



SERVICES

Photonic System and Package Design

- High efficiency laser and optical fiber coupling
- Single and multi emitter beam forming and combining
- Multiple wavelength combination
- Interferometric and polarization-conserving systems
- Optical system design and tolerancing analysis
- Electrical and fluidic functionalities may be integrated
- Thermal management

Prototyping and Small Series Assemblies

- Passive or active alignment of electronic and photonic components
- Various substrate materials and joining processes available
- In-house laser-processed thin glass optical packaging platform

Optical Characterization and System Test

- Optical beam characterization (pointing, divergence, M2, wavefront)
- Analysis of epoxy-curing processes and compensation of shrink processes
- Variable ambiance and harsh environment testing (temperature, humidity, shock)
- Correlative Raman and Scanning Near-field Optical Microscopy (SNOM) for high-resolution optical imaging beyond the diffraction limit (ca. 60 nm laterally)

CONTACT

Fraunhofer Institute for Reliability and Microintegration IZM

Gustav-Meyer-Allee 25
13355 Berlin, Germany
www.izm.fraunhofer.de
info@izm.fraunhofer.de

Dr. Henning Schröder

Phone: +49 (30) 46403 - 277
henning.schroeder@izm.fraunhofer.de

Oliver Kirsch

Phone: +49 (30) 46403 - 8109
oliver.kirsch@izm.fraunhofer.de

For more information please go to

www.izm.fraunhofer.de/psa

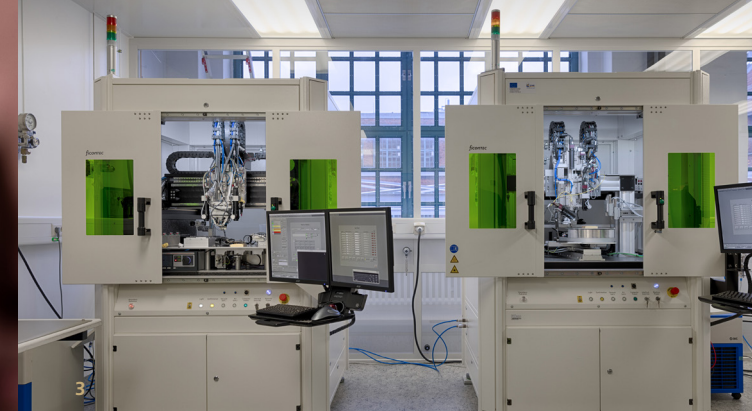
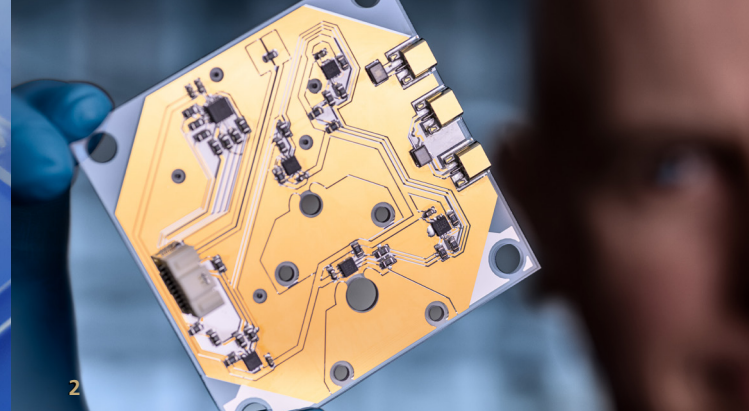
Cover: Fully assembled system of the glas-based electro-optical microbench for sensing

- 1: Subsystem of glas-based electro-optical microbench for sensoric applications
- 2: VCSEL-array testboard on glass for miniaturized LiDAR sensors
- 3: Automated alignment machines from ficonTEC
- 4: Cleanroom lab for photonic system assembly

Alle Fotos: © Fraunhofer IZM | Volker Mai

PHOTONIC SYSTEM ASSEMBLY (PSA)





PHOTONIC PACKAGING & ASSEMBLY

Fraunhofer IZM is known for its expertise in novel and reliable packaging of electronics. We develop packaging solutions that enable building high-precision and robust opto-mechanical systems. With photonic applications becoming more commonly used in everyday applications, hybrid packages and heterogeneous integration strategies with optical and opto-electric components are becoming more important.

Such components typically have to be placed in 3D structured packages or micro-optical systems, requiring six degrees of freedom with sometimes sub micron positioning and post-bond capabilities. To facilitate this, our R&D services encompass the development of thermally controlled opto-mechanical designs and joining techniques as well as reliability testing and tracking.

Manufacturing of complex prototypes and components up to small series implementation is achievable through a flexible concept for our manufacturing machines.

The availability of appropriate integration methods from a vast technology park enables assembly of customized system depending on special requirements like unusual form factors or environmental challenges.

From developing the alignment strategy to developing the assembly equipment, Fraunhofer IZM offers its customers comprehensive know-how and a broad spectrum of processes, such as:

- Pick & align processes for the active automated adjustment of optical components
- Die-bonding (sintering, adhesive, TC-bonding, and more)
- Laser soldering and welding as an alternative to adhesive bonding
- Micro-structuring of different glasses
 - Microchannels
 - TGVs / Blind holes
 - Structured micro-optic components
 - Opto-mechanical assemblies
 - e. g. holders for lenses or mirrors
- Optimal single- / multi-mode fiber coupling and free space beam forming
- Monitoring and compensation of UV / IR-epoxy shrinkage
- Tooling development
- Thin-film processes (PVD) for the generation of solder layers
- Reflow soldering processes for tolerance-insensitive optics
- Two-photon lithography for three-dimensional fabrication of smallest mechanical features

TECHNICAL DATA

Alignment Accuracy and Platforms

- Micro-optical and optical-electrical components mounted in six degrees of freedom (6 DOF)
- Passive and active alignment strategies (better than 200 nm in x/y/z and a few arcsecs around three axes)
- Silicon, silicon nitride, glass and polymer substrates (etched, laser-structured, embossed)

Alignment / Pick-and-place

- Industrial production machines (ficonTec AL 500 / 1000, 6 DOF grippers + additional motion axes)
- Piezo hexapod lab systems (6 DOF with nanometer resolution)
- Finetech FINEPLACER lambda 2 (sub- μm placement accuracy in fully manual or semi-automatic configuration)

Further Structuring + Functionalization

- Free form 2D structuring and cutting of thin glass structures based on either hybrid laser machine (532 nm and 10.6 μm) or SLE machine
- Optical quality laser cleaving of thin glass for direct coupling without polishing (CO_2 laser scribing)
- Processing of silicon and glass vias (TSV, TGV) with high aspect ratios, subsequent filling with metal
- Diverse thin film metallization and direct laser structuring with L/S down to 3 μm for DC & high RF electrical transmission lines (≥ 40 GHz)