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:	EVO Ⅱ Mobile Station
Model No.:	MDCMS-2
Trade Mark:	AUTEL ROBOTICS
FCC ID:	2AGNTMDCMS58B
Applicable standards:	FCC CFR Title 47 Part 15 Subpart E Section 15.407
Date of sample receipt:	April. 12, 2021
Date of Test:	April. 12 –April. 29, 2021
Date of report issued:	April. 30, 2021
Test Result :	PASS *

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

Authorized Signature:

Robinson Luo
Laboratory Manager

2 Version

Version No.	Date	Description
00	*April. 30, 2021*	*Original*

Prepared By: ***Date:*** *April. 30, 2021*

Project Engineer

Check By: ***Date:*** *April. 30, 2021*

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
Conducted Peak Output Power	15.407(a)(3)	Pass
Channel Bandwidth	15.407(e)	Pass
Power Spectral Density	15.407(a)(3)	Pass
Band Edge	15.407(b)(4)	Pass
Spurious Emission	15.205/15.209/15.407(b)(4)	Pass
Frequency Stability	15.407(g)	Pass

Remarks：

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

4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	30MHz-200MHz	3.8039dB	(1)
Radiated Emission	200MHz-1GHz	3.9679dB	(1)
Radiated Emission	1GHz-18GHz	4.29dB	(1)
Radiated Emission	18GHz-40GHz	3.30dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	3.44dB	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

5 General Information

5.1 General Description of EUT

Product Name:	EVO Ⅱ Mobile Station
Model No.:	MDCMS-2
Serial No.:	SE1202104110
Hardware Version:	V4.0.0.0
Software Version:	V4.0.0.0
Test sample(s) ID:	GTSL202104000267-1
Sample(s) Status:	Engineer sample
Operation Frequency:	802.11a/802.11n(HT20): 5745MHz ~ 5825MHz 802.11n(HT40): 5745MHz ~ 5825MHz
Channel numbers:	802.11a/802.11n(HT20): 5 802.11n(HT40): 2
Channel bandwidth:	802.11a/802.11n(HT20): 20MHz 802.11n(HT40): 40MHz
Modulation technology:	OFDM
Antenna Type:	FPC Antenna
Antenna gain:	3.4dBi
Power supply:	DC 11.55V, 4950mAh rechargeable battery
Adapter Information:	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

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	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(HT20)
Lowest channel	5745
Middle channel	5785
Highest channel	5825

Test channel	Frequency (MHz)
	802.11 n(HT40)
Lowest channel	5755
Highest channel	5795

5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode
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:

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

Mode	Data rate (Mbps)
802.11a	6
802.11n(HT20)	MCS0
802.11n(HT20)	MCS0

5.3 Description of Support Units

None.

5.4 Deviation from Standards

None.

5.5 Abnormalities from Standard Conditions

None.

5.6 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

5.7 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.
No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone,
Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102
Tel: 0755-27798480
Fax: 0755-27798960

6 Test Instruments list

Radiated Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July. 02 2020	July. 01 2025
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June. 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

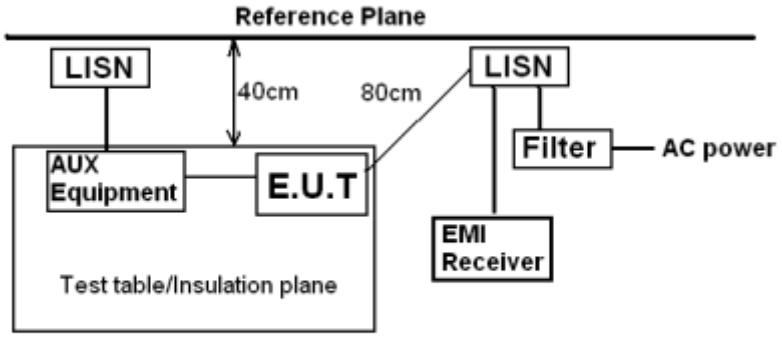
General used equipment:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 25 2020	June. 24 2021
2	Barometer	ChangChun	DYM3	GTS255	June. 25 2020	June. 24 2021

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 3.4dBi, reference to the appendix II for details	

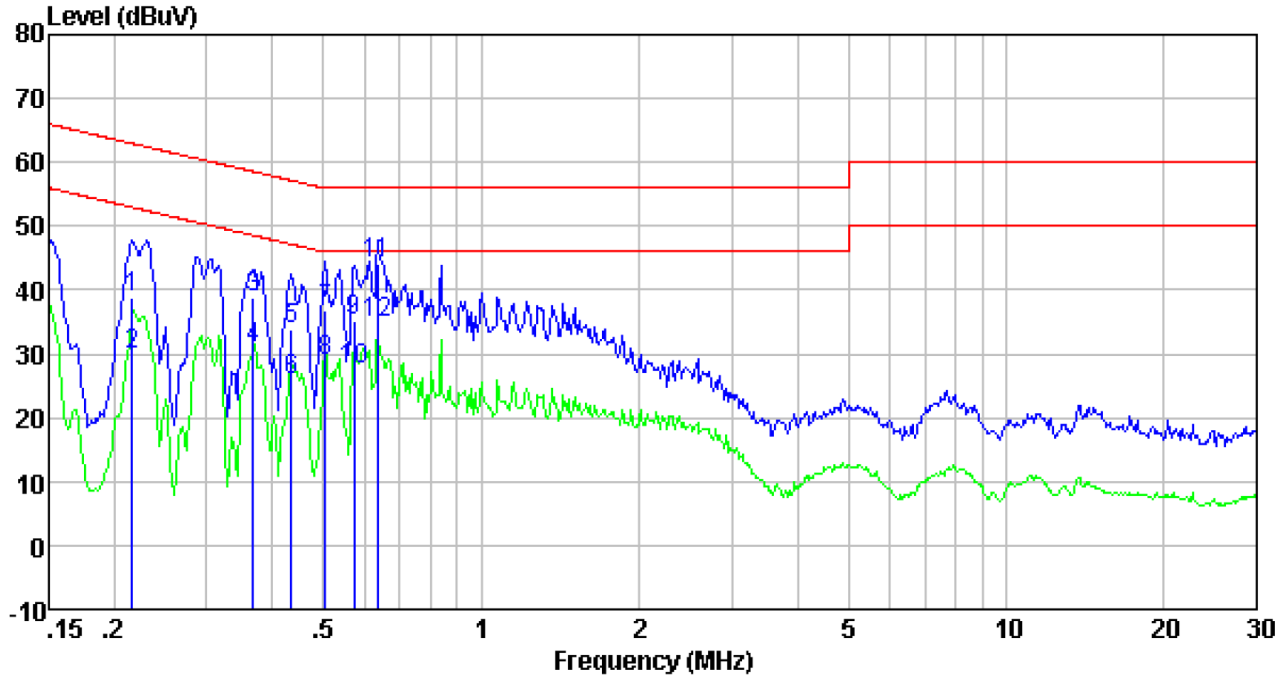
7.2 Conducted Emissions

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, 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:	 *Remark:* *E.U.T: Equipment Under Test* *LISN: Line Impedence Stabilization Network* *Test table height=0.1m*
Test procedure:	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test environment:	Temp.: 25 °C / Humid.: 52% / Press.: 1012mbar
Test voltage:	AC 120V, 60Hz
Test results:	Pass

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

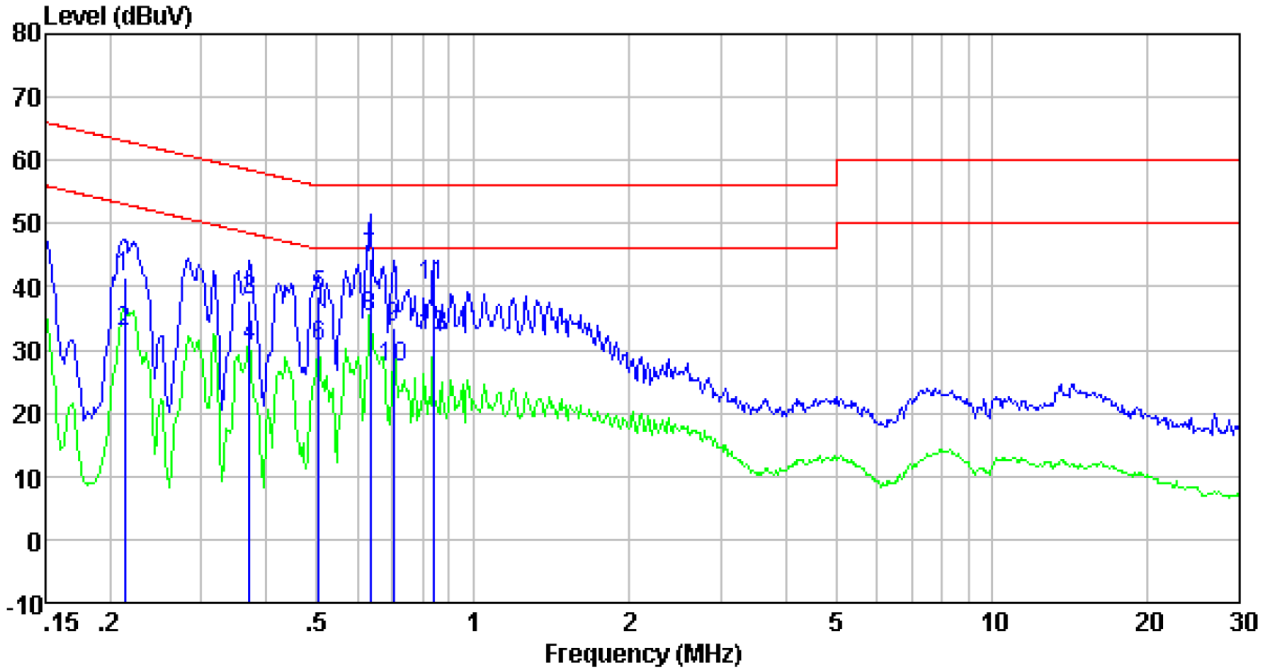
Measurement data

Line:



Freq MHz	Reading level dBuV	LISN/ISN factor dB/m	Cable loss dB	Level dBuV	Limit level dBuV	Over limit dB	Remark
0.22	18.47	20.40	0.11	38.98	62.96	-23.98	QP
0.22	9.19	20.40	0.11	29.70	52.96	-23.26	Average
0.37	18.49	20.37	0.10	38.96	58.56	-19.60	QP
0.37	10.54	20.37	0.10	31.01	48.56	-17.55	Average
0.44	13.52	20.34	0.11	33.97	57.15	-23.18	QP
0.44	5.30	20.34	0.11	25.75	47.15	-21.40	Average
0.50	16.43	20.31	0.11	36.85	56.00	-19.15	QP
0.50	8.35	20.31	0.11	28.77	46.00	-17.23	Average
0.57	14.80	20.29	0.12	35.21	56.00	-20.79	QP
0.57	7.14	20.29	0.12	27.55	46.00	-18.45	Average
0.63	23.88	20.28	0.12	44.28	56.00	-11.72	QP
0.63	14.59	20.28	0.12	34.99	46.00	-11.01	Average

Neutral:

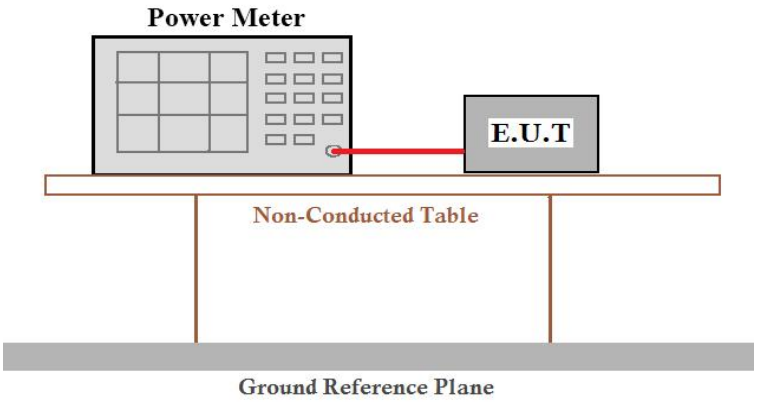


Freq	Reading level	LISN/ISN factor	Cable loss	Level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dBuV	dBuV	dB	
0.21	20.98	20.40	0.11	41.49	63.10	-21.61	QP
0.21	12.21	20.40	0.11	32.72	53.10	-20.38	Average
0.37	17.37	20.36	0.10	37.83	58.47	-20.64	QP
0.37	9.96	20.36	0.10	30.42	48.47	-18.05	Average
0.50	18.17	20.31	0.11	38.59	56.00	-17.41	QP
0.50	10.16	20.31	0.11	30.58	46.00	-15.42	Average
0.63	23.98	20.28	0.12	44.38	56.00	-11.62	QP
0.63	14.73	20.28	0.12	35.13	46.00	-10.87	Average
0.70	13.15	20.26	0.13	33.54	56.00	-22.46	QP
0.70	6.93	20.26	0.13	27.32	46.00	-18.68	Average
0.84	19.61	20.23	0.14	39.98	56.00	-16.02	QP
0.84	11.78	20.23	0.14	32.15	46.00	-13.85	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.*
5. *Only show the worst case 802.11a 5825MHz mode on the report.*

7.3 Conducted Transmitter output Power

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

Measurement Data

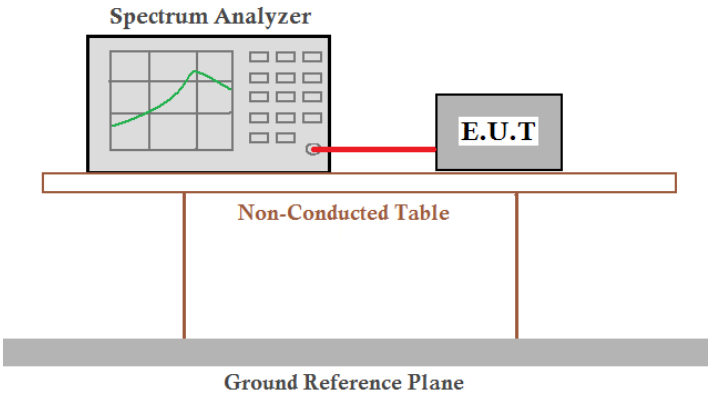
Modulation	Duty cycle	Duty Factor
802.11a	100%	0.00
802.11n(HT20)	100%	0.00
802.11n(HT40)	100%	0.00

802.11a mode								
CH No.	Frequency (MHz)	Measured Power (dBm)		Duty Factor		Total Output Power (dBm)	Limit (dBm)	Result
		ANT 1	ANT 2	ANT 1	ANT 2			
149	5745	20.87	20.89	0.00	0.00	23.89	30.00	Pass
157	5785	21.05	21.09	0.00	0.00	24.09	30.00	Pass
165	5825	21.01	21.04	0.00	0.00	24.04	30.00	Pass
802.11n(HT20) mode								
CH No.	Frequency (MHz)	Measured Power (dBm)		Duty Factor		Total Output Power (dBm)	Limit (dBm)	Result
		ANT 1	ANT 2	ANT 1	ANT 2			
149	5745	20.80	20.82	0.00	0.00	23.82	30.00	Pass
157	5785	21.06	21.08	0.00	0.00	24.08	30.00	Pass
165	5825	20.31	20.33	0.00	0.00	23.33	30.00	Pass
802.11n(HT40) mode								
CH No.	Frequency (MHz)	Measured Power (dBm)		Duty Factor		Total Output Power (dBm)	Limit (dBm)	Result
		ANT 1	ANT 2	ANT 1	ANT 2			
151	5755	21.00	21.03	0.00	0.00	24.03	30.00	Pass
159	5795	20.87	20.89	0.00	0.00	23.89	30.00	Pass

Note: Output Power = Measured Power + Duty Factor
Duty Factor = 10 log (1/Duty Cycle)

Note: We measured the conducted output power of antenna one and antenna two. Please refer to appendix D of appendix III for specific data.

7.4 Channel Bandwidth

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

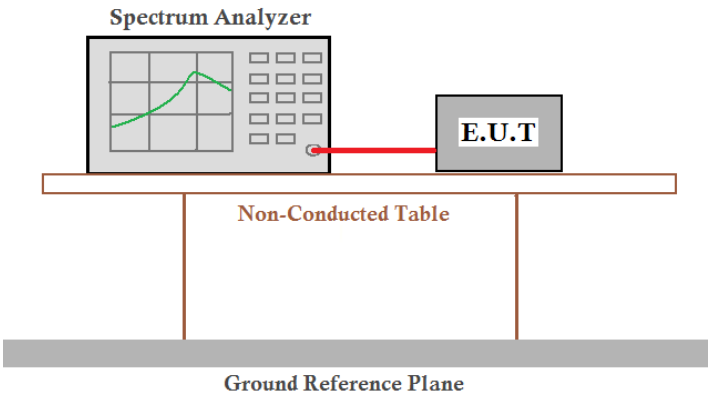
Measurement Data

CH. No.	Frequency (MHz)	6dB Occupied Bandwidth (MHz)				Limit[MHz]	Result
		802.11a ANT 1	802.11a ANT 2	802.11n (HT20) ANT 1	802.11n (HT20) ANT 2		
149	5745	16.600	16.600	17.720	17.800	0.5	PASS
157	5785	16.520	16.520	17.680	17.800	0.5	PASS
165	5825	16.600	16.600	17.720	17.880	0.5	PASS

CH. No.	Frequency (MHz)	6dB Occupied Bandwidth (MHz)		Limit[MHz]	Result
		802.11n(HT40) ANT 1	802.11n(HT40) ANT 2		
151	5755	36.720	36.640	0.5	PASS
159	5795	36.560	36.640	0.5	PASS

Note: We measured the 6dB Occupied Bandwidth of antenna one and antenna two. Please refer to appendix C of appendix III for specific data.

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

Modulation	Duty cycle	Duty Factor
802.11a	100%	0
802.11n(HT20)	100%	0
802.11n(HT40)	100%	0

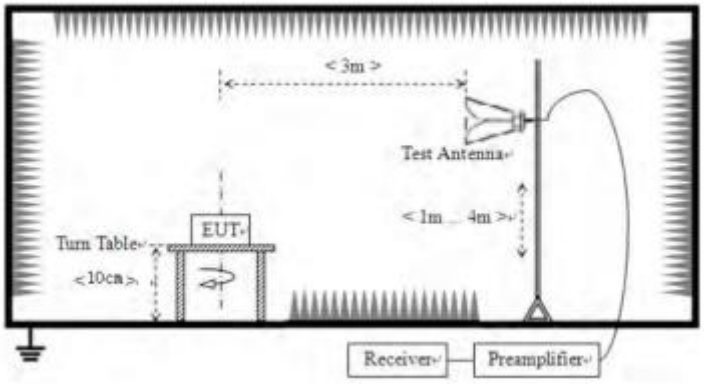
802.11a mode								
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)		Duty Factor		Total PSD Power(dBm/MHz)	Calculation Limit (dBm/500kHz)	Result
		ANT 1	ANT 2	ANT 1	ANT 2			
149	5745	4.05	4.25	0	0	7.16	29.59	Pass
157	5785	4.67	4.45	0	0	7.57	29.59	Pass
165	5825	4.33	4.50	0	0	7.43	29.59	Pass

802.11n(HT20) mode								
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)		Duty Factor		Total PSD Power(dBm/MHz)	Calculation Limit (dBm/500kHz)	Result
		ANT 1	ANT 2	ANT 1	ANT 2			
149	5745	3.78	4.11	0	0	6.96	29.59	Pass
157	5785	4.42	4.36	0	0	7.40	29.59	Pass
165	5825	5.02	4.03	0	0	7.56	29.59	Pass
802.11n(HT40) mode								
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)		Duty Factor		Total PSD Power(dBm/MHz)	Calculation Limit (dBm/500kHz)	Result
		ANT 1	ANT 2	ANT 1	ANT 2			
151	5755	1.67	1.87	0	0	4.78	29.59	Pass
159	5795	2.53	2.73	0	0	5.64	29.59	Pass

Note: 1. Output Power = Measured Power + Duty Factor
Duty Factor = 10 log (1/Duty Cycle)
2. Directional gain= 5.8G band Ant Gain+10log2=3.4+3.01=6.41
PSD Limit calculation= 30dBm -（6.41 -6）=30-0.41=29.59
3. We measured the maximum power spectral density of antenna one and antenna two.
Please refer to appendix E of appendix III for specific data.
.

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:	<table><tr><th>Frequency</th><th>Detector</th><th>RBW</th><th>VBW</th><th>Value</th></tr><tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak</td></tr><tr><td>RMS</td><td>1MHz</td><td>3MHz</td><td>RMS</td></tr></table>
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 0.1 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. *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 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:

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
5650.00	38.82	32.36	9.72	23.83	57.07	68.20	-11.13	Horizontal
5700.00	39.34	32.50	9.79	23.84	57.79	105.20	-47.41	Horizontal
5720.00	39.41	32.53	9.81	23.85	57.9	110.80	-52.9	Horizontal
5725.00	46.84	32.53	9.83	23.86	65.34	122.20	-56.86	Horizontal
5850.00	43.17	32.70	9.99	23.87	61.99	122.20	-60.21	Horizontal
5855.00	37.05	32.72	9.99	23.88	55.88	110.80	-54.92	Horizontal
5875.00	38.94	32.74	10.04	23.89	57.83	105.20	-47.37	Horizontal
5925.00	38.6	32.80	10.11	23.90	57.61	68.20	-10.59	Horizontal
5650.00	38.55	32.36	9.72	23.83	56.8	68.20	-11.4	Vertical
5700.00	37.34	32.50	9.79	23.84	55.79	105.20	-49.41	Vertical
5720.00	38.38	32.53	9.81	23.85	56.87	110.80	-53.93	Vertical
5725.00	45.58	32.53	9.83	23.86	64.08	122.20	-58.12	Vertical
5850.00	43.25	32.70	9.99	23.87	62.07	122.20	-60.13	Vertical
5855.00	37.23	32.72	9.99	23.88	56.06	110.80	-54.74	Vertical
5875.00	37.92	32.74	10.04	23.89	56.81	105.20	-48.39	Vertical
5925.00	38.71	32.80	10.11	23.90	57.72	68.20	-10.48	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
5650.00	38.33	32.36	9.72	23.83	56.58	68.20	-11.62	Horizontal
5700.00	39.23	32.50	9.79	23.84	57.68	105.20	-47.52	Horizontal
5720.00	39.29	32.53	9.81	23.85	57.78	110.80	-53.02	Horizontal
5725.00	46.81	32.53	9.83	23.86	65.31	122.20	-56.89	Horizontal
5850.00	43.14	32.70	9.99	23.87	61.96	122.20	-60.24	Horizontal
5855.00	38.65	32.72	9.99	23.88	57.48	110.80	-53.32	Horizontal
5875.00	38.06	32.74	10.04	23.89	56.95	105.20	-48.25	Horizontal
5925.00	37.91	32.80	10.11	23.90	56.92	68.20	-11.28	Horizontal
5650.00	38.81	32.36	9.72	23.83	57.06	68.20	-11.14	Vertical
5700.00	38.7	32.50	9.79	23.84	57.15	105.20	-48.05	Vertical
5720.00	37.64	32.53	9.81	23.85	56.13	110.80	-54.67	Vertical
5725.00	45.79	32.53	9.83	23.86	64.29	122.20	-57.91	Vertical
5850.00	43.07	32.70	9.99	23.87	61.89	122.20	-60.31	Vertical
5855.00	38.06	32.72	9.99	23.88	56.89	110.80	-53.91	Vertical
5875.00	38.28	32.74	10.04	23.89	57.17	105.20	-48.03	Vertical
5925.00	38.04	32.80	10.11	23.90	57.05	68.20	-11.15	Vertical

IEEE 802.11n HT40								
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
5650.00	38.33	32.36	9.72	23.83	56.58	68.20	-11.62	Horizontal
5700.00	39.23	32.50	9.79	23.84	57.68	105.20	-47.52	Horizontal
5720.00	39.29	32.53	9.81	23.85	57.78	110.80	-53.02	Horizontal
5725.00	46.81	32.53	9.83	23.86	65.31	122.20	-56.89	Horizontal
5850.00	43.14	32.70	9.99	23.87	61.96	122.20	-60.24	Horizontal
5855.00	38.65	32.72	9.99	23.88	57.48	110.80	-53.32	Horizontal
5875.00	38.06	32.74	10.04	23.89	56.95	105.20	-48.25	Horizontal
5925.00	37.91	32.80	10.11	23.90	56.92	68.20	-11.28	Horizontal
5650.00	38.81	32.36	9.72	23.83	57.06	68.20	-11.14	Vertical
5700.00	38.7	32.50	9.79	23.84	57.15	105.20	-48.05	Vertical
5720.00	37.64	32.53	9.81	23.85	56.13	110.80	-54.67	Vertical
5725.00	45.79	32.53	9.83	23.86	64.29	122.20	-57.91	Vertical
5850.00	43.07	32.70	9.99	23.87	61.89	122.20	-60.31	Vertical
5855.00	38.06	32.72	9.99	23.88	56.89	110.80	-53.91	Vertical
5875.00	38.28	32.74	10.04	23.89	57.17	105.20	-48.03	Vertical
5925.00	38.04	32.80	10.11	23.90	57.05	68.20	-11.15	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

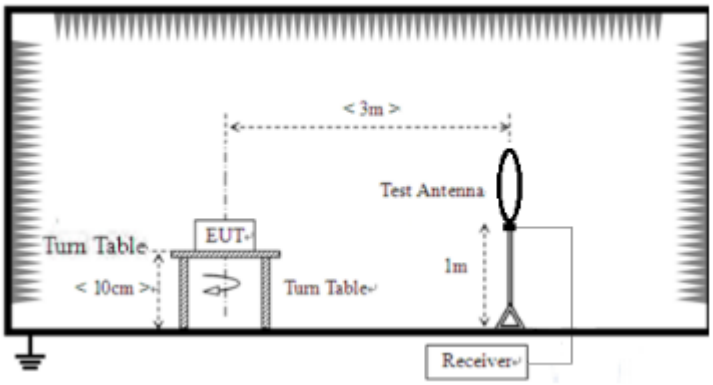
Limit:

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

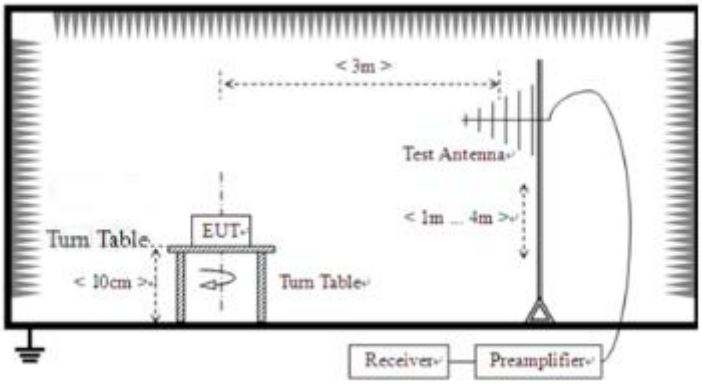
Frequency	Limit (dBm/MHz)	Remark
Above 1GHz	-27.0	Peak Value

Test setup:

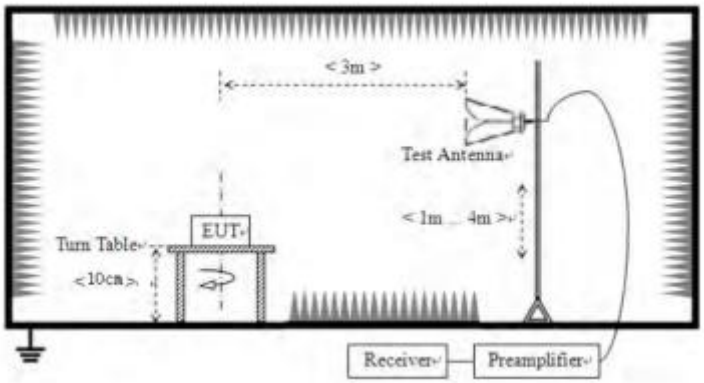
For radiated emissions from 9kHz to 30MHz



For radiated emissions from 30MHz to1GHz



For radiated emissions above 1GHz



Test Procedure:	1. The EUT was placed on the top of a rotating table (0.1m for below 1GHz and 0.1 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. *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:

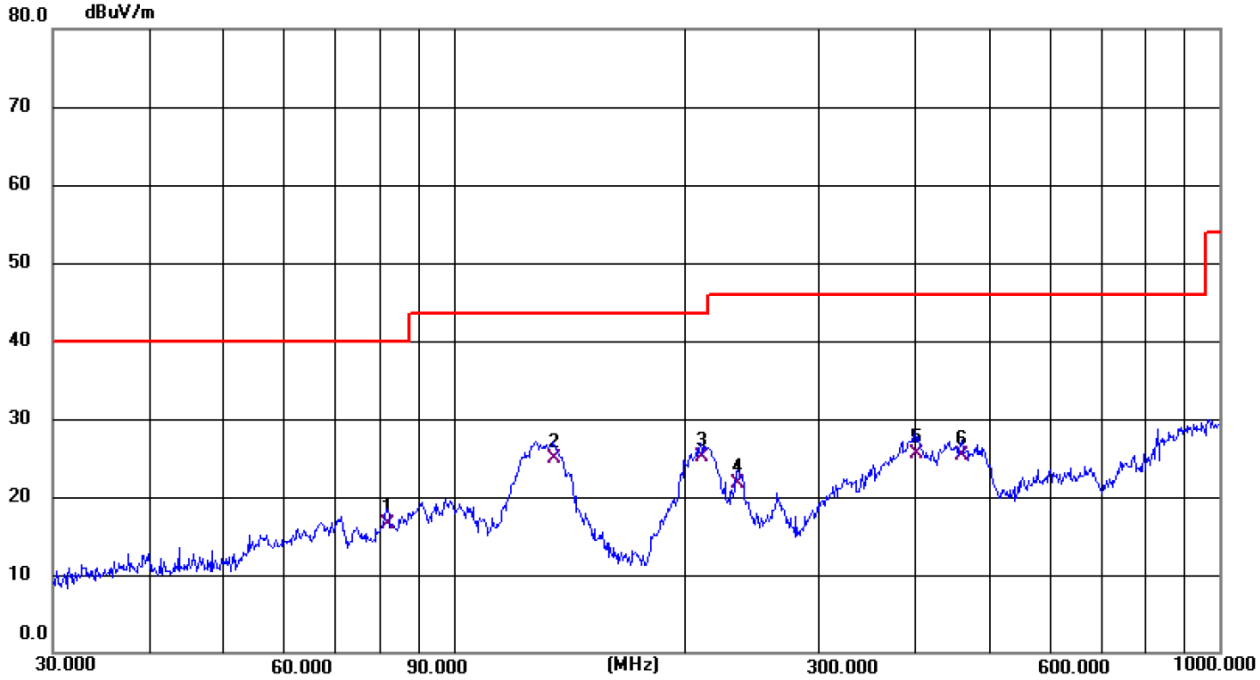
9 kHz ~ 30 MHz

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

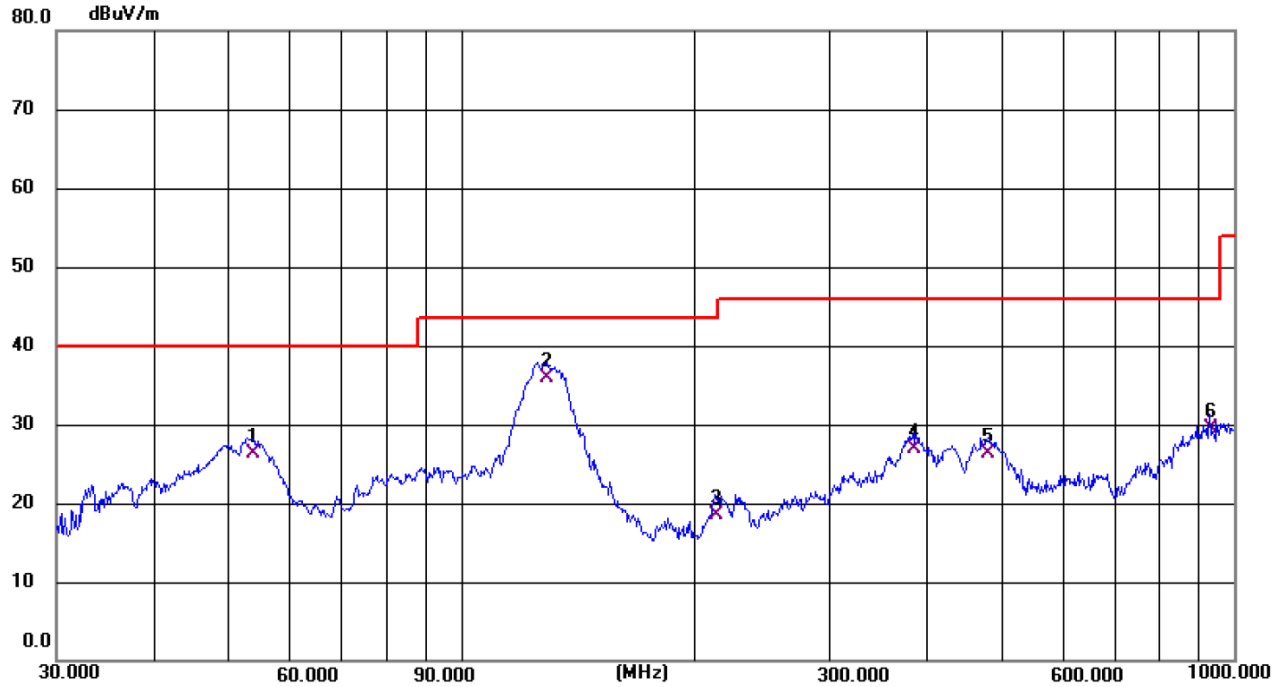
Pre-scan all test modes, found worst case at 5825MHz of 802.11a mode, and so only show the test result at 5825MHz of 802.11a.

Horizontal:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	81.7833	37.08	-20.52	16.56	40.00	-23.44	QP	200	110	P	
2	135.0319	42.56	-17.67	24.89	43.50	-18.61	QP	200	110	P	
3 *	210.0482	43.54	-18.42	25.12	43.50	-18.38	QP	200	110	P	
4	234.9909	38.56	-16.91	21.65	46.00	-24.35	QP	200	110	P	
5	400.4319	36.46	-10.97	25.49	46.00	-20.51	QP	200	110	P	
6	460.7271	33.78	-8.55	25.23	46.00	-20.77	QP	200	110	P	

Vertical:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	53.6932	43.35	-17.03	26.32	40.00	-13.68	QP	100	0	P	
2 *	129.0146	56.26	-20.36	35.90	43.50	-7.60	QP	100	0	P	
3	213.0151	35.28	-16.79	18.49	43.50	-25.01	QP	100	0	P	
4	386.6338	36.32	-9.35	26.97	46.00	-19.03	QP	100	0	P	
5	480.5276	33.79	-7.39	26.40	46.00	-19.60	QP	100	0	P	
6	929.0082	29.58	-0.03	29.55	46.00	-16.45	QP	100	0	P	

Above 1GHz:

802.11a, 11n(HT20), 11n(HT40) have been tested.

Only the data of worst case at each channel plan is reported.

Test mode:		802.11a		Test channel:		lowest	
Antenna Pol.	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dBuV/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over limit(dB)	Detector
V	11490	24.24	21.64	45.88	68.20	-22.32	PK
V	17235	21.83	21.8	43.63	68.20	-24.57	PK
H	11490	22.18	21.83	44.01	68.20	-24.19	PK
H	17235	20.89	21.67	42.56	68.20	-25.64	PK

Test mode:		802.11a		Test channel:		Middle	
Antenna Pol.	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dBuV/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over limit(dB)	Detector
V	11490	22.07	21.64	43.71	68.20	-24.49	PK
V	17235	20.62	21.8	42.42	68.20	-25.78	PK
H	11490	18.56	21.83	40.39	68.20	-27.81	PK
H	17235	19.13	21.67	40.8	68.20	-27.40	PK

Test mode:		802.11a		Test channel:		Highest	
Antenna Pol.	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dBuV/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over limit(dB)	Detector
V	11490	22.24	21.64	43.88	68.20	-24.32	PK
V	17235	19.71	21.8	41.51	68.20	-26.69	PK
H	11490	20.22	21.83	42.05	68.20	-26.15	PK
H	17235	18.19	21.67	39.86	68.20	-28.34	PK

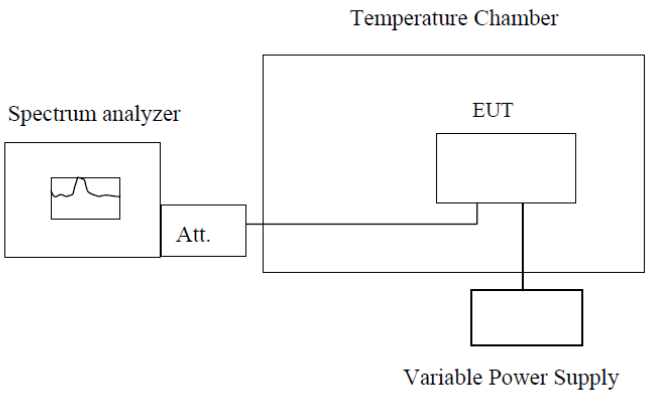
Notes:

1. Measure Level = Reading Level + 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 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 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement data:

Voltage VS Frequency stability

Band: IV			Test Frequency: 5190.00MHz	
Temperature (℃)	Voltage (V)	Frequency Deviation (Hz)	Frequency Deviation (ppm)	Result
25	DC 11.55	60900	11.734104	PASS
25	DC 10.40	67700	13.044316	PASS
25	DC 12.71	73900	14.238921	PASS

Temperature VS Frequency stability

Band: IV			Test Frequency: 5190.00MHz	
Voltage (V)	Temperature (℃)	Frequency Deviation (Hz)	Frequency Deviation (ppm)	Result
DC 11.55	-20	89500	17.244701	PASS
DC 11.55	-10	90500	17.437380	PASS
DC 11.55	0	90500	17.437380	PASS
DC 11.55	10	88500	17.052023	PASS
DC 11.55	20	89500	17.244701	PASS
DC 11.55	30	90500	17.437380	PASS
DC 11.55	40	88500	17.052023	PASS
DC 11.55	50	90500	17.437380	PASS

Note: We measured the Frequency stability of antenna one and antenna two under different Voltage and Temperature . Please refer to appendix F of appendix III for specific data.

8 Test Setup Photo

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

9 EUT Photo

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

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