

Supporting Information

26.75 cm² organic solar modules demonstrate a certified efficiency of 14.34%

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1. Materials

PM6, Y6 and PC₆₁BM were purchased from Solarmer Materials Inc. The molybdenum oxide (MoO₃) was purchased from Sigma-Aldrich. Chloroform was purchased from Shanghai Titan Scientific Co., Ltd. ZnO nanoparticles inks were synthesized according to our previous work^[1]. ITO-coated glass substrates were purchased from Beijing HuaMin New Materials Technology Co., Ltd.

2. Device fabrication

Small-area OSCs were fabricated with a device structure of ITO/ZnO:PEI/Active Layer/MoO₃/Ag. The ITO glass was sequentially cleaned with detergent, deionized water, and ethanol, then dried at 70 °C in a baking oven. After 25 min UV treatment for the ITO substrate, a thin layer ZnO:PEI was deposited through doctor-blading at 21 mm/s on ITO-coated glass. Then the active layer was blade-coated from a solution of PM6:Y6 (1:1.2, wt%; 22 mg/mL) in chloroform on the ZnO:PEI layer. The ambient temperature and substrate temperature are regulated by air conditioning, which is left on overnight. The substrate temperature of 30 °C can be easily achieved by the heating plate on the doctor-blade coater. The active layer was transferred to the glovebox and annealed at 100 °C for 10 min. Next, MoO₃ (~10 nm) and silver (Ag, ~100 nm) were sequentially deposited on active layers by thermal evaporation. The large-area modules were fabricated with similar processing steps to the small-area OSCs.

3. AFM

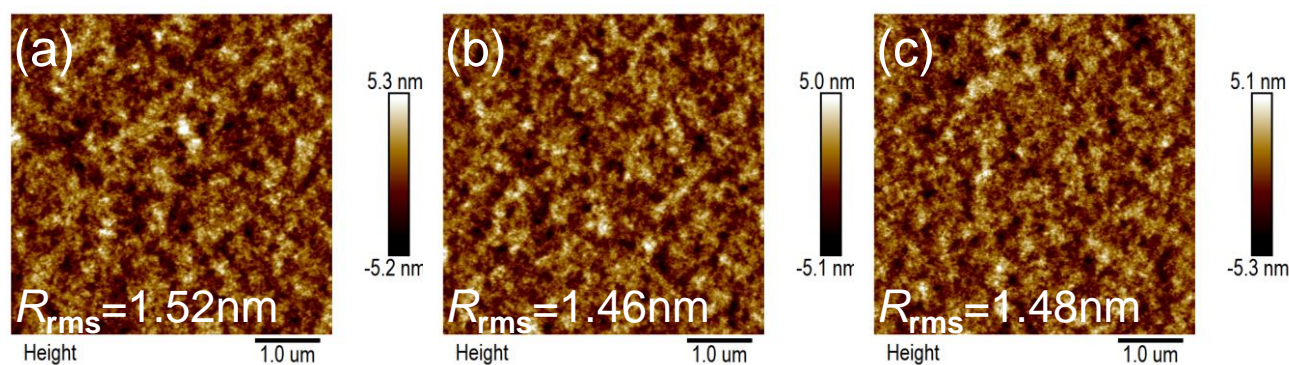


Fig. S1. (Color online) AFM height images of doctor-bladed PM6:Y6 blend thin films at the different temperatures. (a) 17 °C. (b) 24 °C. (c) 30 °C.

4. 2D GIWAXS

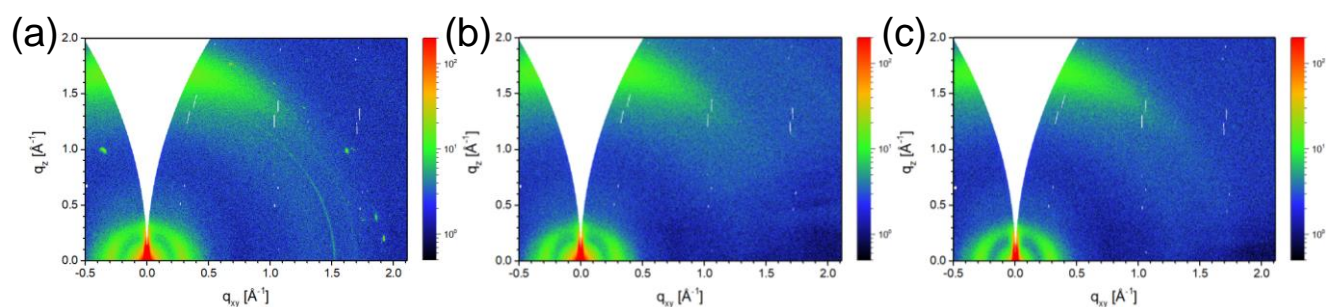


Fig. S2. (Color online) 2D GIWAXS patterns of doctor-bladed PM6:Y6 blend thin films at the different temperatures. (a) 17 °C. (b) 24 °C. (c) 30 °C.

5. Device performance

Table S1. Performance parameters of doctor-bladed small-area PM6:Y6 OSCs at the different temperatures.

Temperature (°C)	V_{oc} (V)	J_{sc} (mA/cm ²)	J_{cal} (mA/cm ²)	FF (%)	PCE (average) (%)
17	0.832	24.33	23.80	71.98	14.57 (14.35)
24	0.832	24.65	23.87	72.06	14.78 (14.58)
30	0.834	24.23	23.67	72.47	14.64 (14.46)

6. Bimolecular recombination and trap-assisted recombination

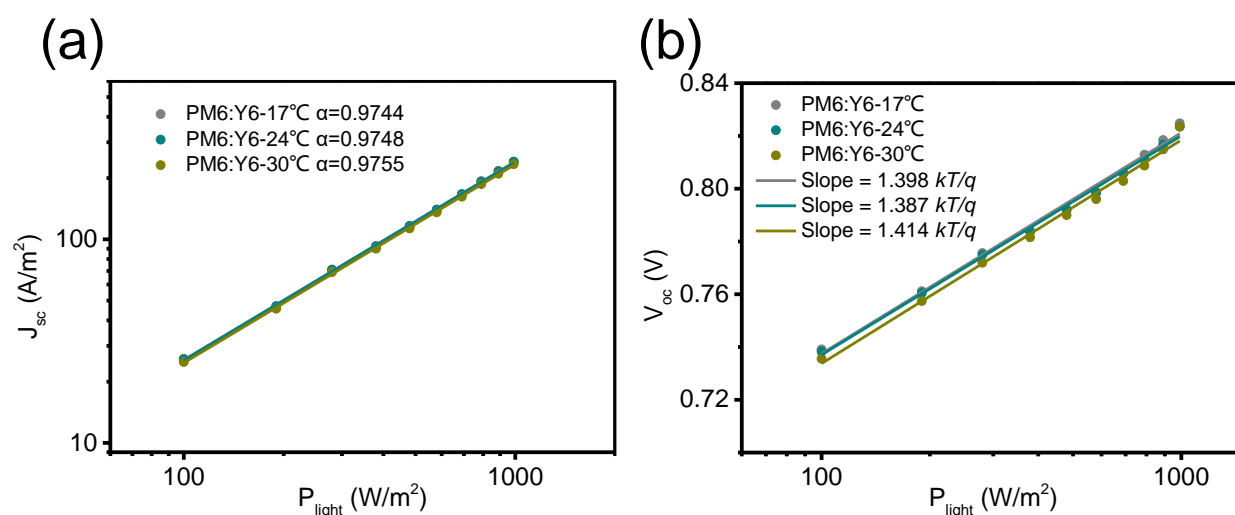


Fig. S3. (Color online) (a) Light intensity-dependent J_{sc} , and (b) Light intensity-dependent V_{oc} of PM6:Y6 OSC devices fabricated at the different temperatures.

7. NPVM certification for PM6:Y6 module



福建省计量科学研究院
FUJIAN METROLOGY INSTITUTE
(国家光伏产业计量测试中心)
National PV Industry Measurement and Testing Center



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合格
TESTING
CNAS L0131

检测报告

Test Report

报告编号: 22Q3-00143
Report No.

客户名称 <small>Name of Customer</small>	Junliang Yang Group, Central South University
联络信息 <small>Contact Information</small>	932 South Lushan Road, Yuelu District, Changsha, Hunan Province, 410083, China
物品名称 <small>Name of Items</small>	Organic Solar Cell Module
型号/规格 <small>Type /Specification</small>	7 cm × 6.5 cm
物品编号 <small>Items No</small>	B17
制造厂商 <small>Manufacturer</small>	Junliang Yang Group, Central South University
物品接收日期 <small>Items Receipt Date</small>	2022-06-28
检测日期 <small>Test Date</small>	2022-06-28



福建省计量科学研究院
证书/报告专用章
3501020056403

批准人		黎健生
核 验 员		何翔
检 测 员		陈彩云

发布日期 2022 年 06 月 30 日
Date of Report Year month Day



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第 1 页/共 7 页
Page of Pages

Fig. S4. NPVM report for PM6:Y6 module.



1. 检测机构说明:

Testing institutions that

本院为国家法定计量检定机构, 国家光伏产业计量测试中心依托本院检测技术开展检测。本院/本中心质量管理体系符合 GB/T 27025 (ISO/IEC 17025, IDT) 标准要求。

The institute is a national legal metrological institution. National PV Industry Measurement and Testing Center carries out testing relying on the institute's testing technology. The Center's quality management system meets the requirements of GB/T 27025 (ISO/IEC 17025, IDT) standard.

2. 本次检测所依据的检测方法(代号及名称):

Reference documents from the test (code, name)

IEC 60904-1-2020 光伏器件-第一部分: 光伏电流-电压特性的测量; IEC 60904-8:2014 光伏器件-第8部分光伏器件的光谱响应度测量

3. 本次检测所使用的主要测量仪器:

Measurement standards used in this test

仪器名称 Name	仪器编号 Number	测量范围 Measuring Range	不确定度/或准确度等级/或最大允许误差 Uncertainty or Accuracy Class or Maximum Permissible Error	溯源机构名称/证书编号 Name of traceability institution/Certificate No.	有效期限 Due date
源表	10807C008 78-2	电流: -10 μ A~1A; 电压: 20mV~20V	测量: DCV: $U_{rel}=0.05\%$, $k=2$; DCI: $U_{rel}=0.05\%$, $k=2$ 输出: DCV: $U_{rel}=0.05\%$, $k=2$; DCI: $U_{rel}=0.05\%$, $k=2$	福建计量院 22D2-01826	2023-04-13
太阳模拟器	2015-006	(300~1200) nm; (800~1200) W/m ²	光谱匹配度(300~310) nm: $U_{rel}=7.4\%$ ($k=2$); (310~400) nm: $U_{rel}=6.4\%$ ($k=2$); (400~1200) nm: $U_{rel}=5.5\%$ ($k=2$); 辐照度比 $U_{rel}=1.2\%$ ($k=2$)	福建计量院 22Q2-00720	2023-06-16
WPVS 单晶硅标准电池	015-2014	(300~1200) nm	$U_{rel}=1.3\%$ ($k=2$)	中国计量院 GXgf2021-10725	2023-04-05
Si 光电探测器	Si-2	(300~1100) nm	(300~400) nm $U_{rel}=1.8\% \sim 1.7\%$ ($k=2$); (400~450) nm $U_{rel}=1.7\% \sim 1.3\%$ ($k=2$); (450~1000) nm $U_{rel}=1.3\% \sim 1.2\%$ ($k=2$); (1000~1100) nm $U_{rel}=1.2\% \sim 1.7\%$ ($k=2$)	中国计量院 GXgf2021-10903	2023-03-24
数字温度计	15-B	(15~65) $^{\circ}$ C	$U=0.060$ $^{\circ}$ C ($k=2$)	福建计量院 22B2-07588	2023-06-20

4. 检测地点及环境条件:

Location and environmental condition for the test

地点: Room 108, Building 4, MinHou Scientific Research Base

Location

温度: 24.9 $^{\circ}$ C

Temperature

相对湿度: 51 %

Relative Humidity

其它: /

Others

5. 备注: /

Note

本报告提供的结果仅对本次被检的物品有效。

The data are valid only for the instrument(s) under testing.

检测报告续页专用

Continued page of test report

Fig. S5. NPVM report for PM6:Y6 module.



检测结果/说明:

Results of Test and Additional Explanation.

- 1 Standard Test Condition (STC): Total Irradiance: 1000 W/m²
Temperature: 25.0 °C
Spectral Distribution: AM1.5G

- 2 Measurement Data and I-V/P-V Curves under STC

Forward Scan

I_{sc} (mA)	V_{oc} (V)	I_{MPP} (mA)	V_{MPP} (V)	P_{MPP} (mW)	FF (%)	η (%)
48.56	10.64	41.99	8.640	362.8	70.22	13.56

Reverse Scan

I_{sc} (mA)	V_{oc} (V)	I_{MPP} (mA)	V_{MPP} (V)	P_{MPP} (mW)	FF (%)	η (%)
48.21	10.66	41.75	8.589	358.6	69.78	13.41

Mismatch Factor: 0.9884

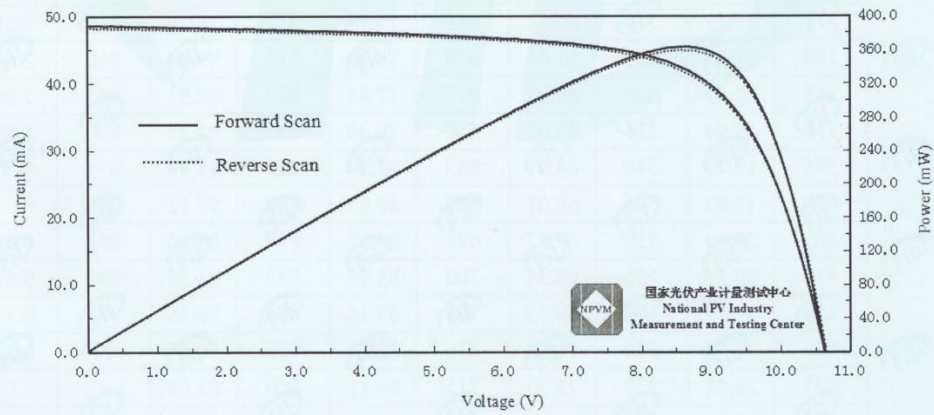


Figure 1. I-V and P-V characteristic curves of the measured sample under STC

Fig. S6. NPVM report for PM6:Y6 module.



检测结果/说明:

Results of Test and Additional Explanation.

3 Measurement Data and Curve of Relative Spectral Responsivity (SR) of the Measured Sample

Wavelength (nm)	SR(%)	Wavelength (nm)	SR(%)	Wavelength (nm)	SR(%)	Wavelength (nm)	SR(%)	Wavelength (nm)	SR(%)
300	3.23	445	34.25	590	75.56	735	92.56	880	59.17
305	4.24	450	36.98	595	76.13	740	93.15	885	52.51
310	5.52	455	39.70	600	76.98	745	93.85	890	49.09
315	6.80	460	42.46	605	77.61	750	94.64	895	41.40
320	8.31	465	44.95	610	77.42	755	95.36	900	34.78
325	9.67	470	47.24	615	77.91	760	95.93	905	29.43
330	10.65	475	49.30	620	78.21	765	96.51	910	24.50
335	11.41	480	51.13	625	78.25	770	97.16	915	20.23
340	12.28	485	52.68	630	77.95	775	97.83	920	15.75
345	13.44	490	54.09	635	77.47	780	98.13	925	13.76
350	15.01	495	55.32	640	76.84	785	98.70	930	10.92
355	16.97	500	56.48	645	76.03	790	99.10	935	8.52
360	18.53	505	57.67	650	75.44	795	99.47	940	6.57
365	20.90	510	58.63	655	75.06	800	99.84	945	5.21
370	21.88	515	59.56	660	75.06	805	99.82	950	4.17
375	21.79	520	60.64	665	75.73	810	100.00	955	3.28
380	21.22	525	61.64	670	76.70	815	99.64	960	2.61
385	20.49	530	62.73	675	77.85	820	98.95	965	2.08
390	19.94	535	63.65	680	79.49	825	98.30	970	1.59
395	19.70	540	64.91	685	81.24	830	98.08	975	1.20
400	19.83	545	66.01	690	82.85	835	97.11	980	0.86
405	20.04	550	67.17	695	84.42	840	95.10	985	0.65
410	20.59	555	68.33	700	85.95	845	93.15	990	0.57
415	21.49	560	69.73	705	87.12	850	90.36	995	0.39
420	22.82	565	71.04	710	88.27	855	86.57	1000	0.33
425	24.48	570	72.20	715	89.11	860	82.68	/	/
430	26.59	575	73.20	720	90.15	865	77.84	/	/
435	28.89	580	74.00	725	90.94	870	72.56	/	/
440	31.46	585	74.81	730	91.77	875	66.42	/	/

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Fig. S7. NPVM report for PM6:Y6 module.



检测结果/说明:

Results of Test and Additional Explanation.

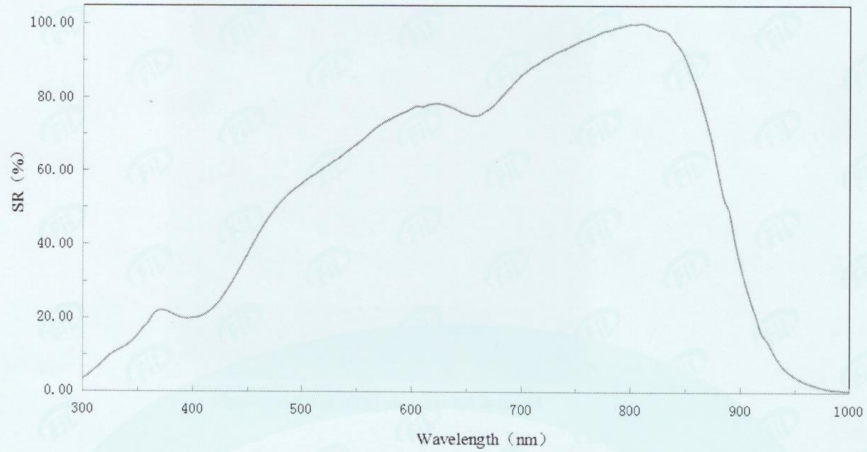


Figure 2. Relative spectral responsivity curve of the measured sample

4 Pictures of the Measured Sample

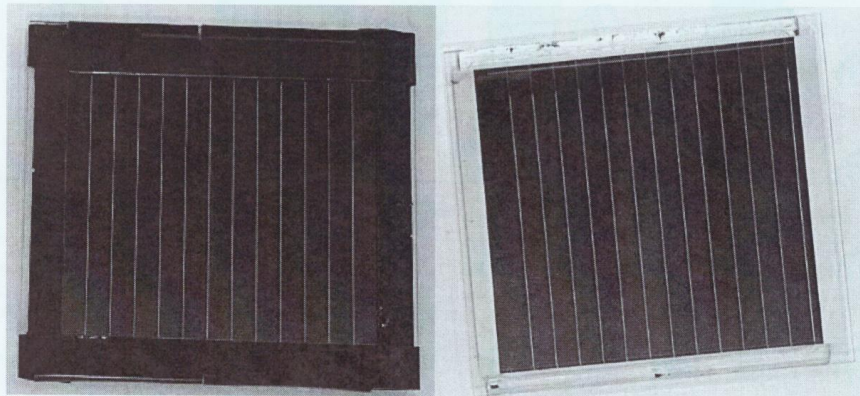


Figure 3. Mask used during test and obverse side of the sample

Fig. S8. NPVM report for PM6:Y6 module.



检测结果/说明:
Results of Test and Additional Explanation.

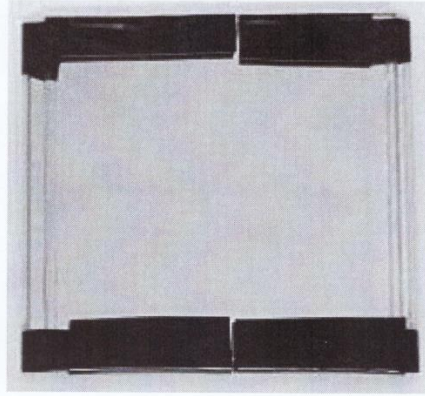


Figure 4. Reverse side of the measured sample

Uncertainty of Measurement Results:

Short-Circuit Current: $U_{rel}=1.8\%$ ($k=2$); Open-Circuit Voltage: $U_{rel}=1.0\%$ ($k=2$);

Maximum Power: $U_{rel}=2.2\%$ ($k=2$); Efficiency: $U_{rel}=2.2\%$ ($k=2$); Fill Factor: $U_{rel}=3.2\%$ ($k=2$).

Relative Spectral Responsivity:

(300~400) nm: $U_{rel} = 2.2\%$ ($k=2$);

(400~1000) nm: $U_{rel} = 1.8\%$ ($k=2$).

说明: The aperture area of the measured sample was 26.75 cm².

Explanation

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Testing Method (Code and Name) for This Test

IEC 60904-1: 2020 Photovoltaic devices- Part 1: Measurement of photovoltaic current-voltage characteristics

IEC 60904-8: 2014 Photovoltaic devices- Part 8: Measurement of spectral responsivity of a photovoltaic (PV) device

Fig. S9. NPVM report for PM6:Y6 module.



检测结果/说明:

Results of Test and Additional Explanation.

Measurement Standards Used in This Test					
Name	Number	Measuring Range	Uncertainty or Accuracy Class or Maximum Permissible Error	Name of Traceability Institution/Certificate No.	Due Date
SourceMeter	10807C0087 8-2	DCI: (-10 μ A~1A); DCV: (20mV~20V)	Measure: DCV: $U_{rel}=0.05\%,k=2$; DCI: $U_{rel}=0.05\%,k=2$ Output: DCV: $U_{rel}=0.05\%,k=2$; DCI: $U_{rel}=0.05\%,k=2$	Fujian Metrology Institute/ 22D2-01826	2023-04-13
Solar Simulator	2015-006	(300~1200) nm; (800~ 1200) W/m ²	Spectral Match: (300~310) nm: $U_{rel}=7.4\% (k=2)$; (310~ 400) nm: $U_{rel}=6.4\%$ ($k=2$); (400~1200) nm: $U_{rel}=5.5\% (k=2)$; Irradiance Ratio: $U_{rel}=1.2\% (k=2)$	Fujian Metrology Institute/ 22Q2-00720	2023-06-16
WPVS Monocrystalline Silicon Reference Cell	015-2014	(300~1200) nm	$U_{rel}=1.3\% (k=2)$	National Institute of Metrology/ GXgf2021-10725	2023-04-05
Si Photoelectric Detector	Si-2	(300~1100) nm	(300~400) nm $U_{rel}=1.8\%~1.7%$ ($k=2$); (400~450) nm $U_{rel}=1.7\%~$ $1.3\% (k=2)$; (450~1000) nm $U_{rel}=1.3\%~1.2\% (k=2)$; (1000~ 1100) nm $U_{rel}=1.2\%~1.7\% (k=2)$	National Institute of Metrology/ GXgf2021-10903	2023-03-24
Digital Thermometer	15-B	(15~65) °C	$U=0.060\text{ }^{\circ}\text{C} (k=2)$	Fujian Metrology Institute/22B2-07588	2023-06-20

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Fig. S10. NPVM report for PM6:Y6 module.

8. NPVM certification for PM6:Y6:PC₆₁BM module

 福建省计量科学研究院 FUJIAN METROLOGY INSTITUTE (国家光伏产业计量测试中心) National PV Industry Measurement and Testing Center		  中国合格评定 国家认可 检测 TESTING CNAS L0131	
<h1>检测报告</h1> Test Report			
报告编号: 22Q3-00142 Report No.			
客户名称 Name of Customer	Junliang Yang Group, Central South University		
联络信息 Contact Information	932 South Lushan Road, Yuelu District, Changsha, Hunan Province, 410083, China		
物品名称 Name of items	Organic Solar Cell Module		
型号/规格 Type/Specification	7 cm × 6.5 cm		
物品编号 Items No	B21		
制造厂商 Manufacturer	Junliang Yang Group, Central South University		
物品接收日期 Items Receipt Date	2022-06-28		
检测日期 Test Date	2022-06-28		
	批准人		黎健生
	核 验 员		何翔
	检 测 员		陈彩云
发布日期 2022 年 06 月 30 日 Date of Report Year month Day			
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网址: www.fjil.net Web Site	咨询电话: 0591-87845050 Inquire line	投诉电话: 0591-87823025 Complaint Tel	
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第 1 页/共 7 页 Page of Pages			

Fig. S11. NPVM report for PM6:Y6:PC₆₁BM module.



1. 检测机构说明:

Testing institutions that

本院为国家法定计量检定机构, 国家光伏产业计量测试中心依托本院检测技术开展检测。本院/本中心质量管理体系符合 GB/T 27025 (ISO/IEC 17025, IDT) 标准要求。

The institute is a national legal metrological institution. National PV Industry Measurement and Testing Center carries out testing relying on the institute's testing technology. The Center's quality management system meets the requirements of GB/T 27025 (ISO/IEC 17025, IDT) standard.

2. 本次检测所依据的检测方法 (代号及名称):

Reference documents from the test (code.name)

IEC 60904-1-2020 光伏器件-第一部分: 光伏电流-电压特性的测量; IEC 60904-8:2014 光伏器件-第8部分光伏器件的光谱响应度测量

3. 本次检测所使用的主要测量仪器:

Measurement standards used in this test

仪器名称 Name	仪器编号 Number	测量范围 Measuring Range	不确定度/或准确度等级/或最大允许误差 Uncertainty or Accuracy Class or Maximum Permissible Error	溯源机构名称/证书编号 Name of traceability institution/Certificate No.	有效期限 Due date
源表	10807C008 78-2	电流: -10 μ A~1A; 电压: 20mV~20V	测量: DCV: $U_{rel}=0.05\%$, $k=2$; DCI: $U_{rel}=0.05\%$, $k=2$ 输出: DCV: $U_{rel}=0.05\%$, $k=2$; DCI: $U_{rel}=0.05\%$, $k=2$	福建计量院 22D2-01826	2023-04-13
太阳模拟器	2015-006	(300~1200) nm; (800~1200) W/m ²	光谱匹配度(300~310) nm: $U_{rel}=7.4\%$ ($k=2$); (310~400) nm: $U_{rel}=6.4\%$ ($k=2$); (400~1200) nm: $U_{rel}=5.5\%$ ($k=2$); 辐照度比 $U_{rel}=1.2\%$ ($k=2$)	福建计量院 22Q2-00720	2023-06-16
WPVS 单晶硅标准电池	015-2014	(300~1200) nm	$U_{rel}=1.3\%$ ($k=2$)	中国计量院 GXgf2021-10725	2023-04-05
Si 光电探测器	Si-2	(300~1100) nm	(300~400) nm $U_{rel}=1.8\% \sim 1.7\%$ ($k=2$); (400~450) nm $U_{rel}=1.7\% \sim 1.3\%$ ($k=2$); (450~1000) nm $U_{rel}=1.3\% \sim 1.2\%$ ($k=2$); (1000~1100) nm $U_{rel}=1.2\% \sim 1.7\%$ ($k=2$)	中国计量院 GXgf2021-10903	2023-03-24
数字温度计	15-B	(15~65) °C	$U=0.060$ °C ($k=2$)	福建计量院 22B2-07588	2023-06-20

4. 检测地点及环境条件:

Location and environmental condition for the test

地点: Room 108, Building 4, MinHou Scientific Research Base

Location

温度: 24.9 °C

Temperature

相对湿度: 51 %

Relative Humidity

其它: /

Others

5. 备注: /

Nota

本报告提供的结果仅对本次被检的物品有效。

The data are valid only for the instrument(s) under testing.

检测报告续页专用

Continued page of test report

Fig. S12. NPVM report for PM6:Y6:PC₆₁BM module.



检测结果/说明:

Results of Test and Additional Explanation.

- 1 Standard Test Condition (STC): Total Irradiance: 1000 W/m²
Temperature: 25.0 °C
Spectral Distribution: AM1.5G

- 2 Measurement Data and I-V/P-V Curves under STC

Forward Scan

I_{sc} (mA)	V_{oc} (V)	I_{MPP} (mA)	V_{MPP} (V)	P_{MPP} (mW)	FF (%)	η (%)
48.62	10.79	42.59	8.941	380.8	72.59	14.24

Reverse Scan

I_{sc} (mA)	V_{oc} (V)	I_{MPP} (mA)	V_{MPP} (V)	P_{MPP} (mW)	FF (%)	η (%)
48.52	10.85	42.68	8.991	383.7	72.89	14.34

Mismatch Factor: 0.9868

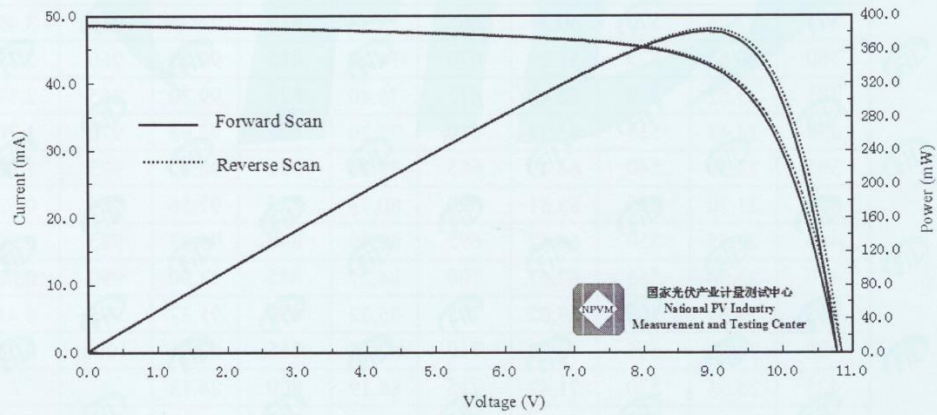


Figure 1. I-V and P-V characteristic curves of the measured sample under STC

Fig. S13. NPVM report for PM6:Y6:PC₆₁BM module.



检测结果/说明:

Results of Test and Additional Explanation.

3 Measurement Data and Curve of Relative Spectral Responsivity (SR) of the Measured Sample

Wavelength (nm)	SR(%)	Wavelength (nm)	SR(%)	Wavelength (nm)	SR(%)	Wavelength (nm)	SR(%)	Wavelength (nm)	SR(%)
300	4.79	445	33.80	590	74.44	735	92.01	880	61.08
305	6.23	450	36.21	595	75.08	740	92.57	885	54.21
310	8.04	455	38.61	600	76.04	745	93.44	890	50.50
315	9.89	460	41.19	605	76.70	750	94.28	895	42.80
320	12.18	465	43.52	610	76.81	755	94.92	900	35.97
325	14.33	470	45.67	615	77.36	760	95.52	905	30.51
330	15.90	475	47.72	620	77.69	765	96.08	910	25.42
335	16.91	480	49.69	625	77.68	770	96.71	915	21.04
340	17.79	485	51.38	630	77.33	775	97.33	920	16.43
345	18.85	490	52.93	635	76.61	780	97.78	925	14.30
350	20.38	495	54.27	640	75.66	785	98.42	930	11.42
355	22.49	500	55.57	645	74.54	790	98.91	935	8.97
360	24.47	505	57.08	650	73.64	795	99.25	940	6.92
365	27.26	510	58.15	655	73.06	800	99.73	945	5.54
370	28.23	515	59.20	660	72.91	805	99.83	950	4.44
375	27.86	520	60.31	665	73.33	810	100.00	955	3.49
380	26.83	525	61.29	670	74.28	815	99.88	960	2.77
385	25.52	530	62.40	675	75.40	820	99.30	965	2.19
390	24.43	535	63.27	680	77.20	825	98.68	970	1.70
395	23.59	540	64.49	685	78.96	830	98.60	975	1.28
400	23.20	545	65.51	690	80.73	835	97.56	980	0.92
405	22.85	550	66.62	695	82.49	840	95.73	985	0.70
410	22.90	555	67.67	700	84.27	845	93.90	990	0.60
415	23.39	560	69.02	705	85.72	850	91.37	995	0.41
420	24.30	565	70.27	710	87.16	855	87.91	1000	0.35
425	25.55	570	71.42	715	88.19	860	84.13	/	/
430	27.26	575	72.32	720	89.46	865	79.43	/	/
435	29.15	580	73.06	725	90.21	870	74.41	/	/
440	31.34	585	73.83	730	91.17	875	68.27	/	/

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正印

Fig. S14. NPVM report for PM6:Y6:PC₆₁BM module.



检测结果/说明:
Results of Test and Additional Explanation.

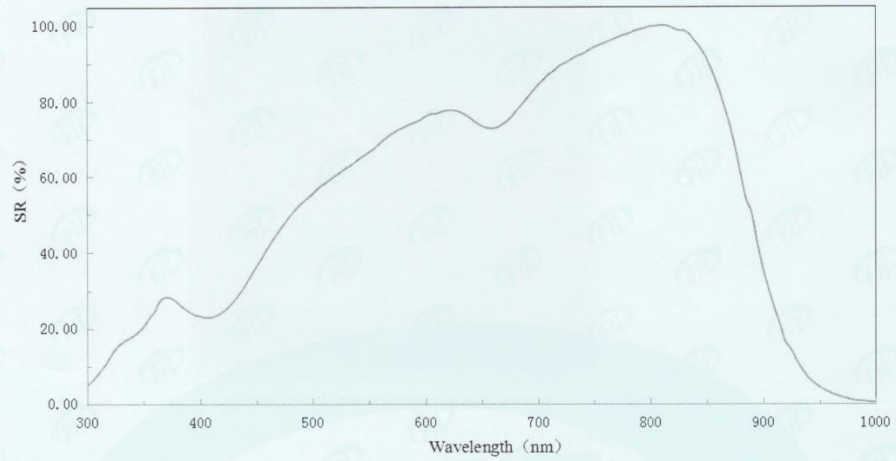


Figure 2. Relative spectral responsivity curve of the measured sample

4 Pictures of the Measured Sample

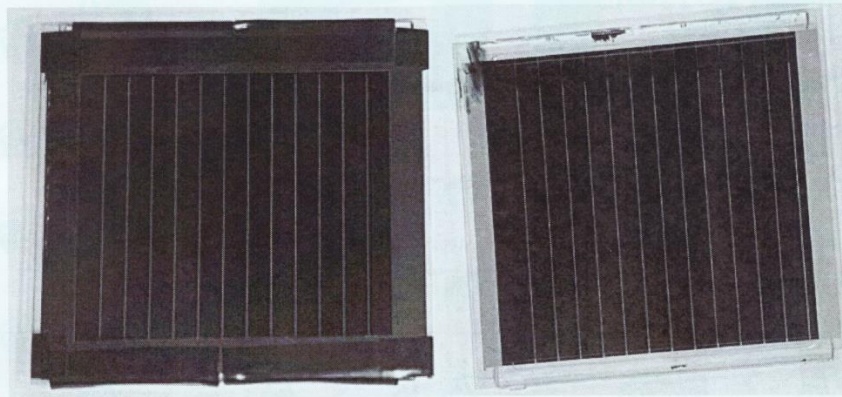


Figure 3. Mask used during test and obverse side of the sample

检测报告续页专用
Continued page of test report

Fig. S15. NPVM report for PM6:Y6:PC₆₁BM module.



检测结果/说明:
Results of Test and Additional Explanation.

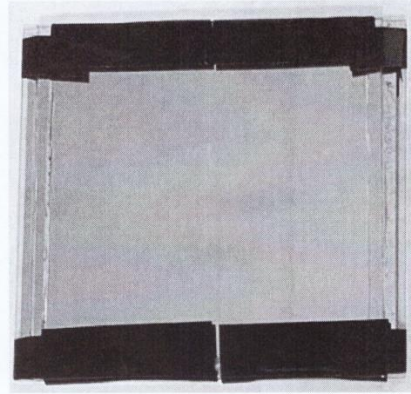


Figure 4. Reverse side of the measured sample

Uncertainty of Measurement Results:

Short-Circuit Current: $U_{rel}=1.8\%$ ($k=2$); Open-Circuit Voltage: $U_{rel}=1.0\%$ ($k=2$);

Maximum Power: $U_{rel}=2.2\%$ ($k=2$); Efficiency: $U_{rel}=2.2\%$ ($k=2$); Fill Factor: $U_{rel}=3.2\%$ ($k=2$).

Relative Spectral Responsivity:

(300~400) nm: $U_{rel} = 2.2\%$ ($k=2$);

(400~1000) nm: $U_{rel} = 1.8\%$ ($k=2$).

说明: The aperture area of the measured sample was 26.75 cm².

Explanation

量科
骑

Testing Method (Code and Name) for This Test
IEC 60904-1: 2020 Photovoltaic devices- Part 1: Measurement of photovoltaic current-voltage characteristics
IEC 60904-8: 2014 Photovoltaic devices- Part 8: Measurement of spectral responsivity of a photovoltaic (PV) device

Fig. S16. NPVM report for PM6:Y6:PC₆₁BM module.



检测结果/说明:

Results of Test and Additional Explanation.

Measurement Standards Used in This Test					
Name	Number	Measuring Range	Uncertainty or Accuracy Class or Maximum Permissible Error	Name of Traceability Institution/Certificate No.	Due Date
SourceMeter	10807C0087 8-2	DCI: (-10 μ A~1A); DCV: (20mV~20V)	Measure: DCV: $U_{rel}=0.05\%,k=2$; DCI: $U_{rel}=0.05\%,k=2$ Output: DCV: $U_{rel}=0.05\%,k=2$; DCI: $U_{rel}=0.05\%,k=2$	Fujian Metrology Institute/ 22D2-01826	2023-04-13
Solar Simulator	2015-006	(300~1200) nm; (800~ 1200) W/m ²	Spectral Match: (300~310) nm: $U_{rel}=7.4\% (k=2)$; (310~ 400) nm: $U_{rel}=6.4\%$ ($k=2$); (400~1200) nm: $U_{rel}=5.5\% (k=2)$; Irradiance Ratio: $U_{rel}=1.2\% (k=2)$	Fujian Metrology Institute/ 22Q2-00720	2023-06-16
WPVS Monocrystalline Silicon Reference Cell	015-2014	(300~1200) nm	$U_{rel}=1.3\% (k=2)$	National Institute of Metrology/ GXgf2021-10725	2023-04-05
Si Photoelectric Detector	Si-2	(300~1100) nm	(300~400) nm $U_{rel}=1.8\%~1.7\%$ ($k=2$); (400~450) nm $U_{rel}=1.7\%~$ 1.3% ($k=2$); (450~1000) nm $U_{rel}=1.3\%~1.2\% (k=2)$; (1000~ 1100) nm $U_{rel}=1.2\%~1.7\% (k=2)$	National Institute of Metrology/ GXgf2021-10903	2023-03-24
Digital Thermometer	15-B	(15~65) °C	$U=0.060\text{ }^{\circ}\text{C} (k=2)$	Fujian Metrology Institute/22B2-07588	2023-06-20

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Fig. S17. NPVM report for PM6:Y6:PC₆₁BM module.

Reference

- [1] Wu N, Luo Q, Bao Z, et al. Zinc oxide: Conjugated polymer nanocomposite as cathode buffer layer for solution processed inverted organic solar cells. *Sol Energy Mater Sol Cells*, 2015, 141, 248