TEST REPORT

Applicant:	CTOUCH Europe B.V.
Address of Applicant:	Achtseweg Zuid 153R, 5651 GW Eindhoven, Nederlands
Manufacturer/Factory:	CTOUCH Europe B.V.
Address of Manufacturer/Factory:	Achtseweg Zuid 153R, 5651 GW Eindhoven, Nederlands

Equipment Under Test (EUT)

Product Name:	WIFI6 MODULE
Model No.:	MT7921AU-FRX
Trade Mark:	CTOUCH
FCC ID:	2APQQ-MT7921AU-FRX
Applicable standards:	FCC CFR Title 47 Part 15 Subpart E Section 15.407
Date of sample receipt:	December 6, 2022
Date of Test:	December 17~29, 2022
Date of report issue:	December 30, 2022
Test Result :	PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Robinson Luo
Laboratory Manager

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

2 Version

Version No.	Date	Description
00	*2022-12-30*	*Original*

Prepared By: ***Date:*** *2022-12-30*

Project Engineer

Check By: ***Date:*** *2022-12-30*

Reviewer

3 Contents

Page

1 COVER PAGE 1

2 VERSION 2

3 CONTENTS 3

4 TEST SUMMARY 4

4.1 MEASUREMENT UNCERTAINTY 4

5 GENERAL INFORMATION 5

5.1 GENERAL DESCRIPTION OF EUT 5
5.2 TEST MODE 6
5.3 TEST FACILITY 6
5.4 TEST LOCATION 6
5.5 DESCRIPTION OF SUPPORT UNITS 6
5.6 DEVIATION FROM STANDARDS 6
5.7 ADDITIONAL INSTRUCTIONS 6

6 TEST INSTRUMENTS LIST 8

7 TEST RESULTS AND MEASUREMENT DATA 10

7.1 ANTENNA REQUIREMENT: 10
7.2 EMISSION BANDWIDTH AND 99% OCCUPIED BANDWIDTH 11
7.3 AVERAGE TRANSMIT POWER 21
7.4 POWER SPECTRAL DENSITY 26
7.5 BAND EDGE 38
7.6 RADIATED EMISSION 45
7.7 FREQUENCY STABILITY 57

8 TEST SETUP PHOTO 64

9 EUT CONSTRUCTIONAL DETAILS 64

4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	PASS
AC Power Line Conducted Emission	15.207	Not Applicable
-26dB Emission Bandwidth	15.407(a)(2)(5)	PASS
Average Transmit Power	15.407(a)(1)	PASS
Power Spectral Density	15.407(a)(1)	PASS
Undesirable Emission	15.407(b)(1), 15.205/15.209	PASS
Radiated Emission	15.205/15.209	PASS
Band Edge	15.407(b)(1)	PASS
Frequency Stability	15.407(g)	PASS

Remark: Pass: The EUT complies with the essential requirements in the standard.

4.1 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	1 x 10-7
2	Duty cycle	0.37%
3	Occupied Bandwidth	3%
4	RF conducted power	0.75dB
5	RF power density	3dB
6	Conducted Spurious emissions	2.58dB
7	AC Power Line Conducted Emission	3.44dB (0.15MHz ~ 30MHz)
8	Radiated Spurious emission test	3.1dB (9kHz-30MHz)
		3.8039dB (30MHz-200MHz)
		3.9679dB (200MHz-1GHz)
		4.29dB (1GHz-18GHz)
		3.30dB (18GHz-40GHz)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.		

5 General Information

5.1 General Description of EUT

Product Name:	WIFI6 MODULE
Model No.:	MT7921AU-FRX
Serial No.:	C43CB0DCFA64
Hardware Version:	V1.0
Software Version:	V1.0
Test sample(s) ID:	GTSL202212000237-1
Sample(s) Status:	Engineer sample
Operation Frequency:	

Band	Mode	Frequency Range (MHz)	Number of channels
U-NII Band I	IEEE 802.11a	5180-5240	4
	IEEE 802.11n 20MHz	5180-5240	4
	IEEE 802.11n 40MHz	5190-5230	2
	IEEE 802.11ac 20MHz	5180-5240	4
	IEEE 802.11ac 40MHz	5190-5230	2
	IEEE 802.11ac 80MHz	5210	1
	IEEE 802.11ax 20MHz	5180-5240	4
	IEEE 802.11ax 40MHz	5190-5230	2
	IEEE 802.11ax 80MHz	5210	1

Modulation technology:	802.11a/n/ac/: OFDM; 802.11ax: OFDMA Beamforming: 802.11a/n/ac/ax (802.11ax mode only support Full RU)
Antenna Type:	External Antenna
Antenna gain:	ANT1:3.43dBi; ANT2:3.43dBi Beamforming technology: (PSD directional gain=6.44dBi, Power directional gain=6.44dBi)
Beamforming Factor	0 dB by manufacturer's declaration
Power supply:	DC 3.3V

Channel list							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180MHz	40	5200MHz	44	5220MHz	48	5240MHz
38	5190MHz	42	5210MHz	46	5230MHz		

Note: In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Test channel	**Frequency (MHz)**								
	802.11 a	802.11 n(HT20)	802.11 n(HT40)	802.11 ac(VHT20)	802.11 ac(VHT40)	802.11 ac(VHT80)	802.11 ax(HE20)	802.11 ax(HE 40)	802.11 ax(HE80)
Lowest	5180	5180	5190	5180	5190	5210	5180	5190	5210
Middle	5200	5200	/	5200	/	/	5200	/	/
Highest	5240	5240	5230	5240	5230	/	5240	5230	/

5.2 Test mode

Transmitting mode	Keep the EUT in transmitting with modulation.

Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.

We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:

Pre-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.

Mode	Data rate
802.11a-Beamforming	6Mbps
n(HT20)-Beamforming	MCS0
n(HT40)-Beamforming	MCS0
ac(VHT20)-Beamforming	MCS0
ac(VHT40)-Beamforming	MCS0
ac(VHT80)-Beamforming	MCS0
ax(HE20)-Beamforming	MCS0
ax(HE40)-Beamforming	MCS0
ax(HE80)-Beamforming	MCS0

5.3 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

● **FCC—Registration No.: 381383**

Designation Number: CN5029

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files.

● **IC —Registration No.: 9079A**

CAB identifier: CN0091

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

● **NVLAP (LAB CODE:600179-0)**

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

5.4 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.
Address: No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, sBaoan District, Shenzhen, Guangdong, China 518102
Tel: 0755-27798480 Fax: 0755-27798960

5.5 Description of Support Units

Computer Mode Number: TPC-F123-MT / Displayer Mode Number: KG223Q
Mouse Mode Number: KM10 / keyboard Mode Number: MK11

5.6 Deviation from Standards

None.

5.7 Additional Instructions

Test Software	MP_AX

Output power setting table:

Test Mode	Set Tx Output Power
802.11a-Beamforming	10
n(HT20)-Beamforming	10
n(HT40)-Beamforming	10
ac(VHT20)-Beamforming	10
ac(VHT40)-Beamforming	13
ac(VHT80)-Beamforming	13
ax(HE20)-Beamforming	13
ax(HE40)-Beamforming	13
ax(HE80)-Beamforming	13

6 Test Instruments list

Radiated Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July 02, 2020	July 01, 2025
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	April 22, 2022	April 21, 2023
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9168	GTS640	March 21, 2022	March 20, 2023
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June 12, 2022	June 11, 2023
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June 23, 2022	June 22, 2023
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	April 22, 2022	April 21, 2023
9	Coaxial Cable	GTS	N/A	GTS211	April 22, 2022	April 21, 2023
10	Coaxial cable	GTS	N/A	GTS210	April 22, 2022	April 21, 2023
11	Coaxial Cable	GTS	N/A	GTS212	April 22, 2022	April 21, 2023
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	April 22, 2022	April 21, 2023
13	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 23, 2022	June 22, 2023
14	Band filter	Amindeon	82346	GTS219	June 23, 2022	June 22, 2023
15	Power Meter	Anritsu	ML2495A	GTS540	June 23, 2022	June 22, 2023
16	Power Sensor	Anritsu	MA2411B	GTS541	June 23, 2022	June 22, 2023
17	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	April 22, 2022	April 21, 2023
18	Splitter	Agilent	11636B	GTS237	June 23, 2022	June 22, 2023
19	Loop Antenna	ZHINAN	ZN30900A	GTS534	Nov. 29, 2022	Nov. 28, 2023
20	Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	April 22, 2022	April 21, 2023
21	Breitband hornantenna	SCHWARZBECK	BBHA 9170	GTS579	Oct. 16, 2022	Oct. 15, 2023
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 16, 2022	Oct. 15, 2023
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 16, 2022	Oct. 15, 2023
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June 23, 2022	June 22, 2023
25	Amplifier(1GHz-26.5GHz)	HP	8449B	GTS601	April 22, 2022	April 21, 2023

RF Conducted Test:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	April 22, 2022	April 21, 2023
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April 22, 2022	April 21, 2023
3	Spectrum Analyzer	Agilent	E4440A	GTS536	April 22, 2022	April 21, 2023
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	April 22, 2022	April 21, 2023
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	April 22, 2022	April 21, 2023
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	April 22, 2022	April 21, 2023
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	April 22, 2022	April 21, 2023
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	April 22, 2022	April 21, 2023

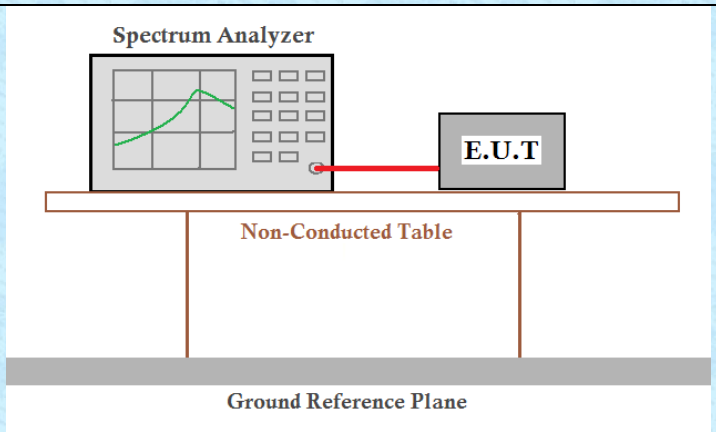
General used equipment:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	April 25, 2022	April 24, 2023
2	Barometer	KUMAO	SF132	GTS647	July 26, 2022	July 25, 2023

7 Test results and Measurement Data

7.1 Antenna requirement:

Standard requirement:	FCC Part15 C Section 15.203
15.203 requirement: *An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.*	
E.U.T Antenna:	
The antennas are external antenna, the best case gain of the antennas are 3.43dBi, reference to the appendix II for details	

7.2 Emission Bandwidth and 99% Occupied Bandwidth

Test Requirement:	FCC Part15 E Section 15.407
Test Method:	KDB 789033 D02 General U-NII Test Procedures New Rules v02r01
Limit:	N/A
Test setup:	
Test procedure:	According to KDB 789033 D02 General U-NII Test Procedures New Rules v02r01.
Test Instruments:	Refer to section 6 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data:

CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Occupied Bandwidth (MHz)	
		802.11a		802.11a	
		ANT1	ANT2	ANT1	ANT2
36	5180	16.696	16.627	24.20	24.14
40	5200	16.651	16.631	25.44	22.09
48	5240	16.371	16.406	19.59	19.44

CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Occupied Bandwidth (MHz)	
		802.11n(HT20)		802.11n(HT20)	
		ANT1	ANT2	ANT1	ANT2
36	5180	17.898	17.783	24.14	24.38
40	5200	17.853	17.804	23.84	24.07
48	5240	17.537	17.587	19.92	19.99

CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Occupied Bandwidth (MHz)	
		802.11n(HT40)		802.11n(HT40)	
		ANT1	ANT2	ANT1	ANT2
38	5190	35.786	35.812	40.18	39.79
46	5230	35.782	35.624	39.41	38.69

CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Occupied Bandwidth (MHz)	
		802.11ac(VHT20)		802.11ac(VHT20)	
		ANT1	ANT2	ANT1	ANT2
36	5180	17.833	17.796	25.41	23.21
40	5200	17.801	17.797	23.23	23.75
48	5240	17.531	17.539	19.82	19.78

CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Occupied Bandwidth (MHz)	
		802.11ac(VHT40)		802.11ac(VHT40)	
		ANT1	ANT2	ANT1	ANT2
38	5190	35.743	35.783	40.01	39.38
46	5230	35.781	35.688	39.81	39.39

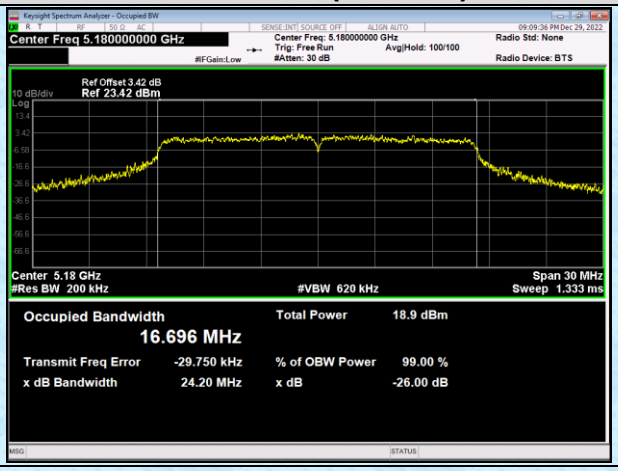
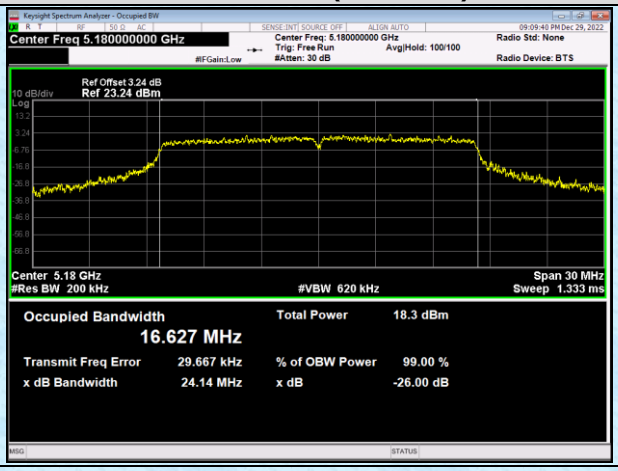
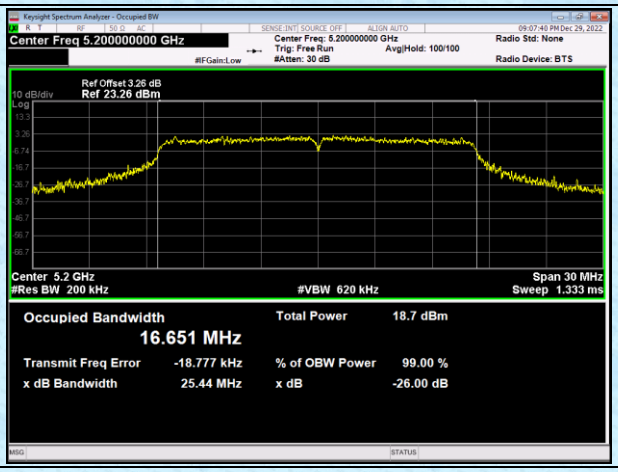
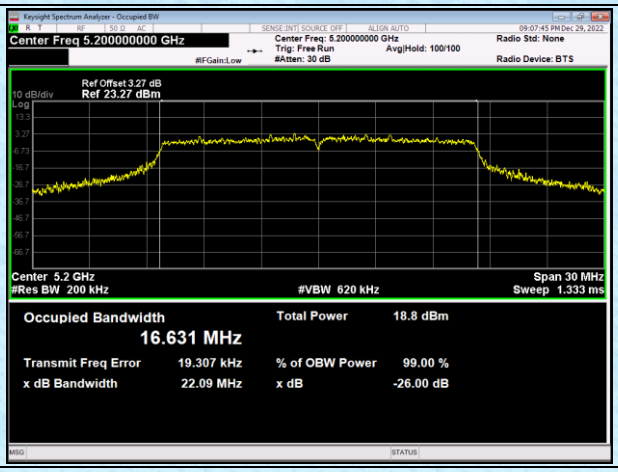
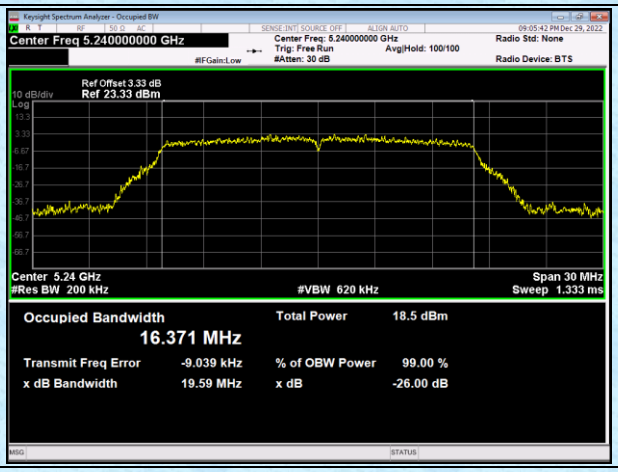
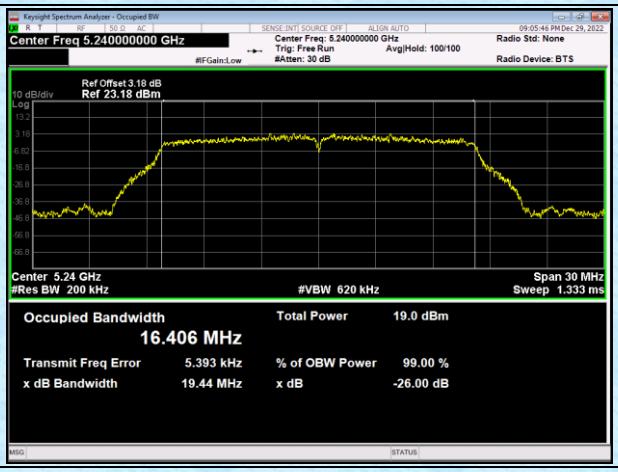
CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Occupied Bandwidth (MHz)	
		802.11ac(VHT80)		802.11ac(VHT80)	
		ANT1	ANT2	ANT1	ANT2
42	5210	75.223	75.006	79.46	79.13

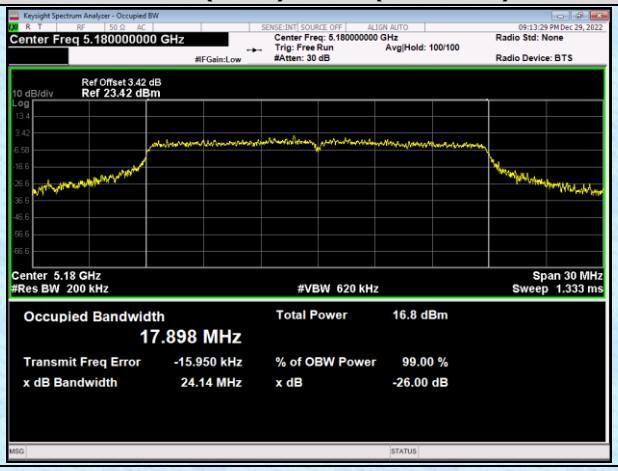
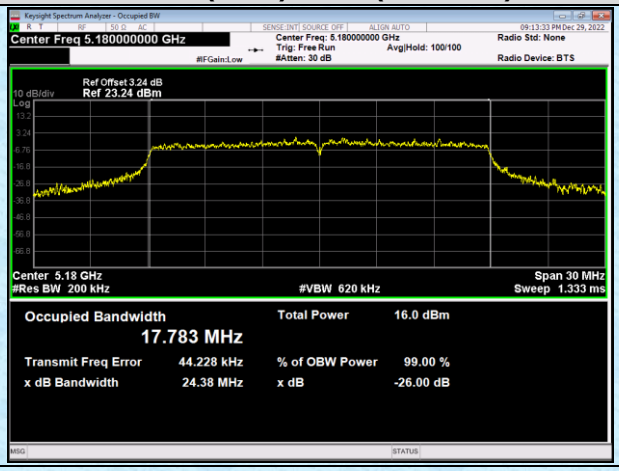
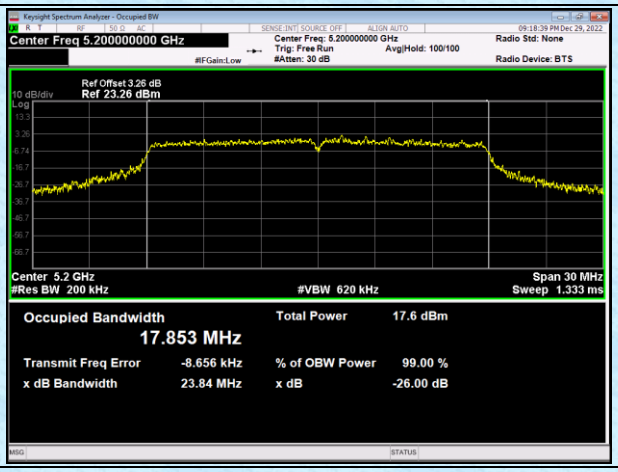
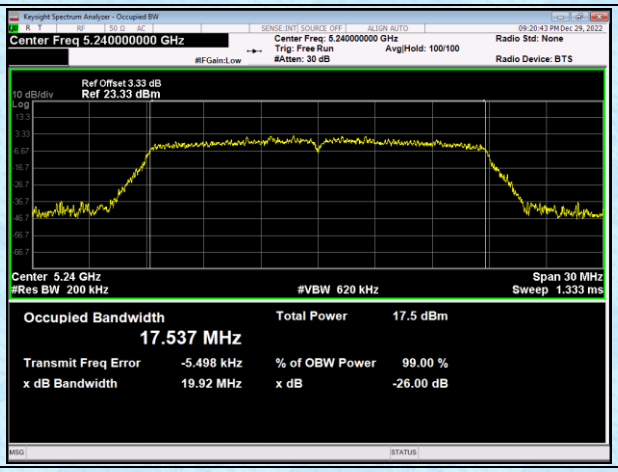
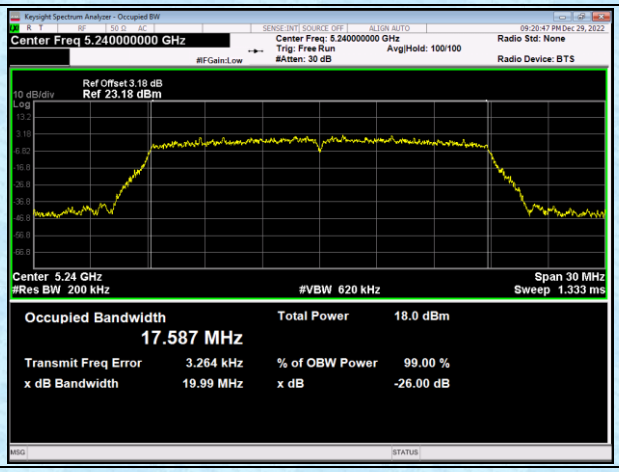
CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Occupied Bandwidth (MHz)	
		802.11ax(HE20)		802.11 ax(HE20)	
		ANT1	ANT2	ANT1	ANT2
36	5180	18.92	18.959	23.98	25.63
40	5200	18.924	18.937	21.53	21.49
48	5240	18.804	18.833	19.73	19.66

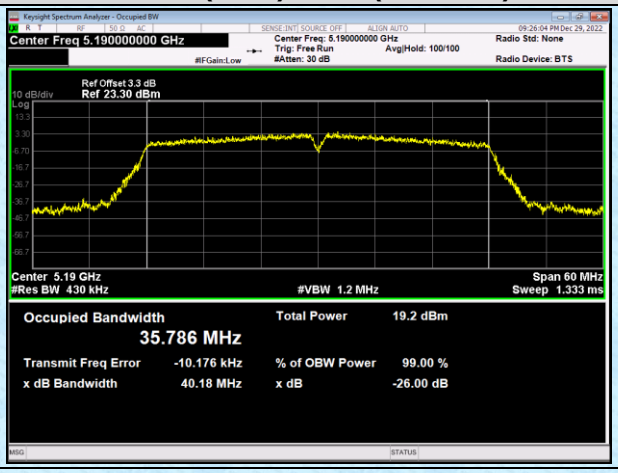
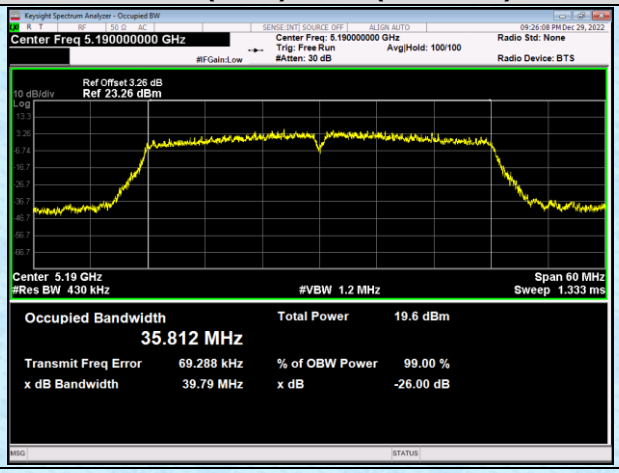
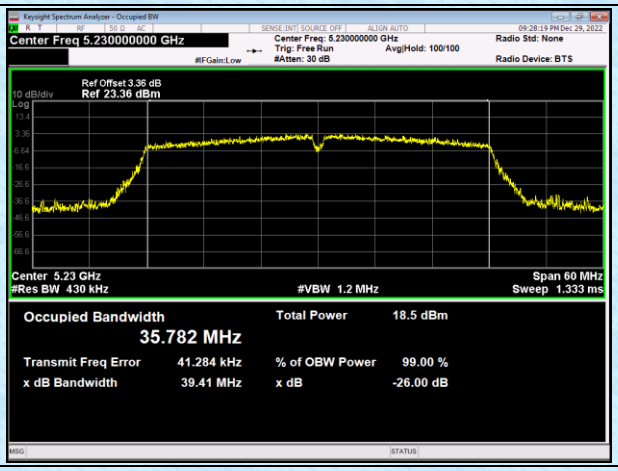
CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Occupied Bandwidth (MHz)	
		802.11ax(HE40)		802.11 ax(HE40)	
		ANT1	ANT2	ANT1	ANT2
38	5190	37.359	37.343	39.08	39.39
46	5230	37.487	37.466	39.23	39.18

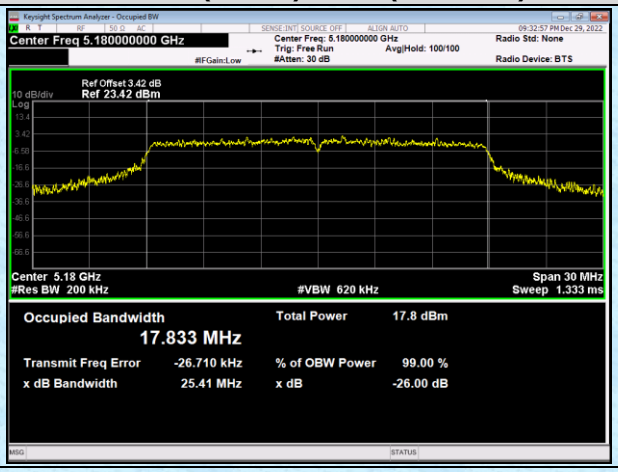
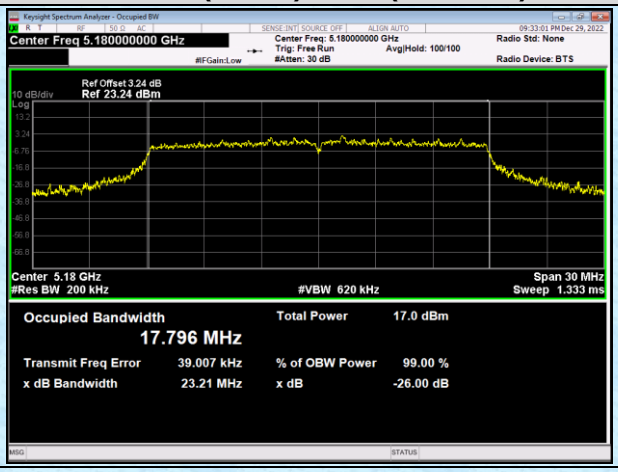
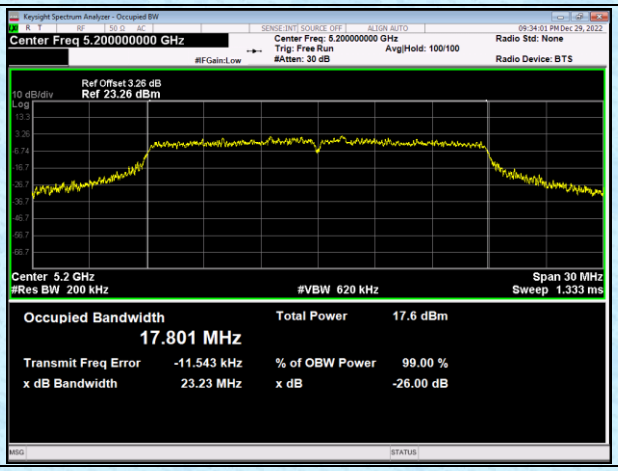
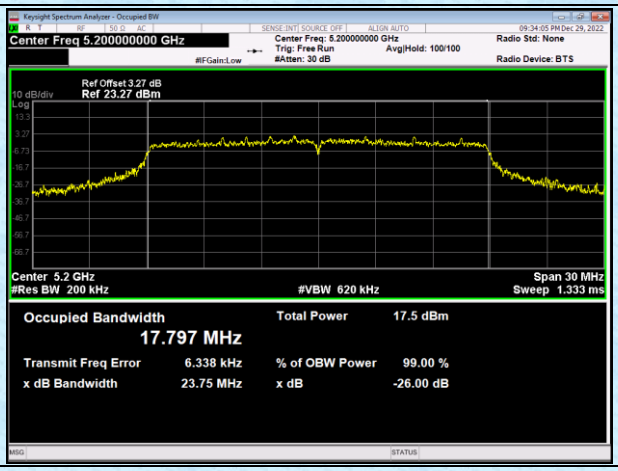
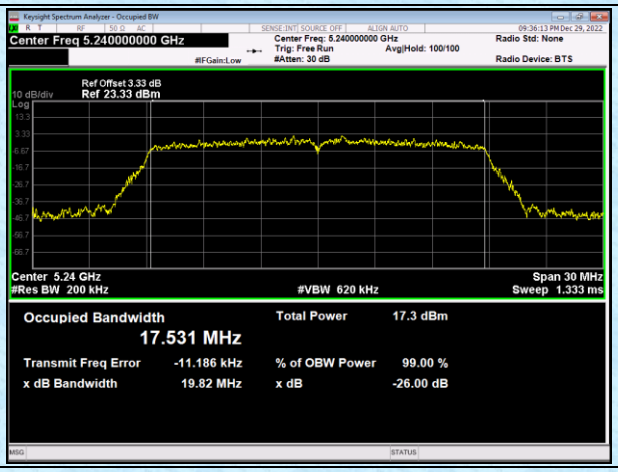
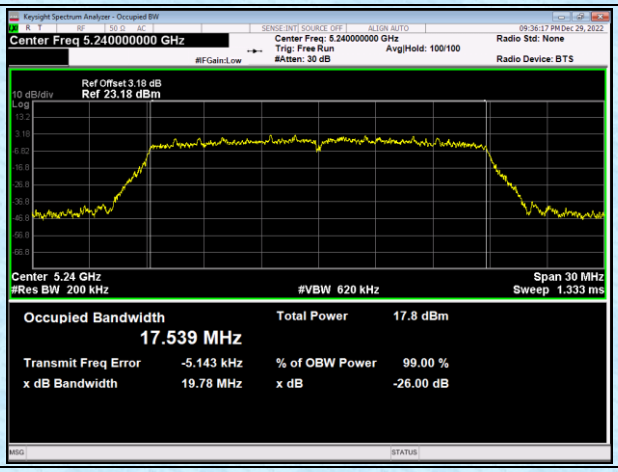
CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Occupied Bandwidth (MHz)	
		802.11ax(HE80)		802.11 ax(HE80)	
		ANT1	ANT2	ANT1	ANT2
42	5210	76.917	76.389	79.70	79.71

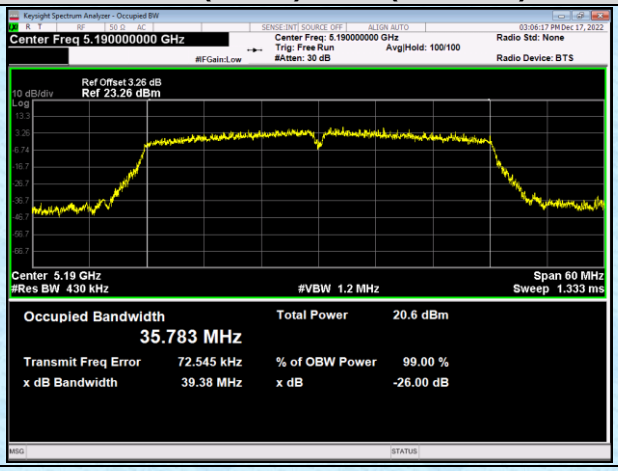
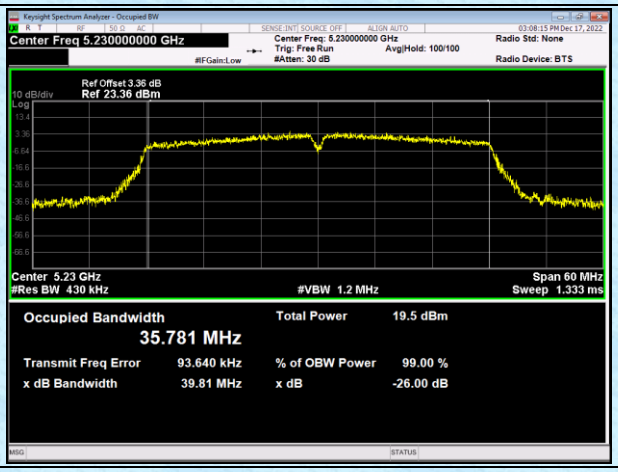
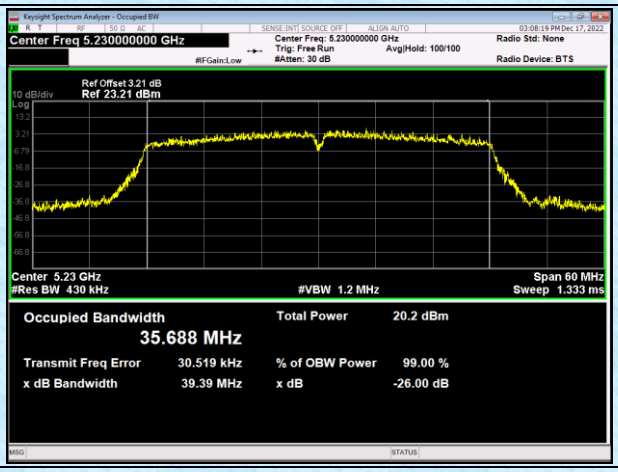
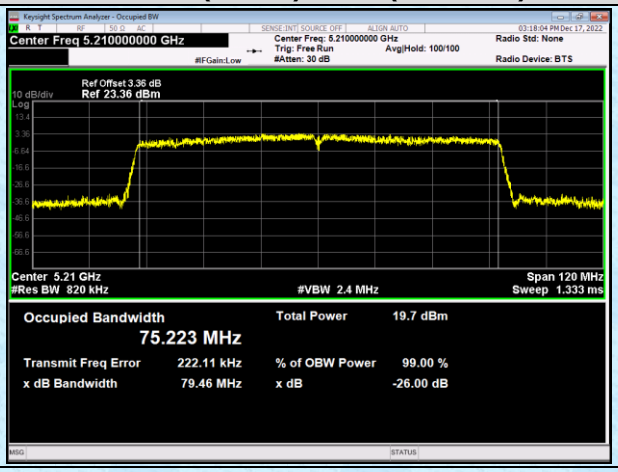
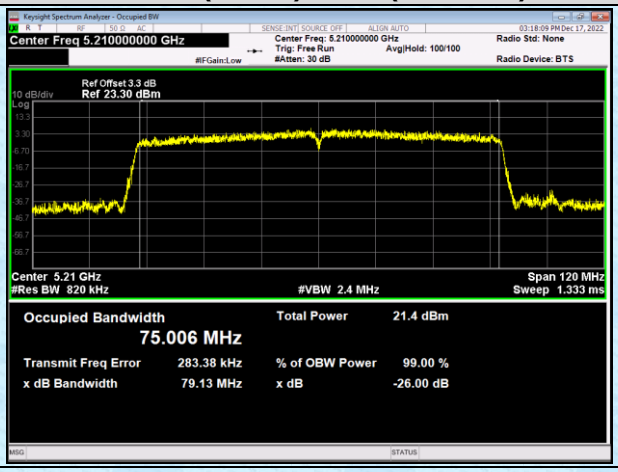
Test plots as followed:

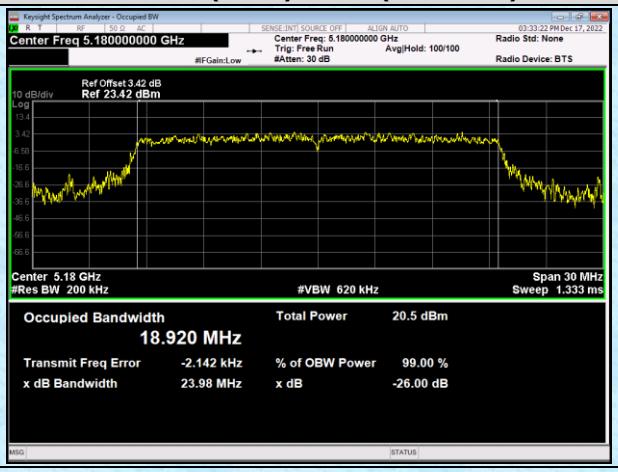
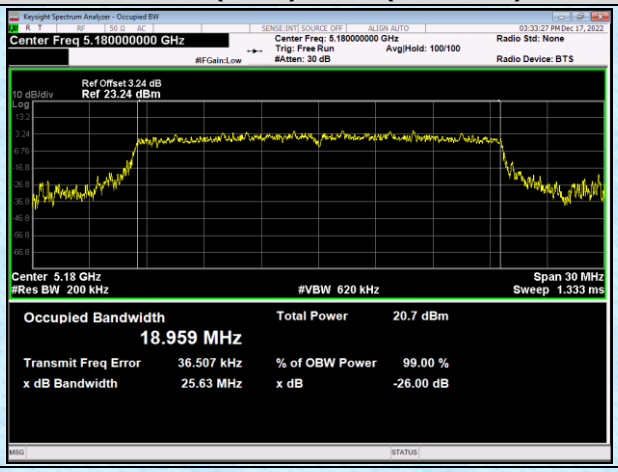
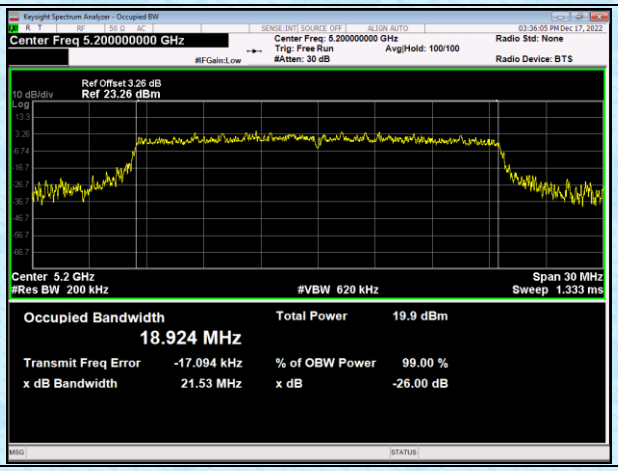
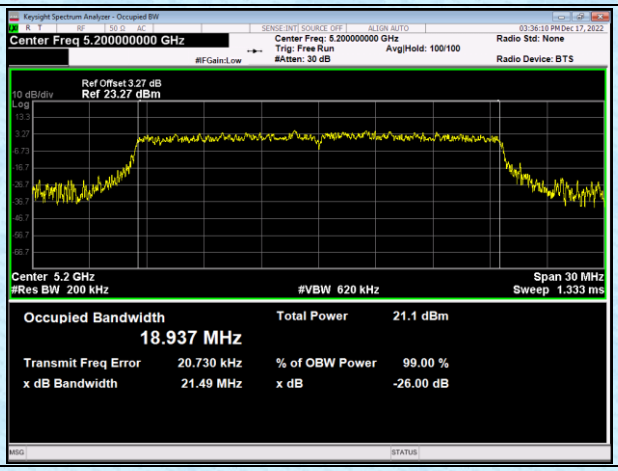
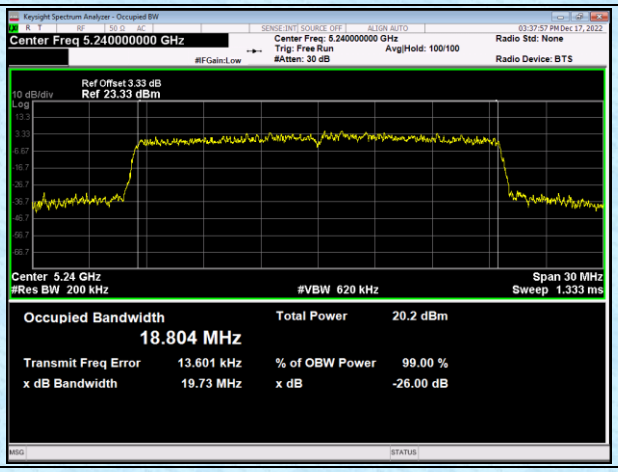
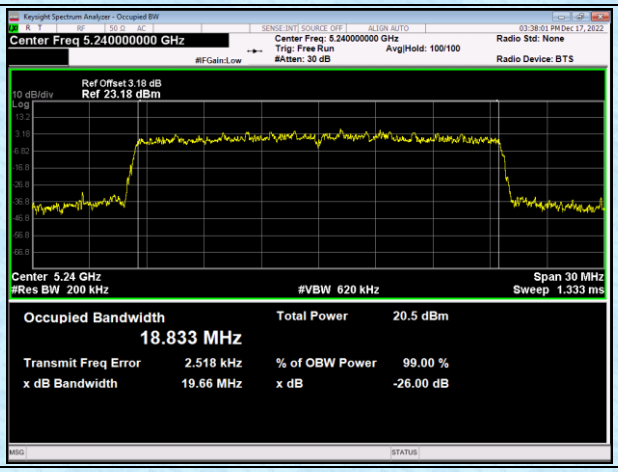
802.11a mode (Antenna1)	802.11a mode (Antenna2)
	
5180	5180
	
5200	5200
	
5240	5240

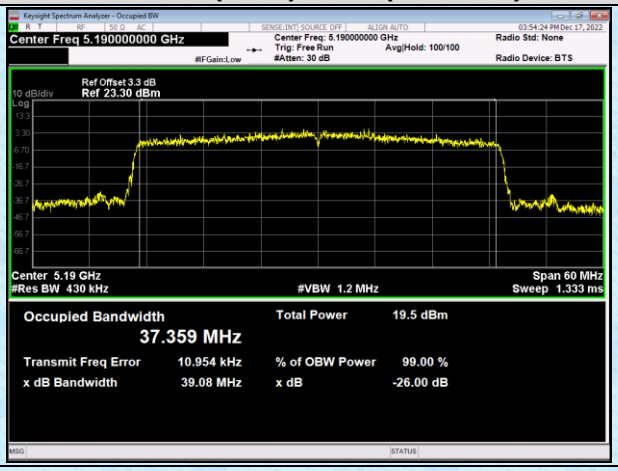
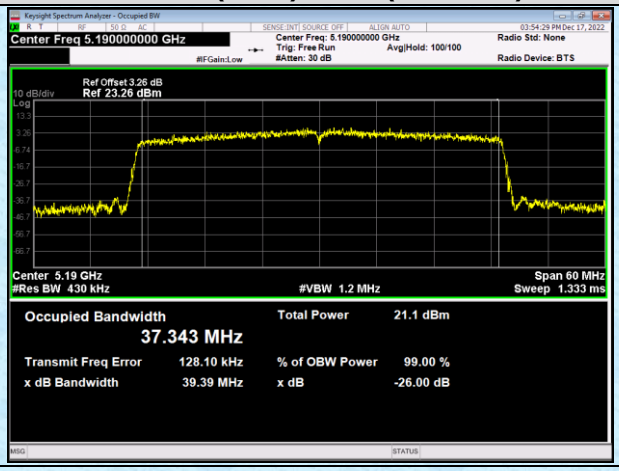
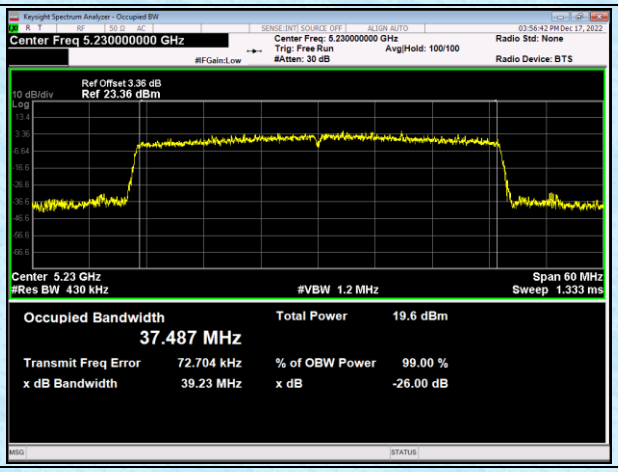
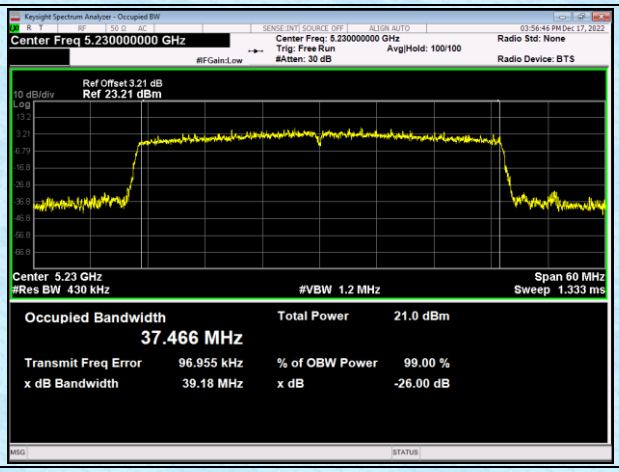
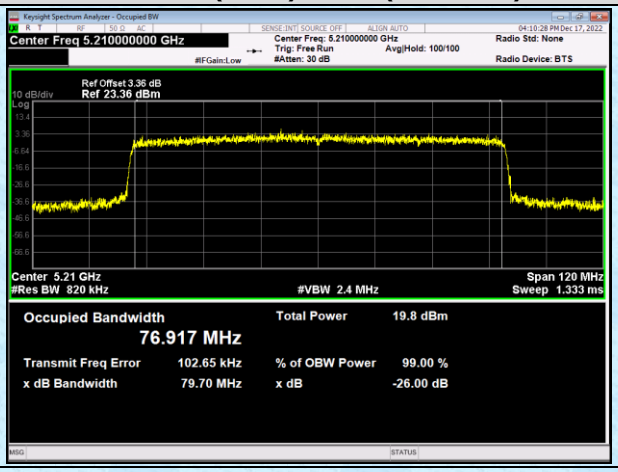
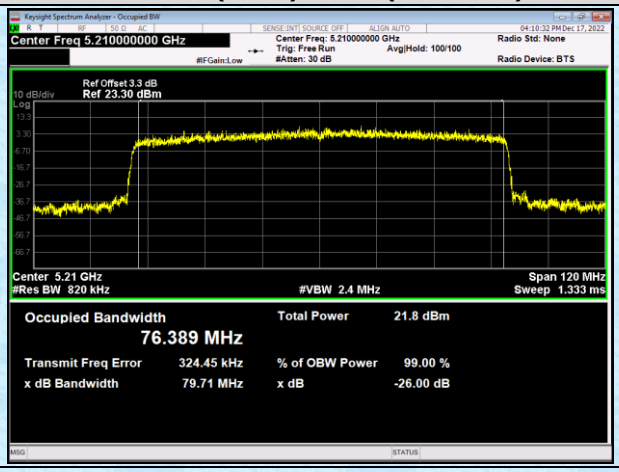
802.11n(HT20) mode (Antenna1)	802.11n(HT20) mode (Antenna2)
	
5180	**5180**
	
5200	**5200**
	
5240	**5240**

802.11n(HT40) mode (Antenna1)	802.11n(HT40) mode (Antenna2)
	
5190	**5190**
	
5230	**5230**

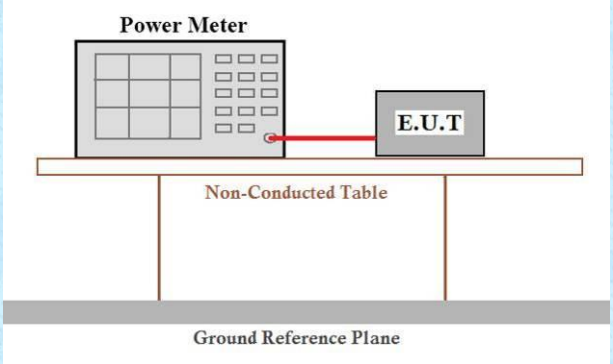
802.11ac(VHT20) mode (Antenna1)	802.11ac(VHT20) mode (Antenna2)
	
5180	5180
	
5200	5200
	
5240	5240

802.11ac(VHT40) mode (Antenna1)	802.11ac(VHT40) mode (Antenna2)
	
5190	5190
	
5230	5230
802.11ac(VHT80) mode (Antenna1)	**802.11ac(VHT80) mode (Antenna2)**
	
5210	5210

802.11ax(HE20) mode (Antenna1)	802.11 ax(HE20) mode (Antenna2)
	
5180	**5180**
	
5200	**5200**
	
5240	**5240**

802.11 ax(HE40) mode (Antenna1)	802.11 ax(HE40) mode (Antenna2)
	
5190	5190
	
5230	5230
802.11 ax(HE80) mode (Antenna1)	**802.11 ax(HE80) mode (Antenna2)**
	
5210	5210

7.3 Average Transmit Power

Test Requirement:	FCC Part15 E Section 15.407
Test Method:	KDB 789033 D02 General U-NII Test Procedures New Rules v02r01
Limit:	<table><tr><th>Frequency band (MHz)</th><th>Limit</th></tr><tr><td rowspan="2">5150-5250</td><td>≤1W(30dBm) for master device</td></tr><tr><td>≤250mW(23.98dBm) for client device</td></tr><tr><td>5250-5350</td><td>≤250mW(23.98dBm) for client device or 11dBm+10logB*</td></tr><tr><td>5470-5725</td><td>≤250mW(23.98dBm) for client device or 11dBm+10logB*</td></tr><tr><td colspan="2">Remark: *Where B is the 26dB emission bandwidth in MHz. The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.</td></tr></table>
Test setup:	
Test procedure:	**Measurement using an RF average power meter** (i) Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied a) The EUT is configured to transmit continuously or to transmit with a constant duty cycle. b) At all times when the EUT is transmitting, it must be transmitting at its maximum power control level. c) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five. (ii) If the transmitter does not transmit continuously, measure the duty cycle, x, of the transmitter output signal as described in section B). (iii) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter. (iv) Adjust the measurement in dBm by adding 10 log(1/x) where x is the duty cycle (e.g., 10log(1/0.25) if the duty cycle is 25 percent).
Test Instruments:	Refer to section 6 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

Modulation	Frequency (MHz)	Duty cycle		Duty Factor	
		Antenna1	Antenna2	Antenna1	Antenna2
802.11a	5180	79.68	79.68	0.99	0.99
	5200	79.49	79.49	1.00	1.00
	5240	79.46	79.46	1.00	1.00
802.11n(HT20)	5180	78.03	78.03	1.08	1.08
	5200	77.92	77.92	1.08	1.08
	5240	78.33	78.33	1.06	1.06
802.11n(HT40)	5190	64.93	64.93	1.88	1.88
	5230	64.92	64.92	1.88	1.88
802.11ac(VHT20)	5180	65.85	65.85	1.81	1.81
	5200	65.79	65.79	1.82	1.82
	5240	65.37	65.37	1.85	1.85
802.11ac(VHT40)	5190	69.76	69.76	1.56	1.56
	5230	69.63	69.63	1.57	1.57
802.11ac(VHT80)	5210	65.62	65.62	1.83	1.83
802.11ax(HE20)	5180	69.51	69.51	1.58	1.58
	5200	69.09	69.09	1.61	1.61
	5240	69.66	69.66	1.57	1.57
802.11ax(HE40)	5190	69.51	69.51	1.58	1.58
	5230	68.84	68.84	1.62	1.62
802.11ax(HE80)	5210	65.94	65.94	1.81	1.81

802.11a mode										
CH No.	Frequency (MHz)	Measured Power (dBm)			Duty Factor	Output Power (dBm)			Limit (dBm)	Result
		ANT1	ANT2	ANT 1+2		ANT1	ANT2	ANT 1+2		
36	5180	12.463	11.909	15.205	0.99	13.453	12.899	16.195	23.56	Pass
40	5200	12.216	12.358	15.298	1.00	13.216	13.358	16.298		
48	5240	12.034	12.768	15.427	1.00	13.034	13.768	16.427		

802.11n(HT20) mode										
CH No.	Frequency (MHz)	Measured Power (dBm)			Duty Factor	Output Power (dBm)			Limit (dBm)	Result
		ANT1	ANT2	ANT 1+2		ANT1	ANT2	ANT 1+2		
36	5180	11.059	10.946	14.013	1.08	12.139	12.026	15.093	23.56	Pass
40	5200	10.878	11.364	14.138	1.08	11.958	12.444	15.218		
48	5240	10.275	11.928	14.19	1.06	11.335	12.988	15.25		

802.11n(HT40) mode										
CH No.	Frequency (MHz)	Measured Power (dBm)			Duty Factor	Output Power (dBm)			Limit (dBm)	Result
		ANT1	ANT2	ANT 1+2		ANT1	ANT2	ANT 1+2		
38	5190	12.136	12.093	15.125	1.88	14.016	13.973	17.005	23.56	Pass
46	5230	11.12	12.038	14.614	1.88	13	13.918	16.494		

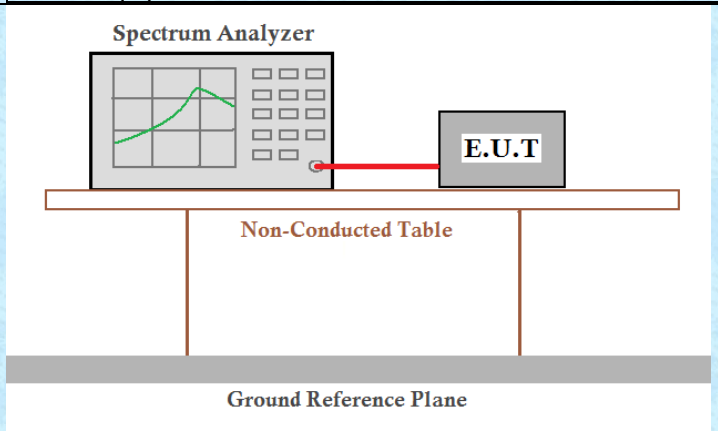
802.11ac(VHT20) mode										
CH No.	Frequency (MHz)	Measured Power (dBm)			Duty Factor	Output Power (dBm)			Limit (dBm)	Result
		ANT1	ANT2	ANT 1+2		ANT1	ANT2	ANT 1+2		
36	5180	10.645	10.113	13.397	1.81	12.455	11.923	15.207	23.56	Pass
40	5200	10.276	10.611	13.457	1.82	12.096	12.431	15.277		
48	5240	9.427	10.698	13.119	1.85	11.277	12.548	14.969		

802.11ac(VHT40) mode										
CH No.	Frequency (MHz)	Measured Power (dBm)			Duty Factor	Output Power (dBm)			Limit (dBm)	Result
		ANT1	ANT2	ANT 1+2		ANT1	ANT2	ANT 1+2		
38	5190	11.141	12.4	14.826	1.56	12.701	13.96	16.386	23.56	Pass
46	5230	10.898	11.465	14.201	1.57	12.468	13.035	15.771		
802.11ac(VHT80) mode										
CH No.	Frequency (MHz)	Measured Power (dBm)			Duty Factor	Output Power (dBm)			Limit (dBm)	Result
		ANT1	ANT2	ANT 1+2		ANT1	ANT2	ANT 1+2		
42	5210	9.498	10.813	13.215	1.83	11.328	12.643	15.045	23.56	Pass
802.11ax(HE20) mode										
CH No.	Frequency (MHz)	Measured Power (dBm)			Duty Factor	Output Power (dBm)			Limit (dBm)	Result
		ANT1	ANT2	ANT 1+2		ANT1	ANT2	ANT 1+2		
36	5180	10.512	10.776	13.656	1.58	12.092	12.356	15.236	23.56	Pass
40	5200	10.079	11.259	13.719	1.61	11.689	12.869	15.329		
48	5240	10.399	10.704	13.564	1.57	11.969	12.274	15.134		

802.11ax(HE40) mode										
CH No.	Frequency (MHz)	Measured Power (dBm)			Duty Factor	Output Power (dBm)			Limit (dBm)	Result
		ANT1	ANT2	ANT 1+2		ANT1	ANT2	ANT 1+2		
38	5190	9.532	11.221	13.468	1.58	11.112	12.801	15.048	23.56	Pass
46	5230	9.678	11.022	13.412	1.62	11.298	12.642	15.032		
802.11ax(HE80) mode										
CH No.	Frequency (MHz)	Measured Power (dBm)			Duty Factor	Output Power (dBm)			Limit (dBm)	Result
		ANT1	ANT2	ANT 1+2		ANT1	ANT2	ANT 1+2		
42	5210	9.312	11.216	13.378	1.81	11.122	13.026	15.188	23.56	Pass

Note: Output Power = Measured Power + Duty Factor
Duty Factor = 10 log (1/Duty Cycle)
Power directional gain=6.44dBi, So Limit=24-0.44=23.56dBm
Beamforming Factor is 0 dB, and the results are unchanged

7.4 Power Spectral Density

Test Requirement:	FCC Part15 E Section 15.407
Test Method:	KDB 789033 D02 General U-NII Test Procedures New Rules v02r01
Limit:	<table><tr><th>Frequency band (MHz)</th><th>Limit</th></tr><tr><td rowspan="2">5150-5250</td><td>≤17dBm in 1MHz for master device</td></tr><tr><td>≤11dBm in 1MHz for client device</td></tr><tr><td>5250-5350</td><td>≤11dBm in 1MHz for client device</td></tr><tr><td>5470-5725</td><td>≤11dBm in 1MHz for client device</td></tr><tr><td colspan="2">Remark: The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test.</td></tr></table>
Test setup:	
Test procedure:	1) Create an average power spectrum for the EUT operating mode being tested by following the instructions in section E)2) for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, “Compute power…”. 2) Use the peak search function on the instrument to find the peak of the spectrum. 3) Make the following adjustments to the peak value of the spectrum, if applicable: a) If Method SA-2 or SA-2 Alternative was used, add 10 log(1/x), where x is the duty cycle, to the peak of the spectrum. b) If Method SA-3 Alternative was used and the linear mode was used in step E)2)g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging. 4) The result is the PSD.
Test Instruments:	Refer to section 6 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data Measurement Data

Modulation	Frequency (MHz)	Duty cycle		Duty Factor	
		Antenna1	Antenna2	Antenna1	Antenna2
802.11a	5180	79.68	79.68	0.99	0.99
	5200	79.49	79.49	1.00	1.00
	5240	79.46	79.46	1.00	1.00
802.11n(HT20)	5180	78.03	78.03	1.08	1.08
	5200	77.92	77.92	1.08	1.08
	5240	78.33	78.33	1.06	1.06
802.11n(HT40)	5190	64.93	64.93	1.88	1.88
	5230	64.92	64.92	1.88	1.88
802.11ac(VHT20)	5180	65.85	65.85	1.81	1.81
	5200	65.79	65.79	1.82	1.82
	5240	65.37	65.37	1.85	1.85
802.11ac(VHT40)	5190	69.76	69.76	1.56	1.56
	5230	69.63	69.63	1.57	1.57
802.11ac(VHT80)	5210	65.62	65.62	1.83	1.83
802.11ax(HE20)	5180	69.51	69.51	1.58	1.58
	5200	69.09	69.09	1.61	1.61
	5240	69.66	69.66	1.57	1.57
802.11ax(HE40)	5190	69.51	69.51	1.58	1.58
	5230	68.84	68.84	1.62	1.62
802.11ax(HE80)	5210	65.94	65.94	1.81	1.81

802.11a mode										
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)			Duty Factor	Total PSD Power(dBm/MHz)			Limit (dBm/MHz)	Result
		ANT1	ANT2	ANT 1+2		ANT1	ANT2	ANT 1+2		
36	5180	2.545	2.009	5.296	0.99	3.535	2.999	6.286	10.56	Pass
40	5200	2.362	2.732	5.561	1.00	3.362	3.732	6.561	10.56	Pass
48	5240	2.182	3.432	5.862	1.00	3.182	4.432	6.862	10.56	Pass
802.11n(HT20) mode										
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)			Duty Factor	Total PSD Power(dBm/MHz)			Limit (dBm/MHz)	Result
		ANT1	ANT2	ANT 1+2		ANT1	ANT2	ANT 1+2		
36	5180	3.506	3.153	6.343	1.08	4.586	4.233	7.423	10.56	Pass
40	5200	1.263	0.87	4.081	1.08	2.343	1.95	5.161	10.56	Pass
48	5240	2.835	4.038	6.488	1.06	3.895	5.098	7.548	10.56	Pass
802.11n(HT40) mode										
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)			Duty Factor	Total PSD Power(dBm/MHz)			Limit (dBm/MHz)	Result
		ANT1	ANT2	ANT 1+2		ANT1	ANT2	ANT 1+2		
38	5190	1.656	1.413	4.546	1.88	3.536	3.293	6.426	10.56	Pass
46	5230	0.66	0.019	3.362	1.88	2.54	1.899	5.242	10.56	Pass

802.11ac(VHT20) mode										
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)			Duty Factor	Total PSD Power(dBm/MHz)			Limit (dBm/MHz)	Result
		ANT1	ANT2	ANT 1+2		ANT1	ANT2	ANT 1+2		
36	5180	2.497	3.025	5.779	1.81	4.307	4.835	7.589	10.56	Pass
40	5200	0.729	0.358	3.558	1.82	2.549	2.178	5.378	10.56	Pass
48	5240	2.354	1.628	5.016	1.85	4.204	3.478	6.866	10.56	Pass
802.11ac(VHT40) mode										
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)			Duty Factor	Total PSD Power(dBm/MHz)			Limit (dBm/MHz)	Result
		ANT1	ANT2	ANT 1+2		ANT1	ANT2	ANT 1+2		
38	5190	1.781	2.976	5.43	1.56	3.341	4.536	6.99	10.56	Pass
46	5230	2.905	2.291	5.619	1.57	4.475	3.861	7.189	10.56	Pass
802.11ac(VHT80) mode										
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)			Duty Factor	Total PSD Power(dBm/MHz)			Limit (dBm/MHz)	Result
		ANT1	ANT2	ANT 1+2		ANT1	ANT2	ANT 1+2		
42	5210	-2.968	0.025	1.792	1.83	-1.138	1.855	3.622	10.56	Pass

802.11ax(HE20) mode										
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)			Duty Factor	Total PSD Power(dBm/MHz)			Limit (dBm/MHz)	Result
		ANT1	ANT2	ANT 1+2		ANT1	ANT2	ANT 1+2		
36	5180	0.755	0.919	3.848	1.58	2.335	2.499	5.428	10.56	Pass
40	5200	0.634	1.584	4.145	1.61	2.244	3.194	5.755	10.56	Pass
48	5240	0.89	0.963	3.937	1.57	2.46	2.533	5.507	10.56	Pass
802.11 ax(HE40) mode										
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)			Duty Factor	Total PSD Power(dBm/MHz)			Limit (dBm/MHz)	Result
		ANT1	ANT2	ANT 1+2		ANT1	ANT2	ANT 1+2		
38	5190	-2.816	-0.803	1.316	1.58	-1.236	0.777	2.896	10.56	Pass
46	5230	-2.165	-0.877	1.537	1.62	-0.545	0.743	3.157	10.56	Pass
802.11 ax(HE80) mode										
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)			Duty Factor	Total PSD Power(dBm/MHz)			Limit (dBm/MHz)	Result
		ANT1	ANT2	ANT 1+2		ANT1	ANT2	ANT 1+2		
42	5210	-6.22	-3.395	-1.571	1.81	-4.41	-1.585	0.239	10.56	Pass

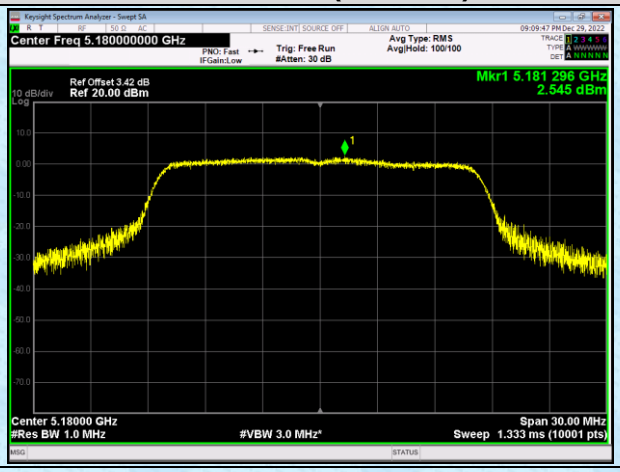
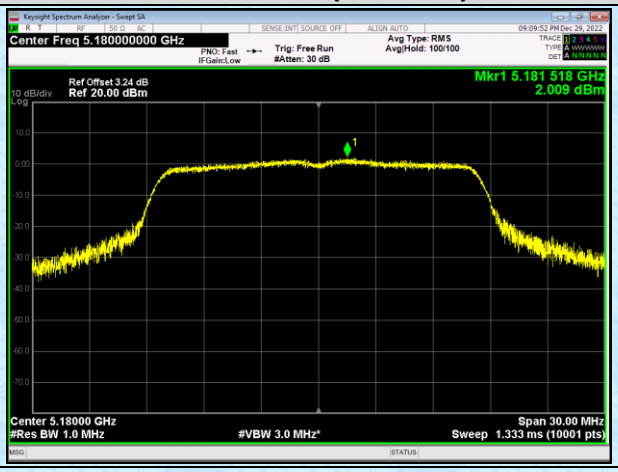
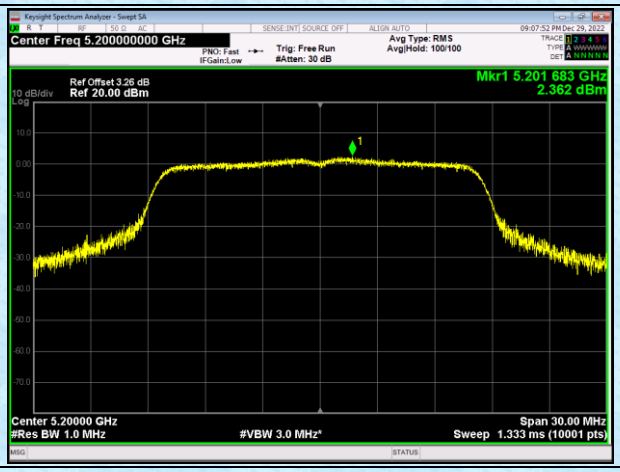
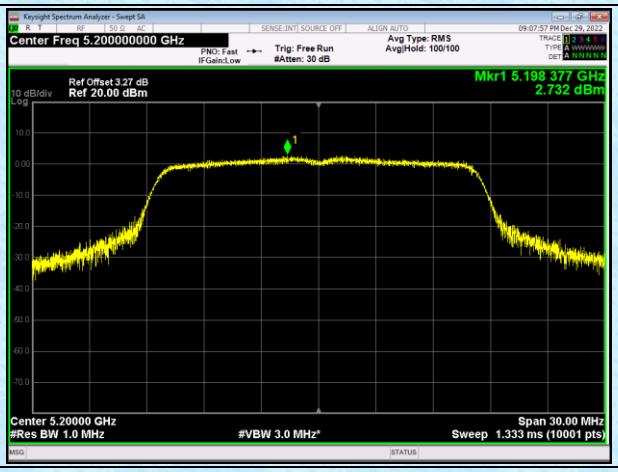
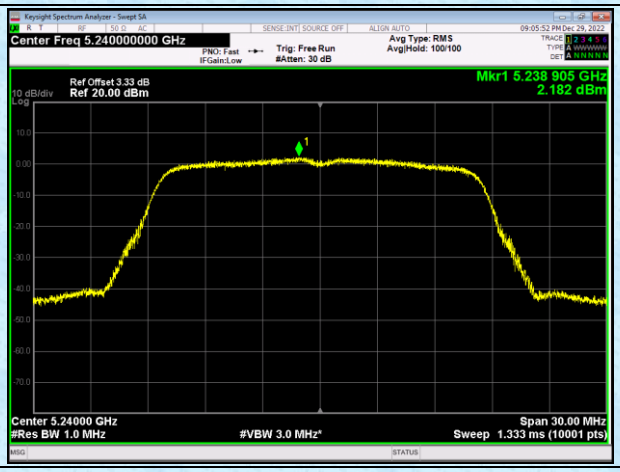
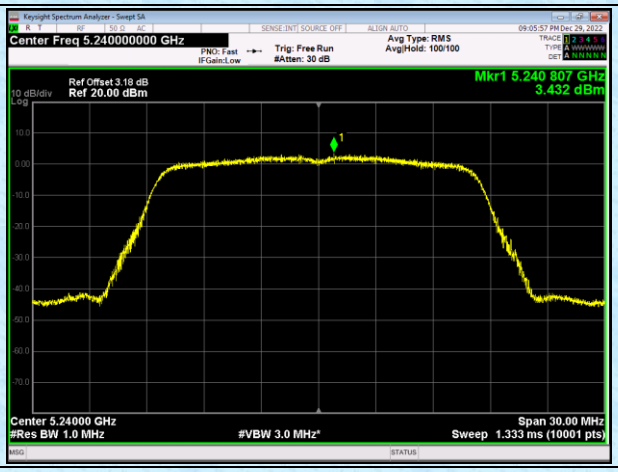
Note: Output Power = Measured Power + Duty Factor

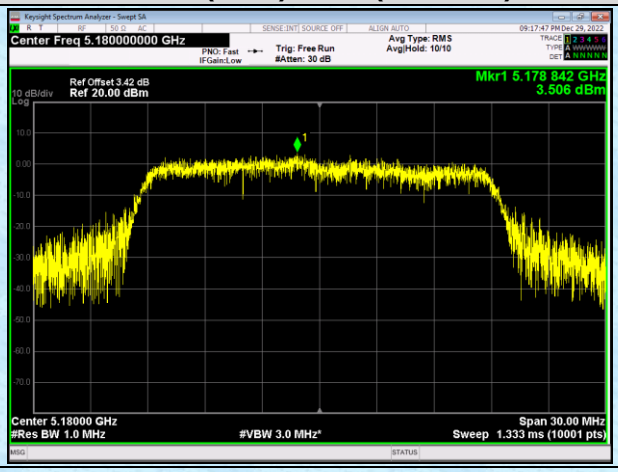
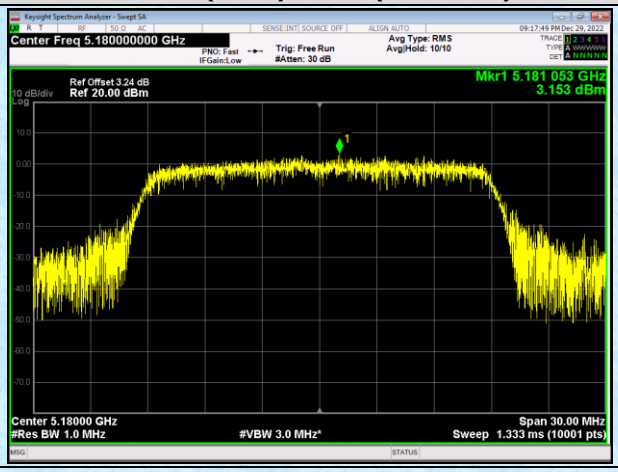
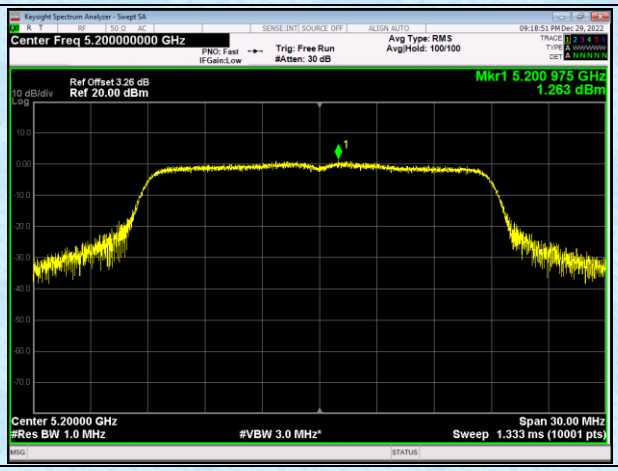
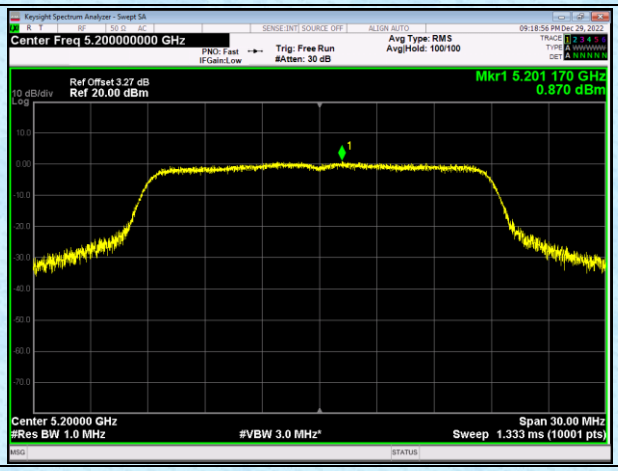
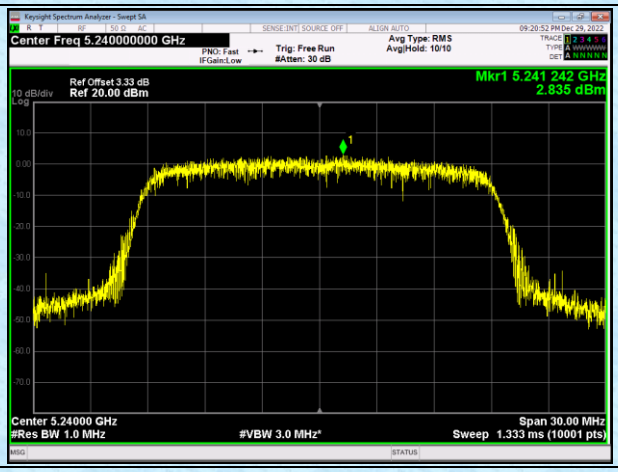
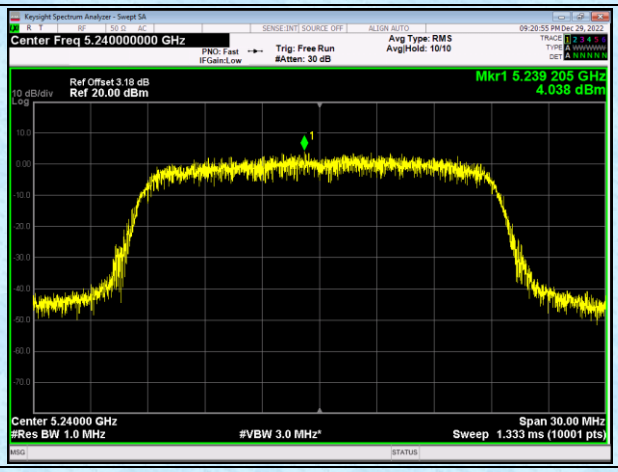
Duty Factor = 10 log (1/Duty Cycle)

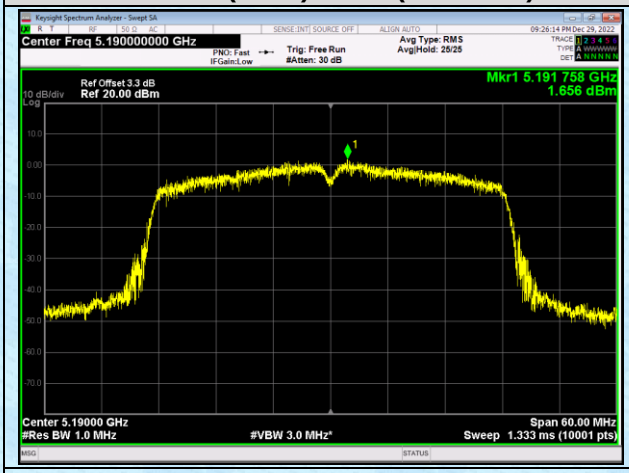
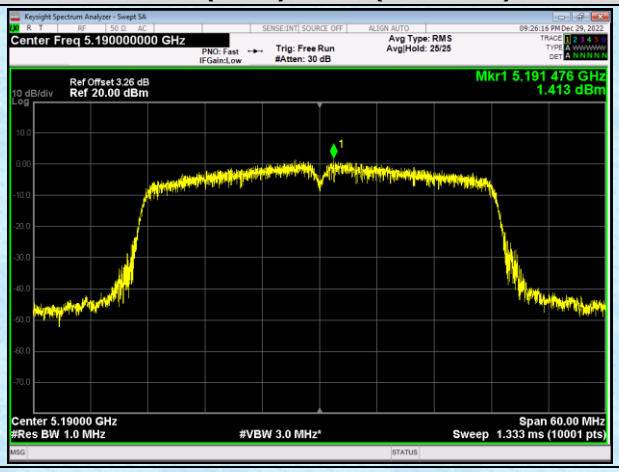
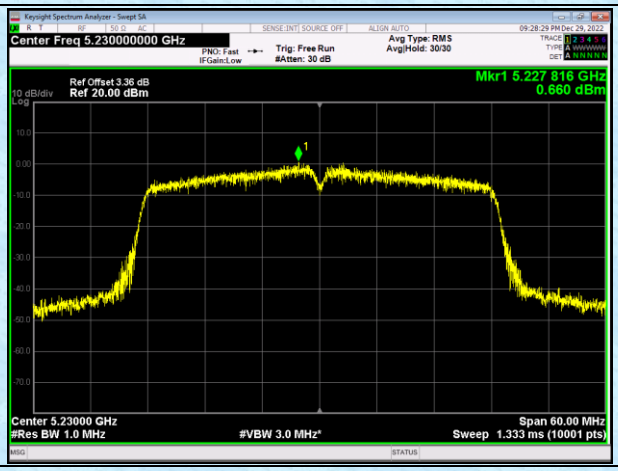
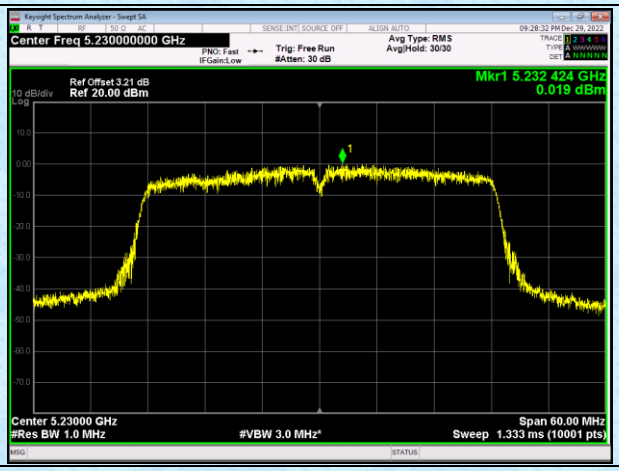
Power directional gain=6.44dBi, So Limit=11-0.44=10.56dBm

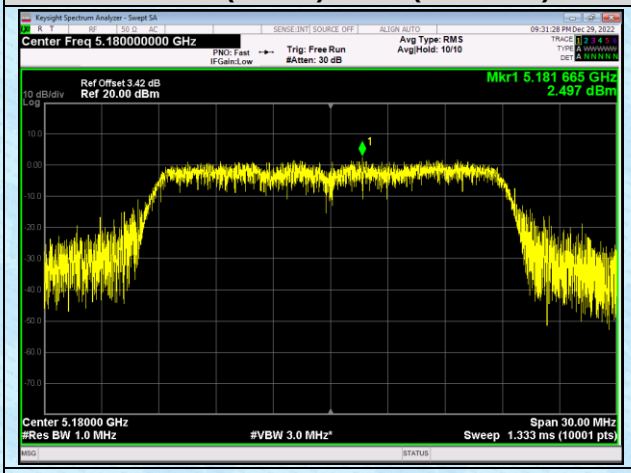
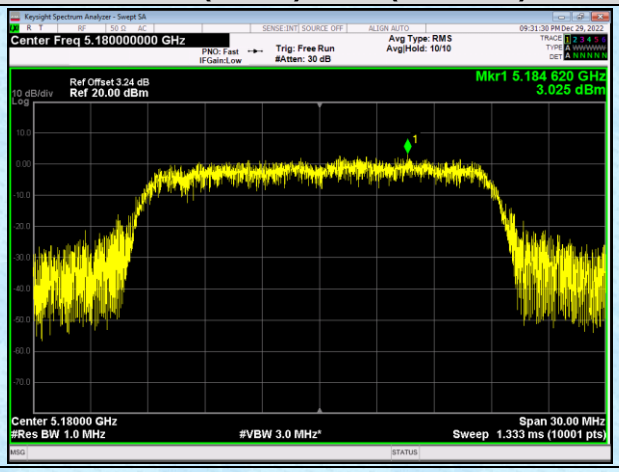
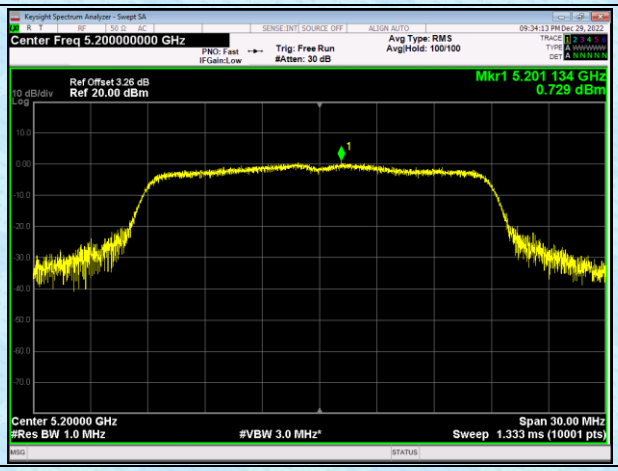
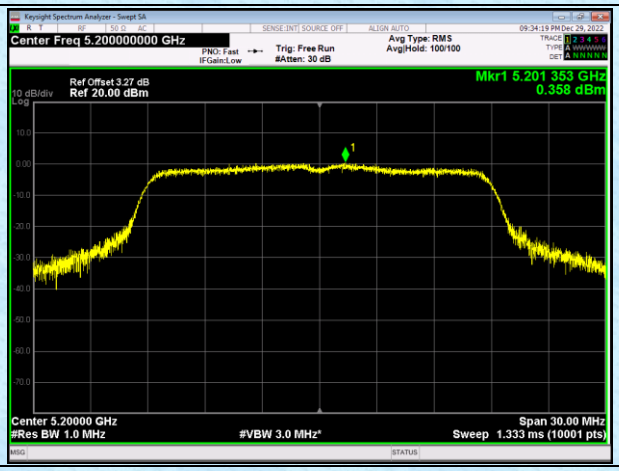
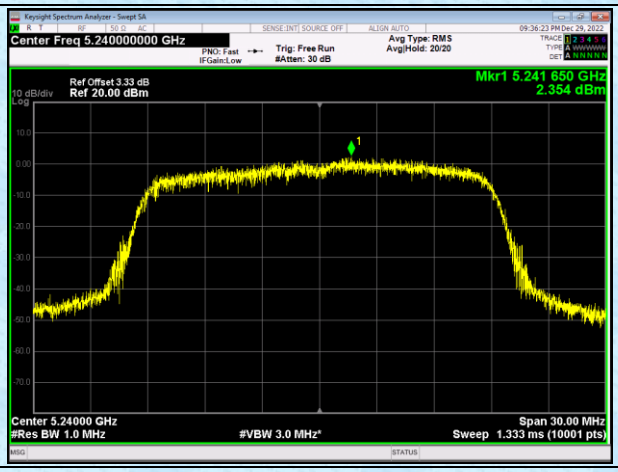
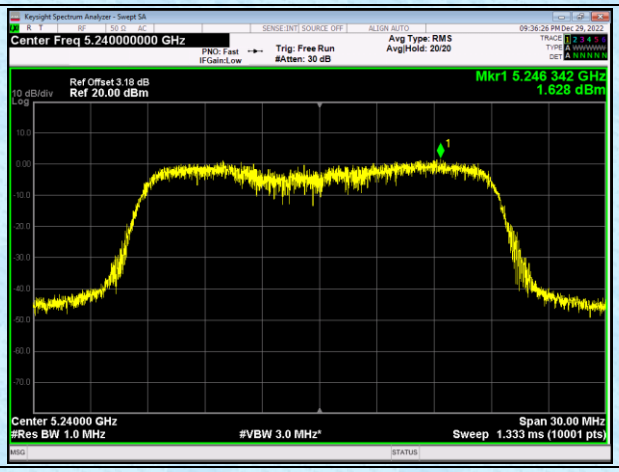
Beamforming Factor is 0 dB, and the results are unchanged

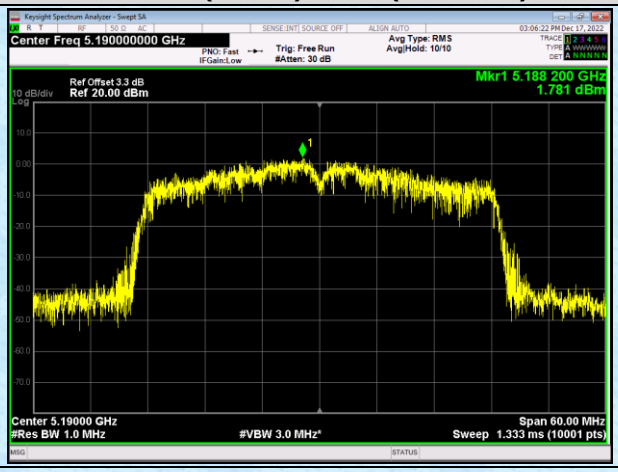
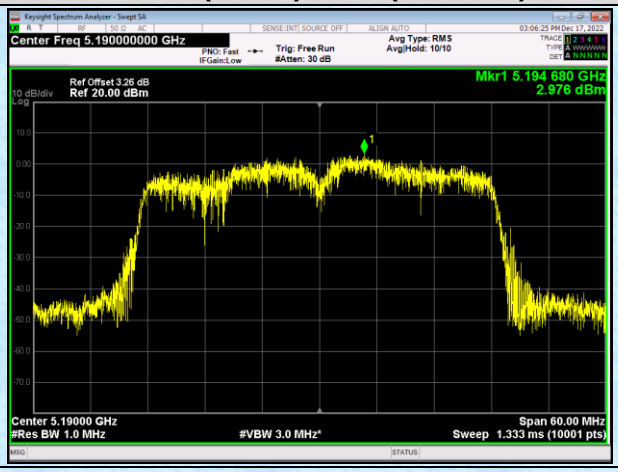
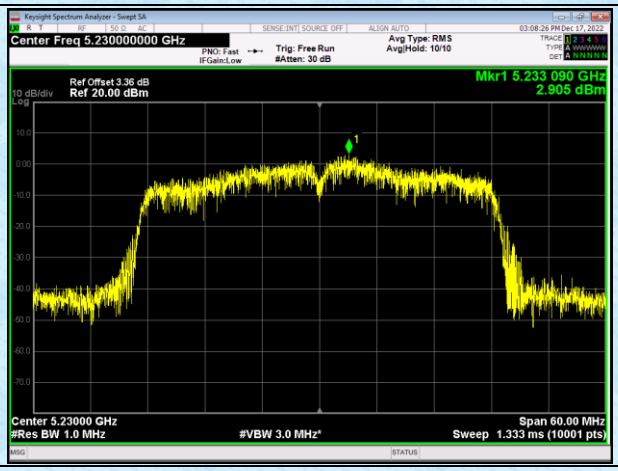
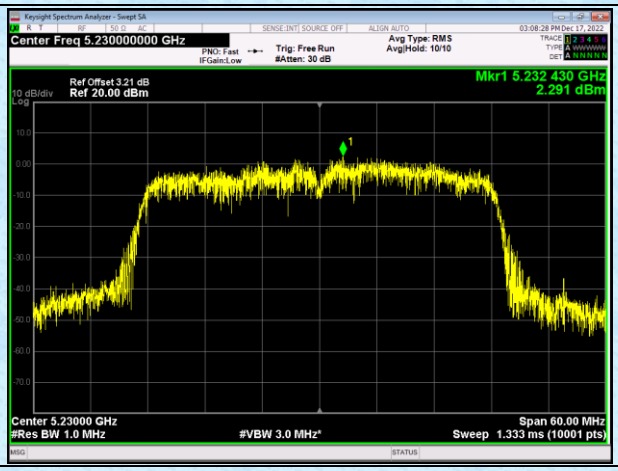
Test plots as followed:

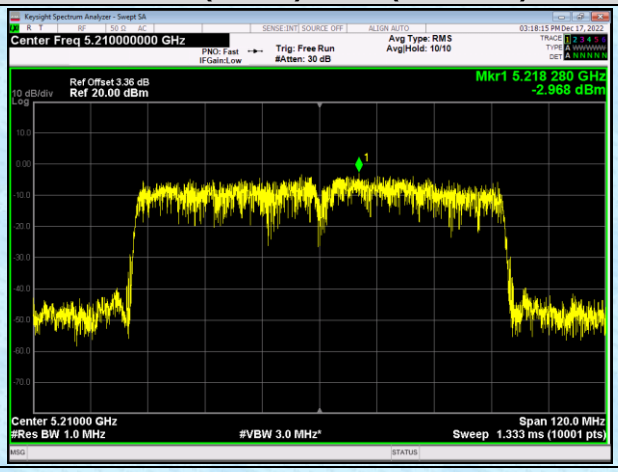
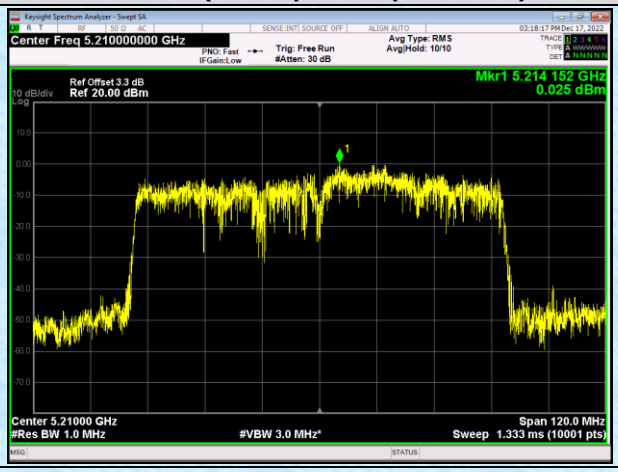
802.11a mode (Antenna1)	802.11a mode (Antenna2)
	
5180	**5180**
	
5200	**5200**
	
5240	**5240**

802.11n(HT20) mode (Antenna1)	802.11n(HT20) mode (Antenna2)
	
5180	5180
	
5200	5200
	
5240	5240

802.11n(HT40) mode (Antenna1)	802.11n(HT40) mode (Antenna2)
	
5190	**5190**
	
5230	**5230**

802.11ac(VHT20) mode (Antenna1)	802.11ac(VHT20) mode (Antenna2)
	
5180	**5180**
	
5200	**5200**
	
5240	**5240**

802.11ac(VHT40) mode (Antenna1)	802.11ac(VHT40) mode (Antenna2)
	
5190	5190
	
5230	5230

802.11ac(VHT80) mode (Antenna1)	802.11ac(VHT80) mode (Antenna2)
	
5210	5210