HIT
Heidelberger Ionenstrahl-Therapiezentrum

MAXIMIZING TECHNOLOGY TRANSFER BENEFITS TO SOCIETY

Andreas Peters

Heidelberg Ion Beam Therapy Centre (HIT),

Head Accelerator Operations

HIT Betriebs GmbH am
Universitätsklinikum Heidelberg

http://www.hit-centrum.de

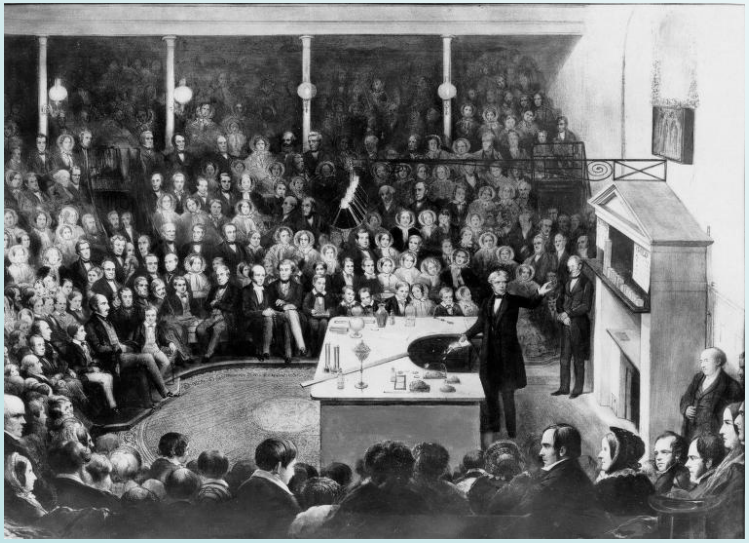
Outline

- Introduction: What is 'Technology Transfer'?
- Challenges for successful Technology Transfer
- Experiences in Industry
  - Instrumentation Technologies
  - Sigmaphi
  - Bergoz Instrumentation
  - Danfysik
  - GSI – HIT - Siemens
- Summary and Conclusions
- Acknowledgements

What is Technology Transfer?

Michael Faraday,
1791 - 1867

"A popular story goes that, following a demonstration of the new miracle of electricity, Faraday was asked by Gladstone 'What use is it?' He responded, 'One day Sir you may tax it'. "



William Ewart Gladstone, British Prime Minister,
1809 - 1898

What is Technology Transfer?

→It is obvious that technology transfer has to do with science, inventions and also economics.

→In literature one can find a lot of attempts to define the expression more precisely, one short version of these reads as follows: "The process of promoting technical innovation through the transfer of ideas, knowledge, devices and artefacts from leading edge companies, R&D organizations and academic research to more general and effective application in industry and commerce."

What is Technology Transfer?

→**Does the 'linear model' describe the process really?**

→**Is Technology Transfer only a One-Way Street?**

→**Or is it a more complex interaction between two or more partners?**

→**What are the interdependencies between the partners?**

Challenges for successful Technology Transfer

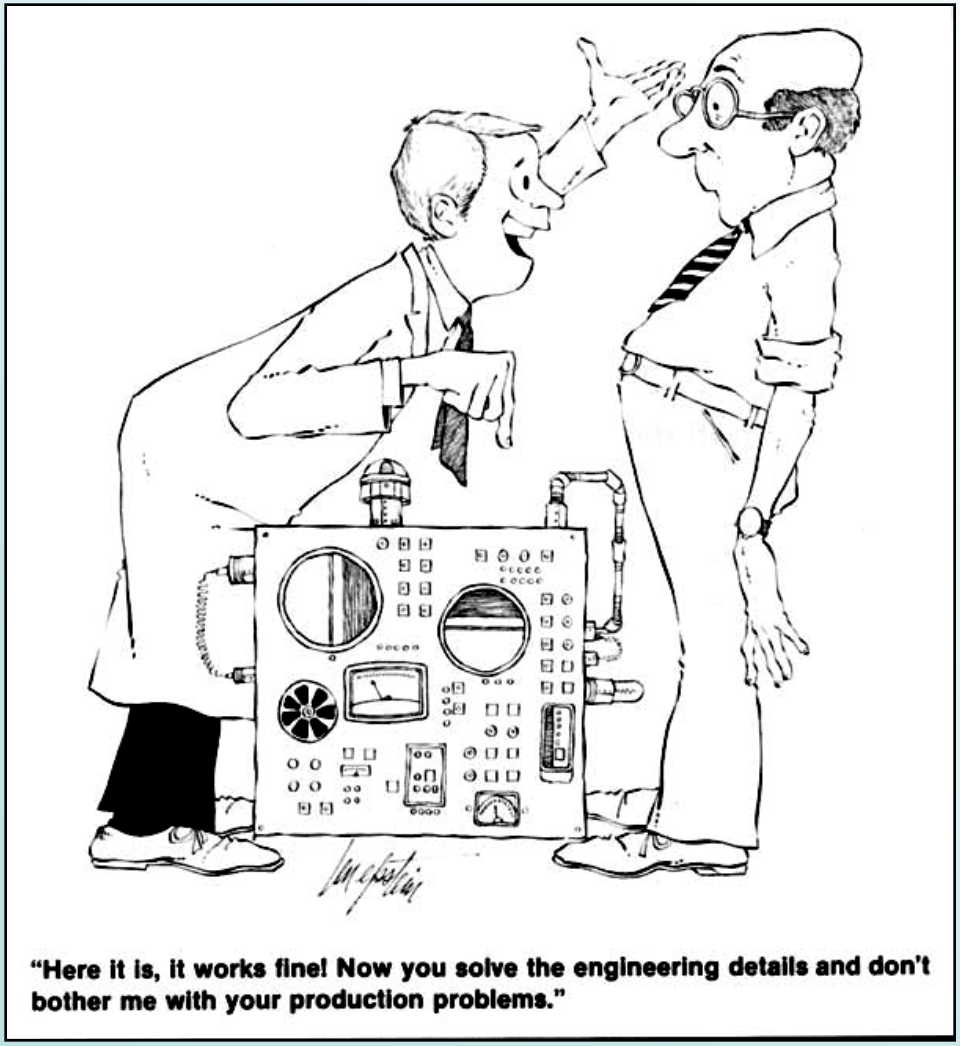
Mostly all (accelerator) scientists have experiences with collaborations between institutes to exchange know-how or to bundle their power to build up common projects.

→ What is the difference to technology transfer if commercial companies are involved?

→ Do different "cultures" or working styles play an important role?

→ Or is it simply the influence of economical aspects on both sides?

Challenges for successful Technology Transfer



"Here it is, it works fine! Now you solve the engineering details and don't bother me with your production problems."

And a key question:

Is technology transfer just some sort of knowledge movement or does it need an interactive process between the included partners?

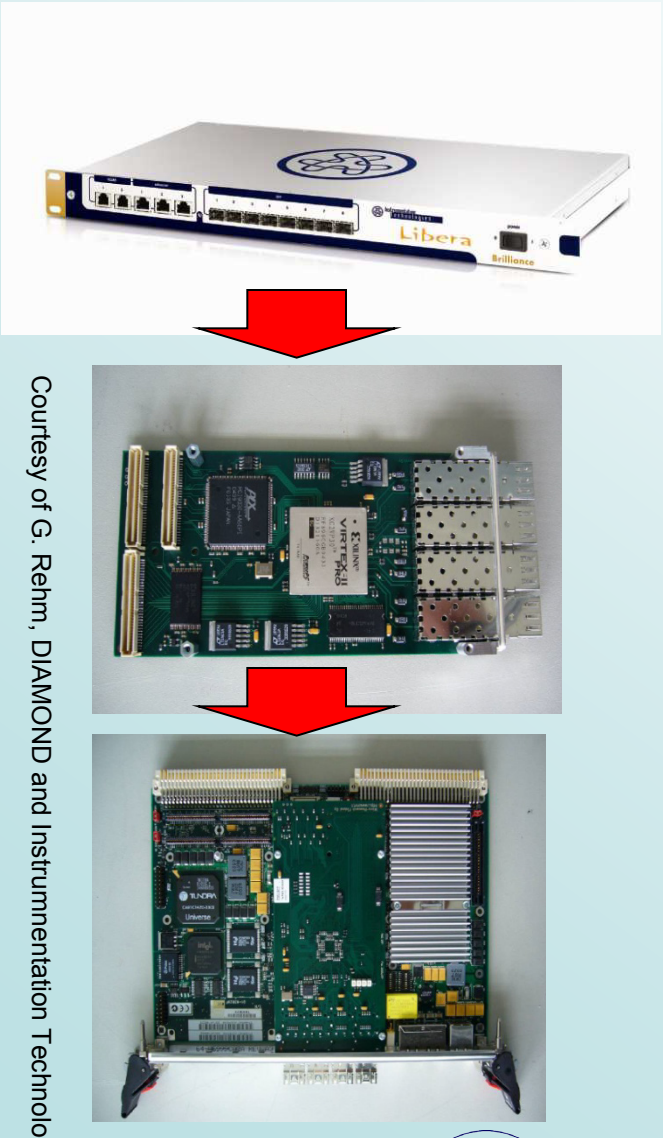
... how to get answers?

Challenges for successful Technology Transfer

Questionnaire to (accelerator) industry:

- **Can you provide examples of technology transfer between institutes or universities with your company?**
- **What were / are the advantages and disadvantages in such technology transfer projects concerning technical problem-solving, efficiency, creativity, etc.?**
- **How do you "synchronize" the (possibly) different working styles in an institute / university with the working methods in your company?**
- **How do you see and judge the possibility of technology transfer by exchanging personnel, from time to time or longer-lasting? Do you have examples for this, which you can describe briefly?**

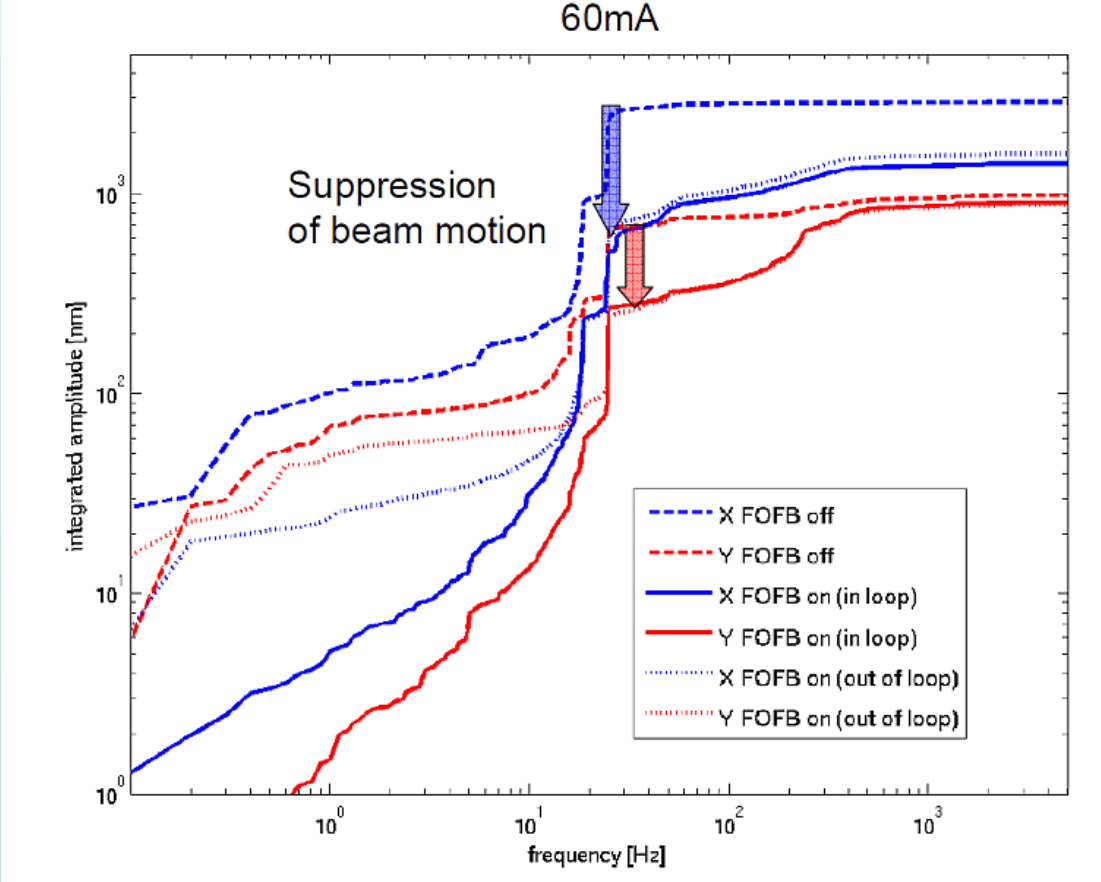
Experiences in Industry: Instrumentation Technologies



Courtesy of G. Rehm, DIAMOND and Instrumentation Technologies

Rok Uršič, CEO of Instrumentation Technologies, reports on an example of successful technology transfer: "We developed a family of products that are sold under Libera brand name. They are building on an open platform. Among the first customers was also Diamond Light Source (DLS) in GB. They took advantage of Libera openness and developed a specific communication controller that is used to connect many (>100) of Libera Electron products (beam position monitoring electronics) in to a big fast global orbit feedback.

Experiences in Industry: Instrumentation Technologies



Courtesy of G. Rehm, DIAMOND

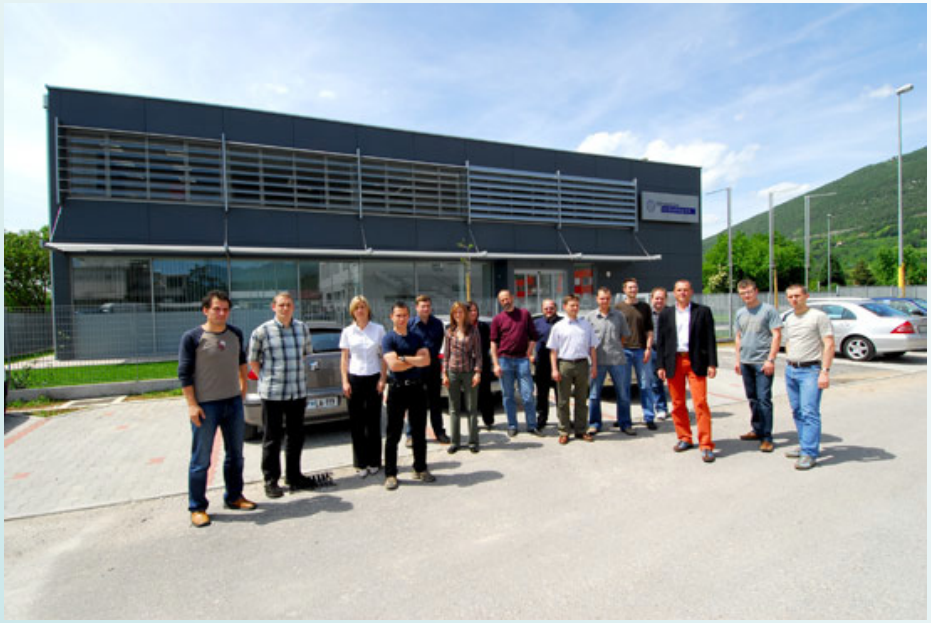
Open software and also hardware platforms provide a good basis for an interactive cooperation of institutes and companies.

The outcome is an enhancement of performance and functionality options for the product portfolio.

Experiences in Industry: Instrumentation Technologies

"We exchange personnel with institutes in both directions for a restricted period, examples are DESY or the Brazilian light source. We consider this to be our competitive advantage."

Rok Uršič



Courtesy of Instrumentation Technologies

Experiences in Industry: Sigmaphi

Courtesy of SOLEIL an ALBA

Sigmaphi benefited from a technology transfer by SOLEIL, initiated in 2007 and lasting for three years. The objects of this transfer were complete pulsed magnetic systems, which were asked for delivery by ALBA. SOLEIL offered training of an accelerator physicist hired by Sigmaphi on the specialities of such magnets including power supplies, etc. and was involved in the development .

Experiences in Industry: Sigmaphi

Pierre Lebasque from SOLEIL: "... collaboration has made my group think about new concepts. ... By working with Sigmaphi to answer a call for tenders concerning a proton and ion ring, we came up with completely new solutions that resulted in Sigmaphi's tender being accepted."

"Gradually the idea grew for a transfer of know-how."

Pierre Lebasque, in charge of the "Power Supplies and Pulsed Magnets group".

From: INNOVATIONS, The magazine of the SOLEIL Synchrotron, No. 19, June 2010

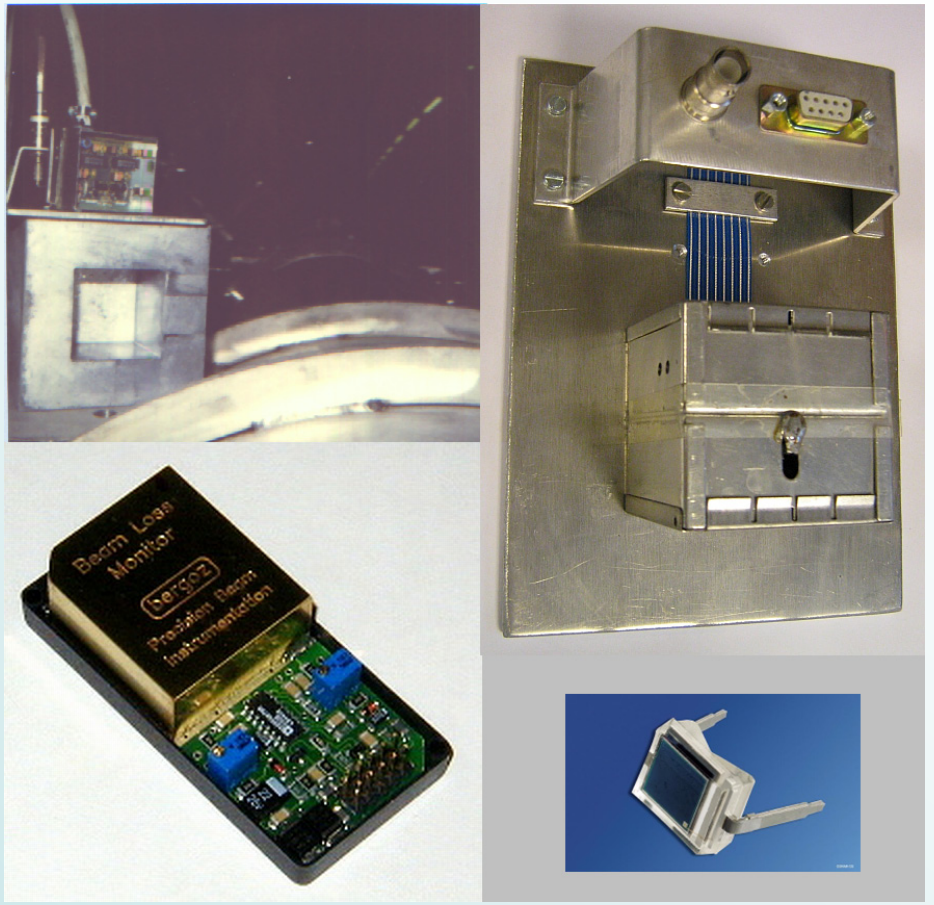
Experiences in Industry: Sigmaphi

Jean- Luc Lancelot, Sigmaphi: "The labs have the advantage of deep expertise and time. The company brings industrial approach, cost reduction, and also sometimes a broader view as exposed to many different views from different labs. … Bringing together two different approaches is very productive, providing that each party comes very open minded."

Courtesy of Sigmaphi

Experiences in Industry: Bergoz Instrumentation

In the HERA project at DESY a BLM system was necessary to monitor Hera-p loss in the presence of Hera-e synchrotron light. A detector based on two PIN-diodes working in coincidence scheme was chosen because of its large insensitivity to X background photons hence, the high radiation tolerance and an excellent linearity over 8 orders of magnitude.



Courtesy of Kay Wittenburg, DESY and Bergoz Instrumentation

Experiences in Industry: Bergoz Instrumentation

Julien Bergoz: "DESY proposed that we industrialize it, more compact and less expensive. A formal TT contract was signed with royalties to be paid to DESY. The BLM instrument was redesigned by us. Kay Wittenburg at DESY tested it on beam and intense radiations, which resulted in further improvements." The combination of creating a series product with industrial methods on one side and the expertise and beam test possibilities of an institute like DESY on the other side lead to a successful product with more than 3000 units used worldwide.

Courtesy of Bergoz Instrumentation

Experiences in Industry: Danfysik

Courtesy of Danfysik

XFEL
X-Ray Free-Electron Laser

Bjarne Roger Nielsen on TT: "It requires a good understanding from both sides. Make written technology transfer and/or collaboration agreements. Make sure to involve the scientist's superior (ex. dean or institute director) in the agreement so that there is an understanding for the time needed for the project. It is easier to 'bridge the culture gap' if you have people in the company organisation that have previously worked in a university environment."

HIT
Heidelberger Ionenstrahl-Therapiezentrum

Experiences in Industry: Danfysik

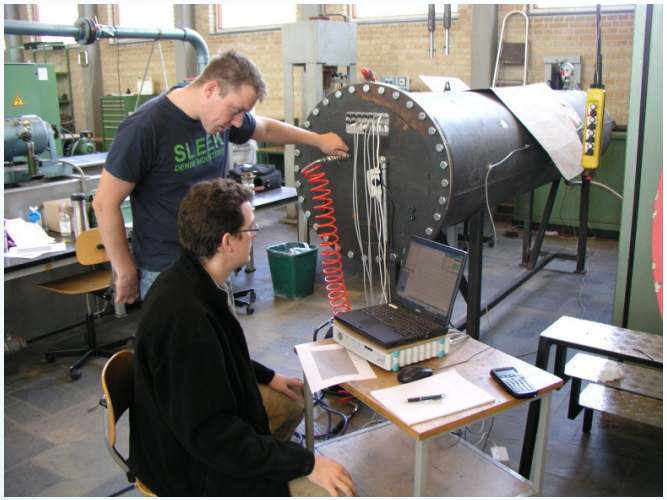
In 2007 Danfysik initiated a collaboration named InnovAcc with university and industrial partners e.g. new types of thin walled vacuum chambers. Together with the Engineering College of Aarhus, the Institute for Storage Ring Facilities Aarhus and the company B-Rustfrit Stål A/S new designs with corrugated surfaces were successfully tested and manufactured.

Courtesy of Danfysik, Engineering College of Aarhus and B-Rustfrit

Experiences in Industry: Danfysik

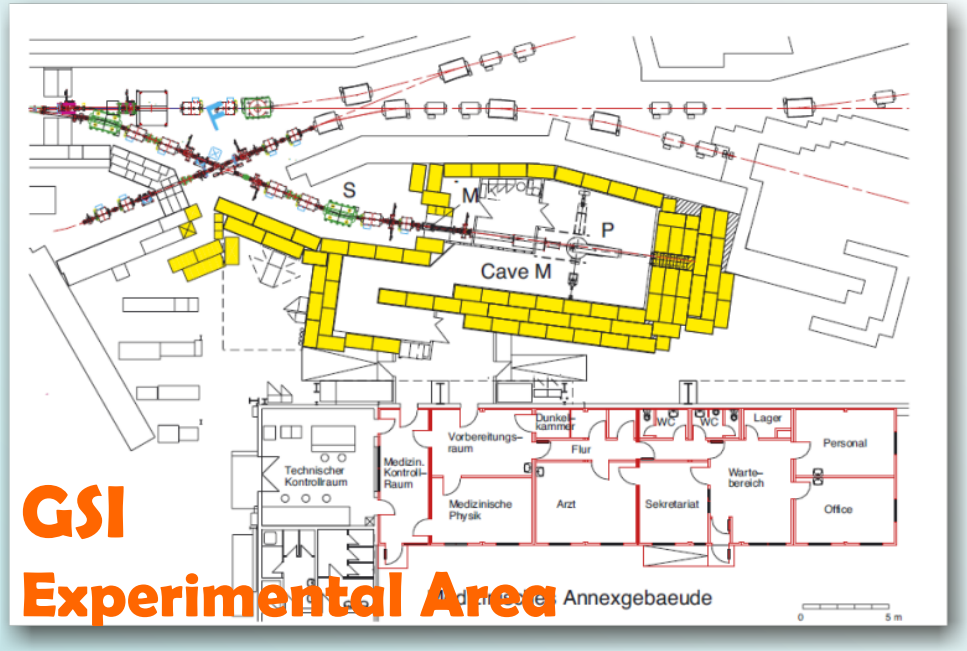
Lars Erik Bräuner (Engineering College of Aarhus): "Finite Element Analysis of thin walled pressure vessels with complex surfaces under external pressure lead to increased knowledge in this field in the institute. Many of the students involved are now employed in good jobs in R&D departments."

Bjarne Roger Nielsen: "Advantages of such collaborations are that the institutes often have a higher level of theoretical/technical competency than the companies and that company staff is trained during the technology transfer.



Courtesy of Engineering College of Aarhus

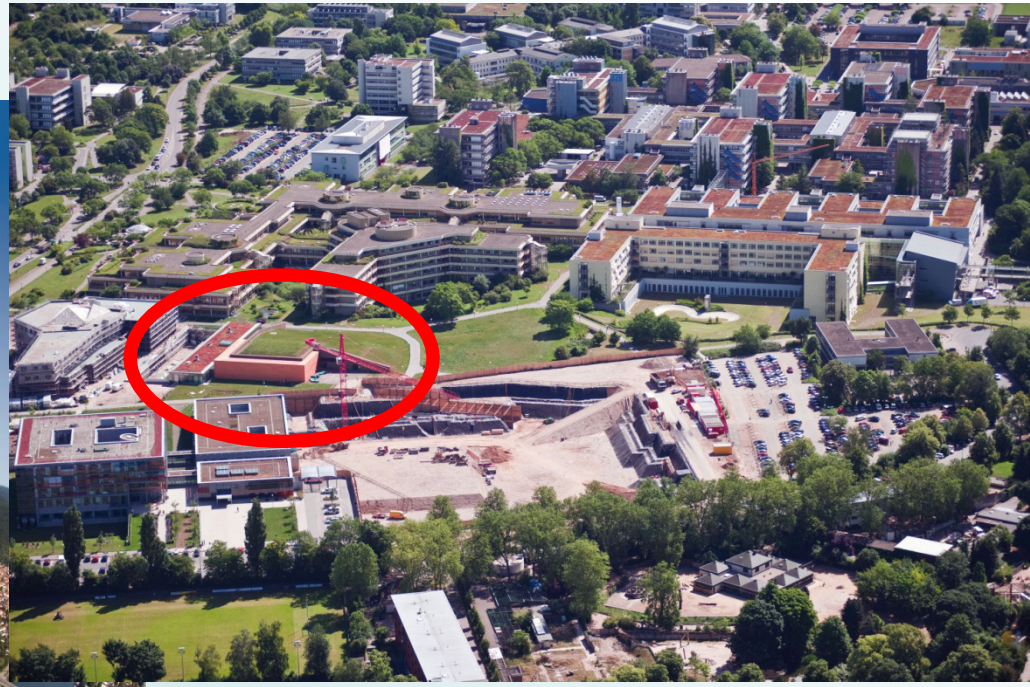
Experiences in Industry: GSI – HIT - Siemens



448 patients were treated with carbon beams from a research synchrotron facility from 1997 – 2008 at GSI using raster scanning technique. The HIT concept and layout is based on this experience from GSI.

Experiences in Industry: GSI – HIT - Siemens

HIT: Heidelberg Ion Beam Therapy Centre

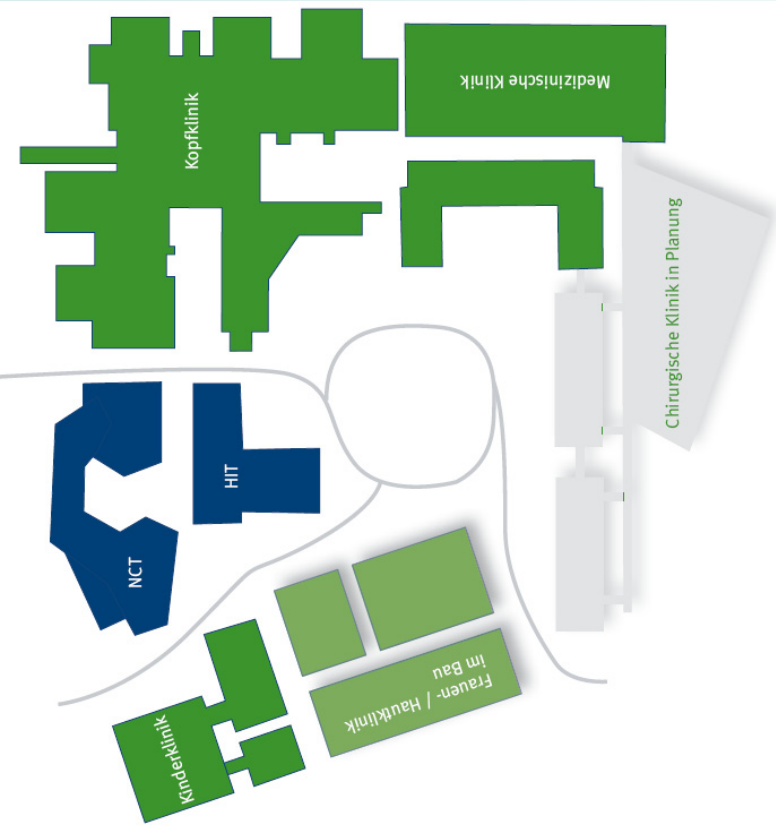


University Campus
„Im Neuenheimer Feld“

HIT Heidelberger Ionenstrahl-Therapiezentrum

Experiences in Industry: GSI – HIT - Siemens

HIT: Heidelberg Ion Beam Therapy Centre



Ring of Hospitals with „Kopfklinik“ incl. Radiooncology Department

Experiences in Industry: GSI – HIT - Siemens

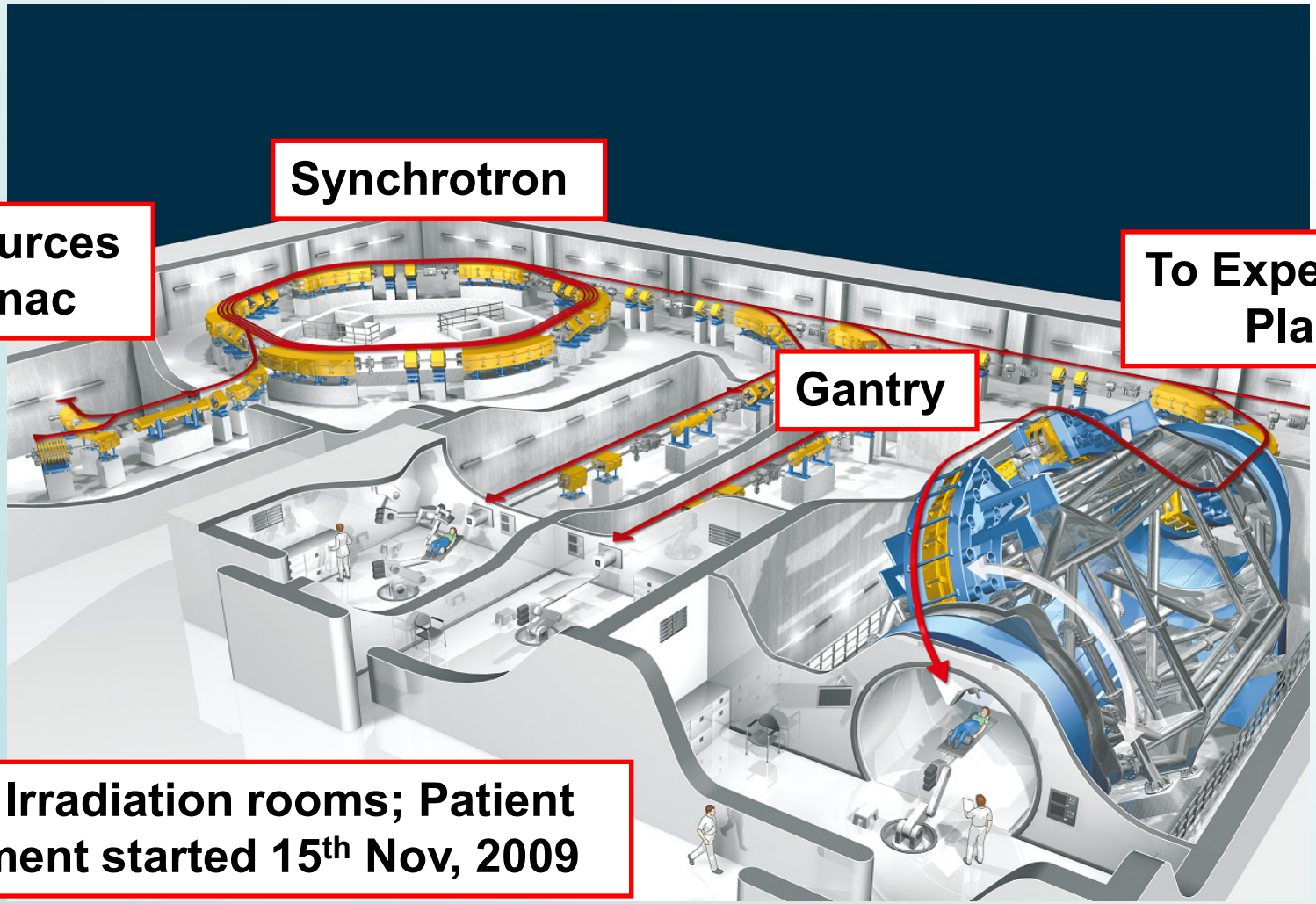
HIT: Heidelberg Ion Beam Therapy Centre

Front side of HIT building

HIT Building (backside) with accelerator beneath the hillock

HIT Heidelberger Ionenstrahl-Therapiezentrum

Experiences in Industry: GSI – HIT - Siemens

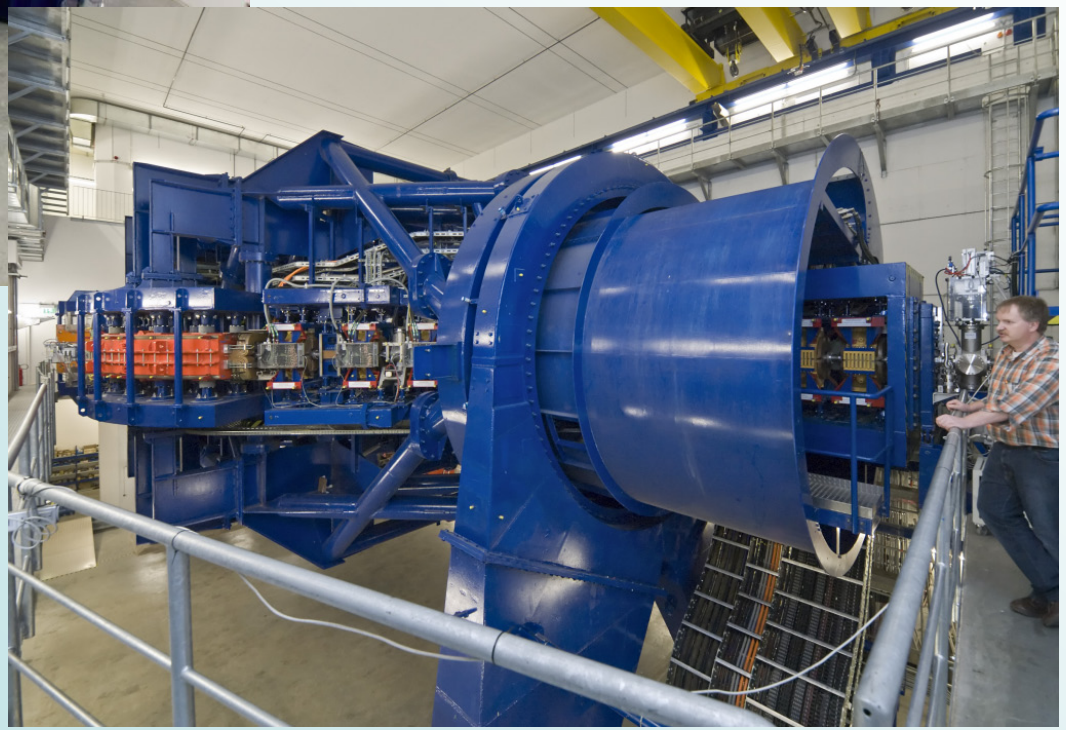


Three Irradiation rooms; Patient Treatment started 15th Nov, 2009

Experiences in Industry: GSI – HIT - Siemens

HIT synchrotron

HIT gantry



Experiences in Industry: GSI – HIT - Siemens

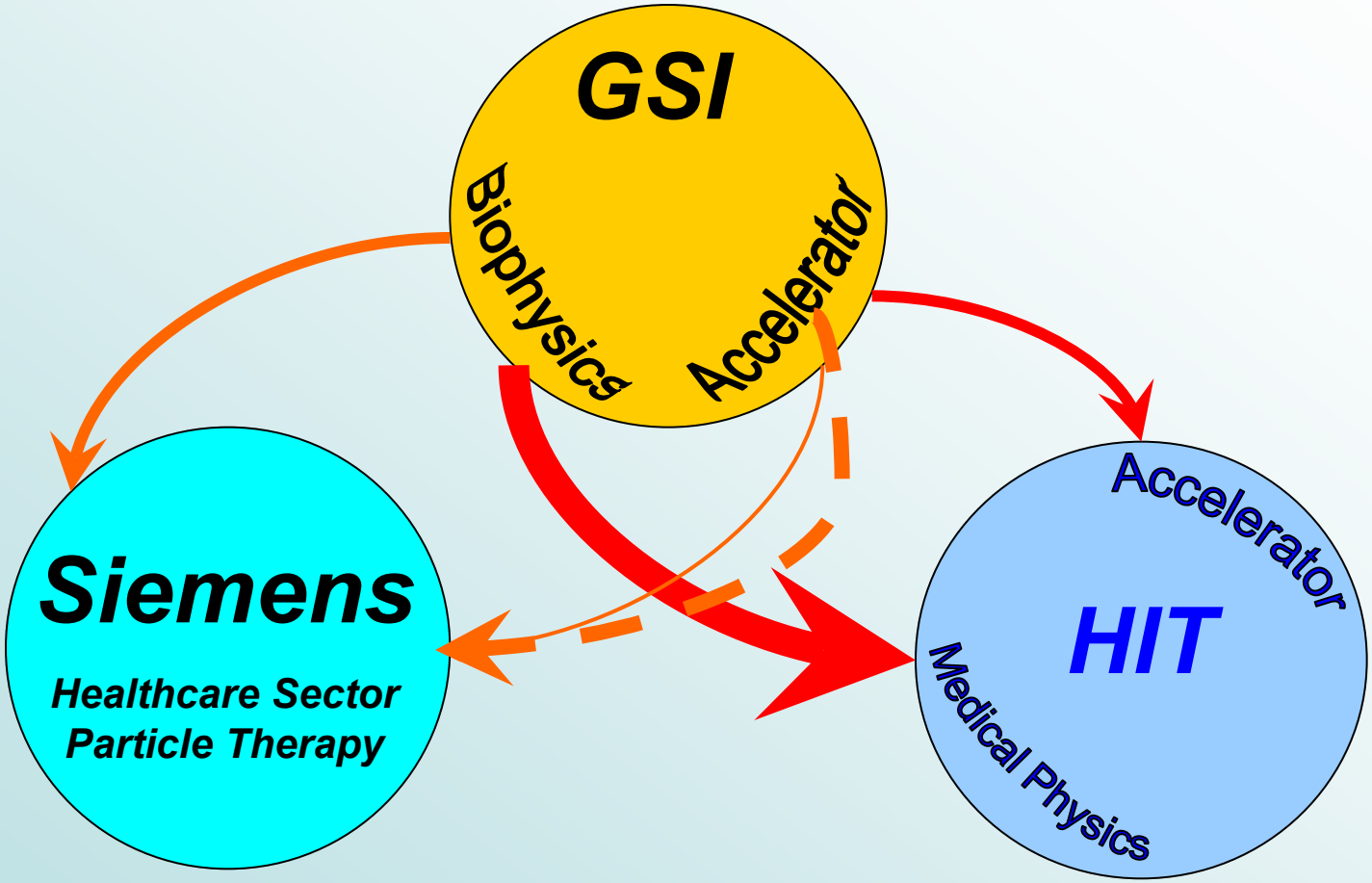
HIT gantry rotating …

Experiences in Industry: GSI – HIT - Siemens

All these activities lead to a Technology Transfer contract between GSI (and indirectly IAP Frankfurt) and Siemens Healthcare Particle Therapy on Particle Therapy Accelerators and Raster-Scanning treatment techniques, which gave Siemens access to the concept and design documents produced at GSI for the HIT project and the previous GSI pilot project on radiation therapy with carbon ions.

A transfer of knowledge and technology with the enormous scope mentioned above seems not to be possible without the transfer of personnel.

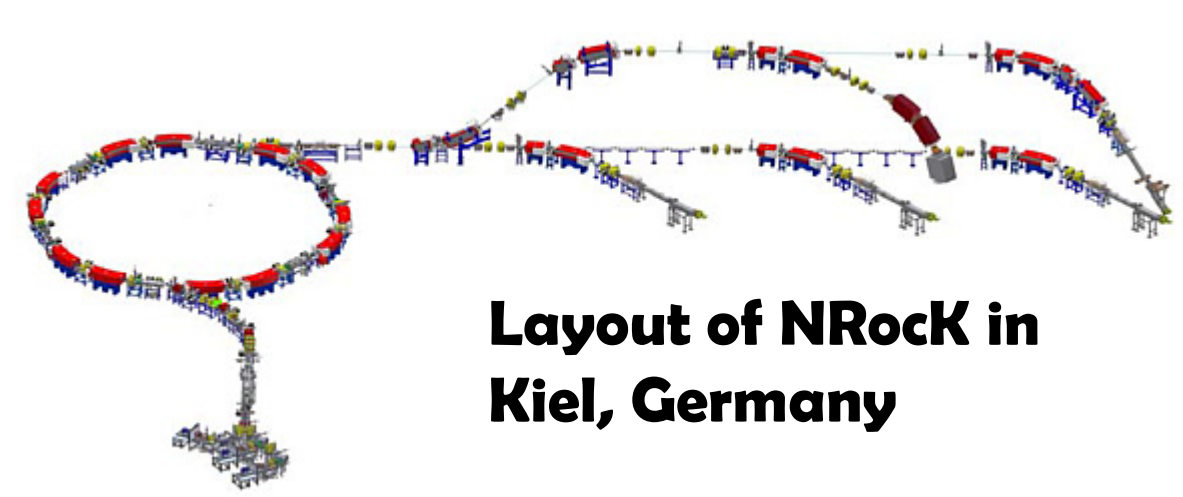
Personnel exchange between GSI, Siemens and HIT



[This is only a simplified view without time flow aspects, etc.]

Experiences in Industry: GSI – HIT - Siemens

Heiko Rohdjess, Siemens: "Industry can enter the market after 'proof-of-concept' in a science institute. This reduces the risk and lowers the threshold to enter new markets based on new innovative technologies."



Layout of NRocK in Kiel, Germany

HEBT at RKA in Marburg, Germany

Courtesy of Siemens AG, Healthcare Sector

Summary and Conclusions I

- All partners including all persons involved in the technology transfer should 'know' each other including their background as good as possible; especially the hierarchies of the partners, the decision-making processes and also restrictions within the institutes or companies must be aware to all persons concerned.

- The interaction of all partners should take place 'at eye level', although different 'cultures' in science institutes and industry are mostly obvious.

- An atmosphere of openness should be found on both sides of the technology transfer, which should create the background for an interactive process.

Summary and Conclusions II

- An interactive process opens new perspectives not only for the technology recipient, but also for the donator.
- One of the most essential prerequisites for a successful technology transfer, especially when it concerns complex systems, is a temporary or long-lasting exchange of personnel.
- Initiatives for technology transfer can and should be started from both sides, public scientific or technical institutes as well as industry companies. One should not rely on the 'linear model' only.
- As in most economic and interhuman relations the willingness for compromises is very important to overcome deadlock situations.

Summary and Conclusions III

- As technology transfer is an additional task for scientists, which sometimes causes drawbacks in their scientific work, a (monetary) compensation is necessary as a motivation.

- Young scientists should have contact to industry as early as possible by traineeship during their university time or by taking part in networks, DITANET is such an example.

Acknowledgement

I would like to express my gratitude to Julian Bergoz, Jean-Luc Lancelot, Bjarne Roger Nielsen, Heiko Rohdjess, Rok Uršič and my HIT colleagues for providing me their experiences in technology transfer along with their material used in the talk and the proceedings. Thank you!

And thank you for your attention!