UN Test Data (Model: ML1220)

1.Test Item: Altitude simulation (T1)

2.Test Purpose: This test simulates air transport under low-pressure conditions.

3.Test Procedure:

The cells and batteries shall be stored at a pressure of 11.6kPa or less for at least six hours at ambient temperature(20±5°C).

FDK Internal Procedure:

As above.

4.Test Requirements:

No mass loss(less than 0.5% or 0.2% or 0.1%),no leakage,no venting,no disassembly,no rupture and no fire,and the voltage retention is not less than 90%.

The requirement relating to voltage is not applicable to test cells at fully discharged states.

5.Test Date: 2011/1/5

6.Test Data

Type of Lithium Battery: coin type rechargeable lithium cell							**Lithium Content:** 0.009 **g**			
Cell No.		**Mass(g)**		**Mass loss (< 0.5%)**	**Voltage(V)**		**Voltage Retention (>90%)**	**Other event**	**Result**	**Judgement**
		Before test	**After test**		**Before test**	**After test**				
At first cycle,in fully charged states	1	0.8956	0.8952	0.04	3.156	3.157	100.03	0	PASS	PASS
	2	0.9059	0.9054	0.06	3.154	3.156	100.06	0	PASS	
	3	0.8994	0.8996	-0.02	3.158	3.159	100.03	0	PASS	
	4	0.9018	0.9018	0.00	3.159	3.160	100.03	0	PASS	
	5	0.8986	0.8985	0.01	3.156	3.157	100.03	0	PASS	
	6	0.9087	0.9084	0.03	3.155	3.157	100.06	0	PASS	
	7	0.9082	0.9071	0.12	3.160	3.161	100.03	0	PASS	
	8	0.9047	0.9036	0.12	3.159	3.160	100.03	0	PASS	
	9	0.8982	0.8969	0.14	3.157	3.158	100.03	0	PASS	
	10	0.9013	0.8997	0.18	3.155	3.156	100.03	0	PASS	
	11									
	12									
	13									
	14									
	15									
	16									
	17									
	18									
	19									
	20									

Notes: L-Leakage, V-Venting, D-Disassembly, R-Rupture, F-Fire,
0-No leakage, no venting, no disassembly, no rupture & no fire

7.Test Requirement:

This UN test data meets test requirement of "UN Manual of Test and Criteria Five revised edition Amendment 2 part Ⅲ, sub-section 38.3".

UN Test Data (Model: ML1220)

1.Test Item: Thermal Test (T2)

2.Test Purpose: This test assesses cell and battery seal integrity and internal electrical connections. The test is conducted using rapid and extreme temperature changes.

3.Test Procedure:

Test cells and batteries are to be stored for at least six hours at a test temperature equal to 72±2℃, followed by storage for at least six hours at temperature equal to -40±2℃.The maximum time internal between test temperature extremes is 30 minutes.This procedure is to be repeated 10 times after which all test cells and batteries are to be storedfor 24 hours at ambient temperature (20 ±5℃)For large cells and batteries the duration of exposure to the test temperature extremes should be at least 12 hours.

FDK Internal Procedure:

As above.

4.Test Requirements:

No mass loss(less than 0.5% or 0.2% or 0.1%),no leakage,no venting,no disassembly,no rupture and no fire,and the voltage retention is not less than 90%.

The requirement relating to voltage is not applicable to test cells at fully discharged states.

5.Test Date: 2011/1/5-2011/1/12

6.Test Data

Type of Lithium Battery: coin type rechargeable lithium cell							**Lithium Content:** 0.009 **g**			
Cell No.		**Mass(g)**		**Mass loss (< 0.5%)**	**Voltage(V)**		**Voltage Retention (>90%)**	**Other event**	**Result**	**Judgement**
		Before test	**After test**		**Before test**	**After test**				
At first cycle,in fully charged states	1	0.8952	0.8947	0.06	3.157	3.046	96.47	0	PASS	PASS
	2	0.9054	0.9040	0.15	3.156	3.047	96.54	0	PASS	
	3	0.8996	0.8986	0.11	3.159	3.048	96.48	0	PASS	
	4	0.9018	0.9007	0.12	3.160	3.047	96.44	0	PASS	
	5	0.8985	0.8976	0.10	3.157	3.043	96.38	0	PASS	
	6	0.9084	0.9079	0.06	3.157	3.046	96.48	0	PASS	
	7	0.9071	0.9068	0.03	3.161	3.051	96.53	0	PASS	
	8	0.9036	0.9035	0.01	3.160	3.048	96.45	0	PASS	
	9	0.8969	0.8970	-0.01	3.158	3.047	96.47	0	PASS	
	10	0.8997	0.9000	-0.03	3.156	3.045	96.48	0	PASS	
	11									
	12									
	13									
	14									
	15									
	16									
	17									
	18									
	19									
	20									

Notes: L-Leakage, V-Venting, D-Disassembly, R-Rupture, F-Fire,
0-No leakage, no venting, no disassembly, no rupture & no fire

7.Test Requirement:

This UN test data meets test requirement of "UN Manual of Test and Criteria Five revised edition Amendment 2 part Ⅲ, sub-section 38.3".

UN Test Data (Model: ML1220)

1.Test Item: Vibration (T3)

2.Test Purpose: This test simulates vibration during transport.

3.Test Procedure:

Cells and batteries are firmly secured to the platform of the vibration machine without distorting the cells in such a manner as to faithfully transmit the vibration. The vibration shall be a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes.
This cycle shall be repeated 12 times for total of 3 hours for each of the three mutually perpendicular mounting positions of the cell. One of the directions of vibration must be perpendicular to the terminal face.
The logarithmic frequency sweep is as follows: from 7 Hz a peak acceleration of 1gn is maintained frequency increased until a peak acceleration of 8gn occurs (approximately 50Hz).A peak acceleration of 8 g_n is then maintained until the frequency is increased to 200Hz.

FDK Internal Procedure:

As above.

4.Test Requirements:

No mass loss(less than 0.5% or 0.2% or 0.1%),no leakage,no venting,no disassembly,no rupture and no fire,and the voltage retention is not less than 90%.
The requirement relating to voltage is not applicable to test cells at fully discharged states.

5.Test Date: 2011/1/12-2011/1/13

6.Test Data

Type of Lithium Battery: coin type rechargeable lithium cell							**Lithium Content:** 0.009 **g**			
Cell No.		**Mass(g)**		**Mass loss (< 0.5%)**	**Voltage(V)**		**Voltage Retention (>90%)**	**Other event**	**Result**	**Judgement**
		Before test	**After test**		**Before test**	**After test**				
At first cycle,in fully charged states	1	0.8947	0.8944	0.03	3.046	3.046	100.01	0	PASS	PASS
	2	0.9040	0.9036	0.04	3.047	3.047	100.01	0	PASS	
	3	0.8986	0.8973	0.14	3.048	3.048	100.01	0	PASS	
	4	0.9007	0.8997	0.11	3.047	3.048	100.02	0	PASS	
	5	0.8976	0.8970	0.07	3.043	3.044	100.02	0	PASS	
	6	0.9079	0.9070	0.10	3.046	3.046	100.01	0	PASS	
	7	0.9068	0.9062	0.07	3.051	3.052	100.01	0	PASS	
	8	0.9035	0.9029	0.07	3.048	3.048	100.02	0	PASS	
	9	0.8970	0.8968	0.02	3.047	3.047	100.02	0	PASS	
	10	0.9000	0.8990	0.11	3.045	3.046	100.02	0	PASS	
	11									
	12									
	13									
	14									
	15									
	16									
	17									
	18									
	19									
	20									

Notes: L-Leakage, V-Venting, D-Disassembly, R-Rupture, F-Fire,
0-No leakage, no venting, no disassembly, no rupture & no fire

7.Test Requirement:

This UN test data meets test requirement of "UN Manual of Test and Criteria Five revised edition Amendment 2 part Ⅲ, sub-section 38.3".

UN Test Data (Model: ML1220)

1.Test Item: Shock (T4)

2.Test Purpose: This test simulates possible impacts during transport.

3.Test Procedure:

Test cells and batteries shall be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test battery. Each cell or battery shall be subjected to a half-sine shock of pack acceleration of 150 g_n and pulse duration of 6 milliseconds. Each cell or battery shall be subjected to three shocks in the positive direction followed by three shocks in the negative direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.

However, large cells and large batteries shall be subjected to a half-sine shock of peak acceleration of 50 g_n pulse duration of 11 milliseconds. Each cell or battery is subjected to three shocks in the positive direction followed by three shocks in thenegative direction of each of three mutually perpendicular mounting positions of the cell for a total of 18 shocks.

FDK Internal Procedure:

As above.

4.Test Requirements:

No mass loss(less than 0.5% or 0.2% or 0.1%),no leakage,no venting,no disassembly,no rupture and no fire,and the voltage retention is not less than 90%.

The requirement relating to voltage is not applicable to test cells at fully discharged states.

5.Test Date: 2011/1/13

6.Test Data

Type of Lithium Battery: coin type rechargeable lithium cell							**Lithium Content:** 0.009 **g**			
Cell No.		**Mass(g)**		**Mass loss (< 0.5%)**	**Voltage(V)**		**Voltage Retention (>90%)**	**Other event**	**Result**	**Judgement**
		Before test	**After test**		**Before test**	**After test**				
At first cycle,in fully charged states	1	0.8944	0.8944	0.00	3.046	3.045	99.97	0	PASS	PASS
	2	0.9036	0.9038	-0.02	3.047	3.047	99.99	0	PASS	
	3	0.8973	0.8984	-0.12	3.048	3.048	99.99	0	PASS	
	4	0.8997	0.9001	-0.04	3.048	3.048	100.00	0	PASS	
	5	0.8970	0.8978	-0.09	3.044	3.043	99.98	0	PASS	
	6	0.9070	0.9071	-0.01	3.046	3.046	99.99	0	PASS	
	7	0.9062	0.9062	0.00	3.052	3.051	99.98	0	PASS	
	8	0.9029	0.9035	-0.07	3.048	3.048	99.99	0	PASS	
	9	0.8968	0.8970	-0.02	3.047	3.047	100.00	0	PASS	
	10	0.8990	0.8980	0.11	3.046	3.046	100.02	0	PASS	
	11									
	12									
	13									
	14									
	15									
	16									
	17									
	18									
	19									
	20									

Notes: L-Leakage, V-Venting, D-Disassembly, R-Rupture, F-Fire,
0-No leakage, no venting, no disassembly, no rupture & no fire

7.Test Requirement:

This UN test data meets test requirement of "UN Manual of Test and Criteria Five revised edition Amendment 2 part Ⅲ, sub-section 38.3".

UN Test Data (Model: ML1220)

1.Test Item: External short circuit (T5)

2.Test Purpose: This test simulates an external short circuit.

3.Test Procedure:

The cell or battery to be tested shall be temperature stabilized so that its external case temperature reaches 55±2℃ and then the cell or battery shall be subjected to a short condition with a total external resistance of less than 0.1ohm at 55±2℃.This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to 55±2℃. The cell or battery must be observed for a further six hours for the test to be concluded.

FDK Internal Procedure:

As above.

4.Test Requirements:

External temperature of test batteries does not exceed 170°C and there is no disassembly, no rupture and no fire within six hours of this test.

5.Test Date: 2011/1/14

6.Test Data

Type of Lithium Battery: coin type rechargeable lithium cell

Lithium Content: 0.009 **g**

Cell No.		Maximum Temperature (°C)	Other event	Result	Judgement
At first cycle,in fully charged states	1	57.0	0	PASS	PASS
	2	55.8	0	PASS	
	3	56.5	0	PASS	
	4	56.1	0	PASS	
	5	56.5	0	PASS	
	6	57.1	0	PASS	
	7	56.3	0	PASS	
	8	56.1	0	PASS	
	9	56.6	0	PASS	
	10	56.4	0	PASS	
	11				
	12				
	13				
	14				
	15				
	16				
	17				
	18				
	19				
	20				

Notes: D-Disassembly, R-Rupture, F-Fire, 0-No disassembly, no rupture & no fire

7.Test Requirement:

This UN test data meets test requirement of "UN Manual of Test and Criteria Five revised edition Amendment 2 part Ⅲ, sub-section 38.3".

UN Test Data (Model: ML1220)

1.Test Item: Crush (T6)

2.Test Purpose: This test simulate mechanical abuse from crush that may result in an internal short circuit.

3.Test Procedure: (applicable to prismatic, pouch, coin/button cells and cylindrical cells not more than 20 mm in diameter)

A cell or component cell is to be crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1.5 cm/s at the first point of contact. The crushing is to be continued until the first of the three options below is reached.

(a) The applied force reaches 13 kN±0.78 kN;

(b) The voltage of the cell drops by at least 100 mV;

(c) The cell is deformed by 50% or more of its original thickness.

Once the maximum pressure has been obtained, the voltage drops by 100 mV or more, or the cell is deformed by at least 50% of its original thickness, the pressure shall be released.

Each test cell or component cell is to be subjected to one crush only. The test sample shall be observed for a further 6h.

The test shall be conducted using test cells or component cells that have not previously been subjected to other tests.

FDK Internal Procedure:

As above.

4.Test Requirements:

External temperature of test batteries does not exceed 170°C and there is no disassembly,and no fire within six hours of this test.

5.Test Date: 2013/11/21

6.Test Data

Type of Lithium Battery: coin type rechargeable lithium cell

Lithium Content: 0.009 **g**

Cell No.		Event	Result	Judgement
At first cycle,50% charged states	1	0	PASS	PASS
	2	0	PASS	
	3	0	PASS	
	4	0	PASS	
	5	0	PASS	

Notes: D-Disassembly, F-Fire, 0-No disassembly & no fire & not exceed 170°C

7.Test Requirement:

This UN test data meets test requirement of "UN Manual of Test and Criteria Five revised edition Amendment 2 part Ⅲ, sub-section 38.3".

UN Test Data (Model: ML1220)

1.Test Item: Forced discharge (T8)

2.Test Purpose: This test evaluates the ability of a primary or a rechargeable cell to withstand a forced discharged condition.

3.Test Procedure:

Each cell shall be forced discharged at ambient temperature by connecting it in series with a 12V D.C. power supply at an initial current equal to the maximum discharge current specified by the manufacturer. The specified discharge current is to be obtained by connecting a resistive load of the appropriate size and rating in series with the test cell. Each cell shall be forced discharged for a time interval (in hours) equal to its rated capacity divided by the initial test current (in Ampere).

FDK Internal Procedure:

As above.

4.Test Requirements:

There is no disassembly and no fire within seven days of this test.

5.Test Date: 2010/9/17-2010/9/24 , 2010/9/28-2010/9/29

6.Test Data

Type of Lithium Battery: coin type rechargeable lithium cell				
Lithium Content: 0.009 **g**				
Cell No.		**Event**	**Result**	**Judgement**
At first cycle,in fully discharged states	1	0	PASS	PASS
	2	0	PASS	
	3	0	PASS	
	4	0	PASS	
	5	0	PASS	
	6	0	PASS	
	7	0	PASS	
	8	0	PASS	
	9	0	PASS	
	10	0	PASS	
After 50 cycles ending,in fully discharged states	11	0	PASS	
	12	0	PASS	
	13	0	PASS	
	14	0	PASS	
	15	0	PASS	
	16	0	PASS	
	17	0	PASS	
	18	0	PASS	
	19	0	PASS	
	20	0	PASS	

Notes: D-Disassembly, F-Fire, 0-No disassembly & no fire

7.Test Requirement:

This UN test data meets test requirement of "UN Manual of Test and Criteria Five revised edition Amendment 2 part Ⅲ, sub-section 38.3".