

# Knowledge and Technology Transfer @ CERN

**G. Anelli, Head of KT Group**

**25.11.2016**

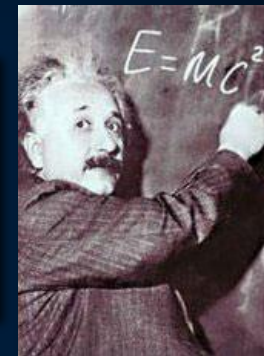
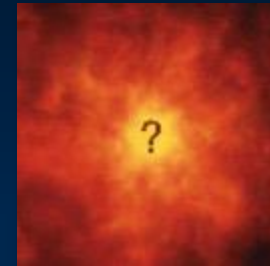




# The Mission of CERN

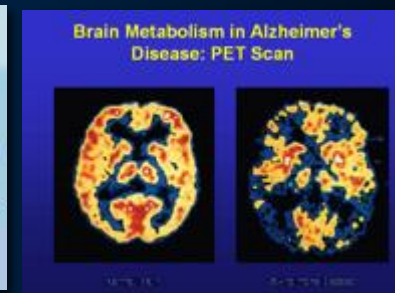
## ❑ Push back the frontiers of knowledge

E.g. the secrets of the Big Bang ...what was the matter like within the first moments of the Universe's existence?



## ❑ Develop new technologies for accelerators and detectors

Information technology - the Web and the GRID  
Medicine - diagnosis and therapy



## ❑ Train scientists and engineers of tomorrow



## ❑ Unite people from different countries and cultures





LHCb

ATLAS

CERN Meyrin

CERN Provençin

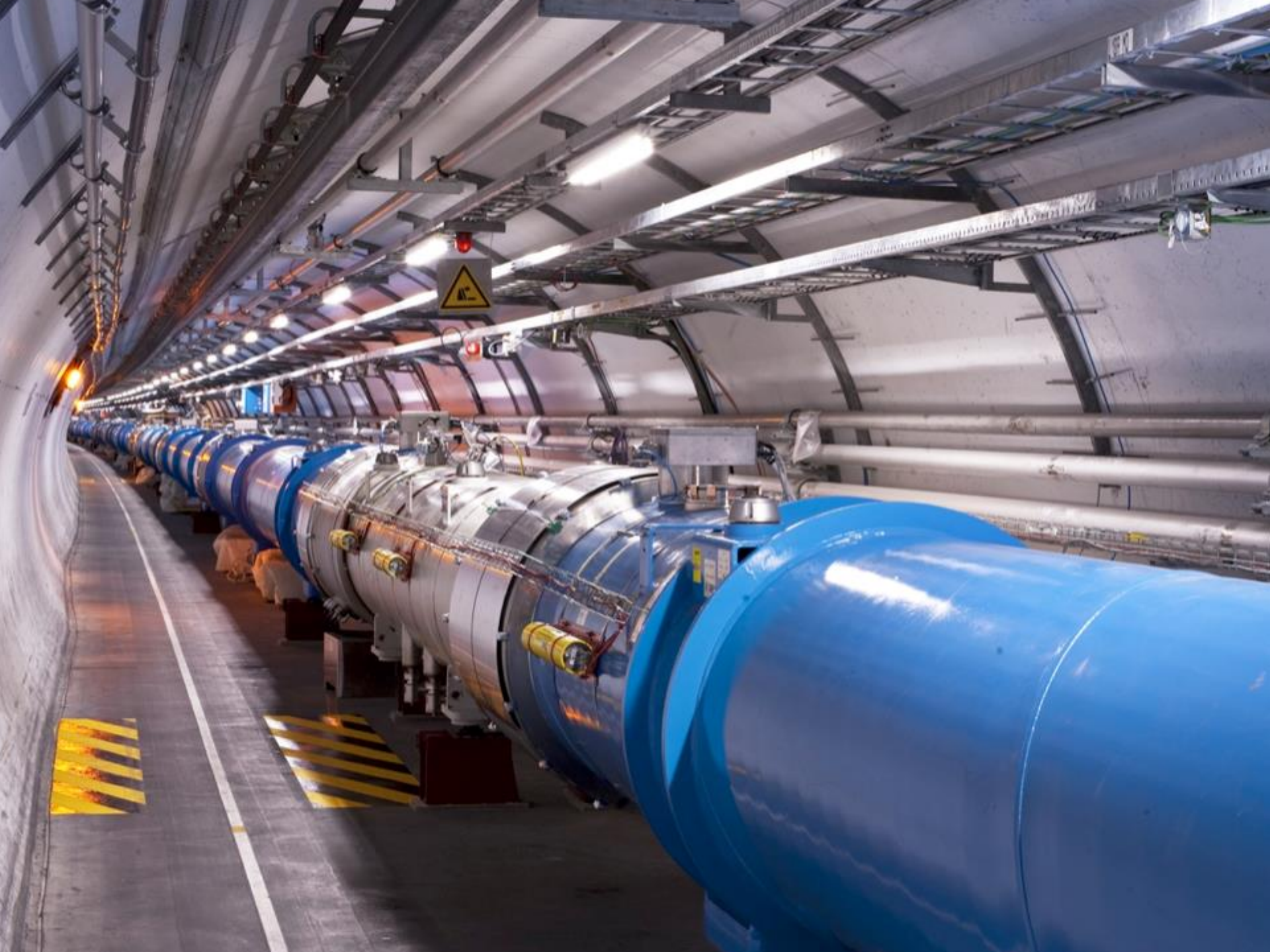
SPS 7 km

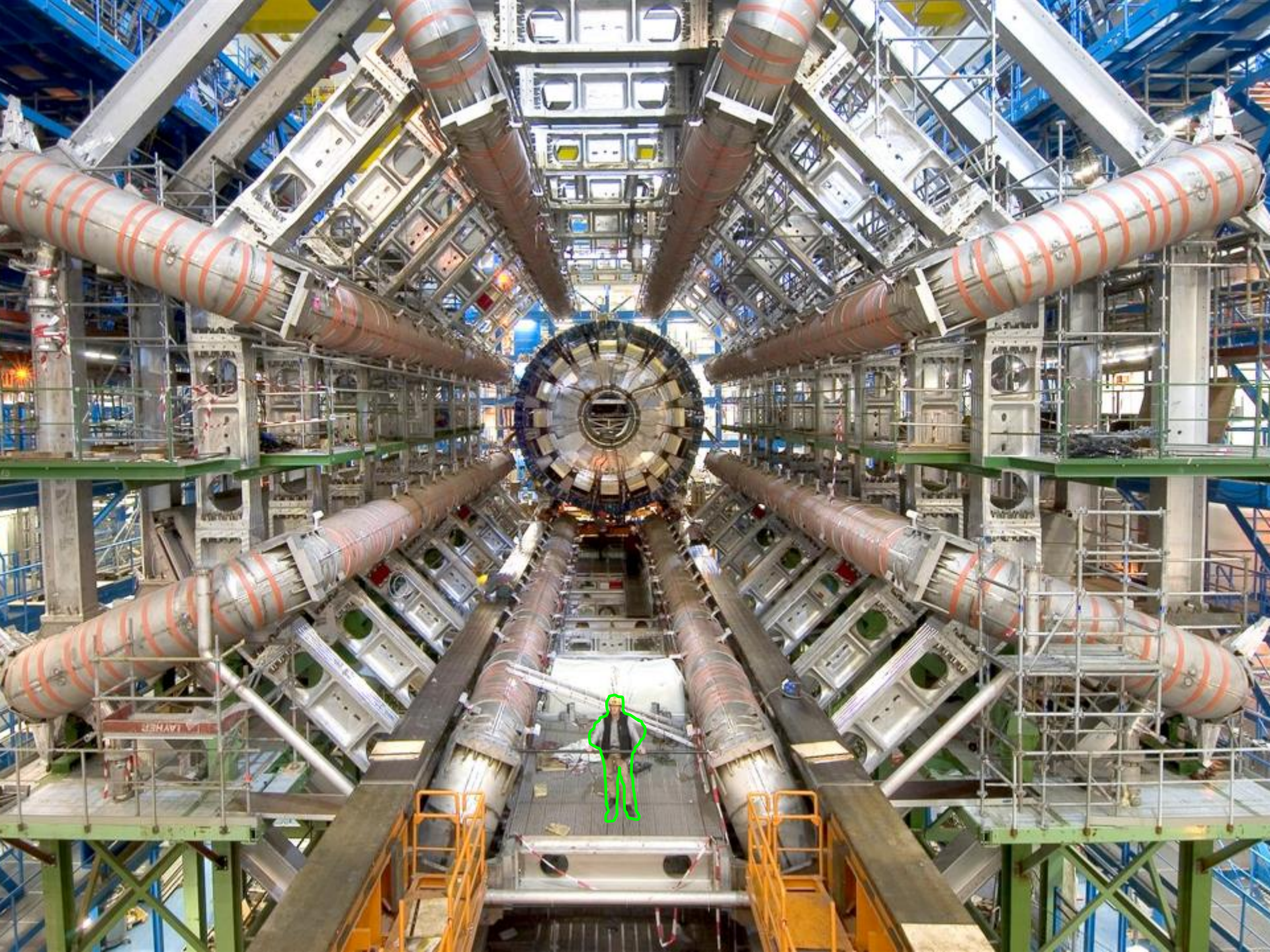
ALICE

CMS

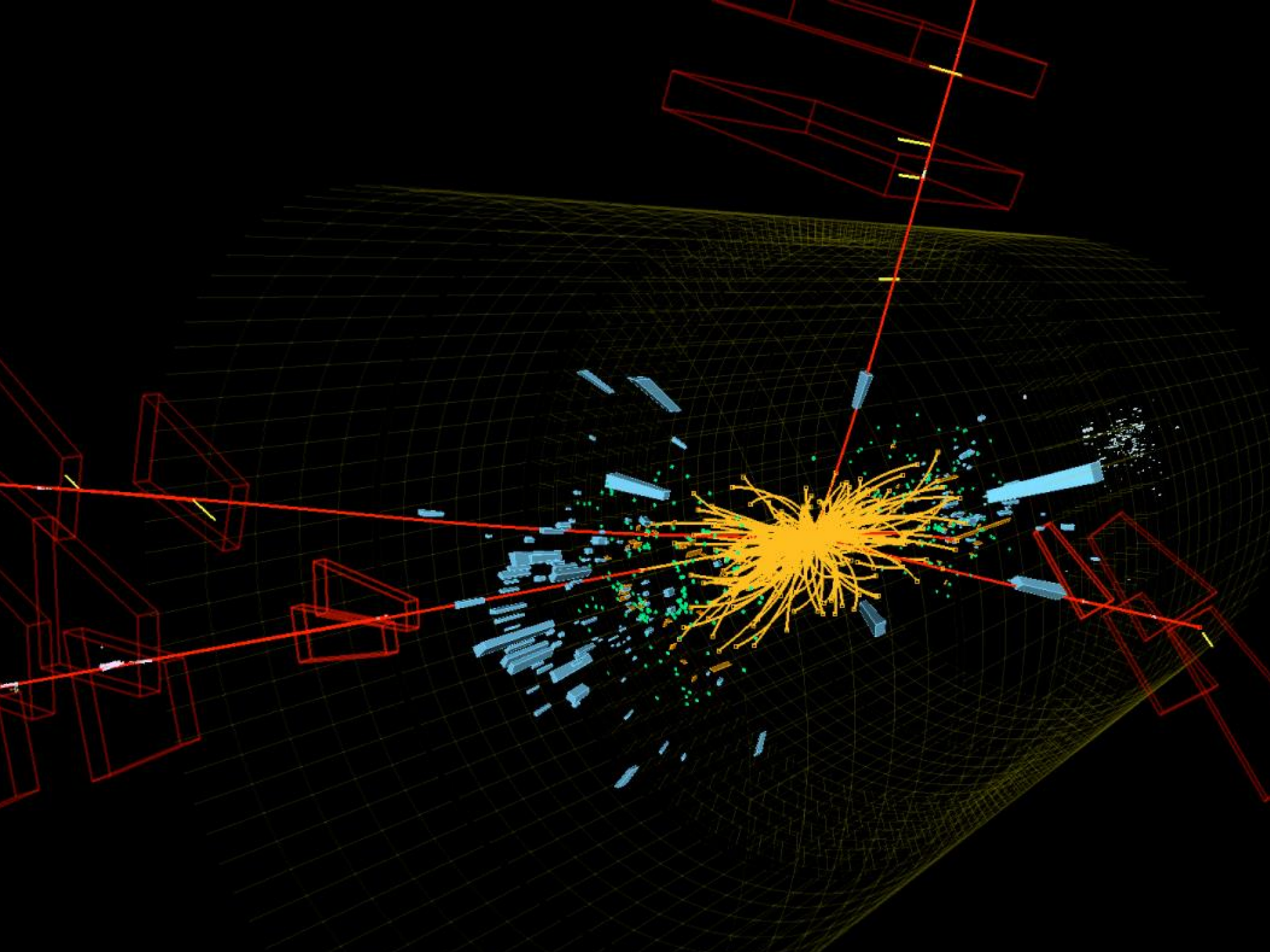
LHC 27 km

SUISSE  
FRANCE









**The  
Economist**

JULY 7TH-13TH 2012

[Economist.com](http://Economist.com)

In praise of charter schools  
Britain's banking scandal spreads  
Volkswagen overtakes the rest  
A power struggle at the Vatican  
When Lonesome George met Nora

# A giant leap for science

**Finding the  
Higgs boson**

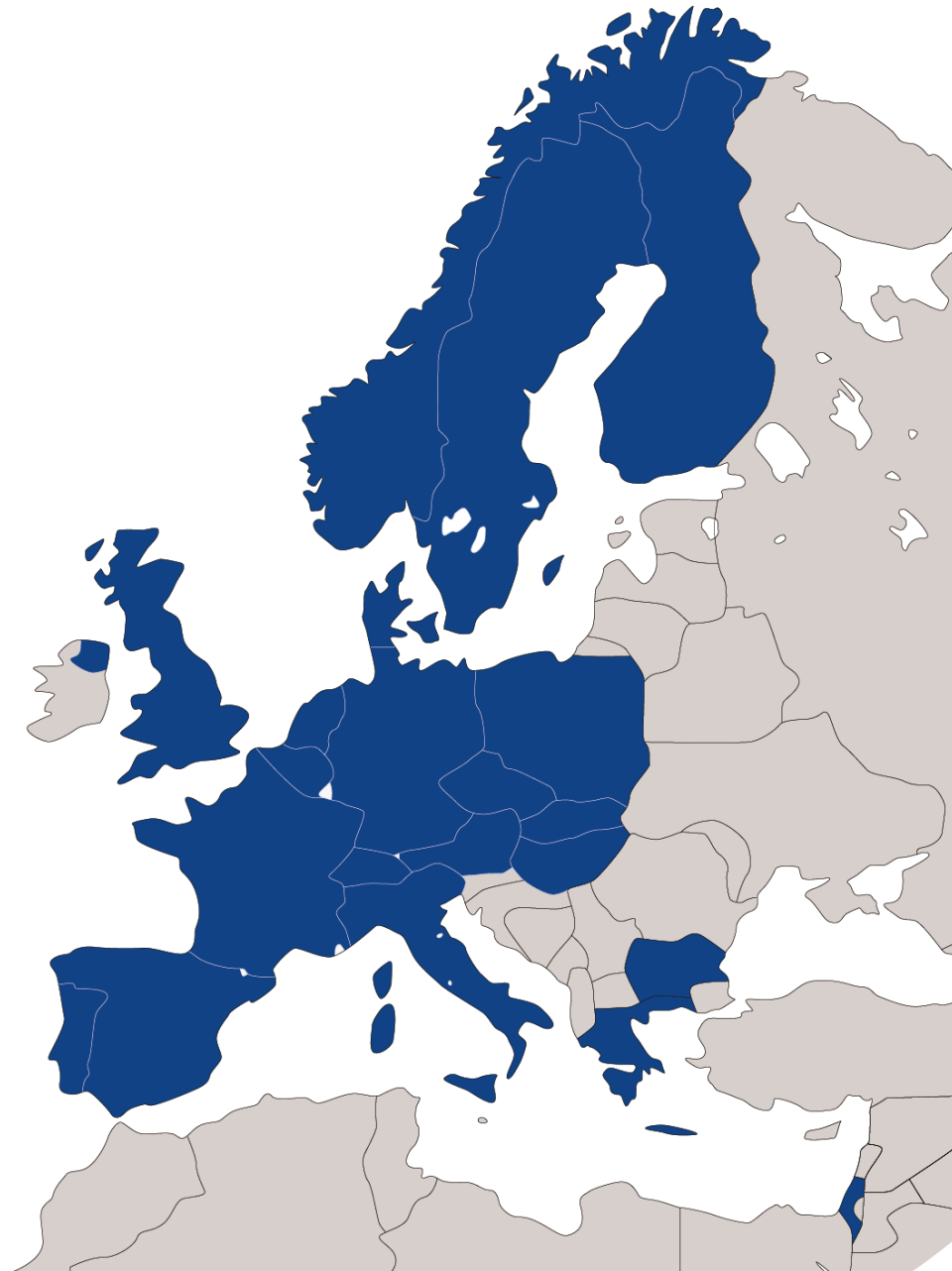
# KT Mission

Maximize the technological and knowledge return to society, in particular through Member States industry

Promote CERN's image as a center of excellence for technology and innovation

Demonstrate the importance and impact of fundamental research investments

**Key words are dissemination and impact**

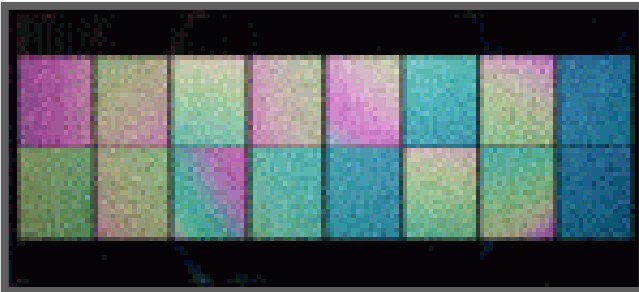
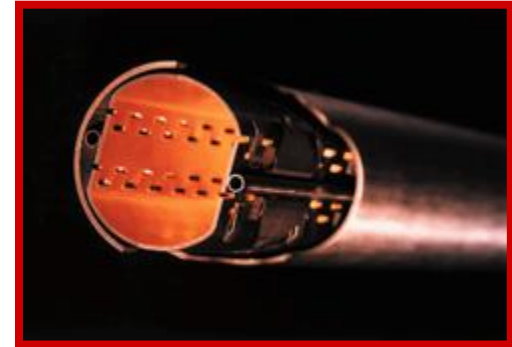


# CERN Core Competences

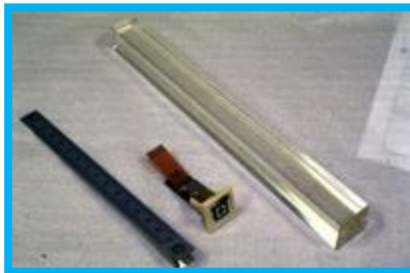
Super-  
conductivity  
(13kA,  
7MJoules)



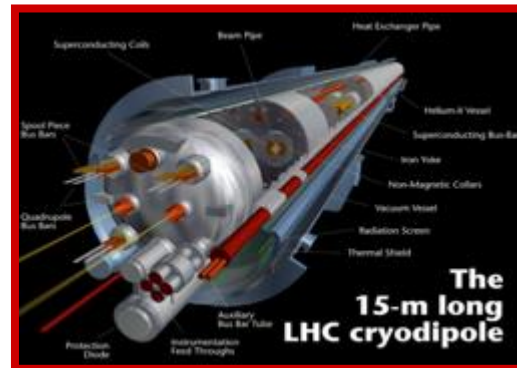
Vacuum  
( $10^{-12}$   
Torr)



Very high  
performance  
detectors and  
electronics

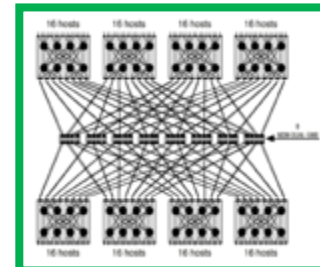


Cryogenics (1.9 K)

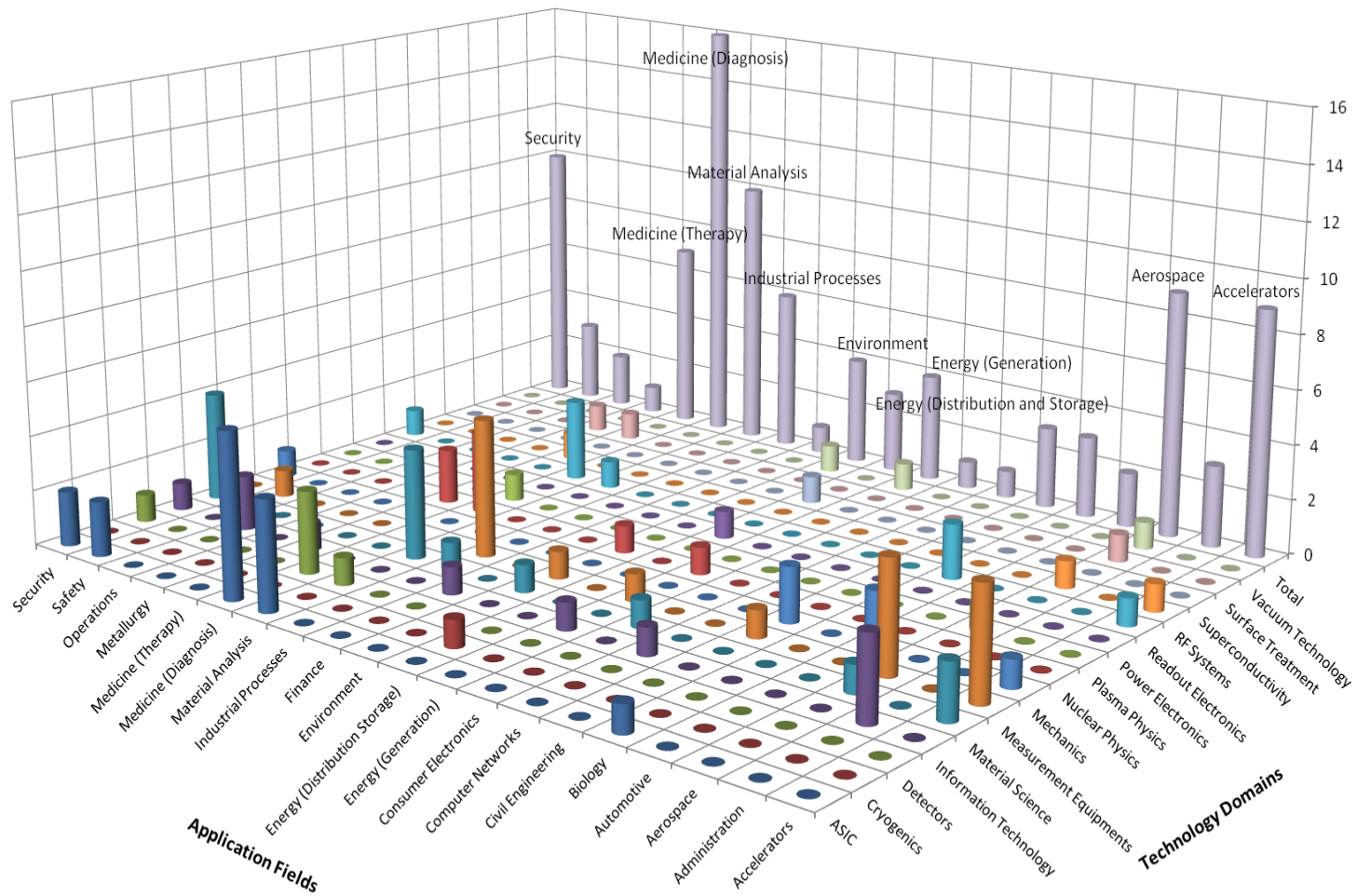


Magnets  
(10 T)

Data  
processing



# CERN's Technology Portfolio



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

[www.cern.ch/  
knowledgetransfer](http://www.cern.ch/knowledgetransfer)

## Knowledge Transfer

 Search

[Home](#) [Technology Transfer Office](#) [Life Sciences](#) [Our team](#) [Contact us](#)

### Technology portfolio

All CERN technologies listed below are available for licensing and/or research collaborations with industry or institutes.

- 3D Magnetic sensor calibrator
- Compact cryogenic cooling pump
- CRISTAL
- Cryogenic optical fiber temperature sensor
- Cryogenic Saving Unit
- Diaphragm System
- Evacuable Flat Panel Solar Collector
- Fast front-end readout electronics for photon and electron counting applications
- Gas electron multiplier
- High performance time to digital converter
- High power high frequency loads for energy recovery
- Hood clamshell tool
- Indico
- Integrated CO<sub>2</sub> cooling system
- Invenio
- MammoGrid
- Medipix2
- Method for the production of carrier-free radioisotopes
- Micro Chemical Vias
- Micro-scrintillation particle detector for hadrontherapy
- Mounting mechanism for cantilever with high precision positioning
- Multifunctional detector
- Neutron-driven element transmuter
- NiceAdmin
- NINO
- Non-evaporable getter (NEG) thin film coatings
- OnnoRx Data compression
- Palladium thin-film coatings
- PHOSWICH
- Power converter with integrated energy storage
- Pulse tube refrigerator/cryo-cooler
- Quantum osimetry
- Reduction of SEY by magnetic roughness
- Resistive MicroMegas
- RF Waveguide Vacuum Valve
- ROOT
- Single layer 3D tracking semiconductor detector
- Thermally insulatable vessel
- Titanium polishing

[View technologies by domain »](#)

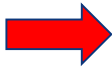
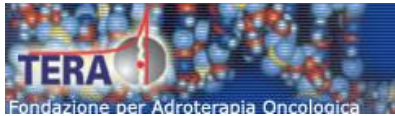
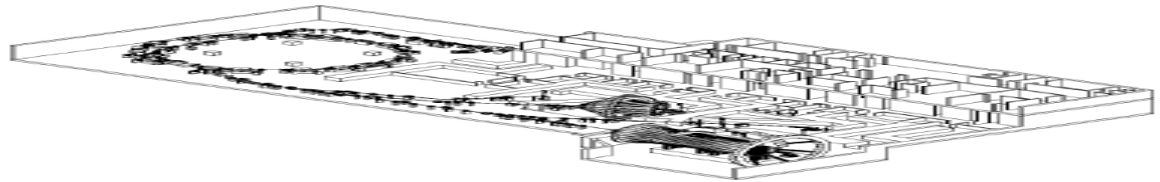


# KT Modes



# CERN's PIMMS Study

PIMMS 2000  
(coordinated by  
CERN) has led to:



fondazione CNAO

Treatment centre in Pavia, Italy.

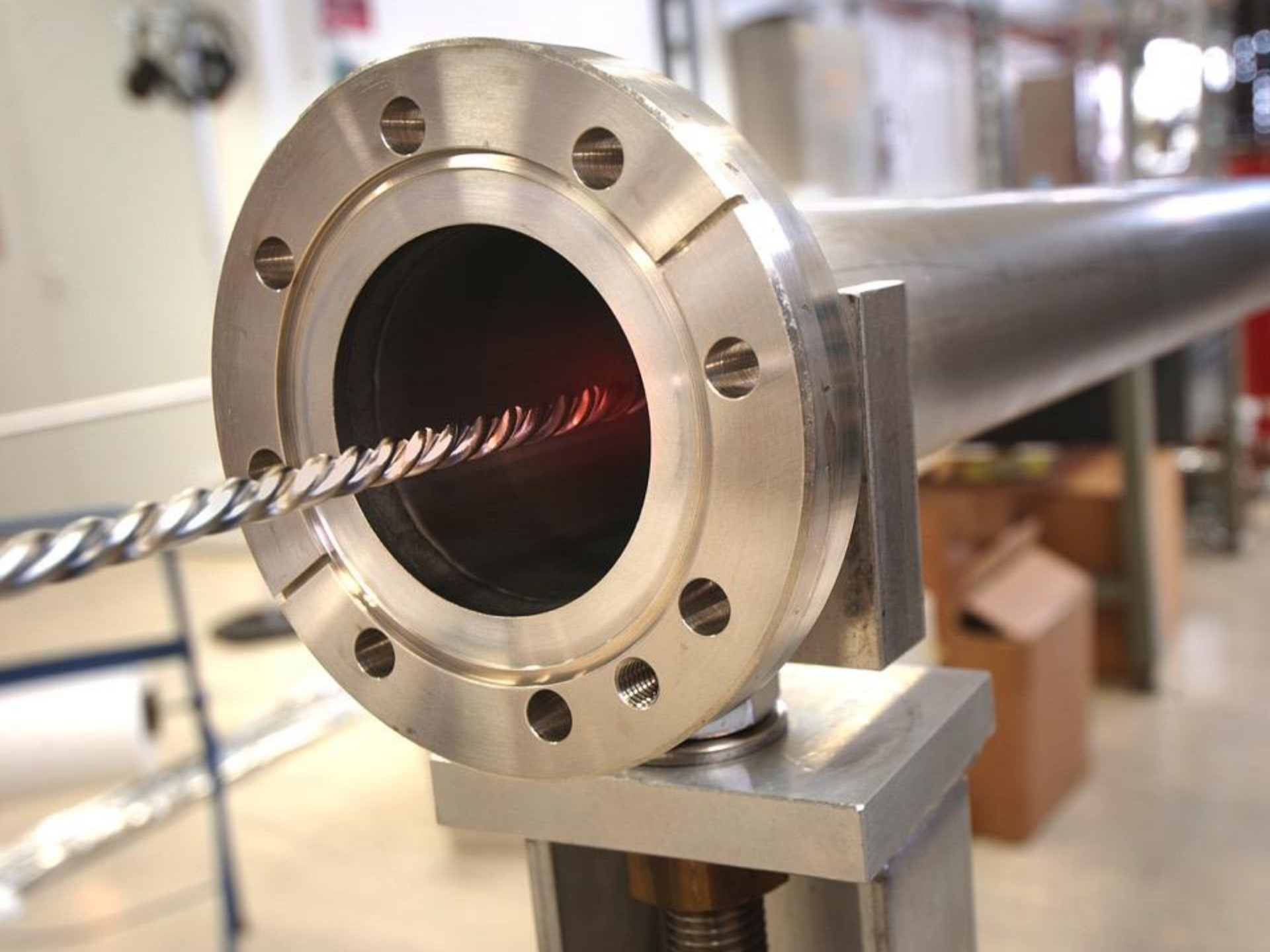
**First patient treated with Carbon ions in November 2012!**



Treatment centre in Wiener Neustadt, Austria,  
foundation stone 16 March 2011, will be ready in 2017

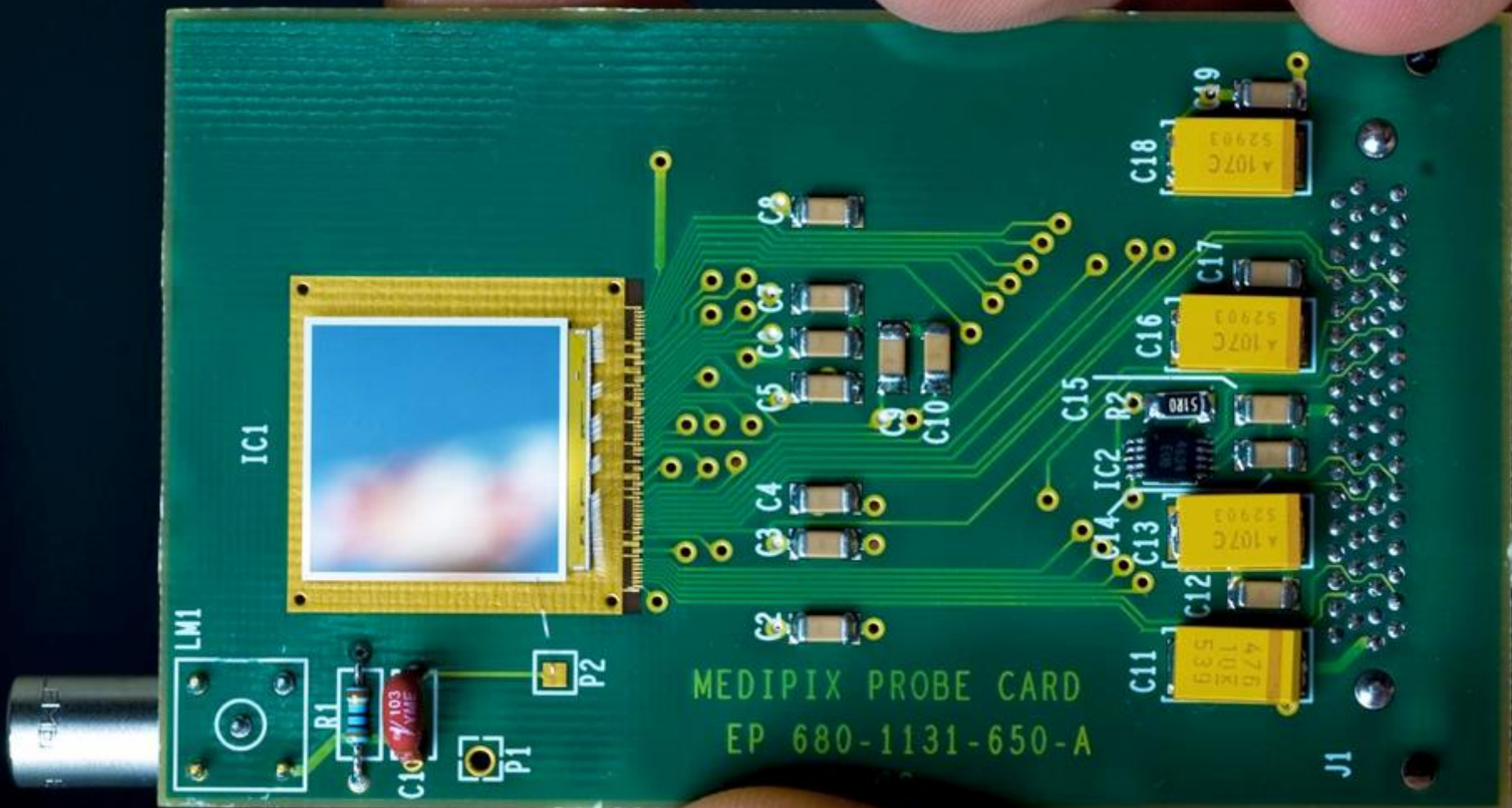


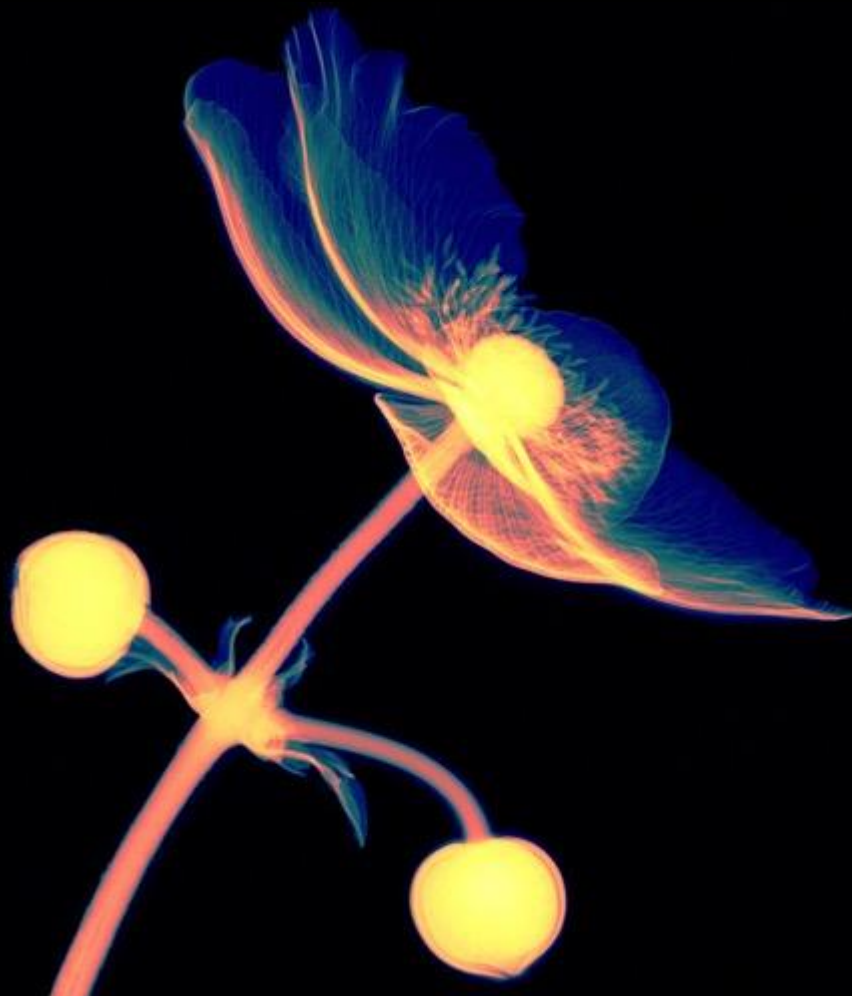




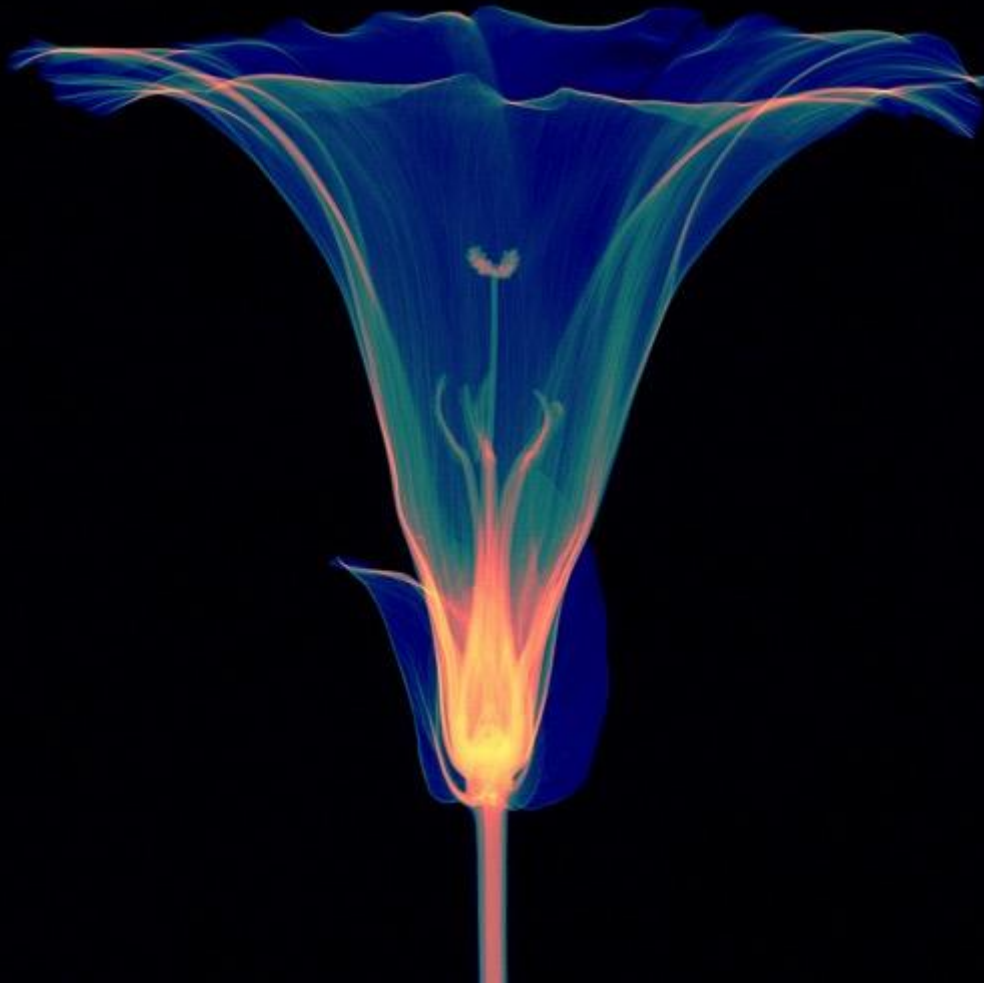




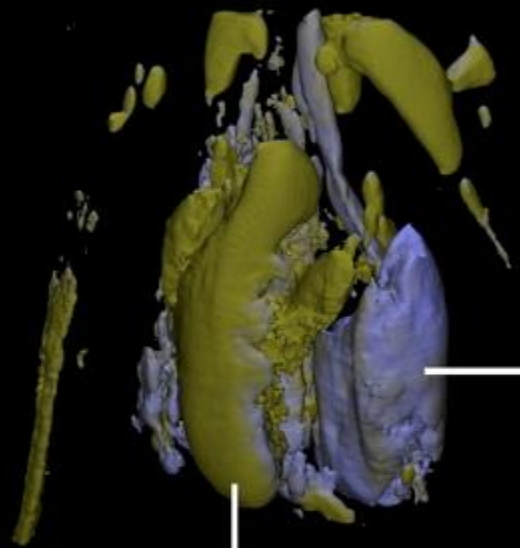
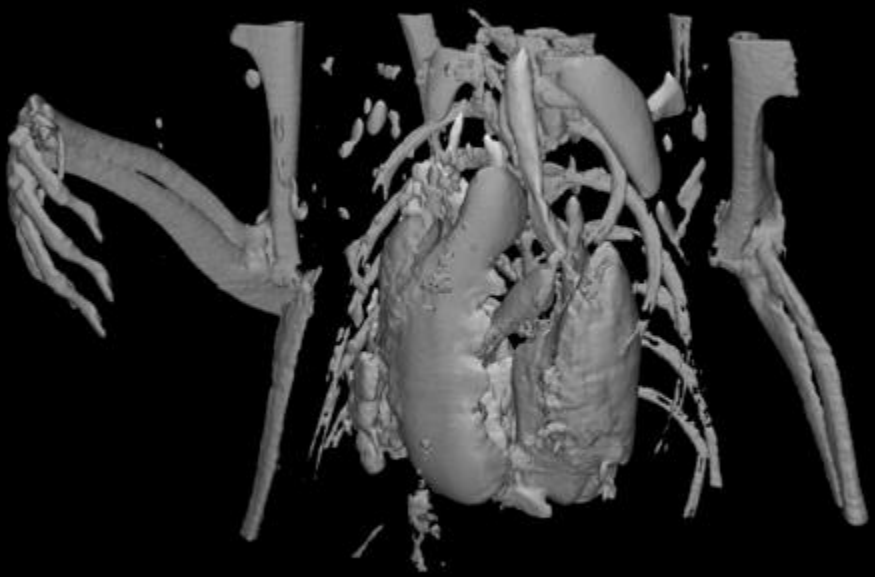




Credit: Simon Procz



Credit: Simon Procz



Iodine

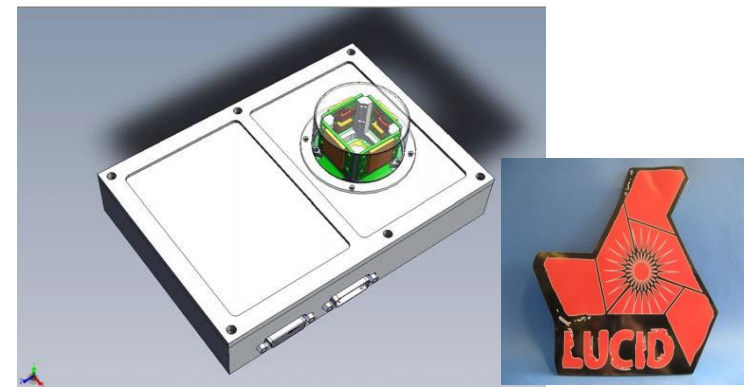
Barium



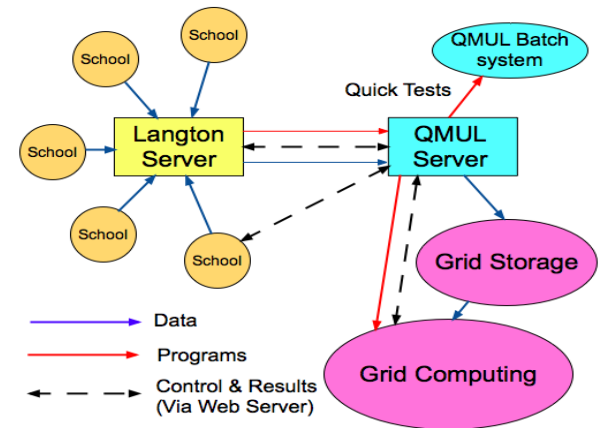




CERN@school allows students to use a Timepix chip in the lab to visualise radiation



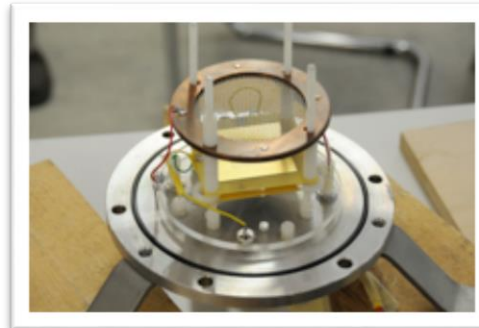
Langton Ultimate Cosmic ray Intensity Detector uses 5 Timepix chips to monitor the radiation environment in Space



Data from LUCID and CERN@school detectors will be uploaded to the Grid and made available for students to analyse

# The KT fund

- CERN's incentive scheme to help transferring our Knowledge and Technologies
- Projects selected by a committee composed by the Heads of Department and KT
- 32 projects have been financed so far



# KT Fund Examples – B

## Funded:

Prototype of a hand-held radiation survey meter operable in high magnetic fields



The KT Fund has catalysed the creation of



Off-the-shelf industrial-grade radiation survey meter by a company from a member state



# KT Fund Examples – Photonic Crystals

## Funded:

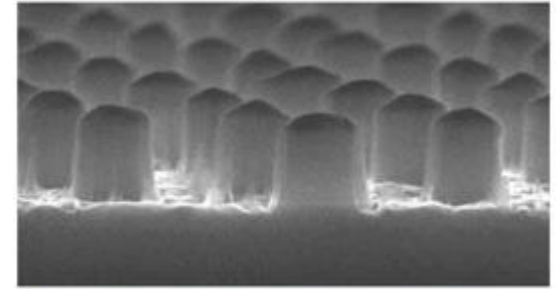
Nanostructuring for improved light extraction  
from scintillating materials



The KT Fund has catalysed the creation  
of



An industry-driven collaboration to achieve  
breakthrough PET scanning performance for  
breast cancer diagnosis



*Si<sub>3</sub>N<sub>4</sub> layer nanostructured to produce a photonic crystal*



# KT Fund Examples - KiCAD

**SHOWS OFF NEW KICAD**

**CERN is Getting**  
posted by [janrinok](#) on Thu  
from the open-data dep

"gewg\_" writes:  
The computer-aided de  
circuit board layouts ha  
different vendor--due to  
Many years ago, Cadsoft  
to view/print already-crea  
for amateurs and pros on  
In 2006, however, Cadsoft  
circumstances, as [describe](#)  
engineers are hoping to pro

Ad  
professional too  
and disen

**Update on CERN's investment in KiCAD**  
October 22, 2014 in [software](#) by DP | 1 comment

Pcbnew (2011-nov-30)-testing /usr/share/doc/kicad/demos/kit-dev-coldfire-xilinx\_5213/kit-dev-coldfire-xilinx\_5213.brd [Read Only]

File Edit View Place Preferences Tools DesignRules Help

Track 0.198 mm \* Via 0.635 mm \* Grid 1.270 Auto

Layer Render

- ☒ Component
- ☒ GND\_layer
- ☒ 3.3V\_layer
- ☒ Cuivre
- ☒ Adhes\_Front
- ☒ Adhes\_Back
- ☒ SolidF\_Front
- ☒ SolidF\_Back
- ☒ Silks\_Front
- ☒ Silks\_Back
- ☒ Mask\_Front
- ☒ Mask\_Back
- ☒ Drawings
- ☒ Comments
- ☒ Eco1
- ☒ Eco2
- ☒ PCB\_edges

Pads: 634 Vias: 353 trackSegm: 2335 Nodes: 743 Nets: 246 Links: 534 Connect: 534 Unconnected: 0

**Comments**  
14, 2014

**Circuits**

and printed  
ge produced by a

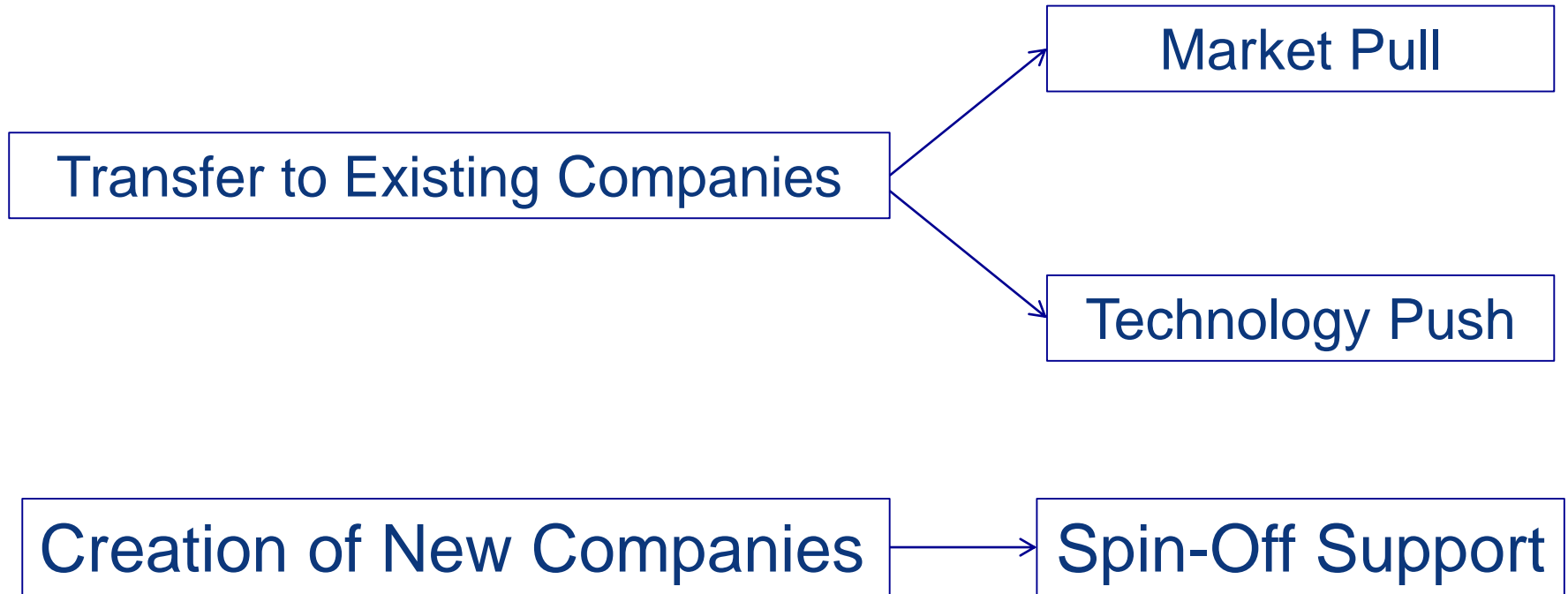
unlimited ability  
quasi-standard

nder certain  
community. CERN

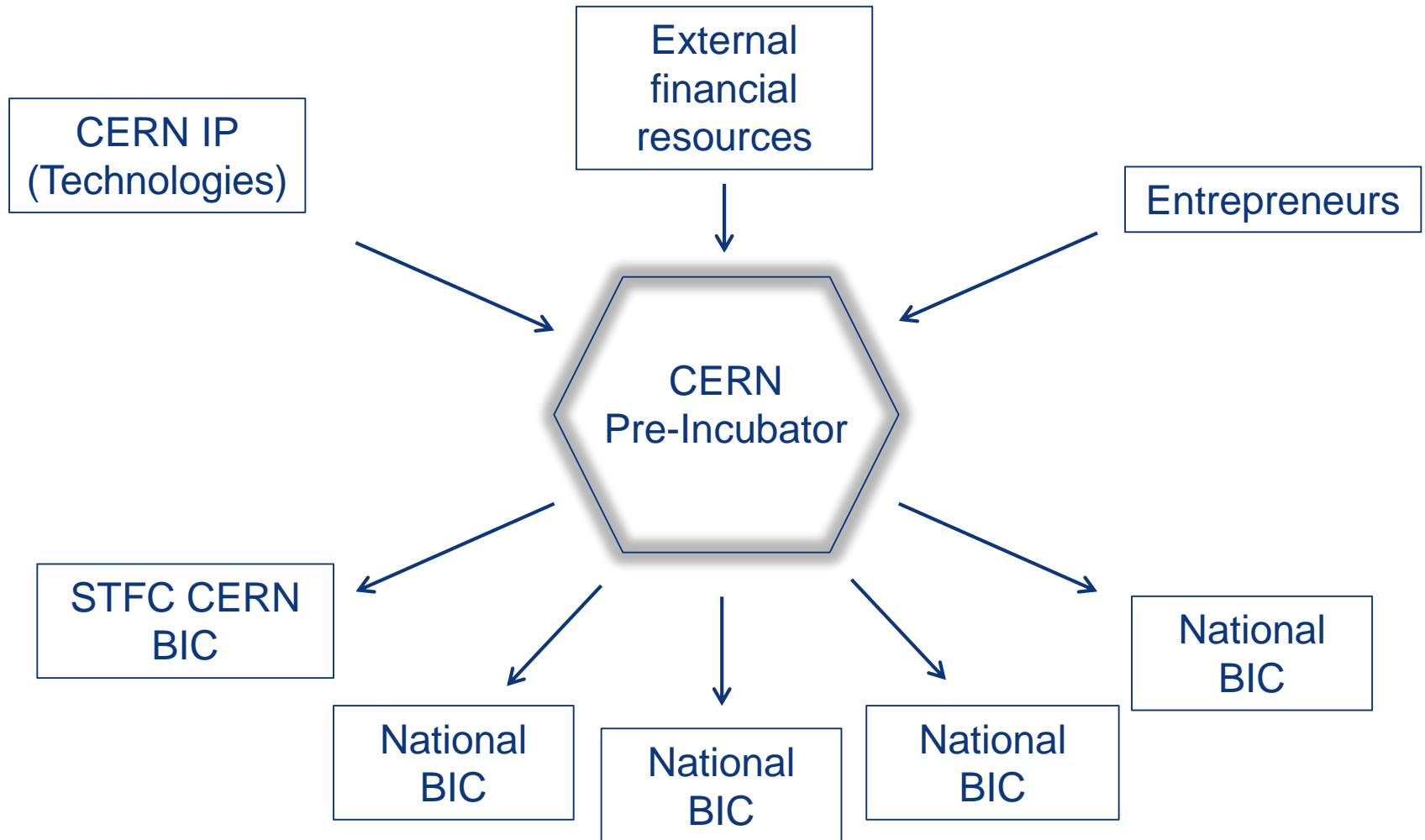
v.Ob



# KT implementation ways



# CERN Business Ideas Accelerator



# Entrepreneurship Development



Fostering an Entrepreneurship Culture

Facilitating CERN Spin-Off creation



# CERN BIC Network

## Established incubators:

UK – STFC-CERN BIC

Netherlands – NIKHEF-CERN BIC

Norway – NTNU BIC of CERN Technology

Greece – Technopolis BIC of CERN Technology

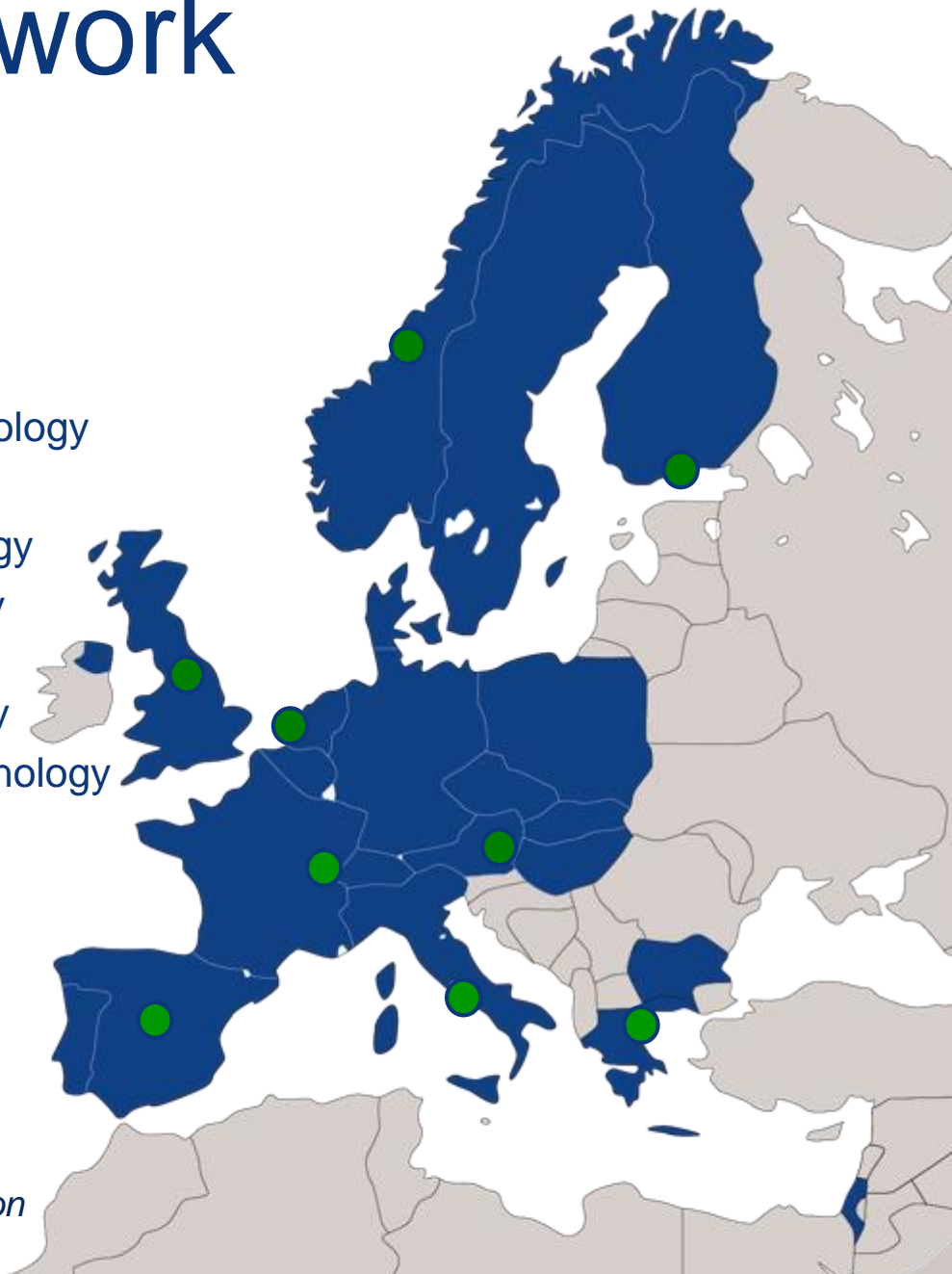
Austria – Austria BIC of CERN Technology

France – InnoGEX BIC of CERN Technology

Finland – Finnish BIC of CERN Technology

Spain – INEUSTAR-PIONEERS Spanish  
Incubator network of CERN Technology

Italy – Italian BIC of CERN and INFN Technology



# Network of BIC's of CERN Technologies

STFC-CERN BIC (UK, 2012)



CamsTech Ltd



NTNU BIC of CERN Tech. (NO, 2014)



NIKHEF CERN BIC (NL, 2014):



Austria BIC of CERN Tech. (AT, 2014):



InnoGex (FR, 2015):



# TIND Technologies

MANAGE, SHOWCASE AND PRESERVE  
ALL DIGITAL ASSETS.



The collage features three overlapping elements: a tweet from UN Library (@UNLibrary) stating 'We've selected @T... Library's Digital Lib... preserve our digital...'; a blue banner for 'Caltech Library News' with an orange logo; and a white banner for a 'Press Release: TIND Technologies [January 4, 2016]' with the headline 'ITU goes live on TIND Library Management System' in red. Below the headline, it says 'CERN open source... professional cloud service.'

spin-off

<http://tind.io>



# 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.



# CERN OHL: it is making an impact!

- CERN OHL v1.1 Launched in 2011, great interest from the worldwide community
- More than 50 hardware designs licensed under CERN OHL
- More than 20 companies are using it
- The license is being used by people outside our community as well (and for any kind of hardware)
- Thanks to the interactions with the community, we improved the license and prepared v1.2



# 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.

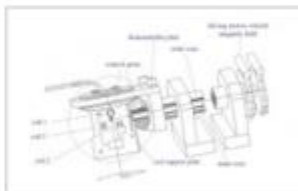
If you would like to know more about CERN Easy Access IP or other technology transfer opportunities, please contact CERN's [Technology Transfer Office](#).

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.

[\[ read more \]](#)

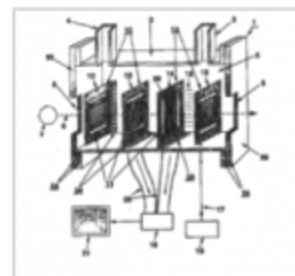


## Multifunctional detector

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](#)<sup>®</sup>, 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](#)



# Knowledge Transfer through Procurement

Results from a survey of companies involved in technology-intensive procurement contracts with CERN.

178 questionnaires analyzed, related to 503 MCHF procurement budget.

## Results:

- 44% indicated technological learning
- 42% increased their international exposure
- 38% developed new products
- 36% indicated market learning
- 13% started new R&D teams
- 52% would have had poorer sales performance without CERN
- 41% would have had poorer technological performance

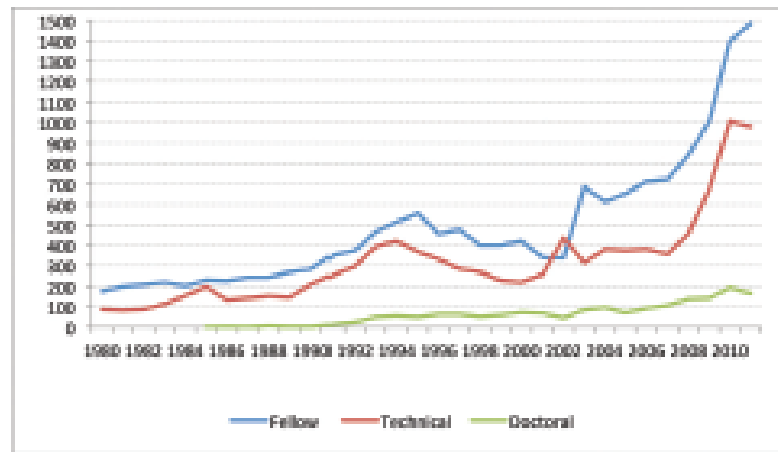


# Knowledge Transfer through People

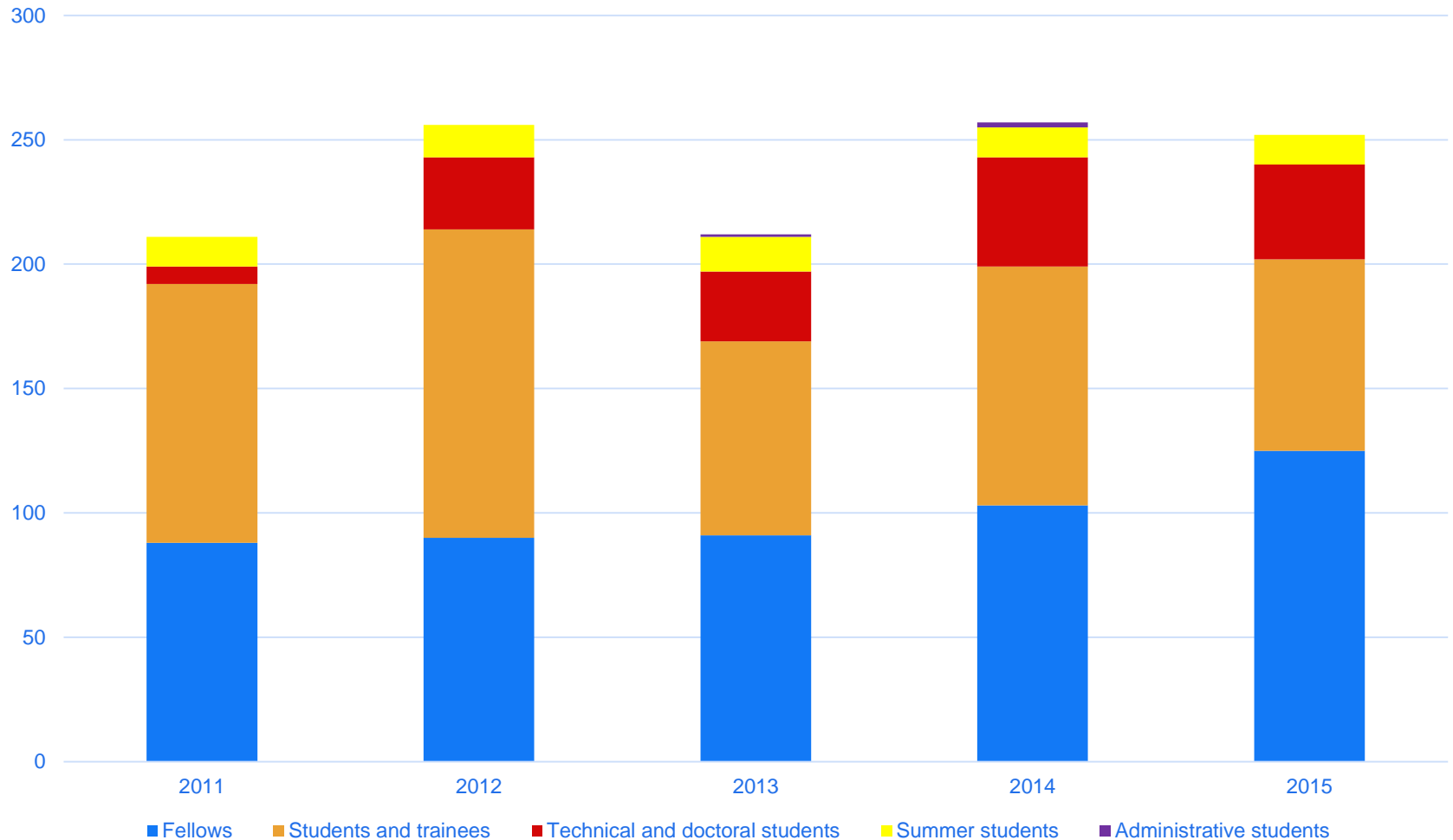
Every year, hundreds of students come to CERN to contribute to our research programs

An opportunity for young people to learn in a multicultural environment

Not only for physicists!  
Also engineers,  
computer scientists,  
administrative  
students...



# Students and fellows from Italy



# More info / Contacts

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[mail-KT@cern.ch](mailto:mail-KT@cern.ch)

