TEST REPORT

Product Name:	MoticamX4
FCC ID:	2AF2V-X4
Trademark:	MOTICAM
Model Number:	MoticamX4
Prepared For:	Motic China Group Co., Ltd.
Address:	Motic Building, Torch park, Torch Hi-Teach Industrial Development Zone, Xiamen, P.R. China
Manufacturer:	Motic China Group Co., Ltd.
Address:	Motic Building, Torch park, Torch Hi-Teach Industrial Development Zone, Xiamen, P.R. China
Prepared By:	Shenzhen CTB Testing Technology Co., Ltd.
Address:	Floor 1&2, Building A, No. 26 of Xinhe Road, Xinqiao Street, Baoan District, Shenzhen China
Sample Received Date:	Jan. 12, 2022
Sample tested Date:	Jan. 12, 2022 to Mar. 2, 2022
Issue Date:	Mar. 2, 2022
Report No.:	CTB220226002RFX
Test Standards	47 CFR Part 15 Subpart E KDB 789033 V02r01
Test Results	PASS
Remark:	This is WIFI-5GHz band radio test report.

Compiled by:	Reviewed by:	Approved by:
Chen Zheng	Arron Liu	Bin Mei / Director

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.

TABLE OF CONTENT

(Note: N/A means not applicable)

1. VERSION

Report No.	Issue Date	Description	Approved
CTB220226002RFX	Mar. 2, 2022	Original	Valid

2. TEST SUMMARY

The Product has been tested according to the following specifications:

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

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

3. MEASUREMENT UNCERTAINTY

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

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

4. PRODUCT INFORMATION AND TEST SETUP

.1 Product Information

Model(s):	MoticamX4
Model Description:	N/A
Wi-Fi Specification:	IEEE 802.11a/b/g/n/ac
Hardware Version:	V1.0
Software Version:	V1.0
Operation Frequency:	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): 7.31dBm
Type of Modulation:	WiFi: DSSS, OFDM, CCK
Antenna installation:	Internal Antenna
Antenna Gain:	1.0dBi
Ratings:	DC 5.0V from adaptor

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(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 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 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	500M

EUT has two Internal Antenna with Max Antenna Gain 1.0dBi on every antenna, CDD device with two spatial streams, according to KDB662911 D01 v02r01,

Directional gain= GANT + Array Gain, where Array Gain is as follows.

1) For power spectral density(PSD) measurements,

Array Gain=10log(NANT/NSS)dB=10log(2/1)=0dB,

So the directional gain for PSD is 1Bi

2) For power measurements,

The Array gain=0 dB for NANT≤4,

So the directional gain for Power measurements is 1dBi

NOTE: Dutycycle>98%.

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)	5150MHz ~5250 MHz	Channel 38	N/A	Channel 46
		5190MHz	N/A	5230MHz
802.11a/n/ac(20M)	5725MHz ~5850 MHz	Channel 149	Channel 157	Channel 165
		5745MHz	5785MHz	5825MHz
802.11n/ac(40M)	5725MHz ~5850 MHz	Channel 151	N/A	Channel 159
		5755MHz	N/A	5795MHz
		N/A	5775MHz	N/A

4.6 Test Environment

Humidity(%):	55
Atmospheric Pressure(kPa):	101.1
Normal Voltage(AC):NV	120
Normal Temperature(℃):NT	25
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 Floor 1&2, Building A, No. 26 of Xinhe Road, Xinqiao Street, Baoan District, Shenzhen 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	Model No.	Serial No.	Calibrated date	Calibrated until
1	Spectrum Analyzer	Agilent	N9020A	MY52090073	2021.09.27	2022.08.05
2	Power Sensor	Agilent	U2021XA	MY56120032	2021.09.27	2022.08.05
3	Power Sensor	Agilent	U2021XA	MY56120034	2021.09.27	2022.08.05
4	Communication test set	R&S	CMW500	108058	2021.09.27	2022.08.05
5	Spectrum Analyzer	R&S	FSP40	100550	2021.09.27	2022.08.05
6	Signal Generator	Agilent	N5181A	MY49060920	2021.09.27	2022.08.16
7	Signal Generator	Agilent	N5182A	MY47420195	2021.09.27	2022.08.05
8	Communication test set	Agilent	E5515C	MY50102567	2021.09.27	2022.08.16
9	band rejection filter	Shenxiang	MSF2400-2483.5MS-1154	20181015001	2021.09.27	2022.08.05
10	band rejection filter	Shenxiang	MSF5150-5850MS-1155	20181015001	2021.09.27	2022.08.05
11	band rejection filter	Xingbo	XBLBQ-DZA120	190821-1-1	2021.09.27	2022.08.05
12	BT&WI-FI Automatic test software	Micowave	MTS8310	Ver. 2.0.0.0	2021.09.27	2022.08.05
13	Rohde & Schwarz SFU Broadcast Test System	R&S	SFU	101017	2021.09.27	2022.08.05
14	Temperature humidity chamber	Hongjing	TH-80CH	DG-15174	2021.09.27	2022.08.05
15	234G Automatic test	Micowave	MTS8200	Ver. 2.0.0.0	2021.09.27	2022.08.05

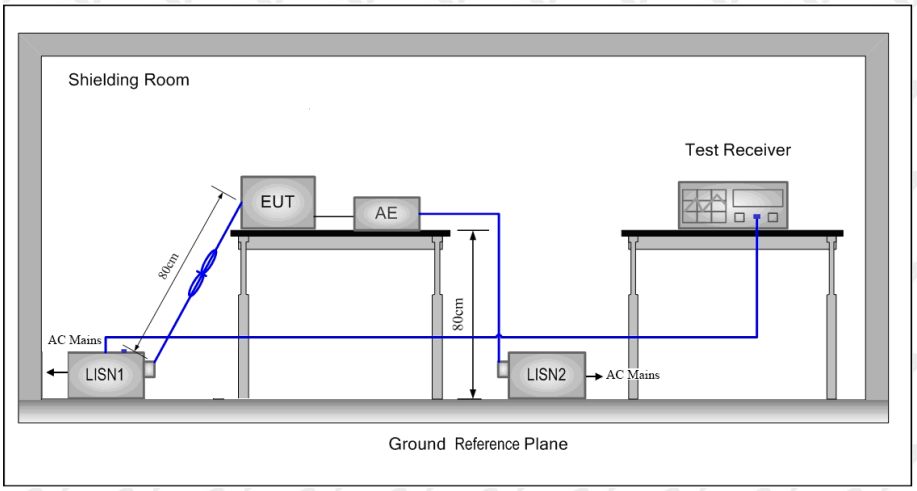
	software					
16	966 chamber	C.R.T.	966 Room	966	2021.09.27	2024.08.11
17	Receiver	R&S	ESPI	100362	2021.09.27	2022.08.05
18	Amplifier	HP	8447E	2945A02747	2021.09.27	2022.08.05
19	Amplifier	Agilent	8449B	3008A01838	2021.09.27	2022.08.05
20	TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	869	2021.09.27	2022.08.07
21	Horn Antenna	Schwarzbeck	BBHA9120D	1911	2021.09.27	2022.08.08
22	Software	Fala	EZ-EMC	FA-03A2 RE	2021.09.27	2022.08.05
23	3-Loop Antenna	Daze	ZN30401	17014	2021.09.27	2022.08.05
24	loop antenna	ZHINAN	ZN30900A	/	2021.09.27	2022.08.05
25	Horn antenna	A/H/System	SAS-574	588	2021.09.27	2022.08.05
26	Amplifier	AEROFLEX	/	S/N/ 097	2021.09.27	2022.08.05

Continuous disturbance						
No.	Equipment	Manufacturer	Model No.	Serial No.	Calibrated date	Calibrated until
1	AMN	ROHDE&SCHWARZ	ESH3-Z5	831551852	2021.09.27	2022.08.05
2	Pulse limiter	ROHDE&SCHWARZ	ESH3Z2	357881052	2021.09.27	2022.08.05
3	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCS30	834115/006	2021.09.27	2022.08.05
4	Coaxial cable	ZDECL	Z302S	18091904	2021.09.27	2022.08.05
5	AAN	Schwarzbeck	NTFM8158	183	2021.09.27	2022.08.05
6	Communication test set	Agilent	E5515C	MY50102567	2021.09.27	2022.08.05
7	Communication test set	R&S	CMW500	108058	2021.09.27	2022.08.05
8	EZ-EMC	Frad	EMC-con3A1.1	/	/	/

Radiated emission						
No.	Equipment	Manufacturer	Model No.	Serial No.	Calibrated date	Calibrated until
1	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA 9120D	1911	2021.11.01	2022.08.05
2	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	869	2021.11.01	2022.08.05
3	Amplifier	Agilent	8449B	3008A01838	2021.09.27	2022.08.05
4	Amplifier	HP	8447E	2945A02747	2021.09.27	2022.08.05
5	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESPI7	100362	2021.09.27	2022.08.05
6	Coaxial cable	ETS	RFC-SNS-100-NMS-80 NI	/	2021.09.27	2022.08.05
7	Coaxial cable	ETS	RFC-SNS-100-NMS-20 NI	/	2021.09.27	2022.08.05
8	Coaxial cable	ETS	RFC-SNS-100-SMS-20 NI	/	2021.09.27	2022.08.05
9	Coaxial cable	ETS	RFC-NNS-100-NMS-300 NI	/	2021.09.27	2022.08.05
10	Communication test set	Agilent	E5515C	MY50102567	2021.09.27	2022.08.05
11	Communication test set	R&S	CMW500	108058	2021.09.27	2022.08.05
12	EZ-EMC	Frad	EMC-con3A1.1	/	/	/

6. AC POWER LINE CONDUCTED EMISSION

6.1 Block Diagram Of Test Setup



6.2 Limit

Table 4 – AC power-line conducted emissions limits

Frequency (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56[Note 1]	56 to 46[Note 1]
0.5 – 5	56	46
5 – 30	60	50

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

* Decreasing linearly with the logarithm of the frequency

6.3 Test procedure

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

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

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

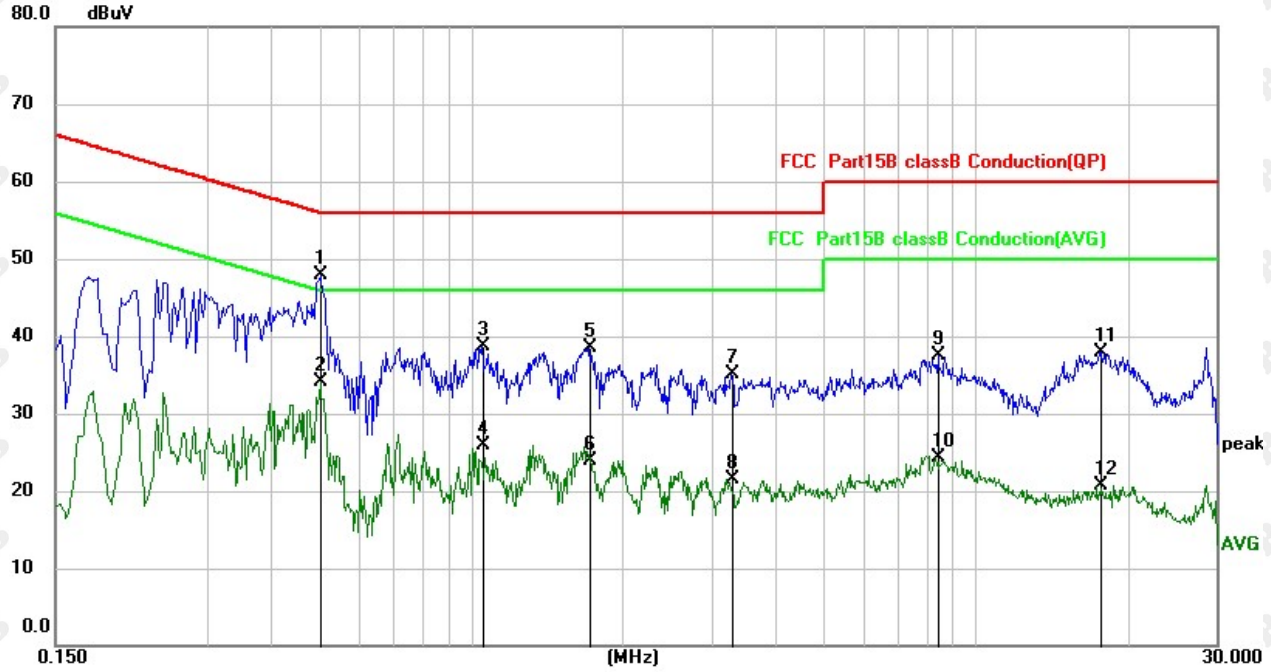
4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0,4 m from the vertical ground reference plane. The vertical ground reference

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.

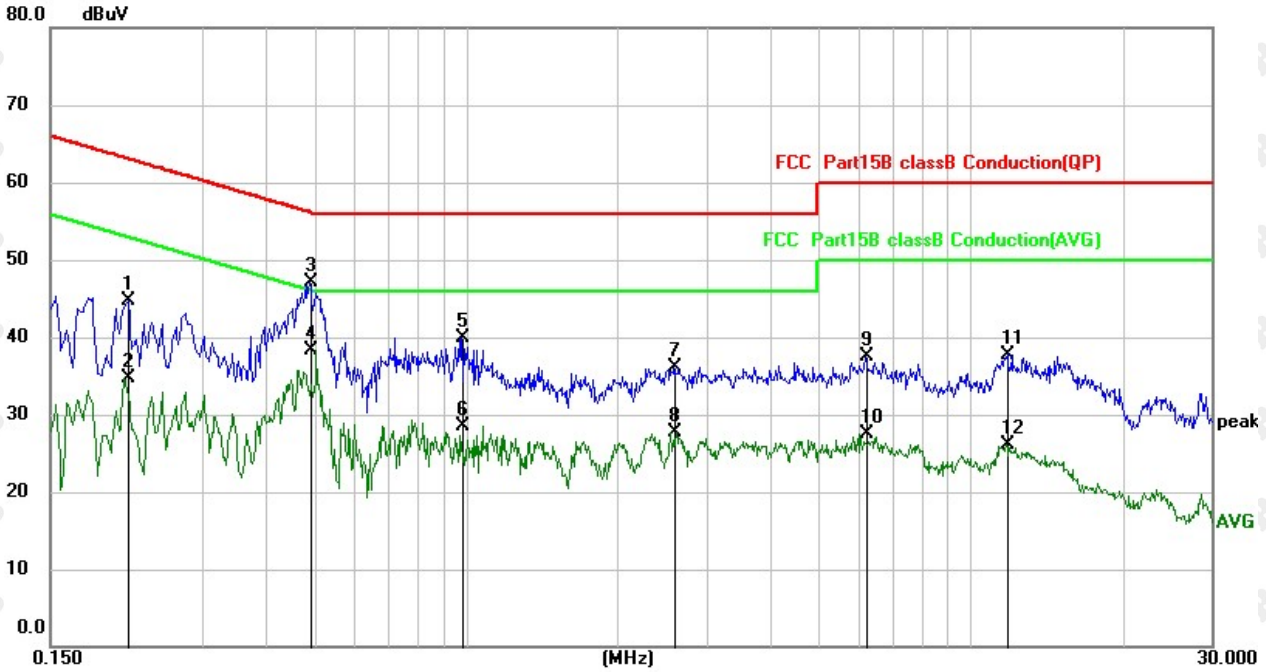
6.4 Test Result

Test Specification: Neutral



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.5020	37.39	10.52	47.91	56.00	-8.09	QP
2		0.5020	23.61	10.52	34.13	46.00	-11.87	AVG
3		1.0500	28.09	10.62	38.71	56.00	-17.29	QP
4		1.0500	15.20	10.62	25.82	46.00	-20.18	AVG
5		1.7100	27.78	10.63	38.41	56.00	-17.59	QP
6		1.7100	13.23	10.63	23.86	46.00	-22.14	AVG
7		3.2860	24.40	10.64	35.04	56.00	-20.96	QP
8		3.2860	10.87	10.64	21.51	46.00	-24.49	AVG
9		8.4419	26.80	10.77	37.57	60.00	-22.43	QP
10		8.4419	13.59	10.77	24.36	50.00	-25.64	AVG
11		17.6219	26.97	10.95	37.92	60.00	-22.08	QP
12		17.6219	9.82	10.95	20.77	50.00	-29.23	AVG

Test Specification: Line



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.2139	33.93	10.68	44.61	63.05	-18.44	QP
2		0.2139	24.10	10.68	34.78	53.05	-18.27	AVG
3		0.4900	36.59	10.53	47.12	56.17	-9.05	QP
4	*	0.4900	27.75	10.53	38.28	46.17	-7.89	AVG
5		0.9819	29.37	10.62	39.99	56.00	-16.01	QP
6		0.9819	17.96	10.62	28.58	46.00	-17.42	AVG
7		2.5819	25.53	10.63	36.16	56.00	-19.84	QP
8		2.5819	17.15	10.63	27.78	46.00	-18.22	AVG
9		6.2019	26.86	10.69	37.55	60.00	-22.45	QP
10		6.2019	16.87	10.69	27.56	50.00	-22.44	AVG
11		11.8500	26.95	10.85	37.80	60.00	-22.20	QP
12		11.8500	15.17	10.85	26.02	50.00	-23.98	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

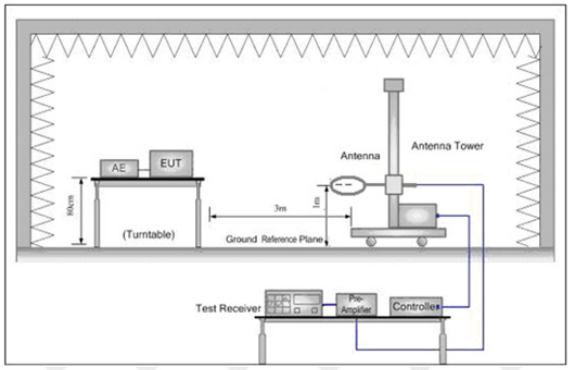


Figure 1. Below 30MHz

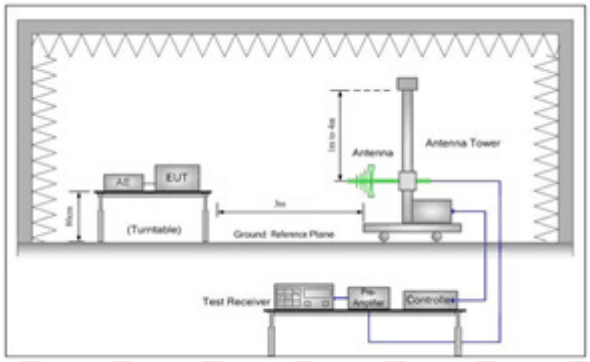


Figure 2. 30MHz to 1GHz

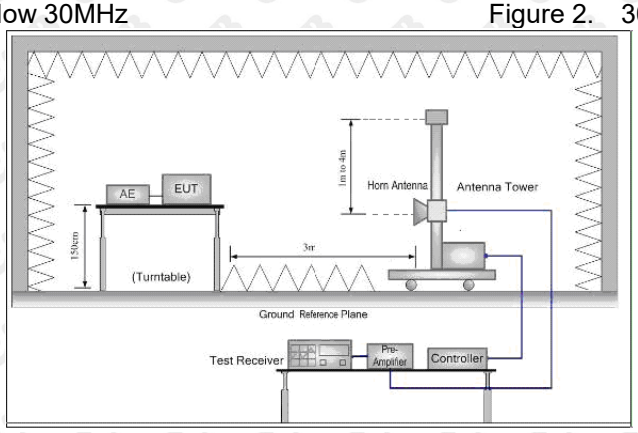


Figure 3. Above 1GHz

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

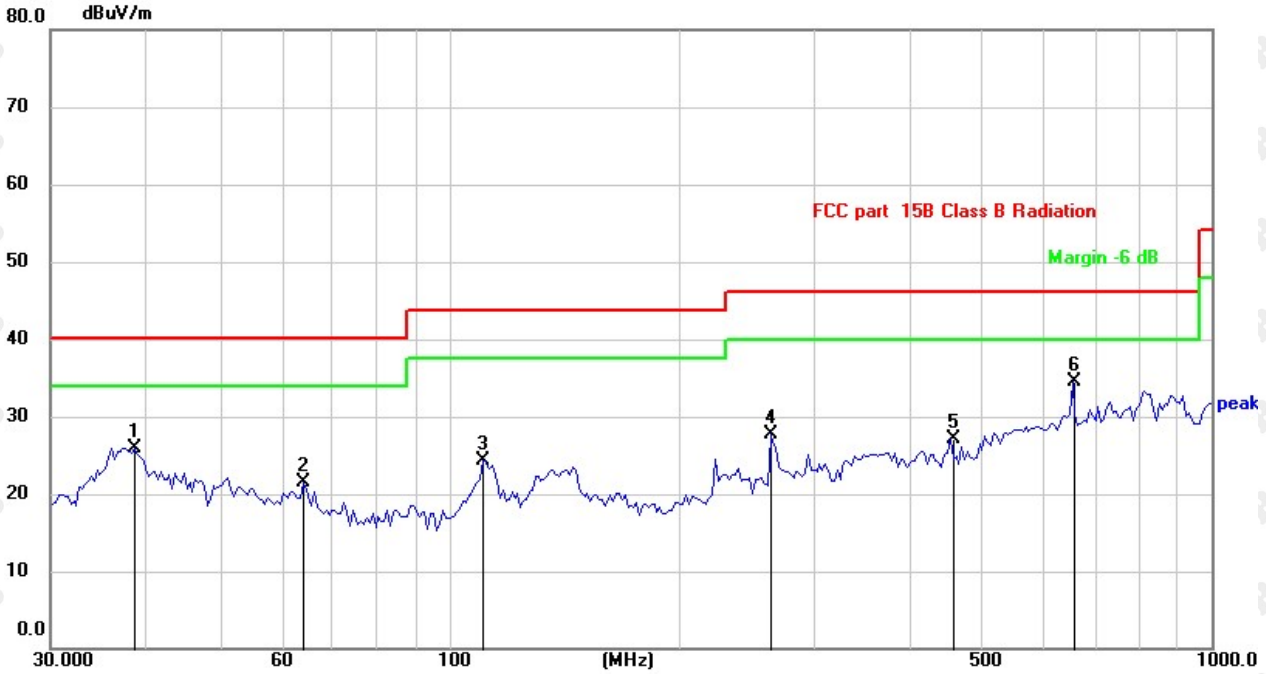
Below 1GHz test procedure as below:
a.The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b.The EUT was set 3 meters away from the interference-receiving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

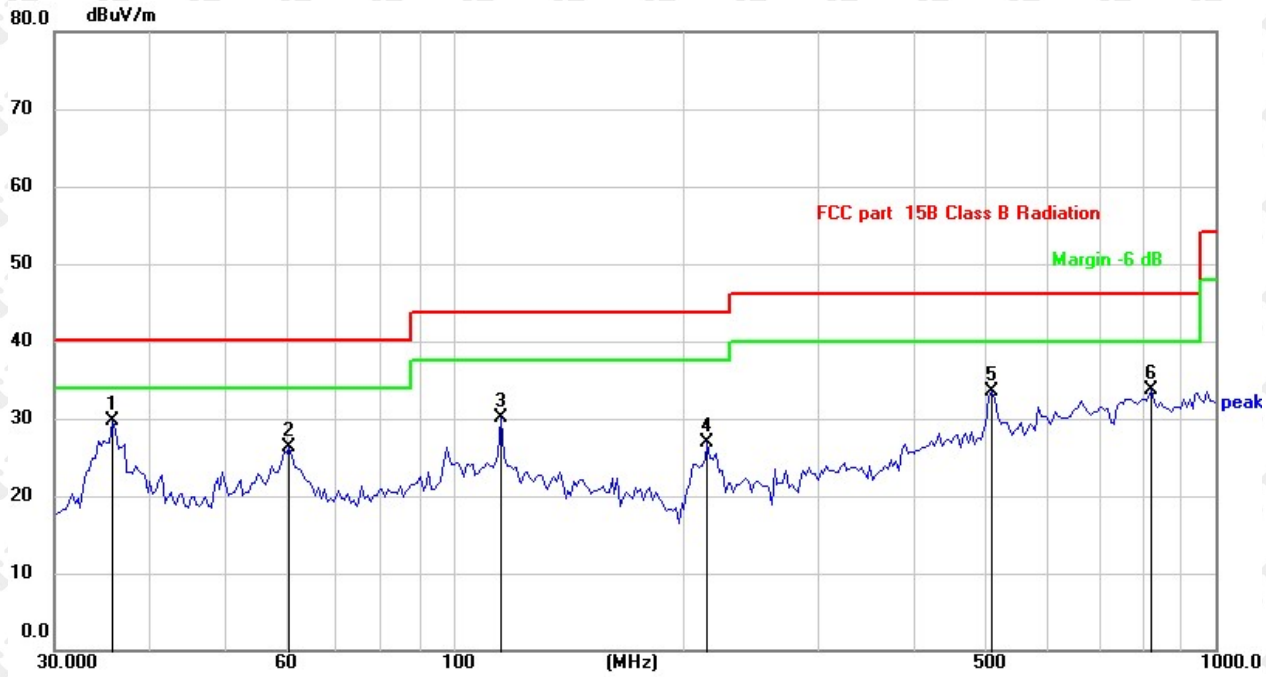
7.4 Test Result

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		38.6837	31.57	-5.59	25.98	40.00	-14.02	QP
2		64.3200	28.39	-6.93	21.46	40.00	-18.54	QP
3		110.7626	32.21	-7.91	24.30	43.50	-19.20	QP
4		263.8190	33.30	-5.57	27.73	46.00	-18.27	QP
5		454.3100	27.46	-0.38	27.08	46.00	-18.92	QP
6	*	656.5300	31.17	3.36	34.53	46.00	-11.47	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	*	35.7490	36.03	-6.30	29.73	40.00	-10.27	QP
2		61.0242	32.56	-6.35	26.21	40.00	-13.79	QP
3		115.7256	37.48	-7.36	30.12	43.50	-13.38	QP
4		215.6451	33.92	-7.03	26.89	43.50	-16.61	QP
5		509.1501	32.67	0.88	33.55	46.00	-12.45	QP
6		824.5968	27.61	6.07	33.68	46.00	-12.32	QP

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

1. The margin of 9K-30MH measurement exceeds 20dB, so the test chart is not included. Test Mode: TM1 (the worst)
2. After pre-scanning three directions, the report recorded the worst case Test Mode: TM1 (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	44.21	16.39	60.60	74	-13.40	PK	1.4	28	H
10360	27.76	16.39	44.15	54	-9.85	AV	1.5	187	H
10360	43.48	16.39	59.87	74	-14.13	PK	1.7	236	V
10360	28.89	16.39	45.28	54	-8.72	AV	1.3	134	V
Channel:5240MHz									
10480	44.33	16.11	60.44	74	-13.56	PK	1.4	102	H
10480	27.56	16.11	43.67	54	-10.33	AV	1.7	331	H
10480	43.98	16.11	60.09	74	-13.91	PK	1.5	314	V
10480	29.04	16.11	45.15	54	-8.85	AV	1.4	66	V
Channel:5745MHz									
11490	44.22	17.46	61.68	74	-12.32	PK	308	251	H
11490	29.50	17.46	46.96	54	-7.04	AV	121	343	H
11490	43.14	17.46	60.60	74	-13.40	PK	205	61	V
11490	28.13	17.46	45.59	54	-8.41	AV	235	157	V
Channel:5825MHz									
11650	44.03	17.57	61.60	74	-12.40	PK	308	80	H
11650	28.41	17.57	45.98	54	-8.02	AV	121	250	H
11650	41.44	17.57	59.01	74	-14.99	PK	205	48	V
11650	29.22	17.57	46.79	54	-7.21	AV	235	280	V

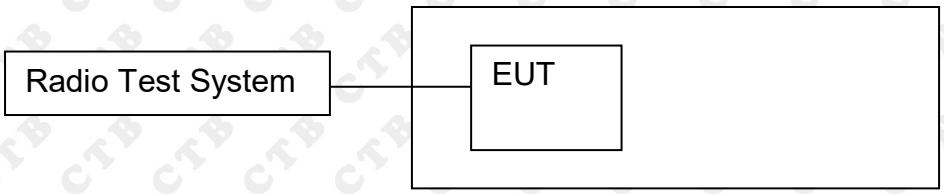
Modulation : 802.11(n40) (the worst data)

Freq (MHz)	Rd_level (dBuV/m)	Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	detector	Height	Degree	Antenna polarization
Channel:5190MHz									
10380	42.93	16.34	59.27	74	-14.73	PK	1.77	355	H
10380	25.24	16.34	41.58	54	-12.42	AV	1.49	19	H
10380	41.52	16.34	57.86	74	-16.14	PK	1.72	255	V
10380	27.28	16.34	43.62	54	-10.38	AV	1.10	147	V
Channel:5230MHz									
10460	39.38	16.15	55.53	74	-18.47	PK	1.13	186	H
10460	28.69	16.15	44.84	54	-9.16	AV	1.74	276	H
10460	41.89	16.15	58.04	74	-15.96	PK	1.87	343	V
10460	26.68	16.15	42.83	54	-11.17	AV	1.03	123	V
Channel:5755MHz									
11510	40.61	17.49	58.10	74	-15.90	PK	1.40	57	H
11510	28.73	17.49	46.22	54	-7.78	AV	1.84	281	H
11510	42.19	17.49	59.68	74	-14.32	PK	1.20	131	V
11510	26.55	17.49	44.04	54	-9.96	AV	1.10	348	V
Channel:5795MHz									
11590	41.85	17.52	59.37	74	-14.63	PK	1.83	294	H
11590	25.78	17.52	43.30	54	-10.70	AV	1.39	248	H
11590	43.29	17.52	60.81	74	-13.19	PK	1.23	320	V
11590	25.86	17.52	43.38	54	-10.62	AV	1.06	105	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

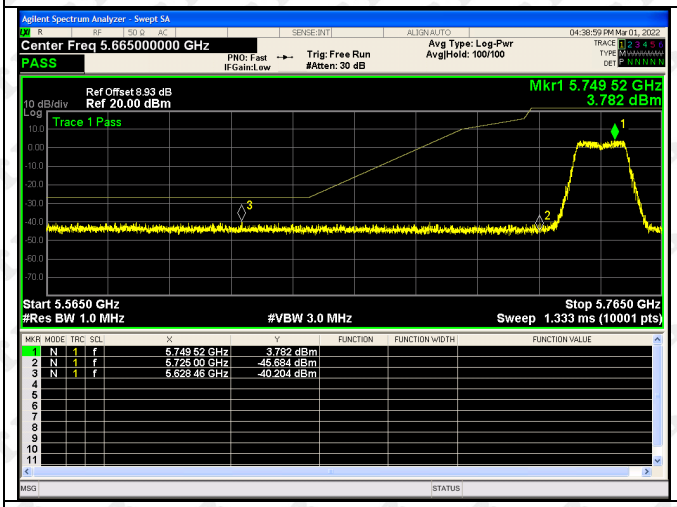
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then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

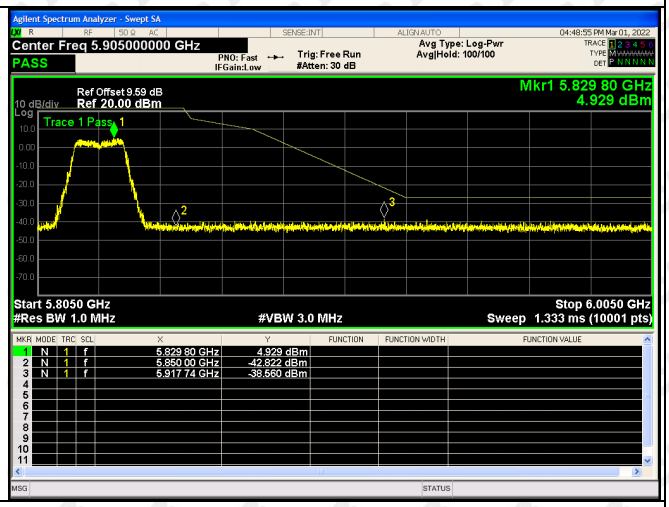
Test Graph

5745-5825MHz
ANT 1:

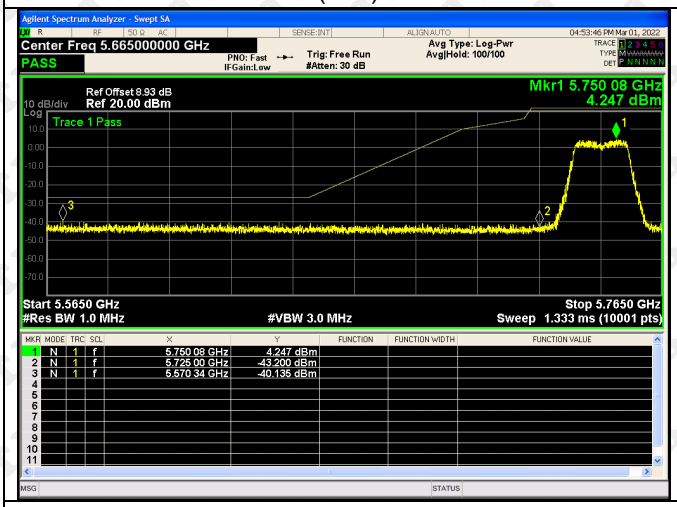
802.11a-5745



802.11a-5825



802.11(n20)-5745



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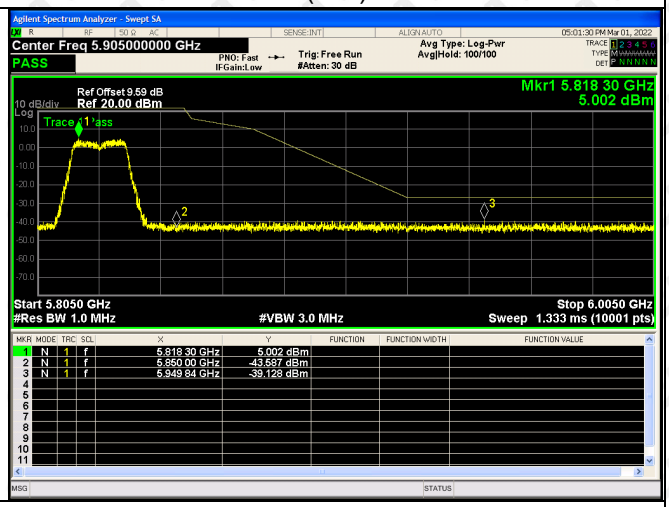
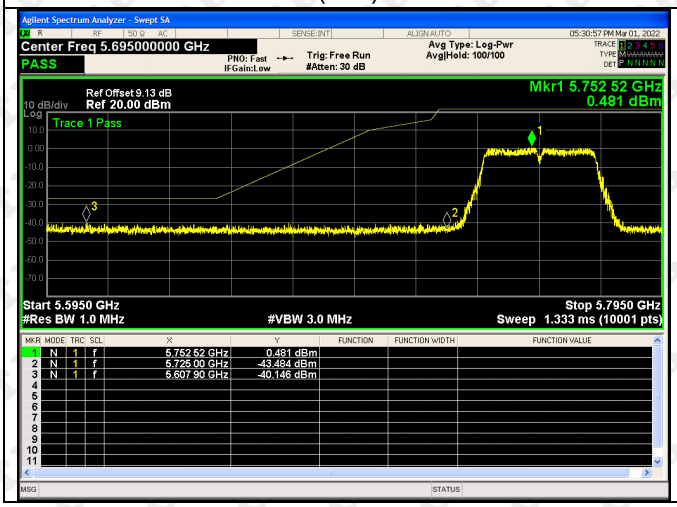
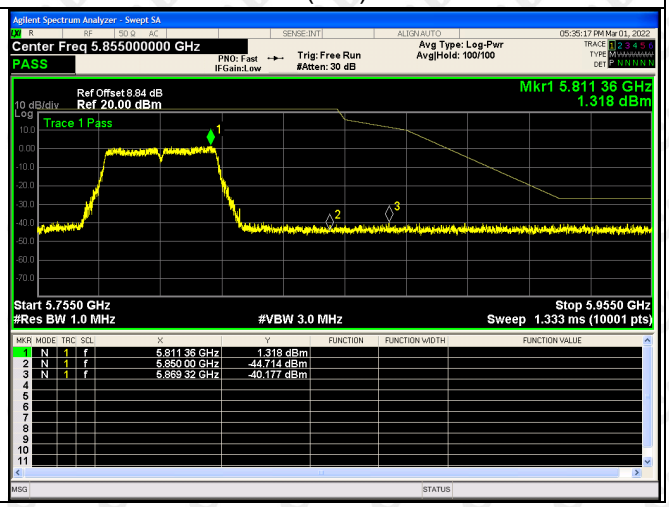


802.11(n40)-5755



802.11(n40)-5795



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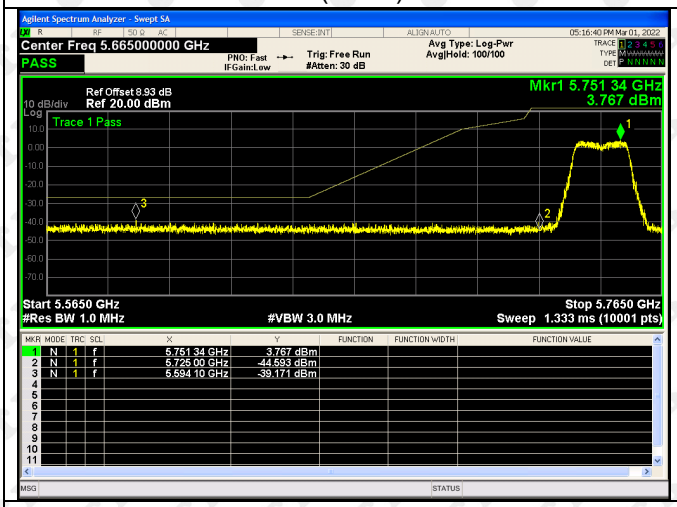
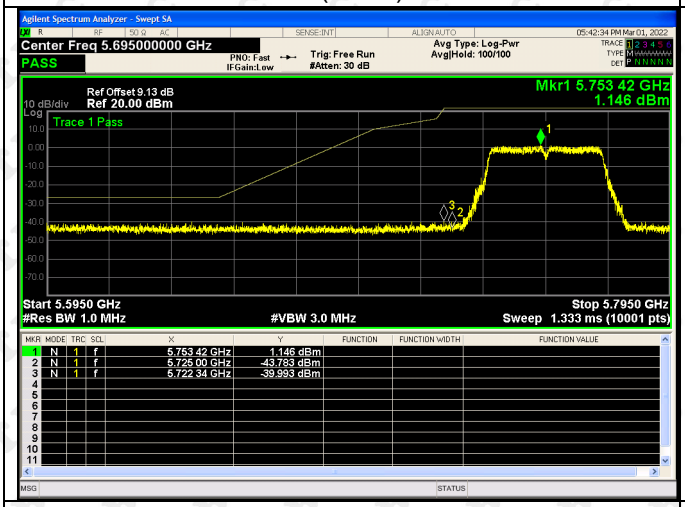


802.11ac(VH20)-5825

802.11ac(VH40)-5755



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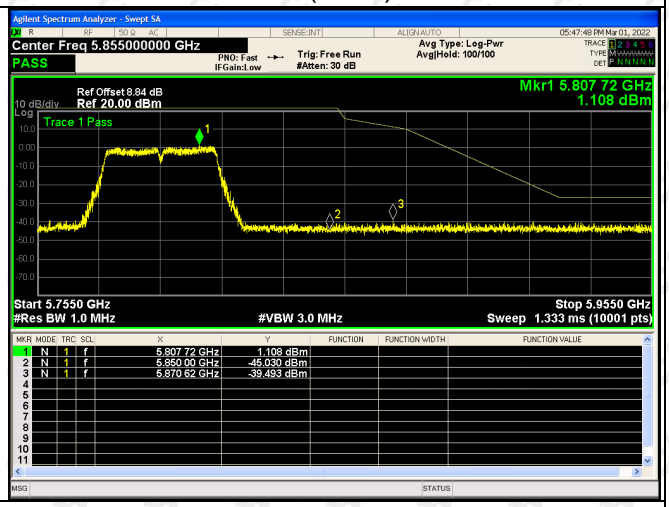
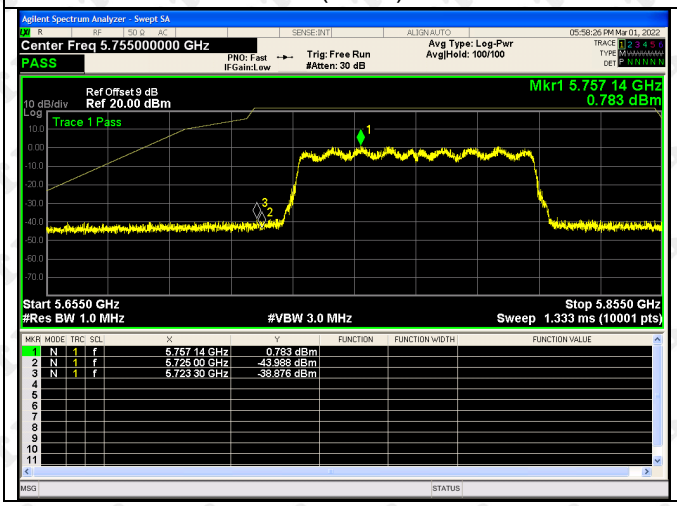
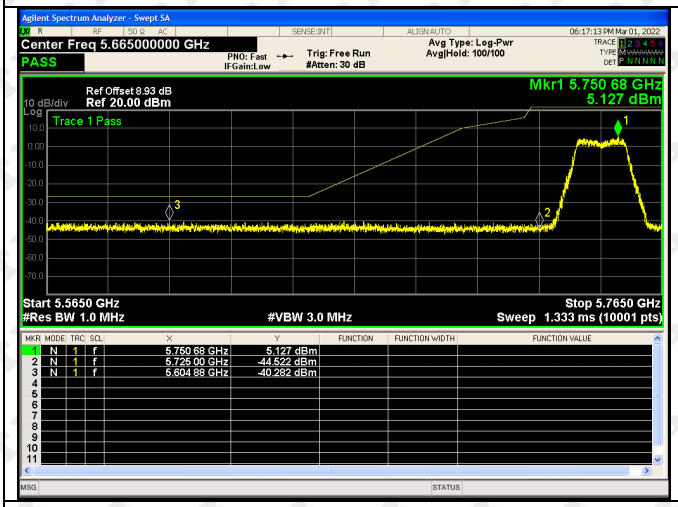


802.11ac(VH80)-5775

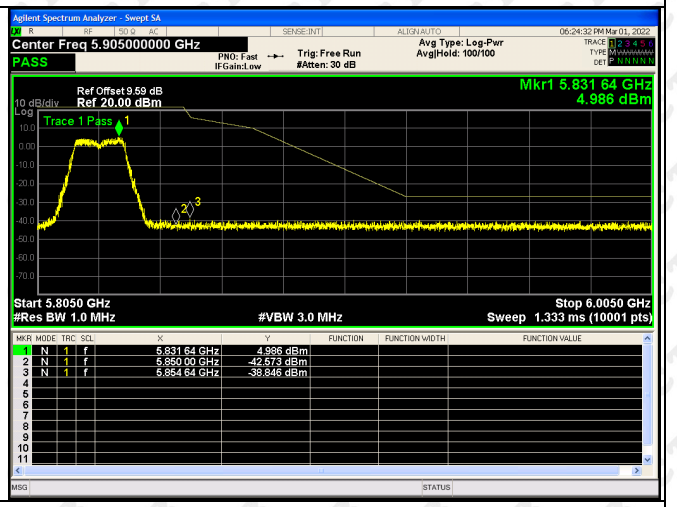


ANT 2:

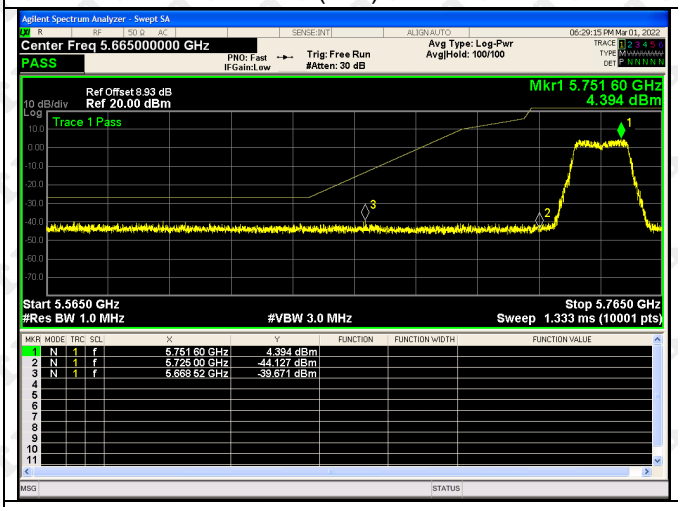
802.11a-5745



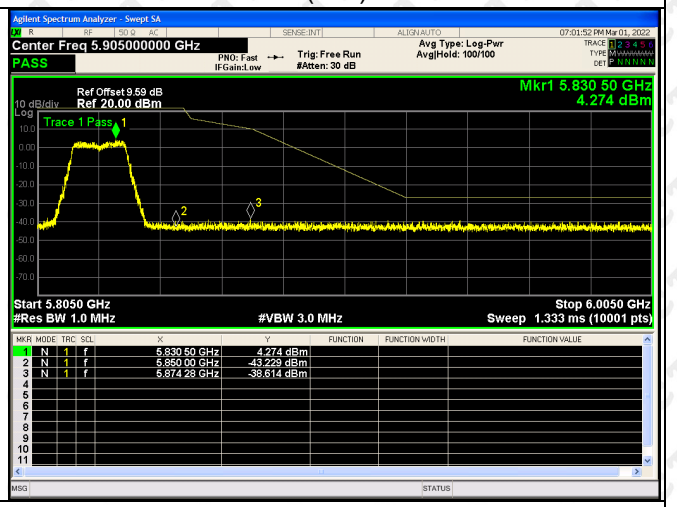
802.11a-5825



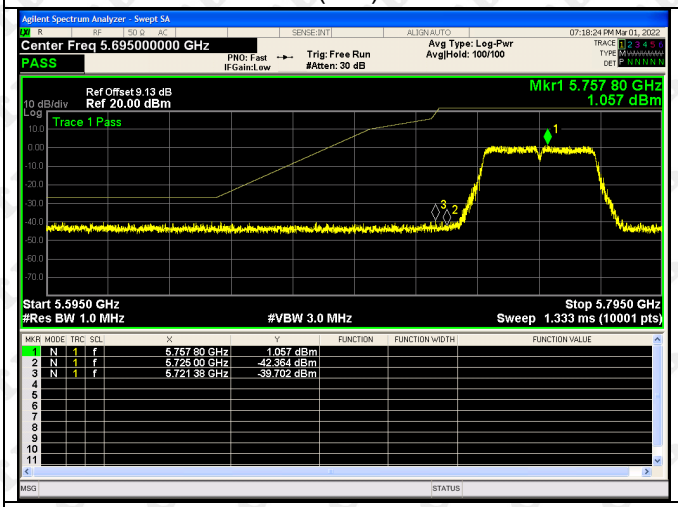
802.11(n20)-5745



802.11(n20)-5825



802.11(n40)-5755



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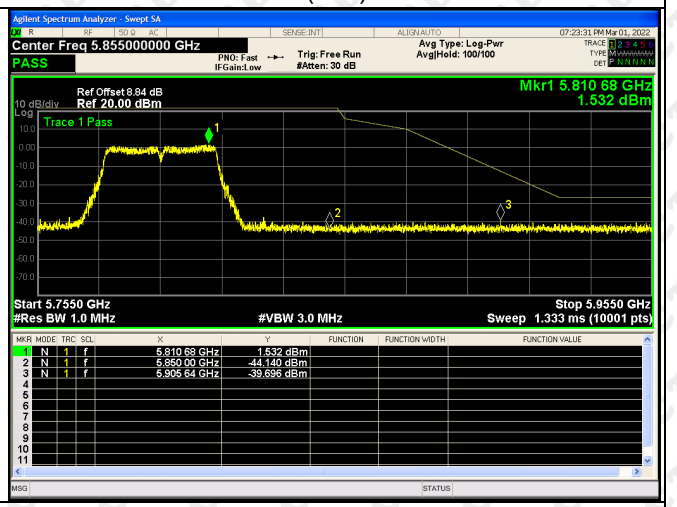
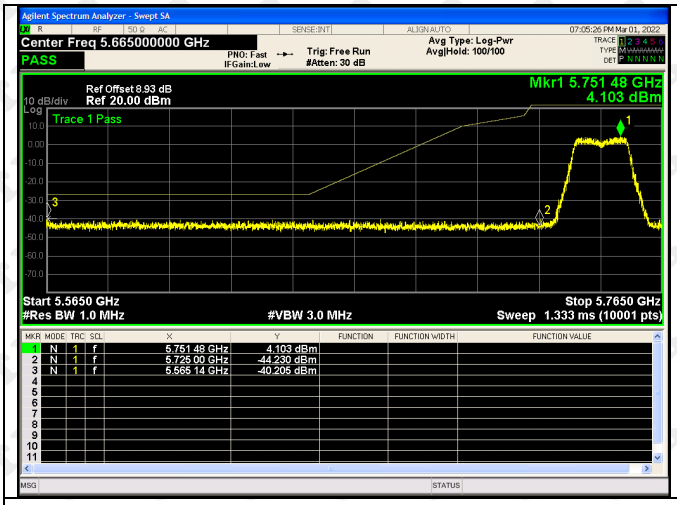
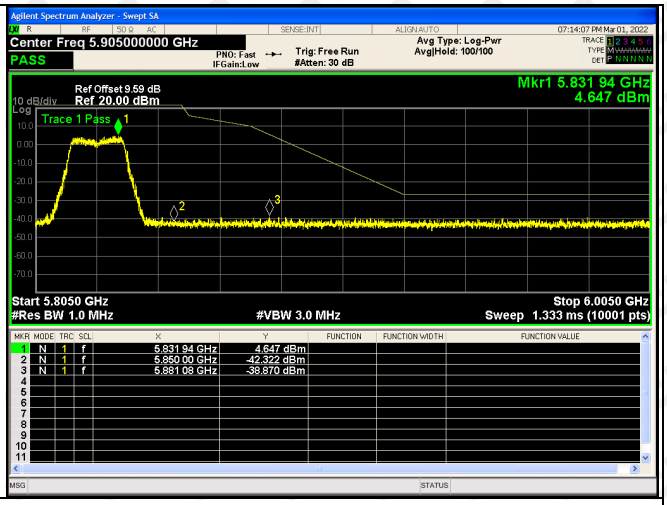


802.11ac(VH20)-5745

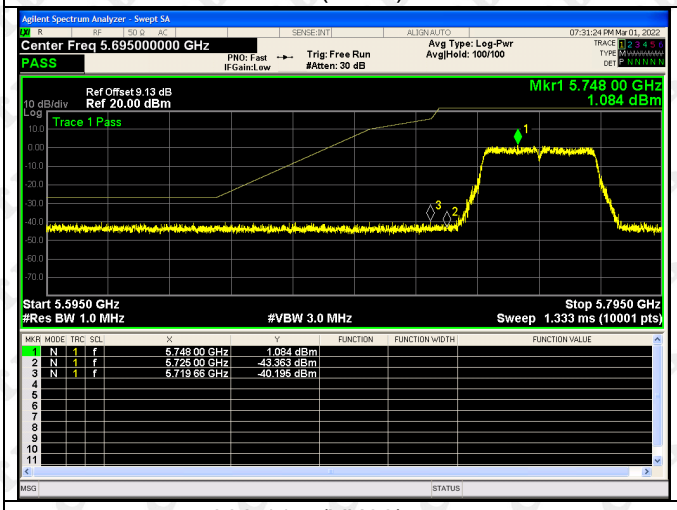
802.11ac(VH20)-5825



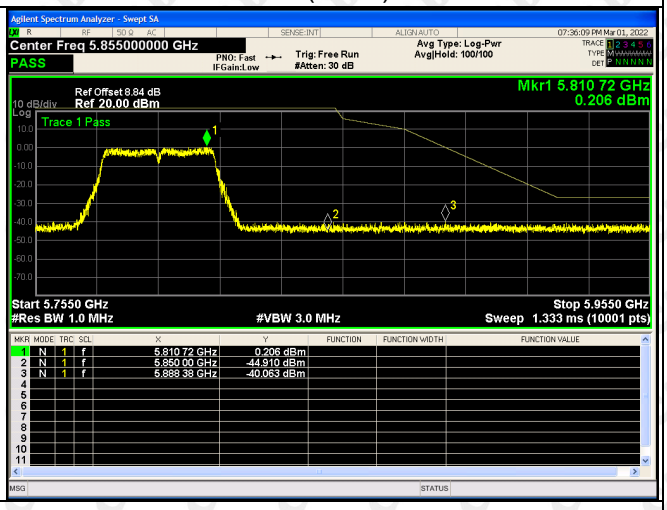
802.11ac(VH40)-5755

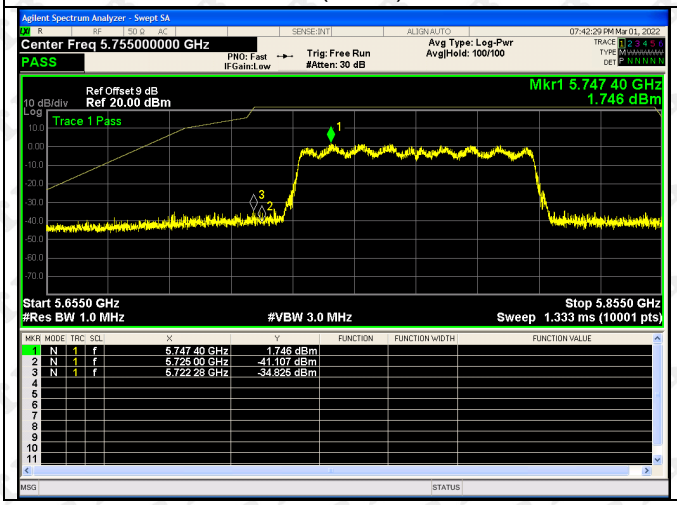


802.11ac(VH40)-5795



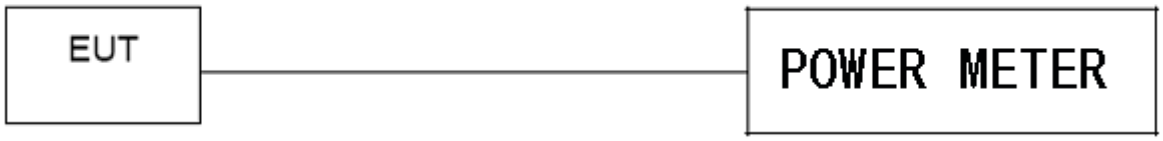
802.11ac(VH80)-5775





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

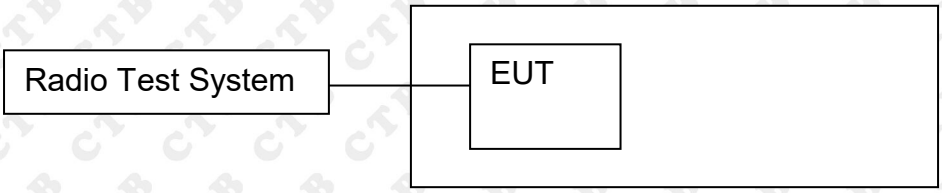
1. The EUT was directly connected to the Power meter

9.4 Test Result

Test mode1	Test Channel (MHz)	Output Power dBm ANT1	Output Power dBm ANT2	Output Power dBm Total	Limit dBm
802.11a	5745	4.10	4.22	/	30
	5785	4.17	4.05	/	30
	5825	4.12	4.18	/	30
802.11ac20	5745	4.23	3.72	6.99	30
	5785	4.13	3.97	7.06	30
	5825	4.05	4.17	7.12	30
802.11ac40	5755	4.17	4.08	7.14	30
	5795	4.07	4.07	7.08	30
802.11ac80	5775	4.11	4.27	7.20	30
802.11n(HT20)	5745	4.19	4.17	7.19	30
	5785	4.08	4.19	7.15	30
	5825	4.12	3.94	7.04	30
802.11n(HT40)	5755	4.15	3.87	7.02	30
	5795	4.28	3.91	7.11	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

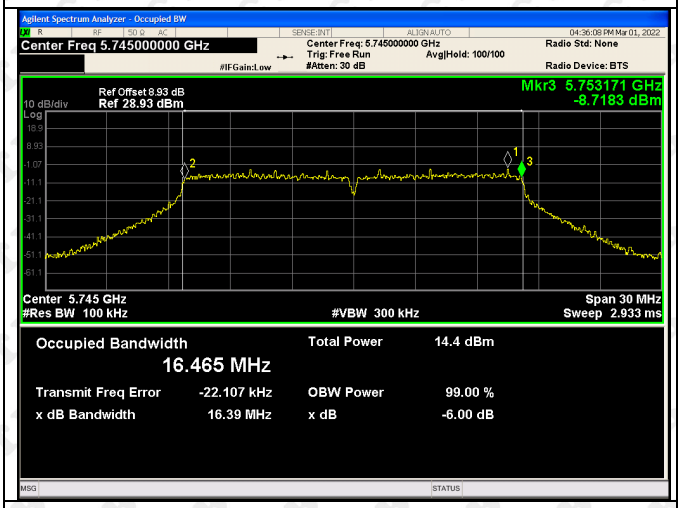
Test mode ANT 1	Test Channel (MHz)	6dB Bandwidth (MHz)
802.11a	5745	16.387
	5785	16.411
	5825	16.363
802.11a20	5745	17.559
	5785	17.565
	5825	17.28
802.11ac40	5755	36.021
	5795	36.058
802.11ac80	5775	75.185
802.11n(HT20)	5745	17.565
	5785	17.618
	5825	17.28
802.11n(HT40)	5755	36.094
	5795	35.927

Test mode ANT 2	Test Channel (MHz)	6dB Bandwidth (MHz)
802.11a	5745	16.397
	5785	16.419
	5825	16.445
802.11a20	5745	17.626
	5785	17.608
	5825	17.537
802.11ac40	5755	35.584
	5795	36.373
802.11ac80	5775	72.828
802.11n(HT20)	5745	17.594
	5785	17.606
	5825	17.616
802.11n(HT40)	5755	35.824
	5795	36.303

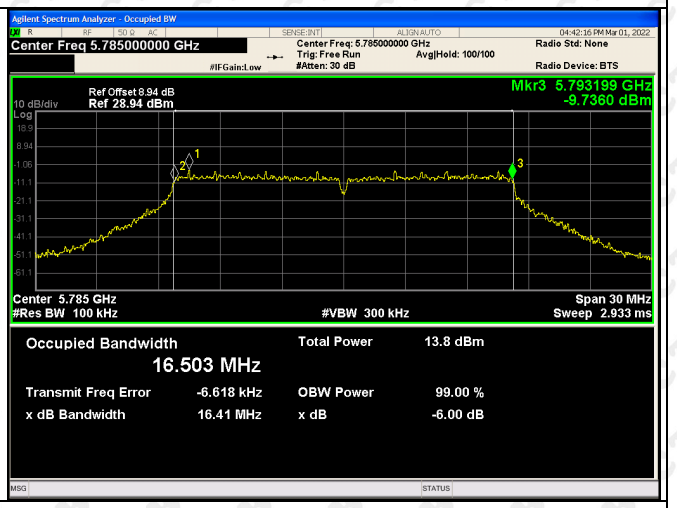
Test Graph

5745-5825MHz ANT 1:

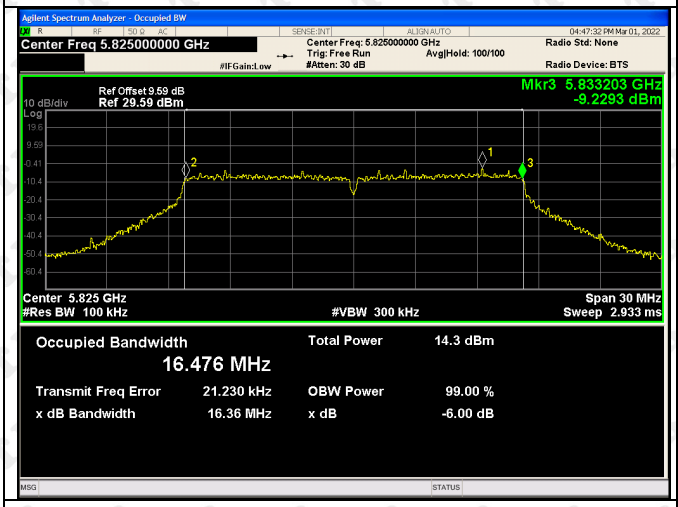
802.11a-5745



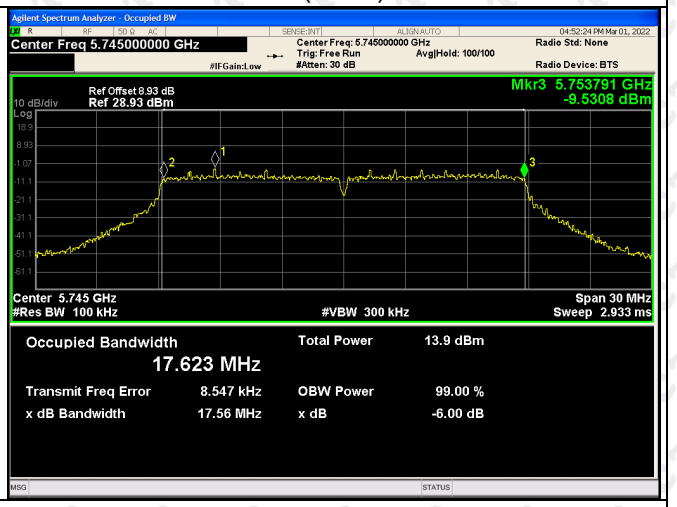
802.11a-5785



802.11a-5825



802.11n(HT20)-5745



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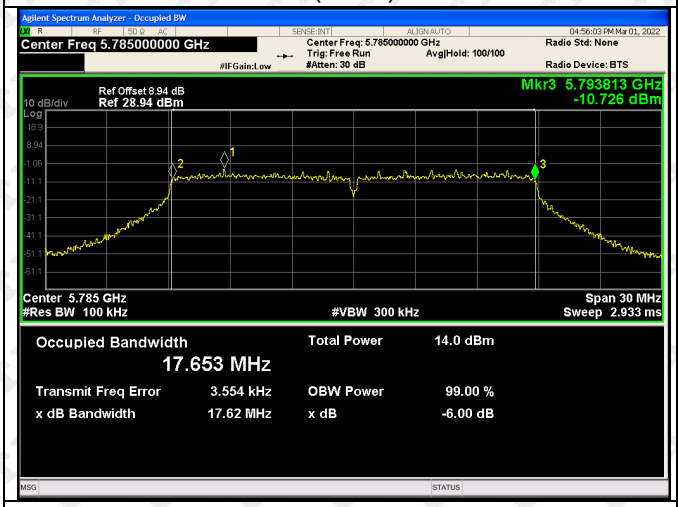
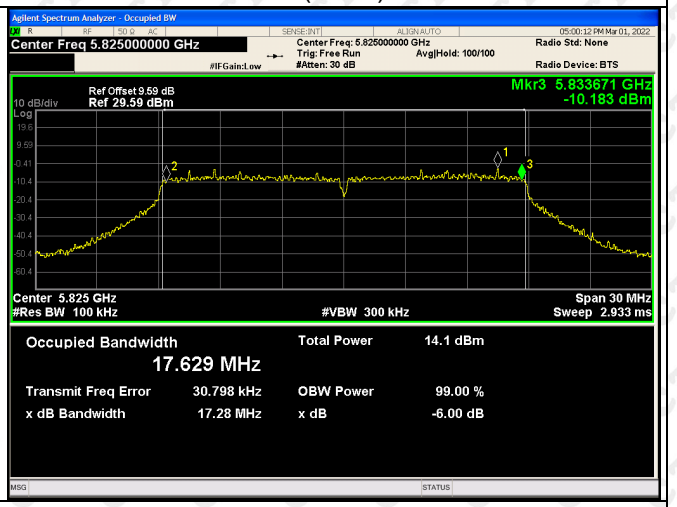
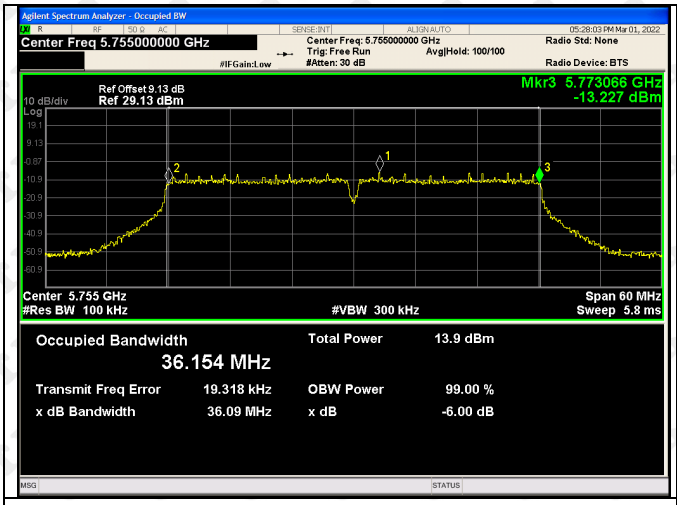


802.11n(HT20)-5825

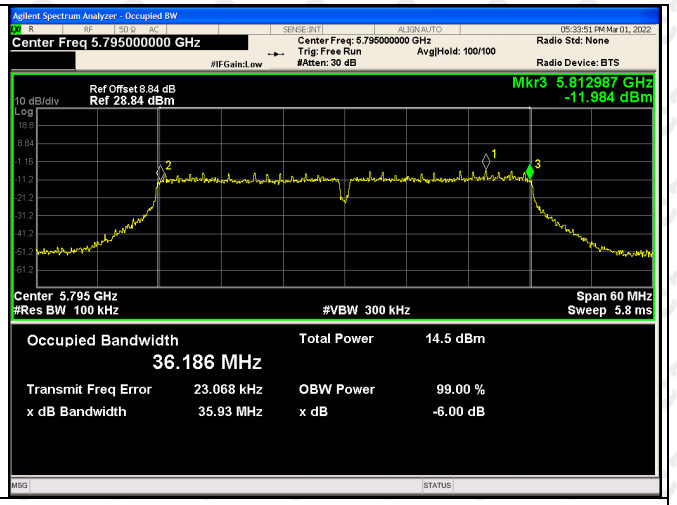


802.11n(HT40)-5755

802.11n(HT40)-5795



802.11ac(VH20)-5745



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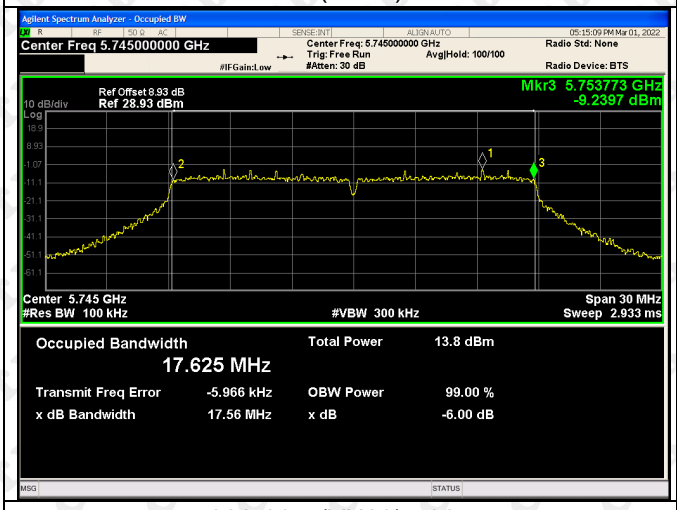

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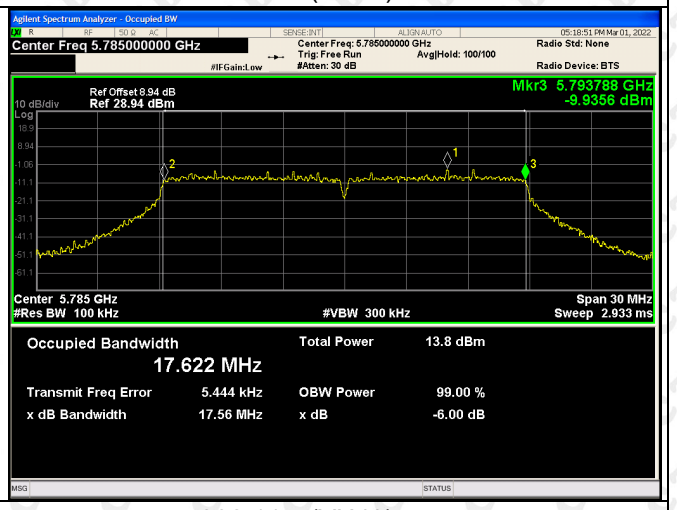
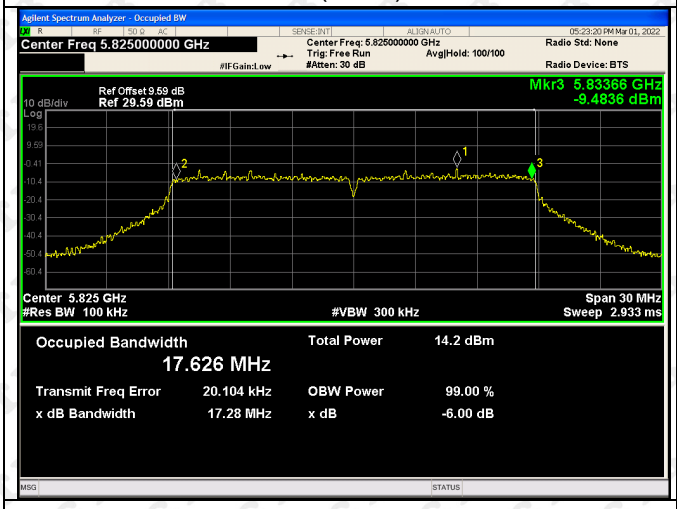
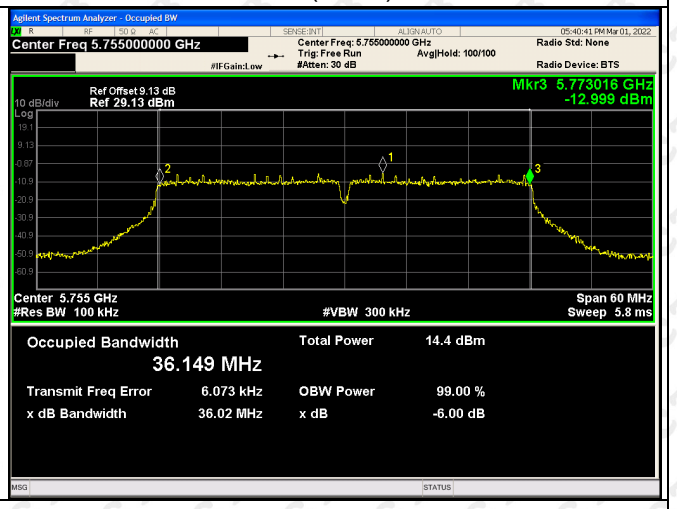


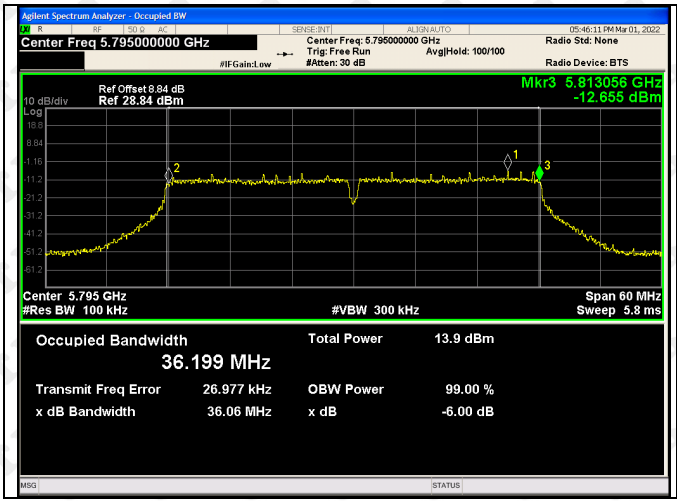
802.11ac(VH40)-5755

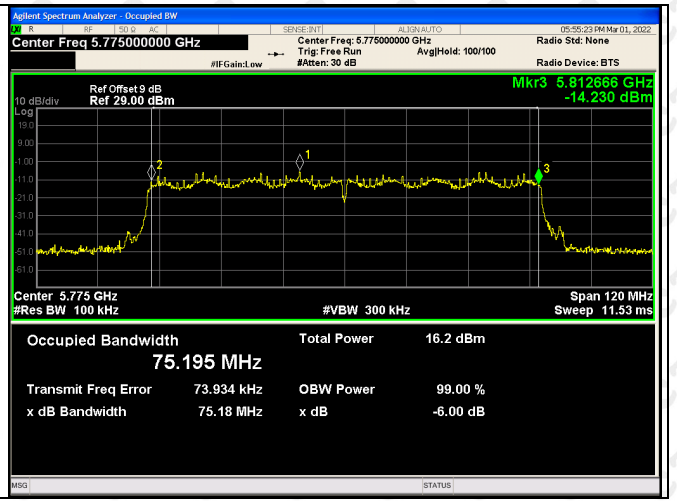


802.11ac(VH40)-5795



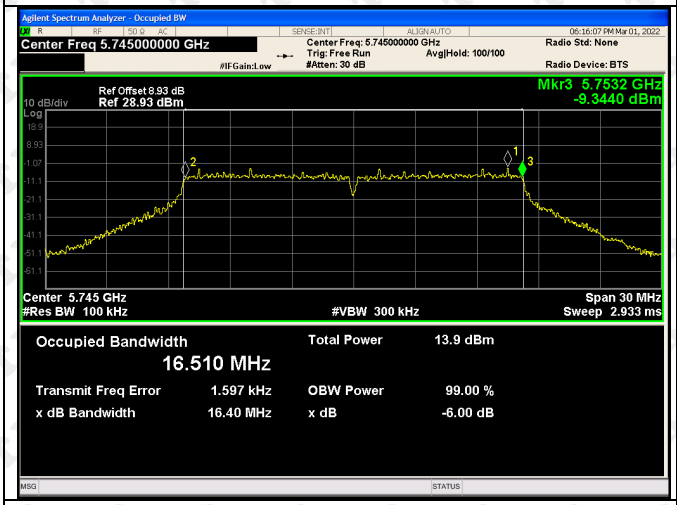
802.11ac(VH80)-5775


Agilent Spectrum Analyzer - Occupied BW
Center Freq 5.795000000 GHz
Center Freq: 5.795000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
#IFGain:Low
Ref Offset 8.84 dB
10 dB/div
Ref 28.84 dBm
Mkr3 5.813056 GHz
-12.655 dBm
Center 5.795 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 60 MHz
Sweep 5.8 ms
Occupied Bandwidth
36.199 MHz
Total Power 13.9 dBm
Transmit Freq Error 26.977 kHz
OBW Power 99.00 %
x dB Bandwidth 36.06 MHz
x dB -6.00 dB

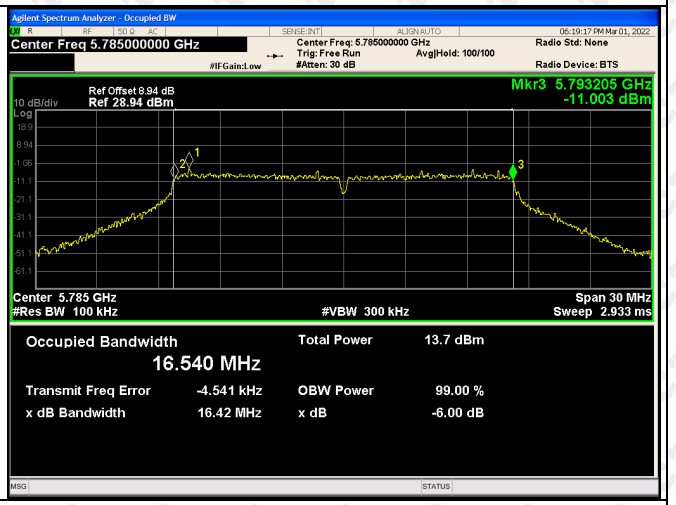

Agilent Spectrum Analyzer - Occupied BW
Center Freq 5.775000000 GHz
Center Freq: 5.775000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
#IFGain:Low
Ref Offset 9 dB
10 dB/div
Ref 29.00 dBm
Mkr3 5.812666 GHz
-14.230 dBm
Center 5.775 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 120 MHz
Sweep 11.53 ms
Occupied Bandwidth
75.195 MHz
Total Power 16.2 dBm
Transmit Freq Error 73.934 kHz
OBW Power 99.00 %
x dB Bandwidth 75.18 MHz
x dB -6.00 dB

5745-5825MHz ANT 2:

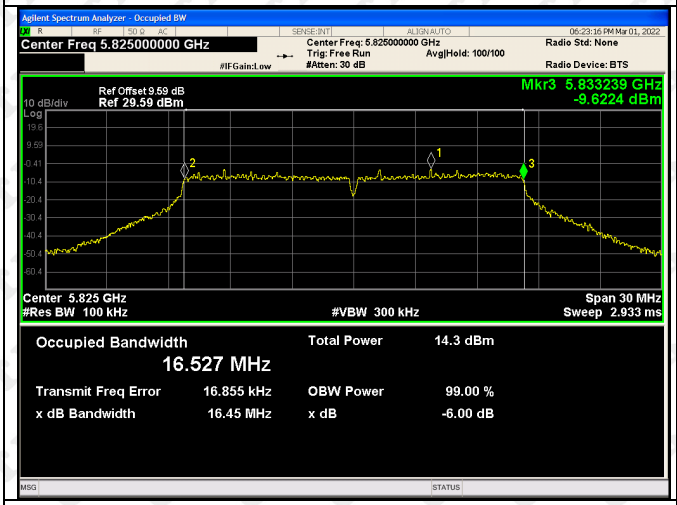
802.11a-5745



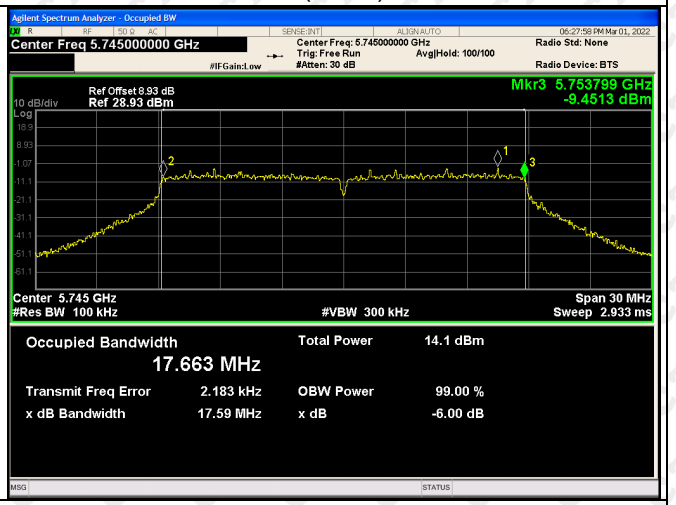
802.11a-5785



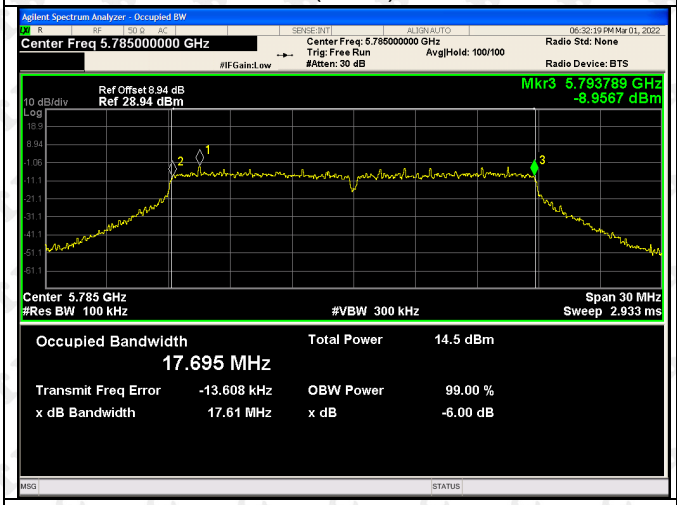
802.11a-5825



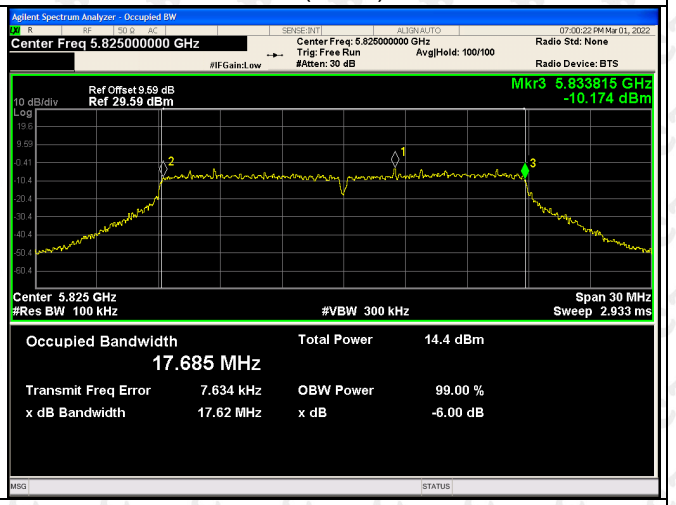
802.11n(HT20)-5745



802.11n(HT20)-5785

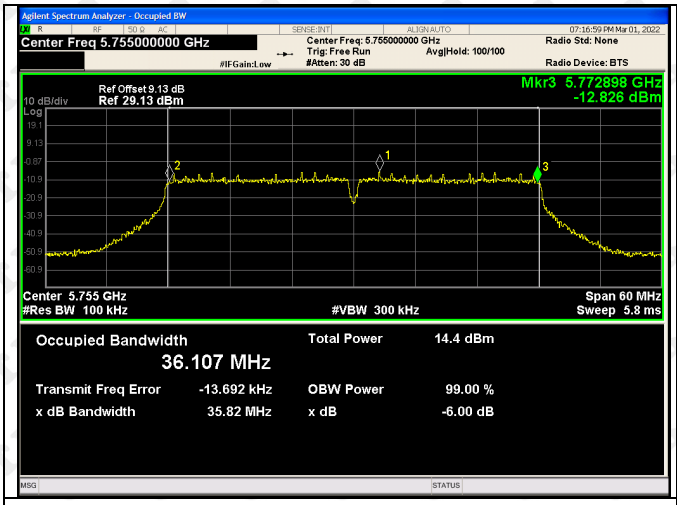


802.11n(HT20)-5825

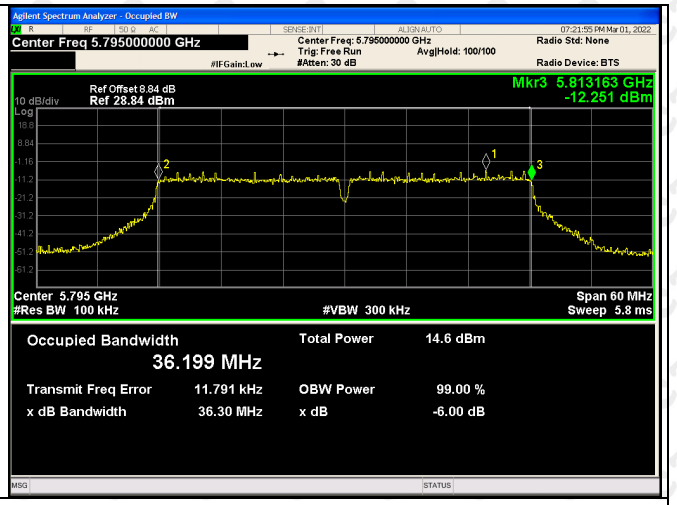


802.11n(HT40)-5755

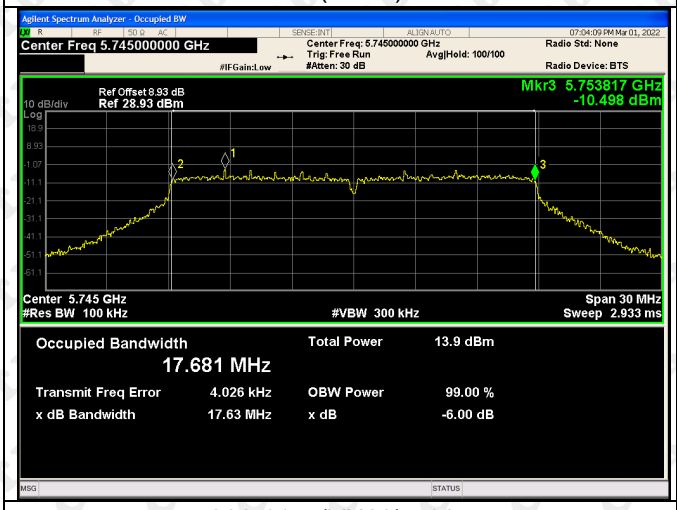
802.11n(HT40)-5795



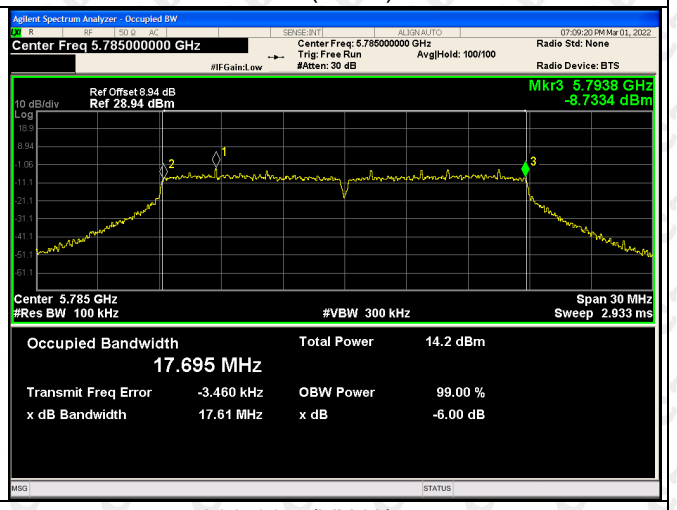
802.11ac(VH20)-5745



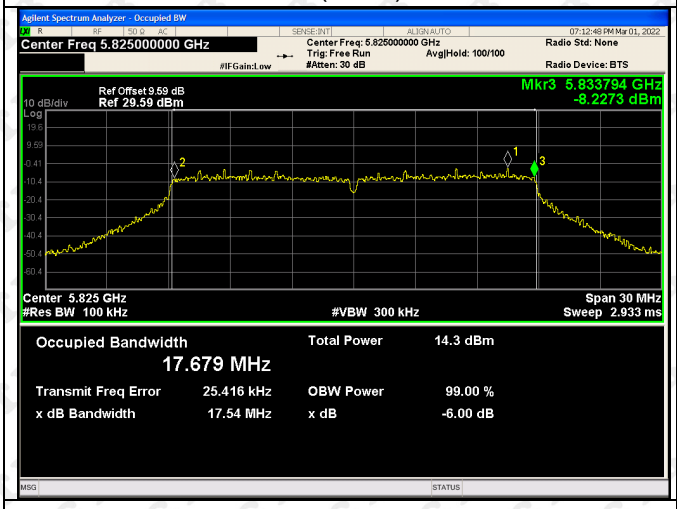
802.11ac(VH20)-5785



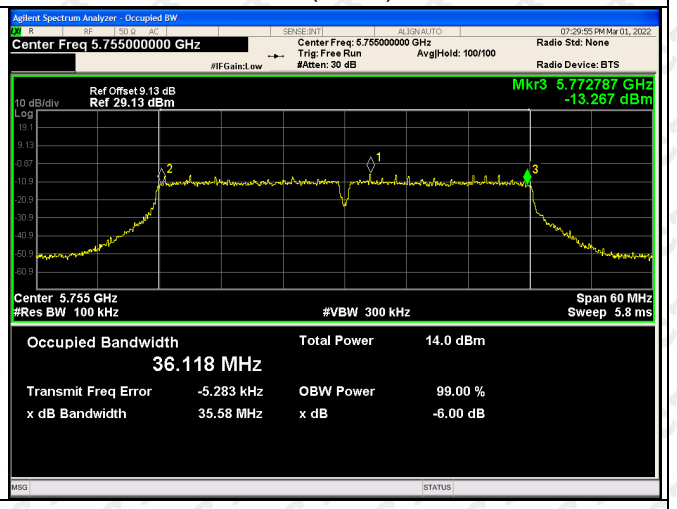
802.11ac(VH20)-5825



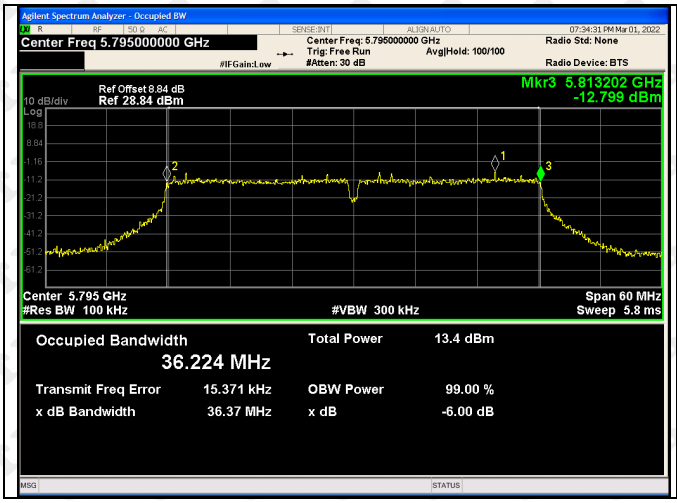
802.11ac(VH40)-5755

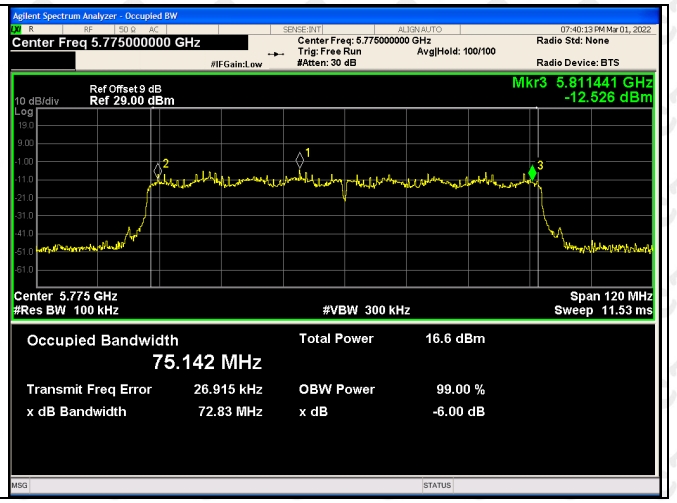


802.11ac(VH40)-5795



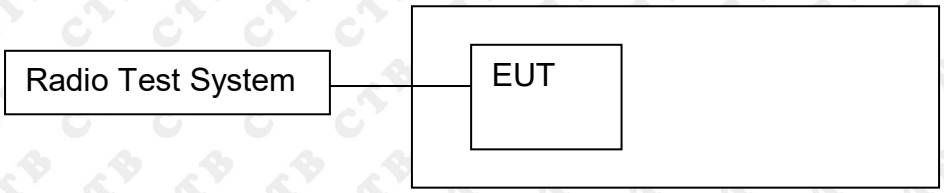
802.11ac(VH80)-5775


Agilent Spectrum Analyzer - Occupied BW
Center Freq 5.795000000 GHz
Center Freq: 5.795000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Ref Offset 8.84 dB
10 dB/div
Ref 28.84 dBm
Mkr3 5.813202 GHz
-12.799 dBm
Center 5.795 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 60 MHz
Sweep 5.8 ms
Occupied Bandwidth
36.224 MHz
Total Power 13.4 dBm
Transmit Freq Error 15.371 kHz
OBW Power 99.00 %
x dB Bandwidth 36.37 MHz
x dB -6.00 dB


Agilent Spectrum Analyzer - Occupied BW
Center Freq 5.775000000 GHz
Center Freq: 5.775000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Ref Offset 9 dB
10 dB/div
Ref 29.00 dBm
Mkr3 5.811441 GHz
-12.526 dBm
Center 5.775 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 120 MHz
Sweep 11.53 ms
Occupied Bandwidth
75.142 MHz
Total Power 16.6 dBm
Transmit Freq Error 26.915 kHz
OBW Power 99.00 %
x dB Bandwidth 72.83 MHz
x dB -6.00 dB

11. POWER SPECTRAL DENSITY

11.1 Block Diagram Of Test Setup



11.2 Limit

(1) For the band 5.15-5.25 GHz.

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

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

11.3 Test procedure

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

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

b) Set VBW ≥ 3 RBW.

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

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

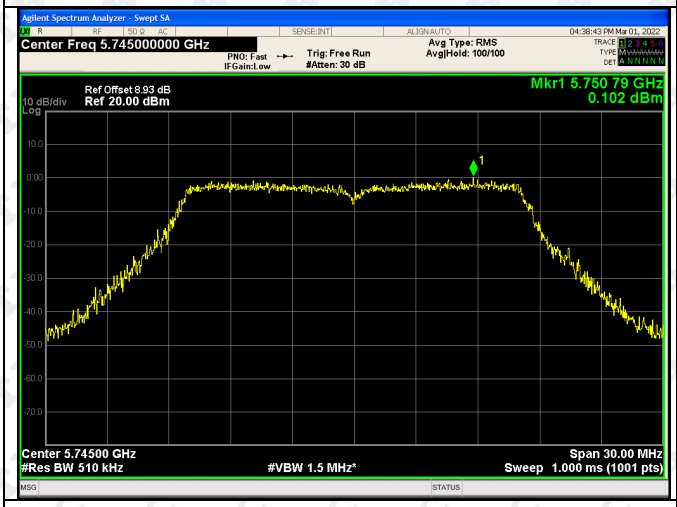
e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.
Note: As a practical matter, it is recommended to use reduced RBW of 100 kHz for the II.F.5.c) and II.F.5.d), since RBW=100 kHz is available on nearly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

11.4 Test Result

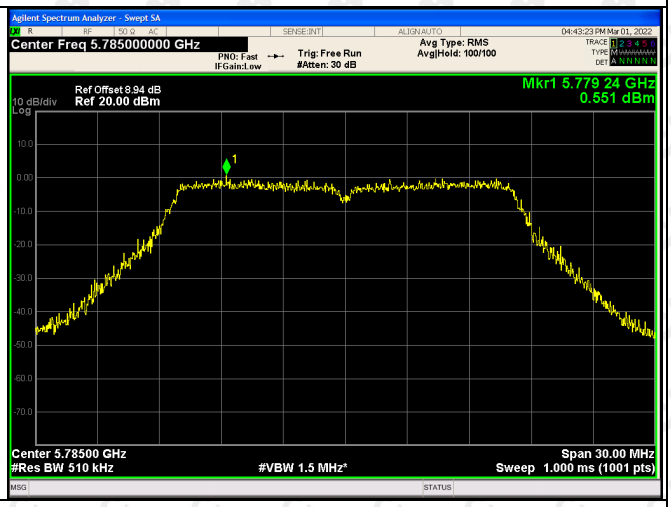
Test mode	Test Channel (MHz)	PSD [dBm/MHz] ANT 1	PSD [dBm/MHz] ANT 2	PSD [dBm/MHz] Total	Limit (dBm)	Result
802.11a	5180	0.102	-0.165	2.98089	11	Pass
	5200	0.551	1.676	4.16008	11	Pass
	5240	0.475	0.875	3.68993	11	Pass
802.11n(HT20)	5180	-0.119	0.281	3.09588	11	Pass
	5200	0.135	-0.029	3.06404	11	Pass
	5240	0.27	-0.256	3.02526	11	Pass
802.11n(HT40)	5190	-3.559	-3.226	-0.3791	11	Pass
	5230	-3.009	-2.53	0.24732	11	Pass
802.11ac(VH20)	5210	-0.62	-0.429	2.48684	11	Pass
	5180	-0.45	0.111	2.84994	11	Pass
	5200	0.365	0.828	3.61293	11	Pass
802.11ac(VH40)	5240	-2.979	-3.223	-0.0891	11	Pass
	5190	-3.285	-4.052	-0.6414	11	Pass
802.11ac(VH80)	5230	-3.532	-3.178	-0.3409	11	Pass

5745-5825MHz ANT 1:

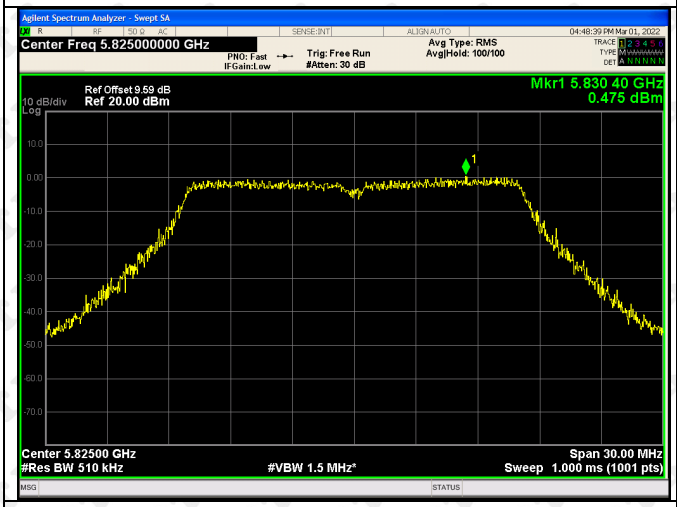
802.11a-5745



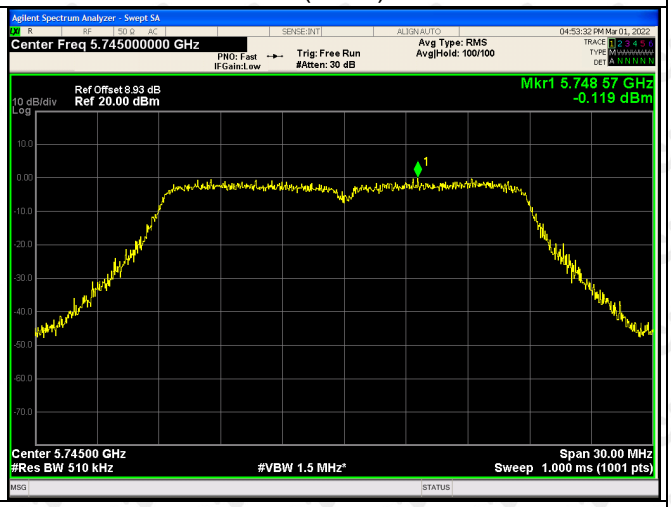
802.11a-5785



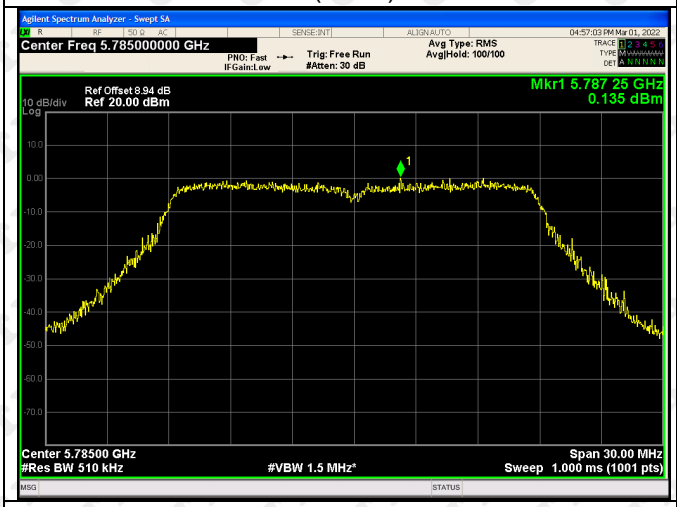
802.11a-5825



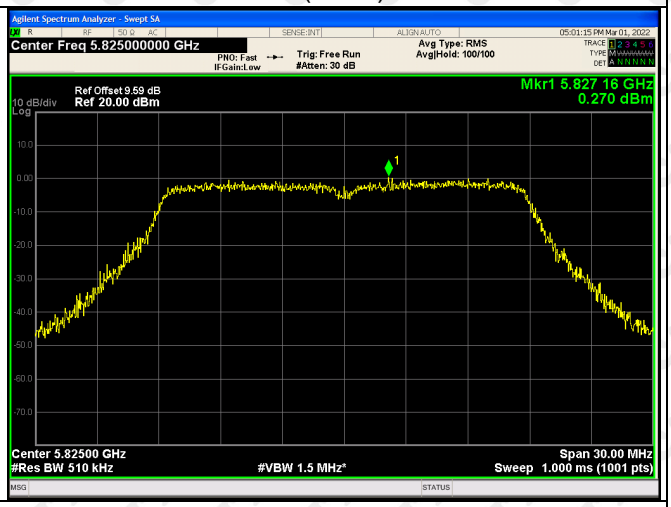
802.11n(HT20)-5745



802.11n(HT20)-5785

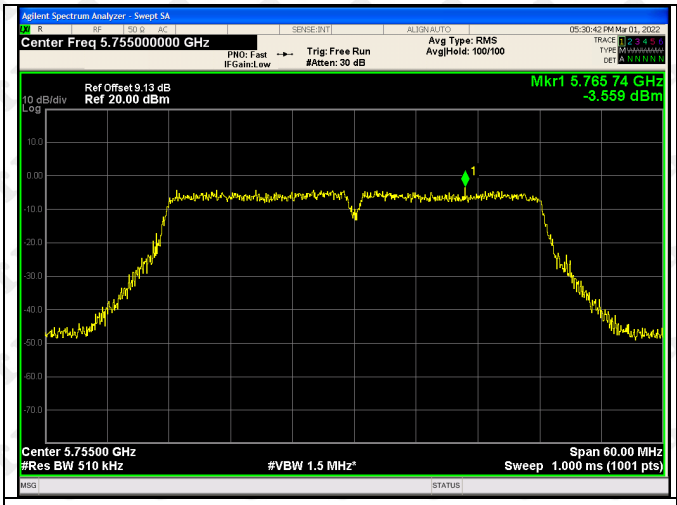


802.11n(HT20)-5825

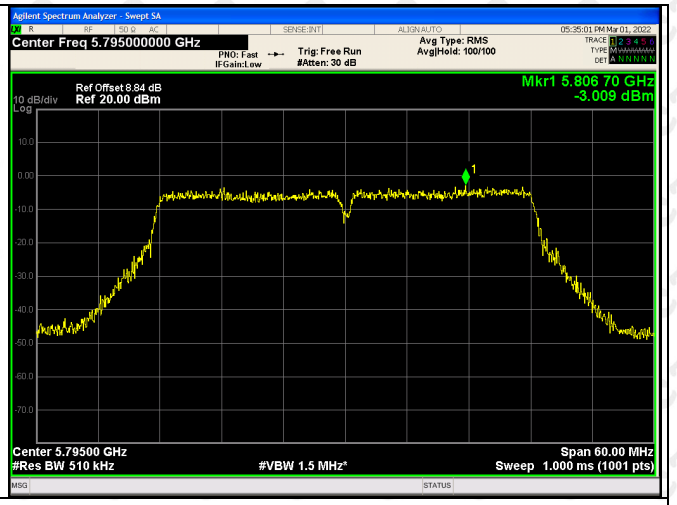


802.11n(HT40)-5755

802.11n(HT40)-5795



802.11ac(VH20)-5745



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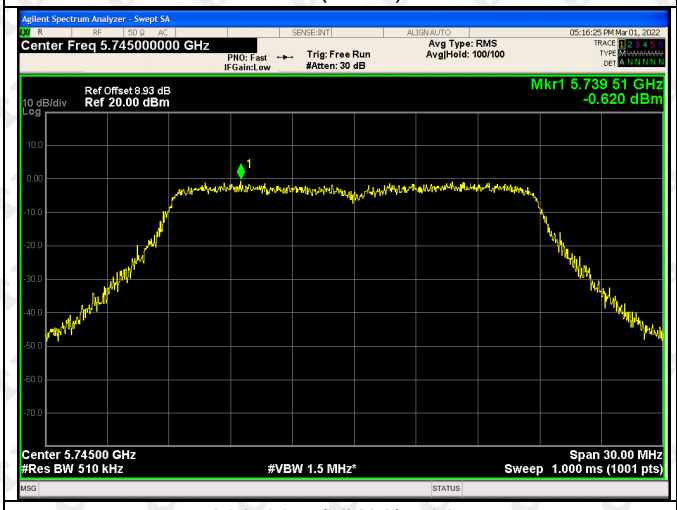

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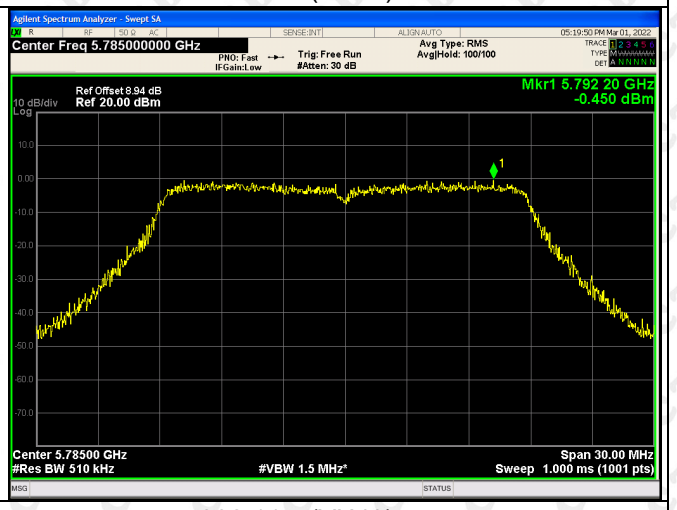

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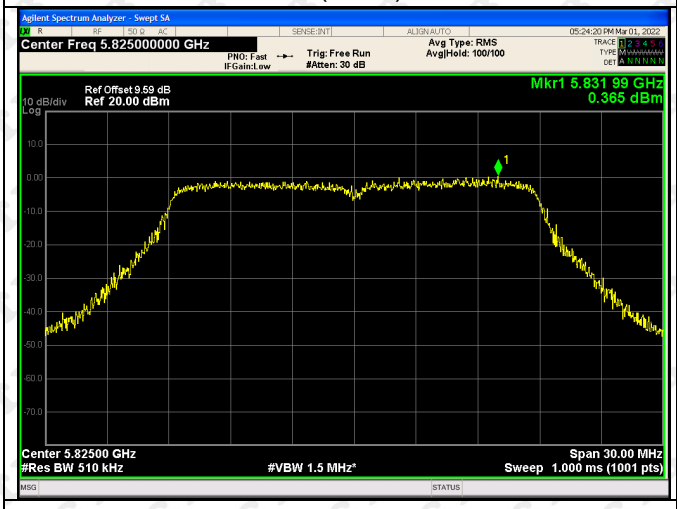

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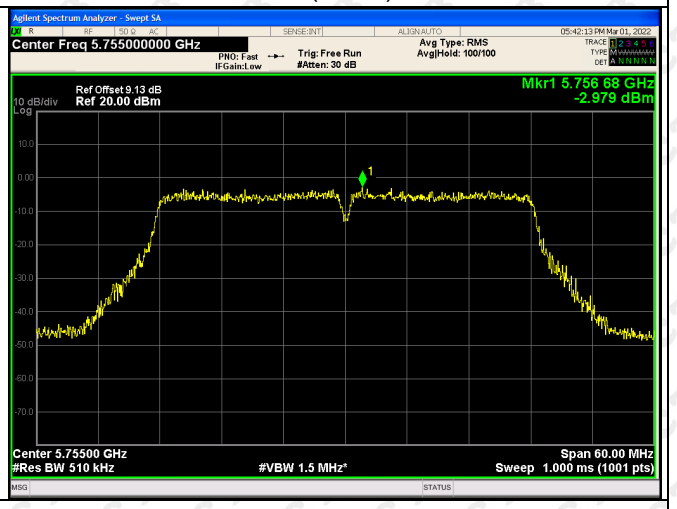
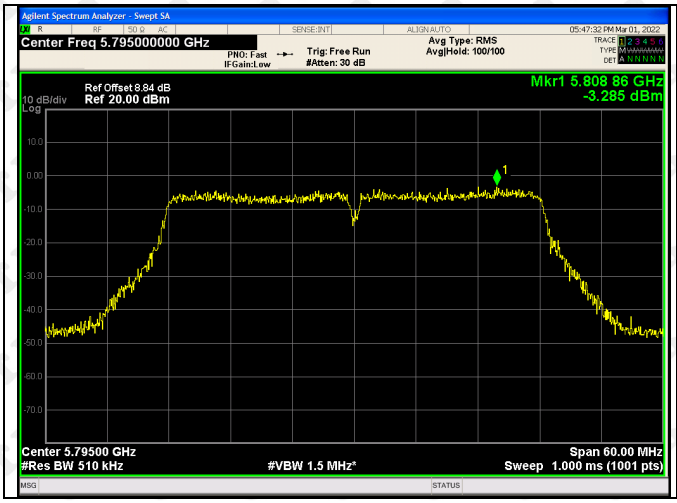


802.11ac(VH80)-5775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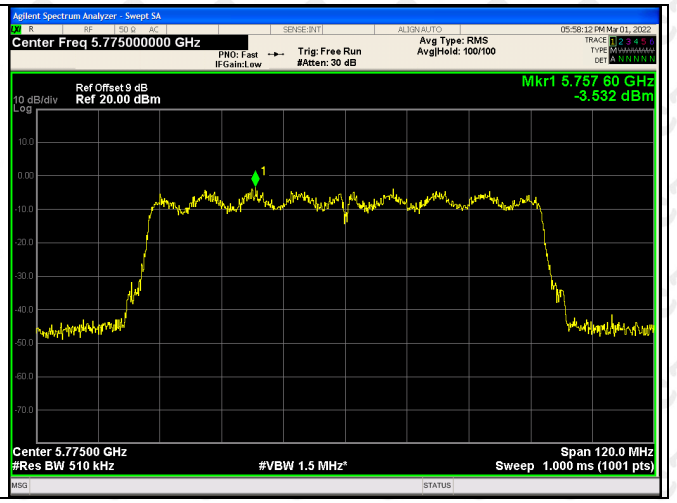
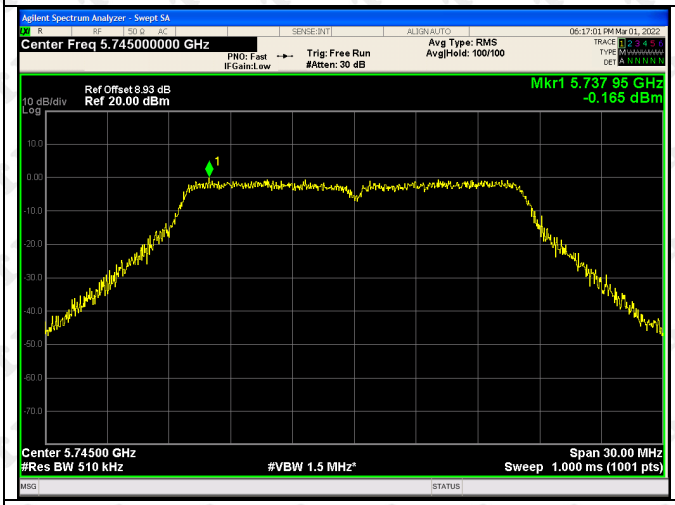
Center Freq 5.795000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 100/100
Ref Offset 8.84 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.808 86 GHz
-3.285 dBm
Center 5.79500 GHz
#Res BW 510 kHz
#VBW 1.5 MHz*
Span 60.00 MHz
Sweep 1.000 ms (1001 pts)

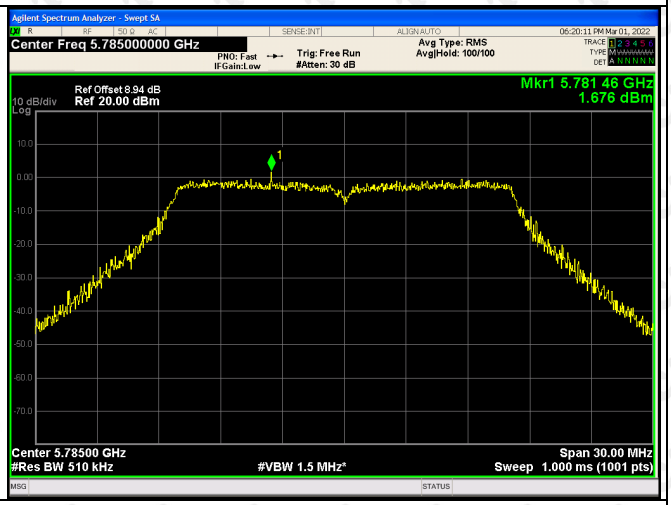

Agilent Spectrum Analyzer - Swept SA
Center Freq 5.775000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 100/100
Ref Offset 9 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.757 60 GHz
-3.532 dBm
Center 5.77500 GHz
#Res BW 510 kHz
#VBW 1.5 MHz*
Span 120.0 MHz
Sweep 1.000 ms (1001 pts)

5745-5825MHz ANT 2:

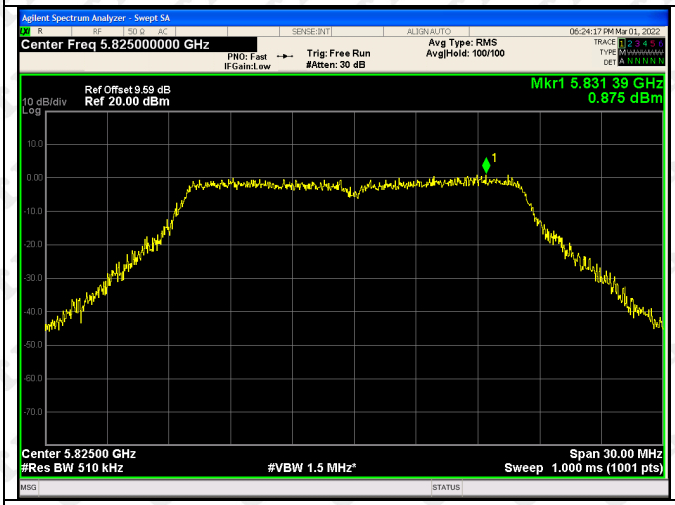
802.11a-5745



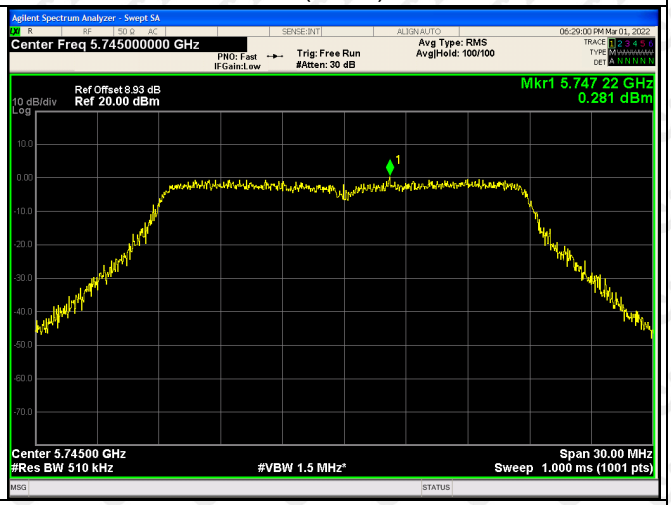
802.11a-5785



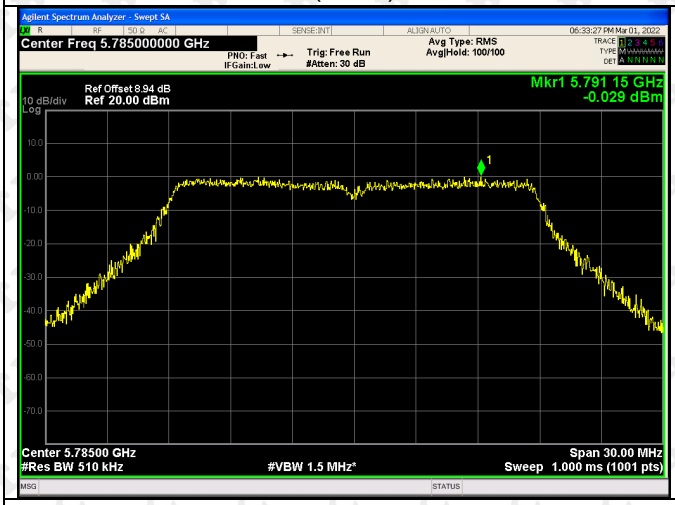
802.11a-5825



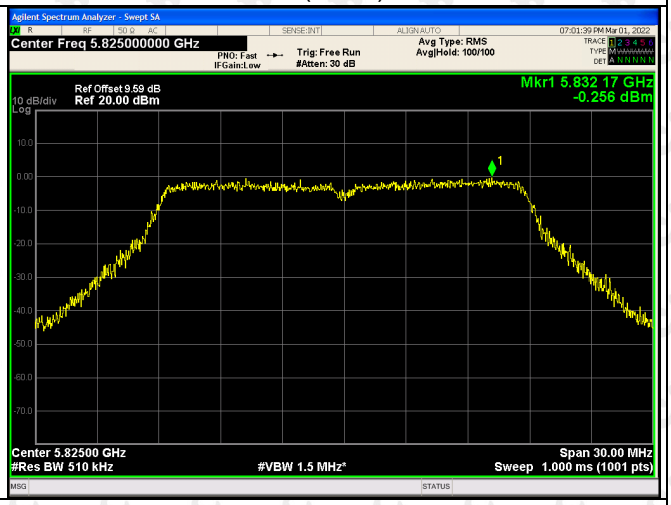
802.11n(HT20)-5745



802.11n(HT20)-5785

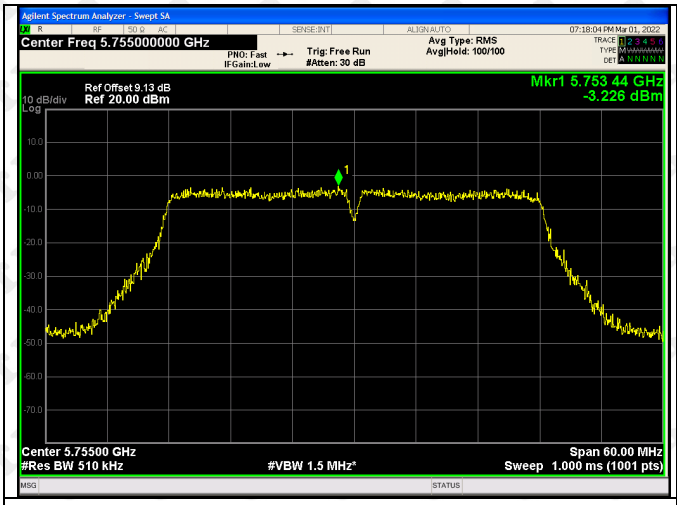


802.11n(HT20)-5825

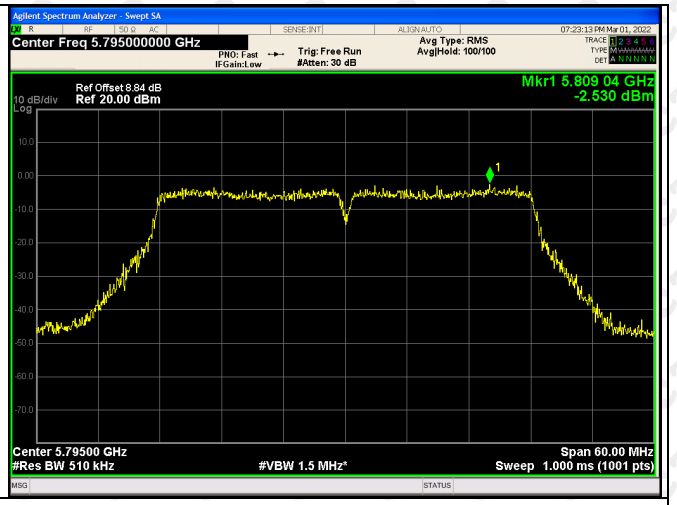


802.11n(HT40)-5755

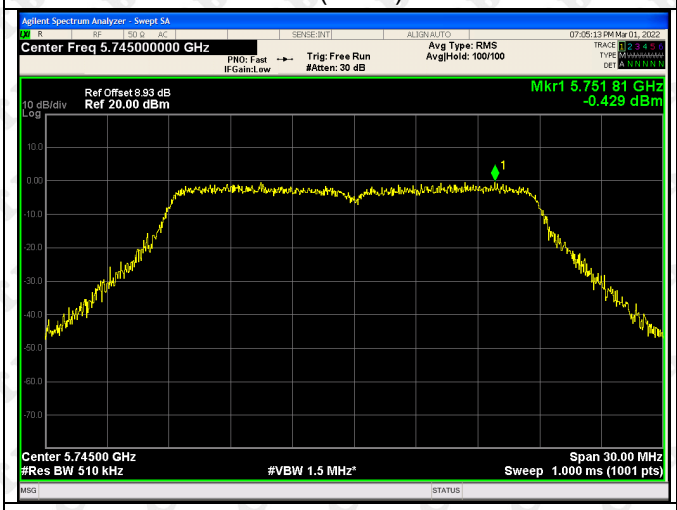
802.11n(HT40)-5795



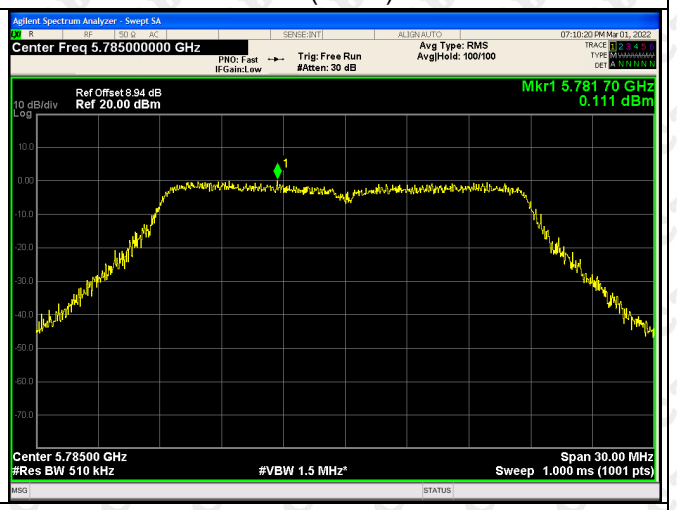
802.11ac(VH20)-5745



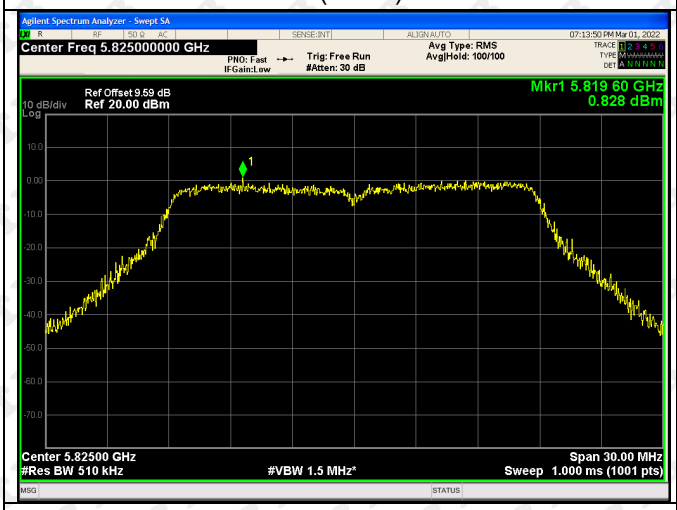
802.11ac(VH20)-5785



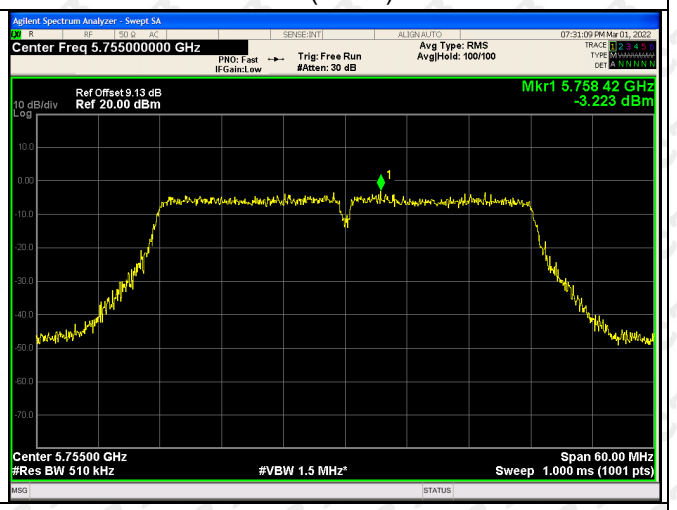
802.11ac(VH20)-5825



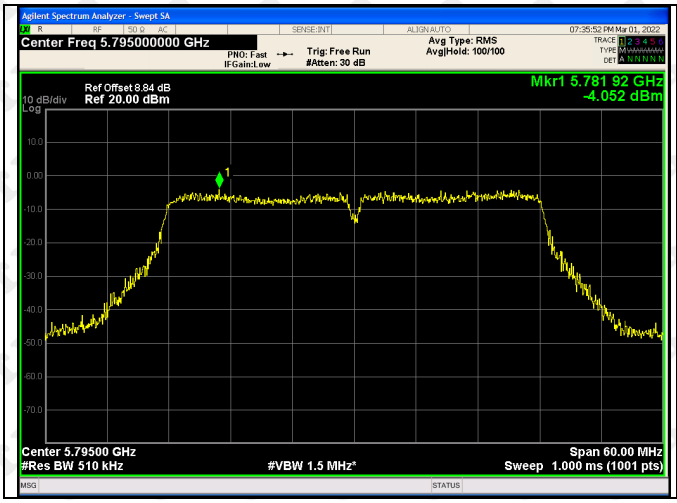
802.11ac(VH40)-5755

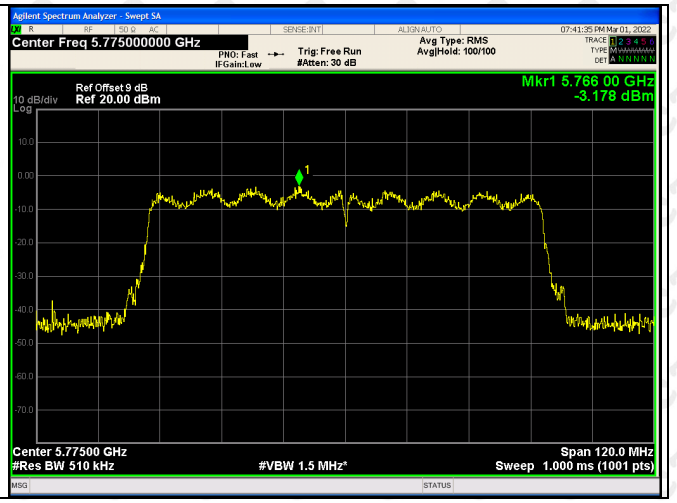


802.11ac(VH40)-5795



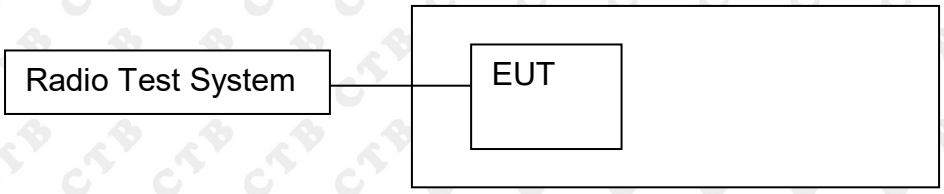
802.11ac(VH80)-5775


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
07:35:52 PM Mar 01, 2022
Ref Offset 8.84 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.781 92 GHz
-4.052 dBm
Center 5.79500 GHz
#Res BW 510 kHz
#VBW 1.5 MHz*
Span 60.00 MHz
Sweep 1.000 ms (1001 pts)


Agilent Spectrum Analyzer - Swept SA
Center Freq 5.775000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 100/100
07:41:25 PM Mar 01, 2022
Ref Offset 9 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.766 00 GHz
-3.178 dBm
Center 5.77500 GHz
#Res BW 510 kHz
#VBW 1.5 MHz*
Span 120.0 MHz
Sweep 1.000 ms (1001 pts)

12. FREQUENCY STABILITY

12.1 Block Diagram Of Test Setup



12.2 Limit

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

12.3 Test procedure

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

2. Set EUT as normal operation.

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

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

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

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

12.4 Test Result

ANT 1:

TX Frequency(5745-5825MHz)

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (° C)	20	V nom (V)	5.00	5745.00866	5745	0.00866	1.5070
		V max (V)	5.75	5745.00758	5745	0.00758	1.3202
		V min (V)	4.25	5745.00199	5745	0.00199	0.3463
Limits				5725-5850 MHz			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	3.8	T (°C)	-20	5745.01066	5745	0.01066	1.8561
		T (°C)	-10	5745.01269	5745	0.01269	2.2087
		T (°C)	0	5745.00194	5745	0.00194	0.3383
		T (°C)	10	5745.00138	5745	0.00138	0.2400
		T (°C)	20	5745.00340	5745	0.00340	0.5914
		T (°C)	30	5745.00089	5745	0.00089	0.1551
		T (°C)	40	5745.00692	5745	0.00692	1.2049
		T (°C)	50	5745.00283	5745	0.00283	0.4923
		T (°C)	60	5745.00817	5745	0.00817	1.4215
		T (°C)	70	5745.00444	5745	0.00444	0.7720
Limits				5725-5850 MHz			
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)	5.00	5785.01135	5785	0.01135	1.9618
		V max (V)	5.75	5785.01318	5785	0.01318	2.2791
		V min (V)	4.25	5785.00714	5785	0.00714	1.2351
Limits				5725-5850 MHz			
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)	-20	5785.00751	5785	0.00751	1.2983
		T (°C)	-10	5785.00891	5785	0.00891	1.5405
		T (°C)	0	5785.00662	5785	0.00662	1.1446
		T (°C)	10	5785.01236	5785	0.01236	2.1373
		T (°C)	20	5785.01176	5785	0.01176	2.0323
		T (°C)	30	5785.01000	5785	0.01000	1.7280
		T (°C)	40	5785.00788	5785	0.00788	1.3620
		T (°C)	50	5785.00203	5785	0.00203	0.3510
		T (°C)	60	5785.00758	5785	0.00758	1.3101
		T (°C)	70	5785.00131	5785	0.00131	0.2260
Limits				5725-5850 MHz			
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)	5.00	5825.00657	5825	0.00657	1.1276
		V max (V)	5.75	5825.00149	5825	0.00149	0.2565
		V min (V)	4.25	5825.00106	5825	0.00106	0.1824
Limits				5725-5850 MHz			
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)	-20	5825.00353	5825	0.00353	0.6052
		T (°C)	-10	5825.00156	5825	0.00156	0.2683
		T (°C)	0	5825.00400	5825	0.00400	0.6864
		T (°C)	10	5825.00768	5825	0.00768	1.3178
		T (°C)	20	5825.00280	5825	0.00280	0.4811
		T (°C)	30	5825.00278	5825	0.00278	0.4769
		T (°C)	40	5825.00416	5825	0.00416	0.7136
		T (°C)	50	5825.00108	5825	0.00108	0.1854
		T (°C)	60	5825.00714	5825	0.00714	1.2258
		T (°C)	70	5825.00873	5825	0.00873	1.4995
Limits				5725-5850 MHz			
Result				Complies			

ANT 2:
TX Frequency(5745-5825MHz)
Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5.00	5745.00321	5745	0.00321	0.5592
		V max (V)	5.75	5745.00960	5745	0.00960	1.6713
		V min (V)	4.25	5745.00300	5745	0.00300	0.5227
Limits				5725-5850 MHz			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	3.8	T (°C)	-20	5745.00148	5745	0.00148	0.2569
		T (°C)	-10	5745.01261	5745	0.01261	2.1944
		T (°C)	0	5745.00986	5745	0.00986	1.7158
		T (°C)	10	5745.00878	5745	0.00878	1.5274
		T (°C)	20	5745.00988	5745	0.00988	1.7194
		T (°C)	30	5745.00850	5745	0.00850	1.4800
		T (°C)	40	5745.00924	5745	0.00924	1.6085
		T (°C)	50	5745.00290	5745	0.00290	0.5041
		T (°C)	60	5745.00027	5745	0.00027	0.0462
		T (°C)	70	5745.01216	5745	0.01216	2.1164
Limits				5725-5850 MHz			
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)	5.00	5785.00032	5785	0.00032	0.0553
		V max (V)	5.75	5785.00053	5785	0.00053	0.0922
		V min (V)	4.25	5785.00751	5785	0.00751	1.2982
Limits				5725-5850 MHz			
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)	-20	5785.00091	5785	0.00091	0.1577
		T (°C)	-10	5785.00781	5785	0.00781	1.3493
		T (°C)	0	5785.00621	5785	0.00621	1.0740
		T (°C)	10	5785.00991	5785	0.00991	1.7126
		T (°C)	20	5785.00803	5785	0.00803	1.3883
		T (°C)	30	5785.00743	5785	0.00743	1.2841
		T (°C)	40	5785.01146	5785	0.01146	1.9804
		T (°C)	50	5785.00575	5785	0.00575	0.9931
		T (°C)	60	5785.00880	5785	0.00880	1.5207
		T (°C)	70	5785.01068	5785	0.01068	1.8456
Limits				5725-5850 MHz			
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)	5.00	5825.01312	5825	0.01312	2.2518
		V max (V)	5.75	5825.00316	5825	0.00316	0.5424
		V min (V)	4.25	5825.00619	5825	0.00619	1.0627
Limits				5725-5850 MHz			
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)	-20	5825.00288	5825	0.00288	0.4948
		T (°C)	-10	5825.00272	5825	0.00272	0.4672
		T (°C)	0	5825.00846	5825	0.00846	1.4515
		T (°C)	10	5825.01323	5825	0.01323	2.2704
		T (°C)	20	5825.00871	5825	0.00871	1.4950
		T (°C)	30	5825.00902	5825	0.00902	1.5479
		T (°C)	40	5825.00427	5825	0.00427	0.7336
		T (°C)	50	5825.00059	5825	0.00059	0.1005
		T (°C)	60	5825.01235	5825	0.01235	2.1201
		T (°C)	70	5825.00089	5825	0.00089	0.1526
Limits				5725-5850 MHz			
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:

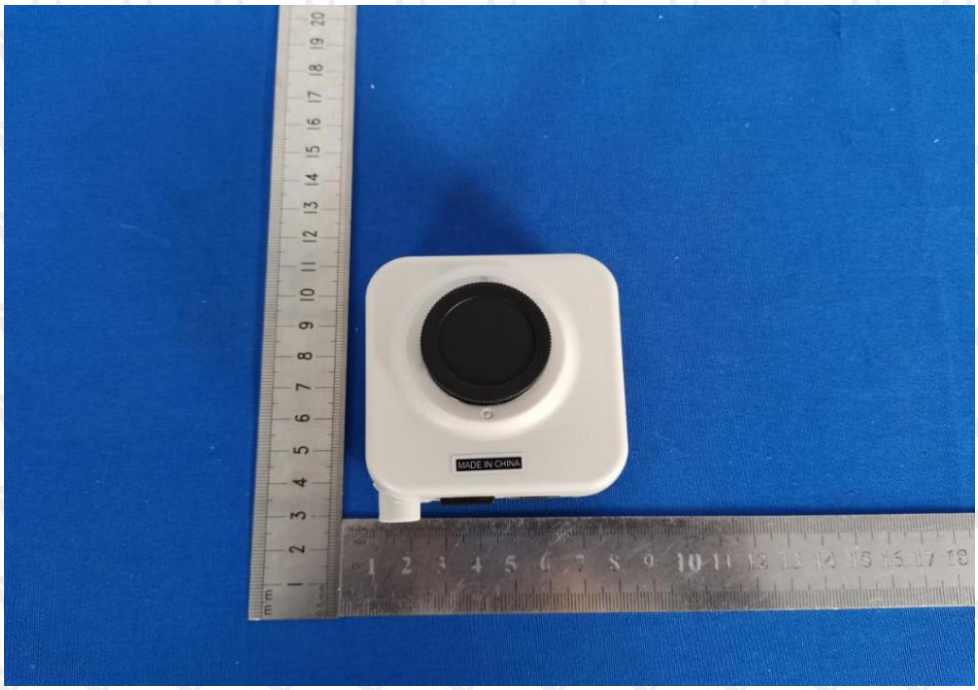
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit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

EUT Antenna:

The antenna is Internal Antenna and no consideration of replacement. The best case gain of the antenna is 1.0dBi.

15. EUT PHOTOGRAPHS

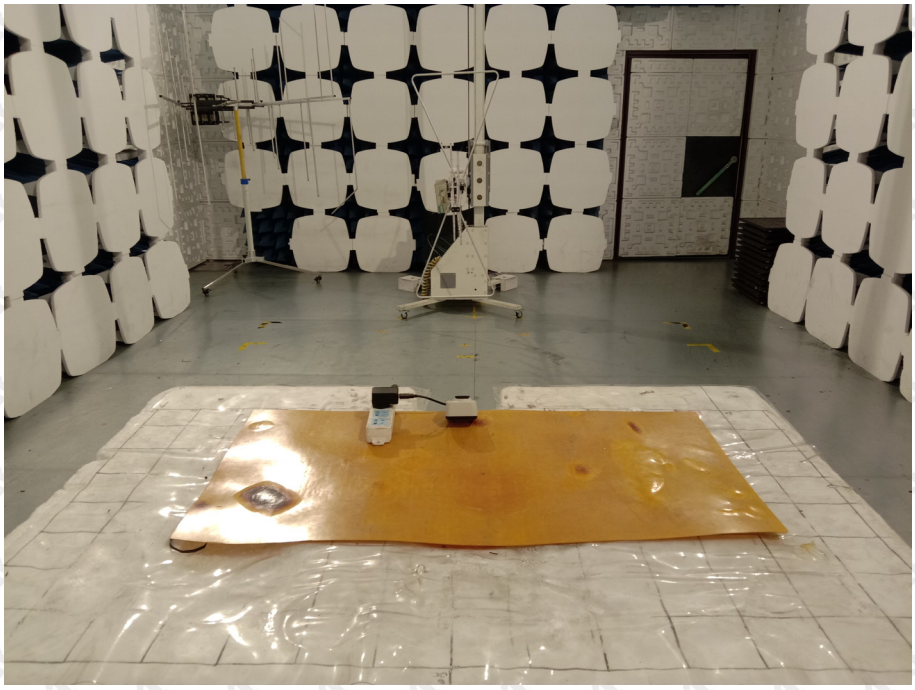
EUT Photo 1



16. EUT TEST SETUP PHOTOGRAPHS

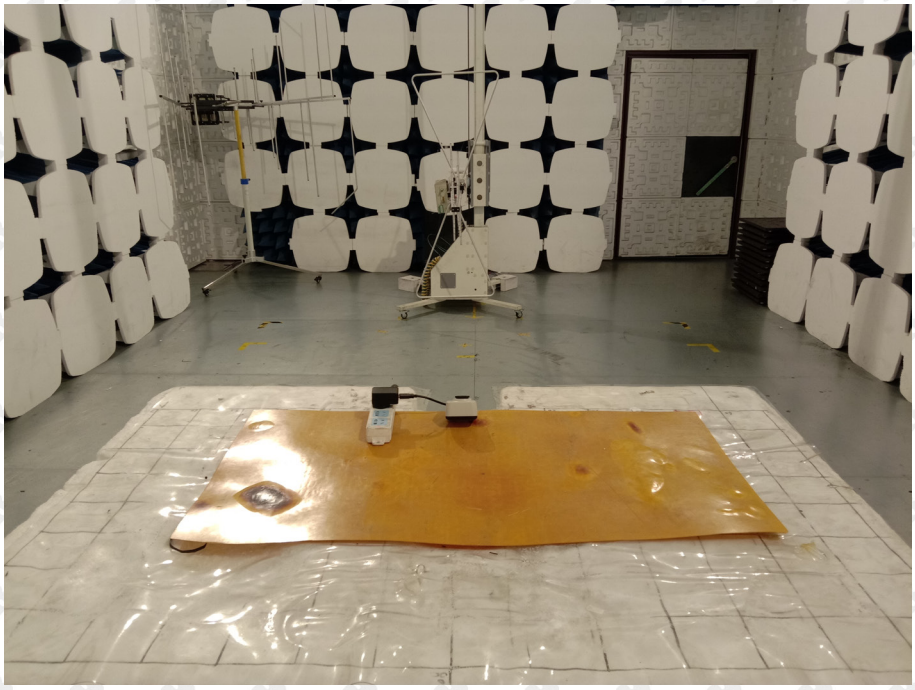
Spurious emissions

Below 1GHz



Above 1G

Conducted Emission



※※※※※ END OF **REPORT** ※※※※※