TEST REPORT

Product Name:	Portable reader
FCC ID:	VUJ-AT909
Trademark:	N/A
Model Number:	AT909
Prepared For:	ATID Co., Ltd
Address:	#1402, 83, Gasan digital 1-ro, Geumcheon-gu, Seoul, 08589 South Korea
Manufacturer:	ATID Co., Ltd
Address:	#1402, 83, Gasan digital 1-ro, Geumcheon-gu, Seoul, 08589 South Korea
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:	Jan. 21, 2025
Sample tested Date:	Jan. 21, 2025 to Apr. 21, 2025
Issue Date:	Apr. 21, 2025
Report No.:	CTB25012101303RF04
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	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
CTB25012101303RF04	Apr. 21, 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 15.207(a)	ANSI C63.10-2013	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 (c)	47 CFR Part 15 Subpart E	PASS
Antenna Requirement	47 CFR Part 15 Subpart E Section 15.203	/	PASS

Remark:
Test according to ANSI C63.10-2013.

3. MEASUREMENT UNCERTAINTY

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

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):	AT909
Model Description:	N/A
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): 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): 16.33dBm
Type of Modulation:	WiFi (5G): OFDM
Antenna installation:	WiFi (5G): Internal antenna
Antenna Gain:	WiFi (5.2G): 0.92dBi WiFi (5.3G): 1.02dBi WiFi (5.8G): 1.58dBi
Ratings:	DC 5V charging from adapter DC 3.8V by battery

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	Adapter	JIYIN	JY-05100C	/	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.

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 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 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 5725MHz ~5850 MHz band			
Channel	Frequency	NA	NA
155	5775MHz	NA	NA

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)	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(DC):NV	3.8V
Normal Temperature(℃):NT	23
Low Temperature(℃):LT	0
High Temperature(℃):HT	40

5. TEST FACILITY AND TEST INSTRUMENT USED

5.1 Test Facility

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

5.2 Test Instrument Used

No.	Equipment	Manufacturer	Type No.	Serial No.	Firmware Version	Calibrated until
1	Spectrum Analyzer	Agilent	N9020A	MY52090073	A.14.16	2025/6/28
2	Power Sensor	Agilent	U2021XA	MY56120032	/	2025/6/28
3	Power Sensor	Agilent	U2021XA	MY56120034	/	2025/6/28
4	Communication test set	R&S	CMW500	108058	V3.5.80	2025/6/28
5	Spectrum Analyzer	KEYSIGHT	N9020A	MY51289897	A.14.16	2025/6/28
6	Signal Generator	Agilent	N5181A	MY50140365	A.01.60	2025/6/28
7	Vector signal generator	Agilent	N5182A	MY47420195	A.01.87	2025/6/28
8	Communication test set	Agilent	E5515C	MY50102567	B.19.07 (E1962B)	2025/6/28
9	2.4 GHz Filter	Shenxiang	MSF2400-2483.5MS-1154	20181015001	/	2025/6/30
10	5 GHz Filter	Shenxiang	MSF5150-5850MS-1155	20181015001	/	2025/6/30
11	Filter	Xingbo	XBLBQ-DZA120	190821-1-1	/	2025/6/30
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	/	2025/6/28
14	Temperature humidity chamber	Hongjing	TH-80CH	DG-15174	/	2025/6/28
15	234G Automatic test software	Micowave	MTS8200	Ver. 2.0.0.0	/	/
16	966 chamber	C.R.T.	966	/	/	2027/6/21
17	Receiver	R&S	ESPI	100362	RF_ATTEN_7 (104489/003)	2025/6/28
18	Amplifier	HP	8447E	2945A02747	/	2025/6/28
19	Amplifier	Agilent	8449B	3008A01838	/	2025/6/28
20	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	00869	/	2025/6/28
21	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA9120D	01911	/	2025/6/28

22	EMI test software	Fala	EZ-EMC	FA-03A2 RE	/	/
23	Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-224	/	2025/6/28
24	loop antenna	ZHINAN	ZN30900A	GTS534	/	/
25	40G Horn antenna	A/H/System	SAS-574	588	/	2025/6/28
26	Amplifier	AEROFLEX	Aeroflex	097	/	2025/6/28
27	Power Metter	KEYSIGHT	N1912AP	N/A	A.05.00	2025/6/28

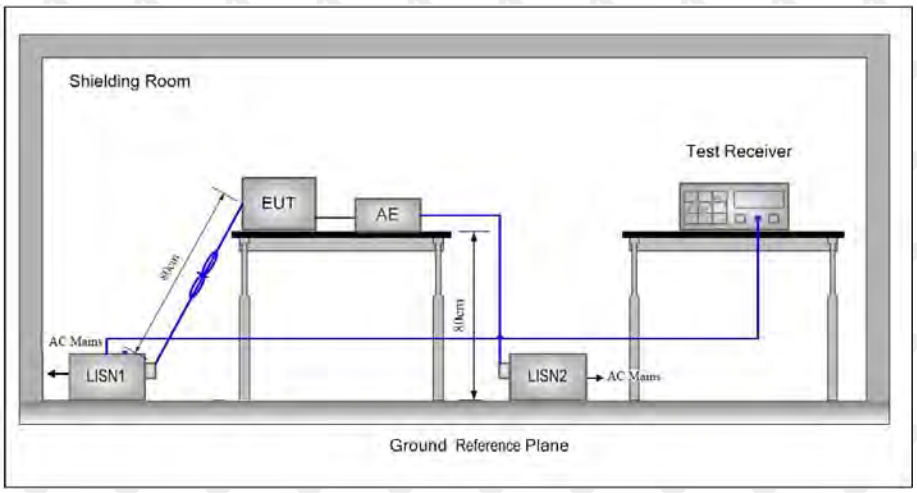
Continuous disturbance						
No.	Equipment	Manufacturer	Model No.	Serial No.	Firmware version	Calibrated until
1	843 Shield Room	C/ R/ T	843	/	/	2027/6/21
2	AMN	ROHDE&SCHWARZ	ESH3-Z5	831551852	/	2025/6/30
3	Pulse limiter	ROHDE&SCHWARZ	ESH3Z2	357881052	/	2025/6/28
4	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100428	V4.42.SP3	2025/6/30
5	Coaxial cable	ZDECL	Z302S	18091904	/	2025/6/30
6	ISN	Schwarzbeck	NTFM8158	183	/	2025/6/30
7	Voltage sensor	Schwarzbeck	TK 9420	01189	/	2025/10/25
8	EZ-EMC	Frad	EMC-con3A1.1	/	/	/
9	Current Probe	FCC	F-52B	199453	/	2025/5/27
10	Communication test set	R&S	CMW500	108058	B.19.07 (E1962B)	2025/6/28
11	Communication test set	Agilent	E5515C	MY50102567	V3.5.80	2025/6/28

Radiated emission(No.1 Chamber)						
No.	Equipment	Manufacturer	Model No.	Serial No.	Firmware version	Calibrated until
1	966 Chamber	C/ R/ T	966	/	/	2027/6/21
2	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA 9120 D	01911	/	2025/7/06
3	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	00869	/	2025/6/29
4	Amplifier	Agilent	8449B	3008A01838	/	2025/6/30
5	Amplifier	HP	8447E	2945A02747	/	2025/6/28
6	loop antenna	Schwarzbeck	FMZB 1519B	1519B-224	/	2025/6/29
7	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESPI	100362	RF_ATTEN_7 (104489/003)	2025/6/28
8	Spectrum Analyzer	KEYSIGHT	N9020A	MY51289897	A.14.16	2025/6/28
9	Coaxial cable	ETS	RFC-SNS-100-NMS-80	/	/	2025/6/28

10	Coaxial cable	ETS	RFC-SN-100-NMS-20	/	/	2025/6/28
11	Coaxial cable	ETS	RFC-SNS-100-SMS-20	/	/	2025/6/28
12	Coaxial cable	ETS	RFC-NNS-100-NMS-300	/	/	2025/6/28
13	EMI test software	Frad	EZ-EMC	Ver/ FA-03A2 RE	/	/
14	Communication test set	R&S	CMW500	108058	B.19.07 (E1962B)	2025/6/28
15	Communication test set	Agilent	E5515C	MY50102567	V3.5.80	2025/6/28

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.

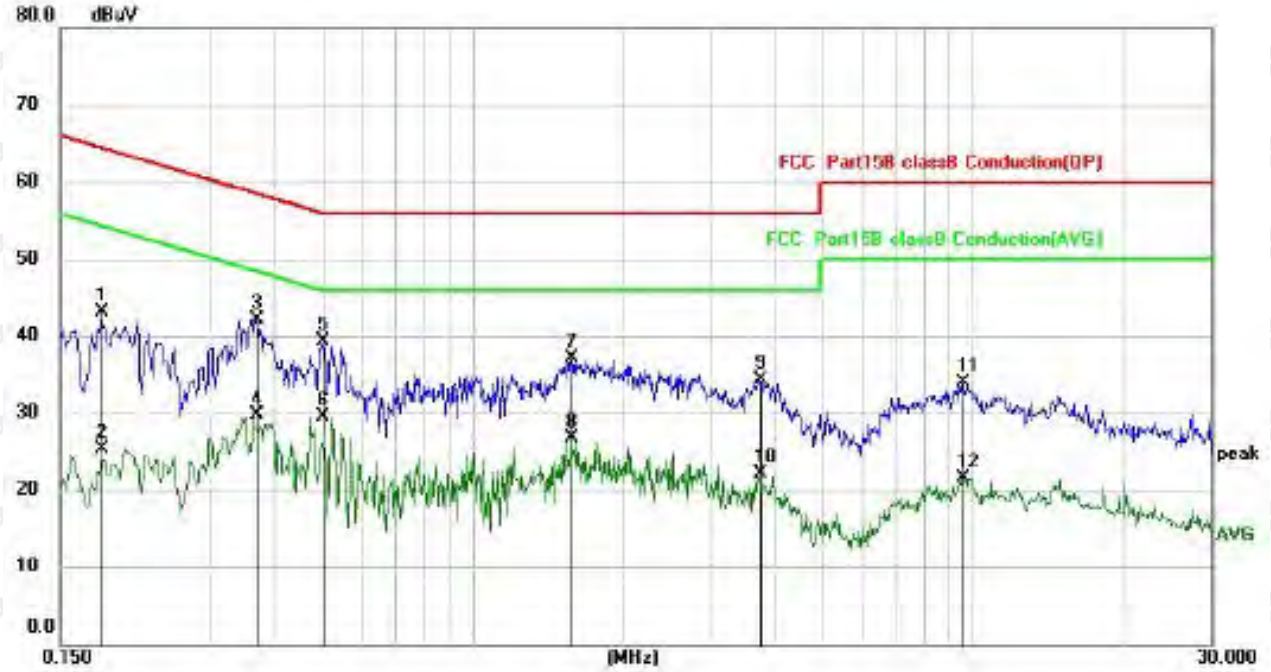
This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0,8 m from the LISN 2.

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

Modulation : 802.11a (the worst data)
Test Channel : 5180MHz

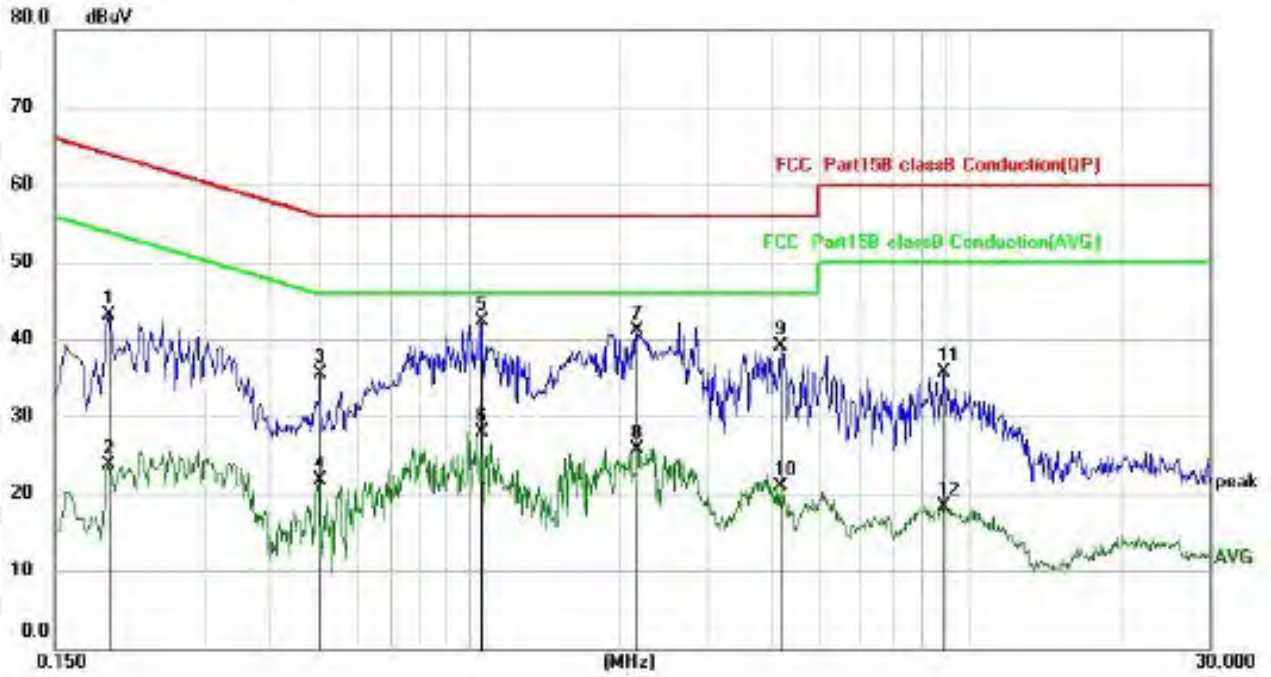
L:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1819	32.36	10.78	43.14	64.40	-21.26	QP
2		0.1819	14.61	10.78	25.39	54.40	-29.01	AVG
3	*	0.3700	31.52	10.59	42.11	58.50	-16.39	QP
4		0.3700	19.03	10.59	29.62	48.50	-18.88	AVG
5		0.5020	28.89	10.50	39.39	56.00	-16.61	QP
6		0.5020	19.07	10.50	29.57	46.00	-16.43	AVG
7		1.5740	25.78	11.31	37.09	56.00	-18.91	QP
8		1.5740	15.44	11.31	26.75	46.00	-19.25	AVG
9		3.7580	22.32	11.97	34.29	56.00	-21.71	QP
10		3.7580	10.22	11.97	22.19	46.00	-23.81	AVG
11		9.5219	20.73	13.19	33.92	60.00	-26.08	QP
12		9.5219	8.39	13.19	21.58	50.00	-28.42	AVG

Modulation : 802.11a (the worst data)
Test Channel : 5180MHz

N:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1922	32.36	10.74	43.10	63.94	-20.84	QP
2		0.1922	12.98	10.74	23.72	53.94	-30.22	AVG
3		0.5060	25.05	10.51	35.56	56.00	-20.44	QP
4		0.5060	11.26	10.51	21.77	46.00	-24.23	AVG
5	*	1.0620	31.22	10.99	42.21	56.00	-13.79	QP
6		1.0620	16.97	10.99	27.96	46.00	-18.04	AVG
7		2.1779	29.51	11.62	41.13	56.00	-14.87	QP
8		2.1779	14.13	11.62	25.75	46.00	-20.25	AVG
9		4.1977	26.95	12.06	39.01	56.00	-16.99	QP
10		4.1977	8.93	12.06	20.99	46.00	-25.01	AVG
11		8.8619	22.60	13.13	35.73	60.00	-24.27	QP
12		8.8619	5.22	13.13	18.35	50.00	-31.65	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

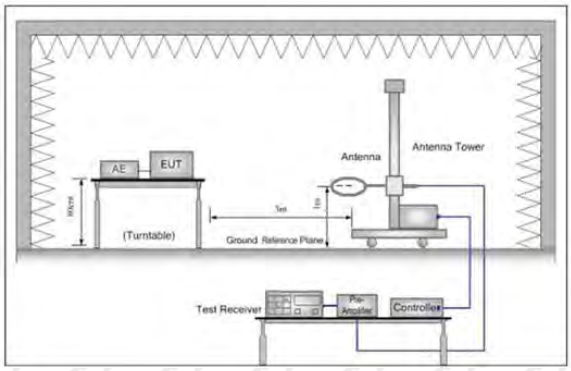


Figure 1. Below 30MHz

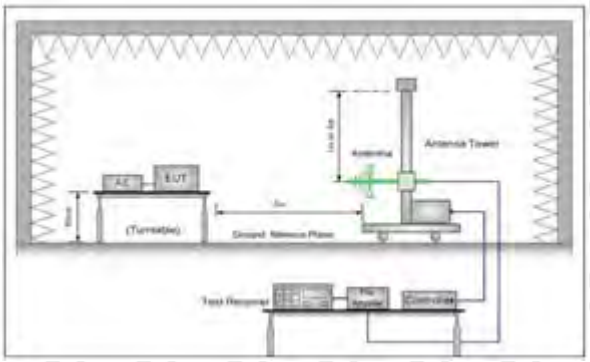


Figure 2. 30MHz to 1GHz

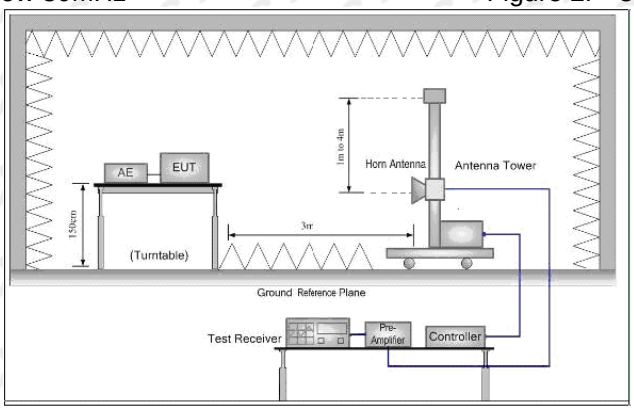


Figure 3. Above 1GHz

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:

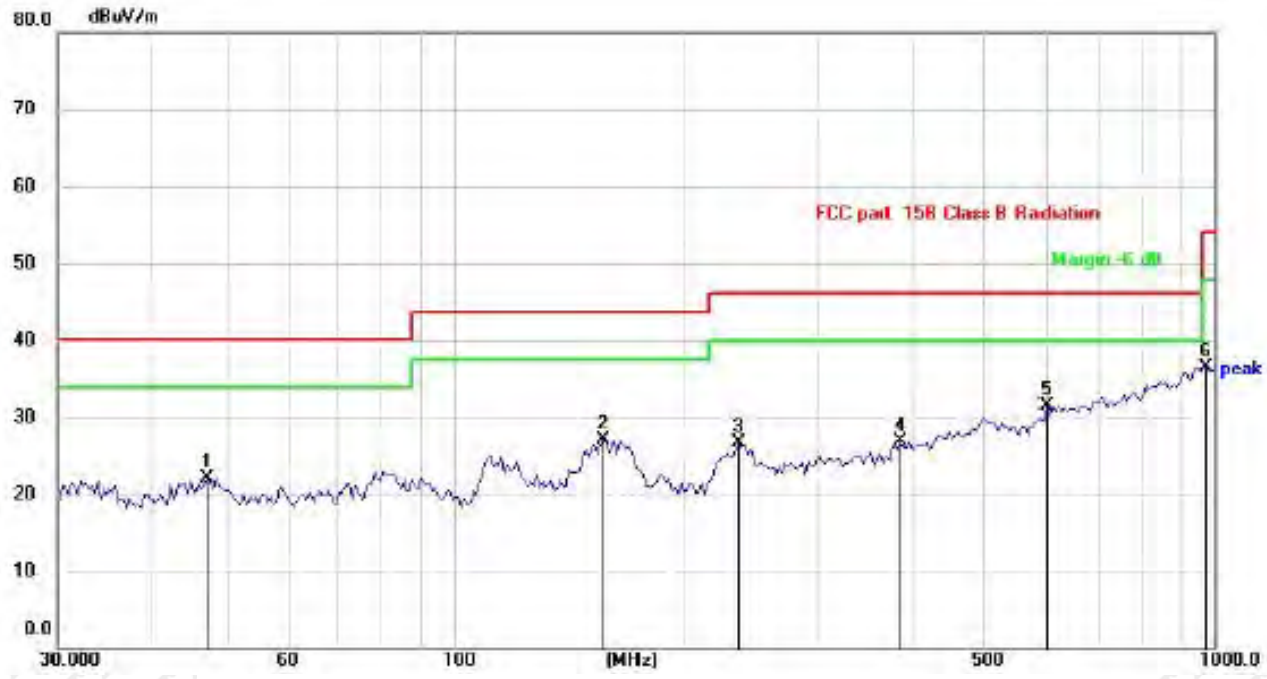
Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30KHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30KHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30KHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30KHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30KHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
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 : 5180MHz
Antenna polarity: H

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		49.4459	30.50	-6.64	23.86	40.00	-16.14	QP
2		131.9889	32.16	-5.17	26.99	43.50	-16.51	QP
3		219.4596	30.82	-4.43	26.39	46.00	-19.61	QP
4		358.5568	29.11	-1.62	27.49	46.00	-18.51	QP
5		601.4265	26.76	3.59	30.35	46.00	-15.65	QP
6	*	908.0730	28.25	8.32	36.57	46.00	-9.43	QP

Modulation : 802.11a (the worst data)
Test Channel : 5180MHz
Antenna polarity: V



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		47.3253	28.78	-6.69	22.09	40.00	-17.91	QP
2		157.2828	28.50	-1.38	27.12	43.50	-16.38	QP
3		237.4757	30.74	-4.06	26.68	46.00	-19.32	QP
4		387.9917	27.94	-0.98	26.96	46.00	-19.04	QP
5	*	601.4265	27.88	3.59	31.47	46.00	-14.53	QP
6		974.0434	27.76	8.78	36.54	54.00	-17.46	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):
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	39.72	16.39	56.11	68.2	-12.09	PK	1.59	109	H
10360	25.99	16.39	42.38	54	-11.62	AV	1.43	125	H
10360	39.83	16.39	56.22	68.2	-11.98	PK	1.07	305	V
10360	25.47	16.39	41.86	54	-12.14	AV	1.49	275	V
Channel:5200MHz									
10400	39.70	16.29	55.99	68.2	-12.21	PK	1.50	107	H
10400	25.97	16.29	42.26	54	-11.74	AV	1.41	121	H
10400	39.81	16.29	56.10	68.2	-12.10	PK	1.00	301	V
10400	25.45	16.29	41.74	54	-12.26	AV	1.40	270	V
Channel:5240MHz									
10480	40.26	16.11	56.37	68.2	-11.83	PK	1.18	222	H
10480	26.84	16.11	42.95	54	-11.05	AV	1.44	92	H
10480	41.01	16.11	57.12	68.2	-11.08	PK	1.69	81	V
10480	26.95	16.11	43.06	54	-10.94	AV	1.01	235	V
Channel:5260MHz									
10520	41.16	16.39	57.55	68.2	-10.65	PK	1.03	153	H
10520	25.77	16.39	42.16	54	-11.84	AV	1.25	314	H
10520	41.47	16.39	57.86	68.2	-10.34	PK	1.36	35	V
10520	25.88	16.39	42.27	54	-11.73	AV	1.50	222	V
Channel:5280MHz									
10560	41.10	16.29	57.39	68.2	-10.81	PK	1.01	150	H
10560	25.71	16.29	42.00	54	-12.00	AV	1.20	311	H
10560	41.41	16.29	57.7	68.2	-10.5	PK	1.32	30	V
10560	25.82	16.29	42.11	54	-11.89	AV	1.51	220	V
Channel:5320MHz									
10640	41.79	16.39	58.18	74	-15.82	PK	1.43	262	H
10640	26.98	16.39	43.37	54	-10.63	AV	1.20	76	H
10640	39.34	16.39	55.73	74	-18.27	PK	1.09	120	V
10640	25.86	16.39	42.25	54	-11.75	AV	1.02	188	V

Channel:5745MHz									
11490	40.72	17.46	58.18	74	-15.82	PK	1.85	259	H
11490	25.38	17.46	42.84	54	-11.16	AV	1.36	352	H
11490	39.52	17.46	56.98	74	-17.02	PK	1.37	306	V
11490	27.99	17.46	45.45	54	-8.55	AV	1.23	110	V
Channel:5785MHz									
11570	41.02	17.32	58.34	74	-15.66	PK	1.80	257	H
11570	29.25	17.32	46.57	54	-7.43	AV	1.30	350	H
11570	39.88	17.32	57.2	74	-16.8	PK	1.31	301	V
11570	27.78	17.32	45.1	54	-8.9	AV	1.22	112	V
Channel:5825MHz									
11650	39.84	17.57	57.41	74	-16.59	PK	1.42	209	H
11650	27.75	17.57	45.32	54	-8.68	AV	1.54	192	H
11650	41.32	17.57	58.89	74	-15.11	PK	1.49	96	V
11650	25.43	17.57	43.00	54	-11.00	AV	1.84	163	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	39.69	16.34	56.03	68.2	-12.17	PK	1.69	260	H
10380	27.80	16.34	44.14	54	-9.86	AV	1.29	146	H
10380	40.23	16.34	56.57	68.2	-11.63	PK	1.87	189	V
10380	27.10	16.34	43.44	54	-10.56	AV	1.56	25	V
Channel:5230MHz									
10460	40.11	16.15	56.26	68.2	-11.94	PK	1.37	23	H
10460	27.65	16.15	43.80	54	-10.20	AV	1.90	170	H
10460	40.21	16.15	56.36	68.2	-11.84	PK	1.37	9	V
10460	25.63	16.15	41.78	54	-12.22	AV	1.59	183	V

Channel:5270MHz									
10540	39.69	16.34	56.03	68.2	-12.17	PK	1.69	260	H
10540	27.80	16.34	44.14	54	-9.86	AV	1.29	146	H
10540	40.23	16.34	56.57	68.2	-11.63	PK	1.87	189	V

10540	27.10	16.34	43.44	54	-10.56	AV	1.56	25	V
Channel:5310MHz									
10620	39.64	16.34	55.98	74	-18.02	PK	1.49	192	H
10620	25.78	16.34	42.12	54	-11.88	AV	1.21	103	H
10620	39.19	16.34	55.53	74	-18.47	PK	1.80	6	V
10620	25.26	16.34	41.60	54	-12.40	AV	1.27	345	V

Channel:5755MHz									
11510	40.42	17.49	57.91	74	-16.09	PK	1.73	165	H
11510	25.88	17.49	43.37	54	-10.63	AV	1.86	87	H
11510	39.43	17.49	56.92	74	-17.08	PK	1.78	204	V
11510	27.32	17.49	44.81	54	-9.19	AV	1.88	234	V
Channel:5795MHz									
11590	41.00	17.52	58.52	74	-16.37	PK	1.23	320	H
11590	25.32	17.52	42.84	54	-15.48	AV	1.49	187	H
11590	40.09	17.52	57.61	74	-16.39	PK	1.43	11	V
11590	27.73	17.52	45.25	54	-8.75	AV	1.77	84	V

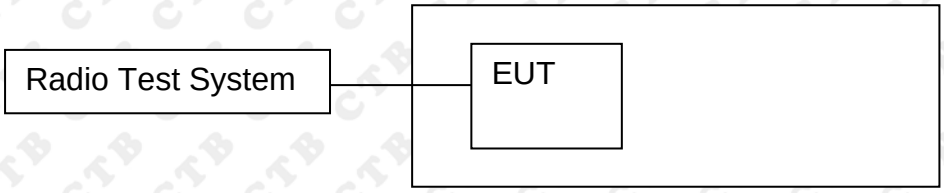
Modulation : 802.11(VH80) (the worst data)

Freq (MHz)	Rd_level (dBuV/m)	Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	detector	Height	Degree	Antenna polarization
Channel:5210MHz									
10420	41.38	16.25	57.63	68.2	-10.57	PK	1.28	135	H
10420	25.76	16.25	42.01	54	-11.99	AV	1.82	227	H
10420	39.18	16.25	55.43	68.2	-12.77	PK	1.21	280	V
10420	25.51	16.25	41.76	54	-12.24	AV	1.88	141	V
Channel:5290MHz									
10580	40.74	16.25	56.99	68.2	-11.21	PK	1.55	76	H
10580	25.90	16.25	42.15	54	-11.85	AV	1.51	321	H
10580	40.93	16.25	57.18	68.2	-11.02	PK	1.72	51	V
10580	27.85	16.25	44.10	54	-9.90	AV	1.30	237	V
Channel:5775MHz									
11550	40.18	17.50	57.68	74	-16.32	PK	1.09	331	H
11550	27.39	17.50	44.89	54	-9.11	AV	1.52	343	H
11550	39.36	17.50	56.86	74	-17.14	PK	1.25	173	V
11550	26.85	17.50	44.35	54	-9.65	AV	1.09	214	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

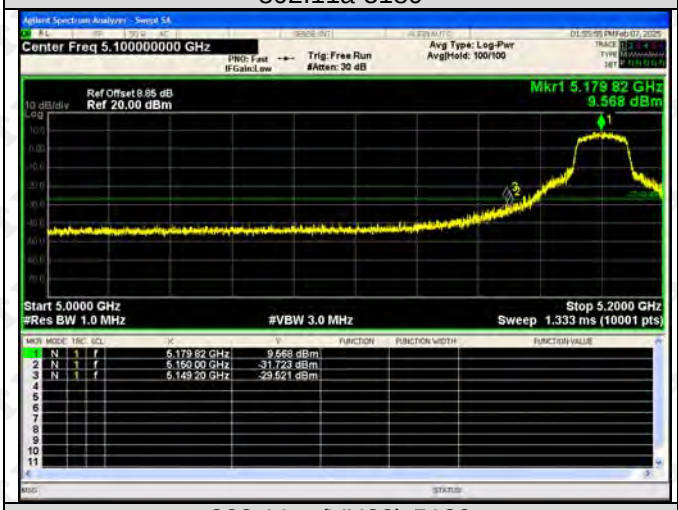
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then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

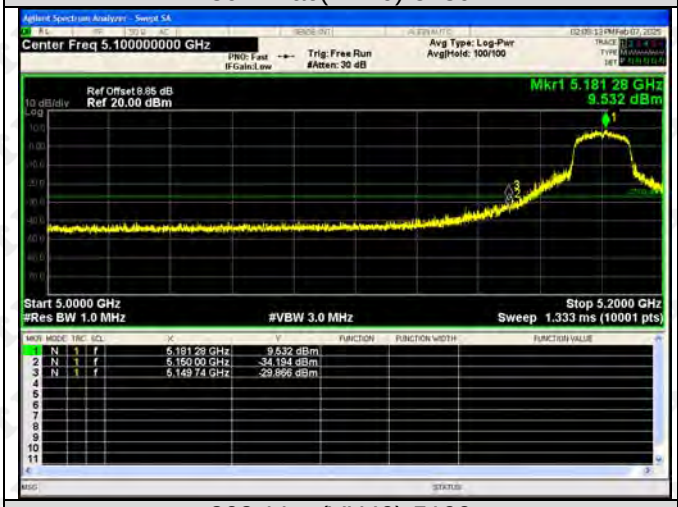
5150-5250MHz:

802.11a-5180



802.11a-5240

802.11ac(VH20)-5180



802.11ac(VH20)-5240

802.11ac(VH40)-5190

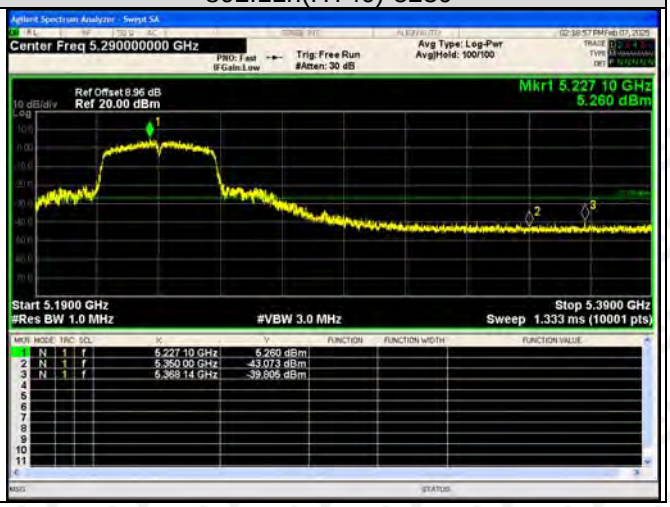
802.11ac(VH40)-5230

802.11n(HT20)-5180

802.11n(HT20)-5240

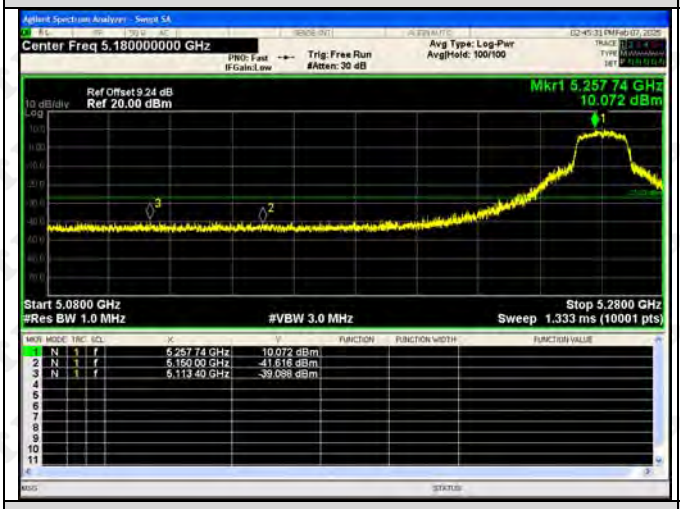
802.11n(HT40)-5190

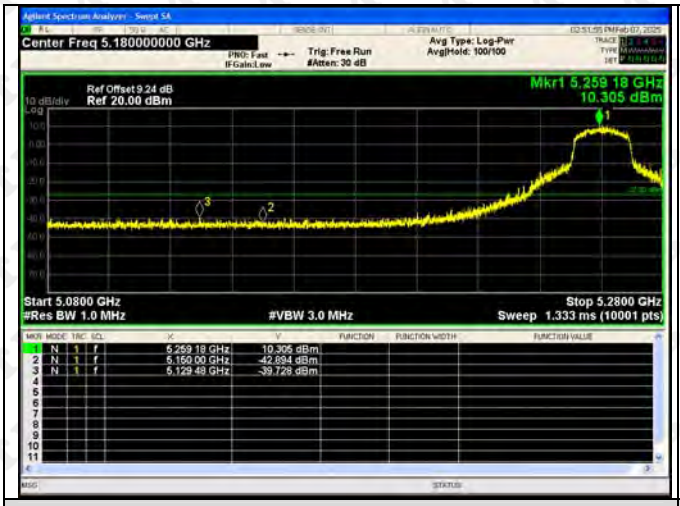
802.11n(HT40)-5230



802.11ac(VH80)-5210

5250-5350MHz:

802.11a-5260	802.11a-5320
	
802.11ac(VH20)-5260	802.11ac(VH20)-5320
	
802.11ac(VH40)-5270	802.11ac(VH40)-5310
	
802.11n(HT20)-5260	802.11n(HT20)-5320



802.11n(HT40)-5270

802.11n(HT40)-5310

802.11ac(VH80)-5290

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5725-5850MHz

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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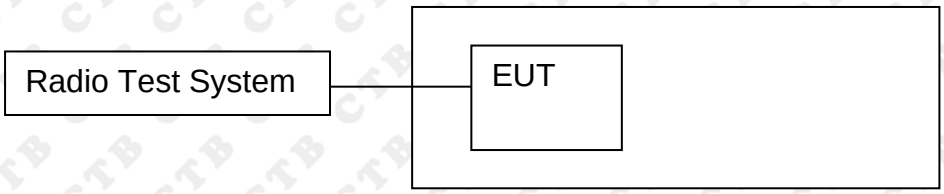
9. CONDUCTED OUTPUT POWER

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.
For Duty cycle:
Measurements of duty cycle and transmission duration shall be performed using one of the following techniques:

a) A diode detector and an oscilloscope that together have a sufficiently short response time to permit accurate measurements of the ON and OFF times of the transmitted signal.
b) The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the ON and OFF times of the transmitted signal:
1) Set the center frequency of the instrument to the center frequency of the transmission.
2) Set RBW≥OBW if possible; otherwise, set RBW to the largest available value.
3) Set VBW≥RBW. Set detector = peak or average.
4)The zero-span measurement method shall not be used unless both RBW and VBW are> 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring the duty cycle shall not be used if T≤16.7 μs.)

9.4 Test Result

5150-5250MHz:

Test mode1	Test Channel (MHz)	Output Power dBm	Limit dBm
802.11a20	5180	16.288	23.98
	5200	16.145	23.98
	5240	16.158	23.98
802.11ac20	5180	16.295	23.98
	5200	16.043	23.98
	5240	16.109	23.98
802.11ac40	5190	14.057	23.98
	5230	14.599	23.98
802.11ac80	5210	7.484	23.98
802.11n20	5180	16.33	23.98
	5200	16.2	23.98
	5240	16.104	23.98
802.11n40	5190	14.223	23.98
	5230	14.267	23.98

5250-5350MHz:

Test mode1	Test Channel (MHz)	Output Power dBm	Limit dBm
802.11a20	5260	11.506	23.98
	5280	11.079	23.98
	5320	9.796	23.98
802.11ac20	5260	10.797	23.98
	5280	10.208	23.98
	5320	9.728	23.98
802.11ac40	5270	7.712	23.98
	5310	7.106	23.98
802.11ac80	5290	7.398	23.98
802.11n20	5270	11.595	23.98
	5310	10.177	23.98
	5260	9.679	23.98
802.11n40	5280	14.211	23.98
	5320	7.304	23.98

5725-5850MHz:

Test mode1	Test Channel (MHz)	Output Power dBm	Limit dBm
802.11a20	5745	11.677	30
	5785	11.546	30
	5825	14.004	30
802.11ac20	5745	11.718	30
	5785	11.488	30
	5825	13.98	30
802.11ac40	5755	12.198	30
	5795	11.948	30
802.11ac80	5775	13.094	30
802.11n20	5745	11.899	30
	5785	11.443	30
	5825	13.822	30
802.11n40	5755	12.163	30
	5795	11.748	30

Duty Cycle 5150-5250MHz:

Mode	Channel.	Duty Cycle(%)	Correction Factor (dB)
802.11a20	LCH	100	0
802.11ac20	LCH	100	0
802.11ac40	LCH	100	0
802.11ac80	LCH	100	0
802.11n20	LCH	100	0
802.11n40	LCH	100	0

Duty Cycle 5250-5350MHz:

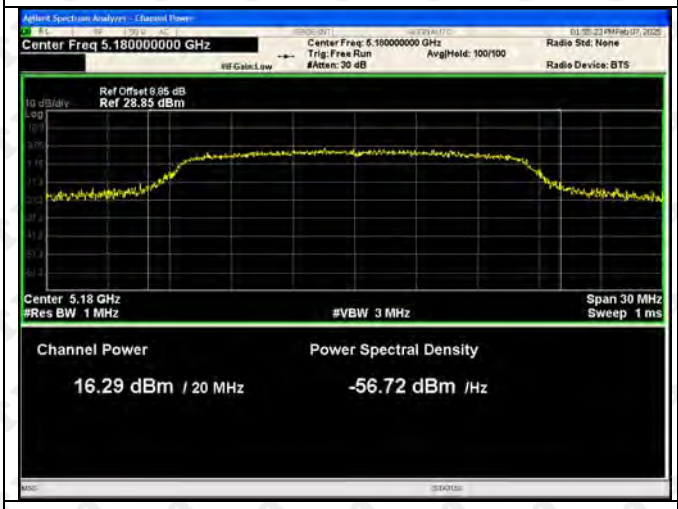
Mode	Channel.	Duty Cycle(%)	Correction Factor (dB)
802.11a20	LCH	100	0
802.11ac20	LCH	100	0
802.11ac40	LCH	100	0
802.11ac80	LCH	100	0
802.11n20	LCH	100	0
802.11n40	LCH	100	0

Duty Cycle 5725-5850MHz:

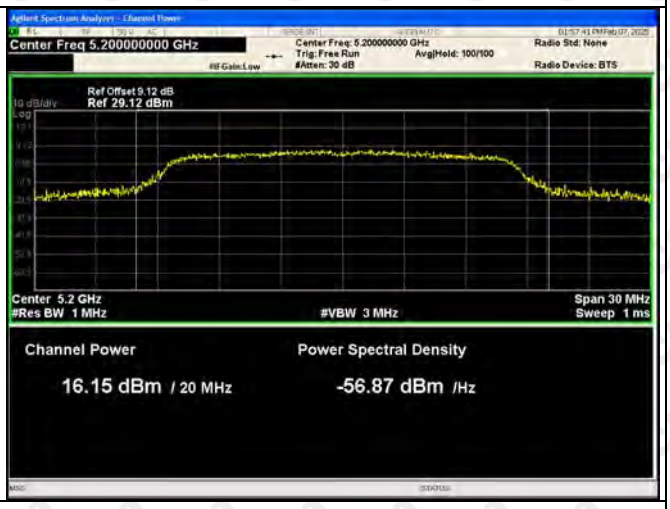
Mode	Channel.	Duty Cycle(%)	Correction Factor (dB)
802.11a20	LCH	100	0
802.11ac20	LCH	100	0
802.11ac40	LCH	100	0
802.11ac80	LCH	100	0
802.11n20	LCH	100	0
802.11n40	LCH	100	0

Test Graph:
5150-5250MHz-Power

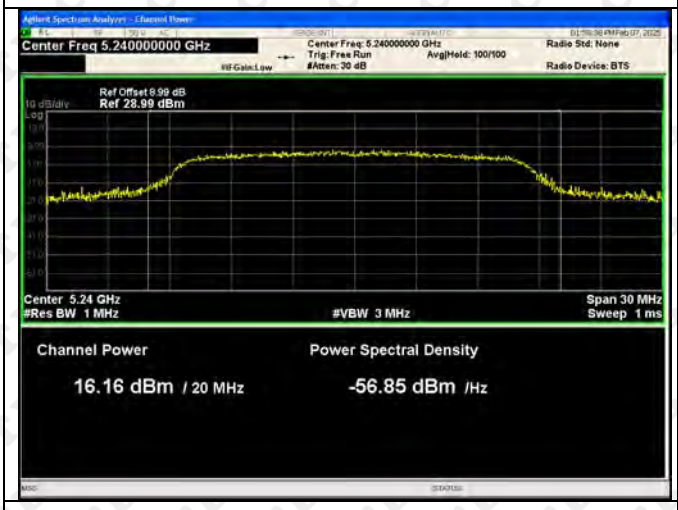
802.11a-5180



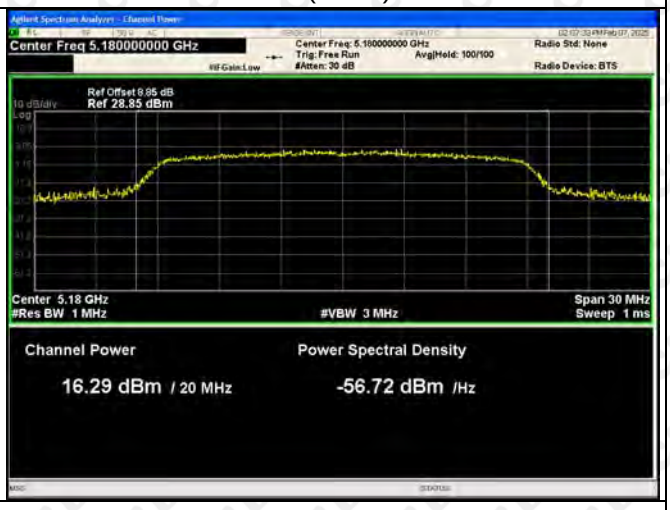
802.11a-5200



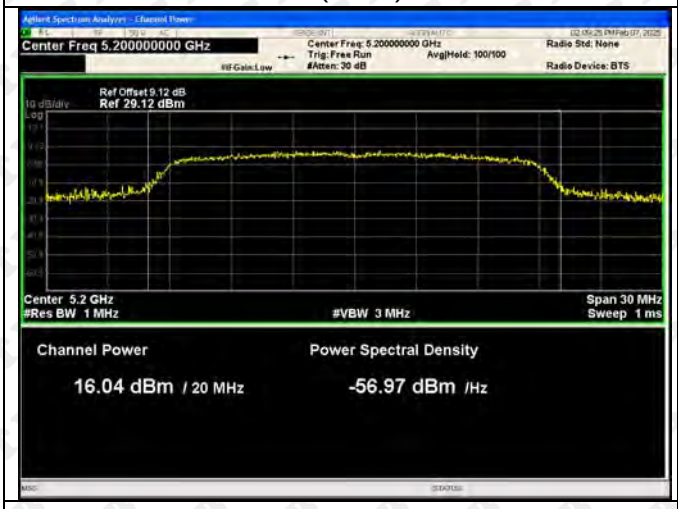
802.11a-5240



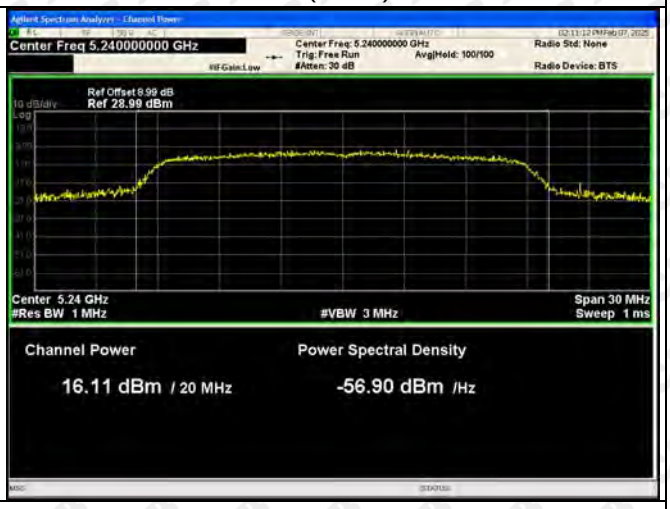
802.11ac(VH20)-5180



802.11ac(VH20)-5200



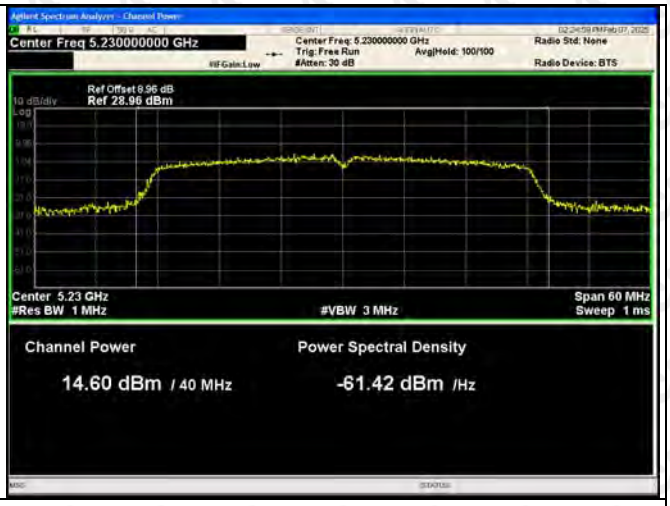
802.11ac(VH20)-5240



802.11ac(VH40)-5190

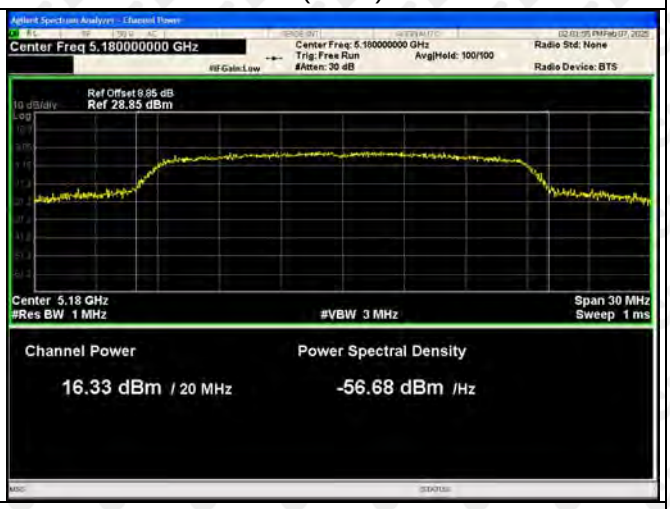
802.11ac(VH40)-5230

802.11ac(VH80)-5210



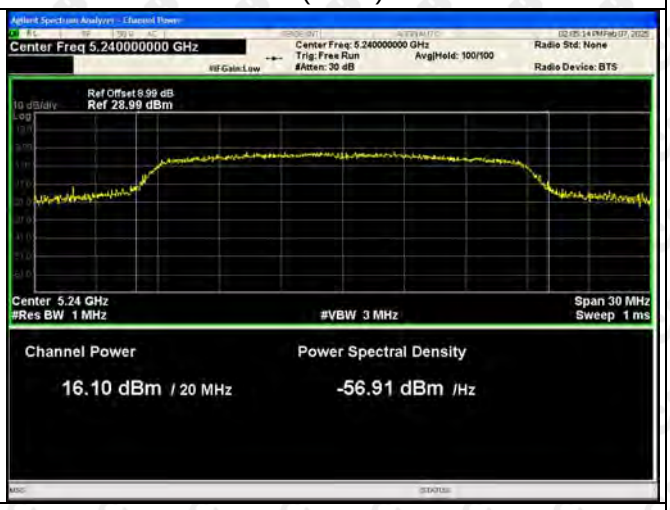
802.11n(HT20)-5180

802.11n(HT20)-5200

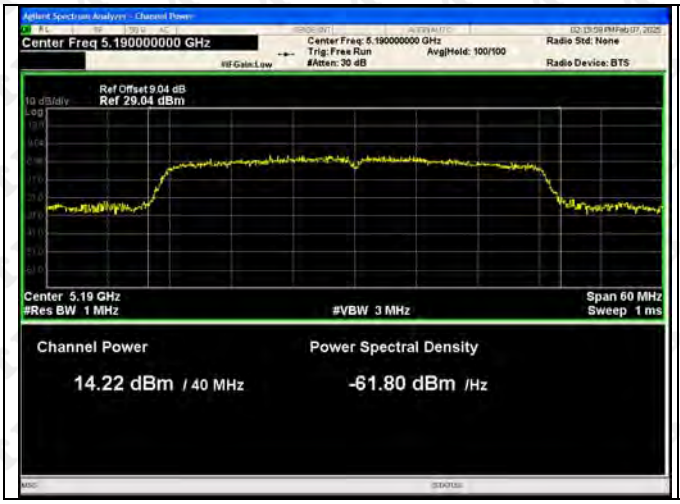


802.11n(HT20)-5240

802.11n(HT40)-5190

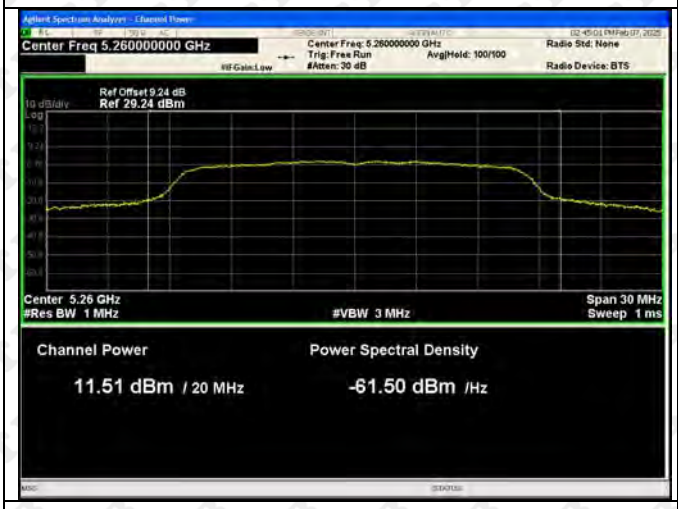
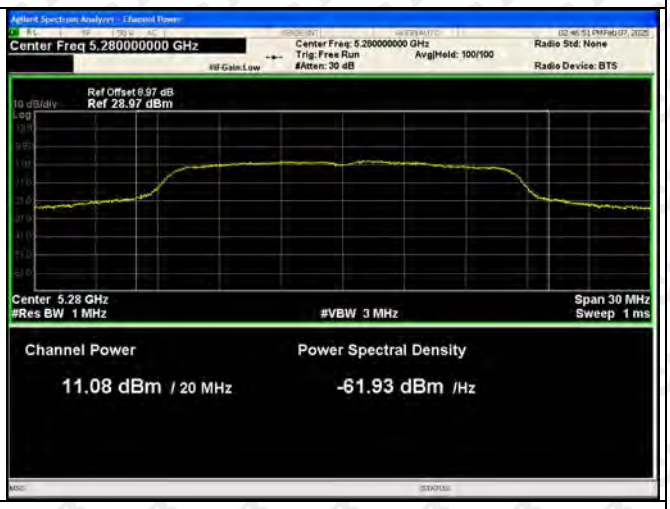
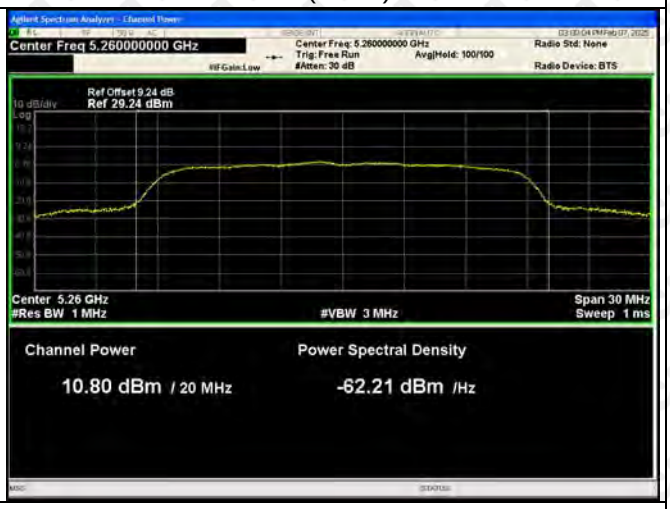
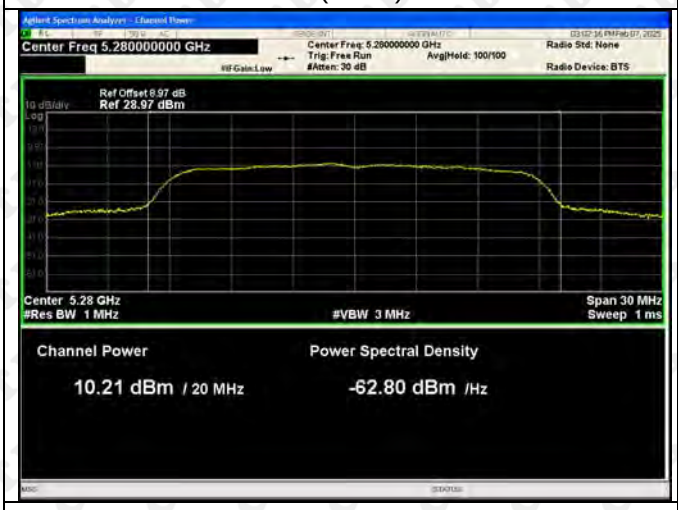


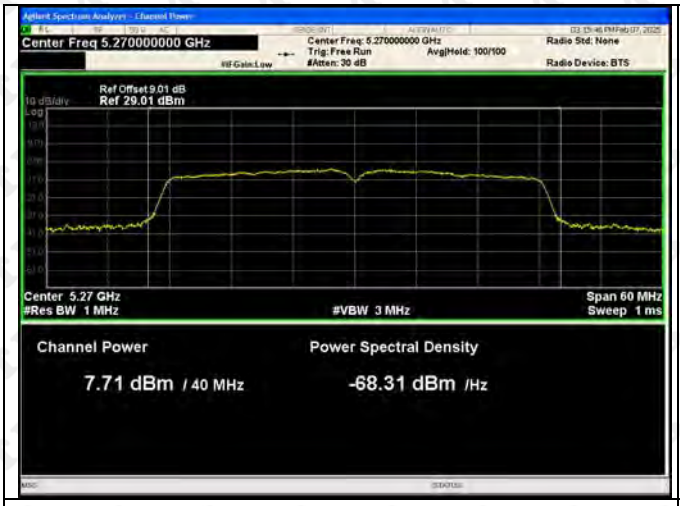
802.11n(HT40)-5230


Agilent Spectrum Analyzer - Channel Power
Center Freq 5.190000000 GHz
Center Freq: 5.190000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
Ref Offset 9.04 dB
10 dB/div
Ref 29.04 dBm
Log
Center 5.19 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 60 MHz
Sweep 1 ms
Channel Power
14.22 dBm / 40 MHz
Power Spectral Density
-61.80 dBm /Hz

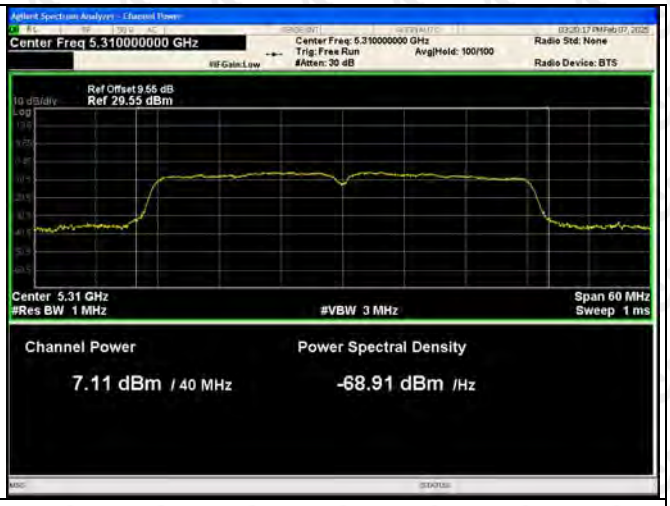

Agilent Spectrum Analyzer - Channel Power
Center Freq 5.230000000 GHz
Center Freq: 5.230000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
Ref Offset 8.96 dB
10 dB/div
Ref 28.96 dBm
Log
Center 5.23 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 60 MHz
Sweep 1 ms
Channel Power
14.27 dBm / 40 MHz
Power Spectral Density
-61.75 dBm /Hz

5250-5350MHz-Power

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

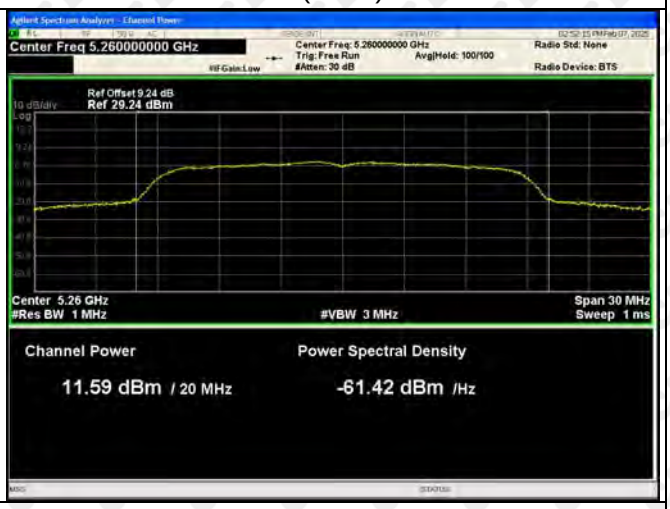


802.11ac(VH80)-5290



802.11n(HT20)-5260

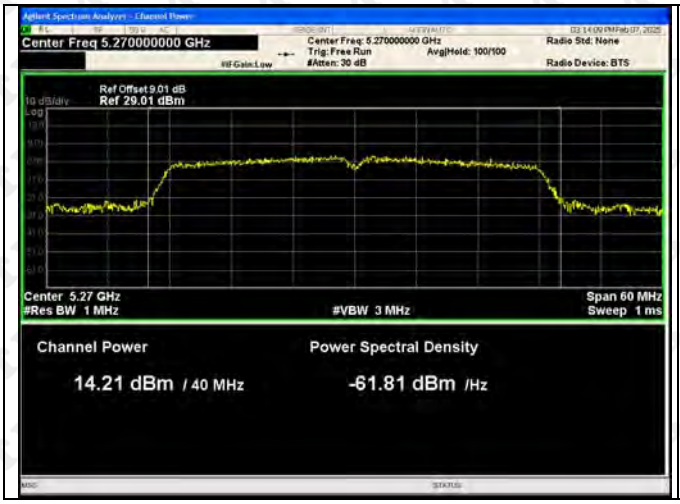
802.11n(HT20)-5280

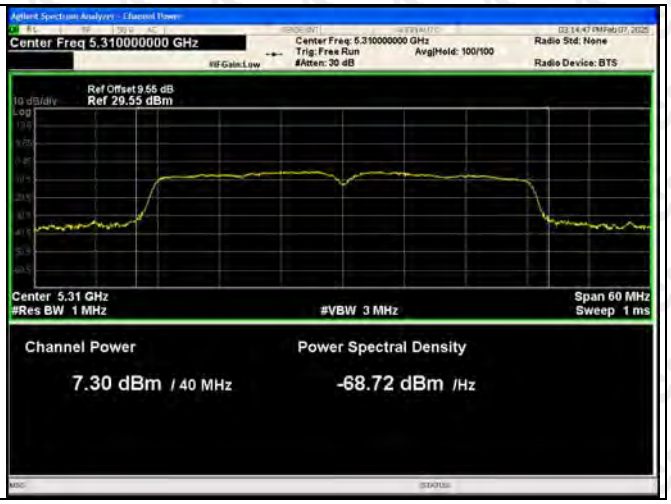


802.11n(HT20)-5320

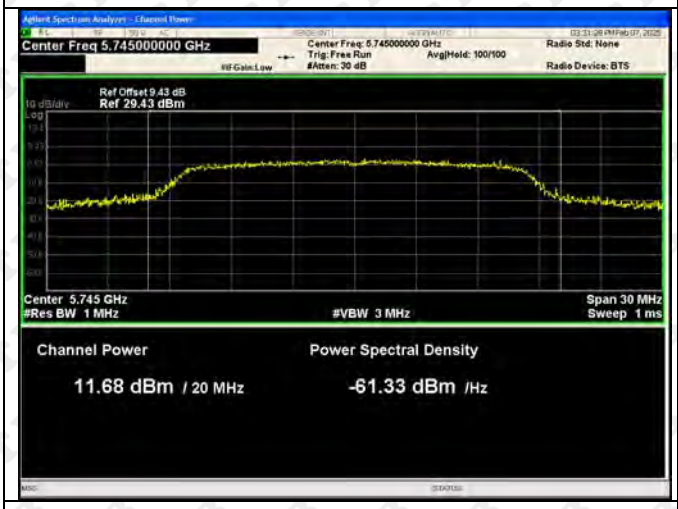
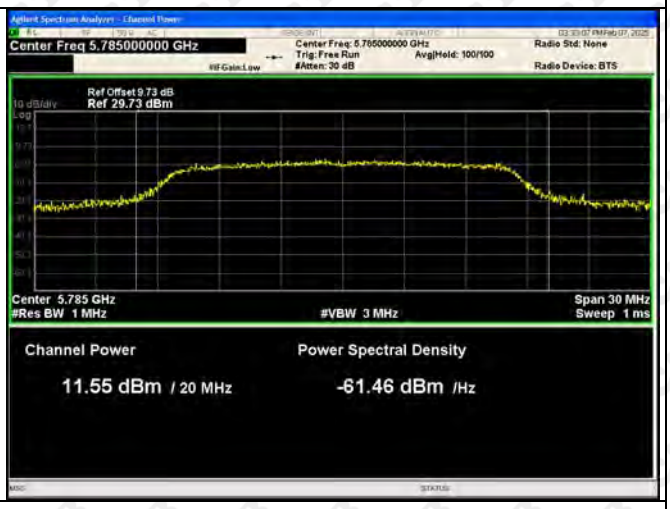
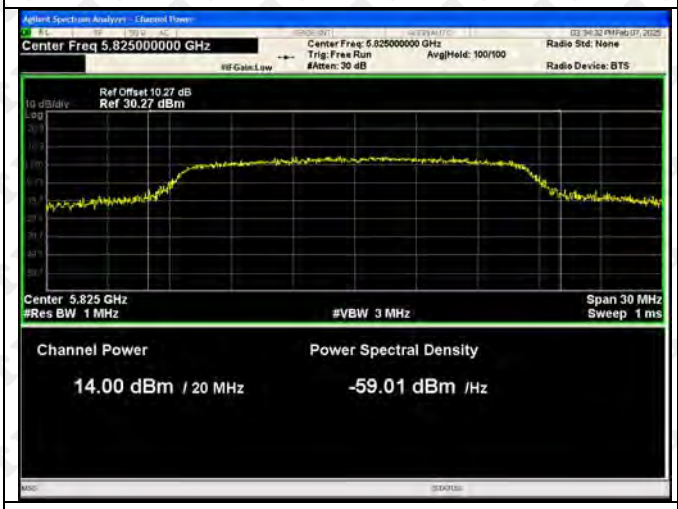
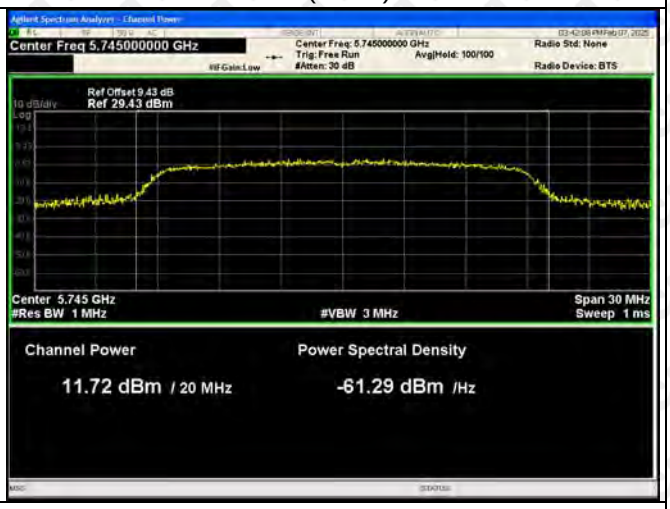
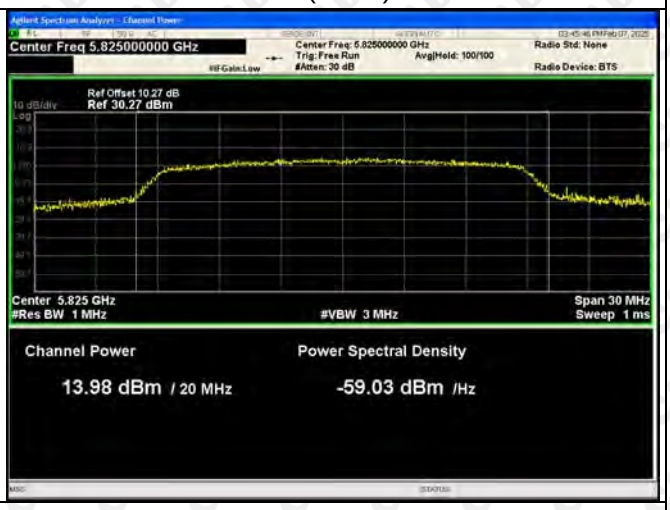
802.11n(HT40)-5270

802.11n(HT40)-5310


Agilent Spectrum Analyzer - Channel Power
Center Freq 5.270000000 GHz
Center Freq: 5.270000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
Ref Offset 9.01 dB
10 dB/div
Ref 29.01 dBm
Center 5.27 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 60 MHz
Sweep 1 ms
Channel Power
14.21 dBm / 40 MHz
Power Spectral Density
-61.81 dBm /Hz


Agilent Spectrum Analyzer - Channel Power
Center Freq 5.310000000 GHz
Center Freq: 5.310000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
Ref Offset 9.55 dB
10 dB/div
Ref 29.55 dBm
Center 5.31 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 60 MHz
Sweep 1 ms
Channel Power
7.30 dBm / 40 MHz
Power Spectral Density
-68.72 dBm /Hz

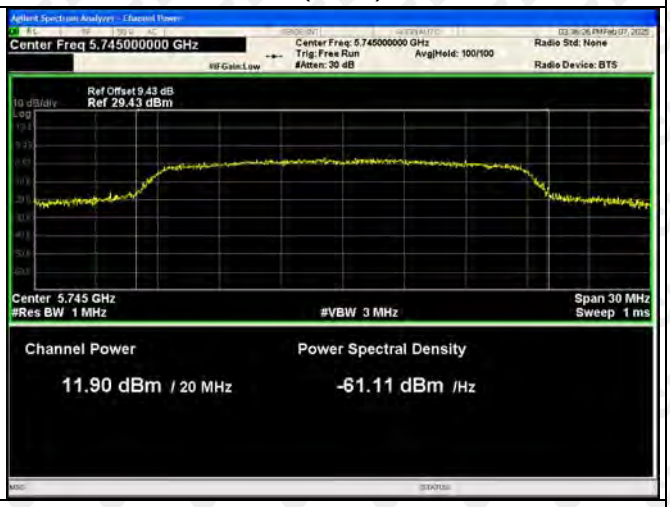
5725-5850MHz:-Power

802.11a-5745	802.11a-5785
	
802.11a-5825	802.11ac(VH20)-5745
	
802.11ac(VH20)-5785	802.11ac(VH20)-5825
	
802.11ac(VH40)-5755	802.11ac(VH40)-5795

802.11ac(VH80)-5775

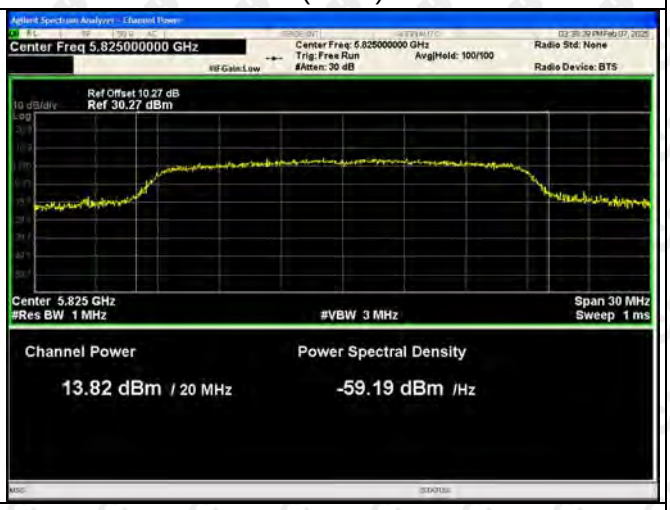
802.11n(HT20)-5745

802.11n(HT20)-5785

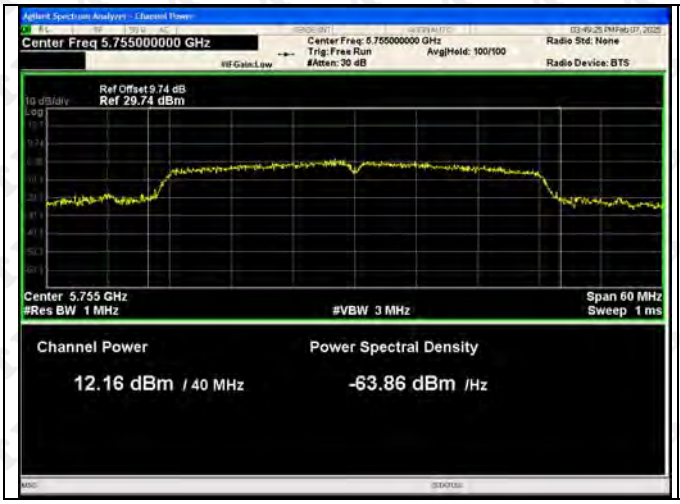


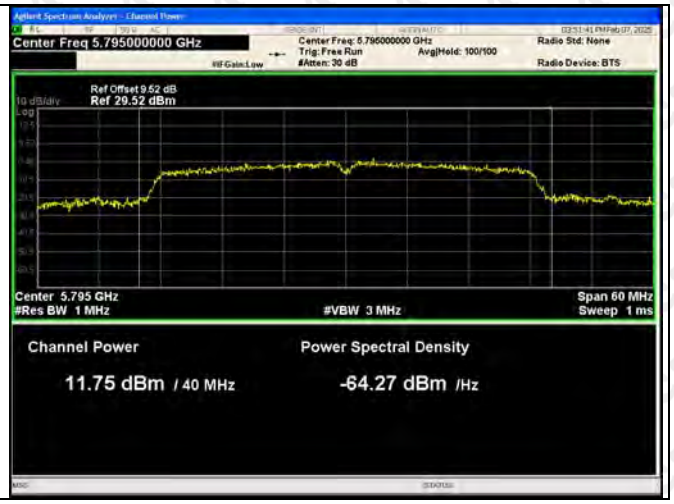
802.11n(HT20)-5825

802.11n(HT40)-5795

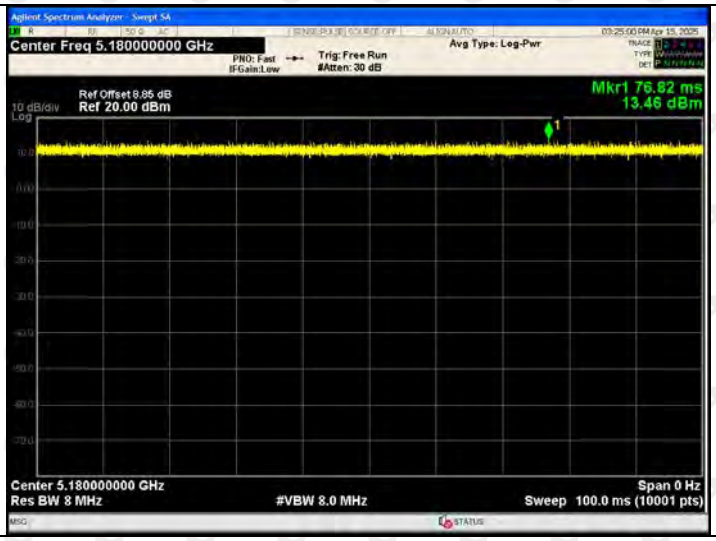


802.11n(HT40)-5825

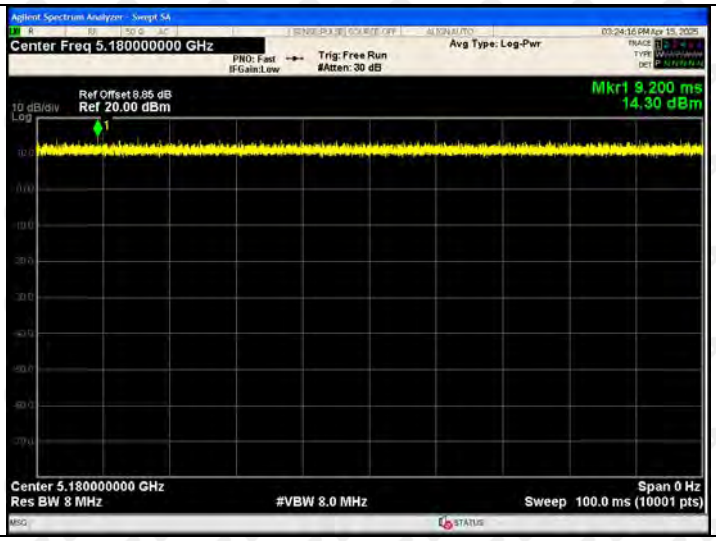

Agilent Spectrum Analyzer - Channel Power
Center Freq 5.755000000 GHz
Center Freq: 5.755000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
Ref Offset 9.74 dB
10 dB/div
Ref 29.74 dBm
Center 5.755 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 60 MHz
Sweep 1 ms
Channel Power
12.16 dBm / 40 MHz
Power Spectral Density
-63.86 dBm /Hz


Agilent Spectrum Analyzer - Channel Power
Center Freq 5.795000000 GHz
Center Freq: 5.795000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
Ref Offset 9.52 dB
10 dB/div
Ref 29.52 dBm
Center 5.795 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 60 MHz
Sweep 1 ms
Channel Power
11.75 dBm / 40 MHz
Power Spectral Density
-64.27 dBm /Hz

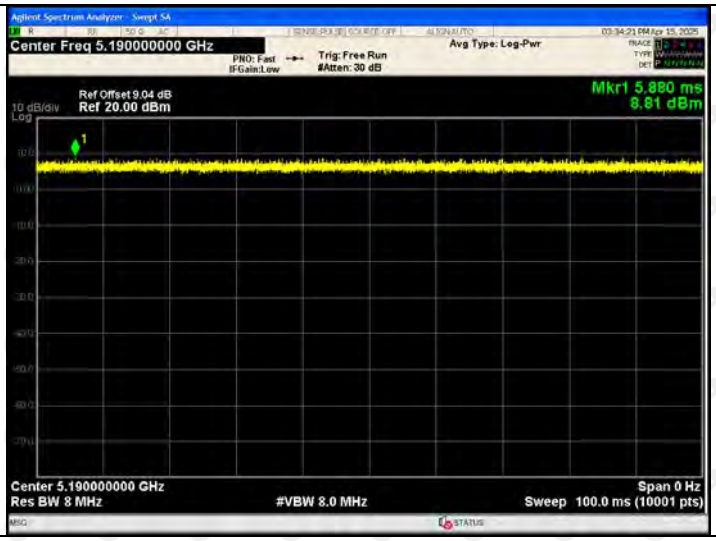
Duty Cycle
5150-5250MHz
802.11a:
Test Graph:

Low channel	

802.11ac20:
Test Graph:

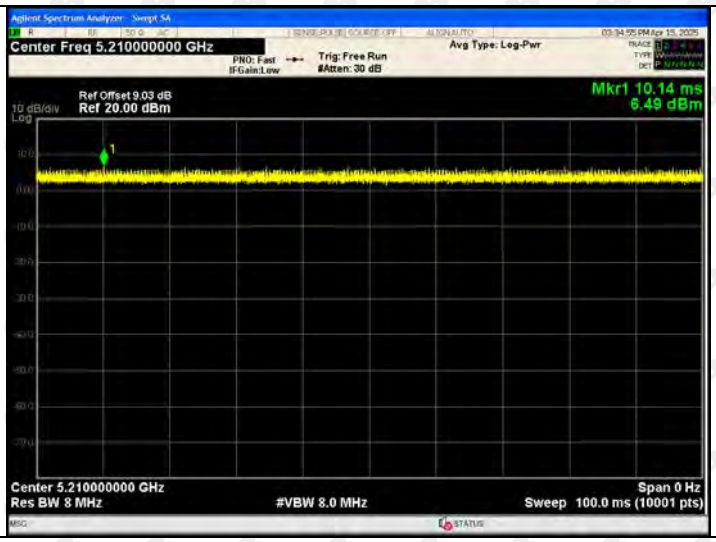
Low channel	

802.11ac40:
Test Graph:

Low channel	

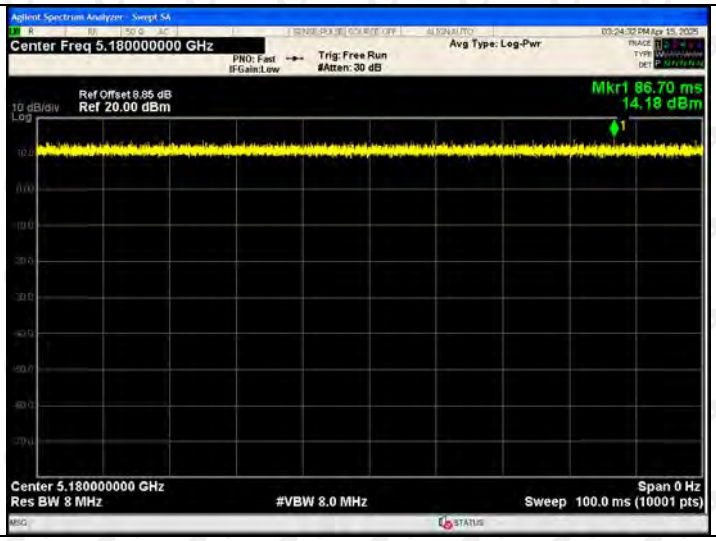
802.11ac80:

Test Graph:

Low channel	

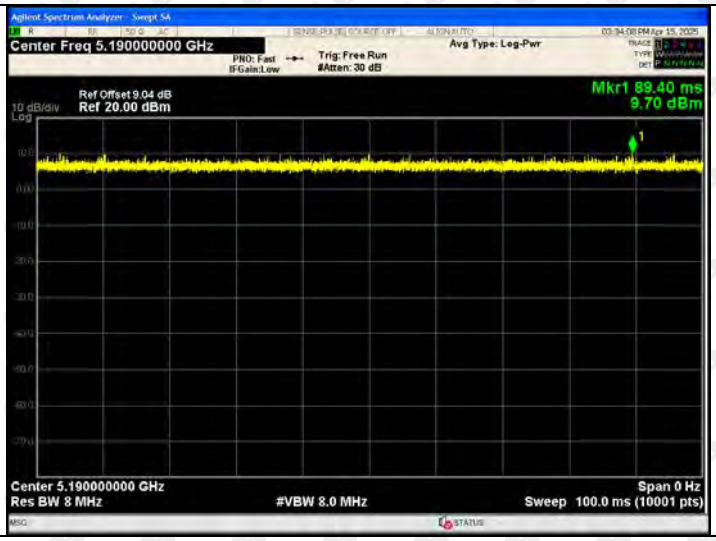
802.11n20:

Test Graph:

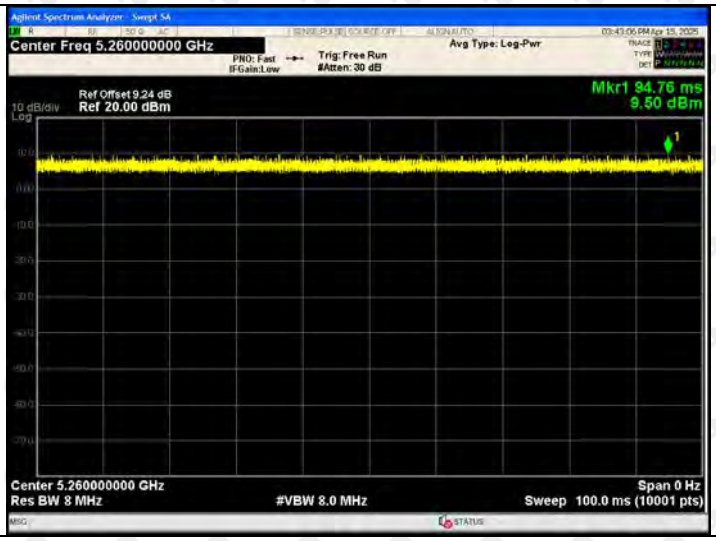
Low channel	

802.11n40:

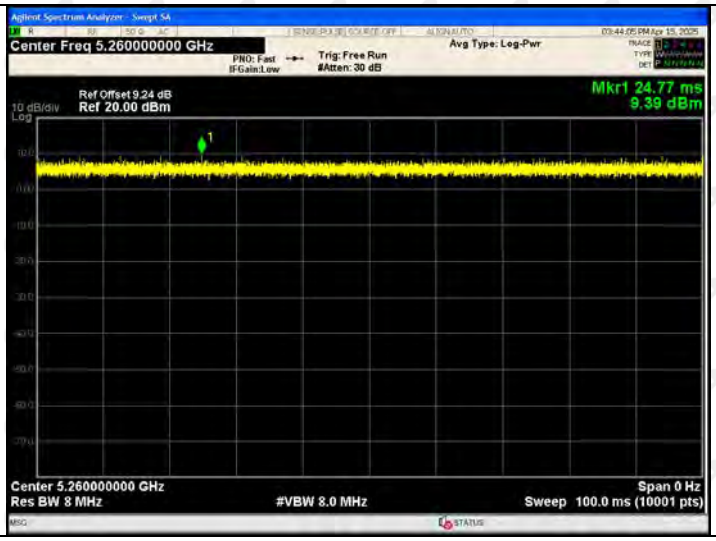
Test Graph:

Low channel	

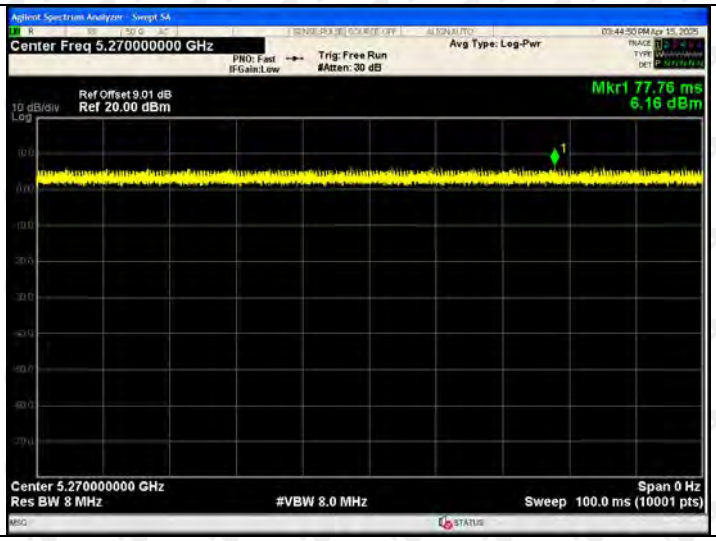
5250-5350MHz
802.11a:
Test Graph:

Low channel	

802.11ac20:
Test Graph:

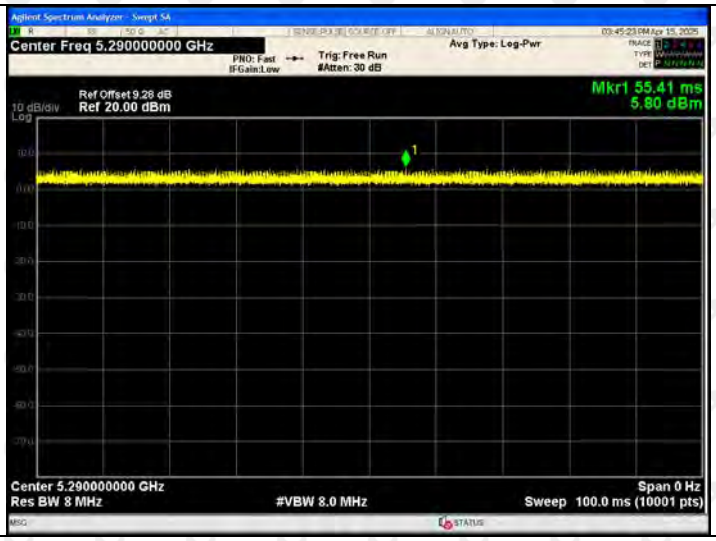
Low channel	

802.11ac40:
Test Graph:

Low channel	

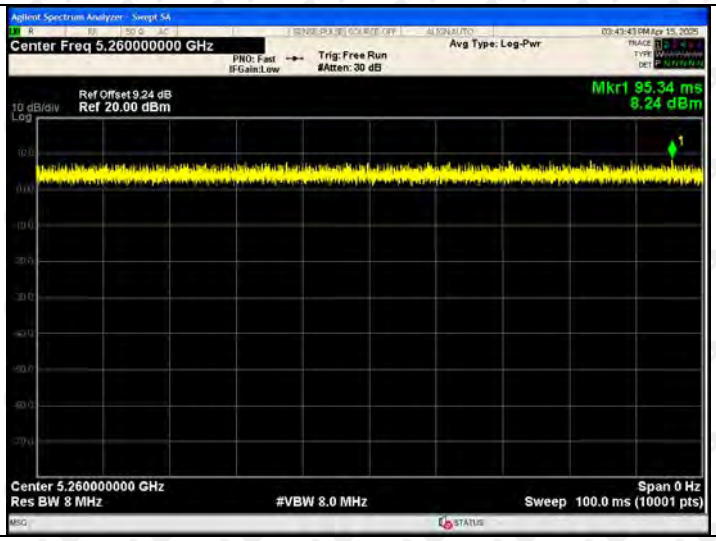
802.11ac80:

Test Graph:

Low channel	

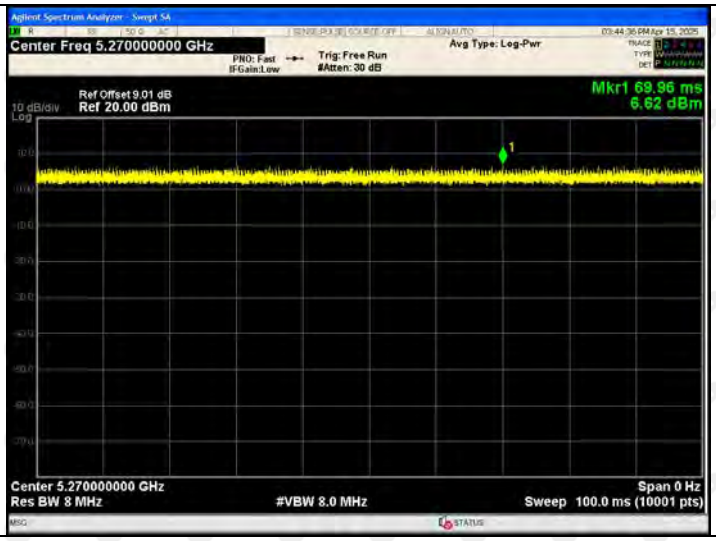
802.11n20:

Test Graph:

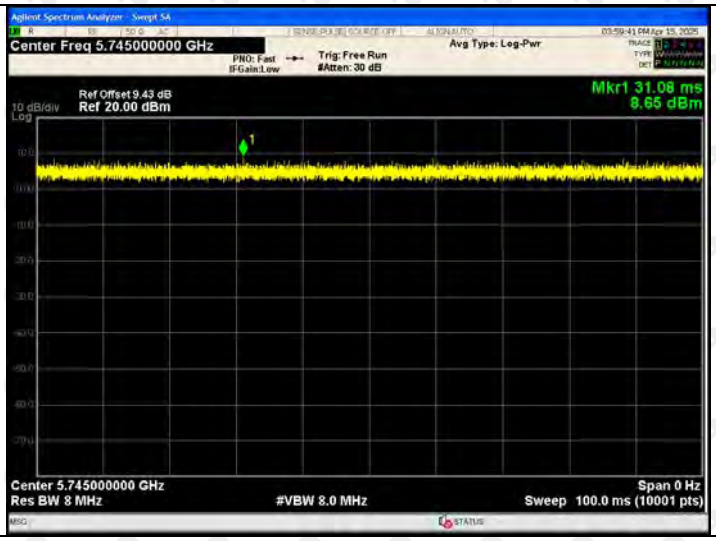
Low channel	

802.11n40:

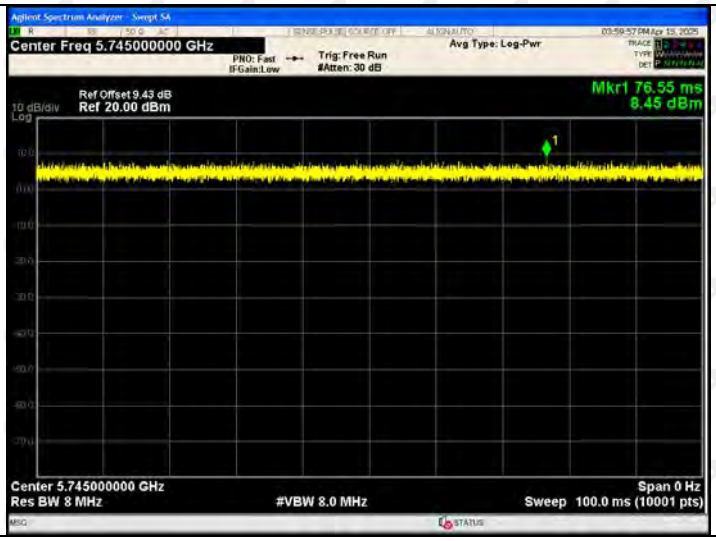
Test Graph:

Low channel	

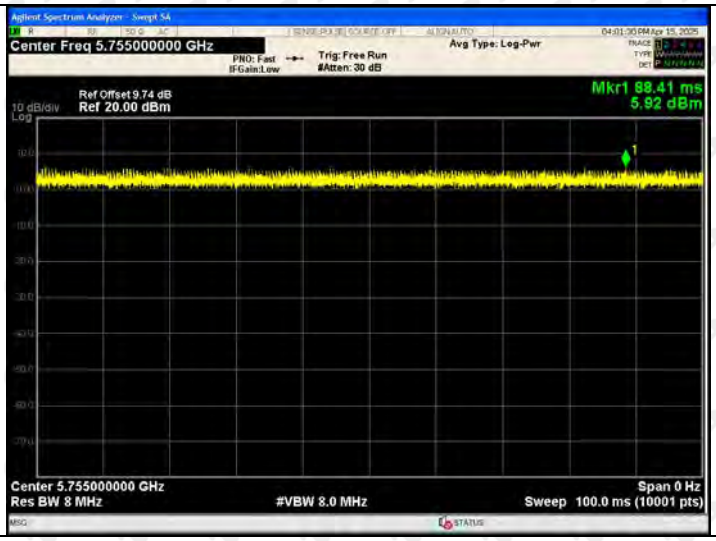
5725-5850MHz
802.11a:
Test Graph:

Low channel	

802.11ac20:
Test Graph:

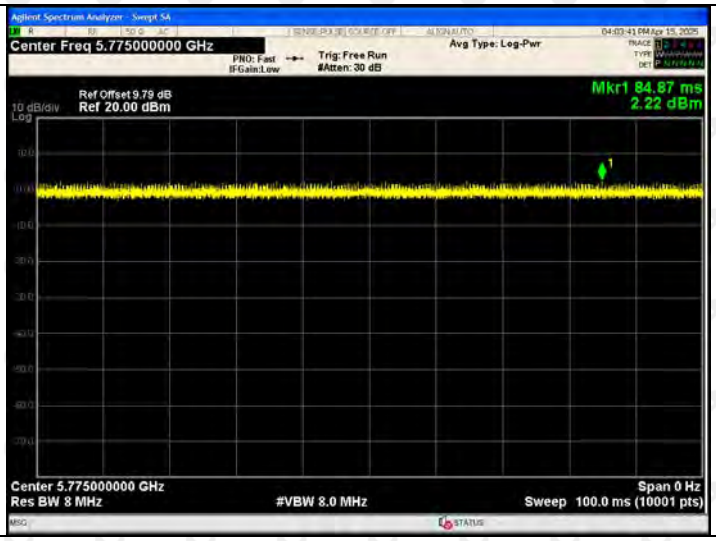
Low channel	

802.11ac40:
Test Graph:

Low channel	

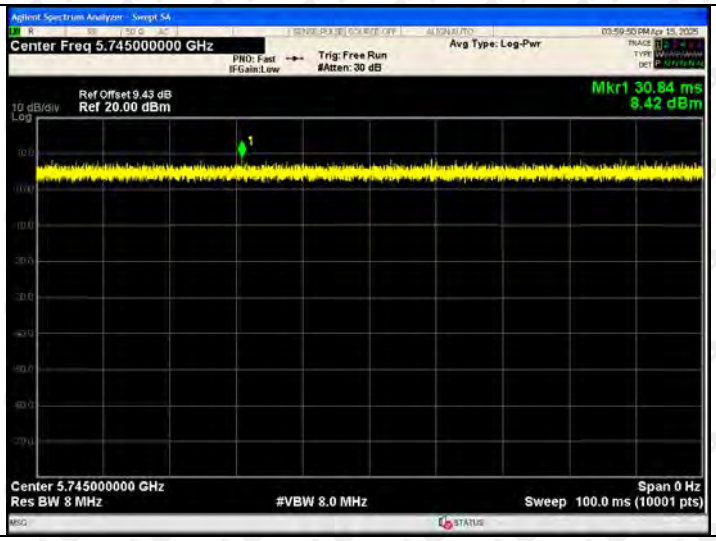
802.11ac80:

Test Graph:

Low channel	

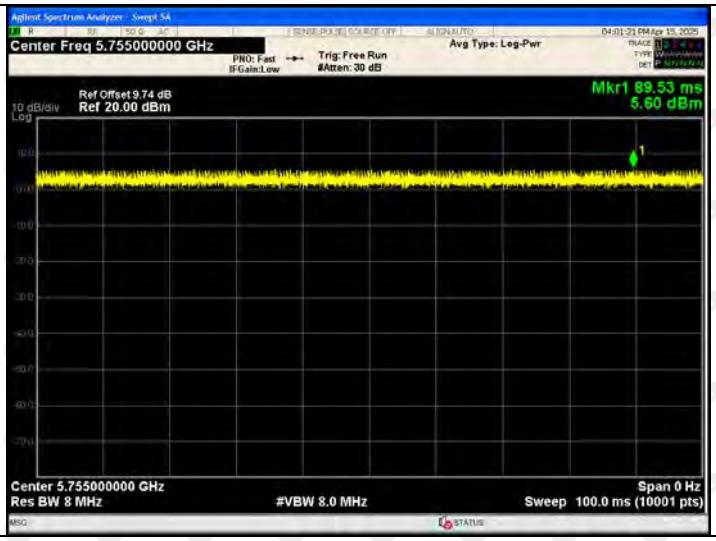
802.11n20:

Test Graph:

Low channel	

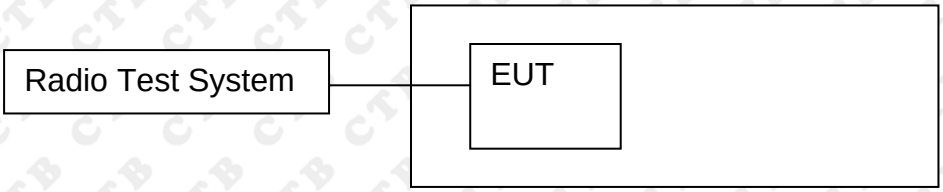
802.11n40:

Test Graph:

Low channel	

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)
802.11a	5180	26.57
	5200	29.24
	5240	28.018
802.11ac20	5180	28.49
	5200	29.32
	5240	26.748
802.11ac40	5190	43.451
	5230	41.387
802.11ac80	5210	79.942
802.11n(HT20)	5180	29.137
	5200	29.441
	5240	27.445
802.11n(HT40)	5190	50.445
	5230	41.06

5250-5350 MHz:

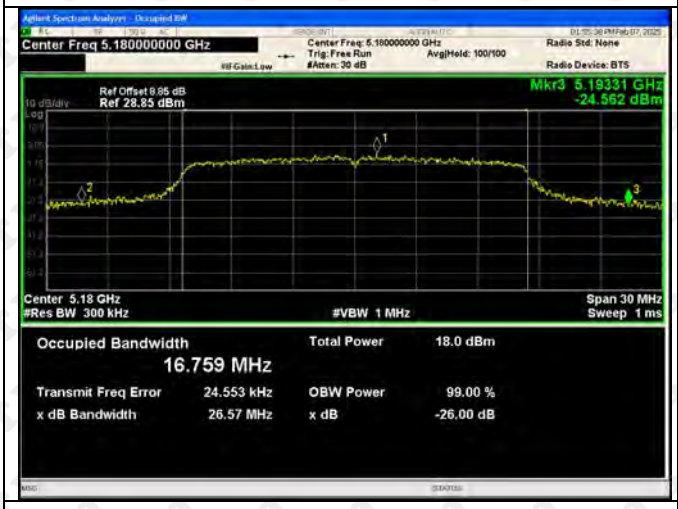
Test mode	Test Channel (MHz)	26dB Bandwidth (MHz)
802.11a	5260	29.856
	5280	29.713
	5320	29.092
802.11ac20	5260	28.133
	5280	28.867
	5320	29.78
802.11ac40	5270	40.65
	5310	44.87
802.11ac80	5290	82.98
802.11n(HT20)	5260	28.601
	5280	28.785
	5320	29.542
802.11n(HT40)	5270	41.373
	5310	47.75

5725-5850MHz:

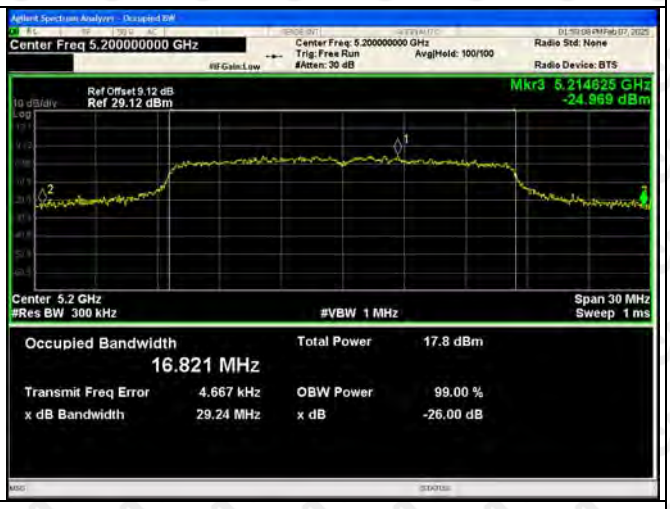
Test mode	Test Channel (MHz)	6dB Bandwidth (MHz)
802.11a	5745	15.124
	5785	15.654
	5825	15.135
802.11ac20	5745	15.68
	5785	15.136
	5825	15.117
802.11ac40	5755	35.088
	5795	34.977
802.11ac80	5775	75.233
802.11n(HT20)	5745	15.136
	5785	15.113
	5825	16.021
802.11n(HT40)	5755	35.084
	5795	35.078

Test Graph:
5150-5250MHz-Power

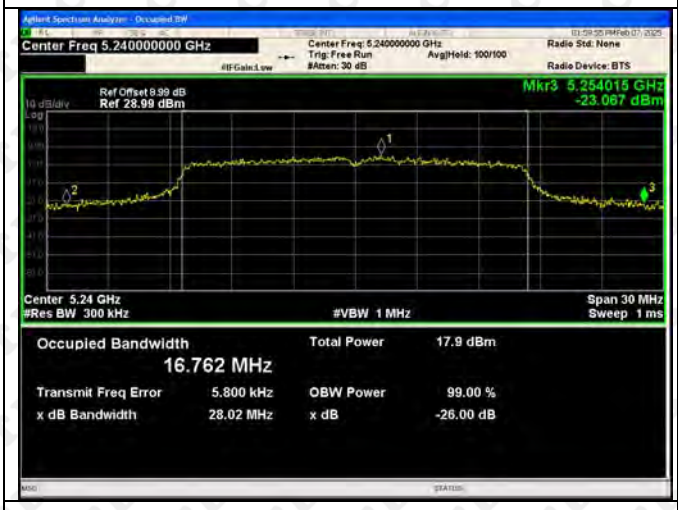
802.11a-5180



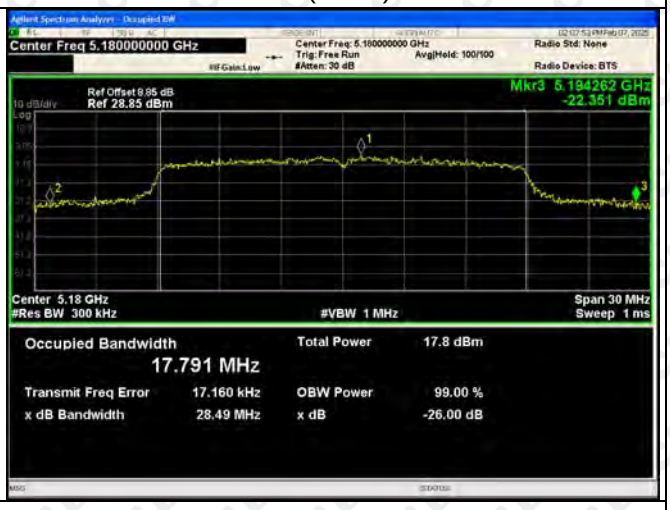
802.11a-5200



802.11a-5240

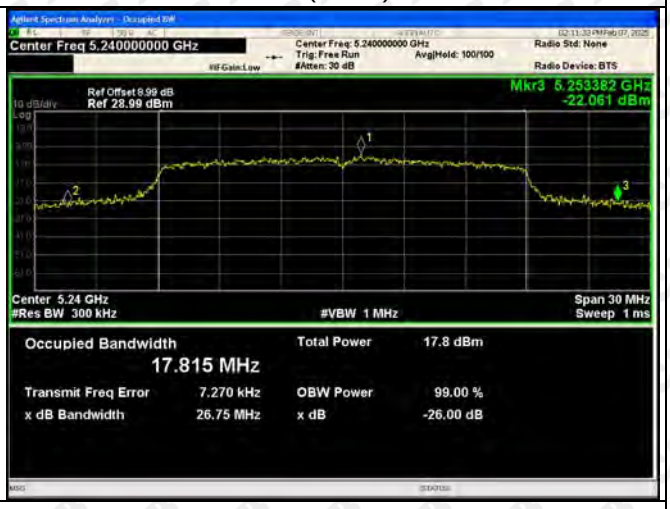


802.11ac(VH20)-5180



802.11ac(VH20)-5200

802.11ac(VH20)-5240



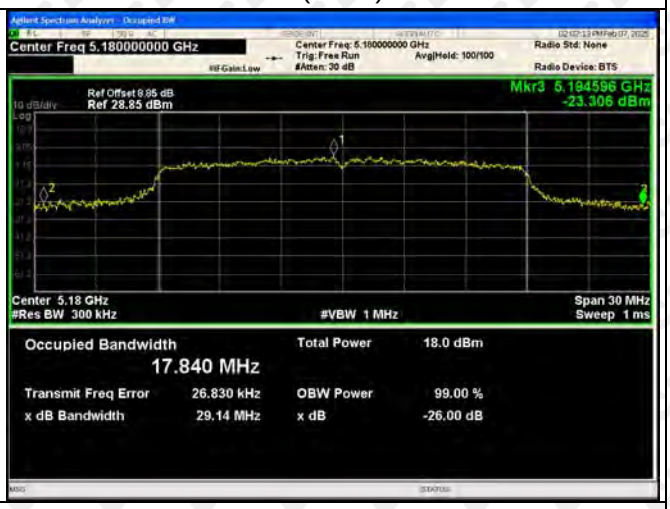
802.11ac(VH40)-5190

802.11ac(VH40)-5230

802.11ac(VH80)-5210

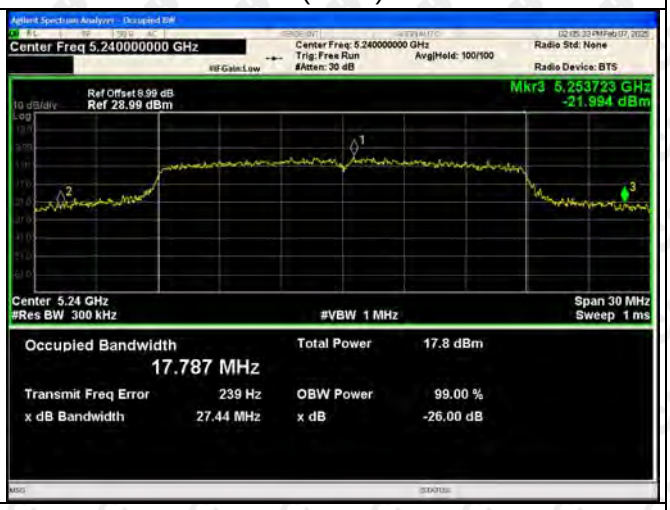
802.11n(HT20)-5180

802.11n(HT20)-5200



802.11n(HT20)-5240

802.11n(HT40)-5190



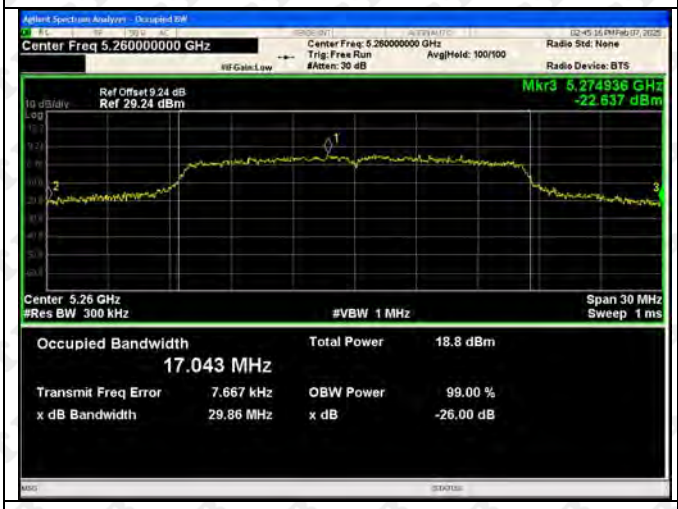
802.11n(HT40)-5230


Agilent Spectrum Analyzer - Occupied BW
Center Freq 5.190000000 GHz
Center Freq: 5.190000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
#IFGain:Low
Ref Offset 9.04 dB
10 dB/div
Ref 29.04 dBm
Mkr3 5.215264 GHz
-32.015 dBm
Center 5.19 GHz
#Res BW 300 kHz
#VBW 1 MHz
Span 60 MHz
Sweep 1 ms
Occupied Bandwidth
36.034 MHz
Total Power 15.9 dBm
Transmit Freq Error 41.049 kHz
OBW Power 99.00 %
x dB Bandwidth 50.45 MHz
x dB -26.00 dB

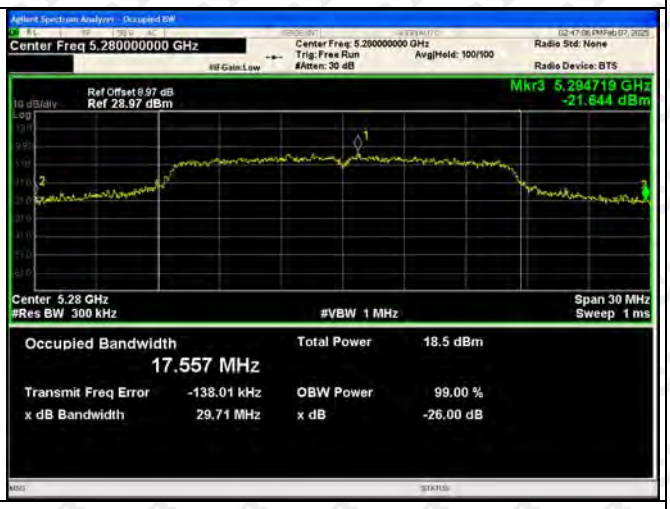

Agilent Spectrum Analyzer - Occupied BW
Center Freq 5.230000000 GHz
Center Freq: 5.230000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
#IFGain:Low
Ref Offset 8.96 dB
10 dB/div
Ref 28.96 dBm
Mkr3 5.250652 GHz
-26.935 dBm
Center 5.23 GHz
#Res BW 300 kHz
#VBW 1 MHz
Span 60 MHz
Sweep 1 ms
Occupied Bandwidth
35.985 MHz
Total Power 15.9 dBm
Transmit Freq Error 121.47 kHz
OBW Power 99.00 %
x dB Bandwidth 41.06 MHz
x dB -26.00 dB

5250-5350MHz-Power

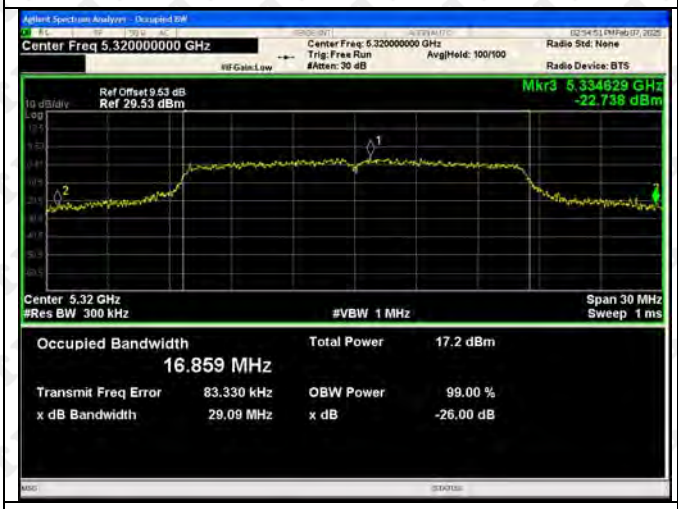
802.11a-5260



802.11a-5280

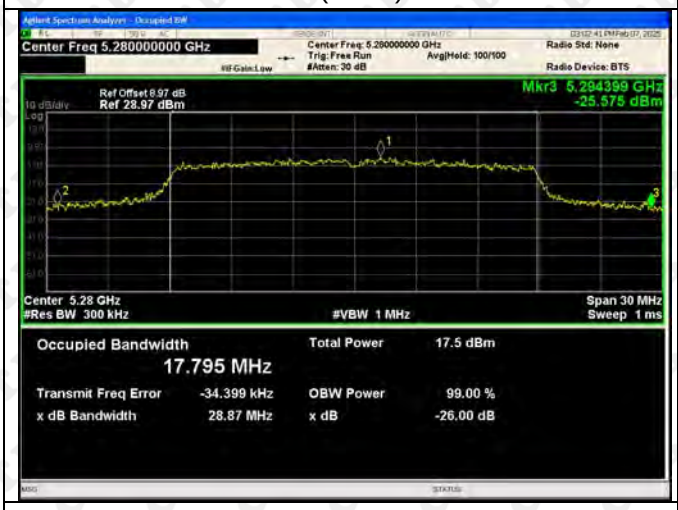


802.11a-5320

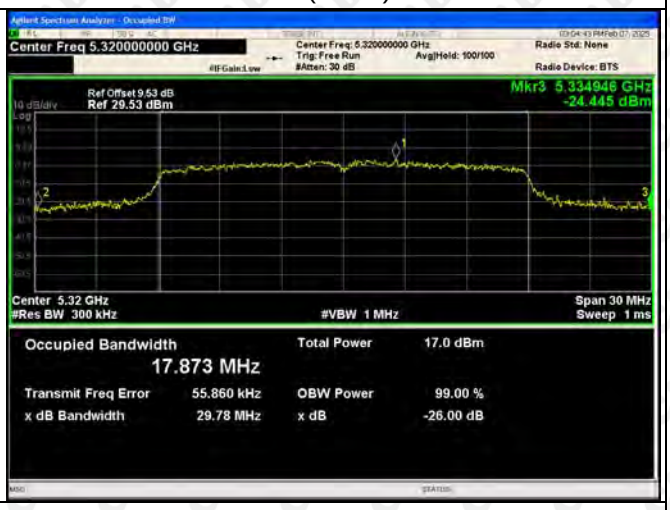


802.11ac(VH20)-5260

802.11ac(VH20)-5280



802.11ac(VH20)-5320



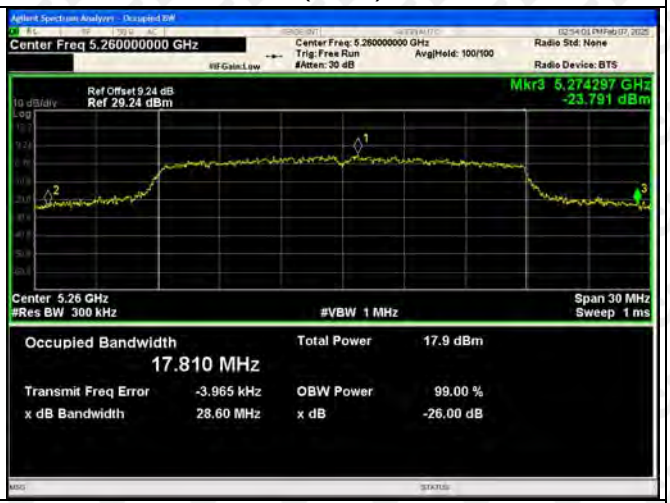
802.11ac(VH40)-5270

802.11ac(VH40)-5310

802.11ac(VH80)-5290

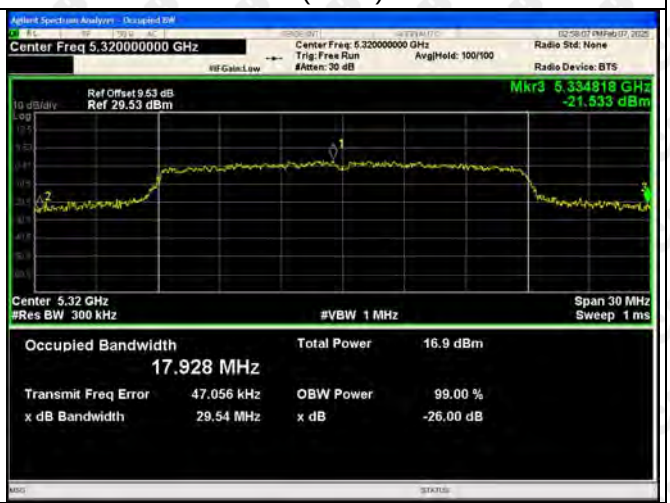
802.11n(HT20)-5260

802.11n(HT20)-5280



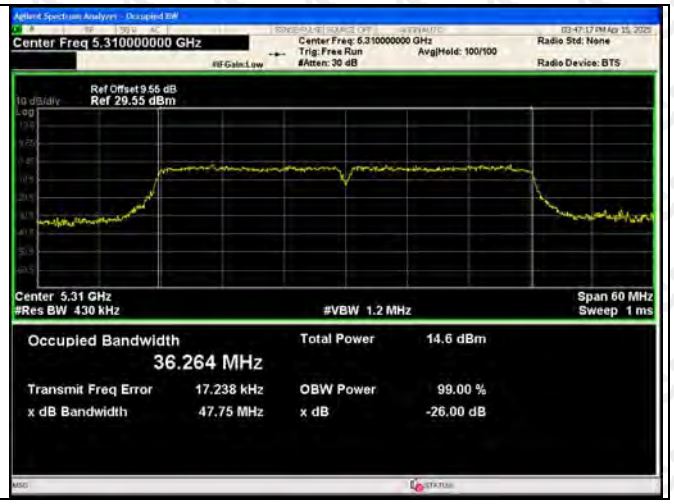
802.11n(HT20)-5320

802.11n(HT40)-5270



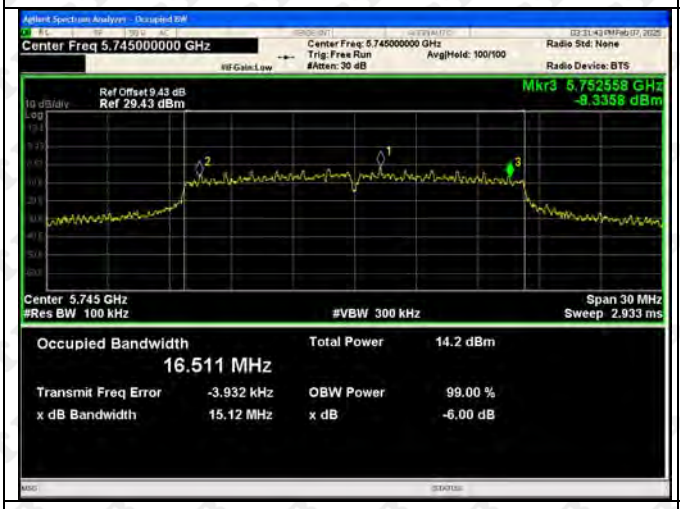
802.11n(HT40)-5310


Agilent Spectrum Analyzer - Occupied BW
Center Freq 5.270000000 GHz
Center Freq: 5.270000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
Ref Offset 9.01 dB
10 dB/div
Ref 29.01 dBm
Mkr3 5.290718 GHz
-28.585 dBm
Center 5.27 GHz
#Res BW 300 kHz
#VBW 1 MHz
Span 60 MHz
Sweep 1 ms
Occupied Bandwidth
36.003 MHz
Total Power 16.0 dBm
Transmit Freq Error 31.966 kHz
OBW Power 99.00 %
x dB Bandwidth 41.37 MHz
x dB -26.00 dB

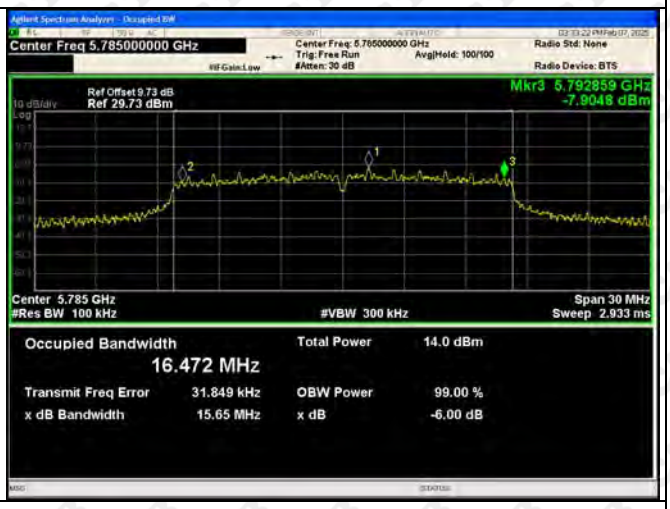

Agilent Spectrum Analyzer - Occupied BW
Center Freq 5.310000000 GHz
Center Freq: 5.310000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
Ref Offset 9.55 dB
10 dB/div
Ref 29.55 dBm
Center 5.31 GHz
#Res BW 430 kHz
#VBW 1.2 MHz
Span 60 MHz
Sweep 1 ms
Occupied Bandwidth
36.264 MHz
Total Power 14.6 dBm
Transmit Freq Error 17.238 kHz
OBW Power 99.00 %
x dB Bandwidth 47.75 MHz
x dB -26.00 dB

5725-5850MHz:-Power

802.11a-5745

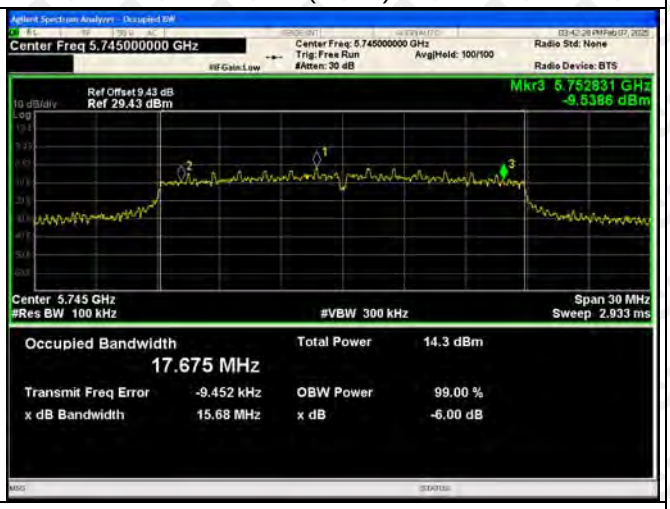


802.11a-5785



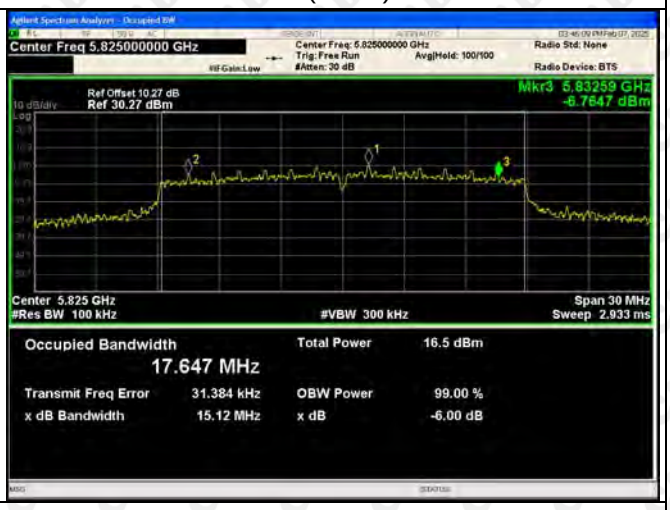
802.11a-5825

802.11ac(VH20)-5745



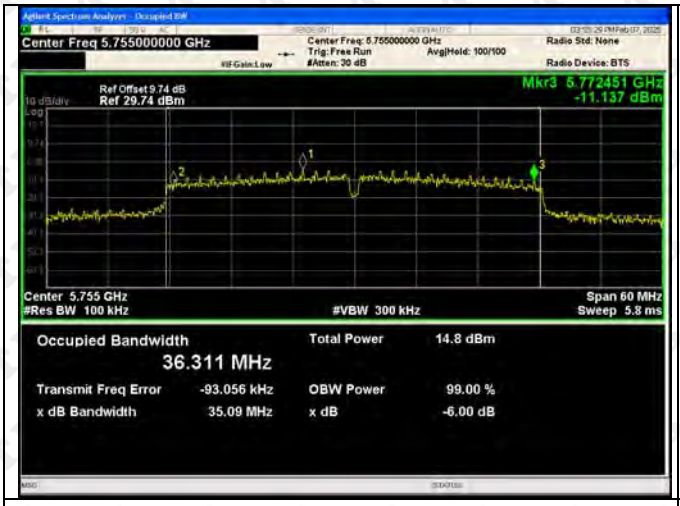
802.11ac(VH20)-5785

802.11ac(VH20)-5825

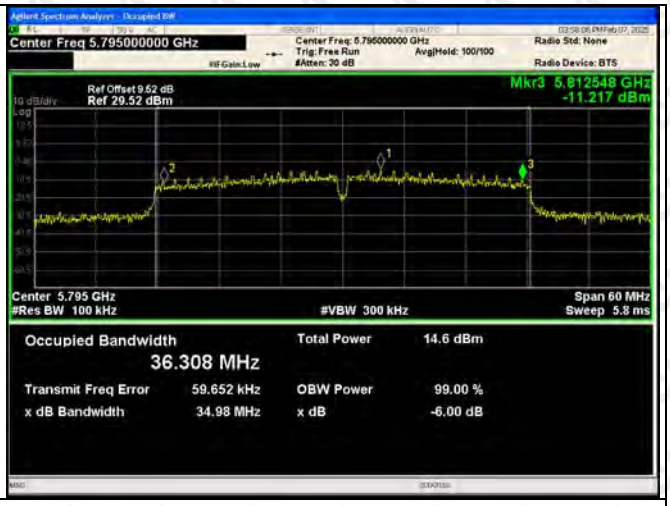


802.11ac(VH40)-5755

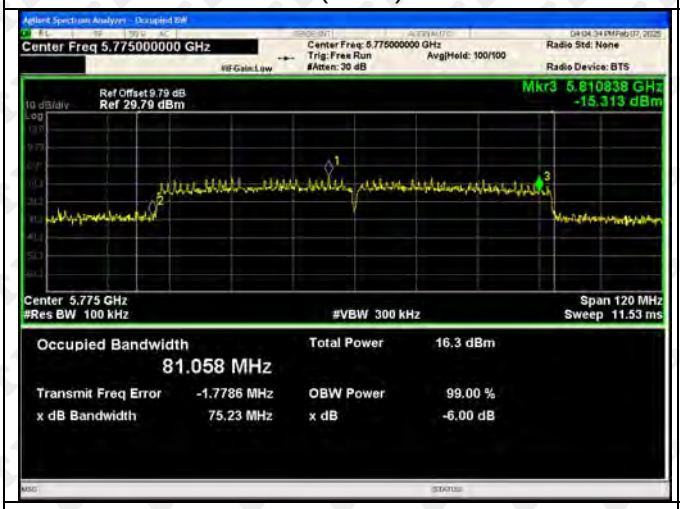
802.11ac(VH40)-5795



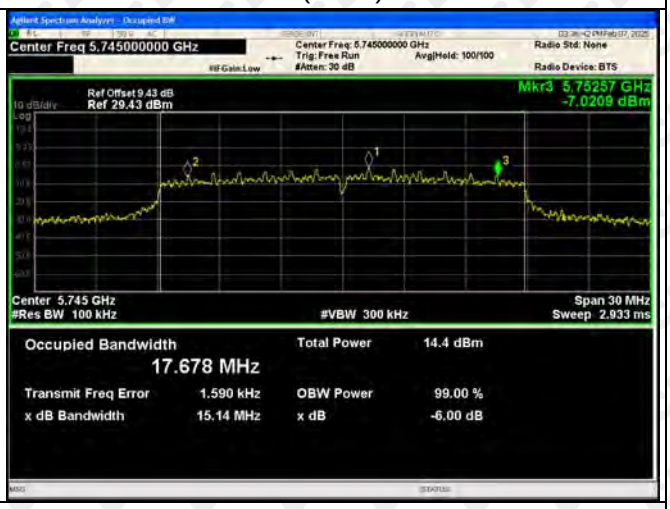
802.11ac(VH80)-5775



802.11n(HT20)-5745



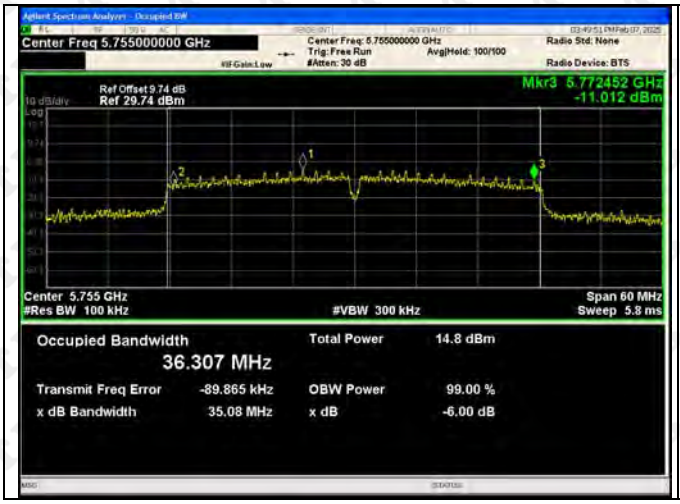
802.11n(HT20)-5785

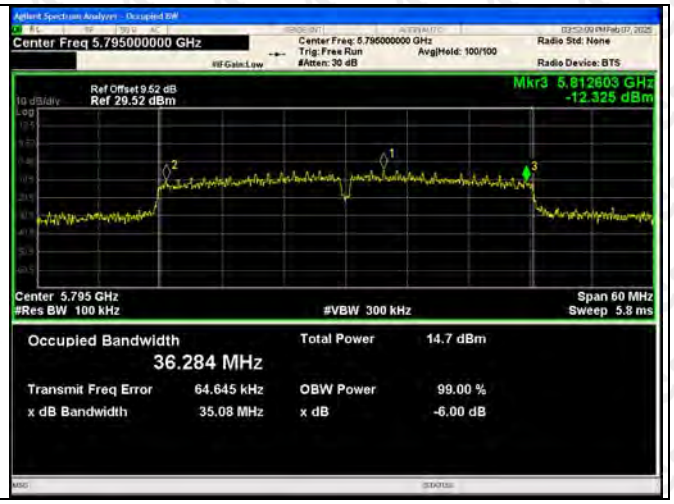


802.11n(HT20)-5825

802.11n(HT40)-5795

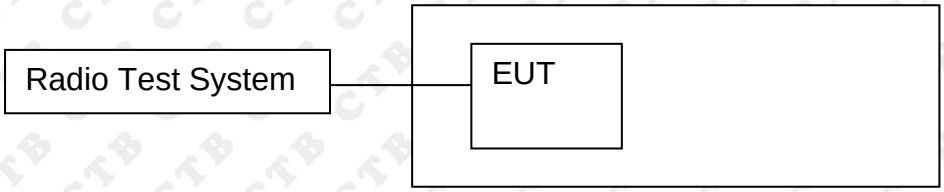
802.11n(HT40)-5825


Agilent Spectrum Analyzer - Occupied BW
Center Freq 5.755000000 GHz
Center Freq: 5.755000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
Ref Offset 9.74 dB
10 dB/div
Ref 29.74 dBm
Mkr3 5.772452 GHz
-11.012 dBm
Center 5.755 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 60 MHz
Sweep 5.8 ms
Occupied Bandwidth
36.307 MHz
Total Power 14.8 dBm
Transmit Freq Error -89.865 kHz
OBW Power 99.00 %
x dB Bandwidth 35.08 MHz
x dB -6.00 dB


Agilent Spectrum Analyzer - Occupied BW
Center Freq 5.795000000 GHz
Center Freq: 5.795000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
Ref Offset 9.52 dB
10 dB/div
Ref 29.52 dBm
Mkr3 5.812603 GHz
-12.325 dBm
Center 5.795 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 60 MHz
Sweep 5.8 ms
Occupied Bandwidth
36.284 MHz
Total Power 14.7 dBm
Transmit Freq Error 64.645 kHz
OBW Power 99.00 %
x dB Bandwidth 35.08 MHz
x dB -6.00 dB

11. POWER SPECTRAL DENSITY

11.1 Block Diagram Of Test Setup



11.2 Limit

(1) For the band 5.15-5.25 GHz.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

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

11.3 Test procedure

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

For devices operating in the bands 5.15−5.25 GHz, 5.25−5.35 GHz, and 5.47−5.725 GHz, the preceding procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in Section 15.407(a)(5). For devices operating in the band 5.725−5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:
a) Set RBW ≥ 1/*T*, where *T* is defined in II.B.l.a).

b) Set VBW ≥ 3 RBW.

c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10 log (500 kHz/RBW) to the

measured result, whereas RBW (<500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

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

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

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port

to the spectrum.

2. Set the spectrum analyzer:

5150-5250MHz
5250-5350MHz
RBW = 1MHz, VBW ≥3* RBW Sweep = auto; Detector Function = Peak. Trace = Max hold.

5725-5850MHz
RBW = 510KHz, VBW ≥3* RBW Sweep = auto; Detector Function = Peak. Trace = Max hold.

3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

11.4 Test Result

5150-5250MHz:MHz

Test mode	Test Channel (MHz)	PSD [dBm/MHz]	Limit (dBm)	Result
802.11a	5180	7.74	11	Pass
	5200	7.497	11	Pass
	5240	7.704	11	Pass
802.11n(HT20)	5180	6.954	11	Pass
	5200	6.556	11	Pass
	5240	7.554	11	Pass
802.11n(HT40)	5190	2.594	11	Pass
	5230	3.535	11	Pass
802.11ac(VH20)	5210	-11.075	11	Pass
	5180	7.065	11	Pass
	5200	6.749	11	Pass
802.11ac(VH40)	5240	7.359	11	Pass
	5190	3.503	11	Pass
802.11ac(VH80)	5230	2.549	11	Pass

5250-5350 MHzMHz

Test mode	Test Channel (MHz)	PSD [dBm/MHz]	Limit (dBm)	Result
802.11a	5260	1.84	11	Pass
	5280	1.403	11	Pass
	5320	0.645	11	Pass
802.11n(HT20)	5260	1.01	11	Pass
	5280	0.291	11	Pass
	5320	-0.109	11	Pass
802.11n(HT40)	5270	-5.328	11	Pass
	5310	-6.016	11	Pass
802.11ac(VH20)	5260	-6.953	11	Pass
	5280	1.479	11	Pass
	5320	0.029	11	Pass
802.11ac(VH40)	5270	-0.66	11	Pass
	5310	-4.95	11	Pass
802.11ac(VH80)	5290	-5.952	11	Pass

5725-5850MHz:

Test mode	Test Channel (MHz)	PSD [dBm/MHz]	Limit (dBm)	Result
802.11a	5745	0.351	30	Pass
	5785	0.327	30	Pass
	5825	3.187	30	Pass
802.11n(HT20)	5745	0.331	30	Pass
	5785	0.455	30	Pass
	5825	3.438	30	Pass
802.11n(HT40)	5755	-0.827	30	Pass
	5795	-0.798	30	Pass
802.11ac(VH20)	5745	-5.131	30	Pass
	5785	0.962	30	Pass
	5825	0.936	30	Pass
802.11ac(VH40)	5755	2.84	30	Pass
	5795	-1.502	30	Pass
802.11ac(VH80)	5775	-1.169	30	Pass

Test Graph:
5150-5250MHz

802.11a-5180

802.11a-5200

802.11a-5240

802.11ac(VH20)-5180

802.11ac(VH20)-5200

802.11ac(VH20)-5240

802.11ac(VH40)-5190

802.11ac(VH40)-5230

802.11ac(VH80)-5210

802.11n(HT20)-5180

802.11n(HT20)-5200

802.11n(HT20)-5240

802.11n(HT40)-5190

802.11n(HT40)-5230


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.190000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 100/100
Ref Offset 9.04 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.194 08 GHz
3.503 dBm
Center 5.19000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Span 60.00 MHz
Sweep 1.000 ms (1001 pts)


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.230000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 100/100
Ref Offset 8.96 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.232 34 GHz
2.549 dBm
Center 5.23000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Span 60.00 MHz
Sweep 1.000 ms (1001 pts)

5250-5350MHz

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

802.11n(HT20)-5260

802.11n(HT20)-5280

802.11n(HT20)-5320

802.11n(HT40)-5270

802.11n(HT40)-5310


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.270000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 100/100
Ref Offset 9.01 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.267 36 GHz
-4.950 dBm
Center 5.27000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Span 60.00 MHz
Sweep 1.000 ms (1001 pts)


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.310000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 100/100
Ref Offset 9.55 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.307 36 GHz
-5.952 dBm
Center 5.31000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Span 60.00 MHz
Sweep 1.000 ms (1001 pts)

5725-5850MHz:

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

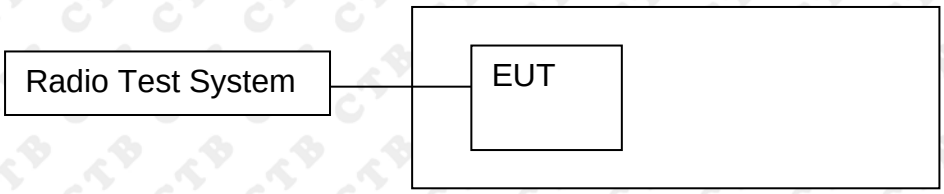
802.11n(HT40)-5825


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.755000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 100/100
Ref Offset 9.74 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.748 40 GHz
-1.502 dBm
Center 5.75500 GHz
#Res BW 510 kHz
#VBW 1.5 MHz*
Span 60.00 MHz
Sweep 1.000 ms (1001 pts)


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.795000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 100/100
Ref Offset 9.62 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.793 38 GHz
-1.169 dBm
Center 5.79500 GHz
#Res BW 510 kHz
#VBW 1.5 MHz*
Span 60.00 MHz
Sweep 1.000 ms (1001 pts)

12. FREQUENCY STABILITY

12.1 Block Diagram Of Test Setup



12.2 Limit

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

12.3 Test procedure

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

2. Set EUT as normal operation.

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

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

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

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

12.4 Test Result

TX Frequency (5150-5250MHz)

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	3.8	5180.1106	5180	0.1106	21.3456
		V max (V)	4.4	5180.0308	5180	0.0308	5.9547
		V min (V)	3.2	5180.1171	5180	0.1171	22.6153
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	0	5180.0412	5180	0.0412	7.9538
		T (°C)	10	5180.0095	5180	0.0095	1.8279
		T (°C)	20	5180.0121	5180	0.0121	2.3436
		T (°C)	30	5180.0054	5180	0.0054	1.0405
		T (°C)	40	5180.0337	5180	0.0337	6.5153
Limits				±20ppm			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5200MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	3.8	5200.0180	5200	0.0180	3.4533
		V max (V)	4.4	5200.0168	5200	0.0168	3.2254
		V min (V)	3.2	5200.0197	5200	0.0197	3.7904
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5200MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	0	5200.0197	5200	0.0197	3.7858
		T (°C)	10	5200.0306	5200	0.0306	5.8751
		T (°C)	20	5200.0209	5200	0.0209	4.0250
		T (°C)	30	5200.0090	5200	0.0090	1.7388
		T (°C)	40	5200.0130	5200	0.0130	2.4991
Limits				±20ppm			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	3.8	5240.0465	5240	0.0465	8.8752
		V max (V)	4.4	5240.0209	5240	0.0209	3.9894
		V min (V)	3.2	5240.0293	5240	0.0293	5.5961
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	0	5240.0234	5240	0.0234	4.4685
		T (°C)	10	5240.0309	5240	0.0309	5.9000
		T (°C)	20	5240.0208	5240	0.0208	3.9759
		T (°C)	30	5240.0407	5240	0.0407	7.7631
		T (°C)	40	5240.0437	5240	0.0437	8.3371
Limits				±20ppm			
Result				Complies			

TX Frequency (5250-5350MHz)

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5260MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	3.8	5260.0488	5260	0.0488	9.2748
		V max (V)	4.4	5260.0018	5260	0.0018	0.3516
		V min (V)	3.2	5260.0383	5260	0.0383	7.2846
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5260MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	0	5260.0075	5260	0.0075	1.4222
		T (°C)	10	5260.0688	5260	0.0688	13.0746
		T (°C)	20	5260.0735	5260	0.0735	13.9709
		T (°C)	30	5260.0368	5260	0.0368	7.0045
		T (°C)	40	5260.0118	5260	0.0118	2.2356
Limits				±20ppm			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5280MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	3.8	5280.0575	5280	0.0575	10.8991
		V max (V)	4.4	5280.0142	5280	0.0142	2.6953
		V min (V)	3.2	5280.0258	5280	0.0258	4.8935
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5280MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	0	5280.0176	5280	0.0176	3.3384
		T (°C)	10	5280.0629	5280	0.0629	11.9113
		T (°C)	20	5280.0703	5280	0.0703	13.3084
		T (°C)	30	5280.0060	5280	0.0060	1.1455
		T (°C)	40	5280.0134	5280	0.0134	2.5431
Limits				±20ppm			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5320MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	3.8	5320.0872	5320	0.0872	16.3997
		V max (V)	4.4	5320.0649	5320	0.0649	12.2055
		V min (V)	3.2	5320.0857	5320	0.0857	16.1099
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5320MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	0	5320.0152	5320	0.0152	2.8491
		T (°C)	10	5320.0250	5320	0.0250	4.7043
		T (°C)	20	5320.0757	5320	0.0757	14.2202
		T (°C)	30	5320.0102	5320	0.0102	1.9167
		T (°C)	40	5320.0171	5320	0.0171	3.2200
Limits				±20ppm			
Result				Complies			

TX Frequency (5725-5850MHz)

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	3.8	5745.0591	5745	0.0591	10.2925
		V max (V)	4.4	5745.0151	5745	0.0151	2.6329
		V min (V)	3.2	5745.0591	5745	0.0591	10.2925
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	0	5745.0900	5745	0.0900	15.6624
		T (°C)	10	5745.0129	5745	0.0129	2.2430
		T (°C)	20	5745.0815	5745	0.0815	14.1822
		T (°C)	30	5745.0697	5745	0.0697	12.1290
		T (°C)	40	5745.0705	5745	0.0705	12.2760
Limits				±20ppm			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5785MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	3.8	5785.0460	5785	0.0460	7.9445
		V max (V)	4.4	5785.0058	5785	0.0058	1.0020
		V min (V)	3.2	5785.0100	5785	0.0100	1.7214
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5785MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	0	5785.0896	5785	0.0896	15.4964
		T (°C)	10	5785.0432	5785	0.0432	7.4747
		T (°C)	20	5785.0830	5785	0.0830	14.3437
		T (°C)	30	5785.0376	5785	0.0376	6.4991
		T (°C)	40	5785.0594	5785	0.0594	10.2685
Limits				±20ppm			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5825MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	3.8	5825.0261	5825	0.0261	4.4889
		V max (V)	4.4	5825.0708	5825	0.0708	12.1577
		V min (V)	3.2	5825.0077	5825	0.0077	1.3188
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5825MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	0	5825.0340	5825	0.0340	5.8399
		T (°C)	10	5825.0048	5825	0.0048	0.8252
		T (°C)	20	5825.0907	5825	0.0907	15.5661
		T (°C)	30	5825.0272	5825	0.0272	4.6612
		T (°C)	40	5825.0300	5825	0.0300	5.1459
Limits				±20ppm			
Result				Complies			

13. OPERATION IN THE ABSENCE OF INFORMATION TO THE TRANSMIT

13.1 Requirement

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

13.2 Test Results

Operation in the absence of information to the transmit:

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

14. ANTENNA REQUIREMENT

15.203 requirement:
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.
15.247(b) (4) requirement:
The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:

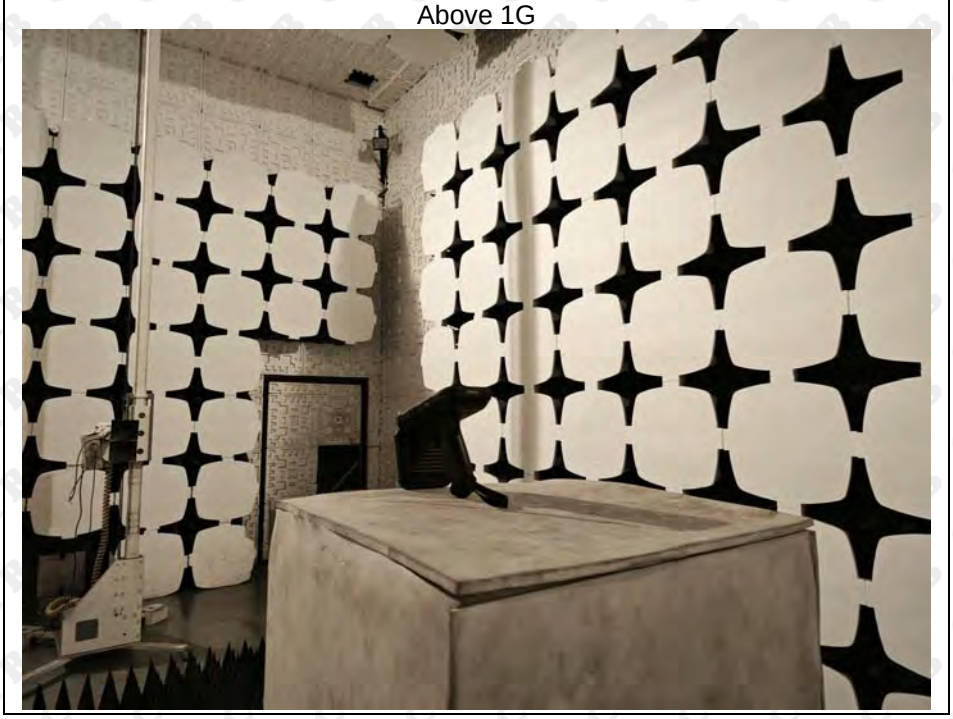
The antenna is Internal antenna and no consideration of replacement. The best case gain of the antenna is WiFi (5.2G): 0.92dBi; WiFi (5.3G): 1.02dBi ; WiFi (5.8G): 1.58dBi.

15. EUT TEST SETUP PHOTOGRAPHS

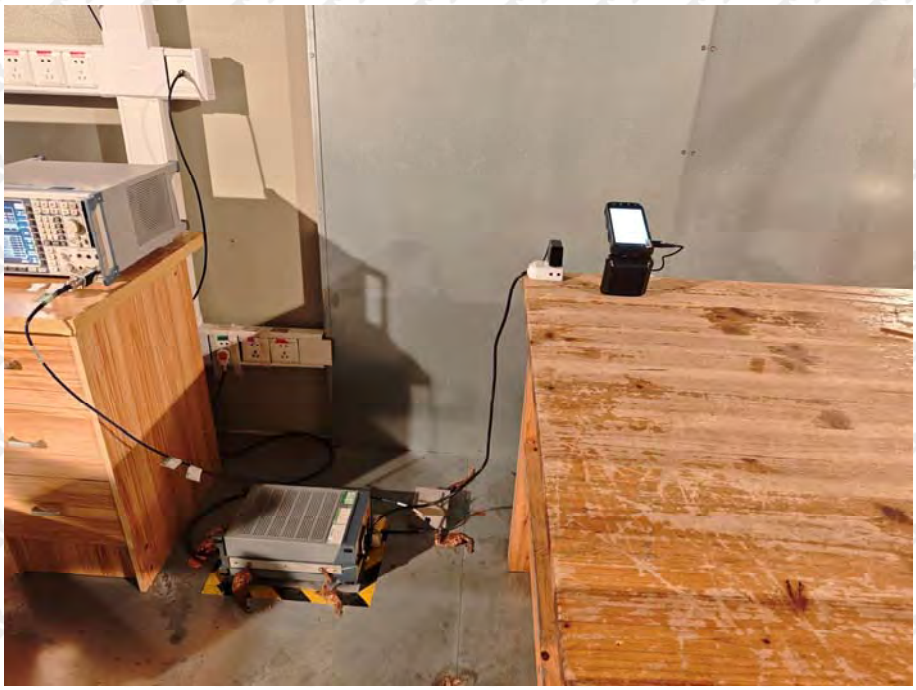
Spurious emissions

Below 1G

Above 1G



Conducted emission



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