EMC Test Report

Client Name	:	**Hunan Wisdom Technology Co., Ltd.**
Client Address	:	**Building 15, Xingsha International Enterprise Center, No. 68 Luositang Road, Changsha Economic and Technological Development Zone, Hunan, China**
Product Name	:	**Li-ion Battery Pack**
Report Date	:	**Jul. 28, 2022**

Shenzhen Anbotek Compliance Laboratory Limited

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TEST REPORT

Applicant	:	Hunan Wisdom Technology Co., Ltd.
Manufacturer	:	Hunan Wisdom Technology Co., Ltd.
Product Name	:	Li-ion Battery Pack
Model No.	:	VENUS-BAT-10 (51.2V 200Ah)
Trade Mark	:	N.A.
Rating(s)	:	Input: DC 51.2V, 200Ah Battery: DC 51.2V, 200Ah
Test Standard(s)	**:**	**EN IEC 61000-6-3: 2021; EN IEC 61000-6-1: 2019; (IEC 61000-4-2; IEC 61000-4-3)**

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the EN IEC 61000-6-3 and EN IEC 61000-6-1 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Receipt: Jul. 18, 2022

Date of Test: Jul. 18~ Jul. 22, 2022

Prepared By: Yee Huang
(Yee Huang)

Approved & Authorized Signer: KingKong Jin
(KingKong Jin)

1. General Information

1.1. Client Information

Applicant	:	Hunan Wisdom Technology Co., Ltd.
Address	:	Building 15, Xingsha International Enterprise Center, No. 68 Luositang Road, Changsha Economic and Technological Development Zone, Hunan, China
Manufacturer	:	Hunan Wisdom Technology Co., Ltd.
Address	:	Building 15, Xingsha International Enterprise Center, No. 68 Luositang Road, Changsha Economic and Technological Development Zone, Hunan, China
Factory	:	Hunan Wisdom Technology Co., Ltd.
Address	:	Building 15, Xingsha International Enterprise Center, No. 68 Luositang Road, Changsha Economic and Technological Development Zone, Hunan, China

1.2. Description of Device (EUT)

Product Name	:	Li-ion Battery Pack	
Model No.	:	VENUS-BAT-10 (51.2V 200Ah)	
Trade Mark	:	N.A.	
Test Power Supply	:	DC 51.2V	
Test Sample No.	:	1-1-1	
Product Description	:	Adapter:	N/A
Remark: (1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.			

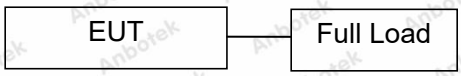
1.3. Auxiliary Equipment Used During Test

N/A		

1.4. Description of Test Mode

Pretest Mode	Description
Mode 1	Discharging

For Mode 1 Block Diagram of Test Setup



1.5. Test Summary

Test Items	Test Mode	Status
Power Line Conducted Emission Test (150KHz To 30MHz)	/	N
Radiated Emission Test(30MHz To 1000MHz)	Mode 1	P
Electrostatic Discharge immunity Test	Mode 1	P
RF Field Strength susceptibility Test	Mode 1	P
Electrical Fast Transient/Burst Immunity Test	/	N
Surge Immunity Test	/	N
Injected Currents Susceptibility Test	/	N
Magnetic Field Susceptibility Test	/	N
Voltage Dips and Interruptions Test	/	N
P) Indicates “PASS”. N) Indicates “Not applicable”.		

1.6. Test Equipment List

Radiated Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Oct. 22, 2021	1 Year
2.	Pre-amplifier	Schwarzbeck	BBV-9745	9745-075	Oct. 22, 2021	1 Year
3.	Bilog Broadband Antenna	SCHWARZBECK	VULB 9163	01109	Oct. 22, 2021	2 Year
4.	Software Name EZ-EMC	Ferrari Technology	EMEC-3A1	N/A	N/A	N/A

Electrostatic Discharge Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	ESD Simulators	emtest	ESD NX30.1	11936	Mar. 25, 2022	1 Year

R/S Immunity Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Signal Generator	Agilent	N5182A	MY48180656	Oct. 22, 2021	1 Year
2.	Amplifier	Micotoop	MPA-80-1000-250	MPA1903096	Oct. 22, 2021	1 Year
3.	Amplifier	Micotoop	MPA-1000-6000-100	MPA1903122	Oct. 22, 2021	1 Year
4.	Log-Periodic Antenna	Schwarzbeck	VULP9118E	00992	N/A	N/A
5.	Horn Antenna	Instruments corporation	GTH-0118	351600	Oct. 22, 2021	2 Year
6.	Power Sensor	Agilent	E9301A	MY41498906	Oct. 22, 2021	1 Year
7.	Power Sensor	Agilent	E9301A	MY41498088	Oct. 22, 2021	1 Year
8.	Power Meter	Agilent	E4419B	GB40202909	Oct. 22, 2021	1 Year
9.	Electric field Probe	Narda	EP 601	811ZX10351	Oct. 22, 2021	1 Year
10.	RS Test software	EMtrace	EM 3	V1.1.7	N/A	N/A

1.7. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 184111

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111.

ISED-Registration No.: 8058A

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A.

Test Location

Shenzhen Anbotek Compliance Laboratory Limited.
1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518128

1.8. EMS Performance Criteria

√ A: Normal performance within the specification limits
√ B: Temporary degradation or loss of function or performance which is self-recoverable
√ C: Temporary degradation or loss of function or performance which requires operator intervention or system reset
√ D: Degradation or loss of function which is not recoverable due to damage of equipment (components) or software, or loss of data

Note: The manufacturer's specification may define effects on the EUT which may be considered insignificant, and therefore acceptable.

This classification may be used as a guide in formulating performance criteria, by committees responsible for generic, product and product-family standards, or as a framework for the agreement on performance criteria between the manufacturer and the purchaser, for example where no suitable generic, product or product-family standard exists.

2. Radiated Emission Test

2.1. Test Standard and Limit

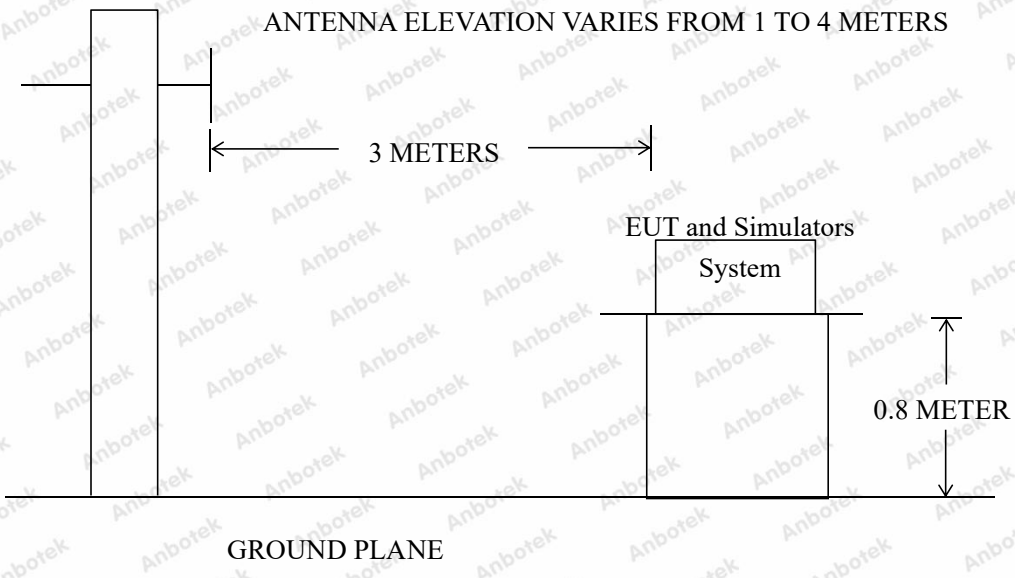
Test Standard	EN IEC 61000-6-3

Radiated Emission Test Limit

Test Limit	Frequency (MHz)	DISTANCE (Meters)	FIELD STRENGTHS LIMIT (dBμV/m)
	30 ~ 230	3	40
	230 ~ 1000	3	47

Remark: (1) The smaller limit shall apply at the combination point between two frequency bands.
(2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the EUT.

2.2. Test Setup



2.3. EUT Configuration on Measurement

The EN IEC 61000-6-3 regulations test method must be used to find the maximum emission during radiated emission measurement.

2.4. Operating Condition of EUT

2.4.1. Setup the EUT as shown in Section 2.2.

2.4.2. Turn on the power of all equipments.

2.4.3. Let the EUT work in test mode and measure it.

2.5. Test Procedure

The EUT is placed on a turn table which is 0.8 meter high above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Bilog antenna is used as a receiving antenna. Both horizontal and vertical polarization of the antenna are set on test.

The bandwidth of the Receiver (ESCI) is set at 120kHz.

The EUT is tested in 9*6*6 Chamber.

The test results are listed in Section 2.6.

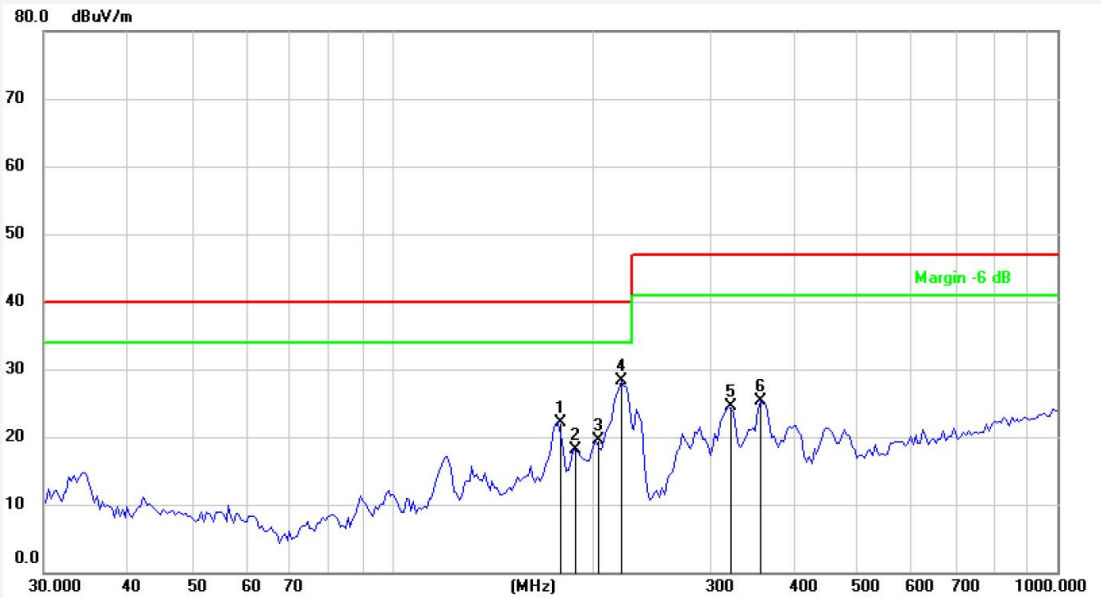
2.6. Test Results

PASS

The frequency range from 30MHz to 1000MHz is investigated.

The test curves are shown in the following pages.

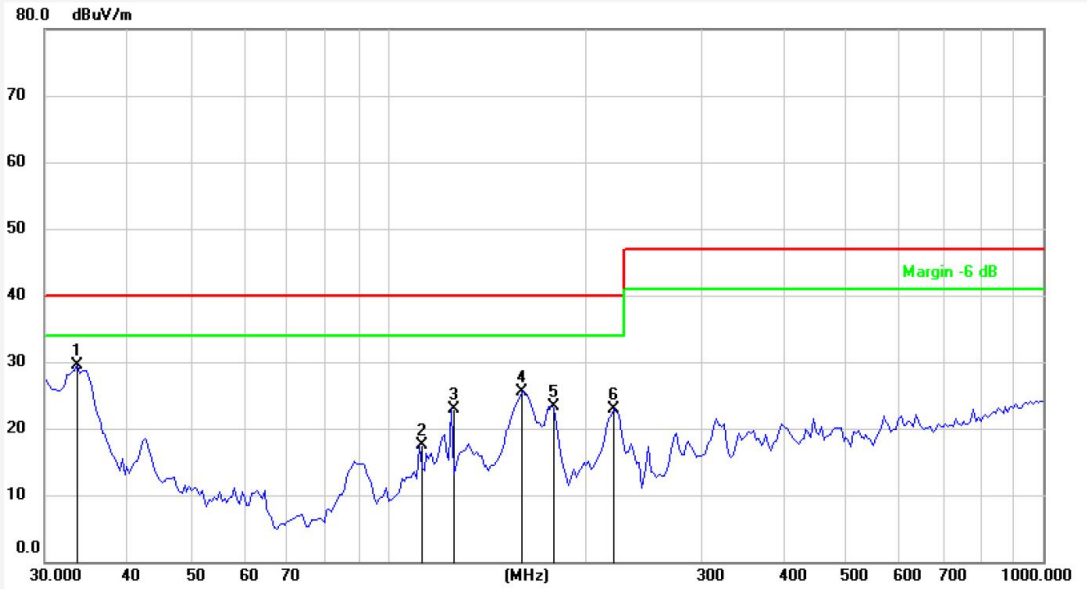
Test item:	**Radiation Test**	**Polarization:**	**Horizontal**
Standard:	**(RE)EN IEC 61000-6-3**	**Power Source:**	**DC 51.2V**
Distance:	**3m**	**Temp.(℃)/Hum.(%RH):**	**23.3(℃)/52%RH**



No.	Freq. (MHz)	Reading (dBuV)	Factor ()	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	177.8207	41.50	-19.48	22.02	40.00	-17.98	QP			
2	189.0743	36.99	-18.82	18.17	40.00	-21.83	QP			
3	202.8104	37.49	-18.06	19.43	40.00	-20.57	QP			
4	221.3921	45.48	-17.27	28.21	40.00	-11.79	QP			
5	319.9370	38.86	-14.36	24.50	47.00	-22.50	QP			
6	358.5568	38.72	-13.41	25.31	47.00	-21.69	QP			

Note: **Result=Reading+Factor Over Limit=Result-Limit**

Test item:	**Radiation Test**	**Polarization:**	**Vertical**
Standard:	**(RE)EN IEC 61000-6-3**	**Power Source:**	**DC 51.2V**
Distance:	**3m**	**Temp.(℃)/Hum.(%RH):**	**23.3(℃)/52%RH**



No.	Freq. (MHz)	Reading (dBuV)	Factor ()	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	33.6213	47.50	-18.05	29.45	40.00	-10.55	QP			
2	111.7380	35.91	-18.47	17.44	40.00	-22.56	QP			
3	125.2260	43.03	-20.21	22.82	40.00	-17.18	QP			
4	160.0648	46.06	-20.53	25.53	40.00	-14.47	QP			
5	177.8207	42.86	-19.48	23.38	40.00	-16.62	QP			
6	221.3921	40.11	-17.27	22.84	40.00	-17.16	QP			

Note: **Result=Reading+Factor Over Limit=Result-Limit**

3. Electrostatic Discharge Immunity Test

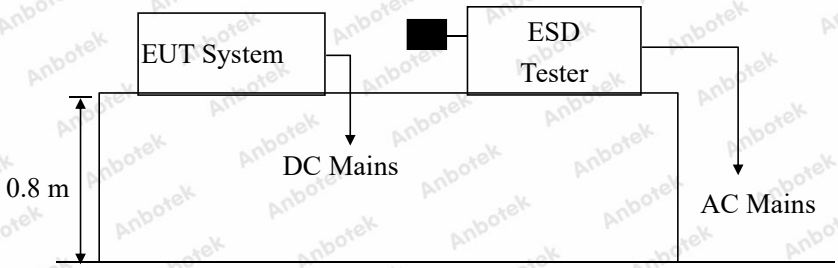
3.1. Test Standard and Level

Test Standard:	EN IEC 61000-6-1 (IEC 61000-4-2)
Performance Criterion:	B
Severity Level: 4 / Air Discharge: ±8kV, Level: 2 / Contact Discharge: ±4kV	

Test Level

Level	Test Voltage Contact Discharge (kV)	Test Voltage Air Discharge (kV)
1.	±2	±2
2.	±4	±4
3.	±6	±8
4.	±8	±15
X.	Special	Special

3.2. Test Setup



3.3. EUT Configuration on Measurement

The following equipments are installed on electrostatic discharge immunity measurement to meet EN IEC 61000-6-1 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

3.4. Operating Condition of EUT

3.4.1. Setup the EUT as shown on Section 3.2.

3.4.2. Turn on the power of all equipments.

3.4.3. After that, let the EUT work in test mode measure it.

3.5. Test Procedure

3.5.1. Air Discharge:

This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed

3.5.2. Contact Discharge:

All the procedure shall be same as Section 3.5.1. except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

3.5.3. Indirect discharge for horizontal coupling plane

At least 20 single discharges shall be applied to the horizontal coupling plane, at points on each side of the EUT. The discharge electrode positions vertically at a distance of 0.1m from the EUT and with the discharge electrode touching the coupling plane.

3.5.4. Indirect discharge for vertical coupling plane

At least 20 single discharge shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m × 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

3.6. Test Results

PASS

Please refer to the following page.

Electrostatic Discharge Test Results

Air discharge :	±8.0kV	Temperature :	24.2℃
Contact discharge :	±4.0kV	Humidity :	47%
Power Supply :	DC 51.2V	Expert conclusion :	A
Number of discharge :	10	Test Result:	☒ Pass ☐ Fail

Location		Kind A-Air Discharge C-Contact Discharge	Result
Slot	4 points	A	☑A ☐B ☐C ☐D
Screen	4 points	A	☑A ☐B ☐C ☐D
Light	4 points	A	☑A ☐B ☐C ☐D
Metal	4 points	C	☑A ☐B ☐C ☐D
Screw	4 points	C	☑A ☐B ☐C ☐D
HCP	4 points	C	☑A ☐B ☐C ☐D
VCP of the front	4 points	C	☑A ☐B ☐C ☐D
VCP of the rear	4 points	C	☑A ☐B ☐C ☐D
VCP of the left	4 points	C	☑A ☐B ☐C ☐D
VCP of the right	4 points	C	☑A ☐B ☐C ☐D

Remark: Discharge should be considered on Contact and Air and Horizontal Coupling Plane (HCP) and Vertical Coupling Plane (VCP).

4. RF Field Strength Susceptibility Test

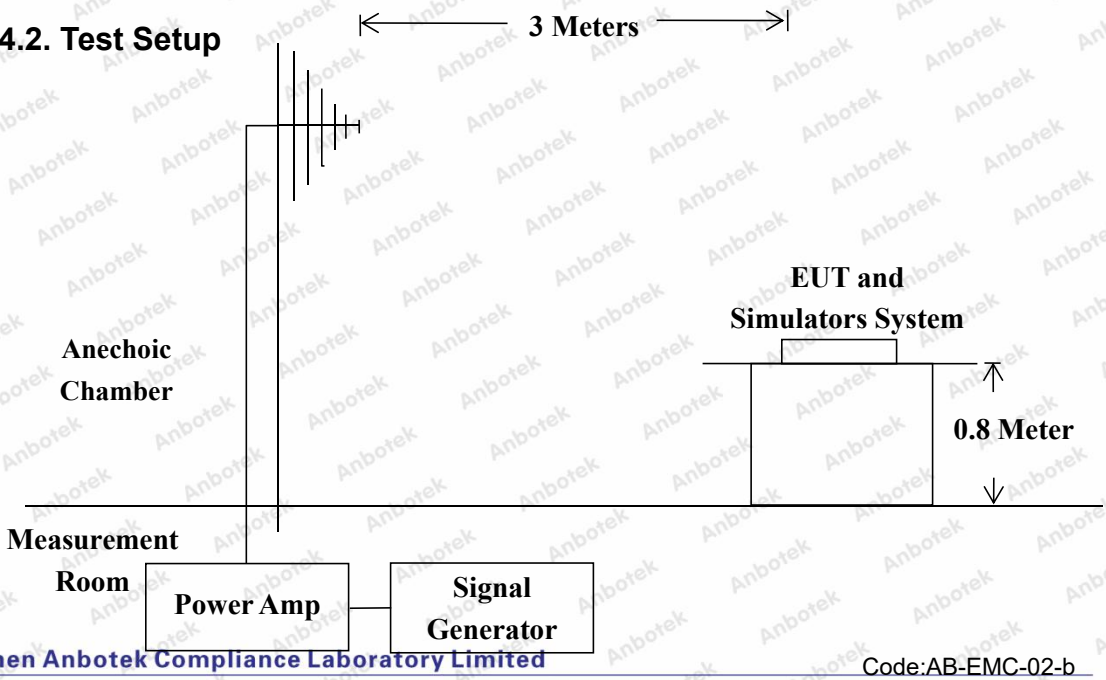
4.1. Test Standard and Level

Test Standard:	EN IEC 61000-6-1 (IEC 61000-4-3)
Required Performance:	A
Frequency Range:	80MHz to 1000MHz/ 1.4GHz to 6.0GHz
Field Strength:	3 V/m, 3V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	3 m
Antenna Height:	1.5 m
Dwell Time:	at least 0.5s

Test Level

Level	Field Strength V/m
1.	1
2.	3
3.	10
X.	Special

4.2. Test Setup



4.3. EUT Configuration on Measurement

The following equipments are installed on RF Field Strength susceptibility Measurement to meet EN IEC 61000-6-1 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

4.4. Operating Condition of EUT

4.4.1. Setup the EUT as shown on Section 4.2.

4.4.2. Turn on the power of all equipments.

4.4.3. After that, let the EUT work in test mode measure it.

4.5. Test Procedure

The EUT and support equipment, which are placed on a table that is 0.8 meter above ground and the testing was performed in a fully-anechoic chamber. The testing distance from antenna to the EUT was 3 meters.

1) 80 MHz to 1000 MHz the field strength level was 3V/m, 1.4 GHz to 6.0 GHz the field strength level was 3V/m.
2) The frequency range is swept from 80 MHz to 1000 MHz, 1.4 GHz to 6.0 GHz with the signal 80% amplitude modulated with a 1kHz sine wave.
3) The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond, but shall in no case be less than 0.5s.
4) The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

4.6. Measuring Results

PASS

Please refer to the following page.

RF Field Strength Susceptibility Test Results

Field Strength :	3 V/m, 3 V/m	Temperature :	24.6℃
Expert conclusion :	A	Humidity :	49%
Power Supply :	DC 51.2V	Test Result :	☒ Pass ☐ Fail
Dwell Time:	1s		

Frequency Range	Antenna Polarity	R.F. Field Strength	Azimuth	Result
80MHz~1000MHz	H / V	3 V/m (rms)	Front	☑ A ☐ B ☐ C ☐ D
			Rear	
			Left	
			Right	
1.4GHz~6.0GHz	H / V	3 V/m (rms)	Front	☑ A ☐ B ☐ C ☐ D
			Rear	
			Left	
			Right	

APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Radiated Emission Test

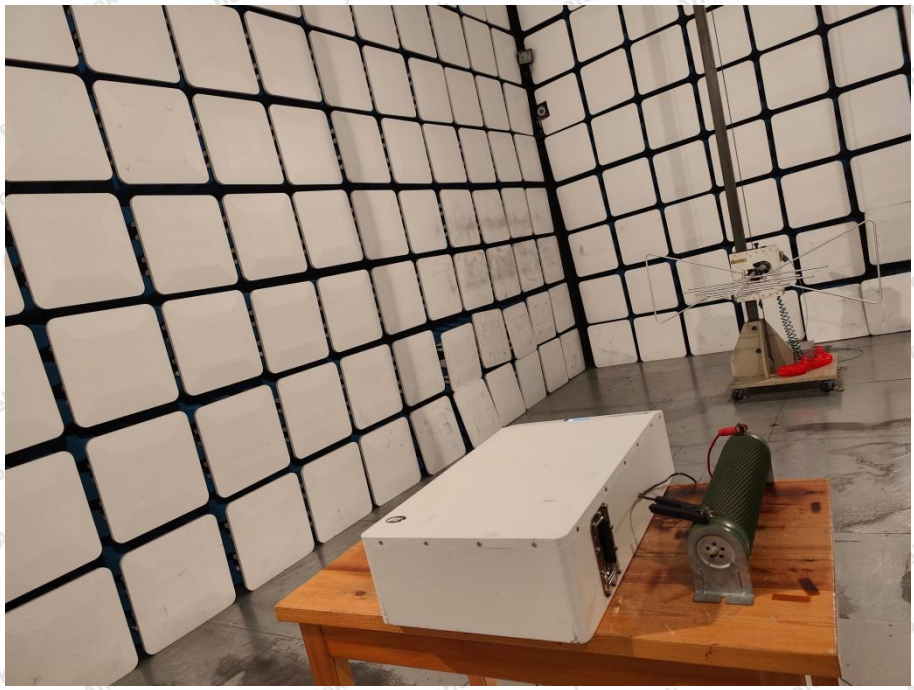


Photo of Electrostatic Discharge Immunity Test

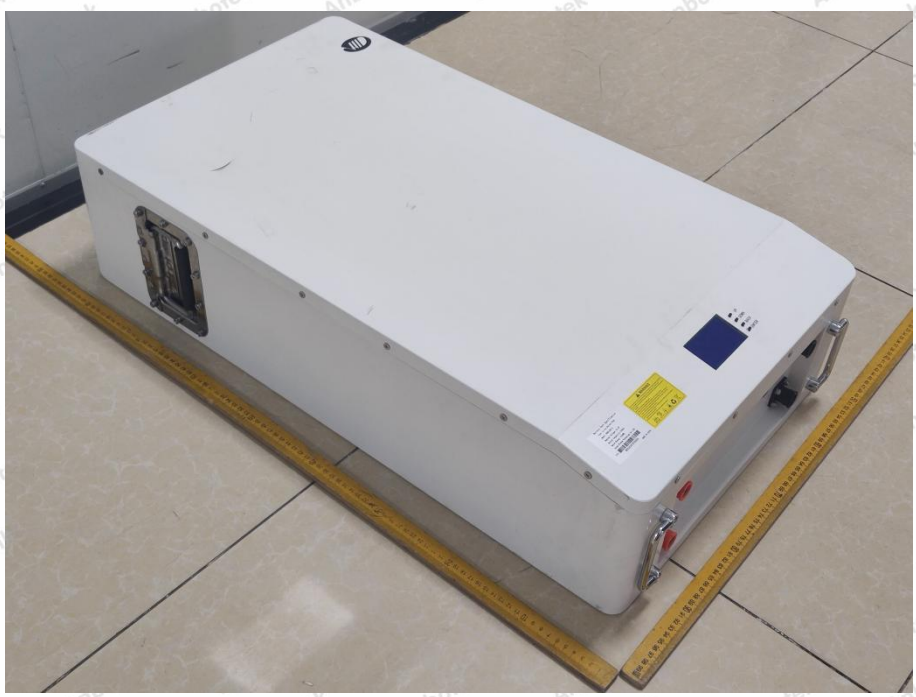


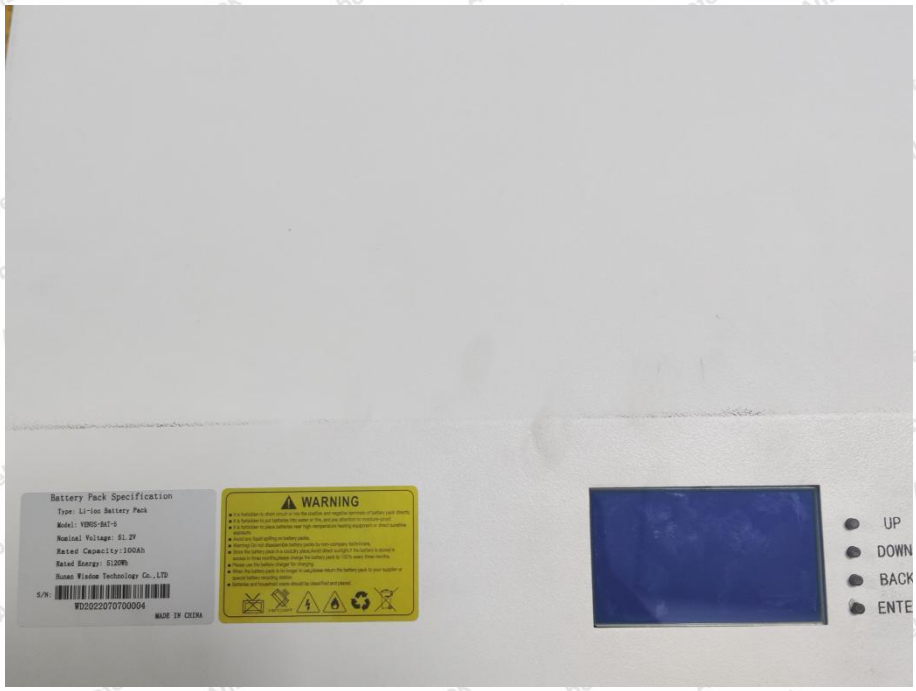
Photo of RF Field Strength susceptibility Test



APPENDIX II -- Photo documentation






Battery Pack Specification
Type: Li-ion Battery Pack
Model: WDNS-BAT-S
Nominal Voltage: 51.2V
Rated Capacity:100Ah
Rated Energy: 5120Wh
Hunan Wisdom Technology Co.,LTD
S/N:
WD2022070700004
MADE IN CHINA
WARNING
UP
DOWN
BACK
ENTE

CE Label

1. The CE conformity marking must consist of the initials ‘CE’ taking the following form:
   If the CE marking is reduced or enlarged, the proportions given in the above graduated drawing must be respected.
2. The CE marking must have a height of at least 5 mm except where this is not possible on account of the nature of the apparatus.
3. The CE marking must be affixed to the product or to its data plate. Additionally it must be affixed to the packaging, if any, and to the accompanying documents.
4. The CE marking must be affixed visibly, legibly and indelibly.
   It must have the same height as the initials ‘CE’.

---------- End of Report ----------