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TEST REPORT

Product Name : Hybrid Power Systems
Model Number : HPS30, HPS50, HPS100, HPS120, HPS150

Prepared for : Shenzhen Ates Power Technology Co.,Ltd
Address : 2nd Floor, No.23 Zhulongtian Road, Shuitian Community,
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Report Number : ENS2402230082E00101R
Date of Test : February 26, 2024 to March 07, 2024
Date of Report : March 07, 2024




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TEST REPORT DESCRIPTION

Applicant : Shenzhen Ates Power Technology Co.,Ltd
 Manufacturer : Shenzhen Ates Power Technology Co.,Ltd
 Trade Mark : 
 EUT : Hybrid Power Systems
 Model Number : HPS30, HPS50, HPS100, HPS120, HPS150
 Rating : AC rated voltage: 400Va.c. (3/PE)
 MPPT voltage range(full load): 800Vd.c.-480Vd.c.
 BAT: 352Vd.c.

Measurement Procedure Used:


EN 62920:2017+A1:2021
 CISPR 11:2015+A1:2016
 EN 61000-3-12:2011
 EN IEC 61000-3-11: 2019
 (IEC 61000-4-2:2008, IEC 61000-4-3:2006+A1:2007+A2:2010, IEC 61000-4-4:2012,
 IEC 61000-4-5:2014, IEC 61000-4-6:2013, IEC 61000-4-11:2004, IEC 61000-4-34:2005+A1:2009)

The device described above is tested by EMTEK (SHENZHEN) CO., LTD. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and EMTEK (SHENZHEN) CO., LTD. is assumed full of responsibility for the accuracy and completeness of these measurements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of EMTEK (SHENZHEN) CO., LTD.

Date of Test : February 26, 2024 to March 07, 2024

Prepared by : 
 Kangtao Zhang/Editor

Reviewer : 
 Kaimin Guo/Supervisor

Approved & Authorized Signer : 
 Lisa Wang/Manager



Modified Information

Version	Report No.	Revision Date	Summary
Ver.1.0	ENS2402230082E00101R	/	Original Report



1. DESCRIPTION OF STANDARDS AND RESULTS (EUT)

EMISSION				
Description of Test Item		Standard	Limits	Results
Disturbance Voltage at the AC Power Port		EN 62920:2017+A1:2021	Class A	Pass
Disturbance Voltage at the DC Power Port		EN 62920:2017+A1:2021	Class A	Pass
Disturbance Voltage at the Wired Network Port and the Signal and Control Port		EN 62920:2017+A1:2021	Class A	N/A
Radiated emissions		EN 62920:2017+A1:2021	Class A	Pass
Harmonic Current Emissions		EN 61000-3-12:2011	Table 3	Pass
Voltage Fluctuation and Flicker		EN IEC 61000-3-11:2019	--	Pass
IMMUNITY				
Description of Test Item		Basic Standard	Performance Criteria	Results
Electrostatic Discharge	Enclosure ports	IEC 61000-4-2:2008	B	Pass
Continuous RF electromagnetic field disturbances	Enclosure ports	IEC 61000-4-3:2006+A1:2007+A2:2010	A	Pass
Electrical fast transients/burst	AC mains power ports	IEC61000-4-4:2012	B	Pass
	Wired Network Port and the Signal and Control Port		B	N/A
	DC network power ports		B	Pass
Surges	AC mains power ports	IEC 61000-4-5:2014	B	Pass
	Wired Network Port and the Signal and Control Port		B	N/A
	DC network power ports		B	Pass
Continuous induced RF disturbances	AC mains power ports	IEC 61000-4-6:2013	A	Pass
	Wired Network Port and the Signal and Control Port		A	N/A
	DC network power ports		A	Pass
Voltage dips and interruptions	AC mains power ports	IEC 61000-4-11:2004 IEC 61000-4-34:2005+A1:2009	B,C	Pass
Note: N/A is an abbreviation for Not Applicable.				

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

EUT	:	Hybrid Power Systems
Model Number	:	HPS30, HPS50, HPS100, HPS120, HPS150 (Note: These models are identical in circuitry and electrical, mechanical and physical construction; the only differences are the power. for trading purpose. We are ready for HPS150 to test all items, HPS30 to test Harmonic and Flicker.)
Applicant	:	Shenzhen Ateess Power Technology Co.,Ltd
Address	:	2nd Floor, No.23 Zhulongtian Road, Shuitian Community, Shiyan Street, Baoan District, Shenzhen
Manufacturer	:	Shenzhen Ateess Power Technology Co.,Ltd
Address	:	2nd Floor, No.23 Zhulongtian Road, Shuitian Community, Shiyan Street, Baoan District, Shenzhen
Factory	:	Shenzhen Ateess Power Technology Co.,Ltd
Address	:	2nd Floor, No.23 Zhulongtian Road, Shuitian Community, Shiyan Street, Baoan District, Shenzhen
Date of Received	:	February 26, 2024
Date of Test	:	February 26, 2024 to March 07, 2024

2.2. Input / Output Ports

Port No.	Name	Type *	Cable Max. >3m	Cable Max. >30m	Cable Shielded	Comments (I/O lines must include description of use)
0	Enclosure	N/E	--	--	--	None
1	DC Input	DC	Yes	Yes	Non-shielded	None
2	AC Output	AC	Yes	No	Non-shielded	None

Supplementary information:

*Note: AC = AC Power Port, DC = DC Power Port, N/E = Non-Electrical I/O= Signal Input/output Port, TP= Telecommunication Ports

2.3. Independent Operation Modes

A. Operating mode

1. PV IN & AC On Grid(Highest DC voltage at rated power)
2. PV IN & AC On Grid(Lowest DC voltage at rated power)
3. Battery discharge & AC On Grid
4. AC Charging Mode

B. Standby

2.4. Test Manner

Test Items	Test Voltage	Operation Modes	Worst case
Disturbance Voltage at the AC Power Port	AC 400V/50Hz&DC 800V AC 400V/50Hz&DC 480V AC 400V/50Hz&DC 352V AC 400V/50Hz	Mode A Mode B	Mode A.3
Disturbance Voltage at the DC Power Port	DC 800V DC 480V	Mode A.1 Mode A.2 Mode B	Mode A.1
Radiated emissions	AC 400V/50Hz&DC 800V AC 400V/50Hz&DC 480V AC 400V/50Hz&DC 352V AC 400V/50Hz	Mode A Mode B	Mode A.2
Harmonic Current Emissions	AC 400V/50Hz	Mode A.1	\
Voltage Fluctuation and Flicker	AC 400V/50Hz	Mode A.1	\
EMS	AC 400V/50Hz&DC 800V AC 400V/50Hz&DC 480V AC 400V/50Hz&DC 352V AC 400V/50Hz	Mode A Mode B	\

2.5. Description of Support Device

N/A

2.6. Description of Test Facility

Site Description

EMC Lab.

: **Accredited by CNAS**

The Certificate Registration Number is L2291.

The Laboratory has been assessed and proved to be in compliance with CNAS-CL01 (identical to ISO/IEC 17025:2017)

Accredited by FCC

Designation Number: CN1204

Test Firm Registration Number: 882943

Accredited by A2LA

The Certificate Number is 4321.01.

Accredited by Industry Canada

The Conformity Assessment Body Identifier is CN0008

Name of Firm : EMTEK (SHENZHEN) CO., LTD.

Site Location : Building 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China

2.7. Measurement Uncertainty

Test Item	Uncertainty
Conducted Emission Uncertainty	: 3.16dB(9k~150kHz Conduction 2#) 2.90dB(150k-30MHz Conduction 2#)
Radiated Emission Uncertainty (10m Chamber)	: 4.32dB (30M~1GHz Polarize: H) 4.30dB (30M~1GHz Polarize: V)
Uncertainty for Flicker test	: 0.314%
Uncertainty for Harmonic test	: 3.68%
Uncertainty for C/S Test	: 0.94dB(Using CDN Test) 2.37dB(Using EM Clamp Test)
Uncertainty for R/S Test	: 1.95dB(80MHz-6000MHz)
Uncertainty for test site temperature and humidity	: 0.6°C 4%

3. MEASURING DEVICE AND TEST EQUIPMENT

3.1. For Disturbance Voltage at the AC Power Port

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	EMI Test Receiver	Rohde & Schwarz	ESCI	101045	May 13, 2023	1 Year
<input checked="" type="checkbox"/>	PULSE LIMITER	Rohde & Schwarz	ESH3-Z2	100107	May 13, 2023	1 Year
<input checked="" type="checkbox"/>	AMN	Schwarzbeck	NNLK 8129	8129203	May 13, 2023	1 Year

3.2. For Disturbance Voltage at the DC Power Port

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	EMI Test Receiver	Rohde & Schwarz	ESCI	101045	May 13, 2023	1 Year
<input checked="" type="checkbox"/>	PULSE LIMITER	Rohde & Schwarz	ESH3-Z2	100107	May 13, 2023	1 Year
<input checked="" type="checkbox"/>	V-Network	Rohde & Schwarz	ESH3-Z6	100011	May 11, 2023	1 Year
<input checked="" type="checkbox"/>	V-Network	Rohde & Schwarz	ESH3-Z6	100253	May 11, 2023	1 Year
<input checked="" type="checkbox"/>	DC LISN	Schwarzbeck	PVDC 8301	00075	May 10, 2023	1Year

3.3. For Radiated Emission Measurement (10m)

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Loop Antenna	Schwarzbeck	FMZB1519	1519-012	May 12, 2023	2 Year
<input checked="" type="checkbox"/>	Bilog Antenna	Schwarzbeck	VULB9163	659	Sep. 01, 2023	2 Year
<input checked="" type="checkbox"/>	Bilog Antenna	Schwarzbeck	VULB9163	712	July 02, 2023	2 Year
<input checked="" type="checkbox"/>	EMI Test Receiver	Rohde & Schwarz	ESR3	101707	May 11, 2023	1 Year
<input checked="" type="checkbox"/>	EMI Test Receiver	Rohde & Schwarz	ESR3	101706	May 11, 2023	1 Year
<input checked="" type="checkbox"/>	Pre-Amplifier	Lunar EM	LNA10M1G-40	J10111311260 01	May 11, 2023	1 Year
<input checked="" type="checkbox"/>	Pre-Amplifier	Lunar EM	LNA10M1G-40	J10111311260 02	May 11, 2023	1 Year

3.4. For Harmonic Current / Flicker Measurement

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	45KVA AC Power source	Teseq	NSG 1007-45/45KV A	1305A02873	May 13, 2023	1 Year
<input checked="" type="checkbox"/>	Signal conditioning Unit	Teseq	CCN 1000-3	1305A02873	May 13, 2023	1 Year
<input checked="" type="checkbox"/>	Impedance network	Teseq	INA2197/37A	1305A02873	May 13, 2023	1 Year
<input checked="" type="checkbox"/>	Impedance network	Teseq	INA 2196/75A	1305A02874	May 13, 2023	1 Year
<input type="checkbox"/>	Proflin 2100 AC Switching Unit	Teseq	NSG 2200-3	A22714	May 13, 2023	1 Year

3.5. For Electrostatic Discharge Immunity

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	ESD Tester	EMTEST	Dito	P2220263883	Oct. 20, 2023	1 Year

3.6. For Continuous RF Electromagnetic Field Disturbances Immunity

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Power Amplifier	MILMEGA	AS0102-55	1018770	May 13, 2023	1 Year
<input checked="" type="checkbox"/>	RF Power Meter. Dual Channel	BOONTON	4232A	10539	May 13, 2023	1 Year
<input checked="" type="checkbox"/>	Log.-Per. Antenna	SCHWARZBECK	VULP 9118E	811	N/A	N/A
<input checked="" type="checkbox"/>	Broad-Band Horn Antenna	SCHWARZBECK	STLP 9149	9149-227	N/A	N/A
<input checked="" type="checkbox"/>	Signal Generator	Agilent	N5181A	MY50145187	May 13, 2023	1 Year
<input checked="" type="checkbox"/>	50ohm Diode Power Sensor	BOONTON	51011EMC	36164	May 13, 2023	1 Year
<input checked="" type="checkbox"/>	Field Strength Meter	DARE	RSS1006A	10I00037SNO 22	May 19, 2023	1 Year
<input checked="" type="checkbox"/>	Multi-function interface system	DARE	CTR1009B	12I00250SNO 72	N/A	N/A
<input checked="" type="checkbox"/>	Automatic switch group	DARE	RSW1004A	N/A	N/A	N/A
<input checked="" type="checkbox"/>	Power Amplifier	MILMEGA	AS1860-50	1059346	May 13, 2023	1 Year
<input checked="" type="checkbox"/>	Power Amplifier	Vectawave	VBA 1000-600C	133627	Oct. 23, 2023	1 Year

3.7. For Electrical Fast Transient / Burst Immunity

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Burst Tester	Partner	IMU-MGS	109938-1635	Oct. 23, 2023	1Year
<input checked="" type="checkbox"/>	Coupling Clamp	HAEFELY	IP-4A	147147	May 11, 2023	1 Year
<input checked="" type="checkbox"/>	Three phase CDN	Teseq	CDN 163	202	May 13, 2023	1 Year

3.8. For Surges Immunity

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Controller	HAEFELY	Psurge 8000	174031	May 10, 2023	1 Year
<input checked="" type="checkbox"/>	Impulse Module	HAEFELY	PIM 100	174124	May 10, 2023	1 Year
<input checked="" type="checkbox"/>	Coupling Decoupling	HAEFELY	PCD 130	172181	May 10, 2023	1 Year
<input checked="" type="checkbox"/>	Coupling Module	HAEFELY	PCD122	174354	May 10, 2023	1 Year
<input checked="" type="checkbox"/>	Impulse Module	HAEFELY	PIM 120	174435	May 10, 2023	1 Year
<input checked="" type="checkbox"/>	Coupling Module	HAEFELY	PCD 126A	174387	May 10, 2023	1 Year
<input checked="" type="checkbox"/>	Impulse Module	HAEFELY	PIM 110	174391	May 10, 2023	1 Year
<input checked="" type="checkbox"/>	Impulse Module	HAEFELY	PIM 150	178707	Aug. 26, 2023	1 Year
<input checked="" type="checkbox"/>	Impulse Module	PMI	PCDN8	190422	May 10, 2023	1 Year

3.9. For Continuous Induced RF Disturbances Immunity

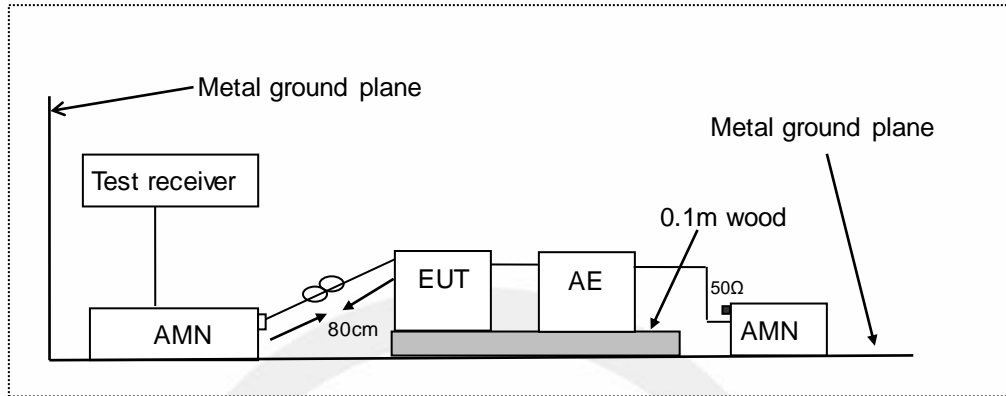
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Continuous Wave Simulator	EMTEST	CWS500C	0900-12	May 11, 2023	1 Year
<input checked="" type="checkbox"/>	EM Injection Clamp	EMTEST	F-2031-23MM	368	May 10, 2023	1 Year
<input checked="" type="checkbox"/>	Attenuator	EMTEST	100W 6dB DC-3G	/	May 11, 2023	1 Year
<input checked="" type="checkbox"/>	Signal Generator	ifn	2023B	1702128	May 11, 2023	1Year
<input checked="" type="checkbox"/>	Three phase CDN	TESEQ	CDN M532S	33799	May 10, 2023	1 Year
<input checked="" type="checkbox"/>	Power meter	AGILENT	E4418B	MY45102886	May 11, 2023	1 Year
<input checked="" type="checkbox"/>	Directional coupler	SKET	DC_0110000 M-100W	SK201808030 1	May 11, 2023	1 Year

3.10.For Voltage Dips and Interruptions Immunity

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	45KVA AC Power source	Teseq	NSG 1007-45/45KV A	1305A02873	May 13, 2023	1 Year
<input type="checkbox"/>	Signal conditioning Unit	Teseq	CCN 1000-3	1305A02873	May 13, 2023	1 Year
<input type="checkbox"/>	Impedance network	Teseq	INA2197/37A	1305A02873	May 13, 2023	1 Year
<input type="checkbox"/>	Impedance network	Teseq	INA 2196/75A	1305A02874	May 13, 2023	1 Year
<input checked="" type="checkbox"/>	Proflin 2100 AC Switching Unit	Teseq	NSG 2200-3	A22714	May 13, 2023	1 Year

4. DISTURBANCE VOLTAGE AT THE AC POWER PORT

4.1. Block Diagram of Test Setup



LISN: Artificial Mains Network
AE: Associated equipment
EUT: Equipment under test

4.2. Limits

EN 62920:2017+A1:2021
CISPR 11:2015+A1:2016
Class A

Frequency Range MHz	<input checked="" type="checkbox"/> Rated power of ≤ 20 kVA		<input type="checkbox"/> Rated power of > 20 kVA		<input type="checkbox"/> High power electronic systems and equipment, rated power of > 75 kVA	
	Quasi-peak dB(μ V)	Average dB(μ V)	Quasi-peak dB(μ V)	Average dB(μ V)	Quasi-peak dB(μ V)	Average dB(μ V)
0.15 to 0.50	79	66	100	90	130	120
0.50 to 5	73	60	86	76	125	115
5 to 30	73	60	90	80	115	105
			Decreasing linearly with logarithm of frequency to			
			73	60		

At the transition frequency, the more stringent limit shall apply.

4.3. Test Procedure

The EUT was placed on an insulating support 0.1 m height from the metal ground plane and 0.4 m from the conducting wall of the shielding room and it was kept at least 0.8 m from any other grounded conducting surface.

The rear of the arrangement shall be flush with the back of the supporting tabletop unless that would not be possible or typical of normal use.

All units of equipment forming the system under test (includes the EUT as well as connected peripherals and associated equipment or devices) shall be arranged such that a nominal 0.1 m separation is achieved between the neighboring units.

Connect EUT to the power mains through a artificial mains network (AMN). Where the mains cable supplied by the manufacturer is longer than 1 m, the excess should be folded at the centre into a bundle no longer than 0.4 m, so that its length is shortened to 1 m.

The AMN provides 50 ohm coupling impedance for the measuring instrument.

The CISPR states that the AMN with 50 ohm and 50 microhenry should be used.

Both sides of AC line were checked for maximum conducted interference.

The frequency range from 150 kHz to 30 MHz was sweep.

Set the test-receiver system to quasi peak detect function and average detect function, and to measure the conducted emissions values.

Test results were obtained from the following equation:

Emission Level (dB μ V) = AMN Factor (dB) + Cable Loss (dB) + Reading (dB μ V)

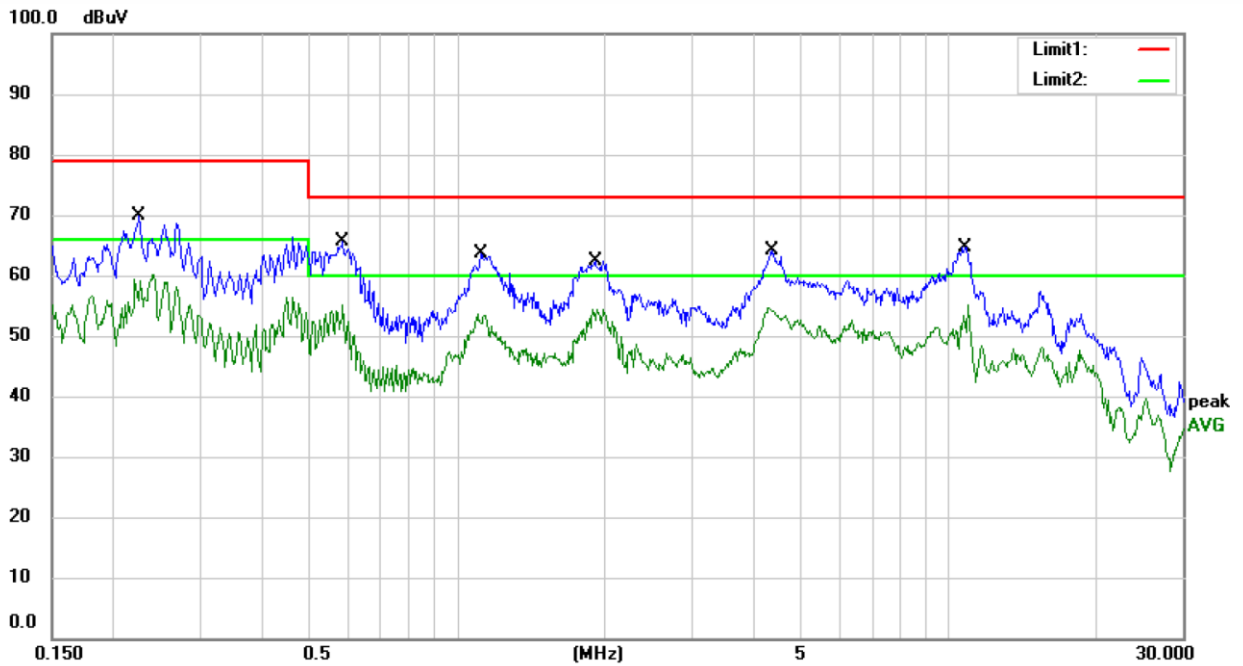
Margin (dB) = Emission Level (dB μ V) - Limit (dB μ V)

4.4. Measuring Results

PASS.

All the modes were tested and the data of the worst modes are attached the following pages.

Temperature	:	24.8°C
Humidity	:	54%
Atmospheric Pressure	:	101kpa
Test Engineer	:	Liming Sui
Test Date	:	2024-03-05
Test Mode	:	Battery discharge & AC On Grid



Site 10m Chamber 1#

Phase: **L1**

Temperature: 24.8 C

Limit: (CE)EN62920 class A_QP 1组≤20KW

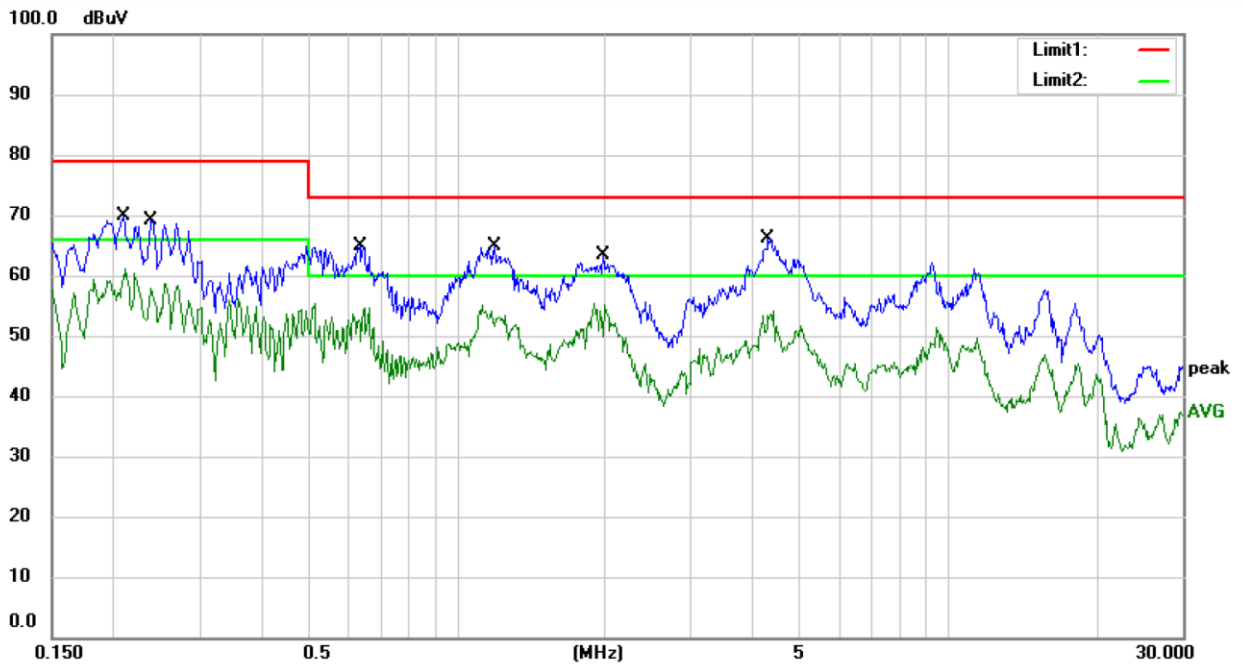
Power: AC 400V/50Hz&DC 352V

Humidity: 54 %

Mode: Battery discharge & AC On Grid

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.2255	59.68	10.23	69.91	79.00	-9.09	QP	
2		0.2255	49.86	10.23	60.09	66.00	-5.91	AVG	
3		0.5854	55.29	10.24	65.53	73.00	-7.47	QP	
4		0.5854	44.83	10.24	55.07	60.00	-4.93	AVG	
5		1.1170	53.39	10.18	63.57	73.00	-9.43	QP	
6		1.1170	43.34	10.18	53.52	60.00	-6.48	AVG	
7		1.9080	52.29	10.21	62.50	73.00	-10.50	QP	
8		1.9080	44.18	10.21	54.39	60.00	-5.61	AVG	
9		4.3605	53.87	10.25	64.12	73.00	-8.88	QP	
10		4.3605	44.50	10.25	54.75	60.00	-5.25	AVG	
11		10.7900	54.33	10.38	64.71	73.00	-8.29	QP	
12	*	10.7900	44.75	10.38	55.13	60.00	-4.87	AVG	



Site 10m Chamber 1#

Phase: **L2**

Temperature: 24.8 C

Limit: (CE)EN62920 class A_QP 1组≤20KW

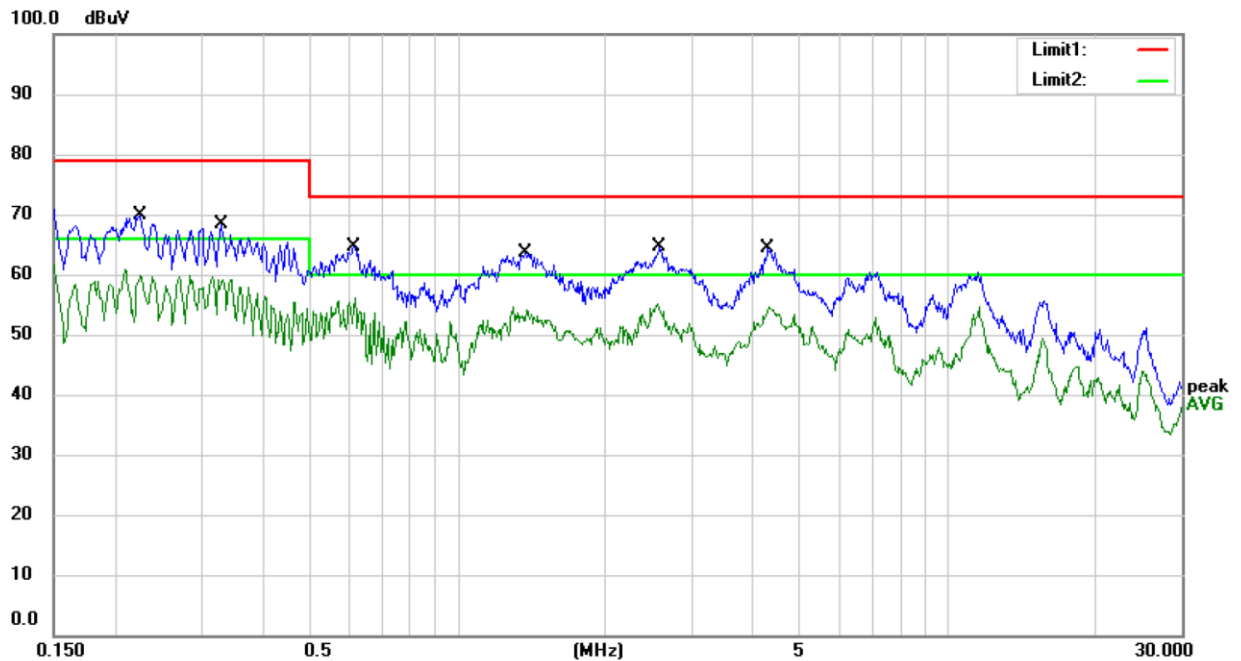
Power: AC 400V/50Hz&DC 352V

Humidity: 54 %

Mode: Battery discharge & AC On Grid

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.2094	59.63	10.23	69.86	79.00	-9.14	QP	
2		0.2094	50.82	10.23	61.05	66.00	-4.95	AVG	
3		0.2378	58.80	10.23	69.03	79.00	-9.97	QP	
4		0.2378	47.68	10.23	57.91	66.00	-8.09	AVG	
5		0.6338	54.61	10.24	64.85	73.00	-8.15	QP	
6		0.6338	44.48	10.24	54.72	60.00	-5.28	AVG	
7		1.1906	54.58	10.19	64.77	73.00	-8.23	QP	
8		1.1906	43.40	10.19	53.59	60.00	-6.41	AVG	
9		1.9800	53.06	10.21	63.27	73.00	-9.73	QP	
10	*	1.9800	44.98	10.21	55.19	60.00	-4.81	AVG	
11		4.3375	55.78	10.25	66.03	73.00	-6.97	QP	
12		4.3375	43.89	10.25	54.14	60.00	-5.86	AVG	



Site 10m Chamber 1#

Phase: **L3**

Temperature: 24.8 C

Limit: (CE)EN62920 class A_QP 1组≤20KW

Power: AC 400V/50Hz&DC 352V

Humidity: 54 %

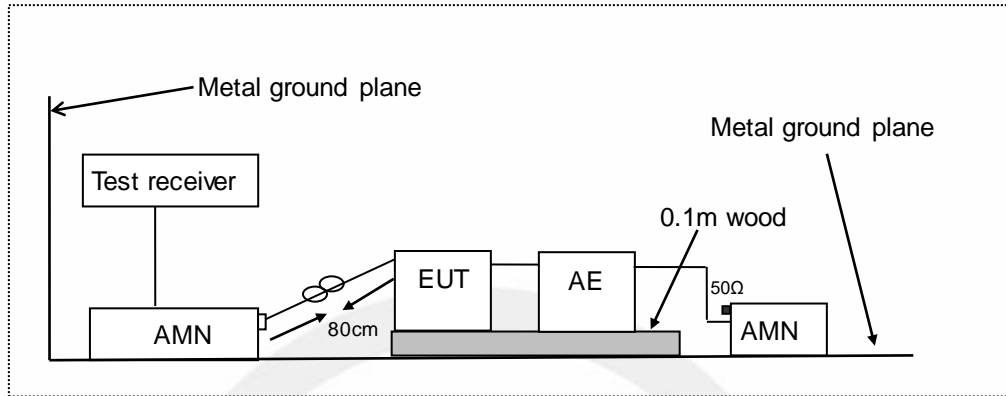
Mode: Battery discharge & AC On Grid

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.2255	59.71	10.23	69.94	79.00	-9.06	QP	
2		0.2255	49.69	10.23	59.92	66.00	-6.08	AVG	
3		0.3285	58.13	10.23	68.36	79.00	-10.64	QP	
4		0.3285	49.43	10.23	59.66	66.00	-6.34	AVG	
5		0.6140	54.50	10.24	64.74	73.00	-8.26	QP	
6	*	0.6140	45.85	10.24	56.09	60.00	-3.91	AVG	
7		1.3733	53.32	10.19	63.51	73.00	-9.49	QP	
8		1.3733	43.88	10.19	54.07	60.00	-5.93	AVG	
9		2.5807	54.36	10.22	64.58	73.00	-8.42	QP	
10		2.5807	44.99	10.22	55.21	60.00	-4.79	AVG	
11		4.2918	54.02	10.25	64.27	73.00	-8.73	QP	
12		4.2918	44.27	10.25	54.52	60.00	-5.48	AVG	

5. DISTURBANCE VOLTAGE AT THE DC POWER PORT

5.1. Block Diagram of Test Setup



LISN: Artificial Mains Network
AE: Associated equipment
EUT: Equipment under test

5.2. Limits

EN 62920:2017+A1:2021
Class A

Frequency Range MHz	<input checked="" type="checkbox"/> Rated power of ≤ 20 kVA		<input type="checkbox"/> Rated power of > 20 kVA		<input type="checkbox"/> Rated power of > 75 kVA	
	Quasi-peak dB(μ V)	Average dB(μ V)	Quasi-peak dB(μ V)	Average dB(μ V)	Quasi-peak dB(μ V)	Average dB(μ V)
0.15	97	84	116	106	132	122
to	to	to	to	to	to	to
5	89	76	106	96	122	112
5	89	76	106	96	122	112
to			to	to	to	to
30			89	76	105	92

In certain frequency ranges, the limits in this table decrease linearly with logarithm of frequency. Selection of the appropriate set of limits shall be based on the rated AC power stated by the manufacturer.

5.3. Test Procedure

The EUT was placed on an insulating support 0.1 m height from the metal ground plane and 0.4 m from the conducting wall of the shielding room and it was kept at least 0.8 m from any other grounded conducting surface. The size of the table will nominally be 1.5 m x1.0 m.

The rear of the arrangement shall be flush with the back of the supporting tabletop unless that would not be possible or typical of normal use.

All units of equipment forming the system under test (includes the EUT as well as connected peripherals and associated equipment or devices) shall be arranged such that a nominal 0.1 m separation is achieved between the neighboring units.

Connect EUT to the through a DC artificial network (DC-AN). Where the DC cable supplied by the manufacturer is longer than 1 m, the excess should be folded at the centre into a bundle no longer than 0.4 m, so that its length is shortened to 1 m.

The DC-AN provides 150 ohm coupling impedance for the measuring instrument.

Both sides of DC line were checked for maximum conducted interference.

The frequency range from 150 kHz to 30 MHz was sweep.

Set the test-receiver system to quasi peak detect function and average detect function, and to measure the conducted emissions values.

Test results were obtained from the following equation:

Emission Level (dB μ V) = AMN Factor (dB) + Cable Loss (dB) + Reading (dB μ V)

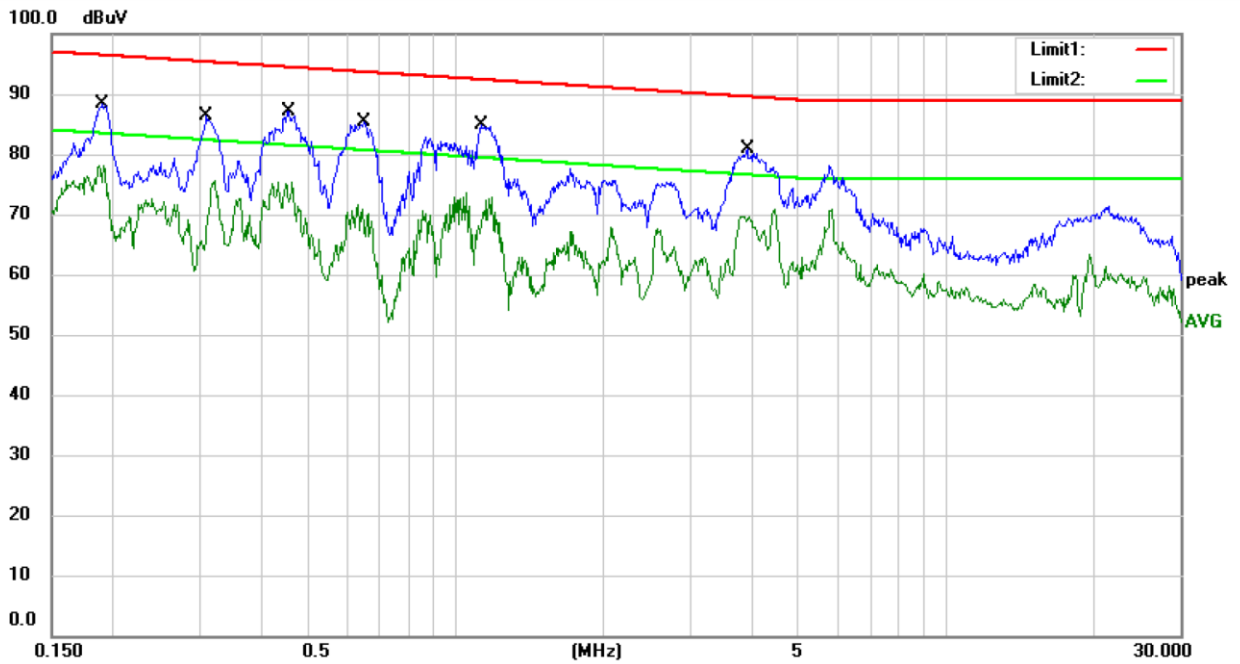
Margin (dB) = Emission Level (dB μ V) - Limit (dB μ V)

5.4. Measuring Results

PASS.

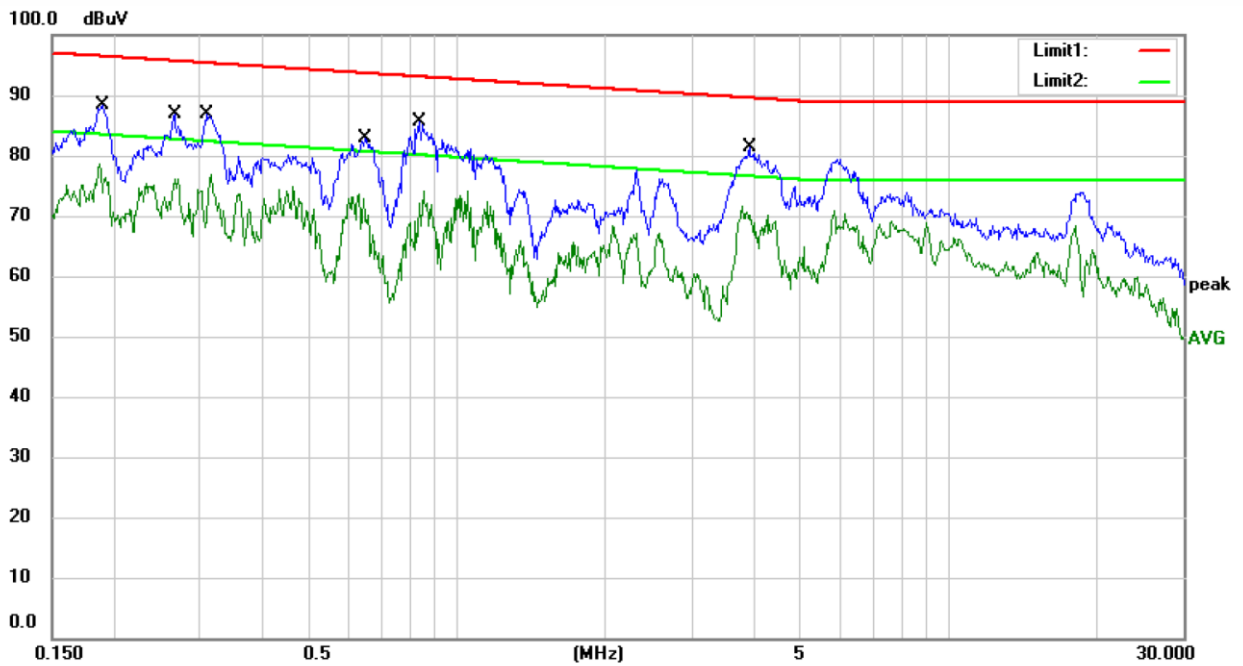
All the modes were tested and the data of the worst modes are attached the following pages.

Temperature	:	24.8 °C
Humidity	:	54%
Atmospheric Pressure	:	101kpa
Test Engineer	:	Liming Sui
Test Date	:	2024-03-05
Test Mode	:	PV in & AC On Grid(Highest DC voltage at rated power)



Site 10m Chamber 1# Phase: + Temperature: 24.8 C
 Limit: (CE)EN62920 class A_QP 1组≤20KW(DC) Power: AC 400V/50Hz&DC 800V Humidity: 54 %
 Mode: PV in & AC On Grid(Highest DC voltage at rated power)
 Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1901	78.09	10.22	88.31	96.46	-8.15	QP	
2	*	0.1901	68.00	10.22	78.22	83.46	-5.24	AVG	
3		0.3100	76.21	10.24	86.45	95.34	-8.89	QP	
4		0.3100	58.84	10.24	69.08	82.34	-13.26	AVG	
5		0.4562	76.99	10.24	87.23	94.46	-7.23	QP	
6		0.4562	65.12	10.24	75.36	81.46	-6.10	AVG	
7		0.6473	75.08	10.24	85.32	93.66	-8.34	QP	
8		0.6473	61.28	10.24	71.52	80.66	-9.14	AVG	
9		1.1231	74.71	10.18	84.89	92.41	-7.52	QP	
10		1.1231	62.58	10.18	72.76	79.41	-6.65	AVG	
11		3.9220	70.59	10.25	80.84	89.55	-8.71	QP	
12		3.9220	59.49	10.25	69.74	76.55	-6.81	AVG	

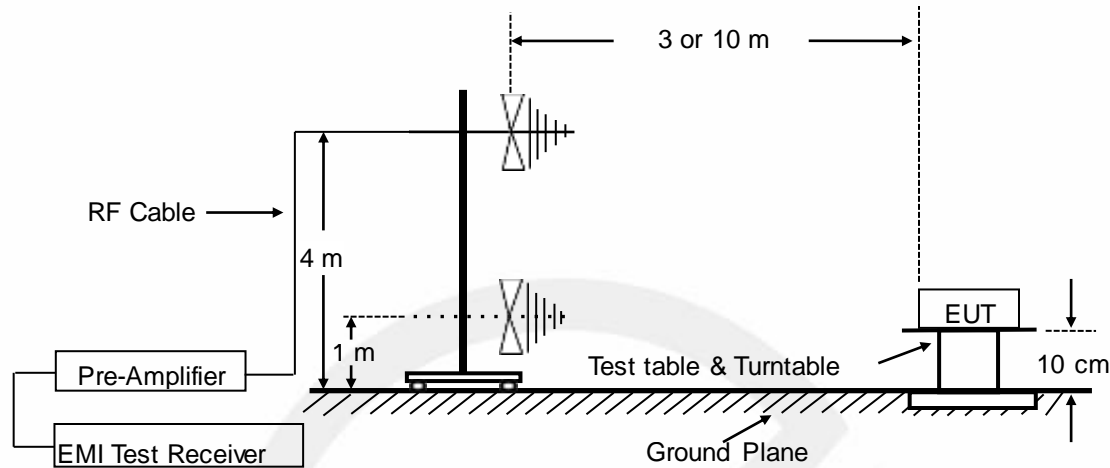


Site 10m Chamber 1# Phase: - Temperature: 24.8 C
 Limit: (CE)EN62920 class A_QP 1组≤20KW(DC) Power: AC 400V/50Hz&DC 800V Humidity: 54 %
 Mode: PV in & AC On Grid(Highest DC voltage at rated power)
 Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.1892	78.23	10.22	88.45	96.47	-8.02	QP	
2	*	0.1892	68.50	10.22	78.72	83.47	-4.75	AVG	
3		0.2655	76.59	10.24	86.83	95.70	-8.87	QP	
4		0.2655	65.80	10.24	76.04	82.70	-6.66	AVG	
5		0.3100	76.71	10.24	86.95	95.34	-8.39	QP	
6		0.3100	66.71	10.24	76.95	82.34	-5.39	AVG	
7		0.6472	72.58	10.24	82.82	93.66	-10.84	QP	
8		0.6472	63.28	10.24	73.52	80.66	-7.14	AVG	
9		0.8346	75.45	10.20	85.65	93.08	-7.43	QP	
10		0.8346	63.98	10.20	74.18	80.08	-5.90	AVG	
11		3.9220	71.09	10.25	81.34	89.55	-8.21	QP	
12		3.9220	61.49	10.25	71.74	76.55	-4.81	AVG	

6. RADIATED EMISSION MEASUREMENT

6.1. Block Diagram of Test Setup



6.2. Radiated Limit

EN 62920:2017+A1:2021

CISPR 11:2015+A1:2016

Class A

Frequency Range MHz	<input checked="" type="checkbox"/> 10 m measuring distance rated power of ≤ 20 kVA	<input type="checkbox"/> 10 m measuring distance rated power of > 20 kVA	<input type="checkbox"/> 3 m measuring distance rated power of ≤ 20 kVA	<input type="checkbox"/> 3 m measuring distance rated power of > 20 kVA
	Quasi-peak dB(μ V/m)	Quasi-peak dB(μ V/m)	Quasi-peak dB(μ V/m)	Quasi-peak dB(μ V/m)
30 to 230	40	50	50	60
230 to 1000	47	50	57	60

On a test site, class A equipment can be measured at a nominal distance of 3 m, 10 m or 30 m. A measuring distance less than 10 m is allowed only for equipment which complies with the definition given in 3.16. In case of measurements at a separation distance of 30 m, an inverse proportionality factor of 20 dB per decade shall be used to normalize the measured data to the specified distance for determining compliance.

At the transition frequency, the more stringent limit shall apply.

6.3. Test Procedure

The EUT was placed on an insulating support whose total height equaled 10cm. All units of equipment forming the system under test (includes the EUT as well as connected peripherals and associated equipment or devices) shall be arranged such that a nominal 0.1 m separation is achieved between the neighboring units. Where the mains cable supplied by the manufacturer is longer than 1 m, the excess should be folded at the centre into a bundle no longer than 0.4 m, so that its length is shortened to 1 m.

The EUT was set 3 meters (or 10 meters) away from the receiving antenna that was mounted on a non-conductive mast. The antenna can move up and down between 1 to 4 meters to find out the maximum emission level.

The turntable can rotate 360 degree to determine the position of the maximum emission level.

The initial testing identified the frequency that has the highest disturbance relative to the limit while operating the EUT in typical modes of operation and cable positions in a test setup representative of typical system configuration.

The identification of the frequency of highest emission with respect to the limit was found by investigating emissions at a number of significant frequencies. The probable frequency of maximum emission had been found and that the associated cable and EUT configuration and mode of operation had been identified.

The bandwidth of the Receiver is set at 120 kHz.

Test results were obtained from the following equation:

Emission level (dB μ V/m) = Antenna Factor -Amp Factor +Cable Loss + Reading

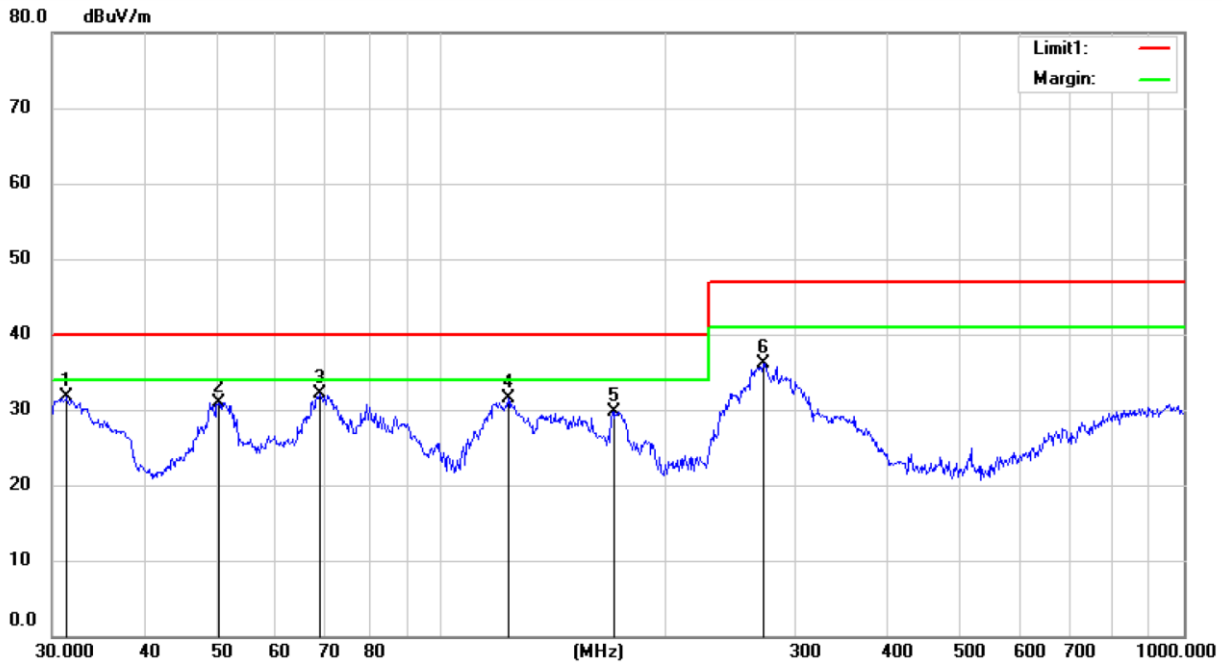
Margin (dB) = Emission Level (dB μ V/m) - Limit (dB μ V/m)

6.4. Measuring Results

PASS.

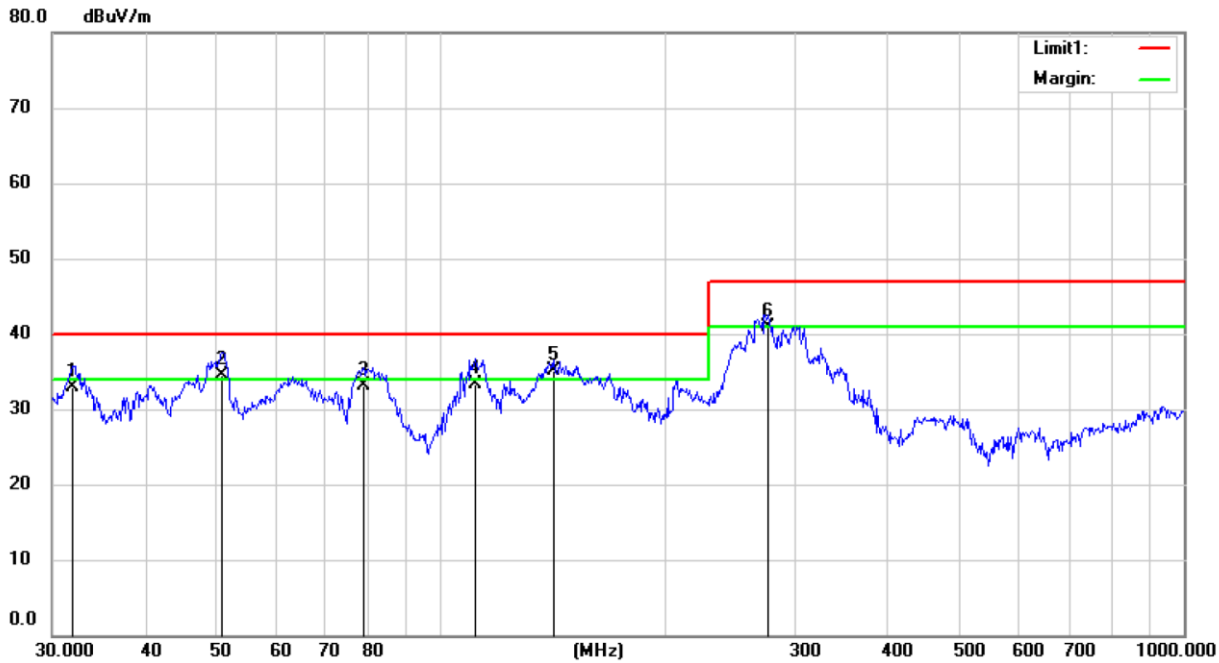
All the modes were tested and the data of the worst modes are attached the following pages.

Temperature	:	24.9 °C
Humidity	:	54%
Atmospheric Pressure	:	101kpa
Test Engineer	:	Liming Sui
Test Date	:	2024-03-05
Test Mode	:	PV in & AC On Grid(Lowest DC voltage at rated power)



Site 10m Chamber 1# Polarization: **Horizontal** Temperature: 24.9 C
 Limit: (RE10M)EN62920 Class A ≤20KV Power: AC 400V/50Hz&DC 480V Humidity: 54 %
 Mode: PV in & AC On Grid(Lowest DC voltage at rated power)
 Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Ant. Factor dB/m	Pre Amp Gain dB	Cable loss dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	HI	Degree	
										Detector	cm	deg. Comment
1		31.3992	63.18	10.52	43.28	1.29	31.71	40.00	-8.29	QP		
2		50.2323	59.89	12.7	43.29	1.63	30.93	40.00	-9.07	QP		
3	*	68.8721	61.95	11.55	43.3	1.87	32.07	40.00	-7.93	QP		
4		123.2651	62.56	9.53	43.22	2.54	31.41	40.00	-8.59	QP		
5		171.3925	59.95	9.71	43.01	3.08	29.73	40.00	-10.27	QP		
6		271.3245	62.50	12.31	42.48	3.86	36.19	47.00	-10.81	QP		

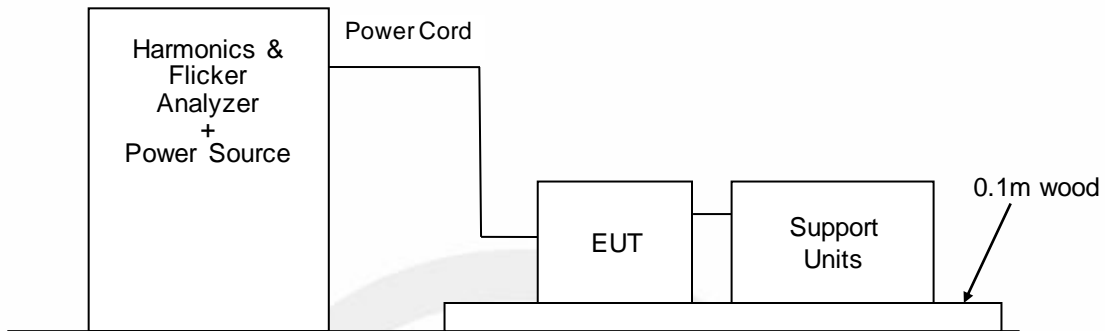


Site 10m Chamber 1# Polarization: **Vertical** Temperature: 24.9 C
 Limit: (RE10M)EN62920 Class A ≤20KV Power: AC 400V/50Hz&DC 480V Humidity: 54 %
 Mode: PV in & AC On Grid(Lowest DC voltage at rated power)
 Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Ant. Factor dB/m	Pre Amp Gain dB	Cable loss dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	HI	Degree	Comment
1		31.9542	64.27	10.61	43.28	1.3	32.90	40.00	-7.10	QP		
2	!	50.7635	63.55	12.7	43.29	1.64	34.60	40.00	-5.40	QP		
3		78.6885	64.81	9.61	43.31	1.99	33.10	40.00	-6.90	QP		
4		111.3468	64.82	9.41	43.27	2.44	33.40	40.00	-6.60	QP		
5	*	141.8262	65.89	9.72	43.14	2.73	35.20	40.00	-4.80	QP		
6		275.1570	66.99	12.46	42.45	3.9	40.90	47.00	-6.10	QP		

7. HARMONIC CURRENT EMISSION MEASUREMENT

7.1. Block Diagram of Test Setup



7.2. Standard Limits

EN 61000-3-12

Harmonic current emissions evaluate the potential for the EUT to cause distortion on the AC power lines. It is applicable to electrical and electronic equipment having an input current >16 A and ≤ 75 A per phase, and intended to be connected to public low-voltage distribution systems.

Table 3 – Current emission 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.

7.3. Test Results

PASS.

Please see the attached page.

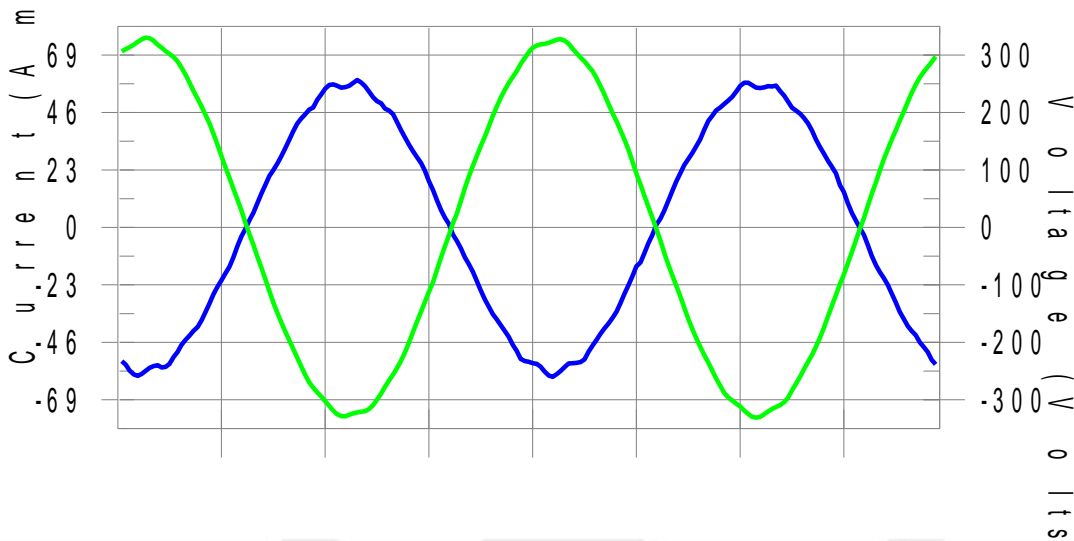
Harmonics – Per EN/IEC61000-3-12, Ed. 2.0(Phase A-Run time)

EUT: HPS30
 Test category: Table:3, Rsce=33, Inter-Harm,)
 Test date: 2024/2/29 Start time: 15:08:11
 Test duration (min): 2.5 Data file name: WIN2106_H-000198.cts_data
 Comment: PV IN&AC ON GRID
 Customer: Shenzhen Ates Power Technology Co.,Ltd

Tested by: LHT
 Test Margin: 100
 End time: 15:10:53

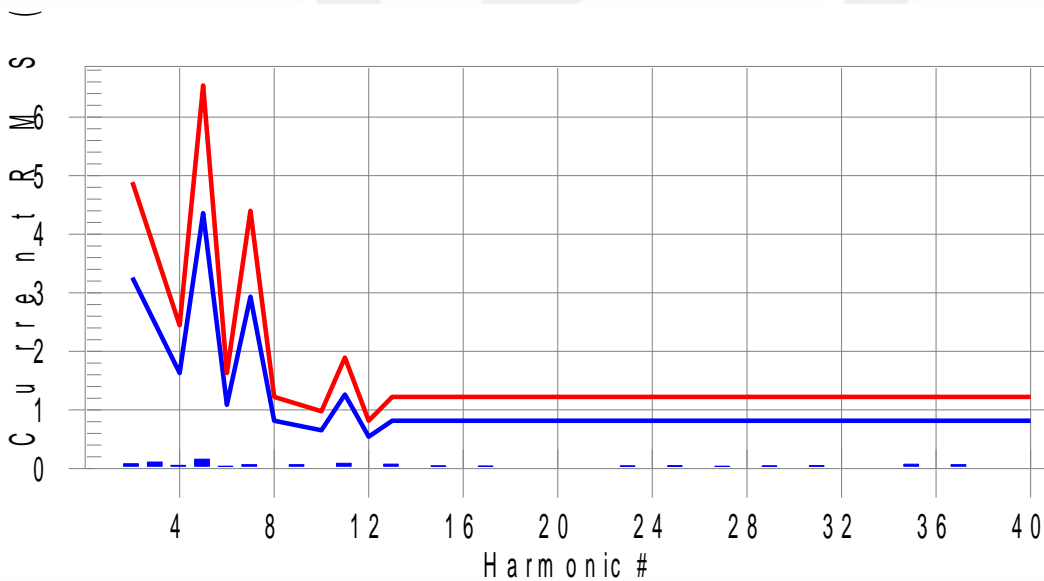
Test Result: Pass Source qualification: Normal

Current & voltage waveforms



Harmonics and Class 3 limit line

European Limits



Test result: Pass Worst harmonics H13-6.7% of 150% limit, H13-9.3% of 100% limit.

Current Test Result Summary (Phase A-Run time)

EUT: HPS30
 Test category: Table:3, Rsce=33, Inter-Harm,)
 Test date: 2024/2/29 Start time: 15:08:11
 Test duration (min): 2.5 Data file name: WIN2106_H-000198.cts_data
 Comment: PV IN&AC ON GRID
 Customer: Shenzhen Ates Power Technology Co.,Ltd

Tested by: LHT
 Test Margin: 100
 End time: 15:10:53

Test Result: Pass Measured Iref: 40.742(Amps) Source: Normal
 THC/Iref (%): 0.0 Limit (%): 13.0 PWHC/Iref (%): 0.0 PWHC Limit (%): 22.0

Highest parameter values during test:

V_RMS (Volts):	231.27	Frequency (Hz):	50.00
I_Peak (Amps):	60.446	I_RMS (Amps):	40.837
I_Fund (Amps):	40.730(avg)	Crest Factor:	1.488
Power (Watts):	-9449	Power Factor:	-0.999

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.082	3.259	2.5	0.129	4.889	2.6	Pass
3	0.111	N/A	N/A	0.156	N/A	N/A	N/A
4	0.055	1.630	3.4	0.074	2.445	3.0	Pass
5	0.158	4.359	3.6	0.190	6.539	2.9	Pass
6	0.038	1.086	3.5	0.047	1.630	2.9	Pass
7	0.065	2.933	2.2	0.077	4.400	1.8	Pass
8	0.030	0.815	3.7	0.037	1.222	3.0	Pass
9	0.066	N/A	N/A	0.076	N/A	N/A	N/A
10	0.026	0.652	4.0	0.031	0.978	3.2	Pass
11	0.089	1.263	7.0	0.102	1.895	5.4	Pass
12	0.028	0.543	5.2	0.033	0.815	4.1	Pass
13	0.076	0.815	9.3	0.082	1.222	6.7	Pass
14	0.027	N/A	N/A	0.032	N/A	N/A	N/A
15	0.043	N/A	N/A	0.048	N/A	N/A	N/A
16	0.024	N/A	N/A	0.028	N/A	N/A	N/A
17	0.041	N/A	N/A	0.045	N/A	N/A	N/A
18	0.021	N/A	N/A	0.024	N/A	N/A	N/A
19	0.037	N/A	N/A	0.041	N/A	N/A	N/A
20	0.022	N/A	N/A	0.025	N/A	N/A	N/A
21	0.035	N/A	N/A	0.038	N/A	N/A	N/A
22	0.019	N/A	N/A	0.022	N/A	N/A	N/A
23	0.042	N/A	N/A	0.054	N/A	N/A	N/A
24	0.024	N/A	N/A	0.027	N/A	N/A	N/A
25	0.047	N/A	N/A	0.050	N/A	N/A	N/A
26	0.023	N/A	N/A	0.026	N/A	N/A	N/A
27	0.038	N/A	N/A	0.041	N/A	N/A	N/A
28	0.017	N/A	N/A	0.019	N/A	N/A	N/A
29	0.045	N/A	N/A	0.052	N/A	N/A	N/A
30	0.020	N/A	N/A	0.023	N/A	N/A	N/A
31	0.050	N/A	N/A	0.057	N/A	N/A	N/A
32	0.017	N/A	N/A	0.020	N/A	N/A	N/A
33	0.024	N/A	N/A	0.027	N/A	N/A	N/A
34	0.015	N/A	N/A	0.018	N/A	N/A	N/A
35	0.074	N/A	N/A	0.083	N/A	N/A	N/A
36	0.017	N/A	N/A	0.019	N/A	N/A	N/A
37	0.065	N/A	N/A	0.076	N/A	N/A	N/A
38	0.015	N/A	N/A	0.017	N/A	N/A	N/A
39	0.026	N/A	N/A	0.029	N/A	N/A	N/A
40	0.011	N/A	N/A	0.013	N/A	N/A	N/A

Note: Measured I-ref was applied for this test.

Voltage Source Verification Data (Phase A-Run time)

EUT: HPS30
 Test category: Table:3, Rsce=33, Inter-Harm,)
 Test date: 2024/2/29 Start time: 15:08:11
 Test duration (min): 2.5 Data file name: WIN2106_H-000198.cts_data
 Comment: PV IN&AC ON GRID
 Customer: Shenzhen Ates Power Technology Co.,Ltd

Tested by: LHT
 Test Margin: 100
 End time: 15:10:53

Test Result: Pass Source qualification: Normal
 Measured source distortion is within the requirements of the standards
 Measurements are compliant with IEC/EN61000-3-12 Ed. 2.0 & IEC/EN61000-4-7 Ed. 2.1

Highest parameter values during test:

Voltage (Vrms):	231.27	Frequency (Hz):	50.00
I_Peak (Amps):	60.446	I_RMS (Amps):	40.837
I_Fund (Amps):	40.730(avg)	Crest Factor:	1.488
Power (Watts):	-9449	Power Factor:	-0.999

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.322	0.925	34.79	OK
3	0.176	2.891	6.09	OK
4	0.037	0.925	3.96	OK
5	0.119	3.468	3.44	OK
6	0.015	0.925	1.67	OK
7	0.146	2.890	5.06	OK
8	0.020	0.925	2.11	OK
9	0.167	1.388	12.04	OK
10	0.017	0.925	1.88	OK
11	0.166	1.619	10.24	OK
12	0.021	0.694	3.07	OK
13	0.141	1.387	10.15	OK
14	0.020	0.694	2.90	OK
15	0.112	0.694	16.11	OK
16	0.024	0.694	3.44	OK
17	0.101	0.694	14.58	OK
18	0.018	0.694	2.56	OK
19	0.105	0.694	15.12	OK
20	0.025	0.694	3.66	OK
21	0.082	0.694	11.79	OK
22	0.018	0.694	2.65	OK
23	0.095	0.694	13.65	OK
24	0.018	0.694	2.59	OK
25	0.081	0.694	11.74	OK
26	0.016	0.694	2.25	OK
27	0.074	0.694	10.67	OK
28	0.024	0.694	3.41	OK
29	0.075	0.694	10.76	OK
30	0.021	0.694	3.08	OK
31	0.077	0.694	11.08	OK
32	0.017	0.694	2.40	OK
33	0.041	0.694	5.97	OK
34	0.017	0.694	2.49	OK
35	0.114	0.694	16.43	OK
36	0.017	0.694	2.39	OK
37	0.105	0.694	15.19	OK
38	0.016	0.694	2.34	OK
39	0.045	0.694	6.54	OK
40	0.021	0.694	3.08	OK

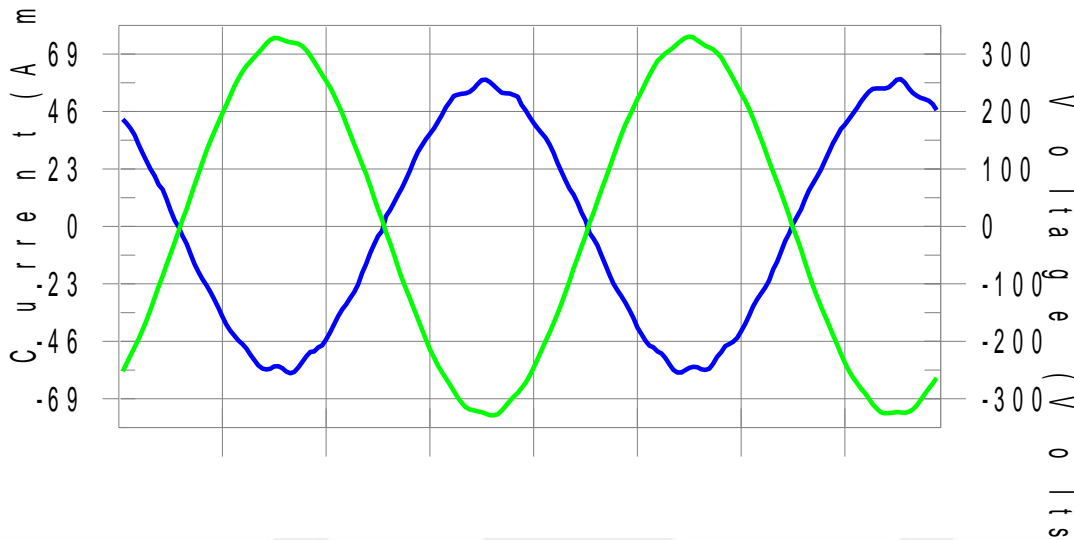
Harmonics – Per EN/IEC61000-3-12, Ed. 2.0(Phase B-Run time)

EUT: HPS30
 Test category: Table:3, Rsce=33, Inter-Harm,)
 Test date: 2024/2/29 Start time: 15:08:11
 Test duration (min): 2.5 Data file name: WIN2106_H-000198.cts_data
 Comment: PV IN&AC ON GRID
 Customer: Shenzhen Ates Power Technology Co.,Ltd

Tested by: LHT
 Test Margin: 100
 End time: 15:10:53

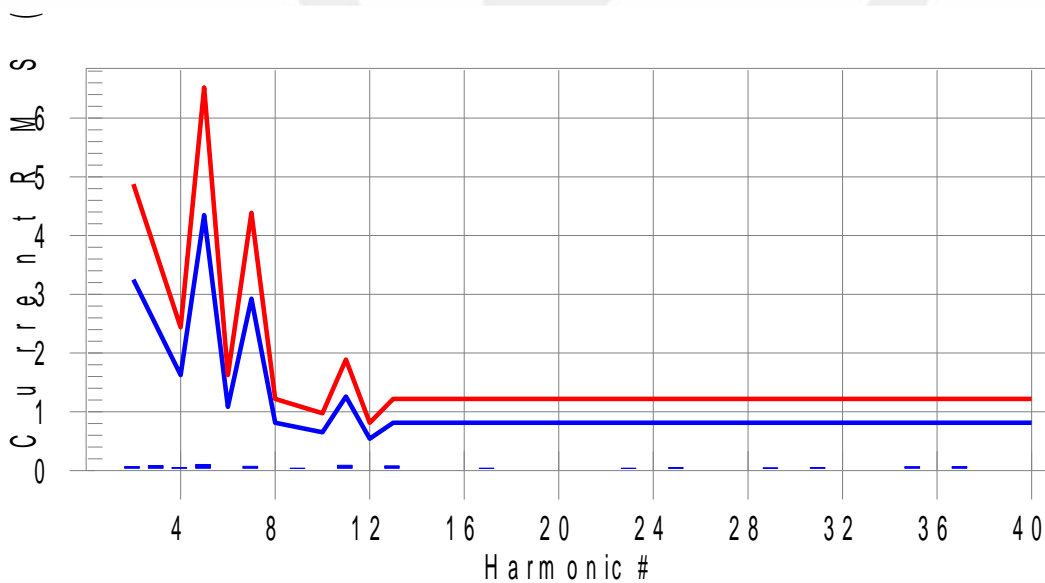
Test Result: Pass Source qualification: Normal

Current & voltage waveforms



Harmonics and Class 3 limit line

European Limits



Test result: Pass Worst harmonics H13-7.8% of 150% limit, H13-9.8% of 100% limit.

Current Test Result Summary (Phase B-Run time)

EUT: HPS30
 Test category: Table:3, Rsce=33, Inter-Harm,)
 Test date: 2024/2/29 Start time: 15:08:11
 Test duration (min): 2.5 Data file name: WIN2106_H-000198.cts_data
 Comment: PV IN&AC ON GRID
 Customer: Shenzhen Ates Power Technology Co.,Ltd

Tested by: LHT
 Test Margin: 100
 End time: 15:10:53

Test Result: Pass Measured Iref: 40.631(Amps) Source: Normal
 THC/Iref (%): 0.0 Limit (%): 13.0 PWHC/Iref (%): 0.0 PWHC Limit (%): 22.0

Highest parameter values during test:

V_RMS (Volts): 231.35 Frequency (Hz): 50.00
 I_Peak (Amps): 60.392 I_RMS (Amps): 40.676
 I_Fund (Amps): 40.618(avg) Crest Factor: 1.495
 Power (Watts): -9408 Power Factor: -0.999

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.068	3.250	2.1	0.123	4.876	2.5	Pass
3	0.111	N/A	N/A	0.125	N/A	N/A	N/A
4	0.051	1.625	3.1	0.066	2.438	2.7	Pass
5	0.103	4.347	2.4	0.129	6.521	2.0	Pass
6	0.033	1.083	3.0	0.042	1.625	2.6	Pass
7	0.072	2.925	2.5	0.085	4.388	1.9	Pass
8	0.029	0.813	3.6	0.036	1.219	3.0	Pass
9	0.066	N/A	N/A	0.045	N/A	N/A	N/A
10	0.025	0.650	3.8	0.031	0.975	3.2	Pass
11	0.089	1.260	7.0	0.097	1.889	5.1	Pass
12	0.029	0.542	5.3	0.033	0.813	4.0	Pass
13	0.080	0.813	9.8	0.095	1.219	7.8	Pass
14	0.023	N/A	N/A	0.027	N/A	N/A	N/A
15	0.032	N/A	N/A	0.039	N/A	N/A	N/A
16	0.022	N/A	N/A	0.025	N/A	N/A	N/A
17	0.039	N/A	N/A	0.049	N/A	N/A	N/A
18	0.022	N/A	N/A	0.025	N/A	N/A	N/A
19	0.035	N/A	N/A	0.048	N/A	N/A	N/A
20	0.021	N/A	N/A	0.024	N/A	N/A	N/A
21	0.031	N/A	N/A	0.037	N/A	N/A	N/A
22	0.018	N/A	N/A	0.021	N/A	N/A	N/A
23	0.038	N/A	N/A	0.042	N/A	N/A	N/A
24	0.022	N/A	N/A	0.025	N/A	N/A	N/A
25	0.048	N/A	N/A	0.053	N/A	N/A	N/A
26	0.021	N/A	N/A	0.024	N/A	N/A	N/A
27	0.033	N/A	N/A	0.039	N/A	N/A	N/A
28	0.016	N/A	N/A	0.018	N/A	N/A	N/A
29	0.042	N/A	N/A	0.047	N/A	N/A	N/A
30	0.019	N/A	N/A	0.021	N/A	N/A	N/A
31	0.051	N/A	N/A	0.056	N/A	N/A	N/A
32	0.016	N/A	N/A	0.019	N/A	N/A	N/A
33	0.025	N/A	N/A	0.028	N/A	N/A	N/A
34	0.015	N/A	N/A	0.017	N/A	N/A	N/A
35	0.066	N/A	N/A	0.071	N/A	N/A	N/A
36	0.018	N/A	N/A	0.021	N/A	N/A	N/A
37	0.070	N/A	N/A	0.074	N/A	N/A	N/A
38	0.015	N/A	N/A	0.017	N/A	N/A	N/A
39	0.025	N/A	N/A	0.029	N/A	N/A	N/A
40	0.011	N/A	N/A	0.014	N/A	N/A	N/A

Note: Measured I-ref was applied for this test.

Voltage Source Verification Data (Phase B-Run time)

EUT: HPS30
 Test category: Table:3, Rsce=33, Inter-Harm,)
 Test date: 2024/2/29 Start time: 15:08:11
 Test duration (min): 2.5 Data file name: WIN2106_H-000198.cts_data
 Comment: PV IN&AC ON GRID
 Customer: Shenzhen Ates Power Technology Co.,Ltd

Tested by: LHT
 Test Margin: 100
 End time: 15:10:53

Test Result: Pass Source qualification: Normal
 Measured source distortion is within the requirements of the standards
 Measurements are compliant with IEC/EN61000-3-12 Ed. 2.0 & IEC/EN61000-4-7 Ed. 2.1

Highest parameter values during test:

Voltage (Vrms):	231.35	Frequency (Hz):	50.00
I_Peak (Amps):	60.392	I_RMS (Amps):	40.676
I_Fund (Amps):	40.618(avg)	Crest Factor:	1.495
Power (Watts):	-9408	Power Factor:	-0.999

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.320	0.925	34.55	OK
3	0.153	2.891	5.28	OK
4	0.039	0.925	4.16	OK
5	0.116	3.470	3.34	OK
6	0.019	0.925	2.02	OK
7	0.136	2.892	4.71	OK
8	0.019	0.925	2.10	OK
9	0.124	1.388	8.94	OK
10	0.019	0.925	2.06	OK
11	0.154	1.619	9.50	OK
12	0.017	0.694	2.49	OK
13	0.142	1.388	10.23	OK
14	0.018	0.694	2.64	OK
15	0.089	0.694	12.78	OK
16	0.024	0.694	3.51	OK
17	0.091	0.694	13.14	OK
18	0.016	0.694	2.37	OK
19	0.087	0.694	12.60	OK
20	0.020	0.694	2.85	OK
21	0.069	0.694	9.95	OK
22	0.023	0.694	3.28	OK
23	0.081	0.694	11.73	OK
24	0.017	0.694	2.47	OK
25	0.078	0.694	11.28	OK
26	0.017	0.694	2.50	OK
27	0.050	0.694	7.18	OK
28	0.020	0.694	2.88	OK
29	0.063	0.694	9.08	OK
30	0.018	0.694	2.65	OK
31	0.076	0.694	10.90	OK
32	0.020	0.694	2.91	OK
33	0.054	0.694	7.71	OK
34	0.017	0.694	2.41	OK
35	0.112	0.694	16.10	OK
36	0.017	0.694	2.52	OK
37	0.104	0.694	14.98	OK
38	0.019	0.694	2.72	OK
39	0.047	0.694	6.80	OK
40	0.024	0.694	3.44	OK

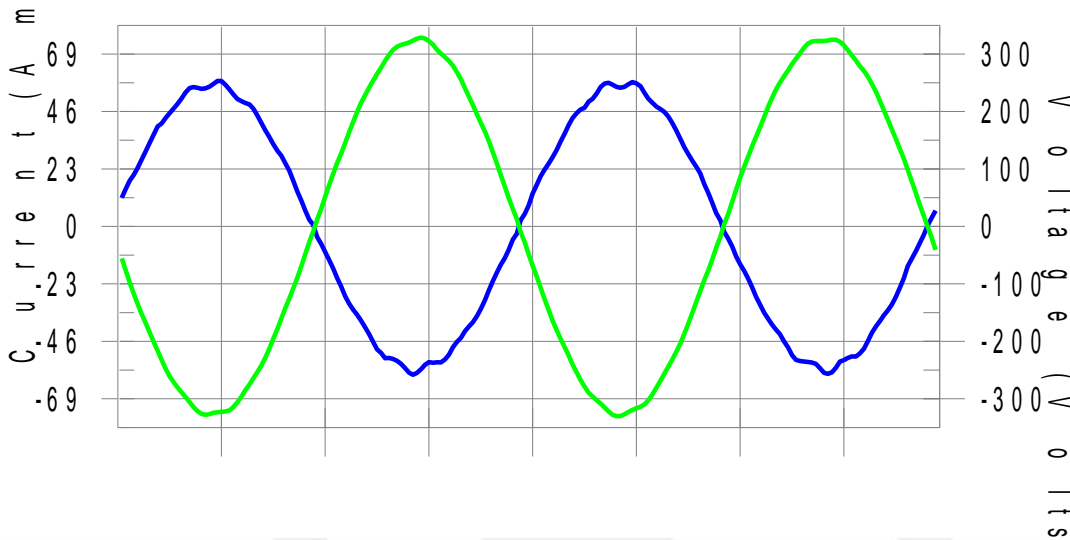
Harmonics – Per EN/IEC61000-3-12, Ed. 2.0(Phase C-Run time)

EUT: HPS30
 Test category: Table:3, Rsce=33, Inter-Harm,)
 Test date: 2024/2/29 Start time: 15:08:11
 Test duration (min): 2.5 Data file name: WIN2106_H-000198.cts_data
 Comment: PV IN&AC ON GRID
 Customer: Shenzhen Ates Power Technology Co.,Ltd

Tested by: LHT
 Test Margin: 100
 End time: 15:10:53

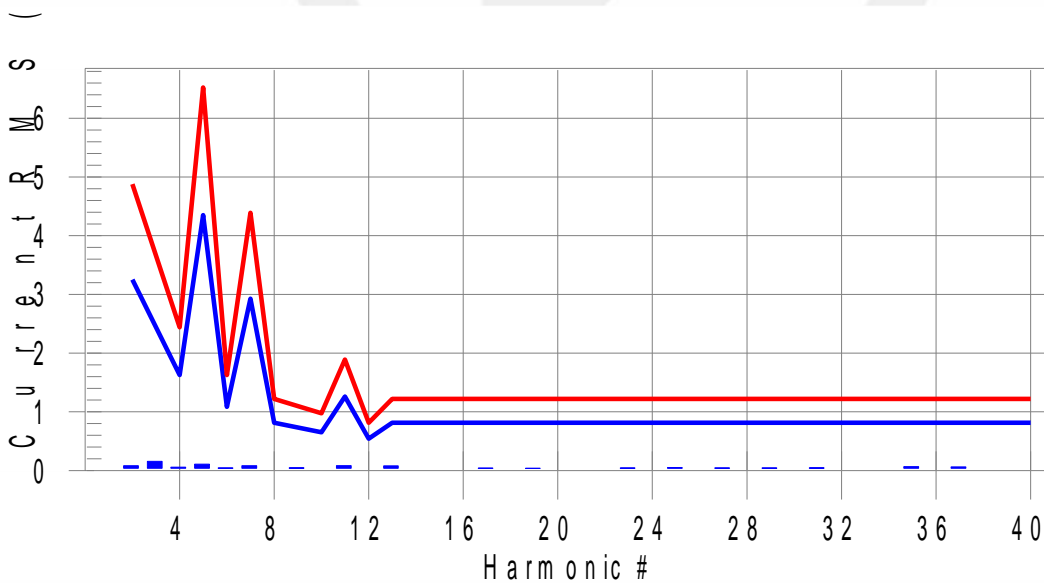
Test Result: Pass Source qualification: Normal

Current & voltage waveforms



Harmonics and Class 3 limit line

European Limits



Test result: Pass Worst harmonics H13-7.2% of 150% limit, H13-9.8% of 100% limit.

Current Test Result Summary (Phase C-Run time)

EUT: HPS30
 Test category: Table:3, Rsce=33, Inter-Harm,)
 Test date: 2024/2/29 Start time: 15:08:11
 Test duration (min): 2.5 Data file name: WIN2106_H-000198.cts_data
 Comment: PV IN&AC ON GRID
 Customer: Shenzhen Ates Power Technology Co.,Ltd

Tested by: LHT
 Test Margin: 100
 End time: 15:10:53

Test Result: Pass Measured Iref: 40.653(Amps) Source: Normal
 THC/Iref (%): 0.0 Limit (%): 13.0 PWHC/Iref (%): 0.0 PWHC Limit (%): 22.0

Highest parameter values during test:

V_RMS (Volts):	231.41	Frequency (Hz):	50.00
I_Peak (Amps):	60.135	I_RMS (Amps):	40.720
I_Fund (Amps):	40.641(avg)	Crest Factor:	1.479
Power (Watts):	-9419	Power Factor:	-0.999

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.082	3.252	2.5	0.129	4.878	2.6	Pass
3	0.111	N/A	N/A	0.226	N/A	N/A	N/A
4	0.057	1.626	3.5	0.080	2.439	3.3	Pass
5	0.109	4.350	2.5	0.136	6.525	2.1	Pass
6	0.043	1.084	3.9	0.056	1.626	3.4	Pass
7	0.081	2.927	2.8	0.093	4.391	2.1	Pass
8	0.030	0.813	3.7	0.036	1.220	2.9	Pass
9	0.066	N/A	N/A	0.055	N/A	N/A	N/A
10	0.029	0.650	4.4	0.034	0.976	3.5	Pass
11	0.083	1.260	6.6	0.090	1.890	4.8	Pass
12	0.024	0.542	4.5	0.029	0.813	3.5	Pass
13	0.080	0.813	9.8	0.087	1.220	7.2	Pass
14	0.026	N/A	N/A	0.029	N/A	N/A	N/A
15	0.036	N/A	N/A	0.040	N/A	N/A	N/A
16	0.024	N/A	N/A	0.026	N/A	N/A	N/A
17	0.041	N/A	N/A	0.046	N/A	N/A	N/A
18	0.022	N/A	N/A	0.026	N/A	N/A	N/A
19	0.038	N/A	N/A	0.042	N/A	N/A	N/A
20	0.022	N/A	N/A	0.026	N/A	N/A	N/A
21	0.035	N/A	N/A	0.038	N/A	N/A	N/A
22	0.019	N/A	N/A	0.024	N/A	N/A	N/A
23	0.042	N/A	N/A	0.049	N/A	N/A	N/A
24	0.026	N/A	N/A	0.030	N/A	N/A	N/A
25	0.052	N/A	N/A	0.057	N/A	N/A	N/A
26	0.026	N/A	N/A	0.030	N/A	N/A	N/A
27	0.042	N/A	N/A	0.049	N/A	N/A	N/A
28	0.018	N/A	N/A	0.021	N/A	N/A	N/A
29	0.043	N/A	N/A	0.049	N/A	N/A	N/A
30	0.020	N/A	N/A	0.025	N/A	N/A	N/A
31	0.047	N/A	N/A	0.051	N/A	N/A	N/A
32	0.017	N/A	N/A	0.020	N/A	N/A	N/A
33	0.025	N/A	N/A	0.027	N/A	N/A	N/A
34	0.016	N/A	N/A	0.018	N/A	N/A	N/A
35	0.066	N/A	N/A	0.075	N/A	N/A	N/A
36	0.016	N/A	N/A	0.018	N/A	N/A	N/A
37	0.062	N/A	N/A	0.075	N/A	N/A	N/A
38	0.015	N/A	N/A	0.017	N/A	N/A	N/A
39	0.028	N/A	N/A	0.032	N/A	N/A	N/A
40	0.011	N/A	N/A	0.014	N/A	N/A	N/A

Note: Measured I-ref was applied for this test.

Voltage Source Verification Data (Phase C-Run time)

EUT: HPS30
 Test category: Table:3, Rsce=33, Inter-Harm,)
 Test date: 2024/2/29 Start time: 15:08:11
 Test duration (min): 2.5 Data file name: WIN2106_H-000198.cts_data
 Comment: PV IN&AC ON GRID
 Customer: Shenzhen Ates Power Technology Co.,Ltd

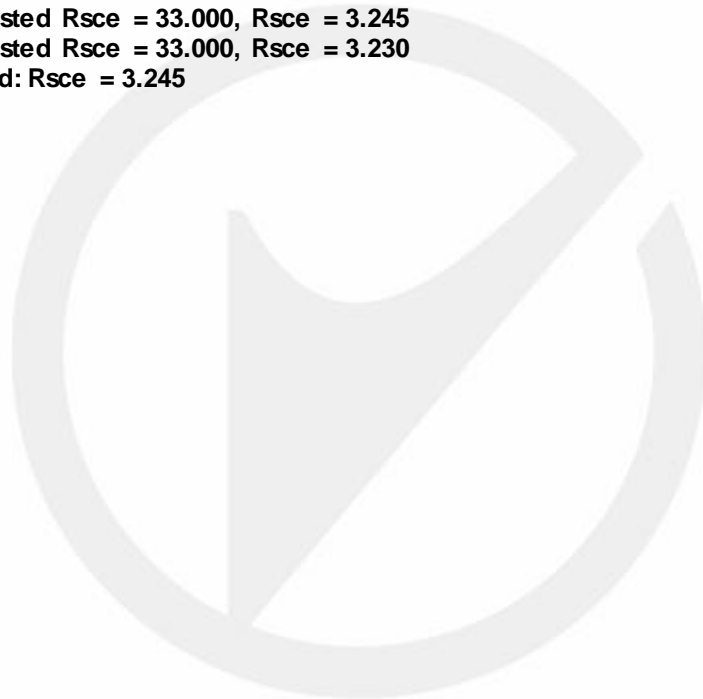
Tested by: LHT
 Test Margin: 100
 End time: 15:10:53

Test Result: Pass Source qualification: Normal
 Measured source distortion is within the requirements of the standards
 Measurements are compliant with IEC/EN61000-3-12 Ed. 2.0 & IEC/EN61000-4-7 Ed. 2.1

Highest parameter values during test:

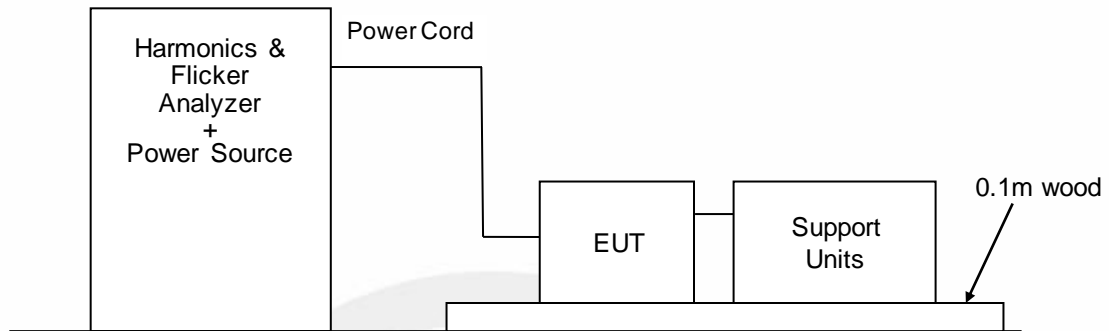
Voltage (Vrms):	231.41	Frequency (Hz):	50.00
I_Peak (Amps):	60.135	I_RMS (Amps):	40.720
I_Fund (Amps):	40.641(avg)	Crest Factor:	1.479
Power (Watts):	-9419	Power Factor:	-0.999

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.291	0.925	31.48	OK
3	0.158	2.893	5.46	OK
4	0.040	0.925	4.36	OK
5	0.116	3.468	3.35	OK
6	0.021	0.925	2.27	OK
7	0.137	2.890	4.75	OK
8	0.029	0.925	3.11	OK
9	0.133	1.387	9.62	OK
10	0.029	0.925	3.13	OK
11	0.143	1.619	8.81	OK
12	0.021	0.694	3.09	OK
13	0.148	1.387	10.65	OK
14	0.020	0.694	2.91	OK
15	0.098	0.694	14.19	OK
16	0.021	0.694	3.10	OK
17	0.091	0.694	13.10	OK
18	0.026	0.694	3.68	OK
19	0.080	0.694	11.51	OK
20	0.021	0.694	3.01	OK
21	0.068	0.694	9.87	OK
22	0.023	0.694	3.34	OK
23	0.076	0.694	10.97	OK
24	0.019	0.694	2.72	OK
25	0.068	0.694	9.85	OK
26	0.020	0.694	2.94	OK
27	0.058	0.694	8.40	OK
28	0.020	0.694	2.88	OK
29	0.064	0.694	9.28	OK
30	0.022	0.694	3.15	OK
31	0.075	0.694	10.75	OK
32	0.023	0.694	3.28	OK
33	0.050	0.694	7.27	OK
34	0.021	0.694	3.06	OK
35	0.110	0.694	15.86	OK
36	0.018	0.694	2.64	OK
37	0.102	0.694	14.72	OK
38	0.022	0.694	3.18	OK
39	0.058	0.694	8.31	OK
40	0.022	0.694	3.17	OK

5th Harmonic Phase Angle and Magnitude for Phase A:**H-5_min_phase: 255.6 Degree (Leading)****H-5_max_phase: 298.7 Degree (Leading)****H-5_ave_phase: 276.0 Degree (Leading)****H-5_ave_vector_magnitude: 0.145 Amp****H-5_standard_ave_magnitude: 0.158 Amp****H-5_standard_max_magnitude: 0.190 Amp****Ratio of H-5_ave_vector / H-5_standard_ave: 0.920****Phase A = 9.281% of tested Rsce = 33.000, Rsce = 3.063****Phase B = 9.832% of tested Rsce = 33.000, Rsce = 3.245****Phase C = 9.787% of tested Rsce = 33.000, Rsce = 3.230****Minimum Rsce required: Rsce = 3.245**

8. VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT

8.1. Block Diagram of Test Setup



8.2. Standard Limits

EN IEC 61000-3-11 Limits

The limits shall be applicable to voltage fluctuations and flicker at the supply terminals of the equipment under test, measured or calculated according to clause 4 under test conditions described in clause 6. Tests made to prove the compliance with the limits are considered to be type tests.

The following limits apply:

- the value of the short-term flicker indicator, P_{st} shall not be greater than 1,0;
- the value of the long-term flicker indicator, P_{lt} shall not be greater than 0,65;
- the value of $d(t)$ during a voltage change shall not exceed 3,3 % for more than 500 ms;
- the relative steady-state voltage change, d_c , shall not exceed 3,3 %;
- the maximum relative voltage change d_{max} , shall not exceed:

8.3. Test Procedure

The total impedance of the test circuit, excluding the appliance under test, but including the internal impedance of the supply source, shall be equal to the reference impedance. The stability and tolerance of the reference impedance shall be adequate to ensure that the overall accuracy of 8% is achieved during the whole assessment procedure.

8.4. Test Results

PASS.

Please see the attached page.

Flicker Test Summary Per EN/IEC61000-3-11, Ed. 2.0(2017)(Phase A-Run time)

EUT: HPS30
 Test category: All parameters
 Test date: 2024/2/29
 Test duration (min): 10
 Comment: PV IN&AC ON GRID
 Customer: Shenzhen Ateess Power Technology Co.,Ltd)
 Z-test Phase = (0.150 + j 0.150 Ohm) Neutral = (0.100 + j 0.100 Ohm)

Tested by: LHT
 Test Margin: 100
 End time: 15:25:33

Start time: 15:15:04
 Data file name: WIN2106_F-000199.cts_data

Test Result: Pass
 Status: Test Completed

Pst and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt): 227.71

T-max (mS):	0.0	Test limit (mS):	500.0	Pass
Highest dc (%):	0.00	Test limit (%):	3.30	Pass
Highest dmax (%):	-0.08	Test limit (%):	4.00	Pass
Highest Pst (10 min. period):	0.363	Test limit:	1.000	Pass

Calculated dmax(%): 0.000
 Calculated dc(%): 0.000
 Calculated Pst : 0.485
 Calculated Plt : 0.212

The maximum permissible system impedance Zsys:

Z-phase A = 0.711 Ohm + j 0.444 Ohm (0.711 Ohm + 1414 μH)
 Z-neutral A = 0.474 Ohm + j 0.296 Ohm (0.474 Ohm + 943 μH)

Flicker Test Summary Per EN/IEC61000-3-11, Ed. 2.0(2017)(Phase B-Run time)

EUT: HPS30
 Test category: All parameters
 Test date: 2024/2/29
 Test duration (min): 10
 Comment: PV IN&AC ON GRID
 Customer: Shenzhen Atecs Power Technology Co.,Ltd)
 Z-test Phase = (0.150 + j 0.150 Ohm) Neutral = (0.100 + j 0.100 Ohm)

Tested by: LHT
 Test Margin: 100
 Start time: 15:15:04
 End time: 15:25:33
 Data file name: WIN2106_F-000199.cts_data

Test Result: Pass
 Status: Test Completed

Pst_i and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt): 226.71

Time(mS) > dt:	0.0	Test limit (mS):	500.0	Pass
Highest dc (%):	-0.47	Test limit (%):	3.30	Pass
Highest dmax (%):	0.64	Test limit (%):	4.00	Pass
Highest Pst (10 min. period):	0.388	Test limit:	1.000	Pass

Calculated dmax(%): 0.852
 Calculated dc(%): -0.622
 Calculated Pst : 0.518
 Calculated Plt : 0.226

The maximum permissible system impedance Zsys :

Z-phase B = 0.644 Ohm + j 0.403 Ohm (0.644 Ohm + 1282 μH)
 Z-neutral B = 0.429 Ohm + j 0.268 Ohm (0.429 Ohm + 854 μH)

Flicker Test Summary Per EN/IEC61000-3-11, Ed. 2.0(2017)(Phase C-Run time)

EUT: HPS30 **Tested by:** LHT
Test category: All parameters **Test Margin:** 100
Test date: 2024/2/29 **Start time:** 15:15:04 **End time:** 15:25:33
Test duration (min): 10 **Data file name:** WIN2106_F-000199.cts_data
Comment: PV IN&AC ON GRID
Customer: Shenzhen Ateess Power Technology Co.,Ltd)
Z-test Phase = (0.150 + j 0.150 Ohm) **Neutral =** (0.100 + j 0.100 Ohm)

Test Result: Pass
Status: Test Completed

Pst_i and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt): 227.68

Time(mS) > dt:	0.0	Test limit (mS):	500.0	Pass
Highest dc (%):	0.00	Test limit (%):	3.30	Pass
Highest dmax (%):	-0.09	Test limit (%):	4.00	Pass
Highest Pst (10 min. period):	0.384	Test limit:	1.000	Pass

Calculated dmax(%): 0.000
Calculated dc(%): 0.000
Calculated Pst : 0.513
Calculated Plt : 0.224

The maximum permissible system impedance Zsys :

Z-phase C = 0.654 Ohm + j 0.409 Ohm **(0.654 Ohm + 1301 μH)**
Z-neutral C = 0.436 Ohm + j 0.272 Ohm **(0.436 Ohm + 867 μH)**

9. IMMUNITY GENERAL PERFORMANCE CRITERIA DESCRIPTION

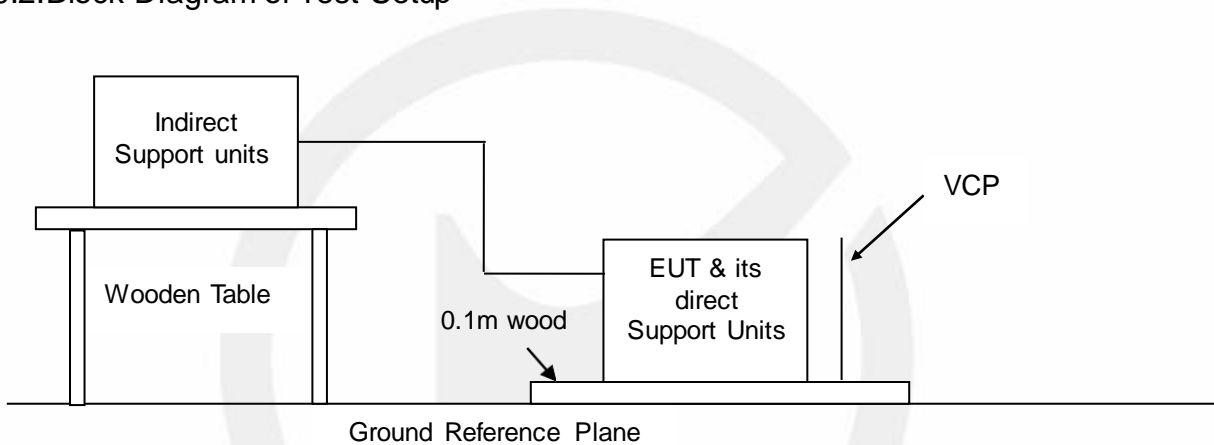
Item	Criterion A	Criterion B	Criterion C
Operating status	No noticeable change of the operating status. Operating as intended.	Noticeable changes of the operating characteristic. Self-recoverable	Shutdown, changes in operating status. Triggering of protective devices. Not self-recoverable
Power output	Power output permitted to vary only within $\pm 25\%$.	Power output permitted to temporarily vary outside $\pm 25\%$ Self-recoverable	Loss of power output. Not self-recoverable
External and internal Indications and metering	No noticeable change of the operating status.	Changes only during test	Shutdown, triggering of protective devices. Not self-recoverable
Control signal to external devices	Undisturbed Communication and data exchange to external devices	Temporarily disturbed communication, but no error reports of the internal or external devices which could cause shut-down	Errors in communication, loss of data and information. No loss of stored program, no loss of user program. Not self-recoverable

10. ELECTROSTATIC DISCHARGE

10.1. Test Specification

Test standard	: EN 62920
Basic standard	: IEC 61000-4-2
Performance criterion	: B
Test level	: $\pm 8.0\text{kV}$ (Air discharge) $\pm 4.0\text{kV}$ (Contact discharge)

10.2. Block Diagram of Test Setup



10.3. Test Procedure

- In the case of air discharge testing, the climatic conditions shall be within the following ranges:
 - ambient temperature: 15°C to 35°C;
 - relative humidity : 30% to 60%;
 - atmospheric pressure : 86 kPa (860 mbar) to 106 kPa (1060 mbar)
- Test programs and software shall be chosen so as to exercise all normal modes of operation of the EUT. The use of special exercising software is encouraged, but permitted only where it can be shown that the EUT is being comprehensively exercised.
- In the case of contact discharges, the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.
- In the case of painted surface covering a conducting substrate, the following procedure shall be adopted :
 - If the coating is not declared to be an insulating coating by the equipment manufacturer, then the pointed tip of the generator shall penetrate the coating so as to make contact with the conducting substrate.
 - Coating declared as insulating by the manufacturer shall only be submitted to the air discharge.
 - The contact discharge test shall not be applied to such surfaces.
- In the case of air discharges, the round discharge tip of the discharge electrode shall be approached as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator (discharge electrode) shall be removed from the EUT. The generator is then retriggered for a new single discharge. This procedure shall be repeated until the discharges are completed. In the case of an air discharge test, the discharge switch, which is used for contact discharge, shall be closed.
- The test voltage shall be increased from the minimum to the selected test severity level, in order to determine any threshold of failure. The final test level should not exceed the product specification value in order to avoid damage to the equipment.

- g. The test shall be performed with both air discharge and contact discharge. The test shall be performed with single discharges. On each pre-selected point at least 10 single discharges (in the most sensitive polarity) shall be applied. For the time interval between successive single discharges an initial value of 1 s is recommended. Longer intervals may be necessary to determine whether a system failure has occurred.
- h. Ensure that the applied charge on the EUT has been dis-charged before next ESD pulse.

10.4. Test Results

PASS

Temperature : 21.3°C
 Humidity : 47%
 Atmospheric Pressure : 101kpa
 Test Engineer : LHT
 Test Date : 2024-02-29
 Test Mode : Mode A, Mode B

Air Discharge:

Test Voltage	Location	Actual criterion	Required performance criterion	Result (Pass/Fail)
± 8kV	SLOT/SCREEN/ BUTTON	A	B	Pass

Contact Discharge

Test Voltage	Location	Actual criterion	Required performance criterion	Result (Pass/Fail)
± 4kV	METAL/SCREW	A	B	Pass

Indirect Discharge

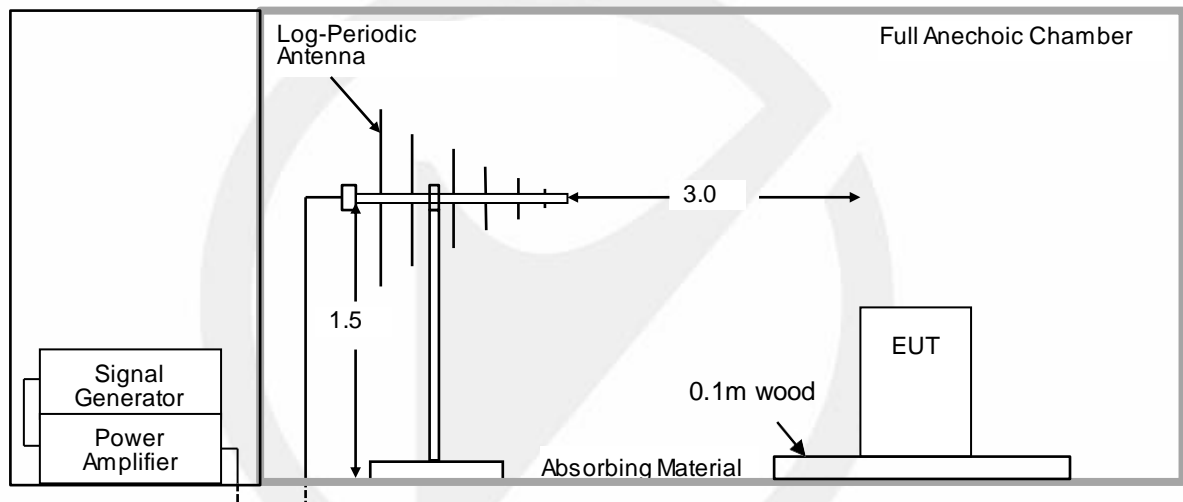
Test Voltage	Location	Actual criterion	Required performance criterion	Result (Pass/Fail)
± 4kV	VCP	A	B	Pass

11. CONTINUOUS RF ELECTROMAGNETIC FIELD DISTURBANCES

11.1. Test Specification

Test standard	: EN 62920	
Basic standard	: IEC 61000-4-3	
Performance criterion	: A	
Frequency range &	: <input checked="" type="checkbox"/> 80M-1000MHz	10V/m
Test level	: <input checked="" type="checkbox"/> 1400M-6000MHz	3V/m
Modulation	: AM, 80%, 1kHz sine-wave	

11.2. Block Diagram of Test Setup



11.3. Test procedure

The procedure defined in this part requires the generation of electromagnetic fields within which the test sample is placed and its operation observed. To generate fields that are useful for simulation of actual (field) conditions may require significant antenna drive power and the resultant high field strength levels. To comply with local regulations and to prevent biological hazards to the testing personnel, it is recommended that these tests be carried out in a shielded enclosure or semi-anechoic chamber.

- a. The antenna which is enabling the complete frequency range of 80-6000 MHz is placed 3m (or 1m) away from the equipment. The required field strength is determined by placing the field strength meter(s) on top of or directly alongside the equipment under test and monitoring the field strength meter via a remote field strength indicator outside the enclosure while adjusting the continuous-wave to the antenna.
- b. The test is performed with the antenna facing the front and back sides of the EUT with. Both vertical and horizontal polarizations from antenna are tested.

11.4. Test results

PASS

Temperature : 21.6°C
 Humidity : 45%
 Atmospheric Pressure : 101kpa
 Test Engineer : LHT
 Test Date : 2024-02-29
 Test Mode : Mode A

80M-1000MHz:

Freq. Range (MHz)	Field	Modulation	Polarity	Position (°)	Actual criterion	Required performance criterion	Result
80-1000	10V/m	AM, 80%	H / V	0, 90,180, 270	A	A	Pass
1400-6000	3V/m	AM, 80%	H / V	0, 90,180, 270	A	A	Pass



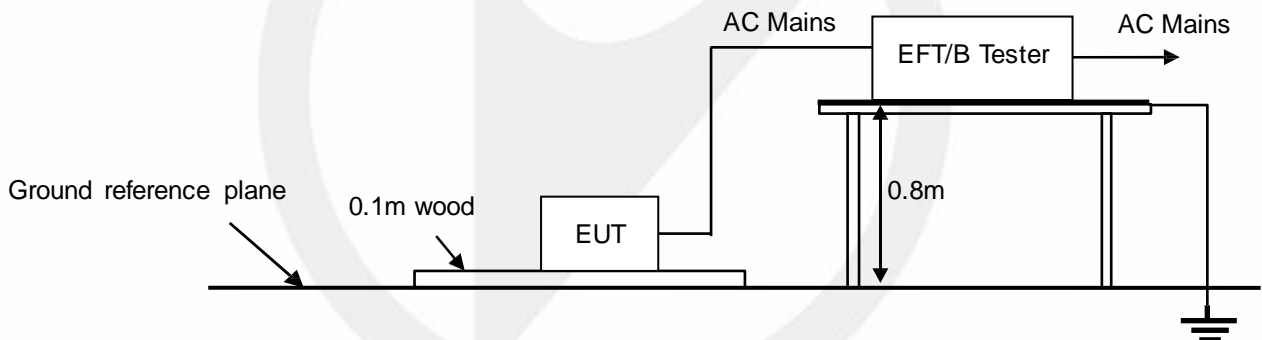
12. ELECTRICAL FAST TRANSIENTS/BURST

12.1. Test Specification

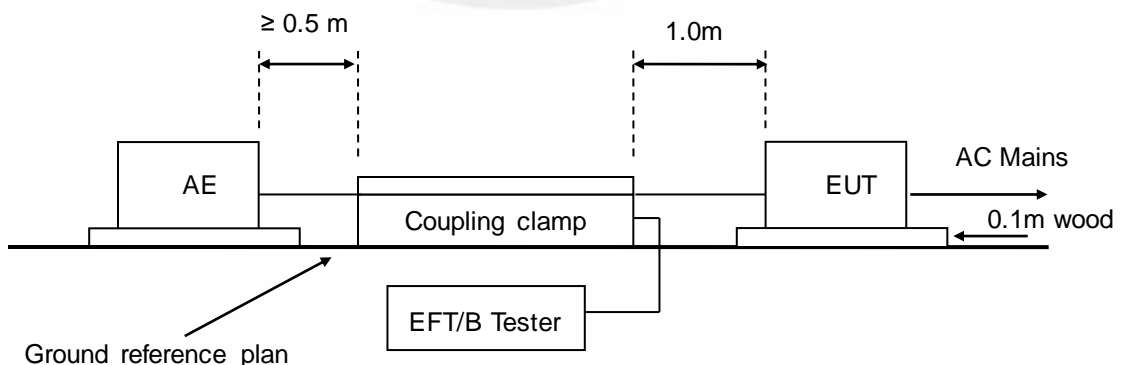
Test standard	: EN 62920
Basic standard	: IEC 61000-4-4
Performance criterion	: B
Test level	: <input checked="" type="checkbox"/> 2kV, AC mains power ports <input checked="" type="checkbox"/> 1kV, DC network power ports <input type="checkbox"/> 1kV, Signal and control (wired network) ports
Repetition frequency	: <input checked="" type="checkbox"/> 5kHz, <input checked="" type="checkbox"/> 100kHz
Tr/Th:	: 5/50ns
Burst period	: 300ms
Test time	: 120s

12.2. Block Diagram of Test Setup

AC Lines:



DC lines:



12.3. Test Procedure

The EUT is put on the insulating support that is 0.1 meter high above the ground. This reference ground plane shall project beyond the EUT by at least 0.1m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane beneath the EUT, shall be more than 0.5m.

12.4. Test Results

PASS

Temperature : 21.2°C
 Humidity : 50%
 Atmospheric Pressure : 101kpa
 Test Engineer : LHT
 Test Date : 2024-02-29
 Test Mode : Mode A

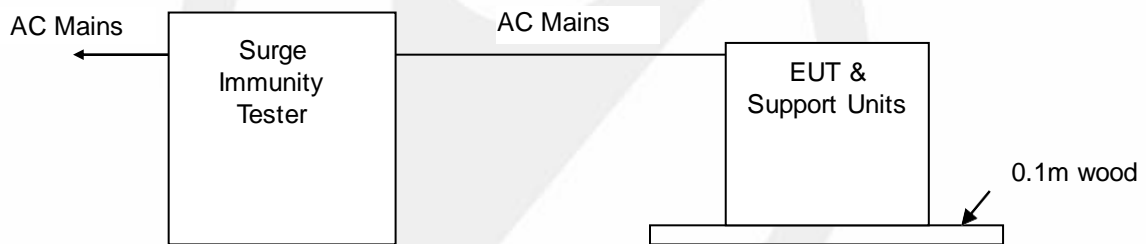
Injection Line	Voltage (kV)	Injected Method	Actual criterion	Required performance criterion	Result (Pass/Fail)
<input checked="" type="checkbox"/> AC mains power ports	± 2	<input checked="" type="checkbox"/> CDN <input type="checkbox"/> Direct injection <input type="checkbox"/> Capacitive coupling clamp	A	B	Pass
<input checked="" type="checkbox"/> DC network power ports	± 1	<input type="checkbox"/> CDN <input type="checkbox"/> Direct injection <input checked="" type="checkbox"/> Capacitive coupling clamp	A	B	Pass
<input type="checkbox"/> Signal and control (wired network) ports	± 1	<input type="checkbox"/> CDN <input type="checkbox"/> Direct injection <input checked="" type="checkbox"/> Capacitive coupling clamp	N/A	N/A	N/A

13. SURGES

13.1. Test Specification

Test standard	: EN 62920
Basic standard	: IEC 61000-4-5
Test level	: <input checked="" type="checkbox"/> 1kV, Line to Line, AC mains power ports, Criterion B <input checked="" type="checkbox"/> 2kV, Line to Earth, AC mains power ports, Criterion B <input checked="" type="checkbox"/> 0.5kV, Line to Reference Line, DC network power ports, Criterion B <input checked="" type="checkbox"/> 1kV, Line to Reference ground, DC network power ports, Criterion B <input type="checkbox"/> 1.0kV, Lines to Ground, Signal and control (wired network) ports, Criterion B
Number of surges	: 5 (for each combination of parameters)
Repetition rate	: 1 minute / time
Polarity:	: Positive / Negative
Phase angle:	: 0°, 90°, 180°, 270° (Only AC mains power ports)

13.2. Block Diagram of Test Setup



13.3. Test Procedure

This test simulates a lightning event by inducing transients onto the AC/DC power supply lines in common mode (Line to Ground) and differential mode (Line to Line). Each device was tested in a total of two surge configurations: Line to Ground (L-G): Combination Wave, Line to Protective Earth with 9uF and 10Ohm and Neutral to Protective Earth with 9uF and 10Ohm, common mode, generator earthed.

Line to Line (L-L): Combination Wave,

Line to Neutral with 18uF, differential mode, generator floated.

2 ohm : the source impedance of the low-voltage power supply network.

12 ohm : the source impedance of the low-voltage power supply network and ground.

- If not otherwise specified the surges have to be applied synchronized to the voltage phase at the zero-crossing and the peak value of the a.c. voltage wave (positive and negative).
- The surges have to be applied line to line and line to earth. When testing line to earth, the test voltage has to be applied successively between each of the lines and earth, if there is no other specification.
- The test procedure shall also consider the non-linear current-voltage characteristics of the equipment under test. Therefore the test voltage has to be increased by steps up to the test level specified in the product standard or test plan. All lower levels including the selected test level shall be satisfied.
- For testing the secondary protection, the output voltage of the generator shall be increased up to the worst-case voltage breakdown level (let-through level) of the primary protection.
- Testing shall be performed according to a Test Plan, which shall be included in the test report.
- To find all critical points of the duty cycle of the equipment, a sufficient number of positive and negative test pulses shall be applied.

13.4. Test results

PASS

Temperature : 21.2°C
 Humidity : 50%
 Atmospheric Pressure : 101kpa
 Test Engineer : LHT
 Test Date : 2024-02-29
 Test Mode : Mode A.1, Mode B

AC mains power ports:

Coupling Line	Voltage (kV)	Waveform (μs)	Polarity	Actual criterion	Required performance criterion	Result (Pass/Fail)
<input checked="" type="checkbox"/> Line to line	1	1.2/50 (8/20)	Pos./ Neg.	A	B	Pass
<input checked="" type="checkbox"/> Line to earth	2	1.2/50 (8/20)	Pos./ Neg.	A	B	Pass

DC network power ports:

Coupling Line	Voltage (kV)	Waveform (μs)	Polarity	Actual criterion	Required performance criterion	Result (Pass/Fail)
<input checked="" type="checkbox"/> Line to Reference line	0.5	1.2/50 (8/20)	Pos./ Neg.	A	B	Pass
<input checked="" type="checkbox"/> Line to Reference ground	1	1.2/50 (8/20)	Pos./ Neg.	A	B	Pass

Signal and control (wired network) ports:

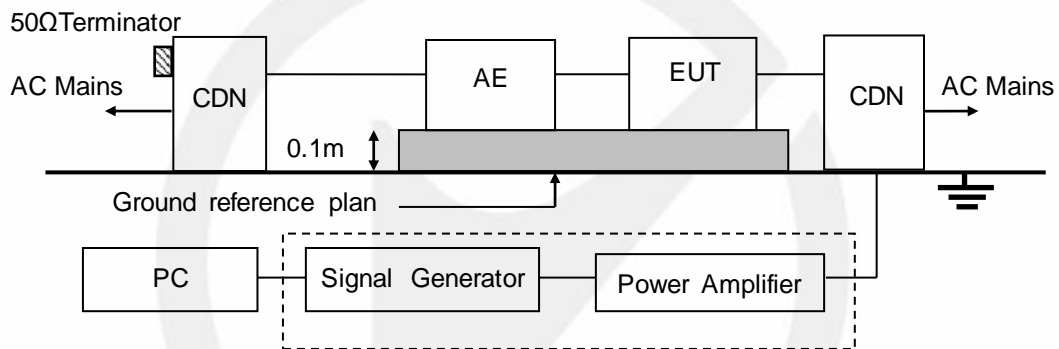
Port type	Coupling Line	Voltage (kV)	Waveform (μs)	Polarity	Actual criterion	Required performance criterion	Result (Pass/Fail)
<input type="checkbox"/> Signal and control (wired network) ports	Lines to ground	1	10/700 (5/320)	Pos./ Neg.	N/A	B	N/A

14. CONTINUOUS INDUCED RF DISTURBANCES

14.1. Test Specification

Test standard	: EN 62920
Basic standard	: IEC 61000-4-6
Performance criterion	: A
Frequency range & Test level	: 0.15M to 80MHz, 10V
Modulation	: AM 80%, 1kHz sine-wave
Frequency Step	: 1% of fundamental

14.2. Block Diagram of Test Setup



14.3. Test Procedure

- The EUT shall be operated within its intended climatic conditions. The temperature and relative humidity should be recorded.
- The EUT is placed on a 0.1m high insulating support, and a well grounded cable is connected to metallic plane above the test table.
- All cables/wires must be laid out on test plate (3cm in thickness), and the EUT is set up on test plate (10 cm in thickness) as shown in test setup photo. Ensure that the EUT is properly connected to the accessory equipment.
- The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn while the other non-excited RF-input ports of the coupling devices are terminated by a 50 ohm load resistor.
- The frequency range is swept from 150 kHz to 80 MHz, using the signal levels established during the setting process, and with the disturbance signal 80% amplitude modulated with a 1 kHz sine wave, pausing to adjust the RF-signal level or to switch coupling devices as necessary. The rate of sweep shall no exceed 1.5×10^{-3} decades/s. Where the frequency is swept incrementally, the step size shall no exceed 1% of the start and thereafter 1% of the preceding frequency value.
- The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies e.g. clock frequency (ies) and harmonics or frequencies of dominant interest shall be analyzed separately.
- Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility
- Testing shall be performed according to a Test Plan, which shall be included in the test report.

14.4. Test results

PASS

Temperature : 21.2°C
 Humidity : 50%
 Atmospheric Pressure : 101kpa
 Test Engineer : LHT
 Test Date : 2024-02-29
 Test Mode : Mode A

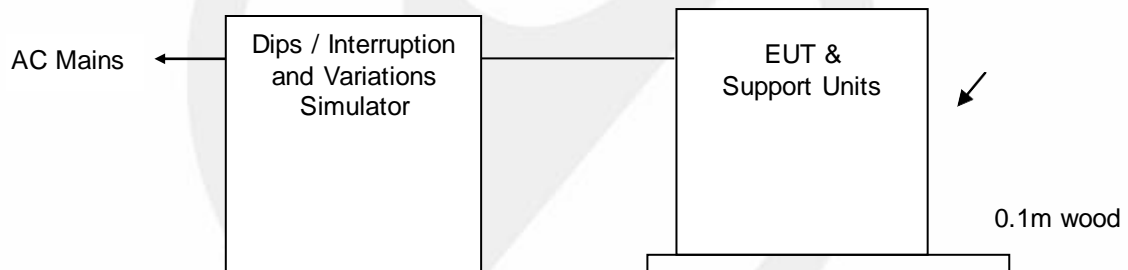
Range (MHz)	Levers (V)	Injection port	Coupling type	Actual criterion	Required performance criterion	Result (Pass/Fail)
0.15-80	10	<input checked="" type="checkbox"/> AC mains power ports	<input checked="" type="checkbox"/> CDN <input type="checkbox"/> EM Clamp <input type="checkbox"/> Current Clamp <input type="checkbox"/> Direct injection	A	A	Pass
0.15-80	10	<input checked="" type="checkbox"/> DC network power ports	<input type="checkbox"/> CDN <input checked="" type="checkbox"/> EM Clamp <input type="checkbox"/> Current Clamp <input type="checkbox"/> Direct injection	A	A	Pass
0.15-80	10	<input type="checkbox"/> Signal and control (wired network) ports	<input type="checkbox"/> CDN <input checked="" type="checkbox"/> EM Clamp <input type="checkbox"/> Current Clamp <input type="checkbox"/> Direct injection	N/A	N/A	N/A

15. VOLTAGE DIPS AND INTERRUPTIONS

15.1. Test Specification

Test standard	: EN 62920
Basic standard	: IEC 61000-4-11 : IEC 61000-4-34
Test level	: 0%, 1 period, Criterion B <input checked="" type="checkbox"/> 40%, 10 periods for 50Hz, Criterion C <input type="checkbox"/> 40%, 12 periods for 60Hz, Criterion C <input checked="" type="checkbox"/> 70%, 25 periods for 50Hz, Criterion C <input type="checkbox"/> 70%, 30 periods for 60Hz, Criterion C <input checked="" type="checkbox"/> 0%, 250 periods for 50Hz, Criterion C <input type="checkbox"/> 0%, 300 periods for 60Hz, Criterion C

15.2. Block Diagram of Test Setup



15.3. Test Procedure

a. Where the equipment has a rated voltage the following shall apply - If the voltage range does not exceed 20% of the lower voltage specified for the rated voltage range, a single voltage within that range may be specified as a basis for test level specification.
- In all other cases, the test procedure shall be applied for both the lowest and highest voltages declared in the voltage range.

b. Test Conditions

- Select operated voltage and frequency of EUT - Test of interval : 10 sec.
- Level and duration : Sequence of 3 dips/interrupts.
- Voltage rise (and fall) time : 1.5 μ s.

15.4. Test results

PASS

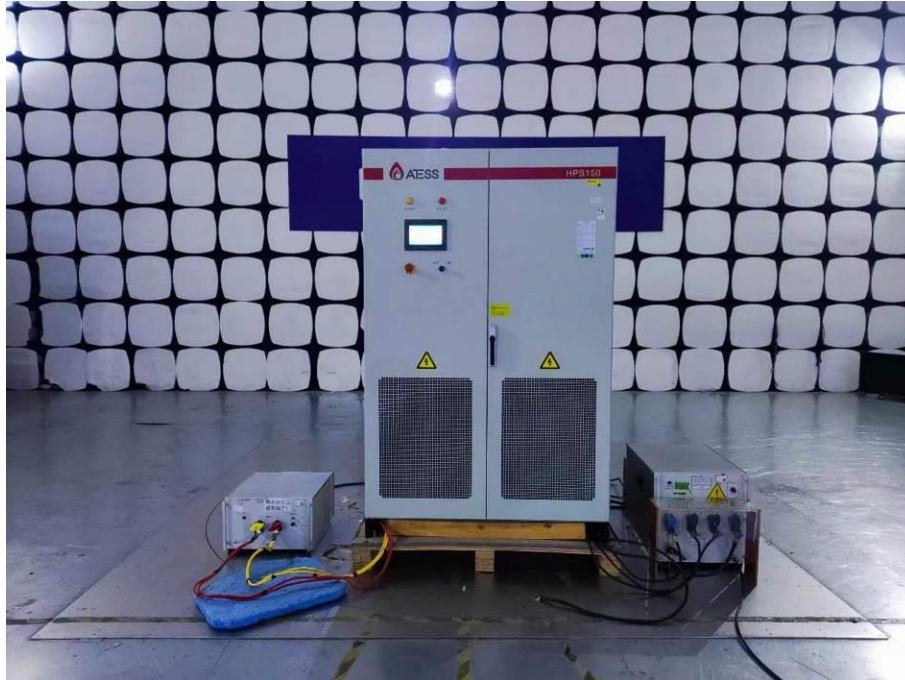
Temperature : 21.2°C
 Humidity : 50%
 Atmospheric Pressure : 101kpa
 Test Engineer : LHT
 Test Date : 2024-02-29
 Test Mode : Mode A

	Test Level (% UT)	Phase angle (°)	Input Voltage (V)	Freq (Hz)	Duration (periods)	Actual criterion	Required performance criterion	Result (Pass /Fail)
<input checked="" type="checkbox"/> Voltage dips	0%	0°~315°	AC 400V	50	1	A	B	Pass
<input checked="" type="checkbox"/> Voltage dips	40%	0°~315°	AC 400V	50	10	A	C	Pass
<input checked="" type="checkbox"/> Voltage dips	70%	0°~315°	AC 400V	50	25	A	C	Pass
<input checked="" type="checkbox"/> Voltage interruptions	0%	0°~315°	AC 400V	50	250	B	C	Pass

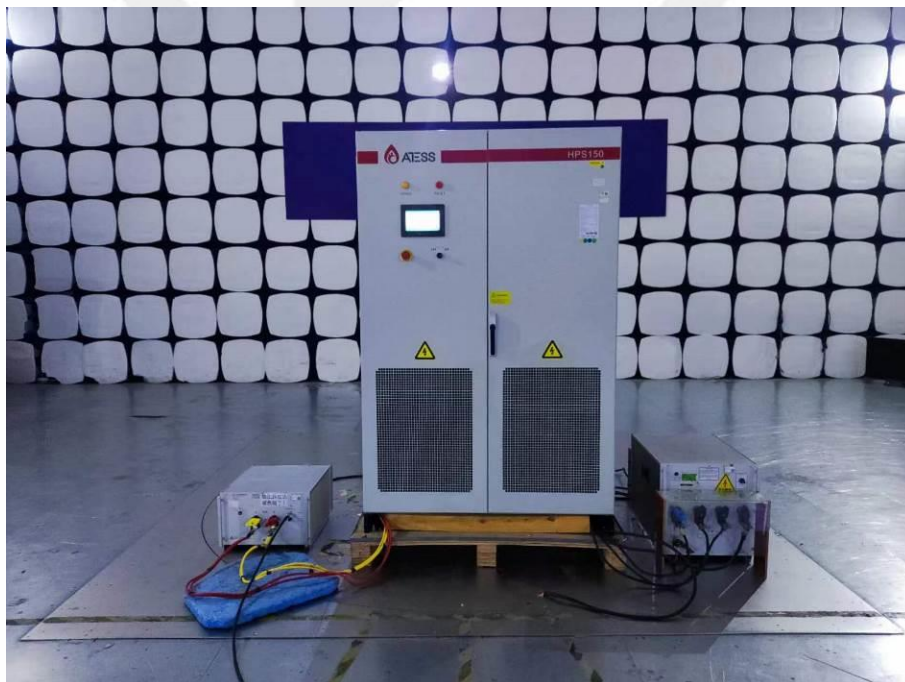
Note: 1. Dips to 0%, Duration 250P, EUT stopped operation, but after the test, it will automatically return to normal.

16.PHOTOGRAPHS

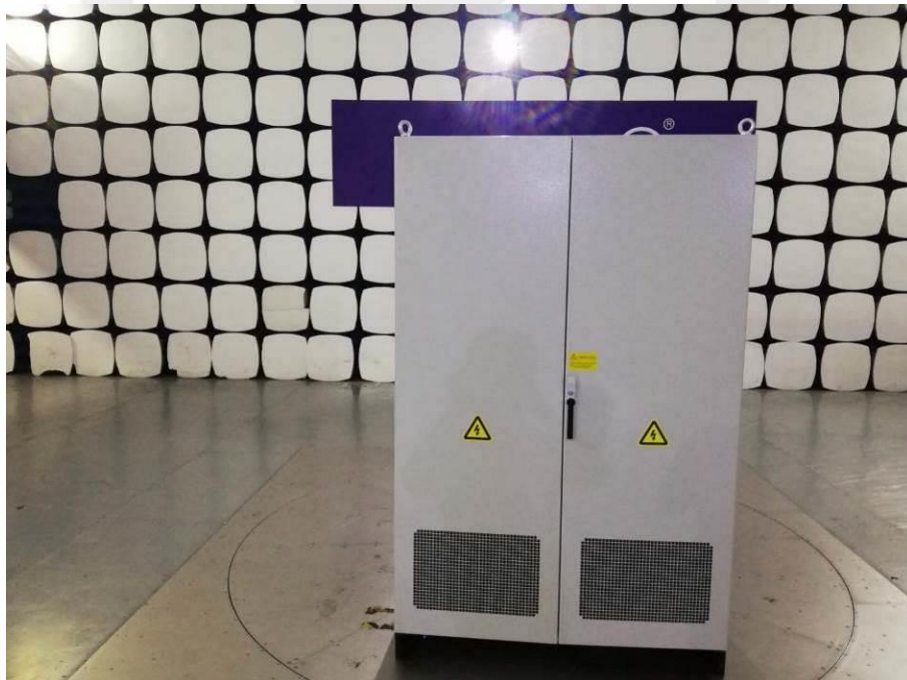
16.1.Photos of Disturbance Voltage at the AC Power Port



16.2.Photos of Disturbance Voltage at the DC Power Port



16.3.Photos of Radiation Emission Measurement



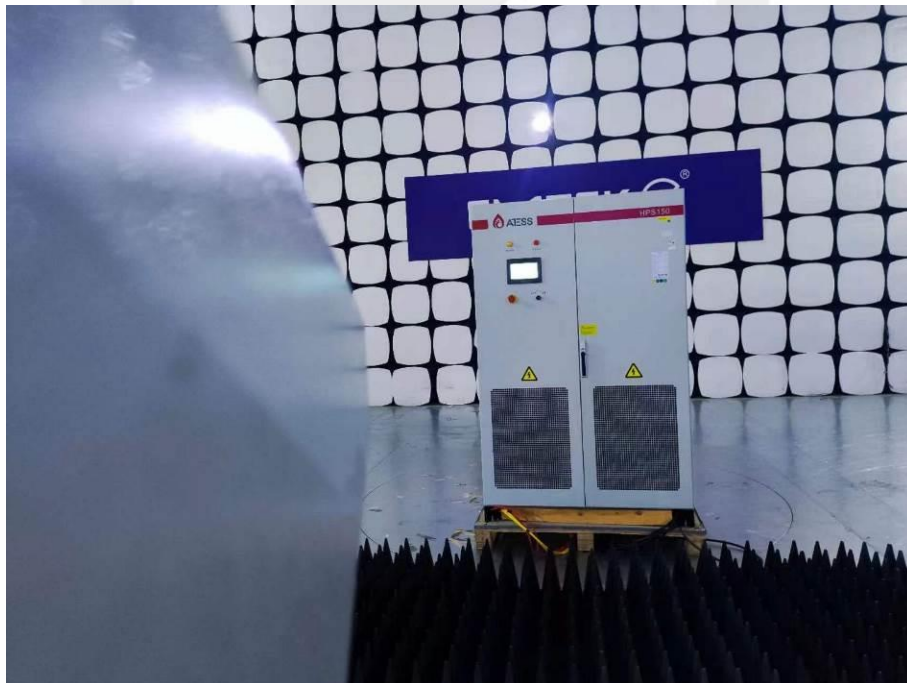
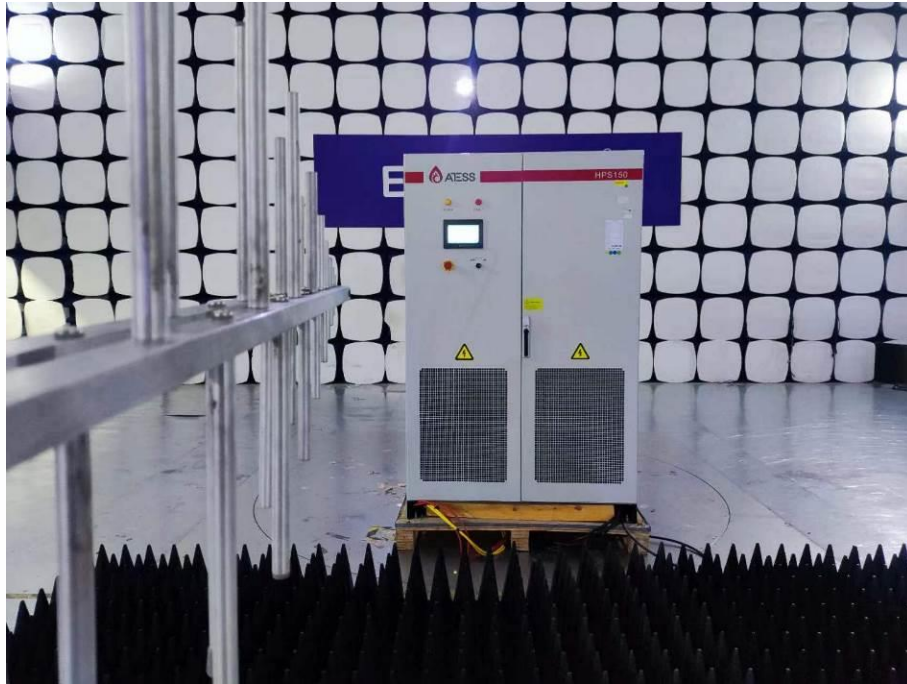
16.4. Photo of Harmonic / Flicker Measurement



16.5. Photo of Electrostatic Discharges



16.6. Photo of Continuous RF Electromagnetic Field Disturbances



16.7.Photos of Electrical Fast Transients/Burst

AC Mains:



DC Line



16.8.Photos of Surges

AC Mains:



DC Line



16.9.Photos of Continuous Induced RF Disturbances

AC Mains:



DC Line



16.10.Photo of Voltage Dips and Interruptions



APPENDIX (PHOTOS OF EUT)



End of Report

Statement

- 1 . This report is invalid without the signature of the authorized approver and "special seal for testing".
- 2 . This report shall not be copied partly without authorization.
- 3 . The test results or observations are applicable only to tested sample. Client shall be responsible for representativeness of the sample and authenticity of the material.
- 4 . The observations or tests with special mark fall outside the scope of accreditation, and are only used for purpose of commission, research, training, internal quality control etc.
- 5 . The test results or observations are provided in accordance with measured value, without taking risks caused by uncertainty into account. Without explicit stipulation in special agreements, standards or regulations, EMTEK shall not assume any responsibility.
- 6 . Objections shall be raised within 20 days from the date receiving the report.