TEST REPORT

Reference No.	:	WTF22D09183192W004
FCC ID	:	2A6J9E120-FCWP
Applicant	:	Bkav corporation
Address	:	2nd Floor, HH1 Building, Yen Hoa Ward, Cau Giay District, Ha Noi, 10 0000 Vietnam
Manufacturer	:	Bkav corporation
Address	:	2nd Floor, HH1 Building, Yen Hoa Ward, Cau Giay District, Ha Noi, 10 0000 Vietnam
Product	:	AI Box
Model(s)	:	E120-FCWP
Standards	:	CFR47 FCC Part 15 E Section 15.407
Date of Receipt sample	:	2022-09-13
Date of Test	:	2022-09-13 to 2022-10-08
Date of Issue	:	2022-10-09
Test Result	:	**Pass**

Remarks:
The 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.

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Approved by:

Deval Qin / Designated Reviewer

2 Contents

3 Revision History

Test Report No.	Date of Receipt Sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTF22D09183192W004	2022-09-13	2022-09-13 to 2022-10-08	2022-10-09	Original	-	Valid

4 General Information

4.1 General Description of E.U.T.

Product:	AI Box
Model(s):	E120-FCWP
Model Description:	N/A
Bluetooth Version:	Bluetooth v5.0 with BLE
Wi-Fi Specification:	2.4G-802.11b/g/n HT20/n HT40 5G-802.11a/ n(HT20/40)/ac (HT20/40/80)
Hardware Version:	V2.0.1
Software Version:	1.0.0.5

4.2 Details of E.U.T.

Operation Frequency:	U-NII-1 802.11a/n(HT20)/ac (HT20), 5180-5240MHz 4CH 802.11n(HT40)/ac (HT40), 5190-5230MHz 2CH 802.11ac (HT80), 5210MHz 1CH U-NII-3 802.11a/n(HT20)/ac (HT20), 5745-5825MHz 5CH 802.11n(HT40)/ac (HT40), 5755-5795MHz 2CH 802.11ac (HT80), 5775MHz 1CH
Conducted output power:	Ant. 1 16.43 dBm, Ant. 2 16.38 dBm, Total: 19.34dBm Max.
Type of Modulation:	802.11a: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
Antenna installation:	External antenna with RP-SMA connector
Antenna Gain:	Max. Peak 3.7dBi
Ratings:	DC12V 1A/PoE
Adapter:	Manufacturer: XING YUAN ELECTRONICS CO., LTD Model No.: XY12J-1201000Q-UW Input: 100-240VAC, 0.5A Max. 50/60Hz Output: 12V ⎓ 1.0A
DFS Function:	Not support
TPC Function:	Not support

4.3 Channel List

U-NII-1 (5.15-5.25GHz)			
channel	**Frequency(MHz)**	**channel**	**Frequency(MHz)**
36	5180	38	5190
40	5200	42	5210
44	5220	46	5230
48	5240		

U-NII-3 (5.725-5.85GHz)			
channel	**Frequency(MHz)**	**channel**	**Frequency(MHz)**
149	5745	151	5755
153	5765	155	5775
157	5785	159	5795
161	5805	165	5825

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:

For 802.11a/n/ac (HT20):

channel	**Frequency(MHz)**	**channel**	**Frequency(MHz)**
36	5180	40	5200
48	5240		

channel	**Frequency(MHz)**	**channel**	**Frequency(MHz)**
149	5745	157	5785
165	5825		

For 802.11n/ac(HT40):

channel	**Frequency(MHz)**	**channel**	**Frequency(MHz)**
38	5190	46	5230

channel	**Frequency(MHz)**	**channel**	**Frequency(MHz)**
151	5755	159	5795

For 802.11ac(HT80):

channel	**Frequency(MHz)**	**channel**	**Frequency(MHz)**
42	5210		

channel	**Frequency(MHz)**	**channel**	**Frequency(MHz)**
155	5775		

5 Test Mode Description

During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Transmitting duty cycle is 100%.

The software is installed in operation system, named “QRCT4.exe” Version 4

Test Items	Mode	Data Rate	TX/RX
Radiated Emissions	802.11a (HT20)	6 Mbps	TX
	802.11n (HT20/40)	MCS0	TX
	802.11ac(HT20/40/80)	MCS0	TX
Duty Cycle	802.11a (HT20)	6 Mbps	TX
	802.11n (HT20/40)	MCS0	TX
	802.11ac(HT20/40/80)	MCS0	TX
Band Edge	802.11a (HT20)	6 Mbps	TX
	802.11n (HT20/40)	MCS0	TX
	802.11ac(HT20/40/80)	MCS0	TX
6dB Bandwidth	802.11a (HT20)	6 Mbps	TX
	802.11n (HT20/40)	MCS0	TX
	802.11ac(HT20/40/80)	MCS0	TX
26dB Bandwidth and 99% Occupied Bandwidth	802.11a (HT20)	6 Mbps	TX
	802.11n (HT20/40)	MCS0	TX
	802.11ac(HT20/40/80)	MCS0	TX
Conducted Output Power	802.11a (HT20)	6 Mbps	TX
	802.11n (HT20/40)	MCS0	TX
	802.11ac(HT20/40/80)	MCS0	TX
Power Spectral Density	802.11a (HT20)	6 Mbps	TX
	802.11n (HT20/40)	MCS0	TX
	802.11ac(HT20/40/80)	MCS0	TX
Frequency Stability	Un-modulation	/	TX

5.1 Test Facility

The test facility has a test site registered with the following organizations:

ISED CAB identifier: CN0013. Test Firm Registration No.: 7760A.

Waltek Testing Group Co., Ltd. Has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration number 7760A, October 15, 2016.

FCC Designation No.: CN1201. Test Firm Registration No.: 523476.

Waltek Testing Group Co., Ltd. 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 our files. Registration number 523476, September 10, 2019.

5.2 Subcontracted

Whether parts of tests for the product have been subcontracted to other labs:

☐ Yes ☒ No

If Yes, list the related test items and lab information:

Test Lab: N/A

Lab address: N/A

Test items: N/A

5.3 Abnormalities from Standard Conditions

None.

6 Equipment Used during Test

6.1 Equipments List

Conducted Emissions (Test site 1#)						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal. Date**	**Valid**
1	EMI Test Receiver	R&S	ESCI	100947	2022-08-01	1Year
2	LISN	R&S	ENV216	100115	2022-08-01	1Year
3	Cable	Top	TYPE16(3.5M)	-	2022-08-01	1Year
4	Test software	EZ-EMC	RA-03A1-1	-	N/A	N/A
Conducted Emissions (Test site 2#)						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal. Date**	**Valid**
1	EMI Test Receiver	R&S	ESCI	101155	2022-08-01	1Year
2	LISN	SCHWARZBECK	NSLK 8128	8128-259	2022-08-01	1Year
3	Limiter	CYBERTEK	EM5010	261115-001-0024	2022-08-01	1Year
4	Cable	Laplace	RF300	-	2022-08-01	1Year
5	Test software	EZ-EMC	RA-03A1-1	-	N/A	N/A
3m Semi-anechoic Chamber for Radiation Emissions (Test site 1#)						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal. Date**	**Valid**
1	Spectrum Analyzer	R&S	FSP30	100091	2022-04-28	1Year
2	Amplifier	Agilent	8447D	2944A10178	2022-08-01	1Year
3	Tri-log Broadband Antenna	SCHWARZBECK	VULB9163	336	2022-08-07	1Year
4	Coaxial Cable	Top	TYPE16(13M)	-	2022-04-28	1Year
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120D	667	2022-04-28	1Year
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	2022-07-29	1Year
7	Broadband Preamplifier	COMPLIANCE	PAP-1G18	2004	2022-04-28	1Year
8	Coaxial Cable	Top	ZT26-NJ-NJ-8M/FA	-	2022-08-01	1Year
9	Microwave Broadband Preamplifier	SCHWARZBECK	BBV 9721	100472	2022-08-01	1Year
10	Spectrum Analyzer	R&S	FSP40	100501	2022-08-01	1Year
11	Coaxial Cable	Top	ZT40-2.92J-2.92J-2.0M	17100919	2022-08-01	1Year
12	Test software	EZ-EMC	RA-03A1-1	-	N/A	N/A
3m Semi-anechoic Chamber for Radiation Emissions (Test site 2#)						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No**	**Last Cal. Date**	**Valid**
1	Test Receiver	R&S	ESCI	101296	2022-04-28	1Year
2	Tri-log Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2021-10-31	1Year
3	Active Loop Antenna	Com-Power	AL-130R	10160007	2022-05-02	1Year
4	Amplifier	ANRITSU	MH648A	M43381	2022-04-28	1Year
5	Cable	HUBER+SUHNER	CBL2	525178	2022-04-28	1Year
6	Test software	EZ-EMC	RA-03A1-1	-	N/A	N/A

RF Conducting Testing						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No**	**Last Cal. Date**	**Valid**
1	EXA Signal Analyzer	Keysight	N9010A	MY50520207	2022-04-28	1Year
2	Spectrum Analyzer	R&S	FSP40	100501	2022-08-01	1Year

6.2 Description of Support Units

Equipment	Manufacturer	Model No.	Series No.
/	/	/	/

6.3 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	± 1 x 10^{-6}
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Radiated Spurious Emissions test	± 5.03 dB (30M~1000MHz)
	± 5.47 dB (1000M~25000MHz)
Conducted Spurious Emissions test	± 3.64 dB (AC mains 150KHz~30MHz)

6.4 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R. China.

7 Test Summary

Test Items	Test Requirement	Result
Conducted Emissions	15.207(a) 15.407(b)(9)	PASS
Radiated Emissions	15.407(b) (9) 15.205(a) 15.209(a)	PASS
Duty Cycle	KDB 789033	-
6dB Bandwidth	15.407(e)	PASS
26 dB Emission Bandwidth & 99% Occupied Bandwidth	15.407(a)	PASS
Maximum Conducted Output Power	15.407(a)	PASS
Power Spectral Density	15.407(a)()	PASS
Restricted bands around fundamental frequency	15.407(b)	PASS
Frequency stability	15.407(g)	PASS
Antenna Requirement	15.203	PASS
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	PASS
Note: “N/A” indicates not applicable. “—" indicates the results need not be judged.		

8 Conducted Emission

Test Requirement: 47CFR FCC Part15 Subpart C §15.207

Test Method: ANSI C63.10:2013

Test Result: PASS

Frequency Range: 150kHz to 30MHz

Limit:

Frequency (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5.0	56	46
5.0 to 30	60	50
*Decreases with the logarithm of the frequency.		

8.1 E.U.T. Operation

Operating Environment:

Temperature: 22.4 °C

Humidity: 54.7 % RH

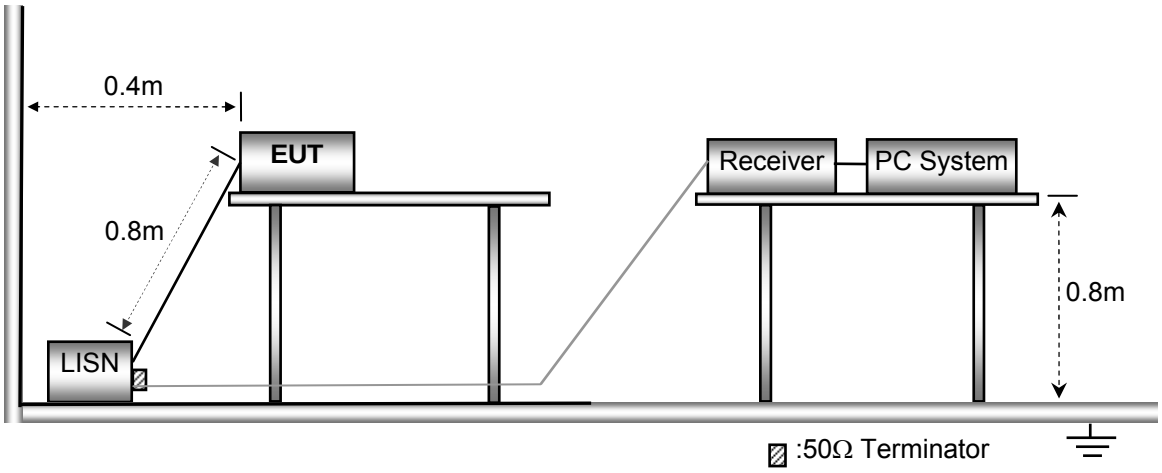
Atmospheric Pressure: 101.3kPa

Test Voltage: AC 120V, 60Hz

EUT Operation: Please refer to section 5.

8.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10:2013.



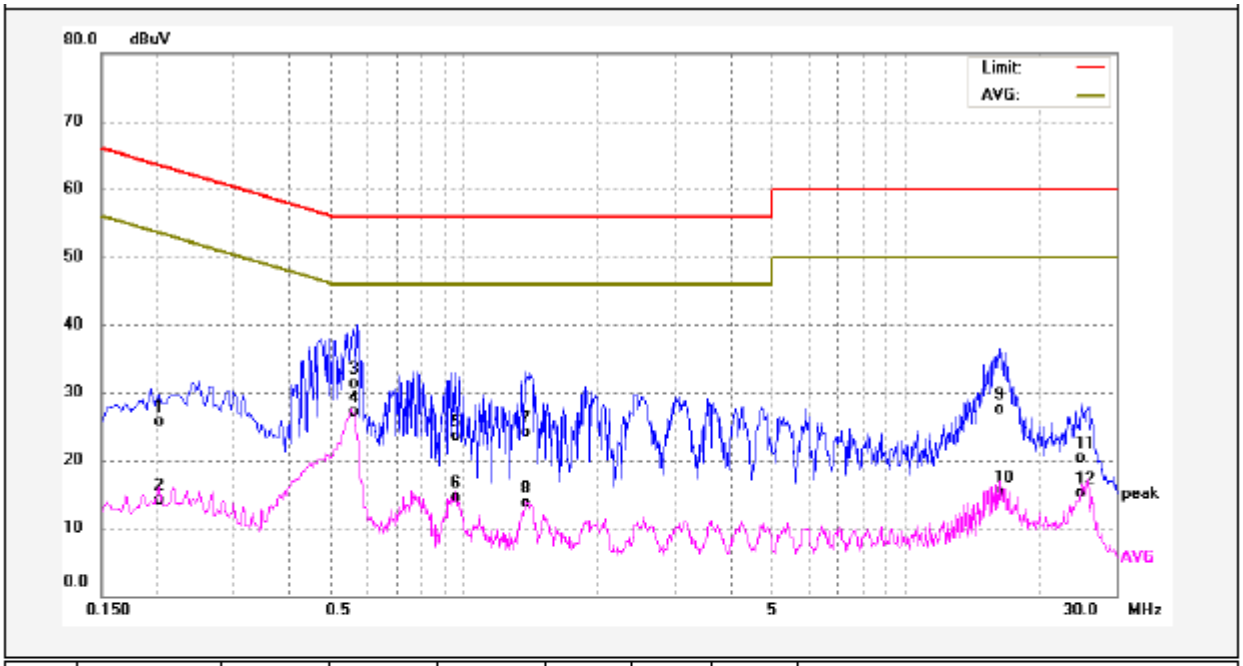
8.3 Measurement Description

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

8.4 Conducted Emission Test Result

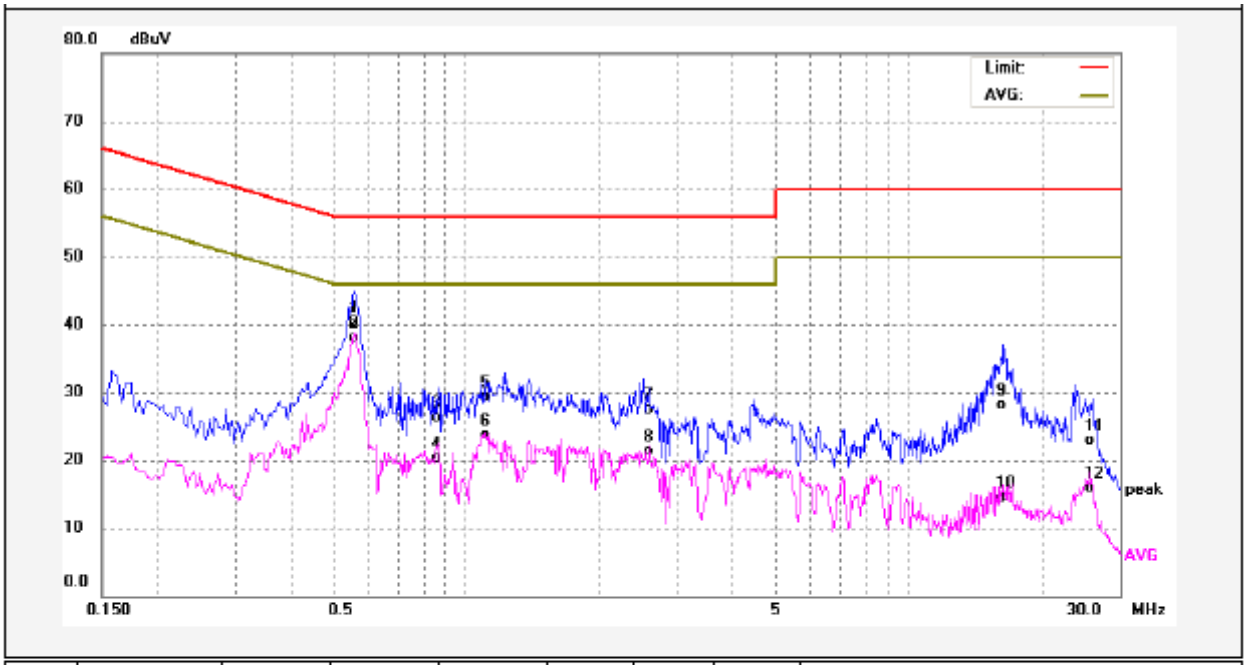
Remark: An initial pre-scan was performed on the live and neutral lines, only the worst data (U-NII-1 802.11n(HT20) mode High channel mode) were reported.

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.2020	15.34	10.29	25.63	63.52	-37.89	QP	
2	0.2020	3.81	10.29	14.10	53.52	-39.42	AVG	
3	0.5700	21.01	10.29	31.30	56.00	-24.70	QP	
4	0.5700	16.91	10.29	27.20	46.00	-18.80	AVG	
5	0.9500	13.11	10.35	23.46	56.00	-32.54	QP	
6	0.9500	4.06	10.35	14.41	46.00	-31.59	AVG	
7	1.3660	13.65	10.36	24.01	56.00	-31.99	QP	
8	1.3660	3.34	10.36	13.70	46.00	-32.30	AVG	
9	16.3940	17.06	10.50	27.56	60.00	-32.44	QP	
10	16.3940	4.80	10.50	15.30	50.00	-34.70	AVG	
11	24.9020	9.91	10.46	20.37	60.00	-39.63	QP	
12	24.9020	4.64	10.46	15.10	50.00	-34.90	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.5580	30.02	10.28	40.30	56.00	-15.70	QP	
2	0.5580	27.92	10.28	38.20	46.00	-7.80	AVG	
3	0.8620	15.95	10.35	26.30	56.00	-29.70	QP	
4	0.8620	10.04	10.35	20.39	46.00	-25.61	AVG	
5	1.1060	18.95	10.35	29.30	56.00	-26.70	QP	
6	1.1060	13.43	10.35	23.78	46.00	-22.22	AVG	
7	2.5900	17.11	10.44	27.55	56.00	-28.45	QP	
8	2.5900	10.94	10.44	21.38	46.00	-24.62	AVG	
9	16.3779	17.66	10.50	28.16	60.00	-31.84	QP	
10	16.3779	4.00	10.50	14.50	50.00	-35.50	AVG	
11	25.6580	12.46	10.47	22.93	60.00	-37.07	QP	
12	25.6580	5.43	10.47	15.90	50.00	-34.10	AVG	

9 Duty Cycle

Test Requirement:	FCC part 15 section15.407
Test Method:	ANSI C63.10:2013 KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Section B
Test Limit:	N/A
Test Result:	PASS
Remark:	Through Pre-scan, the duty cycle set for channel low, middle and high are same, and the duty cycle test is performed at channel low only.

9.1 Test Results

Type of Modulation	On time ms	Period ms	Duty Cycle linear	Duty Cycle %	Duty Cycle Factor(dB)	Average Factor(dB)
U-NII-1 802.11a	100	100	1	100	0	0
U-NII-1 802.11n(HT20)	100	100	1	100	0	0
U-NII-1 802.11n(HT40)	100	100	1	100	0	0
U-NII-1 802.11ac (HT20)	100	100	1	100	0	0
U-NII-1 802.11ac (HT40)	100	100	1	100	0	0
U-NII-1 802.11ac (HT80)	100	100	1	100	0	0
U-NII-3 802.11a	100	100	1	100	0	0
U-NII-3 802.11n(HT20)	100	100	1	100	0	0
U-NII-3 802.11n(HT40)	100	100	1	100	0	0
U-NII-3 802.11ac (HT20)	100	100	1	100	0	0
U-NII-3 802.11ac (HT40)	100	100	1	100	0	0
U-NII-3 802.11ac (HT80)	100	100	1	100	0	0

Remark:

Duty cycle=On Time/period;

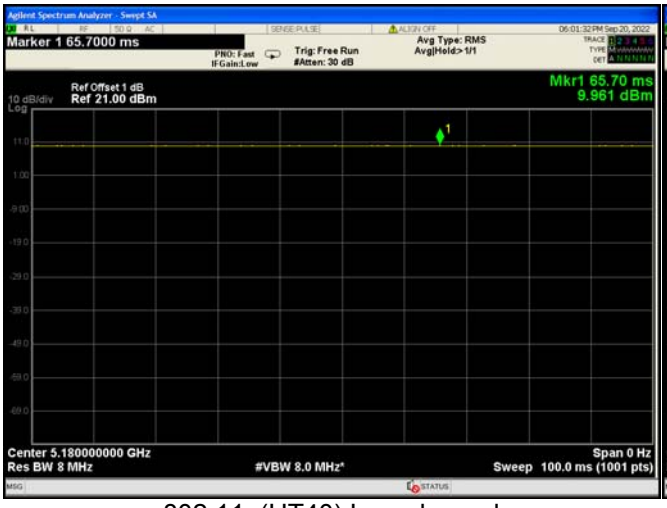
Duty cycle factor=10*log (1/Duty cycle);

Average factor=$20\log_{10}$Duty cycle

Test result plots shown as follows:

U-NII-1

802.11a Low channel



802.11n(HT20) Low channel

802.11n(HT40) Low channel

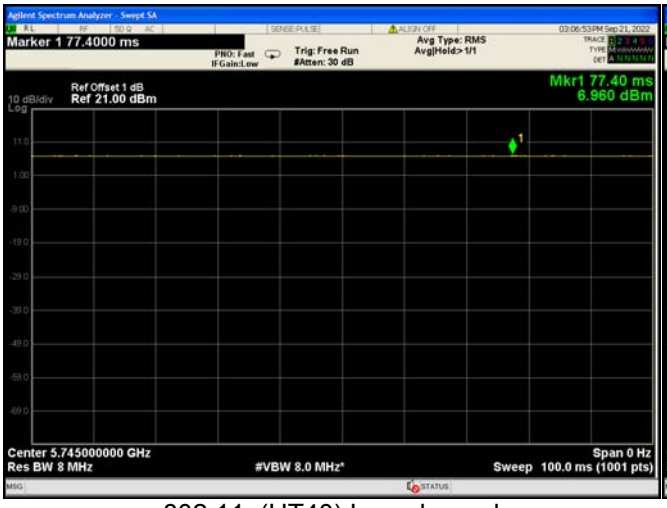
802.11ac(HT20) Low channel

802.11ac(HT40) Low channel

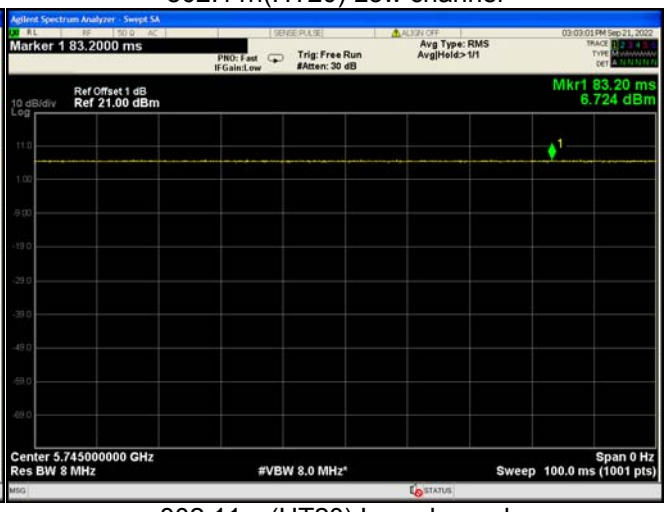
802.11ac(HT80) Low channel

U-NII-3

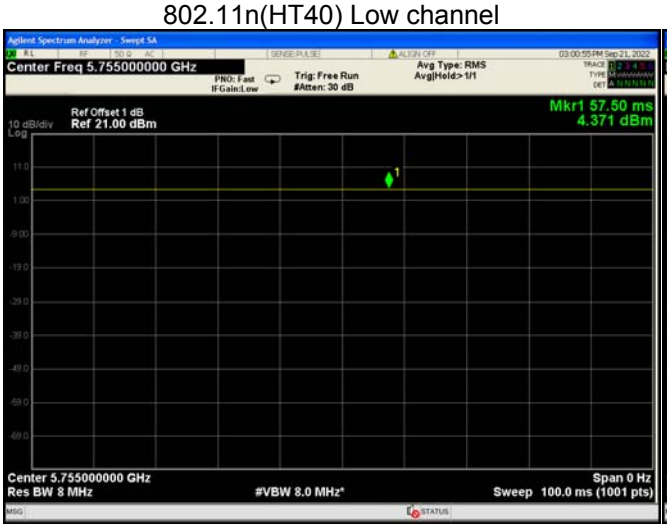
802.11a Low channel



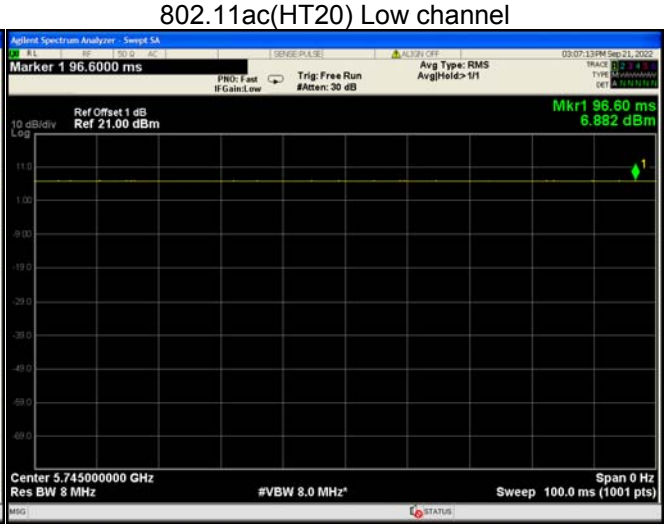
802.11n(HT20) Low channel



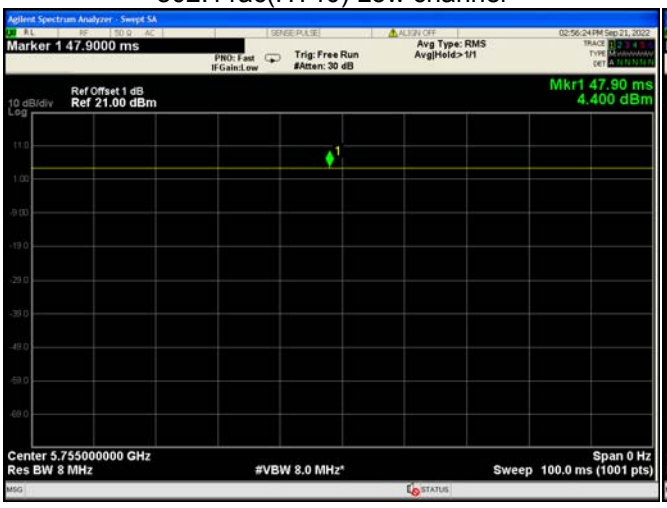
802.11n(HT40) Low channel



802.11ac(HT20) Low channel



802.11ac(HT40) Low channel



802.11ac(HT80) Low channel

10 Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.407

Test Method: ANSI C63.10:2013

Test Result: PASS

Measurement Distance: 3m

Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Distance	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

10.1 EUT Operation

Operating Environment:

Temperature: 23.8 °C

Humidity: 52.5 % RH

Atmospheric Pressure: 101.3kPa

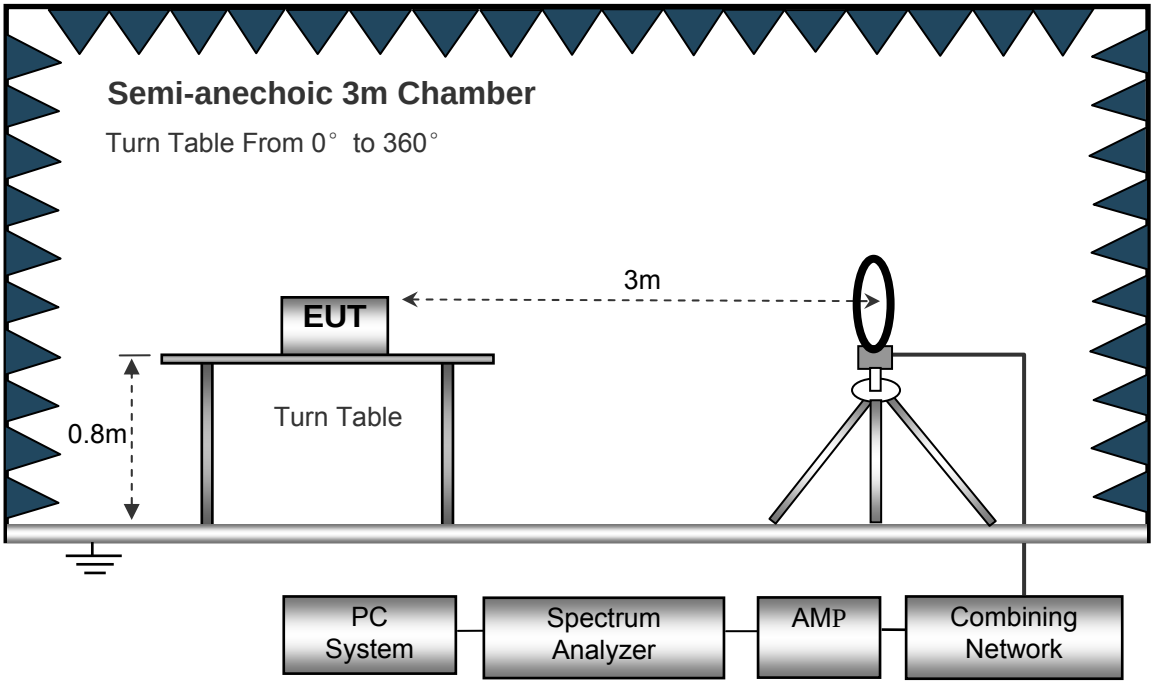
EUT Operation:

The test was performed in transmitting mode, the test data were shown in the report.

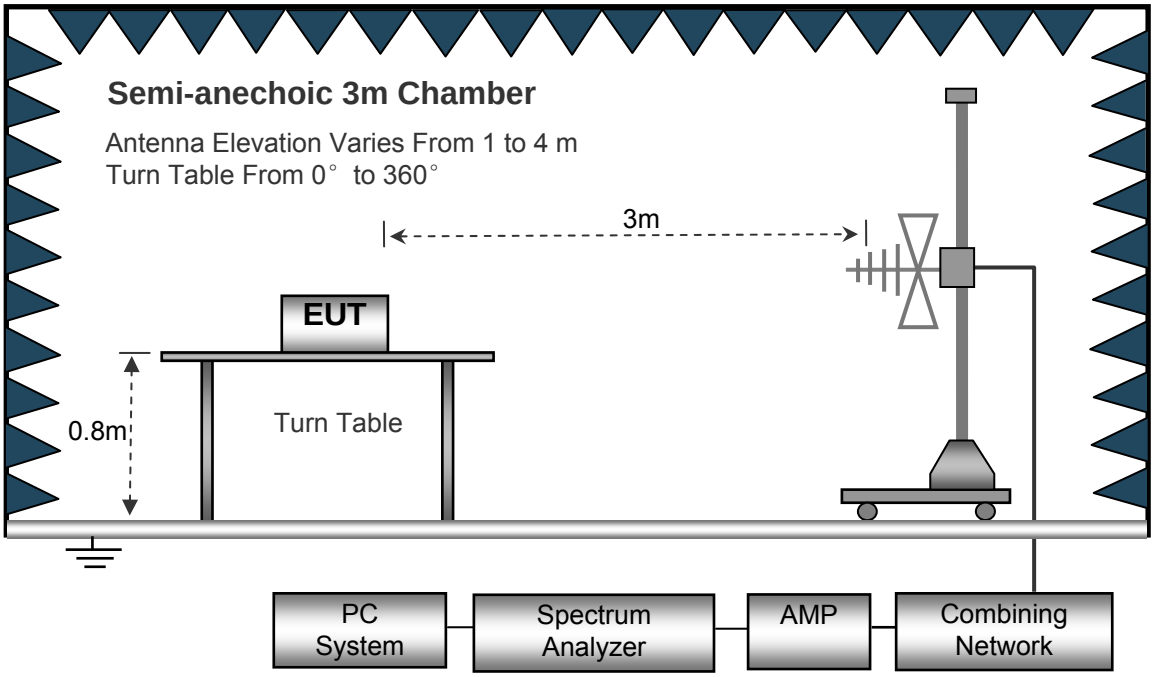
10.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10: 2013.

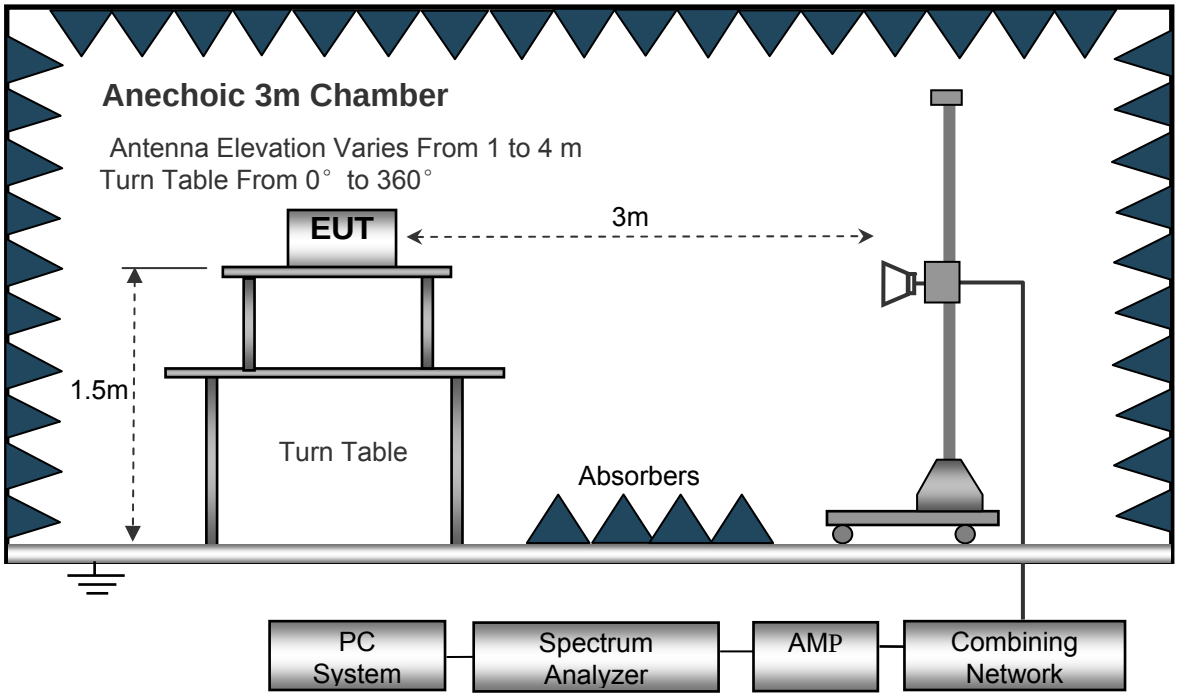
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



10.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed ..... Auto
IF Bandwidth..... 10kHz
Video Bandwidth..... 10kHz
Resolution Bandwidth..... 10kHz

30MHz ~ 1GHz

Sweep Speed ..... Auto
Detector ..... PK
Resolution Bandwidth..... 100kHz
Video Bandwidth..... 300kHz

Above 1GHz

Sweep Speed ..... Auto
Detector ..... PK
Resolution Bandwidth..... 1MHz
Video Bandwidth..... 3MHz
Detector ..... Ave.
Resolution Bandwidth..... 1MHz
Video Bandwidth..... 10Hz

10.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane for below 1GHz and 1.5m for above 1GHz.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are performed in X,Y and Z axis positioning(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand),the worst condition was tested putting the eut in X axis,so the worst data were shown as follow.
8. A 2.4GHz high –pass filter is used druing radiated emissions above 1GHz measurement.

10.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Limit

10.6 Summary of Test Results

Test Mode: TX (Ant. 1+ Ant. 2)

Note:
Only the worst-case 802.11n HT20 mode were record in the report.

Test Frequency: 9KHz~30MHz

The measurements were more than 20 dB below the limit and not reported.

Test Frequency: 30MHz ~ 18GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.407/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
802.11a U-NII-1 Low Channel 5180MHz									
223.45	42.14	QP	91	1.8	H	-11.62	30.52	46.00	-15.48
223.45	37.13	QP	319	1.1	V	-11.62	25.51	46.00	-20.49
4521.83	50.98	PK	283	1.5	H	-2.03	48.95	74.00	-25.05
4521.83	44.94	Ave	283	1.5	H	-2.03	42.91	54.00	-11.09
5122.11	52.14	PK	135	1.9	H	-1.02	51.12	74.00	-22.88
5122.11	43.34	Ave	135	1.9	H	-1.02	42.32	54.00	-11.68
10360.00	40.28	PK	261	1.7	H	5.33	45.61	74.00	-28.39
10360.00	37.63	Ave	261	1.7	H	5.33	42.96	54.00	-11.04
802.11a U-NII-1 Middle channel 5200MHz									
223.45	41.46	QP	122	1.1	H	-11.62	29.84	46.00	-16.16
223.45	37.37	QP	132	1.3	V	-11.62	25.75	46.00	-20.25
4525.27	51.43	PK	198	1.3	H	-1.94	49.49	74.00	-24.51
4525.27	45.73	Ave	198	1.3	H	-1.94	43.79	54.00	-10.21
5144.28	52.66	PK	292	1.6	H	-1.06	51.60	74.00	-22.40
5144.28	43.45	Ave	292	1.6	H	-1.06	42.39	54.00	-11.61
10400.00	39.30	PK	130	1.6	H	5.21	44.51	74.00	-29.49
10400.00	37.82	Ave	130	1.6	H	5.21	43.03	54.00	-10.97
802.11a U-NII-1 High channel 5240MHz									
223.45	44.81	QP	180	1.9	H	-11.62	33.19	46.00	-12.81
223.45	35.24	QP	249	1.0	V	-11.62	23.62	46.00	-22.38
4527.27	51.71	PK	301	2.0	H	-2.24	49.47	74.00	-24.53
4527.27	44.54	Ave	301	2.0	H	-2.24	42.30	54.00	-11.70
5123.10	54.93	PK	291	1.7	H	-1.09	53.84	74.00	-20.16
5123.10	42.33	Ave	291	1.7	H	-1.09	41.24	54.00	-12.76
10480.00	40.65	PK	267	1.8	H	5.14	45.79	74.00	-28.21
10480.00	36.52	Ave	267	1.8	H	5.14	41.66	54.00	-12.34

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.407/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
802.11n HT20 U-NII-1 Low Channel 5180MHz									
223.45	41.86	QP	94	1.3	H	-11.62	30.24	46.00	-15.76
223.45	36.76	QP	90	1.1	V	-11.62	25.14	46.00	-20.86
4537.17	51.48	PK	261	1.4	H	-2.14	49.34	74.00	-24.66
4537.17	45.74	Ave	261	1.4	H	-2.14	43.60	54.00	-10.40
5142.97	46.01	PK	75	1.8	H	-1.06	44.95	74.00	-29.05
5142.97	39.29	Ave	75	1.8	H	-1.06	38.23	54.00	-15.77
10360.00	41.27	PK	119	1.7	H	5.33	46.60	74.00	-27.40
10360.00	38.11	Ave	119	1.7	H	5.33	43.44	54.00	-10.56
802.11n HT20 U-NII-1 Middle channel 5200MHz									
223.45	41.90	QP	102	1.3	H	-11.62	30.28	46.00	-15.72
223.45	36.91	QP	359	1.9	V	-11.62	25.29	46.00	-20.71
4532.91	50.98	PK	319	1.6	H	-2.12	48.86	74.00	-25.14
4532.91	44.83	Ave	319	1.6	H	-2.12	42.71	54.00	-11.29
5133.08	47.12	PK	353	1.7	H	-1.06	46.06	74.00	-27.94
5133.08	40.63	Ave	353	1.7	H	-1.06	39.57	54.00	-14.43
10400.00	41.02	PK	328	1.7	H	5.21	46.23	74.00	-27.77
10400.00	36.64	Ave	328	1.7	H	5.21	41.85	54.00	-12.15
802.11n HT20 U-NII-1 High channel 5240MHz									
223.45	42.48	QP	89	1.2	H	-11.62	30.86	46.00	-15.14
223.45	35.85	QP	277	1.7	V	-11.62	24.23	46.00	-21.77
4539.24	51.07	PK	11	1.8	H	-1.96	49.11	74.00	-24.89
4539.24	43.51	Ave	11	1.8	H	-1.96	41.55	54.00	-12.45
5118.53	47.06	PK	323	1.0	H	-1.06	46.00	74.00	-28.00
5118.53	40.38	Ave	323	1.0	H	-1.06	39.32	54.00	-14.68
10480.00	41.70	PK	94	1.8	H	5.14	46.84	74.00	-27.16
10480.00	38.75	Ave	94	1.8	H	5.14	43.89	54.00	-10.11

Test Frequency: 18GHz~40GHz

The measurements were more than 20 dB below the limit and not reported.

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.407/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
802.11a U-NII-3 Low Channel 5745MHz									
223.45	43.91	QP	323	1.2	H	-11.62	32.29	46.00	-13.71
223.45	37.64	QP	46	1.7	V	-11.62	26.02	46.00	-19.98
4538.87	50.34	PK	152	1.2	H	-2.06	48.28	74.00	-25.72
4538.87	44.48	Ave	152	1.2	H	-2.06	42.42	54.00	-11.58
11490.00	40.20	PK	360	1.6	H	5.93	46.13	68.20	-22.07
11490.00	36.79	Ave	360	1.6	H	5.93	42.72	54.00	-11.28
5373.32	45.88	PK	272	1.5	H	-1.25	44.63	74.00	-29.37
5373.32	39.06	Ave	272	1.5	H	-1.25	37.81	54.00	-16.19
802.11a U-NII-3 Middle channel 5785MHz									
223.45	43.19	QP	322	2.0	H	-11.62	31.57	46.00	-14.43
223.45	38.36	QP	107	1.9	V	-11.62	26.74	46.00	-19.26
4501.39	50.48	PK	117	1.5	H	-2.03	48.45	74.00	-25.55
4501.39	43.96	Ave	117	1.5	H	-2.03	41.93	54.00	-12.07
11570.00	40.49	PK	4	1.8	H	5.81	46.30	68.20	-21.90
11570.00	37.17	Ave	4	1.8	H	5.81	42.98	54.00	-11.02
5374.94	45.89	PK	63	1.4	H	-1.22	44.67	74.00	-29.33
5374.94	39.22	Ave	63	1.4	H	-1.22	38.00	54.00	-16.00
802.11a U-NII-3 High channel 5825MHz									
223.45	42.19	QP	137	1.2	H	-11.62	30.57	46.00	-15.43
223.45	38.00	QP	299	1.5	V	-11.62	26.38	46.00	-19.62
4535.37	51.17	PK	222	1.6	H	-1.84	49.33	74.00	-24.67
4535.37	42.86	Ave	222	1.6	H	-1.84	41.02	54.00	-12.98
11650.00	39.29	PK	359	1.1	H	5.84	45.13	68.20	-23.07
11650.00	36.73	Ave	359	1.1	H	5.84	42.57	54.00	-11.43
5373.95	45.28	PK	161	1.5	H	-1.30	43.98	74.00	-30.02
5373.95	37.22	Ave	161	1.5	H	-1.30	35.92	54.00	-18.08

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.407/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
802.11n HT20 U-NII-3 Low Channel 5745MHz									
223.45	35.37	QP	201	1.9	H	-11.62	23.75	46.00	-22.25
223.45	40.97	QP	283	1.3	V	-11.62	29.35	46.00	-16.65
4516.00	49.55	PK	201	1.8	H	-2.06	47.49	74.00	-26.51
4516.00	37.79	Ave	201	1.8	H	-2.06	35.73	54.00	-18.27
11490.00	36.81	PK	164	1.1	H	5.93	42.74	68.20	-25.46
11490.00	36.46	Ave	164	1.1	H	5.93	42.39	54.00	-11.61
5363.73	45.93	PK	176	1.9	H	-1.25	44.68	74.00	-29.32
5363.73	37.92	Ave	176	1.9	H	-1.25	36.67	54.00	-17.33
802.11n HT20 U-NII-3 Middle channel 5785MHz									
223.45	34.50	QP	129	1.0	H	-11.62	22.88	46.00	-23.12
223.45	40.64	QP	334	1.6	V	-11.62	29.02	46.00	-16.98
4516.17	50.88	PK	56	1.4	H	-2.03	48.85	74.00	-25.15
4516.17	37.45	Ave	56	1.4	H	-2.03	35.42	54.00	-18.58
11570.00	37.15	PK	305	1.9	H	5.81	42.96	68.20	-25.24
11570.00	36.28	Ave	305	1.9	H	5.81	42.09	54.00	-11.91
5379.63	46.40	PK	185	1.7	H	-1.22	45.18	74.00	-28.82
5379.63	38.85	Ave	185	1.7	H	-1.22	37.63	54.00	-16.37
802.11n HT20 U-NII-3 High channel 5825MHz									
223.45	34.98	QP	317	1.7	H	-11.62	23.36	46.00	-22.64
223.45	41.03	QP	212	1.8	V	-11.62	29.41	46.00	-16.59
4531.84	50.95	PK	33	1.2	H	-1.84	49.11	74.00	-24.89
4531.84	38.38	Ave	33	1.2	H	-1.84	36.54	54.00	-17.46
11650.00	37.50	PK	47	1.8	H	5.84	43.34	68.20	-24.86
11650.00	37.32	Ave	47	1.8	H	5.84	43.16	54.00	-10.84
5386.90	46.92	PK	348	1.4	H	-1.30	45.62	74.00	-28.38
5386.90	37.67	Ave	348	1.4	H	-1.30	36.37	54.00	-17.63

Test Frequency: 18GHz~40GHz

The measurements were more than 20 dB below the limit and not reported.

11 Band Edge

Test Requirement:	FCC CFR47 Part 15 Section 15.407
Test Method:	ANSI C63.10 2013
Test Limit:	For transmitters with operating frequencies in the band 5150-5250 MHz, all emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. All emissions outside the band 5250-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p.; or All emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. Emissions outside the band 5470-5725 MHz shall not exceed -27 dBm/MHz e.i.r.p. However, devices with bandwidth overlapping the band edge of 5725 MHz can meet the emission limit of -27 dBm/MHz e.i.r.p. at 5850 MHz instead of 5725 MHz. Devices operating in the band 5725-5850 MHz shall have e.i.r.p. of unwanted emissions comply with the following: a) 27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edges; b) 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges; c) 10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or below the band edges; and d) -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.
Test Result:	PASS

11.1 Test Produce

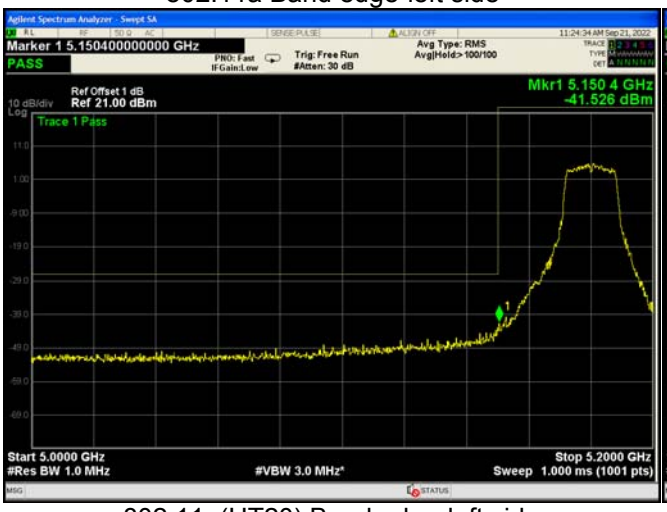
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 1000 kHz and VBW of spectrum analyzer to 3000 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

11.2 Test Result

Test plots shown as follows:

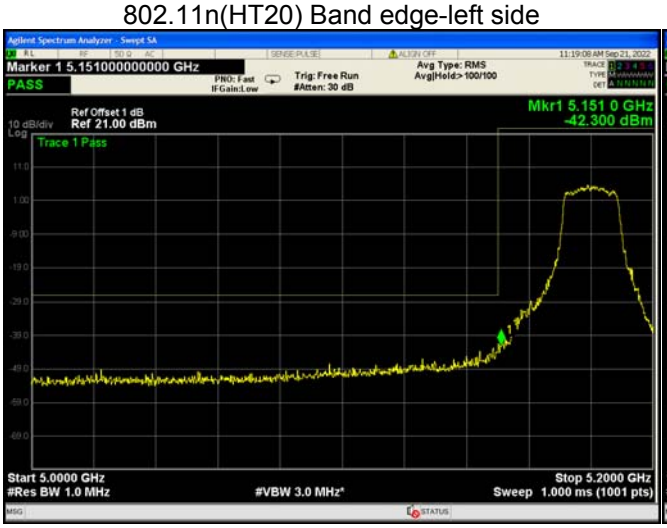
U-NII-1

802.11a Band edge-left side



802.11a Band edge-right side

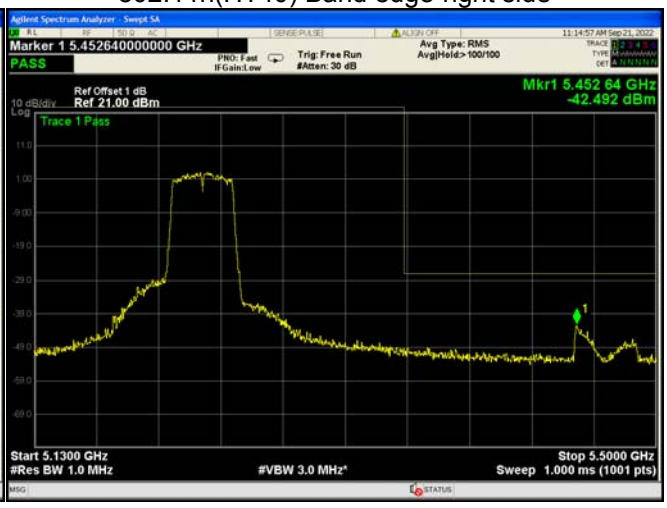
802.11n(HT20) Band edge-left side



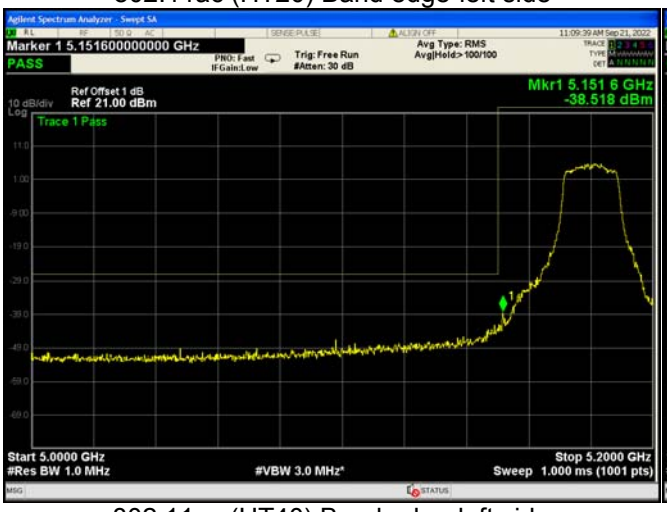
802.11n(HT20) Band edge-right side

802.11n(HT40) Band edge-left side

802.11n(HT40) Band edge-right side

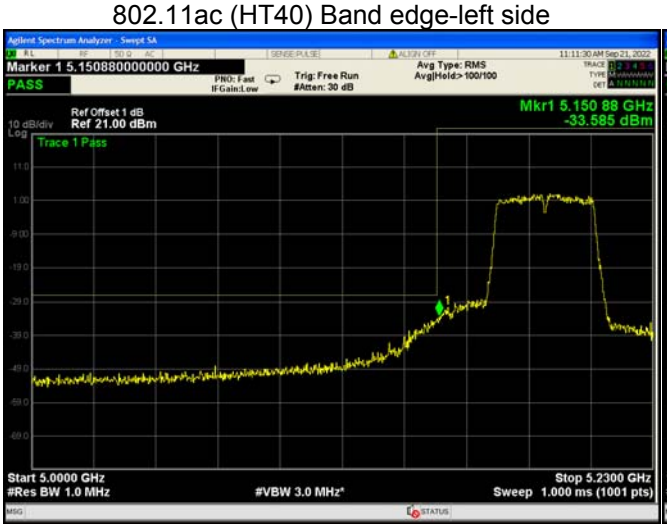


802.11ac (HT20) Band edge-left side

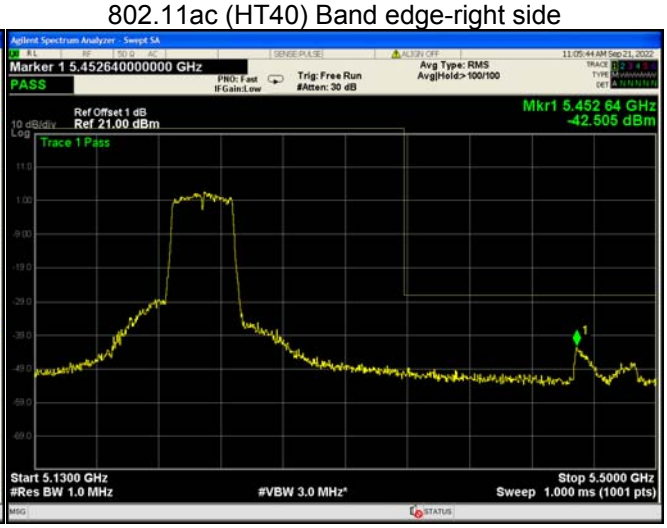


802.11ac (HT20) Band edge-right side

802.11ac (HT40) Band edge-left side

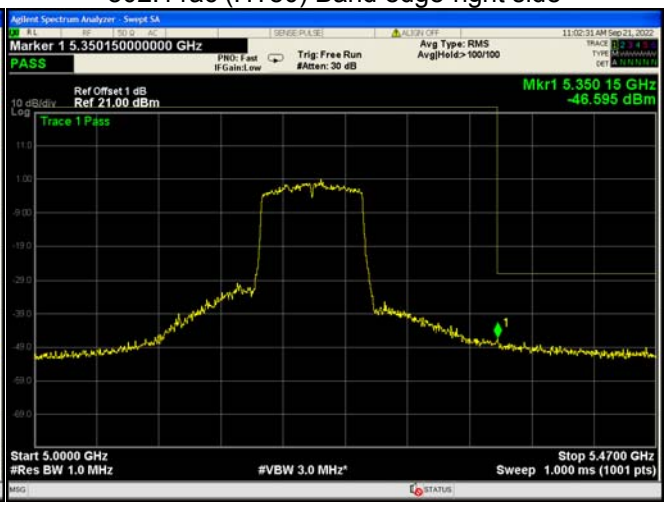


802.11ac (HT40) Band edge-right side



802.11ac (HT80) Band edge-left side

802.11ac (HT80) Band edge-right side

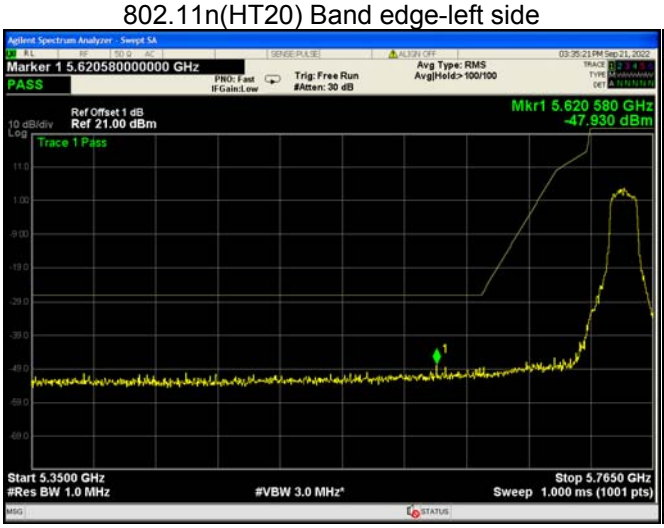


U-NII-3

802.11a Band edge-left side

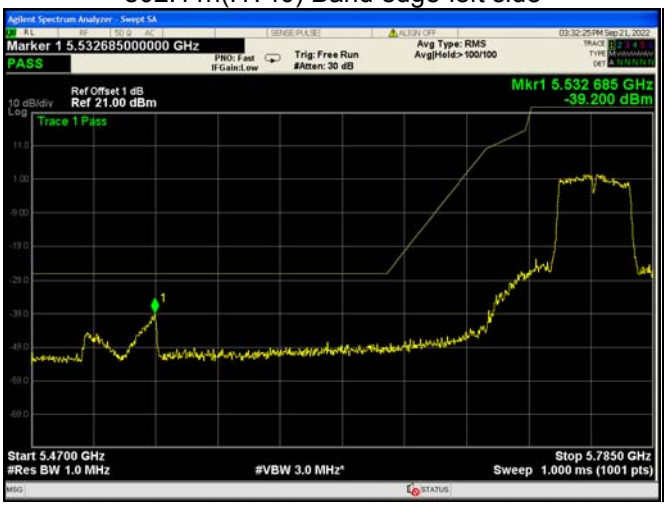
802.11a Band edge-right side

802.11n(HT20) Band edge-left side



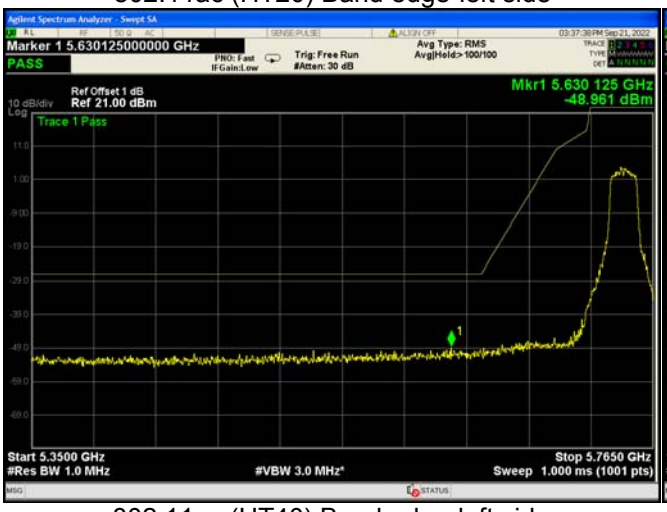
802.11n(HT20) Band edge-right side

802.11n(HT40) Band edge-left side



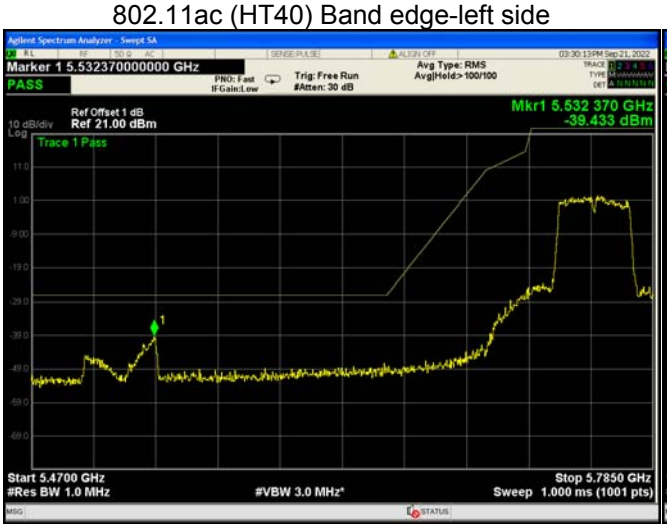
802.11n(HT40) Band edge-right side

802.11ac (HT20) Band edge-left side



802.11ac (HT20) Band edge-right side

802.11ac (HT40) Band edge-left side



802.11ac (HT40) Band edge-right side

802.11ac (HT80) Band edge-left side

802.11ac (HT80) Band edge-right side

12 6 dB Bandwidth

Test Requirement:	FCC CFR47 Part 15 Section 15.407(e)
Test Method:	KDB789033 D02 General U-NII Test Procedures New Rules v02r01 Section C
Test Limit:	≥ 500 kHz
Test Result:	PASS

12.1 Test Procedure:

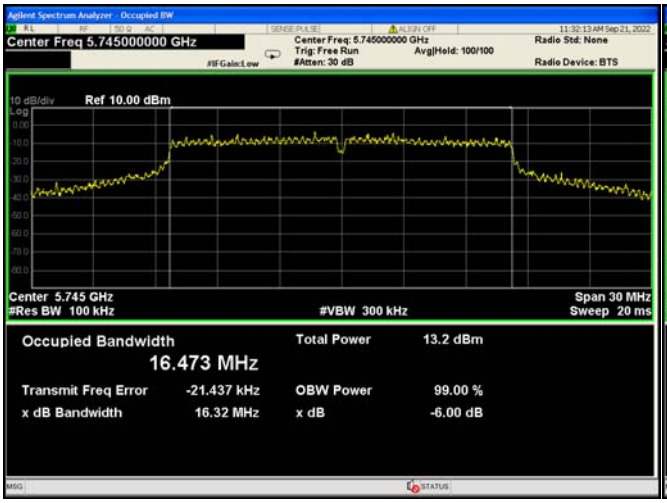
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. The following procedure shall be used for measuring this bandwidth:
   a) Set RBW = 100 kHz.
   b) Set the video bandwidth (VBW) ≥ 3 times RBW.
   c) Detector = Peak.
   d) Trace mode = max hold.
   e) Sweep = auto couple.
   f) Allow the trace to stabilize.
   g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

12.2 Test Result:

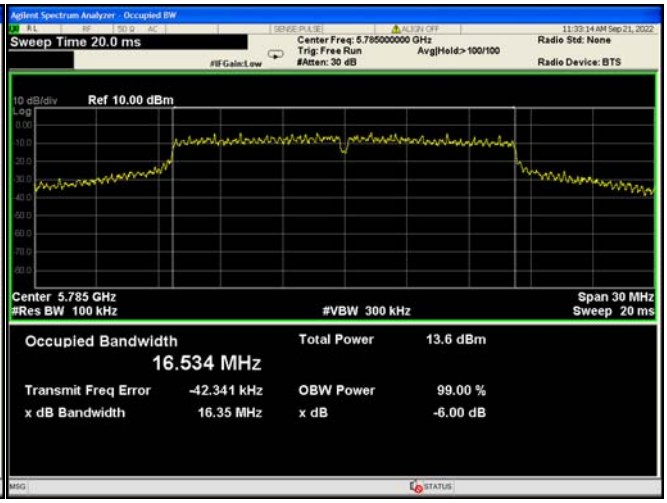
Band	Operation mode	6 dB Bandwidth (MHz)		
		Low	Middle	High
U-NII-3	802.11a	16.32	16.35	16.33
	802.11n(HT20)	17.54	17.21	17.55
	802.11n(HT40)	35.76	/	36.35
	802.11ac (HT20)	17.56	17.19	17.57
	802.11ac (HT40)	35.77	/	36.35
	802.11ac (HT80)	/	73.14	/

Test plots refer to next page:

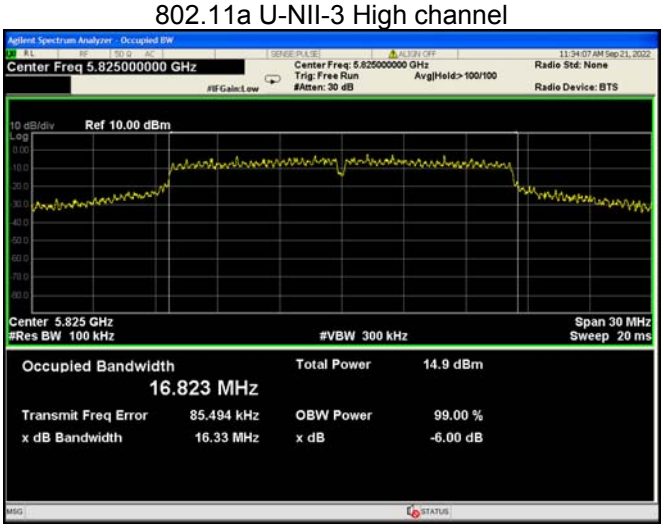
802.11a U-NII-3 Low channel



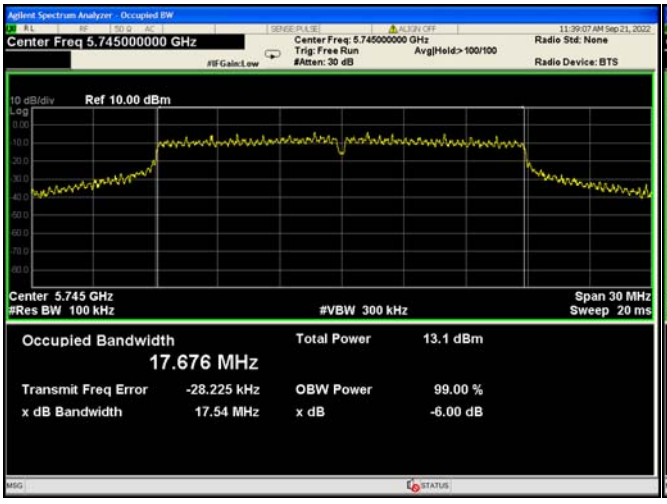
802.11a U-NII-3 Middle channel



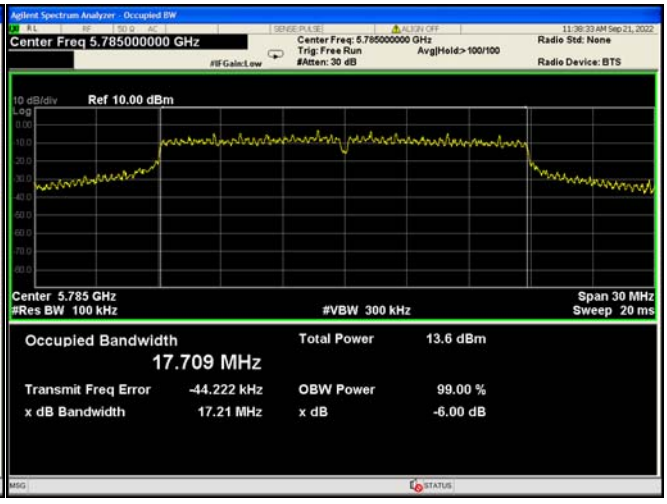
802.11a U-NII-3 High channel



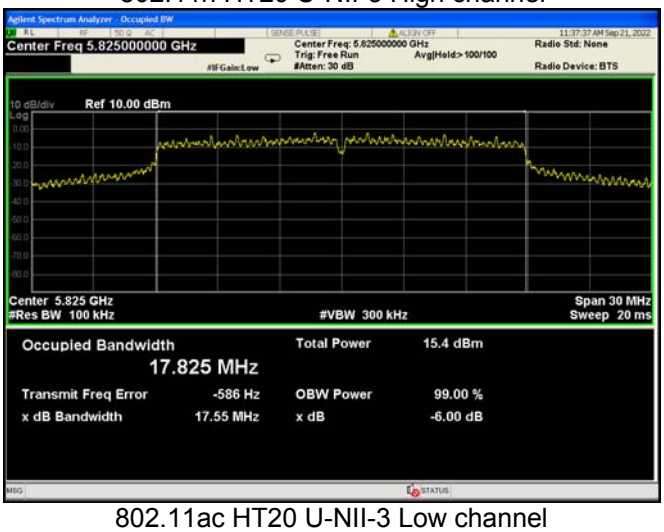
802.11n HT20 U-NII-3 Low channel



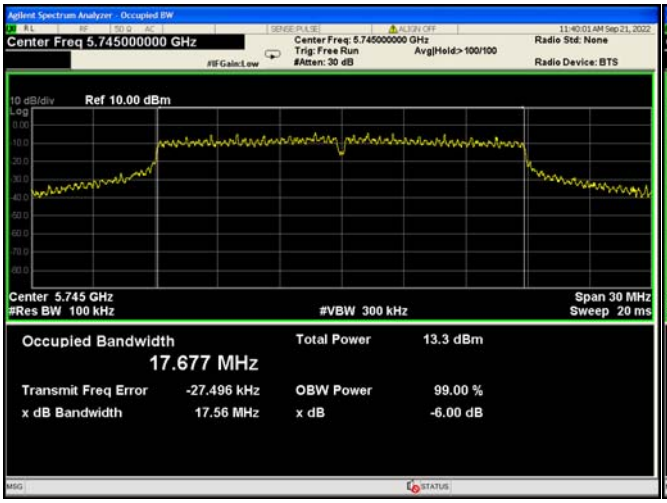
802.11n HT20 U-NII-3 Middle channel



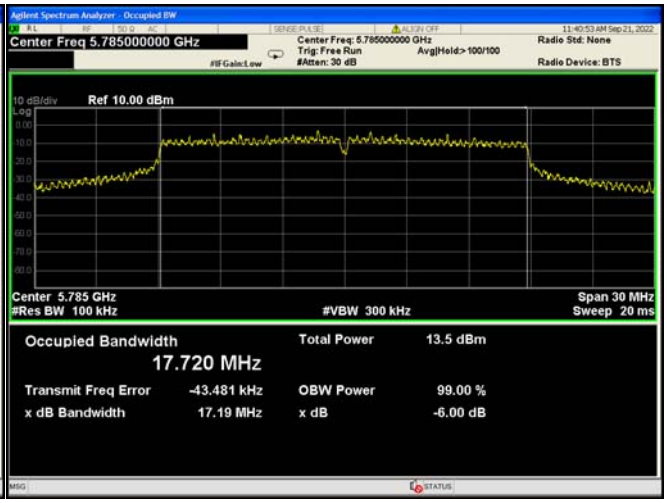
802.11n HT20 U-NII-3 High channel



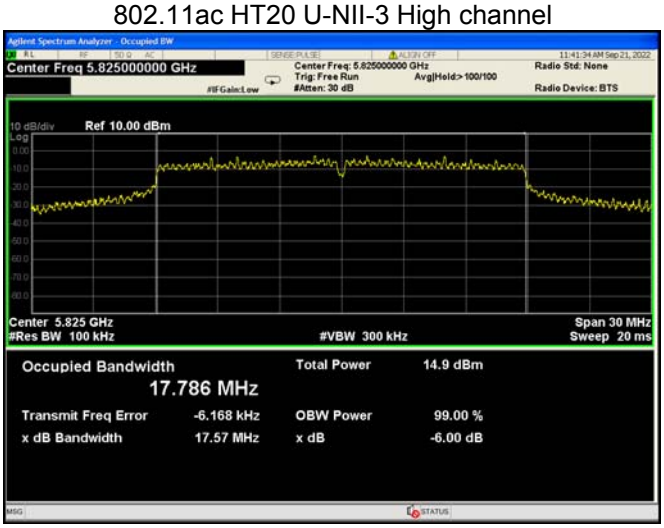
802.11ac HT20 U-NII-3 Low channel



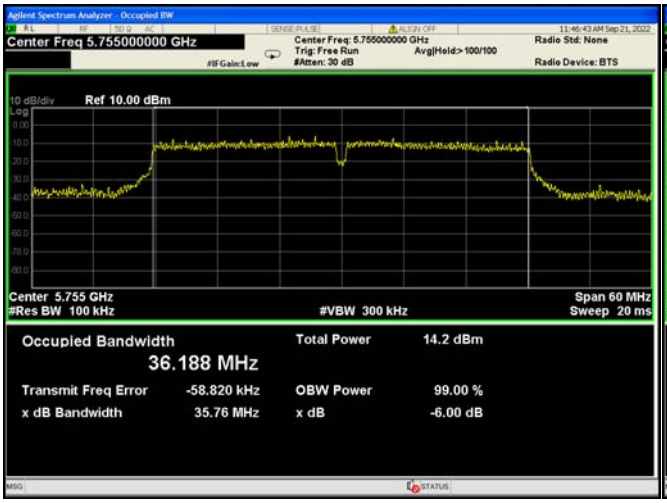
802.11ac HT20 U-NII-3 Middle channel



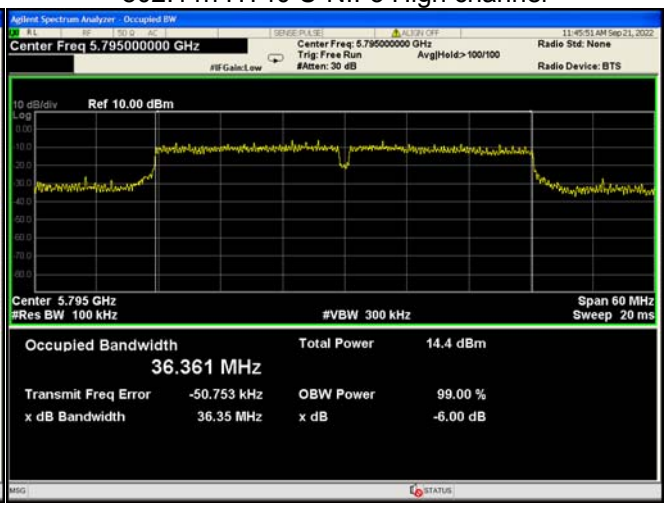
802.11ac HT20 U-NII-3 High channel



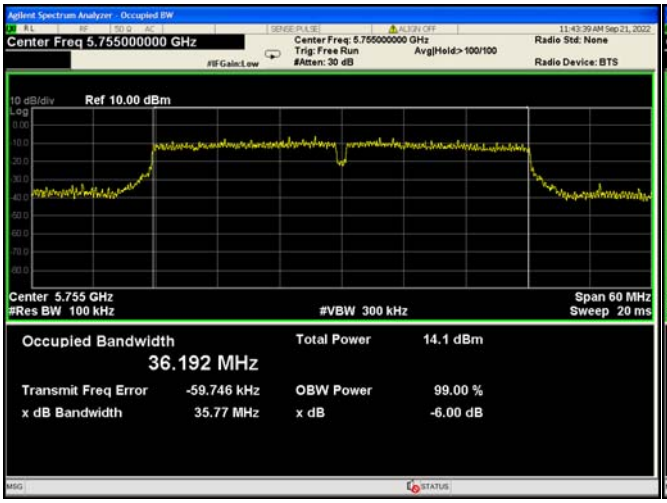
802.11n HT40 U-NII-3 Low channel



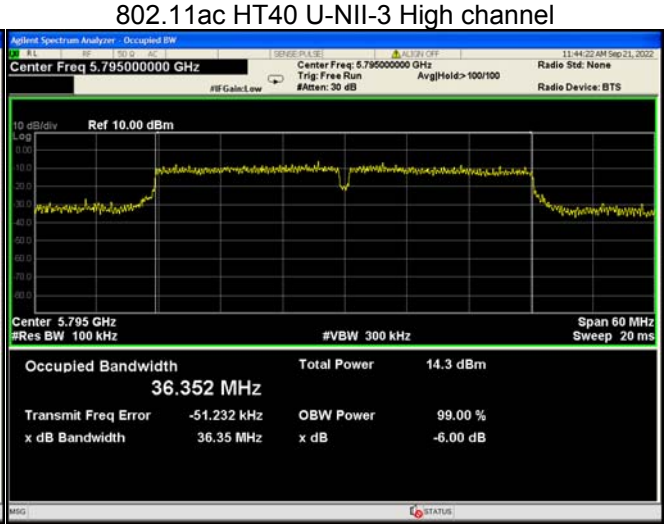
802.11n HT40 U-NII-3 High channel



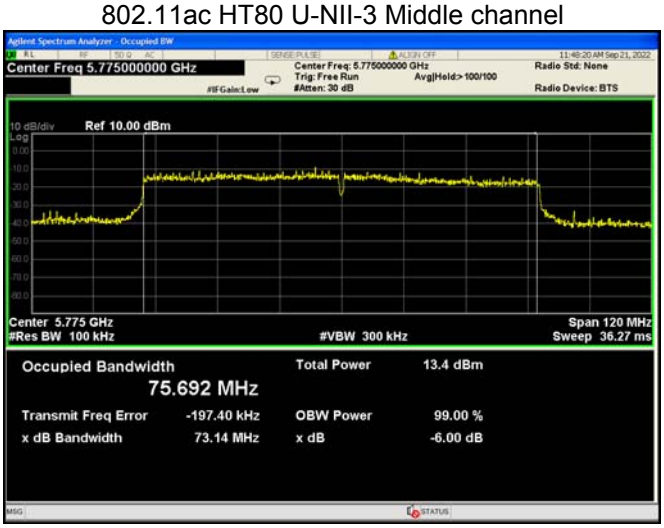
802.11ac HT40 U-NII-3 Low channel



802.11ac HT40 U-NII-3 High channel



802.11ac HT80 U-NII-3 Middle channel



13 Emission Bandwidth (EBW) and 99% Occupied Bandwidth

Test Requirement:	47 CFR Part 15C Section 15.407 (a)
Test Method:	KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Section C&D
Test Limit:	No restriction limits
Test Result:	PASS

13.1 Test Procedure:

Emission Bandwidth (EBW)

a) Set RBW = approximately 1% of the emission bandwidth.
b) Set the VBW > RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

99% Occupied Bandwidth

The following procedure shall be used for measuring (99%) power bandwidth:

1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1% to 5% of the OBW
4. Set VBW ≥ 3 times RBW
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99% power bandwidth function of the instrument (if available).
7. If the instrument does not have a 99% power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

Note: For devices that use channel aggregation refer to III.A and III.C for determining 99% bandwidth.

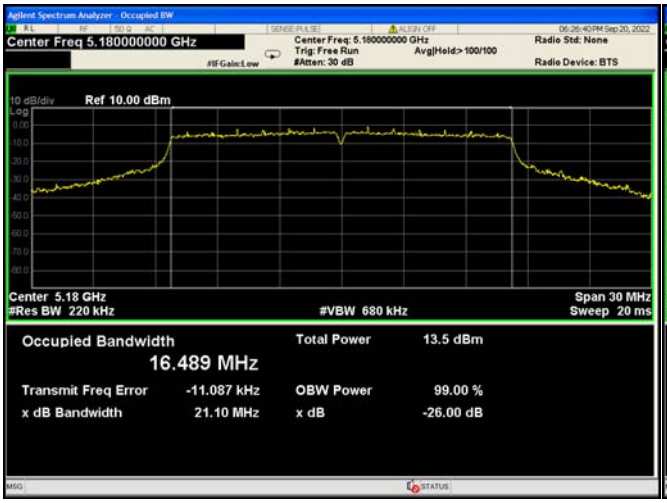
13.2 Test Result:

Band	Operation mode	26 dB Bandwidth (MHz)			99% Bandwidth (MHz)		
		Low	Middle	High	Low	Middle	High
U-NII-1	802.11a	21.10	21.04	21.92	16.489	16.473	16.472
	802.11n(HT20)	21.57	21.35	21.36	17.697	17.698	17.699
	802.11n(HT40)	40.55	/	40.64	36.223	/	36.191
	802.11ac (HT20)	21.38	21.19	21.45	17.709	17.700	17.698
	802.11ac (HT40)	40.70	/	40.56	36.216	/	36.196
	802.11ac (HT80)	/	82.09	/	/	75.585	/
U-NII-3	802.11a	23.23	26.06	27.57	16.541	16.627	16.896
	802.11n(HT20)	23.73	25.24	28.20	17.737	17.811	17.914
	802.11n(HT40)	45.68	/	60.00	36.242	/	36.511
	802.11ac (HT20)	23.27	25.69	28.81	17.748	17.812	17.913
	802.11ac (HT40)	45.89	/	60.00	36.524	/	36.526
	802.11ac (HT80)	/	103.2	/	/	75.838	/

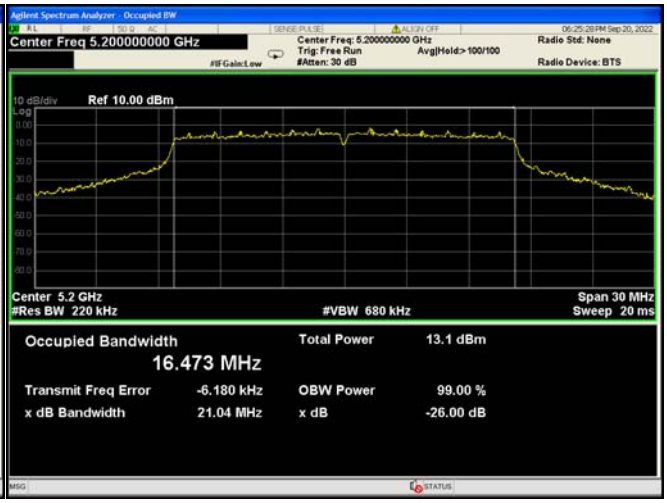
Test plots refer to next page:

U-NII-1

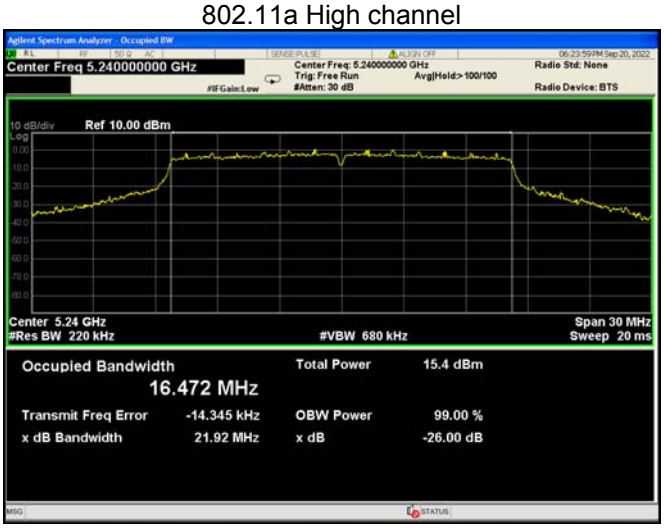
802.11a Low channel



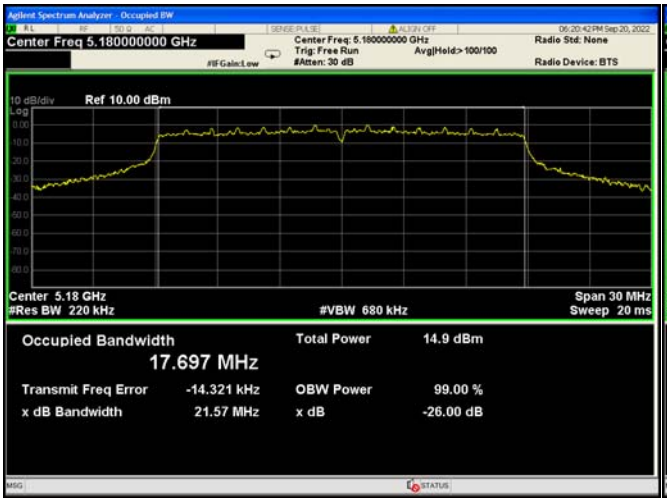
802.11a Middle channel



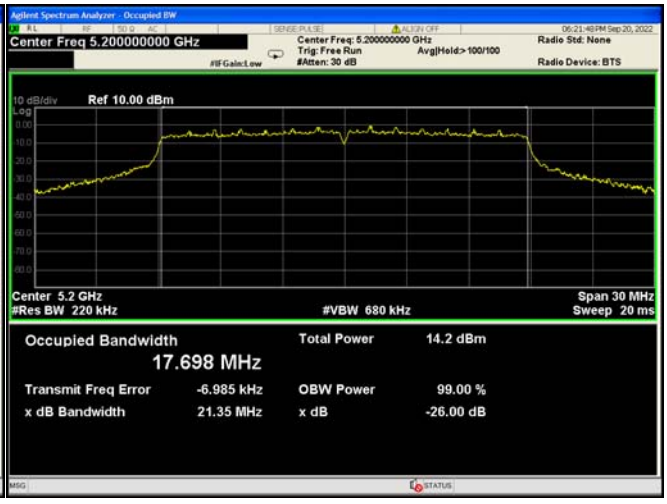
802.11a High channel



802.11n HT20 Low channel



802.11n HT20 Middle channel



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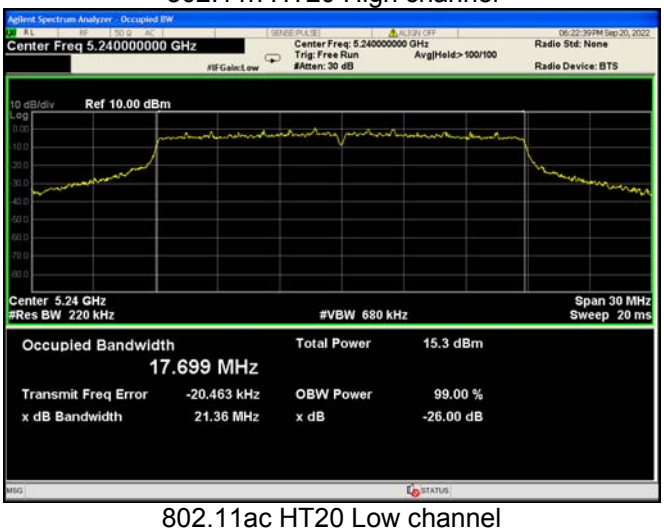
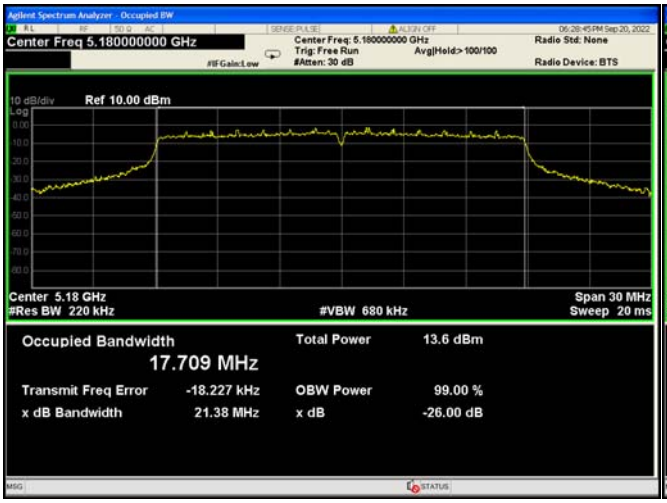
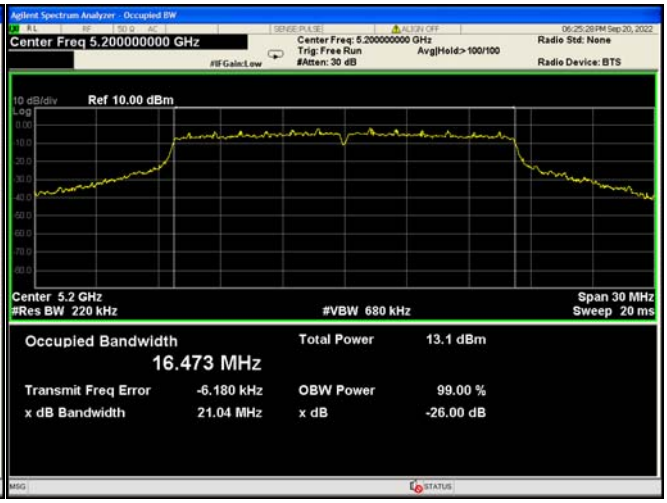


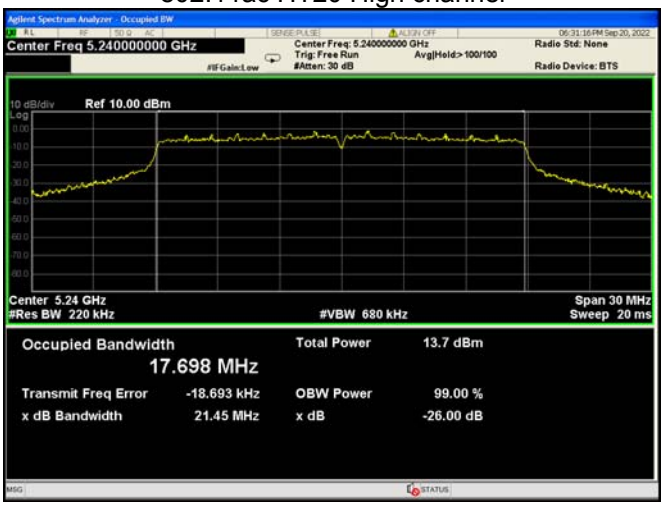
802.11ac HT20 Low channel



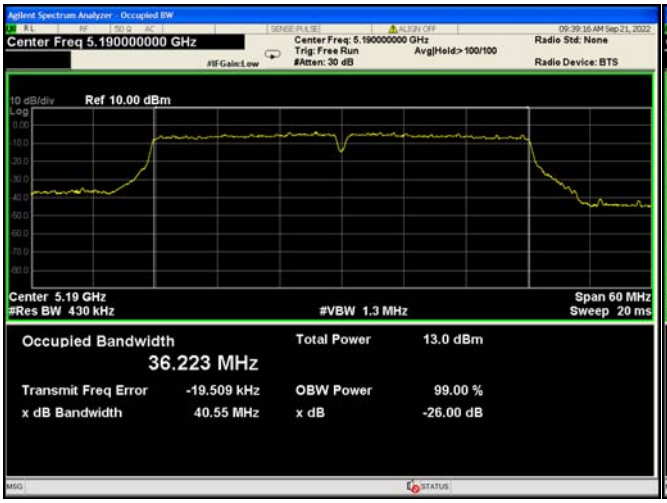
802.11ac HT20 Middle channel



802.11ac HT20 High channel

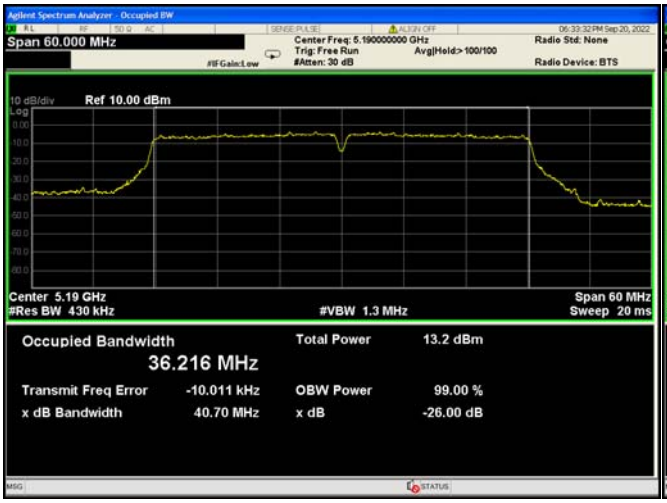


802.11n HT40 Low channel

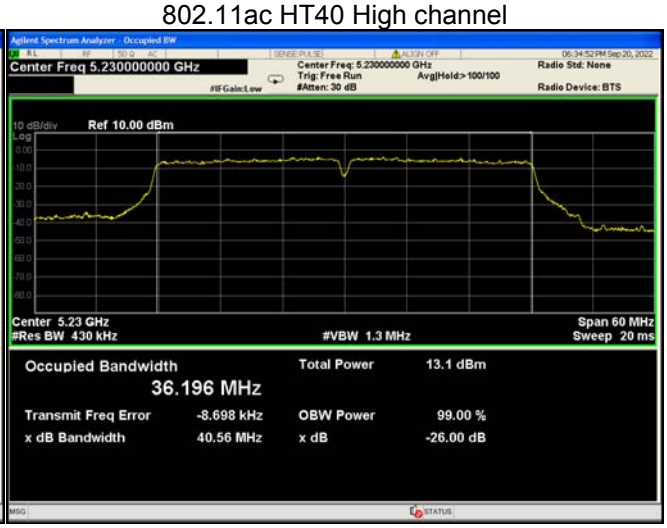


802.11n HT40 High channel

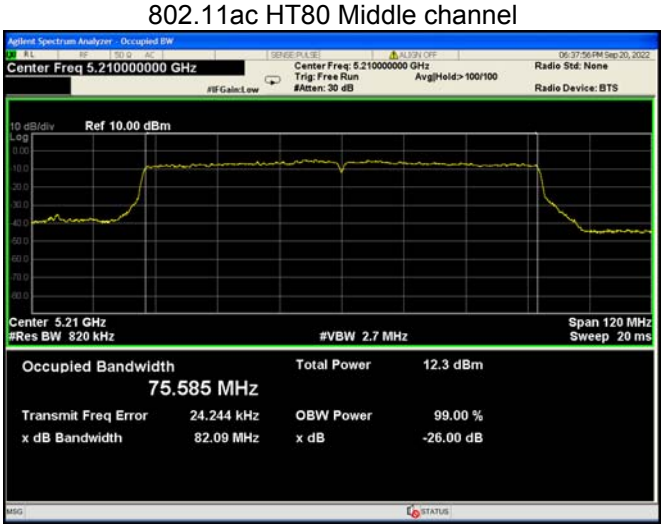
802.11ac HT40 Low channel



802.11ac HT40 High channel

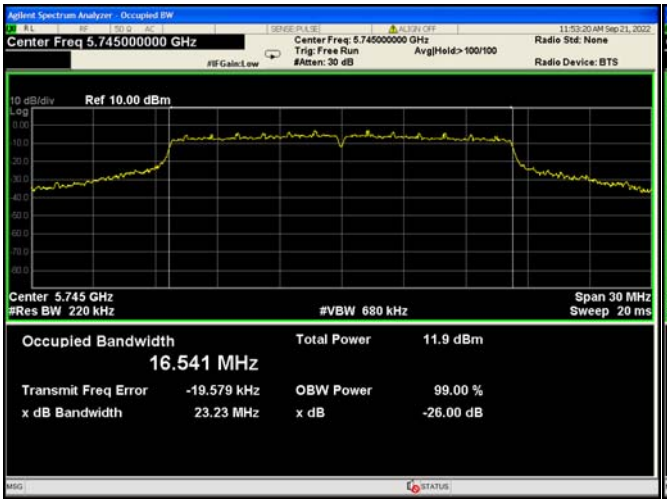


802.11ac HT80 Middle channel

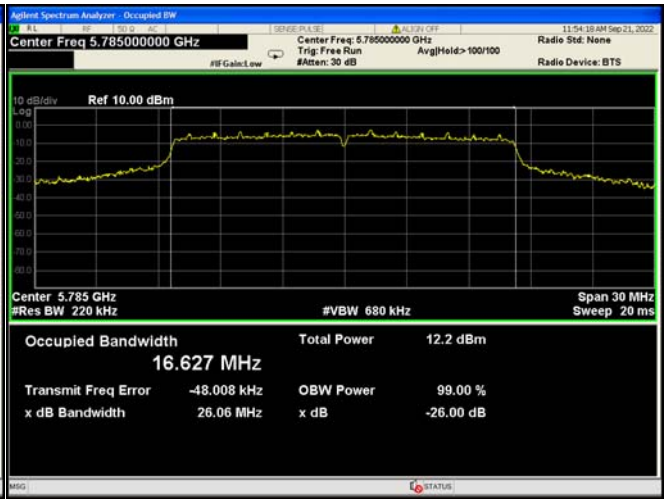


U-NII-3

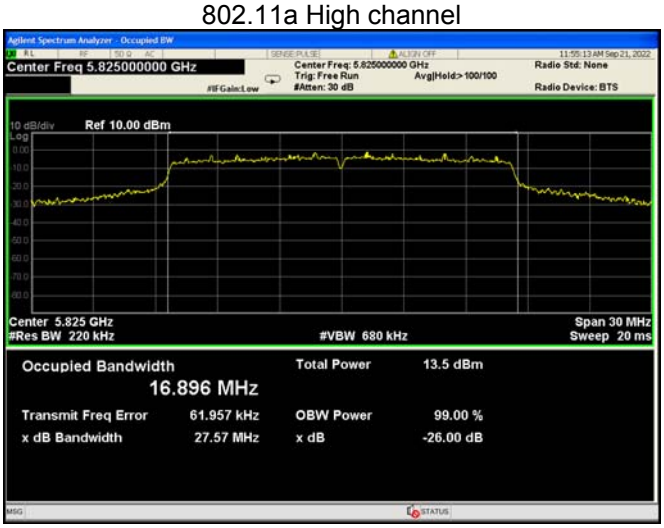
802.11a Low channel



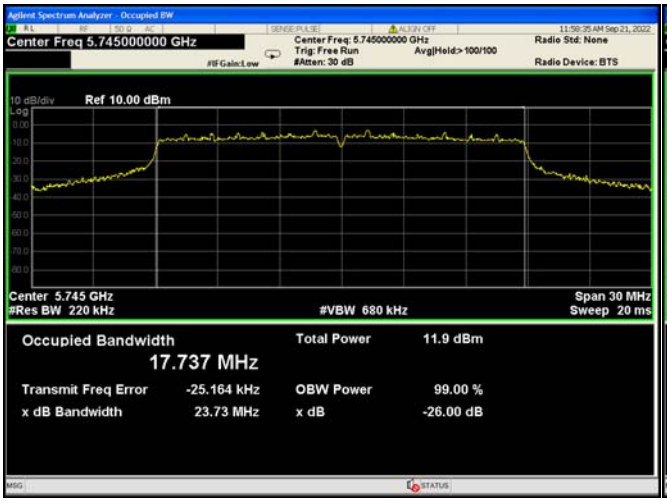
802.11a Middle channel



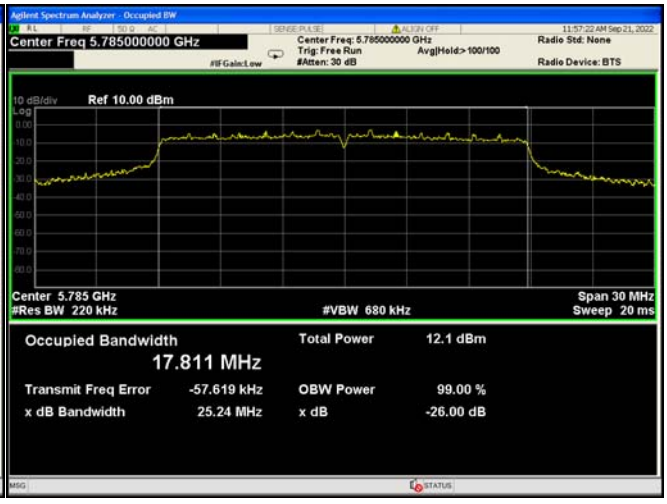
802.11a High channel



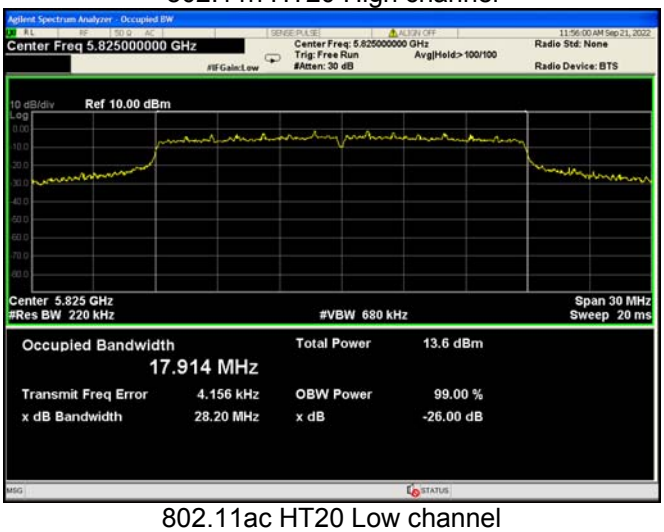
802.11n HT20 Low channel



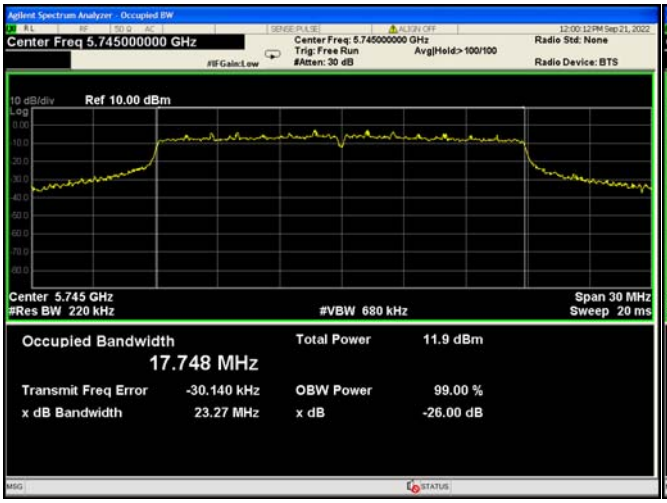
802.11n HT20 Middle channel



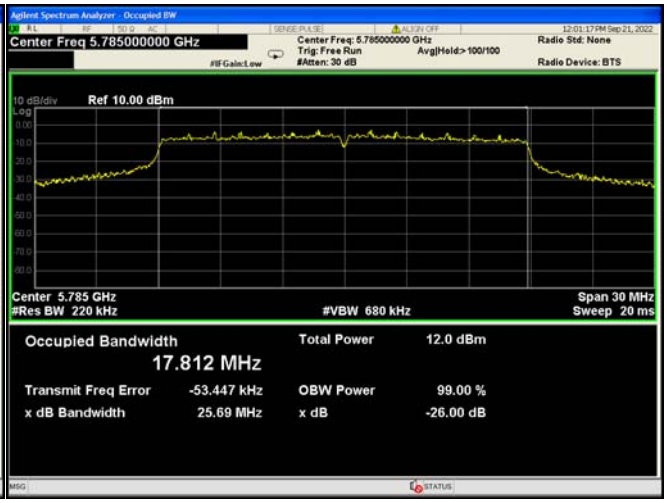
802.11n HT20 High channel



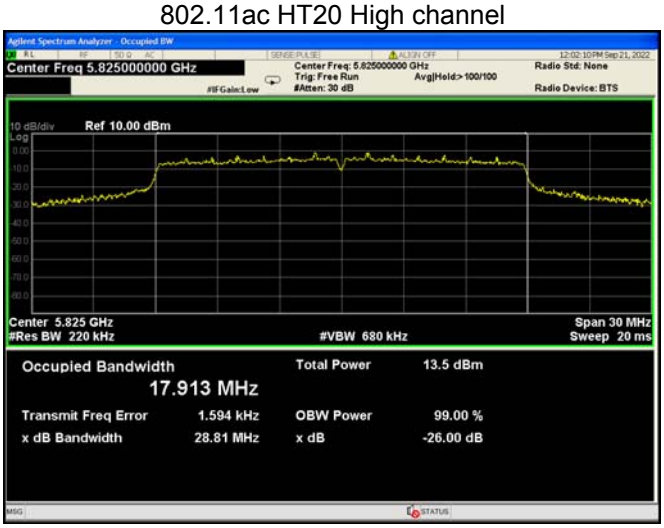
802.11ac HT20 Low channel



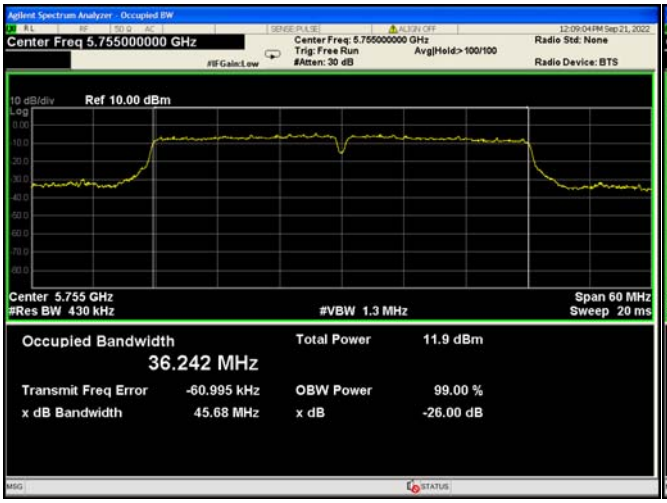
802.11ac HT20 Middle channel



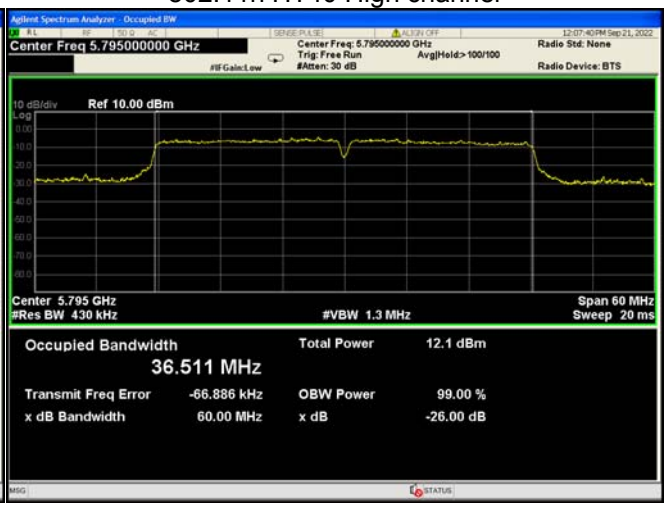
802.11ac HT20 High channel



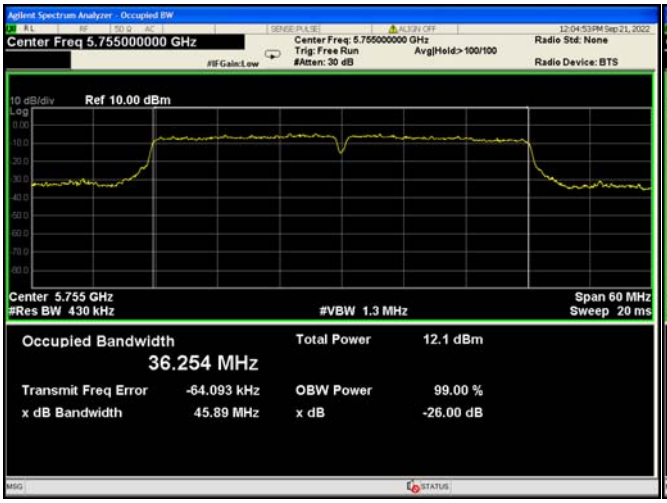
802.11n HT40 Low channel



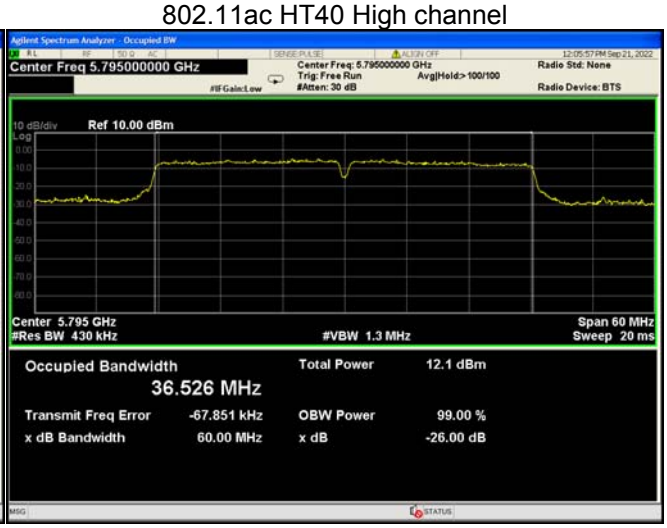
802.11n HT40 High channel



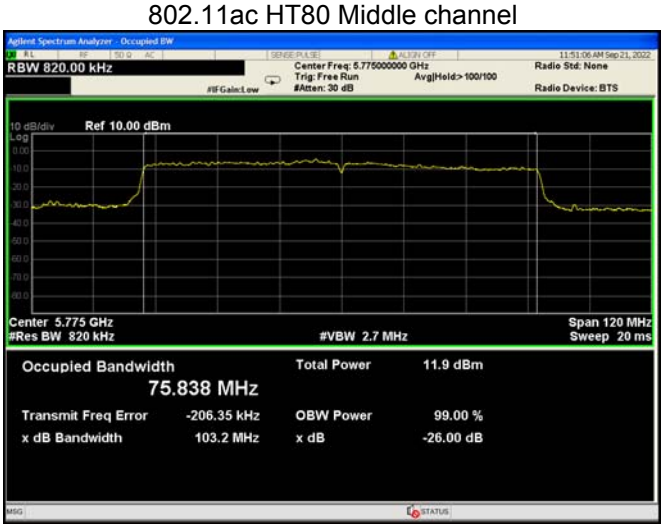
802.11ac HT40 Low channel



802.11ac HT40 High channel



802.11ac HT80 Middle channel



14 Conducted Output Power

Test Requirement:	FCC CFR47 Part 15 Section 15.407(a)
Test Method:	KDB 789033 D02 General U-NII Test Procedures New Rules v02r01 Section E ANSI C63.10:2013
Test Limit:	**For the band 5.15-5.25 GHz** For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. **For the 5.25-5.35 GHz and 5.47-5.725 GHz bands** For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. **For the band 5.725-5.850 GHz** For the band 5.725-5.850 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.
Test Result:	PASS

14.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum annlyzer.
2. Refer to section 4 of this report, according to KDB 789033 and ANSI C63.10, select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each).
3. Record the test results and calculate the final test data.

14.2 Test Result:

Note:

Conducted Output Power = Measurements + Duty Cycle Factor

According to ANSI C63.10 clause 14.4.3.1,

Directional gain=antenna gain + 10log(N)=3.7 + 10log2= 6.71dBi

N is number of array elements or staves

According to ANSI C63.10 clause 11.7,

For those cases where it is specified that the conducted output power be reduced by the amount in dB that the directional gain of the transmitting antenna exceeds 6dBi, the output power effective limit shall be calculated as follows in Equation:

$$P_{out} = P_{Limit} - (G_{TX} - 6)$$

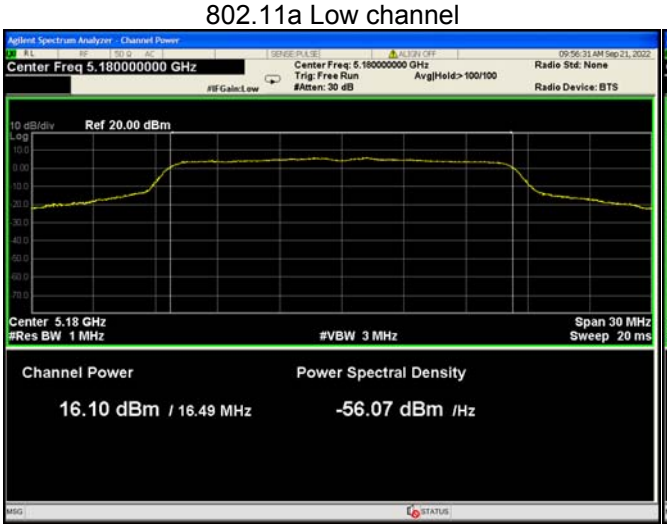
The Directional gain is 6.71dBi that greater than 6dBi, Limit of power (SUM) is **29.29dBm**.

Band	Operation mode	Channel	Duty Cycle Factor (dB)	Conducted Output Power (dBm)		
				Ant. 1	Ant. 2	SUM
U-NII-1	802.11a	Low	0	16.10	16.21	/
		Middle		15.42	15.97	/
		High		**16.43**	**16.38**	**/**
	802.11n(HT20)	Low	0	16.06	16.01	19.05
		Middle		15.38	15.86	18.64
		High		16.39	16.27	**19.34**
	802.11ac (HT20)	Low	0	16.16	16.03	19.11
		Middle		15.44	15.89	18.68
		High		16.36	16.22	19.30
	802.11n(HT40)	Low	0	15.11	14.58	17.86
		High		15.52	15.52	18.53
	802.11ac (HT40)	Low	0	15.37	14.58	18.00
		High		15.63	15.50	18.58
	802.11ac (HT80)	Middle	0	14.93	14.70	17.83
U-NII-3	802.11a	Low	0	**15.30**	**15.42**	/
		Middle		14.60	14.26	/
		High		13.29	14.92	/
	802.11n(HT20)	Low	0	14.61	15.25	17.95
		Middle		15.05	14.16	17.64
		High		13.37	14.80	17.15
	802.11ac (HT20)	Low	0	14.68	15.23	**17.97**
		Middle		14.61	14.13	17.39
		High		13.22	14.83	17.11
	802.11n(HT40)	Low	0	14.46	14.35	17.42
		High		12.85	13.28	16.08
	802.11ac (HT40)	Low	0	14.54	14.34	17.45
		High		12.82	13.29	16.07
	802.11ac (HT80)	Middle	0	12.81	13.43	16.14

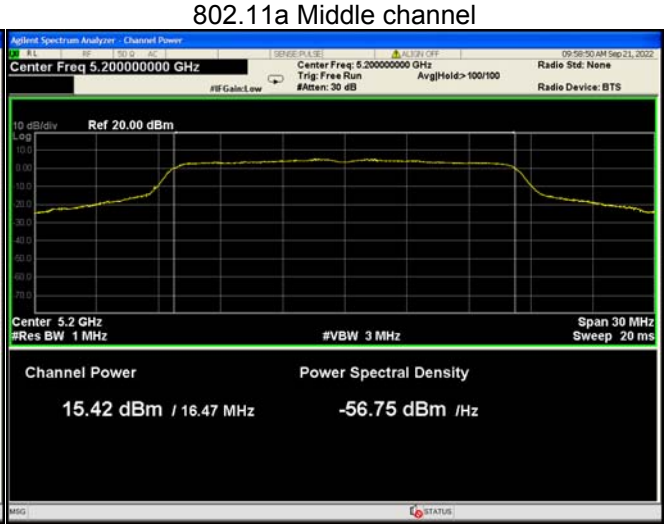
Test plots refer to next page:

Ant. 1
U-NII-1

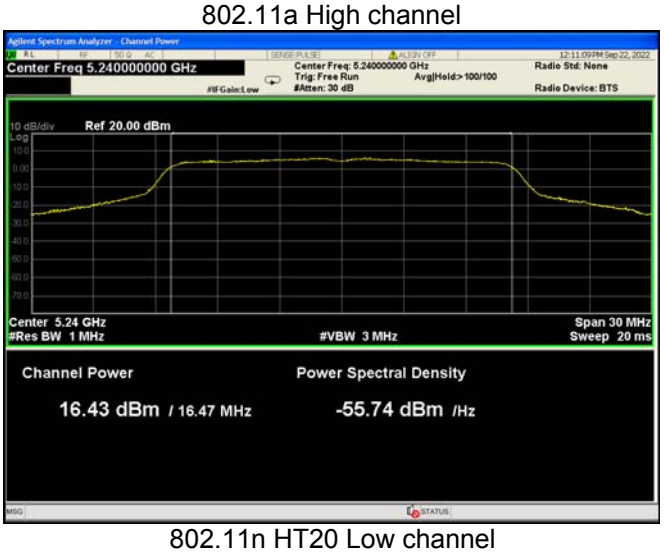
802.11a Low channel



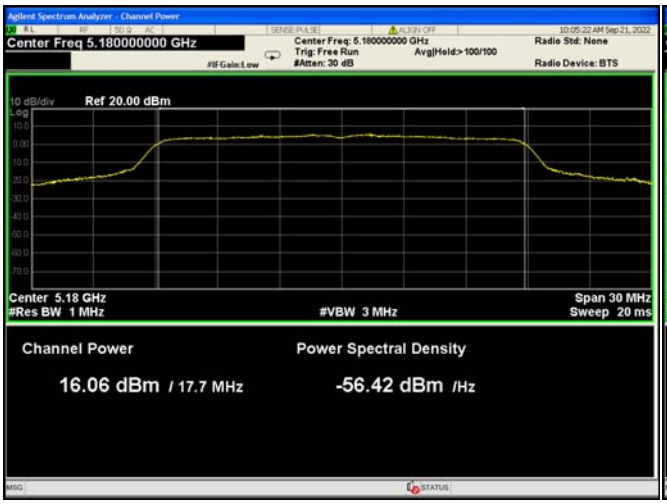
802.11a Middle channel



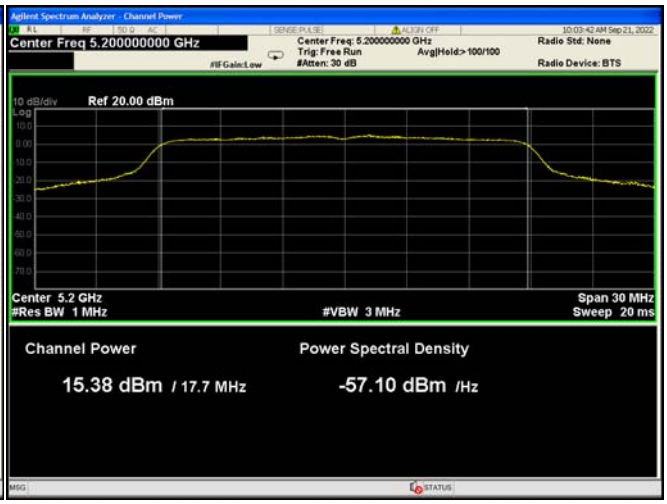
802.11a High channel



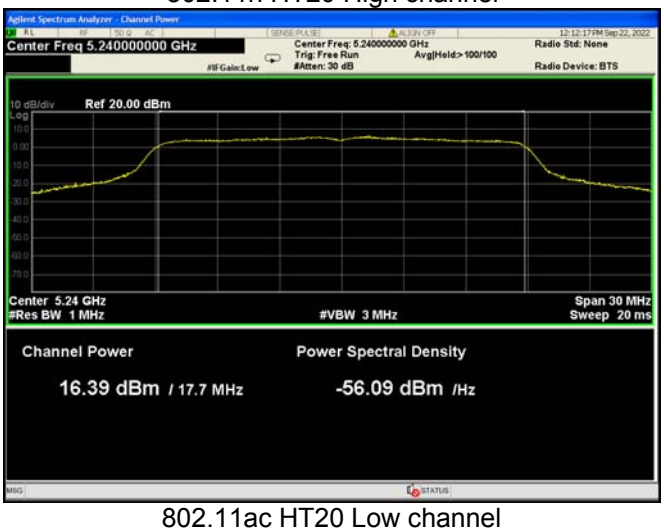
802.11n HT20 Low channel



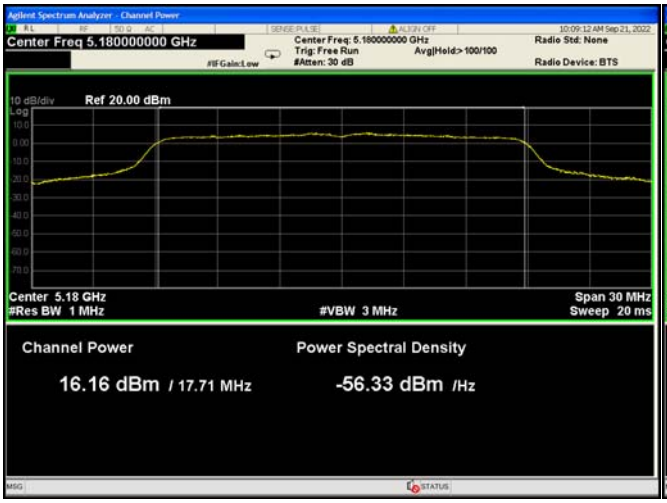
802.11n HT20 Middle channel



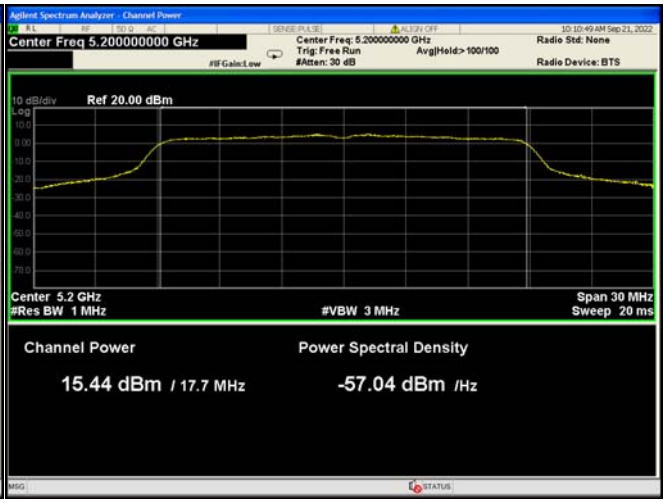
802.11n HT20 High channel



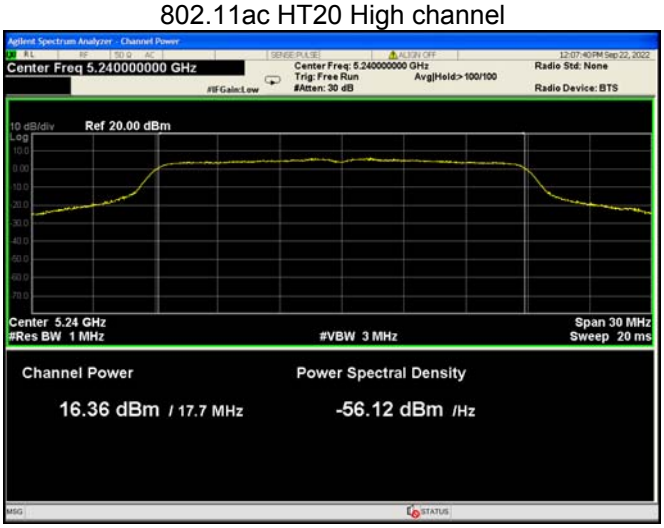
802.11ac HT20 Low channel



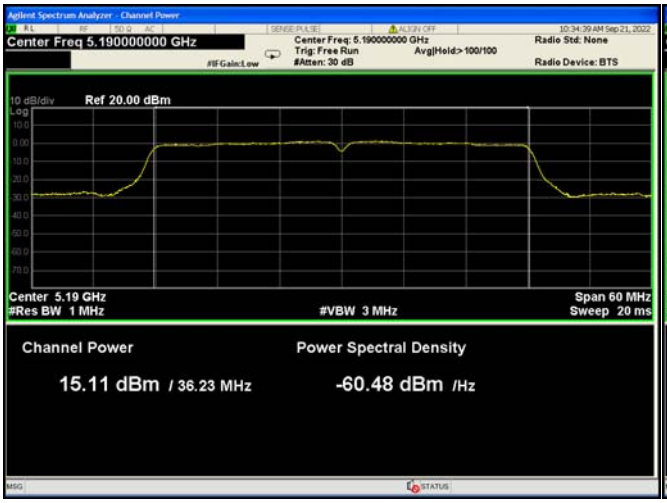
802.11ac HT20 Middle channel



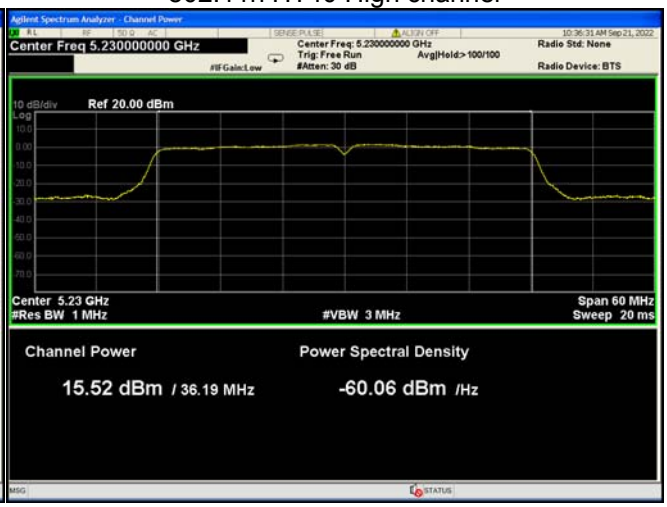
802.11ac HT20 High channel



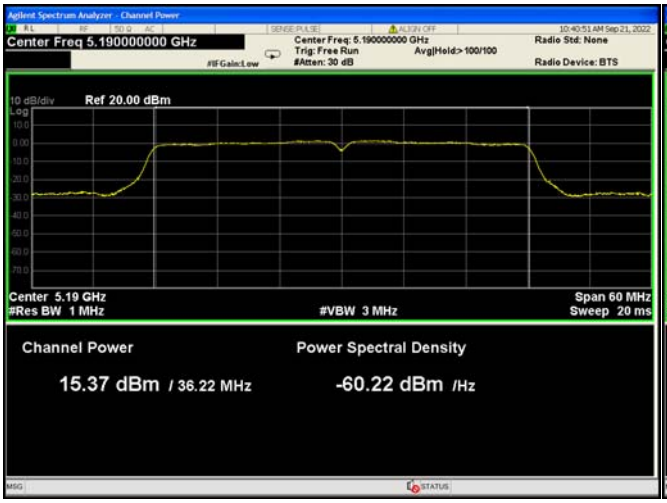
802.11n HT40 Low channel



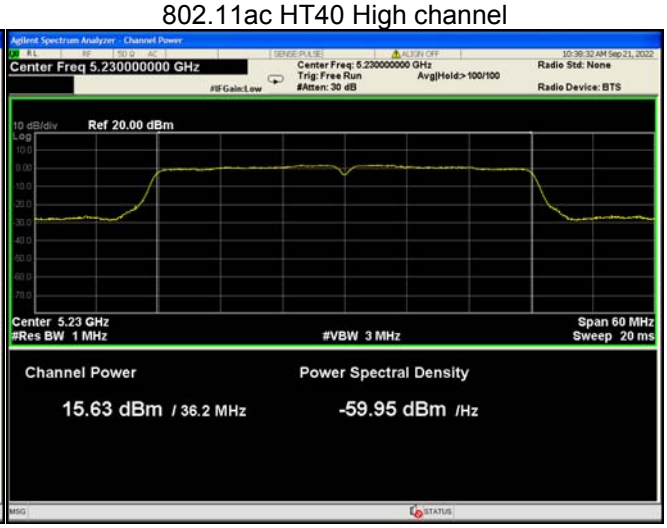
802.11n HT40 High channel



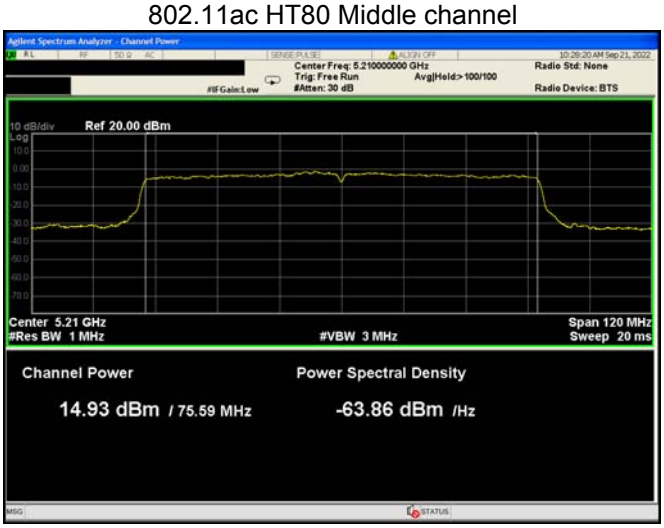
802.11ac HT40 Low channel



802.11ac HT40 High channel

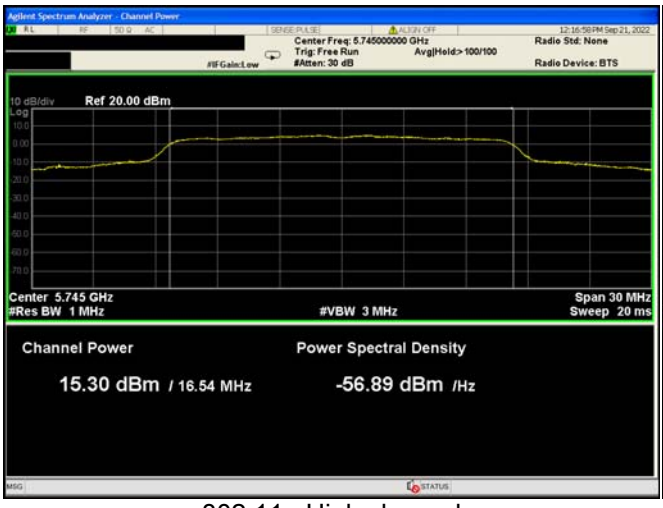


802.11ac HT80 Middle channel

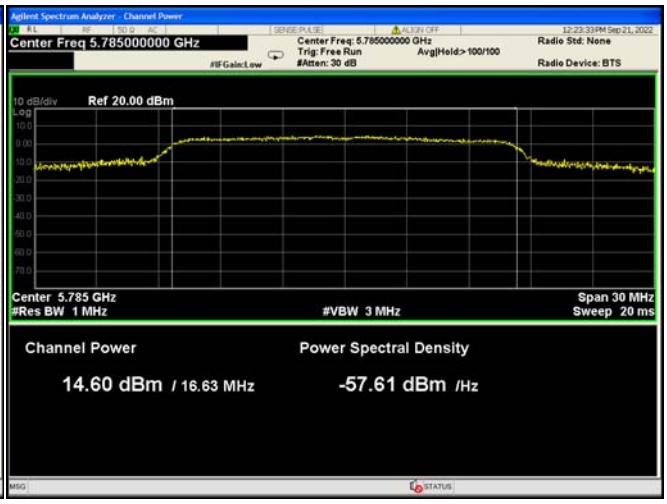


U-NII-3

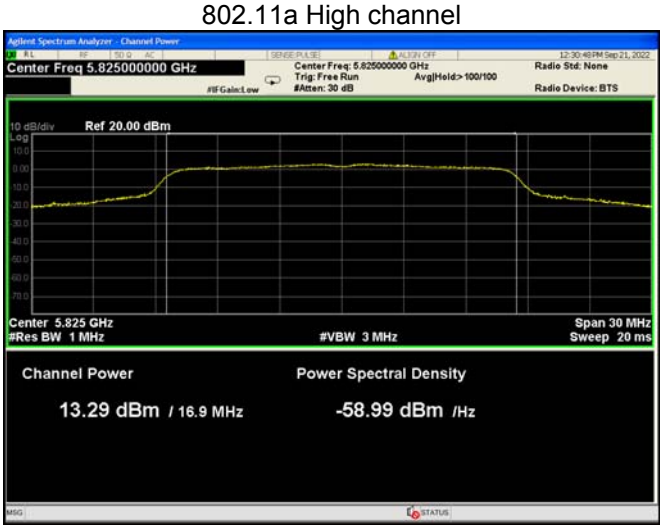
802.11a Low channel



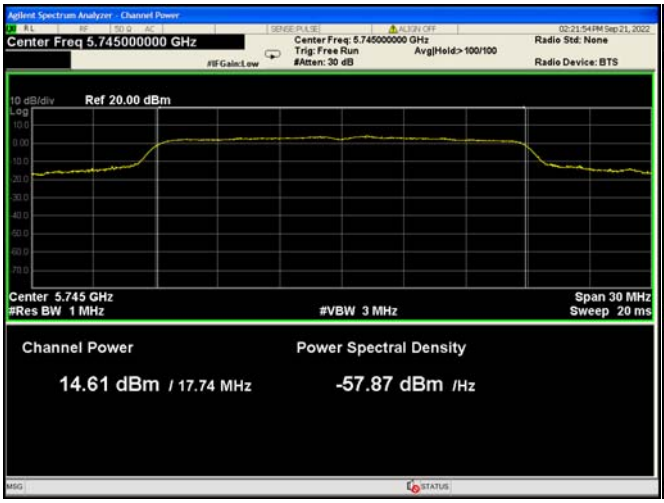
802.11a Middle channel



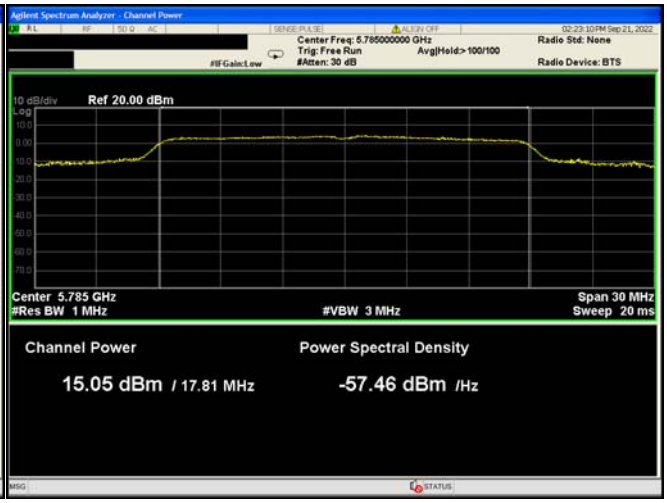
802.11a High channel



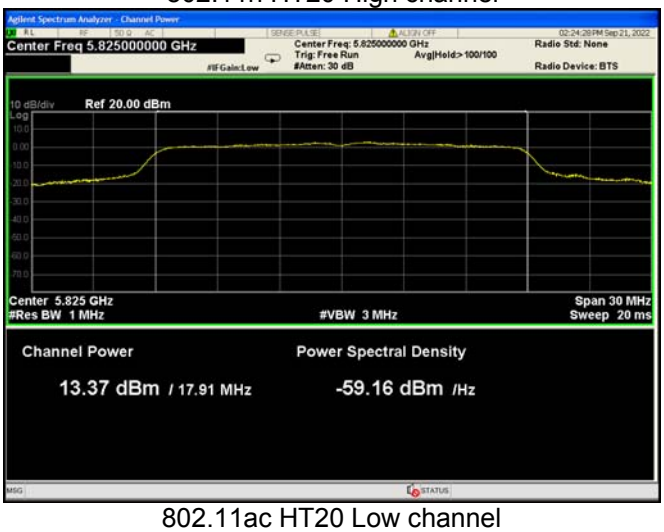
802.11n HT20 Low channel



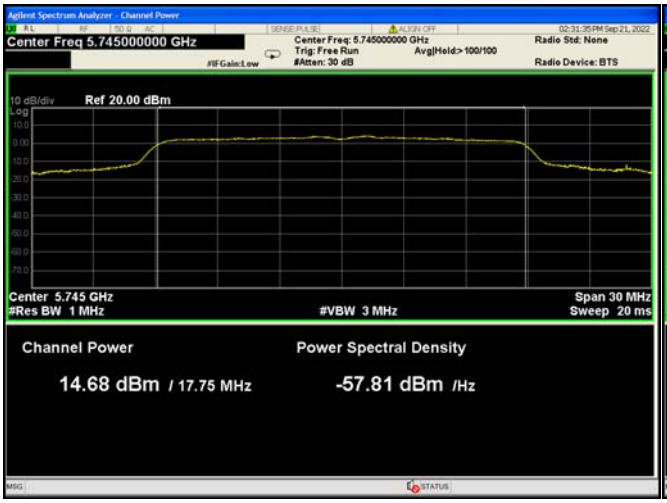
802.11n HT20 Middle channel



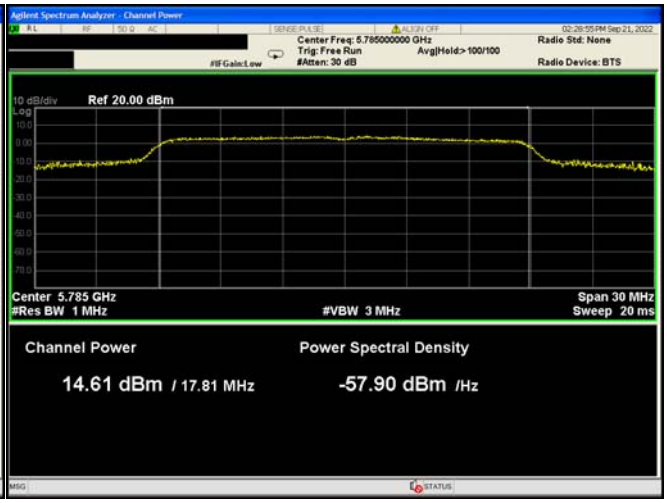
802.11n HT20 High channel



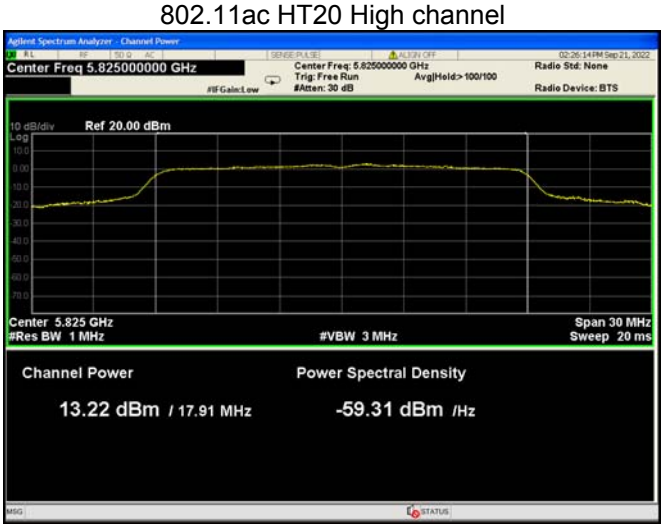
802.11ac HT20 Low channel



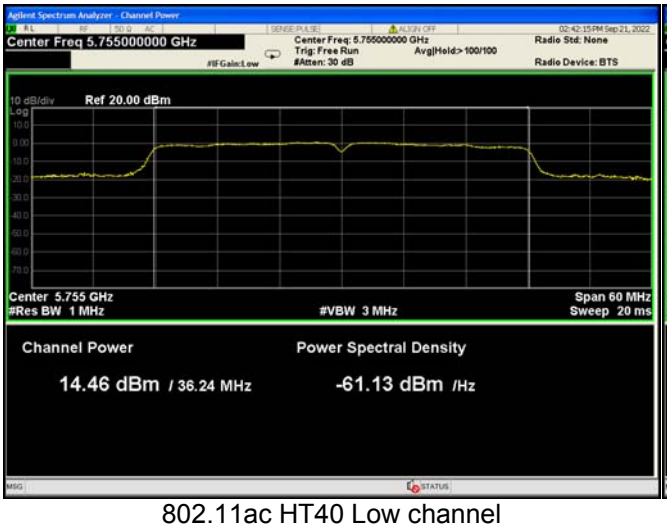
802.11ac HT20 Middle channel



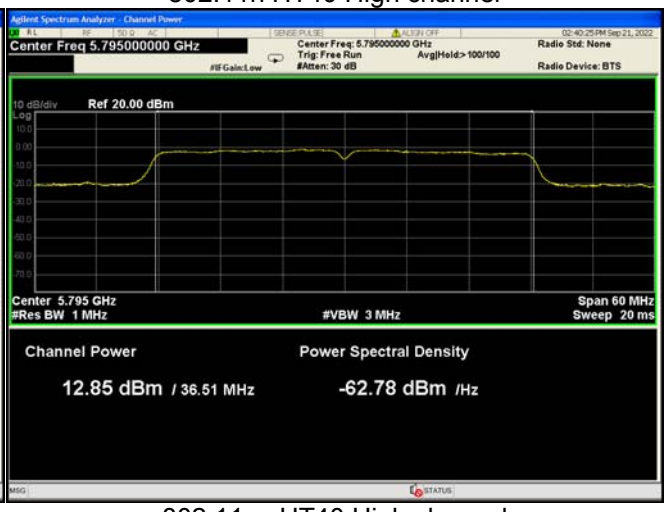
802.11ac HT20 High channel



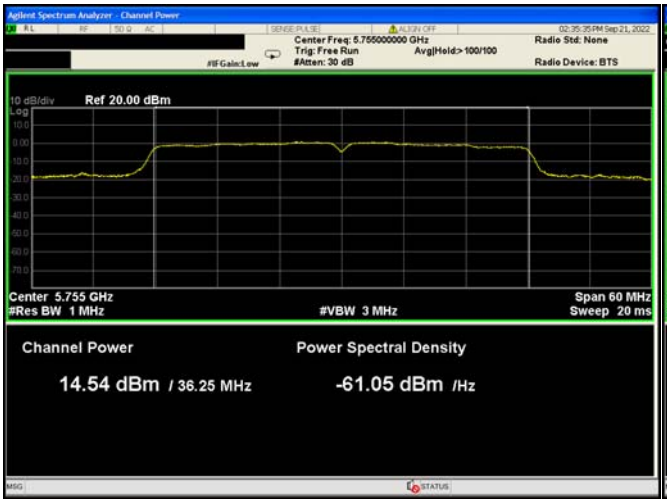
802.11n HT40 Low channel



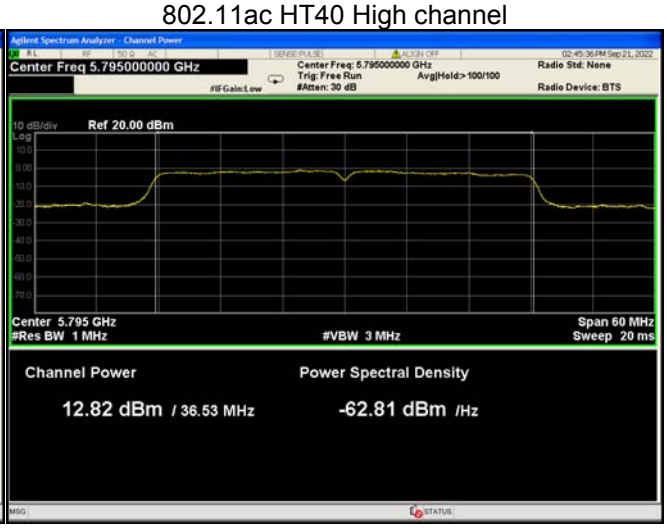
802.11n HT40 High channel



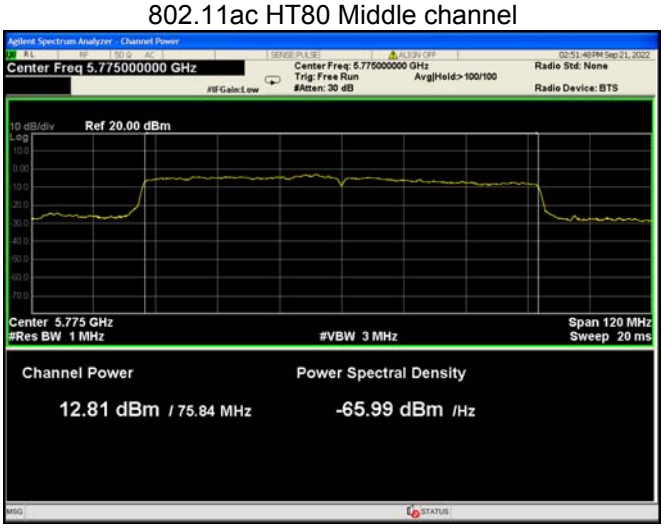
802.11ac HT40 Low channel



802.11ac HT40 High channel

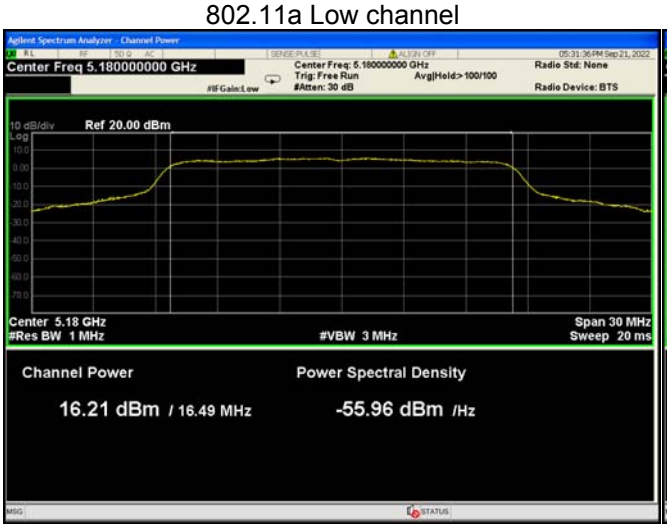


802.11ac HT80 Middle channel

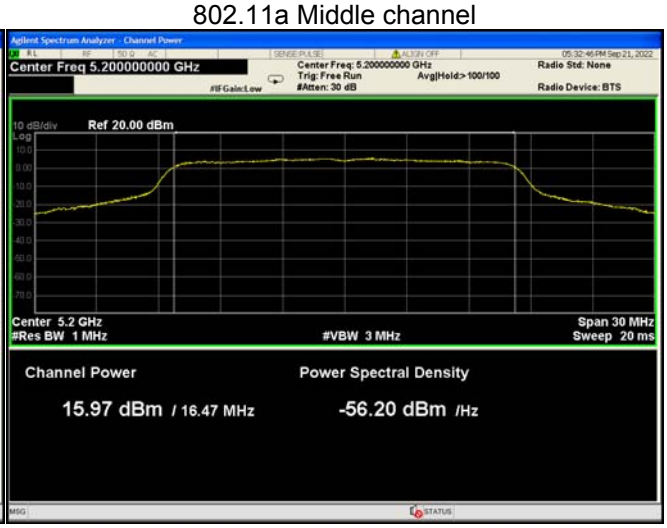


Ant. 2
U-NII-1

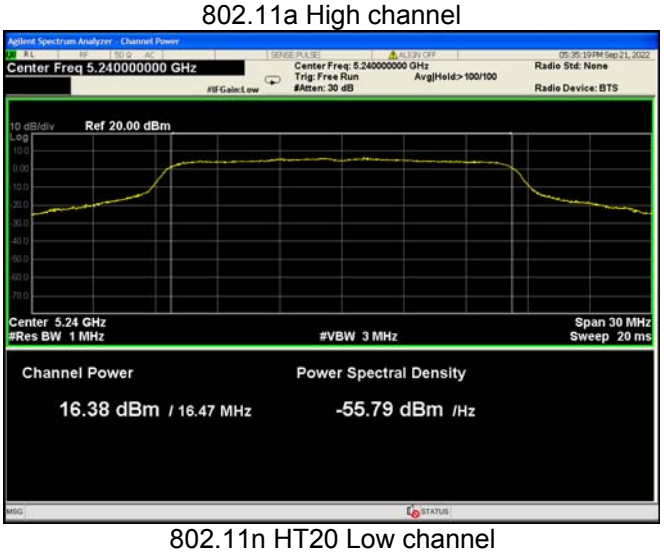
802.11a Low channel



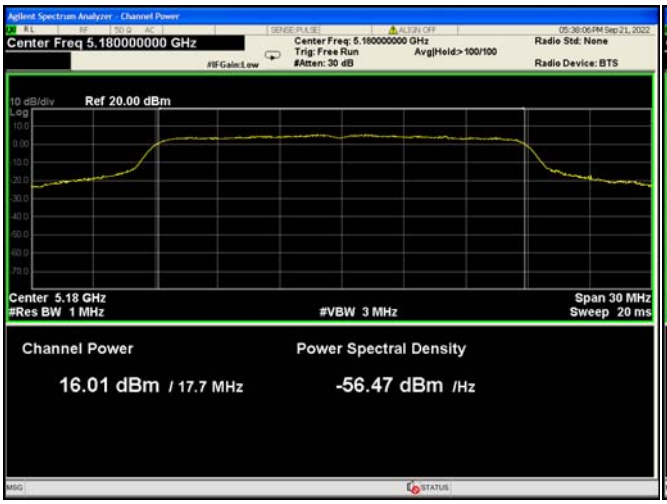
802.11a Middle channel



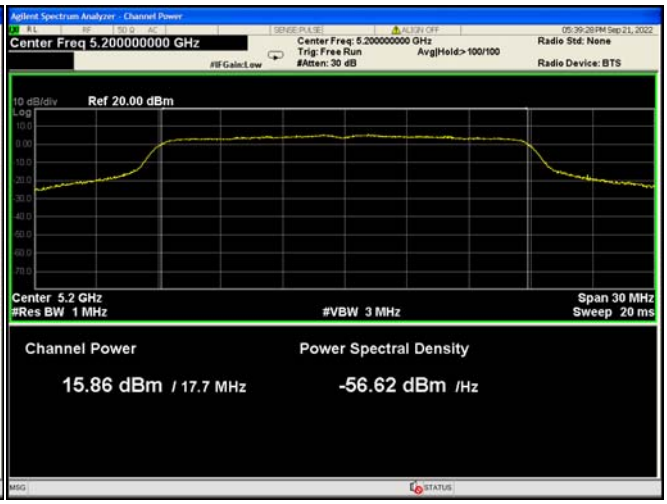
802.11a High channel



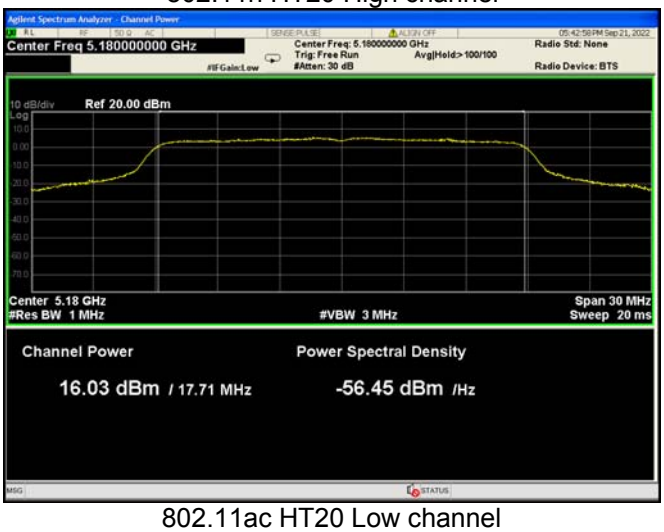
802.11n HT20 Low channel



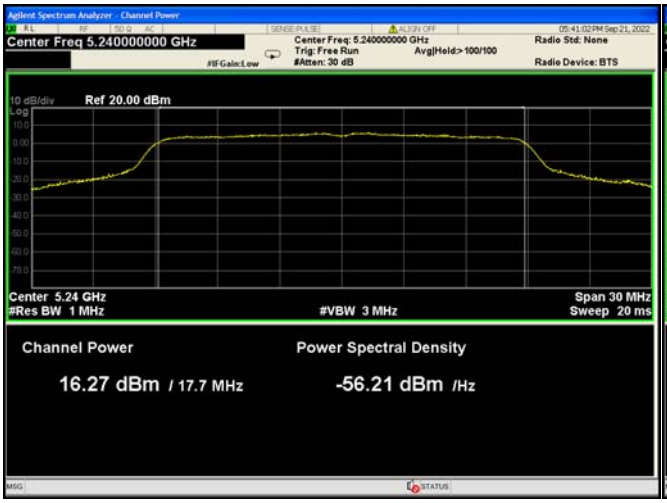
802.11n HT20 Middle channel



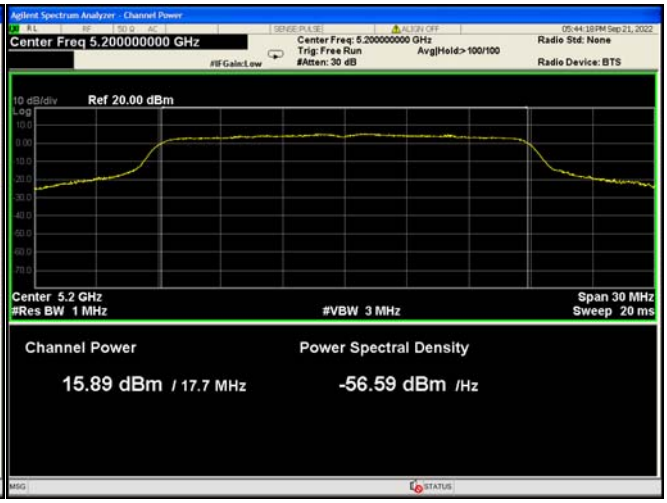
802.11n HT20 High channel



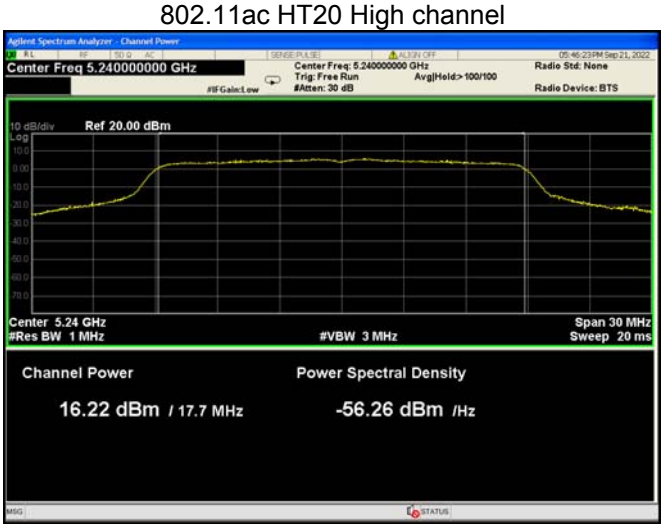
802.11ac HT20 Low channel



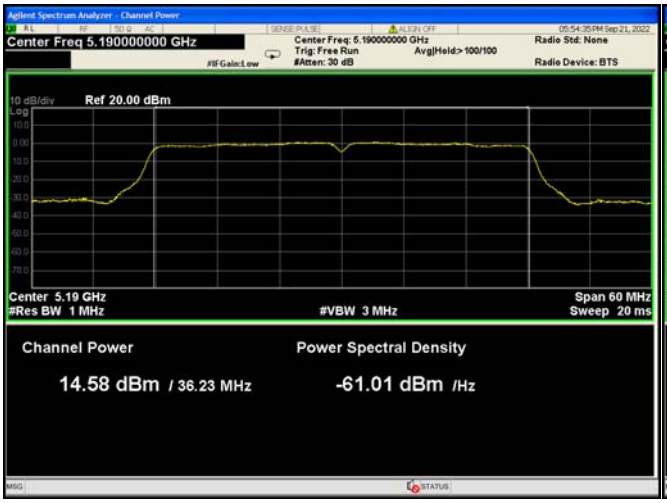
802.11ac HT20 Middle channel



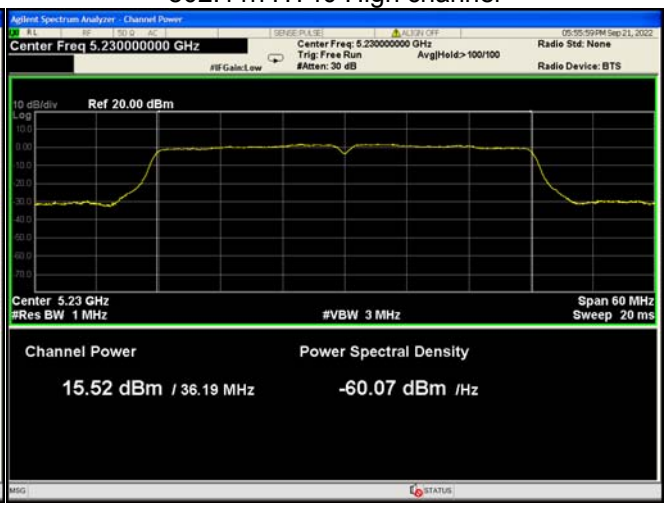
802.11ac HT20 High channel



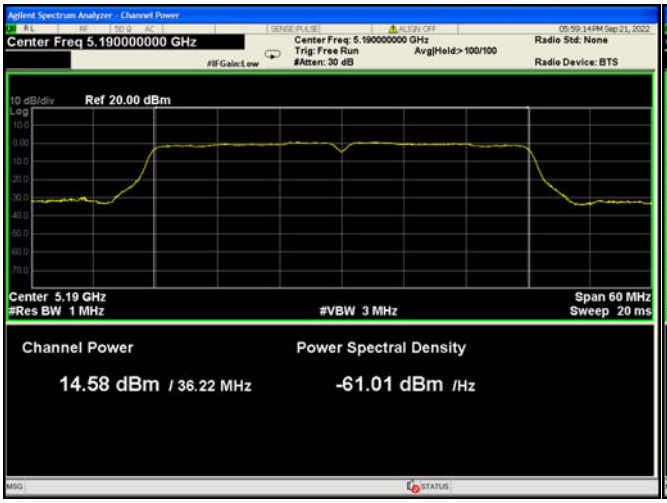
802.11n HT40 Low channel



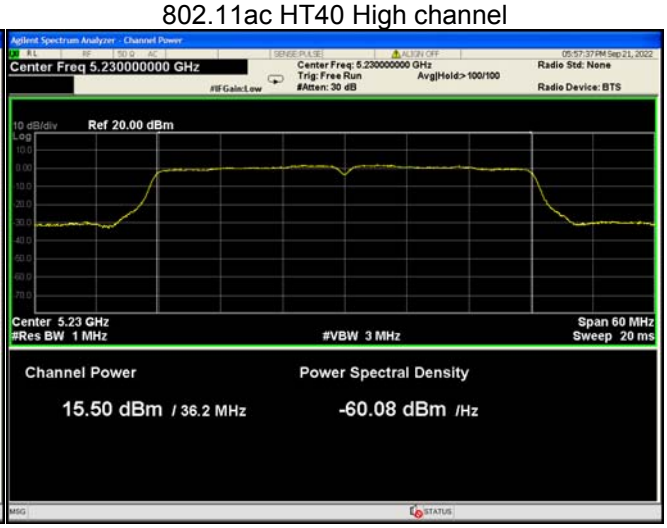
802.11n HT40 High channel



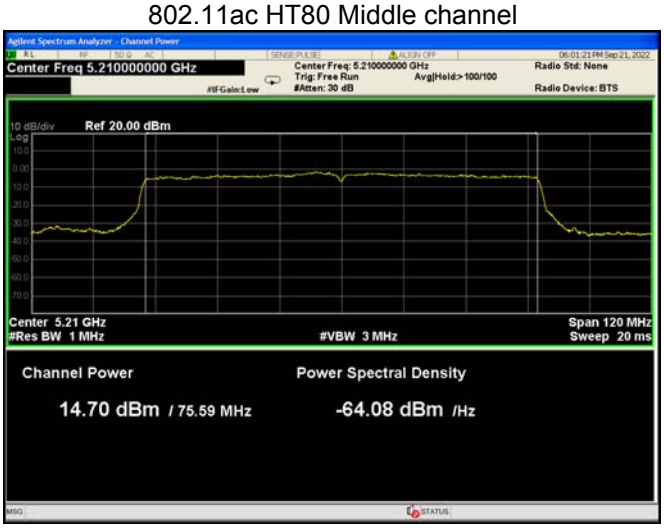
802.11ac HT40 Low channel



802.11ac HT40 High channel

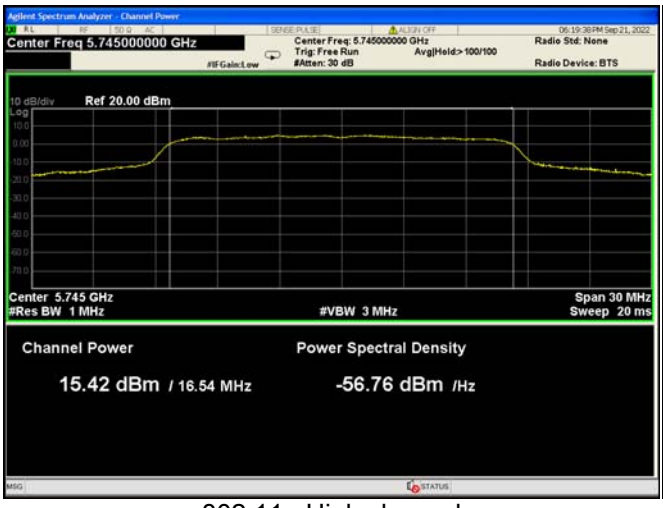


802.11ac HT80 Middle channel

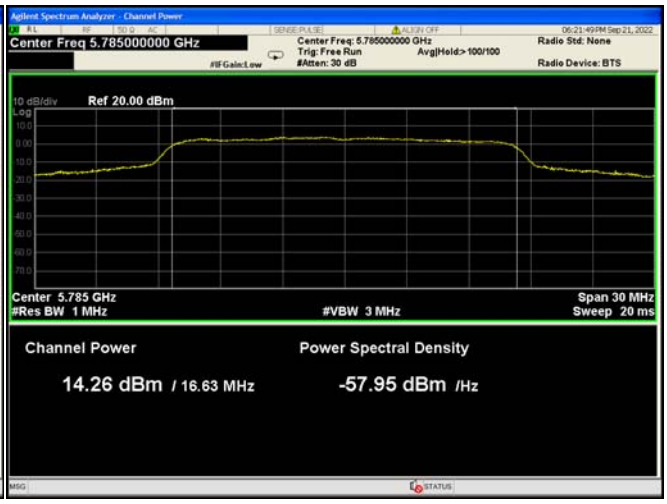


U-NII-3

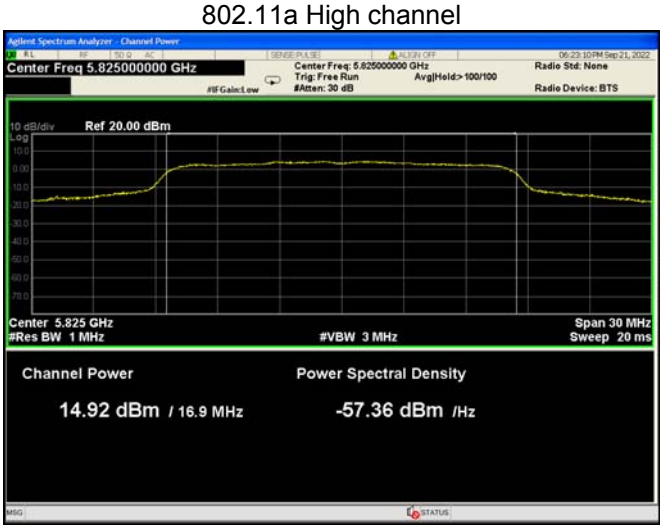
802.11a Low channel



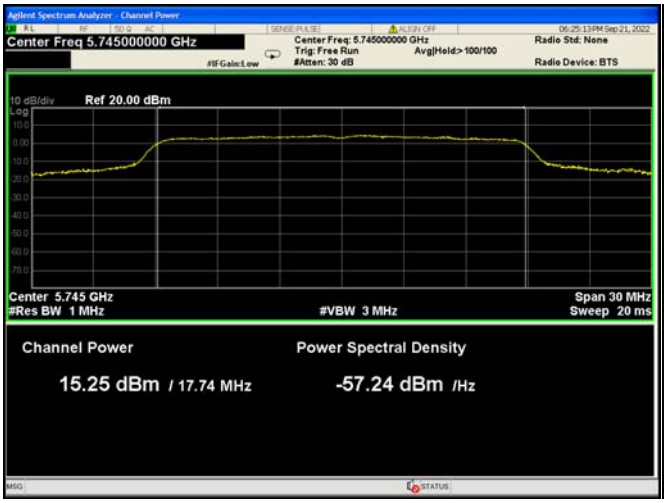
802.11a Middle channel



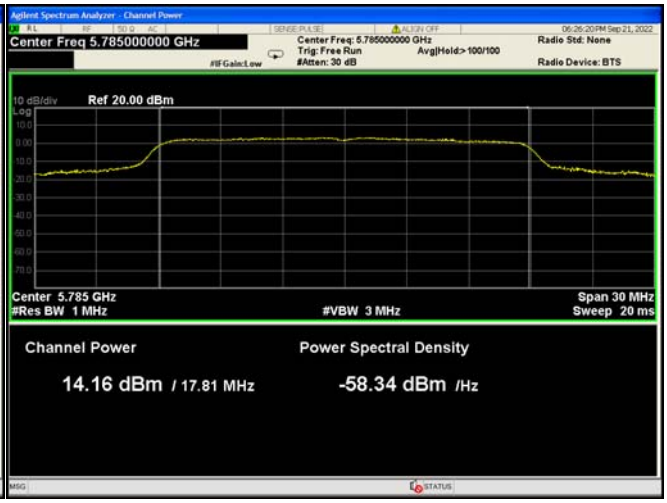
802.11a High channel



802.11n HT20 Low channel

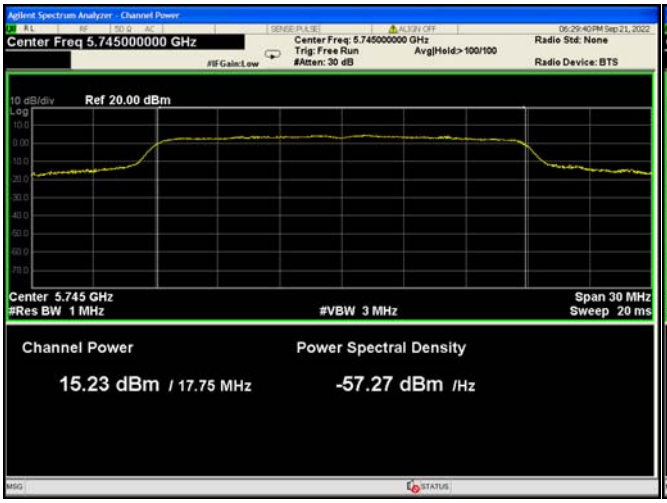


802.11n HT20 Middle channel

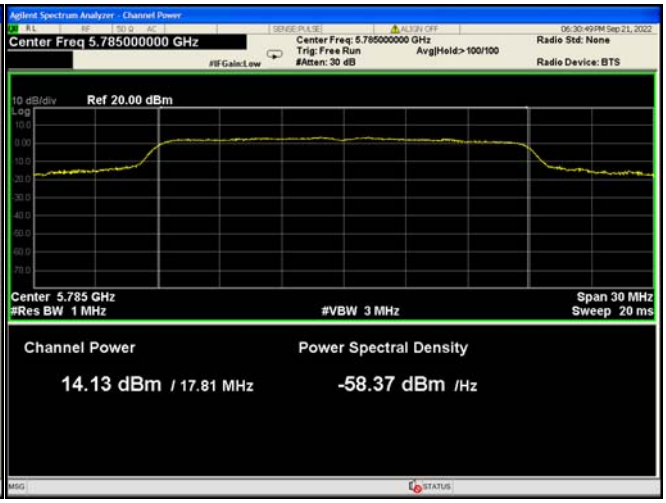


802.11n HT20 High channel

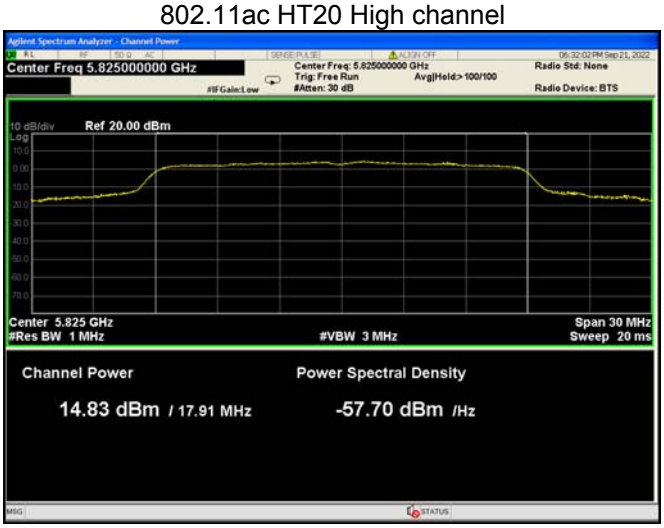
802.11ac HT20 Low channel



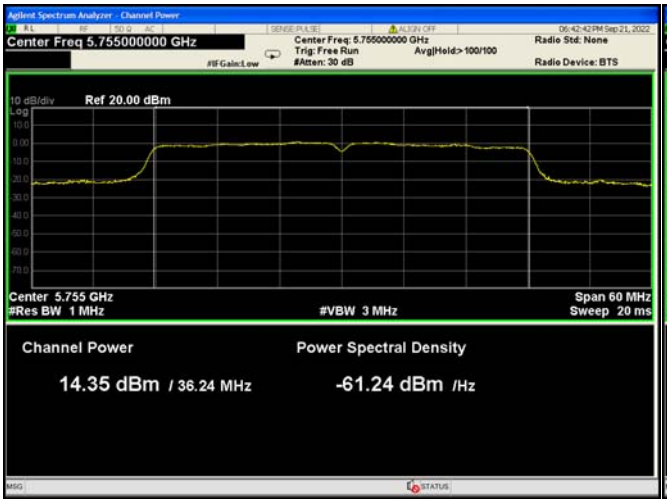
802.11ac HT20 Middle channel



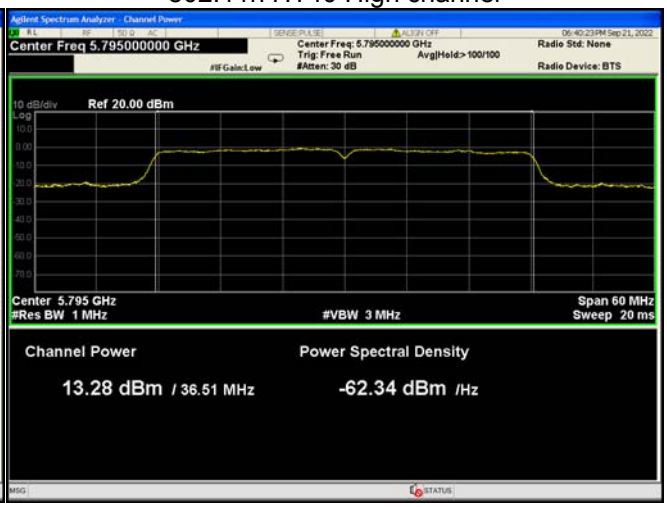
802.11ac HT20 High channel



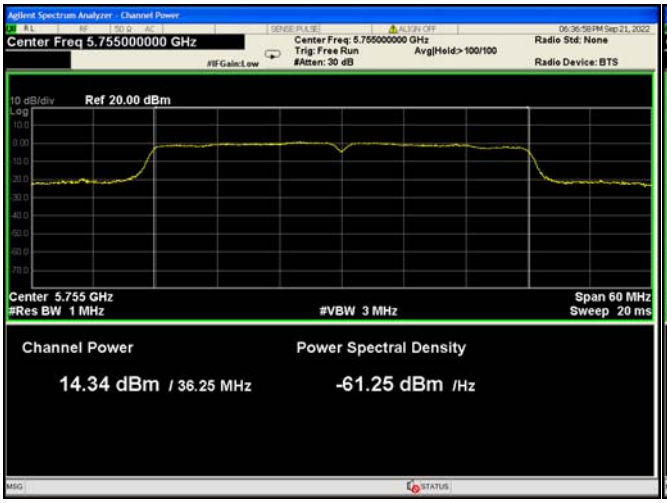
802.11n HT40 Low channel



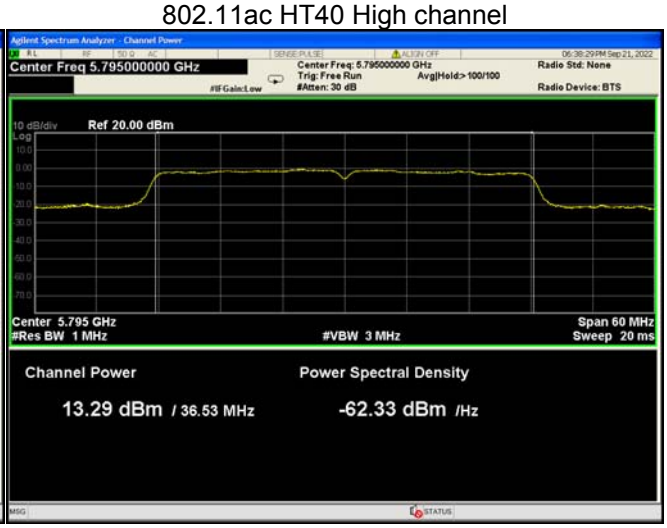
802.11n HT40 High channel



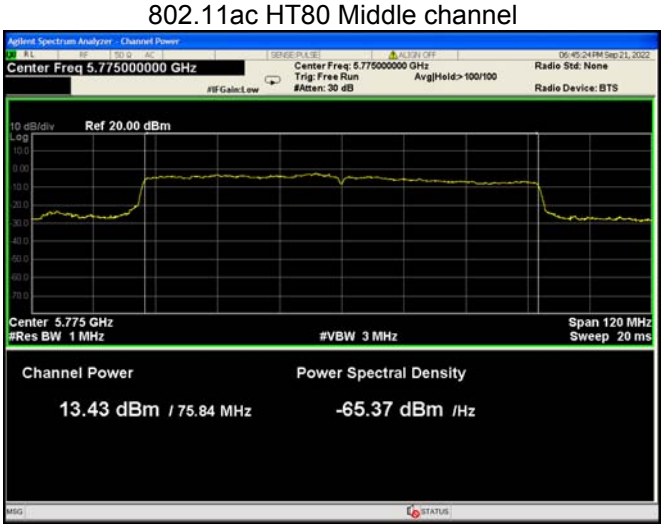
802.11ac HT40 Low channel



802.11ac HT40 High channel



802.11ac HT80 Middle channel



15 Power Spectral density

Test Requirement:	FCC CFR47 Part 15 Section 15.407(a) ANSI C63.10:2013
Test Method:	KDB 789033 D02 General UNII Test Procedures New Rules v02r01, Section F
Test Limit:	**For the band 5.15-5.25 GHz** For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. For an indoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. For client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. **For the 5.25-5.35 GHz and 5.47-5.725 GHz bands** The maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. **For the band 5.725-5.850 GHz** The maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.
Test Result:	PASS

15.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum annlyzer.
2. Refer to section 4 of this report, according to KDB 789033 and ANSI C63.10, select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each).
3. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
4. 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 II.E.2.g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
5. The result is the Maximum PSD over 1 MHz reference bandwidth.
6. For devices operating in the band 5.725−5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz).

15.2 Test Result:

Band	Operation mode	Channel	Duty Cycle Factor (dB)	Power Spectral density (dBm)		
				Ant. 1	Ant. 2	SUM
U-NII-1	802.11a	Low	0	6.05	6.19	/
		Middle		5.27	5.71	/
		High		6.30	6.63	/
	802.11n(HT20)	Low	0	6.12	6.01	9.08
		Middle		5.04	5.70	8.39
		High		5.58	6.16	8.89
	802.11ac (HT20)	Low	0	6.65	6.05	9.37
		Middle		5.58	5.85	8.73
		High		6.63	6.56	9.61
	802.11n(HT40)	Low	0	3.30	3.45	6.39
		High		3.30	3.68	6.51
	802.11ac (HT40)	Low	0	3.29	3.63	6.47
		High		3.32	3.53	6.44
	802.11ac (HT80)	Middle	0	0.27	0.32	3.30
U-NII-3	802.11a	Low	0	5.53	5.43	/
		Middle		4.76	5.24	/
		High		6.60	6.73	/
	802.11n(HT20)	Low	0	5.50	5.39	8.46
		Middle		5.44	4.45	7.98
		High		6.55	6.72	9.64
	802.11ac (HT20)	Low	0	4.99	4.74	7.88
		Middle		5.15	5.09	8.13
		High		6.29	6.13	9.22
	802.11n(HT40)	Low	0	2.11	2.75	5.45
		High		2.39	2.56	5.49
	802.11ac (HT40)	Low	0	2.01	2.37	5.21
		High		2.46	2.71	5.59
	802.11ac (HT80)	Middle	0	-0.33	0.14	2.92

Note:

Power Spectral density = Measurements + Duty Cycle Factor

According to ANSI C63.10 clause 14.4.3.1,

Directional gain=antenna gain + 10log(N)=3.7 + 10log2= 6.71dBi

N is number of array elements or staves

According to ANSI C63.10 clause 11.7,

For those cases where it is specified that the conducted output power be reduced by the amount in dB that the directional gain of the transmitting antenna exceeds 6dBi, the output power effective limit shall be calculated as follows in Equation:

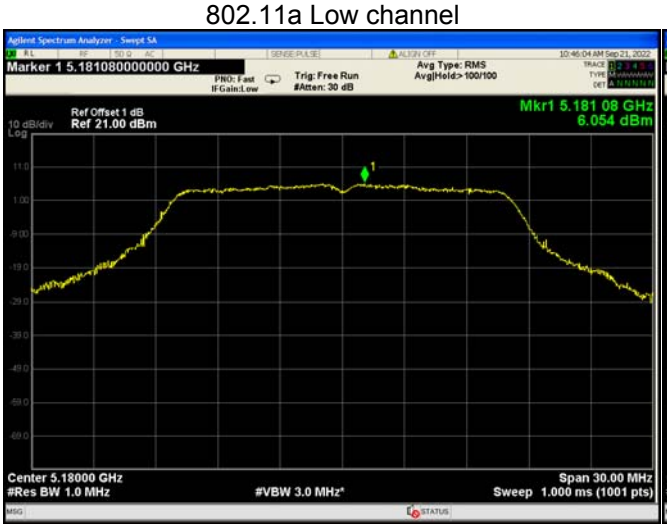
$$P_{out} = P_{Limit} - (G_{TX} - 6)$$

The Directional gain is 6.71dBi that greater than 6dBi, Limit of PSD (SUM) in U-NII-1 band is **16.29dBm/MHz**, and Limit of PSD (SUM) in U-NII-3 is **29.29dBm/500kHz.**

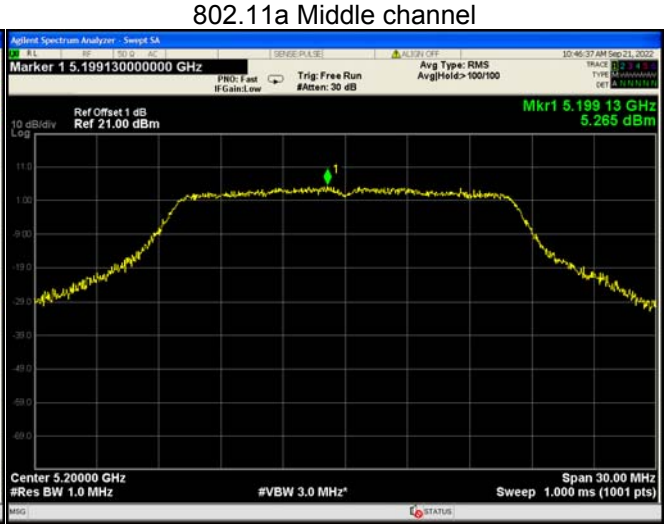
Test plots refer to next page:

Ant. 1
U-NII-1

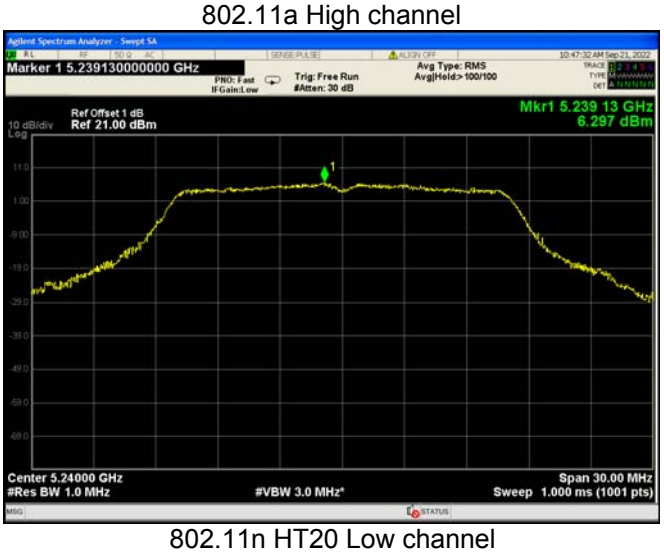
802.11a Low channel



802.11a Middle channel



802.11a High channel



802.11n HT20 Low channel

802.11n HT20 Middle channel