EMC Test Report

China

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Applicant: Jiangsu SolarEast Energy Storage Technology Co., Ltd.

Product: Rechargeable Li-ion Battery System

Model: Refer to page 3

In accordance with EN 301 489-1, EN 301 489-17

Prepared for: Jiangsu SolarEast Energy Storage Technology Co., Ltd.
No. 199, Yingzhou South Road, Haizhou District, 222243 Lianyungang City, Jiangsu Province, PEOPLE'S REPUBLIC OF CHINA.

COMMERCIAL-IN-CONFIDENCE

Report Number: 4861923320500B

RESPONSIBLE FOR	NAME	SIGNATURE	DATE
Approved By	Dingpeng Xia	Dingpeng Xia	2023.12.20
Prepared By	Jin Cai	Jin Cai	2023.12.20

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

EXECUTIVE SUMMARY
A sample of this product was tested and found to be compliant with EN 301 489-1 V2.2.3:2019 and Draft EN 301 489-17 V3.2.6:2023.

TÜV SÜD Certification and Testing (China) Co., Ltd.

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1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	2023.12.20

1.2 Introduction

The information contained in this report is intended to show verification of the EMC Qualification Approval Testing of the requirements of the standards for the tests listed in Section 1.3.

Applicant	Jiangsu SolarEast Energy Storage Technology Co., Ltd.
address	No. 199, Yingzhou South Road, Haizhou District, 222243 Lianyungang City, Jiangsu Province, PEOPLE'S REPUBLIC OF CHINA
Manufacturer	Jiangsu SolarEast Energy Storage Technology Co., Ltd.
address	No. 199, Yingzhou South Road, Haizhou District, 222243 Lianyungang City, Jiangsu Province, PEOPLE'S REPUBLIC OF CHINA
Model Number(s)	PowerCool-LFP-HV-10, PowerCool-LFP-HV-15, PowerCool-LFP-HV-20, PowerCool-LFP-HV-25, PowerCool-LFP-HV-30, PowerCool-LFP-HV-35
Nominal voltage	PowerCool-LFP-HV-10: DC 102.4V, PowerCool-LFP-HV-15: DC 153.6V, PowerCool-LFP-HV-20: DC 204.8V, PowerCool-LFP-HV-25: DC 256.0V, PowerCool-LFP-HV-30: DC 307.2V, PowerCool-LFP-HV-35: DC 358.4V,
Rated capacity	102Ah
Sample(s) Tested	PowerCool-LFP-HV-10
Test Specification	EN 301 489-1 V2.2.3:2019, Draft EN 301 489-17 V3.2.6:2023
Date of Receipt of EUT	2023.09.21
Start of Test	2023.09.21
Finish of Test	2023.09.25
Name of Engineer(s)	Jin Cai

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with ETSI EN 301 489-1, and ETSI EN 301 489-17 is shown below.

Section	Specification	Clause	Test Description	Result	Comments/Base Standard
DC Powered, power on					
2.1	EN 301 489-1 V2.2.3:2019	8.2	Emission - Enclosure Port	PASS	EN 55032
2.2	EN 301 489-1 V2.2.3:2019	8.4	Conducted Emissions	PASS	EN 55032
--	EN 301 489-1 V2.2.3:2019	8.5	Emission - Harmonic current emissions	N/A	The Standards were not applicable
--	EN 301 489-1 V2.2.3:2019	8.6	Emission - Voltage fluctuations and flicker	N/A	The Standards were not applicable
2.3	EN 301 489-1 V2.2.3:2019	9.2	Immunity - Enclosure ports - Radio-frequency electromagnetic field. Amplitude modulated	PASS	EN 61000-4-3
2.4	EN 301 489-1 V2.2.3:2019	9.3	Immunity - Enclosure Port - Electrostatic Discharge	PASS	EN 61000-4-2
2.5	EN 301 489-1 V2.2.3:2019	9.5	Immunity - Radio-frequency common mode	PASS	EN 61000-4-6
--	EN 301 489-1 V2.2.3:2019	9.8	Immunity - Surges	PASS	The Standards were not applicable
2.6	EN 301 489-1 V2.2.3:2019	9.4	Immunity - Fast transients	PASS	EN 61000-4-4
--	EN 301 489-1 V2.2.3:2019	9.7	Immunity to Voltage dips and interruptions	PASS	The Standards were not applicable

1.4 Product Information

1.4.1 Technical Description

The Equipment Under Test (EUT) was Rechargeable Li-ion Battery System.

The Battery system consists of one controller box and several same battery modules, Given the complexity of the equipment, according to User manual, all models have similar electric structure and different nominal voltage, Base on the analysis and evaluation for the electrical structure of the Rechargeable Li-ion Battery System, only model PowerCool-LFP-HV-10 was valuated.

1.4.2 EUT Port/Cable Identification

Port	Max Cable Length specified	Usage	Type	Screened
DC Power line	--	DC Power line	--	No
signal line	<3m	--	--	--

1.4.3 Test Configuration

Configuration	Description
1	charging mode: normal working with DC power supply, Keep EUT monitoring and data running continual, by notebook software.
2	discharge mode: Power on for load, Keep EUT monitoring and data running continual, by notebook software

1.4.4 Modes of Operation

Mode	Description
1	The EUT: Power on (Wi-Fi connecting), charging,
2	The EUT: Power on (Wi-Fi connecting), discharge

1.4.5 Monitoring of Performance

The EUT works normally. Keep EUT monitoring and data running continual,

1.4.6 Performance Criteria

Functional tests before, during and after the immunity tests were performed in order to verify compliance with the Performance criterion in section 6 of ETSI EN 301 489-17 and section 7 of EN 55024

Performance criteria A

During immunity tests, the test object shall operate as intended with no loss of function, and no unintentional transmissions.

After each test case the test object shall operate as intended, with no loss of function, no degradation of performance, no loss of stored data or user programmable functions.

Performance criteria B

During immunity tests, the test object may be loss of function (one or more) and degradation of performance, with no unintentional transmissions.

After each test case the test object shall operate as intended, lost function(s) shall be self-recoverable, with no degradation of performance, no loss of stored data or user programmable functions.

Performance criteria C

During immunity tests, the test object may be loss of function (one or more).

After each test case the test object functions shall be recoverable by the operator and shall operate as intended after recovering, no degradation of performance

1.5 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.6 Test Location

TÜV SÜD Certification and Testing (China) Co., Ltd.

Address: Floor 1-4, Building B, No.37, Tuanjie Road(Middle), Xishan Economic and Technological Development Zone, Wuxi, Jiangsu, China.

Test Name	Name of Engineer(s)
DC Powered, power on	
Emission - Enclosure port	Tianshuo Yuan
Emission - Conducted Emissions	Tianshuo Yuan
Immunity - Enclosure ports - Radio-frequency electromagnetic field. Amplitude modulated	Tianshuo Yuan
Immunity - Enclosure ports - Electrostatic Discharge	Tianshuo Yuan
Immunity - Radio-frequency common mode	Tianshuo Yuan
Immunity - Fast transients	Tianshuo Yuan

2 Test Details

2.1 Emission - Enclosure port

2.1.1 Specification Reference

Refer to Clause 1.3

2.1.2 Equipment Under Test

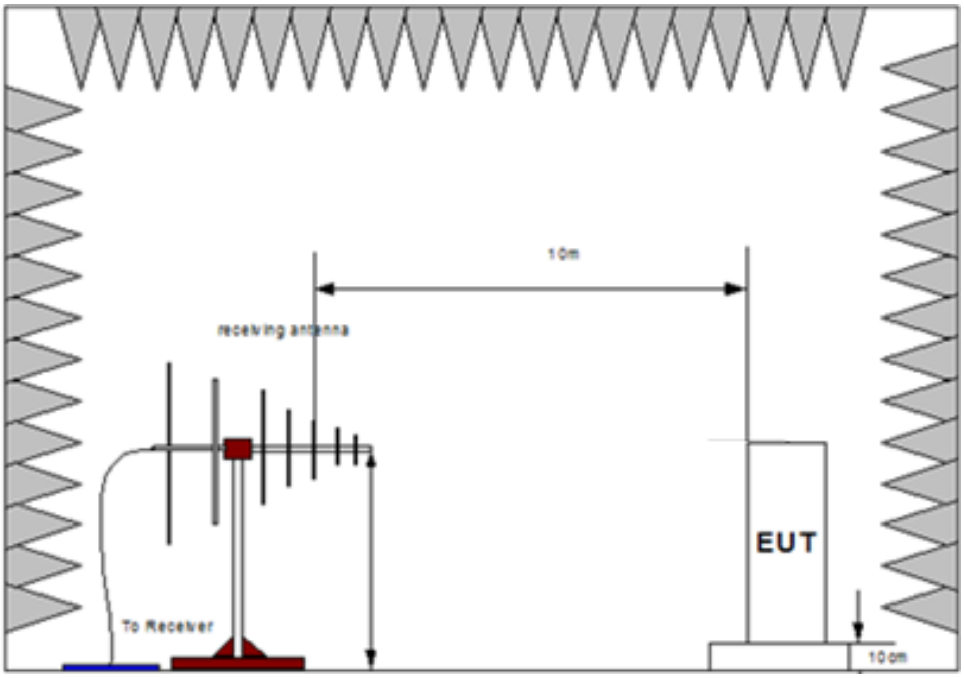
PowerCool-LFP-HV-10

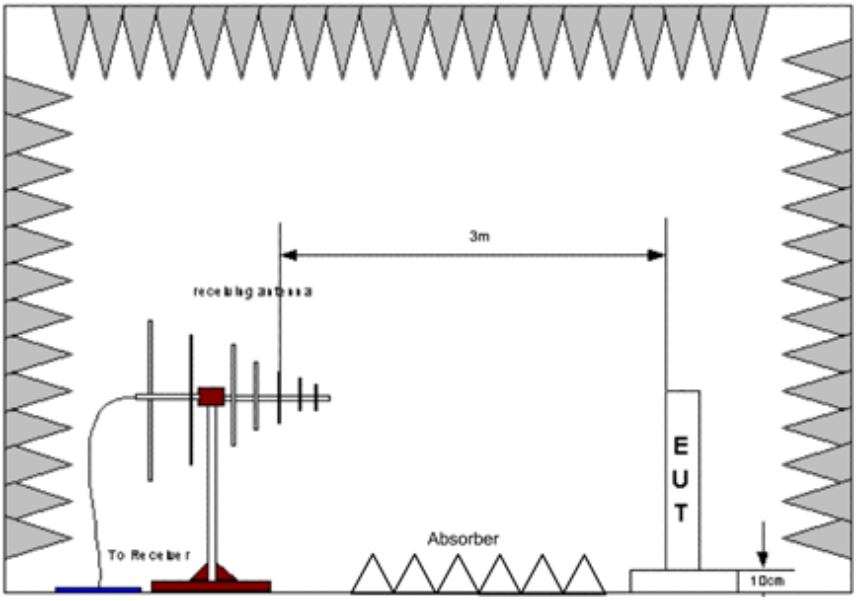
2.1.3 Date of Test

2023.09.21

2.1.4 Test Method

The EUT was set up in a semi-anechoic chamber on a remotely controlled turntable and placed on a non-conductive support 0.1 m above a reference ground plane.
A prescan of the EUT emissions profile was made while varying the antenna-to-EUT azimuth and antenna-to-EUT polarization using a peak detector; measurements were taken at a 10m and 3m distance. Using the prescan list of the highest emissions detected, their bearing and associated antenna polarization, the EUT was then formally measured using Quasi-Peak and Average detectors, as appropriate. The readings were maximized by adjusting the antenna height, polarization and turntable azimuth, in accordance with the specification.





2.1.5 Environmental Conditions

Ambient Temperature	24°C
Relative Humidity	51%
Atmospheric Pressure	1010.3 mbar

2.1.6 Specification Limits

Port	Frequency range	Limits	Remarks
Enclosure Test facility: OATS or SAC	30 MHz to 230 MHz 230 MHz to 1000 MHz	30 dB(μV/m) quasi-peak at 10 m 37 dB(μV/m) quasi-peak at 10 m	May be measured at 3 m distance using the limits increased by 10 dB.
Enclosure Test facility: OATS, SAC or FAR	1 GHz to 3 GHz	70 dB(μV/m) peak at 3 m 50 dB(μV/m) average at 3 m	May be measured at greater distance with the limits decreased by 20 dB/decade (relative to distance)
	3 GHz to 6 GHz	74 dB(μV/m) peak at 3 m 54 dB(μV/m) average at 3 m	

NOTE:
For apparatus containing devices operating at frequencies less than 9 kHz measurements only need to be performed up to 230 MHz.

If the highest internal frequency of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz.
If the highest internal frequency of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz.
If the highest internal frequency of the EUT is between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz.
If the highest internal frequency of the EUT is above 1 GHz, the measurement shall be made up to 6 GHz.

Where the highest internal frequency if not known, tests shall be performed up to 6 GHz.

At transitional frequencies the lower limit applies.

2.1.7 Test Results

Results for Configuration and Mode: Configuration 1, 2, Mode 1, 2**.**

Performance assessment of the EUT made during this test: Pass.

Detailed results are shown below:

30-1000MHz Radiated Emission Test

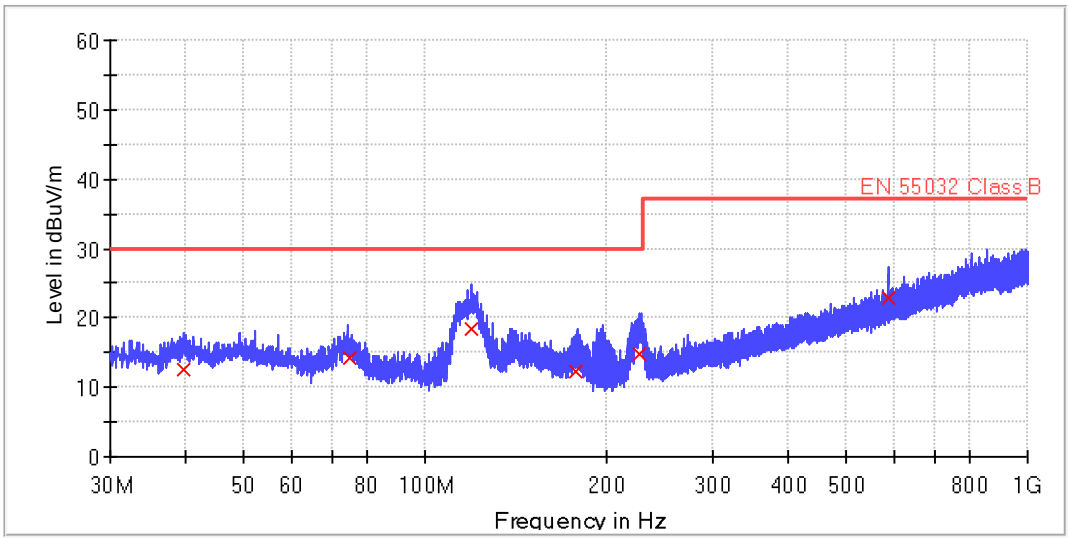
Common Information

EUT:	Rechargeable Li-ion Battery System
Model:	PowerCool-LFP-HV-10
Client:	Jiangsu SolarEast Energy Storage Technology Co.,Ltd
Operating Conditions:	Configuration 1, Mode 1
Operator Name:	Tianshuo Yuan
Test Standard:	EN 55032 Class B
Comment:	Horizontal
Comment:	Temp.:24℃,Humi.:51%,Atm.:1010.3hPa

Scan Setup:

Hardware Setup:	Radiated E Field 30MHz-1GHz_10m
Receiver:	[ESW 8]
Level Unit:	dBuV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 1 GHz	40 kHz	PK+	120 kHz	0.001 s	0 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Height (cm)	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
39.800000	12.6	1000.0	400.0	120.0	-11.3	17.4	30.0
74.840000	14.4	1000.0	400.0	11.0	-13.7	15.7	30.0
119.160000	18.3	1000.0	400.0	183.0	-13.5	11.7	30.0
177.840000	12.4	1000.0	400.0	338.0	-12.8	17.6	30.0
226.760000	14.7	1000.0	400.0	55.0	-13.0	15.3	30.0
585.600000	22.9	1000.0	400.0	323.0	-3.3	14.2	37.0

30-1000MHz Radiated Emission Test

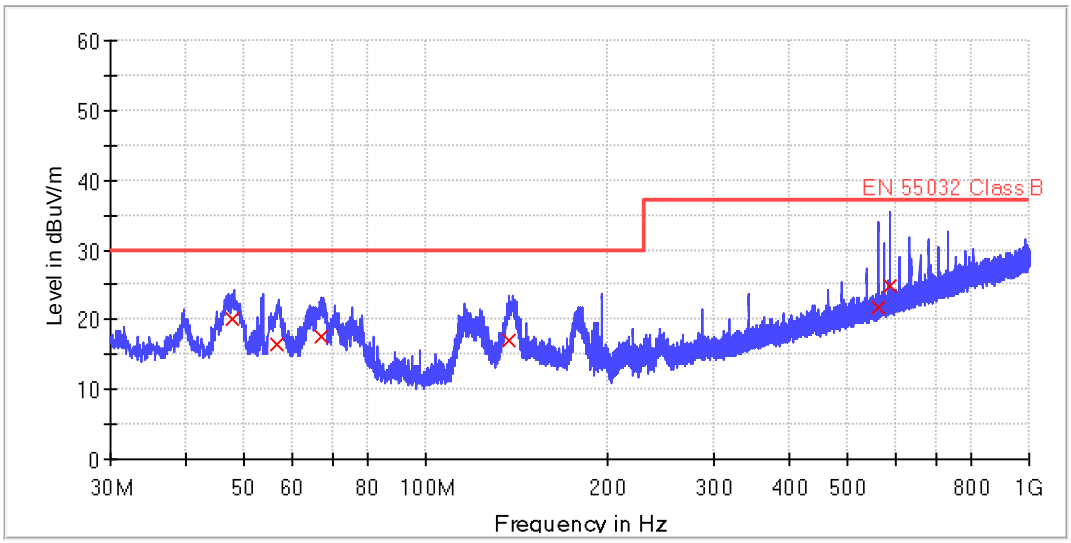
Common Information

EUT:	Rechargeable Li-ion Battery System
Model:	PowerCool-LFP-HV-10
Client:	Jiangsu SolarEast Energy Storage Technology Co.,Ltd
Operating Conditions:	Configuration 1, Mode 1
Operator Name:	Tianshuo Yuan
Test Standard:	EN 55032 Class B
Comment:	Vertical
Comment:	Temp.:24℃,Humi.:51%,Atm.:1010.3hPa

Scan Setup:

Hardware Setup:	Radiated E Field 30MHz-1GHz_10m
Receiver:	[ESW 8]
Level Unit:	dBuV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 1 GHz	40 kHz	PK+	120 kHz	0.001 s	0 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Height (cm)	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
47.840000	20.0	1000.0	100.0	295.0	-10.8	10.0	30.0
56.720000	16.4	1000.0	100.0	54.0	-12.0	13.6	30.0
67.160000	17.5	1000.0	100.0	22.0	-12.9	12.5	30.0
137.280000	17.2	1000.0	100.0	254.0	-11.7	12.8	30.0
561.520000	21.9	1000.0	100.0	20.0	-3.7	15.2	37.0
585.880000	24.9	1000.0	100.0	319.0	-3.3	12.1	37.0

30-1000MHz Radiated Emission Test

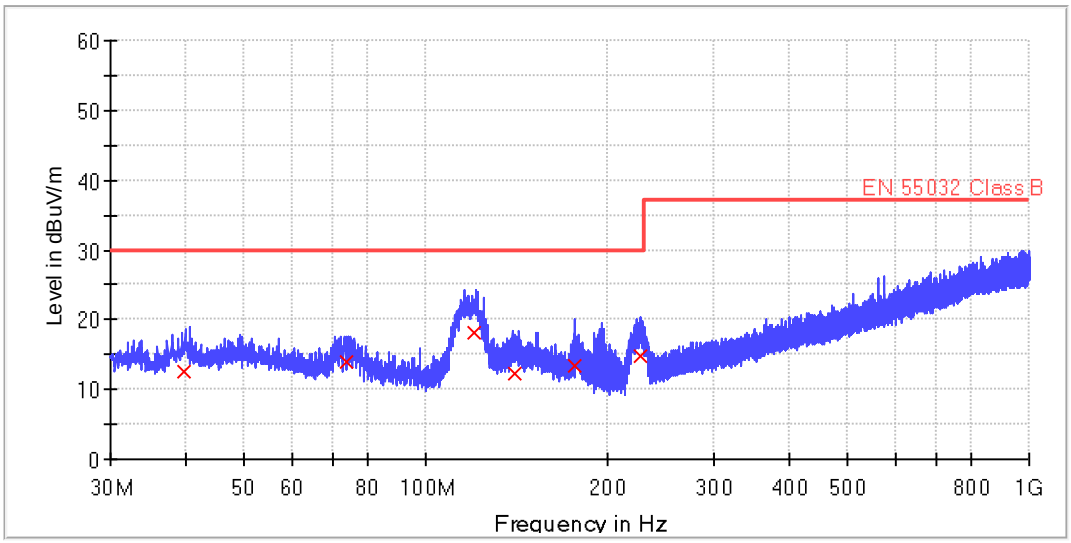
Common Information

EUT:	Rechargeable Li-ion Battery System
Model:	PowerCool-LFP-HV-10
Client:	Jiangsu SolarEast Energy Storage Technology Co.,Ltd
Operating Conditions:	Configuration 2, Mode 2
Operator Name:	Tianshuo Yuan
Test Standard:	EN 55032 Class B
Comment:	Horizontal
Comment:	Temp.:24℃,Humi.:51%,Atm.:1010.3hPa

Scan Setup:

Hardware Setup:	Radiated E Field 30MHz-1GHz_10m
Receiver:	[ESW 8]
Level Unit:	dBuV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 1 GHz	40 kHz	PK+	120 kHz	0.001 s	0 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Height (cm)	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
39.720000	12.5	1000.0	400.0	84.0	-11.3	17.5	30.0
73.840000	14.1	1000.0	400.0	305.0	-13.6	15.9	30.0
119.760000	18.3	1000.0	400.0	227.0	-13.4	11.8	30.0
140.400000	12.2	1000.0	400.0	211.0	-11.4	17.8	30.0
176.680000	13.4	1000.0	400.0	127.0	-12.7	16.6	30.0
226.400000	14.7	1000.0	400.0	234.0	-13.0	15.3	30.0

30-1000MHz Radiated Emission Test

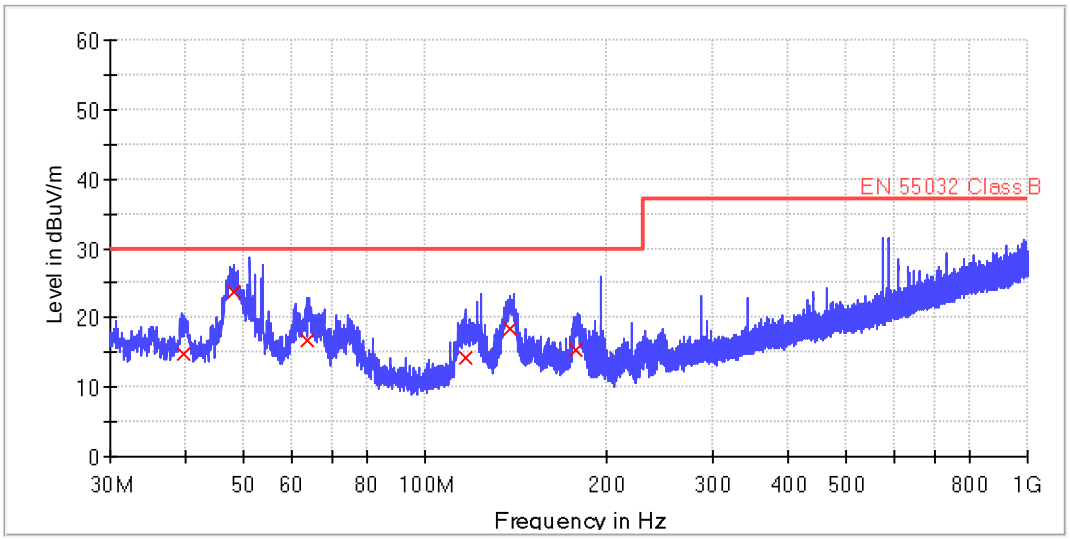
Common Information

EUT:	Rechargeable Li-ion Battery System
Model:	PowerCool-LFP-HV-10
Client:	Jiangsu SolarEast Energy Storage Technology Co.,Ltd
Operating Conditions:	Configuration 2, Mode 2
Operator Name:	Tianshuo Yuan
Test Standard:	EN 55032 Class B
Comment:	Vertical
Comment:	Temp.:24℃,Humi.:51%,Atm.:1010.3hPa

Scan Setup:

Hardware Setup:	Radiated E Field 30MHz-1GHz_10m
Receiver:	[ESW 8]
Level Unit:	dBuV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 1 GHz	40 kHz	PK+	120 kHz	0.001 s	0 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Height (cm)	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
39.720000	14.9	1000.0	100.0	82.0	-11.3	15.1	30.0
48.080000	23.8	1000.0	100.0	68.0	-10.8	6.2	30.0
63.680000	16.9	1000.0	100.0	190.0	-12.7	13.1	30.0
116.440000	14.3	1000.0	100.0	323.0	-13.7	15.7	30.0
138.720000	18.4	1000.0	100.0	190.0	-11.6	11.6	30.0
178.000000	15.3	1000.0	100.0	301.0	-12.8	14.7	30.0

1-6G Radiated Emission Test

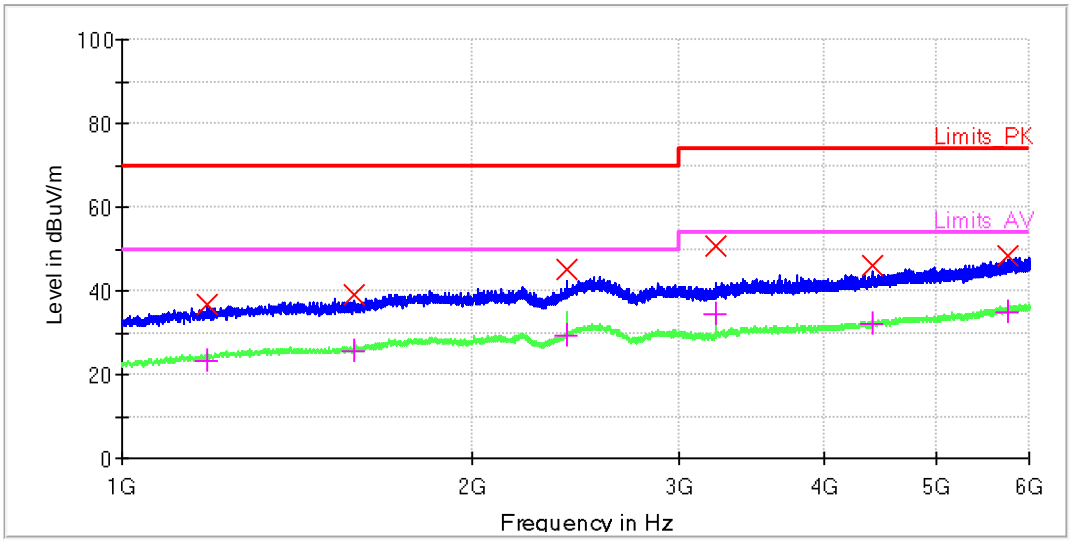
Common Information

EUT:	Rechargeable Li-ion Battery System
Model:	PowerCool-LFP-HV-10
Client:	Jiangsu SolarEast Energy Storage Technology Co.,Ltd
Operating Conditions:	Configuration 1, Mode 1
Operator Name:	Tianshuo Yuan
Test Standard:	EN 55032 Class B
Comment:	Horizontal

Sweep Setup:

Hardware Setup:	Radiated E Field 1GHz-6GHz_3m
Receiver:	[ESR 7]
Level Unit:	dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
1 GHz - 6 GHz	416.667 kHz	PK+ ; AVG	1 MHz	1 s	0 dB



Limit and Margin

Frequency (MHz)	MaxPeak (dBuV/m)	CAverage (dBuV/m)	Meas. Time (ms)	Height (cm)	Azimuth (deg)	Margin - PK+ (dB)	Limit - PK+ (dBuV/m)	Margin - CAV (dB)	Limit - CAV (dBuV/m)
1182.800000	36.7	23.4	1000.0	100.0	112.0	33.3	70.0	26.6	50.0
1583.600000	39.3	25.5	1000.0	100.0	309.0	30.8	70.0	24.5	50.0
2410.800000	45.0	29.1	1000.0	100.0	214.0	25.0	70.0	20.9	50.0
3229.200000	50.5	34.5	1000.0	100.0	179.0	23.5	74.0	19.5	54.0
4404.000000	46.0	31.9	1000.0	100.0	325.0	28.0	74.0	22.1	54.0
5748.400000	48.2	34.9	1000.0	100.0	218.0	25.8	74.0	19.1	54.0

1-6G Radiated Emission Test

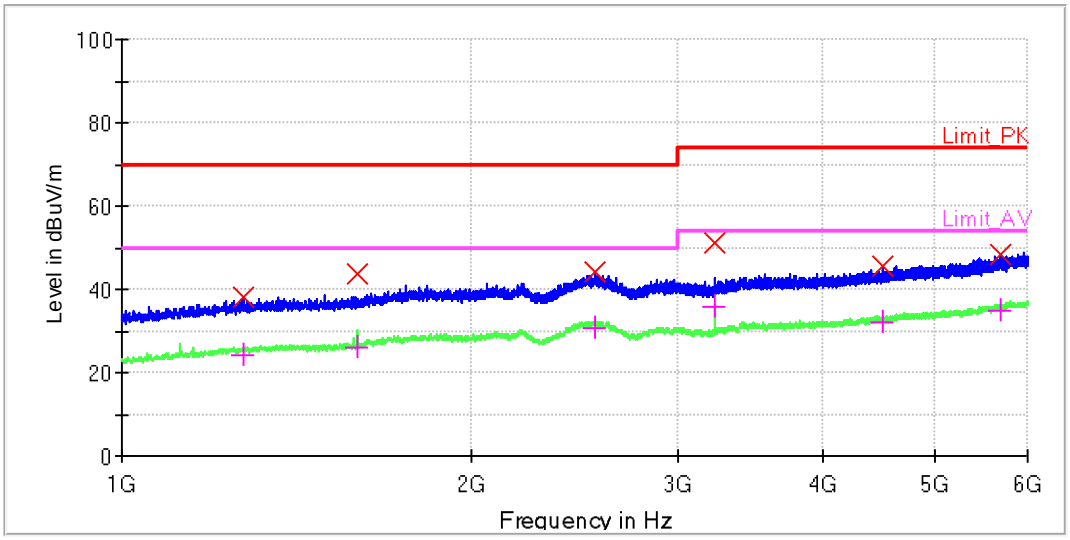
Common Information

EUT:	Rechargeable Li-ion Battery System
Model:	PowerCool-LFP-HV-10
Client:	Jiangsu SolarEast Energy Storage Technology Co.,Ltd
Operating Conditions:	Configuration 1, Mode 1
Operator Name:	Tianshuo Yuan
Test Standard:	EN 55032 Class B
Comment:	Vertical

Sweep Setup:

Hardware Setup:	Radiated E Field 1GHz-6GHz_3m
Receiver:	[ESR 7]
Level Unit:	dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
1 GHz - 6 GHz	416.667 kHz	PK+ ; AVG	1 MHz	1 s	0 dB



Limit and Margin

Frequency (MHz)	MaxPeak (dBuV/m)	CAverage (dBuV/m)	Meas. Time (ms)	Height (cm)	Azimuth (deg)	Margin - PK+ (dB)	Limit - PK+ (dBuV/m)	Margin - CAV (dB)	Limit - CAV (dBuV/m)
1271.600000	38.1	24.4	1000.0	100.0	78.0	31.9	70.0	25.6	50.0
1594.400000	43.8	25.8	1000.0	100.0	43.0	26.2	70.0	24.2	50.0
2546.000000	44.2	30.7	1000.0	100.0	230.0	25.8	70.0	19.3	50.0
3229.600000	51.2	35.8	1000.0	100.0	89.0	22.8	74.0	18.2	54.0
4506.800000	45.6	32.2	1000.0	100.0	334.0	28.4	74.0	21.8	54.0
5682.000000	48.3	35.1	1000.0	100.0	313.0	25.7	74.0	18.9	54.0

1-6G Radiated Emission Test

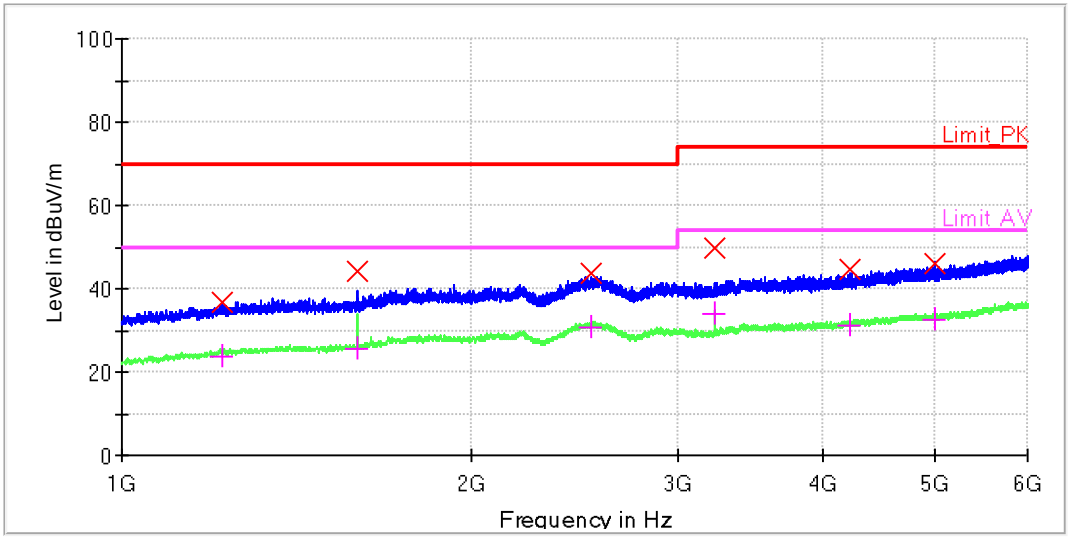
Common Information

EUT:	Rechargeable Li-ion Battery System
Model:	PowerCool-LFP-HV-10
Client:	Jiangsu SolarEast Energy Storage Technology Co.,Ltd
Operating Conditions:	Configuration 2, Mode 2
Operator Name:	Tianshuo Yuan
Test Standard:	EN 55032 Class B
Comment:	Horizontal

Sweep Setup:

Hardware Setup:	Radiated E Field 1GHz-6GHz_3m
Receiver:	[ESR 7]
Level Unit:	dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
1 GHz - 6 GHz	416.667 kHz	PK+ ; AVG	1 MHz	1 s	0 dB



Limit and Margin

Frequency (MHz)	MaxPeak (dBuV/m)	CAverage (dBuV/m)	Meas. Time (ms)	Height (cm)	Azimuth (deg)	Margin - PK+ (dB)	Limit - PK+ (dBuV/m)	Margin - CAV (dB)	Limit - CAV (dBuV/m)
1220.800000	36.9	23.6	1000.0	100.0	284.0	33.1	70.0	26.4	50.0
1594.400000	44.3	25.8	1000.0	100.0	96.0	25.7	70.0	24.2	50.0
2528.400000	43.8	30.5	1000.0	100.0	30.0	26.2	70.0	19.5	50.0
3229.200000	50.0	33.8	1000.0	100.0	150.0	24.1	74.0	20.2	54.0
4220.800000	44.6	31.2	1000.0	100.0	359.0	29.4	74.0	22.9	54.0
5003.200000	46.0	32.5	1000.0	100.0	45.0	28.0	74.0	21.5	54.0

1-6G Radiated Emission Test

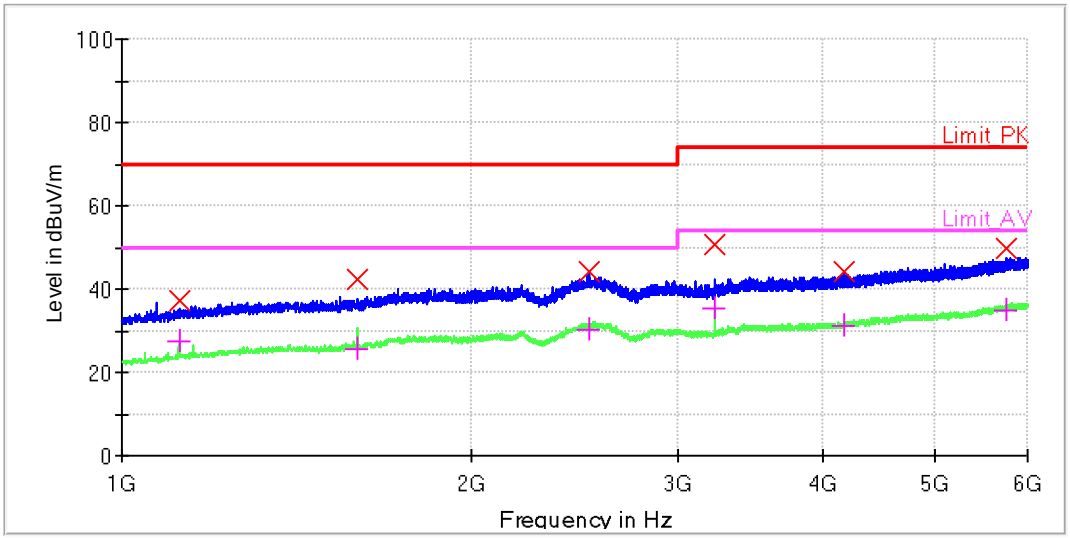
Common Information

EUT:	Rechargeable Li-ion Battery System
Model:	PowerCool-LFP-HV-10
Client:	Jiangsu SolarEast Energy Storage Technology Co.,Ltd
Operating Conditions:	Configuration 2, Mode 2
Operator Name:	Tianshuo Yuan
Test Standard:	EN 55032 Class B
Comment:	Vertical

Sweep Setup:

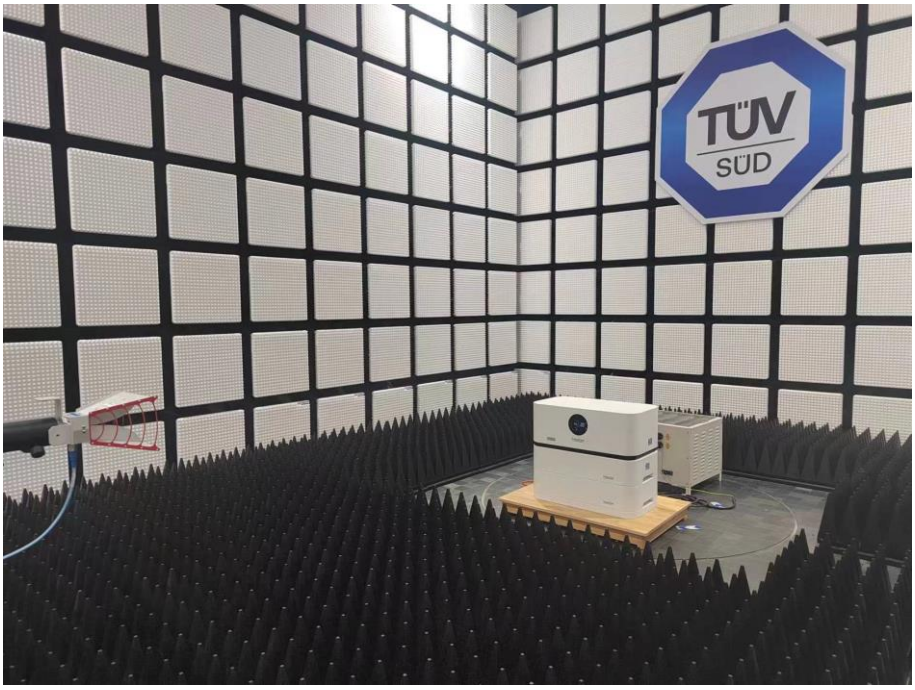
Hardware Setup:	Radiated E Field 1GHz-6GHz_3m
Receiver:	[ESR 7]
Level Unit:	dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
1 GHz - 6 GHz	416.667 kHz	PK+ ; AVG	1 MHz	1 s	0 dB



Limit and Margin

Frequency (MHz)	MaxPeak (dBuV/m)	CAverage (dBuV/m)	Meas. Time (ms)	Height (cm)	Azimuth (deg)	Margin - PK+ (dB)	Limit - PK+ (dBuV/m)	Margin - CAV (dB)	Limit - CAV (dBuV/m)
1119.600000	37.3	27.5	1000.0	100.0	295.0	32.7	70.0	22.5	50.0
1594.400000	42.5	25.6	1000.0	100.0	159.0	27.5	70.0	24.4	50.0
2520.000000	44.0	30.4	1000.0	100.0	165.0	26.0	70.0	19.6	50.0
3229.600000	50.7	35.5	1000.0	100.0	179.0	23.3	74.0	18.5	54.0
4169.600000	44.4	31.0	1000.0	100.0	86.0	29.6	74.0	23.0	54.0
5744.400000	49.8	34.8	1000.0	100.0	98.0	24.2	74.0	19.2	54.0



Test Setup

2.1.8 Test Location

This test was carried out in 10m and 3m SAC.

2.2 Emission - Conducted Emissions

2.2.1 Specification Reference

Refer to Clause 1.3

2.2.2 Equipment Under Test

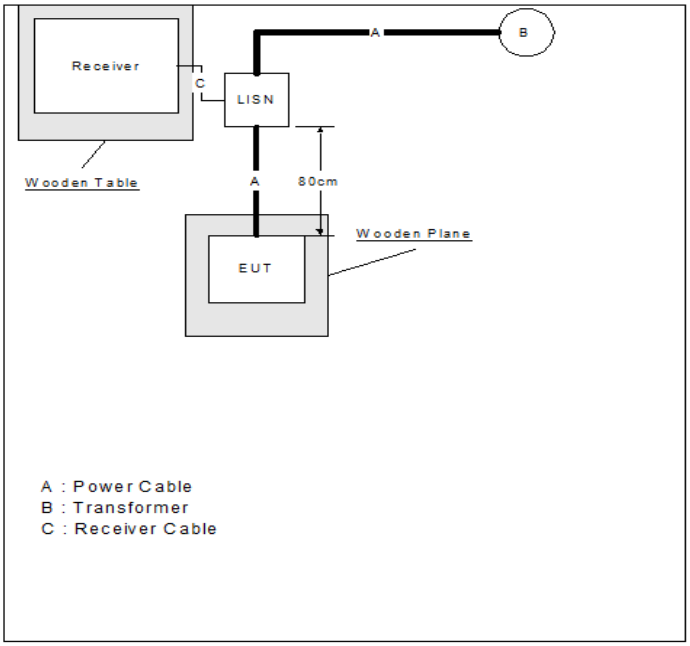
PowerCool-LFP-HV-10

2.2.3 Date of Test

2023.09.22

2.2.4 Test Method

The EUT was placed on a non-conductive support 0.1 m above a reference ground plane
All power was connected to the EUT through an Artificial Mains Network (AMN). Conducted disturbance voltage measurements on mains lines were made at the output of the AMN. The AMN was placed 0.8 m from the boundary of the EUT and bonded to the reference ground plane.



2.2.5 Environmental Conditions

Ambient Temperature	25°C
Relative Humidity	47%
Atmospheric Pressure	1012.3 mbar

2.2.6 Specification Limits

Port	Frequency range	Limits	Remarks
DC Power	0.15 MHz to 0.5 MHz	79 dB(μV) quasi-peak 66 dB(μV) average	-
	0.5 MHz to 30 MHz	73 dB(μV) quasi-peak 60 dB(μV) average	-
			-
a*: At transitional frequencies the lower limit applies.			

2.2.7 Test Results

Results for Configuration and Mode: Configuration 1, 2, Mode 1, 2**.**

Performance assessment of the EUT made during this test: Pass.

Detailed results are shown below.

0.15-30MHz Conducted Emission Test

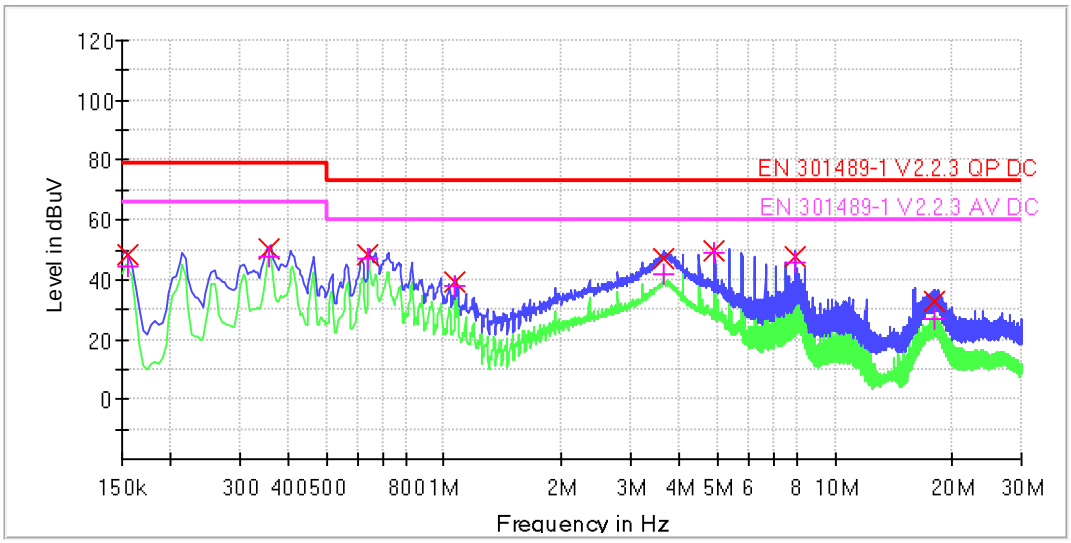
Common Information

EUT:	Rechargeable Li-ion Battery System
Model:	PowerCool-LFP-HV-10
Client:	Jiangsu SolarEast Energy Storage Technology Co.,Ltd
Operating Conditions:	Configuration 1, Mode 1
Operator Name:	Tianshuo Yuan
Test Standard:	EN 301489-1
Comment:	Port DC +
Comment:	Temp.:25℃,Humi.:47%,Atm.:1012.3hPa

Scan Setup:

Hardware Setup:	Mains Voltage LISN 2 Lines 150kHz-30MHz
Receiver:	[ESR 3]
Level Unit:	dBuV

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
150 kHz - 30 MHz	4 kHz	PK+ ; AVG	9 kHz	0.01 s	0 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV)	Margin - CAV (dB)	Limit - CAV (dBuV)
0.154500	48.4	44.7	1000.0	9.000	10.4	30.7	79.0	21.3	66.0
0.357000	50.3	47.7	1000.0	9.000	10.4	28.7	79.0	18.3	66.0
0.640500	48.5	46.9	1000.0	9.000	10.4	24.5	73.0	13.1	60.0
1.068000	39.2	38.1	1000.0	9.000	10.4	33.8	73.0	21.9	60.0
3.637500	47.1	41.7	1000.0	9.000	10.5	25.9	73.0	18.3	60.0
4.924500	49.9	49.2	1000.0	9.000	10.5	23.1	73.0	10.8	60.0
7.917000	47.4	45.9	1000.0	9.000	10.6	25.6	73.0	14.1	60.0
17.997000	33.0	27.1	1000.0	9.000	10.7	40.0	73.0	32.9	60.0

0.15-30MHz Conducted Emission Test

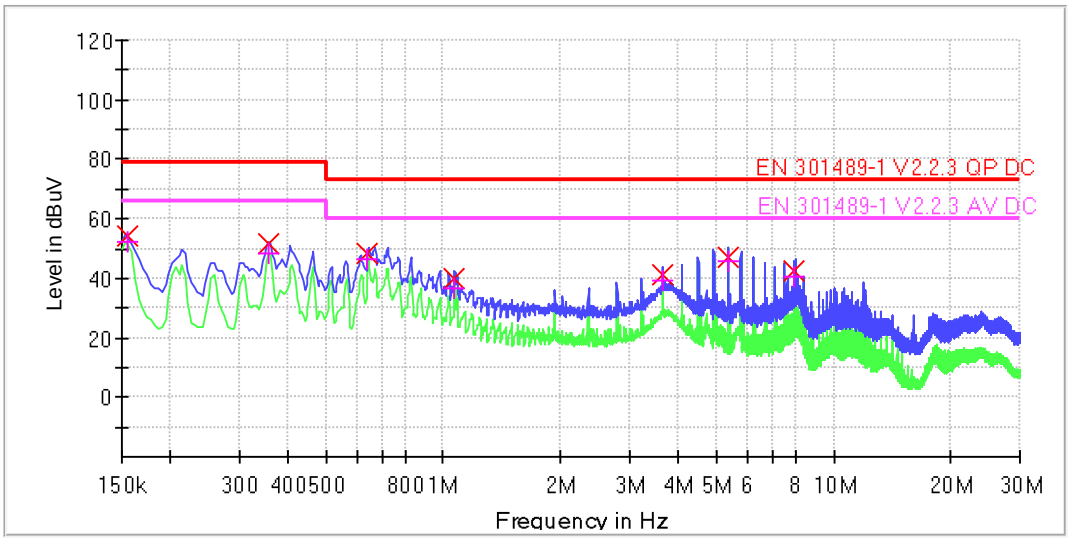
Common Information

EUT:	Rechargeable Li-ion Battery System
Model:	PowerCool-LFP-HV-10
Client:	Jiangsu SolarEast Energy Storage Technology Co.,Ltd
Operating Conditions:	Configuration 1, Mode 1
Operator Name:	Tianshuo Yuan
Test Standard:	EN 301489-1
Comment:	Port DC-
Comment:	Temp.:25℃,Humi.:47%,Atm.:1012.3hPa

Scan Setup:

Hardware Setup:	Mains Voltage LISN 2 Lines 150kHz-30MHz
Receiver:	[ESR 3]
Level Unit:	dBuV

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
150 kHz - 30 MHz	4 kHz	PK+ ; AVG	9 kHz	0.01 s	0 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV)	Margin - CAV (dB)	Limit - CAV (dBuV)
0.154500	54.2	52.3	1000.0	9.000	10.4	24.8	79.0	13.7	66.0
0.357000	51.4	48.2	1000.0	9.000	10.4	27.6	79.0	17.8	66.0
0.640500	48.1	46.4	1000.0	9.000	10.4	24.9	73.0	13.6	60.0
1.068000	39.6	36.9	1000.0	9.000	10.4	33.4	73.0	23.1	60.0
3.642000	41.5	39.3	1000.0	9.000	10.5	31.5	73.0	20.7	60.0
5.356500	47.0	45.8	1000.0	9.000	10.5	26.0	73.0	14.2	60.0
7.926000	42.5	40.7	1000.0	9.000	10.6	30.5	73.0	19.4	60.0

0.15-30MHz Conducted Emission Test

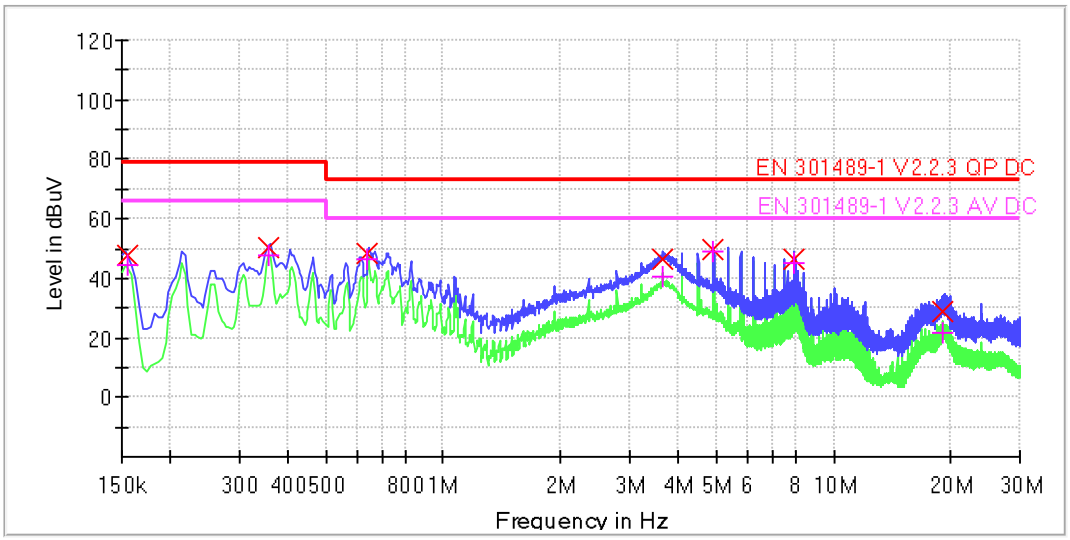
Common Information

EUT:	Rechargeable Li-ion Battery System
Model:	PowerCool-LFP-HV-10
Client:	Jiangsu SolarEast Energy Storage Technology Co.,Ltd
Operating Conditions:	Configuration 2, Mode 2
Operator Name:	Tianshuo Yuan
Test Standard:	EN 301489-1
Comment:	Port DC+
Comment:	Temp.:25℃,Humi.:47%,Atm.:1012.3hPa

Scan Setup:

Hardware Setup:	Mains Voltage LISN 2 Lines 150kHz-30MHz
Receiver:	[ESR 3]
Level Unit:	dBuV

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
150 kHz - 30 MHz	4 kHz	PK+ ; AVG	9 kHz	0.01 s	0 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV)	Margin - CAV (dB)	Limit - CAV (dBuV)
0.154500	47.7	44.4	1000.0	9.000	10.4	31.3	79.0	21.6	66.0
0.357000	50.1	47.4	1000.0	9.000	10.4	28.9	79.0	18.6	66.0
0.640500	48.2	46.7	1000.0	9.000	10.4	24.8	73.0	13.3	60.0
3.642000	46.1	40.8	1000.0	9.000	10.5	26.9	73.0	19.2	60.0
4.924500	49.8	49.3	1000.0	9.000	10.5	23.2	73.0	10.7	60.0
7.926000	46.1	44.9	1000.0	9.000	10.6	26.9	73.0	15.2	60.0
18.987000	28.8	21.6	1000.0	9.000	10.7	44.3	73.0	38.4	60.0

0.15-30MHz Conducted Emission Test

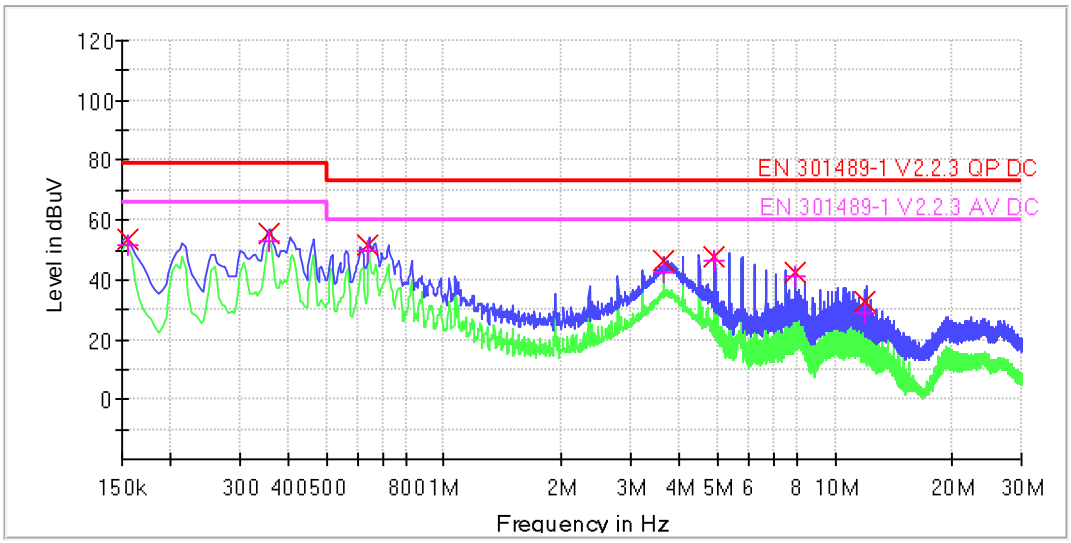
Common Information

EUT:	Rechargeable Li-ion Battery System
Model:	PowerCool-LFP-HV-10
Client:	Jiangsu SolarEast Energy Storage Technology Co.,Ltd
Operating Conditions:	Configuration 2, Mode 2
Operator Name:	Tianshuo Yuan
Test Standard:	EN 301489-1
Comment:	Port DC-
Comment:	Temp.:25℃,Humi.:47%,Atm.:1012.3hPa

Scan Setup:

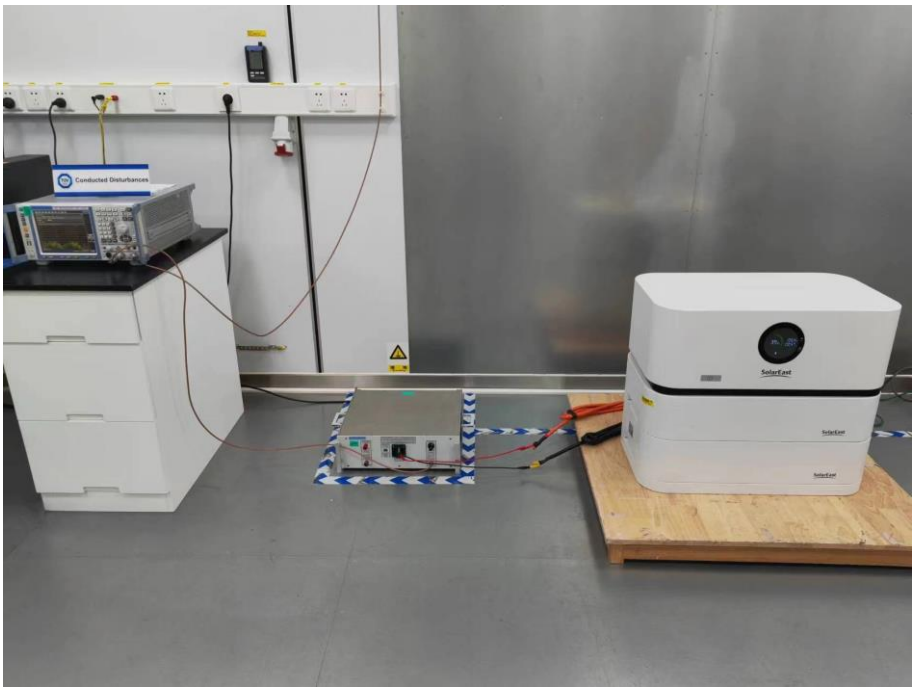
Hardware Setup:	Mains Voltage LISN 2 Lines 150kHz-30MHz
Receiver:	[ESR 3]
Level Unit:	dBuV

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
150 kHz - 30 MHz	4 kHz	PK+ ; AVG	9 kHz	0.01 s	0 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV)	Margin - CAV (dB)	Limit - CAV (dBuV)
0.154500	53.8	51.8	1000.0	9.000	10.4	25.2	79.0	14.2	66.0
0.357000	55.7	52.6	1000.0	9.000	10.4	23.3	79.0	13.4	66.0
0.640500	51.4	49.6	1000.0	9.000	10.4	21.6	73.0	10.4	60.0
3.637500	46.2	42.8	1000.0	9.000	10.5	26.8	73.0	17.2	60.0
4.920000	47.6	46.7	1000.0	9.000	10.5	25.4	73.0	13.3	60.0
7.921500	42.3	41.4	1000.0	9.000	10.6	30.7	73.0	18.6	60.0
11.940000	32.4	29.0	1000.0	9.000	10.7	40.6	73.0	31.0	60.0



Test Setup

2.2.8 Test Location

This test was carried out in SR-B.

2.3 Immunity - Enclosure port - Radio-frequency electromagnetic field. Amplitude modulated

2.3.1 Specification Reference

Refer to Clause 1.3

2.3.2 Equipment Under Test

PowerCool-LFP-HV-10

2.3.3 Date of Test

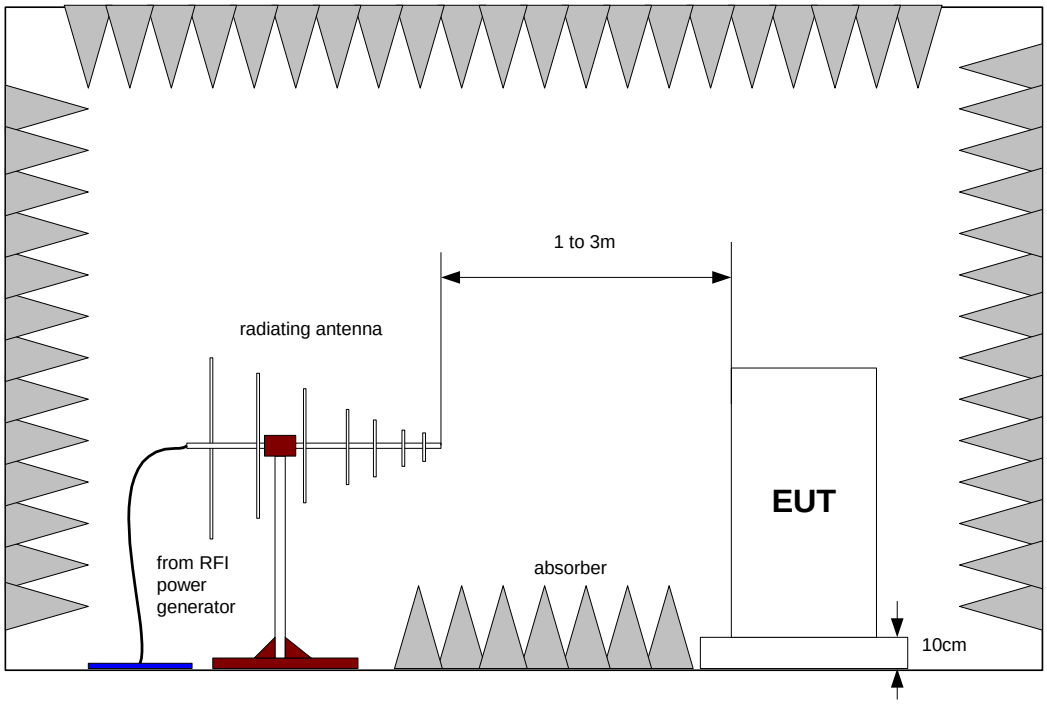
2023.09.23

2.3.4 Test Method

The equipment under test including associated cabling was configured on a 0.1 m insulated support for floor standing equipment; with a pre-calibrated semi anechoic chamber.

All four side of the equipment under test were subjected to the required RF field strength, modulated as described, swept over the frequency range of test with the antenna positioned in both horizontal and vertical polarizations.

During this testing any anomalies in the equipment under tests performance was recorded.



2.3.5 Environmental Conditions

Ambient Temperature	25°C
Relative Humidity	53 %
Atmospheric Pressure	1009.8 mbar

2.3.6 Specification Limits

Required Test Levels					Performance Criteria
Frequency Range (MHz)	Level (V/m)	Modulation	Step Size (%)	Dwell (s)	
80 to 6000	3	AM (80 %,1 kHz, sine wave)	1	3	A
Supplementary information: Note 1. EUT powered at one of the Nominal input voltages and frequencies Note 2. If the wanted signal is modulated at 1 000 Hz, then an audio signal of 400 Hz shall be used					

2.3.7 Test Results

Results for Configuration and Mode: Configuration 1, 2, Mode 1, 2.

Performance assessment of the EUT made during this test: *Pass*.

Detailed results are shown below.

Tabulated Results for RF Electromagnetic Field 80 - 6000 MHz				
Side of the equipment under test	Antenna polarization	Test Level	Dwell Time	Result
Front	horizontal	3 V/m	3 s	Pass PC A
Front	vertical	3 V/m	3 s	Pass PC A
Rear	horizontal	3 V/m	3 s	Pass PC A
Rear	vertical	3 V/m	3 s	Pass PC A
Left	horizontal	3 V/m	3 s	Pass PC A
Left	vertical	3 V/m	3 s	Pass PC A
Right	horizontal	3 V/m	3 s	Pass PC A
Right	vertical	3 V/m	3 s	Pass PC A

Test Setup

2.3.8 Test Location

This test was carried out in 3m SAC.

2.4 Immunity - Enclosure port - Electrostatic discharge

2.4.1 Specification Reference

Refer to Clause 1.3

2.4.2 Equipment Under Test

PowerCool-LFP-HV-10

2.4.3 Date of Test

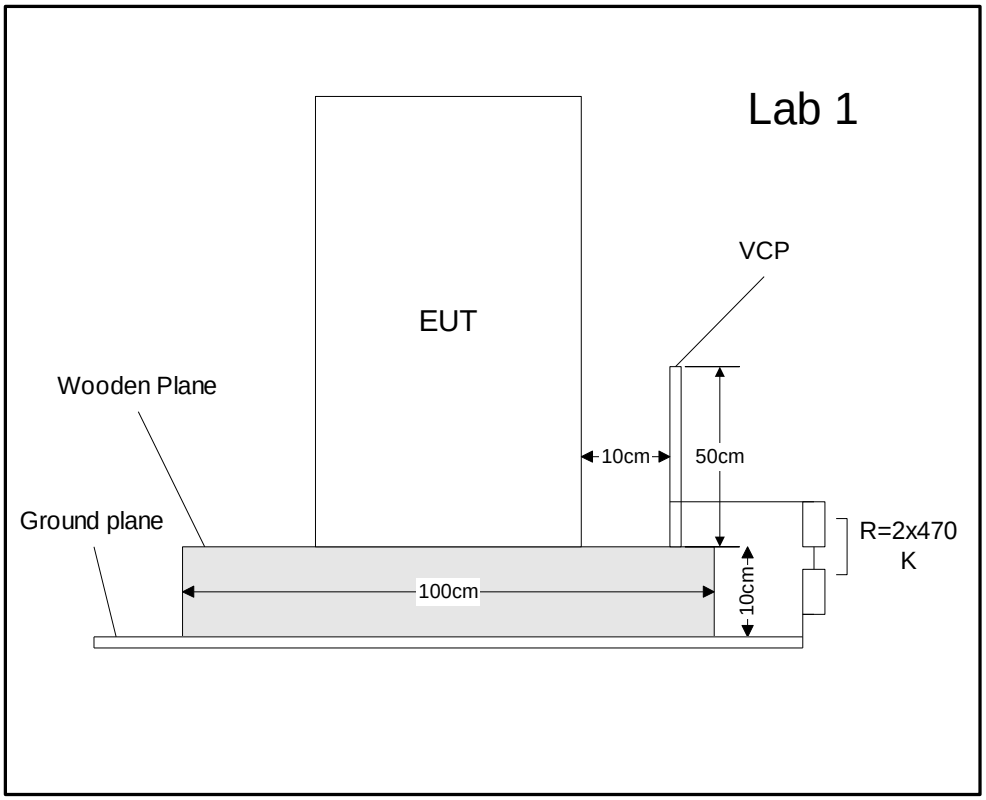
2023.09.22

2.4.4 Test Method

The equipment under test including associated cabling was configured on but insulted from, using a 0.5mm isolator, a horizontal coupling plane fitted to the top of a 0.8 m non-conductive table for table-top equipment; and on a 0.1 m insulated support for floor standing equipment; above a ground reference plane all within a test laboratory.

Using the air discharge method for non-metallic parts, contact discharge method for metallic parts with both vertical and horizontal couple plane discharge methods for the sides of the equipment under test, the required electrostatic discharge voltage levels in both voltage polarities were applied at the detailed pulse repartition rate.

During this testing any anomalies in the equipment under tests performance was recorded.



2.4.5 Environmental Conditions

Ambient Temperature	25°C
Relative Humidity	52 %
Atmospheric Pressure	1009.3 mbar

2.4.6 Specification Limits

Environmental phenomena		Test specifications	Units	Remarks	Performance criteria
Electrostatic discharge	Contact discharge	±4 (charge voltage)	kV	-	B
	Air discharge	±8 (charge voltage)	kV	-	B

2.4.7 Test Results

Results for Configuration and Mode: Configuration 1, 2, Mode 1, 2**.**

Performance assessment of the EUT made during this test: Pass.

Detailed results are shown below.

ID	Test Point	Discharge	Results: Pass PC A									
			2kV		4kV		6kV		8kV		15kV	
			+	-	+	-	+	-	+	-	+	-
1	Metal Enclosure, Metal screws, VCP, screen	Contact			✓	✓						
2	Gaps,	Air							✓	✓		

Key to Results	
✓	The EUTs performance was not impacted when the ESD pulse was applied.
✓*	No discharge occurred at this point when the ESD pulse was applied
O1	Observation
Fx	Failed
N/A	Not Applicable

Test setup

2.4.8 Test Location

This test was carried out in ESD TR.

2.5 Immunity –Radio-frequency common mode

2.5.1 Specification Reference

Refer to Clause 1.3

2.5.2 Equipment Under Test

PowerCool-LFP-HV-10

2.5.3 Date of Test

2023.09.22

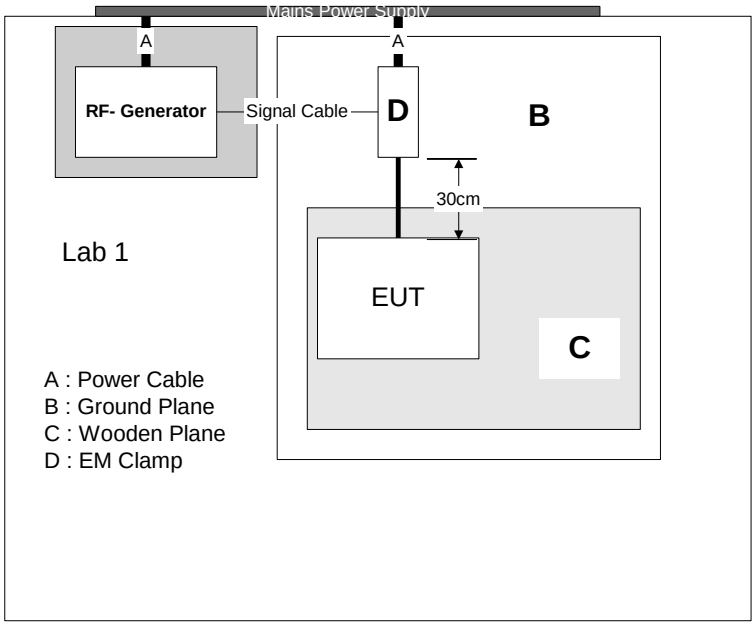
2.5.4 Test Method

The equipment under test was configured, on but insulted from, using a 0.1 m isolator, a horizontal coupling plane fitted to the top of a 0.8 m non-conductive table for table-top equipment; and on a 0.1 m insulated support for floor standing equipment; above a ground reference plane all within a test laboratory.

All associated cabling was configured, on but insulted from, using a 50 mm isolator, the same horizontal coupling plane as the equipment under test.

Using CDNs, EM Clamps or current clamps as appropriate, the power ports and applicable signal and control ports were subjected to the required, pre calibrated RF injected signal strength, modulated as described, swept over the frequency range of test.

During this testing any anomalies in the equipment under tests performance was recorded.



2.5.5 Environmental Conditions

Ambient Temperature	25°C
Relative Humidity	53 %
Atmospheric Pressure	1011.4 mbar

2.5.6 Specification Limits

Environmental phenomena	Test specifications	Units	Remarks	Performance criteria
Radio-frequency common mode	0.15 to 80 3 80	MHz V % AM (1 kHz)	The test level specified is the r.m.s. value of the unmodulated carrier. A*	A
Supplementary information: a* : The test level can also be defined as the equivalent current into a 150 Ω load.				

2.5.7 Test Results

Results for Configuration and Mode: Configuration 1, 2, Mode 1, 2**.**

Performance assessment of the EUT made during this test: Pass.

Detailed results are shown below.

Tabulated Results for Conducted Radio Frequency Interference					
Modulation = 80 % AM (1 kHz)		Step Size = 1 %		Dwell = 3 s	
Line Under Test	Frequency Range	Test Level	Coupling Method	Interference Return Path	Result
DC power line	150kHz to 80MHz	3 V	injection probe	injection probe	Pass PC A

Test Setup

2.5.8 Test Location

This test was carried out in SR-C.

2.6 Immunity - Fast transients

2.6.1 Specification Reference

Refer to Clause 1.3

2.6.2 Equipment Under Test

PowerCool-LFP-HV-10

2.6.3 Date of Test

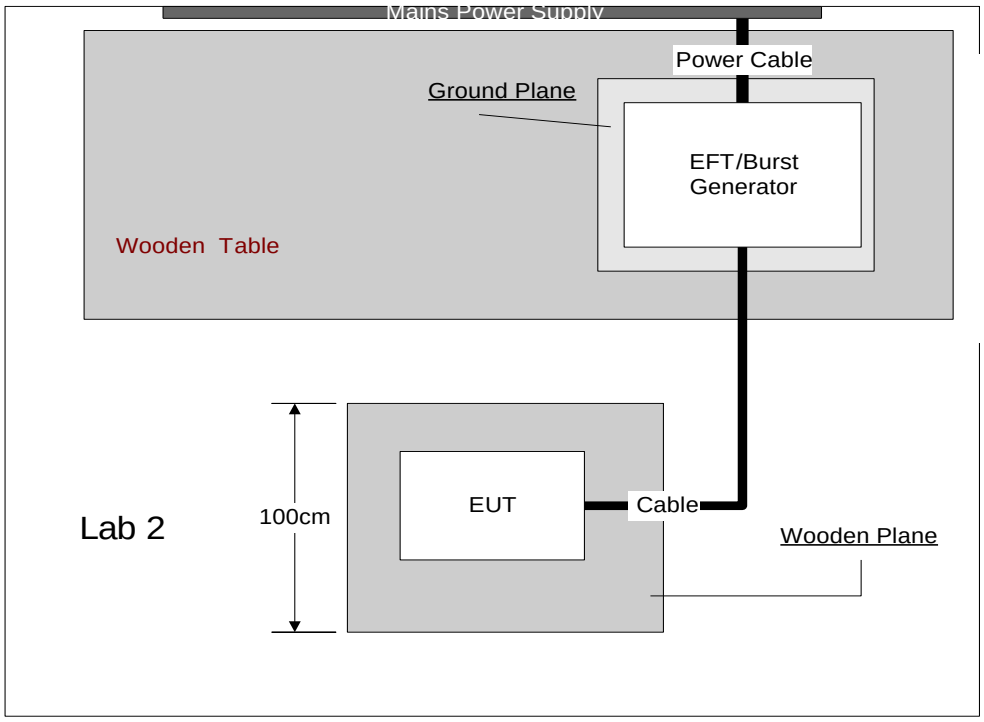
2023.09.22

2.6.4 Test Method

The equipment under test including associated cabling was configured on but insulted from, using a 0.1m isolator, a horizontal coupling plane fitted to the top of a 0.8 m non-conductive table for table-top equipment; and on a 0.1 m insulated support for floor standing equipment; above a ground reference plane all within a test laboratory.

Using a CDN for power ports, capacitive coupling clamp for signal and control ports and a 33 nF coupling capacitor for earth ports, the required fast transient burst voltage levels in both voltage polarities were applied at the detailed pulse repartition rate and duration of test.

During this testing any anomalies in the equipment under tests performance was recorded.



2.6.5 Environmental Conditions

Ambient Temperature	24°C
Relative Humidity	53 %
Atmospheric Pressure	1012.3 mbar

2.6.6 Specification Limits

Environmental phenomena	Test specifications	Units	Remarks	Performance criteria
Fast transients	±0.5 5/50 5	kV (open circuit test voltage) Tr/Th ns Repetition frequency kHz	-	B
Supplementary information:				

2.6.7 Test Results

Results for Configuration and Mode: Configuration 1, 2, Mode 1, 2**.**

Performance assessment of the EUT made during this test: Pass.

Detailed results are shown below.

Tabulated Results for Fast Transient Burst Immunity					
Line under test	Test Level (kV)	Repetition Rate	Test Duration	Coupling Method	Result
DC power line	±0.5	5 kHz	60s	Direct	Pass PC A

Test Setup

2.6.8 Test Location

This test was carried out in SR-C.

3 Test Equipment Information

3.1 General Test Equipment Used

Instrument	Manufacturer	Type No	TE No	Calibration Date	Calibration Due
Conducted Emission					
EMI Test Receiver	Rohde & Schwarz	ESR 3	487/632314	2023.04.18	2024.04.17
LISN	Rohde & Schwarz	NSLK8127	487/601428	2022.11.26	2023.11.25
Electromagnetic Radiation Disturbance					
EMI Test Receiver	Rohde & Schwarz	ESW 8	487/632317	2023.05.24	2024.05.23
Antenna	Schwarzbeck	VULB 9168	487/622344	2023.02.22	2024.02.21
10m chamber	Beijing Yice	10m SAC	487/772309	2023.03.03	2026.03.02
Immunity					
ESD Simulator	HAEFELY	ONYX 30	487/751520	2023.09.02	2024.09.01
Burst Generator	EM test	UCS 500N5E	487/751219	2023.04.27	2024.04.26
Coupling/decoupling Network	TeseQ	CDN M216S	487/571842	2023.09.02	2024.09.01
Conducted immunity test system	TeseQ	NSG 4070C-80	487/752227	2023.04.27	2024.04.26
injection probe	TeseQ	CIP9136A	487/431315	2023.04.27	2024.04.26
Signal Generator	Rohde & Schwarz	SMB 100B	487/392352	2023.04.17	2024.04.16
Power Amplifier	Rohde & Schwarz	BBA-BC1000	487/400908	2023.04.17	2024.04.16
Power Amplifier	Rohde & Schwarz	BBA-D110E100	487/402321	2023.04.17	2024.04.16
Power Meter	Rohde & Schwarz	NRX	487/741156	2022.11.26	2023.11.25
Power sensor	Rohde & Schwarz	NRP6A	487/742390-487/742391	2023.04.17	2024.04.16
Antenna	AR	ALT80M6G	487/622350	2023.04.17	2024.04.16
AC PF generator	Skylark	PFM-300	487/752329	2023.05.05	2024.05.04

EMC Testing software

software	version	Testing items
EMC32	10.6	CE, RE, RS
ICD CONTROL	7.1.2	CS

4 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

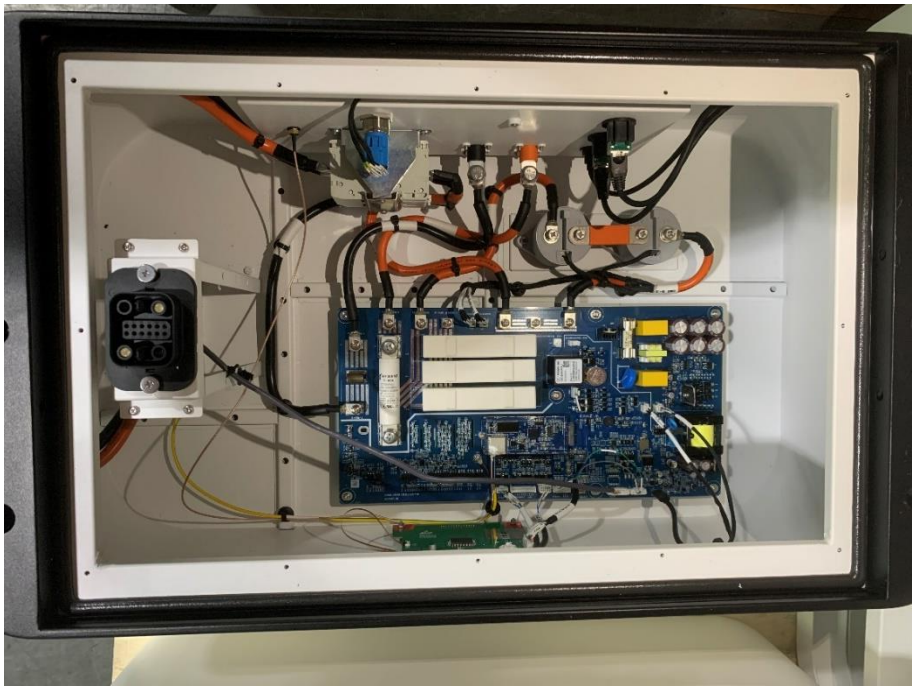
Test Name	Measurement Uncertainty
Mains Terminal Disturbance Voltage	150kHz to 30MHz, LISN, 3.08dB
Electromagnetic Radiation Disturbance	30MHz to 1GHz, H&V: 4.47dB(10m) H&V: 4.91dB(3m) 1GHz to 6GHz H&V: 5.15dB
Electrostatic Discharge	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-2.
Electromagnetic field	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-3.
Power frequency magnetic field	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-8.
Voltage dip	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-11
Short interruptions	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-11
Burst	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-4
Surge	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-5
Conducted RF	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-6.

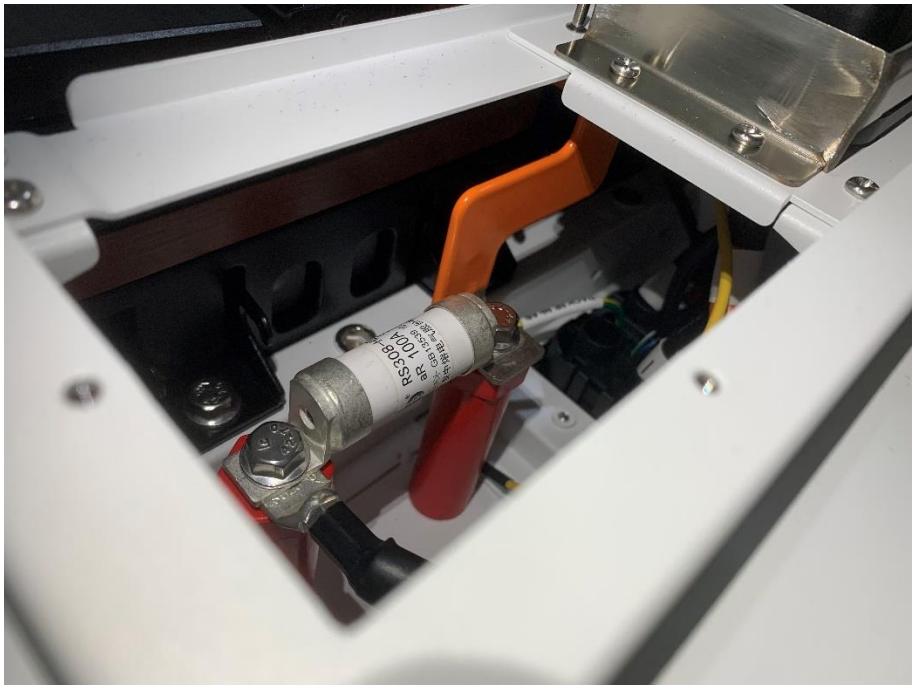
Measurement Uncertainty Decision Rule

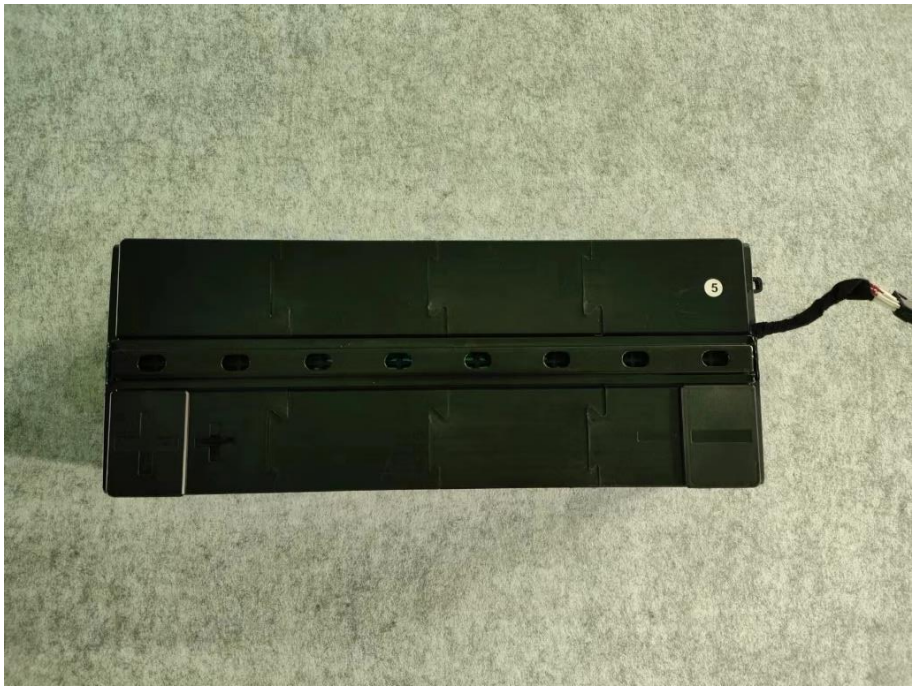
Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2021, clause 4.4.3 and 4.5.1

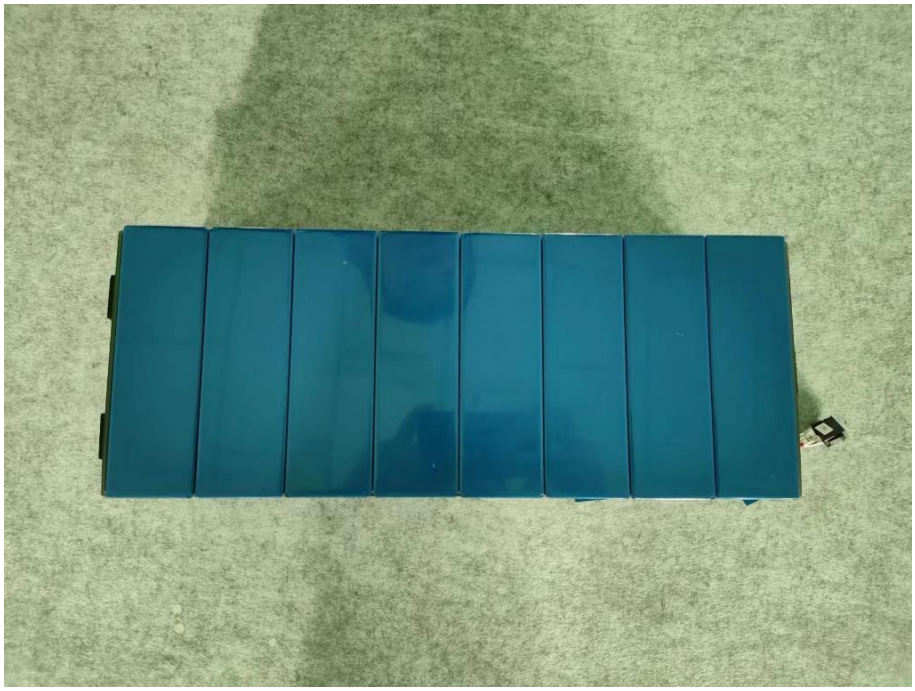
5 Photographs

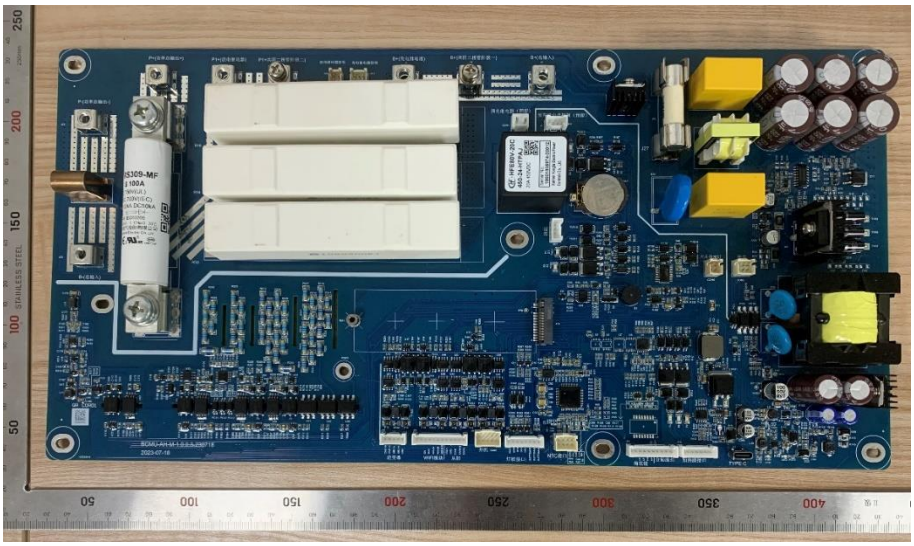
Model: PowerCool-LFP-HV-10

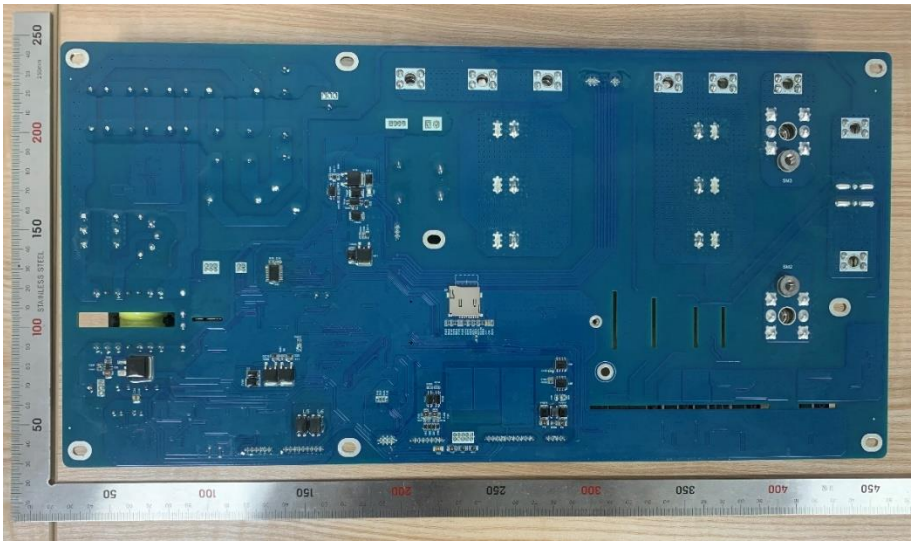


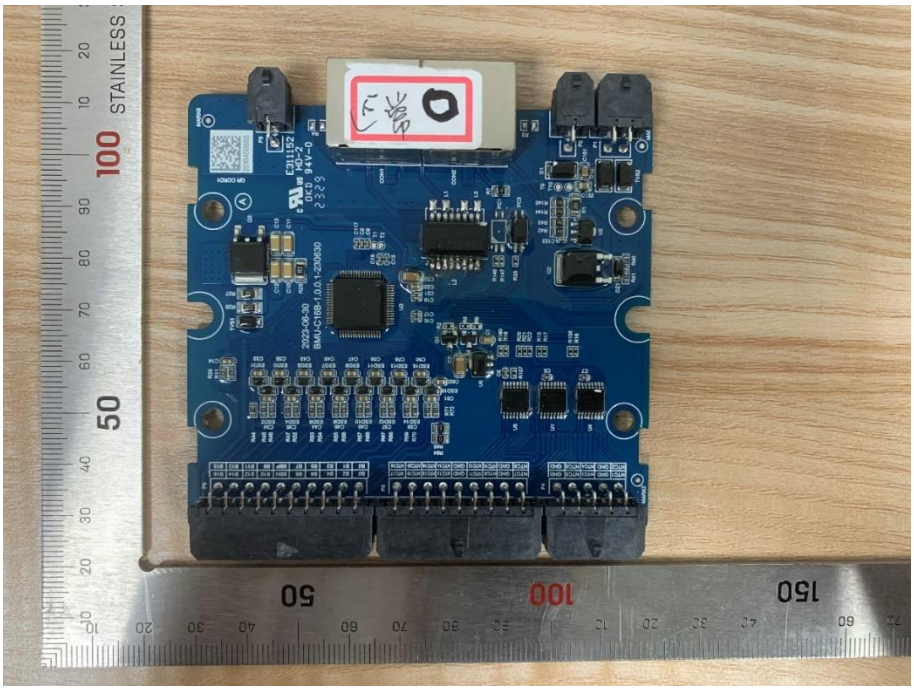


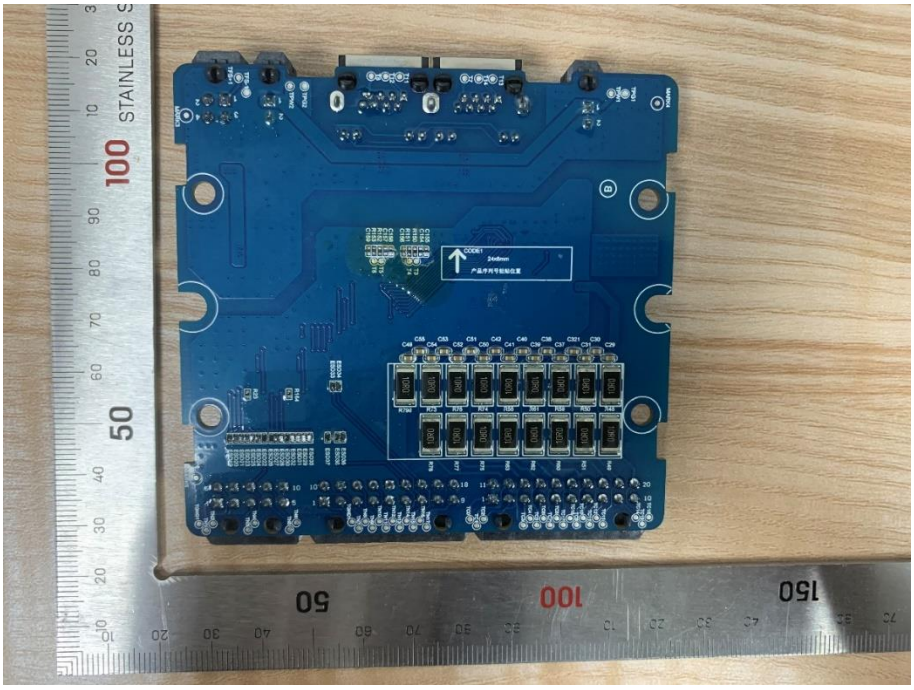


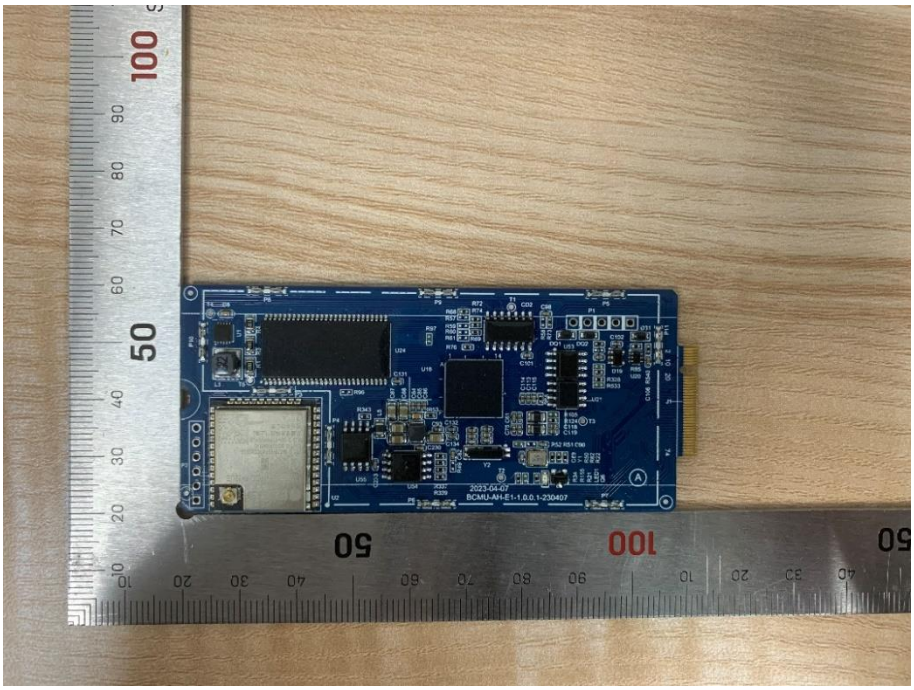


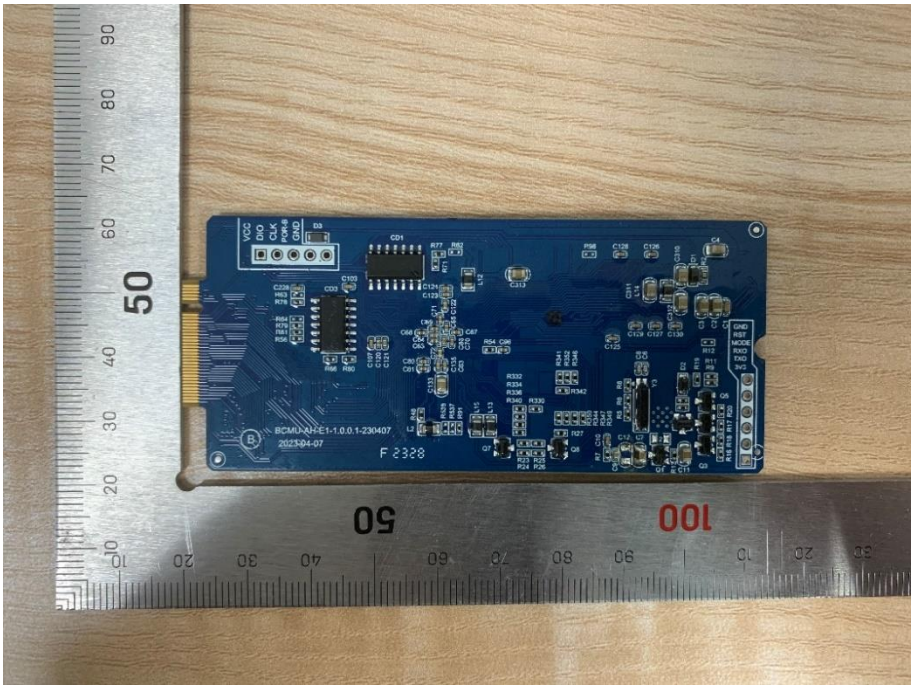












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