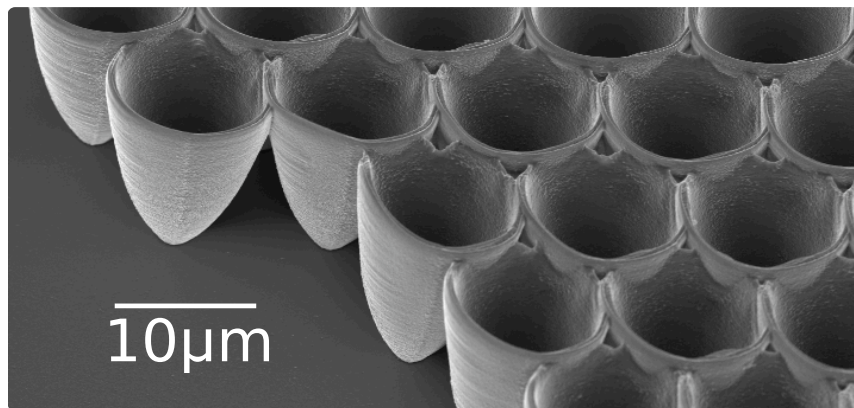
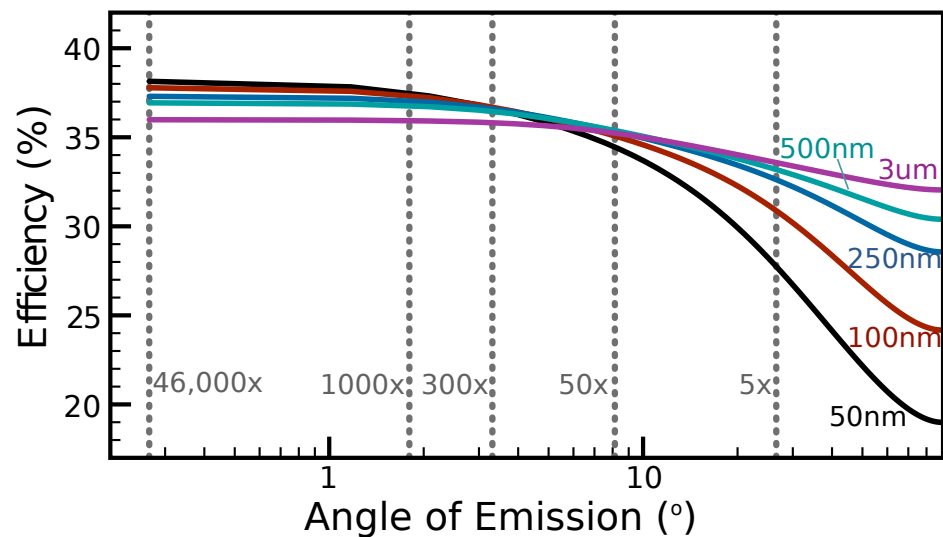


# Angle Restriction for High Single Junction Efficiency



Top: Predicted effect of angle restriction in GaAs cells.

Below: SEM of fabricated angle restricting coupler.

Work was performed at Caltech and FOM Institute AMOLF

## Scientific Achievement

We have demonstrated that very high efficiencies, up to 38%, may be achievable using ray optical angle restriction in ultrathin (50nm) GaAs cells. Light trapping cell geometry and an excellent back reflector are key to the highest efficiencies.

## Significance and Impact

The high efficiencies and thin cells that are possible in this regime could allow for significantly reduced PV cost per watt and with reduced materials usage.

## Research Details

- Used detailed balance modeling accounting for cell modal structure and non-radiative recombination
- Ray tracing and initial fabrication via two-photon lithography of angle-restricting designs

E.D. Kosten, J.H. Atwater, J. Parsons, A. Polman, and H.A. Atwater. *Light: Science & Applications*. **2**, e45 (2013).



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