Stacked
Planar
Integrated
Optics

SPIO SYSTEMS

Optics manufacturing done cheaper and faster

About SPIO Systems

SPIO Systems is a deep-tech company.

SPIO has developed/invented a radically new manufacturing technology of optical engines/devices

The SPIO technology enables miniaturization of existing optical engines by at least an order of magnitude

The SPIO technology enables cost-effective, mass production of optical engines in millions of units, which were not possible with previous manufacturing technologies

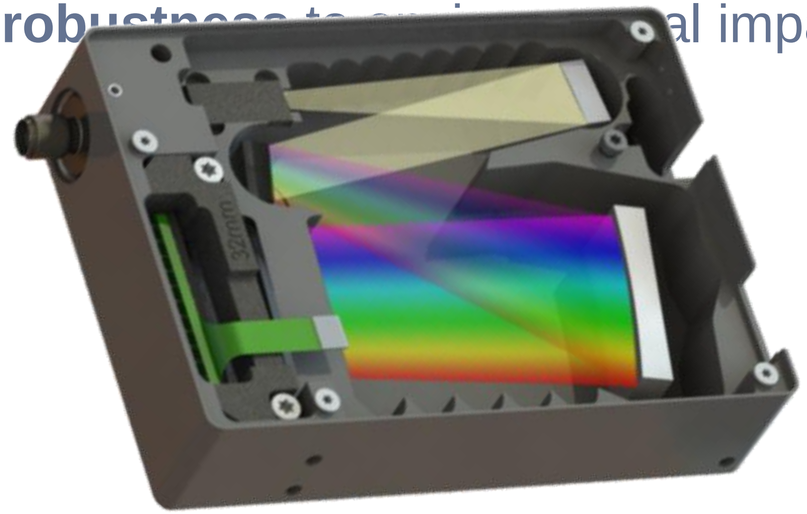
Founded in September 2020

Based in Farum, Denmark

Optics design & manufacturing – a market ready for *disruption*

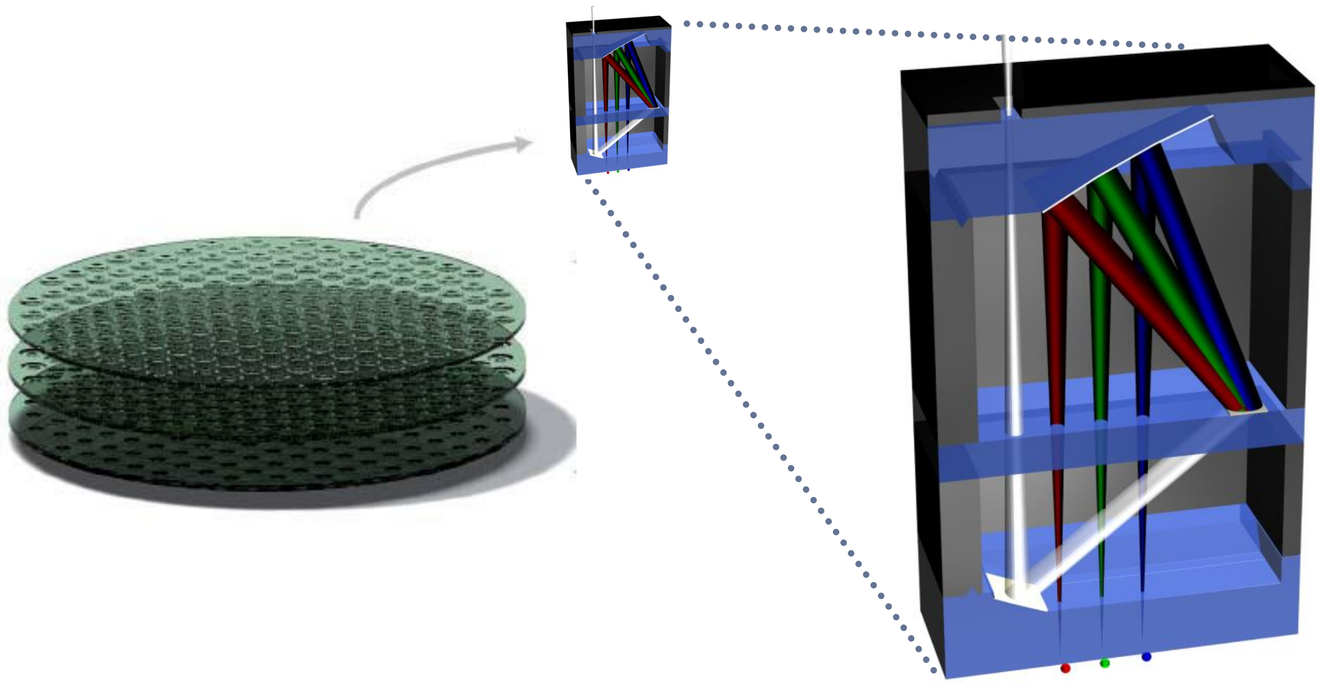
Optics manufacturing is not ready for future markets

- ✗ **Discrete** optical elements into box
- ✗ Extensive **assembly** process: Account for +70% **cost**
- ✗ Lacking **scalability** to deliver mass volumes
- ✗ Lacking **robustness** to [illegible]al impact



Introducing SPIO Technology in optics manufacturing

- ✗ Thousands optical elements in one go: **Lower unit cost**
- ✗ Cut in assembly process: **Reduce 80%**
- ✗ Scale to volume with: **Less equipment & manpower**
- ✗ Enhanced **robustness** to environmental impact



Optics design & manufacturing – a market ready for *disruption*

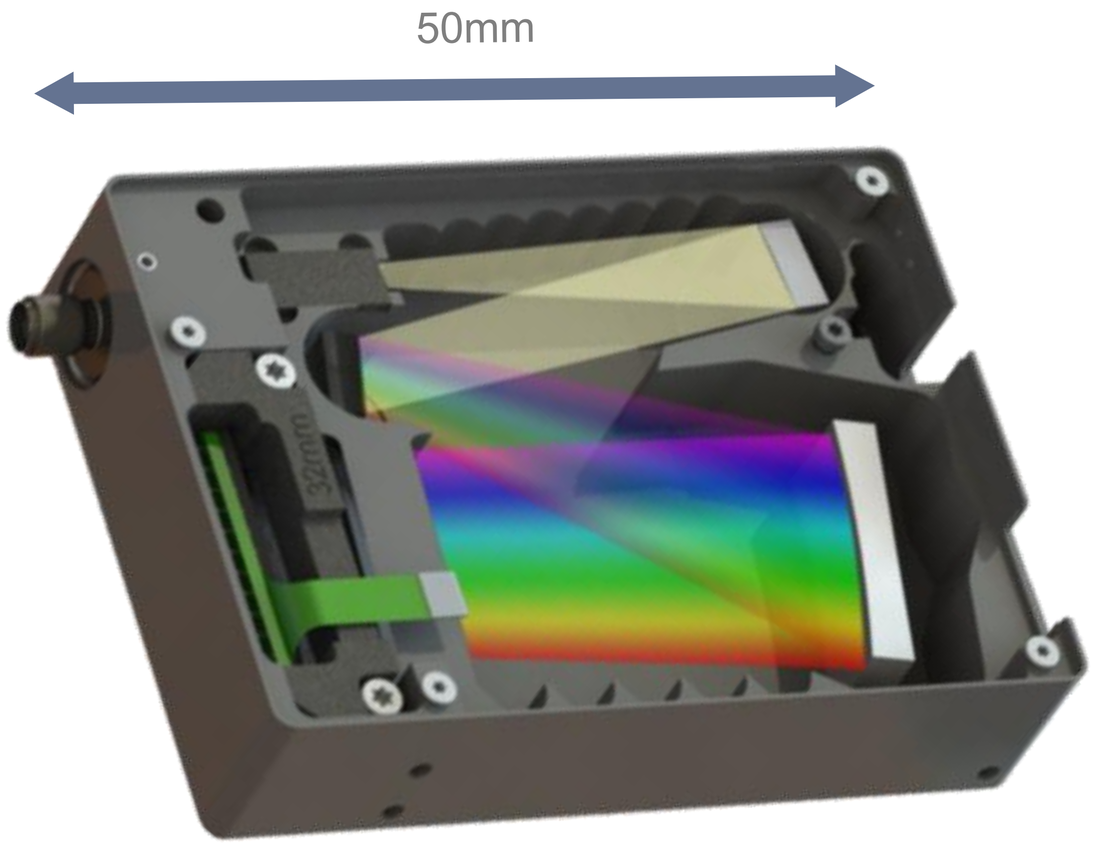
SPIO vs. Conventional optics manufacturing

Same optical device but different space occupation and production cost and scaling rate

CONVENTIONAL DEVICE: €€€€€

Discrete optical elements

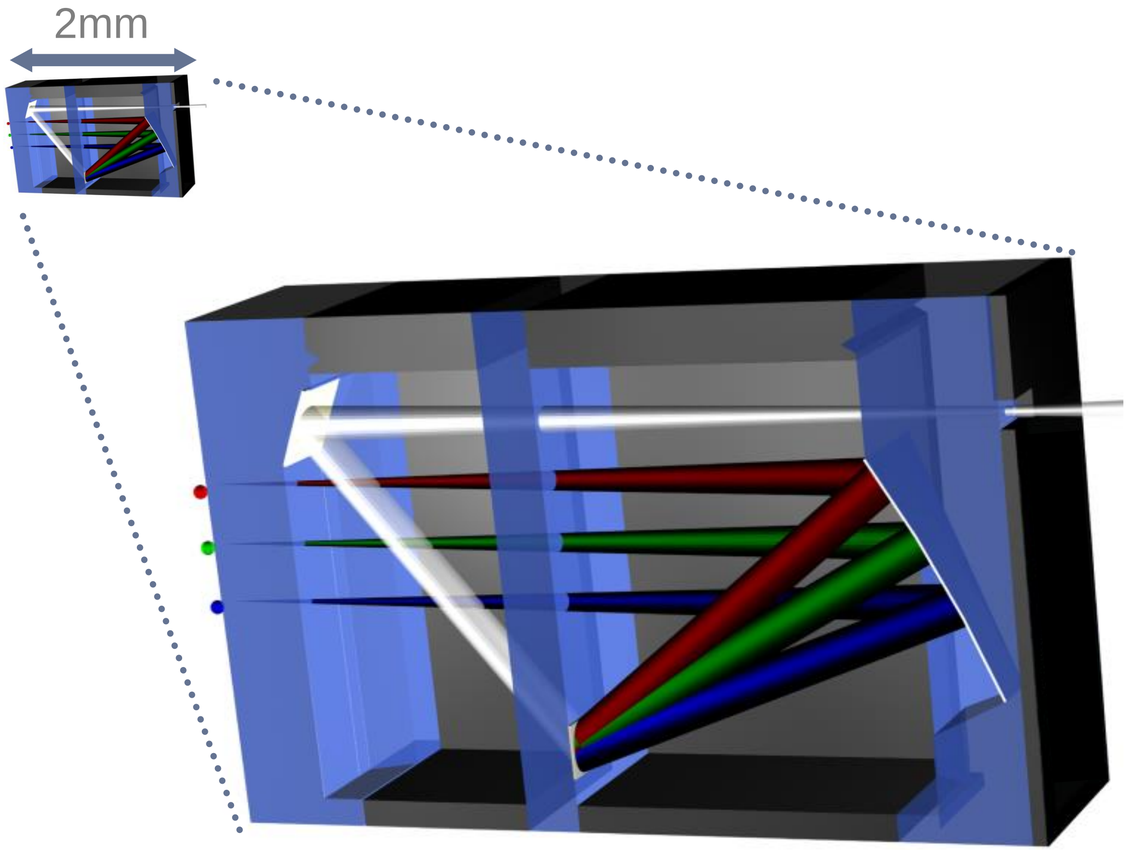
Active alignment and manual assembly



SPIO DEVICE: €

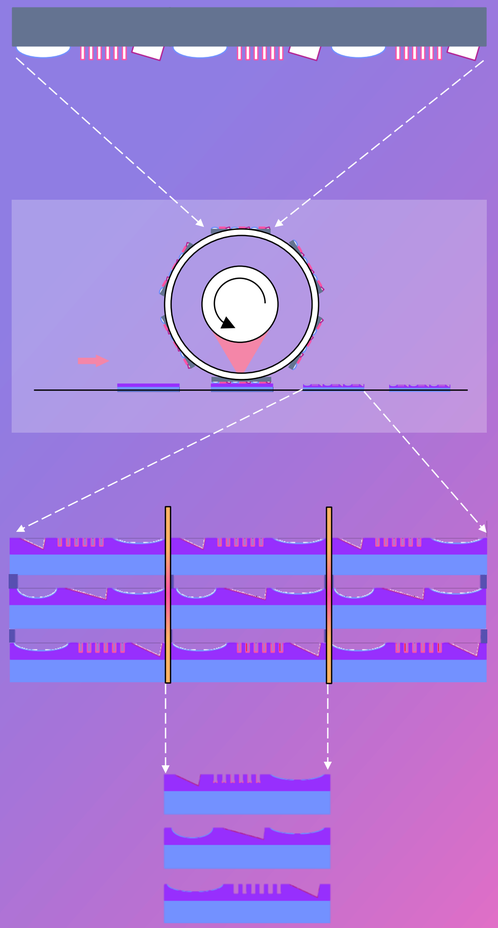
Integrated optical components in single planar layers (wafer)

Passive alignment and automated assembly



Technology

LOW COST, MASS PRODUCTION OF COMPLEX OPTICAL SYSTEMS



1. Master design and production

2. Roll-to-plate transfer to polymer on glass wafers

3. Stacking and characterization

4. Dicing into individual components

- **Master that enables compact and complex optics**
- **Cheap and fast production process**
- **Stacking of wafers: Assembly thousands of optical devices in parallel**
- **A very compact 3D optical SPIO device with a high dense of light processing. A manufacturing technology that makes SPIO Systems unique**

What is SPIO?

SPIO IS…

A technology platform that enables guiding and processing of light in advanced, complex optical structures.

- A toolbox of optical elements made to a single component
- Closed packed design: No mechanics on individual elements

- “Cubic” design: Optical light paths in 3 dimensions – in 2D planar layers but between layers as well

SPIO stands for:

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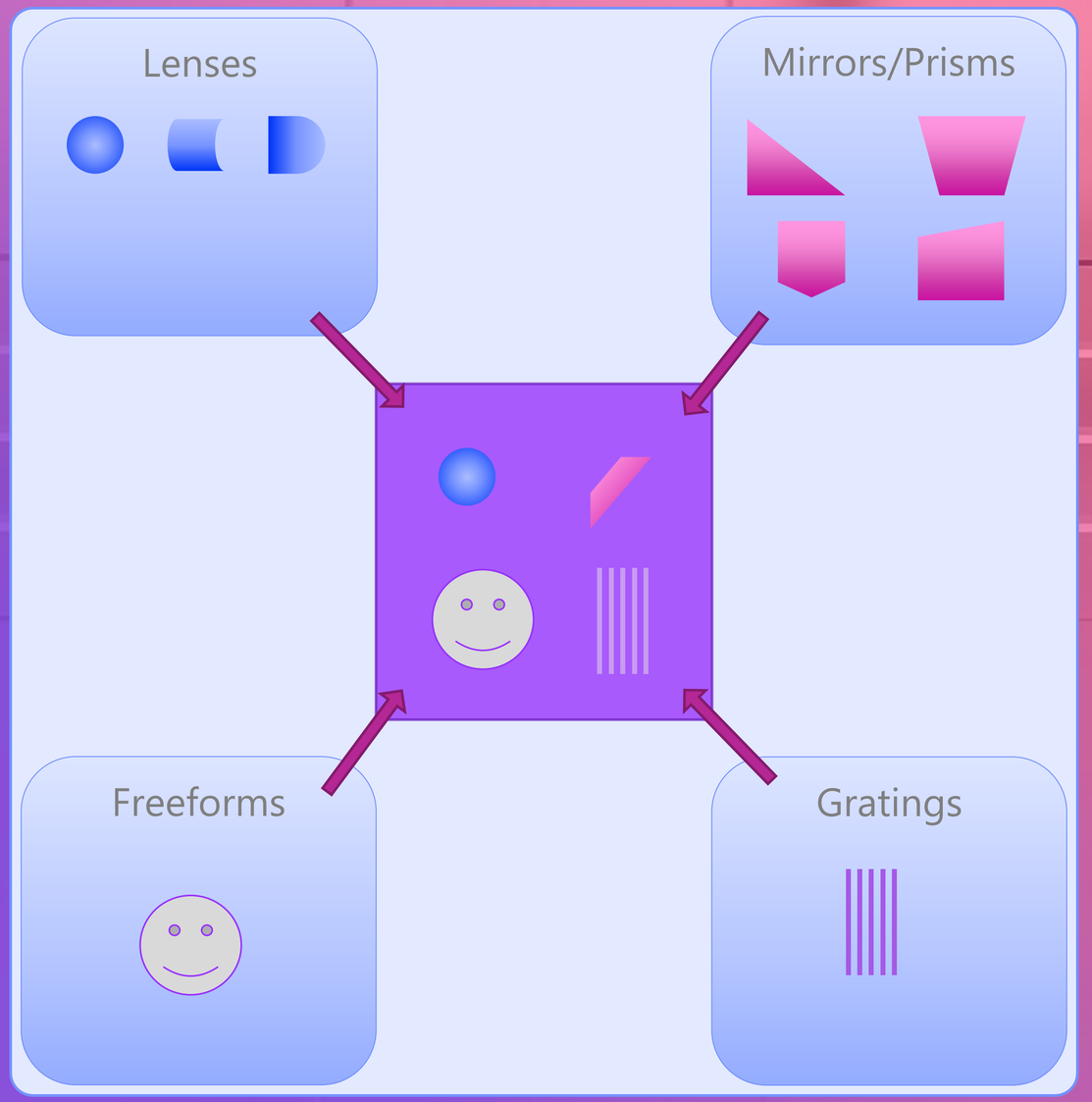

What is SPIO?

SPIO IS…

A manufacturing method that uses advanced Nanoimprint Lithography (NIL) processes and fast-curing polymer material as the primary consumable instead of slow-curing glass.

- Master replicated into polymer on glass wafers
- Hybrid master: Different optical elements on same wafer

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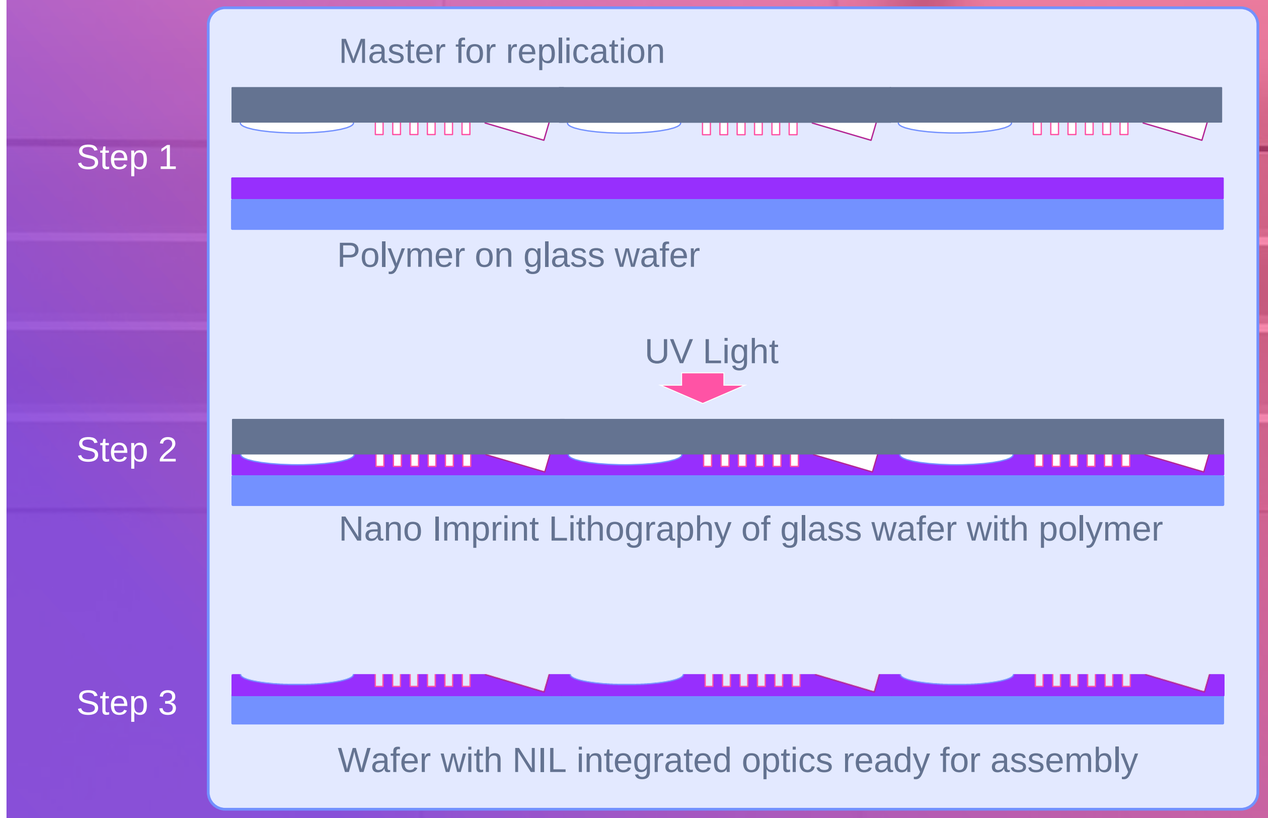
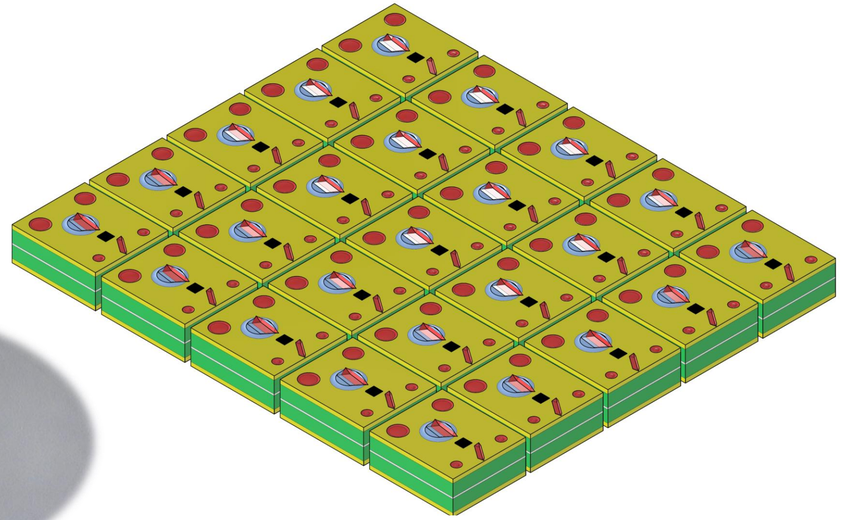
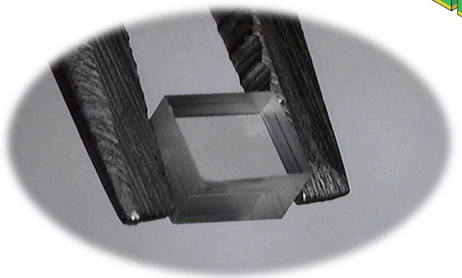


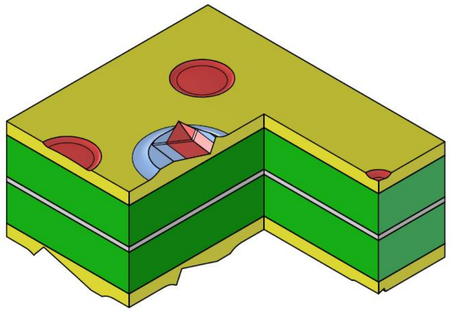
What is SPIO?

SPIO IS…

A production technology that allows mass production of small-size optical devices with photonic component integration.







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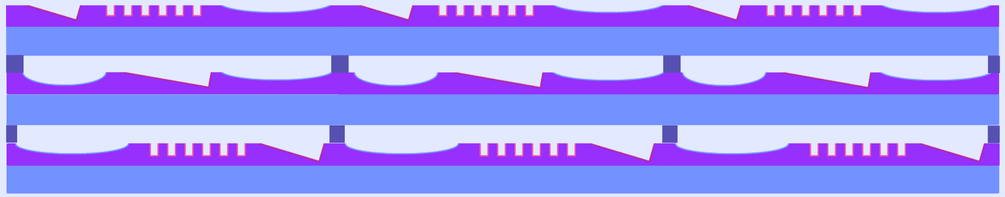
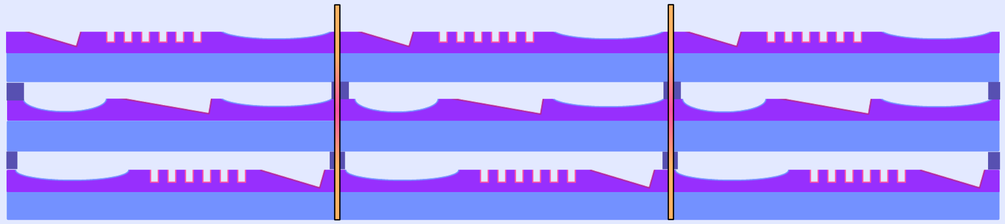
Step 1



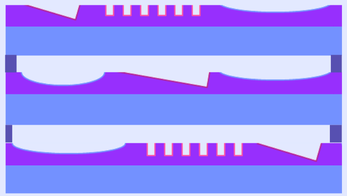
Assembly of hundreds of SPIO devices on wafer level

Step 2



Testing on wafer-level and separation into SPIO devices

Step 3



SPIO device die for integration

Spectrometer design with SPIO technology

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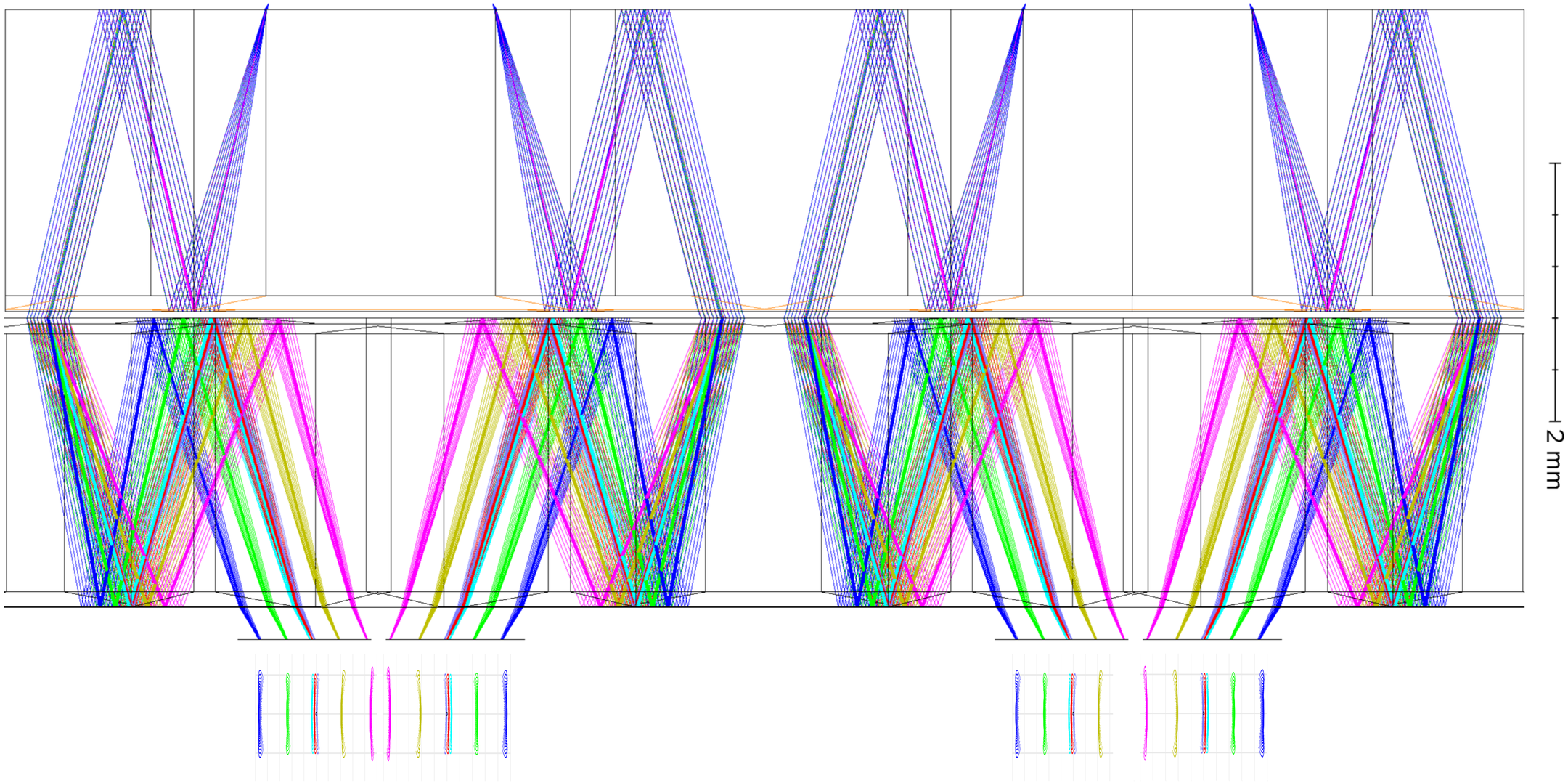
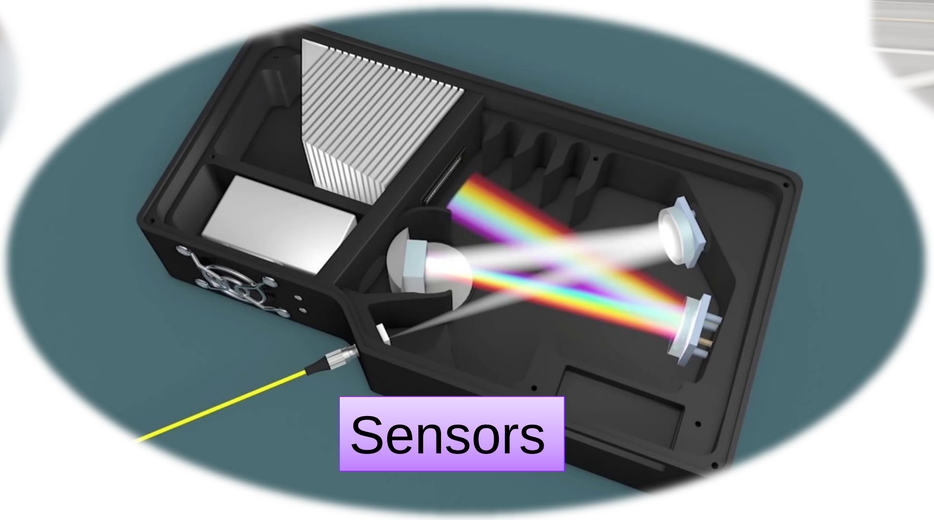


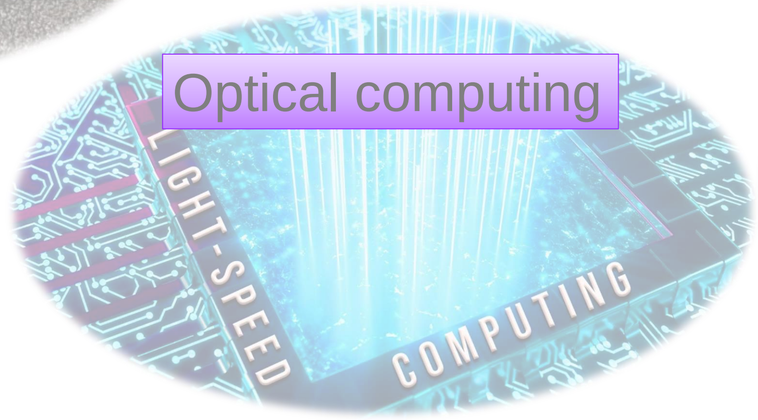
Who can benefit by SPIO Technology?


Health Care


Sensors

Autonomous cars

Telecom

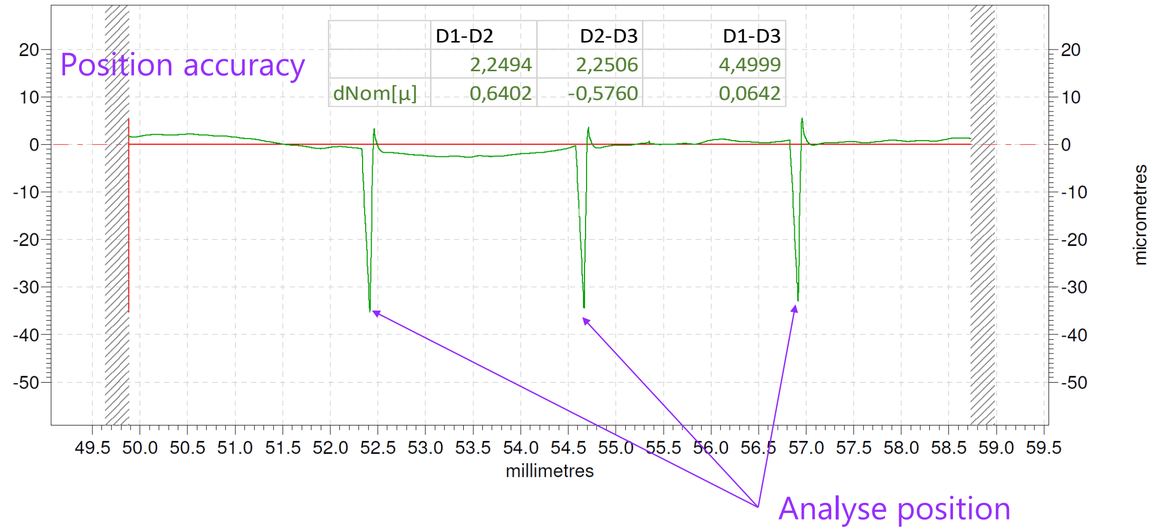


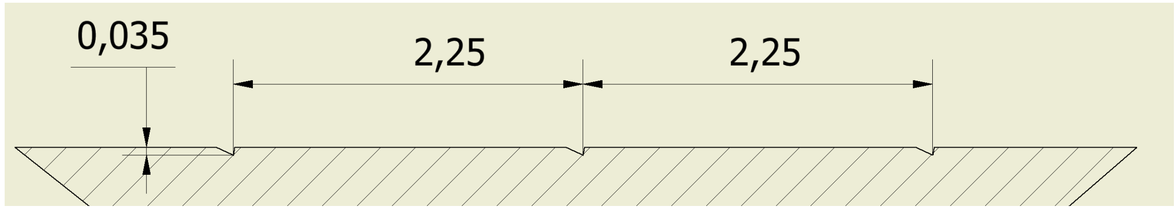
Optical computing

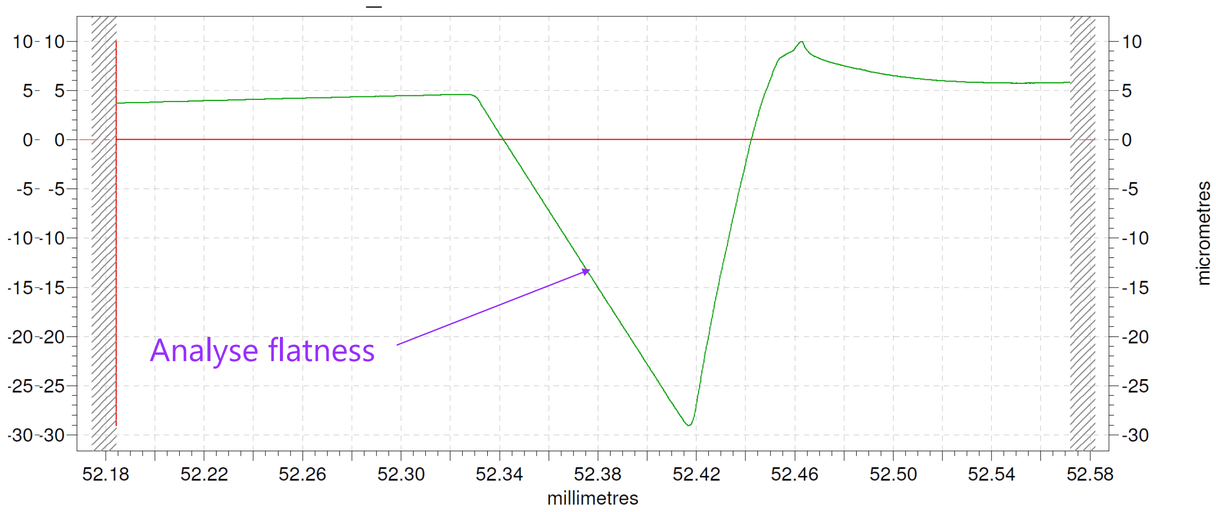

Metaverse

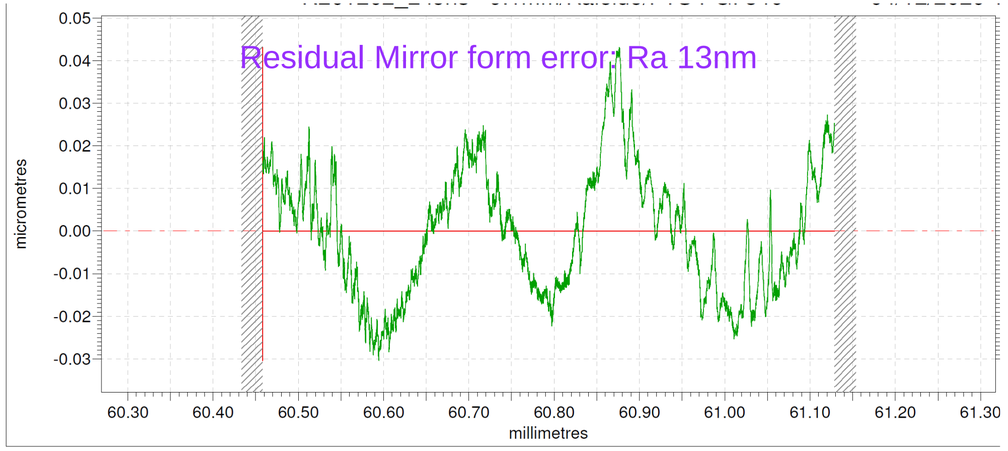

Smartphones

Imprint accuracy



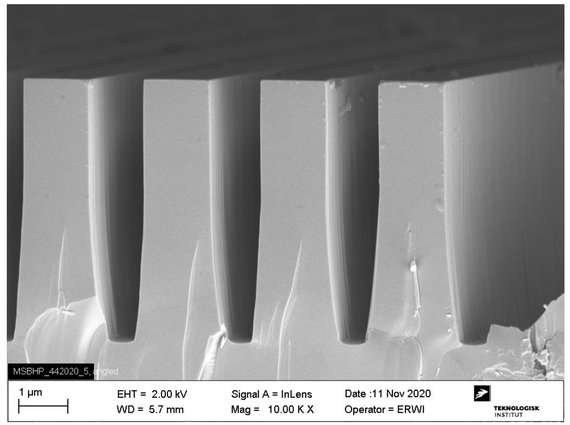




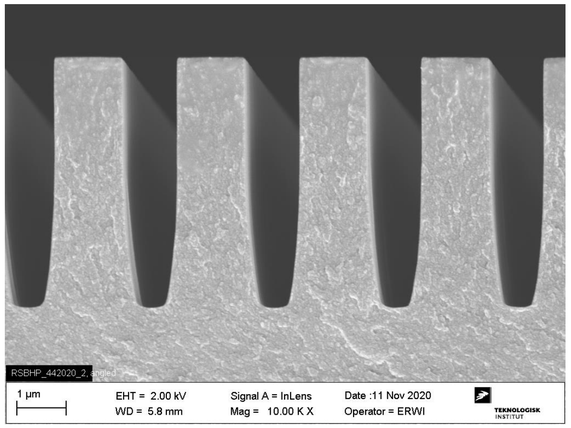


Grating, Prism structures

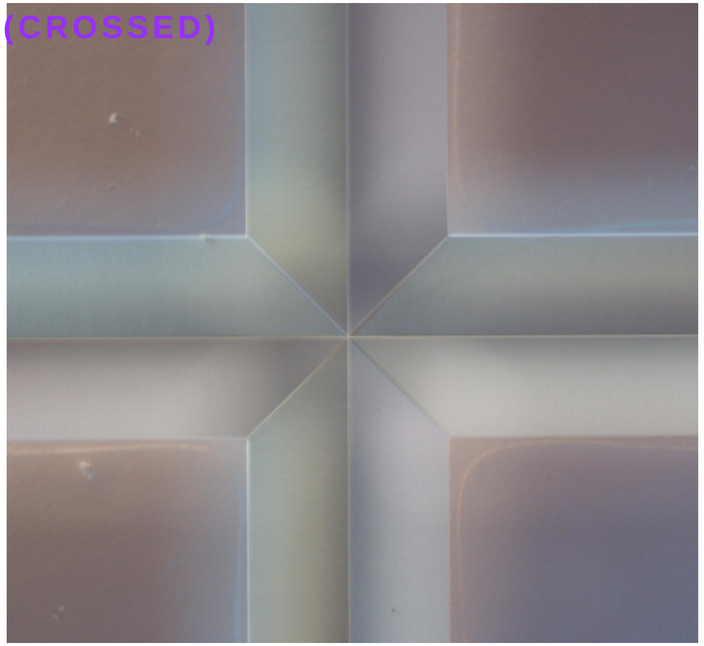
MASTER GRATING: FUSED SILICA



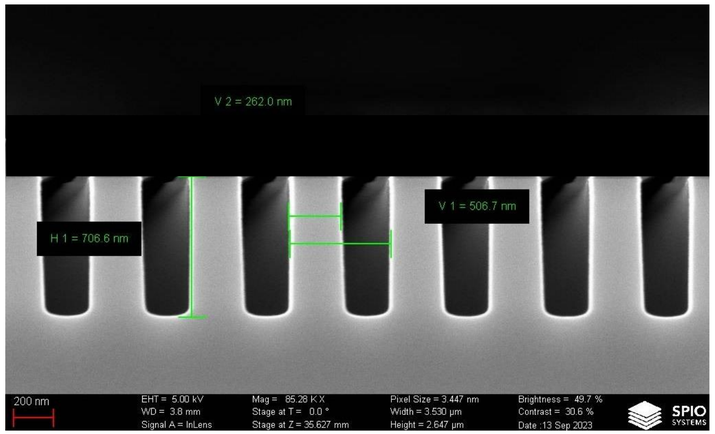
REPLICATED GRATING: POLYMER



REPLICATED V-GROOVES (CROSSED)



REPLICATED GRATING: SPECTROMETER



What we need in SPIO design toolbox

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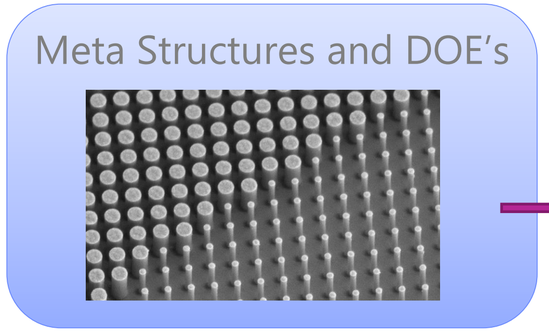

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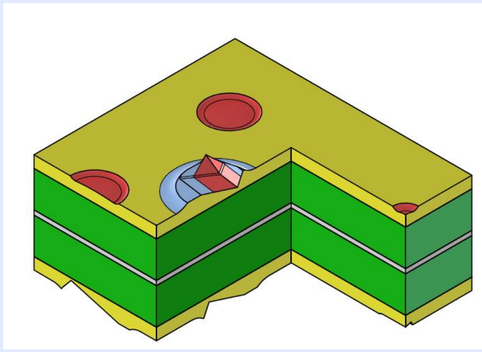
What we need in SPIO process:

AR + HR coatings on polymer:
Low temperature process



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What we need in SPIO process:

High index resins + low index bonding resin

Integrate detector array on wafer level:
Si wafer w CMOS

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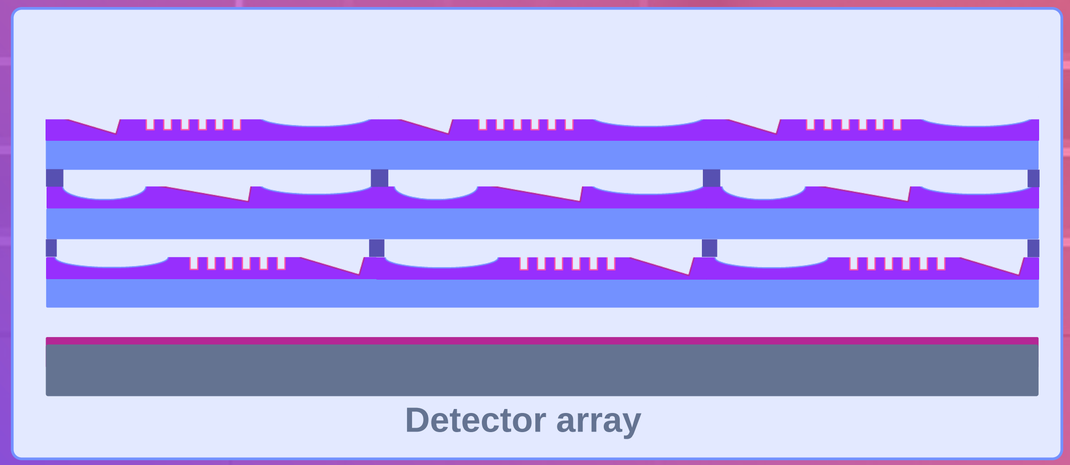

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