EMC TEST REPORT

Applicant	:	MUST ENERGY (GUANGDONG) TECHNOLOGY CO.,LTD
Address	:	1-5F, 7F, 9F, 10Fof No.8 building, No.115,Zhangcha Road 1, Chancheng district,Foshan city, Guangdong Province, P.R.China
Manufacturer	:	MUST ENERGY (GUANGDONG) TECHNOLOGY CO.,LTD
Address	:	1-5F, 7F, 9F, 10Fof No.8 building, No.115,Zhangcha Road 1, Chancheng district,Foshan city, Guangdong Province, P.R.China
Factory	:	MUST ENERGY (GUANGDONG) TECHNOLOGY CO.,LTD
Address	:	1-5F, 7F, 9F, 10Fof No.8 building, No.115,Zhangcha Road 1, Chancheng district,Foshan city, Guangdong Province, P.R.China
E.U.T.	:	SOLAR POWER SYSTEM
Brand Name	:	MUST
Model No.	:	HBP18-3024, HBP18-2024, HBP18-1012
Standard	:	EN IEC 61000-6-1: 2019 EN IEC 61000-6-3: 2021 EN 61000-3-12: 2011 EN IEC 61000-3-11: 2019
Date of Receiving Samples	:	October 24, 2022
Date of Test	:	October 25, 2022 to November 04, 2022
Date of Report	:	February 28, 2023

This Test Report is Issued Under the Authority of :

Prepared by	Approved & Authorized Signer
Jonny Guo	
Jonny Guo / Engineer	Evan Yang / Authorized Signatory

This report shows that above equipment is technically compliant with the requirements of the standards above. All test results in this report apply only to the tested sample(s). Without prior written approval of Shenzhen Nore Testing Center Co., Ltd, this report shall not be reproduced except in full.

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Revision History of This Test Report

Report Number	Description	Issued Date
SZNTC2210052EV00	Initial Issue	2023-02-28

1.SUMMARY OF TEST RESULTS

The E.U.T. has been tested according to the following specifications:

EMISSION			
Standard	**Test Type**	**Verdict**	**Remarks**
EN IEC 61000-6-3: 2021	Conducted Emission Measurement	PASS	Meets the requirements
	Radiated Emission Measurement	PASS	Meets the requirements.
EN 61000-3-12: 2011	Harmonic current emission Measurement	PASS	Meets the requirements.
EN IEC 61000-3-11: 2019	Voltage Fluctuations & Flicker Measurement	PASS	Meets the requirements.

IMMUNITY(EN IEC 61000-6-1: 2019)			
Basic Standard	**Test Type**	**Verdict**	**Results** (Performance Criterion)
IEC 61000-4-2: 2008	Electrostatic Discharge Test	PASS	A
IEC 61000-4-3: 2006/ A1:2007/ A2:2010	Radio-Frequency Electromagnetic Field Test	PASS	A
IEC 61000-4-4: 2012	Fast transients test	PASS	A
IEC 61000-4-5: 2014	Surge Test	PASS	A
IEC 61000-4-6: 2013	Radio-Frequency Common Mode Test	PASS	A
IEC 61000-4-8: 2009	Power-Frequency Magnetic Field Test	N/A note 1	---
IEC 61000-4-34: 2005	Voltage dips and interruptions	PASS	B

Note: 1. Applicable only to equipment containing devices susceptible to magnetic fields.

2.TEST UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

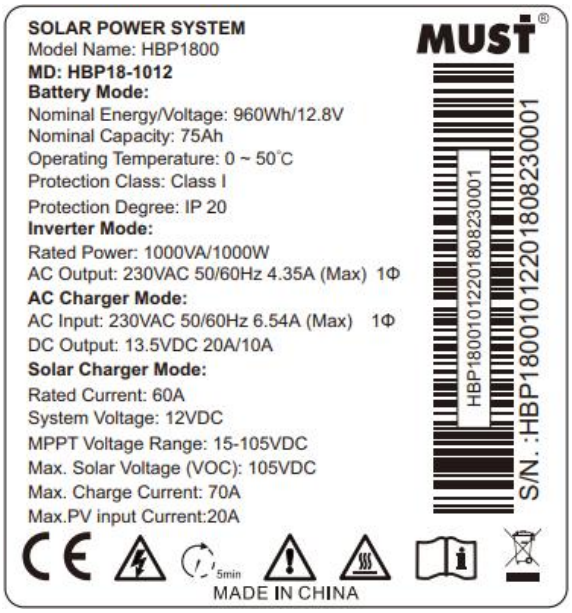
Test item	Uncertainty
Conducted Emission Measurement (0.15-30MHz)	±2.3dB
Radiated Emission Measurement (30-1000MHz)	±3.9dB
Remark: As U_{lab} in all applicable tests listed above are less than U_{cispr} according to CISPR 16-4-2, compliance is deemed to occur if no measured disturbance exceeds the disturbance limit; non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.	

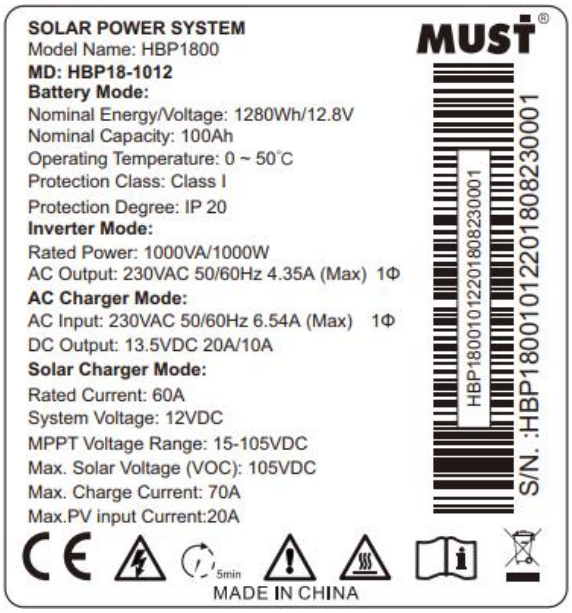
3.GENERAL INFORMATION

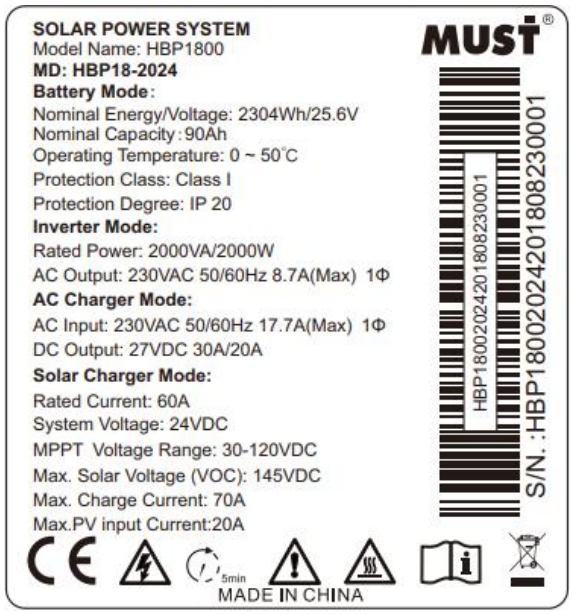
3.1.Product Information

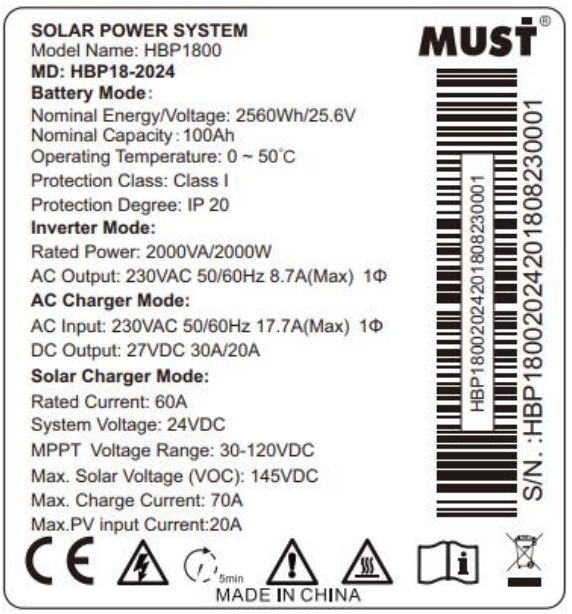
E.U.T.:	SOLAR POWER SYSTEM
Main Model Name:	HBP18-3024
Additional Model Name:	HBP18-2024, HBP18-1012
Description of model difference:	These models are identical in terms of internal structure, circuits, components, etc., but the model name and output power are different. Therefore, only HBP18-3024 is used for testing.
E.U.T Type:	Residential Environment
Typical arrangement:	floor type
Brand Name:	MUST
Highest Internal Frequency:	Below 108MHz
Rating:	See pages 8-9
Cable:	N/A
Sample No.:	SZNTC2210052EV00--001
Remark:	All the information above are provided by the manufacturer. More detailed feature of the EUT please refers to the user manual.

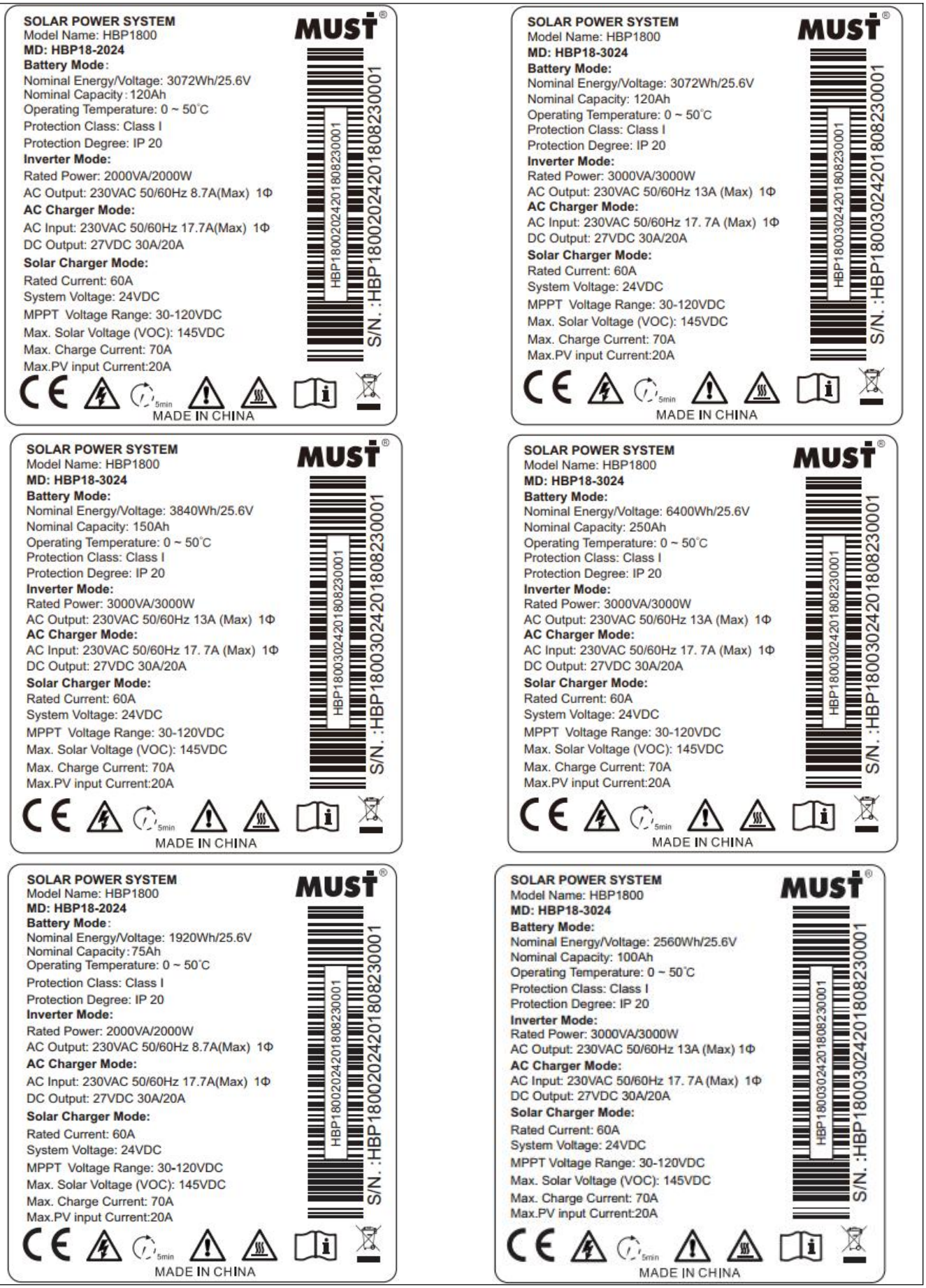
Rating:


SOLAR POWER SYSTEM
Model Name: HBP1800
MD: HBP18-1012
Battery Mode:
Nominal Energy/Voltage: 960Wh/12.8V
Nominal Capacity: 75Ah
Operating Temperature: 0 ~ 50˚C
Protection Class: Class I
Protection Degree: IP 20
Inverter Mode:
Rated Power: 1000VA/1000W
AC Output: 230VAC 50/60Hz 4.35A (Max) 1Φ
AC Charger Mode:
AC Input: 230VAC 50/60Hz 6.54A (Max) 1Φ
DC Output: 13.5VDC 20A/10A
Solar Charger Mode:
Rated Current: 60A
System Voltage: 12VDC
MPPT Voltage Range: 15-105VDC
Max. Solar Voltage (VOC): 105VDC
Max. Charge Current: 70A
Max.PV input Current:20A
MUST
S/N. :HBP18001012201808230001
HBP18001012201808230001
5min
MADE IN CHINA


SOLAR POWER SYSTEM
Model Name: HBP1800
MD: HBP18-1012
Battery Mode:
Nominal Energy/Voltage: 1280Wh/12.8V
Nominal Capacity: 100Ah
Operating Temperature: 0 ~ 50˚C
Protection Class: Class I
Protection Degree: IP 20
Inverter Mode:
Rated Power: 1000VA/1000W
AC Output: 230VAC 50/60Hz 4.35A (Max) 1Φ
AC Charger Mode:
AC Input: 230VAC 50/60Hz 6.54A (Max) 1Φ
DC Output: 13.5VDC 20A/10A
Solar Charger Mode:
Rated Current: 60A
System Voltage: 12VDC
MPPT Voltage Range: 15-105VDC
Max. Solar Voltage (VOC): 105VDC
Max. Charge Current: 70A
Max.PV input Current:20A
MUST
S/N. :HBP18001012201808230001
HBP18001012201808230001
5min
MADE IN CHINA

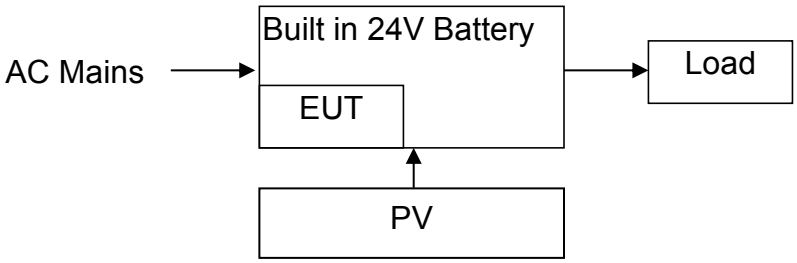

SOLAR POWER SYSTEM
Model Name: HBP1800
MD: HBP18-2024
Battery Mode:
Nominal Energy/Voltage: 2304Wh/25.6V
Nominal Capacity: 90Ah
Operating Temperature: 0 ~ 50˚C
Protection Class: Class I
Protection Degree: IP 20
Inverter Mode:
Rated Power: 2000VA/2000W
AC Output: 230VAC 50/60Hz 8.7A(Max) 1Φ
AC Charger Mode:
AC Input: 230VAC 50/60Hz 17.7A(Max) 1Φ
DC Output: 27VDC 30A/20A
Solar Charger Mode:
Rated Current: 60A
System Voltage: 24VDC
MPPT Voltage Range: 30-120VDC
Max. Solar Voltage (VOC): 145VDC
Max. Charge Current: 70A
Max.PV input Current:20A
MUST
S/N. :HBP18002024201808230001
HBP18002024201808230001
5min
MADE IN CHINA


SOLAR POWER SYSTEM
Model Name: HBP1800
MD: HBP18-2024
Battery Mode:
Nominal Energy/Voltage: 2560Wh/25.6V
Nominal Capacity: 100Ah
Operating Temperature: 0 ~ 50˚C
Protection Class: Class I
Protection Degree: IP 20
Inverter Mode:
Rated Power: 2000VA/2000W
AC Output: 230VAC 50/60Hz 8.7A(Max) 1Φ
AC Charger Mode:
AC Input: 230VAC 50/60Hz 17.7A(Max) 1Φ
DC Output: 27VDC 30A/20A
Solar Charger Mode:
Rated Current: 60A
System Voltage: 24VDC
MPPT Voltage Range: 30-120VDC
Max. Solar Voltage (VOC): 145VDC
Max. Charge Current: 70A
Max.PV input Current:20A
MUST
S/N. :HBP18002024201808230001
HBP18002024201808230001
5min
MADE IN CHINA

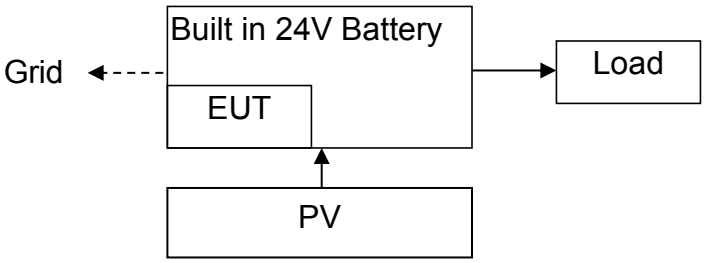

SOLAR POWER SYSTEM
Model Name: HBP1800
MD: HBP18-2024
Battery Mode:
Nominal Energy/Voltage: 3072Wh/25.6V
Nominal Capacity: 120Ah
Operating Temperature: 0 ~ 50°C
Protection Class: Class I
Protection Degree: IP 20
Inverter Mode:
Rated Power: 2000VA/2000W
AC Output: 230VAC 50/60Hz 8.7A(Max) 1Φ
AC Charger Mode:
AC Input: 230VAC 50/60Hz 17.7A(Max) 1Φ
DC Output: 27VDC 30A/20A
Solar Charger Mode:
Rated Current: 60A
System Voltage: 24VDC
MPPT Voltage Range: 30-120VDC
Max. Solar Voltage (VOC): 145VDC
Max. Charge Current: 70A
Max.PV input Current:20A
MUST
HBP18002024201808230001
S/N.:HBP18002024201808230001
5min
MADE IN CHINA
SOLAR POWER SYSTEM
Model Name: HBP1800
MD: HBP18-3024
Battery Mode:
Nominal Energy/Voltage: 3072Wh/25.6V
Nominal Capacity: 120Ah
Operating Temperature: 0 ~ 50°C
Protection Class: Class I
Protection Degree: IP 20
Inverter Mode:
Rated Power: 3000VA/3000W
AC Output: 230VAC 50/60Hz 13A (Max) 1Φ
AC Charger Mode:
AC Input: 230VAC 50/60Hz 17. 7A (Max) 1Φ
DC Output: 27VDC 30A/20A
Solar Charger Mode:
Rated Current: 60A
System Voltage: 24VDC
MPPT Voltage Range: 30-120VDC
Max. Solar Voltage (VOC): 145VDC
Max. Charge Current: 70A
Max.PV input Current:20A
MUST
HBP18003024201808230001
S/N.:HBP18003024201808230001
5min
MADE IN CHINA
SOLAR POWER SYSTEM
Model Name: HBP1800
MD: HBP18-3024
Battery Mode:
Nominal Energy/Voltage: 3840Wh/25.6V
Nominal Capacity: 150Ah
Operating Temperature: 0 ~ 50°C
Protection Class: Class I
Protection Degree: IP 20
Inverter Mode:
Rated Power: 3000VA/3000W
AC Output: 230VAC 50/60Hz 13A (Max) 1Φ
AC Charger Mode:
AC Input: 230VAC 50/60Hz 17. 7A (Max) 1Φ
DC Output: 27VDC 30A/20A
Solar Charger Mode:
Rated Current: 60A
System Voltage: 24VDC
MPPT Voltage Range: 30-120VDC
Max. Solar Voltage (VOC): 145VDC
Max. Charge Current: 70A
Max.PV input Current:20A
MUST
HBP18003024201808230001
S/N.:HBP18003024201808230001
5min
MADE IN CHINA
SOLAR POWER SYSTEM
Model Name: HBP1800
MD: HBP18-3024
Battery Mode:
Nominal Energy/Voltage: 6400Wh/25.6V
Nominal Capacity: 250Ah
Operating Temperature: 0 ~ 50°C
Protection Class: Class I
Protection Degree: IP 20
Inverter Mode:
Rated Power: 3000VA/3000W
AC Output: 230VAC 50/60Hz 13A (Max) 1Φ
AC Charger Mode:
AC Input: 230VAC 50/60Hz 17. 7A (Max) 1Φ
DC Output: 27VDC 30A/20A
Solar Charger Mode:
Rated Current: 60A
System Voltage: 24VDC
MPPT Voltage Range: 30-120VDC
Max. Solar Voltage (VOC): 145VDC
Max. Charge Current: 70A
Max.PV input Current:20A
MUST
HBP18003024201808230001
S/N.:HBP18003024201808230001
5min
MADE IN CHINA
SOLAR POWER SYSTEM
Model Name: HBP1800
MD: HBP18-2024
Battery Mode:
Nominal Energy/Voltage: 1920Wh/25.6V
Nominal Capacity: 75Ah
Operating Temperature: 0 ~ 50°C
Protection Class: Class I
Protection Degree: IP 20
Inverter Mode:
Rated Power: 2000VA/2000W
AC Output: 230VAC 50/60Hz 8.7A(Max) 1Φ
AC Charger Mode:
AC Input: 230VAC 50/60Hz 17.7A(Max) 1Φ
DC Output: 27VDC 30A/20A
Solar Charger Mode:
Rated Current: 60A
System Voltage: 24VDC
MPPT Voltage Range: 30-120VDC
Max. Solar Voltage (VOC): 145VDC
Max. Charge Current: 70A
Max.PV input Current:20A
MUST
HBP18002024201808230001
S/N.:HBP18002024201808230001
5min
MADE IN CHINA
SOLAR POWER SYSTEM
Model Name: HBP1800
MD: HBP18-3024
Battery Mode:
Nominal Energy/Voltage: 2560Wh/25.6V
Nominal Capacity: 100Ah
Operating Temperature: 0 ~ 50°C
Protection Class: Class I
Protection Degree: IP 20
Inverter Mode:
Rated Power: 3000VA/3000W
AC Output: 230VAC 50/60Hz 13A (Max) 1Φ
AC Charger Mode:
AC Input: 230VAC 50/60Hz 17. 7A (Max) 1Φ
DC Output: 27VDC 30A/20A
Solar Charger Mode:
Rated Current: 60A
System Voltage: 24VDC
MPPT Voltage Range: 30-120VDC
Max. Solar Voltage (VOC): 145VDC
Max. Charge Current: 70A
Max.PV input Current:20A
MUST
HBP18003024201808230001
S/N.:HBP18003024201808230001
5min
MADE IN CHINA

3.2.Block Diagram of Test Setup

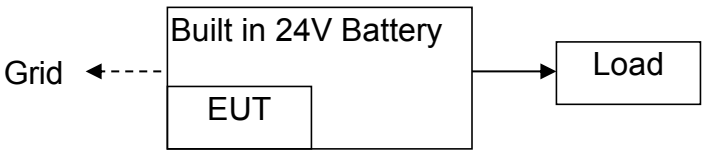
1. AC Input mode+ Battery + load



2. PV Input mode+ Battery + load



3. Inverter mode



3.3.Test Mode

No.	Test Mode	Remark
1.	AC Input mode+ Battery + load	With R load
2.	PV Input mode+ Battery + load	With R load
3.	Inverter mode	With R load

3.4.Test Conditions

No.	Test Item	Test Mode	Test Voltage	Tested by	Remarks
1.	Conducted Emission - AC power input port	1-3	AC 230V/50Hz PV 100V DC 24V	YXH	See note 1
2.	Conducted Emission - AC power output port	---	---	---	---
3	Conducted Disturbances - Wired network port or signal / control port	---	---	---	---
4.	Radiated Emission	1-3	AC 230V/50Hz PV 100V DC 24V	PH	See note 1
5.	Harmonic Current Emission	1	AC 230V/50Hz	CRB	See note 1
5.	Voltage Fluctuations & Flicker	1	AC 230V/50Hz	CRB	See note 1
6.	Electrostatic Discharges (ESD)	1	AC 230V/50Hz	CRB	See note 2&3
7.	Radio-Frequency Electromagnetic Field	1	AC 230V/50Hz	Chance	See note 1&3
8.	Fast transients test	1	AC 230V/50Hz	CRB	See note 1&3
9.	Surges	1	AC 230V/50Hz	CRB	See note 1&3
10.	Radio-Frequency Common Mode Test	1	AC 230V/50Hz	Chance	See note 1&3
11.	Power Frequency Magnetic Field	---	---	---	---
12	Voltage dips and interruptions	1	AC 230V/50Hz	YXH	See note 1&3

Note:

1. The testing climatic conditions for temperature, humidity, and atmospheric pressure are within: 15~35°C, 30~70%, 86~106kPa.
2. The testing climatic conditions for temperature, humidity, and atmospheric pressure are within: 15~35°C, 30~60%, 86~106kPa.
3. Only the worst data were recorded on the report.
4. Only the most stringent limits and data were recorded on the report.

3.5.Sample Calculations

Conducted Emission						
Freq. (MHz)	**Factor (dB/m)**	**Reading (dBuV)**	**Level (dBuV)**	**Limit (dBuV)**	Margin **(dB)**	**Detector**
0.2260	11.56	12.50	24.06	66.00	-41.94	AVG

Where,

Freq. = Emission frequency in MHz
Reading = Spectrum Analyzer/Receiver Reading
Factor = Insertion loss of LISN + Cable Loss
Level = Reading + Factor
Limit = Limit stated in standard
Margin = Measurement - Limit
Detector = Reading for Quasi-Peak / Average / Peak

Radiated Emission						
Freq. (MHz)	**Factor (dB/m)**	**Reading (dBuV)**	**Level (dBuV/m)**	**Limit (dBuV/m)**	Margin **(dB)**	**Detector**
75.9773	-17.06	59.36	42.30	49.00	-6.70	QP

Where,

Freq. = Emission frequency in MHz
Reading = Spectrum Analyzer/Receiver Reading
Factor = Antenna Factor + Cable Loss - Pre-amplifier
Level = Reading + Factor
Limit = Limit stated in standard
Margin = Margin, which calculated by Level - Limit
Detector = Reading for Quasi-Peak / Average / Peak

3.6.Test Facility

Test Site:	Shenzhen Nore Testing Center Co., Ltd.
Accreditations and Authorizations:	Listed by CNAS, May 18, 2018 The certificate is valid until May 17, 2024 The Laboratory has been assessed and proved to be in compliance with CNAS/CL01 The Certificate Registration Number is L11038.
Test Site Location:	South, No. 1, Building 10, Maqueling Industrial Zone, Nanshan Shenzhen, Guangdong, 518057, China
Subcontractor 1:	Dongguan Nore Testing Center Co.,Ltd.
Test Site Location:	Building D, Gaosheng Science and Technology Park, Hongtu Road, Nancheng District, Dongguan City, Guangdong Province, China
Test Items:	Radio-Frequency Electromagnetic Field Conducted Radio-Frequency Common Mode

3.7.Abnormalities from Standard Conditions

None

4.MEASURING DEVICES AND TEST EQUIPMENT

4.1.For Conducted Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESCI-3	100120	Mar. 28, 2022	1 Year
2.	L.I.S.N	Rohde & Schwarz	ESH3-Z5	100157	Mar. 28, 2022	1 Year
3.	L.I.S.N	SCHWARZBECK	NNLK8129	8129-212	Mar. 28, 2022	1 Year
4.	Test Software	EZ	EZ-EMC (Ver. CT3A11)	N/A	N/A	N/A

4.2.For Radiated Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESPI-7	100006	Mar. 28, 2022	1 Year
2.	Loop Antenna	ZHINAN	ZN30900C	16036	Apr. 09, 2022	2 Year
3.	Composite logarithmic antenna	SCHAFFNER	CBL6112B	2625	Apr. 09, 2022	2 Year
4.	Horn Antenna	SCHWARZBECKI	BBHA 9120 D	01884	Apr. 09, 2022	2 Year
5.	Power Amplifier	HP	HP 8447D	2443A04646	Mar. 28, 2022	1 Year
6.	Power Amplifier	KSYET	PAM-118	443007	Mar. 28, 2022	1 Year
7.	Test Software	EZ	EZ-EMC (Ver. CT3A11)	N/A	N/A	N/A

4.3.For Harmonic Current/ Flicker Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	POWER ANALYZER	HIOKI	PW3390	N/A	Oct. 26, 2022	1 Year
2.	Current probe	HIOKI	9709-05	N/A	Oct. 26, 2022	1 Year
3.	Three-phase Flicker Impedance	YANBIXIN	YX91L1-75A-T RD2110008F	N/A	Mar. 28, 2022	1 Year

4.4.For Electrostatic Discharge Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	ESD Tester	HAEFELY	ONYX16	1811981	Apr. 09, 2022	1 Year

4.5.For Voltage Dips and Interruption

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Analog power supply	Ainuo	ANBGS060TL	2209GBS021	Oct. 20, 2022	1 Year

4.6.For Radio-Frequency Electromagnetic Field Test

(Dongguan Nore Testing Center Co., Ltd.)

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Signal Generator	Agilent	N5181A	MY47070160	Mar. 13, 2022	1 Year
2.	RF Switch	SKET	N/A	N/A	N/A	N/A
3.	Power Amplifier	SKET	HAP801000M_250W	201804008	N/A	N/A
4.	Power Amplifier	SKET	HAP0103G_75W	201804009	N/A	N/A
5.	Power Amplifier	SKET	HAP0306G_50W	201804010	N/A	N/A
6.	Power Meter	Agilent	E4419B	GB40201469	Mar. 13, 2022	1 Year
7.	Power Sensor	Agilent	E9304A	MY41498919	Mar. 13, 2022	1 Year
8.	Power Sensor	Agilent	E9300A	US39211259	Mar. 13, 2022	1 Year
9.	E-Field Probe	Narda	EP-601	N/A	Mar. 23, 2022	1 Year
10.	Antenna	Schwarzbeck	STLP 9129	9129071	N/A	N/A
11.	Audio Analyzer	Rohde & Schwarz	UPV	100894	Mar. 13, 2022	1 Year
12.	Test Software	SKET	SKET_RS	N/A	N/A	N/A

4.7.For Fast transients test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EFT Simulator	HTEC	HEFT	203601	Mar. 28, 2022	1 Year
2.	Three- phase EFT Coupling CDN	HTEC	HCOUPLER 60E	204301	Mar. 28, 2022	1 Year

4.8.For Surge Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Surge Simulator	HTEC	HCWG	205301	Mar. 28, 2022	1 Year
2.	Three- phase Surge Coupling CDN	HTEC	HCOUPLER 60S	204201	Mar. 28, 2022	1 Year

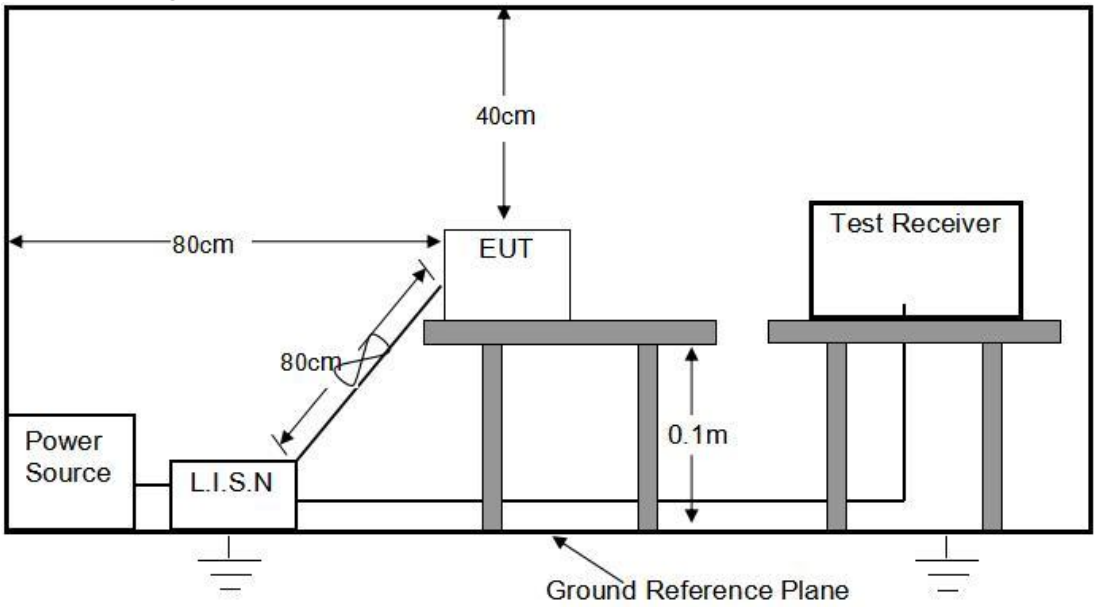
4.9.For Conducted Radio-Frequency Common Mode Test

(Dongguan Nore Testing Center Co., Ltd.)

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Signal generator	IFR	2023A	2023051280	Mar. 13, 2022	1 Year
2.	Power Amplifier	SCHAFFNER	CBA9425	1022	Mar. 13, 2022	1 Year
3.	6dB 50Watt Attenuator	SCHAFFNER	ATN6025	N/A	Mar. 13, 2022	1 Year
4.	CDN	Lioncel	CDN-M3-16	0170703	Mar. 13, 2022	1 Year
5.	CDN	Lioncel	CDN-M2-16	0170708	Mar. 13, 2022	1 Year
6.	CDN	CDSI	ADN-M5/AF5	8105001	Mar. 13, 2022	1 Year
7.	EM Clamp	CDSI	EMCL-22	8192007	Mar. 13, 2022	1 Year
8.	Directional Coupler	SCHAFFNER	255	19184	Mar. 13, 2022	1 Year
9.	Audio Analyzer	Rohde & Schwarz	UPV	100894	Mar. 13, 2022	1 Year
10.	Test Software	EZ	EZ_CS	N/A	N/A	N/A

5.CONDUCTED EMISSION MEASUREMENT

5.1.Block Diagram of Test Setup



5.2.Limit of Conducted Emission Measurement

Frequency range MHz	Limits dB (μV)						
	☒ AC Mains Port		☐ DC Power Port		☐ Other Wire Port		Detector type / bandwidth
	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average	
0,15 to 0,50[b]	66 to 56[a]	56 to 46[a]	79	66	84 to 74[a]	74 to 64[a]	9 kHz
0,50 to 5,0[b]	56	46	66	60	74	64	
5,0 to 30,0	60	50					

a The limits decrease linearly with the logarithm of the frequency.
b The lower limit shall apply at the transition frequency.

5.3.Test Procedure

a. The EUT was placed on a wooden table 0.1m height from the metal ground plan and 0.4m from the conducting wall of the shielding room and it was kept at 0.8m from any other grounded conducting surface.
b. Configure the EUT and support devices as per section 5.1.
c. All cables and support devices were positioned as per EN IEC 61000-6-3.
d. Connect mains power port of the EUT to a line impedance stabilization network (LISN). Wired network port to Asymmetric Artificial Network (AAN).
e. Connect all support devices to the other LISN and AAN, if needed.

f. Turn on the EUT and all support devices, and make it run stably.

g. Set the detector and measurement bandwidth of test-receiver system as per EN IEC 61000-6-3.

h. Scan the frequency range from 150KHz to 30MHz at each side of AC line for conducted interference checking

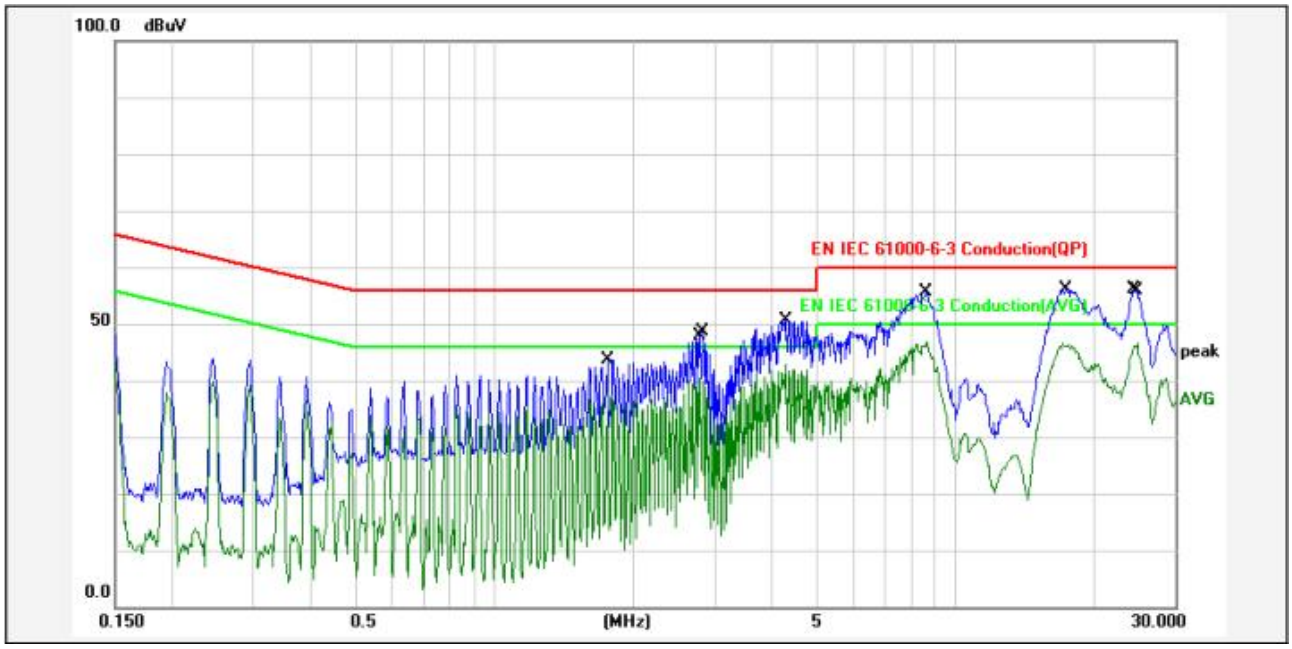
i. Repeat the above scans in each mode and record the test data.

5.4.Test Results

PASS.

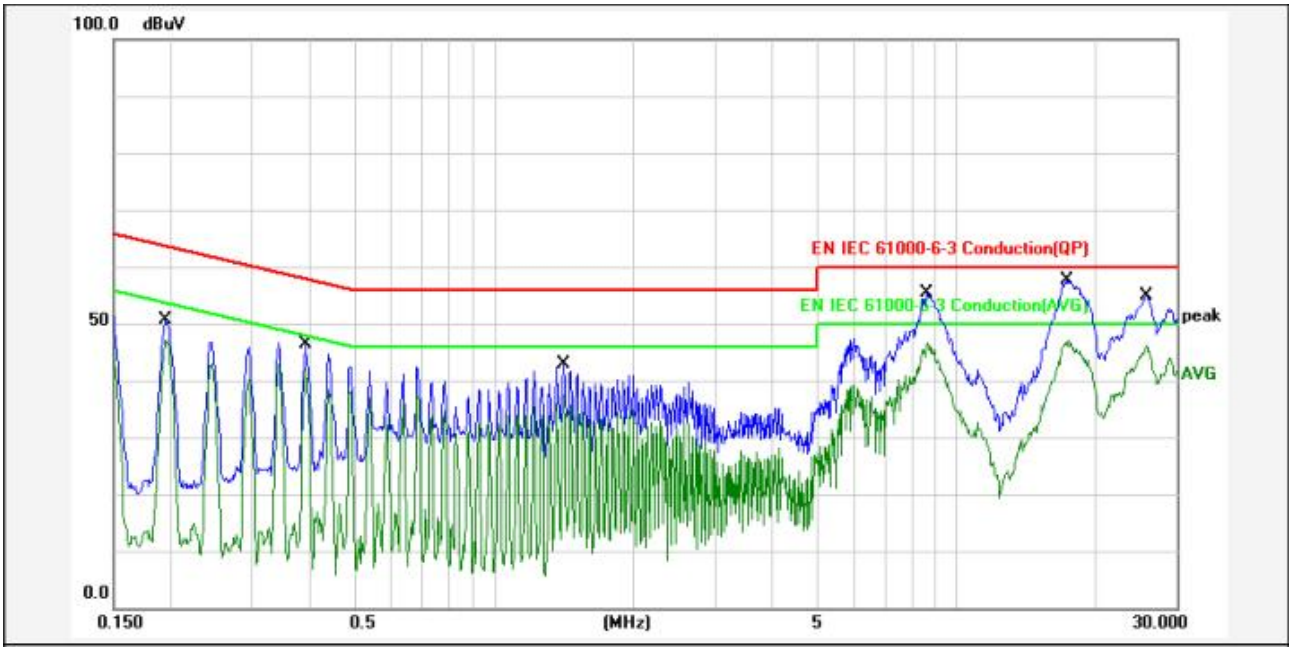
Please refer to the following pages.

E.U.T:	SOLAR POWER SYSTEM	Model Name :	HBP18-3024
Temperature:	26℃	Relative Humidity:	60%
Pressure:	1011hPa	Test Voltage:	AC 230V 50Hz
Test Mode:	AC Input mode+ Battery + load	Phase:	Line1
Test Date:	2022-11-02		



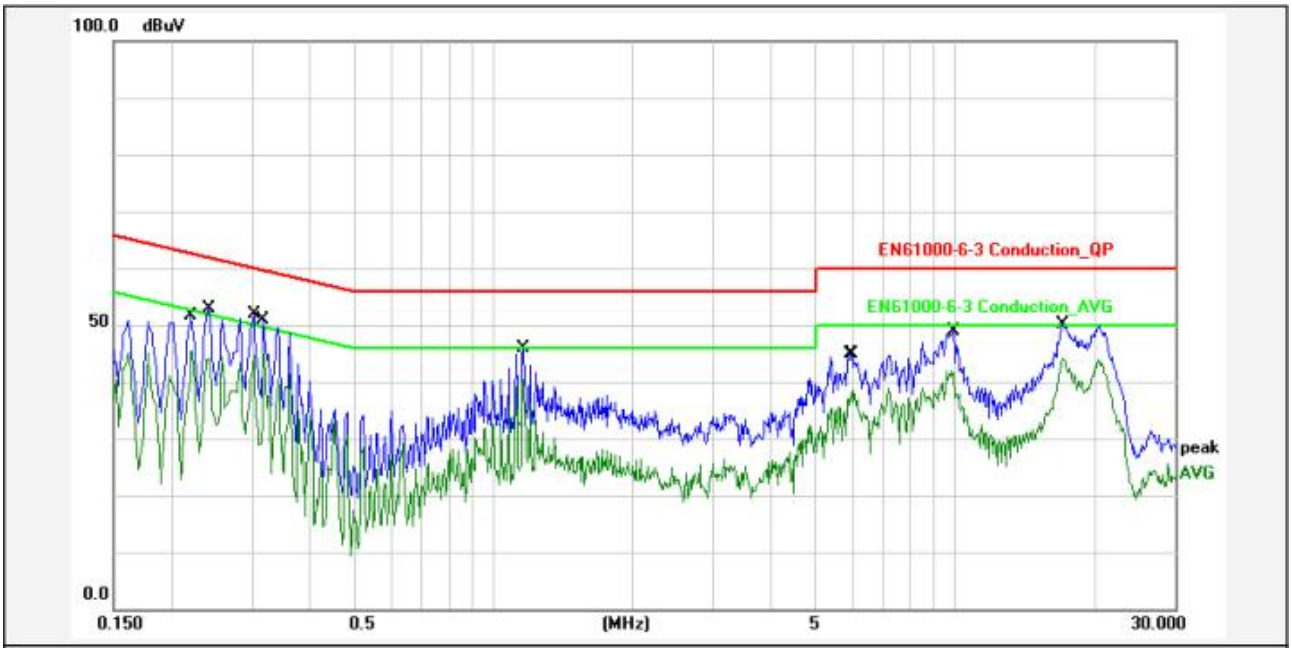
No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	1.7580	10.44	31.16	41.60	56.00	-14.40	QP	P	
2	1.7580	10.44	27.36	37.80	46.00	-8.20	AVG	P	
3	2.7860	10.42	29.88	40.30	46.00	-5.70	AVG	P	
4	2.8340	10.42	36.08	46.50	56.00	-9.50	QP	P	
5	4.2979	10.46	38.14	48.60	56.00	-7.40	QP	P	
6	4.2979	10.46	32.24	42.70	46.00	-3.30	AVG	P	
7	8.5975	10.58	43.02	53.60	60.00	-6.40	QP	P	
8	8.6935	10.58	36.22	46.80	50.00	-3.20	AVG	P	
9	17.1979	10.84	35.76	46.60	50.00	-3.40	AVG	P	
10	17.2939	10.84	43.26	54.10	60.00	-5.90	QP	P	
11	24.4220	11.03	43.27	54.30	60.00	-5.70	QP	P	
12	24.8140	11.02	35.58	46.60	50.00	-3.40	AVG	P	

E.U.T:	SOLAR POWER SYSTEM	Model Name :	HBP18-3024
Temperature:	26℃	Relative Humidity:	60%
Pressure:	1011hPa	Test Voltage:	AC 230V 50Hz
Test Mode:	AC Input mode+ Battery + load	Phase:	Neutral
Test Date:	2022-11-02		



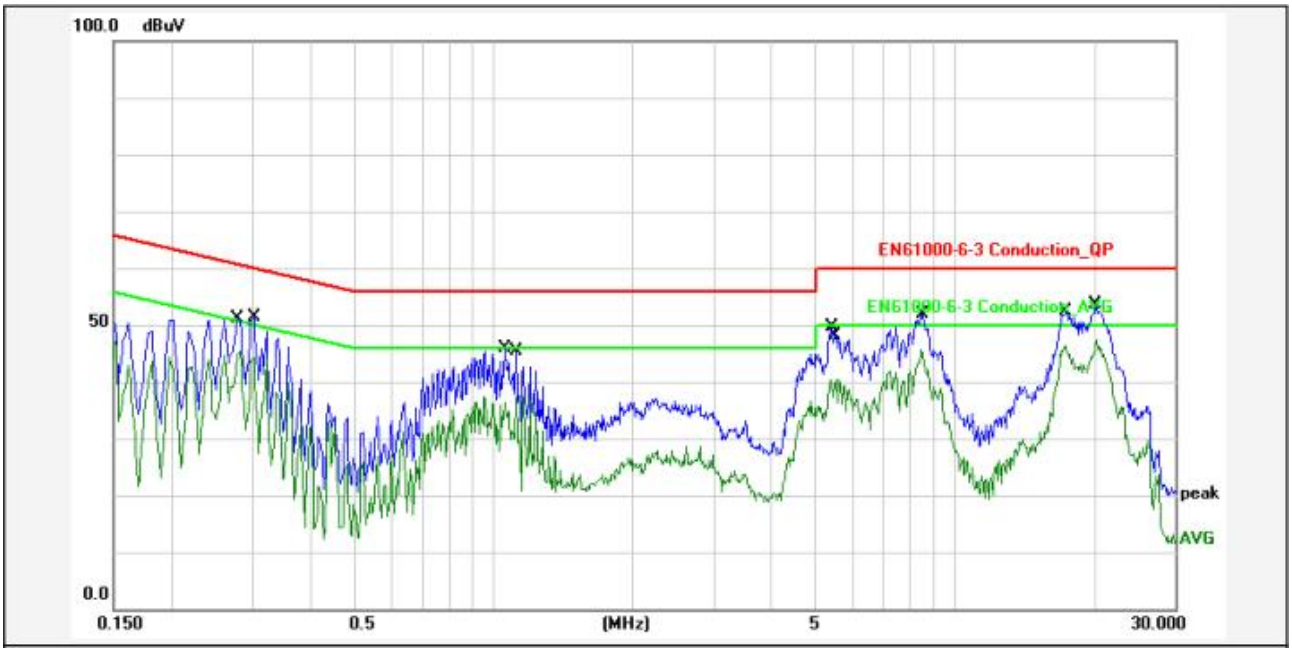
No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1940	10.23	38.37	48.60	63.86	-15.26	QP	P	
2	0.1940	10.23	36.97	47.20	53.86	-6.66	AVG	P	
3	0.3899	10.38	33.82	44.20	58.06	-13.86	QP	P	
4	0.3899	10.38	31.72	42.10	48.06	-5.96	AVG	P	
5	1.4134	10.41	30.39	40.80	56.00	-15.20	QP	P	
6	1.4134	10.41	26.99	37.40	46.00	-8.60	AVG	P	
7	8.5937	10.58	42.72	53.30	60.00	-6.70	QP	P	
8	8.6897	10.58	36.02	46.60	50.00	-3.40	AVG	P	
9	17.3819	10.85	44.75	55.60	60.00	-4.40	QP	P	
10	17.4779	10.85	35.95	46.80	50.00	-3.20	AVG	P	
11	25.8338	11.03	41.87	52.90	60.00	-7.10	QP	P	
12	25.8338	11.03	35.17	46.20	50.00	-3.80	AVG	P	

E.U.T:	SOLAR POWER SYSTEM	Model Name :	HBP18-3024
Temperature:	26℃	Relative Humidity:	60%
Pressure:	1011hPa	Test Voltage:	PV 100V
Test Mode:	PV Input mode+ Battery + load	Phase:	Line1
Test Date:	2022-11-02		



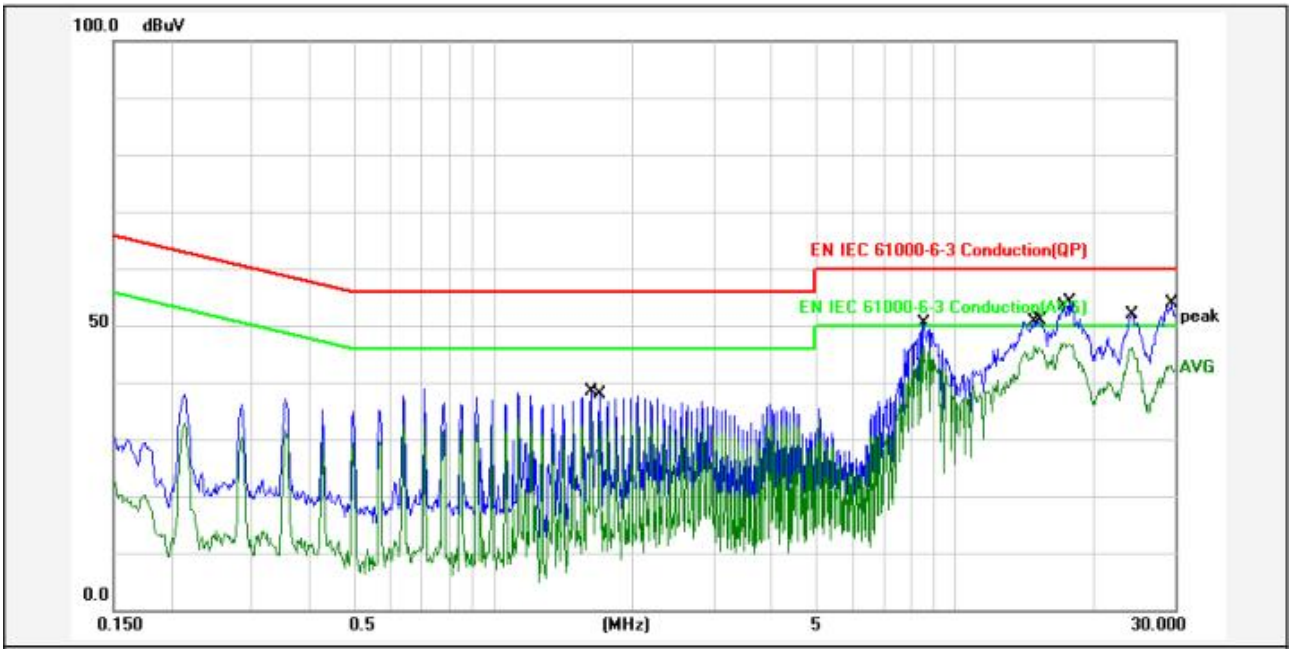
No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.2207	10.26	36.04	46.30	52.79	-6.49	AVG	P	
2	0.2416	10.28	40.52	50.80	62.04	-11.24	QP	P	
3	0.3017	10.36	39.44	49.80	60.19	-10.39	QP	P	
4	0.3165	10.36	32.94	43.30	49.80	-6.50	AVG	P	
5	1.1592	10.51	33.39	43.90	56.00	-12.10	QP	P	
6	1.1592	10.51	29.89	40.40	46.00	-5.60	AVG	P	
7	5.9291	10.55	32.35	42.90	60.00	-17.10	QP	P	
8	6.0243	10.55	27.95	38.50	50.00	-11.50	AVG	P	
9	9.8085	10.67	31.13	41.80	50.00	-8.20	AVG	P	
10	9.9130	10.68	36.12	46.80	60.00	-13.20	QP	P	
11	17.1082	10.83	37.27	48.10	60.00	-11.90	QP	P	
12	17.1082	10.83	33.07	43.90	50.00	-6.10	AVG	P	

E.U.T:	SOLAR POWER SYSTEM	Model Name :	HBP18-3024
Temperature:	26℃	Relative Humidity:	60%
Pressure:	1011hPa	Test Voltage:	PV 100V
Test Mode:	PV Input mode+ Battery + load	Phase:	Neutral
Test Date:	2022-11-02		



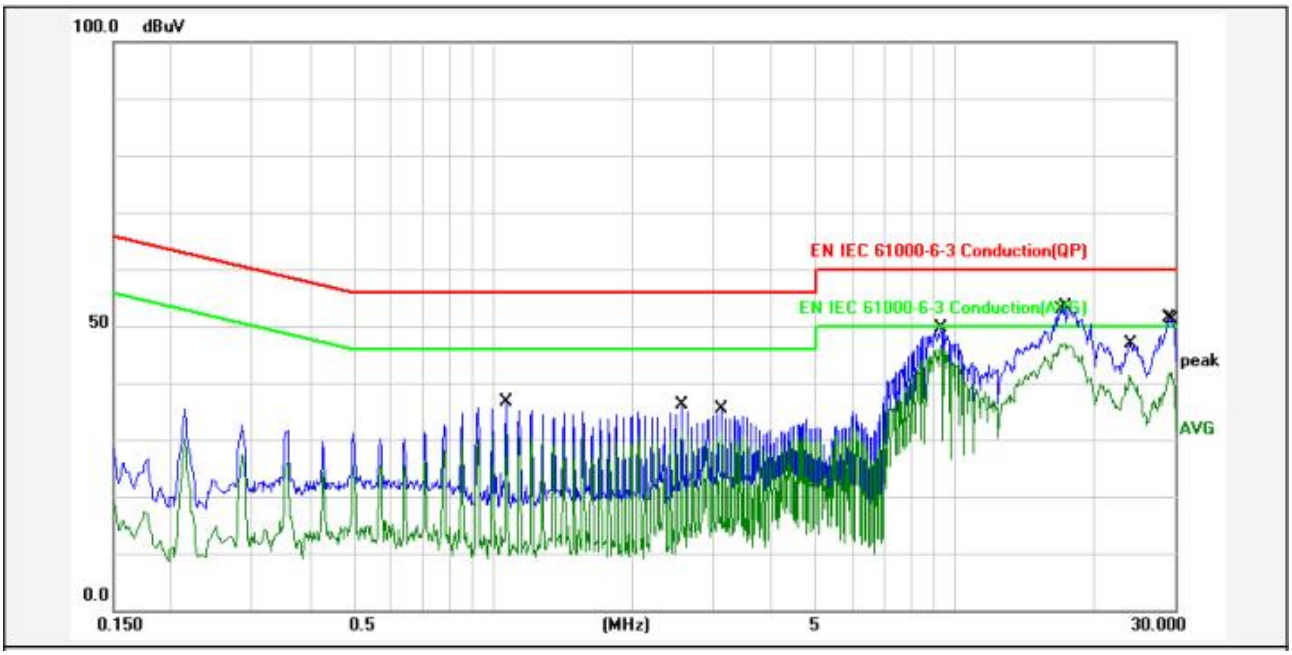
No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.2816	10.34	34.96	45.30	50.77	-5.47	AVG	P	
2	0.3017	10.36	38.94	49.30	60.19	-10.89	QP	P	
3	1.0596	10.52	32.38	42.90	56.00	-13.10	QP	P	
4	1.1169	10.51	26.89	37.40	46.00	-8.60	AVG	P	
5	5.3897	10.56	36.74	47.30	60.00	-12.70	QP	P	
6	5.5346	10.55	29.75	40.30	50.00	-9.70	AVG	P	
7	8.4557	10.62	34.98	45.60	50.00	-4.40	AVG	P	
8	8.5007	10.62	39.28	49.90	60.00	-10.10	QP	P	
9	17.2907	10.83	35.57	46.40	50.00	-3.60	AVG	P	
10	17.3826	10.83	39.37	50.20	60.00	-9.80	QP	P	
11	20.1623	10.88	40.72	51.60	60.00	-8.40	QP	P	
12	20.2695	10.88	36.32	47.20	50.00	-2.80	AVG	P	

E.U.T:	SOLAR POWER SYSTEM	Model Name :	HBP18-3024
Temperature:	26℃	Relative Humidity:	60%
Pressure:	1011hPa	Test Voltage:	DC 24V
Test Mode:	Inverter mode	Phase:	Line1
Test Date:	2022-11-02		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	1.6294	10.43	25.97	36.40	56.00	-19.60	QP	P	
2	1.7016	10.44	22.96	33.40	46.00	-12.60	AVG	P	
3	8.5899	10.58	37.82	48.40	60.00	-11.60	QP	P	
4	8.5899	10.58	35.82	46.40	50.00	-3.60	AVG	P	
5	14.8376	10.69	35.61	46.30	50.00	-3.70	AVG	P	
6	15.3338	10.71	38.09	48.80	60.00	-11.20	QP	P	
7	17.2539	10.84	35.96	46.80	50.00	-3.20	AVG	P	
8	17.7499	10.87	31.13	42.00	60.00	-18.00	QP	P	
9	24.2220	11.02	41.08	52.10	60.00	-7.90	QP	P	
10	24.2220	11.02	35.18	46.20	50.00	-3.80	AVG	P	
11	29.2500	11.03	31.87	42.90	50.00	-7.10	AVG	P	
12	29.5380	11.03	40.77	51.80	60.00	-8.20	QP	P	

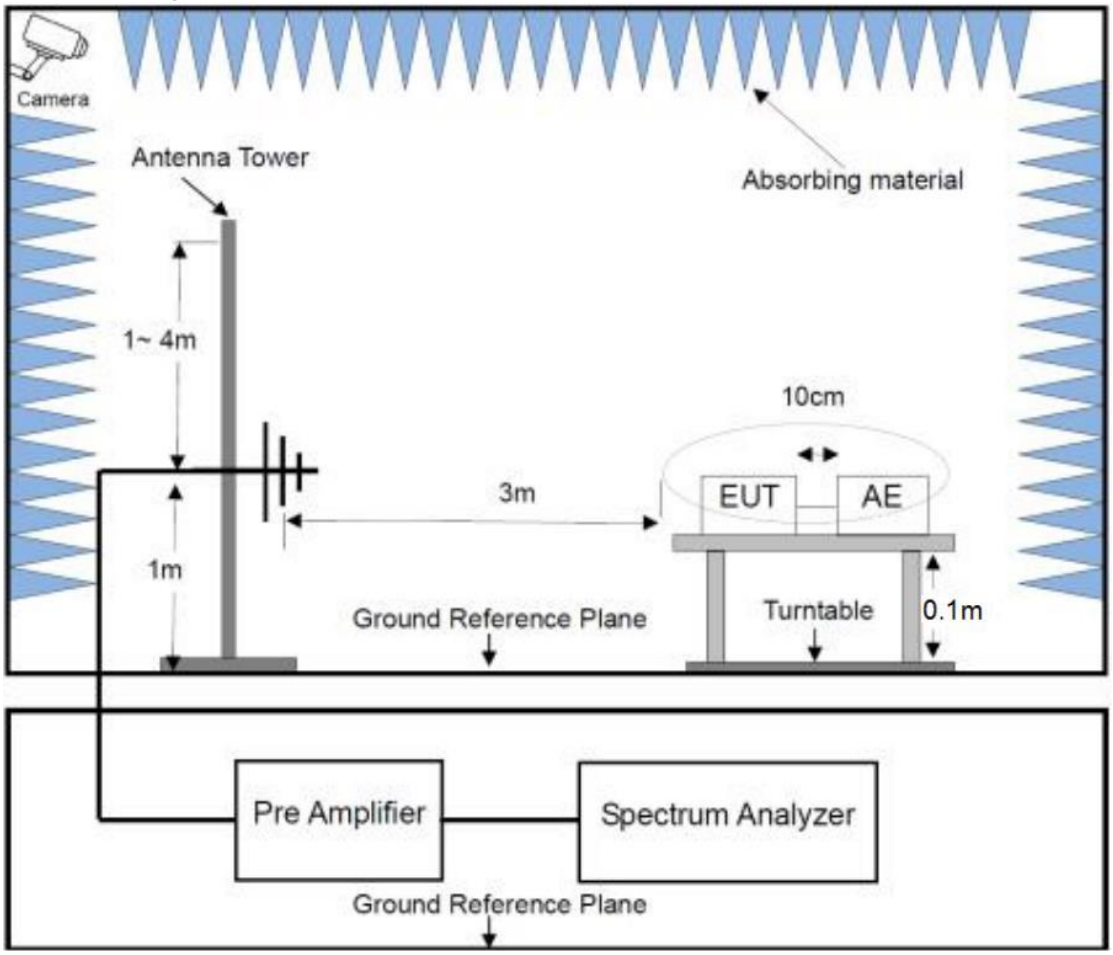
E.U.T:	SOLAR POWER SYSTEM	Model Name :	HBP18-3024
Temperature:	26℃	Relative Humidity:	60%
Pressure:	1011hPa	Test Voltage:	DC 24V
Test Mode:	Inverter mode	Phase:	Neutral
Test Date:	2022-11-02		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	1.0660	10.38	24.12	34.50	56.00	-21.50	QP	P	
2	1.0660	10.38	20.42	30.80	46.00	-15.20	AVG	P	
3	2.5619	10.43	21.17	31.60	46.00	-14.40	AVG	P	
4	3.1299	10.42	22.98	33.40	56.00	-22.60	QP	P	
5	9.3215	10.59	37.11	47.70	60.00	-12.30	QP	P	
6	9.3215	10.59	36.01	46.60	50.00	-3.40	AVG	P	
7	16.8699	10.81	36.09	46.90	50.00	-3.10	AVG	P	
8	17.3699	10.85	40.55	51.40	60.00	-8.60	QP	P	
9	23.9176	11.02	30.18	41.20	50.00	-8.80	AVG	P	
10	24.1340	11.02	33.98	45.00	60.00	-15.00	QP	P	
11	29.1260	11.03	38.17	49.20	60.00	-10.80	QP	P	
12	29.5534	11.03	30.67	41.70	50.00	-8.30	AVG	P	

6.RADIATED EMISSION MEASUREMENT

6.1.Block Diagram of Test Setup



6.2.Limit of Radiated Emission Measurement

Below 1 GHz:

Frequency range MHz	Quasi-peak limits dB(μV/m)	Distance m	Detector type / Bandwidth
30 to 230	40	3	120 KHz
230 to 1000	47	3	120 KHz
Note: The lower limit shall apply at the transition frequency.			

Above 1 GHz :

Frequency range MHz	Peak limits dB(μV/m)	Average limits dB(μV/m)	Distance m	Detector type / Bandwidth
1000 to 3000	70	50	3	1MHz
3000 to 6000	74	54	3	1MHz

Required highest frequency for radiated measurement

Highest internal frequency* (F_x)	Highest measured frequency
$F_x \leq 108$ MHz	1 GHz
108 MHz < $F_x \leq 500$ MHz	2 GHz
500 MHz < $F_x \leq 1$ GHz	5 GHz
$F_x > 1$ GHz	$5 \times F_x$ up to a maximum of 6 GHz

Note
1. F_x is highest fundamental frequency generated or used within the EUT or highest frequency at which it operates.
2. Where the F_x is not known, tests are performed up to 6 GHz.

6.3.Test Procedure

a. The EUT was placed on a rotatable wooden table top 0.1m above ground.

b. The EUT was set 3m away from the receiving antenna which was mounted on the top of a variable height antenna tower.

c. Configure the EUT and support devices as per section 6.1.

d. All cables and support devices were positioned as per EN IEC 61000-6-3.

e. Connect mains power port of the EUT to the outlet socket under the turntable and connect all other support devices to other outlet socket under the turntable.

f. Turn on the EUT and all support devices, and make it run stably.

g. Set the detector and measurement bandwidth of test-receiver system as per EN IEC 61000-6-3.

h. Scan the frequency range from 30MHz to 1000MHz for radiation emissions checking.

i. Emissions were scanned and measured rotating the EUT from 0 to 360 degrees and positioning the antenna from 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.

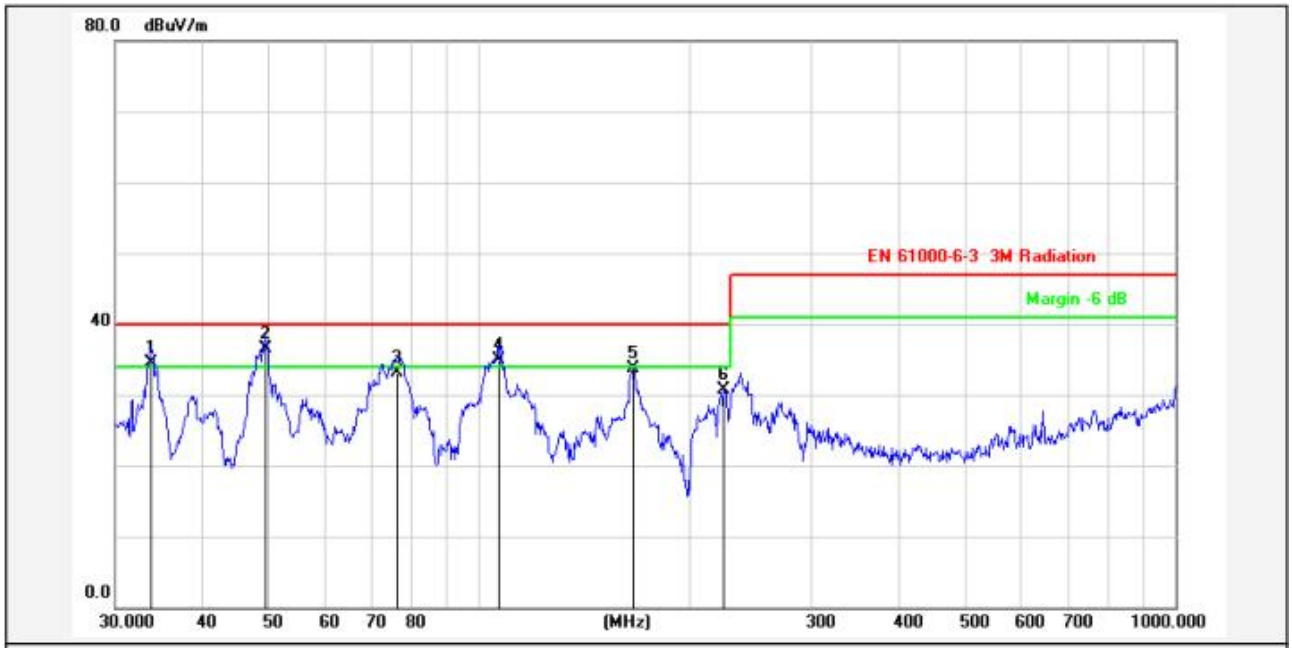
j. Repeat the above scans in each mode and channel and record the test data.

6.4.Test Results

PASS.

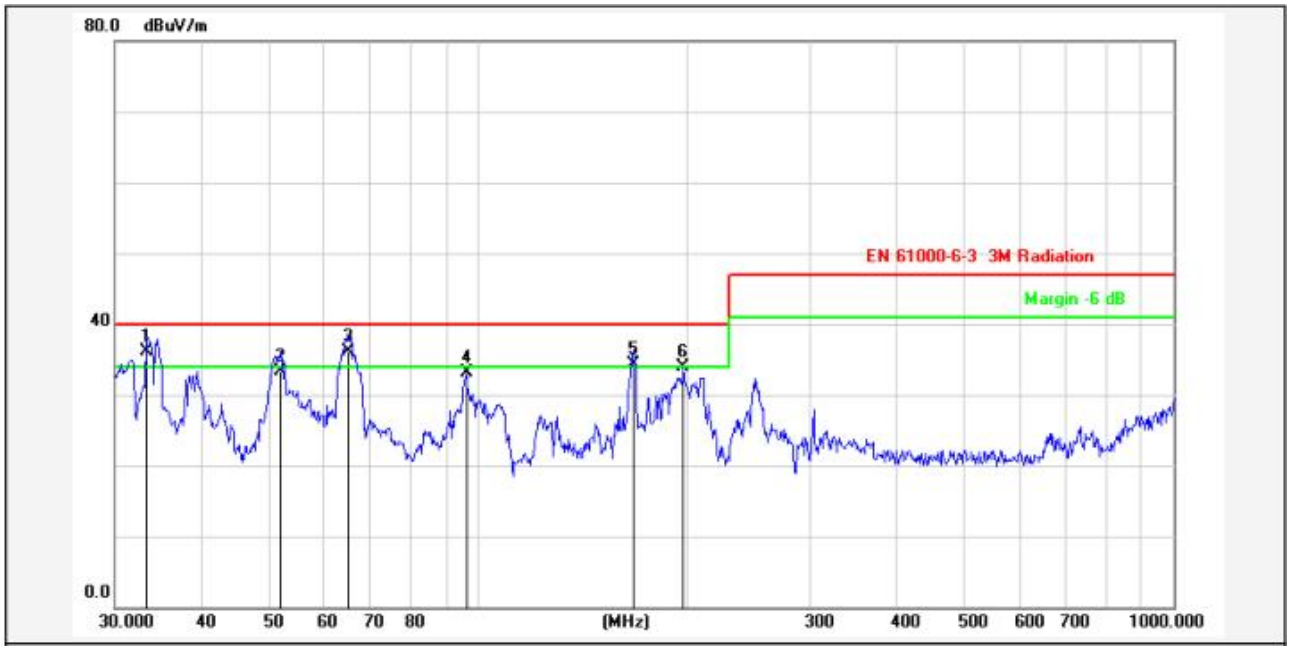
Please refer to the following pages.

E.U.T:	SOLAR POWER SYSTEM	Model Name :	HBP18-3024
Temperature:	23.5℃	Relative Humidity:	58%
Pressure:	1011hPa	Test Voltage:	AC 230V 50Hz
Test Mode:	AC Input mode+ Battery + load	Polarization:	Horizontal
Test Date:	2022-10-28		



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	33.7986	-16.84	51.44	34.60	40.00	-5.40	QP			P	
2	49.3594	-19.95	56.45	36.50	40.00	-3.50	QP			P	
3	76.2442	-19.32	52.52	33.20	40.00	-6.80	QP			P	
4	106.7587	-12.37	47.27	34.90	40.00	-5.10	QP			P	
5	166.0680	-11.56	45.25	33.69	40.00	-6.31	peak			P	
6	224.5192	-13.27	43.96	30.69	40.00	-9.31	peak			P	

E.U.T:	SOLAR POWER SYSTEM	Model Name :	HBP18-3024
Temperature:	23.5℃	Relative Humidity:	58%
Pressure:	1011hPa	Test Voltage:	AC 230V 50Hz
Test Mode:	AC Input mode+ Battery + load	Polarization:	Vertical
Test Date:	2022-10-28		



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	33.3278	-14.40	50.60	36.20	40.00	-3.80	QP			P	
2	52.0251	-20.86	54.26	33.40	40.00	-6.60	QP			P	
3	65.1144	-21.98	58.18	36.20	40.00	-3.80	QP			P	
4	96.0985	-14.06	47.11	33.05	40.00	-6.95	peak			P	
5	167.2366	-11.87	46.17	34.30	40.00	-5.70	QP			P	
6	197.1999	-14.07	48.00	33.93	40.00	-6.07	peak			P	

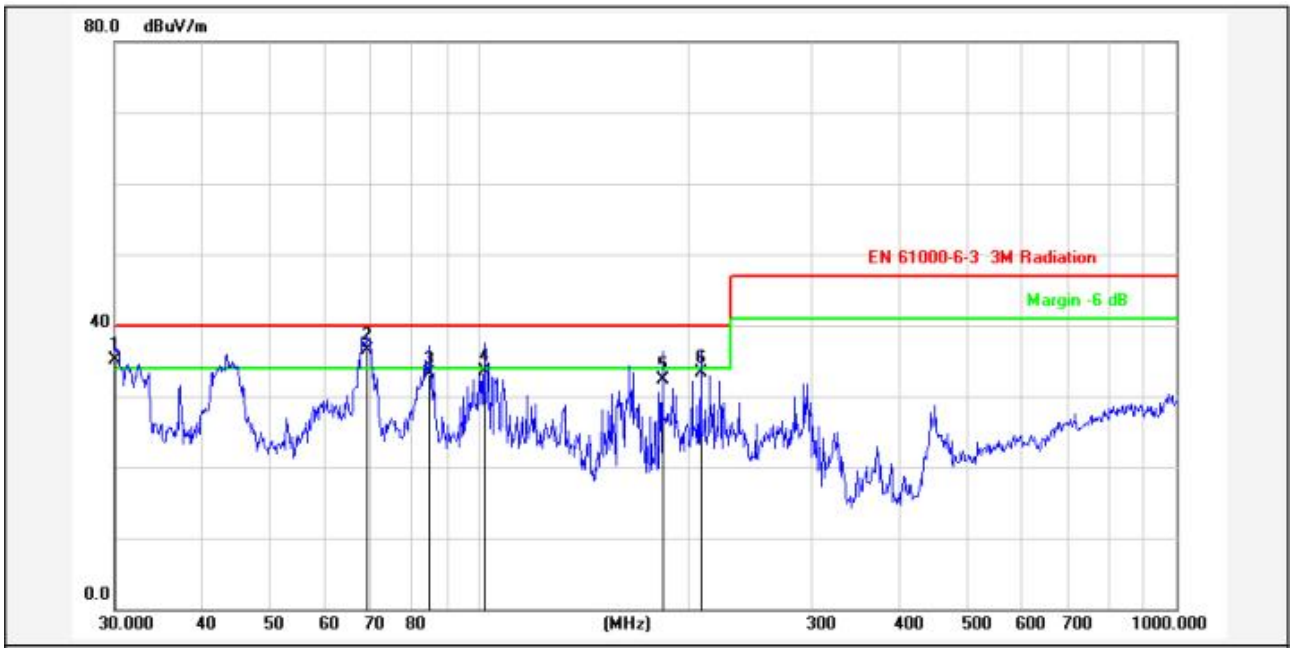
E.U.T:	SOLAR POWER SYSTEM	Model Name :	HBP18-3024
Temperature:	23.5℃	Relative Humidity:	58%
Pressure:	1011hPa	Test Voltage:	PV 100V
Test Mode:	PV Input mode+ Battery + load	Polarization:	Horizontal
Test Date:	2022-10-28		

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	33.7986	-16.84	51.94	35.10	40.00	-4.90	QP			P	
2	51.6613	-20.27	55.57	35.30	40.00	-4.70	QP			P	
3	72.5913	-20.40	53.24	32.84	40.00	-7.16	peak			P	
4	106.7587	-12.37	43.77	31.40	40.00	-8.60	peak			P	
5	166.0680	-11.56	45.16	33.60	40.00	-6.40	QP			P	
6	213.0149	-13.60	46.50	32.90	40.00	-7.10	QP			P	

E.U.T:	SOLAR POWER SYSTEM	Model Name :	HBP18-3024
Temperature:	23.5℃	Relative Humidity:	58%
Pressure:	1011hPa	Test Voltage:	PV 100V
Test Mode:	PV Input mode+ Battery + load	Polarization:	Vertical
Test Date:	2022-10-28		

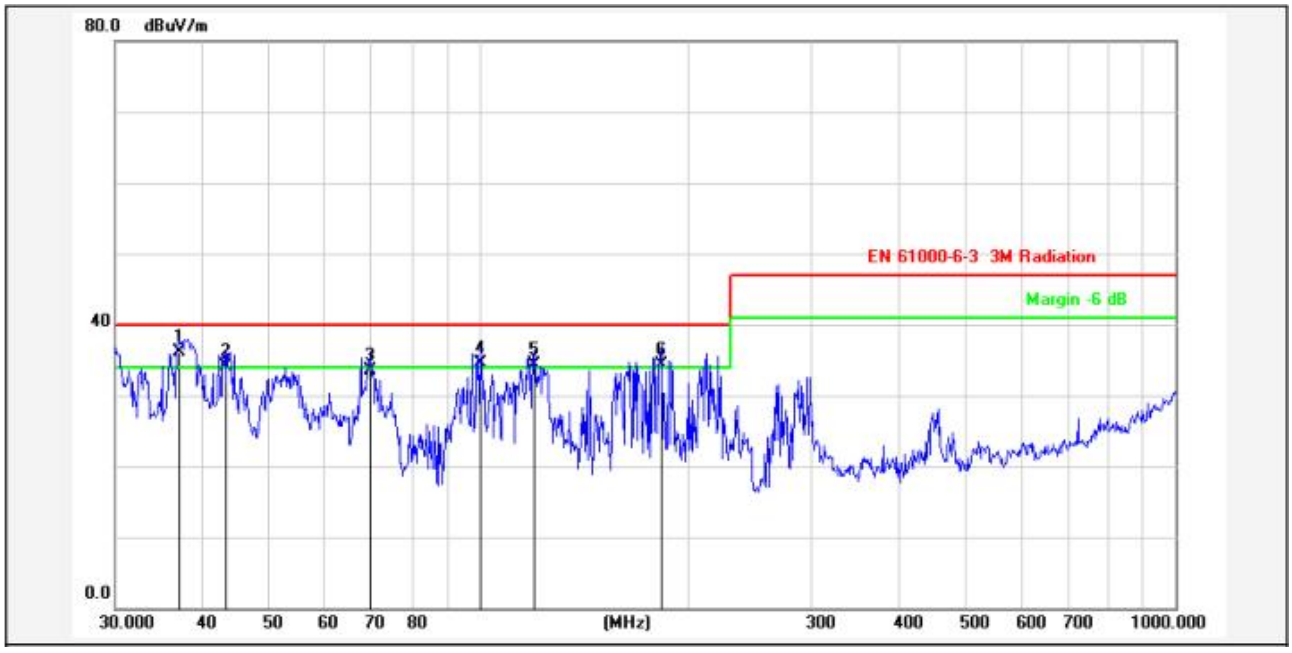
No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	32.9791	-14.36	49.66	35.30	40.00	-4.70	QP			P	
2	38.8877	-15.94	49.19	33.25	40.00	-6.75	peak			P	
3	50.9417	-20.61	53.51	32.90	40.00	-7.10	QP			P	
4	96.0985	-14.06	46.56	32.50	40.00	-7.50	QP			P	
5	167.2366	-11.87	48.17	36.30	40.00	-3.70	QP			P	
6	197.1999	-14.07	47.47	33.40	40.00	-6.60	QP			P	

E.U.T:	SOLAR POWER SYSTEM	Model Name :	HBP18-3024
Temperature:	23.5℃	Relative Humidity:	58%
Pressure:	1011hPa	Test Voltage:	DC 24V
Test Mode:	Inverter mode	Polarization:	Horizontal
Test Date:	2022-10-28		



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	30.1051	-15.24	50.44	35.20	40.00	-4.80	QP			P	
2	69.1140	-21.21	57.81	36.60	40.00	-3.40	QP			P	
3	84.9993	-17.14	50.24	33.10	40.00	-6.90	QP			P	
4	101.6443	-13.31	46.81	33.50	40.00	-6.50	QP			P	
5	183.2005	-13.14	45.44	32.30	40.00	-7.70	QP			P	
6	207.8497	-13.76	47.06	33.30	40.00	-6.70	QP			P	

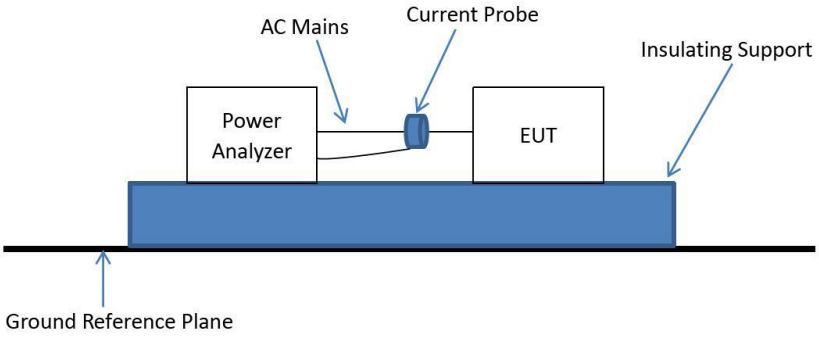
E.U.T:	SOLAR POWER SYSTEM	Model Name :	HBP18-3024
Temperature:	23.5℃	Relative Humidity:	58%
Pressure:	1011hPa	Test Voltage:	DC 24V
Test Mode:	Inverter mode	Polarization:	Vertical
Test Date:	2022-10-28		



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	37.1548	-15.37	51.47	36.10	40.00	-3.90	QP			P	
2	43.2014	-17.13	51.33	34.20	40.00	-5.80	QP			P	
3	69.8448	-21.28	54.88	33.60	40.00	-6.40	QP			P	
4	100.2283	-13.19	47.69	34.50	40.00	-5.50	QP			P	
5	119.8555	-10.23	44.53	34.30	40.00	-5.70	QP			P	
6	182.5592	-13.24	47.64	34.40	40.00	-5.60	QP			P	

7.HARMONIC CURRENT EMISSION MEASUREMENT

7.1.Block Diagram of Test Setup



7.2.Test Limits

☒ **Limits for equipment other than balanced three-phase equipment**

Minimum R_{sce}	Admissible individual harmonic current I_h/I_{ref} [a] %						Admissible harmonic parameters %	
	I_3	I_5	I_7	I_9	I_{11}	I_{13}	THC/I_{ref}	$PWHC/I_{ref}$
33	21,6	10,7	7,2	3,8	3,1	2	23	23
66	24	13	8	5	4	3	26	26
120	27	15	10	6	5	4	30	30
250	35	20	13	9	8	6	40	40
≥350	41	24	15	12	10	8	47	47
The relative values of even harmonics up to order 12 shall not exceed 16/h %. Even harmonics above order 12 are taken into account in THC and $PWHC$ in the same way as odd order harmonics. Linear interpolation between successive R_{sce} values is permitted.								
[a] I_{ref} = reference current; I_h = harmonic current component.								

☐ **Limits for balanced three-phase equipment**

Minimum R_{sce}	Admissible individual harmonic current I_h/I_{ref} [a] %				Admissible harmonic parameters %	
	I_5	I_7	I_{11}	I_{13}	THC/I_{ref}	$PWHC/I_{ref}$
33	10,7	7,2	3,1	2	13	22
66	14	9	5	3	16	25
120	19	12	7	4	22	28
250	31	20	12	7	37	38
≥350	40	25	15	10	48	46
The relative values of even harmonics up to order 12 shall not exceed 16/h %. Even harmonics above order 12 are taken into account in THC and $PWHC$ in the same way as odd order harmonics. Linear interpolation between successive R_{sce} values is permitted.						
[a] I_{ref} = reference current; I_h = harmonic current component.						

☐ **Limits for balanced three-phase equipment under specified conditions(a,b,c)**

Minimum R_{sce}	Admissible individual harmonic current I_h/I_{ref} [a] %				Admissible harmonic parameters %	
	I_5	I_7	I_{11}	I_{13}	THC / I_{ref}	$PWHC/ I_{ref}$
33	10,7	7,2	3,1	2	13	22
≥120	40	25	15	10	48	46
The relative values of even harmonics up to order 12 shall not exceed 16/h %. Even harmonics above order 12 are taken into account in THC and $PWHC$ in the same way as odd order harmonics. Linear interpolation between both R_{sce} values is permitted.						
[a] I_{ref} = reference current; I_h = harmonic current component.						

☐ **Limits for balanced three-phase equipment under specified conditions(d,e,f)**

Minimum R_{sce}	Admissible individual harmonic current I_h/I_{ref} [a] %												Admissible harmonic parameters %	
	I_5	I_7	I_{11}	I_{13}	I_{17}	I_{19}	I_{23}	I_{25}	I_{29}	I_{31}	I_{35}	I_{37}	THC / I_{ref}	$PWHC/ I_{ref}$
33	10,7	7,2	3,1	2	2	1,5	1,5	1,5	1	1	1	1	13	22
≥250	25	17,3	12,1	10,7	8,4	7,8	6,8	6,5	5,4	5,2	4,9	4,7	35	70
For R_{sce} equal to 33, the relative values of even harmonics up to order 12 shall not exceed 16/h %. The relative values of all harmonics from I_{14} to I_{40} not listed above shall not exceed 1 % of I_{ref} For R_{sce}≥ 250, the relative values of even harmonics up to order 12 shall not exceed 16/h %. The relative values of all harmonics from I_{14} to I_{40} not listed above shall not exceed 3 % of I_{ref}. Linear interpolation between both R_{sce} values is permitted.														
[a] I_{ref} = reference current; I_h = harmonic current component.														

For the following categories of equipment limits are not specified in this edition of the standard.
Note: Equipment with a rated power of 75W or less, other than lighting equipment.

7.3.Test Procedure

a. The EUT was placed on a wooden table 0.1m above ground.
b. Configure the EUT and support devices as per section 7.1.
c. Turn on the EUT and all support devices, and make it run stably.
d. Set the EUT to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn.
e. Set correspondent test program and measurement time of the test system to measure the current harmonics emanated from EUT, and then record the test data.

7.4.Test Results

PASS.

Please refer to the following pages.

EUT:	SOLAR POWER SYSTEM	M/N :	HBP18-3024
Test Mode:	AC Input mode+ Battery + load	Test Date:	2022-11-03
Tested by:	CRB		

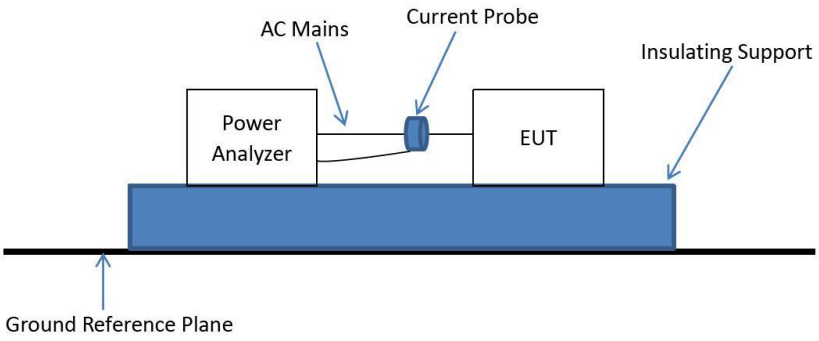
Voltage (V):	227.9	Frequency (Hz):	50
Reference Current I_1 (A):	16.17	Active input power (W):	3668
Apparent power(VA)	3686	Power Factor:	0.995
Test Times	2.5 min		

Minimum R_{sce} = 33	Admissible individual harmonic current I_h/I_{ref} %						Admissible harmonic parameters %	
---	**I_3**	**I_5**	**I_7**	**I_9**	**I_{11}**	**I_{13}**	**THC/I_{ref}**	**PWHC/I_{ref}**
Limit	21.6	10.7	7.2	3.8	3.1	2	23	23
Measured value	0.771	1.225	3.354	2.839	0.568	1.826	2.299	7.733
Verdict	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

Minimum R_{sce} = 33	Admissible individual harmonic current I_h/I_{ref} %						Admissible harmonic parameters %	
---	**I_2**	**I_4**	**I_6**	**I_8**	**I_{10}**	**I_{12}**	**THC/I_{ref}**	**PWHC/I_{ref}**
Limit	8	4	2.6	2	1.6	1.3	23	23
Measured value	3.482	1.486	1.580	0.379	0.885	0.837	2.299	7.733
Verdict	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

8.VOLTAGE FLUCTUATIONS & FLICKER MEASUREMENT

8.1.Block Diagram of Test Setup



8.2.Test Limits

Test Item	Limit
P_{st} (Short-term flicker indicator.)	1.0
P_{lt} (Long-term flicker indicator.)	0.65
$T_{d(t)}$(ms) (Maximum time that d(t) exceeds 3.3%)	500
d_{max}(%) (Maximum relative voltage change.)	4
d_c(%) (Relative steady-state voltage change)	3.3

8.3.Test Procedure

a. The EUT was placed on a wooden table 0.1m above ground.
b. Configure the EUT and support devices as per section 8.1.
c. Turn on the EUT and all support devices, and make it run stably.
d. Set the EUT to produce the most unfavorable sequence of voltage changes under normal operating conditions.
e. Set correspondent test program and measurement time of the test system to measure the most unfavorable sequence of voltage changes from EUT, and then record the test data.

8.4.Test Results

PASS.

Please refer to the following pages.

EUT:	SOLAR POWER SYSTEM	M/N :	HBP18-3024
Test Mode:	AC Input mode+ Battery + load	Test Date:	2022-11-03
Tested by:	CRB		

Voltage (V):	229.17	Frequency (Hz):	50
Reference Current I_1 (A):	16.17	Active input power (W):	3668
Apparent power(VA)	3686	Power Factor:	0.995
Test Times	10 min		

	L1	Limts	Result
Pst	0.04	1.00	PASS
Plt	0.00	0.65	PASS
dc(%)	0.00	3.30	PASS
dmax(%)	0.02	4.00	PASS
dt(s)	0	0.5	PASS

9.PERFORMANCE CRITERIA FOR IMMUNITY

The performance criteria are referred to the test standard: EN IEC 61000-6-1

The variety and the diversity of the apparatus within the scope of this standard makes it difficult to define precise criteria for the evaluation of the immunity test results.
If, as a result of the application of the tests defined in this standard, the apparatus becomes dangerous or unsafe, the apparatus shall be deemed to have failed the test.
A functional description and a definition of performance criteria, during or as a consequence of the EMC testing, shall be provided by the manufacturer and noted in the test report.

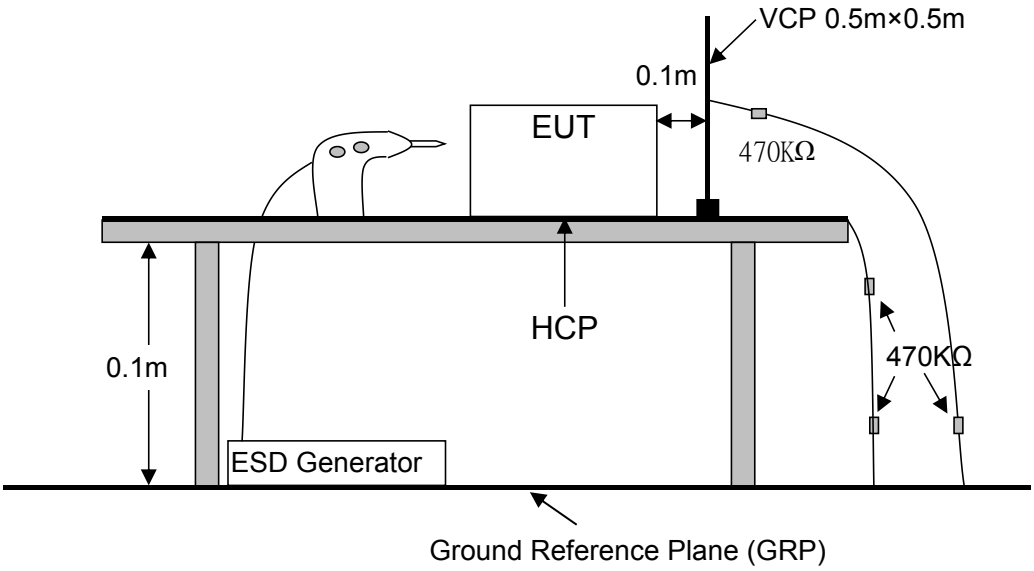
a) Performance Criterion A: The apparatus shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as the minimum performance level or the permissible 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 reasonable except from the apparatus if used as intended.

B) 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. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operation 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 apparatus if used as intended.

c) Performance Criteria C: Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

10.ELECTROSTATIC DISCHARGE TEST

10.1.Block Diagram of Test Setup



10.2.Test Standard and Severity Levels

a. Test Standard:

Product standard	EN IEC 61000-6-1
Basic standard	IEC 61000-4-2
Performance criterion	B

b. Severity Levels:

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

10.3.Test Procedure

Air Discharge:

Air discharges at slots and apertures and insulating surfaces. On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those are normally handled by the user. A minimum of 10 single air discharges shall be applied to the selected test point for each such area.

Contact Discharge:

Contact discharges to the conductive surfaces and coupling planes. The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 20 indirect discharges to the center of the front edge of the Horizontal Coupling Plane (HCP). The remaining three test points shall each receive at least 20 direct contact discharges. If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.

a. The EUT was placed on a wooden table 0.8m height from the ground.

b. The EUT was located 0.1m minimum from all side of the HCP (dimensions 1.6m x0.8m).

c. Configure the EUT and support devices as per section 10.1.

d. The support units were located 30cm away from the EUT, but direct support unit was/were located at same location as EUT on the HCP and keep at a distance of 10cm with EUT.

e. Turn on the EUT and all support devices, and make it run stably.

f. The time interval between two successive single discharges was at least 1 second. Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.

g. Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.

h. At least ten single discharges (in the most sensitive polarity) were applied at the front edge of each HCP opposite the center point of each unit of the EUT and 0.1 meters from the front of the EUT. The long axis of the discharge electrode was in the plane of the HCP and perpendicular to its front edge during the discharges.

i. At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the Vertical Coupling Plane (VCP) in sufficiently different positions that the four faces of the EUT were completely illuminated. The VCP (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the EUT.

j. Repeat the above steps in each mode and record the test result.

10.4.Test Results

PASS.

Please refer to the following page.

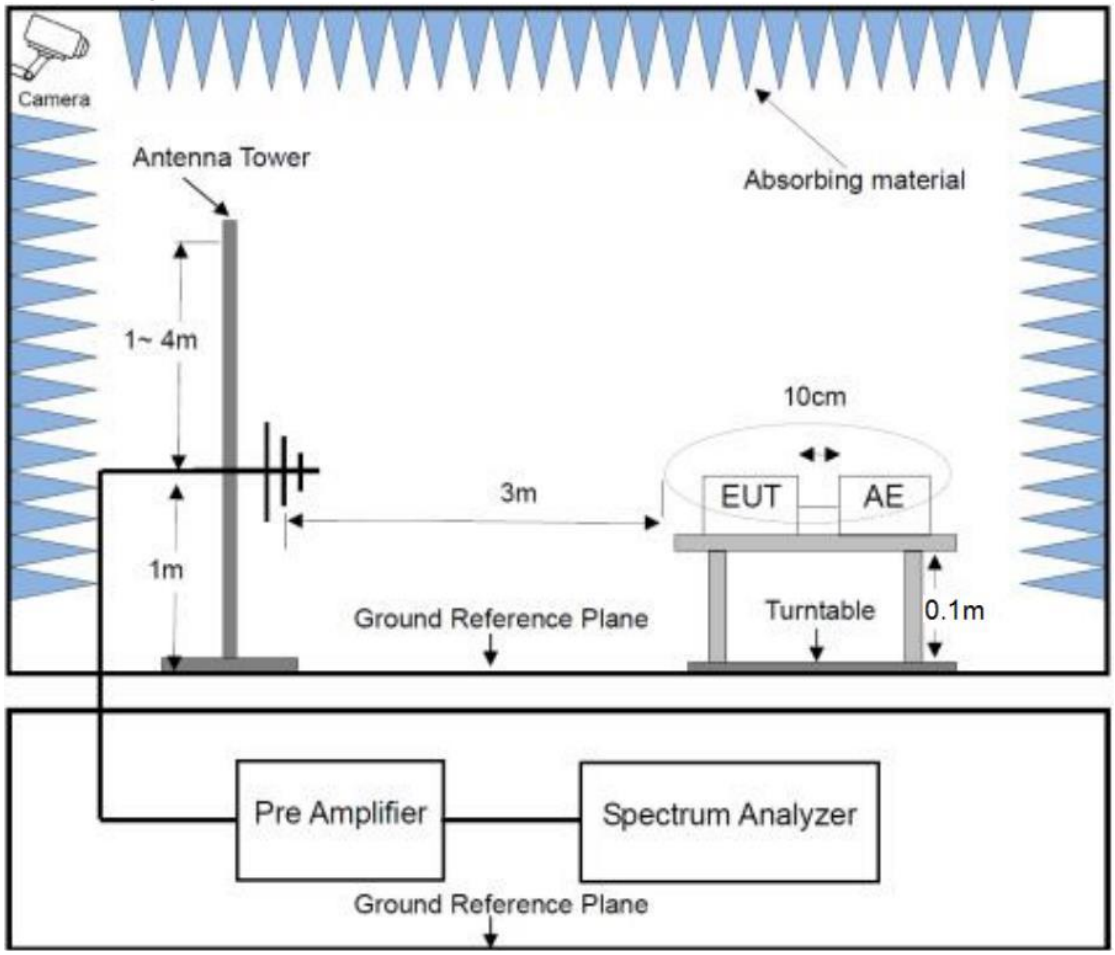
Electrostatic Discharge Test Results			
Ambient Condition:	Temp.: 26.7°C	R.H.: 54%	Air Pressure : 101 kPa
Test Specifications	Test level:	±4 KV for Contact Discharge ± 8 KV for Air Discharge	
	Discharge impedance:	330ohm / 150pF	
	No. of discharges:	10 times at each test point for each polarity at least	
	Polarity:	Positive / Negative	
	Discharge mode:	Single	
	Interval time of discharges:	≥1s	
Required Performance Criterion	B		
Tested Mode	AC Input mode+ Battery + load		

Test Point	Kind A-Air Discharge C-Contact Discharge	Result (Performance Criterion)
Metal case	C	A
Screw	C	A
PV port	A	A
Screen	A	A
Button	A	A
AC Output Port	A	A
USB Port	A&C	A
Indirect Discharge(VCP)	C	A
Indirect Discharge(HCP)	C	A

Note: No performance degradation or other exceptions occurred during and after the test.

11.RADIO-FREQUENCY ELECTROMAGNETIC FIELD TEST

11.1.Block Diagram of Test Setup



11.2.Test Standard and Severity Levels

a. Test Standard

Product standard	EN IEC 61000-6-1
Basic standard	IEC 61000-4-3
Performance criterion	A

b. Severity Levels

Level	Field Strength (V/m)
1.	1
2.	3
3.	10
4.	30
X	Special

11.3.Test Procedure

a. The testing was performed in a fully anechoic chamber.

b. The EUT and necessary support devices were placed on a turn table which is 0.1 meter above ground.

c. EUT was set 3 meter away from the transmitting antenna which is mounted on an antenna tower.

d. Configure the EUT and support devices as per section 11.1.

e. Turn on the EUT and all support devices, and make it run stably.

f. Set horizontal and vertical polarization of the antenna to test. Each of the four sides of EUT must be faced this transmitting antenna and measured individually.

g. Repeat the above steps in each mode and record the test result.

11.4.Test Results

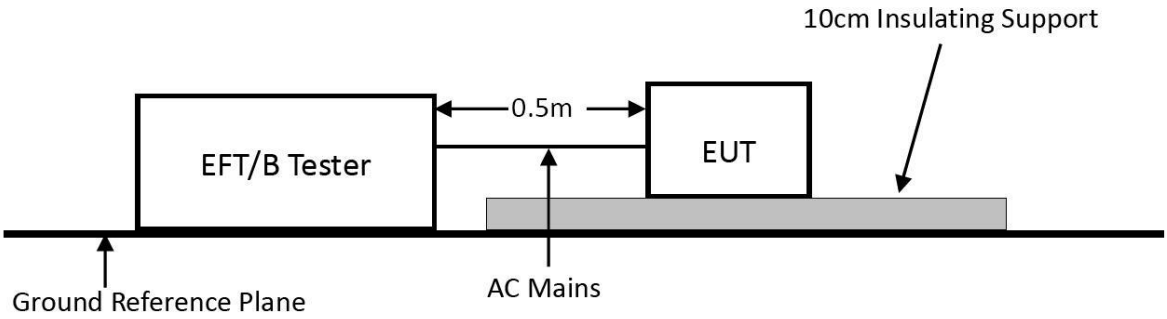
PASS.

Please refer to the following page.

Radio-Frequency Electromagnetic Field Test Results				
Ambient Condition	Temp.: 23.4°C		R.H.: 50.5%	Air Pressure: 101 kPa
Test Specifications	Fielded Strength:		3V/m	
	Modulation:		1kHz sine wave, 80%AM	
	Frequency Size:		1% of preceding frequency value	
	Dwell Time:		1s	
	Mode:		Swept test	
Required Performance Criterion	A			
Tested mode	AC Input mode+ Battery + load			
Frequency (MHz)	Level (V/m)	Antenna polarity	Side	Result (Performance Criterion)
80-1000	3	Horizontal/ Vertical	Front	A
			Left	A
			Right	A
			Back	A
1400-6000	3	Horizontal/ Vertical	Front	A
			Left	A
			Right	A
			Back	A
Note: No performance degradation or other exceptions occurred during and after the test.				

12.FAST TRANSIENTS TEST

12.1.Block Diagram of Test Setup



12.2.Test Standard and Severity Levels

a. Test Standard

Product standard	EN IEC 61000-6-1
Basic standard	IEC 61000-4-4
Performance criterion	B

b. Severity level

Open circuit output test voltage and repetition rate of the impulses				
Level	Power ports, earth port (PE)		Signal data and control ports	
	Voltage peak kV	Repetition frequency kHz	Voltage peak kV	Repetition frequency kHz
1.	0.5	5 or 100	0.25	5 or 100
2.	1.0	5 or 100	0.5	5 or 100
3.	2.0	5 or 100	1.0	5 or 100
4.	4.0	5 or 100	2.0	5 or 100
X	Special	Special	Special	Special

Note 1 The use of 5 kHz repetition rates is traditional, however, 100 kHz is closer to reality. Product committees should determine which frequencies are relevant for specific products or product types.
Note 2 With some products, there may be no clear distinction between power ports and signal ports, in which case it is up to product committees to make this determination for test purposes.
Note 3 “X” can be any level, above, below or in between the others. The level shall be specified in the dedicated equipment specification.

12.3.Test Procedure

a. The EUT was placed on the insulating support 0.1m above the reference ground plane.

b. Configure the EUT and support devices as per section 12.1.

c. Turn on the EUT and all support devices, and make it run stably.

d. For input and output AC power port of the EUT, the EUT was connected to the power mains by using a coupling device which couples the EFT interference signal to AC power lines. The coaxial output of the EFT generator to the terminals on the EUT should not exceed 0.5 meter. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 2 minutes.

e. For signal ports of the EUT, the EUT was connected to the power mains, and the signal line through a coupling device which couples the EUT interference signal to signal line. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 2 minutes.

f. Repeat the above steps in each mode and record the test result.

12.4.Test Result

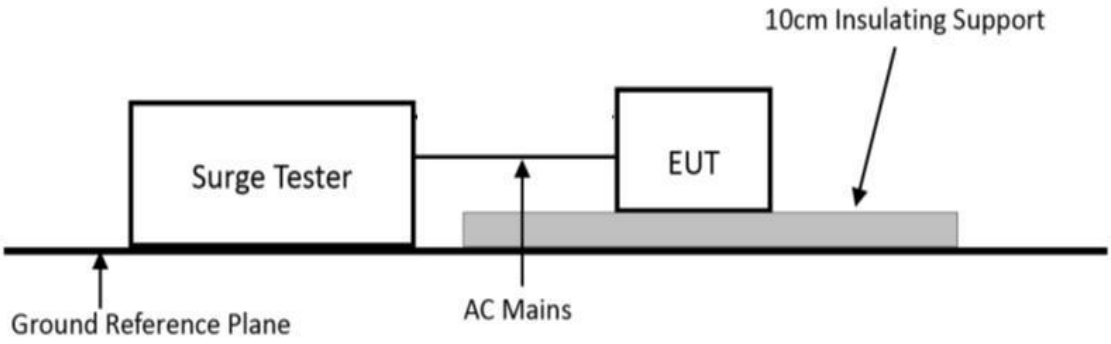
PASS.

Please refer to the following page.

Fast transients test Results			
Ambient Condition	Temp.: 28.3°C	R.H.56.2%	Air Pressure: 101 kPa
Test Specifications	Test Level:	1.0 kV for power port, 0.5KV for pv port	
	Repetition Frequency:	5kHz	
	Duration:	15ms	
	Period:	300ms	
	Impulse wave shape:	5/50ns (Tr/Th)	
	Test Duration:	≥1min	
Required Performance Criterion	B		
Test mode	AC Input mode+ Battery + load		
Coupling mode and port	☒ AC Power ☒ Direct ☐ Signal line ☐ Capacitive ☒ DC port		
Test Line	Test Voltage	Result (Performance Criterion)	
AC Input Power Ports	±1KV	A	
AC Output Power Ports	±1KV	A	
PV port	±0.5KV	A	
Signal port	---	---	
Note : No performance degradation or other exceptions occurred during and after the test.			

13. SURGE TEST

13.1.Block Diagram of Test Setup



13.2.Test Standard and Severity Levels

a. Test Standard

Product standard	EN IEC 61000-6-1
Basic standard	IEC 61000-4-5
Performance criterion	B

b. Severity level

Level	Open-Circuit Test Voltage KV
1.	0.5
2.	1.0
3.	2.0
4.	4.0
*	Special

13.3.Test Procedure

a. The EUT was placed on the wooden table 0.1m above the ground.
b. Configure the EUT and support devices as per section 13.1.
c. Turn on the EUT and all support devices, and make it run stably.
d. The surge is applied to the EUT power supply terminals via the capacitive coupling network Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.
e. For test applied to unshielded un-symmetrically operated interconnection lines of EUT, the surge was applied to the lines via the capacitive coupling. The coupling / decoupling networks didn't influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.
f. For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT, the surge was applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor were not specified. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.
g. Five positive and five negative (polarity) pulses at specified phase angles with a 1min repetition rate are conducted during test.
h. Repeat the above steps in each mode and record the test result.

13.4.Test Result

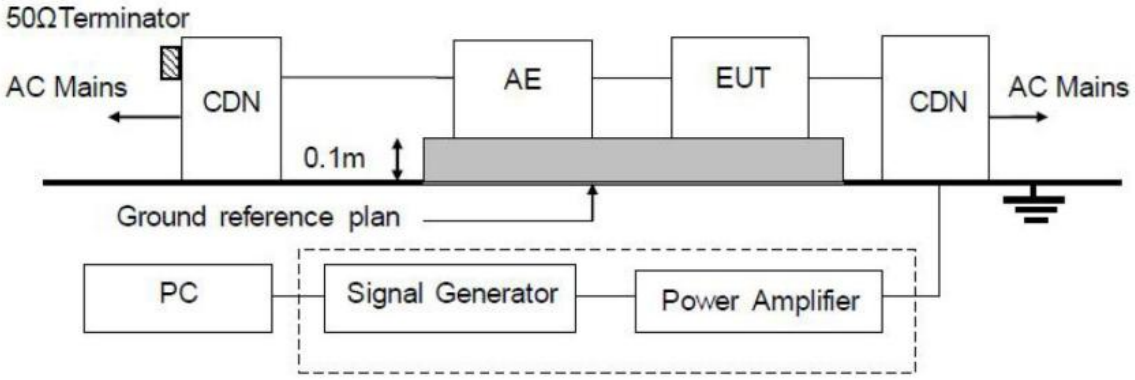
PASS.

Please refer to the following pages.

Surge Test Results			
Ambient Condition	Temp.: 27.3°C	R.H.: 50.4%	Air Pressure: 101 kPa
Test Specifications	Wave-shape:	1.2/50 us (Tr/Th) / 8/20 us (Tr/Th) for power port	
	Test Level:	±1kV for Line to Line ±1kV, ±2kV for Line to Earth	
	Phase angle:	0°, 90°, 180° and 270°	
	Polarity:	Positive / Negative	
	NO. of pulse:	5 positive / 5 negative	
	Pulse repetition rate:	1 time per minute / maximum	
	Generator source impedance:	2 ohm / power supply network 12 ohm / power supply network to ground	
Required Performance Criterion	B		
Test mode	AC Input mode+ Battery + load		
Test Line	Phase Angle	Test Voltage	Result (Performance Criterion)
AC Input Power Ports Line to line	0°, 90°, 180°, 270°	±1KV	A
AC Input Power Ports Line to earth	0°, 90°, 180°, 270°	±2KV	A
AC Output Power Ports Line to line	0°, 90°, 180°, 270°	±1KV	A
AC Output Power Ports Line to earth	0°, 90°, 180°, 270°	±2KV	A
PV port Line to line	/	±0.5KV	A
PV port Line to earth	/	±1KV	A
DC port	---	---	---
Note : No performance degradation or other exceptions occurred during and after the test.			

14.CONDUCTED RADIO-FREQUENCY COMMON MODE TEST

14.1.Block Diagram of Test Setup



14.2.Test Standard and Severity Levels

a. Test Standard

Product standard	EN IEC 61000-6-1
Basic standard	IEC 61000-4-6
Performance criterion	A

b. Severity level

Level	Field Strength (V)
1.	1
2.	3
3.	10
X	Special

14.3.Test Procedure

a. The EUT was placed on the insulating support 0.1m above the ground reference plane. CDN (coupling and decoupling device) or EM clamp is placed on the ground plane about 0.3m from EUT. Cables between CDN or EM clamp and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).
b. Configure the EUT and support devices as per section 14.1.
c. Turn on the EUT and all support devices, and make it run stably.
d. The disturbance signal described below is injected to EUT through CDN or EM clamp.
e. The frequency range is swept from 150 KHz to 80 MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1kHz sine wave. The rate of sweep shall not exceed 1.5*10-3decades/s. Where the frequency is swept incrementally, the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.
f. Repeat the above steps in each mode and record the test result.

14.4.Test Result

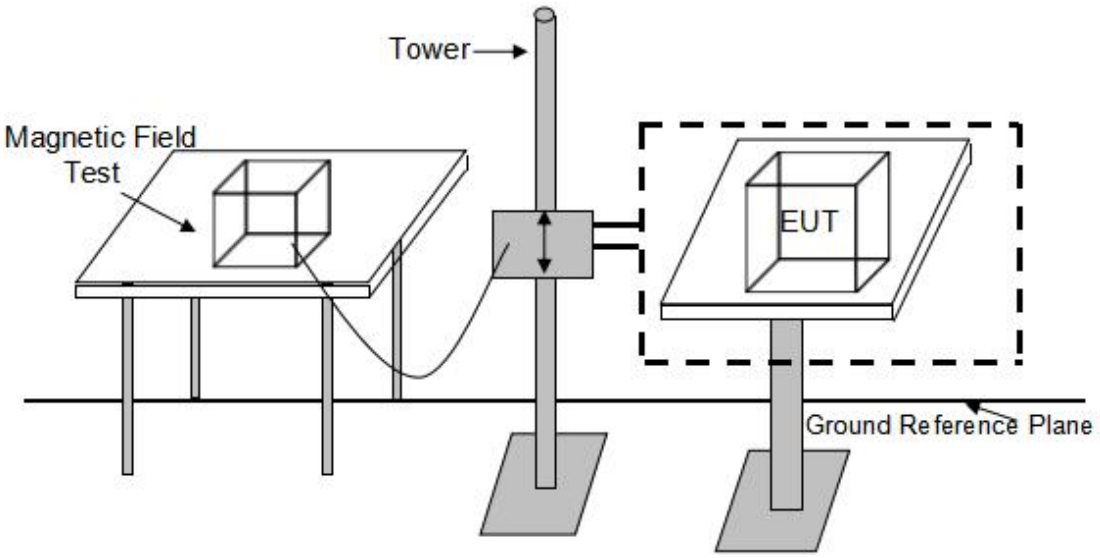
PASS.

Please refer to the following page.

Conducted RF Common Mode Test Results			
Ambient Condition	Temp.: 23.1°C	R.H.: 51.2%	Air Pressure:101kPa
Test Specifications	Test Level:	3V	
	Modulation:	1kHz sine wave, 80%AM	
	Step Size:	1% of preceding frequency value	
	Dwell Time:	1s	
	Mode:	Swept test	
Required Performance Criterion	A		
Test mode	AC Input mode+ Battery + load		
Test Port	Frequency (MHz)	Level(V)	Result (Performance Criterion)
AC Input Power Ports	0.15-80	3V	A
AC Output Power Ports	0.15-80	3V	A
PV port	0.15-80	3V	A
Signal port	---	---	---
Note : No performance degradation or other exceptions occurred during and after the test.			

15.POWER-FREQUENCY MAGNETIC FIELD TEST

15.1.Block Diagram of Test Setup



15.2.Test Standard and Severity Levels

a. Test Standard

Product standard	EN IEC 61000-6-1
Basic standard	IEC 61000-4-8
Performance criterion	A

b. Severity level

Level	Magnetic Field Strength A/m
1.	1
2.	3
3.	10
4.	30
5.	100
X	Special

15.3.Test Procedure

a. The EUT was placed on the middle of an induction coil(1*1m), under which is a 0.1m-thick insulating support.

b. Configure the EUT and support devices as per section 15.1.

c. All cables of the EUT were exposed to the magnetic field for 1m of their length.

d. X, Y and Z polarization of the induction coil are set on test, so that each side of the E.U.T. is affected by the magnetic field. If not possible as the EUT size, change the position of the EUT is permitted.

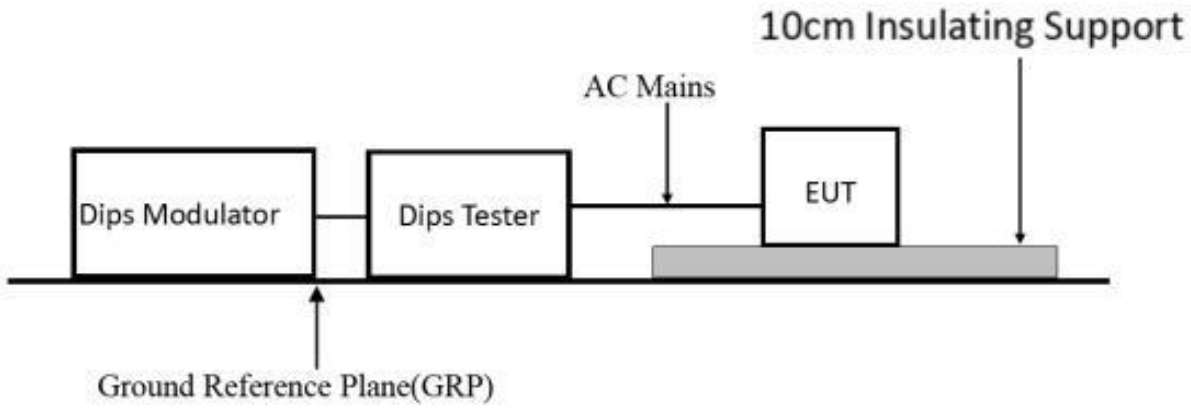
e. Repeat the above steps in each mode and record the test result.

15.4.Test Result

N/A.

16.VOLTAGE DIPS AND INTERRUPTIONS TEST

16.1.Block Diagram of Test Setup



16.2.Test Standard and Severity Levels

a. Test Standard

Product standard	EN IEC 61000-6-1
Basic standard	IEC 61000-4-11
Performance criterion	B&C

b. Severity level

Class	Test level and durations for voltage dips (t_s)(50Hz/60Hz)				
Class 1	Case-by-case according to the equipment requirements				
Class 2	0 % during $^1/_2$ cycle	0 % during 1 cycle	70 % during 25/30[b] cycles		
Class 3	0 % during $^1/_2$ cycle	0 % during 1 cycle	40 %[c] during 10/12[b] cycles	70 % during 25/30[b] cycles	80 % during 250/300[b] cycles
Class X[a]	X	X	X	X	X

Note: a. To be defined by product committee. For equipment connected directly or indirectly to the public network, the levels must not be less severe than Class 2.

b. "25/30 cycles" means "25 cycles for 50 Hz test" and "30 cycles for 60 Hz test", “10/12 cycles” means “10 cycles for 50 Hz test” and “12 cycles for 60 Hz test” and “250/300 cycles” means “250 cycles for 50 Hz test” and “300 cycles for 60 Hz test”.

c. May be replaced by product committee with a test level of 50 % for equipment that is intended primarily for 200 V or 208V nominal operation.

Class	Test level and durations for short interruptions (t_s) (50 Hz/60 Hz)				
Class 1	Case-by-case according to the equipment requirements				
Class 2	0 % during 250/300[b] cycles				
Class 3	0 % during 250/300[b] cycles				
Class X[a]	X	X	X	X	X
Note: a. To be defined by product committee. For equipment connected directly or indirectly to the public network, the levels must not be less severe than Class 2. b. "250/300 cycles" means "250 cycles for 50 Hz test" and "300 cycles for 60 Hz test".					

16.3.Test Procedure

a. The EUT was placed on the wooded table 0.1m above the ground.

b. Configure the EUT and support devices as per section 16.1.

c. Setting the parameter of tests and then perform the test software of test simulator.

d. Conditions changes to occur at 0 and 180 degree crossover point of the voltage waveform.

e. Repeat the above steps in each mode and record the test result.

16.4.Test Result

PASS.

Please refer to the following page.

Voltage Dips and Interruptions Test Results			
Ambient Condition:	Temp.: 27.8°C	R.H.: 56%	Air Pressure: 101 kPa
Test Specifications:	Residual voltage:	0%, 40%, 70%, 0%	
	Duration (periods):	☒ 0.5 for 50/60Hz ☒ 25 for 50Hz ☒ 250 for 50Hz	☒ 1 for 50/60Hz ☒ 30 for 60Hz ☒ 300 for 60Hz
	Phase angle:	0° and 180°	
	Interval between tests:	10s	
	NO. of tests:	3 times	
Required Performance Criterion	B for voltage dips C for voltage dips and voltage interruptions		
Test mode:	AC Input mode+ Battery + load		

Test Level (% Residual voltage) (Input)	Duration (periods)		Result (Performance Criterion)
	50Hz	60Hz	
0	0.5P	0.5P	B note
0	1P	1P	B note
70	25P	30P	B note
0	250P	300P	B note

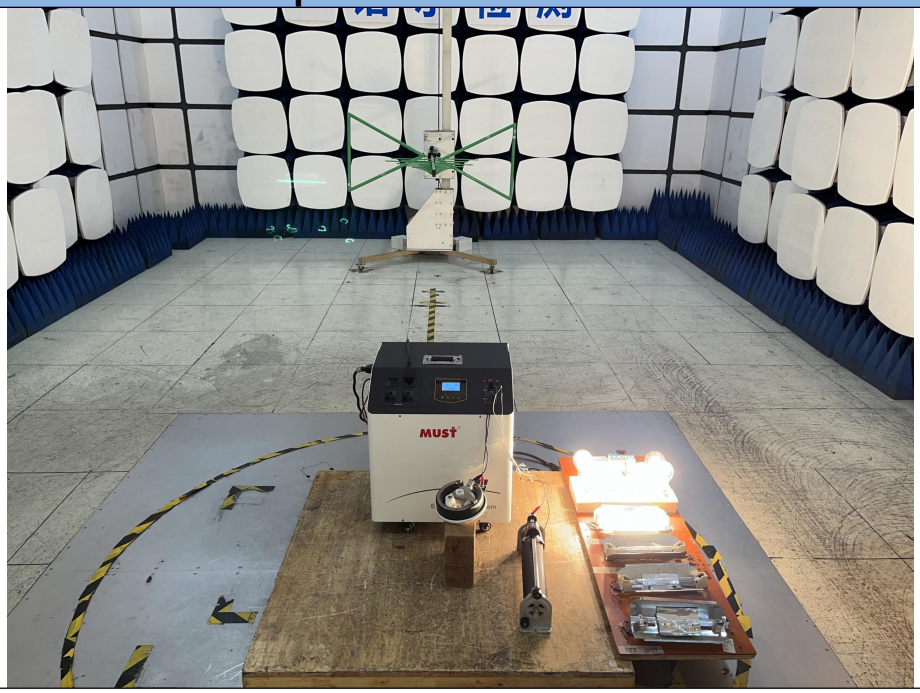
Note :During the test, the working mode of EUT is changing, it can be recovered automatically after test.

APPENDIX I (PHOTOS OF TEST SETUP)

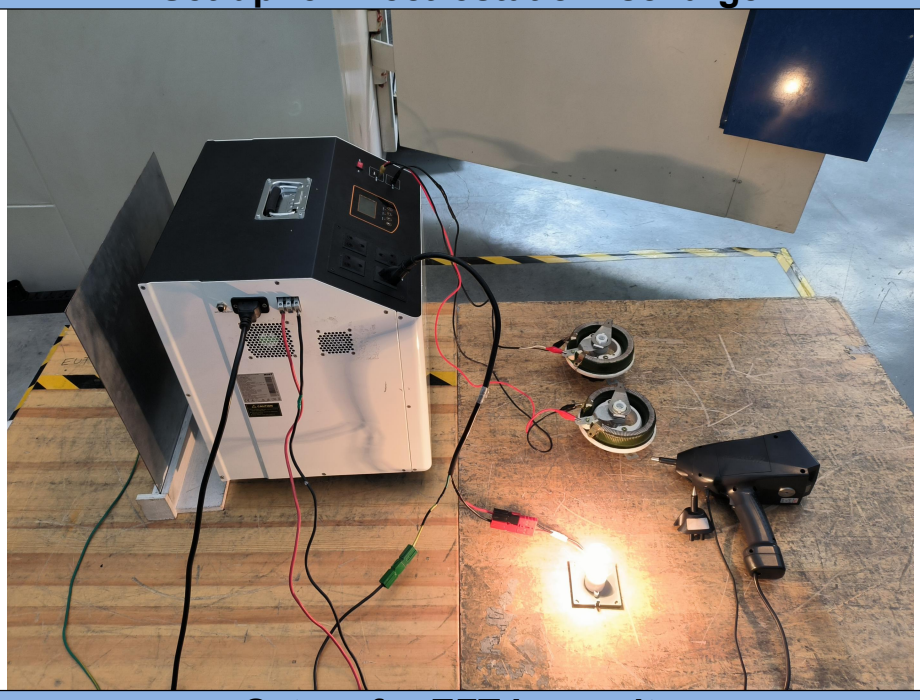
Photos of Test Setup

Set-up for Conducted Emission

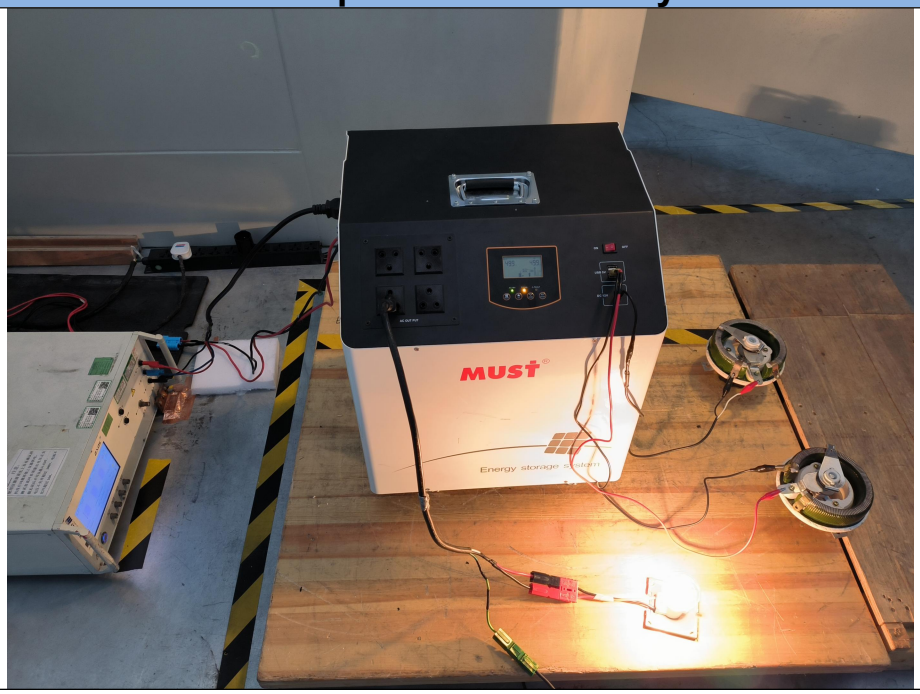
Set-up for Radiated Emission



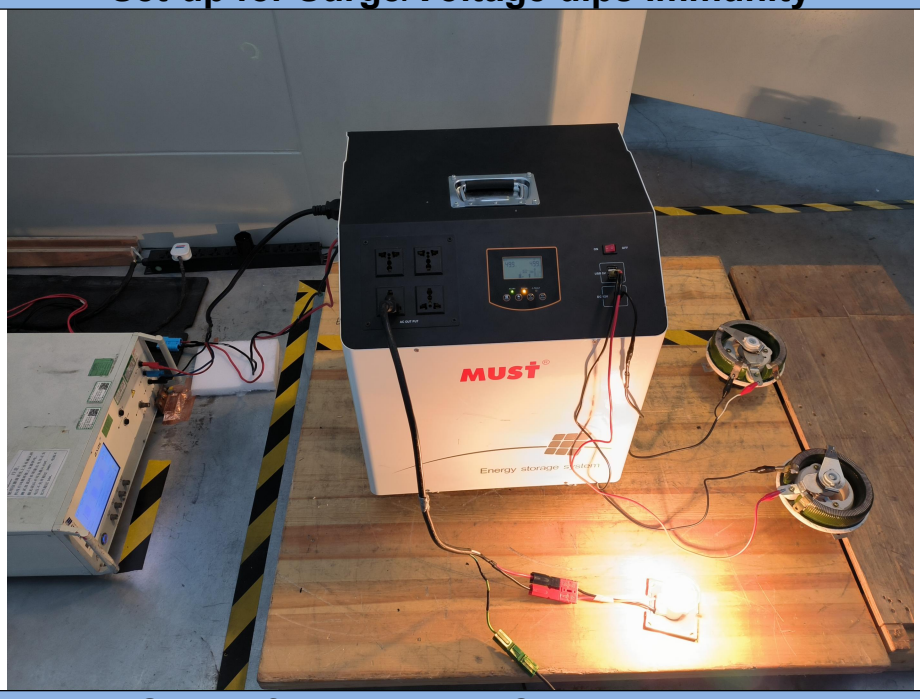
Set-up for Electrostatic Discharge



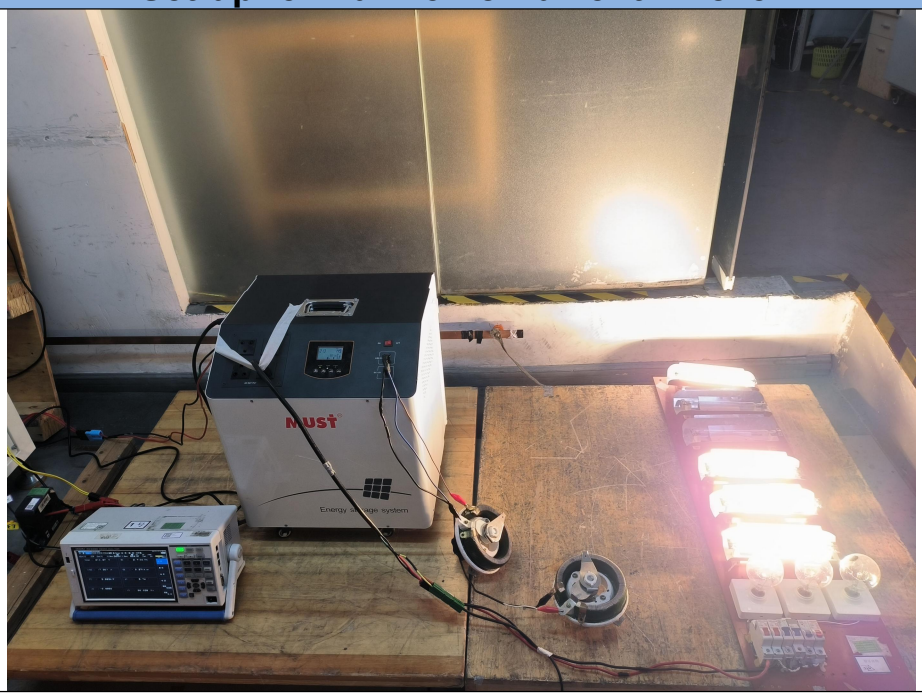
Set-up for EFT Immunity



Set-up for Surge/Voltage dips Immunity



Set-up for Harmonic Current/ Flicker



APPENDIX II (PHOTOS OF E.U.T)

Photos of the EUT

Over View -1(socket 1)

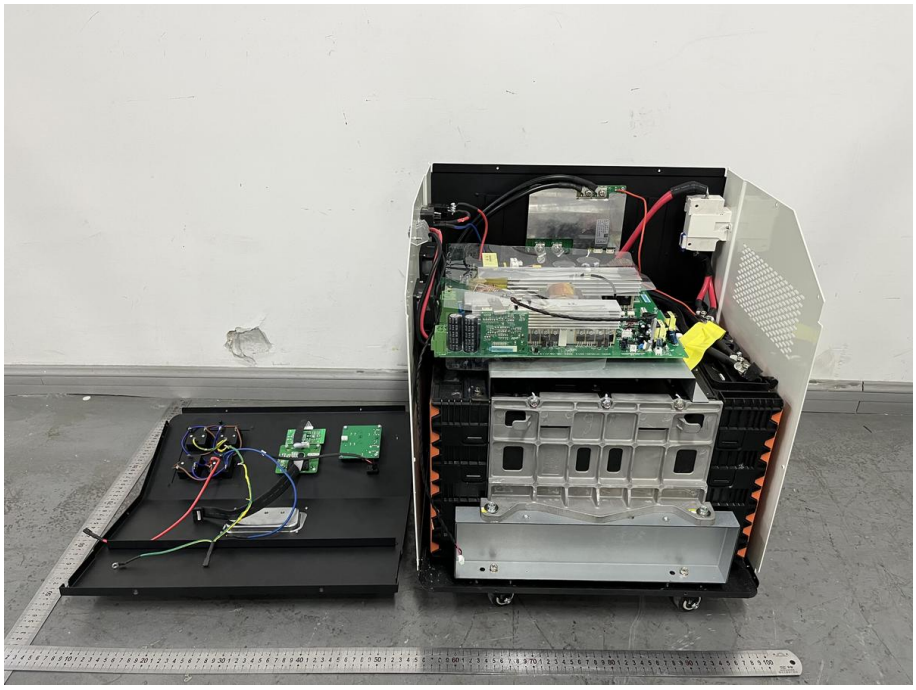
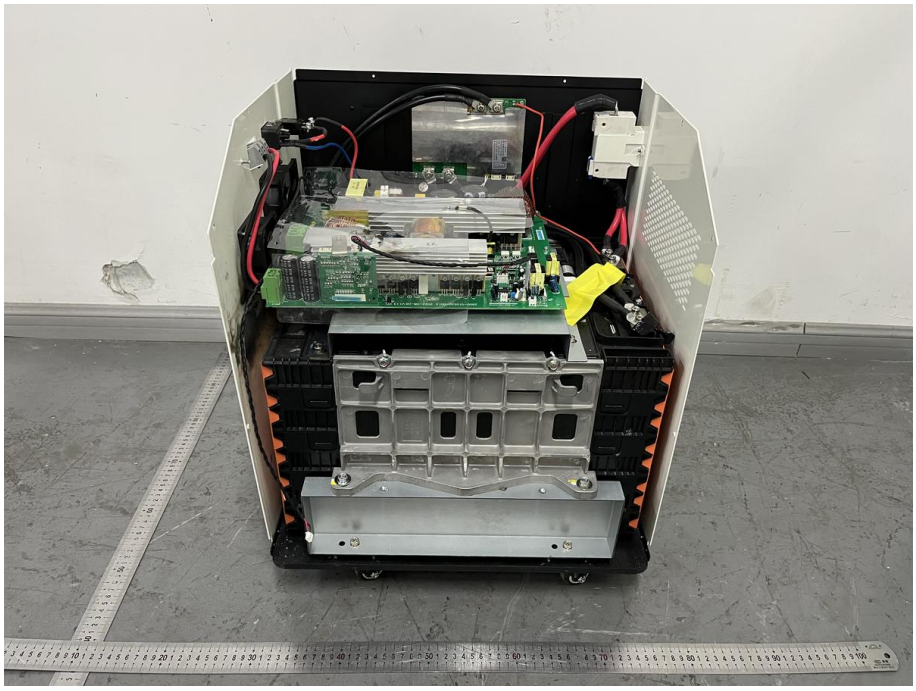
Over View -2(socket 1)

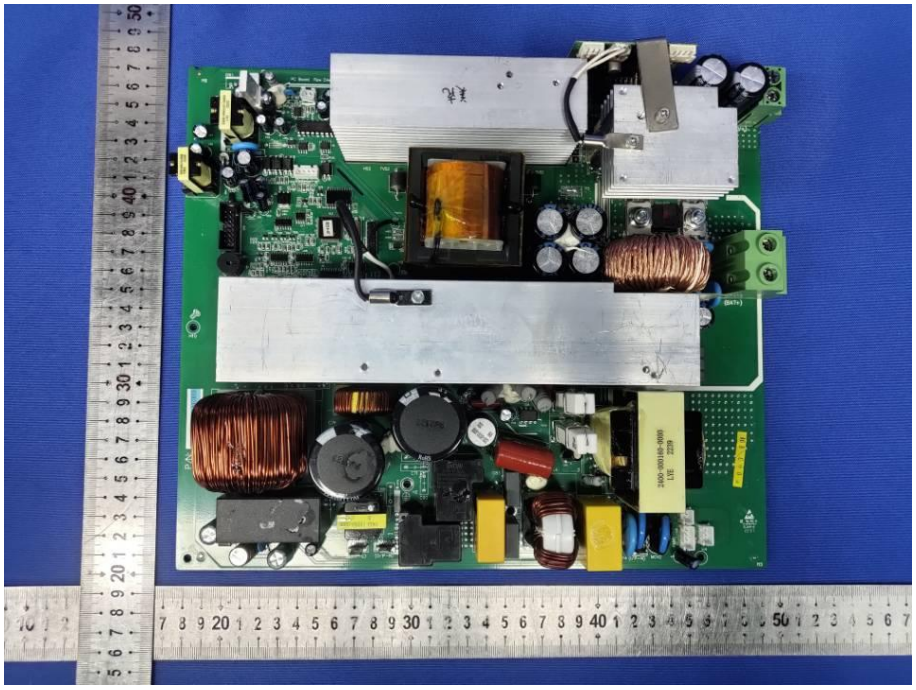
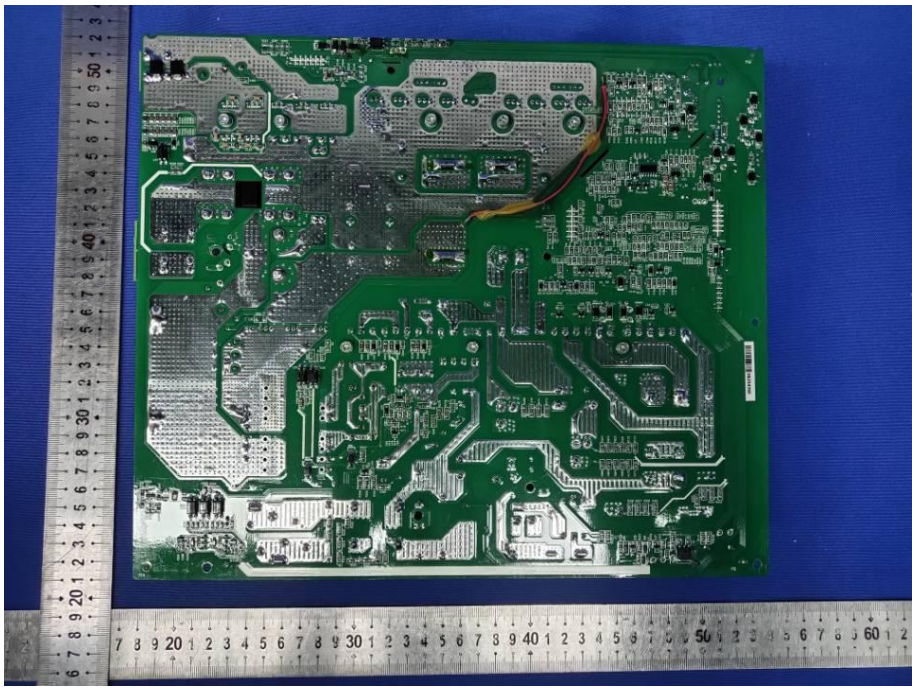

Over View -1(socket 2)

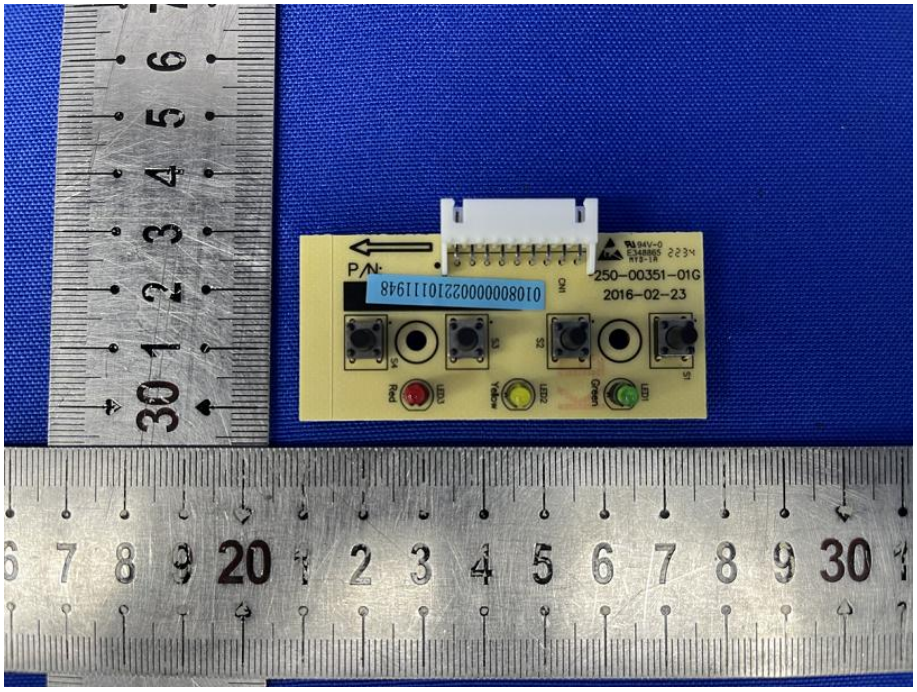
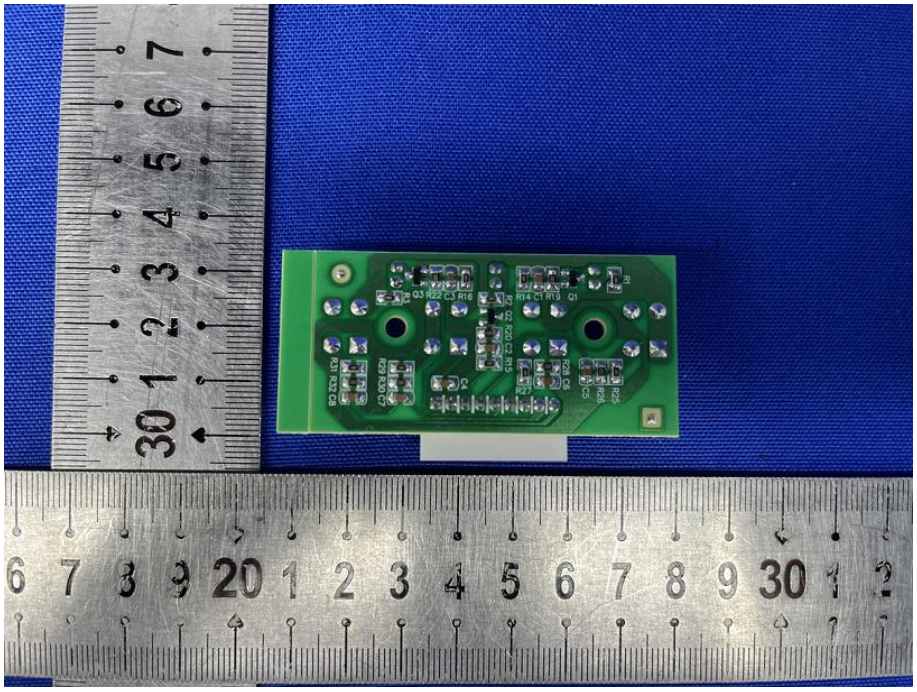
Over View -2(socket 2)

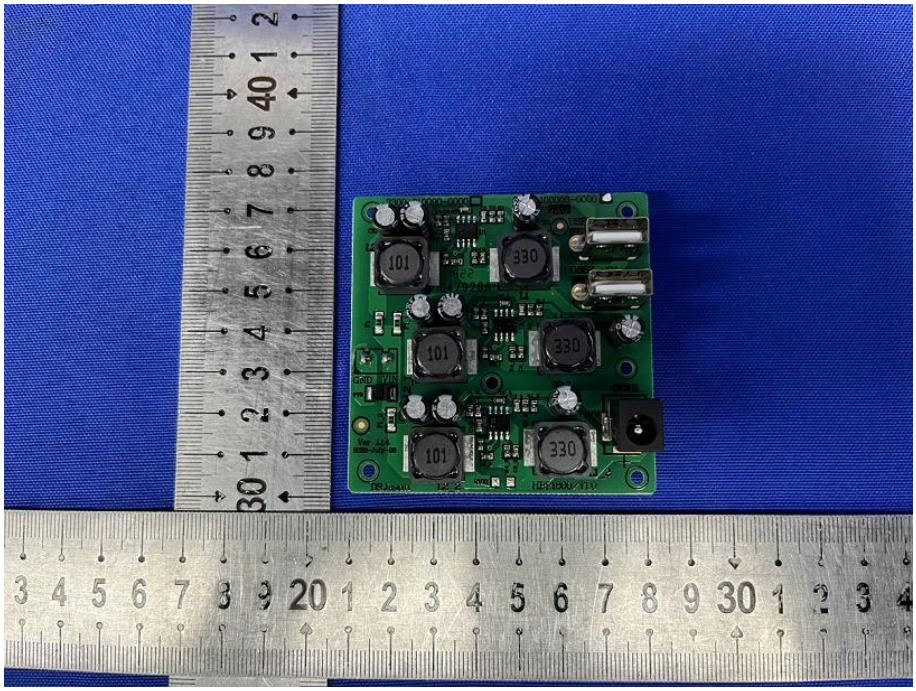
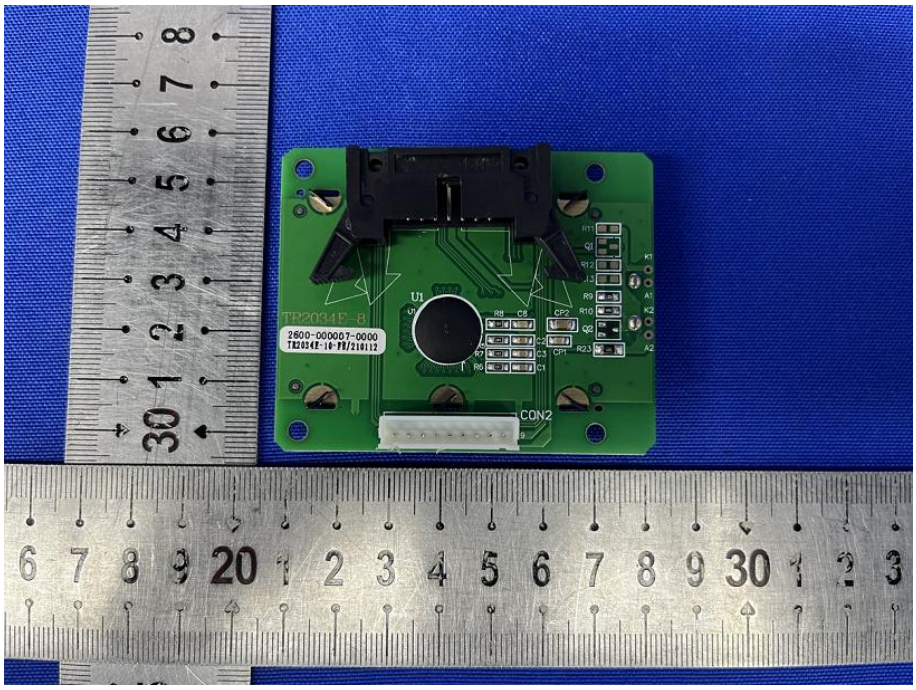

Over View -3

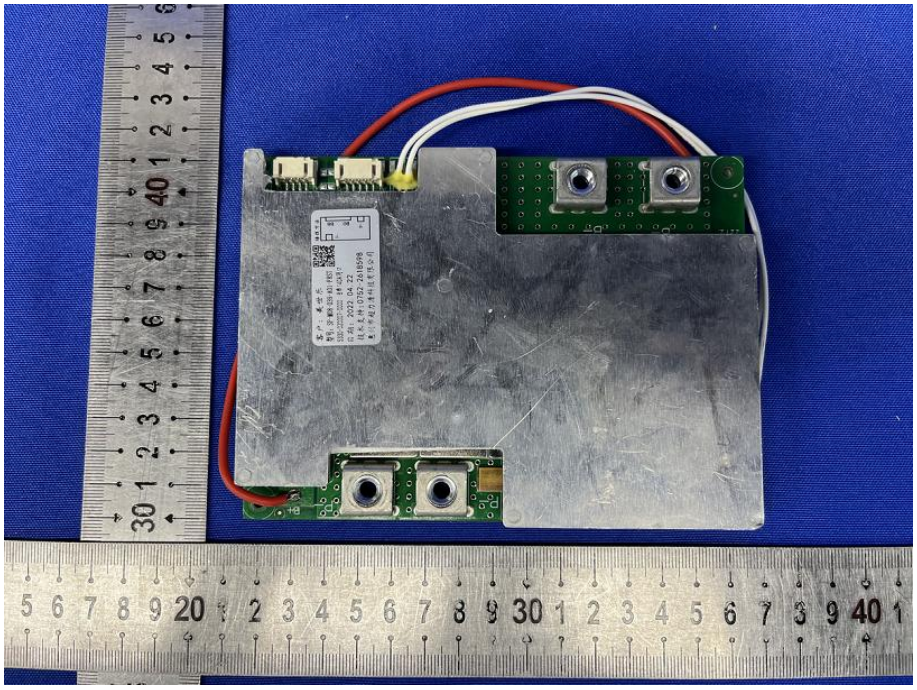
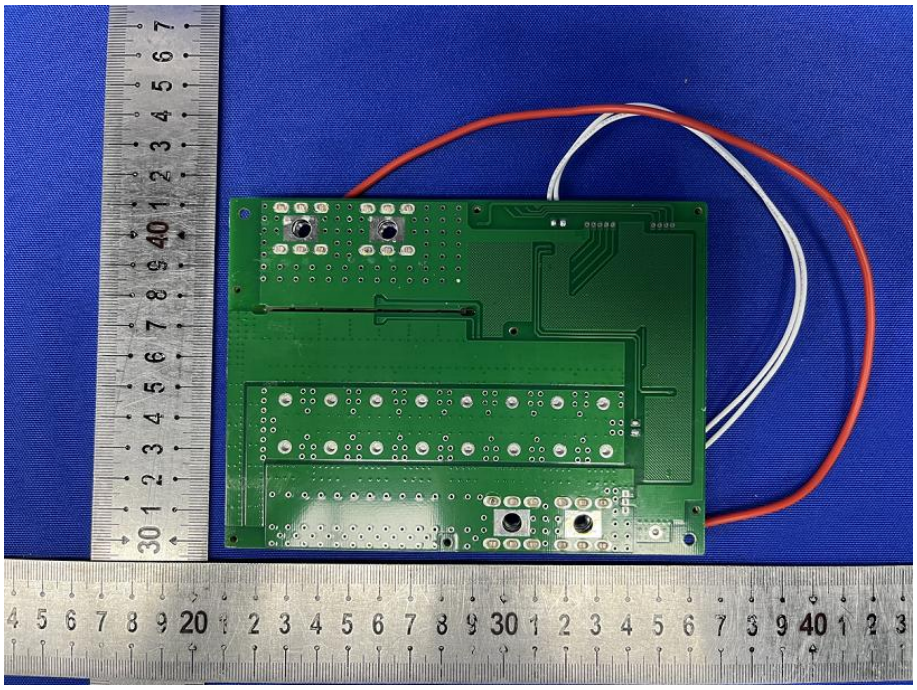
Over View -4


Internal View -1

Internal View -2


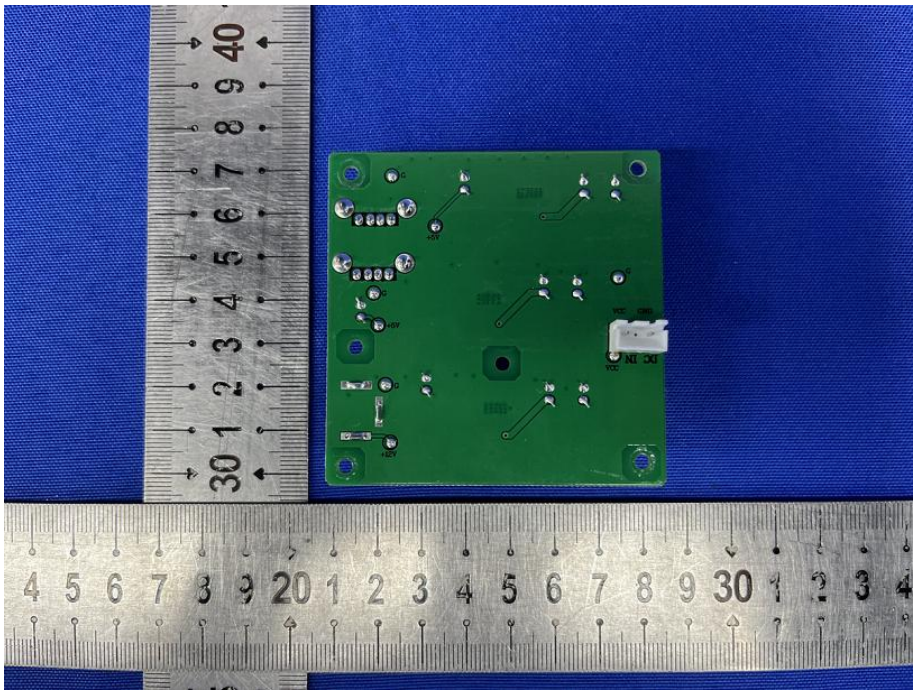
PCB View -1

PCB View -2


PCB View -3

PCB View -4


PCB View -5

PCB View -6


PCB View -7

PCB View -8


PCB View -9

PCB View -10


Over View -1

Over View -2


---End ---