



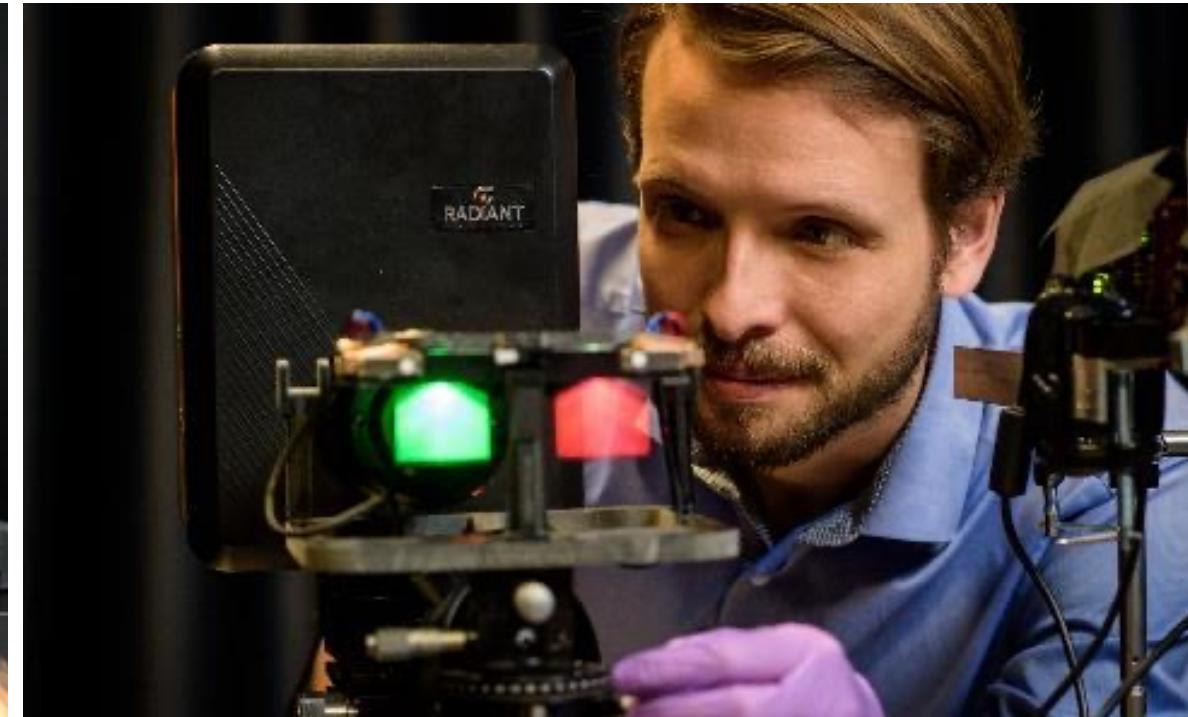
**Snap Inc.**

# *Snap's Journey to the Next Generation Spectacles - Our First AR Glasses*

*Speaker: Arseny Alexeev, PhD  
Director of Nanophotonics Technology*

# Our AR Vision

Since 2013 we have been pioneering the design of the key optical components of AR headsets and smart glasses: waveguides & projectors. WaveOptics was acquired by Snapchat in 2021. We are now part of Snap Labs.



# The Journey

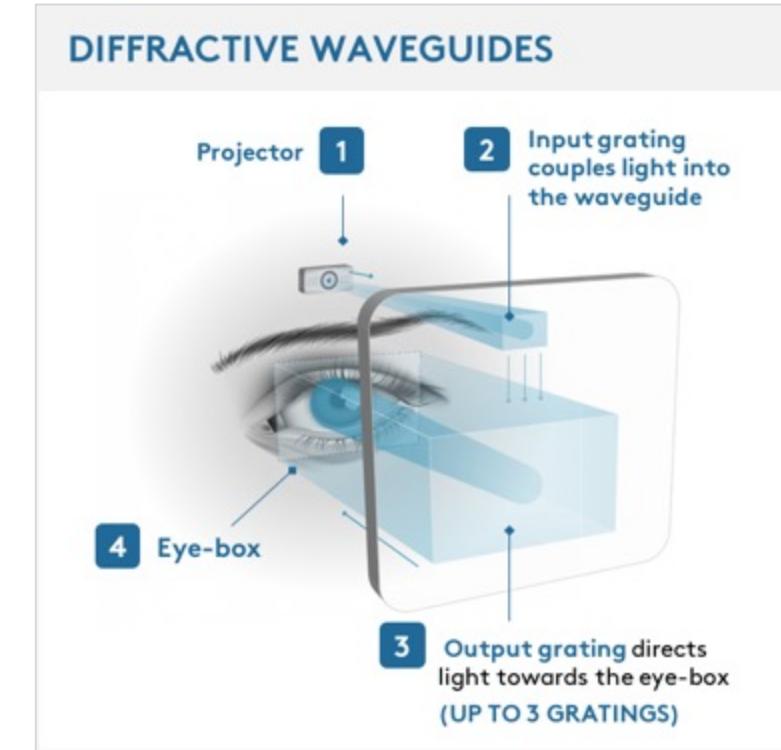
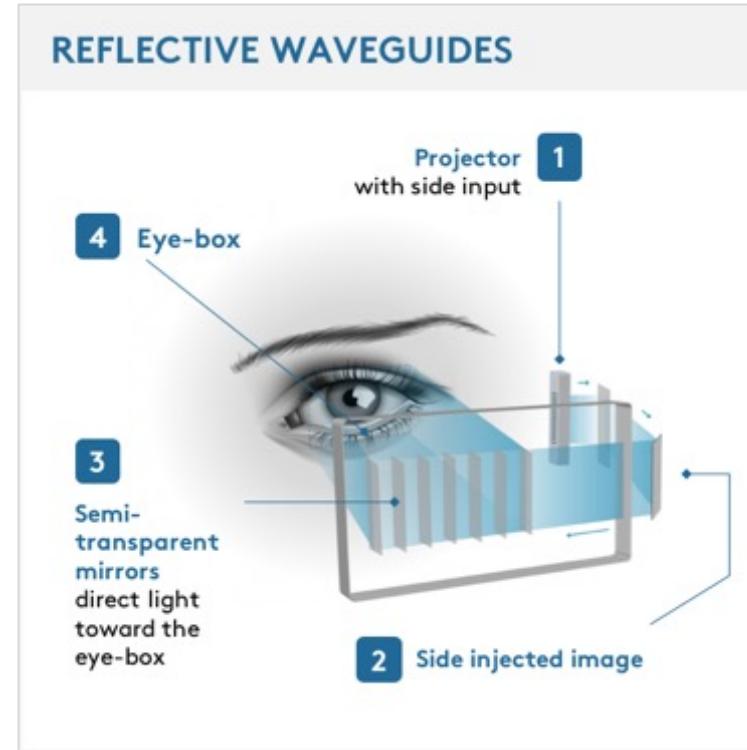
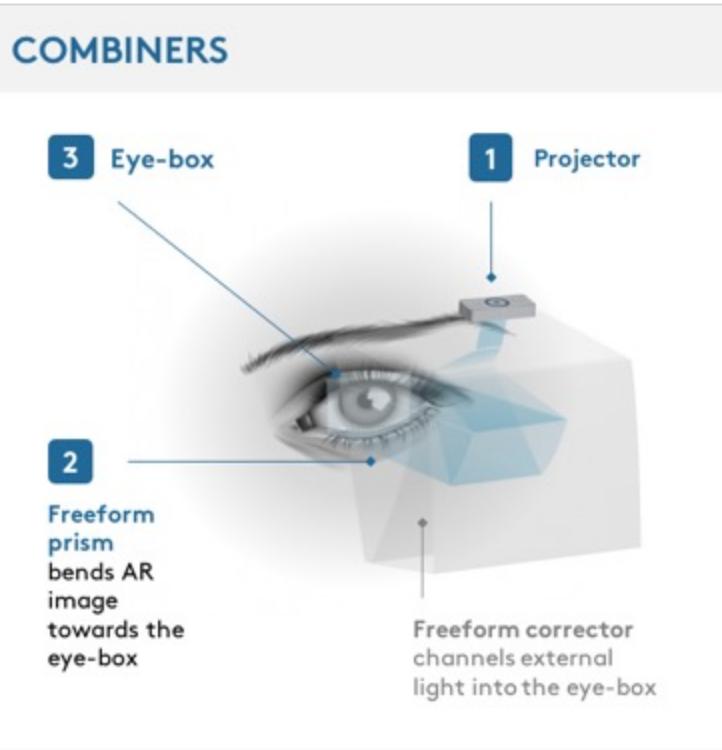
2014...



2021...



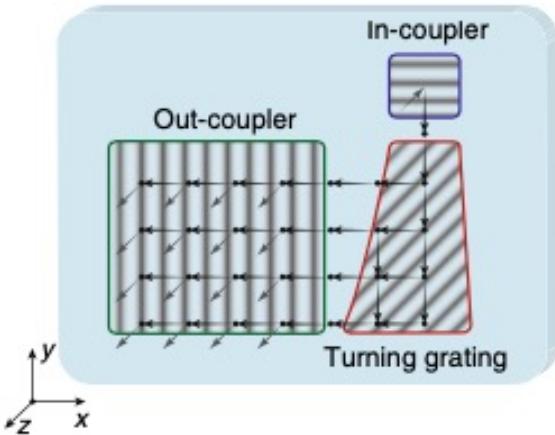
# 3 Main Types of AR Displays



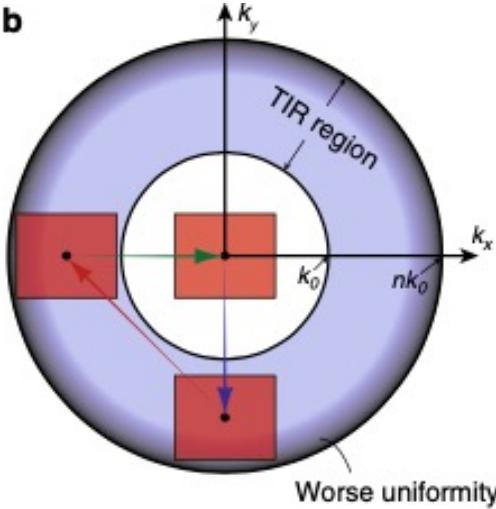
The market is moving towards waveguides as the industry standard

# Traditional 1D v. Unique 2D Gratings

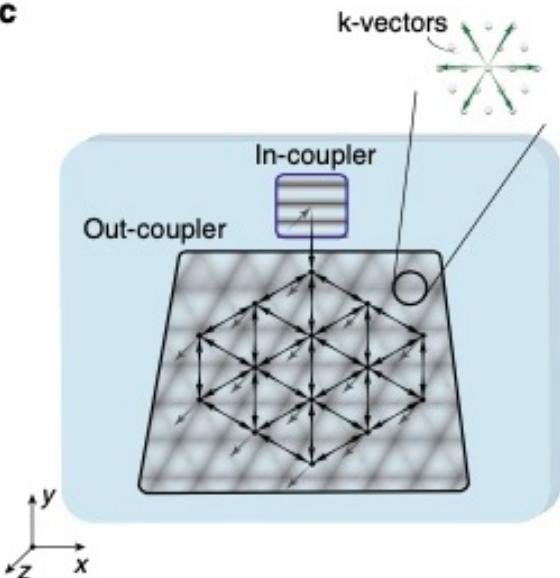
a



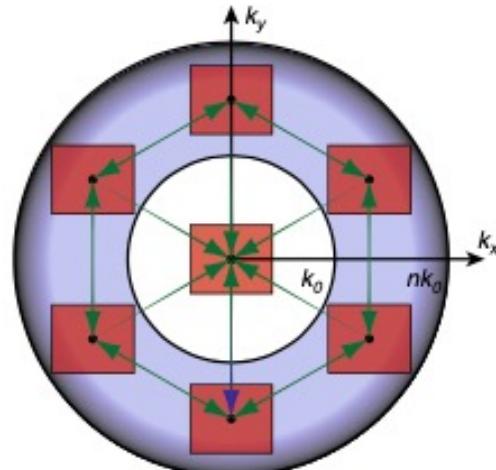
b



c



d

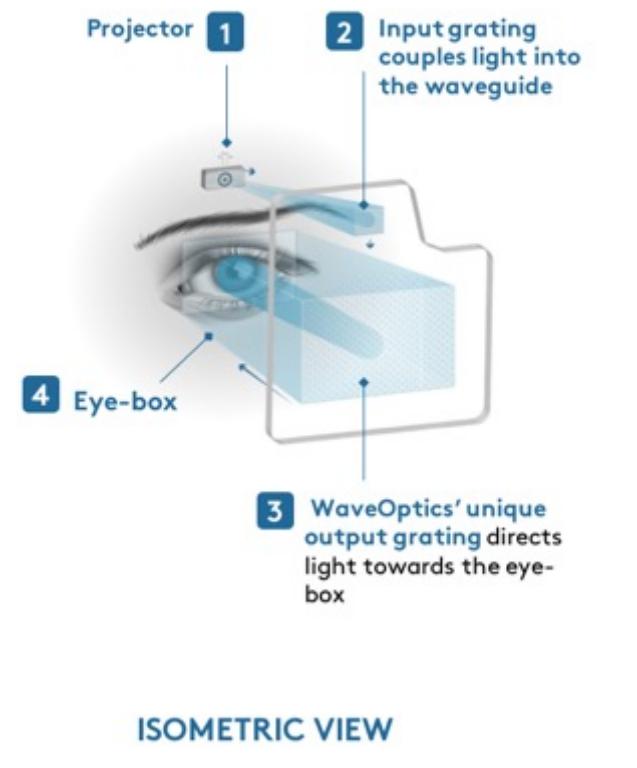


WaveOptics' iconic Vulcan design

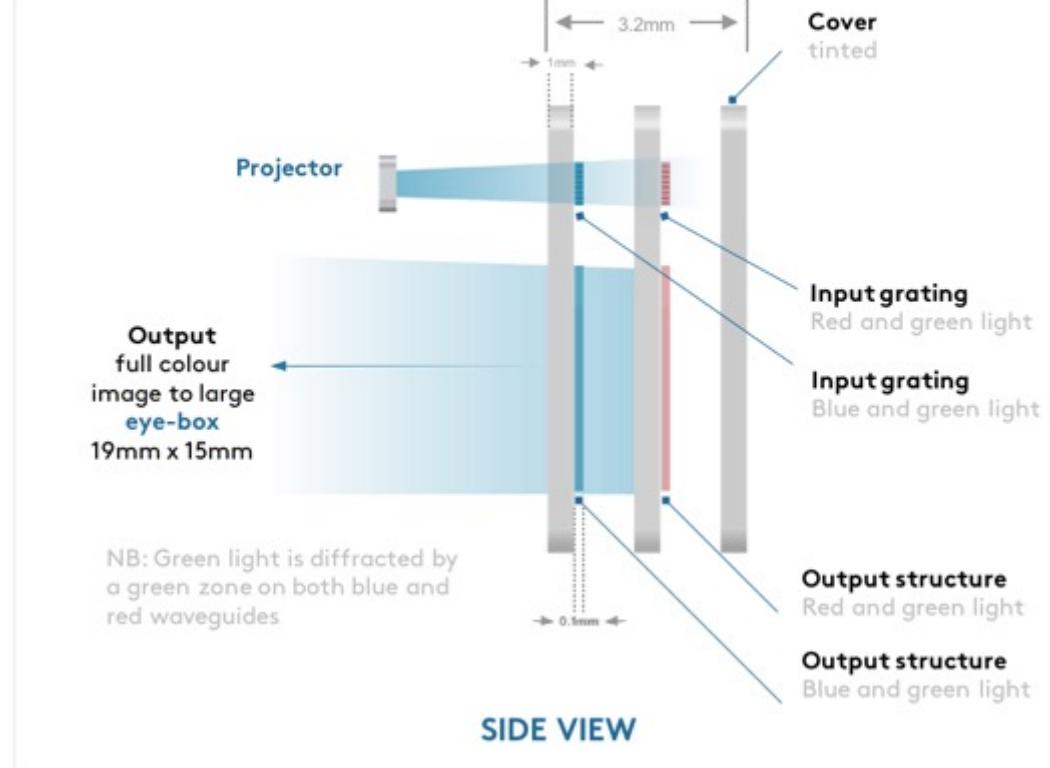
# Diffractive Waveguides Explained

## HOW WAVEOPTICS' DIFFRACTIVE WAVEGUIDES WORK

Light for AR image diffracted using nanostructures. 2D pupil expansion



Computer generated imagery projected by our near-eye displays which overlay the real world.



## KEY ADVANTAGES



Best in class optical performance



Flexibility of form factor design fits c.95% of adult population



Low cost manufacture at scale

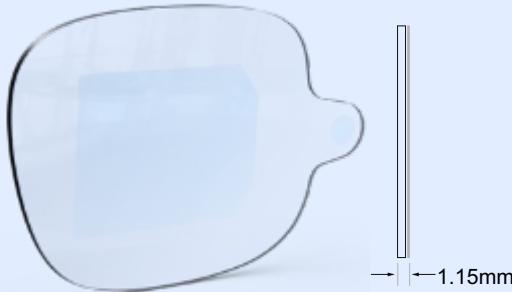
# 2014-2021: Waveguide Platforms

- Range of platforms with widest range of field of view between 15-60°
- Latest generation waveguides based on 1.8+ refractive index technology

## KATANA PLATFORM

designs up to 30°

- 1 active waveguide
- Monocular – single colour
- Binocular – colour or monochrome
- Light weight, low cost, low power smart glasses design
- **Ideal for notification uses**

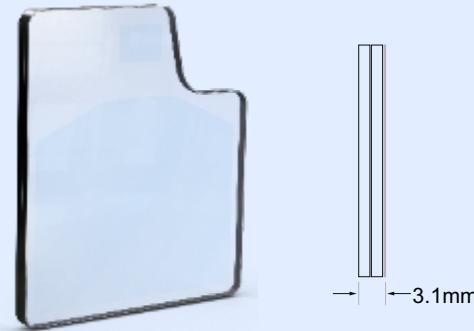


Blackbeard WG profile

## VULCAN PLATFORM

designs up to 40°

- 2 active waveguides
- Full colour
- Light weight smart glasses design where colour and complexity of AR headset is more than just notification-based use cases
- **Ideal for enterprise**

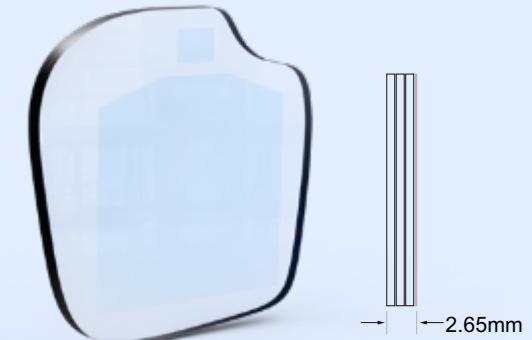


D08 WG profile

## ODIN PLATFORM

designs up to 60°

- 3 active waveguides
- Full colour
- Ultra high field of view & periphery vision
- **Ideal for gaming**



Odin 55 WG profile

# 2014-2021: Projector Platforms

Designed to be paired with the respective our waveguide portfolio to bring out the best of both technologies for superior image quality.

## MARS PLATFORM

up to 30°

- Ideal for 30° waveguides
- LCOS based technology
- Side injection
- Light weight
- Low cost



## SATURN PLATFORM

up to 40°

- Ideal for 40° waveguides
- DLP based technology
- Top injection



*Commonly used in our standard evaluation kits and modules*

## MERCURY PLATFORM

up to 55°

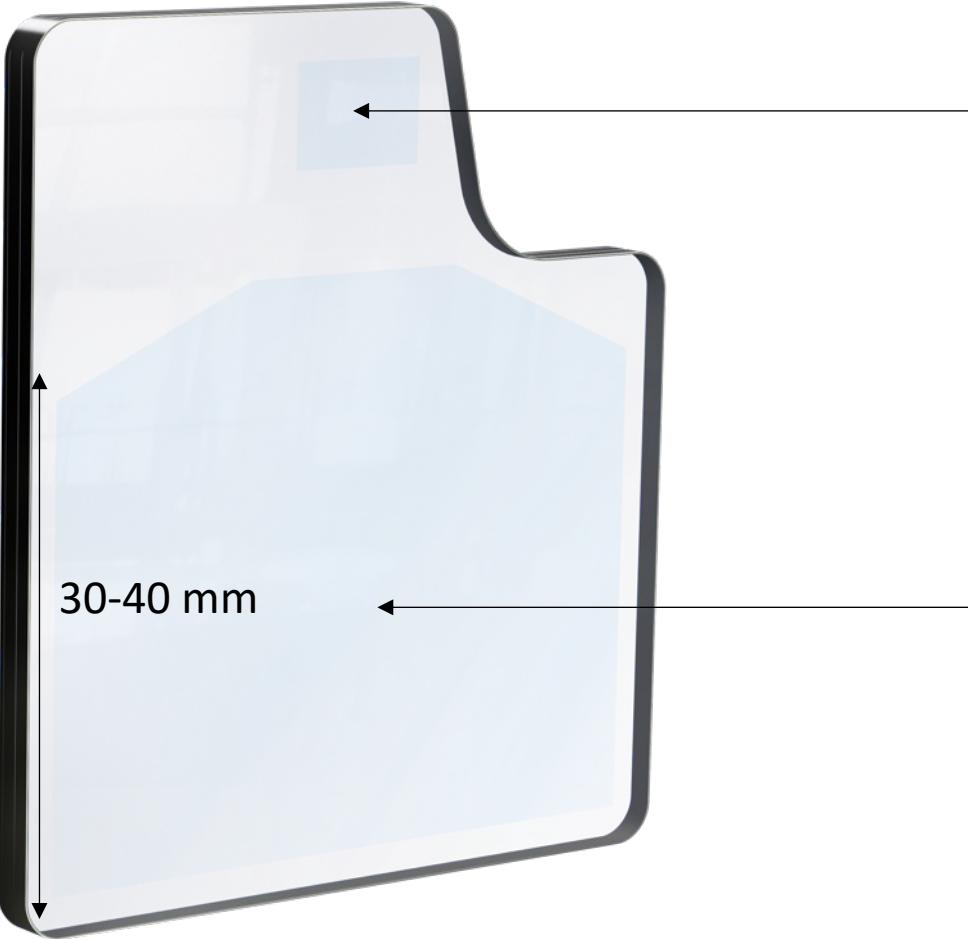
- Ideal for 55°+ waveguides
- LCOS based technology
- Top injection



# 2021: Next Generation Spectacles

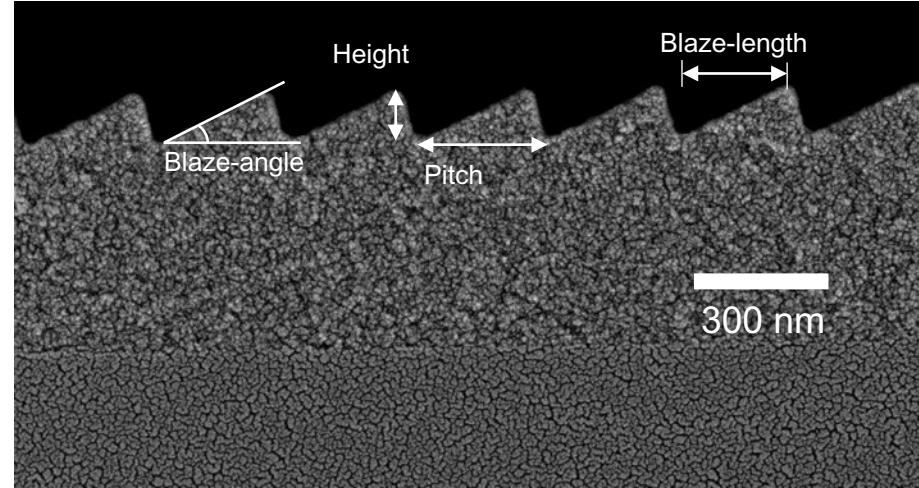


# Manufacturing Challenge

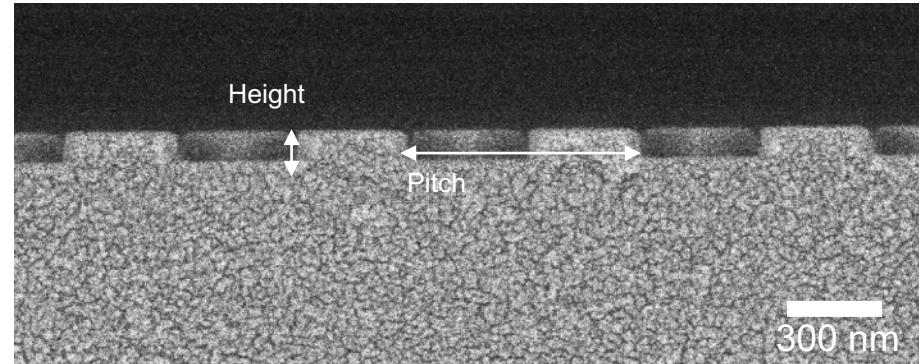


Patterned area:  $1200 \text{ mm}^2$  Resolution: <20 nm.

Blazed Grating:

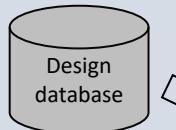


2D Grating:



# Waveguides Manufacturing

## MASTERING



Silicon wafer

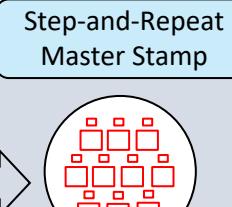


Electron Beam  
Lithography and Etch

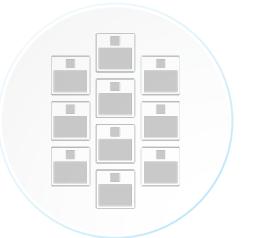
Master Stamp



Step-and-Repeat  
Master Stamp



TOOLING



200mm wafer  
10 imprints

## IMPRINTING



Nanolithography



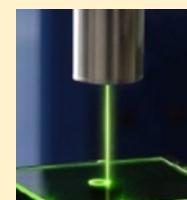
200mm glass  
wafers

Imprinted  
wafers

Functional (Optical)  
Coating

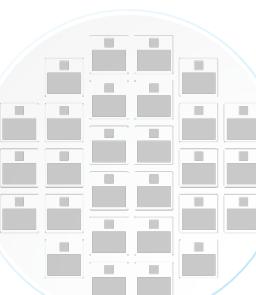


Coated  
wafers



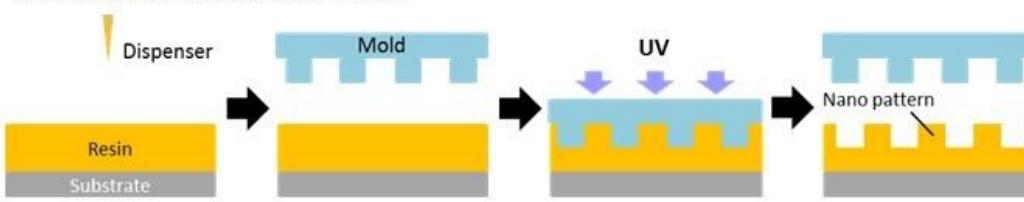
Laser cutting

Waveguide  
units



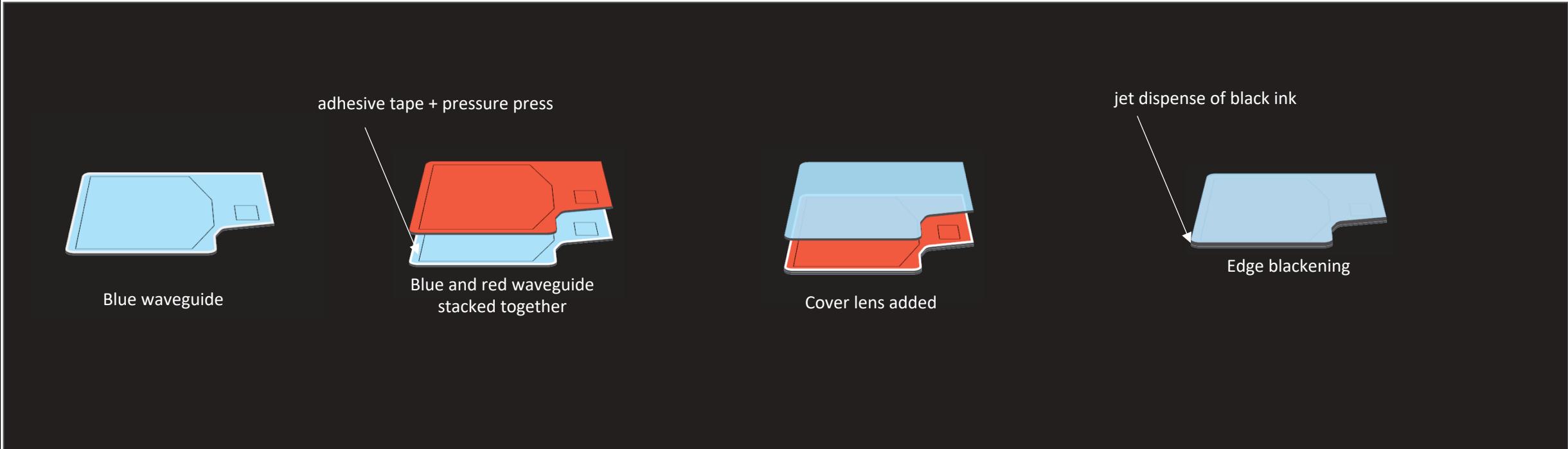
300mm wafer  
28 imprints

UV Nanoimprint Lithography Image

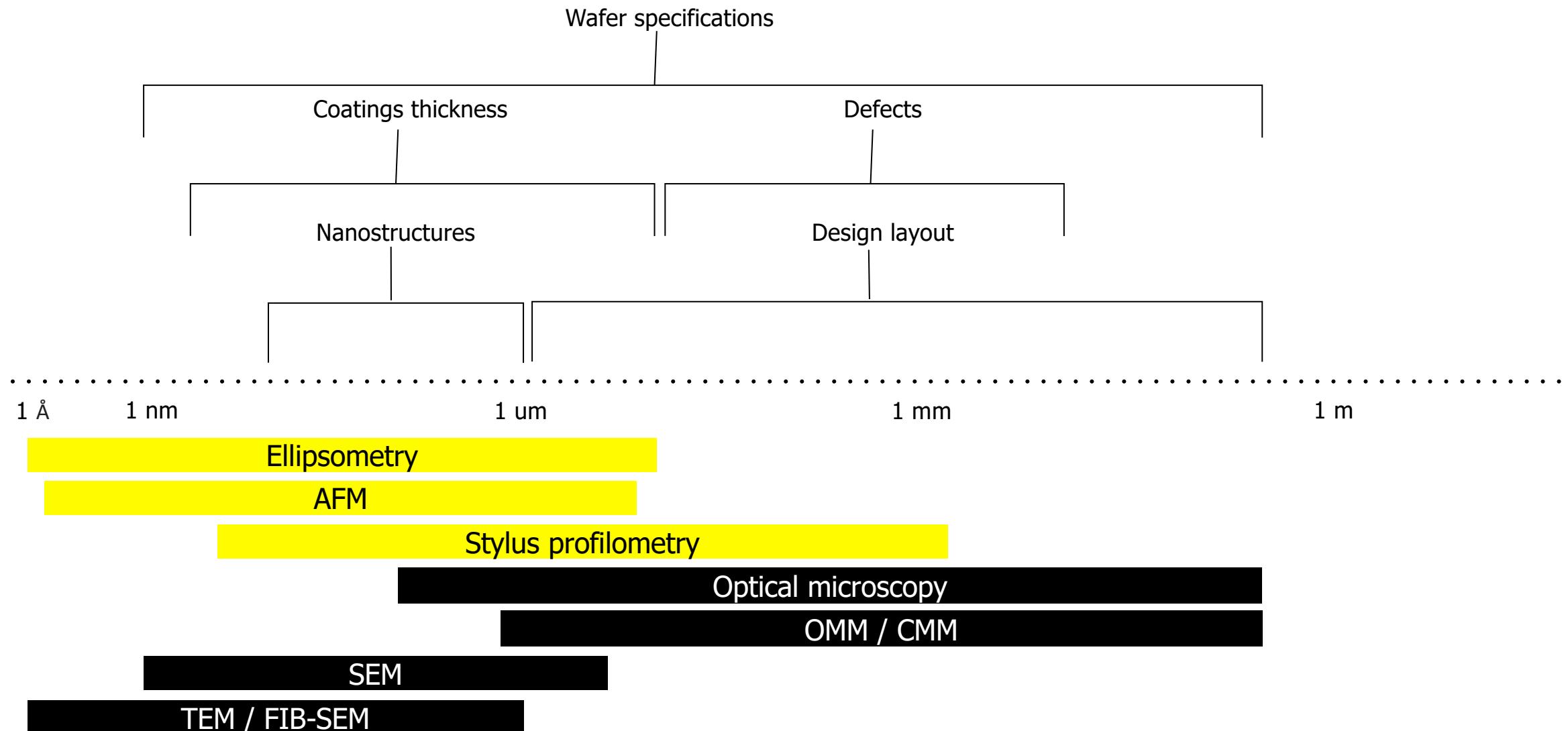


PRODUCT

# Waveguides Manufacturing

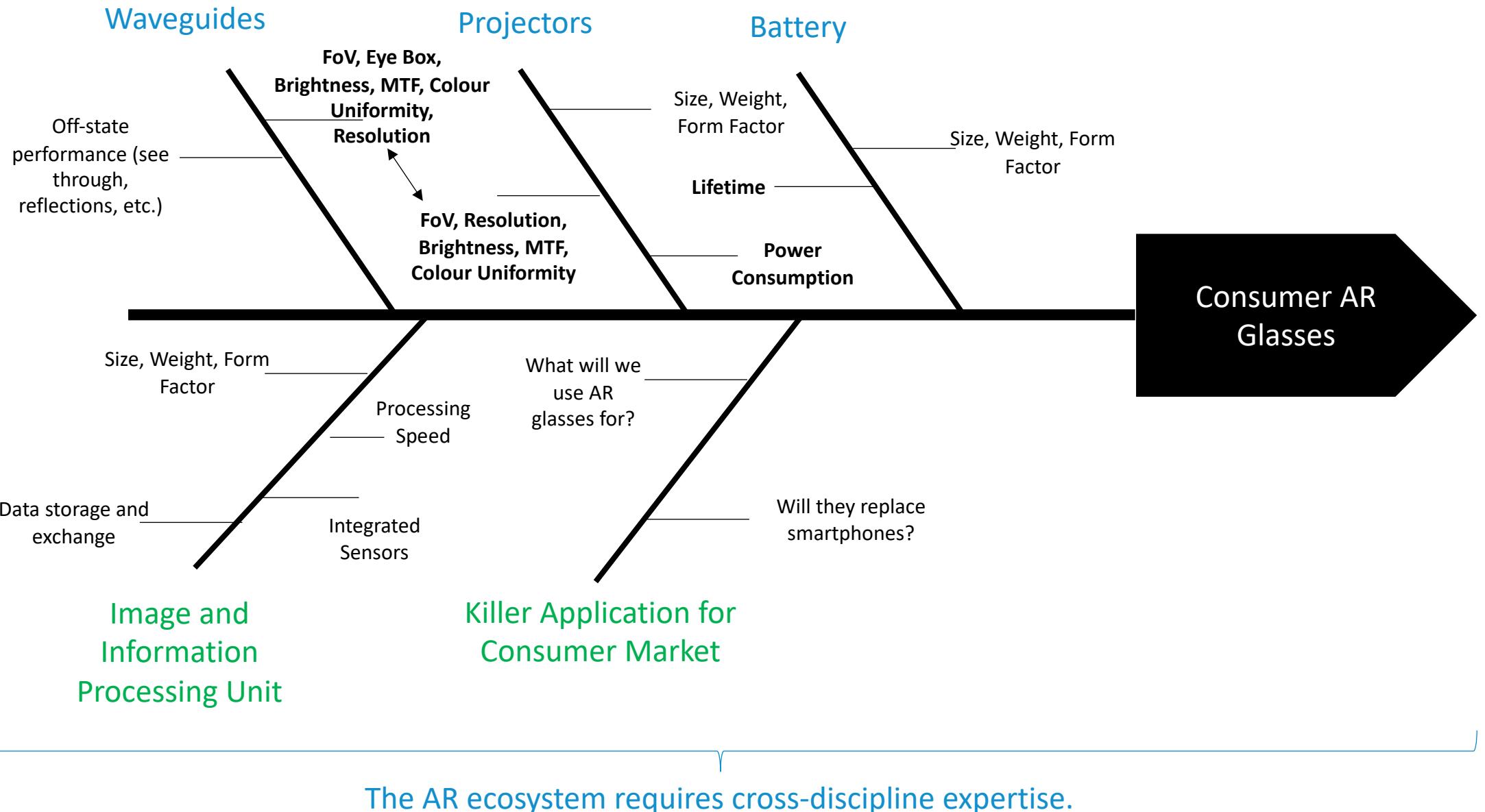


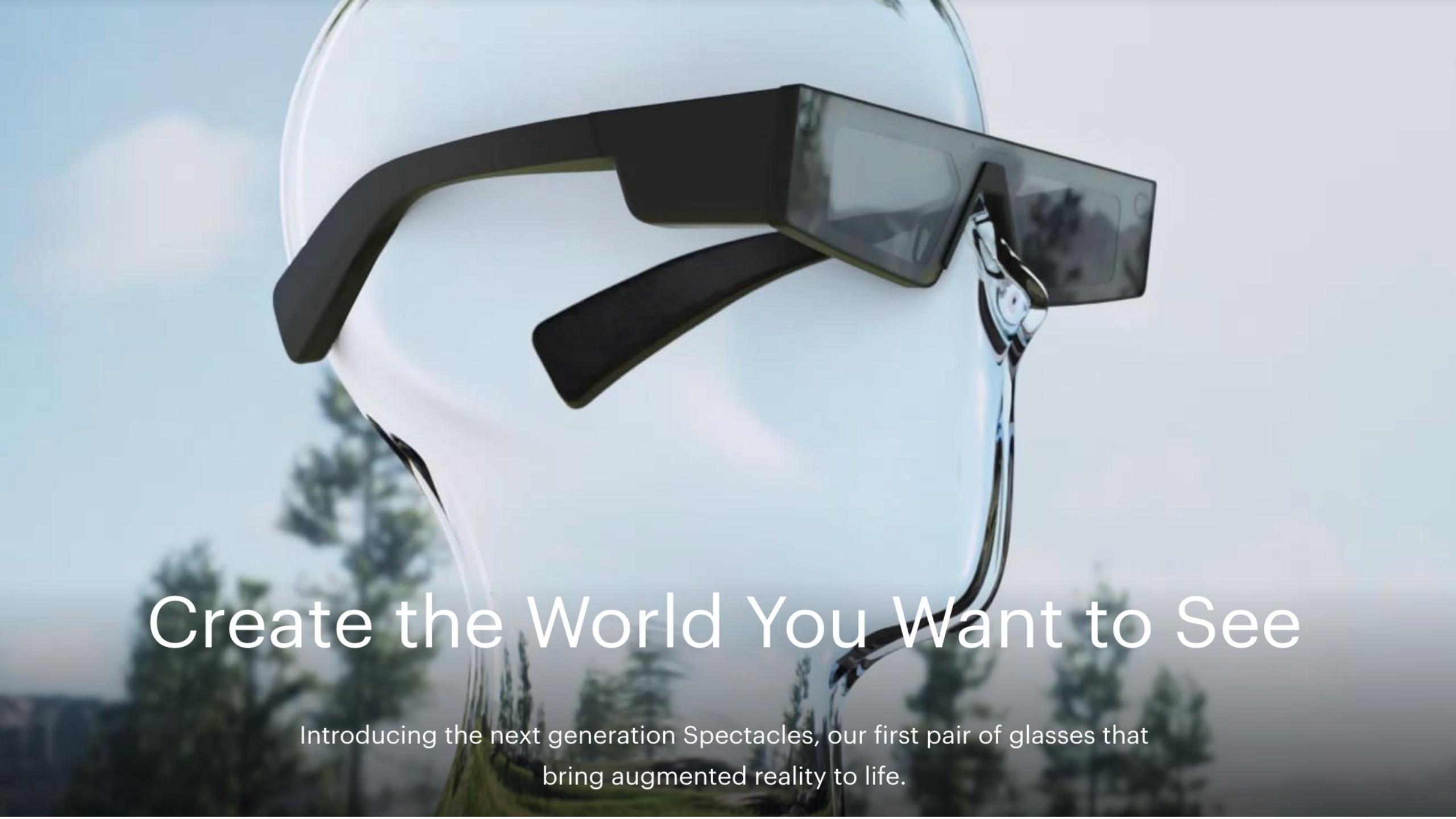
# Metrology Challenge



New solutions are needed for metrology of nanophotonic devices – for both R&D and Mass Production.

# Consumer AR Glasses





# Create the World You Want to See

Introducing the next generation Spectacles, our first pair of glasses that bring augmented reality to life.