FCC REPORT

Applicant:	ShenZhen Aratek Biometrics Technology Co., Ltd.
Address of Applicant:	2F, T2-A Building, ShenZhen Software Park, South Area, Hi-Tech Park, Shenzhen, Guangdong, China

Equipment Under Test (EUT)

Product Name:	Mobile ID Terminal
Model No.:	Marshall, Marshall L, Marshall U, Marshall M, Marshall C, Marshall S, Marshall 8, BM5510, BM5520
Trade mark:	ARATEK
FCC ID:	2AGUJMARSHALL
Applicable standards:	FCC CFR Title 47 Part 15 Subpart B
Date of sample receipt:	14 Mar., 2019
Date of Test:	14 Mar., to 16 May, 2019
Date of report issued:	16 May, 2019
Test Result:	PASS *

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

Authorized Signature:

Bruce Zhang
Laboratory Manager

2 Version

Version No.	Date	Description
00	*16 May, 2019*	*Original*

Tested by:  ***Date:*** *16 May, 2019*

Test Engineer

Reviewed by:  ***Date:*** *16 May, 2019*

Project Engineer

3 Contents

Page

1 COVER PAGE 1
2 VERSION 2
3 CONTENTS 3
4 TEST SUMMARY 4
5 GENERAL INFORMATION 5
5.1 CLIENT INFORMATION 5
5.2 GENERAL DESCRIPTION OF E.U.T. 5
5.3 TEST MODE 5
5.4 MEASUREMENT UNCERTAINTY 6
5.5 DESCRIPTION OF SUPPORT UNITS 6
5.6 RELATED SUBMITTAL(S) / GRANT (S) 6
5.7 DESCRIPTION OF CABLE USED 6
5.8 LABORATORY FACILITY 6
5.9 LABORATORY LOCATION 6
5.10 TEST INSTRUMENTS LIST 7
6 TEST RESULTS AND MEASUREMENT DATA 8
6.1 CONDUCTED EMISSION 8
6.2 RADIATED EMISSION 11
7 TEST SETUP PHOTO 17
8 EUT CONSTRUCTIONAL DETAILS 18

4 Test Summary

Test Item	Section in CFR 47	Result
Conducted Emission	Part 15.107	Pass
Radiated Emission	Part 15.109	Pass
Remark: *Pass: The EUT complies with the essential requirements in the standard.* *N/A: The EUT not applicable of the test item.*		

5 General Information

5.1 Client Information

Applicant:	ShenZhen Aratek Biometrics Technology Co., Ltd.
Address:	2F, T2-A Building, ShenZhen Software Park, South Area, Hi-Tech Park, Shenzhen, Guangdong, China
Manufacturer:	ShenZhen Aratek Biometrics Technology Co., Ltd.
Address:	2F,T2-A Building, ShenZhen Software Park, South Area, Hi-Tech Park, Shenzhen, Guangdong, China

5.2 General Description of E.U.T.

Product Name:	Mobile ID Terminal
Model No.:	Marshall, Marshall L, Marshall U, Marshall M, Marshall C, Marshall S, Marshall 8, BM5510, BM5520
Power supply:	Rechargeable Li-ion Battery DC3.8V, 10000mAh
AC adapter :	Model: RH-050250US Input: AC100-240V, 50/60Hz, 0.6A Output: DC 5.0V, 2500mA
Test Sample Condition:	The test samples were provided in good working order with no visible defects.
Remark:	Item No.: Marshall, Marshall L, Marshall U, Marshall M, Marshall C, Marshall S, Marshall 8, BM5510, BM5520 were identical inside, the electrical circuit design, layout, components used and internal wiring, with difference being model name and shell color .

5.3 Test Mode

Operating mode	Detail description
PC mode	Keep the EUT in Downloading mode(Worst case)
Charging+Printing mode	Keep the EUT in Charging+Printing mode
Charging+Scanning mode	Keep the EUT in Charging+Scanning mode
Charging+MRZ Reading mode	Keep the EUT in Charging+MRZ Reading mode
Charging+Smart Card Reading mode	Keep the EUT in Charging+Smart Card Reading mode
Charging+Recording mode	Keep the EUT in Charging+Recording mode
Charging+Playing mode	Keep the EUT in Charging+Playing mode
FM mode	Keep the EUT in FM receiver mode
GPS mode	Keep the EUT in GPS receiver mode
The sample was placed 0.8m above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.	

5.4 Measurement Uncertainty

Parameters	Expanded Uncertainty
Conducted Emission (9kHz ~ 30MHz)	±1.60 dB (k=2)
Radiated Emission (9kHz ~ 30MHz)	±3.12 dB (k=2)
Radiated Emission (30MHz ~ 1000MHz)	±4.54 dB (k=2)
Radiated Emission (1GHz ~ 18GHz)	±5.84 dB (k=2)
Radiated Emission (18GHz ~ 40GHz)	±3.36 dB (k=2)

5.5 Description of Support Units

Manufacturer	Description	Model	Serial Number	FCC ID/DoC
DELL	PC	OPTIPLEX745	N/A	DoC
DELL	MONITOR	E178FPC	N/A	DoC
DELL	KEYBOARD	SK-8115	N/A	DoC
DELL	MOUSE	MOC5UO	N/A	DoC
LENOVO	Laptop	SL510	2847A65	DoC

5.6 Related Submittal(s) / Grant (s)

This is an original grant, no related submittals and grants.

5.7 Description of Cable Used

Cable Type	Description	Length	From	To
Overall USB Cable	Unshielded	0.9m	EUT	Adapter

5.8 Laboratory Facility

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

- **FCC - Registration No.: 727551**

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

- **IC - Registration No.: 10106A-1**

The 3m Semi-anechoic chamber of Shenzhen Zhongjian Nanfang Testing 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 L6048**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6048.

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

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 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

5.9 Laboratory Location

Shenzhen Zhongjian Nanfang Testing Co., Ltd.
Address: No. B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road,
Bao'an District, Shenzhen, Guangdong, China
Tel: +86-755-23118282, Fax: +86-755-23116366
Email: info@ccis-cb.com, Website: http://www.ccis-cb.com

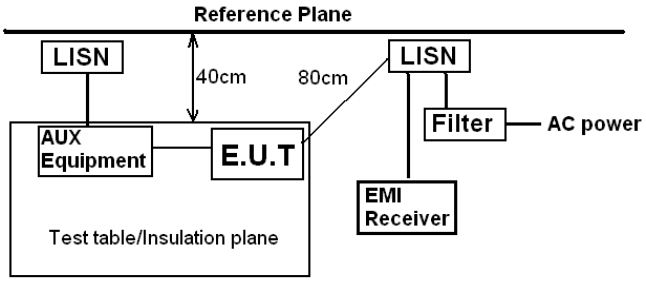
5.10 Test Instruments list

Radiated Emission:					
Test Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date (mm-dd-yy)**	**Cal. Due date (mm-dd-yy)**
3m SAC	SAEMC	9m*6m*6m	966	07-22-2017	07-21-2020
Loop Antenna	SCHWARZBECK	FMZB1519B	00044	03-18-2018	03-17-2019
				03-18-2019	03-17-2020
BiConiLog Antenna	SCHWARZBECK	VULB9163	497	03-18-2018	03-17-2019
				03-18-2019	03-17-2020
Horn Antenna	SCHWARZBECK	BBHA9120D	916	03-18-2018	03-17-2019
				03-18-2019	03-17-2020
Horn Antenna	SCHWARZBECK	BBHA9120D	1805	06-22-2017	06-21-2020
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170582	11-21-2018	11-20-2019
EMI Test Software	AUDIX	E3	Version: 6.110919b		
Pre-amplifier	HP	8447D	2944A09358	03-18-2018	03-17-2019
				03-18-2019	03-17-2020
Pre-amplifier	CD	PAP-1G18	11804	03-18-2018	03-17-2019
				03-18-2019	03-17-2020
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-18-2018	03-17-2019
				03-18-2019	03-17-2020
Spectrum analyzer	Rohde & Schwarz	FSP40	100363	11-21-2018	11-20-2019
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-18-2018	03-17-2019
				03-18-2019	03-17-2020
Cable	ZDECL	Z108-NJ-NJ-81	1608458	03-18-2018	03-17-2019
				03-18-2019	03-17-2020
Cable	MICRO-COAX	MFR64639	K10742-5	03-18-2018	03-17-2019
				03-18-2019	03-17-2020
Cable	SUHNER	SUCOFLEX100	58193/4PE	03-18-2018	03-17-2019
				03-18-2019	03-17-2020

Conducted Emission:					
Test Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date (mm-dd-yy)**	**Cal. Due date (mm-dd-yy)**
EMI Test Receiver	Rohde & Schwarz	ESCI	101189	03-18-2018	03-17-2019
				03-18-2019	03-17-2020
Pulse Limiter	SCHWARZBECK	OSRAM 2306	9731	03-18-2018	03-17-2019
				03-18-2019	03-17-2020
LISN	CHASE	MN2050D	1447	03-18-2018	03-17-2019
				03-18-2019	03-17-2020
LISN	Rohde & Schwarz	ESH3-Z5	8438621/010	07-21-2018	07-20-2019
Cable	HP	10503A	N/A	03-18-2018	03-17-2019
				03-18-2019	03-17-2020
EMI Test Software	AUDIX	E3	Version: 6.110919b		

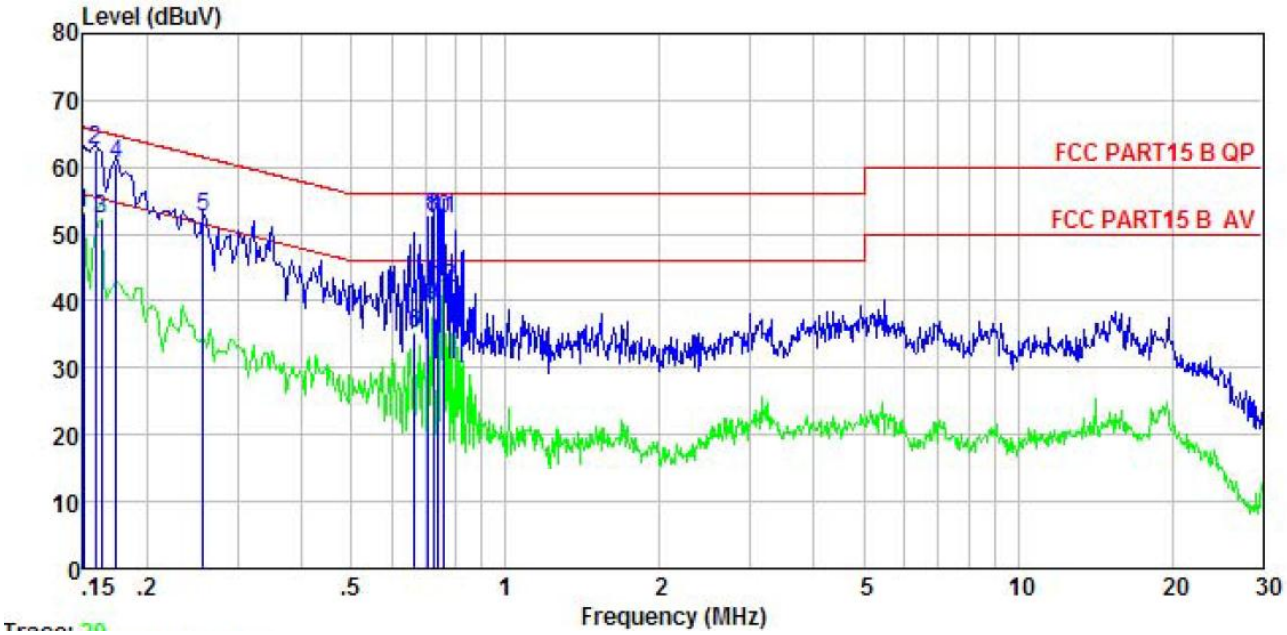
6 Test results and Measurement Data

6.1 Conducted Emission

Test Requirement:	FCC Part 15 B Section 15.107		
Test Method:	ANSI C63.4:2014		
Test Frequency Range:	150kHz to 30MHz		
Class / Severity:	Class B		
Receiver setup:	RBW=9kHz, VBW=30kHz		
Limit:	Frequency range (MHz)	Limit (dBµV)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	0.5-30	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=0.8m*		
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.). The provide 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 refers 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 C63.4: 2014 on conducted measurement.		
Test Instruments:	Refer to section 5.9 for details		
Test mode:	Refer to section 5.3 for details		
Test results:	Pass		

Measurement data:

Product name:	Mobile ID Terminal	Product model:	Marshall
Test by:	Carey	Test mode:	Charging & Printing mode
Test frequency:	150 kHz ~ 30 MHz	Phase:	Line
Test voltage:	AC 120 V/60 Hz	Environment:	Temp: 22.5℃ Huni: 55%

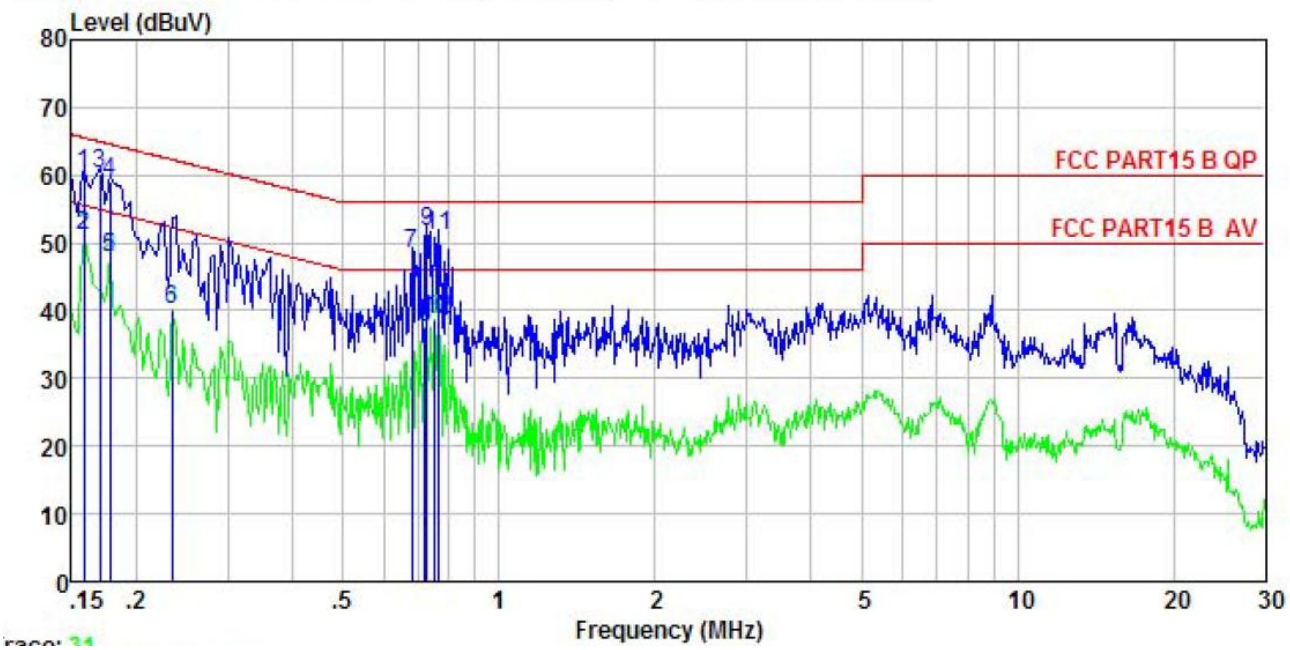


	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.150	42.73	-0.45	10.78	53.06	56.00	-2.94	Average
2	0.158	52.16	-0.44	10.77	62.49	65.56	-3.07	QP
3	0.162	41.98	-0.44	10.77	52.31	55.34	-3.03	Average
4	0.174	50.26	-0.43	10.77	60.60	64.77	-4.17	QP
5	0.258	42.09	-0.40	10.75	52.44	61.51	-9.07	QP
6	0.665	24.66	-0.38	10.77	35.05	46.00	-10.95	Average
7	0.708	28.51	-0.38	10.77	38.90	46.00	-7.10	Average
8	0.724	42.19	-0.38	10.78	52.59	56.00	-3.41	QP
9	0.724	28.97	-0.38	10.78	39.37	46.00	-6.63	Average
10	0.739	41.70	-0.38	10.79	52.11	56.00	-3.89	QP
11	0.755	41.82	-0.38	10.79	52.23	56.00	-3.77	QP
12	0.755	31.63	-0.38	10.79	42.04	46.00	-3.96	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.*

Product name:	Mobile ID Terminal	Product model:	Marshall
Test by:	Carey	Test mode:	Charging & Printing mode
Test frequency:	150 kHz ~ 30 MHz	Phase:	Neutral
Test voltage:	AC 120 V/60 Hz	Environment:	Temp: 22.5℃ Huni: 55%

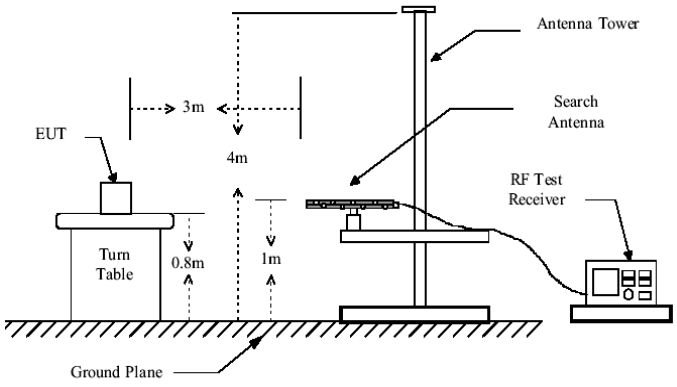
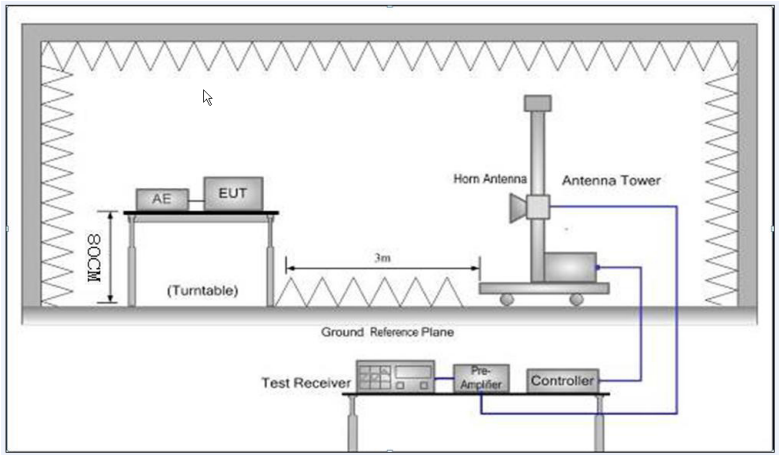


	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.158	50.23	-0.68	10.77	60.32	65.56	-5.24	QP
2	0.158	40.95	-0.68	10.77	51.04	55.56	-4.52	Average
3	0.170	50.11	-0.68	10.77	60.20	64.94	-4.74	QP
4	0.178	48.91	-0.69	10.77	58.99	64.59	-5.60	QP
5	0.178	37.67	-0.69	10.77	47.75	54.59	-6.84	Average
6	0.234	30.21	-0.67	10.75	40.29	52.30	-12.01	Average
7	0.679	38.21	-0.64	10.77	48.34	56.00	-7.66	QP
8	0.720	27.38	-0.64	10.78	37.52	46.00	-8.48	Average
9	0.727	41.49	-0.64	10.78	51.63	56.00	-4.37	QP
10	0.751	28.42	-0.64	10.79	38.57	46.00	-7.43	Average
11	0.763	40.82	-0.64	10.80	50.98	56.00	-5.02	QP
12	0.763	28.62	-0.64	10.80	38.78	46.00	-7.22	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.*

6.2 Radiated Emission

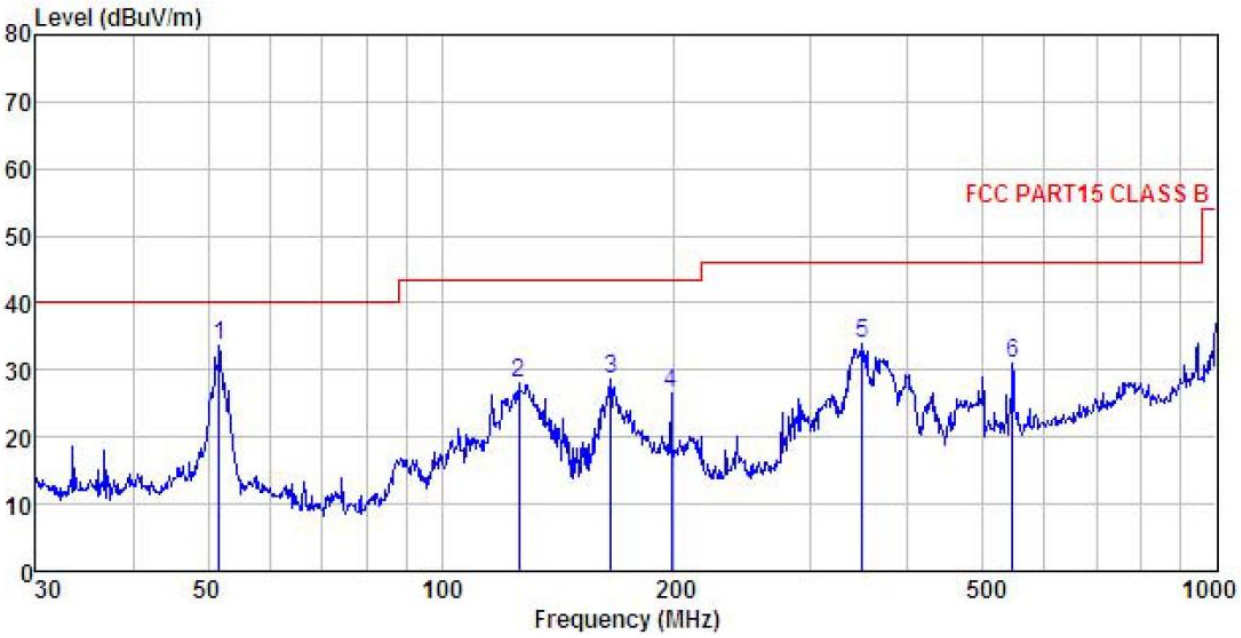
Test Requirement:	FCC Part 15 B Section 15.109				
Test Method:	ANSI C63.4:2014				
Test Frequency Range:	30MHz to 6000MHz				
Test site:	Measurement Distance: 3m (Semi-Anechoic Chamber)				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		RMS	1MHz	3MHz	Average Value
Limit:	Frequency	Limit (dBuV/m @3m)			Remark
	30MHz-88MHz	40.0			Quasi-peak Value
	88MHz-216MHz	43.5			Quasi-peak Value
	216MHz-960MHz	46.0			Quasi-peak Value
	960MHz-1GHz	54.0			Quasi-peak Value
	Above 1GHz	54.0			Average Value
		74.0			Peak Value
Test setup:	Below 1GHz  Above 1GHz 				

Test Procedure:	1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic 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 rotatable 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.
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed
Remark:	All of the observed value above 6GHz ware the niose floor , which were no recorded

Measurement Data:

Below 1GHz:

Product Name:	Mobile ID Terminal	**Product Model:**	Marshall
Test By:	Carey	**Test mode:**	PC mode
Test Frequency:	30 MHz ~ 1 GHz	**Polarization:**	Vertical
Test Voltage:	AC 120/60Hz	**Environment:**	Temp: 24℃ Huni: 57%

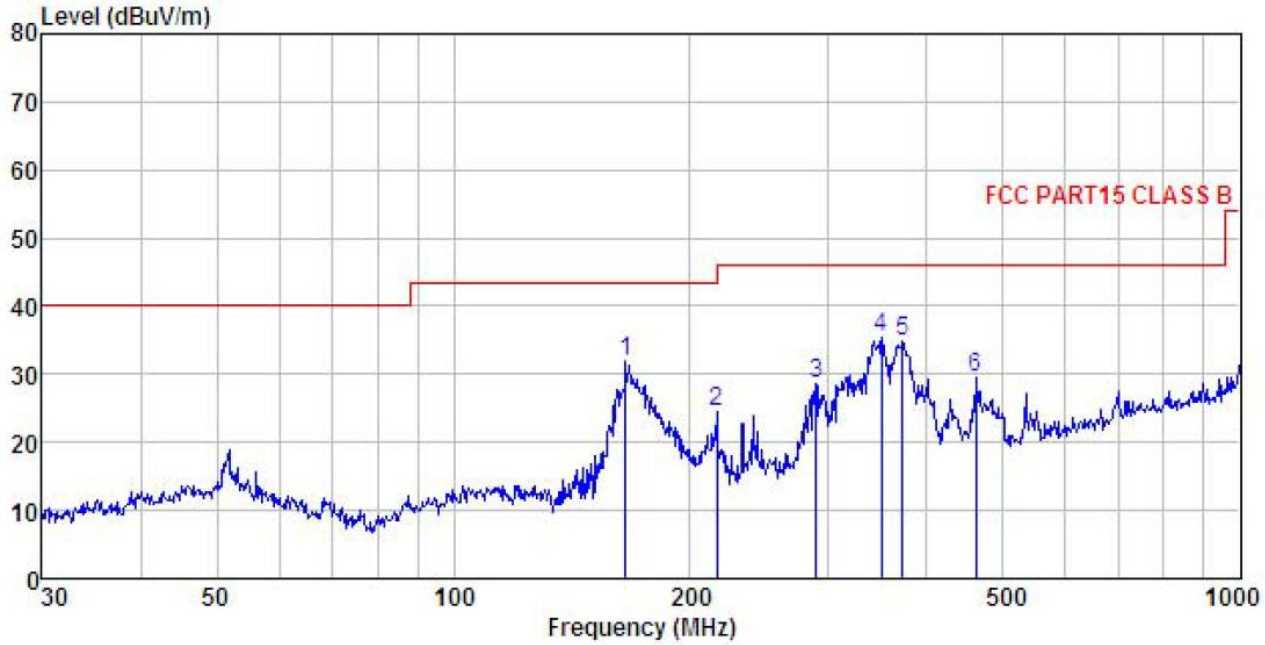


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	51.662	48.51	13.80	1.27	29.81	33.77	40.00	-6.23	QP
2	125.886	45.77	9.30	2.24	29.35	27.96	43.50	-15.54	QP
3	165.487	45.77	9.27	2.62	29.09	28.57	43.50	-14.93	QP
4	197.893	40.97	11.44	2.86	28.84	26.43	43.50	-17.07	QP
5	349.250	44.79	14.59	3.10	28.56	33.92	46.00	-12.08	QP
6	545.183	38.26	17.95	3.86	29.08	30.99	46.00	-15.01	QP

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

Product Name:	Mobile ID Terminal	Product Model:	Marshall
Test By:	Carey	Test mode:	PC mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Horizontal
Test Voltage:	AC 120/60Hz	Environment:	Temp: 24℃ Huni: 57%



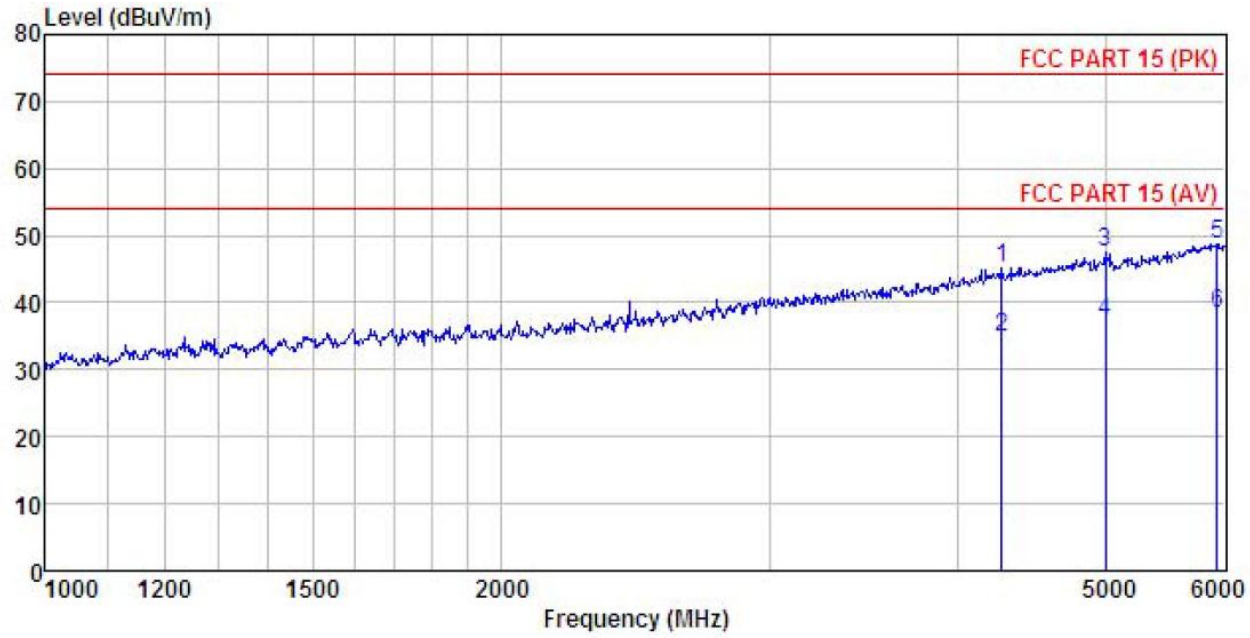
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	165.487	48.96	9.27	2.62	29.09	31.76	43.50	-11.74	QP
2	216.024	38.37	12.12	2.85	28.73	24.61	46.00	-21.39	QP
3	289.002	40.72	13.54	2.91	28.47	28.70	46.00	-17.30	QP
4	350.477	46.41	14.61	3.10	28.56	35.56	46.00	-10.44	QP
5	372.005	45.45	15.01	3.09	28.66	34.89	46.00	-11.11	QP
6	460.727	38.71	16.41	3.29	28.89	29.52	46.00	-16.48	QP

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

Above 1GHz:

Product Name:	Mobile ID Terminal	**Product Model:**	Marshall
Test By:	Carey	**Test mode:**	PC mode
Test Frequency:	1 GHz ~ 6 GHz	**Polarization:**	Vertical
Test Voltage:	AC 120/60Hz	**Environment:**	Temp: 24℃ Huni: 57%

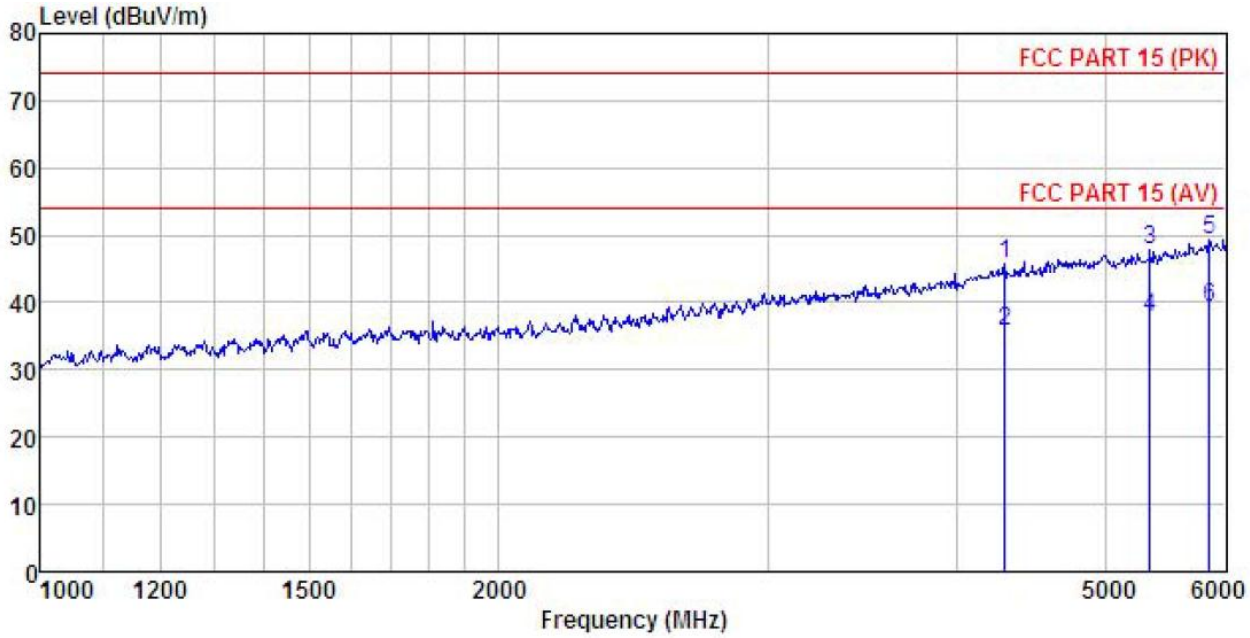


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	4270.150	47.47	30.70	6.50	41.86	45.10	74.00	-28.90	Peak
2	4270.150	37.22	30.70	6.50	41.86	34.85	54.00	-19.15	Average
3	4999.149	47.96	31.90	6.94	41.88	47.42	74.00	-26.58	Peak
4	4999.149	37.74	31.90	6.94	41.88	37.20	54.00	-16.80	Average
5	5921.334	46.96	33.16	7.91	42.04	48.76	74.00	-25.24	Peak
6	5921.334	36.49	33.16	7.91	42.04	38.29	54.00	-15.71	Average

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

Product Name:	Mobile ID Terminal	Product Model:	Marshall
Test By:	Carey	Test mode:	PC mode
Test Frequency:	1 GHz ~ 6 GHz	Polarization:	Horizontal
Test Voltage:	AC 120/60Hz	Environment:	Temp: 24℃ Huni: 57%



	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	4295.151	47.94	30.74	6.54	41.88	45.64	74.00	-28.36	Peak
2	4295.151	38.00	30.74	6.54	41.88	35.70	54.00	-18.30	Average
3	5351.487	47.73	32.26	7.11	41.89	47.82	74.00	-26.18	Peak
4	5351.487	37.76	32.26	7.11	41.89	37.85	54.00	-16.15	Average
5	5852.603	47.67	33.04	7.90	42.03	49.34	74.00	-24.66	Peak
6	5852.603	37.61	33.04	7.90	42.03	39.28	54.00	-14.72	Average

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*