

TEST REPORT

Applicant: Shenzhen Ezhang Technology Co., Ltd.

Address of Applicant: 1504, Block C, Tianli Central Business Building, Yuehai Street, Nanshan District, Shenzhen

Manufacturer/Factory: Shenzhen Ezhang Technology Co., Ltd.

Address of Manufacturer/Factory: 1504, Block C, Tianli Central Business Building, Yuehai Street, Nanshan District, Shenzhen

Equipment Under Test (EUT)

Product Name: Mini pc

Model No.: DK08, DK01, DK02, DK03, DK04, DK05, DK06, DK07, DK09, DK10

Trade Mark: JUSAKA

FCC ID: 2A3IF-DK08

Applicable standards: FCC CFR Title 47 Part 15 Subpart E Section 15.407

Date of sample receipt: Sep. 28,2021

Date of Test: Sep. 28,2021-Oct. 29,2021

Date of report issued: Oct. 29,2021

Test Result : PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Robinson Luo

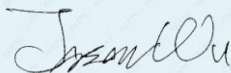
Laboratory Manager

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2 Version

Version No.	Date	Description
00	Oct. 29,2021	Original

Prepared By:

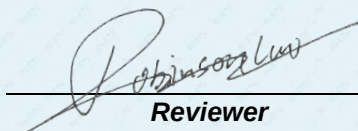


Project Engineer

Date:

Oct. 29,2021

Check By:



Reviewer

Date:

Oct. 29,2021

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4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
AC Power Line Conducted Emission	15.207	Pass
Maximum Conducted Output Power	15.407(a)(3)	Pass
6dB Bandwidth	15.407(e)	Pass
Power Spectral Density	15.407(a)(3)	Pass
Band Edge	15.407(b)(4)	Pass
Spurious Emission	15.205/15.209/15.407(b)(4)	Pass
Frequency Stability	15.407(g)	Pass

Remarks:

1. Pass: The EUT complies with the essential requirements in the standard.
2. Test according to ANSI C63.10:2013.

4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	30MHz-200MHz	3.8039dB	(1)
Radiated Emission	200MHz-1GHz	3.9679dB	(1)
Radiated Emission	1GHz-18GHz	4.29dB	(1)
Radiated Emission	18GHz-40GHz	3.30dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	3.44dB	(1)

Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

5 General Information

5.1 General Description of EUT

Product Name:	Mini pc
Model No.:	DK08
Serial models:	DK01, DK02, DK03, DK04, DK05, DK06, DK07, DK09, DK10
Model Declaration:	PCB board, structure and internal of these model(s) are the same, So no additional models were tested.
Test sample(s) ID:	GTSL202110000182-1
Sample(s) Status:	Engineer sample
Hardware Version:	A1
Software Version:	windows10
Operation Frequency:	802.11a/802.11n(HT20)/802.11ac(HT20): 5745MHz ~ 5825MHz 802.11n(HT40)/ 802.11ac(HT40): 5755MHz ~ 5795MHz 802.11ac(HT80): 5775MHz
Channel numbers:	802.11a/802.11n(HT20)/802.11ac(HT20): 5 802.11n(HT40)/ 802.11ac(HT40): 2 802.11ac(HT80): 1
Channel bandwidth:	802.11a/802.11n(HT20)/802.11ac(HT20) : 20MHz 802.11n(HT40)/802.11ac(HT40) : 40MHz 802.11ac(HT80): 80MHz
Modulation technology:	802.11a/802.11n(H20)/802.11n(H40)/802.11ac(HT20)/802.11ac(HT40) /802.11ac(HT80): Orthogonal Frequency Division Multiplexing (OFDM) MIMO: 802.11n/ac SISO: 802.11a
Antenna Type:	FPC Antenna1 and FPC Antenna2
Antenna gain:	0.00dBi
Power supply:	DC 19V From External Circuit
Adapter Information:	Mode: HKA18019095-6C Input: AC100-240V, 50/60Hz, 2.5A Output: DC 19V, 9.47A, 179.93W

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
149	5745MHz	151	5755MHz	153	5765MHz	155	5775MHz
157	5785MHz	159	5795MHz	161	5805MHz	163	5815MHz
165	5825MHz						

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Test channel	Frequency (MHz)		
	802.11 a/n/ac(HT20)	802.11 n/ac(HT40)	802.11ac(HT80)
Lowest channel	5745	5755	
Middle channel	5785		5775
Highest channel	5825	5795	

5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode
<i>Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.</i>	

We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:

Per-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.

Mode	Data rate
802.11a	6Mbps
802.11n(HT20)	6.5Mbps
802.11n(HT40)	13Mbps
802.11ac(HT20)	6.5Mbps
802.11ac(HT40)	13.5Mbps
802.11ac(HT80)	29.3Mbps

5.3 Description of Support Units

None.

5.4 Deviation from Standards

None.

5.5 Abnormalities from Standard Conditions

None.

5.6 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Conducted testing:

Temperature:	25.2 ° C
Humidity:	52.4 %
Atmospheric pressure:	950-1050mbar

5.7 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **FCC—Registration No.: 381383**

Designation Number: CN5029

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files.

- **IC —Registration No.: 9079A**

CAB identifier: CN0091

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

- **NVLAP (LAB CODE:600179-0)**

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

5.8 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone,
Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480

Fax: 0755-27798960

6 Test Instruments list

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July. 02 2020	July. 01 2025
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June. 24 2021	June. 23 2022
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 24 2021	June. 23 2022
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 24 2021	June. 23 2022
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 24 2021	June. 23 2022
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 24 2021	June. 23 2022
9	Coaxial Cable	GTS	N/A	GTS211	June. 24 2021	June. 23 2022
10	Coaxial cable	GTS	N/A	GTS210	June. 24 2021	June. 23 2022
11	Coaxial Cable	GTS	N/A	GTS212	June. 24 2021	June. 23 2022
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 24 2021	June. 23 2022
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 24 2021	June. 23 2022
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 24 2021	June. 23 2022
15	Band filter	Amindeon	82346	GTS219	June. 24 2021	June. 23 2022
16	Power Meter	Anritsu	ML2495A	GTS540	June. 24 2021	June. 23 2022
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 24 2021	June. 23 2022
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 24 2021	June. 23 2022
19	Splitter	Agilent	11636B	GTS237	June. 24 2021	June. 23 2022
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 24 2021	June. 23 2022
21	Breitband hornantenne	SCHWARZBECK	BBHA 9170	GTS579	Oct. 17 2021	Oct. 16 2022
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 17 2021	Oct. 16 2022
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 17 2021	Oct. 16 2022
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June. 24 2021	June. 23 2022

Conducted Emission						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	May.15 2019	May.14 2022
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 24 2021	June. 23 2022
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June. 24 2021	June. 23 2022
4	ENV216 2-L-V-NETZNACHB.DE	ROHDE&SCHWARZ	ENV216	GTS226	June. 24 2021	June. 23 2022
5	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Thermo meter	KTJ	TA328	GTS233	June. 24 2021	June. 23 2022
8	Absorbing clamp	Elektronik-Feinmechanik	MDS21	GTS229	June. 24 2021	June. 23 2022
9	ISN	SCHWARZBECK	NTFM 8158	GTS565	June. 24 2021	June. 23 2022
10	High voltage probe	SCHWARZBECK	TK9420	GTS537	July. 09 2021	July. 08 2022

RF Conducted Test:						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	June. 24 2021	June. 23 2022
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 24 2021	June. 23 2022
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 24 2021	June. 23 2022
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 24 2021	June. 23 2022
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 24 2021	June. 23 2022
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 24 2021	June. 23 2022
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 24 2021	June. 23 2022
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 24 2021	June. 23 2022

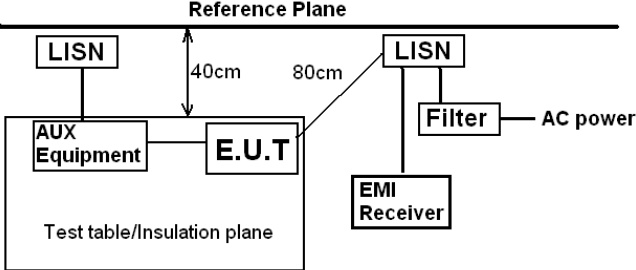
General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 24 2021	June. 23 2022
2	Barometer	ChangChun	DYM3	GTS255	June. 24 2021	June. 23 2022

7 Test results and Measurement Data

7.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203
<i>15.203 requirement:</i> <i>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.</i>	
E.U.T Antenna:	
<i>The antennas are FPC antenna, the best case gain of the antennas are 0.00dBi, reference to the appendix II for details</i>	

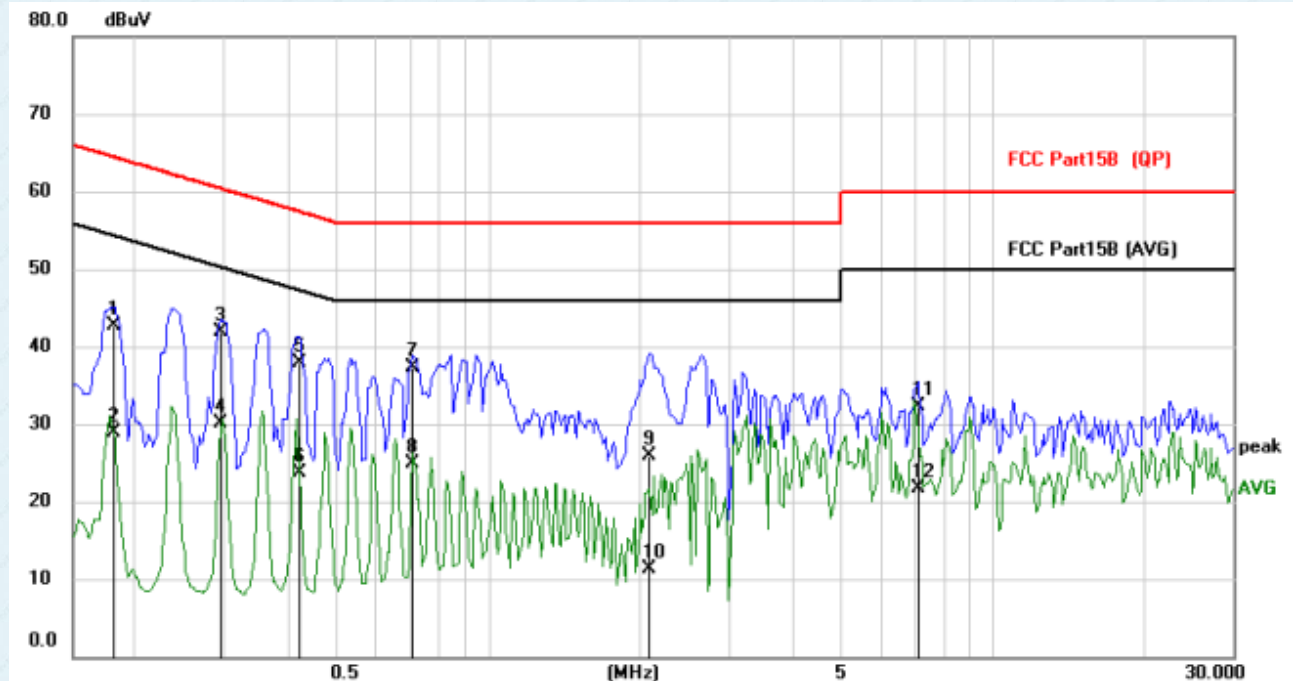
7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207																			
Test Method:	ANSI C63.10:2013																			
Test Frequency Range:	150KHz to 30MHz																			
Class / Severity:	Class B																			
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto																			
Limit:	<table><tr><th rowspan="2">Frequency range (MHz)</th><th colspan="2">Limit (dBuV)</th></tr><tr><th>Quasi-peak</th><th>Average</th></tr><tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr><tr><td>0.5-5</td><td>56</td><td>46</td></tr><tr><td>5-30</td><td>60</td><td>50</td></tr></table> * Decreases with the logarithm of the frequency.						Frequency range (MHz)	Limit (dBuV)		Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dBuV)																			
	Quasi-peak	Average																		
0.15-0.5	66 to 56*	56 to 46*																		
0.5-5	56	46																		
5-30	60	50																		
Test setup:	Reference Plane  Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m																			
Test procedure:	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.																			
Test Instruments:	Refer to section 6.0 for details																			
Test mode:	Refer to section 5.2 for details																			
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar														
Test voltage:	AC 120V, 60Hz																			
Test results:	Pass																			

Remark: Both high and low voltages of antenna 1 and antenna 2 have been tested to show only the worst low voltage test data.

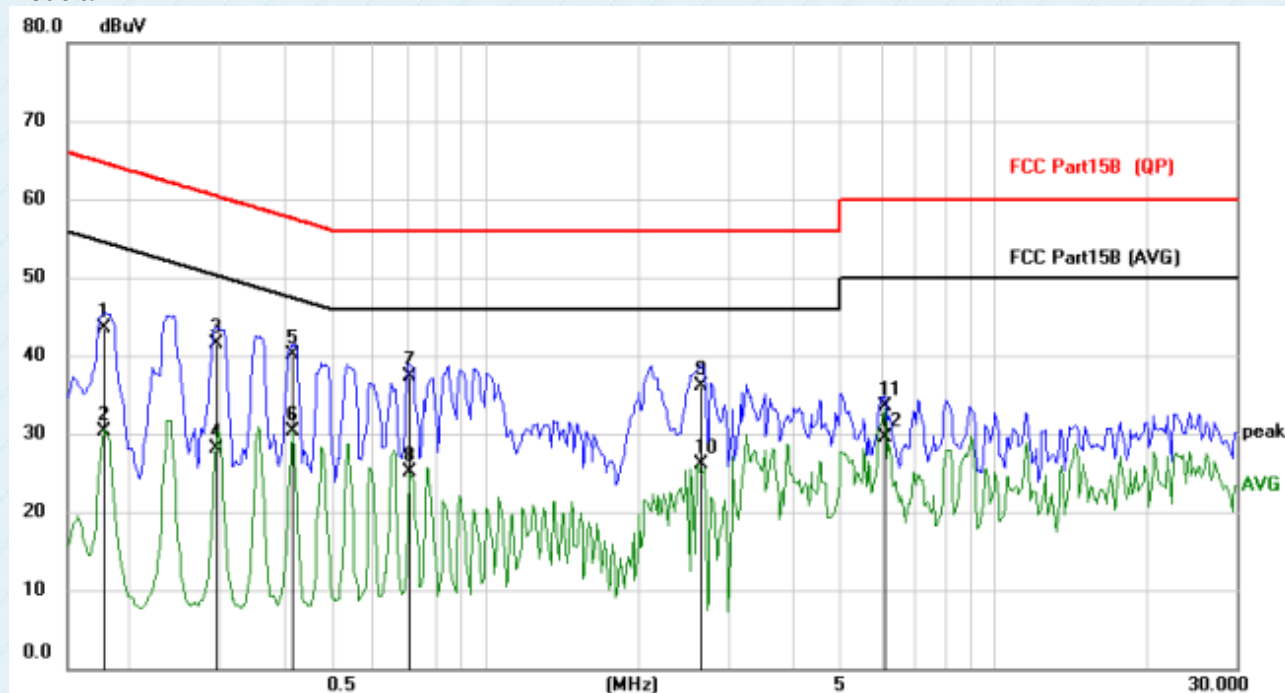
Measurement data

Line:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1812	32.28	10.39	42.67	64.43	-21.76	QP
2		0.1812	18.44	10.39	28.83	54.43	-25.60	AVG
3	*	0.2943	31.55	10.41	41.96	60.40	-18.44	QP
4		0.2943	19.69	10.41	30.10	50.40	-20.30	AVG
5		0.4230	27.46	10.44	37.90	57.39	-19.49	QP
6		0.4230	13.28	10.44	23.72	47.39	-23.67	AVG
7		0.7077	26.46	10.75	37.21	56.00	-18.79	QP
8		0.7077	14.11	10.75	24.86	46.00	-21.14	AVG
9		2.0844	15.17	10.82	25.99	56.00	-30.01	QP
10		2.0844	0.42	10.82	11.24	46.00	-34.76	AVG
11		7.1184	20.86	11.44	32.30	60.00	-27.70	QP
12		7.1184	10.22	11.44	21.66	50.00	-28.34	AVG

Neutral:

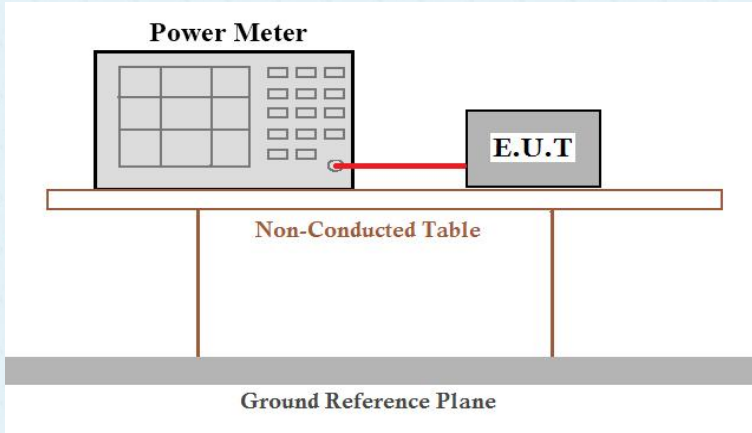


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector
1		0.1773	33.23	10.23	43.46	64.61	-21.15	QP
2		0.1773	20.09	10.23	30.32	54.61	-24.29	AVG
3		0.2943	31.23	10.24	41.47	60.40	-18.93	QP
4		0.2943	17.95	10.24	28.19	50.40	-22.21	AVG
5		0.4152	29.72	10.30	40.02	57.54	-17.52	QP
6	*	0.4152	20.04	10.30	30.34	47.54	-17.20	AVG
7		0.7077	26.56	10.65	37.21	56.00	-18.79	QP
8		0.7077	14.47	10.65	25.12	46.00	-20.88	AVG
9		2.6576	25.23	10.84	36.07	56.00	-19.93	QP
10		2.6576	15.33	10.84	26.17	46.00	-19.83	AVG
11		6.0888	22.62	10.91	33.53	60.00	-26.47	QP
12		6.0888	18.67	10.91	29.58	50.00	-20.42	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. Final Level =Receiver Read level + LISN Factor + Cable Loss
4. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both *limits and measurement with the average detector receiver is unnecessary.*

7.3 Conducted Peak Output Power

Test Requirement:	FCC Part15 E Section 15.407(a)(3)
Test Method:	ANSI C63.10:2013 and KDB 789033 D02 General U-NII Test Procedures New Rules v02r01
Limit:	30dBm
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

ANT1:

Test CH	Peak Output Power (dBm)						Limit(dBm)	Result
	802.11a	802.11n (HT20)	802.11ac (HT20)	802.11n (HT40)	802.11ac (HT40)	802.11ac (HT80)		
Lowest	9.05	9.05	9.03	9.14	9.19	9.81	30.00	Pass
Middle	9.69	9.65	9.51	--	--			
Highest	8.70	8.72	8.66	9.59	9.63			

ANT2:

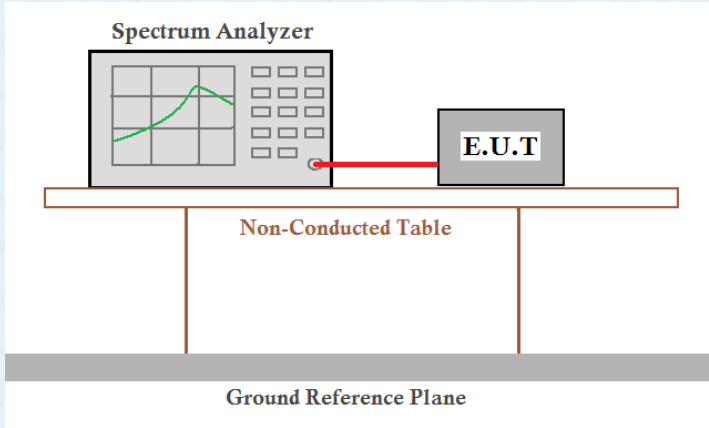
Test CH	Peak Output Power (dBm)						Limit(dBm)	Result
	802.11a	802.11n (HT20)	802.11ac (HT20)	802.11n (HT40)	802.11ac (HT40)	802.11ac (HT80)		
Lowest	6.81	6.75	6.70	6.99	7.01	7.53	30.00	Pass
Middle	7.47	7.40	7.37	--	--			
Highest	5.80	5.70	5.74	7.32	7.28			

ANT1+ ANT2:

802.11n(HT20) mode						
CH No.	Frequency (MHz)	Output Power (dBm) ANT1	Output Power (dBm) ANT2	MIMO Output Power (dBm)	Limit (dBm)	Result
36	5180	9.05	6.75	11.06	30.0	Pass
40	5200	9.65	7.4	11.68	30.0	Pass
48	5240	8.72	5.7	10.48	30.0	Pass
802.11ac(HT20) mode						
CH No.	Frequency (MHz)	Output Power (dBm) ANT1	Output Power (dBm) ANT2	MIMO Output Power (dBm)	Limit (dBm)	Result
36	5180	9.03	6.7	11.03	30.0	Pass
40	5200	9.51	7.37	11.58	30.0	Pass
48	5240	8.66	5.74	10.45	30.0	Pass
802.11n(HT40) mode						
CH No.	Frequency (MHz)	Output Power (dBm) ANT1	Output Power (dBm) ANT2	MIMO Output Power (dBm)	Limit (dBm)	Result
38	5190	9.14	6.99	11.21	30.0	Pass
46	5230	9.59	7.32	11.61	30.0	Pass
802.11 ac(HT40) mode						
CH No.	Frequency (MHz)	Output Power (dBm) ANT1	Output Power (dBm) ANT2	MIMO Output Power (dBm)	Limit (dBm)	Result
38	5190	9.19	7.01	11.25	30.0	Pass
46	5230	9.63	7.28	11.62	30.0	Pass
802.11 ac(HT80)						
CH No.	Frequency (MHz)	Output Power (dBm) ANT1	Output Power (dBm) ANT2	MIMO Output Power (dBm)	Limit (dBm)	Result
42	5210	9.81	7.53	11.83	30.0	Pass

Remark: "---"is not applicable

7.4 Channel Bandwidth

Test Requirement:	FCC Part15 E Section 15.407(e)
Test Method:	ANSI C63.10:2013 and KDB 789033 D02 General U-NII Test Procedures New Rules v02r01
Limit:	>500KHz
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

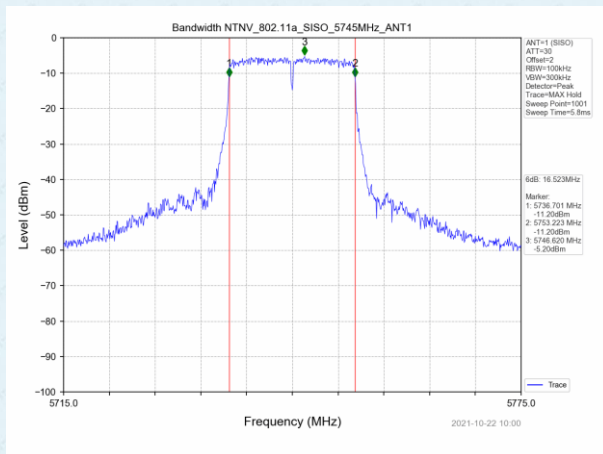
ANT1:

Test CH	Channel Bandwidth (MHz)						Limit (KHz)	Result
	802.11a	802.11n (HT20)	802.11ac (HT20)	802.11n (HT40)	802.11ac (HT40)	802.11ac (HT80)		
Lowest	16.523	17.720	17.719	36.549	36.505	74.008	>500	Pass
Middle	16.520	17.729	17.751	--	--			
Highest	16.538	17.725	17.715	36.460	36.472			

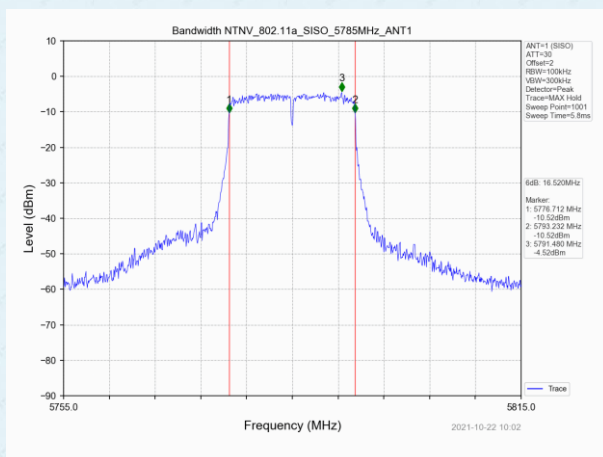
Remark: “---“is not applicable

Test plot as follows:

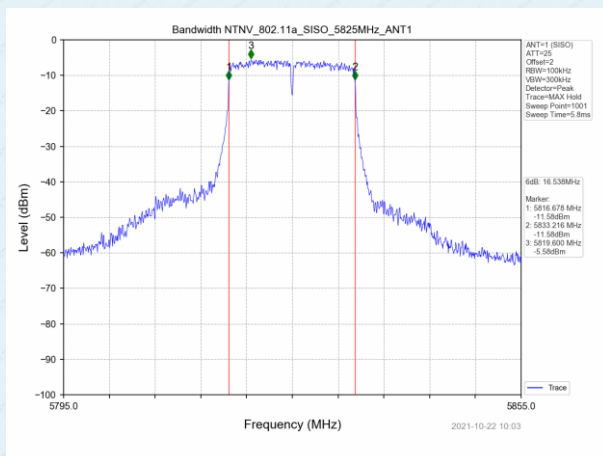
Test mode: 802.11a



Lowest channel

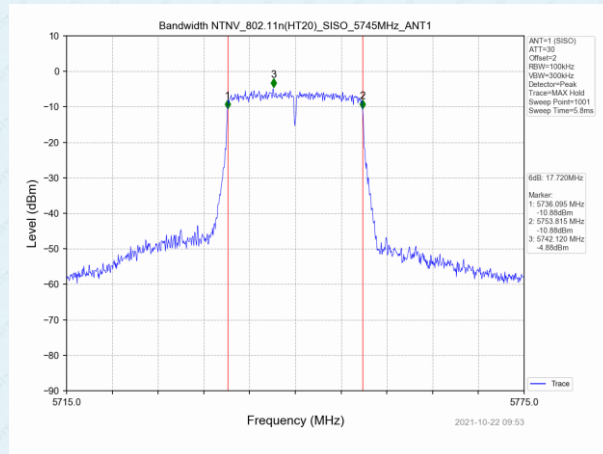


Middle channel

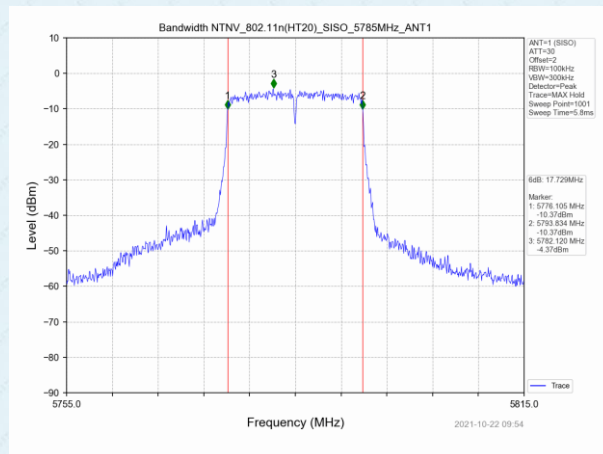


Highest channel

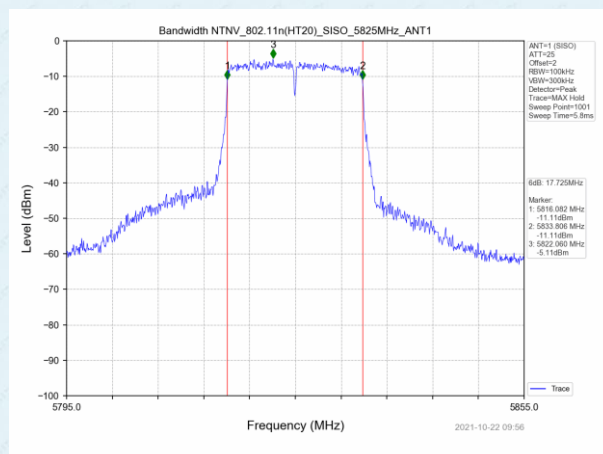
Test mode: 802.11n(HT20)



Lowest channel

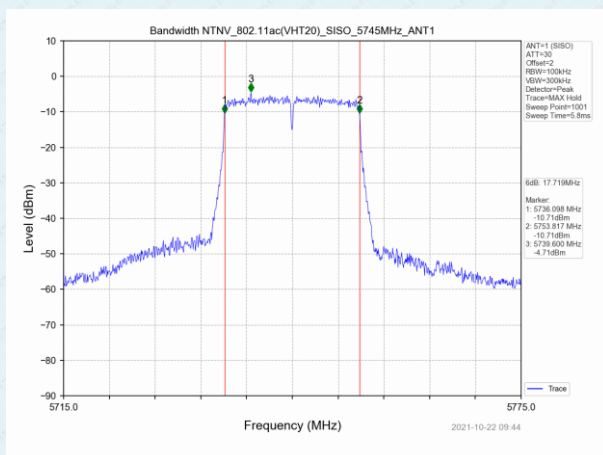


Middle channel

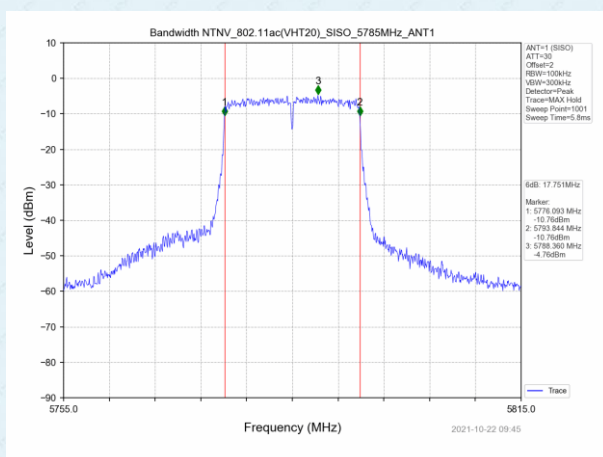


Highest channel

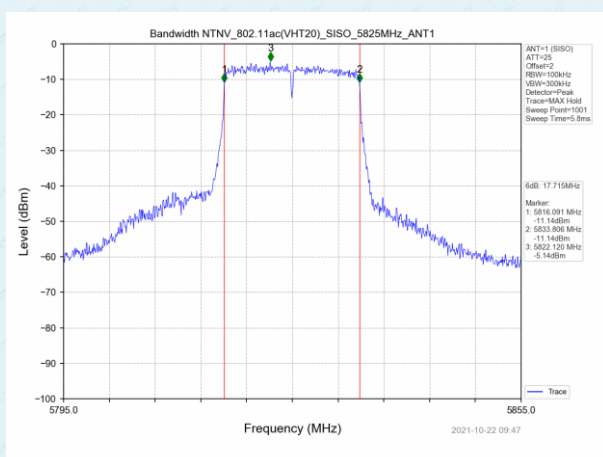
Test mode: 802.11ac(HT20)



Lowest channel

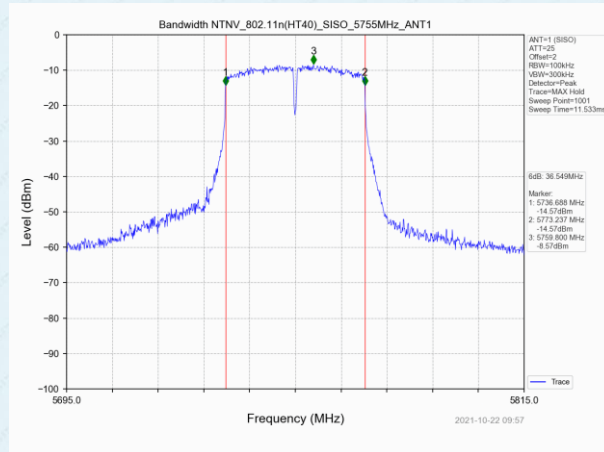


Middle channel

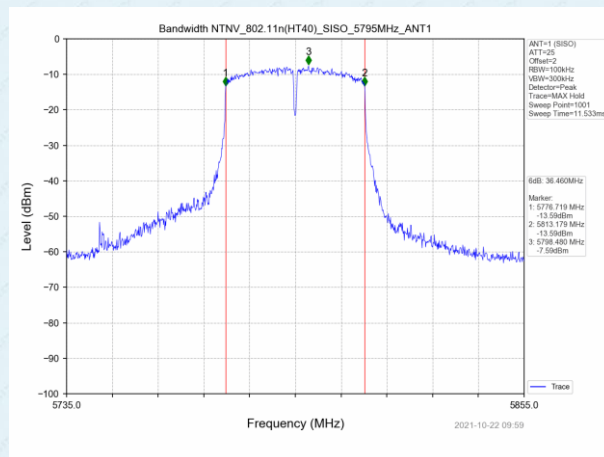


Highest channel

Test mode: 802.11n(HT40)

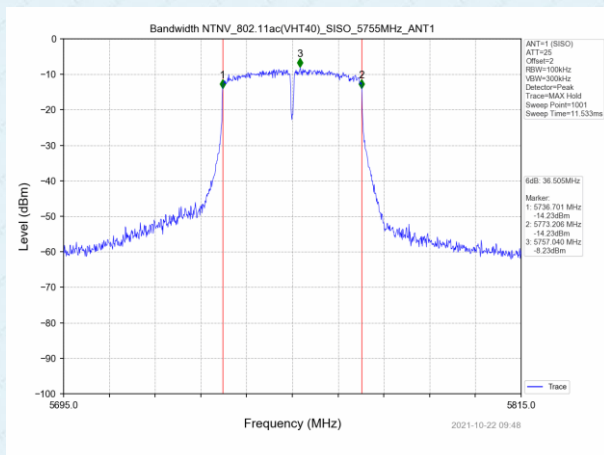


Lowest channel

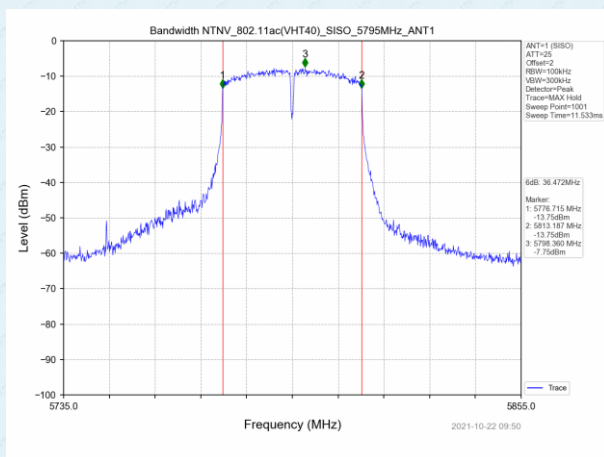


Highest channel

Test mode: 802.11ac(HT40)

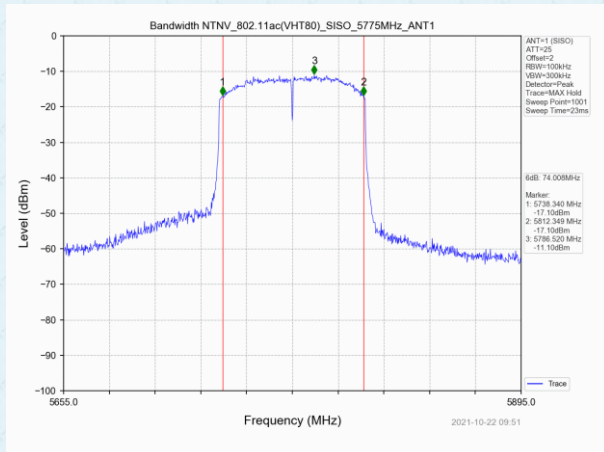


Lowest channel



Highest channel

Test mode: 802.11ac(HT80)



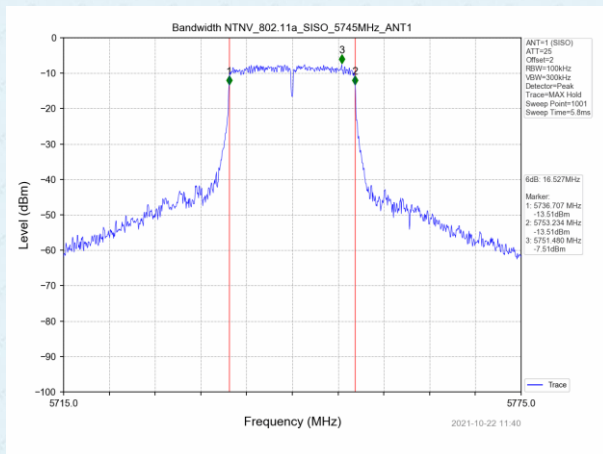
ANT2:

Test CH	Channel Bandwidth (MHz)						Limit (KHz)	Result
	802.11a	802.11n (HT20)	802.11ac (HT20)	802.11n (HT40)	802.11ac (HT40)	802.11ac (HT80)		
Lowest	16.527	17.724	17.731	36.491	36.499	72.686	>500	Pass
Middle	16.514	17.702	17.776	--	--			
Highest	16.519	17.713	17.740	36.408	36.477			

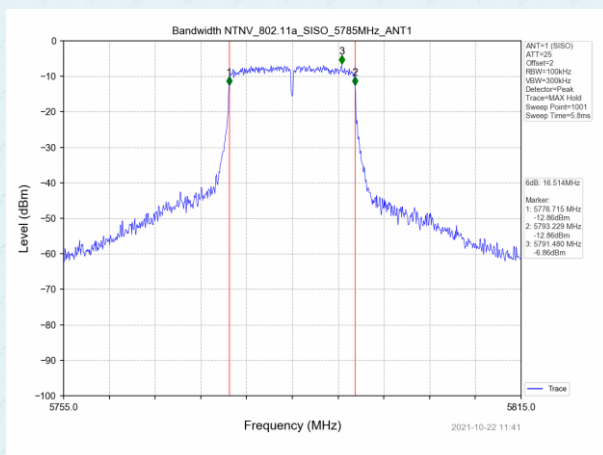
Remark: "---" is not applicable

Test plot as follows:

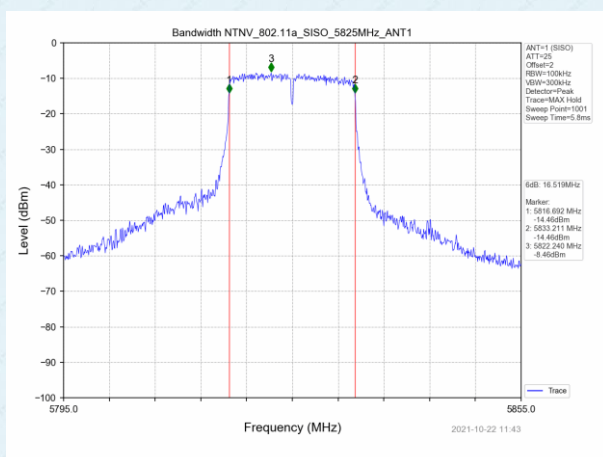
Test mode: 802.11a



Lowest channel

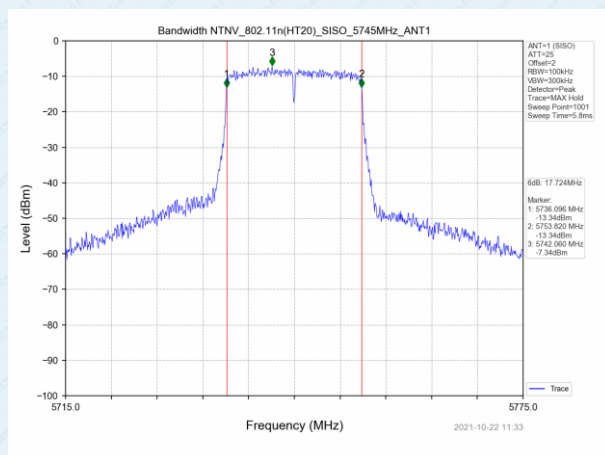


Middle channel

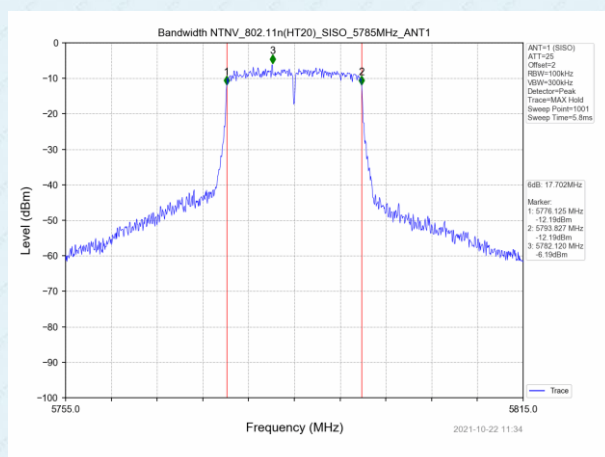


Highest channel

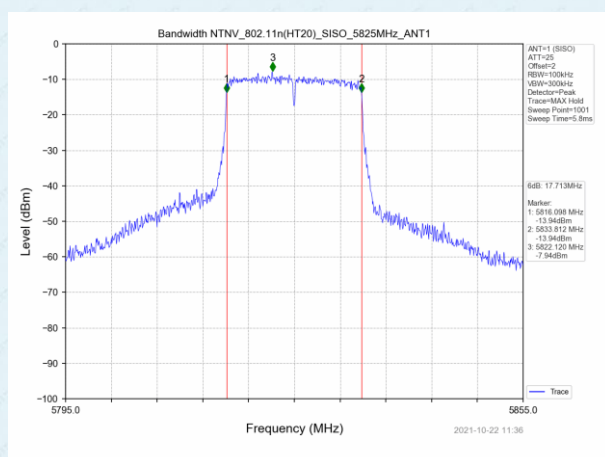
Test mode: 802.11n(HT20)



Lowest channel

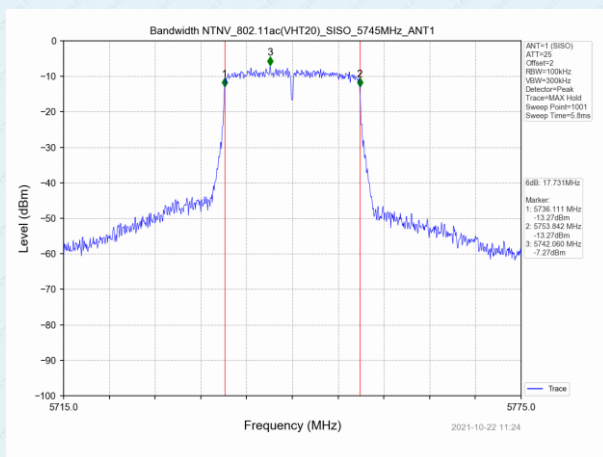


Middle channel

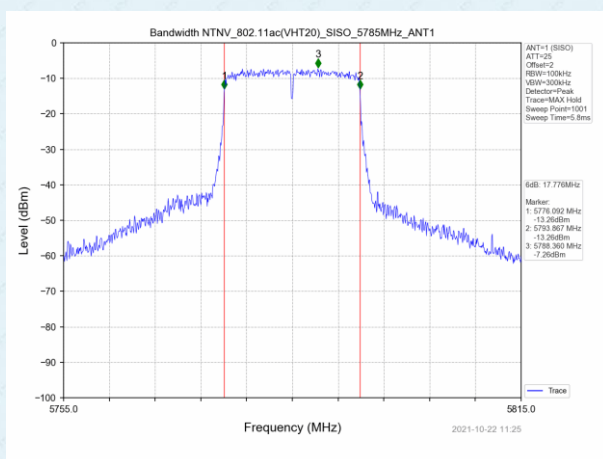


Highest channel

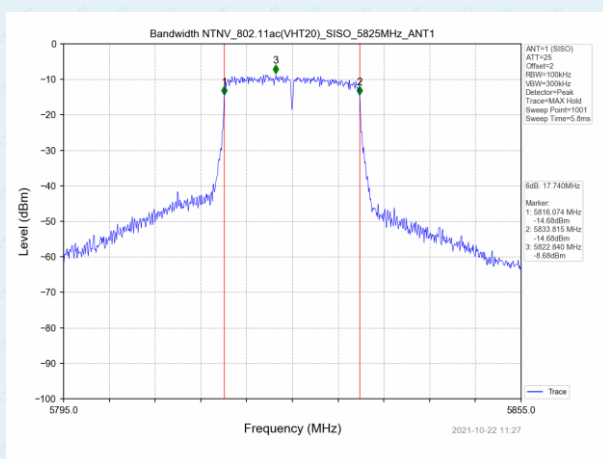
Test mode: 802.11ac(HT20)



Lowest channel

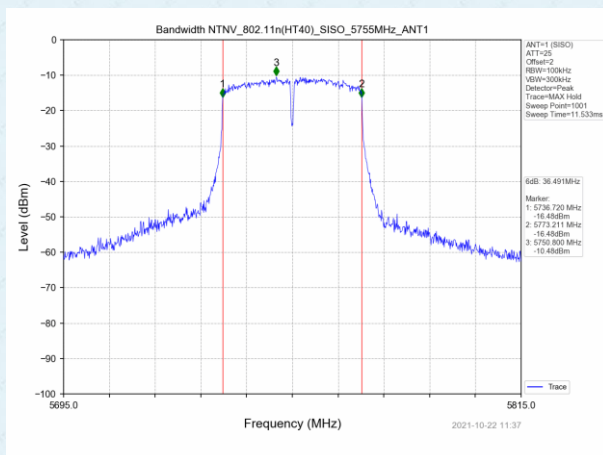


Middle channel

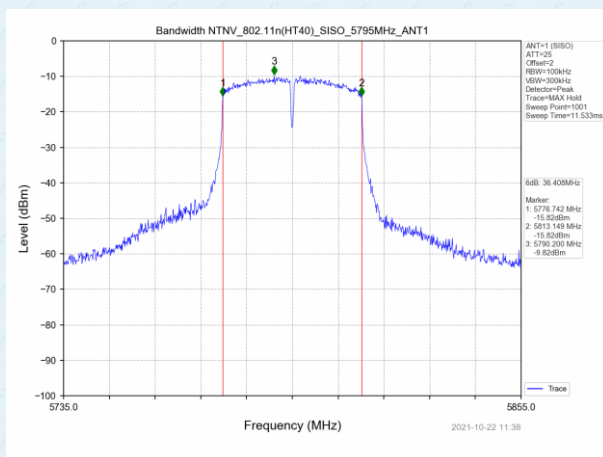


Highest channel

Test mode: 802.11n(HT40)

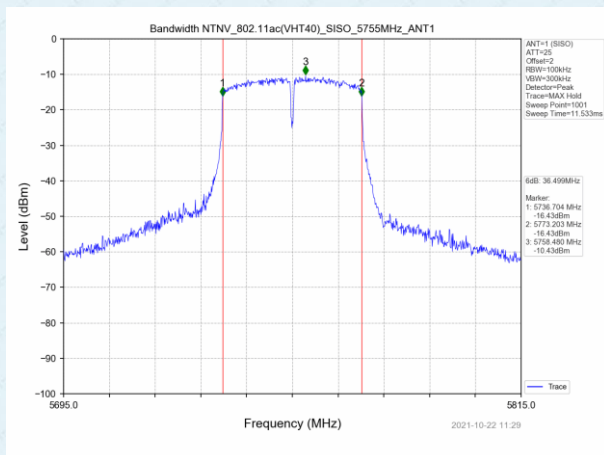


Lowest channel

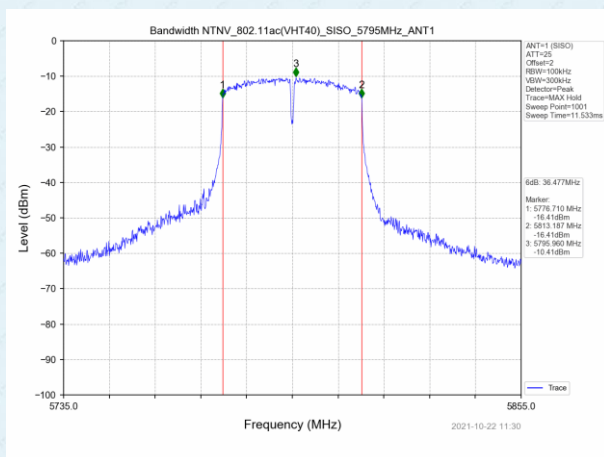


Highest channel

Test mode: 802.11ac(HT40)

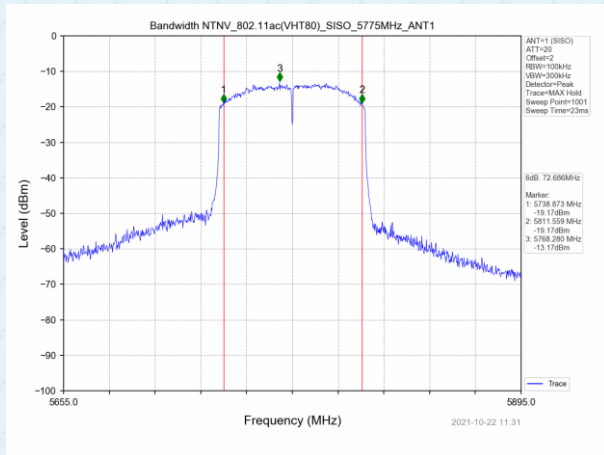


Lowest channel

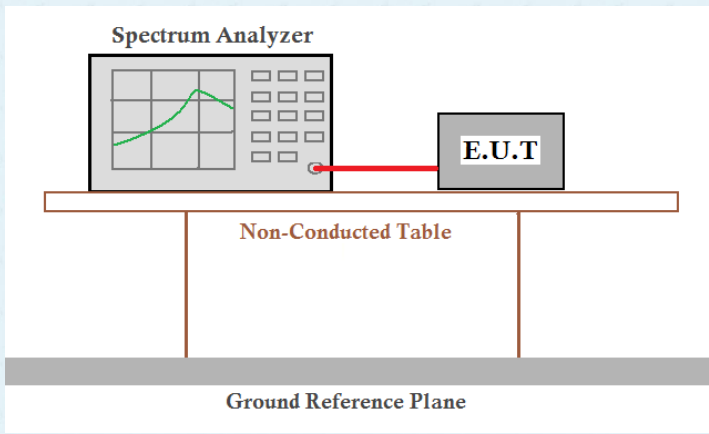


Highest channel

Test mode: 802.11ac(HT80)



7.5 Power Spectral Density

Test Requirement:	FCC Part15 E Section 15.407(a)(3)
Test Method:	ANSI C63.10:2013 and KDB 789033 D02 General U-NII Test Procedures New Rules v02r01
Limit:	30dBm/500kHz
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

ANT1:

Test CH	Power Spectral Density (dBm)						Limit (dBm/500k Hz)	Result
	802.11a	802.11n (HT20)	802.11ac (HT20)	802.11n (HT40)	802.11ac (HT40)	802.11ac (HT80)		
Lowest	-5.05	-5.16	-5.32	-7.95	-7.77	-10.89	30.00	Pass
Middle	-4.47	-4.71	-4.57	--	--			
Highest	-5.02	-5.52	-5.58	-7.41	-7.27			

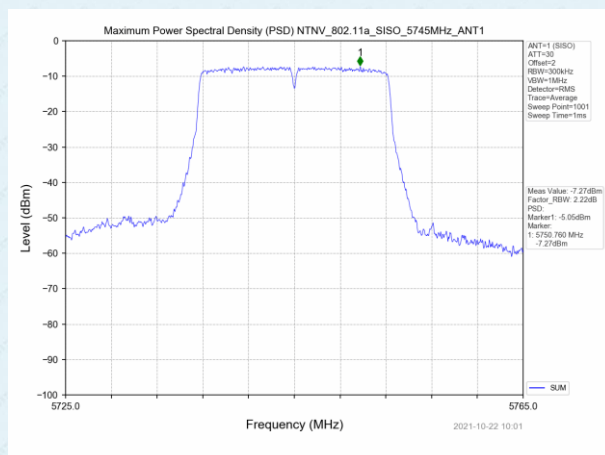
Remark: “---“is not applicable

Note: Report conducted PSD = measured conducted PSD + Duty Cycle factor + RBW factor;

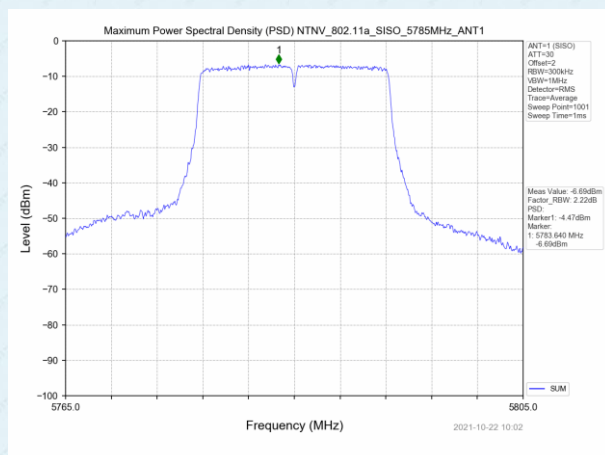
RBW factor = $10 \log (500 \text{ KHz} / 300 \text{ KHz}) = 2.216 \text{ dB}$;

Test plot as follows:

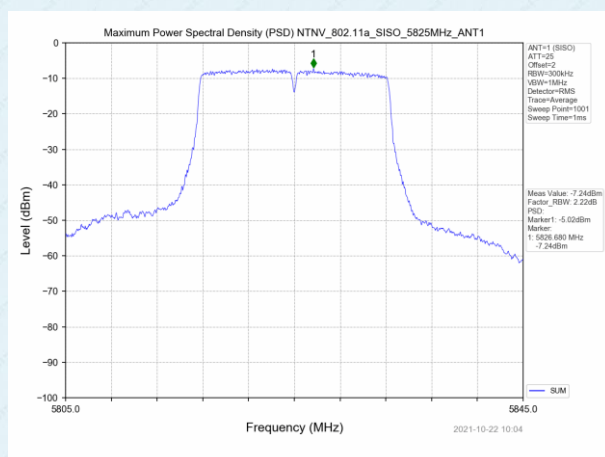
Test mode: 802.11a



Lowest channel

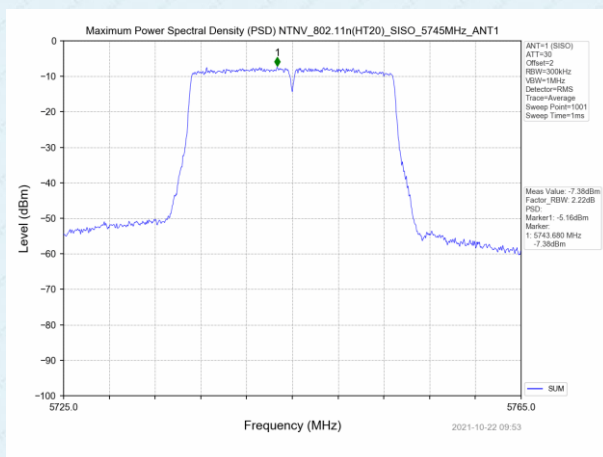


Middle channel

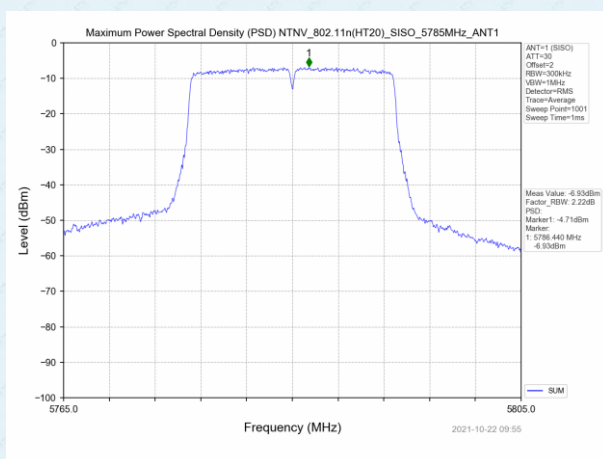


Highest channel

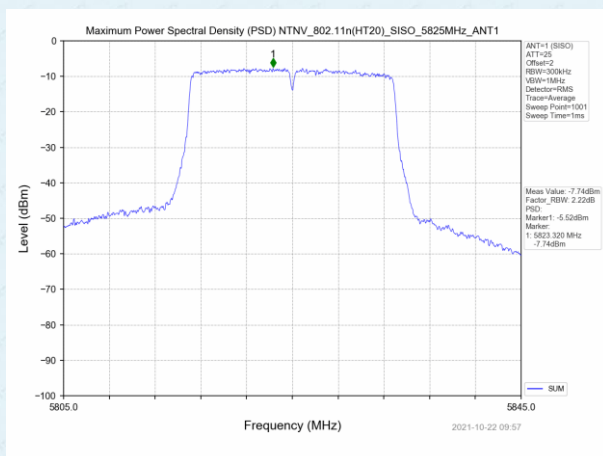
Test mode: 802.11n(HT20)



Lowest channel

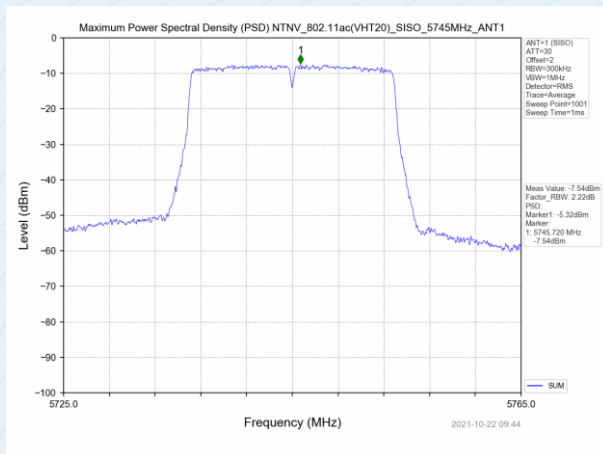


Middle channel

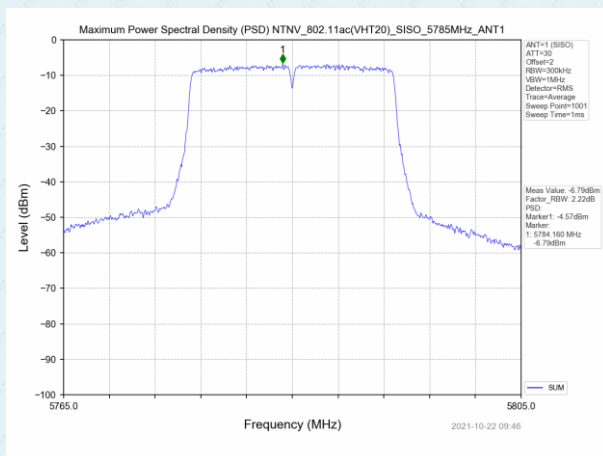


Highest channel

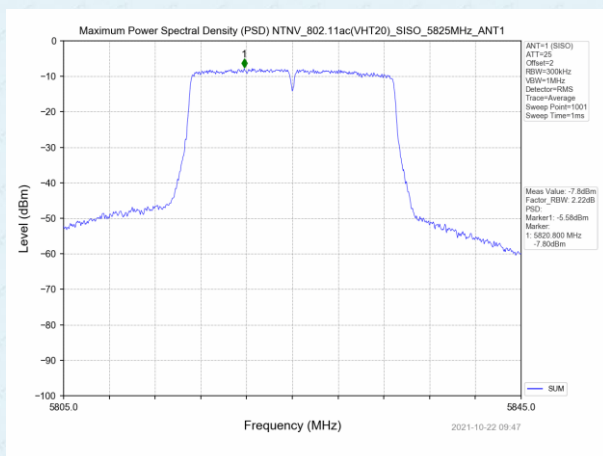
Test mode: 802.11ac(HT20)



Lowest channel

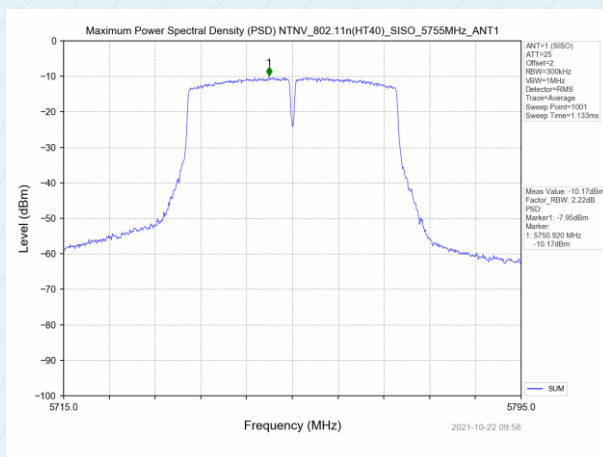


Middle channel

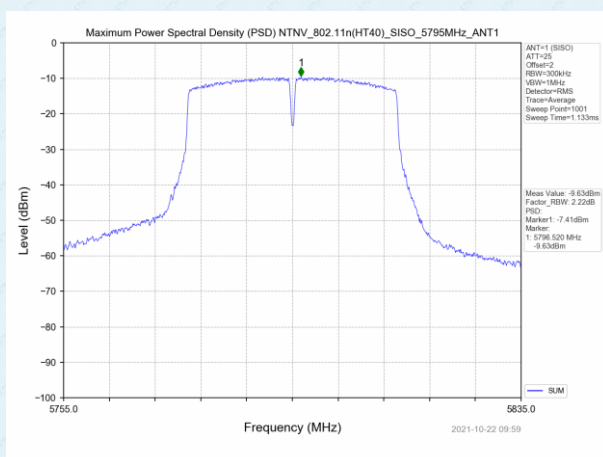


Highest channel

Test mode: 802.11n(HT40)

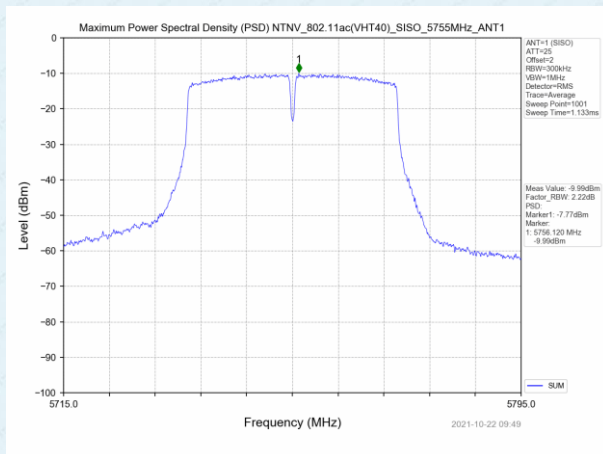


Lowest channel

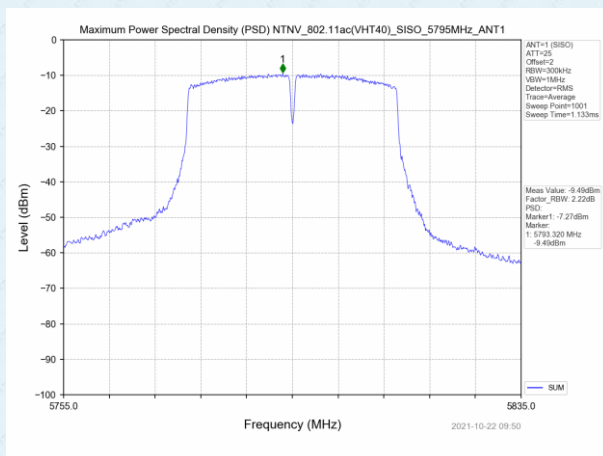


Highest channel

Test mode: 802.11ac(HT40)

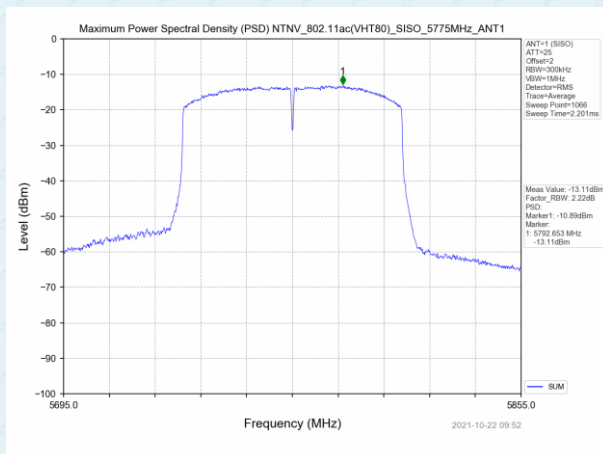


Lowest channel



Highest channel

Test mode: 802.11ac(HT80)



Middle channel

ANT2:

Test CH	Power Spectral Density (dBm)						Limit (dBm/500k Hz)	Result
	802.11a	802.11n (HT20)	802.11ac (HT20)	802.11n (HT40)	802.11ac (HT40)	802.11ac (HT80)		
Lowest	-7.12	-7.57	-7.45	-10.05	-10.06	-12.96	30.00	Pass
Middle	-6.57	-6.73	-6.91	--	--			
Highest	-8.26	-8.29	-8.55	-9.53	-9.46			

Remark: "---" is not applicable

Note: Report conducted PSD = measured conducted PSD + Duty Cycle factor + RBW factor;

RBW factor = $10 \log (500 \text{ KHz} / 300 \text{ KHz}) = 2.216 \text{ dB}$;

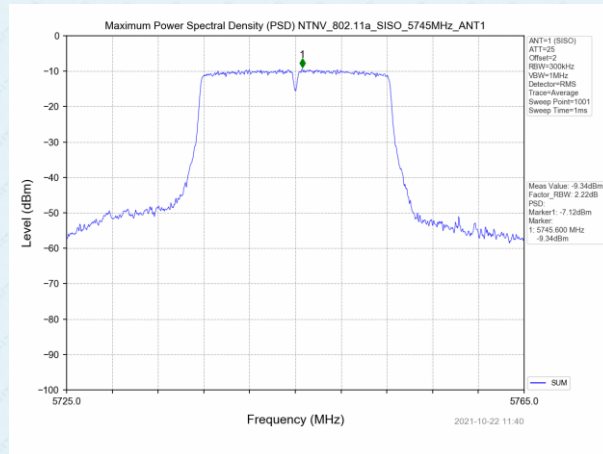
ANT1+ANT2:

802.11n(HT20) mode						
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz) ANT1	Measured PSD (dBm/MHz) ANT2	MIMO Measured PSD (dBm/MHz)	Limit (dBm)	Result
36	5180	-5.16	-7.57	-3.19	30.0	Pass
40	5200	-4.71	-6.73	-2.59	30.0	Pass
48	5240	-5.52	-8.29	-3.68	30.0	Pass
802.11ac(HT20) mode						
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz) ANT1	Measured PSD (dBm/MHz) ANT2	MIMO Measured PSD (dBm/MHz)	Limit (dBm)	Result
36	5180	-5.32	-7.45	-3.25	30.0	Pass
40	5200	-4.57	-6.91	-2.57	30.0	Pass
48	5240	-5.58	-8.55	-3.81	30.0	Pass
802.11n(HT40) mode						
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz) ANT1	Measured PSD (dBm/MHz) ANT2	MIMO Measured PSD (dBm/MHz)	Limit (dBm)	Result
38	5190	-7.95	-10.05	-5.86	30.0	Pass
46	5230	-7.41	-9.53	-5.33	30.0	Pass
802.11 ac(HT40) mode						
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz) ANT1	Measured PSD (dBm/MHz) ANT2	MIMO Measured PSD (dBm/MHz)	Limit (dBm)	Result
38	5190	-7.77	-10.06	-5.76	30.0	Pass
46	5230	-7.27	-9.46	-5.22	30.0	Pass
802.11 ac(HT80)						

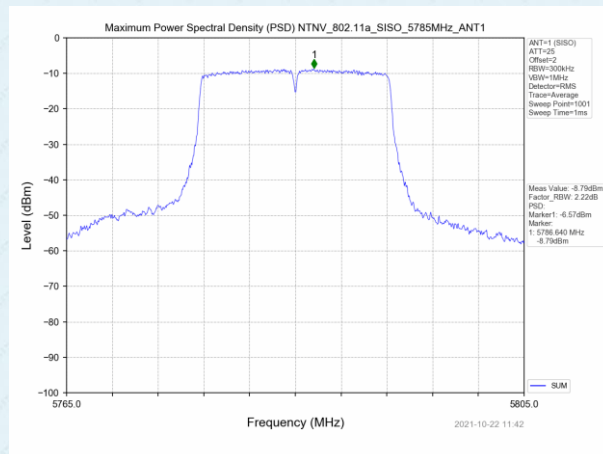
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz) ANT1	Measured PSD (dBm/MHz) ANT2	MIMO Measured PSD (dBm/MHz)	Limit (dBm)	Result
42	5210	-10.89	-12.96	-8.79	30.0	Pass

Test plot as follows:

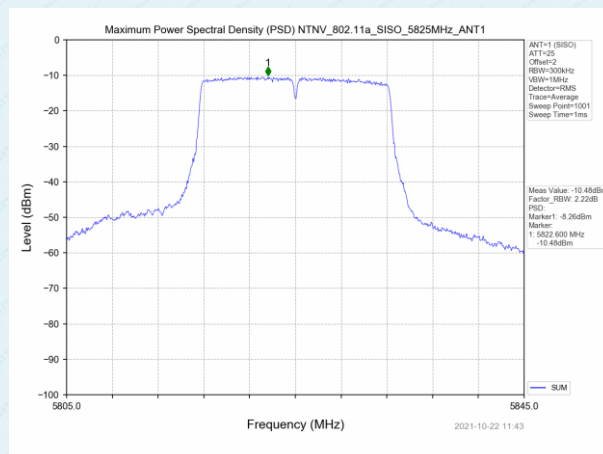
Test mode: 802.11a



Lowest channel

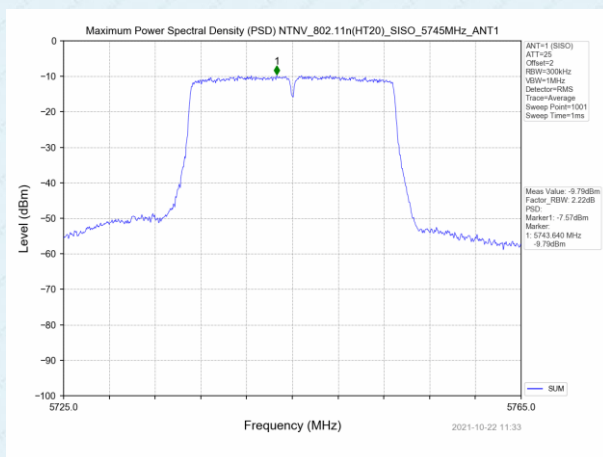


Middle channel

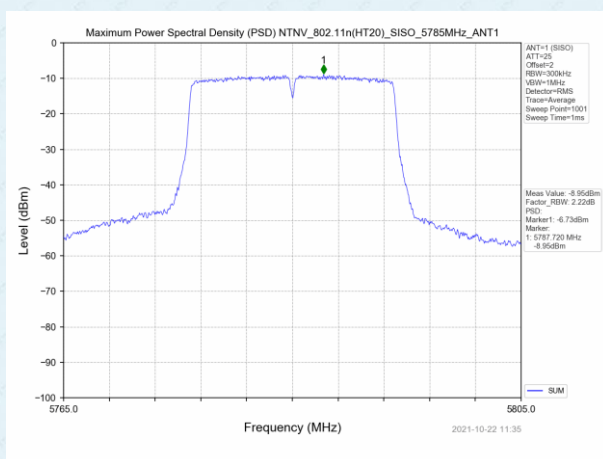


Highest channel

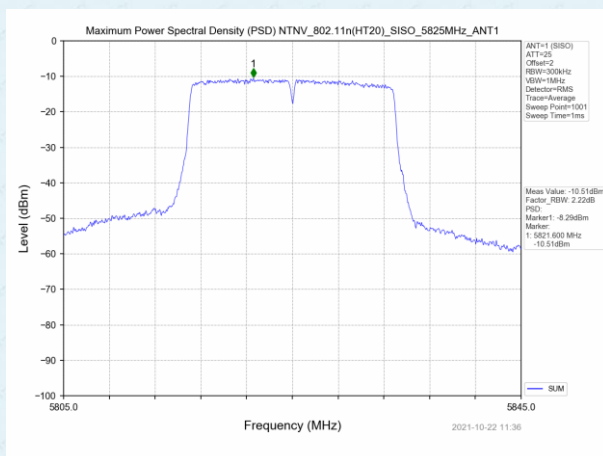
Test mode: 802.11n(HT20)



Lowest channel

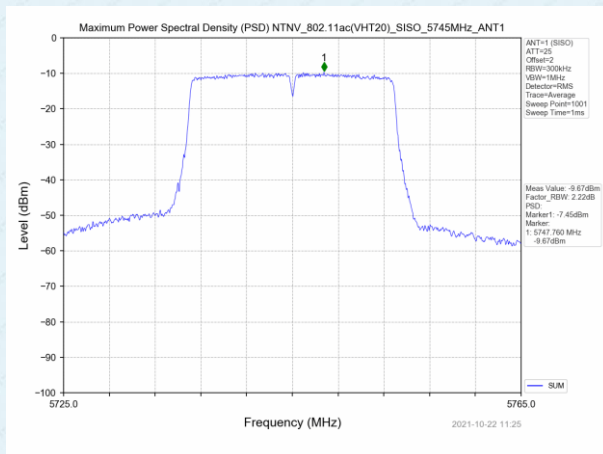


Middle channel

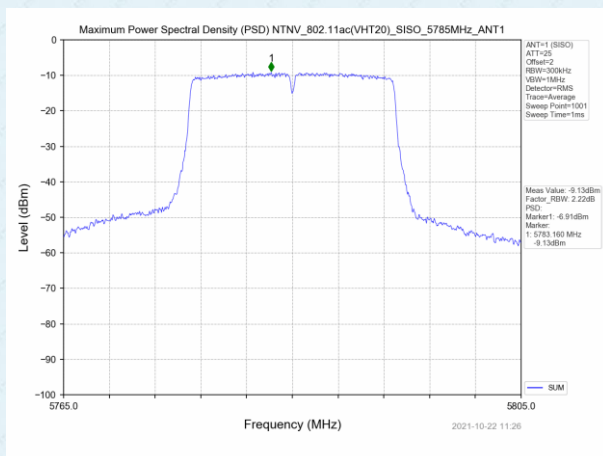


Highest channel

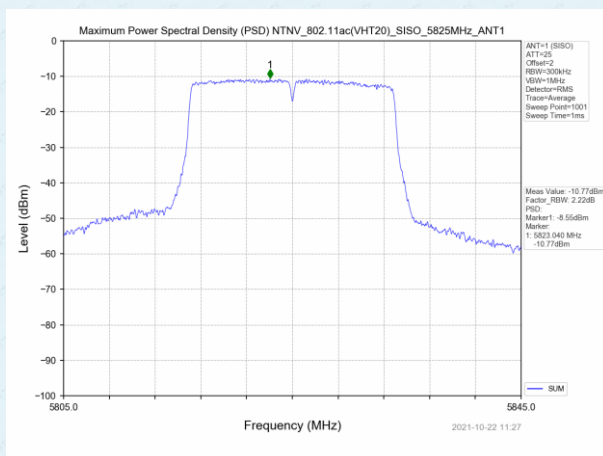
Test mode: 802.11ac(HT20)



Lowest channel

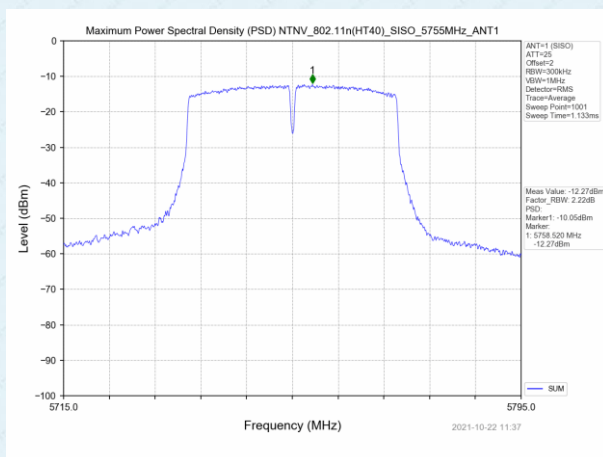


Middle channel

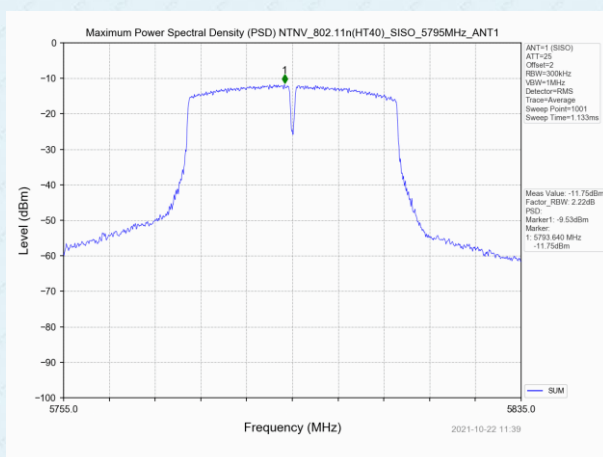


Highest channel

Test mode: 802.11n(HT40)

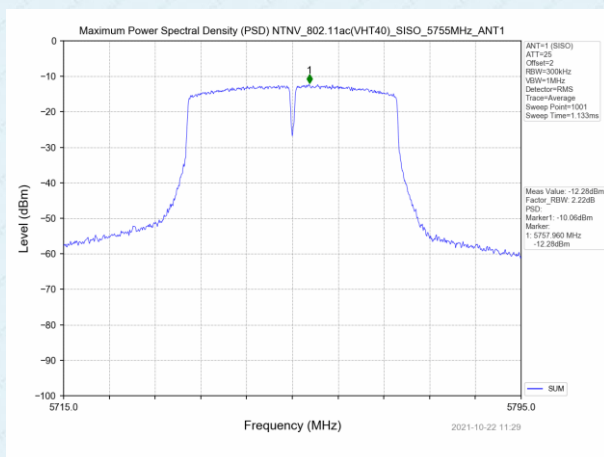


Lowest channel

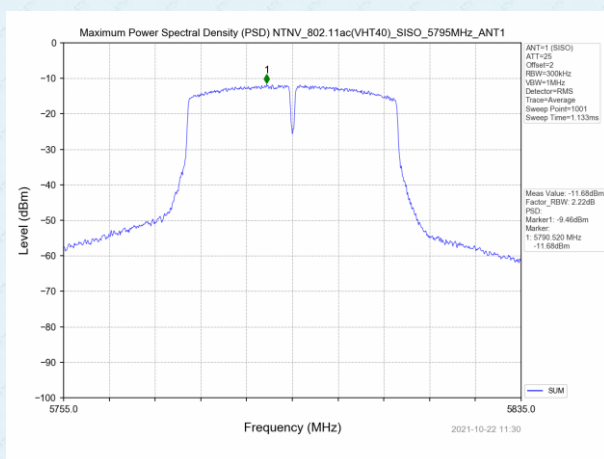


Highest channel

Test mode: 802.11ac(HT40)

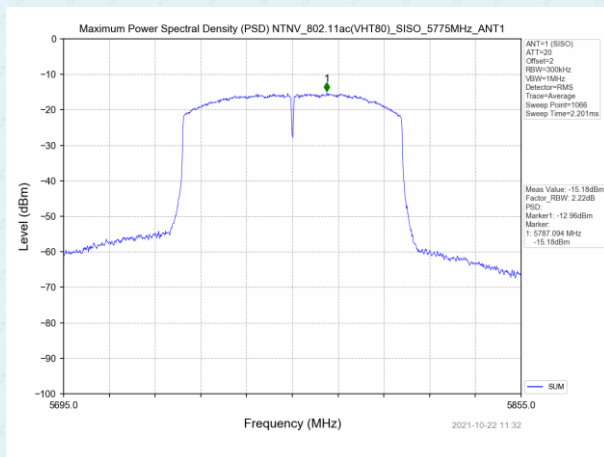


Lowest channel



Highest channel

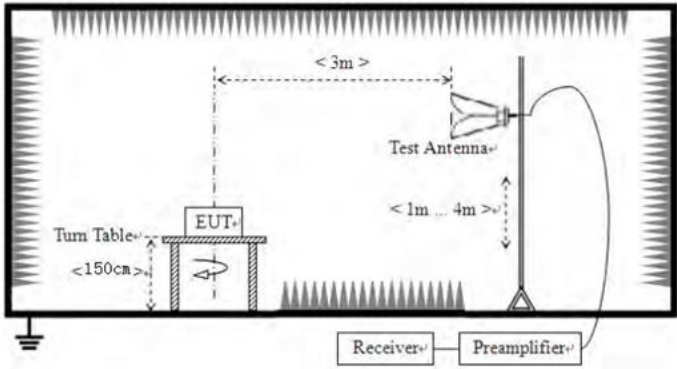
Test mode: 802.11ac(HT80)



Middle channel

7.6 Band edge

7.6.1 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and 15.205				
Test Method:	ANSI C63.10: 2013				
Test Frequency Range:	9kHz to 40GHz, only worse case is reported				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	Above 1GHz	Peak	1MHz	3MHz	Peak
		RMS	1MHz	3MHz	RMS
Limit:	All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.				
Test setup:					
Test Procedure:	1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. 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. 4. 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 and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. 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. 7. The radiation measurements are performed in X, Y, Z axis positioning.				

	And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Remarks:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *The pre-test were performed on lowest, middle and highest frequencies, only the worst case's (lowest and highest frequencies) data was showed.*
4. *According to KDB 789033 D02v02r01 section G) 1) d),for measurements above 1000 MHz @3m distance, the limit of field strength is computed as follows:*

$$E[\text{dBuV/m}] = \text{EIRP}[\text{dBm}] + 95.2;$$

$$E[\text{dBuV/m}] = -27 + 95.2 = 68.2\text{dBuV/m}.$$

$$E[\text{dBuV/m}] = 10 + 95.2 = 105.2\text{dBuV/m}.$$

$$E[\text{dBuV/m}] = 15.6 + 95.2 = 110.8\text{dBuV/m}.$$

$$E[\text{dBuV/m}] = 27 + 95.2 = 122.2\text{dBuV/m}$$

Measurement Data:

802.11ac(HT20)					PK			
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
5650	51.59	31.9	5.4	35.98	52.91	68.2	-15.29	Horizontal
5850	52.28	31.96	5.98	35.68	54.54	68.2	-13.66	Horizontal
5650	49.22	31.9	5.4	35.98	50.54	68.2	-17.66	Vertical
5850	48.19	31.96	5.98	35.68	50.45	68.2	-17.75	Vertical

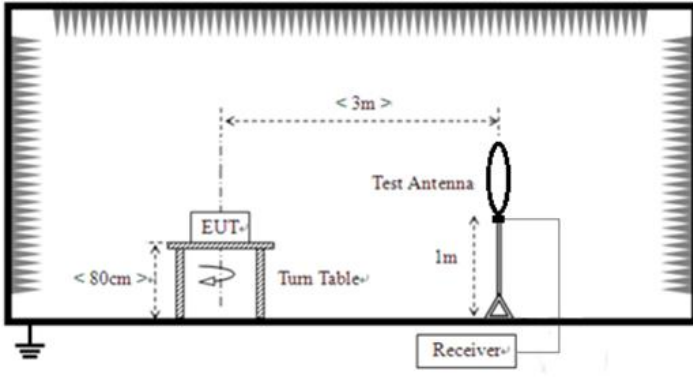
802.11ac(HT20)					AV			
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
5650	33.79	31.9	5.4	35.98	35.11	54	-18.89	Horizontal
5850	34.02	31.96	5.98	35.68	36.28	54	-17.72	Horizontal
5650	33.91	31.9	5.4	35.98	35.23	54	-18.77	Vertical
5850	33.89	31.96	5.98	35.68	36.15	54	-17.85	Vertical

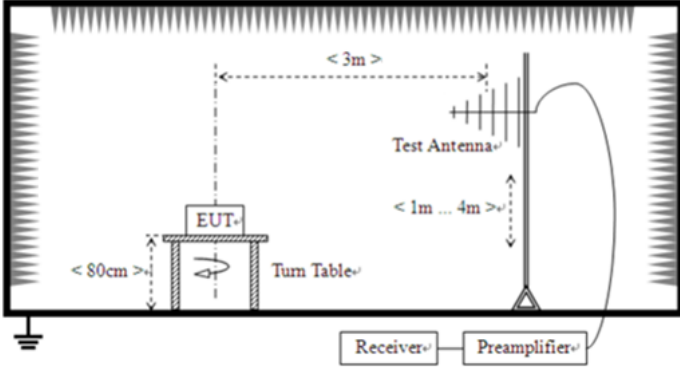
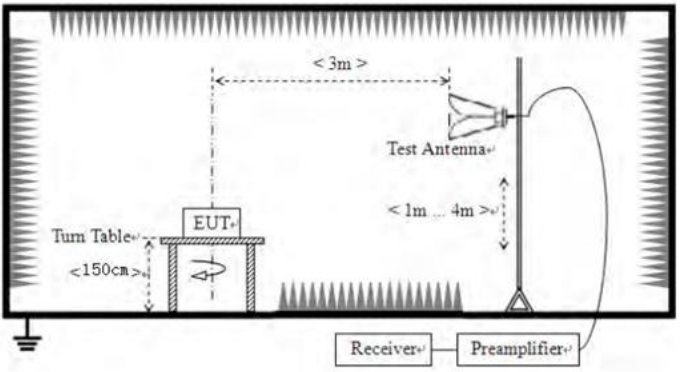
Notes:

1. Level = Read Level + Antenna Factor+ Cable loss- Preamp Factor.
2. The test trace is same as the ambient noise (the test frequency range: 18GHz~40GHz), therefore no data appear in the report.
3. This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.
4. All modes were tested, only recorded the worst case data in the test report.

7.7 Spurious Emission

7.7.1 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209, Part 15E Section 15.407(b)(4)				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	9kHz to 40GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	9kHz-150KHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value
	150kHz-30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		AV	1MHz	3MHz	Average Value
Limit:	Frequency		Limit (uV/m)	Value	Measurement Distance
	0.009MHz-0.490MHz		2400/F(KHz)	QP	300m
	0.490MHz-1.705MHz		24000/F(KHz)	QP	300m
	1.705MHz-30MHz		30	QP	30m
	30MHz-88MHz		100	QP	3m
	88MHz-216MHz		150	QP	
	216MHz-960MHz		200	QP	
	960MHz-1GHz		500	QP	
	Frequency		Limit (dBm/MHz)	Remark	
	Above 1GHz		-27.0	Peak Value	
Test setup:	For radiated emissions from 9kHz to 30MHz				
					
	For radiated emissions from 30MHz to1GHz				

	 For radiated emissions above 1GHz 
Test Procedure:	1. The EUT was placed on the top of a rotating table (0.8m for below 1GHz and 1.5 meters for above 1GHz) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. 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. 4. 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 and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. 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. 7. The radiation measurements are performed in X, Y, Z axis positioning.

	And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.					
Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	AC 120V, 60Hz					
Test results:	Pass					

Remarks:

1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.
2. Antenna 1 and antenna 2 have been tested to show only the worst antenna 1 test data.

Measurement Data:

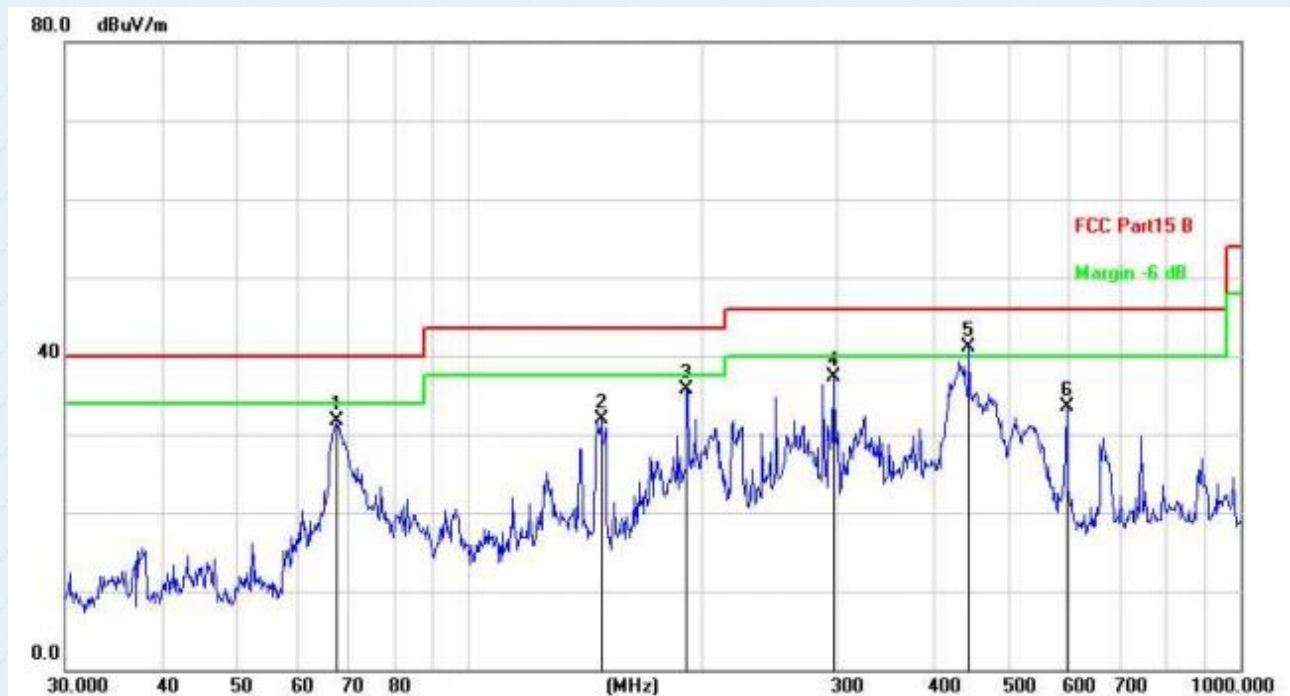
9 kHz ~ 30 MHz

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

Below 1GHz

Pre-scan all test modes, found worst case at 802.11ac(HT80), and so only show the test result of 802.11ac(HT80)

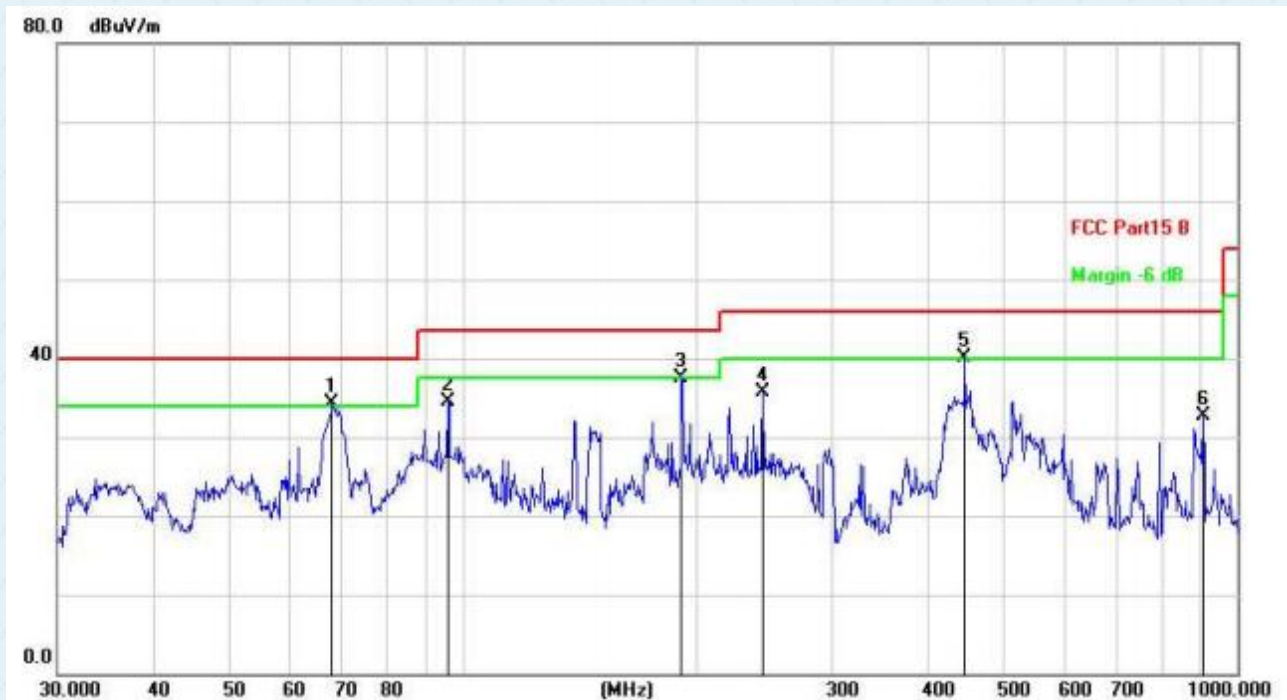
Horizontal:



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1	67.4381	51.36	-19.63	31.73	40.00	-8.27	QP
2	148.4410	49.57	-17.74	31.83	43.50	-11.67	QP
3	191.7450	55.60	-19.94	35.66	43.50	-7.84	QP
4	297.2241	55.70	-18.38	37.32	46.00	-8.68	QP
5 *	444.8514	57.31	-16.15	41.16	46.00	-4.84	QP
6	595.1326	46.79	-13.34	33.45	46.00	-12.55	QP

Final Level = Receiver Read level + Correct Factor

Vertical:



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1	*	67.9128	53.89	-19.68	34.21	40.00	-5.79	QP
2		95.7622	55.40	-20.85	34.55	43.50	-8.95	QP
3		191.7450	57.43	-19.94	37.49	43.50	-6.01	QP
4		244.2321	55.16	-19.51	35.65	46.00	-10.35	QP
5	!	444.8514	56.28	-16.15	40.13	46.00	-5.87	QP
6		903.3093	42.15	-9.54	32.61	46.00	-13.39	QP

Final Level =Receiver Read level + Correct Factor

Above 1-40GHz:

Pre-scan all test modes of antenna 1 and antenna 2, found worst case at 802.11ac(HT20), and so only show the test result of 802.11ac(HT20).

Above 1GHz:

802.11ac(HT20) 5745MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
15090	32.01	39.71	14.62	32.65	53.69	68.2	-14.51	Vertical
17235	31.25	38.62	17.66	34.46	53.07	68.2	-15.13	Vertical
15090	31.06	39.71	14.62	32.65	52.74	68.2	-15.46	Horizontal
17235	30.88	38.62	17.66	34.46	52.7	68.2	-15.5	Horizontal

802.11ac(HT20) 5755MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
11510	43.59	39.46	8.12	33.85	57.32	68.2	-10.88	Vertical
17265	42.88	38.33	9.58	31.51	59.28	68.2	-8.92	Vertical
11510	42.31	39.46	8.12	33.85	56.04	68.2	-12.16	Horizontal
17265	41.38	38.33	9.58	31.51	57.78	68.2	-10.42	Horizontal

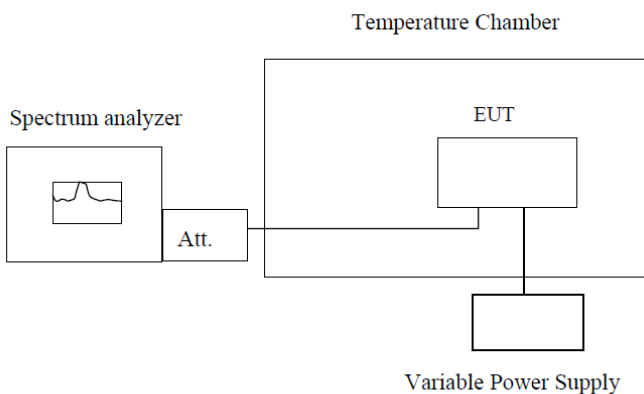
802.11ac(HT20) 5775MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
11550	44.65	39.67	8.19	33.74	58.77	68.2	-9.43	Vertical
17325	43.28	37.69	9.5	31.43	59.04	68.2	-9.16	Vertical
11550	42.22	39.67	8.19	33.74	56.34	68.2	-11.86	Horizontal
17325	41.09	37.69	9.5	31.43	56.85	68.2	-11.35	Horizontal

Notes:

1. Level = Read Level + Antenna Factor+ Cable loss- Preamplifier Factor.
2. The test trace is same as the ambient noise (the test frequency range: 18GHz~40GHz), therefore no data appear in the report.
3. This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

7.8 Frequency stability

Test Requirement:	FCC Part15 C Section 15.407(g)
Test Method:	ANSI C63.10:2013, FCC Part 2.1055
Limit:	Manufactures 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
Test Procedure:	The EUT was setup to ANSI C63.4, 2003; tested to 2.1055 for compliance to FCC Part 15.407(g) requirements.
Test setup:	 Note : Measurement setup for testing on Antenna connector
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Remark:

Measured all conditions and recorded worst case.

Measurement data:

IEEE 802.11a Mode / 5745 – 5825 MHz / 5745 MHz

Enviroment Temperature (Degree)	Voltage (V)	Measured Frequency (MHz)	Limit Range (MHz)	Test Results
20	20.9	5744.964576	5725 – 5850	PASS
20	17.1	5744.964047	5725 – 5850	PASS
50	19.0	5744.926486	5725 – 5850	PASS
40	19.0	5744.987663	5725 – 5850	PASS
30	19.0	5744.934372	5725 – 5850	PASS
20	19.0	5744.976471	5725 – 5850	PASS
10	19.0	5744.944765	5725 – 5850	PASS
0	19.0	5744.966916	5725 – 5850	PASS
-10	19.0	5744.974312	5725 – 5850	PASS
-20	19.0	5744.933575	5725 – 5850	PASS
-30	19.0	5744.994782	5725 – 5850	PASS

IEEE 802.11a Mode / 5745 – 5825 MHz / 5825 MHz

Enviroment Temperature (Degree)	Voltage (V)	Measured Frequency (MHz)	Limit Range (MHz)	Test Results
20	20.9	5824.932794	5725 – 5850	PASS
20	17.1	5824.914014	5725 – 5850	PASS
50	19.0	5824.984101	5725 – 5850	PASS
40	19.0	5824.945475	5725 – 5850	PASS
30	19.0	5824.964403	5725 – 5850	PASS
20	19.0	5824.948001	5725 – 5850	PASS
10	19.0	5824.968467	5725 – 5850	PASS
0	19.0	5824.958169	5725 – 5850	PASS
-10	19.0	5824.942103	5725 – 5850	PASS
-20	19.0	5824.939561	5725 – 5850	PASS
-30	19.0	5824.948633	5725 – 5850	PASS

8 Test Setup Photo

Reference to the **appendix I** for details.

9 EUT Constructional Details

Reference to the **appendix II** for details.

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