



# Knowledge and technology transfer,

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Holland@CERN

10<sup>th</sup> November 2010



# Outline

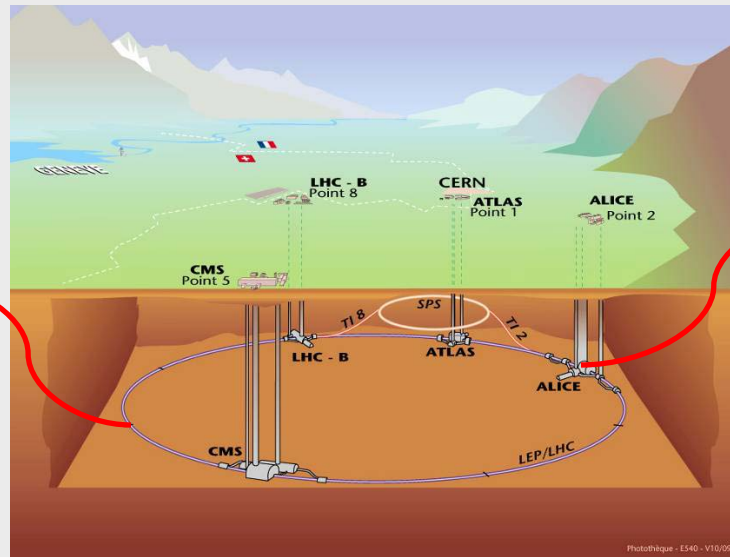
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- CERN technologies
- Technology transfer modes and practices
- Example of a successful transfer

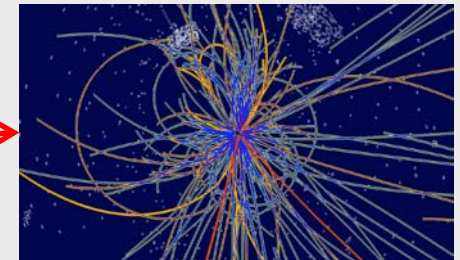
# CERN technologies

## ■ 3 sources of innovation:

### Accelerators



### Detectors



## LHC

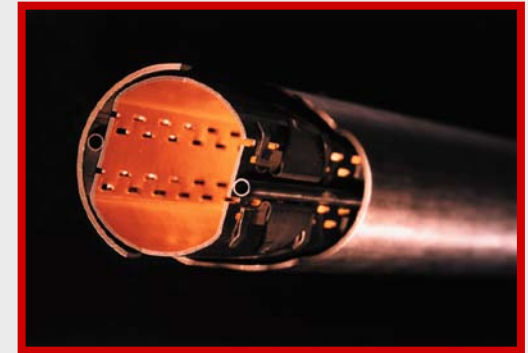
### Large-scale computing



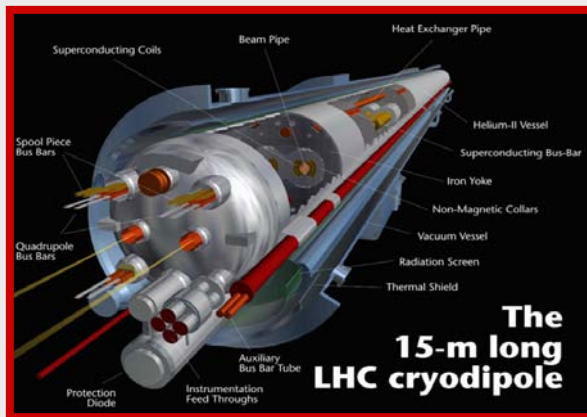
# CERN technologies

## ■ Technology to the very limit

Super-conductivity  
(13kA, 7MJoules)



Vacuum  
( $10^{-12}$  Torr)



Cryogenics  
(1.9 K)



Magnets (8-10 T)

# CERN technologies

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## ■ Portfolio

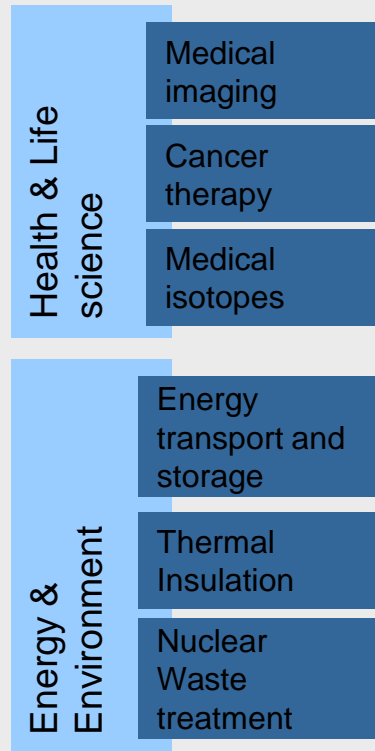
- Particle detectors
- Accelerators
- Vacuum technologies
- Magnets and power supplies
- Super-conductivity and cryogenics
- Electronics and IT
- Mechanics and surface treatments

## ■ Forms

- Expertise and know-how, patents, design, hardware, software, etc...

# CERN technologies

## ■ Application domains



	Detectors	Electronics	IT	Accelerator	Vacuum	Cryogenics	Power converter
Medical imaging	✓	✓	✓				
Cancer therapy	✓		✓	✓	✓	✓	
Medical isotopes				✓	✓	✓	
Energy transport and storage						✓	✓
Thermal Insulation					✓	✓	
Nuclear Waste treatment				✓			

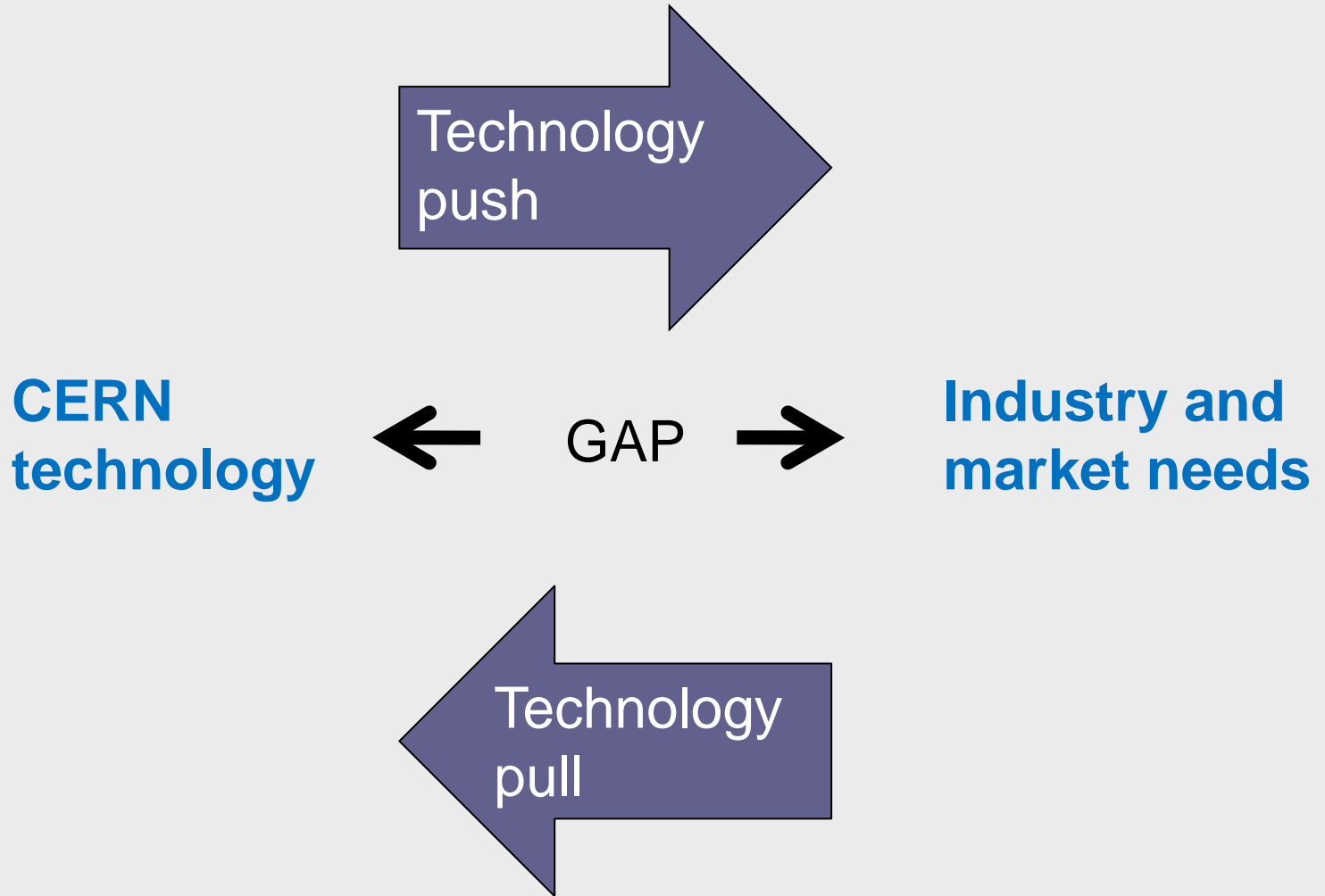
# Technology Transfer modes

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- Focused modes:
  - Collaborative research
  - Contract research, service and consultancy
  - Licensing of intellectual property
- Other modes:
  - Procurement
  - Training, networking and personnel mobility

# Technology Transfer modes

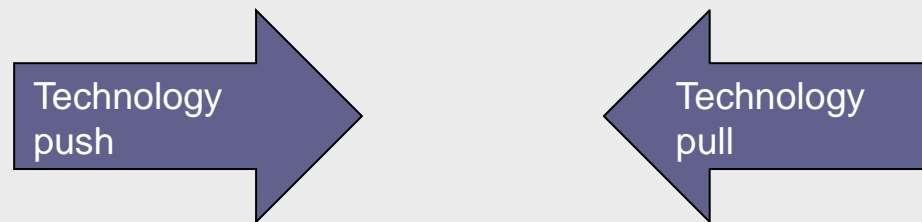
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# Collaborative research

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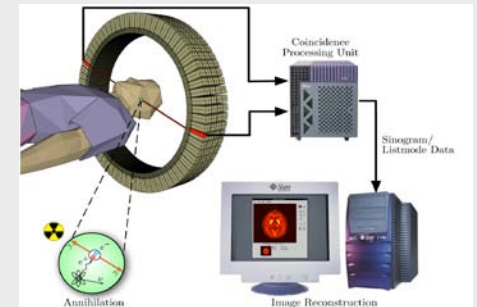
- Collaboration of academic institutes aiming at the development of technologies having identified industrial and/or commercial applications
- National institutes develop privileged link with local industry



# Collaborative research

- Crystal Clear Collaboration

Development of scintillating crystals  
Applications: Positron Emission  
Tomography



- RD51 Collaboration

Development of micro-pattern gas  
detector technologies

Applications: Medical imaging, vehicle  
scanning, etc.

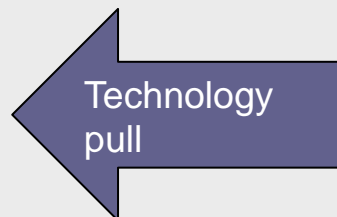


- Opportunities in the framework of EC-funded projects

# Contract research, service & consultancy

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- R&D work, specialized service and expertise executed by CERN for industry
  - Using CERN technology, expertise and/or unique equipment
  - **CERN do not compete with industry** and need to recover its costs
  - Subject to availability of CERN expert and equipments



# Contract research, service & consultancy

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- Example: Development and implementation of a very low rate leak detection method for the testing of inertial sensors (gyroscopic and accelerometer technologies)
  - CERN has experience in ultra high vacuum and leak detection
  - CERN developed the detection method
  - The method has been applied by CERN on samples
  - CERN has transferred the method (document) and the associated know-how

# Licensing of Intellectual Property

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- License to commercially exploit technologies that are “closed” to commercial processes and/or products
- Object of the license:
  - Patent
  - Design
  - Software
  - Know-how
  - Combination of the above
- Condition: no military applications

# Licensing of Intellectual Property

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- Examples of available patented technologies:
  - *Titanium polishing*: a process to polish titanium and titanium alloys to a high degree of surface smoothness, typically of a nanometer level
  - *Micro Chemical Vias*: a new chemical method to make microvias for high density printed multilayer circuits
  - *Quatum dosimetry*: a novel invention comprising a method, software and apparatus to determine dose, dose rate and composition of radiation.

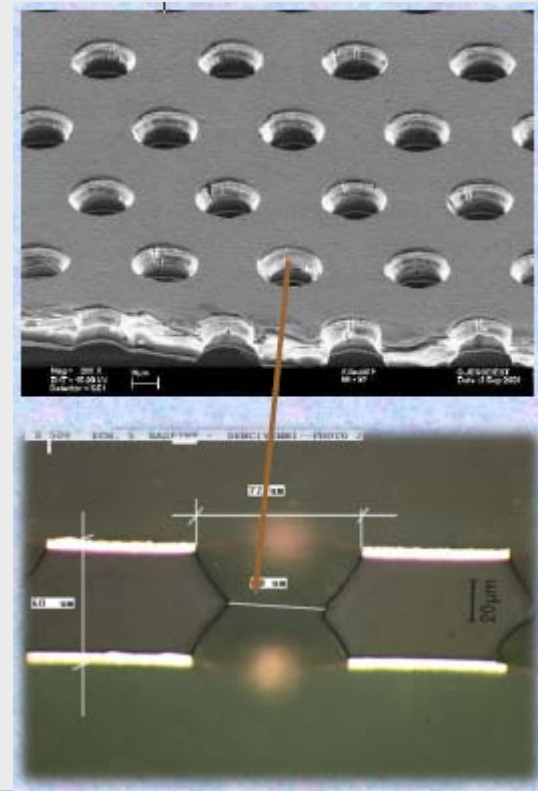
# Licensing of Intellectual Property

- Business opportunities - CERN is looking for technology producers and provide for production license for:

Production of GEM foils  
and GEM-based products

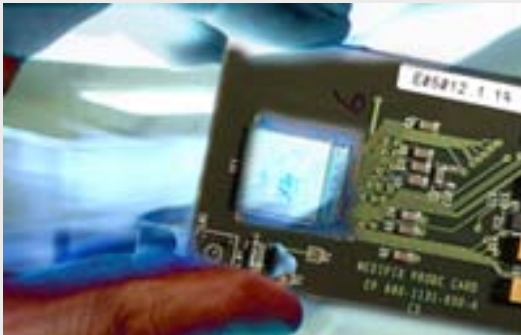
Company profile:  
Flexible PCB manufacturer

Markets:  
HEP labs and institutes  
Medical applications  
Homeland security (!)



# Licensing of Intellectual Property

- Business opportunities - CERN is looking for technology producers and provide for production license for:



## Production of MEDIPIX2 assemblies

### Company profile:

Clean-room and wafer processing capability

### Markets:

Imaging devices  
Material analysis  
Dosimetry

# Training, networking and personnel mobility

- CERN plays a coordinating role in several EC-funded networks and projects in particular in the area of hadron therapy

ENVISION  
European NoVel Imaging Systems for ION therapy

(Project started 1st February 2010)

PARTNER

Particle Training Network for European Radiotherapy



ULICE - Union of Light Ion Centres in Europe



European Network for LIGHT ion Hadron Therapy

Home News Events Contact

ENLIGHT

Related Links

- News
- Members
- Projects
- Documents
- Events
- Glossary

ENLIGHT++ Events

- 2010 February 2-4 Physics for Health in Europe Workshop
- 2009 Sept 28-29 ULICE Kick-off Meeting
- 2009 June 18-19 ENLIGHT Meeting
- 2007 3-4 May COST-ENLIGHT Workshop
- 2006 4th March ENLIGHT++ Preparatory meeting

The European Network for LIGHT ion Hadron Therapy is a multidisciplinary platform that aims at a coordinated effort towards ion beam research in Europe.

The ENLIGHT network is formed by the European Hadron Therapy Community which consists of more than 150 researchers, belonging to more than fifty European Universities and research institutes from sixteen European countries.

A major success of ENLIGHT has been uniting traditionally separate communities so that clinicians, physicists, biologists and engineers with experience and interest in particle therapy work together. ENLIGHT has demonstrated the advantages of regular and organized exchanges of data, information, best practices as well as information on treatment procedures, protocols and strategies.

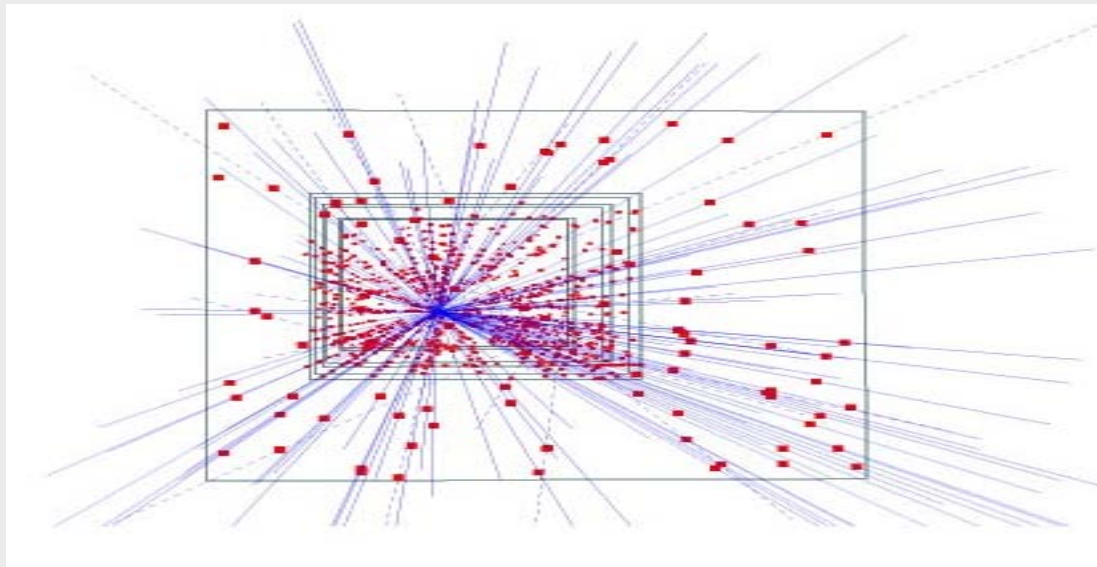
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# Example of successful transfer

- **Hybrid silicon pixel detectors** for tracking applications in High Energy Physics



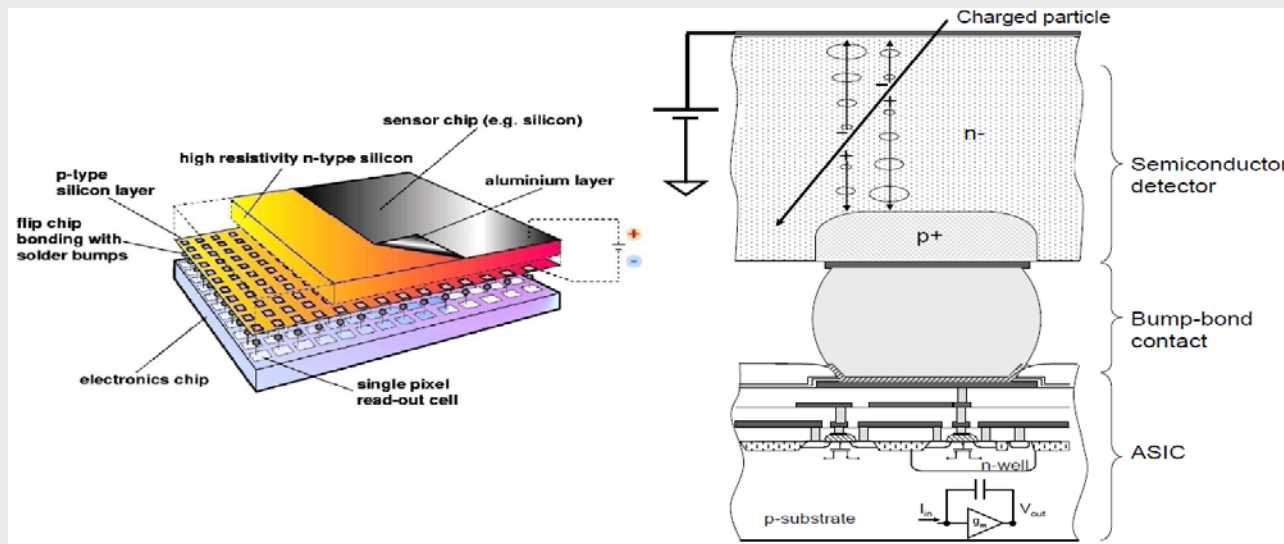
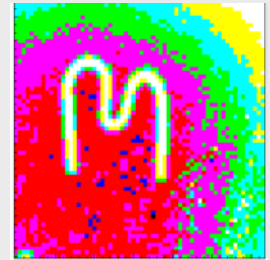
153 high energy particle tracks flying through a telescope of half a million pixels in the WA97 experiment back in 1995

# Example of successful transfer

- **Medipix 2 collaboration**

17 institutes and labs including Nihkef

High spatial, high contrast resolving CMOS pixel read-out chip working in single photon counting mode



# Example of successful transfer

- Partnership and license agreements with a Dutch company to build a X-ray diffractometer



# Example of successful transfer

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- Other applications
  - X-ray imaging
  - SPEC
  - Nuclear power plan decommissioning
  - Electron microscopy
  - Dosimetry
  - Background radiation monitoring
  - Etc.

# Useful links and contacts

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- CERN Technology Transfer web site:

<http://technologytransfer.web.cern.ch/TechnologyTransfer/>

E-mail contacts:

[Giovanni.Anelli@cern.ch](mailto:Giovanni.Anelli@cern.ch)

[Hartmut.Hillemanns@cern.ch](mailto:Hartmut.Hillemanns@cern.ch)

[Enrico.Chesta@cern.ch](mailto:Enrico.Chesta@cern.ch)

[Bernard.Denis@cern.ch](mailto:Bernard.Denis@cern.ch)

- Collaborations

<http://medipix.web.cern.ch/MEDIPIX>

<http://rd51-public.web.cern.ch/RD51-public>

<http://crystalclear.web.cern.ch>

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Thank you!

