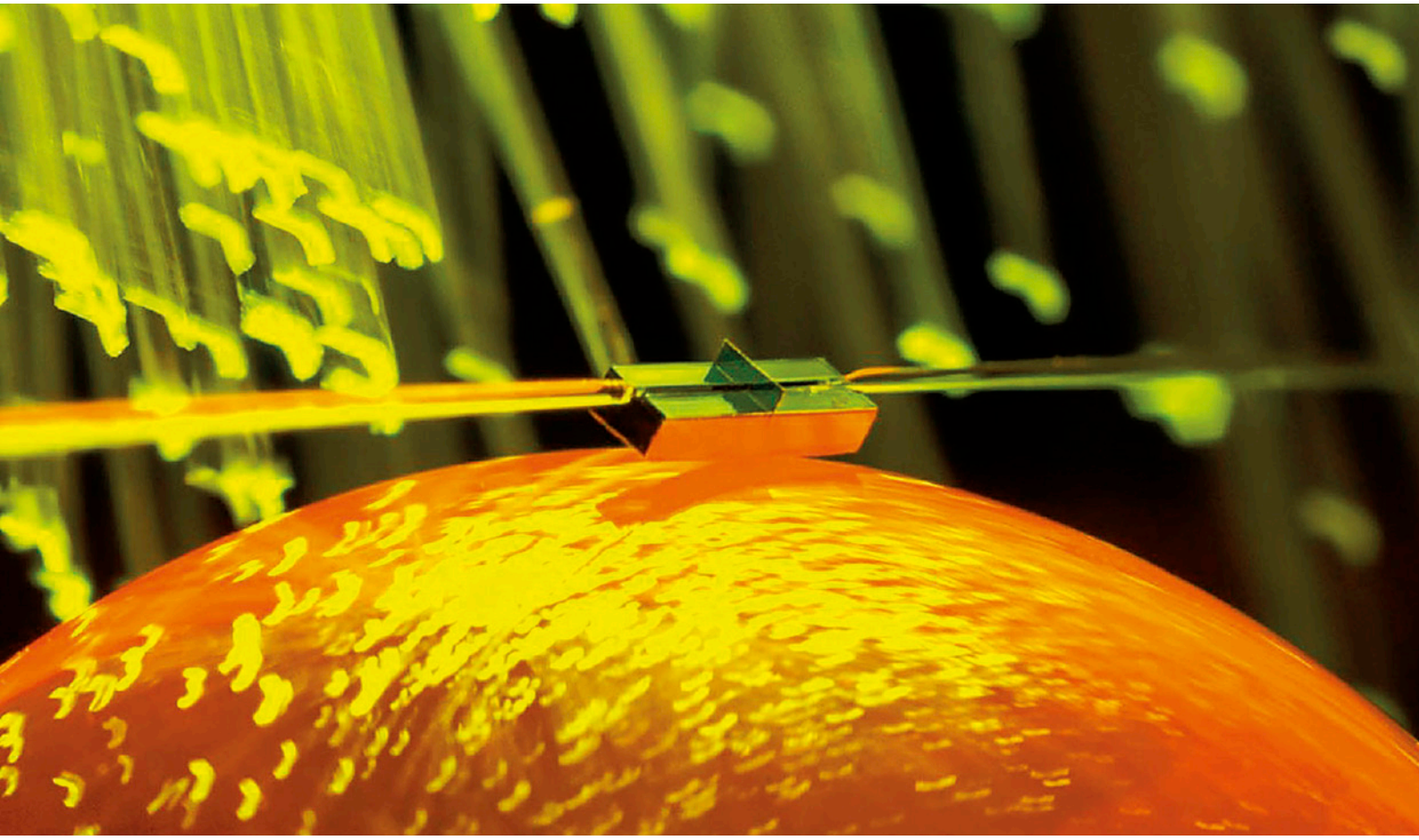
LAND BRANDENBURG

be Berlin

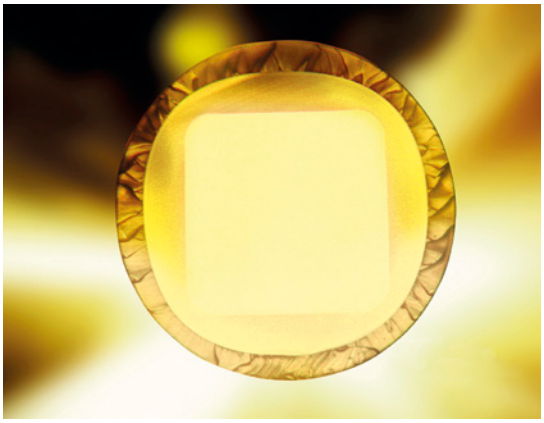


Photonics for Communication and Sensors

in the Capital Region Berlin-Brandenburg

THE GERMAN CAPITAL REGION

excellence in photonics



Special optical fiber with square core

On-wafer chip characterization at Fraunhofer HHI

Companies

ADVA Optical Networking
AEMtec
art photonics
Astro- und Feinwerktechnik Adlershof
Berlin Fibre
Berliner Glas
Bruker Nano
CreaTec Fischer & Co
ColVisTec
Corning Optical Communications
CRYSTAL
Dr. Türck Ingenieurbüro für Optikentwicklung und Software
eagleyard Photonics
FCC FibreCableConnect
FCI Deutschland
fiberware
fibrisTerre Systems
Finetech
Finisar Deutschland
First Sensor
FISBA Photonics
FOC-fibre optical components
F & T Fibers and Technology
greateyes
HOLOEYE Photonics
InBeCon
iris
JCMwave
Jenoptik Diode Lab
LEONI Fiber Optics
LOPTEK Glasfasertechnik
LUCEO Technologies
Lumics
micro resist technology
Optris
Panono
PDW Analytics
Pepperl+Fuchs
Polymerics
QUARTIQ
Raab-Photonik

The amount of data created, duplicated, and transferred around the world is expected to be around 40 zettabytes by 2020. The only technology that can move this once unimaginable amount of data around the world is based on light transmitted in glass fibers. This fiberoptic technology can be used to move, detect, direct, collect, and amplify data but is also used in many sensor applications.

Research and development in Berlin and Brandenburg is focusing on the necessary components and technologies: fast laser sources, light modulation, integration into closed systems, and everything needed to interface the real with the digital world. The German capital region is home to world-leading research institutions such as the Fraunhofer Institute for Reliability and Microintegration (IZM), the Fraunhofer Heinrich Hertz Institute (HHI), and the Ferdinand-Braun-Institut fuer Höchstfrequenztechnik (FBH), as well as such industry leaders as Corning, Finisar, Leoni and ADVA and numerous small and medium-sized, highly innovative startups. The density of companies and institutions working in this field is only surpassed by Silicon Valley.

Polymer-based integration

»Berlin is home to a large part of the value chain for optical communication, from basic research to chips, subsystems and complete devices. We play an active role in this. For ADVA, this productive environment and the attractiveness of Berlin for young talents is a driving factor. «

Michael Roth
Vice President R&D
ADVA Optical Networking SE

»Half of all the information on the Internet is transferred via transmitter and receiver chips that were developed and produced in Berlin.«

Prof. Dr. Martin Schell
Director
Fraunhofer Heinrich Hertz Institute

technology

The technology network PolyPhotonics Berlin is doing pioneering work in the field of modern fiberoptics. Eleven companies and three research institutes have joined forces in this regional competence network to develop polymer-based optical components. The focus is on a hybrid-optical modular technology platform that can serve as the flexible basis for different assemblies. The central chip with optical waveguides made of polymer material can accommodate other passive elements such as glass fibers, thin-film filters, and micro-optics as well as active components such as photo diodes and laser chips. The network's vision is to become the world leader in polymer-based integration technology.

Data highway in space

Berlin is a leader in the development of technologies for laser-based data transmission in space. The ESA earth observation satellite Sentinel-1A, for example, is equipped with a communication terminal containing laser diode benches from FBH and several optical components and systems from the Berliner Glas Group. The German communications satellite Heinrich Hertz is scheduled to go into orbit in 2021. First Sensor AG and its

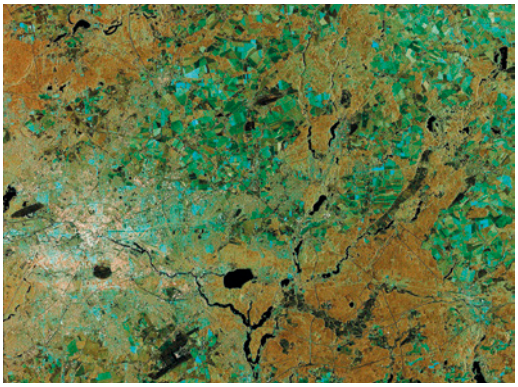


Photo of Berlin from the Sentinel-1A satellite, transmitted via laser

- Powerful scientific basis
- Large number of specialized small and medium-sized companies with a wide range of know-how
- Close networking between science and business
- R&D areas of concentration: Photonics system integration (chip-integrated and hybrid), optical sensor systems for orientation and position determination, analytics, the development of high-rate dynamic communication systems and free-space optical communication
- Appealing location for well-educated skilled specialists
- Excellent financial incentives

partners are developing a special antenna for communication with the earth.

Fast internet

An important focus of research and development activities in the region are optical data transmission technologies in data centers. The interconnects used today are reaching physical limits in terms of energy efficiency, data rate, and transmission distance. What is needed are innovative, cost-effective photonic packaging concepts based on very fast laser and highly sensitive photodiode chips such as those developed at Fraunhofer IZM. Sicoya has succeeded in integrating ultra-fast electronic BiCMOS circuits for drivers and amplifiers with photonic circuits onto a single chip. The core technology includes the world's smallest silicon modulator, more than 10,000 of which can be processed on a square millimeter.

Intensive networking in the cluster

»For optical communication and sensor systems technology, the physical advantages of optoelectronics and optical packaging technologies in data communication and telecommunication, medical technology, industrial sensor systems and the life sciences are crucial. A wide spectrum of expertise, a first-class research infrastructure, short channels and sustainable networks – these are the factors that make Berlin-Brandenburg attractive. For many years, the close exchange between science and business has been a tradition in our focal area of photonics for communication and sensors.«

Dr. Henning Schröder
Spokesperson Focal Area Photonics for Communication and Sensors
Fraunhofer IZM

»FISBA is the market leader in the area of micro optics for laser diodes. Our experience shows that Berlin is a hot spot for new developments and their translation into industrial applications in our field and adjacent ones.«

Michael Graurock
Managing Director
FISBA Photonics GmbH

Photonics for communication and sensor technology is one of six focus areas for the Berlin Brandenburg Photonics Cluster, one of the world's leading centers for the industry. The strong research basis and the large number of specialized SMEs with a wide range of expertise create ideal conditions for the mutual transfer of knowledge between science and industry and are also driving innovations in other sectors.

Institutions such as the Fraunhofer Berlin Center for Digital Transformation offer an excellent platform for interdisciplinary R&D cooperation.

High speed, high sensitivity silicon avalanche photodiodes (APD)

Raytek
Schmidt + Haensch
SECOPTA
SENTECH Instruments
SHF Communication Technologies
Sicoya
SPECS Surface Nano Analysis
TechnoLab
TEC Microsystems
VI Systems
VPIphotonics

Education and Research
Fraunhofer FOKUS
Fraunhofer IAP
Fraunhofer IPK
Fraunhofer HHI
Fraunhofer IZM
Fraunhofer PYCO
Fritz Haber Institut
German Aerospace Center (DLR)
innoFSPEC Potsdam
Institute of Optical Sensor Systems (DLR)
Leibniz Institute for Astrophysics Potsdam (AIP)
Leibniz-Institut fuer Hoechstfrequenztechnik (FBH)
Leibniz-Institut fuer innovative Mikroelektronik (IHP)
Optotransmitter-Umweltschutz-Technologie (OUT)
TH Wildau
TU Berlin
University of Potsdam

Associations and networks
AMA Association for Sensors and Measurement
OpTecBB

Our aim: your success!

Berlin and Brandenburg support the focal area Photonics for Communication and Sensors with an economic policy developed across state borders in the Photonics cluster. The cluster is managed under the aegis of Berlin Partner for Business and Technology, the Economic Development Agency Brandenburg (WFBB) and the network OpTecBB.

Our aim is to provide comprehensive support to companies and scientific institutions interested in inward investment or further development in the capital region.

We are ready to assist you with:

- **Finding a site**
- **Funding and financing**
- **Technology transfer and R&D cooperation**
- **Cooperating in networks**
- **Recruiting personnel**
- **Developing international markets**

Reach out and contact us!
www.photonics-bb.com

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