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Monte Carlo Simulations of Luminescent Solar Concentrators with Front-Facing Photovoltaic Cells for Building Integrated Photovoltaics SHIN WOEI LEOW, Electrical Engineering, University of California Santa Cruz, CARLEY CORRADO, MELISSA OSBORN, SUE CARTER, Physics Department, University of California Santa Cruz — Luminescent solar concentrators (LSCs) have the ability to receive light from a wide range of angles and concentrate the captured light on to small photo active areas. This enables LSCs to be integrated more extensively into buildings as windows and wall claddings on top of roof installations. LSCs with front facing PV cells collect both direct and concentrated light ensuring a gain factor greater than one. It also allows for flexibility in determining the placement and percentage coverage of PV cells when designing panels to balance reabsorption losses, power output and the level of concentration desired. A Monte-Carlo ray tracing program was developed to study the transport of photons and loss mechanisms in LSC panels and aid in design optimization. The program imports measured absorption/emission spectra and transmission coefficients as simulation parameters. Interactions of photons with the LSC panel are determined by comparing calculated probabilities with random number generators. Simulation results reveal optimal panel dimensions and PV cell layouts to achieve maximum power output.

Shin Woei Leow
Electrical Engineering, University of California Santa Cruz

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