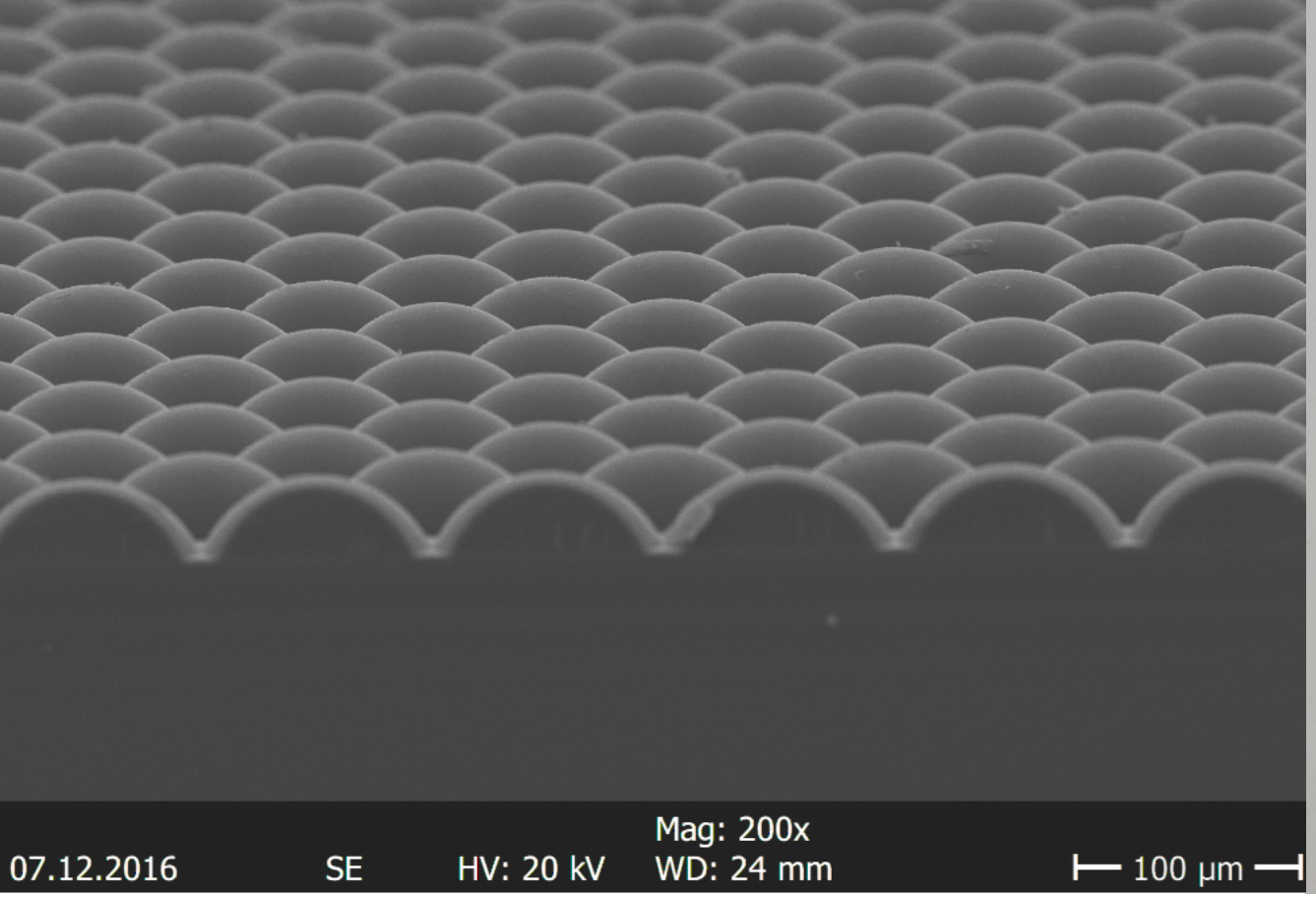
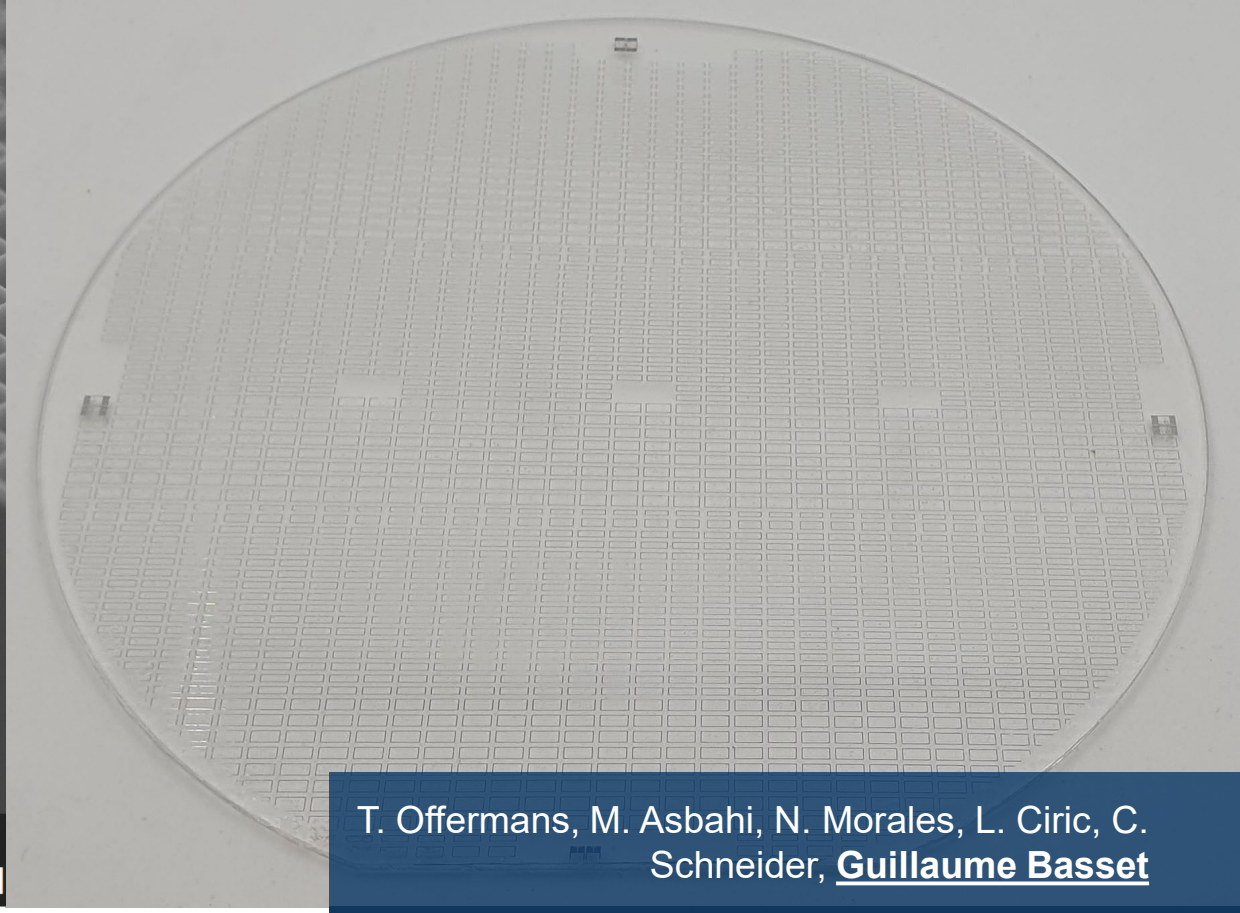




T. Offermans, M. Asbahi, N. Morales, L. Ciric, C. Schneider, **Guillaume Basset**

MicroOptics Summit 2024, 03.12.2024

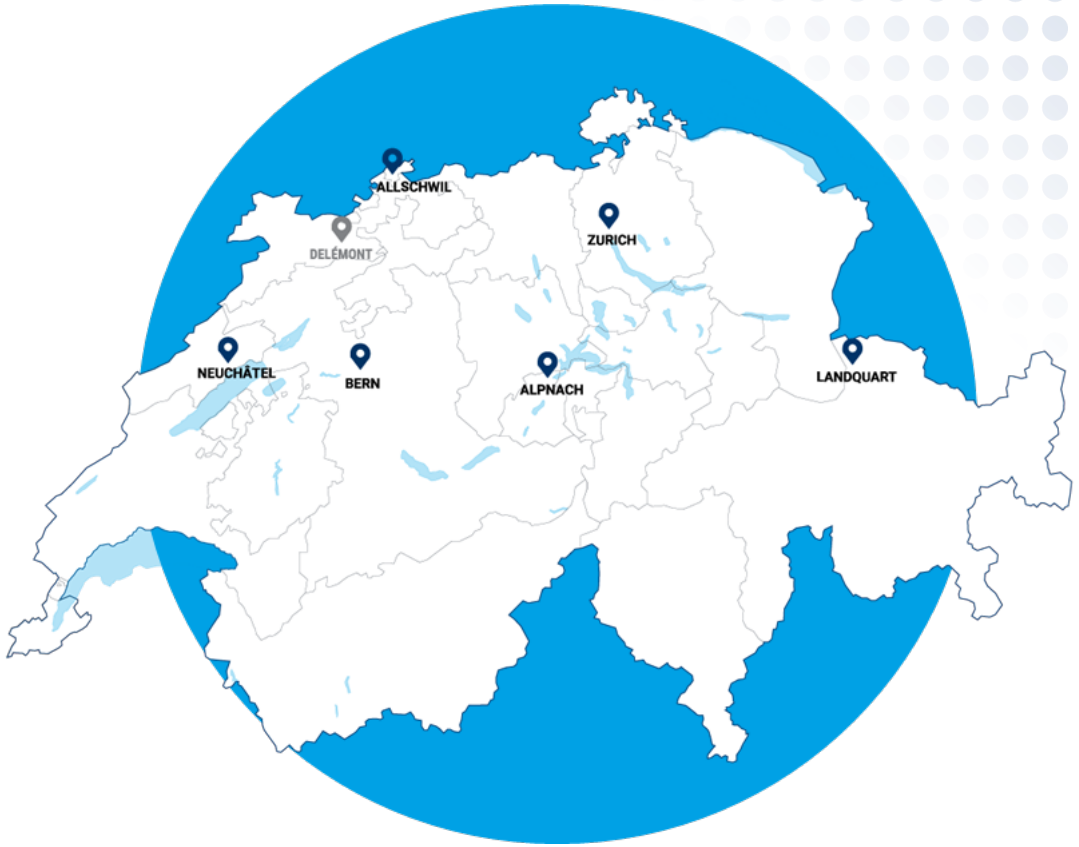
EXPANDED BEAM CONNECTOR FOR DATACOM

csem
40 YEARS OF INNOVATION

CSEM AT A GLANCE

We are a public-private, non-profit Swiss **technology innovation center**

We enable competitiveness by **developing and transferring world-class technologies to the industrial sector**



1984
FOUNDED

630
SPECIALISTS

107.6
M TURNOVER
in 2023

177
PATENT
FAMILIES

> 50
VENTURES
since 1984

csem

WE ARE 100% INDUSTRY-FOCUSED

Staff with industry experience

Long-term support
(80% of staff on permanent contract)

Processes with built-in confidentiality

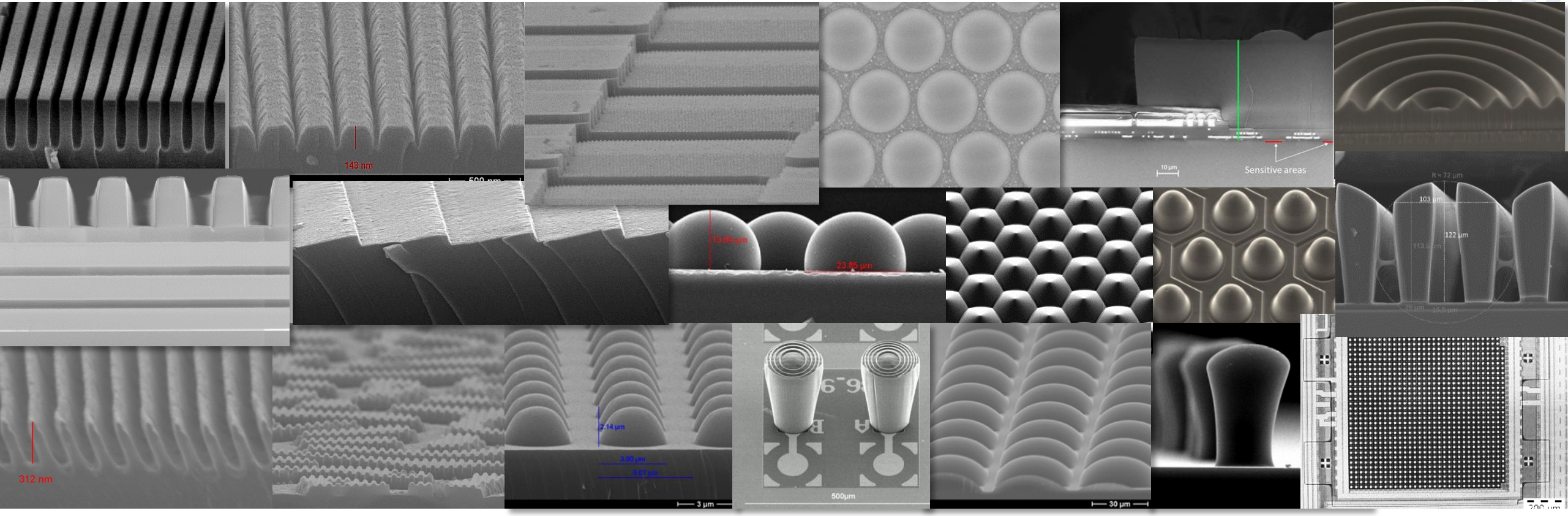
Industrial equipment
(clean rooms, characterization labs)

Proven project management methodology
(300 projects/year)

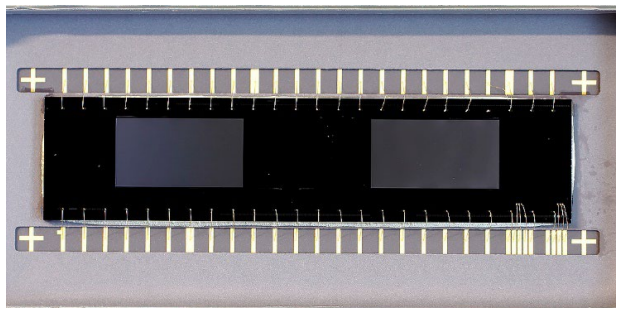
QMS & certifications
(ISO 9001 and 14001,
ISO 13485: Medical devices)

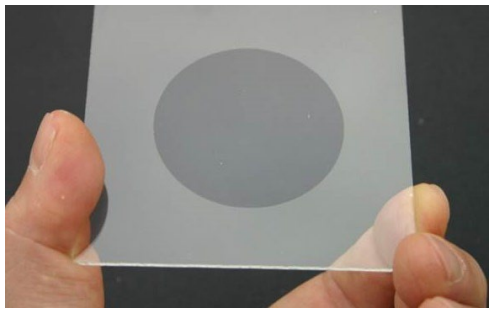
csem

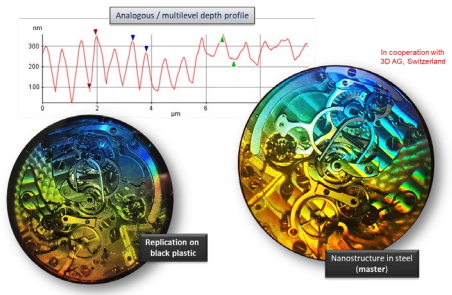
MICRO AND NANO OPTICS MADE AT CSEM



Made on silicon (CMOS etc.), glass, polymer foils, injection molded polymers, metals, ceramics...



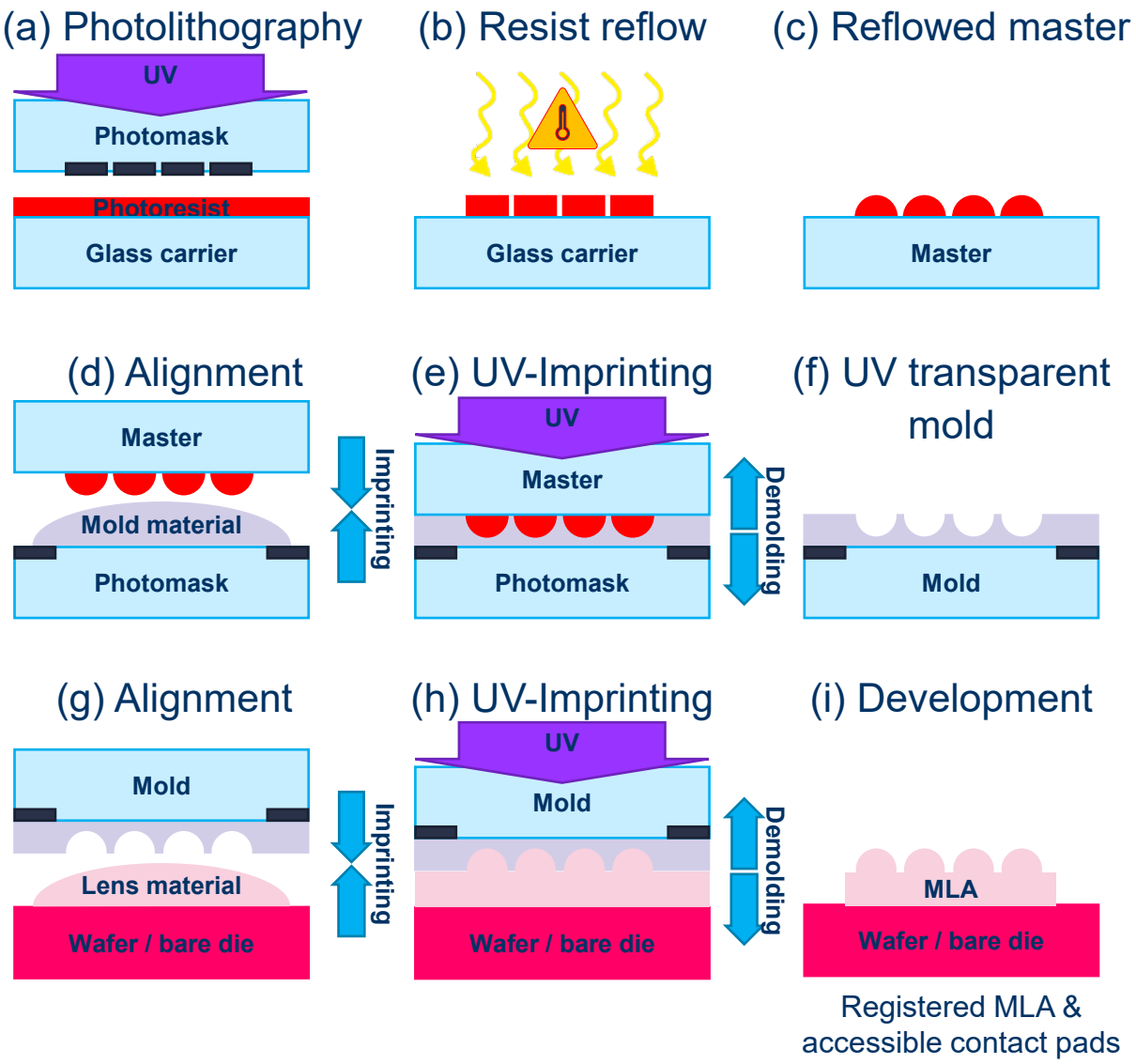


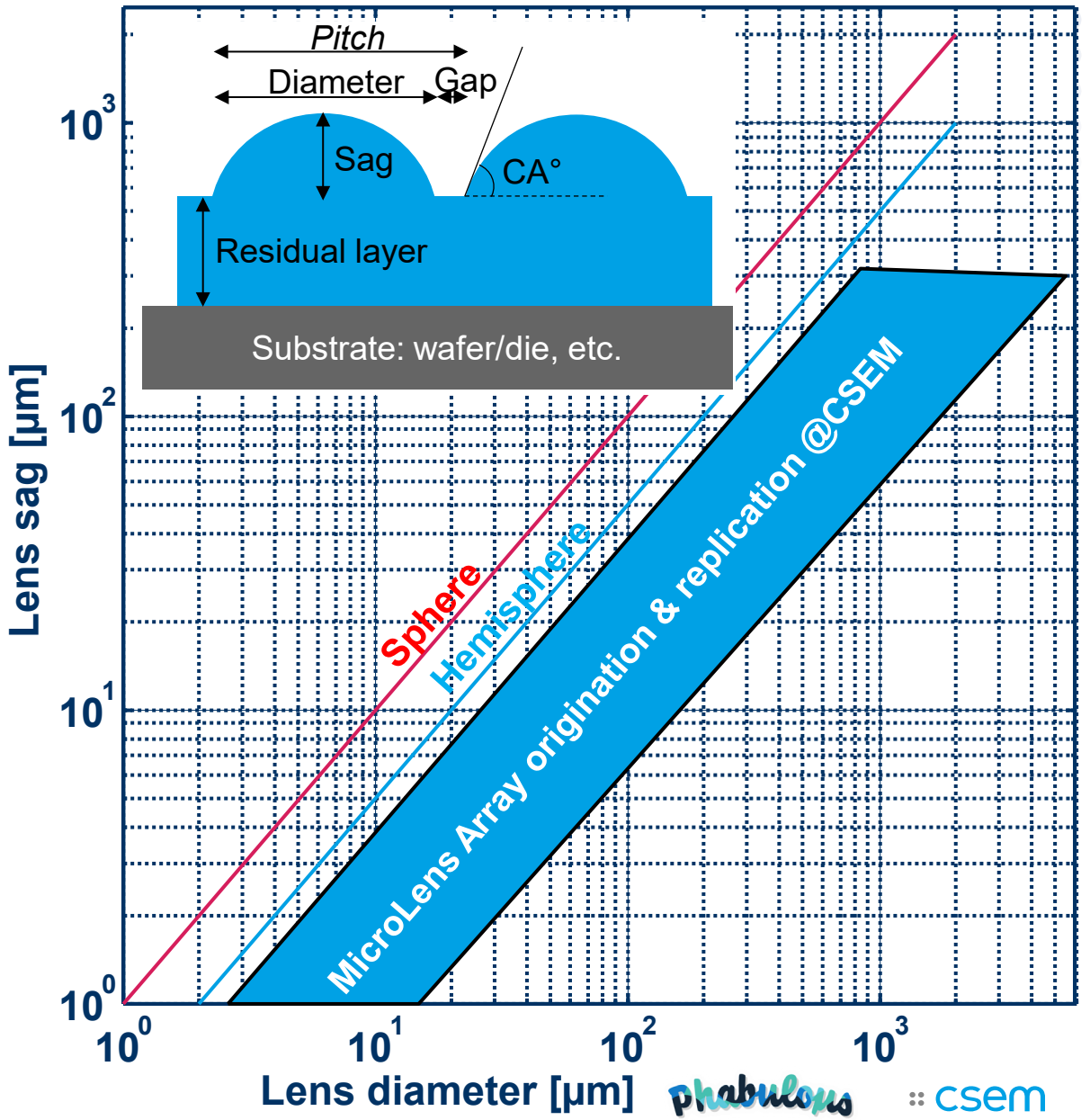


csem

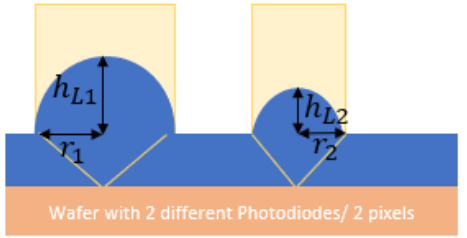
BUILDING BLOCK FOR NEW EXPANDED BEAM CONNECTORS FOR FIBER ARRAYS

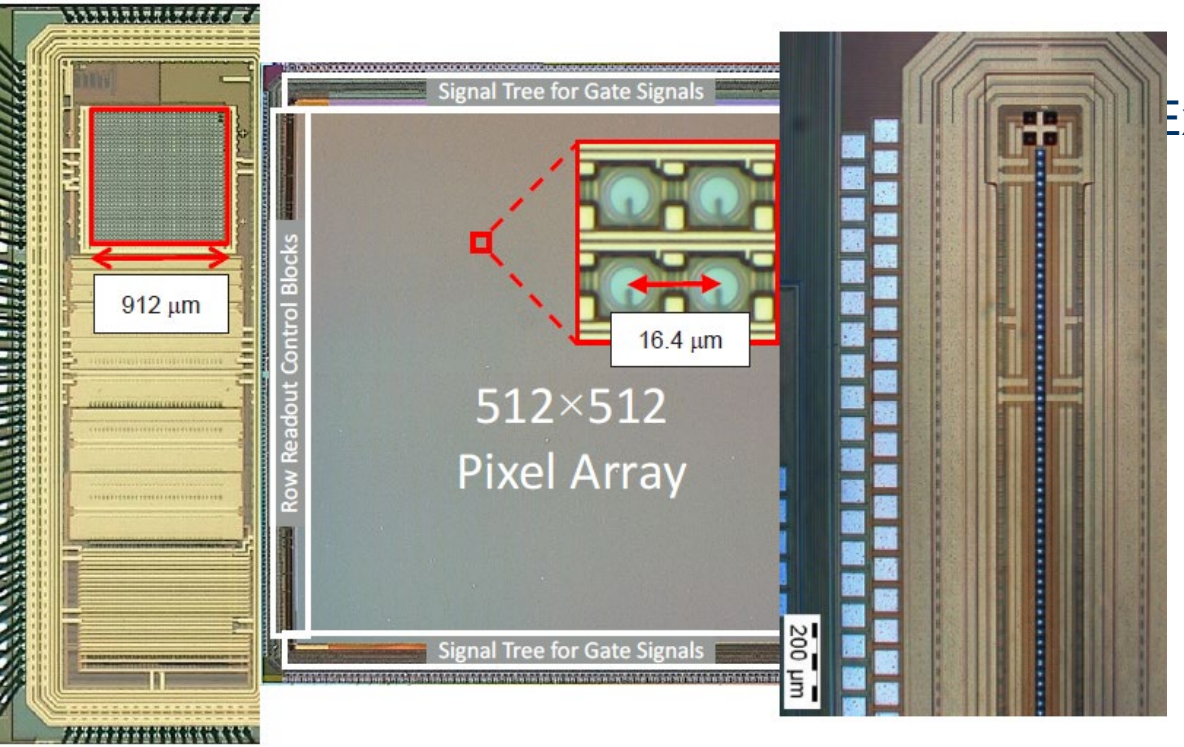
SPHERICAL MICROLENSES FULL PROCESS FLOW





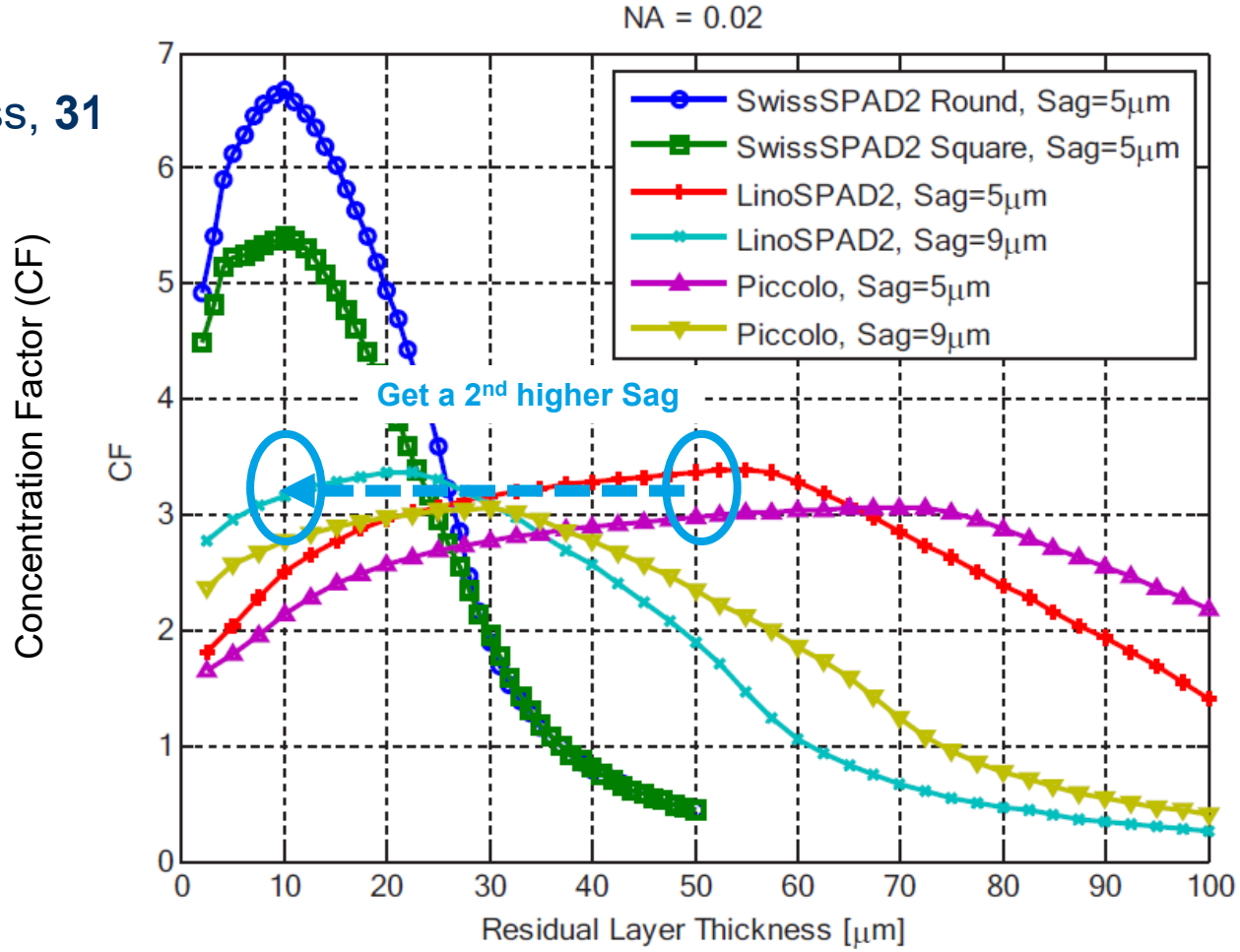
SPAD LIGHT CONCENTRATION ON MULTI-PROJECT WAFER/RETICLE → NEED FOR MULTIPLE SAG MLA





Express, **31**

Fig. 1. Micrographs of Piccolo, a 32 × 32 SPAD array with photosensitive area on the top section, highlighted in red (left) [41,42] – see also Fig. 8 (center); SwissSPAD2 512 × 512, a gated SPAD imager with 4 pixels shown in the inset (center, featuring round SPAD active areas in this case) [45]; Detail of LinoSPAD2, a 512 × 1 linear SPAD array with top alignment cross integrated in the metal stack (right).



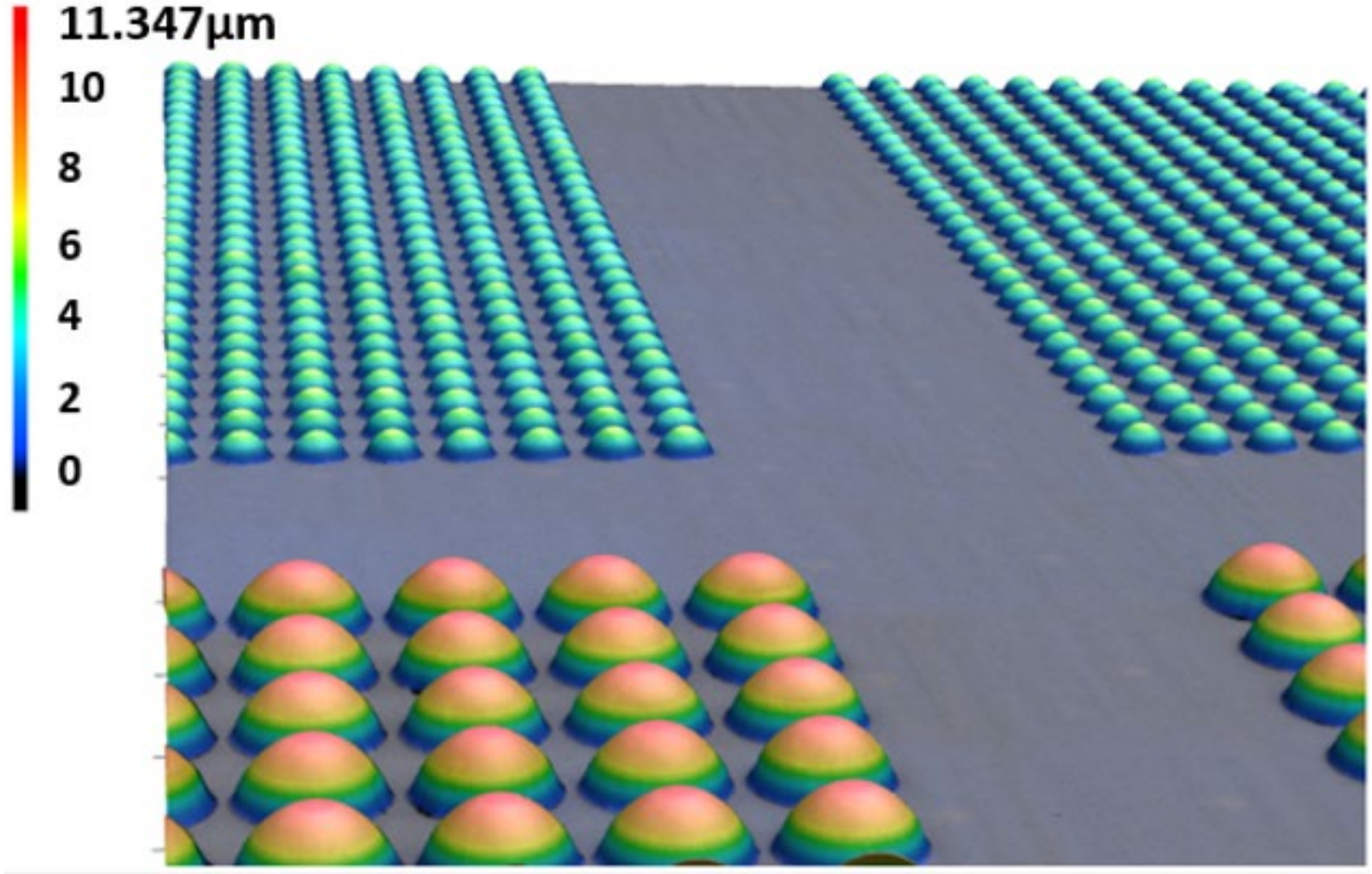
https://www.csem.ch/en/tailored-services/mla-foundry-services/

Phabulous :: csem

MULTIPLE SAG MLA AT WAFER SCALE

Back MLA: ←
Sag = 6 µm
diameter = 16 µm

Front MLA: ←
Sag = 11 µm
diameter = 34 µm.



https://www.csem.ch/en/tailored-services/mla-foundry-services/

PHABULOUS' CUSTOMER WORD

LightBridge

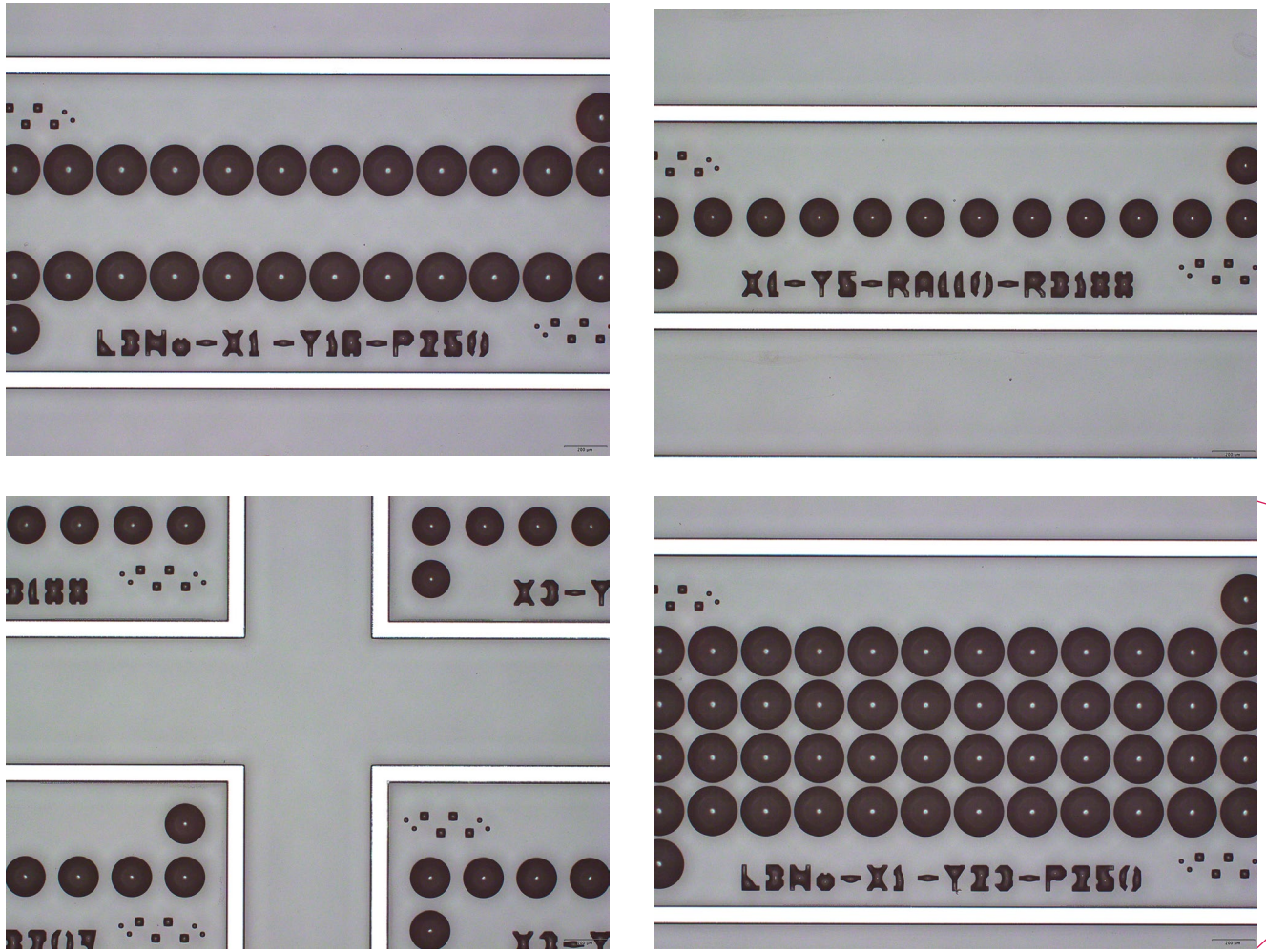
Integrated Photonics Connectivity

Dr Bruno Sfez

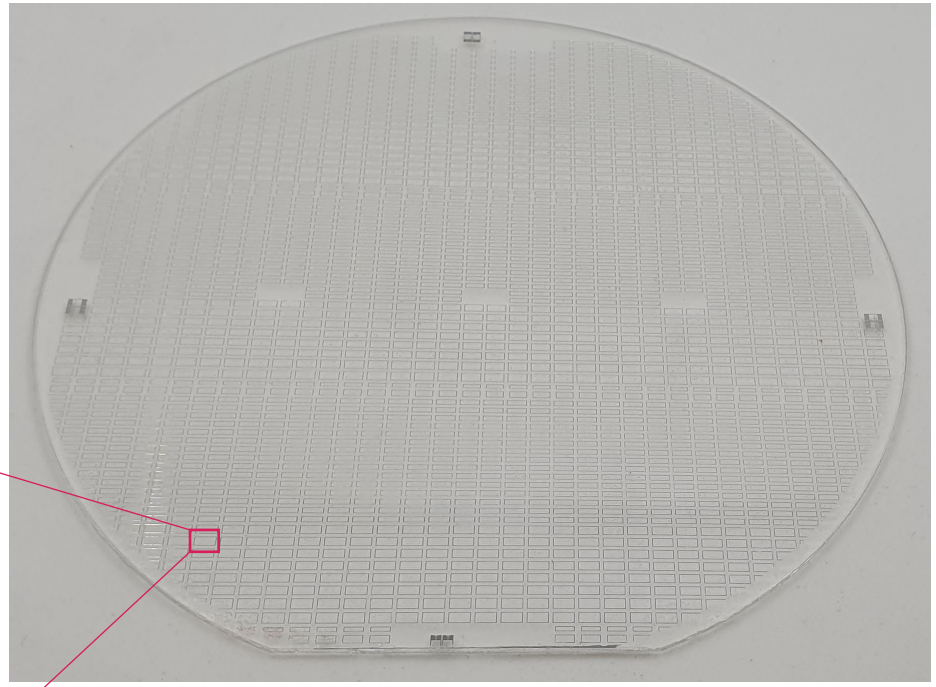
Sfez Technologies Ltd

EXPANDED BEAM CONNECTORS FOR DATACOM

MOLD FABRICATION FOR WAFER-SCALE DATACOM EXPANDED BEAM CONNECTORS



Concave lenses

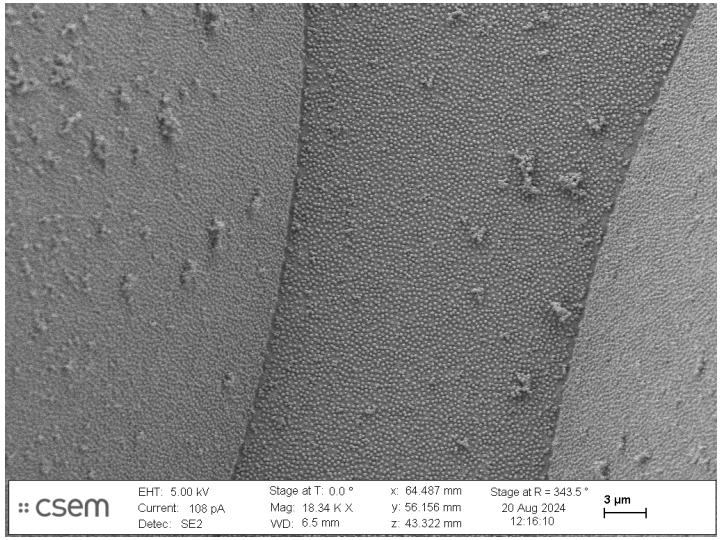


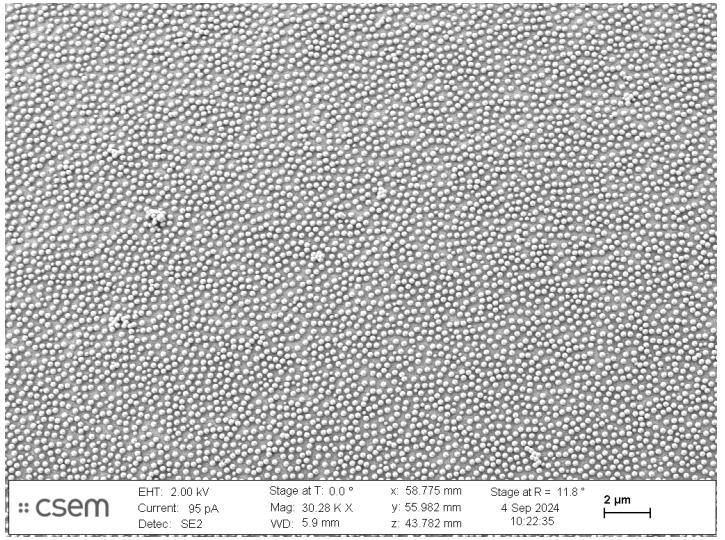
Mold layer

BUILT-IN ANTIREFLECTIVE NANOSTRUCTURES

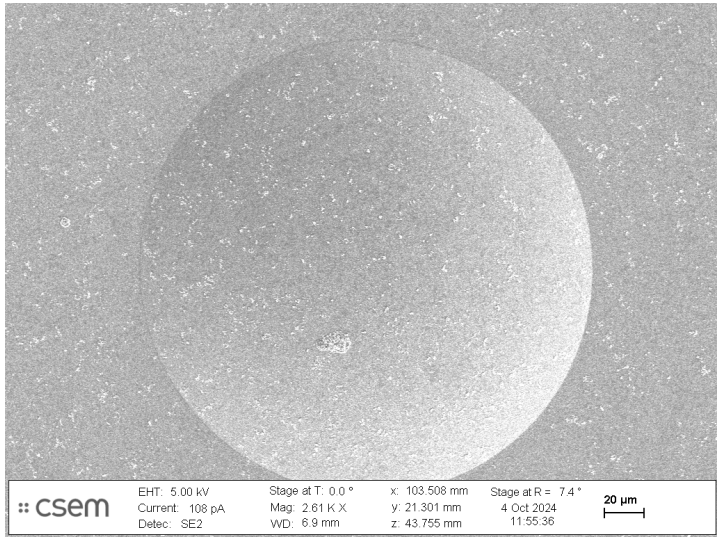
Process development ongoing. Applicability to selected materials confirmed.

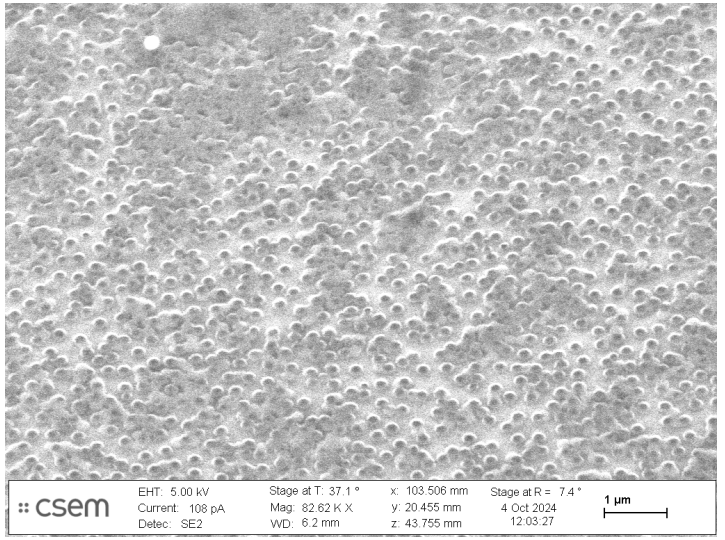
Process step 1





Process step 2





Process being optimized.

phabulous csem

SUMMARY AND OUTLOOK

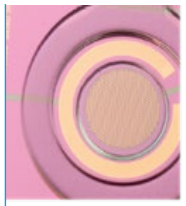
- MicroOptics (wafer level optics) has proven very successful in consumer electronics over the last 2 decades.

Xemics (1997) acquired by **Semtech Corp**.

2005

Neroxis (2009) acquired by **Veolia Water technologies**

2009



CSM Instruments (1998) acquired by **Anton Paar**

2013

Avalon Photonics (2000) acquired by **II-VI Inc.**

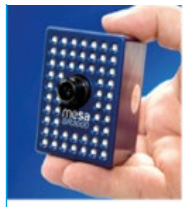
2013

Colibrys (2001) acquired by **Sagem (Safran)**

2013

Mesa Imaging (2006) acquired by **Heptagon**

2015



Snap Sensor (2011) acquired by **Analog Devices**

2016

Heptagon (1993) acquired by **AMS**

2016

ViDi Systems (2012) acquired by **Cognex**

2017

- Similar market success have been reached in secured documents (banknotes, passports, ID cards…)
- As seen yesterday, Micro Optics is having more and more use cases and deployment in automotive.
- For many other industries, most optical and photonic systems are not yet miniaturized. Our imagination is the limit to deploy micro-optics in new markets – combined with photonic integrated circuits, small light sources...

TAKE ON CHALLENGES WITH THE RIGHT TEAM

Contact: Daniele Brunazzo -
daniele.brunazzo@csem.ch