

# Optical Coatings for Defense and Laser Applications

*Laurent Luong*

*MARCH 2026 11th & 12th*



EPIC Technology Meeting on Photonics for Defense: Securing the Future



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## Meet Materion

- A global high-tech solutions provider of electronic materials, performance materials and precision optics
- Nearly 100 years of material sciences knowledge
- Publicly traded since 1972 – NYSE (MTRN)
- \$1 billion in sales
- Based in Cleveland, Ohio
- Nearly 3,000 employees



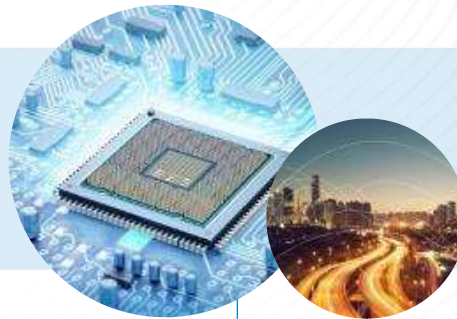
# Our Business

We operate in three reportable business segments.



## Performance Materials

One of the world's leading suppliers of high-performance alloys, beryllium products, clad metals, metal matrix composites, and technical ceramics.



## Electronic Materials

Specialty materials for thin film deposition, microelectronic packaging products and inorganic chemicals.

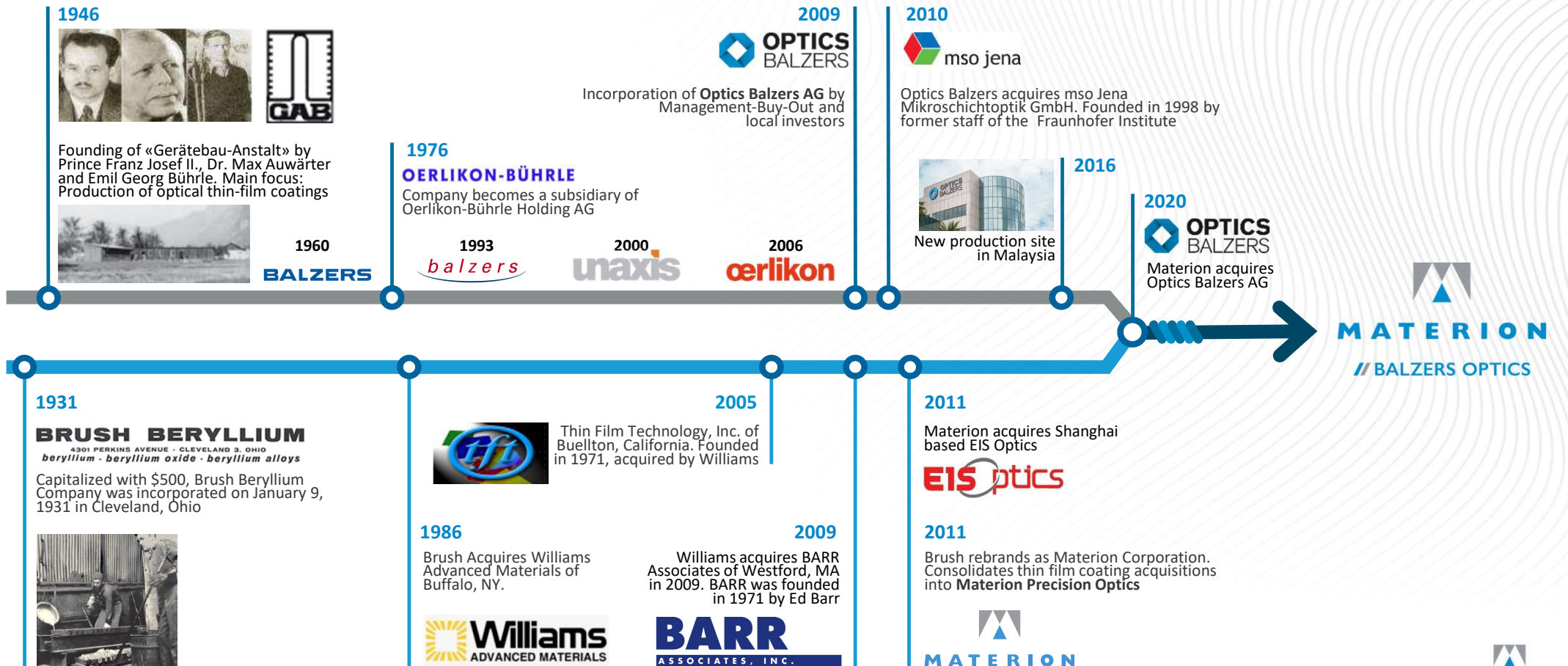


## Precision Optics

One of the world's largest manufacturers of customized optical thin-film coatings and components.



# Our History



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# Precision Optics Locations

## Precision Optics

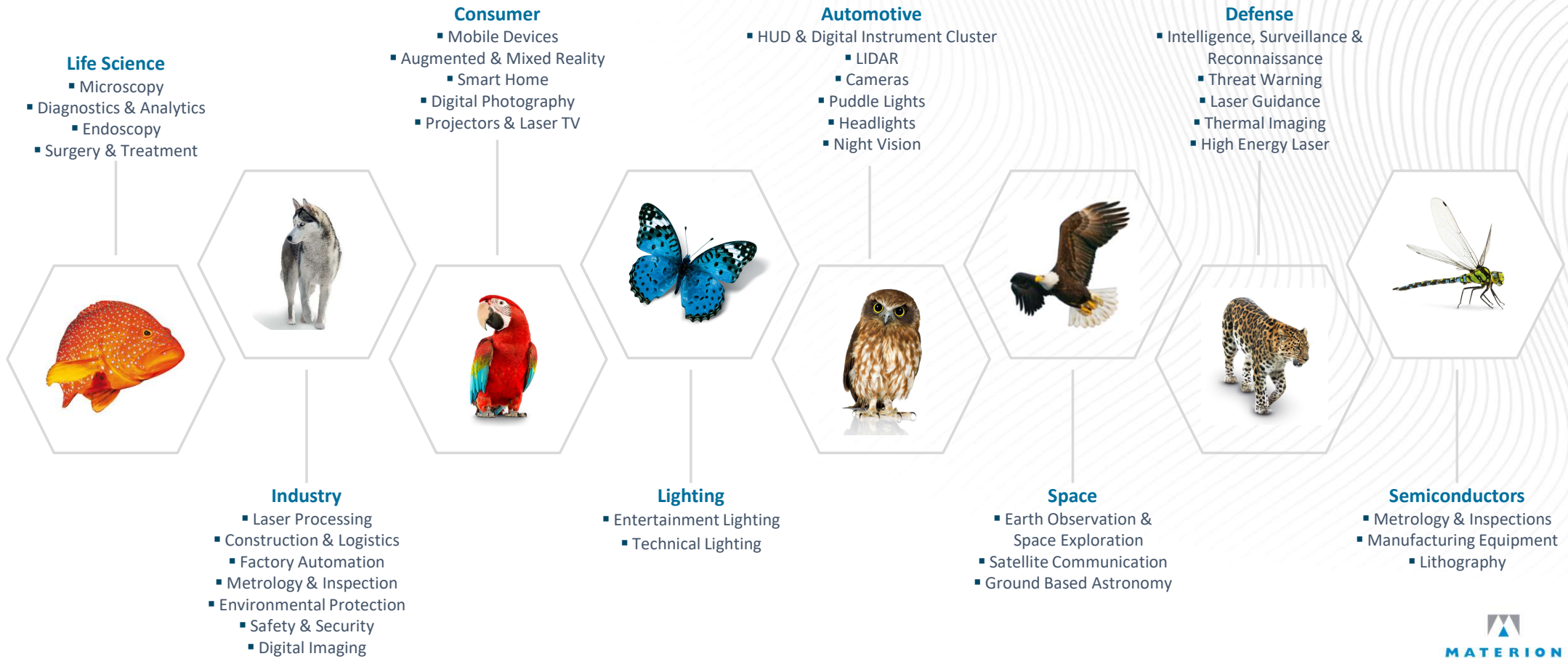
- Balzers, Lichtenstein
- Jena, Germany
- Penang, Malaysia
- Shanghai, China
- Tyngsboro, Massachusetts
- Westford, Massachusetts
- Eschborn, Germany



**Precision Optics**

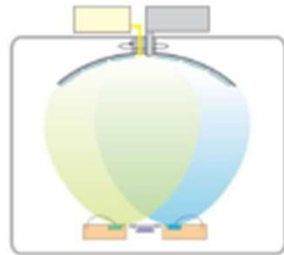


# Unlimited Applications in High-Tech Markets



# Coating Equipments

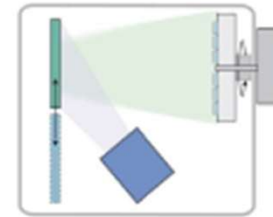
## Overview Optical Coating-Technologies



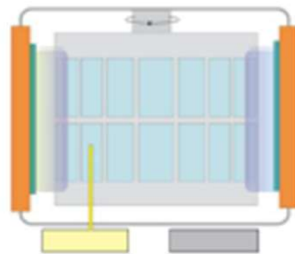
**Evaporation**  
(e-beam and boat sources)



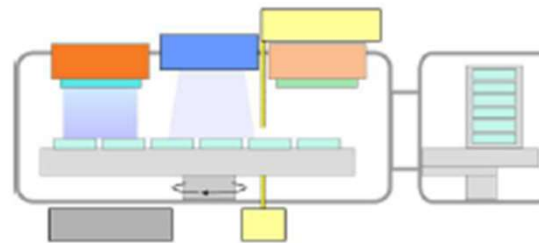
**IAD Evaporation**  
(Ion Assisted Deposition)



**IBS Deposition**  
(Ion Beam Sputtering)



**Magnetron Sputter**  
**Deposition**






**Plasma-Assisted Reactive Magnetron**  
**Sputter Deposition**

Company Presentation | Optics Balzers AG | Februar, 2019

# Production Capability

## Thin Film Coating Equipment

Criteria					
	Standard Evaporation	IAD Evaporation	MSP Magnetron Sputter Coating	Plasma assisted sputtering SMALL	Plasma assisted sputtering LARGE
Stability of Filters (spectral, mechanical)	-	+	++	++	++
Spectral precision / Narrow tolerance	-	0...+	+	++	++
Low optical Loss	0...++	0...+	0	++	++
Low Surface Defect Quality	- ...+	++	-	+	+
Volume production compatibility (automation/standardization)	-	0	++	+	+
Throughput (filter area / time)	+	+	++	0	+...++
Reproducibility / Process Stability	-	+	++	++	++
Flexibility (shapes / coat. materials)	++	++	-	-	-

# APPLICATION Examples

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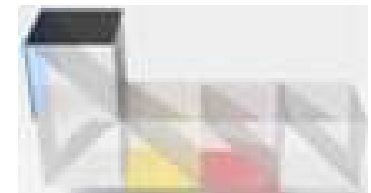
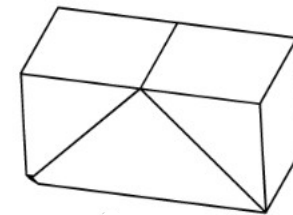
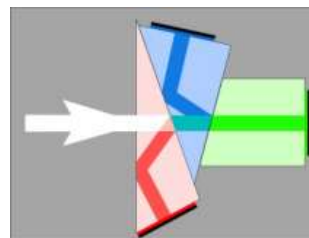


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# Prism Assemblies

- Our Product
  - Prisms, - assemblies
  - New: mirrors, filters, reticles
- Application
  - Warning systems / surveillance
- USP
  - Superior quality



[visu-l.tv/clients/materion/Materion\\_Film\\_HEX\\_03.mp4](https://visu-l.tv/clients/materion/Materion_Film_HEX_03.mp4)

Ctrl-Click link to view assembly animation



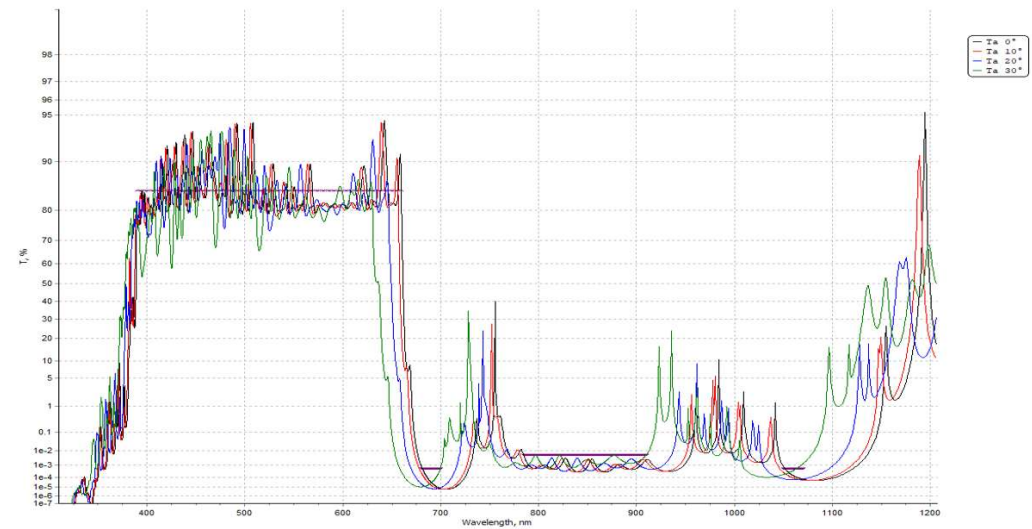
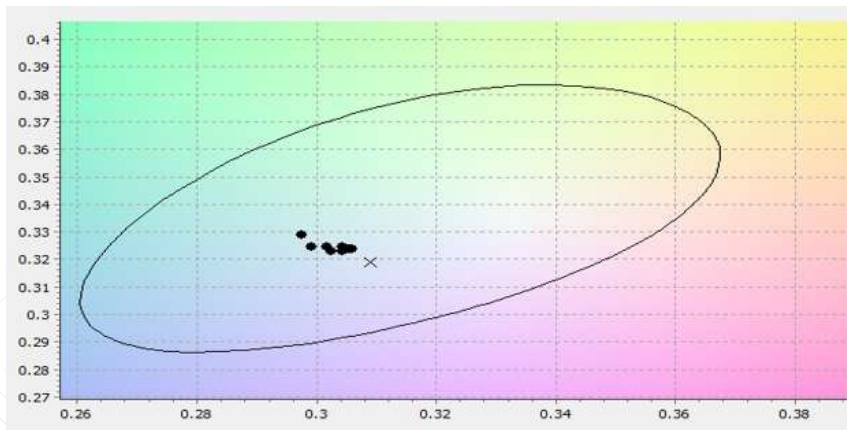
# Laser Protection Filters

## Applications:

- Laser safety filters for Periscope armoured vehicles or Google
- 1064nm BP filter with OD 7 blocking

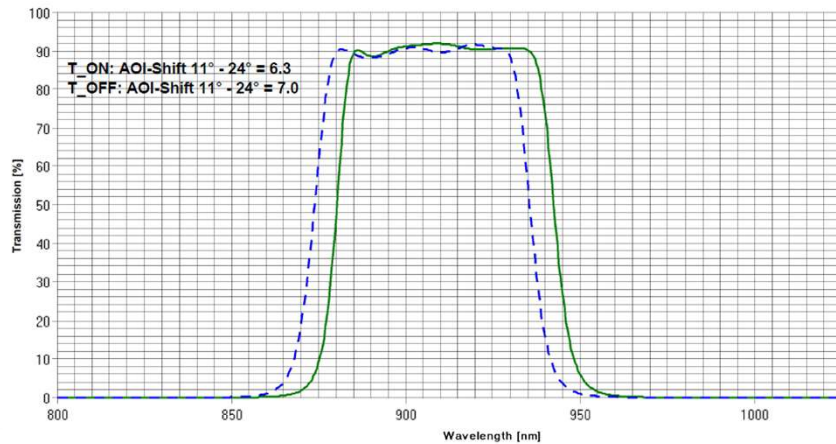
## Customers pain points

- Large substrates, narrowly defined colour coordinates & high LIDT requirements.
- Defined colour points



# Near Infrared bandpass filters

- Our Product:
  - NIR-BP-Filters
- Application:
  - Filter for training vests
  - Filters for Military Google / Laser Range Finder
- Status:
  - mass production
  - Customer like our high performance, zero defect rate



— 1006\_21951+21952\_T11q.dsp    - - - 1006\_21951+21952\_T24q.dsp

1 PDD overview

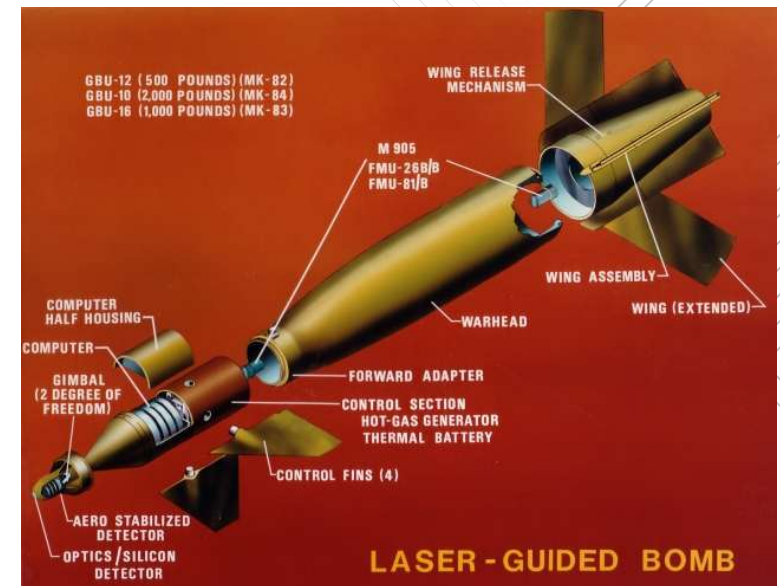


1. Head harness	4. PCU (Personel Computer Unit)
2. Body harness	5. Laser detectors
3. GPS antenna (advanced configuration)	6. Player ID Number

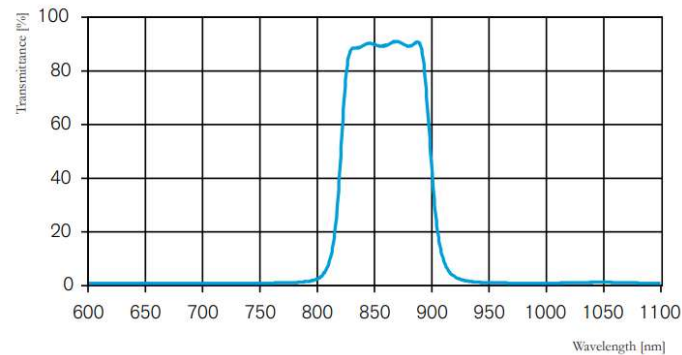


# Filters on sapphire

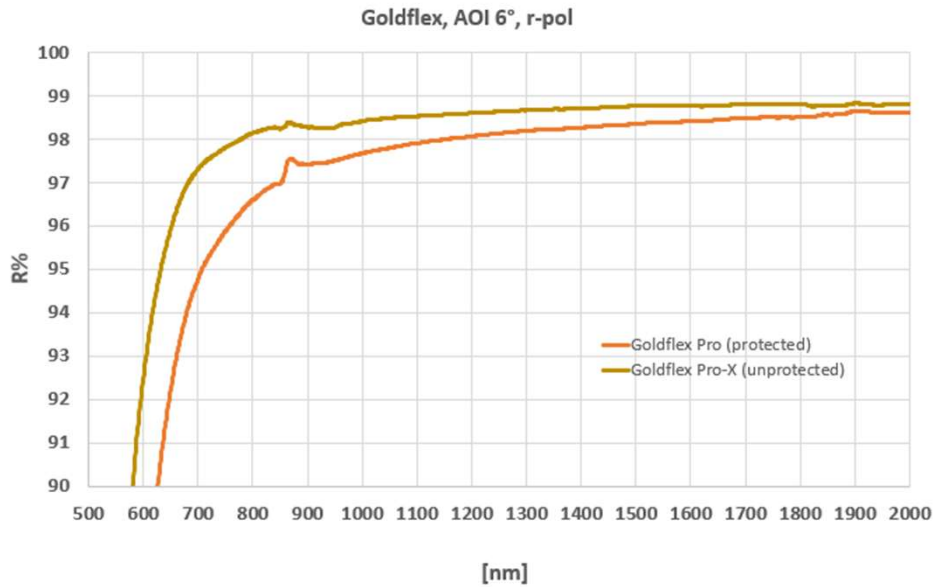
- Our Product
  - Filter on Sapphire lens
  - Head window for Rocket head designator
- Application
  - Laser guided bomb
- USP
  - good sapphire substrate, excellent coatings
  - Can offer the LP/ or BP 1064/1550 nm filter
  - **ITO option on top of the filter for EMS shielding as alternative to conventional mesh grid**



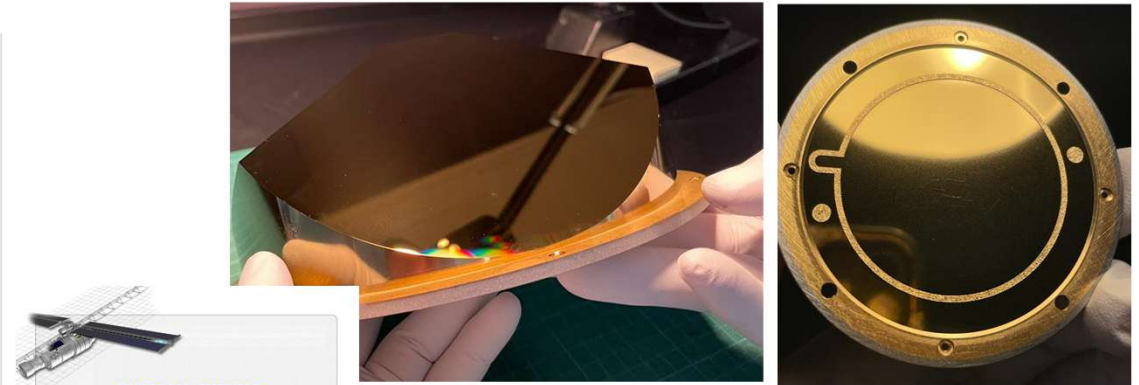
Transmission spectrum of NIR Bandpass Filter SP, CWL @ 865nm



# Goldflex: top IR Reflectance



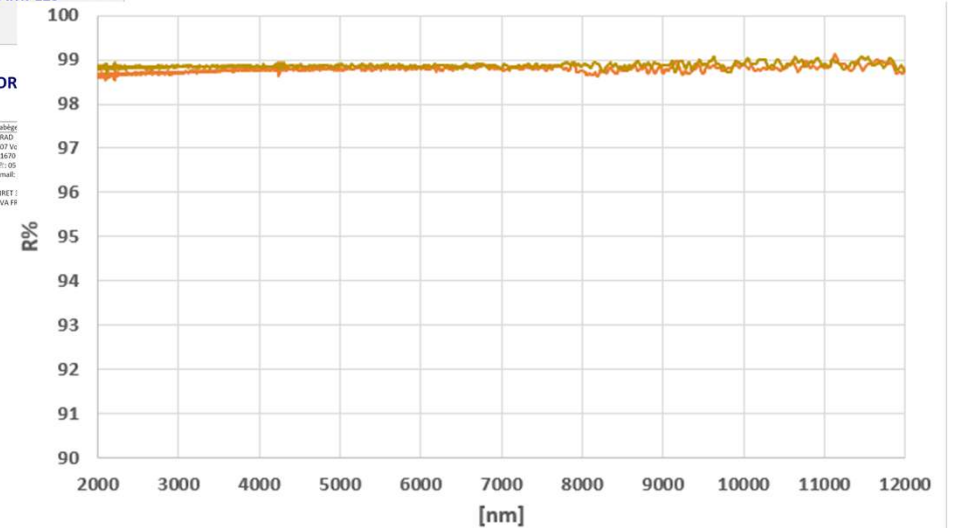
- Top reflectance in IR
- Space application: Fast Steering Mirrors, Coarse Pointing Assembly
- s/p Phase-shift optimization (example  $< 2^\circ$  at 855 nm)
- Substrate versatile



TEST REPORT

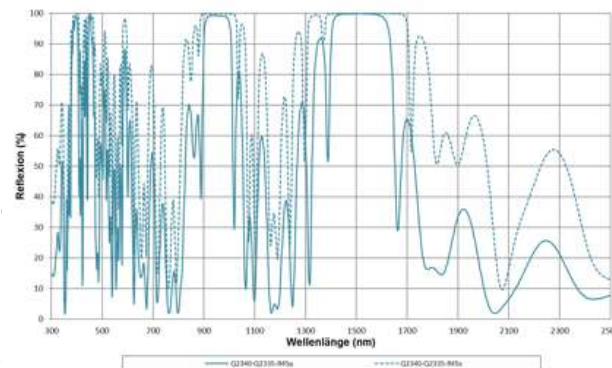
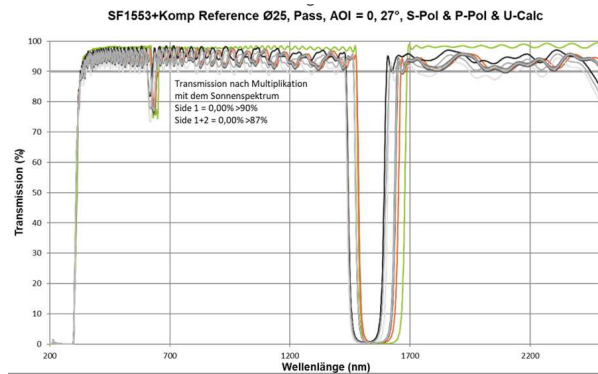
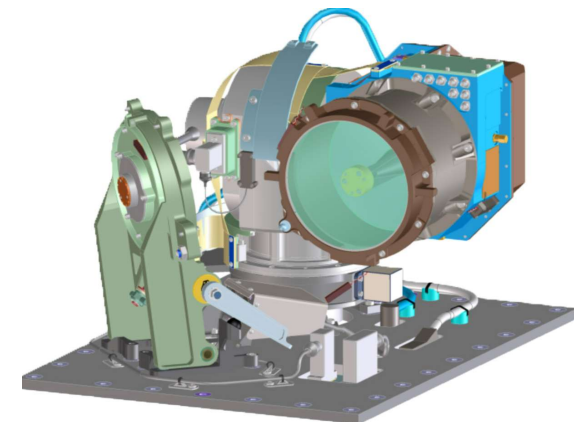


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Date: 05/05  
Email: info@trad.fr  
Sheet: 1/1

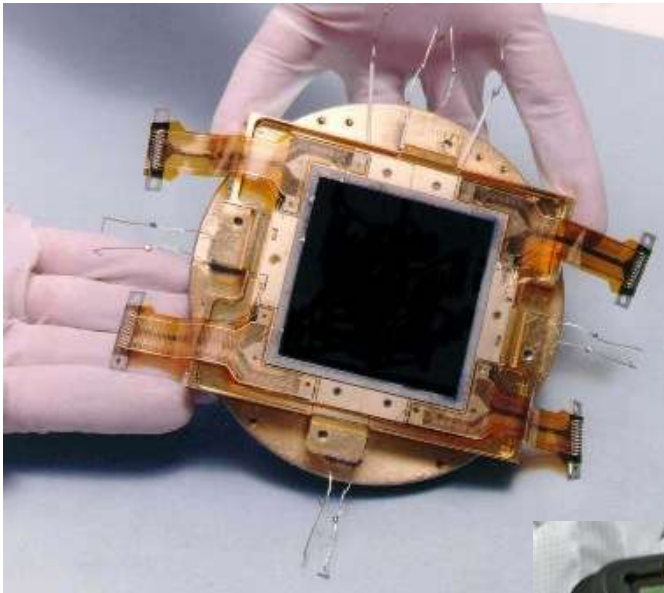


# Products for Laser Communication

- ❑ Narrow Bandpass Filters
- ❑ High performance mirrors with solar blocking
- ❑ Beam Splitters

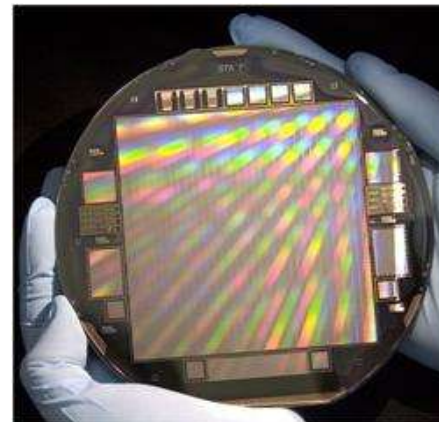


# ITO appli: Sensors for Cameras in Extreme Environmental Cond.



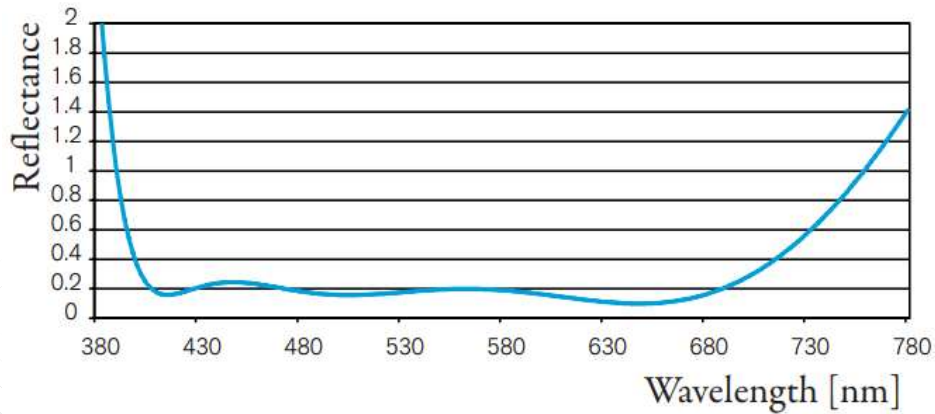
- **Short description main Application:**

- Surface heater
- EMI shielding
- Airborne Systems
- Defence



# Polymer Coatings

- Our Product:
  - AR / AR on polymer makrolon
  - Discussion ongoing to add ITO layer for smutch detection
- Application:
  - Cover glass for sensor
  - Buying KITs (cover glasses in different sizes)



# PARMS Coating Equipment load lock key advantages

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# Applied coating technology

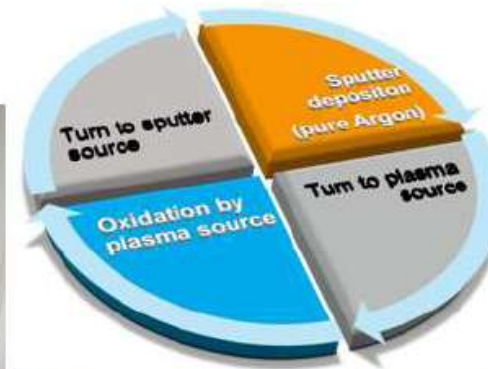
## PARMS



Front View



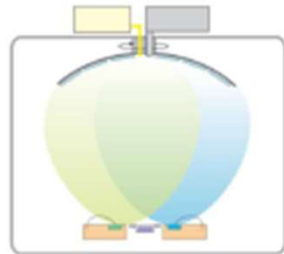
Stacker – loading/unloading zone



Stacker (empty)

# Coating Equipments

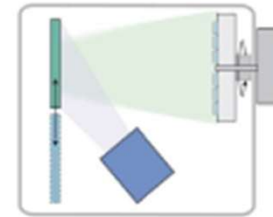
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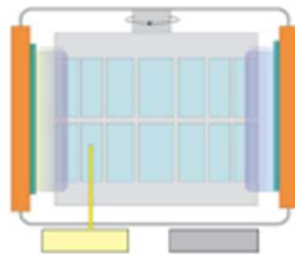
**Evaporation**  
(e-beam and boat sources)



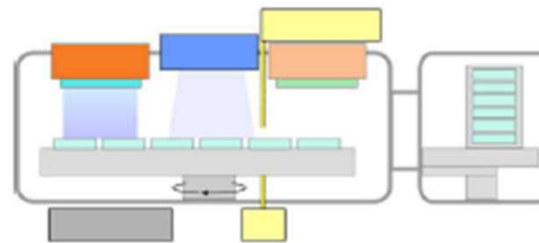
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**Magnetron Sputter**  
**Deposition**



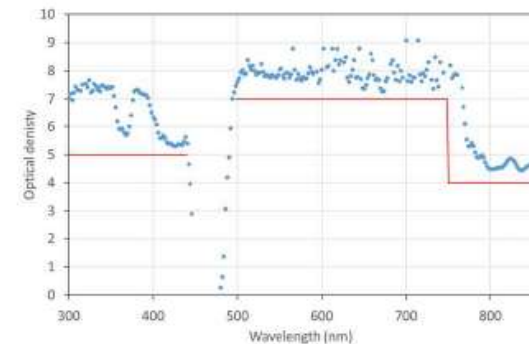
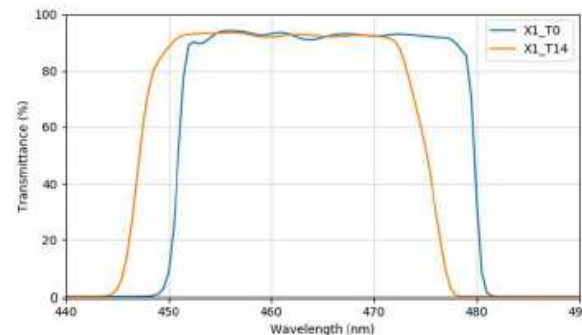
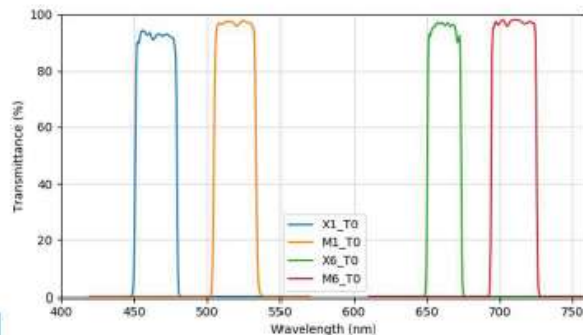
**Plasma-Assisted Reactive Magnetron**  
**Sputter Deposition**

Company Presentation | Optics Balzers AG | Februar, 2019

## Achievable performance

### PARMS – Capabilities Bandpass Filters

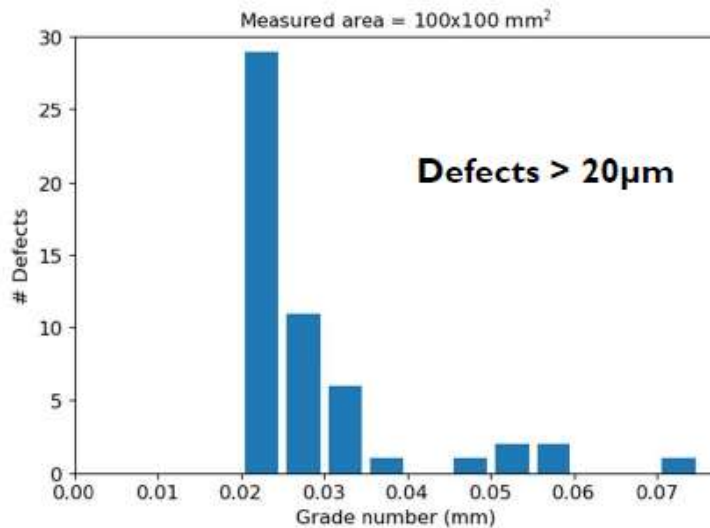
- ▶ High transmittance over 92% anywhere between 450 and 750nm
- ▶ High optical density up to 7.5
- ▶ Low angle shift
- ▶ High edge steepness



# Achievable performance

## PARMS – Capabilities Bandpass Filters

- ▶ Low Defect Quality: close to zero defects  $> 30\mu\text{m}$
- ▶ Attractive for high volumes and large substrates



# MWIR Capabilities Balzers 1<sup>st</sup> World Premiere Announcement

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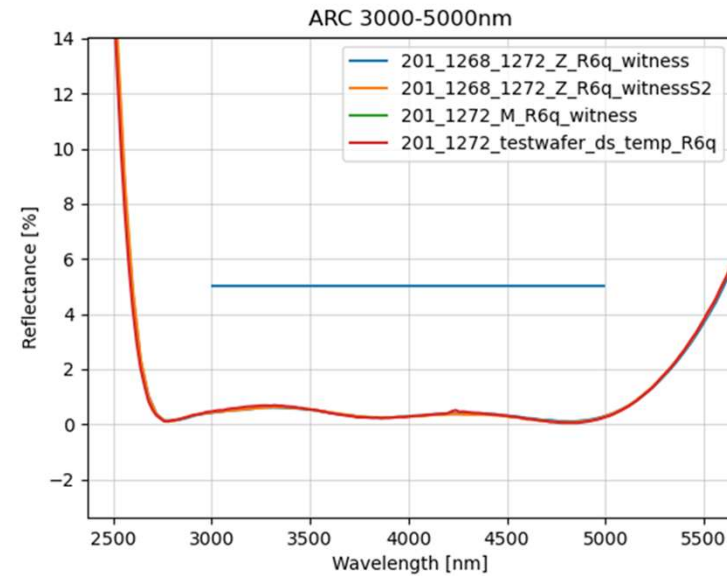
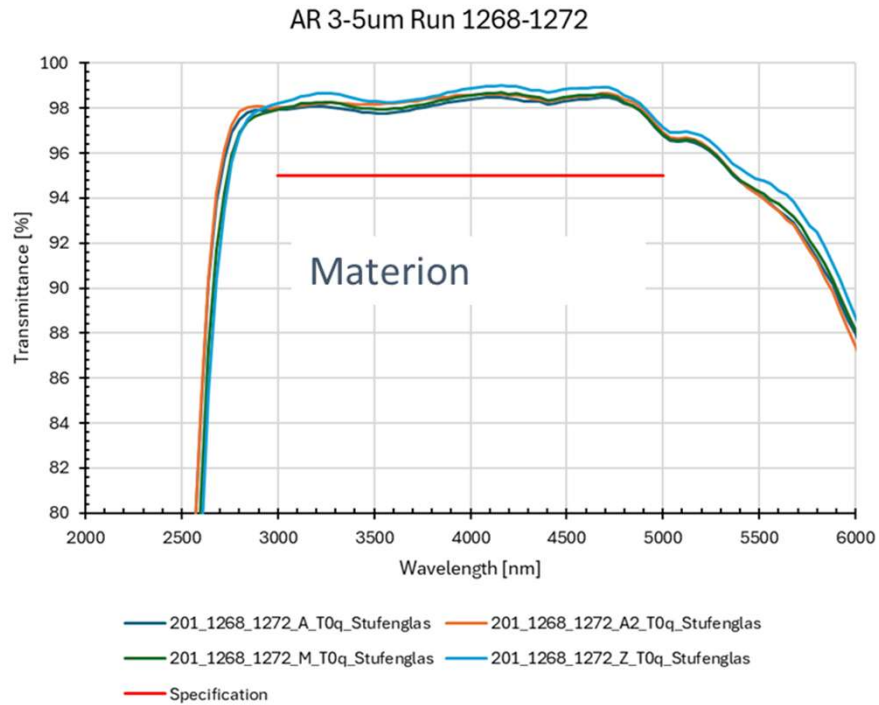
*BALZERS Production Plant in Europe*



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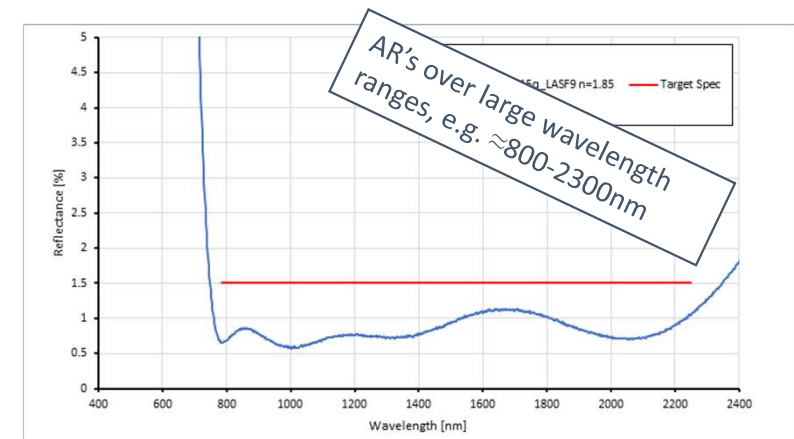
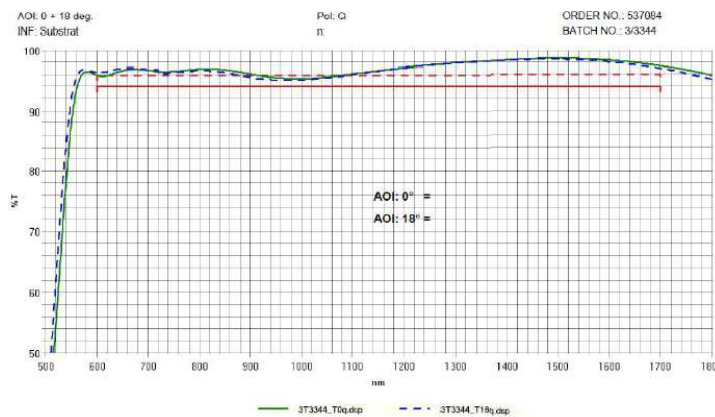
# AR 3-5um



- Very competitive pricing due to load lock and therefor short processing times

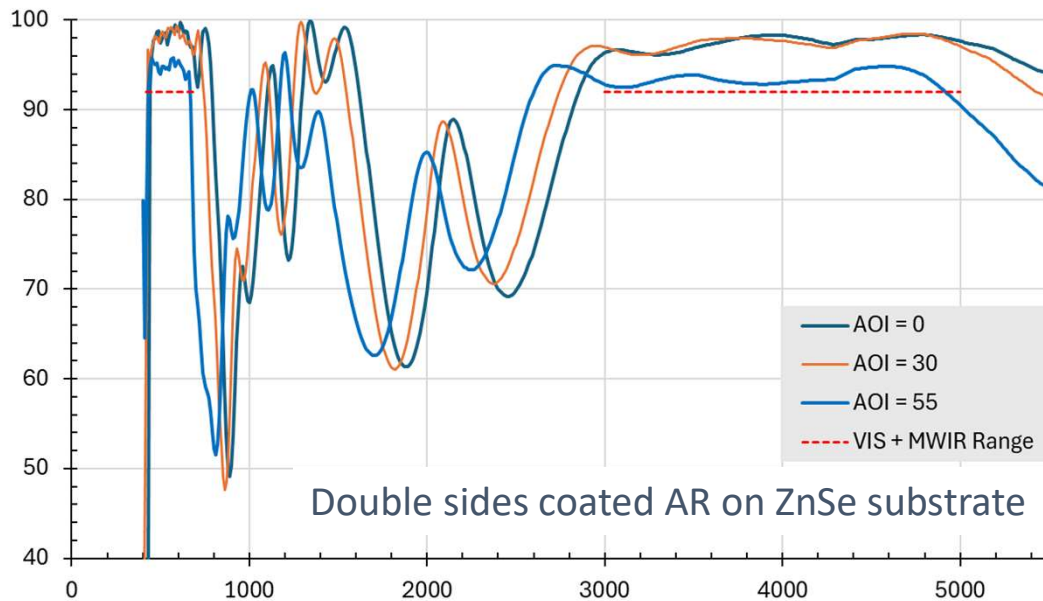
# Cover glass for VIS-SWIR image sensor

- Cover glasses and lenses for VIS+SWIR Image sensor
- Low defect coatings for sensor lids: Example on sapphire ( $\varnothing$  20mm)
  - Defect requirement: no defects  $>20\mu\text{m}$
  - Coating: Complex AR coating (400-2500nm), both sides
- Space heritage



# Coatings for VIS-MWIR hybrid imaging system

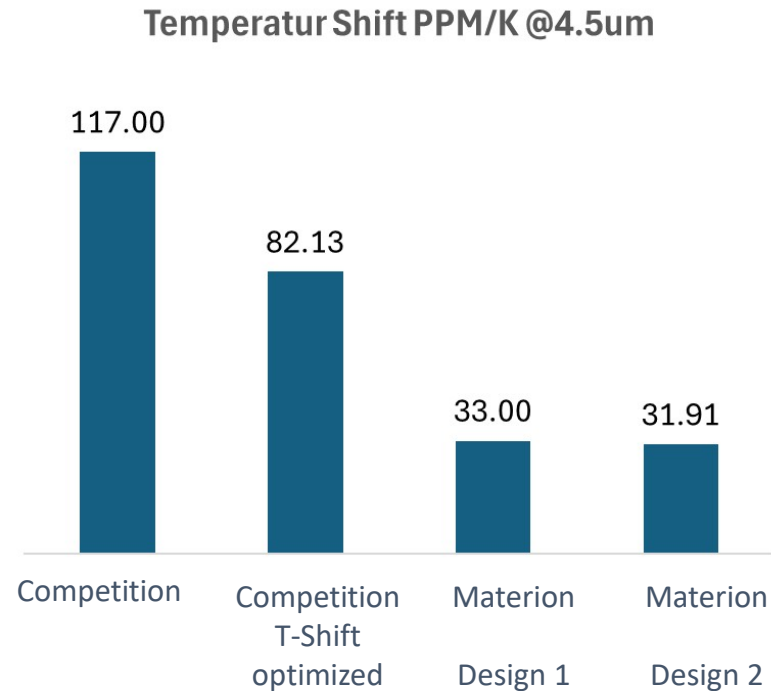
- Cover glasses and lenses for VIS-MWIR hybrid imaging systems
- High transmission over a large angle of incidences



	AOI 0°	AOI 30°	AOI 55°
Avg Transmission VIS 440-660nm	>97%	>97%	>93%
Avg Transmission MWIR 3000-5000nm	>96%	>96%	>92%

# Identified competitive advantage Material

- ✓ Significant lower temperature shift than comparable coatings
- ✓ Increased contrast between high end low index materials leads to thinner designs with fewer layers, thus lower manufacturing cost
- ✓ Germanium sourcing issues eliminated



Questions?



We are shaping the Century of the Photon

To learn more about Materion Balzers Optics and our capabilities, please feel free to contact me:

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