Test Report No.64.290.23.30337.01

Dated 2023-04-03

Client:	Guangdong Lesso Banhao New Energy Technology Group Co., Ltd. The 1st and 2nd floors of the workshop in Zone 2 No. 58, Longzhou West Road Longjiang Town Shunde District, 528318 Foshan City, Guangdong Province PEOPLE'S REPUBLIC OF CHINA
Manufacturer:	Guangdong Lesso Banhao New Energy Technology Group Co., Ltd. The 1st and 2nd floors of the workshop in Zone 2 No. 58, Longzhou West Road Longjiang Town Shunde District, 528318 Foshan City, Guangdong Province PEOPLE'S REPUBLIC OF CHINA
Manufacturing place:	Guangdong Lesso Banhao New Energy Technology Group Co., Ltd. Plot A-2, South side of Longjiang Dachong, beside Chanxi Avenue, Longjiang Town, Shunde District, 528000 Foshan City, Guangdong Province, PEOPLE'S REPUBLIC OF CHINA
Test subject:	Product: Photovoltaic modules
Test specification:	IEC 61853-1:2011 IEC 61853-2:2016 IEC 60891:2009
Purpose of examination:	PAN File Parameters Determination
Test result:	The test results for the present samples are show in clause3

www.tuvsud.com

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch, TÜV SÜD Group

5F, Communication Building, 163 Pingyun Rd, Huangpu Ave. West,Guangzhou, 510656, P.R.China

1 Description of the test subject

1.1 Function

Manufacturer's specification for intended use:

The PV modules for electricity generation systems with max. voltage of 1500 V DC

1.2 Consideration of the foreseeable misuse

☒ Not applicable
☐ Covered through the applied standard
☐ Covered by the following comment
☐ Covered by attached risk analysis

1.3 Technical Data

Type or model number	540D(HPM)72(182)
Voc (Vdc)	49.42±3%
Vmp (Vdc)	41.60
Isc (Adc)	13.85±4%
Imp (Adc)	12.98
Pmp (W)	540
Bifaciality factor, if bifacial module	N/A
Power tolerance	±3%
Maximum system voltage (V)	1500
Maximum over-current protection rating (A)	25
Application Class	Class II

www.tuvsud.com

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch, TÜV SÜD Group

5F, Communication Building, 163 Pingyun Rd, Huangpu Ave. West,Guangzhou, 510656, P.R.China

2 Order

2.1 Date of Purchase Order, Customer's Reference

2023-02-22, 5785111

2.2 Receipt of Test Sample, Location

2023-03-07

Changzhou HuaYang Inspection and Testing Technology Co., Ltd.

No.8 Lanxiang Road, Wujin Economic Development Zone, Changzhou, Jiangsu, P.R.China

2.3 Date of Testing

2023-03-07 / 2023-03-31

2.4 Location of Testing

Changzhou HuaYang Inspection and Testing Technology Co., Ltd.

No.8 Lanxiang Road, Wujin Economic Development Zone, Changzhou, Jiangsu, .R.China

2.5 Points of Non-compliance or Exceptions of the Test Procedure

N/A

www.tuvsud.com

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch, TÜV SÜD Group

5F, Communication Building, 163 Pingyun Rd, Huangpu Ave. West,Guangzhou, 510656, P.R.China

3 Test Results

3.1 Sample Information

Sample #	Model	Sample S/N	Remark
1	540D(HPM)72(182)	BH1C51LAC220927010817	IEC 61853-1
2	540D(HPM)72(182)	BH1C51LAC220927010816	IEC 61853-1
			IEC 61853-2
3	540D(HPM)72(182)	BH1C51LAC220927010776	IEC 61853-1

3.2 Flash Tests According to Table 2 of the IEC 61853-1

To determine the relationship between efficiency and irradiance & temperature, PV modules are tested across a matrix of operating conditions according to the standard IEC 61853-1:2011, ranging in irradiance from 100 W/m^2 to 1100 W/m^2 and ranging in temperature from 15 °C to 75 °C.

To determine the temperature coefficients, PV modules are tested according to IEC 60891:2009, under irradiance 1000W/m^2 and ranging in temperature from 15 °C to 45 °C.

Based on the laboratory measurement data, PAN file can be optimized, then match ability between the resulting efficiencies in PVsyst software and the lab data can be compared.

3.3 Raw Data

TABLE 2:

Flash test data for each sample at the real irradiance and temperature conditions in table 2 of the IEC 61853-1

#1							
T_{TARGET} [ºC]	IRR_{TARGET} [W/m^2]	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]
15	100	46.225	39.658	1.341	1.335	52.950	85.45
15	200	47.662	41.688	2.757	2.648	110.369	83.98
15	400	49.331	42.402	5.528	5.322	225.647	82.74
15	600	50.082	42.827	8.258	7.926	339.438	82.07
15	800	50.620	43.022	10.993	10.525	452.802	81.37
15	1000	50.974	43.163	13.599	13.099	565.382	81.56
25	100	45.207	38.481	1.356	1.331	51.217	83.55
25	200	46.923	40.253	2.758	2.664	107.226	82.86
25	400	48.025	41.097	5.538	5.330	219.063	82.36
25	600	48.776	41.496	8.303	7.938	329.407	81.34

www.tuvsud.com

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch, TÜV SÜD Group

5F, Communication Building, 163 Pingyun Rd, Huangpu Ave. West,Guangzhou, 510656, P.R.China

25	800	49.296	41.584	11.043	10.549	438.66	80.58
25	1000	49.779	41.694	13.662	13.117	546.918	80.42
25	1100	49.934	41.751	15.003	14.375	600.159	80.11
50	400	45.054	37.479	5.592	5.356	200.753	79.68
50	600	45.861	38.005	8.358	7.949	302.084	78.81
50	800	46.436	38.165	11.071	10.563	403.138	78.42
50	1000	46.732	38.177	13.842	13.147	501.907	77.59
50	1100	46.924	38.219	15.195	14.404	550.498	77.21
75	600	42.514	34.522	8.406	7.955	274.613	76.84
75	800	43.091	34.677	11.124	10.577	366.789	76.52
75	1000	43.446	34.549	14.056	13.238	457.351	74.89
75	1100	43.576	34.753	15.356	14.447	502.058	75.03

#2							
T_{TARGET} [ºC]	IRR_{TARGET} [W/m^2]	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]
15	100	45.965	40.158	1.355	1.329	53.369	85.70
15	200	47.605	41.411	2.752	2.659	110.112	84.05
15	400	49.292	42.523	5.507	5.289	224.908	82.86
15	600	50.078	42.948	8.215	7.894	339.036	82.41
15	800	50.629	43.023	10.959	10.520	452.609	81.57
15	1000	50.902	42.856	13.690	13.156	563.833	80.91
25	100	45.159	38.609	1.389	1.364	52.663	83.96
25	200	46.508	40.407	2.761	2.637	106.572	82.98
25	400	48.161	41.234	5.536	5.305	218.729	82.04
25	600	48.902	41.524	8.265	7.928	329.216	81.45
25	800	49.415	41.621	10.962	10.534	438.453	80.94
25	1000	49.974	41.813	13.628	13.061	546.125	80.19
25	1100	50.017	41.797	15.104	14.421	602.769	79.79
50	400	44.966	37.799	5.552	5.304	200.489	80.31
50	600	45.841	38.219	8.349	7.937	303.358	79.26
50	800	46.440	38.373	11.100	10.558	405.127	78.59
50	1000	46.803	38.314	13.857	13.151	503.851	77.69
50	1100	47.048	38.216	15.162	14.457	552.495	77.45
75	600	42.661	34.746	8.394	7.934	275.661	76.98
75	800	43.223	34.926	11.182	10.525	367.601	76.06
75	1000	43.619	34.660	14.008	13.187	457.049	74.80
75	1100	43.708	34.793	15.344	14.469	503.406	75.06

#3							
T_{TARGET} [ºC]	IRR_{TARGET} [W/m^2]	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]
15	100	46.037	39.718	1.349	1.337	53.092	85.46
15	200	47.744	41.775	2.765	2.641	110.320	83.58
15	400	49.320	42.398	5.523	5.304	224.875	82.56
15	600	50.089	42.955	8.249	7.881	338.538	81.93
15	800	50.632	42.887	10.969	10.535	451.803	81.35
15	1000	50.886	42.860	13.702	13.152	563.722	80.85
25	100	45.190	38.631	1.365	1.341	51.822	84.02
25	200	46.508	40.421	2.776	2.650	107.122	82.97
25	400	48.193	41.350	5.560	5.308	219.502	81.92
25	600	48.931	41.655	8.271	7.925	330.127	81.57
25	800	49.454	41.749	11.063	10.555	440.649	80.54
25	1000	49.866	41.682	13.673	13.125	547.091	80.24
25	1100	50.027	41.768	15.076	14.382	600.731	79.65
50	400	44.994	37.800	5.553	5.301	200.362	80.19
50	600	45.839	38.095	8.352	7.969	303.590	79.30
50	800	46.432	38.362	11.096	10.545	404.533	78.52
50	1000	46.851	38.321	13.838	13.169	504.647	77.84
50	1100	47.084	38.387	15.126	14.412	553.234	77.68
75	600	42.771	35.002	8.411	7.903	276.612	76.89
75	800	43.108	34.589	11.169	10.608	366.919	76.21
75	1000	43.753	34.915	13.975	13.127	458.337	74.96
75	1100	43.908	35.053	15.327	14.418	505.406	75.10

Table 3:

Temperature Coefficients Measurement Data at the 1000 W.m^{-2} Irradiance

#1				
T [ºC]	IRR_{TARGET} [W/m^2]	Voc [V]	Isc [A]	Pmp [W]
15.1	1000	50.974	13.599	565.382
20.2	1000	50.504	13.655	555.160
25.0	1000	49.779	13.662	546.918
29.9	1000	49.439	13.714	538.080
35.1	1000	48.699	13.732	529.886
40.3	1000	48.163	13.754	520.473
45.0	1000	47.395	13.793	511.201

www.tuvsud.com

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch,
TÜV SÜD Group

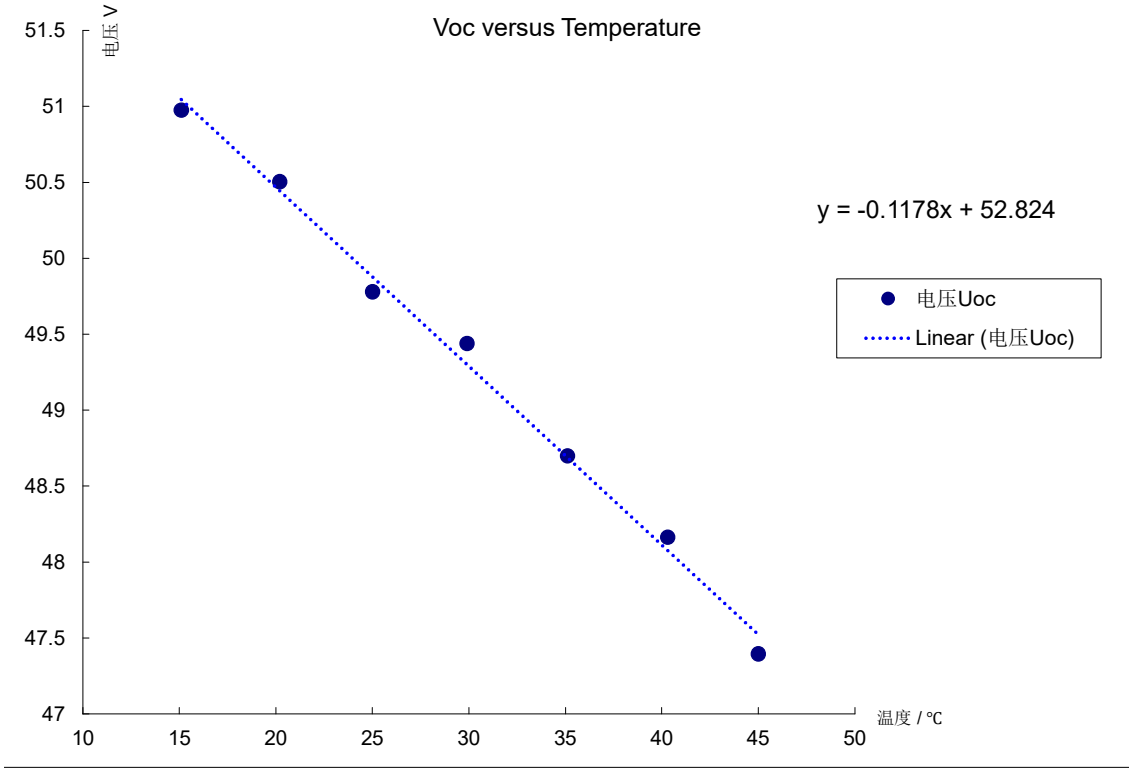
5F, Communication Building, 163 Pingyun Rd, Huangpu Ave.
West,Guangzhou, 510656, P.R.China

3.3.1 Test Data Analysis

3.3.1.1 Temperature Coefficients

Figure 1:

Plot of measured Voc vs. temperature of flash-tests taken at 1000 W/m^2 for sample #1

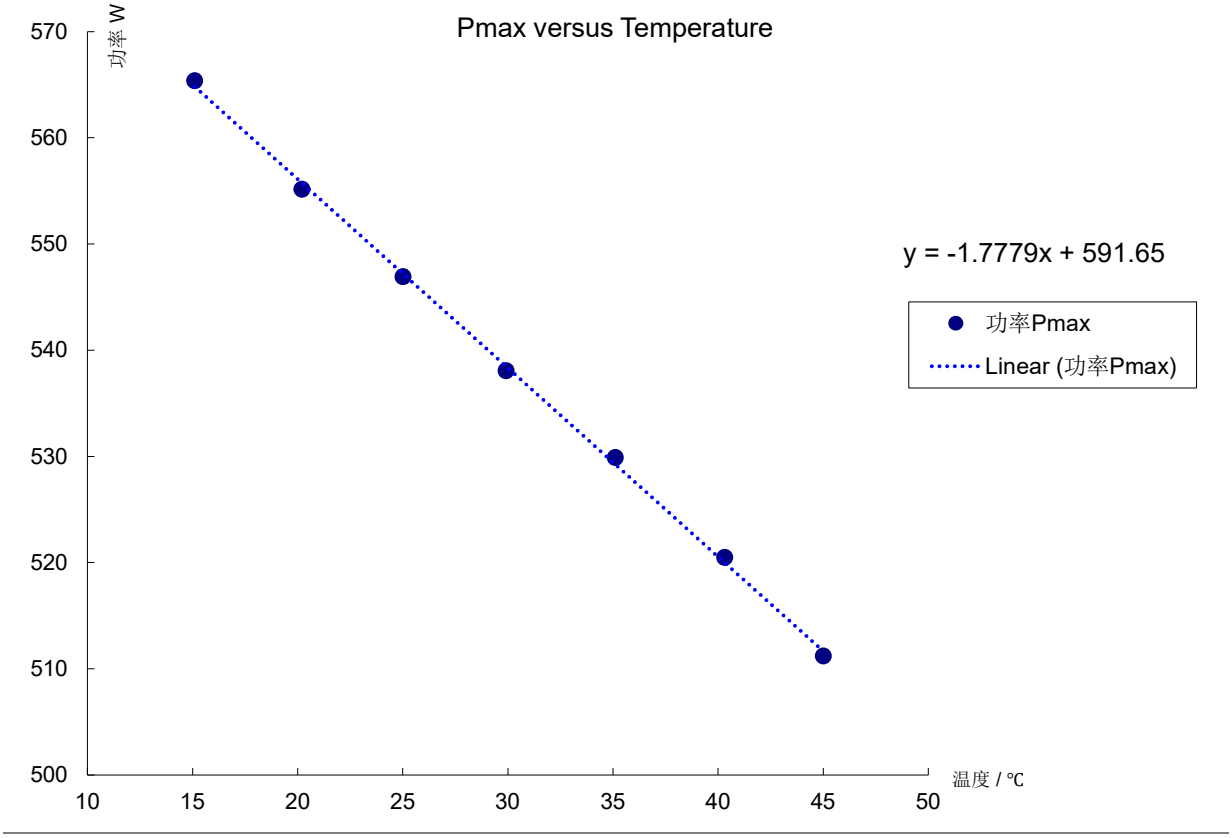


www.tuvsud.com

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch,
TÜV SÜD Group

5F, Communication Building, 163 Pingyun Rd, Huangpu Ave.
West,Guangzhou, 510656, P.R.China

Figure 2:
Plot of measured P_{MAX} vs. temperature of flash-tests taken at 1000 W/m² for sample #1



www.tuvsud.com

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch,
TÜV SÜD Group

5F, Communication Building, 163 Pingyun Rd, Huangpu Ave.
West,Guangzhou, 510656, P.R.China

Figure 3:

Plot of measured Isc vs. temperature of flash-tests taken at 1000W/m² for sample #1

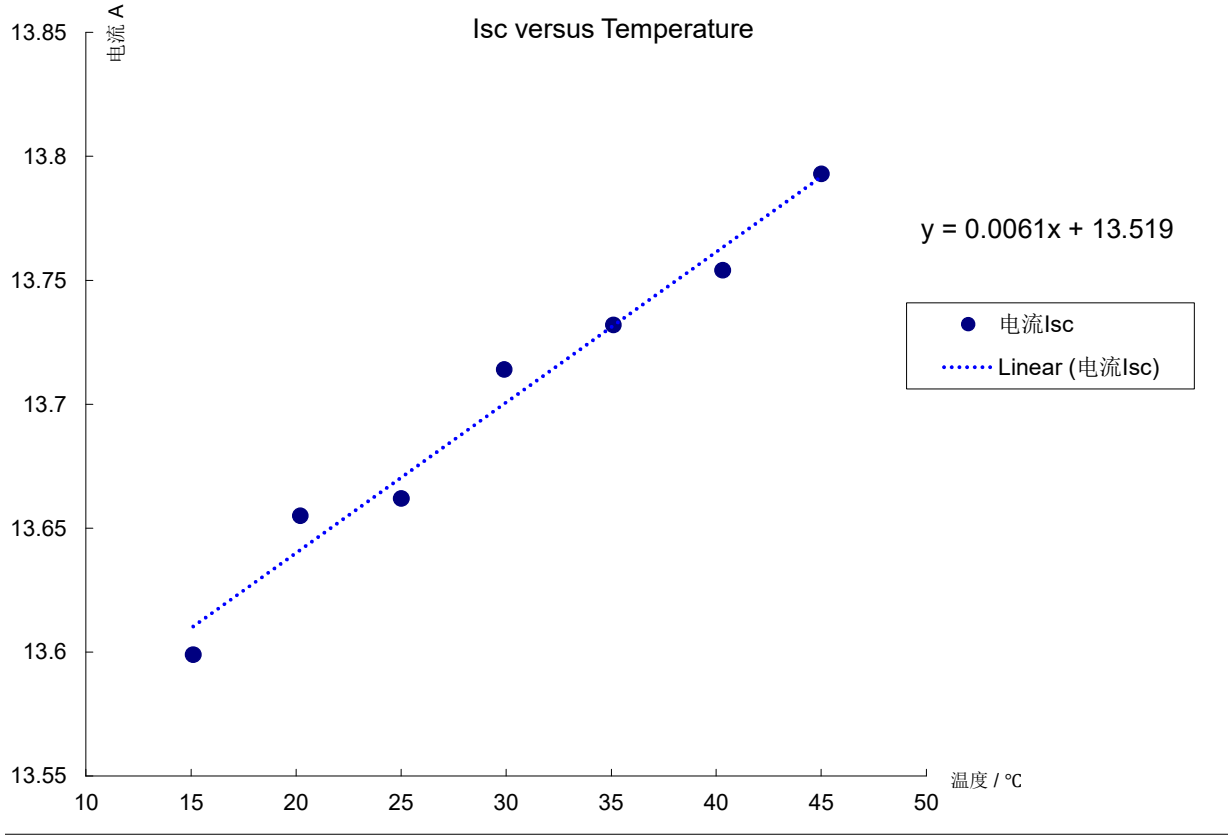


Table 4:

Average Temperature Coefficients Determined by Laboratory Results

Sample No	Alpha (α) ISC [%]	Beta (β) VOC [%]	Gamma (γ) PMAX [%]
#1	0.0471	-0.2428	-0.3251

3.3.1.2 P_{MAX} vs. Irradiance & Temperature

Table 5:

Average P_{MAX} Determined by Laboratory Results according to the IEC 61853-1 based on Table 2

Average Pmax [W] Results Acquired over Multiple Irradiances per Temperature				
Irradiance [W/m²]	Module Temperature			
	15 °C	25 °C	50 °C	75 °C
100	52.950	51.217	-	-
200	110.369	107.226	-	-
400	225.647	219.063	200.753	-

www.tuvsud.com

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch, TÜV SÜD Group

5F, Communication Building, 163 Pingyun Rd, Huangpu Ave. West,Guangzhou, 510656, P.R.China

600	339.438	329.407	302.084	274.613
800	452.802	438.660	403.138	366.789
1000	565.382	546.918	501.907	457.351
1100	-	600.159	550.498	502.058

Table 6:

P_{MAX} Determined by Laboratory Results Scaled to Nameplate Power at STC

Average Pmax [W] Results Acquired over Multiple Irradiances per Temperature				
Irradiance [W/m²]	**Module Temperature**			
	15 °C	**25 °C**	**50 °C**	**75 °C**
100	52.485	51.264	-	-
200	108.913	105.660	-	-
400	222.380	216.409	198.073	-
600	334.843	325.538	299.291	272.245
800	446.851	433.862	399.304	362.597
1000	557.385	540.000	497.288	451.962
1100	-	593.840	545.299	497.441

Table 7:

Relative Efficiency by Laboratory Results Scaled to Nameplate vs. Irradiance at 25°C

Sample No	**Irradiance [W/m²]**						
	100	200	400	600	800	1000	1100
Average	94.93%	97.83%	100.19%	100.48%	100.43%	100.00%	99.97%

4 PAN File Creation

4.1 PAN File Creation Method

The PAN file contains a number of model parameters organized in different tabs within PVsyst. The parameters which affect the model results in forward bias (normal operation) are located in the tabs labeled “Basic Data” and “Model Parameters”. TUV-SUD’s approach to PAN file creation is as following:

1. Enter manufacturer specifications on the “Basic Data” tab;
2. Enter the relative efficiency test results in **Table 7**under different irradiance at 25°C into “Additional Data/Low-light data” , and optimized the Rserie; It is mentioned that the relative efficiency is calculated after scale the average measured P_{MAX} lab data from **Table 5** to the manufacturer’s nameplate power. The scaled data is shown in **Table 6** and **Table 7**.
3. Define the Rsh, Rsh0 and Rexp (on the “Model parameters” tab) for default values;
4. Enter the Pmax, Isc, Voc temperature coefficient in **Table 4** into “Model parameters” tab;

4.2 Optimized PAN File Results

PV module - 540D(HPM)72(182)

Manufacturer	LESSO	**Commercial data**	
Model	540D(HPM)72(182)	Data source :	TUV SUD
Pnom STC power (manufacturer)	540 Wp	Technology	Si-mono
Module size (W x L)	1.134 x 2.278 m²	Rough module area (Amodule)	2.58 m²
Number of cells	2 x 72	Sensitive area (cells) (Acells)	2.38 m²

Specifications for the model (manufacturer or measurement data)

Reference temperature (TRef)	25 °C	Reference irradiance (GRef)	1000 W/m²
Open circuit voltage (Voc)	49.4 V	Short-circuit current (Isc)	13.85 A
Max. power point voltage (Vmpp)	41.6 V	Max. power point current (Impp)	12.98 A
=> maximum power (Pmpp)	540.0 W	Isc temperature coefficient (muIsc)	6.5 mA/°C

One-diode model parameters

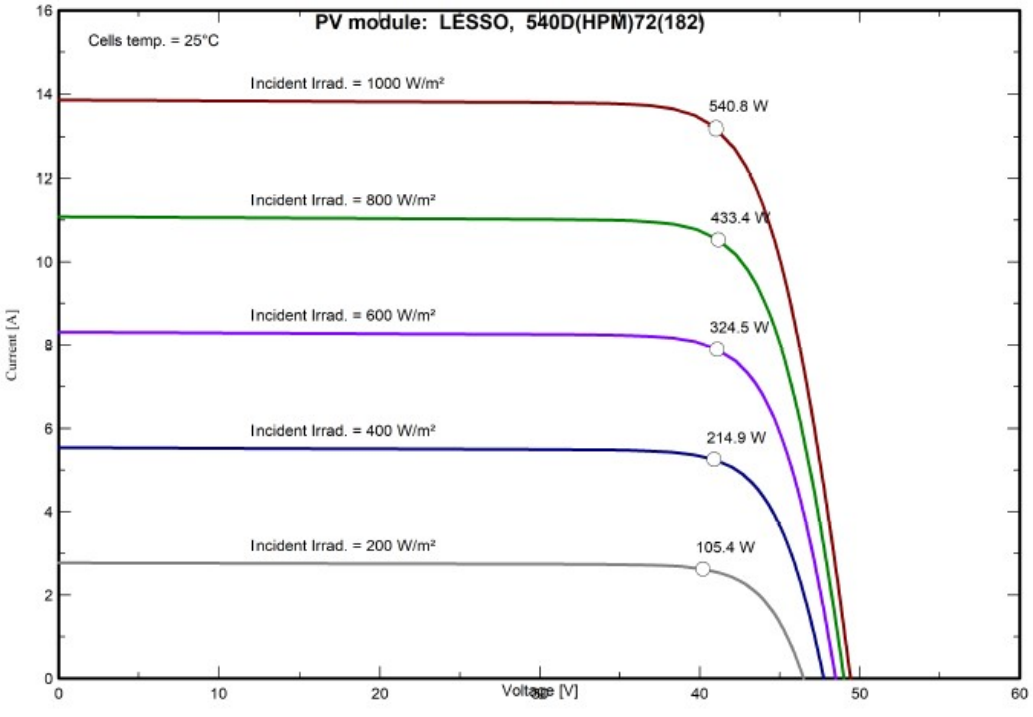
Shunt resistance (Rshunt)	500 Ω	Diode saturation current (IoRef)	0.020 nA
Serie resistance (Rserie)	0.20 Ω	Voc temp. coefficient (MuVoc)	-138 mV/°C
Specified Pmax temper. coeff. (muPMaxR)	-0.34 %/°C	Diode quality factor (Gamma)	0.98
		Diode factor temper. coeff. (muGamma)	0.000 1/°C

Reverse Bias Parameters, for use in behaviour of PV arrays under partial shadings or mismatch

Reverse characteristics (dark) (BRev)	3.20 mA/V²	(quadratic factor (per cell))	
Number of by-pass diodes per module	3	Direct voltage of by-pass diodes	-0.7 V

Model results for standard conditions (STC: T=25 ° C, G=1000 W/m² , AM=1.5)

Max. power point voltage (Vmpp)	41.0 V	Max. power point current (Impp)	13.22 A
Maximum power (Pmpp)	540.8 Wp	Power temper. coefficient (muPmpp)	-0.34 %/°C
Efficiency(/ Module area) (Eff_mod)	20.9 %	Fill factor (FF)	0.790
Efficiency(/ Cells area) (Eff_cells)	22.7 %		



www.tuvsud.com

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch,
TÜV SÜD Group

5F, Communication Building, 163 Pingyun Rd, Huangpu Ave.
West,Guangzhou, 510656, P.R.China

4.3 PAN File Result Verification

After creating the PAN file, a quality check is implemented in order to compare the PAN file model consistence with measurements from the laboratory. The laboratory test results scaled are plotted as efficiency vs. irradiance curves for each temperature of the IEC61853-1 test matrix, as shown in **Table 8**. Similarly, efficiency vs. irradiance curves are generated using PVsyst and the newly created PAN file, as shown in **Table 9**. Comparison between the model and the measurements is represented with the following graph and table.

Table 8:

Efficiency Determined by Laboratory Results Scaled to Nameplate Power at STC

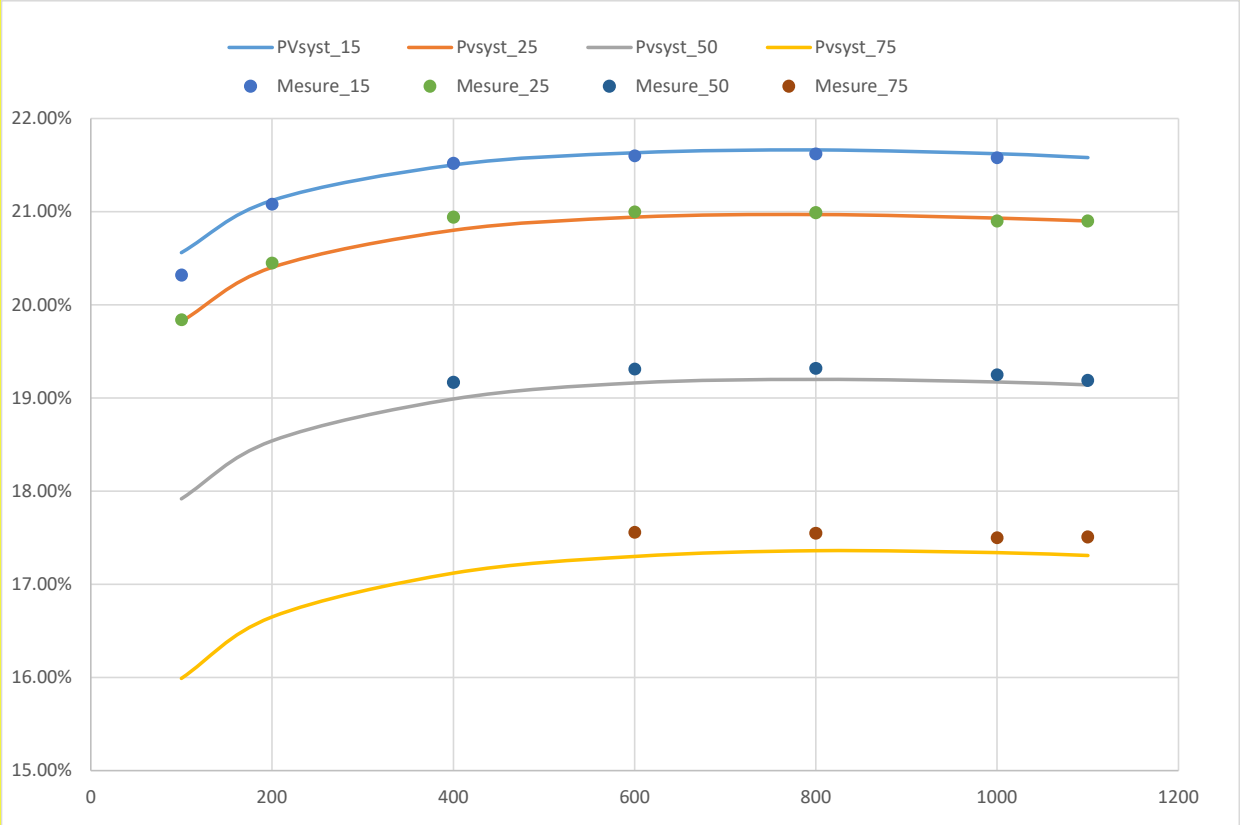
Average Pmax [W] Results Acquired over Multiple Irradiances per Temperature				
Irradiance [W/m²]	**Module Temperature**			
	15 °C	**25 °C**	**50 °C**	**75 °C**
100	20.32%	19.84%	-	-
200	21.08%	20.45%	-	-
400	21.52%	20.94%	19.17%	-
600	21.60%	21.00%	19.31%	17.56%
800	21.62%	20.99%	19.32%	17.55%
1000	21.58%	20.90%	19.25%	17.50%
1100	-	20.90%	19.19%	17.51%

Table 9:

Efficiency Generated Using PVsyst and the Newly Created PAN file.

Average Pmax [W] Results Acquired over Multiple Irradiances per Temperature				
Irradiance [W/m²]	**Module Temperature**			
	15 °C	**25 °C**	**50 °C**	**75 °C**
100	20.56%	19.82%	17.92%	15.99%
200	21.12%	20.40%	18.54%	16.65%
400	21.50%	20.80%	18.99%	17.12%
600	21.63%	20.94%	19.16%	17.30%
800	21.66%	20.97%	19.20%	17.36%
1000	21.62%	20.93%	19.17%	17.34%
1100	21.58%	20.90%	19.14%	17.31%

Figure 4:
Comparison of PVsyst Model, Using the Optimized PAN file, to the Laboratory Testing Results



www.tuvsud.com

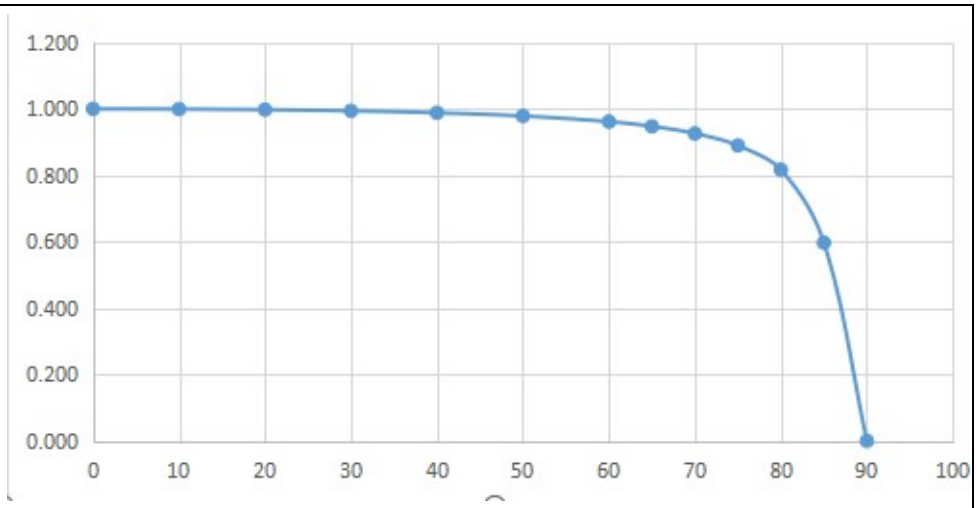
TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch,
TÜV SÜD Group

5F, Communication Building, 163 Pingyun Rd, Huangpu Ave.
West,Guangzhou, 510656, P.R.China

4.4 Measurement of incidence angle effects

Sample No	#2	—
Isc_80°/A:	1.841	—
Isc_-80°/A:	1.812	—
Isc_0°/A:	13.568	—
m=(Isc_80°/Isc_0°)/ cos 80°	0.781	—
n=(Isc_-80°/Isc_0°)/ cos 80°	0.769	—
DeviationΔ=|(m-n)/(m+n)|×100% ⩽2%	0.8%	P

Module Angle	Im [A]	Vm [V]	Isc [A] (Average)	Voc [V]	P [W]	IAM value according to IEC61853-2	IAM value according to PVsyst
0	-	-	13.568	-	-	1.00	1.00
10	-	-	13.394	-	-	1.00	1.00
20	-	-	12.775	-	-	1.00	1.00
30	-	-	11.816	-	-	1.01	0.99
40	-	-	10.424	-	-	1.00	0.99
50	-	-	8.746	-	-	1.00	0.98
60	-	-	6.698	-	-	0.99	0.96
65	-	-	5.603	-	-	0.98	0.95
70	-	-	4.397	-	-	0.95	0.93
75	-	-	3.108	-	-	0.89	0.89
80	-	-	1.841	-	-	0.78	0.82
85	-	-	0.711	-	-	0.60	0.60

Fitted curve	 $\tau(\theta) = 1 - bo \times (1/\cos(\theta) - 1)$ (formula according to PVsystem), $b_0 = 0.0385$

www.tuvsud.com

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch,
TÜV SÜD Group

5F, Communication Building, 163 Pingyun Rd, Huangpu Ave.
West,Guangzhou, 510656, P.R.China

5 Documentation

Annex 1: PRODUCT DESCRIPTION SHEET (MANUFACTURERS AND TYPE REFERENCES)

A1.1	**MODULE TYPE/S**	
	540D(HPM)72(182)	
A1.2	**MODULE DESIGN –DIMENSIONS**	
	Module dimensions (L x W x H) [mm] .....:	2278 x 1134 x 35
A1.3	**SOLAR CELL**	
	Cell type reference .....:	P type mono-Si, Cell type: 7M9E1018A-L1, 10BB Cell dimensions L x W: 182.0 × 91.0 ± 0.5(mm), Cell thickness: 165 ± 16.5 (μm), Zhejiang Aiko Solar Energy Technology Co., Ltd
A1.4	**IDENTIFICATION OF MATERIALS**	
	Front cover .....:	Material:Anti-reflective coating low iron patterend solar glass, Thickness: 3.2(mm), Xinyi Environmental Protection Special Type Glass (Wu hu) Co., Ltd.
	Rear cover .....:	Type: FFC-JW3010(Plus), Color: White, Total Thickness: 310 ± 5% mm, Jolywood (Suzhou) Sunwatt Co., Ltd.
	Encapsulation material .....:	Type: F406PS (contact with front cover) Hangzhou First PV Material Co., Ltd
		Type: F806PS (contact with rear cover) Hangzhou First PV Material Co., Ltd
	Frame .....:	Material：6005 T6, Lesso Banhao New Energy Technology (Guangdong) Co., Ltd.
	Adhesive for frame .....:	Type: SMG533, Material:Silicon, white, GUANGZHOU BAIYUN CHEMICAL INDUSTRY Co., Ltd.
	Cell connector.....:	Type: Tin-coated copper ribbon, Cross section: Φ=0.32 (mm), Xi'an Telison New Materials Co.,Ltd
	String connector .....:	Type: Tin-coated copper ribbon, Cross section: 0.45 x 4 (mm) & 0.35 x 6 (mm), Xi'an Telison New Materials Co.,Ltd

www.tuvsud.com

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch, TÜV SÜD Group

5F, Communication Building, 163 Pingyun Rd, Huangpu Ave. West,Guangzhou, 510656, P.R.China

	Junction box .....:	Type: PV-JB12x, Suzhou UKT New Energy Technology Co., Ltd.
	Potting material.....:	Type: SKF323, Material:Silicon, GUANGZHOU BAIYUN CHEMICAL INDUSTRY Co., Ltd.
	Adhesive for junction box .....:	Type: SMG533, Material:Silicon, white, GUANGZHOU BAIYUN CHEMICAL INDUSTRY Co., Ltd.
	Cable .....:	Type H1Z2Z2-K 1×4mm^2, WUXI XINHONGYE WIRE & CABLE CO., LTD.
	Connector .....:	Type: PV-CO02, Suzhou UKT New Energy Technology Co., Ltd.
	Bypass diode .....:	Type: TM3045-30, Suzhou UKT New Energy Technology Co., Ltd.

Annex 2: List of measurement equipment

Description	Type/ Equipment ID	Calibration due date	Remark
Pulsed Solar Simulator	HYJC-YS-021	2024.01.04	-

Annex 3: Statement of the estimated uncertainty of the test results

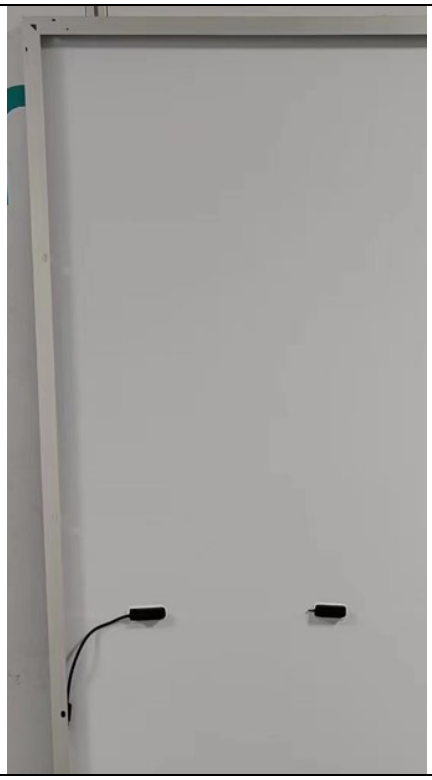
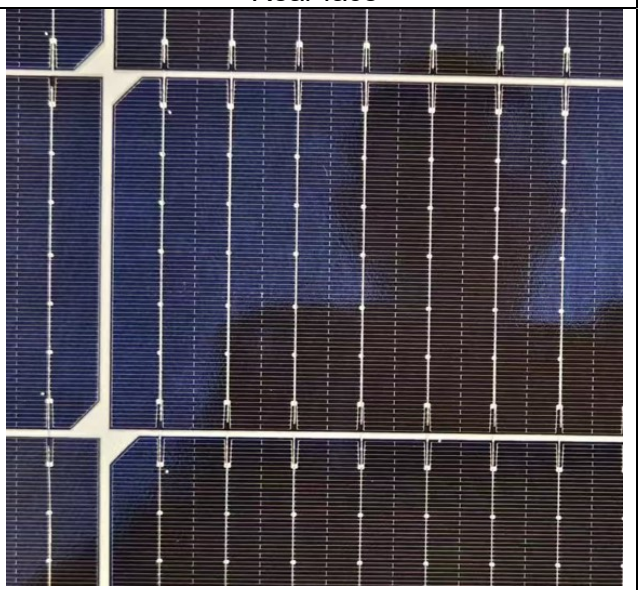
Pmax measurement uncertainty: 2.16% (K=2) Voc measurement uncertainty: 1.00% (K=2) Isc measurement uncertainty: 2.40% (K=2)

www.tuvsud.com

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch,
TÜV SÜD Group

5F, Communication Building, 163 Pingyun Rd, Huangpu Ave. West,Guangzhou, 510656, P.R.China

Annex 4: Picture of the module

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Front face</td><td>Rear face</td></tr>
<tr><td> 
</td><td>  </td></tr>
<tr><td>nameplate</td><td>Solar cell</td></tr>
</table>

6 Summary

Below parameters are measured on three representative PV modules:

- The relative efficiency test results under different irradiance at 25°C
- Performance at the real irradiance and temperature conditions in table 2 of the IEC 61853-1

Based on the test results, PANFILE are optimized in Pvsyst. Efficiency vs. irradiance curves are generated using PVsyst and the newly created PAN file, which is highly matched with the test results in lab.

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
TÜV SÜD Group

Tested by: Catherine Shu

Catherine Shu, Project Handler

Approved by: Tom Cai

Tom Cai, Designated Reviewer

--- End of Report ---

www.tuvsud.com

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch,
TÜV SÜD Group

5F, Communication Building, 163 Pingyun Rd, Huangpu Ave.
West,Guangzhou, 510656, P.R.China