— AI-NATIVE PHOTONIC DESIGN INFRASTRUCTURE

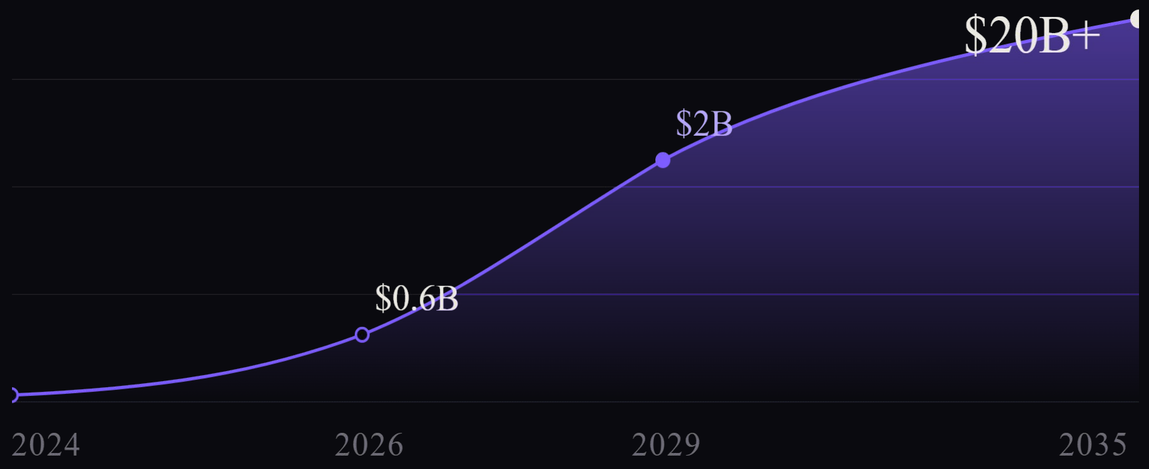
PriPhase.

The Cadence for photonic metasurfaces that breaks the speed barrier holding back next-generation optics.

— THE OPTICAL LAYER OF THE NEXT HARDWARE WAVE

Metasurfaces become the fundamental optics for 3D sensing, biometrics, and LiDAR in devices shipping after 2027.

METASURFACE-enabled module & system revenue · USD



Source: 3D sensing, LiDAR, and AR optics module markets (Yole, MarketsandMarkets)

METASURFACE-INTEGRATED MODULES

- **3D sensing** — STMicroelectronics
- **Face Authentication** — Metalenz, UMC
- **LiDAR** — Lumotive
- **Biometrics** — Samsung (in progress)

Next wave: Optical AI computing

— TODAY'S PHOTONIC EDA

Every commercial photonic EDA runs on approximation-based legacy solvers.

OPTION A

Full-wave simulation

2 – 6 weeks / design

Accurate, but impossible at production scale.

- Ansys Lumerical
- Synopsys RSoft
- Tidy3D / Flexcompute

DEAD ZONE

Where LPA fails:

High-NA, Broadband, Polarization-multiplexed

where next-gen designs live

OPTION B · INDUSTRY STANDARD

Locally Periodic Approximation (LPA)

~ min / design

Fast, but fundamentally wrong where it matters.

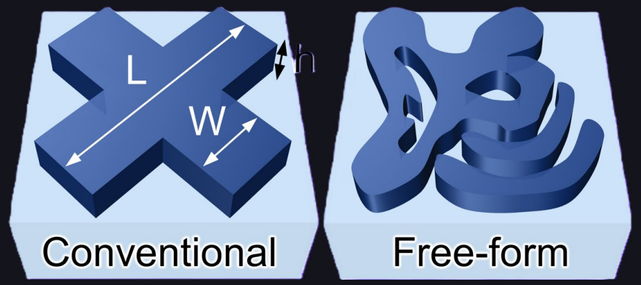
- Synopsys MetaOptic Designer
- Ansys Lumerical + Zemax
- PlanOpSim

— AI-NATIVE, MULTI-SCATTERING ACCURATE, END-TO-END DIFFERENTIABLE

Full EM response of photonic metasurface structures in milliseconds.

LAYER 1

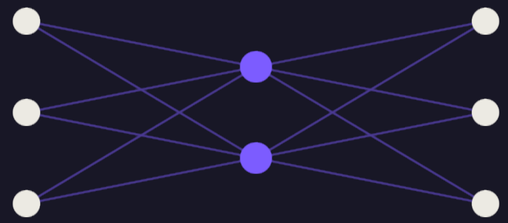
Atom characterization



Foundry-specific library of unit cells with full far-field response.

LAYER 2

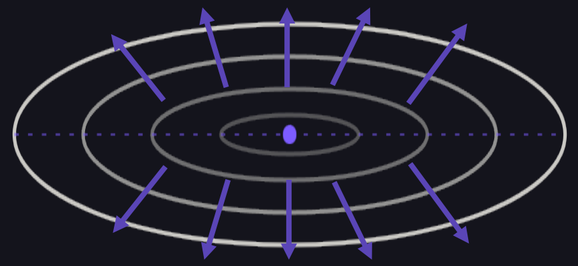
AI surrogate inference



Differentiable forward surrogate with high accuracy, ms-scale inference.

LAYER 3

Array assembly



cm-scale assembly with global optimization and built-in inverse design.

END-TO-END DIFFERENTIABLE — 100–1000× FASTER

Objective → Manufacturable design

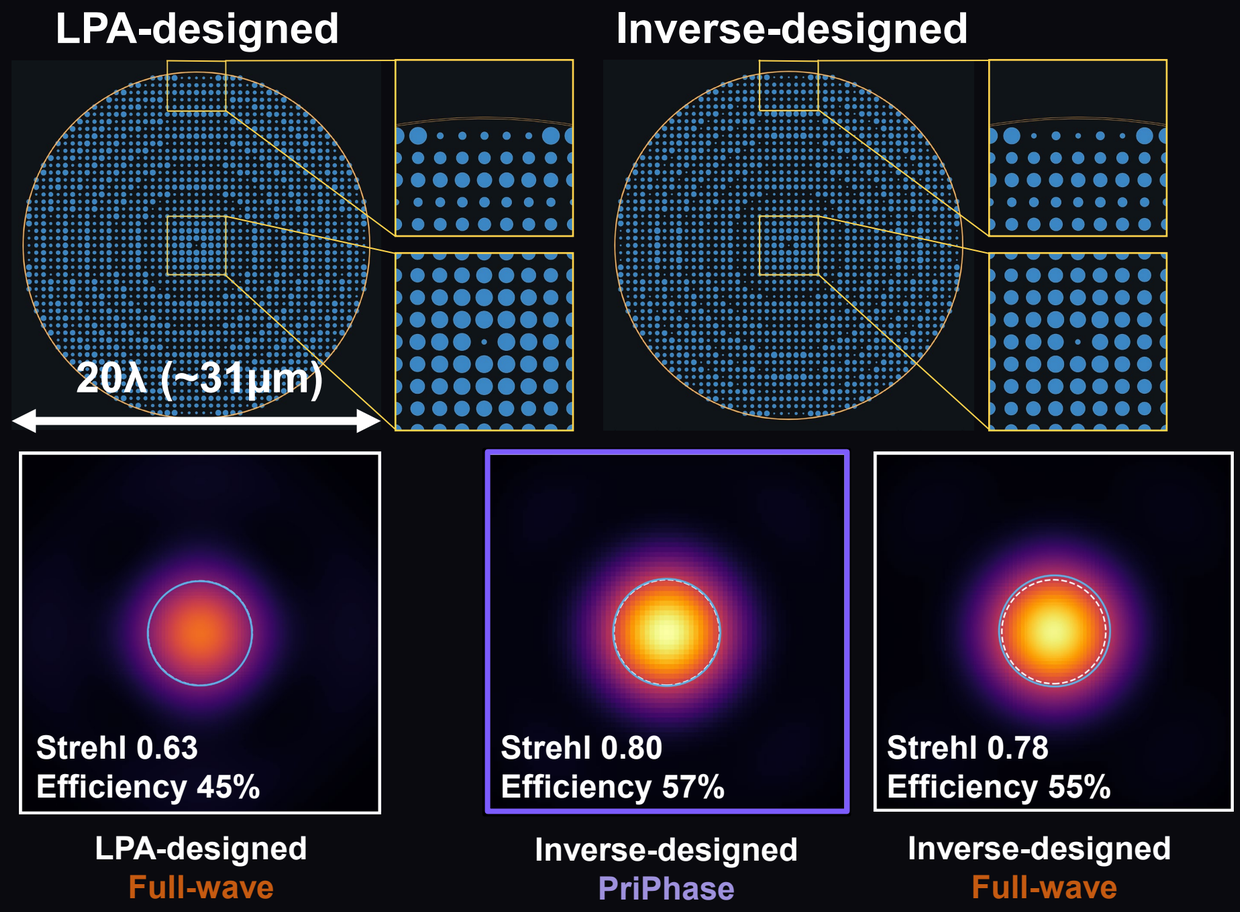
For **20λ** aperture, it takes only

3 MINUTES

For the entire inverse design session.

Traditional FDTD (64 CPU)	~60 days (estimated)
Tidy3D (GPU FDTD, cloud-based)	~1 day
PriPhase (1 A100 GPU, on-premises)	3 min

(NA 0.9, 20λ aperture, 3D)

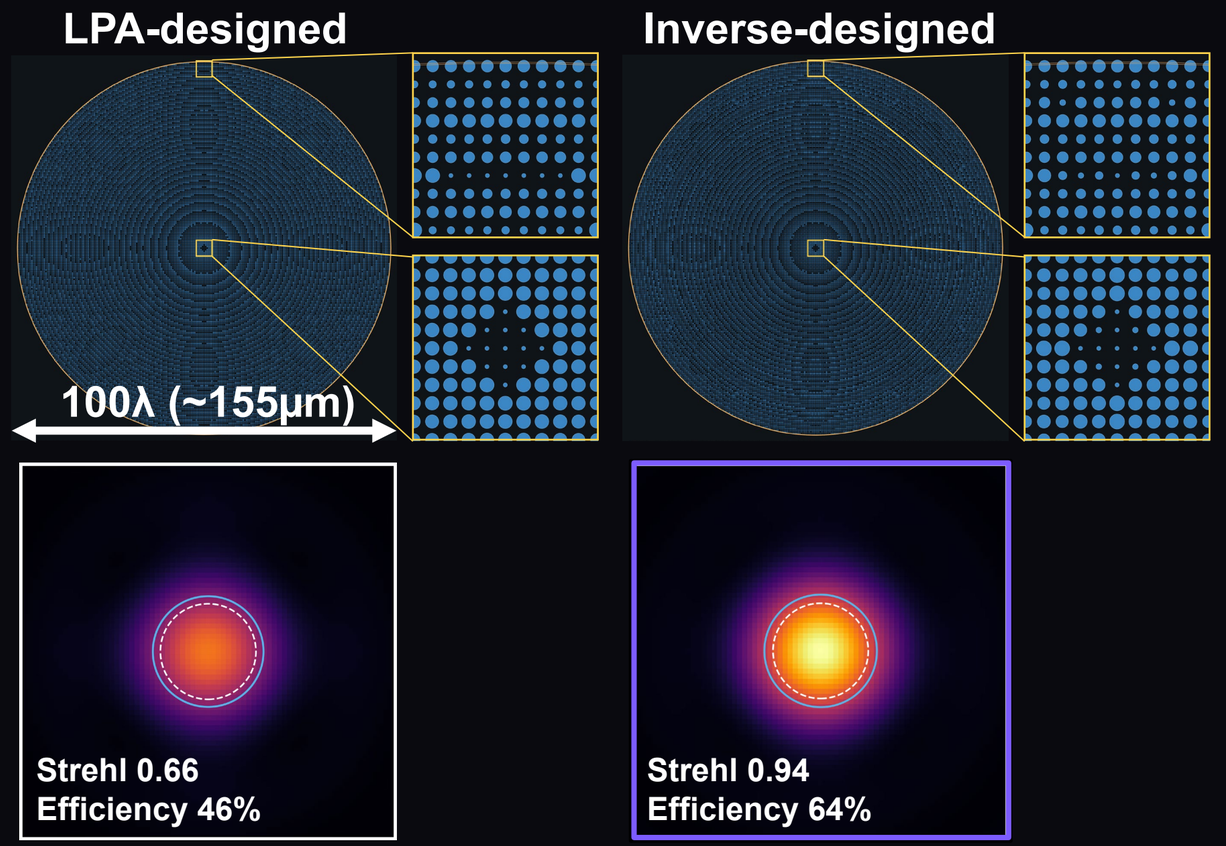


For **100λ** aperture, it's almost impossible to run inverse design using traditional full-wave solvers.

PriPhase takes only 1 hour to run entire inverse design session.

Traditional FDTD (64 CPU)	~months (estimated)
Tidy3D (GPU FDTD, cloud-based)	~few days (estimated)
PriPhase (1 A100 GPU, on-premises)	1 hour

(NA 0.9, 100λ aperture, 3D)



LPA-designed PriPhase

Inverse-designed PriPhase

Full-wave solver at 100λ is infeasible, Only showing PriPhase results.

— MOAT

A moat that gets deeper with every foundry and every customer.

L5 Team profile (Photonics + RF + ML)

L4 Vertical product (LiDAR) as a reference proof

L3 Patents (1 granted (US 12,085,830) and 2 provisional filed)

L2 Foundry-trained models and proprietary data

L1 · CORE Differentiable forward surrogate

CORE TECHNOLOGY

Years of cross-domain research to build a single model that is fast, accurate, and differentiable simultaneously.

DATA FLYWHEEL

Every foundry partnership produces proprietary data and models. Replicating requires their fab access *and* our framework.

VERTICAL PROOF

Our developing LiDAR product will be the canonical reference design and the first customer of our own platform.

BUSINESS MODEL

Revenue streams

STREAM 1

Design platform licensing

Annual seat and on-premise compute licenses to hardware companies. EDA-style recurring revenue.

STREAM 2

Foundry PDK partnerships

Co-developed Process Design Kits with semiconductor foundries. Royalty per product and data moat.

STREAM 3 (Future)

LiDAR vertical product

Complete 3D beam-steering chip/modules for OEM integration into existing supply chain.

REFERENCE COMPARABLE — Cadence · $4.6B ARR · 90% recurring · 36% op margin

— BEACHHEAD MARKET (LiDAR)

TOTAL ADDRESSABLE MARKET

From $2.8B in 2024

$8.4B

by 2030 • 24% CAGR

SERVICEABLE ADDRESSABLE MARKET

$2.1B

Robotics, automation & energy infrastructure

SERVICEABLE OBTAINABLE MARKET (5 YR)

$105M

5% of SAM • Conservative estimate

TARGET MARKET SEGMENTS

Industrial Robotics

Warehouse automation, manufacturing inspection, AGVs

$850M

by 2030

Energy Infrastructure & Commercial Drones

Energy infrastructure inspection, surveying & delivery

$620M

by 2030

Security & Perimeter

Smart buildings, critical infrastructure, surveillance

$430M

by 2030

Automotive (Future)

ADAS, autonomous vehicles — longer qualification cycle

$4.5B+

by 2030

Sources: MarketsandMarkets LiDAR Market Report 2024, Grand View Research, company analysis

Platform expands to 3D sensing & biometrics (Slide 2) and optical AI computing

— TEAM

Only group to demonstrate both full 2π phase modulation AND high-efficiency inverse-designed metasurfaces – the two prerequisites for practical beam steering

Juho Park

Founder

LinkedIn

5 years dedicated to solving this exact problem

Staff Senior RF engineer, Marvell
Postdoc research associate, Princeton University
AI-enabled RFIC design (published on ISSCC, IMS)

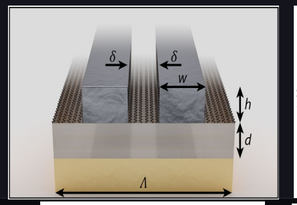
Staff Engineer, Samsung
Foundry 4nm process integration

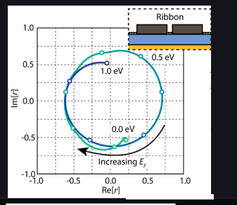
PhD, KAIST
Best Dissertation Award for inventing avoided crossing methodology for active photonic metasurfaces

IP, Technical validations

Nature Communications 13 (1), 2022

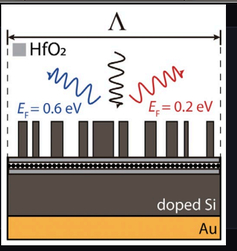
Full 2π tunable phase modulation using avoided crossing

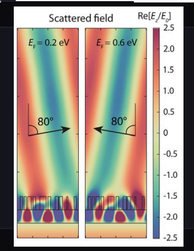




Advanced Optical Materials 13 (17), 2025

Graphene-based beam switching metasurface





US Patent 12085830 (nonprovisional, granted)

Metasurface modulation method for 2π phase modulation

Two provisional patents filed

Differentiable multiple-scattering framework
AI-enabled prediction method for multi-port photonic/RF responses

— PRE-SEED ROUND

Raising a $750K pre-seed.

USE OF FUNDS · 18 MONTHS

Team: Founder + Founding engineer	55% $410K
Chip prototype fab & validation	25% $190K
Computing, IP & operations	20% $150K

MILESTONES

SOFTWARE

Month 1-6: Design engine improvements

- Current engine handles primitive shapes only. Next version adds ML models for free-form shapes toward high-performance metasurface design.

Month 3-9: LiDAR chip design

- Solid-State beam-steering metasurface, designed entirely on our own engine.

HARDWARE VALIDATION

Month 8-14: First chip fabrication & measurement

- Prototype beam steering metasurface proving our software matches real hardware.

Month 12-18: 1-2 Paid design projects

- Design services for meta-optics companies, using measured chip data as sales proof.

PRIPHASE

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