vanguard
AUTOMATION

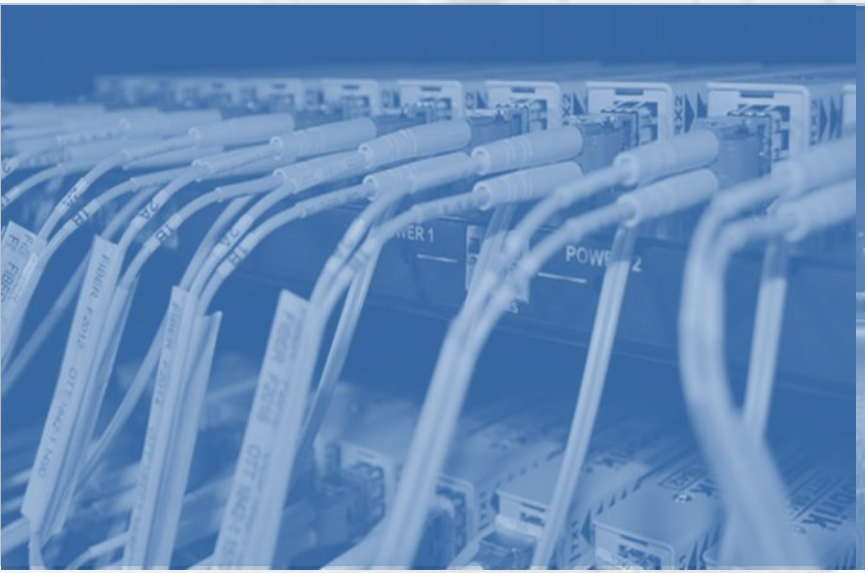
bright connections

Scaling 3D Laser Lithography Based Packaging of Hybrid Multi-Chip Assemblies from Prototyping to Volume Production

Philipp-Immanuel Dietrich

Photonics Integrated Circuits are Growing at >20% CAGR

Tele and Data Communications



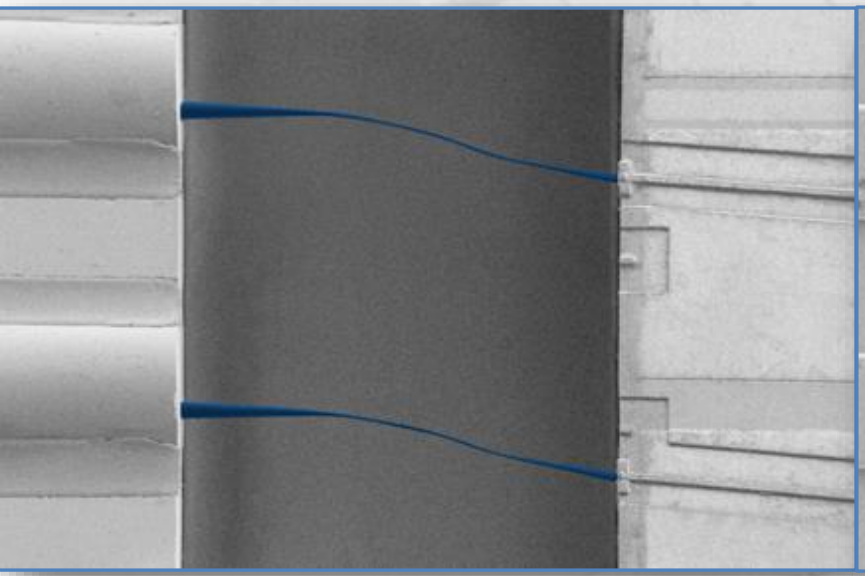
3D Sensing

Quantum Applications

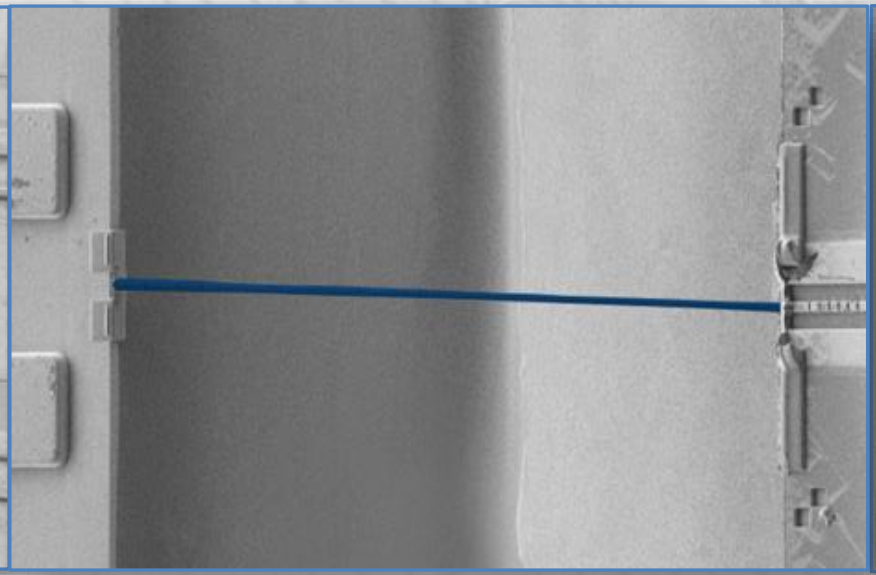
Packaging of Photonic Systems from Discrete Chips still Represent a Technical and Commercial Challenge.

Enabling next Generation Photonic Integration and Packaging Solutions with 3D Laser Lithography Solutions

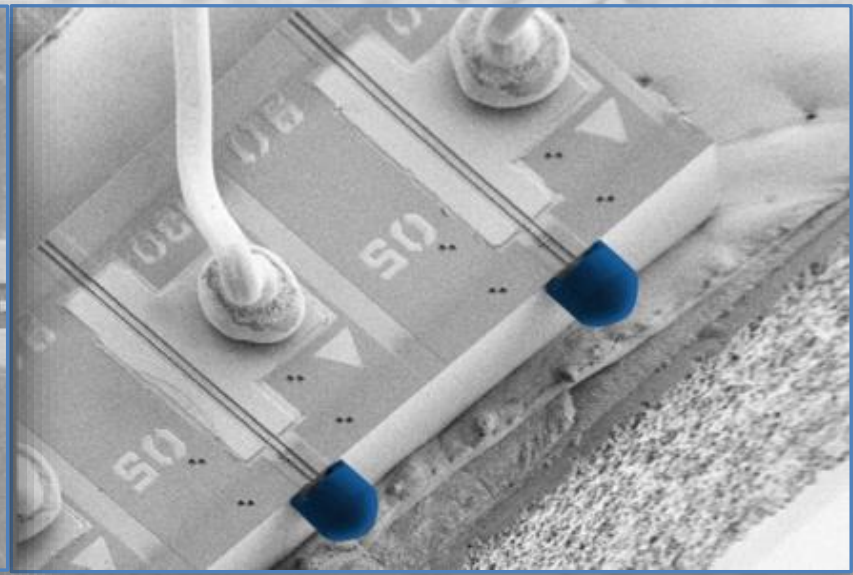
Laser by Freedom Photonics LLC



Samples bx PIXAPP (Photonic Packaging Pilot Line)



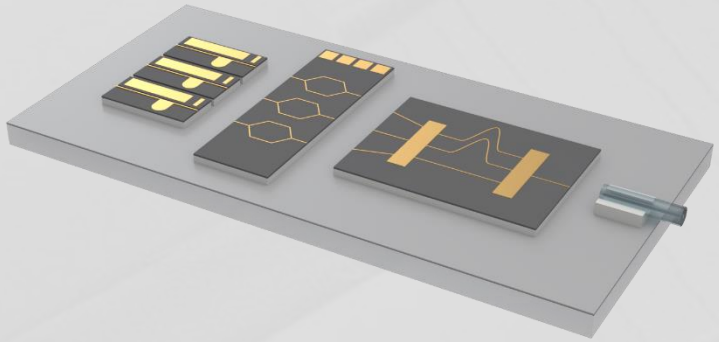
Samples bx PIXAPP (Photonic Packaging Pilot Line)



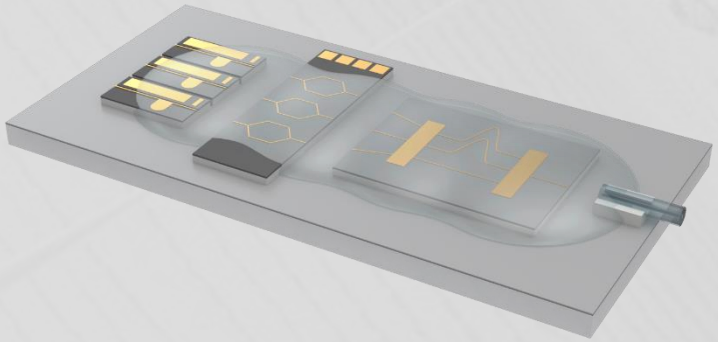
Photonic Wire Bonding and Micro Optical Lenses

3D Laser Lithography for Photonic Packaging – The Process

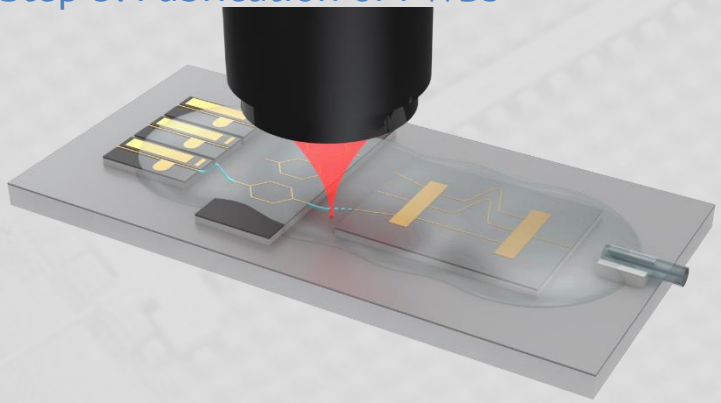
Step 1: Assembly Build-Up



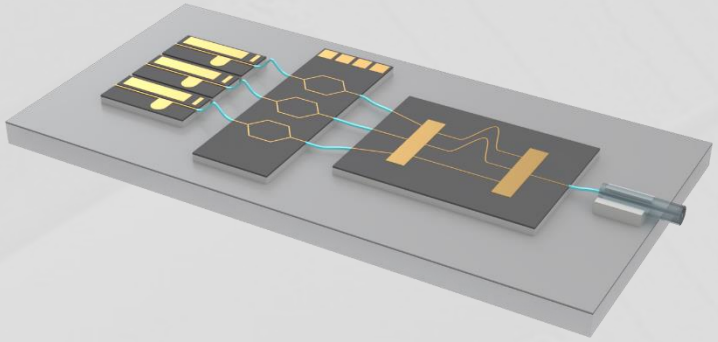
Step 2: Resist and Interface Detection



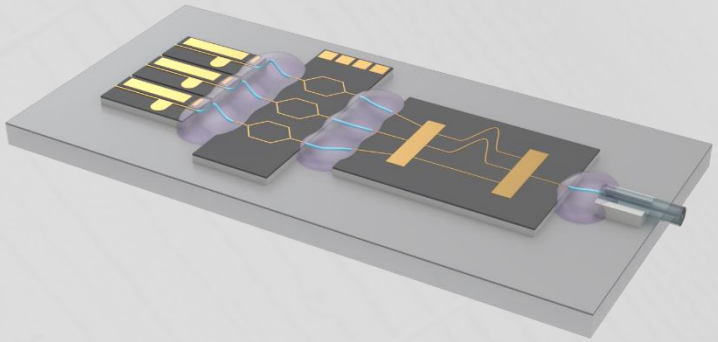
Step 3: Fabrication of PWBs



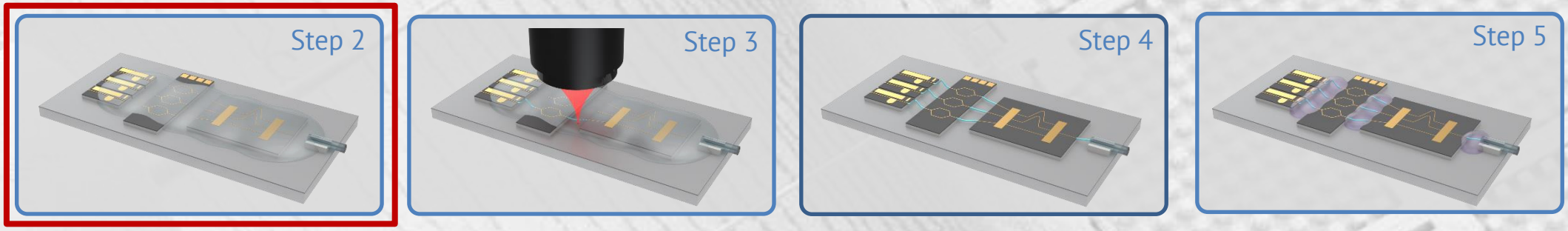
Step 4: Developing and Cleansing

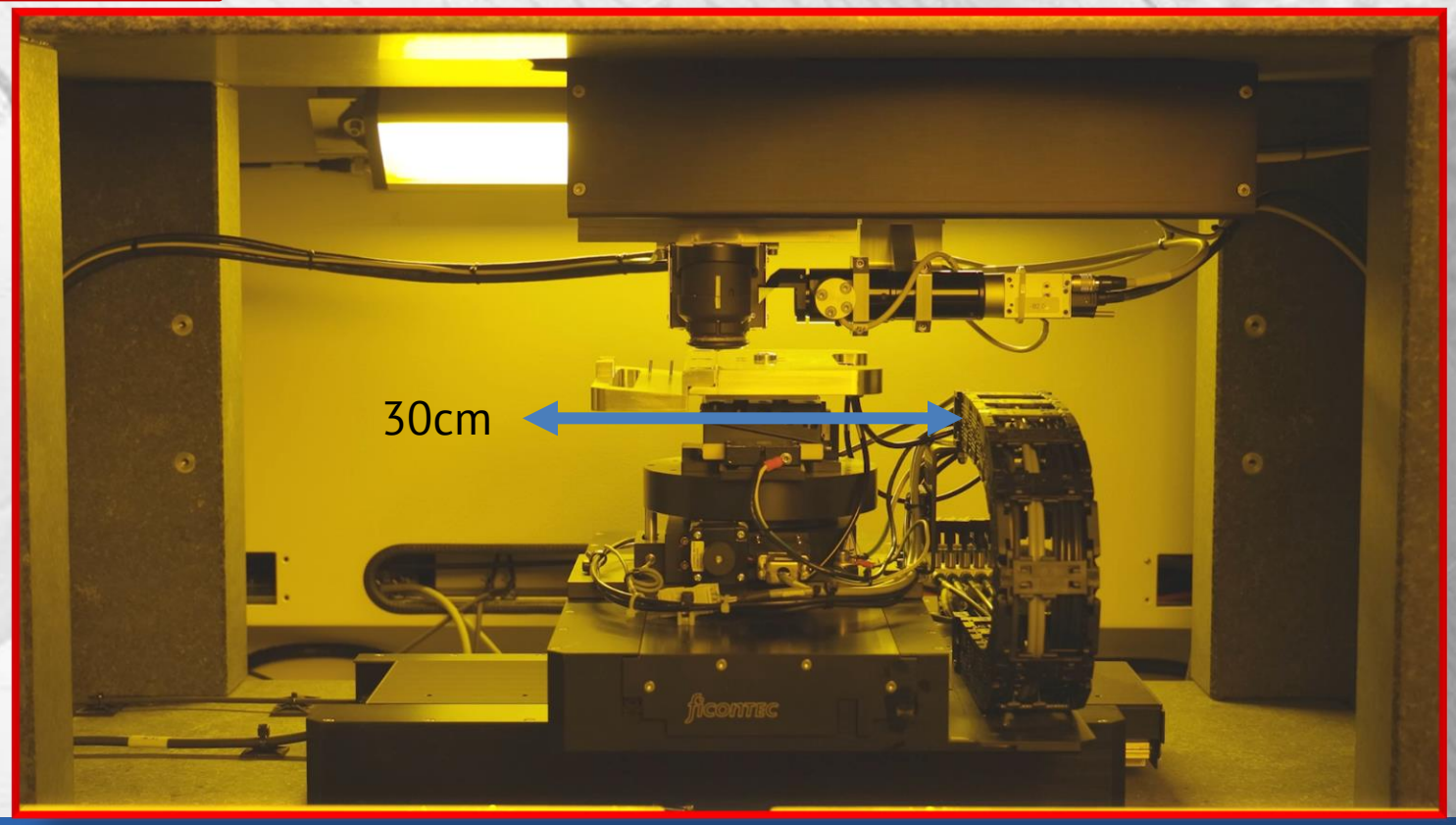


Step 5: Cladding (Encapsulation)

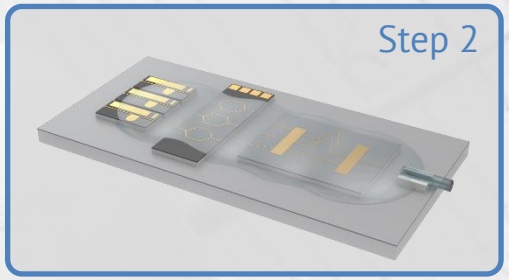


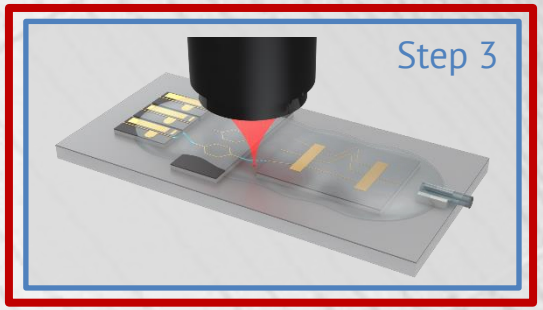
Fully Automated 3D Lithography – vanguard SONATA 1000

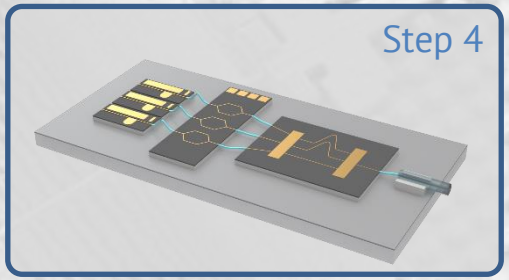


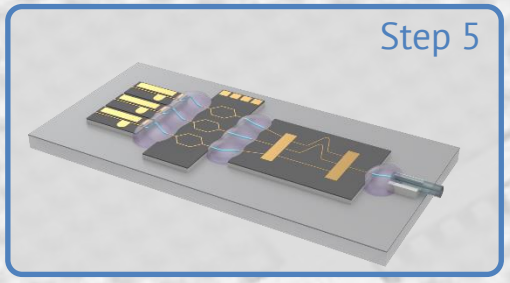


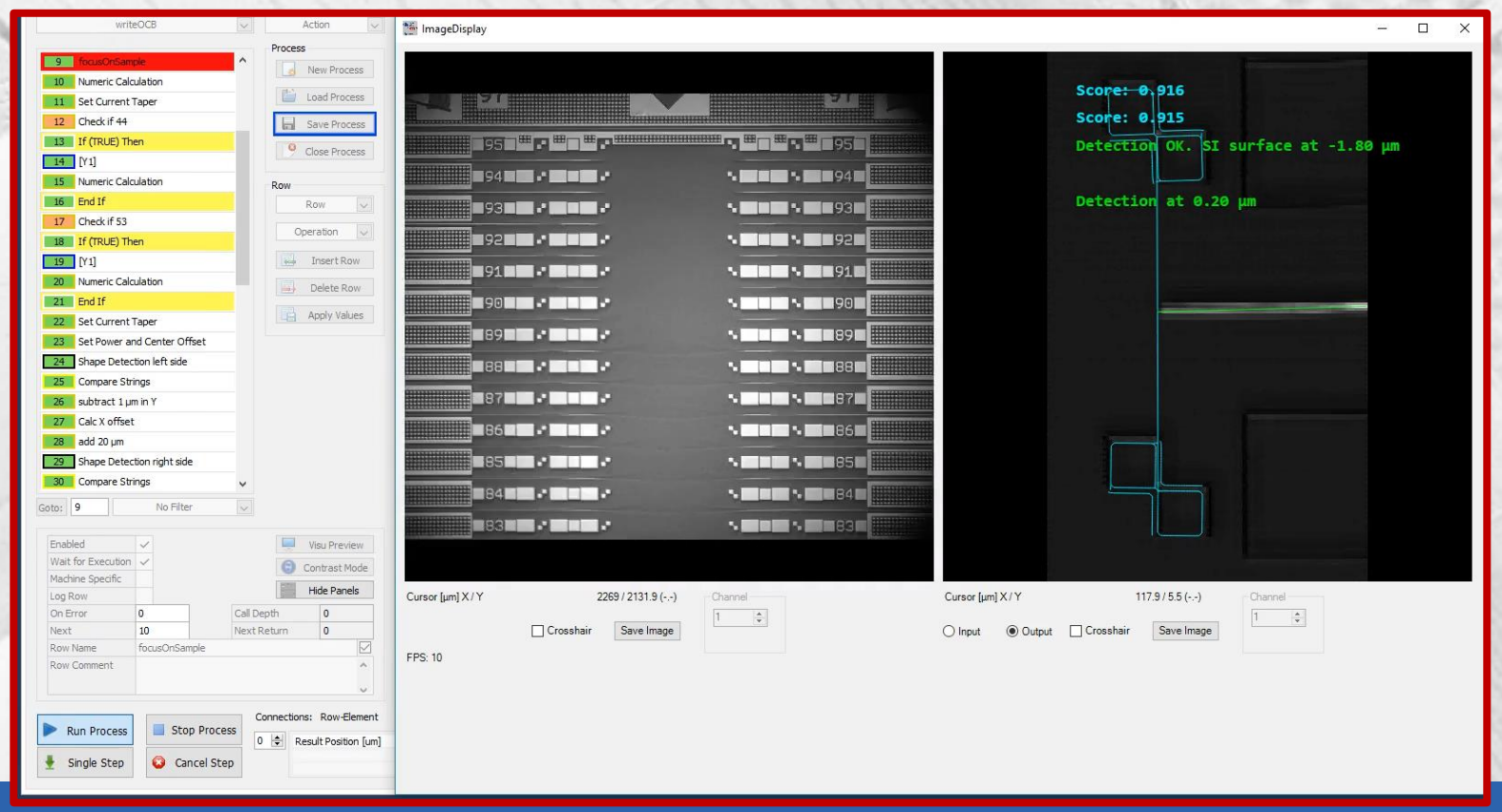
Fully Automated 3D Lithography – vanguard BrightWire3D



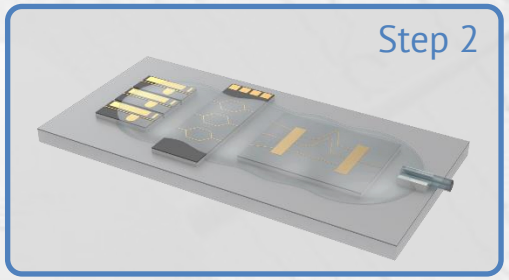


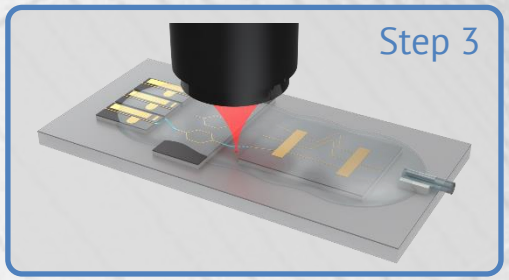


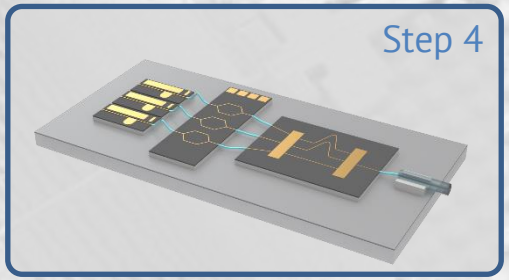


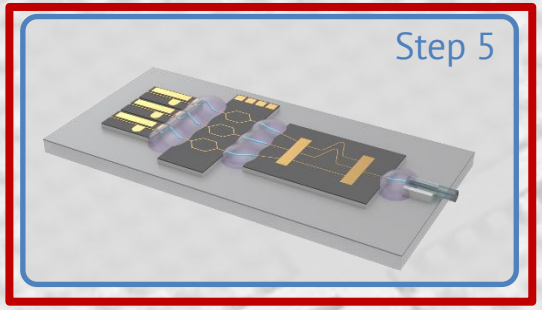


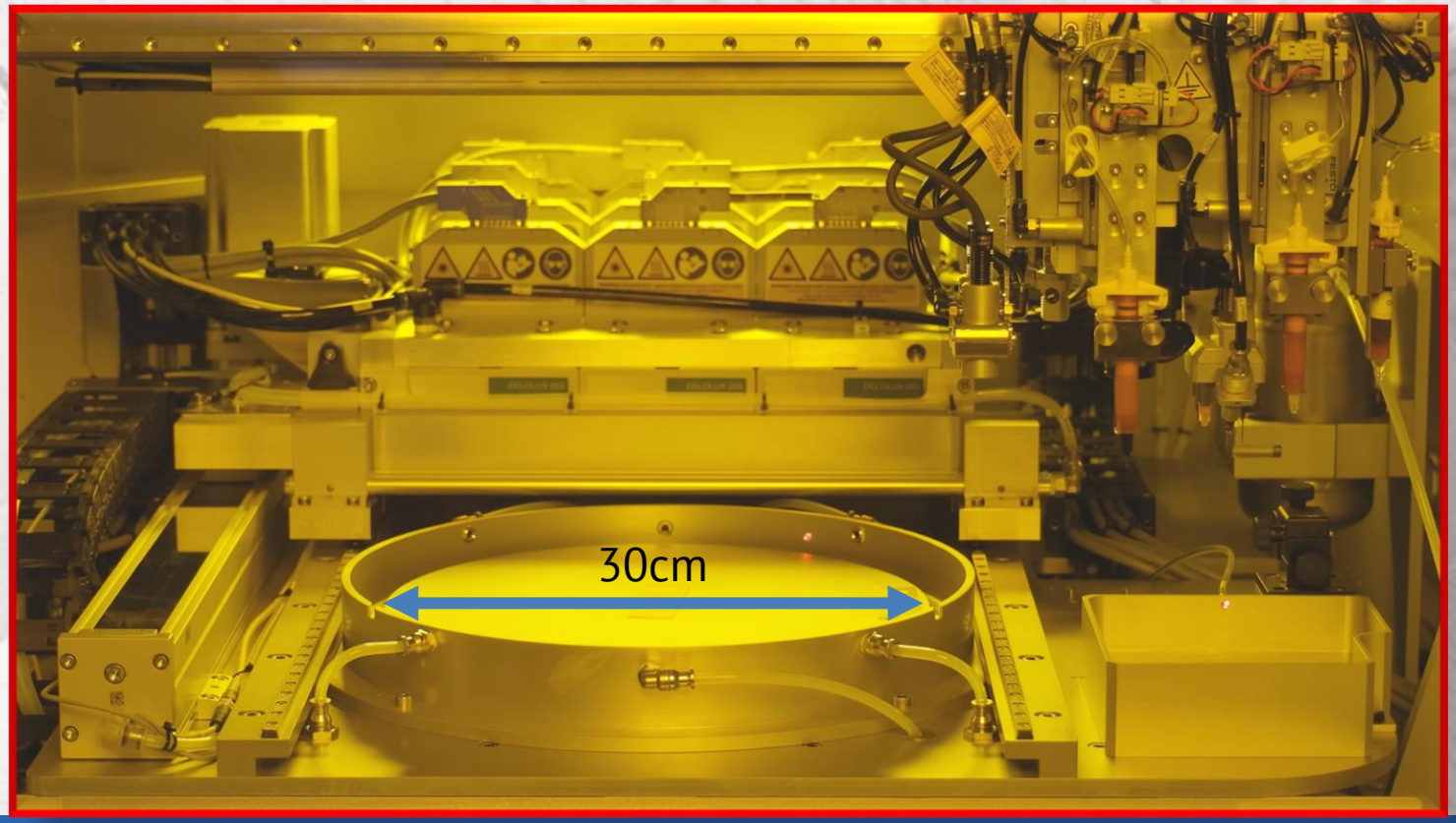
Fully Automated Post Processing – vanguard REPRISE 1000











One Platform – vanguard SYMPHONY 1000

Software-Defined Fabrication of PWBs and Micro-Optical Lenses

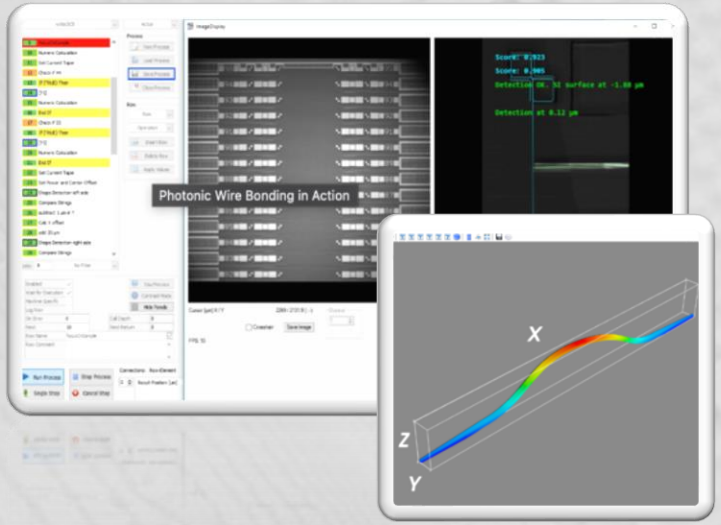
Automated 3D Lithography Based Nano Fabrication

SONATA 1000

Automated Pre- and Postprocessing (Development and Encapsulation)

REPRISE 1000

Software for Machine Control, Process Development and Management

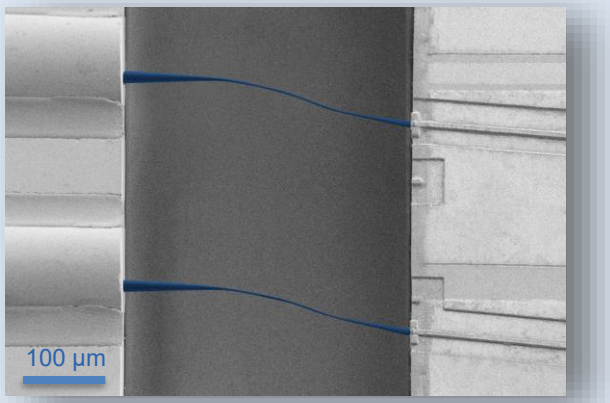


Composer and BrightWire3D

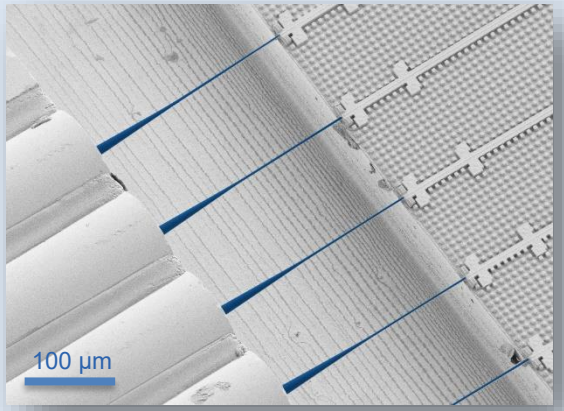
Standard Fabrication Processes | Materials | Product Support and Services

Next Generation Photonic Integration and Packaging Solutions

Photonic Wire Bonds

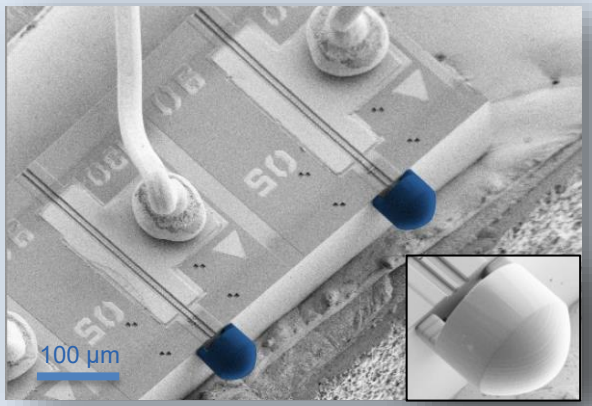


Laser by Freedom Photonics LLC

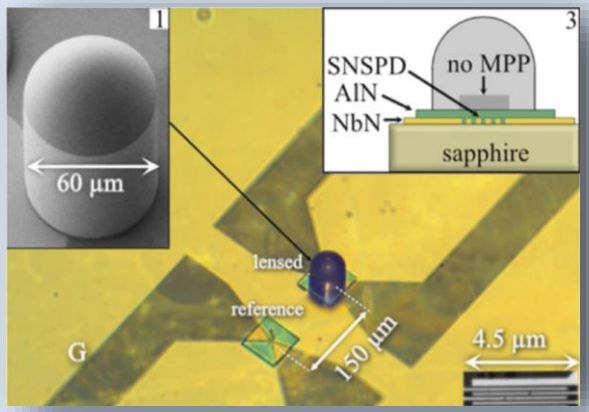


PIC by Institut für Mikroelektronik Stuttgart

Micro-Optical Elements

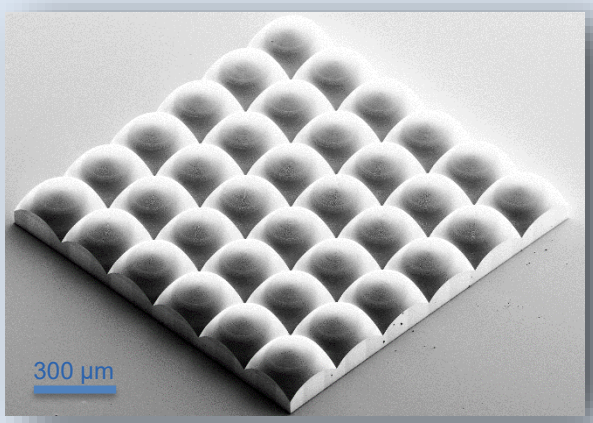


Samples by PIXAPP (Photonic Packaging Pilot Line)



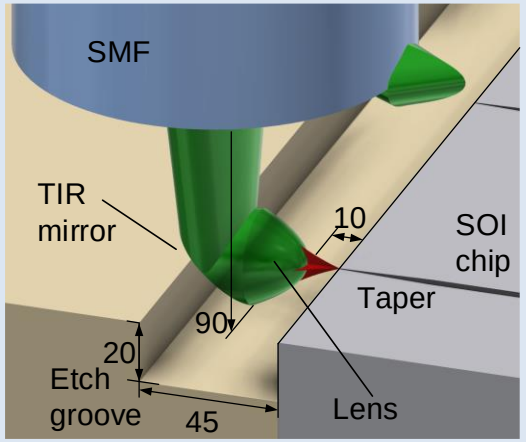
Xu et al., Superconducting nanowire single-photon detector with 3D-printed free-form microlenses, Opt. Expr. 29, 27708-27731 (2021)

Write Field Extension



Design by Moveon Technologies Pte Ltd.

Wafer-Level Probing



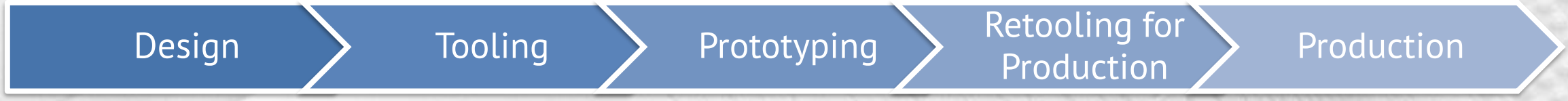
From Design to Production

3D Nano Fabrication (Inherently Software–Defined)

Short Innovation Cycles

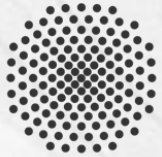
Supply Chain Flexibility

Design Flexibility



"Traditional" Approach (Inherently Hardware-Defined)

End-Users and Ecosystem Partners



University of Stuttgart

Centre de Collaboration
MiQro Innovation

南京大學