

Solar Cells Reporting Summary

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► Experimental design

Please check: are the following details reported in the manuscript?

1. Dimensions

Area of the tested solar cells	☒ Yes ☐ No	0.125 cm ² or 0.1 cm ² (in Experimental section)
Method used to determine the device area	☒ Yes ☐ No	Defined by the aperture

2. Current-voltage characterization

Current density-voltage (J-V) plots in both forward and backward direction	☒ Yes ☐ No	Fig 3a and Fig s17a
Voltage scan conditions <i>For instance: scan direction, speed, dwell times</i>	☒ Yes ☐ No	J-V curves were measured at a scan rate of 130 mV/s or 260mV/s
Test environment <i>For instance: characterization temperature, in air or in glove box</i>	☒ Yes ☐ No	All device are measured in air at room temperature
Protocol for preconditioning of the device before its characterization	☐ Yes ☒ No	No preconditioning is required before characterization.
Stability of the J-V characteristic <i>Verified with time evolution of the maximum power point or with the photocurrent at maximum power point; see ref. 7 for details.</i>	☒ Yes ☐ No	Fig s17a

3. Hysteresis or any other unusual behaviour

Description of the unusual behaviour observed during the characterization	☐ Yes ☒ No	No Unusual behavior (Fig 3a and Fig s17a)
Related experimental data	☐ Yes ☒ No	No Unusual behavior

4. Efficiency

External quantum efficiency (EQE) or incident photons to current efficiency (IPCE)	☒ Yes ☐ No	Fig 3b
A comparison between the integrated response under the standard reference spectrum and the response measure under the simulator	☒ Yes ☐ No	Fig 3b
For tandem solar cells, the bias illumination and bias voltage used for each subcell	☐ Yes ☒ No	Single-layer solar cell

5. Calibration

Light source and reference cell or sensor used for the characterization	☒ Yes ☐ No	Current density-voltage (J-V) curves were measured under AM 1.5G one sun (100 mW/cm ²) illumination using a solar simulator (Oriel Sol 3A, class AAA) equipped with 450 W Xenon lamp (Newport 6280NS) and a Kiethley 2400 source meter.
Confirmation that the reference cell was calibrated and certified	☒ Yes ☐ No	The light intensity was adjusted by NREL-calibrated Si solar cell having KG-5 filter.

Calculation of spectral mismatch between the reference cell and the devices under test

☒ Yes
☐ No

It was reflected to the calibration process.

6. Mask/aperture

Size of the mask/aperture used during testing

☒ Yes
☐ No

0.125 cm² or 0.1 cm² (in Experimental section)

Variation of the measured short-circuit current density with the mask/aperture area

☐ Yes
☒ No

0.125 cm² for most of devices , 0.1cm² for only best performing devices

7. Performance certification

Identity of the independent certification laboratory that confirmed the photovoltaic performance

☐ Yes
☒ No

It has not measured in the independent certification laboratory

A copy of any certificate(s)

Provide in Supplementary Information

☐ Yes
☒ No

We don't have a certification.

8. Statistics

Number of solar cells tested

☒ Yes
☐ No

18 cells (in Fig s10)

Statistical analysis of the device performance

☒ Yes
☐ No

(in Fig s10)

9. Long-term stability analysis

Type of analysis, bias conditions and environmental conditions

For instance: illumination type, temperature, atmosphere humidity, encapsulation method, preconditioning temperature

☒ Yes
☐ No

Fig s17a