TEST REPORT

Applicant:	Autel Robotics Co., Ltd.
Address of Applicant:	9th Floor, Bldg.B1, Zhiyuan, 1001 Xueyuan Rd. Xili, Nanshan, Shenzhen, China
Manufacturer/Factory:	Autel Robotics Co., Ltd.
Address of Manufacturer/Factory:	9th Floor, Bldg.B1, Zhiyuan, 1001 Xueyuan Rd. Xili, Nanshan, Shenzhen, China
Equipment Under Test (EUT)	
Product Name:	Dragon Fish Mobile Station
Model No.:	DFMS-1
Trade Mark:	AUTEL
FCC ID:	2AGNTDFMS2409A
Applicable standards:	FCC CFR Title 47 Part 15 Subpart E Section 15.407
Date of sample receipt:	Sep. 10, 2020
Date of Test:	Sep. 10 –Nov. 23, 2020
Date of report issue:	Nov. 24, 2020
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	*Nov. 24, 2020*	*Original*

Prepared By: ***Date:*** *Nov. 24, 2020*

Project Engineer

Check By: ***Date:*** *Nov. 24, 2020*

Reviewer

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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
Peak Transmit Power	15.407(a)(1)	PASS
Power Spectral Density	15.407(a)(1)	PASS
Undesirable Emission	15.407(b)(6), 15.205/15.209	PASS
Radiated Emission	15.205/15.209	PASS
Band Edge	15.407(b)(1)	PASS
Frequency Stability	15.407(g)	PASS

Remark:

Pass: The EUT complies with the essential requirements in the standard.

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

<table>
<tr><td>Product Name:</td><td>Dragon Fish Mobile Station</td></tr>
<tr><td>Model No.:</td><td>DFMS-1</td></tr>
<tr><td>Serial No.:</td><td>N/A</td></tr>
<tr><td>Hardware Version:</td><td>V202010</td></tr>
<tr><td>Software Version:</td><td>V202010</td></tr>
<tr><td>Test sample(s) ID:</td><td>GTS202010000052-01</td></tr>
<tr><td>Sample(s) Status:</td><td>Engineer sample</td></tr>
<tr><td>Operation Frequency:</td><td><table>
<tr><th>Band</th><th>Mode</th><th>Frequency Range(MHz)</th><th>Number of channels</th></tr>
<tr><td rowspan="2">U-NII Band I</td><td>IEEE 802.11a</td><td>5180-5240</td><td>4</td></tr>
<tr><td>IEEE 802.11n(HT20)</td><td>5180-5240</td><td>4</td></tr>
</table></td></tr>
<tr><td>Modulation technology:</td><td>OFDM:802.11a/n(HT20)</td></tr>
<tr><td>Antenna Type:</td><td>FPC Antenna</td></tr>
<tr><td>Antenna gain:</td><td>4.2dBi</td></tr>
<tr><td>Power supply:</td><td>DC 11.55V, 4950mAh rechargeable battery</td></tr>
<tr><td>Adapter Information:</td><td>Model:GaN-001
Input: AC100-240V,50/60Hz
USB –C1/C2 output: DC 5V, 3A/ DC 9V, 3A/ DC 12V, 3A/ DC 15V, 3A/ DC 20V, 3.25A
USB-A output: DC 3.4-5.5V, 5A/ DC 5V, 3A/ DC 9V, 3A/ DC 12V, 3A/ DC 20V, 3A</td></tr>
</table>

Channel list for 802.11a/n/ac(HT20)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180MHz	40	5200MHz	44	5220MHz	48	5240MHz

5.2 Test mode

Transmitting mode	Keep the EUT in transmitting with modulation..

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.

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:

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

Mode	Data rate
802.11a/n(HT20)	6/6.5 Mbps

5.3 Test Facility

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

● **FCC —Registration No.: 381383**

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. Registration 381383.

● **IC —Registration No.: 9079A**

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 with Registration No.: 9079A

● **NVLAP (LAB CODE:600179-0)**

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). LAB CODE:600179-0

5.4 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, sBaoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480

Fax: 0755-27798960

5.5 Description of Support Units

None.

5.6 Deviation from Standards

None.

5.7 Abnormalities from Standard Conditions

None.

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. 25 2020	June. 24 2021
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 25 2020	June. 24 2021
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 25 2020	June. 24 2021
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 25 2020	June. 24 2021
7	Broadband Horn Antenna	SCHWARZBECK	BBHA9170	GTS579	June. 25 2020	June. 24 2021
8	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
9	Coaxial Cable	GTS	N/A	GTS213	June. 25 2020	June. 24 2021
10	Coaxial Cable	GTS	N/A	GTS211	June. 25 2020	June. 24 2021
11	Coaxial cable	GTS	N/A	GTS210	June. 25 2020	June. 24 2021
12	Coaxial Cable	GTS	N/A	GTS212	June. 25 2020	June. 24 2021
13	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 25 2020	June. 24 2021
14	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 25 2020	June. 24 2021
15	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 25 2020	June. 24 2021
16	Band filter	Amindeon	82346	GTS219	June. 25 2020	June. 24 2021
17	Power Meter	Anritsu	ML2495A	GTS540	June. 25 2020	June. 24 2021
18	Power Sensor	Anritsu	MA2411B	GTS541	June. 25 2020	June. 24 2021
19	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 25 2020	June. 24 2021
20	Splitter	Agilent	11636B	GTS237	June. 25 2020	June. 24 2021
21	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 25 2020	June. 24 2021
22	Breitband hornantenne	SCHWARZBECK	BBHA 9170	GTS579	Oct. 18 2020	Oct. 17 2021
23	Amplifier	TDK	PA-02-02	GTS574	Oct. 18 2020	Oct. 17 2021
24	Amplifier	TDK	PA-02-03	GTS576	Oct. 18 2020	Oct. 17 2021
25	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June. 25 2020	June. 24 2021

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. 25 2020	June. 24 2021
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June. 25 2020	June. 24 2021
4	ENV216 2-L-V-NETZNACHB.DE	ROHDE&SCHWARZ	ENV216	GTS226	June. 25 2020	June. 24 2021
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. 25 2020	June. 24 2021
8	Absorbing clamp	Elektronik-Feinmechanik	MDS21	GTS229	June. 25 2020	June. 24 2021
9	ISN	SCHWARZBECK	NTFM 8158	GTD565	June. 25 2020	June. 24 2021

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. 25 2020	June. 24 2021
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 25 2020	June. 24 2021
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 25 2020	June. 24 2021
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 25 2020	June. 24 2021
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 25 2020	June. 24 2021
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 25 2020	June. 24 2021
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 25 2020	June. 24 2021
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 25 2020	June. 24 2021

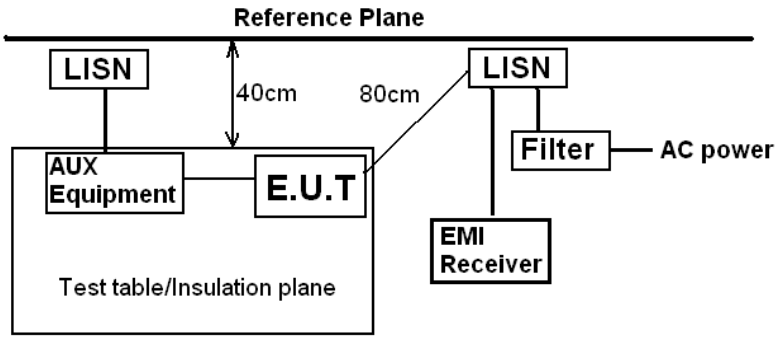
General used equipment:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 25 2020	June. 24 2021
2	Barometer	ChangChun	DYM3	GTS255	June. 25 2020	June. 24 2021

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 FPC antenna, the best case gain is 4.2dBi, reference to the appendix II for details	

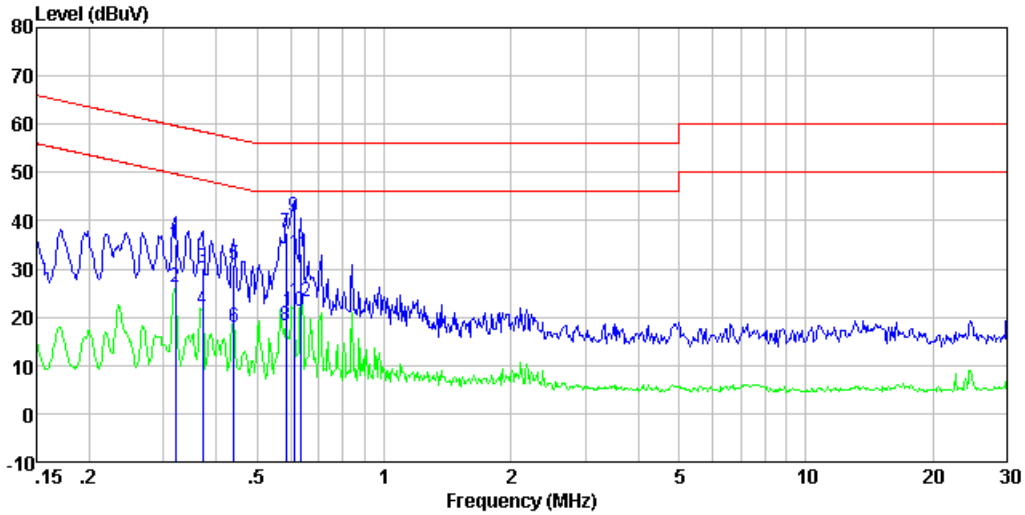
7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10:2013
Test Frequency Range:	150KHz to 30MHz
Class / Severity:	Class B
Receiver setup:	RBW=9KHz, VBW=30KHz
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 procedure	The E.U.T and simulators are connected to the main power through a line impedance stabilization network(L.I.S.N.). The provide a 50ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs). 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 setup:	 *Remark:* *E.U.T: Equipment Under Test* *LISN: Line Impedence Stabilization Network* *Test table height=0.8m*
Test Instruments:	Refer to section 5.10 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 have been tested to show only the worst low voltage test data.

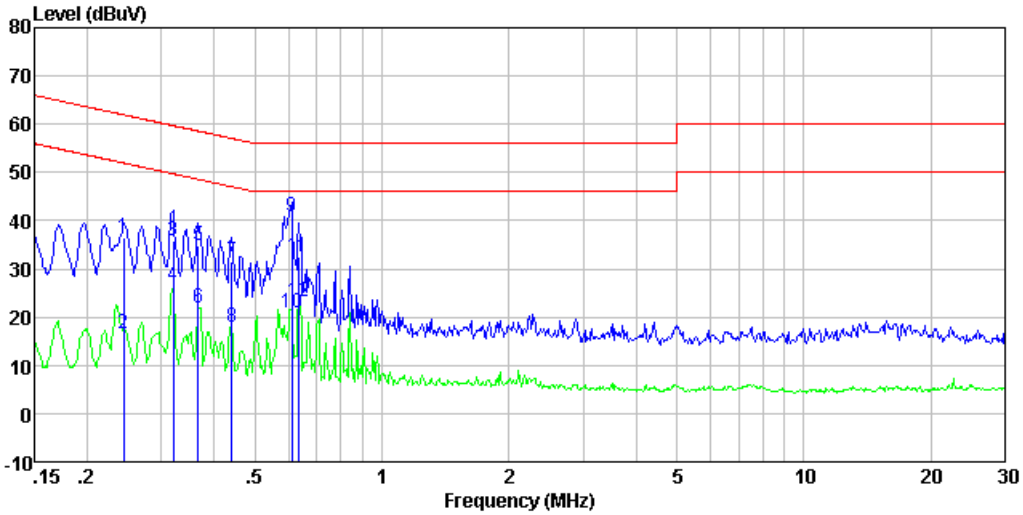
Measurement data:

Line:



Freq MHz	Reading level dBuV	LISN/ISN factor dB/m	Cable loss dB	Level dBuV	Limit level dBuV	Over limit dB	Remark
0.32	14.51	20.39	0.10	35.00	59.71	-24.71	QP
0.32	5.72	20.39	0.10	26.21	49.71	-23.50	Average
0.37	9.81	20.36	0.10	30.27	58.47	-28.20	QP
0.37	0.97	20.36	0.10	21.43	48.47	-27.04	Average
0.44	10.52	20.34	0.11	30.97	57.07	-26.10	QP
0.44	-2.48	20.34	0.11	17.97	47.07	-29.10	Average
0.59	16.96	20.29	0.12	37.37	56.00	-18.63	QP
0.59	-2.16	20.29	0.12	18.25	46.00	-27.75	Average
0.61	20.49	20.28	0.12	40.89	56.00	-15.11	QP
0.61	0.92	20.28	0.12	21.32	46.00	-24.68	Average
0.63	12.64	20.28	0.12	33.04	56.00	-22.96	QP
0.63	2.80	20.28	0.12	23.20	46.00	-22.80	Average

Neutral:

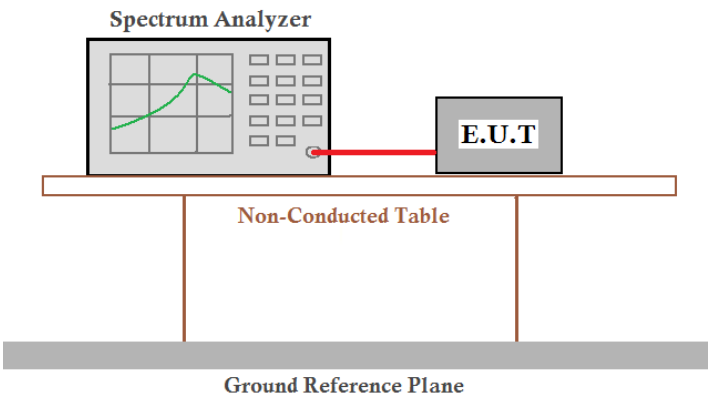


Freq MHz	Reading level dBuV	LISN/ISN factor dB/m	Cable loss dB	Level dBuV	Limit level dBuV	Over limit dB	Remark
0.24	15.91	20.40	0.11	36.42	61.95	-25.53	QP
0.24	-3.90	20.40	0.11	16.61	51.95	-35.34	Average
0.32	15.41	20.39	0.10	35.90	59.71	-23.81	QP
0.32	5.91	20.39	0.10	26.40	49.71	-23.31	Average
0.37	14.36	20.37	0.10	34.83	58.56	-23.73	QP
0.37	1.52	20.37	0.10	21.99	48.56	-26.57	Average
0.44	11.22	20.34	0.11	31.67	57.07	-25.40	QP
0.44	-2.54	20.34	0.11	17.91	47.07	-29.16	Average
0.61	20.38	20.28	0.12	40.78	56.00	-15.22	QP
0.61	0.39	20.28	0.12	20.79	46.00	-25.21	Average
0.63	12.15	20.28	0.12	32.55	56.00	-23.45	QP
0.63	2.93	20.28	0.12	23.33	46.00	-22.67	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*

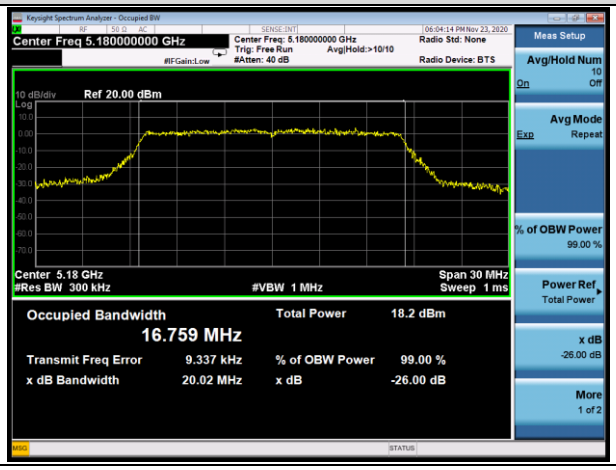
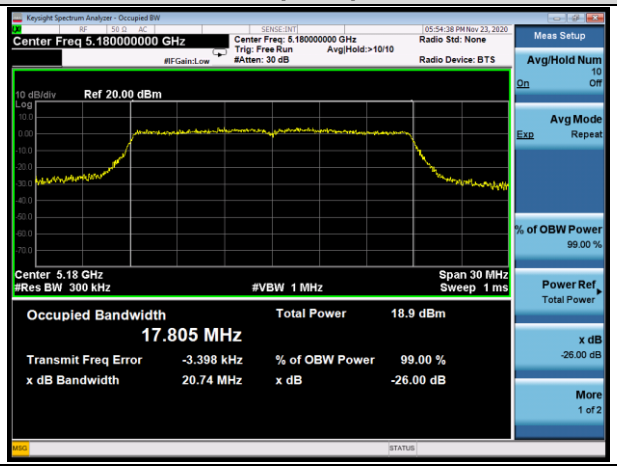
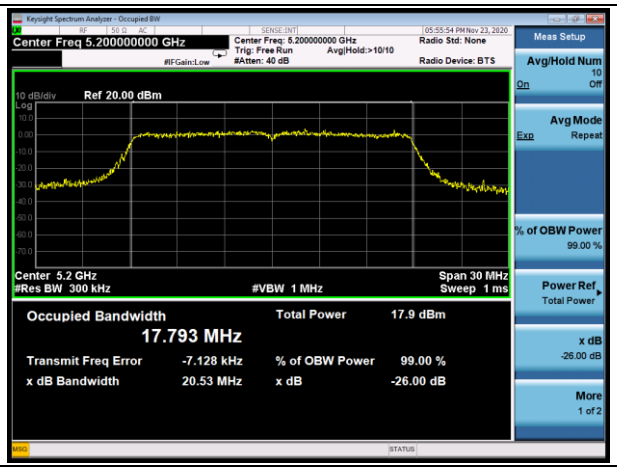
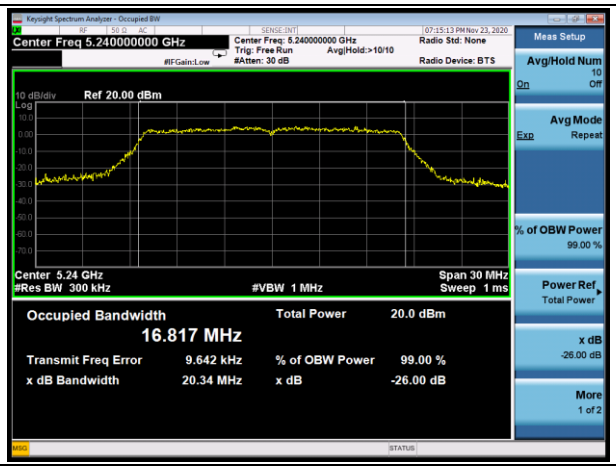
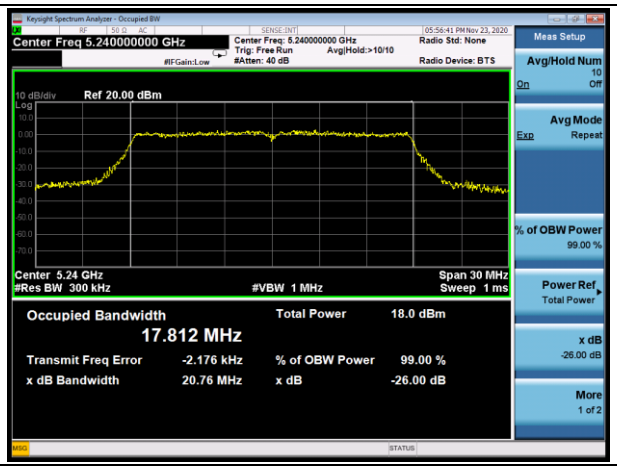
7.3 Emission Bandwidth and 99% Occupied Bandwidth

Test Requirement:	FCC Part15 E Section 15.407
Test Method:	KDB 789033 D02 General U-NII Test Procedures New Rules v02r01
Limit:	N/A
Test setup:	
Test procedure:	According to KDB 789033 D02 General U-NII Test Procedures New Rules v02r01.
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

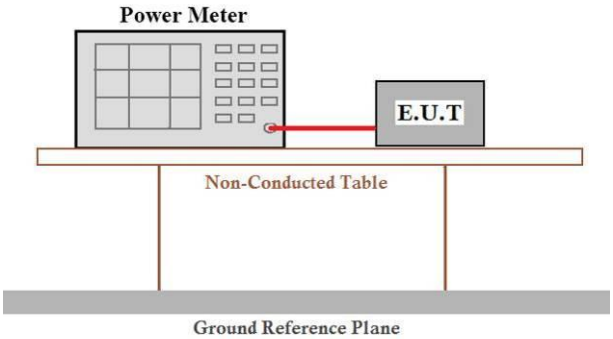
Measurement Data:

CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Occupied Bandwidth (MHz)	
		802.11a	802.11n(HT20)	802.11a	802.11n(HT20)
36	5180	16.759	17.805	20.02	20.84
40	5200	16.818	17.793	20.39	20.53
48	5240	16.817	17.812	20.34	20.76

Test plots as followed:

802.11a mode	802.11n(HT20) mode
	
5180	**5180**
	
5200	**5200**
	
5240	**5240**

7.4 Peak Transmit Power

Test Requirement:	FCC Part15 E Section 15.407
Test Method:	KDB 789033 D02 General U-NII Test Procedures New Rules v02r01
Limit:	<table><tr><th>Frequency band (MHz)</th><th>Limit</th></tr><tr><td rowspan="2">5150-5250</td><td>≤1W(30dBm) for master device and outdoor AP, The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm)</td></tr><tr><td>≤250mW(23.98dBm) for client device</td></tr><tr><td>5250-5350</td><td>≤250mW(23.98dBm) for client device or 11dBm+10logB*</td></tr><tr><td>5470-5725</td><td>≤250mW(23.98dBm) for client device or 11dBm+10logB*</td></tr><tr><td colspan="2">Remark: *Where B is the 26dB emission bandwidth in MHz. The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.</td></tr></table>
Test setup:	
Test procedure:	**Measurement using an RF average power meter** (i) Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied a) The EUT is configured to transmit continuously or to transmit with a constant duty cycle. b) At all times when the EUT is transmitting, it must be transmitting at its maximum power control level. c) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five. (ii) If the transmitter does not transmit continuously, measure the duty cycle, x, of the transmitter output signal as described in section B). (iii) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter. (iv) Adjust the measurement in dBm by adding 10 log(1/x) where x is the duty cycle (e.g., 10log(1/0.25) if the duty cycle is 25 percent).
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.2 for details

Test results:	Pass

Measurement Data

Modulation	Duty cycle	Duty Factor
802.11a	98.8%	0.05
802.11n(HT20)	98.8%	0.05

802.11a mode						
CH No.	Frequency (MHz)	Measured Power (dBm)	Duty Factor	Output Power (dBm)	Limit (dBm)	Result
36	5180	20.84	0.05	20.89	30.00	Pass
40	5200	20.54	0.05	20.59	30.00	Pass
48	5240	20.13	0.05	20.18	30.00	Pass
802.11n(HT20) mode						
CH No.	Frequency (MHz)	Measured Power (dBm)	Duty Factor	Output Power (dBm)	Limit (dBm)	Result
36	5180	20.69	0.05	20.74	30.00	Pass
40	5200	20.12	0.05	20.17	30.00	Pass
48	5240	20.04	0.05	20.09	30.00	Pass

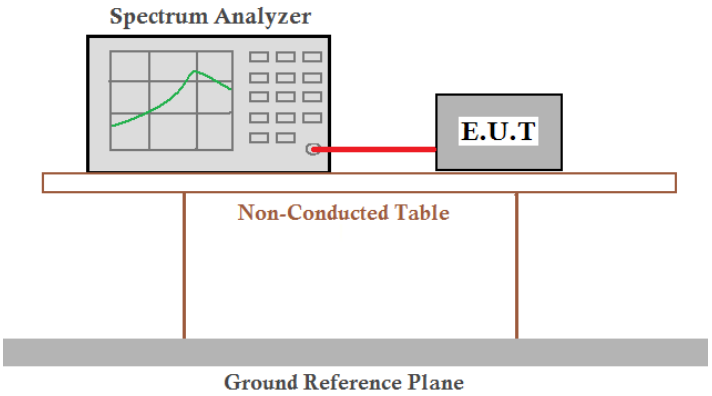
Note: Output Power = Measured Power + Duty Factor

Duty Factor = 10 log (1/Duty Cycle)

The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm)

Note: This test data refers to clause 7.7.

7.5 Power Spectral Density

Test Requirement:	FCC Part15 E Section 15.407
Test Method:	KDB 789033 D02 General U-NII Test Procedures New Rules v02r01
Limit:	<table><tr><th>Frequency band (MHz)</th><th>Limit</th></tr><tr><td rowspan="2">5150-5250</td><td>≤17dBm in 1MHz for master device and outdoor AP</td></tr><tr><td>≤11dBm in 1MHz for client device</td></tr><tr><td>5250-5350</td><td>≤11dBm in 1MHz for client device</td></tr><tr><td>5470-5725</td><td>≤11dBm in 1MHz for client device</td></tr><tr><td colspan="2">Remark: The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test.</td></tr></table>
Test setup:	
Test procedure:	1) Create an average power spectrum for the EUT operating mode being tested by following the instructions in section E)2) for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, “Compute power…”. 2) Use the peak search function on the instrument to find the peak of the spectrum. 3) Make the following adjustments to the peak value of the spectrum, if applicable: a) If Method SA-2 or SA-2 Alternative was used, add 10 log(1/x), where x is the duty cycle, to the peak of the spectrum. b) If Method SA-3 Alternative was used and the linear mode was used in step E)2)g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging. 4) The result is the PSD.
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

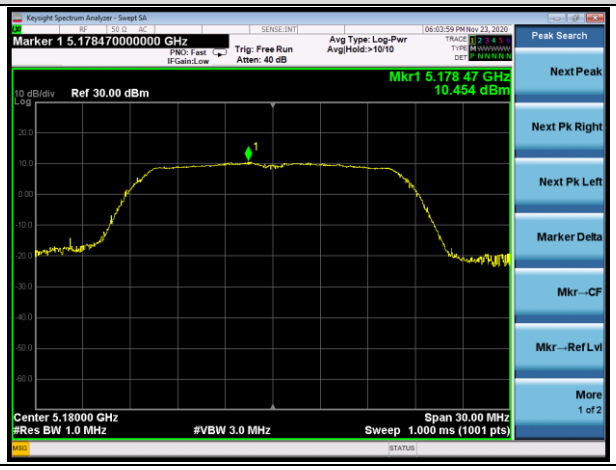
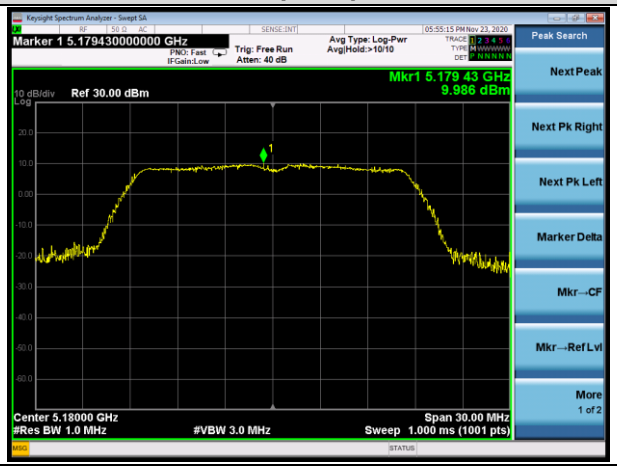
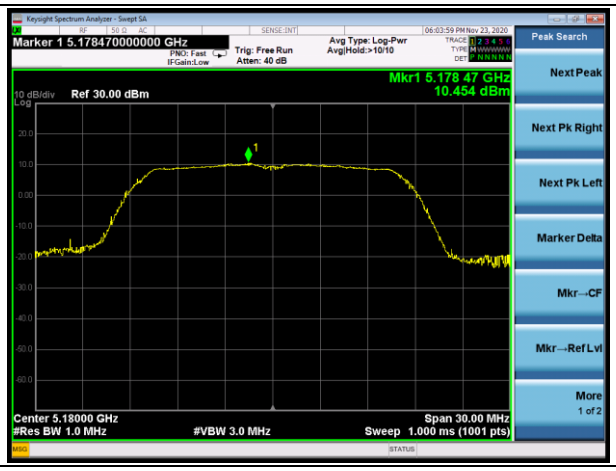
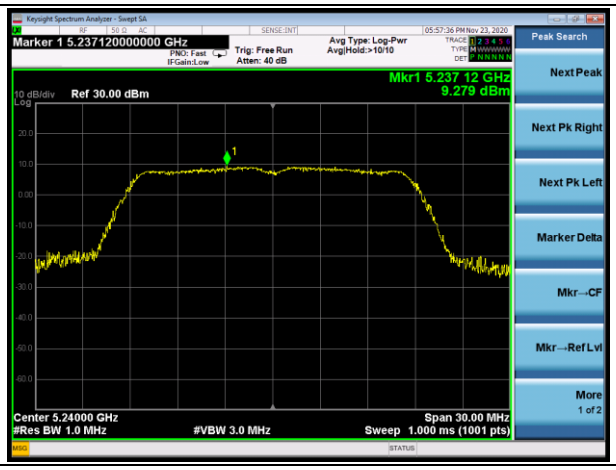
Modulation	Duty cycle	Duty Factor
802.11a	98.8%	0.05
802.11n(HT20)	98.8%	0.05

802.11a mode						
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD Power(dBm/MHz)	Limit (dBm/MHz)	Result
36	5180	10.454	0.05	10.504	17	Pass
40	5200	10.057	0.05	10.107	17	Pass
48	5240	9.279	0.05	9.329	17	Pass
802.11n(HT20) mode						
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD Power(dBm/MHz)	Limit (dBm/MHz)	Result
36	5180	9.986	0.05	10.036	17	Pass
40	5200	10.340	0.05	10.390	17	Pass
48	5240	9.866	0.05	9.916	17	Pass

Note: Output Power = Measured Power + Duty Factor

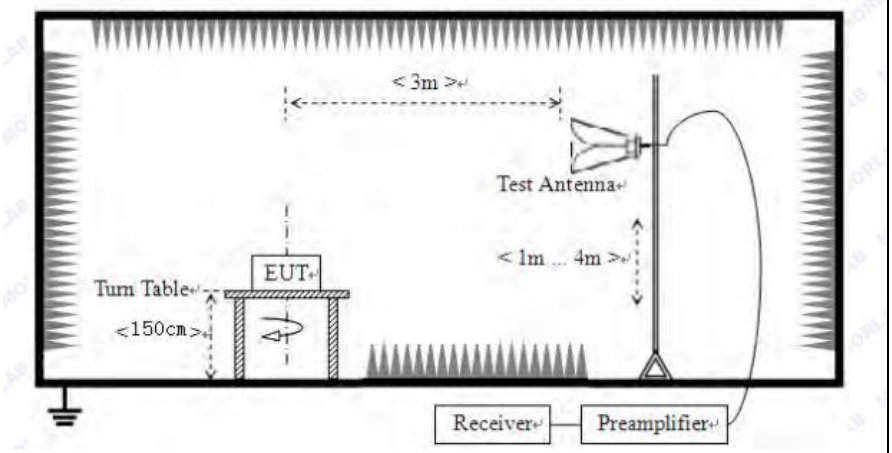
Duty Factor = 10 log (1/Duty Cycle)

Test plots as followed:

802.11a mode	802.11n(HT20) mode
	
5180	**5180**
	
5200	**5200**
	
5240	**5240**

7.6 Band Edge

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 E Section 15.407 and 5.205</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m (Semi-Anechoic Chamber)</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>100KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>AV</td><td>1MHz</td><td>3MHz</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr>
<tr><td>30MHz-88MHz</td><td>40.0</td><td>Quasi-peak Value</td></tr>
<tr><td>88MHz-216MHz</td><td>43.5</td><td>Quasi-peak Value</td></tr>
<tr><td>216MHz-960MHz</td><td>46.0</td><td>Quasi-peak Value</td></tr>
<tr><td>960MHz-1GHz</td><td>54.0</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>54.0</td><td>Average Value</td></tr>
<tr><td>68.2</td><td>Peak Value</td></tr>
</table>
Undesirable emission limits:
(1) For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.
(2) For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.
(3) For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of −27 dBm/MHz.
</td></tr>
<tr><td>Test Procedure:</td><td>
a. The EUT was placed on the top of a rotating table 1.5 m above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not
</td></tr>
</table>

	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.
Test setup:	For radiated emissions above 1GHz 
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Remarks:

1. *Only the worst case Main Antenna test data.*
2. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
4. *The pre-test were performed on lowest, middle and highest frequencies, only the worst case's (lowest and highest frequencies) data was showed.*
5. *According to KDB 789033 D02 v02r01 section G) 1) (d), for For measurements above 1000 MHz @ 3m distance, the limit of field strength is computed as follows:*
   E[dBuV/m] = EIRP[dBm] + 95.2;
   For example, if EIRP = -27dBm
   E[dBuV/m] = -27 + 95.2 = 68.2dBuV/m.

Measurement Data:

Lowest Channel:

802.11a					**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
5150.00	47.37	32.07	8.99	37.49	50.94	68.20	-17.26	Horizontal
5350.00	36.55	31.75	9.29	37.20	40.39	68.20	-27.81	Horizontal
5150.00	44.83	32.07	8.99	37.49	48.40	68.20	-19.80	Vertical
5350.00	36.73	31.75	9.29	37.20	40.57	68.20	-27.63	Vertical

802.11a					**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
5150.00	39.71	32.07	8.99	37.49	43.28	54.00	-10.72	Horizontal
5350.00	31.90	31.75	9.29	37.20	35.74	54.00	-18.26	Horizontal
5150.00	38.68	32.07	8.99	37.49	42.25	54.00	-11.75	Vertical
5350.00	31.28	31.75	9.29	37.20	35.12	54.00	-18.88	Vertical

Highest Channel:

802.11a					**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
5150.00	37.04	32.07	8.99	37.49	40.61	68.20	-27.59	Horizontal
5350.00	37.14	31.75	9.29	37.20	40.98	68.20	-27.22	Horizontal
5150.00	35.95	32.07	8.99	37.49	39.52	68.20	-28.68	Vertical
5350.00	36.91	31.75	9.29	37.20	40.75	68.20	-27.45	Vertical

802.11a					**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
5150.00	31.09	32.07	8.99	37.49	34.66	54.00	-19.34	Horizontal
5350.00	31.44	31.75	9.29	37.20	35.28	54.00	-18.72	Horizontal
5150.00	30.63	32.07	8.99	37.49	34.20	54.00	-19.80	Vertical
5350.00	30.44	31.75	9.29	37.20	34.28	54.00	-19.72	Vertical

Lowest Channel:

802.11n(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
5150.00	45.43	32.07	8.99	37.49	49.00	68.20	-19.20	Horizontal
5350.00	37.44	31.75	9.29	37.20	41.28	68.20	-26.92	Horizontal
5150.00	45.13	32.07	8.99	37.49	48.70	68.20	-19.50	Vertical
5350.00	37.07	31.75	9.29	37.20	40.91	68.20	-27.29	Vertical

802.11n(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
5150.00	39.39	32.07	8.99	37.49	42.96	54.00	-11.04	Horizontal
5350.00	37.06	31.75	9.29	37.20	40.90	54.00	-13.10	Horizontal
5150.00	38.33	32.07	8.99	37.49	41.90	54.00	-12.10	Vertical
5350.00	37.10	31.75	9.29	37.20	40.94	54.00	-13.06	Vertical

Highest Channel:

802.11n(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
5150.00	37.02	32.07	8.99	37.49	40.59	68.20	-27.61	Horizontal
5350.00	37.75	31.75	9.29	37.20	41.59	68.20	-26.61	Horizontal
5150.00	36.65	32.07	8.99	37.49	40.22	68.20	-27.98	Vertical
5350.00	36.98	31.75	9.29	37.20	40.82	68.20	-27.38	Vertical

802.11n(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
5150.00	31.38	32.07	8.99	37.49	34.95	54.00	-19.05	Horizontal
5350.00	31.36	31.75	9.29	37.20	35.20	54.00	-18.80	Horizontal
5150.00	31.06	32.07	8.99	37.49	34.63	54.00	-19.37	Vertical
5350.00	30.81	31.75	9.29	37.20	34.65	54.00	-19.35	Vertical

7.7 Radiated Emission

Test Requirement:	FCC Part15 C Section 15.209 and 15.205
Test Method:	ANSI C63.10:2013
Test Frequency Range:	9kHz to 40GHz
Test site:	Measurement Distance: 3m (Semi-Anechoic Chamber)
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	100KHz	300KHz	Quasi-peak Value
Above 1GHz	Peak	1MHz	3MHz	Peak Value
	AV	1MHz	3MHz	Average Value

Limit:

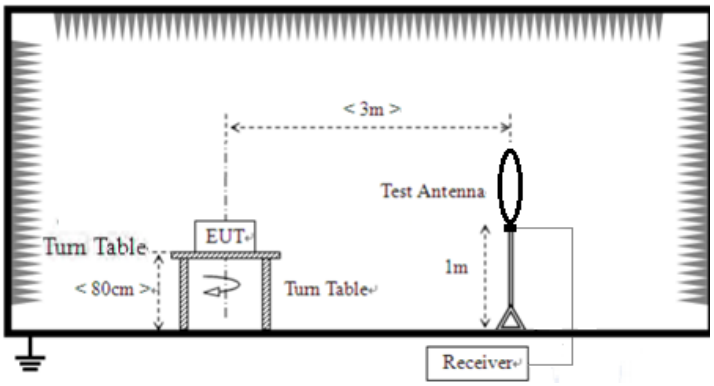
Frequency	Limit (uV/m)	Value	Measurement Distance
0.009MHz-0.490MHz	2400/F(KHz)	QP	300m
0.490MHz-1.705MHz	24000/F(KHz)	QP	300m
1.705MHz-30MHz	30	QP	30m
30MHz-88MHz	100	QP	3m
88MHz-216MHz	150	QP	
216MHz-960MHz	200	QP	
960MHz-1GHz	500	QP	
Above 1GHz	500	Average	
	5000	Peak	

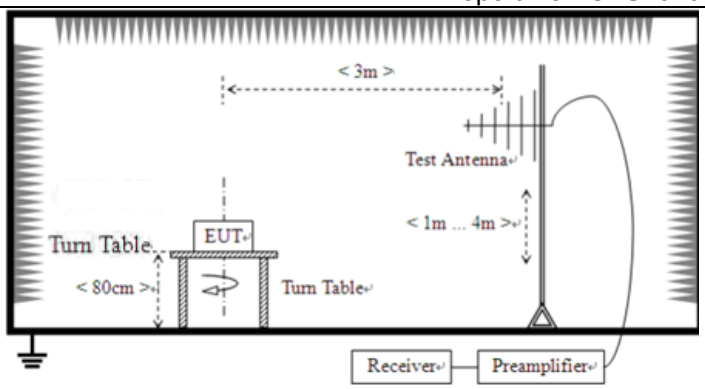
Test Procedure:

Substitution method was performed to determine the actual ERP emission levels of the EUT.
The following test procedure as below:
1>.Below 1GHz test procedure:

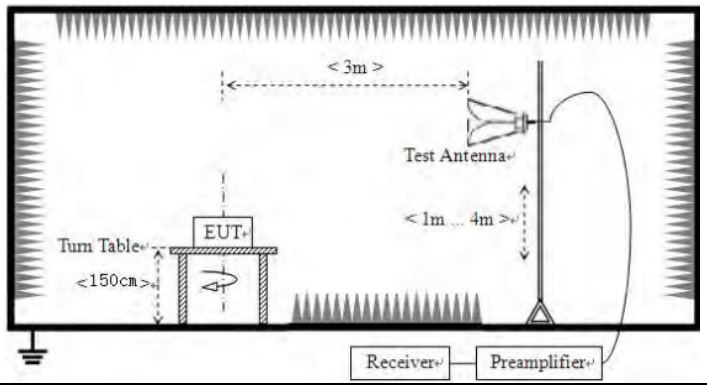
1. The EUT was placed on the top of a rotating table (0.8m for below 1GHz and 1.5 meters for above 1GHz) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, 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 rotable 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.

2>.Above 1GHz test procedure:

	1. On the test site as test setup graph above,the EUT shall be placed at the 0.8m support on the turntable and in the position closest to normal use as declared by the provider. 2. The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter.The output of the test antenna shall be connected to the measuring receiver. 3. The transmitter shall be switched on, if possible, without modulation and the measuring receiver shall be tuned to the frequency of the transmitter under test. 4. The test antenna shall be raised and lowered from 1m to 4m until a maximum signal level is detected by the measuring receiver. Then the turntable should be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver. 5. Repeat step 4 for test frequency with the test antenna polarized horizontally. 6. Remove the transmitter and replace it with a substitution antenna 7. Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a nonradiating cable. With the antennas at both ends vertically polarized, and with the signal generator tuned to a particular test frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output. 8. Repeat step 7 with both antennas horizontally polarized for each test frequency. 9. Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps 7 and 8 by the power loss in the cable between the generator and the antenna, and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna by the following formula: EIRP(dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dBi) where: Pg is the generator output power into the substitution antenna.
Test setup:	For radiated emissions from 9kHz to 30MHz  For radiated emissions from 30MHz to1GHz



For radiated emissions above 1GHz



Test Instruments:	Refer to section 5.10 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. *Only the worst case Main Antenna test data.*
2. *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:

The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm). The test result shows bellow.

Test Mode	CH No.	Frequency (MHz)	Maximum EIRP (dBm)	Limit (dBm)	Result
802.11a	36	5180	20.29	21.00	Pass
	40	5200	20.15	21.00	Pass
	48	5240	20.11	21.00	Pass
802.11n(HT20)	36	5180	20.08	21.00	Pass
	40	5200	19.83	21.00	Pass
	48	5240	20.11	21.00	Pass

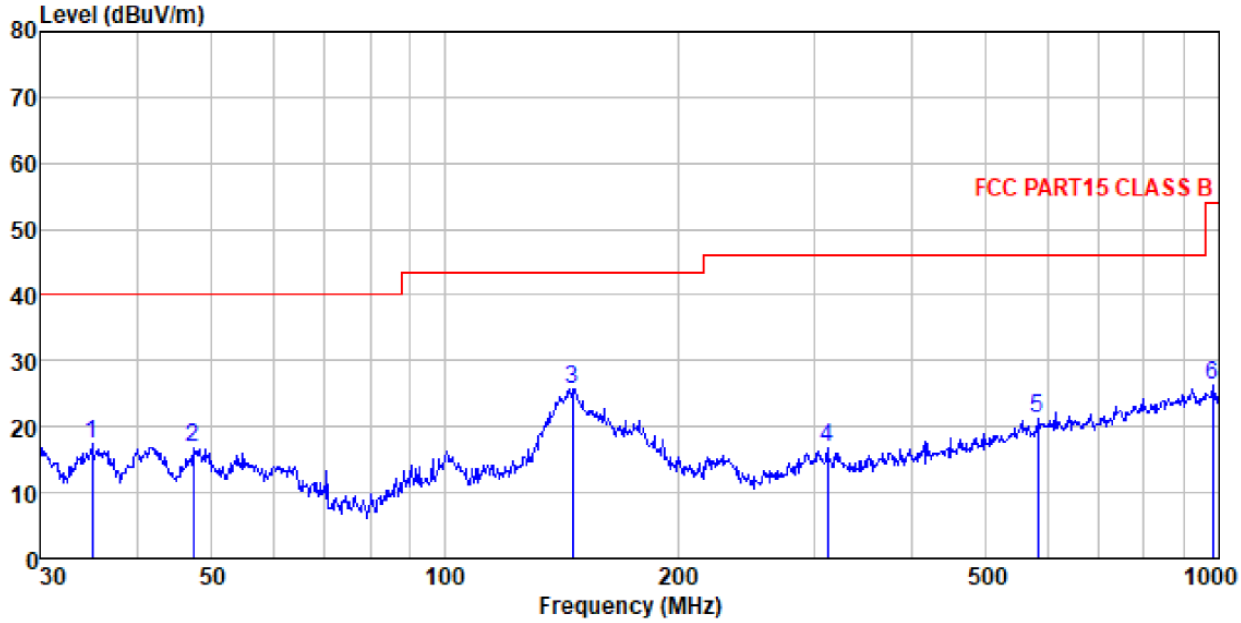
9kHz ~ 30 MHz

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.

30MHz~ 1GHz

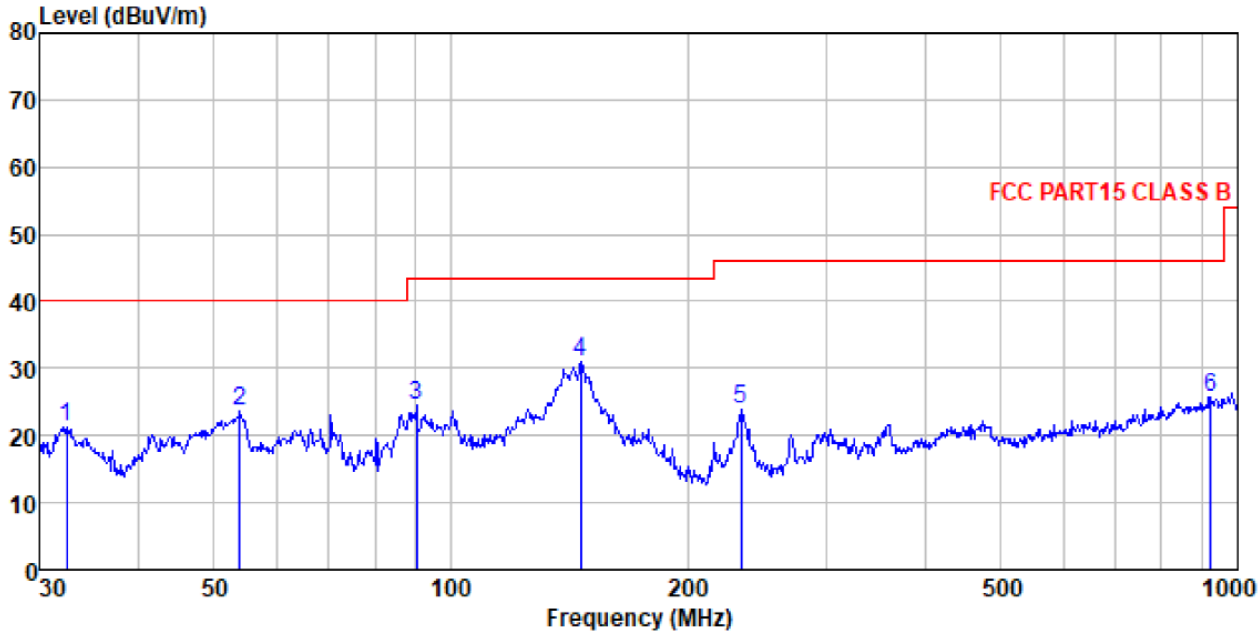
Pre-scan all test modes, found worst case at 5180MHz of 802.11a mode, and so only show the test result at 5180MHz of 802.11a.

Horizontal:



	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	35.005	40.76	11.33	35.36	0.61	17.34	40.00	-22.66	QP
2	47.326	40.00	12.28	36.05	0.74	16.97	40.00	-23.03	QP
3	146.374	53.71	7.53	37.06	1.55	25.73	43.50	-17.77	QP
4	312.179	38.03	13.85	37.43	2.42	16.87	46.00	-29.13	QP
5	582.743	35.89	19.11	37.54	3.66	21.12	46.00	-24.88	QP
6	982.620	36.04	22.65	37.52	5.16	26.33	54.00	-27.67	QP

Vertical:



	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	32.520	44.74	11.25	35.19	0.58	21.38	40.00	-18.62	QP
2	53.882	47.00	11.90	36.24	0.81	23.47	40.00	-16.53	QP
3	90.537	49.33	10.77	36.64	1.11	24.57	43.50	-18.93	QP
4	146.374	58.94	7.53	37.06	1.55	30.96	43.50	-12.54	QP
5	233.349	47.59	11.60	37.36	2.04	23.87	46.00	-22.13	QP
6	922.516	35.98	22.39	37.58	4.93	25.72	46.00	-20.28	QP

Above 1GHz:

802.11a 5180MHz

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
10360	30.10	39.67	14.62	32.65	51.74	68.20	-16.46	Vertical
15540	31.47	38.60	17.66	34.46	53.27	68.20	-14.93	Vertical
10360	29.80	39.67	14.62	32.65	51.44	68.20	-16.76	Horizontal
15540	31.99	38.60	17.66	34.46	53.79	68.20	-14.41	Horizontal

802.11a 5200MHz

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	30.35	39.75	14.63	32.71	52.02	68.20	-16.18	Vertical
17235	31.17	38.33	17.67	34.17	53.00	68.20	-15.20	Vertical
11490	29.01	39.75	14.63	32.71	50.68	68.20	-17.52	Horizontal
17235	31.45	38.33	17.67	34.17	53.28	68.20	-14.92	Horizontal

802.11a 5240MHz

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	28.76	39.82	14.68	32.86	50.40	68.20	-17.80	Vertical
17235	30.90	38.09	17.73	33.66	53.06	68.20	-15.14	Vertical
11490	29.22	39.82	14.68	32.86	50.86	68.20	-17.34	Horizontal
17235	30.65	38.09	17.73	33.66	52.81	68.20	-15.39	Horizontal

802.11n(HT20) 5180MHz

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
11510	29.93	39.67	14.62	32.65	51.57	68.20	-16.63	Vertical
17265	30.61	38.60	17.66	34.46	52.41	68.20	-15.79	Vertical
11510	29.15	39.67	14.62	32.65	50.79	68.20	-17.41	Horizontal
17265	30.81	38.60	17.66	34.46	52.61	68.20	-15.59	Horizontal

802.11n(HT20) 5200MHz

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
10400	29.62	39.75	14.63	32.71	51.29	68.20	-16.91	Vertical
15600	30.82	38.33	17.67	34.17	52.65	68.20	-15.55	Vertical
10400	29.59	39.75	14.63	32.71	51.26	68.20	-16.94	Horizontal
15600	30.13	38.33	17.67	34.17	51.96	68.20	-16.24	Horizontal

802.11n(HT20) 5240MHz

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
11590	29.45	39.82	14.68	32.86	51.09	68.20	-17.11	Vertical
17385	30.29	38.09	17.73	33.66	52.45	68.20	-15.75	Vertical
11590	28.73	39.82	14.68	32.86	50.37	68.20	-17.83	Horizontal
17385	30.66	38.09	17.73	33.66	52.82	68.20	-15.38	Horizontal

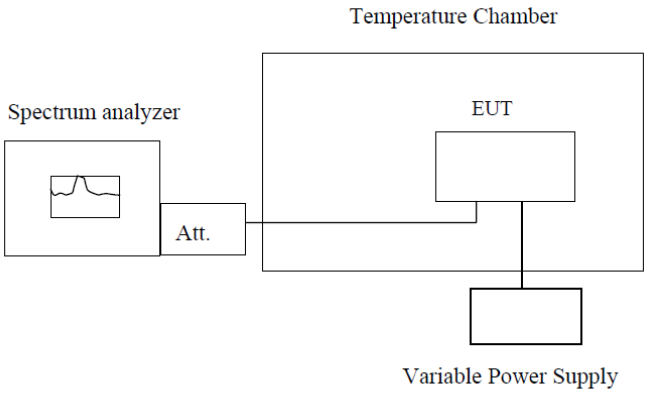
Notes:

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.

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: Set the EUT transmits at un-modulation mode to test frequency stability.

Measurement data:

Voltage VS Frequency stability

Band: I			Test Frequency: 5180.00MHz	
Temperature (℃)	Voltage (V)	Frequency Deviation (Hz)	Frequency Deviation (ppm)	Result
25	DC 11.55	-1000.00	-0.19305	PASS
25	DC 10.40	-1000.00	-0.19305	PASS
25	DC 12.71	-1000.00	-0.19305	PASS

Temperature VS Frequency stability

Band: I			Test Frequency: 5180.00MHz	
Voltage (V)	Temperature (℃)	Frequency Deviation (Hz)	Frequency Deviation (ppm)	Result
DC 11.55	-20	-1000.00	-0.19305	PASS
DC 11.55	-10	-1000.00	-0.19305	PASS
DC 11.55	0	-1000.00	-0.19305	PASS
DC 11.55	10	-1000.00	-0.19305	PASS
DC 11.55	20	-1000.00	-0.19305	PASS
DC 11.55	30	-1000.00	-0.19305	PASS
DC 11.55	40	-1000.00	-0.19305	PASS
DC 11.55	50	-1000.00	-0.19305	PASS

8 Test Setup Photo

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

9 EUT Constructional Details

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

---END---