

TEST REPORT

Report No. : B105RE0291

Report Date : 2016/08/30

Customer : DIJIYA Energy Saving Tech INC.

**Address : No.6, Xingye St., Guishan Dist., Taoyuan City 333, Taiwan
(R.O.C.)**

Test Lab. : Environment Testing Laboratory

Test Item : Vibration test

Test Category : Test For Research

Product : Power Battery Pack

Model : JD512126AP

This report consisted of 12 pages in total which including 1 cover page.

Non-part of this report may be abstracted or reproduced without authorization.

The test result of this report applied only to the tested subject.



財團法人 **車輛研究測試中心**
Automotive Research & Testing Center

50544 彰化縣鹿港鎮鹿工南七路 6 號 Tel:+886-4-7811222 Fax:+886-4-7811777
No.6, Lugong S. 7th Rd., Lukang Township, Changhua County 50544, Taiwan (R.O.C.)

TEST REPORT

Report No.: B105RE0291

Test Category: Test for Research

Test Item: Vibration test

Page: 1 / 11

Product Identification Information:

Product Name: Power Battery Pack

Product Model: JD512126AP

Product Number: #1

Environment Condition:

Temperature : 23 ~26°C

Humidity: 55 ~57 %RH

Test Standard and Procedure: According to the test condition provided by client.

Vibration condition :

Vibration direction : Z→Y₁→X→Y₂ Axis.

Vibration profile : As table 1~table 4.

Vibration duration : 21 hours per axis.

Battery capacity : 50% SOC

※Monitor the battery voltage and temperature during the vibration test.

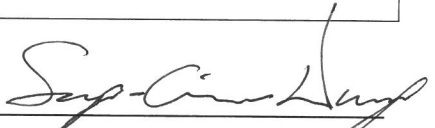
※The test shall be end with an observation period of 2 hours.

Table 1 PSD profile of Z axis

| Frequency (Hz) | PSD (g ² /Hz) | PSD [(m/s ²) ² /Hz] |
|----------------|--------------------------|--|
| 5 | 0.05 | 4.81 |
| 10 | 0.06 | 5.77 |
| 20 | 0.06 | 5.77 |
| 200 | 0.0008 | 0.08 |
| RMS | 1.44 g | 14.13 m/s ² |

Table 2 PSD profile of Y₁ axis (If the DUT is designed for a vehicle mounting position below the vehicle passenger compartment)

| Frequency (Hz) | PSD (g ² /Hz) | PSD [(m/s ²) ² /Hz] |
|----------------|--------------------------|--|
| 5 | 0.01 | 0.96 |
| 10 | 0.015 | 1.44 |
| 20 | 0.015 | 1.44 |
| 50 | 0.01 | 0.96 |
| 200 | 0.0004 | 0.04 |
| RMS | 0.95 g | 9.32 m/s ² |


Signatory of Laboratory

TEST REPORT

Report No.: B105RE0291

Test Category: Test for Research

Test Item: Vibration test

Page: 2 / 11

Table 3 PSD profile of X axis

| Frequency (Hz) | PSD (g^2/Hz) | PSD [$(m/s^2)^2/Hz$] |
|----------------|------------------|------------------------|
| 5 | 0.0125 | 1.20 |
| 10 | 0.03 | 2.89 |
| 20 | 0.03 | 2.89 |
| 200 | 0.00025 | 0.02 |
| RMS | 0.96 g | 9.42 m/s^2 |

Table 4 PSD profile of Y_2 axis (If the DUT is designed for a vehicle mounting position on the vehicle back side compartment)

| Frequency (Hz) | PSD (g^2/Hz) | PSD [$(m/s^2)^2/Hz$] |
|----------------|------------------|------------------------|
| 5 | 0.04 | 3.85 |
| 20 | 0.04 | 3.85 |
| 200 | 0.0008 | 0.08 |
| RMS | 1.23 g | 12.07 m/s^2 |

Requirements:

1. There is no voltage drastic change in the minimum monitoring unit of the battery system during the test (cell voltage change $\leq 0.15V$).
2. After the test, the structure of battery system was no abnormal, and the connector was well-connected. There are no phenomenon of leakages, case rupture, fired and Explosion.
3. After the test, the isolation resistance was greater than 100 Ω/V .

Test Equipment: 24000lb shaker (M/N : APIC EC3120HVCS-8001, S/N : 2012001)
 Resistance Box (M/N : IET HPRS-F-9 ; S/N : E1-1133824)
 Resistance Meter (M/N : FLUKE 289 ; S/N : 17050069)

Test Result:

Test duration: 2016/08/08~2016/08/19

| Product number | Test axis | Test result |
|----------------|------------|--|
| #1 | Z axis | After test, the results fulfill the following requirements of GB/T 31467.3-2015 section 7.1.3.1. 1. There is no voltage drastic change in the minimum monitoring unit of the battery system during the test (cell voltage change $\leq 0.15V$), as Table 5. 2. After the test, the structure of battery system was no abnormal, and the connector was well-connected. There are no phenomenon of leakages, case rupture, fire and Explosion. 3. After the test, the isolation resistance was greater than 100 Ω/V , as Table 6. |
| | Y_1 axis | |
| | X axis | |
| | Y_2 axis | |

TEST REPORT

Report No.: B105RE0291

Test Category: Test for Research

Test Item: Vibration test

Page: 3 / 11

Table.5 The cell voltage analysis during vibration test

| Test of Z axis | | | | | | | | | | |
|-----------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Cell NO. | BSU7 -C1 | BSU7 -C2 | BSU7 -C3 | BSU7 -C4 | BSU7 -C5 | BSU7 -C6 | BSU7 -C7 | BSU7 -C8 | BSU7 -C9 | BSU7 -C10 |
| Max. voltage(mV) | 3309 | 3312 | 3311 | 3313 | 3313 | 3312 | 3313 | 3312 | 3312 | 3312 |
| Min. voltage (mV) | 3304 | 3305 | 3303 | 3306 | 3304 | 3304 | 3306 | 3305 | 3305 | 3306 |
| Dif. of voltage (mV) | 5 | 7 | 8 | 7 | 9 | 8 | 7 | 7 | 7 | 6 |
| Cell NO. | BSU7 -C11 | BSU7 -C12 | BSU7 -C13 | BSU7 -C14 | BSU7 -C15 | BSU7 -C16 | BSU7 -C17 | BSU7 -C18 | BSU7 -C19 | BSU7 -C20 |
| Max. voltage(mV) | 3310 | 3314 | 3311 | 3313 | 3308 | 3312 | 3310 | 3314 | 3310 | 3312 |
| Min. voltage (mV) | 3303 | 3306 | 3303 | 3305 | 3301 | 3305 | 3303 | 3308 | 3303 | 3305 |
| Dif. of voltage (mV) | 7 | 8 | 8 | 8 | 7 | 7 | 7 | 6 | 7 | 7 |
| Test of Y ₁ axis | | | | | | | | | | |
| Cell NO. | BSU7 -C1 | BSU7 -C2 | BSU7 -C3 | BSU7 -C4 | BSU7 -C5 | BSU7 -C6 | BSU7 -C7 | BSU7 -C8 | BSU7 -C9 | BSU7 -C10 |
| Max. voltage(mV) | 3308 | 3309 | 3307 | 3312 | 3309 | 3309 | 3311 | 3310 | 3309 | 3311 |
| Min. voltage (mV) | 3302 | 3302 | 3300 | 3305 | 3302 | 3302 | 3303 | 3303 | 3301 | 3304 |
| Dif. of voltage (mV) | 6 | 7 | 7 | 7 | 7 | 7 | 8 | 7 | 8 | 7 |
| Cell NO. | BSU7 -C11 | BSU7 -C12 | BSU7 -C13 | BSU7 -C14 | BSU7 -C15 | BSU7 -C16 | BSU7 -C17 | BSU7 -C18 | BSU7 -C19 | BSU7 -C20 |
| Max. voltage(mV) | 3308 | 3312 | 3306 | 3310 | 3305 | 3311 | 3307 | 3313 | 3306 | 3309 |
| Min. voltage (mV) | 3300 | 3304 | 3298 | 3303 | 3298 | 3303 | 3300 | 3307 | 3300 | 3302 |
| Dif. of voltage (mV) | 8 | 8 | 8 | 7 | 7 | 8 | 7 | 6 | 6 | 7 |
| Test of X axis | | | | | | | | | | |
| Cell NO. | BSU7 -C1 | BSU7 -C2 | BSU7 -C3 | BSU7 -C4 | BSU7 -C5 | BSU7 -C6 | BSU7 -C7 | BSU7 -C8 | BSU7 -C9 | BSU7 -C10 |
| Max. voltage(mV) | 3307 | 3308 | 3306 | 3311 | 3308 | 3308 | 3310 | 3309 | 3307 | 3310 |
| Min. voltage (mV) | 3300 | 3301 | 3298 | 3304 | 3300 | 3301 | 3301 | 3302 | 3300 | 3303 |
| Dif. of voltage (mV) | 7 | 7 | 8 | 7 | 8 | 7 | 9 | 7 | 7 | 7 |
| Cell NO. | BSU7 -C11 | BSU7 -C12 | BSU7 -C13 | BSU7 -C14 | BSU7 -C15 | BSU7 -C16 | BSU7 -C17 | BSU7 -C18 | BSU7 -C19 | BSU7 -C20 |
| Max. voltage(mV) | 3307 | 3312 | 3305 | 3309 | 3304 | 3309 | 3306 | 3312 | 3305 | 3308 |
| Min. voltage (mV) | 3299 | 3304 | 3298 | 3302 | 3297 | 3303 | 3299 | 3305 | 3298 | 3301 |
| Dif. of voltage (mV) | 8 | 8 | 7 | 7 | 7 | 6 | 7 | 7 | 7 | 7 |
| Test of Y ₂ axis | | | | | | | | | | |
| Cell NO. | BSU7 -C1 | BSU7 -C2 | BSU7 -C3 | BSU7 -C4 | BSU7 -C5 | BSU7 -C6 | BSU7 -C7 | BSU7 -C8 | BSU7 -C9 | BSU7 -C10 |
| Max. voltage(mV) | 3306 | 3307 | 3306 | 3310 | 3307 | 3307 | 3310 | 3308 | 3308 | 3309 |
| Min. voltage (mV) | 3300 | 3301 | 3298 | 3303 | 3300 | 3300 | 3301 | 3302 | 3300 | 3302 |
| Dif. of voltage (mV) | 6 | 6 | 8 | 7 | 7 | 7 | 9 | 6 | 8 | 7 |
| Cell NO. | BSU7 -C11 | BSU7 -C12 | BSU7 -C13 | BSU7 -C14 | BSU7 -C15 | BSU7 -C16 | BSU7 -C17 | BSU7 -C18 | BSU7 -C19 | BSU7 -C20 |
| Max. voltage(mV) | 3306 | 3310 | 3304 | 3309 | 3304 | 3308 | 3306 | 3311 | 3305 | 3307 |
| Min. voltage (mV) | 3299 | 3303 | 3297 | 3302 | 3296 | 3302 | 3299 | 3305 | 3298 | 3300 |
| Dif. of voltage (mV) | 7 | 7 | 7 | 7 | 8 | 6 | 7 | 6 | 7 | 7 |

TEST REPORT

Report No.: B105RE0291

Test Category: Test for Research

Test Item: Vibration test

Page: 4 / 11

Table.6 Measurement of the isolation resistance

| | |
|--|-------------|
| Measure method refer to ECE R100.02 Annex 4B | |
| V_b (V) is operating voltage of battery pack | 66.03 |
| $V_b \times 100 = R_0$ (k. Ω) | 6.60 |
| V_1 (V) is the voltage between negative pole of battery pack and ground connection | 33.02 |
| V_2 (V) is the voltage between positive pole of battery pack and ground connection | 32.99 |
| V_1 is greater than V_2 , insert standard known resistance R_0 between the positive pole of battery pack and ground connection, measure the voltage V'_1 (V) | 0.0001 |
| $R_i = R_0 \times (V_b/V'_1 - V_b/V_1)$ (k Ω) | 4357966.80 |
| R_i/V_b (Ω/V) | 65999800.16 |
| Pass: >100 Ω/V , Fail: <100 Ω/V | Pass |

Table Explanation:

- Table 1 PSD profile of Z axis.
- Table 2 PSD profile of Y_1 axis (If the DUT is designed for a vehicle mounting position below the vehicle passenger compartment).
- Table 3 PSD profile of X axis.
- Table 4 PSD profile of Y_2 axis (If the DUT is designed for a vehicle mounting position on the vehicle back side compartment).
- Table.5 The cell voltage analysis during vibration test.
- Table.6 Measurement of the isolation resistance.

Figure Explanation:

- Fig.1 Show the DUT of Z axis vibration test.
- Fig.2 Show the DUT of Y_1 axis vibration test.
- Fig.3 Show the DUT of X axis vibration test.
- Fig.4 Show the DUT of Y_2 axis vibration test.
- Fig.5 Show the cell voltage of Z axis vibration test.
- Fig.6 Show the cell voltage of Y_1 axis vibration test.
- Fig.7 Show the cell voltage of X axis vibration test.
- Fig.8 Show the cell voltage of Y_2 axis vibration test.
- Fig.9 Show the PSD profile of Z axis.
- Fig.10 Show the PSD profile of Y_1 axis.
- Fig.11 Show the PSD profile of X axis.
- Fig.12 Show the PSD profile of Y_2 axis.
- Fig.13 Measurement of the isolation resistance after test.

Note: The test procedures according to GB/T 31467.3-2015 section 7.1 for the DUT is designed for a vehicle mounting position below the vehicle passenger compartment. Then add the test condition for the DUT is designed for a vehicle mounting position on the vehicle back side compartment of Y_2 axis

TEST REPORT

Report No.: B105RE0291
Test Item: Vibration test

Test Category: Test for Research
Page: 5 / 11

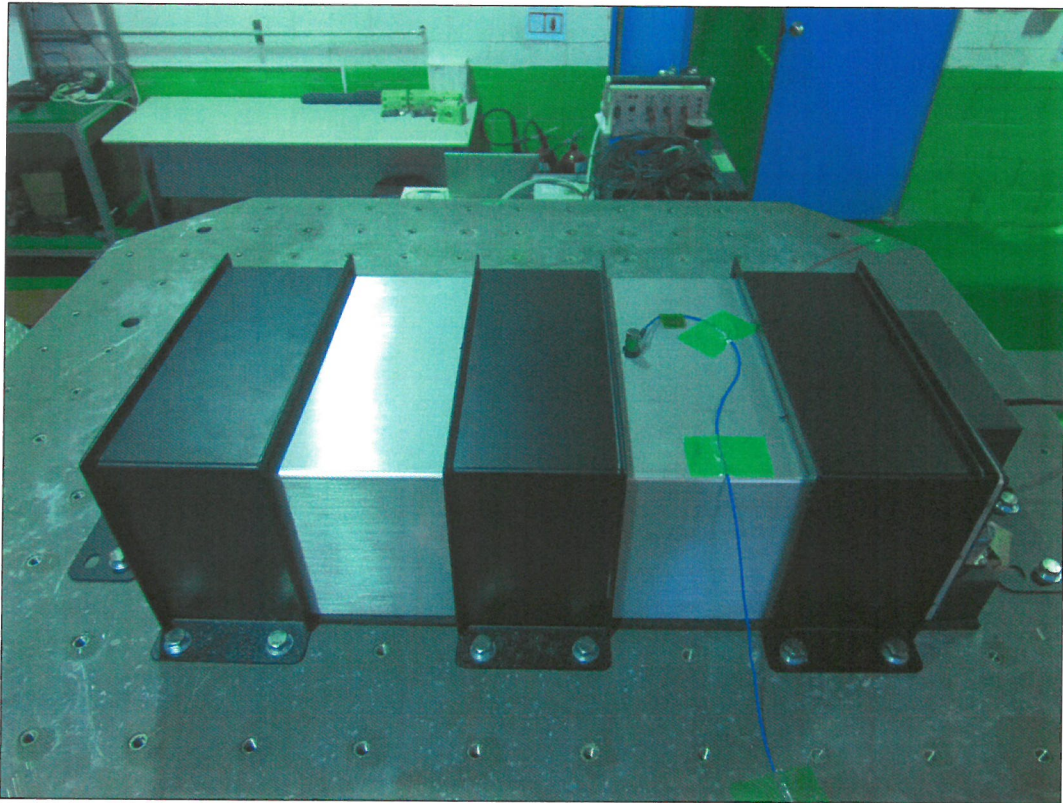


Fig.1 Show the DUT of Z axis vibration test

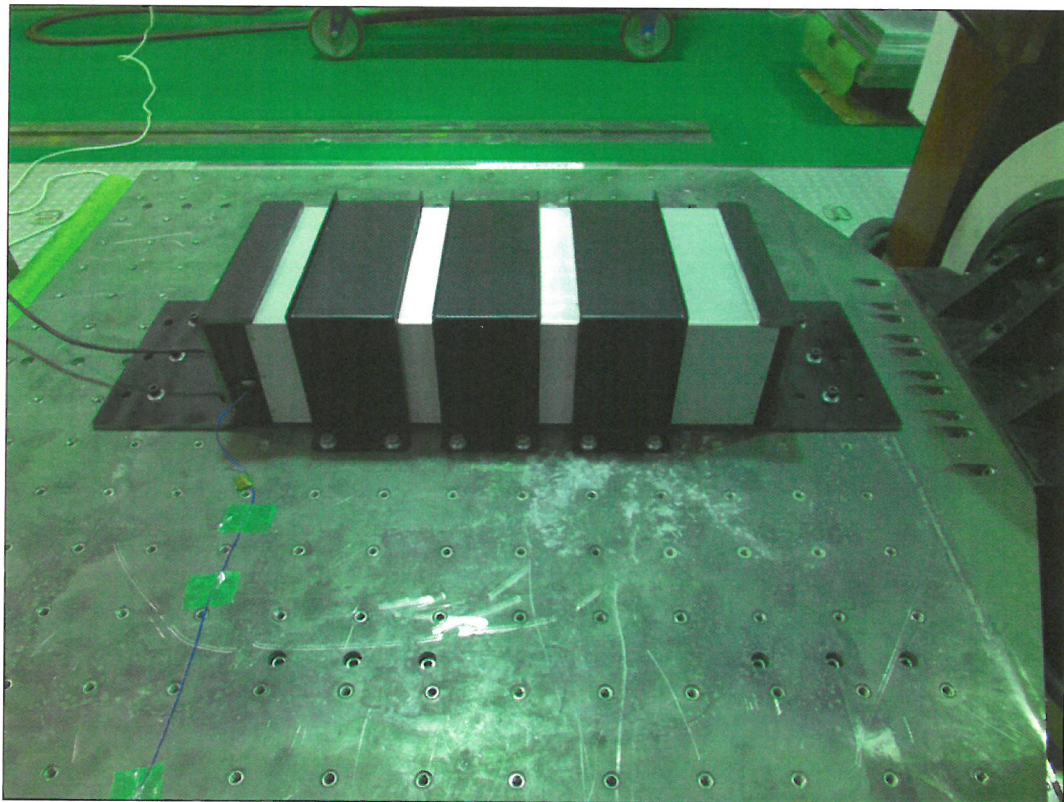


Fig.2 Show the DUT of Y_1 axis vibration test

TEST REPORT

Report No.: B105RE0291

Test Category: Test for Research

Test Item: Vibration test

Page: 6 / 11

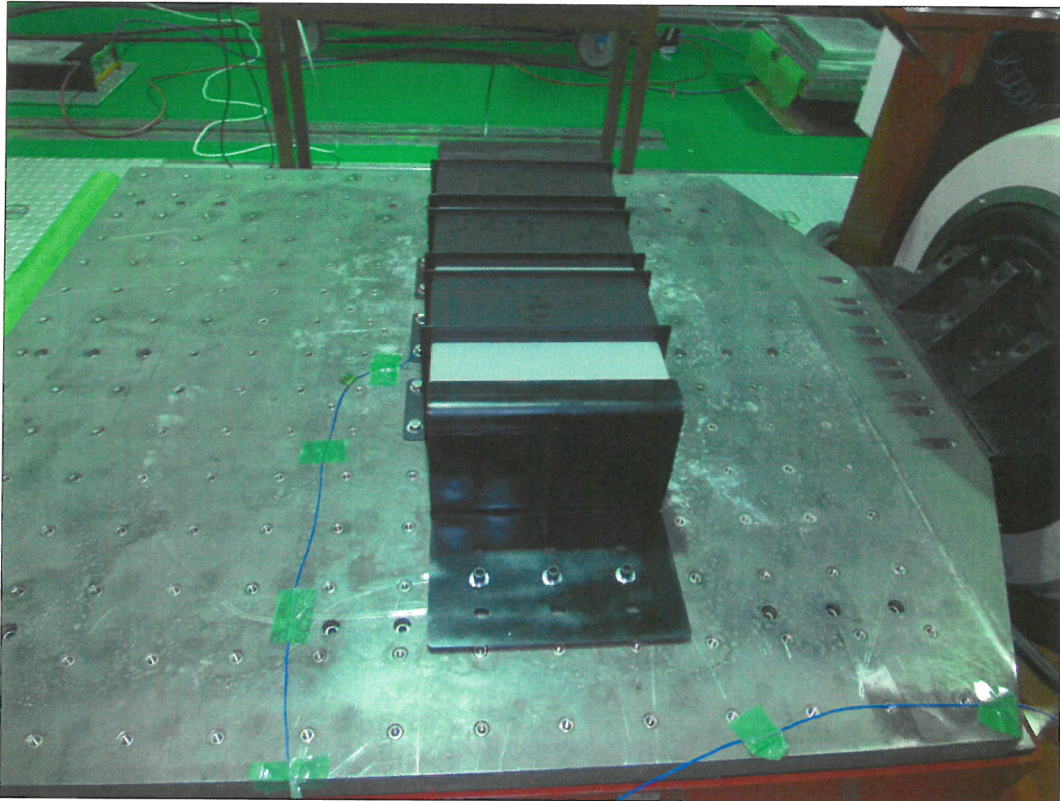


Fig.3 Show the DUT of X axis vibration test

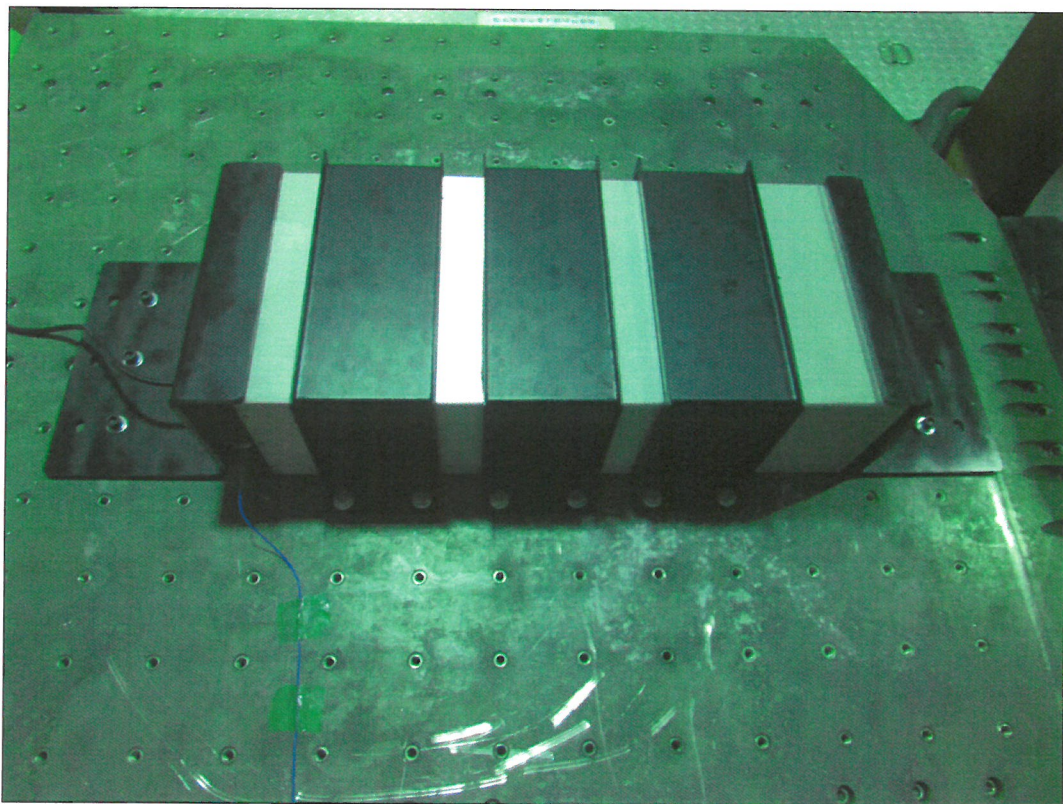


Fig.4 Show the DUT of Y_2 axis vibration test

TEST REPORT

Report No.: B105RE0291

Test Category: Test for Research

Test Item: Vibration test

Page: 7 / 11

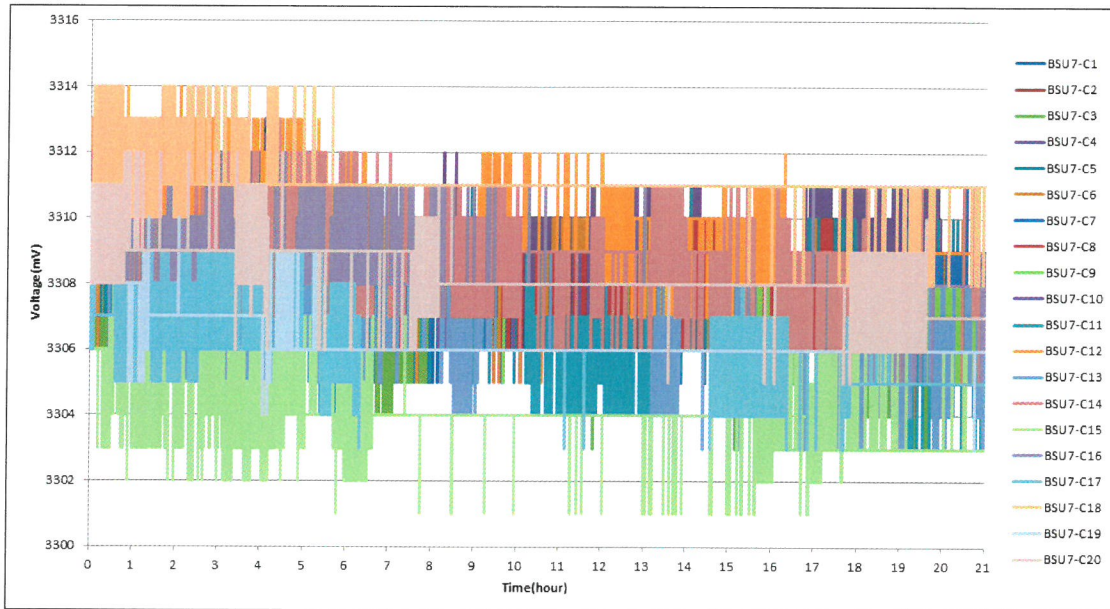


Fig.5 Show the cell voltage during Z axis vibration test

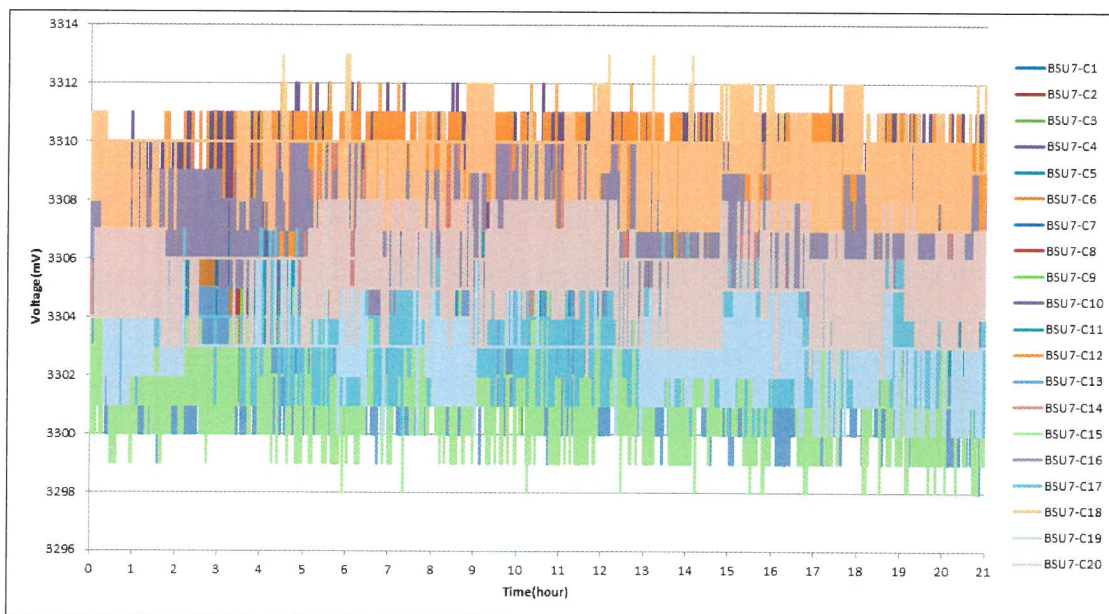


Fig.6 Show the cell voltage during Y₁ axis vibration test

TEST REPORT

Report No.: B105RE0291

Test Category: Test for Research

Test Item: Vibration test

Page: 8 / 11

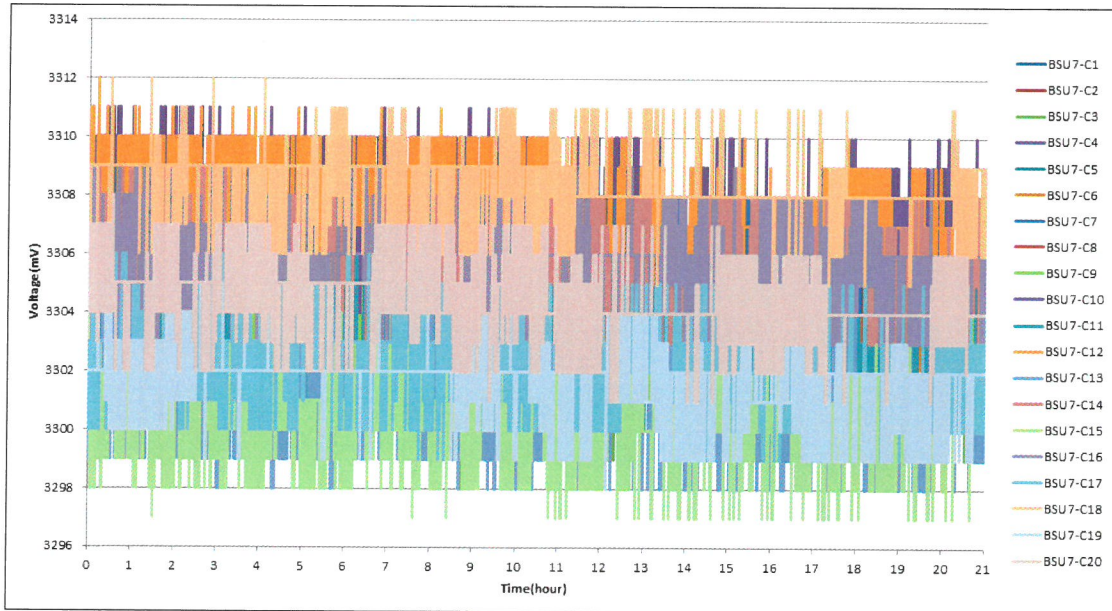


Fig.7 Show the cell voltage during X axis vibration test

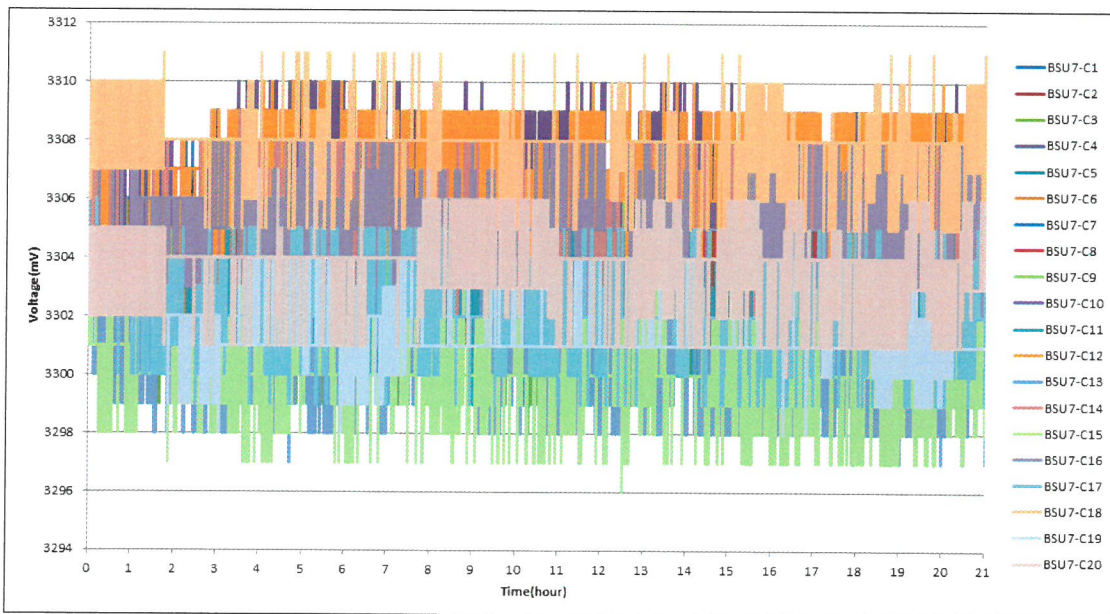


Fig.8 Show the cell voltage during Y₂ axis vibration test

TEST REPORT

Report No.: B105RE0291
Test Item: Vibration test

Test Category: Test for Research
Page: 9 / 11

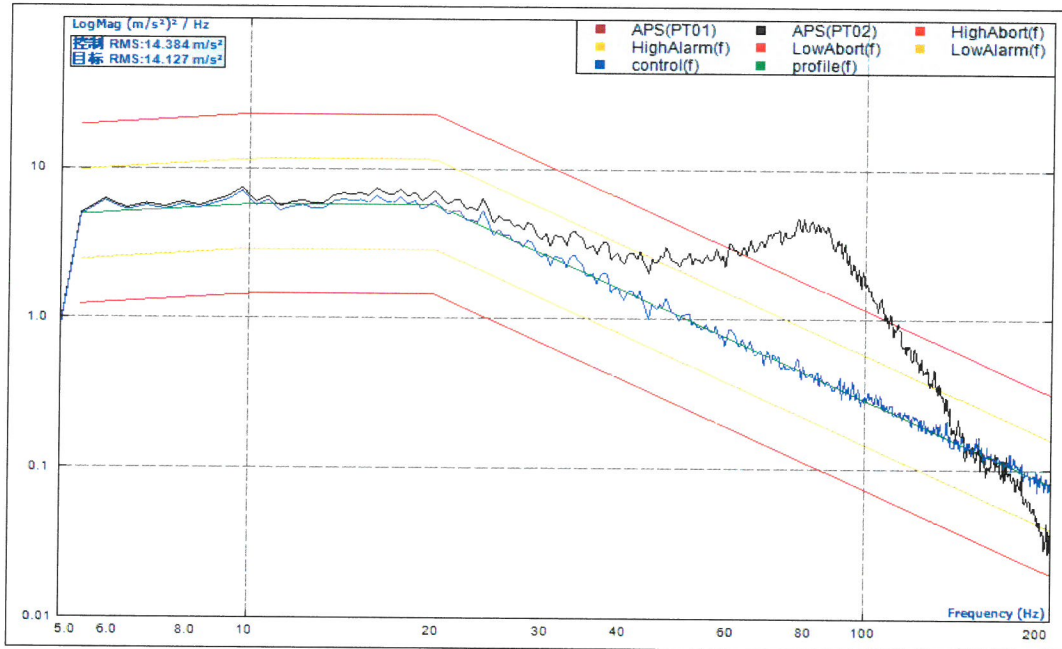


Fig.9 Show the PSD profile of Z axis

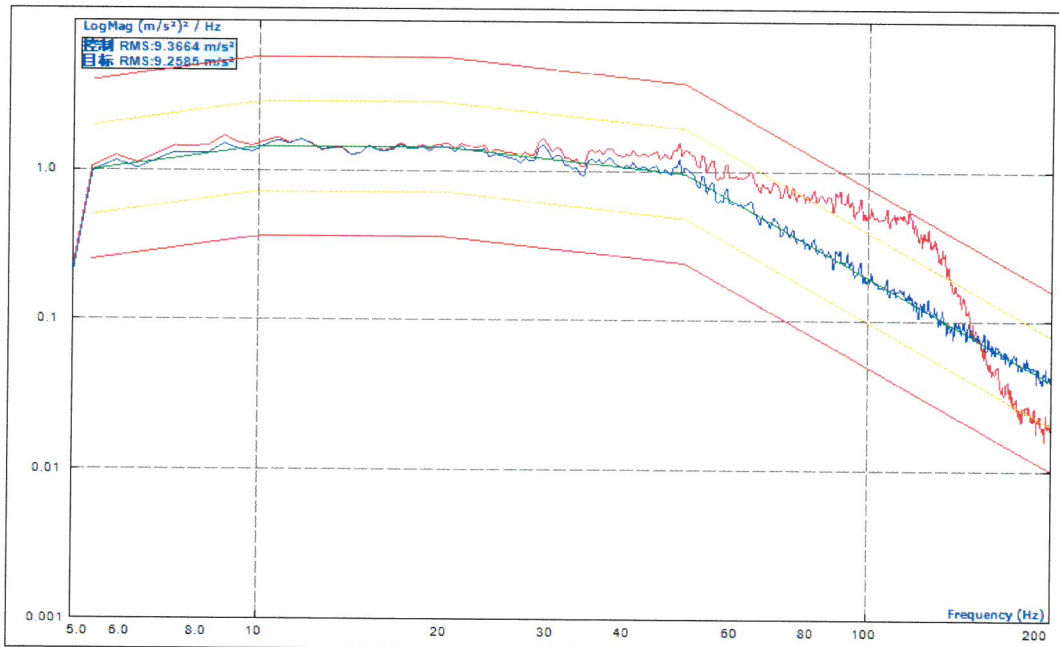


Fig.10 Show the PSD profile of Y₁ axis

TEST REPORT

Report No.: B105RE0291

Test Category: Test for Research

Test Item: Vibration test

Page: 10 / 11

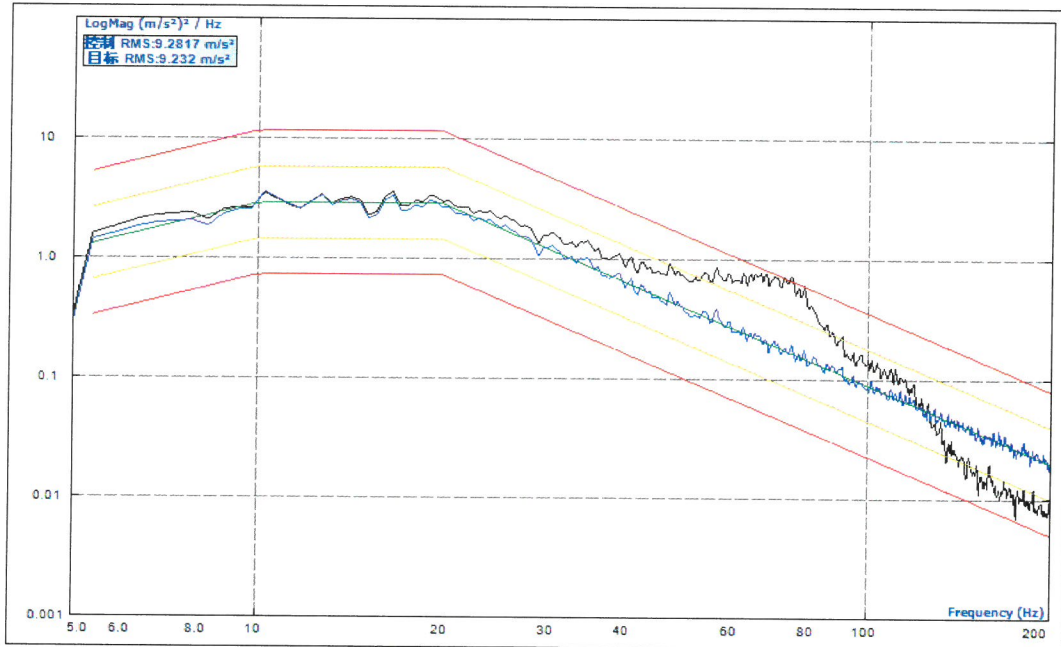


Fig.11 Show the PSD profile of X axis

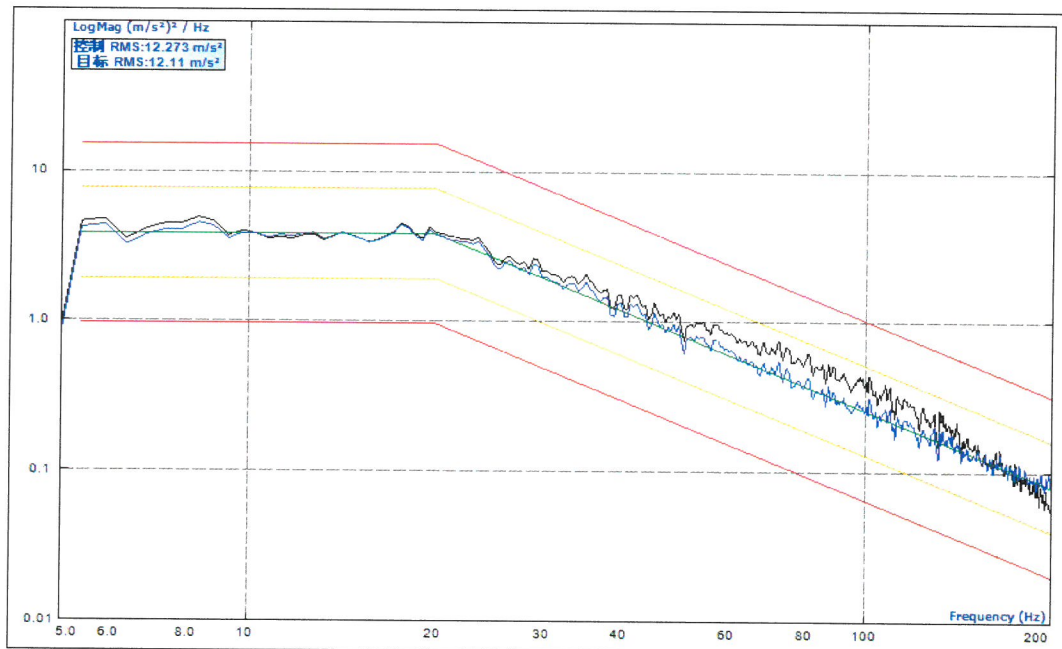


Fig.12 Show the PSD profile of Y₂ axis

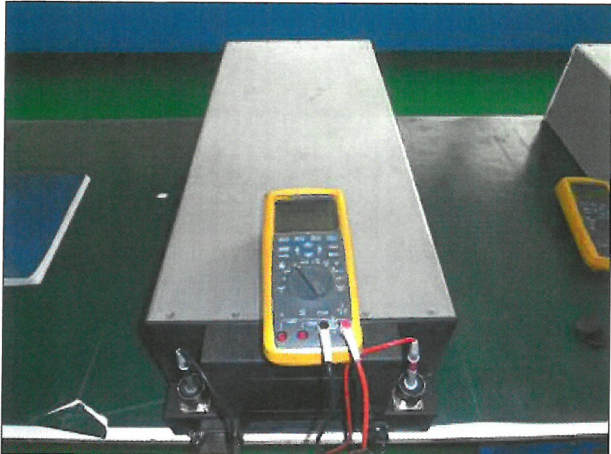
TEST REPORT

Report No.: B105RE0291

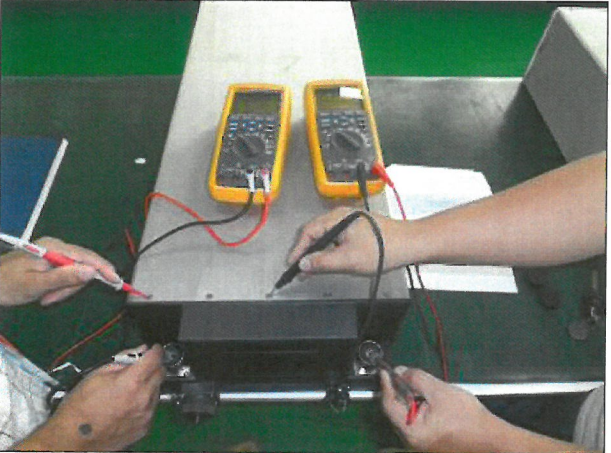
Test Category: Test for Research

Test Item: Vibration test

Page: 11 / 11



Measure for voltage, V_b



Measure for voltage, V_1 , V_2



Measure for voltage, V'_1

Fig.13 Measurement of the isolation resistance after test