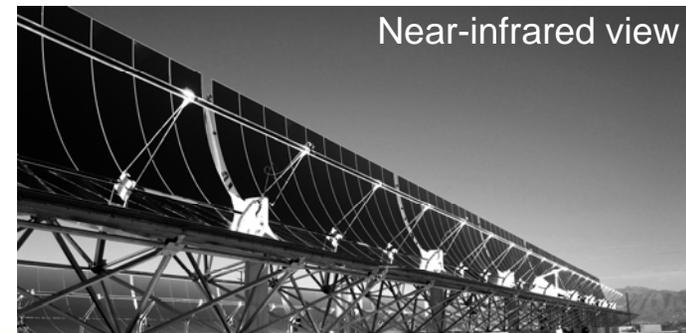
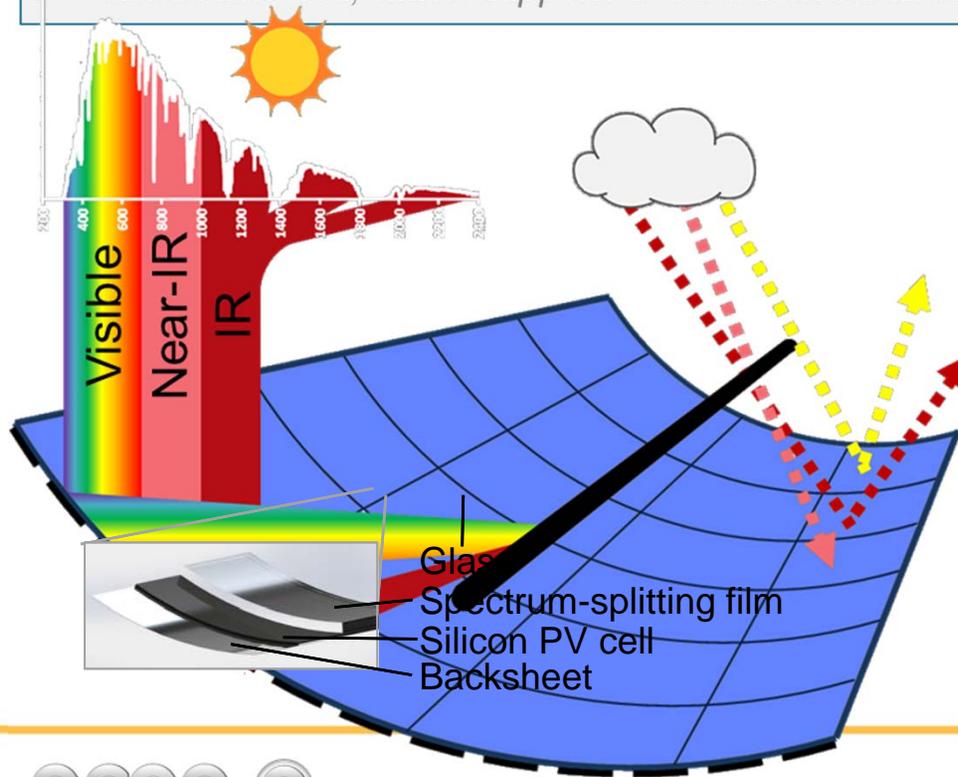


Zachary Holman, Arizona State University

PVMirror: A Solar Concentrator Mirror Incorporating PV Cells

What is the technology?

- Hybrid solar-power-plant technology combining the high efficiency of photovoltaics (PV) with the energy storage benefits of concentrating solar thermal power (CSP)
- **CSP perspective:** A trough mirror that steals some of the light and spits out DC electricity
- **PV perspective:** Strange four-terminal tandem in which the top cell is under one-sun illumination and the bottom cell, which happens to be a thermal absorber, is under concentration

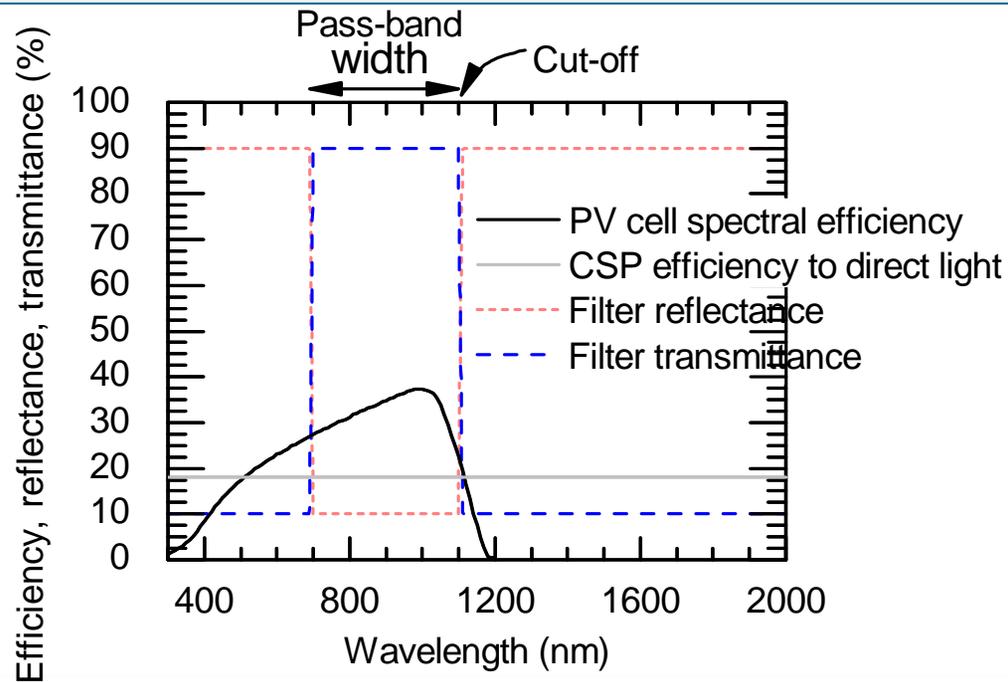


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How does it improve the state-of-the-art?

- Spectrum-splitting film directs the solar spectrum to location of best use; VIS & IR reflected to the CSP receiver tube, NIR transmitted to the PV cells

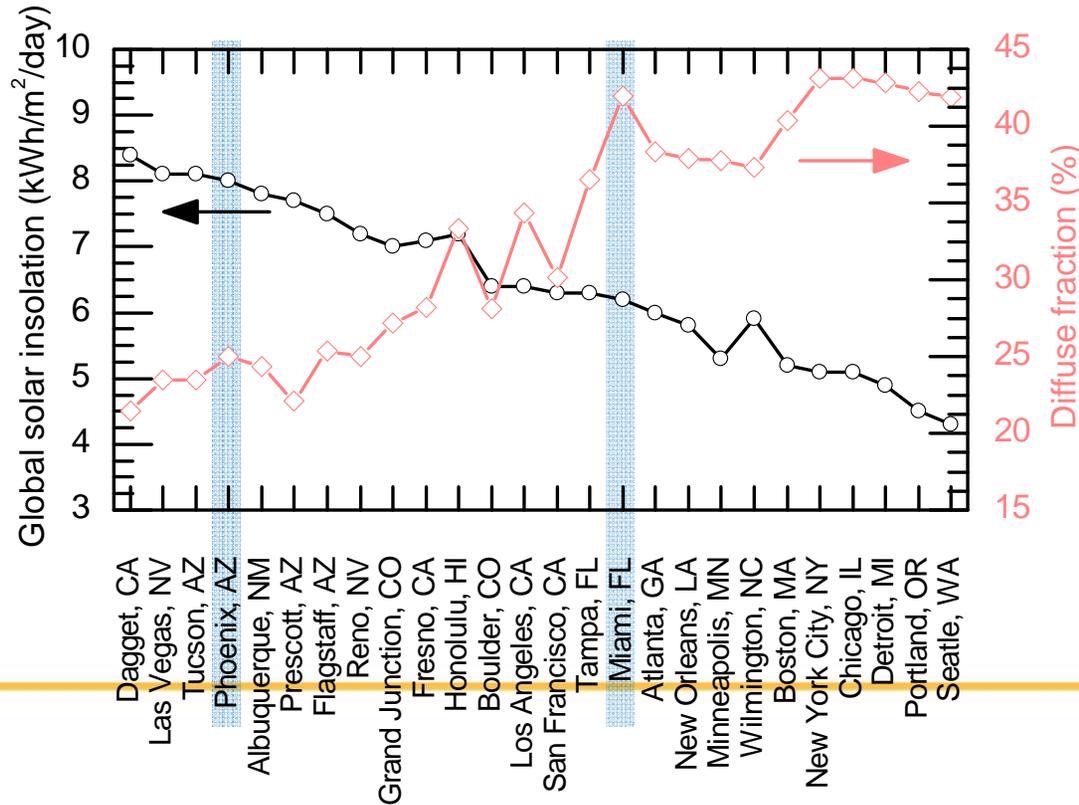


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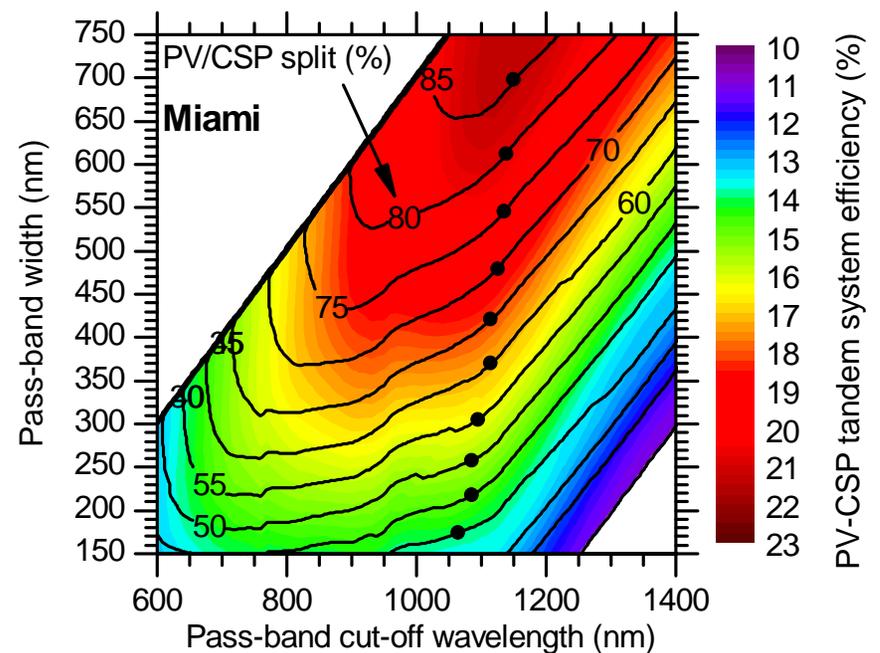
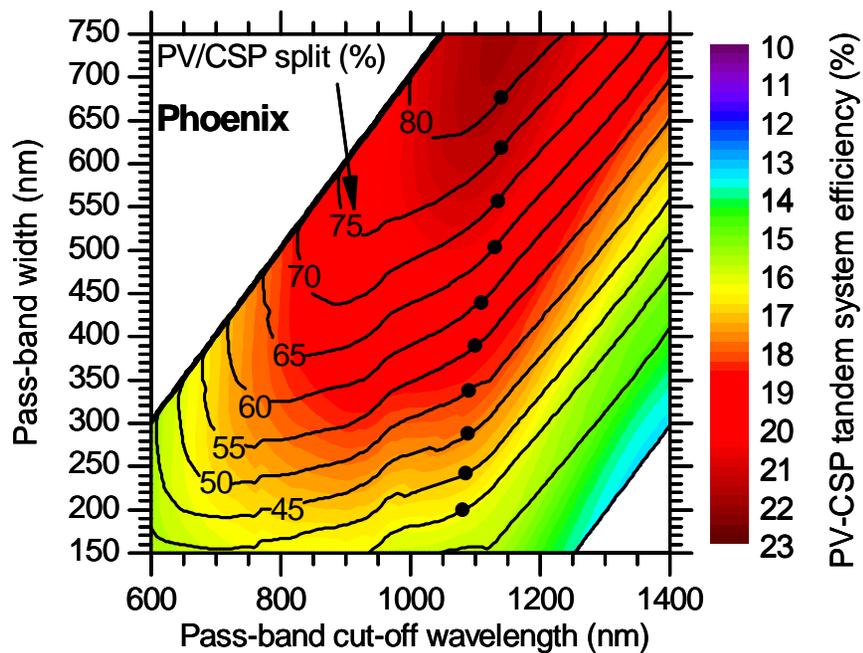


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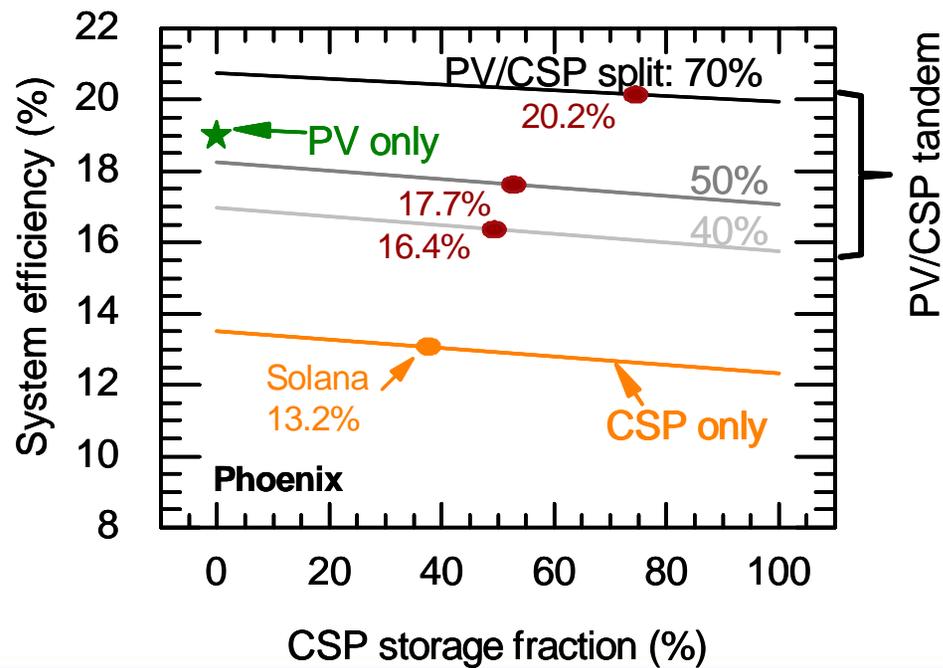


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- Diffuse light is collected by PV cells → broader geographical use than CSP
- 50% higher annual energy output than trough CSP... but with the same storage capacity
- Only 10% more \$\$\$ than trough CSP

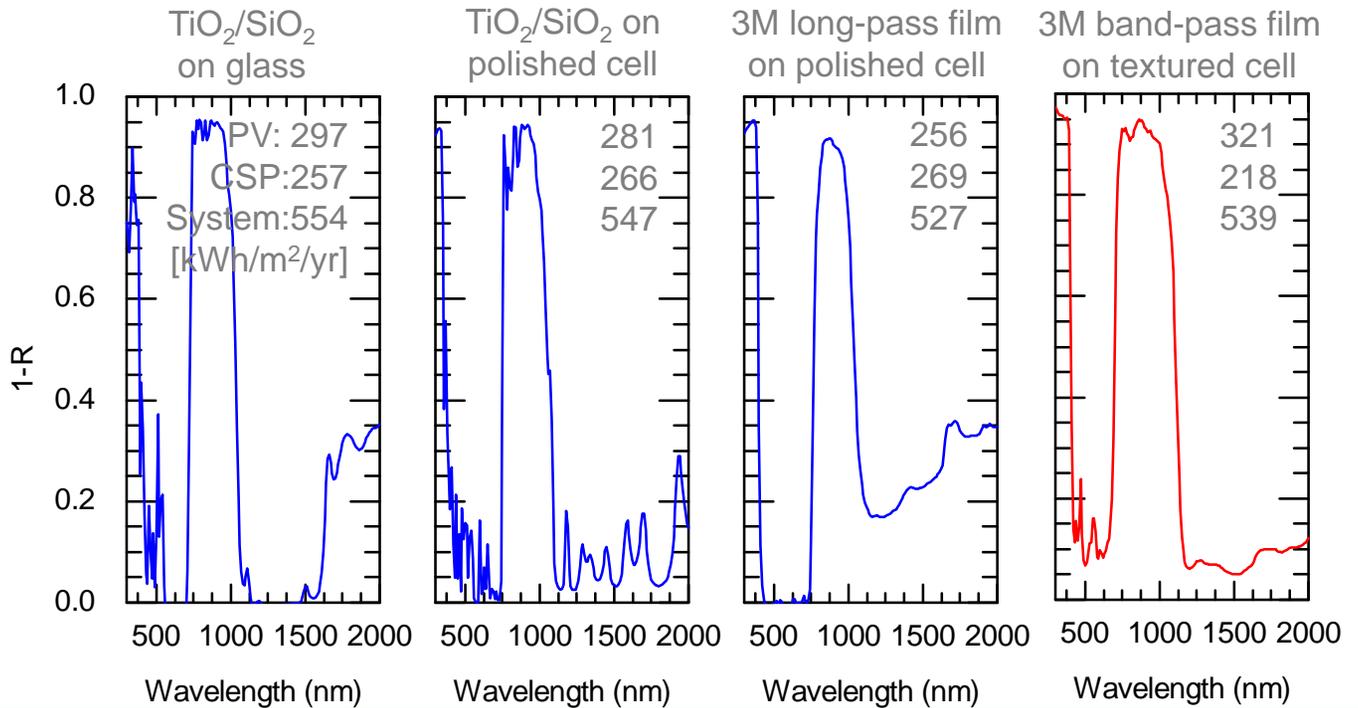


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Status and achievements of the project to date

- Silicon solar cells with enhanced NIR efficiency designed and fabricated
- Dichroic mirror down-selection



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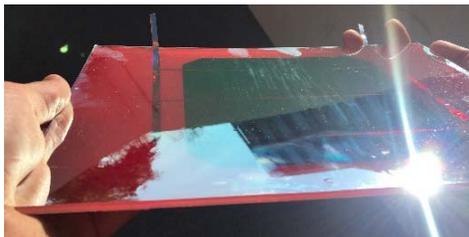
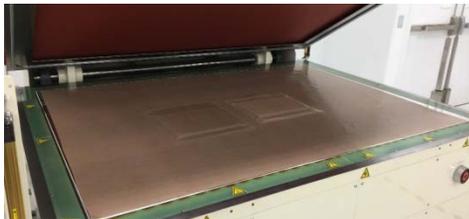


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Status and achievements of the project to date

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- Dichroic mirror down-selection
- Light reflected from prototype measured to be highly specular (<10 mrad half cone)
- Prototypes with cell voltages ~700 mV successfully fabricated and on tracker



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PVMirror: A Solar Concentrator Mirror Incorporating PV Cells

Challenges that the team has encountered

- Larger-than-expected FF losses after tabbing cells
- 3M does not presently manufacture a band-pass film with the desired optical properties
- Conformal lamination of 3M films is challenging; also simultaneously need good shear strength

