

FCC RF Test Report

(U-NII)

Report No.: JYTSZ-R12-2400865

Applicant: Aratek Biometrics Co., Ltd.

Address of Applicant: 1F, T2-B building, Shenzhen Hi-tech Industrial Park, 518057, Shenzhen, China

Equipment Under Test (EUT)

Product Name: Marshall 8 Plus

Model No.: Marshall 8 Plus

Trade Mark: ARATEK

FCC ID: 2AGUJM8PLUS

Applicable Standards: FCC CFR Title 47 Part 15E (\$15.407)

Date of Sample Receipt: 09 May, 2024

Date of Test: 10 May, to 19 Aug., 2024

Date of Report Issued: 20 Aug., 2024

Test Result: PASS

Tested by:

Victa Zhang
Project Engineer
Wang Ping
Senior Engineer

Date:

20 Aug., 2024

Reviewed by:

Date:

20 Aug., 2024

Approved by:

James Wei
Manager

Date:

20 Aug., 2024

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in above the application standard version. Test results reported herein relate only to the item(s) tested.

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1 Version

Version No.	Date	Description
00	20 Aug., 2024	Original

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3 General Information

3.1 Client Information

Applicant:	Aratek Biometrics Co., Ltd.
Address:	1F, T2-B building, Shenzhen Hi-tech Industrial Park, 518057, Shenzhen, China
Manufacturer:	Aratek Biometrics Co., Ltd.
Address:	1F, T2-B building, Shenzhen Hi-tech Industrial Park, 518057, Shenzhen, China

3.2 General Description of E.U.T.

Product Name:	Marshall 8 Plus
Model No.:	Marshall 8 Plus
Operation Frequency:	Band 1: 5150 MHz - 5250 MHz
Channel Numbers:	Band 1: 4 (802.11a, n-HT20, ac-VHT20)
	Band 1: 2 (802.11n-HT40, ac-VHT40)
	Band 1: 1 (802.11ac-VHT80)
Modulation Technology: (IEEE 802.11a/802.11n)	OFDM-BPSK, QPSK, 16QAM, 64QAM
Modulation Technology: (IEEE 802.11ac)	OFDM-BPSK, QPSK, 16QAM, 64QAM, 256QAM
Antenna Type:	Internal Antenna
Antenna Gain:	1.81 dBi (declare by applicant)
Antenna Transmit Mode:	SISO (1TX, 1RX)
Power Supply:	Rechargeable Li-ion Polymer Battery DC3.7V, 10000mAh
AC Adapter:	Model: ES015C-U120150XYE Input: AC100-240V, 50/60Hz, 0.6A Output: DC 5.0V, 3.0A 15.0W or 9.0V, 2.0A 18.0W or 12.0V, 1.5A 18.0W
Test Sample Condition:	The test samples were provided in good working order with no visible defects.

3.3 Test Mode and Environment

Test Mode:	
Transmitting mode:	Keep the EUT in continuous transmitting with modulation
Per-scan all kind of data rate, the follow list were the worst case:	
Mode	Data rate
802.11a	6.0 Mbps
802.11n-HT20	6.5 Mbps
802.11n-HT40	13.5 Mbps
802.11ac-VHT20	6.5 Mbps
802.11ac-VHT40	13.5 Mbps
802.11ac-VHT80	29.3 Mbps
Remark: For AC power line conducted emission and radiated spurious emission (below 1GHz), pre-scan 802.11a, n, ac modulation mode, found 802.11a modulation mode was worse case mode. The report only reflects the test data of worst mode.	
Operating Environment:	
Temperature:	Normal: 15°C ~ 35°C,
Humidity:	20 % ~ 75 % RH
Atmospheric Pressure:	1008 mbar
Voltage:	Nominal: 3.70 Vdc, Extreme: Low 3.50 Vdc, High 4.25 Vdc
Test Engineer:	Logan Li (Conducted measurement) Robin Gu (Radiated measurement)

3.4 Description of Test Auxiliary Equipment

The EUT has been tested as an independent unit.

3.5 Measurement Uncertainty

Parameter	Expanded Uncertainty (Confidence of 95%(U = 2Uc(y)))
Conducted Emission for LISN (9kHz ~ 150kHz)	3.57 dB
Conducted Emission for LISN (150kHz ~ 30MHz)	3.14 dB
Radiated Emission (30MHz ~ 200MHz) (10m SAC)	4.3 dB
Radiated Emission (200MHz ~ 1000MHz) (10m SAC)	4.3 dB
Radiated Emission (1GHz ~ 6GHz) (3m FAR)	4.95 dB
Radiated Emission (6GHz ~ 18GHz) (3m FAR)	5.23 dB
Radiated Emission (18GHz ~ 40GHz) (3m FAR)	5.32 dB
Note: All the measurement uncertainty value were shown with a coverage k=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.	

3.6 Additions to, Deviations, or Exclusions from the Method

No

3.7 Laboratory Facility

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

- **FCC - Designation No.: CN1211**

JianYan Testing Group Shenzhen Co., Ltd. has been accredited as a testing laboratory by FCC(Federal Communications Commission). The test firm Registration No. is 727551.

- **ISED – CAB identifier.: CN0021**

The 3m Semi-anechoic chamber and 10m Semi-anechoic chamber of JianYan Testing Group Shenzhen Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

- **CNAS - Registration No.: CNAS L15527**

JianYan Testing Group Shenzhen Co., Ltd. is accredited to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L15527.

- **A2LA - Registration No.: 4346.01**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: <https://portal.a2la.org/scopepdf/4346-01.pdf>

3.8 Laboratory Location

JianYan Testing Group Shenzhen Co., Ltd.

Address: No.101, Building 8, Innovation Wisdom Port, No.155 Hongtian Road, Huangpu Community, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, People's Republic of China.

Tel: +86-755-23118282, Fax: +86-755-23116366

Email: info-JYTee@lets.com, Website: <http://jyt.lets.com>

3.9 Test Instruments List

Radiated Emission(3m FAR):					
Test Equipment	Manufacturer	Model No.	Manage No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
3m FAR	YUNYI	9m*6m*6m	WXJ097	06-15-2023	06-14-2028
BiConiLog Antenna	Schwarzbeck	VULB9163	WXJ097-2	07-13-2023	07-12-2024
				07-01-2024	06-30-2025
Biconical Antenna	Schwarzbeck	VUBA9117	WXJ002-1	07-02-2021	07-01-2024
				07-01-2024	06-30-2027
Horn Antenna	Schwarzbeck	BBHA9120D	WXJ097-3	07-14-2023	07-13-2024
				06-16-2024	06-15-2025
Horn Antenna	Schwarzbeck	BBHA9120D	WXJ002-3	12-28-2023	12-27-2024
Horn Antenna	Schwarzbeck	BBHA9170	WXJ002-5	12-28-2023	12-27-2024
Horn Antenna	Schwarzbeck	BBHA9170	WXJ002-6	12-28-2023	12-27-2024
Pre-amplifier (30MHz ~ 1GHz)	YUNYI	PAM-310N	WXJ097-5	04-24-2024	04-23-2025
Pre-amplifier (1GHz ~ 18GHz)	YUNYI	PAM-118N	WXJ097-6	04-24-2024	04-23-2025
Pre-amplifier (18GHz ~ 40GHz)	RF System	TRLA-180400G45B	WXJ002-7	12-28-2023	12-27-2024
EMI Test Receiver	Rohde & Schwarz	ESCI3	WXJ003	12-27-2023	12-26-2024
Spectrum Analyzer	Rohde & Schwarz	FSP 30	WXJ004	12-27-2023	12-26-2024
Spectrum Analyzer	KEYSIGHT	N9020B	WXJ081-1	06-13-2023	06-12-2024
				06-11-2024	06-10-2025
Coaxial Cable (30MHz ~ 1GHz)	JYTSZ	JYT3M-1G-NN-13M	WXG097-1	08-01-2023	07-31-2024
				07-30-2024	07-29-2025
Coaxial Cable (1GHz ~ 18GHz)	JYTSZ	JYT3M-18G-NN-8M	WXG097-2	08-01-2023	07-31-2024
				07-30-2024	07-29-2025
Coaxial Cable (18GHz ~ 40GHz)	JYTSZ	JYT3M-40G-SS-8M	WXG097-3	08-01-2023	07-31-2024
				07-30-2024	07-29-2025
High Band Reject Filter Group	Tonscend	JS0806-F	WXJ089	N/A	
Low Band Reject Filter Group	Tonscend	JS0806-F	WXJ097-4	N/A	
Test Software	Tonscend	TS+	Version: 5.0.0		

Radiated Emission(10m SAC):					
Test Equipment	Manufacturer	Model No.	Manage No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
10m SAC	ETS	RFSD-100-F/A	WXJ090	04-28-2021	04-27-2026
BiConiLog Antenna	SCHWARZBECK	VULB 9168	WXJ090-1	01-05-2024	01-04-2025
BiConiLog Antenna	SCHWARZBECK	VULB 9168	WXJ090-2	12-28-2023	12-27-2024
EMI Test Receiver	R&S	ESR 3	WXJ090-3	12-27-2023	12-26-2024
EMI Test Receiver	R&S	ESR 3	WXJ090-4	12-27-2023	12-26-2024
Low Pre-amplifier	Bost	LNA 0920N	WXJ090-6	12-27-2023	12-26-2024
Low Pre-amplifier	Bost	LNA 0920N	WXJ090-7	12-27-2023	12-26-2024
Cable	Bost	JYT10M-1G-NN-10M	WXG002-7	01-17-2024	01-16-2025
Cable	Bost	JYT10M-1G-NN-10M	WXG002-8	01-17-2024	01-16-2025
Test Software	R&S	EMC32	Version: 10.50.40		

Conducted Emission:					
Test Equipment	Manufacturer	Model No.	Manage No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
EMI Test Receiver	Rohde & Schwarz	ESR3	WXJ003-2	07-05-2023	07-04-2024
				06-11-2024	06-10-2025
LISN	Schwarzbeck	NSLK 8127	QCJ001-13	12-27-2023	12-26-2024
LISN	Rohde & Schwarz	ESH3-Z5	WXJ005-1	12-27-2023	12-26-2024
LISN Coaxial Cable (9kHz ~ 30MHz)	JYTSZ	JYTCE-1G-NN-2M	WXG003-1	01-17-2024	01-16-2025
Test Software	AUDIX	E3	Version: 6.110919b		

Conducted Method:					
Test Equipment	Manufacturer	Model No.	Manage No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
Spectrum Analyzer	Keysight	N9010B	WXJ004-3	11-01-2023	10-31-2024
Temperature Humidity Chamber	ZHONG ZHI	CZ-A-80D	WXJ032-3	01-09-2023	01-08-2025
Power Detector Box	MWRFTTEST	MW100-PSB	WXJ007-4	09-25-2023	09-24-2024
RF Control Unit	MWRFTTEST	MW100-RFCB	WXG006	N/A	
RF Switch	TOP PRECISION	RSU0301	WXG003	N/A	
DC Power Supply	Keysight	E3642A	WXJ025-2	N/A	
Test Software	MWRFTTEST	MTS 8310	Version: 2.0.0.0		

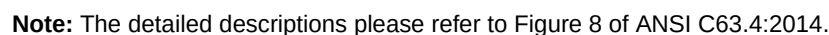
4 Measurement Setup and Procedure

4.1 Test Channel

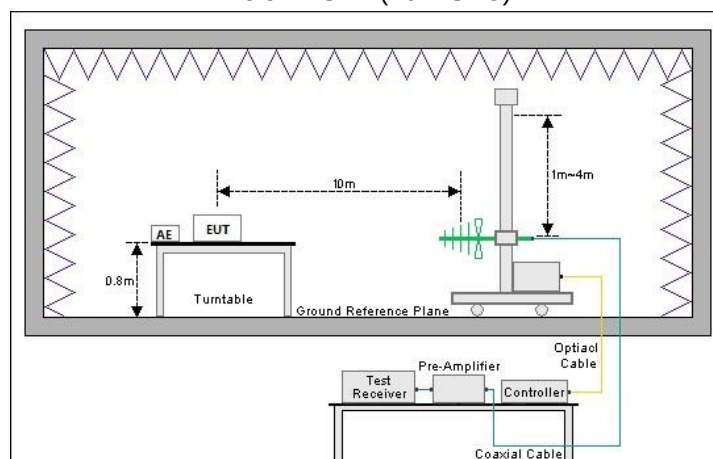
According to ANSI C63.10-2013 chapter 5.6.1 Table 4 requirement, select lowest channel, middle channel, and highest channel in the frequency range in which device operates for testing. The detailed frequency points are as follows:

Operation frequency: 5150 MHz – 5250 MHz						
Modulation mode	Lowest channel		Middle channel		Highest channel	
	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
802.11a, n-HT20, ac-VHT20	36	5180	40	5200	48	5240
802.11n-HT40, ac-VHT40	38	5190	/	/	46	5230
802.11ac-VHT80	/	/	42	5210	/	/

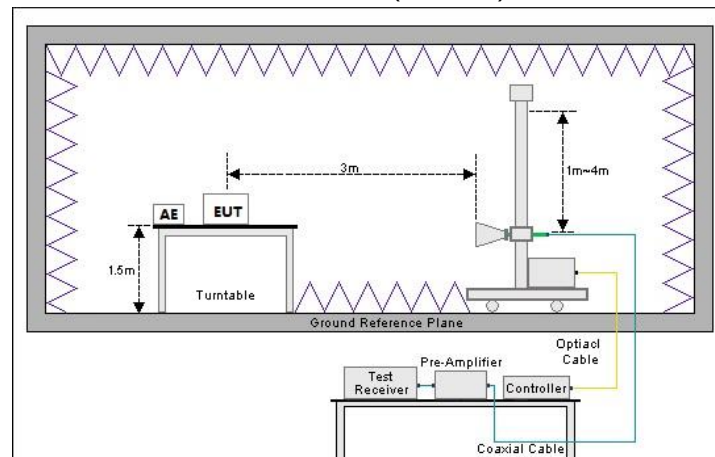
1) Conducted emission measurement:



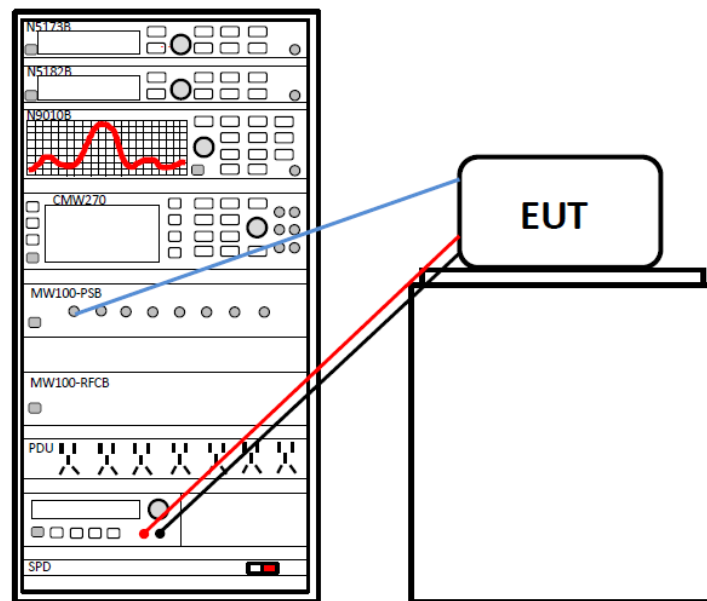
Below 1GHz (10m SAC)



Above 1GHz (3m FAR)



3) Conducted test method



4.3 Test Procedure

Test method	Test step
Conducted emission	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 on conducted measurement.
Radiated emission	For below 1GHz: 1. The EUT was placed on the tabletop of a rotating table 0.8 m the ground at a 10 m semi anechoic chamber. The measurement distance from the EUT to the receiving antenna is 10 m. 2. EUT works in each mode of operation that needs to be tested , and having the EUT continuously working, respectively on 3 axis (X, Y & Z) and considered typical configuration to obtain worst position. The highest signal levels relative to the limit shall be determined by rotating the EUT from 0° to 360° and with varying the measurement antenna height between 1 m and 4 m in vertical and horizontal polarizations. 3. Open the test software to control the test antenna and test turntable. Perform the test, save the test results, and export the test data. For above 1GHz: 1. The EUT was placed on the tabletop of a rotating table 1.5 m the ground at a 3 m fully anechoic room. The measurement distance from the EUT to the receiving antenna is 3 m. 2. EUT works in each mode of operation that needs to be tested , and having the EUT continuously working, respectively on 3 axis (X, Y & Z) and considered typical configuration to obtain worst position. The highest signal levels relative to the limit shall be determined by rotating the EUT from 0° to 360° and with varying the measurement antenna height between 1 m and 4 m in vertical and horizontal polarizations. 3. Open the test software to control the test antenna and test turntable. Perform the test, save the test results, and export the test data.
Conducted test method	1. The Wi-Fi antenna port of EUT was connected to the test port of the test system through an RF cable. 2. The EUT is keeping in continuous transmission mode and tested in all modulation modes. 3. Open the test software, prepare a test plan, and control the system through the software. After the test is completed, the test report is exported through the test software.

5 Test Results

5.1 Summary

5.1.1 Clause and Data Summary

Test items	Standard clause	Test data	Result
Antenna Requirement	15.203	See Section 5.2	Pass
AC Power Line Conducted Emission	15.207 15.407 (b)(9)	See Section 5.3	Pass
Duty Cycle	ANSI C63.10-2013	Appendix – 5.2G Wi-Fi	Pass
Conducted Peak Output Power Power Spectral Density	15.407 (a)(1)(iv)	Appendix – 5.2G Wi-Fi	Pass
26dB Emission Bandwidth 99% Occupied Bandwidth	15.407 (a)(12)	Appendix – 5.2G Wi-Fi	Pass
6dB Emission Bandwidth	15.407 (e)	Appendix – 5.2G Wi-Fi	Pass
Unwanted Emissions	15.205 15.209 15.407 (b)(1), (9), (10)	See Section 5.4	Pass
Frequency Stability	15.407 (g)	Appendix – 5.2G Wi-Fi	Pass
Dynamic frequency selection	15.407 (h)(2)	N/A	N/A
Remark: 1. Pass: The EUT complies with the essential requirements in the standard. 2. N/A: Not Applicable. 3. The cable insertion loss used by “RF Output Power” and other conduction measurement items is 1.0dB (provided by the customer).			
Test Method:	ANSI C63.10-2013 KDB 789033 D02 General U-NII Test Procedures New Rules v02r01		

5.1.2 Test Limit

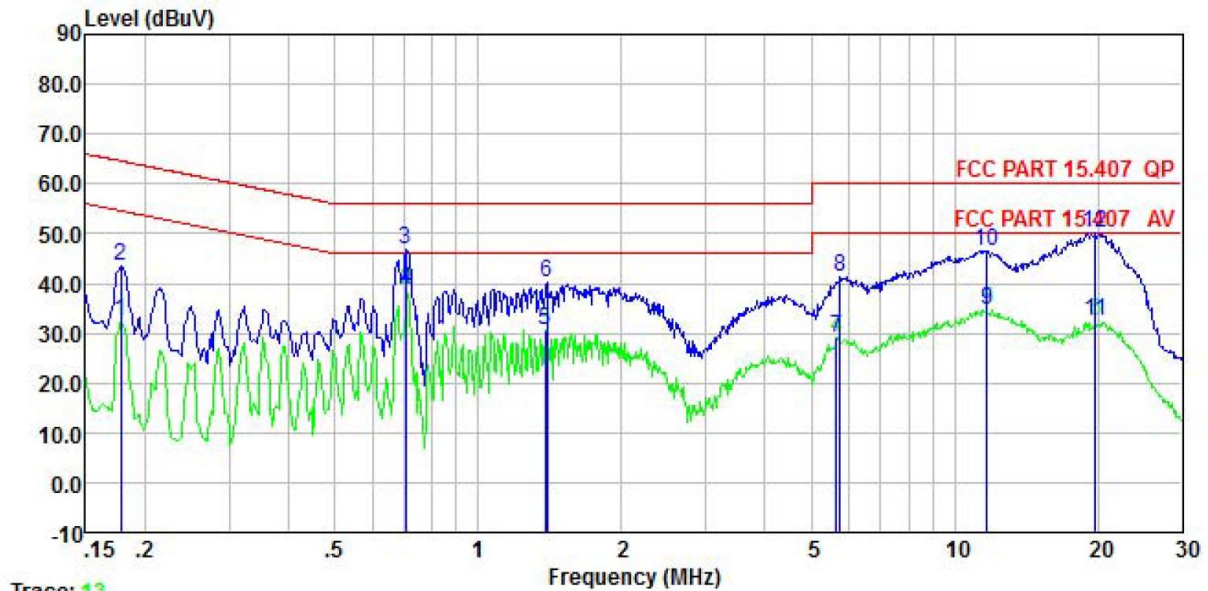
Test items	Limit																														
AC Power Line Conducted Emission	<table><tr><th rowspan="2">Frequency (MHz)</th><th colspan="2">Limit (dBμV)</th></tr><tr><th>Quasi-Peak</th><th>Average</th></tr><tr><td>0.15 – 0.5</td><td>66 to 56 Note 1</td><td>56 to 46 Note 1</td></tr><tr><td>0.5 – 5</td><td>56</td><td>46</td></tr><tr><td>5 – 30</td><td>60</td><td>50</td></tr></table> Note 1: The limit level in dBμV decreases linearly with the logarithm of frequency. Note 2: The more stringent limit applies at transition frequencies.	Frequency (MHz)	Limit (dBμV)		Quasi-Peak	Average	0.15 – 0.5	66 to 56 Note 1	56 to 46 Note 1	0.5 – 5	56	46	5 – 30	60	50																
Frequency (MHz)	Limit (dBμV)																														
	Quasi-Peak	Average																													
0.15 – 0.5	66 to 56 Note 1	56 to 46 Note 1																													
0.5 – 5	56	46																													
5 – 30	60	50																													
Conducted Peak Output Power Power Spectral Density	For the 5.15-5.25 GHz band: For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.																														
26dB Emission Bandwidth 99% Occupied Bandwidth	N/A																														
6dB Emission Bandwidth	Within the 5.725-5.850 GHz and 5.850-5.895 GHz bands, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.																														
Unwanted Emissions	(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 e.i.r.p. of 27 dBm/MHz. (2) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209. The provisions of § 15.205 apply to intentional radiators operating under this section: <table><tr><th rowspan="2">Frequency (MHz)</th><th colspan="2">Limit (dBμV/m)</th><th rowspan="2">Detector</th></tr><tr><th>@ 3m</th><th>@ 10m</th></tr><tr><td>30 – 88</td><td>40.0</td><td>30.0</td><td>Quasi-peak</td></tr><tr><td>88 – 216</td><td>43.5</td><td>33.5</td><td>Quasi-peak</td></tr><tr><td>216 – 960</td><td>46.0</td><td>36.0</td><td>Quasi-peak</td></tr><tr><td>960 – 1000</td><td>54.0</td><td>44.0</td><td>Quasi-peak</td></tr></table> Note: The more stringent limit applies at transition frequencies. <table><tr><th rowspan="2">Frequency</th><th colspan="2">Limit (dBμV/m) @ 3m</th></tr><tr><th>Average</th><th>Peake</th></tr><tr><td>Above 1 GHz</td><td>54.0</td><td>74.0</td></tr></table> Note: The measurement bandwidth shall be 1 MHz or greater.	Frequency (MHz)	Limit (dBμV/m)		Detector	@ 3m	@ 10m	30 – 88	40.0	30.0	Quasi-peak	88 – 216	43.5	33.5	Quasi-peak	216 – 960	46.0	36.0	Quasi-peak	960 – 1000	54.0	44.0	Quasi-peak	Frequency	Limit (dBμV/m) @ 3m		Average	Peake	Above 1 GHz	54.0	74.0
Frequency (MHz)	Limit (dBμV/m)		Detector																												
	@ 3m	@ 10m																													
30 – 88	40.0	30.0	Quasi-peak																												
88 – 216	43.5	33.5	Quasi-peak																												
216 – 960	46.0	36.0	Quasi-peak																												
960 – 1000	54.0	44.0	Quasi-peak																												
Frequency	Limit (dBμV/m) @ 3m																														
	Average	Peake																													
Above 1 GHz	54.0	74.0																													
Frequency Stability	Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.																														

5.2 Antenna requirement

Standard requirement:	FCC Part 15 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 Wi-Fi antenna is an internal antenna which cannot replace by end-user, the best case gain of the antenna is 1.81 dBi. See product internal photos for details.	

5.3 AC Power Line Conducted Emission

Product name:	Marshall 8 Plus	Product model:	Marshall 8 Plus
Test by:	Asher Zhang	Test mode:	5G Wi-Fi mode
Test frequency:	150 kHz ~ 30 MHz	Phase:	Line
Test voltage:	AC 120 V/60 Hz		



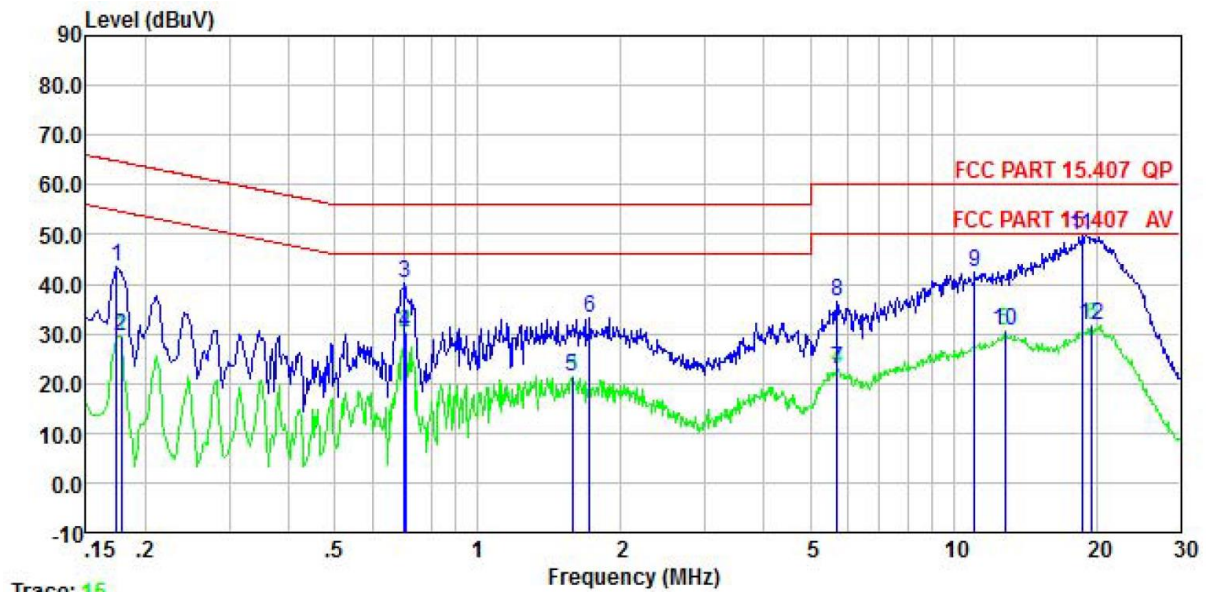
Trace: 13

	Freq	Read Level	LISN Factor	Aux Factor	Aux2 Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dB	dBuV	dBuV	dB	
1	0.178	22.22	0.20	0.00	9.88	0.01	32.31	54.59	-22.28	Average
2	0.178	33.57	0.20	0.00	9.88	0.01	43.66	64.59	-20.93	QP
3	0.705	36.71	0.20	0.00	9.88	0.03	46.82	56.00	-9.18	QP
4	0.708	28.53	0.20	0.00	9.88	0.03	38.64	46.00	-7.36	Average
5	1.381	20.29	0.20	0.00	9.88	0.13	30.50	46.00	-15.50	Average
6	1.396	29.83	0.20	0.00	9.88	0.13	40.04	56.00	-15.96	QP
7	5.653	18.92	0.20	0.00	9.90	0.09	29.11	50.00	-20.89	Average
8	5.744	31.15	0.20	0.00	9.90	0.09	41.34	60.00	-18.66	QP
9	11.683	24.48	0.24	0.00	9.92	0.10	34.74	50.00	-15.26	Average
10	11.683	36.29	0.24	0.00	9.92	0.10	46.55	60.00	-13.45	QP
11	19.740	21.95	0.39	0.00	9.96	0.15	32.45	50.00	-17.55	Average
12	19.740	39.68	0.39	0.00	9.96	0.15	50.18	60.00	-9.82	QP

Remark:

1. Level = Read level + LISN Factor + Cable Loss.

Product name:	Marshall 8 Plus	Product model:	Marshall 8 Plus
Test by:	Asher Zhang	Test mode:	5G Wi-Fi mode
Test frequency:	150 kHz ~ 30 MHz	Phase:	Neutral
Test voltage:	AC 120 V/60 Hz		



	Freq	Read Level	LISN Factor	Aux Factor	Aux2 Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dB	dBuV	dBuV	dB	
1	0.174	33.27	0.20	0.00	9.88	0.01	43.36	64.77	-21.41	QP
2	0.178	19.54	0.20	0.00	9.88	0.01	29.63	54.59	-24.96	Average
3	0.701	30.07	0.20	0.00	9.88	0.03	40.18	56.00	-15.82	QP
4	0.705	19.95	0.20	0.00	9.88	0.03	30.06	46.00	-15.94	Average
5	1.577	10.98	0.27	0.00	9.88	0.16	21.29	46.00	-24.71	Average
6	1.716	22.71	0.28	0.00	9.88	0.17	33.04	56.00	-22.96	QP
7	5.683	12.55	0.30	0.00	9.90	0.09	22.84	50.00	-27.16	Average
8	5.683	26.09	0.30	0.00	9.90	0.09	36.38	60.00	-23.62	QP
9	11.080	31.82	0.40	0.00	9.91	0.11	42.24	60.00	-17.76	QP
10	12.852	20.09	0.40	0.00	9.92	0.11	30.52	50.00	-19.48	Average
11	18.622	39.20	0.40	0.00	9.95	0.15	49.70	60.00	-10.30	QP
12	19.532	21.28	0.40	0.00	9.96	0.15	31.79	50.00	-18.21	Average

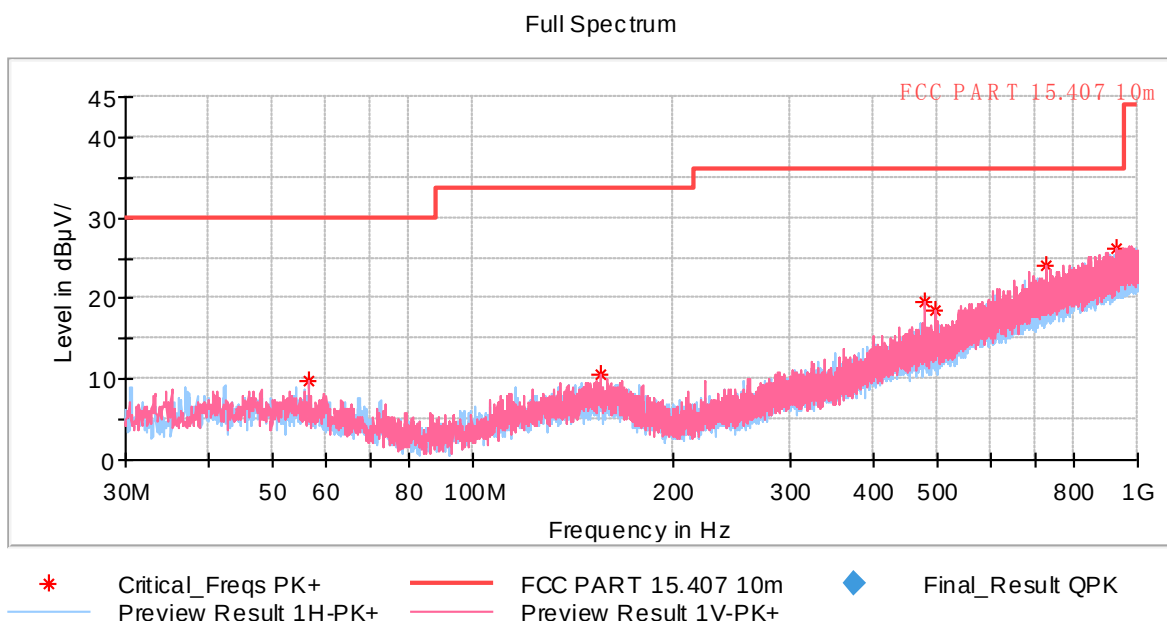
Remark:

1. Level = Read level + LISN Factor + Cable Loss.

5.4 Unwanted Emissions

Below 1GHz:

Product Name:	Marshall 8 Plus	Product Model:	Marshall 8 Plus
Test By:	Kiran Zeng	Test mode:	5G Wi-Fi mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Vertical & Horizontal
Test Voltage:	DC 3.7V		



Critical_Freqs

Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
56.529500	9.66	30.00	20.34	100.0	V	71.0	-16.7	14:28:20 - 2024/5/20
155.178500	10.51	33.50	22.99	100.0	V	110.0	-15.2	14:28:20 - 2024/5/20
478.334000	19.54	36.00	16.46	100.0	V	43.0	-9.8	14:28:20 - 2024/5/20
494.290500	18.40	36.00	17.60	100.0	V	93.0	-9.6	14:28:20 - 2024/5/20
730.631000	24.06	36.00	11.94	100.0	V	332.0	-3.6	14:28:20 - 2024/5/20
928.462500	26.21	36.00	9.79	100.0	V	349.0	-0.6	14:30:50 - 2024/5/20

Remark:

1. Level = Reading + Factor(Antenna Factor + Cable Loss – Preamplifier Factor).

Above 1GHz

Band 1: 5150 MHz - 5250 MHz, 802.11a						
Test channel: Lowest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
5150.00	68.41	-6.26	62.15	74.00	11.85	Vertical
10360.00	46.88	1.27	48.15	68.20	20.05	Vertical
5150.00	67.07	-6.26	60.81	74.00	13.19	Horizontal
10360.00	47.92	1.27	49.19	68.20	19.01	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
5150.00	53.65	-6.26	47.39	54.00	6.61	Vertical
5150.00	51.74	-6.26	45.48	54.00	8.52	Horizontal
Test channel: Middle channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
10400.00	46.78	2.39	49.17	68.20	19.03	Vertical
10400.00	46.89	2.39	49.28	68.20	18.92	Horizontal
Test channel: Highest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
5350.00	59.47	-6.32	53.15	74.00	20.85	Vertical
10480.00	46.33	2.80	49.13	68.20	19.07	Vertical
5350.00	59.42	-6.32	53.10	74.00	20.90	Horizontal
10480.00	46.81	2.80	49.61	68.20	18.59	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
5350.00	48.52	-6.32	42.20	54.00	11.80	Vertical
5350.00	48.42	-6.32	42.10	54.00	11.90	Horizontal
Remark: 1. Level = Reading + Factor. 2. Test Frequency up to 40GHz, and the emission levels of other frequencies are lower than the limit 20dB, not show in test report.						

Band 1: 5150 MHz - 5250 MHz, 802.11n-HT20						
Test channel: Lowest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
5150.00	72.75	-6.26	66.49	74.00	7.51	Vertical
10360.00	46.73	1.27	48.00	68.20	20.20	Vertical
5150.00	67.80	-6.26	61.54	74.00	12.46	Horizontal
10360.00	47.50	1.27	48.77	68.20	19.43	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
5150.00	54.78	-6.26	48.52	54.00	5.48	Vertical
5150.00	52.37	-6.26	46.11	54.00	7.89	Horizontal
Test channel: Middle channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
10400.00	46.80	2.39	49.19	68.20	19.01	Vertical
10400.00	47.17	2.39	49.56	68.20	18.64	Horizontal
Test channel: Highest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
5350.00	60.51	-6.32	54.19	74.00	19.81	Vertical
10480.00	46.50	2.80	49.30	68.20	18.90	Vertical
5350.00	60.05	-6.32	53.73	74.00	20.27	Horizontal
10480.00	47.83	2.80	50.63	68.20	17.57	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
5350.00	48.46	-6.32	42.14	54.00	11.86	Vertical
5350.00	48.60	-6.32	42.28	54.00	11.72	Horizontal
Remark: 1. Level = Reading + Factor. 2. Test Frequency up to 40GHz, and the emission levels of other frequencies are lower than the limit 20dB, not show in test report.						

Band 1: 5150 MHz - 5250 MHz, 802.11n-HT40						
Test channel: Lowest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
5150.00	70.26	-6.26	64.00	74.00	10.00	Vertical
10380.00	45.68	1.84	47.52	68.20	20.68	Vertical
5150.00	66.79	-6.26	60.53	74.00	13.47	Horizontal
10380.00	47.91	1.84	49.75	68.20	18.45	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
5150.00	56.48	-6.26	50.22	54.00	3.78	Vertical
5150.00	53.82	-6.26	47.56	54.00	6.44	Horizontal
Test channel: Highest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
5350.00	68.51	-6.32	62.19	74.00	11.81	Vertical
10460.00	45.89	1.65	47.54	68.20	20.66	Vertical
5350.00	59.98	-6.32	53.66	74.00	20.34	Horizontal
10460.00	46.94	1.65	48.59	68.20	19.61	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
5350.00	56.10	-6.32	49.78	54.00	4.22	Vertical
5350.00	49.76	-6.32	43.44	54.00	10.56	Horizontal
Remark: 1. Level = Reading + Factor. 2. Test Frequency up to 40GHz, and the emission levels of other frequencies are lower than the limit 20dB, not show in test report.						

Band 1: 5150 MHz - 5250 MHz, 802.11ac-VHT20						
Test channel: Lowest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
5150.00	72.61	-6.26	66.35	74.00	7.65	Vertical
10360.00	46.68	1.27	47.95	68.20	20.25	Vertical
5150.00	67.39	-6.26	61.13	74.00	12.87	Horizontal
10360.00	47.59	1.27	48.86	68.20	19.34	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
5150.00	54.46	-6.26	48.20	54.00	5.80	Vertical
5150.00	52.17	-6.26	45.91	54.00	8.09	Horizontal
Test channel: Middle channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
10400.00	46.72	2.39	49.11	68.20	19.09	Vertical
10400.00	46.97	2.39	49.36	68.20	18.84	Horizontal
Test channel: Highest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
5350.00	60.33	-6.32	54.01	74.00	19.99	Vertical
10480.00	46.51	2.80	49.31	68.20	18.89	Vertical
5350.00	59.65	-6.32	53.33	74.00	20.67	Horizontal
10480.00	47.88	2.80	50.68	68.20	17.52	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
5350.00	48.37	-6.32	42.05	54.00	11.95	Vertical
5350.00	48.27	-6.32	41.95	54.00	12.05	Horizontal
Remark: 1. Level = Reading + Factor. 2. Test Frequency up to 40GHz, and the emission levels of other frequencies are lower than the limit 20dB, not show in test report.						

Band 1: 5150 MHz - 5250 MHz, 802.11ac-VHT40						
Test channel: Lowest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
5150.00	69.90	-6.26	63.64	74.00	10.36	Vertical
10380.00	45.78	1.84	47.62	68.20	20.58	Vertical
5150.00	66.41	-6.26	60.15	74.00	13.85	Horizontal
10380.00	47.79	1.84	49.63	68.20	18.57	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
5150.00	56.28	-6.26	50.02	54.00	3.98	Vertical
5150.00	53.69	-6.26	47.43	54.00	6.57	Horizontal
Test channel: Highest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
5350.00	68.07	-6.32	61.75	74.00	12.25	Vertical
10460.00	45.82	1.65	47.47	68.20	20.73	Vertical
5350.00	59.61	-6.32	53.29	74.00	20.71	Horizontal
10460.00	46.96	1.65	48.61	68.20	19.59	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
5350.00	56.01	-6.32	49.69	54.00	4.31	Vertical
5350.00	49.39	-6.32	43.07	54.00	10.93	Horizontal
Remark: 1. Level = Reading + Factor. 2. Test Frequency up to 40GHz, and the emission levels of other frequencies are lower than the limit 20dB, not show in test report.						

Band 1: 5150 MHz - 5250 MHz, 802.11ac-VHT80						
Test channel: Middle channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
5150.00	66.81	-6.26	60.55	74.00	13.45	Vertical
5350.00	59.64	-6.32	53.32	74.00	20.68	Vertical
10420.00	46.84	1.85	48.69	68.20	19.51	Vertical
5150.00	65.44	-6.26	59.18	74.00	14.82	Horizontal
5350.00	59.22	-6.32	52.90	74.00	21.1	Horizontal
10420.00	47.56	1.85	49.41	68.20	18.79	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBμV)	Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
5150.00	56.24	-6.26	49.98	54.00	4.02	Vertical
5350.00	48.62	-6.32	42.30	54.00	11.7	Vertical
5150.00	53.14	-6.26	46.88	54.00	7.12	Horizontal
5350.00	48.42	-6.32	42.10	54.00	11.9	Horizontal
Remark: 1. Level = Reading + Factor. 2. Test Frequency up to 40GHz, and the emission levels of other frequencies are lower than the limit 20dB, not show in test report.						

-----End of report-----