EMC Test Report

Report No.: AGC09609200401EE01

PRODUCT DESIGNATION	:	5.2kWh Lithium Battery Pack
BRAND NAME	:	GivEnergy
MODEL NAME	:	Giv-Bat5.2
APPLICANT	:	JMHING POWER LTD
DATE OF ISSUE	:	Apr. 29, 2020
STANDARD(S)	:	EN 61000-6-1:2019 EN 61000-6-3:2007
REPORT VERSION	:	V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Apr. 29, 2020	Valid	Initial release

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1 VERIFICATION OF CONFORMITY

Applicant	JMHING POWER LTD
Address	UNIT 5 TOWER HOUSE LANE INDUSTRIAL ESTATE,TOWER HOUSE LANE, HEDON ROAD, HULL, HU12 8EE, UK
Manufacturer	JMHING POWER LTD
Address	UNIT 5 TOWER HOUSE LANE INDUSTRIAL ESTATE,TOWER HOUSE LANE, HEDON ROAD, HULL, HU12 8EE, UK
Factory	Shenzhen GivEnergy Technology Co Ltd
Address	4th Floor 225th Building Xiang Shan Blv Bao An Shen Zhen Guang Dong China
Product Designation	5.2kWh Lithium Battery Pack
Brand Name	GivEnergy
Test Model	Giv-Bat5.2
Date of test	Apr. 23, 2020 to Apr. 29, 2020
Deviation	The sample has no any deviation to the method of standard mentioned on page 1
Condition of Test Sample	Normal
Test Result	Pass

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. for compliance with the requirements set forth in the Technical Standards mentioned above. This said equipment in the configuration described in this report shows the maximum emission levels emanating from equipment and the level of the immunity endurance of the equipment are within the compliance requirements.

The test results of this report relate only to the tested sample identified in this report.

Prepared By	Jack Gui Jack Gui(Gui Jiafeng) Project Engineer	Apr. 29, 2020
Reviewed By	Erik.Yang Erik Yang(Yang Jianmin) Reviewer	Apr. 29, 2020
Approved By	Forrest Lei Forrest Lei(Lei Yonggang) Authorized Officer	Apr. 29, 2020

2 SYSTEM DESCRIPTION

TEST MODE DESCRIPTION		
NO.	**TEST MODE DESCRIPTION**	**WORST**
1	Discharging	V
2	Charging	
Note: 1. V means EMI worst mode 2. Only worst mode data recorded in the test report.		

3 MEASUREMENT UNCERTAINTY

The uncertainty is calculated using the methods suggested in the “Guide to the Expression of Uncertainty in measurement” (GUM) published by ISO.

- Uncertainty of Radiated Emission Below 1GHz, Uc = ±4.0dB

4 PRODUCT INFORMATION

Housing Type	Plastic and metal
EUT Input Rating	DC 51.2V 51A

I/O Port Information (☐Applicable ☒Not Applicable)

I/O Port of EUT			
I/O Port Type	**Number**	**Cable Description**	**Tested With**
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5 SUPPORT EQUIPMENT

Device Type	Manufacturer	Model Name	Serial No.	Data Cable	Power Cable
Resistance box	--	--	--	--	--

6 TEST FACILITY

Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao 'an District, Shenzhen, Guangdong, China

7 TEST EQUIPMENT LIST

TEST EQUIPMENT OF RADIATED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Test Receiver	R&S	ESCI	10096	Jun.12, 2019	Jun. 11, 2020
Antenna	SCHWARZBECK	VULB9168	494	Sep. 20, 2019	Sep. 19, 2021
Test software	FARA	EZ_EMC (Ver.RA-03A)	N/A	N/A	N/A

TEST EQUIPMENT OF ESD TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
ESD Simulator	EM Test	dito	P1527160053	Oct. 24, 2019	Oct. 23, 2020

TEST EQUIPMENT OF RS IMMUNITY TEST

Description	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Signal Generator	R&S	E4421B	MY43351603	Jun. 12, 2019	Jun. 11, 2020
Power Sensor	R&S	URV5-Z4	100124	May 17, 2019	May 16, 2020
Power Meter	R&S	NRVD	8323781027	May 17, 2019	May 16, 2020
Power Amplifier	KALMUS	7100LC	04-02/17-06-001	Jun.12, 2019	Jun.11, 2020
Power Amplifier	Milmega	AS0104-55_55	1004793	Jun.12, 2019	Jun.11, 2020
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	May 17, 2019	May 16, 2021
Antenna	SCHWARZBECK	VULB9168	D69250	Jan. 09, 2019	Jan. 08, 2021

8 TEST SUMMARY LIST

Test item	Test Requirement	Test Method	Class/Severity	Result
CONDUCTED EMISSION	EN 61000-6-3	EN 61000-6-3	Class B	N/A
RADIATED EMISSION	EN 61000-6-3	EN 61000-6-3	Class B	Pass
Electrostatic Discharge Immunity	EN61000-6-1	EN 61000-4-2	± 8.0 kV (Air Discharge) ± 4.0 kV (Contact Discharge) ± 4.0 kV (Indirect Discharge)	Pass
Radiated RF Electromagnetic	EN61000-6-1	EN 61000-4-3	3V/mwith80% AM. 1kHz Modulation at 80-1000MHz 3V/mwith80% AM. 1kHz Modulation at 1400-2000MHz 1V/m with 80% AM. 1kHz Modulation at 2000-2700MHz	Pass
Electrical fast transient/burst Immunity	EN61000-6-1	EN 61000-4-4	+/- 1kV for Power Supply Lines	N/A
SURGE IMMUNITY	EN61000-6-1	EN 61000-4-5	+/- 1kV (Line to Line) +/- 2kV (Line to Ground)	N/A
Immunity to Conducted Disturbances Induced by RF fields	EN61000-6-1	EN 61000-4-6	3V with 80% AM. 1 kHz Modulation	N/A
Power frequency magnetic field	EN61000-6-1	EN61000-4-8	50/60Hz 3A/m	N/A
Voltage dips and short interruptions immunity	EN61000-6-1	EN 61000-4-11	PHASE ANGLE 0 degrees	N/A

Note：N/A means not applicable.

9 EN 61000-6-3 RADIATED EMISSION TEST

9.1 LIMITS OF RADIATED DISTURBANCES

AT 10M DISTANCES

Frequency (MHz)	Distance (m)	Maximum Field Strength Limit (dBuV/m Q.P.)
30-230	10	30.00
230-1000	10	37.00

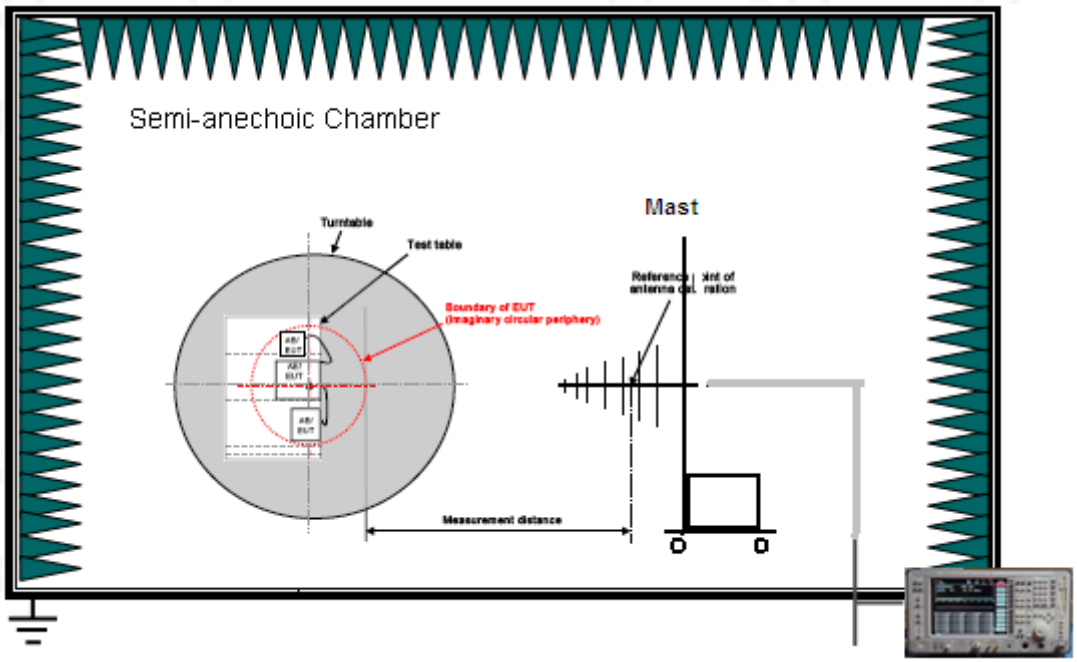
AT 3M DISTANCES

Frequency (MHz)	Distance (m)	Maximum Field Strength Limit (dBuV/m Q.P.)
30-230	3	40.00
230-1000	3	47.00

Note: The lower limit shall apply at the transition frequency.

9.2 BLOCK DIAGRAM OF TEST SETUP

System Diagram of Connections between EUT and Simulators



9.3 PROCEDURE OF RADIATED EMISSION TEST

(1) The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane as per EN 61000-6-3 (see Test Facility for the dimensions of the ground plane used).When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 10cm non-conductive covering to insulate the EUT from the ground plane.

(2) Support equipment, if needed, was placed as per EN 61000-6-3.

(3) All I/O cables were positioned to simulate typical actual usage as per EN 61000-6-3.

(4) The EUT was discharged to resistor.

(5) The antenna was placed at 3 meter away from the EUT as stated in EN 61000-6-3. The antenna connected to the Analyzer via a cable and at times a pre-amplifier would be used.

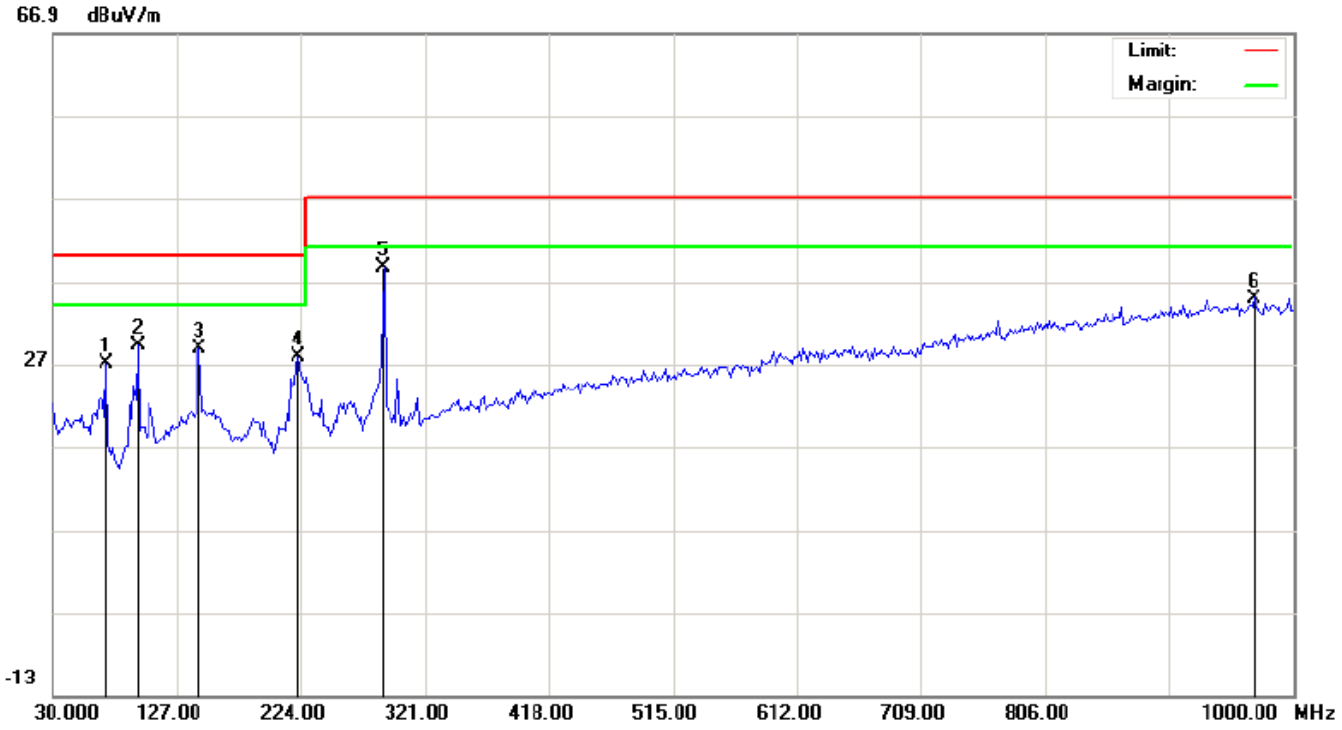
(6) The Analyzer / Receiver quickly scanned from 30MHz to 1000MHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.

(7) The test mode(s) were scanned during the test.

(8) Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and Q.P./Peak reading is presented.

9.4 TEST RESULT OF RADIATED EMISSION TEST

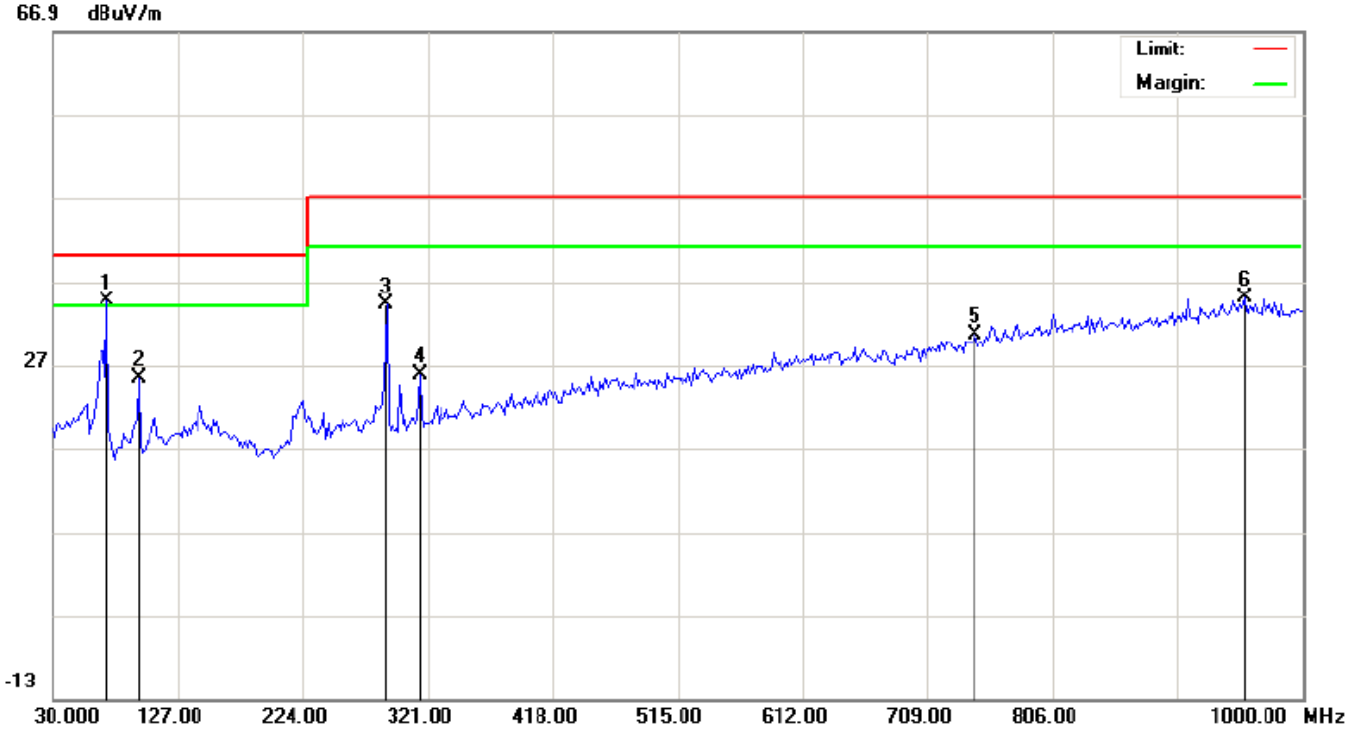
Radiated Emission Test at 3m Distance-Horizontal



No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		72.0333	10.27	16.67	26.94	40.00	-13.06	peak			
2		96.2833	13.53	15.63	29.16	40.00	-10.84	peak			
3		144.7833	9.65	19.22	28.87	40.00	-11.13	peak			
4		222.3833	10.44	17.41	27.85	40.00	-12.15	peak			
5	*	288.6666	18.83	19.74	38.57	47.00	-8.43	peak			
6		969.2833	2.60	32.30	34.90	47.00	-12.10	peak			

RESULT: PASS

Radiated Emission Test at 3m Distance-Vertical



No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	72.0333	17.85	16.67	34.52	40.00	-5.48	peak			
2		96.2833	9.87	15.63	25.50	40.00	-14.50	peak			
3		288.6666	14.49	19.74	34.23	47.00	-12.77	peak			
4		314.5333	5.79	19.98	25.77	47.00	-21.23	peak			
5		746.1833	1.39	29.19	30.58	47.00	-16.42	peak			
6		954.7333	2.74	32.17	34.91	47.00	-12.09	peak			

RESULT: PASS

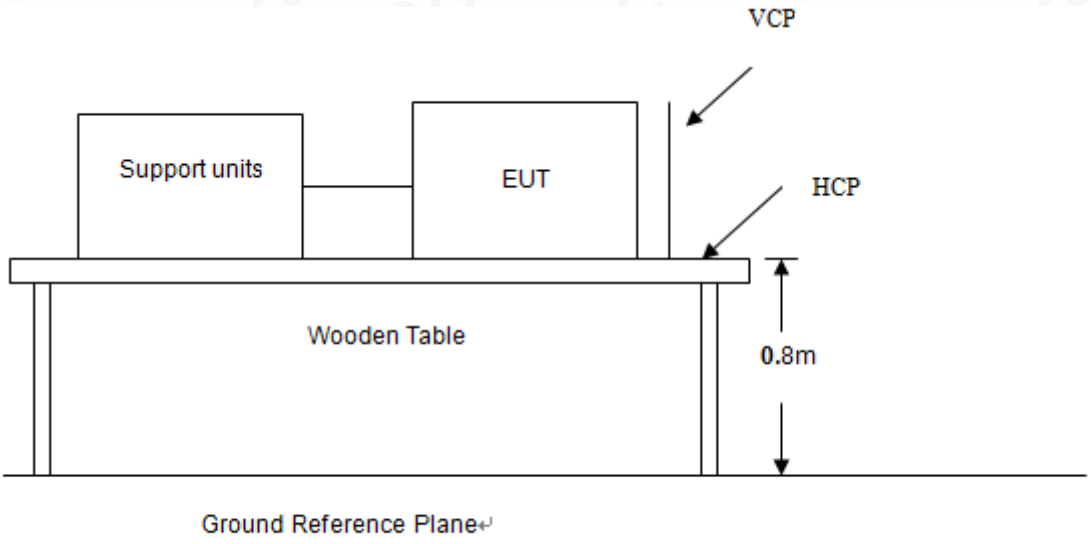
10 EN 61000-4-2 ESD IMMUNITY TEST

ELECTROSTATIC DISCHARGE (ESD) IMMUNITY TEST

Port	Enclosure
Basic Standard	EN 61000-4-2
Test Level	±8.0 kV (Air Discharge) ±4.0 kV (Contact Discharge) ±4.0 kV (Indirect Discharge)
Standard require	B
Tester	Jack
Temperature	24.8°C
Humidity	57.5%

10.1 BLOCK DIAGRAM OF TEST SETUP

(The 470 k ohm resistors are installed per standard requirement)



10.2 TEST PROCEDURE

The EUT was located 0.1 m minimum from all side of the HCP.
The support units were located 1 m minimum away from the EUT.
EUT worked with resistance load, and make sure EUT worked normally.
Active the communication function if the EUT with such port(s).
As per the requirement of EN 61000-4-2; applying direct contact discharge at the sides other than front of EUT at minimum 20 discharges (10 positive and 10 negative) if applicable, can't be applied direct contact discharge side of EUT then the indirect discharge shall be applied. One of the test points shall be subjected to at least 50 indirect discharge (contact) to the front edge of horizontal coupling plane.
Other parts of EUT where it is not possible to perform contact discharge then selecting appropriate points of EUT for air discharge, a minimum of 10 single air discharges shall be applied.
The application of ESD to the contact of open connectors is not required.
Putting a mark on EUT to show tested points. The following test condition was followed during the tests.
Note: As per the A2 to EN 61000-4-2, a bleed resistor cable is connected between the EUT and HCP during the test.
The electrostatic discharges were applied as follows:

Voltage	Coupling	Test Performance	Result
±4kV	Contact Discharge	No function loss	A
±4kV	Indirect Discharge HCP (Front)	No function loss	A
±4kV	Indirect Discharge HCP (Back)	No function loss	A
±4kV	Indirect Discharge HCP (Left)	No function loss	A
±4kV	Indirect Discharge HCP (Right)	No function loss	A
±4kV	Indirect Discharge VCP (Front)	No function loss	A
±4kV	Indirect Discharge VCP (Back)	No function loss	A
±4kV	Indirect Discharge VCP (Left)	No function loss	A
±4kV	Indirect Discharge VCP (Right)	No function loss	A
±8kV	Air Discharge	No function loss	A

10.3 PERFORMANCE & RESULT

Criteria A:	The apparatus continues to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance.
Criteria B:	The apparatus continues to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.
Criteria C:	Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

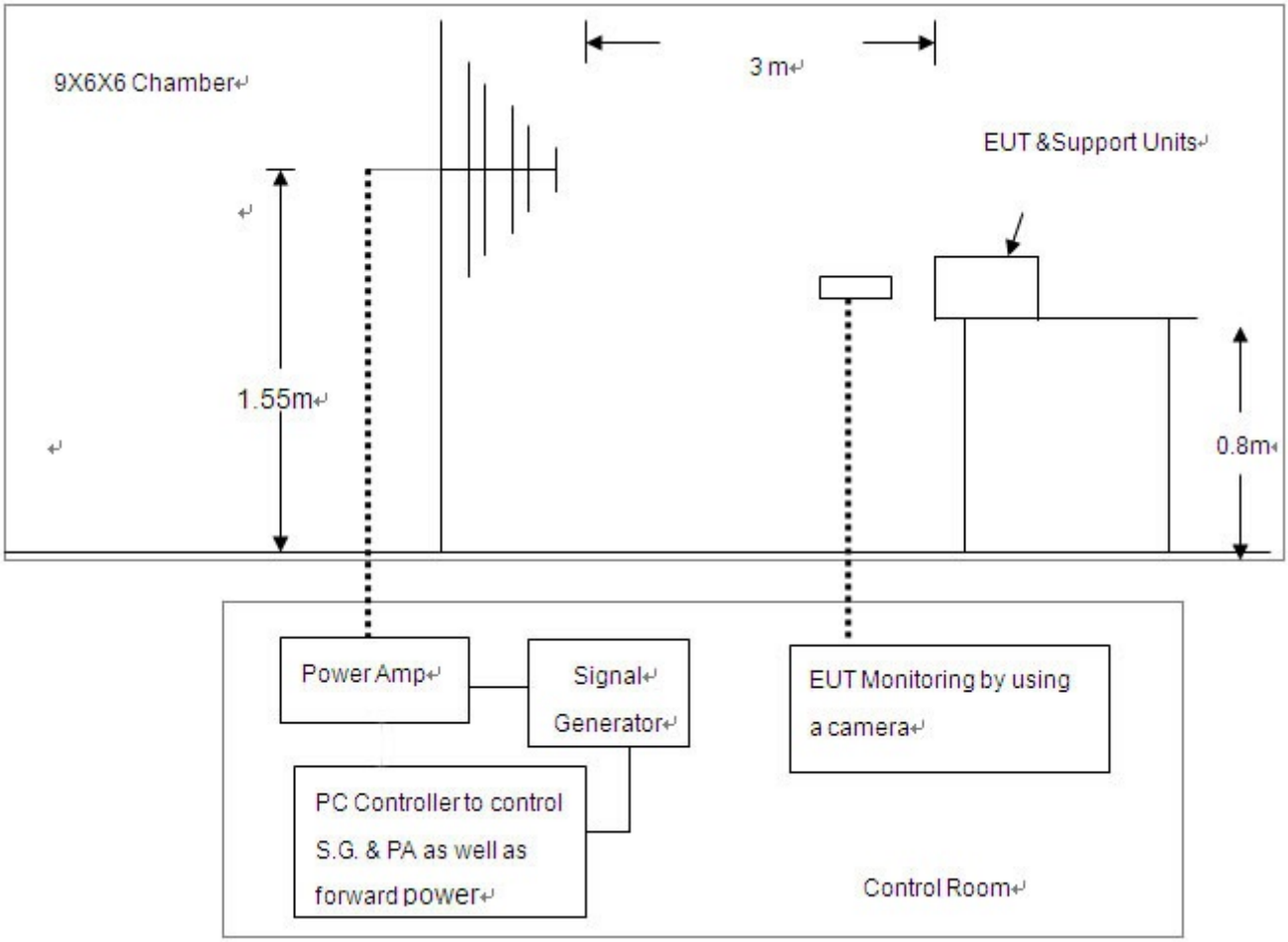
☒***PASS*** ☐***FAIL***

11 EN 61000-4-3 RS IMMUNITY TEST

RADIATED ELECTROMAGNETIC FIELD IMMUNITY TEST

Port	Enclosure
Basic Standard	EN 61000-4-3
Test Level	3V/m with 80% AM. 1kHz Modulation at 80-1000MHz 3V/m with 80% AM. 1kHz Modulation at 1400-2000MHz 1V/m with 80% AM. 1kHz Modulation at 2000-2700MHz
Standard require	A
Tester	Jack
Temperature	24.4°C
Humidity	57.8%

11.1 BLOCK DIAGRAM OF TEST SETUP



11.2 TEST PROCEDURE

The EUT was located at the edge of supporting table keep 3 meter away from transmitting antenna, it just the calibrated square area of field uniformity. The support units were located outside of the uniformity area, but the cable(s) connected with EUT were exposed to the calibrated field as per EN 61000-4-3.

EUT worked with resistance load, and make sure EUT worked normally.

Setting the testing parameters of RS test software per EN 61000-4-3.

From the result of pre-test in step 5, choose the worst side of EUT for final test from 80 MHz to 1000 MHz and 1400MHz to 2700MHz at 1% steps.

Recording the test result in following table.

Test Conditions:

Test level: 3V/m

Steps: 1 % of fundamental

Dwell Time: 1 sec

Range (MHz)	Field	Modulation	Polarity	Position	Result
80-1000	3V/m	AM	H	Front	A
80-1000	3V/m	AM	H	Left	A
80-1000	3V/m	AM	H	Back	A
80-1000	3V/m	AM	H	Right	A
80-1000	3V/m	AM	V	Front	A
80-1000	3V/m	AM	V	Left	A
80-1000	3V/m	AM	V	Back	A
80-1000	3V/m	AM	V	Right	A

Test level: 3V/m

Steps: 1 % of fundamental

Dwell Time: 1 sec

Range (MHz)	Field	Modulation	Polarity	Position	Result
1400-2000	3V/m	AM	H	Front	A
1400-2000	3V/m	AM	H	Left	A
1400-2000	3V/m	AM	H	Back	A
1400-2000	3V/m	AM	H	Right	A
1400-2000	3V/m	AM	V	Front	A
1400-2000	3V/m	AM	V	Left	A
1400-2000	3V/m	AM	V	Back	A
1400-2000	3V/m	AM	V	Right	A

Test level: 1V/m

Steps: 1 % of fundamental

Dwell Time: 1 sec

Range (MHz)	Field	Modulation	Polarity	Position	Result
2000-2700	1V/m	AM	H	Front	A
2000-2700	1V/m	AM	H	Left	A
2000-2700	1V/m	AM	H	Back	A
2000-2700	1V/m	AM	H	Right	A
2000-2700	1V/m	AM	V	Front	A
2000-2700	1V/m	AM	V	Left	A
2000-2700	1V/m	AM	V	Back	A
2000-2700	1V/m	AM	V	Right	A

11.3 PERFORMANCE & RESULT

Criteria A:	The apparatus continues to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance.
Criteria B:	The apparatus continues to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.
Criteria C:	Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

☒***PASS*** ☐***FAIL***

APPENDIX A: PHOTOGRAPHS OF TEST SETUP

EN 61000-6-3 RADIATED EMISSION TEST SETUP

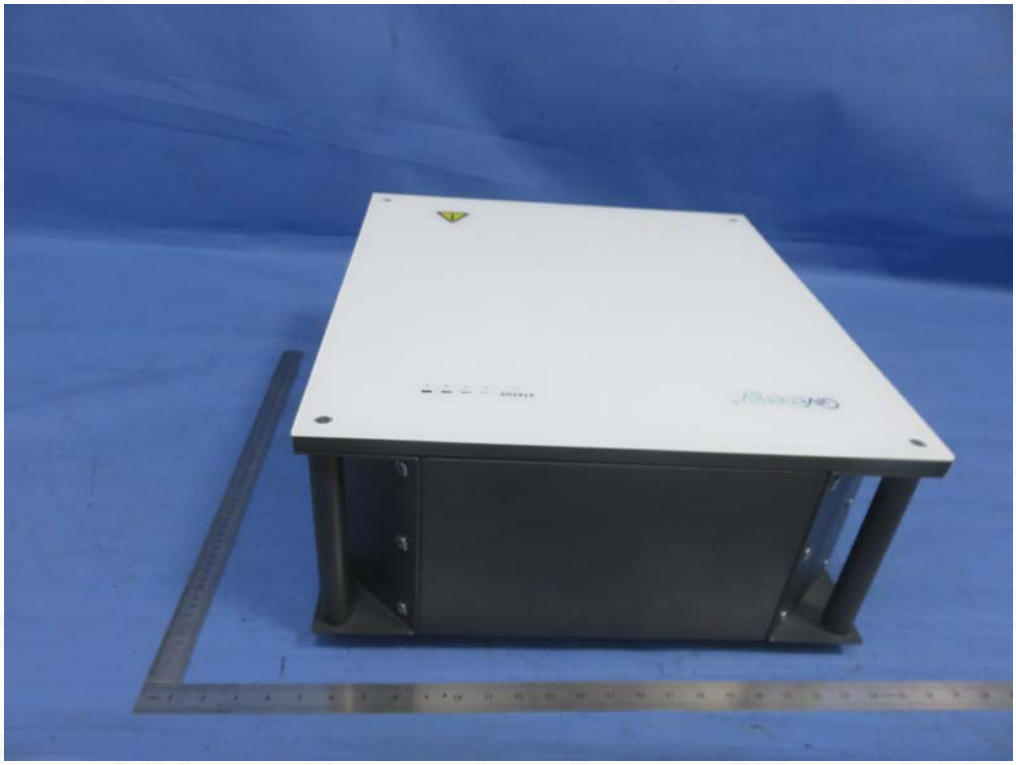
EN 61000-4-2 ESD IMMUNITY TEST SETUP-1

EN 61000-4-2 ESD IMMUNITY TEST SETUP-2

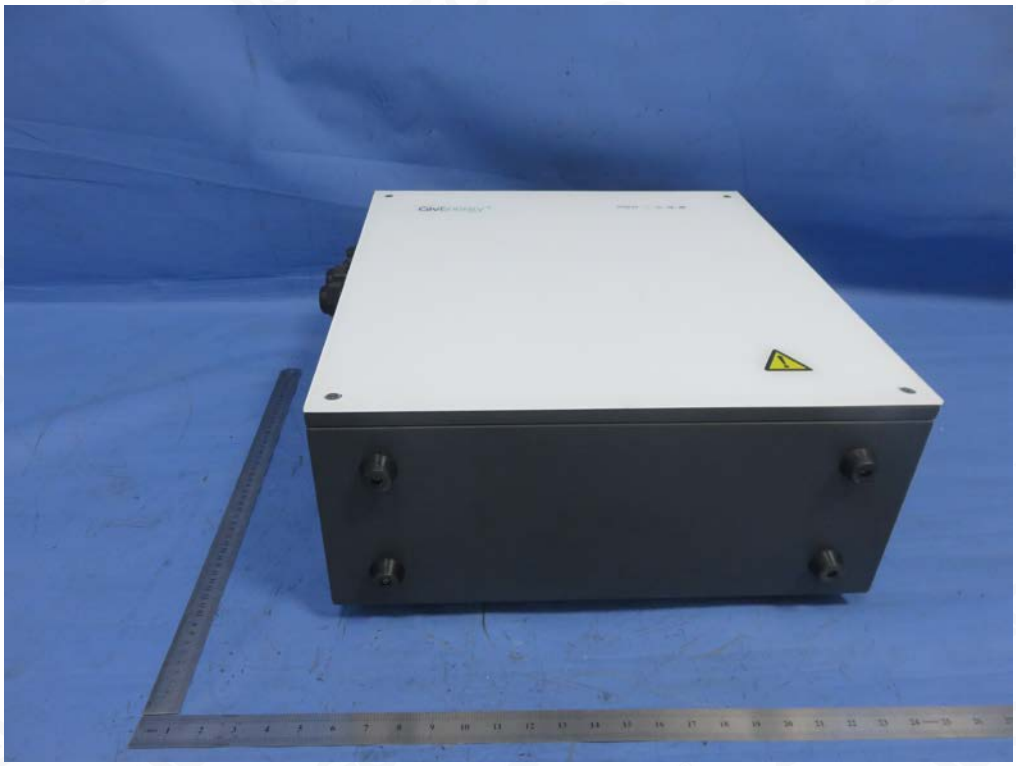
EN 61000-4-3 RS IMMUNITY TEST SETUP

APPENDIX B: PHOTOGRAPHS OF EUT

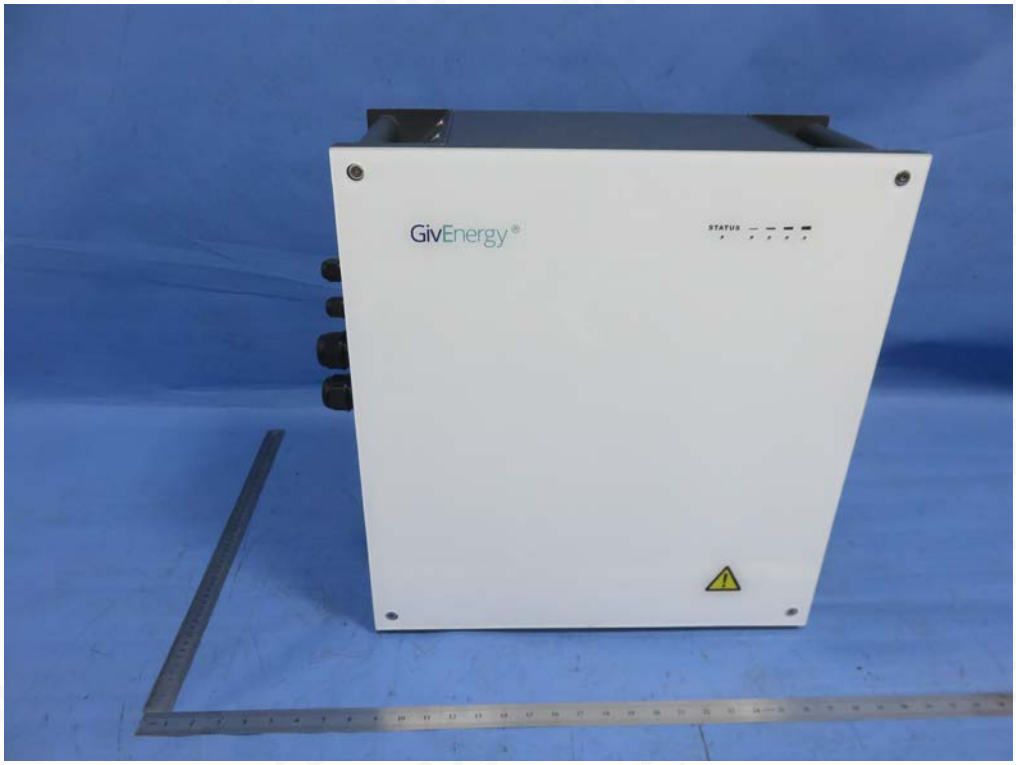
TOP VIEW OF EUT



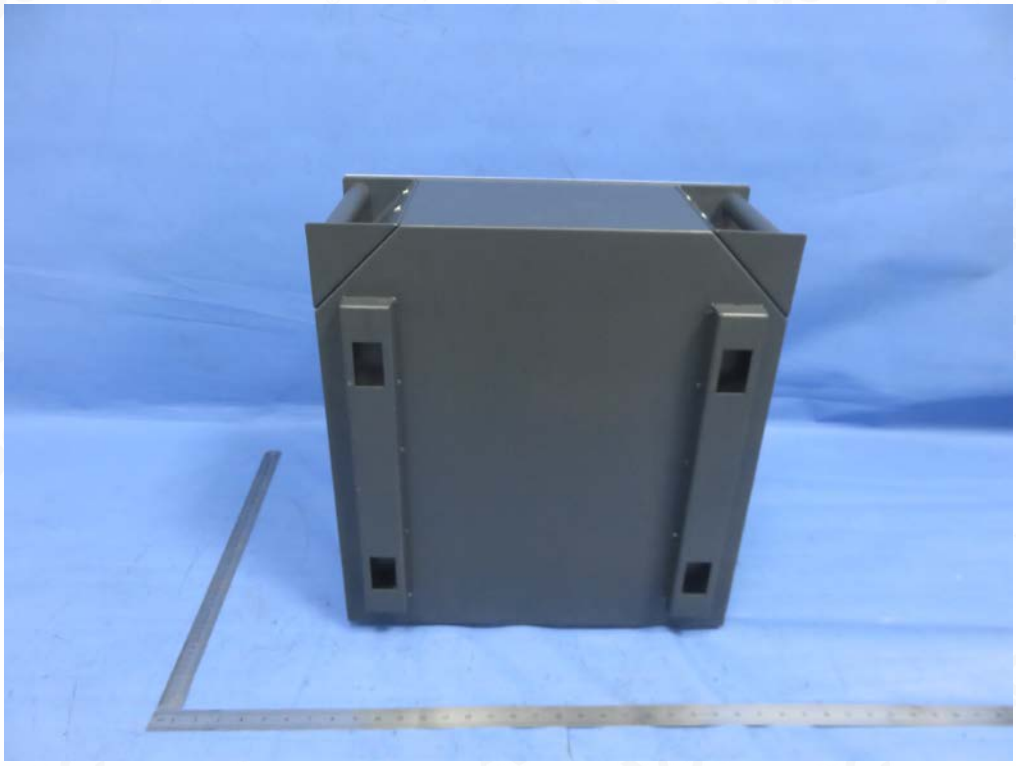
BOTTOM VIEW OF EUT



FRONT VIEW OF EUT



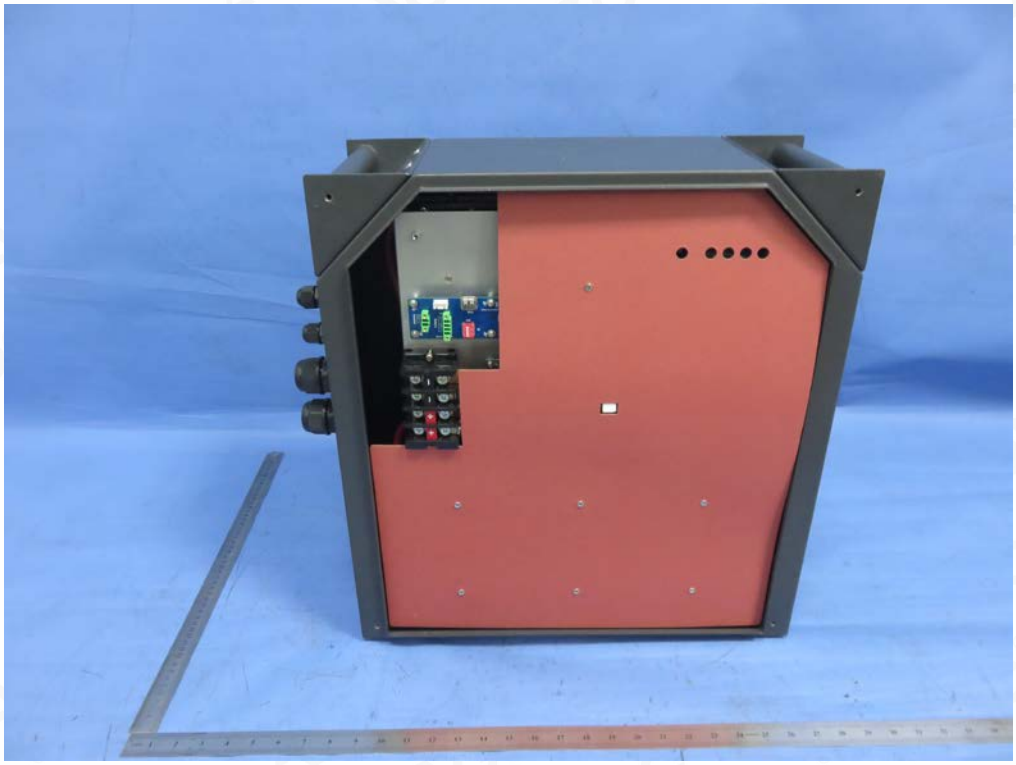
BACK VIEW OF EUT



LEFT VIEW OF EUT

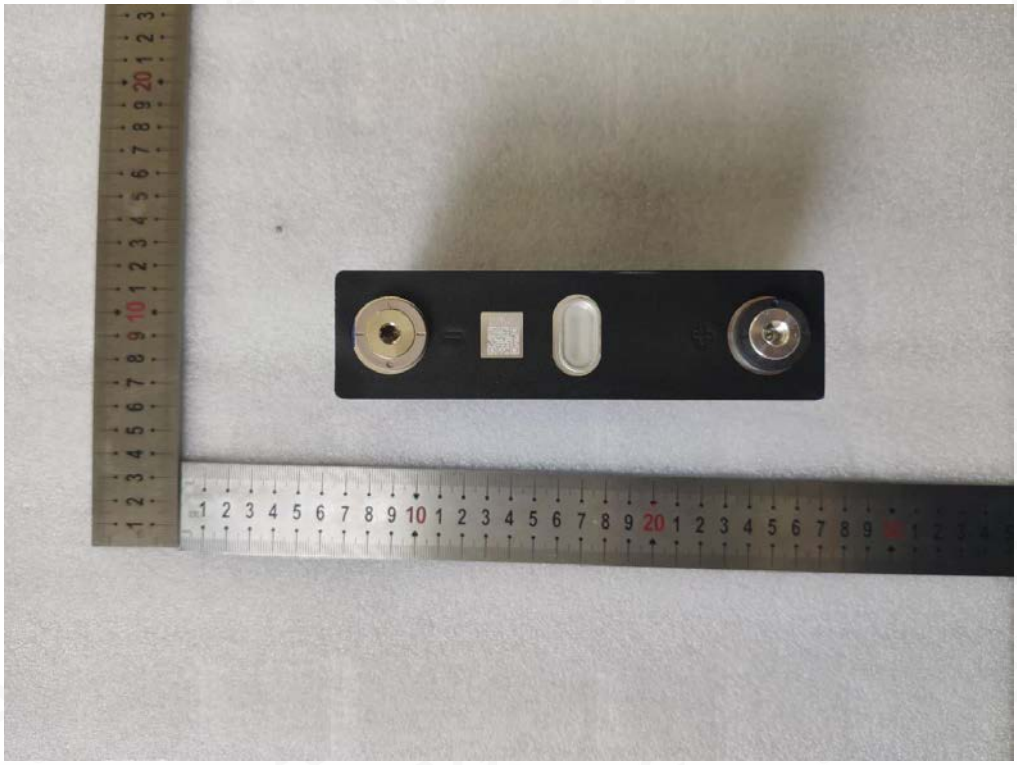
RIGHT VIEW OF EUT

OPEN VIEW OF EUT

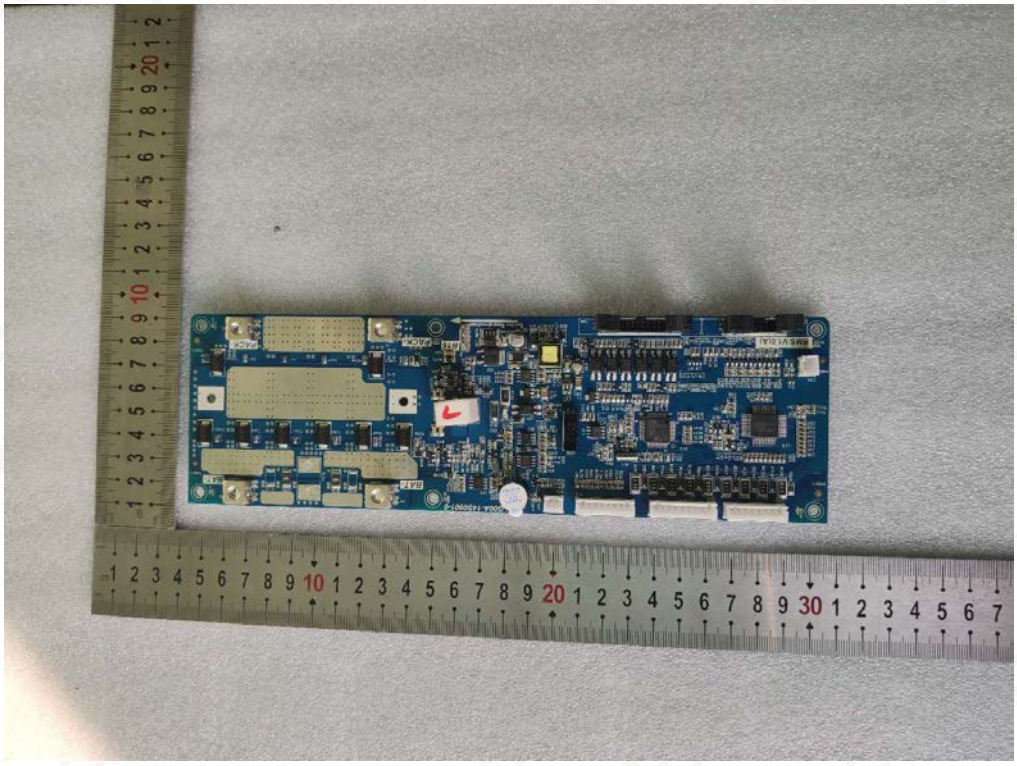


INTERNAL VIEW OF EUT-1

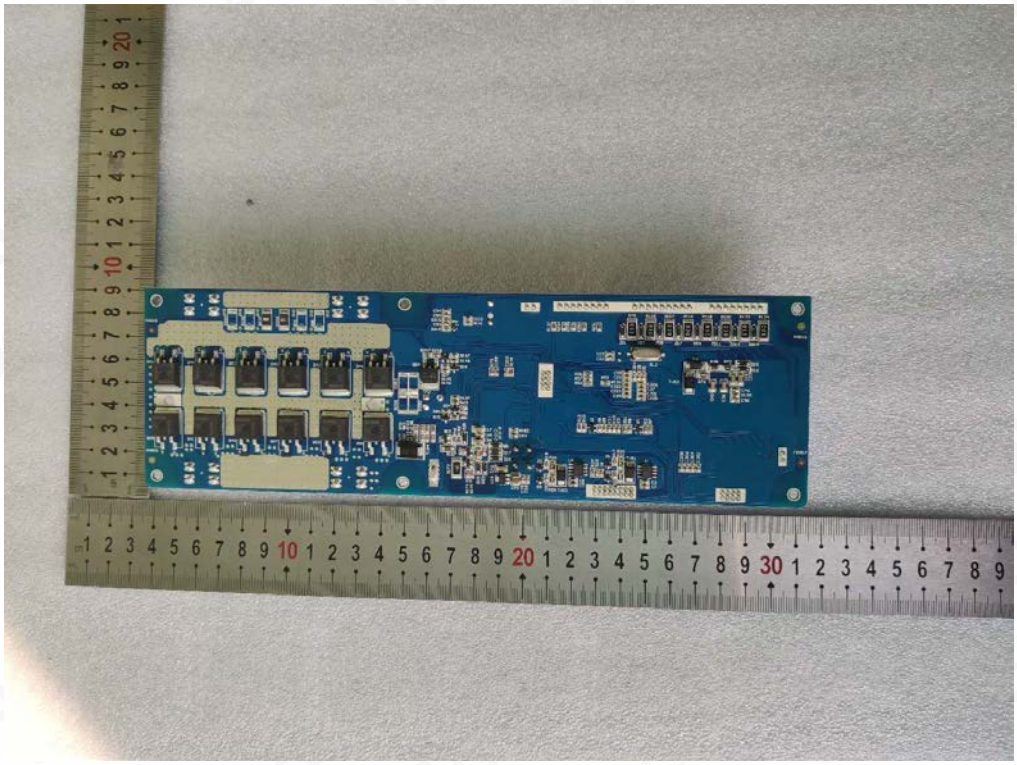
INTERNAL VIEW OF EUT-2



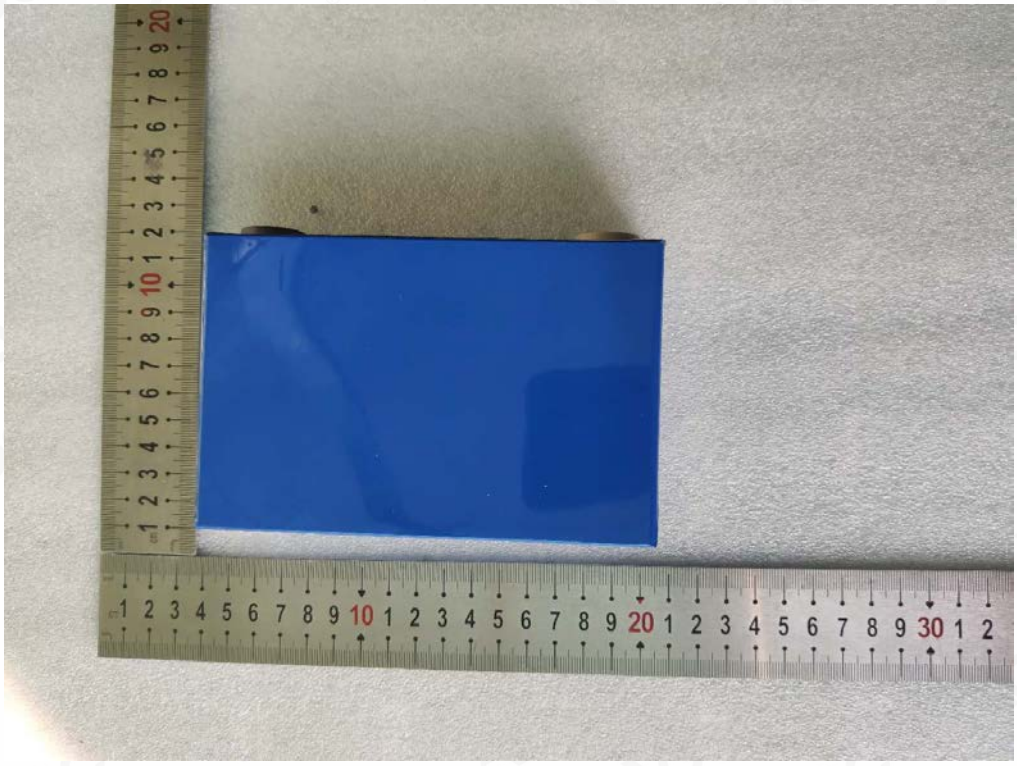
INTERNAL VIEW OF EUT-3



INTERNAL VIEW OF EUT-4



INTERNAL VIEW OF EUT-5



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