TEST REPORT

Applicant:	Shantou Shangheng Toy Technology Co., Ltd
Address of Applicant:	6th Floor, No. 2, Lane 2, Garden Road, Neilong Industrial Zone, Waisha Town, Longhu District, Shantou City, Guangdong Province, China
Manufacturer:	Shantou Shangheng Toy Technology Co., Ltd
Address of Manufacturer:	6th Floor, No. 2, Lane 2, Garden Road, Neilong Industrial Zone, Waisha Town, Longhu District, Shantou City, Guangdong Province, China
Equipment Under Test (EUT)	
Product Name:	Four axis aircraft
Model No.:	See section 5.1
FCC ID:	2BDDG-AE86PROMAX
Applicable standards:	FCC CFR Title 47 Part 15 Subpart E Section 15.407
Date of sample receipt:	October 10, 2023
Date of Test:	October 11-27, 2023
Date of report issued:	October 27, 2023
Test Result :	PASS *

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

Authorized Signature:

Robinson Luo
Laboratory Manager

This 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.

2 Version

Version No.	Date	Description
00	*October 27, 2023*	*Original*

Prepared By: ***Date:*** *October 27, 2023*

Project Engineer

Check By: ***Date:*** *October 27, 2023*

Reviewer

3 Contents

Page

1 COVER PAGE 1

2 VERSION 2

3 CONTENTS 3

4 TEST SUMMARY 4

4.1 MEASUREMENT UNCERTAINTY 4

5 GENERAL INFORMATION 5

5.1 GENERAL DESCRIPTION OF EUT 5
5.2 TEST MODE 7
5.3 DESCRIPTION OF SUPPORT UNITS 7
5.4 TEST FACILITY 7
5.5 TEST LOCATION 7
5.6 ADDITIONAL INSTRUCTIONS 7

6 TEST INSTRUMENTS LIST 8

7 TEST RESULTS AND MEASUREMENT DATA 10

7.1 ANTENNA REQUIREMENT 10
7.2 CONDUCTED EMISSIONS 11
7.3 MAXIMUM CONDUCTED OUTPUT POWER 14
7.4 CHANNEL BANDWIDTH AND 99% OCCUPIED BANDWIDTH 15
7.5 POWER SPECTRAL DENSITY 16
7.6 BAND EDGE 17
7.6.1 Radiated Emission Method 17
7.7 SPURIOUS EMISSION 22
7.7.1 Radiated Emission Method 22
7.8 FREQUENCY STABILITY 30

8 TEST SETUP PHOTO 31

9 EUT CONSTRUCTIONAL DETAILS 31

4 Test Summary

Test Item	Section	Result
Antenna requirement	FCC part 15.203	Pass
AC Power Line Conducted Emission	FCC part 15.207	Pass
Maximum Conducted Output Power	FCC part 15.407(a)(3)	Pass
Channel Bandwidth and 99% Occupied Bandwidth	FCC part 15.407(e)	Pass
Power Spectral Density	FCC part 15.407(a)(3)	Pass
Band Edge	FCC part 15.407(b)(4)	Pass
Spurious Emission	FCC part 15.205/15.209/15.407(b)(4)	Pass
Frequency Stability	FCC part 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	9kHz-30MHz	3.1dB	(1)
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:	Four axis aircraft
Model No.:	AE86 Pro Max, A10 Max, A20 Max, A30 Max, A60 Max, AE3 Pro Max, AE8 Pro Max, AE8 EVO, AE86 Pro Max, AE4 Pro, AE5 Pro, AE6 Pro, AE7 Pro, AE1, AE2, AE3, AE9, AE10 mini, AE11, AE12, AE13, AE14, AE15, A40, A50, A70, A80, A90, A380, AE16, AE17, AE18, AE19, AE01, AE02, AE03, AE04, AE05, AE06, AE07, AE08, AE09, AE10, AE20, AE30, AE40, AE50, AE60, AE70, AE80, AE90, AE11, AE21, AE31, AE41, AE51, AE61, AE71, AE81, AE91, AE101, AE102, AE103, AE104, AE105, AE106, AE22, AE33, AE44, AE55, AE66, AE77, AE88, AE99, YK1, YK2, YK3, YK5, YK6, YK8, YK9, YK10, YK18, YK20, K6 Max, K9, K10, GX, G5, S150, S151, S155, S138, P8, P10, P11, P14, P15, P20, S802, S806, S808, E58, E68, E88, E99, L1, L2, G6, G7, H203, H303, P9, YP1
Test Model No:	AE86 Pro Max
Remark: All above models are identical in the same PCB layout, interior structure and electrical circuits. The differences are appearance color and model name for commercial purpose.	
Test sample(s) ID:	GTS2023100034-1
Sample(s) Status:	Engineer sample
S/N:	
Operation Frequency:	802.11a/802.11n(HT20)/802.11ac(HT20): 5745MHz ~ 5825MHz
Channel numbers:	802.11a/802.11n(HT20)/802.11ac(HT20): 5
Channel bandwidth:	802.11a/802.11n(HT20)/802.11ac(HT20): 20MHz
Modulation technology:	Orthogonal Frequency Division Multiplexing (OFDM)
Antenna Type:	Integral Antenna
Antenna gain:	ANT 1: 2.97dBi ANT 2: 2.97dBi
Power supply:	TX: DC 3.7V, 18650/1500mAh for Li-ion battery The battery is charged via USB DC5V

Remark:
1. Antenna gain information provided by the customer
2. The relevant information of the sample is provided by the entrusting company, and the laboratory is not responsible for its authenticity.

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)
Lowest channel	5745
Middle channel	5785
Highest channel	5825

5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode

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/ac(HT20)	6.5Mbps

5.3 Description of Support Units

None

5.4 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.

● **ISED—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 ISED 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).

5.5 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.
Address: 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

5.6 Additional Instructions

Test Software	Special test software provided by manufacturer
Power level setup	Default

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	June 23, 2021	June 22, 2024
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	April 14, 2023	April 13, 2024
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9168	GTS640	March 19, 2023	March 18, 2025
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	April 17, 2023	April 16, 2025
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	April 14, 2023	April 13, 2024
8	Loop Antenna	ZHINAN	ZN30900A	GTS534	Nov. 29, 2022	Nov. 28, 2023
9	Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	April 14, 2023	April 13, 2024
10	Amplifier(1GHz-26.5GHz)	HP	8449B	GTS601	April 14, 2023	April 13, 2024
11	Horn Antenna (18-26.5GHz)	/	UG-598A/U	GTS664	Oct. 30, 2022	Oct. 29, 2023
12	Horn Antenna (26.5-40GHz)	A.H Systems	SAS-573	GTS665	Oct. 30, 2022	Oct. 29, 2023
13	FSV·Signal Analyzer (10Hz-40GHz)	Keysight	FSV-40-N	GTS666	March 13, 2023	March 12, 2024
14	Amplifier	/	LNA-1000-30S	GTS650	April 14, 2023	April 13, 2024
15	CDNE M2+M3-16A	HCT	30MHz-300MHz	GTS668	Dec. 20, 2022	Dec.19, 2023
16	Wideband Amplifier	/	WDA-01004000-15P35	GTS602	April 14, 2023	April 13, 2024
17	Thermo meter	JINCHUANG	GSP-8A	GTS643	April 19, 2023	April 18, 2024
18	RE cable 1	GTS	N/A	GTS675	July 31. 2023	July 30. 2024
19	RE cable 2	GTS	N/A	GTS676	July 31. 2023	July 30. 2024
20	RE cable 3	GTS	N/A	GTS677	July 31. 2023	July 30. 2024
21	RE cable 4	GTS	N/A	GTS678	July 31. 2023	July 30. 2024
22	RE cable 5	GTS	N/A	GTS679	July 31. 2023	July 30. 2024
23	RE cable 6	GTS	N/A	GTS680	July 31. 2023	July 30. 2024
24	RE cable 7	GTS	N/A	GTS681	July 31. 2023	July 30. 2024
25	RE cable 8	GTS	N/A	GTS682	July 31. 2023	July 30. 2024

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	July 12, 2022	July 11, 2027
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April 14, 2023	April 13, 2024
3	LISN	ROHDE & SCHWARZ	ENV216	GTS226	April 14, 2023	April 13, 2024
4	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
5	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
6	Thermo meter	JINCHUANG	GSP-8A	GTS642	April 19, 2023	April 18, 2024
7	Absorbing clamp	Elektronik-Feinmechanik	MDS21	GTS229	April 14, 2023	April 13, 2024
8	ISN	SCHWARZBECK	NTFM 8158	GTS565	April 14, 2023	April 13, 2024
9	High voltage probe	SCHWARZBECK	TK9420	GTS537	April 14, 2023	April 13, 2024
10	Antenna end assembly	Weinschel	1870A	GTS560	April 14, 2023	April 13, 2024

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	April 14, 2023	April 13, 2024
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April 14, 2023	April 13, 2024
3	PSA Series Spectrum Analyzer	Agilent	E4440A	GTS536	April 14, 2023	April 13, 2024
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	April 14, 2023	April 13, 2024
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	April 14, 2023	April 13, 2024
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	April 14, 2023	April 13, 2024
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	April 14, 2023	April 13, 2024
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	April 14, 2023	April 13, 2024
9	Thermo meter	JINCHUANG	GSP-8A	GTS641	April 19, 2023	April 18, 2024
10	EXA Signal Analyzer	Keysight	N9010B	MY60241168	Nov. 04, 2022	Nov. 03, 2023

General used equipment:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Barometer	KUMAO	SF132	GTS647	April 19, 2023	April 18, 2024

7 Test results and Measurement Data

7.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203
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.	
E.U.T Antenna:	
The antenna is integral antenna, reference to the appendix II for details	

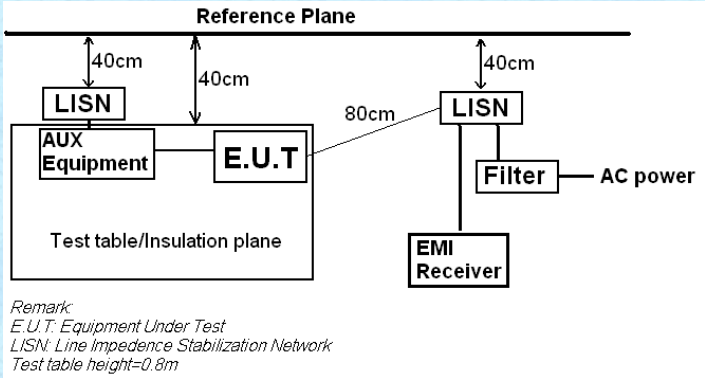
7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10:2013
Test Frequency Range:	150KHz to 30MHz
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto
Limit:	

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

* Decreases with the logarithm of the frequency.

Test setup:



Test procedure:

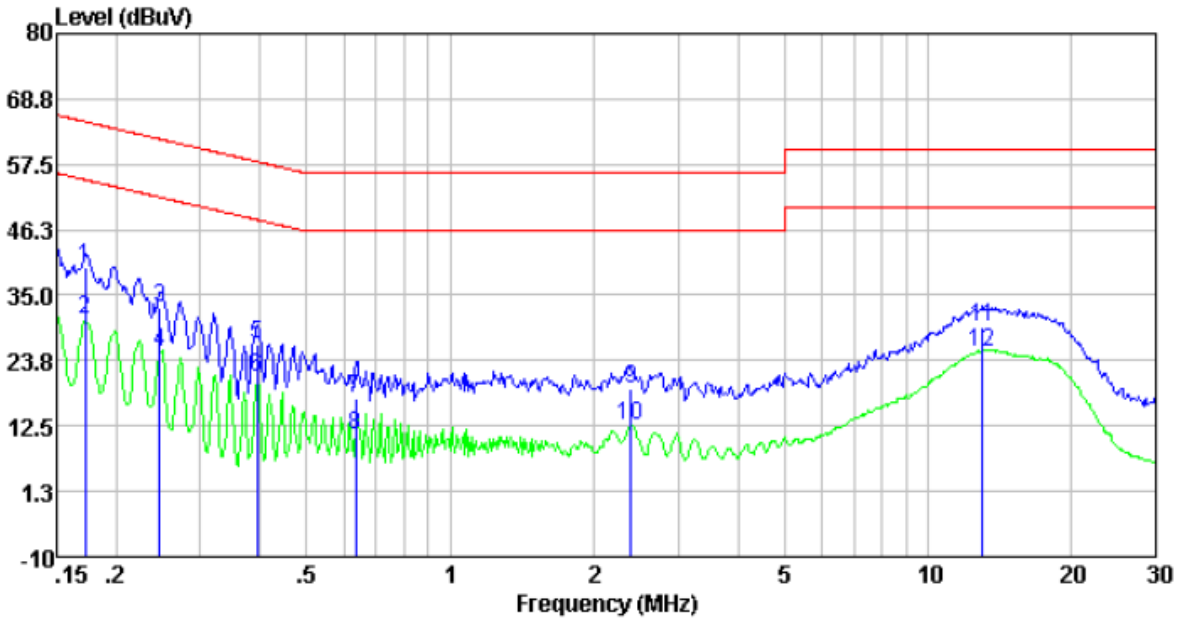
1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.
2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling 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					

Measurement data

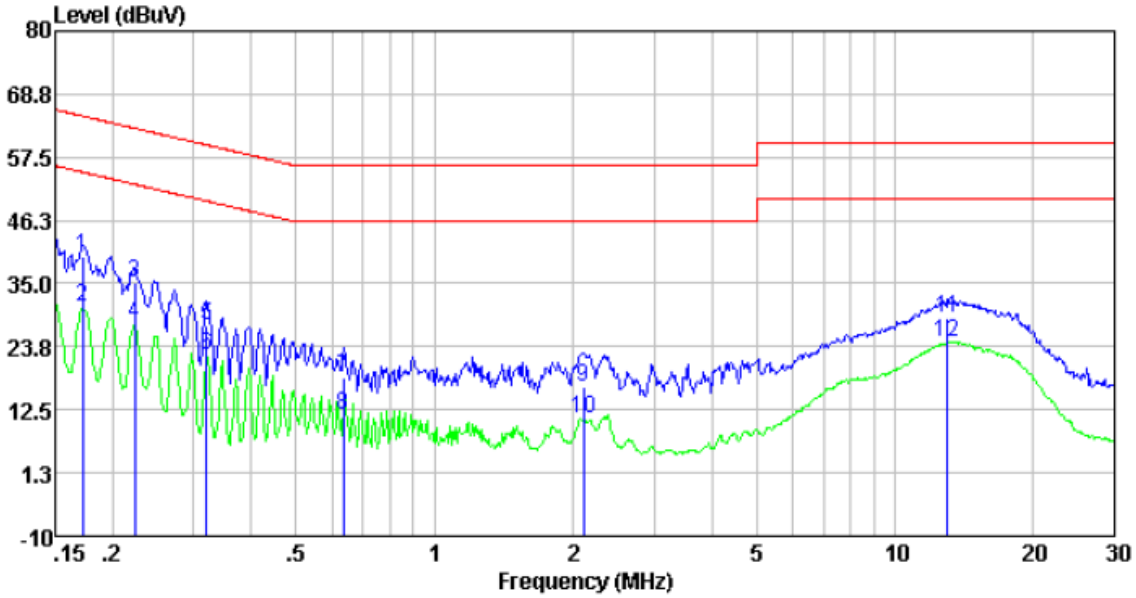
Pre-scan all test modes, found worst case at 802.11ac(VHT20) 5745MHz@Ant 1, and so only show the test result of it.

Line:



Freq	Reading level	LISN/ISN factor	Cable loss	Level	Limit level	Over limit	Remark
MHz	dBuV	dB	dB	dBuV	dBuV	dB	
0.17	30.13	9.54	0.01	39.68	64.86	-25.18	QP
0.17	21.14	9.54	0.01	30.69	54.86	-24.17	Average
0.25	23.39	9.50	0.01	32.90	61.86	-28.96	QP
0.25	15.76	9.50	0.01	25.27	51.86	-26.59	Average
0.39	17.07	9.49	0.01	26.57	57.99	-31.42	QP
0.39	11.37	9.49	0.01	20.87	47.99	-27.12	Average
0.63	7.82	9.50	0.02	17.34	56.00	-38.66	QP
0.63	1.45	9.50	0.02	10.97	46.00	-35.03	Average
2.38	9.40	9.58	0.05	19.03	56.00	-36.97	QP
2.38	3.11	9.58	0.05	12.74	46.00	-33.26	Average
12.99	20.04	9.48	0.14	29.66	60.00	-30.34	QP
12.99	15.64	9.48	0.14	25.26	50.00	-24.74	Average

Neutral:



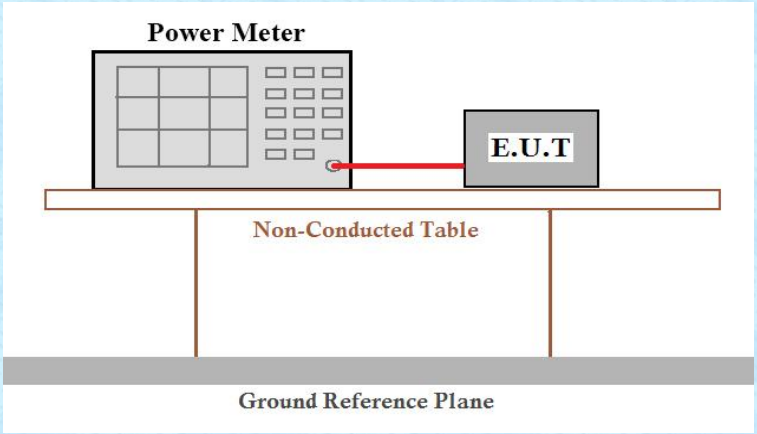
Freq	Reading level	LISN/ISN factor	Cable loss	Level	Limit level	Over limit	Remark
MHz	dBuV	dB	dB	dBuV	dBuV	dB	
0.17	30.13	9.55	0.01	39.69	64.86	-25.17	QP
0.17	21.25	9.55	0.01	30.81	54.86	-24.05	Average
0.22	25.67	9.56	0.01	35.24	62.70	-27.46	QP
0.22	18.13	9.56	0.01	27.70	52.70	-25.00	Average
0.32	18.05	9.56	0.01	27.62	59.71	-32.09	QP
0.32	12.63	9.56	0.01	22.20	49.71	-27.51	Average
0.63	8.49	9.56	0.02	18.07	56.00	-37.93	QP
0.63	1.92	9.56	0.02	11.50	46.00	-34.50	Average
2.11	7.07	9.55	0.05	16.67	56.00	-39.33	QP
2.11	1.21	9.55	0.05	10.81	46.00	-35.19	Average
12.99	18.97	9.61	0.14	28.72	60.00	-31.28	QP
12.99	14.70	9.61	0.14	24.45	50.00	-25.55	Average

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

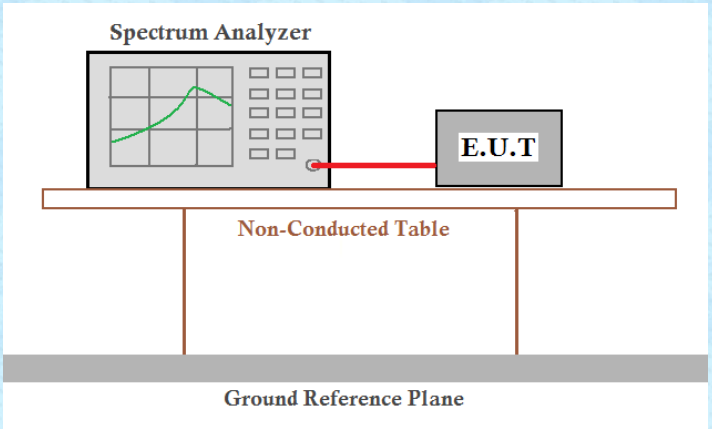
4. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

7.3 Maximum Conducted 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
Duty Cycle set up:	RBW=VBW=8MHz
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

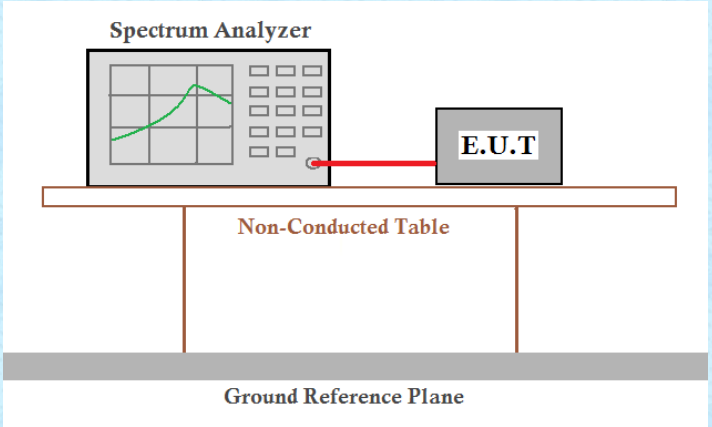
Measurement Data: The detailed test data see Appendix.

7.4 Channel Bandwidth and 99% Occupied 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: The detailed test data see Appendix.

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

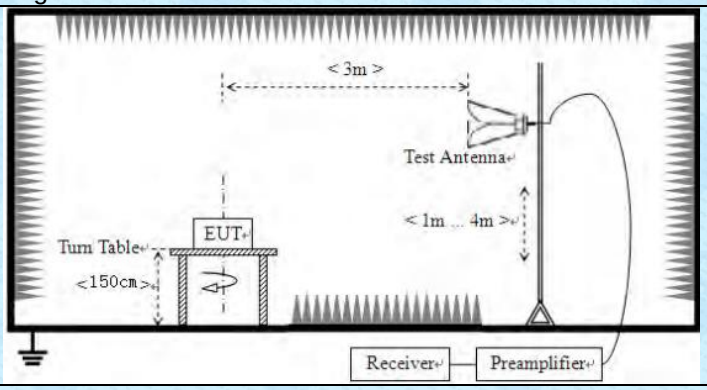
Measurement Data: The detailed test data see Appendix.

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. *All antennas were tested and passed, only an1 report*
5. *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[dBuV/m] = EIRP[dBm] + 95.2;

   E[dBuV/m] = -27 + 95.2 = 68.2dBuV/m.

   E[dBuV/m] = 10 + 95.2 = 105.2dBuV/m.

   E[dBuV/m] = 15.6 + 95.2 = 110.8dBuV/m.

   E[dBuV/m] = 27 + 95.2 = 122.2dBuV/m

Measurement data:

All antennas have test, only the worst case ANT 1 report.

IEEE 802.11a								
Peak value:								
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	34.54	32.36	9.72	23.83	52.79	68.20	-15.41	Horizontal
5700	32.48	32.5	9.79	23.84	50.93	105.20	-54.27	Horizontal
5720	28.65	32.53	9.81	23.85	47.14	110.80	-63.66	Horizontal
5725	32.16	32.53	9.83	23.86	50.66	122.20	-71.54	Horizontal
5850	33.61	32.7	9.99	23.87	52.43	122.20	-69.77	Horizontal
5855	29.99	32.72	9.99	23.88	48.82	110.80	-61.98	Horizontal
5875	32.63	32.74	10.04	23.89	51.52	105.20	-53.68	Horizontal
5925	30.34	32.8	10.11	23.9	49.35	68.20	-18.85	Horizontal
5650	30.86	32.36	9.72	23.83	49.11	68.20	-19.09	Vertical
5700	27.48	32.5	9.79	23.84	45.93	105.20	-59.27	Vertical
5720	31.02	32.53	9.81	23.85	49.51	110.80	-61.29	Vertical
5725	32.04	32.53	9.83	23.86	50.54	122.20	-71.66	Vertical
5850	28.48	32.7	9.99	23.87	47.30	122.20	-74.90	Vertical
5855	33.37	32.72	9.99	23.88	52.20	110.80	-58.60	Vertical
5875	29.47	32.74	10.04	23.89	48.36	105.20	-56.84	Vertical
5925	30.99	32.8	10.11	23.9	50.00	68.20	-18.20	Vertical

IEEE 802.11n HT20								
Peak value:								
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	28.71	32.36	9.72	23.83	46.96	68.20	-21.24	Horizontal
5700	27.68	32.5	9.79	23.84	46.13	105.20	-59.07	Horizontal
5720	29.00	32.53	9.81	23.85	47.49	110.80	-63.31	Horizontal
5725	29.79	32.53	9.83	23.86	48.29	122.20	-73.91	Horizontal
5850	34.13	32.7	9.99	23.87	52.95	122.20	-69.25	Horizontal
5855	30.22	32.72	9.99	23.88	49.05	110.80	-61.75	Horizontal
5875	33.58	32.74	10.04	23.89	52.47	105.20	-52.73	Horizontal
5925	33.42	32.8	10.11	23.9	52.43	68.20	-15.77	Horizontal
5650	33.06	32.36	9.72	23.83	51.31	68.20	-16.89	Vertical
5700	32.45	32.5	9.79	23.84	50.90	105.20	-54.30	Vertical
5720	32.88	32.53	9.81	23.85	51.37	110.80	-59.43	Vertical
5725	30.54	32.53	9.83	23.86	49.04	122.20	-73.16	Vertical
5850	32.35	32.7	9.99	23.87	51.17	122.20	-71.03	Vertical
5855	33.56	32.72	9.99	23.88	52.39	110.80	-58.41	Vertical
5875	28.27	32.74	10.04	23.89	47.16	105.20	-58.04	Vertical
5925	34.45	32.8	10.11	23.9	53.46	68.20	-14.74	Vertical

IEEE 802.11ac HT20								
Peak value:								
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	31.51	32.36	9.72	23.83	49.76	68.20	-18.44	Horizontal
5700	31.45	32.5	9.79	23.84	49.90	105.20	-55.30	Horizontal
5720	32.93	32.53	9.81	23.85	51.42	110.80	-59.38	Horizontal
5725	32.80	32.53	9.83	23.86	51.30	122.20	-70.90	Horizontal
5850	31.77	32.7	9.99	23.87	50.59	122.20	-71.61	Horizontal
5855	32.63	32.72	9.99	23.88	51.46	110.80	-59.34	Horizontal
5875	32.79	32.74	10.04	23.89	51.68	105.20	-53.52	Horizontal
5925	31.87	32.8	10.11	23.9	50.88	68.20	-17.32	Horizontal
5650	29.80	32.36	9.72	23.83	48.05	68.20	-20.15	Vertical
5700	28.05	32.5	9.79	23.84	46.50	105.20	-58.70	Vertical
5720	29.19	32.53	9.81	23.85	47.68	110.80	-63.12	Vertical
5725	32.52	32.53	9.83	23.86	51.02	122.20	-71.18	Vertical
5850	28.24	32.7	9.99	23.87	47.06	122.20	-75.14	Vertical
5855	28.44	32.72	9.99	23.88	47.27	110.80	-63.53	Vertical
5875	31.96	32.74	10.04	23.89	50.85	105.20	-54.35	Vertical
5925	31.68	32.8	10.11	23.9	50.69	68.20	-17.51	Vertical

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
Note: For Duty cycle ≥ 98%, average detector set as above For Duty cycle < 98%, average detector set as below: VBW ≥ 1 / T				

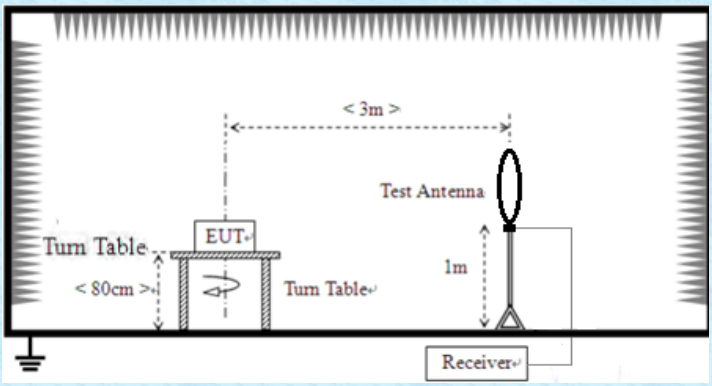
Limit:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

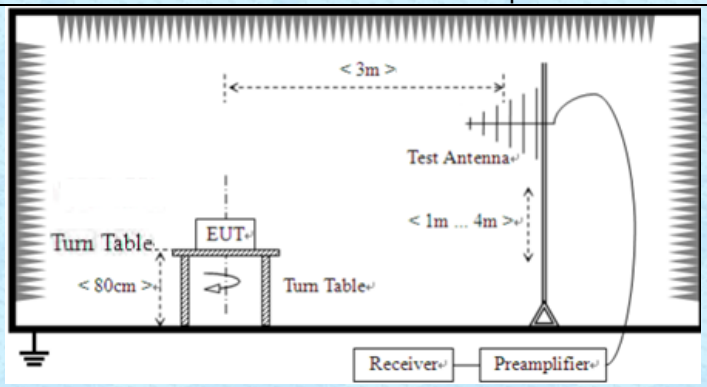
The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

Test setup:

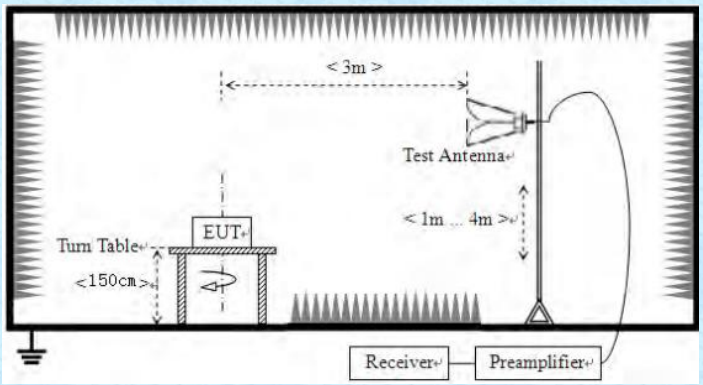
For radiated emissions from 9kHz to 30MHz



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.*

Measurement Data:

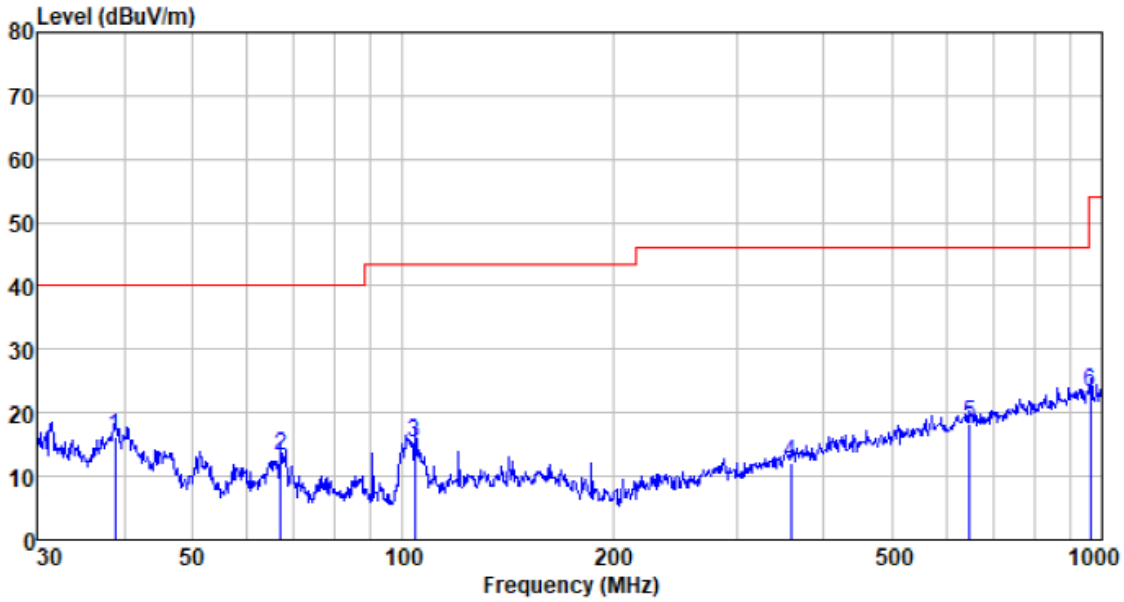
9 kHz ~ 30 MHz

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

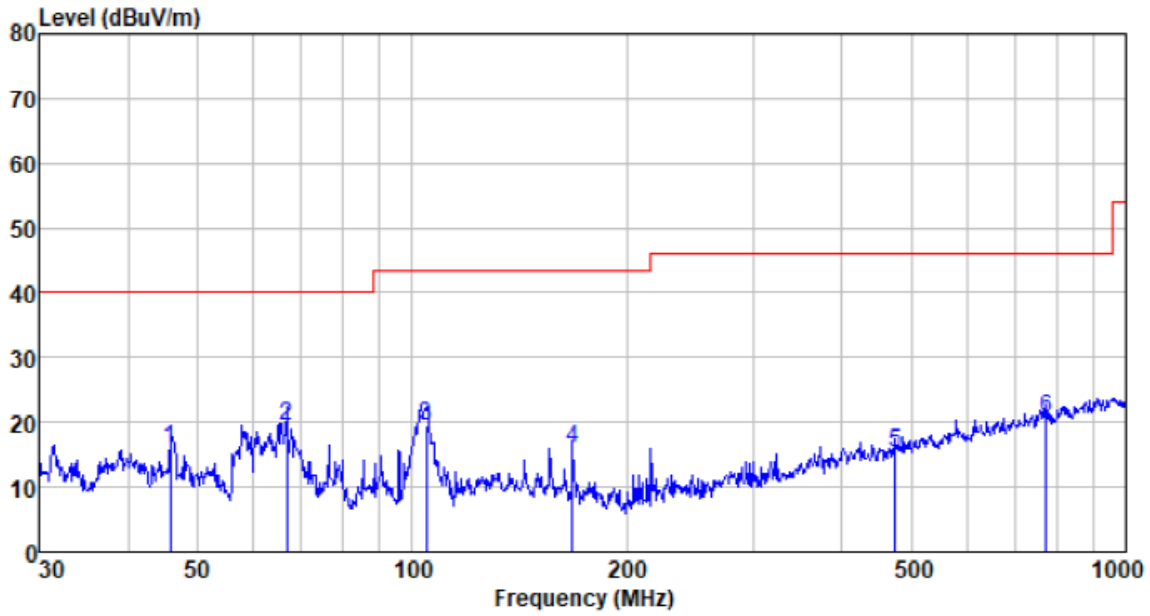
Pre-scan all test modes, found worst case at 802.11ac(VHT20) 5745MHz@Ant 1, and so only show the test result of it.

Horizontal:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
38.752	32.35	13.31	0.65	30.00	16.31	40.00	-23.69	QP
66.967	31.23	11.10	0.92	30.00	13.25	40.00	-26.75	QP
104.170	34.00	10.04	1.23	30.00	15.27	43.50	-28.23	QP
359.186	24.98	14.47	2.67	30.00	12.12	46.00	-33.88	QP
647.386	24.36	20.04	3.91	30.00	18.31	46.00	-27.69	QP
962.162	23.77	24.41	5.09	30.00	23.27	54.00	-30.73	QP

Vertical:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
45.855	32.03	13.32	0.73	30.00	16.08	40.00	-23.92	QP
66.733	37.37	11.15	0.91	30.00	19.43	40.00	-20.57	QP
104.536	38.26	10.06	1.23	30.00	19.55	43.50	-23.95	QP
167.824	32.68	11.67	1.67	30.00	16.02	43.50	-27.48	QP
475.499	24.97	17.17	3.21	30.00	15.35	46.00	-30.65	QP
774.158	24.18	22.23	4.36	30.00	20.77	46.00	-25.23	QP

Above 1GHz:

All antennas have test, only the worst case ANT 1 report.

802.11a					Test Frequency: 5745MHz			
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
11490	28.60	39.40	8.73	36.30	40.43	68.20	-27.77	Horizontal
17235	29.15	41.00	11.37	36.28	45.24	68.20	-22.96	Horizontal
11490	30.05	39.40	8.73	36.30	41.88	68.20	-26.32	Vertical
17235	29.05	41.00	11.37	36.28	45.14	68.20	-23.06	Vertical

802.11a					Test Frequency: 5785MHz			
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
11570	27.70	39.28	8.77	36.29	39.46	68.20	-28.74	Horizontal
17355	31.28	41.52	11.48	36.26	48.02	68.20	-20.18	Horizontal
11570	32.13	39.28	8.77	36.29	43.89	68.20	-24.31	Vertical
17355	26.39	41.52	11.48	36.26	43.13	68.20	-25.07	Vertical

802.11a					Test Frequency: 5825MHz			
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
11650	31.32	39.16	8.79	36.27	42.67	68.20	-25.53	Horizontal
17475	27.17	42.30	11.58	36.25	44.20	68.20	-24	Horizontal
11650	30.18	39.16	8.79	36.27	41.46	68.20	-26.74	Vertical
17475	26.71	42.30	11.58	36.25	44.04	68.20	-24.16	Vertical

802.11n(HT20)					Test Frequency: 5745MHz			
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
11490	33.11	39.40	8.73	36.30	44.32	68.20	-23.88	Horizontal
17235	30.12	41.00	11.37	36.28	45.82	68.20	-22.38	Horizontal
11490	27.66	39.40	8.73	36.30	39.21	68.20	-28.99	Vertical
17235	31.43	41.00	11.37	36.28	46.99	68.20	-21.21	Vertical

802.11n(HT20)					Test Frequency: 5785MHz			
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
11570	32.91	39.28	8.77	36.29	45.33	68.20	-22.87	Horizontal
17355	30.30	41.52	11.48	36.26	46.78	68.20	-21.42	Horizontal
11570	32.94	39.28	8.77	36.29	45.13	68.20	-23.07	Vertical
17355	26.38	41.52	11.48	36.26	42.74	68.20	-25.46	Vertical

802.11n(HT20)					Test Frequency: 5825MHz			
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
11650	33.15	39.16	8.79	36.27	44.56	68.20	-23.64	Horizontal
17475	30.80	42.30	11.58	36.25	47.94	68.20	-20.26	Horizontal
11650	30.64	39.16	8.79	36.27	41.99	68.20	-26.21	Vertical
17475	30.12	42.30	11.58	36.25	47.50	68.20	-20.7	Vertical

802.11ac(HT20)					Test Frequency: 5745MHz			
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
11490	30.79	39.40	8.73	36.30	42.35	68.20	-25.85	Horizontal
17235	28.07	41.00	11.37	36.28	43.67	68.20	-24.53	Horizontal
11490	30.15	39.40	8.73	36.30	41.65	68.20	-26.55	Vertical
17235	30.86	41.00	11.37	36.28	46.70	68.20	-21.5	Vertical

802.11ac(HT20)					Test Frequency: 5785MHz			
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
11570	30.39	39.28	8.77	36.29	41.90	68.20	-26.3	Horizontal
17355	28.33	41.52	11.48	36.26	44.45	68.20	-23.75	Horizontal
11570	27.99	39.28	8.77	36.29	39.36	68.20	-28.84	Vertical
17355	31.03	41.52	11.48	36.26	47.52	68.20	-20.68	Vertical

802.11ac(HT20)					Test Frequency: 5825MHz			
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
11650	31.17	39.16	8.79	36.27	42.74	68.20	-25.46	Horizontal
17475	29.01	42.30	11.58	36.25	46.57	68.20	-21.63	Horizontal
11650	27.78	39.16	8.79	36.27	39.41	68.20	-28.79	Vertical
17475	25.94	42.30	11.58	36.25	43.48	68.20	-24.72	Vertical

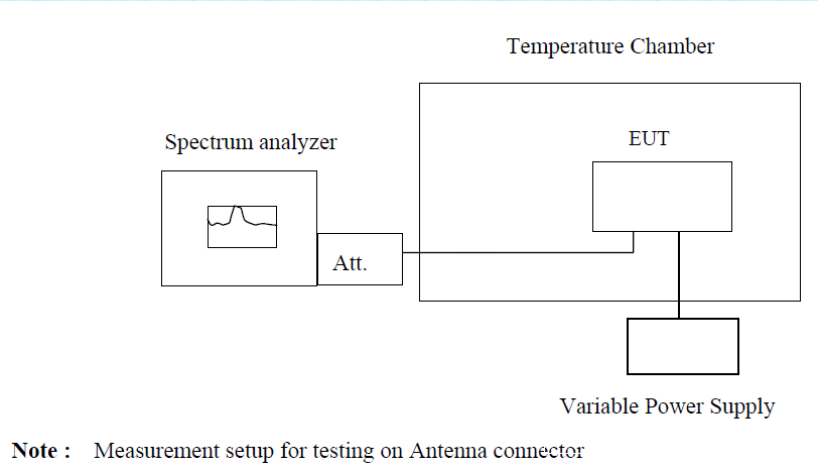
Notes:

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. If the test result on peak is lower than the limit more than 20dB, 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:	
Test Instruments:	Refer to section 6 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data:

All were test, only the ANT 1 test result recorded in the report.

Test Condition	Test Mode	Test Frequency [MHz]	Ant	Result [ppm]	Limit [ppm]	Verdict
NTNV	Carrier	5745	1	-2.34	<=20	PASS
		5755	1	-3.54	<=20	PASS
		5775	1	-3.26	<=20	PASS
		5785	1	-3.54	<=20	PASS
		5795	1	-3.26	<=20	PASS
		5825	1	-3.41	<=20	PASS
		5745	2	-3.52	<=20	PASS
		5755	2	-3.67	<=20	PASS
		5775	2	-3.43	<=20	PASS
		5785	2	-3.26	<=20	PASS
		5795	2	-3.43	<=20	PASS
		5825	2	-3.26	<=20	PASS

8 Test Setup Photo

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

9 EUT Constructional Details

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

------END------