



Contribution ID: 169

Type: Oral Presentation

Optical design of low concentration photovoltaic modules

Wednesday, 13 July 2011 11:30 (15 minutes)

The benefit of concentrating sunlight onto solar cells is that expensive solar cell material can be reduced and replaced with relatively inexpensive optical elements, which has the potential to reduce the cost of solar energy. In low concentration photovoltaics (LCPV), solar cells are subjected to higher irradiance levels. The electrical output, and hence efficiency of a LCPV module is dependent on the amount of irradiance, temperature and more importantly the uniformity of illumination across the solar cells. This paper discusses the design and characterization of the optical subsystem of a LCPV concentrator. By optimizing the aperture area of the LCPV concentrator while still maintaining a uniform illumination intensity across the solar cells, the module's electrical performance can be maximized. In the study a mathematical model was developed to design and evaluate suitable optical elements for LCPV application. This model was based on a faceted reflector that was designed to meet a predetermined set of boundary conditions. Initial evaluation of an experimental LCPV concentrator, based on this type of design, will be discussed in this paper. Results from the model illustrate the angles and positions of receiver and reflectors for maximum geometric concentration ratio as well as the best illumination profile across the receiver.

**Level (Hons, MSc,
 PhD, other)?**

MSc

**Consider for a student
 award (Yes / No)?**

Yes

**Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?**

No

Primary author: Mr BENECKE, Mario (Nelson Mandela Metropolitan University)

Co-authors: Prof. VAN DYK, Ernest (Nelson Mandela Metropolitan University); Dr VORSTER, Frederik (Nelson Mandela Metropolitan University)

Presenter: Mr BENECKE, Mario (Nelson Mandela Metropolitan University)

Session Classification: Applied

Track Classification: Track F - Applied and Industrial Physics