

Alta Devices Single Junction Solarcell Tops 28 Percent Efficiency

by Staff Writers

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When the scientists at Alta Devices began seeing their solar devices achieve efficiency results beyond what was previously thought possible, they realized that something scientifically important was going on. Their conclusion: a great solar cell also emits light and collecting that light increases cell performance.

Previously, the efficiency of a solar device was understood to be based in part on the amount of external light that could be captured and retained, but this understanding didn't account for the necessity to maximize the number of photons being generated within the device itself in order to achieve even higher efficiencies. This discovery has the potential to change expectations for the future of solar devices.



Extraction of light generated inside [solar](#) devices proves critical

At the PVSC37 conference taking place this week in Seattle, Alta will disclose details of how it achieved record cell efficiencies of 27.6% late last year, as well as its best result to date of 28.2%. Both results have been verified by the National [Renewable Energy](#) Laboratory (NREL).

These cell efficiencies exceed the previous highest demonstrated efficiency of 26.4%. The theoretical maximum solar cell efficiency limit for a single junction device has been shown to be 33.5% (called the "Shockley-Queisser Limit"), but efforts to attain this efficiency have been slow in coming.

"Up until now it was understood that to increase the current from our best solar materials, we had to find ways to get the material to absorb more light," said Alta co-founder Eli Yablonovitch, director of the NSF Center for [Energy Efficient](#) Electronics Science and professor at the University of California at Berkeley.

"But, the voltage is a different story. It was not recognized that to maximize the voltage, we needed the material to generate more photons inside the solar cell. Counter-intuitively, efficient light emission is the key for these high efficiencies."

At the conference, Prof. Yablonovitch, will present a description and analysis of this scientific discovery.

"In 2009, our team came to me with an aggressive timeline for solar cell efficiency advances, but with a few caveats: they were butting up against what appeared to be entrenched, practical limits," said Christopher Norris, president and CEO of Alta.

"Nevertheless, over the past two years, the team has succeeded in meeting each of its milestones." According to Norris, Alta's scientists and engineers have achieved new cell efficiency improvements about once every two months.

"We are committed to using new scientific understanding, such as internal light generation and extraction, to push the limits of solar cell and module efficiencies while simultaneously [driving](#) production costs down through other important developments," Norris stated.

"The goal of achieving the \$1 per [installed](#) watt target set by the Department of Energy has energized our entire company."

The Alta paper being presented at the PVSC37 conference is entitled "[27.6% Conversion Efficiency, A New Record For Single-Junction Solar Cells Under 1 Sun Illumination](#)". It will feature Alta's Dr. Brendan Kayes, who will explain how Alta achieved its results.

The title of Prof. Yablonovitch's paper is "[The Physics Required to Approach the Shockley-Queisser Limit](#)", and concentrates on the scientific discovery itself.

Prof. Harry Atwater, Alta co-founder and Director of the Energy Frontier Research Center on Light-Matter Interactions as well as Director of the Resnick Institute for [Science](#), Energy and Sustainability at CalTech, will give a plenary talk in this conference entitled "[Paths to High Efficiency Low Cost Photovoltaics](#)".

Said Atwater, "The energy conversion efficiency results being achieved by Alta, in combination with other manufacturing and form factor advances, will enable new ways to deploy solar without the economic compromises of other technologies."

Alta Devices was founded in 2007 and is focused on improving the production economics of high efficiency solar PV applications. Alta is currently a development stage company and has received venture capital funding from August Capital, Kleiner Perkins Caufield and Byers, Crosslink Capital, AIMCo and others. The company is based in Santa Clara, CA.