



# **TEST REPORT**

**Report Number. :** R13510374-E4

**Applicant :** Sonos, Inc.  
614 Chapala Street  
Santa Barbara, CA 93101  
USA

**Model :** S38

**FCC ID :** SBVRM038

**IC :** 5373A-RM038

**EUT Description :** Wireless Smart Speaker

**Test Standard(s) :** FCC 47 CFR PART 15 SUBPART E: 2021  
ISED RSS-247 ISSUE 2: 2017  
ISED RSS-GEN ISSUE 5 + A1: 2019

**Date Of Issue:**

2021-04-25

**Prepared by:**

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NVLAP Lab code: 200246-0

## REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2021-04-01	Initial Issue	Cristian Melara
V2	2021-04-05	Updated EUT description to Wireless Smart Speaker	Cristian Melara
V3	2021-04-20	Revised antenna gains. Editorial revisions.	Brian T. Kiewra
V4	2021-04-25	Editorial revisions.	Brian T. Kiewra

## TABLE OF CONTENTS

<b>REPORT REVISION HISTORY .....</b>	<b>2</b>
<b>TABLE OF CONTENTS .....</b>	<b>3</b>
<b>1. ATTESTATION OF TEST RESULTS .....</b>	<b>5</b>
<b>2. TEST RESULT SUMMARY .....</b>	<b>7</b>
<b>3. TEST METHODOLOGY .....</b>	<b>8</b>
<b>4. FACILITIES AND ACCREDITATION .....</b>	<b>8</b>
<b>5. DECISION RULES AND MEASUREMENT UNCERTAINTY .....</b>	<b>9</b>
5.1. METROLOGICAL TRACEABILITY .....	9
5.2. DECISION RULES.....	9
5.3. MEASUREMENT UNCERTAINTY.....	9
5.4. SAMPLE CALCULATION .....	10
<b>6. EQUIPMENT UNDER TEST .....</b>	<b>11</b>
6.1. EUT DESCRIPTION .....	11
6.2. MAXIMUM OUTPUT POWER.....	11
6.3. DESCRIPTION OF AVAILABLE ANTENNAS .....	12
6.4. SOFTWARE AND FIRMWARE.....	12
6.5. WORST-CASE CONFIGURATION AND MODE.....	13
6.6. DESCRIPTION OF TEST SETUP.....	14
<b>7. MEASUREMENT METHOD.....</b>	<b>15</b>
<b>8. TEST AND MEASUREMENT EQUIPMENT .....</b>	<b>16</b>
<b>9. ANTENNA PORT TEST RESULTS .....</b>	<b>20</b>
9.1. ON TIME AND DUTY CYCLE.....	20
9.1.1. 5.2 GHz Band .....	20
9.1.2. 5.3 GHz Band .....	21
9.1.3. 5.6 GHz Band .....	22
9.1.4. 5.8 GHz Band .....	23
9.2. 26 dB BANDWIDTH.....	24
9.2.1. 802.11a MODE IN THE 5.2 GHz BAND.....	24
9.2.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND .....	26
9.2.3. 802.11a MODE IN THE 5.3 GHz BAND.....	28
9.2.4. 802.11n HT20 MODE IN THE 5.3 GHz BAND .....	30
9.2.5. 802.11a MODE IN THE 5.6 GHz BAND.....	32
9.2.6. 802.11n HT20 MODE IN THE 5.6 GHz BAND .....	34
9.3. 99% BANDWIDTH.....	36

9.3.1.	802.11a MODE IN THE 5.2 GHz BAND.....	36
9.3.2.	802.11n HT20 MODE IN THE 5.2 GHz BAND .....	38
9.3.3.	802.11a MODE IN THE 5.3 GHz BAND.....	40
9.3.4.	802.11n HT20 MODE IN THE 5.3 GHz BAND .....	42
9.3.5.	802.11a MODE IN THE 5.6 GHz BAND.....	44
9.3.6.	802.11n HT20 MODE IN THE 5.6 GHz BAND .....	46
9.3.7.	802.11a MODE IN THE 5.8 GHz BAND.....	48
9.3.8.	802.11n HT20 MODE IN THE 5.8 GHz BAND .....	50
9.4.	<b>6 dB BANDWIDTH.....</b>	<b>52</b>
9.4.1.	802.11a MODE IN THE 5.8 GHz BAND.....	52
9.4.2.	802.11n HT20 MODE IN THE 5.8 GHz BAND .....	54
9.5.	<b>OUTPUT POWER AND PSD.....</b>	<b>56</b>
9.5.1.	802.11a MODE IN THE 5.2 GHz BAND.....	59
9.5.2.	802.11n HT20 MODE IN THE 5.2 GHz BAND .....	62
9.5.3.	802.11a MODE IN THE 5.3 GHz BAND.....	65
9.5.4.	802.11n HT20 MODE IN THE 5.3 GHz BAND .....	71
9.5.5.	802.11a MODE IN THE 5.6 GHz BAND.....	77
9.5.6.	802.11n HT20 MODE IN THE 5.6 GHz BAND .....	80
9.5.7.	802.11a MODE IN THE 5.8 GHz BAND.....	83
9.5.8.	802.11n HT20 MODE IN THE 5.8 GHz BAND .....	86
<b>10.</b>	<b>RADIATED TEST RESULTS.....</b>	<b>89</b>
10.1.	<b>TRANSMITTER ABOVE 1 GHz.....</b>	<b>91</b>
10.1.1.	TX ABOVE 1 GHz 802.11a MODE IN THE 5.2 GHz BAND .....	91
10.1.2.	TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.2 GHz BAND.....	99
10.1.3.	TX ABOVE 1 GHz 802.11a MODE IN THE 5.3 GHz BAND .....	107
10.1.4.	TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.3 GHz BAND.....	117
10.1.5.	TX ABOVE 1 GHz 802.11a MODE IN THE 5.6 GHz BAND .....	127
10.1.6.	TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.6 GHz BAND.....	141
10.1.7.	TX ABOVE 1 GHz 802.11a MODE IN THE 5.8 GHz BAND .....	155
10.1.8.	TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.8 GHz BAND.....	165
10.2.	<b>WORST CASE BELOW 30MHZ.....</b>	<b>175</b>
10.3.	<b>WORST CASE BELOW 1 GHZ.....</b>	<b>177</b>
10.4.	<b>WORST CASE 18-26 GHZ.....</b>	<b>179</b>
10.5.	<b>WORST CASE 26-40 GHZ.....</b>	<b>181</b>
<b>11.</b>	<b>AC POWER LINE CONDUCTED EMISSIONS.....</b>	<b>183</b>
11.1.1.	AC Power Line.....	184
<b>12.</b>	<b>SETUP PHOTOS.....</b>	<b>186</b>

# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** Sonos, Inc.  
614 Chapala Street  
Santa Barbara, CA 93101  
USA

**EUT DESCRIPTION:** Wireless Smart Speaker

**MODEL:** S38

**SERIAL NUMBER:** 00:0E:58:71:72:5D  
00:0E:58:21:EF:54  
00:0E:58:96:2E:87

**SAMPLE RECEIPT DATE:** 2021-03-15

**DATE TESTED:** 2021-03-15 to 2021-03-19

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart E: 2021	Complies
ISED RSS-247 Issue 2: 2017	Complies
ISED RSS-GEN Issue 5 + A1: 2017	Complies

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. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. government.

Approved & Released For  
UL LLC. By:

Prepared By:



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Jeff Moser  
Operations Manager  
Consumer Technology Division  
UL LLC.

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Cristian Melara  
Engineer  
Consumer Technology Division  
UL LLC.

## 2. TEST RESULT SUMMARY

FCC Clause	ISED Clause	Requirement	Result	Comment
See Comment		Duty Cycle	Reporting purposes only	Per ANSI C63.10, Section 12.2.
See Comment	RSS-GEN 6.7	26dB BW/99% OBW	Reporting purposes only	Per ANSI C63.10 Sections 6.9.2 and 6.9.3
15.407 (e)	RSS-247 6.2.4.1	6 dB BW	Complies	None.
15.407 (a) (1-4), (h) (1)	RSS-247 6.2	Output Power	Complies	None.
15.407 (a) (1-3, 5)	RSS-247 6.2	PSD	Complies	None.
15.209, 15.205, 15.407 (b)	RSS-GEN 8.9, 8.10, RSS-247 6.2	Radiated Emissions	Complies	None.
15.207	RSS-Gen 8.8	AC Mains Conducted Emissions	Complies	None.

This report contains data provided by the applicant 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.

### 3. TEST METHODOLOGY

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

- FCC CFR 47 Part 2: 2021
- FCC CFR 47 Part 15: 2021,
- FCC KDB 662911 D01 v02r01,
- FCC KDB 905462 D06 v02
- FCC KDB 789033 D02 v02r01,
- ANSI C63.10-2013,
- RSS-GEN Issue 5: 2019
- RSS-247 Issue 2: 2017

### 4. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Drive, Research Triangle Park, North Carolina, USA and 2800 Perimeter Park Dr., Suite B, Morrisville, North Carolina, USA. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

	Address	ISED CABID	ISED Company Number	FCC Registration
<input type="checkbox"/>	Building: 12 Laboratory Dr RTP, NC 27709, U.S.A	US0067	2180C	703469
<input checked="" type="checkbox"/>	Building: 2800 Perimeter Park Dr., Suite B Morrisville, NC, 27560 U.S.A			

UL LLC (RTP), CABID US00067, is accredited by NVLAP, Laboratory Code 200246-0



## 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	UNCERTAINTY
Radio Frequency (Spectrum Analyzer)	141.2 Hz
Occupied Channel Bandwidth	1.22%
RF output power, conducted	1.3 dB (PK) 0.45 dB (AV)
RF output power, radiated (SAC) <180 MHz	6.18 dB
RF output power, radiated (SAC) <180 MHz	3.23 dB
Power Spectral Density, conducted	2.47 dB
Unwanted Emissions, conducted	1.94 dB
All emissions, radiated	5.86 dB
Conducted Emissions (0.150-30MHz) - LISN	3.40 dB
Temperature	2.26°C
Humidity	6.79%
DC Supply voltages	1.70%
Time	3.39%

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)

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

### **MAINS CONDUCTED EMISSIONS**

Where relevant, the following sample calculation is provided:

Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + 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 wireless speaker with a BLE radio and 2.4GHz/5GHz WLAN radio. This report covers 5GHz WLAN testing only.

### 6.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

#### 5.2 GHz BAND (FCC/IC)

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
<b>5.2 GHz band, 2TX</b>			
5180-5240	802.11a	15.82	38.19
5180-5240	802.11n HT20	15.79	37.93

SISO and MIMO per chain power are set to the same level

#### 5.3 GHz BAND (FCC/IC)

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
<b>5.3 GHz band, 2TX</b>			
5260 - 5320	802.11a	19.98	99.54
5260 - 5320	802.11n HT20	19.96	99.08

SISO and MIMO per chain power are set to the same level

#### 5.6 GHz BAND (FCC/IC)

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
<b>5.6 GHz band, 2TX</b>			
5500-5700	802.11a	20.75	118.85
5500-5700	802.11n HT20	20.74	118.58

SISO and MIMO per chain power are set to the same level

**5.8 GHz BAND (FCC/IC)**

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
<b>5.8 GHz band, 2TX</b>			
5745-5825	802.11a	20.19	104.47
5745-5825	802.11n HT20	20.34	108.14

SISO and MIMO per chain power are set to the same level

**6.3. DESCRIPTION OF AVAILABLE ANTENNAS**

The EUT supports 2 antennas. The antenna gain and type, as provided by the manufacturer, are as follows:

The radio utilizes 2 FPC antennas. Tx chains are uncorrelated for power and correlated for PSD due to the device supporting CDD in all MIMO modes. The directional gains are as follows:

Band (GHz)	Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)	Correlated Chains Directional Gain (dBi)
5.2	1.9	1.2	1.56	4.57
5.3	1.6	2.0	1.80	4.81
5.6	1.6	3.0	2.36	5.34
5.8	0.6	1.9	1.30	4.28

**6.4. SOFTWARE AND FIRMWARE**

The EUT firmware installed during testing was Sonos S2 V13.2

The test utility software used during testing was JPerf 2.0.2

## 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 and PSD as worst-case scenario.

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

EUT is intended to operate in one orientation, therefore all tests were performed in its intended orientation.

Radiated and AC mains emissions testing were performed with both antennas transmitting.  
Note – The per chain power setting is the same whether in SISO or MIMO modes.

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

802.11a mode: 6 Mbps

802.11n HT20mode: MCS0

## 6.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer/Brand	Model	Serial Number	FCC ID
Laptop	Lenovo	T440P	PB0294NN	NA

### I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	1	1	AC Mains	I/O	<3m	Powers EUT
2	1	1	Ethernet	I/O	<3m	Communications Port

### SETUP DIAGRAMS

Please refer to R13510374-EP1 for setup diagrams

## 7. MEASUREMENT METHOD

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

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

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

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

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.1, G.3, G.4, G.5, and G.6.

Unwanted emissions in non-restricted bands: KDB 789033 D02 v02r01, Sections G.2, G.3, and G.5.

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

General Radiated Emissions: ANSI C63.10-2013 Section 6.3-6.6, 6.10.5

## 8. TEST AND MEASUREMENT EQUIPMENT

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

### Test Equipment Used – Conducted Emissions Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
<b>Conducted Room 1</b>					
CBL087	Coax cable, RG223, N-male to BNC-male, 20-ft.	Pasternack	PE3W06143-240	2020-03-26	2021-03-26
HI0091	Environmental Meter	Fisher Scientific	14-650-118	2020-06-26	2021-06-26
LISN003	LISN, 50-ohm/50-uH, 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50-25-2-01-550V	2020-08-18	2021-08-18
75141	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2020-08-18	2021-08-18
PS214	AC Power Source	Elgar	CW2501M (s/n 1523A02396)	NA	NA
ATA222	Transient Limiter, 0.009-100MHz	Electro-Metrics	EM-7600	2020-03-26	2021-03-26
SA0027	Spectrum Analyzer	Keysight	N9030A	2020-06-10	2021-06-10
SOFTEMI	EMI Software	UL	Version 9.5 2015-08-20	NA	NA
EMISoftware	Antenna Port Software	UL LLC	AP Version 2021.02.16	NA	NA



Test Equipment Used – Conducted Emissions Measurement Equipment (Morrisville –  
 Conducted 2)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
SA0027	Spectrum Analyzer	Keysight	N9030A	2020-06-10	2021-06-10
PWM002	Power Meter	Keysight	N1912A	2020-07-31	2021-07-31
PWM001	Power Meter	Keysight	N1912A	2020-07-17	2021-07-17
PWM005	Power Meter	Keysight	N1912A	2020-07-14	2021-07-14
PWS006	Power Sensor	Keysight	N1921A	2020-11-25	2021-11-25
PWS005	Power Sensor	Keysight	N1921A	2020-05-26	2021-05-26
PWS002	Power Sensor	Keysight	N1921A	2020-09-10	2021-09-10
PWS001	Power Sensor	Keysight	N1921A	2020-05-27	2021-05-27
HI0090	Environmental Meter	Fisher Scientific	15-077-963	2020-06-26	2021-06-26
EMISoftware	Antenna Port Software	UL LLC	AP Version 2021.02.02, 2021.02.16, 2021.03.09, 2021.03.16	NA	NA

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - North Chamber)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	<b>0.009-30MHz</b>	<b>(Loop Ant.)</b>			
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2020-08-20	2021-08-20
	<b>30-1000 MHz</b>				
AT0074	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2020-07-27	2021-07-27
	<b>1-18 GHz</b>				
AT0072	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2020-04-27	2021-04-27
	<b>Gain-Loss Chains</b>				
N-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2020-08-07	2021-08-07
N-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2020-08-07	2021-08-07
N-SAC03	Gain-loss string: 1-18GHz	Various	Various	2020-08-07	2021-08-07
	<b>Receiver &amp; Software</b>				
SA0026	Spectrum Analyzer	Agilent	N9030A	2020-07-16	2021-07-16
SOFTEMI	EMI Software	UL	Version 9.5 2020-08-19	NA	NA
	<b>Additional Equipment Used</b>				
HI0094	Environmental Meter	Fisher Scientific	06-662-4 11725843	2020-01-21	2022-01-21

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - South Chamber)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	<b>1-18 GHz</b>				
AT0067	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2020-04-28	2021-04-28
	<b>18-40 GHz</b>				
AT0063	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2020-10-30	2021-10-30
AT0061	Horn Antenna, 26-40GHz	ARA	MWH-2640/B	2020-10-30	2021-10-30
	<b>Gain-Loss Chains</b>				
S-SAC03	Gain-loss string: 1-18GHz	Various	Various	2020-07-06	2020-07-06
S-SAC04	Gain-loss string: 18-40GHz	Various	Various	2020-07-07	2021-07-07
	<b>Receiver &amp; Software</b>				
197954	Spectrum Analyzer	Rohde & Schwarz	ESW44	2020-03-27	2021-03-27
197955	Spectrum Analyzer	Rohde & Schwarz	ESW44	2020-03-11	2021-03-11
SA0025	Spectrum Analyzer	Agilent	N9030A	2020-03-17	2021-03-17
SOFTEMI	EMI Software	UL	Version 2020-08-19	NA	NA
	<b>Additional Equipment used</b>				
s/n 181474409	Environmental Meter	Fisher Scientific	15-077-963	2020-08-06	2021-08-06

## 9. ANTENNA PORT TEST RESULTS

### 9.1. ON TIME AND DUTY CYCLE

#### LIMITS

None; for reporting purposes only.

#### PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

#### ON TIME AND DUTY CYCLE RESULTS

##### 9.1.1. 5.2 GHz Band

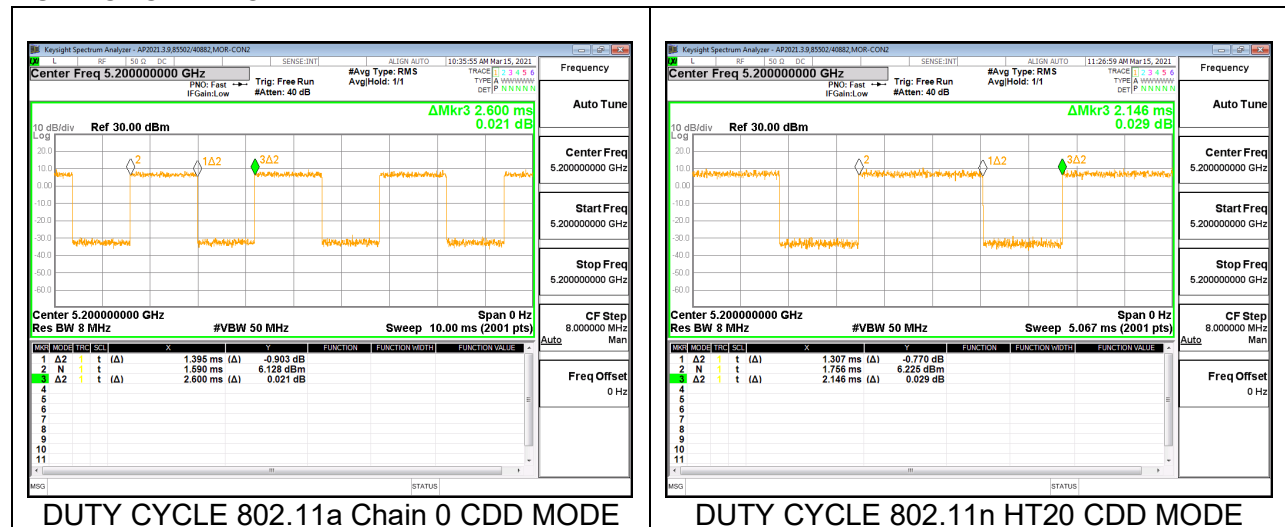
##### Voltage Averaging Duty Cycle (Radiated Testing)

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
802.11a CDD	1.395	2.600	0.537	53.65%	5.41	0.717
802.11n HT20 SDM	1.307	2.146	0.609	60.90%	4.31	0.765

##### Power Averaging Duty Cycle (Conducted Testing)

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
802.11a CDD	1.395	2.600	0.537	53.65%	2.70	0.717
802.11n HT20 SDM	1.307	2.146	0.609	60.90%	2.15	0.765

#### DUTY CYCLE PLOTS



### 9.1.2. 5.3 GHz Band

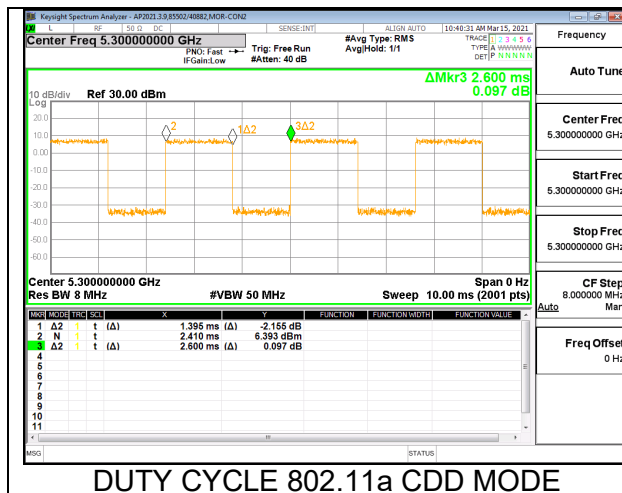
#### Voltage Averaging Duty Cycle (Radiated Testing)

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
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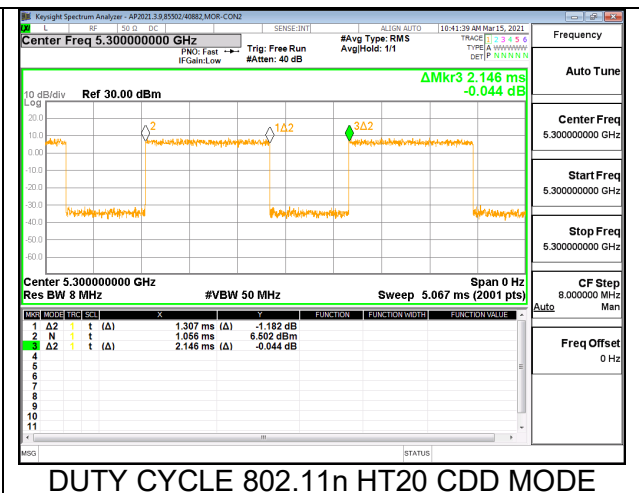
#### Power Averaging Duty Cycle (Conducted Testing)

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
802.11a CDD	1.395	2.600	0.537	53.65%	2.70	0.717
802.11n HT20 SDM	1.307	2.146	0.609	60.90%	2.15	0.765

#### DUTY CYCLE PLOTS



DUTY CYCLE 802.11a CDD MODE



DUTY CYCLE 802.11n HT20 CDD MODE

### 9.1.3. 5.6 GHz Band

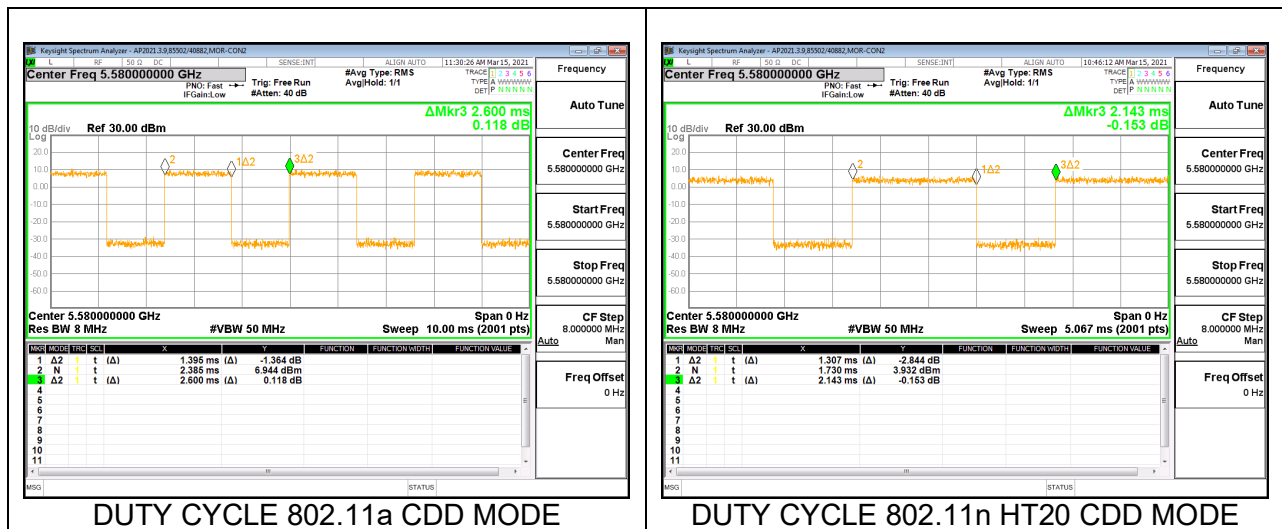
#### Voltage Averaging Duty Cycle (Radiated Testing)

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
802.11a CDD	1.395	2.600	0.537	53.65%	5.41	0.717
802.11n HT20 SDM	1.307	2.143	0.610	60.99%	4.3	0.765

#### Power Averaging Duty Cycle (Conducted Testing)

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
802.11a CDD	1.395	2.600	0.537	53.65%	2.70	0.717
802.11n HT20 SDM	1.307	2.143	0.610	60.99%	2.15	0.765

#### DUTY CYCLE PLOTS



### 9.1.4. 5.8 GHz Band

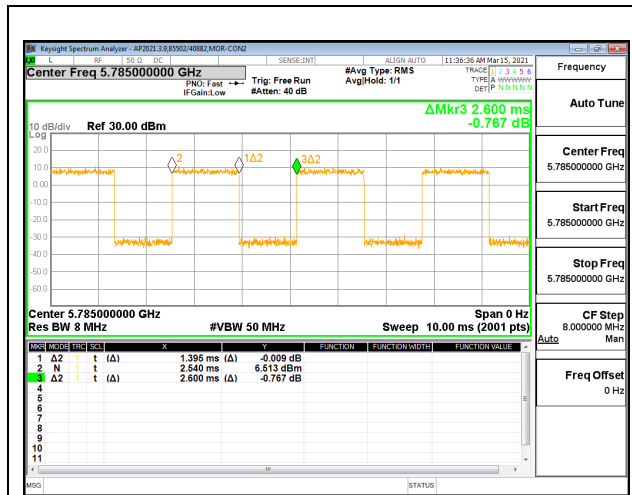
#### Voltage Averaging Duty Cycle (Radiated Testing)

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
802.11a CDD	1.395	2.600	0.537	53.65%	5.41	0.717
802.11n HT20 SDM	1.307	2.146	0.609	60.90%	4.31	0.765

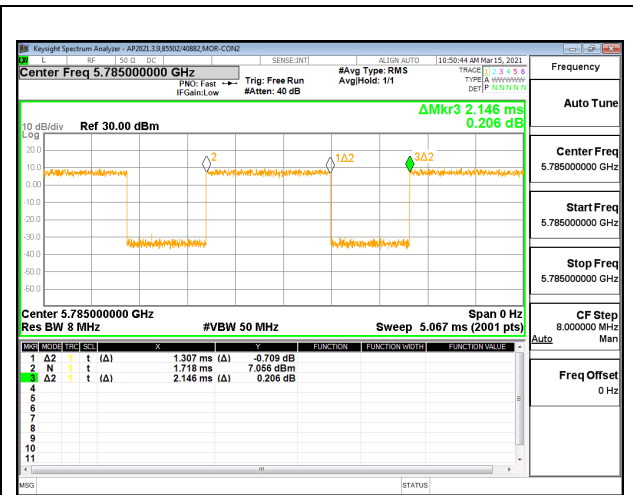
#### Power Averaging Duty Cycle (Conducted Testing)

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
802.11a CDD	1.395	2.600	0.537	53.65%	2.70	0.717
802.11n HT20 SDM	1.307	2.146	0.609	60.90%	2.15	0.765

#### DUTY CYCLE PLOTS



DUTY CYCLE 802.11a CDD MODE



DUTY CYCLE 802.11n HT20 CDD MODE

## 9.2. 26 dB BANDWIDTH

### LIMITS

None; for reporting purposes only.

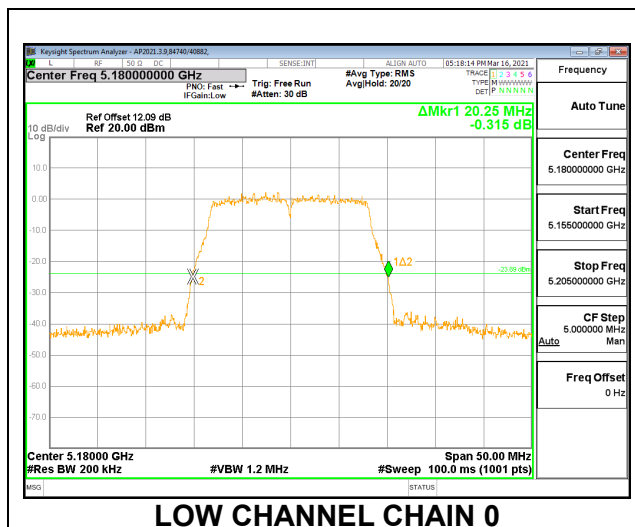
### RESULTS

#### 9.2.1. 802.11a MODE IN THE 5.2 GHz BAND

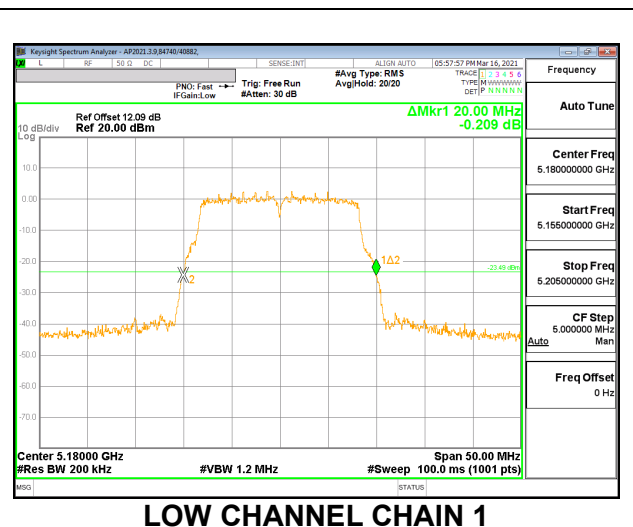
##### 2TX Chain 0 + Chain 1 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5180	20.25	20.00
Mid	5200	23.40	20.00
High	5240	23.80	20.00

### LOW CHANNEL



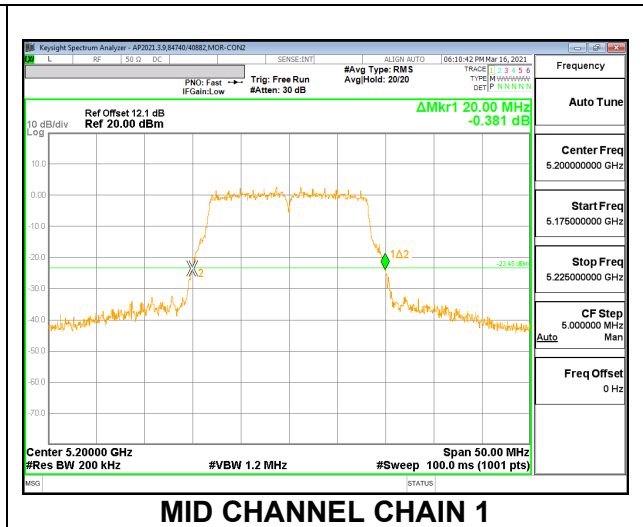
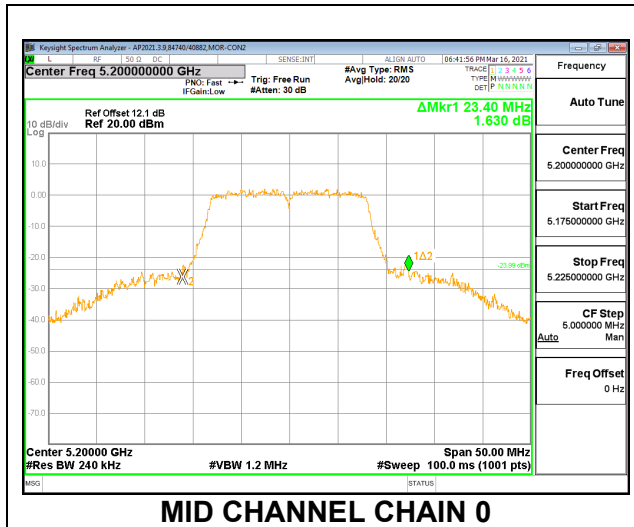
LOW CHANNEL CHAIN 0



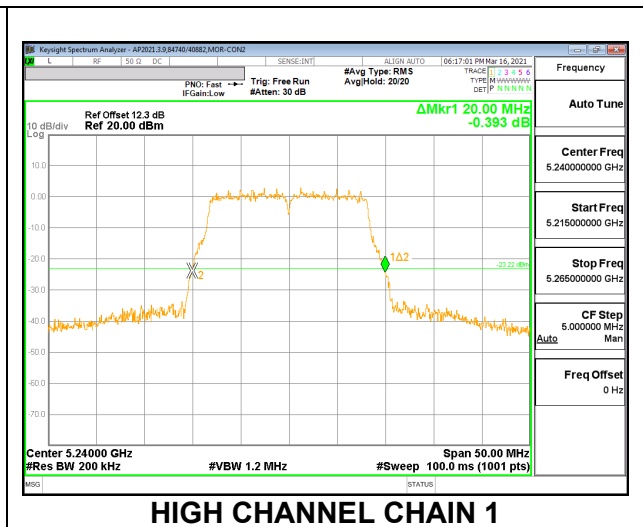
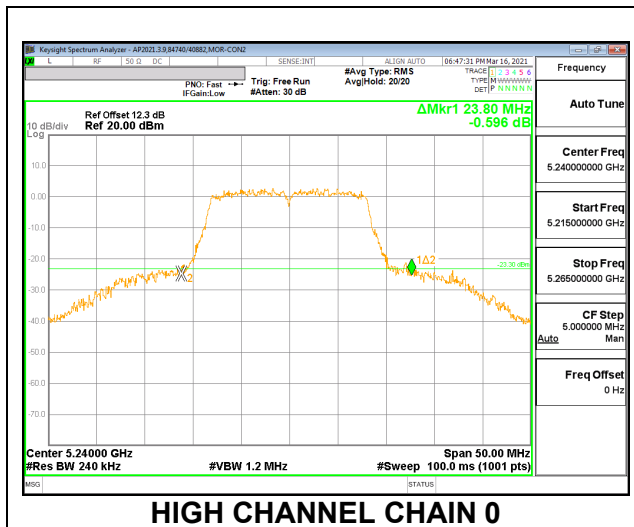
LOW CHANNEL CHAIN 1



### MID CHANNEL



### HIGH CHANNEL

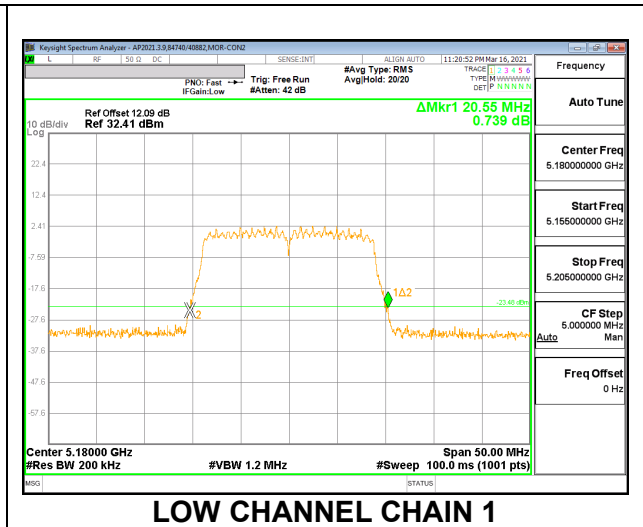
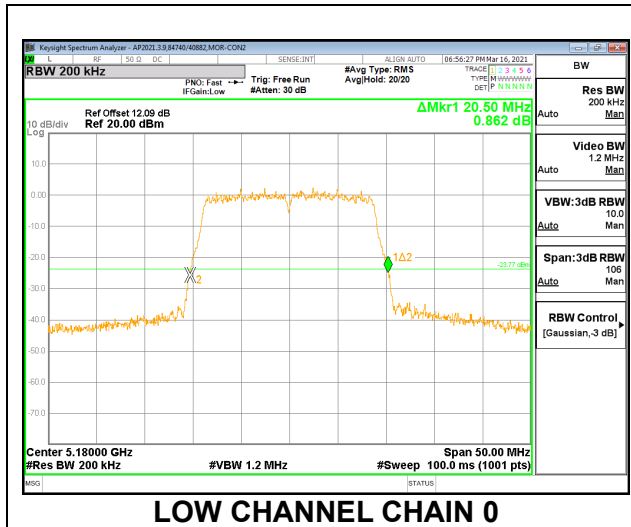


### 9.2.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND

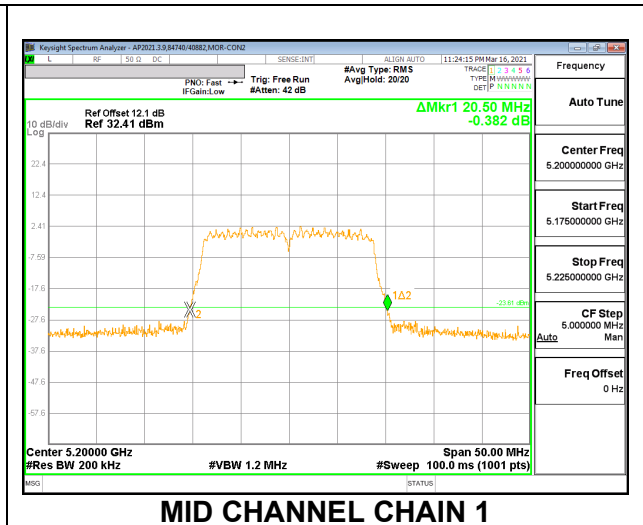
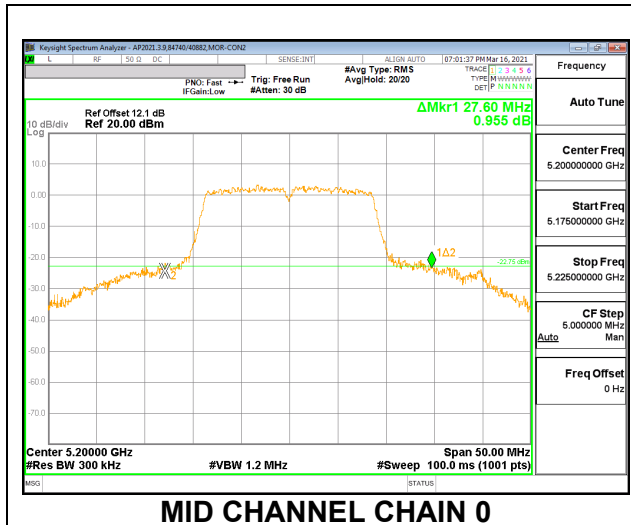
#### 2TX Chain 0 + Chain 1 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5180	20.50	20.55
Mid	5200	27.60	20.50
High	5240	27.60	20.45

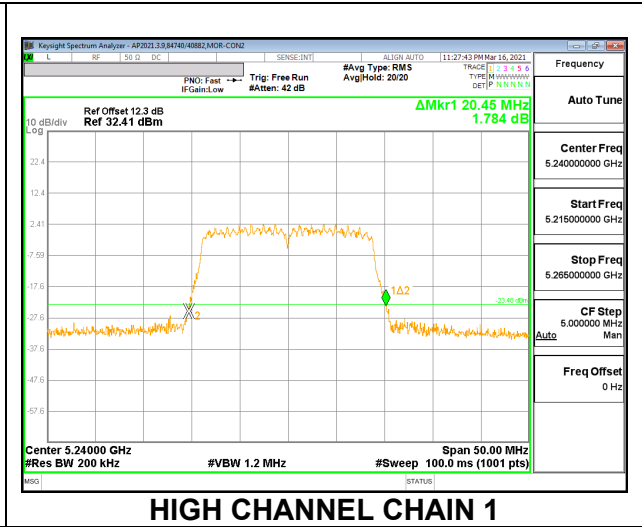
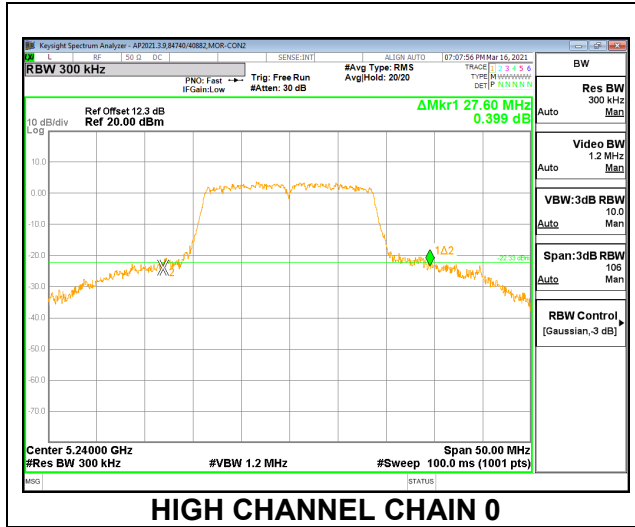
#### LOW CHANNEL



#### MID CHANNEL



### HIGH CHANNEL

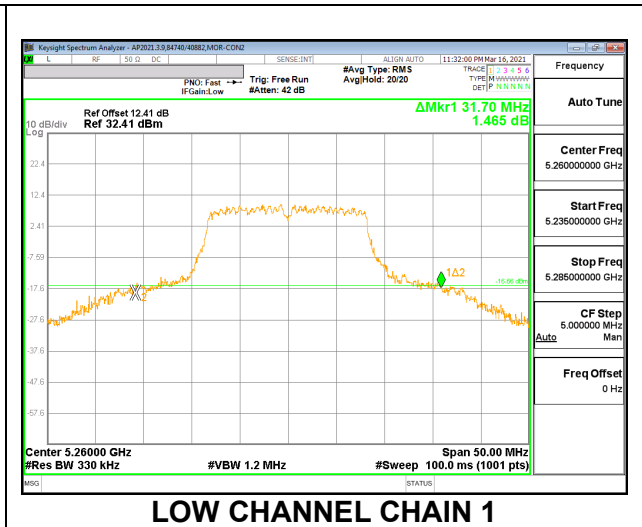
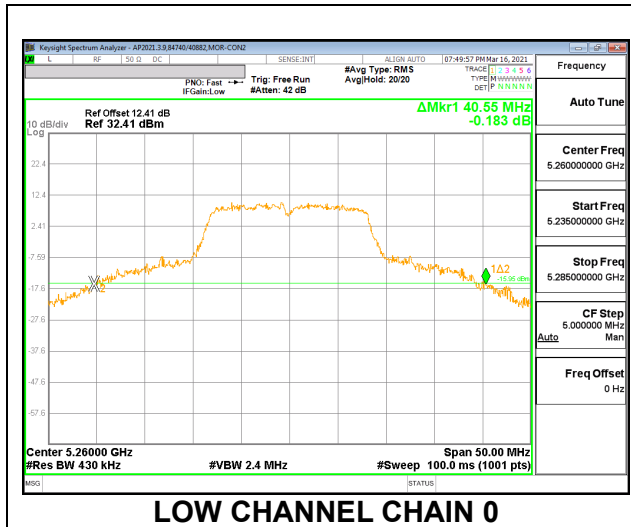


### 9.2.3. 802.11a MODE IN THE 5.3 GHz BAND

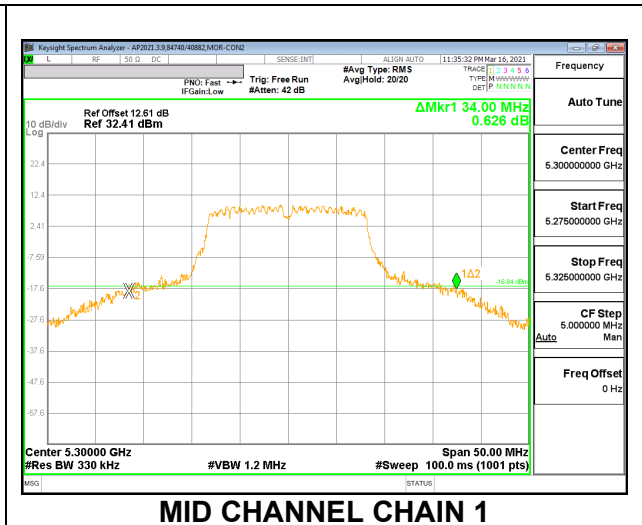
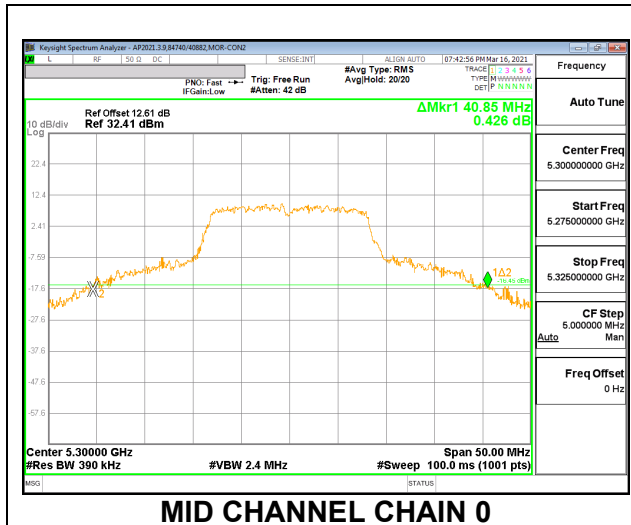
#### 2TX Chain 0 + Chain 1 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5260	40.55	31.70
Mid	5300	40.85	34.00
High	5320	41.40	31.55

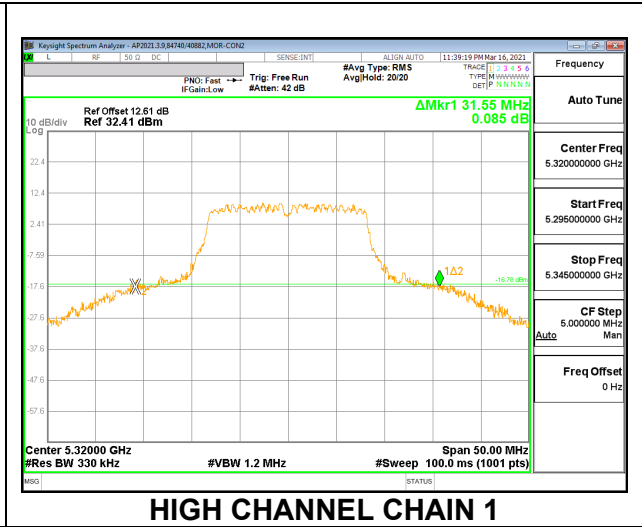
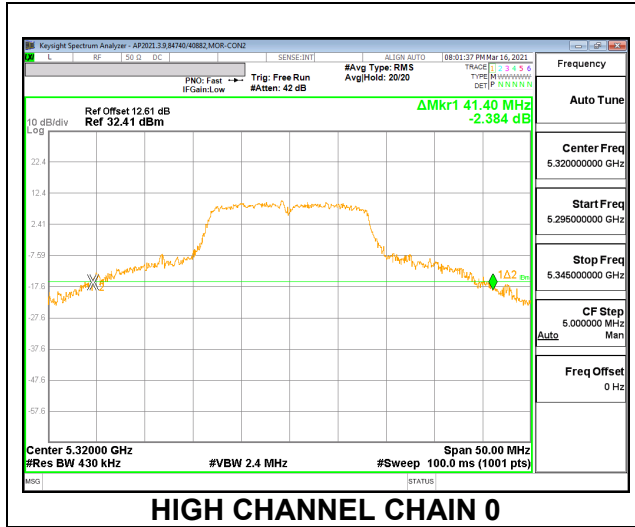
#### LOW CHANNEL



#### MID CHANNEL



### HIGH CHANNEL

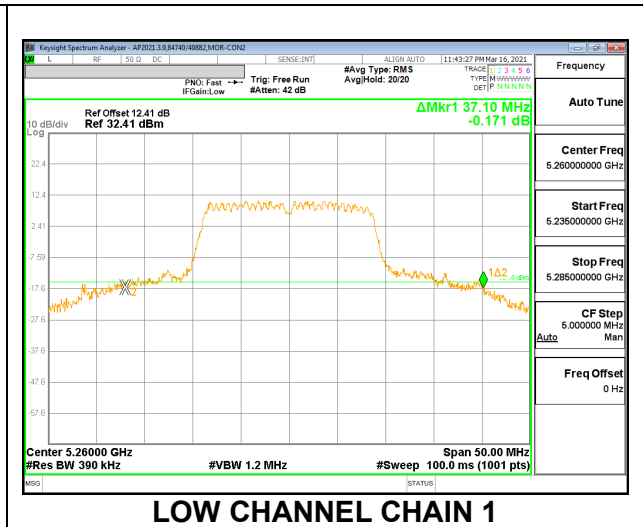
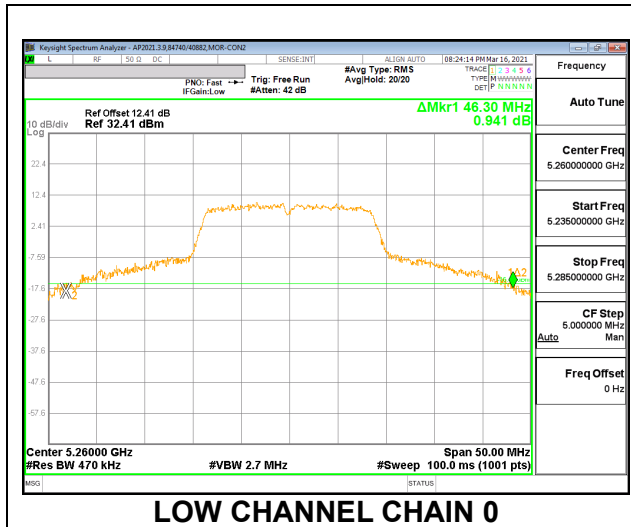


### 9.2.4. 802.11n HT20 MODE IN THE 5.3 GHz BAND

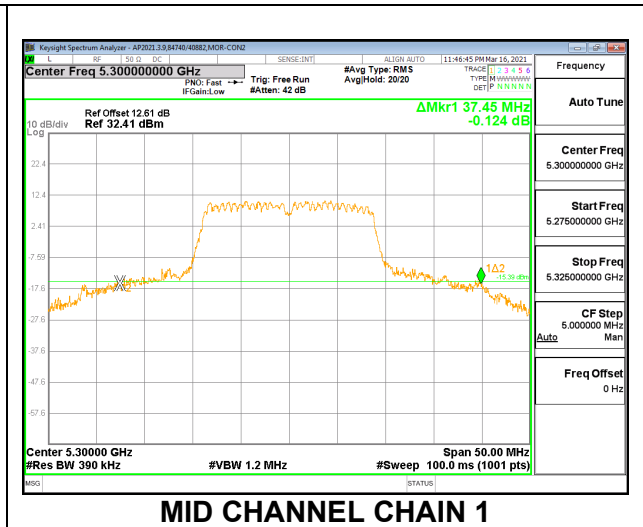
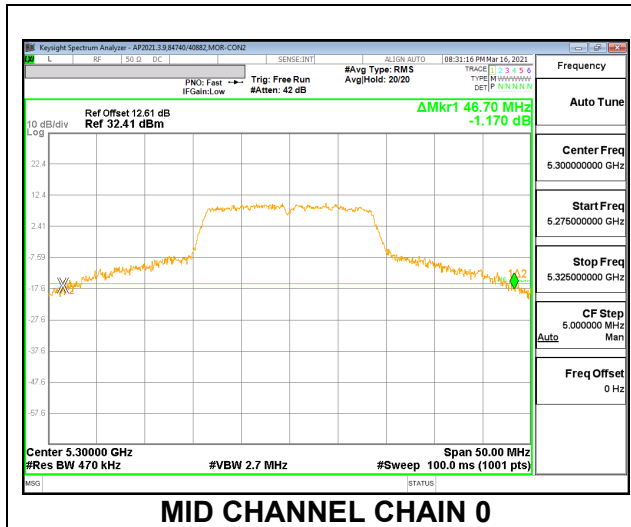
#### 2TX Chain 0 + Chain 1 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth	
		Chain 0 (MHz)	Chain 1 (MHz)
Low	5260	46.30	37.10
Mid	5300	46.70	37.45
High	5320	20.55	20.40

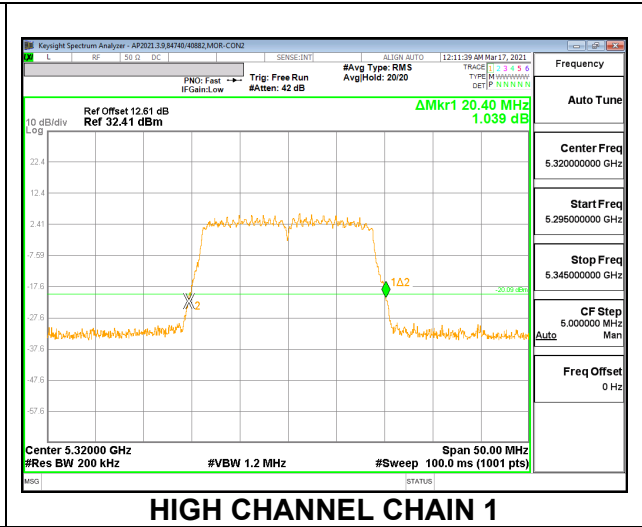
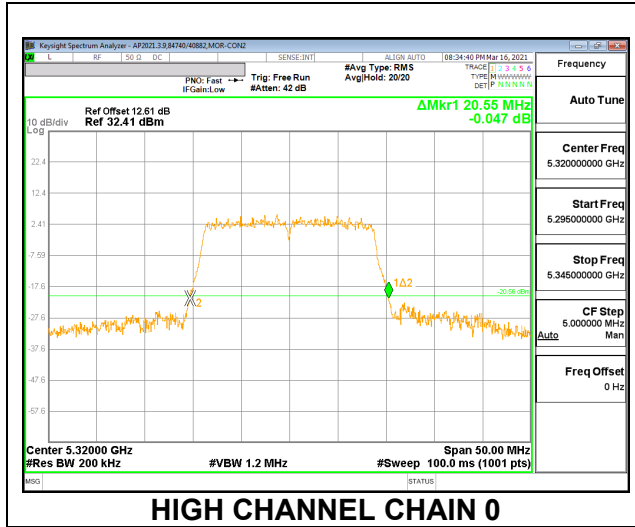
#### LOW CHANNEL



#### MID CHANNEL



### HIGH CHANNEL

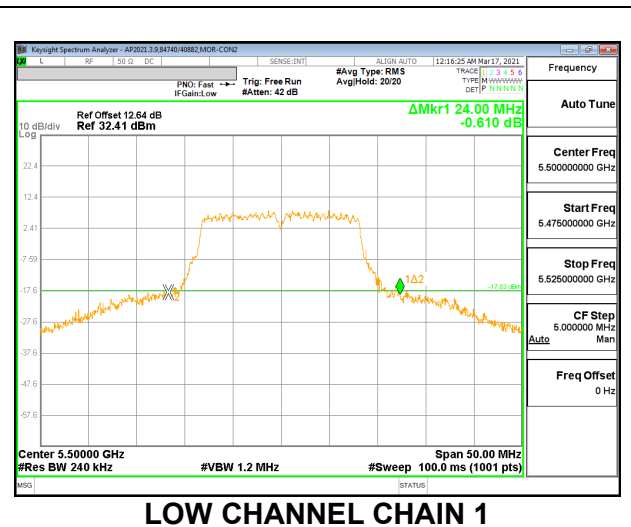
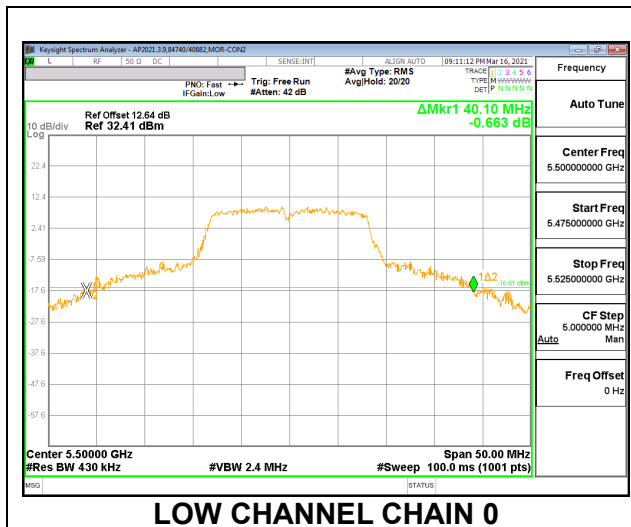


### 9.2.5. 802.11a MODE IN THE 5.6 GHz BAND

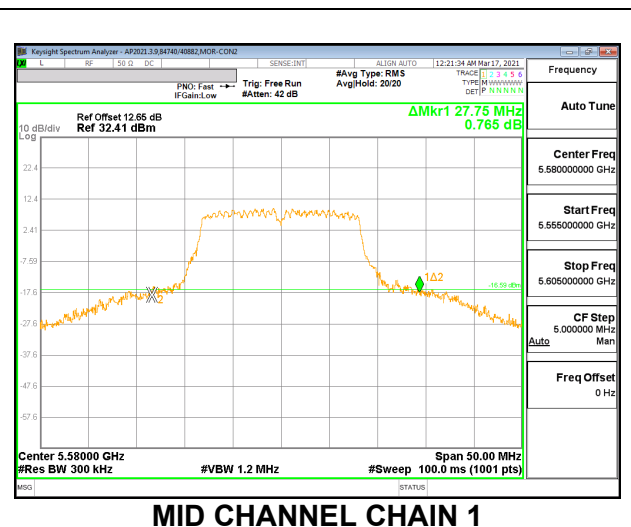
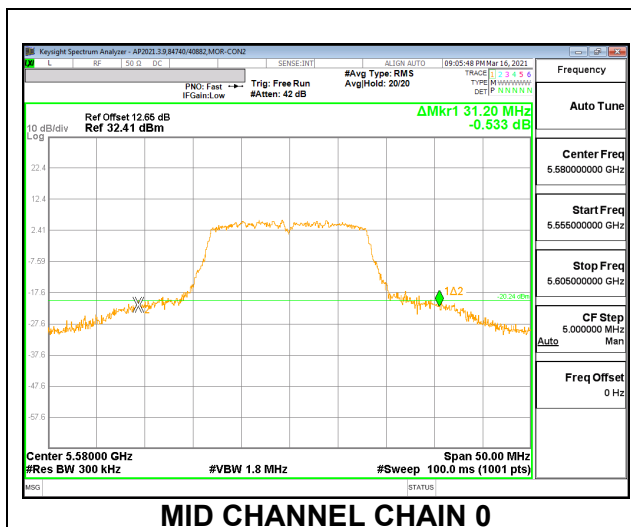
#### 2TX Chain 0 + Chain 1 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5500	40.10	24.00
Mid	5580	31.20	27.75
High	5700	22.95	24.80

#### LOW CHANNEL

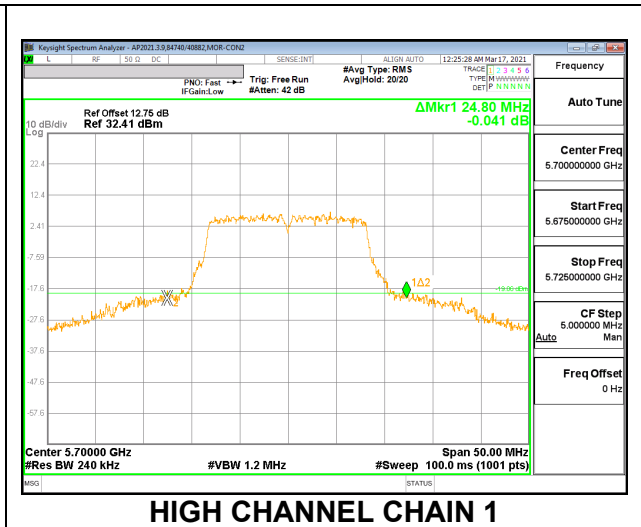
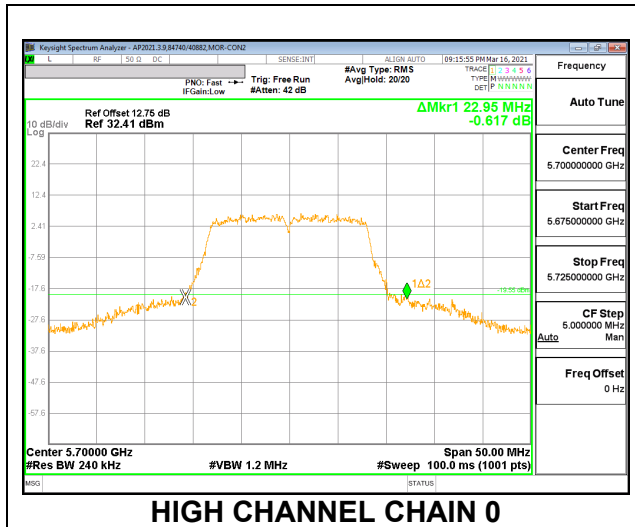


#### MID CHANNEL





### HIGH CHANNEL

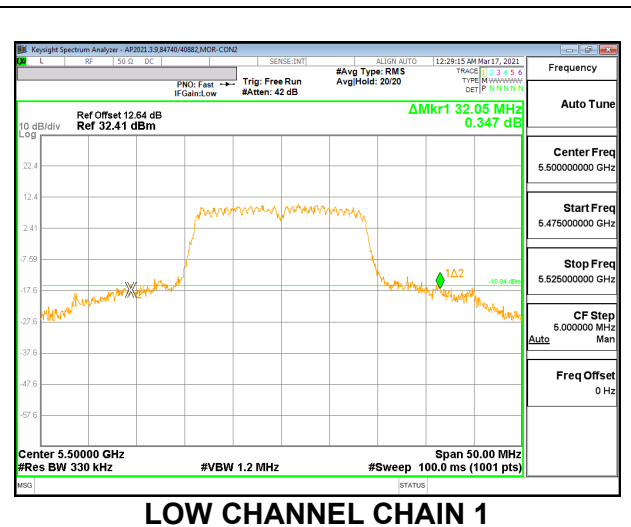
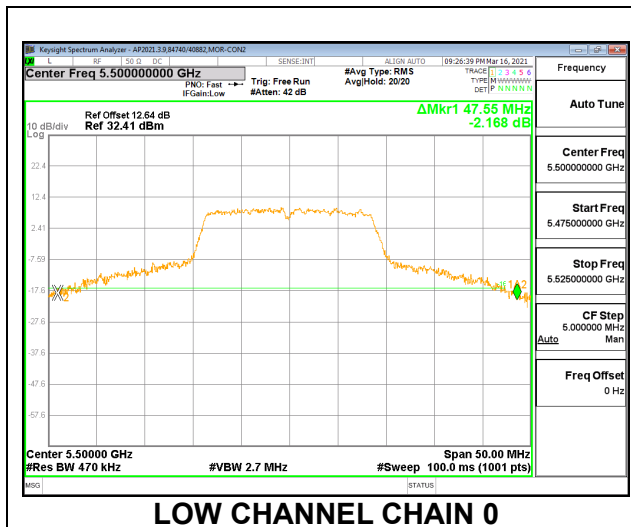


### 9.2.6. 802.11n HT20 MODE IN THE 5.6 GHz BAND

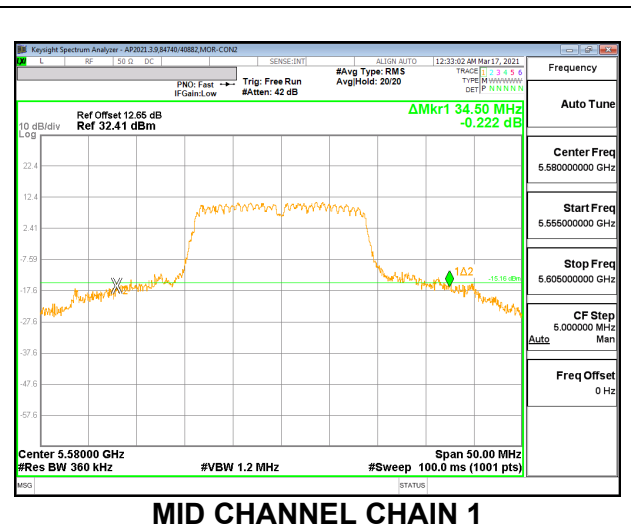
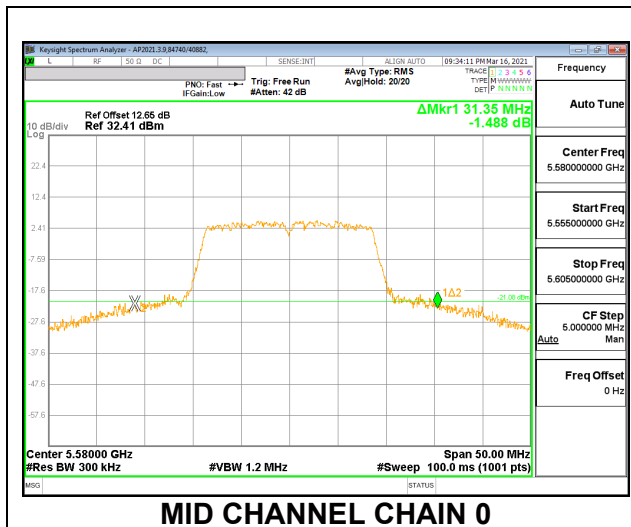
#### 2TX Chain 0 + Chain 1 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5500	47.55	32.05
Mid	5580	31.35	34.50
High	5700	25.35	29.80

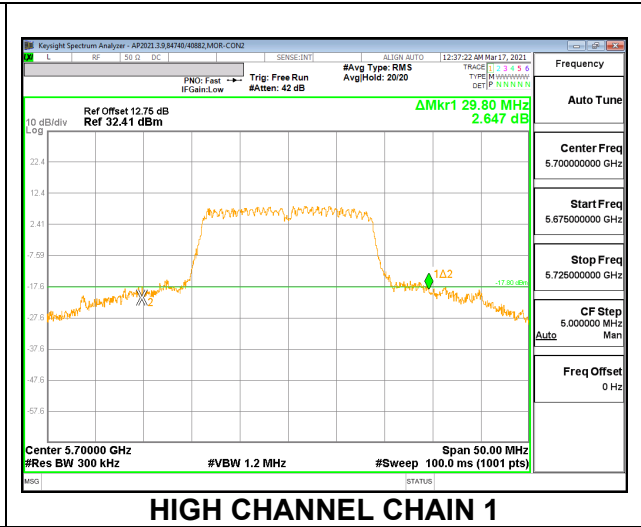
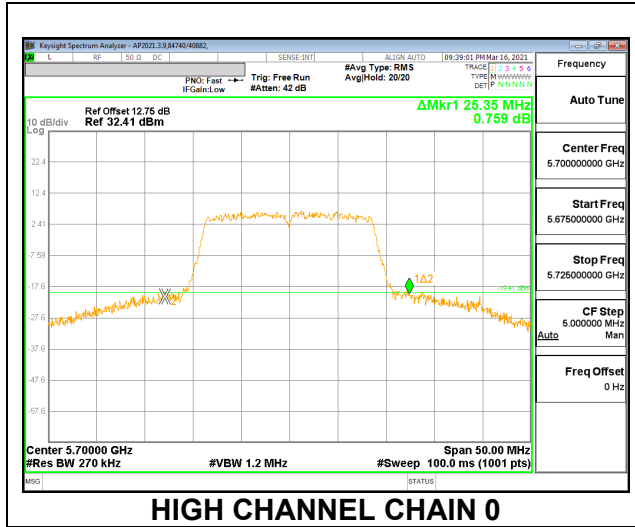
#### LOW CHANNEL



#### MID CHANNEL



### HIGH CHANNEL



### 9.3. 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only.

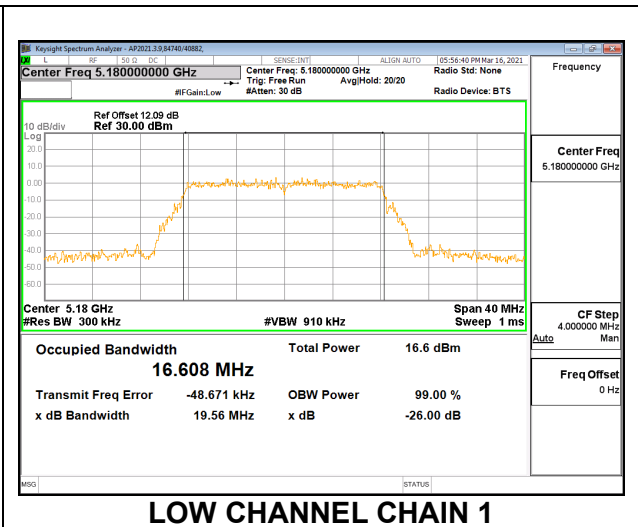
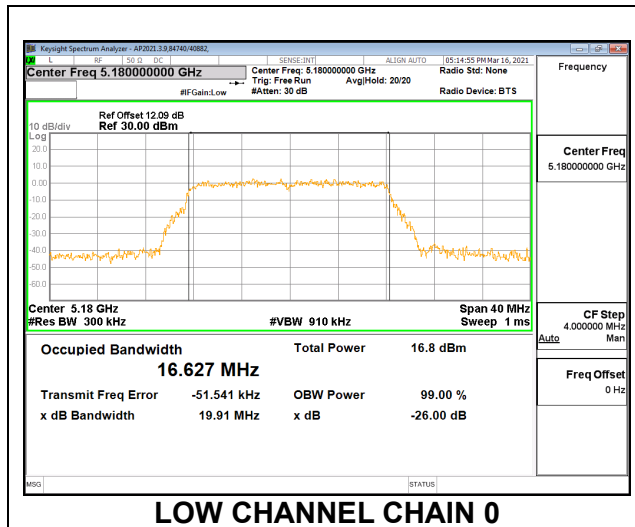
#### RESULTS

##### 9.3.1. 802.11a MODE IN THE 5.2 GHz BAND

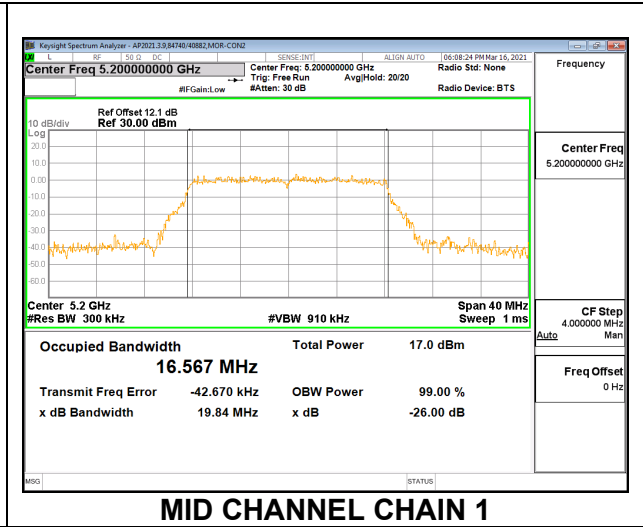
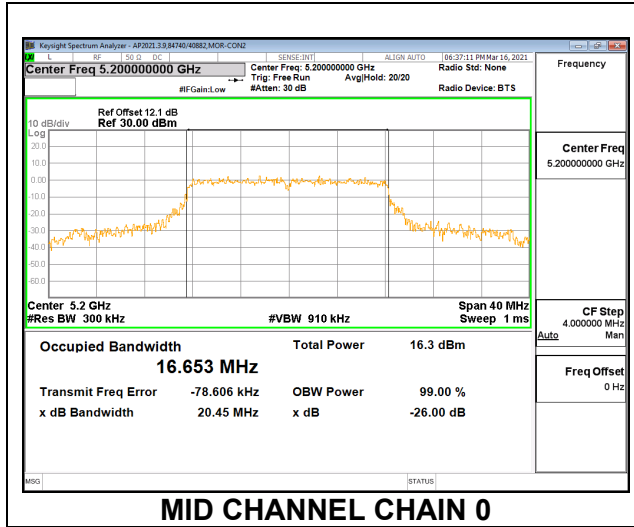
##### 2TX Chain 0 + Chain 1 CDD MODE

Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)
Low	5180	16.627	16.608
Mid	5200	16.653	16.567
High	5240	16.864	16.618

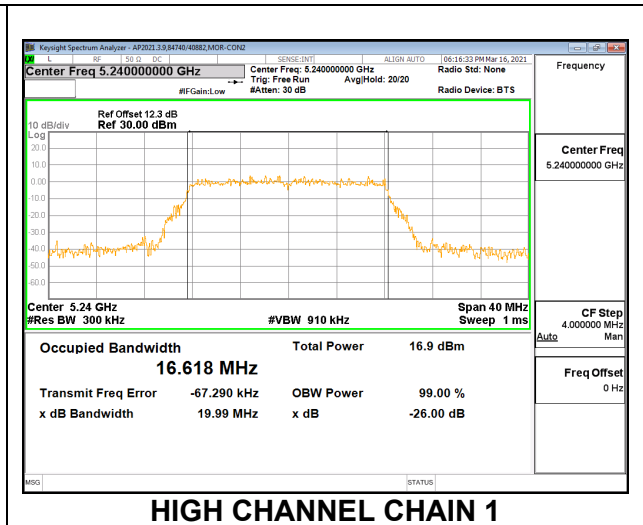
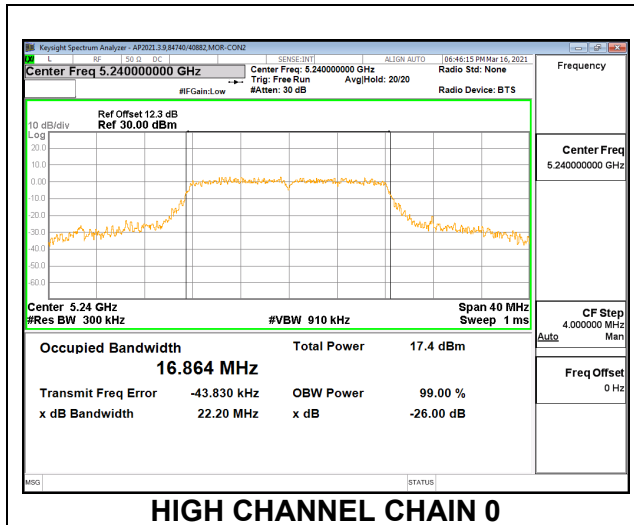
#### LOW CHANNEL



### MID CHANNEL



### HIGH CHANNEL

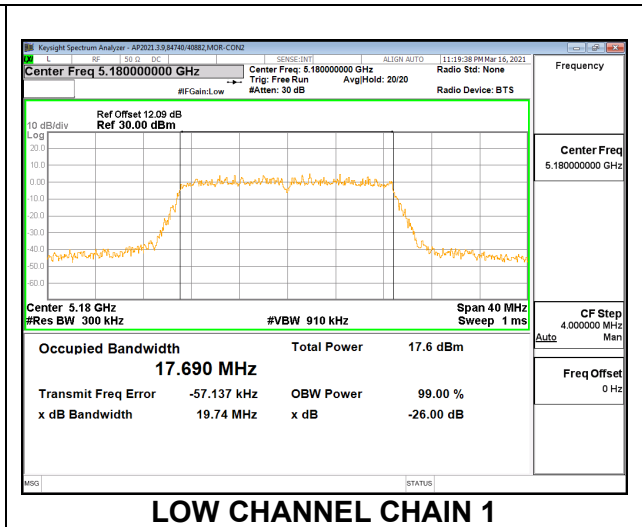
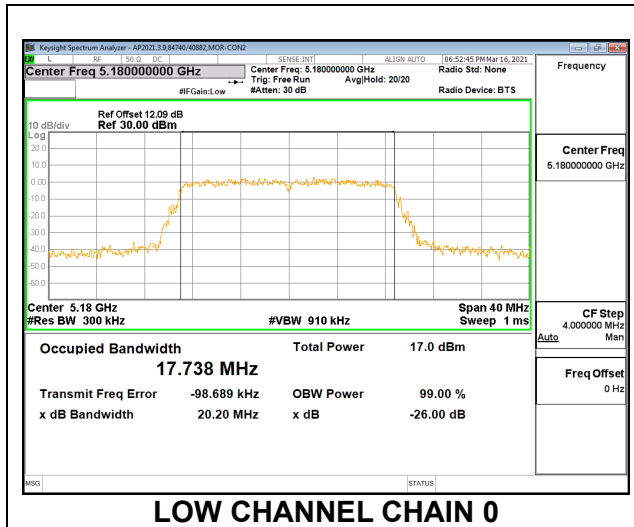


### 9.3.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND

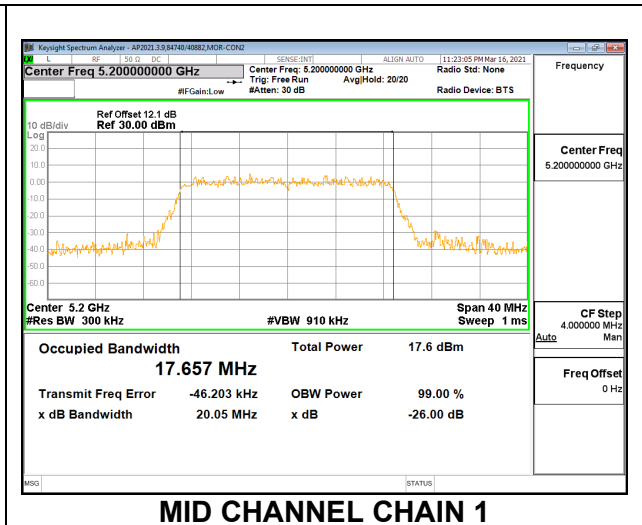
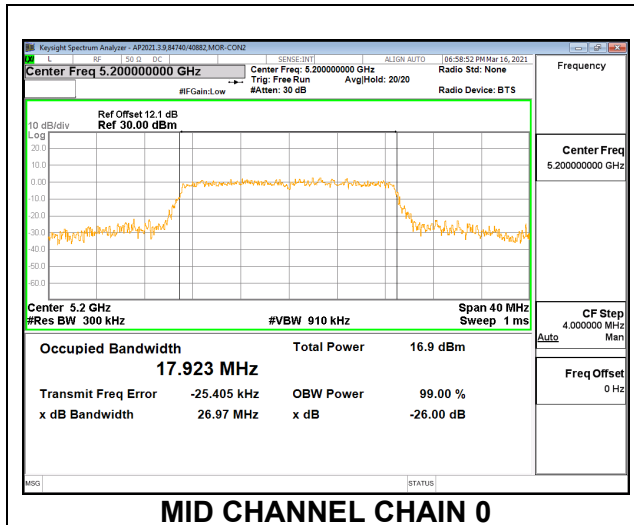
#### 2TX Chain 0 + Chain 1 CDD MODE

Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)
Low	5180	17.738	17.690
Mid	5200	17.923	17.657
High	5240	17.856	17.718

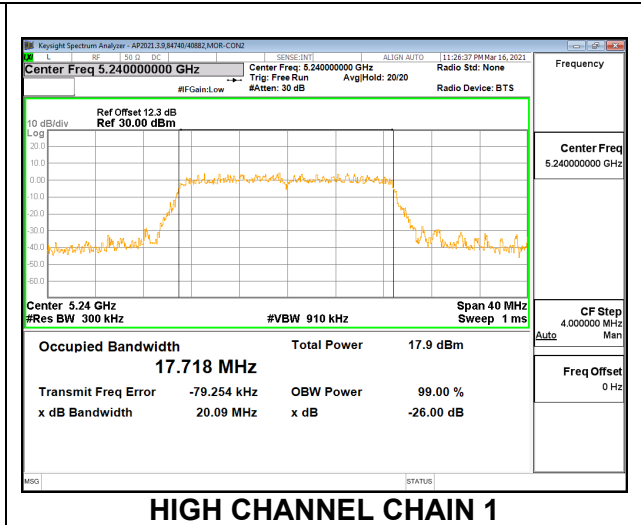
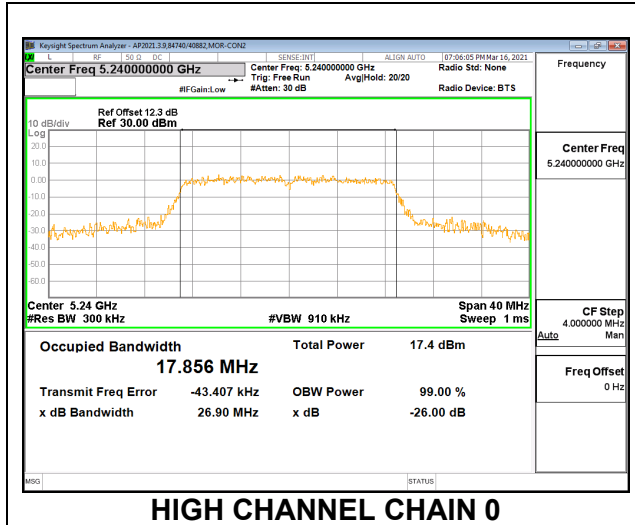
#### LOW CHANNEL



#### MID CHANNEL



### HIGH CHANNEL

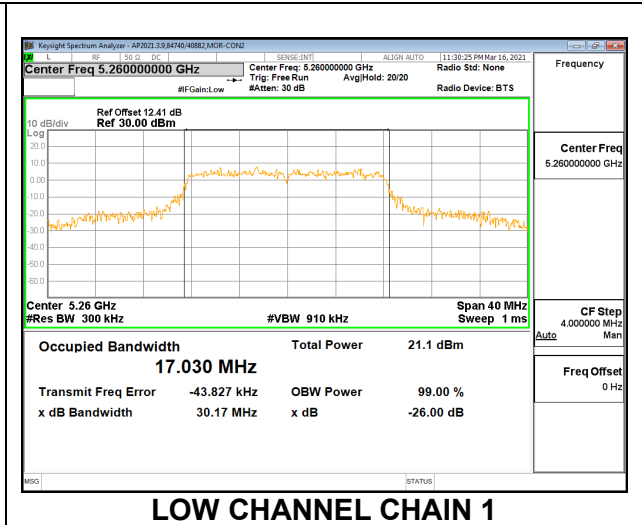
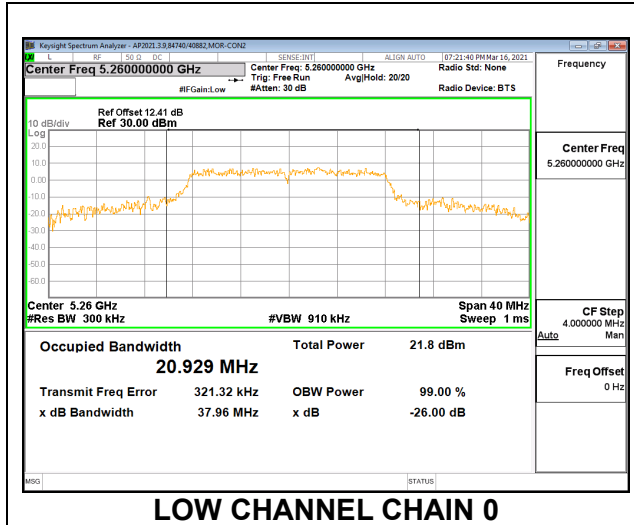


### 9.3.3. 802.11a MODE IN THE 5.3 GHz BAND

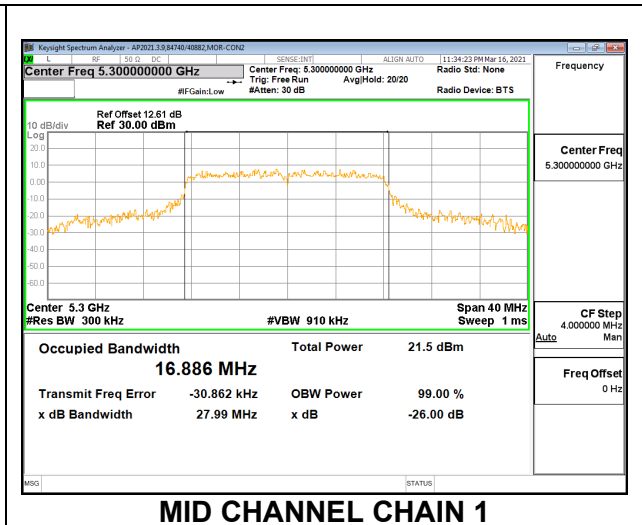
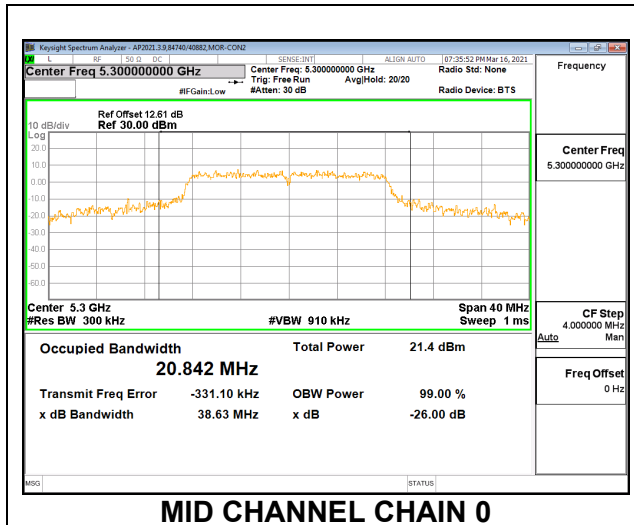
#### 2TX Chain 0 + Chain 1 CDD MODE

Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)
Low	5260	20.929	17.030
Mid	5300	20.842	16.886
High	5320	20.726	16.855

#### LOW CHANNEL

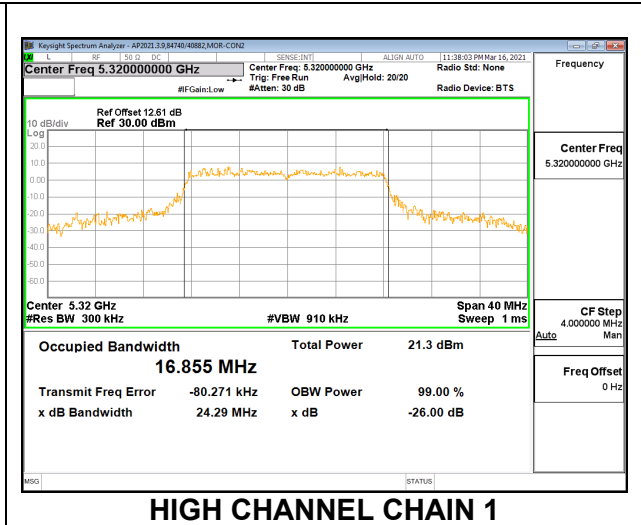
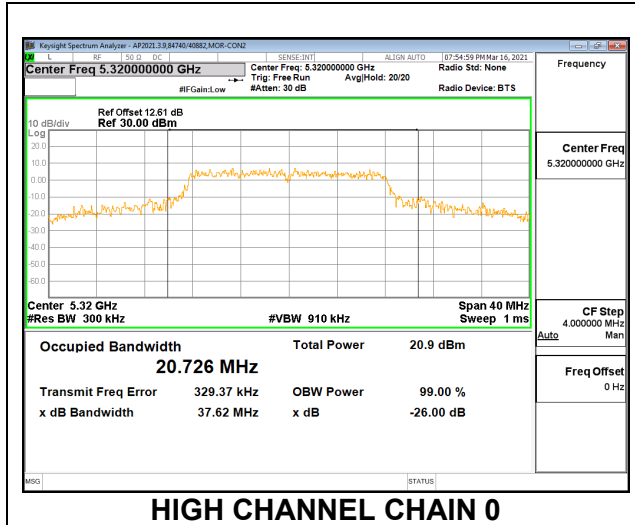


#### MID CHANNEL





### HIGH CHANNEL

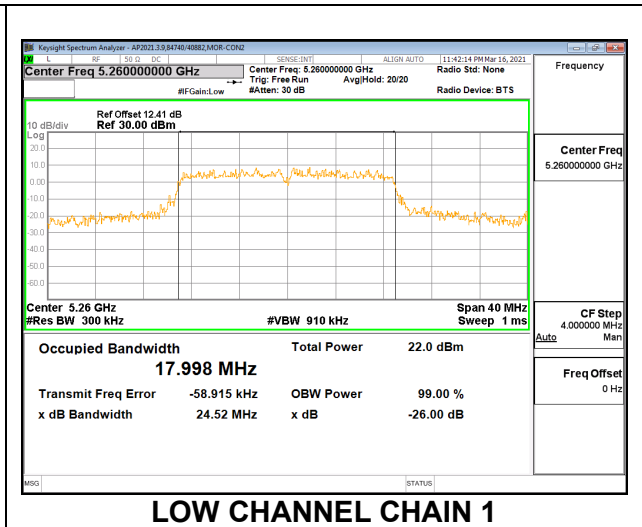
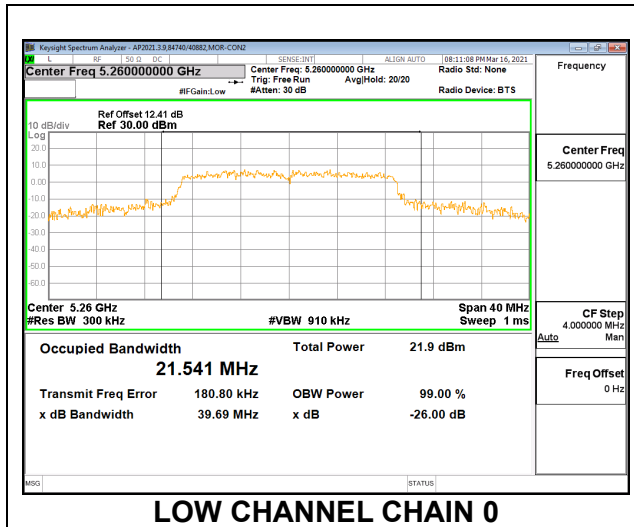


### 9.3.4. 802.11n HT20 MODE IN THE 5.3 GHz BAND

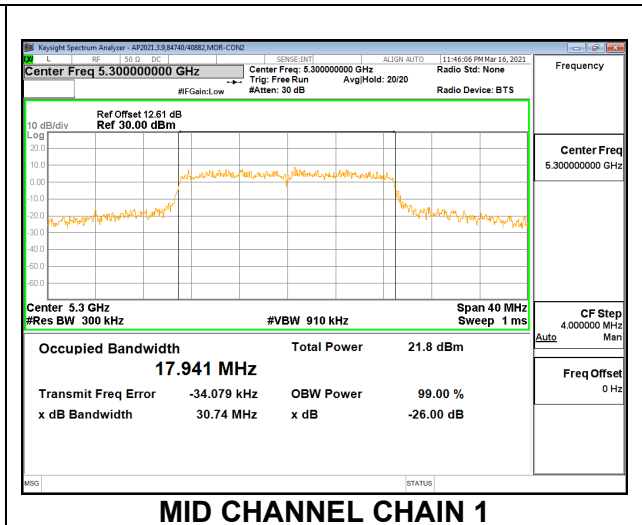
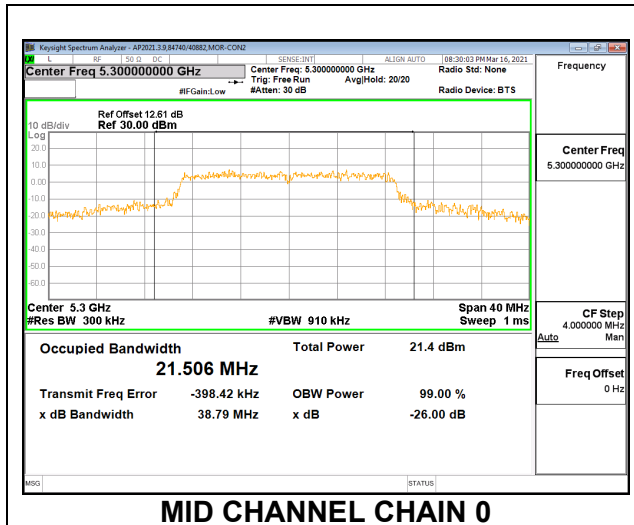
#### 2TX Chain 0 + Chain 1 CDD MODE

Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)
Low	5260	21.541	17.998
Mid	5300	21.506	17.941
High	5320	17.772	17.785

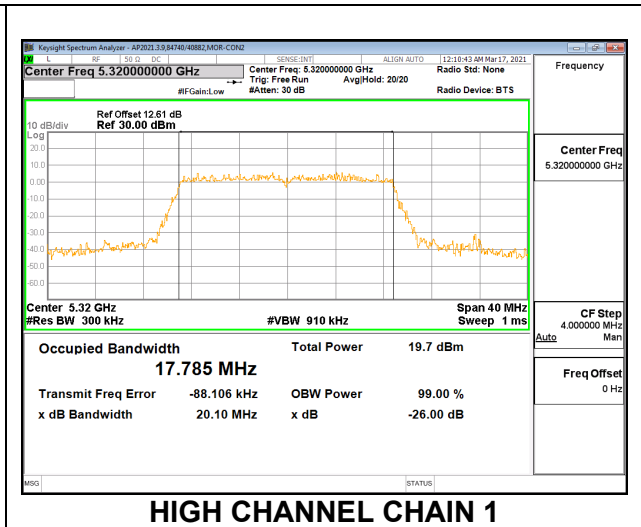
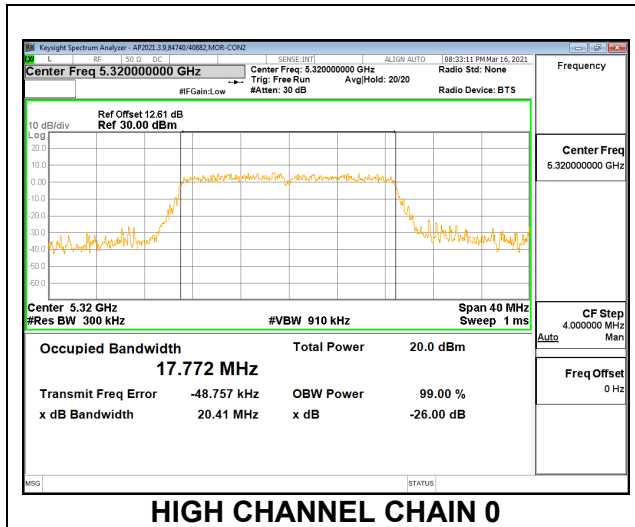
#### LOW CHANNEL



#### MID CHANNEL



### HIGH CHANNEL

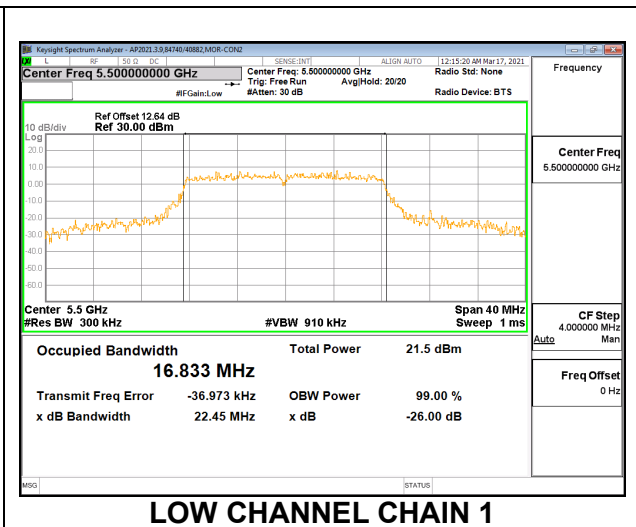
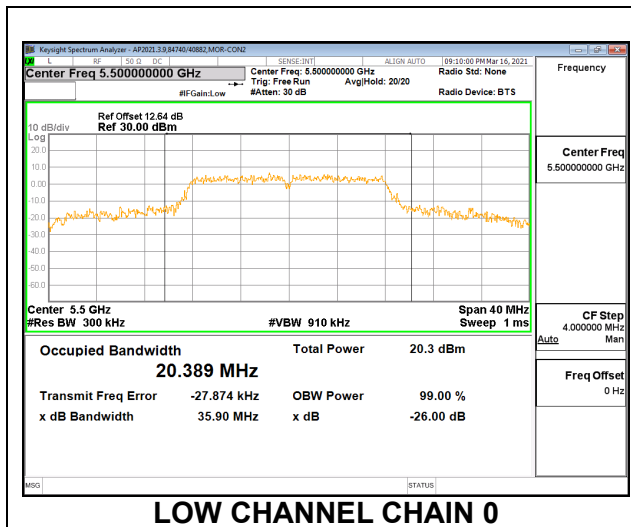


### 9.3.5. 802.11a MODE IN THE 5.6 GHz BAND

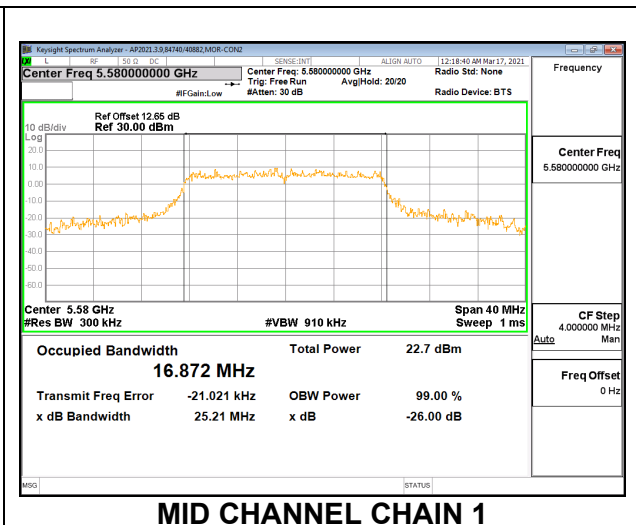
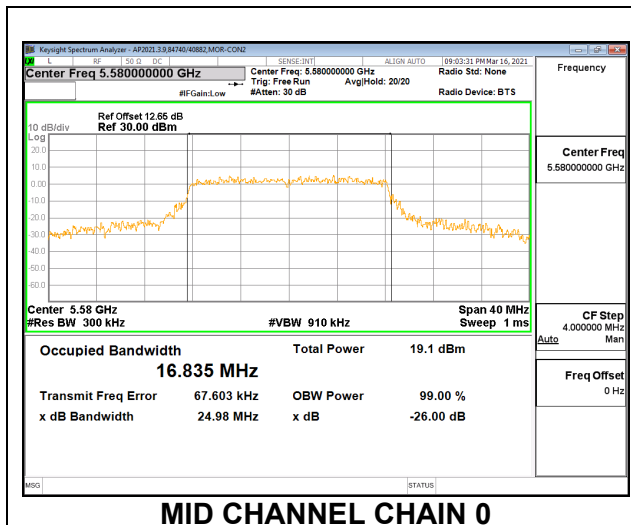
#### 2TX Chain 0 + Chain 1 CDD MODE

Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)
Low	5500	20.389	16.833
Mid	5580	16.835	16.872
High	5700	16.727	16.713

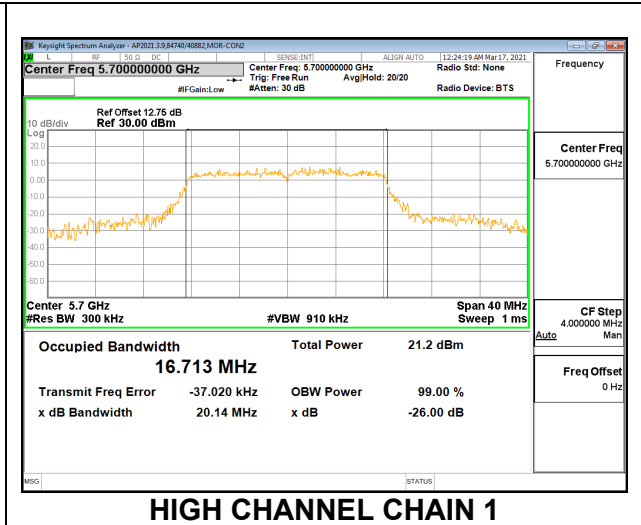
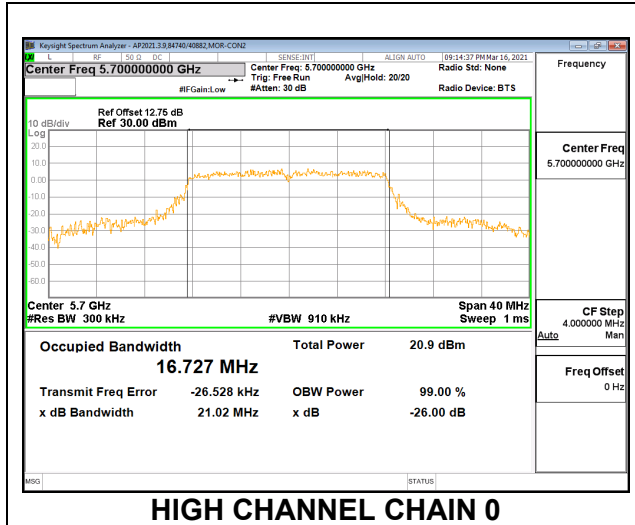
#### LOW CHANNEL



#### MID CHANNEL



### HIGH CHANNEL

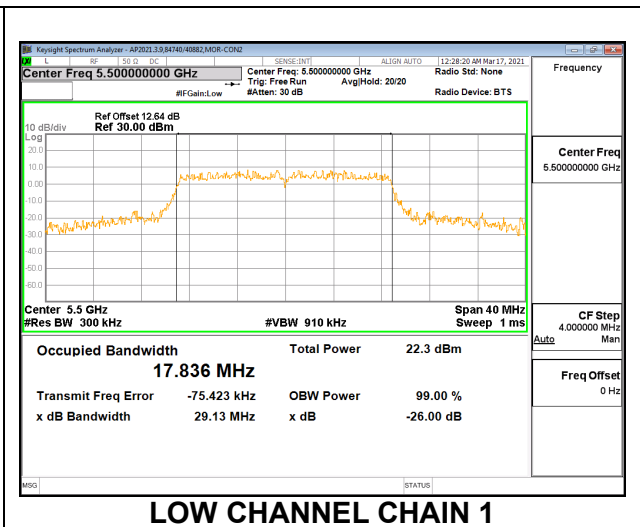
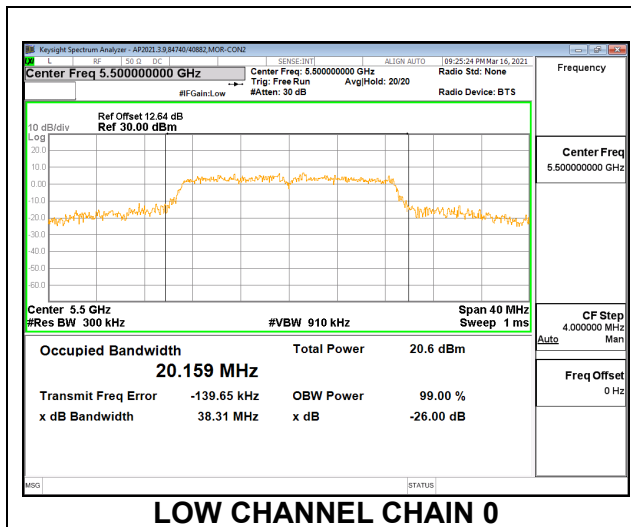


### 9.3.6. 802.11n HT20 MODE IN THE 5.6 GHz BAND

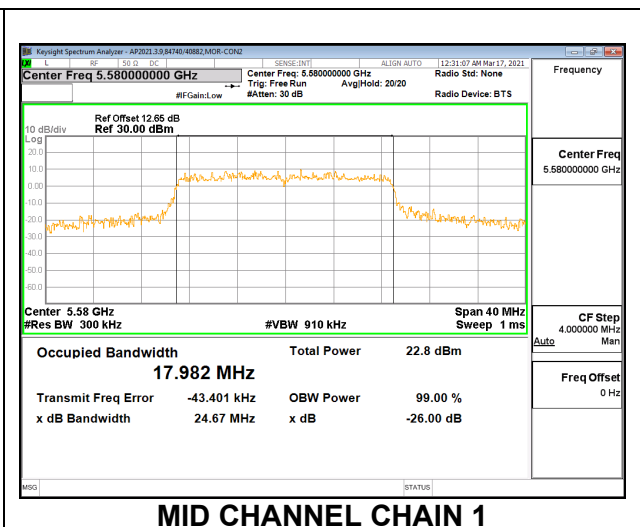
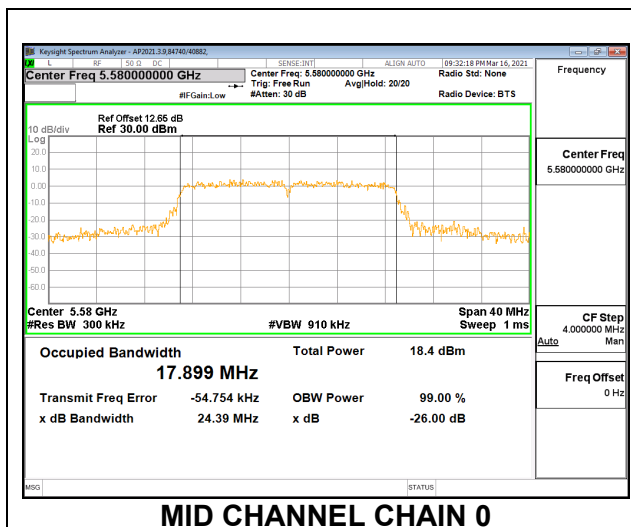
#### 2TX Chain 0 + Chain 1 CDD MODE

Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)
Low	5500	20.159	17.836
Mid	5580	17.899	17.982
High	5700	17.823	17.785

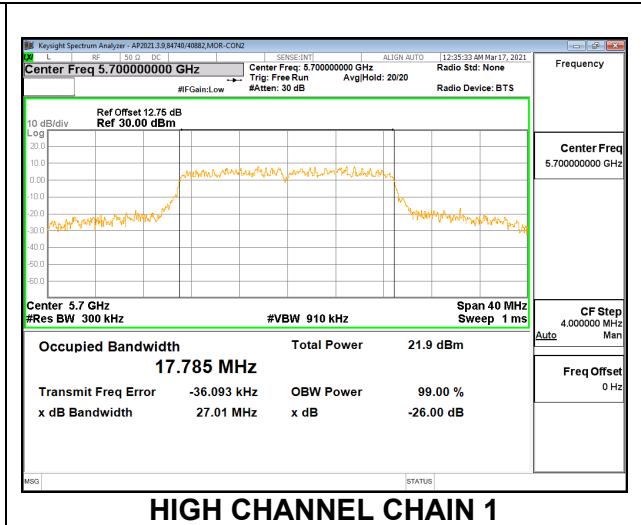
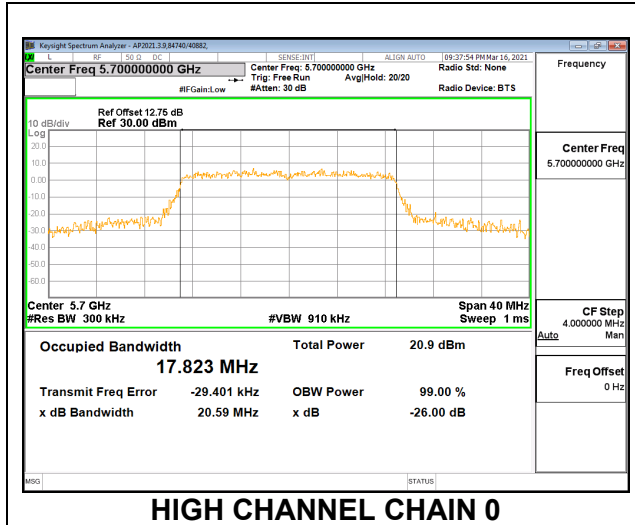
#### LOW CHANNEL



#### MID CHANNEL



### HIGH CHANNEL

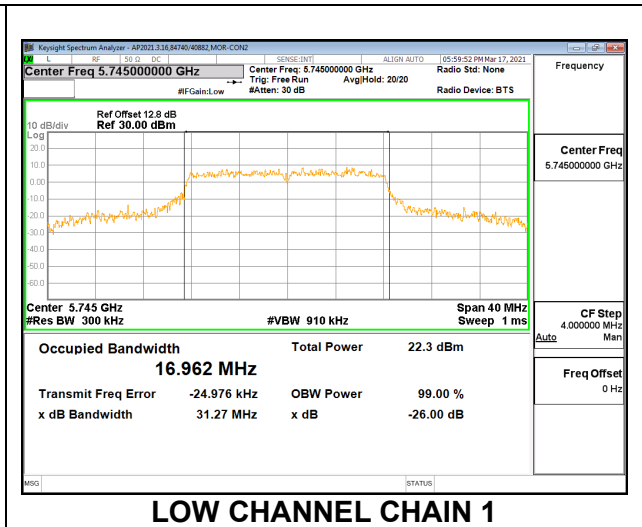
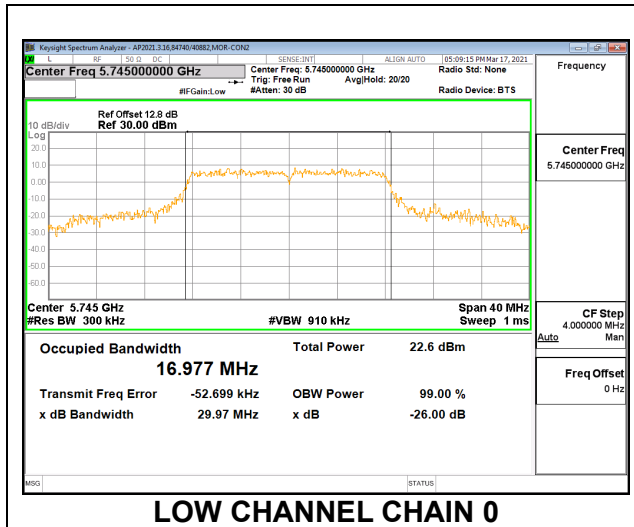


### 9.3.7. 802.11a MODE IN THE 5.8 GHz BAND

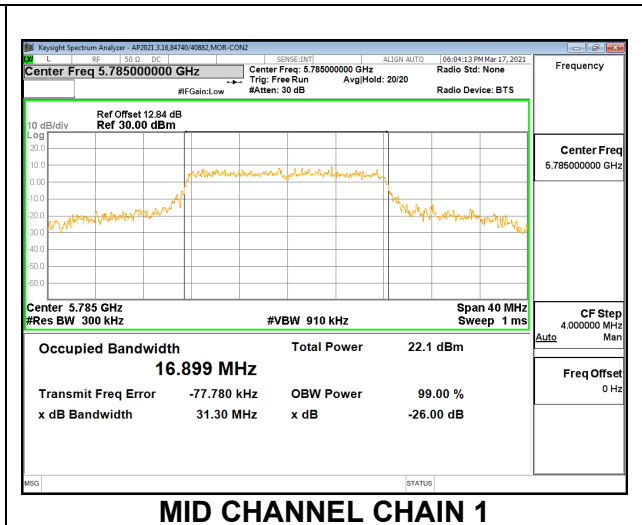
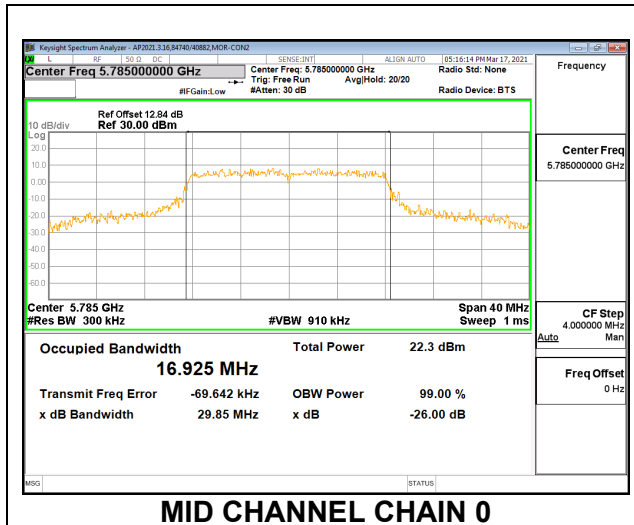
#### 2TX Chain 0 + Chain 1 CDD MODE

Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)
Low	5745	16.977	16.962
Mid	5785	16.925	16.899
High	5825	16.906	17.075

#### LOW CHANNEL



#### MID CHANNEL





### HIGH CHANNEL

