

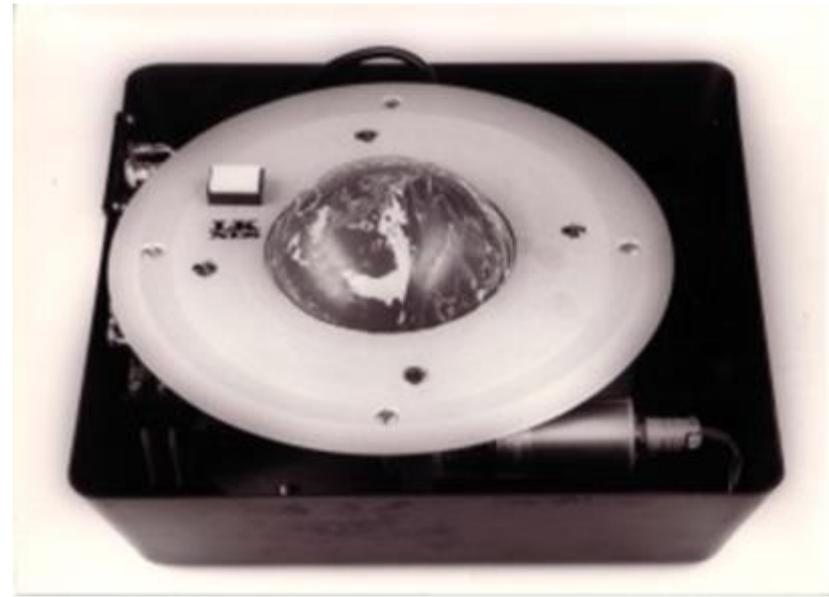
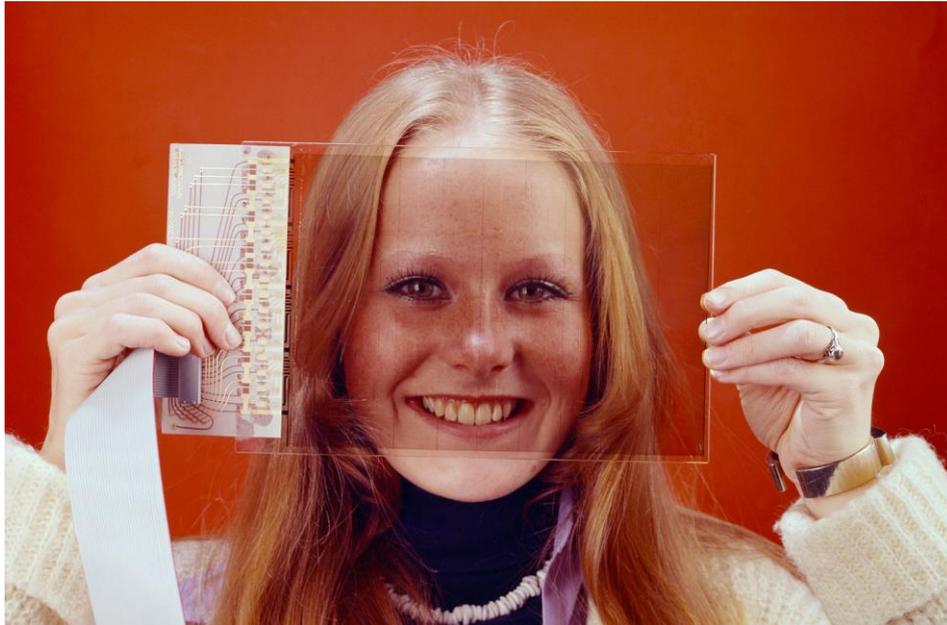
KT @ CERN

G. Anelli, KT Group Leader, IPT Department

30.05.2016



Did you know?



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

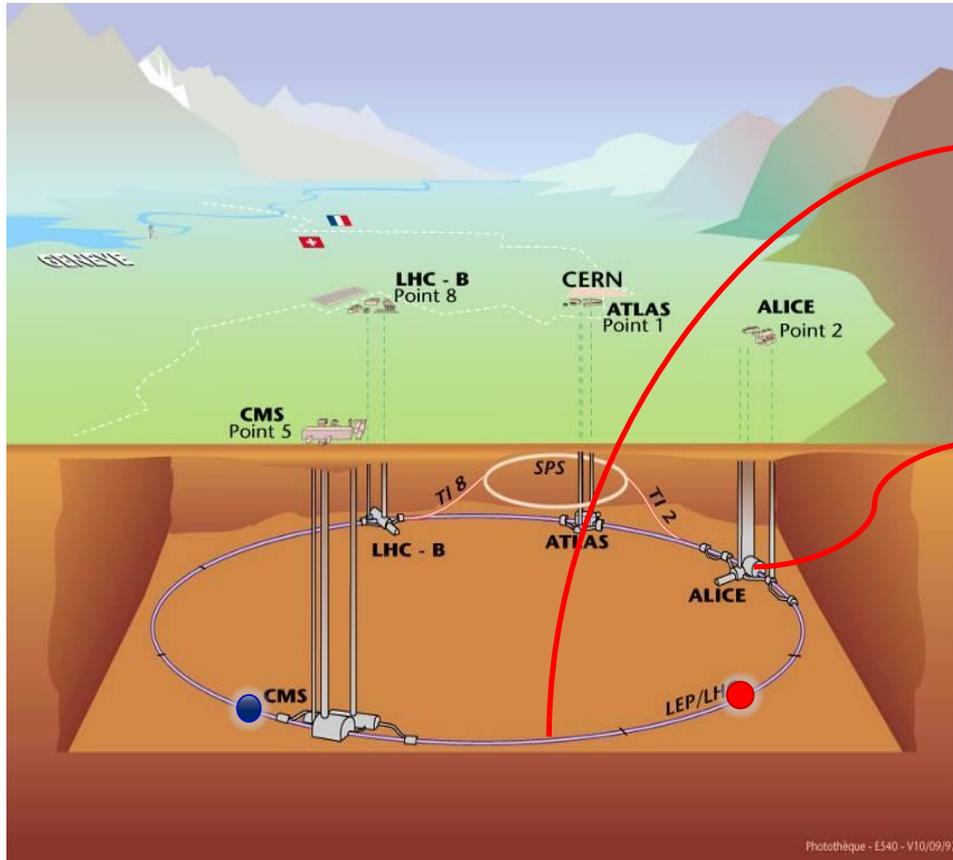
Key words are dissemination and impact



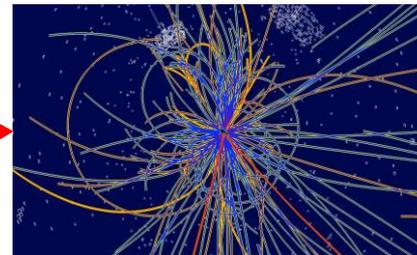
KT Modes



CERN's areas of excellence



Accelerating
particle beams



Detecting
particles



IT
technologies



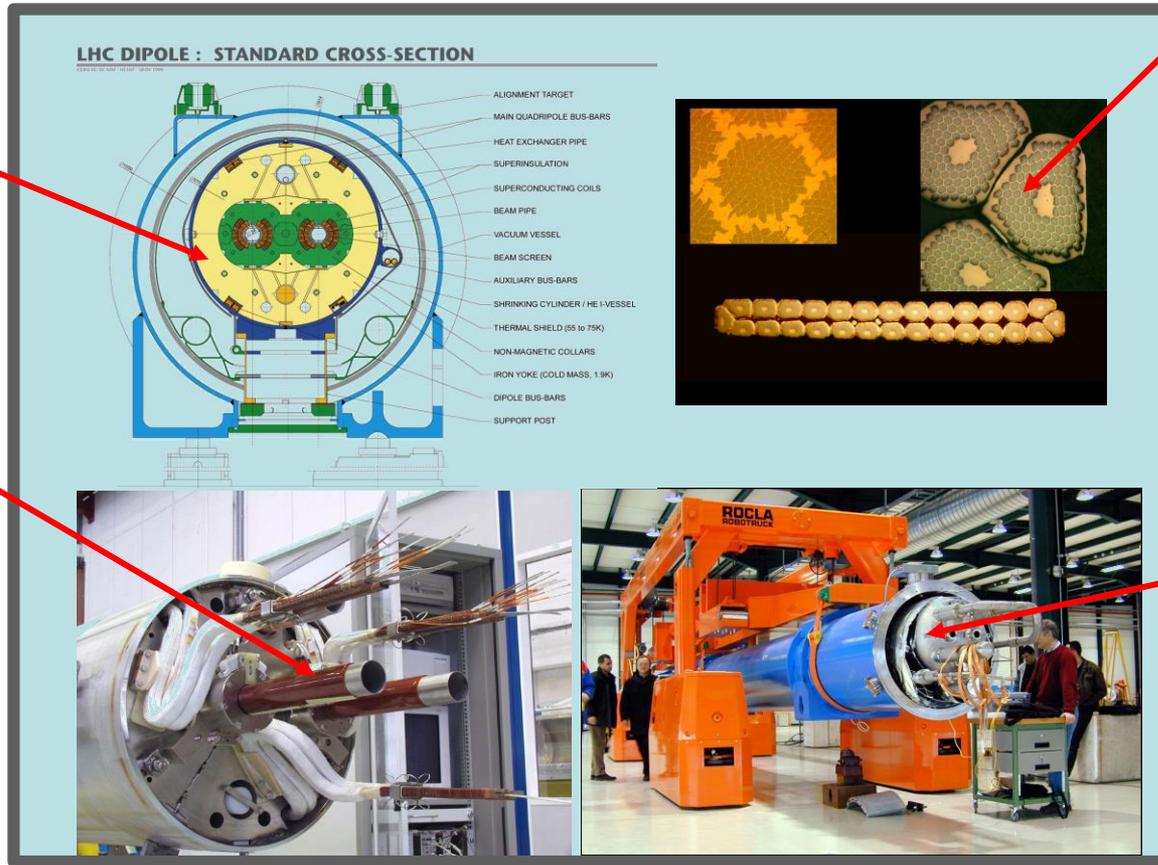
Accelerator Technologies

Cryogenics
(1.9 K)

Vacuum
(10^{-13} atm)

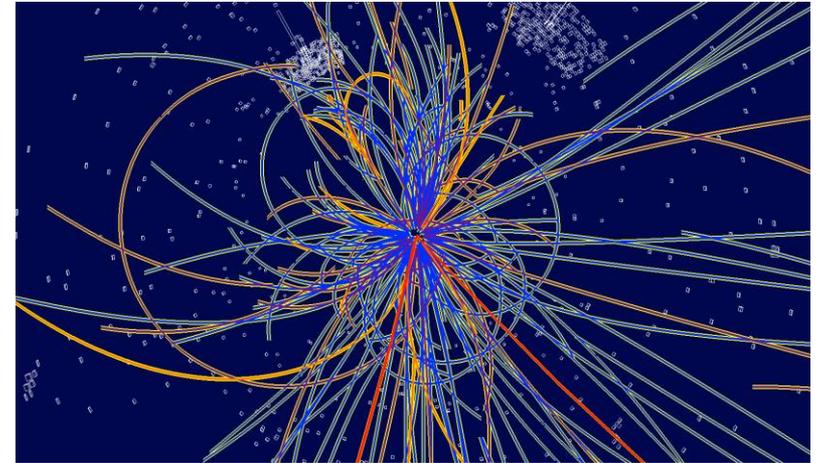
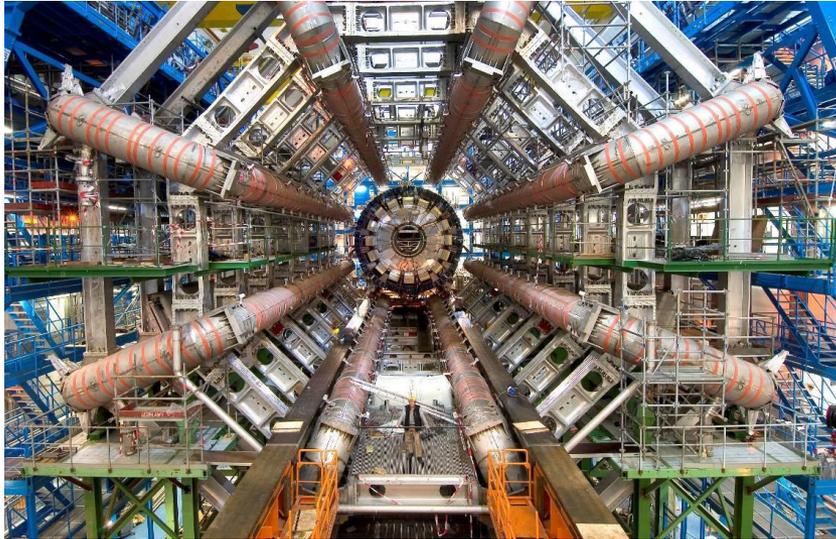
Superconductivity
(12kA)

Magnets
(8 T)



Detector Technologies

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



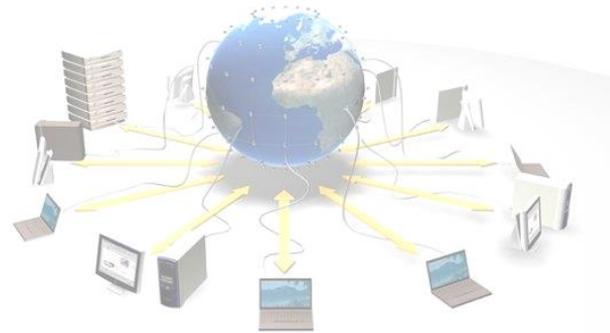
LHC detectors have sophisticated electronic trigger systems that precisely measure the passage time of a particle to accuracies in the region of a few billionths of a second. The trigger system also registers the location of the particles to millionths of a metre. This is essential for ensuring that 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 25 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
- > 25 Petabytes (25PB)
= 25000TB
Annual LHC data output

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

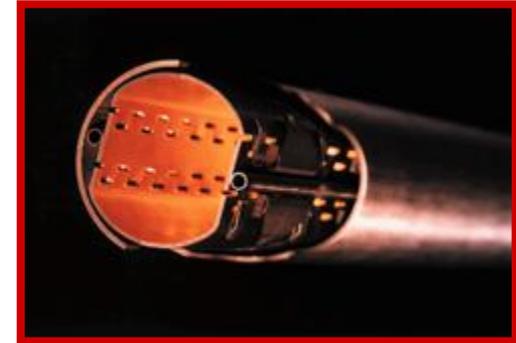


CERN Core Competences

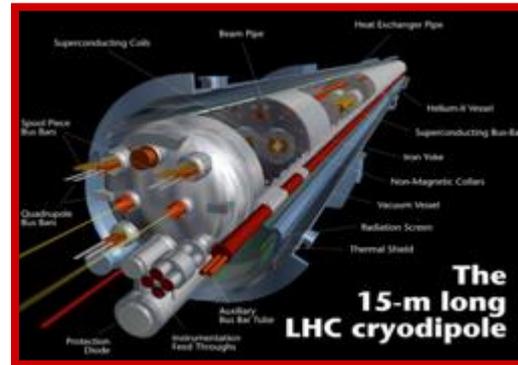
Super-conductivity
(13kA,
7MJoules)



Vacuum
(10^{-12}
Torr)



Cryogenics (1.9 K)

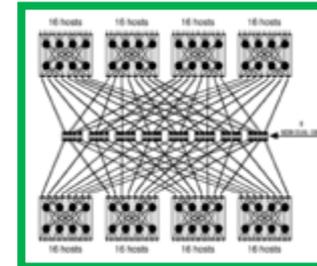


Magnets
(10 T)

Very high
performance
detectors and
electronics



Data
processing



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.

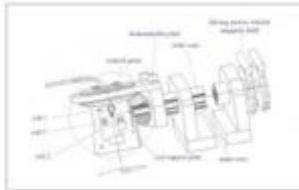
If you would like to know more about CERN Easy Access IP or other technology transfer opportunities, please contact CERN's [Technology Transfer Office](#).

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.

[\[read more \]](#)

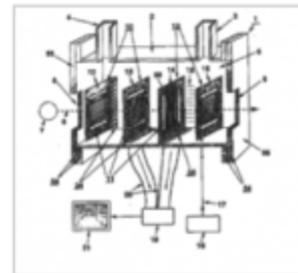


Multifunctional detector

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 trialed 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

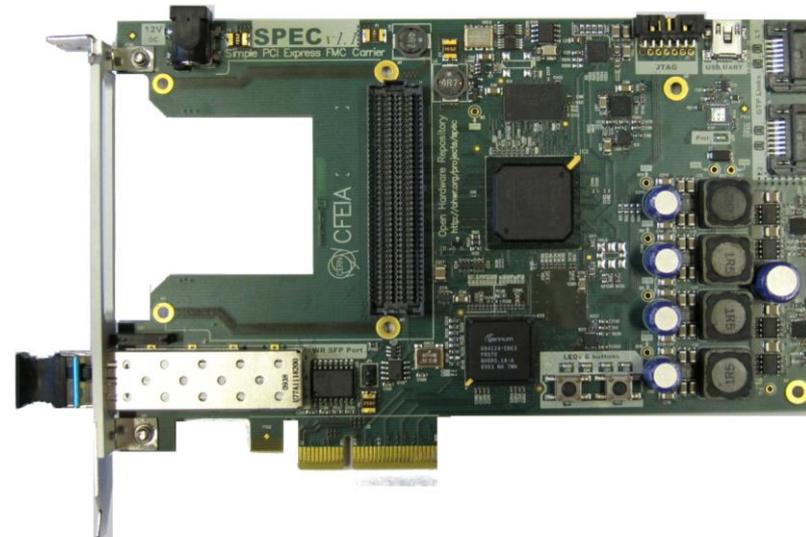
A legal framework to facilitate knowledge exchange across the electronic design community.

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.



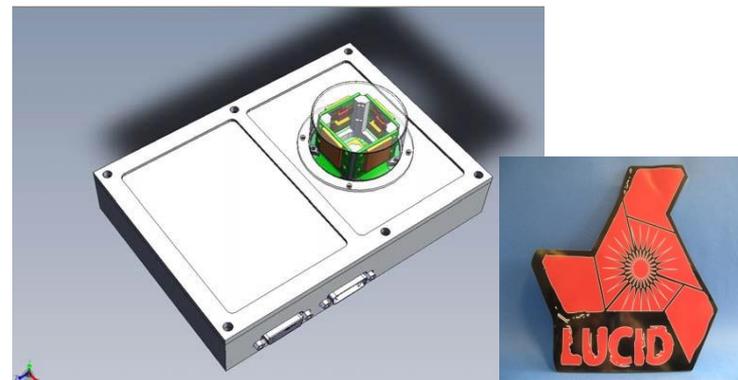
CERN OHL: it is making an impact!

- CERN OHL v1.1 Launched in 2011, great interest from the worldwide community
- More than 100 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 launched v1.2 in 2013

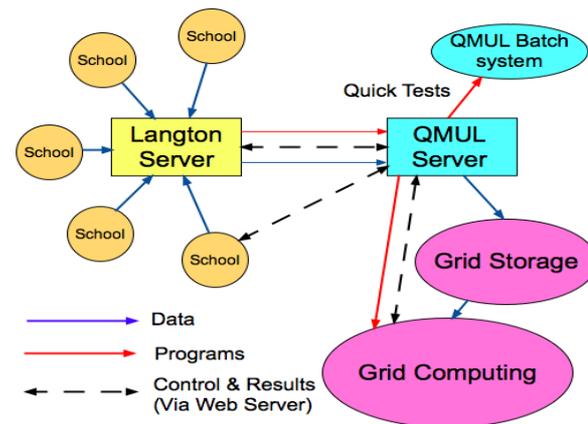


CERN@school

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



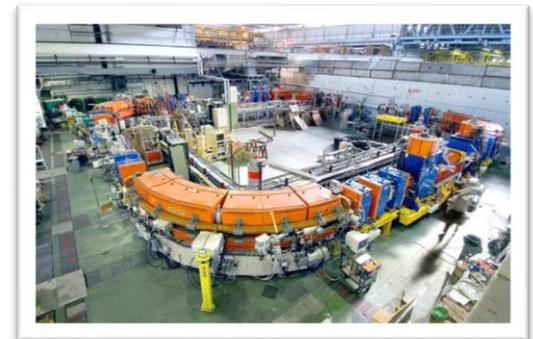
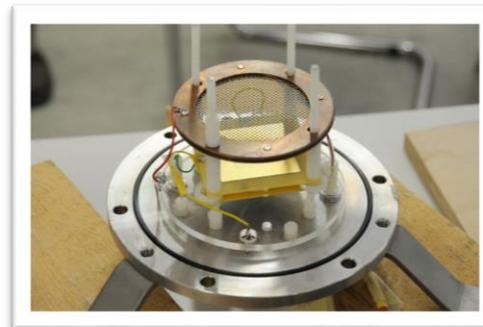
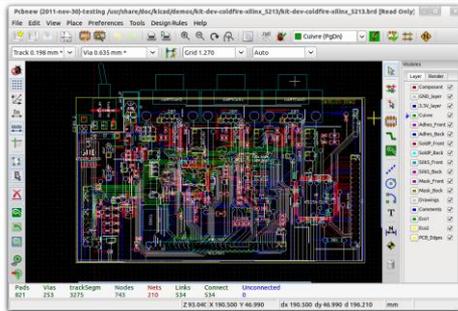
Data from LUCID and CERN@school detectors will be uploaded to the Grid and made available for students to analyse

The KT Fund: bridging the « valley of death »



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



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...

