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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	Methods: Device Fabrication
Method used to determine the device area	☒ Yes ☐ No	Methods: Stability measurements (aperture mask with defined area)

2. Current-voltage characterization

Current density-voltage (J-V) plots in both forward and backward direction	☐ Yes ☒ No	JV data not relevant because no extraordinary PCE values reported and the study is about MPP
Voltage scan conditions *For instance: scan direction, speed, dwell times*	☒ Yes ☐ No	Supplementary Figure 2
Test environment *For instance: characterization temperature, in air or in glove box*	☒ Yes ☐ No	Methods: Stability measurements
Protocol for preconditioning of the device before its characterization	☐ Yes ☒ No	JV data not relevant because no extraordinary PCE values reported and the study is about MPP
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	all the data is obtained like this

3. Hysteresis or any other unusual behaviour

Description of the unusual behaviour observed during the characterization	☒ Yes ☐ No	when discussing Fig. 1h
Related experimental data	☒ Yes ☐ No	Supplementary Figure 1

4. Efficiency

External quantum efficiency (EQE) or incident photons to current efficiency (IPCE)	☒ Yes ☐ No	Supplementary Figure 12
A comparison between the integrated response under the standard reference spectrum and the response measure under the simulator	☐ Yes ☒ No	already reported for such devices
For tandem solar cells, the bias illumination and bias voltage used for each subcell	☐ Yes ☒ No	not applicable

5. Calibration

Light source and reference cell or sensor used for the characterization	☒ Yes ☐ No	Methods: Stability measurements
Confirmation that the reference cell was calibrated and certified	☒ Yes ☐ No	Methods: Stability measurements

Calculation of spectral mismatch between the reference cell and the devices under test	☐ Yes ☒ No	not explicitely done here because already reported and not focus here

6. Mask/aperture

Size of the mask/aperture used during testing	☒ Yes ☐ No	Methods: Stability measurements
Variation of the measured short-circuit current density with the mask/aperture area	☐ Yes ☒ No	only one mask with sufficient size used

7. Performance certification

Identity of the independent certification laboratory that confirmed the photovoltaic performance	☐ Yes ☒ No	Efficiency of such devices has been reported several times
A copy of any certificate(s) *Provide in Supplementary Information*	☐ Yes ☒ No	*Explain why this information is not reported/not relevant.*

8. Statistics

Number of solar cells tested	☒ Yes ☐ No	Data Availability
Statistical analysis of the device performance	☐ Yes ☒ No	for PCE well documented in the literature

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	topic of this study