Angle resolved performance measurements on PV glass and modules

Juutilainen, Line Tollund; Thorsteinsson, Sune; Poulsen, Peter Behrens Dorff; Thorseth, Anders; Dam-Hansen, Carsten; Amdemeskel, Mekbib Wubishet; Canulescu, Stela; Rødder, Peter Melchior; Rødder, Kristin

Publication date: 2016

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

Citation (APA):

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.
Angle resolved performance measurements on PV glass and modules

L. T. Juutilainen¹, S. Thorsteinsson¹, P. B. Poulsen¹*, A. Thorseth¹, C. Dam-Hansen¹, M. W. Amdemeskela¹, S. Canulescu¹, P. M. Rødder², K. Rødder²

¹Department of Photonics Engineering, Technical University of Denmark, Frederiksborgvej 399, Building 130, 4000 Roskilde, Denmark
²SolarLab, 8260 Viby J., Denmark

*Contact: Phone +45 21325110; E-mail: ppou@fotonik.dtu.dk

This research is funded by the Danish Energy Agency within the EUDP programme with the project journal number 64014-0185 “PV BALCONY FENCE – a highly esthetic cost efficient PV integrated balcony”.

Motivation
PV balcony fences are an example of PV application where odd angles of incidence are pronounced. The angular performance of the PV cover glass has a crucial impact on the energy output. We have characterized the angular response on a range of glasses with different AR properties.

Depiction of setup for outdoor measurements as viewed from above. Two pipes leads direct sun light into boxes containing the test sample and a reference sample respectively. The test sample rotates as the angular performance is measured.

Short circuit current measurements. Angular response is obtained by normalizing with respect to normal incidence and reference to the cosine function.

Estimation of annual effective irradiance south faced balcony in Roskilde, Denmark. The results are derived from a simple model based on irradiance data obtained from PVgis folded with the angular response curves.

Conclusion
Proper assessment of solar glass for PV balcony fences requires knowledge of the angular properties of the optical layers. Here solar glass have been investigated. A difference of 13% between annual yield of the best and worst performing solar glass is found.

Outlook
Outdoor measurements introduce additional errors. Future work will include improvement of the experimental setup, while still keeping the actual sun as light source.