

Study of Multilevel Nanoimprinted Metalenses

A collaborative demonstration of scalable, consumer-ready metalens manufacturing.



Project partners

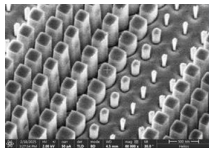
- **PlanOpSim** - Multilevel metaatom modeling (MetaCell & MetaComponent)
- **Tekscend Photomask** - Multilevel mastering (key enabling breakthrough)
- **SCIL Nanoimprint Solutions** - AutoSCIL nanoimprint & NanoGlass™ resist
- **Moxtek** - Pillar mapping, mastering data processing & metrology

Technical highlights

- Multilevel design: 3 metaatom heights (300 / 600 / 900 nm)
- No extreme aspect ratios: high efficiency with high yield
- Large-area optics: metalenses up to ~1" diameter
- Validated models: measured efficiency within 1% of simulated
- High-index nanoimprint: direct replication in $n \geq 1.85$ resist
- Scalable process: functional optics without deposition or etch



Master

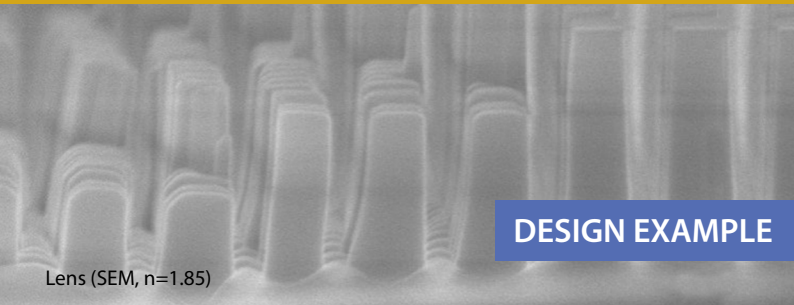


Master (SEM)



Lens

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Lens (SEM, $n=1.85$)

DESIGN EXAMPLE

Demonstrating a mass production process for visible AR optics at consumer price points.

This study showcases a production-ready route to scalable, cost-efficient AR optics by directly replicating multilevel metalenses in stable, inorganic, high-index NIL resists. Multilevel metalenses deliver high optical efficiency without extreme aspect ratios which reduce yields. The result is a manufacturable solution that bridges cutting-edge metalens design and consumer-ready AR applications.

