

Camelion Battery Co., Ltd.

TEST REPORT

SCOPE OF WORK

EMC TESTING–SH908WC, SH916WC

REPORT NUMBER

220927173GZU-002

ISSUE DATE

20-December-2023

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TEST REPORT

Applicant Name & : Camelion Battery Co., Ltd.
Address : Unit 705, Cyber Times Tower A, Tian'an Cyber Park, Shenzhen, China.
Manufacturing Site : Same as applicant
Intertek Report No: 220927173GZU-002

Test standards

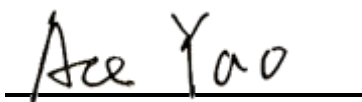
47 CFR PART 1, Subpart I, Section 1.1310
KDB 680106 D01 Wireless Power Transfer v04

Sample Description

Product : Jump Starter & Portable Power Bank
Model No. : SH908WC, SH916WC
Electrical Rating : SH908WC: 29.6Wh(14.8V, 2000mAh)
SH916WC: 59.2Wh(14.8V, 4000mAh)
Input: Micro USB) :5V= 2A, Type-C:5V=3A, 9V=2A, 12V= 1.5A
Output: Type-C:5V=3A, 9V=2A, 12V= 1.5A
USB-A 1: 5V=2.4A, USB-A 2: 5V=2.4A
Wireless Charging: 10W
Serial No. : Not Labeled
Date Received : 27 September 2022
Date Test : 07 December 2023-17 December 2023
Conducted

Prepared and Checked By

Approved By:



Ace Yao
Engineer



Dean Liu
Project Engineer

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TEST REPORT

CONTENT

CAMELION BATTERY CO., LTD.....	1
TEST REPORT.....	1
CONTENT.....	3
1.0 TEST RESULT SUMMARY	4
2.0 GENERAL DESCRIPTION.....	5
2.1 PRODUCT DESCRIPTION	5
2.2 TEST FACILITY.....	5
2.3 EUT EXERCISING SOFTWARE.....	5
2.4 SPECIAL ACCESSORIES.....	5
2.5 EQUIPMENT MODIFICATION	5
2.6 SUPPORT EQUIPMENT LIST AND DESCRIPTION	5
3.0 EMF TEST.....	7
3.1 STANDARD REQUIREMENT.....	7
3.2 TEST SETUP CONFIGURATION.....	7
3.3 TEST DATA.....	8
3.4 CALCULATION OF THEORETICAL H-FIELD STRENGTH WITH BIOT-SAVART'S LAW	8
3.5 THE VALIDATION OF H-FIELD STRENGTH	10
3.6 THE ESTABLISHMENT OF H-FIELD STRENGTH	10
4.0 TEST EQUIPMENT LIST	11

TEST REPORT

1.0 TEST RESULT SUMMARY

Classification of EUT: Class B

Test Item	Standard	Result
EMF	47 CFR PART 1, Subpart I, Section 1.1310	PASS

Remark:

When determining the test results, measurement uncertainty of tests has been considered.

Model SH908WC and SH916WC are the same except for appearance and battery capacity.

We tested both SH908WC and SH916WC, the worst case was SH916WC and only the worst case recorded in this report.

TEST REPORT

2.0 General Description

2.1 Product Description

Operating Frequency	111-203KHz
Type of Modulation:	ASK
Antenna Type	Inductive loop coil antenna
Power Supply:	Wireless output: 10W
Power cord:	--

2.2 Test Facility

Room102/104, No 203, KeZhu Road, Science City, GETDD Guangzhou, China

A2LA Certificate Number 0078.10
Intertek Testing Services Shenzhen Ltd. Guangzhou Branch is accredited by A2LA and Listed in FCC website. FCC accredited test labs may perform both Certification testing under Parts 15 and 18 and Declaration of Conformity testing.

2.3 EUT Exercising Software

N/A

2.4 Special Accessories

N/A

2.5 Equipment Modification

Any modifications installed previous to testing by Camelion Battery Co., Ltd. will be incorporated in each production model sold / leased in the United States.

No modifications were installed by Intertek Testing Services Shenzhen Ltd. Guangzhou Branch.

2.6 Support Equipment List and Description

This product was tested with corresponding support equipment as below:

TEST REPORT

Support Equipment:

Equipment	Model No.	Supplier
Mobile phone	iPhone 15	Intertek

Remark: WPT client was one of typical client devices, it's selected such that the EUT was fully exercised at maximum power from its transmitter. It will not be sold together.

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above evaluated respectively

Pretest mode	Description	
Standby Mode	kept transmitting continuously	
Charging Mode	CH: Low	WPT client is charging at 1% battery power, 50% and 99% battery power respectively, keep transmitting continuously
	CH: Middle	
	CH: High	

TEST REPORT

3.0 EMF TEST

3.1 Standard Requirement

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1093 this device has been defined as a portable device whereby device is within 20 centimeters of the body of the user.

(a) Limits for Occupational / Controlled Exposure

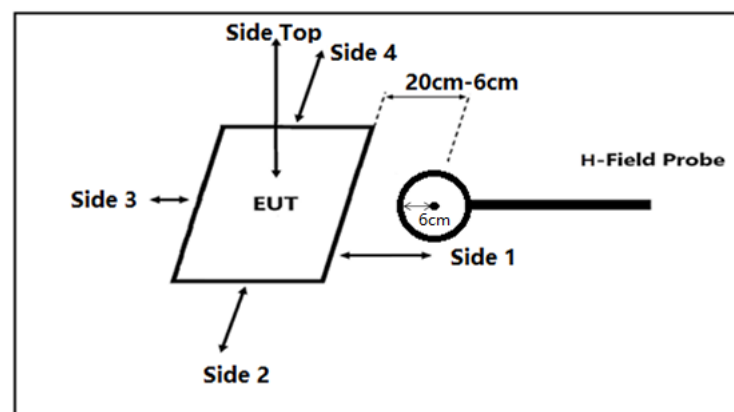
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S)(mW/cm ²)	Averaging Times E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f)*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	F/300	6
1500-100000	--	--	5	6

(b) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S)(mW/cm ²)	Averaging Times E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	F/1500	30
1500-100000	--	--	1.0	30

Note: f=frequency in MHz; *Plane-wave equivalent power density

3.2 Test Setup Configuration



TEST REPORT

3.3 Test Data

Input Voltage: 120V/60Hz

Ambient Condition: 24°C, 50%RH

Test distance: H-field data is taken along all three axes the device, from 0 cm to 20 cm, in 2 cm minimum increment measured from the edge of the device, with one axis coincident with the axis of the main coil, the worst data was tested at Mobile in 1% battery power(the worst case) and shown as below.

Probe has 6 cm radius enclosure, so the test distance can only reach 6cm.

For the H-field strength at 4cm, 2cm and 0cm, it is calculated by theoretical estimation.

H-Filed Strength:

Test Position	Test distance								Limit (A/m)
	6	8	10	12	14	16	18	20	
Side 1	0.077	0.049	0.035	0.024	0.018	0.010	0.006	0.004	1.63
Side 2	0.079	0.057	0.032	0.025	0.017	0.012	0.006	0.007	1.63
Side 3	0.083	0.055	0.039	0.028	0.019	0.014	0.009	0.005	1.63
Side 4	0.081	0.060	0.043	0.032	0.023	0.011	0.008	0.005	1.63
Top	0.088	0.062	0.049	0.038	0.029	0.017	0.010	0.009	1.63

3.4 Calculation of theoretical H-field strength with Biot-Savart's law

According to the self-inductance formula, μ_r (relative permeability) can be obtained.

$$x = \sqrt{1 + \left(\frac{d}{2l}\right)^2}$$

$$L = 2l \left[\ln\left\{\left(\frac{2l}{d}\right)(1+x)\right\} - x + \frac{\mu_r}{4} + \frac{d}{2l} \right],$$

$$\mu_r = 4 \left[\frac{L}{2l} - \ln\left\{\left(\frac{2l}{d}\right)(1+x)\right\} + x - \frac{d}{2l} \right]$$

Where:

L: self inductance [nH]

d: diameter of the wire [cm]

l: length of the wire in [cm]

μ_r : relative permeability

TEST REPORT

L[nH]	d [cm]	l[cm]	u _r
6300	0.12	102	94.3

According to Biot-Savart law, the value of the B-field at the distance z from the coil is expressed as follows.

$$B_z = \frac{\mu_0 I R^2}{2(R^2 + z^2)^{3/2}}$$

Convert the value of the B-field to the H-field.

$$B_z = \mu_0 \times H_z,$$

$$H_z = \frac{I R^2}{2(R^2 + z^2)^{3/2}}$$

Considering the number of turns and relative permeability of coil, it is expressed as follows.

$$H_z = \frac{I R^2}{2(R^2 + z^2)^{3/2}} \times \frac{N}{\mu_r}$$

Where:

I: the maximum current to the EUT during charging can be obtained from the power supply equipment [A]

R: the radial of EUT's coil antenna [m]

z: the distance from the coil antenna to the point to be measured [m]

N: the number of turns in the coil

u_r: relative permeability

Test Condition	I[A]	R[m]	u _r	N	z[m]	Actual measuring distance ³⁾ [m]	Theoretical H-field Value [A/m]
10W	1	0.03	94.3	10	0.072 ¹⁾	0.06	0.099
10W	1	0.03	94.3	10	0.012 ²⁾	0	1.391

Note:

1) Distance z is from the EUT's coil antenna to the measurement point and includes all of the following.

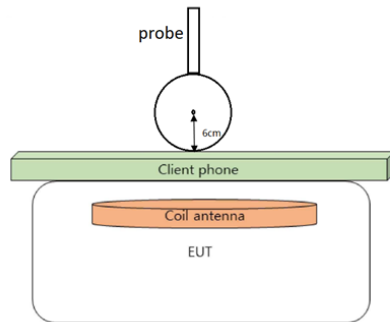
- 6 cm, the distance from the center to the probe outer edge
- 8 mm, the client phone thickness
- 4 mm, the gap from edge of measuring probe to sensing elements of measuring probe

2) Distance z is from the EUT's coil antenna to the measurement point and includes all of the following.

TEST REPORT

- 6 cm, the distance from the center to the probe outer edge
- 8 mm, the client phone thickness

3) In the actual measurement, it means the distance between the EUT and the center of the probe.



6cm, the distance from the center to the probe outer edge
8mm, the client phone thickness
4mm, the gap from EUT's coil antenna to edge of the EUT

3.5 The validation of H-field strength

Test Condition	Distance(cm)	Theoretical H-field value [A/m]	30% tolerance of Theoretical H-field value[A/m]		Measured value	Limits (A/m)
			Min.	Max		
10W	6	0.099	0.069	0.129	0.088	1.63
	8	0.052	0.036	0.068	0.062	

3.6 The establishment of H-field strength

Test Condition	Distance(cm)	Theoretical H-field value [A/m]	Limits (A/m)	Result
10W	4	0.217	1.63	Pass
	2	0.556		Pass
	0	1.391		Pass

Estimation formula and theoretical value have 30% agreement with actual measurement. Estimation for 0mm field strength with validated formula complies limit.

TEST REPORT

4.0 Test Equipment List

Equip. No.	Equipment	Model	Manufacturer	Cal. date	Due date
EM007-03	Exposure Level Tester	ELT-400	NARDA	2023/03/07	2024/03/07

*****End of the test report*****