Nanopatterning @ IMS CHIPS

BEAMeeting Stuttgart 2024

10.04.2024

Julian Hartbaum

Institut für Mikroelektronik Stuttgart

Civil law foundation

Member of Innovationsallianz Baden-Württemberg

- **Director**

  Prof. Dr. Joachim N. Burghartz
- **Established**

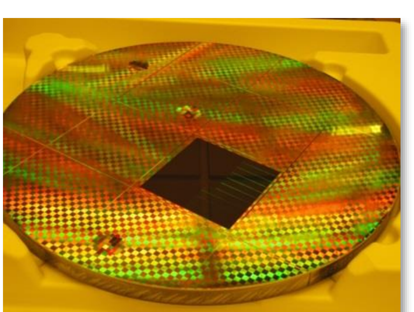
  1983 in the state of Baden-Württemberg
- **Today**

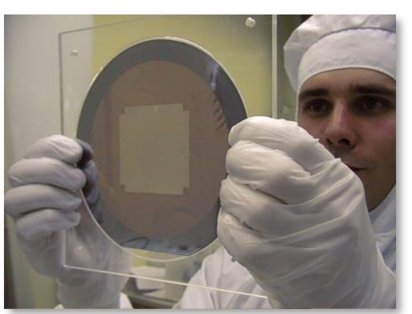
  100+ employees

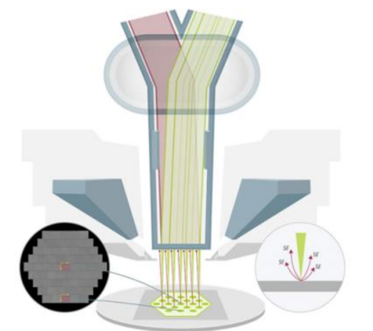
  16.3 million € operating budget

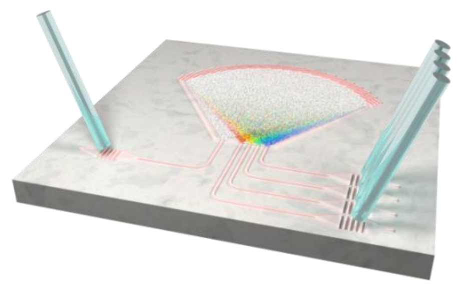
Focus of IMS CHIPS

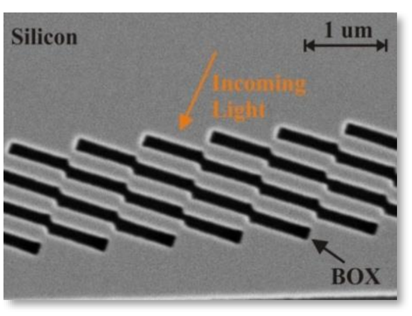
Optical Components	MEMS	Si Photonics	Flexible Electronic

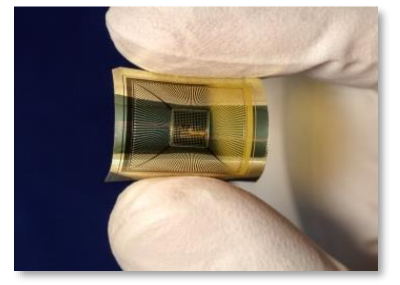


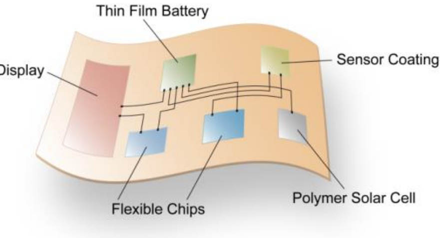




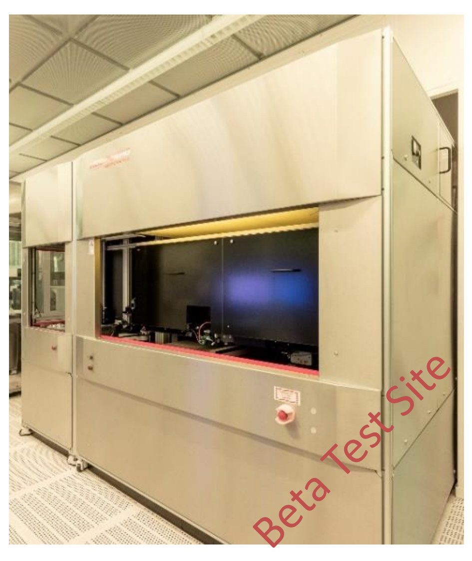








Optical Lithography



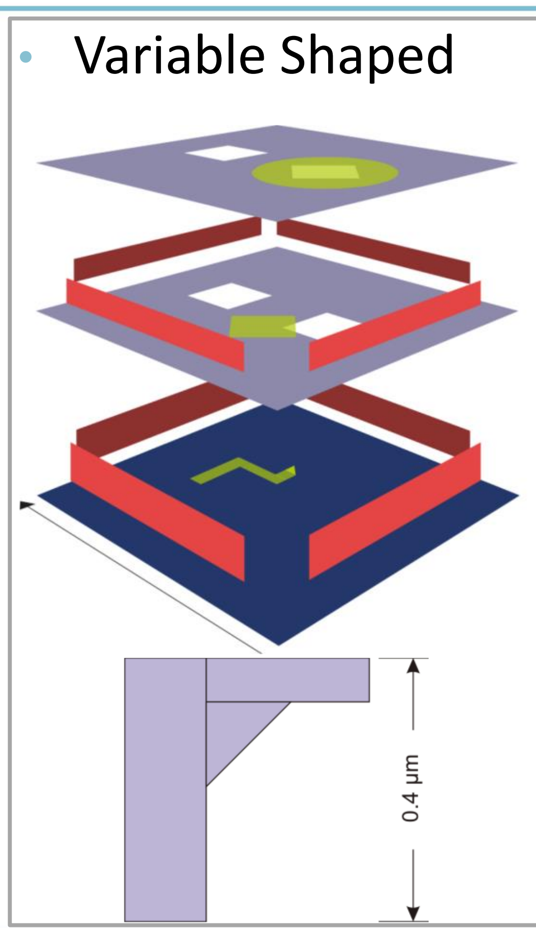
- FPA-3000 i5a
- Die size: 22mm x 25mm
- Through Silicon alignment

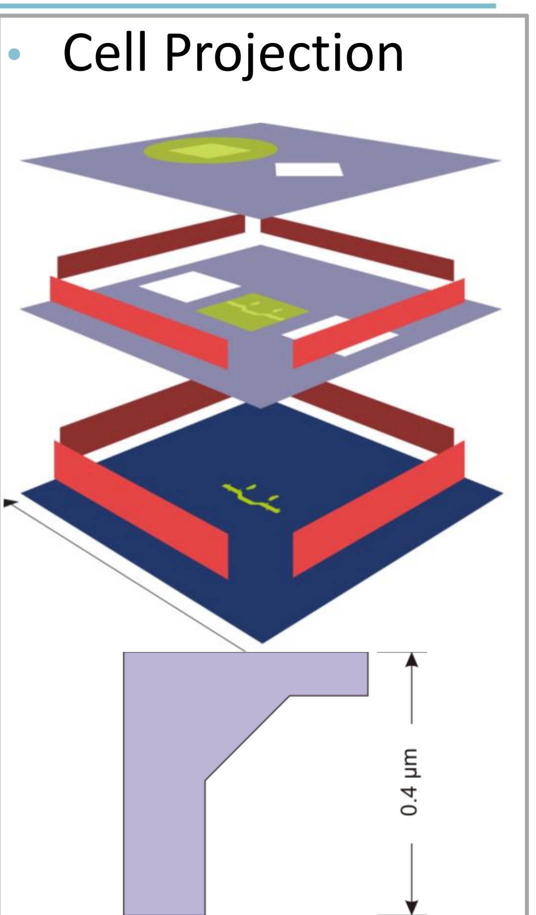
- HIMT VPG400

- HIMT ULTRA

E-Beam Patterning: Vistec SB255

- 100-, 150- & 200-mm Wafer; 6´´-masks
- Cell Projection





E-Beam Patterning: Vistec SB4050

- Wafer 150, 200, 300 mm
- Masks 6025, 9035
- Customized substrates up to ø 450 mm

- Variable shape beam
- Air bearing stage
- Tight climate control

Specs: E-Beam - Laser - Stepper

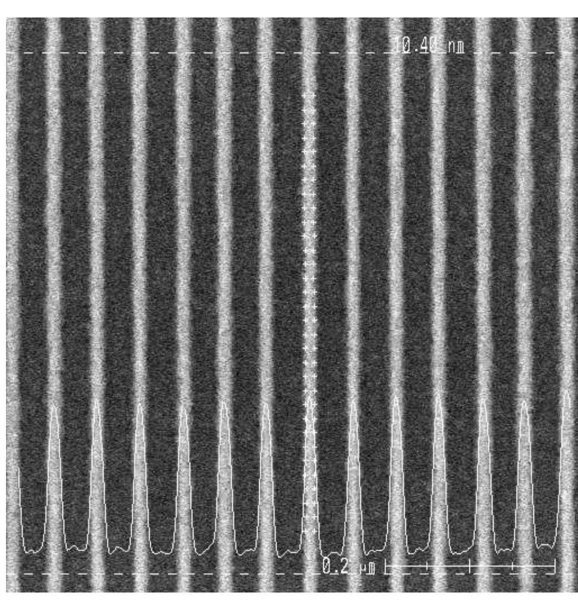
Parameter	E-Beam SB4050	E-Beam SB255	Stepper FPA3000 i5a	Laser ULTRA	Laser VPG400
Substrates	Up to 450 mm Ø	100 - 200 mm Ø 6´´ x 6´´	150 & 200 mm Ø	Up to 230 mm x 230 mm	Up to 400 mm x 400 mm
Resolution	30 nm	45 nm	350 nm	500 nm	700 nm
Alignment Accuracy	10 nm (3σ)	25 nm (3σ)	50 nm (3σ)	100 nm (3σ)	200 nm (3σ)
Placement Accuracy	10 nm (3σ)	15 nm	40 nm (3σ)	40 nm (3σ)	100 nm (3σ)
Address Grid	0.6 nm	1 nm	depends on mask	5 nm	10 nm

13:30 Optimizing chemically amplified photoresist processes in electron beam lithography Markus Greul - IMS

Tomorrow 9:30 Resolution optimization optical lithography Holger Sailer - IMS

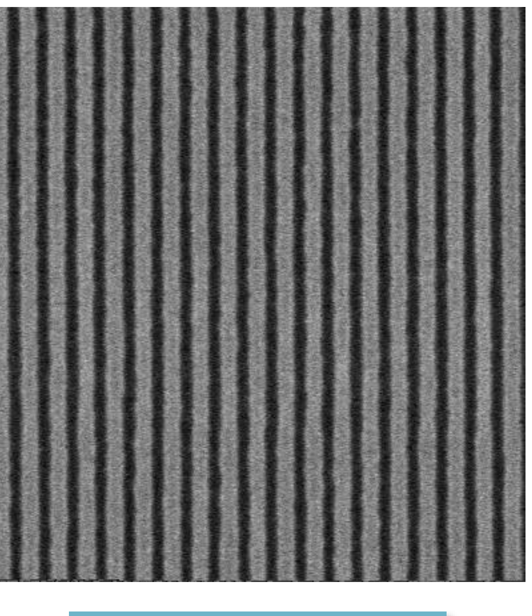
E-Beam SB4050: Resolution

HSQ Line 10.4nm 50nm pitch

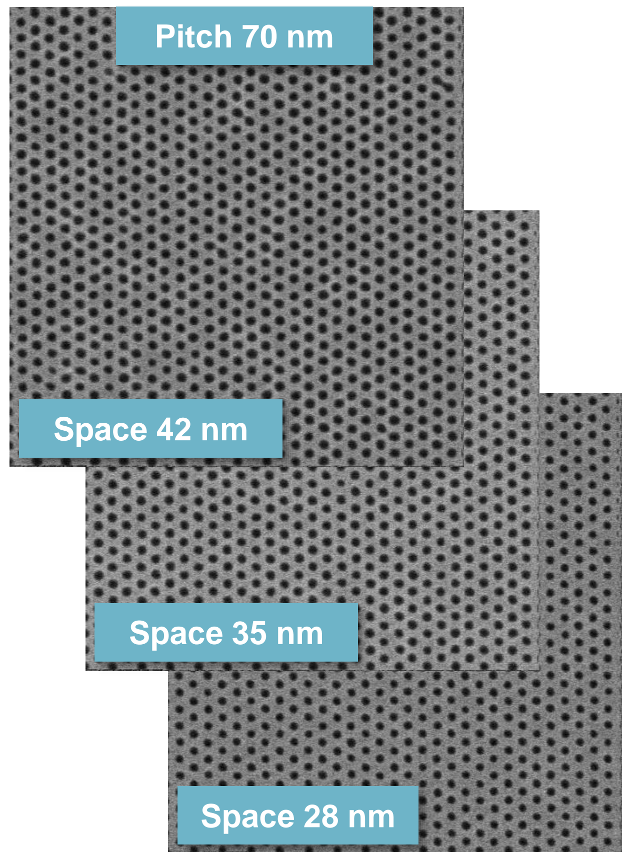


low sensitivity

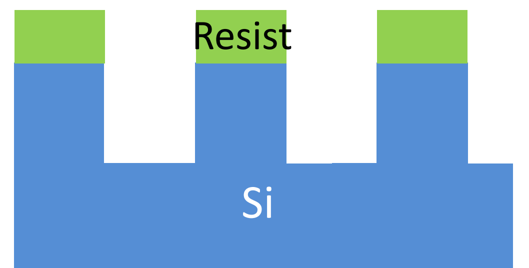
Pitch 80 nm, Space 40 nm

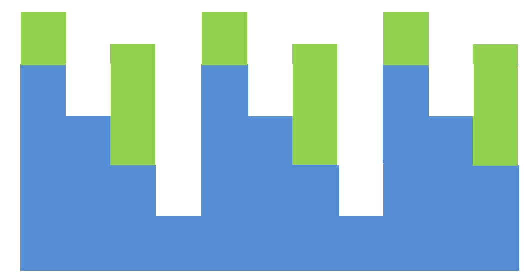


high sensitivity



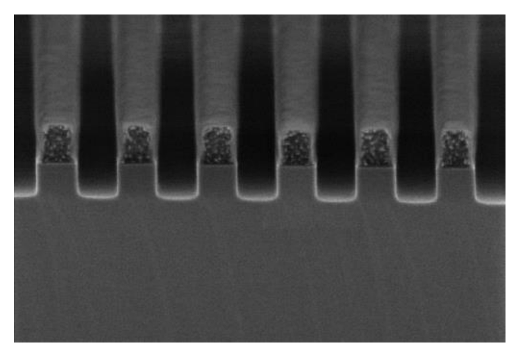
E-Beam Litho: Multi-Level

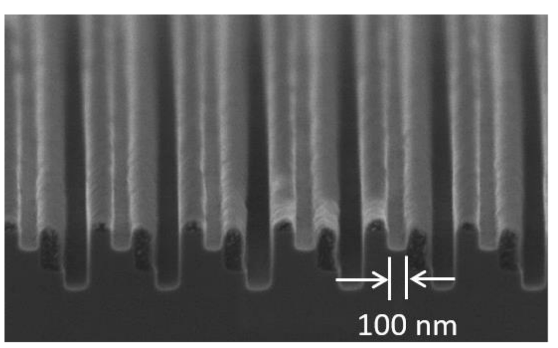


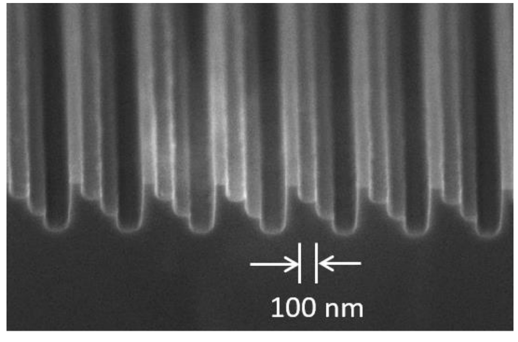


After 1st litho & etch

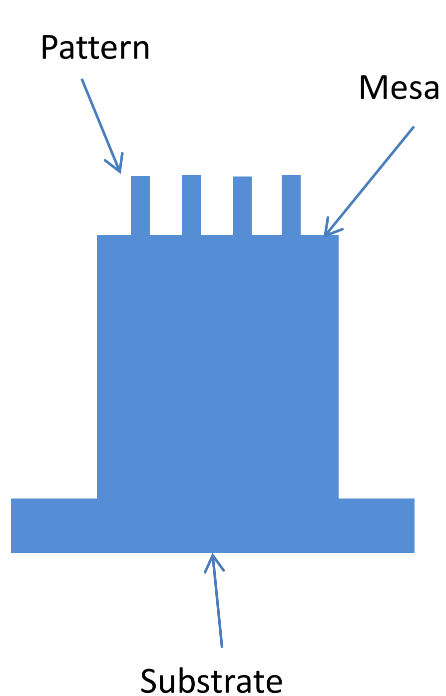
After 2nd litho & etch

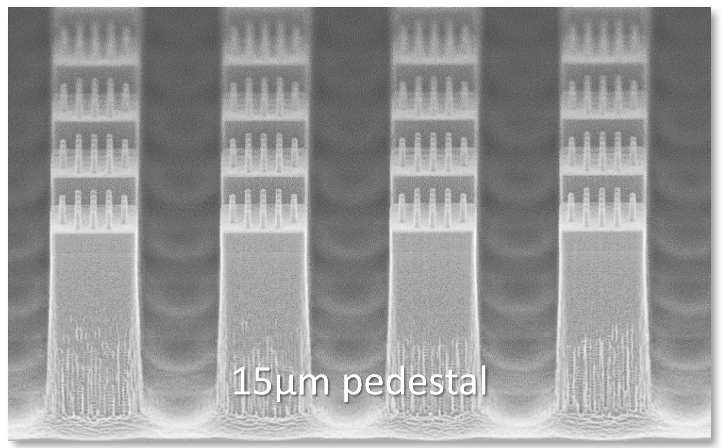


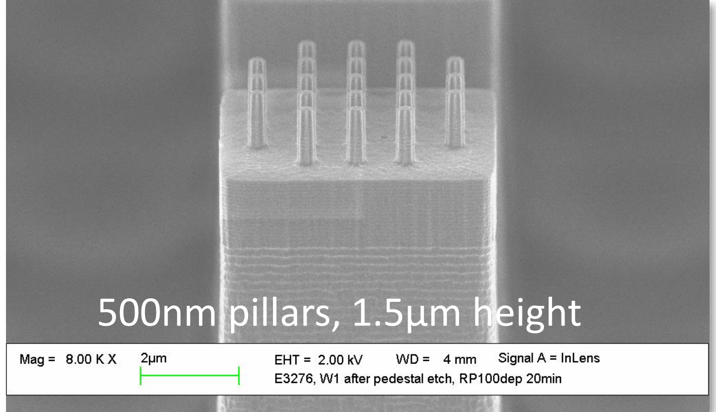


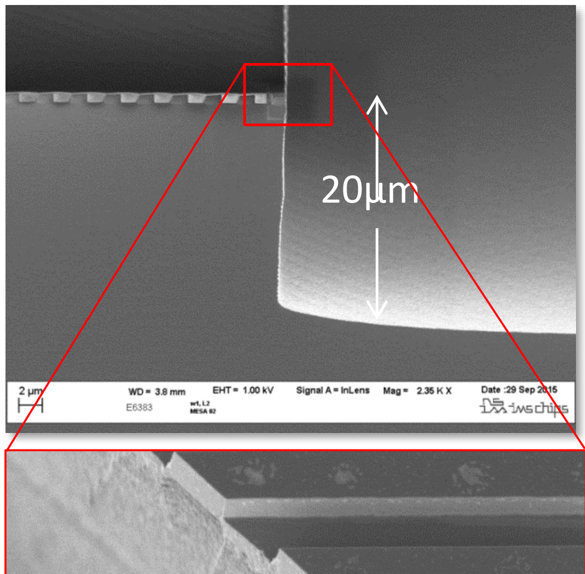


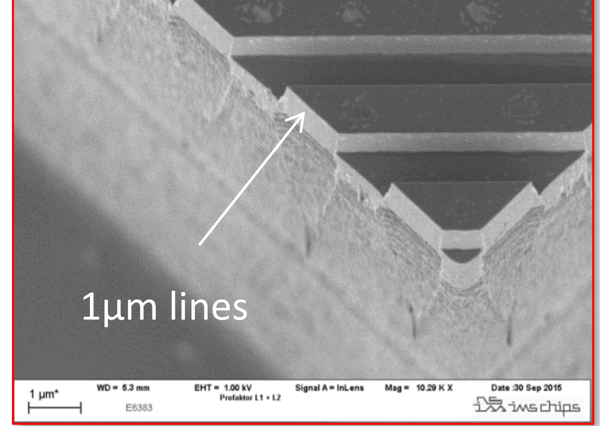
Mesa



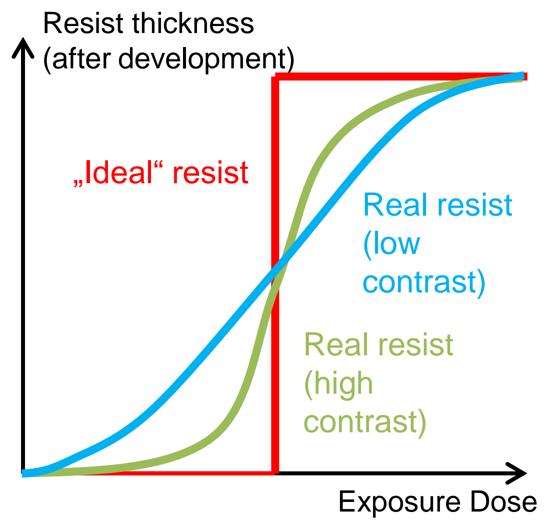


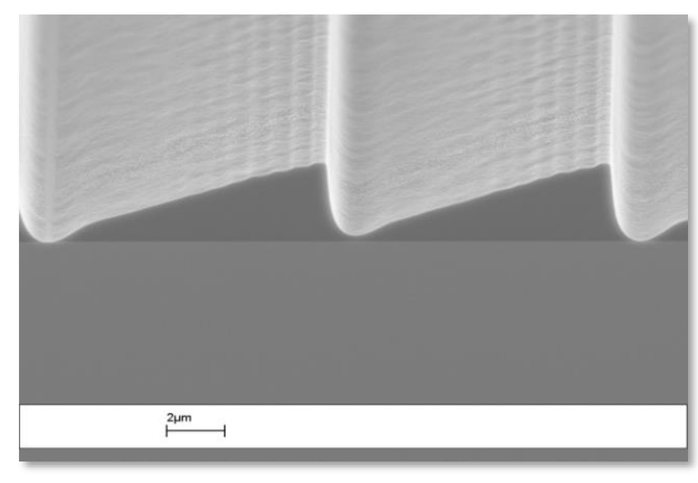


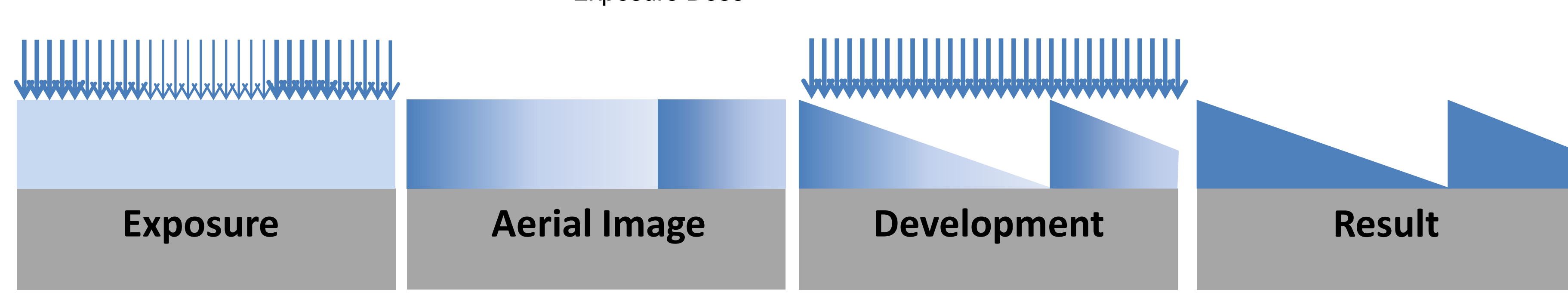




E-Beam- & Laser-Litho: Greyscale

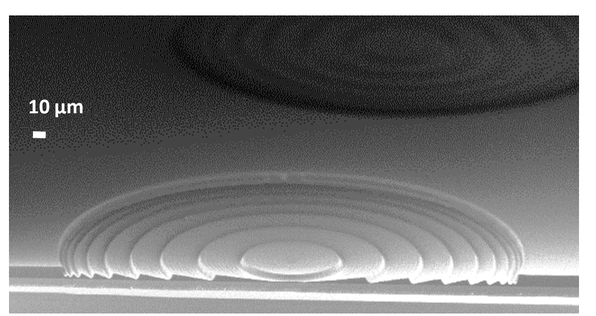


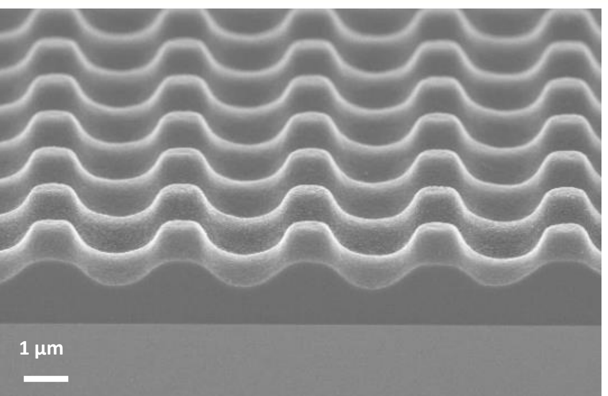


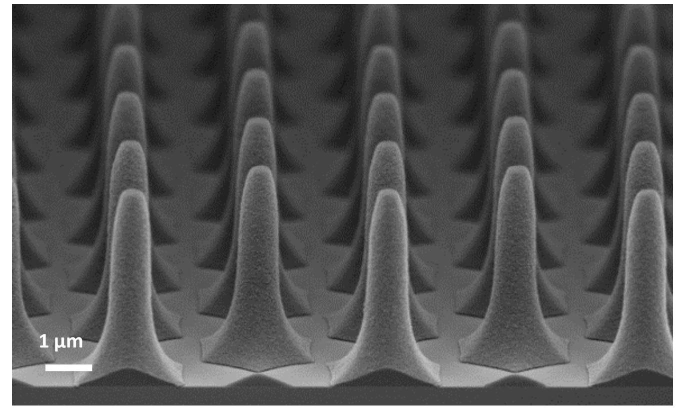


A selection of greyscale images

Laser

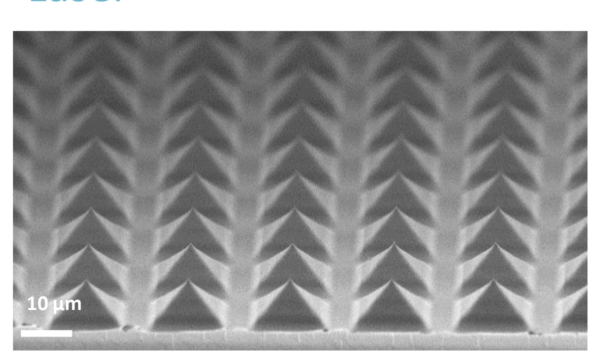


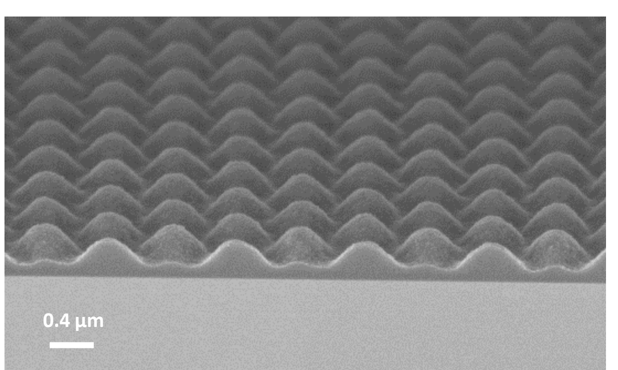


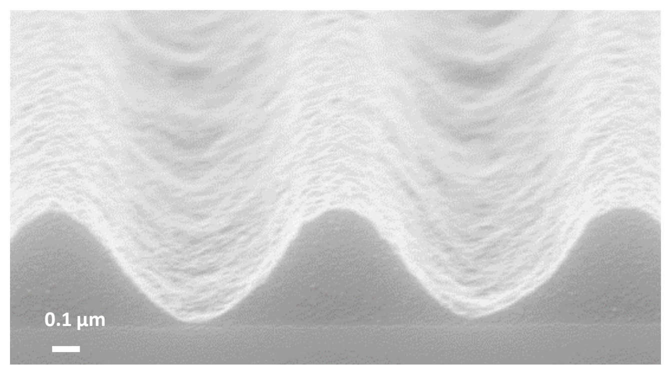


e-beam

Laser



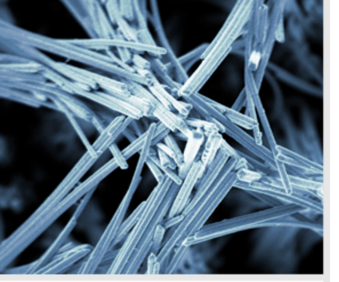




21. Workshop Beams & More: 28.11.2024

IMS CHIPS

PARTNER FOR ADVANCED NANOPATTERNING



20th Workshop "Beams & More"

November 16th, 2023

HLRS Höchstleistungsrechenzentrum Stuttgart
Nobelstraße 19, Stuttgart

Hartbaum@ims-chips.de

Speaker	Talk	Time
Joachim Burghartz, IMS CHIPS, Stuttgart, Germany	Welcom	9:30
Julian Hartbaum, IMS CHIPS, Stuttgart, Germany	IMS CHIPS Update 2023	9:35
Victor Brasch, Q.ANT GmbH, Stuttgart, Germany	E-beam lithography for integrated quantum optics with lithium niobate on insulator	9:50
Mathias Kaschel, IMS CHIPS, Stuttgart, Germany	Quantum projects at IMS	10:10
Jorge Blasco, Photonicsens, Valencia, Spain	Wafer Level Optics for 3D-cameras	10:30
	Coffee Break	10:50
Stefan Fasold, Kevin Edelmann, Vistec Electron Beam GmbH, Jena, IMS CHIPS, Stuttgart, Germany	E-beam lithography optimization for high quality photonic waveguides	11:20
Uwe Zeitner, Fraunhofer IOF, Jena, Germany	The potential of e-beam lithography for micro- and nano-optics fabrication on large areas	11:50
Fabien Laulagnet, CEA-Leti, Grenoble, France	Ebeam Direct Write Lithography: the versatile ally of optical lithography	12:10
Mustapha Chouiki, IMS Nanofabrication GmbH, Brunn am Gebirge, Austria	MBMW-301 and MBMW-100 Flex, the latest revolution in multi-beam mask writing	12:30
	Lunch Break	12:50

Speaker	Talk	Time
Arne Schleunitz, micro resist technology, Berlin, Germany	Update on photoresists and NIL polymers for advanced micro- and nanopatterning techniques	14:20
P. Schuster/T. Achleitner, EVGroup, St. Florian am Inn, Austria	NIL for advanced packaging	14:40
Marc Verschuuren, SCIL Nanoimprint Solutions, Eindhoven, The Netherlands	Wafer based NIL for direct replication of inorganic functional optical materials	15:00
Stefan Schrittwieser, AIT Austrian Institute of Technology GmbH, Vienna, Austria	Nanoimprint lithography for the fabrication of multifunctional nanoparticles for biomedical applications	15:20
	Coffee Break	15:40
Philip Müller, Carl Zeiss SMT, Oberkochen, Germany	High-NA EUV – the future that is already here	16:10
Jean-Michel Asfour, Dioptic GmbH, Weinheim, Germany	Computer Generated Holograms with continuous phase relief structure for beam shaping of Excimerlasers for medical applications	16:30
Sven Bauerdick, GenISys GmbH, Taufkirchen, Germany	SEM-based metrology for micro and nano patterns	16:50
Julian Hartbaum, IMS CHIPS, Stuttgart, Germany	Closing remarks	17:10
	Joint Dinner at relexa Waldhotel Schatten	18:30