FCC TEST REPORT
FCC ID:2AXECLD230EKS-FPN4

Report Number.....:	ZKT-231225L0369E-4
Date of Test.....	Dec. 25, 2023- Feb. 02, 2024
Date of issue.....:	Feb. 02, 2024
Total number of pages.....	109
Test Result .....:	PASS
Testing Laboratory.....:	**Shenzhen ZKT Technology Co., Ltd.**
Address .....:	1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China
Applicant's name .....:	LG Display Co., Ltd.
Address .....:	LG TWIN TOWERS (EAST), 128, Yeoui-daero, Yeongdeungpo-gu, Seoul 07336, Republic of Korea
Manufacturer's name .....:	LG Display Co., Ltd.
Address .....:	LG TWIN TOWERS (EAST), 128, Yeoui-daero, Yeongdeungpo-gu, Seoul 07336, Republic of Korea
Test specification:	
Standard.....:	FCC CFR Title 47 Part 15 Subpart E Section 15.407 ANSI C63.10:2013 KDB 789033 D02 v02r01
Test procedure.....:	/
Non-standard test method .....:	N/A
Test Report Form No.....:	/
Test Report Form(s) Originator.....:	ZKT Testing
Master TRF .....:	Dated: 2020-01-06

This device described above has been tested by ZKT, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.
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Product name.....:	ISS(interactive smart shelf)
Trademark .....:	LG Display
Model/Type reference.....:	LD230EKS-FPN4
Ratings.....:	AC 120V/60Hz

Testing procedure and testing location:

Testing Laboratory..... :	**Shenzhen ZKT Technology Co., Ltd.**
Address..... :	1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China
Tested by (name + signature)..... :	Jim Liu
Reviewer (name + signature)..... :	Jackson Fang
Approved (name + signature)..... :	Lake Xie

TABLE OF CONTENT

(Note: N/A means not applicable)

1. VERSION

Report No.	Version	Description	Approved
ZKT-231225L0369E-4	Rev.01	Initial issue of report	Feb. 02, 2024

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 C63.10-2013	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 (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 C63.10-2013.

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):	LD230EKS-FPN4
Model Description:	N/A
Wi-Fi Specification:	IEEE 802.11a/n/ac/ax
Hardware Version:	V2.2
Software Version:	MID11.0
Operation Frequency:	IEEE 802.11a/n/ac/ax(20M): 5150MHz ~5250MHz/ 4 channel IEEE 802.11n/ac/ax(40M): 5150MHz ~5250MHz/ 2 channel IEEE 802.11a/n/ac/ax(20M): 5250MHz ~5350 MHz/ 4 channel IEEE802.11n/ac/ax(40M): 5250MHz ~5350 MHz/ 2 channel IEEE 802.11a/n/ac/ax(20M): 5470MHz ~5725 MHz/ 11 channel IEEE802.11n/ac/ax(40M): 5470MHz ~5725 MHz/ 5 channel IEEE 802.11a/n/ac/ax(20M): 5725MHz ~5850MHz/ 5 channel IEEE 802.11n/ac/ax(40M): 5725MHz ~5850MHz/ 2 channel
Max. RF output power:	WiFi (5G): 14.552dBm
Type of Modulation:	WiFi (5G):, OFDM/OFDMA, DSSS, OFDM, CCK
Antenna installation:	WiFi (5G): Internal Antenna
Antenna Gain:	WiFi (5G): 3.0dBi
Ratings:	AC 120V/60Hz

4.2 Test Setup Configuration

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

4.3 Support Equipment

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

Notes:

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

4.4 Channel List

For 802.11a/n/ac/ax(20M) Operation in the 5150MHz ~5250 MHz band			
Channel	Frequency	Channel	Frequency
36	5180MHz	44	5220MHz
40	5200MHz	48	5240MHz
For 802.11a/n/ac/ax(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/ax(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/ax(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/ax(40M) Operation in the 5150MHz ~5250 MHz band			
Channel	Frequency	Channel	Frequency
38	5190MHz	46	5230MHz
For 802.11n/ac/ax(40M) Operation in the 5250MHz ~5350 MHz band			
Channel	Frequency	Channel	Frequency
54	5270MHz	62	5310MHz
For 802.11n/ac/ax(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/ax(40M) Operation in the 5725MHz ~5850 MHz band			
Channel	Frequency	Channel	Frequency
151	5755MHz	159	5795MHz

NOTE: Dutycycle>98%.

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

4.5 Test Mode

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

Test Mode	Tx/Rx	RF Channel		
		Low(L)	Middle(M)	High(H)
802.11a/n/ac/ax(20M)	5150MHz ~5250 MHz	Channel 36	Channel 40	Channel 48
		5180MHz	5200MHz	5240MHz
802.11n/ac/ax(40M)		Channel 38	N/A	Channel 46
		5190MHz	N/A	5230MHz
		N/A	5210MHz	N/A
802.11a/n/ac/ax(20M)	5250MHz ~5350 MHz	Channel 52	Channel 56	Channel 64
		5260MHz	5280MHz	5320MHz
802.11n/ac/ax(40M)		Channel 54	N/A	Channel 62
		5270MHz	N/A	5310MHz
		N/A	5290MHz	N/A
802.11a/n/ac/ax(20M)	5470MHz ~5725 MHz	Channel 100	Channel 116	Channel 140
		5500MHz	5580MHz	5700MHz
802.11n/ac/ax(40M)		Channel 102	N/A	Channel 134
		5510MHz	N/A	5670MHz
		5510MHz	N/A	5640MHz
802.11a/n/ac/ax(20M)	5725MHz ~5850 MHz	Channel 149	Channel 157	Channel 165
		5745MHz	5785MHz	5825MHz
802.11n/ac/ax(40M)		Channel 151	N/A	Channel 159
		5755MHz	N/A	5795MHz
		N/A	5775MHz	N/A

4.6 Test Environment

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

5. TEST FACILITY AND TEST INSTRUMENT USED

Conducted emissions Test

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Firmware Version	Last calibration	Calibrated until
1	LISN	R&S	ENV216	101471	N/A	Nov. 14, 2023	Nov. 13, 2024
2	LISN	CYBERTEK	EM5040A	E1850400149	N/A	Nov. 02, 2023	Nov. 01, 2024
3	Test Cable	N/A	C-01	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
4	Test Cable	N/A	C-02	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
5	Test Cable	N/A	C-03	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
6	EMI Test Receiver	R&S	ESCI3	101393	4.42 SP3	Nov. 02, 2023	Nov. 01, 2024
7	Triple-Loop Antenna	N/A	RF300	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
8	Absorbing Clamp	DZ	ZN23201	15034	N/A	Nov. 07, 2023	Nov. 06, 2024
9	EMC Software	Frad	EZ-EMC	Ver.EMC-CON 3A1.1	N/A	\	\

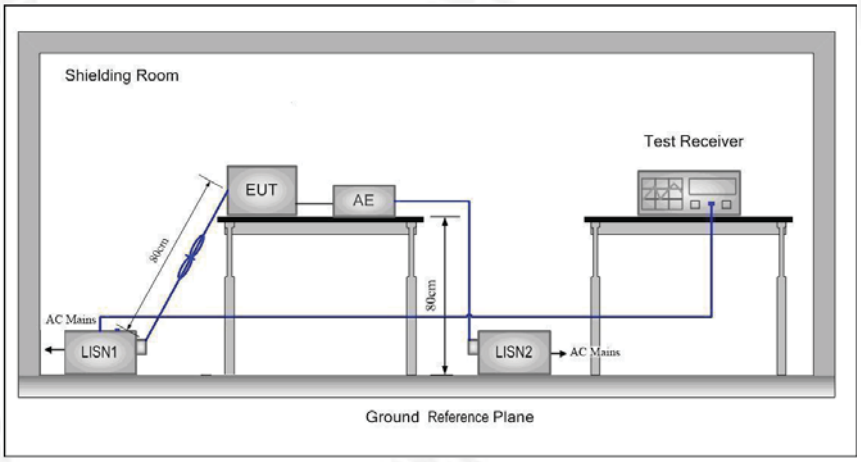
Radiation emissions& Radio Test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Firmware Version	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	KEYSIGHT	9020A	MY55370835	A.17.05	Nov. 02, 2023	Nov. 01, 2024
2	Spectrum Analyzer (10kHz-39.9GHz)	R&S	FSV40-N	100363	1.71 SP2	Nov. 02, 2023	Nov. 01, 2024
3	EMI Test Receiver (9kHz-7GHz)	R&S	ESCI7	100969	4.32	Nov. 02, 2023	Nov. 01, 2024
4	Bilog Antenna (30MHz-1500MHz)	Schwarzbeck	VULB9168	N/A	N/A	Nov. 13, 2023	Nov. 12, 2024
5	Horn Antenna (1GHz-18GHz)	Agilent	AH-118	071145	N/A	Nov. 13, 2023	Nov. 12, 2024
6	Horn Antenna (15GHz-40GHz)	A.H.System	SAS-574	588	N/A	Nov. 13, 2023	Nov. 12, 2024
7	Loop Antenna	TESEQ	HLA6121	58357	N/A	Nov. 16, 2023	Nov. 15, 2024
8	Amplifier (30-1000MHz)	EM Electronics	EM330 Amplifier	60747	N/A	Nov. 02, 2023	Nov. 01, 2024
9	Amplifier (1GHz-26.5GHz)	HuiPu	8449B	3008A00315	N/A	Nov. 02, 2023	Nov. 01, 2024
10	Amplifier (500MHz-40GHz)	QuanJuDa	DLE-161	097	N/A	Nov. 02, 2023	Nov. 01, 2024
11	Test Cable	N/A	R-01	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
12	Test Cable	N/A	R-02	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
13	Test Cable	N/A	R-03	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
14	Test Cable	N/A	RF-01	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
15	Test Cable	N/A	RF-02	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024

16	Test Cable	N/A	RF-03	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
17	ESG Signal Generator	Agilent	E4421B	N/A	B.03.84	Nov. 02, 2023	Nov. 01, 2024
18	Signal Generator	Agilent	N5182A	N/A	A.01.87	Nov. 02, 2023	Nov. 01, 2024
19	Magnetic Field Probe Tester	Narda	ELT-400	0-0344	N/A	Nov. 16, 2023	Nov. 15, 2024
20	Wideband Radio Communication Test	R&S	CMW500	106504	V 3.7.22	Nov. 02, 2023	Nov. 01, 2024
21	MWRF Power Meter Test system	MW	MW100-RF CB	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
22	Power Meter	KEYSIGHT	N1912A P	N/A	A.05.00	Nov. 02, 2023	Nov. 01, 2024
23	D.C. Power Supply	LongWei	TPR-6405D	N/A	N/A	\	\
24	EMC Software	Frad	EZ-EMC	Ver.EMC-CO N 3A1.1	N/A	\	\
25	RF Software	MW	MTS8310	V2.0.0.0	N/A	\	\
26	Turntable	MF	MF-7802BS	N/A	N/A	\	\
27	Antenna tower	MF	MF-7802BS	N/A	N/A	\	\

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.

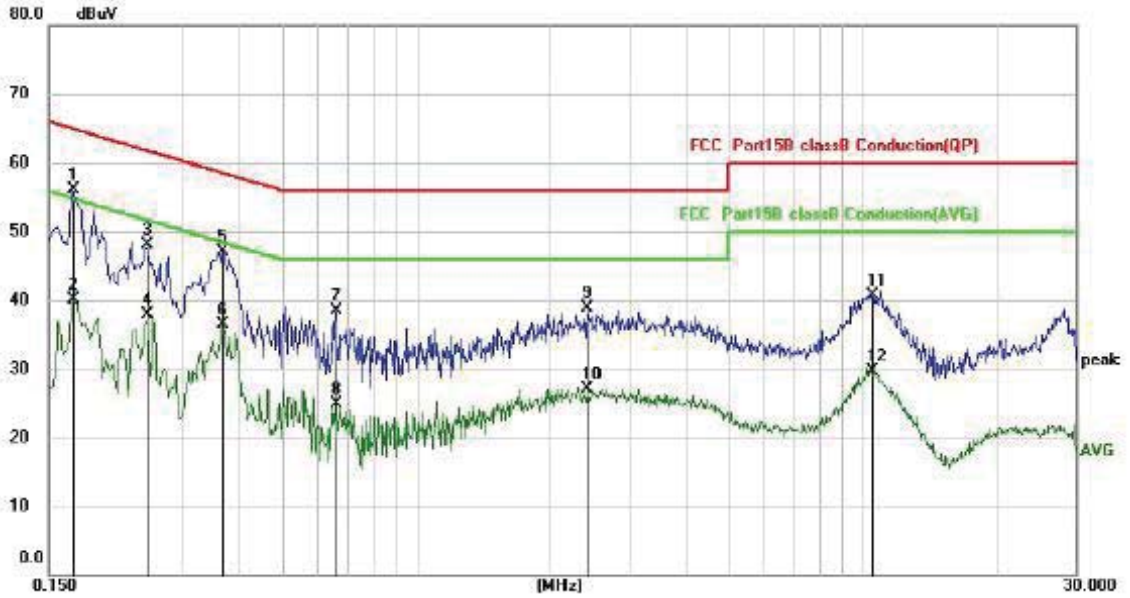
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,

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.

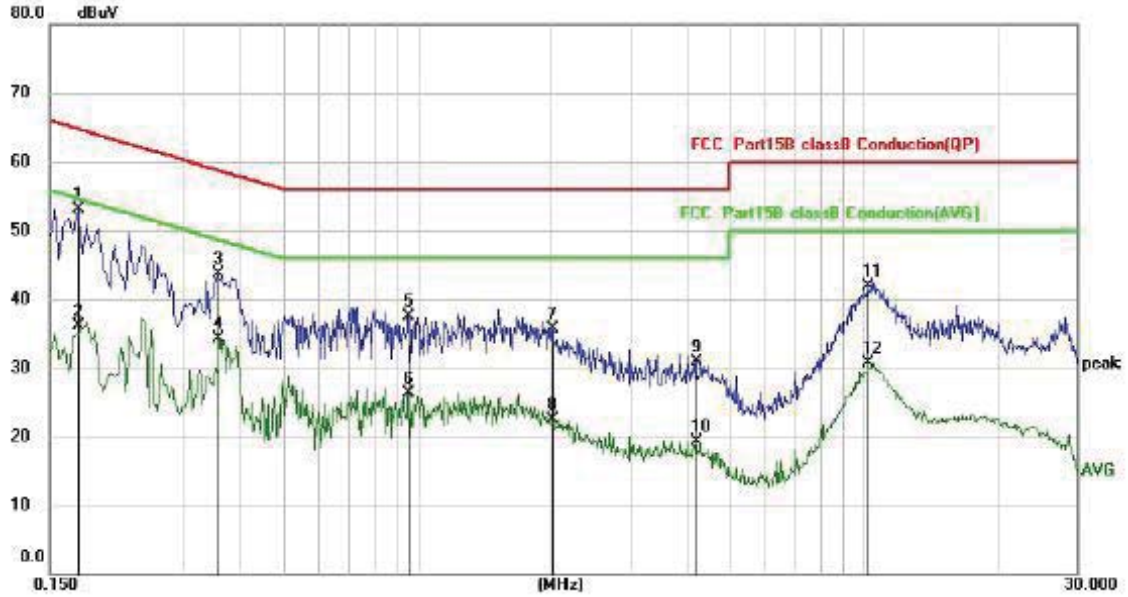
6.4 Test Result

Temperature:	26℃	Relative Humidity:	54%
Pressure:	101 kPa	Polarization:	L
Test Voltage:	AC 120V/60Hz	Test Mode :	TX - 5180MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.1700	46.25	9.95	56.20	64.96	-8.76	QP
2		0.1700	30.13	9.95	40.08	54.96	-14.88	AVG
3		0.2500	38.16	9.96	48.12	61.76	-13.64	QP
4		0.2500	27.93	9.96	37.89	51.76	-13.87	AVG
5		0.3673	37.21	9.97	47.18	58.56	-11.38	QP
6		0.3673	26.58	9.97	36.55	48.56	-12.01	AVG
7		0.6580	28.57	10.01	38.58	56.00	-17.42	QP
8		0.6580	14.85	10.01	24.86	46.00	-21.14	AVG
9		2.4180	28.74	10.13	38.87	56.00	-17.13	QP
10		2.4180	16.91	10.13	27.04	46.00	-18.96	AVG
11		10.4540	30.21	10.59	40.80	60.00	-19.20	QP
12		10.4540	19.11	10.59	29.70	50.00	-20.30	AVG

Temperature：	26℃	Relative Humidity：	54%
Pressure：	101kPa	Phase :	N
Test Voltage ：	AC 120V/60Hz	Test Mode :	TX - 5180MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.1740	43.11	9.95	53.06	64.77	-11.71	QP
2		0.1740	26.12	9.95	36.07	54.77	-18.70	AVG
3		0.3580	33.74	9.97	43.71	58.77	-15.06	QP
4		0.3580	24.29	9.97	34.26	48.77	-14.51	AVG
5		0.9540	27.51	10.01	37.52	56.00	-18.48	QP
6		0.9540	16.37	10.01	26.38	46.00	-19.62	AVG
7		2.0020	25.62	10.09	35.71	56.00	-20.29	QP
8		2.0020	12.42	10.09	22.51	46.00	-23.49	AVG
9		4.2060	20.56	10.30	30.86	56.00	-25.14	QP
10		4.2060	8.94	10.30	19.24	46.00	-26.76	AVG
11		10.2220	31.29	10.59	41.88	60.00	-18.12	QP
12		10.2220	20.06	10.59	30.65	50.00	-19.35	AVG

Notes:
1.An initial pre-scan was performed on the line and neutral lines with peak detector.
2.Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3.Mesurement Level = Reading level + Correct Factor.
4.The test data shows only the worst case TX - 5180MHz.

7. RADIATED SPURIOUS EMISSIONS

7.1 Block Diagram Of Test Setup

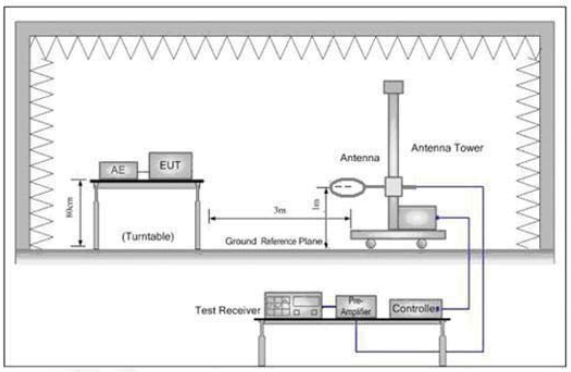


Figure 1. Below 30MHz

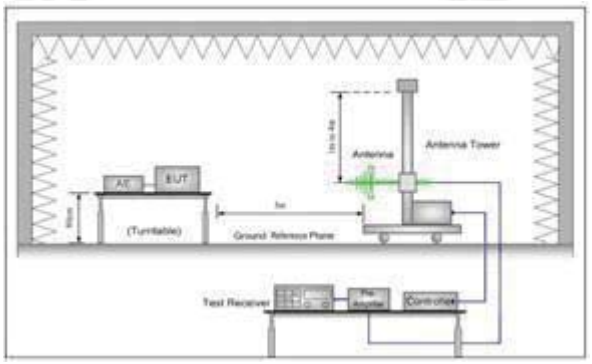


Figure 2. 30MHz to 1GHz

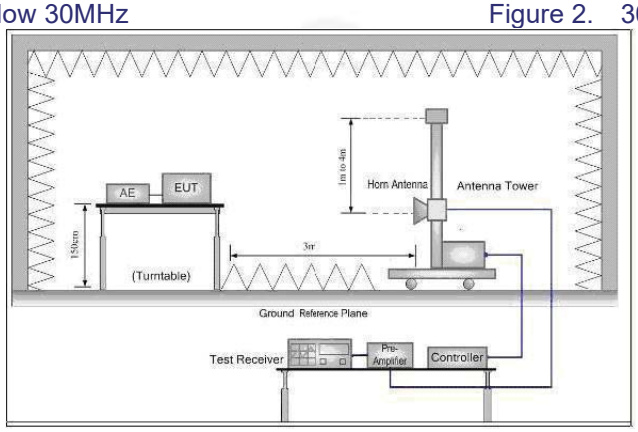


Figure 3. Above 1GHz

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

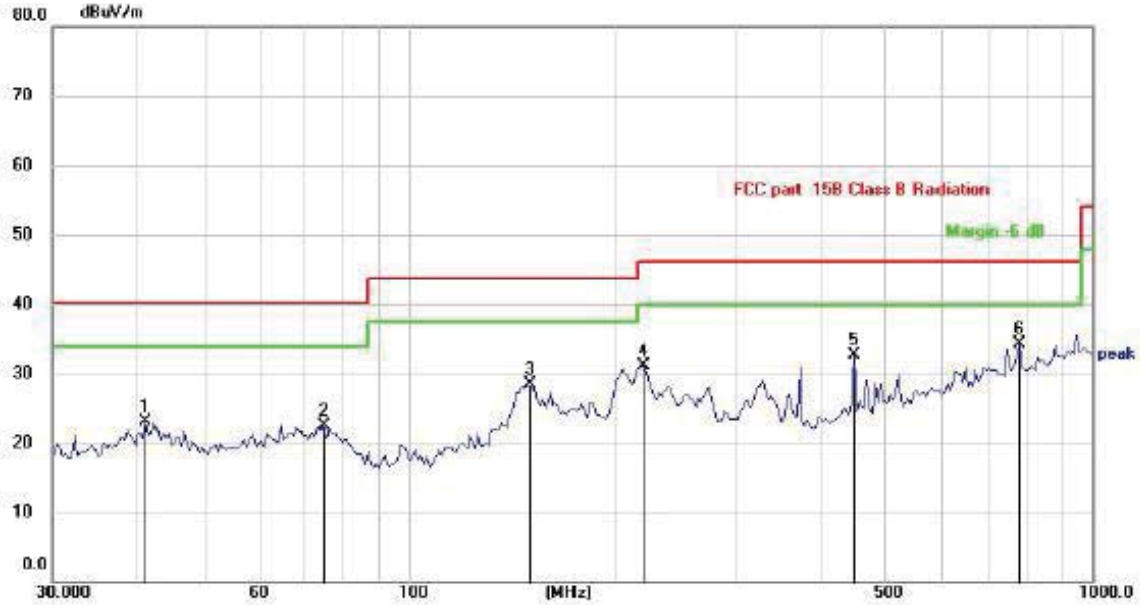
Below 1GHz test procedure as below:
a.The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b.The EUT was set 3 meters away from the interference-receiving 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

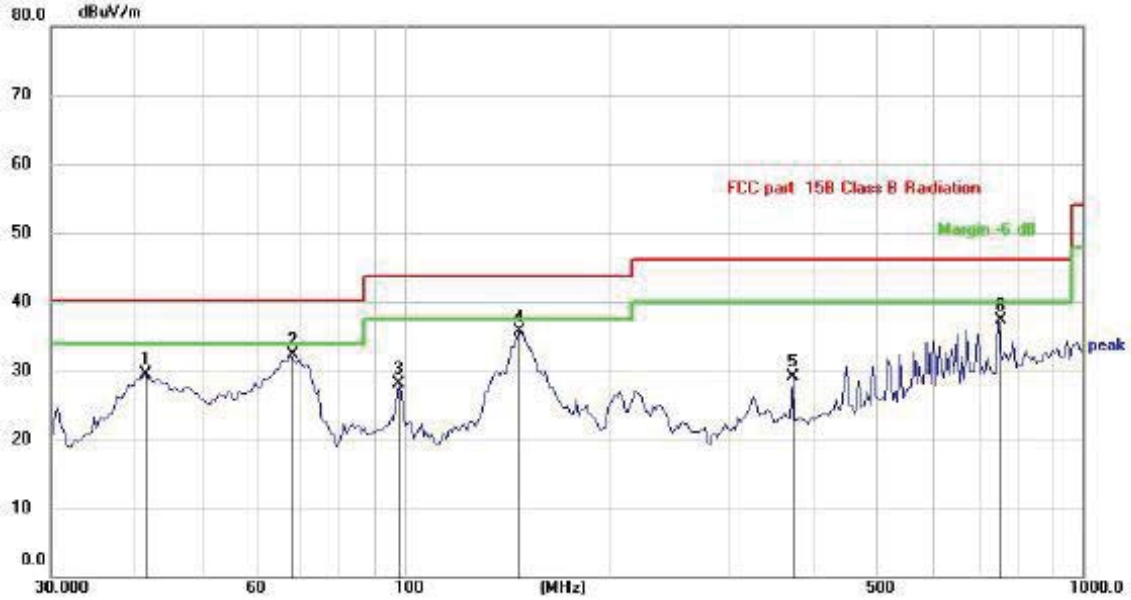
7.4 Test Result

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		41.1320	28.11	-4.98	23.13	40.00	-16.87	QP
2		74.6569	31.02	-8.53	22.49	40.00	-17.51	QP
3		149.2239	31.85	-3.26	28.59	43.50	-14.91	QP
4		221.3921	38.37	-7.23	31.14	46.00	-14.86	QP
5		450.3447	33.74	-1.05	32.69	46.00	-13.31	QP
6	*	782.3453	28.13	6.09	34.22	46.00	-11.78	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		41.4942	34.47	-5.05	29.42	40.00	-10.58	QP
2	*	67.7939	40.09	-7.76	32.33	40.00	-7.67	QP
3		97.9699	37.14	-9.12	28.02	43.50	-15.48	QP
4		147.9214	39.15	-3.42	35.73	43.50	-7.77	QP
5		374.6225	32.00	-2.81	29.19	46.00	-16.81	QP
6		748.7943	31.76	5.46	37.22	46.00	-8.78	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	41.50	16.39	57.89	74	-16.11	PK	1.40	135	H
10360	26.21	16.39	42.60	54	-11.40	AV	1.45	224	H
10360	41.80	16.39	58.19	74	-15.81	PK	1.37	310	V
10360	25.52	16.39	41.91	54	-12.09	AV	1.00	144	V
Channel:5240MHz									
10480	41.50	16.11	57.61	74	-16.39	PK	1.55	309	H
10480	27.18	16.11	43.29	54	-10.71	AV	1.38	142	H
10480	40.59	16.11	56.70	74	-17.30	PK	1.46	53	V
10480	27.52	16.11	43.63	54	-10.37	AV	1.74	251	V
Channel:5260MHz									
10520	40.58	17.46	58.04	74	-15.96	PK	1.60	173	H
10520	26.59	17.46	44.05	54	-9.95	AV	1.21	112	H
10520	39.93	17.46	57.39	74	-16.61	PK	1.88	276	V
10520	26.66	17.46	44.12	54	-9.88	AV	1.58	75	V
Channel:5320MHz									
10640	40.72	17.57	58.29	74	-15.71	PK	1.59	80	H
10640	27.98	17.57	45.55	54	-8.45	AV	1.77	18	H
10640	40.23	17.57	57.80	74	-16.20	PK	1.79	310	V
10640	26.96	17.57	44.53	54	-9.47	AV	1.80	274	V
Channel:5500MHz									
11000	40.83	17.57	58.40	74	-15.60	PK	1.62	297	H
11000	26.48	17.57	44.05	54	-9.95	AV	1.50	109	H
11000	41.31	17.57	58.88	74	-15.12	PK	1.06	314	V
11000	27.93	17.57	45.50	54	-8.50	AV	1.79	43	V

Channel:5700MHz									
11400	40.95	17.46	58.41	74	-15.59	PK	1.48	160	H
11400	25.72	17.46	43.18	54	-10.82	AV	1.45	340	H
11400	41.70	17.46	59.16	74	-14.84	PK	1.12	14	V
11400	25.39	17.46	42.85	54	-11.15	AV	1.72	50	V
Channel:5745MHz									
11490	39.35	17.46	56.81	74	-17.19	PK	1.06	356	H
11490	26.66	17.46	44.12	54	-9.88	AV	1.73	200	H
11490	39.27	17.46	56.73	74	-17.27	PK	1.02	315	V
11490	25.92	17.46	43.38	54	-10.62	AV	1.48	313	V
Channel:5825MHz									
11650	39.13	17.57	56.70	74	-17.30	PK	1.10	261	H
11650	27.87	17.57	45.44	54	-8.56	AV	1.54	339	H
11650	39.81	17.57	57.38	74	-16.62	PK	1.16	123	V
11650	26.51	17.57	44.08	54	-9.92	AV	1.06	233	V

Modulation : 802.11(n40) (the worst data)

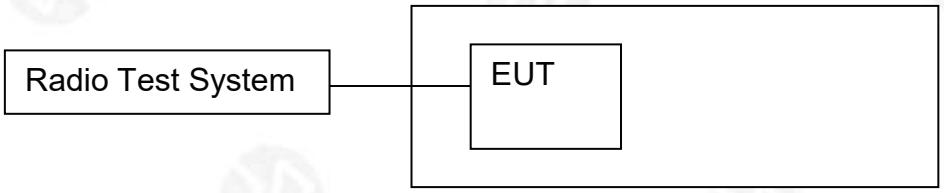
Freq (MHz)	Rd_level (dBuV/m)	Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	detector	Height	Degree	Antenna polarization
Channel:5190MHz									
10380	39.30	16.34	55.64	74	-18.36	PK	1.74	18	H
10380	26.91	16.34	43.25	54	-10.75	AV	1.73	5	H
10380	39.15	16.34	55.49	74	-18.51	PK	1.41	292	V
10380	26.69	16.34	43.03	54	-10.97	AV	1.04	259	V
Channel:5230MHz									
10460	41.17	16.15	57.32	74	-16.68	PK	1.32	332	H
10460	26.48	16.15	42.63	54	-11.37	AV	1.49	119	H
10460	39.53	16.15	55.68	74	-18.32	PK	1.15	83	V
10460	26.18	16.15	42.33	54	-11.67	AV	1.14	248	V
Channel:5270MHz									
10540	39.53	17.49	57.02	74	-16.98	PK	1.06	80	H
10540	25.11	17.49	42.60	54	-11.40	AV	1.13	212	H
10540	39.75	17.49	57.24	74	-16.76	PK	1.56	140	V
10540	26.34	17.49	43.83	54	-10.17	AV	1.33	125	V
Channel:5310MHz									
10620	39.03	17.52	56.55	74	-17.50	PK	1.66	179	H
10620	26.23	17.52	43.75	54	-17.45	AV	1.40	133	H
10620	40.20	17.52	57.72	74	-16.28	PK	1.75	159	V
10620	27.63	17.52	45.15	54	-8.85	AV	1.36	32	V
Channel:5510MHz									
11020	40.41	16.34	56.75	74	-17.25	PK	1.52	110	H
11020	25.59	16.34	41.93	54	-12.07	AV	1.90	101	H
11020	40.18	16.34	56.52	74	-17.48	PK	1.27	288	V
11020	25.54	16.34	41.88	54	-12.12	AV	1.60	136	V
Channel:5670MHz									
11340	41.37	16.15	57.52	74	-16.48	PK	1.41	246	H
11340	26.65	16.15	42.80	54	-11.20	AV	1.78	108	H
11340	41.62	16.15	57.77	74	-16.23	PK	1.14	305	V
11340	25.57	16.15	41.72	54	-12.28	AV	1.15	33	V

Channel:5755MHz									
11510	41.63	17.49	59.12	74	-14.88	PK	1.52	345	H
11510	26.17	17.49	43.66	54	-10.34	AV	1.27	321	H
11510	40.61	17.49	58.10	74	-15.90	PK	1.51	332	V
11510	27.04	17.49	44.53	54	-9.47	AV	1.17	207	V
Channel:5795MHz									
11590	40.13	17.52	57.65	74	-16.03	PK	1.28	241	H
11590	26.98	17.52	44.50	54	-16.35	AV	1.76	58	H
11590	41.71	17.52	59.23	74	-14.77	PK	1.10	313	V
11590	27.78	17.52	45.30	54	-8.70	AV	1.72	244	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

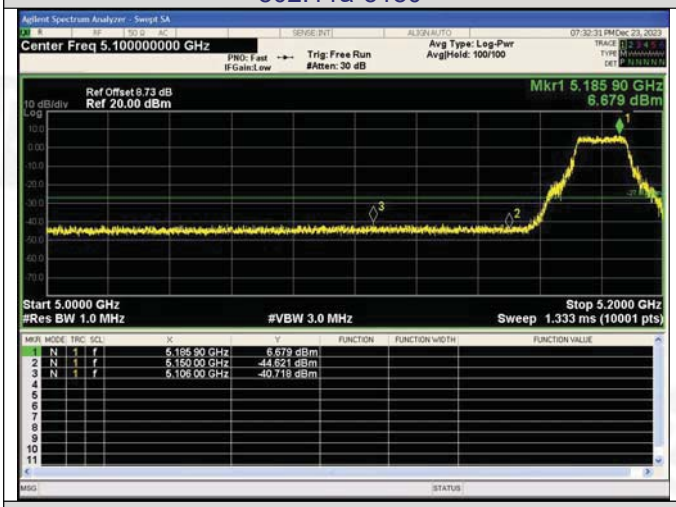
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then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

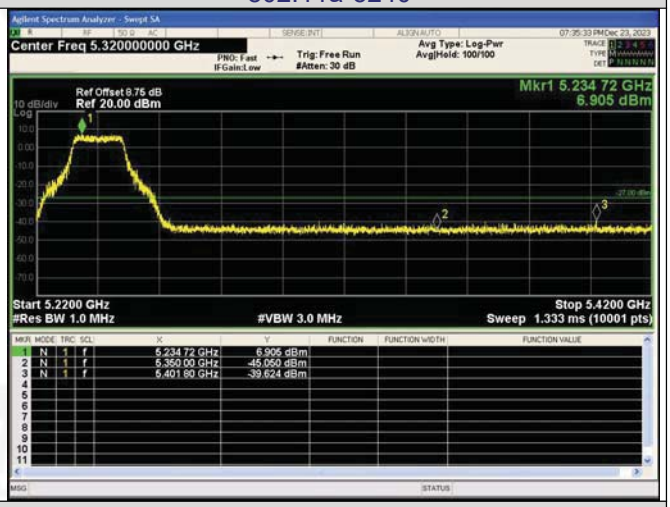
Test Graph

5150-5250MHz:

802.11a-5180



802.11a-5240



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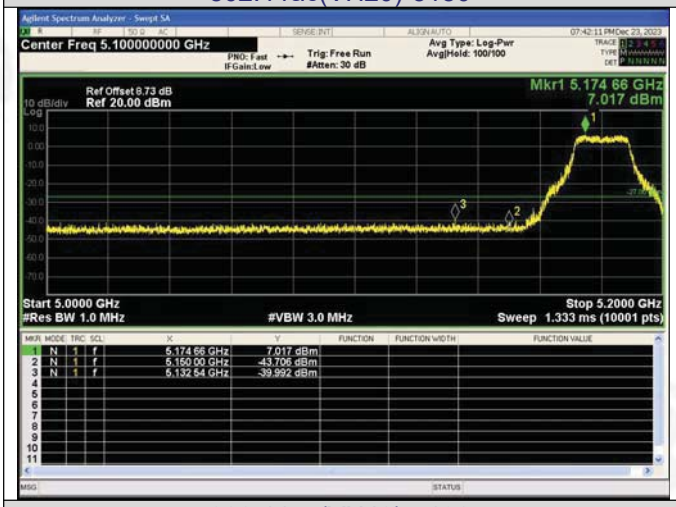

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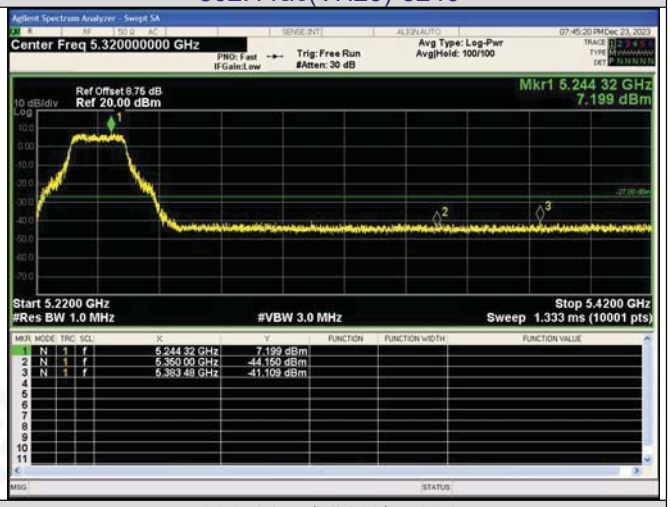

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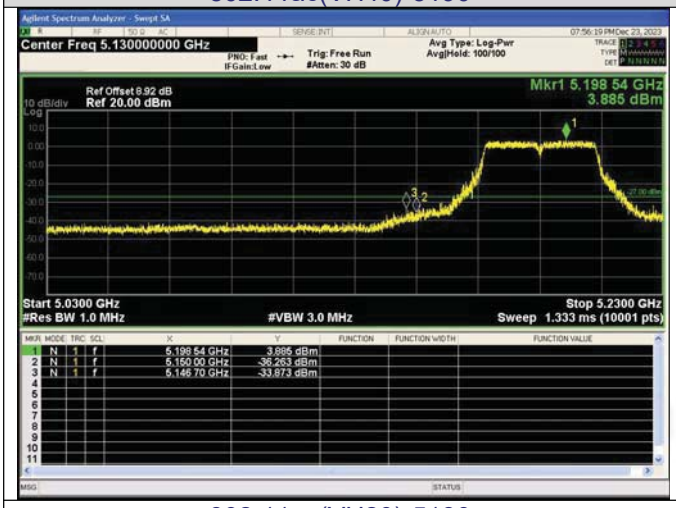
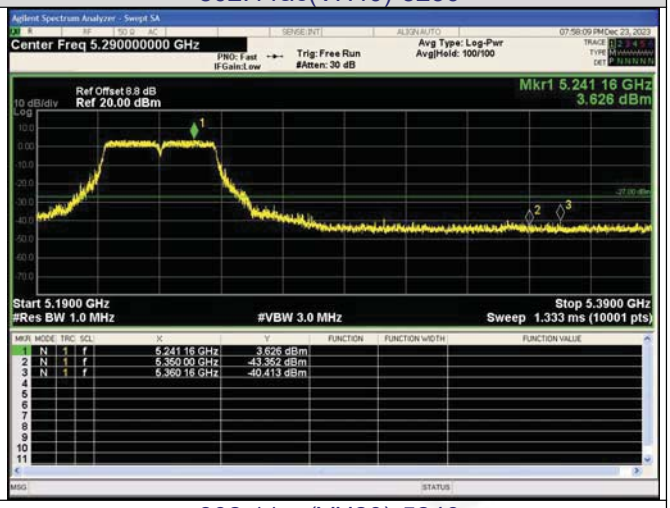
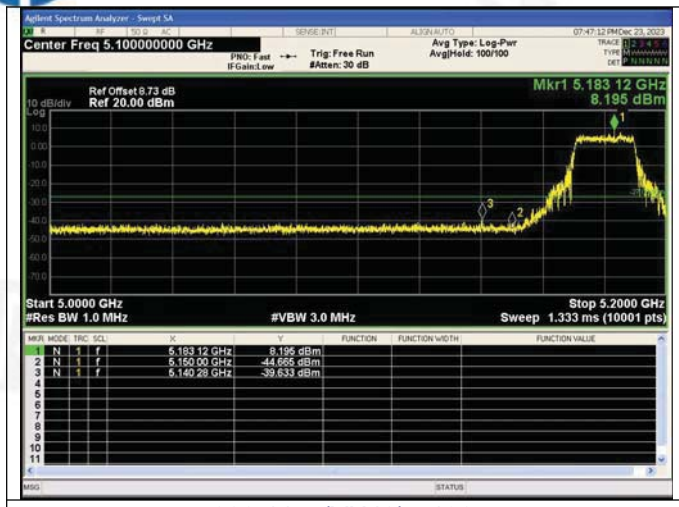


802.11ac(VH40)-5230

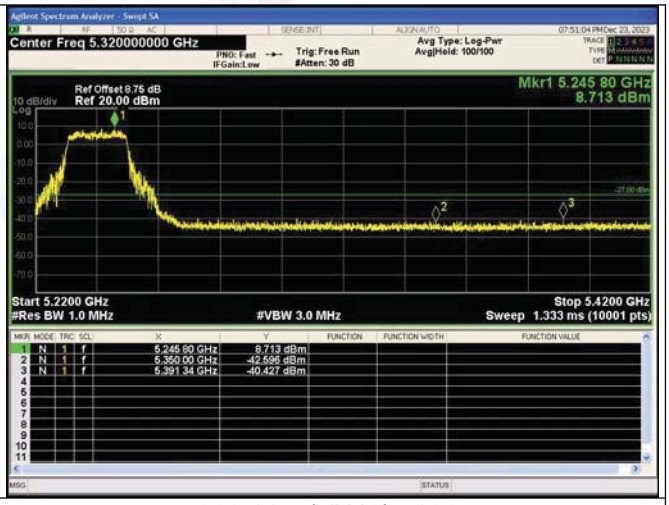


802.11ax(VH20)-5180

802.11ax(VH20)-5240

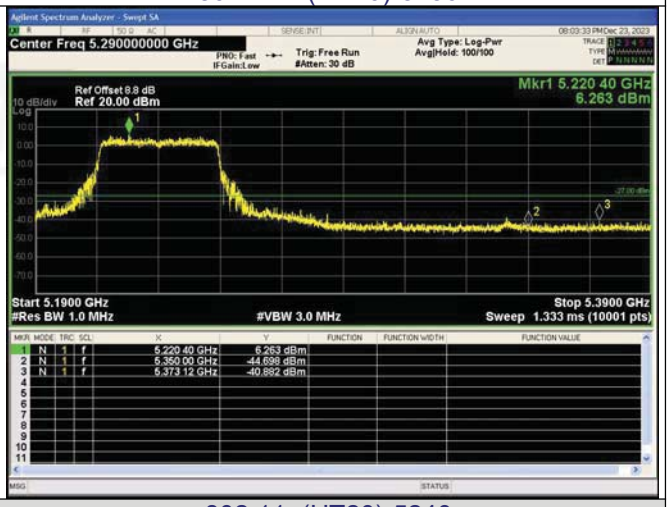


802.11ax(VH40)-5190

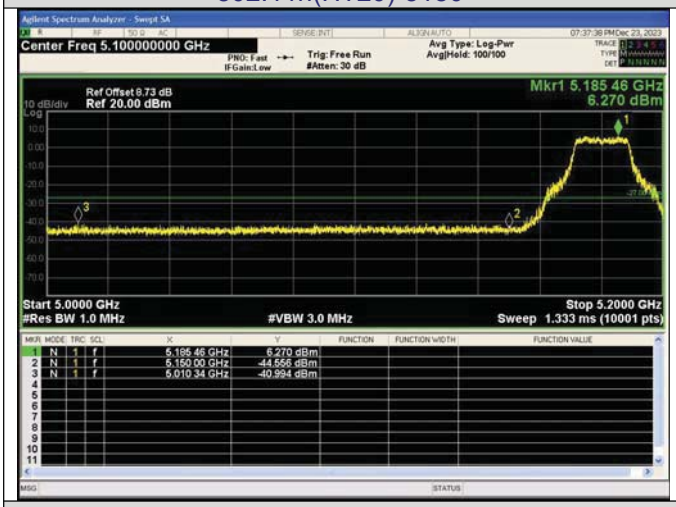


802.11ax(VH40)-5230

802.11n(HT20)-5180



802.11n(HT20)-5240



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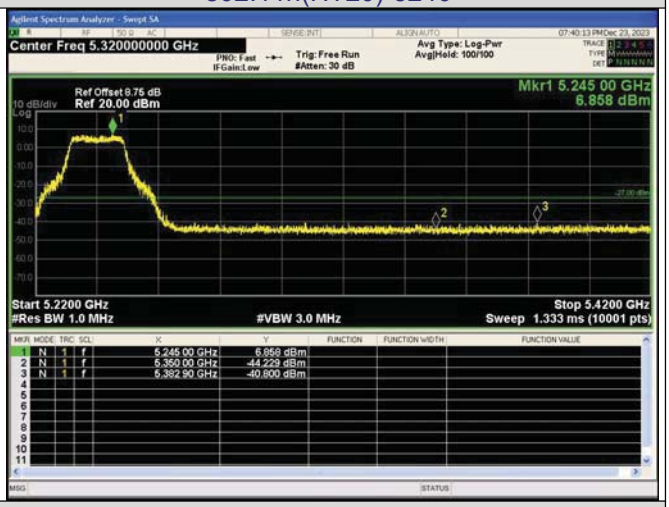
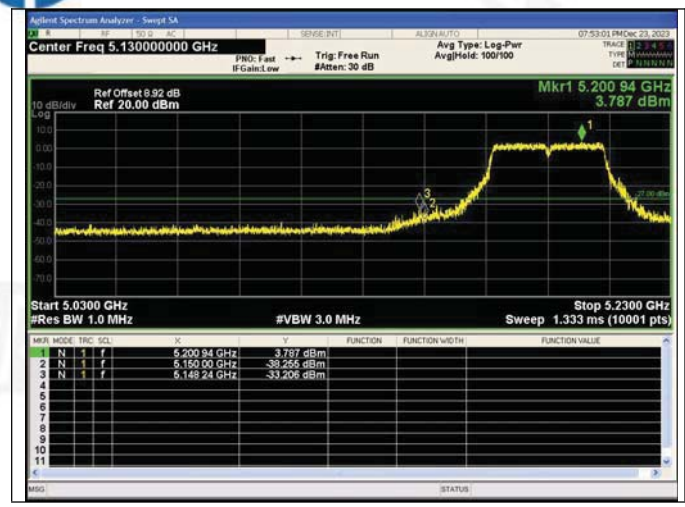
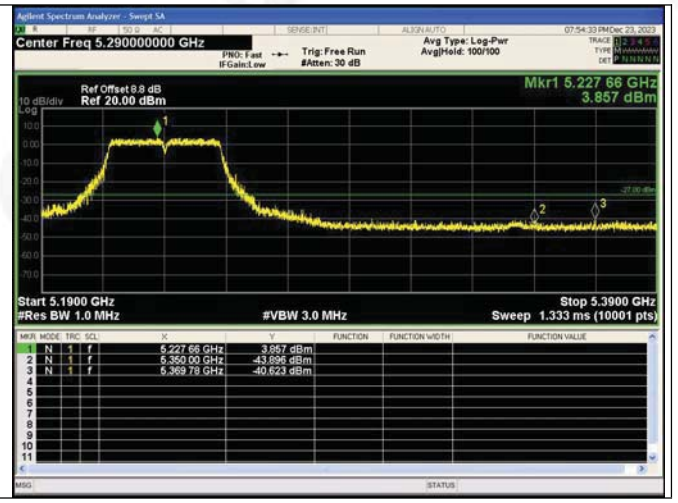
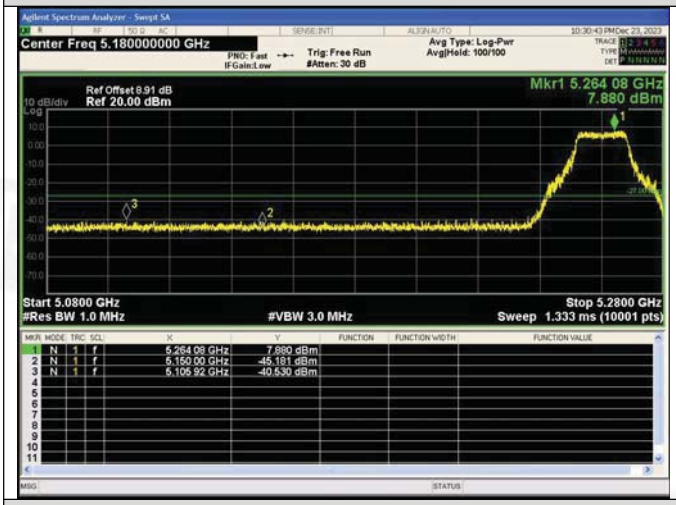
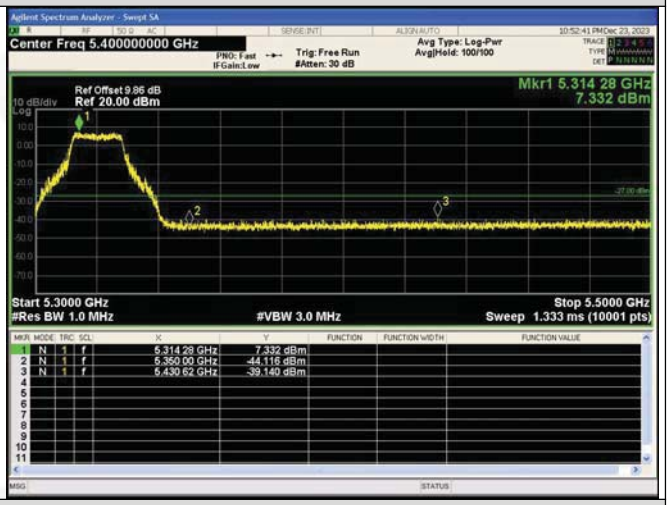
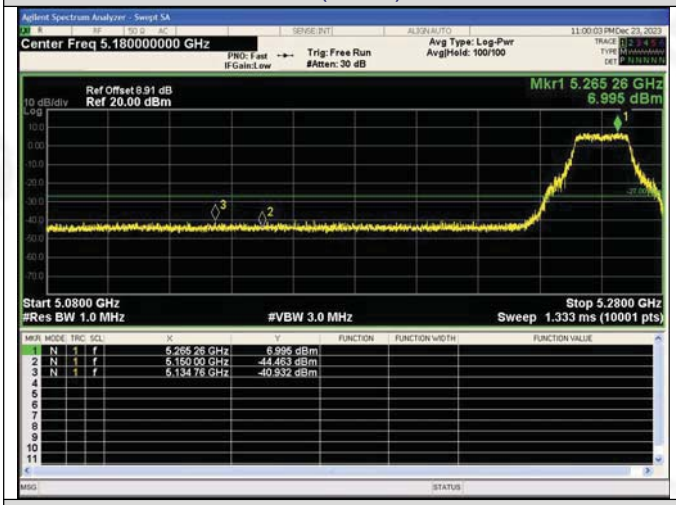
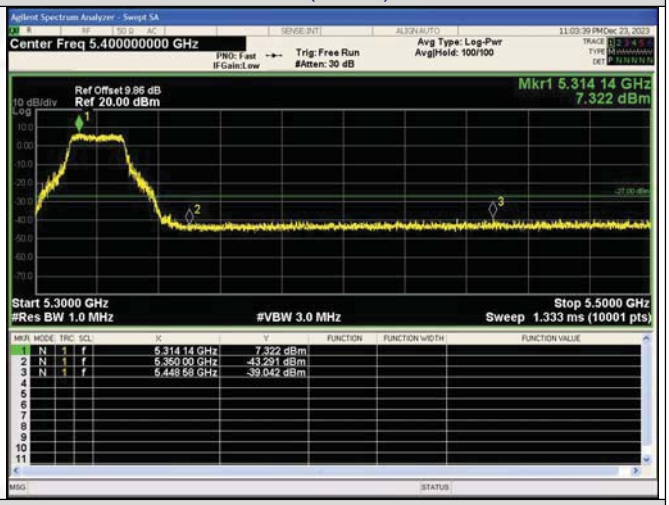


802.11n(HT40)-5230


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.130000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
Ref Offset 8.92 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.200 94 GHz
3.787 dBm
Start 5.0300 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 5.2300 GHz
Sweep 1.333 ms (10001 pts)
1 N 1 f 5.200 94 GHz 3.787 dBm
2 N 1 f 5.150 00 GHz -38.256 dBm
3 N 1 f 5.148 24 GHz -33.206 dBm


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.290000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
Ref Offset 8.9 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.227 66 GHz
3.857 dBm
Start 5.1900 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 5.3900 GHz
Sweep 1.333 ms (10001 pts)
1 N 1 f 5.227 66 GHz 3.857 dBm
2 N 1 f 5.350 00 GHz -43.896 dBm
3 N 1 f 5.369 79 GHz -40.623 dBm

5250-5350MHz:

802.11a-5260	802.11a-5320
	
802.11ac(VH20)-5260	802.11ac(VH20)-5320
	
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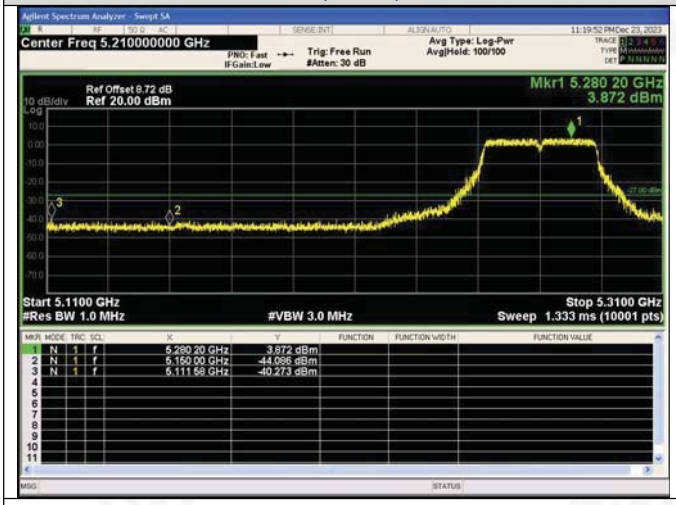
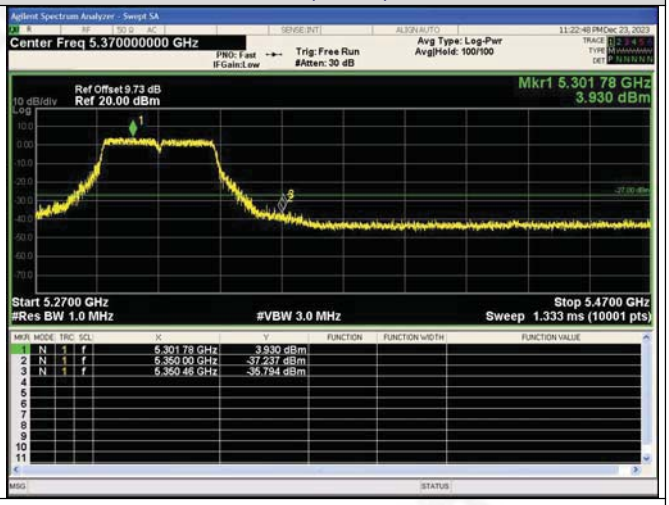
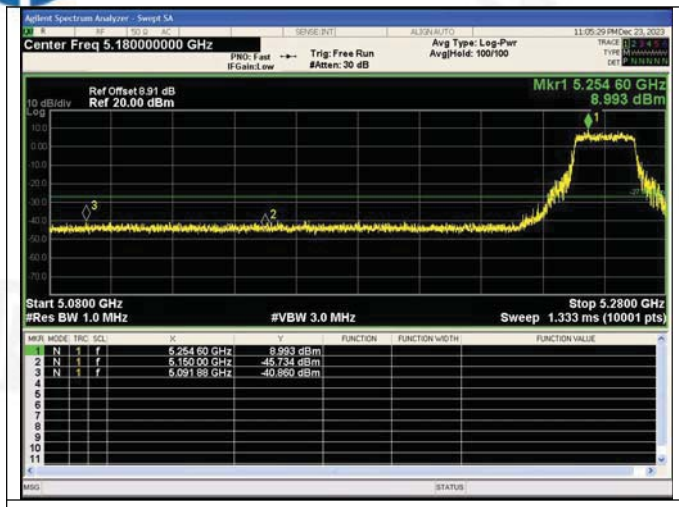
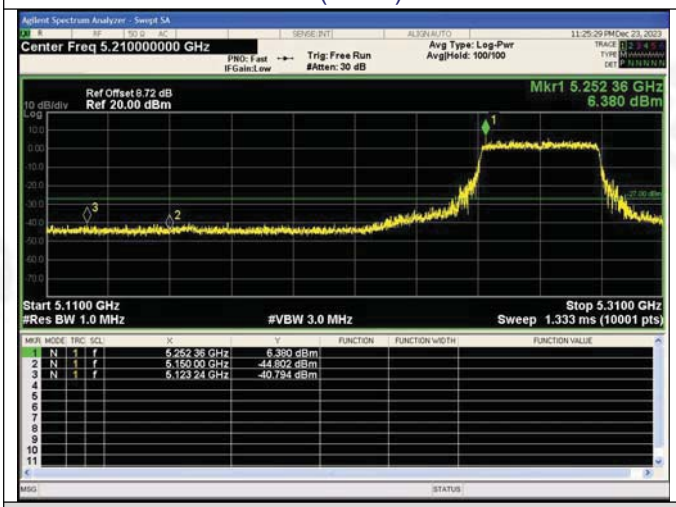
	
802.11ax(VH20)-5260	802.11ax(VH20)-5320



802.11ax(VH40)-5270

802.11ax(VH40)-5310



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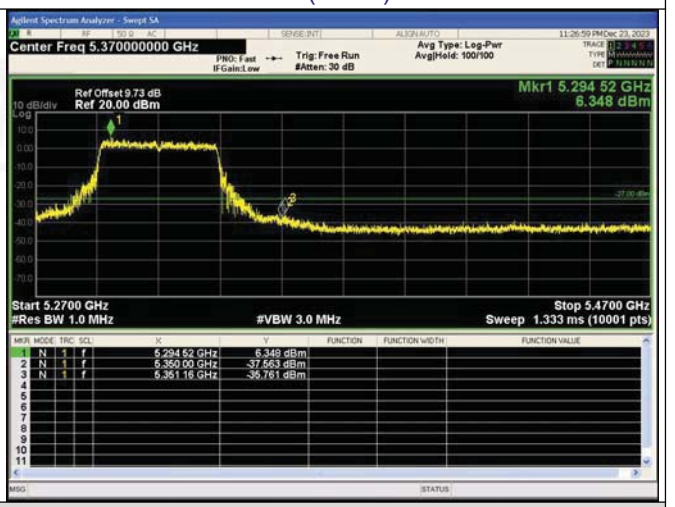

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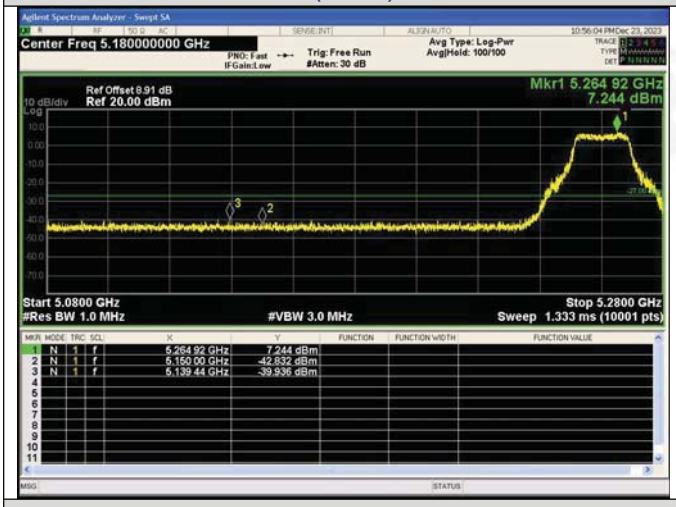

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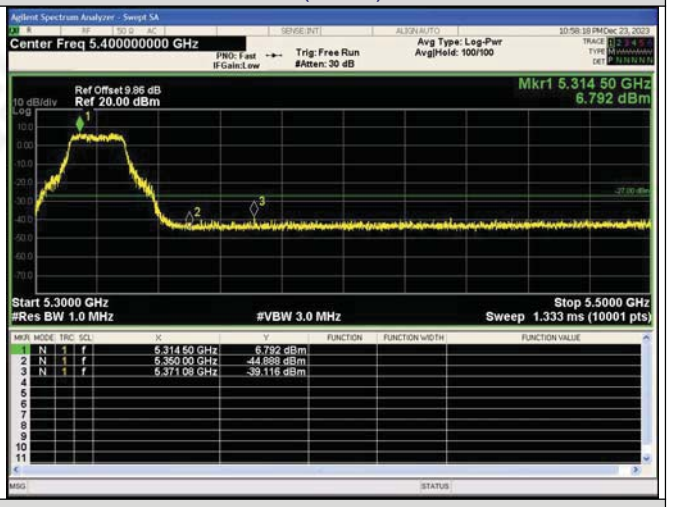
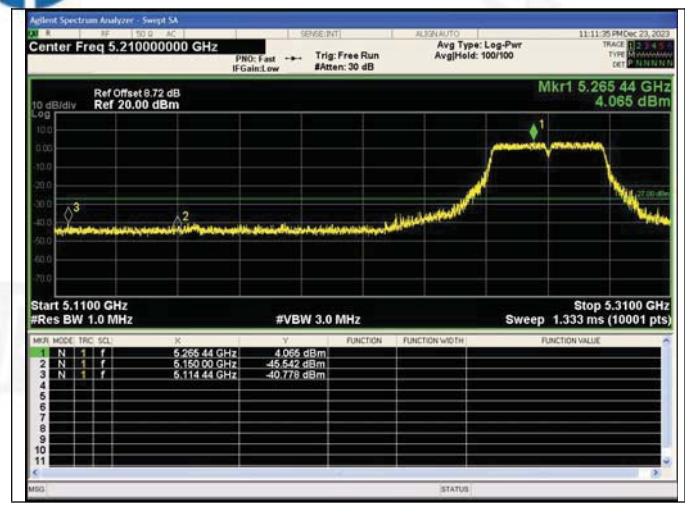
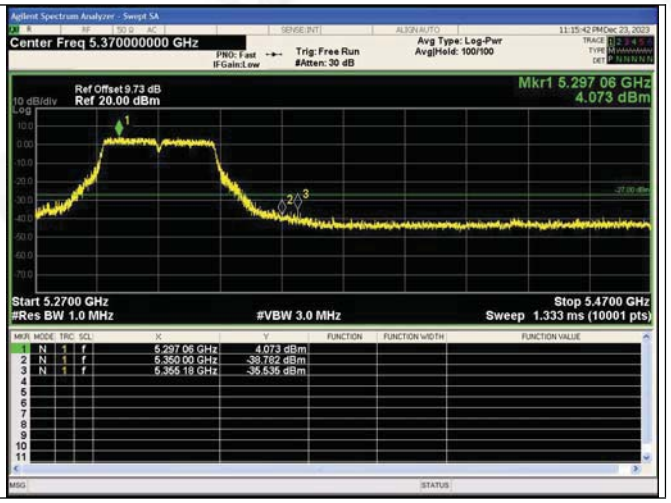
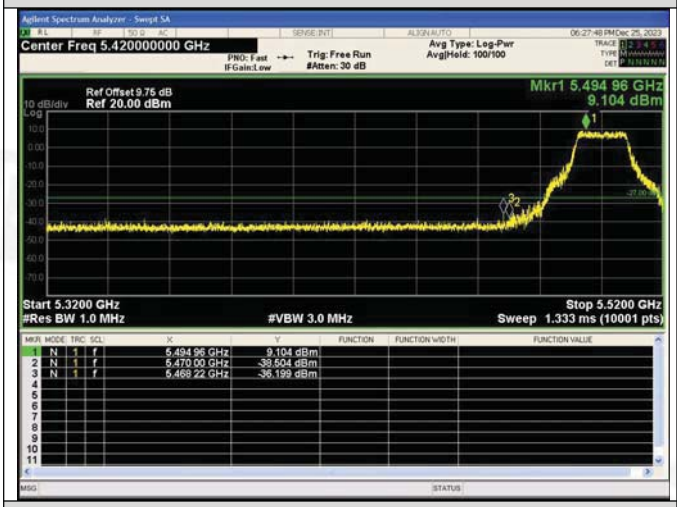
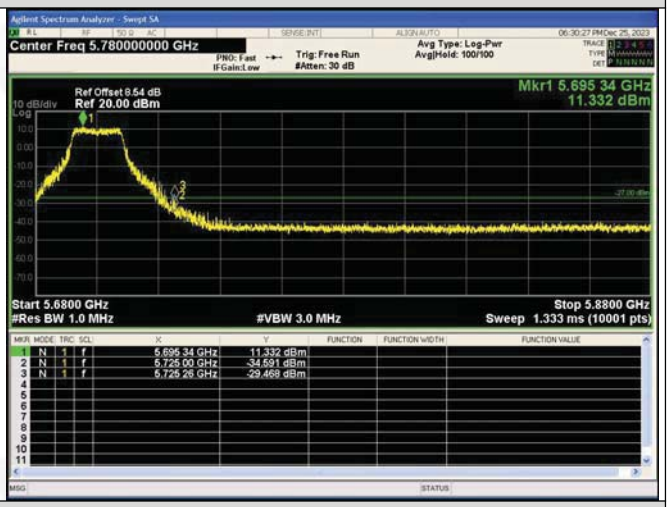
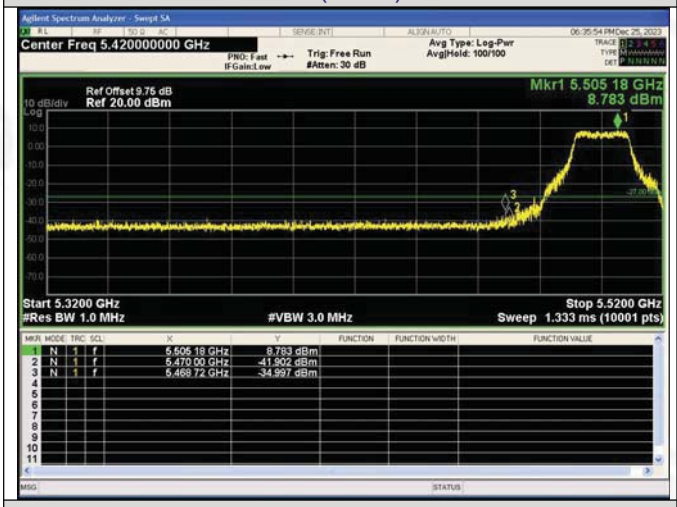
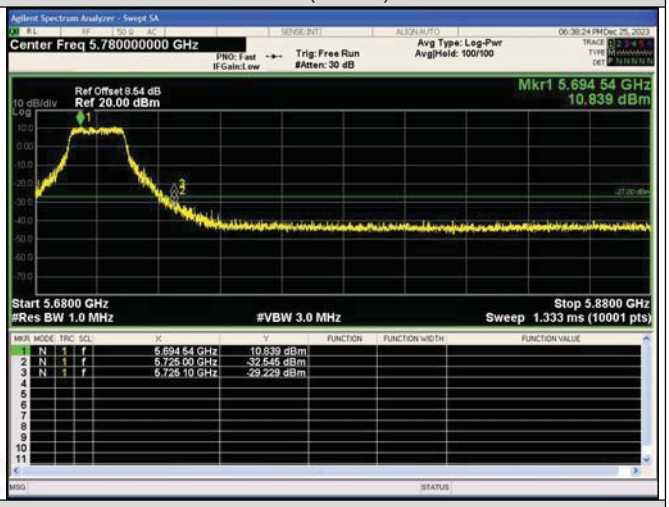
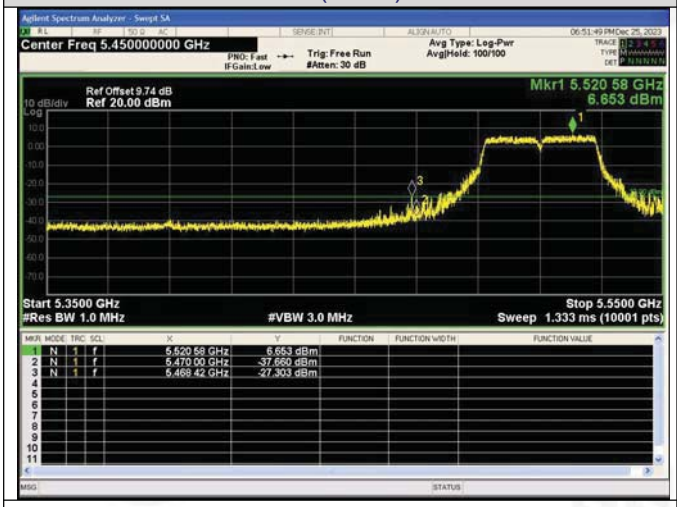
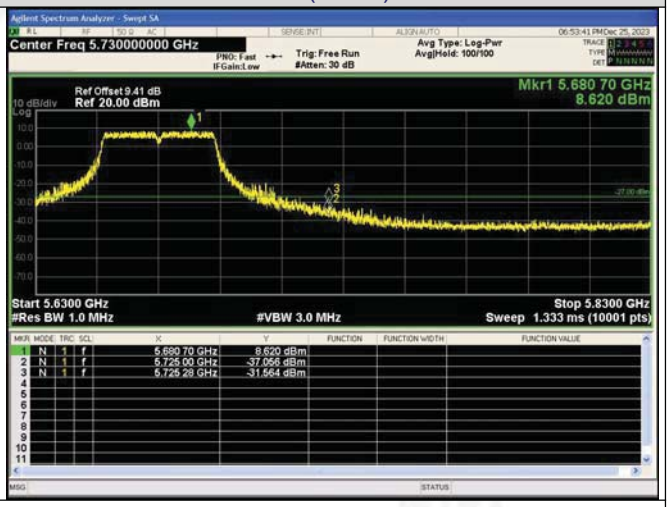


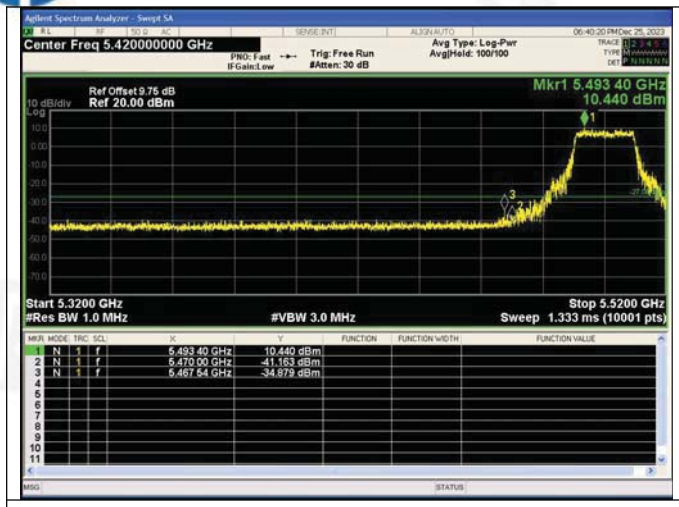
802.11n(HT40)-5310


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.210000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
11:11:35 PM Dec 23, 2023
Ref Offset 8.72 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.265 44 GHz
4.065 dBm
Start 5.1100 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 5.3100 GHz
Sweep 1.333 ms (10001 pts)
1 N 1 f 5.265 44 GHz 4.065 dBm
2 N 1 f 5.150 00 GHz -45.542 dBm
3 N 1 f 5.114 44 GHz -40.778 dBm

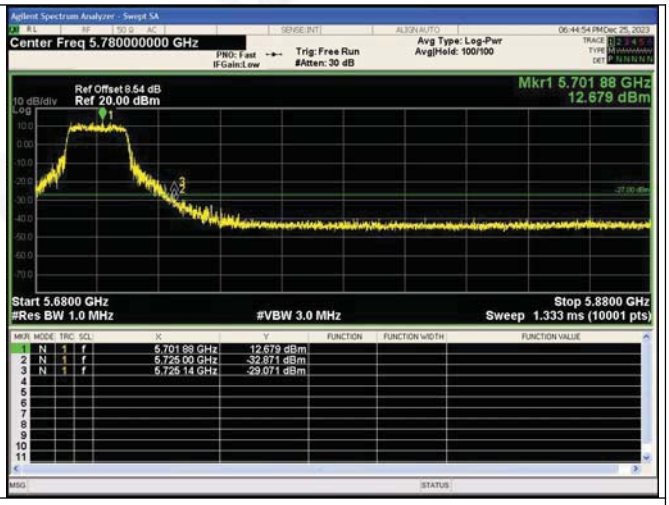

Agilent Spectrum Analyzer - Swept SA
Center Freq 5.370000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
11:15:42 PM Dec 23, 2023
Ref Offset 9.73 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.297 06 GHz
4.073 dBm
Start 5.2700 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 5.4700 GHz
Sweep 1.333 ms (10001 pts)
1 N 1 f 5.297 06 GHz 4.073 dBm
2 N 1 f 5.350 00 GHz -38.762 dBm
3 N 1 f 5.366 18 GHz -36.536 dBm

5470-5725MHz:

802.11a-5500	802.11a-5700
	
802.11ac(VH20)-5500	802.11ac(VH20)-5700
	
802.11ac(VH40)-5510	802.11ac(VH40)-5670
	
802.11ax(VH20)-5500	802.11ax(VH20)-5700

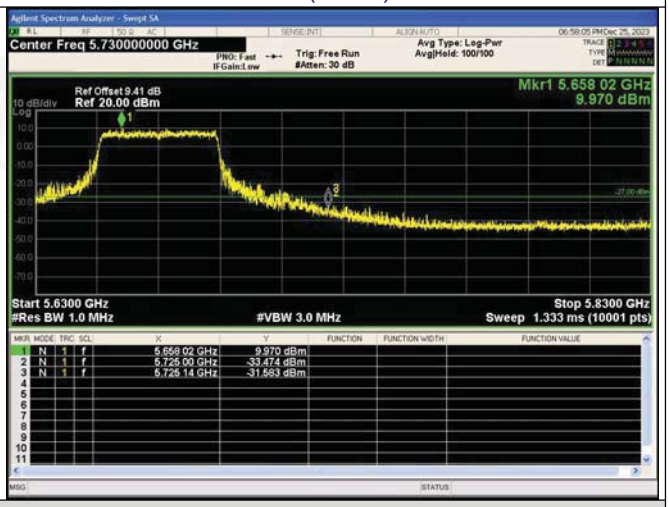


802.11ax(VH40)-5510

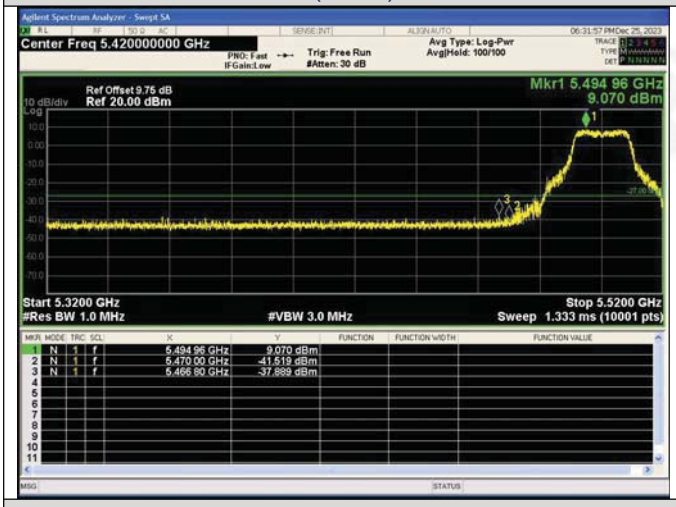


802.11ax(VH40)-5670

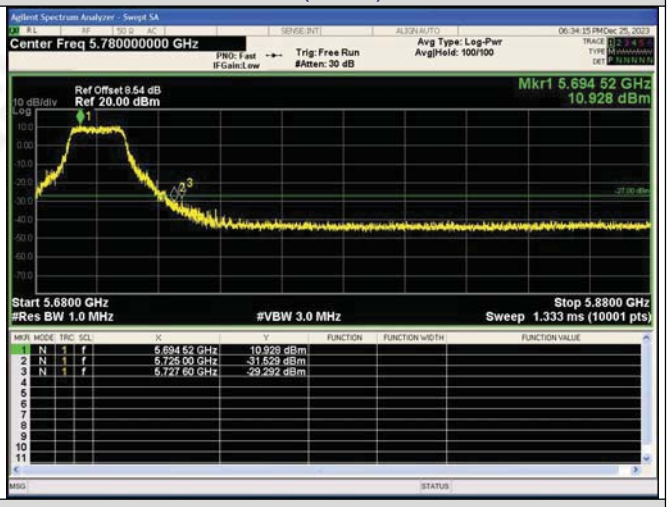
802.11n(HT20)-5500



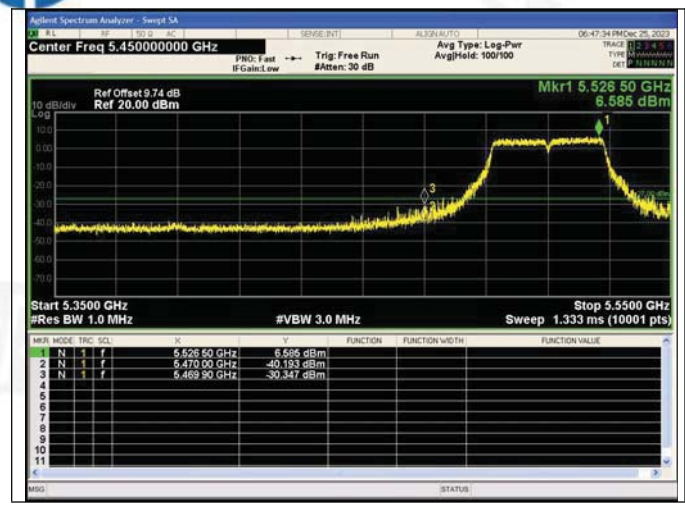
802.11n(HT20)-5700

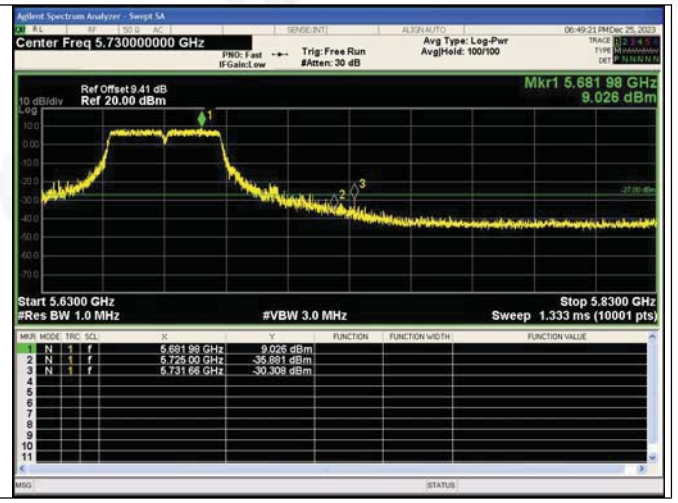


802.11n(HT40)-5510

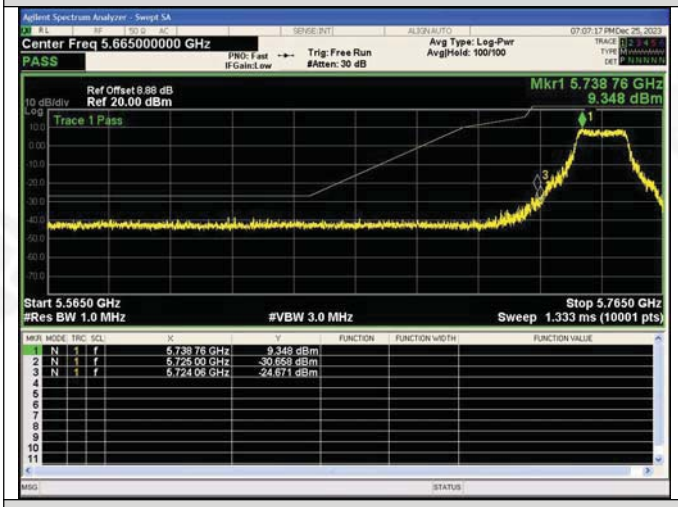
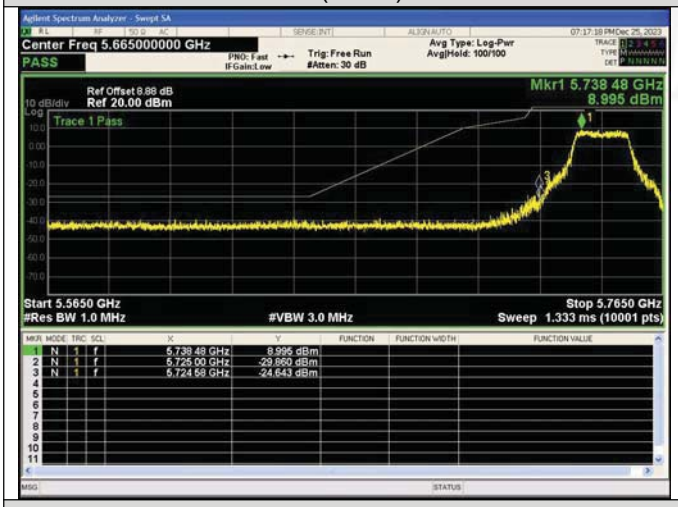
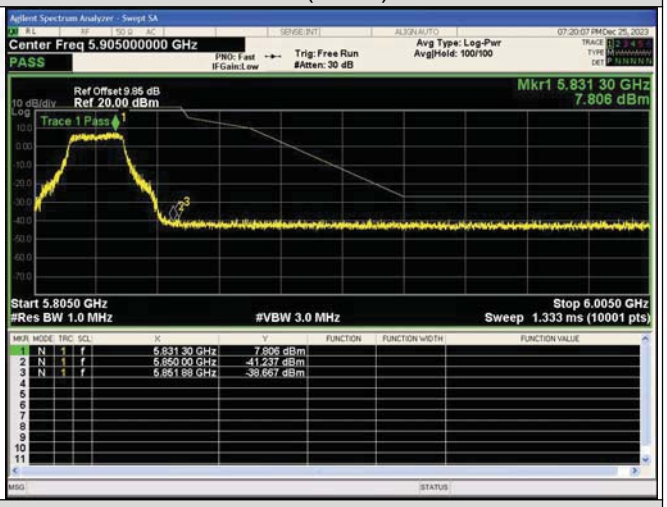


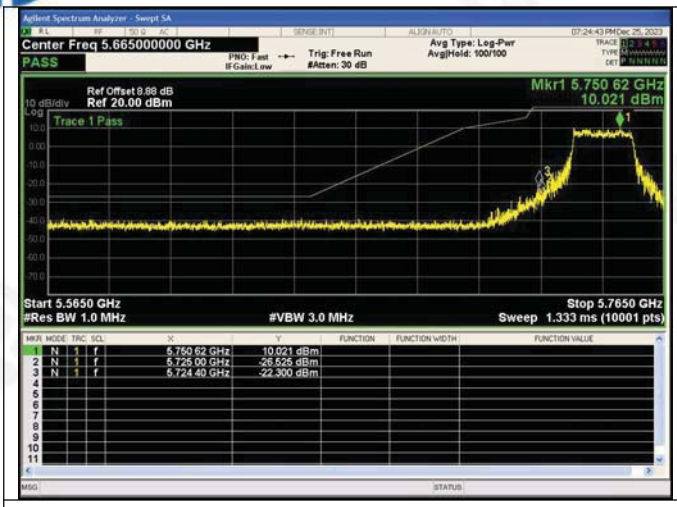
802.11n(HT40)-5670


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.450000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
Ref Offset 9.74 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.526 50 GHz
6.585 dBm
Start 5.3500 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 5.5500 GHz
Sweep 1.333 ms (10001 pts)
1 N 1 f 5.526 50 GHz 6.585 dBm
2 N 1 f 5.470 00 GHz -40.193 dBm
3 N 1 f 5.469 90 GHz -30.347 dBm

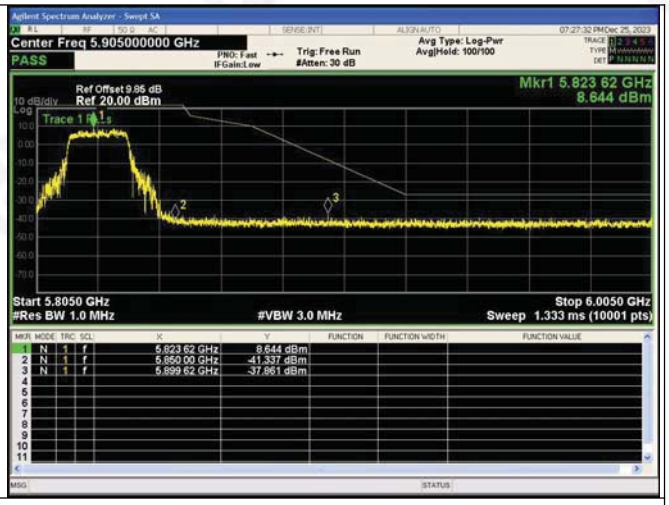

Agilent Spectrum Analyzer - Swept SA
Center Freq 5.730000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
Ref Offset 9.41 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.681 98 GHz
9.026 dBm
Start 5.6300 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 5.8300 GHz
Sweep 1.333 ms (10001 pts)
1 N 1 f 5.681 98 GHz 9.026 dBm
2 N 1 f 5.725 00 GHz -35.881 dBm
3 N 1 f 5.731 66 GHz -30.308 dBm

5725-5850MHz

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

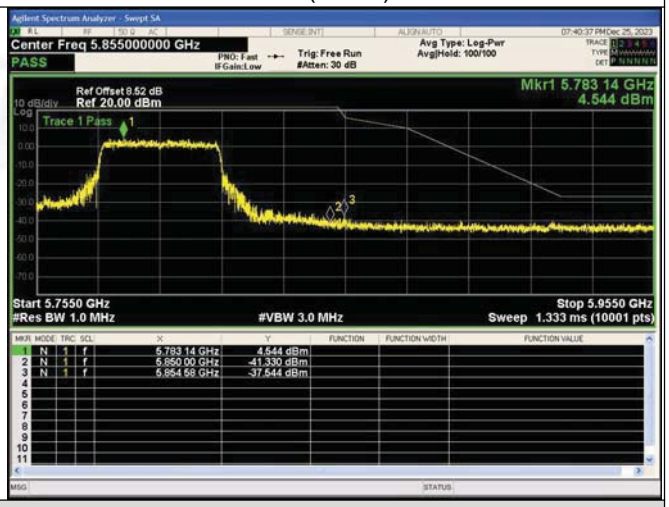


802.11ax(VH40)-5755

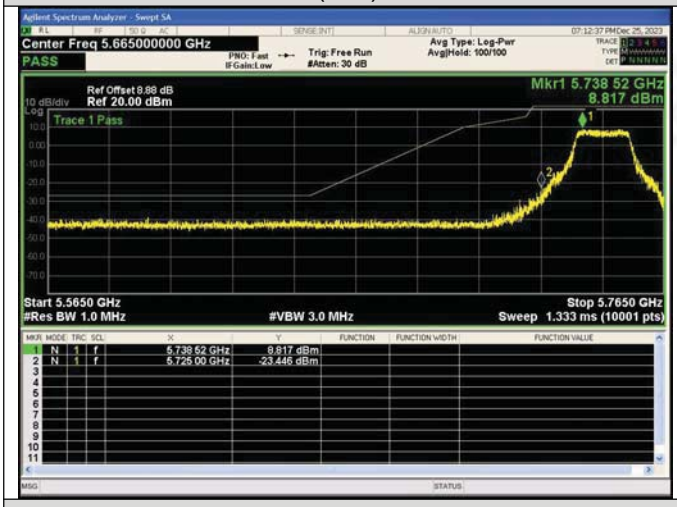


802.11ax(VH40)-5795

802.11(n20)-5745



802.11(n20)-5825



802.11(n40)-5755

802.11(n40)-5795


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.695000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
07:30:07 PM Dec 25, 2023
PASS
Ref Offset 9.29 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.742 88 GHz
6.206 dBm
Trace 1 Pass
Start 5.5950 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 5.7950 GHz
Sweep 1.333 ms (10001 pts)
1 N 1 f 5.742 88 GHz 6.206 dBm
2 N 1 f 5.725 00 GHz -26.596 dBm
3 N 1 f 5.723 70 GHz -22.918 dBm


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.855000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
07:31:43 PM Dec 25, 2023
PASS
Ref Offset 8.52 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.801 68 GHz
3.409 dBm
Trace 1 Pass
Start 5.7550 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 5.9550 GHz
Sweep 1.333 ms (10001 pts)
1 N 1 f 5.801 68 GHz 3.409 dBm
2 N 1 f 5.950 00 GHz -42.435 dBm
3 N 1 f 5.860 36 GHz -37.834 dBm

9. CONDUCTED PEAK 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	Limit dBm
802.11a20	5180	9.407	23.98
	5200	10.007	23.98
	5240	10.112	23.98
802.11ac20	5180	9.408	23.98
	5200	10.039	23.98
	5240	10.165	23.98
802.11ac40	5190	9.582	23.98
	5230	9.797	23.98
802.11ax20	5180	9.433	23.98
	5200	10.057	23.98
	5240	10.089	23.98
802.11ax40	5190	9.418	23.98
	5230	9.767	23.98
802.11n(HT20)	5180	9.506	23.98
	5200	10.083	23.98
	5240	10.14	23.98
802.11n(HT40)	5190	9.492	23.98
	5230	9.855	23.98

5250-5350 MHz

Test mode1	Test Channel (MHz)	Output Power dBm	Limit dBm
802.11a20	5260	11.077	23.98
	5280	11.09	23.98
	5320	10.977	23.98
802.11ac20	5260	10.289	23.98
	5280	10.491	23.98
	5320	10.222	23.98
802.11ac40	5270	9.988	23.98
	5310	10.143	23.98
802.11ax20	5260	10.104	23.98
	5280	10.401	23.98
	5320	10.176	23.98
802.11ax40	5270	9.85	23.98
	5310	9.794	23.98
802.11n(HT20)	5260	10.343	23.98
	5280	10.33	23.98
	5320	10.184	23.98
802.11n(HT40)	5270	9.979	23.98
	5310	10.172	23.98

5470-5725MHz:

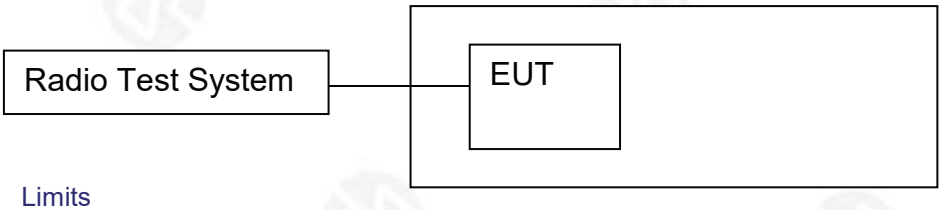
Test mode1	Test Channel (MHz)	Output Power dBm	Limit dBm
802.11a20	5500	12.364	23.98
	5580	14.251	23.98
	5700	13.781	23.98
802.11ac20	5500	12.101	23.98
	5580	13.908	23.98
	5700	13.648	23.98
802.11ac40	5510	12.328	23.98
	5670	14.349	23.98
802.11ax20	5500	12.005	23.98
	5580	13.955	23.98
	5700	13.837	23.98
802.11ax40	5510	12.284	23.98
	5670	14.552	23.98
802.11n(HT20)	5500	12.098	23.98
	5580	14.036	23.98
	5700	13.711	23.98
802.11n(HT40)	5510	12.292	23.98
	5670	14.379	23.98

5725-5850MHz:

Test mode1	Test Channel (MHz)	Output Power dBm	Limit dBm
802.11a20	5745	11.943	30
	5785	9.701	30
	5825	10.782	30
802.11ac20	5745	12.065	30
	5785	9.554	30
	5825	10.677	30
802.11ac40	5755	11.792	30
	5795	9.379	30
802.11ax20	5745	11.835	30
	5785	9.658	30
	5825	10.757	30
802.11ax40	5755	11.647	30
	5795	9.18	30
802.11n(HT20)	5745	11.916	30
	5785	9.763	30
	5825	10.815	30
802.11n(HT40)	5755	11.584	30
	5795	9.114	30

10. EMISSION BANDWIDTH& OCCUPIED BANDWIDTH

10.1 Block Diagram Of Test Setup



10.2 Limits

(1) For the band 5.15-5.25 GHz.

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

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

10.3 Test Procedure

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

1. Emission Bandwidth (EBW)
a) Set RBW = approximately 1% of the emission bandwidth.
b) Set the VBW > RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.
2. Minimum Emission Bandwidth for the band 5.725−5.85 GHz
Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 kHz for the band 5.725−5.85 GHz. The following procedure shall be used for measuring this bandwidth:
a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 * RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.

g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.
Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described in this section. For devices that use channel aggregation refer to III.A and III.C for determining emission bandwidth.

D. 99% Occupied Bandwidth

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

2. Set span = 1.5 times to 5.0 times the OBW.

3. Set RBW = 1% to 5% of the OBW

4. Set VBW ≥ 3 * RBW

5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.

6. Use the 99% power bandwidth function of the instrument (if available).

7. If the instrument does not have a 99% power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

10.4 Test Results

Test mode	Test Channel (MHz)	26dB Bandwidth (MHz)
802.11a	5180	26.356
	5200	24.702
	5240	26.437
802.11ac20	5180	27.267
	5200	25.992
	5240	26.121
802.11ac40	5190	46.184
	5230	46.972
802.11ax20	5180	24.467
	5200	24.383
	5240	24.966
802.11ax40	5190	46.253
	5230	43.131
802.11n(HT20)	5180	25.596
	5200	26.452
	5240	26.068
802.11n(HT40)	5190	45.237
	5230	45.986

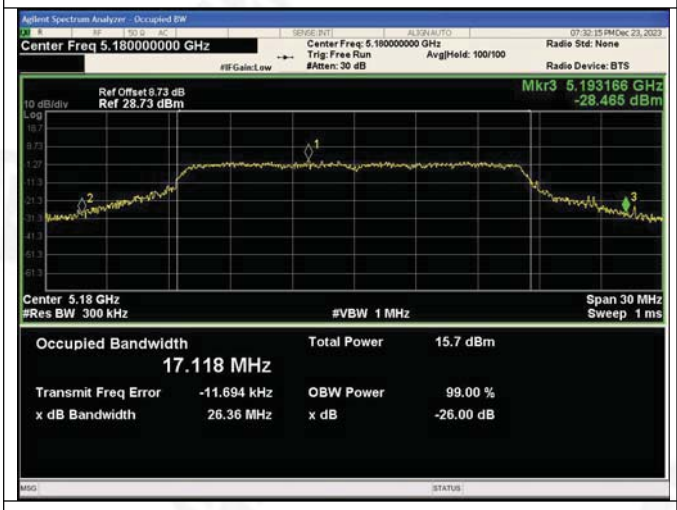
Test mode	Test Channel (MHz)	26dB Bandwidth (MHz)
802.11a	5260	25.581
	5280	26.262
	5320	26.219
802.11ac20	5260	26.709
	5280	28.006
	5320	26.653
802.11ac40	5270	46.703
	5310	46.402
802.11ac20	5260	24.938
	5280	25.218
	5320	25.557
802.11ac40	5270	44.748
	5310	44.192
802.11n(HT20)	5260	26.186
	5280	25.613
	5320	26.716
802.11n(HT40)	5270	45.748
	5310	45.821

Test mode	Test Channel (MHz)	26dB Bandwidth (MHz)
802.11a	5500	25.558
	5580	25.328
	5700	25.937
802.11ac20	5500	25.689
	5580	25.622
	5700	26.41
802.11ac40	5510	47.353
	5670	47.455
802.11ax20	5500	25.402
	5580	24.395
	5700	24.53
802.11ax40	5510	44.459
	5670	46.307
802.11n(HT20)	5500	26.523
	5580	25.69
	5700	28.2
802.11n(HT40)	5510	46.361
	5670	46.689

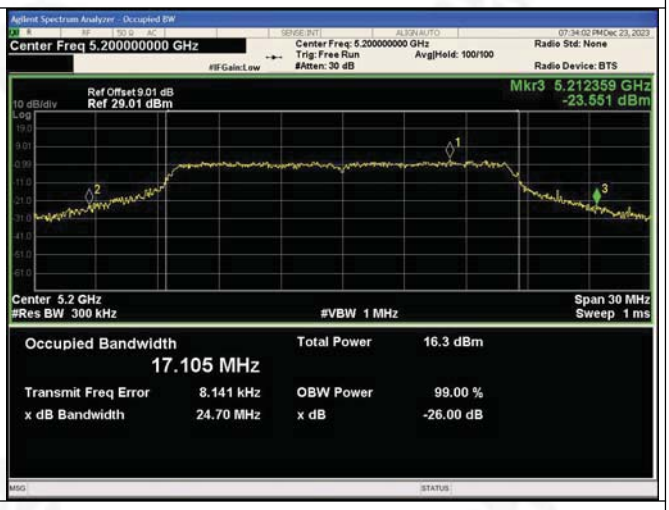
Test mode	Test Channel (MHz)	6dB Bandwidth (MHz)
802.11a	5745	16.366
	5785	16.381
	5825	16.37
802.11ac20	5745	17.623
	5785	17.65
	5825	17.668
802.11ac40	5755	35.985
	5795	36.356
802.11ax20	5745	19.144
	5785	19.005
	5825	18.858
802.11ax40	5755	37.478
	5795	37.822
802.11n(HT20)	5745	17.649
	5785	17.624
	5825	17.662
802.11n(HT40)	5755	36.101
	5795	36.364

Test Graph
5180-5240MHz

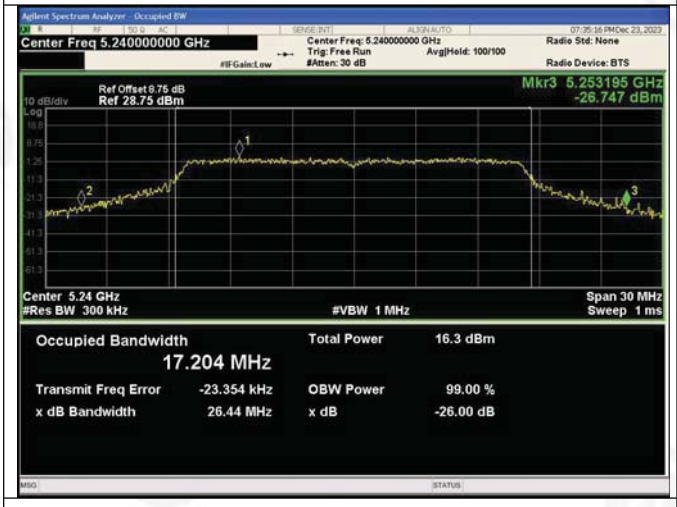
802.11a-5180



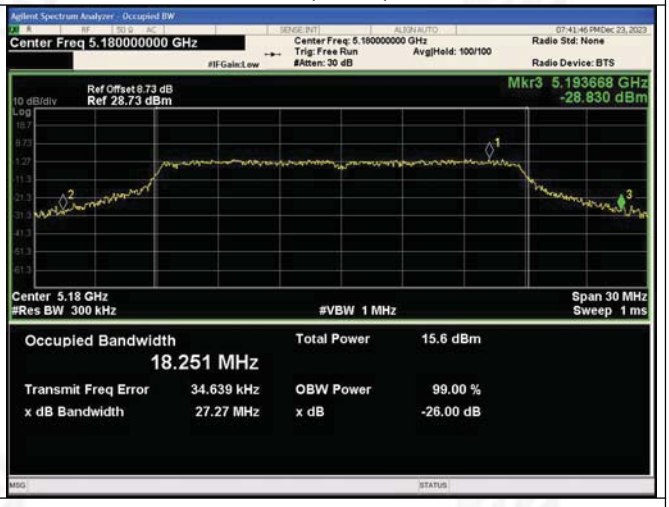
802.11a-5200



802.11a-5240

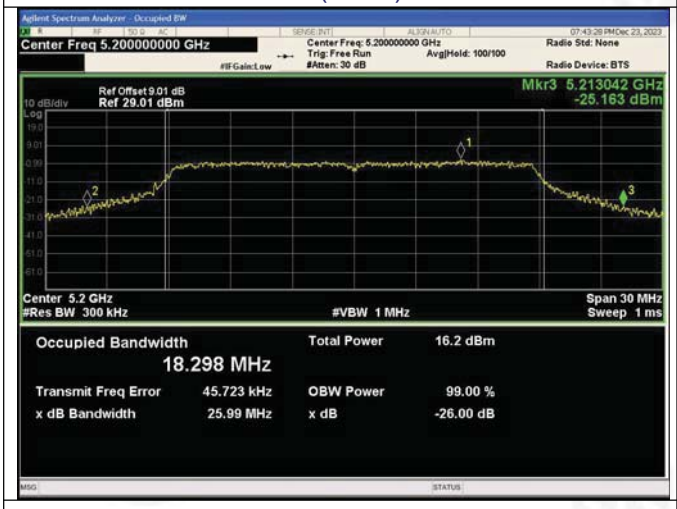


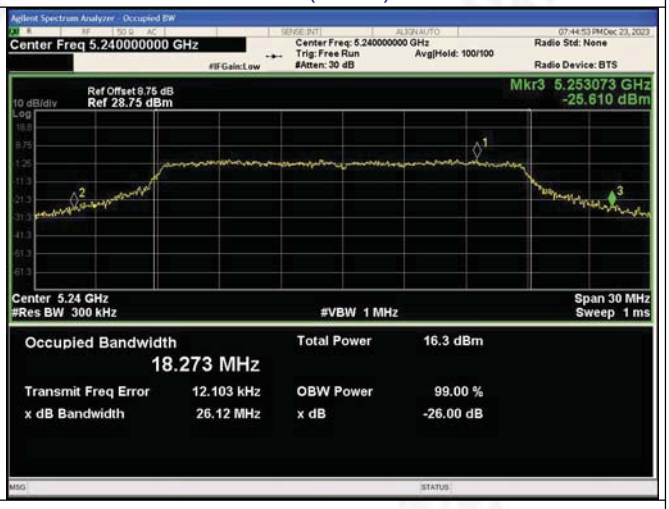
802.11ac(VH20)-5180



802.11ac(VH20)-5200

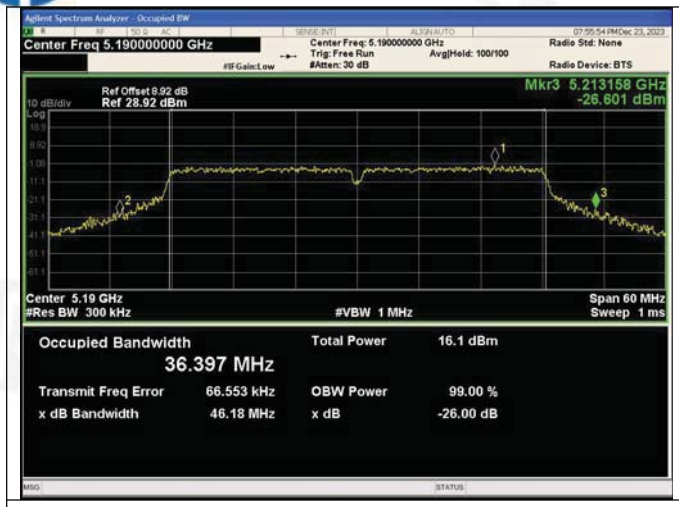
802.11ac(VH20)-5240





802.11ac(VH40)-5190

802.11ac(VH40)-5230



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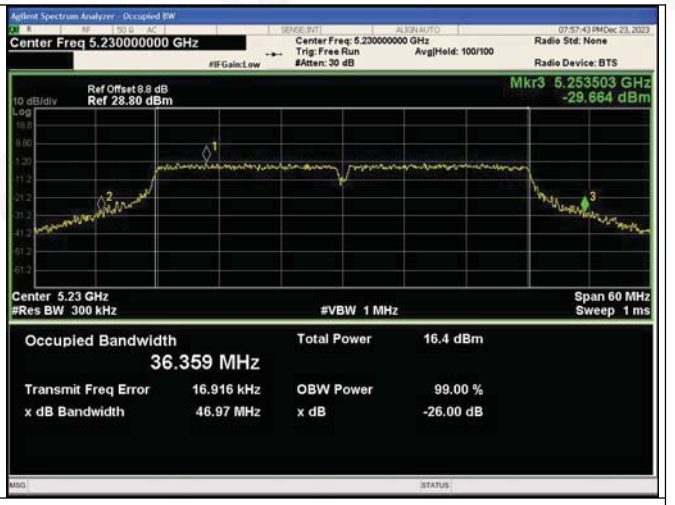

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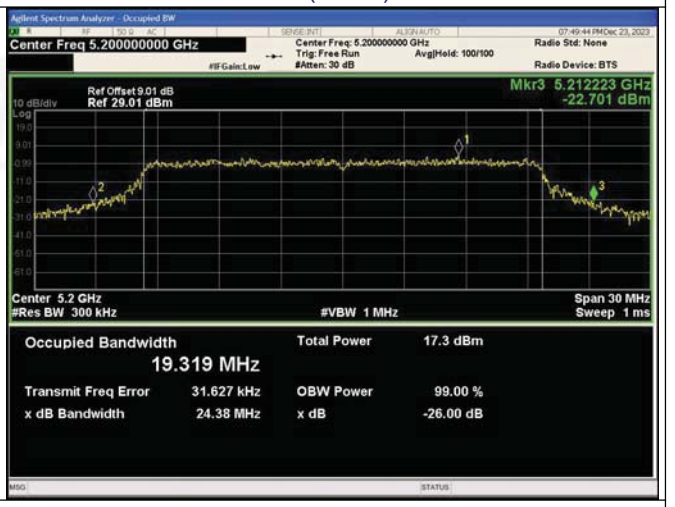

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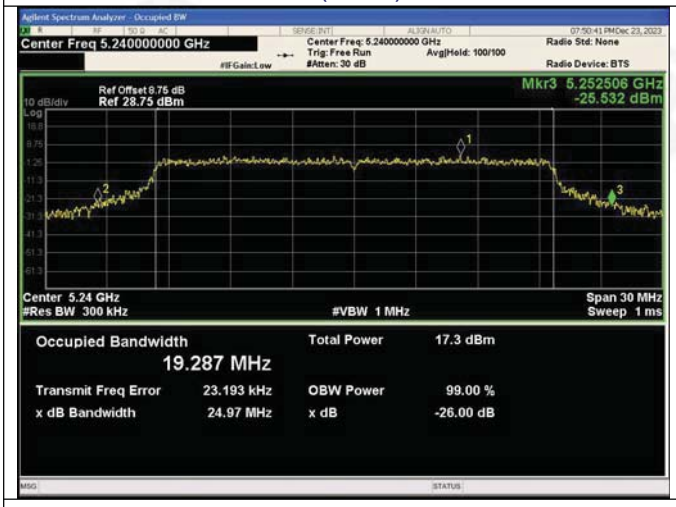

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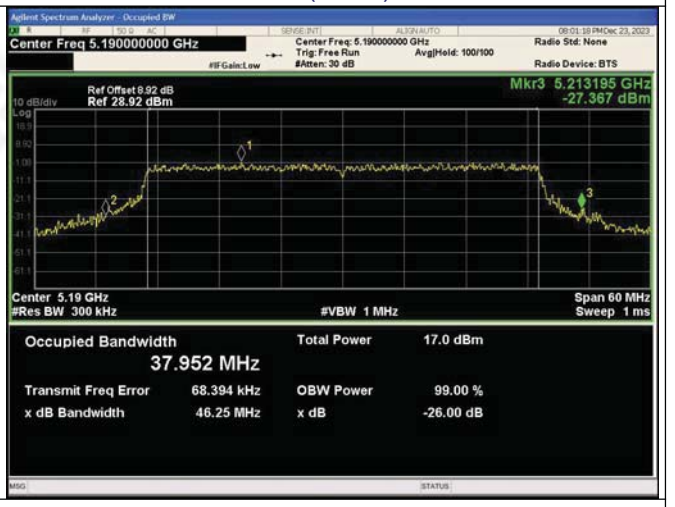

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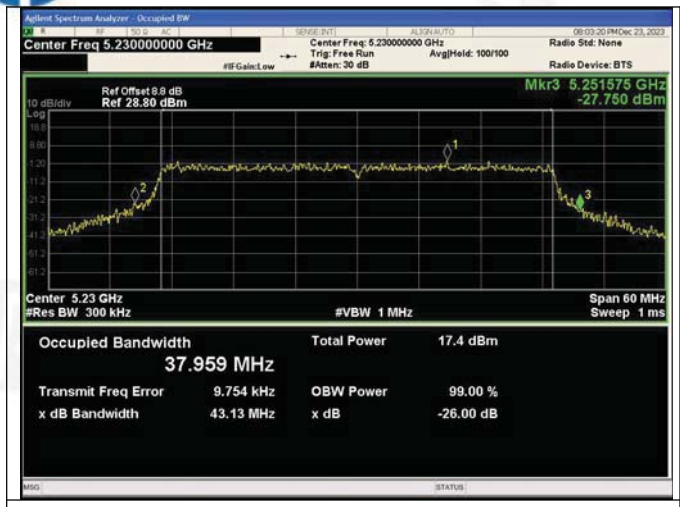

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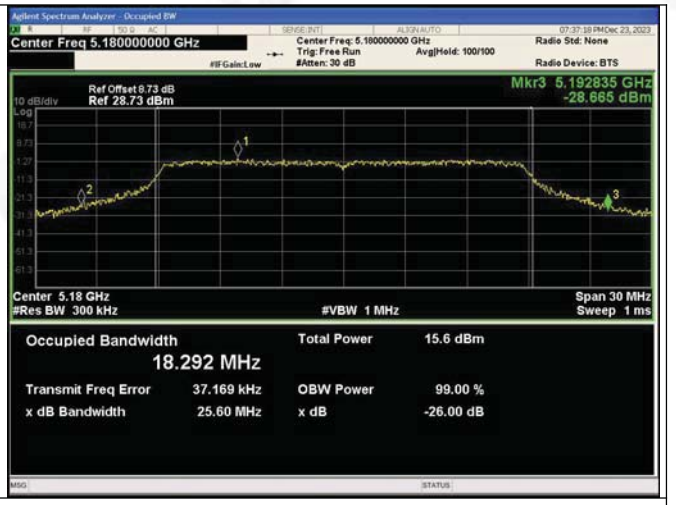

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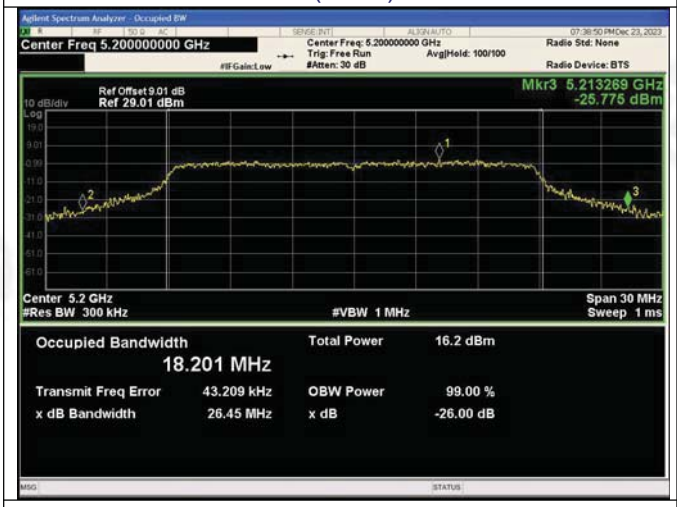

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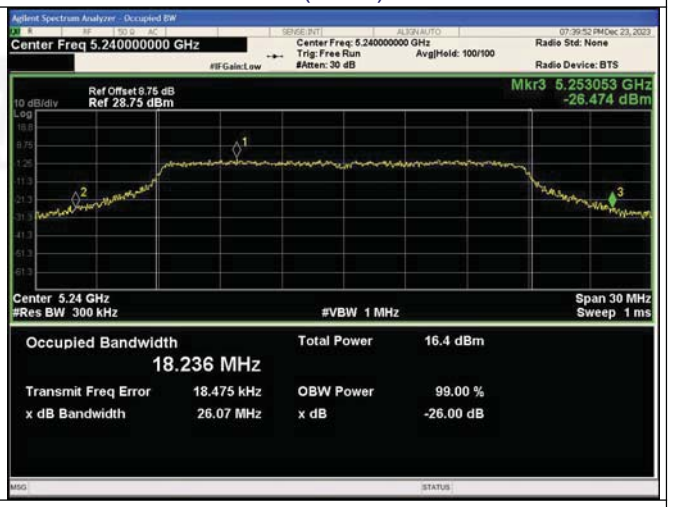

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