ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

Applicant:	Quanta Computer Inc. No. 188, Wenhua 2nd Road, Guishan District, Taoyuan City 33377, Taiwan
Product Name:	Clover Station Solo
Brand Name:	clover
Model No.:	C501
Model Difference:	N/A
Report Number:	E2/2021/10021
FCC ID	HFS-C501
FCC Rule Part:	§15.407, Cat: U-NII
Issue Date:	February 24, 2021
Date of Test:	January 12, 2021 - February 8, 2021
Date of EUT Received:	January 12, 2021

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Central RF Lab The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10: 2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Approved By: Jim Chang

Jim Chang / Manager

Testing Laboratory
3702

Revision History				
Report Number	**Revision**	**Description**	**Issue Date**	**Revised By**
E2/2021/10021	Rev.00	Original.	February 24, 2021	Susan Lin

Note:

1、 Disclaimer
Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

Contents

1 GENERAL INFORMATION

1.1 Product Description

Product Name:	Clover Station Solo
Brand Name:	clover
Model No.:	C501
Model Difference:	N/A
Hardware Version:	N/A
Software Version:	N/A
EUT Series No.:	C051UQ04920067
Power Supply:	24Vdc from AC/DC Adapter

1.2 Modulation & Data Rate

Modulation type:	64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 802.11ac only
Transition Rate:	802.11 a: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 144.4Mbps 802.11 n_40MHz: 13.5 – 300.0Mbps 802.11 ac_20MHz: 6.5 –173.4Mbps 802.11 ac_40MHz: 13.5 –400.0Mbps 802.11 ac_80MHz: 29.3 – 866.6Mbps

1.3 Antenna Designation

Antenna Type	Supplier	Antwnna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)	Worst Case Scenario
PCB	Quanta	WIFI-1 antenna	5150~5250	0.41	☐
			5250~5350	0.41	☐
			5470~5725	0.43	☐
			5725~5850	0.54	☐
	Quanta	WIFI-2 antenna	5150~5250	3.96	☒
			5250~5350	3.96	☒
			5470~5725	3.86	☒
			5725~5850	3.95	☒

Note: Investigation has been done to determine the worst case scenario for the above antennas demonstrated with measurements in this report.

1.4 FCC

Wi-Fi 802.11	Frequency Range	Channels	Rated Power (Avg.) (dBm) (Worst case)	Modulation Technology
a	5180~5240	4	14.94	OFDM
	5260~5320	4	14.80	
	5500~5700	11	14.79	
	5745~5825	5	14.69	
n_HT ac_VHT 20M	5180~5240	4	HT: 18.51	OFDM
	5260~5320	4	HT: 18.51	
	5500~5700	11	HT: 18.49	
	5745~5825	5	HT: 18.36	
n_HT ac_VHT 40M	5190~5230	2	HT: 17.82	OFDM
	5270~5310	2	HT: 17.97	
	5510~5670	5	HT: 17.64	
	5755~5795	2	HT: 17.55	
ac_VHT 80M	5210	1	VHT: 16.09	OFDM
	5290	1	VHT: 14.06	
	5530~5610	2	VHT: 17.00	
	5775	1	VHT: 15.62	

1.5 Test Methodology of Applied Standards

FCC Part 15, Subpart E §15.407
FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01
FCC KDB 662911 D01 Multiple Transmitter Output v02r01
ANSI C63.10:2013

1.6 Test Facility

Laboratory	Test Site Address		FCC Designation number
SGS Taiwan Ltd. Central RF Lab. (TAF code 3702)	☐	No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan.	TW0027
	☒	No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333	TW0028

1.7 Special Accessories

There are no special accessories used while test was conducted.

1.8 Equipment Modifications

There was no modification incorporated into the EUT.

2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on a table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz. The CISPR Quasi-Peak and Average detector mode is employed. The two LISNs provide 50uH/50 ohm of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 Conducted Test (RF)

The active antenna port of the unlicensed wireless device is connected to the spectrum analyzer with attenuator to protect the instrumentation. If a second antenna port is available, it is tested at one operating frequency, with other port(s) appropriately terminated, to verify it has similar output characteristics as the fully tested port.

2.3.3 Radiated Emissions

The EUT is a placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.

2.4 Measurement Results Explanation Example

2.4.1 Radiated Emission Test Sites For Measurements From 9 kHz To 30 MHz

Radiated emission below 30MHz is measured in a 9m*9m*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.
There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

2.4.2 For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

2.5 Configuration of Tested System

Fig. 2-1 Radiated Emission Configuration

Fig. 2-2 Conducted (Antenna Port) Emission Configuration

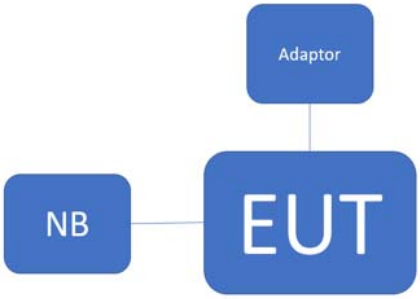


Fig. 2-3 Conducted (AC powerline) Emission Configuration

Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A
2.	Notebook	Lenovo	T470	P0001293	N/A	N/A

3 SUMMARY OF TEST RESULT

FCC Rules	Description Of Test	Result
§15.207	AC Power Line Conducted Emission	Compliant
§15.407(e)	Emission Bandwidth	Compliant
§15.407(a)	Maximum Conducted Output Power	Compliant
§15.407(a)	Power Spectral Density	Compliant
§15.205 §15.209 §15.407(b)	Undesirable Radiated Emissions	Compliant
§15.407(c)	Transmission in case of Absence of Information	Compliant
§15.203 §15.407(a)	Antenna Requirement	Compliant

4 DESCRIPTION OF TEST MODES

4.1 Operating in U-NII Bands

Operated band in 5150 MHz ~5250 MHz:

20 M	
CH	Freq (MHz)
36	5180
40	5200
44	5220
48	5240

40 M	
CH	Freq (MHz)
38	5190
46	5230

80 M	
CH	Freq (MHz)
42	5210

Operated band in 5250 MHz ~5350 MHz:

20 M	
CH	Freq (MHz)
52	5260
56	5280
60	5300
64	5320

40 M	
CH	Freq (MHz)
54	5270
62	5310

80 M	
CH	Freq (MHz)
58	5290

Operated band in 5470 MHz ~5725 MHz:

20 M	
CH	Freq (MHz)
100	5500
104	5520
108	5540
112	5560
116	5580
120	5600
124	5620
128	5640
132	5660
136	5680
140	5700

40 M	
CH	Freq (MHz)
102	5510
110	5550
118	5590
126	5630
134	5670

80 M	
CH	Freq (MHz)
106	5530
122	5610

Operated band in 5745 MHz ~5850 MHz:

20 M	
CH	Freq (MHz)
149	5745
153	5765
157	5785
161	5805
165	5825

40 M	
CH	Freq (MHz)
151	5755
159	5795

80 M	
CH	Freq (MHz)
155	5775

4.2 The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Test program used to control the EUT for staying in continuous transmitting mode is programmed.
3. Investigation has been done on all the possible configurations for searching the worst case. The given UE is pre-scanned among below modes.

Modulation	Transmission Chain				Single Transmission Spatial	Multiple Transmission Spatial
☒ 802.11 a	☒ Ch0	☒ Ch1	☐ Ch2	☐ Ch3	☐ 1TX	☒ 2TX
☒ 802.11 n	☒ Ch0	☒ Ch1	☐ Ch2	☐ Ch3	☐ SISO	☒ MIMO
☒ 802.11 ac	☒ Ch0	☒ Ch1	☐ Ch2	☐ Ch3	☐ SISO	☒ MIMO
☐ 802.11 ax	☐ Ch0	☐ Ch1	☐ Ch2	☐ Ch3	☐ SISO	☐ MIMO

4. Therefore, below summary is the modes of test configuration that yield the highest reading and generate the highest emission chosen to carry out the relevantly mandatory test items.
5. 802.11 a mode only limit single transmit.

4.2.1 RADIATED EMISSION TEST:

RADIATED EMISSION TEST (BELOW 1 GHz)						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5180~5825	36 to 165	44,60,116,157	OFDM	6	2TX
802.11ac_VHT80	5210~5775	42 to 155	42,58,122,155	OFDM	MCS0	MIMO
RADIATED EMISSION TEST (ABOVE 1 GHz)						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5180~5825	36 to 165	36,44,48,52,60, 64,100,116,140, 144,149,157,165	OFDM	6	2TX
802.11n_HT20				OFDM	MCS8	MIMO
802.11n_HT40	5190~5795	38 to 159	38,46,54,62,102, 110,134,142, 151,159	OFDM	MCS8	MIMO
802.11ac_VHT80	5210~5775	42 to 155	42,58,122,155	OFDM	MCS0	MIMO

Note:

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for channel Low, Mid and High, the worst case H position was reported.

4.2.2 ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5180~5240	36 to 48	36 to 48	OFDM	6	2TX
	5260~5320	52 to 64	52 to 64			
	5500~5720	100 to 144	100 to 144			
	5745~5825	149 to 165	149 to 165			
802.11n_HT20	5180~5240	36 to 48	36 to 48	OFDM	MCS8	MIMO
	5260~5320	52 to 64	52 to 64			
	5500~5720	100 to 144	100 to 144			
	5745~5825	149 to 165	149 to 165			
802.11n_HT40	5190~5230	38 to 46	38 to 46	OFDM	MCS8	MIMO
	5270~5310	54 to 62	54 to 62			
	5510~5670	102 to 142	102 to 142			
	5755~5795	151 to 159	151 to 159			
802.11ac_VHT80	5210	42	42	OFDM	MCS0	MIMO
	5290	58	58			
	5530~5610	106 to 138	106 to 138			
	5775	155	155			

5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.34 dB
26dB & 6dB Emission Bandwidth	+/- 1.54 Hz
The Maximum Output Power Measurement	+/- 1 dB
Peak Power Spectral Density Measurement	+/- 1.54 dB
Frequency Stability	+/- 1.54 Hz
Temperature	+/- 0.4 °C
Humidity	+/- 3.5 %
DC / AC Power Source	DC= +/- 1%, AC=+/- 1%

Radiated Spurious Emission Measurement Uncertainty				
Polarization: Vertical	+/-	2.64	dB	9kHz~30MHz: +-2.3dB
	+/-	4.93	dB	30MHz - 1000MHz: +/- 3.37dB
	+/-	4.81	dB	1GHz - 18GHz: +/- 4.04dB
	+/-	4.52	dB	18GHz - 40GHz: +/- 4.04dB
Polarization: Horizontal	+/-	2.64	dB	9kHz~30MHz: +-2.3dB
	+/-	4.45	dB	30MHz - 1000MHz: +/- 4.22dB
	+/-	4.81	dB	1GHz - 18GHz: +/- 4.08dB
	+/-	4.52	dB	18GHz - 40GHz: +/- 4.08dB

Note:

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

6 CONDUCTED EMISSION TEST

6.1 Standard Applicable

Frequency range within 150 kHz to 30 MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note 1.The lower limit shall apply at the transition frequencies 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

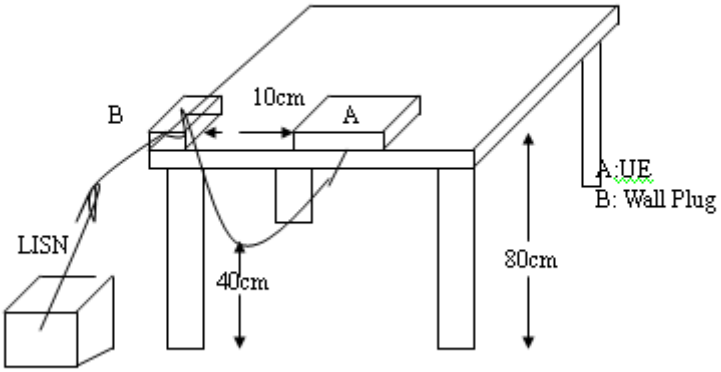
6.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Test Software	audix	e3	Ver. 6.11-20180419c	N.C.R	N.C.R
LISN	SCHWARZBECK Mess-Elektronik	NSLK8127	974	03/25/2020	03/24/2021
EMI Test Receiver	R&S	ESCI	101342	04/28/2020	04/27/2021
Coaxial Cable	EC Lab	RF-HY-CAB-250	RF-HY-CAB-250-01	03/27/2020	03/26/2021
Pulse Limiter	EC Lab	VTSD 9561F-N	485	03/27/2020	03/26/2021

6.3 EUT Setup

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
3. The LISN was connected with 120Vac/60Hz power source.

6.4 Test SET-UP



6.5 Measurement Procedure

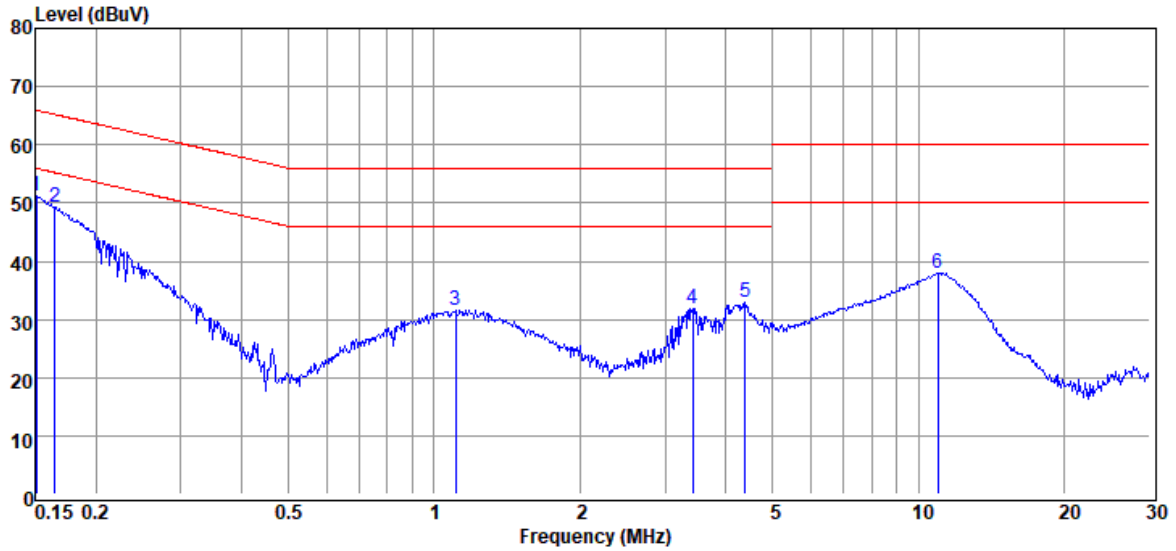
1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all phases of power being supplied by given UE are completed.

6.6 Measurement Result

Note: Refer to next page for measurement data and plots.
Note2: The * reveals the worst-case results that closet to the limit.

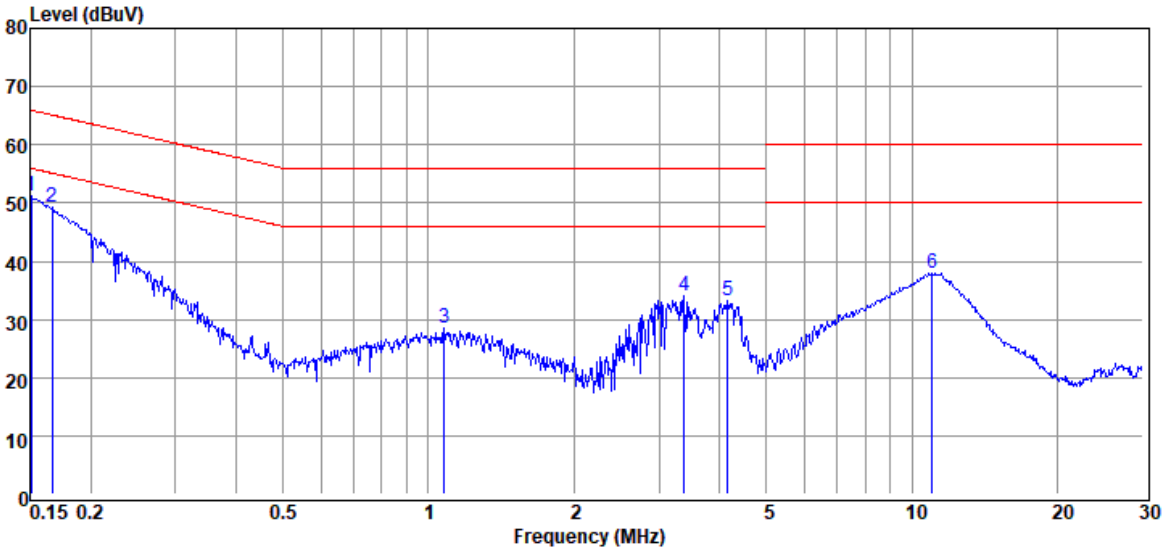
AC POWER LINE CONDUCTED EMISSION TEST DATA

Report Number	:E2/2020/10021	Test Site	:Conduction Room C
Test Mode	:WLAN 5G	Test Date	:2021-01-28
Power	:120V/60Hz	Temp./Humi.	:21.2/62
Probe	:L1	Engineer	:Ashton Chiu
Note:	: Adapter:FSP120-AABN3		



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV	dBµV	dB
0.15	Peak	41.10	10.22	51.32	65.96	-14.64
0.17	Peak	39.07	10.22	49.29	65.21	-15.92
1.11	Peak	21.20	10.44	31.64	56.00	-24.36
3.42	Peak	21.41	10.47	31.88	56.00	-24.12
4.38	Peak	22.44	10.49	32.93	56.00	-23.07
10.96	Peak	27.18	10.72	37.90	60.00	-22.10

Report Number	:E2/2020/10021	Test Site	:Conduction Room C
Test Mode	:WLAN 5G	Test Date	:2021-01-28
Power	:120V/60Hz	Temp./Humi.	:21.2/62
Probe	:N	Engineer	:Ashton Chiu
Note:	: Adapter:FSP120-AABN3		



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV	dBµV	dB
0.15	Peak	40.99	10.21	51.20	65.96	-14.76
0.17	Peak	38.96	10.21	49.17	65.12	-15.95
1.08	Peak	18.00	10.43	28.43	56.00	-27.57
3.38	Peak	23.60	10.48	34.08	56.00	-21.92
4.16	Peak	22.58	10.50	33.08	56.00	-22.92
11.02	Peak	27.17	10.73	37.90	60.00	-22.10

7 DUTY CYCLE TEST SIGNAL

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.
All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

7.1 Measurement Procedure:

1. Set span = Zero
2. RBW = 8MHz
3. VBW = 8MHz,
4. Detector = Peak

Duty Cycle:

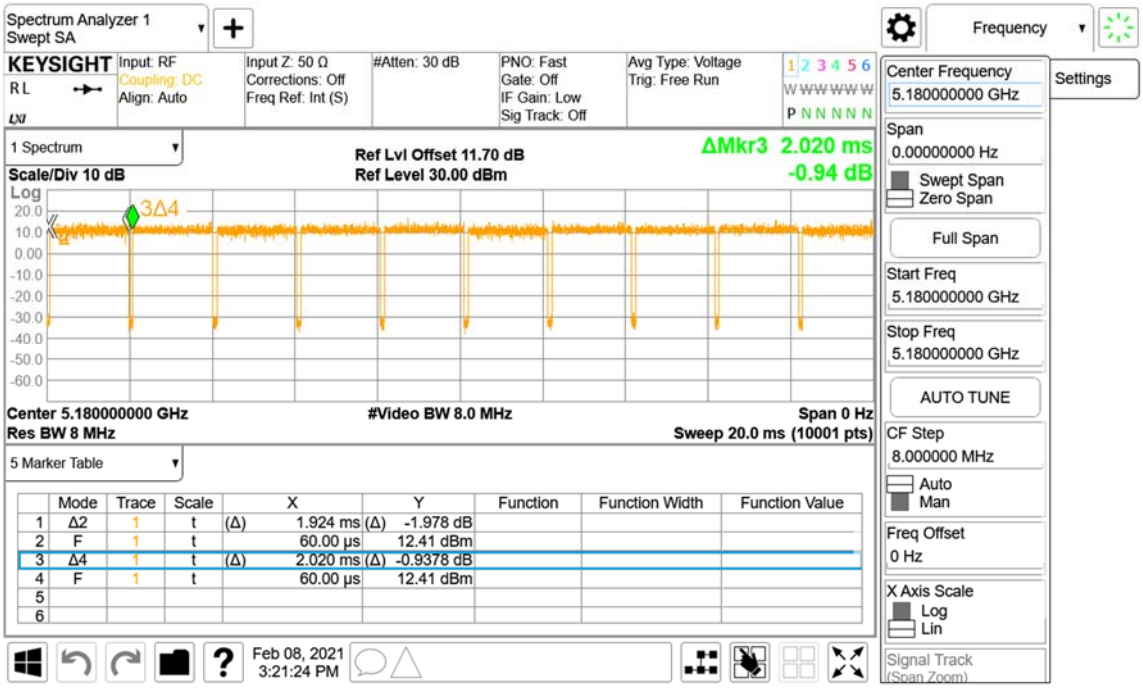
Mode	Duty Cycle (%) =Ton / (Ton+Toff)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
802.11a	95.37	0.21	0.48	1.00
802.11n_20	94.58	0.24	0.52	1.00
802.11ac_20	95.07	0.22	0.52	1.00
802.11n_40	87.44	0.58	2.02	3.00
802.11ac_40	91.35	0.39	1.05	2.00
802.11ac_80	83.15	0.80	2.16	3.00

Duty Cycle Factor: 10 * log(1/0.9537037) = 0.21
Duty Cycle Factor: 10 * log(1/0.94581281) = 0.24
Duty Cycle Factor: 10 * log(1/0.95073892) = 0.22
Duty Cycle Factor: 10 * log(1/0.87439614) = 0.58
Duty Cycle Factor: 10 * log(1/0.91346154) = 0.39
Duty Cycle Factor: 10 * log(1/0.83154122) = 0.8

7.2 DUTY CYCLE TEST SIGNAL MEASUREMENT RESULT

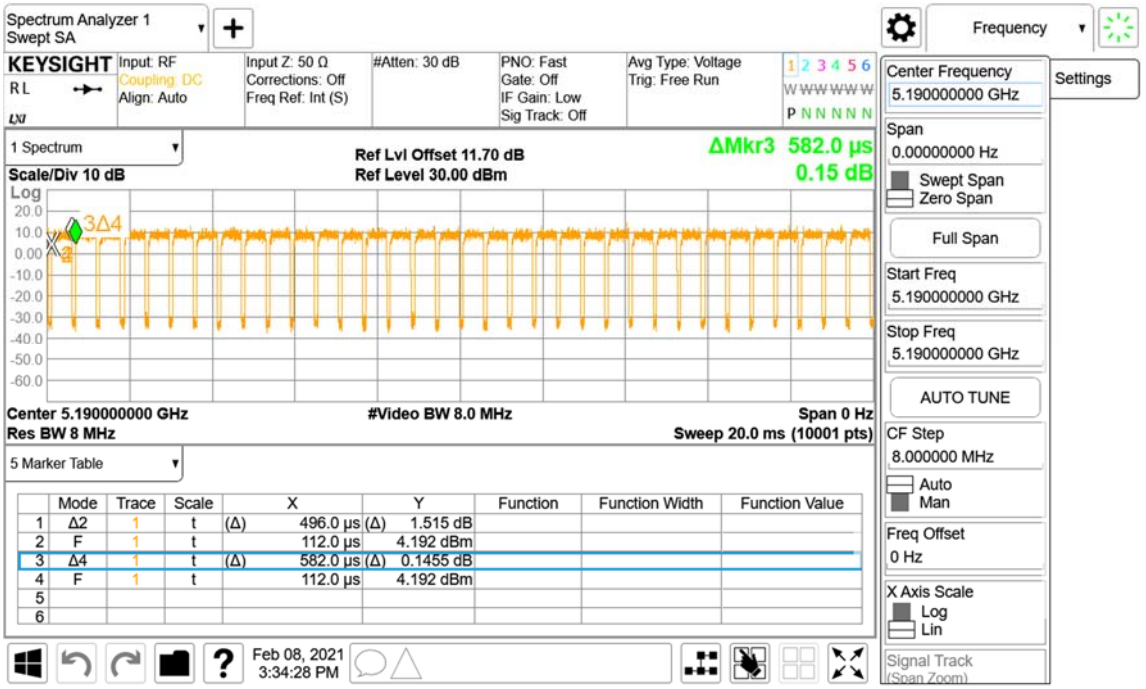
802.11a

802.11n HT20

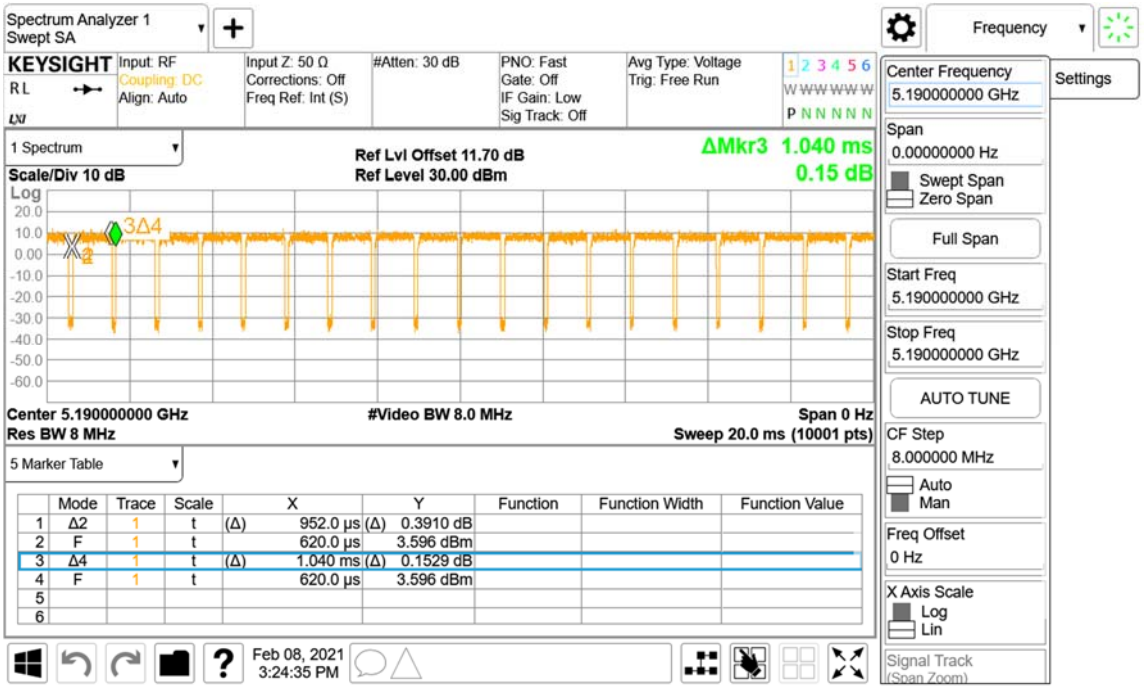


802.11ac VHT20

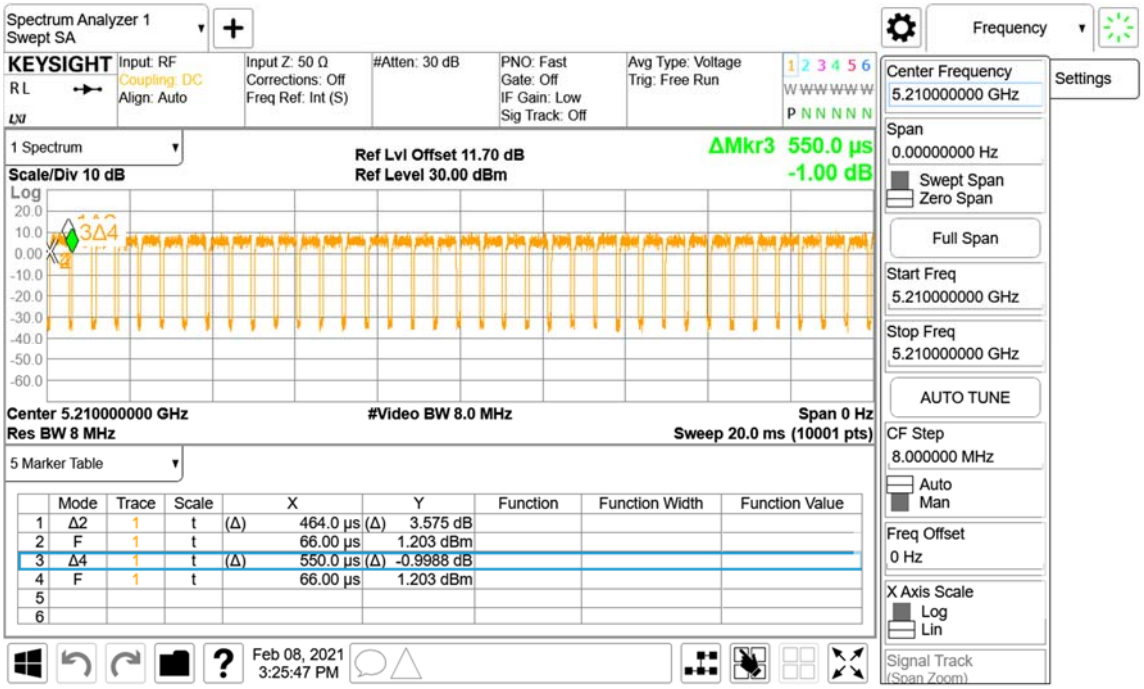
802.11n HT 40



802.11ac VHT 40



802.11ac VHT 80



8 EMISSION BANDWIDTH MEASUREMENT

8.1 Standard Applicable

There is no limit bandwidth for U-NII-1, U-NII-2-A and U-NII-2-C.
The minimum of 6dB Bandwidth measurement is 0.5 MHz for U-NII-3

8.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the Antenna port to the spectrum analyzer.

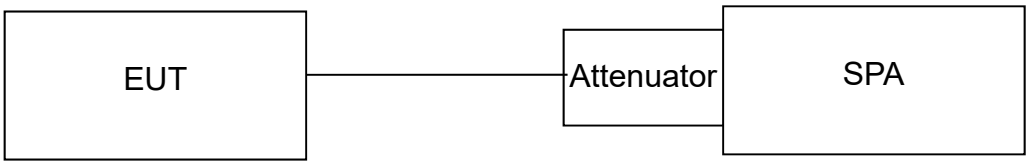
   3.a. 26dB Band width Measurement: Set the spectrum analyzer as 1% of emission BW
   Sweep=auto,
   Detector = Peak,
   Trace Mode = Max Hold,
   Manually readjust RBW until the RBW/EBW ratio is 1% based on EBW as observed on the result of pre-sequence measurement.

   3.b. Mark the peak frequency and –26dB (upper and lower) frequency.
4. Repeat the procedures as list above until all test default channels (low, middle, and high) are completed.
5. Minimum Emission Bandwidth for the band 5.725-5.850GHz.
   a. Set the spectrum analyzer as
   RBW = 100 kHz,
   VBW = 3*RBW,
   Span = 30M/50MHz,
   Detector=Peak,
   Sweep=auto
   b. Mark the peak frequency and –6dB (upper and lower) frequency.
6. Repeat above procedures until all frequency of interest measured was complete.

8.3 Measurement Equipment Used

SGS Conducted Room					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010B	MY59071573	06/26/2020	06/25/2021
Attenuator	Marvelous	MVE2213-10	RF06	11/19/2020	11/18/2021
Attenuator	Marvelous	WATT-218FS-10	RF18	11/19/2020	11/18/2021
DC Block	PASTERNACK	PE8210	RF153	11/19/2020	11/18/2021

8.4 Test Set-up



8.5 Measurement Result

8.5.1 FCC 26dB Bandwidth

802.11a_Ch0

Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	22.51	13.520
5220	21.80	13.380
5240	22.43	13.510
5260	22.11	13.450
5300	21.08	13.240
5320	22.11	13.450
5500	22.78	13.580
5580	23.05	13.630
5700	21.91	13.410

802.11n_HT20_Ch0

Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	23.59	13.730
5220	21.59	13.340
5240	22.27	13.480
5260	22.58	13.540
5300	22.72	13.560
5320	22.28	13.480
5500	21.89	13.400
5580	22.92	13.600
5700	23.21	13.660

802.11n_HT20_Ch1

Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	21.88	13.400
5220	23.47	13.710
5240	22.55	13.530
5260	22.78	13.580
5300	21.63	13.350
5320	23.59	13.730
5500	23.46	13.700
5580	22.05	13.430
5700	22.20	13.460

802.11n _HT40_Ch0

Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5190	40.80	16.110
5230	41.08	16.140
5270	40.59	16.080
5310	40.46	16.070
5510	40.98	16.130
5550	**40.83**	16.110
5670	40.85	16.110

802.11n _HT40_Ch1

Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5190	40.56	16.080
5230	40.64	16.090
5270	40.80	16.110
5310	40.77	16.100
5510	40.95	16.120
5550	**40.59**	16.080
5670	40.68	16.090

802.11ac _VHT80_Ch0

Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5210	81.89	19.130
5290	82.65	19.170
5530	82.43	19.160
5610	82.26	19.150

802.11ac _VHT80_Ch1

Freq. (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5210	83.48	19.220
5290	83.26	19.200
5530	82.80	19.180
5610	82.85	19.180

8.5.2 6dB Bandwidth (5725 MHz~ 5850 MHz) measure with Peak detector for FCC

802.11a_Ch0

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	14.21	11.530
5785	16.37	12.140
5825	16.38	12.140

802.11n_HT20_Ch0

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	17.57	12.450
5785	15.68	11.950
5825	17.33	12.390

802.11n_HT20_Ch1

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	16.66	12.220
5785	15.60	11.930
5825	17.35	12.390

802.11n_HT40_Ch0

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	35.71	15.530
5795	33.90	15.300

802.11n_HT40_Ch1

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	36.07	15.570
5795	35.75	15.530

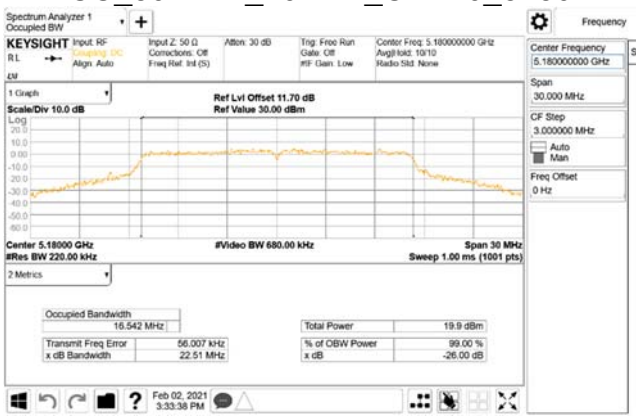
802.11ac _VHT80_Ch0

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5775	75.18	18.760

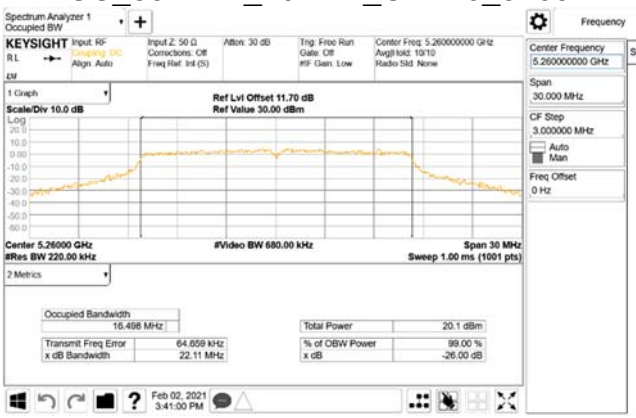
802.11ac _VHT80_Ch1

Freq. (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5775	74.56	18.730

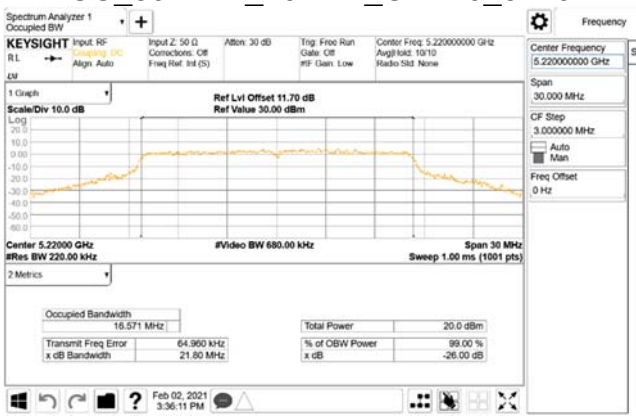
FCC_802.11a_20MHz_Chain0_5180MHz



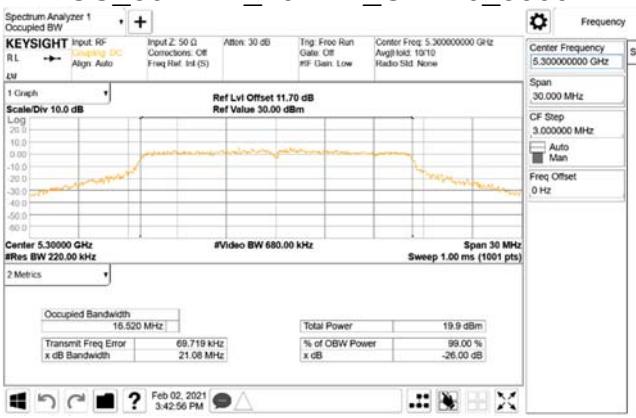
FCC_802.11a_20MHz_Chain0_5260MHz



FCC_802.11a_20MHz_Chain0_5220MHz

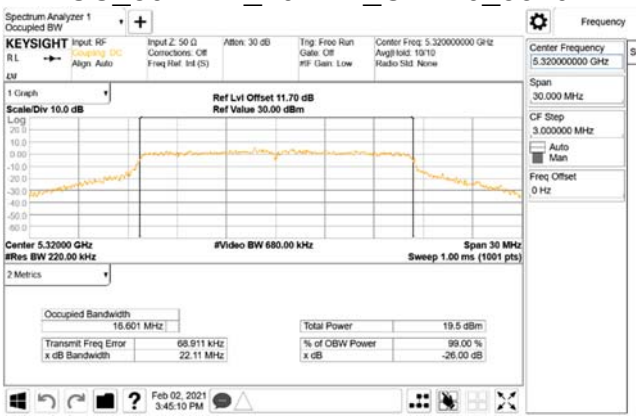


FCC_802.11a_20MHz_Chain0_5300MHz

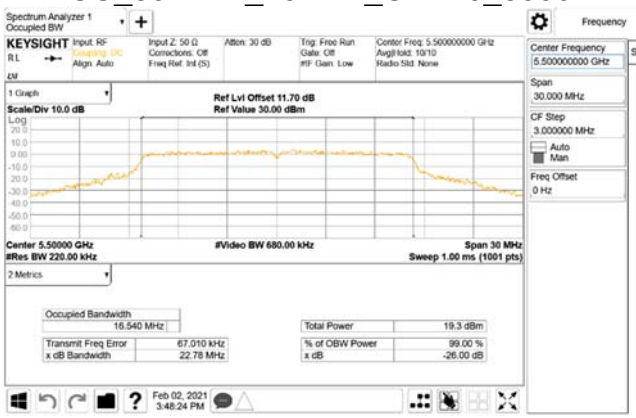


FCC_802.11a_20MHz_Chain0_5240MHz

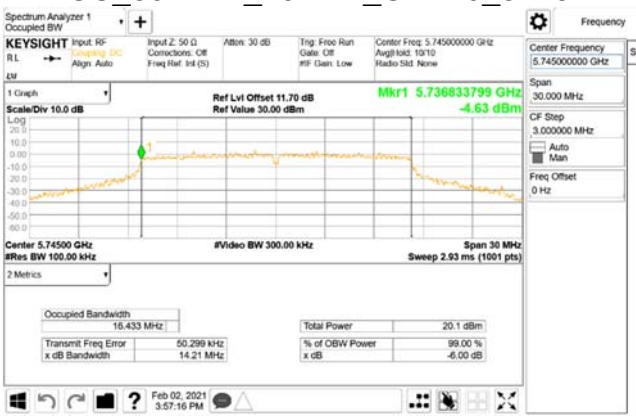
FCC_802.11a_20MHz_Chain0_5320MHz



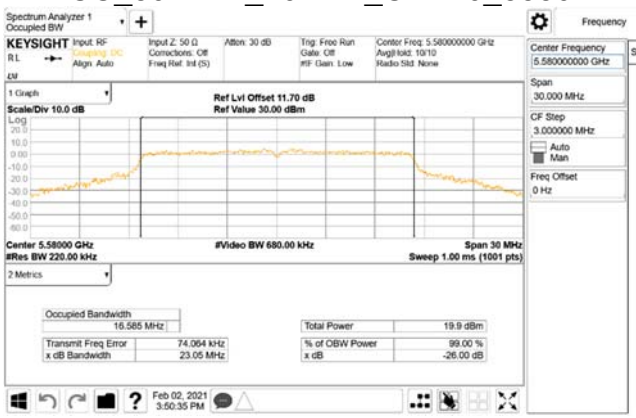
FCC_802.11a_20MHz_Chain0_5500MHz



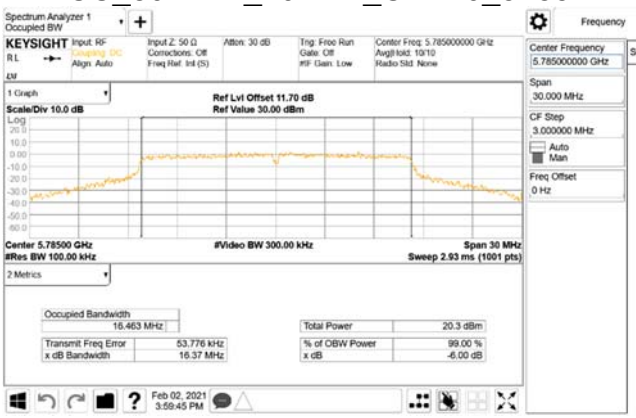
FCC_802.11a_20MHz_Chain0_5745MHz



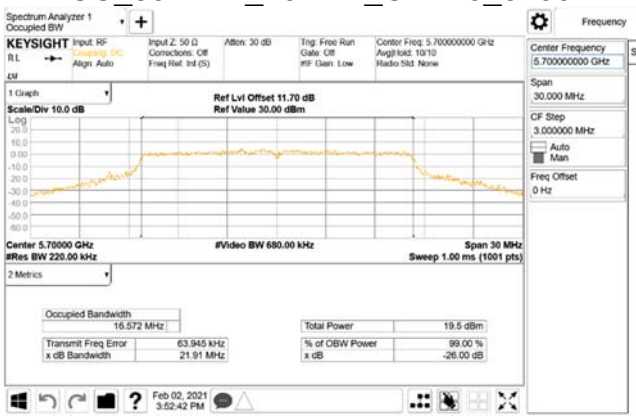
FCC_802.11a_20MHz_Chain0_5580MHz



FCC_802.11a_20MHz_Chain0_5785MHz

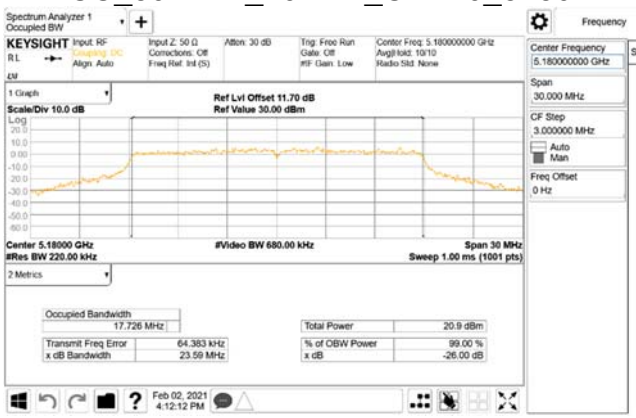


FCC_802.11a_20MHz_Chain0_5700MHz

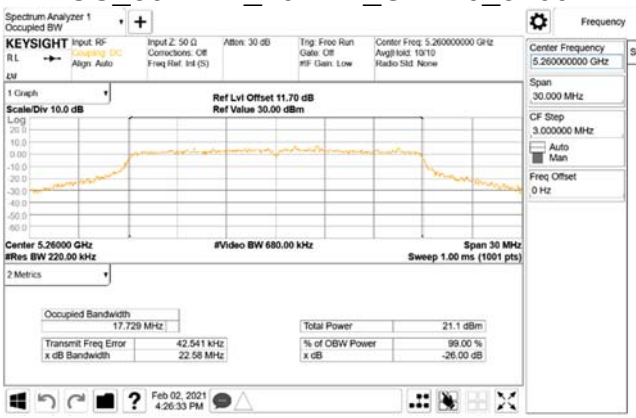


FCC_802.11a_20MHz_Chain0_5825MHz

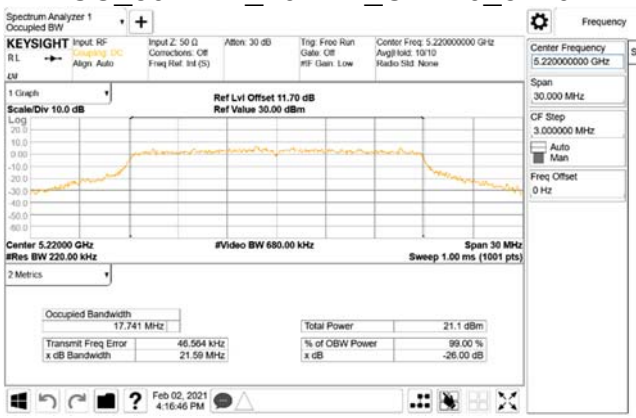
FCC_802.11n_20MHz_Chain0_5180MHz



FCC_802.11n_20MHz_Chain0_5260MHz

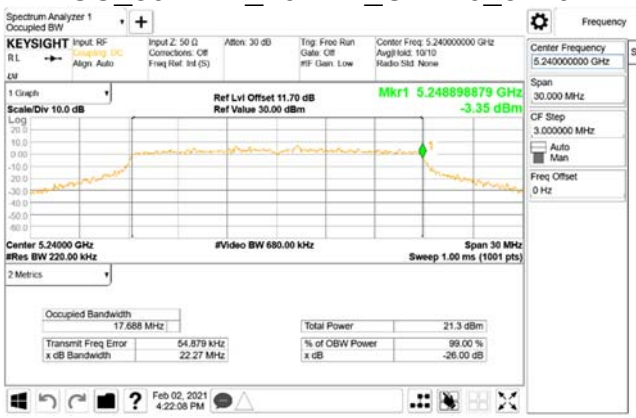


FCC_802.11n_20MHz_Chain0_5220MHz

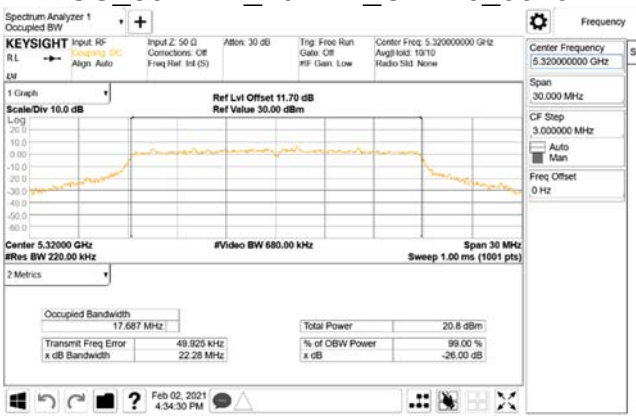


FCC_802.11n_20MHz_Chain0_5300MHz

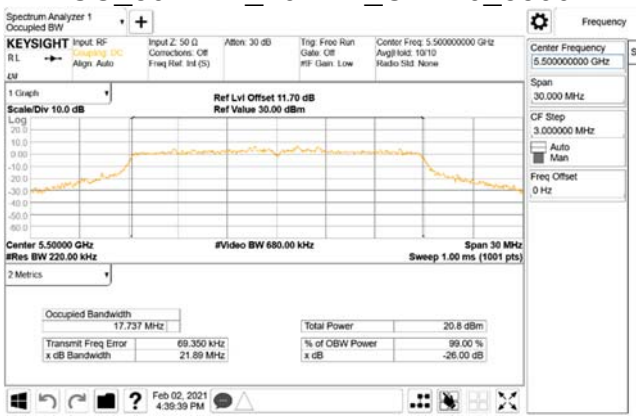
FCC_802.11n_20MHz_Chain0_5240MHz



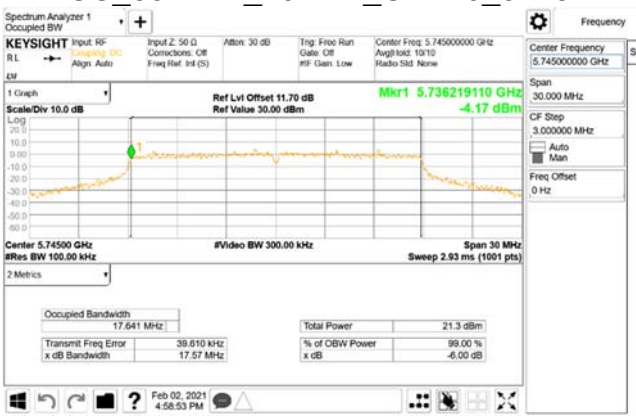
FCC_802.11n_20MHz_Chain0_5320MHz



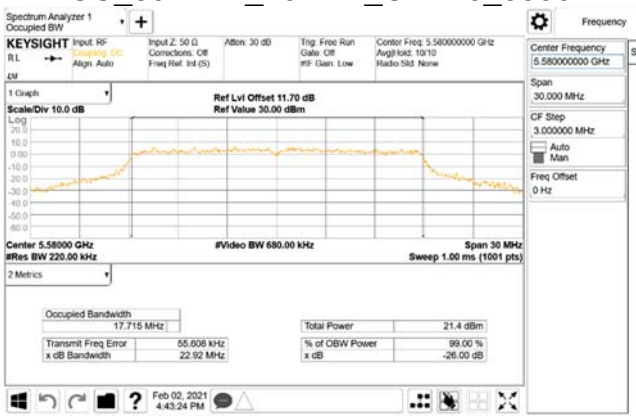
FCC_802.11n_20MHz_Chain0_5500MHz



FCC_802.11n_20MHz_Chain0_5745MHz

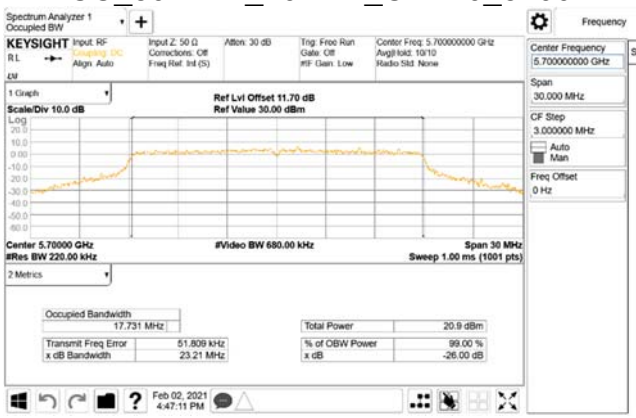


FCC_802.11n_20MHz_Chain0_5580MHz

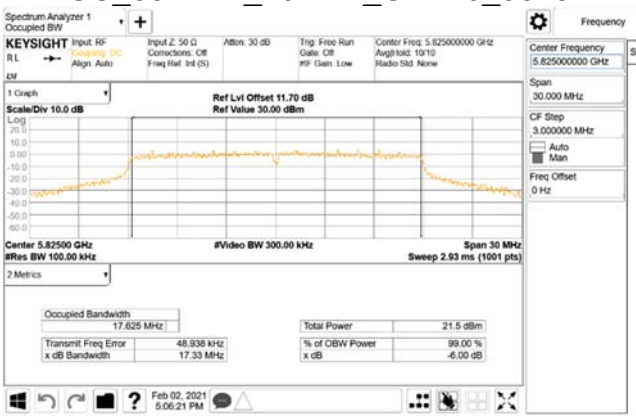


FCC_802.11n_20MHz_Chain0_5785MHz

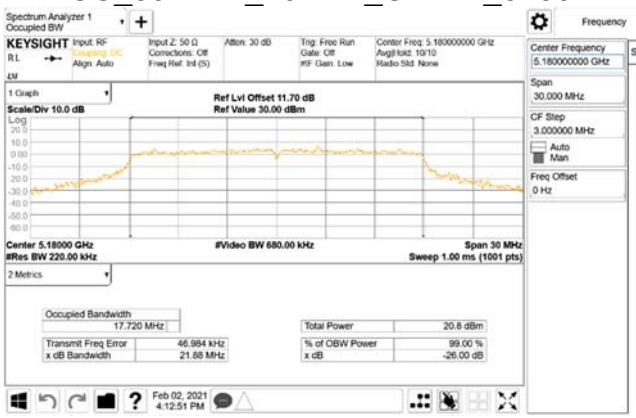
FCC_802.11n_20MHz_Chain0_5700MHz



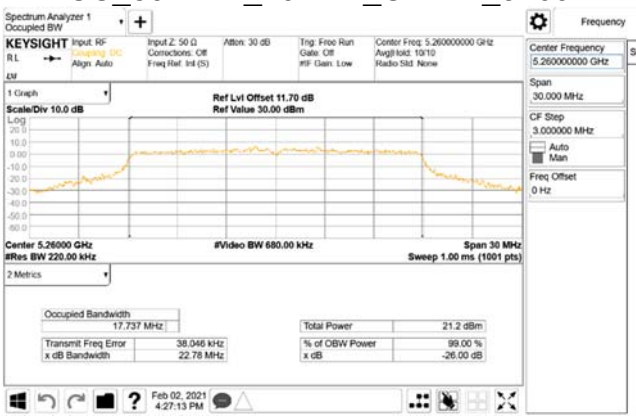
FCC_802.11n_20MHz_Chain0_5825MHz



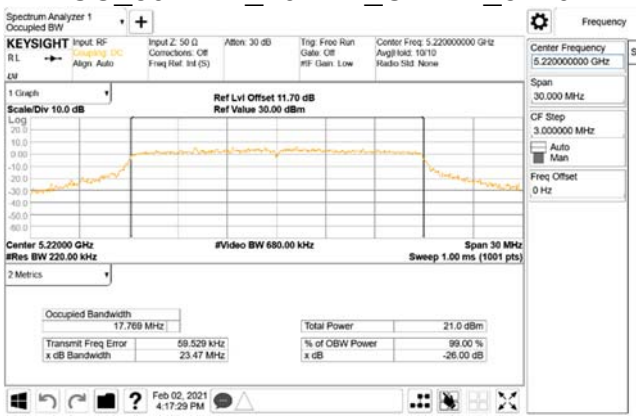
FCC_802.11n_20MHz_Chain1_5180MHz



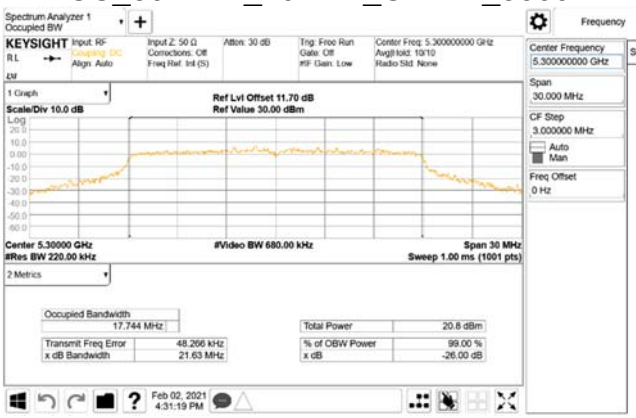
FCC_802.11n_20MHz_Chain1_5260MHz



FCC_802.11n_20MHz_Chain1_5220MHz

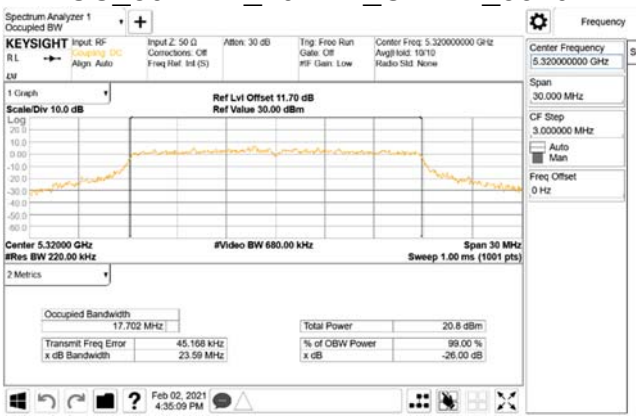


FCC_802.11n_20MHz_Chain1_5300MHz

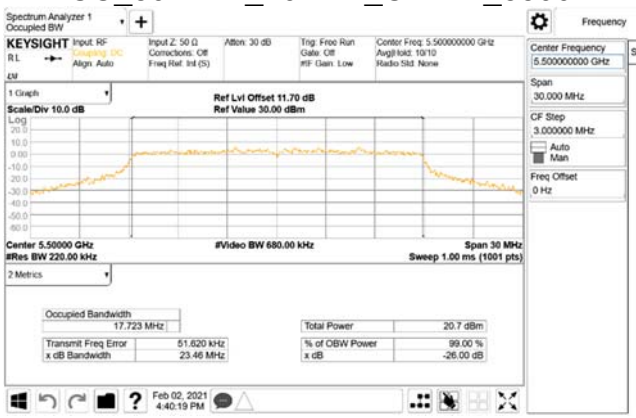


FCC_802.11n_20MHz_Chain1_5240MHz

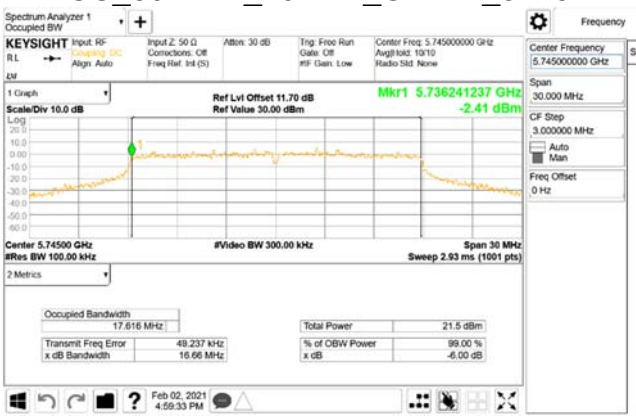
FCC_802.11n_20MHz_Chain1_5320MHz



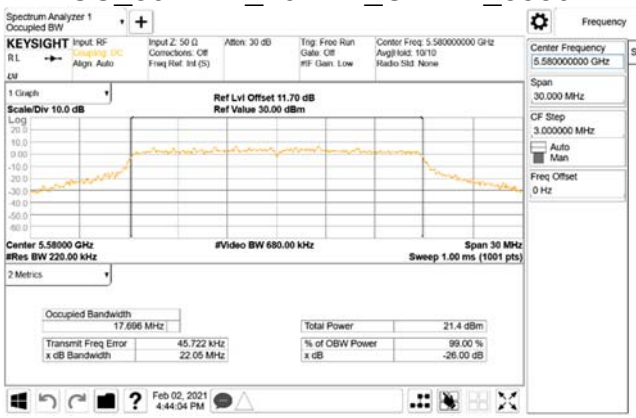
FCC_802.11n_20MHz_Chain1_5500MHz



FCC_802.11n_20MHz_Chain1_5745MHz

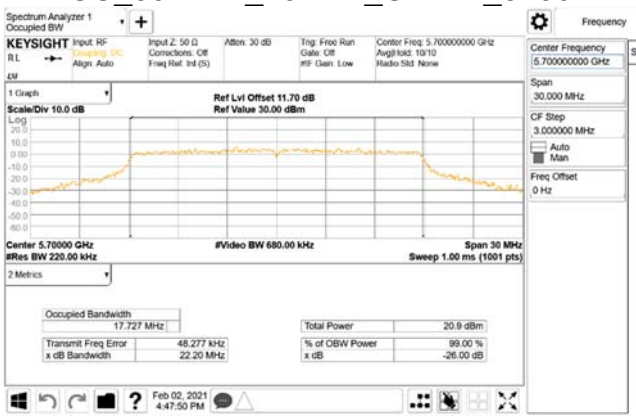


FCC_802.11n_20MHz_Chain1_5580MHz

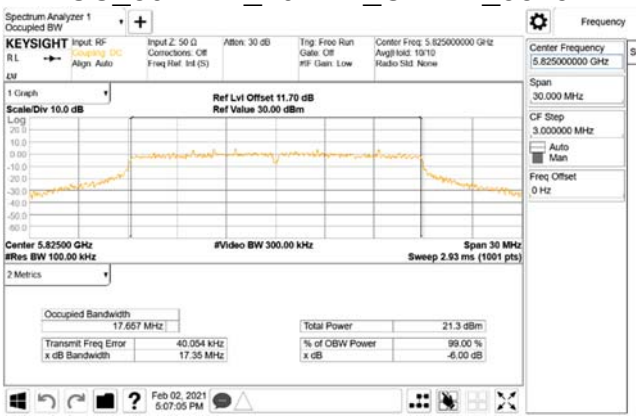


FCC_802.11n_20MHz_Chain1_5785MHz

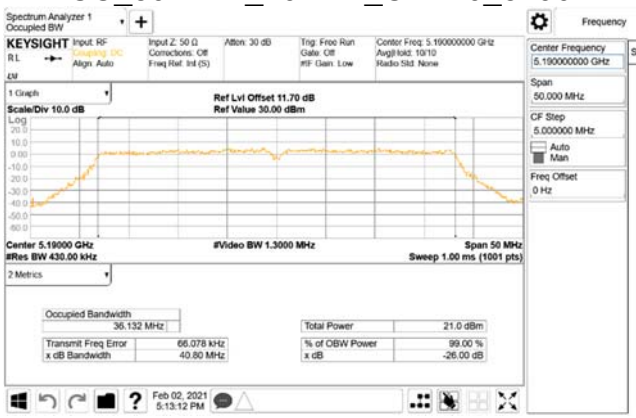
FCC_802.11n_20MHz_Chain1_5700MHz



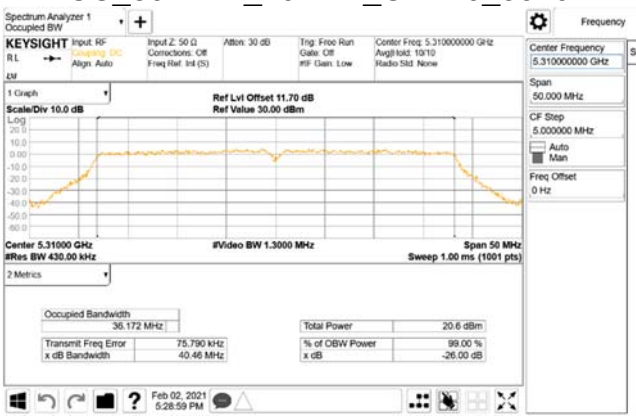
FCC_802.11n_20MHz_Chain1_5825MHz



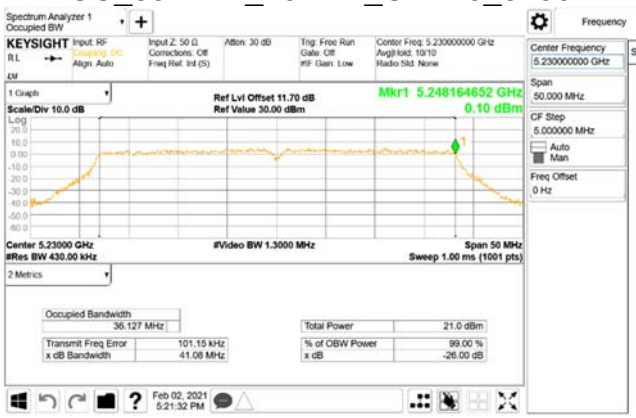
FCC_802.11n_40MHz_Chain0_5190MHz



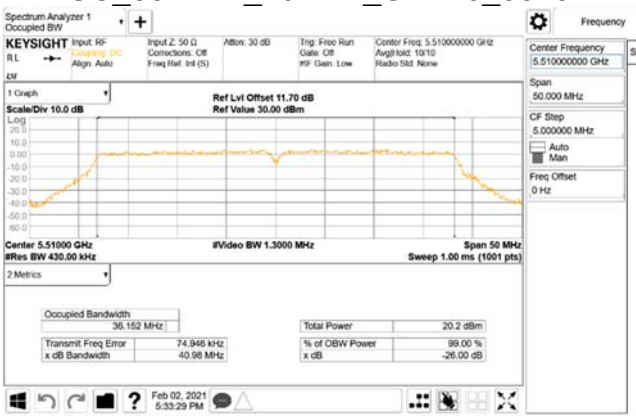
FCC_802.11n_40MHz_Chain0_5310MHz



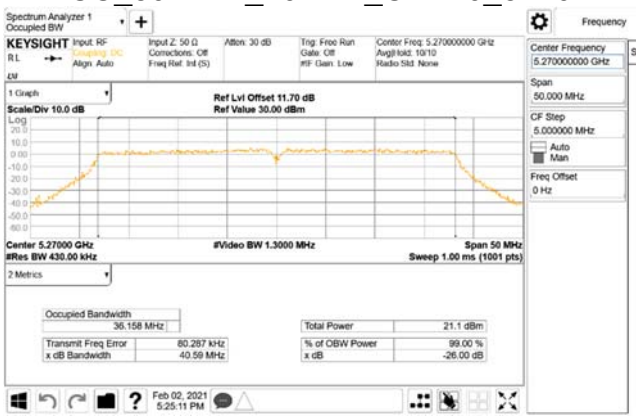
FCC_802.11n_40MHz_Chain0_5230MHz



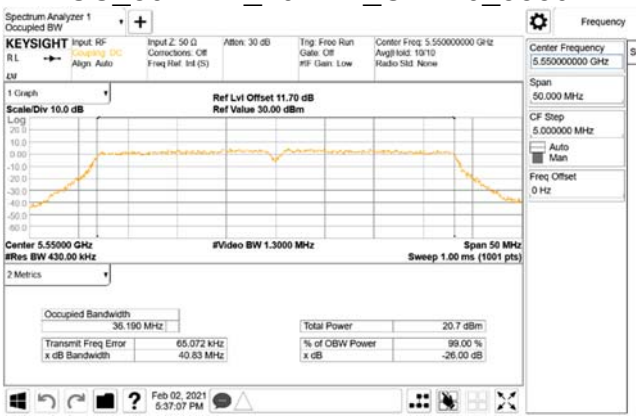
FCC_802.11n_40MHz_Chain0_5510MHz



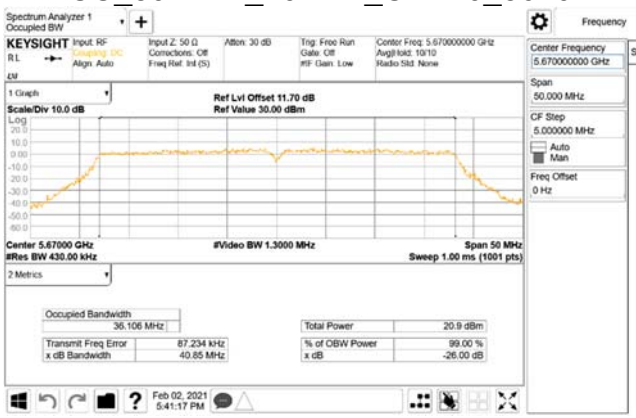
FCC_802.11n_40MHz_Chain0_5270MHz



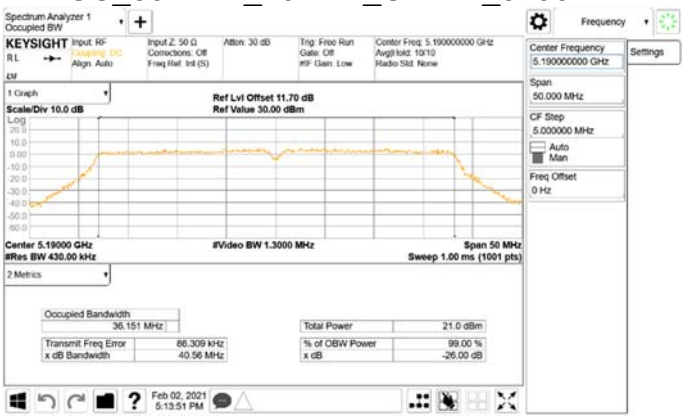
FCC_802.11n_40MHz_Chain0_5550MHz



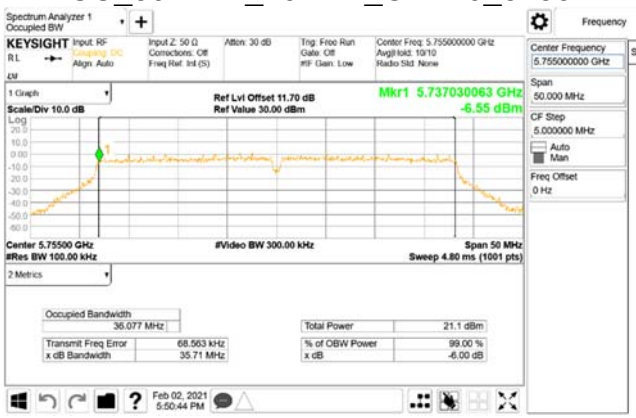
FCC_802.11n_40MHz_Chain0_5670MHz



FCC_802.11n_40MHz_Chain1_5190MHz

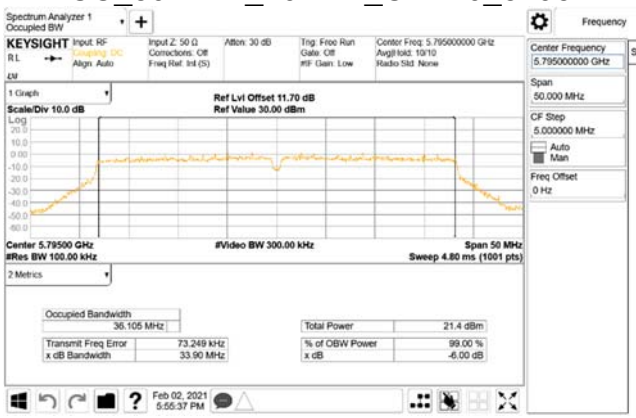


FCC_802.11n_40MHz_Chain0_5755MHz



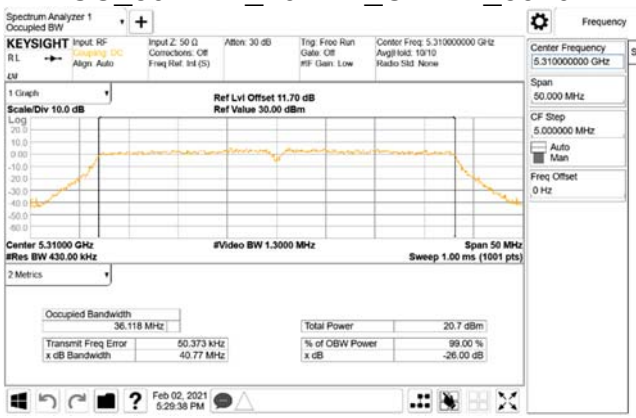
FCC_802.11n_40MHz_Chain1_5230MHz

FCC_802.11n_40MHz_Chain0_5795MHz



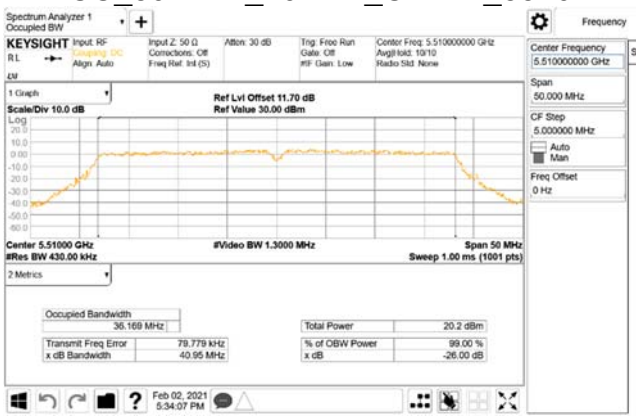
FCC_802.11n_40MHz_Chain1_5270MHz

FCC_802.11n_40MHz_Chain1_5310MHz



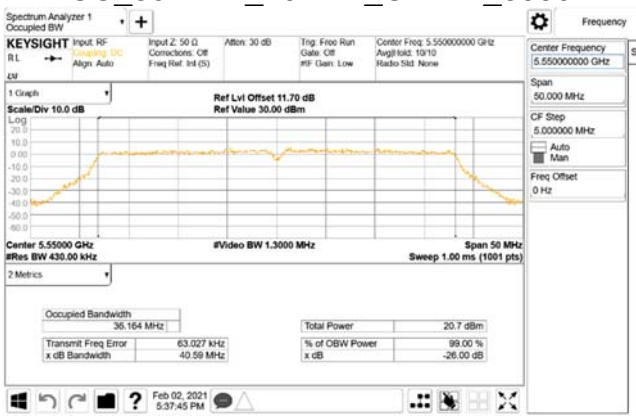
FCC_802.11n_40MHz_Chain1_5670MHz

FCC_802.11n_40MHz_Chain1_5510MHz



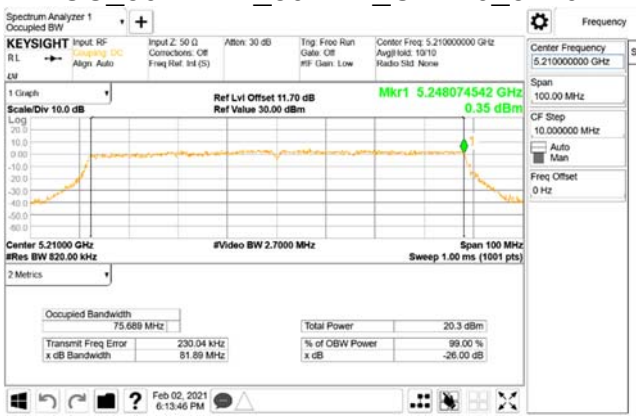
FCC_802.11n_40MHz_Chain1_5755MHz

FCC_802.11n_40MHz_Chain1_5550MHz

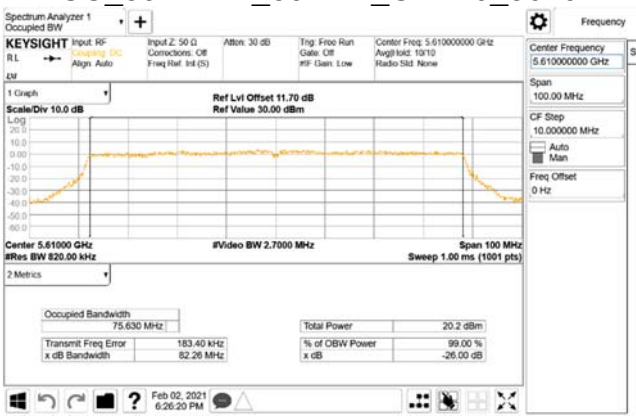


FCC_802.11n_40MHz_Chain1_5795MHz

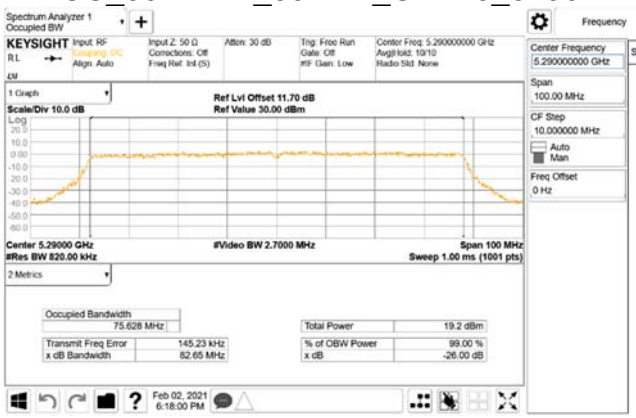
FCC_802.11ac_80MHz_Chain0_5210MHz



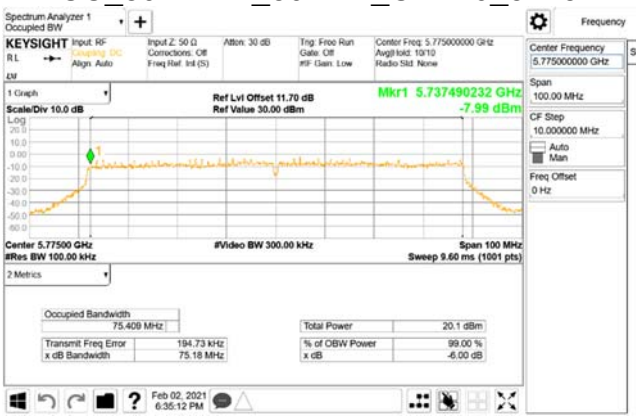
FCC_802.11ac_80MHz_Chain0_5610MHz



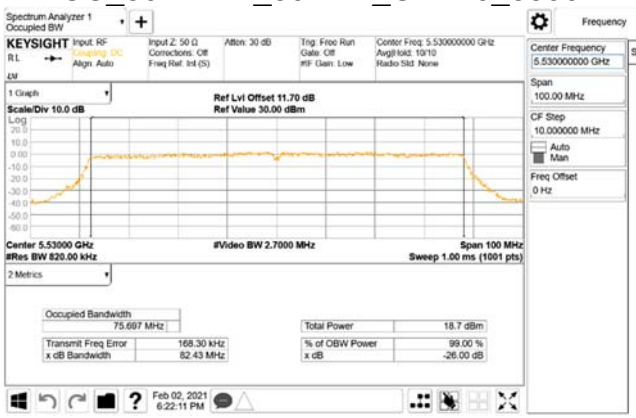
FCC_802.11ac_80MHz_Chain0_5290MHz



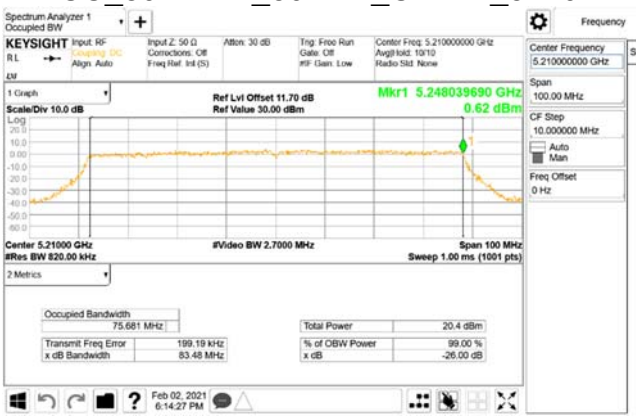
FCC_802.11ac_80MHz_Chain0_5775MHz



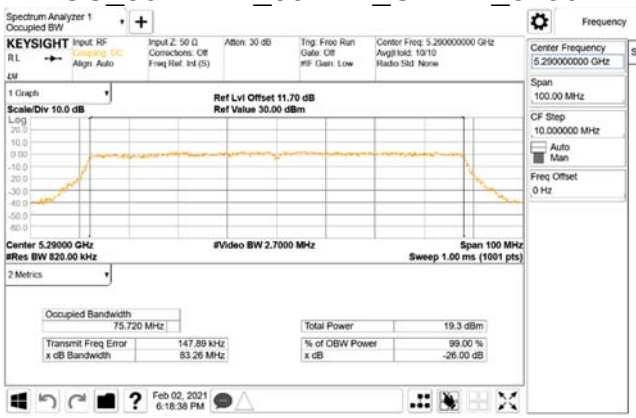
FCC_802.11ac_80MHz_Chain0_5530MHz



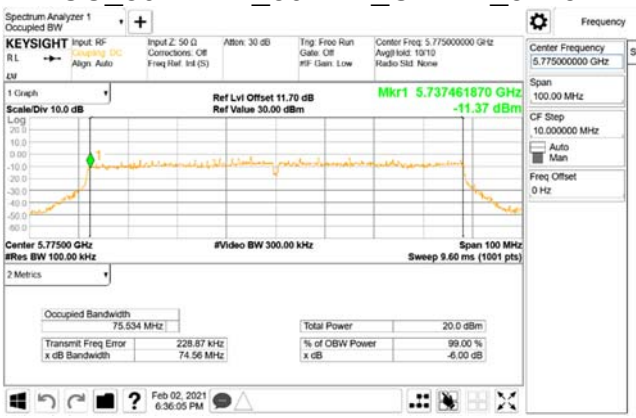
FCC_802.11ac_80MHz_Chain1_5210MHz



FCC_802.11ac_80MHz_Chain1_5290MHz



FCC_802.11ac_80MHz_Chain1_5775MHz



FCC_802.11ac_80MHz_Chain1_5530MHz

FCC_802.11ac_80MHz_Chain1_5610MHz

8.5.3 BW Verification for DFS Function

802.11a_Ch0

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5240	5248.31	< 5250
5745	5736.83	> 5725

802.11n_HT20_Ch0

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5240	5248.90	< 5250
5745	5736.22	> 5725

802.11n_HT20_Ch1

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5240	5248.93	< 5250
5745	5736.24	> 5725

802.11n _HT40_Ch0

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5230	5248.16	< 5250
5755	5737.03	> 5725

802.11n _HT40_Ch1

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5230	5248.17	< 5250
5755	5737.03	> 5725

802.11ac _VHT80_Ch0

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5210	5248.07	< 5250
5775	5737.49	> 5725

802.11ac _VHT80_Ch1

Freq. (MHz)	Measured Freq. (MHz)	Limit (MHz)
5210	5248.04	< 5250
5775	5737.46	> 5725

9 MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT

9.1 Standard Applicable

FCC

OPERZTION Band	EUT CATEGORY		LIMIT
U-NII-1	☐	Access Point (Master device)	1 Watt(30dBm)
	☐	Fixed point-to-point Access Ponit	1 Watt(30dBm)
	☒	Mobile and portable client device	250mW(23.98dBm)
U-NII-2A	☒		250mW(23.98dBm) or 11dBm+10 log B
U-NII-2C	☒		250mW(23.98dBm) or 11dBm+10 log B
U-NII-3	☒		1 Watt(30dBm)
If transmitting antennas of directional gain greater than 6 dBi are used, the Maximum transmit power shall be reduced by the amount in dB that the direction-al gain of the antenna exceeds 6 dBi.			

Note:

As per section F. 2). e). (ii) of FCC KDB 662911 D01
If antenna gains are not equal and each transmit antenna is driven by only one spatial stream, directional gain may be calculated by either of the following formulas.

- $$DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$$

where
Each antenna is driven by no more than one spatial stream;
NSS = the number of independent spatial streams of data;
NANT = the total number of antennas
$g_{j,k} = 10^{Gk/20}$ if the kth antenna is being fed by spatial stream j, or zero if it is not;
G_k is the gain in dBi of the kth antenna.

The antenna gain is not greater than 6 dBi. Therefore, reduction of power is not required.

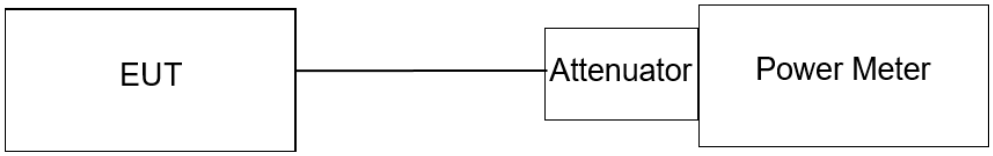
9.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter
4. Power Meter is used as the auxiliary test equipment to conduct the output power measurement.
5. Record the max. reading and add 10 log(1/duty cycle).
6. Repeat above procedures until all frequency (low, middle, and high channel) measured were complete.

9.3 Measurement Equipment Used

SGS Conducted Room					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010B	MY59071573	06/26/2020	06/25/2021
Power Meter	Anritsu	ML2496A	1512003	07/23/2020	07/22/2021
Power Sensor	Anritsu	MA2411B	1339378	07/23/2020	07/22/2021
Power Sensor	Anritsu	MA2411B	1339379	07/23/2020	07/22/2021
Attenuator	Marvelous	MVE2213-10	RF06	11/19/2020	11/18/2021
Attenuator	Marvelous	WATT-218FS-10	RF18	11/19/2020	11/18/2021
DC Block	PASTERNACK	PE8210	RF153	11/19/2020	11/18/2021

9.4 Test Set-up



9.5 Measurement Result

9.5.1 Conducted output power (FCC)

802.11a_Ch0

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	6	14.46	27.899	23.98	PASS
44	5220	6	**14.94**	31.159	23.98	PASS
48	5240	6	14.68	29.349	23.98	PASS
52	5260	6	14.79	30.101	23.98 or 11+10log(B) = 24.45	PASS
60	5300	6	**14.80**	30.171	23.98 or 11+10log(B) = 24.24	PASS
64	5320	6	14.64	29.079	23.98 or 11+10log(B) = 24.45	PASS
100	5500	6	14.16	26.037	23.98 or 11+10log(B) = 24.58	PASS
116	5580	6	**14.79**	30.101	23.98 or 11+10log(B) = 24.63	PASS
140	5700	6	14.40	27.516	23.98 or 11+10log(B) = 24.41	PASS
149	5745	6	14.49	28.092	30	PASS
157	5785	6	**14.69**	29.416	30	PASS
165	5825	6	14.35	27.201	30	PASS

802.11a_Ch1

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	6	14.34	27.139	23.98	PASS
44	5220	6	14.02	25.211	23.98	PASS
48	5240	6	14.03	25.269	23.98	PASS
52	5260	6	14.04	25.327	23.98 or 11+10log(B) = 24.45	PASS
60	5300	6	14.03	25.269	23.98 or 11+10log(B) = 24.24	PASS
64	5320	6	14.09	25.620	23.98 or 11+10log(B) = 24.45	PASS
100	5500	6	14.12	25.798	23.98 or 11+10log(B) = 24.58	PASS
116	5580	6	14.23	26.460	23.98 or 11+10log(B) = 24.63	PASS
140	5700	6	14.45	27.835	23.98 or 11+10log(B) = 24.41	PASS
149	5745	6	14.12	25.798	30	PASS
157	5785	6	14.10	25.679	30	PASS
165	5825	6	14.11	25.739	30	PASS

802.11n_HT20_Ch0

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	MCS0	15.50	35.497	23.98	PASS
44	5220	MCS0	15.68	36.999	23.98	PASS
48	5240	MCS0	15.72	37.342	23.98	PASS
52	5260	MCS0	15.88	38.743	23.98 or 11+10log(B) = 24.54	PASS
60	5300	MCS0	15.62	36.492	23.98 or 11+10log(B) = 24.56	PASS
64	5320	MCS0	15.33	34.135	23.98 or 11+10log(B) = 24.48	PASS
100	5500	MCS0	15.05	32.003	23.98 or 11+10log(B) = 24.40	PASS
116	5580	MCS0	15.53	35.743	23.98 or 11+10log(B) = 24.60	PASS
140	5700	MCS0	15.09	32.299	23.98 or 11+10log(B) = 24.66	PASS
149	5745	MCS0	15.31	33.978	30	PASS
157	5785	MCS0	15.45	35.091	30	PASS
165	5825	MCS0	15.13	32.598	30	PASS

802.11n_HT20_Ch1

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	MCS0	15.08	32.225	23.98	PASS
44	5220	MCS0	15.88	38.743	23.98	PASS
48	5240	MCS0	15.87	38.654	23.98	PASS
52	5260	MCS0	15.92	39.102	23.98 or 11+10log(B) = 24.58	PASS
60	5300	MCS0	15.94	39.282	23.98 or 11+10log(B) = 24.35	PASS
64	5320	MCS0	15.01	31.710	23.98 or 11+10log(B) = 24.73	PASS
100	5500	MCS0	15.12	32.523	23.98 or 11+10log(B) = 24.70	PASS
116	5580	MCS0	15.28	33.744	23.98 or 11+10log(B) = 24.43	PASS
140	5700	MCS0	15.82	38.212	23.98 or 11+10log(B) = 24.46	PASS
149	5745	MCS0	14.60	28.853	30	PASS
157	5785	MCS0	15.07	32.151	30	PASS
165	5825	MCS0	15.08	32.225	30	PASS

802.11n_HT20_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1				
36	5180	MCS8	15.31	15.04	18.43	69.652	23.98	PASS
44	5220	MCS8	15.32	14.83	18.33	68.142	23.98	PASS
48	5240	MCS8	15.68	14.79	**18.51**	70.958	23.98	PASS
52	5260	MCS8	15.71	14.75	**18.51**	70.937	23.98 or 11+10log(B) = 24.54	PASS
60	5300	MCS8	15.45	14.69	18.34	68.216	23.98 or 11+10log(B) = 24.35	PASS
64	5320	MCS8	15.14	14.77	18.21	66.240	23.98 or 11+10log(B) = 24.48	PASS
100	5500	MCS8	14.96	14.83	18.15	65.279	23.98 or 11+10log(B) = 24.40	PASS
116	5580	MCS8	15.43	15.04	**18.49**	70.658	23.98 or 11+10log(B) = 24.43	PASS
140	5700	MCS8	15.01	14.69	18.11	64.643	23.98 or 11+10log(B) = 24.46	PASS
149	5745	MCS8	14.83	14.53	17.93	62.156	30	PASS
157	5785	MCS8	15.41	14.79	**18.36**	68.601	30	PASS
165	5825	MCS8	15.01	14.68	18.10	64.571	30	PASS

802.11n_HT40_Ch0

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
38	5190	MCS0	14.72	29.668	23.98	PASS
46	5230	MCS0	14.94	31.210	23.98	PASS
54	5270	MCS0	14.96	31.354	23.98 or 11+10log(B) = 27.08	PASS
62	5310	MCS0	14.75	29.874	23.98 or 11+10log(B) = 27.07	PASS
102	5510	MCS0	14.75	29.874	23.98 or 11+10log(B) = 27.13	PASS
110	5550	MCS0	13.65	23.190	23.98 or 11+10log(B) = 27.11	PASS
134	5670	MCS0	14.85	30.570	23.98 or 11+10log(B) = 27.11	PASS
151	5755	MCS0	14.83	30.429	30	PASS
159	5795	MCS0	14.96	31.354	30	PASS

802.11n_HT40_Ch1

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
38	5190	MCS0	14.62	28.993	23.98	PASS
46	5230	MCS0	14.44	27.816	23.98	PASS
54	5270	MCS0	14.45	27.880	23.98 or 11+10log(B) = 27.11	PASS
62	5310	MCS0	14.51	28.268	23.98 or 11+10log(B) = 27.10	PASS
102	5510	MCS0	14.66	29.261	23.98 or 11+10log(B) = 27.12	PASS
110	5550	MCS0	13.48	22.299	23.98 or 11+10log(B) = 27.08	PASS
134	5670	MCS0	14.68	29.396	23.98 or 11+10log(B) = 27.09	PASS
151	5755	MCS0	14.11	25.781	30	PASS
159	5795	MCS0	14.51	28.268	30	PASS

802.11n_HT40_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1				
38	5190	MCS8	14.38	13.83	17.71	58.978	23.98	PASS
46	5230	MCS8	14.6	13.82	**17.82**	60.544	23.98	PASS
54	5270	MCS8	14.93	13.75	**17.97**	62.707	23.98 or 11+10log(B) = 27.08	PASS
62	5310	MCS8	14.51	13.76	17.74	59.489	23.98 or 11+10log(B) = 27.07	PASS
102	5510	MCS8	14.05	14.01	17.62	57.853	23.98 or 11+10log(B) = 27.12	PASS
110	5550	MCS8	12.58	12.15	15.96	39.478	23.98 or 11+10log(B) = 27.08	PASS
134	5670	MCS8	14.21	13.88	**17.64**	58.095	23.98 or 11+10log(B) = 27.09	PASS
151	5755	MCS8	14.16	13.44	17.41	55.057	30	PASS
159	5795	MCS8	14.31	13.58	**17.55**	56.932	30	PASS

802.11ac_VHT80_Ch0

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
42	5210	MCS0	13.75	23.720	23.98	PASS
58	5290	MCS0	11.18	13.126	23.98 or 11+10log(B) = 30.17	PASS
106	5530	MCS0	13.44	22.086	23.98 or 11+10log(B) = 30.16	PASS
122	5610	MCS0	13.58	22.810	23.98 or 11+10log(B) = 30.15	PASS
155	5775	MCS0	13.61	22.968	30	PASS

802.11ac_VHT80_Ch1

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
42	5210	MCS0	13.57	22.757	23.98	PASS
58	5290	MCS0	11.01	12.622	23.98 or 11+10log(B) = 30.20	PASS
106	5530	MCS0	13.98	25.010	23.98 or 11+10log(B) = 30.18	PASS
122	5610	MCS0	13.31	21.435	23.98 or 11+10log(B) = 30.18	PASS
155	5775	MCS0	13.51	22.445	30	PASS

802.11ac_VHT80_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1				
42	5210	MCS0	12.46	12.09	**16.09**	40.648	23.98	PASS
58	5290	MCS0	10.46	10.02	**14.06**	25.451	23.98 or 11+10log(B) = 30.17	PASS
106	5530	MCS0	13.36	13	**17.00**	50.063	23.98 or 11+10log(B) = 30.16	PASS
122	5610	MCS0	12.06	11.75	15.72	37.318	23.98 or 11+10log(B) = 30.15	PASS
155	5775	MCS0	11.98	11.64	**15.62**	36.516	30	PASS

10 MAXIMUM POWER SPECTRAL DENSITY

10.1 Standard Applicable

FCC

OPERZTION Band	EUT CATEGORY		LIMIT
U-NII-1	☐	Access Point (Master device)	17dBm/ MHz
	☐	Fixed point-to-point Access Ponit	
	☒	Mobile and portable client device	11dBm/ MHz
U-NII-2A	☒		11dBm/ MHz
U-NII-2C	☒		11dBm/ MHz
U-NII-3	☒		30dBm/ 500kHz
If transmitting antennas of directional gain greater than 6 dBi are used, the Maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.			

Note:

As per section F. 2). e). (ii) of FCC KDB 662911 D01
If antenna gains are not equal and each transmit antenna is driven by only one spatial stream, directional gain may be calculated by either of the following formulas.

- $$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

where

Each antenna is driven by no more than one spatial stream;
NSS = the number of independent spatial streams of data;
NANT = the total number of antennas
$g_{j,k}$ = / 20 10Gk if the kth antenna is being fed by spatial stream j, or zero if it is not;
G_k is the gain in dBi of the kth antenna.

The antenna gain is not greater than 6 dBi. Therefore, reduction of power is not required.

10.2 Measurement Procedure

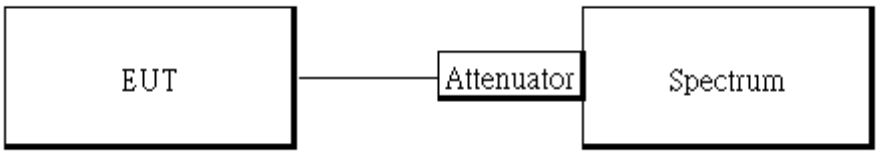
1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to Spectrum.
4. **For U-NII1, U-NII-2A, U-NII-2C Band**:
   Set RBW=1MHz, VBW=3MHz, where span is enough to capture the entire bandwidth, Sweep time = Auto (601 pts), detector = sample, traces 100 sweeps of video averaging. (SA-2 with the omission of procedure x, the integration with 26dB EBW bandwidth)
   For U-NII-3 Band:
   Set RBW= approximately 1% of EBW, VBW≥ 3RBW, where span is enough to capture the entire bandwidth, Sweep time = Auto, detector = RMS or sample, traces 100 sweeps of video averaging.
5. User the cursor on spectrum to peak search the highest level of trace
6. Record the max. reading and add 10 log(1/duty cycle).
7. Repeat above procedures until all default test channel (low, middle, and high) was complete.
8. MIMO mode: offset is set following “measure and add 10 Log (N)” on spectrum to measure the PSD for MIMO mode. Offset = cable loss + 10 log (N), where N is number of transmitting antenna.

Note: For the test of PSD at MIMO mode, the highest emission of worst case employing Measure and add 10 log (N) technical is reported after the comparison between Main Antenna at single transmitting mode and Aux that yields the higher value. The MIMO transmitting mode produces higher value of outcome.

10.3 Measurement Equipment Used

SGS Conducted Room					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010B	MY59071573	06/26/2020	06/25/2021
Attenuator	Marvelous	MVE2213-10	RF06	11/19/2020	11/18/2021
Attenuator	Marvelous	WATT-218FS-10	RF18	11/19/2020	11/18/2021
DC Block	PASTERNACK	PE8210	RF153	11/19/2020	11/18/2021

10.4 Test Set-up



10.5 Measurement Result

10.5.1 Power spectral density

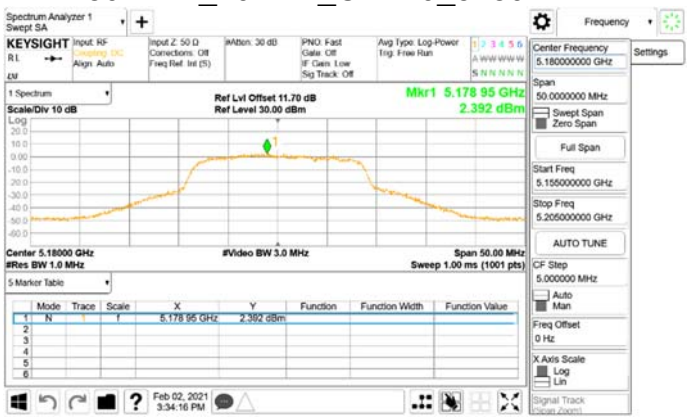
POWER DENSITY 802.11a MODE							
Frequency (MHz)	ch0 meas PSD (dBm/MHz)	ch1 meas PSD (dBm/MHz)	Duty Factor (dB)	Maxmum Corr'd PSD(dBm/MHz)		Limit	Margin (dB)
5180.00	2.39	0.00	0.21	2.60		11.00 dBm/MHz	-8.40
5220.00	2.46	0.00	0.21	2.67		11.00 dBm/MHz	-8.33
5240.00	2.95	0.00	0.21	3.16		11.00 dBm/MHz	-7.84
5260.00	-0.46	0.00	0.21	-0.25		11.00 dBm/MHz	-11.25
5300.00	0.87	0.00	0.21	1.08		11.00 dBm/MHz	-9.92
5320.00	-0.10	0.00	0.21	0.11		11.00 dBm/MHz	-10.89
5500.00	1.93	0.00	0.21	2.14		11.00 dBm/MHz	-8.86
5580.00	2.12	0.00	0.21	2.33		11.00 dBm/MHz	-8.67
5700.00	3.12	0.00	0.21	3.33		11.00 dBm/MHz	-7.67
Frequency (MHz)	ch0 meas PSD (dBm/300kHz)	ch1 meas PSD (dBm/300kHz)	Duty Factor (dB)	10log (500kHz/RBW) Factor(dB)	Maxmum Corr'd PSD (dBm/500kHz)	Limit	Margin (dB)
5745.00	-2.06	0.00	0.21	2.22	0.37	30.00 dBm/500kHz	-29.63
5785.00	-3.29	0.00	0.21	2.22	-0.86	30.00 dBm/500kHz	-30.86
5825.00	-2.85	0.00	0.21	2.22	-0.42	30.00 dBm/500kHz	-30.42

POWER DENSITY 802.11n HT20 MODE							
Frequency (MHz)	ch0 meas PSD (dBm/MHz)	ch1 meas PSD (dBm/MHz)	Duty Factor (dB)	Maxmum Corr'd PSD(dBm/MHz)		Limit	Margin (dB)
5180.00	0.12	1.58	0.24	4.16		11.00 dBm/MHz	-6.84
5220.00	-0.23	1.05	0.24	3.71		11.00 dBm/MHz	-7.29
5240.00	0.40	1.99	0.24	4.52		11.00 dBm/MHz	-6.48
5260.00	1.21	1.28	0.24	4.50		11.00 dBm/MHz	-6.50
5300.00	-1.02	0.40	0.24	3.00		11.00 dBm/MHz	-8.00
5320.00	0.45	1.14	0.24	4.06		11.00 dBm/MHz	-6.94
5500.00	-0.03	0.39	0.24	3.44		11.00 dBm/MHz	-7.56
5580.00	2.54	1.32	0.24	5.22		11.00 dBm/MHz	-5.78
5700.00	0.98	2.54	0.24	5.08		11.00 dBm/MHz	-5.92
Frequency (MHz)	ch0 meas PSD (dBm/300kHz)	ch1 meas PSD (dBm/300kHz)	Duty Factor (dB)	10log (500kHz/RBW) Factor(dB)	Maxmum Corr'd PSD(dBm/500kHz)	Limit	Margin (dB)
5745.00	-4.12	-3.92	0.24	2.22	1.45	30.00 dBm/500kHz	-28.55
5785.00	-3.50	-2.98	0.24	2.22	2.24	30.00 dBm/500kHz	-27.76
5825.00	-2.60	-2.04	0.24	2.22	3.16	30.00 dBm/500kHz	-26.84

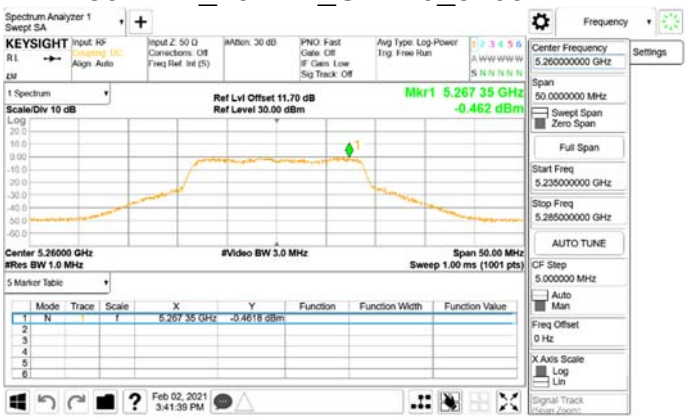
POWER DENSITY 802.11n HT40 MODE							
Frequency (MHz)	ch0 meas PSD (dBm/MHz)	ch1 meas PSD (dBm/MHz)	Duty Factor (dB)	Maxmum Corr'd PSD(dBm/MHz)		Limit	Margin (dB)
5190.00	-4.25	-2.78	0.58	0.14		11.00 dBm/MHz	-10.86
5230.00	-4.51	-5.36	0.58	-1.32		11.00 dBm/MHz	-12.32
5270.00	-5.62	-5.26	0.58	-1.85		11.00 dBm/MHz	-12.85
5310.00	-3.41	-2.97	0.58	0.41		11.00 dBm/MHz	-10.59
5510.00	-4.44	-3.01	0.58	-0.08		11.00 dBm/MHz	-11.08
5550.00	-5.12	-5.55	0.58	-1.74		11.00 dBm/MHz	-12.74
5670.00	-5.28	-6.10	0.58	-2.08		11.00 dBm/MHz	-13.08
Frequency (MHz)	ch0 meas PSD (dBm/300kHz)	ch1 meas PSD (dBm/300kHz)	Duty Factor (dB)	10log (500kHz/RBW) Factor(dB)	Maxmum Corr'd PSD(dBm/500kHz)	Limit	Margin (dB)
5755.00	-9.95	-8.49	0.58	2.22	-3.35	30.00 dBm/500kHz	-33.35
5795.00	-7.93	-8.91	0.58	2.22	-2.58	30.00 dBm/500kHz	-32.58

POWER DENSITY 802.11ac VHT80 MODE							
Frequency (MHz)	ch0 meas PSD (dBm/MHz)	ch1 meas PSD (dBm/MHz)	Duty Factor (dB)	Maxmum Corr'd PSD(dBm/MHz)		Limit	Margin (dB)
5210.00	-7.68	-8.92	0.80	-4.45		11.00 dBm/MHz	-15.45
5290.00	-10.94	-7.75	0.80	-5.25		11.00 dBm/MHz	-16.25
5530.00	-9.49	-10.92	0.80	-6.34		11.00 dBm/MHz	-17.34
5610.00	-9.27	-5.04	0.80	-2.85		11.00 dBm/MHz	-13.85
Frequency (MHz)	ch0 meas PSD (dBm/300kHz)	ch1 meas PSD (dBm/300kHz)	Duty Factor (dB)	10log (500kHz/RBW) Factor(dB)	Maxmum Corr'd PSD(dBm/500kHz)	Limit	Margin (dB)
5775.00	-13.34	-12.57	0.80	2.22	-6.91	30.00 dBm/500kHz	-36.91

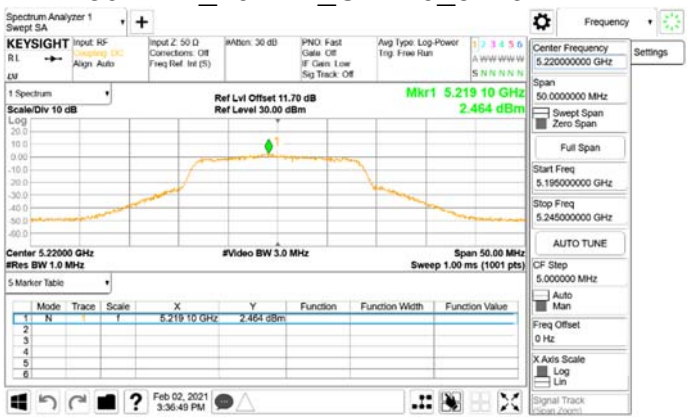
802.11a_20MHz_Chain0_5180MHz



802.11a_20MHz_Chain0_5260MHz

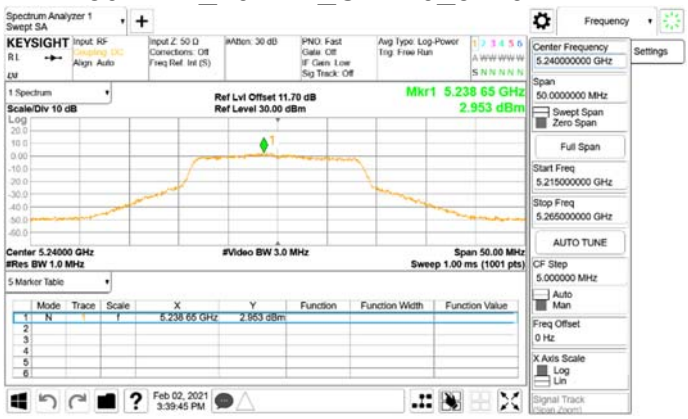


802.11a_20MHz_Chain0_5220MHz



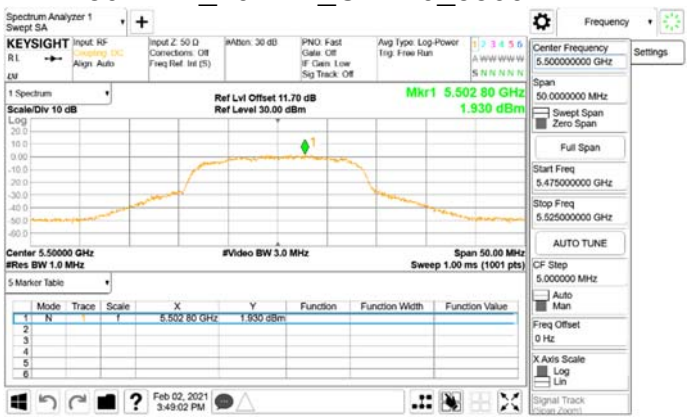
802.11a_20MHz_Chain0_5300MHz

802.11a_20MHz_Chain0_5240MHz



802.11a_20MHz_Chain0_5320MHz

802.11a_20MHz_Chain0_5500MHz

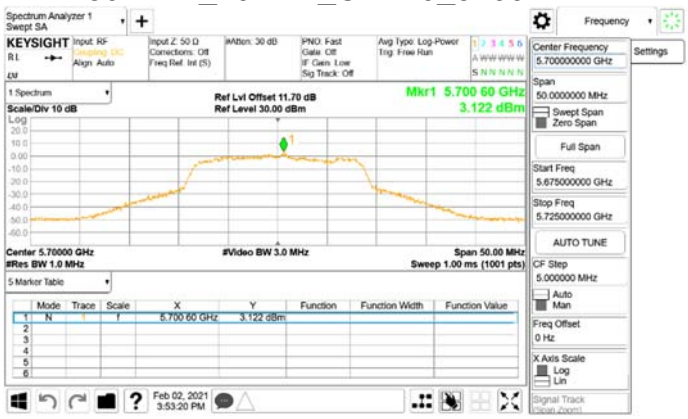


802.11a_20MHz_Chain0_5745MHz

802.11a_20MHz_Chain0_5580MHz

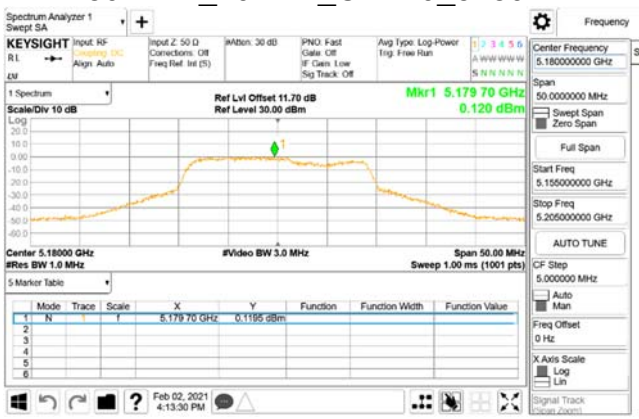
802.11a_20MHz_Chain0_5785MHz

802.11a_20MHz_Chain0_5700MHz



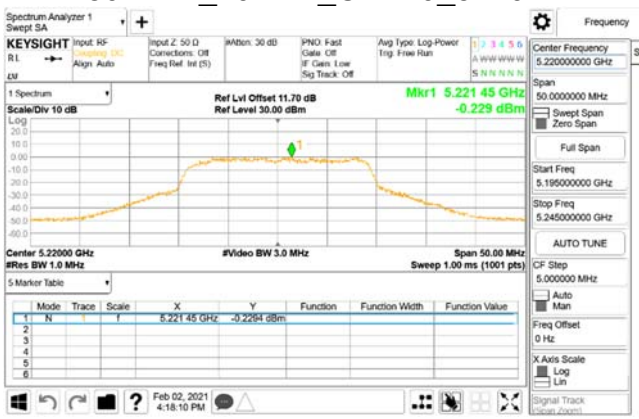
802.11a_20MHz_Chain0_5825MHz

802.11n_20MHz_Chain0_5180MHz



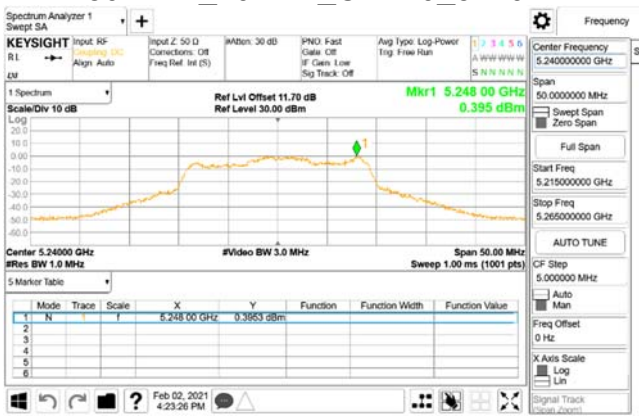
802.11n_20MHz_Chain0_5260MHz

802.11n_20MHz_Chain0_5220MHz

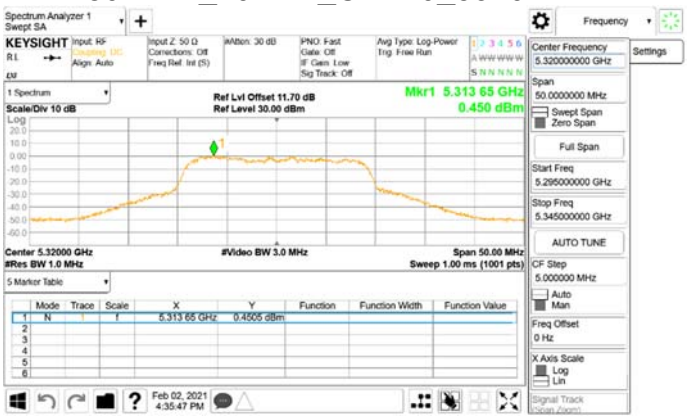


802.11n_20MHz_Chain0_5300MHz

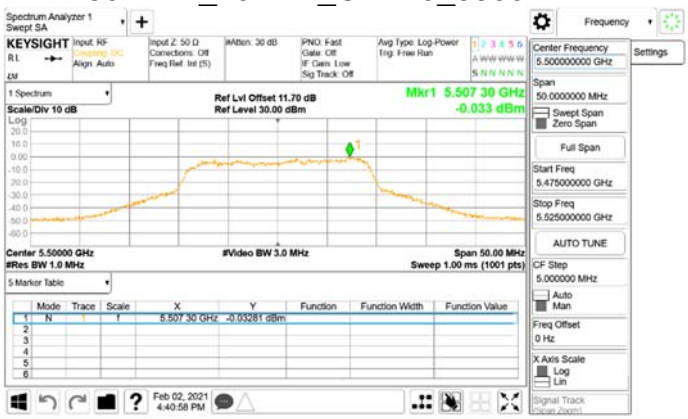
802.11n_20MHz_Chain0_5240MHz



802.11n_20MHz_Chain0_5320MHz

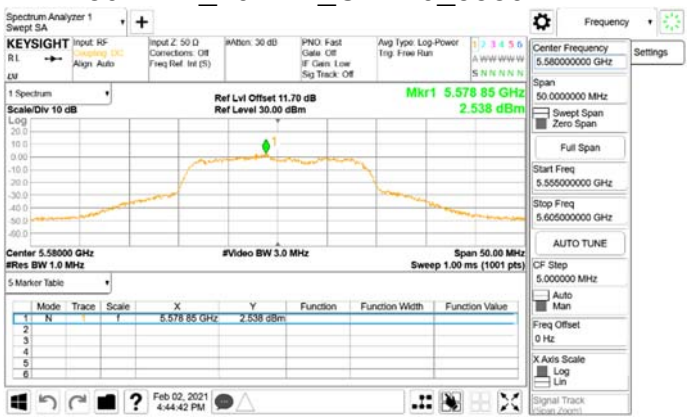


802.11n_20MHz_Chain0_5500MHz



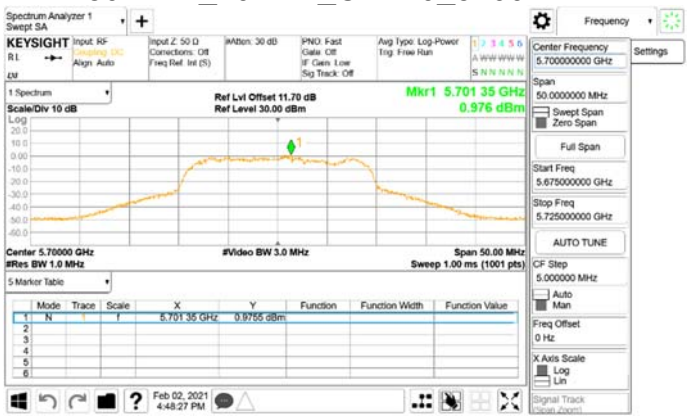
802.11n_20MHz_Chain0_5745MHz

802.11n_20MHz_Chain0_5580MHz



802.11n_20MHz_Chain0_5785MHz

802.11n_20MHz_Chain0_5700MHz



802.11n_20MHz_Chain0_5825MHz