TEST REPORT

Product Name:	32-inch LCD Digital Retail Shelving with Android 11
FCC ID:	2ASCB-DM032NLB
Trademark:	N/A
Model Number:	DM032NLB, ADMR01
Prepared For:	D2G Group LLC
Address:	81 Commerce Drive, Fall River, Massachusetts 02720, United States
Manufacturer:	GUANGZHOU YOUGUANG OPTOELECTRONICS CO., LTD.
Address:	No.75, Pacific Ind. Zone, Xingtang Town, Zengcheng, Guangzhou,511340 China
Prepared By:	Shenzhen CTB Testing Technology Co., Ltd.
Address:	1&2/F., Building A, No.26, Xinhe Road, Xinqiao, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, China
Sample Received Date:	Dec. 11, 2023
Sample tested Date:	Dec. 11, 2023 to Jan. 11, 2024
Issue Date:	Jan. 11, 2024
Report No.:	CTB231220008RFX
Test Standards	47 CFR Part 15 Subpart E KDB 789033 V02r01
Test Results	PASS
Remark:	This is WIFI-5GHz band radio test report.

Compiled by:	Reviewed by:	Approved by:
Zhou Kui	Arron Liu	Bin Mei
Zhou Kui	Arron Liu	Bin Mei / Director

Note: If there is any objection to the inspection results in this report, please submit a written report to the company within 15 days from the date of receiving the report. The test report is effective only with both signature and specialized stamp. This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen CTB Testing Technology Co., Ltd. this report can't be reproduced except in full. The tested sample(s) and the sample information are provided by the client. "*" indicates the testing items were fulfilled by subcontracted lab. "#" indicates the items are not in CNAS accreditation scope.

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(NOTE: N/A MEANS NOT APPLICABLE)

1. VERSION

Report No.	Issue Date	Description	Approved
CTB231220008RFX	Jan. 11, 2024	Original	Valid

2. TEST SUMMARY

The Product has been tested according to the following specifications:

Test Item	Test Requirement	Test method	Result
AC Power Line Conducted Emission	47 CFR Part 15 Subpart E Section 15.407 (b)(9)	ANSI C63.10-2013	PASS
Radiated Spurious emissions	47 CFR Part 15 Subpart E Section 15.205/15.407(b)	KDB789033v02r01	PASS
Band edge	47 CFR Part 15 Subpart E Section 15.205/15.407(b)	KDB789033v02r01	PASS
Conducted Peak Output Power	47 CFR Part 15 Subpart E Section 15.407 (a)	KDB789033v02r01	PASS
Emission Bandwidth & Occupied Bandwidth	47 CFR Part 15 Subpart E Section 15.407 (a)(e)	KDB789033v02r01	PASS
Power Spectral Density	47 CFR Part 15 Subpart E Section 15.407 (a)	KDB789033v02r01	PASS
Frequency stability	47 CFR Part 15 Subpart E Section 15.407 (g)	KDB789033v02r01	PASS
Operation in the absence of information to the transmit	47 CFR Part 15 Subpart E Section 15.407 (c)	47 CFR Part 15 Subpart E	PASS
Antenna Requirement	47 CFR Part 15 Subpart E Section 15.203	ANSI C63.10-2013	PASS

Remark:
Test according to ANSI C63.4-2014 & ANSI C63.10-2013.

3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Uncertainty
1	Occupancy bandwidth	U=±54.3Hz
2	Adjacent channel power	U=±1.3dB
3	Conducted Adjacent channel power	U=±1.38dB
4	Conducted output power Above 1G	U=±1.0dB
5	Conducted output power below 1G	U=±0.9dB
6	Power Spectral Density , Conduction	U=±1.0dB
7	Conduction spurious emissions	U=±2.8dB
8	Out of band emission	U=±54Hz
9	3m camber Radiated spurious emission(30MHz-1GHz)	U=±4.3dB
10	3m chamber Radiated spurious emission(1GHz-18GHz)	U=±4.5dB
11	humidity uncertainty	U=±5.3%
12	Temperature uncertainty	U=±0.59℃
13	Supply volyages	U=±3%
14	Time	U=±5%
15	Conducted Emission (150KHz-30MHz)	3.2 dB
16	3m camber Radiated spurious emission(9KHz-30MHz)	4.8dB
17	3m chamber Radiated spurious emission(18GHz-40GHz)	3.4dB

4. PRODUCT INFORMATION AND TEST SETUP

4.1 Product Information

Model(s):	DM032NLB, ADMR01
Model Description:	All the model are the same circuit and RF module, only different for model name .Test sample model: DM032NLB
Wi-Fi Specification:	IEEE 802.11a/b/g/n/ac/ax
Hardware Version:	V1.0
Software Version:	V1.0
Operation Frequency:	IEEE 802.11a/n/ac/ax(20M): 5150MHz ~5250MHz/ 4 channel IEEE 802.11n/ac/ax(40M): 5150MHz ~5250MHz/ 2 channel IEEE 802.11ac/ax(80M): 5150MHz ~5250MHz/ 1 channel IEEE 802.11a/n/ac/ax(20M): 5725MHz ~5850MHz/ 5 channel IEEE 802.11n/ac/ax(40M): 5725MHz ~5850MHz/ 2 channel IEEE 802.11ac/ax(80M): 5725MHz ~5850MHz/ 1 channel
Max. RF output power:	WiFi (5G): 12.714dBm
Type of Modulation:	WiFi: OFDM
Antenna installation:	Rod antenna
Antenna Gain:	5.2G:3.1dBi 5.8G:2.99dBi
Ratings:	AC 120V/60Hz

4.2 Test Setup Configuration

See test photographs attached in EUT TEST SETUP PHOTOGRAPHS for the actual connections between Product and support equipment.

4.3 Support Equipment

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
/	/	/	/	/	/

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4 Channel List

For 802.11a/n/ac/ax(20M) Operation in the 5180MHz ~5240 MHz band			
Channel	Frequency	Channel	Frequency
36	5180MHz	44	5220MHz
40	5200MHz	48	5240MHz
For 802.11a/n/ac/ax(20M) Operation in the 5745MHz ~5825 MHz band			
Channel	Frequency	Channel	Frequency
149	5745MHz	161	5805MHz
153	5765MHz	165	5825MHz
157	5785MHz	NA	NA

For 802.11n/ac/ax(40M) Operation in the 5190MHz ~5230 MHz band			
Channel	Frequency	Channel	Frequency
38	5190MHz	46	5230MHz
For 802.11n/ac/ax(40M) Operation in the 5755MHz ~5795 MHz band			
Channel	Frequency	Channel	Frequency
151	5755MHz	159	5795MHz

For 802.11ac/ax(80M) Operation in the 5210 MHz band			
Channel	Frequency	Channel	Frequency
42	5210MHz	NA	NA
For 802.11ac/ax(80M) Operation in the 5775 MHz band			
Channel	Frequency	NA	NA
155	5775MHz	NA	NA

NOTE: Dutycycle>98%.

Test mode	rate
802.11a	54M
802.11n	500M
802.11/ac/ax	500M

4.5 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test Mode	Tx/Rx	RF Channel		
		Low(L)	Middle(M)	High(H)
802.11a/n/ac/ax(20M)	5180MHz ~5240 MHz	Channel 36	Channel 40	Channel 48
		5180MHz	5200MHz	5240MHz
802.11n/ac/ax(40M)		Channel 38	N/A	Channel 46
		5190MHz	N/A	5230MHz
802.11ac/ax(80M)		N/A	Channel 42	N/A
		N/A	5210MHz	N/A
802.11a/n/ac/ax(20M)	5745MHz ~5825MHz	Channel 149	Channel 157	Channel 165
		5745MHz	5785MHz	5825MHz
802.11n/ac/ax(40M)		Channel 151	N/A	Channel 159
		5755MHz	N/A	5795MHz
802.11ac/ax(80M)		N/A	Channel 155	N/A
		N/A	5775MHz	N/A

4.6 Test Environment

Humidity(%):	54
Atmospheric Pressure(kPa):	101
Normal Voltage(AC):NV	120V
Normal Temperature(℃):NT	23
Low Temperature(℃):LT	0
High Temperature(℃):HT	40

5. TEST FACILITY AND TEST INSTRUMENT USED

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at 1&2F., Building A, No. 26, Xinhe Road, Xinqiao, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

5.2 Test Instrument Used

Item	Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	Agilent	N9020A	MY52090073	2024.07.05
2	Power Sensor	Agilent	U2021XA	MY56120032	2024.07.05
3	Power Sensor	Agilent	U2021XA	MY56120034	2024.07.05
4	Communication test set	R&S	CMW500	108058	2024.07.05
5	Spectrum Analyzer	KEYSIGHT	N9020A	MY51289897	2024.07.05
6	Signal Generator	Agilent	N5181A	MY50140365	2024.07.05
7	Vector signal generator	Agilent	N5182A	MY47420195	2024.07.05
8	Communication test set	Agilent	E5515C	MY50102567	2024.07.06
9	2.4 GHz Filter	Shenxiang	MSF2400-2483.5MS-1154	20181015001	2024.07.05
10	5 GHz Filter	Shenxiang	MSF5150-5850MS-1155	20181015001	2024.07.06
11	Filter	Xingbo	XBLBQ-DZA120	190821-1-1	2024.07.06
12	BT&WI-FI Automatic test software	Micowave	MTS8000	Ver. 2.0.0.0	/
13	Rohde & Schwarz SFU Broadcast Test System	R&S	SFU	101017	2024.10.30
14	Temperature humidity chamber	Hongjing	TH-80CH	DG-15174	2024.07.05
15	234G Automatic test software	Micowave	MTS8200	Ver. 2.0.0.0	/
16	966 chamber	C.R.T.	966	/	2024.08.11
17	Receiver	R&S	ESPI	100362	2024.07.05
18	Amplifier	HP	8447E	2945A02747	2024.07.05
19	Amplifier	Agilent	8449B	3008A01838	2024.07.05
20	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	00869	2024.07.08

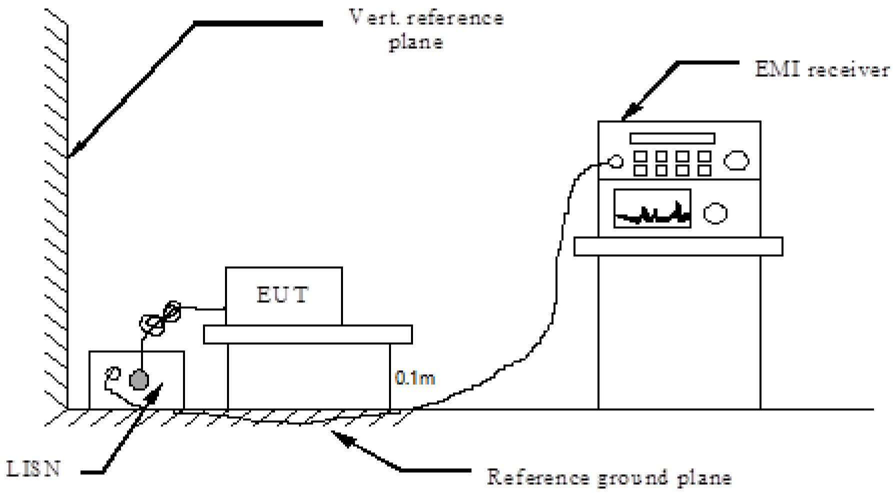
21	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA9120D	01911	2024.07.08
22	EMI test software	Fala	EZ-EMC	FA-03A2 RE	/
23	Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-224	2024.07.08
24	loop antenna	ZHINAN	ZN30900A	GTS534	/
25	40G Horn antenna	A/H/System	SAS-574	588	2024.10.30
26	Amplifier	AEROFLEX	Aeroflex	097	2024.07.05

Continuous disturbance					
No.	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	LISN	ROHDE&SCHWARZ	ESH3-Z5	100318	2024.07.05
2	Pulse limiter	ROHDE&SCHWARZ	ESH3Z2	357881052	2024.07.05
3	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100428/003	2024.07.05
4	Coaxial cable	ZDECL	Z302S-NJ-SMA J-12M	18091905	2024.07.05
5	ISN	Schwarzbeck	NTFM8158	183	2024.07.05
6	Communication test set	Agilent	E5515C	MY50102567	2024.07.05
7	Communication test set	R&S	CMW500	108058	2024.07.05
8	EZ-EMC	Frad	EMC-con3A1.1	/	/

Radiated emission					
No.	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA 9120 D	01911	2024.07.08
2	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	00869	2024.07.08
3	Amplifier	Agilent	8449B	3008A01838	2024.07.05
4	Amplifier	HP	8447E	2945A02747	2024.07.05
5	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100428/003	2024.07.05
6	Coaxial cable	ETS	RFC-SNS-100-NMS-80 NI	/	2024.07.05
7	Coaxial cable	ETS	RFC-SNS-100-NMS-20 NI	/	2024.07.05
8	Coaxial cable	ETS	RFC-SNS-100-SMS-20 NI	/	2024.07.05
9	Coaxial cable	ETS	RFC-NNS-100 -NMS-300 NI	/	2024.07.05
10	Communication test set	Agilent	E5515C	MY50102567	2024.07.05
11	Communication test set	R&S	CMW500	108058	2024.07.05
12	EZ-EMC	Frad	EMC-con3A1.1	/	/

6. AC POWER LINE CONDUCTED EMISSION

6.1 Block Diagram Of Test Setup



6.2 Limit

Table 4 – AC power-line conducted emissions limits		
Frequency (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 Note 1	56 to 46 Note 1
0.5 – 5	56	46
5 – 30	60	50

Note 1: The level decreases linearly with the logarithm of the frequency.

* Decreasing linearly with the logarithm of the frequency

6.3 Test procedure

1) The mains terminal disturbance voltage test was conducted in a shielded room.

2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3) The tabletop EUT was placed upon a non-metallic table 0.1m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,

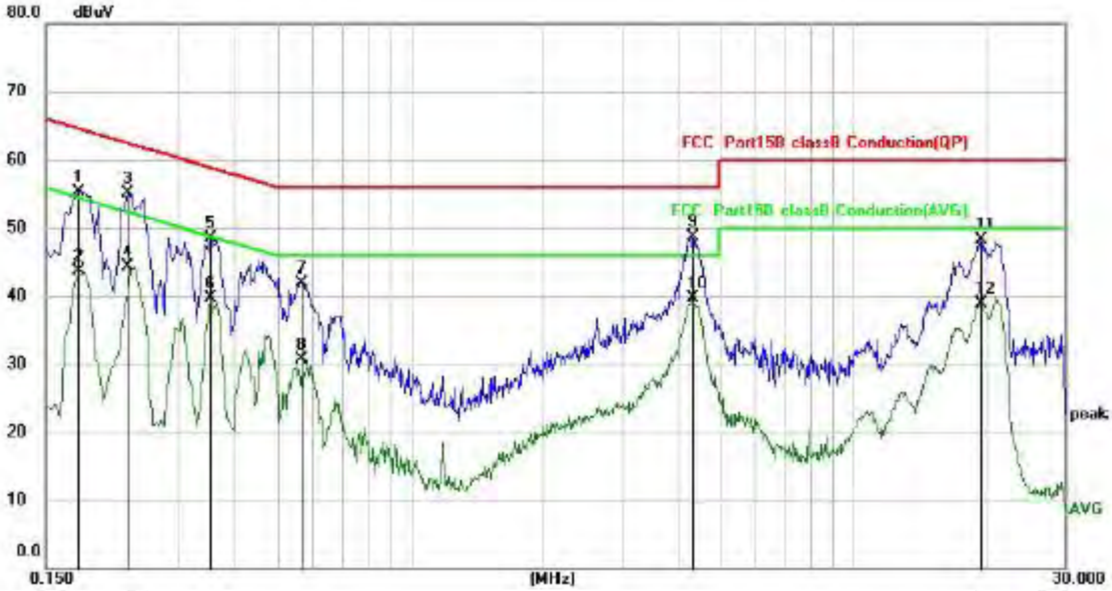
4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0,4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the

horizontal ground reference plane. The LISN 1 was placed 0,1 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0,1 m from the LISN 2.

5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.

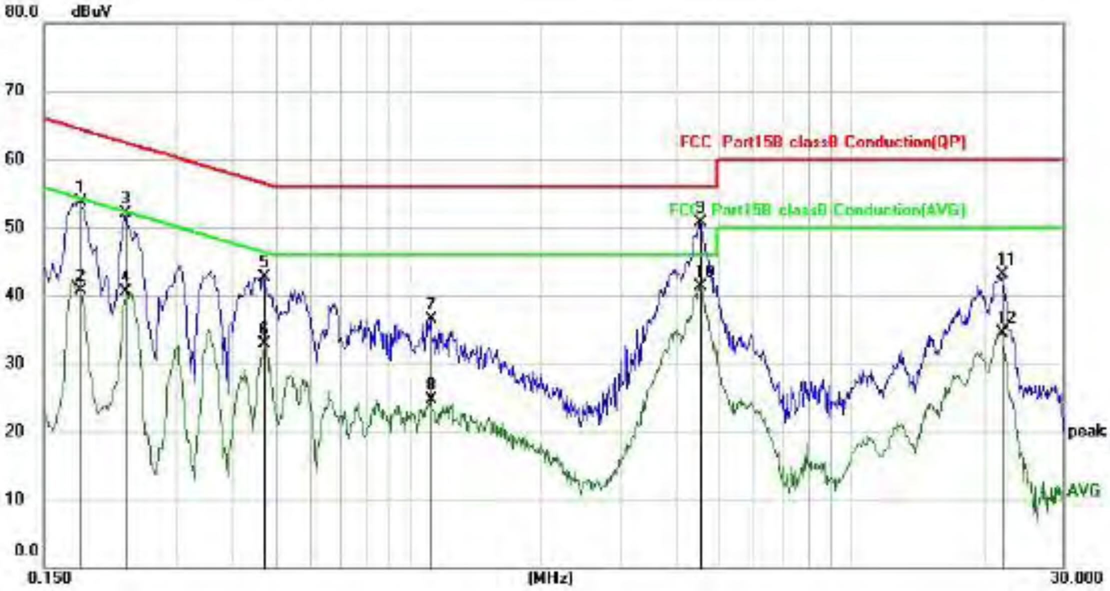
6.4 Test Result

Test Specification: Neutral



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1779	45.32	9.95	55.27	64.58	-9.31	QP
2		0.1779	33.85	9.95	43.80	54.58	-10.78	AVG
3		0.2300	45.06	9.95	55.01	62.45	-7.44	QP
4		0.2300	34.39	9.95	44.34	52.45	-8.11	AVG
5		0.3537	38.50	9.97	48.47	58.88	-10.41	QP
6		0.3537	29.75	9.97	39.72	48.88	-9.16	AVG
7		0.5656	31.84	10.00	41.84	56.00	-14.16	QP
8		0.5656	20.77	10.00	30.77	46.00	-15.23	AVG
9		4.3219	38.39	10.31	48.70	56.00	-7.30	QP
10	*	4.3219	29.36	10.31	39.67	46.00	-6.33	AVG
11		19.3379	37.46	10.81	48.27	60.00	-11.73	QP
12		19.3379	28.11	10.81	38.92	50.00	-11.08	AVG

Test Specification: Line



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1819	43.81	9.95	53.76	64.40	-10.64	QP
2		0.1819	30.75	9.95	40.70	54.40	-13.70	AVG
3		0.2300	42.20	9.95	52.15	62.45	-10.30	QP
4		0.2300	30.52	9.95	40.47	52.45	-11.98	AVG
5		0.4700	32.75	9.99	42.74	56.51	-13.77	QP
6		0.4700	22.90	9.99	32.89	46.51	-13.62	AVG
7		1.1180	26.54	10.02	36.56	56.00	-19.44	QP
8		1.1180	14.66	10.02	24.68	46.00	-21.32	AVG
9		4.5377	40.35	10.34	50.69	56.00	-5.31	QP
10	*	4.5377	30.90	10.34	41.24	46.00	-4.76	AVG
11		21.7778	32.22	10.89	43.11	60.00	-16.89	QP
12		21.7778	23.59	10.89	34.48	50.00	-15.52	AVG

Remark:
1. Factor = Cable loss + LISN factor, Margin = Limit – Level
2. All modes were tested at AC 120V and 240V, only the worst result of AC 120V 60Hz was reported.
3. All the test modes completed for test. Only the worst result of was reported.

7. RADIATED SPURIOUS EMISSIONS

7.1 Block Diagram Of Test Setup

Figure 1. Below 30MHz

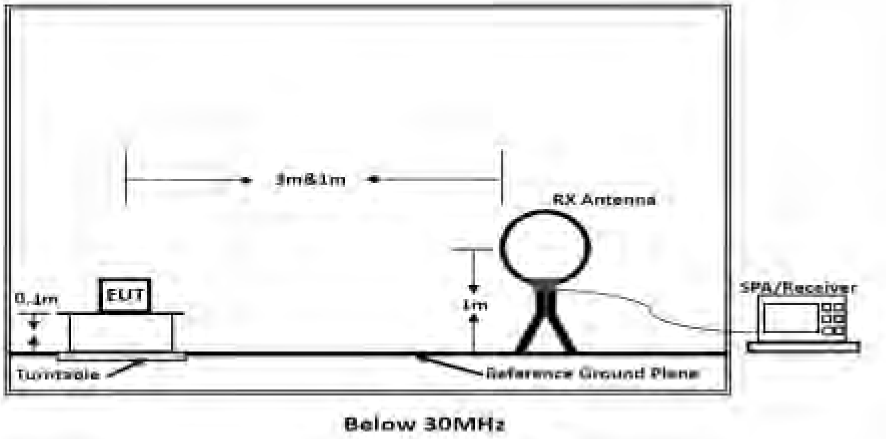


Figure 2. 30MHz to 1GHz

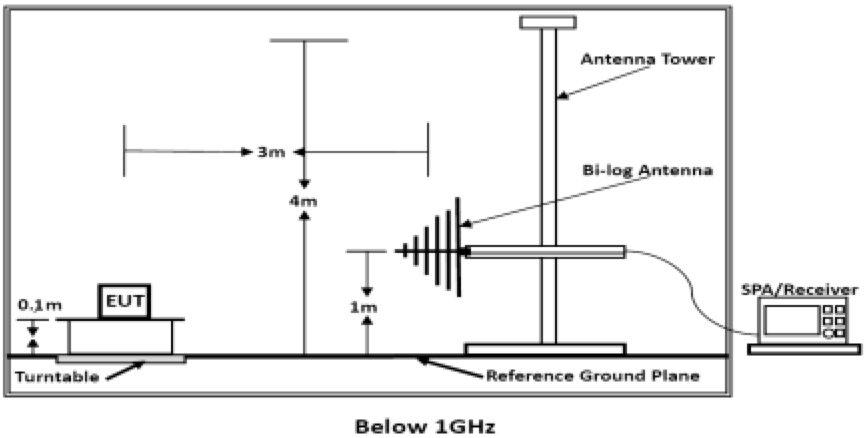
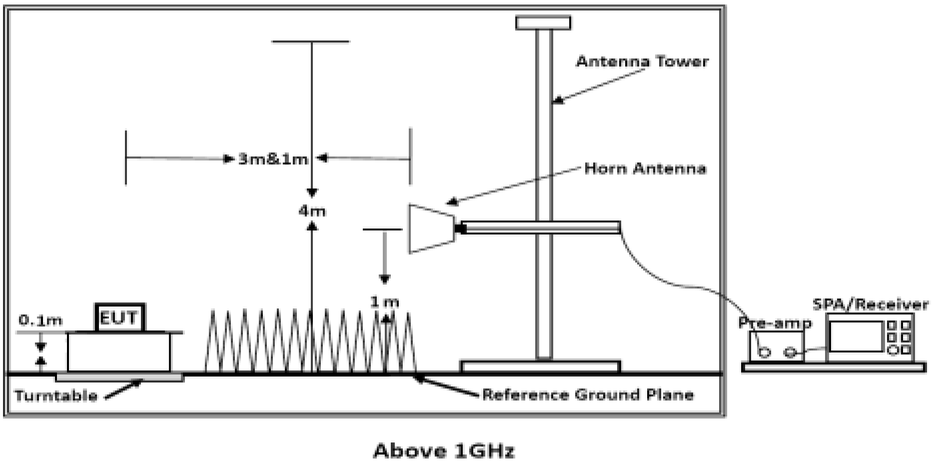


Figure 3. Above 1GHz



7.2 Limit

Spurious Emissions:

Frequency	Field strength (dBμV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	20log 2400/F (kHz) + 80	Quasi-peak	3
0.490MHz-1.705MHz	20log 24000/F (kHz) + 40	Quasi-peak	3
1.705MHz-30MHz	20log 30 + 40	Quasi-peak	3
30MHz-88MHz	40.0	Quasi-peak	3
88MHz-216MHz	43.5	Quasi-peak	3
216MHz-960MHz	46.0	Quasi-peak	3
960MHz-1GHz	54.0	Quasi-peak	3
Above 1GHz	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

If radiated measurements are performed, field strength is then converted to EIRP as follows:
(i) EIRP = ((E*d)^2) / 30
where:
• E is the field strength in V/m;
• d is the measurement distance in meters;
• EIRP is the equivalent isotropically radiated power in watts.
(ii) Working in dB units, the above equation is equivalent to:
EIRP[dBm] = E[dBμV/m] + 20 log(d[meters]) - 104.77
(iii) Or, if d is 3 meters:
EIRP[dBm] = E[dBμV/m] - 95.2

7.3 Test procedure

Below 1GHz test procedure as below:
a.The EUT was placed on the top of a rotating table 0.1 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b.The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c.The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d.For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.
e.The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f.If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
Above 1GHz test procedure as below:
g.Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.1 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).
h.Test the EUT in the lowest channel ,the middle channel ,the Highest channel
i.Repeat above procedures until all frequencies measured was complete.

Receiver set:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30KHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30KHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30KHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30KHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30KHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120 kHz	300KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement –X, Y, and Z-plane. The X-plane results were found as the worst case and were shown in this report.

7.4 Test Result

30MHz-1GHzTest Results:
Modulation : 802.11a (the worst data)
Test Channel : 5180MHz
Antenna polarity: H

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 !	169.5990	40.24	-1.02	39.22	43.50	-4.28	QP
2 !	215.2676	41.59	-3.37	38.22	43.50	-5.28	QP
3	333.6865	39.15	0.77	39.92	46.00	-6.08	QP
4 *	501.1790	37.78	4.53	42.31	46.00	-3.69	QP
5 !	752.7431	31.21	10.23	41.44	46.00	-4.56	QP
6	909.6666	25.76	14.07	39.83	46.00	-6.17	QP

Antenna polarity: V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	37.5478	26.03	3.82	29.85	40.00	-10.15	QP
2	170.7923	36.91	-0.12	36.79	43.50	-6.71	QP
3 !	214.5141	38.09	0.37	38.46	43.50	-5.04	QP
4 !	286.9823	39.68	2.12	41.80	46.00	-4.20	QP
5 *	333.6865	38.66	3.52	42.18	46.00	-3.82	QP
6 !	919.2865	21.07	19.21	40.28	46.00	-5.72	QP

Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Measurement – Limit

1. The margin of 9K-30MH measurement exceeds 20dB, so the test chart is not included. Test Mode: 802.11a20 (the worst)

Radiated Spurious Emission (Above 1GHz):

Modulation : 802.11(a) (the worst data)

Freq (MHz)	Rd_level (dBuV/m)	Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	detector	Height	Degree	Antenna polarization
Channel:5180MHz									
10360	40.27	16.39	56.66	74	-17.34	PK	1.23	142	H
10360	27.31	16.39	43.70	54	-10.30	AV	1.32	45	H
10360	41.25	16.39	57.64	74	-16.36	PK	1.23	349	V
10360	26.23	16.39	42.62	54	-11.38	AV	1.07	343	V
Channel:5240MHz									
10480	40.27	16.11	56.38	74	-17.62	PK	1.65	285	H
10480	26.82	16.11	42.93	54	-11.07	AV	1.25	243	H
10480	40.65	16.11	56.76	74	-17.24	PK	1.88	347	V
10480	25.67	16.11	41.78	54	-12.22	AV	1.47	339	V
Channel:5745MHz									
11490	39.60	17.46	57.06	74	-16.94	PK	1.52	11	H
11490	25.97	17.46	43.43	54	-10.57	AV	1.04	210	H
11490	41.62	17.46	59.08	74	-14.92	PK	1.38	70	V
11490	26.49	17.46	43.95	54	-10.05	AV	1.87	162	V
Channel:5825MHz									
11650	41.96	17.57	59.53	74	-14.47	PK	1.42	144	H
11650	27.10	17.57	44.67	54	-9.33	AV	1.22	328	H
11650	41.38	17.57	58.95	74	-15.05	PK	1.06	189	V
11650	27.96	17.57	45.53	54	-8.47	AV	1.61	16	V

Modulation : 802.11(n40) (the worst data)

Freq (MHz)	Rd_level (dBuV/m)	Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	detector	Height	Degree	Antenna polarization
Channel:5190MHz									
10380	40.54	16.34	56.88	74	-17.12	PK	1.57	353	H
10380	26.58	16.34	42.92	54	-11.08	AV	1.55	282	H
10380	41.50	16.34	57.84	74	-16.16	PK	1.44	121	V
10380	27.76	16.34	44.10	54	-9.90	AV	1.24	61	V
Channel:5230MHz									
10460	39.34	16.15	55.49	74	-18.51	PK	1.40	334	H
10460	25.99	16.15	42.14	54	-11.86	AV	1.44	312	H
10460	40.20	16.15	56.35	74	-17.65	PK	1.75	117	V
10460	25.15	16.15	41.30	54	-12.70	AV	1.56	113	V
Channel:5755MHz									
11510	39.89	17.49	57.38	74	-16.62	PK	1.76	140	H
11510	26.23	17.49	43.72	54	-10.28	AV	1.54	345	H
11510	41.41	17.49	58.90	74	-15.10	PK	1.68	185	V
11510	27.22	17.49	44.71	54	-9.29	AV	1.23	165	V
Channel:5795MHz									
11590	41.78	17.52	59.30	74	-18.07	PK	1.76	201	H
11590	25.18	17.52	42.70	54	-14.70	AV	1.02	231	H
11590	41.17	17.52	58.69	74	-15.31	PK	1.56	24	V
11590	25.06	17.52	42.58	54	-11.42	AV	1.33	153	V

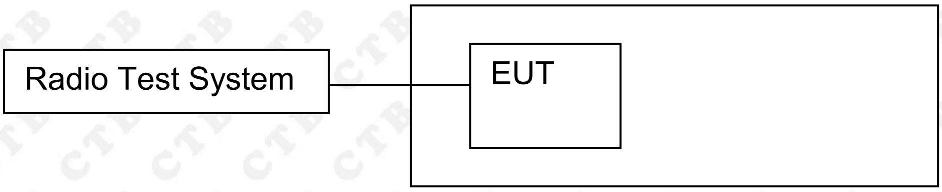
Modulation : 802.11(VH80) (the worst data)

Freq (MHz)	Rd_level (dBuV/m)	Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	detector	Height	Degree	Antenna polarization
Channel:5210MHz									
10420	39.68	16.25	55.93	74	-18.07	PK	1.82	358	H
10420	26.77	16.25	43.02	54	-10.98	AV	1.87	187	H
10420	39.42	16.25	55.67	74	-18.33	PK	1.06	231	V
10420	26.93	16.25	43.18	54	-10.82	AV	1.71	270	V
Channel:5775MHz									
11550	39.70	17.50	57.20	74	-16.80	PK	1.70	10	H
11550	27.71	17.50	45.21	54	-8.79	AV	1.01	334	H
11550	41.59	17.50	59.09	74	-14.91	PK	1.11	149	V
11550	27.73	17.50	45.23	54	-8.77	AV	1.31	175	V

Remark:
1.Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits
2.The EUT was tested in the low, high channel and the worst case position data was reported.
3.Testing is carried out with frequency rang 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

8. BAND EDGE

8.1 Block Diagram Of Test Setup



8.2 Limit

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.
(5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

8.3 Test procedure

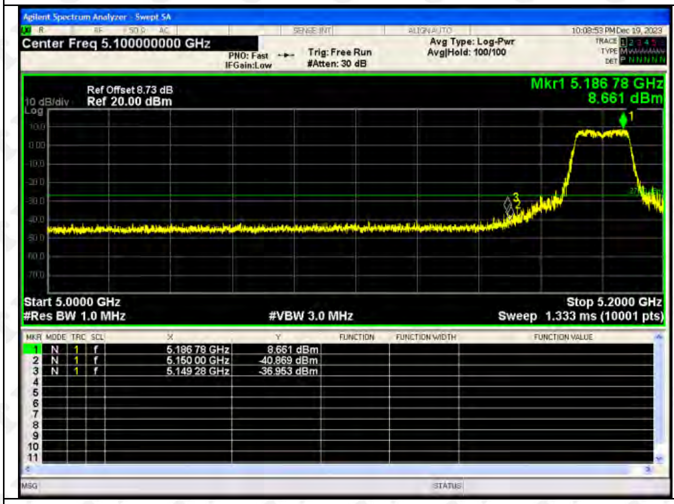
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then 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 of spectrum analyzer to 1 MHz with a convenient frequency span.
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.

8.4 Test Result

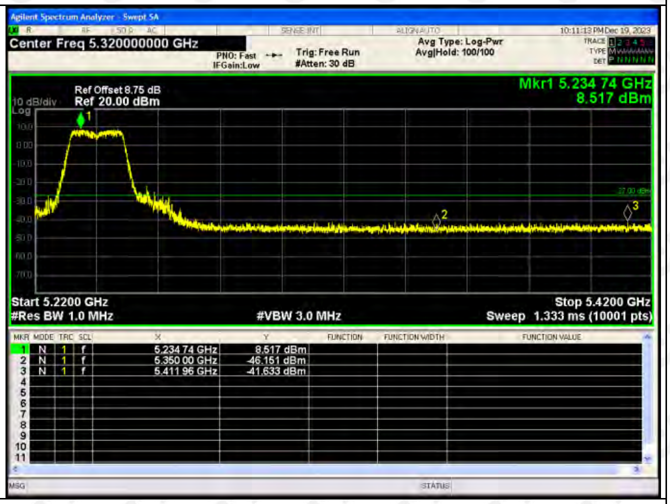
Test Graph

5180-5240MHz

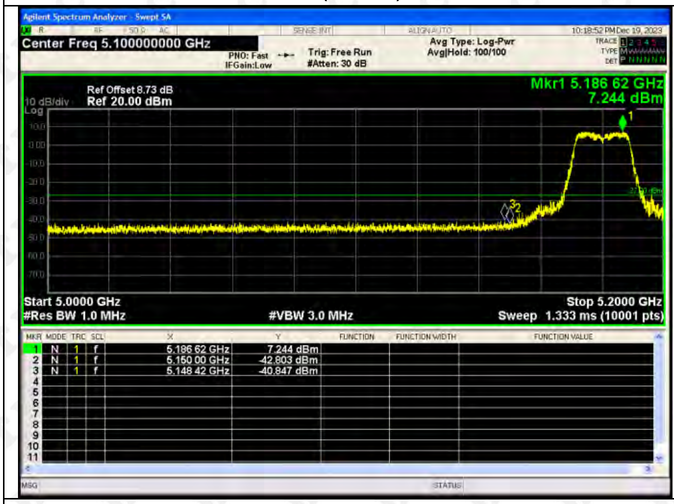
802.11a-5180



802.11a-5240



802.11ac(VH20)-5180



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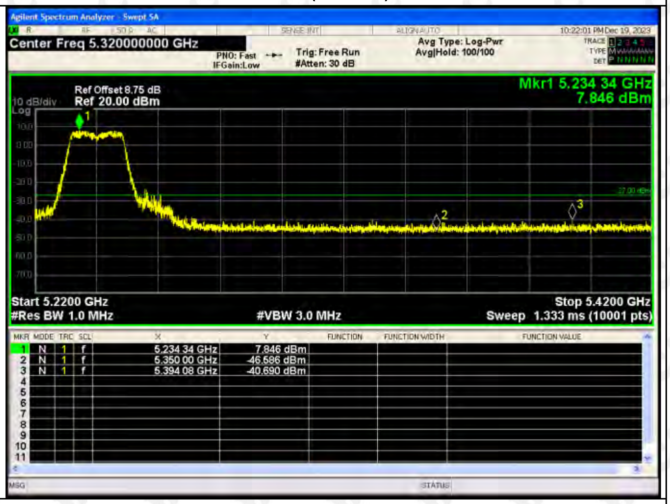
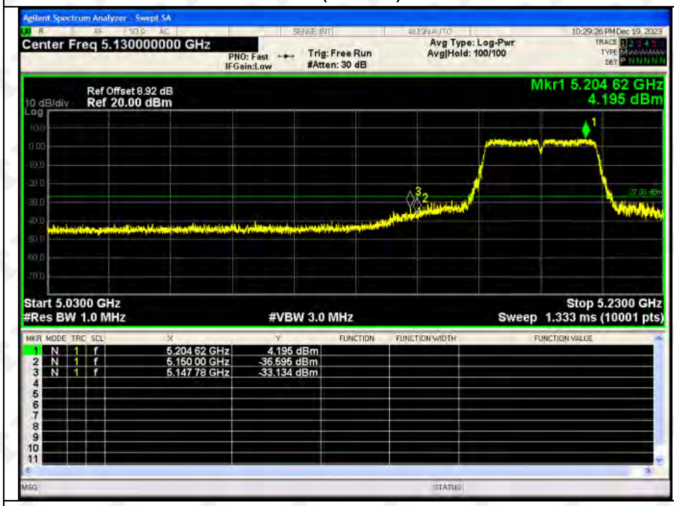


802.11ac(VH40)-5190



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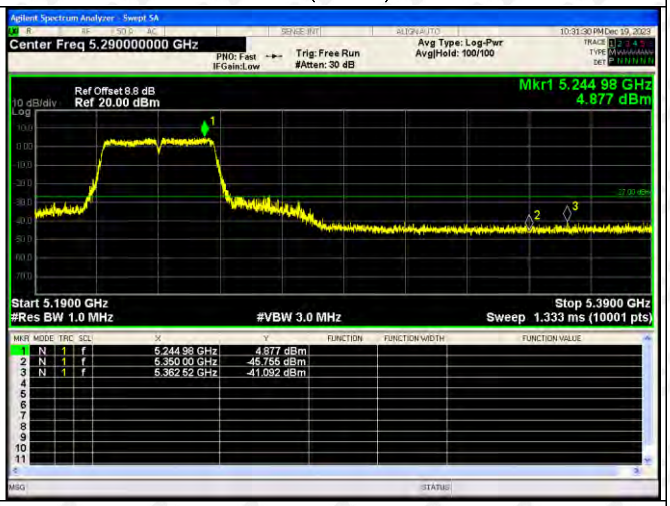
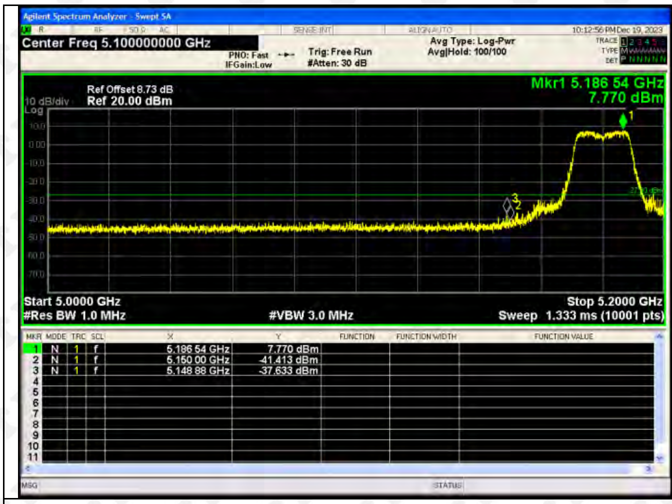
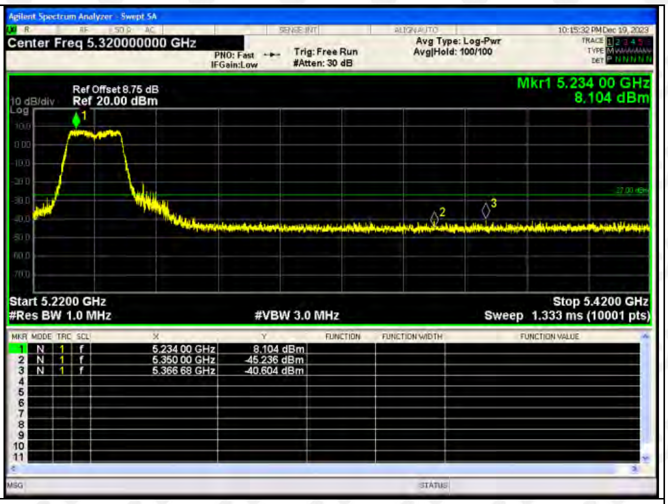


802.11n(HT20)-5180

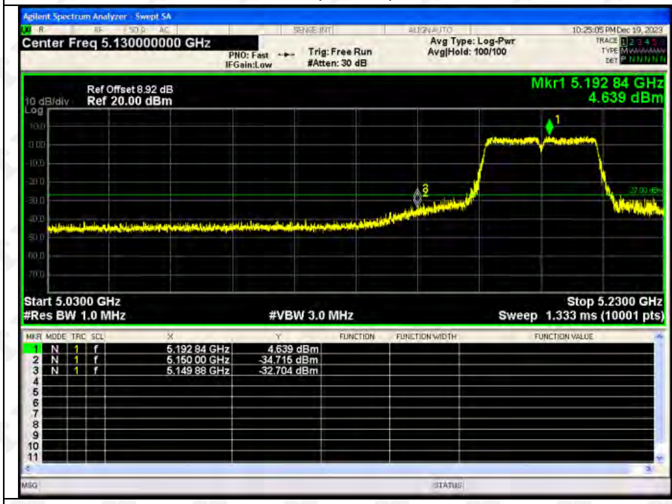
802.11n(HT20)-5240

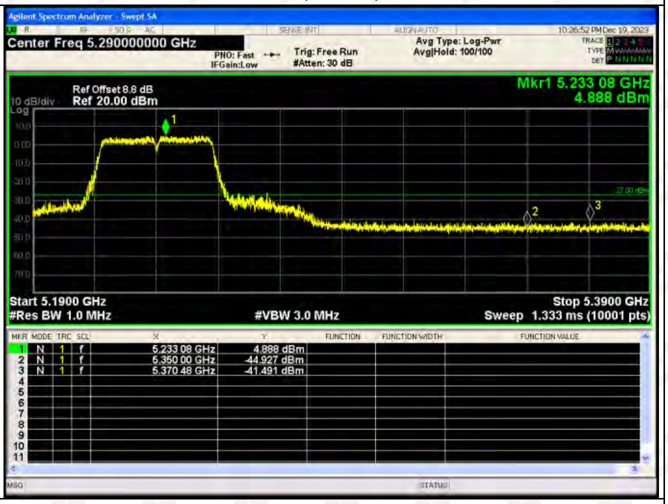




802.11n(HT40)-5190

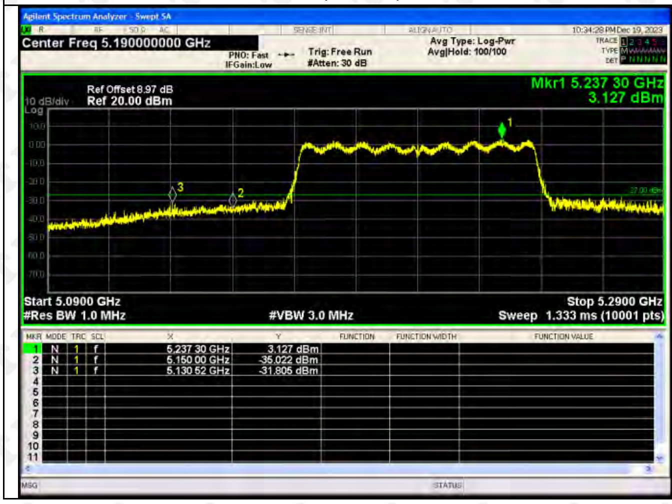
802.11n(HT40)-5230

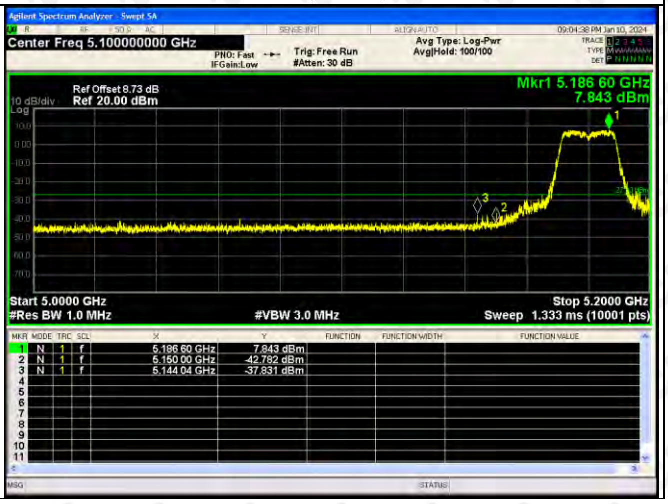


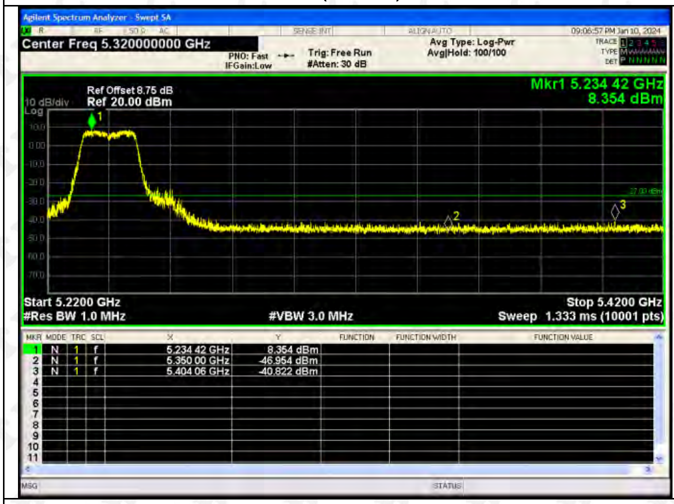
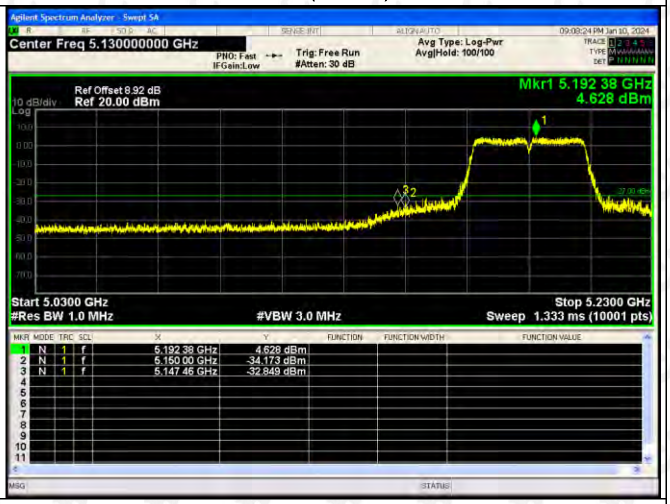
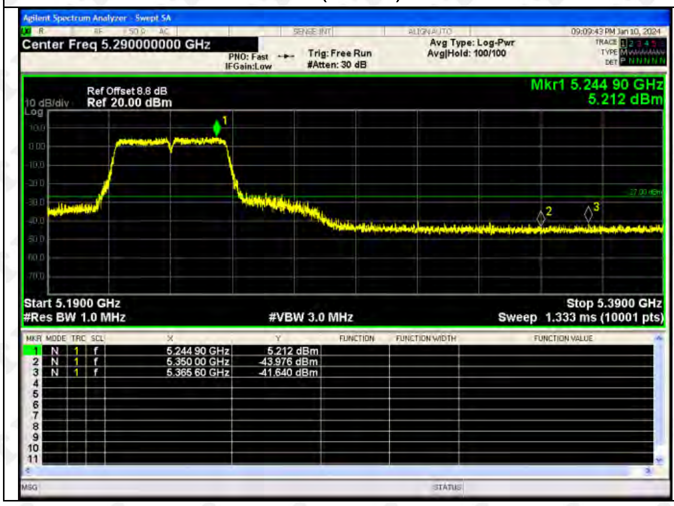
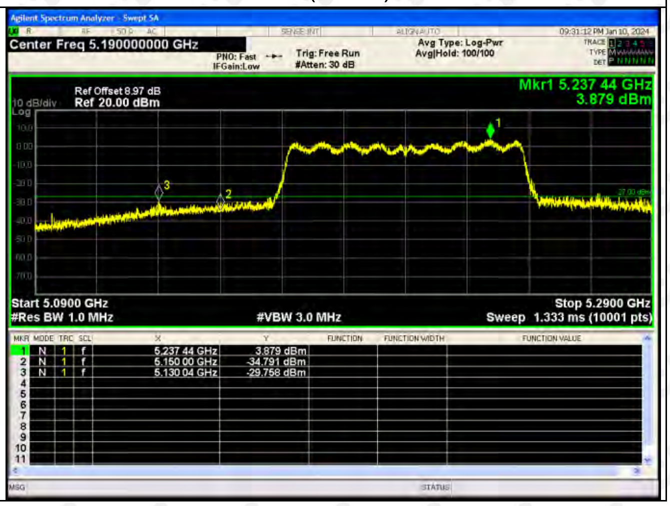


802.11ac(VH80)-5210

802.11ax(VH20)-5180

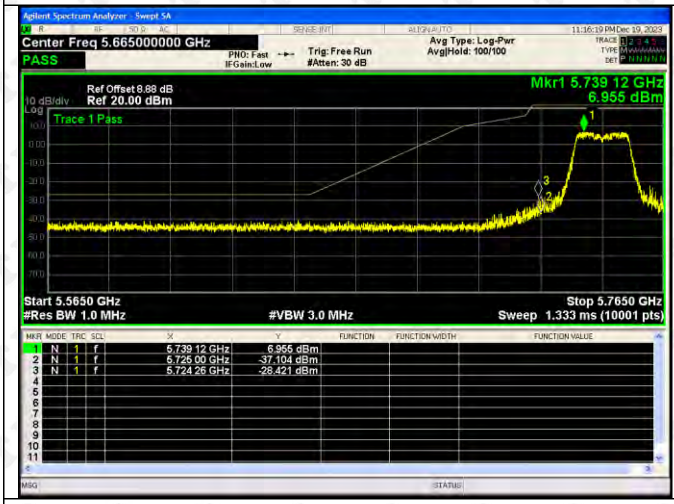




802.11ax(VH20)-5240	802.11ax(VH40)-5190
	
802.11ax(VH40)-5230	802.11ax(VH80)-5210
	

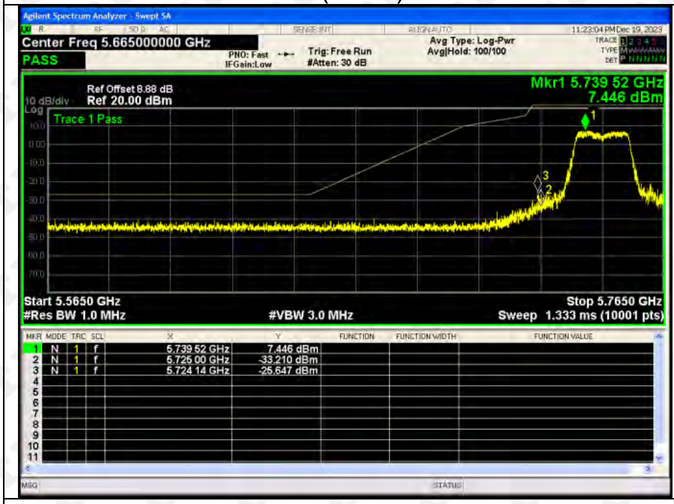
5745-5825MHz

802.11a-5745



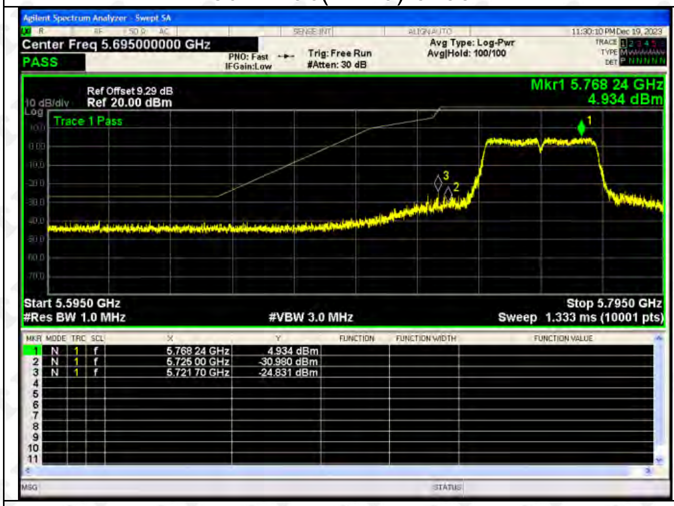
802.11a-5825

802.11ac(VH20)-5745



802.11ac(VH20)-5825

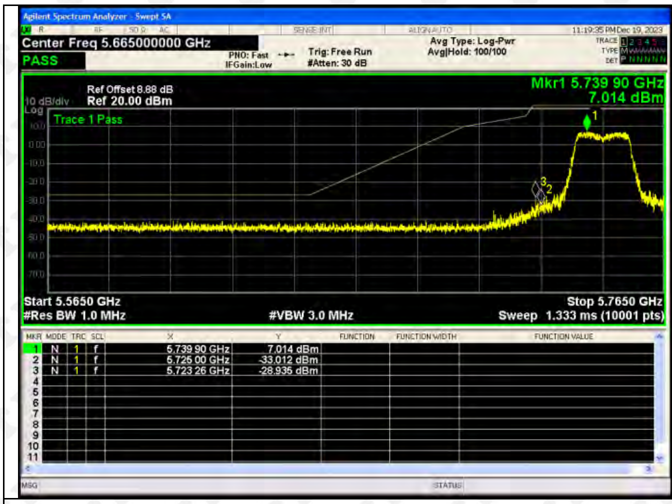
802.11ac(VH40)-5755



802.11ac(VH40)-5795

802.11(n20)-5745

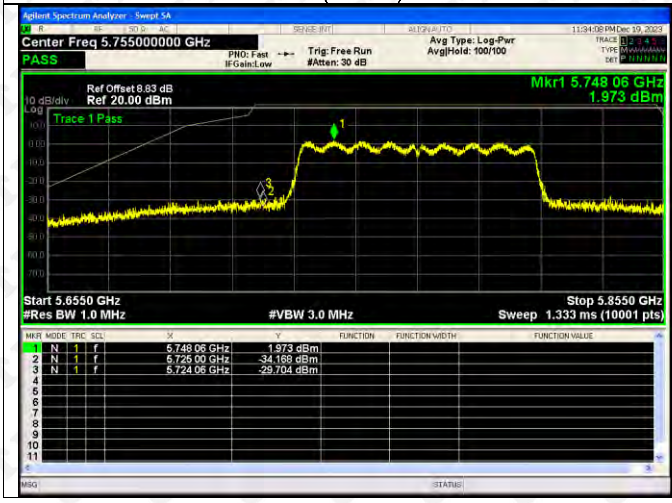
802.11(n20)-5825



802.11(n40)-5755

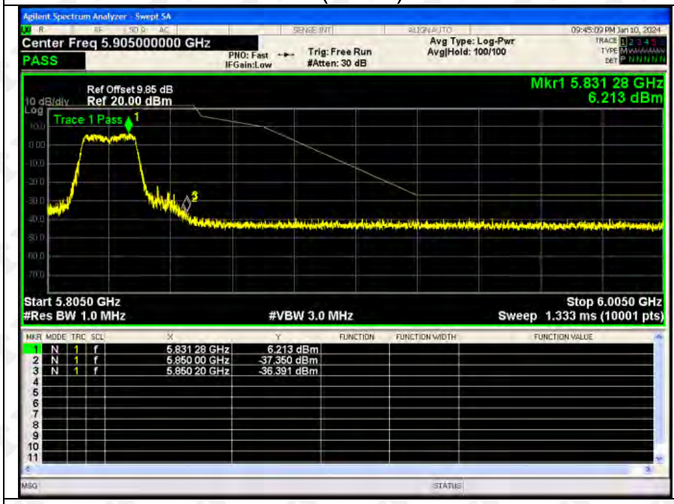
802.11(n40)-5795

802.11ac(VH80)-5775



802.11ax(VH20)-5745

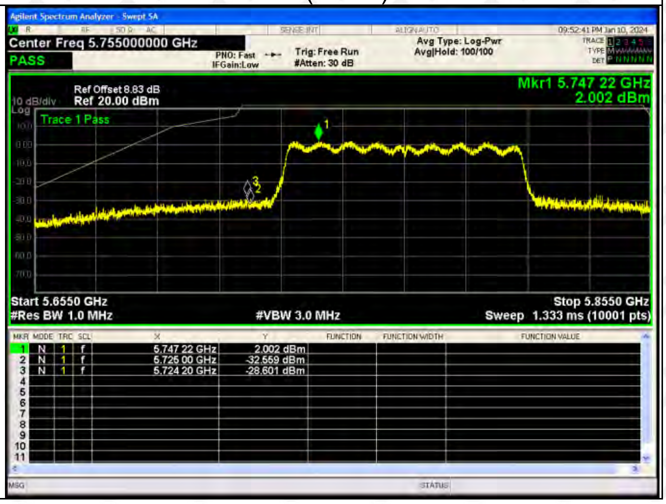
802.11ax(VH20)-5825



802.11ax(VH40)-5755

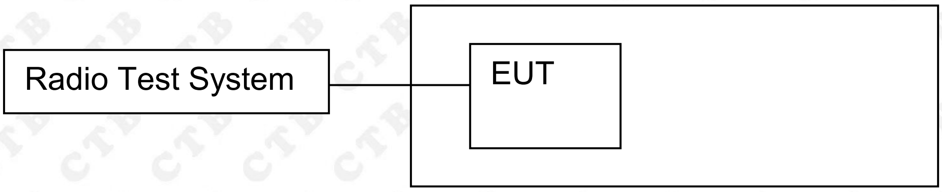
802.11ax(VH40)-5795

802.11ax(VH80)-5775



9. CONDUCTED OUTPUT POWER

9.1 Block Diagram Of Test Setup



9.2 Limit

(1) For the band 5.15-5.25 GHz.
(i) For an outdoor 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. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p.
at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).
(ii) 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. In addition,the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
(iii) 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. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.
(iv) For mobile and portable 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. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
(2) 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. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
(4) The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.
(5) The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band are made over a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. Measurements in the 5.15-5.25 GHz, 5.25-5.35 GHz, and the 5.47-5.725 GHz bands are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

(h) Transmit Power Control (TPC) and Dynamic Frequency Selection (DFS).
(1) Transmit power control (TPC). U-NII devices operating in the 5.25-5.35 GHz band and the 5.47-5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

9.3 Test procedure

According to KDB789033 D02v02r01 sectionE, the following is the measurement procedure.

(i) Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.

(ii) Set RBW = 1 MHz.

(iii) Set VBW ≥ 3 MHz.

(iv) Number of points in sweep ≥ 2 × span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)

(v) Sweep time = auto.

(vi) Detector = power averaging (rms), if available. Otherwise, use sample detector mode.

(vii) If transmit duty cycle < 98%, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98%, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “free run.”

(viii) Trace average at least 100 traces in power averaging (rms) mode.

(ix) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument’s band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the spectrum.

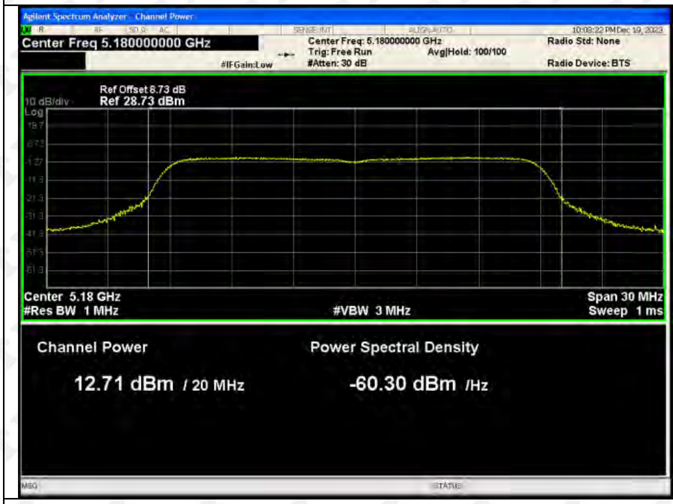
9.4 Test Result

Test mode1	Test Channel (MHz)	Output Power dBm	Limit dBm
802.11a20	5180	12.714	23.98
	5200	12.529	23.98
	5240	12.531	23.98
802.11ac20	5180	10.911	23.98
	5200	11.195	23.98
	5240	11.583	23.98
802.11ac40	5190	11.403	23.98
	5230	11.56	23.98
802.11ac80	5210	11.356	23.98
802.11n(HT20)	5180	10.801	23.98
	5200	11.612	23.98
	5240	12.098	23.98
802.11n(HT40)	5190	11.83	23.98
	5230	11.654	23.98
802.11ax20	5180	11.576	23.98
	5200	11.841	23.98
	5240	12.24	23.98
802.11ax40	5190	11.688	23.98
	5230	12.015	23.98
802.11ax80	5210	12.499	23.98

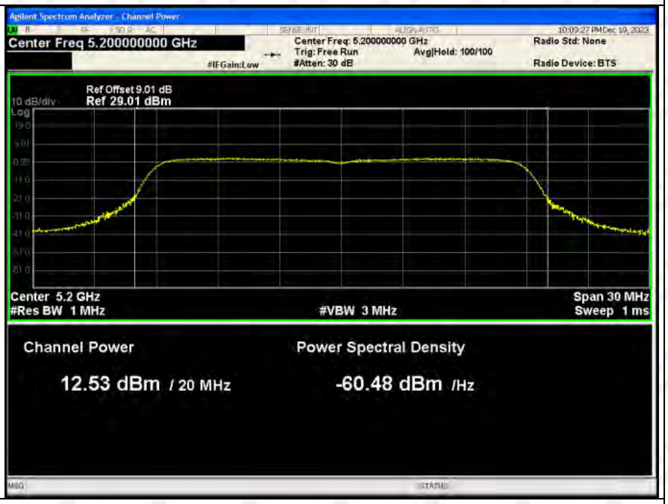
Test mode1	Test Channel (MHz)	Output Power dBm	Limit dBm
802.11a20	5745	10.523	30
	5785	9.734	30
	5825	9.166	30
802.11ac20	5745	10.653	30
	5785	9.924	30
	5825	9.446	30
802.11ac40	5755	11.901	30
	5795	9.791	30
802.11ac80	5775	10.535	30
802.11n(HT20)	5745	10.469	30
	5785	9.635	30
	5825	9.07	30
802.11n(HT40)	5755	11.476	30
	5795	9.886	30
802.11ax20	5745	11.067	30
	5785	10.308	30
	5825	9.7	30
802.11ax40	5755	11.59	30
	5795	9.872	30
802.11ax80	5775	10.758	30

5180-5240MHz-Power

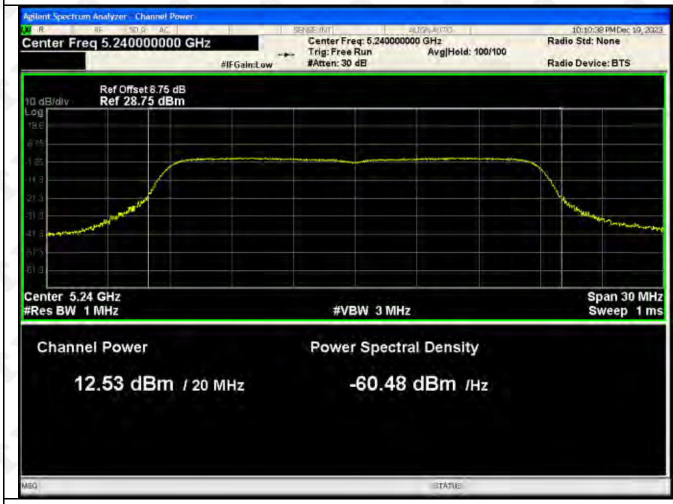
802.11a-5180



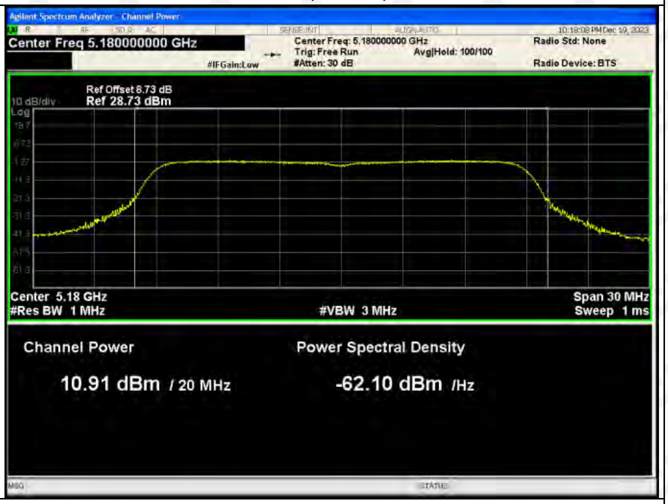
802.11a-5200



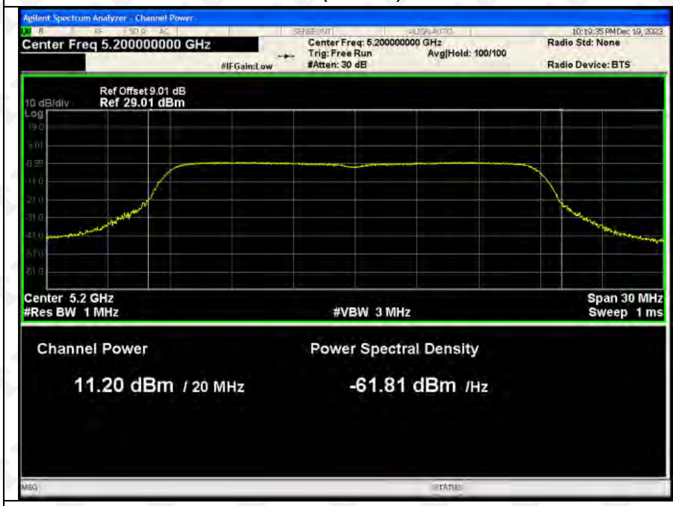
802.11a-5240



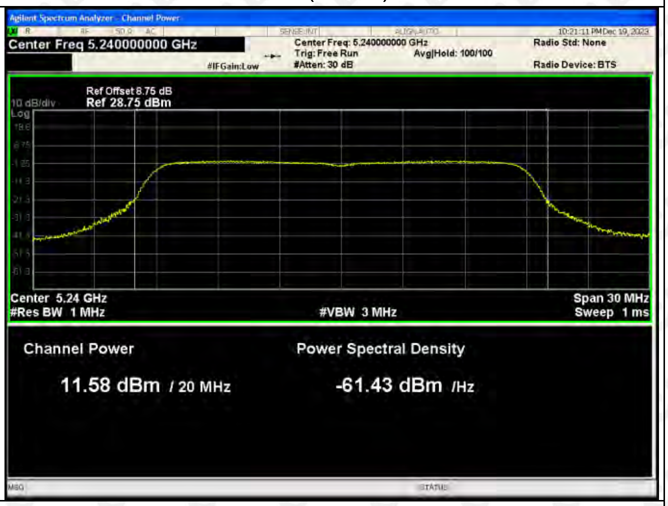
802.11ac(VH20)-5180



802.11ac(VH20)-5200

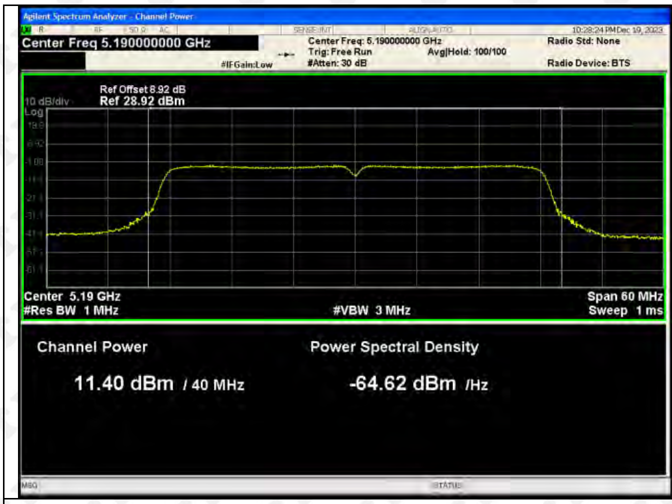


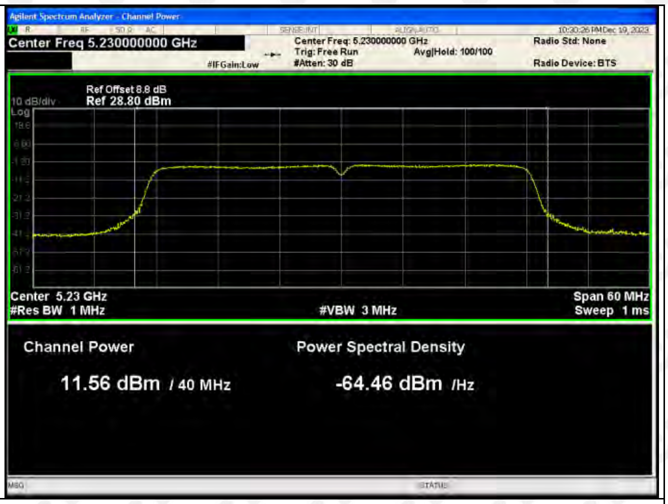
802.11ac(VH20)-5240



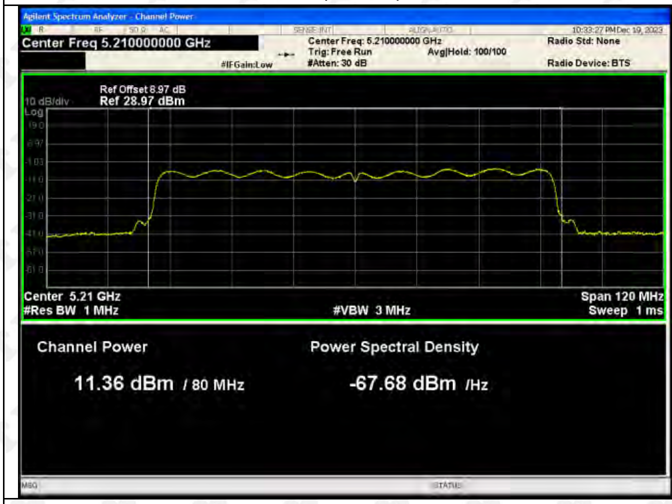
802.11ac(VH40)-5190

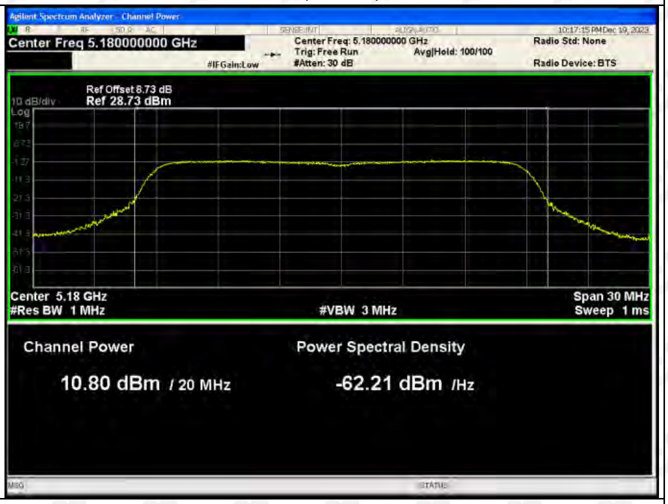
802.11ac(VH40)-5230



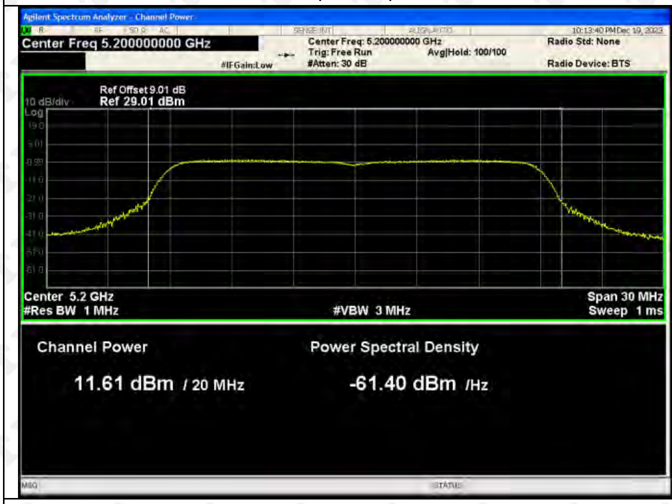


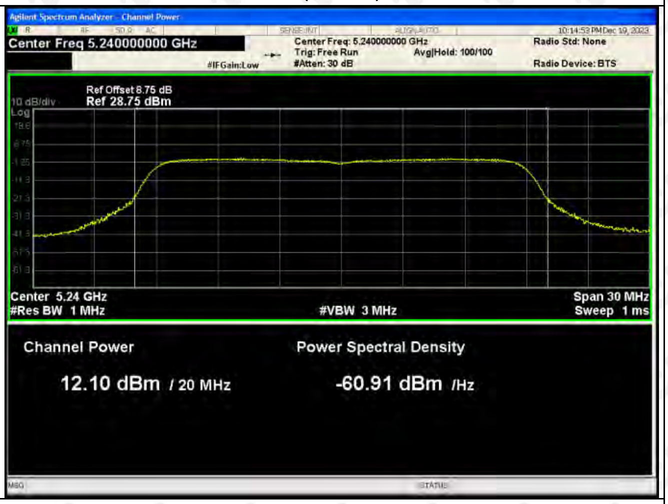
802.11ac(VH80)-5210	802.11n(HT20)-5180



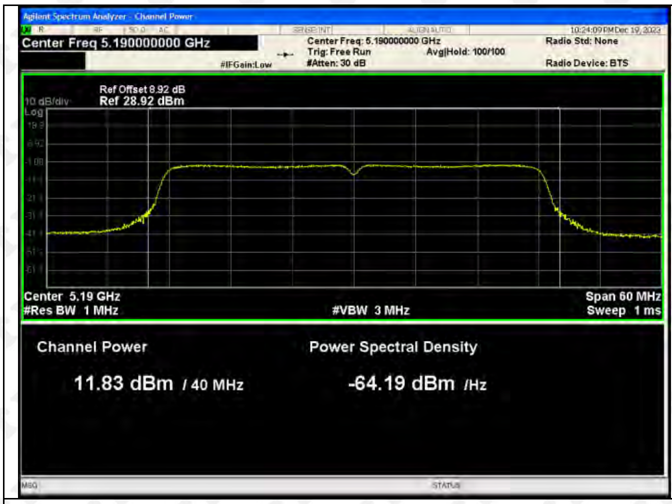


802.11n(HT20)-5200	802.11n(HT20)-5240





802.11n(HT40)-5190	802.11n(HT40)-5230



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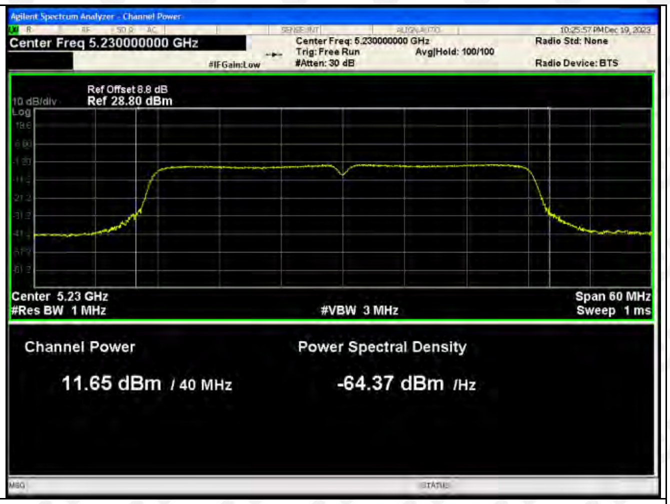

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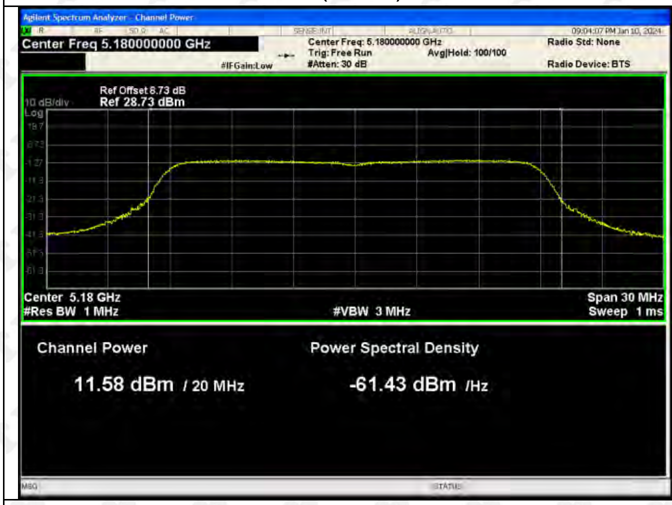

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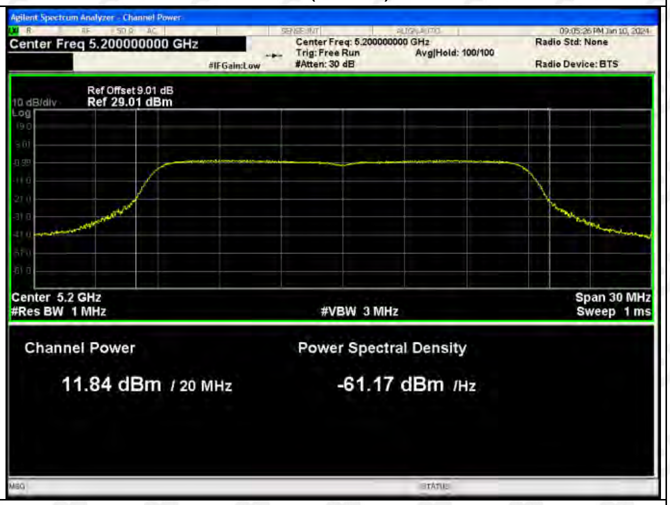

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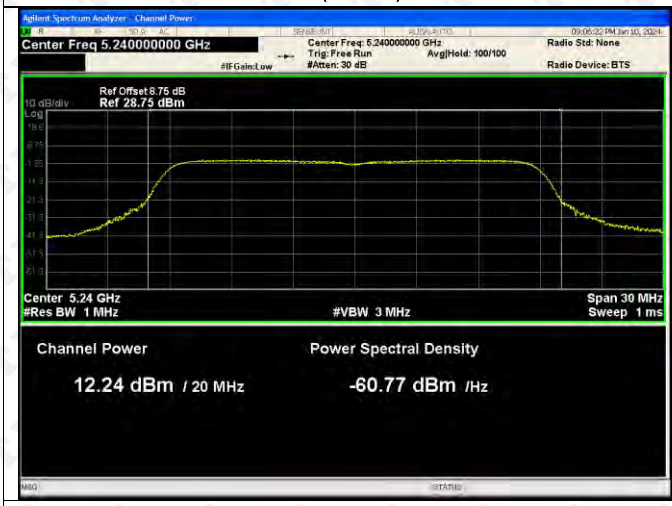

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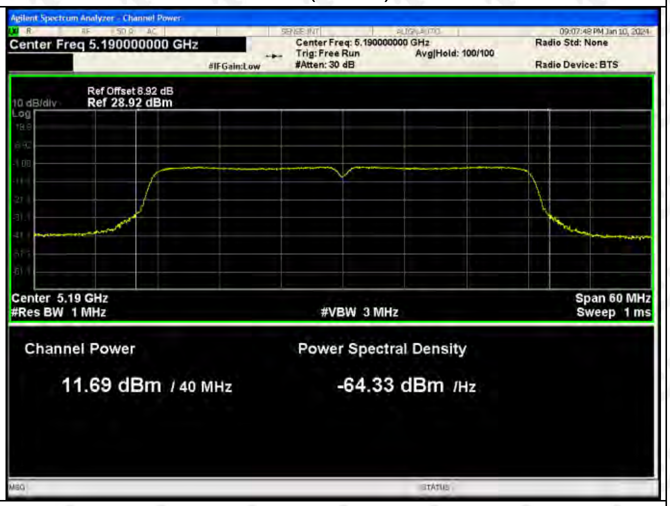
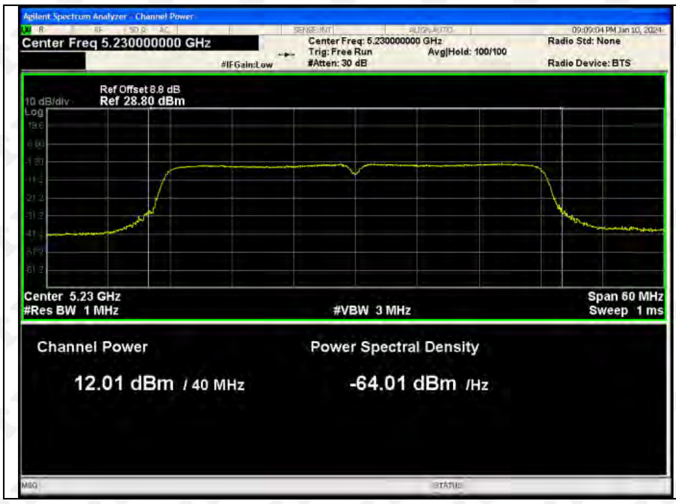
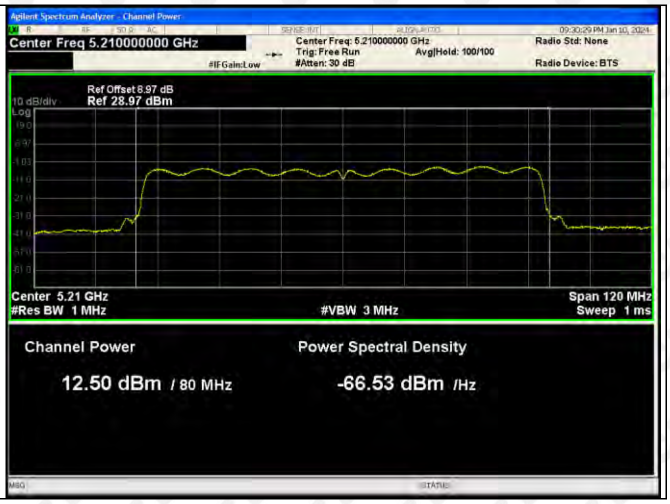


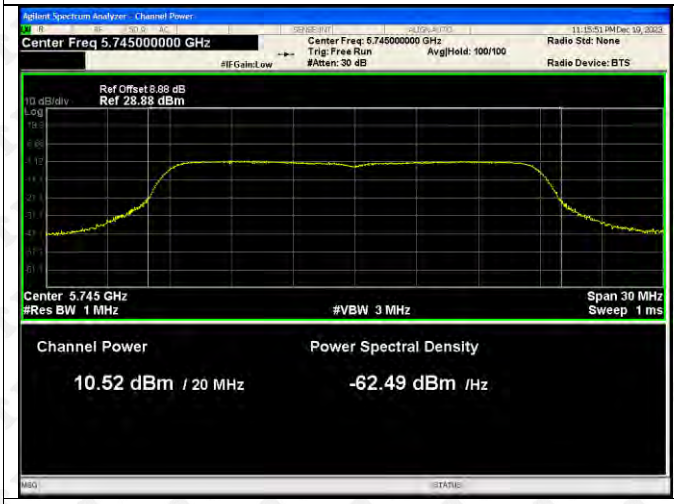
802.11ax(VH80)-5210


Center Freq 5.230000000 GHz
Center Freq: 5.230000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
#IFGain:Low
Ref Offset 8.8 dB
Ref 28.80 dBm
10 dB/div
Log
Center 5.23 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 60 MHz
Sweep 1 ms
Channel Power
12.01 dBm / 40 MHz
Power Spectral Density
-64.01 dBm /Hz

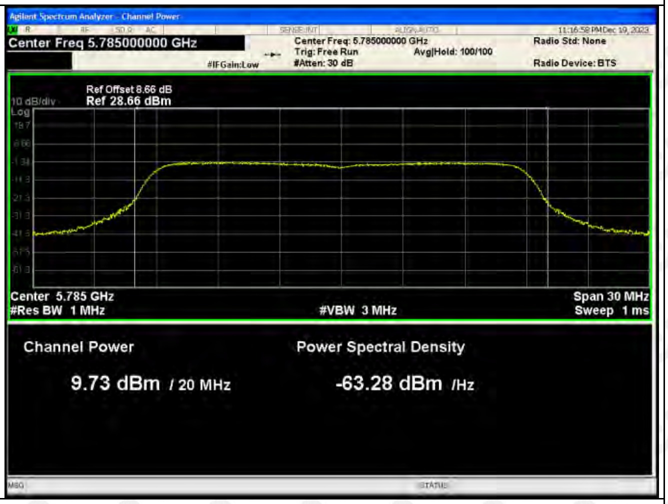

Center Freq 5.210000000 GHz
Center Freq: 5.210000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
#IFGain:Low
Ref Offset 8.97 dB
Ref 28.97 dBm
10 dB/div
Log
Center 5.21 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 120 MHz
Sweep 1 ms
Channel Power
12.50 dBm / 80 MHz
Power Spectral Density
-66.53 dBm /Hz

5745-5825MHz-Power

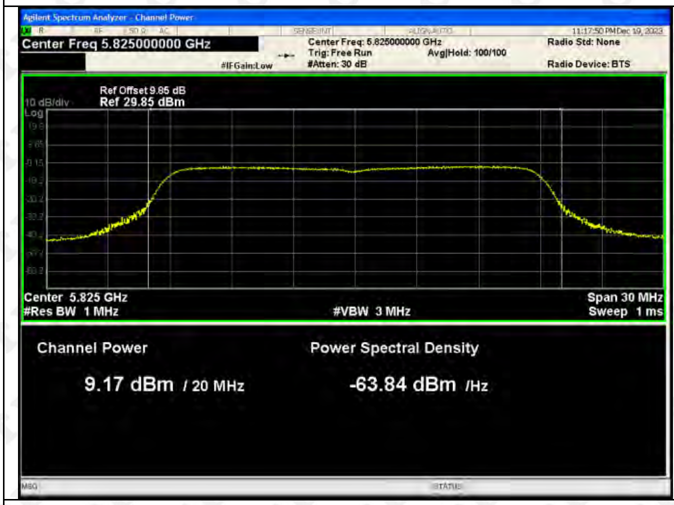
802.11a-5745



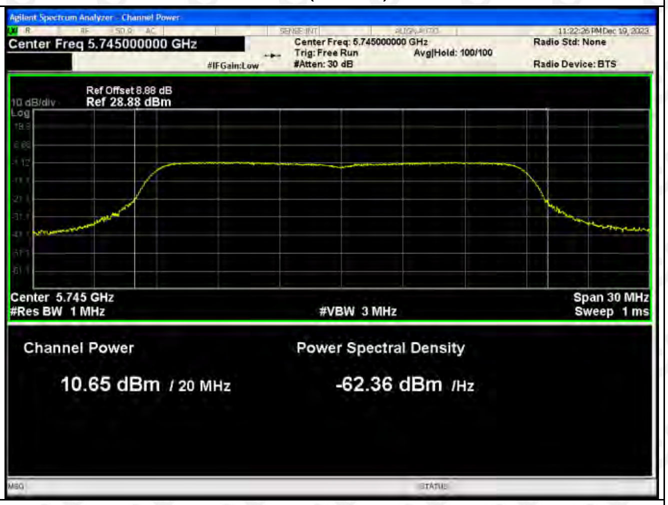
802.11a-5785



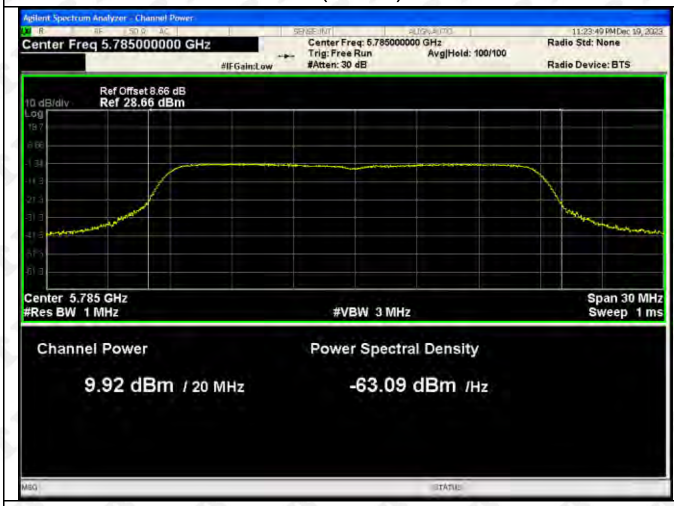
802.11a-5825



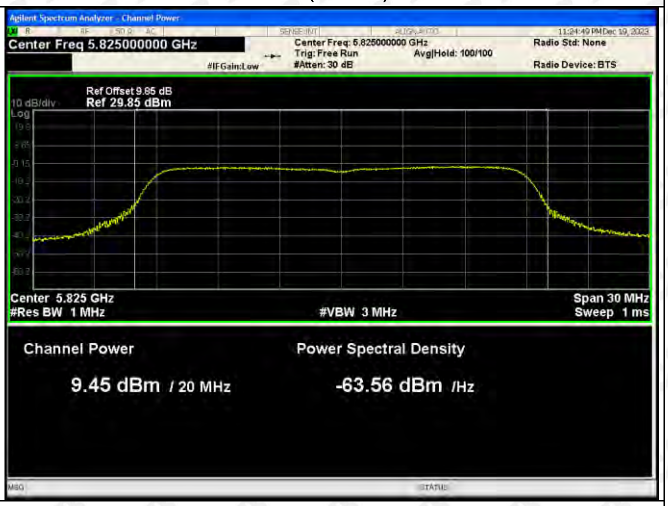
802.11ac(VH20)-5745



802.11ac(VH20)-5785

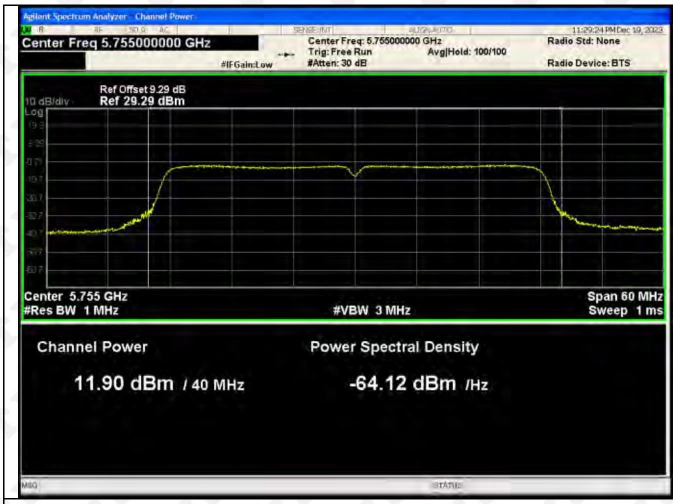


802.11ac(VH20)-5825

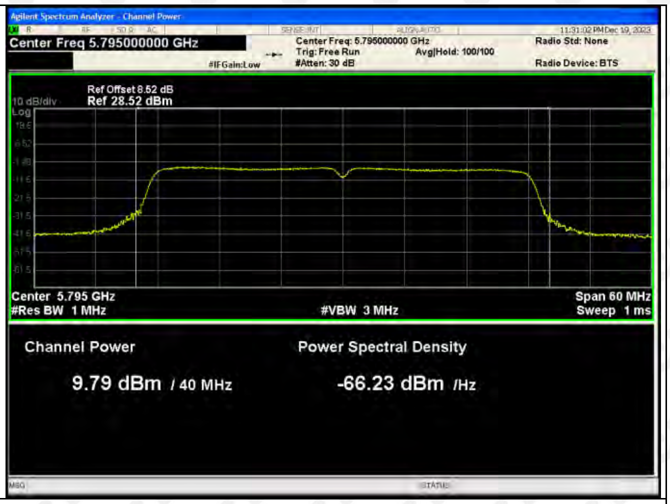


802.11ac(VH40)-5755

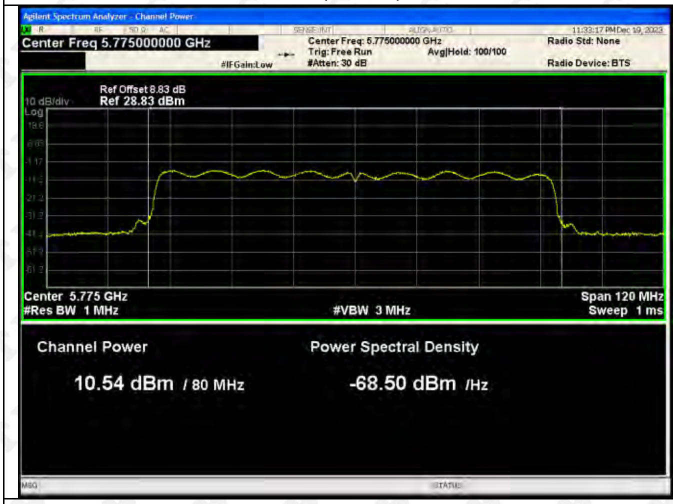
802.11ac(VH40)-5795



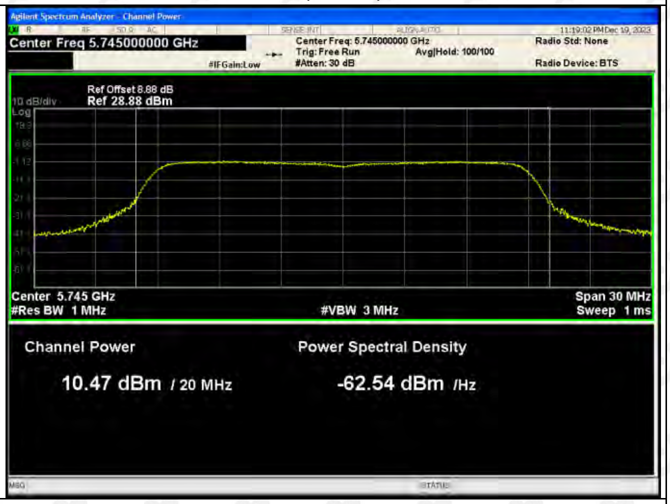
802.11ac(VH80)-5775



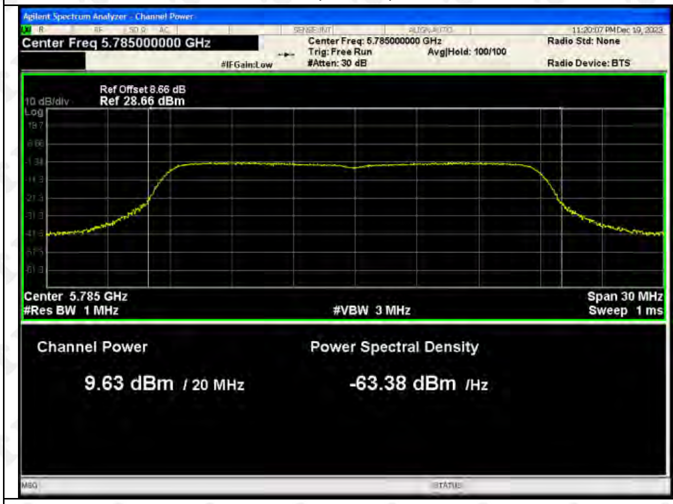
802.11n(HT20)-5745



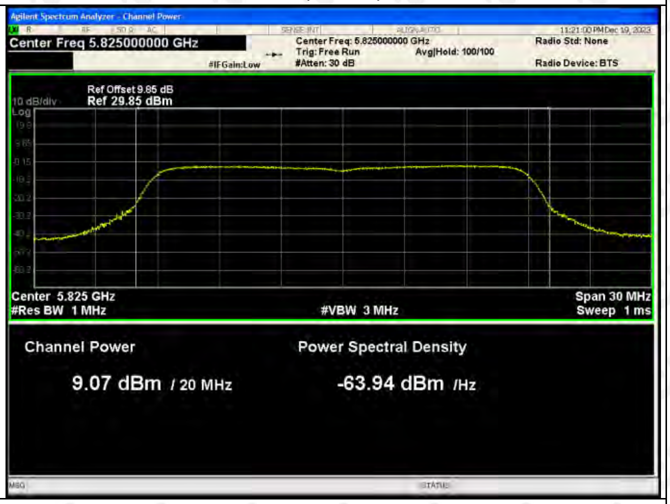
802.11n(HT20)-5785



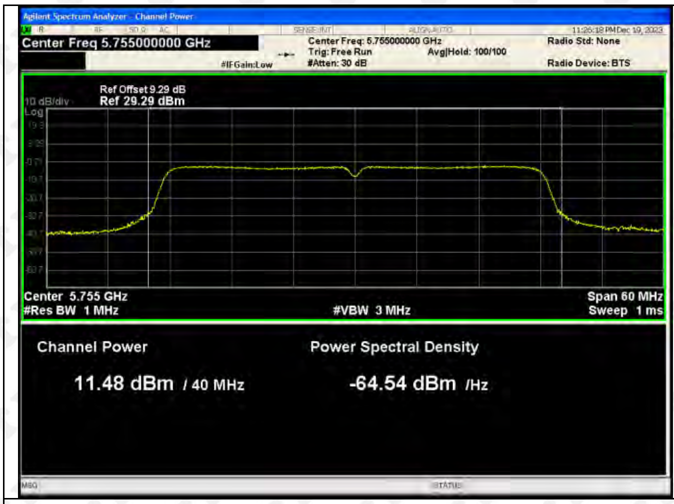
802.11n(HT20)-5825



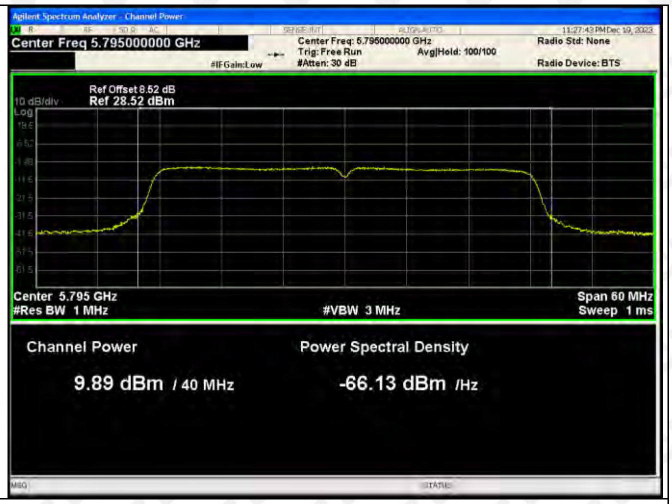
802.11n(HT40)-5755



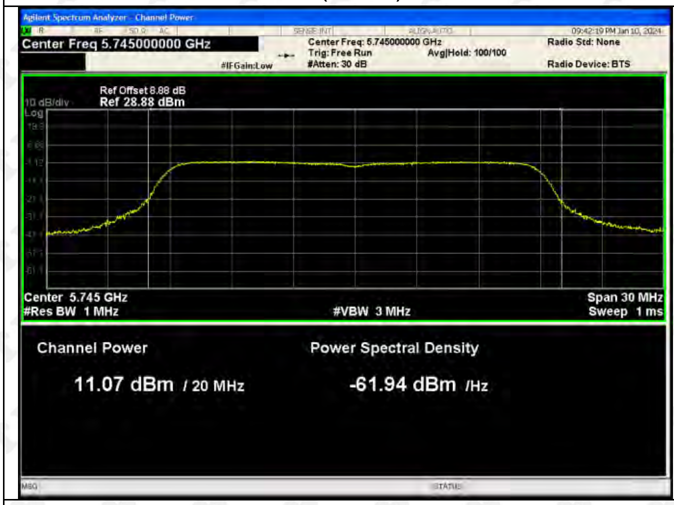
802.11n(HT40)-5795



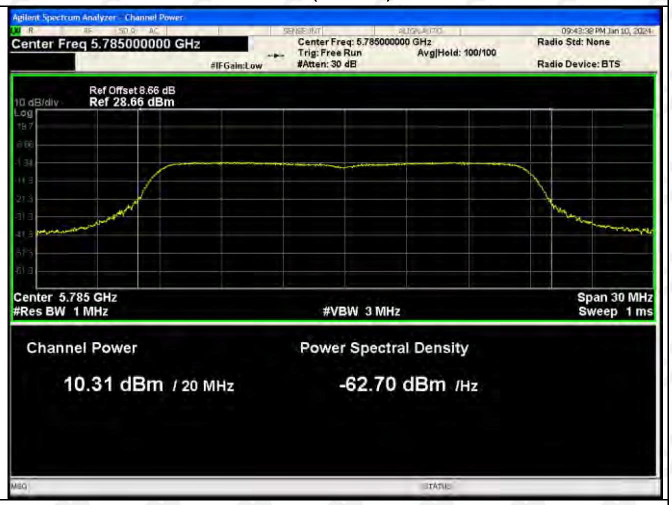
802.11ax(VH20)-5745



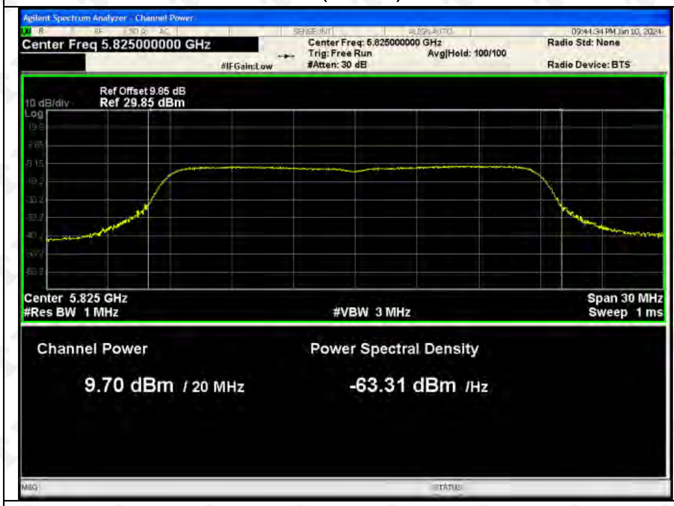
802.11ax(VH20)-5785



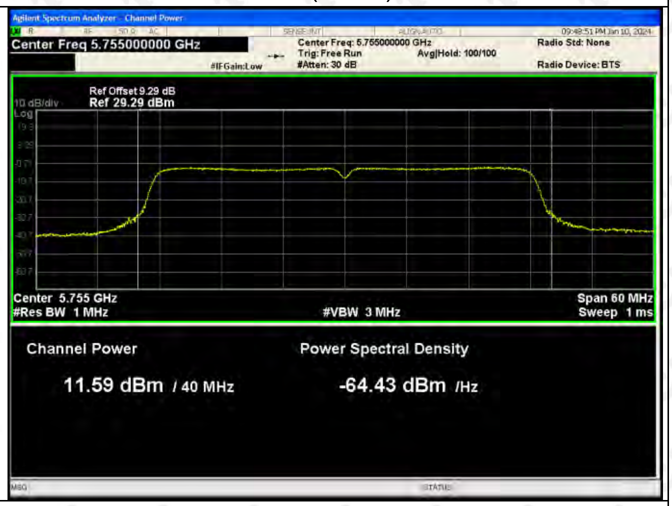
802.11ax(VH20)-5825



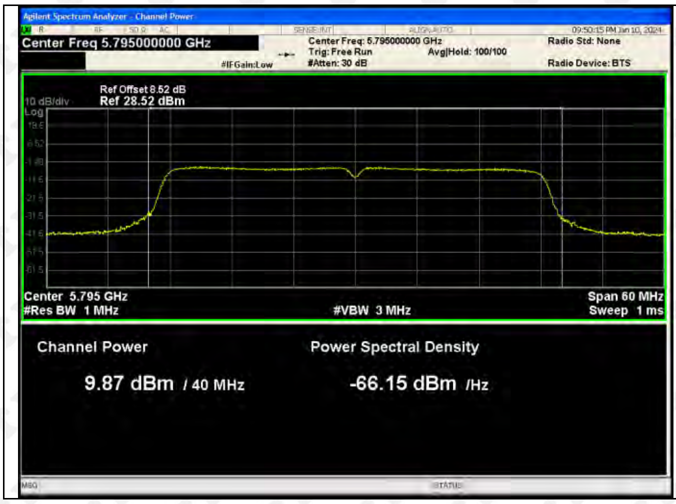
802.11ax(VH40)-5755

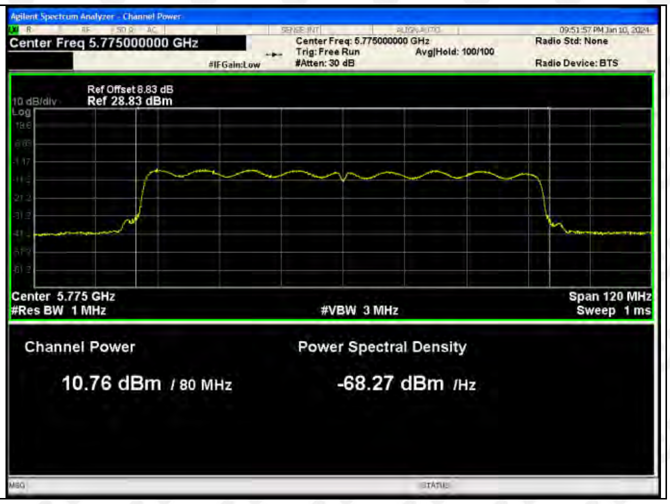


802.11ax(VH40)-5795



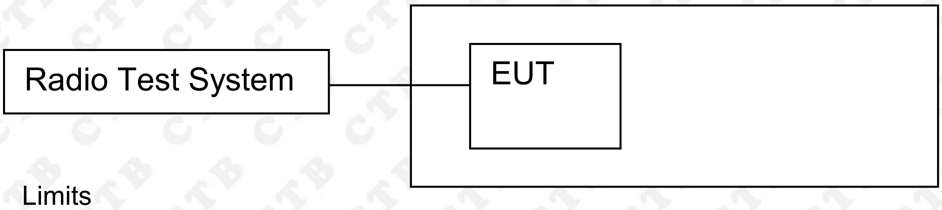
802.11ax(VH80)-5775


Center Freq 5.795000000 GHz
Center Freq: 5.795000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Ref Offset 8.52 dB
Ref 28.52 dBm
Center 5.795 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 60 MHz
Sweep 1 ms
Channel Power
9.87 dBm / 40 MHz
Power Spectral Density
-66.15 dBm /Hz


Center Freq 5.775000000 GHz
Center Freq: 5.775000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Ref Offset 8.83 dB
Ref 28.83 dBm
Center 5.775 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 120 MHz
Sweep 1 ms
Channel Power
10.76 dBm / 80 MHz
Power Spectral Density
-68.27 dBm /Hz

10. EMISSION BANDWIDTH& OCCUPIED BANDWIDTH

10.1 Block Diagram Of Test Setup



10.2 Limits

(1) For the band 5.15-5.25 GHz.

(iv) For mobile and portable 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. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
(2) 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. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.
(e) Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

10.3 Test Procedure

According to KDB789033 D02v02r01 sectionE, the following is the measurement procedure.

1. 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%.
2. Minimum Emission Bandwidth for the band 5.725−5.85 GHz
Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 kHz for the band 5.725−5.85 GHz. The following procedure shall be used for measuring this bandwidth:
a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 * 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.
Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described in this section. For devices that use channel aggregation refer to III.A and III.C for determining emission bandwidth.

D. 99% Occupied Bandwidth

The 99% occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. Measurement of the 99% occupied bandwidth is *required* only as a condition for using the optional band-edge measurement techniques described in II.G.3.d). Measurements of 99% occupied bandwidth may also optionally be used in lieu of the EBW to define the minimum frequency range over which the 789033 D02 General UNII Test Procedures New Rules v02r01 Page 4 spectrum is integrated when measuring maximum conducted output power as described in II.E. However, the EBW must be measured to determine bandwidth dependent limits on maximum conducted output power in accordance with Section 15.407(a).
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 * 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.

10.4 Test Results

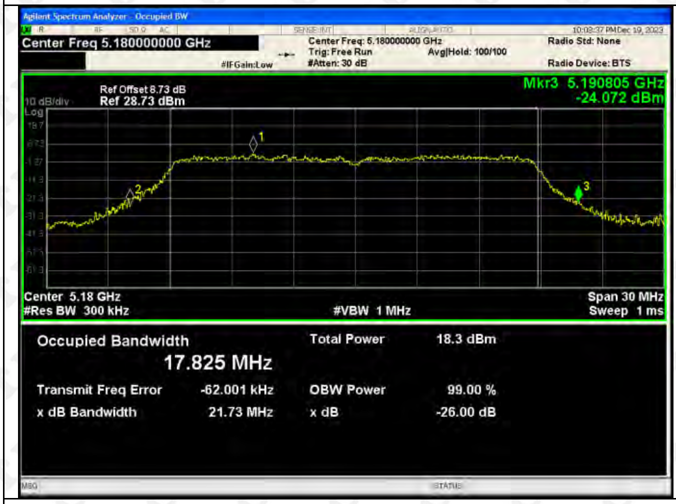
Test mode	Test Channel (MHz)	26dB Bandwidth (MHz)
802.11a	5180	21.733
	5200	21.739
	5240	21.516
802.11ac20	5180	21.585
	5200	21.614
	5240	21.708
802.11ac40	5190	41.298
	5230	40.975
802.11ac80	5210	81.027
802.11n(HT20)	5180	21.853
	5200	21.33
	5240	21.654
802.11n(HT40)	5190	41.155
	5230	40.717
802.11ax20	5180	21.856
	5200	21.414
	5240	21.681
802.11ax40	5190	41.432
	5230	41.315
802.11ax80	5210	80.54

Test mode	Test Channel (MHz)	6dB Bandwidth (MHz)
802.11a	5745	17.761
	5785	17.708
	5825	17.753
802.11ac20	5745	17.675
	5785	17.773
	5825	17.806
802.11ac40	5755	36.494
	5795	36.474
802.11ac80	5775	76.202
802.11n(HT20)	5745	17.759
	5785	17.79
	5825	17.765
802.11n(HT40)	5755	36.499
	5795	36.479
802.11ax20	5745	17.701
	5785	17.8
	5825	17.747
802.11ax40	5755	36.507
	5795	36.485
802.11ax80	5775	76.194

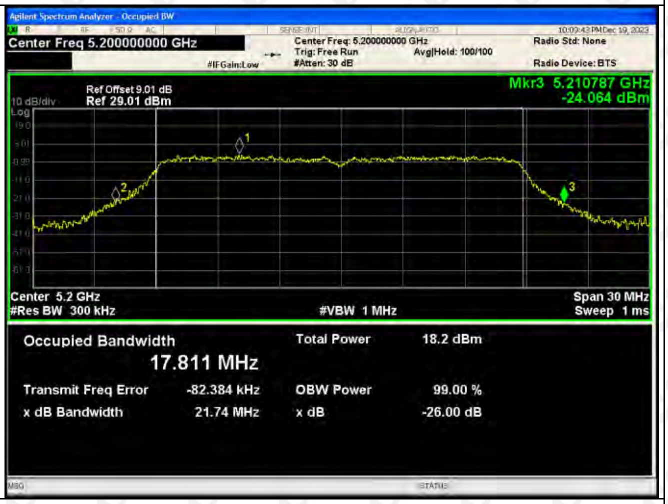
Test Graph

5180-5240MHz

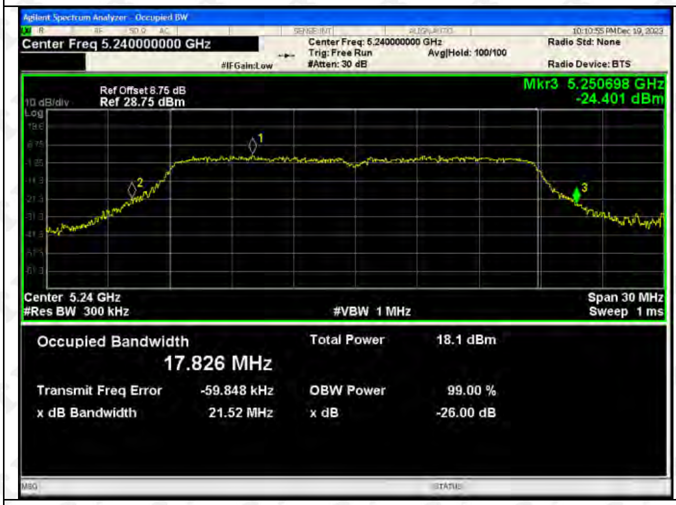
802.11a-5180



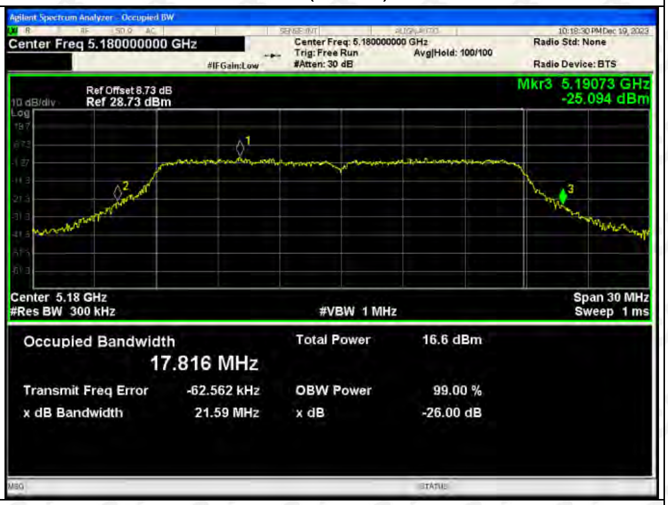
802.11a-5200



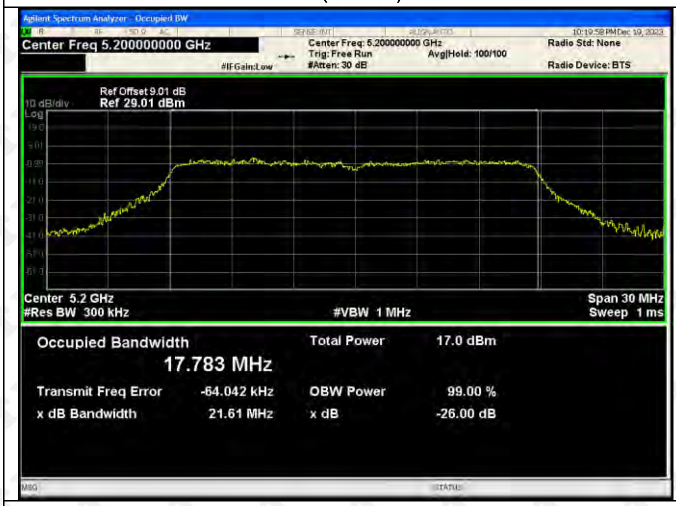
802.11a-5240



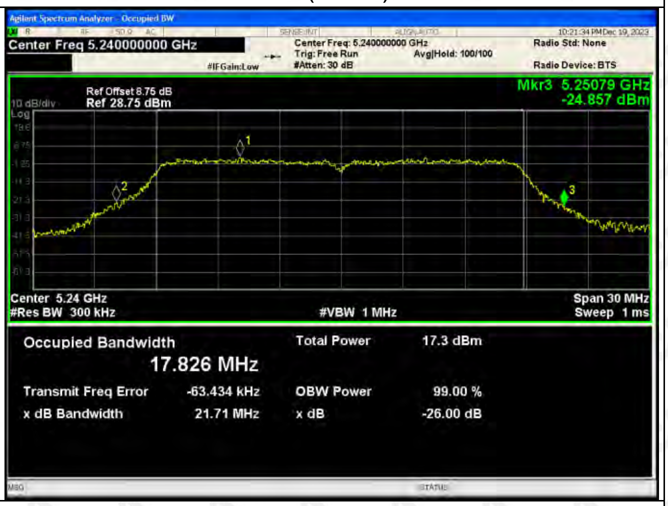
802.11ac(VH20)-5180



802.11ac(VH20)-5200



802.11ac(VH20)-5240

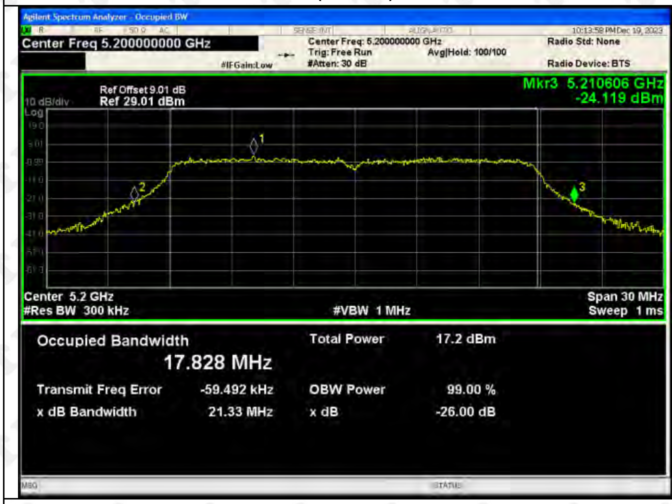


802.11ac(VH40)-5190

802.11ac(VH40)-5230

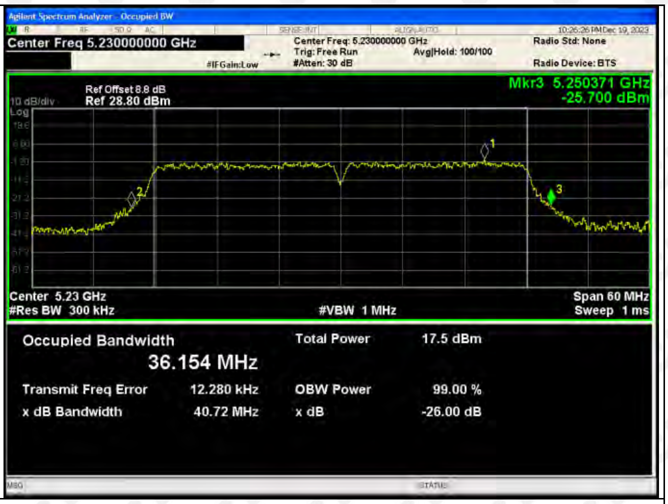
802.11ac(VH80)-5210 | 802.11n(HT20)-5180

802.11n(HT20)-5200 | 802.11n(HT20)-5240

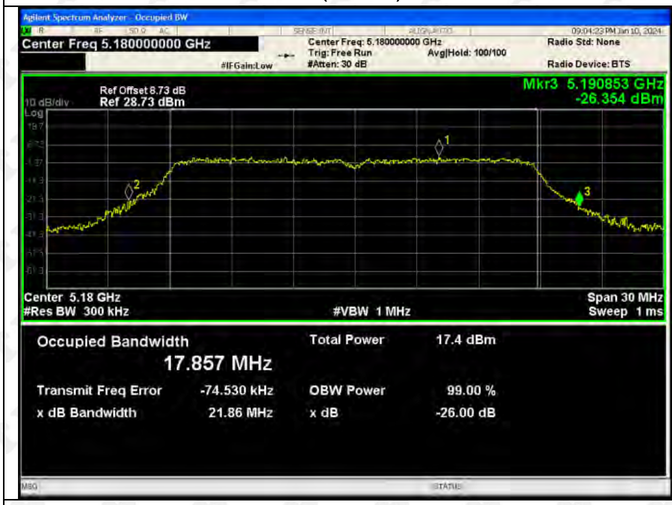


802.11n(HT40)-5190 | 802.11n(HT40)-5230

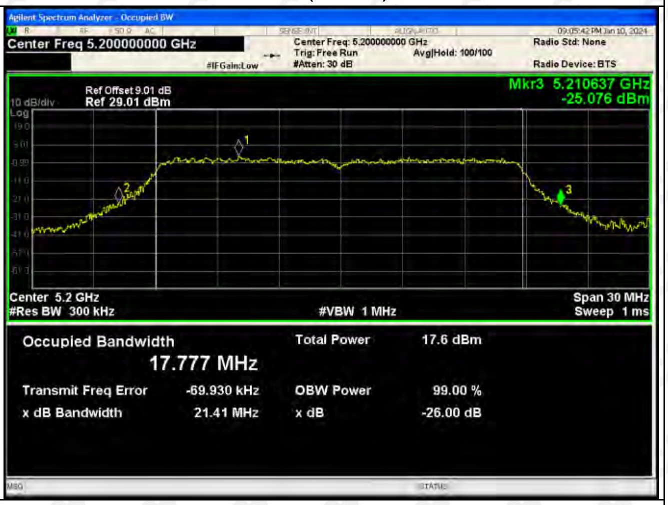
802.11ax(VH20)-5180



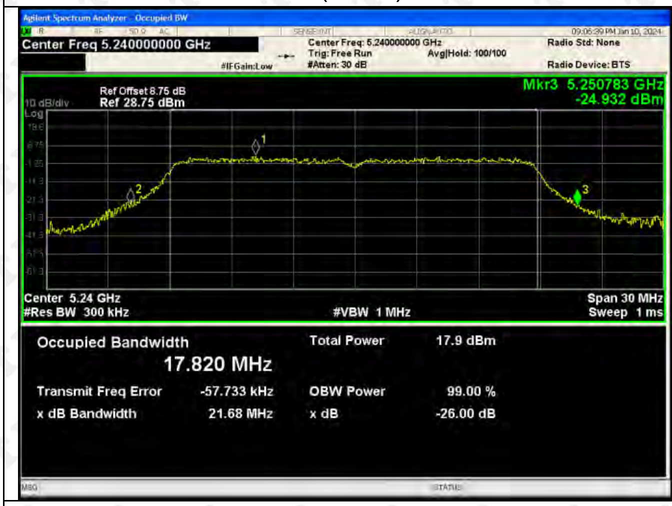
802.11ax(VH20)-5200



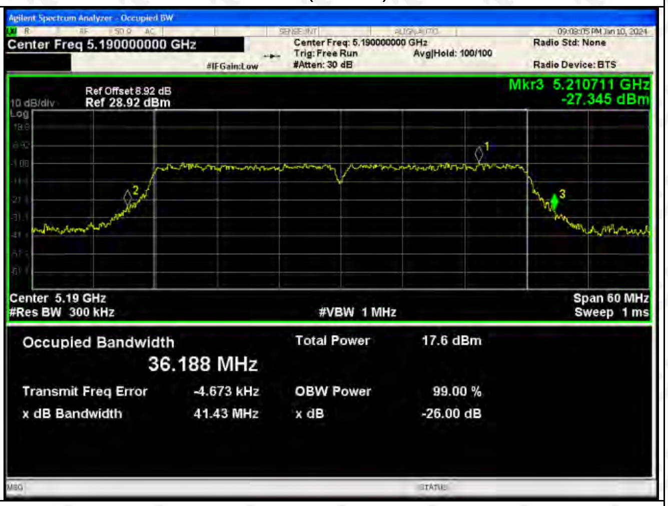
802.11ax(VH20)-5240



802.11ax(VH40)-5190

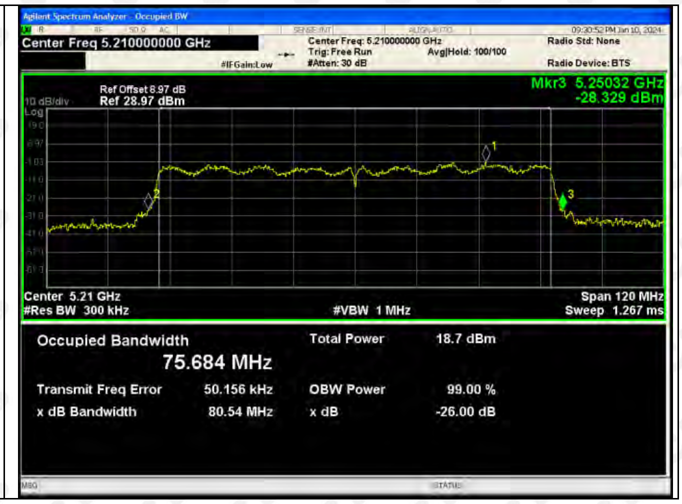


802.11ax(VH40)-5230



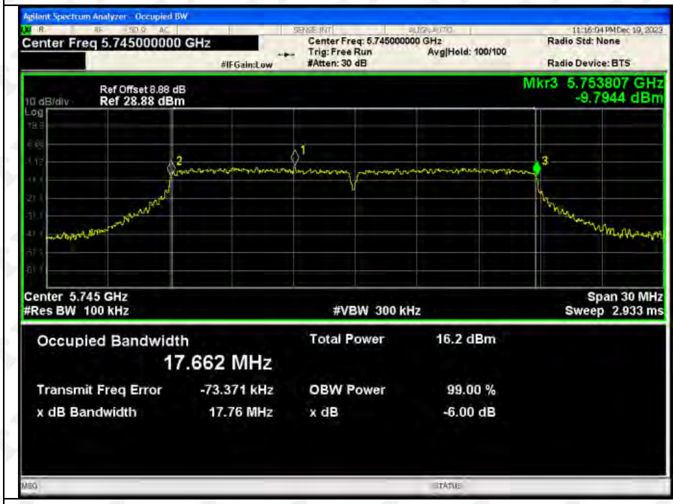
802.11ax(VH80)-5210


Center Freq 5.230000000 GHz
Center Freq: 5.230000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Ref Offset 8.8 dB
Ref 28.80 dBm
Mkr3 5.250686 GHz
-25.932 dBm
Center 5.23 GHz
#Res BW 300 kHz
#VBW 1 MHz
Span 60 MHz
Sweep 1 ms
Occupied Bandwidth
36.160 MHz
Total Power 17.8 dBm
Transmit Freq Error 29.008 kHz
OBW Power 99.00 %
x dB Bandwidth 41.31 MHz
x dB -26.00 dB

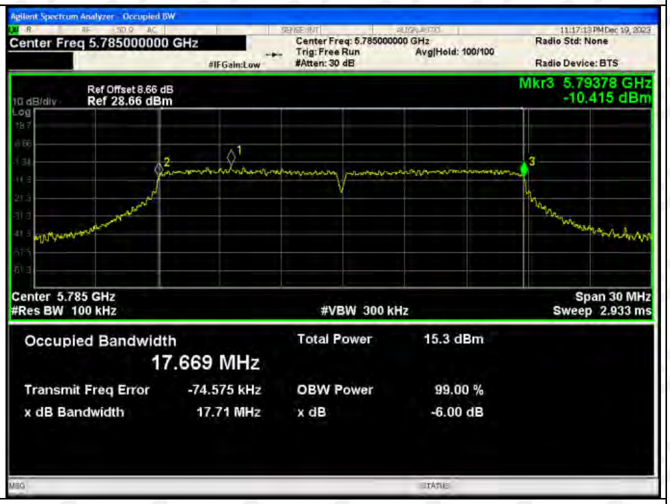

Center Freq 5.210000000 GHz
Center Freq: 5.210000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Ref Offset 8.97 dB
Ref 28.97 dBm
Mkr3 5.25032 GHz
-28.329 dBm
Center 5.21 GHz
#Res BW 300 kHz
#VBW 1 MHz
Span 120 MHz
Sweep 1.267 ms
Occupied Bandwidth
75.684 MHz
Total Power 18.7 dBm
Transmit Freq Error 50.156 kHz
OBW Power 99.00 %
x dB Bandwidth 80.54 MHz
x dB -26.00 dB

5745-5825MHz

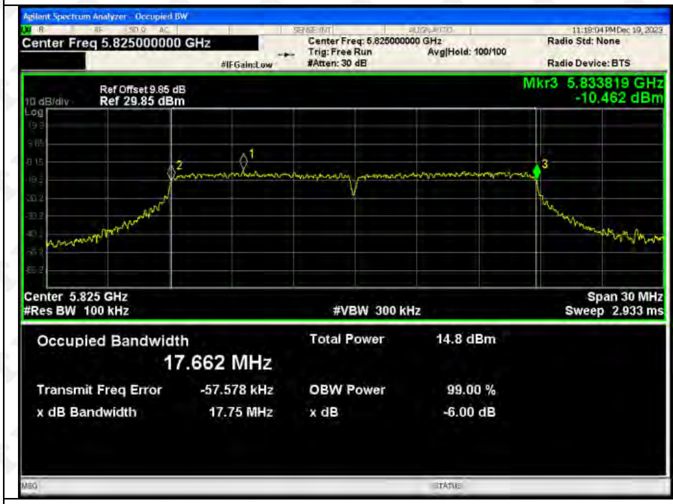
802.11a-5745



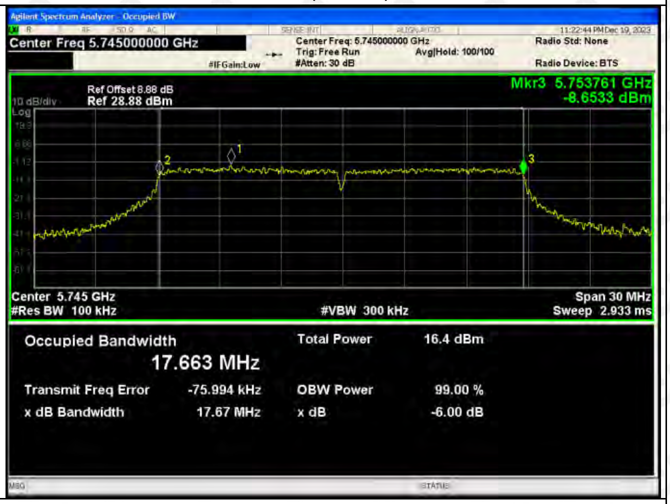
802.11a-5785



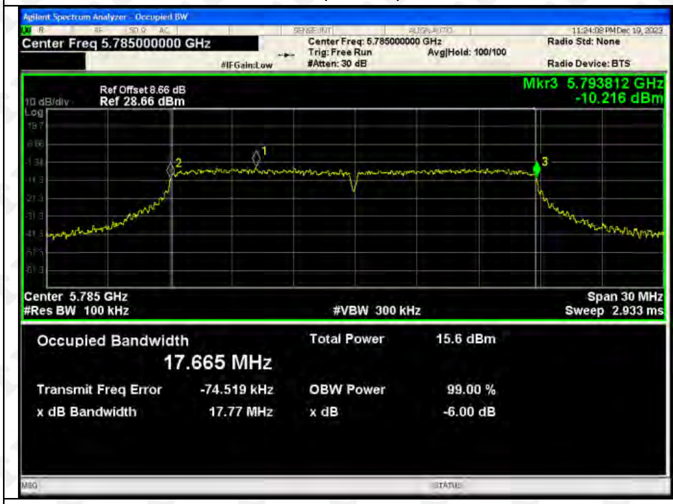
802.11a-5825



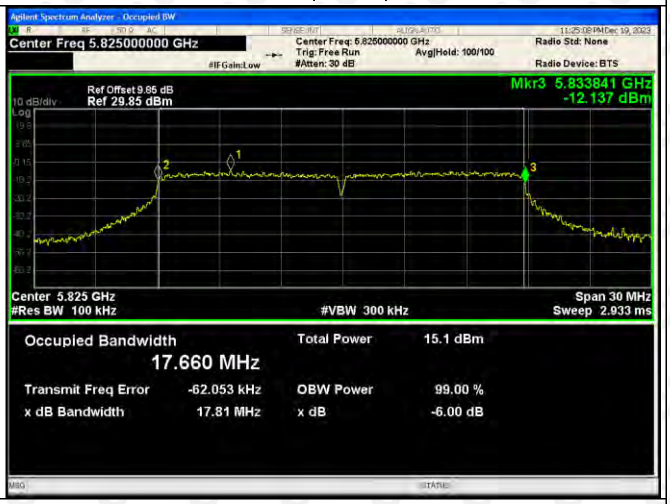
802.11ac(VH20)-5745



802.11ac(VH20)-5785

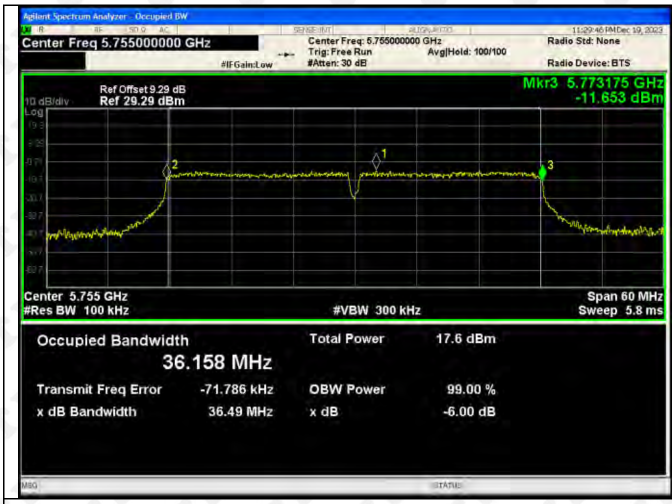


802.11ac(VH20)-5825

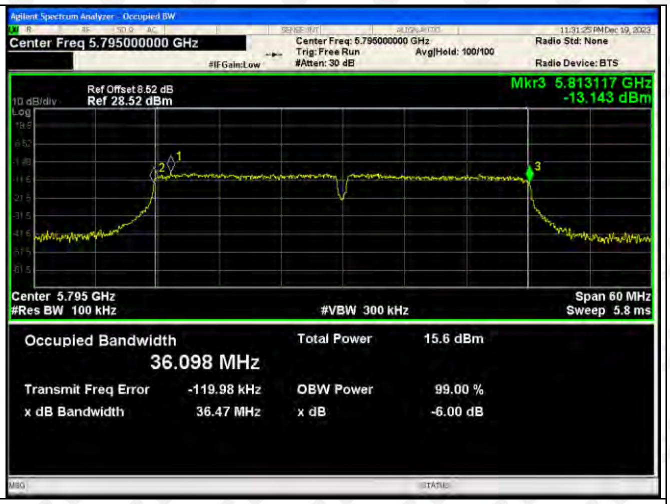


802.11ac(VH40)-5755

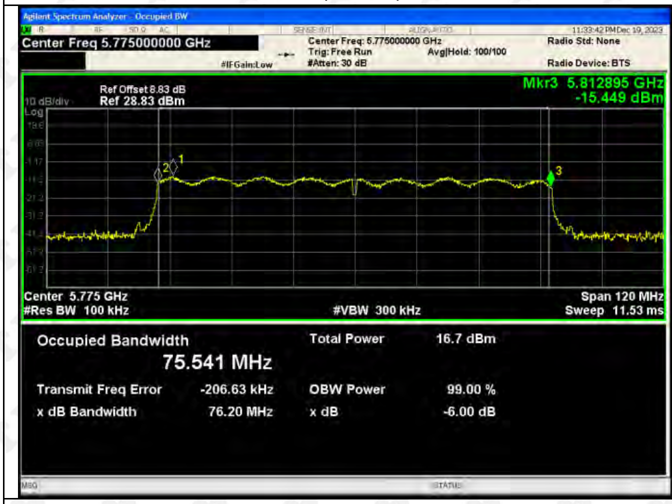
802.11ac(VH40)-5795



802.11ac(VH80)-5775

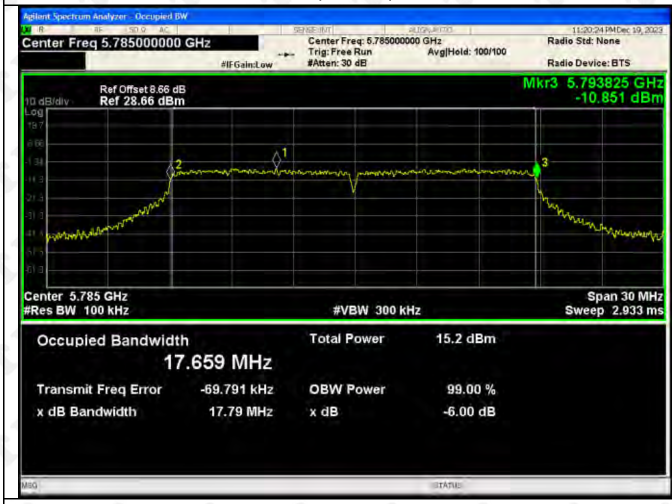


802.11n(HT20)-5745

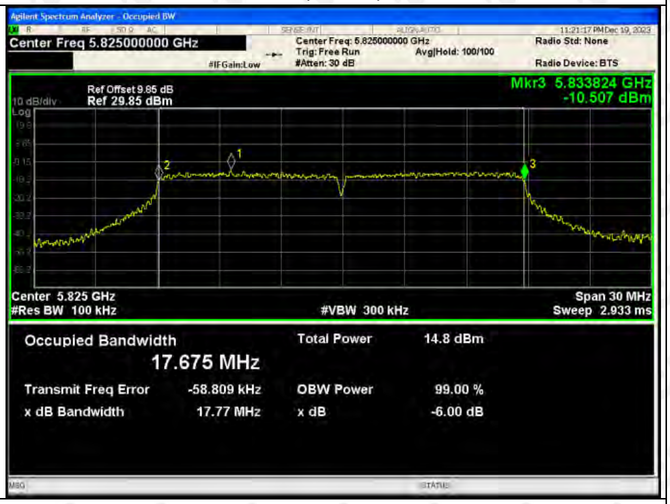


802.11n(HT20)-5785

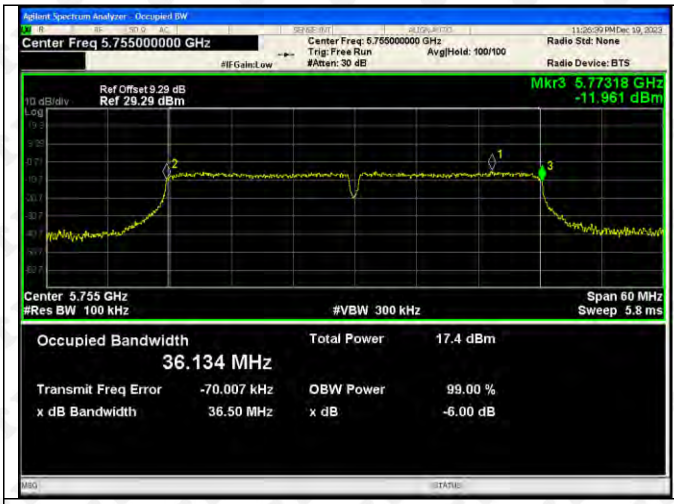
802.11n(HT20)-5825



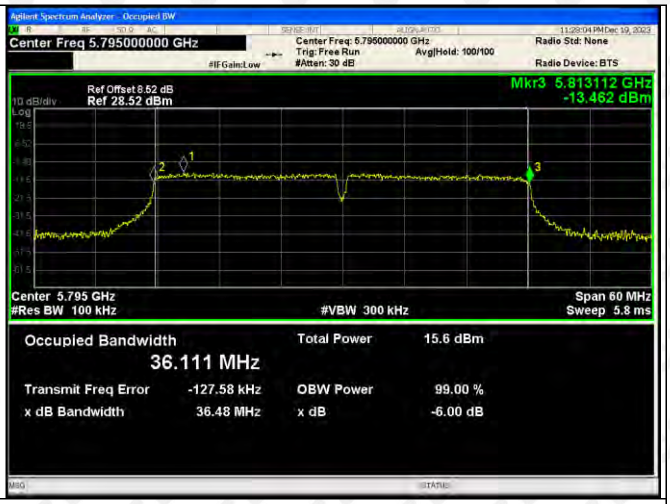
802.11n(HT40)-5755



802.11n(HT40)-5795

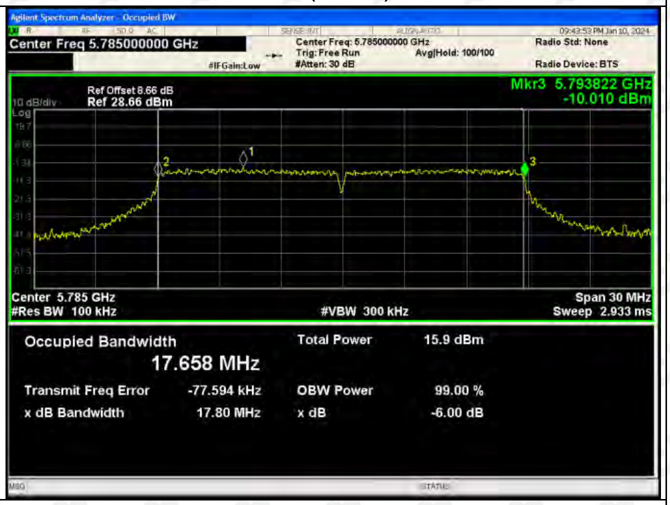


802.11ax(VH20)-5745

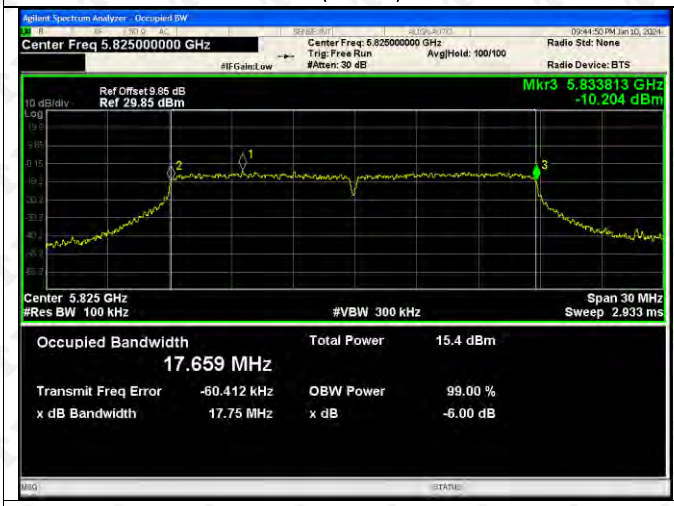


802.11ax(VH20)-5785

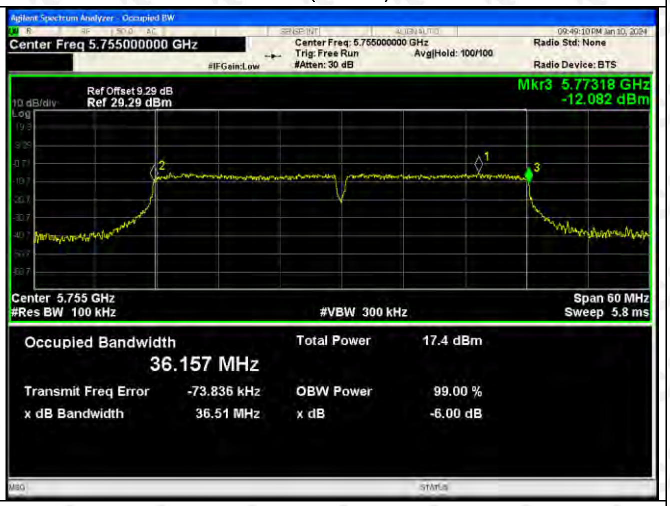
802.11ax(VH20)-5825



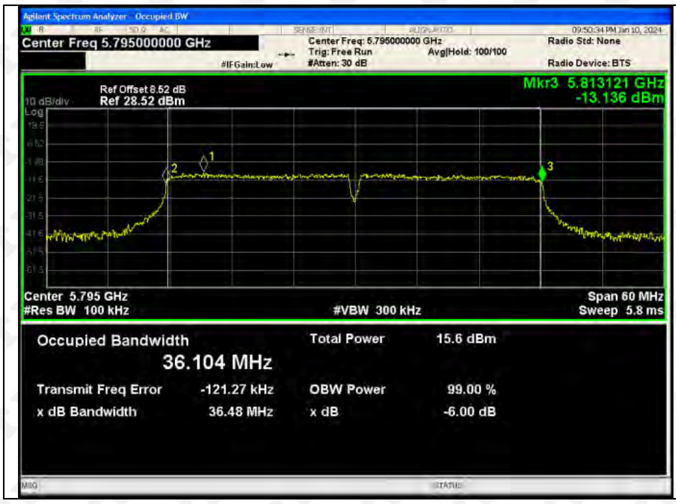
802.11ax(VH40)-5755

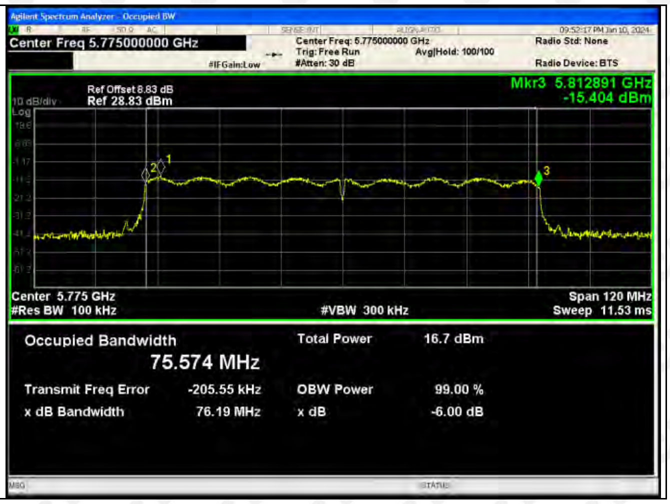


802.11ax(VH40)-5795



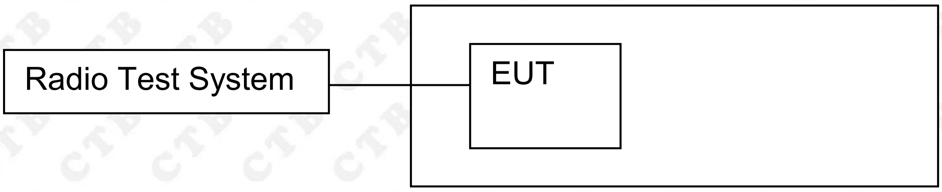
802.11ax(VH80)-5775


Center Freq 5.795000000 GHz
Center Freq: 5.795000000 GHz
Trig: Free Run
#Atten: 30 dB
Avg|Hold: 100/100
Radio Std: None
Radio Device: BTS
Ref Offset 8.52 dB
Ref 28.52 dBm
Mkr3 5.813121 GHz
-13.136 dBm
Center 5.795 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 60 MHz
Sweep 5.8 ms
Occupied Bandwidth
36.104 MHz
Total Power 15.6 dBm
Transmit Freq Error -121.27 kHz
OBW Power 99.00 %
x dB Bandwidth 36.48 MHz
x dB -6.00 dB


Center Freq 5.775000000 GHz
Center Freq: 5.775000000 GHz
Trig: Free Run
#Atten: 30 dB
Avg|Hold: 100/100
Radio Std: None
Radio Device: BTS
Ref Offset 8.83 dB
Ref 28.83 dBm
Mkr3 5.812891 GHz
-15.404 dBm
Center 5.775 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 120 MHz
Sweep 11.53 ms
Occupied Bandwidth
75.574 MHz
Total Power 16.7 dBm
Transmit Freq Error -205.55 kHz
OBW Power 99.00 %
x dB Bandwidth 76.19 MHz
x dB -6.00 dB

11. POWER SPECTRAL DENSITY

11.1 Block Diagram Of Test Setup



11.2 Limit

(1) For the band 5.15-5.25 GHz.

(iv) For mobile and portable 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. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
(2) 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. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

11.3 Test procedure

According to KDB789033 D02v02r01 sectionE, the following is the measurement procedure.

For devices operating in the bands 5.15−5.25 GHz, 5.25−5.35 GHz, and 5.47−5.725 GHz, the preceding procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in Section 15.407(a)(5). 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). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:
a) Set RBW ≥ 1/*T*, where *T* is defined in II.B.l.a).

b) Set VBW ≥ 3 RBW.

c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10 log (500 kHz/RBW) to the measured result, whereas RBW (<500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10 log (1MHz/RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.

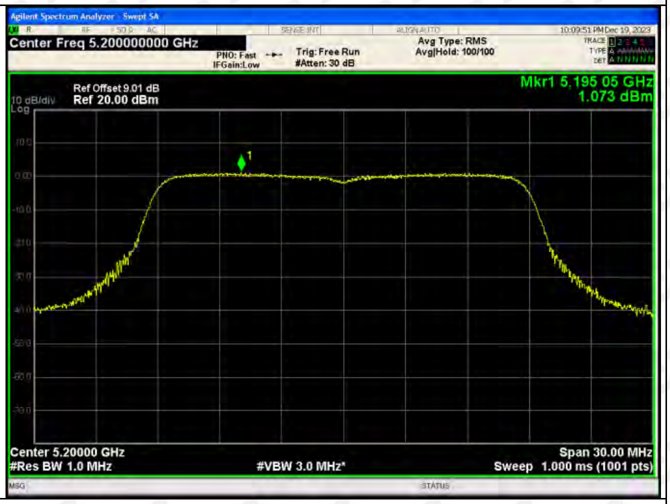
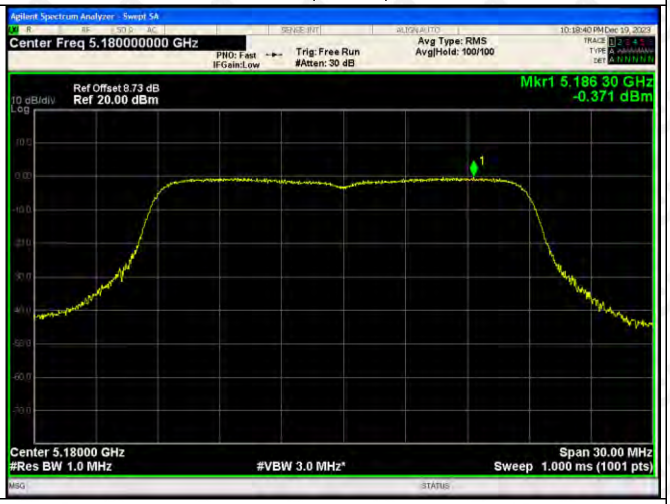
e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.
Note: As a practical matter, it is recommended to use reduced RBW of 100 kHz for the II.F.5.c) and II.F.5.d), since RBW=100 kHz is available on nearly all spectrum analyzers.

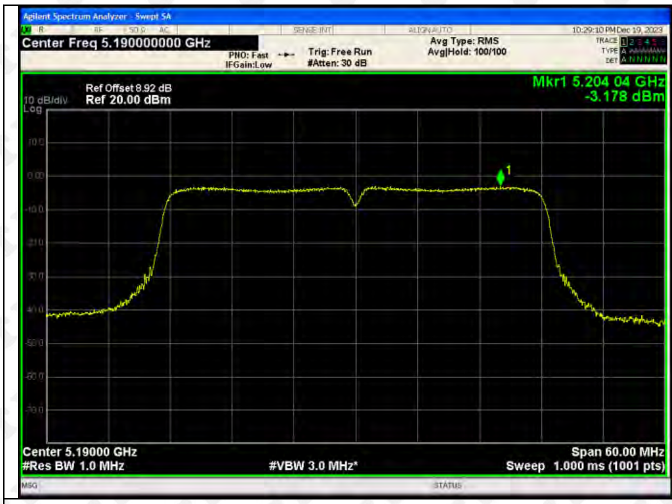
11.4 Test Result

Test mode	Test Channel (MHz)	PSD [dBm/MHz]	Limit [dBm/MHz]	Result
802.11a	5180	1.184	11	Pass
	5200	1.073	11	Pass
	5240	0.967	11	Pass
802.11ac(VH20)	5180	-0.371	11	Pass
	5200	-0.241	11	Pass
	5240	0.24	11	Pass
802.11ac(VH40)	5190	-3.178	11	Pass
	5230	-2.697	11	Pass
802.11ac(VH80)	5210	-4.773	11	Pass
802.11n(HT20)	5180	0.079	11	Pass
	5200	0.198	11	Pass
	5240	0.903	11	Pass
802.11n(HT40)	5190	-2.762	11	Pass
	5230	-2.566	11	Pass
802.11ax(VH20)	5180	0.378	11	Pass
	5200	0.696	11	Pass
	5240	0.845	11	Pass
802.11ax(VH40)	5190	-2.695	11	Pass
	5230	-2.24	11	Pass
802.11ax(VH80)	5210	-3.69	11	Pass

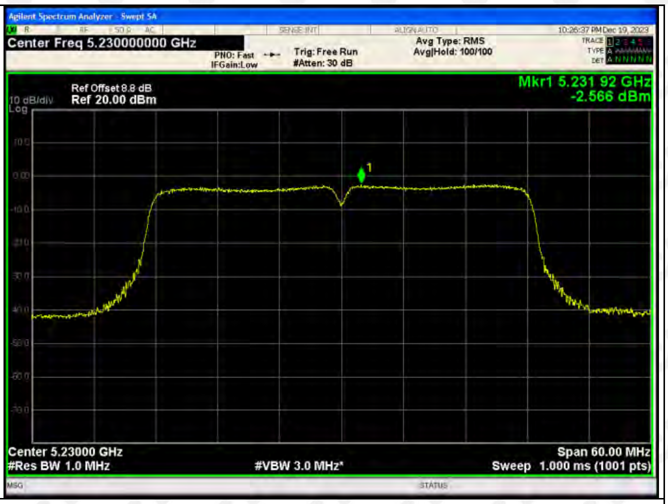
Test mode	Test Channel (MHz)	PSD [dBm/500kHz]	Limit [dBm/MHz]	Result
802.11a	5745	-3.52	30	Pass
	5785	-4.375	30	Pass
	5825	-4.74	30	Pass
802.11ac(VH20)	5745	-3.561	30	Pass
	5785	-4.216	30	Pass
	5825	-4.554	30	Pass
802.11ac(VH40)	5755	-5.145	30	Pass
	5795	-7.223	30	Pass
802.11ac(VH80)	5775	-8.615	30	Pass
802.11n(HT20)	5745	-3.767	30	Pass
	5785	-4.357	30	Pass
	5825	-5.088	30	Pass
802.11n(HT40)	5755	-5.641	30	Pass
	5795	-7.014	30	Pass
802.11ax(VH20)	5745	-3.103	30	Pass
	5785	-3.852	30	Pass
	5825	-4.335	30	Pass
802.11ax(VH40)	5755	-5.516	30	Pass
	5795	-6.436	30	Pass
802.11ax(VH80)	5775	-8.32	30	Pass

5180-5240MHz

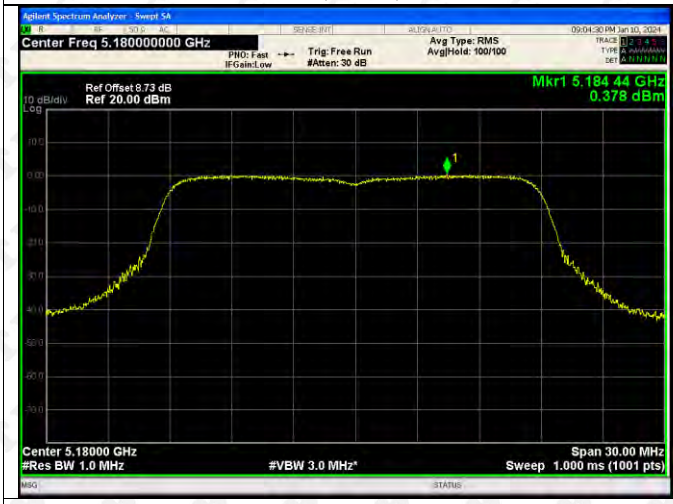
802.11a-5180	802.11a-5200
	
802.11a-5240	802.11ac(VH20)-5180
	
802.11ac(VH20)-5200	802.11ac(VH20)-5240
	
802.11ac(VH40)-5190	802.11ac(VH40)-5230

	
802.11ac(VH80)-5210	802.11n(HT20)-5180
	
802.11n(HT20)-5200	802.11n(HT20)-5240
	
802.11n(HT40)-5190	802.11n(HT40)-5230

802.11ax(VH20)-5180



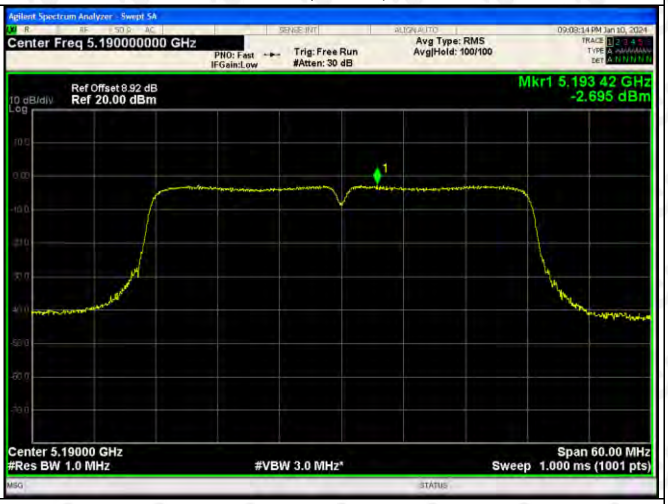
802.11ax(VH20)-5200



802.11ax(VH20)-5240

802.11ax(VH40)-5190

802.11ax(VH40)-5230



802.11ax(VH80)-5210


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.230000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 100/100
Ref Offset 8.8 dB
Ref 20.00 dBm
10 dB/div
Log
Mkr1 5.245 18 GHz
-2.240 dBm
Center 5.23000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Span 60.00 MHz
Sweep 1.000 ms (1001 pts)


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.210000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 100/100
Ref Offset 8.97 dB
Ref 20.00 dBm
10 dB/div
Log
Mkr1 5.236 76 GHz
-3.690 dBm
Center 5.21000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Span 120.0 MHz
Sweep 1.000 ms (1001 pts)

5745-5825MHz

802.11a-5745

802.11a-5785

802.11a-5825

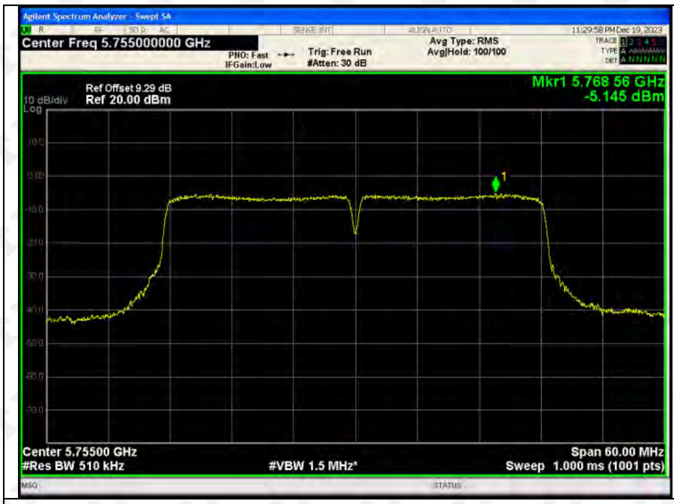
802.11ac(VH20)-5745

802.11ac(VH20)-5785

802.11ac(VH20)-5825

802.11ac(VH40)-5755

802.11ac(VH40)-5795



802.11ac(VH80)-5775

802.11n(HT20)-5745

802.11n(HT20)-5785

802.11n(HT20)-5825

802.11n(HT40)-5755

802.11n(HT40)-5795

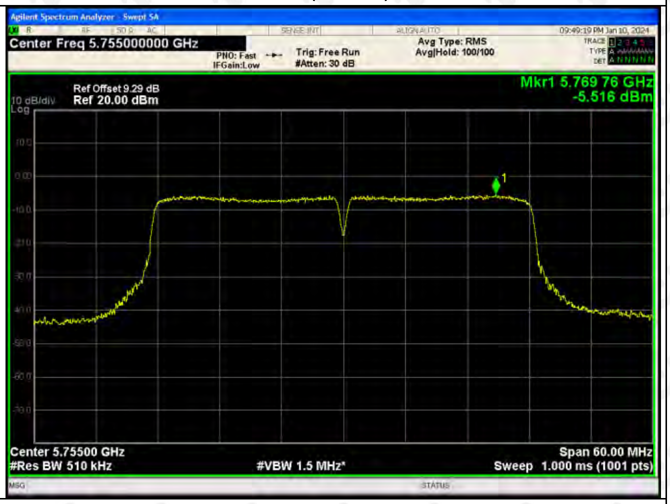
802.11ax(VH20)-5745

802.11ax(VH20)-5785

802.11ax(VH20)-5825

802.11ax(VH40)-5755

802.11ax(VH40)-5795



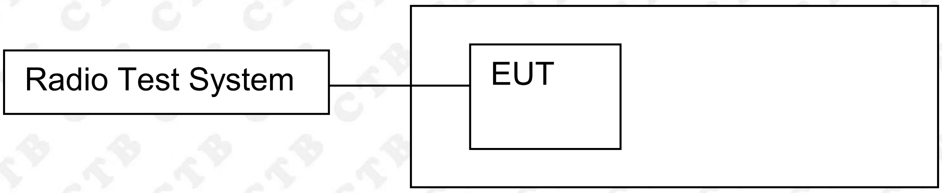
802.11ax(VH80)-5775


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.795000000 GHz
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 100/100
09:50:45 PM Jan 10, 2024
Ref Offset 8.52 dB
10 dB/div Ref 20.00 dBm
Mkr1 5.779 88 GHz
-6.436 dBm
Center 5.79500 GHz
#Res BW 510 kHz
#VBW 1.5 MHz*
Span 60.00 MHz
Sweep 1.000 ms (1001 pts)


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.775000000 GHz
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 100/100
09:52:28 PM Jan 10, 2024
Ref Offset 8.83 dB
10 dB/div Ref 20.00 dBm
Mkr1 5.747 16 GHz
-8.320 dBm
Center 5.77500 GHz
#Res BW 510 kHz
#VBW 1.5 MHz*
Span 120.0 MHz
Sweep 1.000 ms (1001 pts)

12. FREQUENCY STABILITY

12.1 Block Diagram Of Test Setup



12.2 Limit

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user’s manual.

12.3 Test procedure

1. The EUT was placed inside temperature chamber and powered and powered by nominal DC voltage.

2. Set EUT as normal operation.

3. Turn the EUT on and couple its output to spectrum.

4. Turn the EUT off and set the chamber to the highest temperature specified.

5. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT and measure the operating frequency.

6. Repeat step with the temperature chamber set to the lowest temperature.

12.4 Test Result

Pass

13. OPERATION IN THE ABSENCE OF INFORMATION TO THE TRANSMIT

13.1 Requirement

15.407(c) requirement:
The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signal ling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

13.2 Test Results

Operation in the absence of information to the transmit:

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of WLAN message transmitting from remote device and verify whether it shall reconnect. (manufacturer declare)

14. ANTENNA REQUIREMENT

15.203 requirement:
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

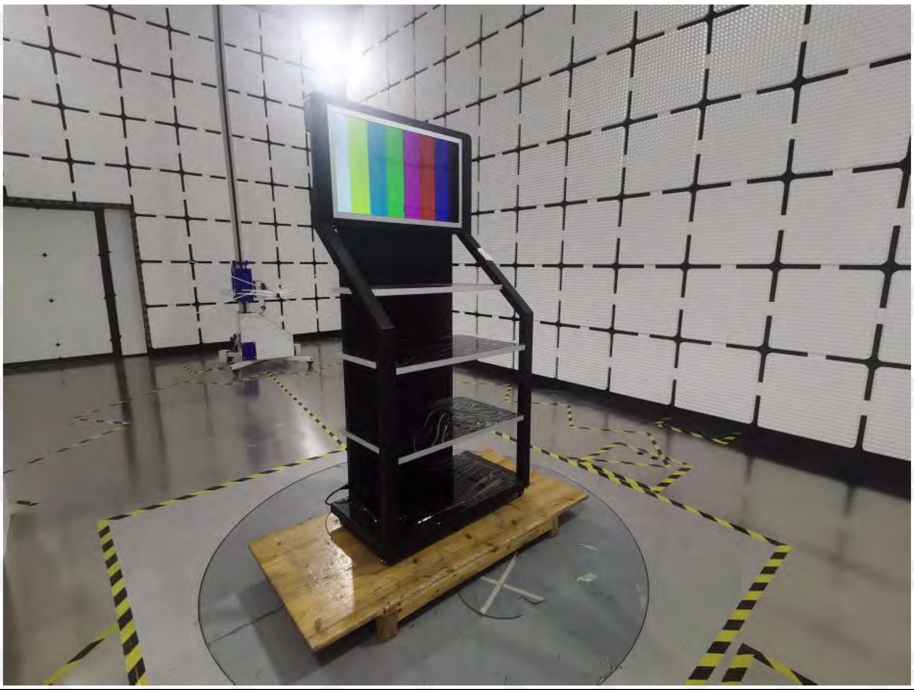
EUT Antenna:

The antenna is Rod antenna. The best case gain of the antenna is 5.2G:3.1dBi, 5.8G:2.99dBi

15. EUT TEST SETUP PHOTOGRAPHS

Radiated Emission

Below 1G



Above 1G

Conducted Emission

※※※※※ **END OF REPORT** ※※※※※