Bavarian research & innovation

FOR PHOTON

Bavarian Research Cooperation for Development and Production of Photonic Microsystems

PHOTONIC TECHNOLOGIES CREATE A BRIGHT FUTURE

In the near future photonics is going to become one of the most important and fast-growing key technologies. Photonic systems have already gained a secure position in many areas of modern society. Tasks that are clearly assigned to electronics today can be performed much more effectively by optical technologies tomorrow, as demonstrated by micro-optics for data transmission in computer tomography. Especially the possibility for reliable processing on very limited space often makes them indispensable. The future car, for instance, is equipped with a number of intelligent sensors for supporting the driver: these can be used for monitoring the car interior or the degree of soiling of headlight covers, for detecting collisions or triggering airbags and many more. Optical transmission systems are used for efficiently processing the data streams of today's information systems. With the aid of new methods these systems can transmit increasing data rates over growing distances.

The research cooperation focuses on the development and production of new and groundbreaking photonic micro systems. For an efficient development of these systems it is necessary to carefully analyse the underlying physical principles. New or suitably customised simulation tools can help to enlarge the application area of photonic micro systems with regard to their performance. Another focus lies on the actual production of the photonic micro systems. In this context the scientists concentrate on flexible and high-precision processes. They realise completely new concepts for light delivery and forming on the basis of microstructures, for example.

Rotary device for high optical data rate transmission. (Photo: Schleifring und Apparatebau GmbH)

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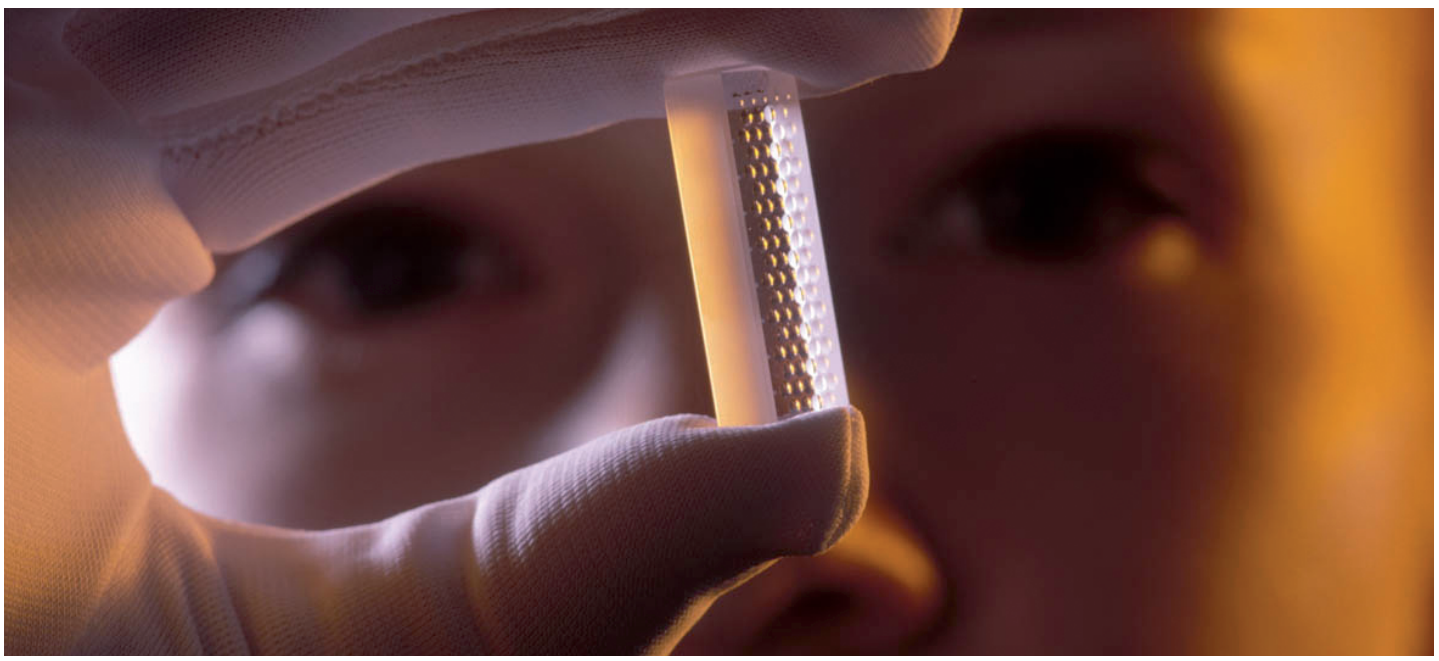
RESEARCH TOPICS

The cooperation is organised in two main research areas:

Design of Photonic Micro Systems:
Due to their size, micro optic systems particularly require an enhanced understanding of the interaction mechanisms between light and matter. At the same time, fluctuating material parameters in smallest dimensions have to be considered. Diffraction effects that are not noticeable in classical systems can lead to completely new phenomena in micro optics. In order to make better use of these effects, simulation models are adapted or newly developed which make it possible to realise more efficient systems for beam forming and delivery in lighting technology or laser processing or to realise high-capacity components for optical data transmission. The findings are then transferred into real systems to verify the models.

Production of Photonic Sensor Systems:
This research area focuses on novel manufacturing concepts and strategies for producing integrated sensor elements. The sensor functions are examined and designed. Furthermore, methods are developed to generate optical waveguides in substrates (e. g. by means of laser radiation) and to integrate them with fluid channels as hybrid systems for fluid diagnostics. New approaches in metrology are required to characterise the generated waveguides and sensors with regard to their optical quality.

Economic Applications:
The leading position in the field of optical technologies is going to safeguard jobs in Bavaria in the future. The prerequisite for this is the perpetual development and subsequent implementation of innovative system solutions. One of the goals of the research cooperation is to realise many aspects of the value-added chain in Bavaria. In addition to optical technologies the different application areas, such as automotive engineering, mechatronics and medical technology, for instance, can also benefit from the new developments and are thus strengthened in the international competition.



Microstructures in optical components to control light delivery. (Photo: BLZ/Fuchs)

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Industrial Partners:
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