

EMC TEST REPORT

Product Name:Lithium-ion Polymer BatteryModel Name:HCP484555NFC-2S1P

Prepared for:

Shenzhen Honcell Energy Co., Ltd. 612, Bldg. A, Weidonglong Industrial Zone, Meilong Ave.194#, Longhua New District, Shenzhen, 518109, China. TEL: 0755-23731316 FAX: 0755-23731319

Prepared by: Unilab (Shanghai) Co., Ltd. Floor 1, No. 1350, Lianxi Rd. Pudong New District, Shanghai, China TEL: +86-21-5027 5125 FAX: +86-21-5027 5126

Report Number	:	UL45520150619001
Date of Report	:	06-26-2015
Date of Test	:	06-19-2015~06-26-2015

Notes :

The test results only relate to these samples which have been tested. Partly using this report will not be admitted unless been allowed by Unilab. Unilab is only responsible for the complete report with the reported stamp of Unilab.



Applicant:	Shenzhen Honcell Energy Co., Ltd. 612, Bldg. A, Weidonglong Industrial Zone, Meilong Ave.194#, Longhua New District, Shenzhen, 518109, China.
Manufacturer:	Shenzhen Honcell Energy Co., Ltd. 612, Bldg. A, Weidonglong Industrial Zone, Meilong Ave.194#, Longhua New District, Shenzhen, 518109, China.
Product Name:	Lithium-ion Polymer Battery
Brand Name:	HC
Model Name:	HCP484555NFC-2S1P
Technical Data:	DC:7.4V 1400mAh
Date of Receipt:	06-19-2015
Date of Test:	06-19-2015~06-26-2015
Test Standard:	EN 55022: 2010+AC:2011
	EN 55024: 2010
Test Result:	PASS

Prepared by : (Technical Engineer: Paul Yang) Reviewed by : (Senior Engineer: Forest Cao) Approved by : (Supervisor Engineer: Eva Wang)

TABLE OF CONTENTS

1.	GENE	RAL INFORMATION	4
	1.1	EUT DESCRIPTION	1
	1.2	TEST MODE DESCRIPTION	1
2.	TECH	NIACL SUMMARY	5
	2.1	SUMMARY OF STANDARDS AND TEST RESULTS	5
	2.2	TEST UNCERTAINTY	5
	2.3	TEST EQUIPMENT LIST	3
	2.4	TEST FACILITY	3
	2.5	Immunity Performance Criteria	7
	2.6	TEST SETUP CONFIGURATION	3
3.	RADIA	ATED DISTURBANCE (RE))
	3.1	TEST SETUP)
	3.2	LIMITS)
	3.3	TEST PROCEDURE)
	3.4	TEST RESULT	1
4.	ELEC.	TROSTATIC DISCHARGE (ESD)13	3
	4.1	TEST SPECIFICATION	3
	4.2	TEST SETUP	3
	4.3	TEST PROCEDURE	3
	4.4	RESULTS & PERFORMANCE	4
5.	RF EL	ECTROMAGNETIC FIELD IMMUNITY16	ò
	5.1	TEST SPECIFICATION	3
	5.2	TEST SETUP	3
	5.3	TEST PROCEDURE	3
	5.4	RESULTS & PERFORMANCE	7
APPE	NDIX 1	PHOTOGRAPHS OF TEST SETUP18	3
APPE	NDIX 2	PHOTOGRAPHS OF EUT20)

1. GENERAL INFORMATION

1.1 EUT DESCRIPTION

Product Name:	Lithium-ion Polymer Battery
Model Name:	HCP484555NFC-2S1P
Technical Data:	7.4V, 1400mAh, Double batteries

1.2 TEST MODE DESCRIPTION

Unilab has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report is the worst test mode.

Final Test Mode

Final Test Mode		
EMI	Discharge Operation	
EMS	Discharge Operation	

2. TECHNIACL SUMMARY

2.1 SUMMARY OF STANDARDS AND TEST RESULTS

The EUT have been tested according to the applicable standards as referenced below:

EMISSION			
Test Item	Standard	Result	
Conducted disturbance	EN 55022:2010+AC:2011	N/A ¹	
Radiated disturbance	EN 55022:2010	Р	
Harmonic current emission	EN 61000-3-2:2006+A1:2009+A2:2009	N/A	
Voltage fluctuations & flicker	EN 61000-3-3:2008	N/A	

IMMUNITY (EN 55024: 2010)			
Test Item	Standard	Result	
Electrostatic discharge (ESD)	IEC 61000-4-2	Р	
Radio-frequency electromagnetic field Immunity	IEC 61000-4-3	Р	
Electrical fast transients (EFT)	IEC 61000-4-4	N/A	
Surges	IEC 61000-4-5	N/A	
Radio-frequency continuous conducted Immunity	IEC 61000-4-6	N/A	
Power-frequency magnetic fields Immunity	IEC 61000-4-8	N/A	
Voltage dips and interruptions	IEC 61000-4-11	N/A	

Note *: 1: P means pass, F means failure, N/A means not applicable.

2.2 TEST UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Value (dB)
Radiated disturbance	4.2

2.3 TEST EQUIPMENT LIST

3M Semi-anechoic Chamber - Radiated disturbance Test				
Equipment	Manufacturer	Model	Serial No.	Due Date
3M Chamber & Accessory Equipment	ETS-LINDGREN	FACT-3	CT-0000336	11/25/2015
Receiver	Agilent	N9038A	MY51210142	11/11/2015
Biconilog Antenna	SCHWARZBECK	VULB 9160	3316	09/19/2016

Shielding Room No. 2 - ESD Test (IEC 61000-4-2)				
Equipment	Manufacturer	Model	Serial No.	Due Date
ESD Simulator	EM TEST AG	Dito Version 2.31	DM-1132	09/04/2015

3M Full-anechoic Chamber - RF electromagnetic field Immunity Test (IEC 61000-4-3)				
Equipment	Manufacturer	Model	Serial No.	Due Date
Power Meter	R&S	NRVD	101457	11/04/2015
Signal generators	R&S	SMR20	101440	11/04/2015
Power Amplifier	B&K	BLWA	056186-01	07/20/2015
VHF/UHF EMS Antenna	SCHWARZBECK	HL046E	100008	10/15/2015

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and has been calibrated by accredited calibration laboratories.

2.4 TEST FACILITY

The site and apparatus are constructed in conformance with the requirements of ANSI C63.4, CISPR 16-1-1 and other equivalent standards. The laboratory is compliance with the requirements of the ISO/IEC/EN 17025.

2.5 Immunity Performance Criteria

The manufacturer has the obligation to express the performance criteria in terms which relate to the performance of his specific product when used as intended.

The following performance criteria are applicable, and shall only be evaluated when the functions referred to are implemented.

Examples of functions defined by the manufacturer to be evaluated during testing include, but are not limited to, the following:

- essential operational modes and states;

- tests of all peripheral access (hard disks, floppy disks, printers, keyboard, mouse, etc.);
- quality of software execution;
- quality of data display and transmission;

- quality of speech transmission.

General Performance Criteria		
Product Standard	EN 55024:2010	
CRITERION A	During and after the test the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a minimum performance level specified by the manufacturer when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the EUT if used as intended.	
CRITERION B	After the test, the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. However, no change of appreciate at at a started data is allowed to permitted the test.	
	If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the EUT if used as intended.	
CRITERION C	During and after testing, a temporary loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls or cycling of the power to the EUT by the user in accordance with the manufacturer's instructions. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.	
	battery backup, shall not be lost.	



2.6 TEST SETUP CONFIGURATION

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.

2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

3. RADIATED DISTURBANCE (RE)

3.1 TEST SETUP

30MHz ~ 1GHz:



Above 1GHz: Support Equipment Att. Feed Point B0cm Spectrum Analyzer /Receiver

3.2 LIMITS

EN Limits for radiated disturbance of Class B ITE

Frequency (MHz)	Quasi-peak limits at 3m dB(µV/m)			
30-230	40			
230-1000	47			
Frequency (GHz)	limit above 1G at 3m dB(µV/m)			
	Average	peak		
1-3	50	70		
3-6	54	74		

NOTE: The lower limit shall apply at the transition frequencies.

3.3 TEST PROCEDURE

30MHz ~ 1GHz:

a. The EUT and support equipment were placed on the non-conductive turntable 0.8m above the horizontal metal ground plane at a chamber. The EUT was set 3 meters away from the receiving antenna, which was mounted on an antenna tower. Broadband antenna (Calibrated Bilog Antenna) was used as receiving antenna.

b. The frequency range from 30MHz to 1GHz was checked. The RBW of the receiver was set at 120kHz. Set the receiver in Peak detector, Max Hold mode. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.

c. For each frequency whose maximum record was higher or close to limit, measure its QP value: vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where EUT radiated the maximum emission, then set the test frequency receiver to QP Detector and record the maximum value.

Above 1GHz:

a. The EUT and support equipment were placed on the non-conductive turntable 0.8m above the ground at a chamber. The EUT was set 3 meters away from the receiving antenna, which was mounted on an antenna tower. Horn antenna was used as receiving antenna.

b. The frequency range above 1GHz was checked. The RBW of the receiver was set at 1MHz. Set the receiver in Peak detector, Max Hold mode. Record the maximum field strength of all the pre-scan process in the full band when the antenna is 1m and varied in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.

c. For each frequency whose maximum record was higher or close to limit, measure its Average value: rotate the turntable from 0 to 360 degrees to find the degree where EUT radiated the maximum emission, then set the test frequency receiver to EMI Average Detector and record the maximum value.

3.4 TEST RESULT

30MHz ~ 1GHz:EN

Test mode:

Full load and connect network cable

80 Level (dBuV/m) 70 60 50 EN 55022 CLASS B 40 6 30 3 2 20 10 0¹30 100. 200. 300. 400. 500. 600. 700. 800. 900. 1000 Frequency (MHz) Site : chamber Condition : EN 55022 CLASS B 3m VULB9160 HORIZONTAL EUT : Model Name : : 23 °C / 54 % Temp/Humi Power Rating: DC 7.4V Mode : Discharge operation Memo : ReadAntenna Cable Preamp Limit Over Freq Level Factor Loss Factor Level Line Limit Remark MHz dB dBuV/m dBuV/m dBuV dB/m dB dB 1 161.92 1.70 18.70 40.00 -21.30 Peak 3.23 13.77 0.00 2 294.81 5.01 13.11 2.40 0.00 20.52 47.00 -26.48 Peak 3 447.10 3.16 16.33 2.88 0.00 22.37 47.00 -24.63 Peak 2.95 18.89 25.17 47.00 -21.83 Peak 4 590.66 3.33 0.00 5 765.26 3.29 21.39 3.71 0.00 28.39 47.00 -18.61 Peak 890.39 3.90 22.38 4.02 0.00 30.30 47.00 -16.70 Peak 6 pp



4. ELECTROSTATIC DISCHARGE (ESD)

4.1 TEST SPECIFICATION

Basic Standard	:	EN 55024 & IEC 61000-4-2
Test Port	:	Enclosure port
Discharge Impedance	:	330 ohm / 150 pF
Discharge Mode	:	Single Discharge
Discharge Period	:	one second between each discharge

4.2 TEST SETUP



4.3 TEST PROCEDURE

The test applied a non-conductive surface and a horizontal coupling plane on a wooden table, 0.8 m high, standing on the reference ground plane, which is a 3 m x 4 m metallic sheet with 1.5 mm thickness. This reference ground plane projected beyond the EUT by at least 0.5 m on all sides and the minimum distance between the EUT and all other conductive structure, except the ground plane beneath the EUT, was more than 1.0 m.

ESD shall be applied only to those points and surfaces of the EUT which are expected to be touched during usual operation, including user access, as specified in the user manual.

The discharges shall be applied in the following:

A. Contact discharge (Tests shall be performed at a maximum repetition rate of one discharge per second.):

a. Direct discharge:

The tip of the discharge electrode should touch the EUT, before the discharge switch was operated. The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points (a minimum of 50 discharges at each point). One of the test points shall be subjected to at least 50 indirect discharges (contact) to the center of the front edge of the horizontal coupling plane. If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode (use of the Vertical Coupling Plane)

b. Indirect discharge:

b1. Horizontal Coupling Plane (HCP): More than 50 single discharges were applied at the front edge of each HCP opposite the center point of the EUT and 0.1m from vertically the front of the EUT. Discharge to the HCP was made horizontal to the edge of the HCP.



b2. Vertical Coupling Plane (VCP): More than 50 single discharges were applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5 m x 0.5 m, was placed parallel to, and positioned at a distance of 0. m from the EUT. Discharges were applied to the coupling plane, with this plane in sufficient different positions that all sides of the EUT were completely illuminated.

B. Air discharge at slots and apertures, and insulating surfaces:

On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. The round discharge tip of the discharge electrode was approached as fast as possible to touch the EUT. After each discharge, the ESD simulator (discharge electrode) was removed from the EUT. The simulator was then re-trigged for a new single discharge and applies more than 10 times on each reselected point. This procedure was repeated until the air discharge completed.

4.4 RESULTS & PERFORMANCE

Discharge point:



EUT	:	Lithium-ion Polymer Battery	M/N	:	HCP484555NFC-2S1P
Humidity	:	51%	Temperature	:	22 °C
Mada		Diachanna Onaratian			

Mode : Discharge Operation

Air discharge (Direct discharge)					
Test location	Test level (±kV)	Minimum number of discharge per polarity (each location)	Result (Pursuant to EN55024,Criterion A)		
1~6 ¹	4,6,8	10	PASS		

Contact discharge (HCP)						
Test location	Test level (±kV)	Minimum number of discharge per polarity (each location)	Result (Pursuant to EN55024,Criterion A)			
Front	2,4	25	PASS			
Rear	2,4	25	PASS			
Left	2,4	25	PASS			
Right	2,4	25	PASS			
	Contact discharge (VCP)					
Test location	Test level (±kV)	Minimum number of discharge per polarity (each location)	Result (Pursuant to EN55024,Criterion A)			
Front	2,4	25	PASS			
	,					
Rear	2,4	25	PASS			
Rear Left	2,4 2,4	25 25	PASS PASS			

Note 1: These points are evaluated before the test. They could be discharged in the process of actual test.

5. RF ELECTROMAGNETIC FIELD IMMUNITY

5.1 TEST SPECIFICATION

Basic Standard	: EN 61000-4-3
Test Port	: Enclosure port
Step Size	: 1%
Modulation	: 1kHz, 80% AM
Dwell Time	: 1 second
Polarization	: Horizontal & Vertical

5.2 TEST SETUP



5.3 TEST PROCEDURE

a. The EUT and support equipment were placed on the non-conductive table 0.8m above the ground plane at a fully-anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT and support equipment.

b. The frequency range is swept from 80MHz to 1000MHz, with the signal 80% amplitude modulated with a 1 kHz sine wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1%. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.

c. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each side. A CCD camera was put inside the chamber and through its display to monitor the operational situation of the EUT to judge the EUT performance criterion during test.

5.4 RESULTS & PERFORMANCE

EUT	:	Lithium-ion Polymer Battery	M/N	:	HCP484555NFC-2S1P
Humidity	:	53%	Temperature	:	23 ℃

Mode : Discharge Operation

Frequency (MHz)	EUT Position	Antenna Polarization	Field Strength (V/m)	Result
80 - 1000	Front	Horizontal	3	PASS
80 - 1000	Front	Vertical	3	PASS
80 - 1000	Rear	Horizontal	3	PASS
80 - 1000	Rear	Vertical	3	PASS
80 - 1000	Left	Horizontal	3	PASS
80 - 1000	Left	Vertical	3	PASS
80 - 1000	Right	Horizontal	3	PASS
80 - 1000	Right	Vertical	3	PASS
80 - 1000	Floor	Horizontal	3	PASS
80 - 1000	Floor	Vertical	3	PASS
80 - 1000	Тор	Horizontal	3	PASS
80 - 1000	Тор	Vertical	3	PASS



APPENDIX 1 PHOTOGRAPHS OF TEST SETUP



ESD TEST SETUP







RADIO-FREQUENCY ELECTROMAGNETIC FIELD IMMUNITY TEST SETUP









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