

# Fabrication of High Concentration Reflected Photovoltaic Module

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## Abstract

The task of this study is to find the optimal condition of designed High Concentration Reflected Photovoltaic (HCRPV) module by simulation method whose concentration ratio is set to be 872. This simulated optimal condition was then utilized to fabricate HCRPV module. In simulation, the focal length of first and secondary mirror, the slope angle and the length of light guide tube were the main parameters to be optimized. From simulation, the light collective efficiency, the energy uniformity, the shape of light spot diagrams can be obtained. It was found that square based pyramid light guide tube can effectively improve the uniformity of light. When the slope angle of square based pyramid shape of light guide tube is set to be 3 degree, the focal length of the first mirror is 60mm and the secondary mirror vertex distance is designed to be 93.1mm, the HCRPV module have the best performance. It was also found that the light collective efficiency can be reached to about 97.7% with these conditions. The Aluminum HCRPV module was then fabricated according to the optimal simulated conditions. As the solar energy of illumination is 650 W/m<sup>2</sup>, the voltage on the multi-junction solar cell was measured to be 2.56V, the current was measured to be 0.68A. The corresponding power was about 1.74W. When the HCRPV module was coated with silver material,

the voltage on the multi-junction solar cell was measured to be 2.7V, the current was measured to be 2.83A, as the solar energy of illumination is 800 W/m<sup>2</sup>. The corresponding power is about 7.64W.

Keyword : High Concentration Reflected Photovoltaic (HCRPV), Light Guide Tube, Multi-junction