TEST REPORT
EN 62133
Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications

Report Number. ..... :	ED170904032S
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Total number of pages	24
Testing Laboratory..... :	EMTEK (DONGGUAN) CO., LTD.
Address ..... :	No.281, Guantai Road, Nancheng District, Dongguan, Guangdong, China.
Tested by (name + signature) ..... :	Tomas Tang
Approved by (+ signature) ..... :	Eddie Yang

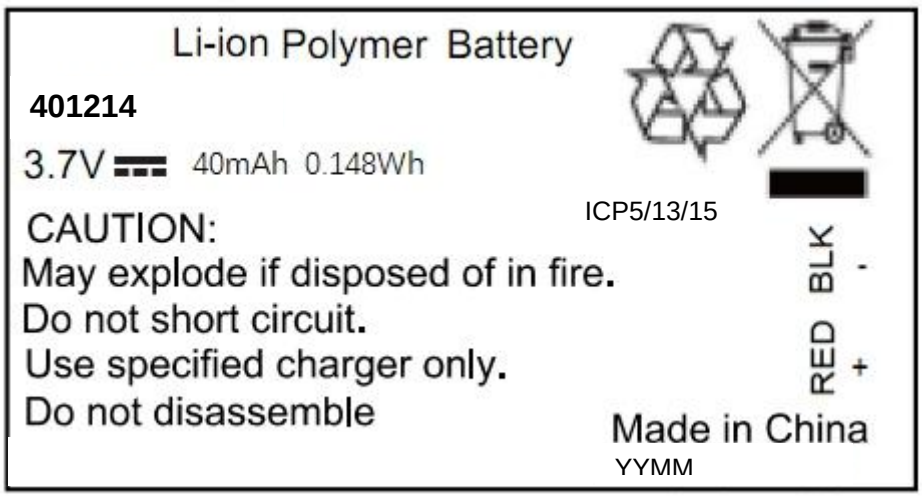
Applicant's name ..... :	
Address ..... :	

Test specification:	
Standard ..... :	EN 62133: 2013
Test procedure ..... :	N/A
Non-standard test method ..... :	N/A

Test item description ..... :	Li-polymer battery
Trade Mark ..... :	N/A
Manufacturer ..... :	
Manufacturer address ..... :	
Model/Type reference ..... :	401214
Ratings ..... :	3.7Vdc, 40mAh, 0.148Wh

Summary of testing:	
Tests performed (name of test and test clause): cl.5.6.2 Design recommendation (Lithium system); cl.8.1 Charging procedure for test purposes (for Cell and Pack); cl.8.2.1 Continuous charging at constant voltage (Cells); cl.8.3.1 External short circuit (Cell); cl.8.3.3 Free fall (for Cell and Pack); cl.8.3.4 Thermal abuse (Cells); cl.8.3.5 Crush (Cells); cl.8.3.7 Forced discharge (Cells); cl.8.3.8 Transport tests (Cells); Charging method: 1). Charging the cell with 8mA constant current, then 4.2V constant voltage until current reduces to 0.4mA at ambient 20°C±5° C (declared by the manufacturer in specifications) for clause 8.2.1, 8.3.3, 8.3.7 and 8.3.8; 2). Charging procedure of clause 8.1.2 applied for clause 8.3.1, 8.3.4, 8.3.5 In accordance with customer requirements, without consideration 8.3.9. Tests are made with the number of cells and batteries specified in IEC/EN 62133 Table 2.	**Testing location:** All tests as described in Test Case and Measurement Sections were performed at the laboratory described on page **Subcontracted Test Condition:** Subcontracted laboratory: EMTEK (SHENZHEN) CO., LTD. Test items: clause. 8.3.4, 8.3.8(T-2, T-3, T-4)

Copy of marking plate:



Data：YYMM（”YY” for year, ”MM” for month）

Note:
-The above markings are the minimum requirements required by the safety standard. For the final production, the additional markings which do not give rise to misunderstanding may be added.
- The Importer information marked on the final product.

Test item particulars ..... :	
Classification of installation and use ..... :	To be defined in final product
Supply connection ..... :	N/A
Recommend charging method declaired by the manufacturer ..... :	CC/ CV
Discharge current (0,2 I_t A) ..... :	8mA
Specified final voltage ..... :	2.75V
Chemistry ..... :	☐ nickel systems..... ☒ lithium systems
Recommend of charging limit for lithium system	
Upper limit charging voltage per cell ..... :	4.2V
Maximum charging current ..... :	40mA
Charging temperature upper limit ..... :	45°C
Charging temperature lower limit ..... :	10°C
Polymer cell electrolyte type ..... :	☐ gel polymer ..... ☐ solid polymer ☒N/A
Possible test case verdicts:	
- test case does not apply to the test object .....:	N/A
- test object does meet the requirement .....:	P (Pass)
- test object does not meet the requirement .....:	F (Fail)
Testing .....:	
Date of receipt of test item.....:	2017-09-04
Date (s) of performance of tests .....:	2017-09-04 to 2017-09-18

General remarks:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

General product information:

The EUT model 401214 is a single cell supplied power for IT/ AV equipment; This battery is constructed with one lithium polymer cell used.

The main features of the cell in the battery pack are shown as below (clause 8.1.1):

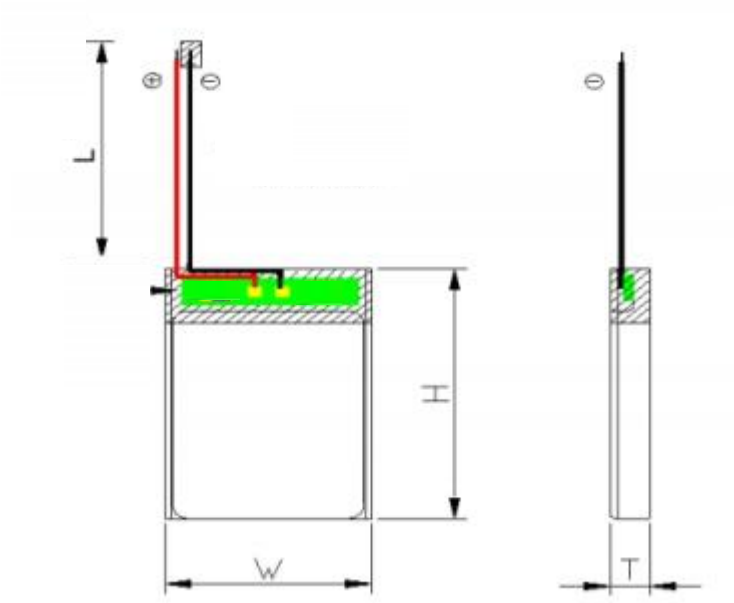
Model	Nominal capacity	Nominal voltage	Nominal Charge Current	Nominal Discharge Current	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Discharge Cut-off Voltage
401214	40mAh	3.7V	8mA	8mA	40mA	40mA	4.2V	2.75V

Continued: (Clause 8.1.2)

Model	Discharge Taper-off current	Upper limit charge voltage	Lower charge temperature	Upper charge temperature
401214	0.4mA	4.20V	10°C	45°C

Construction:

For Cell:



H: 14.1 ±0.2mm, W: 12.1 ±0.2mm, T: 4.2 ±0.1mm, L: 19 ±0.1mm

EN 62133			
Clause	Requirement + Test	Result - Remark	Verdict
4	**Parameter measurement tolerances**		**P**
	Parameter measurement tolerances		P
5	**General safety considerations**		P
5.1	General		P
5.2	Insulation and wiring		P
	The insulation resistance between the positive terminal and externally exposed metal surfaces of the battery (excluding electrical contact surfaces) is not less than 5 MΩ	No metal case exists.	N/A
	Insulation resistance (MΩ)..... :		—
	Internal wiring and insulation are sufficient to withstand maximum anticipated current, voltage and temperature requirements		P
	Orientation of wiring maintains adequate creepage and clearance distances between conductors		P
	Mechanical integrity of internal connections accommodates reasonably foreseeable misuse		P
5.3	Venting		P
	Battery cases and cells incorporate a pressure relief mechanism or are constructed so that they relieve excessive internal pressure at a value and rate that will preclude rupture, explosion and self-ignition	Venting mechanism exists.	P
	Encapsulation used to support cells within an outer casing does not cause the battery to overheat during normal operation nor inhibit pressure relief		P
5.4	Temperature/voltage/current management		N/A
	Batteries are designed such that abnormal temperature rise conditions are prevented		N/A
	Batteries are designed to be within temperature, voltage and current limits specified by the cell manufacturer		N/A
	Batteries are provided with specifications and charging instructions for equipment manufacturers so that associated chargers are designed to maintain charging within the temperature, voltage and current limits specified		N/A
5.5	Terminal contacts		P
	Terminals have a clear polarity marking on the external surface of the battery	The “+” and “-” polarity explicitly marked on surface of the battery	P

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Clause	Requirement + Test	Result - Remark	Verdict
	The size and shape of the terminal contacts ensure that they can carry the maximum anticipated current	DC lead wire contacts Complied with the requirements.	P
	External terminal contact surfaces are formed from conductive materials with good mechanical strength and corrosion resistance		P
	Terminal contacts are arranged to minimize the risk of short circuits		P
5.6	Assembly of cells into batteries		P
5.6.1	If there is more than one battery housed in a single battery case, cells used in the assembly of each battery have closely matched capacities, be of the same design, be of the same chemistry and be from the same manufacturer	Single cell battery.	N/A
	Each battery has an independent control and protection		N/A
	Manufacturers of cells make recommendations about current, voltage and temperature limits so that the battery manufacturer/designer may ensure proper design and assembly		N/A
	Batteries that are designed for the selective discharge of a portion of their series connected cells incorporate separate circuitry to prevent the cell reversal caused by uneven discharges		N/A
	Protective circuit components are added as appropriate and consideration given to the end-device application		N/A
	When testing a battery, the manufacturer of the battery provides a test report confirming the compliance according to this standard		N/A
5.6.2	Design recommendation for lithium systems only		P
	For the battery consisting of a single cell or a single cellblock: - Charging voltage of the cell does not exceed the upper limit of the charging voltage specified in Clause 8.1.2, Table 4; or		N/A
	- Charging voltage of the cell does not exceed the different upper limit of the charging voltage determined through Clause 8.1.2, NOTE 1.	Charging voltage: 4.2V, not exceed 4.25V specified in Clause 8.1.2, Table 4.	P
	For the battery consisting of series-connected plural single cells or series-connected plural cellblocks: - The voltages of any one of the single cells or single cellblocks does not exceed the upper limit of the charging voltage, specified in Clause 8.1.2, Table 4, by monitoring the voltage of every single cell or the single cellblocks; or		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- The voltages of any one of the single cells or single cellblocks does not exceed the different upper limit of the charging voltage, determined through Clause 8.1.2, NOTE 1, by monitoring the voltage of every single cell or the single cellblocks		N/A
	For the battery consisting of series-connected plural single cells or series-connected plural cellblocks: - Charging is stopped when the upper limit of the charging voltage, specified in Clause 8.1.2, Table 4, is exceeded for any one of the single cells or single cellblocks by measuring the voltage of every single cell or the single cellblocks; or		N/A
	- Charging is stopped when the upper limit of the different charging voltage, determined through Clause 8.1.2, NOTE 1, is exceeded for any one of the single cells or single cellblocks by measuring the voltage of every single cell or the single cellblocks		N/A
5.7	Quality plan		P
	The manufacturer prepares and implements a quality plan that defines procedures for the inspection of materials, components, cells and batteries and which covers the whole process of producing each type of cell or battery	Complied. ISO 9001: 2008 Certificate Supplied	P
6	**Type test conditions**		**P**
	Tests were made with the number of cells or batteries specified in Table 1 for nickel-cadmium and nickel-metal hydride systems and Table 2 for lithium systems, using cells or batteries that are not more than six months old	Complied. Lithium system.	P
	Unless noted otherwise in the test methods, testing was conducted in an ambient of 20°C ± 5°C.	Tests are carried out at 20°C ± 5°C.	P
7	**Specific requirements and tests (nickel systems)**		**N/A**
7.1	Charging procedure for test purposes	Lithium system.	N/A
7.2	Intended use		N/A
7.2.1	Continuous low-rate charging (cells)		N/A
	Results: No fire. No explosion		N/A
7.2.2	Vibration		N/A
	Results: No fire. No explosion. No leakage		N/A
7.2.3	Moulded case stress at high ambient temperature		N/A
	Oven temperature (°C) .....:		—
	Results: No physical distortion of the battery casing resulting in exposure if internal components		N/A
7.2.4	Temperature cycling		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Results: No fire. No explosion. No leakage.		N/A
7.3	Reasonably foreseeable misuse		N/A
7.3.1	Incorrect installation cell		N/A
	The test was carried out using: - Four fully charged cells of the same brand, type, size and age connected in series, with one of them reversed; or		N/A
	- A stabilized dc power supply.		N/A
	Results: No fire. No explosion .....:		N/A
7.3.2	External short circuit		N/A
	The cells or batteries were tested until one of the following occurred: - 24 hours elapsed; or		N/A
	- The case temperature declined by 20% of the maximum temperature rise		N/A
	Results: No fire. No explosion .....:		N/A
7.3.3	Free fall		N/A
	Results: No fire. No explosion.		N/A
7.3.4	Mechanical shock (crash hazard)		N/A
	Results: No fire. No explosion. No leakage.		N/A
7.3.5	Thermal abuse		N/A
	Oven temperature (°C) .....:		—
	Results: No fire. No explosion.		N/A
7.3.6	Crushing of cells		N/A
	The crushing force was released upon: - The maximum force of 13 kN ± 1 kN has been applied; or		N/A
	- An abrupt voltage drop of one-third of the original voltage has been obtained		N/A
	The cell is prismatic type and a second set of samples was tested, rotated 90° around longitudinal axis compared to the first set		N/A
	Results: No fire. No explosion .....:		N/A
7.3.7	Low pressure		N/A
	Chamber pressure (kPa) .....:		—
	Results: No fire. No explosion. No leakage.		N/A
7.3.8	Overcharge		N/A
	Results: No fire. No explosion .....:		N/A
7.3.9	Forced discharge		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Results: No fire. No explosion .....:		N/A

8	**Specific requirements and tests (lithium systems)**		**P**
8.1	Charging procedures for test purposes	Complied.	P
8.1.1	First procedure: This charging procedure applied to tests other than those specified in 8.1.2	Test is carried out at 20°C ± 5°C.	P
8.1.2	Second procedure: This charging procedure applied to the tests of 8.3.1, 8.3.2, 8.3.4, 8.3.5, and 8.3.9	Complied.	P
	If a cell's specified upper and/or lower charging temperature exceeds values for the upper and/or lower limit test temperatures of Table 4, the cells were charged at the specified values plus 5 °C for the upper limit and minus 5 °C for the lower limit	The upper limit test: temperature was 45°C; The lower limit test temperature was 10°C.	P
	A valid rationale was provided to ensure the safety of the cell (see Figure A.1) .....:		P
	For a different upper limit charging voltage (i.e. other than for lithium cobalt oxide systems at 4,25 V), the applied upper limit charging voltage and upper limit charging temperatures were adjusted accordingly		N/A
	A valid rationale was provided to ensure the safety of the cell (see Figure A.1) .....:		N/A
8.2	Intended use		P
8.2.1	Continuous charging at constant voltage (cells)	Tested complied.	P
	Results: No fire. No explosion .....:	(See Table 8.2.1)	P
8.2.2	Moulded case stress at high ambient temperature (battery)		N/A
	Oven temperature (°C) .....:		—
	Results: No physical distortion of the battery casing resulting in exposure if internal components		N/A
8.3	Reasonably foreseeable misuse	See below	P
8.3.1	External short circuit (cell)		P
	The cells were tested until one of the following occurred: - 24 hours elapsed; or		N/A
	- The case temperature declined by 20% of the maximum temperature rise		P
	Results: No fire. No explosion .....:	(See Table 8.3.1)	P
8.3.2	External short circuit (battery)	Cell only.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The cells were tested until one of the following occurred: - 24 hours elapsed; or		N/A
	- The case temperature declined by 20% of the maximum temperature rise		N/A
	In case of rapid decline in short circuit current, the battery pack remained on test for an additional one hour after the current reached a low end steady state condition		N/A
	Results: No fire. No explosion.....:		N/A
8.3.3	Free fall	Fully charged batteries and cells were dropped three times from a height of 1.0 m onto a concrete floor.	P
	Results: No fire. No explosion.	No fire. No explosion.	P
8.3.4	Thermal abuse (cells)		P
	The cells were held at 130°C ± 2°C for: - 10 minutes; or	Tested complied.	P
	- 30 minutes for large cells (gross mass of more than 500 g as defined in IEC 62281)		P
	Oven temperature (°C).....:	130°C	—
	Gross mass of cell (g).....:	<500g, Small cell.	—
	Results: No fire. No explosion.	No fire. No explosion.	P
8.3.5	Crush (cells)		P
	The crushing force was released upon: - The maximum force of 13 kN ± 1 kN has been applied; or	Tested complied.	P
	- An abrupt voltage drop of one-third of the original voltage has been obtained; or		N/A
	- 10% of deformation has occurred compared to the initial dimension		N/A
	Results: No fire. No explosion.....:	(See Table 8.3.5)	P
8.3.6	Over-charging of battery	Cell only.	N/A
	Test was continued until the temperature of the outer casing: - Reached steady state conditions (less than 10°C change in 30-minute period); or		N/A
	- Returned to ambient		N/A
	Results: fire. explosion.....:		N/A
8.3.7	Forced discharge (cells)		P
	Results: No fire. No explosion.....:	(See Table 8.3.7)	P
8.3.8	Transport tests		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Manufacturer's documentation provided to show compliance with UN Recommendations on Transport of Dangerous Goods	T-1, T-2, T-3 and T-4 tested complied. No leakage, no venting, no short-circuit, no rupture, no explosion and no fire. T-5, See Table 8.3.8. T-6 is identical to clause 8.3.5.	P
8.3.9	Design evaluation – Forced internal short circuit (cells)		N/A
	The cells complied with national requirement for .....:	France, Japan, republic of Korea and Switzerland.	—
	The pressing was stopped upon: - A voltage drop of 50 mV has been detected; or		N/A
	- The pressing force of 800 N (cylindrical cells) or 400 N (prismatic cells) has been reached		N/A
	Results: No fire.....:	(See Table 8.3.9)	N/A
9	**Information for safety**		**P**
	The manufacturer of secondary cells ensures that information is provided about current, voltage and temperature limits of their products.	Information for safety mentioned in manufacturer's specifications.	P
	The manufacturer of batteries ensures that equipment manufacturers and, in the case of direct sales, end-users are provided with information to minimize and mitigate hazards.	Information for safety mentioned in manufacturer's specifications.	P
	Systems analyses performed by device manufacturers to ensure that a particular battery design prevents hazards from occurring during use of a product		N/A
	As appropriate, information relating to hazard avoidance resulting from a system analysis is provided to the end user.....:		N/A
10	**Marking**		**P**
10.1	Cell marking		P
	Cells marked as specified in the applicable cell standards: IEC 61951-1, IEC 61951-2 or IEC 61960.	The battery is marked in accordance with IEC 61960, also see page 4.	P
10.2	Battery marking		N/A
	Batteries marked in accordance with the requirements for the cells from which they are assembled.		N/A
	Batteries marked with an appropriate caution statement.		N/A
10.3	Other information		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Storage and disposal instructions marked on or supplied with the battery.	Information for recommended charging instructions mentioned in manufacturer's specifications.	P
	Recommended charging instructions marked on or supplied with the battery.	Information for recommended charging instructions mentioned in manufacturer's specifications.	P
11	**Packaging**		**P**
	The materials and packaging design are chosen so as to prevent the development of unintentional electrical conduction, corrosion of the terminals and ingress of environmental contaminants.		P
Annex A	**Charging range of secondary lithium ion cells for safe use**		**P**
A.1	General		P
A.2	Safety of lithium-ion secondary battery	Complied.	P
A.3	Consideration on charging voltage	Complied.	P
A.3.1	General	Charging voltage is 4.20V	P
A.3.2	Upper limit charging voltage		P
A.3.2.1	General		P
A.3.2.2	Explanation of safety viewpoint		P
A.3.2.3	Safety requirements, when different upper limit charging voltage is applied		P
A.4	Consideration of temperature and charging current		P
A.4.1	General		P
A.4.2	Recommended temperature range		P
A.4.2.1	General		P
A.4.2.2	Safety consideration when a different recommended temperature range is applied	Charging temperature declared by client is:10-45°C	P
A.4.3	High temperature range	Charging high temperature declared by client is: 45°C	N/A
/AA.4.3.1	General		N/A
A.4.3.2	Explanation of safety viewpoint		N/A
A.4.3.3	Safety considerations when specifying charging conditions in high temperature range		N/A
A.4.3.4	Safety consideration when specifying new upper limit in high temperature range		N/A
A.4.4	Low temperature range	Charging low temperature declared by client is: 10°C.	P
A.4.4.1	General		P

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Clause	Requirement + Test	Result - Remark	Verdict
A.4.4.2	Explanation of safety viewpoint		N/A
A.4.4.3	Safety considerations, when specifying charging conditions in low temperature range		N/A
A.4.4.4	Safety considerations when specifying a new lower limit in the low temperature range		N/A
A.4.5	Scope of the application of charging current		P
A.5	Sample preparation		N/A
A.5.1	General		N/A
A.5.2	Insertion procedure for nickel particle to generate internal short		N/A
	The insertion procedure carried out at 20°C±5°C and under -25 °C of dew point		N/A
A.5.3	Disassembly of charged cell		N/A
A.5.4	Shape of nickel particle		N/A
A.5.5	Insertion of nickel particle to cylindrical cell		N/A
A.5.5.1	Insertion of nickel particle to winding core		N/A
A.5.5.2	Mark the position of nickel particle on the both end of winding core of the separator		N/A
A.5.6	Insertion of nickel particle to prismatic cell		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	TABLE: Critical components information				P
Object/part no.	**Manufacturer/ trademark**	**Type/model**	**Technical data**	**Standard**	**Mark(s) of conformity [1)]**
Cell		401214	3.7V, 40mAh	EN62133: 2013	Tested with appliance
-Positive electrode	JIANGMEN KEHE	LCO-1	LiCoO2	--	--
-Negative electrode	SHENZHEN SI NUO	MAG-7	Graphite	--	--
-Separator	XINXIANG CITY GE NEW ENERGY MATERIALS CO., LTD.	16μm	Shutdown temperature:135° C	--	--
-Electrolyte	GUANG RUI	GR-A0804	LiPF6, EC, EMC, DEC	--	--
Aluminum plastic film	DNP	113μm	Nylon-AL-CPP	--	--
Tape	Interchangeable	Interchangeable	Min. 130° C	UL510	UL
Lead wire	Interchangeable	Interchangeable	VW-1, 30AWG, 105°C, 30VAC	UL758	UL

Supplementary information:

[1)] Provided evidence ensures the agreed level of compliance.

7.2.1	TABLE: Continuous low rate charge (cells)				N/A
Model	**Recommended charging method, (CC, CV, or CC/CV)**	**Recommended charging voltage V_c, (Vdc)**	**Recommended charging current I_{rec}, (A)**	**OCV at start of test, (Vdc)**	**Results**

Supplementary information:

- No fire or explosion
- No leakage
- Leakage
- Fire
- Explosion
- Bulge
- Others (please explain)

7.2.2	TABLE: Vibration		N/A
Model	**OCV at start of test, (Vdc)**	**Results**	

Supplementary information:

- No fire or explosion
- No leakage
- Leakage
- Fire
- Explosion
- Bulge
- Others (please explain)

7.3.1	TABLE: Incorrect installation (cells)		N/A
Model	**OCV of reversed cell, (Vdc)**	**Results**	

Supplementary information:

- No fire or explosion
- No leakage
- Leakage
- Fire
- Explosion
- Bulge
- Others (please explain)

7.3.2	TABLE: External short circuit				N/A
Model	**Ambient (at 20°C ± 5°C or 55°C ± 5°C)**	**OCV at start of test, (Vdc)**	**Resistance of circuit, (Ω)**	**Maximum case temperature rise ΔT, (°C)**	**Results**

Supplementary information:

- No fire or explosion
- No leakage
- Leakage
- Fire
- Explosion
- Bulge
- Others (please explain)

7.3.6	TABLE: Crush		N/A
Model	**OCV at start of test, (Vdc)**	**OCV at removal of crushing force, (Vdc)**	**Results**

Supplementary information:

- No fire or explosion
- No leakage
- Leakage
- Fire
- Explosion
- Bulge
- Others (please explain)

7.3.8	TABLE: Overcharge			N/A
Model	**OCV prior to charging, (Vdc)**	**Maximum charge current, (A)**	**Time for charging, (hours)**	**Results**

Supplementary information:

- No fire or explosion
- No leakage
- Leakage
- Fire
- Explosion
- Bulge
- Others (please explain)

7.3.9	TABLE: Forced discharge (cells)			
Model	**OCV before application of reverse charge, (Vdc)**	**Measured reverse charge I_t, (A)**	**Time for reversed charge, (minutes)**	**Results**

Supplementary information:

- No fire or explosion
- No leakage
- Leakage
- Fire
- Explosion
- Bulge
- Others (please explain)

8.2.1	TABLE: Continuous charging at constant voltage (cells)			P
Model	**Recommended charging voltage V_c, (Vdc)**	**Recommended charging current I_{rec}, (A)**	**OCV at start of test, (Vdc)**	**Results**
Cell #61	4.20	0.008	4.19	P
Cell #62	4.20	0.008	4.18	P
Cell #63	4.20	0.008	4.19	P
Cell #64	4.20	0.008	4.17	P
Cell #65	4.20	0.008	4.18	P

Supplementary information:

- No fire
- No Explosion
- No leakage

8.3.1	TABLE: External short circuit (cell)				P
Model	**Ambient, (°C)**	**OCV at start of test, (Vdc)**	**Resistance of circuit, (Ω)**	**Maximum case temperature ~~rise ΔT,~~ (°C)**	**Results**
Samples charged at charging temperature upper limit : (45°C)					
Cell #1	24.2	4.19	0.08	81.7	P
Cell #2	24.2	4.18	0.08	79.5	P
Cell #3	24.2	4.19	0.08	78.8	P
Cell #4	24.2	4.18	0.08	79.3	P
Cell #5	24.2	4.17	0.08	78.1	P
Samples charged at charging temperature lower limit : (10°C)					
Cell #6	24.2	4.17	0.08	78.9	P
Cell #7	24.2	4.17	0.08	85.4	P
Cell #8	24.2	4.16	0.08	80.8	P
Cell #9	24.2	4.18	0.08	76.3	P
Cell #10	24.2	4.16	0.08	84.3	P

Supplementary information:

- No fire
- No Explosion

8.3.2	TABLE: External short circuit (battery)				N
Model	**Ambient, (°C)**	**OCV at start of test, (Vdc)**	**Resistance of circuit, (Ω)**	**Maximum case temperature rise ΔT~~, (°C)~~**	**Results**
Samples charged at charging temperature upper limit : (45°C)					
Samples charged at charging temperature lower limit: (10°C)					
Supplementary information: - No fire - No Explosion					

8.3.5	TABLE: Crush				P
Model	**OCV at start of test, (Vdc)**	**OCV at removal of crushing force, (Vdc)**	**Width/ diameter of cell before crush, (mm)**	**Required deformation for crush, (mm)**	**Results**
Samples charged at charging temperature upper limit (45°C)					
Cell #11	4.18	4.17	--	--	P
Cell #12	4.18	4.18	--	--	P
Cell #13	4.19	4.19	--	--	P
Cell #14	4.17	4.16	--	--	P
Cell #15	4.19	4.18	--	--	P

8.3.6	TABLE: Over-charging of battery				N
Constant charging current (A).....:					—
Supply voltage (Vdc).....:					—
Model	**OCV before charging, (Vdc)**	**Resistance of circuit, (Ω)**	**Maximum outer casing temperature, rise ΔT~~, (°C)~~**		**Results**

Supplementary information:

- Leakage
- Fire
- Explosion

8.3.7	**TABLE: Forced discharge (cells)**			**P**
Model	**OCV before application of reverse charge, (Vdc)**	**Measured Reverse Charge I_t, (A)**	**Time for reversed charge, (minutes)**	**Results**
Cell #16	2.78	0.04	90	P
Cell #17	2.81	0.04	90	P
Cell #18	2.80	0.04	90	P
Cell #19	2.79	0.04	90	P
Cell #20	2.78	0.04	90	P

Supplementary information:

- No fire
- No Explosion

8.3.8 T-5	**External short circuit (cell)**				**P**
Model	**Ambient, (°C)**	**OCV at start of test, (Vdc)**	**Resistance of circuit, (Ω)**	**Maximum case temperature ~~Rise ΔT~~, (°C)**	**Results**
Cell #21	56.2	4.19	0.08	81.3	P
Cell #22	56.2	4.19	0.08	80.3	P
Cell #23	56.2	4.17	0.08	87.1	P
Cell #24	56.2	4.18	0.08	79.1	P
Cell #25	56.2	4.19	0.08	79.8	P
Cell #26	56.2	4.18	0.08	80.4	P
Cell #27	56.2	4.19	0.08	81.6	P
Cell #28	56.2	4.16	0.08	82.2	P
Cell #29	56.2	4.17	0.08	84.5	P
Cell #30	56.2	4.18	0.08	89.8	P

Supplementary information:

The external short-circuit test of 10 pcs samples performed after the test of Altitude, Thermal cycling, Vibration and Shock in sequence.

- No fire
- No explosion

8.3.9	TABLE: Forced internal short circuit (cells)					N
Model	**Chamber ambient, (°C)**	**OCV at start of test, (Vdc)**	**Particle location [1)]**	**Maximum applied pressure, (N)**	**Voltage drop, (mV)**	**Results**

Supplementary information:

[1)] Identify one of the following**:**

1: Nickel particle inserted between positive and negative (active material) coated area.

2: Nickel particle inserted between positive aluminium foil and negative active material coated area.

- No fire or explosion

Photo

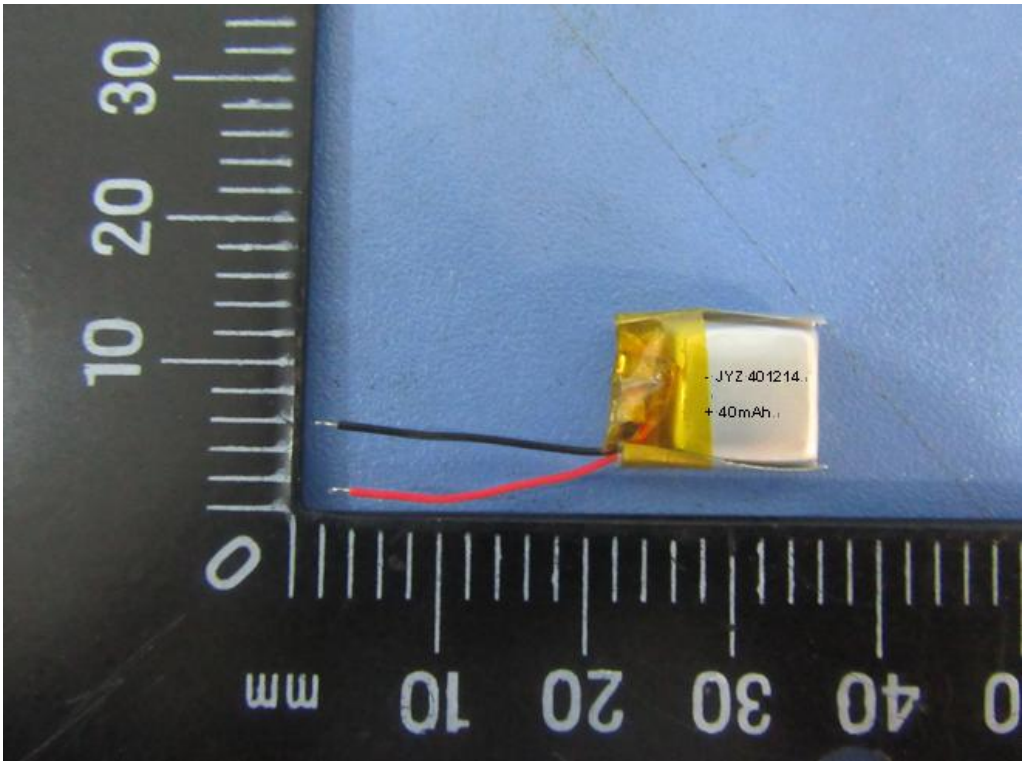

Figure 1. Overall view

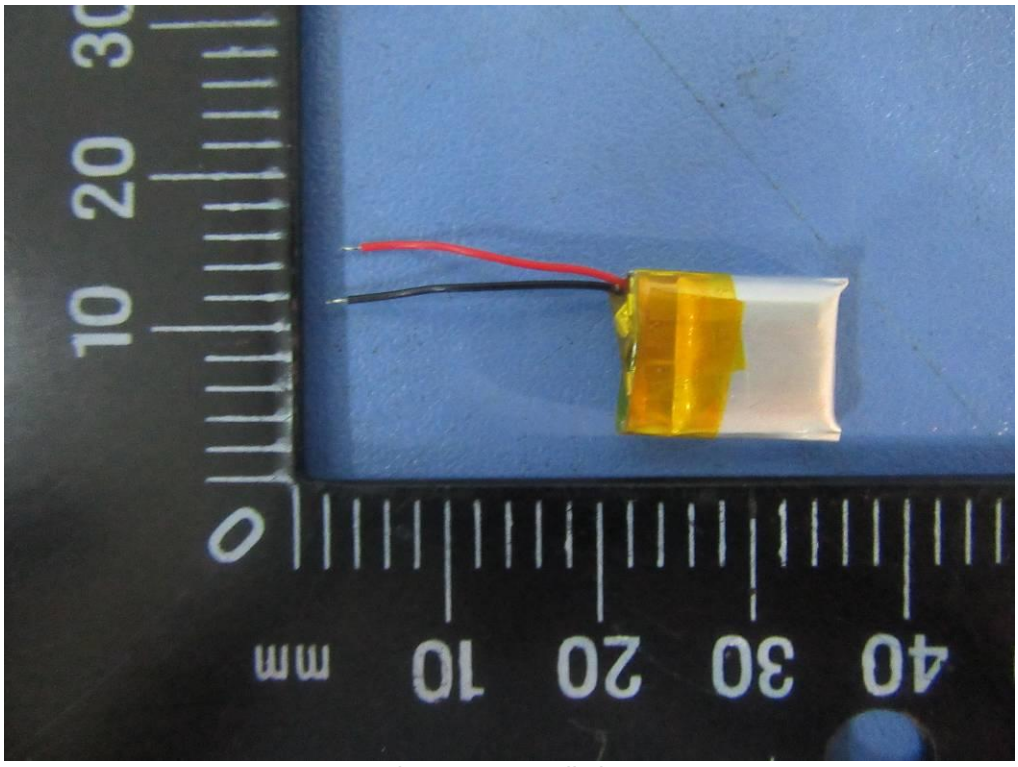

Figure 2. Overall view

Photo

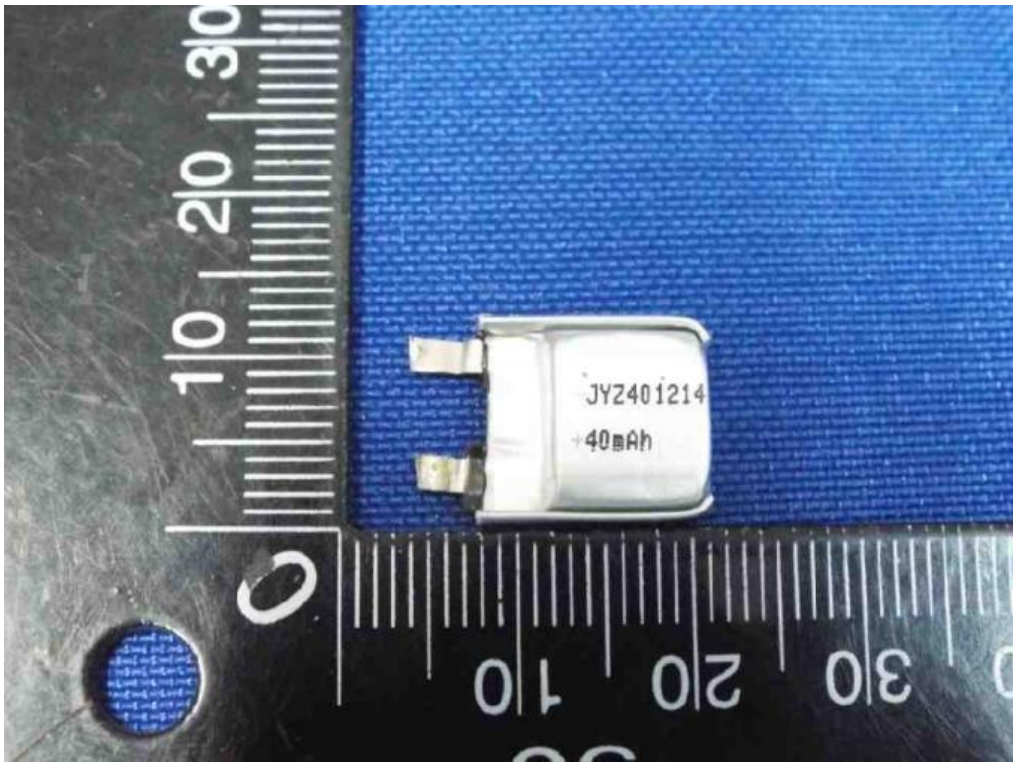

Figure 3. Overall view

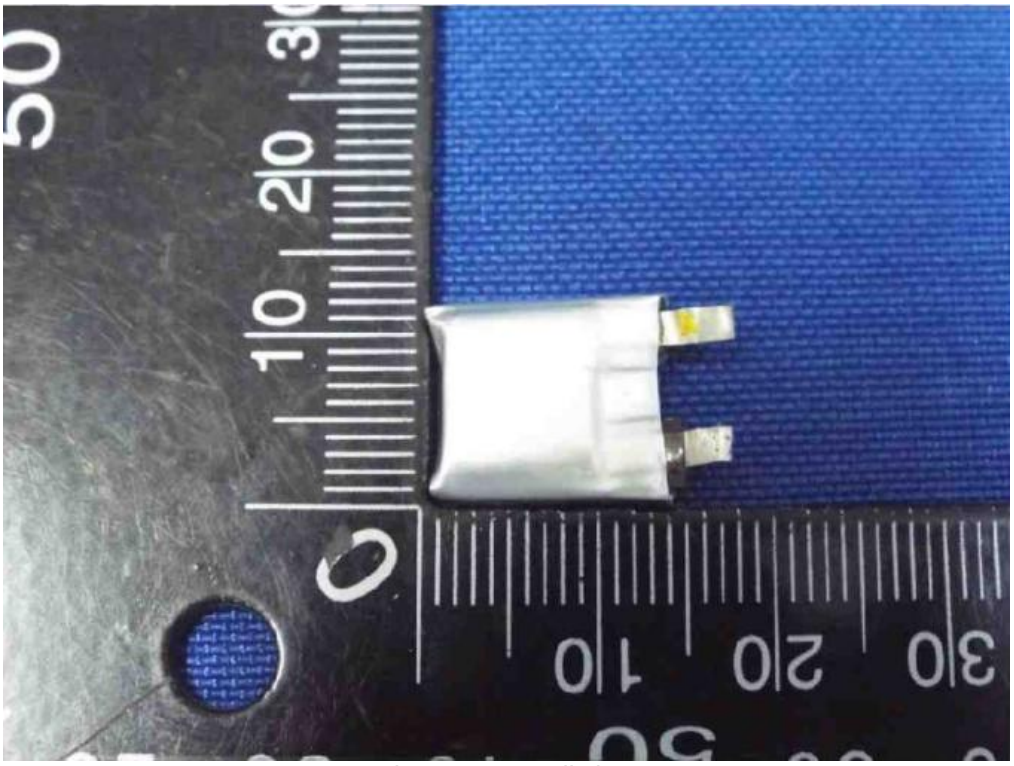

Figure 4. Overall view

-- End of Report --