TEST REPORT

Product Name:	Touch computer
FCC ID:	2BBVL-IEC151N302X
Trademark:	None, 2. TES or TES, MicroTouch or MicroTouch.
Model Number:	IEC-151N3022P1I801, IEC-151N3022P1I802, IEC-151N3022P11001, IEC-151N3022P1F001
Prepared For:	TES Touch Embedded Solutions Inc. Taiwan Branch
Address:	7F., No.141, Sec. 3, Ren ai Rd., Da an Dist., Taipei City 106, Taiwan
Manufacturer:	TES Touch Embedded Solutions Inc. Taiwan Branch
Address:	7F., No.141, Sec. 3, Ren ai Rd., Da an Dist., Taipei City 106, Taiwan
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:	Jun. 06, 2025
Sample tested Date:	Jun. 06, 2025 to Jun. 30, 2025
Issue Date:	Jun. 30, 2025
Report No.:	CTB25060605501RF04
Test Standards	FCC CFR Title 47 Part 15 Subpart E Section 15.407
Test Results	PASS
Remark:	This is WIFI-5GHz band radio test report.

Compiled by:	Reviewed by:	Approved by:
Zhou Kui	Arron Liu	
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
CTB25060605501RF04	Jun. 30, 2025	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)(6)	ANSI C63.10-2020	PASS
Radiated Spurious emissions	47 CFR Part 15 Subpart E Section 15.205/15.407(b)	KDB789033	PASS
Band edge	47 CFR Part 15 Subpart E Section 15.205/15.407(b)	KDB789033	PASS
Conducted Peak Output Power	47 CFR Part 15 Subpart E Section 15.407 (a)	KDB789033	PASS
Emission Bandwidth & Occupied Bandwidth	47 CFR Part 15 Subpart E Section 15.407 (a)(e)	KDB789033	PASS
Power Spectral Density	47 CFR Part 15 Subpart E Section 15.407 (a)	KDB789033	PASS
Frequency stability	47 CFR Part 15 Subpart E Section 15.407 (g)	KDB789033	PASS
Operation in the absence of information to the transmit	47 CFR Part 15 Subpart E Section 15.407 (b)	47 CFR Part 15 Subpart E	PASS
Antenna Requirement	47 CFR Part 15 Subpart E Section 15.203	/	PASS

Remark:
Test according to ANSI C63.10-2020.

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.

Item	Uncertainty
Occupancy bandwidth	U=±54.3Hz
Adjacent channel power	U=±1.3dB
Conducted Adjacent channel power	U=±1.38dB
Conducted output power Above 1G	U=±1.0dB
Conducted output power below 1G	U=±0.9dB
Power Spectral Density , Conduction	U=±1.0dB
Conduction spurious emissions	U=±2.8dB
Out of band emission	U=±54Hz
3m camber Radiated spurious emission(9KHz-30MHz)	U=±4.8dB
3m camber Radiated spurious emission(30MHz-1GHz)	U=±4.3dB
3m chamber Radiated spurious emission(1GHz-18GHz)	U=±4.5dB
3m chamber Radiated spurious emission(18GHz-40GHz)	U=±3.4dB
humidity uncertainty	U=±5.3%
Temperature uncertainty	U=±0.59℃
Supply voltages	U=±3%
Time	U=±5%
Conducted emission(150K-30MHz)	3.2dB

4. PRODUCT INFORMATION AND TEST SETUP

4.1 Product Information

Model(s):	IEC-151N3022P1I801, IEC-151N3022P1I802, IEC-151N3022P11001, IEC-151N3022P1F001
Model Description:	All the model are the same circuit and RF module, only the model names are different. Test sample model: IEC-151N3022P1I801
Wi-Fi Specification:	IEEE 802.11a/n/ac
Hardware Version:	V1.0
Software Version:	V1.0
Operation Frequency:	IEEE 802.11a/n/ac(20M): 5150MHz ~5250MHz/ 4 channel IEEE 802.11n/ac(40M): 5150MHz ~5250MHz/ 2 channel IEEE 802.11ac(80M): 5150MHz ~5250MHz/ 1 channel IEEE 802.11a/n/ac(20M): 5250MHz ~5350 MHz/ 4 channel IEEE 802.11n/ac(40M): 5250MHz ~5350 MHz/ 2 channel IEEE 802.11ac(80M): 5250MHz ~5350 MHz/ 1 channel IEEE 802.11a/n/ac(20M): 5470MHz ~5725 MHz/ 11 channel IEEE 802.11n/ac(40M): 5470MHz ~5725 MHz/ 5 channel IEEE 802.11ac(80M): 5470MHz ~5725 MHz/ 3 channel IEEE 802.11a/n/ac(20M): 5725MHz ~5850MHz/ 5 channel IEEE 802.11n/ac(40M): 5725MHz ~5850MHz/ 2 channel IEEE 802.11ac(80M): 5725MHz ~5850MHz/ 1 channel
Max. RF output power:	WiFi (5G): 17.56dBm
Type of Modulation:	WiFi (5G): OFDM
Antenna installation:	WiFi (5G): FPC antenna
Antenna Gain:	WiFi (5.2G): Ant1: 4.16dBi, Ant2: 3.21dBi WiFi (5.3G): Ant1:2.51dBi, Ant2: 3.21dBi WiFi (5.6G): Ant1: 3.77dBi, Ant2: 3.38dBi WiFi (5.8G): Ant1: 2.31dBi, Ant2: 1.95dBi
Ratings:	Manufacturer: FJ Model: FJ-GN2048A1202000 Power: 12V⎓2A, 24W

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
1.	Laptop	DELL	Vostro 5490	N/A	AE
2.	Monitor	DELL	SE2218HV	N/A	AE
3.	Adapter	FUJIA	FJ-GN2048A1202000	N/A	AE

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.
3. Adapter: AC 100-240V 50/60Hz

4.4 Channel List

For 802.11a/n/ac(20M) Operation in the 5150MHz ~5250 MHz band			
Channel	Frequency	Channel	Frequency
36	5180MHz	44	5220MHz
40	5200MHz	48	5240MHz
For 802.11a/n/ac(20M) Operation in the 5250MHz ~5350 MHz band			
Channel	Frequency	Channel	Frequency
52	5260MHz	60	5300MHz
56	5280MHz	64	5320MHz
For 802.11a/n/ac(20M) Operation in the 5470MHz ~5725 MHz band			
Channel	Frequency	Channel	Frequency
100	5500MHz	124	5620 MHz
104	5520MHz	128	5640 MHz
108	5540MHz	132	5660 MHz
112	5560MHz	136	5680MHz
116	5580MHz	140	5700MHz
120	5600 MHz		
For 802.11a/n/ac(20M) Operation in the 5725MHz ~5850 MHz band			
Channel	Frequency	Channel	Frequency
149	5745MHz	161	5805MHz
153	5765MHz	165	5825MHz
157	5785MHz	NA	NA

For 802.11n/ac(40M) Operation in the 5150MHz ~5250 MHz band			
Channel	Frequency	Channel	Frequency
38	5190MHz	46	5230MHz
For 802.11n/ac(40M) Operation in the 5250MHz ~5350 MHz band			
Channel	Frequency	Channel	Frequency
54	5270MHz	62	5310MHz
For 802.11n/ac(40M) Operation in the 5470MHz ~5725 MHz band			
Channel	Frequency	Channel	Frequency
102	5510MHz	126	5630MHz
110	5550MHz	134	5670MHz

118	5590MHz		
For 802.11n/ac(40M) Operation in the 5725MHz ~5850 MHz band			
Channel	Frequency	Channel	Frequency
151	5755MHz	159	5795MHz

For 802.11ac(80M) Operation in the 5150MHz ~5250 MHz band			
Channel	Frequency	Channel	Frequency
42	5210MHz	NA	NA
For 802.11ac(80M) Operation in the 5250MHz ~5350 MHz band			
Channel	Frequency	Channel	Frequency
58	5290MHz	NA	NA
For 802.11ac(80M) Operation in the 5470MHz ~5725 MHz band			
Channel	Frequency	Channel	Frequency
106	5530MHz	138	5690MHz
122	5610 MHz		
For 802.11ac(80M) Operation in the 5725MHz ~5850 MHz band			
Channel	Frequency	NA	NA
155	5775MHz	NA	NA

NOTE: Duty cycle>98%.

Test mode	Rate
802.11a	54M
802.11n	500M
802.11ac	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(20M)	5150MHz ~5250 MHz	Channel 36	Channel 40	Channel 48
		5180MHz	5200MHz	5240MHz
802.11n/ac(40M)		Channel 38	N/A	Channel 46
		5190MHz	N/A	5230MHz
802.11ac(80M)		N/A	Channel 42	N/A
		N/A	5210MHz	N/A
802.11a/n/ac(20M)	5250MHz ~5350 MHz	Channel 52	Channel 56	Channel 64
		5260MHz	5280MHz	5320MHz
802.11n/ac(40M)		Channel 54	N/A	Channel 62
		5270MHz	N/A	5310MHz
802.11ac(80M)		N/A	Channel 58	N/A
		N/A	5290MHz	N/A
802.11a/n/ac(20M)	5470MHz ~5725 MHz	Channel 100	Channel 116	Channel 140
		5500MHz	5580MHz	5700MHz
802.11n/ac(40M)		Channel 102	N/A	Channel 134
		5510MHz	N/A	5670MHz
802.11ac(80M)		N/A	Channel 106	N/A

		N/A	5530MHz	N/A
802.11a/n/ac(20M)	5725MHz ~5850 MHz	Channel 149	Channel 157	Channel 165
		5745MHz	5785MHz	5825MHz
802.11n/ac(40M)		Channel 151	N/A	Channel 159
		5755MHz	N/A	5795MHz
802.11ac(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)(V):	120
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.

FCC Test Firm Registration Number: CN1276

5.2 Test Instrument Used

No.	Equipment	Manufacturer	Type No.	Serial No.	Firmware Version	Calibrated Date	Calibrated until
1	Spectrum Analyzer	Agilent	N9020A	MY52090073	A.14.16	2025/5/23	2026/5/22
2	Power Sensor	Agilent	U2021XA	MY56120032	/	2025/5/23	2026/5/22
3	Power Sensor	Agilent	U2021XA	MY56120034	/	2025/5/23	2026/5/22
4	Communication test set	R&S	CMW500	108058	V3.5.80	2025/5/23	2026/5/22
5	Spectrum Analyzer	KEYSIGHT	N9020A	MY51289897	A.14.16	2025/5/23	2026/5/22
6	Signal Generator	Agilent	N5181A	MY50140365	A.01.60	2025/5/22	2026/5/21
7	Vector signal generator	Agilent	N5182A	MY47420195	A.01.87	2025/5/22	2026/5/21
8	Communication test set	Agilent	E5515C	MY50102567	B.19.07 （E1962B ）	2025/5/22	2026/5/21
9	2.4 GHz Filter	Shenxiang	MSF2400-2483.5MS-1154	20181015001	/	2025/6/18	2026/6/17
10	5 GHz Filter	Shenxiang	MSF5150-5850 MS-1155	20181015001	/	2025/6/18	2026/6/17
11	Filter	Xingbo	XBLBQ-DZA120	190821-1-1	/	2025/5/24	2026/5/23
12	BT&WI-FI Automatic test software	Micowave	MTS8310	Ver. 2.0.0.0	/	/	/
13	Rohde & Schwarz SFU Broadcast Test System	R&S	SFU	101017	/	2024/10/31	2025/10/30
14	Temperature humidity chamber	Hongjing	TH-80CH	DG-15174	/	2025/5/22	2026/5/21
15	234G Automatic test software	Micowave	MTS8200	Ver. 2.0.0.0	/	/	/
16	966 chamber	C.R.T.	966	/	/	2024/6/23	2027/6/22
17	Receiver	R&S	ESPI	100362	RF_ATTEN_7 （104489/003）	2025/5/23	2026/5/22
18	Amplifier	HP	8447E	2945A02747	/	2025/5/23	2026/5/22

19	Amplifier	Agilent	8449B	3008A01838	/	2025/6/2	2026/6/1
20	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	00869	/	2025/6/29	2026/6/28
21	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA9120D	01911	/	2025/6/1	2026/5/31
22	EMI test software	Fala	EZ-EMC	FA-03A2 RE	/	/	/
23	Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-224	/	2025/6/2	2026/6/1
24	loop antenna	ZHINAN	ZN30900A	GTS534	/	/	/
25	40G Horn antenna	A/H/System	SAS-574	588	/	2025/6/2	2026/6/1
26	Amplifier	AEROFLEX	Aeroflex	097	/	2025/6/2	2026/6/1
27	Power Metter	KEYSIGHT	N1912AP	N/A	A.05.00	2025/6/2	2026/6/1

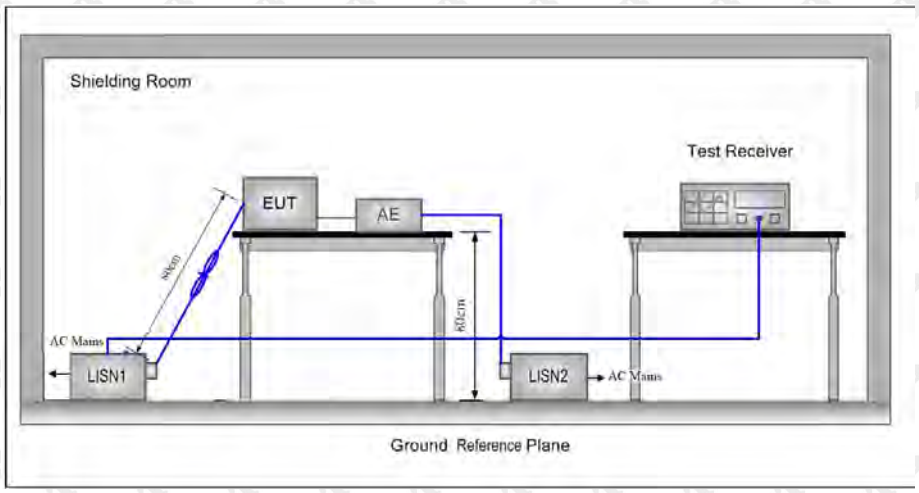
Continuous disturbance							
No.	Equipment	Manufacturer	Model No.	Serial No.	Firmware version	Calibrated Date	Calibrated until
1	843 Shield Room	C/ R/ T	843	/	/	2024/6/22	2027/6/21
2	LISN	ROHDE&SCHWARZ	ESH3-Z5	831551852	/	2025/5/22	2026/5/21
3	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100428	V4.42.SP3	2025/5/22	2026/5/21
4	Coaxial cable	ZDECL	Z302S	18091904	/	2025/5/22	2026/5/21
5	ISN	Schwarzbeck	NTFM8158	183	/	2025/6/18	2026/6/17
6	Voltage sensor	Schwarzbeck	TK 9420	01189	/	2024/10/26	2025/10/25
7	EZ-EMC	Frad	EMC-con3A1.1	/	/	/	/
8	Current Probe	FCC	F-52B	199453	/	2025/5/24	2026/5/23
9	Communication test set	R&S	CMW500	108058	B.19.07 （E1962B ）	2025/5/23	2026/5/22
10	Communication test set	Agilent	E5515C	MY50102567	V3.5.80	2025/5/23	2026/5/22

Radiated emission(No.1 Chamber)							
No.	Equipment	Manufacturer	Model No.	Serial No.	Firmware version	Calibrated until	Calibrated until
1	966 Chamber	C/ R/ T	966	/	/	2024/6/23	2027/6/22
2	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA 9120 D	01911	/	2025/6/1	2026/5/31
3	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	00869	/	2025/6/29	2026/6/28
4	Amplifier	Agilent	8449B	3008A01838	/	2025/6/3	2026/6/2
5	Amplifier	HP	8447E	2945A02747	/	2025/5/23	2026/5/22

6	loop antenna	Schwarzbeck	FMZB 1519B	1519B-224	/	2025/6/2	2026/6/1
7	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESPI	100362	RF_ATTEN_7 (104489/003)	2025/5/23	2026/5/22
8	Spectrum Analyzer	KEYSIGHT	N9020A	MY51289897	A.14.16	2025/5/23	2026/5/22
9	Coaxial cable	ETS	RFC-SNS-100-NMS-80	/	/	2025/5/24	2026/5/23
10	Coaxial cable	ETS	RFC-SN-100-NMS-20	/	/	2025/5/24	2026/5/23
11	Coaxial cable	ETS	RFC-SNS-100-SMS-20	/	/	2025/5/24	2026/5/23
12	Coaxial cable	ETS	RFC-NNS-100-NMS-300	/	/	2025/5/24	2026/5/23
13	EMI test software	Frad	EZ-EMC	Ver/ FA-03A2 RE	/	/	/
14	Communication test set	R&S	CMW500	108058	B.19.07 (E1962B)	2025/5/23	2026/5/22
15	Communication test set	Agilent	E5515C	MY50102567	V3.5.80	2025/5/23	2026/5/22

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 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,

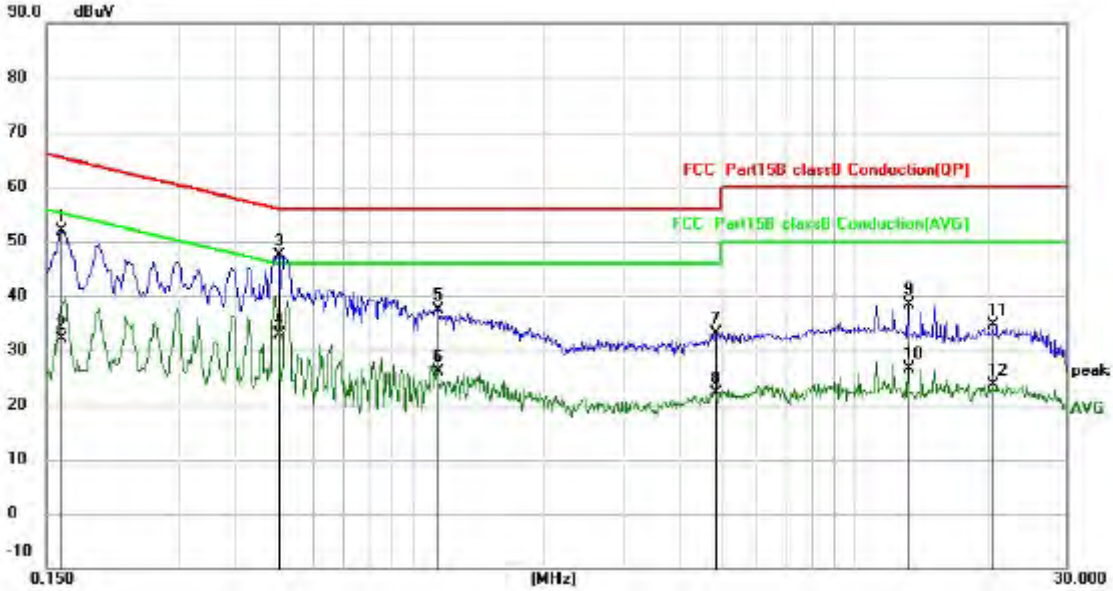
4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0,4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0,8 m from the boundary of the unit under test 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 0,8 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 on conducted measurement.

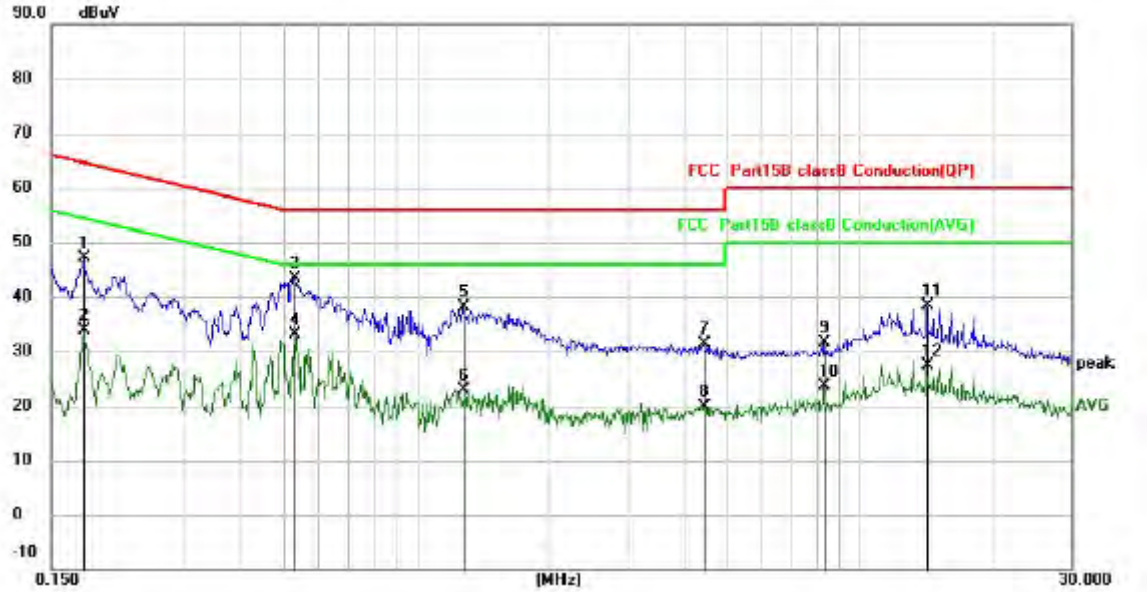
6.4 Test Result

L:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1620	41.07	10.85	51.92	65.36	-13.44	QP
2		0.1620	21.22	10.85	32.07	55.36	-23.29	AVG
3	*	0.5020	36.82	10.50	47.32	56.00	-8.68	QP
4		0.5020	22.46	10.50	32.96	46.00	-13.04	AVG
5		1.1532	26.29	11.05	37.34	56.00	-18.66	QP
6		1.1532	15.09	11.05	26.14	46.00	-19.86	AVG
7		4.8658	20.81	12.21	33.02	56.00	-22.98	QP
8		4.8658	9.86	12.21	22.07	46.00	-23.93	AVG
9		13.1979	25.02	13.30	38.32	60.00	-21.68	QP
10		13.1979	13.38	13.30	26.68	50.00	-23.32	AVG
11		20.5060	20.95	13.63	34.58	60.00	-25.42	QP
12		20.5060	10.08	13.63	23.71	50.00	-26.29	AVG

N:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1779	36.25	10.79	47.04	64.58	-17.54	QP
2		0.1779	23.21	10.79	34.00	54.58	-20.58	AVG
3	*	0.5299	32.77	10.53	43.30	56.00	-12.70	QP
4		0.5299	22.57	10.53	33.10	46.00	-12.90	AVG
5		1.2740	27.00	11.12	38.12	56.00	-17.88	QP
6		1.2740	11.73	11.12	22.85	46.00	-23.15	AVG
7		4.4699	19.15	12.12	31.27	56.00	-24.73	QP
8		4.4699	7.85	12.12	19.97	46.00	-26.03	AVG
9		8.3018	18.67	13.07	31.74	60.00	-28.26	QP
10		8.3018	10.60	13.07	23.67	50.00	-26.33	AVG
11		14.1700	25.12	13.32	38.44	60.00	-21.56	QP
12		14.1700	14.01	13.32	27.33	50.00	-22.67	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

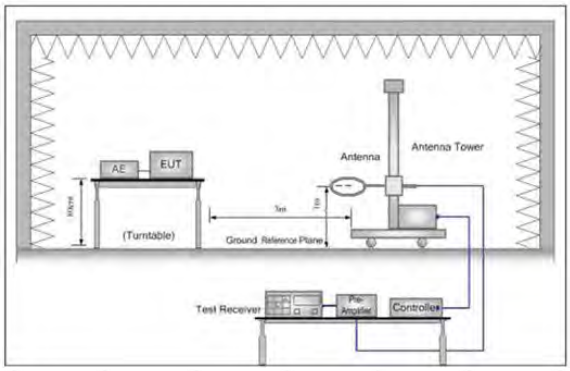


Figure 1. Below 30MHz

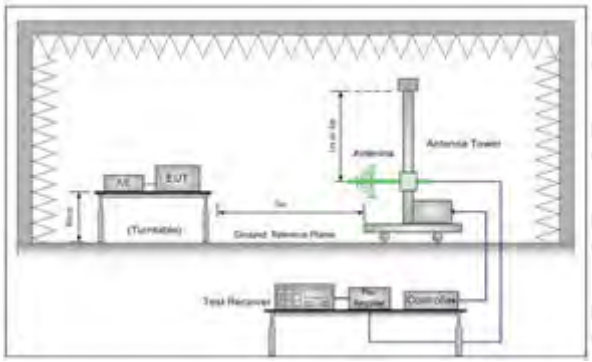


Figure 2. 30MHz to 1GHz

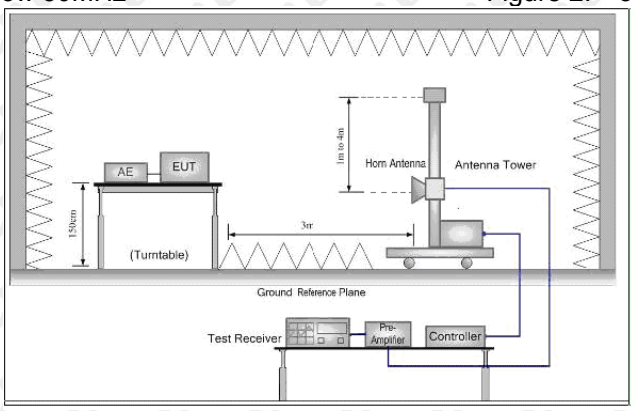


Figure 3. Above 1GHz

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 0.8 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 0.8 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
j.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

7.4 Test Result

30MHz-1GHzTest Results:
Modulation: 802.11a (the worst data)
Test Channel: 5780MHz
Antenna polarity: H

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	*	147.9214	42.74	-3.16	39.58	43.50	-3.92	QP
2		250.3012	40.19	-3.80	36.39	46.00	-9.61	QP
3		374.6225	36.58	-1.27	35.31	46.00	-10.69	QP
4		628.3745	33.98	4.08	38.06	46.00	-7.94	QP
5		762.0385	30.61	6.64	37.25	46.00	-8.75	QP
6		948.7610	28.32	8.60	36.92	46.00	-9.08	QP

Antenna polarity: V

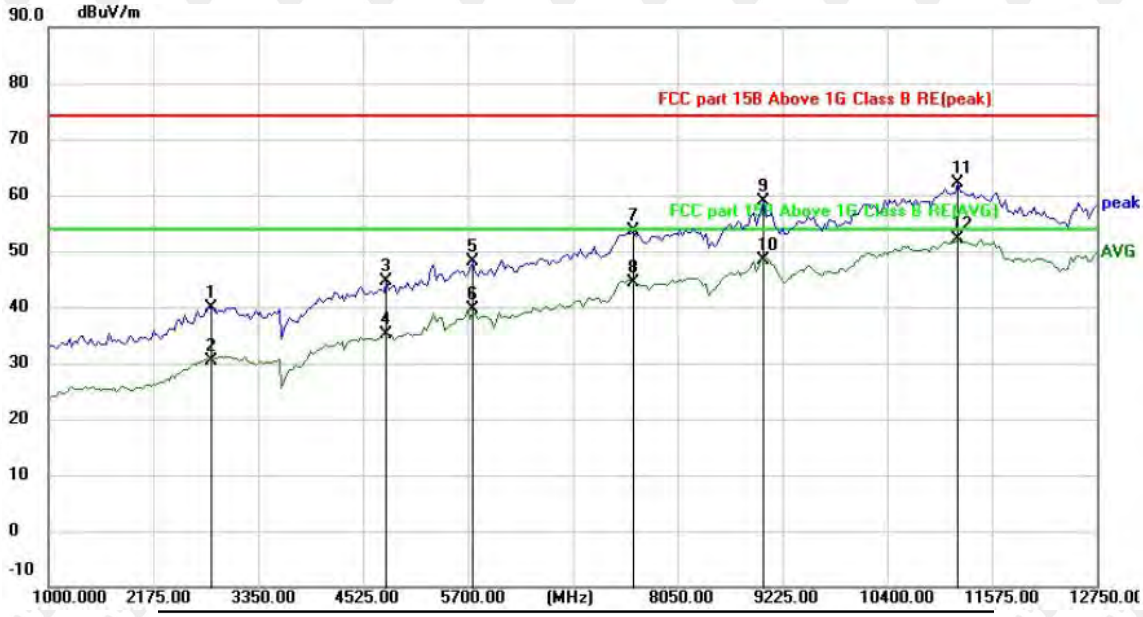
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		44.1202	39.08	-6.78	32.30	40.00	-7.70	QP
2		80.7857	38.40	-8.80	29.60	40.00	-10.40	QP
3	*	147.9214	45.22	-3.16	42.06	43.50	-1.44	QP
4		250.3012	35.73	-3.80	31.93	46.00	-14.07	QP
5		513.6331	34.10	2.33	36.43	46.00	-9.57	QP
6	!	628.3745	38.39	4.08	42.47	46.00	-3.53	QP

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

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

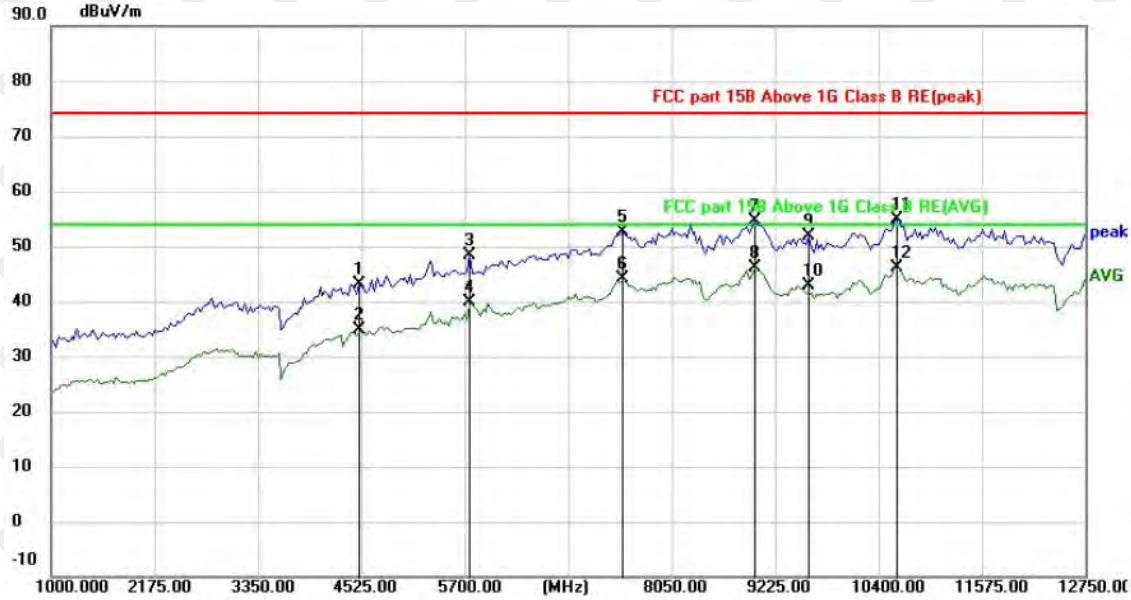
Radiated Spurious Emission (Above 1GHz):

Horizontal:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		2821.250	56.17	-16.23	39.94	74.00	-34.06	peak
2		2821.250	46.72	-16.23	30.49	54.00	-23.51	AVG
3		4789.375	52.52	-7.95	44.57	74.00	-29.43	peak
4		4789.375	43.18	-7.95	35.23	54.00	-18.77	AVG
5		5758.750	53.16	-4.99	48.17	74.00	-25.83	peak
6		5758.750	44.58	-4.99	39.59	54.00	-14.41	AVG
7		7550.625	51.46	2.09	53.55	74.00	-20.45	peak
8		7550.625	42.35	2.09	44.44	54.00	-9.56	AVG
9		9019.375	52.61	6.20	58.81	74.00	-15.19	peak
10		9019.375	42.18	6.20	48.38	54.00	-5.62	AVG
11		11193.12	52.10	10.06	62.16	74.00	-11.84	peak
12	*	11193.12	42.18	10.06	52.24	54.00	-1.76	AVG

Vertical:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		4495.625	52.28	-9.07	43.21	74.00	-30.79	peak
2		4495.625	44.02	-9.07	34.95	54.00	-19.05	AVG
3		5758.750	53.37	-4.99	48.38	74.00	-25.62	peak
4		5758.750	44.82	-4.99	39.83	54.00	-14.17	AVG
5		7491.875	50.66	1.85	52.51	74.00	-21.49	peak
6		7491.875	42.31	1.85	44.16	54.00	-9.84	AVG
7		8990.000	48.37	6.15	54.52	74.00	-19.48	peak
8	*	8990.000	40.02	6.15	46.17	54.00	-7.83	AVG
9		9606.875	44.92	6.97	51.89	74.00	-22.11	peak
10		9606.875	35.85	6.97	42.82	54.00	-11.18	AVG
11		10605.62	46.08	8.85	54.93	74.00	-19.07	peak
12		10605.62	37.31	8.85	46.16	54.00	-7.84	AVG

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	41.00	16.39	57.39	74	-16.61	PK	1.50	85	H
10360	27.14	16.39	43.53	54	-10.47	AV	1.38	119	H
10360	39.60	16.39	55.99	74	-18.01	PK	1.01	176	V
10360	25.92	16.39	42.31	54	-11.69	AV	1.53	333	V
Channel:5240MHz									
10480	41.00	16.11	57.11	74	-16.89	PK	1.50	253	H
10480	25.08	16.11	41.19	54	-12.81	AV	1.63	112	H
10480	41.60	16.11	57.71	74	-16.29	PK	1.23	110	V
10480	25.56	16.11	41.67	54	-12.33	AV	1.01	316	V
Channel:5260MHz									
10520	41.66	16.39	58.05	74	-15.95	PK	1.16	242	H
10520	27.67	16.39	44.06	54	-9.94	AV	1.39	22	H
10520	41.24	16.39	57.63	74	-16.37	PK	1.39	28	V
10520	27.70	16.39	44.09	54	-9.91	AV	1.24	186	V
Channel:5320MHz									
10640	41.79	16.39	58.18	74	-15.82	PK	1.38	56	H
10640	26.82	16.39	43.21	54	-10.79	AV	1.15	87	H
10640	41.04	16.39	57.43	74	-16.57	PK	1.38	36	V
10640	27.31	16.39	43.70	54	-10.30	AV	1.17	126	V
Channel:5500MHz									
11000	40.94	16.39	57.33	74	-16.67	PK	1.27	106	H
11000	26.44	16.39	42.83	54	-11.17	AV	1.34	109	H
11000	41.70	16.39	58.09	74	-15.91	PK	1.40	207	V
11000	27.05	16.39	43.44	54	-10.56	AV	1.22	168	V
Channel:5700MHz									
11400	40.24	16.39	56.63	74	-17.37	PK	1.03	96	H
11400	25.10	16.39	41.49	54	-12.51	AV	1.34	159	H
11400	40.26	16.39	56.65	74	-17.35	PK	1.23	183	V
11400	25.48	16.39	41.87	54	-12.13	AV	1.16	132	V

Channel:5745MHz									
11490	40.23	17.46	57.69	74	-16.31	PK	1.40	210	H
11490	26.27	17.46	43.73	54	-10.27	AV	1.32	340	H
11490	40.07	17.46	57.53	74	-16.47	PK	1.13	205	V
11490	26.05	17.46	43.51	54	-10.49	AV	1.23	359	V
Channel:5825MHz									
11650	39.32	17.57	56.89	74	-17.11	PK	1.59	265	H
11650	25.29	17.57	42.86	54	-11.14	AV	1.28	224	H
11650	41.54	17.57	59.11	74	-14.89	PK	1.05	163	V
11650	27.29	17.57	44.86	54	-9.14	AV	1.76	83	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	41.29	16.34	57.63	74	-16.37	PK	1.69	92	H
10380	25.54	16.34	41.88	54	-12.12	AV	1.59	236	H
10380	40.69	16.34	57.03	74	-16.97	PK	1.65	291	V
10380	26.11	16.34	42.45	54	-11.55	AV	1.80	257	V
Channel:5230MHz									
10460	39.82	16.15	55.97	74	-18.03	PK	1.56	302	H
10460	27.98	16.15	44.13	54	-9.87	AV	1.64	302	H
10460	40.28	16.15	56.43	74	-17.57	PK	1.81	299	V
10460	27.30	16.15	43.45	54	-10.55	AV	1.82	190	V
Channel:5270MHz									
10540	40.40	16.34	56.74	74	-17.26	PK	1.54	345	H
10540	26.74	16.34	43.08	54	-10.92	AV	1.65	71	H
10540	40.86	16.34	57.20	74	-16.80	PK	1.58	49	V
10540	25.05	16.34	41.39	54	-12.61	AV	1.20	296	V
Channel:5310MHz									
10620	41.69	16.34	58.03	74	-15.97	PK	1.01	260	H
10620	27.66	16.34	44.00	54	-10.00	AV	1.32	250	H
10620	40.98	16.34	57.32	74	-16.68	PK	1.73	38	V
10620	27.10	16.34	43.44	54	-10.56	AV	1.56	296	V
Channel:5510MHz									

11020	41.55	16.34	57.89	74	-16.11	PK	1.49	107	H
11020	25.63	16.34	41.97	54	-12.03	AV	1.70	118	H
11020	41.03	16.34	57.37	74	-16.63	PK	1.53	264	V
11020	25.64	16.34	41.98	54	-12.02	AV	1.70	185	V
Channel:5670MHz									
11340	40.04	16.34	56.38	74	-17.62	PK	1.81	256	H
11340	27.50	16.34	43.84	54	-10.16	AV	1.25	174	H
11340	39.02	16.34	55.36	74	-18.64	PK	1.64	351	V
11340	25.87	16.34	42.21	54	-11.79	AV	1.38	271	V

Channel:5755MHz									
11510	41.68	17.49	59.17	74	-14.83	PK	1.18	60	H
11510	26.17	17.49	43.66	54	-10.34	AV	1.62	210	H
11510	41.61	17.49	59.10	74	-14.90	PK	1.08	79	V
11510	27.08	17.49	44.57	54	-9.43	AV	1.53	287	V
Channel:5795MHz									
11590	39.74	17.52	57.26	74	-18.40	PK	1.45	75	H
11590	27.32	17.52	44.84	54	-16.74	AV	1.01	248	H
11590	40.95	17.52	58.47	74	-15.53	PK	1.68	299	V
11590	25.63	17.52	43.15	54	-10.85	AV	1.35	352	V

Modulation: 802.11(VH80) (the worst data)

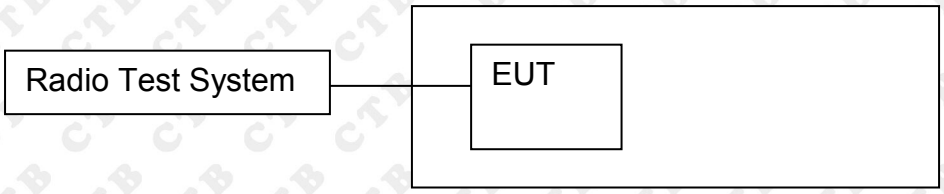
Freq (MHz)	Rd_level (dBuV/m)	Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	detector	Height	Degree	Antenna polarization
Channel:5210MHz									
10420	39.35	16.25	55.60	74	-18.40	PK	1.16	330	H
10420	27.31	16.25	43.56	54	-10.44	AV	1.25	39	H
10420	40.37	16.25	56.62	74	-17.38	PK	1.76	27	V
10420	25.39	16.25	41.64	54	-12.36	AV	1.03	109	V

Channel:5290MHz									
10580	39.76	16.25	56.01	74	-17.99	PK	1.53	123	H
10580	25.89	16.25	42.14	54	-11.86	AV	1.42	147	H
10580	41.77	16.25	58.02	74	-15.98	PK	1.53	335	V
10580	25.43	16.25	41.68	54	-12.32	AV	1.21	249	V
Channel:5530MHz									
11060	41.63	17.50	59.13	74	-14.87	PK	1.13	334	H
11060	25.40	17.50	42.90	54	-11.10	AV	1.23	255	H
11060	39.53	17.50	57.03	74	-16.97	PK	1.25	65	V
11060	25.98	17.50	43.48	54	-10.52	AV	1.17	195	V
Channel:5775MHz									
11550	41.47	17.50	58.97	74	-15.03	PK	1.47	39	H
11550	26.82	17.50	44.32	54	-9.68	AV	1.19	216	H
11550	39.33	17.50	56.83	74	-17.17	PK	1.19	182	V
11550	26.79	17.50	44.29	54	-9.71	AV	1.17	297	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.

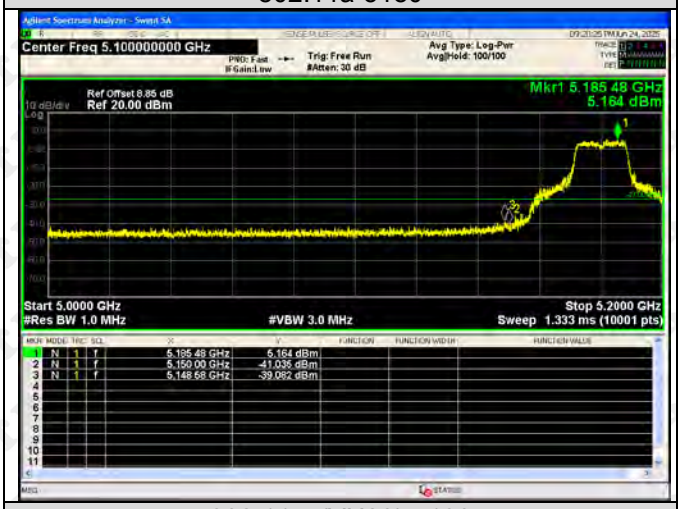
8.4 Test Result

Test Graph

5150-5250MHz:

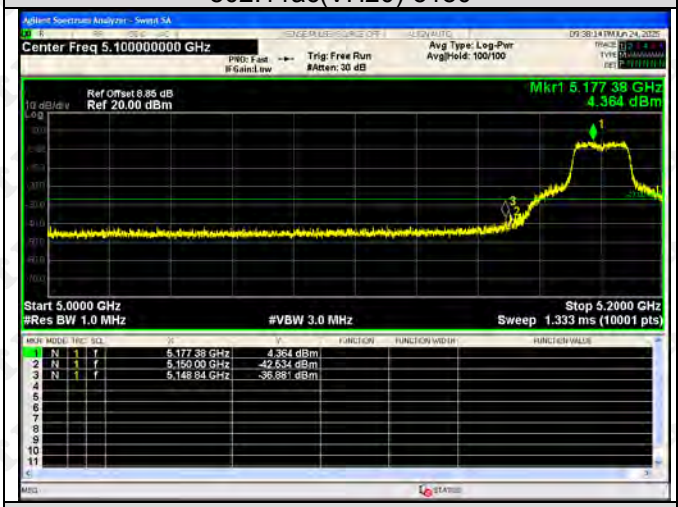
ANT 1

802.11a-5180



802.11a-5240

802.11ac(VH20)-5180

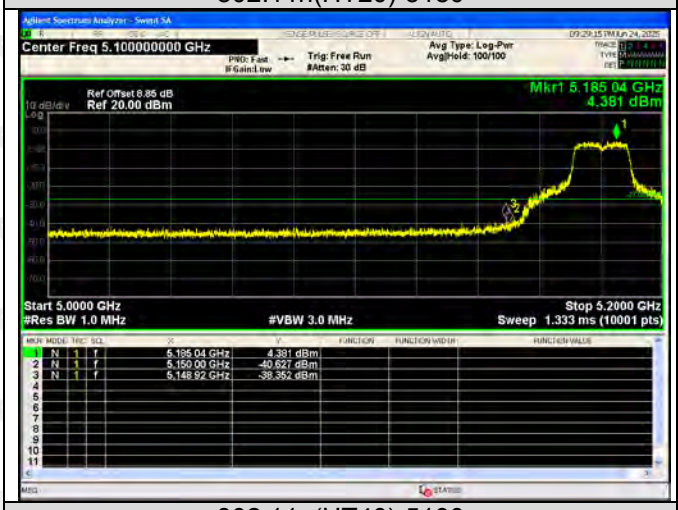


802.11ac(VH20)-5240

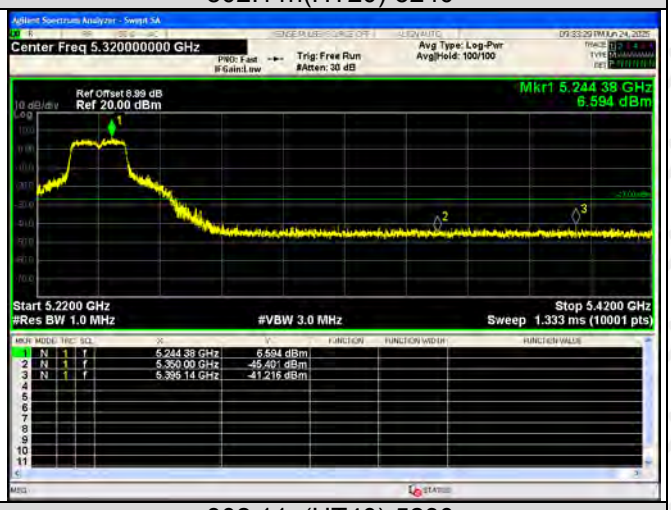
802.11ac(VH40)-5190

802.11ac(VH40)-5230

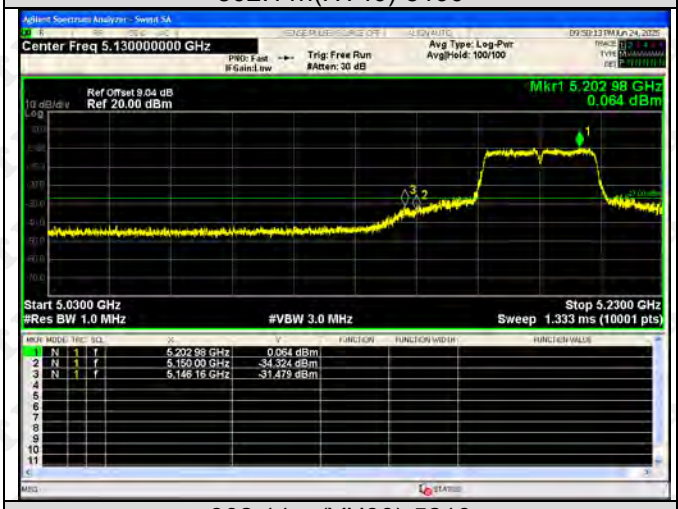
802.11n(HT20)-5180



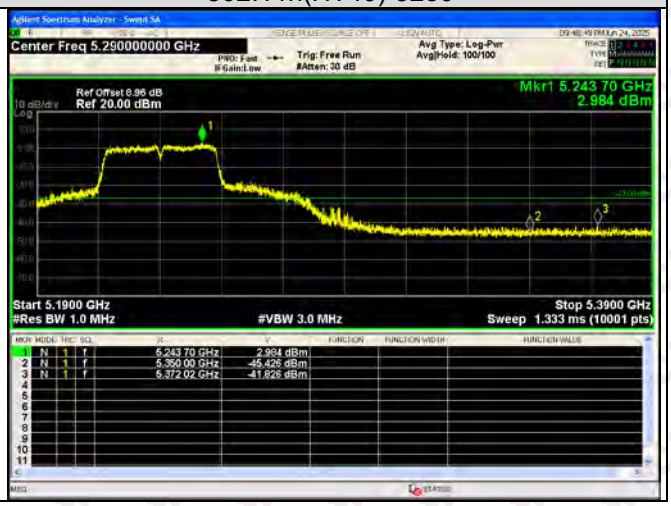
802.11n(HT20)-5240



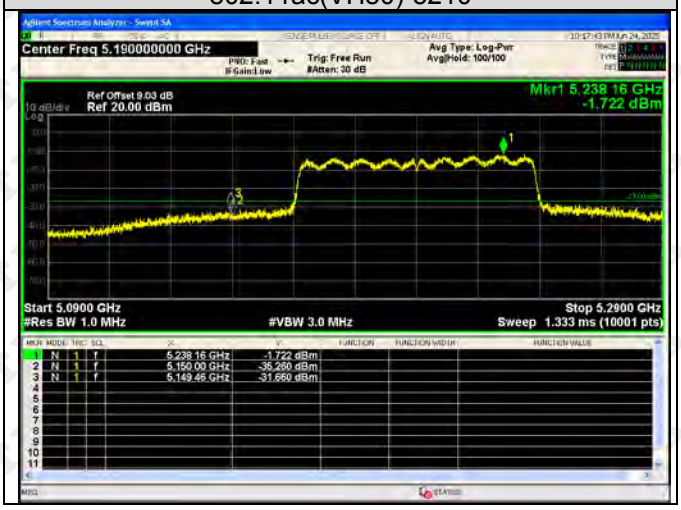
802.11n(HT40)-5190



802.11n(HT40)-5230

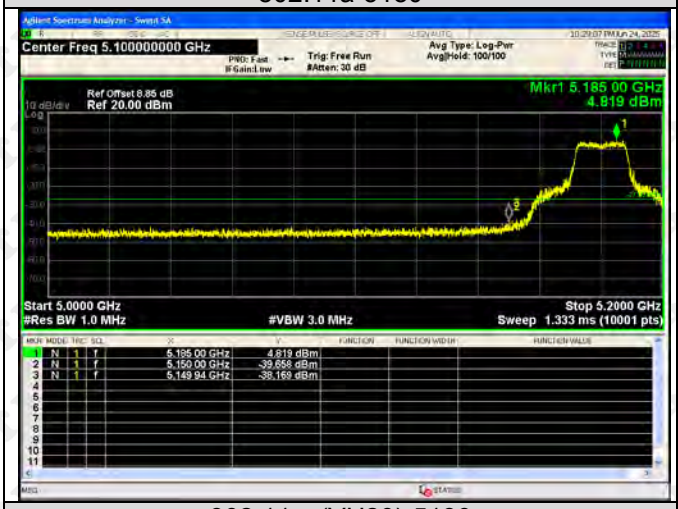


802.11ac(VH80)-5210

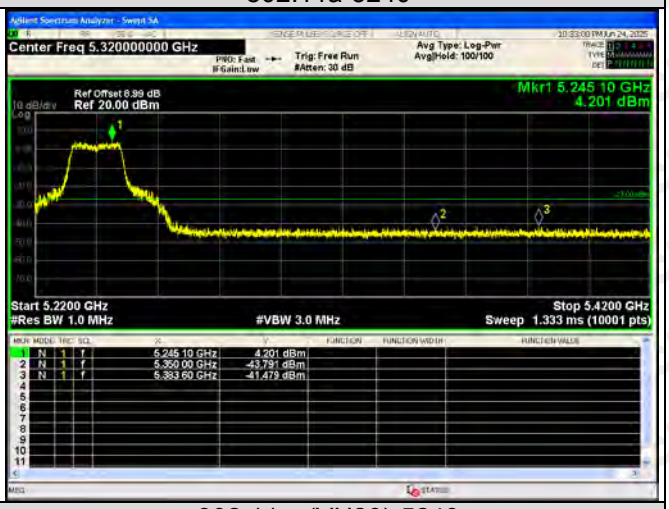


ANT 2

802.11a-5180



802.11a-5240



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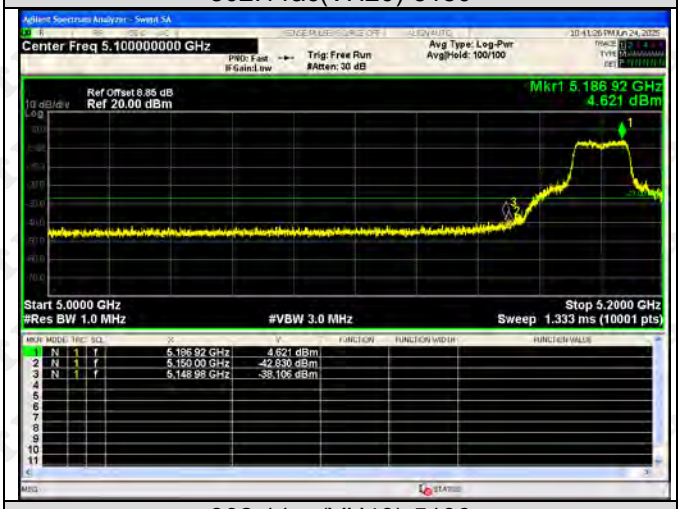

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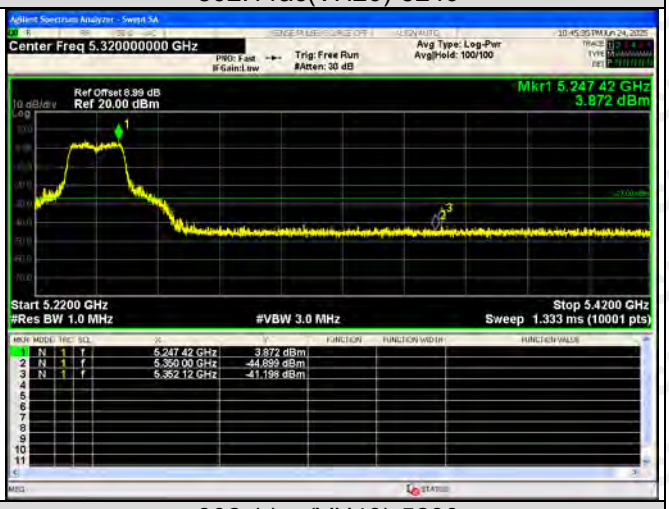

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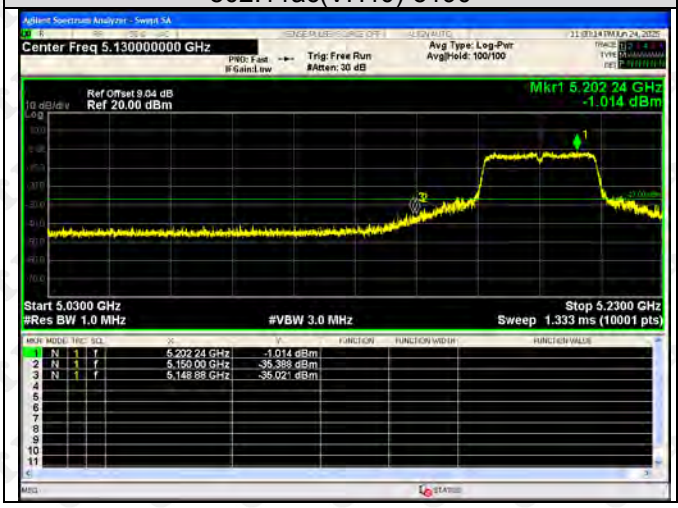

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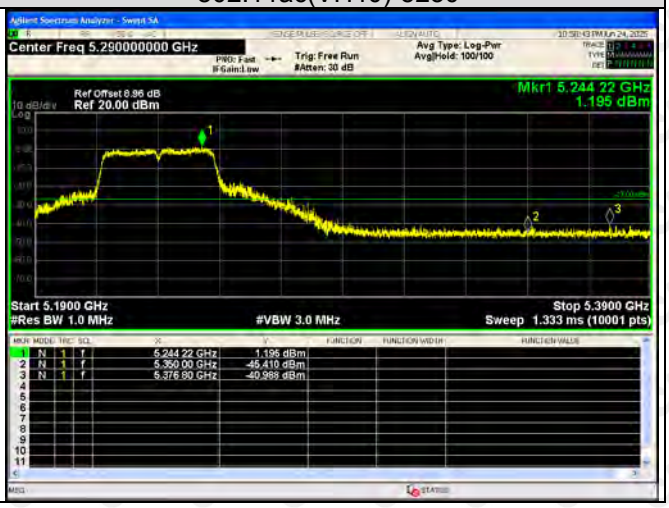

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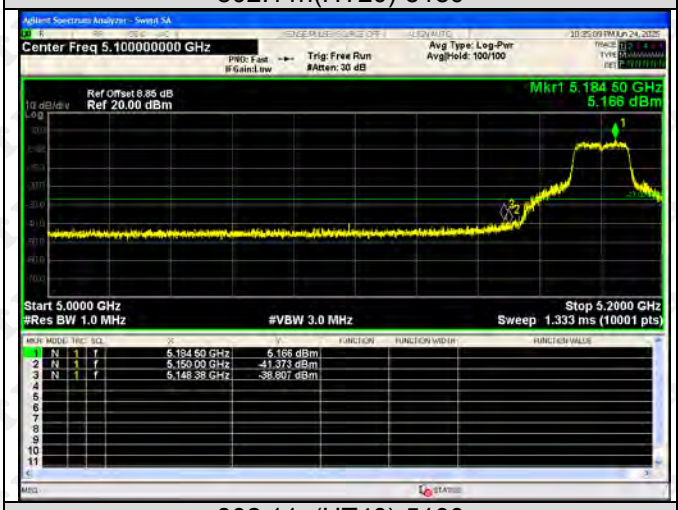

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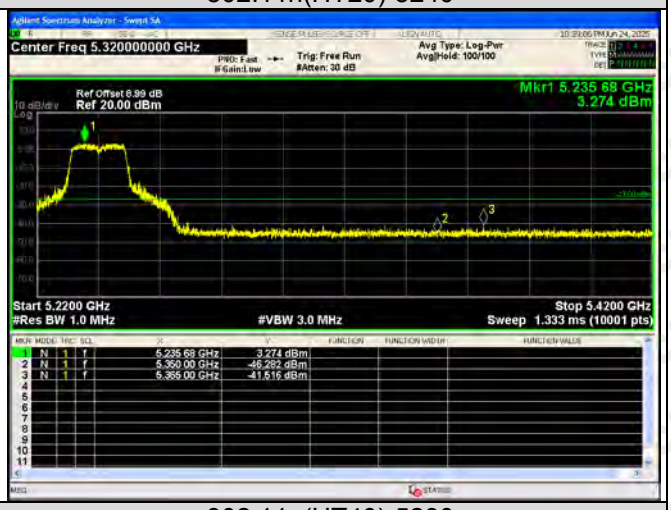

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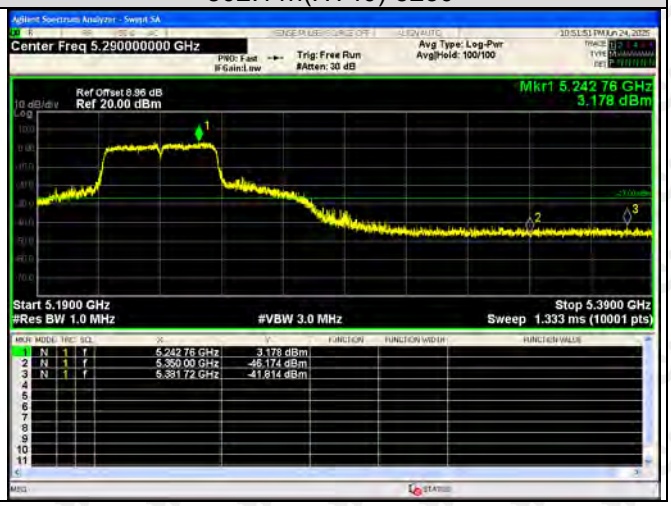

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5250-5350MHz:
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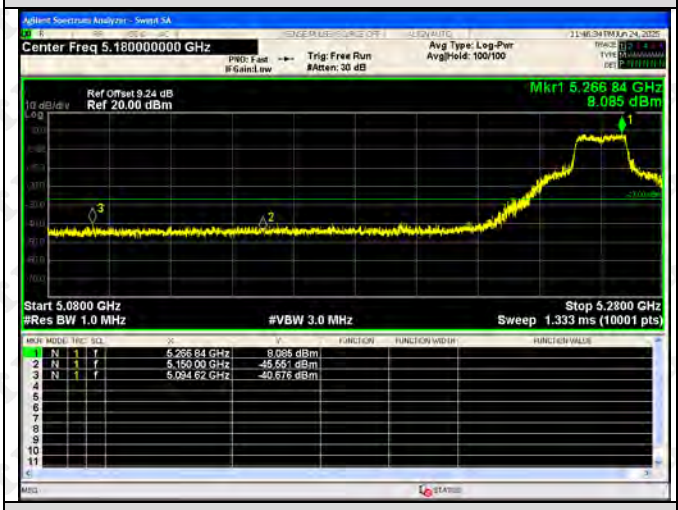
802.11a-5260



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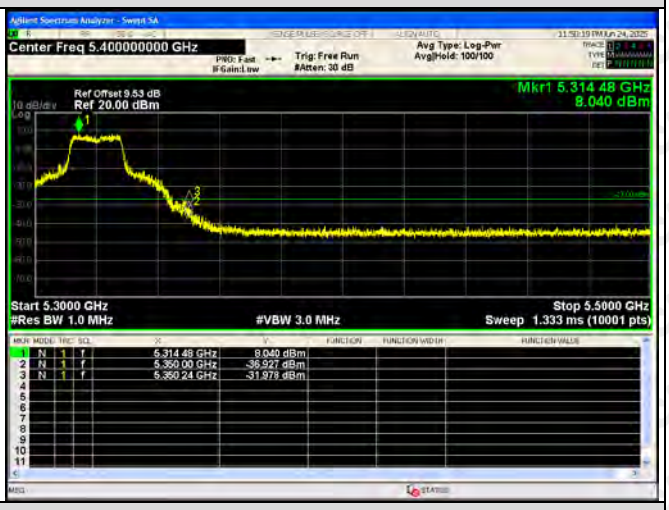

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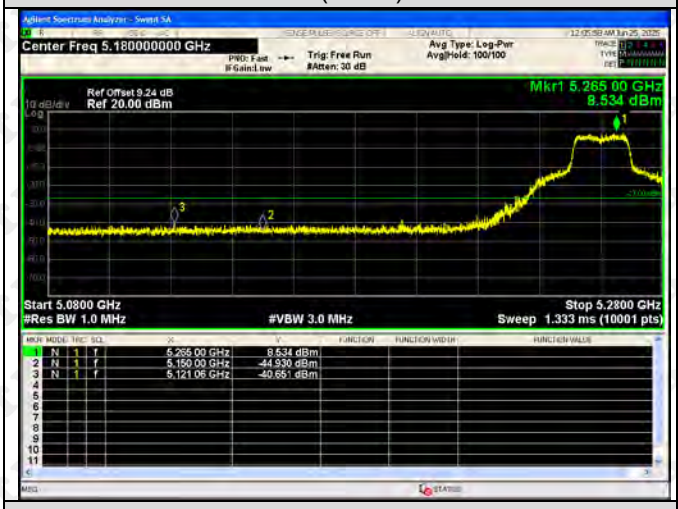


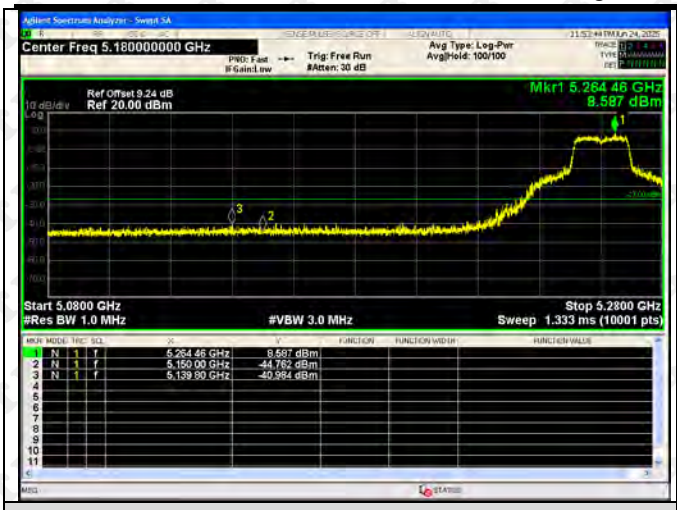
802.11ac(VH20)-5320

802.11ac(VH40)-5270

802.11ac(VH40)-5310

802.11n(HT20)-5260

802.11n(HT20)-5320



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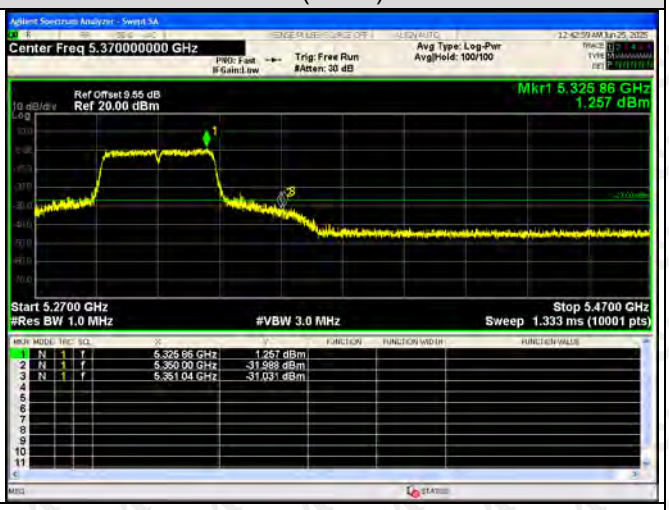
802.11n(HT40)-5310

802.11ac(VH80)-5290



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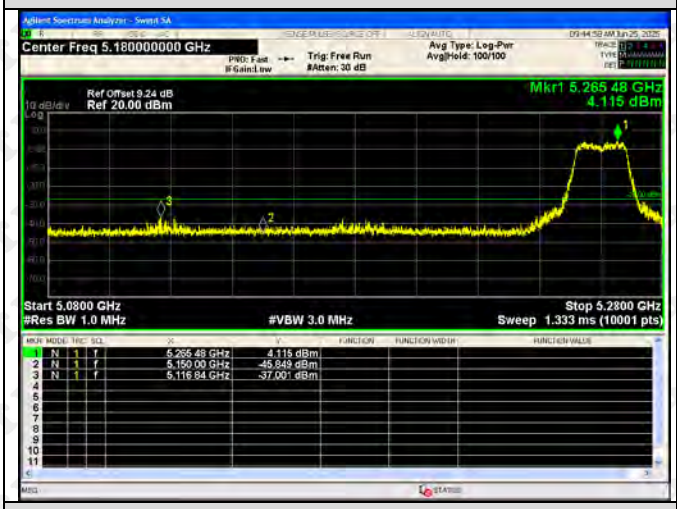
ANT2

802.11a-5260



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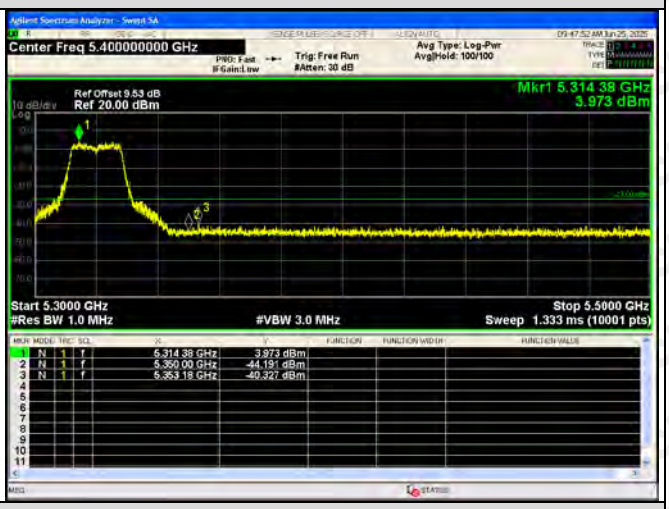

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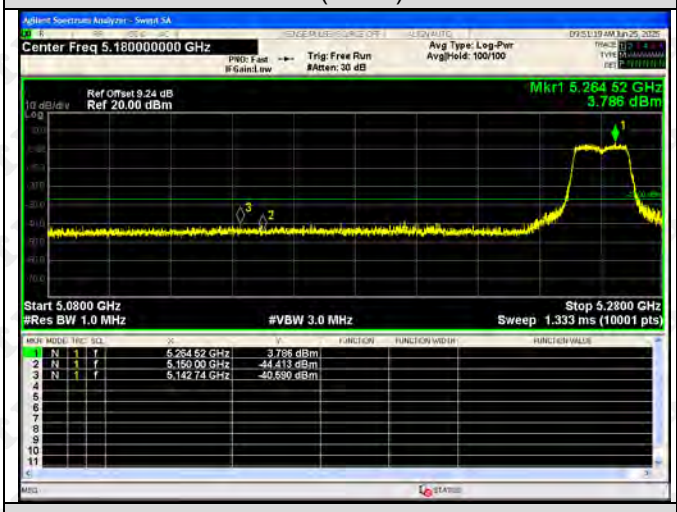

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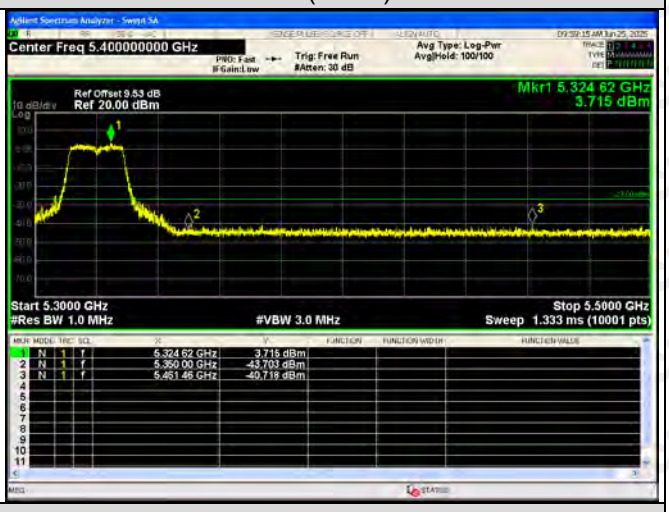

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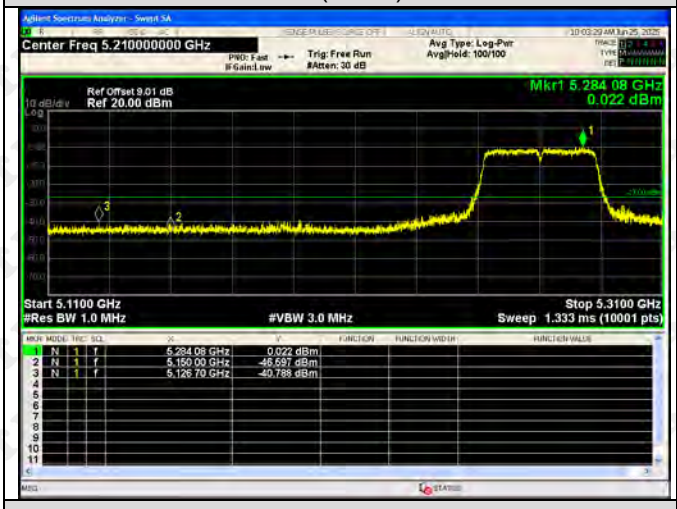

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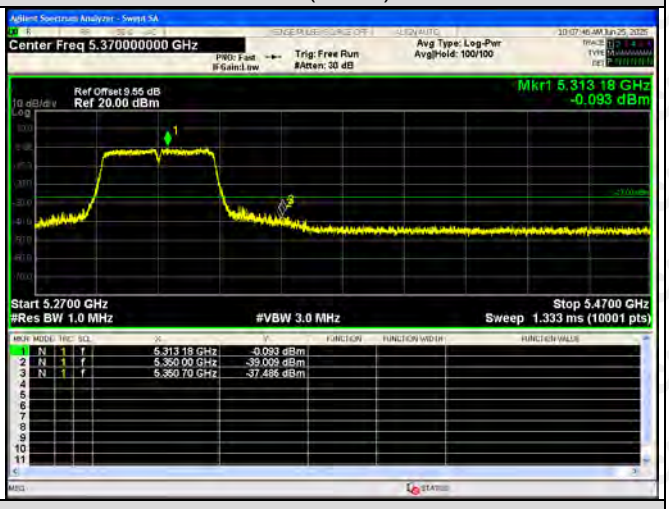

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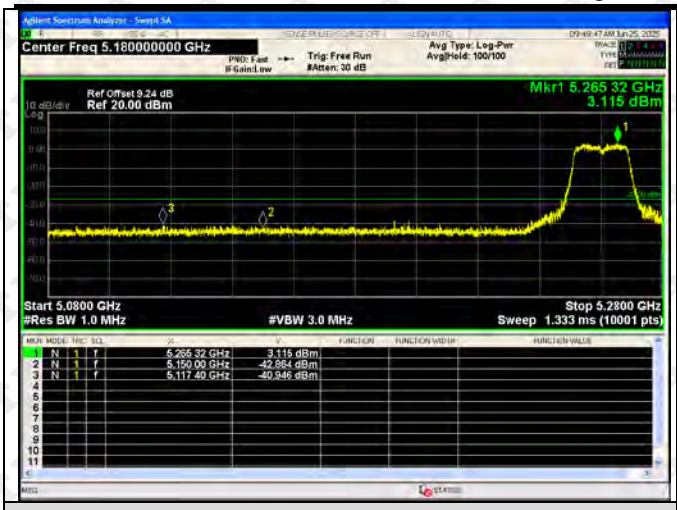
802.11n(HT20)-5320



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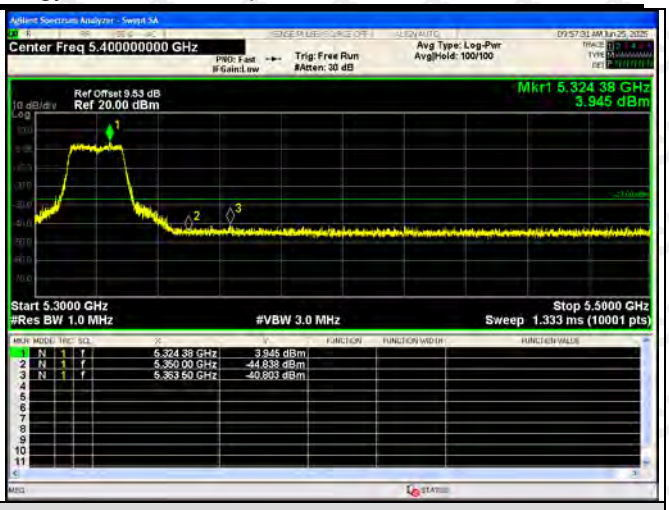

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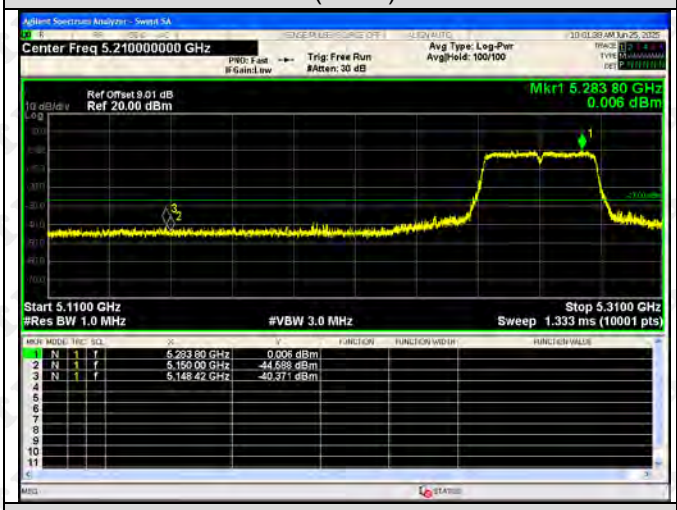

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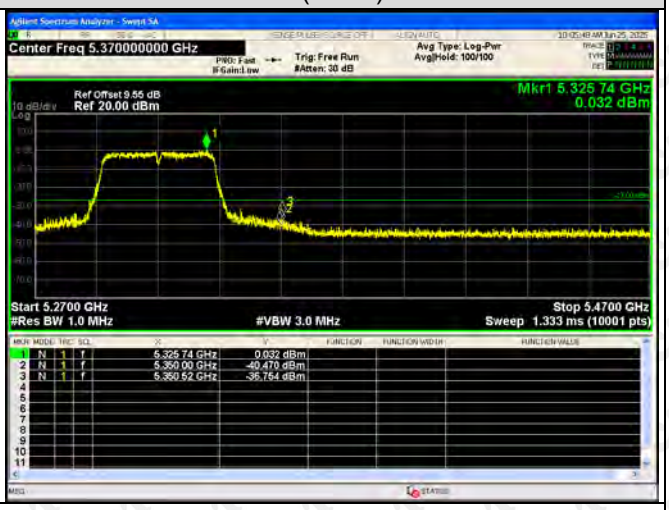

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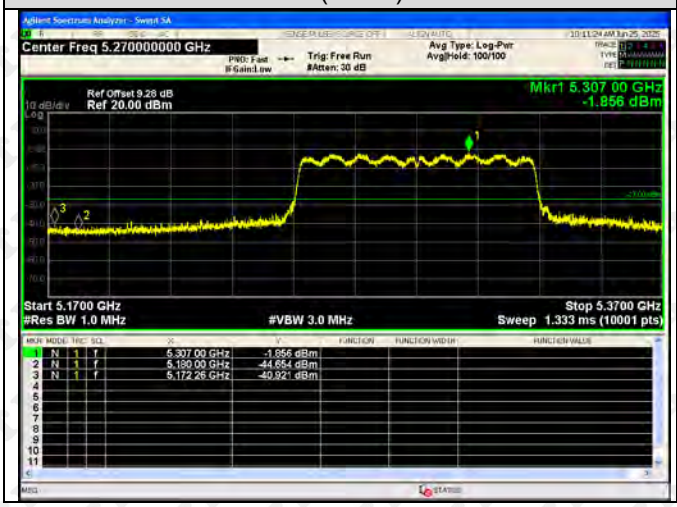

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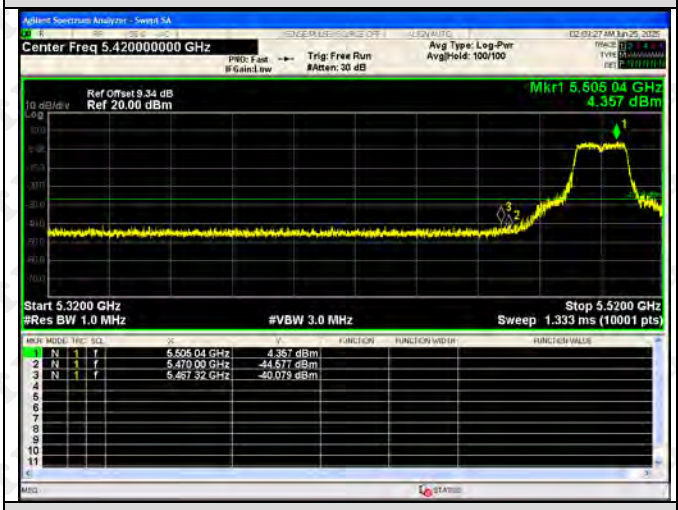
5470-5725MHz:
ANT1

802.11a-5500



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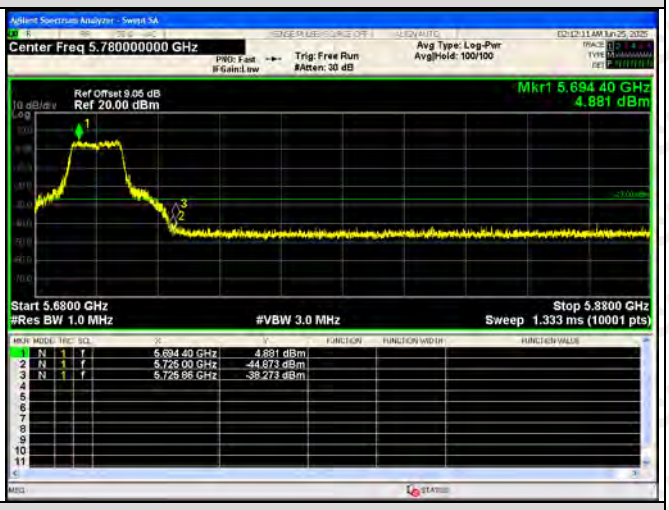

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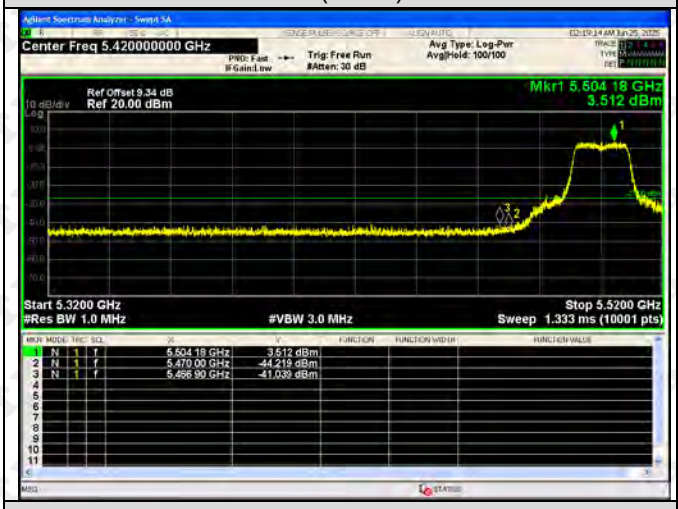

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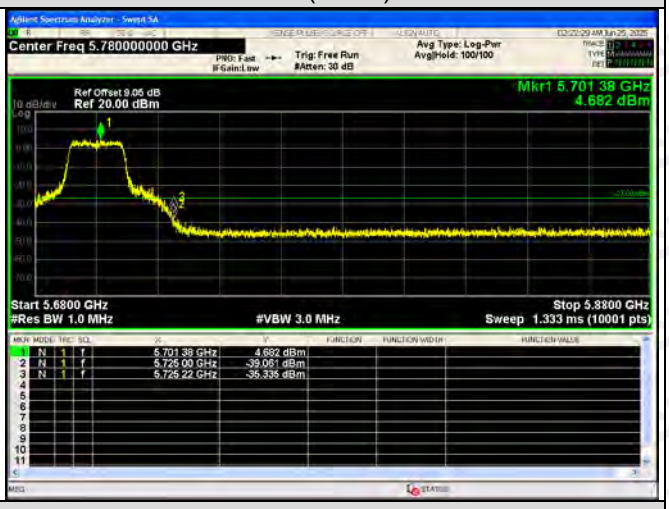

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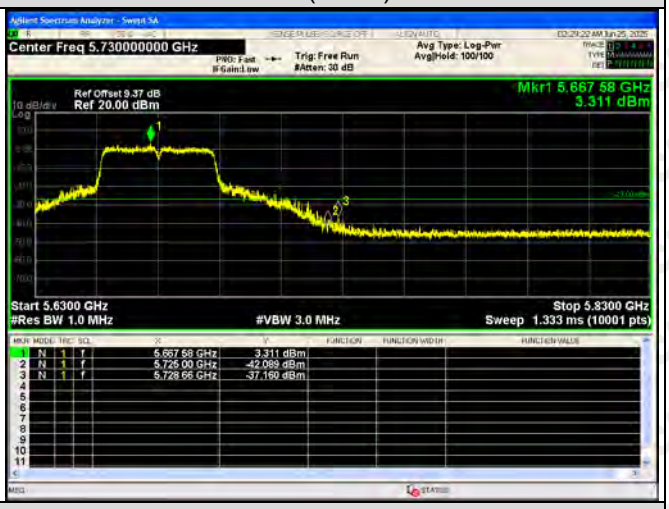
802.11ac(VH40)-5670



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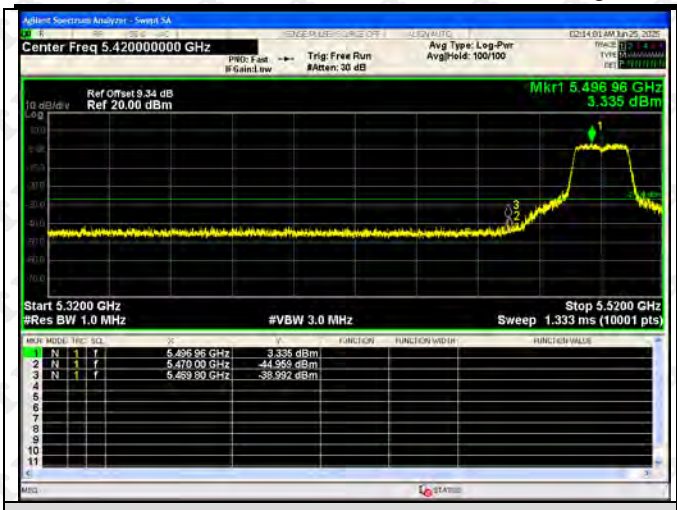
802.11n(HT20)-5700



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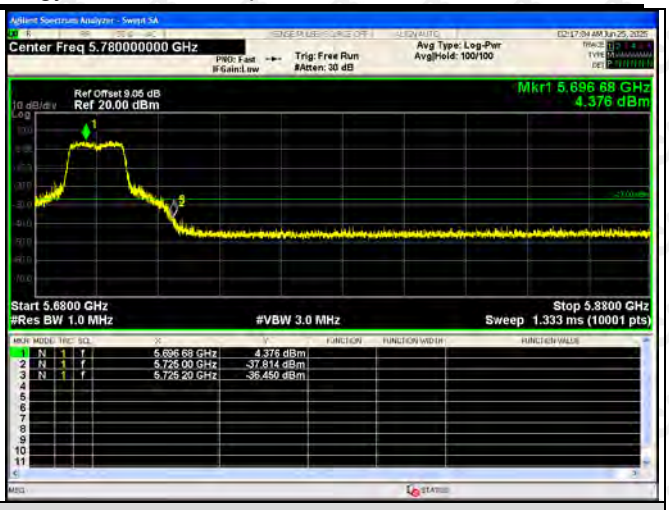

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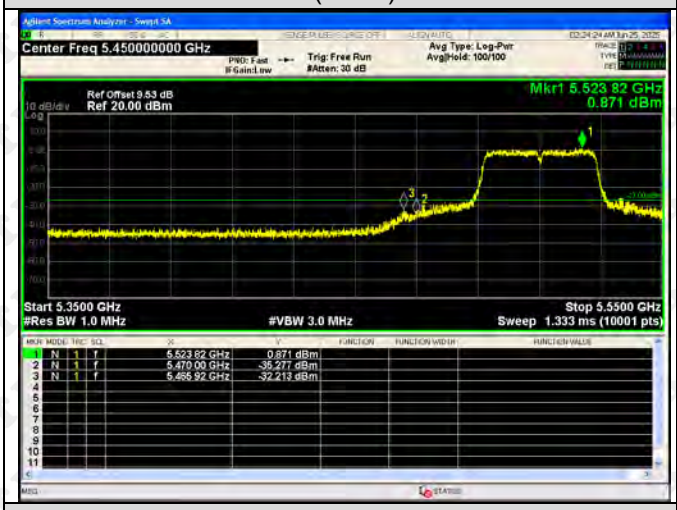

802.11ac(VH80)-5530

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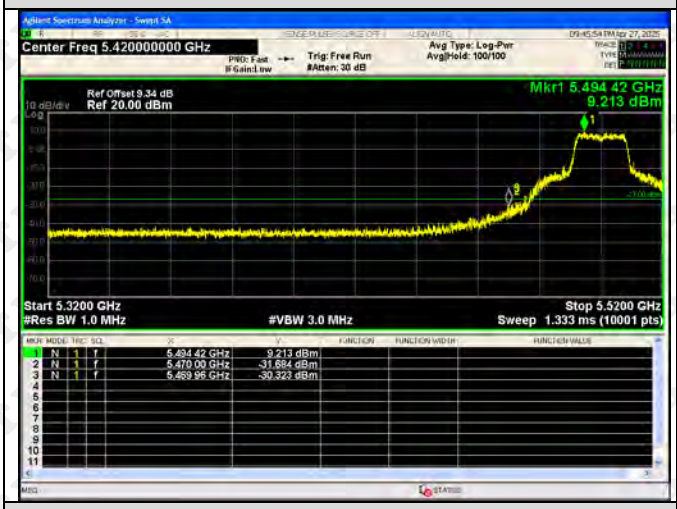
ANT2

802.11a-5500



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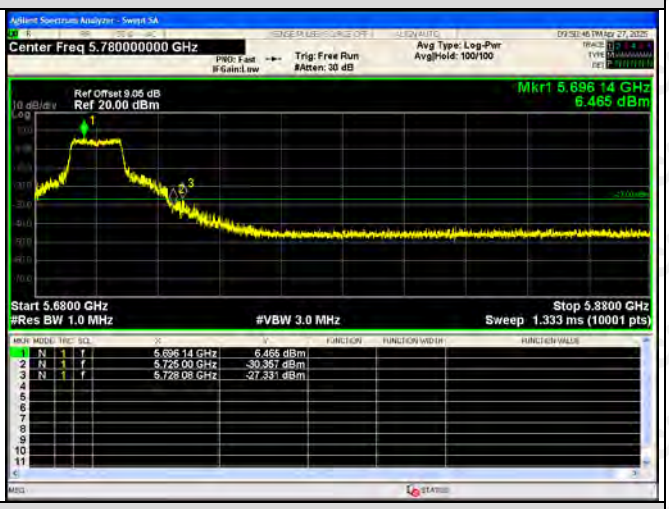

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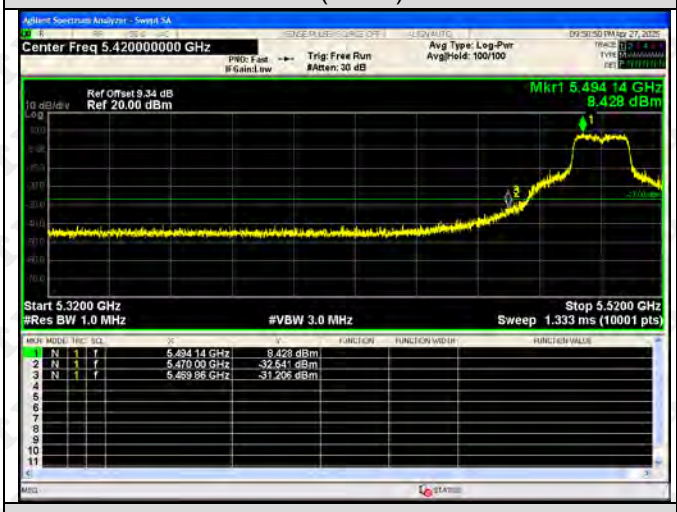

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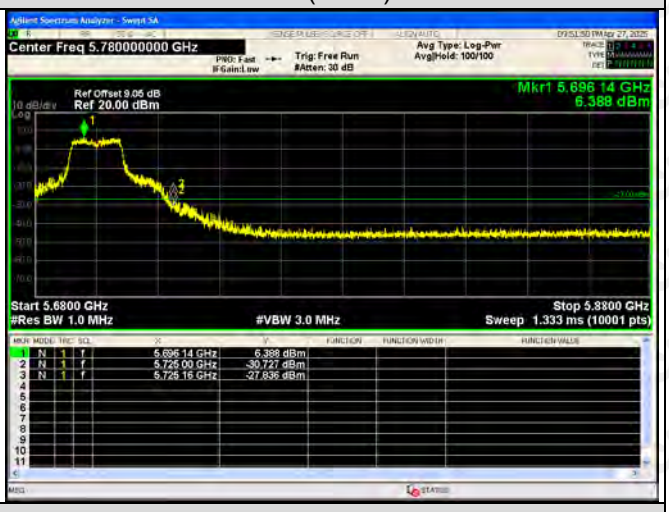

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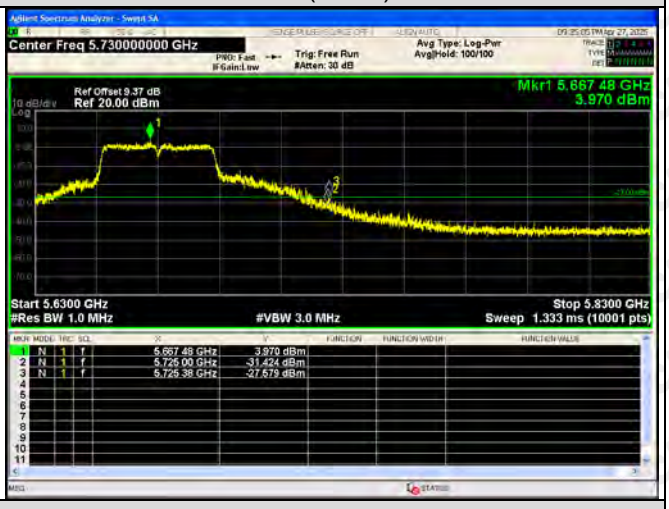
802.11ac(VH40)-5670



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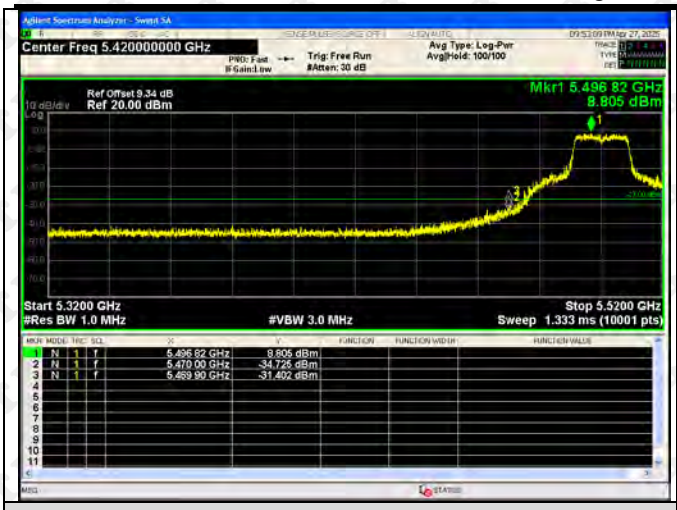
802.11n(HT20)-5700



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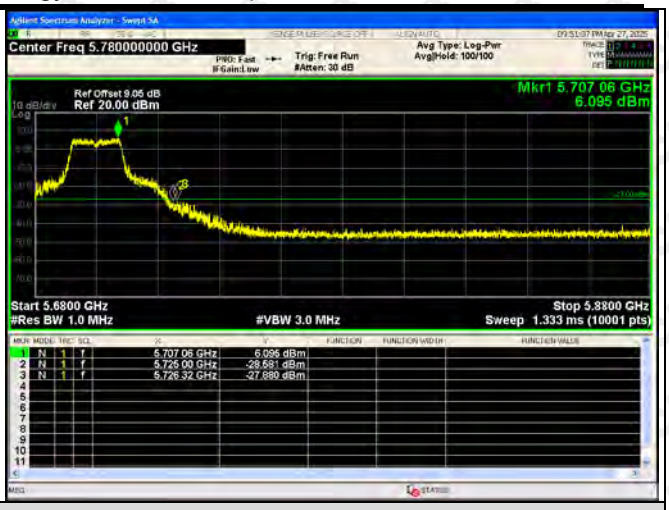

802.11n(HT40)-5670

802.11ac(VH80)-5530

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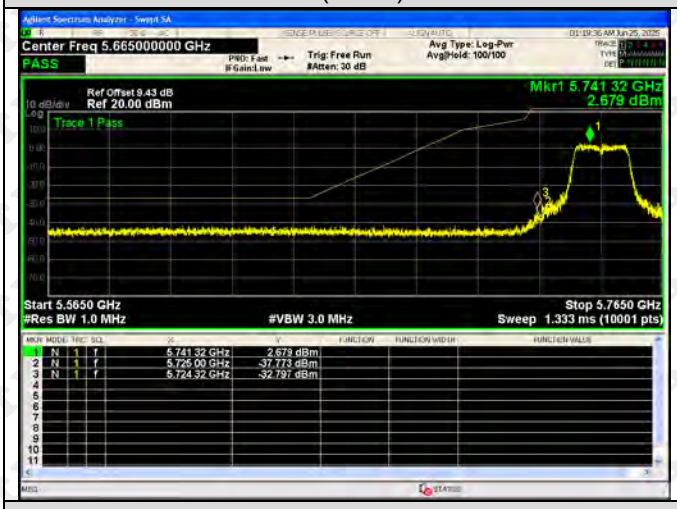
5725-5850MHz
ANT1

802.11a-5745

802.11a-5825

802.11ac(VH20)-5745



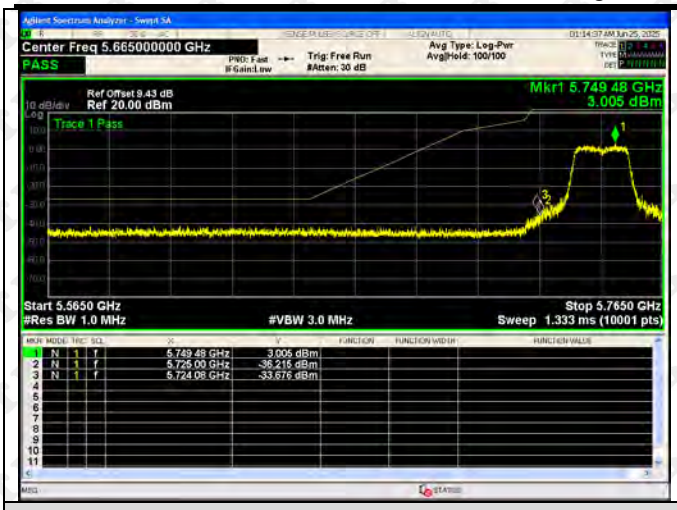
802.11ac(VH20)-5825

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

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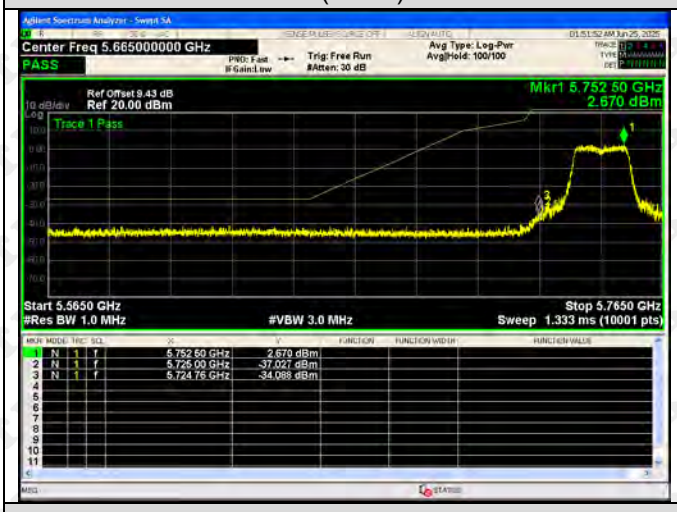
ANT2

802.11a-5745

802.11a-5825

802.11ac(VH20)-5745



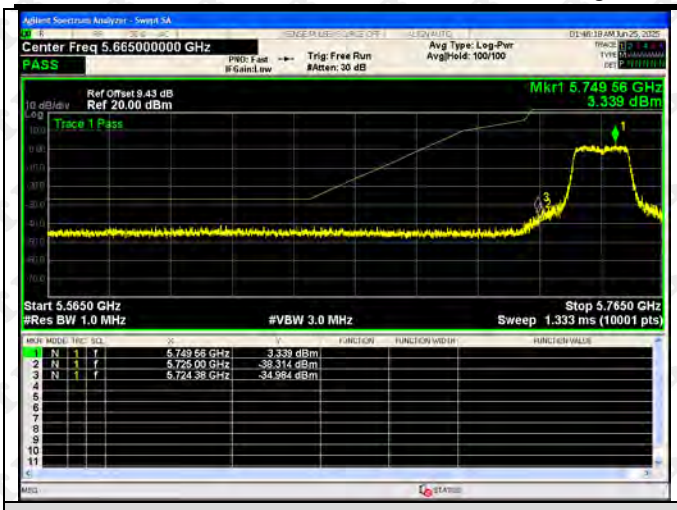
802.11ac(VH20)-5825

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

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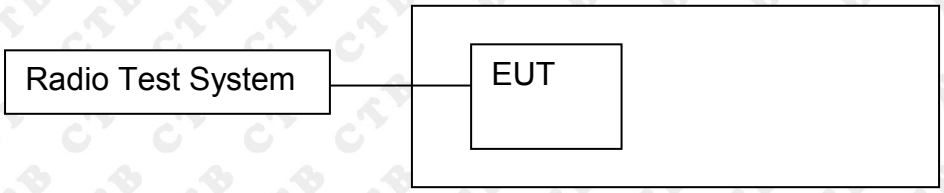
9. CONDUCTED OUTPUT POWER

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

5150-5250MHz:

Test mode1	Test Channel (MHz)	Output Power dBm ANT1	Output Power dBm ANT2	Output Power dBm Total	Limit dBm
802.11a	5180	13.394	13.112	/	30
	5200	13.957	13.675	/	30
	5240	13.147	13.045	/	30
802.11ac20	5180	13.221	13.238	16.240	30
	5200	13.773	13.771	16.782	30
	5240	12.701	12.867	15.795	30
802.11ac40	5190	13.336	13.521	16.440	30
	5230	14.277	13.257	16.807	30
802.11ac80	5210	10.218	10.822	13.541	30
802.11n(HT20)	5180	13.053	13.206	16.140	30
	5200	13.832	13.83	16.841	30
	5240	12.897	12.81	15.864	30
802.11n(HT40)	5190	13.555	13.392	16.485	30
	5230	14.603	13.576	17.130	30

5250-5350MHz:

Test mode1	Test Channel (MHz)	Output Power dBm ANT1	Output Power dBm ANT2	Output Power dBm Total	Limit dBm
802.11a	5260	11.982	11.677	/	23.98
	5280	11.308	11.119	/	23.98
	5320	11.67	11.606	/	23.98
802.11ac20	5260	11.705	11.216	14.478	23.98
	5280	11.196	10.722	13.976	23.98
	5320	11.634	11.138	14.403	23.98
802.11ac40	5270	11.378	11.202	14.301	23.98
	5310	11.791	11.095	14.467	23.98
802.11ac80	5290	11.075	11.322	14.211	23.98
802.11n(HT20)	5260	11.722	11.414	14.581	23.98
	5280	11.202	10.86	14.045	23.98
	5320	11.616	11.232	14.439	23.98
802.11n(HT40)	5270	16.422	11.187	17.560	23.98
	5310	11.862	11.136	14.524	23.98

5470-5725MHz:

Test mode1	Test Channel (MHz)	Output Power dBm ANT1	Output Power dBm ANT2	Output Power dBm Total	Limit dBm
802.11a	5500	12.243	11.08	/	23.98
	5580	12.362	11.582	/	23.98
	5700	12.72	12.093	/	23.98
802.11ac20	5500	11.932	12.103	15.029	23.98
	5580	12.204	11.507	14.880	23.98
	5700	12.868	12.066	15.496	23.98
802.11ac40	5510	12.083	11.566	14.842	23.98
	5670	12.935	11.602	15.330	23.98
802.11ac80	5530	12.128	11.235	14.715	23.98
802.11n(HT20)	5500	11.931	12.108	15.031	23.98
	5580	12.155	11.51	14.855	23.98
	5700	12.873	12.104	15.516	23.98
802.11n(HT40)	5510	12.239	11.73	15.002	23.98
	5670	13.12	11.796	15.519	23.98

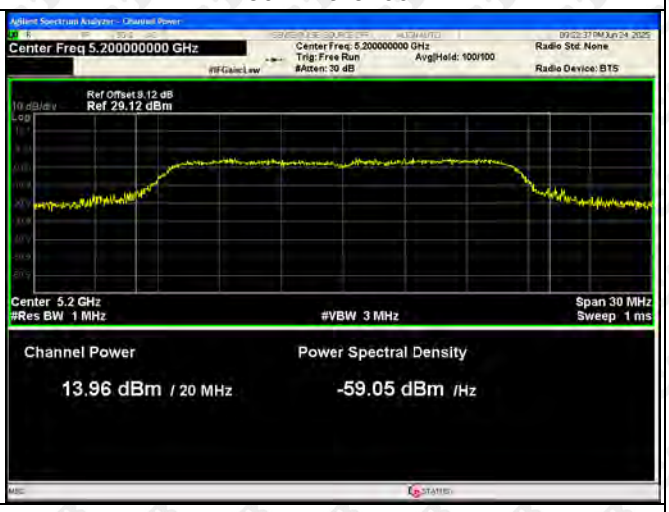
5725-5850MHz:

Test mode1	Test Channel (MHz)	Output Power dBm ANT1	Output Power dBm ANT2	Output Power dBm Total	Limit dBm
802.11a	5745	11.471	11.531	/	23.98
	5785	11.405	11.559	/	23.98
	5825	11.941	12.065	/	23.98
802.11ac20	5745	11.288	11.252	14.280	23.98
	5785	11.377	11.293	14.346	23.98
	5825	11.857	11.792	14.835	23.98
802.11ac40	5755	11.32	11.29	14.315	23.98
	5795	11.065	11.341	14.215	23.98
802.11ac80	5775	12.438	11.561	15.032	23.98
802.11n(HT20)	5745	11.181	11.235	14.218	23.98
	5785	11.257	11.362	14.320	23.98
	5825	11.784	11.744	14.774	23.98
802.11n(HT40)	5755	11.543	11.406	14.485	23.98
	5795	11.127	11.204	14.176	23.98

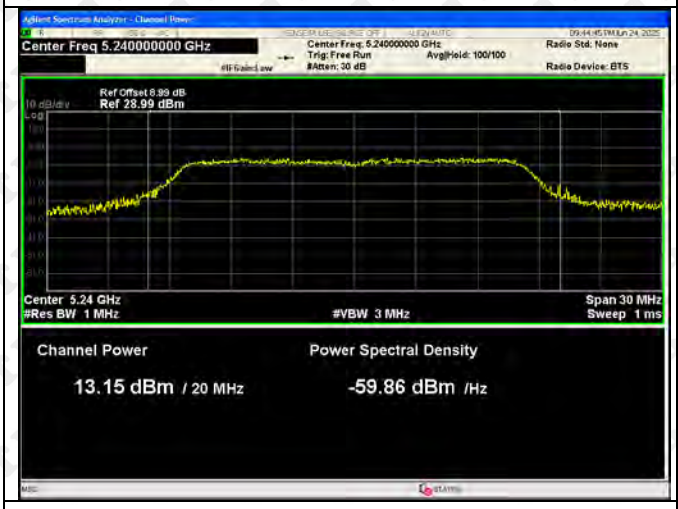
Test Graph:
5150-5250MHz-Power
ANT1

802.11a-5180

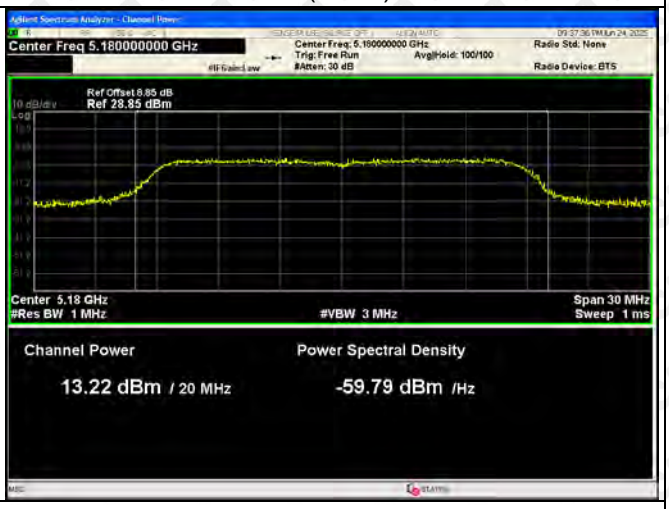
802.11a-5200



802.11a-5240



802.11ac(VH20)-5180



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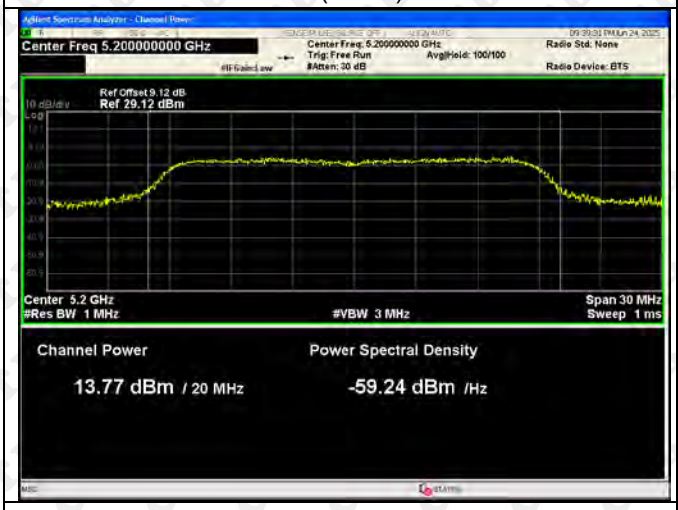

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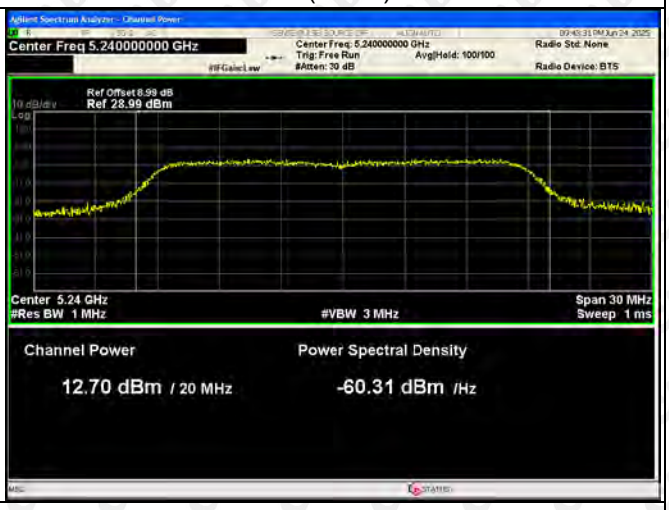
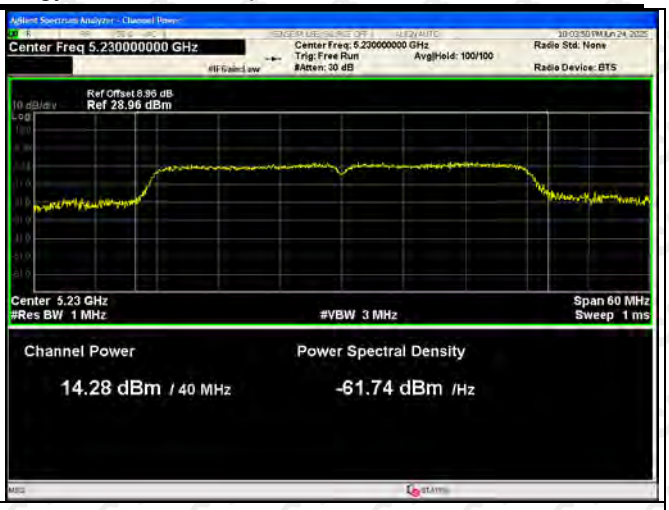


802.11ac(VH40)-5190

802.11ac(VH40)-5230

802.11ac(VH80)-5210



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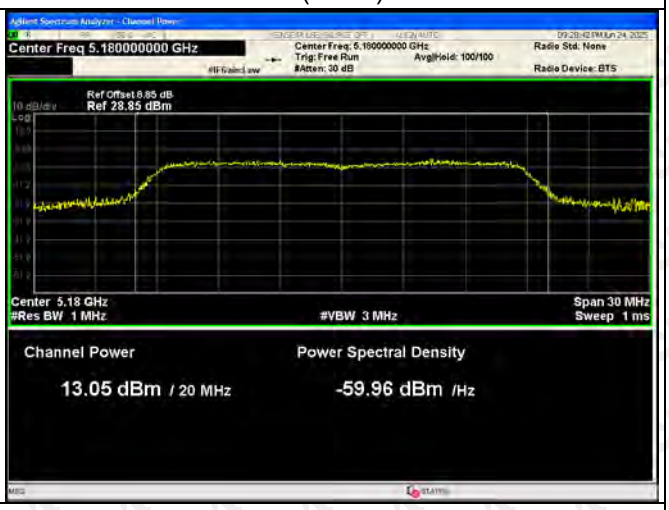
802.11n(HT20)-5200



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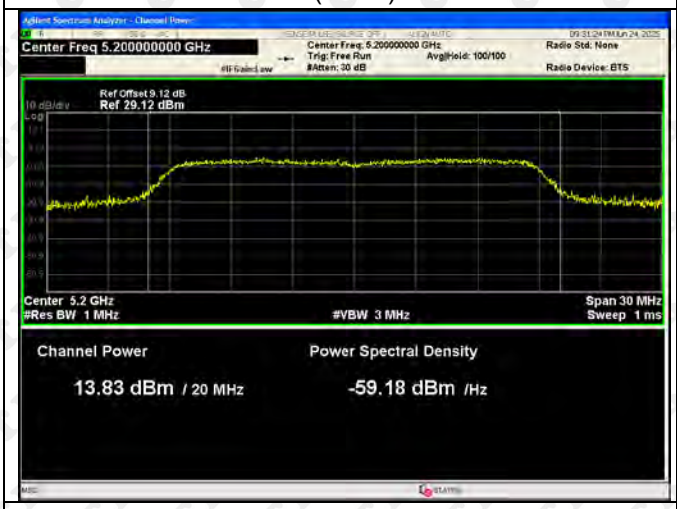

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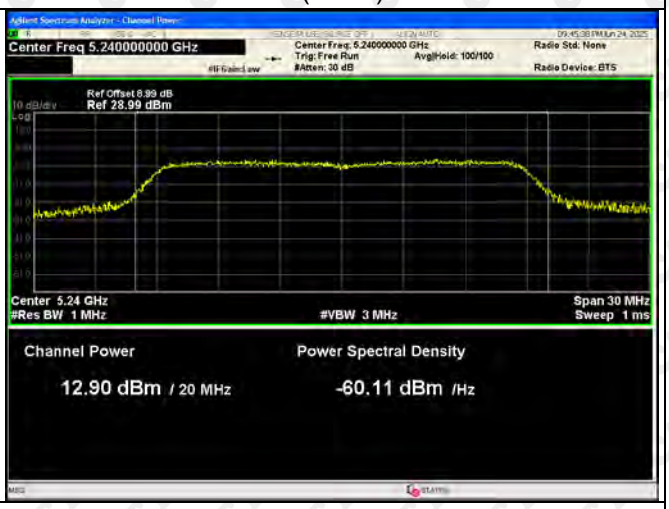

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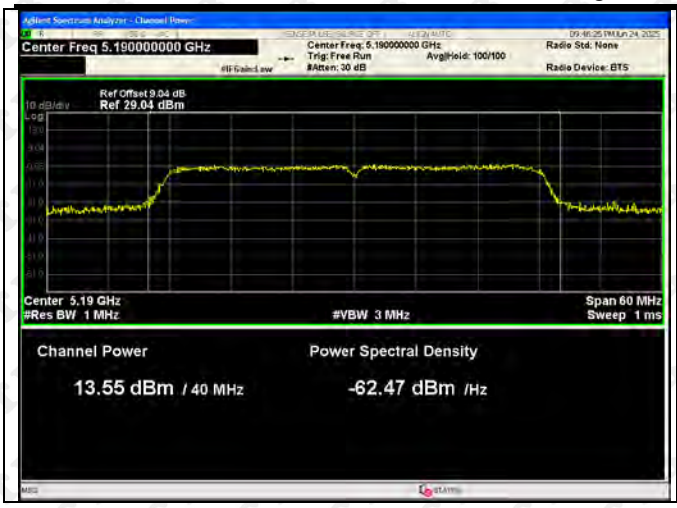
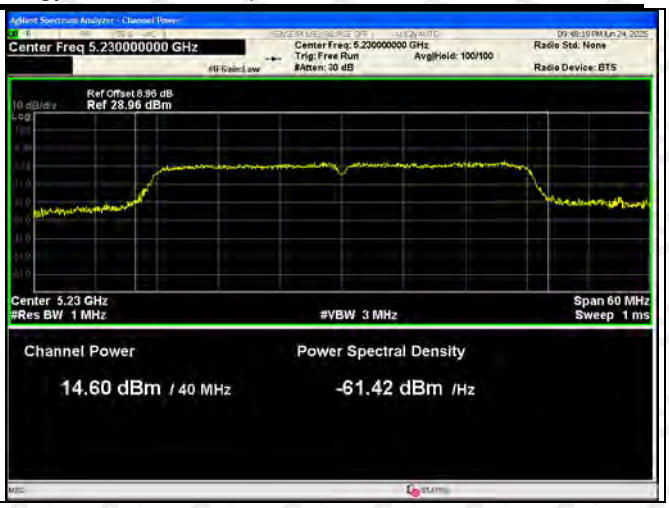
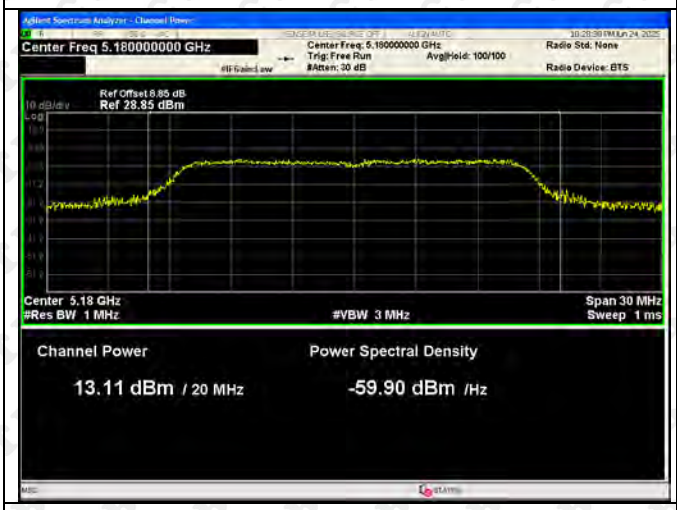


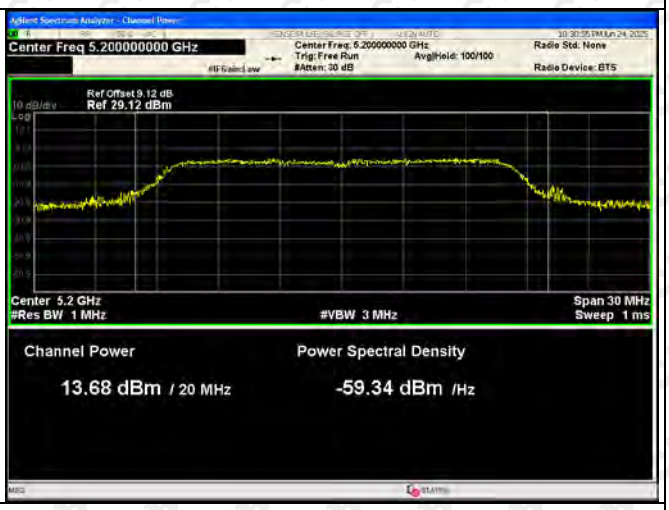


ANT2

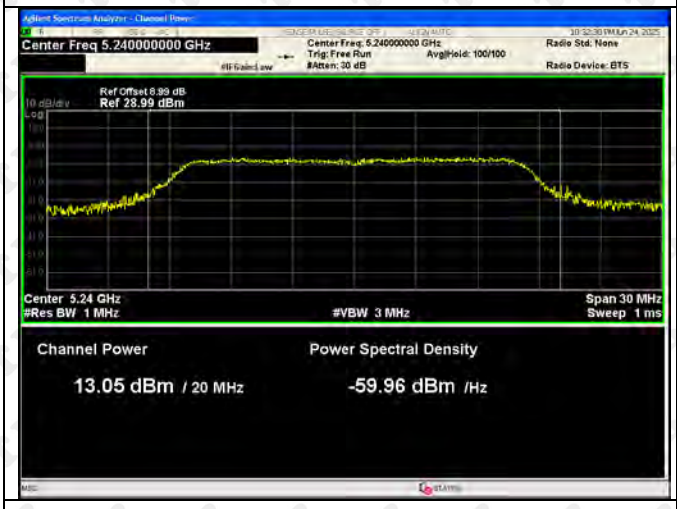
802.11a-5180



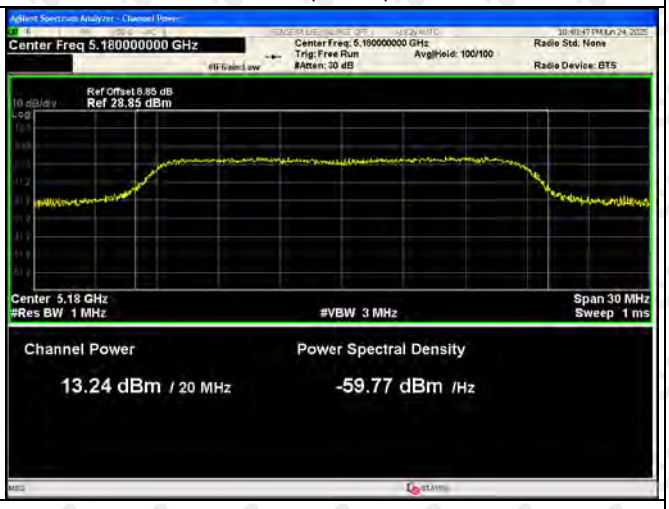
802.11a-5200



802.11a-5240



802.11ac(VH20)-5180



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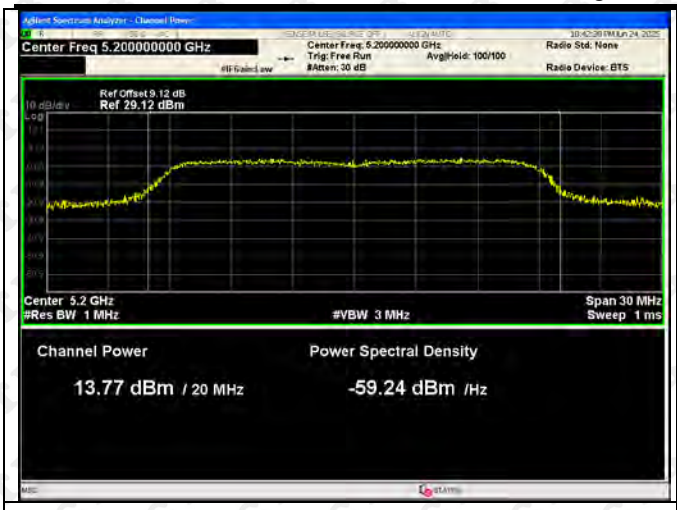
802.11ac(VH20)-5240



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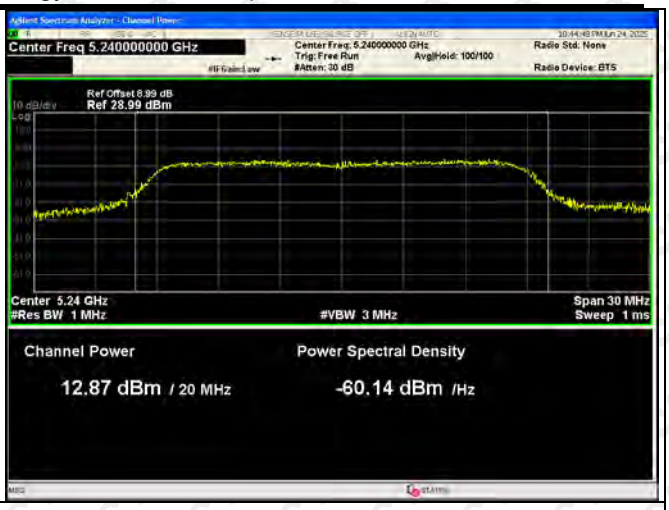

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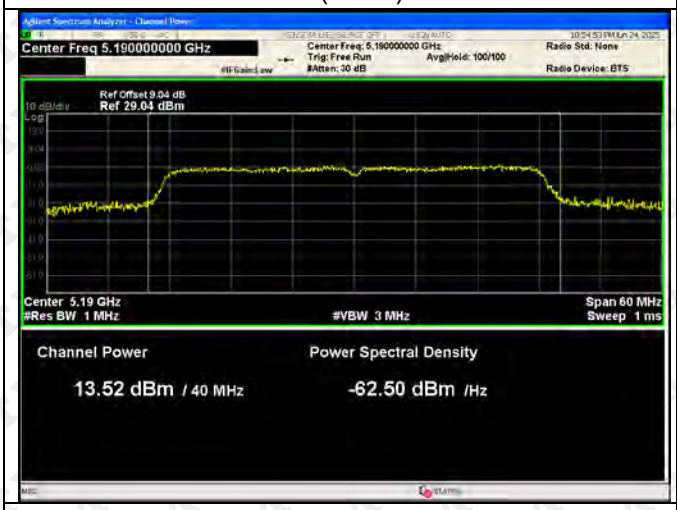
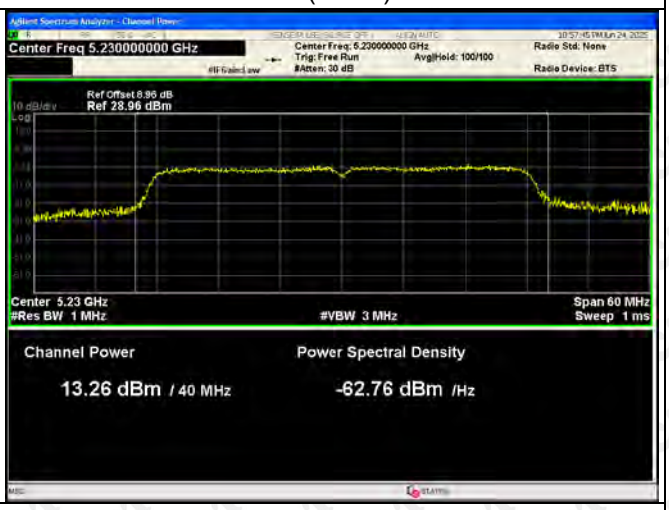


802.11ac(VH80)-5210



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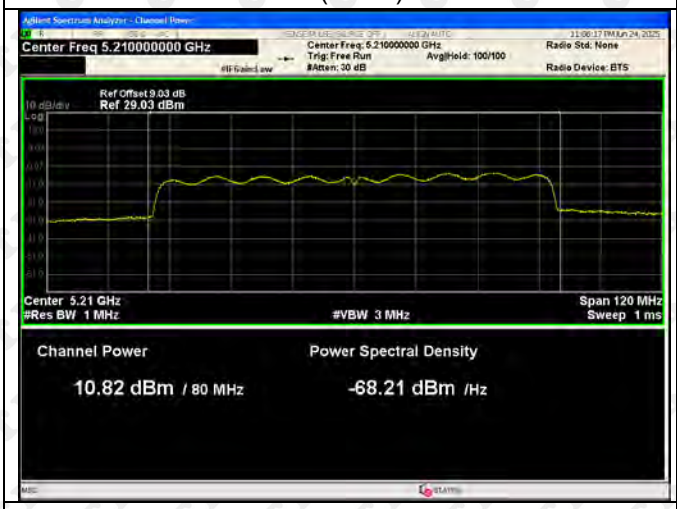

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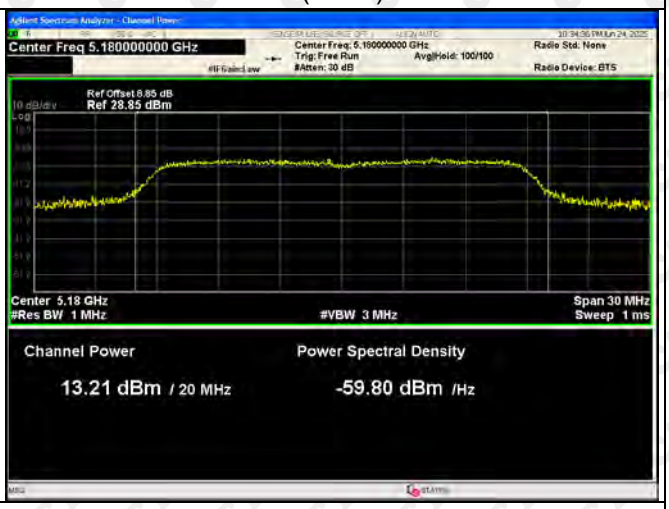

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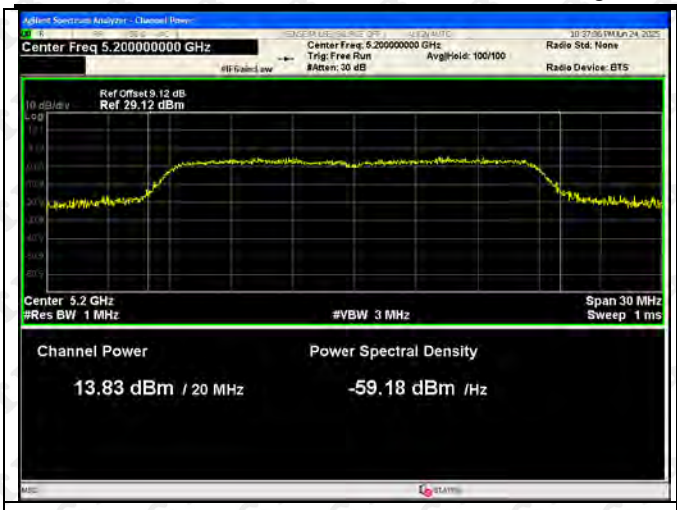
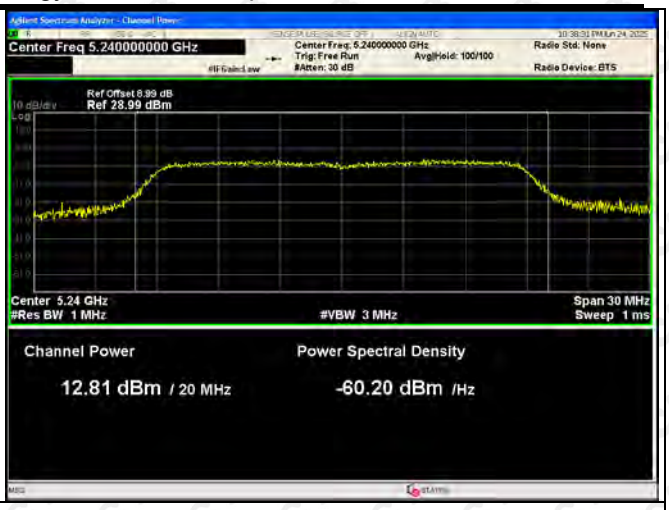
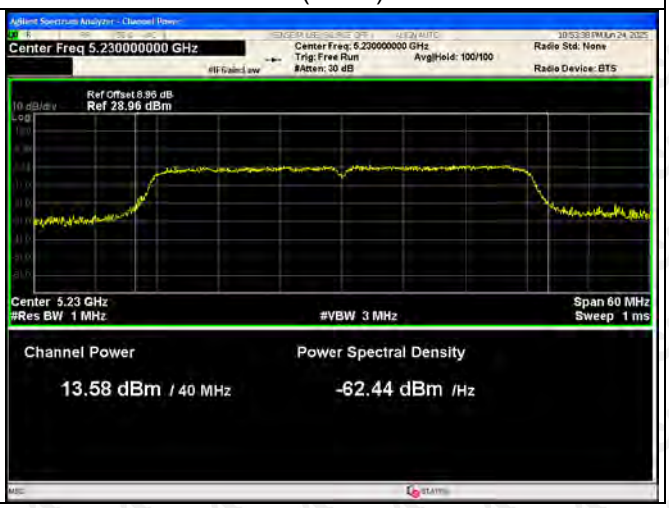




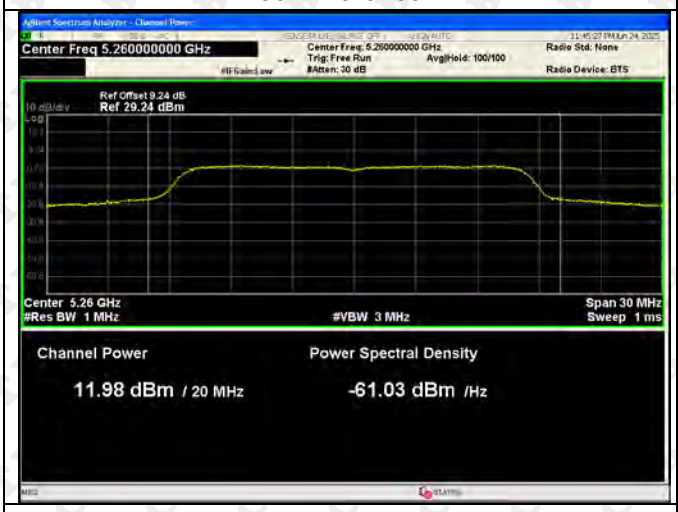
802.11n(HT40)-5190

802.11n(HT40)-5230

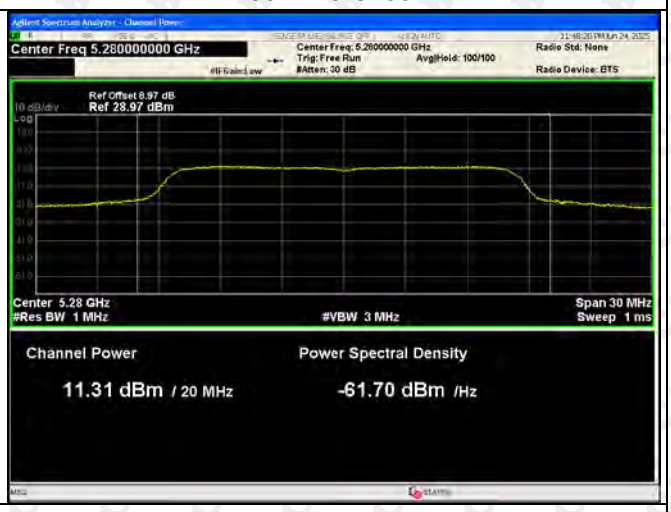


5250-5350MHz-Power
ANT1

802.11a-5260

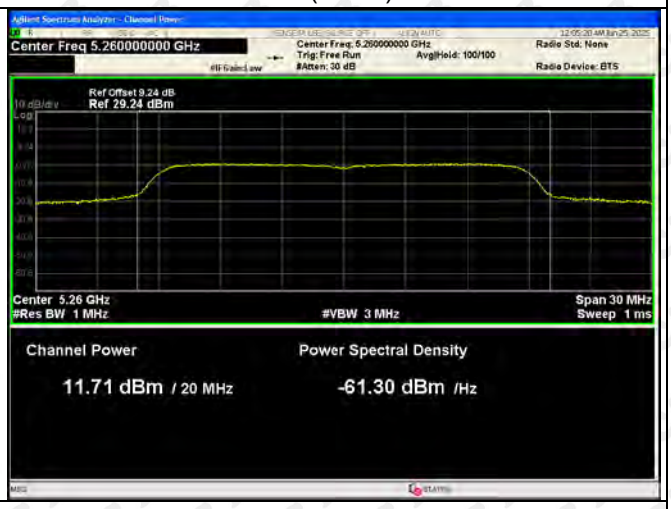


802.11a-5280



802.11a-5320

802.11ac(VH20)-5260



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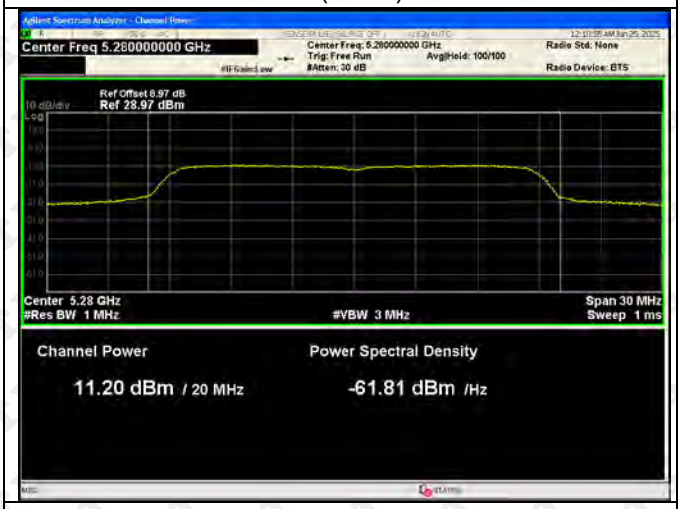

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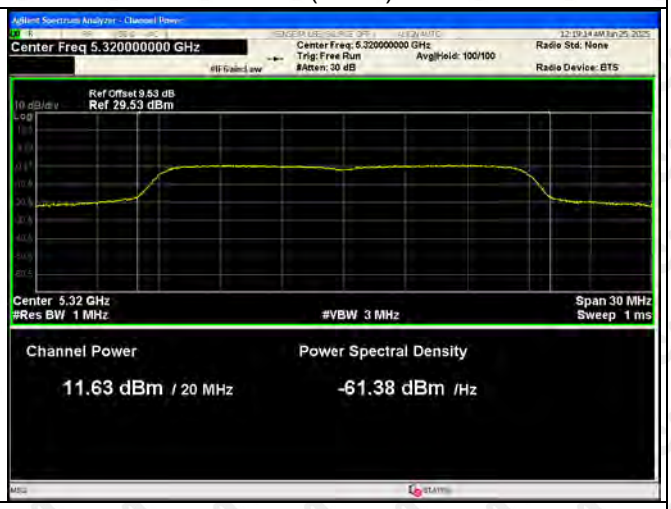
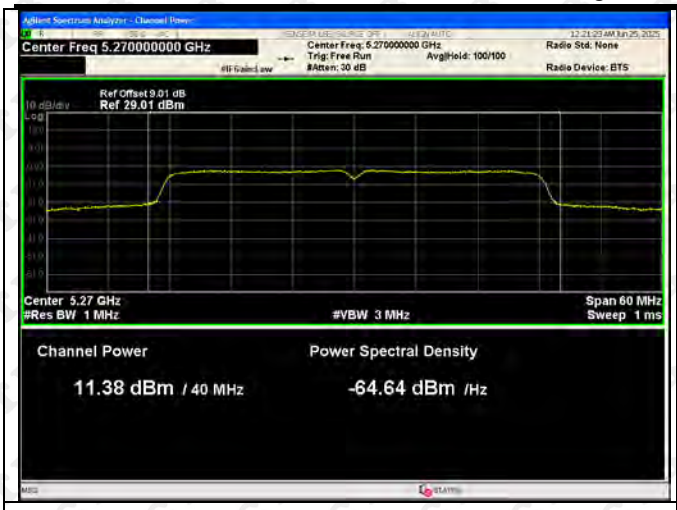


802.11ac(VH40)-5270

802.11ac(VH40)-5310



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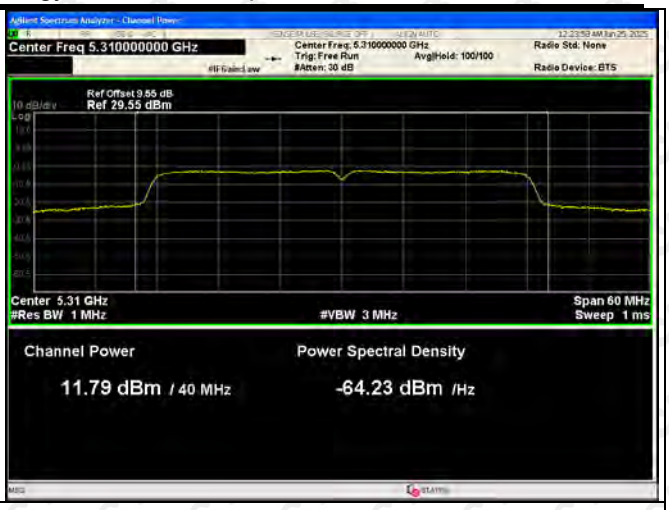
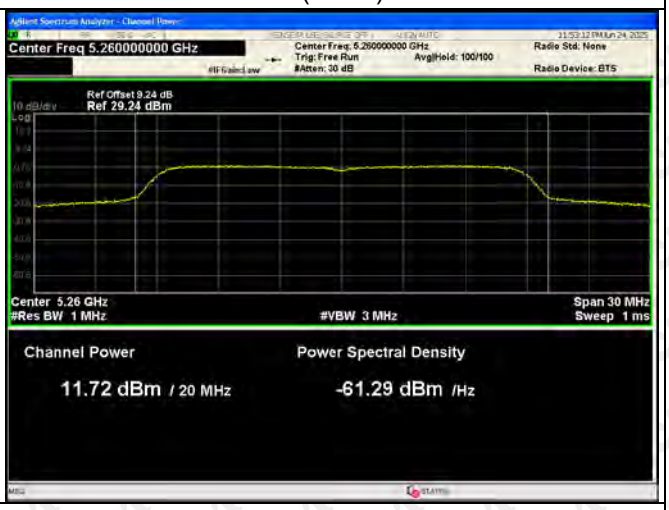


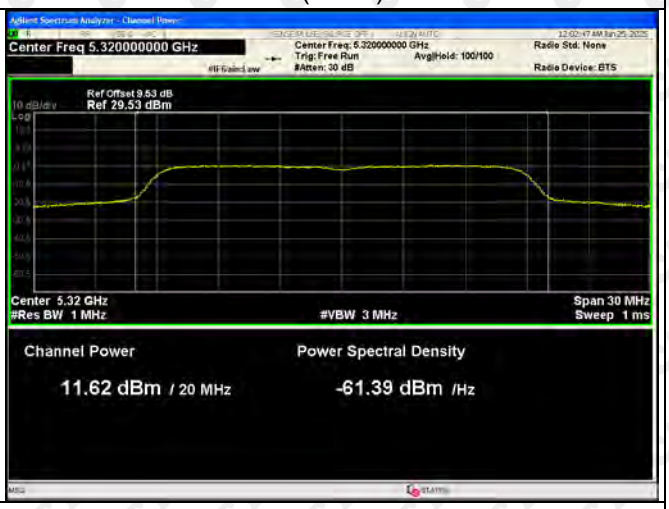
802.11n(HT20)-5260

802.11n(HT20)-5280

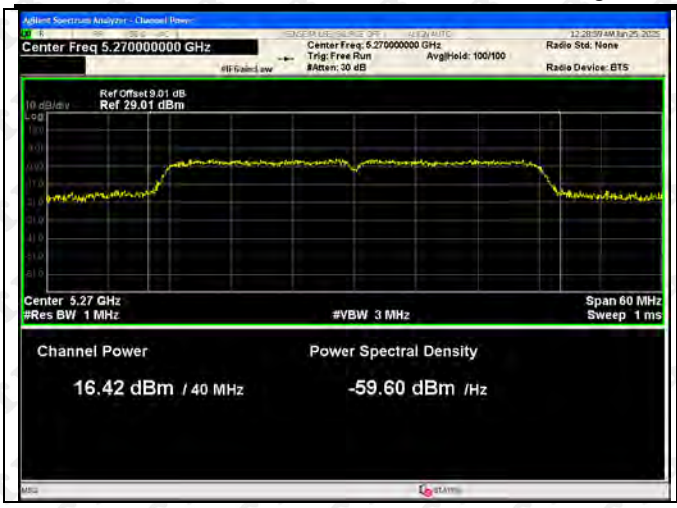


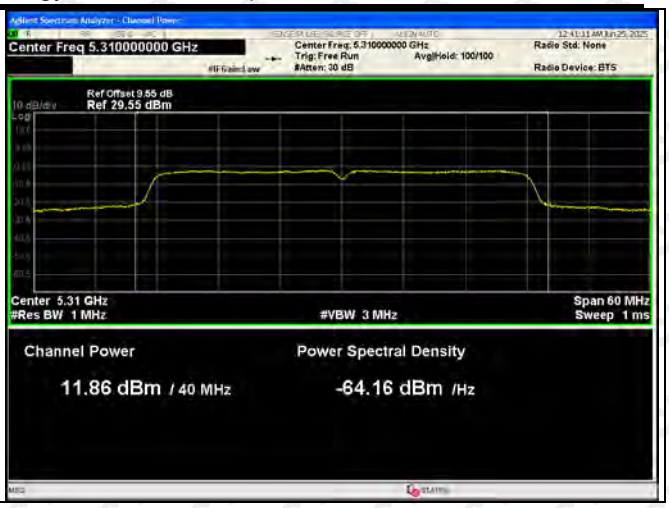
802.11n(HT20)-5320

802.11n(HT40)-5270



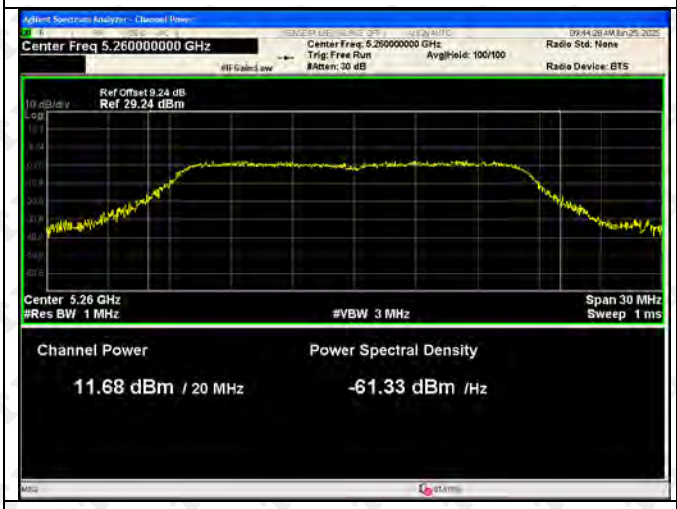
802.11n(HT40)-5310



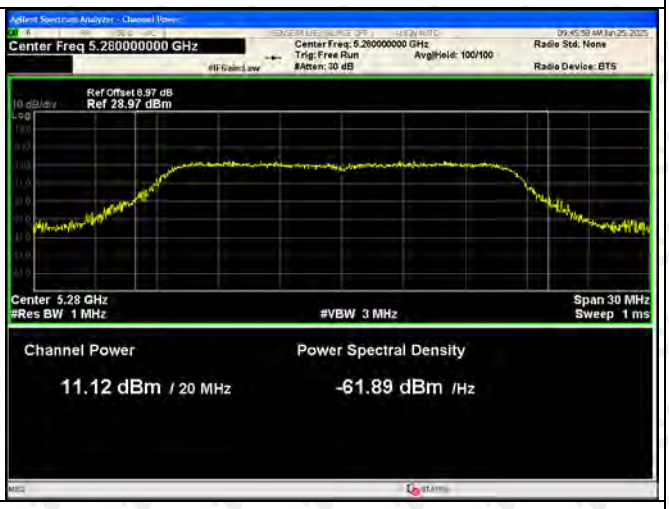


ANT2

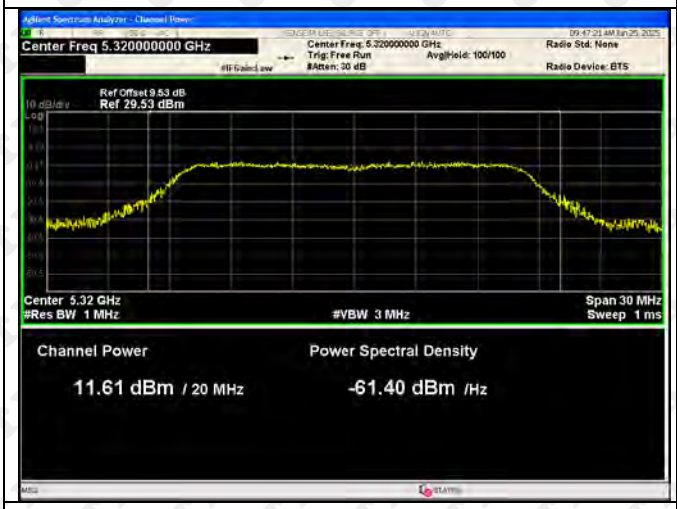
802.11a-5260



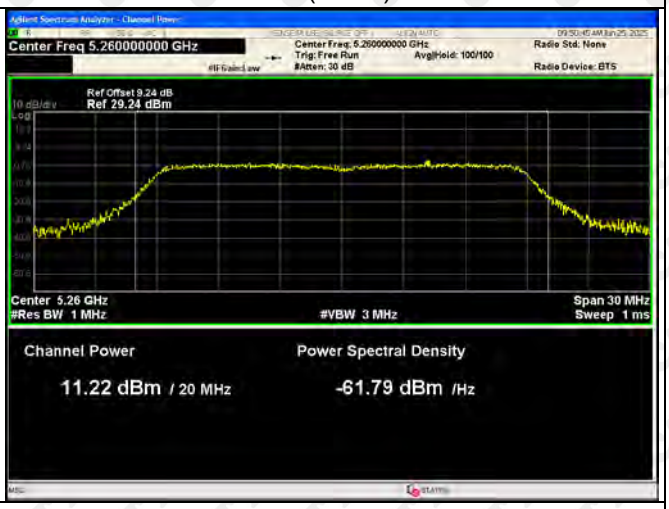
802.11a-5280



802.11a-5320



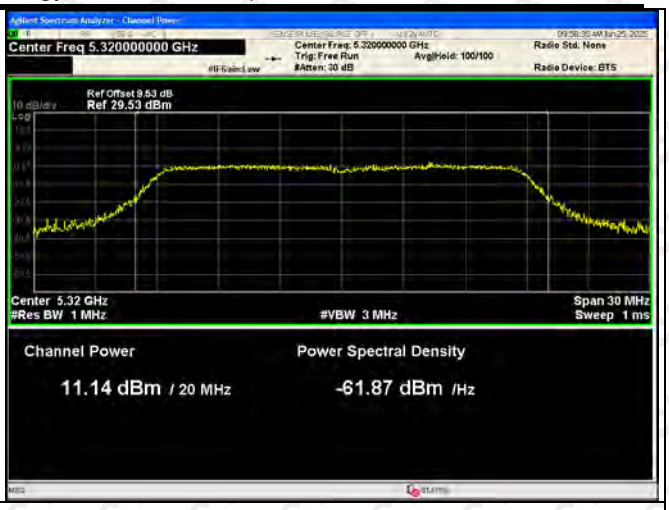
802.11ac(VH20)-5260



802.11ac(VH20)-5280

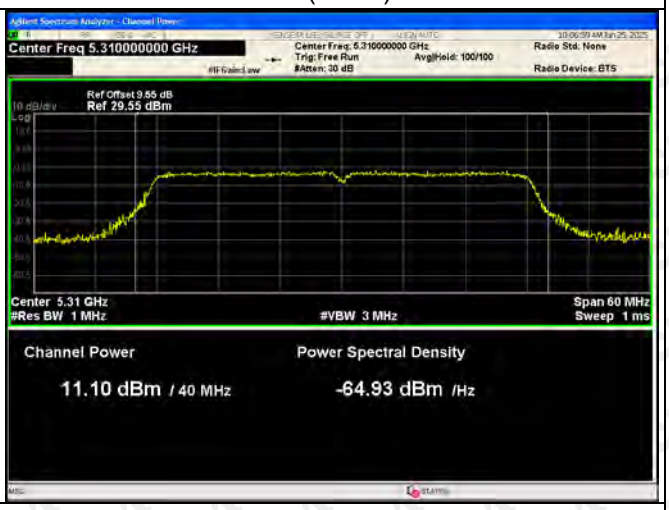
802.11ac(VH20)-5320

802.11ac(VH40)-5270



802.11ac(VH40)-5310

802.11ac(VH80)-5290



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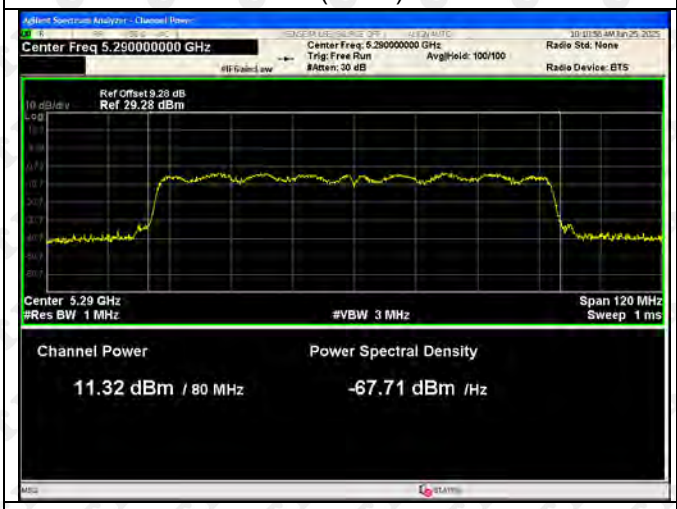

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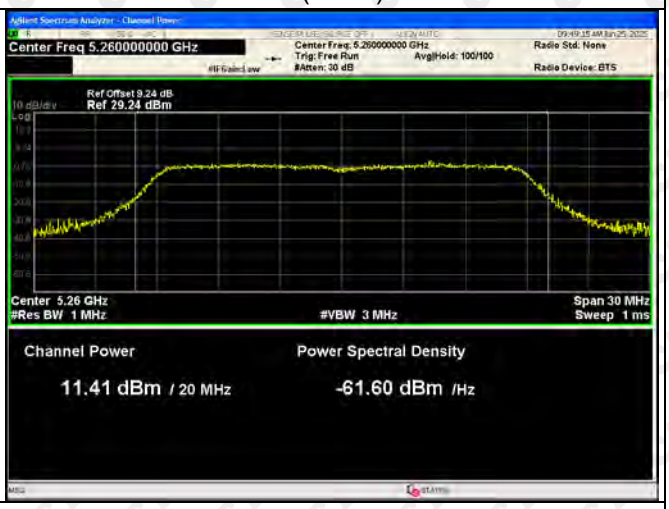

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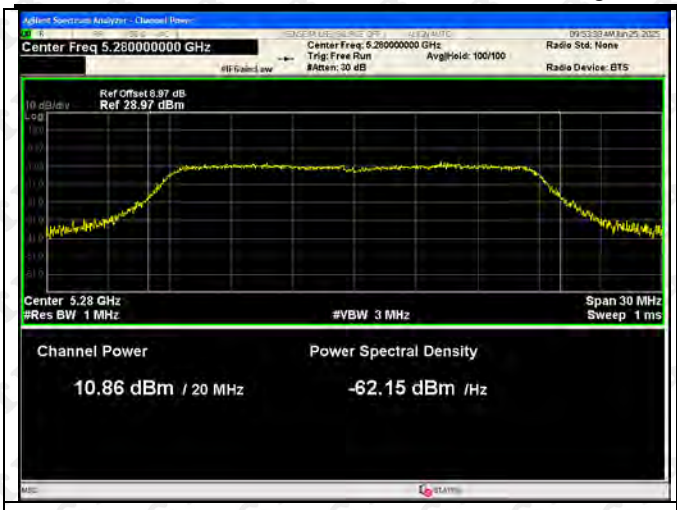
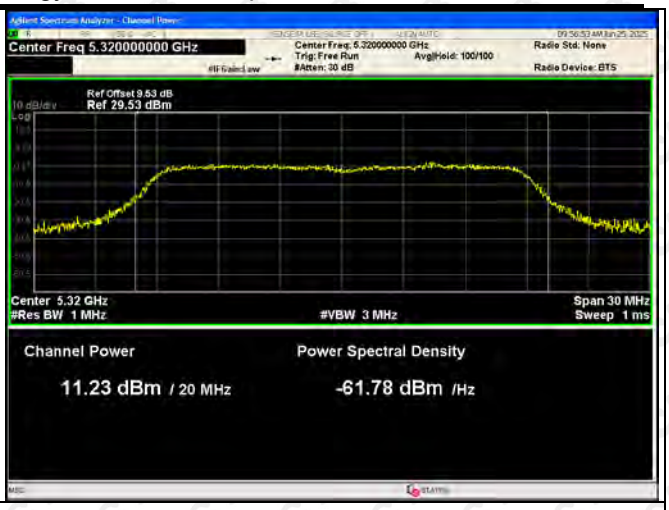
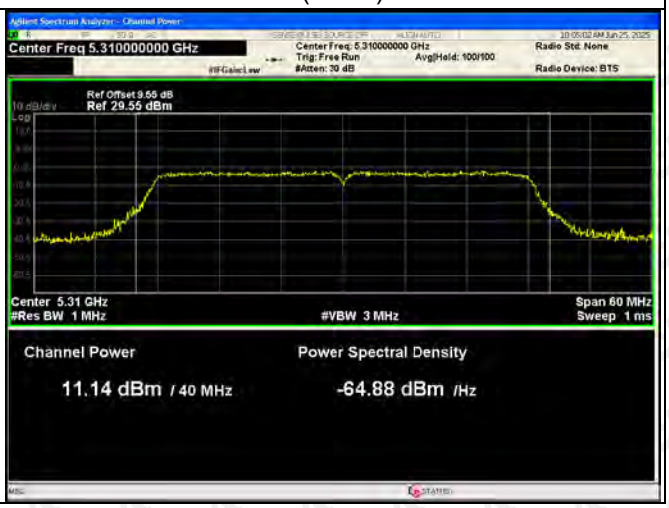


802.11n(HT40)-5270

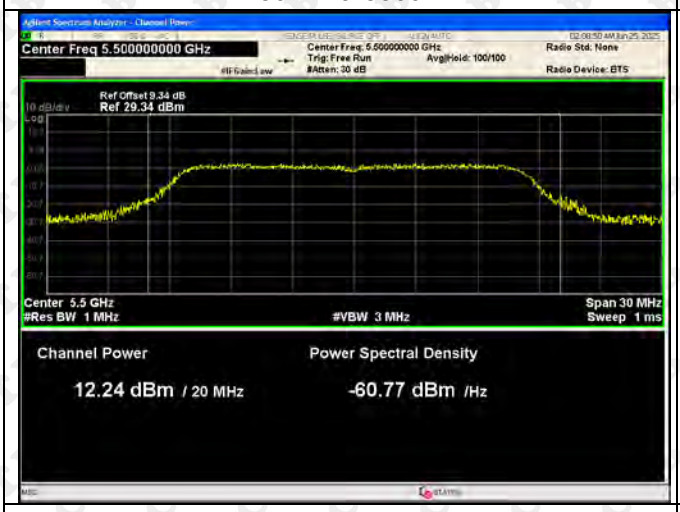


802.11n(HT40)-5310

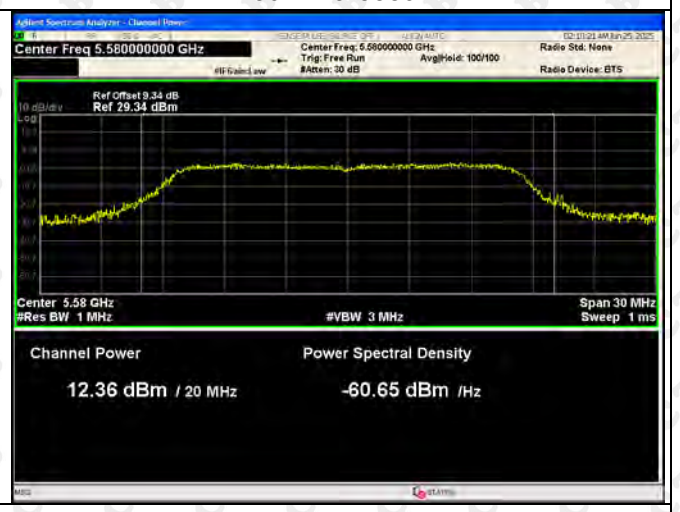


5470-5725MHz-Power
ANT1

802.11a-5500

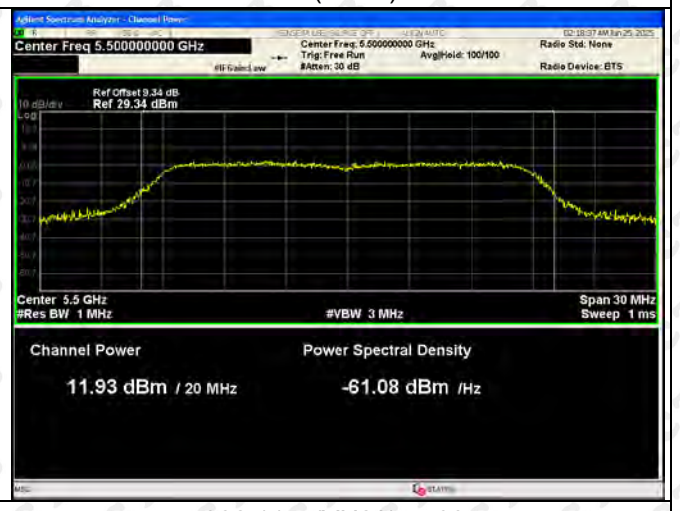


802.11a-5580

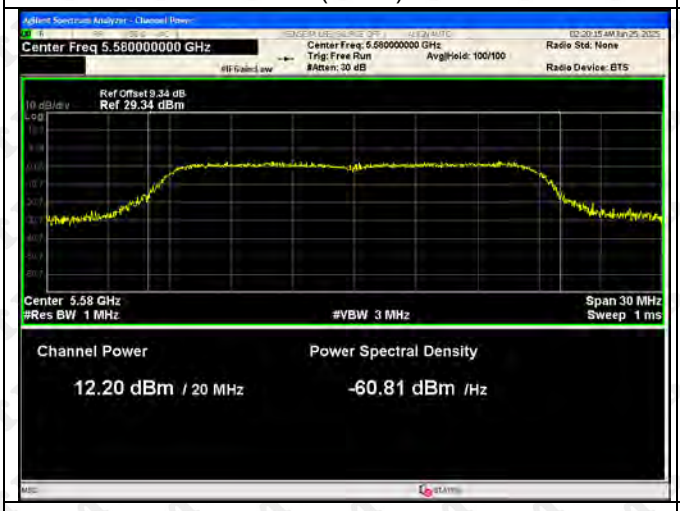


802.11a-5700

802.11ac(VH20)-5500



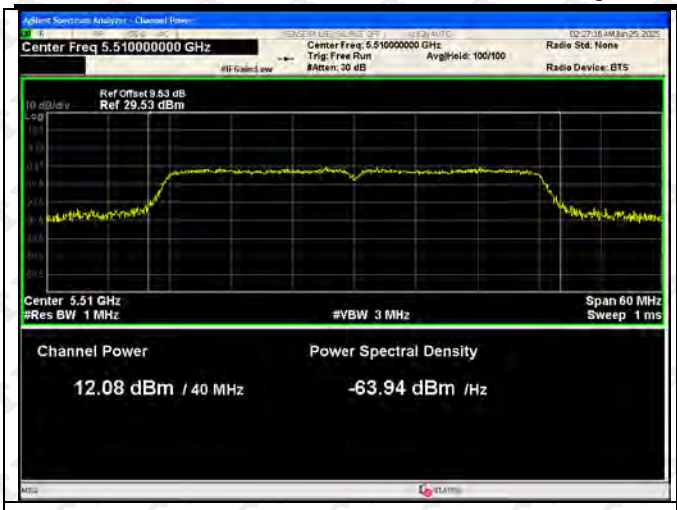
802.11ac(VH20)-5580



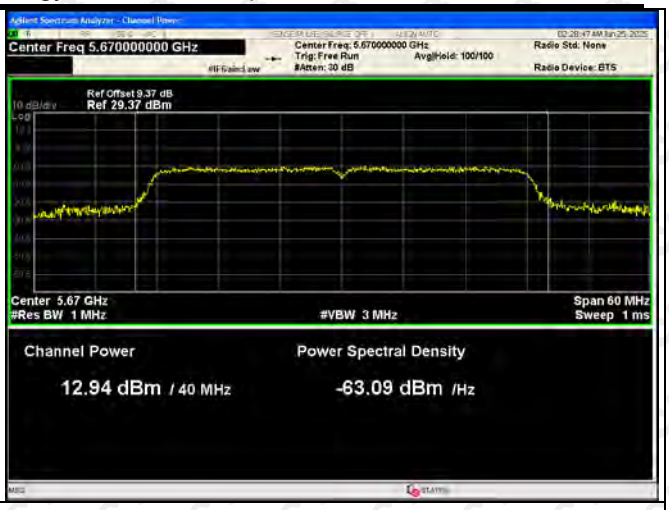
802.11ac(VH20)-5700

802.11ac(VH40)-5510

802.11ac(VH40)-5670

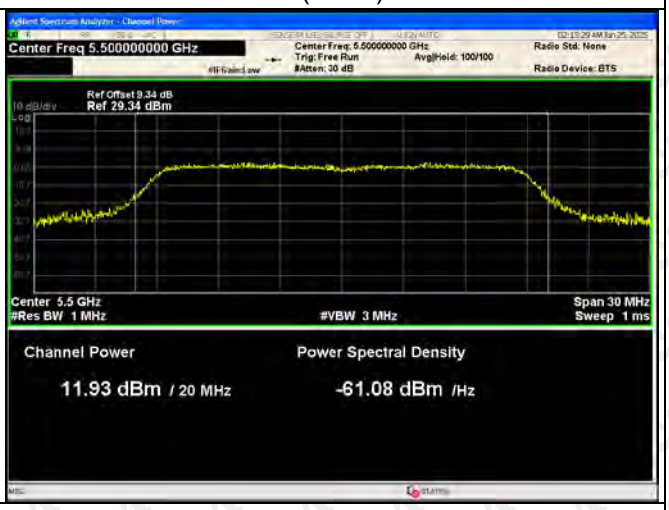


802.11ac(VH80)-5530

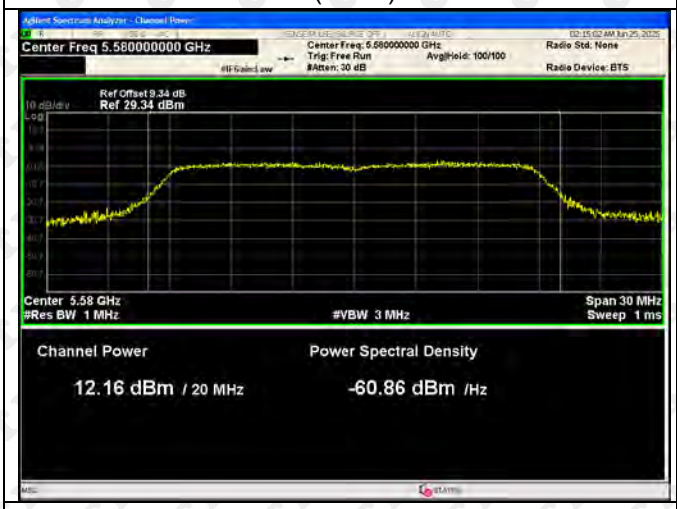


802.11n(HT20)-5500

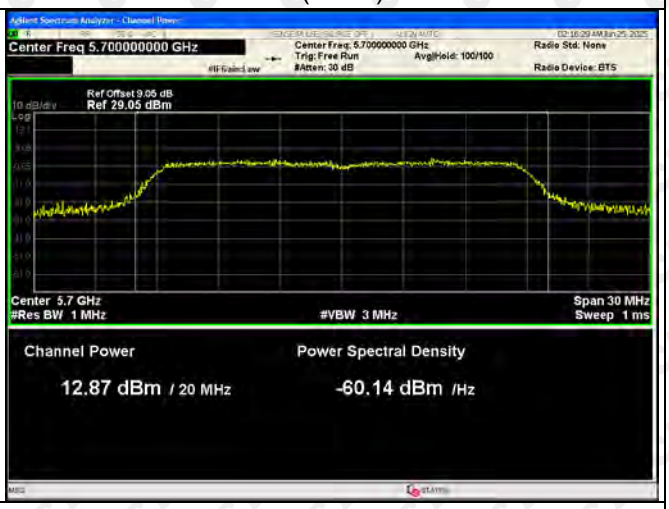
802.11n(HT20)-5580



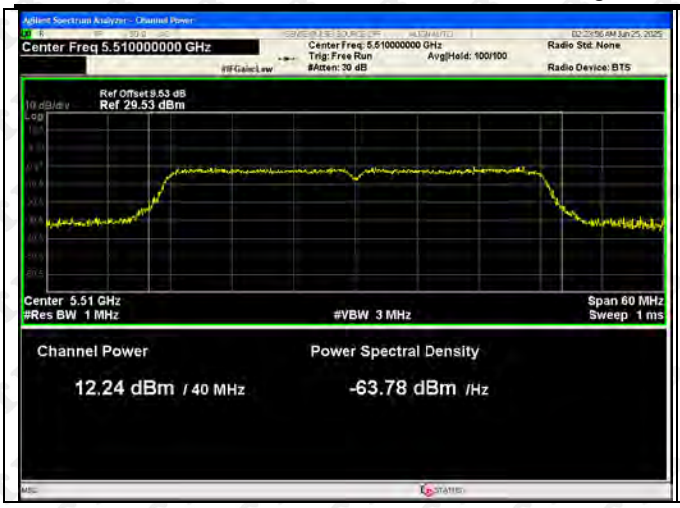
802.11n(HT20)-5700

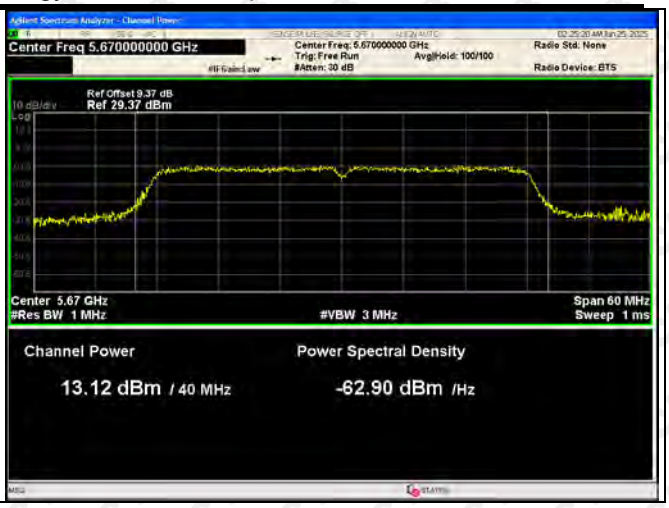


802.11n(HT40)-5510

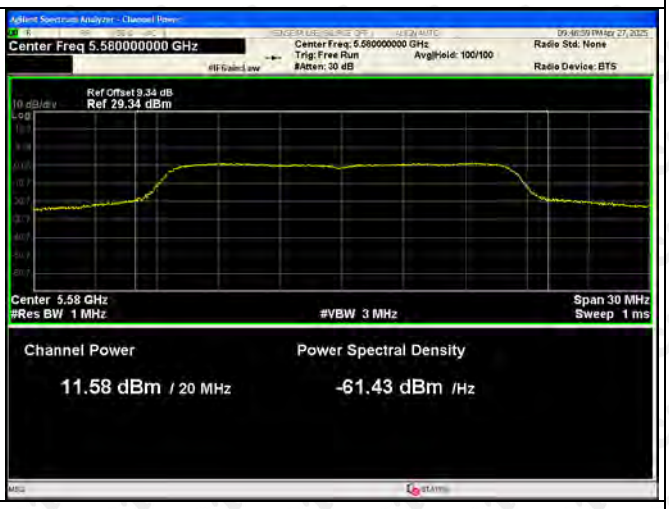
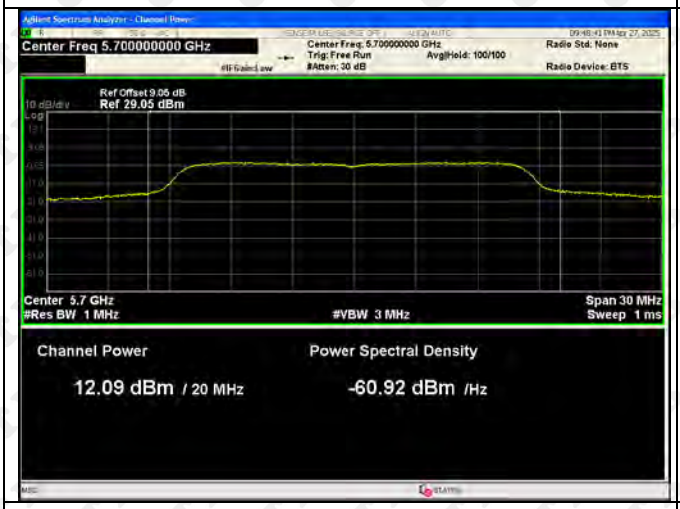
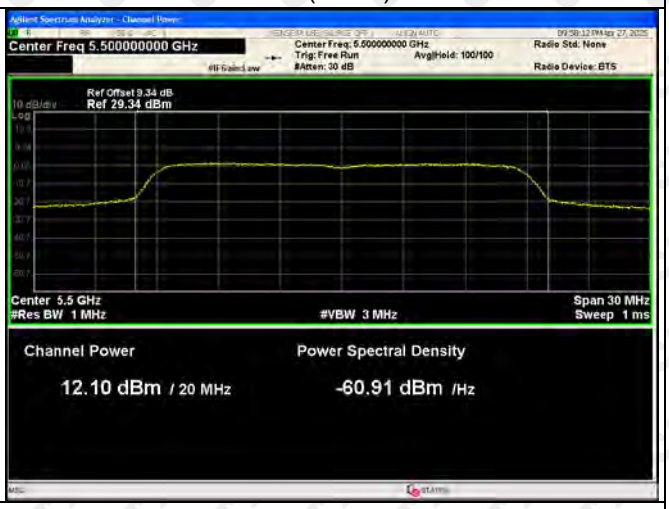


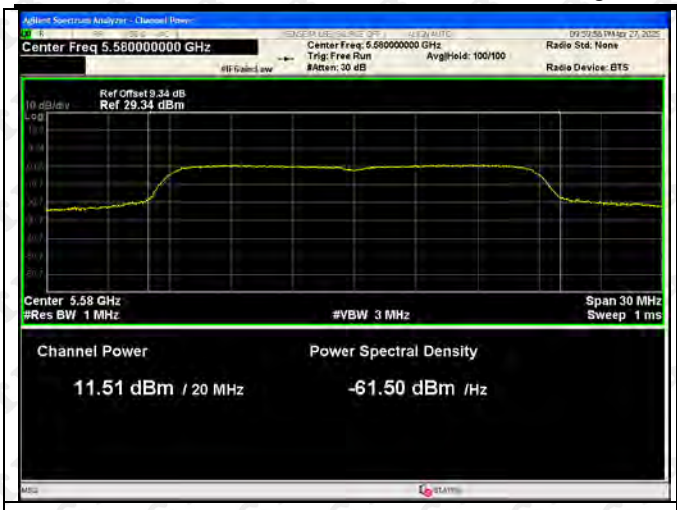
802.11n(HT40)-5670



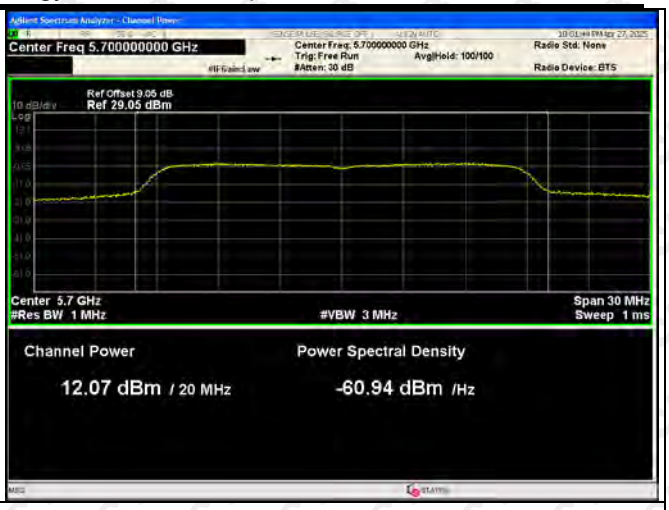


ANT2

802.11a-5500	802.11a-5580
	
802.11a-5700	802.11ac(VH20)-5500
	
802.11ac(VH20)-5580	802.11ac(VH20)-5700

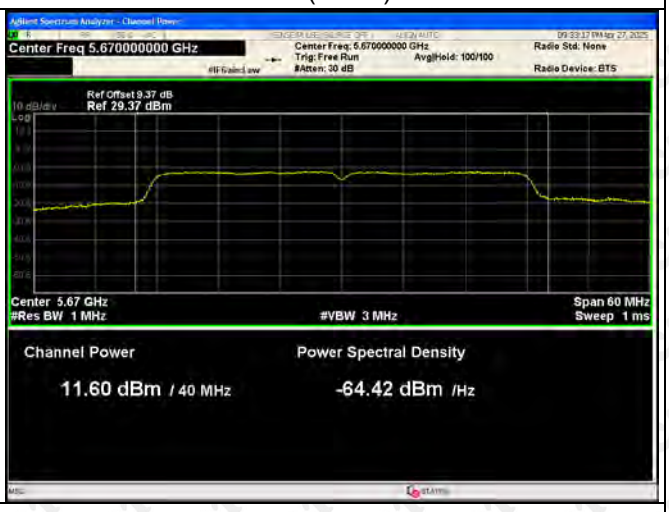


802.11ac(VH40)-5510



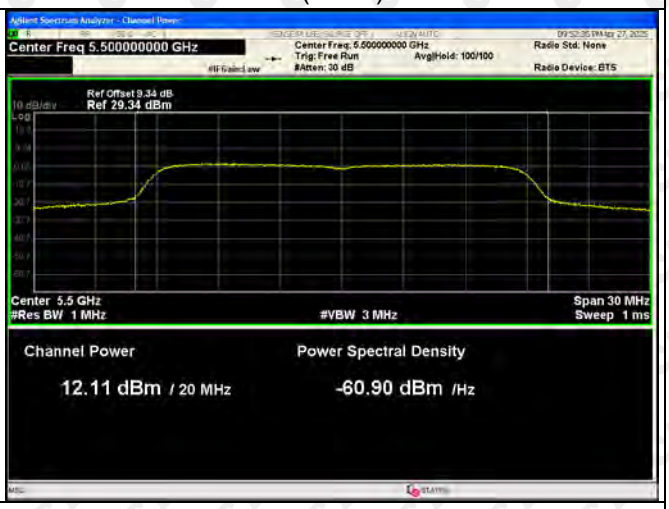
802.11ac(VH40)-5670

802.11ac(VH80)-5530

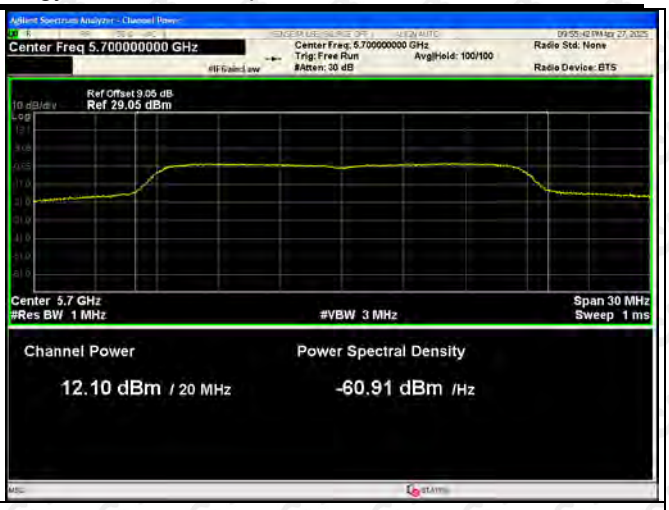


802.11n(HT20)-5500

802.11n(HT20)-5580

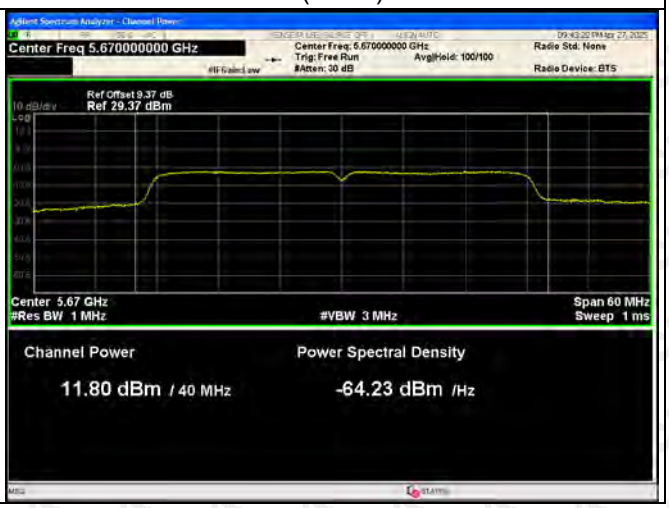


802.11n(HT20)-5700



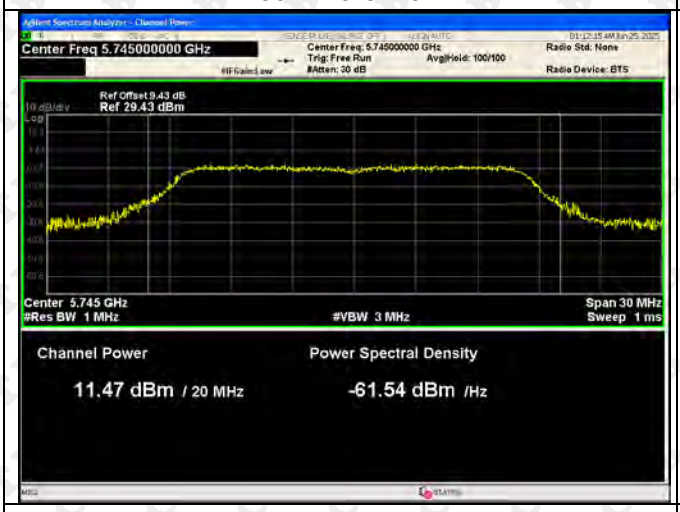
802.11n(HT40)-5510

802.11n(HT40)-5670



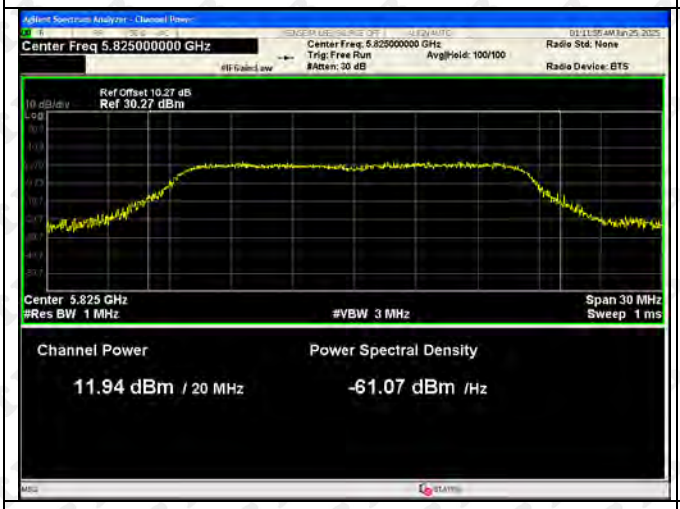
5725-5850MHz:-Power
ANT1

802.11a-5745

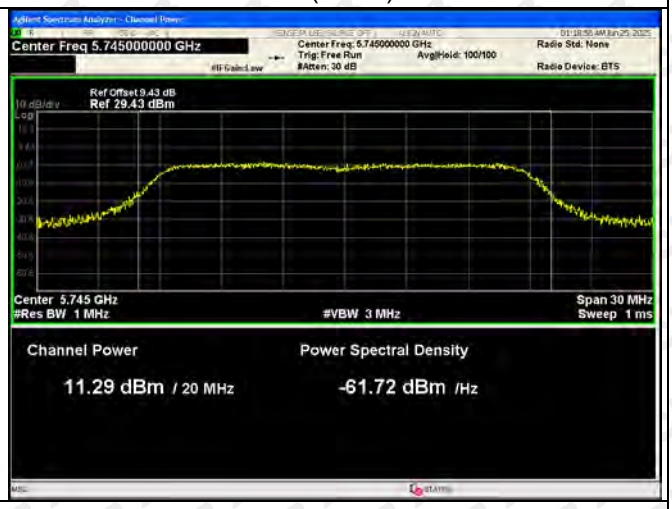


802.11a-5785

802.11a-5825

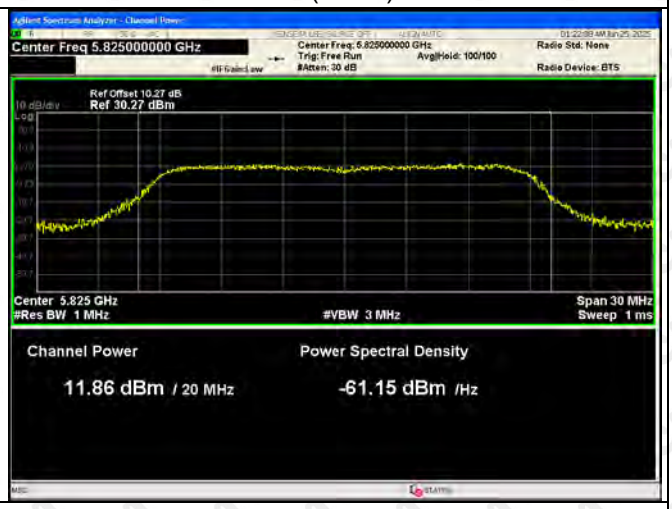


802.11ac(VH20)-5745



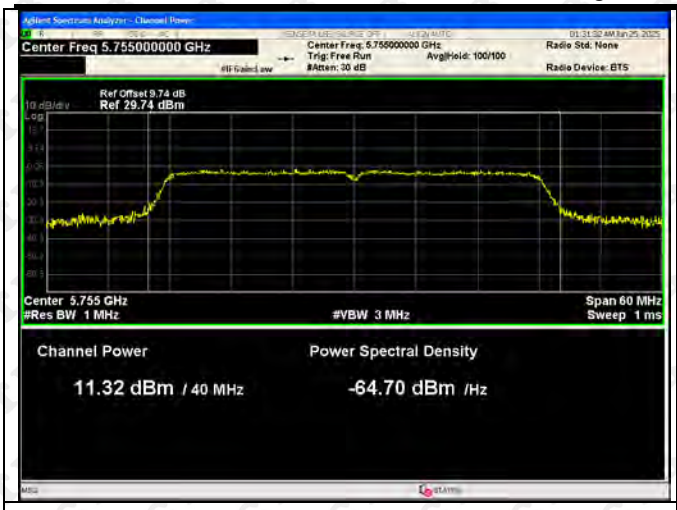
802.11ac(VH20)-5785

802.11ac(VH20)-5825

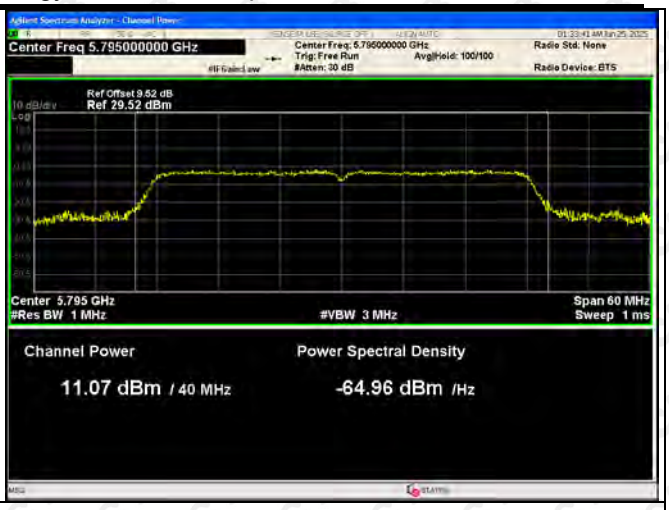


802.11ac(VH40)-5755

802.11ac(VH40)-5795

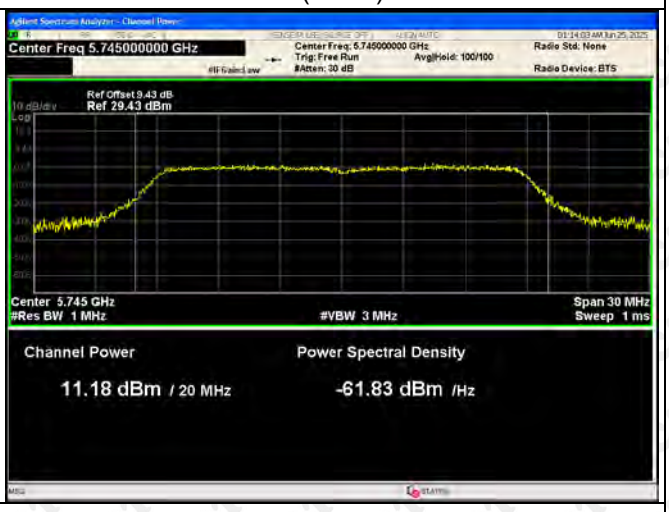


802.11ac(VH80)-5775

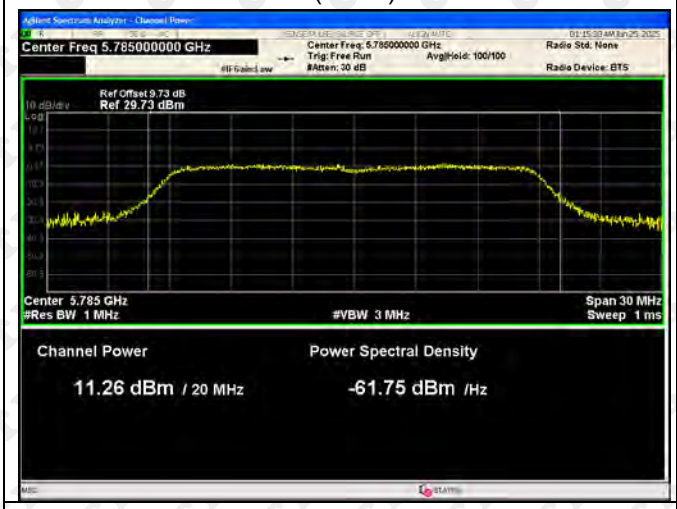


802.11n(HT20)-5745

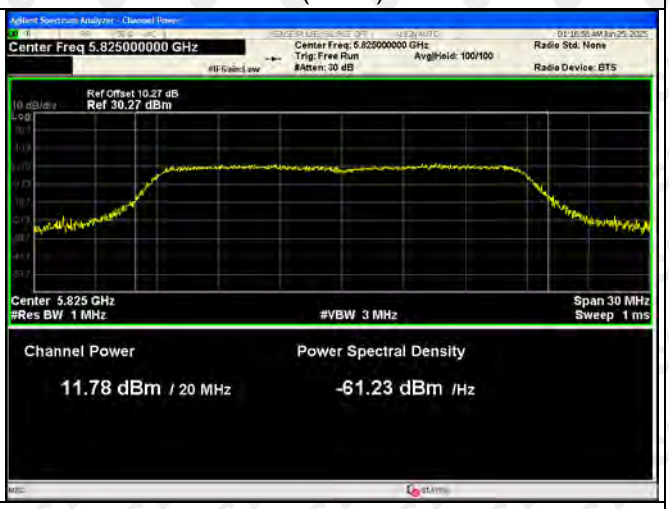
802.11n(HT20)-5785



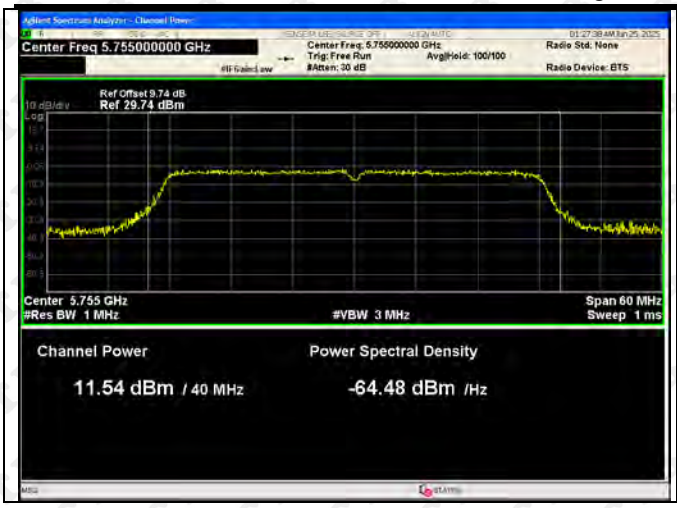
802.11n(HT20)-5825

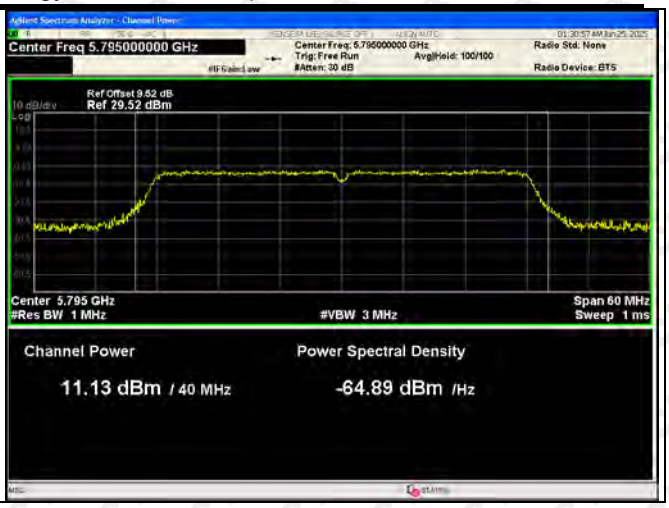


802.11n(HT40)-5795

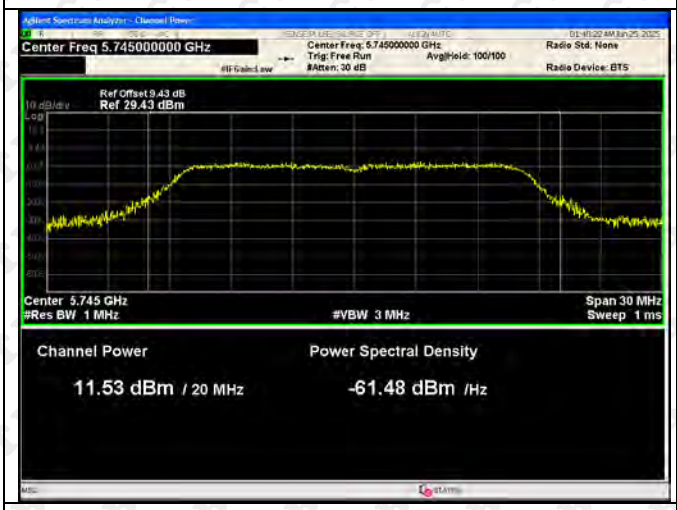
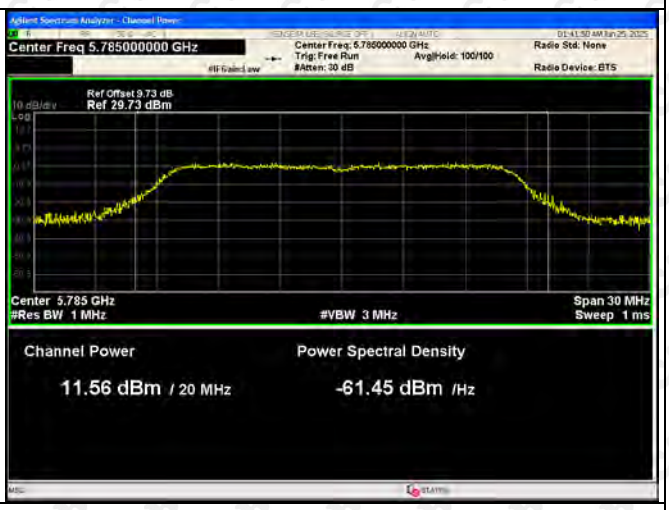
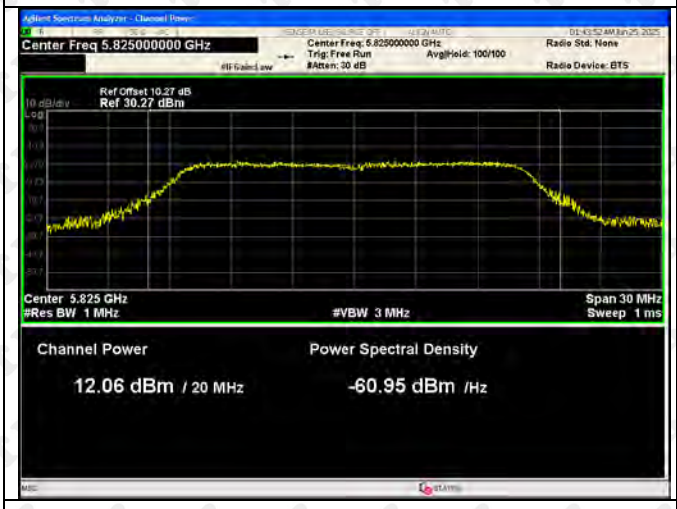
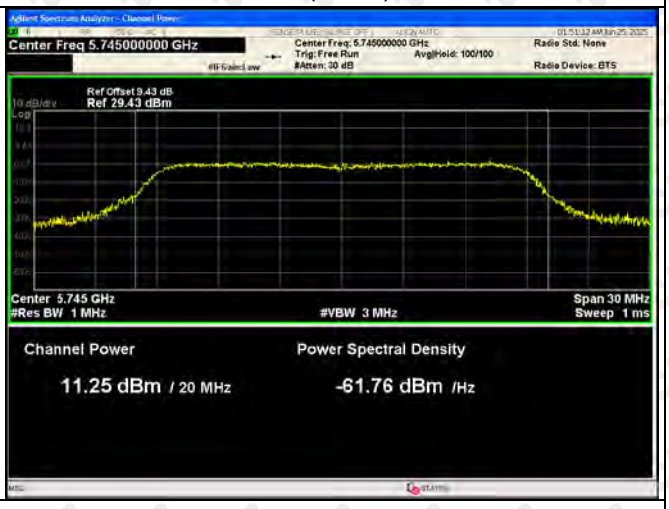


802.11n(HT40)-5825

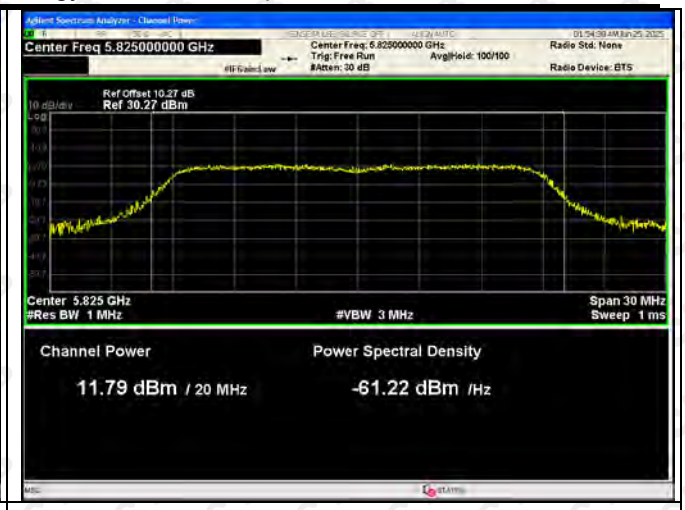




ANT2

802.11a-5745	802.11a-5785
	
802.11a-5825	802.11ac(VH20)-5745
	
802.11ac(VH20)-5785	802.11ac(VH20)-5825

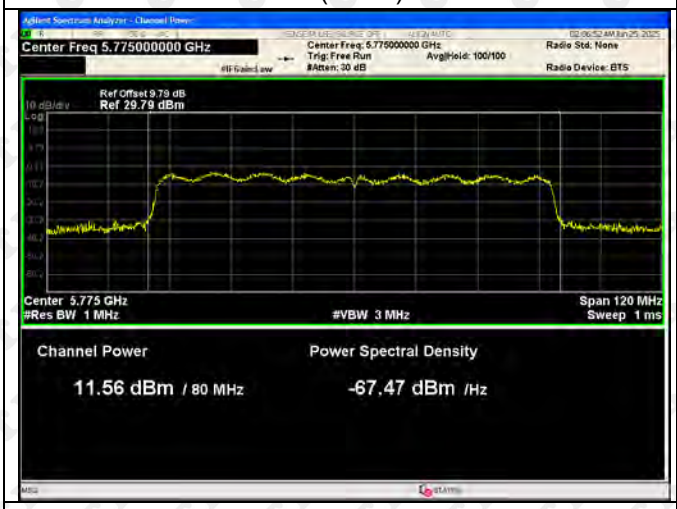
802.11ac(VH40)-5755



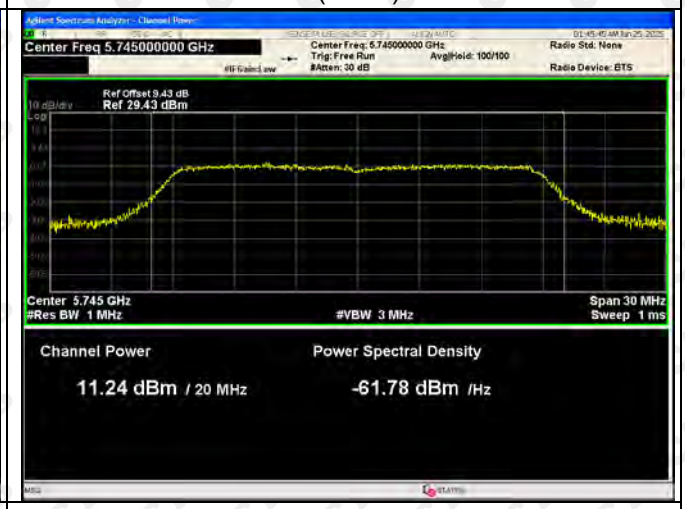
802.11ac(VH40)-5795

802.11ac(VH80)-5775

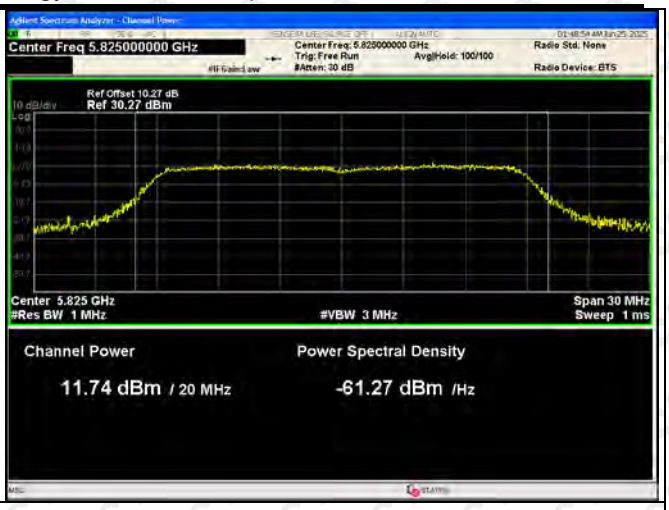
802.11n(HT20)-5745



802.11n(HT20)-5785

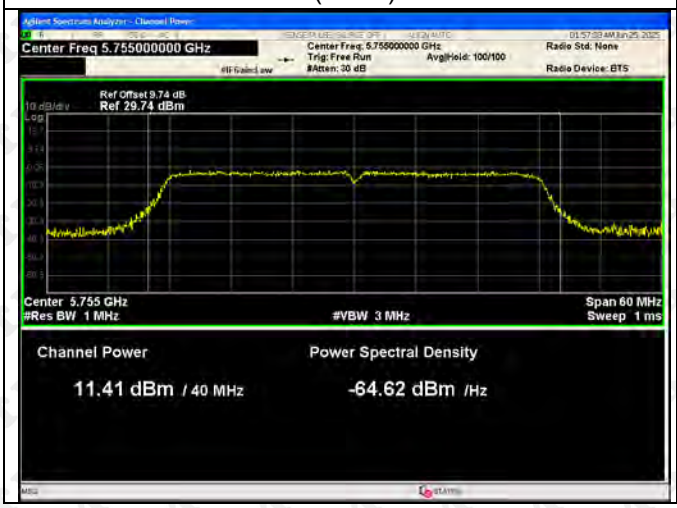


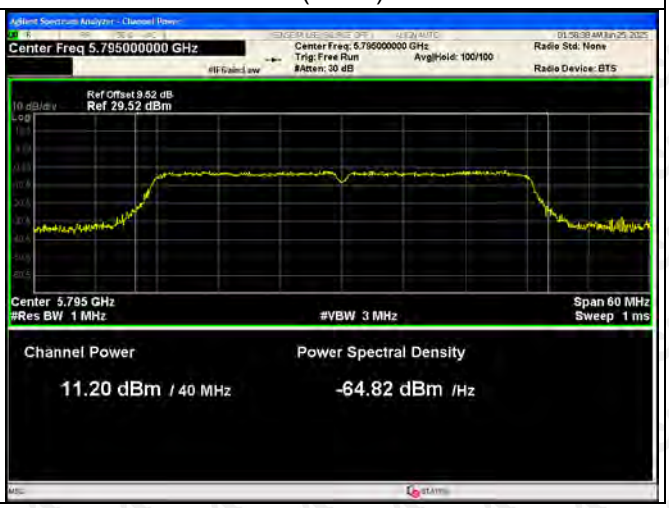
802.11n(HT20)-5825



802.11n(HT40)-5795

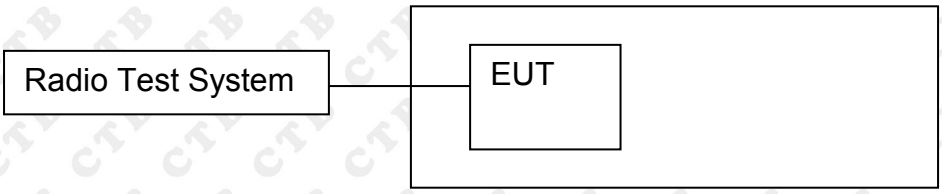
802.11n(HT40)-5825





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

5150-5250MHz:

Test mode	Test Channel (MHz)	26dB Bandwidth (MHz)&ANT1	26dB Bandwidth (MHz)&ANT2
802.11a	5180	28.296	28.376
	5200	28.475	26.678
	5240	29.703	21.773
802.11ac20	5180	29.758	29.85
	5200	29.003	29.283
	5240	29.855	23.223
802.11ac40	5190	60	60
	5230	59.875	52.372
802.11ac80	5210	103.805	117.496
802.11n(HT20)	5180	29.925	29.977
	5200	28.906	29.138
	5240	29.521	24.282
802.11n(HT40)	5190	59.735	58.549
	5230	55.744	53.981

5250-5350 MHz:

Test mode	Test Channel (MHz)	26dB Bandwidth (MHz)&ANT1	26dB Bandwidth (MHz)&ANT2
802.11a	5260	20.888	30
	5280	21.416	30
	5320	21.407	30
802.11ac20	5260	20.624	30
	5280	20.986	30
	5320	20.872	30
802.11ac40	5270	40.47	60
	5310	40.759	60
802.11ac80	5290	78.64	120
802.11n(HT20)	5260	20.753	30
	5280	20.983	30
	5320	20.807	30
802.11n(HT40)	5270	40.353	60
	5310	40.448	60

5470-5725MHz:

Test mode	Test Channel (MHz)	26dB Bandwidth (MHz)&ANT1	26dB Bandwidth (MHz)&ANT2
802.11a	5500	21.452	22.036
	5580	21.443	21.574
	5700	22.268	26.087
802.11ac20	5500	22.073	22.415
	5580	22.171	22.792
	5700	24.336	25.759
802.11ac40	5510	53.139	54.587
	5670	57.082	50.908
802.11ac80	5530	81.57	79.448
802.11n(HT20)	5500	21.091	21.944
	5580	21.134	21.251
	5700	23.667	26.116
802.11n(HT40)	5510	41.017	41.519
	5670	47.731	47.832

5725-5850MHz:

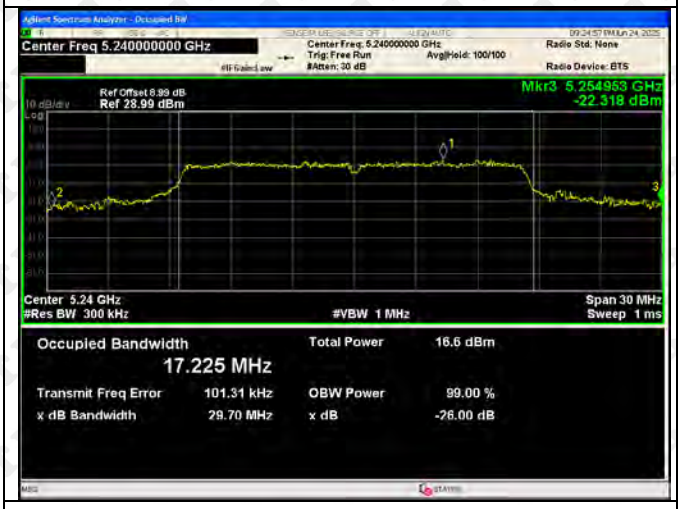
Test mode	Test Channel (MHz)	6dB Bandwidth (MHz)&ANT1	6dB Bandwidth (MHz)&ANT2
802.11a	5745	16.525	16.462
	5785	16.531	16.535
	5825	16.492	16.518
802.11ac20	5745	17.746	17.742
	5785	17.758	17.724
	5825	17.738	17.746
802.11ac40	5755	36.349	36.421
	5795	36.501	36.443
802.11ac80	5775	75.718	75.774
802.11n(HT20)	5745	17.714	17.742
	5785	17.7	17.722
	5825	17.774	17.759
802.11n(HT40)	5755	36.44	36.441
	5795	36.468	36.456

Test Graph:
5150-5250MHz-Power
ANT1

802.11a-5180

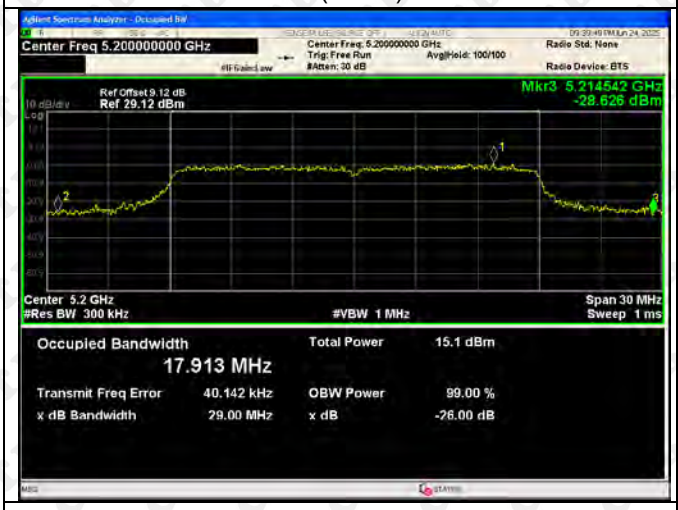
802.11a-5200

802.11a-5240



802.11ac(VH20)-5180

802.11ac(VH20)-5200



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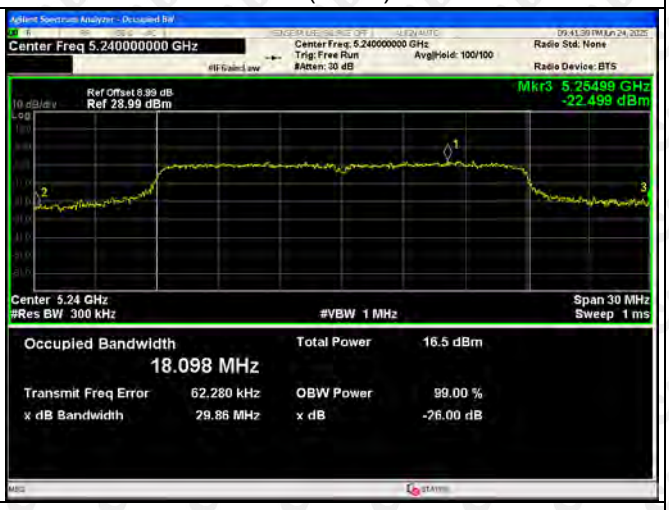

802.11ac(VH40)-5190

802.11ac(VH40)-5230