Technical Assistance Request

There are 4 main components to our indoor photovoltaic wireless energy transfer system that will require some technical assistance. Modifying the crystalline silicon solar cell to overcome the low light recombination velocity involves using higher concentrations of artificial light density. Using monochromatic light to generate photocurrent will be used to operate the crystalline silicon solar cells near one sun conditions. This will require the monochromatic light to inject photocurrent in the range of 40 mA/cm2 in order to establish a baseline safety operating point.

- Solar cell characterization using a lighted current voltage tester is needed and is available at Georgia Institute of Technology for lab rental
- Solar cell internal quantum efficiency measurements and other electrical parameters is also requested (minority carrier lifetime, electroluminescence
- Proper lens selection and optimization for 850nm light focusing is also requested and potentially available at a National Lab such Oak Ridge or National Renewable Energy Lab
- Selection of high efficiency infrared LEDs without a dispersion lens is the final critical component to achieve the indoor photovoltaic wireless energy transfer system using the most common components.

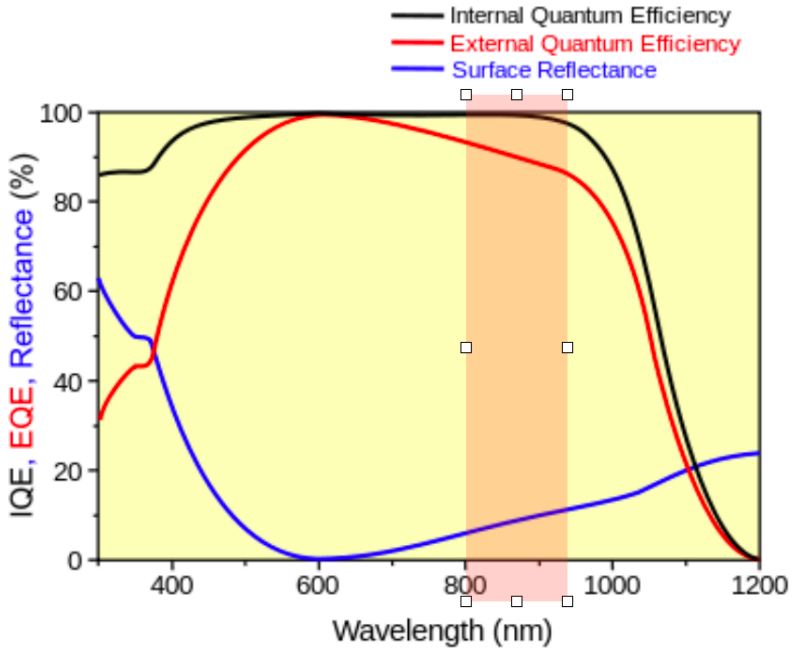

Figure 1. Internal Quantum Efficiency for typical crystalline silicon solar cell. Minimum reflectance is designed for 600nm and can be shifted to 900nm. Photocurrent collection remains close to 100% out to 1000 nm.

Design of circuit boards and programing via Arduino is proposed as the generation 2 product and should be readily available within the Nation of Makers and at Georgia Institute of Technology

See Figure 1 representing a typical Internal Quantum Efficiency (IQE) graph to highlight some key areas for improved solar cell performance by shifting the reflectance minimum to ~900 nm. One can also observe that the IQE for wavelengths of light between 400 nm and 1000 nm is typically above 97% for one sun illumination conditions.

Exposure to companies interested in IPV products is also a key technical request.