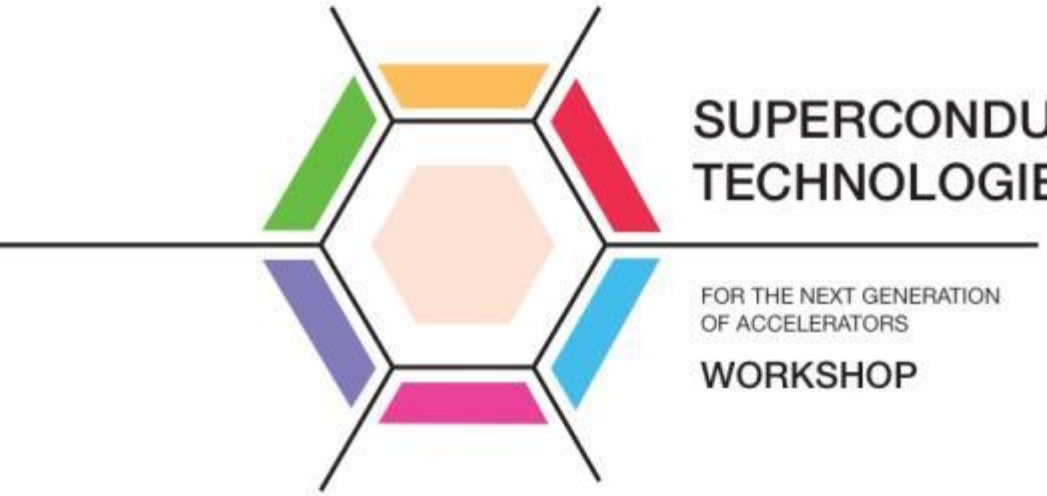
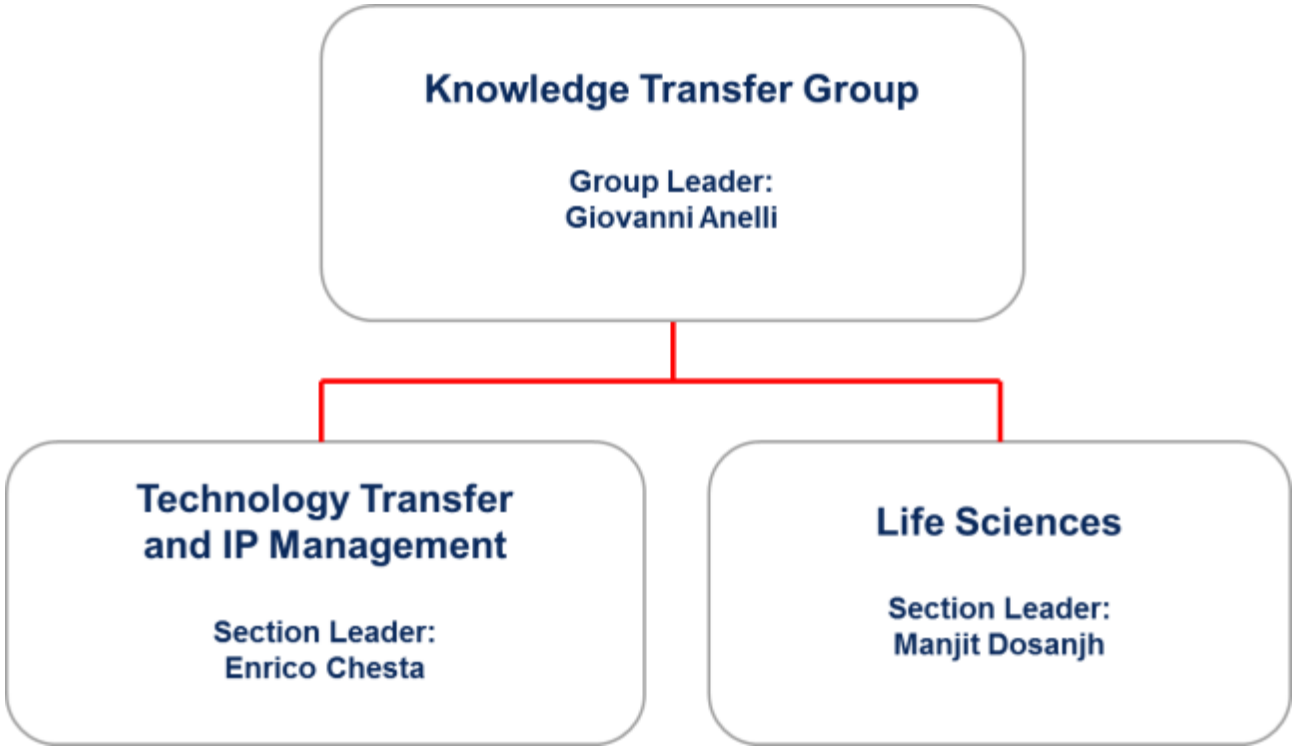
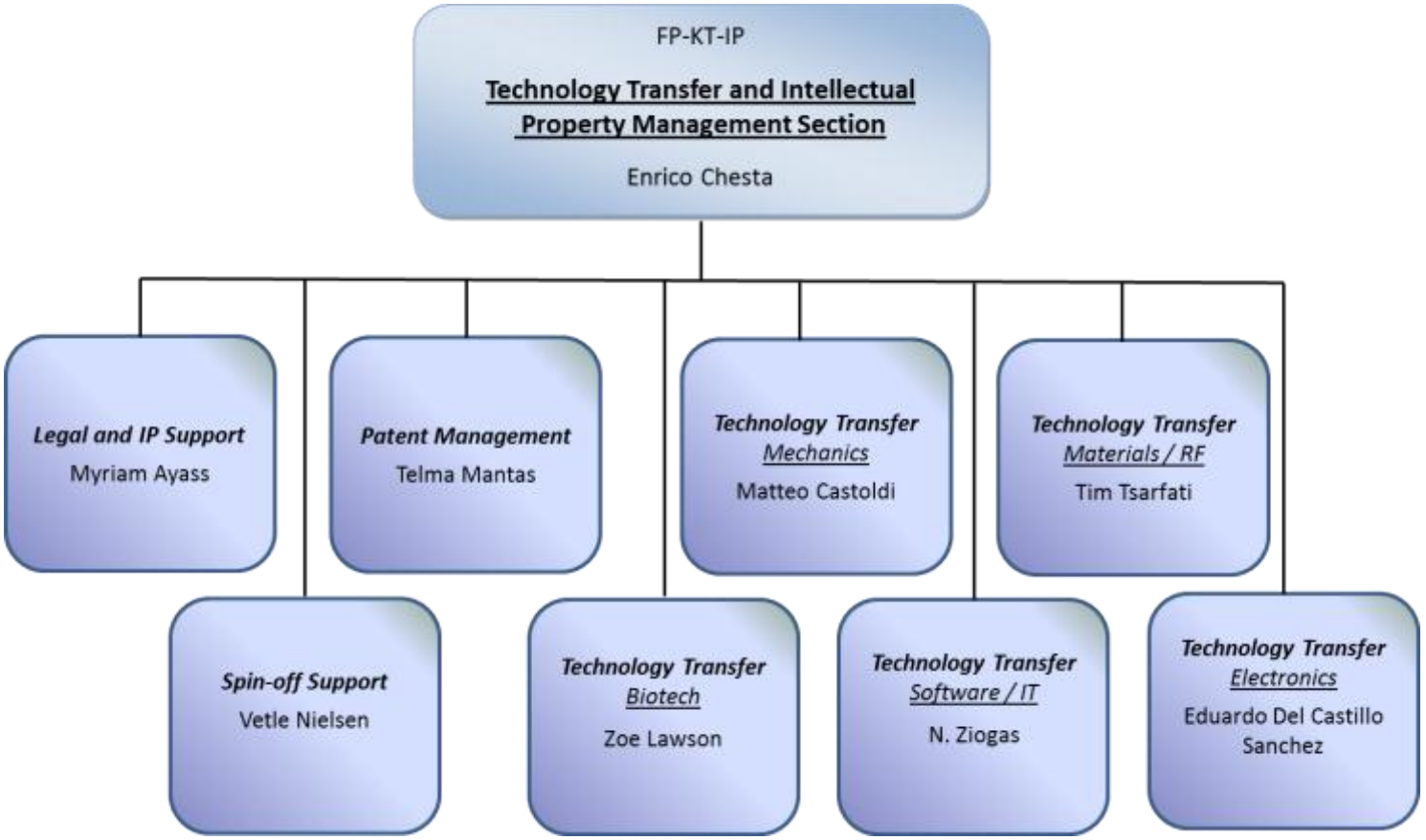


Giovanni Anelli
Knowledge Transfer at CERN

The CERN FP / KT Group



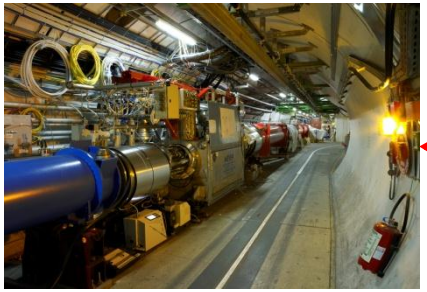
The FP / KT / IP Section

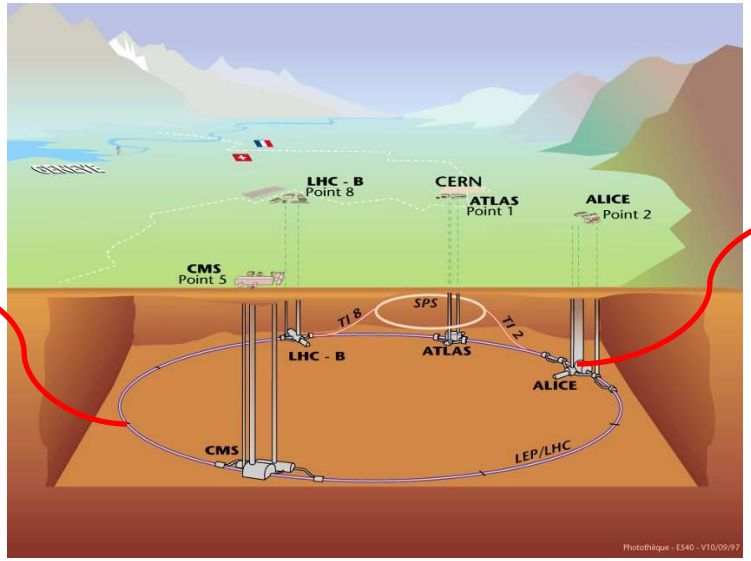


CERN Technologies

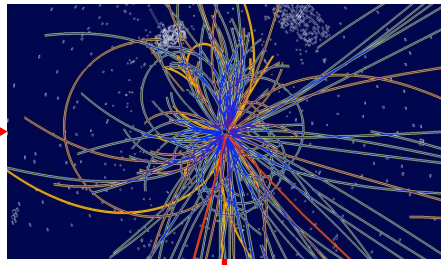
CERN innovates in three areas

Accelerating particle beams





Detecting particles

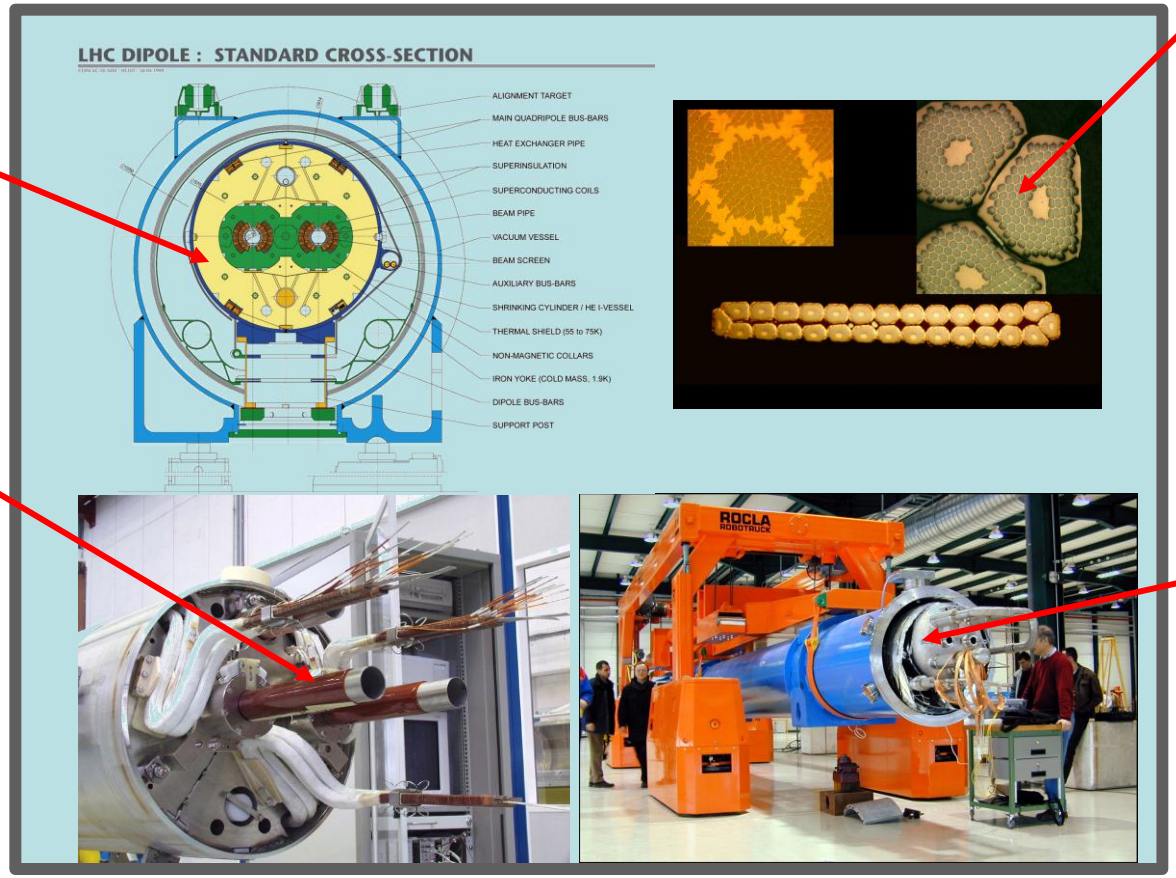


Large-scale computing (Grid)

Accelerator Technologies

Superconductivity
(12kA)

Cryogenics
(1.9 K)

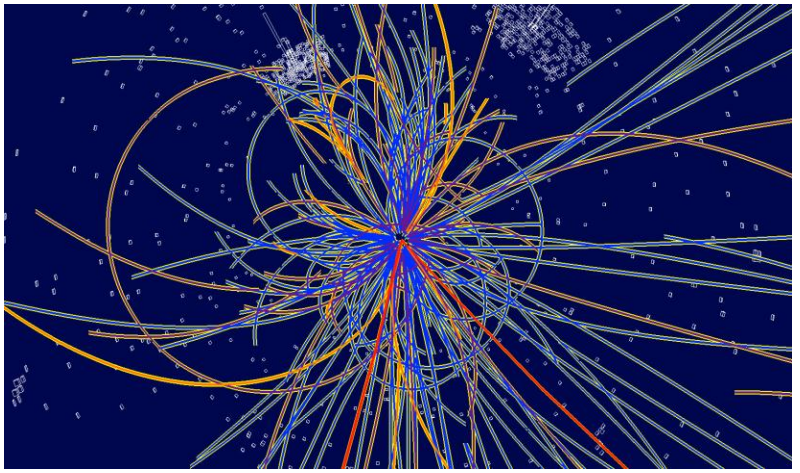


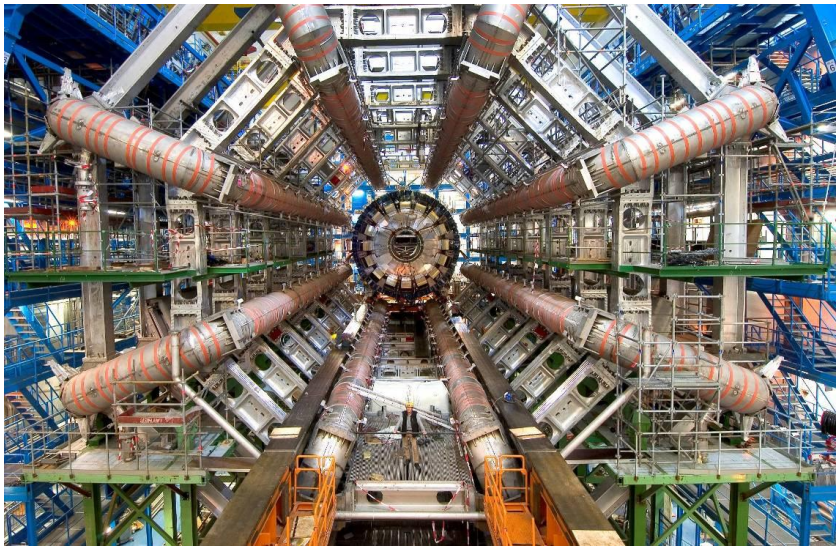
Vacuum
(10^{-13} atm)

Magnets
(8 T)

Detector Technologies

Challenge: sample the results of up to 600 million proton-proton collisions per second!





LHC detectors have sophisticated electronic trigger systems that precisely measure the passage time of a particle to accuracies in the region of a few billionths of a second. The trigger system also registers the location of the particles to millionths of a metre. This is essential for ensuring that the particle recorded in successive layers of a detector is one and the same.

Computing Technologies: the Grid

After filtering, CERN detectors select ~200 interesting collisions per second.
Several MBs of data to be stored for each collision...

→ more than 20 Petabytes/year of data!

8 Megabyte (8MB)
A digital photo

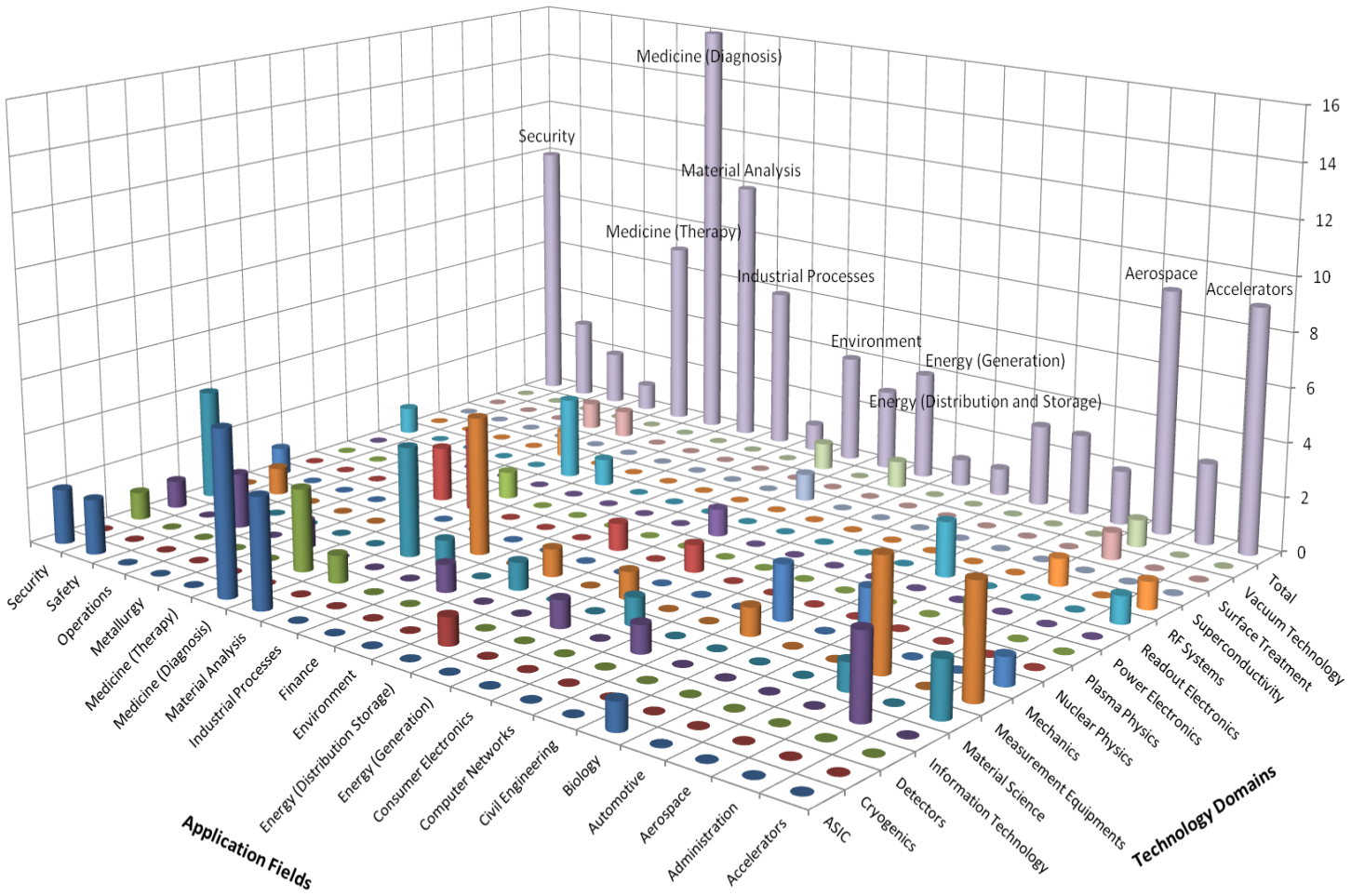
1 Gigabyte (1GB)
= 1000MB
A DVD movie

1 Terabyte (1TB)
= 1000GB
World annual
book production

>20 Petabytes (20PB)
= 20000TB
Annual LHC data output

CERN, home of the World Wide Web, is a driving force in Grid Computing

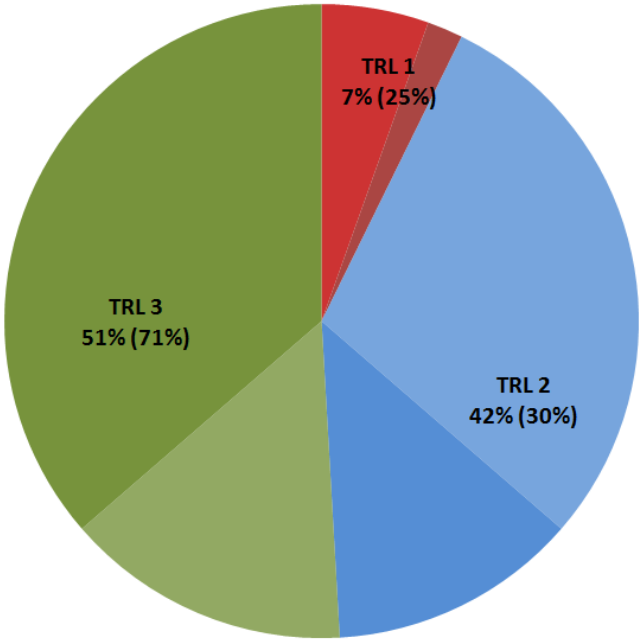
CERN's Technology Portfolio



Technology Portfolio - statistics

Technology Portfolio - General Statistics

- ~200 TT cases (30% open, 20% protected by patent)
- ~20 new disclosures per year
- Exploitation level: ~50%

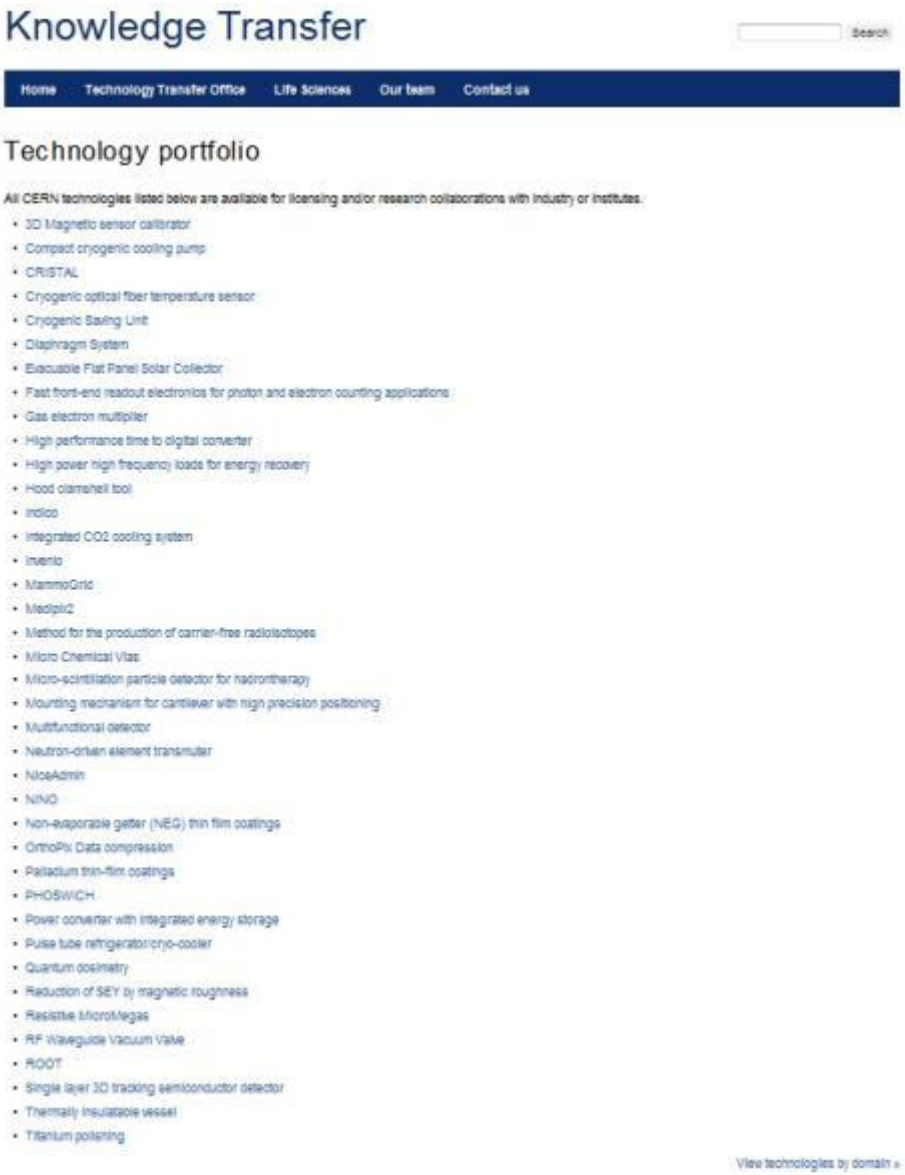


Technology readiness level (TRL)

TRL	Simplified Definition
1	Technology application formulated and basic concept demonstrated
2	Functional validation in laboratory environment
3	Representative prototype fully qualified (technology ready to transfer)

Visit our website to have a look at our technology portfolio in detail

www.cern.ch/knowledgetransfer



A whole spectrum of opportunities

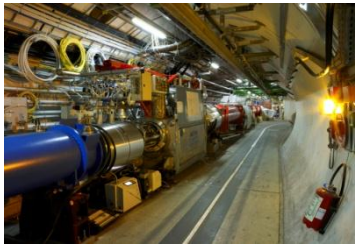
Licensing

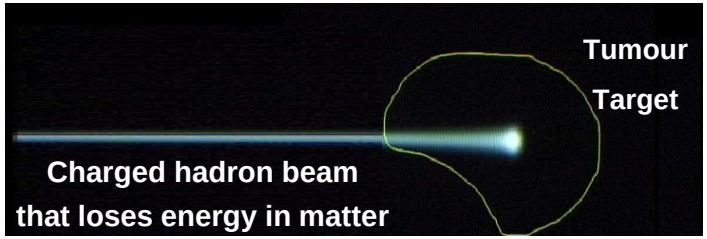
Service and Consultancy

R&D collaborations

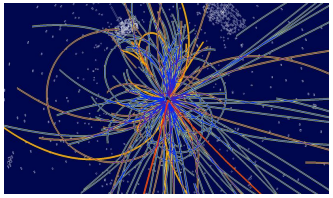
Medical applications

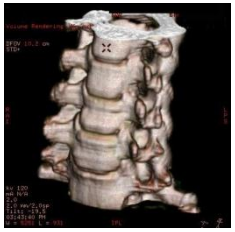
Particle accelerators for hadron therapy



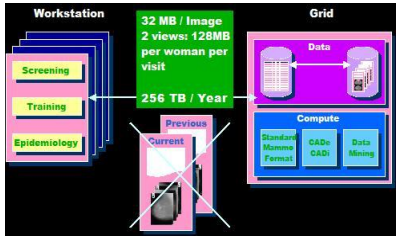


Particle detector for medical imaging

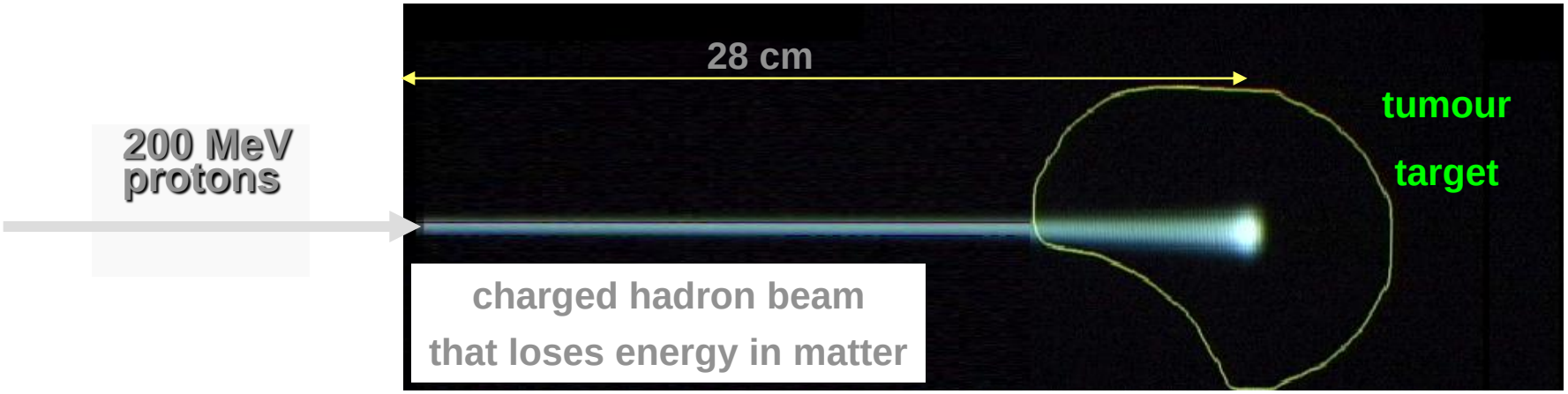




Grid computing for medical data management and analysis

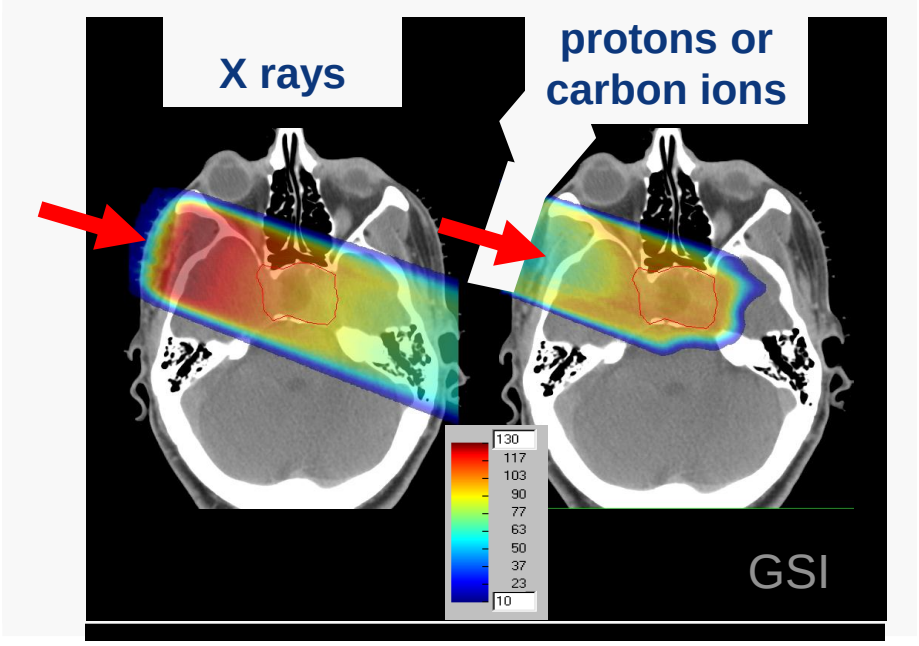


Hadron Therapy



Hadron beams provide new treatment opportunities for deep-seated tumours.

Hadron beams are more effective than X-rays in destroying tumours while sparing healthy tissues nearby.



From high vacuum…

- NEG (Non-Evaporable Getter thin film coatings)

Technology used to create and maintain ultra-high vacuum in the accelerator vacuum chambers.

… to solar energy!

- License and partnership with a start-up company

Development of a commercial product able to use diffused or indirect light and reach very high temperatures of up to 300 degrees
Development of a prototype production chain

Solar panels plant

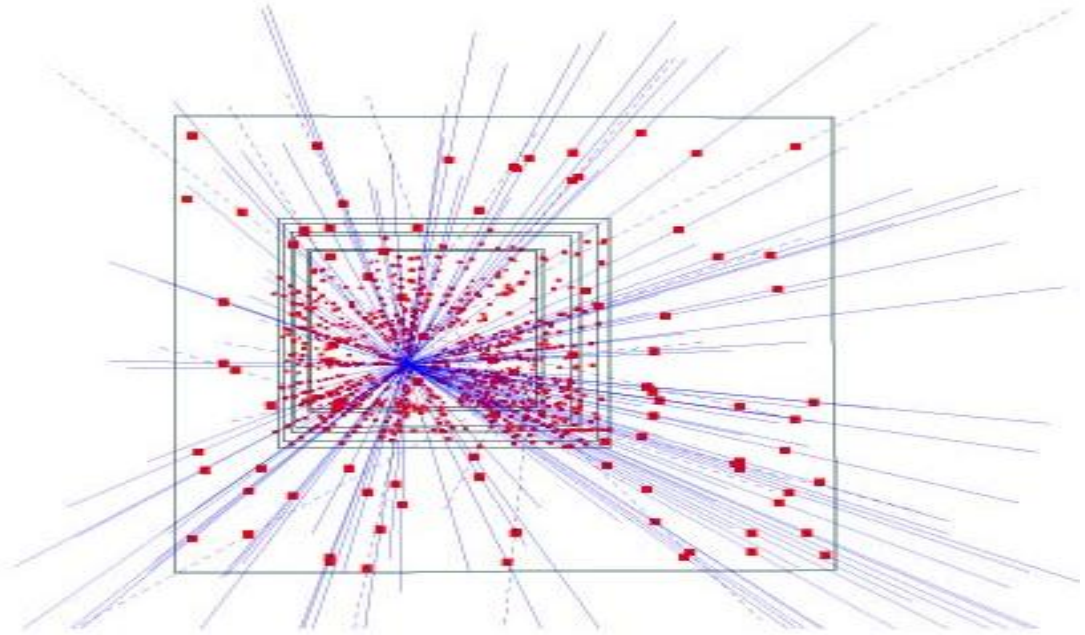
- Civil-engineering company opened a new solar power plant

  Environmentally friendly "solar field" heats close to 80,000 cubic metres of bitumen to 180 degrees.

Installation at GVA airport

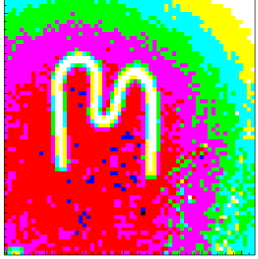
Silicon pixel detectors (SPDs)

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



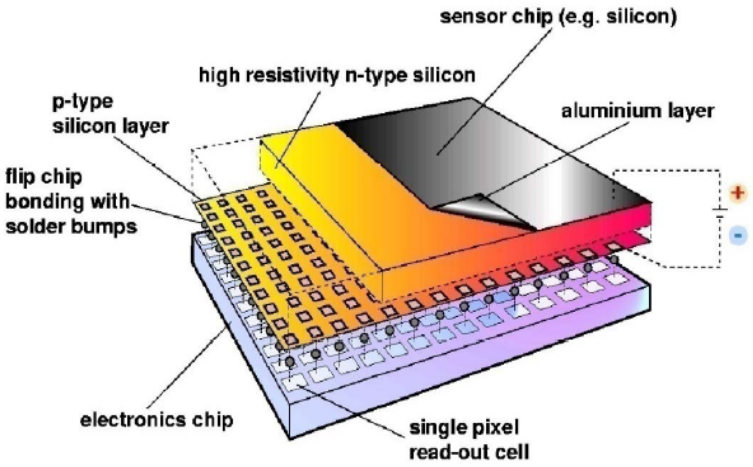
153 high energy particle tracks flying through a telescope of half a million pixels in the WA97 experiment back in 1995

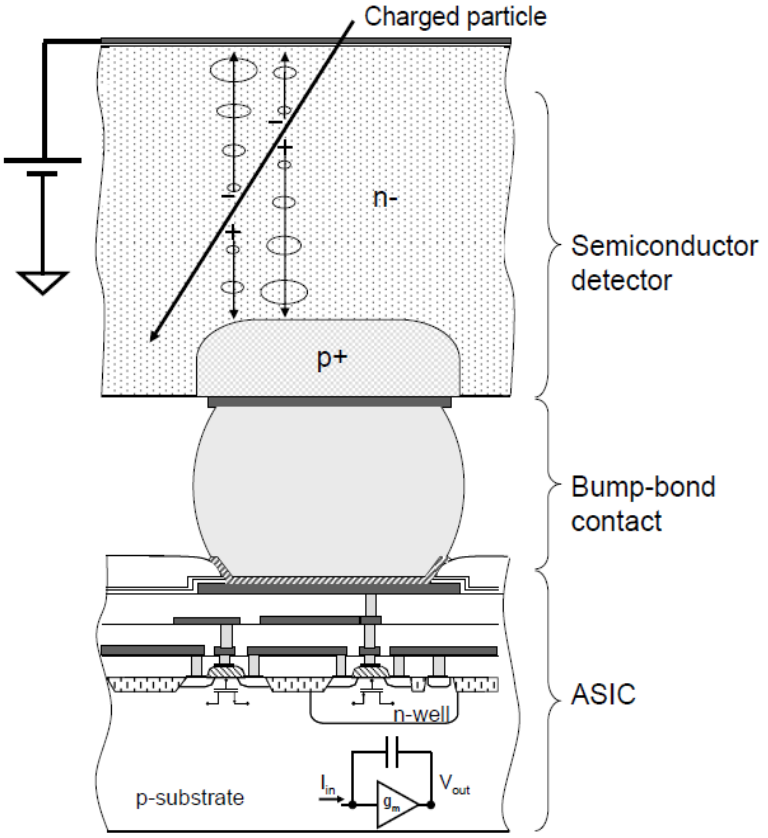
Medipix



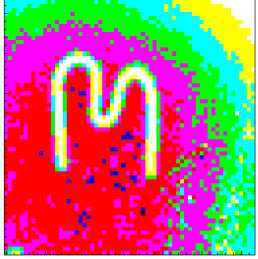
- Medipix 2 collaboration

  17 institutes and labs





Medipix

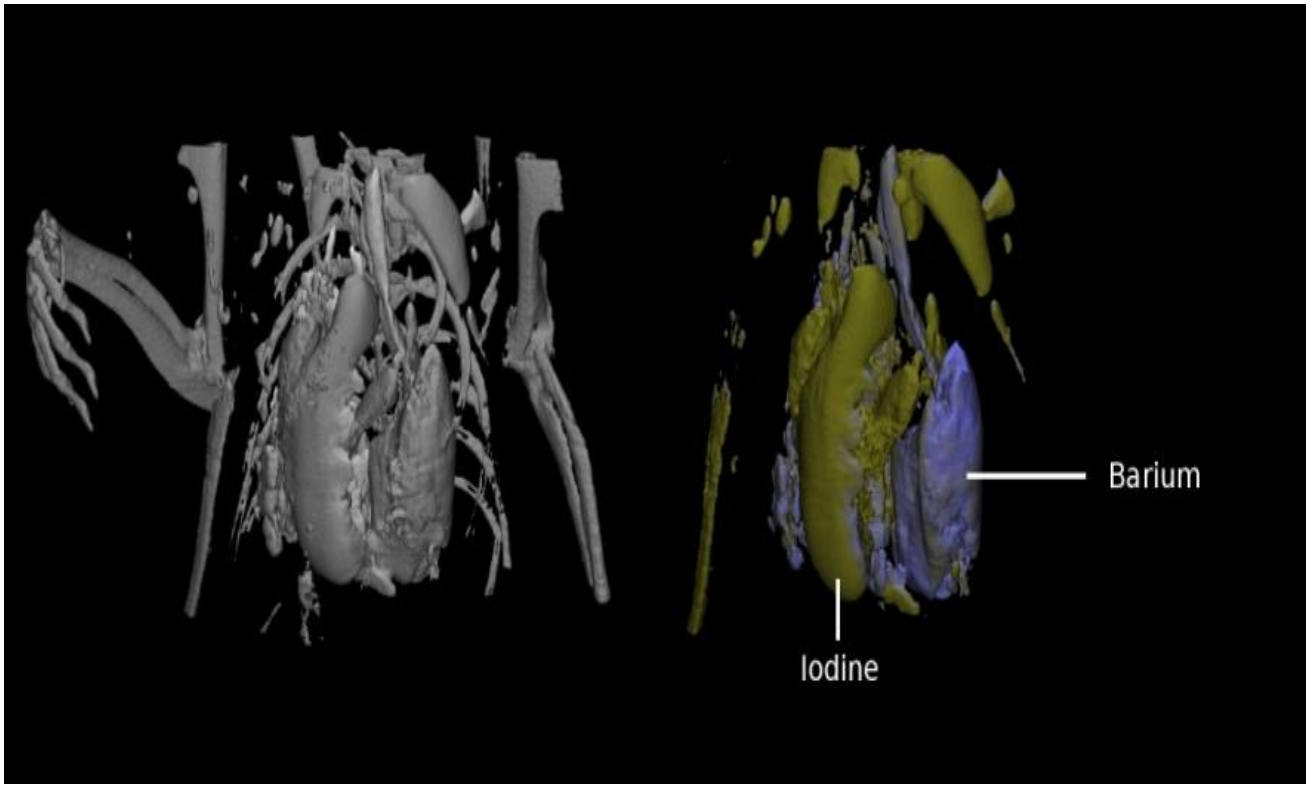


- A family of single photon counting integrated circuits used in Hybrid Silicon Pixel Detectors
- The Medipix collaborations (close to 20 institutes) contributed to the development and dissemination of the technology
- A good example of how (fundamental) science fosters innovation which can be transferred to society… and back!

Application: Medical imaging

- MARS project

  Colour CT X-ray scanner based on the Medipix technology



(courtesy of MARS Bioimaging Ltd)

Application: Material analysis

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

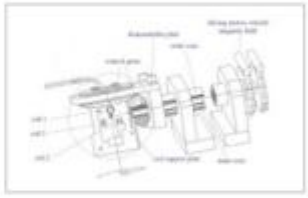
CERN Easy Access IP

CERN Easy Access IP is a new opportunity to benefit of CERN's Intellectual Property.

The scheme involves making some of CERN's technologies available free of royalties, released only to partners who can best develop them to benefit the economy and society.
If you would like to know more about CERN Easy Access IP or other technology transfer opportunities, please contact CERN's Technology Transfer Office.

The following technologies are available under the CERN Easy Access IP scheme:

3D Magnetic sensor calibrator



This is an innovative device for calibrating magnetic field with high resolution. The technology measures all three axes of the magnetic field, by performing a scan over the full unit sphere, independent of its orientation relative to the magnetic field.

[read more]

RF Waveguide Vacuum Valve

This device enables low-loss RF power transmission in a waveguide across a gap, where a liftable instrument is positioned.

[read more]

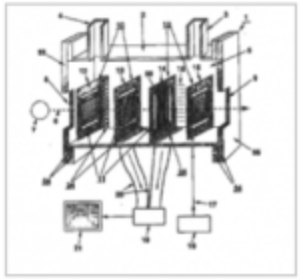
Thermally insulatable vessel

The Thermally insulatable vessel is a simple container system for hot substances, incorporating a temperature display within the vessel's cap or lid.

The key element in this technology is an integrated infra-red thermometer developed with Micro-Electro-Mechanical systems on a common silicon substrate through micro fabrication technology.

[read more]

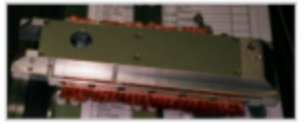
Multifunctional detector



A multifunctional, versatile position-sensitive detector for measuring characteristics of a beam of particles.
The technology consists of a microwire-based monitor that allows measuring non-destructively the spatial profile, divergence, and intensity of UV, x-ray, and charged particle beams, including anti-particles.

[read more]

Cryogenic optical fiber temperature sensor



The technology consists in a simple and relatively cheap cryogenic temperature sensor, composed of an optical fiber and a Brillouin spectral analyzer for measuring one or more temperature dependent Brillouin scattering parameters.

[read more]

Easy Access IP was first trialled by Easy Access Initiative, a collaborative project between the University of Glasgow, King's College London and the University of Bristol.

CERN Easy Access IP Exclusive Licence agreement
CERN Easy Access IP Non-Exclusive Licence agreement

CERN Open Hardware Licence

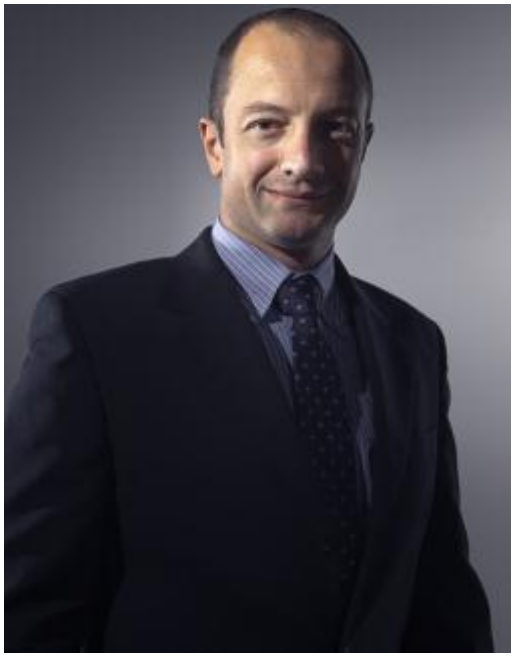
A legal framework to facilitate knowledge exchange across the electronic design community.

In the spirit of knowledge and technology dissemination, the CERN OHL was created to govern the use, copying, modification and distribution of hardware design documentation, and the manufacture and distribution of products.

Other KT people at this workshop

Enrico CHESTA
Technology Transfer
Section Leader

Matteo Castoldi
Technology Transfer
Officer



Tim Tsarfati
Technology Transfer
Officer

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