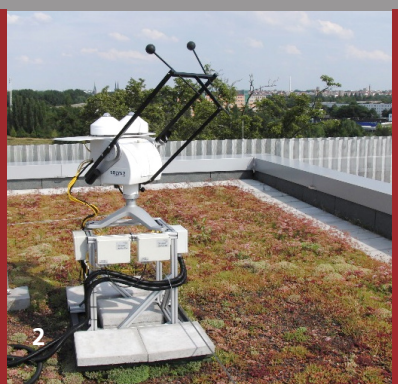
Fraunhofer
CSP

FRAUNHOFER CENTER FOR SILICON PHOTOVOLTAICS CSP



1 *Rooftop test site on Fraunhofer CSP.*
2 *SOLYS 2 – Sun Tracker.*
3 *Two axis tracking system*

OUTDOOR MODULE EFFICIENCY AND ENERGY YIELD

COMPETENCIES AND SERVICE

- Comparison of module performance and specific energy yield of different module technologies (see also: Malik, et al. at PVSEC 2014)
- Evaluation and comparison of different combinations of materials in PV modules and their degradation behavior on the basis of outdoor measurements (e.g. polymers, glass surfaces, ARC coatings)
- Testing of modules according to IEC 61215 under outdoor conditions:
  - ⇨ Determination of temperature coefficients
  - ⇨ Determination of NOCT (nominal operating cell temperature)
  - ⇨ Outdoor exposure test (60kWh/m²)
- Further module characterization according to the Energy Rating Standard IEC 61853 (»Energy Rating«) under various irradiance and temperature conditions
- Impact of incidence angle effects on module performance (e.g. AR-coating)
- International partnership with institutions in Singapore and Morocco (Green Energy Park) (see also: Malik, et al. at 1st Africa PVSEC)

OUTDOOR MEASURING SET-UP

	Fixed mounting system	Two axis tracking system
Module orientation	Azimuth: 180 ° (South) Inclination: 30 °	Operation mode: • Astronomical tracking • Or user defined tracking sequence (variability of inclination- & azimuth angles)
Numbers of measuring places	30	6
Measuring interval	10 s	
Module parameter	IV-Curve (I_{SC}, V_{OC}, P_{MPP}), Module temperature	
Meteorological parameter	Irradiance (global, direct, diffuse und in plane of array) Ambient temperature Wind speed & direction Relative humidity Air pressure Rainfall & duration	
Module operation mode	Maximum-Power-Point-Tracking, I_{SC}, V_{OC}	

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