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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	The area of the tested solar cells (10.4 mm2) can be found in the method section
Method used to determine the device area	☒ Yes ☐ No	The device area was determined through an evaporation mask, see methods

2. Current-voltage characterization

Current density-voltage (J-V) plots in both forward and backward direction	☐ Yes ☒ No	In OPV devices the hysteresis effect is not observed.
Voltage scan conditions *For instance: scan direction, speed, dwell times*	☒ Yes ☐ No	Forward scan - 1V/s - dwell = 20 ms
Test environment *For instance: characterization temperature, in air or in glove box*	☒ Yes ☐ No	The devices were characterized in air at room temperature
Protocol for preconditioning of the device before its characterization	☐ Yes ☒ No	No preconditioning are necessary for OPV characterizations.
Stability of the J-V characteristic *Verified with time evolution of the maximum power point or with the photocurrent at maximum power point; see ref. 7 for details.*	☐ Yes ☒ No	The stability of the devices is out of the scope of this work.

3. Hysteresis or any other unusual behaviour

Description of the unusual behaviour observed during the characterization	☐ Yes ☒ No	No hysteresis was observed in our devices.
Related experimental data	☐ Yes ☒ No	N/A

4. Efficiency

External quantum efficiency (EQE) or incident photons to current efficiency (IPCE)	☒ Yes ☐ No	EQE graph in Figure 1d
A comparison between the integrated response under the standard reference spectrum and the response measure under the simulator	☒ Yes ☐ No	The integrated Jsc obtained from the EQE spectra agrees well with the Jsc value obtained from the J–V curves under the simulator within 5% deviation
For tandem solar cells, the bias illumination and bias voltage used for each subcell	☐ Yes ☒ No	N/A

5. Calibration

Light source and reference cell or sensor used for the characterization	☒ Yes ☐ No	Calibrated silicon reference cell - part of the commercial solar simulator
Confirmation that the reference cell was calibrated and certified	☒ Yes ☐ No	By supplier of the solar simulator

Calculation of spectral mismatch between the reference cell and the devices under test	☐ Yes ☒ No	Jsc (solar simulator) and Jsc (via EQE) agree within 5 % error

6. Mask/aperture

Size of the mask/aperture used during testing	☒ Yes ☐ No	Device area is determined by a mask with area of 10.4 mm2.
Variation of the measured short-circuit current density with the mask/aperture area	☒ Yes ☐ No	No variations observed

7. Performance certification

Identity of the independent certification laboratory that confirmed the photovoltaic performance	☐ Yes ☒ No	This work does not report record efficiency, therefore the photovoltaic performance of our devices were not confirmed from independent certification laboratories.
A copy of any certificate(s) *Provide in Supplementary Information*	☐ Yes ☒ No	N/A

8. Statistics

Number of solar cells tested	☒ Yes ☐ No	The average PCE of OSC is obtained from 24 independent devices.
Statistical analysis of the device performance	☒ Yes ☐ No	Statistical results of the devices are shown in Supplementary Table 8.

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	Not relevant for this work. However, shelf life of all devices was excellent.