

TEST REPORT

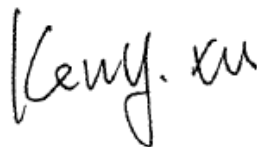
Application No.: SZEM2302000767AT
Applicant: NINGBO DEYE ESS TECHNOLOGY CO., LTD
Address of Applicant: No.18, Zhenlong 2 Road, Binhai Economic Development Zone, Cixi, Ningbo, Zhejiang, China
Manufacturer: NINGBO DEYE ESS TECHNOLOGY CO., LTD
Address of Manufacturer: No.18, Zhenlong 2 Road, Binhai Economic Development Zone, Cixi, Ningbo, Zhejiang, China
Factory: NINGBO DEYE ESS TECHNOLOGY CO., LTD
Address of Factory: No.18, Zhenlong 2 Road, Binhai Economic Development Zone, Cixi, Ningbo, Zhejiang, China

Equipment Under Test (EUT):
EUT Name: Rechargeable Li-ion Battery System
Model No.: AI-W5.1
Trade Mark: Deye
Standard(s) : EN IEC 61000-6-3: 2021
EN IEC 61000-6-1: 2019

Date of Receipt: 2023-02-15
Date of Test: 2023-02-21
Date of Issue: 2023-02-28

Test Result:	Pass*
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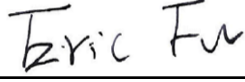
* In the configuration tested, the EUT complied with the standards specified above.



Keny Xu
EMC Laboratory Manager



Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2023-02-28		Original

Authorized for issue by:				
				
		Foray Chen/Project Engineer		
				
		Eric Fu/Reviewer		



2 Test Summary

Emission Part				
Item	Standard	Method	Requirement	Result
Radiated Emissions (30MHz-1GHz)	EN IEC 61000-6-3: 2021	CISPR 16-2-3	Table 3.1	Pass
Radiated Emissions (Above 1GHz)		CISPR 16-2-3	Table 3.4	Pass

Immunity Part				
Item	Standard	Method	Requirement	Result
Electrostatic Discharge	EN IEC 61000-6-1: 2019	EN 61000-4-2:2009	±4kV Contact Discharge, ±8kV Air Discharge	Pass
Radiated Immunity (80MHz-6GHz)		EN IEC 61000-4-3: 2020	3V/m, 80%, 1kHz Amp. Mod.	Pass



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4 General Information

4.1 Details of E.U.T.

Power supply:	Nominal voltage: DC51.2V Capacity: 100Ah Operating voltage: DC43.2V-57.6V Energy: 10.24KW
Cable(s):	DC Power cable: 1.5m unshielded RJ45 communication cable: 1.5m unshielded

Remark: The information in this section is provided by the applicant or manufacturer, SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
DC power supply	Chroma	62012P-80-60	REF. No.SEA27C00
Load Resistor	SGS	N/A	REF. No.SEA06A00
Laptop	Lenovo	T14	REF. No.SEA18F01A
BMS COM Tool	AITAI	USBCAN-I	N/A

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Radiated Emissions (30MHz-1GHz)	± 5.5dB
Radiated Emissions (Above 1GHz)	± 4.7dB
Electrostatic Discharge	± 6%
Radiated Immunity (80MHz-6GHz)	± 2.1dB

Remark:

The U_{lab} (lab Uncertainty) is less than $U_{CISPR/ETSI}$ (CISPR/ETSI Uncertainty), so the test results

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.



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4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

4.5 Test Facility

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

• **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• **VCCI (Member No. 1937)**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen EMC laboratory have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• **Innovation, Science and Economic Development Canada**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

4.8 EMS Monitor

Visual: Monitored the indicator light, communication status and voltage of the EUT

Audio: None



5 Equipment List

Radiated Emissions (30MHz-1GHz)					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2020-07-19	2023-07-18
MXE EMI Receiver	Agilent Technologies	N9038A	SEM004-15	2022-10-20	2023-10-19
BiConiLog Antenna	ETS-LINDGREN	3142C	SEM003-01	2021-09-17	2023-09-16
Pre-Amplifier	Agilent Technologies	8447D	SEM005-01	2022-03-22	2023-03-21
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2022-07-08	2023-07-07

Radiated Emissions (Above 1GHz)					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2022-04-02	2025-04-01
Signal Analyzer	Rohde & Schwarz	FSV40	SEM008-04	2022-03-23	2023-03-22
Horn Antenna	Rohde&Schwarz	HF907	SEM003-07	2022-07-24	2024-07-23
Microwave system amplifier	Agilent	83017A	SEM005-25	2022-09-21	2023-09-20
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2022-07-08	2023-07-07

Electrostatic Discharge					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
ESD Generator	TESEQ AG	NSG 437	SEM019-02	2022-03-25	2023-03-24



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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZEM230200076701

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Radiated Immunity (80MHz-6GHz)					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Fully-Anechoic Chamber 2	Chang Zhou Zhong Shuo	854	SEM001-05	2020-07-19	2023-07-18
Power Sensor	Rohde & Schwarz	NRP-Z91	SEM009-09	2022-03-23	2023-03-22
Stacked Log.-Per.- Broadband Antenna	Schwarzbeck	STLP 9129	SEM003-25	N/A	N/A
Signal Generator	Rohde & Schwarz	SMB100A	SEM006-11	2022-03-22	2023-03-21
Broadband Amplifier	Rohde & Schwarz	BBA150- BC250	SEM005-12	2022-09-21	2023-09-20
Broadband Amplifier	Rohde & Schwarz	BBA150-D110	SEM005-13	2022-03-23	2023-03-22
Broadband Amplifier	Rohde & Schwarz	BBA150-E60	SEM005-16	2022-04-24	2023-04-23
Measurement Software	Rohde & Schwarz	EMC32 V9.25.00	N/A	N/A	N/A

General used equipment					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2022-09-04	2023-09-03
Humidity/ Temperature Indicator	Anymetre	TH101B	SEM002-09	2022-09-04	2023-09-03
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2022-03-28	2023-03-27



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6 Emission Test Results

6.1 Radiated Emissions (30MHz-1GHz)

Test Requirement: EN IEC 61000-6-3: 2021

Test Method: CISPR 16-2-3

Measurement Distance: 3m

Limit:

FREQUENCY (MHz)	dBuV/m (At 10m)	dBuV/m (At 3m)
	Class B	Class B
30 ~ 230	30	40
230 ~ 1000	37	47
Detector: Peak for pre-scan (120kHz resolution bandwidth) 30M to 1000MHz		

6.1.1 E.U.T. Operation

Operating Environment:

Temperature: 20.2 °C

Humidity: 45.2 % RH

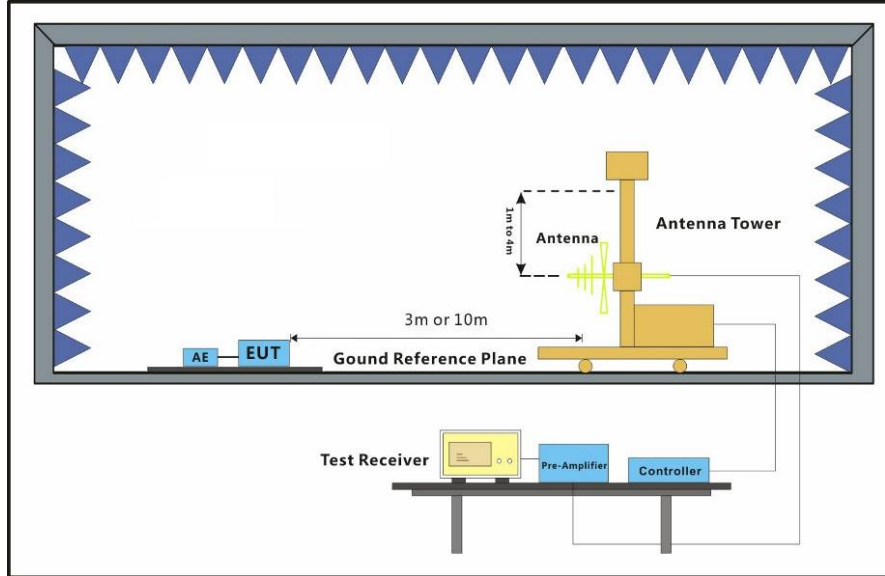
Atmospheric Pressure: 1015 mbar

6.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	Charge mode, keep EUT being charged with DC source and keeping communication via CAN/RS485.
Final test	01	Discharge mode, keep EUT discharging to the full load resistor and keeping communication via CAN/RS485.



6.1.3 Test Setup Diagram



6.1.4 Measurement Procedure and Data

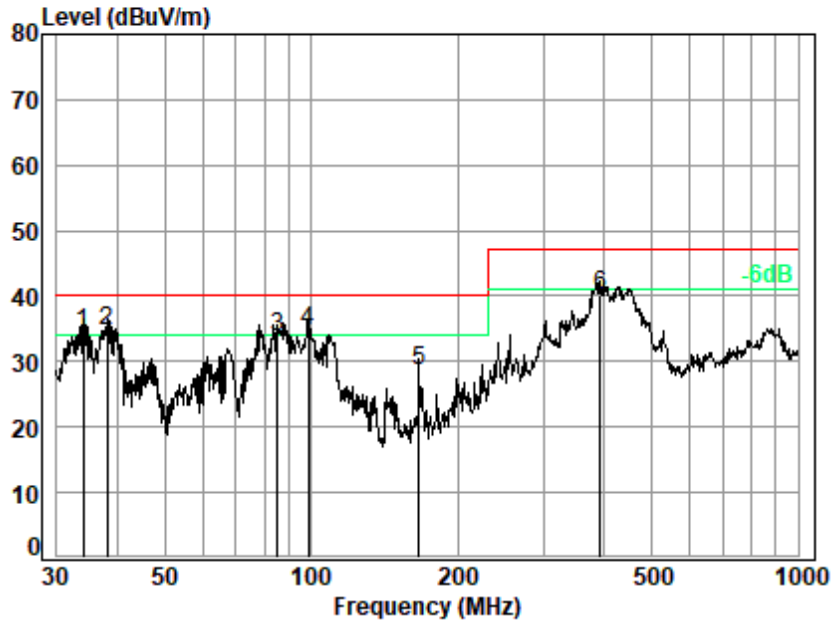
Frequency range: 30MHz-1GHz

An initial pre-scan was performed in the chamber using the spectrum analyser in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by BiConiLog antenna with 2 orthogonal polarities. The red line show in graphic is the limit in standard used in this section.

Level=Read Level + Antenna Factor + Cable Loss - Preamp Factor



Test Mode: 00; Polarity: Horizontal



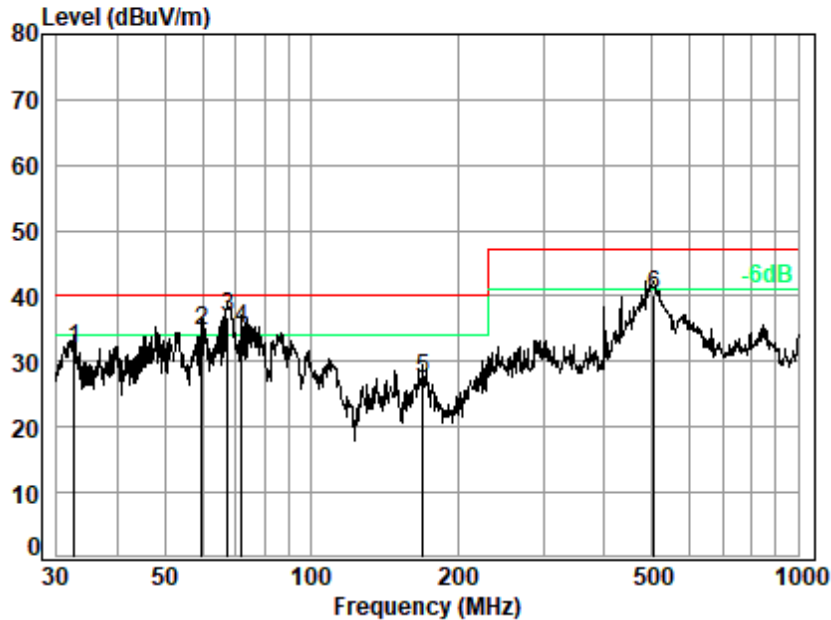
Site : chamber
 Condition: 3m HORIZONTAL
 Job No. : 00767AT
 Test Mode: 00

	Ant	Cable	Preamp	Read	Limit	Over		
Freq	Factor	Loss	Factor	Level	Level	Line	Limit	Remark
MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1	34.04	19.55	0.80	27.49	41.50	34.36	40.00	-5.64 QP
2	38.08	16.74	0.80	27.48	44.49	34.55	40.00	-5.45 QP
3	85.30	11.34	1.40	27.41	48.34	33.67	40.00	-6.33 QP
4 q	98.49	12.95	1.66	27.40	47.42	34.63	40.00	-5.37 QP
5	166.07	13.83	1.99	27.08	39.80	28.54	40.00	-11.46 QP
6	392.10	21.51	2.48	27.16	43.47	40.30	47.00	-6.70 QP



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Test Mode: 00; Polarity: Vertical



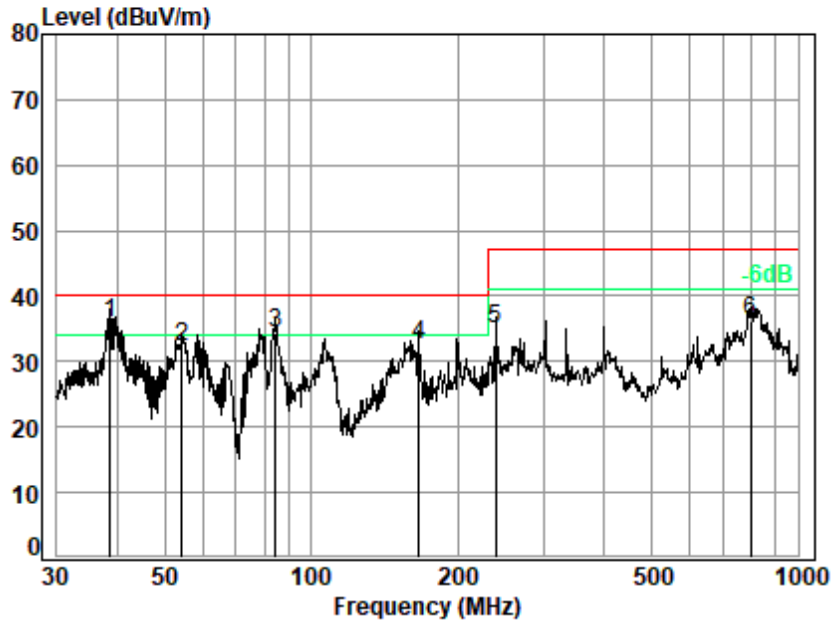
Site : chamber
 Condition: 3m VERTICAL
 Job No. : 00767AT
 Test Mode: 00

	Ant	Cable	Preamp	Read	Limit	Over		
Freq	Factor	Loss	Factor	Level	Level	Line	Limit	Remark
MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1	32.52	20.21	0.80	27.50	38.50	32.01	40.00	-7.99 QP
2	59.44	11.38	1.09	27.45	49.63	34.65	40.00	-5.35 QP
3 q	67.44	10.46	1.18	27.43	52.60	36.81	40.00	-3.19 QP
4	72.08	10.31	1.24	27.43	50.98	35.10	40.00	-4.90 QP
5	169.60	14.05	2.00	27.06	38.50	27.49	40.00	-12.51 QP
6	506.48	23.34	2.61	27.61	41.89	40.23	47.00	-6.77 QP



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Test Mode: 01; Polarity: Horizontal



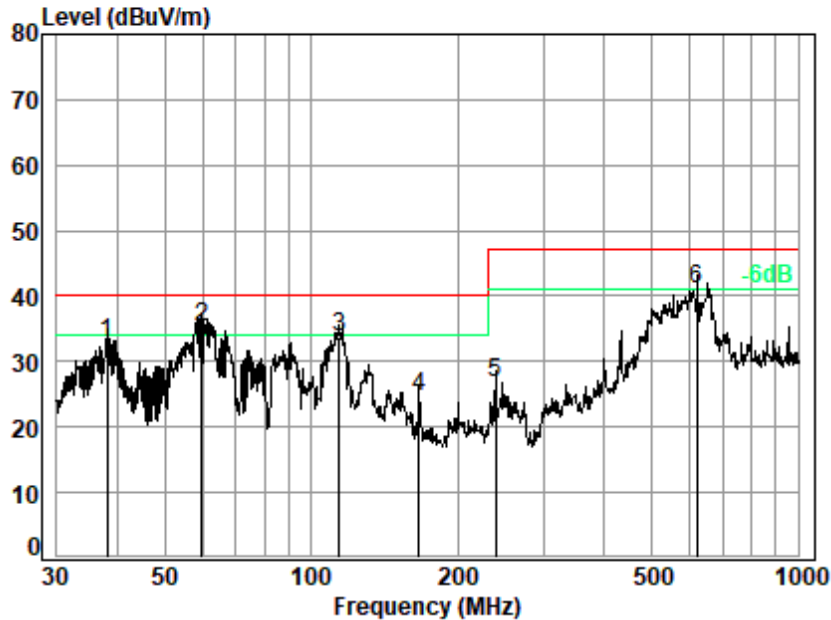
Site : chamber
 Condition: 3m HORIZONTAL
 Job No. : 00767AT
 Test Mode: 01

	Ant	Cable	Preamp	Read	Limit	Over		
Freq	Factor	Loss	Factor	Level	Level	Line	Limit	Remark
MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1 q	38.62	16.19	0.80	27.48	46.43	35.94	40.00	-4.06 QP
2	54.26	12.09	0.99	27.45	46.58	32.21	40.00	-7.79 QP
3	84.41	11.20	1.40	27.41	49.18	34.37	40.00	-5.63 QP
4	166.65	13.83	1.99	27.07	43.82	32.57	40.00	-7.43 QP
5	239.15	17.78	2.14	26.84	41.86	34.94	47.00	-12.06 QP
6	798.98	26.96	3.50	27.50	33.28	36.24	47.00	-10.76 QP



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Test Mode: 01; Polarity: Vertical



Site : chamber
 Condition: 3m VERTICAL
 Job No. : 00767AT
 Test Mode: 01

	Ant	Cable	Preamp	Read	Limit	Over		
Freq	Factor	Loss	Factor	Level	Level	Line	Limit	Remark
MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1	38.08	16.74	0.80	27.48	42.86	32.92	40.00	-7.08 QP
2 q	59.44	11.38	1.09	27.45	50.12	35.14	40.00	-4.86 QP
3	114.11	12.21	1.78	27.32	47.00	33.67	40.00	-6.33 QP
4	166.65	13.83	1.99	27.07	35.78	24.53	40.00	-15.47 QP
5	239.15	17.78	2.14	26.84	33.62	26.70	47.00	-20.30 QP
6	620.71	25.71	2.81	27.85	40.38	41.05	47.00	-5.95 QP



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6.2 Radiated Emissions (Above 1GHz)

Test Requirement: EN IEC 61000-6-3: 2021

Test Method: CISPR 16-2-3

Measurement Distance: 3m

Limit:

Frequency range (MHz)	Radiated emissions limit(dBμV/m)	
	Peak	Average
1000-3000	70	50
3000-6000	74	54

Detector: Peak for pre-scan (1MHz resolution bandwidth) 1GHz to 6GHz

6.2.1 E.U.T. Operation

Operating Environment:

Temperature: 19.5 °C

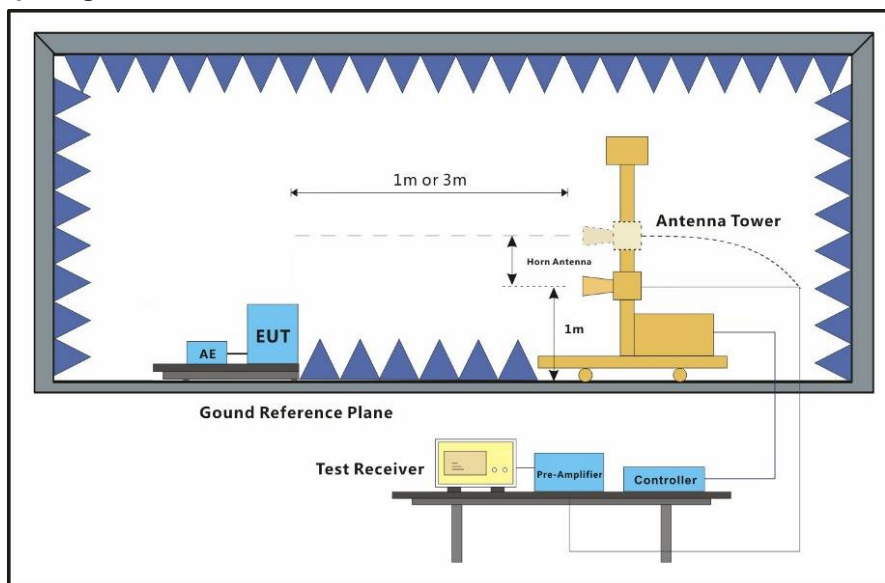
Humidity: 56.2 % RH

Atmospheric Pressure: 1015 mbar

6.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	Charge mode, keep EUT being charged with DC source and keeping communication via CAN/RS485.
Final test	01	Discharge mode, keep EUT discharging to the full load resistor and keeping communication via CAN/RS485.

6.2.3 Test Setup Diagram



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6.2.4 Measurement Procedure and Data

Frequency range: Above 1GHz

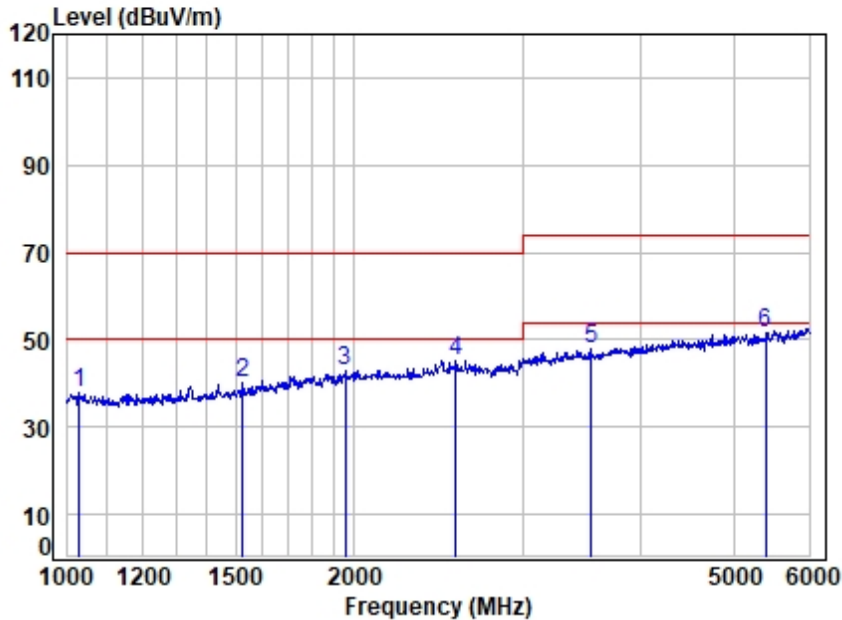
An initial pre-scan was performed in the chamber using the spectrum analyser in peak detection mode. Average measurements were conducted based on the peak sweep graph. The red line show in graphic is the limit in standard used in this section.

The EUT was measured by Horn antenna with 2 orthogonal polarities.

Level=Read Level + Antenna Factor + Cable Loss - Preamp Factor



Test Mode: 00; Polarity: Vertical



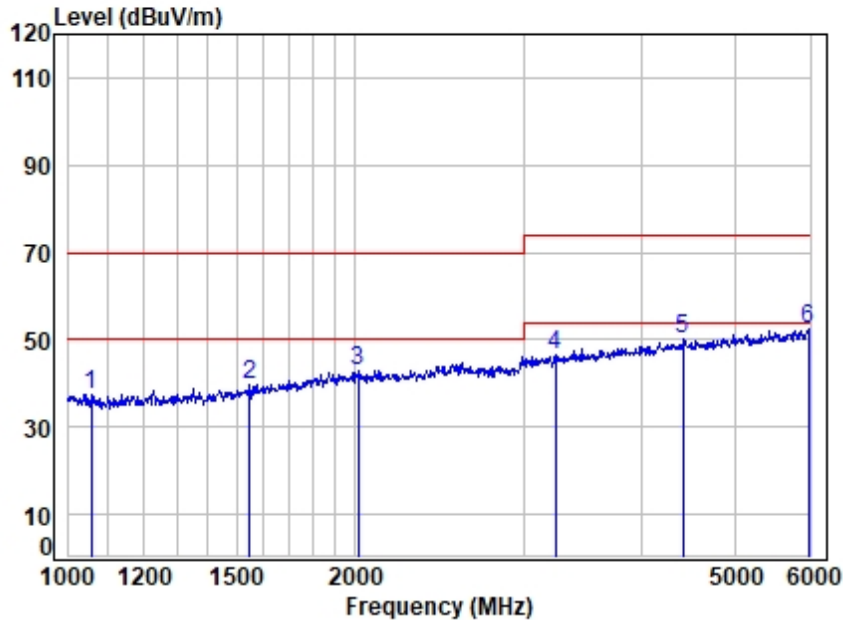
Site : chamber
 Condition: 3m VERTICAL
 Job No : 00767AT
 Mode : 00

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1027.241	2.49	24.67	38.01	48.88	38.03	70.00	-31.97	Peak
2	1526.313	3.28	25.67	36.46	47.50	39.99	70.00	-30.01	Peak
3	1957.973	3.77	27.76	35.48	46.65	42.70	70.00	-27.30	Peak
4	2557.121	4.42	29.51	35.13	46.29	45.09	70.00	-24.91	Peak
5	3543.030	5.66	31.80	34.79	45.02	47.69	74.00	-26.31	Peak
6	5407.773	7.62	34.52	34.48	43.90	51.56	74.00	-22.44	Peak



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Test Mode: 00; Polarity: Horizontal



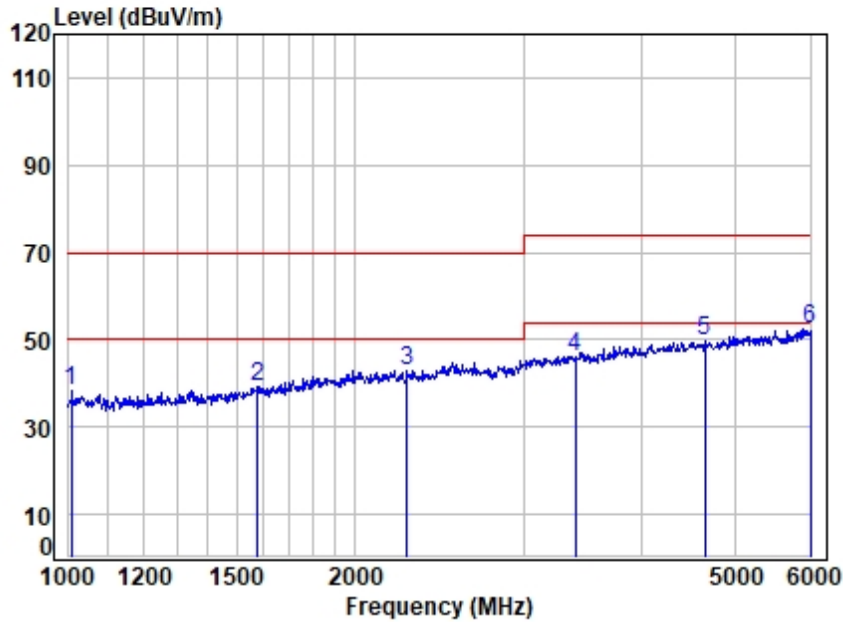
Site : chamber
 Condition: 3m HORIZONTAL
 Job No : 00767AT
 Mode : 00

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1055.224	2.55	24.36	37.91	48.64	37.64	70.00	-32.36	Peak
2	1548.349	3.30	25.88	36.40	46.95	39.73	70.00	-30.27	Peak
3	2011.310	3.82	28.17	35.39	46.35	42.95	70.00	-27.05	Peak
4	3245.229	5.21	31.50	34.88	44.55	46.38	74.00	-27.62	Peak
5	4416.593	6.69	33.50	34.54	44.39	50.04	74.00	-23.96	Peak
6	5978.538	8.14	34.96	34.62	43.91	52.39	74.00	-21.61	Peak



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Test Mode: 01; Polarity: Horizontal



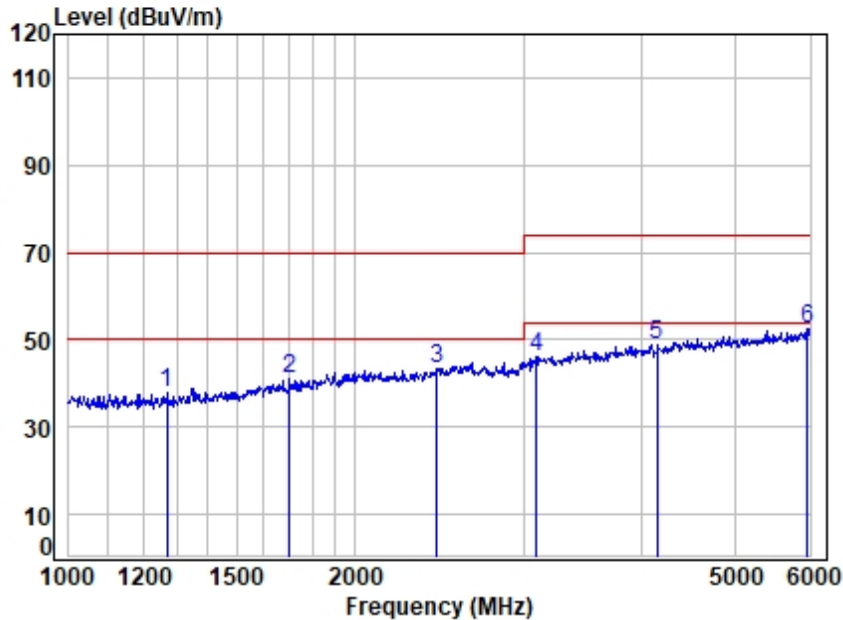
Site : chamber
 Condition: 3m HORIZONTAL
 Job No : 00767AT
 Mode : 01

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1007.193	2.45	24.91	38.09	49.15	38.42	70.00	-31.58	Peak
2	1579.169	3.34	26.25	36.33	46.03	39.29	70.00	-30.71	Peak
3	2267.854	4.12	28.27	35.26	45.88	43.01	70.00	-26.99	Peak
4	3399.987	5.45	31.70	34.83	43.95	46.27	74.00	-27.73	Peak
5	4652.151	6.91	33.50	34.47	43.81	49.75	74.00	-24.25	Peak
6	6000.000	8.16	35.00	34.62	43.98	52.52	74.00	-21.48	Peak



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Test Mode: 01; Polarity: Vertical



Site : chamber
 Condition: 3m VERTICAL
 Job No : 00767AT
 Mode : 01

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	1269.095	2.91	24.58	37.18	47.48	37.79	70.00	-32.21 Peak
2	1705.647	3.50	26.80	36.02	46.70	40.98	70.00	-29.02 Peak
3	2436.358	4.30	29.02	35.19	45.00	43.13	70.00	-26.87 Peak
4	3097.515	4.97	31.40	34.93	44.87	46.31	74.00	-27.69 Peak
5	4148.127	6.43	33.10	34.61	44.12	49.04	74.00	-24.96 Peak
6	5957.151	8.12	34.91	34.61	44.21	52.63	74.00	-21.37 Peak



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7 Immunity Test Results

Performance Criteria Description in EN IEC 61000-6-1:2019

Criterion A

The EUT shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the EUT is used as intended. If the performance level is not specified by the manufacturer, this may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

Criterion B

The EUT 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 EUT is used as intended. The performance level may be replaced by a permissible loss of performance. However, during the test degradation of performance is allowed but no change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

Criterion C

Temporary loss of function is allowed during the test, provided the function is self-recoverable or can be restored by the operation of the controls.

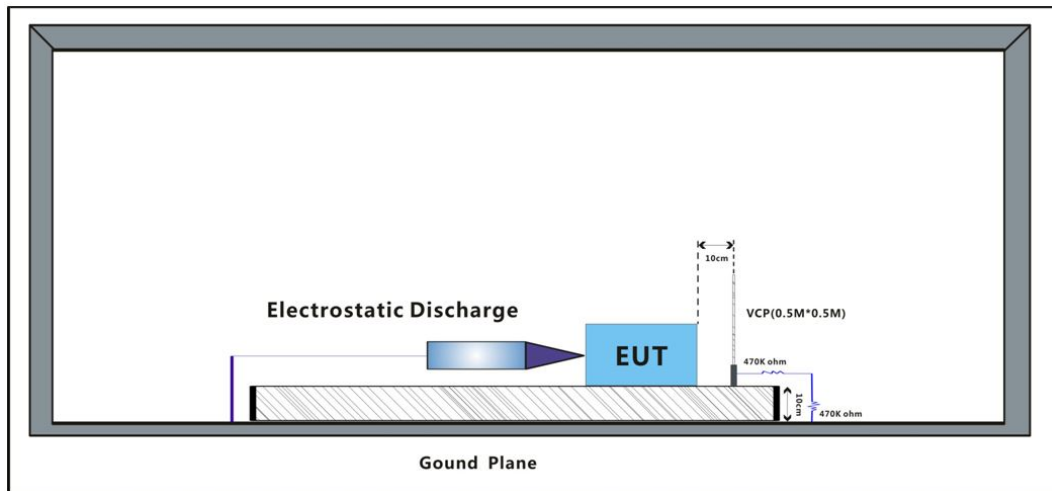


7.1 Electrostatic Discharge

Test Requirement: EN IEC 61000-6-1: 2019

Test Method: EN 61000-4-2:2009

7.1.1 Test Setup Diagram



7.1.2 E.U.T. Operation

Operating Environment:

Temperature: 20.2 °C Humidity: 45.2 % RH Atmospheric Pressure: 1015 mbar

7.1.3 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	Charge mode, keep EUT being charged with DC source and keeping communication via CAN/RS485.
Final test	01	Discharge mode, keep EUT discharging to the full load resistor and keeping communication via CAN/RS485.

7.1.4 Test Condition and Results:

- Performance Criterion: B
- Discharge Impedance: 330Ω/150pF
- Number of Discharge: Minimum 10 times at each test point
- Discharge Mode: Single Discharge
- Discharge Period: 1 second minimum
- Test Point: 1. All insulated enclosure and seams.
2. All accessible metal parts of the enclosure.
3. All side



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Discharge type	Level (kV)	Polarity	Test Point	Result / Observations
Air Discharge	2,4,8	+	1	A
Air Discharge	2,4,8	-	1	A
Contact Discharge	4	+	2	A
Contact Discharge	4	-	2	A
Vertical Coupling	4	+	3	A
Vertical Coupling	4	-	3	A

A: No degradation in the performance of the EUT was observed



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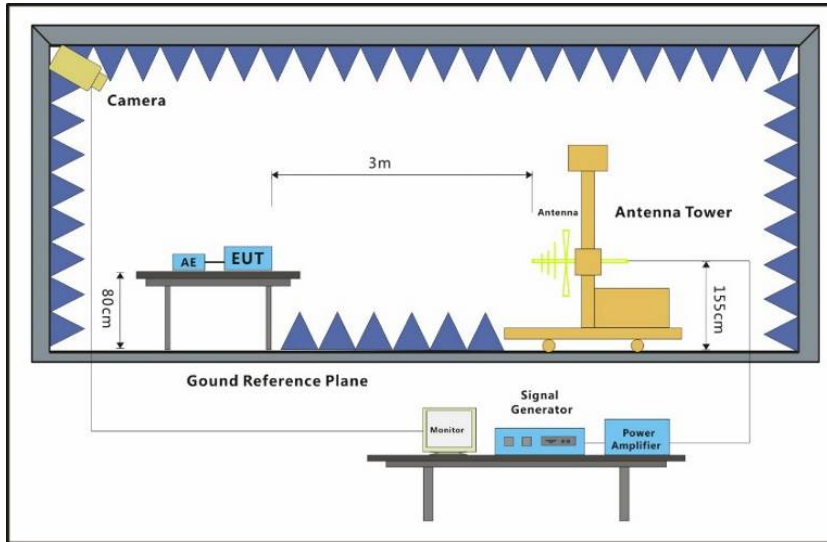
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7.2 Radiated Immunity (80MHz-6GHz)

Test Requirement: EN IEC 61000-6-1: 2019

Test Method: EN IEC 61000-4-3: 2020

7.2.1 Test Setup Diagram



7.2.2 E.U.T. Operation

Operating Environment:

Temperature: 20.2 °C

Humidity: 45.2 % RH

Atmospheric Pressure: 1015 mbar

7.2.3 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	Charge mode, keep EUT being charged with DC source and keeping communication via CAN/RS485.
Final test	01	Discharge mode, keep EUT discharging to the full load resistor and keeping communication via CAN/RS485.

7.2.4 Test Condition and Results:

Performance Criterion:A

Antenna Polarisation:Vertical and Horizontal

Modulation:1kHz,80% Amp. Mod,1% increment

Frequency Range:80MHz to 1GHz, 1.4GHz to 6GHz



SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

SZEMC-TRF-01 Rev. A/0 Aug01,2022

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Frequency	Level (V/m)	EUT Face	Dwell time	Result / Observations
80MHz-1GHz	3	Front	2s	A
80MHz-1GHz	3	Back	2s	A
80MHz-1GHz	3	Left	2s	A
80MHz-1GHz	3	Right	2s	A
80MHz-1GHz	3	Top	2s	A
80MHz-1GHz	3	Underside	2s	A
1.4GHz-6GHz	3	Front	2s	A
1.4GHz-6GHz	3	Back	2s	A
1.4GHz-6GHz	3	Left	2s	A
1.4GHz-6GHz	3	Right	2s	A
1.4GHz-6GHz	3	Top	2s	A
1.4GHz-6GHz	3	Underside	2s	A

A: No degradation in the performance of the EUT was observed



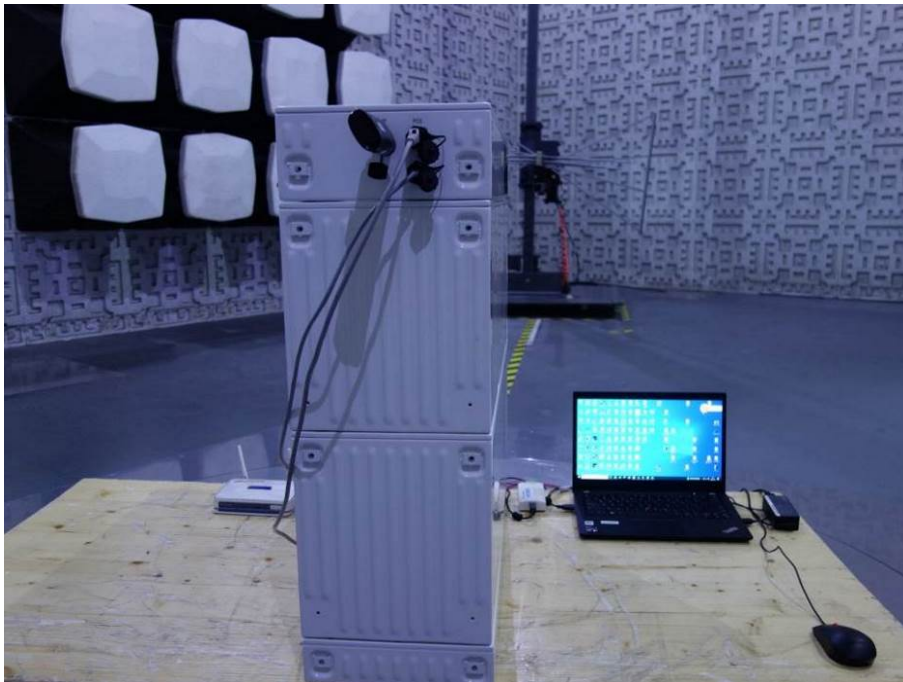
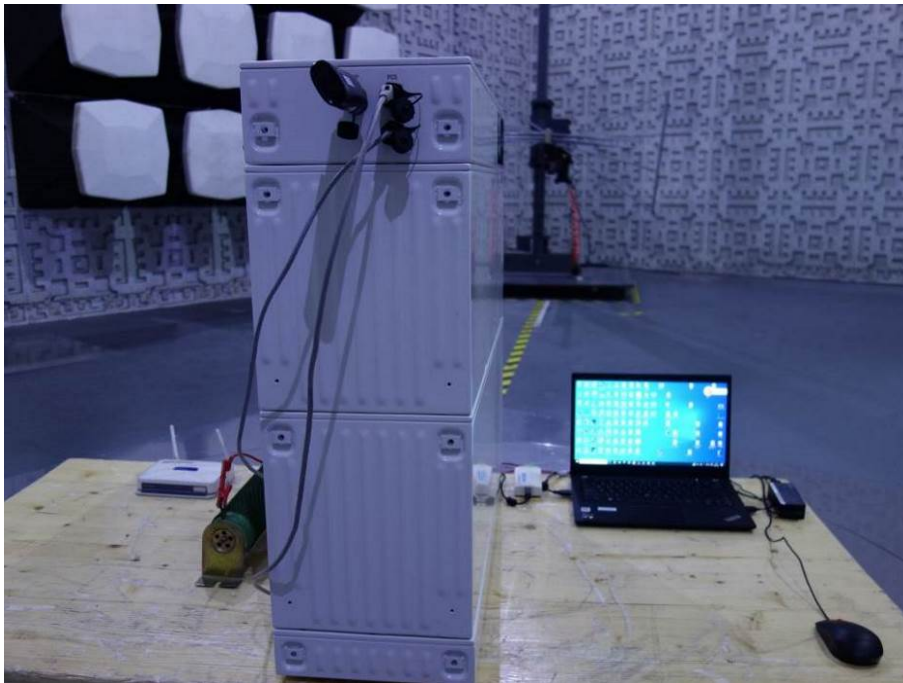
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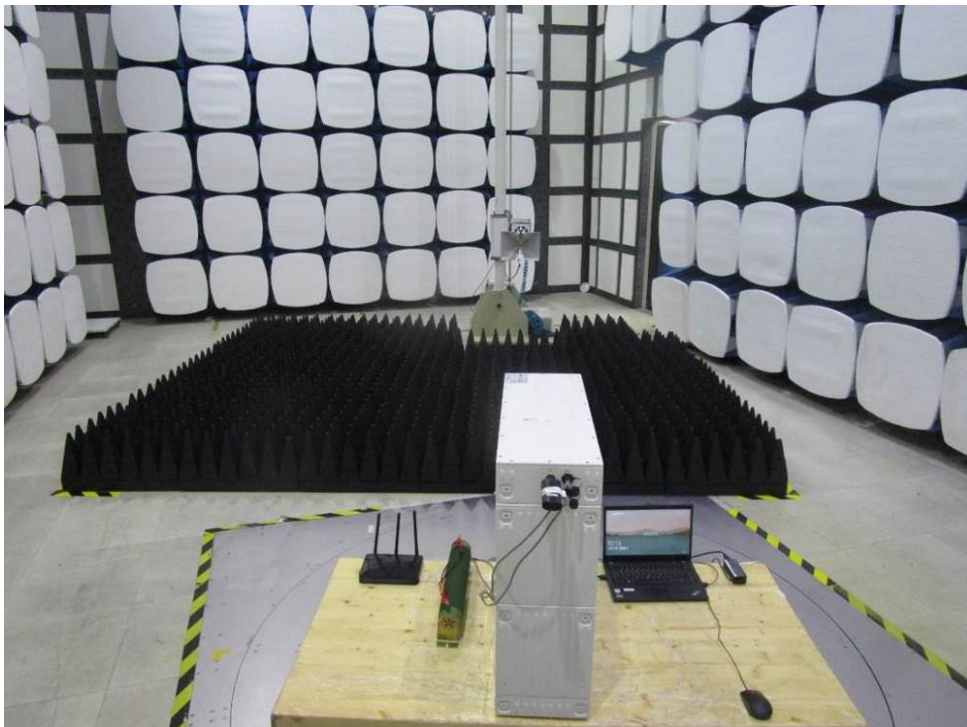
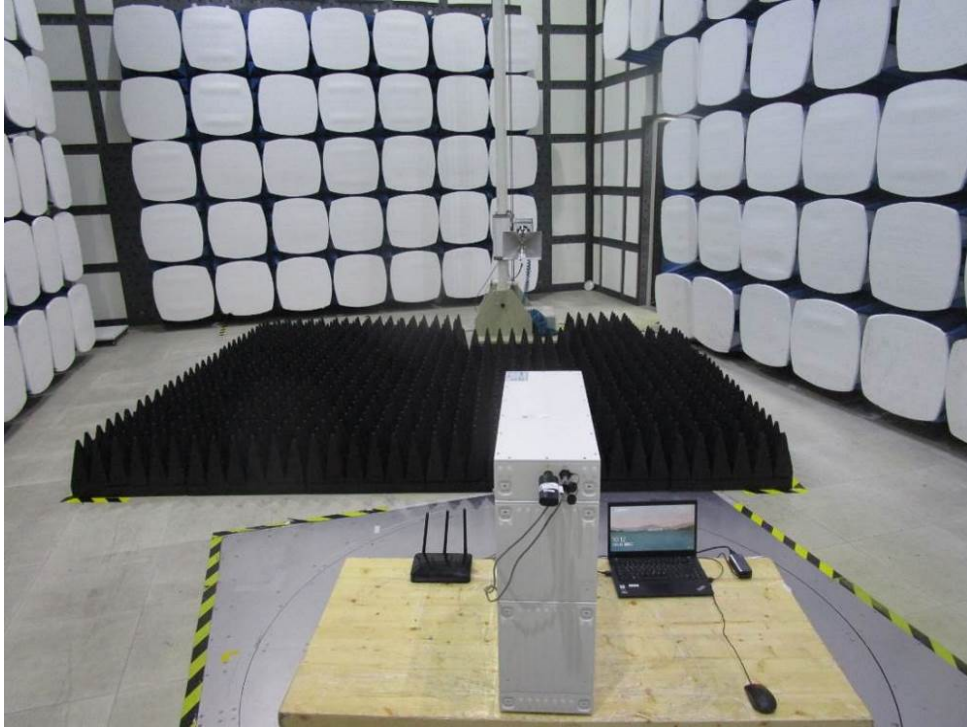
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8 Test Setup Photo

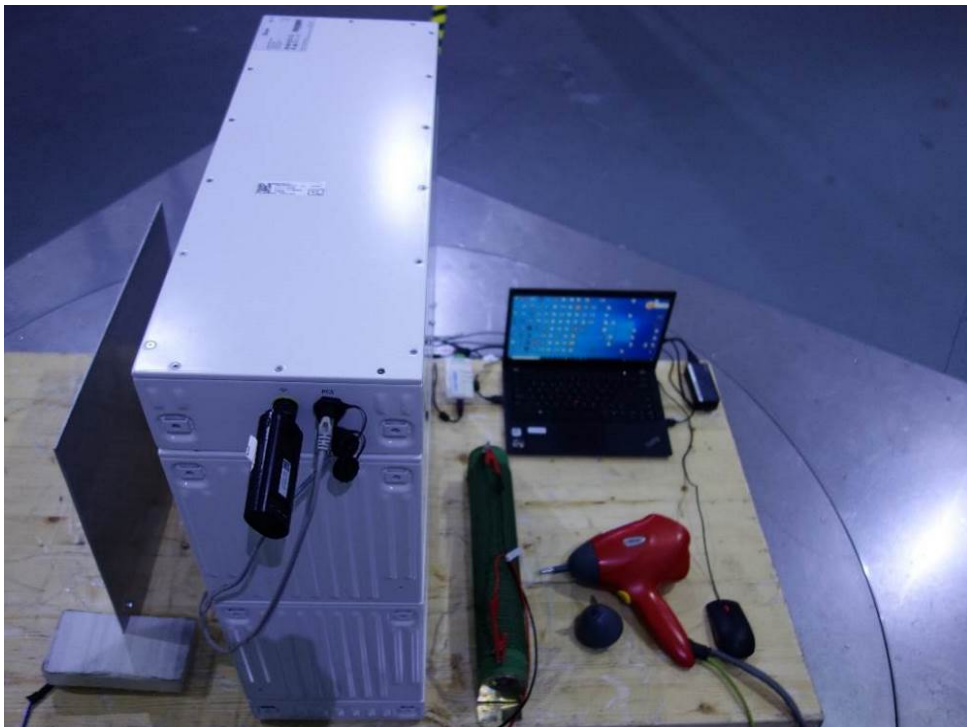
Radiated Emissions (30MHz-1GHz)



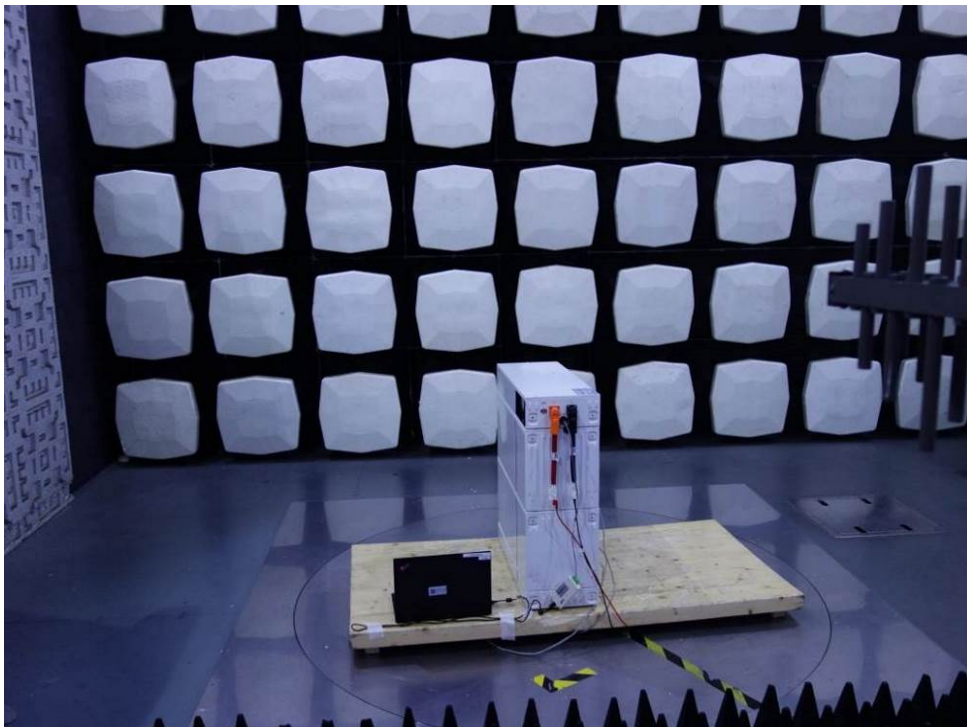
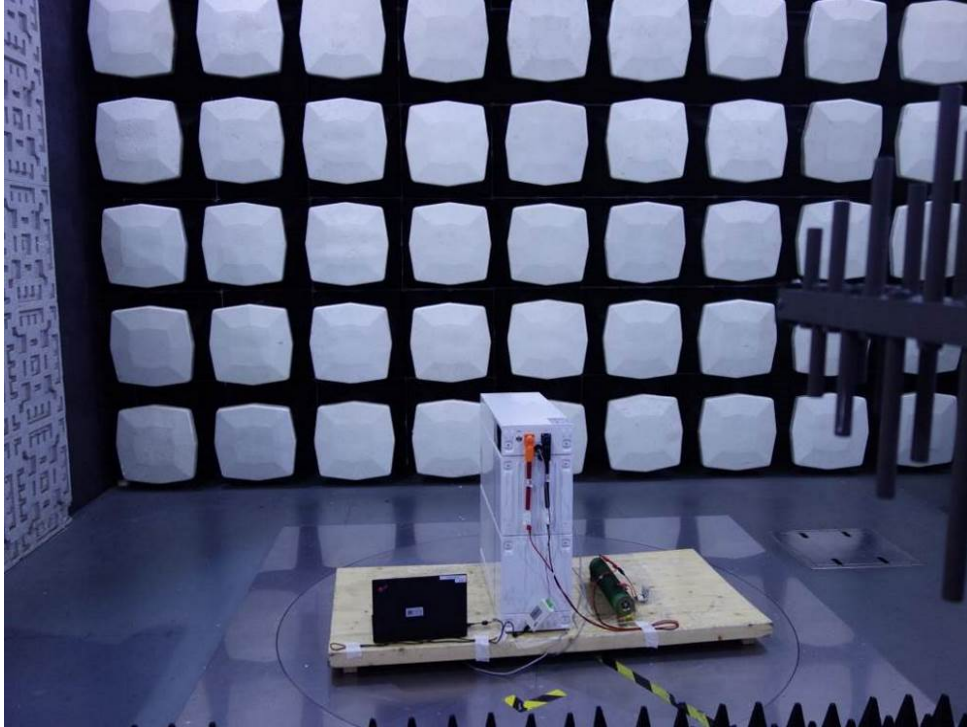
Radiated Emissions (Above 1GHz)



Electrostatic Discharge

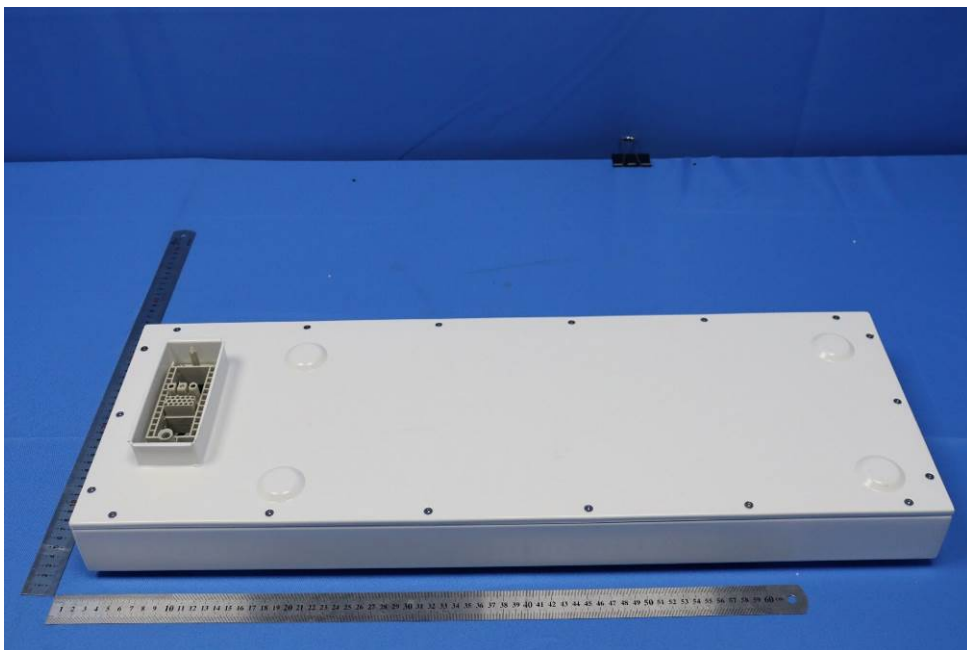
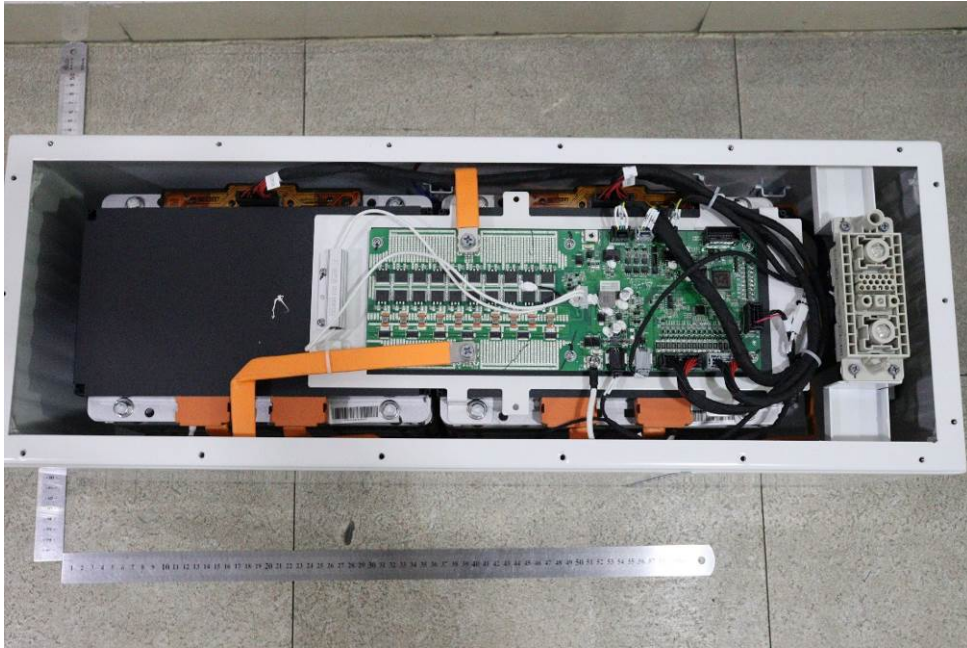


Radiated Immunity (80MHz-6GHz)



9 EUT Construnctional Details (EUT Photos)

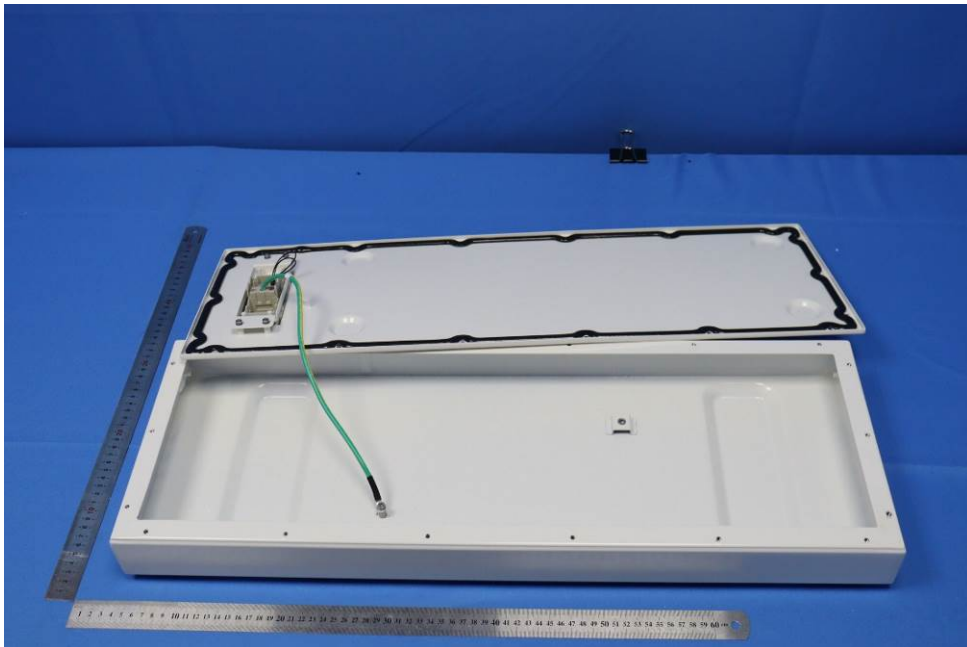
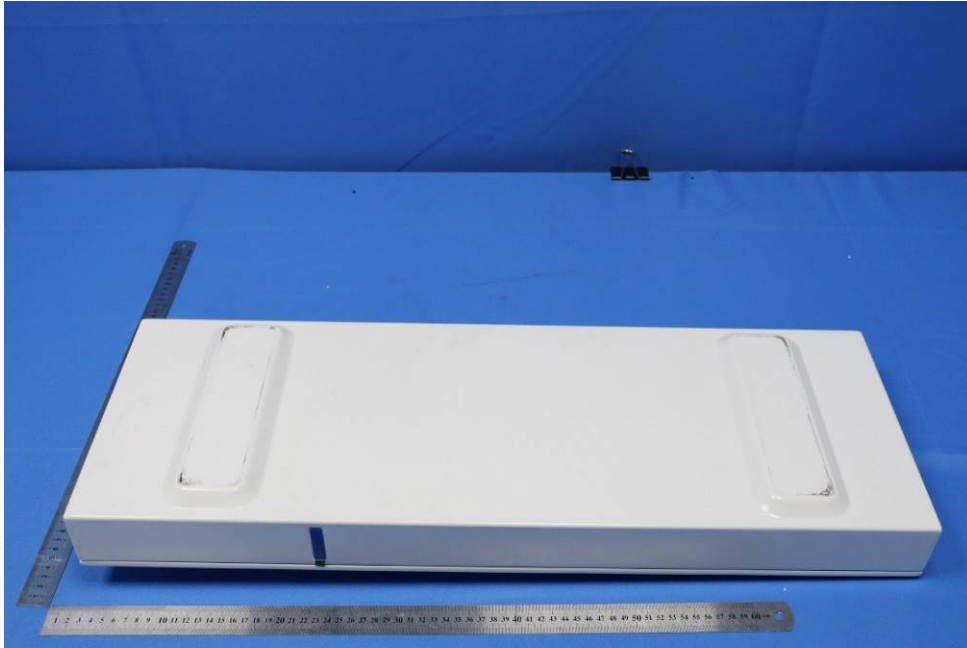




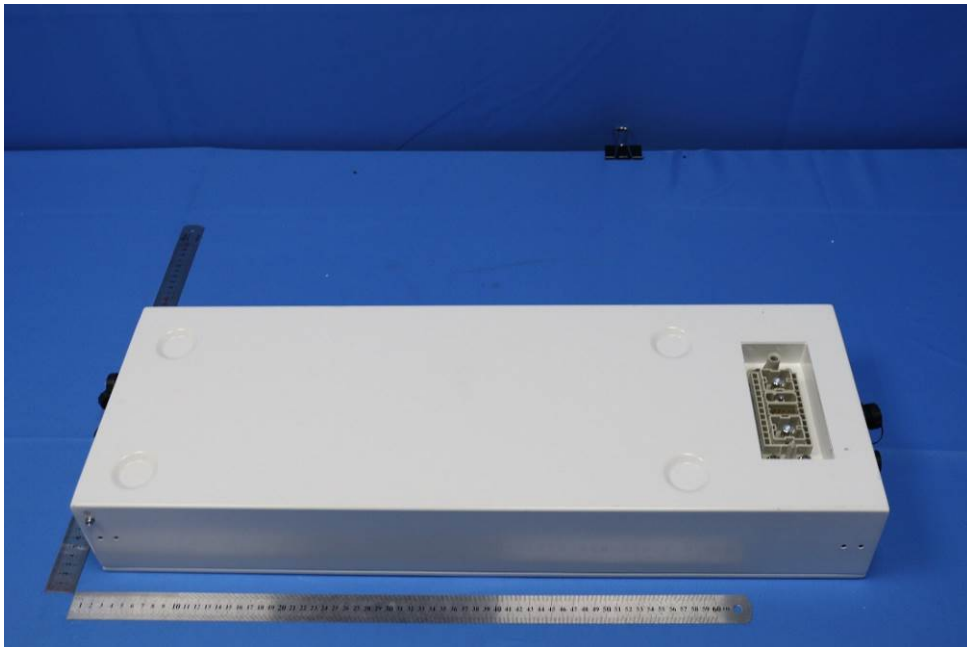
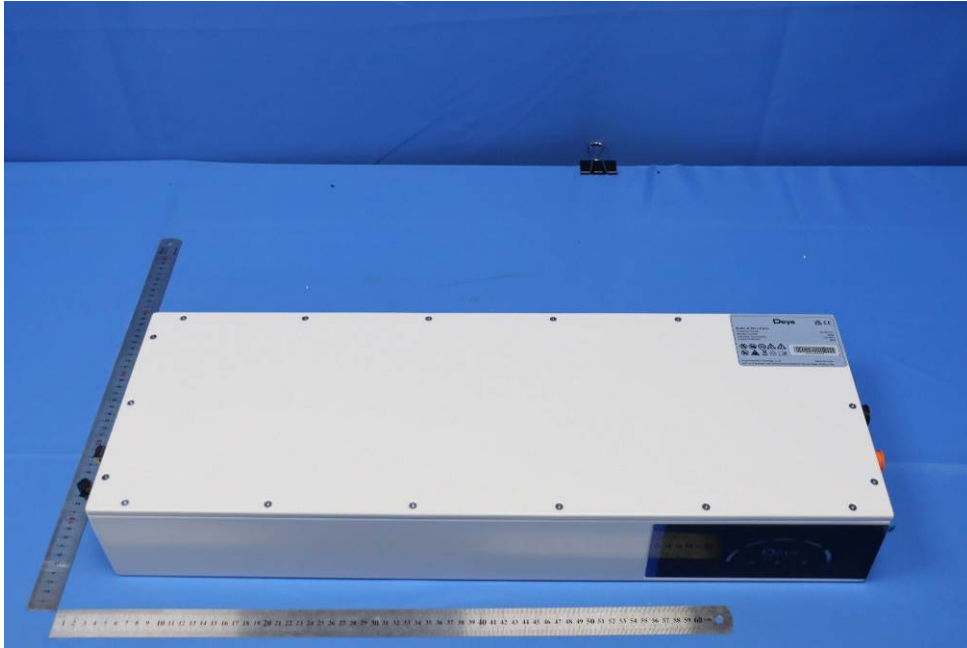
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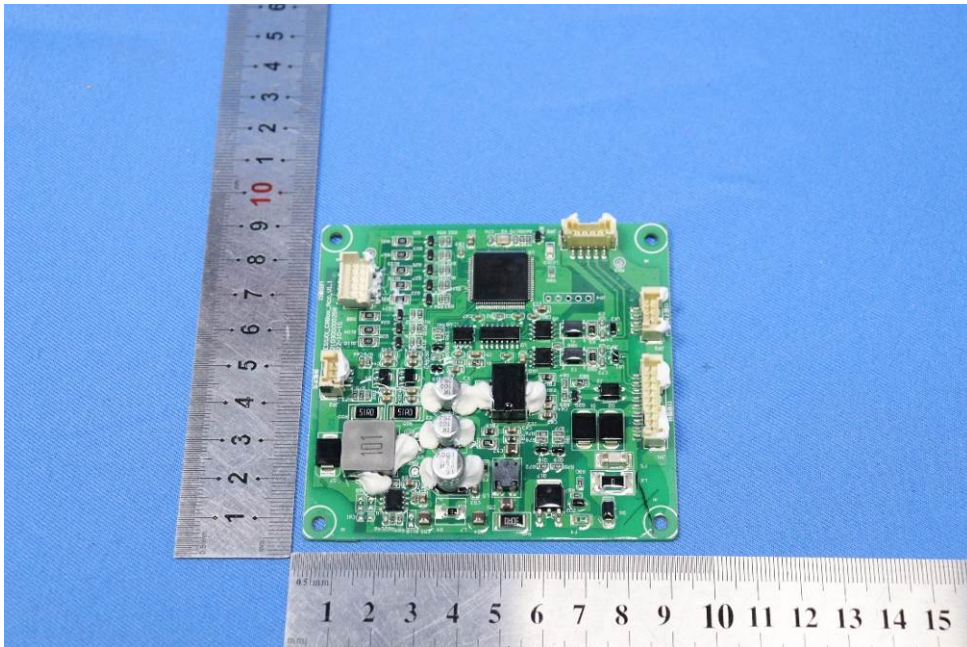
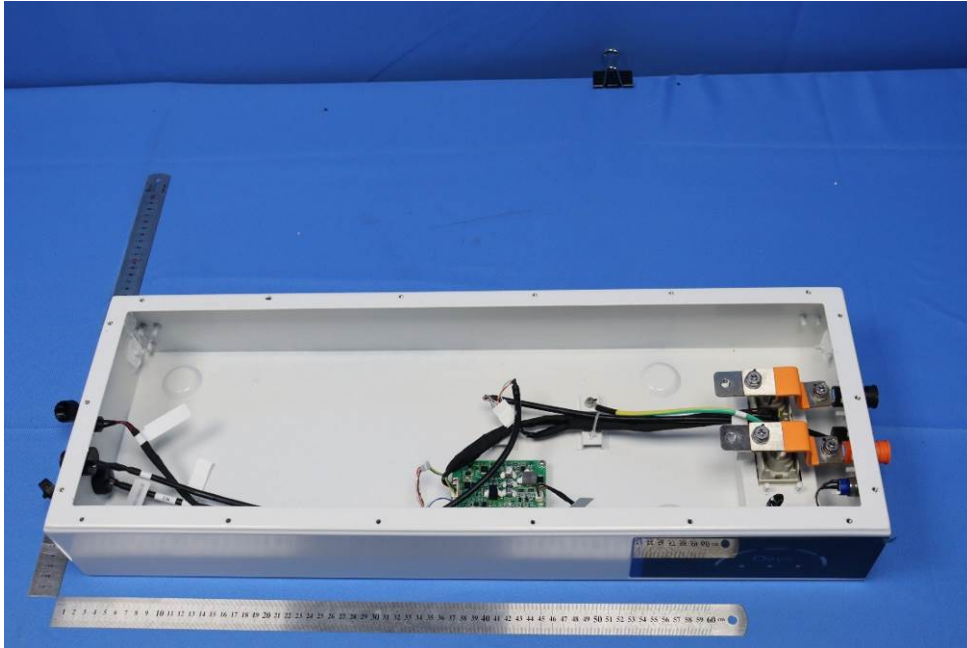
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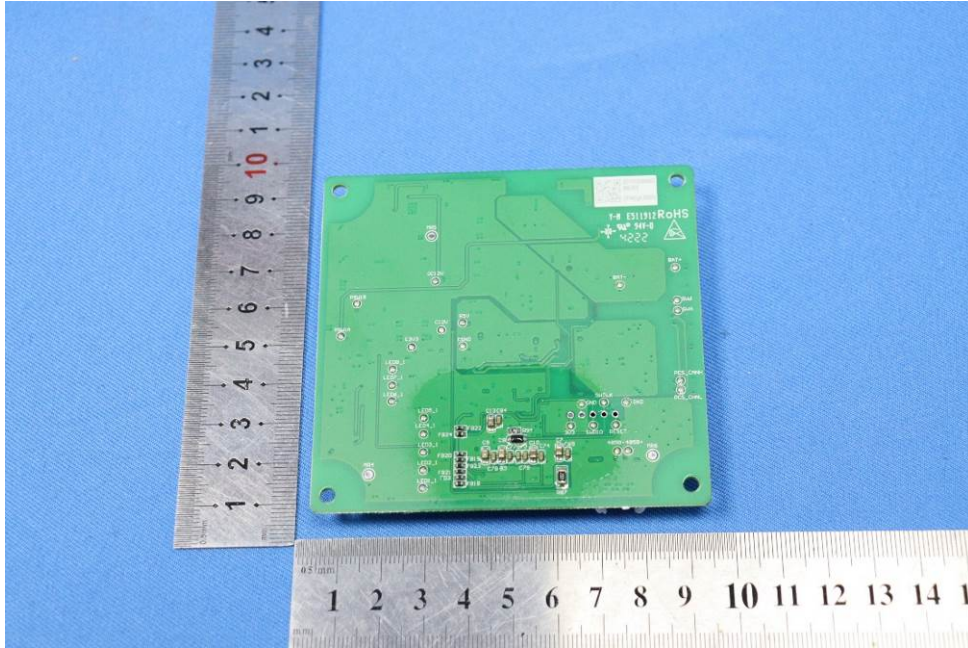




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- End of the Report -

