



EPIC Online Technology Meeting on Lithography, 7th July 2020

EVGroup - Lithography Equipment and Solutions

Dr. Martin Eibelhuber, Deputy Business Development



Leading supplier of wafer processing equipment for the MEMS, nanotechnology and semiconductor markets

Founded in 1980 by DI Erich and Aya Maria Thallner. More than 1000 employees worldwide

Headquarters in Austria, with fully owned subsidiaries in the USA, Japan, South Korea, China and Taiwan

Recent Developments



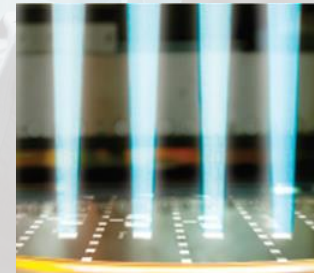
GEMINI® FB
Hybrid Bonding



EVG®850 DB
Laser Debonding



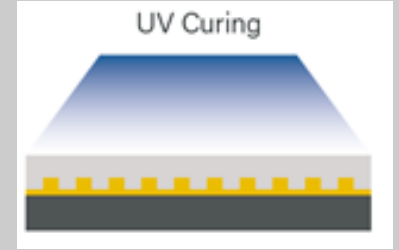
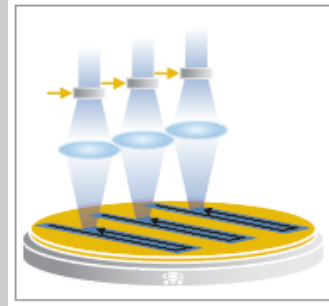
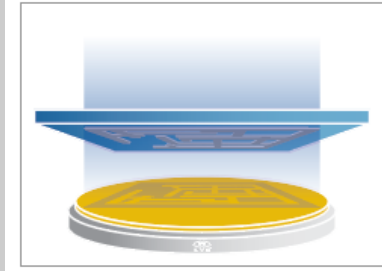
BONDSCALE™
Fusion Bonding



EVG® MLE™
Maskless Exposure
Technology

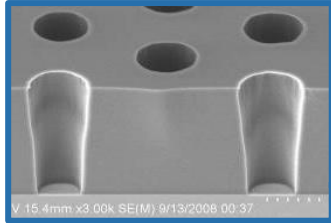
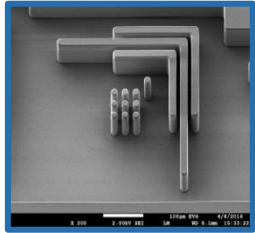


EVG® HERCULES® NIL
SmartNIL® UV-NIL
Up to 300 mm



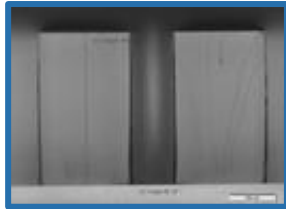
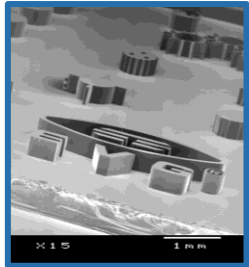
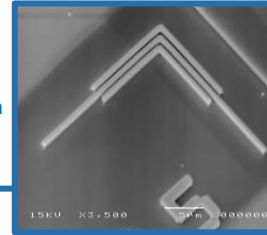
Patterning method	Proximity Mask Aligner Exposure	MLE™ Maskless Exposure Technology	UV Nanoimprint Lithography
Pattern field size	Full field	Clustered Write Heads	S&R and Full Field
Exposure wavelength	Broadband (g, h, i-line)	Multiple - Wavelength Exposure Optics	UV - LED
Resolution L/S	> 3 μm	< 2 μm	<30nm

EVG Optical Lithography | Resist Processing and Lithography

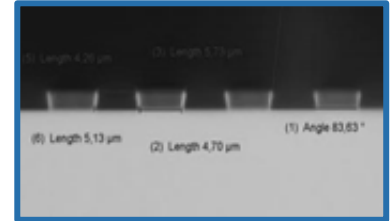


- ✓ Bumping
- ✓ TSVs
- ✓ Deep etching

- ✓ Thin resist processing
- ✓ Metallization
- ✓ Surface protection
- ✓ Etching

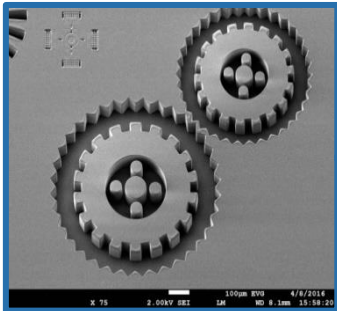


- ✓ Colored Resists



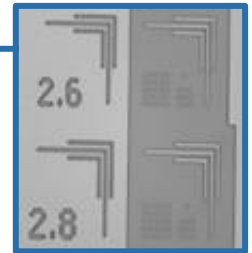
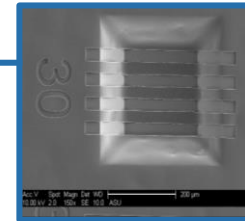
EVG® 1xx Coating and Development Systems

EVG® 6xxx & IQ Aligner Exposure Systems



- ✓ Bond frames
- ✓ LIGA process

- ✓ Large Gap
- ✓ Cavity Exposure
- ✓ Sidewall angle control for lift off



Digital Lithography | Maskless Exposure Technology MLE™

→ Mask-Free Manufacturing

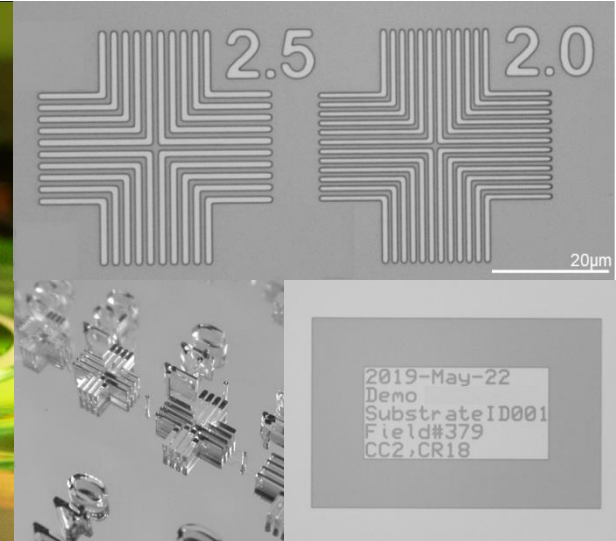
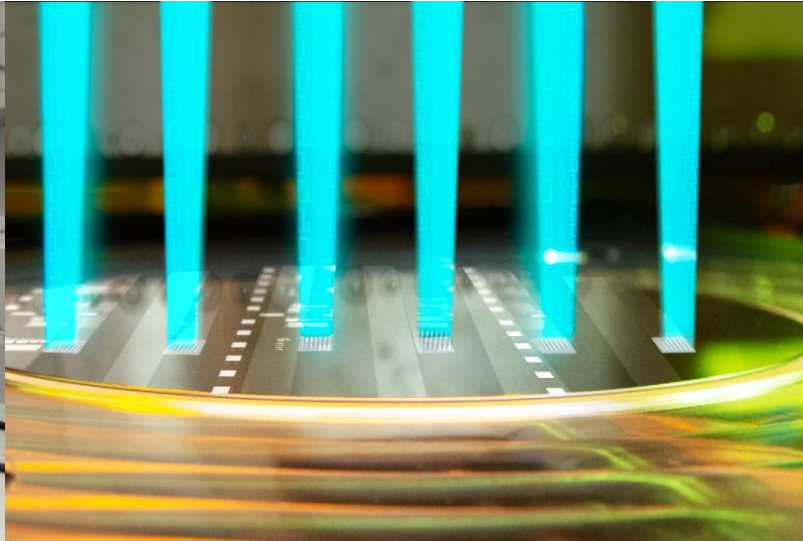
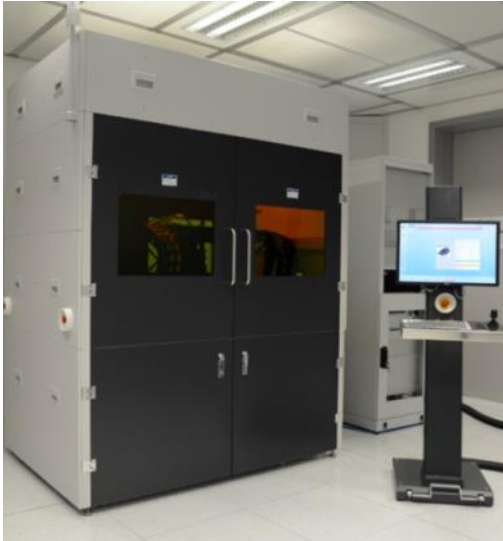
- High product variation
- Agile processing & design mix
- Digital infrastructure
- Low cost multi design logistics
- Consumables-free technology

→ Individual Die Processing

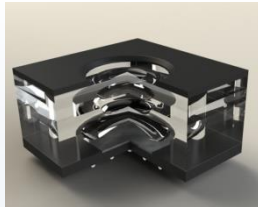
- Exposure of individual stripes
- Small raster size for smooth edges
- Grayscale intensity modulation
- Dynamic die annotation

→ Fast Full-Field Positioning

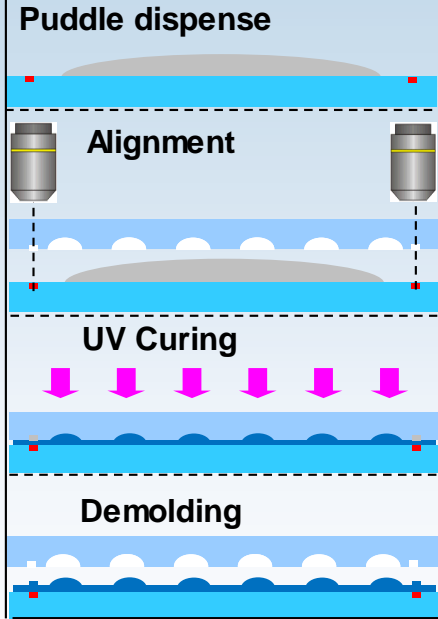
- VIS, top-side alignment, nIR backside alignment for interposer, advanced packaging and MEMS processing
- Scalability in substrate sizes from wafers to panels



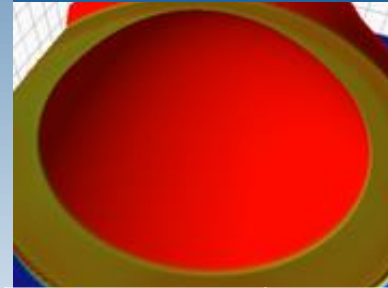
EVG Lens Molding | Wafer Level Optics



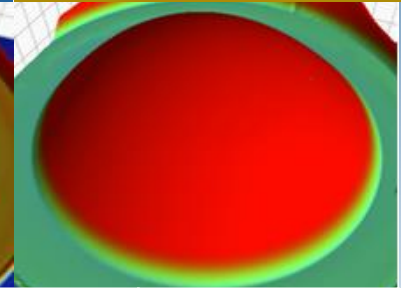
Lens Molding Process Flow



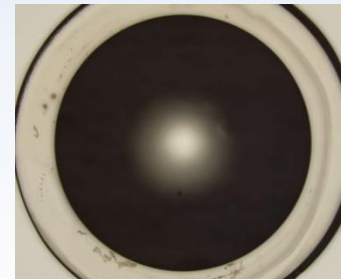
Lens Master



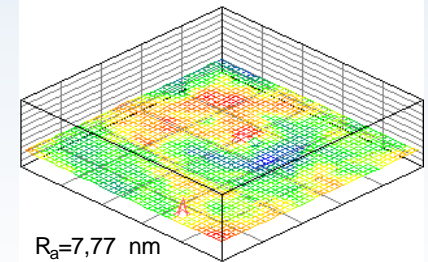
Lens Imprint



[μm]	Lens Master	Imprint
Lens height	238,6	232,3
Lens width	3121	3111



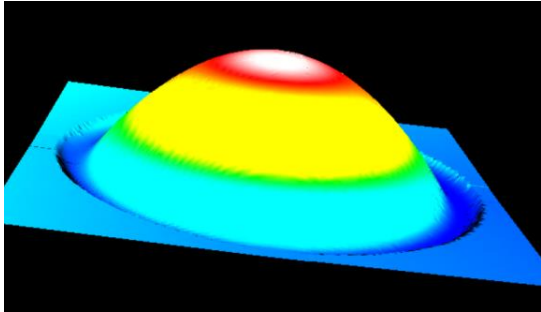
Convex Lens
(**DELO** KATIOBOND)



$R_a=7,77$ nm
Lens roughness – Convex



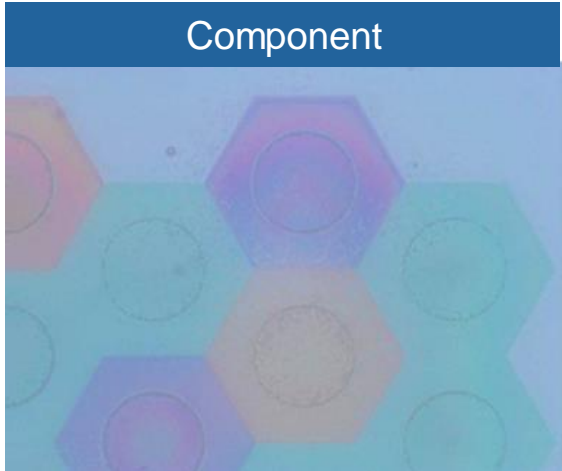
Shape Accuracy



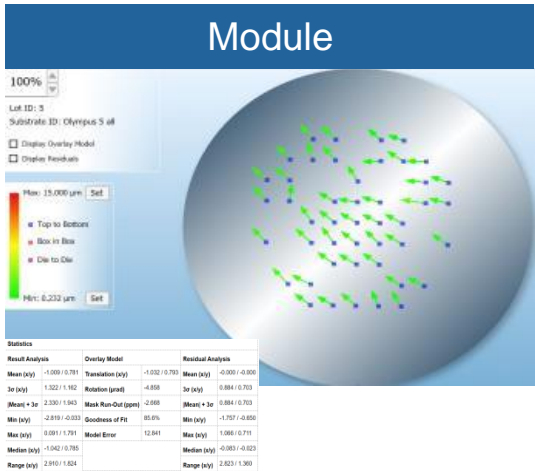
PV	0.621 μm	Peak	0.27 μm
rms	8.7 nm	RadCrv	6728460.07 μm
Valley	-0.4 μm	Removed:	None

Lens roughness
<10nm

Alignment Accuracy

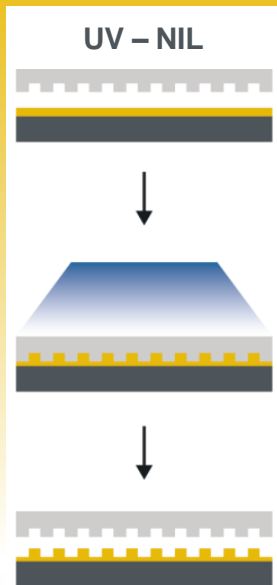


Alignment accuracy **molding**:
< 500 nm

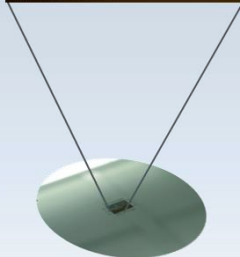


Alignment accuracy **stack**:
< 1 μm

Statistics		Overlay Model	Residual Analysis
Result Analysis		Translation (xy)	Mean (xy)
Mean (xy)	-1.009 / 0.781	-1.022 / 0.753	-0.001 / -0.000
3 σ (xy)	1.322 / 1.162	Rotation (grad)	3 σ (xy)
Mean + 3 σ	2.330 / 1.943	Mask Run-Out (gpm)	0.884 / 0.703
Min (xy)	-2.816 / -0.933	Goodness of Fit	85.6%
Max (xy)	0.091 / 1.791	Model Error	12.841
Median (xy)	-1.042 / 0.785	Max (xy)	1.066 / 0.711
Range (xy)	2.816 / 1.824	Median (xy)	-0.053 / -0.023
		Range (xy)	2.823 / 1.360



150mm Master



→ Made by e-beam lithography, ...

S&R Imprinting

Alignment for imprint on substrate



Imprinting and UV Exposure



Separation

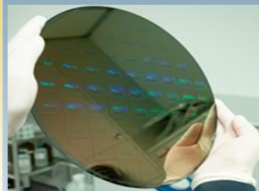


Further S&R Imprinting



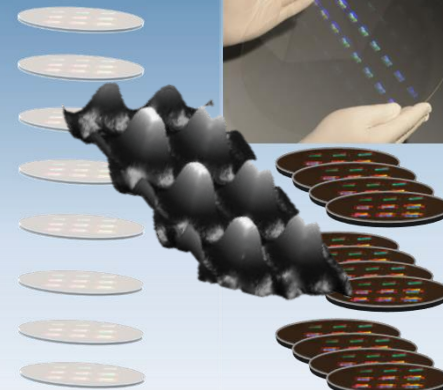
→ Made by EVG770[®] NIL S&R system

200/300mm Master



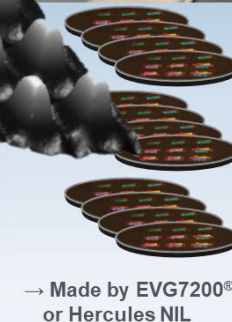
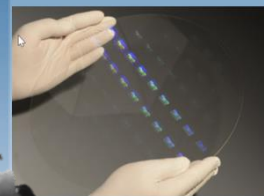
→ Made by EVG770[®] NIL S&R system

Multiple working stamps per master

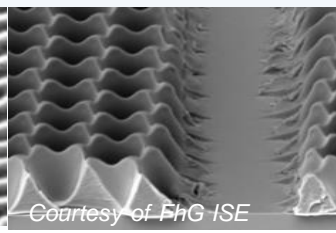
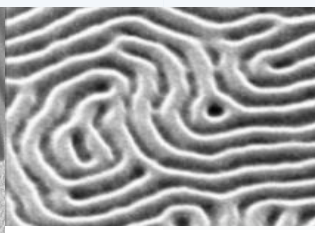
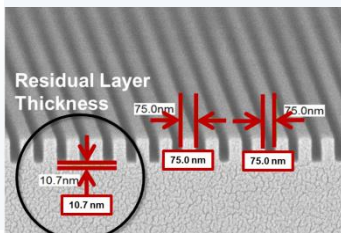


→ Made by EVG7200[®] or Hercules NIL

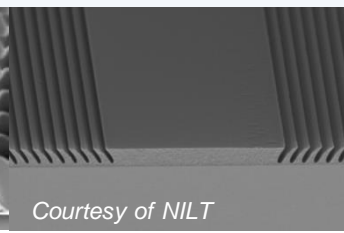
Multi imprints per working stamp



→ Made by EVG7200[®] or Hercules NIL

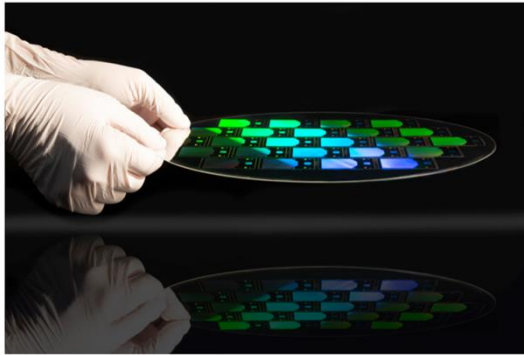


Courtesy of FhG ISE



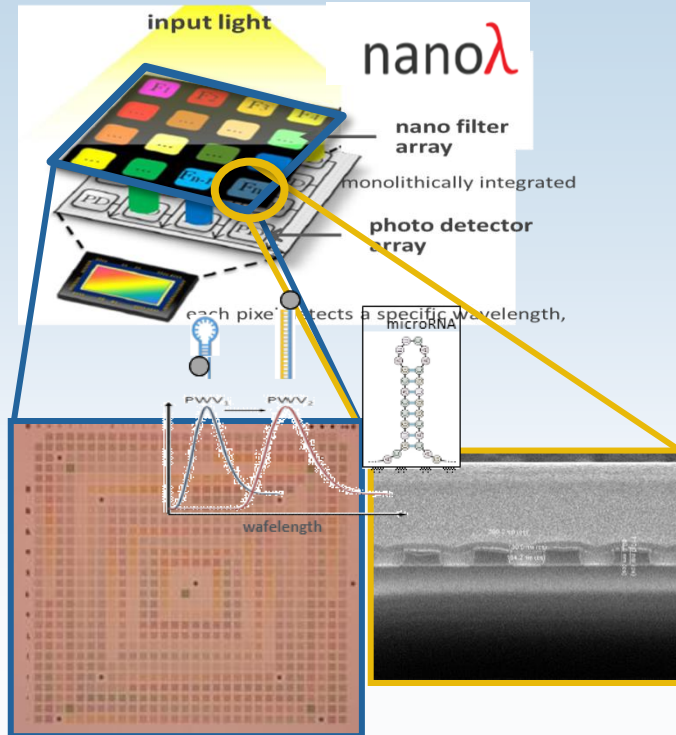
Courtesy of NILT

Augmented Reality



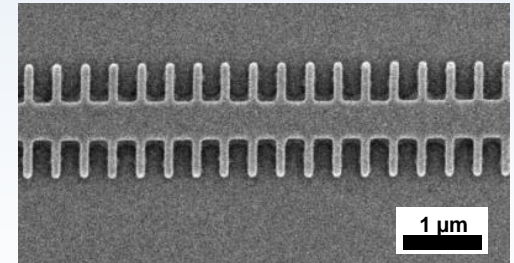
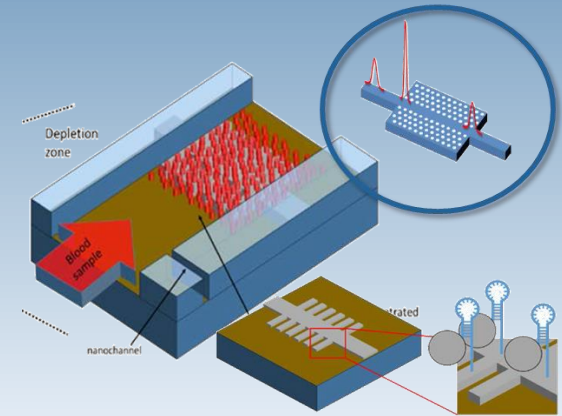
Courtesy of Waveoptics

Advanced Optical Sensing



Courtesy of Nanolambda

Novel Biomedical Sensors



Courtesy of Phocnosis and Saphely

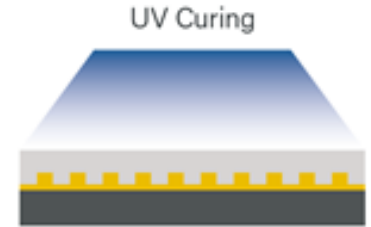
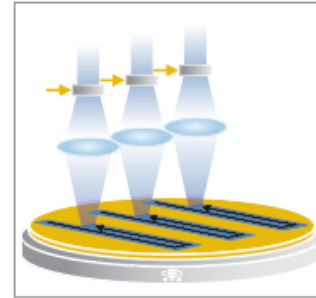
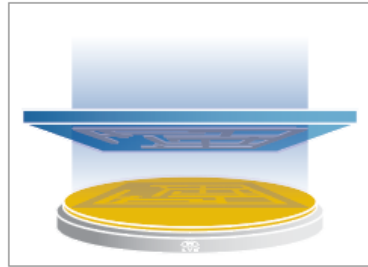
Lithography Methods at EVGroup



Mask Aligner

Maskless Exposure

UV-NIL

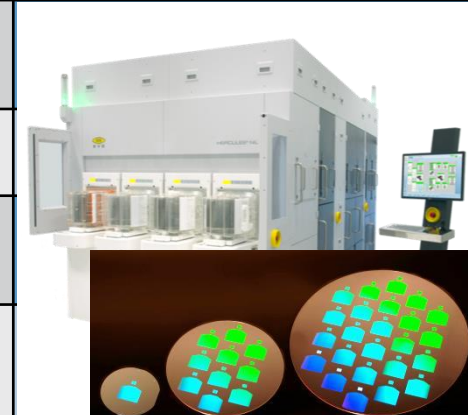
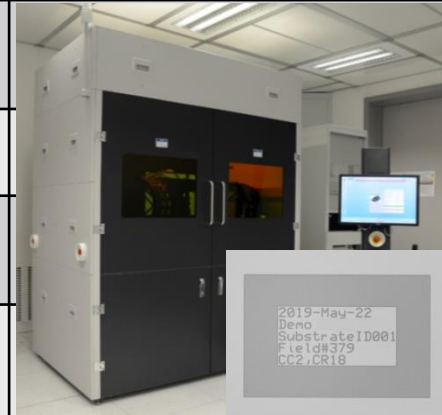


Patterning method

Pattern field size

Exposure wavelength

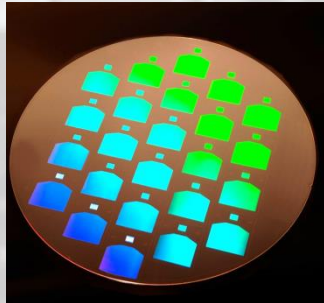
Resolution L/S



NILPhotonics® Competence Center – A smart way to collaborate for success

Establish decisive manufacturing steps in close collaboration with process and equipment experts

Bridging the gap between photonics R&D and volume manufacturing



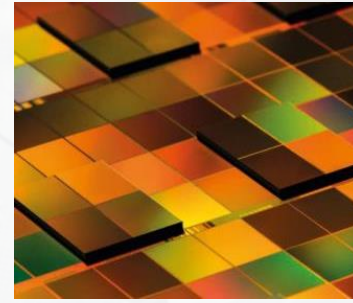
Nanoimprint & S&R Mastering



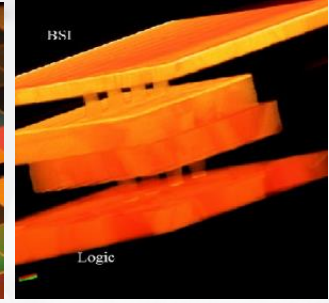
Wafer Level Optics & Photonics Packaging



Advanced Resist Processing



Heterogeneous Integration



3D Integration & Hybrid Bonding

Thank you for your attention.



Dr. Martin Eibelhuber
EV Group - invent • innovate • implement
Deputy Business Development
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Web: www.EVGroup.com



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