

# Test Report



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**Applicant:** Jiangmen Jeeseeng Energy Co., Ltd.

Address: 3rd-4th floor of No.2 building, No. 93, Jiangwan Road,  
Huicheng, Xinhui District, 529000 Jiangmen City, Guang-dong Province,  
PEOPLE'S REPUBLIC OF CHINA

**Product:** Batteries (Rechargeable Li-ion Battery System)

**Model:** See model list in section 1.2

## COMMERCIAL-IN-CONFIDENCE

Report Number: 64.771.23.60320.01

RESPONSIBLE FOR	NAME	SIGNATURE	DATE
Prepared by	Chris Liang	<i>Chris Liang</i>	2024-04-22
Approved by	Matt Zhang	<i>Matt Zhang</i>	2024-04-22

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

<b>EXECUTIVE SUMMARY</b> This product was found to be in compliance with	EN IEC 61000-6-2:2019, EN IEC 61000-6-4:2019
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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	2024-04-22

## 1.2 Introduction

Any use for advertising purposes must be granted in writing. This technical report may only be quoted in full. This report is the result of a single examination of the object in question and is not generally applicable evaluation of the quality of other products in regular production. For further details please see testing and certification regulation, chapter A-3.4.

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 : Jiangmen Jeeseng Energy Co., Ltd.  
 Address : 3rd-4th floor of No.2 building, No. 93, Jiangwan Road, Huicheng, Xinhui District,529000 Jiangmen City, Guang-dong Province, PEOPLE'S REPUBLIC OF CHINA  
 Manufacturer : Same as applicant  
 Address : Same as applicant  
 Factory : Same as applicant  
 Address : Same as applicant  
 Model Number(s) : JEEDD-104100, JEEDD-153100, JEEDD-204100, JEEDD-256100, JEEDD-307100, JEEDD-358100  
 Product Type : Batteries (Rechargeable Li-ion Battery System)  
 Trademark : N/A  
 Date of Receipt of EUT : 2023-09-22  
 Start of Test : 2023-09-22  
 Finish of Test : 2024-04-16  
 Name of Engineer(s) : Chris Liang

### 1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with EN IEC 61000-6-2, EN IEC 61000-6-4 is shown below.

Specification	Clause	Test Description	Result	Remark
EN IEC 61000-6-4:2019	9	Emission - Low voltage AC mains port*	N/A	/
EN IEC 61000-6-4:2019	9	Emission - Low voltage DC power port**	N/A	/
EN IEC 61000-6-4:2019	9	Emission – Telecommunications/network port***	N/A	/
EN IEC 61000-6-4:2019	9	Emission - Enclosure port	Pass	Note 1
EN IEC 61000-6-2:2019 IEC 61000-4-2:2008	9	Electrostatic discharge immunity test	Pass	/
EN IEC 61000-6-2:2019 IEC 61000-4-3:2006/A2:2010	9	Radiated, radio-frequency, electromagnetic field immunity test	Pass	/
EN IEC 61000-6-2:2019 IEC 61000-4-4:2012	9	Electrical fast transient /burst immunity test**	N/A	/
EN IEC 61000-6-2:2019 IEC 61000-4-5:2014	9	Surge immunity test****	N/A	/
EN IEC 61000-6-2:2019 IEC 61000-4-6:2013	9	Immunity to conducted disturbances, induced by radio-frequency fields**	N/A	/
EN IEC 61000-6-2:2019 IEC 61000-4-8:2009	9	Immunity - Enclosure port - Power-frequency magnetic field*****	Pass	/
EN IEC 61000-6-2:2019 IEC 61000-4-11:2004	9	Voltage dips, short interruptions and voltage variations immunity tests*	N/A	/

Remark:

Note \*: Tests are only applicable for AC power port connected to public mains.

Note \*\*: Applicable only to ports with a connecting cable exceeding a length of 3m. Informative requirements.

Note \*\*\*: Signal ports for EUT are used for local communications (not public network). Tests are not applicable to these signal ports.

Note \*\*\*\*: Applicable only to ports interfacing with long distance lines.

Note \*\*\*\*\*: This item need only to be applied to equipment containing components susceptible to magnetic fields, such as Hall elements or magnetic field sensors.

Note 1: The highest internal frequency of the EUT is less than 108 MHz, the measurement was made up to 1GHz.



**1.4 Test Conditions**

**1.4.1 Environmental Conditions**

<p>The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment.</p> <p>The climatic conditions during the tests were within the following limits:</p>		
Temperature	Humidity	Atmospheric pressure
15 °C – 35 °C	30 % - 60 %	860 hPa – 1060 hPa
<p>If explicitly required in the basic standard or applied product standard the climatic values are recorded and documented separately in this test report.</p>		

**1.4.2 Performance Criteria**

Performance criterion A: The apparatus shall continue to operate as intended during 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. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and from what the user may reasonable expect from the apparatus if used as intended.

Performance criterion B: The apparatus shall continue 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. During the test, degradation of performance is allowed, however no change of actual operating state or stored data is allowed to persist after test. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and from what the user may reasonable expect from the apparatus if used as intended.

Performance criterion C: Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls, or by any operation specified in the instruction for use.

## 1.5 Product Information and general remarks

### 1.5.1 Technical Description

Nominal voltage	:	102.4Vd.c. for JEEDD-104100
Rated Capacity	:	100Ah for JEEDD-104100

### 1.5.2 Test Configuration

Configuration	Description
DC powered	Charging mode (112Vd.c. 20A) Discharging mode (102.4Vd.c. 20A)

### 1.5.3 Modes of Operation

Mode	Description
TM1	Charging mode
TM2	Discharging mode
Remark	All DC input/output line and signal line with a maximum length <3m.

### 1.5.4 General remark:

All models have the same control box and battery module, only different in model name and the number of packs.

For evaluation, all tests were performed on model JEEDD-104100.

Model list

Model	Rating
JEEDD-104100	102.4Vd.c.,100Ah
JEEDD-153100	153.6Vd.c.,100Ah
JEEDD-204100	204.8Vd.c.,100Ah
JEEDD-256100	256Vd.c.,100Ah
JEEDD-307100	307.2Vd.c.,100Ah
JEEDD-358100	358.4Vd.c.,100Ah

## 1.6 Deviations from the Standard

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

## 1.7 Test Location

Test Site:  
TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch

Address:  
D1 building, No.63 Chuangqi Road, Shilou Town, Panyu District, Guangzhou, P.R. China

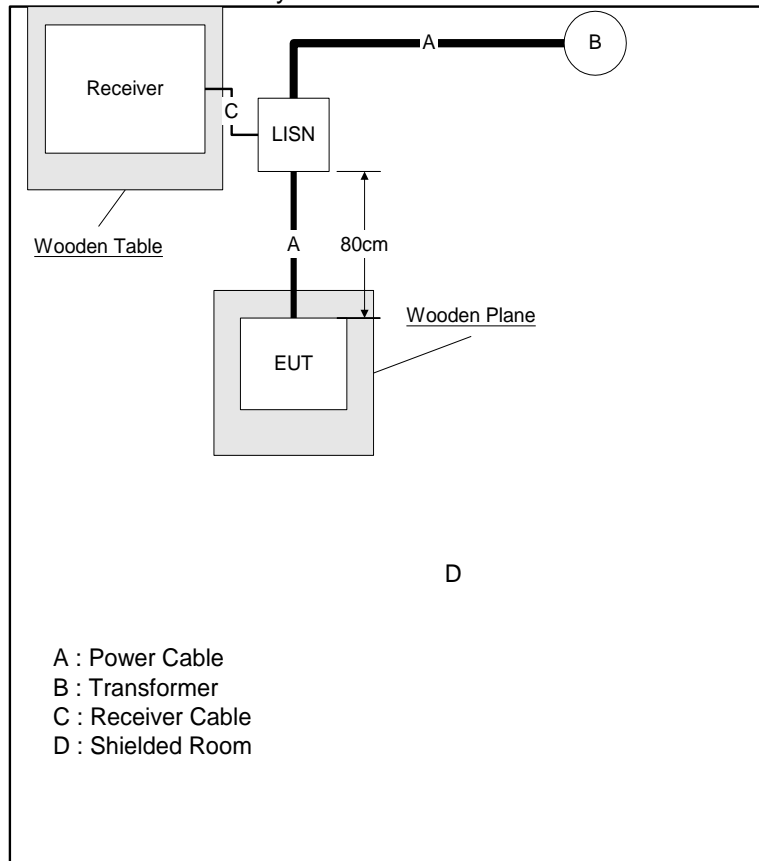
## 2 Test Details

### 2.1 Conducted Disturbance at Mains Terminals

#### 2.1.1 Test Method

The EUT was placed on a 0.8 m non-conductive table for table-top equipment and on a 0.12 m insulated support for floor standing equipment above a ground reference plane all within a test laboratory.

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 0.8m from the boundary of the EUT and bonded to the reference ground plane.





**2.1.2 Specification Limits**

<b>Disturbance voltage limits at the AC mains port</b>		
Frequency range	Limits dB(μV)	
	Quasi-peak	Average
0.15MHz to 0.5MHz	79	66
0.5MHz to 30MHz	73	60

<b>Disturbance voltage limits at the DC power port</b>		
Frequency range	Limits dB(μV)	
	Quasi-peak	Average
0.15MHz to 0.5MHz	89	76
0.5MHz to 30MHz	83	70

<b>Disturbance voltage limits at the wired network port</b>		
Frequency range	Limits dB(μV)	
	Quasi-peak	Average
0.15MHz to 0.5MHz	97 to 87	84 to 74
0.5MHz to 30MHz	87	74

Remark for test data:

\*Level=Reading Level + Correction Factor

\*\*Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

**2.1.3 Test Results**

Results for Configuration and Mode: N/A

Performance assessment of the EUT made during this test: N/A

**2.1.4 Test Setup**

N/A

**2.1.5 Test Location**

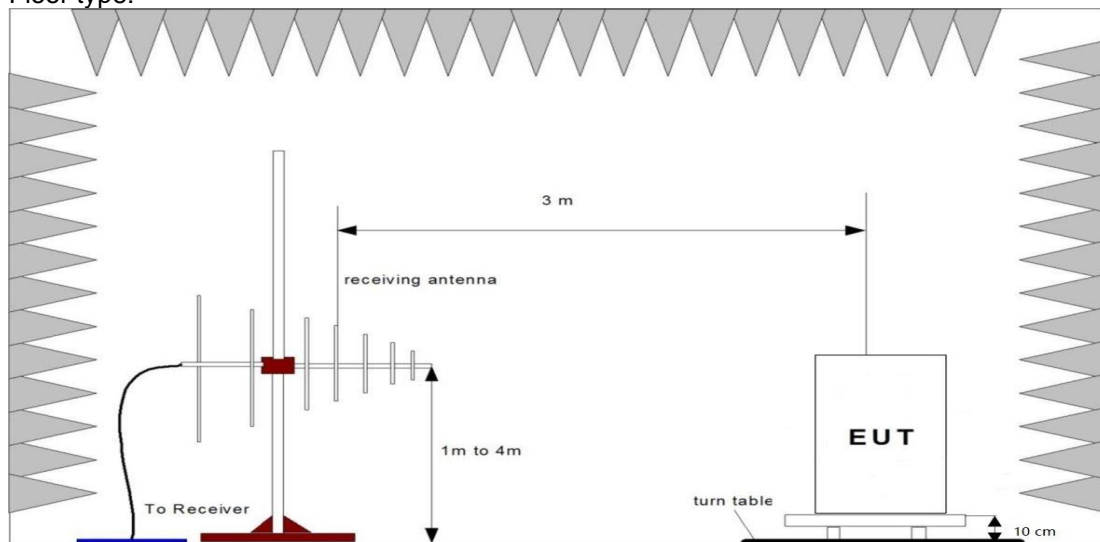
This test was carried out in shielded room.

## 2.2 Radiated Disturbance

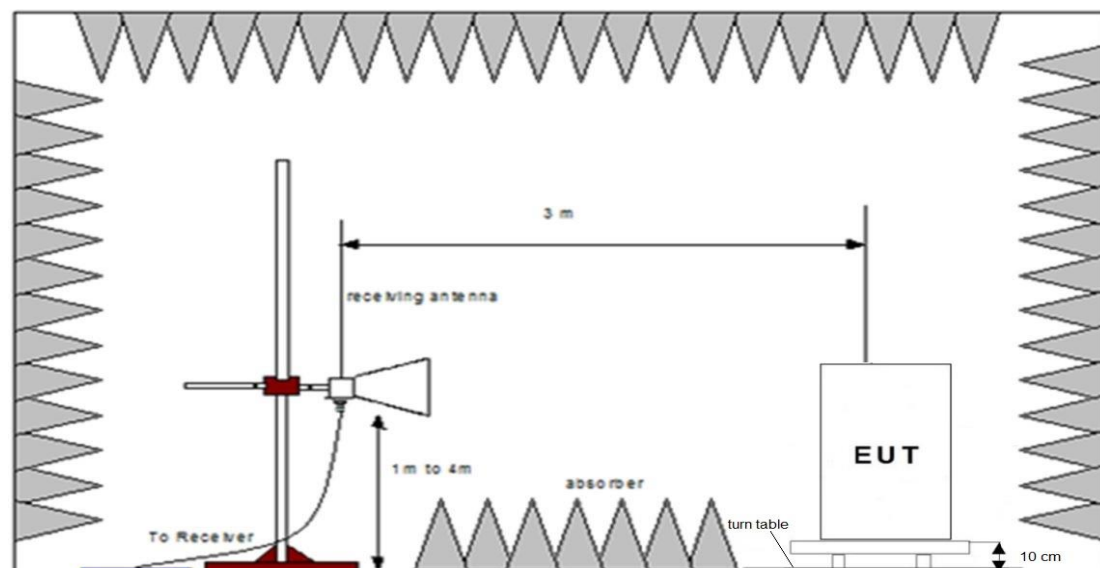
### 2.2.1 Test Method

The EUT was set up in a semi-anechoic chamber on a remotely controlled turntable and placed on a non-conductive  
 < floor 0.1 m above a reference ground plane>  
 < support 0.1 m above a reference ground plane>  
 A prescan of the EUT emissions profile was made while varying the antennae-to-EUT azimuth and antenna-to-EUT polarization using a peak detector; measurements were taken at a 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.

Floor type:

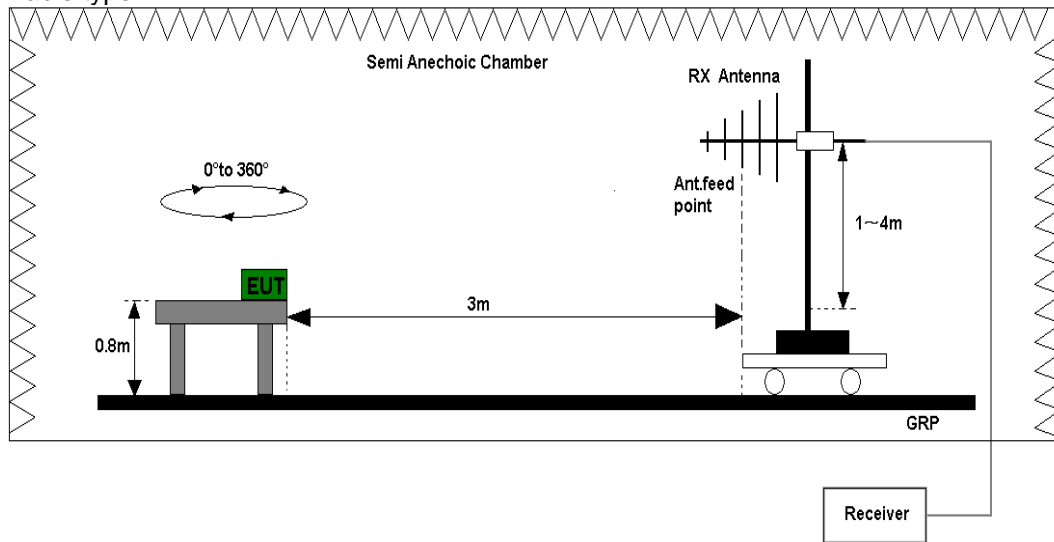


Test set-up of radiated disturbance(30MHz-1GHz)

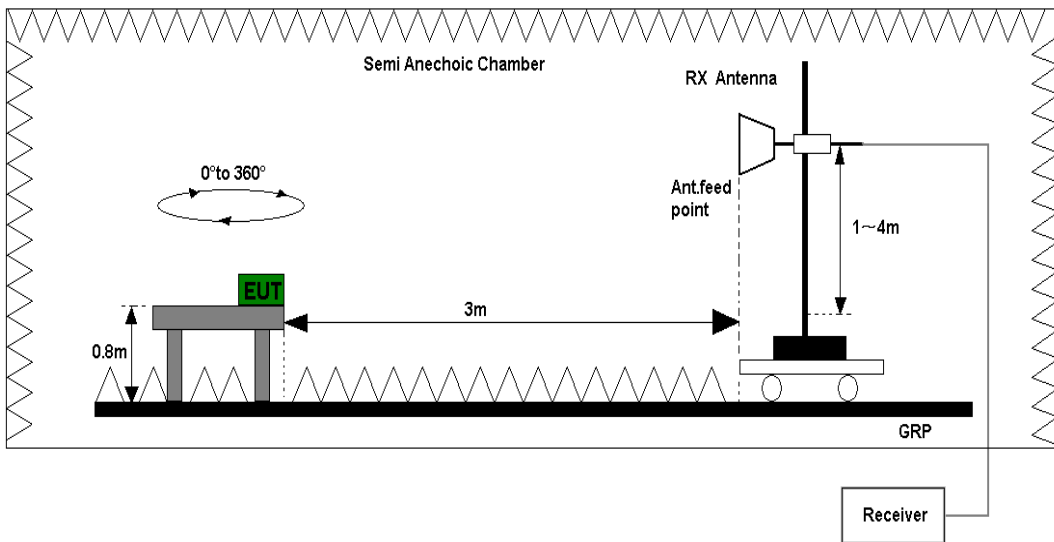


Test set-up of radiated disturbance (above 1GHz)

Table type:



Test set-up of radiated disturbance(30MHz-1GHz)



Test set-up of radiated disturbance (above 1GHz)



**2.2.2 Specification Limits**

Radiated disturbance limits in the frequency range 30MHz to 1000MHz at a measuring distance of 3 m	
Frequency range MHz	Quasi-peak limits dB(μV/m)
30 to 230	50
230 to 1000	57

Radiated disturbance limits in the frequency range 30MHz to 1000MHz at a measuring distance of 10 m	
Frequency range MHz	Quasi-peak limits dB(μV/m)
30 to 230	40
230 to 1000	47

Radiated disturbance limits in the frequency range 1000MHz to 6000MHz at a measuring distance of 3 m		
Frequency range MHz	Quasi-peak limits dB(μV/m)	Average
1000 to 3000	76	56
3000 to 6000	80	60

Remark :

Level=Reading Level + Correction Factor

Correction Factor=Antenna Factor + Cable Loss

(The Reading Level is recorded by software which is not shown in the sheet)

**2.2.3 Test Results**

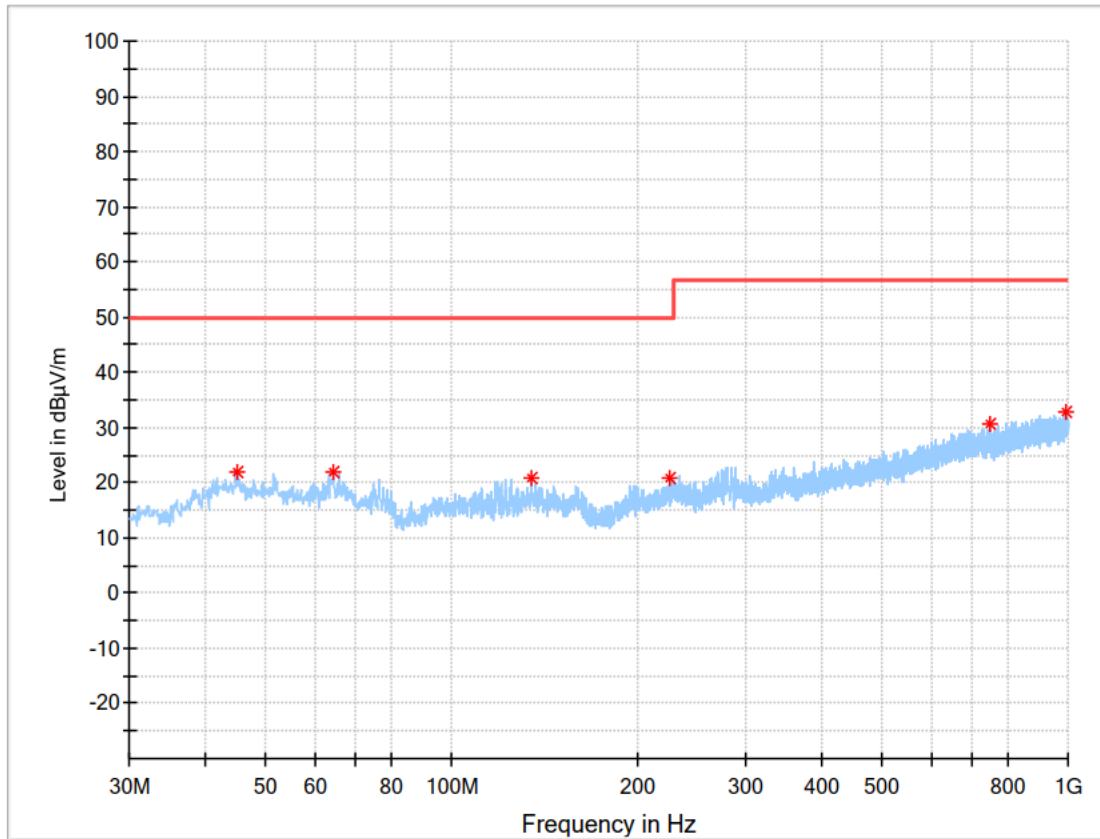
Results for Configuration and Mode: TM1/TM2

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

Detailed results are shown below.



### Radiated Emission 30MHz-1000MHz

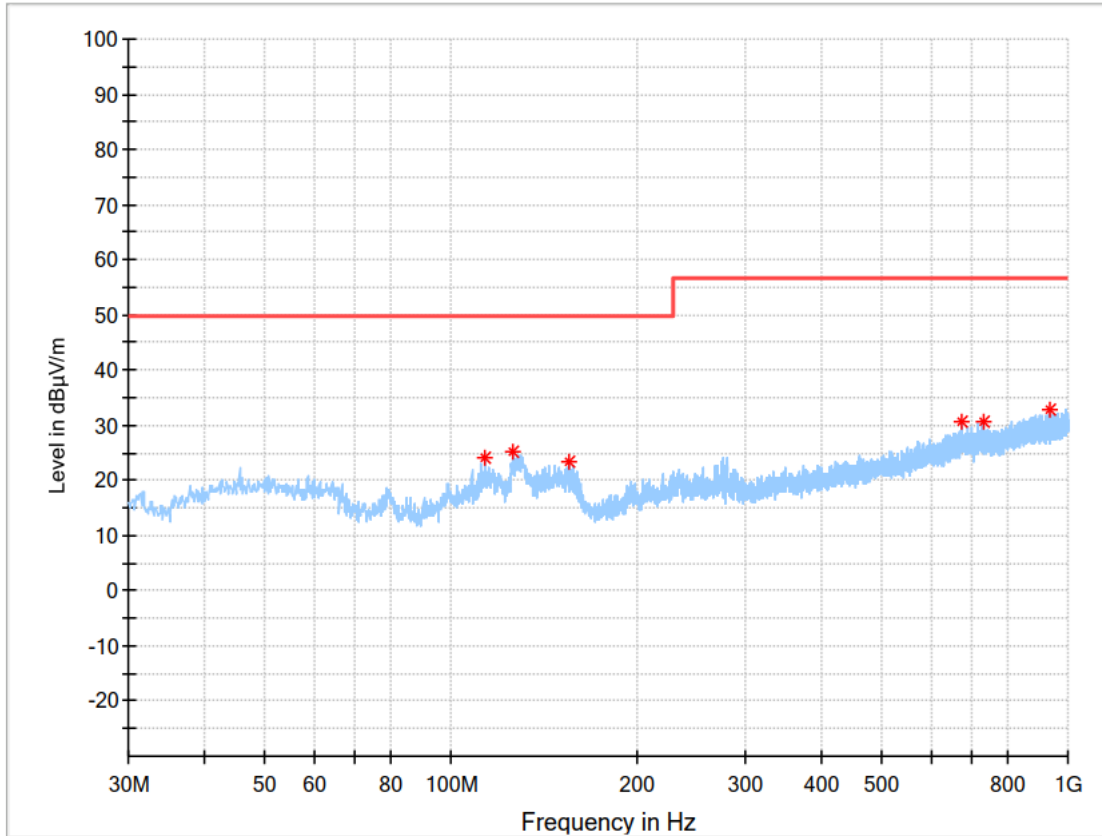


#### Critical\_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
45.035000	22.01	50.00	27.99	H	-12.6
64.313750	21.96	50.00	28.04	H	-16.1
134.760000	20.78	50.00	29.22	H	-19.5
226.303750	20.67	50.00	29.33	H	-16.0
748.527500	30.69	57.00	26.31	H	-4.9
994.543750	32.83	57.00	24.17	H	-1.9

Model : JEEDD-104100  
 Operating Mode : TM1  
 Antenna polarization : Horizontal  
 Test Date : 2024-04-16

### Radiated Emission 30MHz-1000MHz

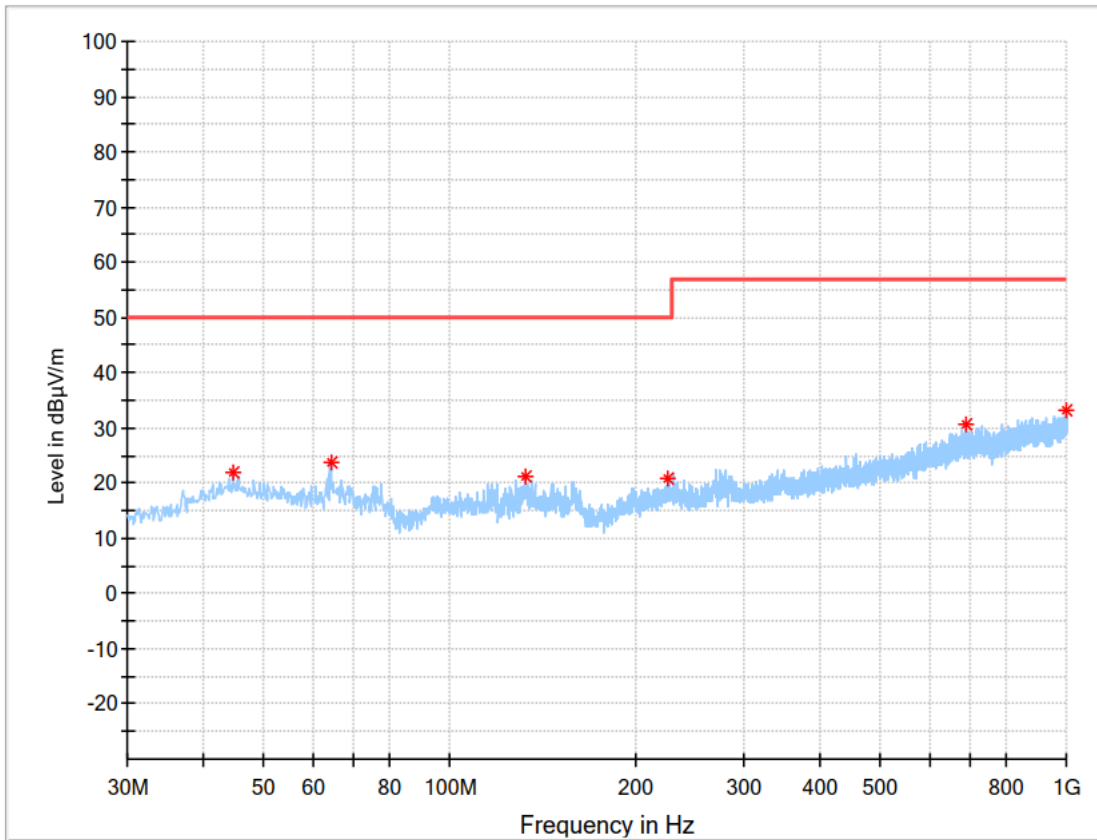


#### Critical\_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
113.420000	24.15	50.00	25.85	V	-16.8
126.272500	25.05	50.00	24.95	V	-18.8
155.372500	23.24	50.00	26.76	V	-19.5
673.716250	30.58	57.00	26.42	V	-5.9
729.248750	30.56	57.00	26.44	V	-5.3
937.920000	32.84	57.00	24.16	V	-2.8

Model : JEEDD-104100  
 Operating Mode : TM1  
 Antenna polarization : Vertical  
 Test Date : 2024-04-16

### Radiated Emission 30MHz-1000MHz



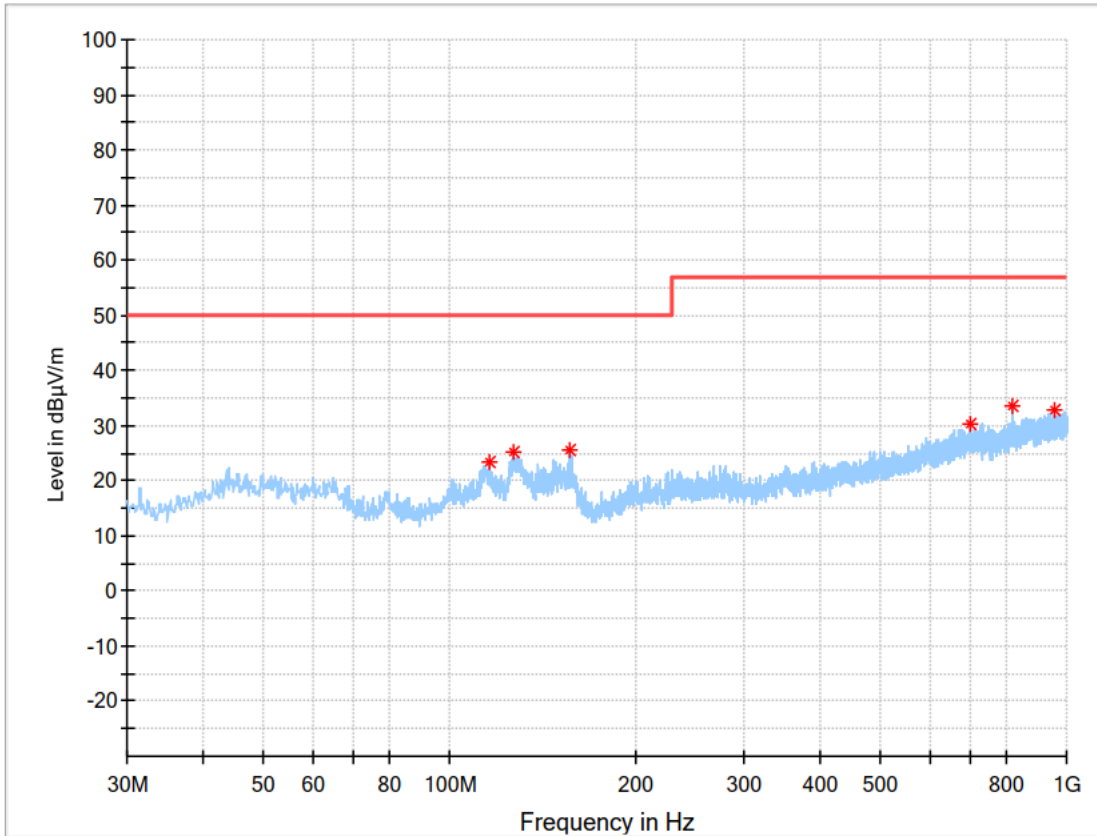
#### Critical\_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
999.393750	33.20	57.00	23.80	H	-1.7
685.962500	30.55	57.00	26.45	H	-5.9
44.428750	21.98	50.00	28.02	H	-12.8
64.192500	23.65	50.00	26.35	H	-16.0
225.576250	20.93	50.00	29.07	H	-16.0
133.062500	21.03	50.00	28.97	H	-19.3

Model : JEEDD-104100  
 Operating Mode : TM2  
 Antenna polarization : Horizontal  
 Test Date : 2024-04-16



### Radiated Emission 30MHz-1000MHz

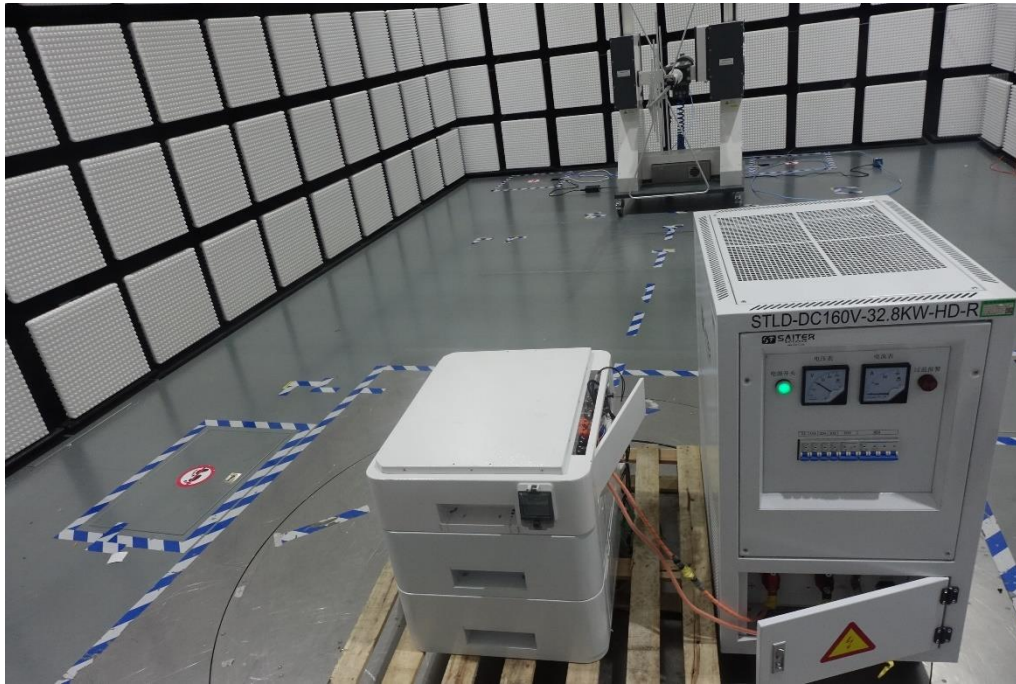


#### Critical\_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
817.518750	33.37	57.00	23.63	V	-4.0
958.290000	32.78	57.00	24.22	V	-2.4
156.221250	25.39	50.00	24.61	V	-19.5
116.087500	23.32	50.00	26.68	V	-17.3
126.878750	25.13	50.00	24.87	V	-18.8
697.360000	30.33	57.00	26.67	V	-5.8

Model : JEEDD-104100  
 Operating Mode : TM2  
 Antenna polarization : Vertical  
 Test Date : 2024-04-16

## 2.2.4 Test Setup



## 2.2.5 Test Location

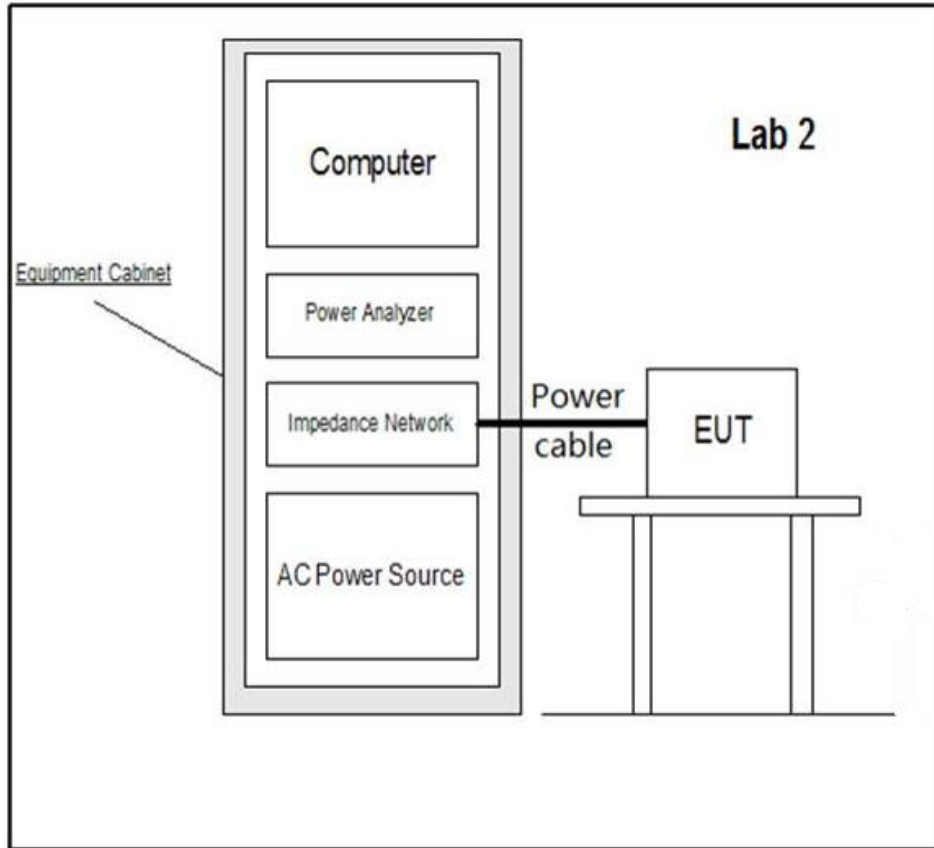
This test was carried out in 3m anechoic chamber.

**2.3 Harmonic current emission**

**2.3.1 Test Method**

Harmonic current test should be conducted with the user's operation control or automatic programs set to the mode expected to produce the maximum total harmonic current under normal operating conditions.

Specific test conditions for the measurement of harmonic currents associated with some types of equipment are given in test equipment list.



**2.3.2 Specification Limits**

Limits for class A Equipment	
Harmonic order n	Maximum permissible harmonic current A
Odd harmonics	
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
$15 \leq n \leq 39$	$0.15(15/n)$
Even harmonics	
2	1.08



Limits for class A Equipment	
4	0.43
6	0.30
$8 \leq n \leq 40$	$0.23(8/n)$

**2.3.3 Test Setup**

N/A

**2.3.4 Test Location**

This test was carried out in Harmonic Flicker Test area.

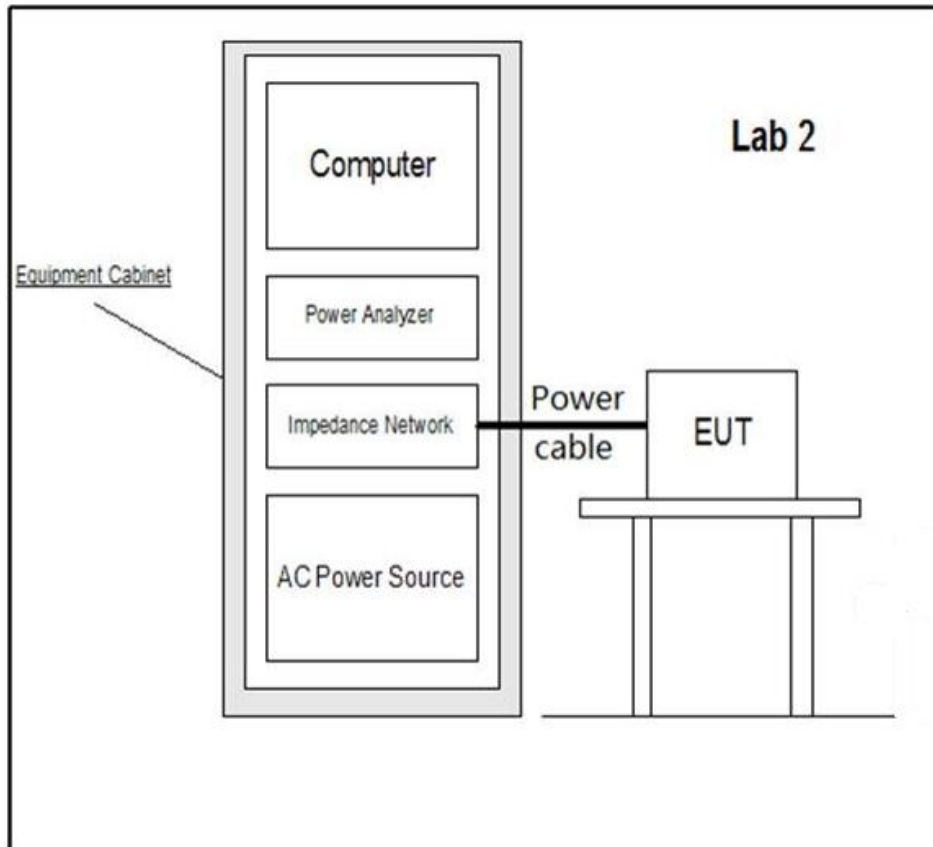
**2.3.5 Test Results**

N/A

## 2.4 Flicker

### 2.4.1 Test Method

Flicker test should be conducted with the user's operation controls or automatic programs set to the mode expected to produce the most unfavourable sequence of voltage change, using only those combinations of controls and programmes which are mentioned by the manufacturer in the instruction manual, or are otherwise likely to be used.



### 2.4.2 Specification Limits

The value of  $P_{st}$  shall not be greater than 1.0

The value of  $P_{lt}$  shall not be greater than 0.65

$T_{max}$ , the accumulated time value of  $d(t)$  with a deviation exceeding 3.3% during a single voltage change at the EUT terminals, shall not exceed 500ms

The maximum relative steady-state voltage change,  $d_c$ , shall not exceed 3.3%

The maximum relative voltage change  $d_{max}$ , shall not exceed

- a) 4% without additional conditions
- b) 6% for equipment which is:
  - Switched manually, or
  - Switched automatically more frequently than twice per day, and also has either a delayed start, or manual restart, after a power supply interruption
- c) 7% for equipment which is:



- Attended whilst in use, or
- Switched on automatically, or is intended to be switched on manually, no more than twice per day, and also has either a delayed restart or manual restart, after a power supply interruption

**2.4.3 Test Setup**

N/A

**2.4.4 Test Location**

This test was carried out in Harmonic Flicker Test area.

**2.4.5 Test Results**

N/A

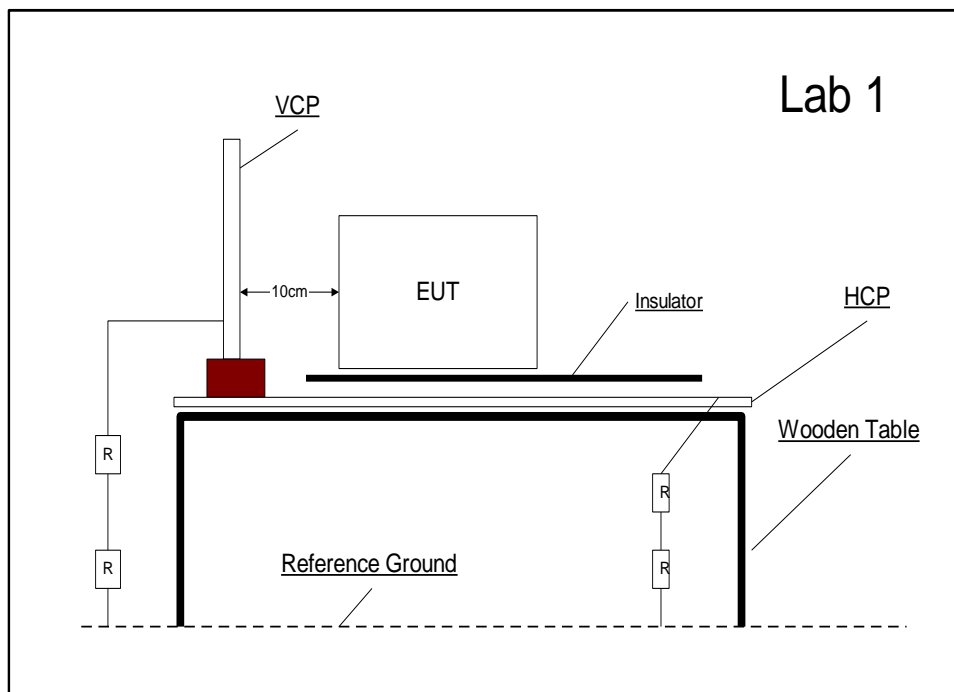
## 2.5 Electrostatic discharge immunity test

### 2.5.1 Test Method

The equipment under test including associated cabling was configured on but insulated from, using a 0.5mm isolator, a horizontal coupling plane fitted to the top of a 0.8 m non-conductive floor for Floor-Stand 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.





**2.5.2 Specification Limits**

Required Test Levels				Performance Criteria
Discharge type	Discharge Level (kV)		Number of discharges per location (each polarity)	
	Positive	Negative		
Air – Direct	8	8	see note 1	B
Contact – Direct	4	4	see note 1	B
Contact – Indirect	4	4	see note 1	B

Supplementary information:  
 Note 1. The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. For Floor-Stand equipment one of the test points shall be the centre front edge of the horizontal coupling plane, which shall be subjected to at least 50 indirect discharges (25 of each polarity).

**2.5.3 Test Results**

Results for Configuration and Mode: TM1&TM2  
 Performance assessment of the EUT made during this test: Pass.  
 Detailed results are shown below.  
 Test date: 2023-09-26

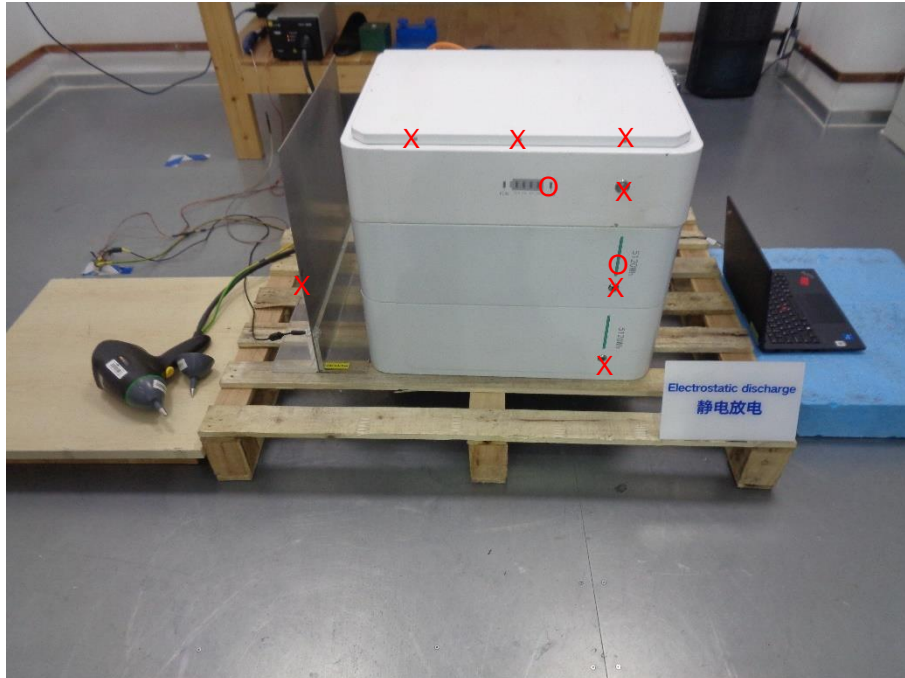
Test Point	Discharge	Results: Met Performance Criteria									
		2kV		4kV		6kV		8kV		15kV	
		+	-	+	-	+	-	+	-	+	-
HCP	Contact	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
VCP	Contact	N/A	N/A	A	A	N/A	N/A	N/A	N/A	N/A	N/A
Each conductive location touchable by hand	Contact	N/A	N/A	A	A	N/A	N/A	N/A	N/A	N/A	N/A
Each nonconductive location touchable by hand	Air	N/A	N/A	N/A	N/A	N/A	N/A	A	A	N/A	N/A
N/A	Not Appliance										

Remark: No observable change.

## 2.5.4 Test Location

This test was carried out in EMS Test Location.

## 2.5.5 Test Setup



X: Contact Discharge, O: Air Discharge

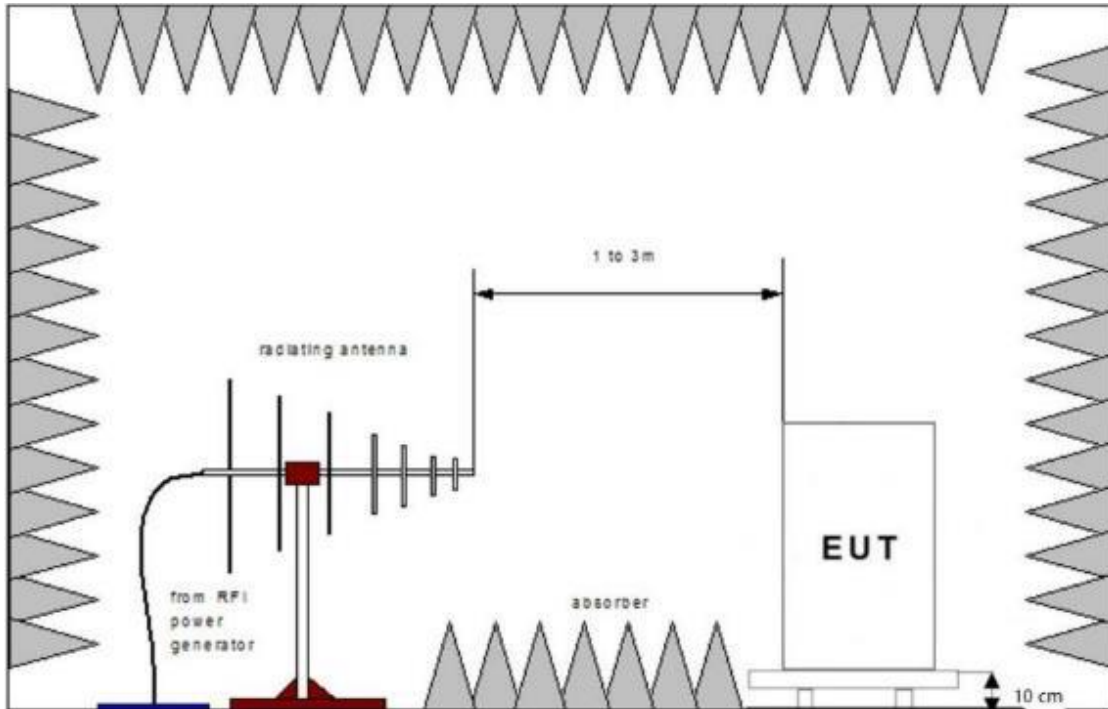
**2.6 Enclosure Port - Radio-frequency electromagnetic field Amplitude modulated**

**2.6.1 Test Method**

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

All four sides 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.



**2.6.2 Specification Limits**

Required Test Levels					Performance Criteria
Frequency Range (MHz)	Level (V/m)	Modulation	Step Size (%)	Dwell (s)	
80 to 1000	10	AM (80 %,1 kHz, sine wave)	1	>=1	A
1400 to 6000	3	AM (80 %,1 kHz, sine wave)	1	>=1	A

**Supplementary information:**  
 Note 1. EUT powered at one of the Nominal input voltages and frequencies

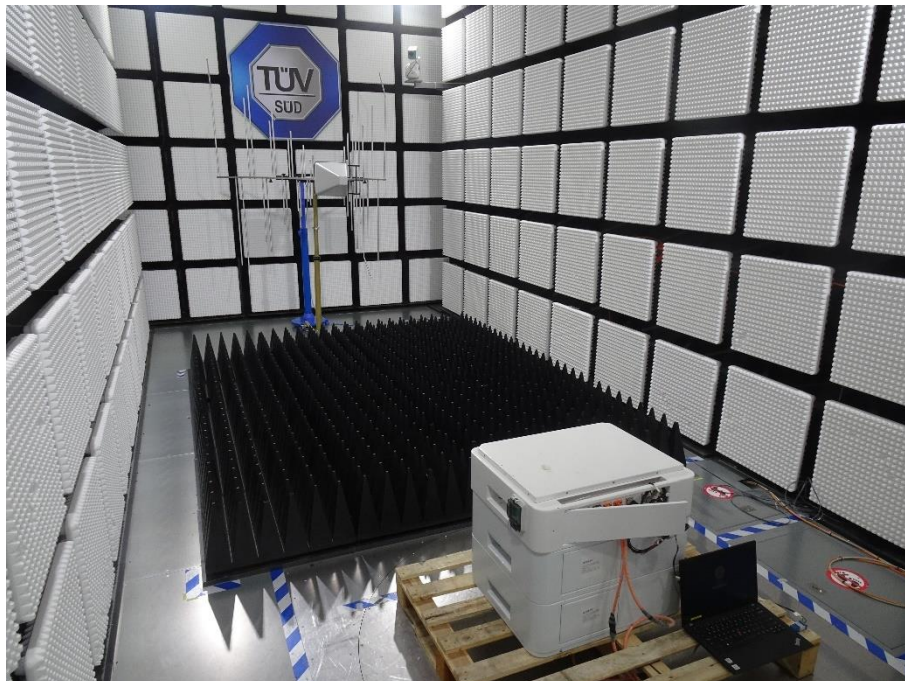
**2.6.3 Test Results**

Results for Configuration and Mode: TM1&TM2  
 Performance assessment of the EUT made during this test: Pass.  
 Detailed results are shown below.  
 Date of Test: 2023-09-26

Tabulated Results for RF Electromagnetic Field 80 - 1000 MHz					
Side of the equipment under test	Antenna polarization	Test Level	Dwell Time	Measuring distance	Results
All sides	Horizontal	10 V/m	1 s	3 m	A
All sides	Vertical	10 V/m	1 s	3 m	A
Tabulated Results for RF Electromagnetic Field 1400 - 6000 MHz					
Side of the equipment under test	Antenna polarization	Test Level	Dwell Time	Measuring distance	Results
All sides	Horizontal	3 V/m	1 s	3 m	A
All sides	Vertical	3 V/m	1 s	3 m	A

Remark: No observable change.

**2.6.4 Test Setup**



**2.6.5 Test Location**

This test was carried out in EMS Test Location.

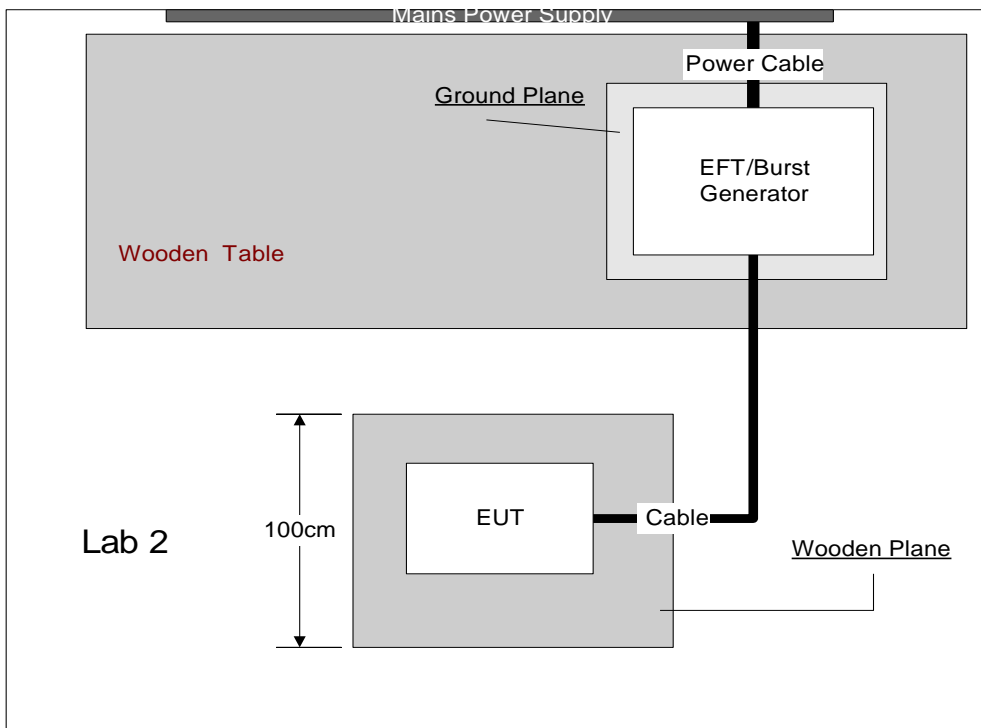
## 2.7 Electrical fast transient /burst immunity test

### 2.7.1 Test Method

The equipment under test including associated cabling was configured on but insulated 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.

Using a CDN for power ports, capacitive coupling clamp for signal and control ports and a 33nF 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.





**2.7.2 Specification Limits**

Required Test Levels Input and output a.c. power ports					Performance Criteria
Line Under Test	Level (kV)	Repetition Rate (kHz)	Test Duration	Coupling Method	
Input and output a.c. power ports	± 2.0	5 kHz	2 min per polarity	Direct	B
For extra low voltage a.c. ports and output a.c. ports, this testing is only applicable to ports interfacing with cables whose total length may exceed 3 m according to the manufacturer's functional specification.					

Required Test Levels ports for DC Power Port					Performance Criteria
Line Under Test	Level (kV)	Repetition Rate (kHz)	Test Duration	Coupling Method	
DC Power port	± 1	5 kHz	2 min per polarity	Direct	B
Not applicable to input ports intended for connection to a battery or a rechargeable battery which shall be removed or disconnected from the equipment for recharging. Equipment with a DC power input port intended for use with a dedicated AC–DC power adaptor shall be tested on the AC power input of the AC–DC power adaptor specified by the manufacturer (see the test level of Table 4). Where no adaptor is specified, the test shall be done on the DC power port using the test level of Table 4. Where an adaptor is specified, the test is applicable to DC power input ports only when intended to be connected permanently to cables longer than 3 m. The test may be performed at one or at both repetition frequencies. The use of 5 kHz repetition frequency is traditional; however, 100 kHz is closer to reality.					

Required Test Levels ports for signal and control lines					Performance Criteria
Line Under Test	Level (kV)	Repetition Rate (kHz)	Test Duration	Coupling Method	
Signal and control lines	± 1	5 kHz	2 min per polarity	Direct	B
Applicable only to ports interfacing with cables whose total length can exceed 3m according to the manufacturer's function specification.					



**2.7.3 Test Results**

Results for Configuration and Mode: N/A  
 Performance assessment of the EUT made during this test: N/A  
 Test date: N/A  
 Remark: N/A  
 Detailed results are shown below.

Tabulated Results for Fast Transient Burst Immunity					
Line under test	Test Level (V/m)	Repetition Rate	Test Duration	Coupling Method	Result
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A

Remark: Length of DC line and signal line <3m.

**2.7.4 Test Setup**

N/A

**2.7.5 Test Location**

This test was carried out in EMS Test Location.

## 2.8 Immunity to conducted disturbances, induced by radio-frequency fields

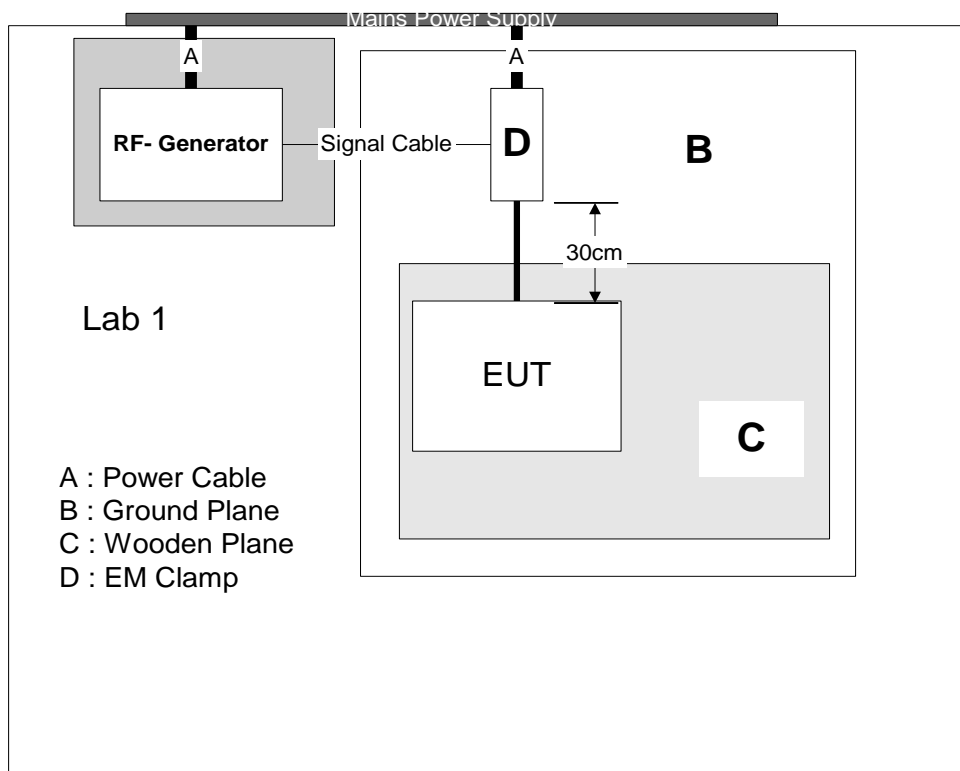
### 2.8.1 Test Method

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

All associated cabling was configured, on but insulated 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.



**2.8.2 Specification Limits**

Required Test Levels Input and output a.c. power ports						Performance Criteria
Line Under Test	Frequency Range (MHz)	Level (V/m)	Modulation	Step Size (%)	Dwell (s)	
Input and output a.c. power ports	0.15 to 80	10	AM (80 %,1 kHz, sine wave)	1	3	A
For extra low voltage a.c ports and output a.c. ports, this testing is only applicable to ports interfacing with cables whose total length may exceed 3 m according to the manufacturer's functional specification.						

Required Test Levels Input and output D.C. power ports						Performance Criteria
Line Under Test	Frequency Range (MHz)	Level (V/m)	Modulation	Step Size (%)	Dwell (s)	
Input and output d.c. power ports	0.15 to 80	10	AM (80 %,1 kHz, sine wave)	1	3	A
For extra low voltage a.c ports and output a.c. ports, this testing is only applicable to ports interfacing with cables whose total length may exceed 3 m according to the manufacturer's functional specification.						

Required Test Levels Ports for signal lines and control lines						Performance Criteria
Line Under Test	Frequency Range (MHz)	Level (V/m)	Modulation	Step Size (%)	Dwell (s)	
Signal and control port	0.15 to 80	10	AM (80 %,1 kHz, sine wave)	1	3	A
Applicable only to ports interfacing with cables whose total length may exceed 3m according to the manufacturer's function specification.						



**2.8.3 Test Results**

Results for Configuration and Mode: N/A  
 Performance assessment of the EUT made during this test: N/A  
 Test date: N/A  
 Remark: N/A  
 Detailed results are shown below.

Tabulated Results for Injected current						
Line and sensitive frequency under test	Test Level	Step	Dwell Time	Coupling Method	Modulation	Result
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Remark: Length of DC line and signal line <3m.

**2.8.4 Test Setup**

N/A

**2.8.5 Test Location**

This test was carried out in EMS Test Location.

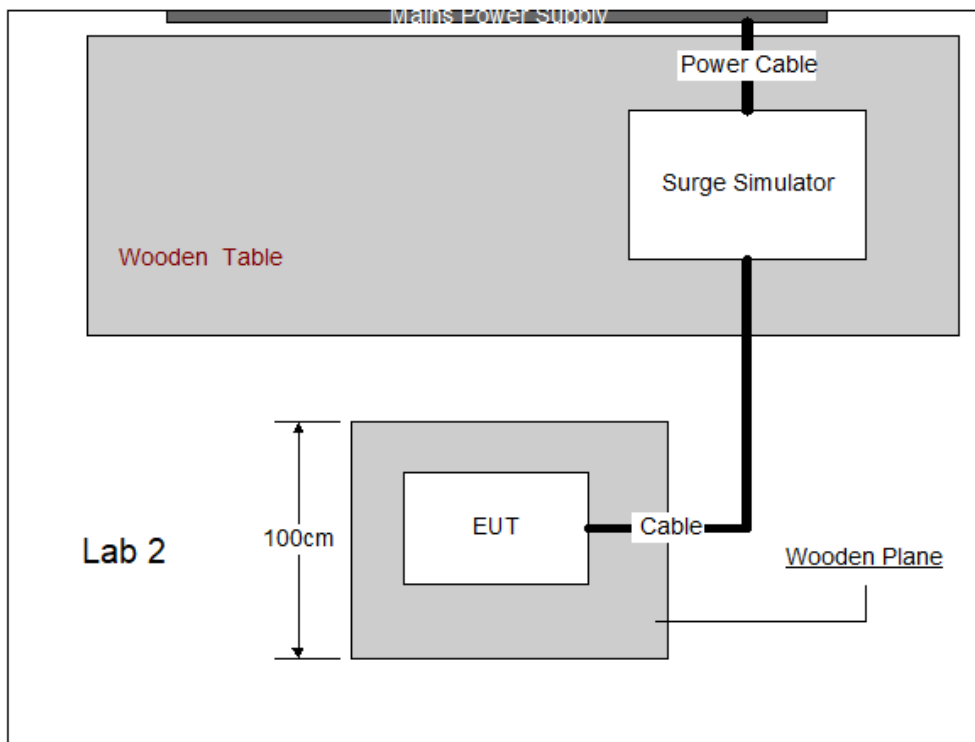
## 2.9 Surge immunity test

### 2.9.1 Test Method

The equipment under test including associated cabling was configured, on 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 CDNs for power ports and appropriate coupling methods for applicable signal and control ports, the required number of surges was applied for each surge voltage level using both positive and negative surge voltage polarities. Surges were applied at the power line frequency phase angles and repartition rates detailed.

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





**2.9.2 Specification Limits**

Required Test Levels Input and output a.c. power ports		
Characteristics	Test Levels	Performance Criteria
Wave-shape data Test levels line to line with 2Ω impedance line to earth with 12Ω impedance	1.2/50 μs ± 1.0 kV ± 2.0 kV	B
Note in addition to the specified test level, all lower levels as detailed in IEC 61000-4-5 should also be satisfied.		

Required Test Levels Input and output d.c. power ports		
Characteristics	Test Levels	Performance Criteria
Wave-shape data Test levels line to line with 2Ω impedance line to earth with 12Ω impedance	1.2/50 μs ± 0.5 kV ±1.0 kV	B
Note in addition to the specified test level, all lower levels as detailed in IEC 61000-4-5 should also be satisfied.		

Required Test Levels Signal ports		
Characteristics	Test Levels	Performance Criteria
Wave-shape data Test levels line to earth with 12Ω impedance	1.2/50 μs ± 1.0 kV	B
Note in addition to the specified test level, all lower levels as detailed in IEC 61000-4-5 should also be satisfied.		



**2.9.3 Test Results**

Results for Configuration and Mode: N/A  
 Performance assessment of the EUT made during this test: N/A  
 Test date: N/A  
 Remark: N/A  
 Detailed results are shown below.

Tabulated Results for Surge Immunity (Power Ports)							
Line Name	Coupling	Level	Polarity	Phase Angle	No of Pulses	Repetition Rate	Result
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Remark: N/A.

**2.9.4 Test Setup**

N/A

**2.9.5 Test Location**

This test was carried out in EMS Test Location.

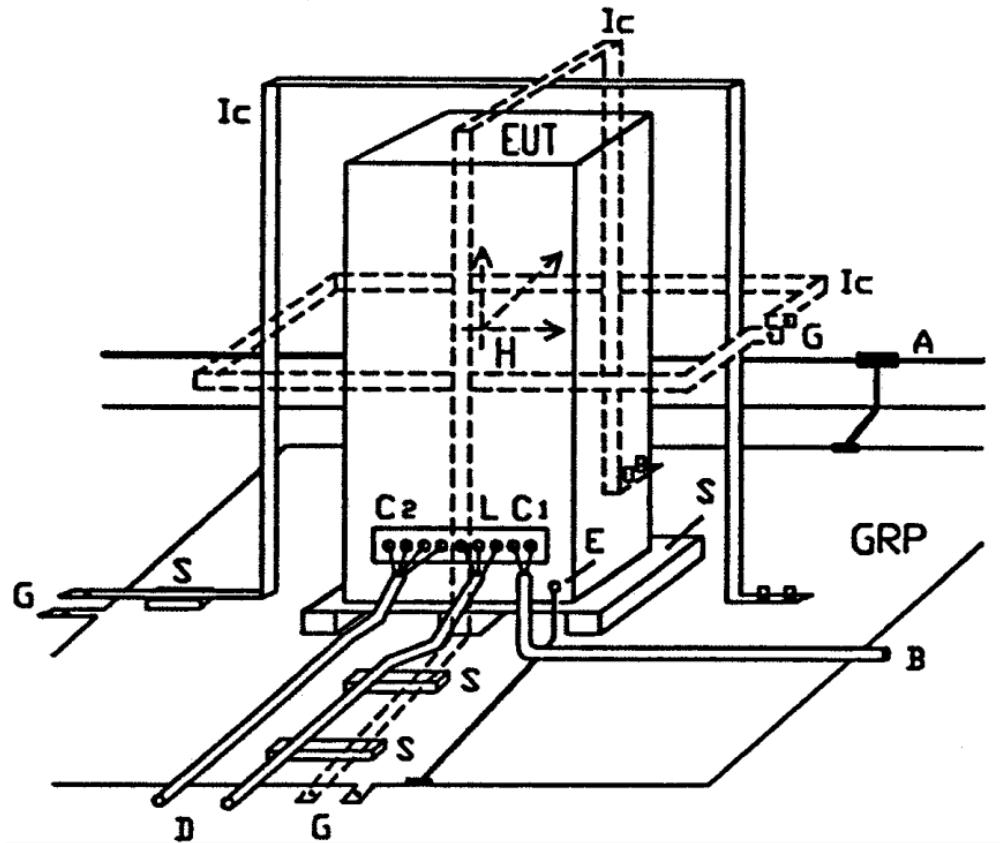
**2.10 Enclosure Port - Power-frequency magnetic field**

**2.10.1 Test Method**

The equipment under test including associated cabling was configured on a non-conductive support at the volumetric center of the immunity coils. A pre calibrated input level was then applied to magnetic immunity coils at the detailed frequency and level for the required test period.

The EUT was retested with the magnetic field applied in all 3 orthogonal planes of the EUT.

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



**2.10.2 Specification Limits**

Required Test Levels			Performance Criteria
Application	Level (A/m)	Duration	
Continuous Field	30	dependent on EUT operating cycle	A
<b>Supplementary information:</b>			
Note 1. EUT powered at one of the Nominal input voltages and frequencies			

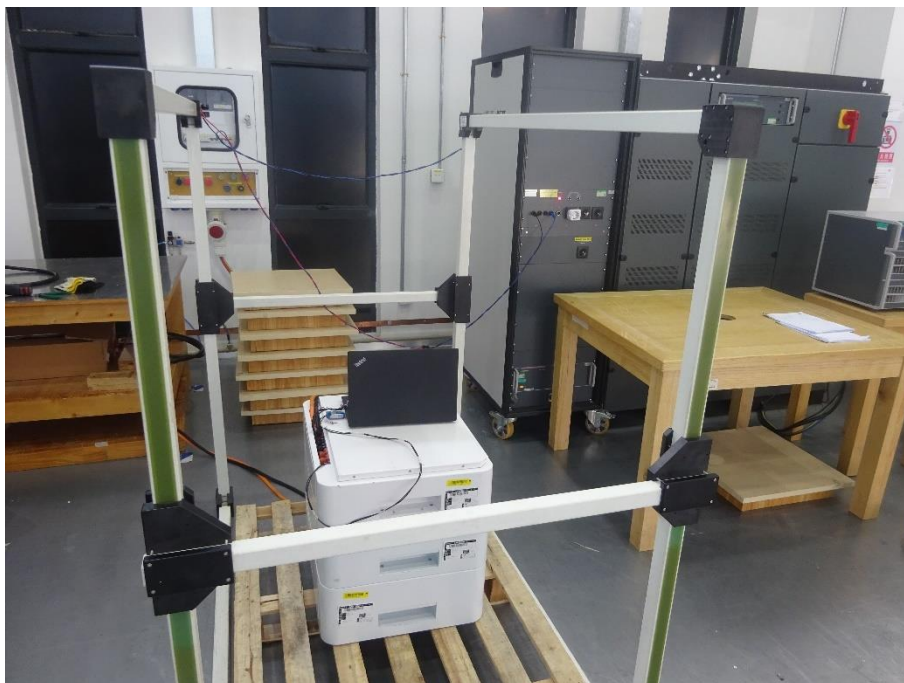
**2.10.3 Test Results**

Results for Configuration and Mode: TM1&TM2  
 Performance assessment of the EUT made during this test: Pass.  
 Date of Test: 2023-09-26

Tabulated Results for Power Frequency Magnetic Immunity			
Orientation	Test Level	Duration	Result
X axis	30 A/m	1 min	A
Y axis	30 A/m	1 min	A
Z axis	30 A/m	1 min	A

Remark: No observable change.

**2.10.4 Test Setup**



**2.10.5 Test Location**

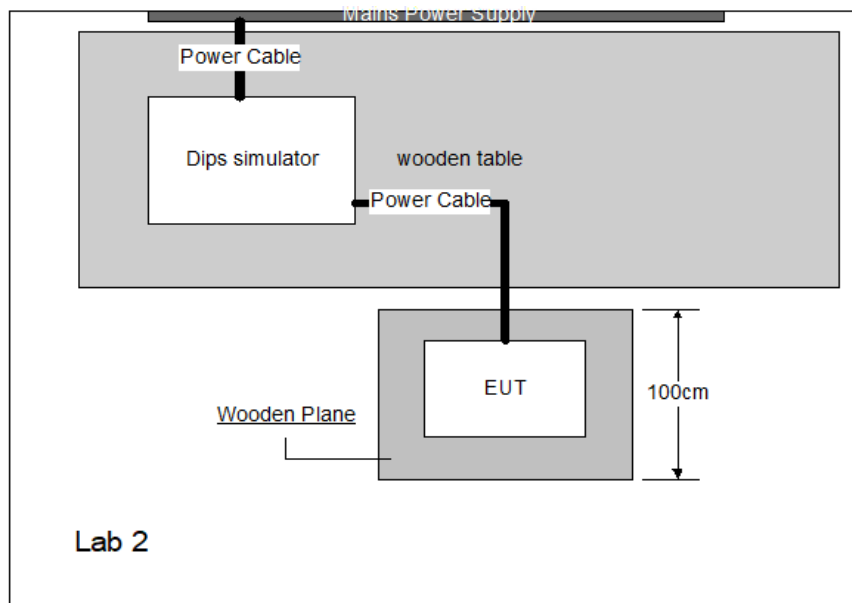
This test was carried out in EMS Test Location.

**2.11 Voltage dips, short interruptions and voltage variations immunity tests**

**2.11.1 Test Method**

The equipment under test including associated cabling was configured, on 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 programmable power supply the equipment under test was subjected to the detailed supply voltage dips and interruptions. The required supply phase synchronization and test repetition rate, detailed, was controlled by the programmable power supply. During this testing any anomalies in the equipment under tests performance was recorded.





**2.11.2 Specification Limits**

Voltage Dips				
Voltage Dips in % UT	Test level in % UT	Duration		Performance Criteria
		50Hz	60Hz	
100	0	1 cycle	1 cycle	B
60	40	10 cycles	12 cycles	C
30	70	25 cycles	30 cycles	C
100	0	250 cycles	300 cycles	C

UT is the rated voltage of the Equipment Under Test

**2.11.3 Test Results**

Results for Configuration and Mode: N/A  
 Performance assessment of the EUT made during this test: N/A  
 Remark: N/A  
 Detailed results are shown below.

Tabulated Results for Voltage Dip and Short Interruption					
Line under test	Vnom	Operating Frequency	Test Level	Duration	Results
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A

Remark: N/A.

**2.11.4 Test Setup**

N/A

**2.11.5 Test Location**

This test was carried out in EMS Test Location.

### 3 Test Equipment Information

#### Radiated Emission Test (SAC-3 area)

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	64-2-63-20-003	101702	1	2024-05-08
EMI Test Receiver	Rohde & Schwarz	ESR 7	64-2-63-20-001	102241	1	2024-11-09
EMI Test Receiver	Rohde & Schwarz	ESR 7	64-2-63-20-002	102240	1	2024-11-09
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9162	64-2-62-20-003	00340	1	2025-02-22
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9162	64-2-62-22-011	00562	1	2024-10-16
Active Loop Antenna	Schwarzbeck	FMZB 1513-60	64-2-62-21-012	00041	1	2024-11-21
Pre-amplifier	Rohde & Schwarz	SCU08F1	64-2-28-20-010	101016	1	2024-11-06
Pre-amplifier	Rohde & Schwarz	SCU08F2	64-2-28-20-005	100742	1	2024-11-06
Pre-amplifier	Rohde & Schwarz	SCU18F	64-2-28-20-011	100759	1	2024-11-06
Pre-amplifier	PHX	BP-01G-18G	64-2-28-22-013	BP230021	1	2024-01-02
Circular magnetic loop	Schwarzbeck	FESP 5133-7/41	64-2-62-21-002	412	1	2025-04-10
Coupling/Decoupling Network	EM TEST	CDNE M310	64-2-60-23-017	65995	1	2024-06-26
Coupling/Decoupling Network	EM TEST	CDNE M310	64-2-60-23-018	65996	1	2024-06-26
Coupling/Decoupling Network	EM TEST	CDNE M210	64-2-60-23-019	65806	1	2024-06-26
Coupling/Decoupling Network	EM TEST	CDNE M210	64-2-60-23-020	65804	1	2024-06-26
PV-DC LISN	SCHWARZBECK	8300	64-2-60-22-002	8300-00270	1	2024-09-27
LISN	SCHWARZBECK	NSLK8163	64-2-60-20-006	05018	1	2024-08-28
Testing Software	R&S	EMC32 (Version: 10.60.20)	64-2-26-20-006	N/A	1	N/A
3m Semi-anechoic chamber	TDK	SAC-3	64-2-90-20-004	N/A	1	2026-09-05

#### Electrostatic Discharge Test (ESD area)

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
ESD Generator	EMTEST	ESD NX30	64-2-75-20-009	23124	1	2024-08-31
ESD Generator	EMTEST	ESD NX30	64-2-75-23-002	P2312274354	1	2024-06-07



### Radiated Immunity Test (CAC-3 area)

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
Signal Generator	Rohde & Schwarz	SMB100B	64-2-64-20-001	101903	1	2024-11-06
Power Amplifier	Rohde & Schwarz	BBA150-BC500	64-2-28-20-002	104061	1	2024-11-06
Power Amplifier	Rohde & Schwarz	BBA150-D110E100	64-2-28-20-003	104048	1	2024-11-06
Microwave Log-Periodic Antenna	Schwarzbeck	STLP9129 SET	64-2-62-20-002	3074	1	N/A
Average Power Sensor	Rohde & Schwarz	NRP6AN	64-2-32-20-001	101424	1	2024-11-06
Average Power Sensor	Rohde & Schwarz	NRP6AN	64-2-32-20-002	101425	1	2024-11-06
Testing Software	R&S	EMC32 (Version: 10.60.20)	64-2-26-20-003	N/A	1	N/A
3m FAC Chamber	TDK	CAC-3	64-2-90-20-003	--	1	2026-09-04

### Power-frequency magnetic field Test (EMS area)

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL. DATE	CAL. DUE DATE
Multifunctional threephase voltage source	EMTEST	NetWave 67.3-400	64-2-09-20-011	P2009239095	2023-11-10	2024-11-09
Helmholtz Coils	Schwarzbeck	HHS 5215-100	64-2-62-20-011	HHS 5215-100 #111	2023-11-10	2024-11-09
Testing Software	EMTEST	Net.Control (Version: 3.2.5)	64-2-09-20-011-A01	N/A	N/A	N/A
magnetic field coil	EMTEST	MS 100N	64-2-62-20-012	P2007238680	2023-11-10	2024-11-09
Current Transformer	EMTEST	MFT 30	64-2-62-20-012-A001	P2142257128	2023-11-10	2024-11-09
Current Transformer	EMTEST	MFT 100-230	64-2-62-20-012-A002	P2236267172	2023-11-10	2024-11-09
Programmable AC power supply	SophPower	SFC-360	64-2-09-22-005	635913	2023-12-13	2024-12-12
Multipurpose power supply	Kikusui	PCR6000LA	64-2-09-08-002	MG002890	2023-11-23	2024-11-22



## 4 Measurement Uncertainty

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

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz	Horizontal: $\pm 4.96\text{dB}$ ; Vertical: $\pm 6.16\text{dB}$ ;
Uncertainty for Radiated Emission in 3m chamber 1000MHz-6000MHz	$\pm 5.12\text{dB}$ ;
Uncertainty for Conducted Emission 9kHz-150kHz	$\pm 3.26\text{dB}$
Uncertainty for Conducted Emission 150kHz-30MHz	$\pm 3.22\text{dB}$
Uncertainty for Conducted Emission in shielding room 9kHz-30MHz (for test using RF Current Clamp EZ-17)	$\pm 2.84\text{dB}$ $\pm 24.64\text{dB}$ ( considering the effect of AE impedance )
Uncertainty for Conducted Emission in shielding room 9kHz-30MHz (for test using High Voltage Probe TK9420(VT9420))	$\pm 2.68\text{dB}$ $\pm 24.62\text{dB}$ ( considering the effect of mains impedance when compared with AMN )
Uncertainty for Radiated Electromagnetic Disturbance 9kHz-30MHz	3.20dB
Uncertainty for Harmonic test	3.16%
Uncertainty for Flicker test	4.69%
Uncertainty for RS test	2.08dB, K=2
Uncertainty for CS test	28.0% (CDN), 45.0% (EM Clamp) K=2
Uncertainty for ESD test	The immunity measurement system uncertainty is within standard requirement and is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.
Uncertainty for EFT test	
Uncertainty for Surges test	
Uncertainty for PFMF test	
Uncertainty for Voltage Dips, Voltage Variations and Short Interruptions Test	

### Measurement Uncertainty Decision Rule

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2023, clause 4.3.3

## 5 Photographs

Details of: General view, JEEDD-104100



Details of: General view, JEEDD-104100



Details of: General view, JEEDD-104100



Details of: General view, JEEDD-104100



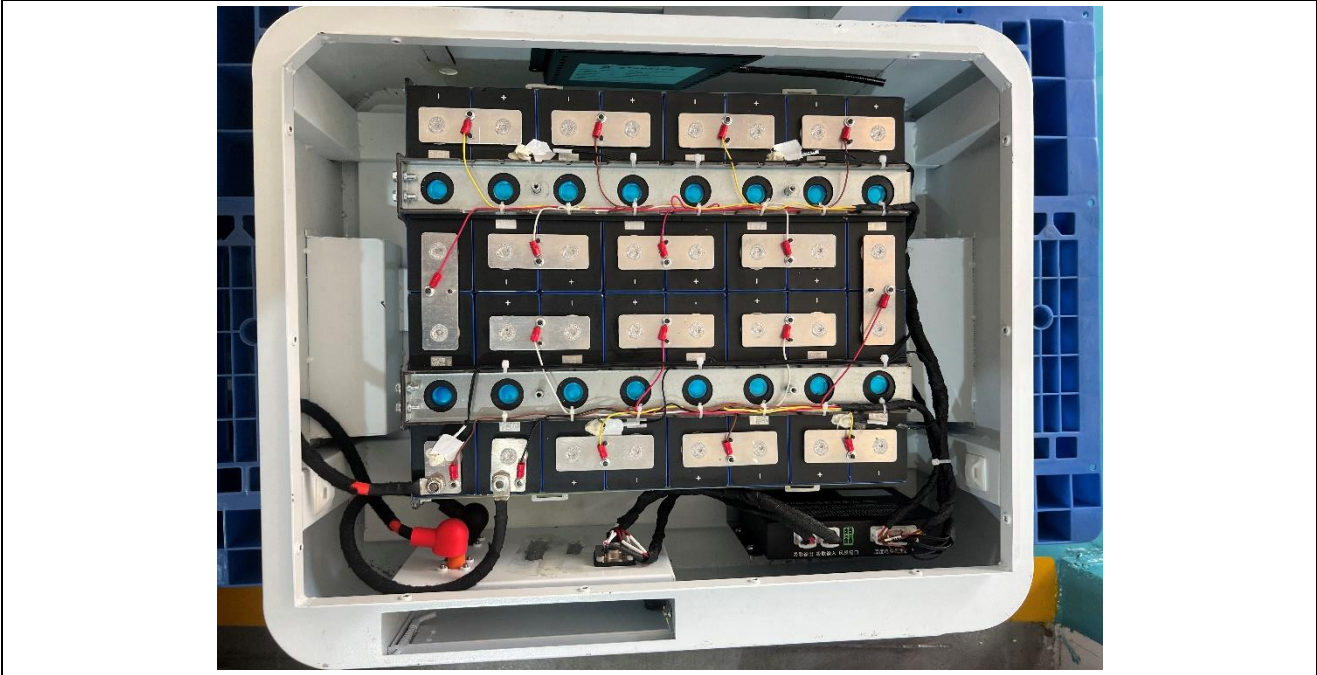
Details of: General view, JEEDD-104100



Details of: General view, JEEDD-104100



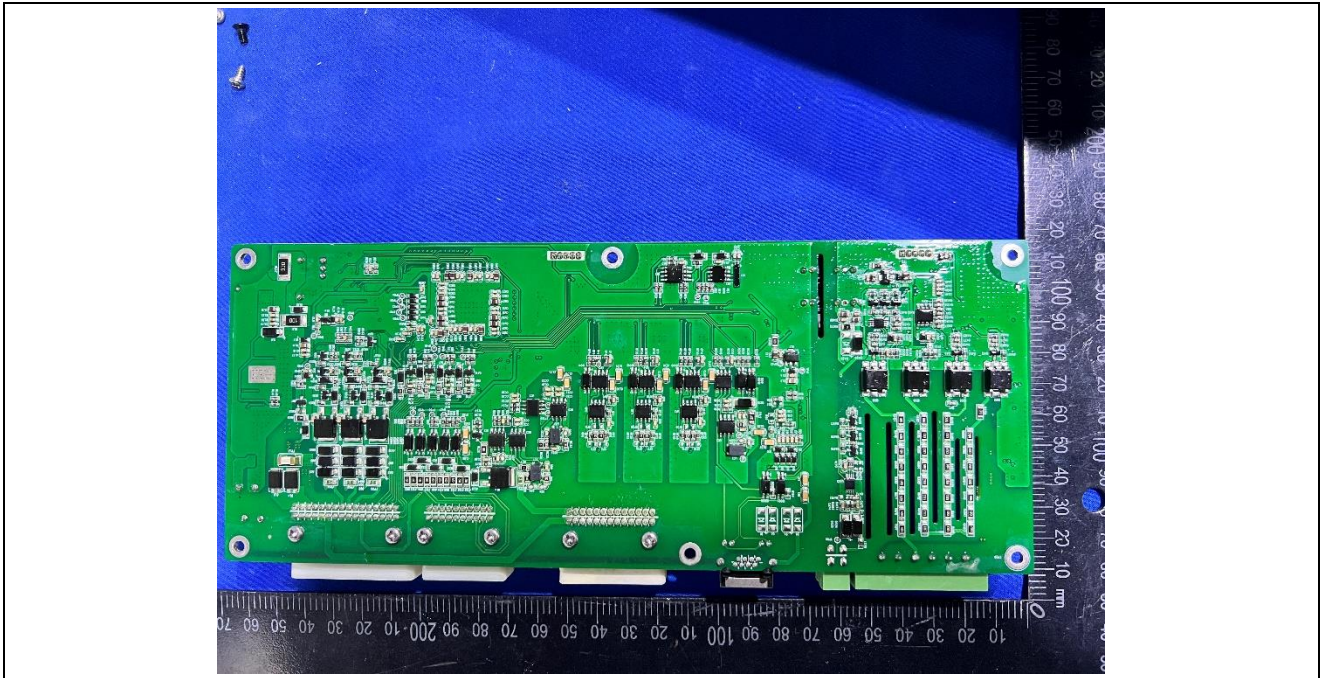
Details of: Internal view, JEEDD-104100



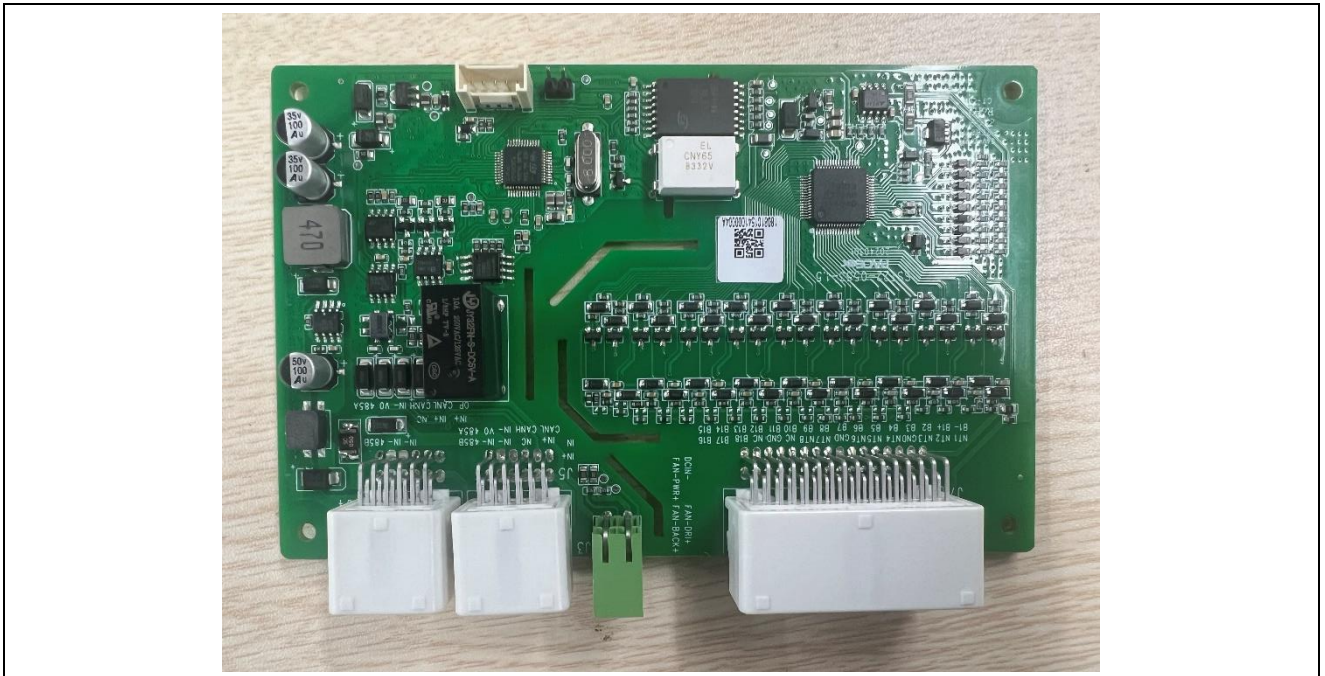
Details of: PCB view, control box



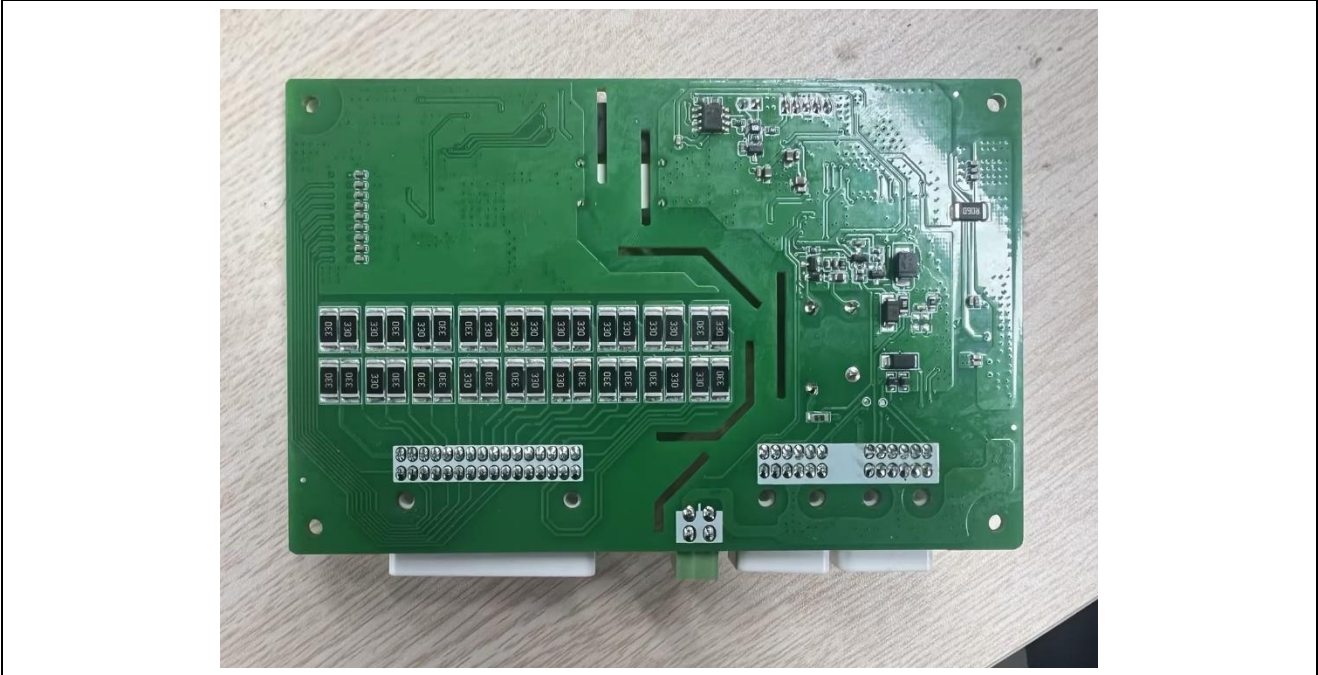
Details of: PCB view, control box



Details of: PCB view, battery module



Details of: PCB view, battery module



---END---