

# Scalable, Flexible, Affordable: FMCW LIDAR, 100% Solid State

DVN Sensing & Applications

20 November 2025



# A Phenomenal New World with Spatial Awareness Awaits



**Voyant is giving machines the power of sight to safely automate the physical world.**



Dec 14, 2022 - Economy & Business

# Quanergy goes bankrupt, less than a year after going public

Microvision  
swallows insolvent  
lidar manufacturer  
Ibeo

Business news | December 7,  
2022

## Low-Cost LiDAR Startup Oryx Vision Shuts Down

Founded in 2009, Oryx developed a light detection and ranging camera system (LiDAR) for autonomous cars

Sophie Shulman 13:28 25.08.19

**LeddarTech, once high-flying Canadian lidar maker, to file for creditor protection**

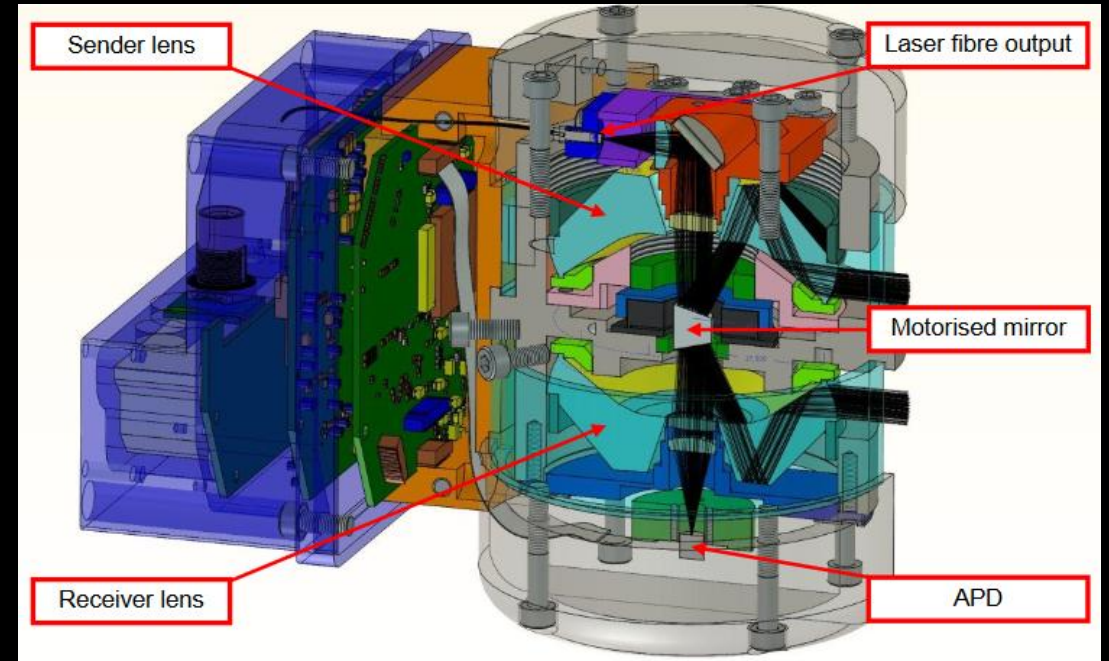
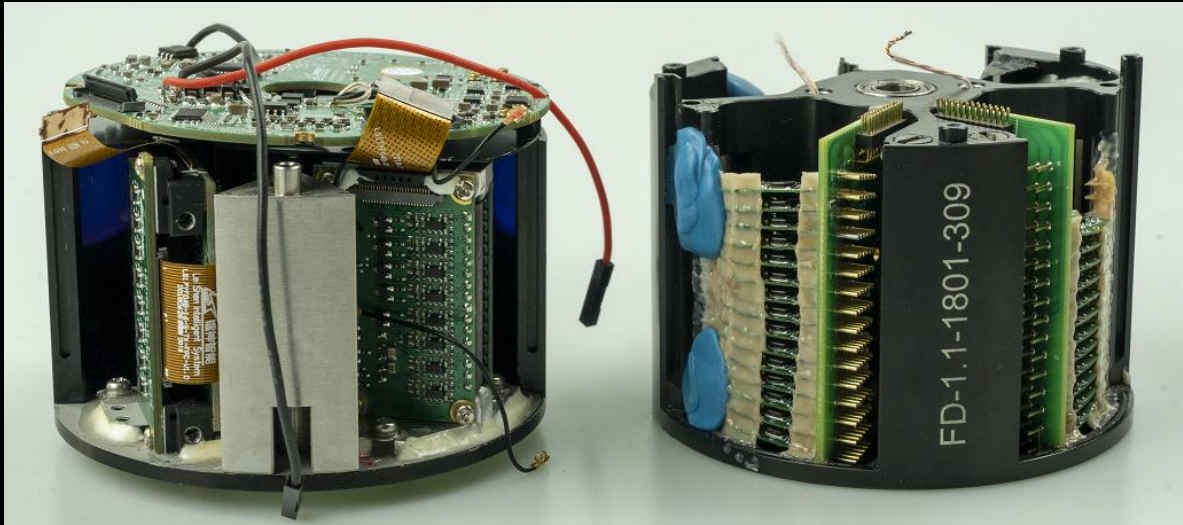
# “LIDAR is a Fool’s Errand”



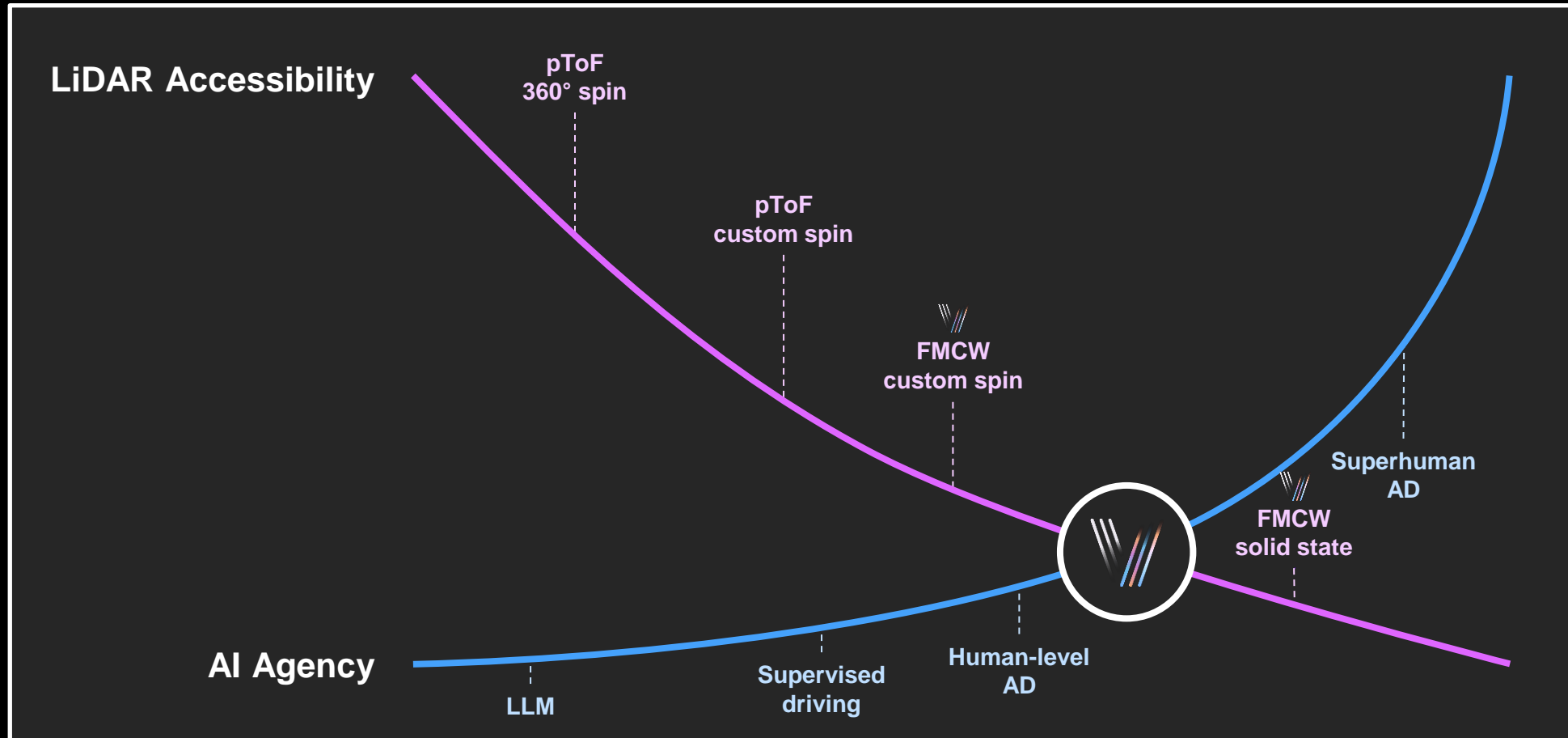
So why is LIDAR not more  
widely adopted?

Because companies keep trying to  
solve the cost problem with  
**mechanical complexity**

# “LIDAR is a Fool’s Errand”



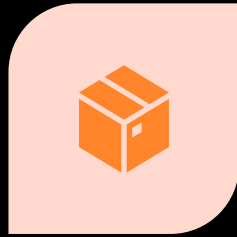
# Widespread PICs Enable Cost-effective Physical AI



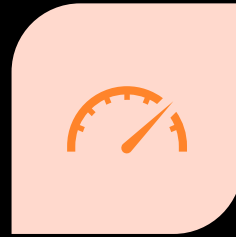
# Advantages of FMCW on a PIC



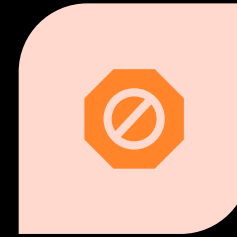
L3+ ADAS FORWARD-FACING LONG-RANGE FMCW LIDAR



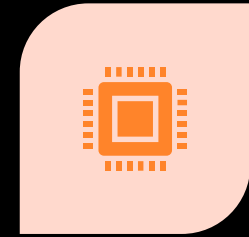
SOLVES THE LOST PARCEL DETECTION PROBLEM



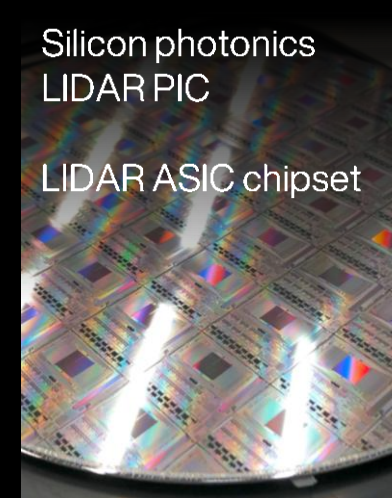
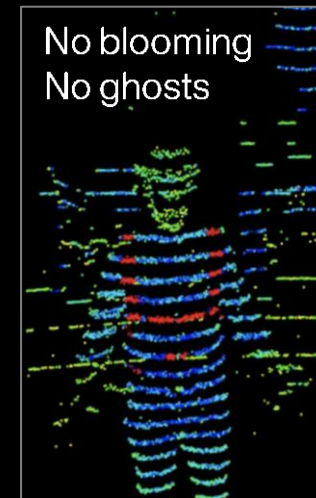
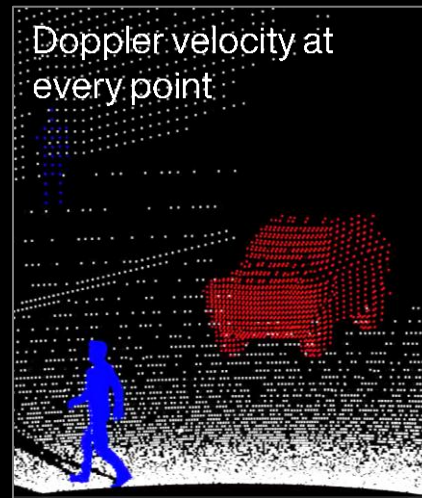
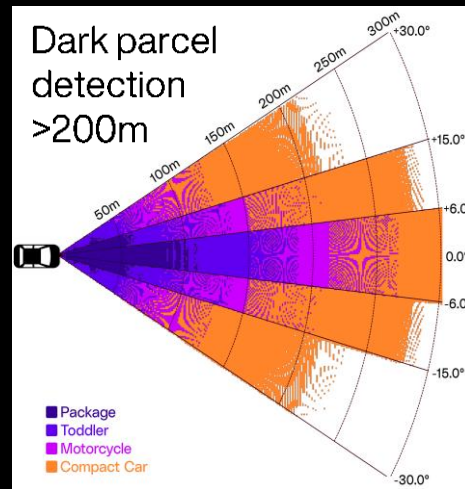
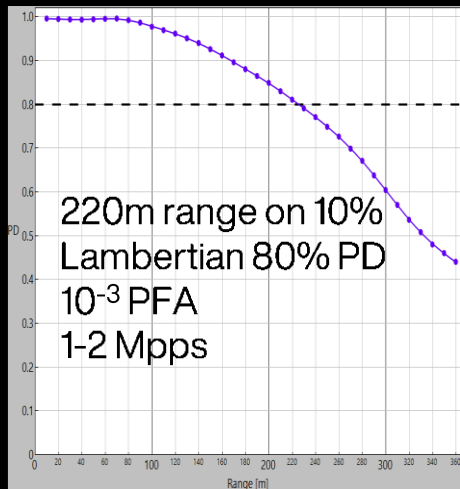
SIMULTANEOUS RANGE, VELOCITY, REFLECTIVITY DATA STREAMS



ZERO ARTIFACTS OR DISTORTIONS FROM RETRO-REFLECTIVE OBJECTS



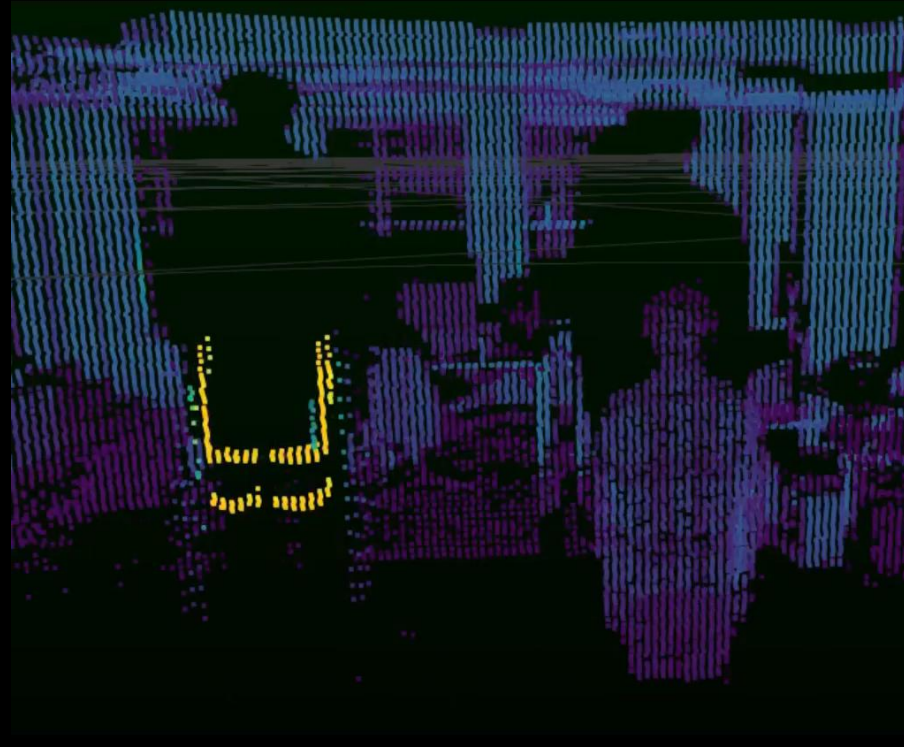
LOW COST FROM SILICON INTEGRATION AND SCALABLE ASSEMBLY



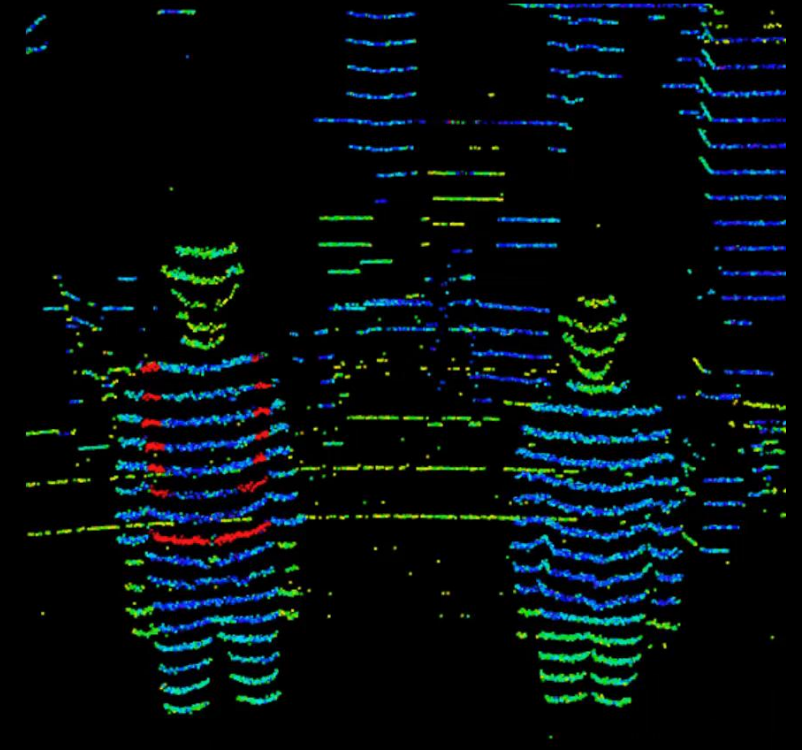
# ToF LIDAR Turns Safety Vest into Invisibility Cloak



Artifacts from reflective targets are a critical problem in all mobility, safety, and automotive applications



Leading ToF LiDAR



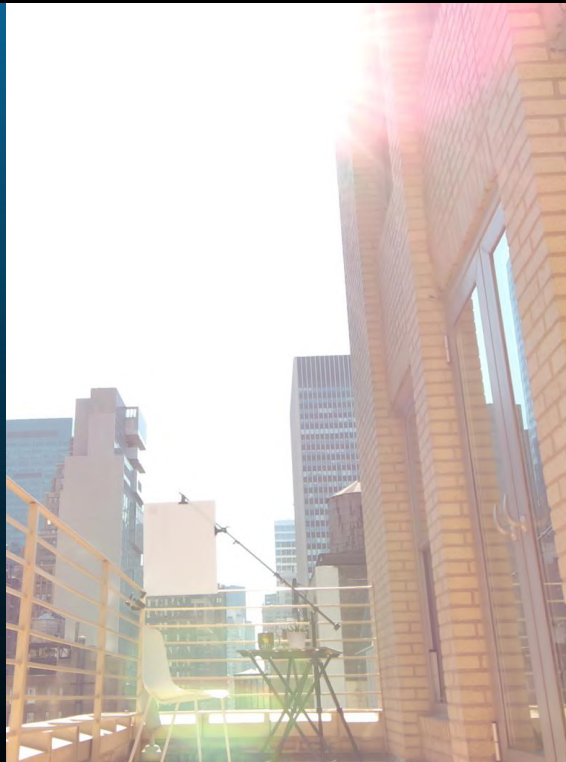
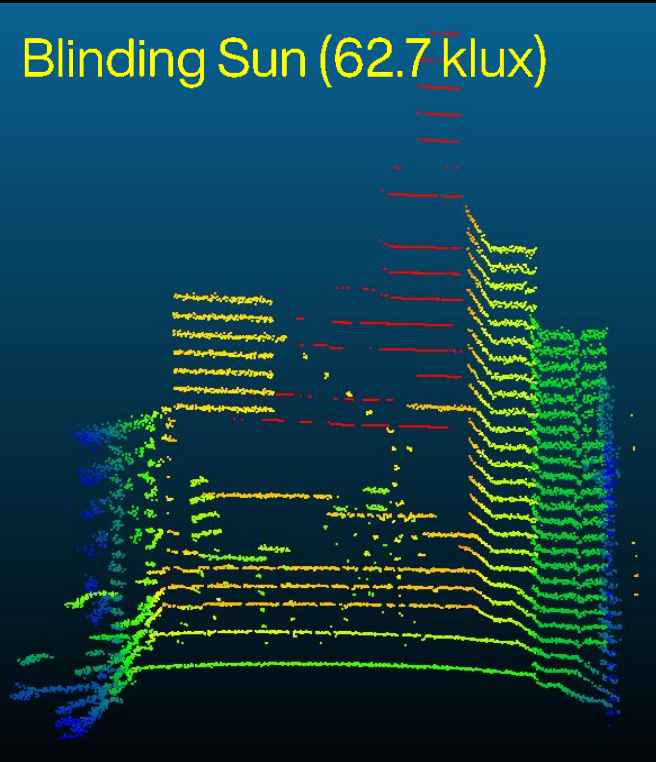
Voyant Dev Kit

# FMCW Sunlight Immunity

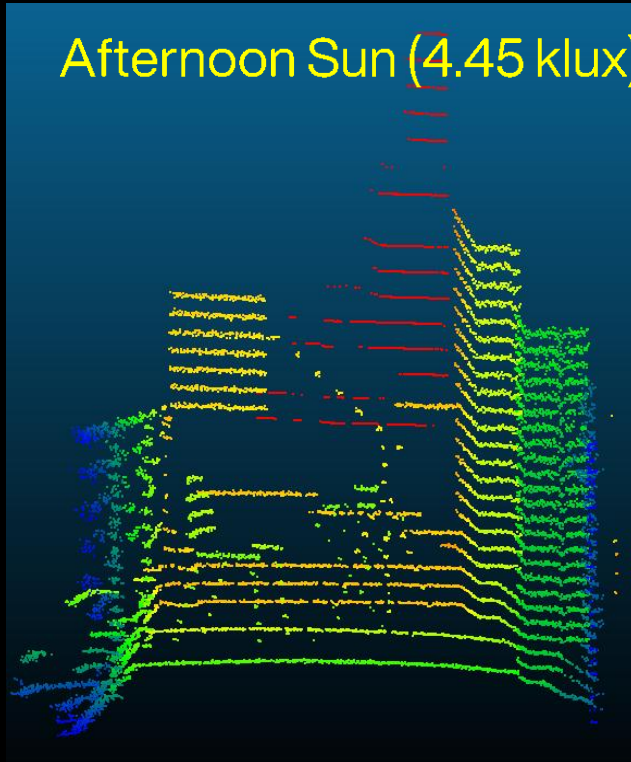


Probability of Detection unchanged under different direct Sunlight conditions

Blinding Sun (62.7 klux)



Afternoon Sun (4.45 klux)



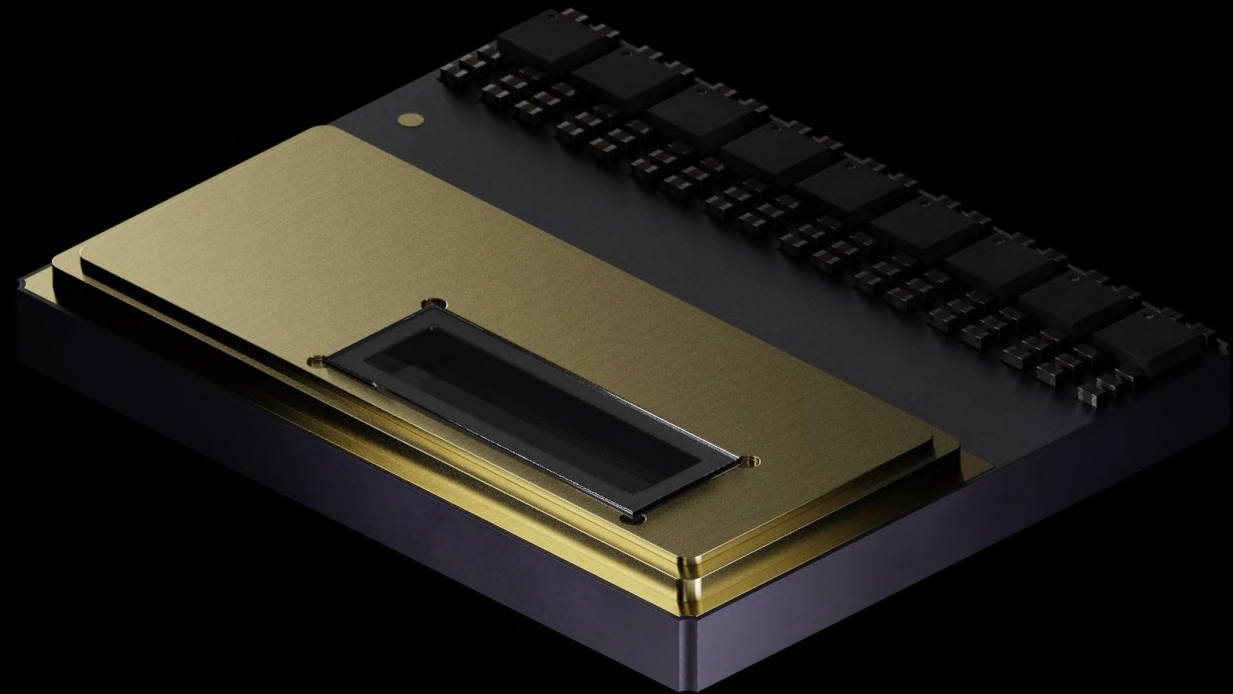
	Blinding Sun	Afternoon Sun	Indoor
Ambient Brightness	62.7 klux	4.45 klux	0.338 klux
PD	99.8%	99.6%	99.99%
Range Mean	6.23 m	6.24 m	6.23 m
Range Std	4.9 cm	5.0 cm	4.9 cm
Velocity Std	3 cm	3 cm	3 cm
SNR	27.8 dB	27.6 dB	27.6 dB

# Integration is Key



All optical components (thousands in total) integrated in a single package:

- Chirped, narrow-linewidth laser
- SOA array
- On-chip beam steering
- Coherent receivers
- Reference path for laser chirp monitoring / calibration

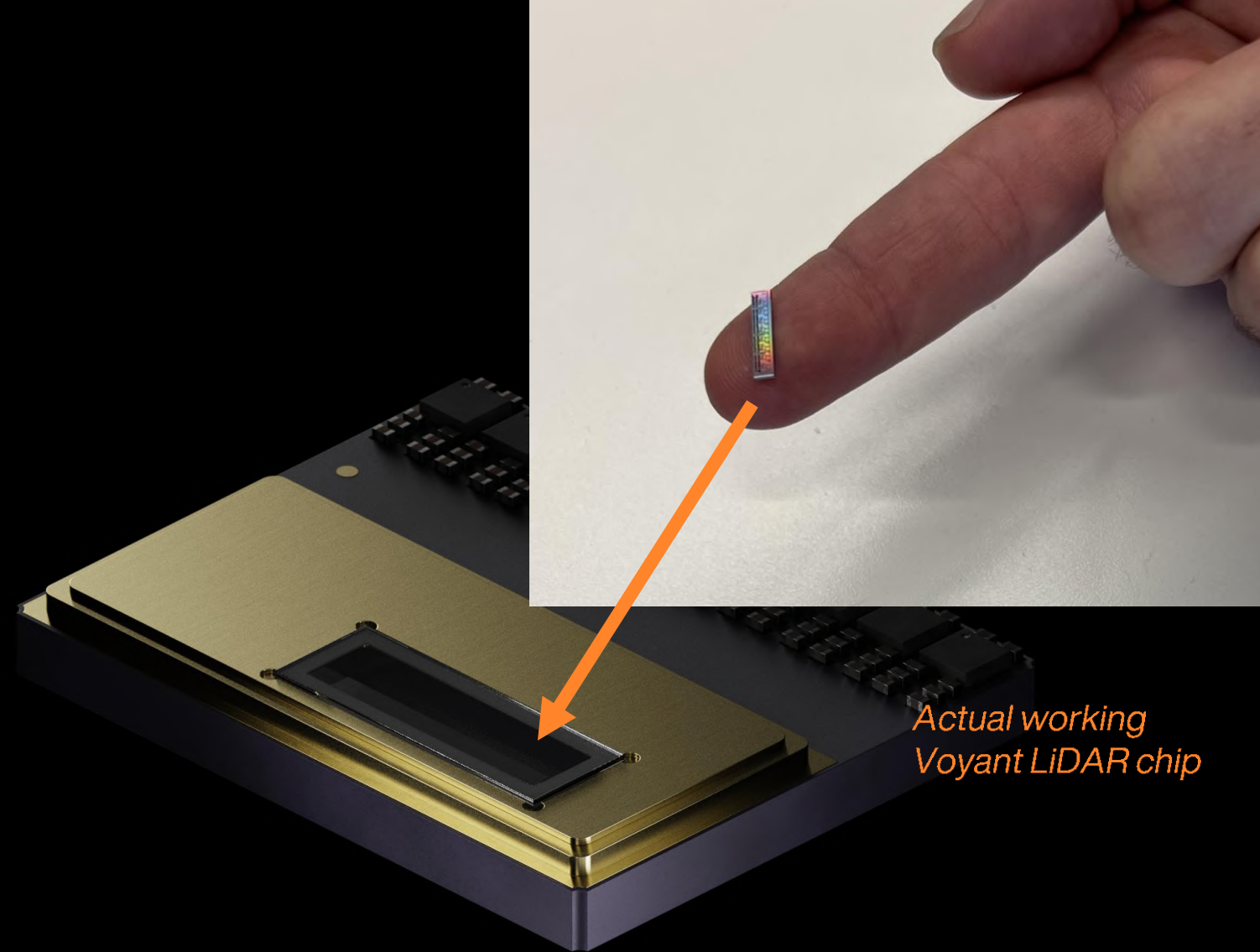


All optics on a  
2 x 2 cm module!

# Integration is Key

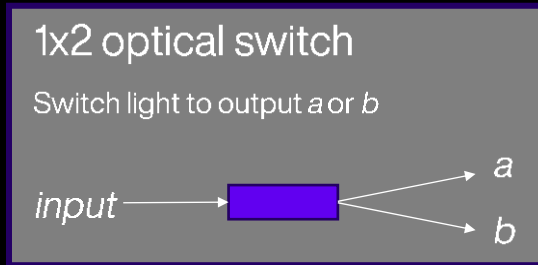
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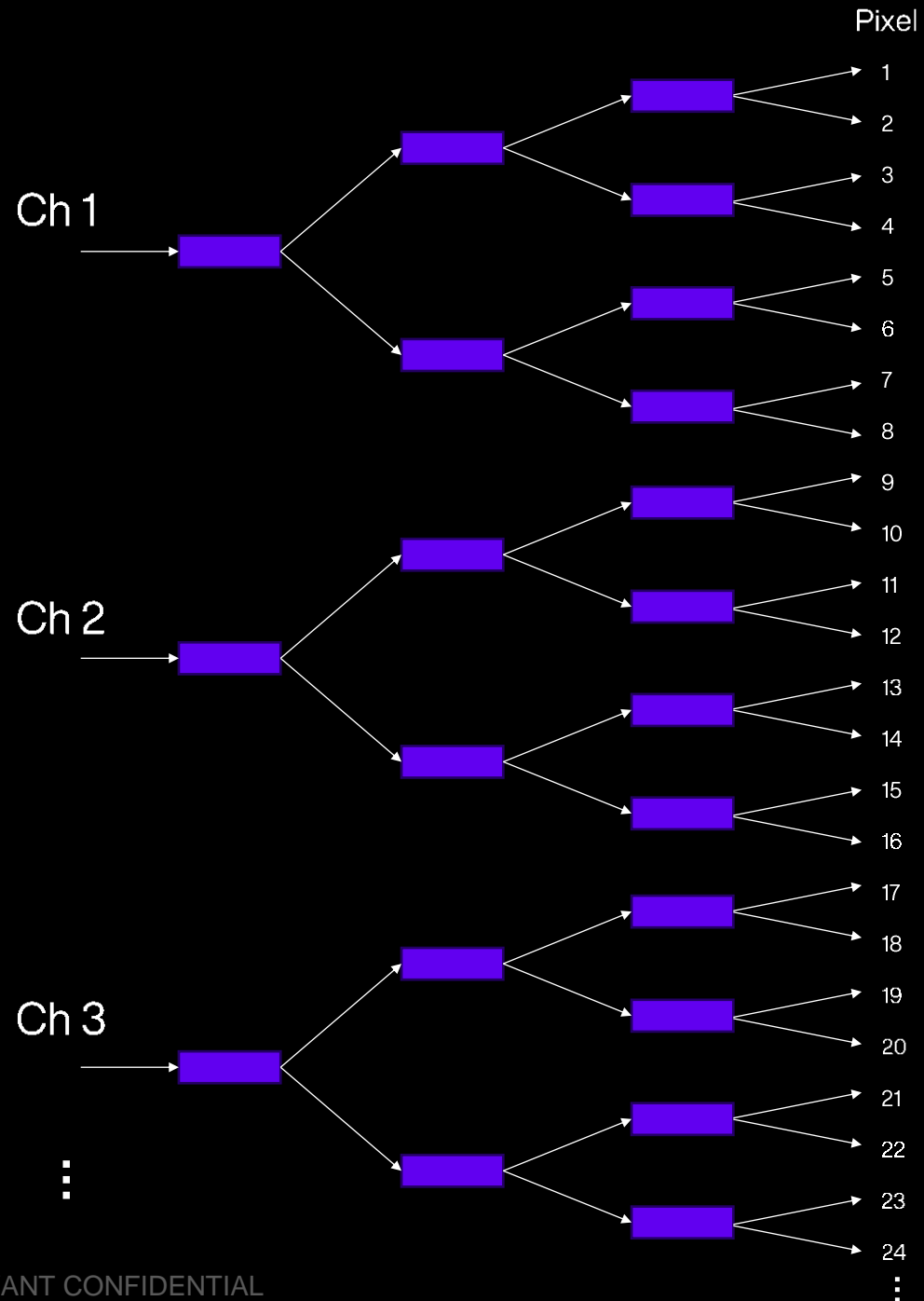


*Actual working  
Voyant LiDAR chip*

# Switch-based Beam Steering



- Each transmit-receiver channel has binary tree of 1x2 optical switches (solid state)
- Optical switches route light to one pixel at a time (per channel)
- Multiple channels = multiple simultaneous beams



# 1D and 2D Focal Plane Array

## 1D “Linear”

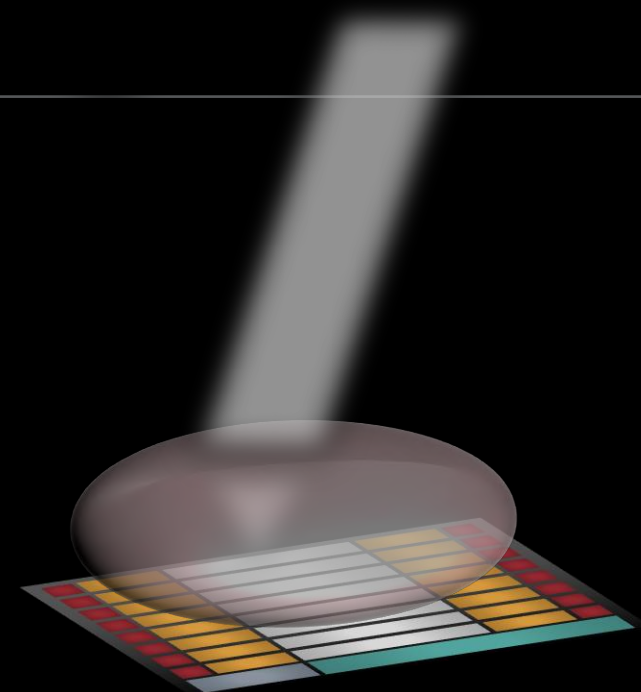
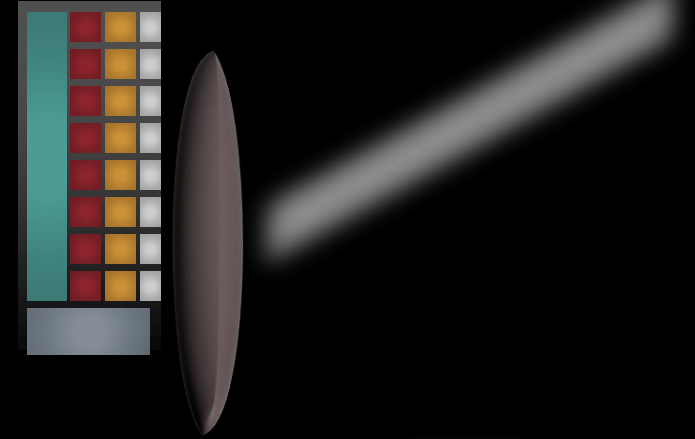
Starting at 128 edge antenna for 128 line image

- Adds moving mirror in front of chip
- Long range
- Roadmap to 0.025° resolution, >250 m

## 2D “Planar”

Starting at 5000 surface-emitting antenna (pixels)

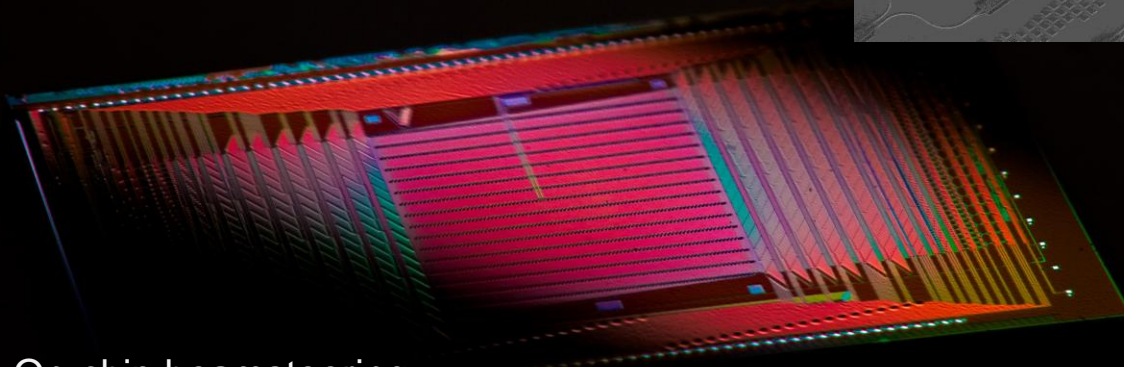
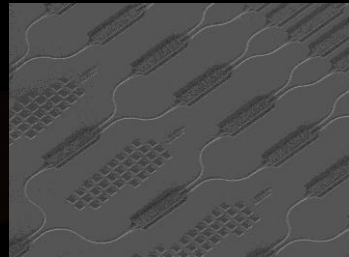
- On-chip 2 axis beam steering
- Simpler system design
- No moving parts, completely solid state
- Pathway to ultra-small and low-cost moderate range system



# Photonic Integration

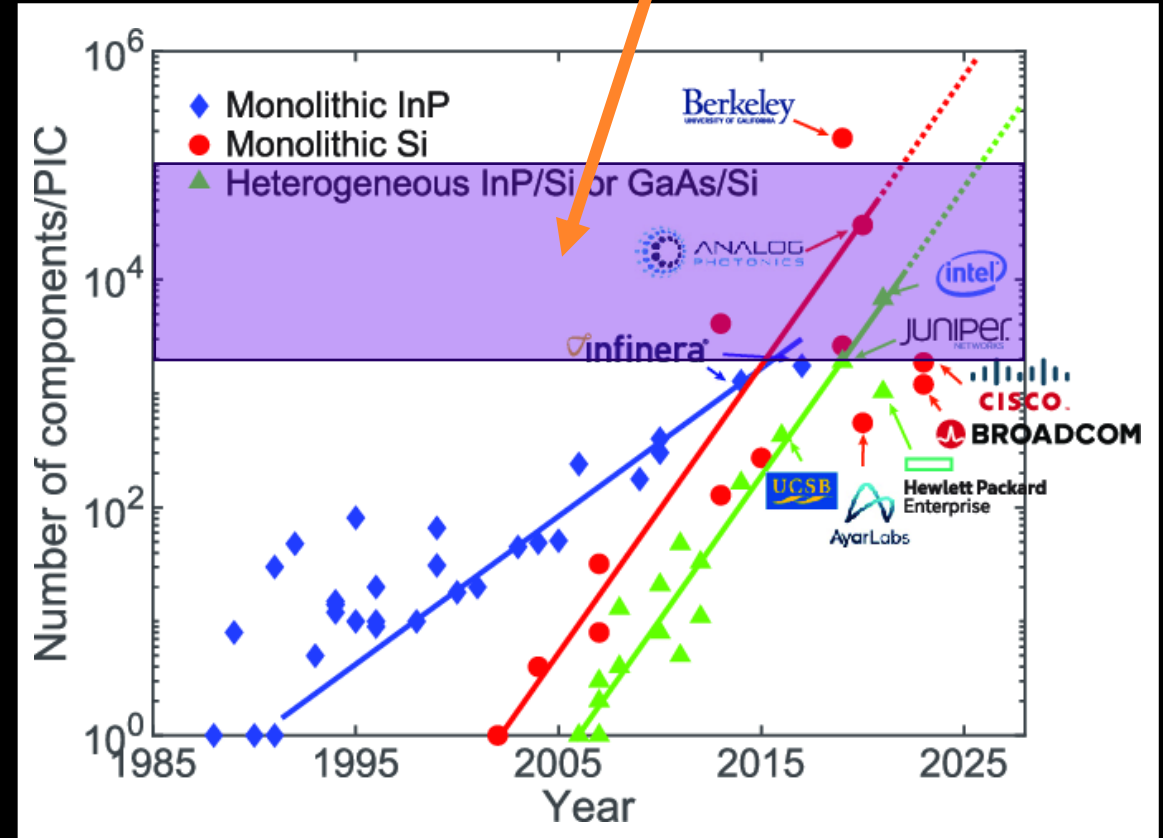


- On-chip LIDAR demands some of the largest photonic systems built to date
- High-volume commercial product: **yield is critical**



- On-chip beamsteering
- Multiple parallel coherent transceivers
- High power lightsource
- Large scale free-space emitter array

On-chip LIDAR  
+ Beam Steering  
Requirements



Near Margalit et al. *Appl. Phys. Lett.* 118 (2021), 220501

# World-leading Chips Drive Product Performance



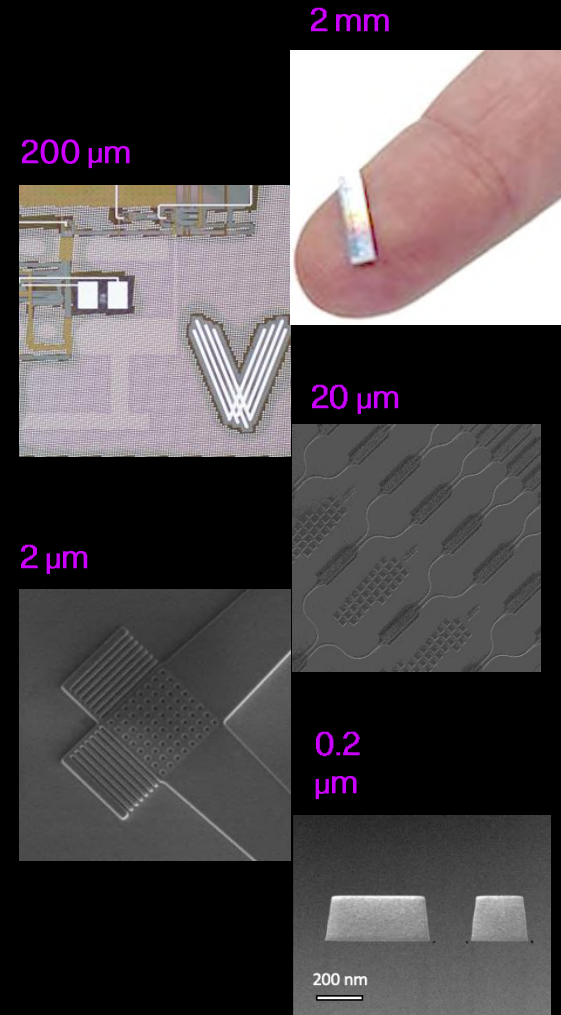
Voyant has developed a proprietary custom component library for high performance 3D imaging

Voyant designs its own PDK from the polygon level in a commercial foundry process

Components are designed for high yield under process variations and verified with wafer level test.

Our chips are among the highest-performance in the world, making our product performance unbeatable:

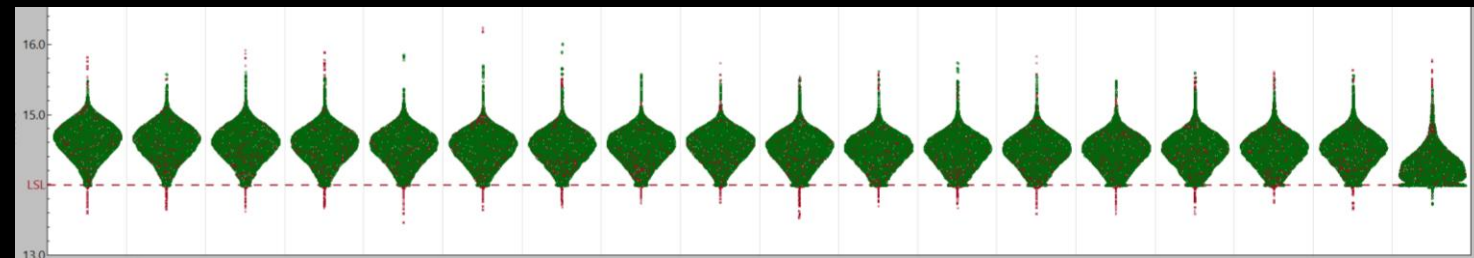
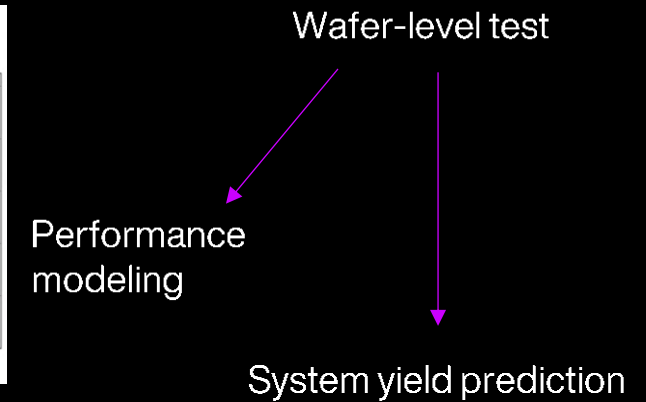
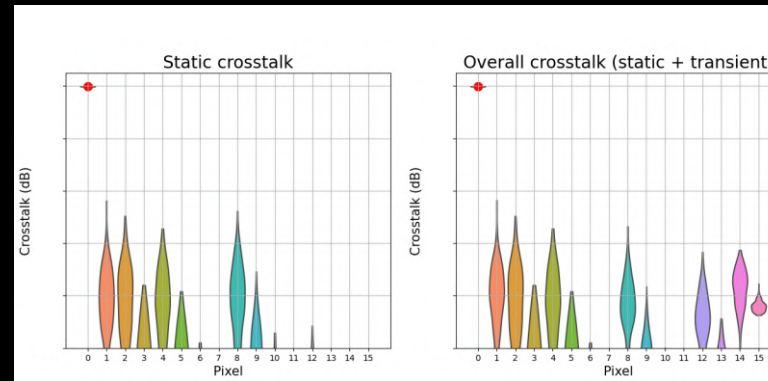
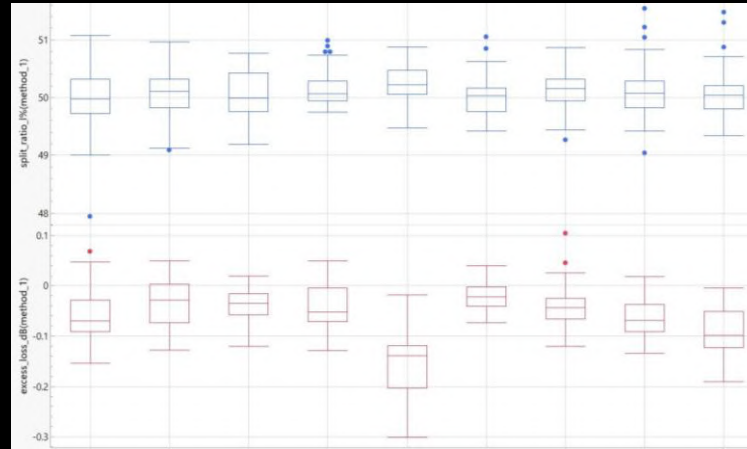
On-chip Element	Typical	Voyant	Product performance impact
Photonic Splitter	0.4 dB IL	0.05 dB IL	➡ Better chip loss = more integration = lower cost
Photodetector (Ge PD)	0.8 A/W @ 1550 nm	>0.95 A/W @ 1550 nm	➡ Fewer lost photons = better detection
Free-space emission	Fiber + collimator	Photonic emitter <u>no fibers</u>	➡ Dramatically reduce assembly cost / complexity
LIDAR beamsteering	Off-chip	On-chip	➡ Reduce SWAP-C



# High-Yield Enabled by Custom PDK



- Full-custom photonic components for optimal performance across fab variation
- Extensive wafer-level data feeds **statistical performance and yield analysis** at the full system level
- Performance is achievable with very high yield → **lowest cost**



# Commercially Available PIC LIDAR



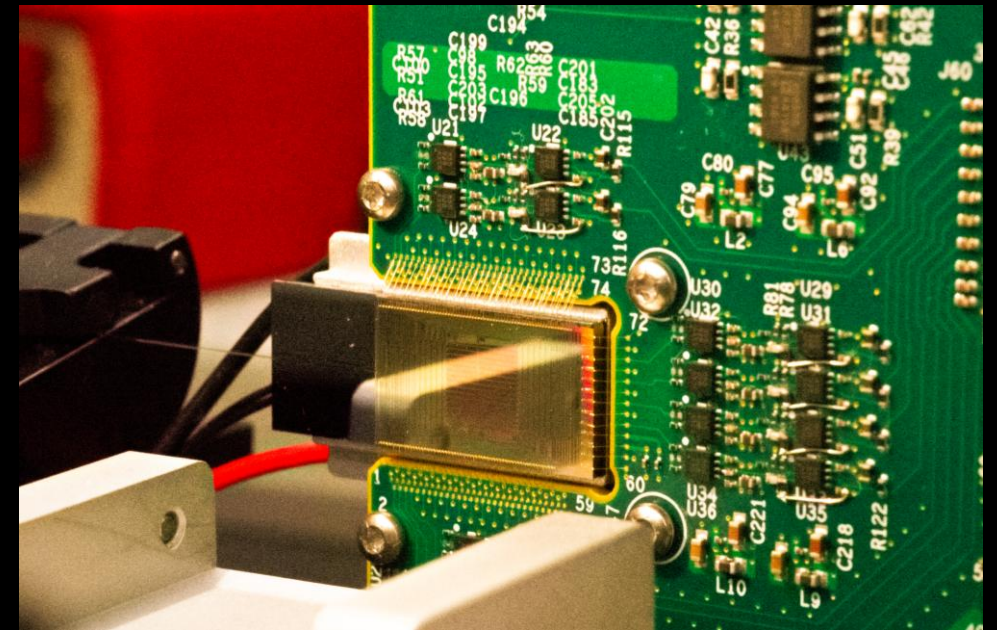
## Carbon

1D on-chip steering + Motor  
Volume ramp in 2026



## Helium

Full on-chip 2D steering  
In development with select partners





## Better Data

Multi-dimensional sensing data  
(velocity, adverse weather)

## Less Expensive

From \$5,000+ mechanical  
system to a sub-\$200 solid-state  
component.

## More Scalable

Time to market and integration  
Silicon production scalability



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# Reinventing Sensing for Scale

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