

Technical University of Denmark



Novel Field test design and initial result for AC and DC characterization for PV-panels

Thorsteinsson, Sune; Riedel, Nicholas; Santamaria Lancia, Adrian Alejo; Poulsen, Peter Behrendorff; Symonowicz, Joanna Karolina; Pedersen, Finn Aage Christensen; Benatto, Gisele Alves dos Reis

Publication date:
2017

Document Version
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):
Thorsteinsson, S., Riedel, N., Santamaria Lancia, A. A., Poulsen, P. B., Symonowicz, J. K., Pedersen, F. A. C., & Benatto, G. A. D. R. (2017). Novel Field test design and initial result for AC and DC characterization for PV-panels. Paper presented at 5th international workshop on LED and Solar Applications, Kgs. Lyngby, Denmark.

DTU Library
Technical Information Center of Denmark

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Novel Field test design and initial result for AC and DC characterization for PV-panels

S. Thorsteinsson^{1,*}, N. Riedel¹, A. Lancia¹, P. Poulsen¹, J. Symonowicz¹, F. Pedersen¹, G. Benatto¹

¹Department of Photonics Engineering, Technical University of Denmark, Frederiksborgvej 399, 4000, Roskilde, Denmark

*E-mail:sunth@fotonik.dtu.dk

Abstract—This work describes the design and initial test results of a field test for PV modules, where the PV modules the majority of the time operates to produce power at their maximum power point. Sequentially the individual modules are switched into a measurement circuitry for IV curves and impedance spectra, with the aim to correlate fault mechanisms to power loss.

Keywords— Field testing, Silicon PV panels, Degradation

I. INTRODUCTION

Controlled field test of modules is important in order to estimate the impact on faults in the field [1], and correlate degradation mechanism to power loss under real operating conditions. In this work we describe a field test, where the modules under test the majority of the time delivers power to grid via commercially available power electronics for PV, and periodically the individual modules is switched into a measurement circuit where IV-curves and impedance spectra is recorded.

II. DESIGN

The overall objective of this work was to establish a field test that enables panel characterization during operation, to investigate how faults on PV modules develop during normal operation. The objective described above was achieved by connecting the modules to commercially available load electronics for grid connection. A relay system was made which can switch the modules into a “measurement bus” facilitating a measurement of an IV-curve and acquisition of an impedance spectrum. The overall principle is shown in Fig. 1. and the load system is designed with the aim to maximize the time each module is operating in its maximum power point.

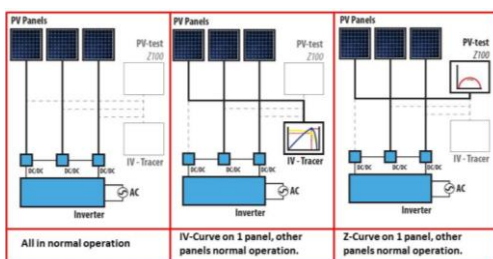


Fig. 1. Working principle of the field test.

III. EXPERIMENTAL PLAN

Modules that had undergone mechanical load test were mounted on the field test together with virgin modules of the same type and batch. Prior to mounting on the Field test indoor IV curves and electroluminescence images of the modules were acquired, Fig. 2.

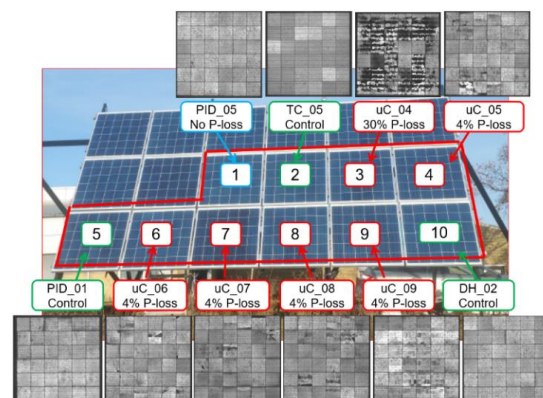


Fig. 2. The field station built at DTU Risø Campus for measuring current-voltage (IV) and IS spectra of PV panels along with weather conditions.

An initial result show that the indoor measurement at STC is generally 2-3 % higher compared to the outdoor clear sky measurements correct to STC before applying the spectral mismatch correction. The field test has now been running for more than a year, and future work includes investigation of the power loss and the development of the micro cracks during this year of field aging.

ACKNOWLEDGMENT

The work was funded by the Energy Technology Development and Demonstration Program (EUDP).

REFERENCES

[1] M. Kántges, S. Kurtz, C. Packard, U. Jahn, K. A. Berger, K. Kato, T. Friesen, H. Lui, and M. Van Iseghem, “Review of Failures of Photovoltaic Modules,” 2014.