



Teknologiplattformen



Europeisk strategisk forskningsagenda innen optikk

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Forskningsrådet, 2006-11-29

www.photonics21.org; SRA: *"Towards a Bright Future for Europe"*

Fotonikk:

- Tidligere mest brukt i forbindelse med fiberoptikk - "integrasjon av fotoner med elektronikk"

I Photonics21:

- *"Photonics is the science of the harnessing of light. Photonics encompasses the generation of light, the detection of light, the management of light through guidance, manipulation, and amplification, and most importantly, its utilisation for the benefit of mankind."*
- Dvs. optikk i sin videste og gode forstand!

Bakgrunn

- Optikk industri er tradisjonell en viktig europeisk industrigren
- i EU - Fokus på verdiskapning og europeisk industris konkurranseevne ift USA og Japan.
- Optikk inngår i flere og flere komponenter, 15-40% årlig vekst i markedene.
- 2 mill. mennesker i EU jobber med produksjon av optikk-baserte produkter.
- Optikk er "enabling" teknologi for mange applikasjonsområder – men har ikke et eget program i EU-forskningen.



Historie

■ høsten 2004:

Europeisk forskningsinitiativ innen optikk

■ februar 2005:

Strategisk forskningsvisjon:
“Photonics for the 21st Century”

■ 05. desember 2005:

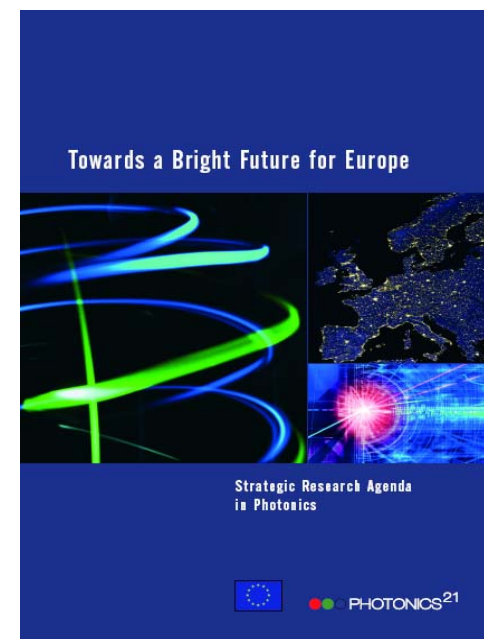
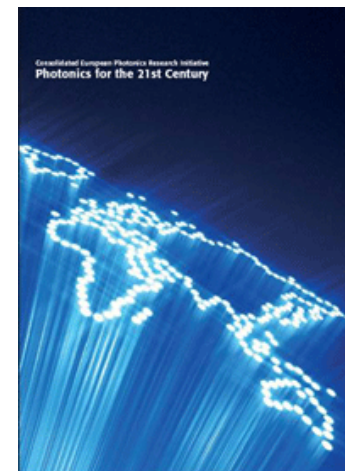
ETP Photonics²¹ ble grunnlagt
på Bibliotheque Solvay i Brüssel

■ april 2006:

Publikasjon „Strategic Research Agenda (SRA)“
„Towards a Bright Future for Europe“

■ 04./05. desember 2006:

Årsmøte ETP Photonics²¹ i Brüssel



Hva er Photonics²¹?

Teknologiplattformen Photonics²¹ er en europeisk medlemsorganisasjon som er åpen for alle.

Hovedmålene i Photonics²¹ er å:

- etablere en sterk europeisk allianse innenfor optikkforskning
- gjøre europeisk industri internasjonalt ledende ved å lage en strategisk link mellom forskning og industri
- definere langsiktige mål for utviklingen av europeisk optikkforskning
- skape de nødvendige rammebetingelser for å forsere optikkforskningen i Europa

Photonics21 Executive Board

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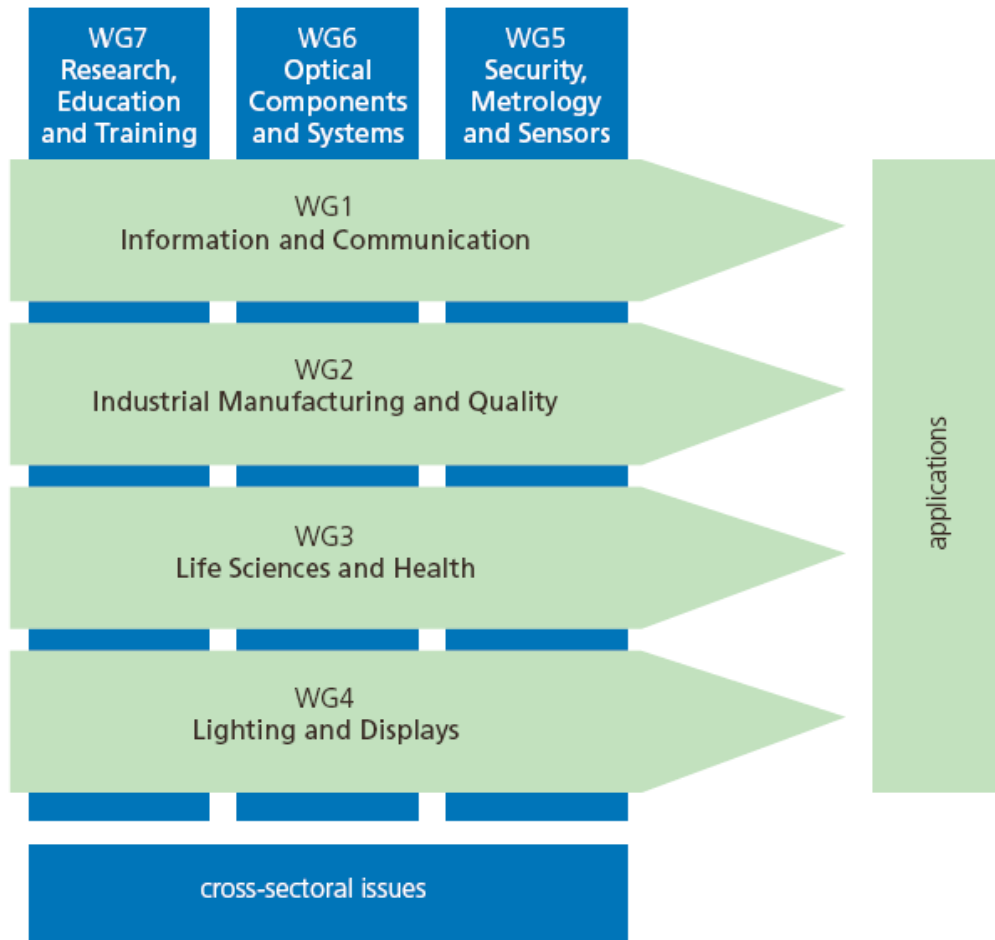
VDI Technologie-
zentrum GmbH

Photonics²¹ i tall (July 2006)

- mer enn **400 medlemmer**
- representerer **27 land**
- omtrent **50% medlemmer fra industrien (BoS)**
- omtrent **3/4** av de industrielle partnerne er **SMBer**
- *Photonics²¹* forener de fleste ledende europeiske industribedrifter og FoU-organisasjoner innenfor optikk
- hele verdikjeden er representert



Arbeitsgrupper





Life Sciences and Health



Security, Metrology
and Sensors



Lighting and Displays

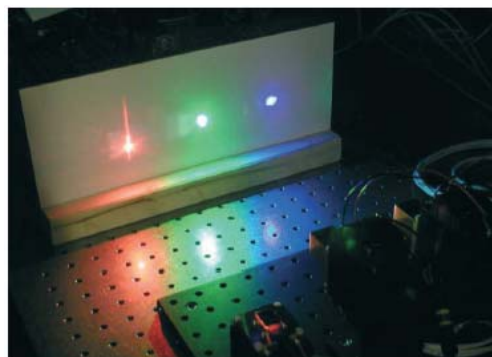


Design and Manufacturing
of Components and Systems

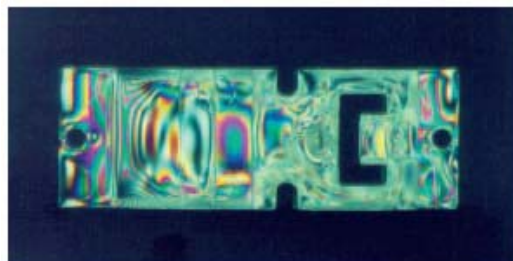
Prioriterte forskningsområder



Information and
Communication



Industrial Production /
Manufacturing and Quality



Information and Communication

- **Optical Transmission (broadband)**
 - high and ultra high speed optical core networks (100Tbps/carrier)
 - radical cost reduction and enhancement of the Access Network (1Gbps per subscriber)
- **Optical Data Storage (near field, holographic)**
- **Optical Signal Processing (optical switching, quantum cryptography and computing)**



Fig. 3.1.5 Light transmission through optical fibres will enable transmission capacities per carrier in the 100 Tbps range by 2015 © left: Telekom; right: France Telecom

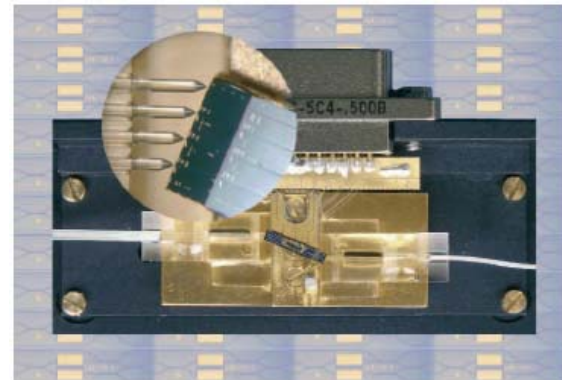


Fig. 3.1.7
Next Generation Networks will apply optical switching and routing in the nodes in order to adapt the net dynamically and cost effectively to variable traffic demands
© Fraunhofer HH

Industrial Production / Manufacturing and Quality

cost down – reliability up – safety-ensured

- **Photonic applications** (new solutions and products; optical macro-, micro-, and nano processing)
 - **Photonic material processing for new solutions and products**
- **Photonic tools** (sources, beam delivery and manipulation, optical components, photonic systems)
 - **High brilliance lasers**
- **Photonic processes** (process control)
- **Photonic diagnostics quality control and machine vision** (sensor technology, quality ensurance, 3D sensors, ...)



Life Sciences and Health Care

- cell and molecular biology
- preventive medicine
- advanced and early diagnostics
- minimally-invasive and personalized therapies
 - minimally-invasive diagnosis and therapy
- photonic tools for cell and tissue manipulation
 - new photonic tools for the analysis of cell processes
- in-vivo cellular diagnostics, in-vivo histology, pathology
- ophthalmic instruments
- optical biochips and biosensors
- microscopic tomography, microscopes
- advanced implants



Fig. 3.3.7
Example for dynamic handling of cells,
using laser pressure catapulting technology
to take out a specific cell out of the tissue
with no biological contamination
© PALM

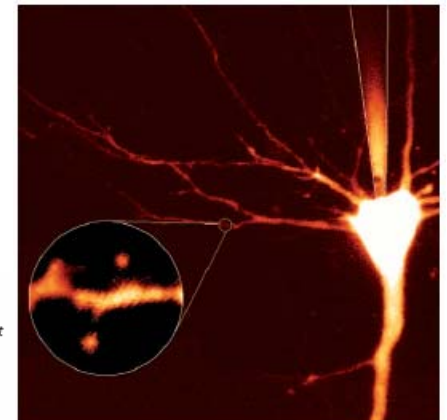


Fig 3.3.6
Example for measuring dynamical processes
in living cells: Experiment on calcium gradient
in dendrite nerves using two photon laser
scanning microscopy
© Dr. Koester, MPI for Medical Research

Lighting and Displays



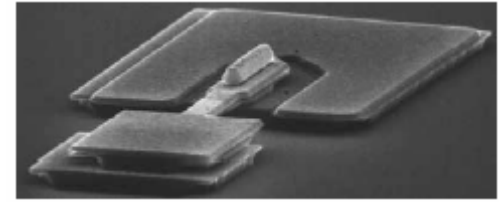
Fig. 3.4.15
OLED light sources have the potential to replace today's conventional light sources
© Philips

- **Material research for LED**
 - **High efficiency Solid State Lighting for general lighting applications**
- **Material research for OLED**
- **Materials for flexible substrates and large area processing**
 - **Novel large-area processing for high-performance display and lighting technologies and applications**
- **highly integrated and efficient RGB-lasers**
 - **Laser light sources for display and lighting applications**
- **packaging technologies for LED and lasers**
- **tailored light – photon management**

further: medium and long term research topics
e.g. 3D-displays, flexible displays

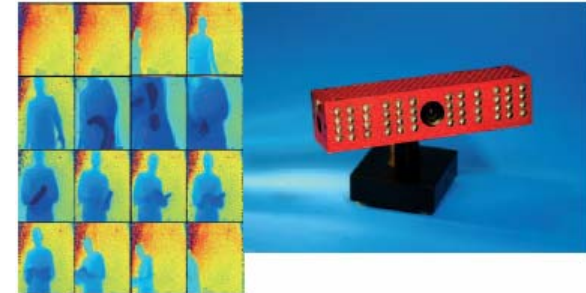


Security, Metrology and Sensors



short term:

- high sensitivity (ultra low noise CMOS detector)
- function integrated (active pixel sensor)
- specialised sources (fiber laser)
- High-performance electronic imaging



mid term:

- function integration (MOEMS, polymer optics)
- extended wavelength (IR,UV)
- Terahertz sensors & sources
- specialised sources (high power IR quantum cascade laser, UV-lasers)



long term:

- high sensitivity (plasmon enhanced detector)
- extended wavelength (uncooled IR quantum detectors)

Design and Manufacturing of Components and Systems

short term:

- Production strategies and systems for the integrated manufacturing and packaging of components and subsystems
- Semiconductor lasers without cooling
- High power / beam quality solid-state lasers
- Optical generation of millimetre wave signals
- Silicon photonics based on CMOS compatible technology

mid term:

- Controlled self-organization of structures (i.e. photonic crystals)
- RT operating Quantum Cascade Lasers
- Novel function enabling materials (metamaterials)
- Controlled self assembling of hybrid integrated photonics devices

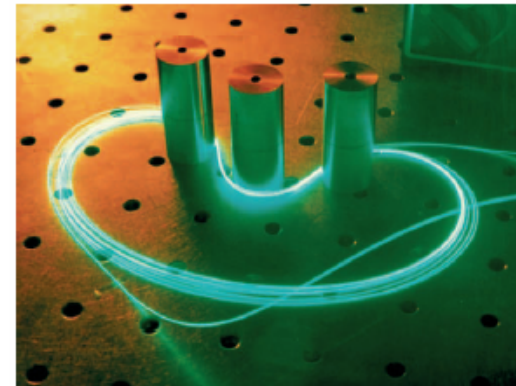
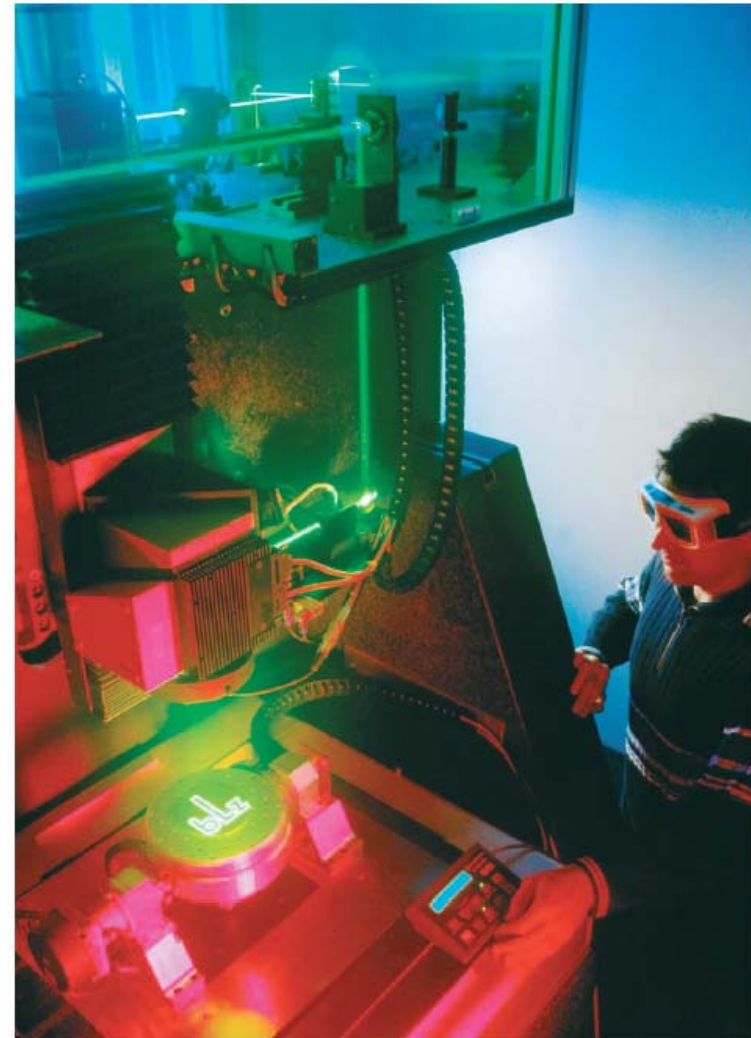


Fig. 3.6.5
Double clad fiber laser with kidney-shaped geometry for improvement of absorption behaviour
© Friedrich-Schiller-University

Photonics Education, Training and Research Infrastructure

- Education programs
- Promotion of research results
- Increasing interest of young people and children
- Research Networks
- Research Facilities



Examples: Photonics research topics in FP7

	Lasers for industrial applications	Organic electronics and displays	Broadband and ultra high speed networks (40 Gbps+)	Biophotonics
Photonics21 proposal (priority research topics as identified and proposed by Photonics21)	<u>High brilliance lasers:</u> Develop reliable lasers with high power, high efficiency and premium beam quality for industrial material processing applications.	<u>Novel large-area processing for high-performance display and lighting technologies and applications:</u> Develop, demonstrate and industrialize novel lighting and display technologies with disruptive large-area, low-cost manufacturing techniques and equipment for high-performance applications.	<u>Photonic technologies for high and ultra high speed optical core networks:</u> Develop component technology that can deliver truly cost effective transport at 40Gbps and higher bit rates, to enable the next phase of core network evolution.	<u>New photonic technologies for the minimally-invasive diagnosis and therapy:</u> Monitoring tools on molecular level for new, more effective and minimal invasive therapy. <u>New photonic tools for the analysis of cell processes:</u> Develop new methods and techniques to study the dynamic behaviour of cells.
FP7 draft (technical objectives and call topics as implemented in the FP7 <u>draft</u> workprogram mes)	NMP (Production): „Integration of technologies for industrial applications“ incl. ‘new generation of high brilliance lasers and beam delivery equipment’ (indicative priority for 2008) IST: "Components and subsystems (...) for high performance lasers"	IST: "Organic and large-area electronics and display systems (including OLEDs)" NMP (Materials): „Knowledge-based smart materials with tailored properties: Organic materials for electronics and photonics"	IST: "Application specific photonic components and subsystems (...) for truly cost effective broadband core networks at 40 Gb/s or beyond per channel"	NMP (Nano): „Integration of technologies for industrial applications“ (divers sub-topics) IST: "Components and subsystems (...) for minimally invasive medical diagnosis and prevention" LSH: - not yet known -

Information og kontakt

Website:

www.photonics21.org

Meld deg på!

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Board of Stakeholders (BoS)

