WORKSHOP OF PHOTONICS

Depolarization compensator

Solution for depolarization loss issues

EPIC
European Photonics Industry Consortium

wophotonics.com

About WOP

We deliver **solutions** for **your µ tasks**

18 years of expertise
in femtosecond laser micromachining with a high focus on glass

6 in-house and 2 licensed patents
enabling cutting-edge technologies

50+ professionals
5 Ph.D., 30 M.S. and B.S.

R&D studies
with more than 10 academic and research partners

Members of

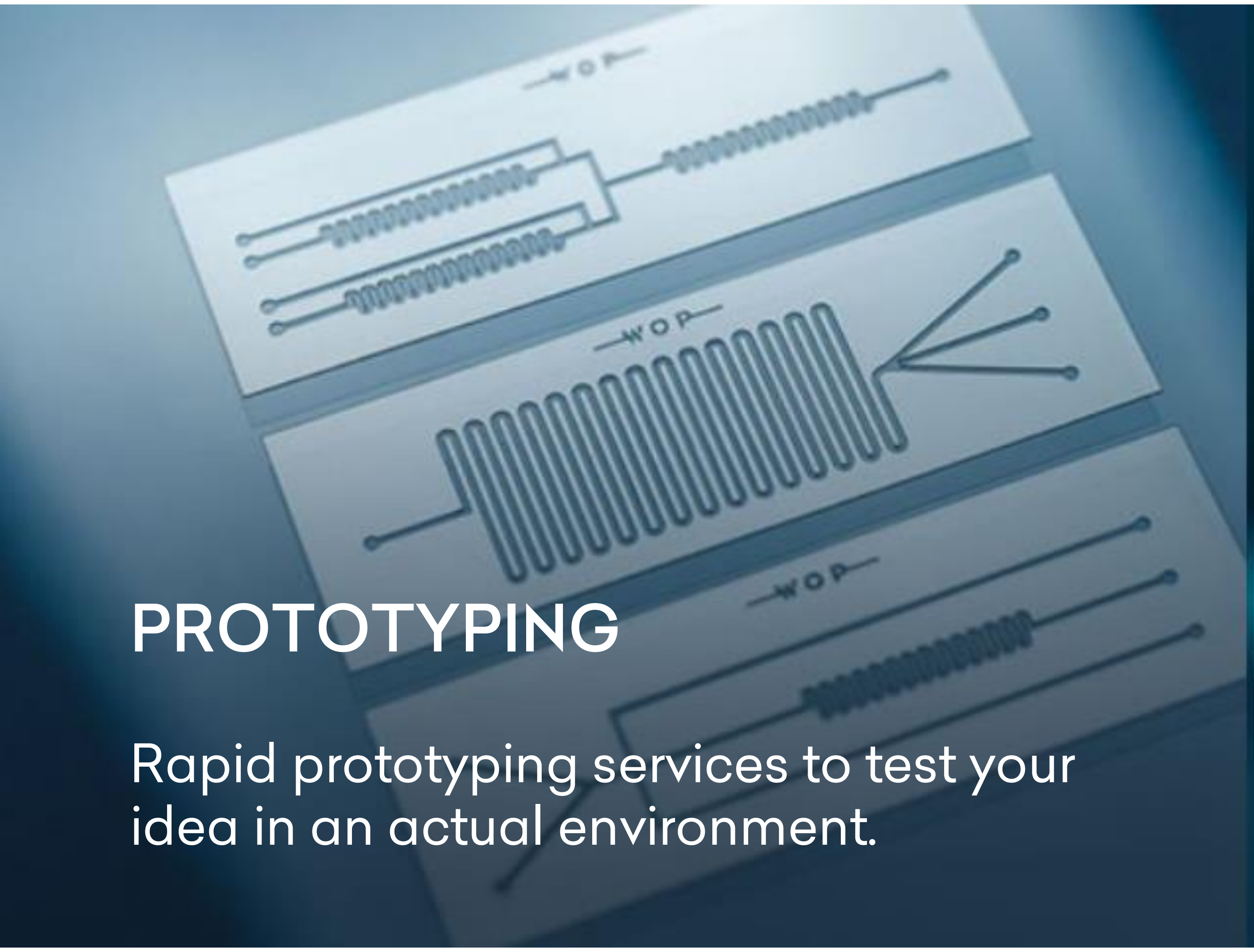
EPIC European Photonics Industry Consortium · Lithuanian Laser Association · semi · Toolas

ISO certified

ISO

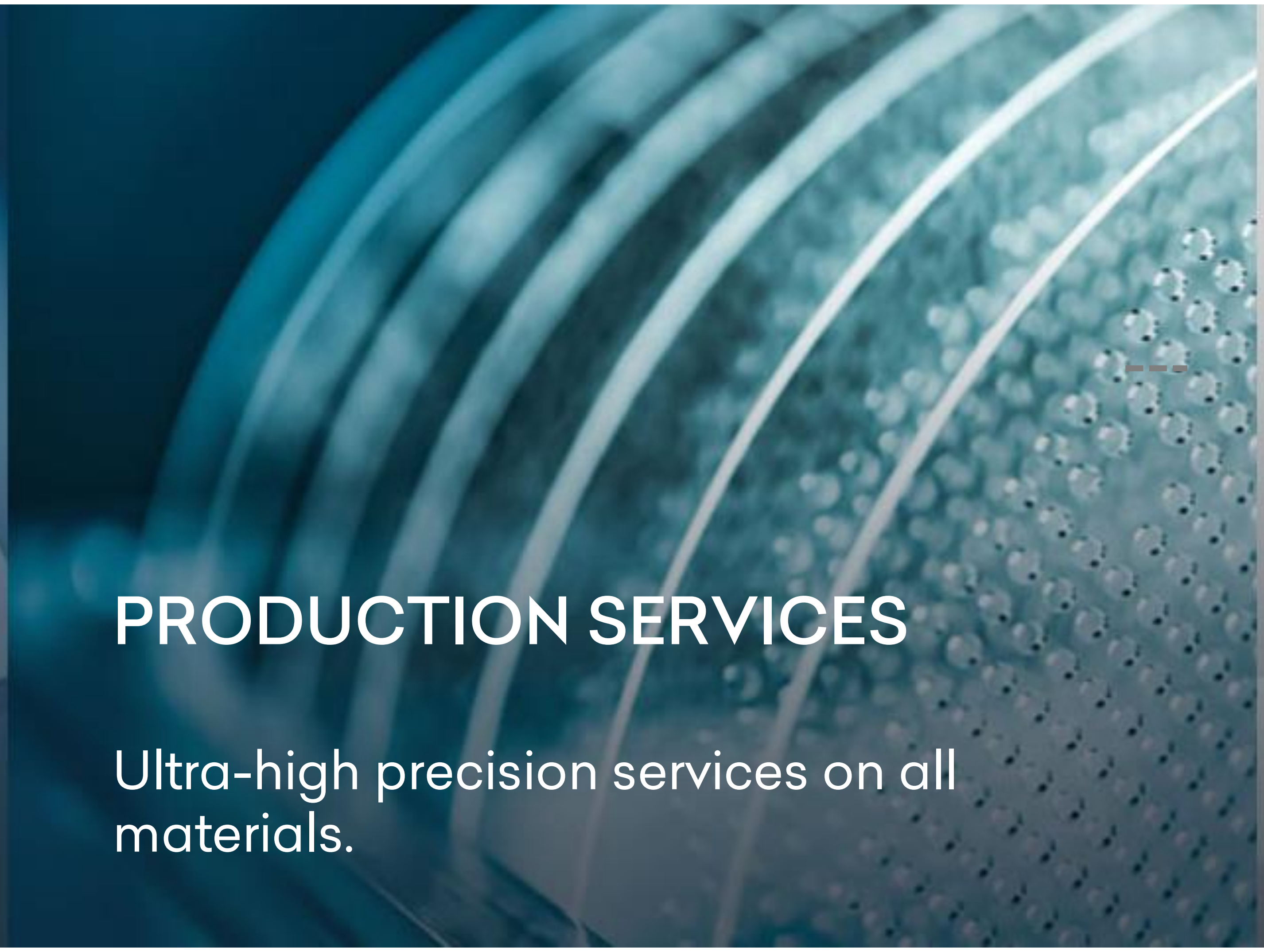
Full-service solutions

HAVE A MICRON CHALLENGE?



PROTOTYPING

Rapid prototyping services to test your idea in an actual environment.



PRODUCTION SERVICES

Ultra-high precision services on all materials.

LASER SYSTEM DEVELOPMENT

Tailor-made laser systems designed for your specific application.

All materials: glass, sapphire, ceramics, silicon, metal, plastic, optical fibers.

Our Customers: Science & Industry

W O P

LIGHT CONVERSION

CISCO

HITACHI Inspire the Next

Technische Universität Berlin

EKSPLA

ThermoFisher SCIENTIFIC

SCHOTT glass made of ideas

Fraunhofer

KLA Keep Looking Ahead

SG Stevanato Group

CORNING

UNIVERSITY OF CALIFORNIA

miDIAGNOSTICS

10x GENOMICS

RICE

TU Delft

FormFactor™

flex MEDICAL SOLUTIONS

esa European Space Agency

INESCTEC

Laser Manufacturers Challenges

- **How to generate high peak power** (TW/cm2) **and high repetition rate** (MHz) of subpicosecond pulses?
- Chirped pulse **amplification method is limited** in gratings size.
- **Fiber lasers are limited** in SMF mode area.
- Solid-state amplifiers at room temperature **require high peak power pumping** and **face cooling challenges**.
- Double-pass bulk amplifiers experience **thermal effects in the highly pumped gain medium** cause significant **power losses via depolarization** if a laser system contains polarization-sensitive elements.
- Cooling **causes axially symmetric temperature gradients** that entail mechanical stresses in the crystal resulting in birefringence of the crystal.

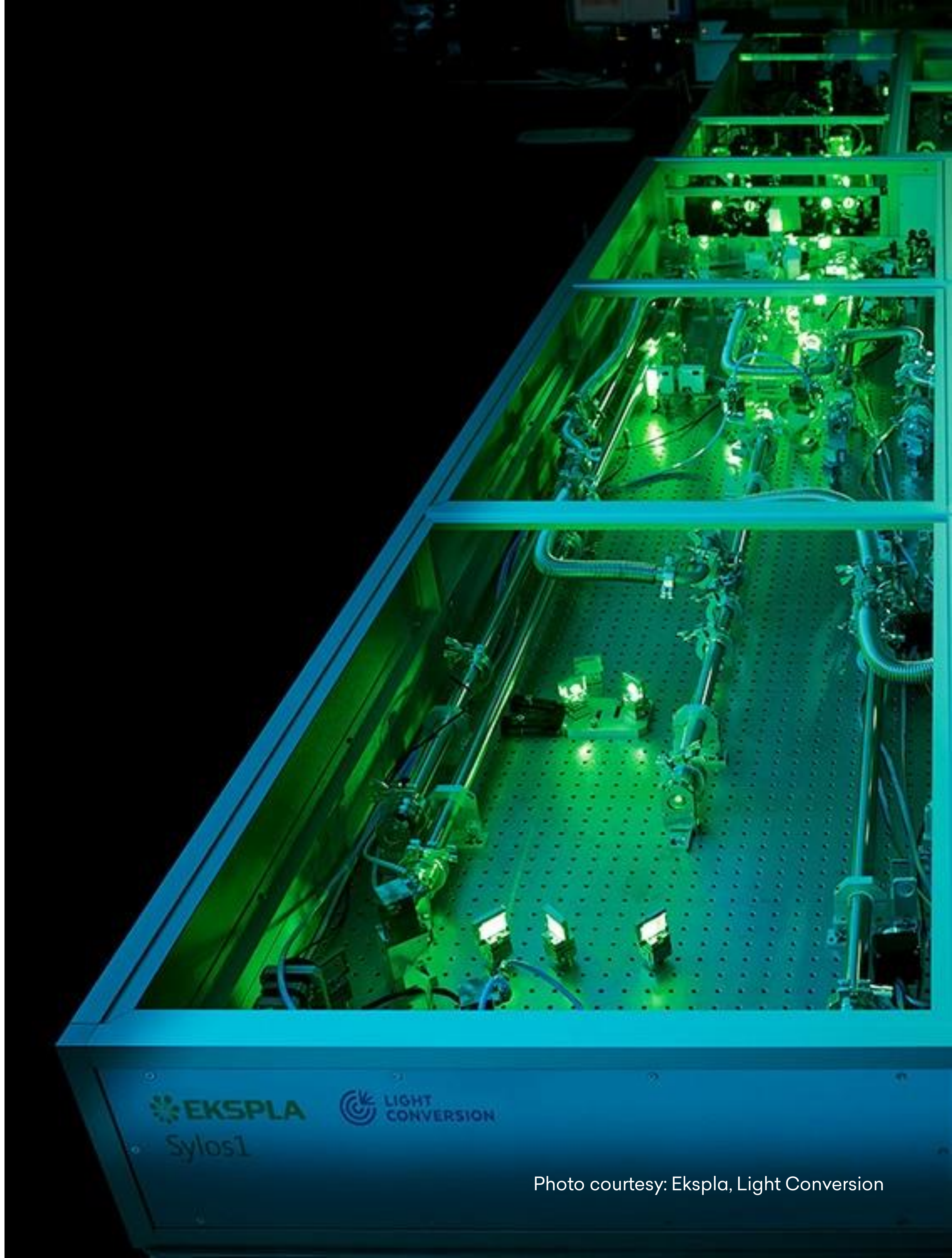
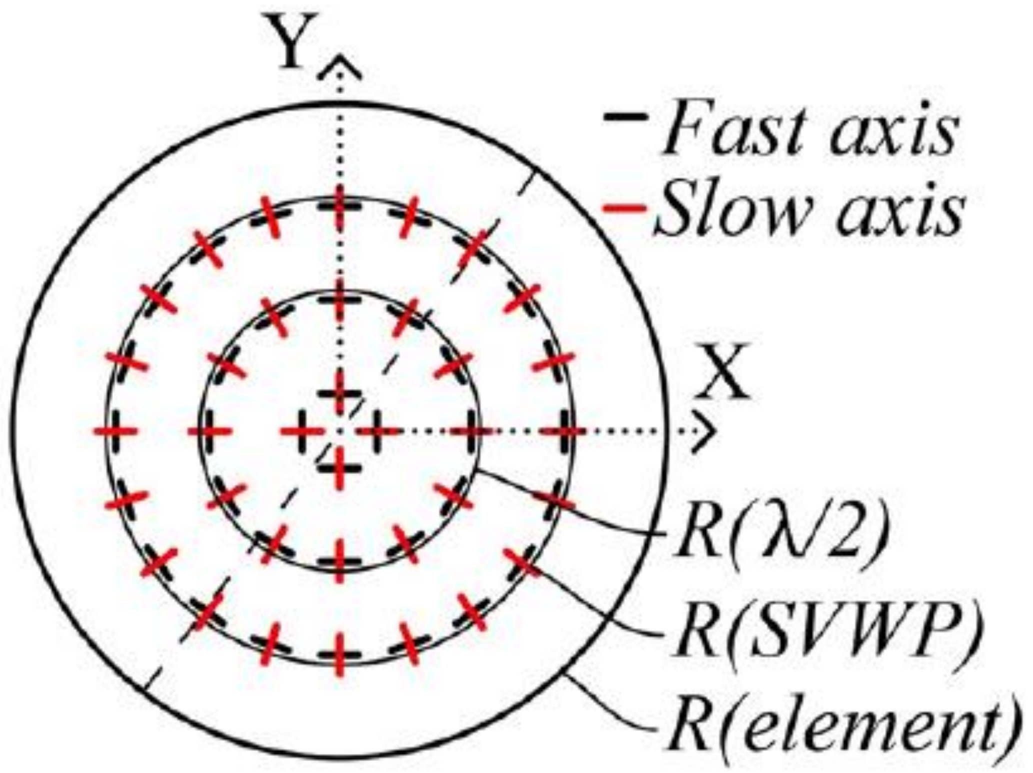


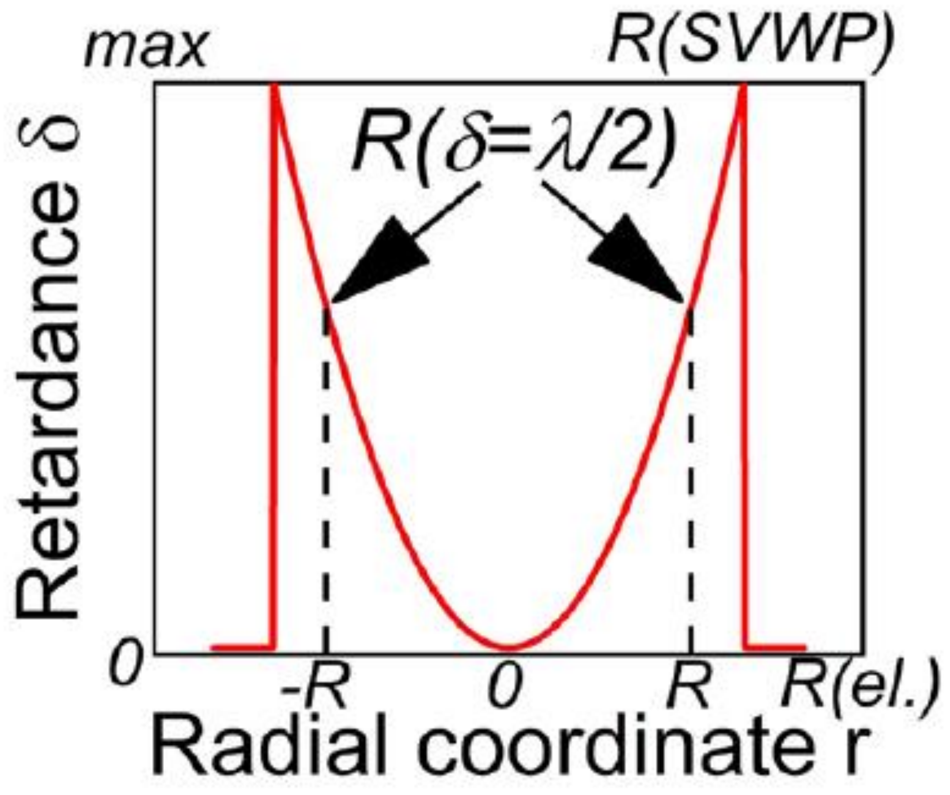
Photo courtesy: Ekspla, Light Conversion

Solution: Depolarization Compensator

- **Thermal effects** in a high-power laser's gain medium **create** predictable axially symmetric **temperature gradients**.
- They **generate mechanical stresses** in pumped crystal - it **leads to induced birefringence**.
- Generated optical **anisotropy causes significant power losses** if a laser system contains polarization-sensitive elements (e. g. Brewster plates, Faraday rotators).
- WOP solution – **DEPOLARIZATION COMPENSATOR**.



Two-dimensional fast and slow axis orientation distribution map. R.=2/ marks the contour of SVWP where phase retardance is =2, R.SVWP/ marks the edge of the inscribed birefringence map, and R.e l ./ marks the radius of the glass substrate of the element.

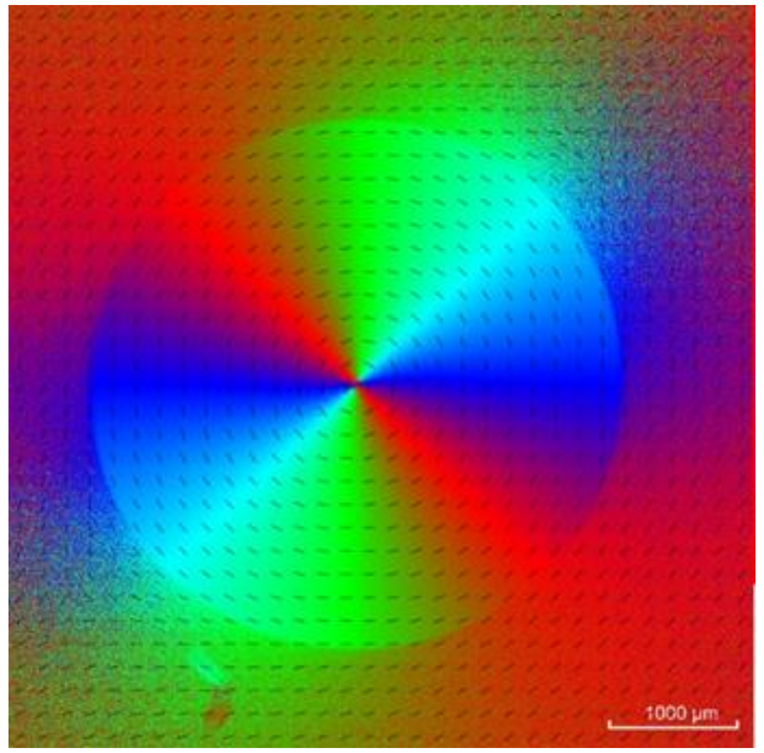


Retardance profile across the dashed line within SVWP element.

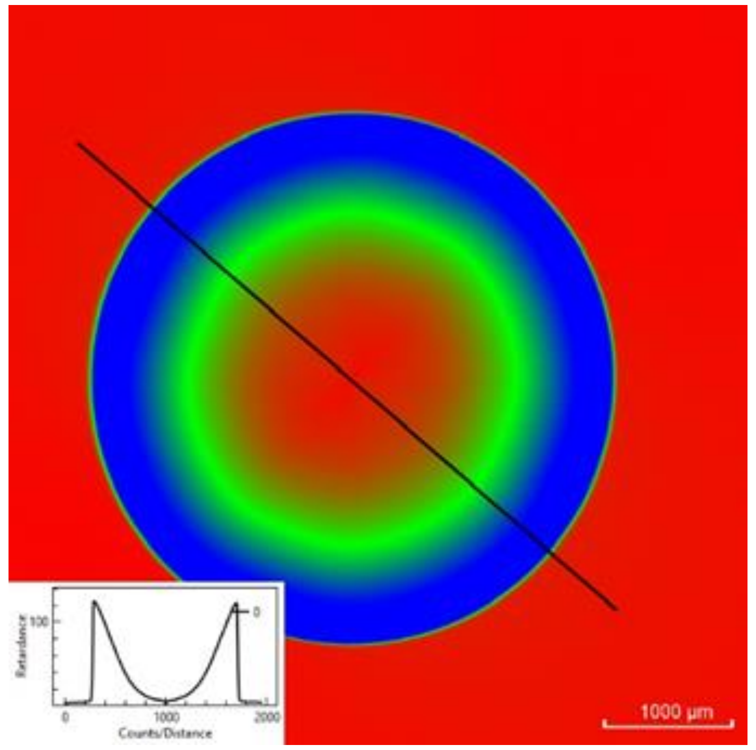
Advantages vs. Alternatives

It is **more beneficial** compared to other known methods:

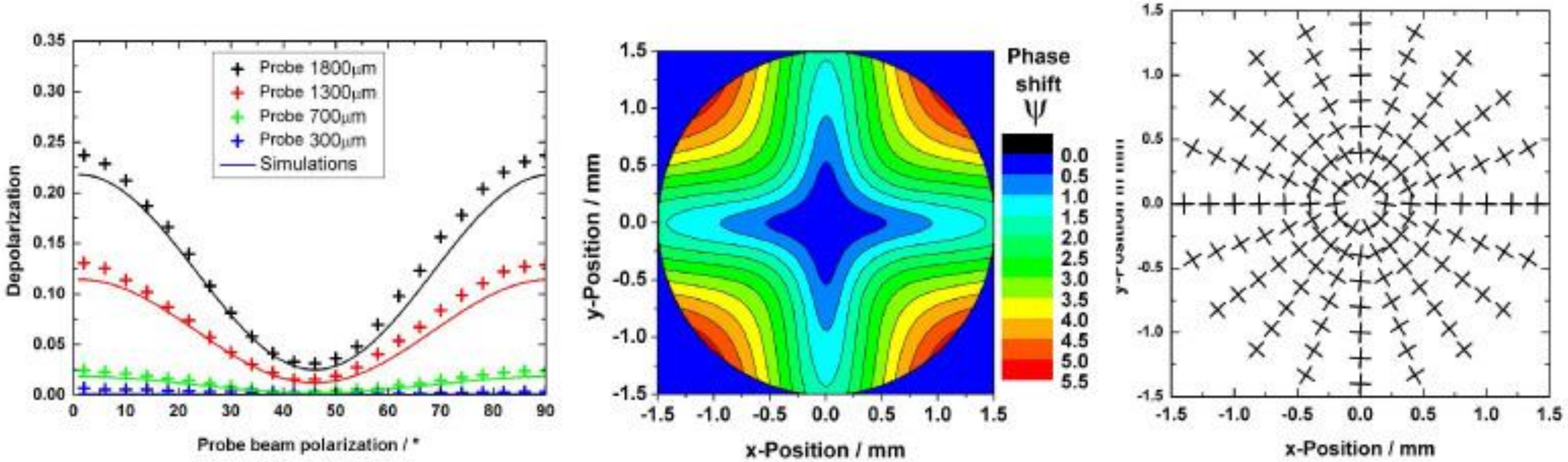
- No absorption
- Very low scattering
- Custom and continuous point-by-point patterns
- Maximum power extraction possibility without additional beam quality degradation
- Flexibility to compensate different amounts of depolarization by stacking more than one element
- Saves space, is easy to handle
- Significantly lower price



Two-dimensional distribution map of orientation of fast and slow axes.



Retardance profile.



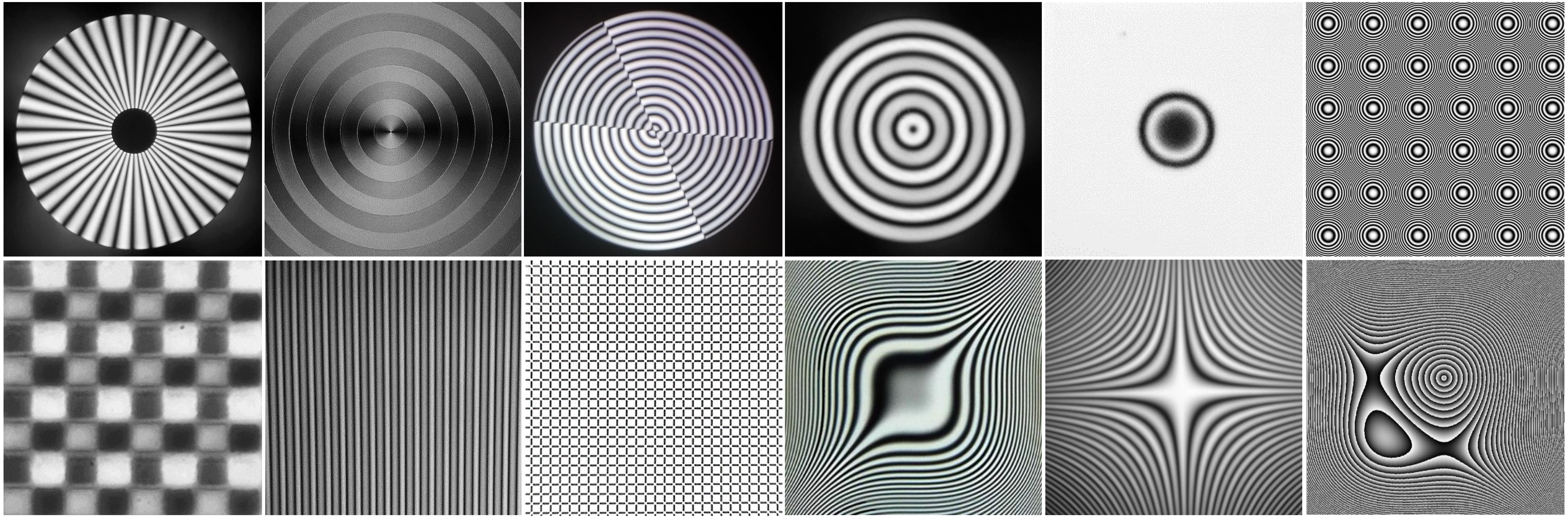
Depolarization in dependence of probe beam polarization for a [100]-cut crystal (left), phase shift (middle) and local orientation of the birefringent axes (right).

Initial SVR specifications

- Substrate material – fused silica (Ø 1 inch)
- Wavelength range from 200 nm to 3500 nm
- Retardance from 10 nm to 1750 nm
- Diameter from 0.1 mm to 15 mm
- High 94% transmission @ 1030 nm (no AR coating)
- High damage threshold:
  63,4 J/cm^2 @1064 nm, 10 ns
  2,2 J/cm^2 @1030 nm, 212 fs

We Can Fabricate Various SVRs

for tailored polarization conversion and beam shaping



WOP

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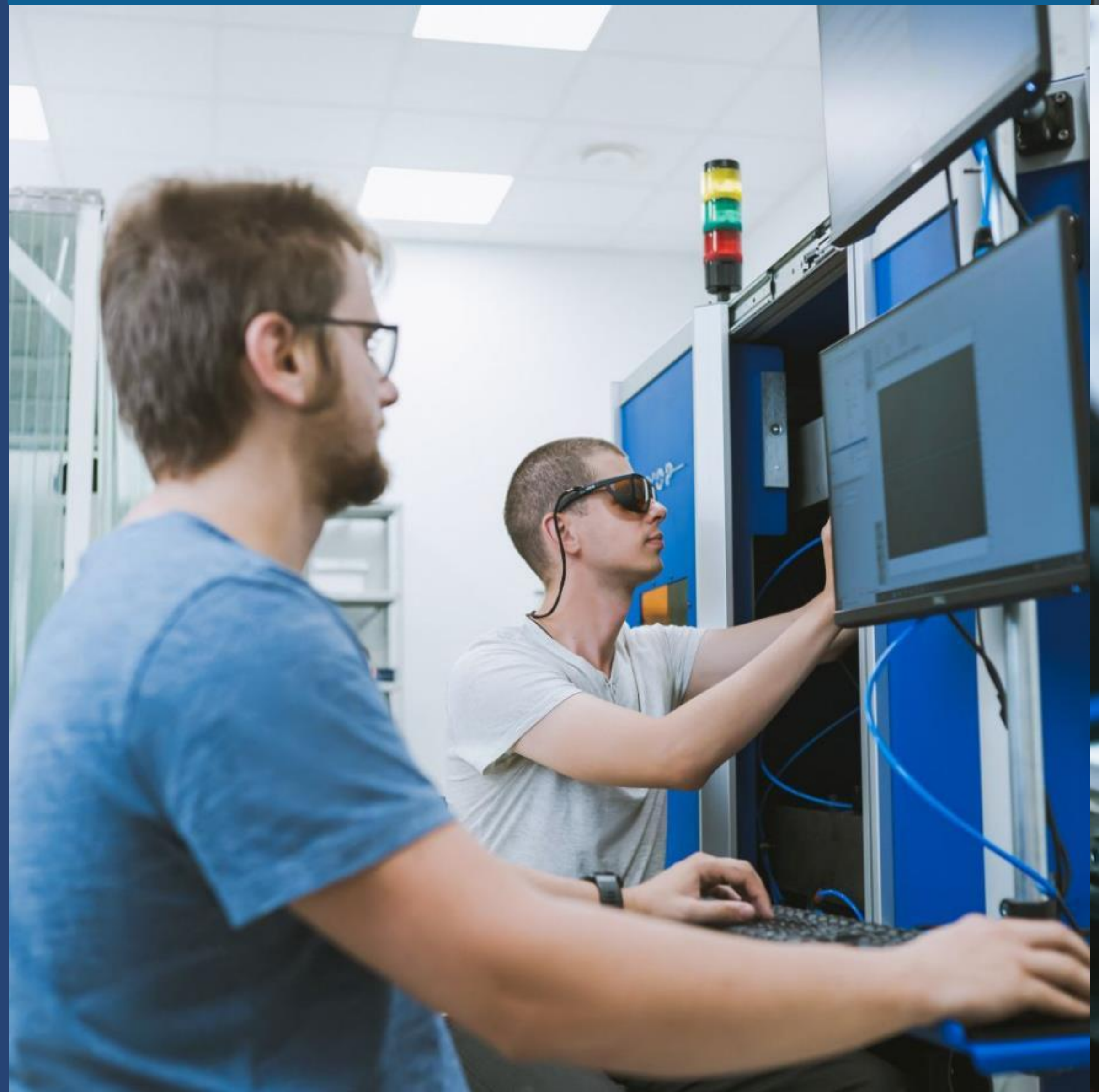
for your
µ tasks

Don‘t hesitate, contact us!



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