

TEST REPORT

Report Number : R14777340-E5

Applicant : Sony Corporation
1-7-1 Konan Minato-Ku
Tokyo, 108-0075, Japan

FCC ID : PY7-76732V

EUT Description : GSM/WCDMA/LTE/5G Phone with BT, DTS/UNII a/b/g/n/ac/ax,
GPS, WPT & NFC

Test Standard(s) : FCC 47 CFR PART 15 SUBPART E

Date Of Issue:
2023-07-06

Prepared by:
UL LLC
12 Laboratory Dr.
Research Triangle Park, NC 27709 U.S.A.
TEL: (919) 549-1400



REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2023-07-06	Initial Issue	B. Kiewra

TABLE OF CONTENTS

REPORT REVISION HISTORY	2
TABLE OF CONTENTS	3
1. ATTESTATION OF TEST RESULTS	6
2. TEST RESULT SUMMARY	7
3. TEST METHODOLOGY	7
4. FACILITIES AND ACCREDITATION	7
5. DECISION RULES AND MEASUREMENT UNCERTAINTY	8
5.1. METROLOGICAL TRACEABILITY	8
5.2. DECISION RULES.....	8
5.3. MEASUREMENT UNCERTAINTY.....	8
5.4. SAMPLE CALCULATION	8
6. EQUIPMENT UNDER TEST	9
6.1. EUT DESCRIPTION	9
6.2. MAXIMUM OUTPUT POWER.....	9
6.3. DESCRIPTION OF AVAILABLE ANTENNAS	10
6.4. SOFTWARE AND FIRMWARE.....	11
6.5. WORST-CASE CONFIGURATION AND MODE.....	11
6.6. DESCRIPTION OF TEST SETUP.....	12
7. MEASUREMENT METHOD.....	13
8. TEST AND MEASUREMENT EQUIPMENT	14
9. ANTENNA PORT TEST RESULTS	18
9.1. ON TIME AND DUTY CYCLE.....	18
9.2. 26 dB BANDWIDTH.....	22
9.2.1. 802.11a MODE IN THE 5.2 GHz BAND.....	22
9.2.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND	23
9.2.3. 802.11n HT40 MODE IN THE 5.2 GHz BAND	24
9.2.4. 802.11ac VHT80 MODE IN THE 5.2 GHz BAND	25
9.2.5. 802.11ax HE20 MODE IN THE 5.2 GHz BAND	26
9.2.6. 802.11ax HE40 MODE IN THE 5.2 GHz BAND	29
9.2.7. 802.11ax HE80 MODE IN THE 5.2 GHz BAND	30
9.2.8. 802.11a MODE IN THE 5.3 GHz BAND.....	31
9.2.9. 802.11n HT20 MODE IN THE 5.3 GHz BAND	32
9.2.10. 802.11n HT40 MODE IN THE 5.3 GHz BAND	33
9.2.11. 802.11ac VHT80 MODE IN THE 5.3 GHz BAND	34
9.2.12. 802.11ac VHT160 MODE IN THE 5.2 AND 5.3 GHz BAND.....	35

9.2.13.	802.11ax HE20 MODE IN THE 5.3 GHz BAND	36
9.2.14.	802.11ax HE40 MODE IN THE 5.3 GHz BAND	39
9.2.15.	802.11ax HE80 MODE IN THE 5.3 GHz BAND	41
9.2.16.	802.11ax HE160 MODE IN THE 5.2 AND 5.3 GHz BAND	42
9.2.17.	802.11a MODE IN THE 5.6 GHz BAND.....	43
9.2.18.	802.11n HT20 MODE IN THE 5.6 GHz BAND	44
9.2.19.	802.11n HT40 MODE IN THE 5.6 GHz BAND	45
9.2.20.	802.11ac VHT80 MODE IN THE 5.6 GHz BAND	46
9.2.21.	802.11ac VHT160 MODE IN THE 5.6 GHz BAND	47
9.2.22.	802.11ax HE20 MODE IN THE 5.6 GHz BAND	48
9.2.23.	802.11ax HE40 MODE IN THE 5.6 GHz BAND	53
9.2.24.	802.11ax HE80 MODE IN THE 5.6 GHz BAND	55
9.2.25.	802.11ax HE160 MODE IN THE 5.6 GHz BAND	57
9.3.	6 dB BANDWIDTH.....	59
9.3.1.	802.11ax HE20 MODE IN THE 5.8 GHz BAND	59
9.4.	OUTPUT POWER AND PSD.....	60
9.4.1.	802.11a MODE IN THE 5.2 GHz BAND.....	62
9.4.2.	802.11n HT20 MODE IN THE 5.2 GHz BAND	64
9.4.3.	802.11n HT40 MODE IN THE 5.2 GHz BAND	65
9.4.4.	802.11ac VHT80 MODE IN THE 5.2 GHz BAND	66
9.4.5.	802.11ac VHT160 MODE IN THE 5.2 & 5.3 GHz BAND.....	67
9.4.6.	802.11ax HE20 MODE IN THE 5.2GHz BAND	68
9.4.7.	802.11ax HE40 MODE IN THE 5.2GHz BAND	74
9.4.8.	802.11ax HE80 MODE IN THE 5.2GHz BAND	75
9.4.9.	802.11ax HE160 MODE IN THE 5.2GHz & 5.3GHz BAND	76
9.4.10.	802.11a MODE IN THE 5.3 GHz BAND.....	77
9.4.11.	802.11n HT20 MODE IN THE 5.3 GHz BAND	79
9.4.12.	802.11n HT40 MODE IN THE 5.3 GHz BAND	80
9.4.13.	802.11ac VHT80 MODE IN THE 5.3 GHz BAND	81
9.4.14.	802.11ax HE20 MODE IN THE 5.3GHz BAND	82
9.4.15.	802.11ax HE40 MODE IN THE 5.3GHz BAND	88
9.4.16.	802.11ax HE80 MODE IN THE 5.3GHz BAND	89
9.4.17.	802.11a MODE IN THE 5.6 GHz BAND.....	90
9.4.18.	802.11n HT20 MODE IN THE 5.6 GHz BAND	93
9.4.19.	802.11n HT40 MODE IN THE 5.6 GHz BAND	94
9.4.20.	802.11ac VHT80 MODE IN THE 5.6 GHz BAND	95
9.4.21.	802.11ac VHT160 MODE IN THE 5.6 GHz BAND	96
9.4.22.	802.11ax HE20 MODE IN THE 5.6GHz BAND	97
9.4.23.	802.11ax HE40 MODE IN THE 5.6GHz BAND	106
9.4.24.	802.11ax HE80 MODE IN THE 5.6GHz BAND	108
9.4.25.	802.11ax HE160 MODE IN THE 5.6GHz BAND	110
9.4.26.	802.11a MODE IN THE 5.8 GHz BAND.....	111
9.4.27.	802.11n HT20 MODE IN THE 5.8 GHz BAND	114
9.4.28.	802.11n HT40 MODE IN THE 5.8 GHz BAND	115
9.4.29.	802.11ac VHT80 MODE IN THE 5.8 GHz BAND	116
9.4.30.	802.11ax HE20 MODE IN THE 5.8GHz BAND	117
9.4.31.	802.11ax HE40 MODE IN THE 5.8GHz BAND	126
9.4.32.	802.11ax HE80 MODE IN THE 5.8GHz BAND	128
10.	RADIATED TEST RESULTS.....	129
10.1.	TRANSMITTER ABOVE 1 GHz.....	130

10.1.1.	TX ABOVE 1 GHz 802.11a MODE IN THE 5.2 GHz BAND	130
10.1.2.	TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.2 GHz BAND.....	132
10.1.3.	TX ABOVE 1 GHz 802.11n HT40 MODE IN THE 5.2 GHz BAND.....	134
10.1.4.	TX ABOVE 1 GHz 802.11ac VHT80 MODE IN THE 5.2 GHz BAND	136
10.1.5.	TX ABOVE 1 GHz 802.11ax HE20 MODE IN THE 5.2 GHz BAND.....	138
10.1.6.	TX ABOVE 1 GHz 802.11ax HE40 MODE IN THE 5.2 GHz BAND.....	160
10.1.7.	TX ABOVE 1 GHz 802.11ax HE80 MODE IN THE 5.2 GHz BAND.....	164
10.1.8.	TX ABOVE 1 GHz 802.11a MODE IN THE 5.3 GHz BAND	168
10.1.9.	TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.3 GHz BAND.....	170
10.1.10.	TX ABOVE 1 GHz 802.11n HT40 MODE IN THE 5.3 GHz BAND.....	172
10.1.11.	TX ABOVE 1 GHz 802.11ac VHT80 MODE IN THE 5.3 GHz BAND	178
10.1.12.	TX ABOVE 1 GHz 802.11ac VHT160 MODE IN THE 5.2/5.3 GHz BAND.....	180
10.1.13.	TX ABOVE 1 GHz 802.11ax HE20 MODE IN THE 5.3 GHz BAND.....	184
10.1.14.	TX ABOVE 1 GHz 802.11ax HE40 MODE IN THE 5.3 GHz BAND.....	200
10.1.15.	TX ABOVE 1 GHz 802.11ax HE80 MODE IN THE 5.3 GHz BAND.....	204
10.1.16.	TX ABOVE 1 GHz 802.11ax HE160 MODE IN THE 5.2/5.3 GHz BAND.....	208
10.1.17.	TX ABOVE 1 GHz 802.11a MODE IN THE 5.6 GHz BAND	216
10.1.18.	TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.6 GHz BAND.....	220
10.1.19.	TX ABOVE 1 GHz 802.11n HT40 MODE IN THE 5.6 GHz BAND.....	230
10.1.20.	TX ABOVE 1 GHz 802.11ac VHT80 MODE IN THE 5.6 GHz BAND	234
10.1.21.	TX ABOVE 1 GHz 802.11ax HE20 MODE IN THE 5.6 GHz BAND.....	238
10.1.22.	TX ABOVE 1 GHz 802.11ax HE40 MODE IN THE 5.6 GHz BAND.....	264
10.1.23.	TX ABOVE 1 GHz 802.11ax HE80 MODE IN THE 5.6 GHz BAND.....	272
10.1.24.	TX ABOVE 1 GHz 802.11ax HE160 MODE IN THE 5.6 GHz BAND.....	280
10.1.25.	TX ABOVE 1 GHz 802.11a MODE IN THE 5.8 GHz BAND	288
10.1.26.	TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.8 GHz BAND.....	292
10.1.27.	TX ABOVE 1 GHz 802.11n HT40 MODE IN THE 5.8 GHz BAND.....	296
10.1.28.	TX ABOVE 1 GHz 802.11ac VHT80 MODE IN THE 5.8 GHz BAND	300
10.1.29.	TX ABOVE 1 GHz 802.11ax HE20 MODE IN THE 5.8 GHz BAND.....	304
10.1.30.	TX ABOVE 1 GHz 802.11ax HE40 MODE IN THE 5.8 GHz BAND.....	336
10.1.31.	TX ABOVE 1 GHz 802.11ax HE80 MODE IN THE 5.8 GHz BAND.....	344
10.2.	<i>TRANSMITTER WORST CASE</i>	352
10.2.1.	SPURIOUS BELOW 30MHz (E-FIELD)	352
10.2.2.	SPURIOUS 30-1000MHz.....	353
10.2.3.	SPURIOUS 18-26 GHz.....	355
10.2.4.	SPURIOUS 26-40 GHz.....	357
10.2.5.	SIMULTANEOUS TRANSMISSION.....	359
11.	AC POWER LINE CONDUCTED EMISSIONS	365
11.1.	<i>AC POWER LINE NORM</i>	366
12.	SETUP PHOTOS.....	368
	END OF TEST REPORT	368

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Sony Corporation
1-7-1 Konan Minato-Ku
Tokyo, 108-0075, Japan

EUT DESCRIPTION: GSM/WCDMA/LTE/5G Phone with BT, DTS/UNII a/b/g/n/ac/ax,
GPS, WPT & NFC

SERIAL NUMBER: QV77000RHJ, QV7700F8G9, QV770005HJ

SAMPLE RECEIPT DATE: 2023-05-02

DATE TESTED: 2023-06-26 to 2023-06-30

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
47 CFR Part 15 Subpart E	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:

Prepared By:



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

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 6.5)

FCC Clause	Requirement	Result	Comment
See Comment	Duty Cycle	Reporting purposes only	Per ANSI C63.10, Section 12.2.
See Comment	26dB BW/99% OBW	Reporting purposes only	Per ANSI C63.10 Sections 6.9.2 and 6.9.3
15.407 (e)	6 dB BW	Compliant	None
15.407 (a) (1-3), (h) (1)	Output Power		
15.407 (a) (1-3)	PSD		
15.209, 15.205, 15.407 (b)	Radiated Emissions		
15.207	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,
- KDB 414788 D01 Radiated Test Site v01r01
- ANSI C63.10-2013

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
<input type="checkbox"/>	Building: 12 Laboratory Dr RTP, NC 27709, U.S.A	US0067	2180C	825374
<input checked="" type="checkbox"/>	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:

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

$$36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$$

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

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

$$36.5 \text{ dBuV} + 0 \text{ dB} + 10.1 \text{ dB} + 0 \text{ dB} = 46.6 \text{ dBuV}$$

6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a GSM/WCDMA/LTE/5G Phone with BT, DTS, UNII a/b/g/n/ac/ax, GPS, WPT & NFC. This report covers testing for 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, 2Tx			
5180-5240	802.11a	13.70	23.44
5180-5240	802.11n HT20	13.79	23.93
5190-5230	802.11n HT40	13.37	21.73
5210	802.11ac VHT80	13.79	23.93
5250	802.11ac VHT160	13.26	21.18
5180-5240	802.11ax HE20	13.86	24.32
5190-5230	802.11ax HE40	13.70	23.44
5210	802.11ax HE80	13.58	22.80
5250	802.11ax HE160	13.29	21.33

5.3 GHz BAND

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.3GHz Band, 2Tx			
5260-5320	802.11a	13.85	24.27
5260-5320	802.11n HT20	13.92	24.66
5270-5310	802.11n HT40	14.07	25.53
5290	802.11ac VHT80	13.49	22.34
5260-5320	802.11ax HE20	13.91	24.60
5270-5310	802.11ax HE40	13.78	23.88
5290	802.11ax HE80	13.76	23.77

5.6 GHz BAND

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.6GHz Band, 2Tx			
5500-5720	802.11a	14.31	26.98
5500-5720	802.11n HT20	14.49	28.12
5510-5710	802.11n HT40	14.41	27.61
5530-5690	802.11ac VHT80	14.38	27.42
5570	802.11ac VHT160	14.05	25.41
5500-5720	802.11ax HE20	13.75	23.71
5510-5710	802.11ax HE40	14.07	25.53
5530-5690	802.11ax HE80	13.97	24.95
5570	802.11ax HE160	13.33	21.53

5.8 GHz BAND

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.8GHz Band, 2Tx			
5745-5825	802.11a	14.13	25.88
5745-5825	802.11n HT20	14.17	26.12
5755-5795	802.11n HT40	14.04	25.35
5775	802.11ac VHT80	14.00	25.12
5745-5825	802.11ax HE20	14.24	26.55
5755-5795	802.11ax HE40	13.97	24.95
5775	802.11ax HE80	13.77	23.82

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The antenna(s) gain and type, as provided by the manufacturer' are as follows:
 The radio utilizes two antennas for diversity, with the following types and maximum gains:

Chain	Designation in Documentation	Type	Frequency Range (MHz)	Maximum Gain (dBi)
0	WLAN Main/Bluetooth#1	Loop	5180-5320	-0.97
			5500-5700	-0.24
			5745-5825	-0.07
1	WLAN Sub/Bluetooth#2	Monopole	5180-5320	-4.55
			5500-5700	-3.22
			5745-5825	-3.14

Beamforming gain calculated as MIMO gain – worst-case antenna gain.
 Example calculation: beamforming gain = -2.42 – (-0.97) = -1.45.

6.4. SOFTWARE AND FIRMWARE

The software version used during testing was 2.127.

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.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation.

All testing performed in 2Tx mode (NSS=1), where power per chain is equivalent to the 1Tx power on each chain. Based on preliminary testing, this allows 2Tx 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
802.11ac VHT160 mode: MCS0
802.11ax HE20mode: MCS0 (Nss = 1)
802.11ax HE40mode: MCS0 (Nss = 1)
802.11ax HE80mode: MCS0 (Nss = 1)
802.11ax HE160mode: MCS0 (Nss = 1)

802.11ax modes were determined by the following:

- 802.11ax HE20 26T, 52T, 106T, and 242T modes tested.
- 802.11ax HE40 484T and SU modes tested. 26T, 52T, 106T, and 242T modes are covered by the HE 20MHz modes.
- 802.11ax HE80 996T and SU modes tested. 26T, 52T, 106T, 242T, and 484T modes are covered by the HE20 and HE40 modes.
- 802.11ax HE160 2x996T and SU modes tested. 26T, 52T, 106T, 242T, 484T, and 996T modes are covered by the HE 20MHz, 40MHz, and 80MHz modes.

For PSD testing 11a mode covers remaining non-11ax modes and HE20 26T and 52T(or 242T for 5.8 band) modes cover remaining 11ax modes.

Simultaneous Transmission modes investigated:

802.11g 2437MHz 2Tx and 802.11n HT20 5240MHz 2Tx
BT GFSK 2480MHz C0 and 802.11n HT20 5240MHz 2Tx
BT GFSK 2480MHz C1 and 802.11n HT20 5240MHz 2Tx

6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Dell	Inspiron 15 3000	5KPQJP3	NA
AC Adaptor	Sony	XQZ-UC1	1821W34209742	NA
USB-C	Sony	XQZ-UB1	NA	NA
Headphones	Sony	MDR-EX15AP	NA	NA

I/O CABLES

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	USB-C	1	USB-C	Non-Shielded	<3m	Connected to power supply
2	3.5mm	1	AUX	Non-Shielded	<3m	Connected to headphones

TEST SETUP

Test software exercised the radio card.

SETUP DIAGRAM

Please refer to R14777340-EP2 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 C63.10-2013, Section 6.2.

Radiated Spurious Emissions: ANSI C63.10-2013 Section 6.3 to 6.6

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.
SA0026	Spectrum Analyzer	Keysight Technologies	N9030A	2022-08-02	2023-08-02
HI0090	Environmental Meter	Fisher Scientific	15-077-963	2022-07-20	2023-07-20
134477	RF Power Meter	Keysight Technologies	N1912A	2022-08-30	2023-08-30
135121	RF Power Meter	Keysight Technologies	N1911A	2022-07-02	2023-07-02
135124	Peak and Avg Power Sensor, 50MHz to 18GHz	Keysight Technologies	N1921A	2022-07-07	2023-07-07
135125	Peak and Avg Power Sensor, 50MHz to 18GHz	Keysight Technologies	N1921A	2022-09-27	2023-09-27
MM0167 (PRE0126458)	True RMS Multimeter	Agilent	U1232A	2021-08-17	2023-08-17
MY61466084	DC Regulated Power Supply	Keysight Technologies	E3633A	NA	NA
SOFTEMI	Antenna Port Software	UL	Version 2022.8.16		

Test Equipment Used - Wireless Conducted Attenuators, Cables, and Couplers

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
Attenuators					
226559	SMA Coaxial 10dB Attenuator 25MHz-18GHz	CentricRF	C18S2-10	2023-02-16	2024-02-16
226561	SMA Coaxial 10dB Attenuator 25MHz-18GHz	CentricRF	C18S2-10	2023-02-16	2024-02-16
Cables					
CBL101	Micro-Coax UTiFLEX Cable Assembly, Low Loss, 40Ghz, 39.3", Connectors 2	Carlisle Interconnect Technologies	UFA147A-0-0180-200200	2023-01-24	2024-01-24

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

Equipment ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
1-18 GHz					
89509	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2023-05-23	2025-05-23
Gain-Loss Chains					
207640	Gain-loss string: 1-18GHz	Various	Various	2023-05-17	2024-05-17
Receiver & Software					
197955	Spectrum Analyzer	Rohde & Schwarz	ESW44	2023-04-10	2024-04-10
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
Additional Equipment used					
21642	Environmental Meter	Fisher Scientific	15-077-963 (s/n 210701692)	2021-08-16	2023-08-16

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

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
1-18 GHz					
206211	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2023-04-06	2024-04-06
Gain-Loss Chains					
91979	Gain-loss string: 1-18GHz	Various	Various	2023-05-16	2024-05-16
Receiver & Software					
197954	Spectrum Analyzer	Rohde & Schwarz	ESW44	2023-02-02	2024-02-02
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
Additional Equipment used					
200539	Environmental Meter	Fisher Scientific	15-077-963 s/n 18474341	2022-10-05	2023-10-05

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

Equipment ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
0.009-30MHz					
135144	Active Loop Antenna	ETS-Lindgren	6502	2023-01-17	2024-01-17
30-1000 MHz					
90627	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2022-09-07	2023-09-07
1-18 GHz					
88761	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2022-09-13	2023-09-13
18-40 GHz					
204704	Horn Antenna, 18-26.5GHz	Com-Power	AH-626	2022-07-11	2023-07-11
204705	Horn Antenna, 26-40GHz	Com-Power	AH-640	2022-07-11	2023-07-11
Gain-Loss Chains					
91975	Gain-loss string: 0.009-30MHz	Various	Various	2023-06-06	2024-06-06
91978	Gain-loss string: 25-1000MHz	Various	Various	2023-06-06	2024-06-06
91977	Gain-loss string: 1-18GHz	Various	Various	2023-06-06	2024-06-06
136042	Gain-loss string: 18-40GHz	Various	Various	2023-06-06	2024-06-06
Receiver & Software					
72823	Spectrum Analyzer	Agilent	E4446A	2022-06-30	2023-06-30
90416	Spectrum Analyzer	Keysight	N9030A	2023-06-09	2024-06-30
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
Additional Equipment used					
200540	Environmental Meter	Fisher Scientific	15-077-963 s/n 181474409	2022-10-05	2023-10-05

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	2023-04-04	2024-04-04
HI0091	Environmental Meter	Fisher Scientific	15-077-963	2022-07-20	2023-07-20
LISN001	LISN, 50-ohm/50-uH, 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50-25-2-01-550V	2022-08-01	2023-08-01
75141	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2022-08-03	2023-08-03
52859	Transient Limiter, 0.009-100MHz	Electro-Metrics	EM-7600	2023-04-04	2024-04-04
PS216	AC Power Source	Elgar	CW2501M-1 (s/n 1045A04231)	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
CDECABLE001	ANSI C63.4 1m extension cable.	UL	Per Annex B of ANSI C63.4	2022-09-12	2023-09-12

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE LIMITS

None; for reporting purposes only.

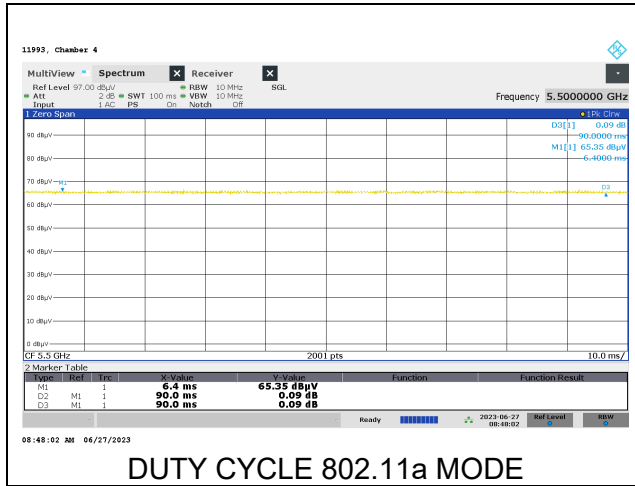
PROCEDURE

KDB 558074 D01 Zero-Span Spectrum Analyzer Method.

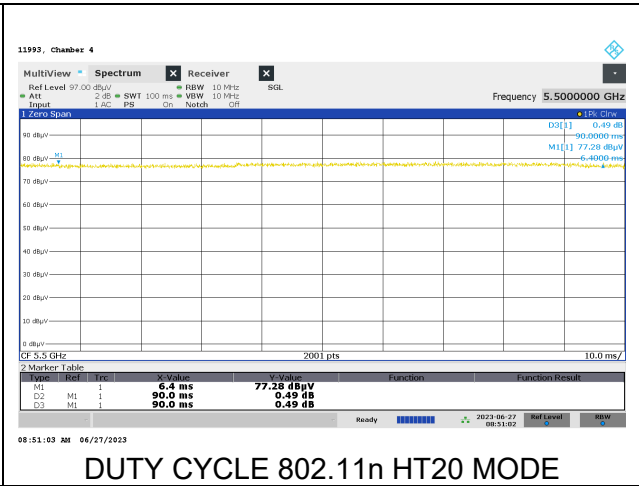
ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	PSD Duty Cycle Correction Factor (dB)	Voltage AV DC Correction (dB)
802.11a CDD	100.000	100.000	1.000	100.00	0.00	0.00
802.11n HT20 CDD	100.000	100.000	1.000	100.00	0.00	0.00
802.11n HT40 CDD	100.0000	100.0000	1.000	100.00	0.00	0.00
802.11ac VHT80 CDD	5.390	5.445	0.990	98.99	0.00	0.00
802.11ac VHT160 CDD	5.4250	5.4500	0.995	99.54	0.00	0.00

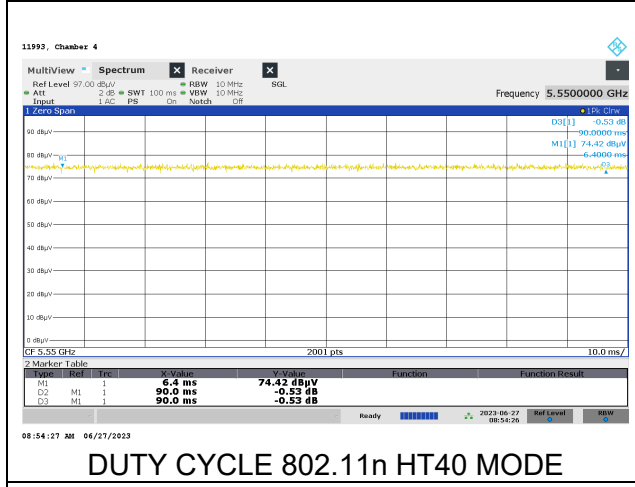
Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	PSD Duty Cycle Correction Factor (dB)	Voltage AV DC Correction (dB)
802.11ax HE20 26T	2.324	2.460	0.945	94.46%	0.25	0.49
802.11ax HE20 52T	1.266	1.344	0.942	94.23%	0.26	0.52
802.11ax HE20 106T	0.639	0.680	0.939	93.93%	0.27	0.54
802.11ax HE20 242T	0.924	0.988	0.935	93.54%	0.29	0.58
802.11ax HE20 SU	100.000	100.000	1.000	100.00%	0.00	0.00
802.11ax HE40 484T	0.506	0.543	0.932	93.19%	0.31	0.61
802.11ax HE40 SU	5.44636	5.47087	0.996	99.55%	0.00	0.00
802.11ax HE80 996T	0.38600	0.42300	0.913	91.25%	0.40	0.80
802.11ax HE80 SU	5.44000	5.52000	0.986	98.55%	0.00	0.00
802.11ax HE160 2x996T	0.38200	0.41900	0.912	91.17%	0.40	0.80
802.11ax HE160 SU	5.43999	5.48500	0.992	99.18%	0.00	0.00



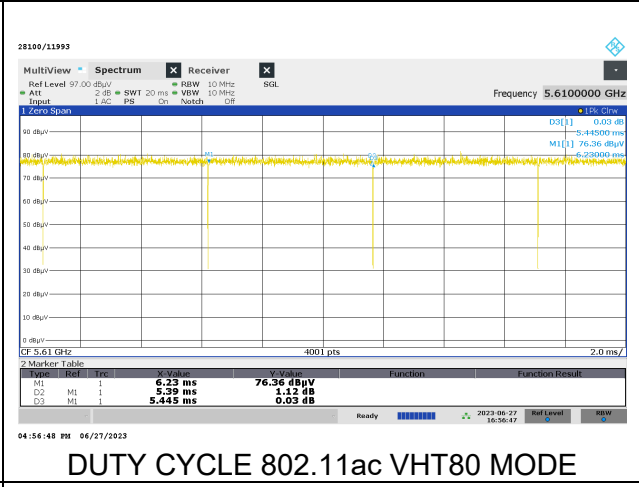
DUTY CYCLE 802.11a MODE



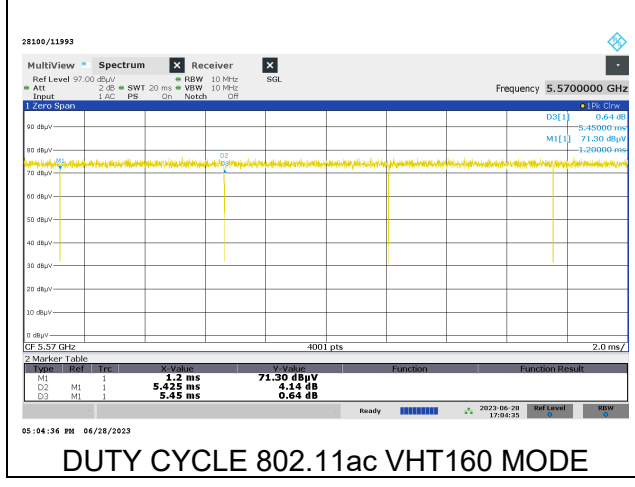
DUTY CYCLE 802.11n HT20 MODE



DUTY CYCLE 802.11n HT40 MODE



DUTY CYCLE 802.11ac VHT80 MODE



DUTY CYCLE 802.11ac VHT160 MODE

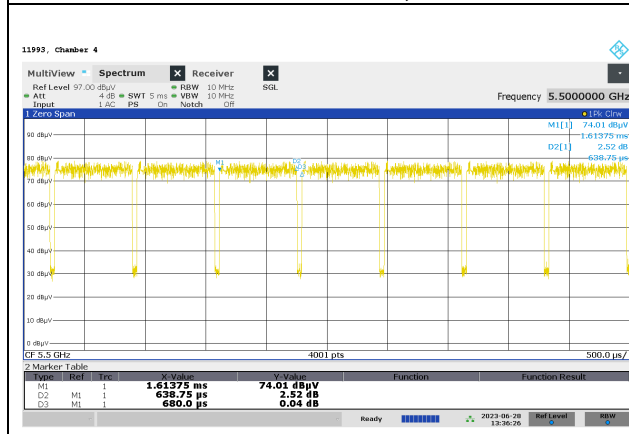
NTENTIONALLY LEFT BLANK



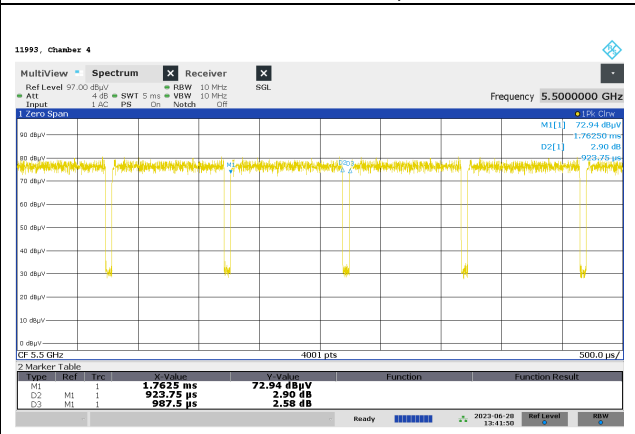
802.11ax HE20 OFDMA, 26T MODE



802.11ax HE20 OFDMA, 52T MODE



802.11ax HE20, 106T MODE



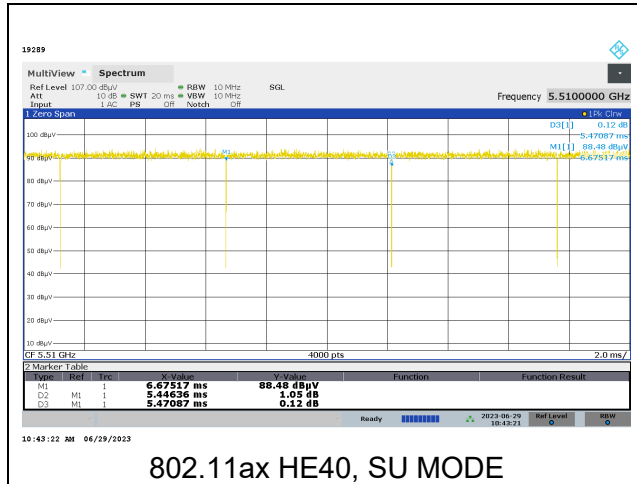
802.11ax HE20, 242T MODE



802.11ax HE20, SU MODE



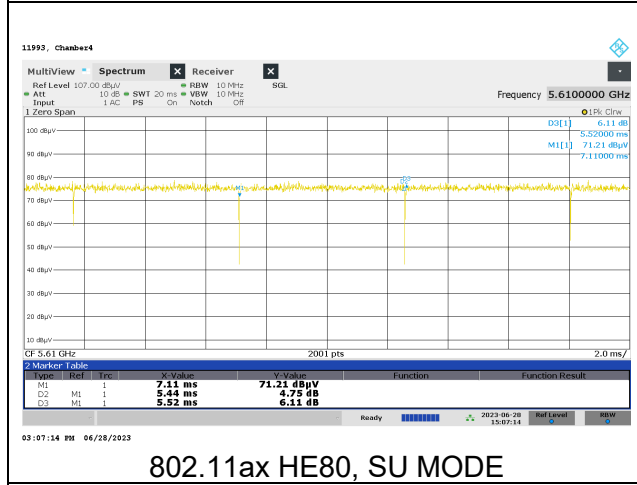
802.11ax HE40, 484T MODE



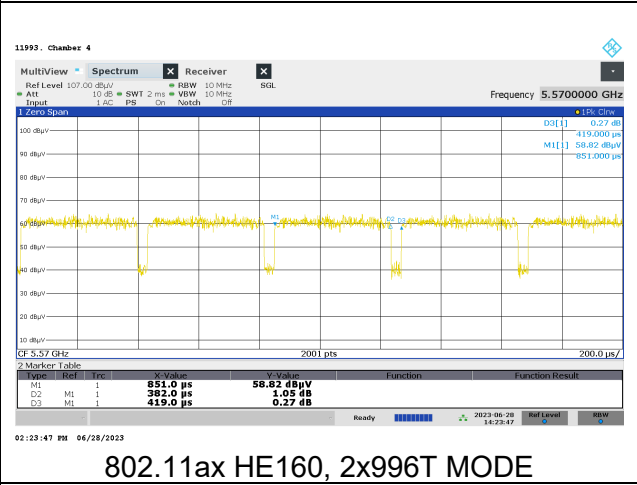
802.11ax HE40, SU MODE



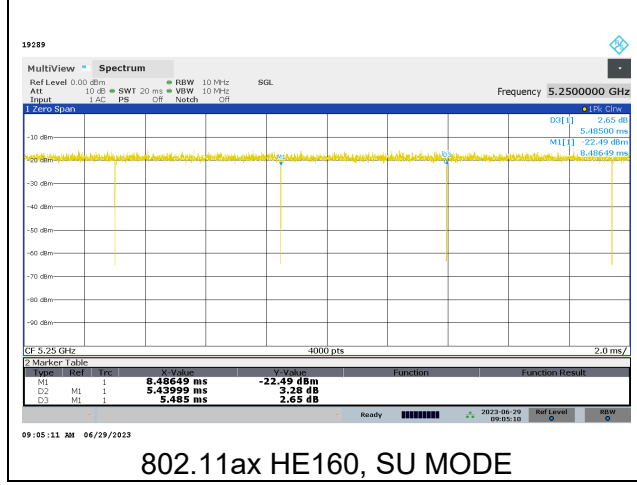
802.11ax HE80, 996T MODE



802.11ax HE80, SU MODE



802.11ax HE160, 2x996T MODE



802.11ax HE160, SU MODE

INTENTIONALLY LEFT BLANK

9.2. 26 dB BANDWIDTH

LIMITS

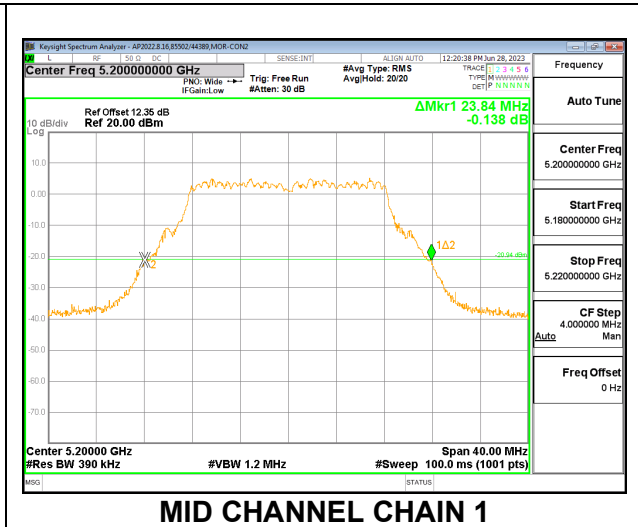
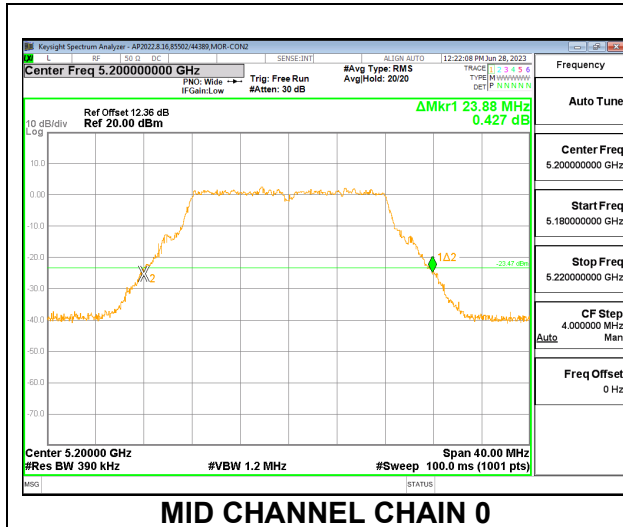
None; for reporting purposes only.

RESULTS

9.2.1. 802.11a MODE IN THE 5.2 GHz BAND

2TX CDD MODE

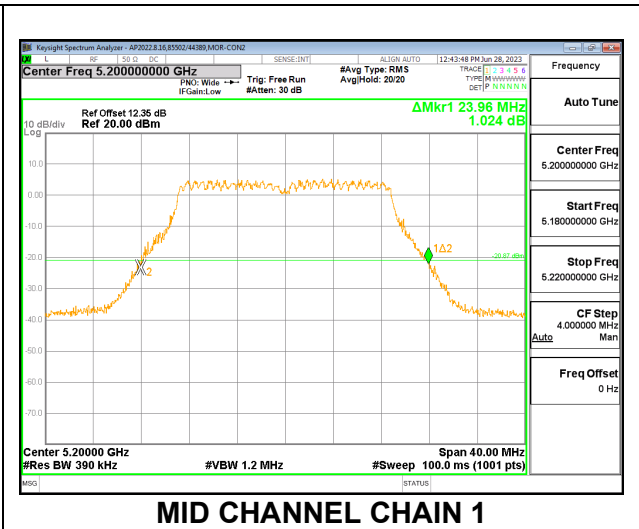
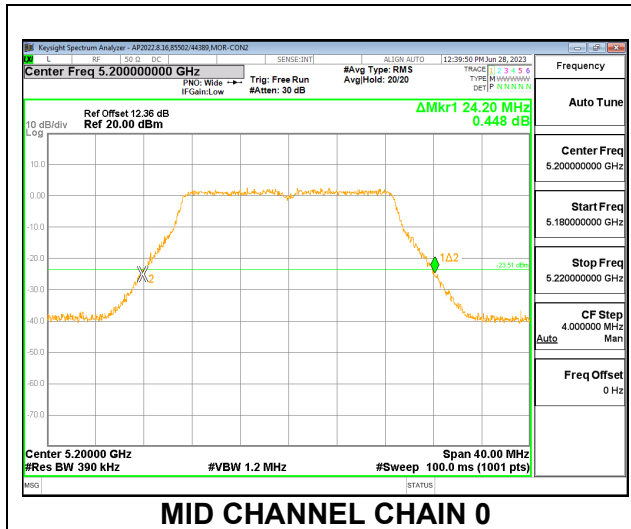
Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5180	24.00	23.04
Mid	5200	23.88	23.84
High	5240	24.00	23.84



9.2.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND

2TX CDD MODE

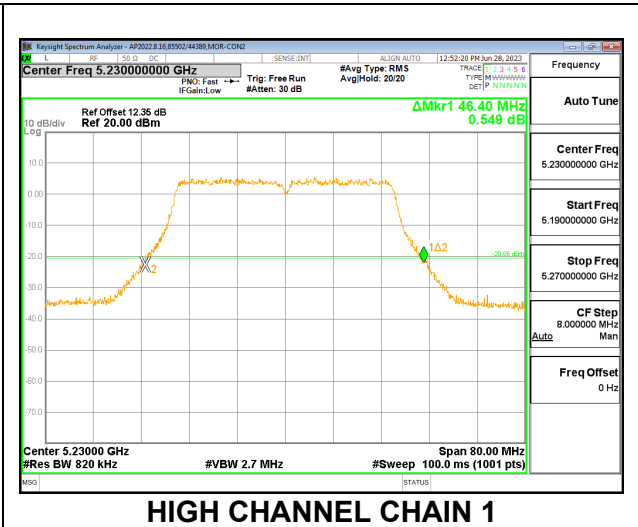
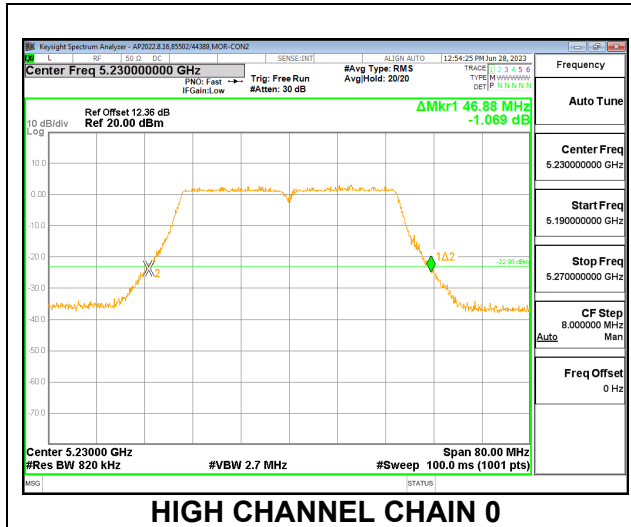
Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5180	23.96	23.76
Mid	5200	24.20	23.96
High	5240	24.48	24.00



9.2.3. 802.11n HT40 MODE IN THE 5.2 GHz BAND

2TX CDD MODE

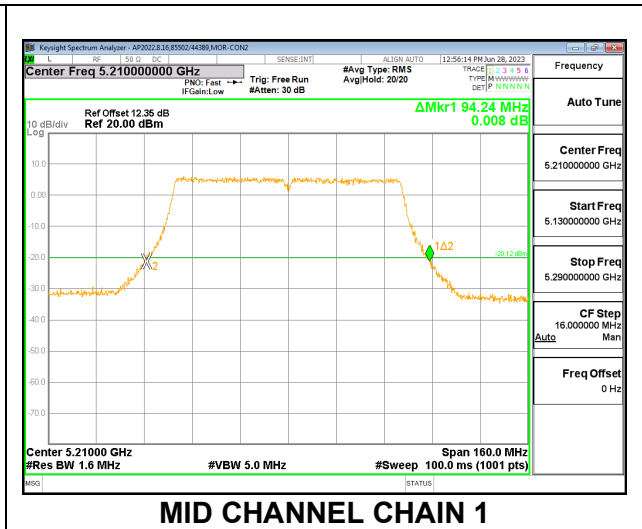
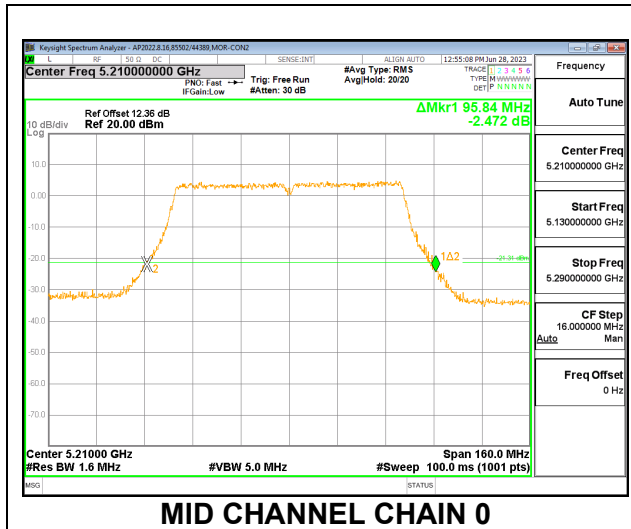
Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5190	47.20	46.24
High	5230	46.88	46.40



9.2.4. 802.11ac VHT80 MODE IN THE 5.2 GHz BAND

2TX CDD MODE

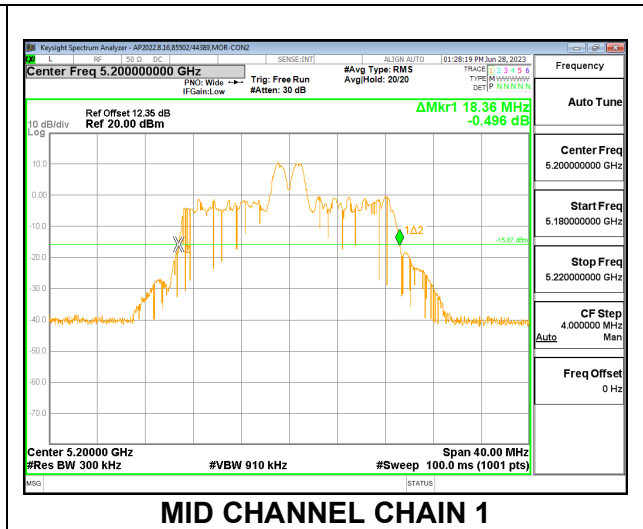
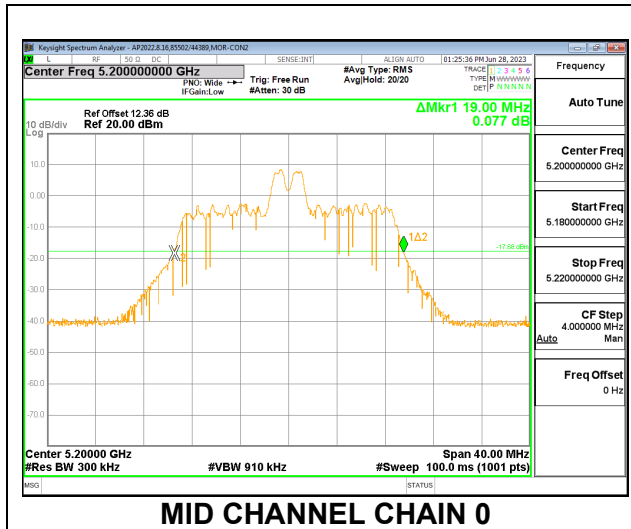
Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Mid	5210	95.84	94.24



9.2.5. 802.11ax HE20 MODE IN THE 5.2 GHz BAND

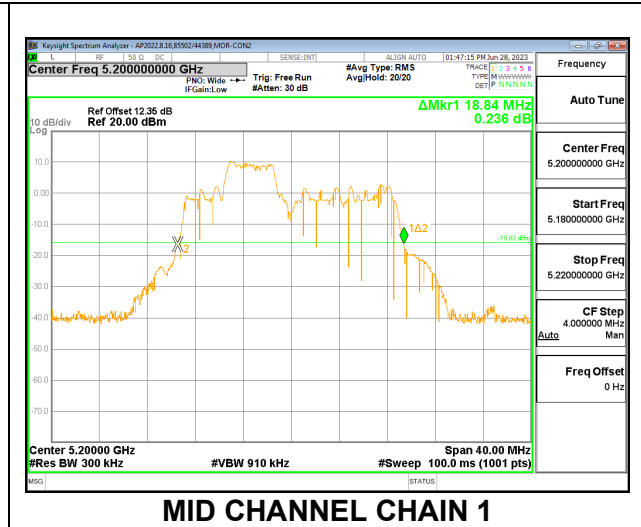
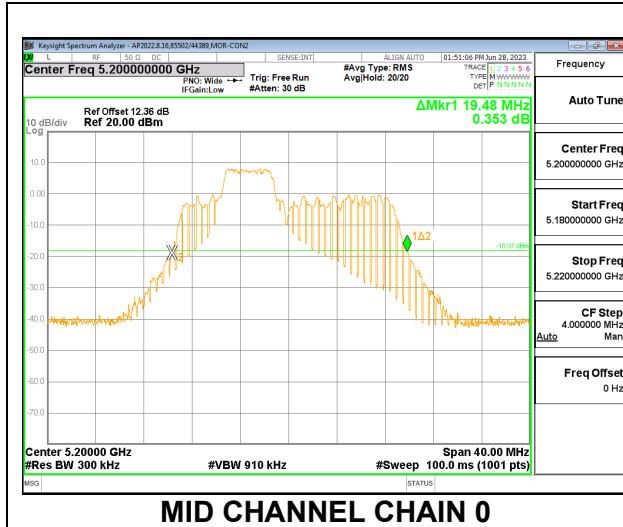
2TX CDD MODE – 26T

Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5180	20.36	20.28
Mid	5200	19.00	18.36
High	5240	20.68	20.36



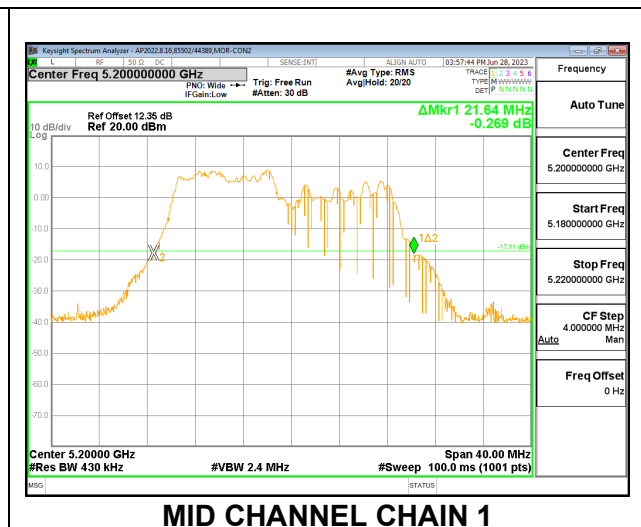
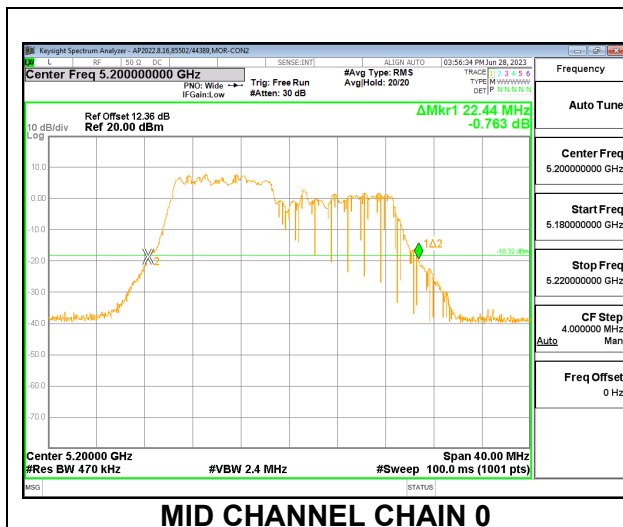
2TX CDD MODE – 52T

Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5180	20.92	20.24
Mid	5200	19.48	18.84
High	5240	20.96	20.48



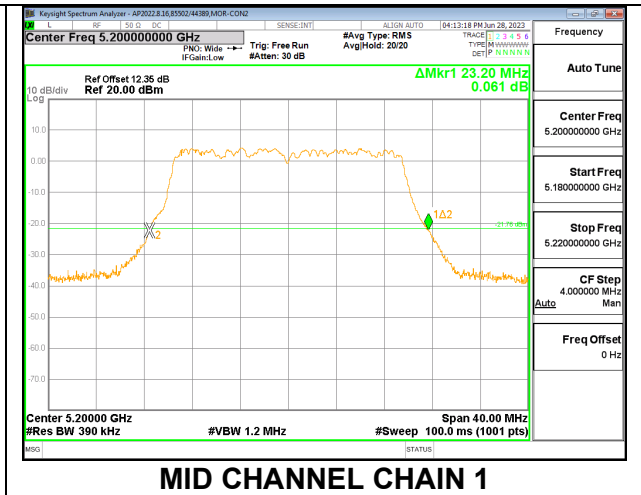
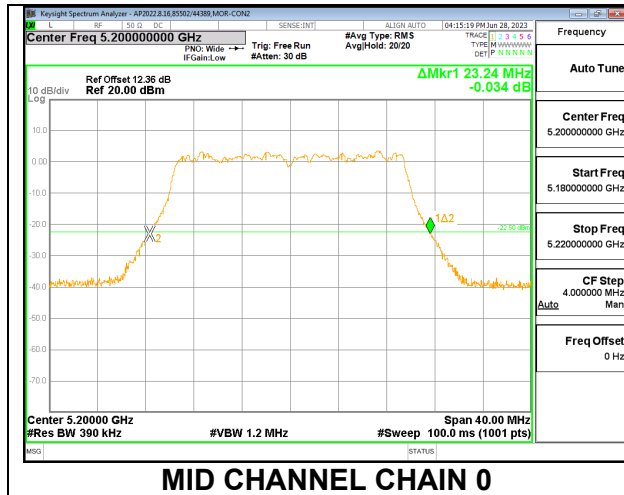
2TX CDD MODE – 106T

Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5180	22.32	21.6
Mid	5200	22.44	21.64
High	5240	21.28	21.16



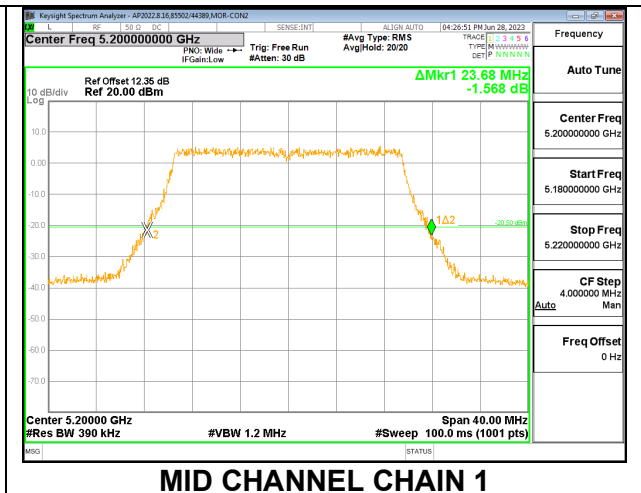
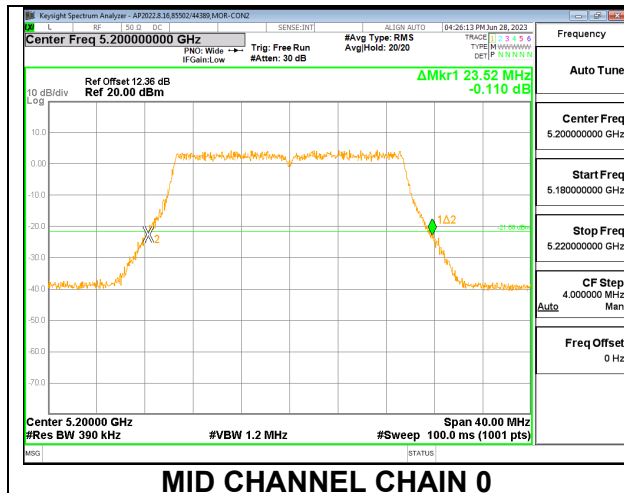
2TX CDD MODE – 242T

Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5180	23.20	23.16
Mid	5200	23.24	23.20
High	5240	23.32	23.16



2TX CDD MODE – SU

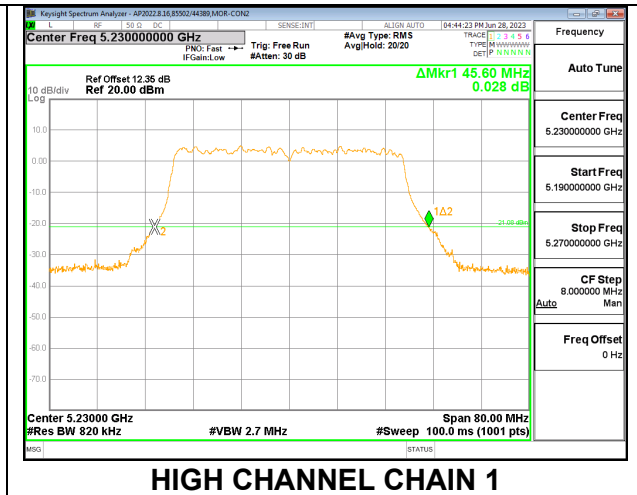
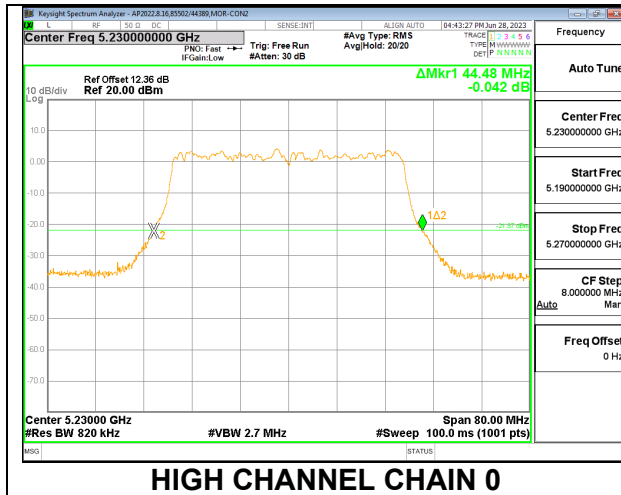
Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5180	23.48	23.44
Mid	5200	23.52	23.68
High	5240	23.40	23.60



9.2.6. 802.11ax HE40 MODE IN THE 5.2 GHz BAND

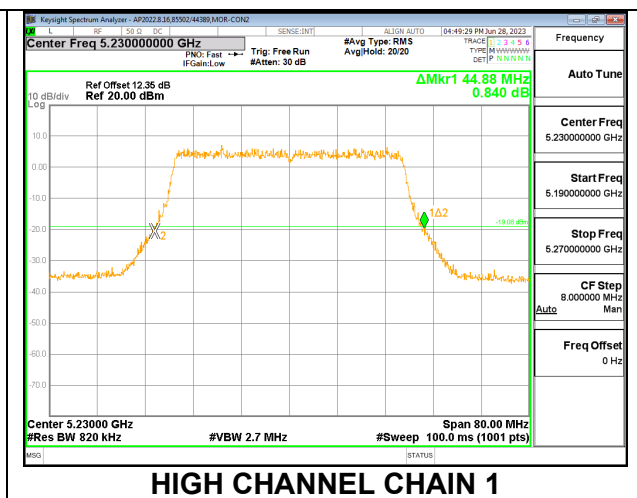
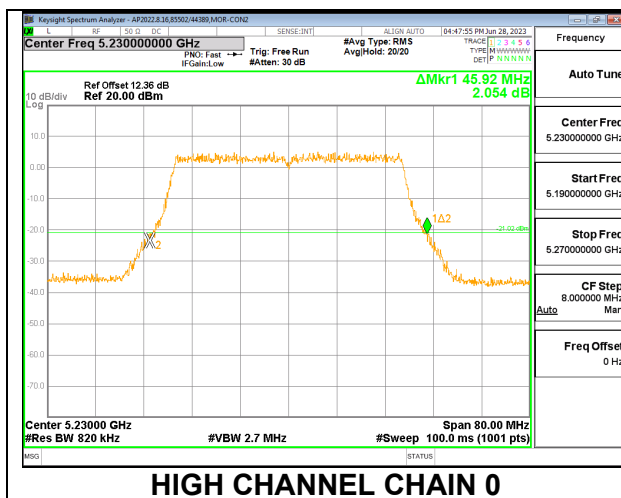
2TX CDD MODE – 484T

Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5190	44.64	45.60
High	5230	44.48	45.60



2TX CDD MODE – SU

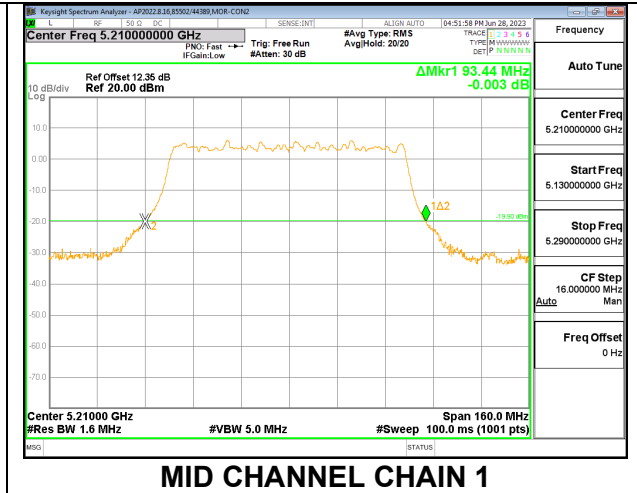
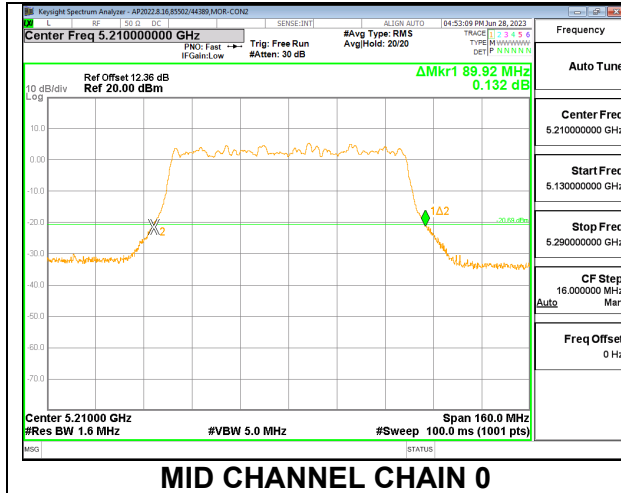
Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5190	45.52	45.28
High	5230	45.92	44.88



9.2.7. 802.11ax HE80 MODE IN THE 5.2 GHz BAND

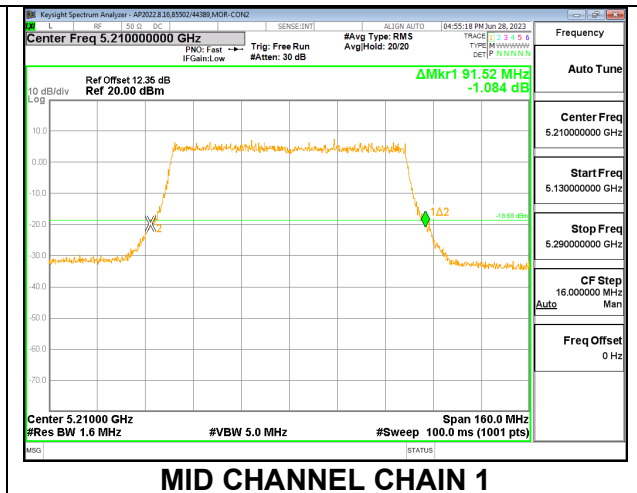
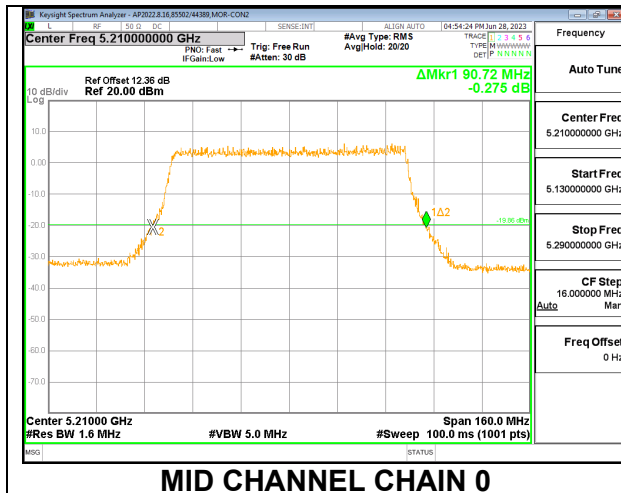
2TX CDD MODE – 996T

Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Mid	5210	89.92	93.44



2TX CDD MODE – SU

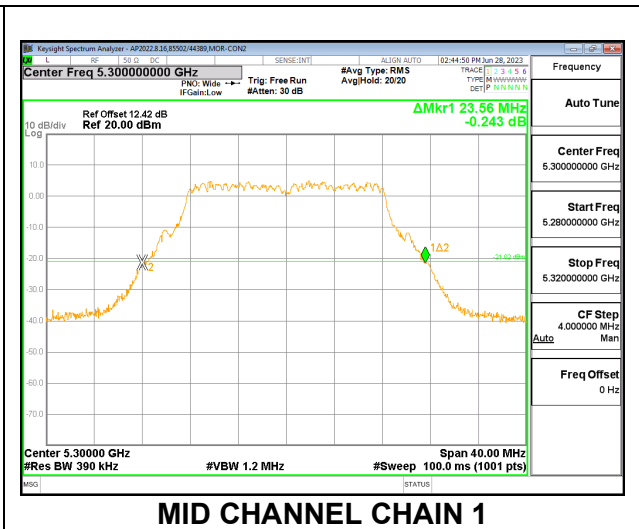
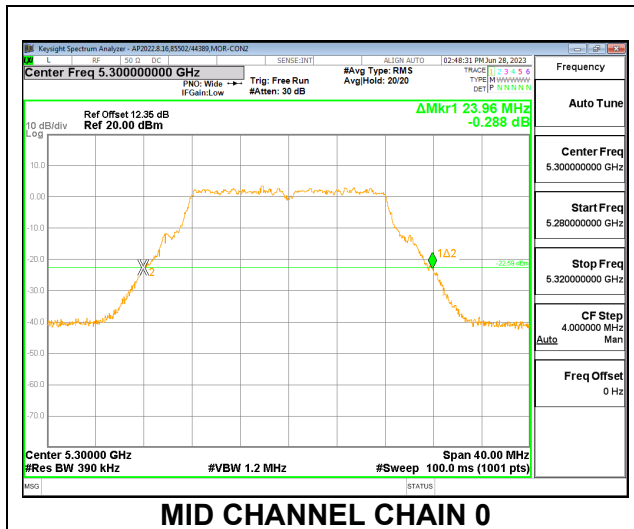
Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Mid	5210	90.72	91.52



9.2.8. 802.11a MODE IN THE 5.3 GHz BAND

2TX CDD MODE

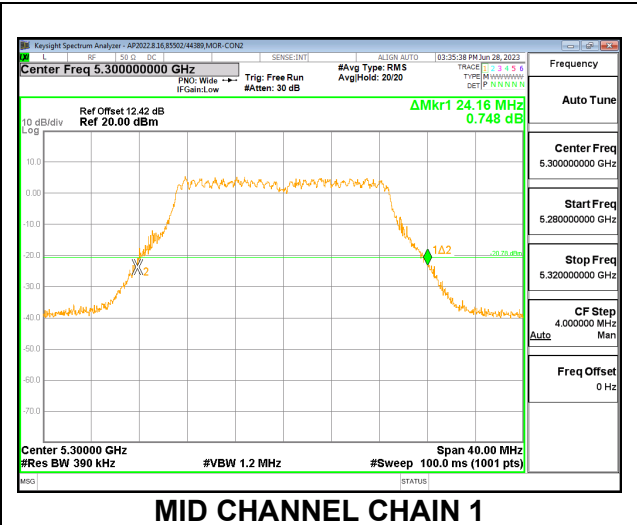
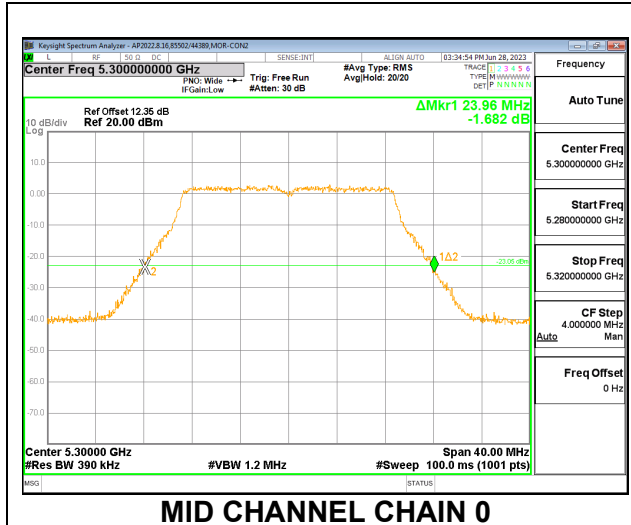
Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5260	23.92	23.64
Mid	5300	23.96	23.56
High	5320	23.96	23.72



9.2.9. 802.11n HT20 MODE IN THE 5.3 GHz BAND

2TX CDD MODE

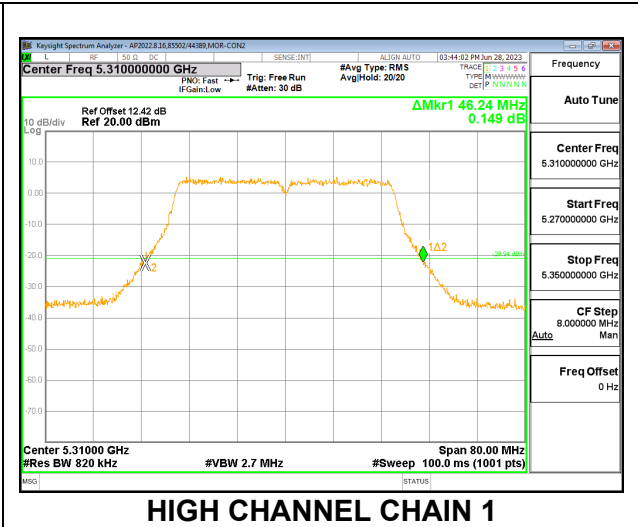
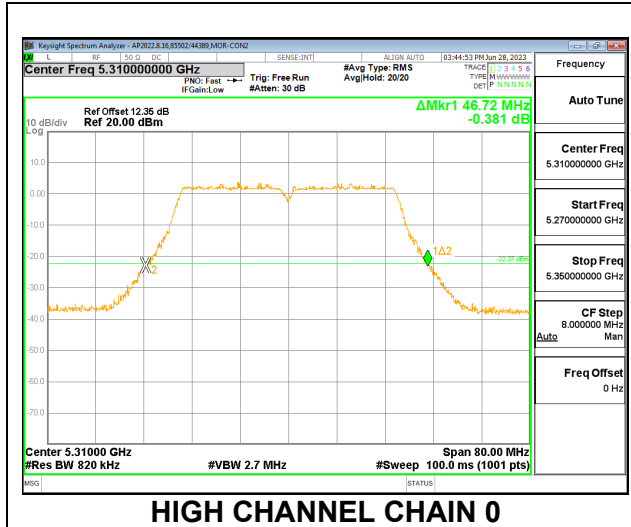
Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5260	24.00	24.04
Mid	5300	23.96	24.16
High	5320	24.52	23.64



9.2.10. 802.11n HT40 MODE IN THE 5.3 GHz BAND

2TX CDD MODE

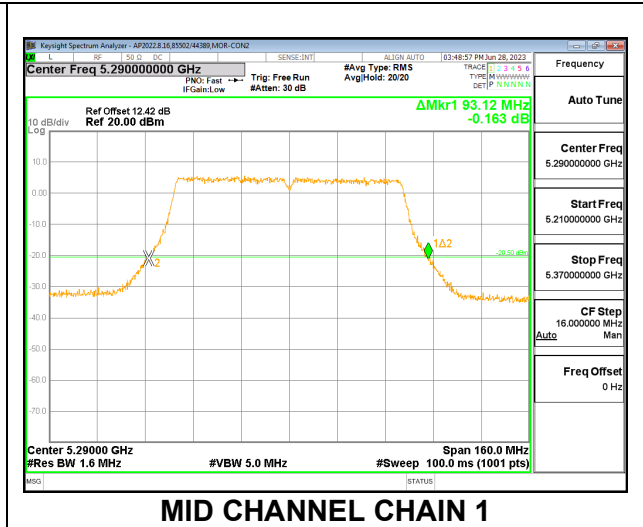
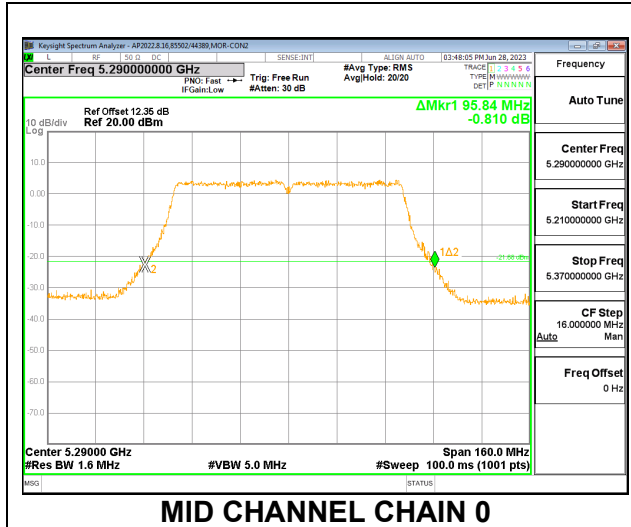
Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5270	46.88	46.16
High	5310	46.72	46.24



9.2.11. 802.11ac VHT80 MODE IN THE 5.3 GHz BAND

2TX CDD MODE

Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Mid	5290	95.84	93.12

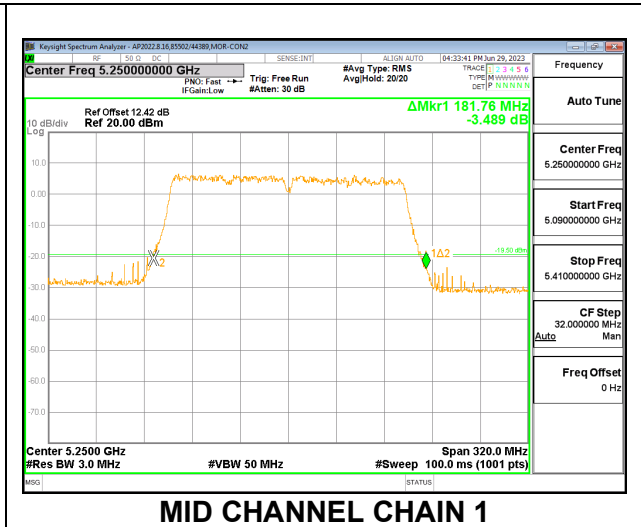
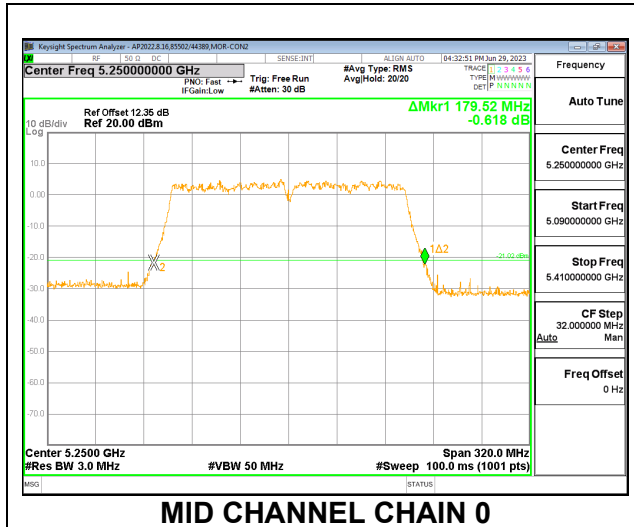


9.2.12. 802.11ac VHT160 MODE IN THE 5.2 AND 5.3 GHz BAND

2TX CDD MODE

Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Mid	5250	179.52	181.76

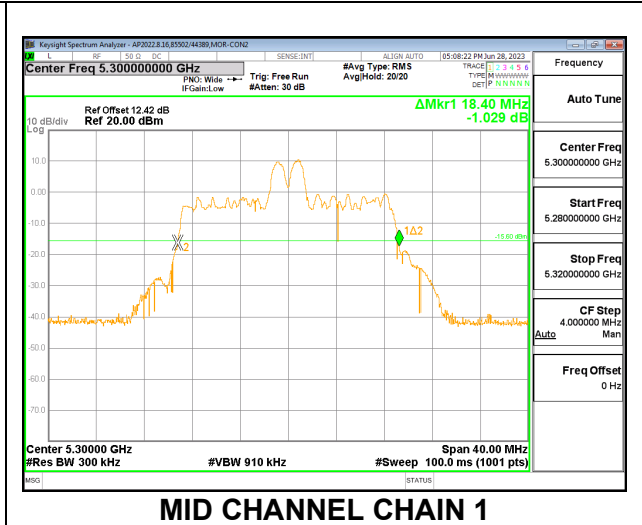
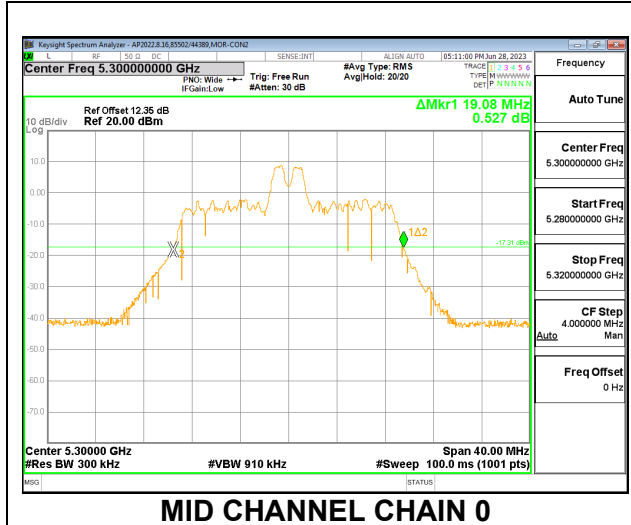
MID CHANNEL



9.2.13. 802.11ax HE20 MODE IN THE 5.3 GHz BAND

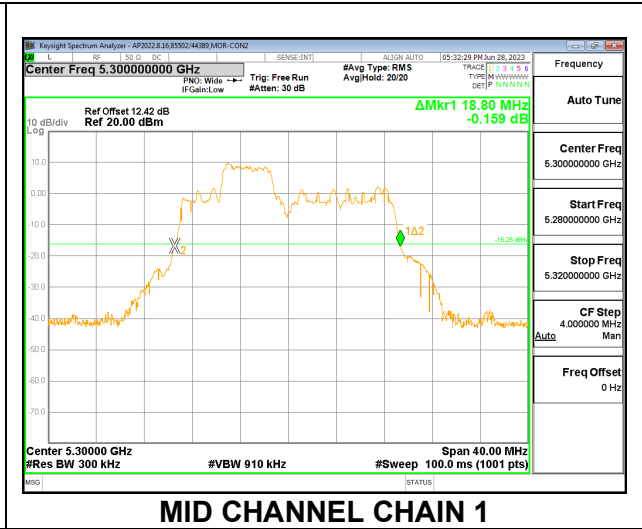
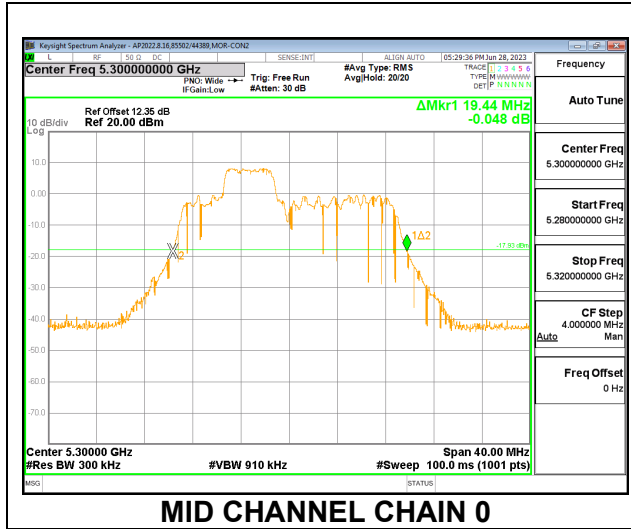
2TX CDD MODE – 26T

Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5260	20.92	20.48
Mid	5300	19.08	18.40
High	5320	20.72	20.28



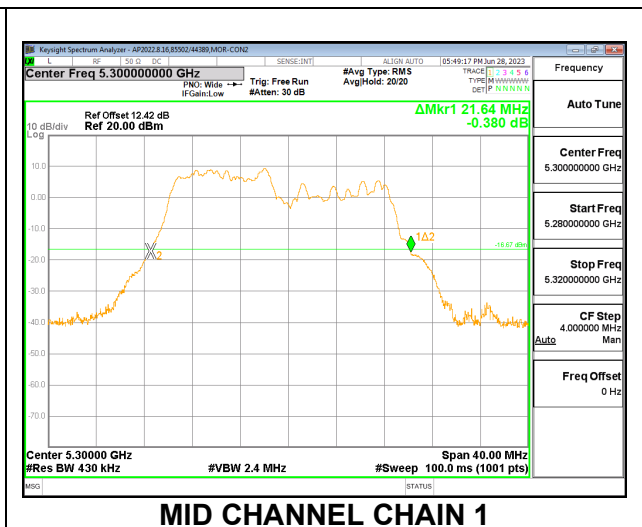
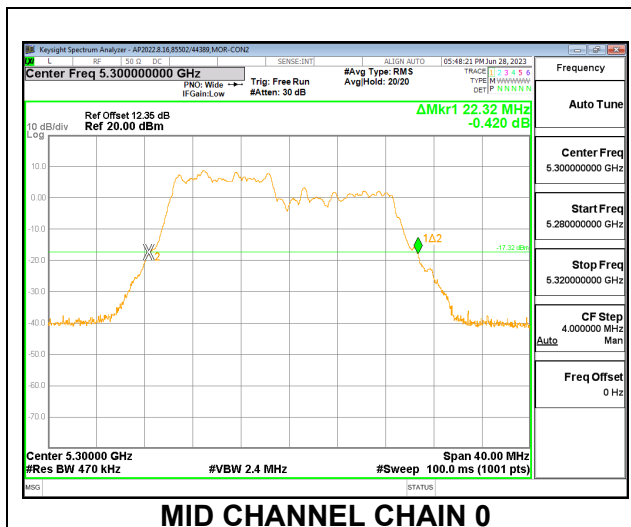
2TX CDD MODE – 52T

Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5260	20.92	20.36
Mid	5300	19.44	18.80
High	5320	20.96	20.48



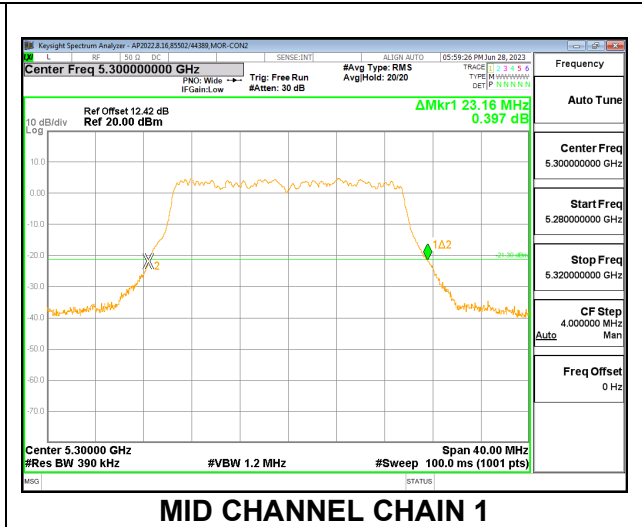
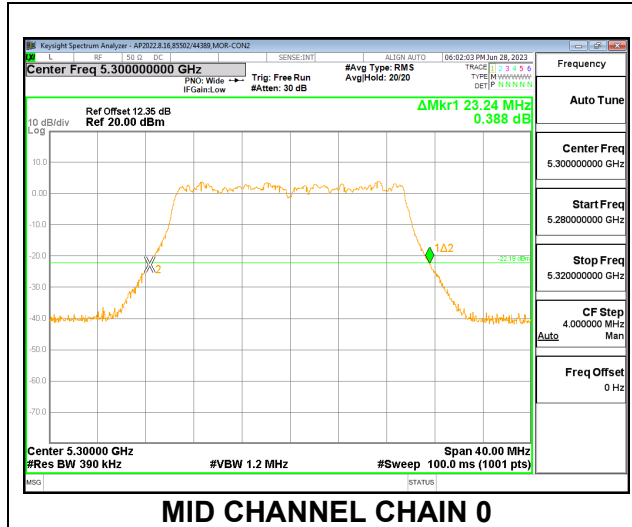
2TX CDD MODE – 106T

Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5260	22.52	21.68
Mid	5300	22.32	21.64
High	5320	21.48	21.20



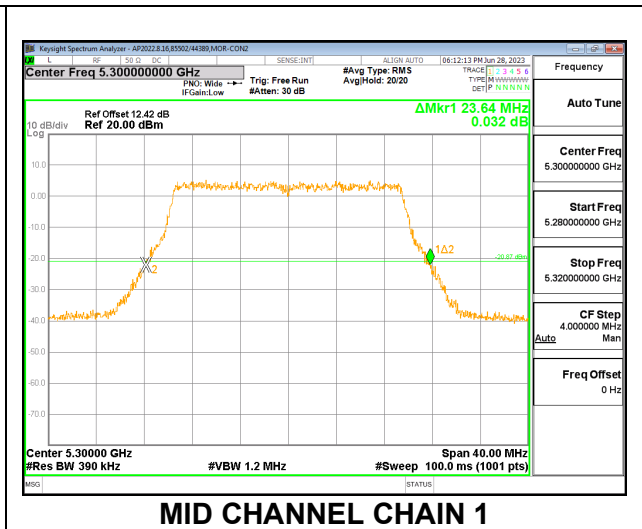
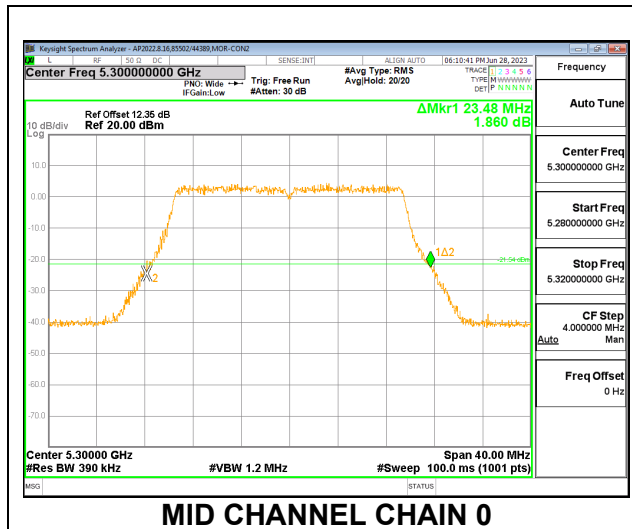
2TX CDD MODE – 242T

Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5260	23.16	23.04
Mid	5300	23.24	23.16
High	5320	23.20	23.20



2TX CDD MODE – SU

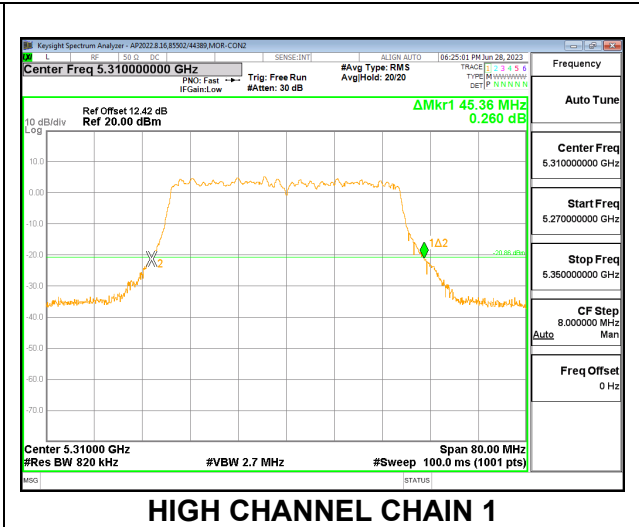
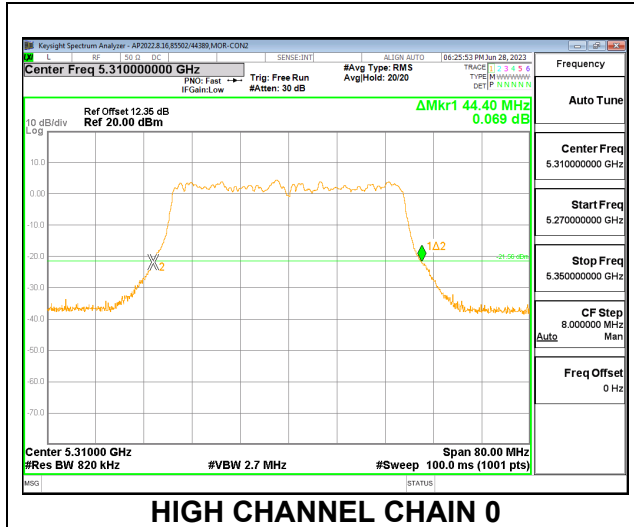
Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5260	23.56	23.6
Mid	5300	23.48	23.64
High	5320	23.64	23.44



9.2.14. 802.11ax HE40 MODE IN THE 5.3 GHz BAND

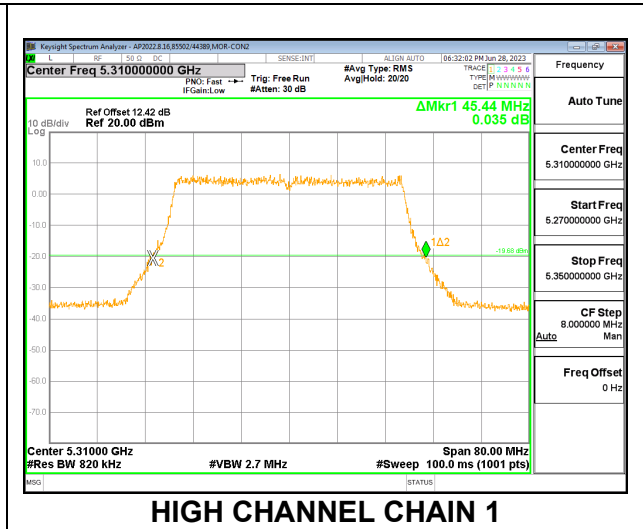
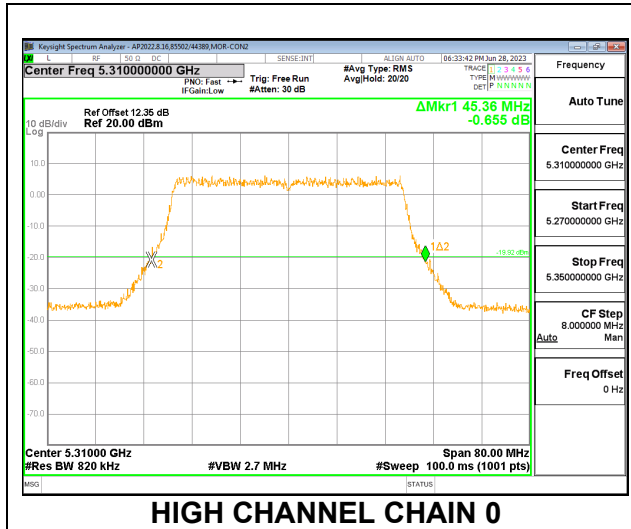
2TX CDD MODE – 484T

Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5270	44.40	45.76
High	5310	44.40	45.36



2TX CDD MODE – SU

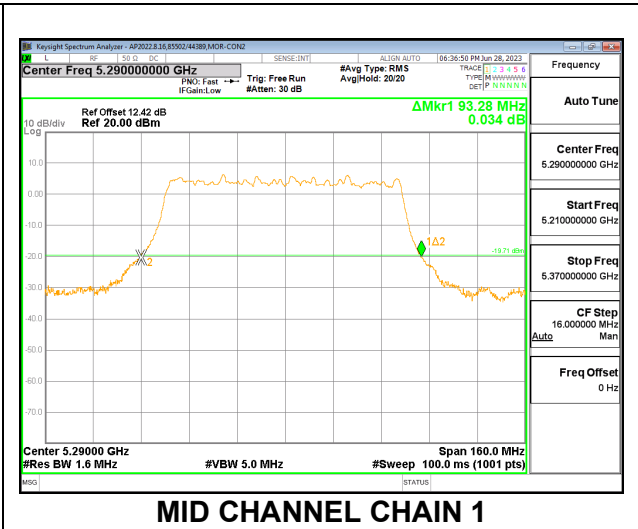
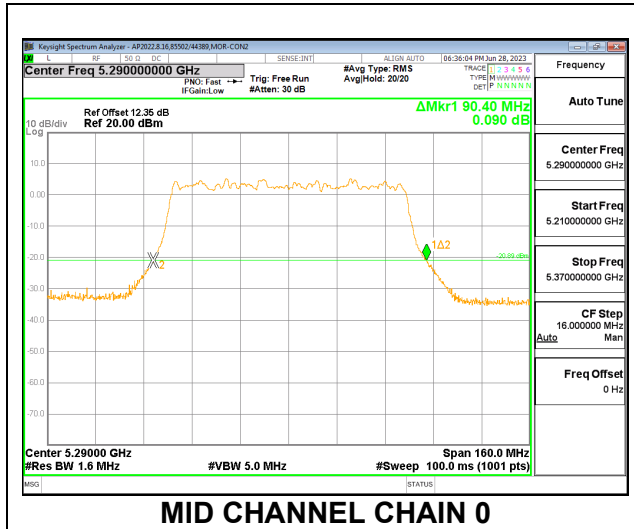
Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5270	45.04	45.20
High	5310	45.36	45.44



9.2.15. 802.11ax HE80 MODE IN THE 5.3 GHz BAND

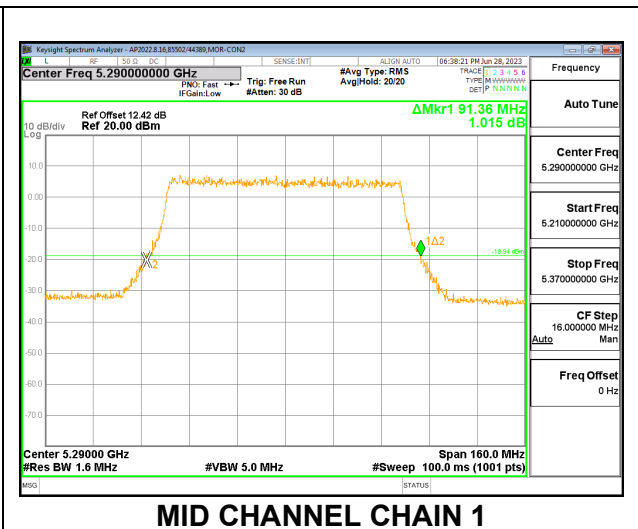
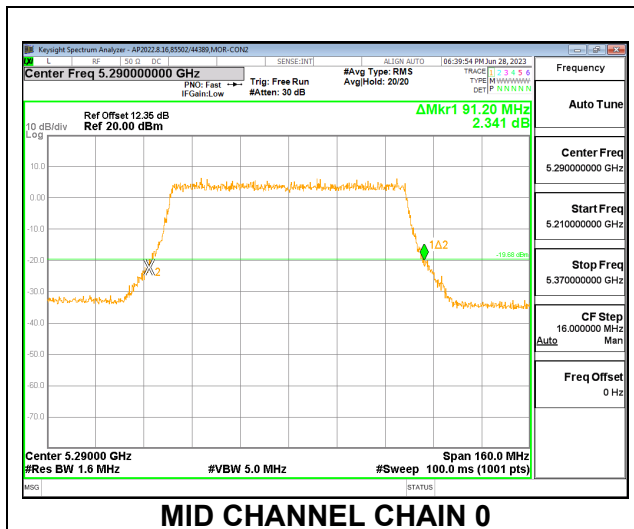
2TX CDD MODE – 996T

Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Mid	5290	90.40	93.28



2TX CDD MODE – SU

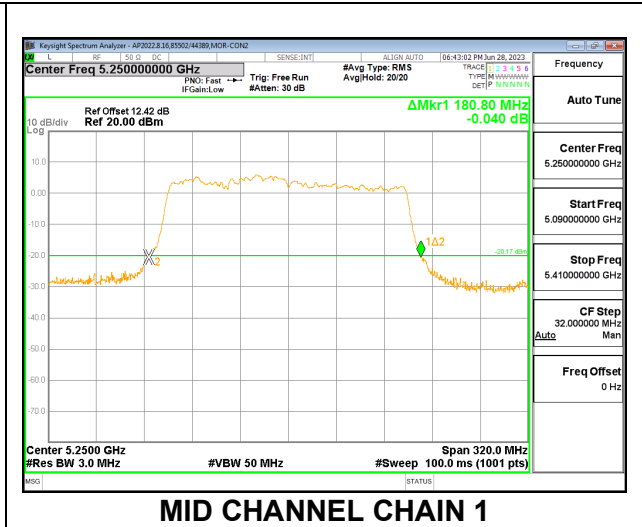
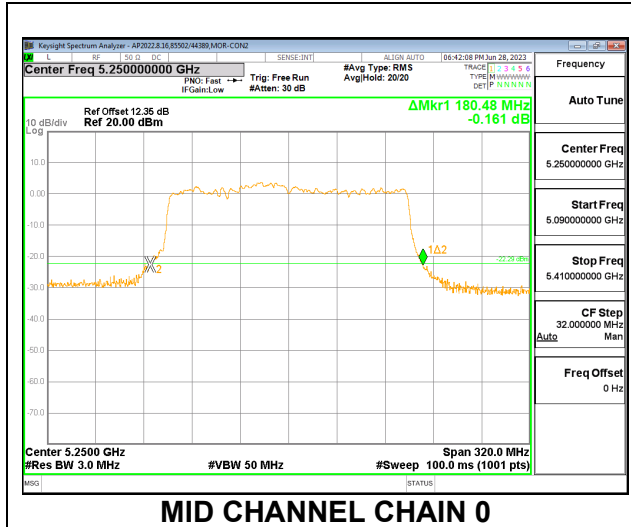
Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Mid	5290	91.20	91.36



9.2.16. 802.11ax HE160 MODE IN THE 5.2 AND 5.3 GHz BAND

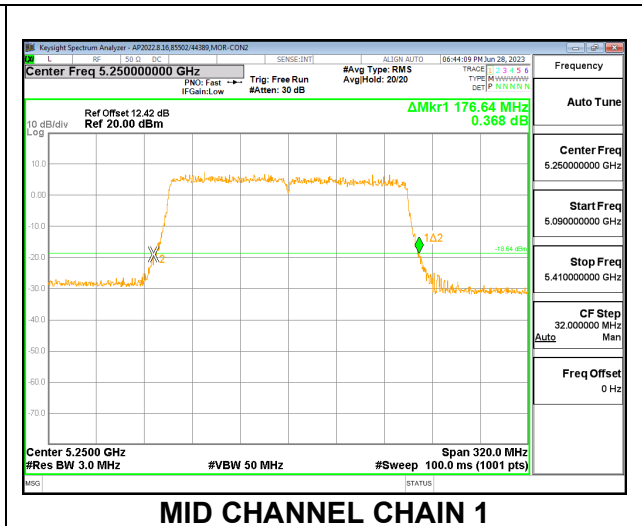
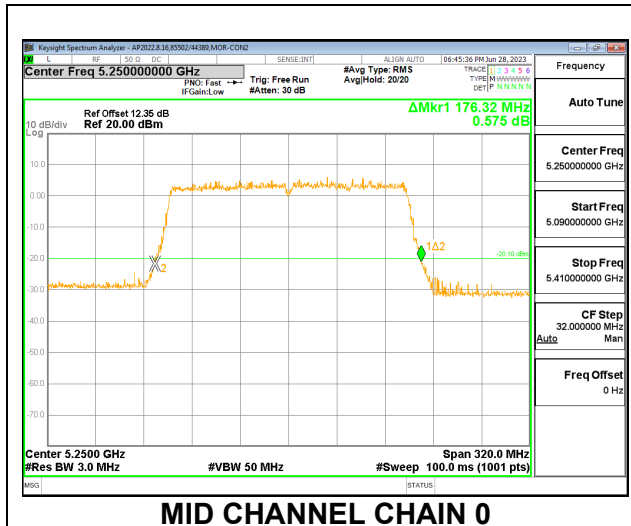
2TX CDD MODE – 2x996T

Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Mid	5250	180.48	180.80



2TX CDD MODE – SU

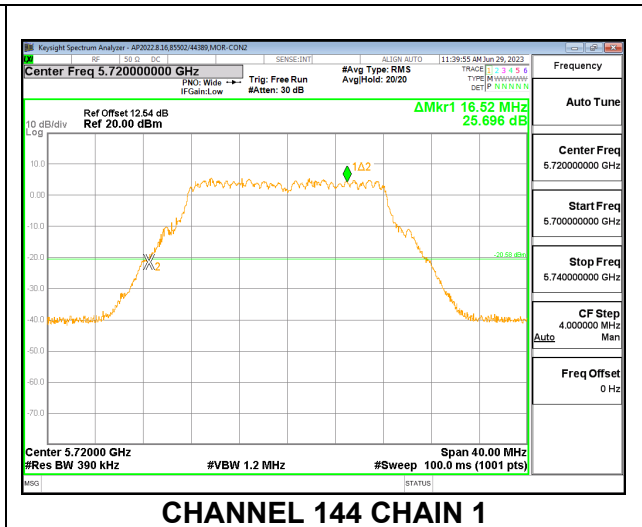
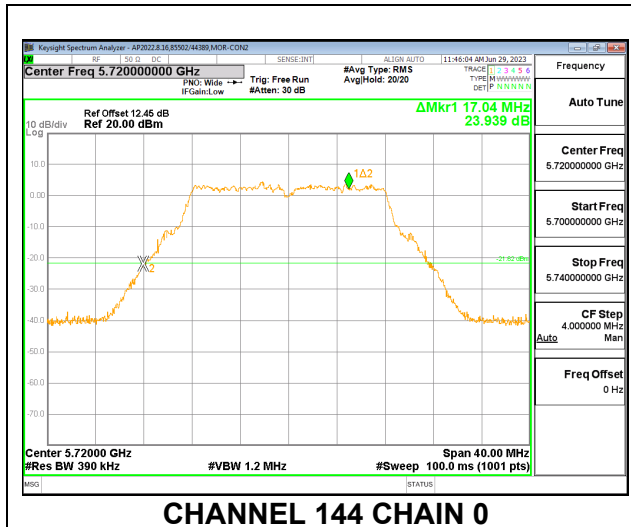
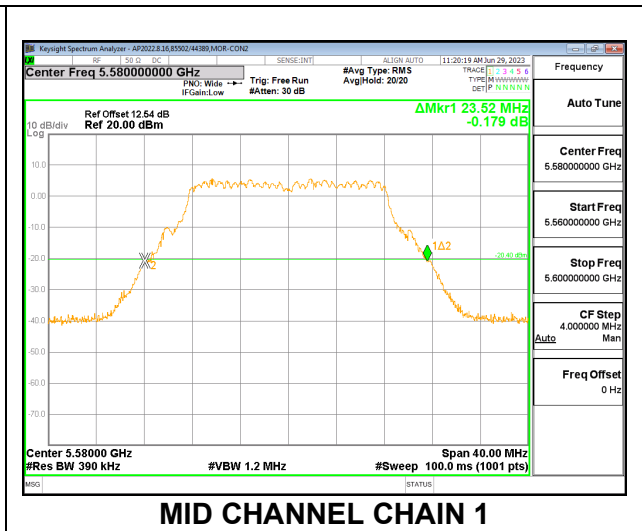
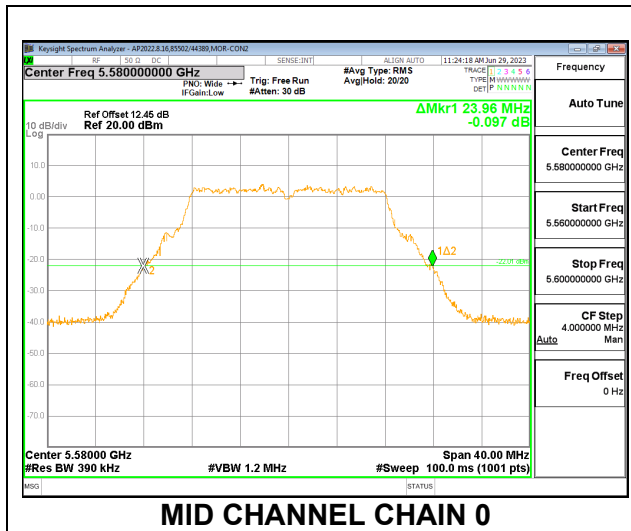
Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Mid	5310	176.32	176.64



9.2.17. 802.11a MODE IN THE 5.6 GHz BAND

2TX CDD MODE

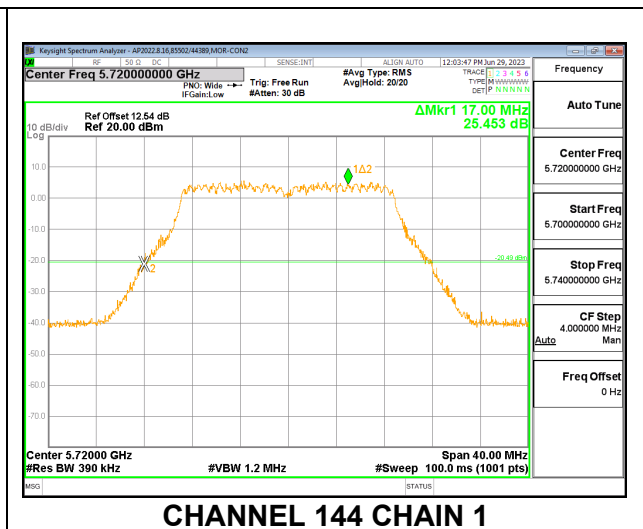
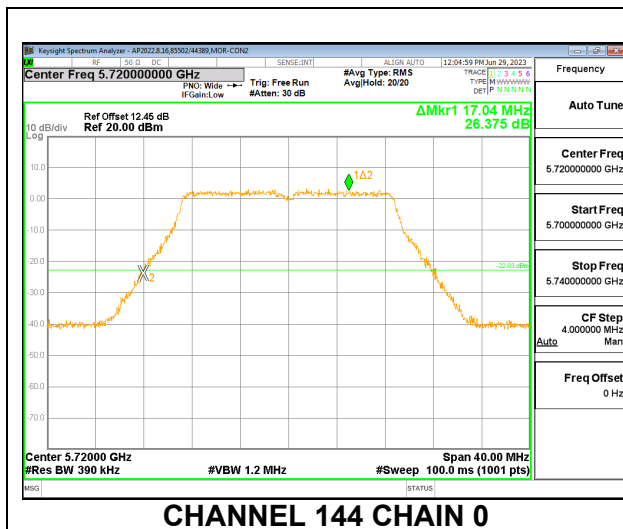
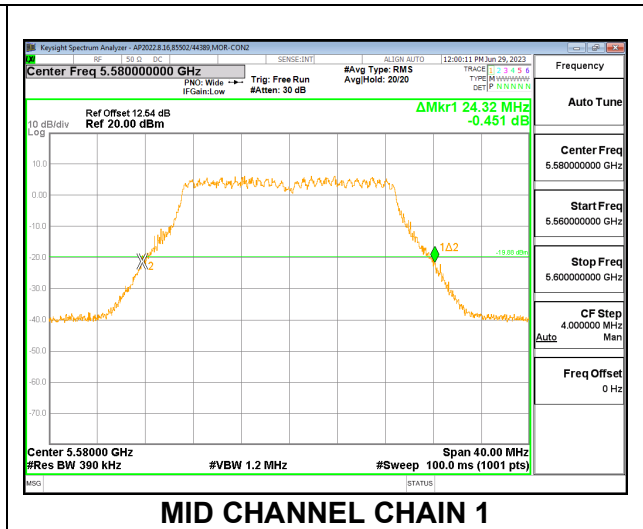
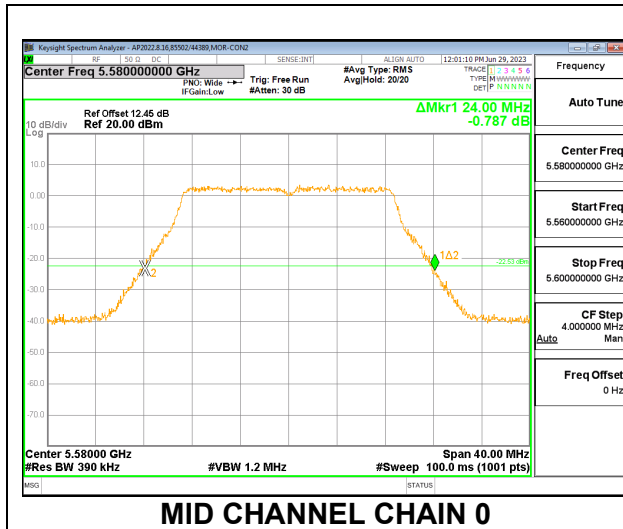
Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5500	23.96	23.16
Mid	5580	23.96	23.52
High	5700	24.00	23.48
144	5720	17.04	16.52



9.2.18. 802.11n HT20 MODE IN THE 5.6 GHz BAND

2TX CDD MODE

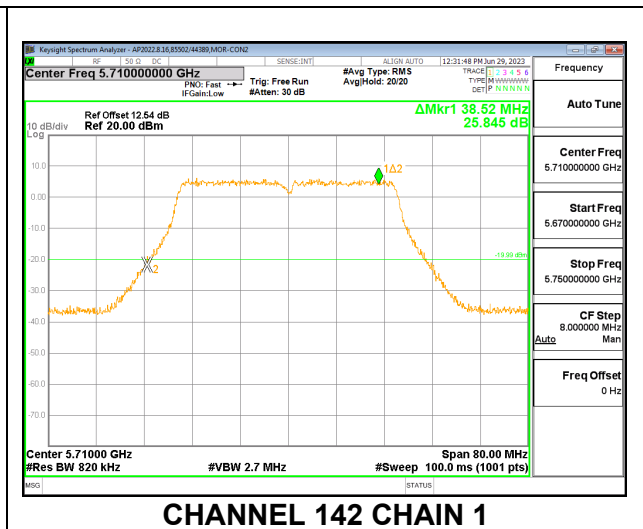
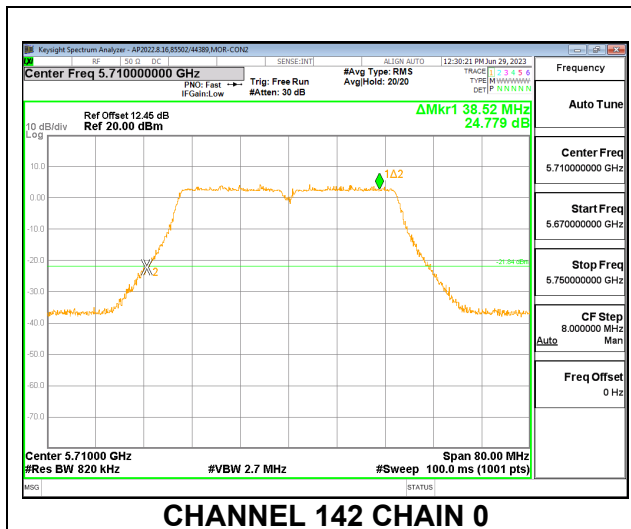
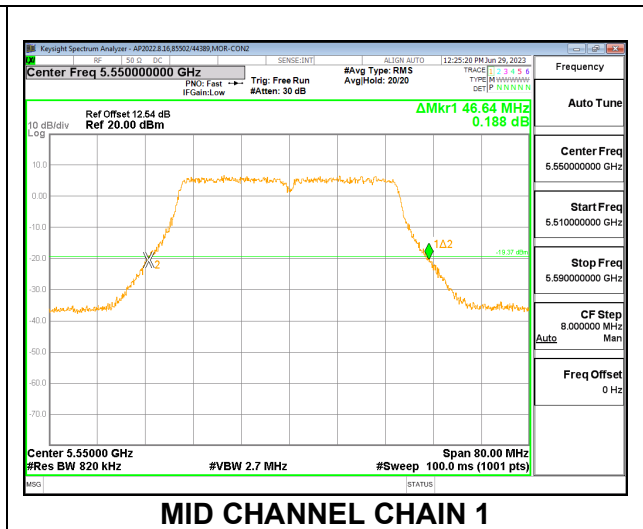
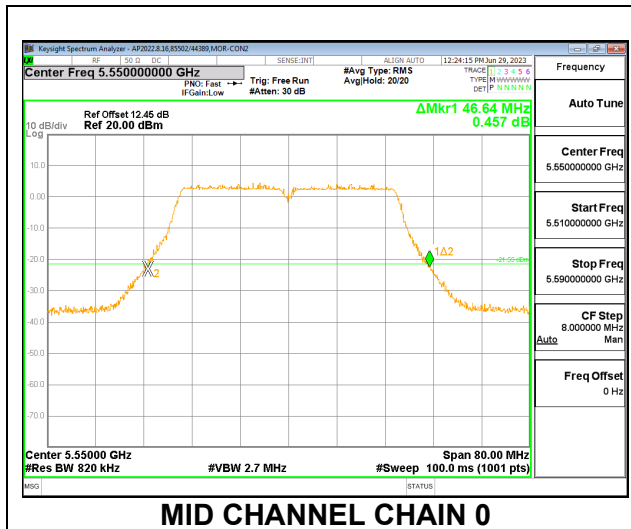
Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5500	24.44	23.96
Mid	5580	24.00	24.32
High	5700	24.04	23.96
144	5720	17.04	17.00



9.2.19. 802.11n HT40 MODE IN THE 5.6 GHz BAND

2TX CDD MODE

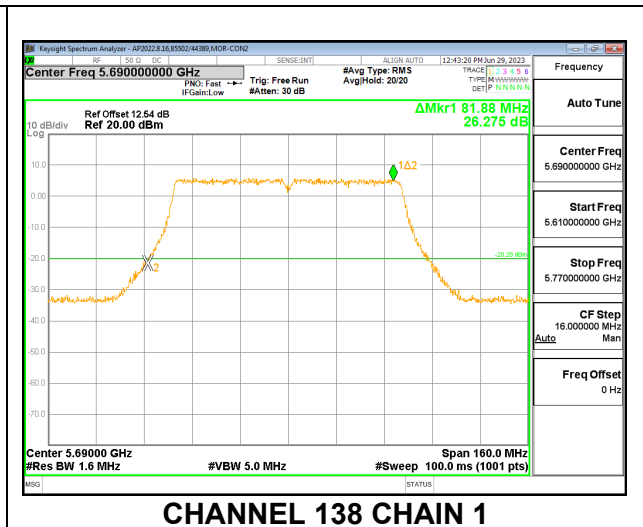
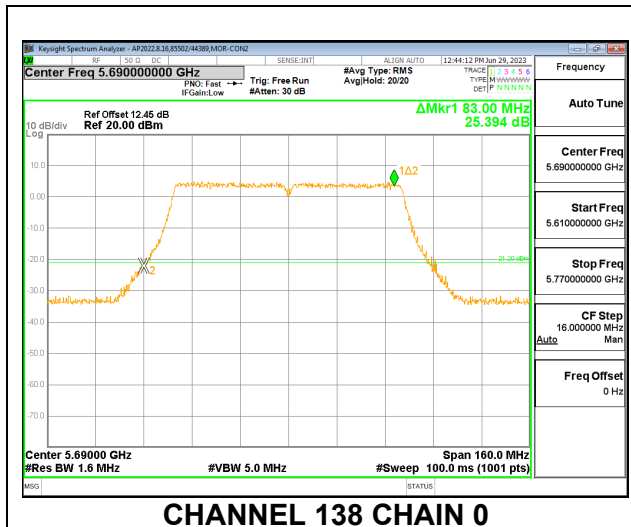
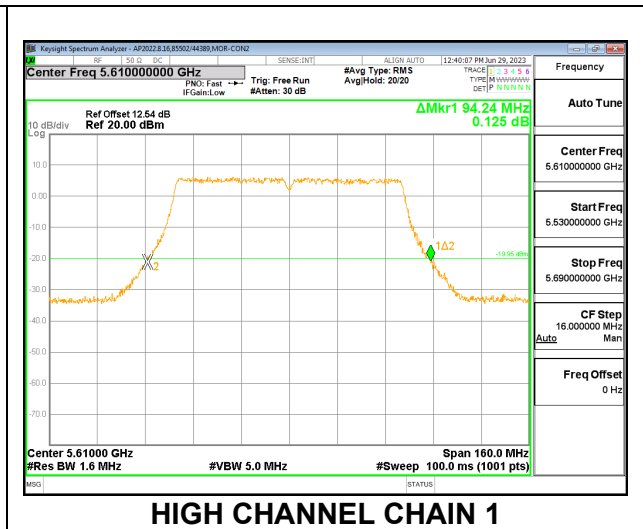
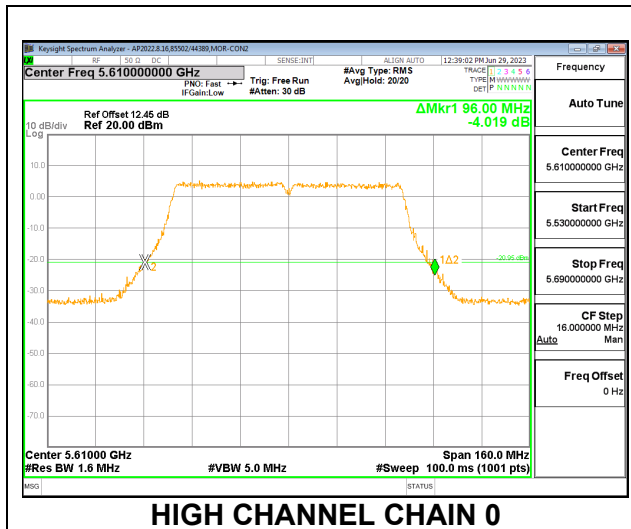
Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5510	46.72	46.72
Mid	5550	46.64	46.64
High	5670	47.20	46.72
142	5710	38.52	38.52



9.2.20. 802.11ac VHT80 MODE IN THE 5.6 GHz BAND

2TX CDD MODE

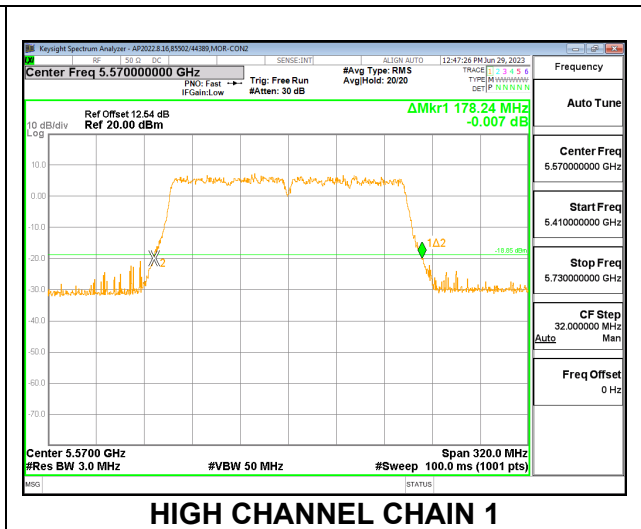
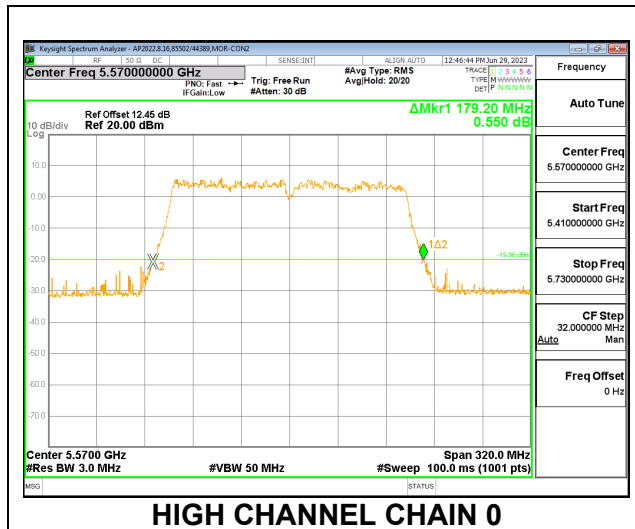
Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5530	95.84	93.92
High	5610	96.00	94.24
138	5690	83.00	81.88



9.2.21. 802.11ac VHT160 MODE IN THE 5.6 GHz BAND

2TX CDD MODE

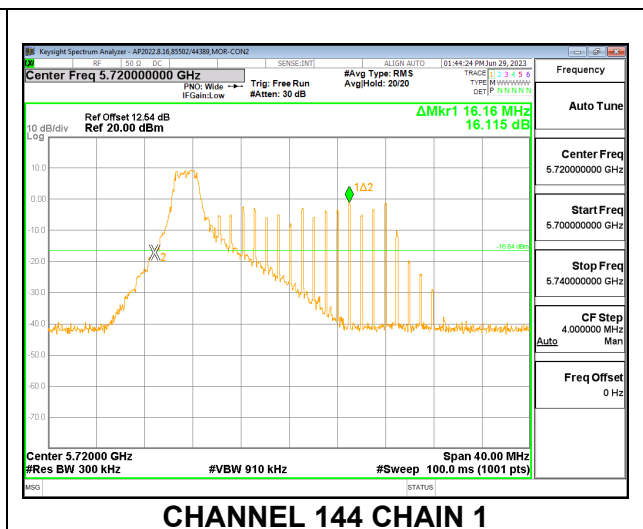
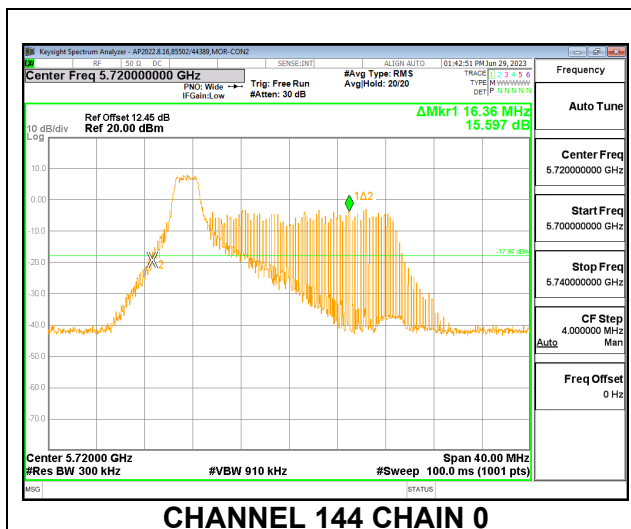
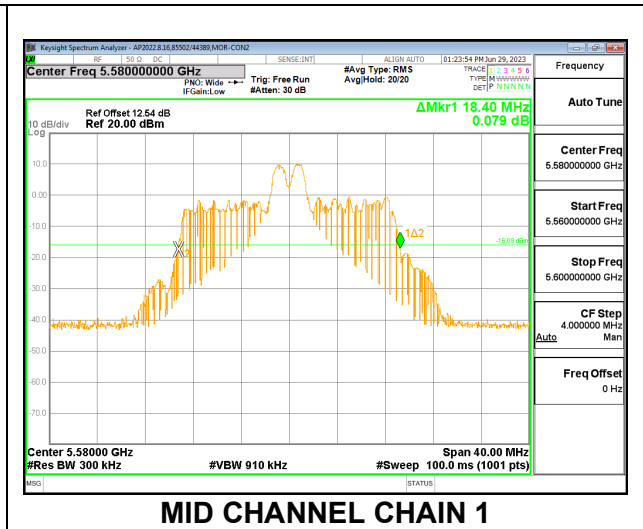
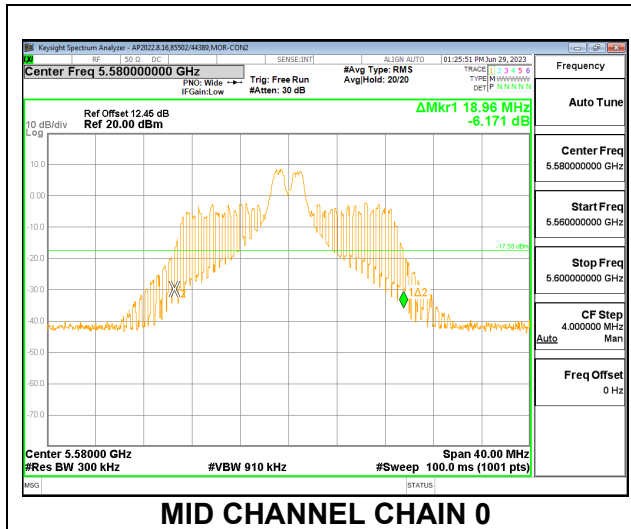
Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Mid	5570	179.20	178.24



9.2.22. 802.11ax HE20 MODE IN THE 5.6 GHz BAND

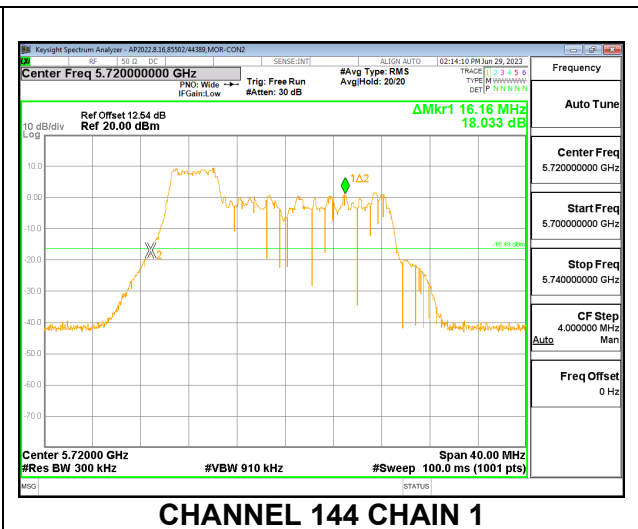
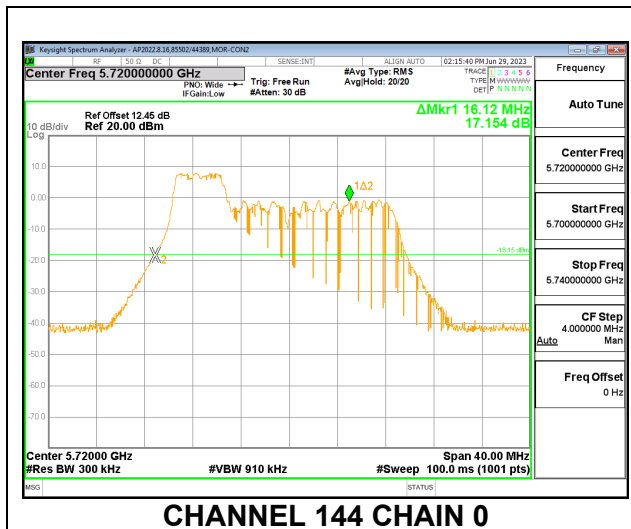
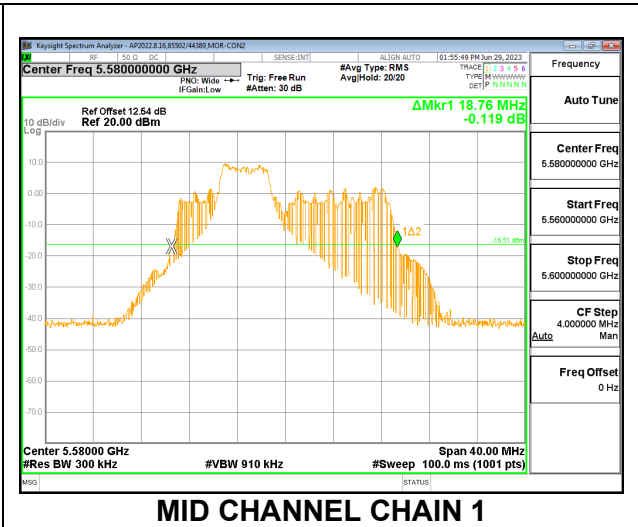
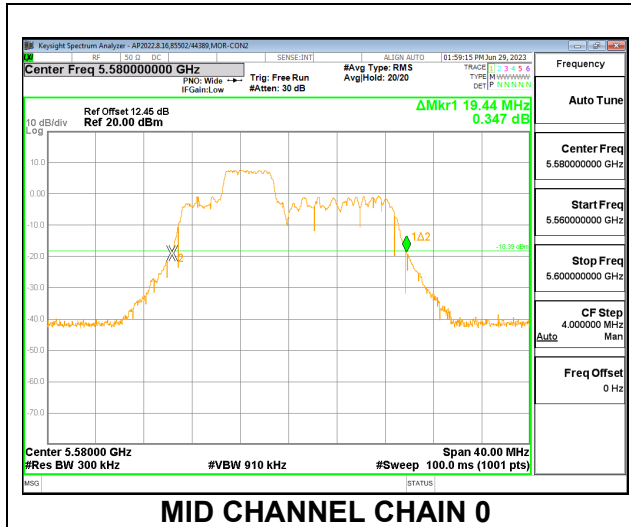
2TX CDD MODE – 26T

Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5500	20.80	20.28
Mid	5580	18.96	18.40
High	5700	20.68	20.24
144	5720	16.36	16.16



2TX CDD MODE – 52T

Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5500	20.88	20.44
Mid	5580	19.44	18.76
High	5700	20.92	20.48
144	5720	16.12	16.16



2TX CDD MODE – 106T

Channel	Frequency	26dB BW Chain 0 (MHz)	26dB BW Chain 1 (MHz)
Low	5500	22.36	21.76
Mid	5580	22.44	21.76
High	5700	21.24	21.24
144	5720	16.76	16.52

