Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

A large-area, LED-based spectral response measurement system for solar PV device characterization

BEHRANG HAMADANI, JOHN ROLLER, HOWARD YOON, BRIAN DOUGHERTY, National Institute of Standards and Technology — Accurate and reliable measurement of the spectral responsivity (SR) of a solar cell is an important step in evaluating the electrical performance of competing photovoltaic (PV) technologies. We have investigated ways to measure the spectral responsivity, and hence the external quantum efficiency, of solar cells using measurement techniques that employ light emitting diodes (LEDs). Our setup includes one or more plates of compactly-installed, high-powered LEDs each containing up to 32 different LEDs that span the wavelength range of 375 nm to 1200 nm. Each LED plate is placed at the entrance of a tapered, highly reflective light guide for light mixing and large-area projection. Two unique measurement techniques have been investigated at NIST. The first technique consists of an LED sweep algorithm where a pulsed signal is applied to a given LED and the photogenerated current from the device under test is recorded using a lock-in technique. In the second SR technique, 32 variable-frequency, pulsed signals are applied to all LEDs at the same time, while recording the photogenerated current by a spectrum analyzer in the frequency domain. We will describe the uniqueness and advantages offered by each technique in detail and compare the accuracy of the two methods. A scheme for providing light bias and its impact on the SR measurements will be reported.

Behrang Hamadani
National Institute of Standards and Technology

Date submitted: 13 Nov 2011 Electronic form version 1.4