
Research → Technology → Industry

»Advanced Radiation Detectors for Industrial Use«, Ravenna, November 11-12, 2013

Prof. Dr. Karsten Buse

Fraunhofer Institute for Physical Measurement Techniques IPM

- **Fraunhofer-Gesellschaft**
- **Fraunhofer IPM**
- **Essential 1: Work on something that the world needs**
- **Essential 2: Build up and secure IP**
- **Essential 3: Contracts matter**
- **Success stories**
- **Summary**

Fraunhofer-Gesellschaft

Joseph von Fraunhofer

- * 1787 in Straubing; † 1826 in Munich
- German optician and physicist
- Researcher, inventor, and entrepreneur

Research

»Fraunhofer-lines«
in the solar spectrum



Innovation

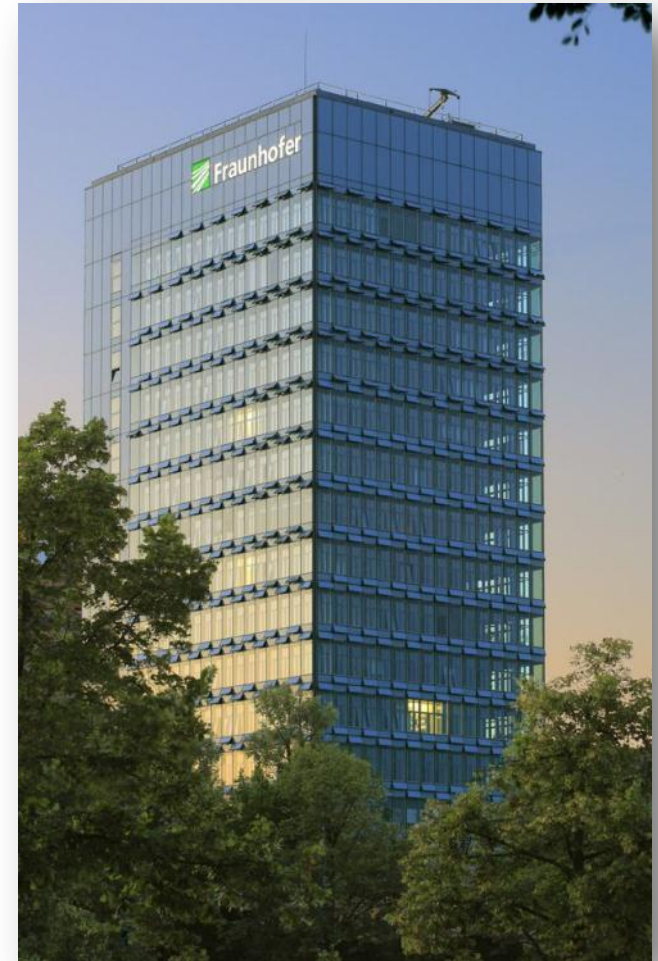
glassworks and
optics manufactory



Fraunhofer-Gesellschaft

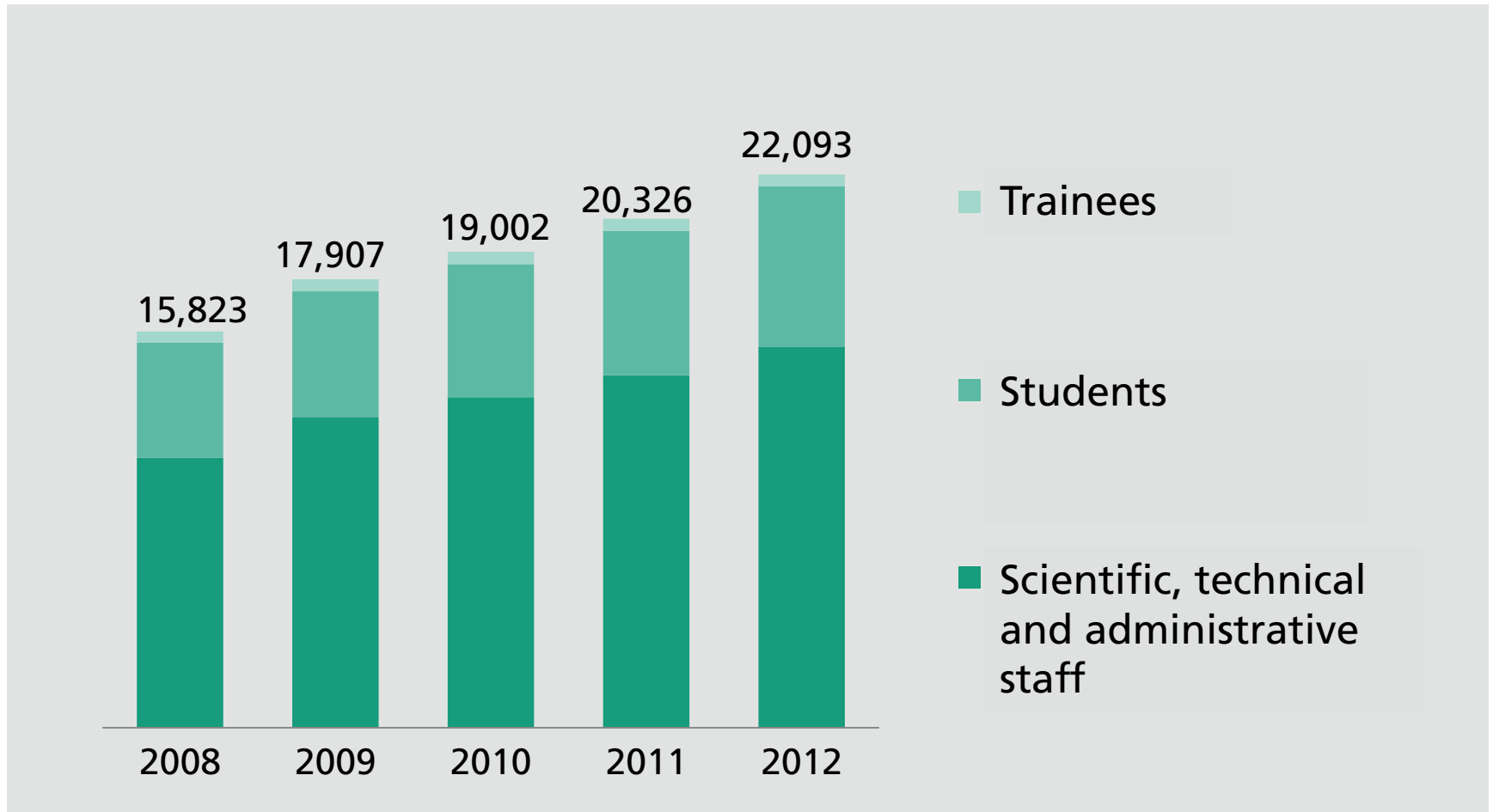
Facts and Figures

- **Foundation**
1949
- **Mission**
Applied research of direct use for industry
and for the benefit to society
- **Objectives**
 - Promoting innovations
 - 70–80 % external level of financing
- **Size**
 - More than 22,000 employees
 - 66 Fraunhofer institutes
 - Annual research volume of 2 billion €



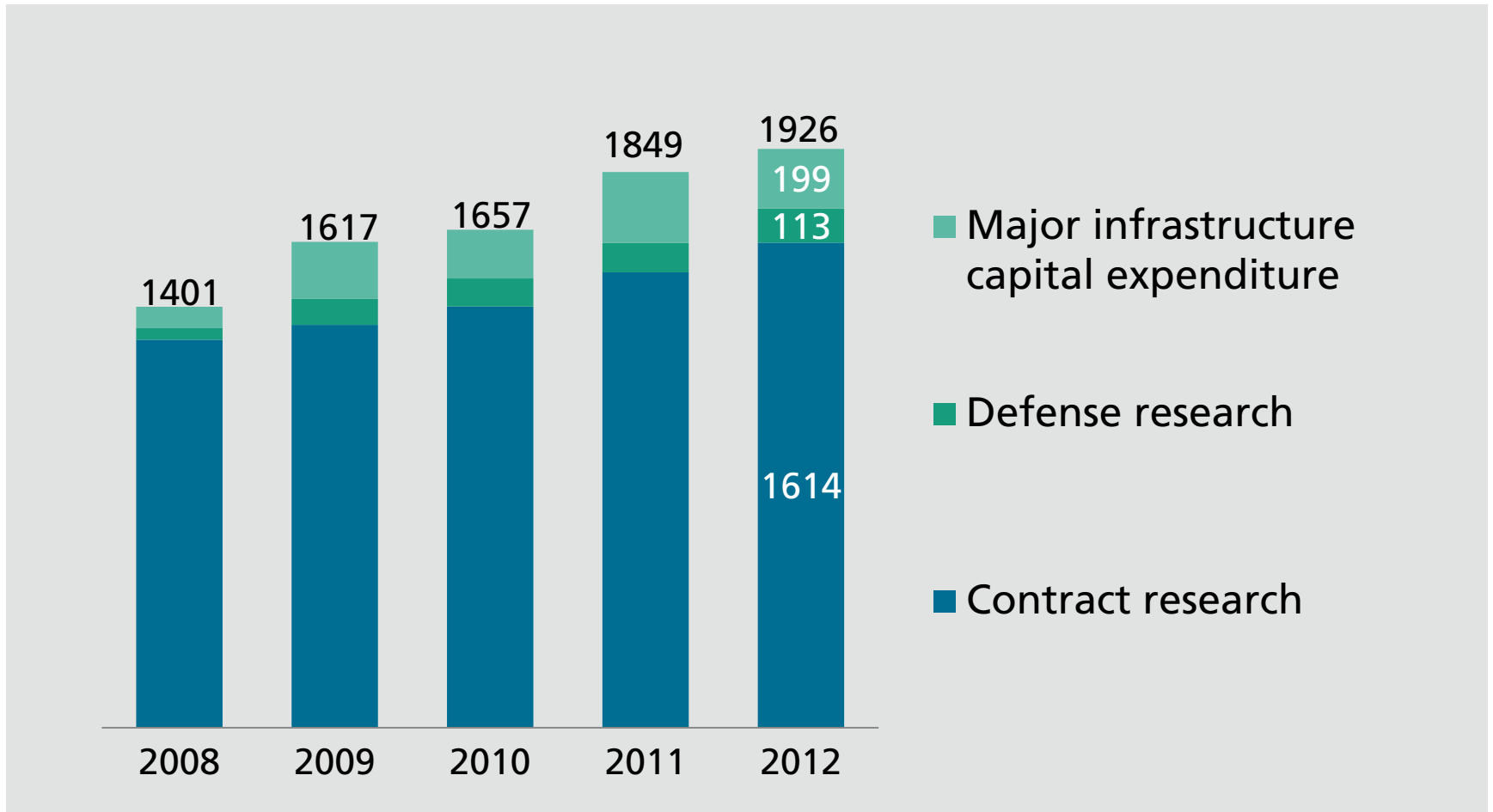
Fraunhofer-Gesellschaft

Number of Employees



Fraunhofer-Gesellschaft

Business Volume in million Euros



Research → Technology → Industry

»Advanced Radiation Detectors for Industrial Use«, Ravenna, November 11-12, 2013

Prof. Dr. Karsten Buse

Fraunhofer Institute for Physical Measurement Techniques IPM

- Fraunhofer-Gesellschaft
- **Fraunhofer IPM**
- Essential 1: Work on something that the world needs
- Essential 2: Build up and secure IP
- Essential 3: Contracts matter
- Success stories
- Summary

Fraunhofer IPM

History and some Numbers



■ History

- 1963 Working Group for Physical Space Research in Freiburg
- 1973 Fraunhofer Institute
- 1980 Fraunhofer IPM
- 2005 Terahertz Measurement and Systems in Kaiserslautern

■ Staff

- 225 Employees

■ Operating budget 2013

- 15 million € total
6 million € industrial proceeds



Fraunhofer IPM

Services and ServiceLab of Fraunhofer IPM

- **Consulting** – feasibility studies, technology-oriented market studies, technology assessment
- **Development** – components, systems, and pilot production
- **Support** – implementation and maintenance of systems, technology transfer, coaching, workshops
- **Contract measurements** – 3D measurements, microscopic image recordings, material characterization
- **Preparation** – structuring, coating



ServiceLab of Fraunhofer IPM

- Fast generation of quotations
- Easy placement of orders
- Fast and very efficient fulfillment of orders using standardized processes

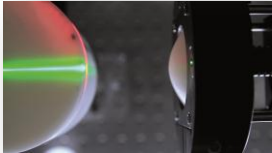
Fraunhofer IPM

Business Units



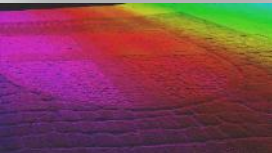
Production Control

Raising Productivity



Materials Characterization and Testing

Non-Destructive Material Testing



Object and Shape Detection

Improving Security



Gas- and Process Technology

Reducing Exhaust Emissions



Energy Systems

Generating Electricity from Heat

Fraunhofer IPM

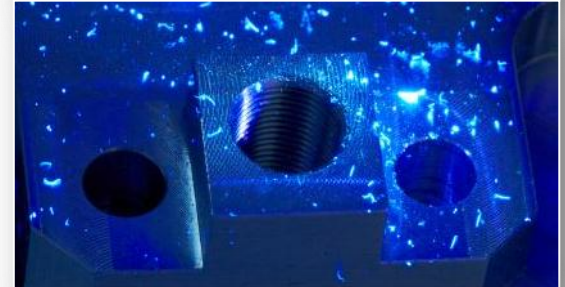
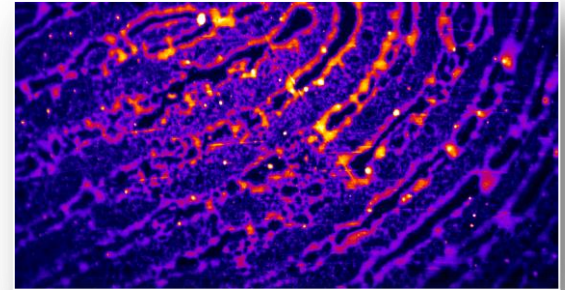
Production Control

Expertise

- Fluorescence measurement techniques
- Fast image processing
- Digital holography
- Laser recording, LED illumination
- Imaging techniques

Market

- Inline production control



Fraunhofer IPM

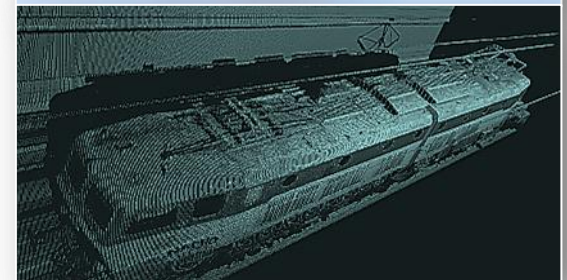
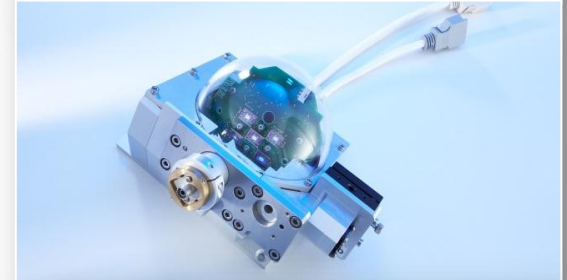
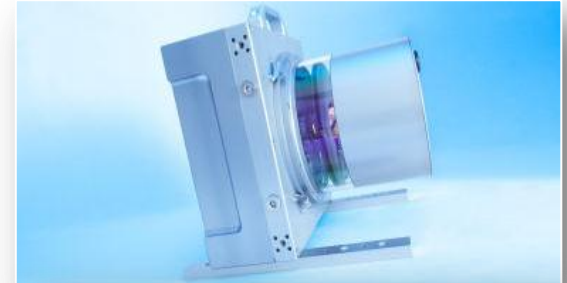
Object and Shape Detection

Expertise

- 3D laser scanner, 3D cameras, 3D data processing
- Detection of moving objects even at 300 km/h
- Fast image processing
- Robust housing technology

Markets

- Transport and logistics
- Railway: 3D measurement of tracks and trains
- Inspection of street surfaces
- Security applications



Fraunhofer IPM

Object and Shape Detection



Fraunhofer IPM

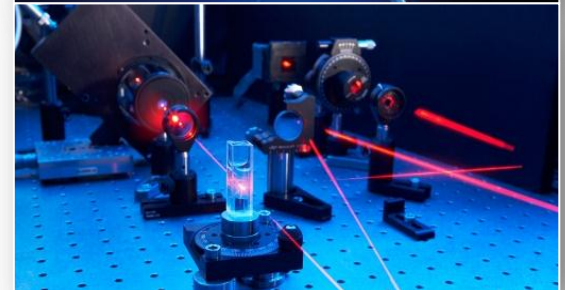
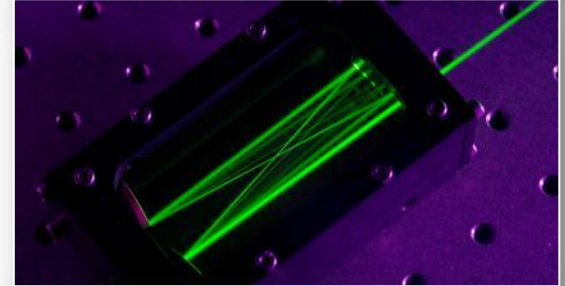
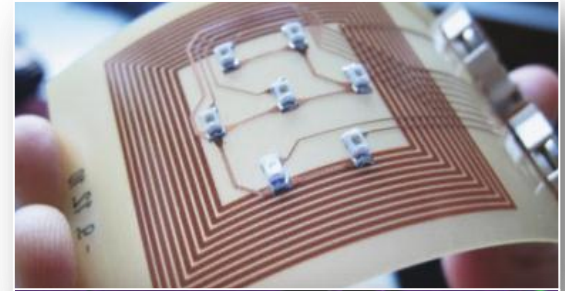
Gas and Process Technology

Expertise

- Spectroscopy from EUV to MIR (laser, Raman, photoelectron spectroscopy)
- Gas and particle sensor technology
- Robust complete systems
- Light source development

Markets

- Automotive
- Energy industry
- Food chain management



Fraunhofer IPM

What are the requirements for success?

- Dedicated and experienced team
- Inspiration
- Excellent working conditions
- Focusing on something that the world needs
- Systematic build-up of IP
- Thorough cooperation contracts

Wonders are always possible, but ...
... in most cases all these items are essential:
If just one is missing, success is unlikely.

Research → Technology → Industry

»Advanced Radiation Detectors for Industrial Use«, Ravenna, November 11-12, 2013

Prof. Dr. Karsten Buse

Fraunhofer Institute for Physical Measurement Techniques IPM

- Fraunhofer-Gesellschaft
- Fraunhofer IPM
- **Essential 1: Work on something that the world needs**
- Essential 2: Build up and secure IP
- Essential 3: Contracts matter
- Success stories
- Summary

Essentials 1: Work on something that the world needs

... and hopefully makes the world somehow better.

- Screen market analyses
- Ask your team to visit companies
- Organize workshops 😊
- Get an understanding for technical and financial needs
- Avoid exotic applications
- Stay in touch with your potential customers/partners



Research → Technology → Industry

»Advanced Radiation Detectors for Industrial Use«, Ravenna, November 11-12, 2013

Prof. Dr. Karsten Buse

Fraunhofer Institute for Physical Measurement Techniques IPM

- Fraunhofer-Gesellschaft
- Fraunhofer IPM
- Essential 1: Work on something that the world needs
- **Essential 2: Build up and secure IP**
- Essential 3: Contracts matter
- Success stories
- Summary

Essentials 2: Build up and secure IP

Bright ideas give patents

- Ask your team frequently for possible new IP
- Generate a process
- Provide incentives
- Check outgoing publications, reports, and presentations

Fraunhofer	2008	2009	2010	2011	2012
Active rights and patent applications	5015	5235	5457	5657	6103

Invention disclosures	690	691	694	671	696

Essentials 2: Build up and secure IP

Bright ideas give patents

Giant Magneto-Resistance

- 2007 Nobel Prize in Physics awarded to Albert Fert and Peter Grünberg
- Applications: hard disc drives, magnetic random access memories
- Invention secured by patents, commercially successful

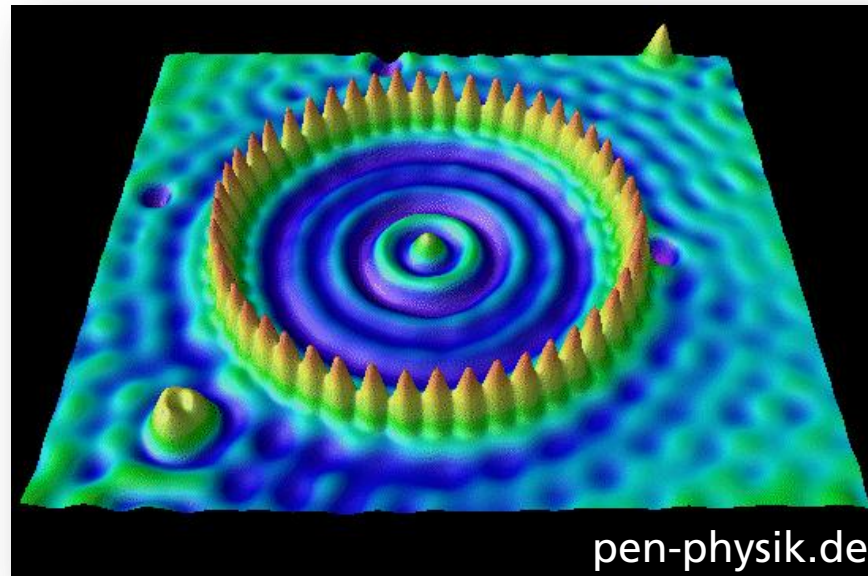


Essentials 2: Build up and secure IP

Bright ideas give patents

Scanning Tunneling Microscope

- 1986 Nobel Prize in Physics awarded to Gerd Binnig and Heinrich Rohrer
- No patent on the original innovation

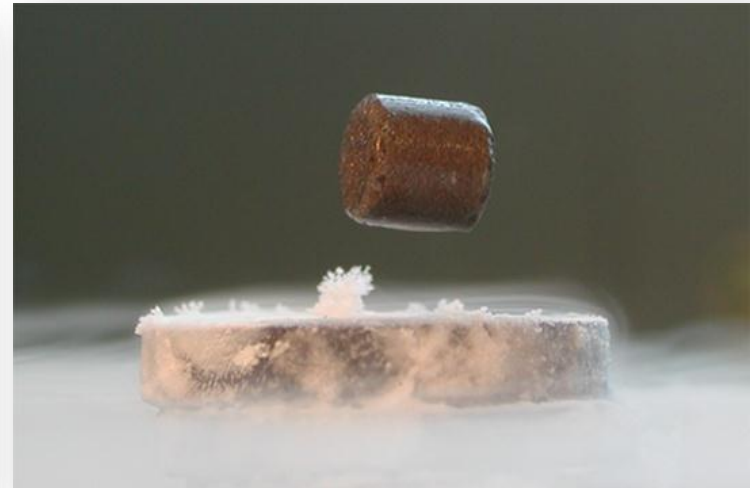
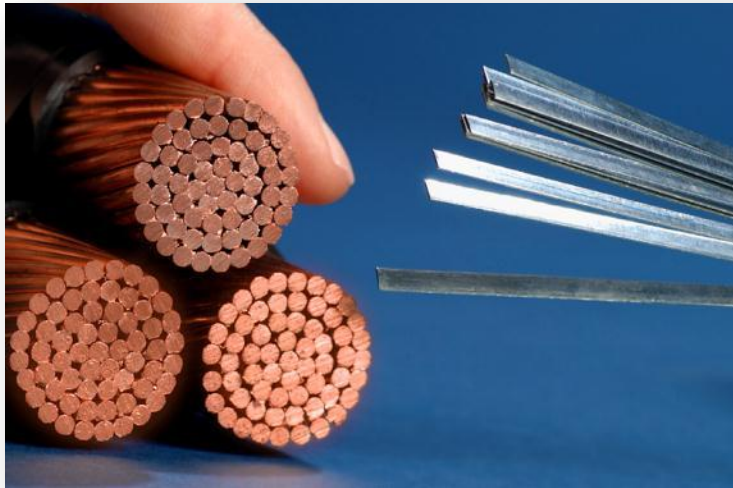


Essentials 2: Build up and secure IP

Bright ideas give patents

High-Temperature Super-Conductivity

- 1987 Nobel Prize in Physics awarded to Johannes Georg Bednorz and Karl Alexander Müller
- No patent on the original innovation



Research → Technology → Industry

»Advanced Radiation Detectors for Industrial Use«, Ravenna, November 11-12, 2013

Prof. Dr. Karsten Buse

Fraunhofer Institute for Physical Measurement Techniques IPM

- Fraunhofer-Gesellschaft
- Fraunhofer IPM
- Essential 1: Work on something that the world needs
- Essential 2: Build up and secure IP
- **Essential 3: Contracts matter**
- Success stories
- Summary

Essentials 3: Contracts matter

Sometimes boring, but absolutely necessary

Contracts should specify:

■ Duties, deliverables, specifications, timelines

- The more detailed, the better: less misunderstandings, less additional requests
- It is tougher to make an industry customer happy than to write a good report after completion of a government project

■ Exclusivity, confidentiality

- It is not standard to give exclusivity at an early stage of a project.
- If exclusivity is given, restrict it to particular applications.
- Make sure that the return is adequate.

■ Royalties, benefits

Can be, e.g., free research money based on a percentage of the sales volume.

Essentials 3: Contracts matter

Sometimes boring, but absolutely necessary

Also to be considered:

- **Serious full-cost calculation**

Consider possible risks.

- **Liability**

Assume what happens if the project is not conducted successfully or if the outcome/product harms someone.

- **Warranty**

Please check whether you have to provide warranty. If yes, are there replacement parts, what are the risks?

- **CE certificate, Product safety**

If you deliver or exchange hardware, you are liable to provide the CE certificate and to fulfill the product safety regulations.

Research → Technology → Industry

»Advanced Radiation Detectors for Industrial Use«, Ravenna, November 11-12, 2013

Prof. Dr. Karsten Buse

Fraunhofer Institute for Physical Measurement Techniques IPM

- Fraunhofer-Gesellschaft
- Fraunhofer IPM
- Essential 1: Work on something that the world needs
- Essential 2: Build up and secure IP
- Essential 3: Contracts matter
- **Success stories**
- Summary

Success Stories

MP3, Fraunhofer IIS

Audio compression algorithm

- Development in 1987 at Fraunhofer IIS
- MP3 reduces the storage capacity needed for music down to 10 %
- Made transmission of media via internet possible
- Changed the culture of listening to music and video
- Annual patent returns: about 80 millions of Euros

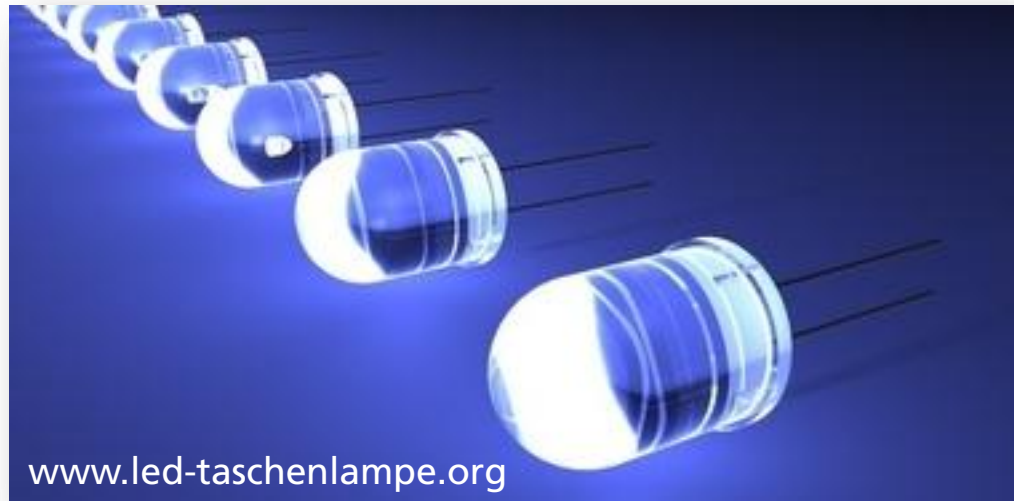


Success Stories

White LED, Fraunhofer IAF

Replacing conventional light bulbs

- 1995 development of white light LED consisting of a single semiconductor-chip by Prof. Dr. Jürgen Schneider at Fraunhofer IAF
- Today widely used in industry, e.g. automotive
- US market research institute »Strategies Unlimited« estimates the worldwide LED-lighting market of 2014 to be higher than 8 billion US dollars



Success Stories

ARRI Laser, Fraunhofer IPM

Cinema Laser Recording

- 1990s: Prototype development for ARRI
- Printing digital information on conventional celluloid
- High color depth
- Automated processing



Success Stories

ARRI Laser, Fraunhofer IPM

»Academy Award of Merit«, 11.02.2012

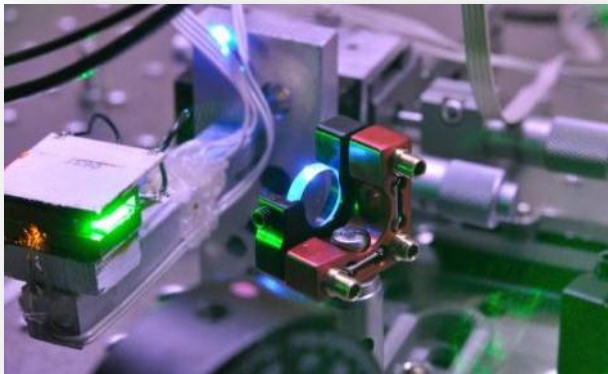


Success Stories

Optical Parametric Oscillator OPO, Fraunhofer IPM

One continuous-wave light source – all colors

- Basic research on OPOs and nonlinear optics at the university chair of »Optical Systems« in Freiburg
- Know-how-transfer to Fraunhofer IPM and securing of industry funding
- Construction of a self-adjusting prototype
- First presentation on the trade fair »LASER – World of Photonics« in May 2013 in Munich, Product will be presented on »Photonics West«, San Francisco, February 2014



Research → Technology → Industry

»Advanced Radiation Detectors for Industrial Use«, Ravenna, November 11-12, 2013

Prof. Dr. Karsten Buse

Fraunhofer Institute for Physical Measurement Techniques IPM

- Fraunhofer-Gesellschaft
- Fraunhofer IPM
- Essential 1: Work on something that the world needs
- Essential 2: Build up and secure IP
- Essential 3: Contracts matter
- Success stories
- **Summary**

Summary

To bridge the gap between academia and industry ...

... requires some attention

... is then less difficult than thought

... and is very rewarding!

Relevant points, overseen in many cases:
Market analysis, IP, contracts.

Visit us at
www.ipm.fraunhofer.de/en