



中国认可  
国际互认  
检测  
TESTING  
CNAS L2291



Access to the World

# TEST REPORT

**Product Name** : Solar Hybrid Inverter  
**Model Number** : HES4865S100-H, HES4860S100-H, HES4855S100-H,  
HES4850S100-H, HES4840S100-H, HES4830S100-H,  
HES4850U100-H, HES4840U100-H, HES4835U100-H,  
HESP4865S100-H, HESP4860S100-H,  
HESP4855S100-H, HESP4850S100-H,  
HESP4850U100-H, HESP4840U100-H,  
HESP4835U100-H

**Prepared for** : SRNE Solar Co.,Ltd  
**Address** : 4-5F, Building13A, Taihua Wutong Industrial Park, Gushu  
Development Zone, Hangcheng Street, Baoan, Shenzhen,  
China PR

**Prepared by** : EMTEK (SHENZHEN) CO., LTD.  
**Address** : Building 69, Majialong Industry Zone, Nanshan District,  
Shenzhen, Guangdong, China

Tel: (0755) 26954280  
Fax: (0755) 26954282

**Report Number** : ENS2207050119E00201R  
**Date(s) of Tests** : July 06, 2022 to August 26, 2022  
**Date of issue** : August 26, 2022



## TABLE OF CONTENT

Test Report Description	Page
<b>1. SUMMARY OF TEST RESULTS .....</b>	<b>7</b>
<b>2. GENERAL INFORMATION.....</b>	<b>9</b>
2.1. Description of Device (EUT) .....	9
2.2. Independent Operation Modes .....	9
2.3. Test Manner .....	10
2.4. Description of Test Facility .....	10
2.5. Description of Support Device .....	10
2.6. Measurement Uncertainty.....	11
<b>3. MEASURING DEVICE AND TEST EQUIPMENT.....</b>	<b>12</b>
3.1. For Power Line Conducted Emission Measurement .....	12
3.2. For Radiated Emission Measurement .....	12
3.3. For Harmonic Current / Flicker Measurement .....	12
3.4. For Electrostatic Discharge Immunity Test .....	12
3.5. For RF Strength Susceptibility Test .....	13
3.6. For Electrical Fast Transient / Burst Immunity Test .....	13
3.7. For Surge Immunity Test.....	13
3.8. For Injected Current Susceptibility Test .....	14
3.9. For Magnetic Field Immunity Test.....	14
3.10. For Voltage Dips and Interruptions Test .....	14
<b>4. POWER LINE CONDUCTED EMISSION MEASUREMENT.....</b>	<b>15</b>
4.1. Block Diagram of Test Setup .....	15
4.2. Measuring Standard.....	15
4.3. Power Line Conducted Emission Limits .....	15
4.4. EUT Configuration of Measurement .....	16
4.5. Test Procedure.....	16
4.6. Measuring Results .....	16
<b>5. RADIATED EMISSION MEASUREMENT .....</b>	<b>19</b>
5.1. Block Diagram of Test Setup .....	19
5.2. Measuring Standard.....	19
5.3. Radiated Emission Limits .....	19
5.4. EUT Configuration of Measurement .....	19
5.5. Test Procedure.....	20
5.6. Measuring Results .....	20
<b>6. HARMONIC CURRENT EMISSION MEASUREMENT .....</b>	<b>25</b>
6.1. Block Diagram of Test Setup .....	25
6.2. Standard Limits .....	25
6.3. Operation Condition of EUT .....	26
6.4. Measuring Results .....	26
<b>7. VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT .....</b>	<b>30</b>
7.1. Block Diagram of Test Setup .....	30
7.2. Standard Limits .....	30
7.3. Test Procedure.....	30
7.4. Operation Condition of EUT .....	30
7.5. Measuring Results .....	30

<b>8. IMMUNITY PERFORMANCE CRITERIA DESCRIPTION .....</b>	<b>32</b>
<b>9. ELECTROSTATIC DISCHARGE IMMUNITY TEST .....</b>	<b>33</b>
9.1. Block Diagram of Test Setup .....	33
9.2. Test Standard .....	33
9.3. Severity Levels and Performance Criterion .....	33
9.4. Operating Condition of EUT .....	33
9.5. Test Procedure .....	34
9.6. Test Results .....	34
<b>10. RF FIELD STRENGTH SUSCEPTIBILITY TEST .....</b>	<b>36</b>
10.1. Block Diagram of Test Setup .....	36
10.2. Test Standard .....	36
10.3. Severity Levels and Performance Criterion .....	36
10.4. Operating Condition of EUT .....	36
10.5. Test Procedure .....	37
10.6. Test Results .....	37
<b>11. ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST .....</b>	<b>39</b>
11.1. Block Diagram of Test Setup .....	39
11.2. Test Standard .....	39
11.3. Severity Levels and Performance Criterion .....	40
11.4. Operating Condition of EUT .....	40
11.5. Test Procedure .....	40
11.6. Test Results .....	40
<b>12. SURGE IMMUNITY TEST .....</b>	<b>42</b>
12.1. Block Diagram of Test Setup .....	42
12.2. Test Standard .....	42
12.3. Severity Levels and Performance Criterion .....	42
12.4. Operating Condition of EUT .....	42
12.5. Test Procedure .....	42
12.6. Test Results .....	43
<b>13. INJECTED CURRENTS SUSCEPTIBILITY TEST .....</b>	<b>45</b>
13.1. Block Diagram of Test Setup .....	45
13.2. Test Standard .....	45
13.3. Severity Levels and Performance Criterion .....	45
13.4. Operating Condition of EUT .....	45
13.5. Test Procedure .....	46
13.6. Test Results .....	46
<b>14. MAGNETIC FIELD SUSCEPTIBILITY TEST .....</b>	<b>48</b>
14.1. Block Diagram of Test Setup .....	48
14.2. Test Standard .....	48
14.3. Severity Levels and Performance Criterion .....	48
14.4. Operating Condition of EUT .....	49
14.5. Test Procedure .....	49
14.6. Test Results .....	49
<b>15. VOLTAGE DIPS AND INTERRUPTIONS TEST .....</b>	<b>51</b>
15.1. Block Diagram of Test Setup .....	51
15.2. Test Standard .....	51
15.3. Severity Levels and Performance Criterion .....	51
15.4. Operating Condition of EUT .....	51
15.5. Test Procedure .....	51
15.6. Test Results .....	52
<b>16. PHOTOGRAPHS .....</b>	<b>54</b>

16.1. Photos of Conducted Emission Measurement .....	54
16.2. Photos of Radiation Emission Measurement .....	55
16.3. Photo of Harmonic / Flicker Measurement .....	56
16.4. Photo of Electrostatic Discharge Test.....	56
16.5. Photo of RF Field Strength Susceptibility Test .....	57
16.6. Photo of Electrical Fast Transient / Burst Test.....	58
16.7. Photo of Surge Test .....	58
16.8. Photo of Injected Currents Susceptibility Test .....	59
16.9. Photo of Magnetic Field Immunity Test.....	59
16.10. Photo of Voltage Dips and Interruption Immunity Test.....	60

APPENDIX (Photos of EUT) (2 Pages)



## TEST REPORT DESCRIPTION

Applicant : SRNE Solar Co.,Ltd  
 Manufacturer : SRNE SOLAR CO.,LTD Dongguan Branch  
 Trade Mark : SRNE  
 EUT : Solar Hybrid Inverter  
 Model No. : HES4865S100-H, HES4860S100-H, HES4855S100-H, HES4850S100-H,  
 HES4840S100-H, HES4830S100-H, HES4850U100-H, HES4840U100-H,  
 HES4835U100-H, HESP4865S100-H, HESP4860S100-H, HESP4855S100-H,  
 HESP4850S100-H, HESP4850U100-H, HESP4840U100-H, HESP4835U100-H  
 Rating : AC Input: AC 170~280V, 50/60Hz  
 Battery Input: DC 40~60V  
 AC Output: AC 230V±5%, 5500W  
 PV Charge: DC 120~500V

### Measurement Procedure Used:

EN IEC 61000-6-3:2021  
 EN 61000-3-12: 2011  
 EN IEC 61000-3-11: 2019  
 EN IEC 61000-6-1:2019  
 (IEC 61000-4-2:2008, IEC 61000-4-3:2006+A1:2007+A2:2010, IEC61000-4-4:2012,  
 IEC 61000-4-5:2014, IEC 61000-4-6:2013, IEC 61000-4-8:2009, IEC 61000-4-11:2004)

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. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the EN 61000-6-3, EN 61000-3-12, EN IEC 61000-3-11 and EN 61000-6-1 requirements.

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 : July 06, 2022 to August 26, 2022

Prepared by : Kangtao Zhang  
 Kangtao Zhang/Editor

Reviewer : Kaimin Guo  
 Kaimin Guo/Supervisor

Approved & Authorized Signer : Lisa Wang  
 Lisa Wang/Manager

## Modified Information

Version	Report No.	Revision Date	Summary
Ver.1.0	ENS2207050119E00201R	/	Original Report



## 1. SUMMARY OF TEST RESULTS

EMISSION				
Description of Test Item		Standard	Limits	Results
Conducted Disturbance at Mains Terminals	AC Mains port	EN IEC 61000-6-3:2021	Table 4	Pass
	DC Power port <input checked="" type="checkbox"/> V-AN <input type="checkbox"/> $\Delta$ -AN		Table 5	N/A
Discontinuous disturbance at mains terminals		Cited from CISPR 14-1	CISPR 14-1	N/A
Telecommunication/network port		Cited from CISPR 32	Table 6	N/A
Radiated emissions at frequencies up to 1 GHz		EN IEC 61000-6-3:2021	--	Pass
Radiated emissions at frequencies above 1 GHz		EN IEC 61000-6-3:2021		N/A
Harmonic Current Emissions		EN 61000-3-12: 2011	Table 2	Pass
Voltage Fluctuation and Flicker		EN IEC 61000-3-11: 2019	--	Pass
DC power port terminal disturbance for class b GCPC-Proportion relation approach		Cited from CISPR 11	Table C.1	N/A
DC power port terminal disturbance for class b GCPC-Current-to-voltage Conversion approach		Cited from CISPR 32	Table C.2	N/A

<b>IMMUNITY (EN IEC 61000-6-1:2019)</b>			
Description of Test Item	Basic Standard	Performance Criteria	Results
Electrostatic Discharge (ESD)	IEC 61000-4-2:2008	B	Pass
Radio-Frequency, Continuous Radiated Disturbance	IEC 61000-4-3:2006+A1:2007+A2:2010	A	Pass
EFT/B Immunity	Signal/control ports	IEC61000-4-4:2012	N/A
	DC power ports		N/A
	AC power ports		Pass
Surge Immunity	Signal/control ports	IEC 61000-4-5:2014	N/A
	DC power ports		N/A
	AC power ports		Pass
Conducted RF Immunity	Signal/control ports	IEC 61000-4-6:2013	N/A
	DC power ports		N/A
	AC power ports		Pass
Power Frequency Magnetic Field	IEC 61000-4-8:2009	A	Pass
Voltage Dips, >95% Reduction	IEC 61000-4-11:2004	B	Pass
Voltage Dips, 30% Reduction		C	Pass
Voltage Interruptions		C	Pass
Note: N/A means not applicable.			



## 2. GENERAL INFORMATION

### 2.1. Description of Device (EUT)

EUT	:	Solar Hybrid Inverter
Model Number	:	HES4865S100-H, HES4860S100-H, HES4855S100-H, HES4850S100-H, HES4840S100-H, HES4830S100-H, HES4850U100-H, HES4840U100-H, HES4835U100-H, HESP4865S100-H, HESP4860S100-H, HESP4855S100-H, HESP4850S100-H, HESP4850U100-H, HESP4840U100-H, HESP4835U100-H (Note: These models are identical in circuitry and electrical, mechanical, and physical structure; The only differences are trade name, model number, rated voltage and power. The purpose of the transaction. We prepare the test for HES4855S100-H.)
Sample number	:	1#
Applicant	:	SRNE Solar Co.,Ltd
Address	:	4-5F, Building13A, Taihua Wutong Industrial Park, Gushu Development Zone, Hangcheng Street, Baoan, Shenzhen, China PR
Manufacturer	:	SRNE SOLAR CO.,LTD Dongguan Branch
Address	:	Room 301, Building 5th, Fuxing Rd No.36, Chang'an Town, Dongguan City, Guangdong Province, China PR
Factory	:	SRNE SOLAR CO.,LTD Dongguan Branch
Address	:	Room 301, Building 5th, Fuxing Rd No.36, Chang'an Town, Dongguan City, Guangdong Province, China PR
Date of Received	:	July 06, 2022
Date of Test	:	July 06, 2022 to August 26, 2022

### 2.2. Independent Operation Modes

- A. On
  - 1. Charging (AC in)
  - 2. PV in
  - 3. Discharging

### 2.3. Test Manner

Test Items	Test Voltage	Operation Modes	Worst case
Conducted Disturbance at Mains Terminals	AC 230V/50Hz	Mode A.1	Mode A.1
Radiated emissions at frequencies up to 1 GHz	AC 230V/50Hz DC 400V DC 48V	Mode A	Mode A.3 (DC 48V)
Harmonic Current Emissions	AC 230V/50Hz	Mode A.1	\
Voltage Fluctuation and Flicker	AC 230V/50Hz	Mode A.1	\
Electrostatic Discharge	AC 230V/50Hz DC 400V DC 48V	Mode A	\
Continuous RF electromagnetic field disturbances	AC 230V/50Hz DC 400V DC 48V	Mode A	\
Electrical fast transients/burst	AC 230V/50Hz	Mode A.1	\
Surges	AC 230V/50Hz	Mode A.1	\
Continuous induced RF disturbances	AC 230V/50Hz	Mode A.1	\
Power frequency magnetic field	AC 230V/50Hz DC 400V DC 48V	Mode A	\
Voltage dips and interruptions	AC 230V/50Hz	Mode A.1	\

### 2.4. 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

### 2.5. Description of Support Device

N/A

## 2.6. Measurement Uncertainty

Test Item	Uncertainty
Conducted Emission Uncertainty	: 3.16dB (9k~150kHz Conduction 2#) 2.90dB (150k-30MHz Conduction 2#)
Radiated Emission Uncertainty (3m 3# Chamber)	: 4.40dB (30M~1GHz Polarize: H) 5.04dB (30M~1GHz Polarize: V)
Uncertainty for Flicker test	: 0.07%
Uncertainty for Harmonic test	: 1.8%
Uncertainty for C/S Test	: 1.45dB(Using CDN Test)
Uncertainty for R/S Test	: 2.10dB(80MHz-200MHz) 1.76dB(200MHz-1000MHz)
Uncertainty for test site temperature and humidity	: 0.6°C 4%

### 3. MEASURING DEVICE AND TEST EQUIPMENT

#### 3.1. For Power Line Conducted Emission Measurement

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	EMI Test Receiver	Rohde & Schwarz	ESCI	101045	May 14, 2022	1 Year
<input checked="" type="checkbox"/>	PULSE LIMTER	Rohde & Schwarz	ESH3-Z2	100107	May 14, 2022	1 Year
<input checked="" type="checkbox"/>	AMN	Schwarzbeck	NNLK 8129	8129203	May 15, 2022	1 Year

#### 3.2. For Radiated Emission Measurement

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	EMI Test Receiver	Rohde & Schwarz	ESU 26	100154	May 14, 2022	1 Year
<input checked="" type="checkbox"/>	Pre-Amplifie	Lunar EM	LNA30M3G-25	J10100000070	May 14, 2022	1 Year
<input checked="" type="checkbox"/>	Bilog Antenna	Schwarzbeck	VULB9163	659	Aug. 22, 2021	2 Year

#### 3.3. 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 1007-45/45KVA	1305A02873	May 15, 2022	1 Year
<input checked="" type="checkbox"/>	Signal conditioning Unit	Teseq	CCN 1000-3	1305A02873	May 15, 2022	1 Year
<input checked="" type="checkbox"/>	Impedance network	Teseq	INA2197/37A	1305A02873	May 15, 2022	1 Year
<input checked="" type="checkbox"/>	Impedance network	Teseq	INA 2196/75A	1305A02874	May 15, 2022	1 Year
<input type="checkbox"/>	Proflin 2100 AC Switching Unit	Teseq	NSG 2200-3	A22714	May 15, 2022	1 Year

#### 3.4. For Electrostatic Discharge Immunity Test

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	ESD Tester	TESEQ AG	NSG 438A	130	June 23, 2022	1 Year

### 3.5. For RF Strength Susceptibility Test

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Power Amplifier	MILMEGA	AS0102-55	1018770	May 14, 2022	1 Year
<input checked="" type="checkbox"/>	RF Power Meter. Dual Channel	BOONTON	4232A	10539	May 14, 2022	1 Year
<input checked="" type="checkbox"/>	Log.-Per. Antenna	SCHWARZBECK	VULP 9118E	811	N/A	N/A
<input checked="" type="checkbox"/>	Signal Generator	Agilent	N5181A	MY50145187	May 14, 2022	1 Year
<input checked="" type="checkbox"/>	50ohm Diode Power Sensor	BOONTON	51011EMC	36164	May 14, 2022	1 Year
<input checked="" type="checkbox"/>	Broad-Band Horn Antenna	SCHWARZBECK	STLP 9149	9149-227	N/A	N/A
<input checked="" type="checkbox"/>	Field Strength Meter	DARE	RSS1006A	10I00037SNO22	May 23, 2022	1 Year
<input checked="" type="checkbox"/>	Multi-function interface system	DARE	CTR1009B	12I00250SNO72	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 14, 2022	1 Year
<input checked="" type="checkbox"/>	Power Amplifier	MILMEGA	80RF1000-175	1059345	May 14, 2022	1 Year
<input checked="" type="checkbox"/>	Directional Coupler	MILMEGA	DC6180AM1	0340463	May 14, 2022	1 Year
<input type="checkbox"/>	Audio Analyzer	R&S	UPV	101473	May 14, 2022	1 Year
<input type="checkbox"/>	Audio Test System	AUDIO PRECISION	ATS-1	41100	May 14, 2022	1 Year

### 3.6. For Electrical Fast Transient / Burst Immunity Test

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Burst Tester	HAEFELY	PEFT4010	080981-16	May 15, 2022	1 Year
<input type="checkbox"/>	Coupling Clamp	HAEFELY	IP-4A	147147	May 15, 2022	1 Year
<input type="checkbox"/>	Three phase CDN	Teseq	CDN 163	202	May 15, 2022	1 Year

### 3.7. For Surge Immunity Test

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Controller	HAEFELY	Psurge 8000	174031	May 15, 2022	1 Year
<input checked="" type="checkbox"/>	Impulse Module	HAEFELY	PIM 100	174124	May 15, 2022	1 Year
<input checked="" type="checkbox"/>	Coupling Decoupling	HAEFELY	PCD 130	172181	May 15, 2022	1 Year
<input type="checkbox"/>	Coupling Module	HAEFELY	PCD122	174354	May 15, 2022	1 Year
<input type="checkbox"/>	Impulse Module	HAEFELY	PIM 120	174435	May 15, 2022	1 Year
<input type="checkbox"/>	Coupling Module	HAEFELY	PCD 126A	174387	May 15, 2022	1 Year
<input type="checkbox"/>	Impulse Module	HAEFELY	PIM 110	174391	May 15, 2022	1 Year
<input type="checkbox"/>	Impulse Module	HAEFELY	PIM 150	178707	May 15, 2022	1 Year
<input type="checkbox"/>	Impulse Module	PMI	PCDN8	190422	May 15, 2022	1 Year

### 3.8. For Injected Current Susceptibility Test

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Continuous Wave Simulator	EMTEST	CWS500C	0900-12	May 15, 2022	1 Year
<input checked="" type="checkbox"/>	CDN	EMTEST	CDN-M2	510010010010	May 15, 2022	1 Year
<input type="checkbox"/>	CDN	EMTEST	CDN-M3	0900-11	May 14, 2022	1 Year
<input type="checkbox"/>	EM Injection Clamp	EMTEST	F-2031-23MM	368	May 15, 2022	1 Year
<input checked="" type="checkbox"/>	Attenuator	EMTEST	100W 6dB DC-3G	/	May 14, 2022	1 Year
<input type="checkbox"/>	Signal Generator	R&S	SMB100A	103041	May 14, 2022	1 Year
<input checked="" type="checkbox"/>	CDN	LUTHI	CDN L-801 M2/M3	2606	May 14, 2022	1 Year
<input type="checkbox"/>	Three phase CDN	TESEQ	CDN M332S	32655	May 14, 2022	1 Year
<input type="checkbox"/>	Three phase CDN	TESEQ	CDN M432S	33670	May 14, 2022	1 Year
<input type="checkbox"/>	Three phase CDN	TESEQ	CDN M432-3LNS	34048	May 14, 2022	1 Year
<input type="checkbox"/>	Three phase CDN	TESEQ	CDN M532S	33799	May 14, 2022	1 Year

### 3.9. For Magnetic Field Immunity Test

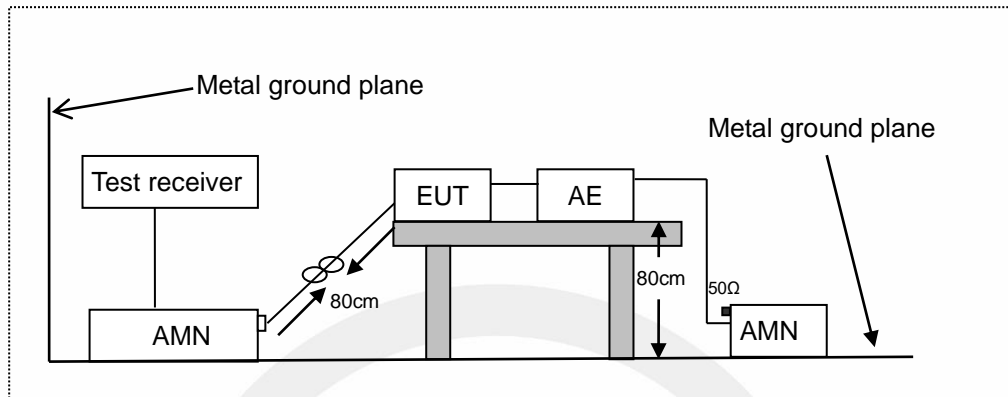
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Magnetic Field Tester	HAEFELY	MAG100	250040.1	May 15, 2022	1 Year

### 3.10. For Voltage Dips and Interruptions Test

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	45KVA AC Power source	Teseq	NSG 1007-45/45K VA	1305A02873	May 15, 2022	1 Year
<input type="checkbox"/>	Signal conditioning Unit	Teseq	CCN 1000-3	1305A02873	May 15, 2022	1 Year
<input type="checkbox"/>	Impedance network	Teseq	INA2197/37A	1305A02873	May 15, 2022	1 Year
<input type="checkbox"/>	Impedance network	Teseq	INA 2196/75A	1305A02874	May 15, 2022	1 Year
<input checked="" type="checkbox"/>	Proflin 2100 AC Switching Unit	Teseq	NSG 2200-3	A22714	May 15, 2022	1 Year

## 4. POWER LINE CONDUCTED EMISSION MEASUREMENT

### 4.1. Block Diagram of Test Setup



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

### 4.2. Measuring Standard

EN IEC 61000-6-3:2021

### 4.3. Power Line Conducted Emission Limits

AC Mains port:

Frequency (MHz)	Limit (dB $\mu$ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66.0 ~ 56.0 *	56.0 ~ 46.0 *
0.50 ~ 5.00	56.0	46.0
5.00 ~ 30.00	60.0	50.0

NOTE1-The lower limit shall apply at the transition frequencies.  
 NOTE2-The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.

DC Power port:

Frequency (MHz)	Limit (dB $\mu$ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	79.0	73.0
0.50 ~ 30.00	66.0	60.0

NOTE1-The lower limit shall apply at the transition frequencies.

Wired network port:

Frequency (MHz)	Voltage Limit dB( $\mu$ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	84.0 ~ 74.0 *	74.0 ~ 64.0 *
0.50 ~ 30.00	74.0	64.0

NOTE1-The lower limit shall apply at the transition frequencies.  
NOTE2-The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.

#### 4.4. EUT Configuration of Measurement

The following equipments are installed on Conducted Emission Measurement to meet EN 61000-6-3 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

EUT : Solar Hybrid Inverter  
Model Number : HES4855S100-H

#### 4.5. Test Procedure

The EUT is put on the plane 0.8 m high above the ground by insulating support and connected to the AC mains through Line Impedance Stability Network (L.I.S.N). This provided a 50ohm coupling impedance for the tested equipments. Both sides of AC line are investigated to find out the maximum conducted emission according to the EN61000-6-3 regulations during conducted emission measurement.

The bandwidth of the field strength meter (R&S Test Receiver) is set at 9kHz in 150kHz~30MHz and 200Hz in 9kHz~150kHz.

The frequency range from 150kHz to 30MHz is investigated.

All the scanning waveform is put in the following pages.

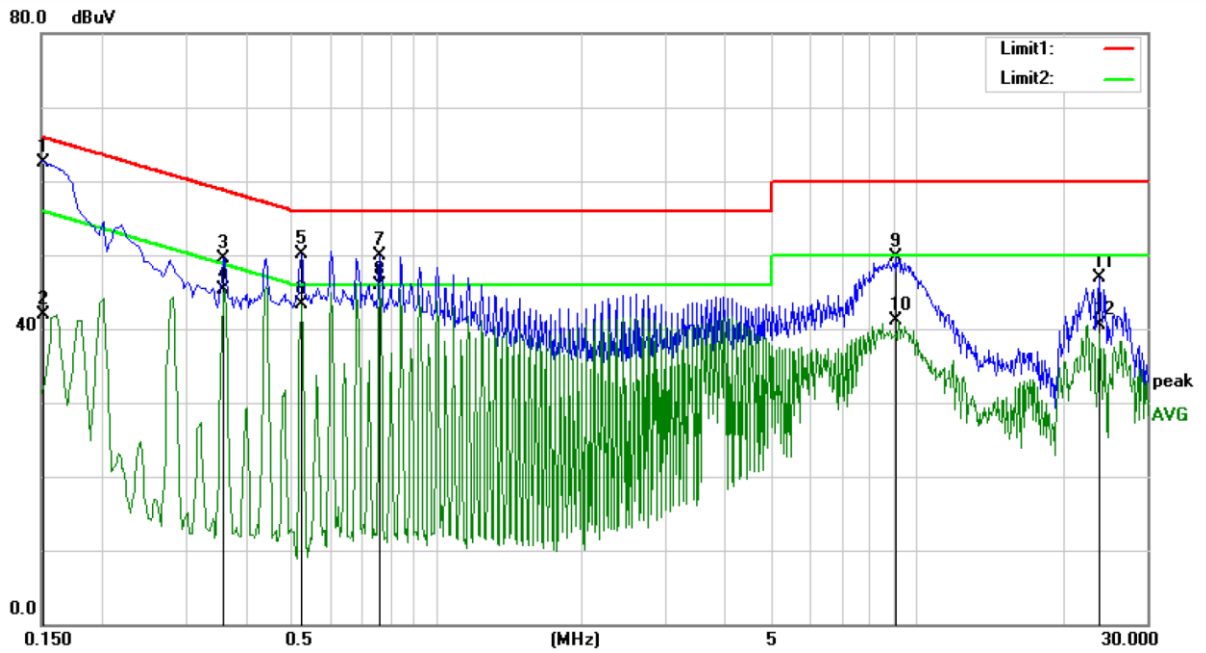
#### 4.6. Measuring Results

**PASS.**

Please see the attached page.

Temperature	:	25.1°C
Humidity	:	45%
Atmospheric Pressure	:	101kpa
Test Engineer	:	YXL
Test Date	:	2022-08-05





Site Conduction #2

Phase: **L1**

Temperature: 25.1

Limit: (CE)EN61000-6-3\_QP

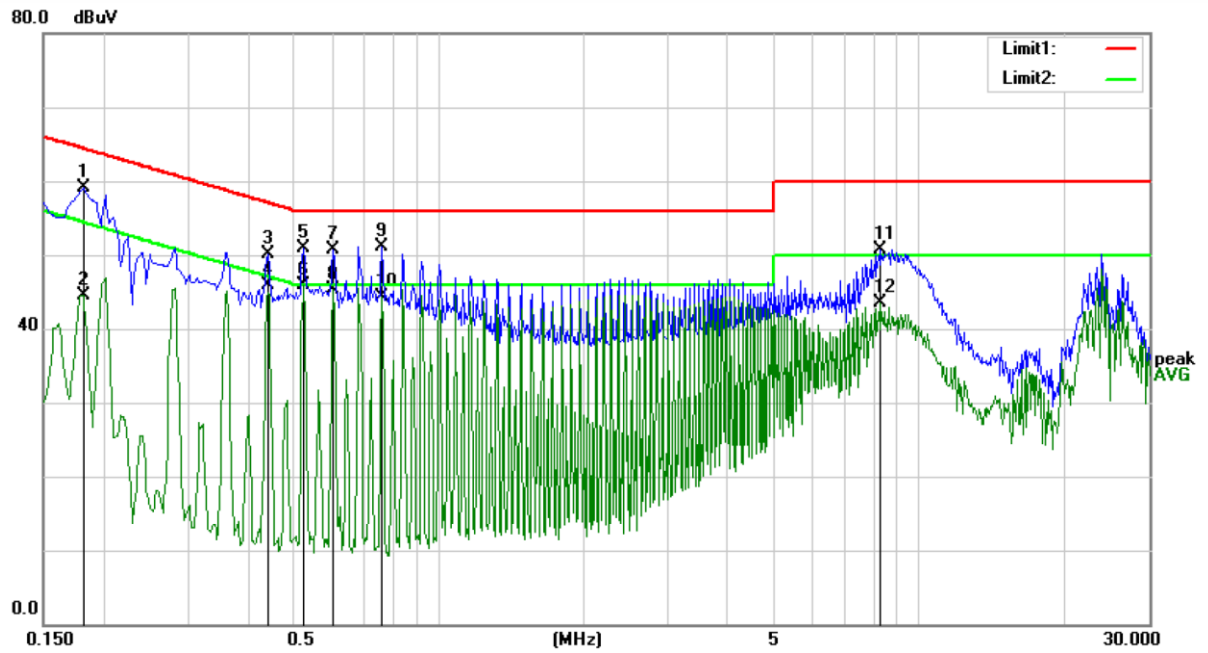
Power: AC 230V/50Hz

Humidity: 45 %

Mode: charging (AC in)

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1516	52.35	10.25	62.60	65.91	-3.31	QP	
2		0.1516	31.65	10.25	41.90	55.91	-14.01	AVG	
3		0.3580	39.39	10.21	49.60	58.77	-9.17	QP	
4		0.3580	35.13	10.21	45.34	48.77	-3.43	AVG	
5		0.5220	39.89	10.22	50.11	56.00	-5.89	QP	
6		0.5220	33.03	10.22	43.25	46.00	-2.75	AVG	
7		0.7620	39.73	10.18	49.91	56.00	-6.09	QP	
8	*	0.7620	35.64	10.18	45.82	46.00	-0.18	AVG	
9		9.0460	39.22	10.41	49.63	60.00	-10.37	QP	
10		9.0460	30.66	10.41	41.07	50.00	-8.93	AVG	
11		23.8460	36.23	10.65	46.88	60.00	-13.12	QP	
12		23.8460	29.76	10.65	40.41	50.00	-9.59	AVG	



Site Conduction #2

Phase: **N**

Temperature: 25.1

Limit: (CE)EN61000-6-3\_QP

Power: AC 230V/50Hz

Humidity: 45 %

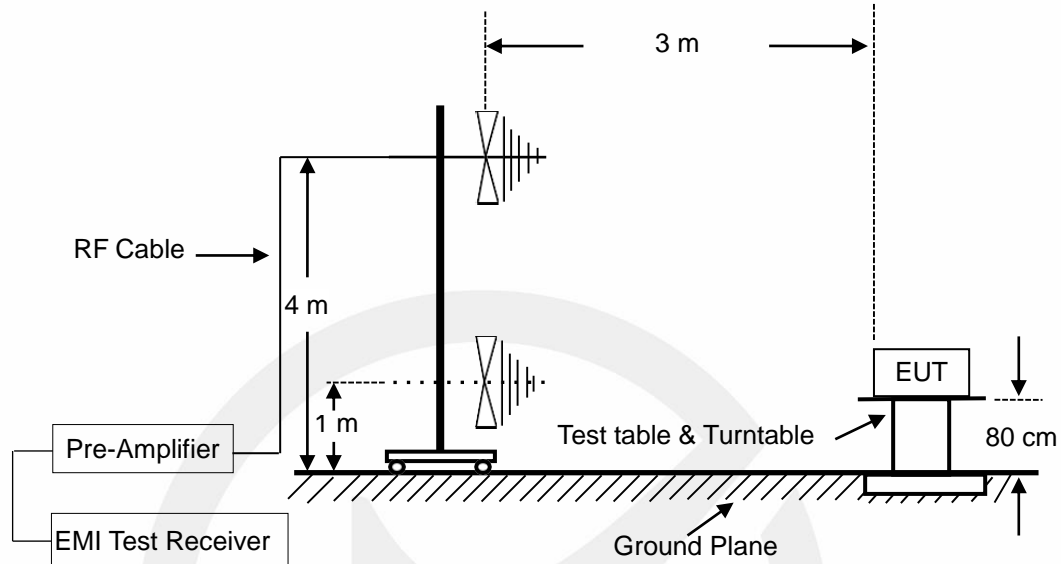
Mode: charging (AC in)

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1820	48.82	10.32	59.14	64.39	-5.25	QP	
2		0.1820	34.27	10.32	44.59	54.39	-9.80	AVG	
3		0.4420	39.83	10.24	50.07	57.02	-6.95	QP	
4		0.4420	35.65	10.24	45.89	47.02	-1.13	AVG	
5		0.5220	40.65	10.22	50.87	56.00	-5.13	QP	
6	*	0.5220	35.70	10.22	45.92	46.00	-0.08	AVG	
7		0.6020	40.48	10.20	50.68	56.00	-5.32	QP	
8		0.6020	35.10	10.20	45.30	46.00	-0.70	AVG	
9		0.7620	40.92	10.18	51.10	56.00	-4.90	QP	
10		0.7620	34.04	10.18	44.22	46.00	-1.78	AVG	
11		8.2820	40.27	10.40	50.67	60.00	-9.33	QP	
12		8.2820	33.04	10.40	43.44	50.00	-6.56	AVG	

## 5. RADIATED EMISSION MEASUREMENT

### 5.1. Block Diagram of Test Setup



### 5.2. Measuring Standard

EN IEC 61000-6-3:2021

### 5.3. Radiated Emission Limits

FREQUENCY (MHz)	DISTANCE (Meters)	FIELD STRENGTHS LIMIT (dB $\mu$ V/m)
30 ~ 230	3	40
230 ~ 1000	3	47

Note: (1) The smaller limit shall apply at the combination point between two frequency bands.  
(2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the EUT.

### 5.4. EUT Configuration of Measurement

The EN 61000-6-3 regulations test method must be used to find the maximum emission during radiated emission measurement.

EUT : Solar Hybrid Inverter  
Model Number : HES4855S100-H

## 5.5. Test Procedure

The EUT is placed on a turntable which is 0.8 meter high above the ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna that is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Bilog antenna (calibrated by Dipole Antenna) is used as a receiving antenna. Both horizontal and vertical polarization of the antenna is set on test.

The bandwidth of the Receiver (ESCI) is set at 120kHz.

All the modes were tested and the worst mode (Charging (AC in), PV in, Discharging)refer to the following pages.

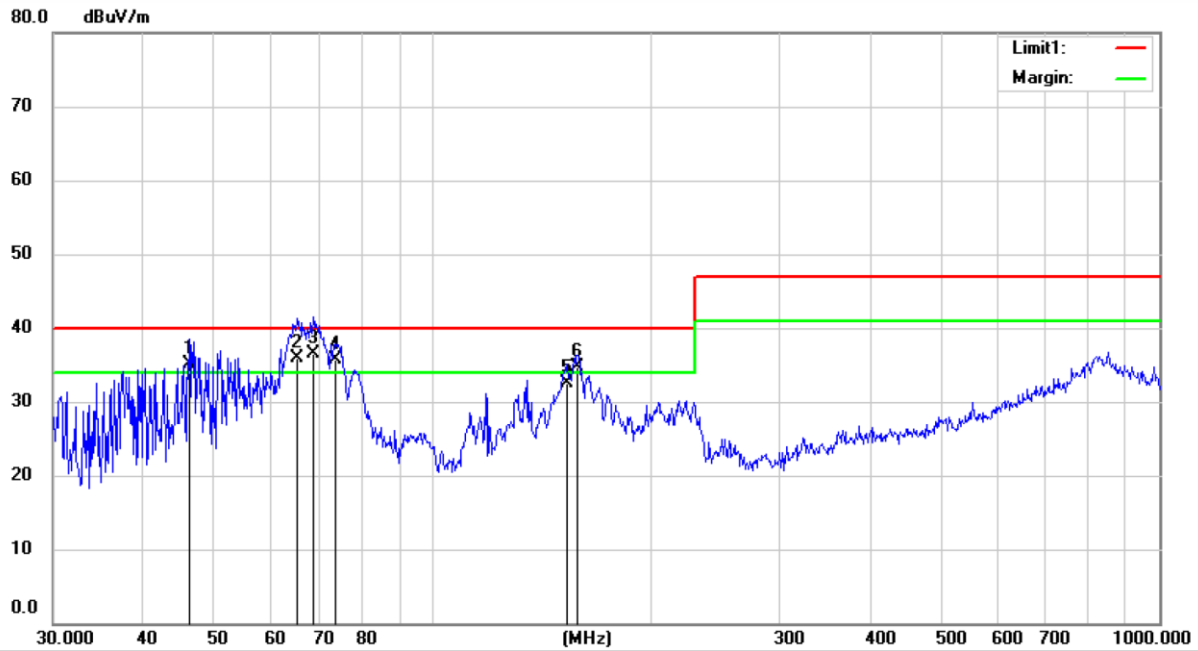
## 5.6. Measuring Results

**PASS.**

The frequency range from 30MHz to 1000MHz is investigated.

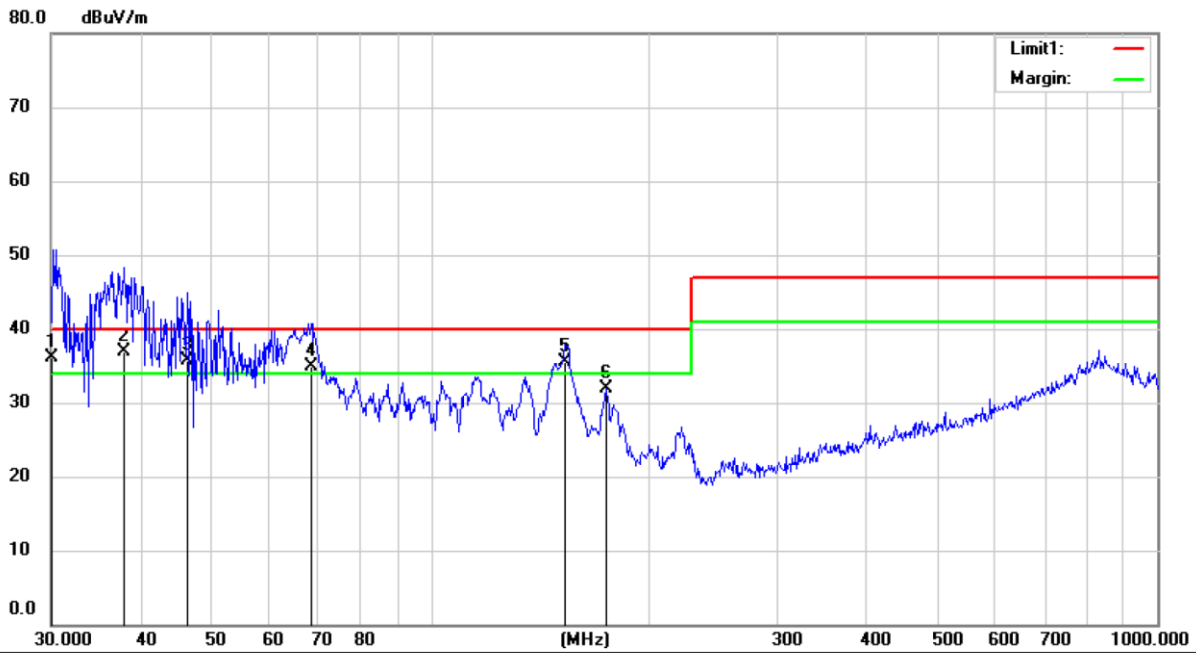
All the modes were tested and the data of the worst modes are attached the following pages.

Temperature	:	25.7°C
Humidity	:	55%
Atmospheric Pressure	:	101kpa
Test Engineer	:	YXL
Test Date	:	2022-08-05



Site 3m Chamber #3 Polarization: **Horizontal** Temperature: 25.7 C  
 Limit: (RE)EN61000-6-3 Power: DC 48V Humidity: 55 %  
 Mode: Discharging  
 Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	!	46.2753	44.33	-9.13	35.20	40.00	-4.80	QP		
2	!	65.2745	44.72	-8.82	35.90	40.00	-4.10	QP		
3	*	68.5107	46.02	-9.52	36.50	40.00	-3.50	QP		
4	!	73.4620	46.39	-10.59	35.80	40.00	-4.20	QP		
5		153.0392	43.79	-11.29	32.50	40.00	-7.50	QP		
6	!	158.1678	46.04	-11.34	34.70	40.00	-5.30	QP		



Site 3m Chamber #3

Polarization: **Vertical**

Temperature: 25.7 C

Limit: (RE)EN61000-6-3

Power: DC 48V

Humidity: 55 %

Mode: Discharging

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	!	30.1054	47.27	-11.07	36.20	40.00	-3.80	QP		
2	*	37.8918	46.82	-9.92	36.90	40.00	-3.10	QP		
3	!	46.2915	44.83	-9.13	35.70	40.00	-4.30	QP		
4	!	68.5830	44.44	-9.54	34.90	40.00	-5.10	QP		
5	!	153.2004	46.90	-11.30	35.60	40.00	-4.40	QP		
6		174.4852	43.15	-11.33	31.82	40.00	-8.18	QP		



Site 3m Chamber #3

Polarization: **Horizontal**

Temperature: 25.7 C

Limit: (RE)EN61000-6-3

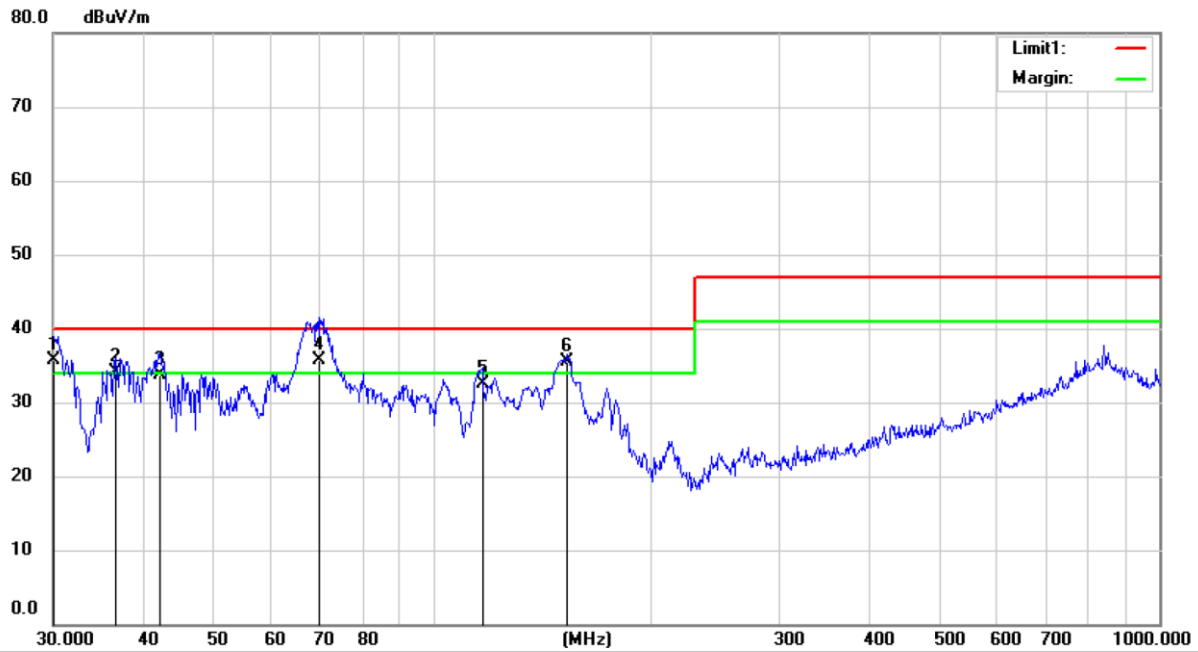
Power: AC 230V/50Hz

Humidity: 55 %

Mode: charging(AC IN)

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree degree	Comment
1		47.4252	37.19	-9.19	28.00	40.00	-12.00	QP		
2	*	66.2894	45.53	-9.03	36.50	40.00	-3.50	QP		
3	!	70.0412	45.25	-9.85	35.40	40.00	-4.60	QP		
4		152.5036	44.72	-11.27	33.45	40.00	-6.55	QP		
5		251.7094	34.22	-8.88	25.34	47.00	-21.66	QP		
6		830.1090	29.99	7.24	37.23	47.00	-9.77	QP		



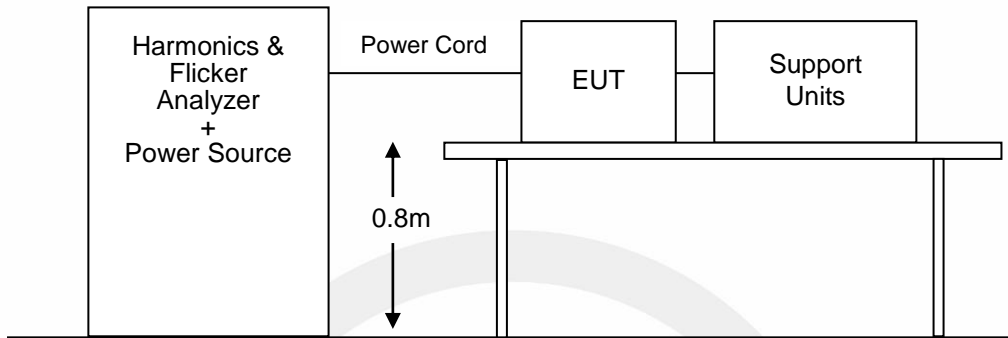
Site 3m Chamber #3 Polarization: **Vertical** Temperature: 25.7 C  
 Limit: (RE)EN61000-6-3 Power: AC 230V/50Hz Humidity: 55 %  
 Mode:charging(AC IN)  
 Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	!	30.0105	46.77	-11.07	35.70	40.00	-4.30	QP		
2	!	36.5861	44.16	-10.06	34.10	40.00	-5.90	QP		
3		42.1542	43.20	-9.50	33.70	40.00	-6.30	QP		
4	*	69.9675	45.63	-9.83	35.80	40.00	-4.20	QP		
5		116.9492	43.91	-11.41	32.50	40.00	-7.50	QP		
6	!	153.5231	46.91	-11.31	35.60	40.00	-4.40	QP		



## 6. HARMONIC CURRENT EMISSION MEASUREMENT

### 6.1. Block Diagram of Test Setup



### 6.2. 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 2 – Current emission limits for equipment other than balanced three-phase equipment**

Minimum $R_{sce}$	Admissible individual harmonic current $I_h/I_{ref}$ <sup>a</sup>						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.

<sup>a</sup>  $I_{ref}$  = reference current;  $I_h$  = harmonic current component.

### 6.3. Operation Condition of EUT

6.3.1. Setup the EUT as shown on Section 6.1.

6.3.2. Turn on the power of all equipment.

6.3.3. Let the EUT work in measuring mode (Charging (AC in)) and measure it.

### 6.4. Measuring Results

**PASS.**

Please see the attached pages.



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

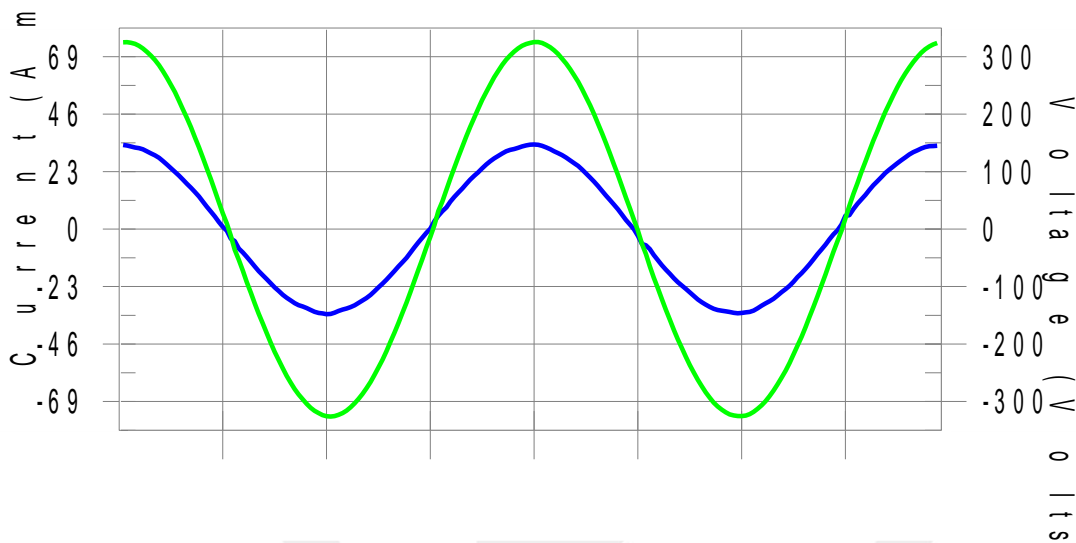
EUT: SOLAR HYBRID INVERER  
 Test category: Table:2, Rsce=33, Inter-Harm,  
 Test date: 2022/8/23  
 Test duration (min): 2.5  
 Comment: CHARGING(AC IN)  
 Customer: SRNE Solar Co.,Ltd

Tested by: LHT  
 Test Margin: 100  
 End time: 19:31:21  
 Data file name: CTSMXH\_H-000271.cts\_data

Test Result: Pass

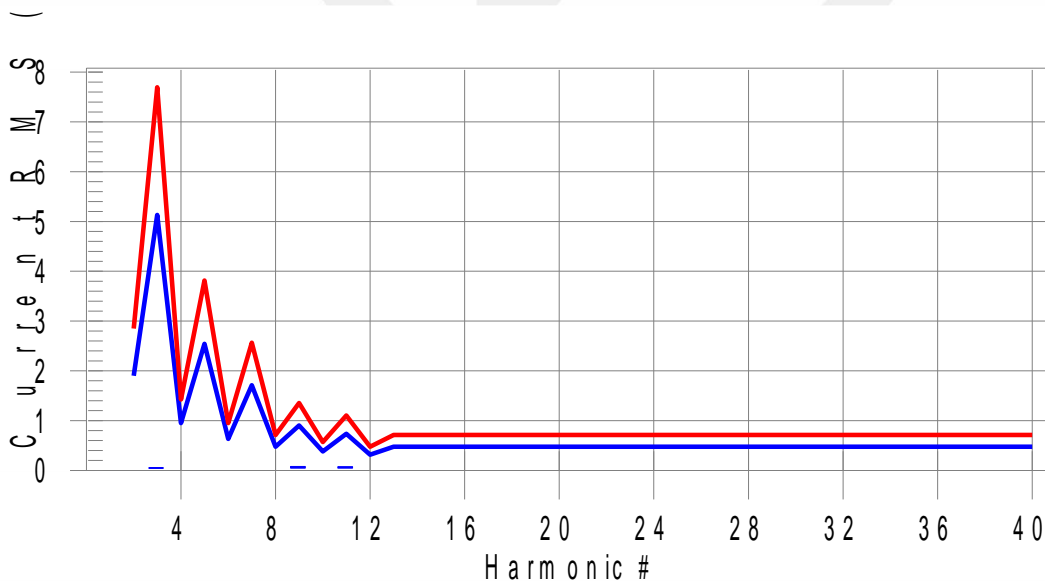
Source qualification: Normal

#### Current & voltage waveforms



#### Harmonics and Class 2 limit line

#### European Limits



**Test result: Pass Worst harmonics H11-7.6% of 150% limit, H11-10.3% of 100% limit.**

### Current Test Result Summary (Run time)

EUT: SOLAR HYBRID INVERER  
 Test category: Table:2, Rsce=33, Inter-Harm,  
 Test date: 2022/8/23 Start time: 19:28:38  
 Test duration (min): 2.5 Data file name: CTSMXH\_H-000271.cts\_data  
 Comment: CHARGING(AC IN)  
 Customer: SRNE Solar Co.,Ltd

Tested by: LHT  
 Test Margin: 100  
 End time: 19:31:21

Test Result: Pass Measured Iref: 23.754(Amps) Source: Normal  
 THC/Iref (%): 0.0 Limit (%): 23.0 PWHC/Iref (%): 0.0 PWHC Limit (%): 23.0

Highest parameter values during test:

V\_RMS (Volts): 230.28 Frequency (Hz): 50.00  
 I\_Peak (Amps): 34.501 I\_RMS (Amps): 23.923  
 I\_Fund (Amps): 23.753(avg) Crest Factor: 1.457  
 Power (Watts): 5497 Power Factor: 0.998

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.009	1.900	0.5	0.013	2.850	0.5	Pass
3	0.049	5.131	1.0	0.100	7.696	1.3	Pass
4	0.006	0.950	0.6	0.008	1.425	0.6	Pass
5	0.035	2.542	1.4	0.099	3.812	2.6	Pass
6	0.004	0.633	N/A	0.005	0.950	N/A	Pass
7	0.012	1.710	0.7	0.060	2.565	2.3	Pass
8	0.012	0.475	2.5	0.013	0.713	1.9	Pass
9	0.081	0.903	9.0	0.095	1.354	7.0	Pass
10	0.013	0.380	3.5	0.015	0.570	2.6	Pass
11	0.076	0.736	10.3	0.084	1.105	7.6	Pass
12	0.005	0.317	1.6	0.006	0.475	1.3	Pass
13	0.036	0.475	7.6	0.049	0.713	6.9	Pass
14	0.003	N/A	N/A	0.005	N/A	N/A	N/A
15	0.011	N/A	N/A	0.024	N/A	N/A	N/A
16	0.003	N/A	N/A	0.004	N/A	N/A	N/A
17	0.030	N/A	N/A	0.033	N/A	N/A	N/A
18	0.007	N/A	N/A	0.008	N/A	N/A	N/A
19	0.019	N/A	N/A	0.028	N/A	N/A	N/A
20	0.007	N/A	N/A	0.009	N/A	N/A	N/A
21	0.034	N/A	N/A	0.040	N/A	N/A	N/A
22	0.005	N/A	N/A	0.009	N/A	N/A	N/A
23	0.022	N/A	N/A	0.029	N/A	N/A	N/A
24	0.006	N/A	N/A	0.008	N/A	N/A	N/A
25	0.034	N/A	N/A	0.036	N/A	N/A	N/A
26	0.006	N/A	N/A	0.008	N/A	N/A	N/A
27	0.026	N/A	N/A	0.030	N/A	N/A	N/A
28	0.006	N/A	N/A	0.010	N/A	N/A	N/A
29	0.033	N/A	N/A	0.036	N/A	N/A	N/A
30	0.005	N/A	N/A	0.006	N/A	N/A	N/A
31	0.026	N/A	N/A	0.029	N/A	N/A	N/A
32	0.004	N/A	N/A	0.005	N/A	N/A	N/A
33	0.031	N/A	N/A	0.033	N/A	N/A	N/A
34	0.004	N/A	N/A	0.005	N/A	N/A	N/A
35	0.027	N/A	N/A	0.031	N/A	N/A	N/A
36	0.004	N/A	N/A	0.005	N/A	N/A	N/A
37	0.030	N/A	N/A	0.031	N/A	N/A	N/A
38	0.003	N/A	N/A	0.004	N/A	N/A	N/A
39	0.028	N/A	N/A	0.030	N/A	N/A	N/A
40	0.004	N/A	N/A	0.005	N/A	N/A	N/A

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

### Voltage Source Verification Data (Run time)

EUT: SOLAR HYBRID INVERER  
 Test category: Table:2, Rsce=33, Inter-Harm,  
 Test date: 2022/8/23 Start time: 19:28:38  
 Test duration (min): 2.5 Data file name: CTSMXH\_H-000271.cts\_data  
 Comment: CHARGING(AC IN)  
 Customer: SRNE Solar Co.,Ltd

Tested by: LHT  
 Test Margin: 100  
 End time: 19:31:21

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:

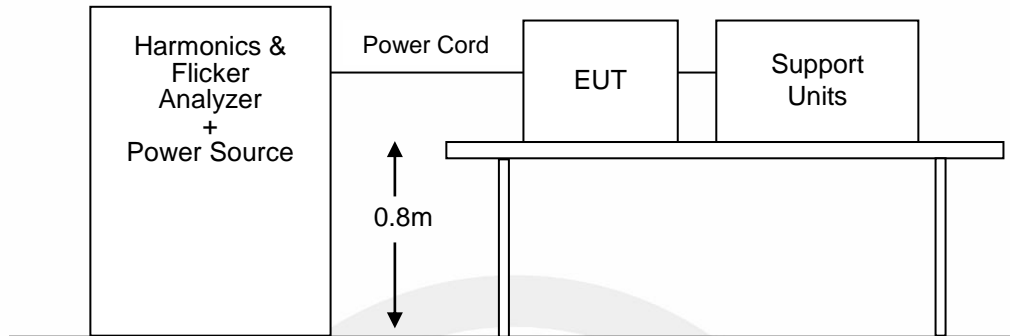
Voltage (Vrms):	230.28	Frequency (Hz):	50.00
I_Peak (Amps):	34.501	I_RMS (Amps):	23.923
I_Fund (Amps):	23.753(avg)	Crest Factor:	1.457
Power (Watts):	5497	Power Factor:	0.998

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.090	0.921	9.73	OK
3	0.179	2.878	6.24	OK
4	0.028	0.921	3.09	OK
5	0.122	3.454	3.52	OK
6	0.012	0.921	1.29	OK
7	0.153	2.878	5.32	OK
8	0.013	0.921	1.38	OK
9	0.202	1.382	14.62	OK
10	0.015	0.921	1.62	OK
11	0.150	1.612	9.29	OK
12	0.015	0.691	2.24	OK
13	0.161	1.382	11.62	OK
14	0.011	0.691	1.64	OK
15	0.146	0.691	21.21	OK
16	0.010	0.691	1.39	OK
17	0.141	0.691	20.40	OK
18	0.011	0.691	1.58	OK
19	0.126	0.691	18.23	OK
20	0.018	0.691	2.66	OK
21	0.130	0.691	18.77	OK
22	0.011	0.691	1.58	OK
23	0.120	0.691	17.34	OK
24	0.008	0.691	1.22	OK
25	0.118	0.691	17.08	OK
26	0.013	0.691	1.91	OK
27	0.106	0.691	15.31	OK
28	0.011	0.691	1.62	OK
29	0.102	0.691	14.76	OK
30	0.010	0.691	1.40	OK
31	0.086	0.691	12.45	OK
32	0.012	0.691	1.75	OK
33	0.091	0.691	13.17	OK
34	0.010	0.691	1.50	OK
35	0.081	0.691	11.71	OK
36	0.009	0.691	1.33	OK
37	0.077	0.691	11.16	OK
38	0.010	0.691	1.50	OK
39	0.071	0.691	10.23	OK
40	0.018	0.691	2.54	OK

Minimum Rsce required: Rsce = 3.404  
 Phase A = 10.3% of tested Rsce = 33.000, Rsce = 3.404

## 7. VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT

### 7.1. Block Diagram of Test Setup



### 7.2. Standard Limits

#### EN 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,  $dc$ , shall not exceed 3,3 %;
- the maximum relative voltage change  $d_{max}$ , shall not exceed:

### 7.3. 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.

### 7.4. Operation Condition of EUT

- 7.4.1. Setup the EUT as shown on Section 7.1.
- 7.4.2. Turn on the power of all equipment.
- 7.4.3. Let the EUT work in measuring mode (Charging (AC in)) and measure it.

### 7.5. Measuring Results

**PASS.**

Please see the attached page.

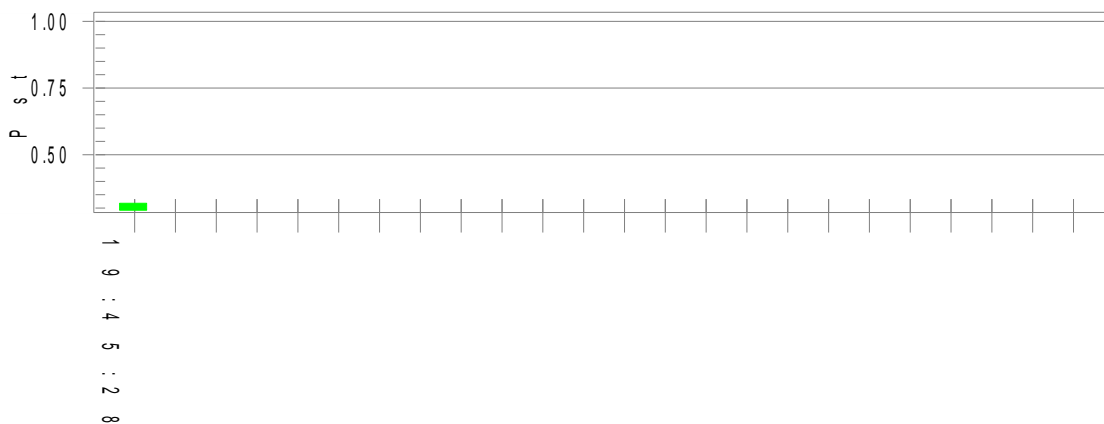
### Flicker Test Summary Per EN/IEC61000-3-11, Ed. 2.0(2017)(Run time)

EUT: SOLAR HYBRID INVERER  
 Test category: All parameters  
 Test date: 2022/8/23  
 Test duration (min): 10  
 Comment: CHARGING(AC IN)  
 Customer: SRNE Solar Co.,Ltd  
 Z-test = (0.400 + j 0.250 Ohm)

Tested by: LHT  
 Test Margin: 100  
 Start time: 19:35:07  
 End time: 19:45:34  
 Data file name: CTSMXH\_F-000272.cts\_data

Test Result: Pass  
 Status: Test Completed

#### Pst<sub>i</sub> and limit line



#### Parameter values recorded during the test:

Vrms at the end of test (Volt): 230.31

T-max (mS):	0.0	Test limit (mS):	500.0	Pass
Highest dc (%):	0.00	Test limit (%):	3.30	Pass
Highest dmax (%):	0.11	Test limit (%):	4.00	Pass
Highest Pst (10 min. period):	0.318	Test limit:	1.000	Pass
Highest Plt (2 hr. period):	0.139	Test limit:	0.650	Pass

Calculated dmax(%): 0.000  
 Calculated dc(%): 0.000  
 Calculated Pst : 0.318  
 Calculated Plt : 0.139

#### The maximum permissible system impedance Z<sub>sys</sub>:

Z = 2.231 Ohm + j 1.394 Ohm (2.231 Ohm + 4439 ?H)

## 8. IMMUNITY PERFORMANCE CRITERIA DESCRIPTION

### Performance Level

The test results shall be classified in terms of the loss of function or degradation of performance of the equipment under test, relative to a performance level by its manufacturer or the requestor of the test, or the agreed between the manufacturer and the purchaser of the product.

Definition related to the performance level:

1. Based on the used product standard
2. Based on the declaration of the manufacturer, requestor or purchaser

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 intended. The performance level may be replaced by a permissible loss of performance. 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.

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 operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

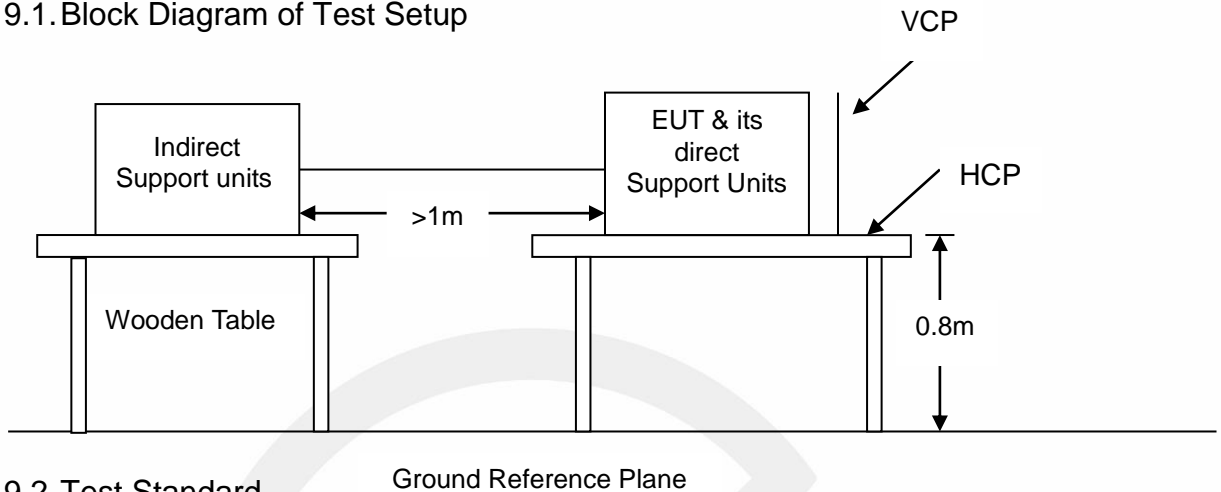
Criterion C:

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



## 9. ELECTROSTATIC DISCHARGE IMMUNITY TEST

### 9.1. Block Diagram of Test Setup



### 9.2. Test Standard

EN IEC 61000-6-1:2019  
 (IEC 61000-4-2:2008 Severity Level: 3 / Air Discharge:  $\pm 8\text{kV}$   
 Level: 2 / Contact Discharge:  $\pm 4\text{kV}$ )

### 9.3. Severity Levels and Performance Criterion

#### 9.3.1. Severity level

Level	Test Voltage Contact Discharge (kV)	Test Voltage Air Discharge (kV)
1	$\pm 2$	$\pm 2$
2	$\pm 4$	$\pm 4$
3	$\pm 6$	$\pm 8$
4	$\pm 8$	$\pm 15$
X	Special	Special

#### 9.3.2. Performance criterion: B

### 9.4. Operating Condition of EUT

9.4.1. Setup the EUT as shown on Section 9.1.

9.4.2. Turn on the power of all equipment.

9.4.3. Let the EUT work in test mode (Charging (AC in), PV in, Discharging) and test it.

## 9.5. Test Procedure

### 9.5.1. Air Discharge:

This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

### 9.5.2. Contact Discharge:

All procedure shall be the same as Section 9.5.1. except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

### 9.5.3. Indirect discharge for horizontal coupling plane

At least 10 single discharges (in the most sensitive polarity) shall be applied at the front edge of each HCP opposite the center point of each unit (if applicable) of the EUT and 0.1m from the front of the EUT. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge.

### 9.5.4. Indirect discharge for vertical coupling plane

At least 10 singles discharge (in the most sensitive polarity) shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m×0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

## 9.6. Test Results

**PASS.**

Please refer to the following page.

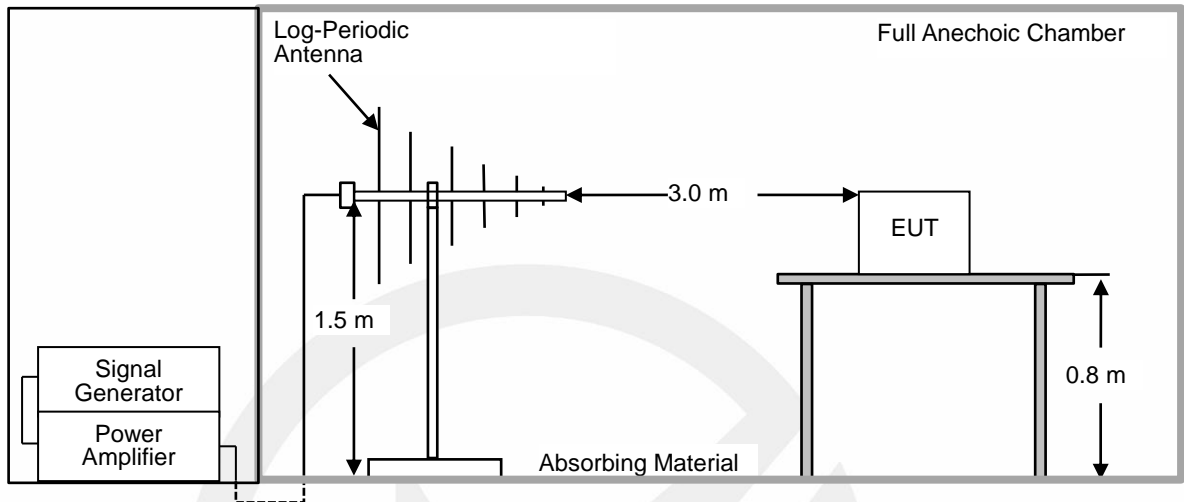
## Electrostatic Discharge Test Result

EMTEK (SHENZHEN) CO., LTD.

Applicant : SRNE Solar Co.,Ltd		
EUT : Solar Hybrid Inverter	Test Date : 2022-08-24	
M/N : HES4855S100-H	Temperature : 21.2°C	
Power Supply : AC 230V/50Hz, DC 400V, DC 48V	Humidity : 49%	
Air discharge : ± 8.0kV	Atmospheric Pressure : 101kpa	
Contact discharge : ± 4.0kV	Criterion : B	
Test mode : Charging (AC in), PV in, Discharging		
<b>Location</b>	<b>Kind</b> A-Air Discharge C-Contact Discharge	<b>Result</b>
Metal/ Screw	C	A
Slot /Button /Screen	A	A
HCP	C	A
VCP of front	C	A
VCP of rear	C	A
VCP of left	C	A
VCP of right	C	A
<b>Note:</b>		

## 10. RF FIELD STRENGTH SUSCEPTIBILITY TEST

### 10.1. Block Diagram of Test Setup



### 10.2. Test Standard

EN IEC 61000-6-1:2019  
(IEC 61000-4-3:2006+A1:2007+A2:2010, Severity Level 2: 3V/m)

### 10.3. Severity Levels and Performance Criterion

#### 10.3.1. Severity Levels

Level	Field Strength V/m
1.	1
2.	3
3.	10
X	Special

#### 10.3.2. Performance Criterion: A

### 10.4. Operating Condition of EUT

- 10.4.1. Setup the EUT as shown on Section 10.1.
- 10.4.2. Turn on the power of all equipment.
- 10.4.3. Let the EUT work in test mode (Charging (AC in), PV in, Discharging) and test it.

### 10.5. Test Procedure

The EUT is placed on a table that is 0.8 meter high above the ground. The EUT is set 3 meters away from the transmitting antenna that is mounted on an antenna tower. Both horizontal and vertical polarization of the antenna is set on test. Each of the four sides of the EUT must be faced this transmitting antenna and measured individually.

In order to judge the EUT performance, a CCD camera is used to monitor it. All the scanning conditions are as following:

Condition of Test	Remark
1. Fielded Strength	3V/m (Severity Level 2)
2. Radiated Signal	Modulated
3. Scanning Frequency	80-6000MHz
4. Sweep time of radiated	0.0015 Decade/s
5. Dwell Time	1 Sec.

### 10.6. Test Results

**PASS.**

Please refer to the following pages.

## RF Field Strength Susceptibility Test Results

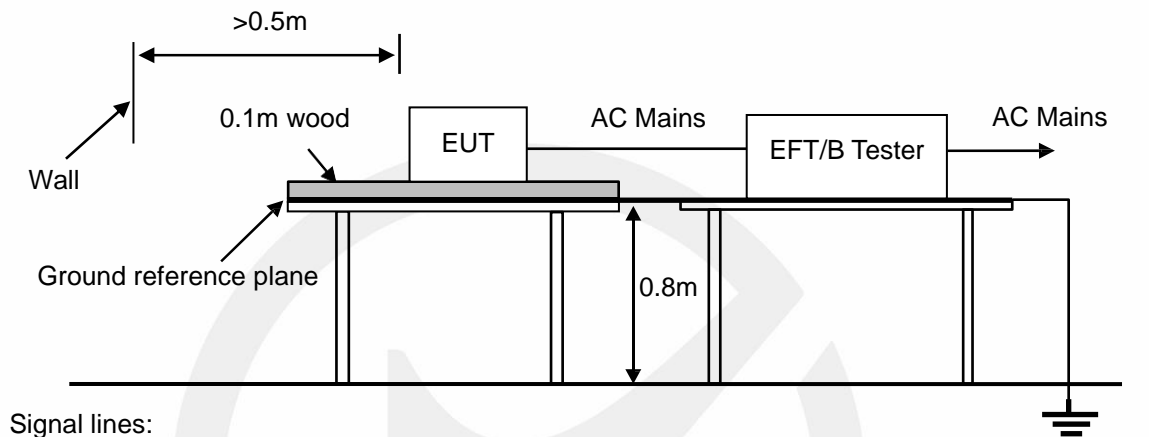
EMTEK (SHENZHEN) CO., LTD.

Applicant : SRNE Solar Co.,Ltd				
EUT : Solar Hybrid Inverter	Test Date : 2022-08-24			
M/N : HES4855S100-H	Temperature : 20.4°C			
Field Strength : 3 V/m	Humidity : 50%			
Power Supply : AC 230V/50Hz, DC 400V, DC 48V	Criterion : A			
Test Mode : Charging (AC in), PV in, Discharging	Frequency Range : 80 MHz to 1000 MHz 1400 MHz to 6000 MHz			
Atmospheric Pressure : 101kpa				
Modulation: <input type="checkbox"/> None <input type="checkbox"/>		Pulse <input checked="" type="checkbox"/> AM 1kHz 80%		
Frequency Rang 1: 80~ 1000MHz		Frequency Rang 2: 1400~ 6000 MHz		
Steps	1%			
	Horizontal	Vertical	Horizontal	Vertical
Front	A	A	A	A
Right	A	A	A	A
Rear	A	A	A	A
Left	A	A	A	A
<b>Test Equipment :</b> 1. Signal Generator : N5181A (Agilent) 2. Power Amplifier : AS0102-55 (MILMEGA) & 80RF1000-175 (MILMEGA) & AS1860-50 (MILMEGA) 3. Log.-Per.Antenna: VULP9118E (SCHWARZBECK) 4. Broad-Band Horn Antenna: STLP 9149 (Schwarzbeck) 5. RF Power Meter. Dual Channel: 4232A (BOONTON) 6. Field Strength Meter: RSS1006A (DARE)				
Note:				

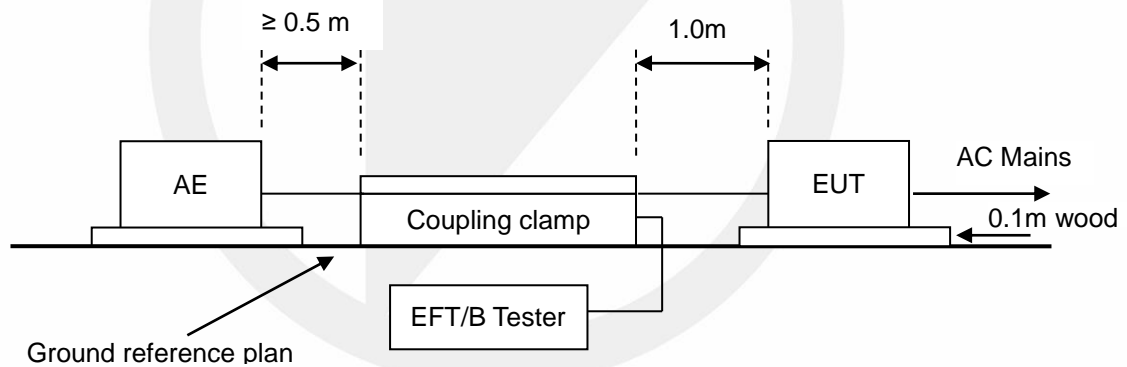
## 11. ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST

### 11.1. Block Diagram of Test Setup

AC Lines:



Signal lines:



### 11.2. Test Standard

EN IEC 61000-6-1:2019  
(IEC61000-4-4:2012, Severity Level: 2: 1kV)

### 11.3. Severity Levels and Performance Criterion

#### 11.3.1. Severity level

Open Circuit Output Test Voltage $\pm 10\%$		
Level	On Power Supply Lines	On I/O (Input/Output) Signal data and control lines
1	0.5 kV	0.25 kV
2	1 kV	0.5 kV
3	2 kV	1 kV
4	4 kV	2 kV
X	Special	Special

#### 11.3.2. Performance criterion: B

### 11.4. Operating Condition of EUT

11.4.1. Setup the EUT as shown on Section 11.1.

11.4.2. Turn on the power of all equipment.

11.4.3. Let the EUT work in test mode (Charging (AC in)) and test it.

### 11.5. Test Procedure

The EUT is put on the table that is 0.8 meter high above the ground. This reference ground plane shall project beyond the EUT by at least 0.1 m 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 0.5 m.

11.5.1. For input and output AC power ports:

The EUT is connected to the power mains by using a coupling device that couples the EFT interference signal to AC power lines. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 2 mins.

11.5.2. For signal lines and control lines ports:

No I/O ports. It's unnecessary to test.

11.5.3. For DC output line ports:

It's unnecessary to test.

### 11.6. Test Results

**PASS.**

Please refer to the following page.



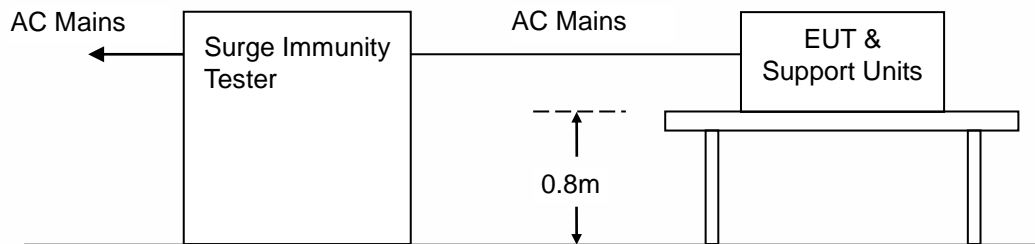
## Electrical Fast Transient/Burst Test Results

EMTEK (SHENZHEN) CO., LTD.

Applicant : <u>SRNE Solar Co.,Ltd</u>			
EUT : <u>Solar Hybrid Inverter</u>		Test Date : <u>2022-08-24</u>	
M/N : <u>HES4855S100-H</u>		Temperature : <u>23.5°C</u>	
Power Supply : <u>AC 230V/50Hz</u>		Humidity : <u>52%</u>	
Test Mode : <u>Charging (AC in)</u>			
Line : <input checked="" type="checkbox"/> AC Mains		Line : <input type="checkbox"/> Signal <input type="checkbox"/> I/O Cable	
Coupling : <input checked="" type="checkbox"/> Direct		Coupling : <input type="checkbox"/> Capacitive	
Test Time : 120s			
Line	Test Voltage	Result(+)	Result(-)
L	1kV	A	A
N	1kV	A	A
PE	1kV	A	A
L, N	1kV	A	A
L, PE	1kV	A	A
N, PE	1kV	A	A
L, N, PE	1kV	A	A
Signal Line			
DC Line			
Note:			

## 12. SURGE IMMUNITY TEST

### 12.1. Block Diagram of Test Setup



### 12.2. Test Standard

EN IEC 61000-6-1:2019  
 (IEC 61000-4-5:2014, Severity Level: line to line: Level 2, 1.0kV  
 line to earth: Level 3, 2.0kV)

### 12.3. Severity Levels and Performance Criterion

#### 12.3.1. Severity level

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

#### 12.3.2. Performance criterion: B

### 12.4. Operating Condition of EUT

- 12.4.1. Setup the EUT as shown on Section 12.1.
- 12.4.2. Turn on the power of all equipment.
- 12.4.3. Let the EUT work in test mode (Charging (AC in)) and test it.

### 12.5. Test Procedure

- 1) Set up the EUT and test generator as shown on Section 12.1.2.
- 2) For line to line coupling mode, provide a 1.0 kV 1.2/50us voltage surge (At open-circuit condition) and 8/20us current surge to EUT selected points.
- 3) At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test.
- 4) Different phase angles are done individually.
- 5) Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

## 12.6. Test Results

**PASS.**

Please refer to the following page.



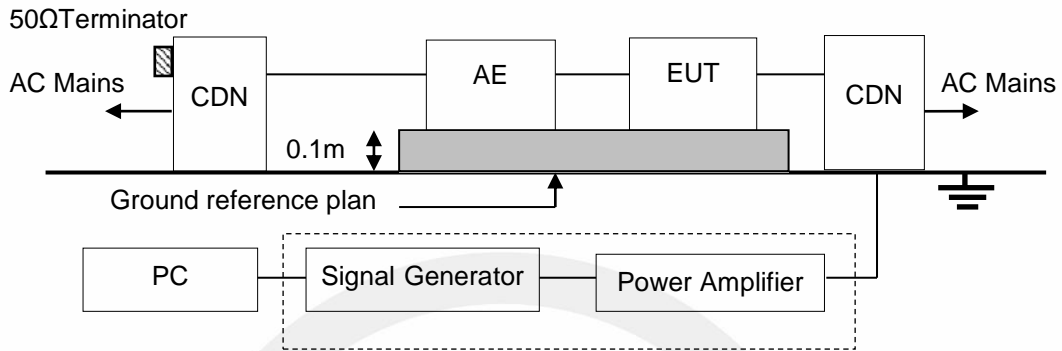
## Surge Immunity Test Result

EMTEK (SHENZHEN) CO., LTD.

Applicant : <u>SRNE Solar Co.,Ltd</u>					
EUT : <u>Solar Hybrid Inverter</u>		Test Date : <u>2022-08-24</u>			
M/N : <u>HES4855S100-H</u>		Temperature : <u>23.5°C</u>			
Power Supply : <u>AC 230V/50Hz</u>		Humidity : <u>52%</u>			
Test Mode : <u>Charging (AC in)</u>		Criterion : <u>B</u>			
Location	Polarity	Phase Angle	Number of Pulse	Pulse Voltage (kV)	Result
L-N	+	0°/90°/180°/270°	5	1.0	A
	-	0°/90°/180°/270°	5	1.0	A
L-PE	+	0°/90°/180°/270°	5	2.0	A
	-	0°/90°/180°/270°	5	2.0	A
N-PE	+	0°/90°/180°/270°	5	2.0	A
	-	0°/90°/180°/270°	5	2.0	A
Remark:					

## 13. INJECTED CURRENTS SUSCEPTIBILITY TEST

### 13.1. Block Diagram of Test Setup



### 13.2. Test Standard

EN IEC 61000-6-1:2019  
(IEC 61000-4-6:2013, Severity Level: Level 2, 3V (r.m.s.), 0.15MHz ~ 80MHz)

### 13.3. Severity Levels and Performance Criterion

#### 13.3.1. Severity level

Level	Field Strength V
1	1
2	3
3	10
X	Special

#### 13.3.2. Performance criterion: A

### 13.4. Operating Condition of EUT

13.4.1. Setup the EUT as shown on Section 13.1.

13.4.2. Turn on the power of all equipment.

13.4.3. Let the EUT work in test mode (Charging (AC in)) and test it.

### 13.5. Test Procedure

- 1) Set up the EUT, CDN and test generators as shown on Section 13.1.2.
- 2) Let the EUT work in test mode and measure it.
- 3) The EUT are placed on an insulating support 0.1 m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).
- 4) The disturbance signal described below is injected to EUT through CDN.
- 5) The EUT operates within its operational mode(s) under intended climatic conditions after power on.
- 6) The frequency range is swept from 150kHz to 80MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1kHz sine wave.
- 7) The rate of sweep shall not exceed  $1.5 \times 10^{-3}$  decades/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.
- 8) Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

### 13.6. Test Results

**PASS.**

Please refer to the following page.

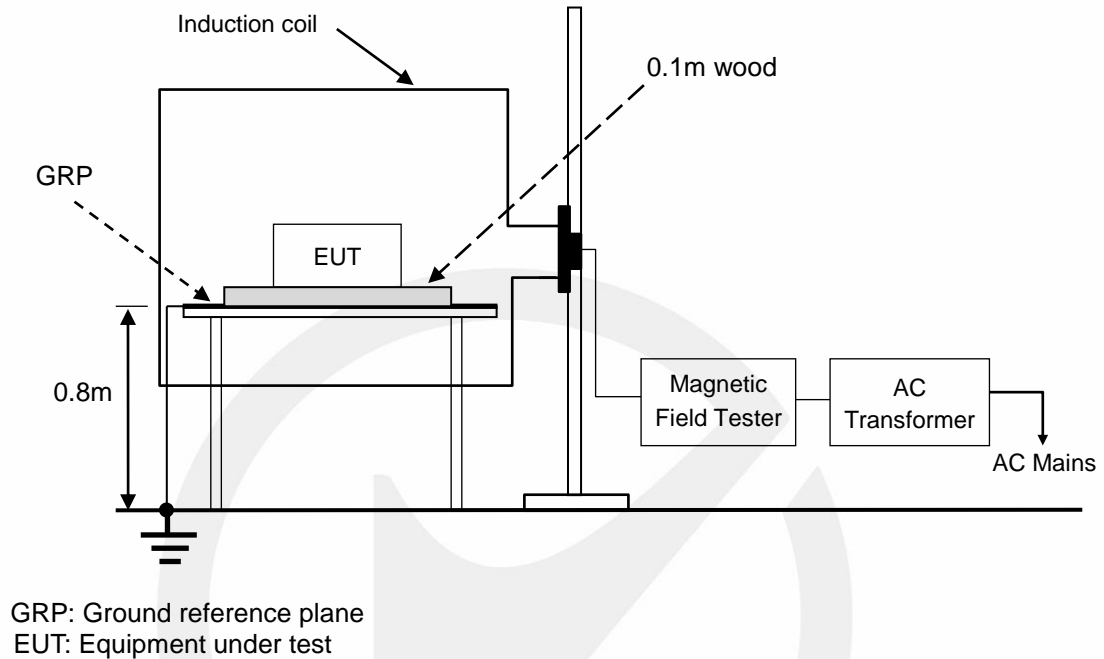
# Injected Currents Susceptibility Test Results

EMTEK (SHENZHEN) CO., LTD.

Applicant : <u>SRNE Solar Co.,Ltd</u>				
EUT : <u>Solar Hybrid Inverter</u>		Test Date: <u>2022-08-24</u>		
M/N : <u>HES4855S100-H</u>		Temperature : <u>23.5°C</u>		
Power Supply : <u>AC 230V/50Hz</u>		Humidity : <u>52%</u>		
Test Mode: <u>Charging (AC in)</u>				
Frequency Range (MHz)	Injected Position	Strength (Unmodulated)	Criterion	Result
0.15 ~ 80	AC Mains	3V	A	A
Test Mode : <u>N/A</u>				
Frequency Range (MHz)	Injected Position	Strength (Unmodulated)	Criterion	Result
Remark : 1. Modulation Signal:1kHz 80% AM Measurement Equipment : Simulator: CWS 500C (SWITZERLAND EMTEST) CDN : <input type="checkbox"/> CDN-M2 (SWITZERLAND EMTEST) <input checked="" type="checkbox"/> CDN-M3 (SWITZERLAND EMTEST)		Note:		

## 14. MAGNETIC FIELD SUSCEPTIBILITY TEST

### 14.1. Block Diagram of Test Setup



### 14.2. Test Standard

EN IEC 61000-6-1:2019  
(IEC 61000-4-8:2009, Severity Level: Level 2, 3A / m)

### 14.3. Severity Levels and Performance Criterion

#### 14.3.1. Severity Levels

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

#### 14.3.2. Performance Criterion: A



#### 14.4. Operating Condition of EUT

- 14.4.1. Setup the EUT as shown on Section 14.1.
- 14.4.2. Turn on the power of all equipment.
- 14.4.3. Let the EUT work in test mode (Charging (AC in), PV in, Discharging) and test it.

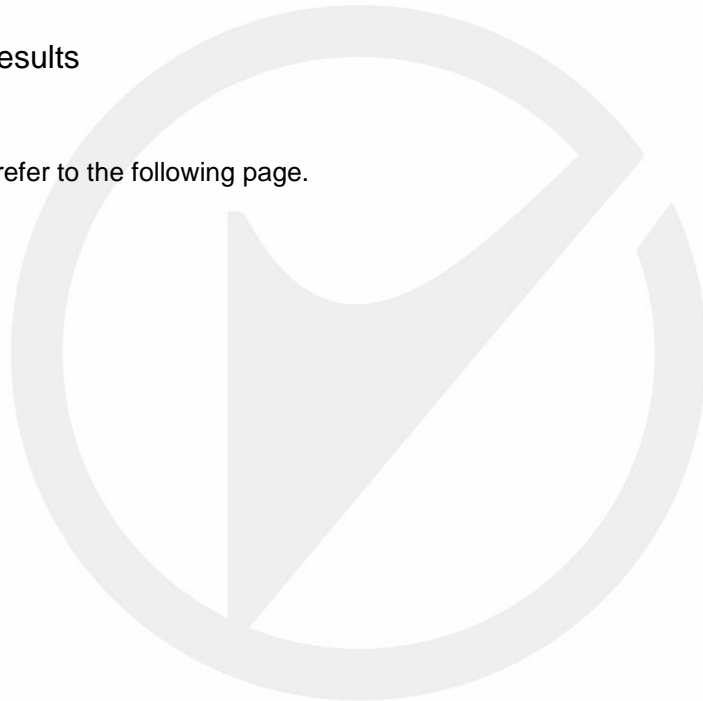
#### 14.5. Test Procedure

The EUT is placed in the middle of a induction coil (1\*1m), under which is a 1\*1\*0.1m (high) table, this small table is also placed on a larger table, above the ground. Both horizontal and vertical polarization of the induction coil is set on test, so that each side of the EUT is affected by the magnetic field. Also can reach the same aim by change the position of the EUT.

#### 14.6. Test Results

**PASS.**

Please refer to the following page.



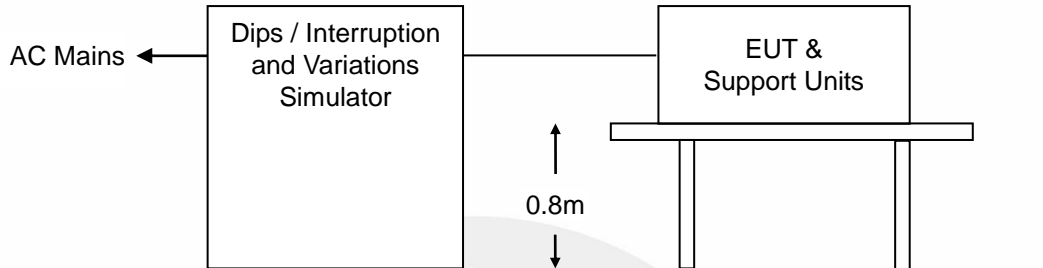
## Magnetic Field Immunity Test Result

EMTEK (SHENZHEN) CO., LTD.

Standard: <input checked="" type="checkbox"/> IEC 61000-4-8		Result: <input checked="" type="checkbox"/> PASS / <input type="checkbox"/> FAIL		
Applicant : <u>SRNE Solar Co.,Ltd</u> EUT : <u>Solar Hybrid Inverter</u> M/N : <u>HES4855S100-H</u> Input Voltage : <u>AC 230V/50Hz, DC400V, DC 48V</u> Date of Test : <u>2022-08-24</u> Ambient Condition : Temp : <u>23.5°C</u> Humid: <u>52%</u> Criterion: A				
Operation Mode: Charging (AC in), PV in, Discharging				
Test Level (A/m)	Testing Duration	Coil Orientation	Criterion	Result
3	5 mins	X	A	A
3	5 mins	Y	A	A
3	5 mins	Z	A	A
Operation Mode: N/A				
Test Level (A/m)	Testing Duration	Coil Orientation	Criterion	Result
Test Equipment	Magnetic Field Test: HEAFELY MAG 100.1			
Note:				

## 15. VOLTAGE DIPS AND INTERRUPTIONS TEST

### 15.1. Block Diagram of Test Setup



### 15.2. Test Standard

EN IEC 61000-6-1:2019 (IEC 61000-4-11:2004)

### 15.3. Severity Levels and Performance Criterion

#### 15.3.1. Severity level

Test Level %UT	Voltage dip and short interruptions %UT	Duration (in period)
0	100	0.5
70	30	1
		5
		10
		25
0	100	50
		*

#### 15.3.2. Performance criterion: B&C

### 15.4. Operating Condition of EUT

15.4.1. Setup the EUT as shown on Section 15.1.

15.4.2. Turn on the power of all equipment.

15.4.3. Let the EUT work in test mode (Charging (AC in)) and test it.

### 15.5. Test Procedure

- 1) Set up the EUT and test generator as shown on Section 15.1.2.
- 2) The interruption is introduced at selected phase angles with specified duration.
- 3) Record any degradation of performance.

## 15.6. Test Results

**PASS.**

Please refer to the following page.



## Voltage Dips and Interruptions Test Results

EMTEK (SHENZHEN) CO., LTD.

Applicant : SRNE Solar Co.,Ltd

EUT : Solar Hybrid Inverter

M/N : HES4855S100-H

Power Supply : AC 230V/50Hz

Test Mode: Charging (AC in)

Test Date : 2022-08-24

Temperature : 23.5°C

Humidity : 52%

Test Level % U <sub>T</sub>	Voltage Dips & Short Interruptions % U <sub>T</sub>	Duration (in periods)	Criterion		Result
			<input type="checkbox"/> A <input checked="" type="checkbox"/> C	<input checked="" type="checkbox"/> B <input type="checkbox"/> D	
0	100	0.5P		<input checked="" type="checkbox"/> B	A
0	100	1P		<input checked="" type="checkbox"/> B	A
70	30	25P		<input checked="" type="checkbox"/> C	A
0	100	250P		<input checked="" type="checkbox"/> C	B

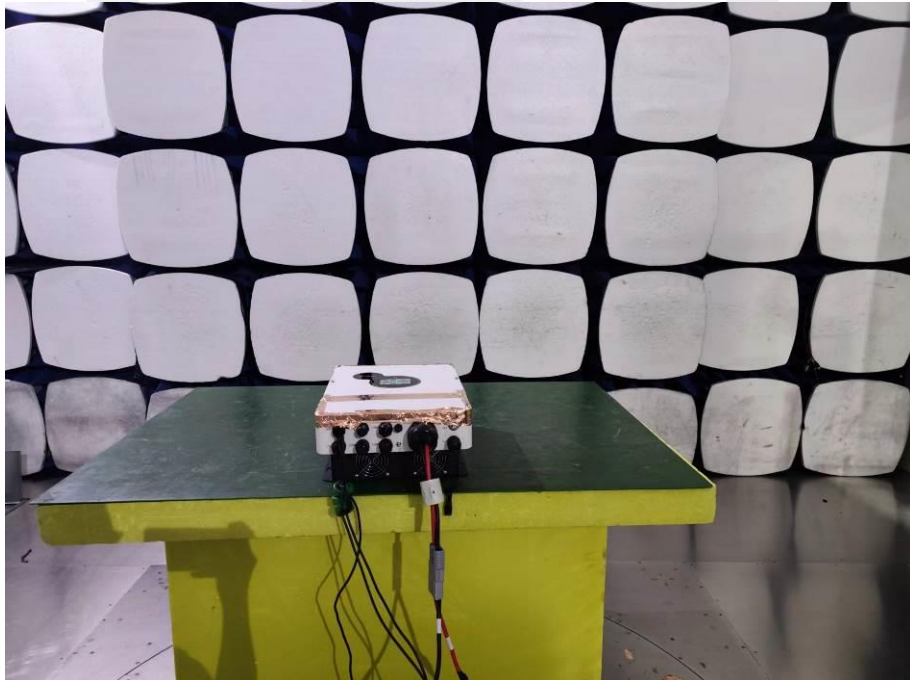
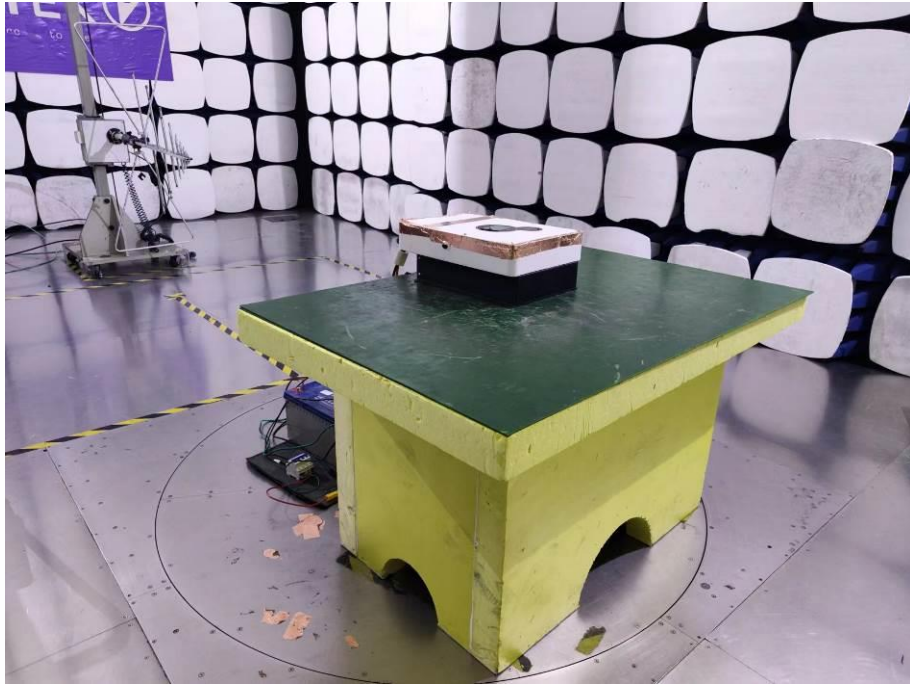
Note: When the sample drops to 0%, 250P, the power is off, the test is over, and the sample automatically returns to normal.

## 16. PHOTOGRAPHS

### 16.1. Photos of Conducted Emission Measurement



## 16.2.Photos of Radiation Emission Measurement



### 16.3.Photo of Harmonic / Flicker Measurement

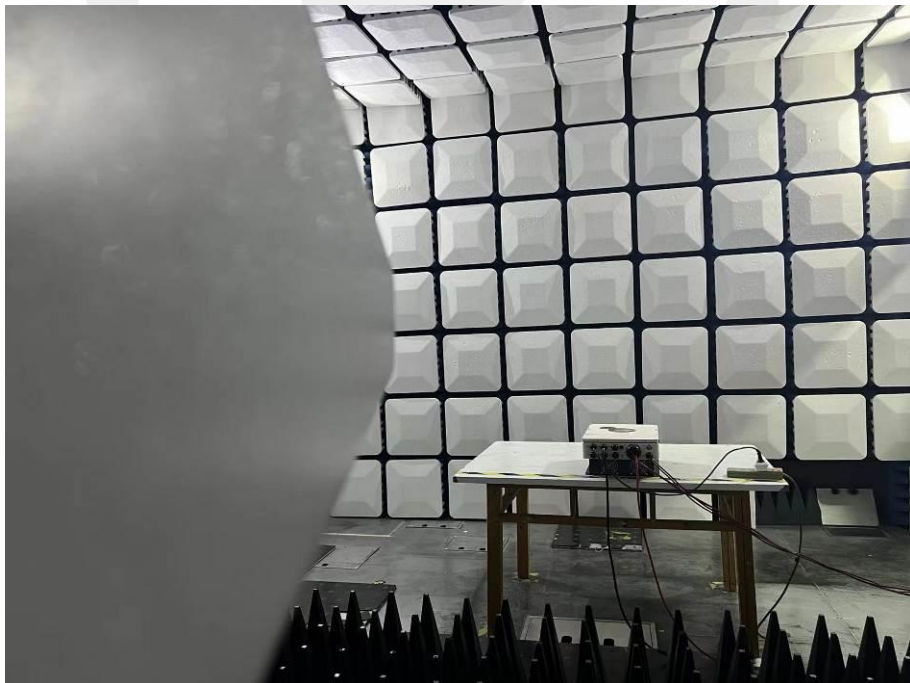


### 16.4.Photo of Electrostatic Discharge Test





### 16.5.Photo of RF Field Strength Susceptibility Test



## 16.6. Photo of Electrical Fast Transient / Burst Test



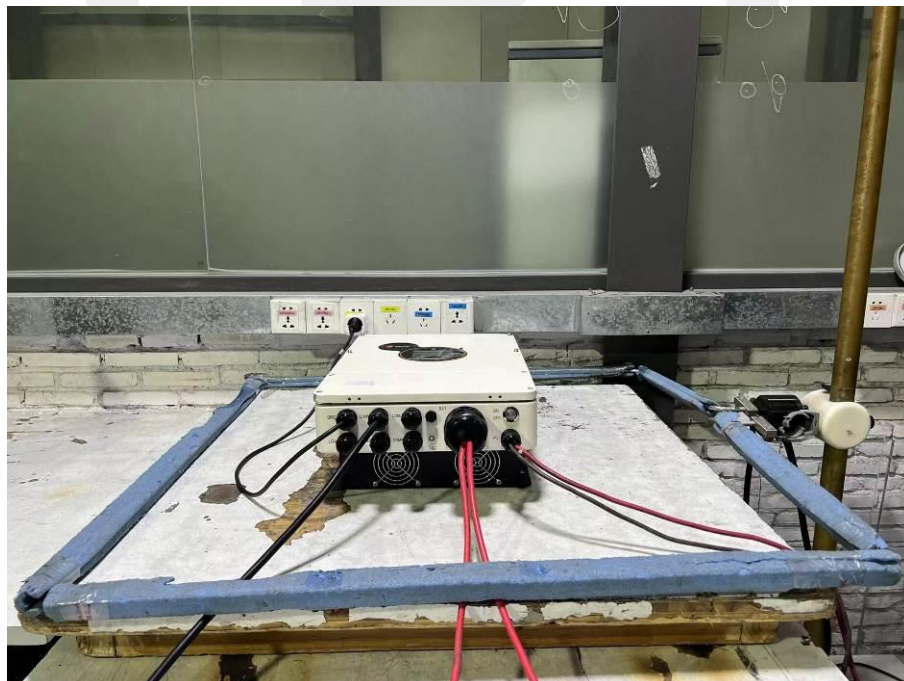
## 16.7. Photo of Surge Test



### 16.8.Photo of Injected Currents Susceptibility Test



### 16.9.Photo of Magnetic Field Immunity Test



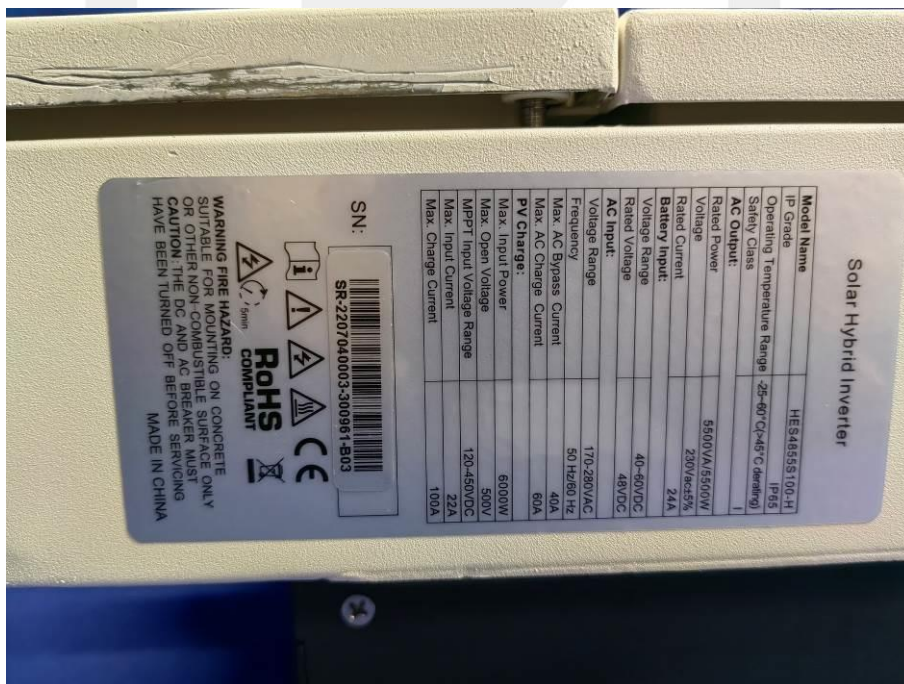
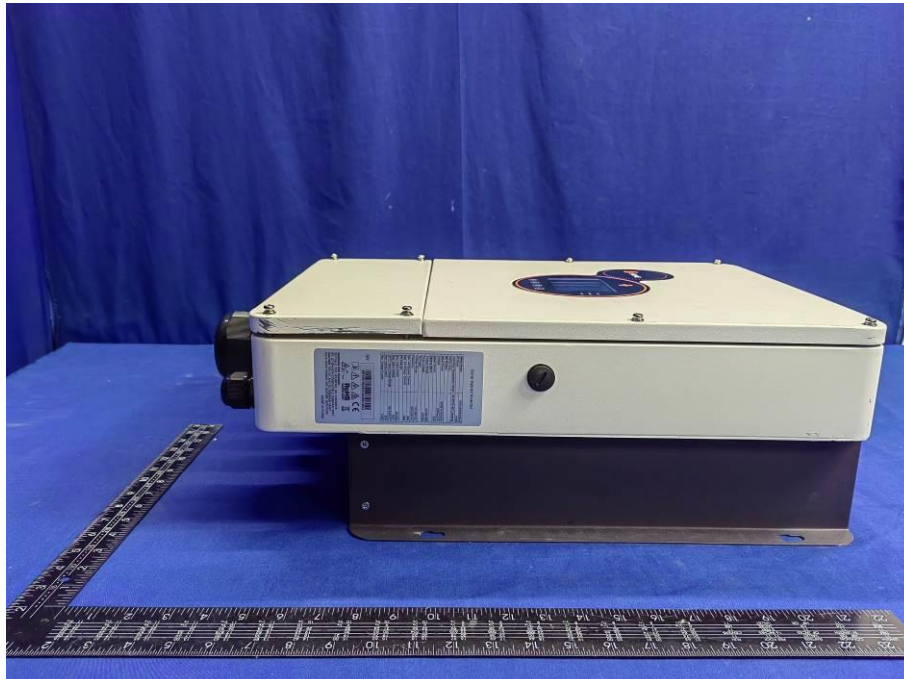
### 16.10.Photo of Voltage Dips and Interruption Immunity Test





# 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.