

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 details can be found in the Methods/Characterization section.
Method used to determine the device area	☐ Yes ☒ No	We used the mask of known area.

2. Current-voltage characterization

Current density-voltage (J-V) plots in both forward and backward direction	☒ Yes ☐ No	Please see the description of Fig. 2
Voltage scan conditions <i>For instance: scan direction, speed, dwell times</i>	☒ Yes ☐ No	The details can be found in the Methods/Characterization section.
Test environment <i>For instance: characterization temperature, in air or in glove box</i>	☒ Yes ☐ No	The details can be found in the Methods/Characterization section.
Protocol for preconditioning of the device before its characterization	☒ Yes ☐ No	The details can be found in the Methods/Characterization section.
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	Please see the description of Fig. 2g.

3. Hysteresis or any other unusual behaviour

Description of the unusual behaviour observed during the characterization	☐ Yes ☒ No	We have not observed any unusual behavior in the J-V measurements
Related experimental data	☐ Yes ☒ No	We do not observe any unusual behavior

4. Efficiency

External quantum efficiency (EQE) or incident photons to current efficiency (IPCE)	☒ Yes ☐ No	Please check the description of Fig. 2
A comparison between the integrated response under the standard reference spectrum and the response measure under the simulator	☒ Yes ☐ No	Please check the description of Fig. 2h
For tandem solar cells, the bias illumination and bias voltage used for each subcell	☐ Yes ☒ No	The article does not report J-V measurements of Tandem cells.

5. Calibration

Light source and reference cell or sensor used for the characterization	☒ Yes ☐ No	The details can be found in the Methods/Characterization section.
Confirmation that the reference cell was calibrated and certified	☒ Yes ☐ No	The details can be found in the Methods/Characterization section.

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

☒ Yes
☐ No

The details can be found in the Methods/Characterization section.

6. Mask/aperture

Size of the mask/aperture used during testing

☒ Yes
☐ No

The details can be found in the Methods/Characterization section.

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

☐ Yes
☒ No

We have used only one mark size in all our measurements

7. Performance certification

Identity of the independent certification laboratory that confirmed the photovoltaic performance

☐ Yes
☒ No

Our article does not report record efficiency in perovskite solar cells, so certification is not required.

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

☐ Yes
☒ No

We have not sent our photovoltaic cells for certification

8. Statistics

Number of solar cells tested

☒ Yes
☐ No

Please check the figure caption of Fig. 2d.

Statistical analysis of the device performance

☒ Yes
☐ No

Please check the description of Fig. 2d.

9. Long-term stability analysis

Type of analysis, bias conditions and environmental conditions

☒ Yes
☐ No

Please check the description of Fig. 5c.

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