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FIT – FRAUNHOFER INSTITUTE FOR
APPLIED INFORMATION TECHNOLOGY

# BIOMOLECULAR OPTICAL SYSTEMS – BioMOS

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# BIOMOLECULAR OPTICAL SYSTEMS – BIOMOS

Biomolecular Optical Systems is a unit in the Life Science Informatics group (LIFE) of the Fraunhofer Institute for Applied Information Technology FIT. The BioMOS staff includes biologists, chemists, computer scientists, engineers and physicists. Besides a strong theoretical orientation in their research they develop technologies for analysis, diagnosis and screening on the biomolecular and cellular level.

The biomolecular optical systems developed by BioMOS are being used in a broad spectrum of interesting applications – screening and managing/controlling ensembles of cells in the microliter range as well as detecting specific single molecules or integrating detection technologies into microfluidic structures.

**Core competences**

- Single molecule technologies
- Development of microfluidic systems
- Development of optical technologies and systems
- Planning and realization of turnkey systems
- Development and integration of IT solutions for diagnostics and analysis

## WE OFFER

**MICROSYSTEMS TECHNOLOGY**

Microfluidic systems; integration; hybrid technology; customized systems and components, feasibility studies.

**Applications**

Fast diagnostics; specific solutions; portability: continuous monitoring of diseases.

**OPTICS**

High-sensitivity detection (LIF); simulation; design and development; customized systems.

**Applications**

Single molecule detection (0D, 2D, 3D); live cell monitoring.

**BIOSYSTEMS TECHNOLOGY**

Assay development; integration of assays into microsystems; integration of biological systems into microsystems.

**Results**

High-throughput screening; high-content screening; precise and reliable diagnostics.

**IT**

Information systems for the Life Sciences; image processing and analysis; high-speed information processing through parallel processing.

BIOMOLECULAR OPTICAL SYSTEMS – BIOMOS

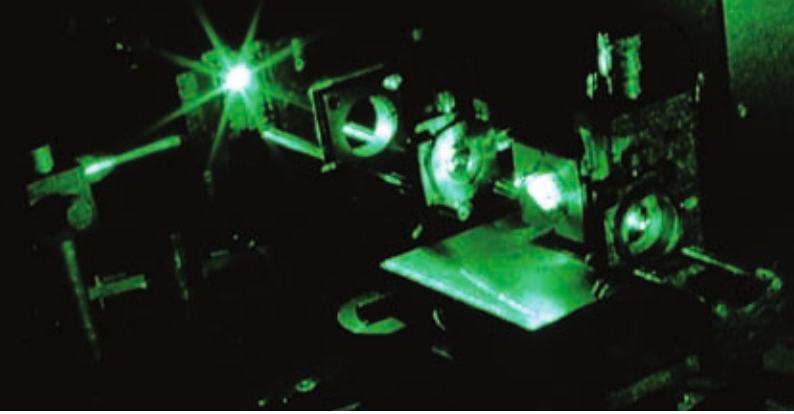
# BIOSYSTEMS TECHNOLOGY

In the biological laboratory we focus on integrating biological and diagnostic assays into microfluidic systems. From particle modifications or fluorescence labeling of proteins to surface modifications for biological applications, optical detection of fluorescence signals and determination of the kinetic properties of biological reactions, we adapt all steps to the microfluidic problem at hand.

Establishing and evaluating anti-gene/anti-body sandwich assays to determine diagnostic parameters is an additional field of application.

The equipment in our labs covers a broad range of basic molecular biological techniques, e.g., UV–VIS photometric measurements, fluorimetric measurements, realtime PCR methods and protein purification (FPLC) etc.

Additional equipment for cell-based applications will be installed in the near future. It will allow us to cultivate several different cell types in microfluidic systems and to measure their signal parameters.



# OPTICS

In the field of scientific and applied optics, we develop customized systems, in particular for ultra-sensitive detection.

To keep development cycles short and to deliver high-quality results already in the early design phases, we use state-of-the-art software such as ZEMAX and TracePro for the design of optical systems. Conceptual designs can be implemented as lab prototypes and thoroughly evaluated in our state-of-the-art laser lab.

For optimal results, we work very closely with our clients throughout the design and development phases.

Besides developing customized systems, we support our clients in integrating optical standard components. Based on our experience from many years we select and purchase the best-suited components from selected manufacturers. When necessary we also carry out mechanical modifications.

BIOMOLECULAR OPTICAL SYSTEMS – BIOMOS

# MICROSYSTEMS TECHNOLOGY

Through developing systems for analysis, diagnostics and screening in biological applications, we built up significant competence in microfluidics, e.g. in the area of interfacing and bonding technologies for integrating sensors into biochips and providing a reliable interface between biochip and measuring system. In our class 1.000 cleanroom we use silicon or polymer molding to produce microfluidic structures for hybrid microsystems. Designs can be modeled and optimized using CFD software.

For our clients, we can thus design, manufacture and characterize microfluidic systems for a broad range of applications in bioanalytics, but we also develop solutions for more specific problems and carry out feasibility studies in this area.

# LAB EQUIPMENT

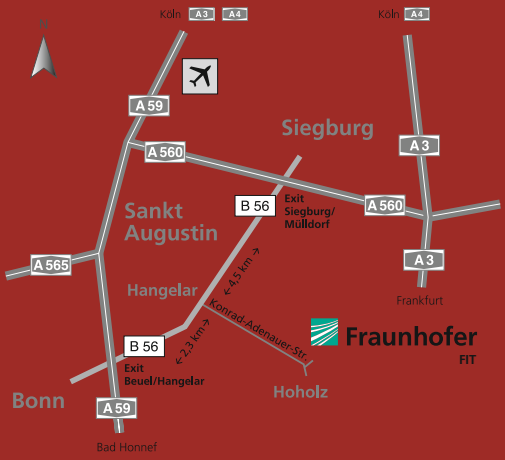
**Molecular biology lab**
S1 safety class molecular biology lab; CCD image analysis system for electrophoresis gels; DNA sequencer; UV/VIS spectrophotometer / fluorimeter; HPLC and FPLC systems; pipette robots and liquid-handling systems.

**Cleanroom**
Class-1000 cleanroom; photomask design; 3D fluidics simulation; isotropic and anisotropic etching; microfluidic interface and bonding technologies.

**Laser lab**
Single-molecule tracker; microfluidic system with highly sensitive fluorescence detection; several DPSS and semiconductor lasers; modulated Ar-Ion laser; pulsed Excimer laser; ultrafast and gated image intensifiers; upright and inverse fluorescence and stereoscopic microscopes; cooled CCD cameras with sensitive objectives.

**Electronics lab**
High-speed parallel computers based on FPGA-technology; standard measuring station for digital circuit boards; CAE design software for complex circuit boards; FPGA design software.

# CONTACT

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