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Solar Cells Reporting Summary

Nature Research wishes to improve the reproducibility of the work that we publish. This form is intended for publication with all accepted papers reporting the characterization of photovoltaic devices and provides structure for consistency and transparency in reporting. Some list items might not apply to an individual manuscript, but all fields must be completed for clarity.

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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	N/A
Method used to determine the device area	☐ Yes ☒ No	N/A

2. Current-voltage characterization

Current density-voltage (J-V) plots in both forward and backward direction	☐ Yes ☒ No	N/A
Voltage scan conditions *For instance: scan direction, speed, dwell times*	☐ Yes ☒ No	N/A
Test environment *For instance: characterization temperature, in air or in glove box*	☐ Yes ☒ No	N/A
Protocol for preconditioning of the device before its characterization	☐ Yes ☒ No	N/A
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	N/A

3. Hysteresis or any other unusual behaviour

Description of the unusual behaviour observed during the characterization	☐ Yes ☒ No	N/A
Related experimental data	☐ Yes ☒ No	N/A

4. Efficiency

External quantum efficiency (EQE) or incident photons to current efficiency (IPCE)	☐ Yes ☒ No	N/A
A comparison between the integrated response under the standard reference spectrum and the response measure under the simulator	☐ Yes ☒ No	N/A
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	N/A
Confirmation that the reference cell was calibrated and certified	☐ Yes ☒ No	N/A

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

☐ Yes
☒ No
N/A

6. Mask/aperture

Size of the mask/aperture used during testing

☐ Yes
☒ No
N/A

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

☐ Yes
☒ No
N/A

7. Performance certification

Identity of the independent certification laboratory that confirmed the photovoltaic performance

☐ Yes
☒ No
N/A

A copy of any certificate(s)
Provide in Supplementary Information

☐ Yes
☒ No
N/A

8. Statistics

Number of solar cells tested

☐ Yes
☒ No
N/A

Statistical analysis of the device performance

☐ Yes
☒ No
N/A

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
N/A