

TEST REPORT

Reference No. : WTF24D09208363W004
FCC ID..... : 2BLB5-WHL001
Applicant..... : Shanghai Woohuloo Technology Co., Ltd.
Address : Room 3327, No. 100, Lane 130, Taopu Road, Putuo District,
Shanghai, China
Manufacturer : Shanghai Woohuloo Technology Co., Ltd.
Address : Room 3327, No. 100, Lane 130, Taopu Road, Putuo District,
Shanghai, China
Product Name : WooHuloo Smart Cat Litter Box
Model No. : WHL001
Standards..... : FCC 47CFR Part 15 Section 15.407
Date of Receipt sample..... : 2024-09-14
Date of Test..... : 2024-09-14 to 2024-10-30
Date of Issue : 2024-11-12
Test Result : Pass

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company.

The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

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3 Revision History

Test Report No.	Date of Receipt Sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTF24D09208363W004	2024-09-14	2024-09-14 to 2024-10-30	2024-11-12	Original	-	Valid

4 General Information

4.1 General Description of E.U.T.

Product:	WooHuloo Smart Cat Litter Box
Model(s):	WHL001
Model Description:	N/A
Test Sample No.:	1-1/1
Wi-Fi Specification:	5G-802.11a/n(HT20)
Hardware Version:	Main board: PC-2WHLMB1 OLED board: PC-2WHLOLED1 Weighing board: PC-2WHL CZ0 Hall board: PC-2WHLHALL1 Roller Hall board: PC-2WHLGTHALL1 BPIR board: PC-2WHLBPIR2 CPIR board: PC-2WHLCP1R1 Atomization board: PC-2WHLFOG1 KEY board: PC-2WHLKB1 Pyroelectric board: PC-2WHLTGS0
Software Version:	1.0.0

4.2 Details of E.U.T.

Operation Frequency: 802.11a/n (HT20):
U-NII-1: 5180-5240MHz,

Max. RF output power: U-NII-1: 12.92dBm

Type of Modulation: OFDM

Antenna installation: PCB Antenna

Antenna Gain: 1.97dBi

Note:

#: The antenna gain is provided by the applicant, and the applicant should be responsible for its authenticity, WALTERK lab has not verified the authenticity of its information.

Ratings: Input: DC 12V by adapter

Adapter: Model: TEKA-TD120200US
Input: 100-240V~ 50/60Hz 0.7A MAX
Output: 12.0V  2.0A

4.3 Channel List

U-NII-1 (5.15-5.25GHz)			
channel	Frequency(MHz)	channel	Frequency(MHz)
36	5180	38	5190
40	5200	42	5210
44	5220	46	5230
48	5240		

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:

For 802.11a/n/(HT20):

channel	Frequency(MHz)	channel	Frequency(MHz)
36	5180	40	5200
48	5240		

4.4 Test Mode Description

During testing, Channel and Power Controlling Software provided by the applicant was used to control the operating channel as well as the maximum output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Transmitting duty cycle is no less 98%.

The software is TermAssist and SecureCRT tool Use together.

Test Items	Mode	Data Rate	TX/RX
Radiated Emissions	802.11a (HT20)	6 Mbps	TX
	802.11n (HT20)	MCS0	TX
Duty Cycle	802.11a (HT20)	6 Mbps	TX
	802.11n (HT20)	MCS0	TX
Band Edge	802.11a (HT20)	6 Mbps	TX
	802.11n (HT20)	MCS0	TX
6dB Bandwidth	802.11a (HT20)	6 Mbps	TX
	802.11n (HT20)	MCS0	TX
26dB Bandwidth and 99% Occupied Bandwidth	802.11a (HT20)	6 Mbps	TX
	802.11n (HT20)	MCS0	TX
Conducted Output Power	802.11a (HT20)	6 Mbps	TX
	802.11n (HT20)	MCS0	TX
Power Spectral Density	802.11a (HT20)	6 Mbps	TX
	802.11n (HT20)	MCS0	TX
Frequency Stability	Un-modulation	/	TX

4.5 Test Facility

The test facility has a test site registered with the following organizations:

ISED CAB identifier: CN0013. Test Firm Registration No.: 7760A.

Waltek Testing Group Co., Ltd. Has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files.

Registration number 7760A, October 15, 2016.

FCC Designation No.: CN1201. Test Firm Registration No.: 523476.

Waltek Testing Group Co., Ltd. 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 our files. Registration number 523476, September 10, 2019.

5 Equipment Used during Test

5.1 Equipments List

Conducted Emissions Test Site 1#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	EMI Test Receiver	R&S	ESCI	101155	2024-07-18	2025-07-17
2	LISN	SCHWARZBECK	NSLK 8128	8128-259	2024-10-10	2025-10-09
3	Pulse Limiter	CYBERTEK	EM5010	261115-001-0024	2024-07-18	2025-07-17
4	Cable	Laplace	RF300	-	2024-07-18	2025-07-17
3m Semi-anechoic Chamber for Radiation Emissions Test site 1#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Spectrum Analyzer	R&S	FSP30	100091	2024-04-22	2025-04-21
2	Amplifier	Agilent	8447D	2944A10178	2024-07-18	2025-07-17
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	2024-07-21	2025-07-20
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	2024-04-22	2025-04-21
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2024-01-23	2025-01-22
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	2024-07-18	2025-07-17
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2024-07-18	2025-07-17
8	Coaxial Cable (above 1GHz)	ZT26-NJ-NJ-8M/FA	1GHz-18GHz	NA	2024-04-22	2025-04-21
3m Semi-anechoic Chamber for Radiation Emissions Test site 2#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Test Receiver	R&S	ESCI	101296	2024-04-22	2025-04-21
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2023-11-04	2024-11-03
3	Active Loop Antenna	Com-Power Corp.	AL-130R	10160007	2024-04-27	2025-04-26
4	Amplifier	ANRITSU	MH648A	M43381	2024-04-22	2025-04-21
5	Cable	HUBER+SUHNER	CBL2	525178	2024-04-22	2025-04-21
RF Conducted Testing						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	Spectrum Analyzer	R&S	FSP40	100501	2024-07-18	2025-07-17

2.	EXA Signal Analyzer	Malaysia Keysight	N9010A	MY50520207	2024-04-22	2025-04-21
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Test Software:

Test Item	Software name	Software version
Conduction disturbance Radiated Emission(3m)	EZ-EMC	EZ-EMC(RA-03A1-1)

5.2 Description of Support Units

Equipment	Manufacturer	Model No.	Series No.
/	/	/	/

5.3 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-6}$
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Radiated Spurious Emissions test	± 5.03 dB (30M~1000MHz)
	± 5.47 dB (1000M~25000MHz)
Conducted Spurious Emissions test	± 3.64 dB (AC mains 150KHz~30MHz)

6 Test Summary

Test Items	Test Requirement	Result
Conducted Emissions	15.207(a)	PASS
Radiated Emissions	15.407(a) 15.205(a) 15.209(a)	PASS
Duty Cycle	KDB 789033	PASS
6dB Bandwidth	15.407(a)	PASS
26 dB Emission Bandwidth & 99% Occupied Bandwidth	15.407(a)	PASS
Maximum Conducted Output Power	15.407(a)	PASS
Power Spectral Density	15.407(a)	PASS
Restricted bands around fundamental frequency	15.407(a)	PASS
Antenna Requirement	15.203	PASS
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	PASS

7 Duty cycle

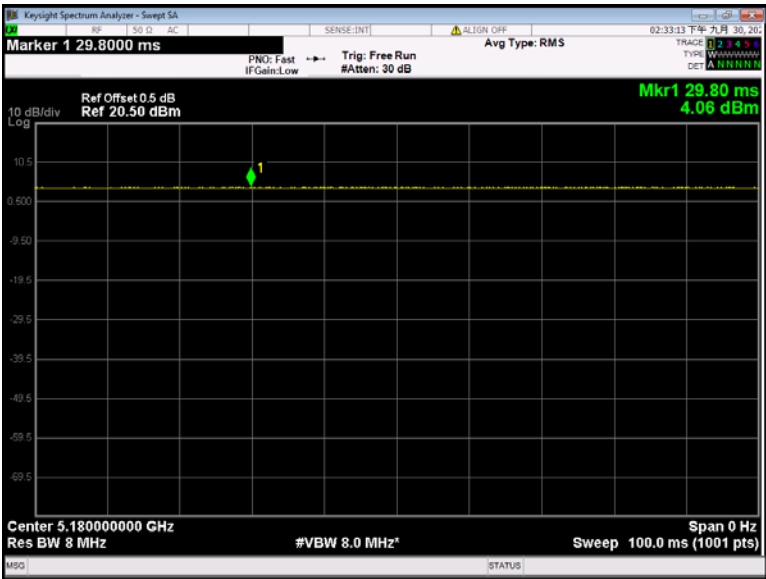
Test Requirement:	FCC 47CFR Part 15 Section 15.407 KDB789033 D02 General U-NII Test Procedures New Rules v02r01, Section (B)
Test Method:	ANSI C63.10: 2013
Test Limit:	N/A
Test Result:	PASS
Remark:	Through Pre-scan, and found 802.11a at lowest channel is the worst case. Only the worst case is recorded in the report.

7.1 Summary of Test Results

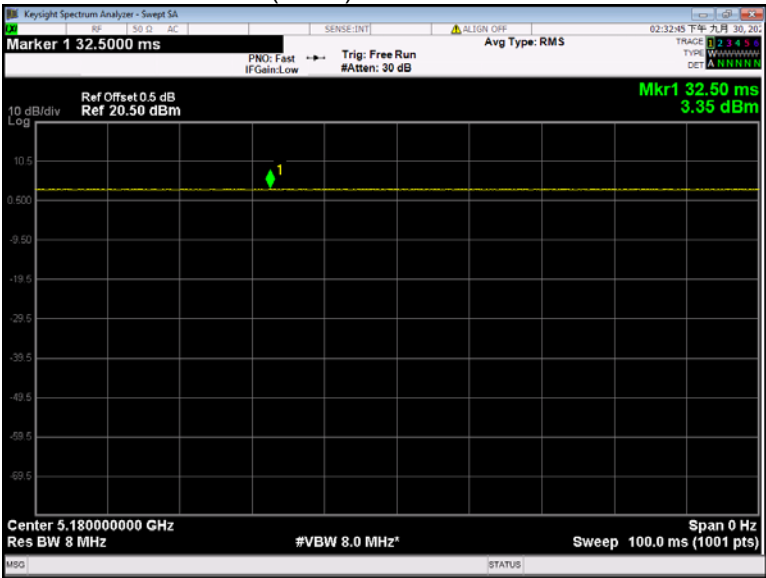
802.11a(HT20) mode			
channel	On time(ms)	Period(ms)	Duty Cycle(%)
36	100	100	100
52	100	100	100
100	100	100	100
149	100	100	100
802.11n(HT20) mode			
channel	On time(ms)	Period(ms)	Duty Cycle(%)
36	100	100	100
52	100	100	100
100	100	100	100
149	100	100	100

Test result plots shown as follows:

802.11a U-NII-1 Low channel



802.11n(HT20) U-NII-1 Low channel



8 Conducted Emission

Test Requirement: FCC 47CFR Part 15 Section 15.207
Test Method: ANSI C63.10:2013
Test Result: PASS
Frequency Range: 150kHz to 30MHz
Limit:

Frequency (MHz)	Limit (dBμV)	
	Quasi-peak	Average
0.15 to 0.5	66 to 56	56 to 46
0.5 to 5	56	46
5 o 30	60	50

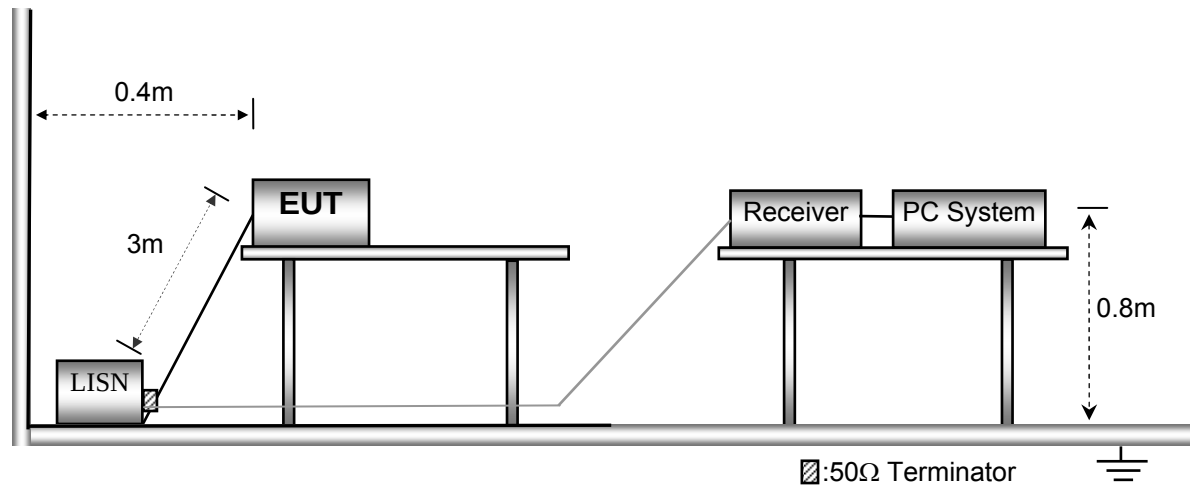
8.1 E.U.T. Operation

Operating Environment :
Temperature: 26.1°C
Humidity: 54.7 % RH
Atmospheric Pressure: 101.2kPa

EUT Operation :
The test was performed in transmitting mode, the test data were shown in the report.

8.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10:2013.



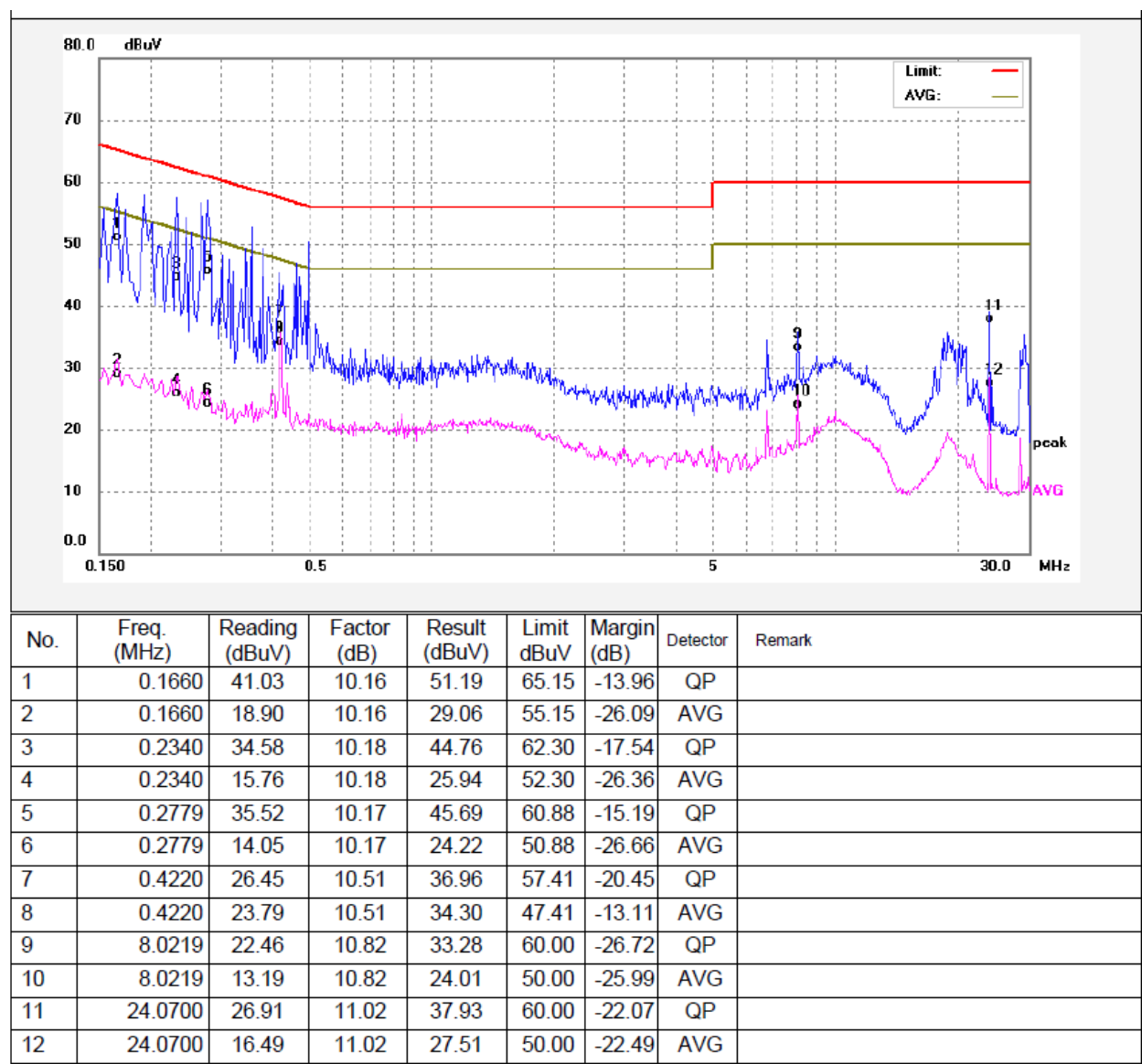
8.3 Measurement Description

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

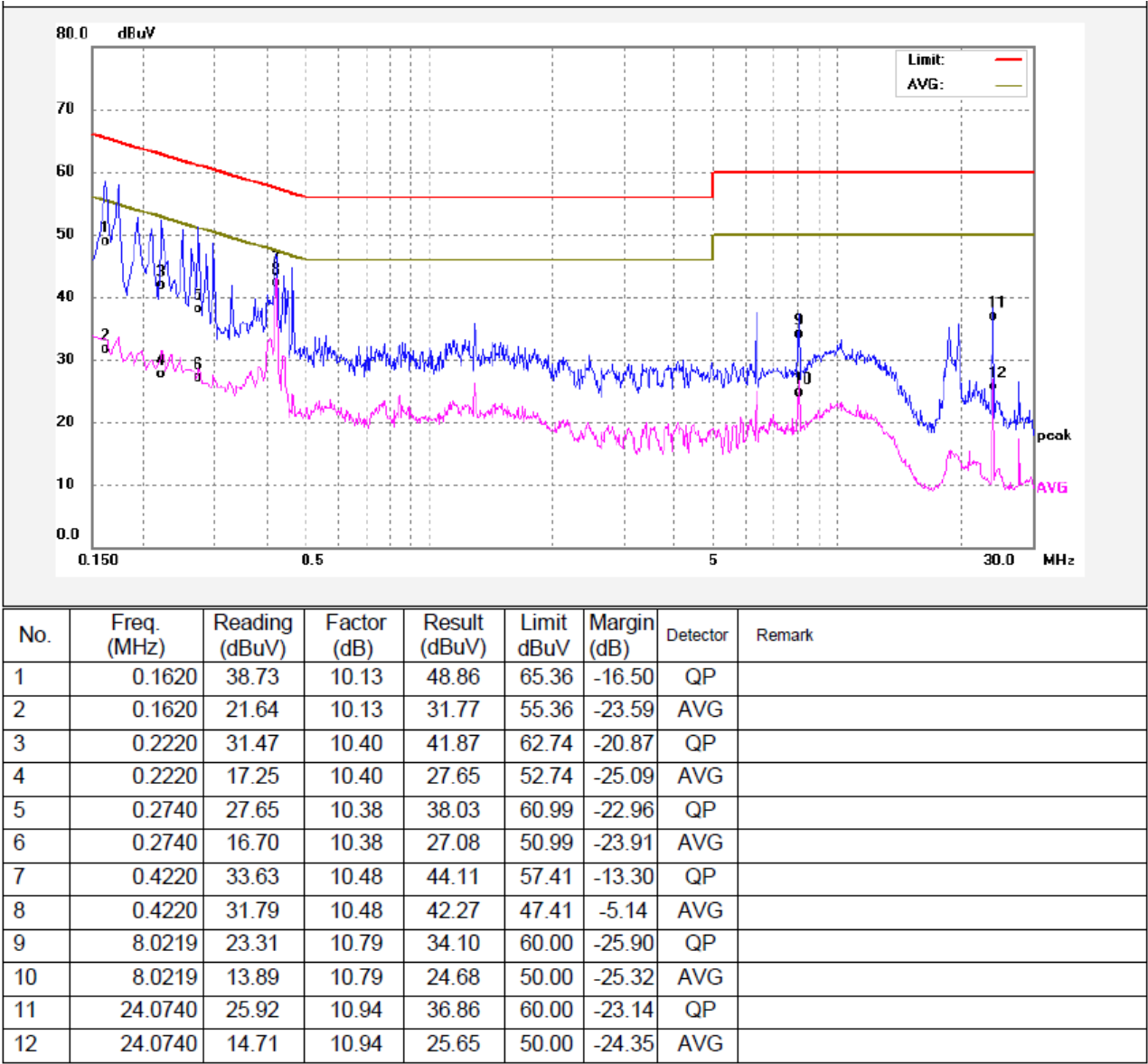
8.4 Conducted Emission Test Result

An initial pre-scan was performed on the live and neutral lines.

Live line:



Neutral line:



9 Radiated Emissions

Test Requirement: FCC 47CFR Part 15 Section 15.209 & 15.407

Test Method: ANSI C63.10:2013

Test Result: PASS

Measurement Distance: 3m

Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Distance	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	$2400/F(\text{kHz})$	300	$10000 * 2400/F(\text{kHz})$	$20\log^{(2400/F(\text{kHz}))} + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log^{(24000/F(\text{kHz}))} + 40$
1.705 ~ 30	30	30	$100 * 30$	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

9.1 EUT Operation

Operating Environment :

Temperature: 23.5 °C

Humidity: 52.1 % RH

Atmospheric Pressure: 101.2kPa

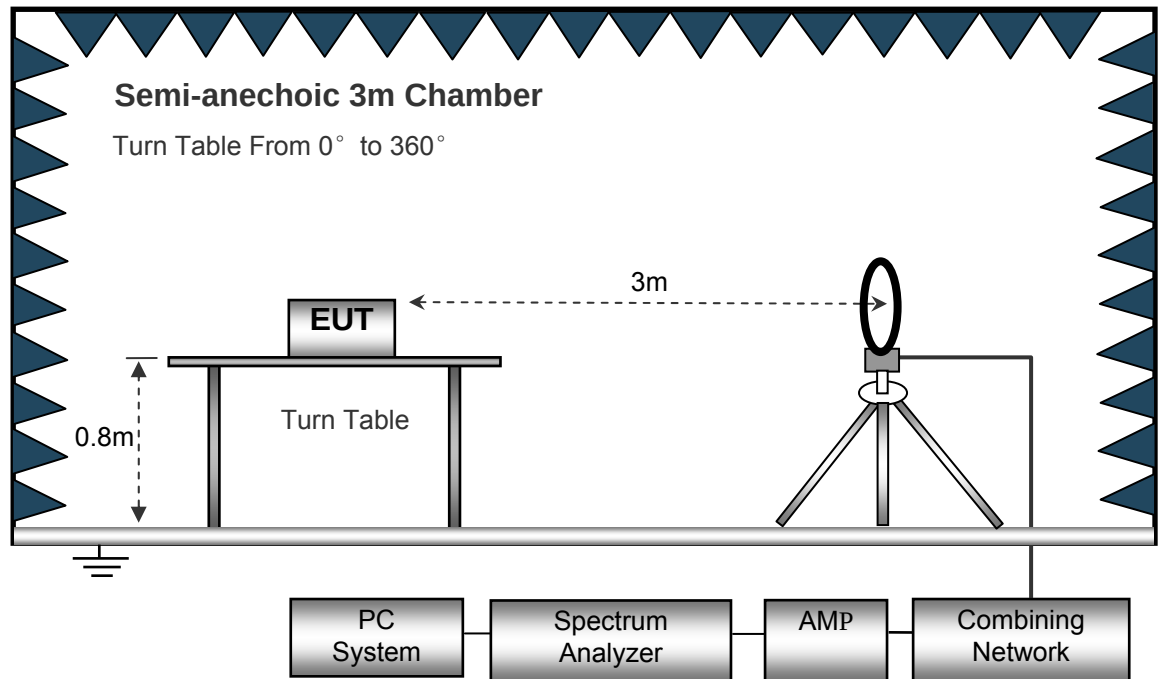
EUT Operation :

The test was performed in transmitting mode, the test data were shown in the report.

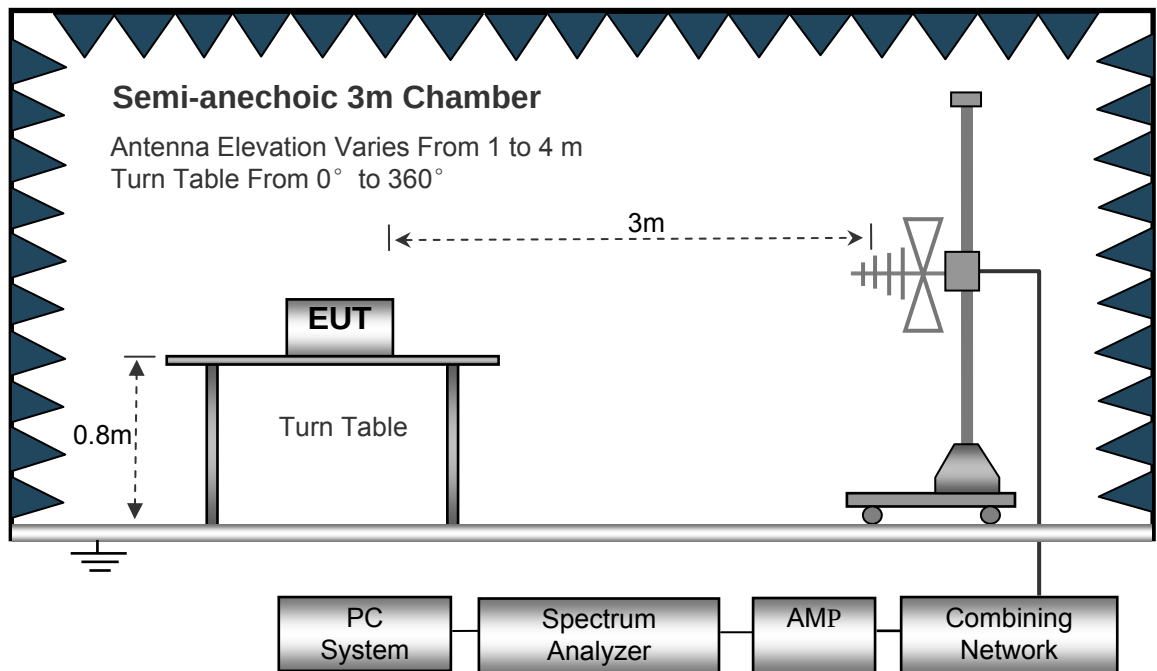
9.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10: 2013.

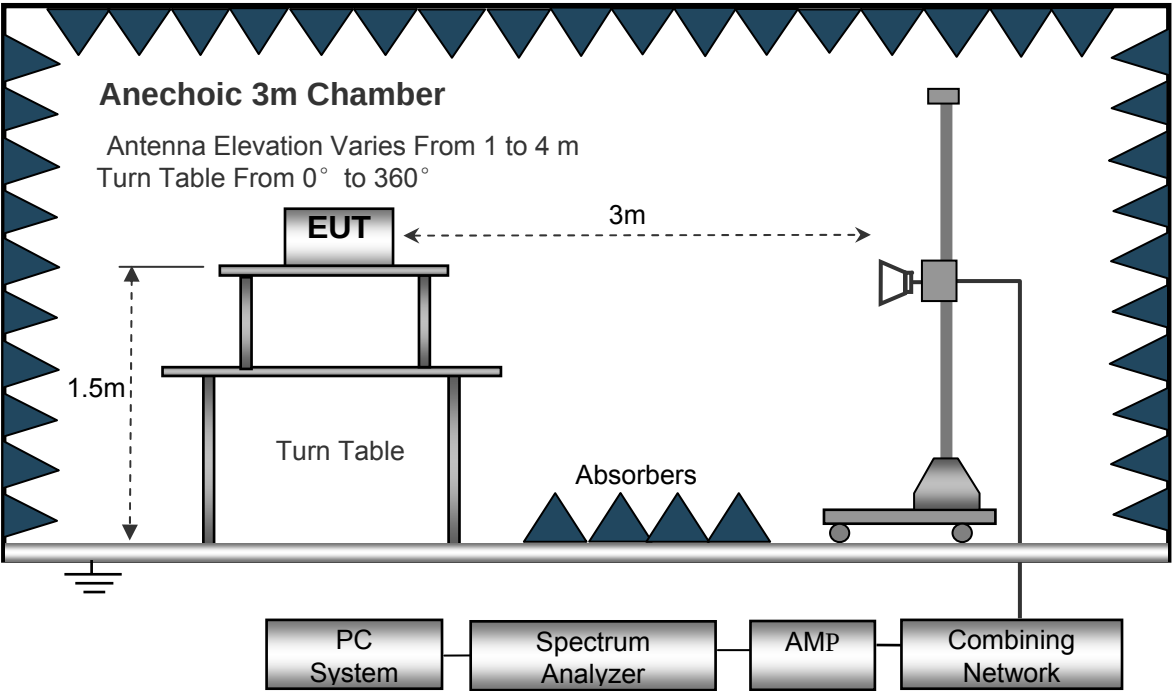
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



9.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed Auto
IF Bandwidth.....10kHz
Video Bandwidth.....10kHz
Resolution Bandwidth.....10kHz

30MHz ~ 1GHz

Sweep Speed Auto
DetectorPK
Resolution Bandwidth.....100kHz
Video Bandwidth.....300kHz

Above 1GHz

Sweep Speed Auto
DetectorPK
Resolution Bandwidth.....1MHz
Video Bandwidth.....3MHz
DetectorAve.
Resolution Bandwidth.....1MHz
Video Bandwidth.....10Hz

9.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane for below 1GHz and 1.5m for above 1GHz.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are performed in X,Y and Z axis positioning(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand),the worst condition was tested putting the eut in X axis,so the worst data were shown as follow.
8. A 2.4GHz high –pass filter is used during radiated emissions above 1GHz measurement.

9.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$

9.6 Summary of Test Results

Test Frequency: 9KHz~30MHz

The measurements were more than 20 dB below the limit and not reported.

Test Frequency : 30MHz ~ 18GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.407/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
802.11a U-NII-1 Low Channel 5180MHz									
226.58	40.49	QP	178	2.0	H	-11.62	28.87	46.00	-17.13
226.58	42.19	QP	109	1.2	V	-11.62	30.57	46.00	-15.43
4508.50	53.72	PK	293	1.2	H	-2.03	51.69	74.00	-22.31
4508.50	43.36	Ave	293	1.2	H	-2.03	41.33	54.00	-12.67
5133.32	53.60	PK	268	1.5	H	-1.02	52.58	74.00	-21.42
5133.32	44.24	Ave	268	1.5	H	-1.02	43.22	54.00	-10.78
10360.00	41.10	PK	157	1.3	H	5.33	46.43	74.00	-27.57
10360.00	37.00	Ave	157	1.3	H	5.33	42.33	54.00	-11.67
802.11a U-NII-1 Middle channel 5200MHz									
226.58	40.52	QP	228	1.4	H	-11.62	28.90	46.00	-17.10
226.58	41.31	QP	72	1.9	V	-11.62	29.69	46.00	-16.31
4511.30	53.53	PK	101	1.8	H	-1.94	51.59	74.00	-22.41
4511.30	43.49	Ave	101	1.8	H	-1.94	41.55	54.00	-12.45
5129.31	54.61	PK	329	1.9	H	-1.06	53.55	74.00	-20.45
5129.31	43.66	Ave	329	1.9	H	-1.06	42.60	54.00	-11.40
10400.00	42.18	PK	11	1.1	H	5.21	47.39	74.00	-26.61
10400.00	36.08	Ave	11	1.1	H	5.21	41.29	54.00	-12.71

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.407/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
802.11a U-NII-1 High channel 5240MHz									
226.58	40.58	QP	149	2.0	H	-11.62	28.96	46.00	-17.04
226.58	41.47	QP	159	1.4	V	-11.62	29.85	46.00	-16.15
4531.05	53.08	PK	245	1.3	H	-2.24	50.84	74.00	-23.16
4531.05	42.43	Ave	245	1.3	H	-2.24	40.19	54.00	-13.81
5140.02	55.84	PK	155	2.0	H	-1.09	54.75	74.00	-19.25
5140.02	43.68	Ave	155	2.0	H	-1.09	42.59	54.00	-11.41
10480.00	39.94	PK	51	1.6	H	5.14	45.08	74.00	-28.92
10480.00	36.93	Ave	51	1.6	H	5.14	42.07	54.00	-11.93

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.407/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
802.11n(HT20) U-NII-1 Low Channel 5180MHz									
226.58	38.90	QP	188	1.1	H	-11.62	27.28	46.00	-18.72
226.58	44.73	QP	58	1.4	V	-11.62	33.11	46.00	-12.89
4504.76	54.80	PK	18	1.3	H	-2.14	52.66	74.00	-21.34
4504.76	41.10	Ave	18	1.3	H	-2.14	38.96	54.00	-15.04
5117.59	47.99	PK	70	1.4	H	-1.06	46.93	74.00	-27.07
5117.59	40.37	Ave	70	1.4	H	-1.06	39.31	54.00	-14.69
10360.00	40.09	PK	310	1.0	H	5.33	45.42	74.00	-28.58
10360.00	38.15	Ave	310	1.0	H	5.33	43.48	54.00	-10.52
802.11n(HT20) U-NII-1 Middle channel 5200MHz									
226.58	40.10	QP	107	1.7	H	-11.62	28.48	46.00	-17.52
226.58	45.57	QP	160	1.9	V	-11.62	33.95	46.00	-12.05
4519.94	55.17	PK	52	1.3	H	-2.12	53.05	74.00	-20.95
4519.94	42.08	Ave	52	1.3	H	-2.12	39.96	54.00	-14.04
5137.65	48.50	PK	5	1.2	H	-1.06	47.44	74.00	-26.56
5137.65	40.51	Ave	5	1.2	H	-1.06	39.45	54.00	-14.55
10400.00	42.11	PK	237	1.9	H	5.21	47.32	74.00	-26.68
10400.00	38.11	Ave	237	1.9	H	5.21	43.32	54.00	-10.68

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.407/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
802.11n(HT20) U-NII-1 High channel 5240MHz									
226.58	40.51	QP	164	1.4	H	-11.62	28.89	46.00	-17.11
226.58	45.54	QP	237	1.6	V	-11.62	33.92	46.00	-12.08
4511.13	54.55	PK	131	1.8	H	-1.96	52.59	74.00	-21.41
4511.13	41.37	Ave	131	1.8	H	-1.96	39.41	54.00	-14.59
5125.47	47.76	PK	5	1.9	H	-1.06	46.70	74.00	-27.30
5125.47	42.27	Ave	5	1.9	H	-1.06	41.21	54.00	-12.79
10480.00	41.20	PK	74	1.8	H	5.14	46.34	74.00	-27.66
10480.00	37.45	Ave	74	1.8	H	5.14	42.59	54.00	-11.41

Test Frequency: 12GHz~40GHz

The measurements were more than 20 dB below the limit and not reported.

10 Band Edge

Test Requirement:	FCC 47CFR Part 15 Section 15.407
Test Method:	ANSI C63.10 2013
Test Limit:	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 -27dBm/MHz. 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. 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. For transmitters operating in the 5.725-5.85 GHz band: (i) 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. (ii) Devices certified before March 2, 2017 with antenna gain greater than 10 dBi may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease by March 2, 2018. Devices certified before March 2, 2018 with antenna gain of 10 dBi or less may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease before March 2, 2020.
Test Result:	PASS

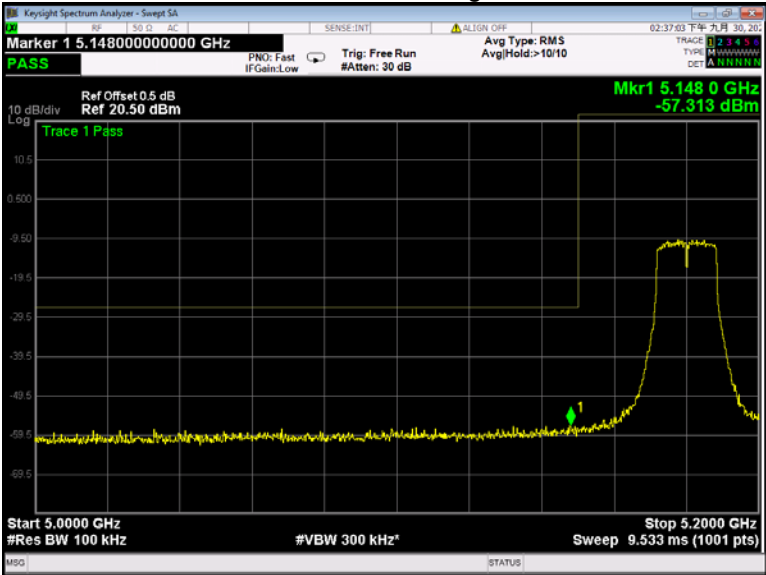
10.1 Test Produce

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 to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
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.

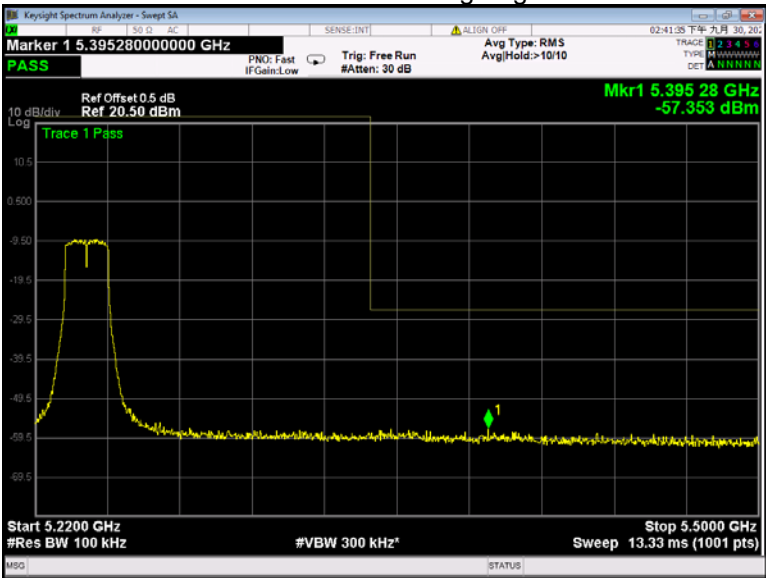
10.2 Test Result

Test result plots shown as follows:

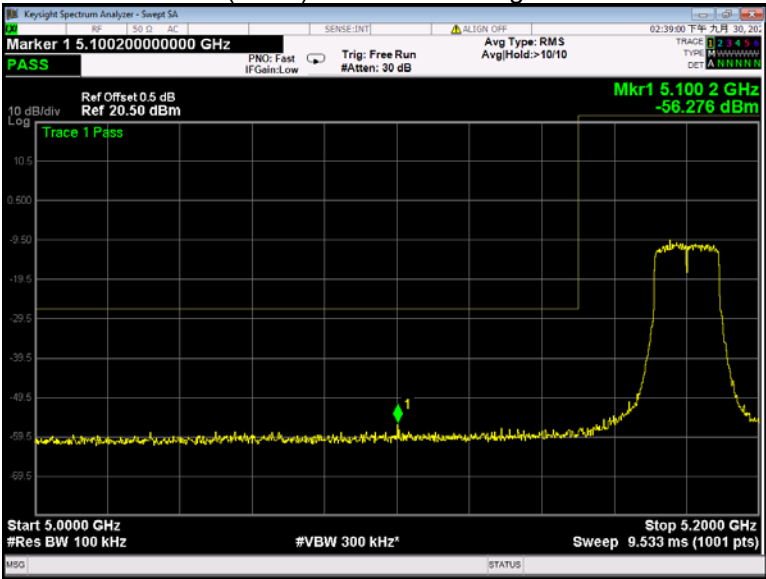
802.11a U-NII-1 Band edge-left side



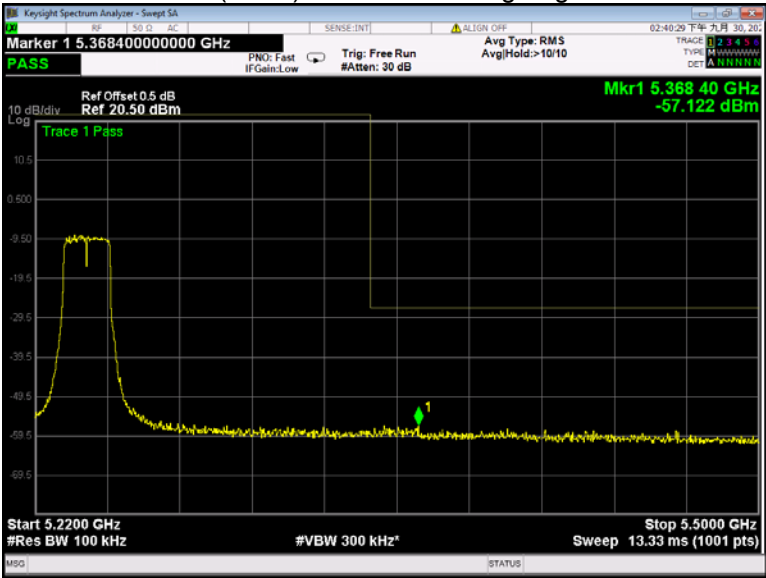
802.11a U-NII-1 Band edge-right side



802.11n(HT20) U-NII-1 Band edge-left side



802.11n(HT20) U-NII-1 Band edge-right side



11 26 dB Bandwidth and 99% Occupied Bandwidth

Test Requirement:	FCC 47CFR Part 15 Section 15.407 (a) KDB662911 D01 Multiple Transmitter Output v02r01
Test Method:	KDB789033 D02 General U-NII Test Procedures New Rules v02r01 Section D
Test Limit:	No restriction limits
Test Result:	PASS

11.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 1% to 5% of the OBW, VBW = 3x RBW

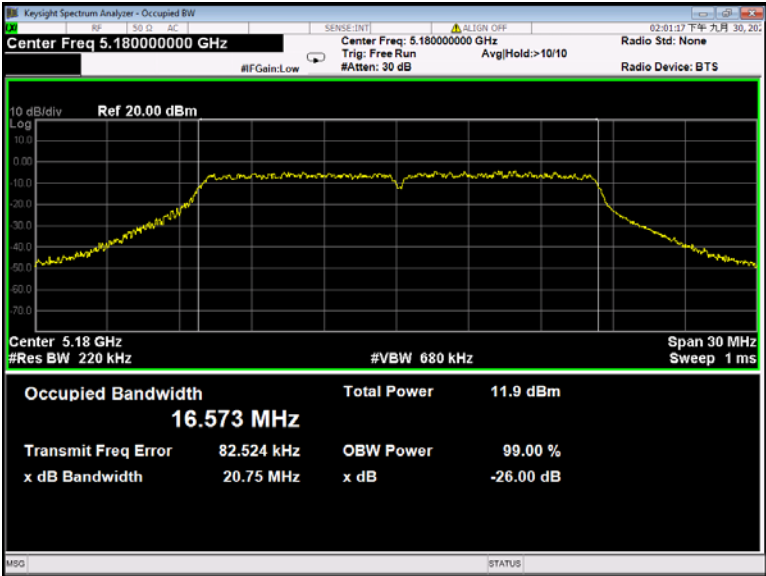
11.2 Test Result

Band	Operation mode	26 dB Bandwidth (MHz)			99% Bandwidth (MHz)		
		Low	Middle	High	Low	Middle	High
U-NII-1	802.11a	20.75	20.75	20.85	16.573	16.593	16.553
	802.11n(HT20)	21.49	21.44	21.30	17.687	17.687	17.687

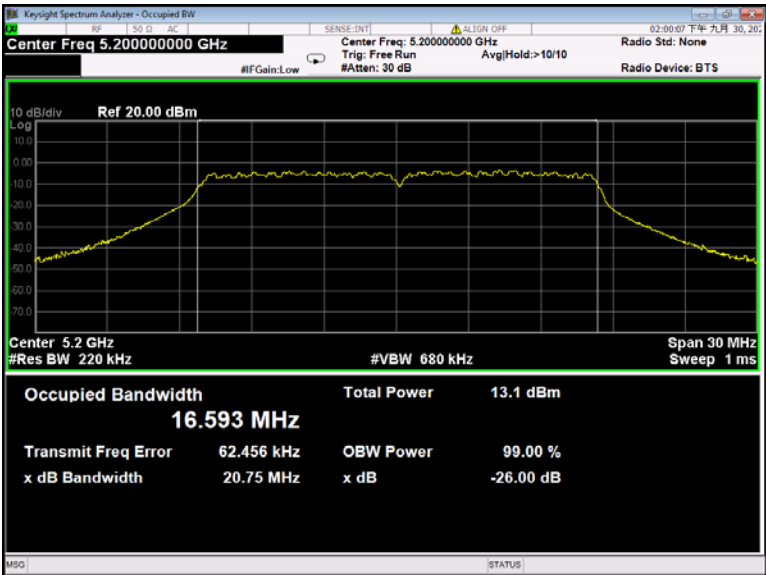
Test result plots shown as follows:

Bandwidth

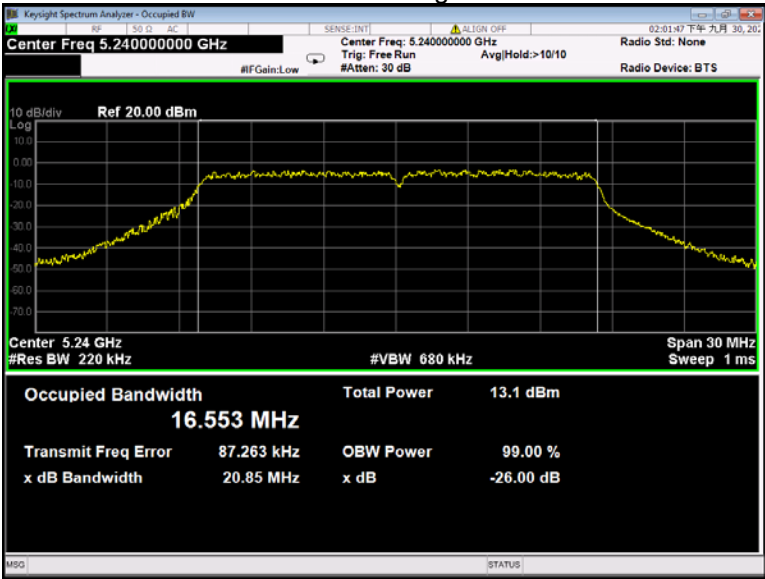
802.11a U-NII-1 Low channel



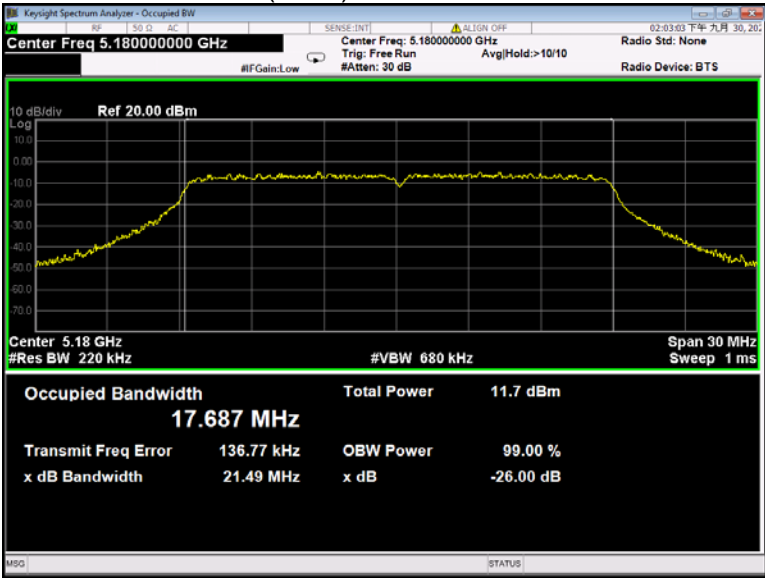
802.11a U-NII-1 Middle channel



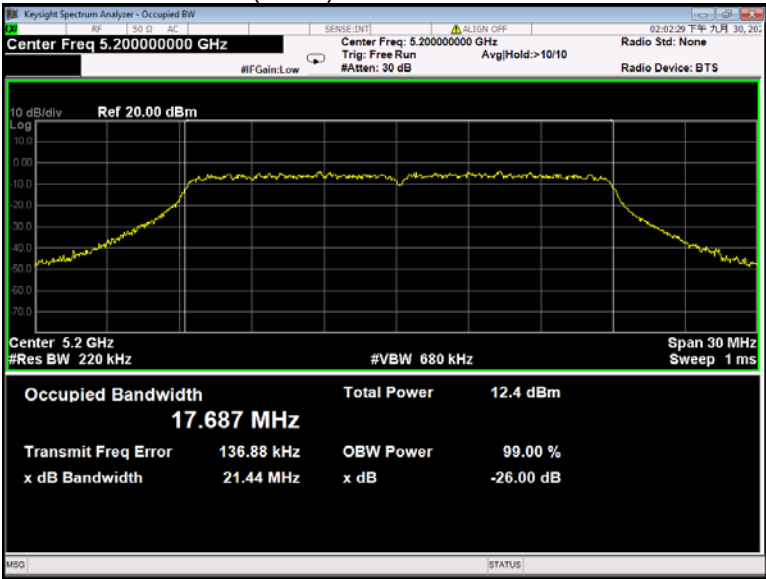
802.11a U-NII-1 High channel



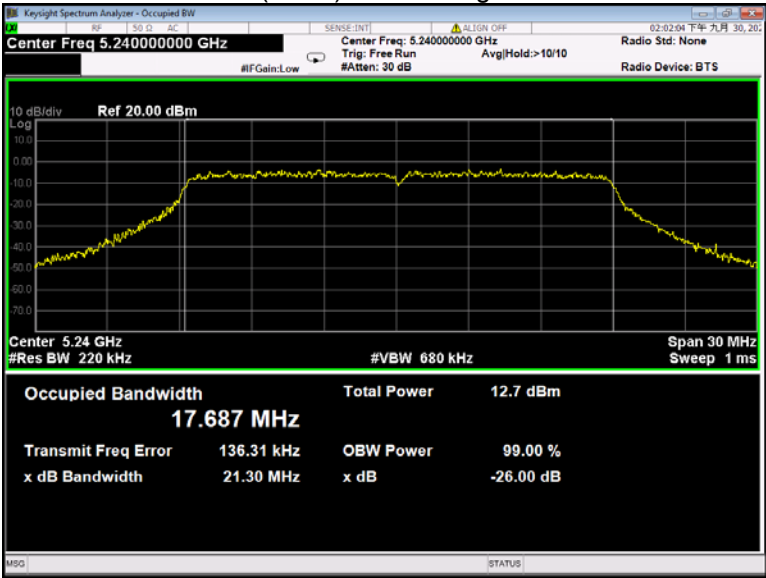
802.11n(HT20) U-NII-1 Low channel



802.11n(HT20) U-NII-1 Middle channel



802.11n(HT20) U-NII-1 High channel



12 Conducted Output Power

Test Requirement:	FCC 47CFR Part 15 Section 15.407(a) KDB662911 D01 Multiple Transmitter Output v02r01
Test Method:	KDB789033 D02 General U-NII Test Procedures New Rules v02r01 Section E
Test Limit:	U-NII-1 250mW(24dBm) U-NII-2A 250mW(24dBm) U-NII-2C 250mW(24dBm) U-NII-3 1W(30dBm)
Test Result:	PASS Conducted output power= measurement power+10log(1/x)
Remark:	X is duty cycle=1, so 10log(1/1)=0 Conducted output power= measurement power

12.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 1 MHz. VBW = 3 MHz. Sweep = auto; Detector Function = Peak, Set the span to fully encompass the DTS bandwidth.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

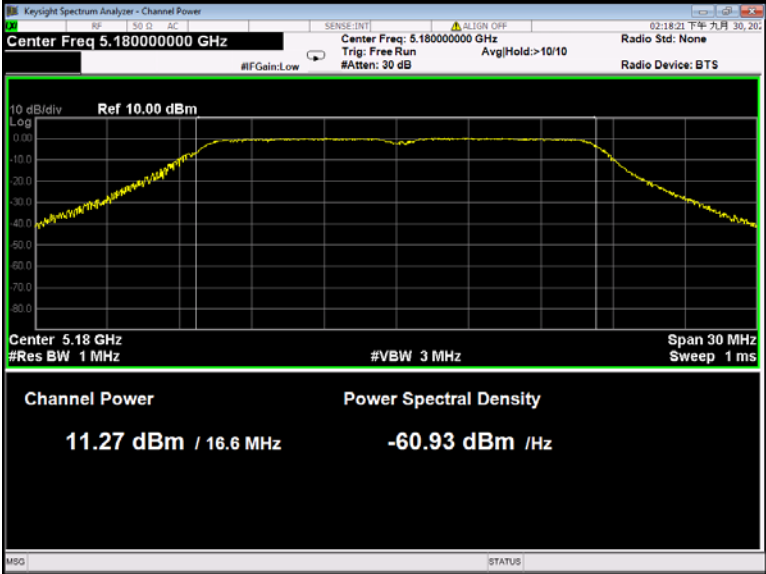
12.2 Test Result

Band	Operation mode	Conducted Output Power (dBm)		
		Low	Middle	High
U-NII-1	802.11a	11.27	12.16	12.47
	802.11n(HT20)	11.62	11.89	12.92

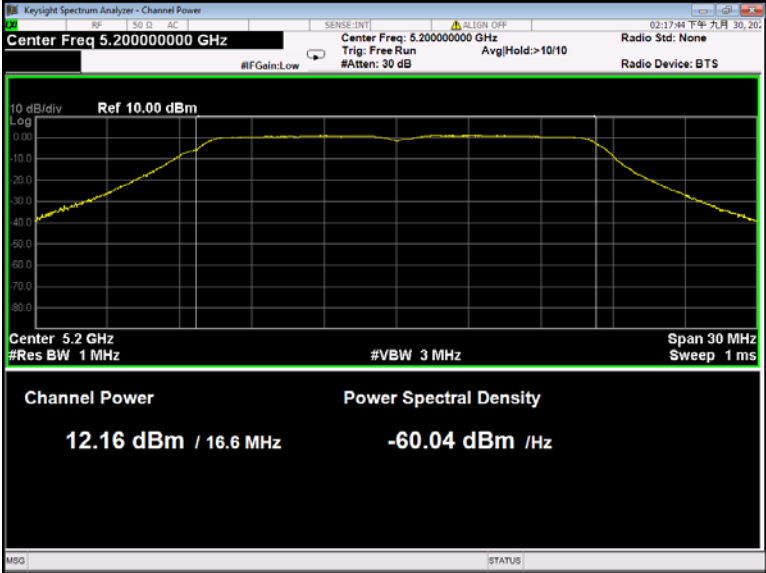
* All transmit signals are completely uncorrelated with each other, Directional gain = G_{ANT} which is less than 6dBi. So the limit does not be reduced.

Test result plots shown as follows:

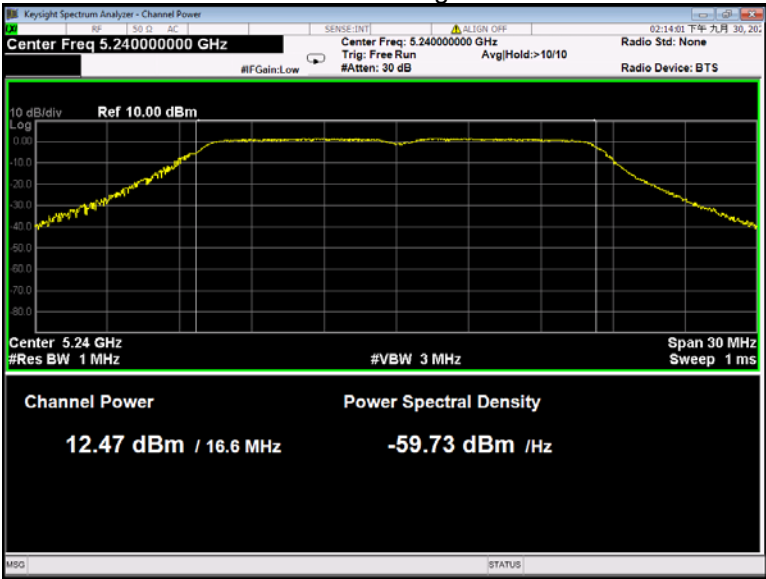
802.11a U-NII-1 Low channel



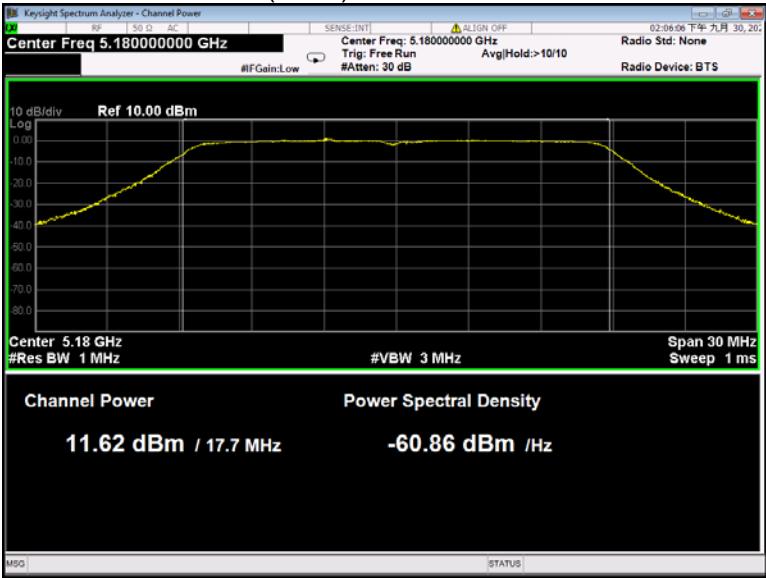
802.11a U-NII-1 Middle channel



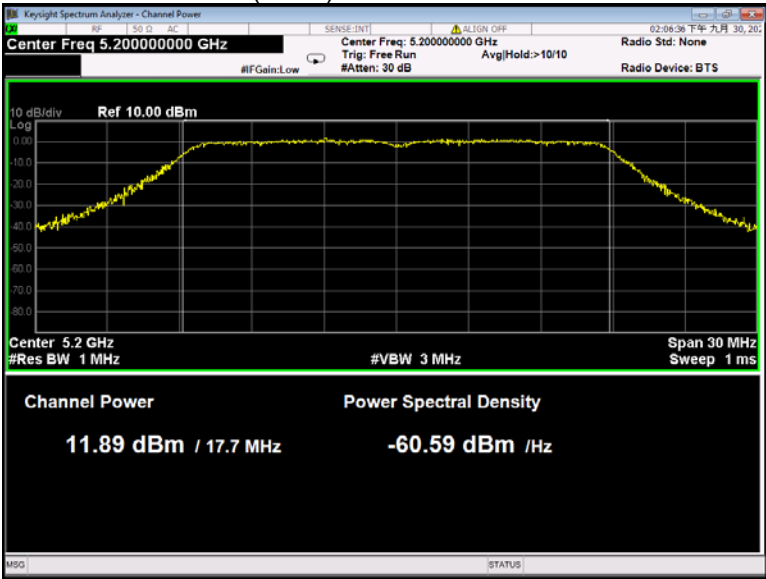
802.11a U-NII-1 High channel



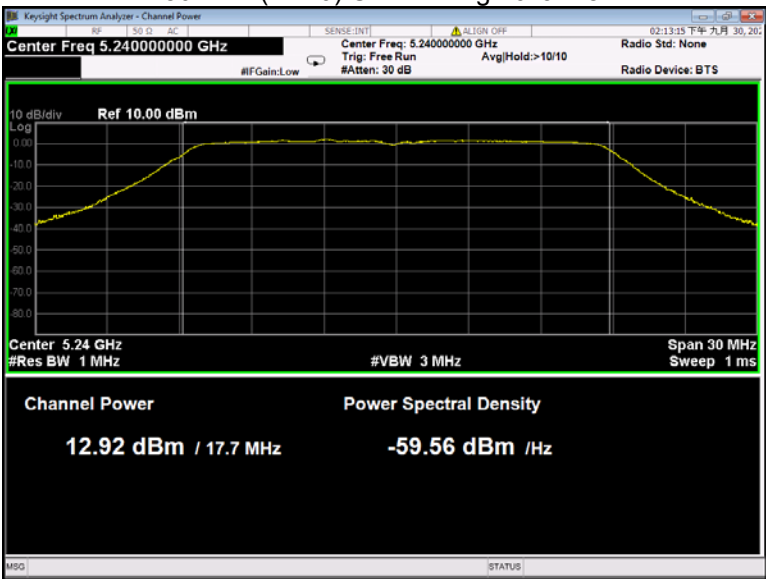
802.11n(HT20) U-NII-1 Low channel



802.11n(HT20) U-NII-1 Middle channel



802.11n(HT20) U-NII-1 High channel



13 Power Spectral density

Test Requirement:	FCC 47CFR Part 15 Section 15.407(a)
Test Method:	KDB 789033 D02 General U-NII Test Procedures New Rules v02r01
Test Limit:	$\leq 11\text{dBm/MHz}$ for Operation in the U-NII-1(5150MHz-5250MHz, 5250-5350MHz and 5470-5725MHz)of device; $\leq 30\text{dBm/500kHz}$ for Operation in the U-NII-3(5725MHz-5850MHz)of device
Test Result:	PASS

13.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer:
U-NII-1
RBW = 1MHz, VBW $\geq 3 \times$ RBW Sweep = auto; Detector Function = Peak. Trace = Max hold.
U-NII-3
RBW = 510KHz, VBW $\geq 3 \times$ RBW Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section
Submit this plot.

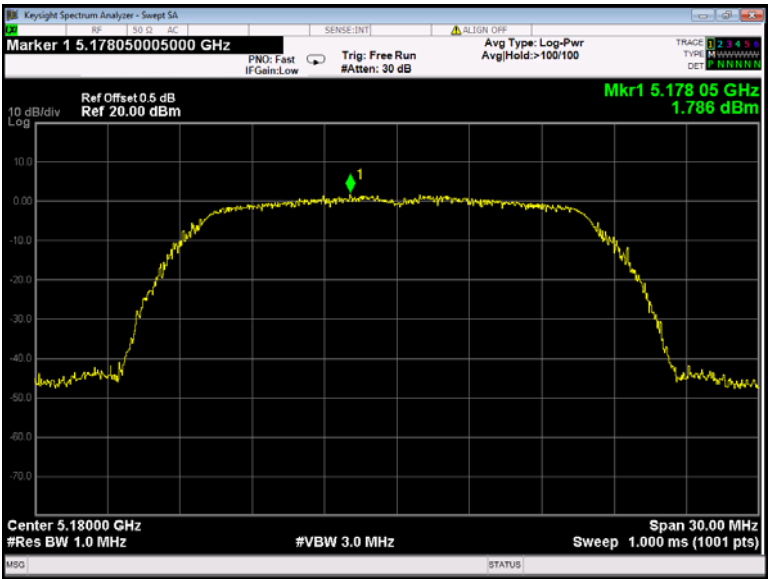
13.2 Test Result

Band	Operation mode	Power Spectral Density (dBm/MHz)		
		Low	Middle	High
U-NII-1	802.11a	1.786	1.808	1.745
	802.11n(HT20)	1.161	1.118	2.488
	Limit	$\leq 11.00 \text{ dBm/MHz}$		

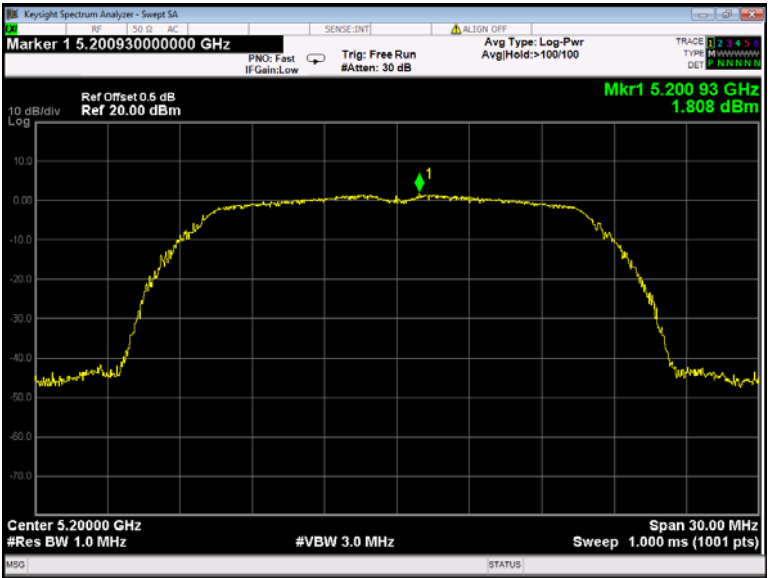
* All transmit signals are completely uncorrelated with each other, Directional gain = G_{ANT} which is less than 6dBi. So the limit does not be reduced.

Test result plots shown as follows:

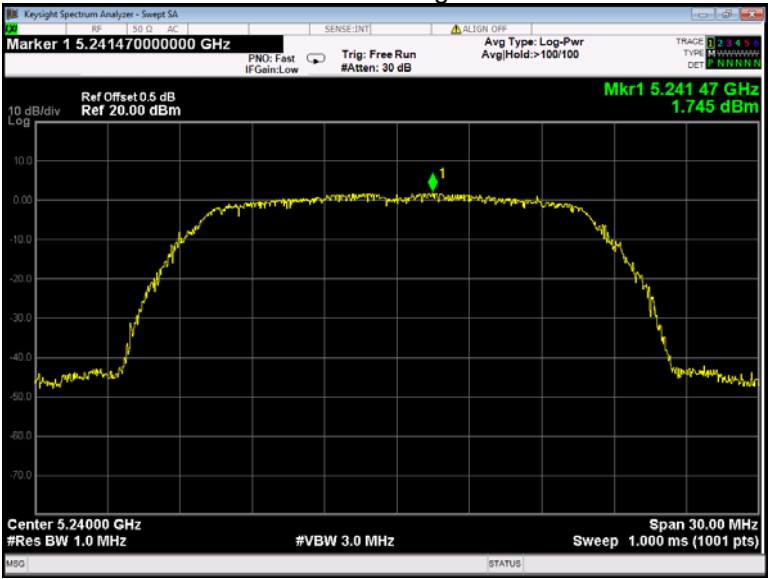
802.11a U-NII-1 Low channel



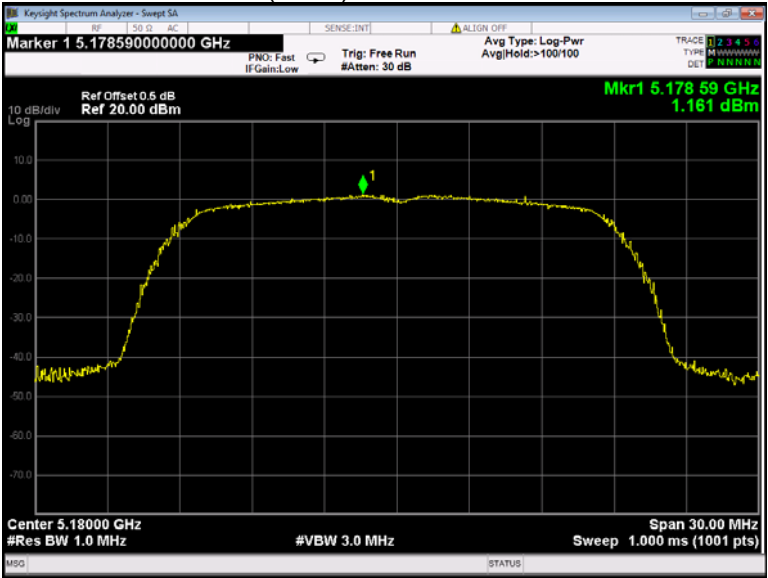
802.11a U-NII-1 Middle channel



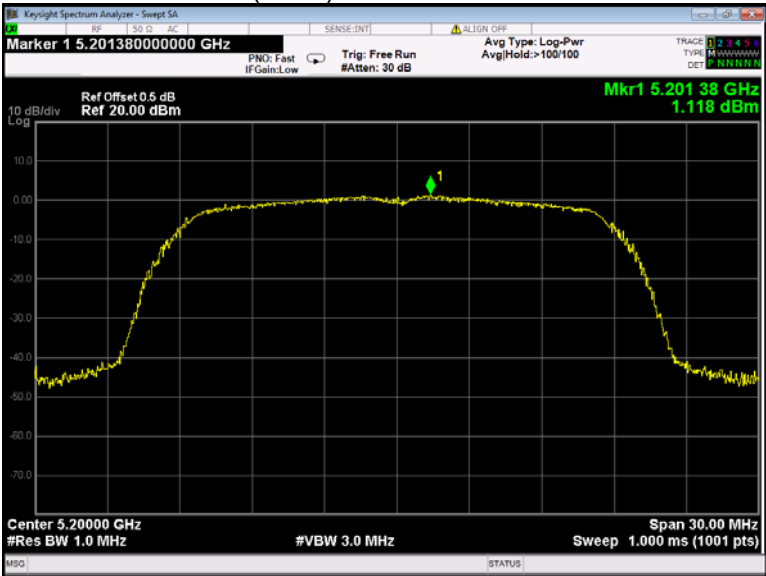
802.11a U-NII-1 High channel



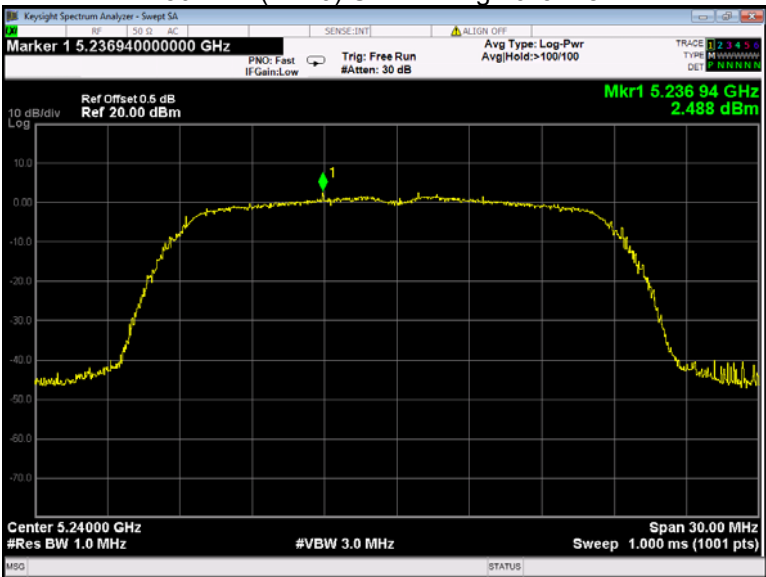
802.11n(HT20) U-NII-1 Low channel



802.11n(HT20) U-NII-1 Middle channel



802.11n(HT20) U-NII-1 High channel



14 Frequency Stability

Test Requirement:	FCC 47CFR Part 15 Section 15.407(g)
Test Method:	ANSI C63.10:2013
Test 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 users manual or 20ppm.
Test Result:	PASS

14.1 Test Procedure

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
EUT have transmitted absence of unmodulation signal and fixed channelise. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings. f_c is declaring of channel frequency. Then the frequency error formula is $(f_c - f)/f_c \times 10^6$ ppm and the limit is less than ± 20 ppm. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value.
2. Extreme temperature rule is $-15^{\circ}\text{C} \sim 45^{\circ}\text{C}$.

14.2 Test Result

U-NII-1 Test Frequency:5180MHz				
Temperature (°C)	Power Supply (VAC)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
50	120	0.0029	0.57	20
45		-0.0038	-0.74	20
30		-0.0082	-1.59	20
20		0.0000	0.00	20
10		-0.0009	-0.18	20
0		-0.0018	-0.34	20
-10		0.0003	0.05	20
-15		-0.0017	-0.33	20
-30		-0.0040	-0.76	20
20	108	-0.0034	-0.65	20
20	132	-0.0049	-0.94	20

15 Antenna 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 shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

This product has a PCB Antenna fulfil the requirement of this section.

Note: Please refer to EUT photos for more details.

16 RF Exposure

Remark: refer to MPE test report: WTF24D09208363W005

17 Photographs of test setup and EUT.

Note: Please refer to appendix: Appendix-WHL001-Photos.

=====End of Report=====