nanoscribe
A BICO COMPANY

Nanoscribe and Photonic Packaging Technology

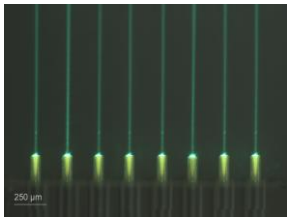
Jörg Smolenski
Business Development Manager
Nanoscribe GmbH
04th April 2022

Main challenges in Hybrid Packaging

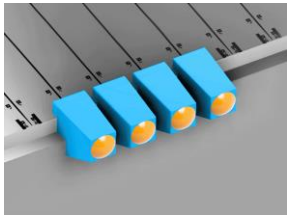
- Reduce coupling losses from/to fibers, edge couplers, grating coupler, emitting facets and especially between different material platforms
- Steer and form beams
  - From small to large or large to small Mode Field Diameters (MFD)
  - In different directions (0°,45°,90°,…)
- Relax alignment tolerances for packaging to several µm instead of 100’s nm
- Flexible use with any material platform & wavelength (InP, SiN, Si,…)

Quantum X align –
Dedicated tool for improved optical coupling

- Up to 100 nm precise alignment to waveguides
- Automatic printing on fiber arrays & chips
- Web offer with Partner PHIX for Lensed Fiber Arrays (LFA)

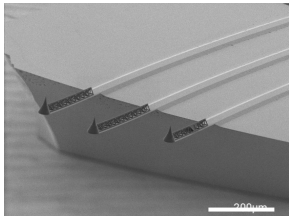


Printing on fibers
3D alignment to fiber core and emission direction



*

Printing on photonic chips
3D alignment to on-chip markers, waveguides etc.

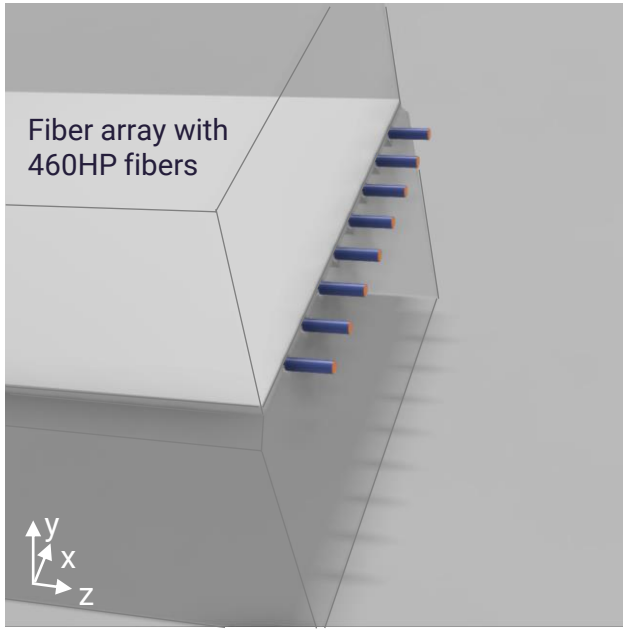


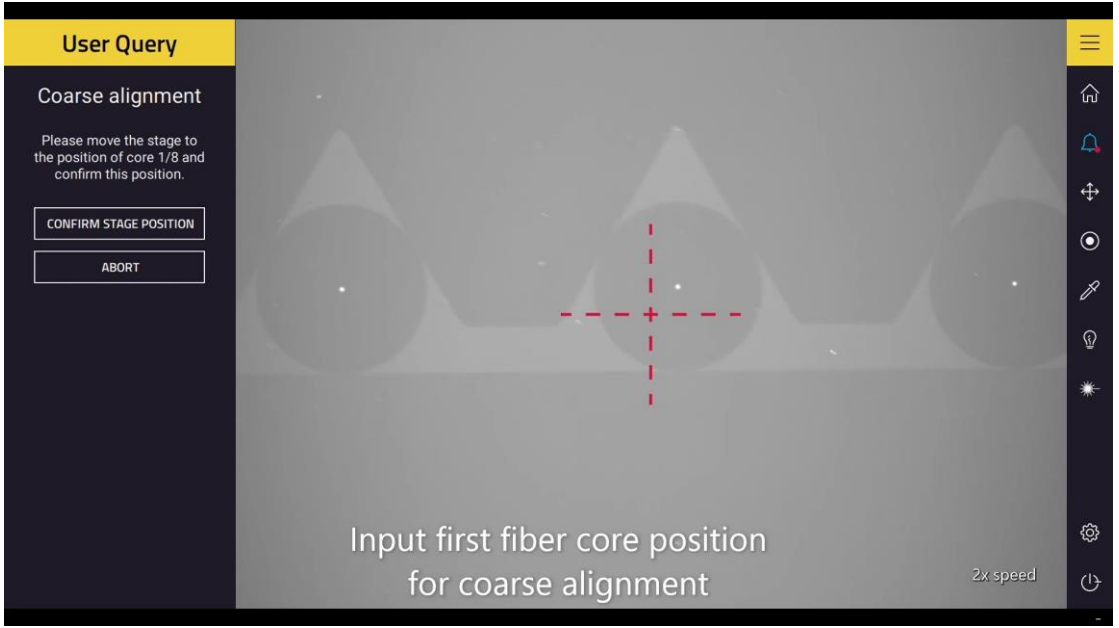
Printing on 3D topographies
3D alignment to topographical features

*Chip from HandheldOCT

EPIC OTM on-hybrid-photonic-integrated-circuits

Application example – Printing on fibers
Beam expander for 532nm wavelength

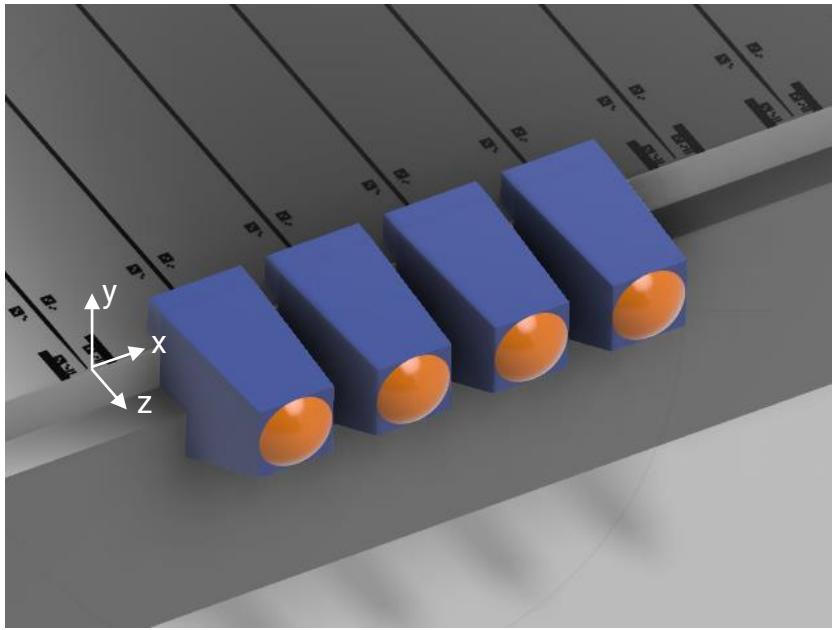


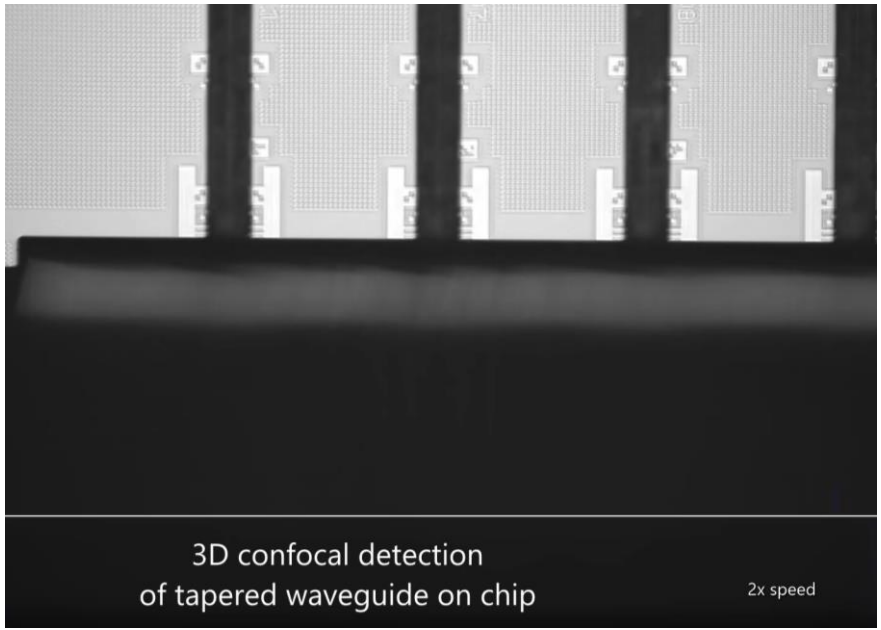


Application example – Printing on photonic chips
Beam shaping optics for 1060nm

Handheld OCT

H2020-ICT-2019-2





EPIC OTM on-hybrid-photonic-integrated-circuits

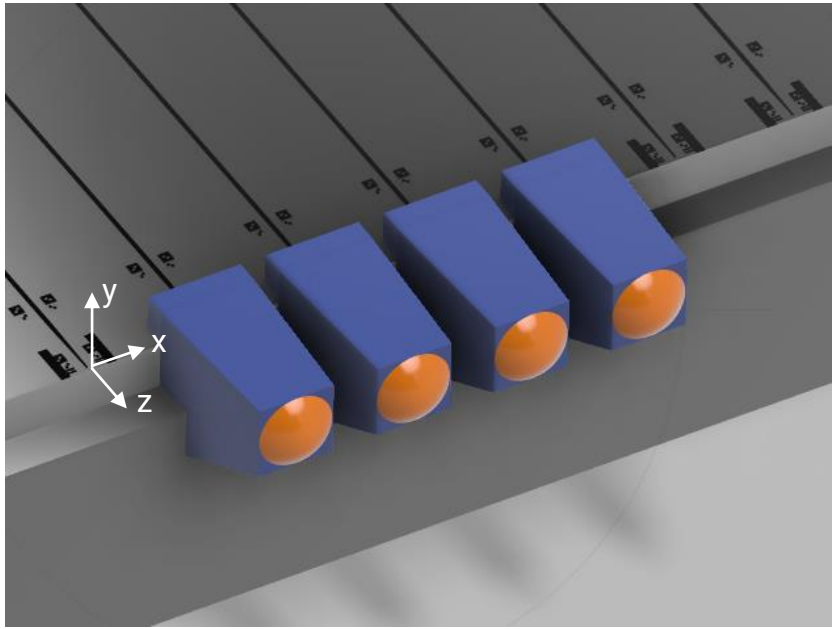
*Chip from HandheldOCT

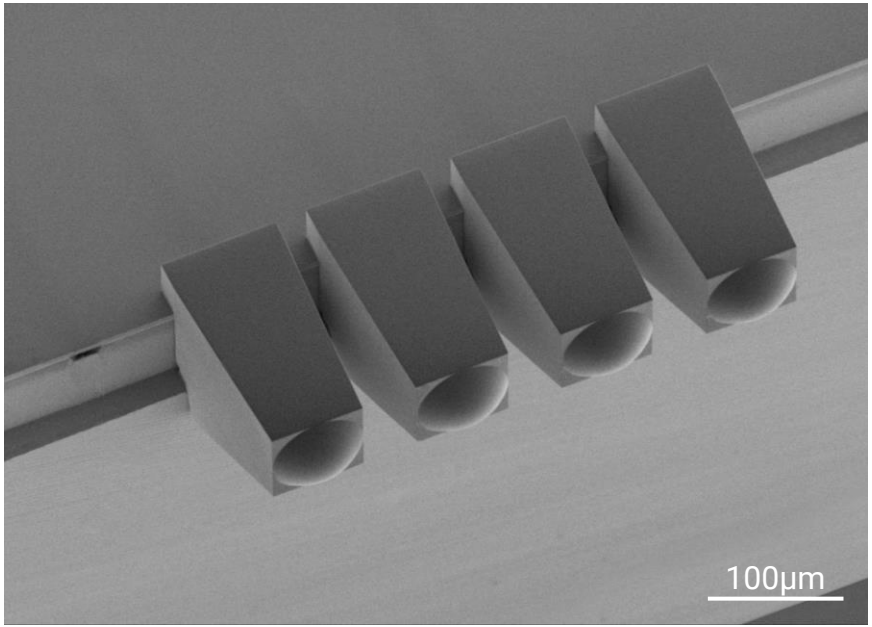
Handheld OCT

H2020-ICT-2019-2

Application example – Printing on photonic chips
Beam shaping optics for 1060nm

7. Development and visual check





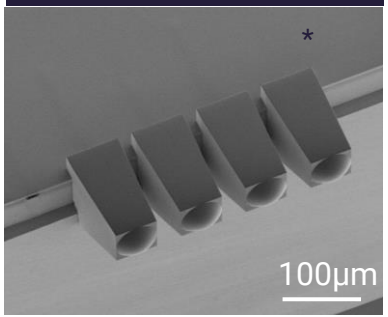
*Chip from HandheldOCT

Quantum X- align
Aligned multiphoton lithography for high precision

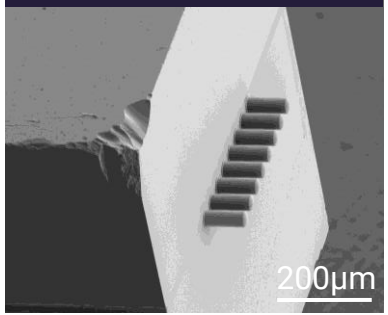
- 3D Printing designed for Photonic Integrated Circuits (PIC)
  - Reduce coupling losses ➔ < 1dB ✓
  - Steer and form beams from
    - From small to large or large to small Mode Field Diameters (MFD) ✓
    - In different directions (0°,45°,90°,…) ✓
  - Relax alignment tolerances for optical coupling ➔ +- few µm (X-Y-Z) ✓
  - Flexible with any material platform & wavelength ➔ aligned 2PP 3D Printing ✓

Nanoscribe
Quantum X align
with automated
alignment

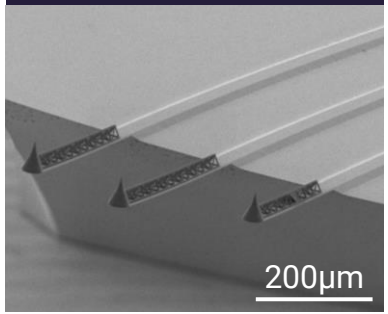
Photonic integration



Photonic integration



Micromechanics



*Chip from HandheldOCT

EPIC OTM on-hybrid-photonic-integrated-circuits

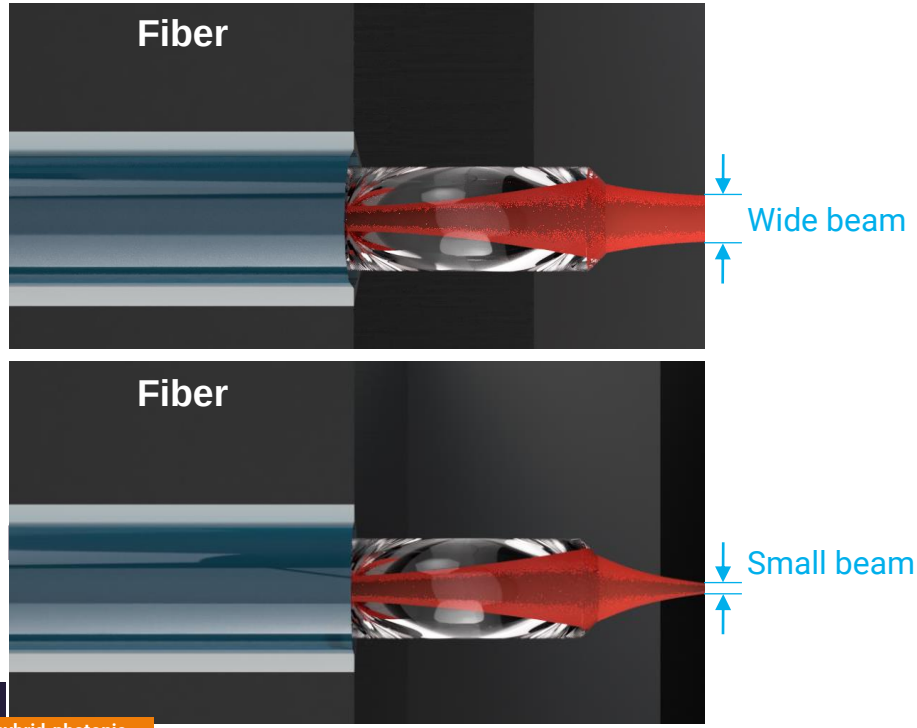
EPIC questions and answers

- What can we do for you ?
  - We can enable efficient coupling between different material platforms due to adaption of the MFD diameter with 3D Printed Free Space Micro Optics
  - This means:
    - Feasibility studies, Prototyping, Design, Simulation and … Equipment

- What can you do for us ?
  - Challenge us with your PIC optical coupling issue:
    - Edge coupler, Fiber Arrays, Grating Coupler, Tapered 3D coupler , Adiabatic coupler, Si, Soi, SiN, ……

Application examples

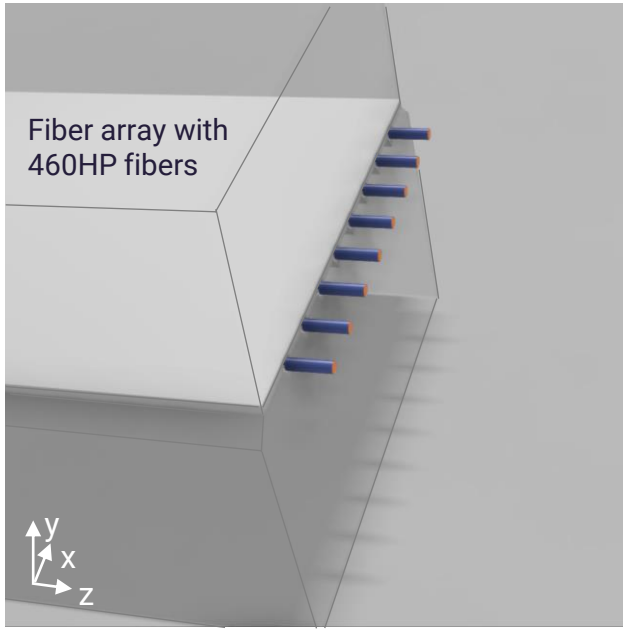
Application example – Printing on fibers
Tailored lensed fibers

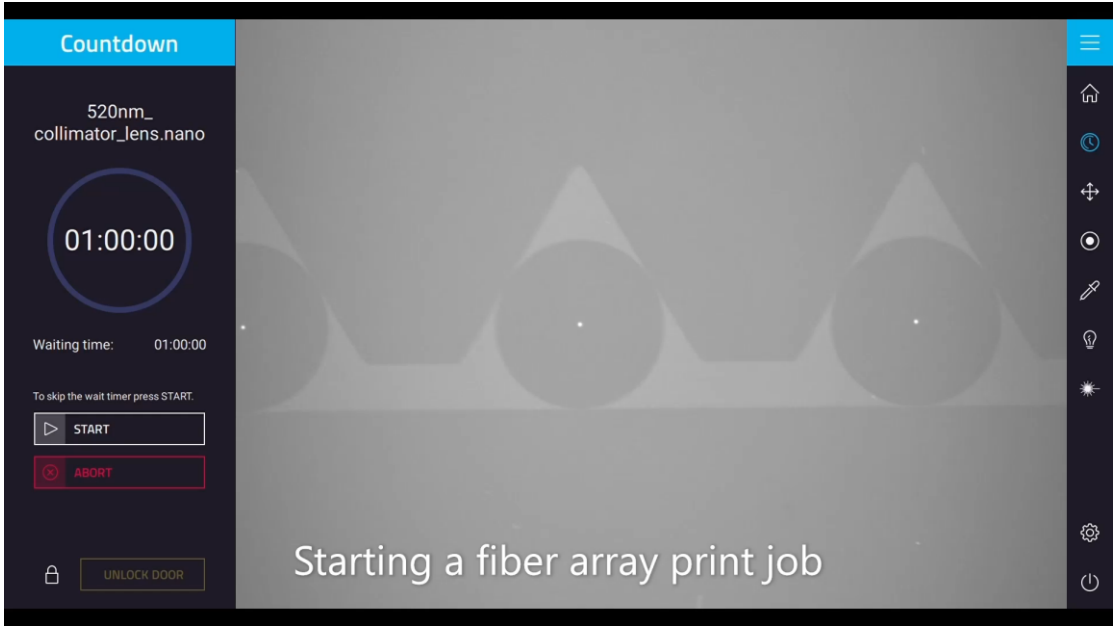


Beam expander for relaxed alignment tolerances in packaging

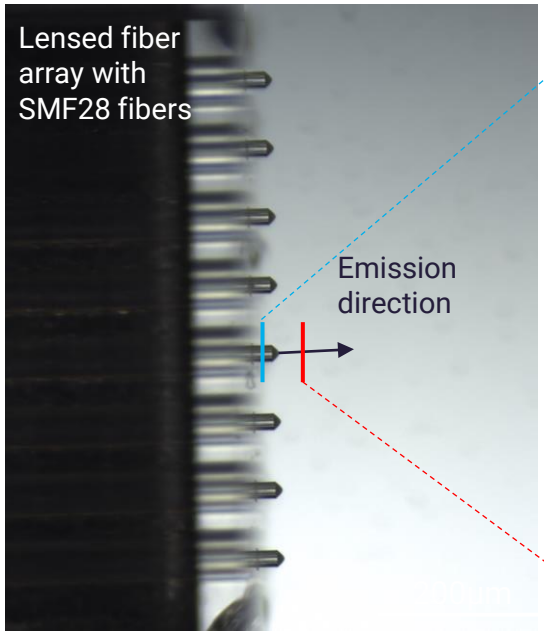
Focusing lenses for low loss direct coupling to tapered waveguides

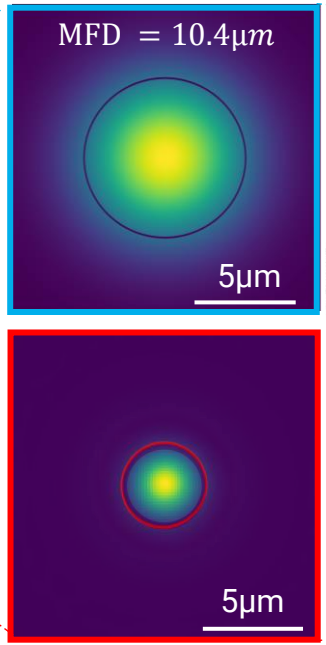
Application example – Printing on fibers
Beam expander for 532nm wavelength

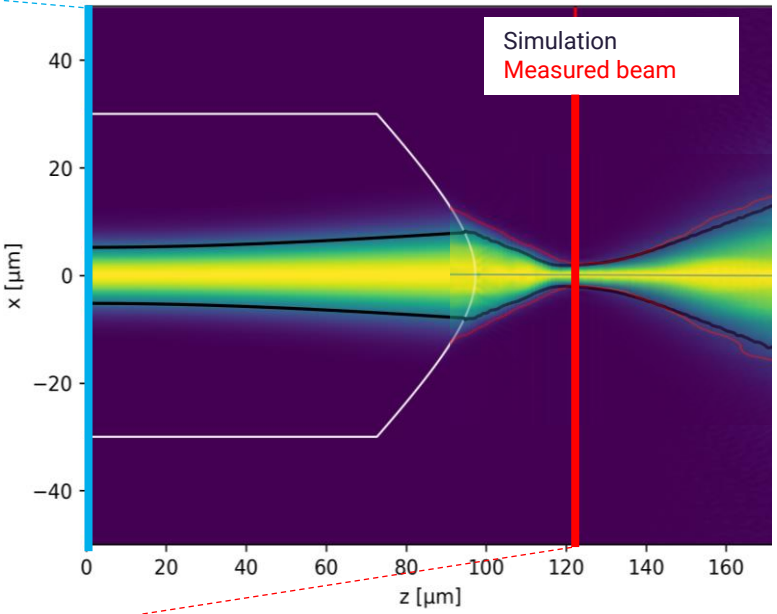




Application example – Printing on fibers
3.6µm MFD focus lens for 1550nm





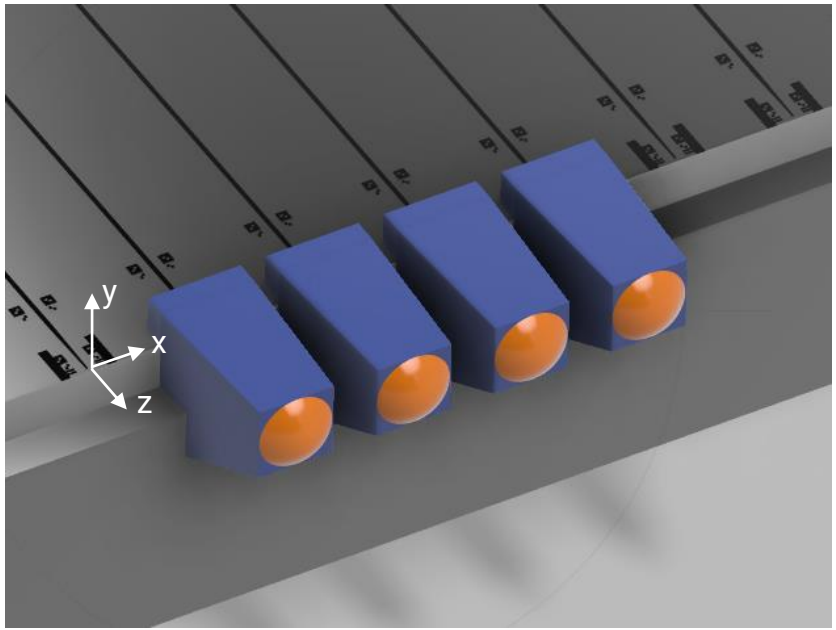


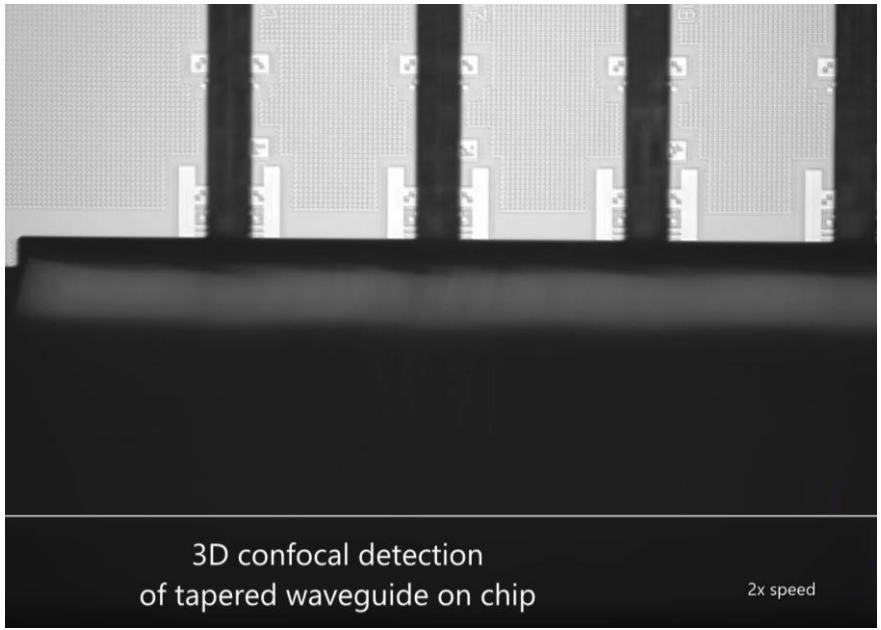
Simulation
Measured beam

Application example – Printing on photonic chips
Beam shaping optics for 1060nm

Handheld OCT

H2020-ICT-2019-2

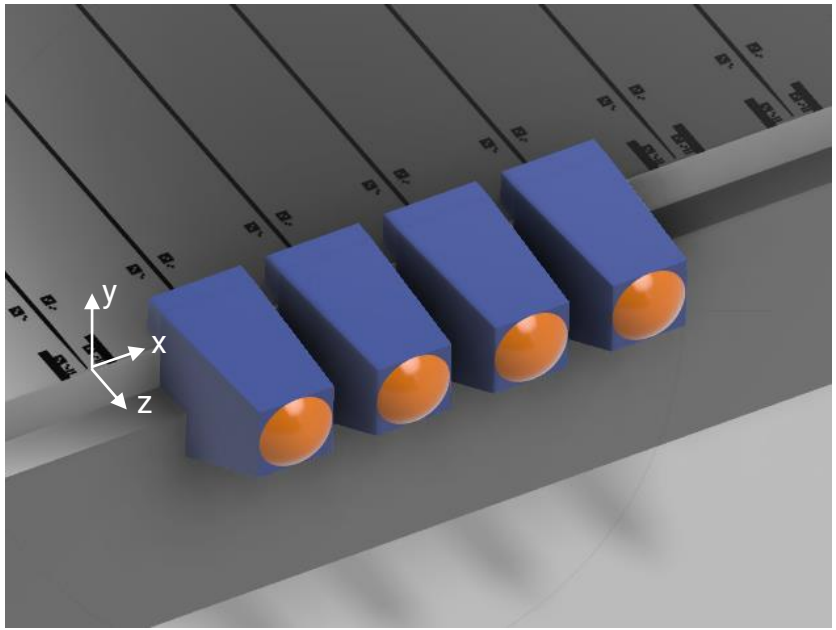


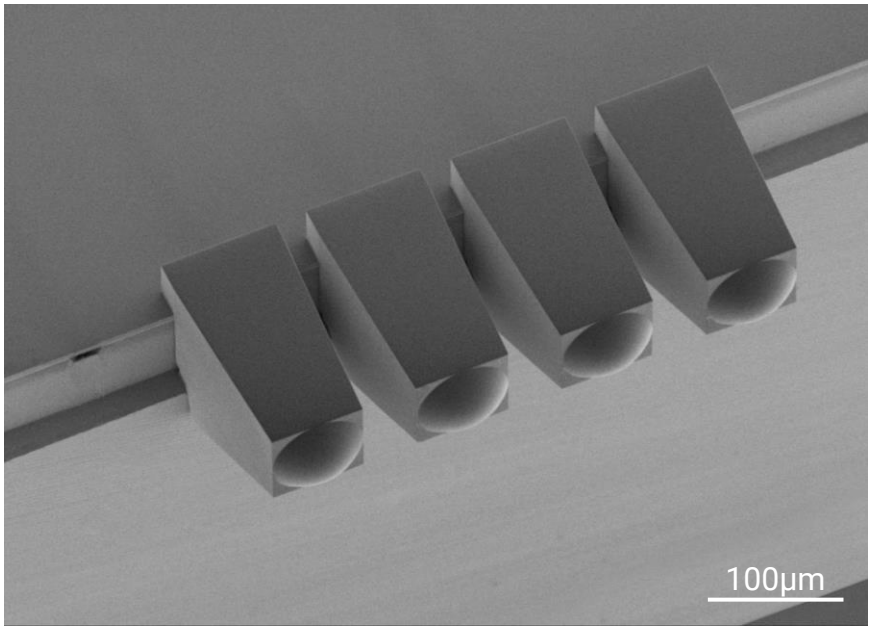


Application example – Printing on photonic chips
Beam shaping optics for 1060nm

Handheld OCT

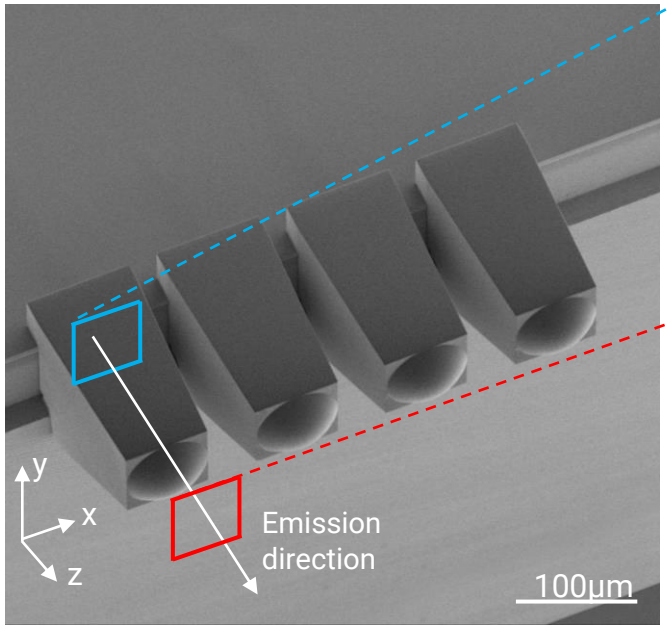
H2020-ICT-2019-2

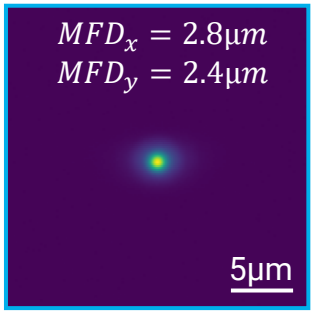


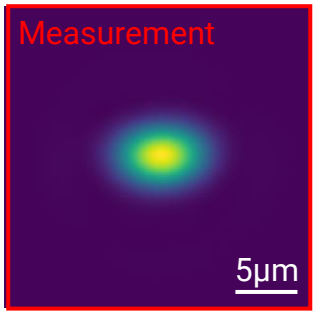


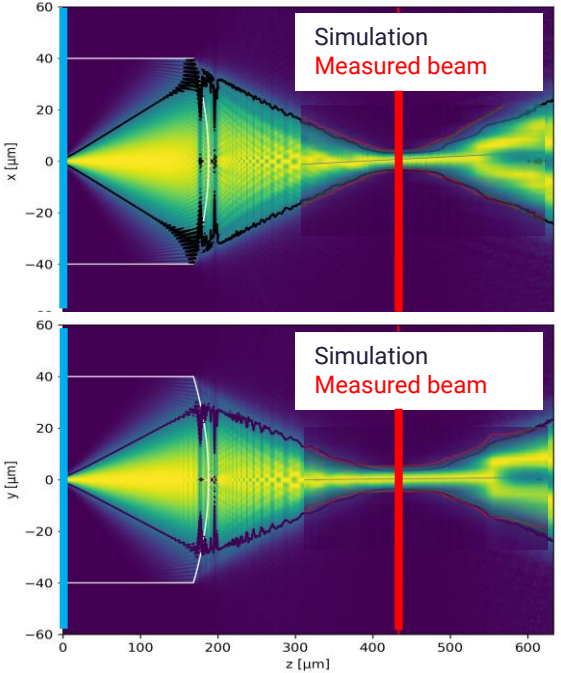
Application example – Printing on photonic chips
Beam shaping optics for 1060nm

8. Beam characterisation

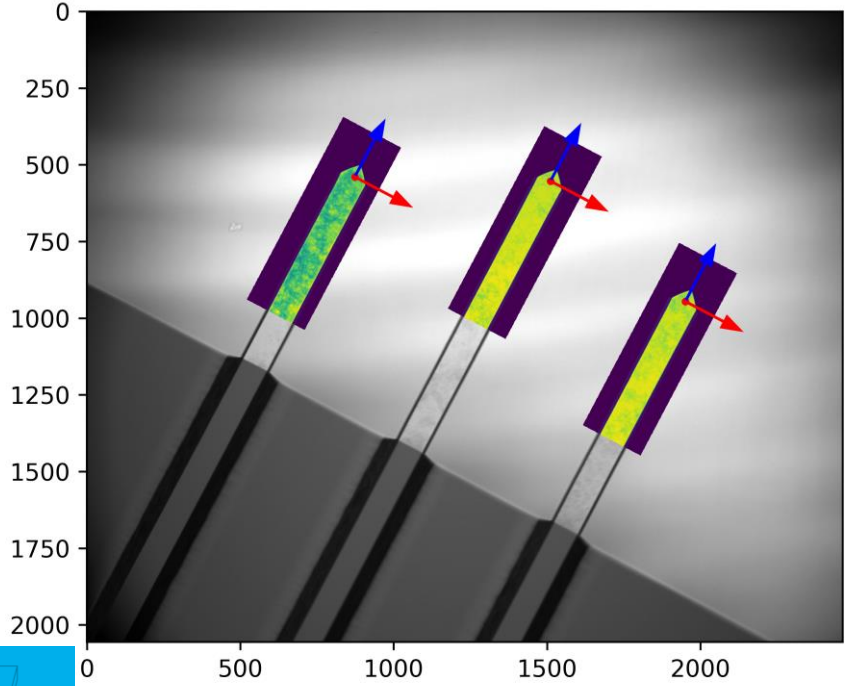


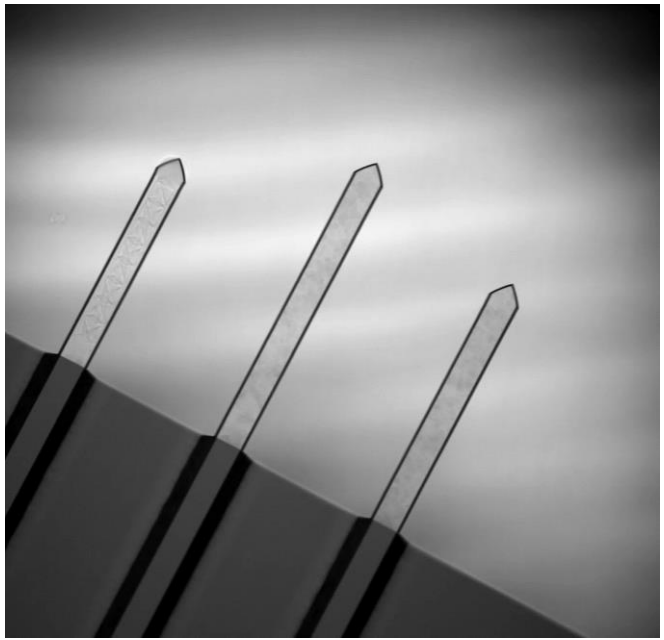




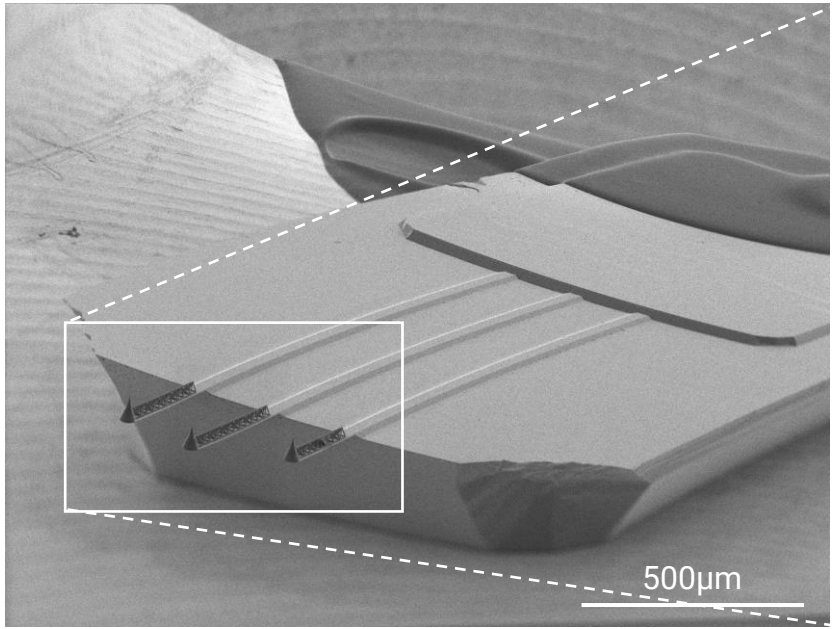


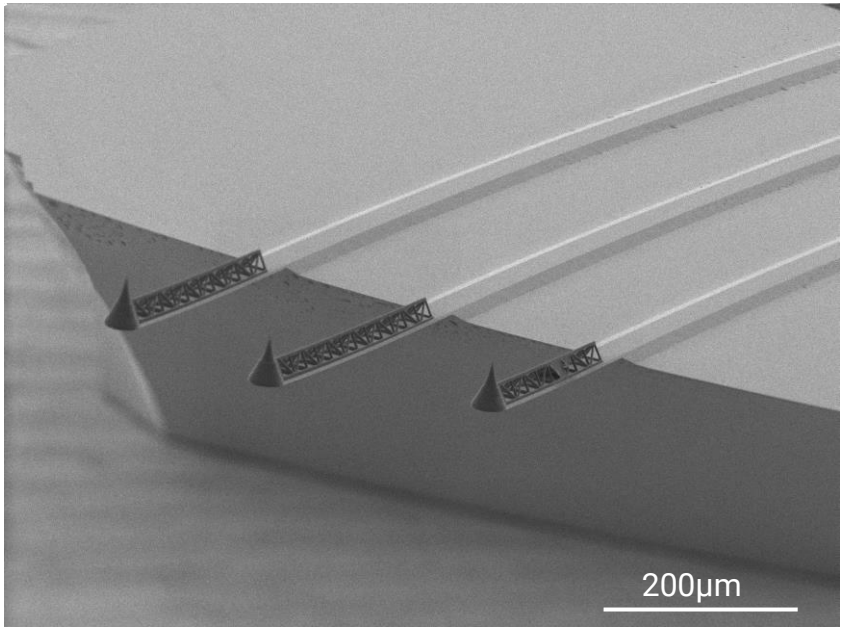
Application example – Printing on 3D topographies
Tips and rebar structures on AFM cantilever





Application example – Printing on 3D topographies
Tips and rebar structures on AFM cantilever





nanoscribe
A BICO COMPANY

Think big. Print nano.

Contact us

Jörg Smolenski
Smolenski@nanoscribe.com

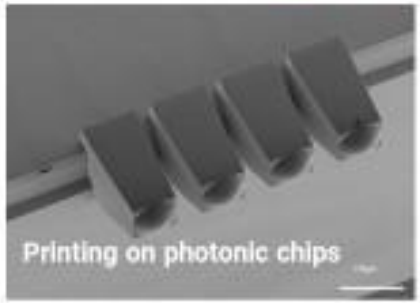
nanoscribe
A BICO COMPANY

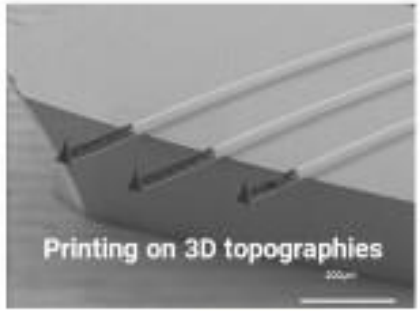
Think big. Print nano.

Contact us

Jörg Smolenski
Smolenski@nanoscribe.com

Quantum X align – Dedicated tool for improved optical coupling





*Chip from HandheldOCT