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Corresponding author(s): Saif A. Haque, M. Saiful Islam

# 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 section |
| Method used to determine the device area | ☒ Yes ☐ No | Methods section |

2. Current-voltage characterization

| | | |
|---|---|---|
| Current density-voltage (J-V) plots in both forward and backward direction | ☐ Yes ☒ No | Not relevant to our study |
| Voltage scan conditions<br>*For instance: scan direction, speed, dwell times* | ☒ Yes ☐ No | Methods section |
| Test environment<br>*For instance: characterization temperature, in air or in glove box* | ☒ Yes ☐ No | Methods section |
| Protocol for preconditioning of the device before its characterization | ☒ Yes ☐ No | Methods section |
| Stability of the J-V characteristic<br>*Verified with time evolution of the maximum power point or with the photocurrent at maximum power point; see ref. 7 for details.* | ☐ Yes ☒ No | Not relevant to our study |

3. Hysteresis or any other unusual behaviour

| | | |
|---|---|---|
| Description of the unusual behaviour observed during the characterization | ☐ Yes ☒ No | Not relevant to our study |
| Related experimental data | ☐ Yes ☒ No | Not relevant to our study |

4. Efficiency

| | | |
|---|---|---|
| External quantum efficiency (EQE) or incident photons to current efficiency (IPCE) | ☐ Yes ☒ No | Not relevant to our study |
| A comparison between the integrated response under the standard reference spectrum and the response measure under the simulator | ☐ Yes ☒ No | Not relevant to our study |
| For tandem solar cells, the bias illumination and bias voltage used for each subcell | ☐ Yes ☒ No | Not relevant to our study |

5. Calibration

| | | |
|---|---|---|
| Light source and reference cell or sensor used for the characterization | ☒ Yes ☐ No | Methods section |
| Confirmation that the reference cell was calibrated and certified | ☐ Yes ☒ No | Not relevant to our study |

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

☐ Yes
☒ No

Not relevant to our study

6. Mask/aperture

Size of the mask/aperture used during testing

☐ Yes
☒ No

Not relevant to our study

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

☐ Yes
☒ No

Not relevant to our study

7. Performance certification

Identity of the independent certification laboratory that confirmed the photovoltaic performance

☐ Yes
☒ No

Not relevant to our study

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

☐ Yes
☒ No

Not relevant to our study

8. Statistics

Number of solar cells tested

☒ Yes
☐ No

Figure S9, Supplementary Information

Statistical analysis of the device performance

☒ Yes
☐ No

Figure S9 and Table S2, Supplementary Information

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 to our study