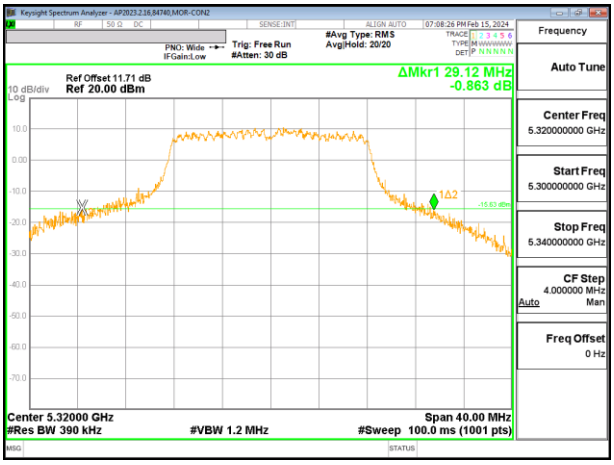
3TX CHAIN 0 + CHAIN 1 + CHAIN 2 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)
Low	5260	23.36	23.00	20.84
Mid	5300	32.36	27.88	29.40
High	5320	30.48	27.68	29.12

CHAIN 0



CHAIN 1



CHAIN 2

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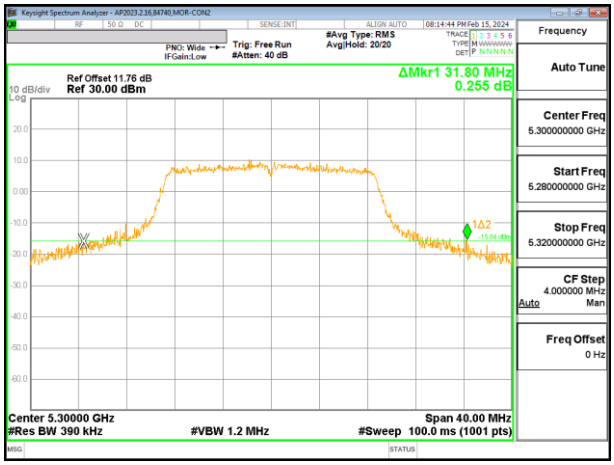
9.2.9. 802.11n HT20 MODE IN THE 5.3 GHz BAND

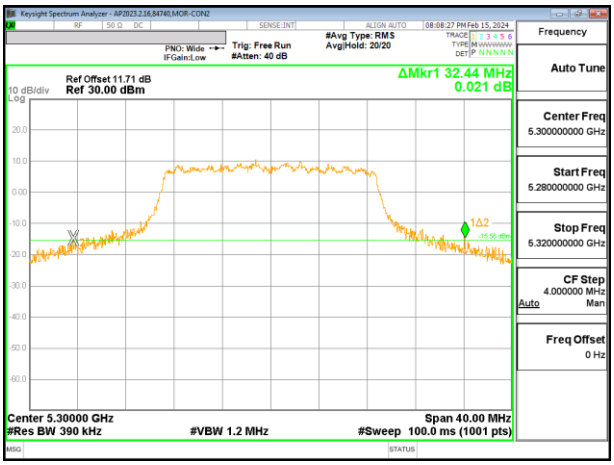
3TX CHAIN 0 + CHAIN 1 + CHAIN 2 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)
Low	5260	25.80	26.12	24.08
Mid	5300	33.40	31.80	32.44
High	5320	32.00	31.60	31.04

CHAIN 0



CHAIN 1



CHAIN 2

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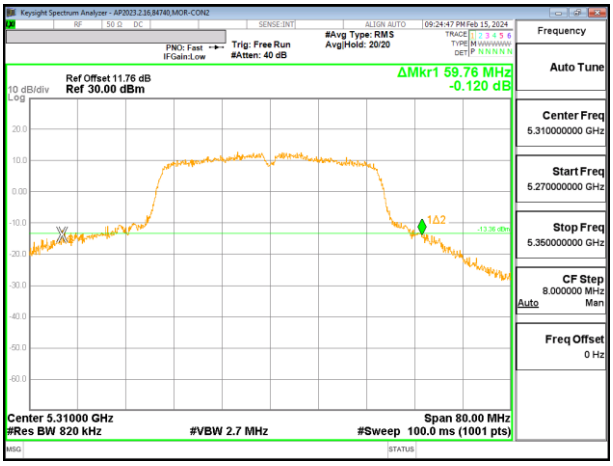
9.2.10. 802.11n HT40 MODE IN THE 5.3 GHz BAND

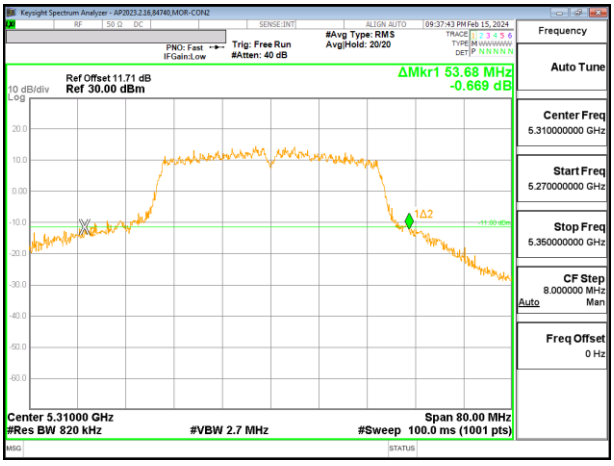
3TX CHAIN 0 + CHAIN 1 + CHAIN 2 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)
Low	5270	44.48	45.92	45.76
High	5310	59.12	59.76	53.68

CHAIN 0



CHAIN 1



CHAIN 2

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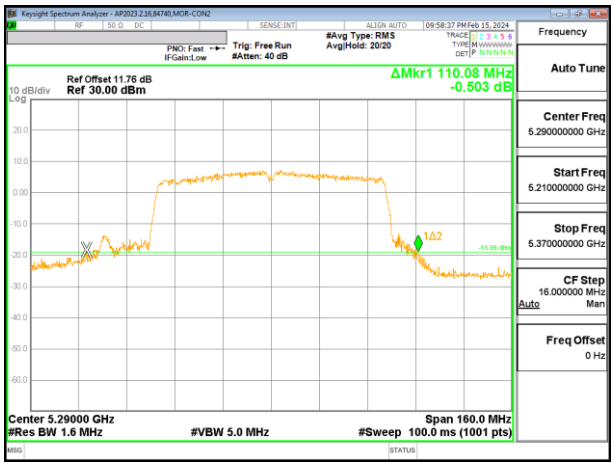
9.2.11. 802.11ac VHT80 MODE IN THE 5.3 GHz BAND

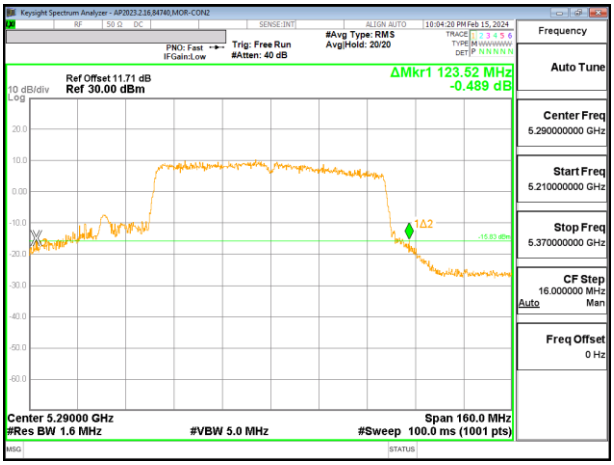
3TX CHAIN 0 + CHAIN 1 + CHAIN 2 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)
Mid	5290	128.32	110.08	123.52

CHAIN 0



CHAIN 1



CHAIN 2

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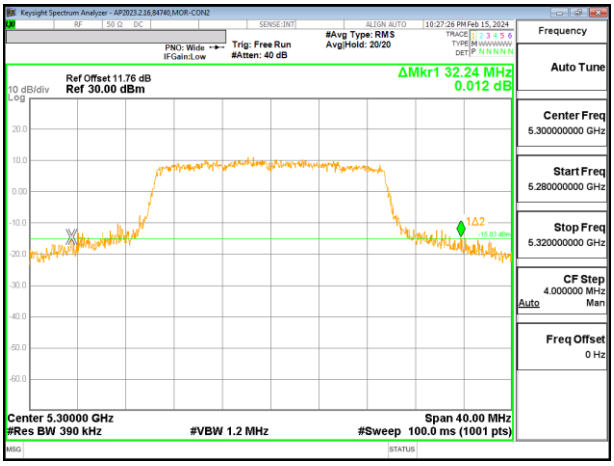
9.2.12. 802.11ax HE20 MODE IN THE 5.3GHz BAND

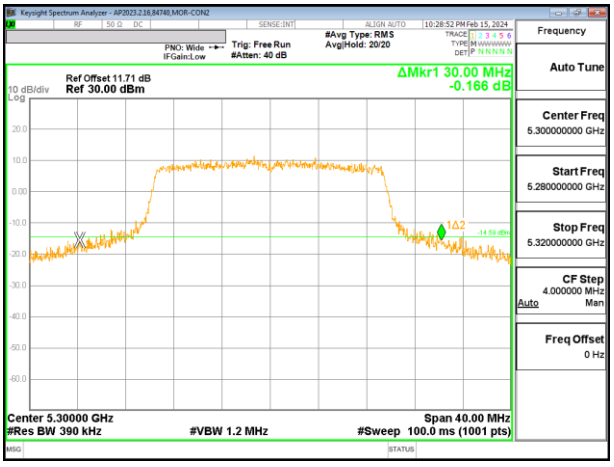
3TX CHAIN 0 + CHAIN 1 + CHAIN 2 CDD OFDMA MODE: SU

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)
Low	5260	22.96	22.40	22.08
Mid	5300	32.24	33.20	30.00
High	5320	31.24	28.88	30.08



CHAIN 0

CHAIN 1



CHAIN 2

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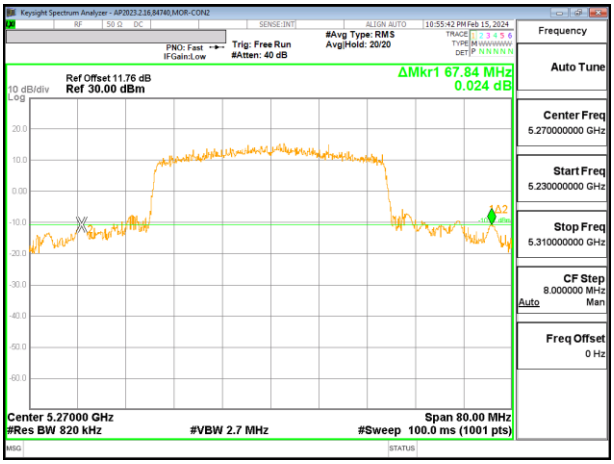
9.2.13. 802.11ax HE40 MODE IN THE 5.3GHz BAND

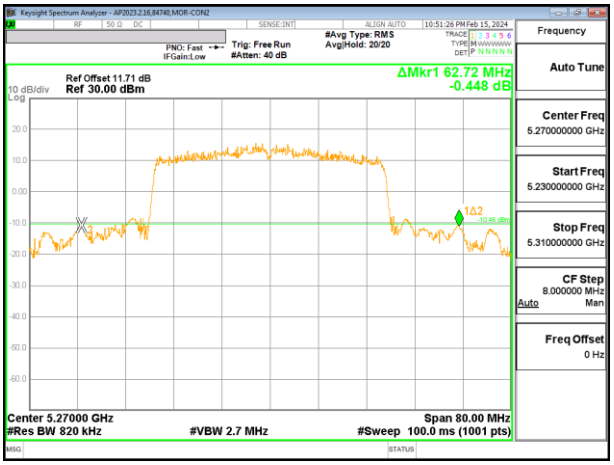
3TX CHAIN 0 + CHAIN 1 + CHAIN 2 CDD OFDMA MODE: SU

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)
Low	5270	67.84	62.96	62.72
High	5310	58.96	59.04	63.12



CHAIN 0

CHAIN 1



CHAIN 2

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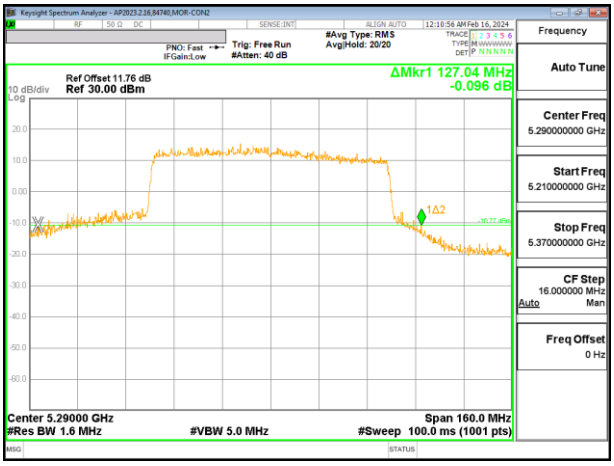
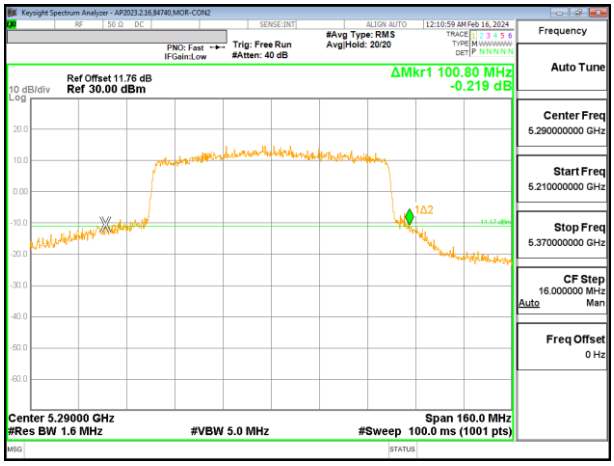
9.2.14. 802.11ax HE80 MODE IN THE 5.3GHz BAND

3TX CHAIN 0 + CHAIN 1 + CHAIN 2 CDD OFDMA MODE: SU

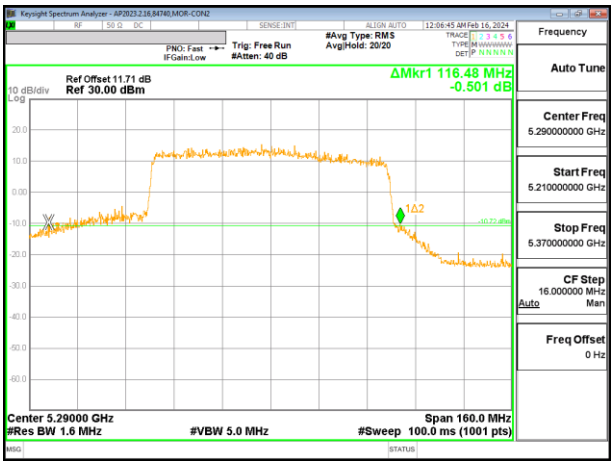
Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)
Mid	5290	127.04	100.80	116.48



CHAIN 0



CHAIN 1



CHAIN 2

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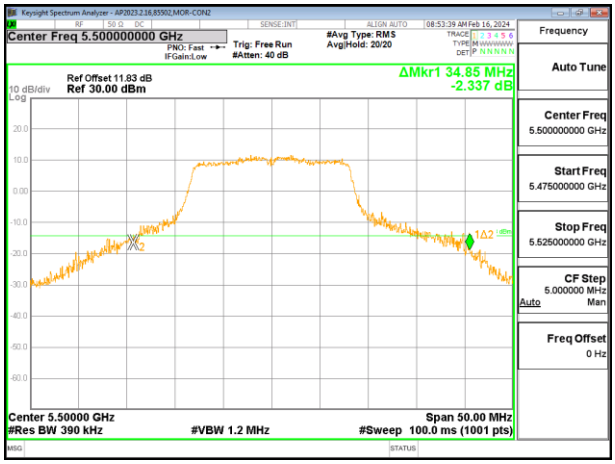
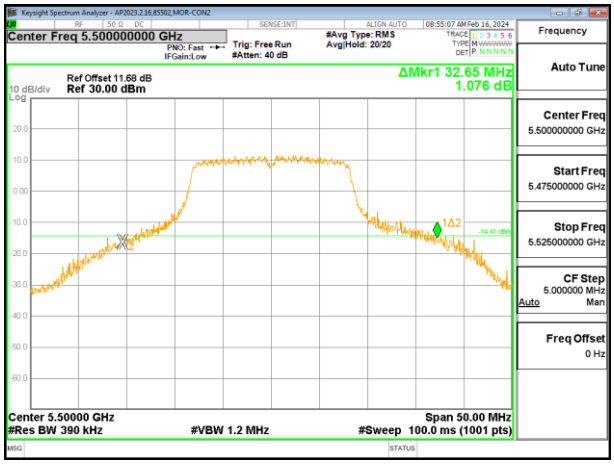
9.2.15. 802.11a MODE IN THE 5.6 GHz BAND

3TX CHAIN 0 + CHAIN 1 + CHAIN 2 CDD MODE

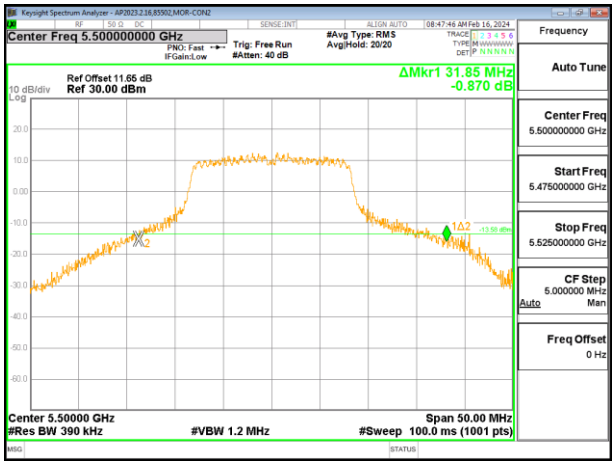
Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)
Low	5500	34.85	32.65	31.85
Mid	5580	25.12	30.80	22.24
High	5700	29.36	27.84	26.76



CHAIN 0



CHAIN 1



CHAIN 2

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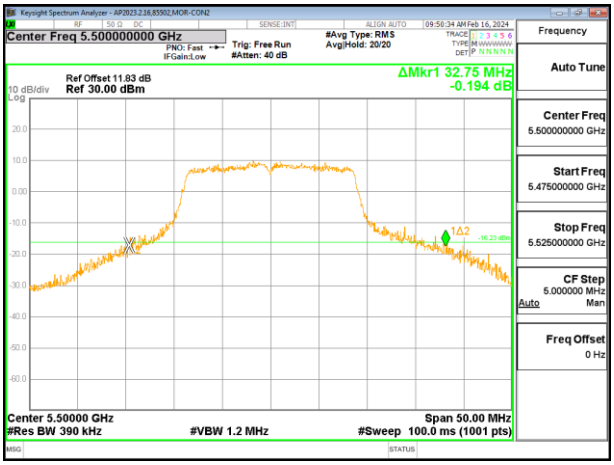
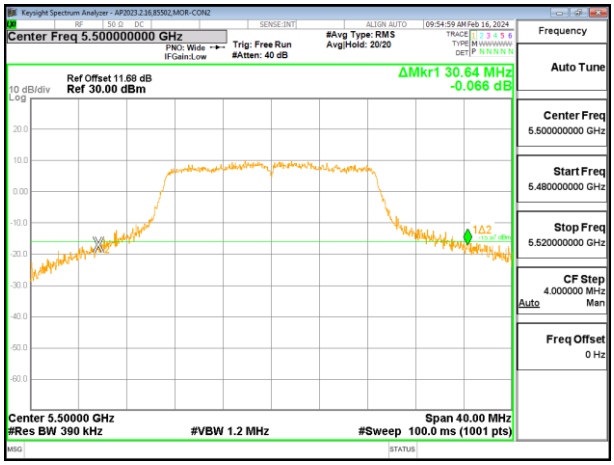
9.2.16. 802.11n HT20 MODE IN THE 5.6 GHz BAND

3TX CHAIN 0 + CHAIN 1 + CHAIN 2 CDD MODE

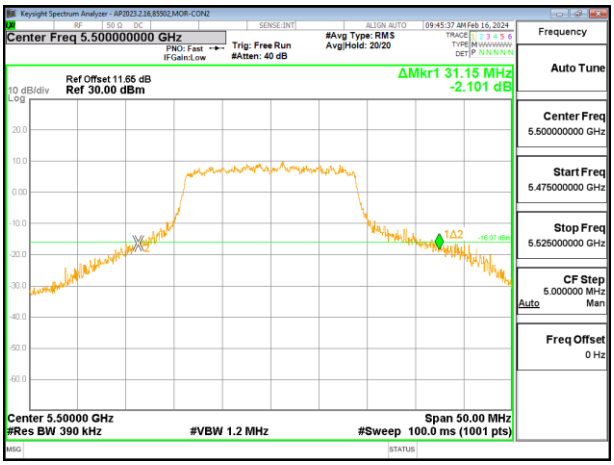
Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)
Low	5500	32.75	30.64	31.15
Mid	5580	23.56	27.24	22.36
High	5700	30.00	30.40	29.48



CHAIN 0



CHAIN 1



CHAIN 2

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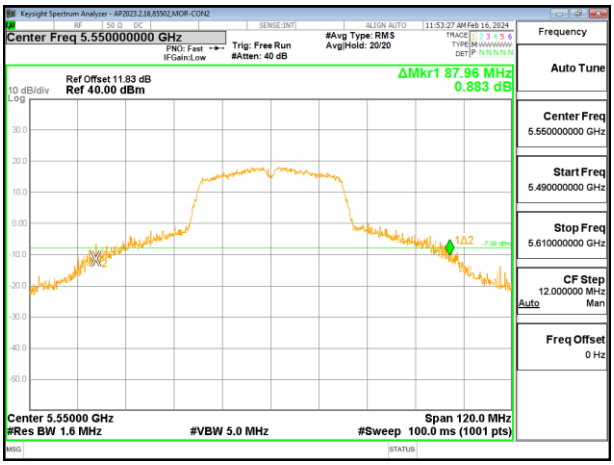
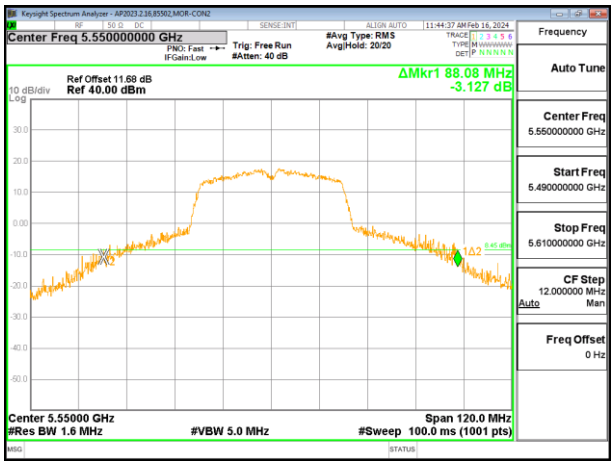
9.2.17. 802.11n HT40 MODE IN THE 5.6 GHz BAND

3TX CHAIN 0 + CHAIN 1 + CHAIN 2 CDD MODE

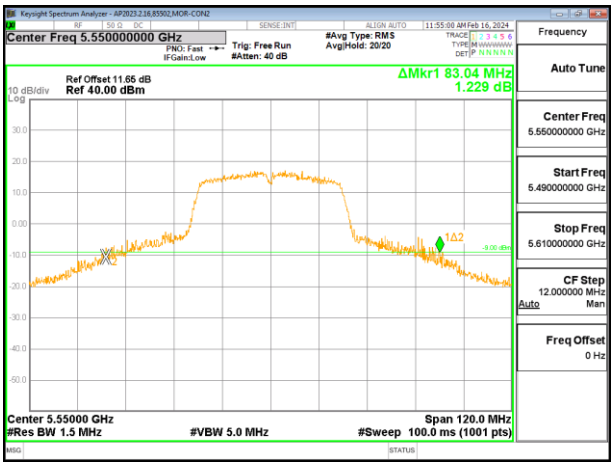
Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)
Low	5510	55.70	58.90	60.10
Mid	5550	87.96	88.08	83.04
High	5670	80.28	67.60	63.76



CHAIN 0



CHAIN 1



CHAIN 2

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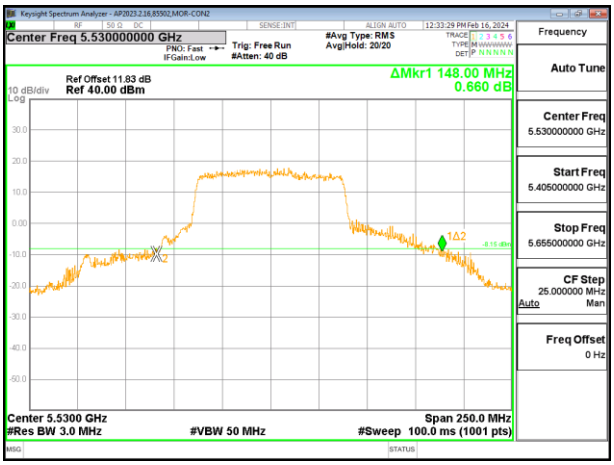
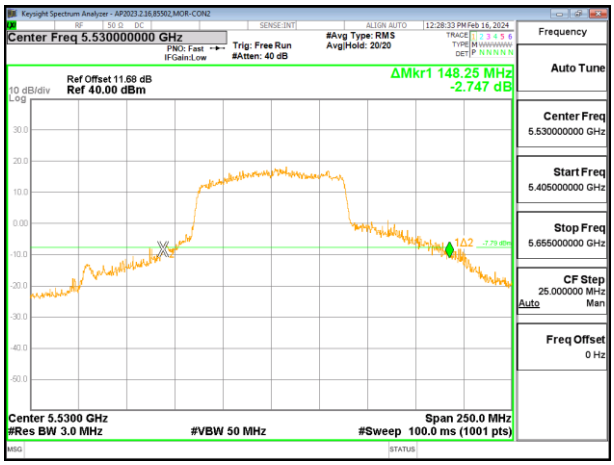
9.2.18. 802.11ac VHT80 MODE IN THE 5.6 GHz BAND

3TX CHAIN 0 + CHAIN 1 + CHAIN 2 CDD MODE

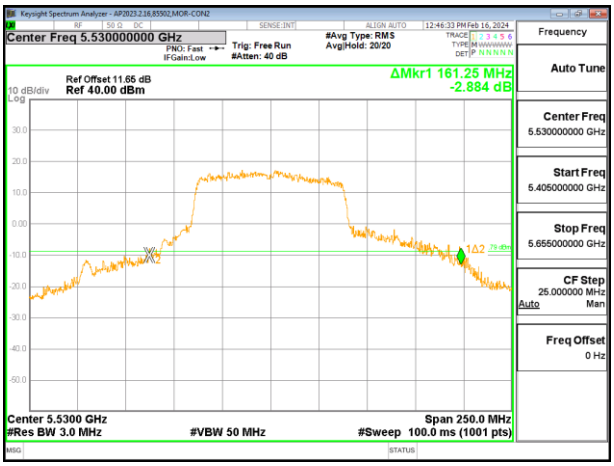
Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)
Low	5530	148.00	148.25	161.25



CHAIN 0



CHAIN 1



CHAIN 2

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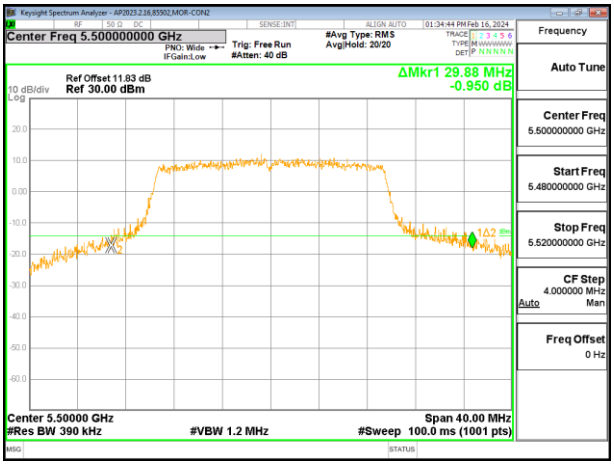
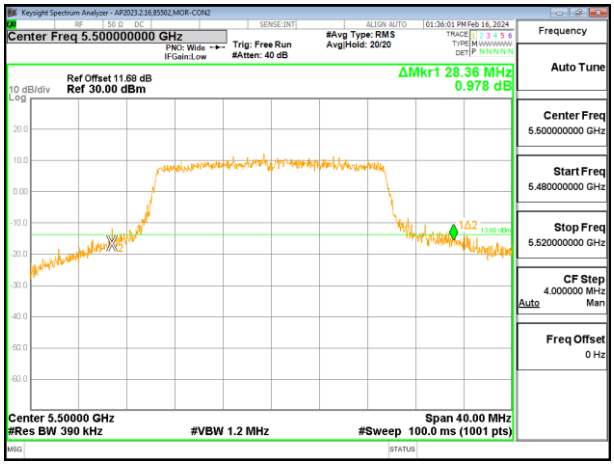
9.2.19. 802.11ax HE20 MODE IN THE 5.6 GHz BAND

3TX CHAIN 0 + CHAIN 1 + CHAIN 2 CDD MODE: SU

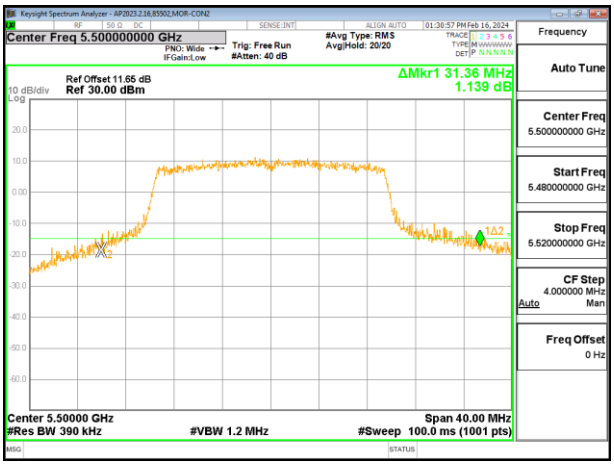
Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)
Low	5500	29.88	28.36	31.36
Mid	5580	24.36	23.80	22.72
High	5700	28.04	29.32	26.92



CHAIN 0



CHAIN 1



CHAIN 2

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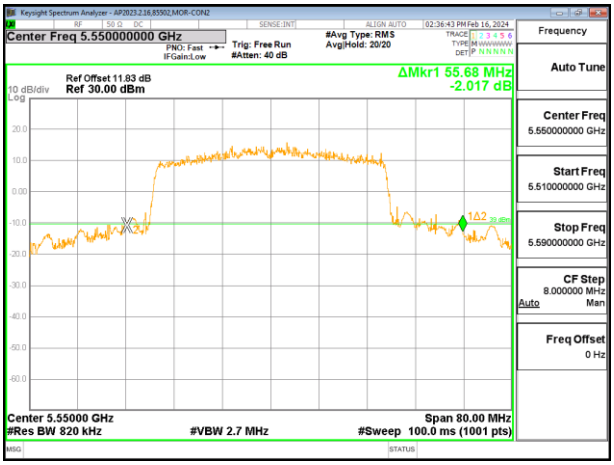
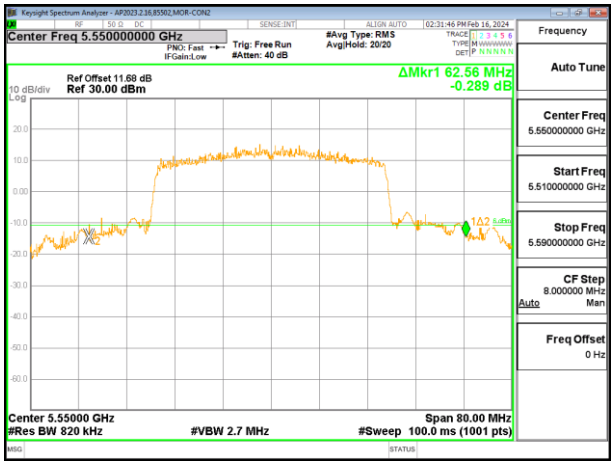
9.2.20. 802.11ax HE40 MODE IN THE 5.6 GHz BAND

3TX CHAIN 0 + CHAIN 1 + CHAIN 2 CDD MODE: SU

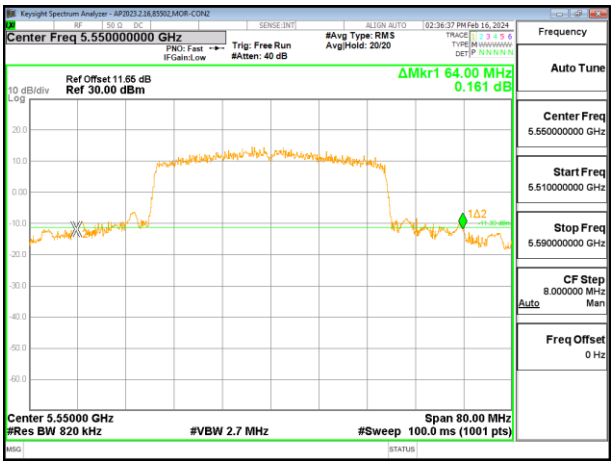
Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)
Low	5510	55.28	55.12	56.48
Mid	5550	55.68	62.56	64.00
High	5670	54.56	56.24	57.12



CHAIN 0



CHAIN 1



CHAIN 2

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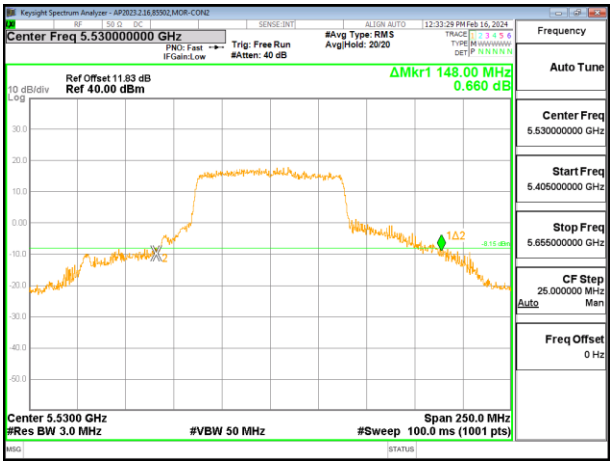
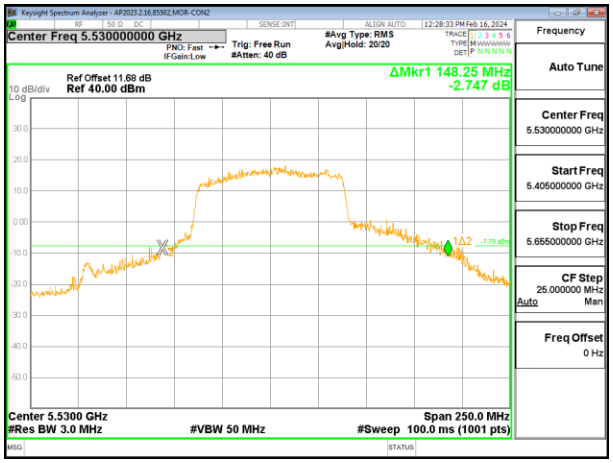
9.2.21. 802.11ax HE80 MODE IN THE 5.6 GHz BAND

3TX CHAIN 0 + CHAIN 1 + CHAIN 2 CDD MODE: SU

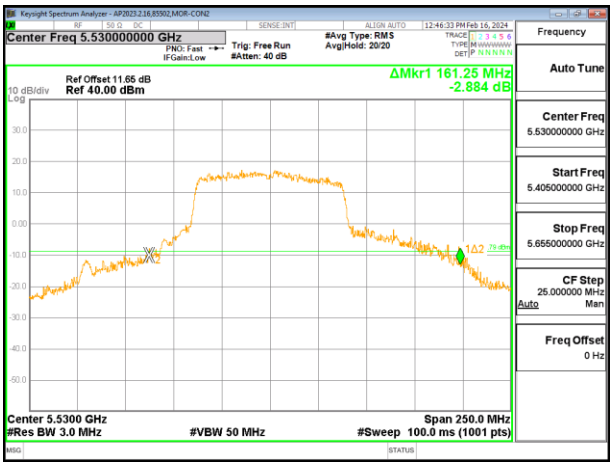
Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)	26 dB Bandwidth Chain 2 (MHz)
Low	5530	148.00	148.25	161.25



CHAIN 0



CHAIN 1



CHAIN 2

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9.3. 6 dB BANDWIDTH

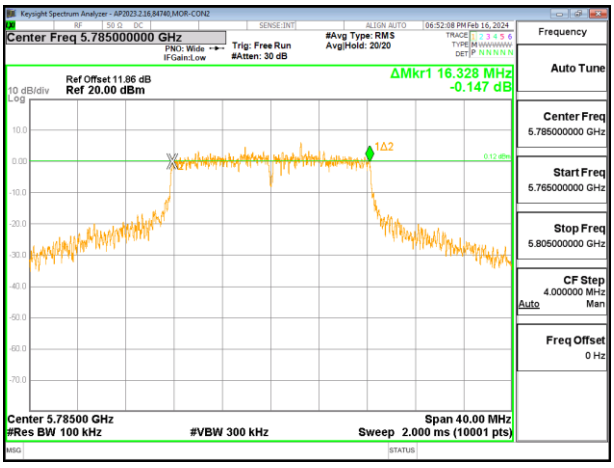
LIMITS

FCC §15.407 (e)
The minimum 6 dB bandwidth shall be at least 500 kHz.

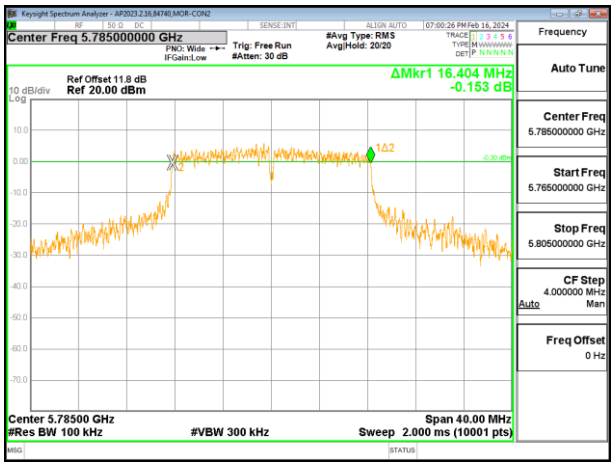
9.3.1. 802.11a MODE IN THE 5.8 GHz BAND

3TX CHAIN 0 + CHAIN 1 + CHAIN 2 CDD MODE

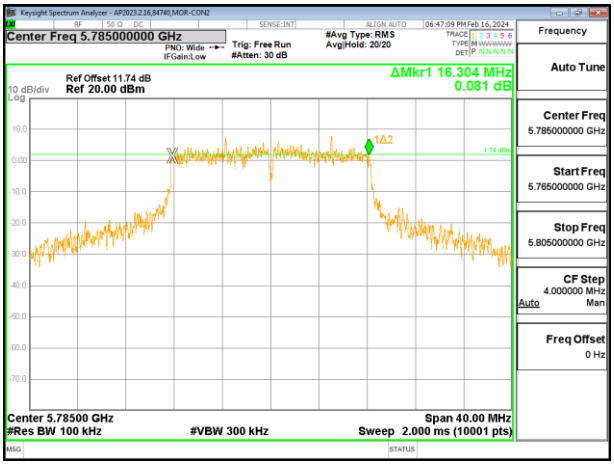
Channel	Frequency (MHz)	6 dB BW CHAIN 0 (MHz)	6 dB BW CHAIN 1 (MHz)	6 dB BW CHAIN 2 (MHz)	Minimum Limit (MHz)
Low	5745	16.352	16.364	16.332	0.5
Mid	5785	16.328	16.404.	16.304	0.5
High	5825	16.088	16.312	16.304	0.5



CHAIN 0



CHAIN 1



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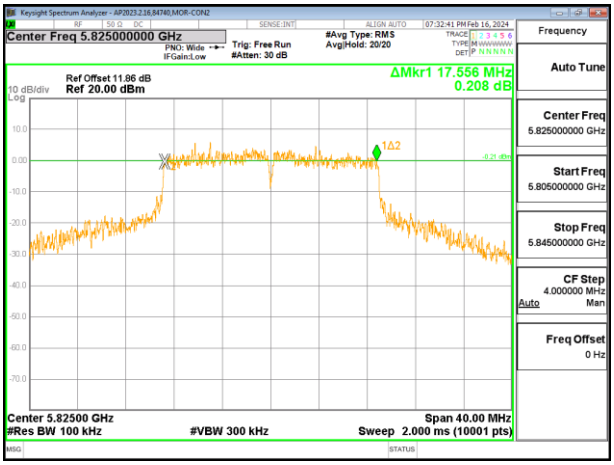
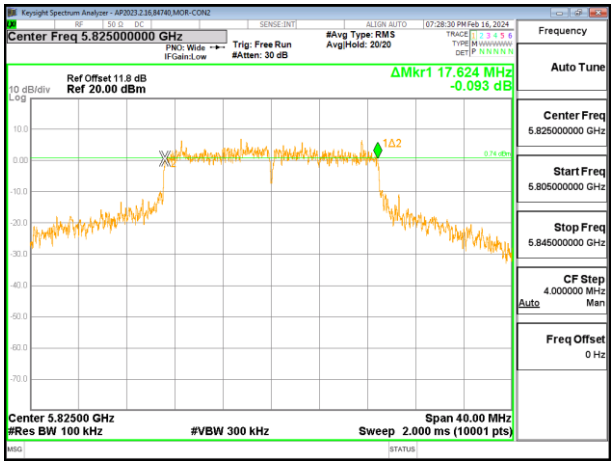
9.3.2. 802.11n HT20 MODE IN THE 5.8 GHz BAND

3TX CHAIN 0 + CHAIN 1 + CHAIN 2 CDD MODE

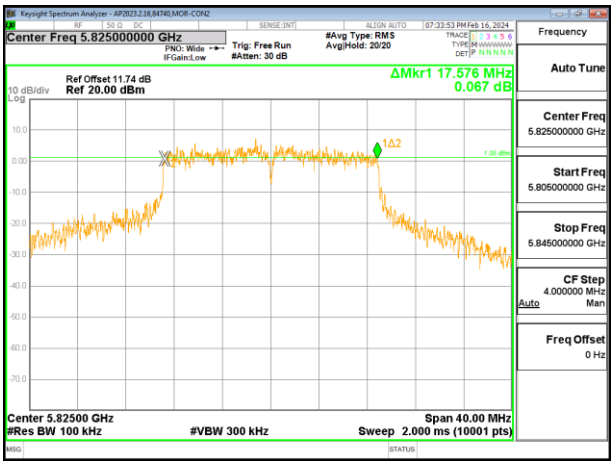
Channel	Frequency (MHz)	6 dB BW CHAIN 0 (MHz)	6 dB BW CHAIN 1 (MHz)	6 dB BW CHAIN 2 (MHz)	Minimum Limit (MHz)
Low	5745	17.540	17.260	17.604	0.5
Mid	5785	17.600	17.600	.17.552	0.5
High	5825	17.556	17.624	17.576	0.5



CHAIN 0



CHAIN 1



CHAIN 2

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