Outdoor Stabilization of Thin-Film Photovoltaic Module Performance

Introduction

Thin-film (TF) photovoltaic (PV) modules go through the process of preconditioning before they reach the metastable and rated operating point. We expose six TF PV modules of three different technologies:

- amorphous silicon (a-Si a,b),
- micromorph tandem silicon (a-Si/µc-Si a,b) and
- chalcopyrite (CIS a,b)

to outdoor conditions to receive 500 kWh/m² of total solar irradiation (H$_{ann}$) and monitor the STC performance and electroluminescence (EL).

Results

Amorphous silicon

![Graph and images]

Inhomogeneity dynamics:

A: insufficient P3 cuts . . . . . mitigation
B: systematic shunts . . . . . improvement
C: shunt . . . . . . . . . . . . . . formation

Outdoor performance stabilization

- a-Si based TF PV modules initially degrade.
- CIS based TF PV modules initially improve.
- Dark storage shows the opposite behaviour
- a-Si PV modules improve, while CIS degrade.

Conclusion

- EL exhibits higher sensitivity to changes than performance parameters.
- Some detected inhomogeneities show temporal changes, among them also mitigation and improvement.

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matevz.bokalic@fe.uni-lj.si

University of Ljubljana, Faculty of Electrical Engineering, 25, SI-1000 Ljubljana, Slovenia