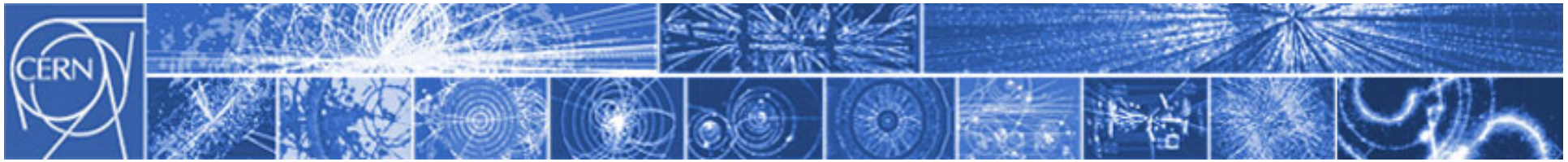


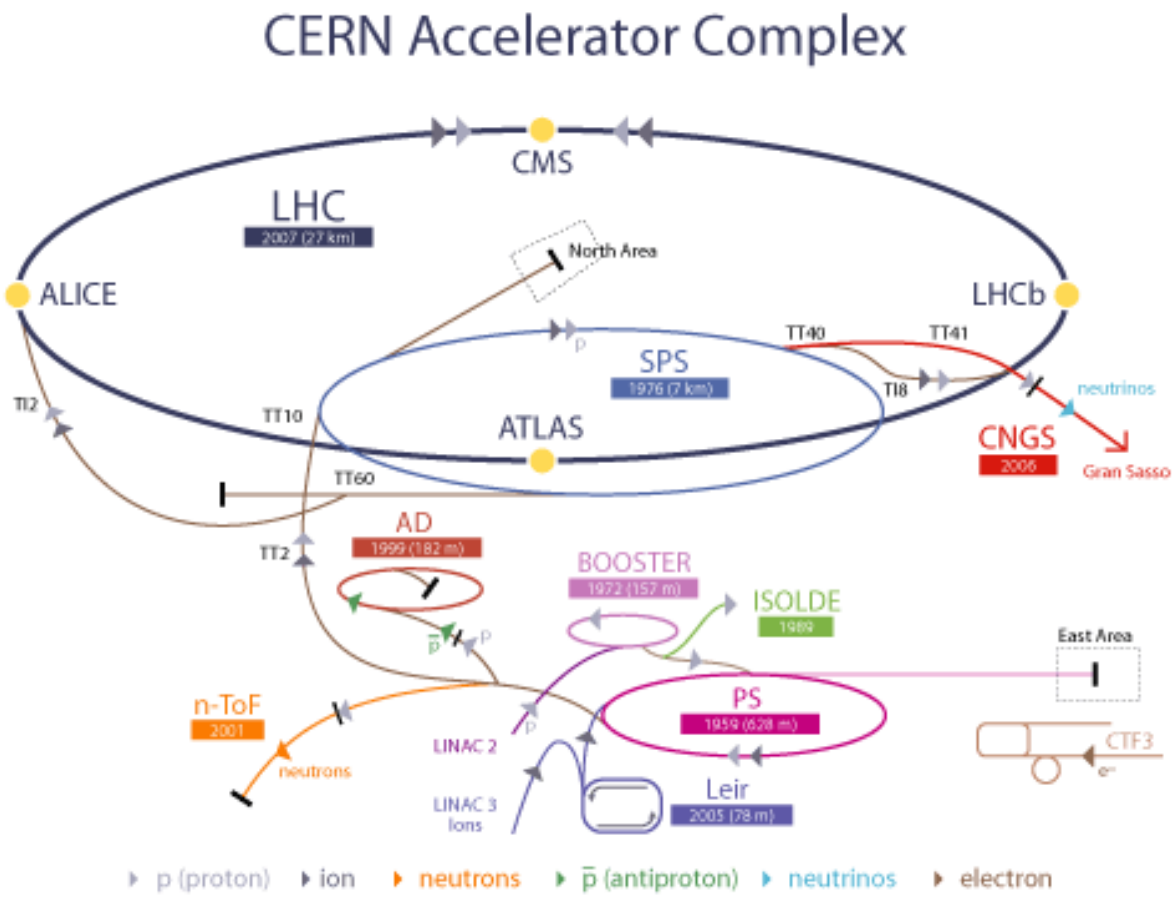
CERN Impact-Driven Innovation Approach

Enrico Chesta

Head of CERN Technology Transfer and
Intellectual Property Management Section

Knowledge Transfer Group, FP Department


LHCb
ATLAS
CERN
CERN
SUISSE
FRANCE
CMS
ALICE
LHC - 27 km



Increasing particle energies:

Linac 2:
50 MeV

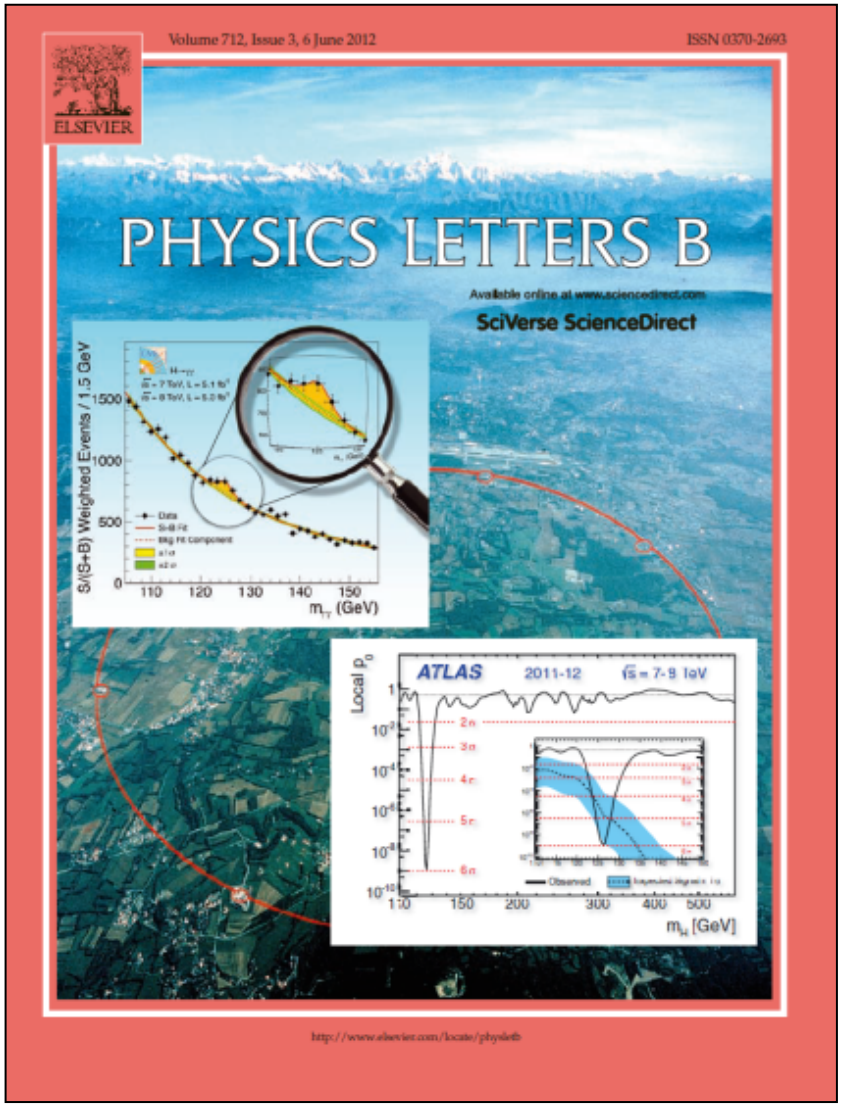
Proton Synchrotron Booster (PSB):
1.4 GeV

Proton Synchotron (PS):
25 GeV

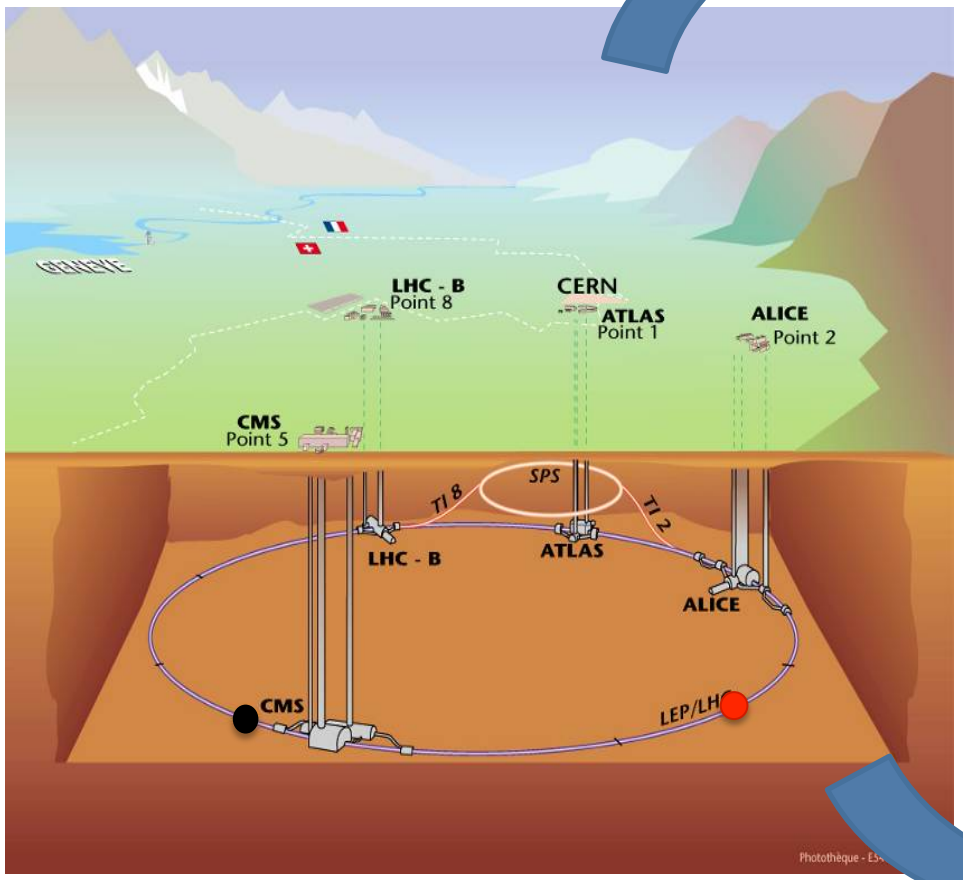
Super Proton Synchotron (SPS):
450 GeV

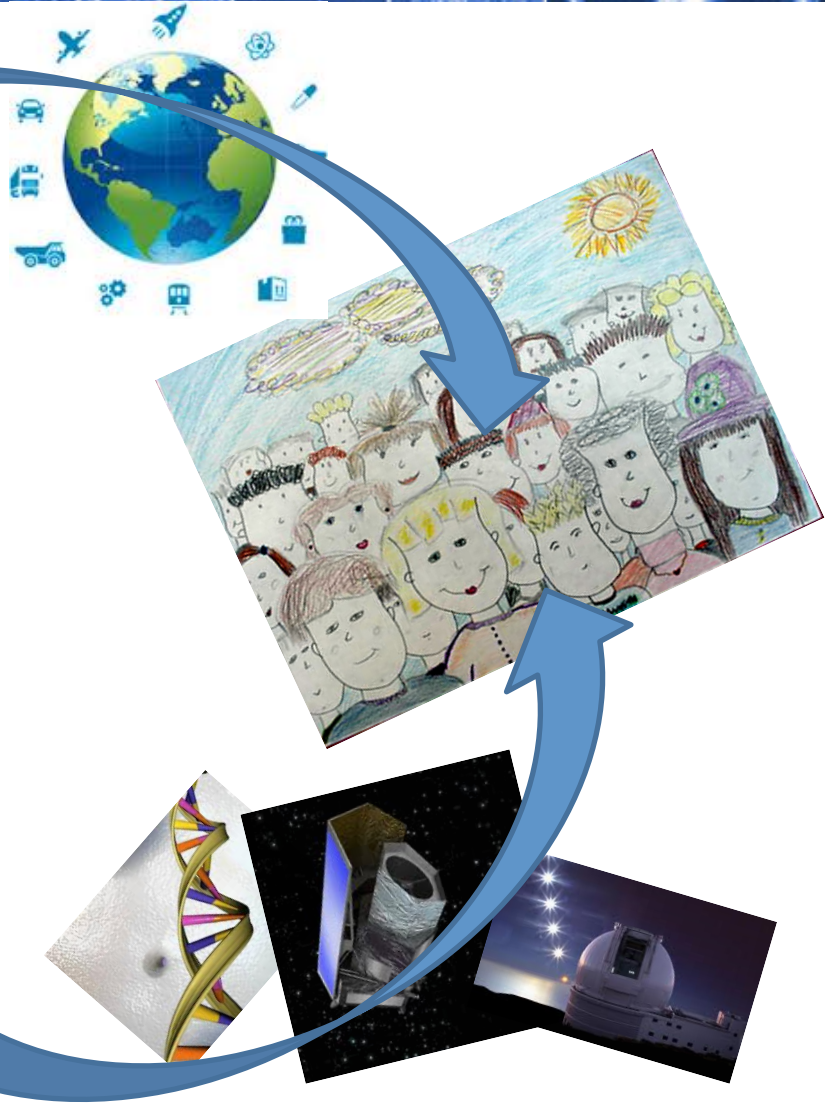
Large Hadron Collider (LHC):
4 TeV per beam
After LS1 (2015):
7 TeV per beam
⇒ 14 TeV total collision energy


The Economist
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
JULY 7TH-13TH 2012
Economist.com
A giant leap for science
Finding the Higgs boson


Volume 712, Issue 3, 6 June 2012
ISSN 0370-2693
ELSEVIER
PHYSICS LETTERS B
Available online at www.sciencedirect.com
SciVerse ScienceDirect
ATLAS
2011-12
√s = 7-8 TeV
Local p0
S/(S+B) Weighted Events / 1.5 GeV
m_γγ (GeV)
m_H [GeV]
http://www.elsevier.com/locate/physletb

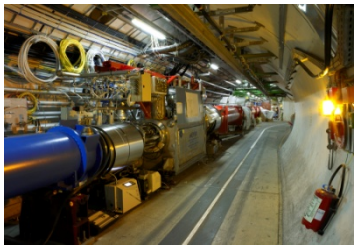
CERN TT Target

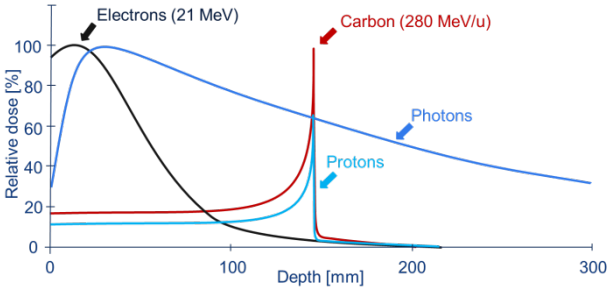


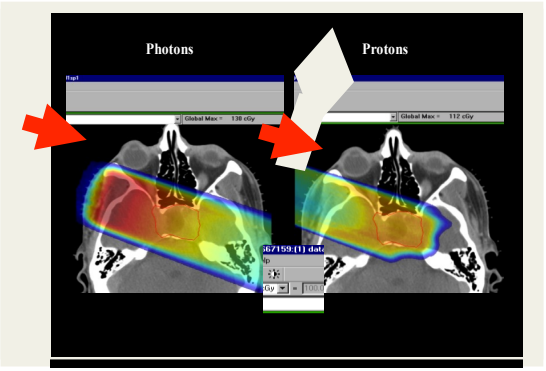


Example: Medical Applications

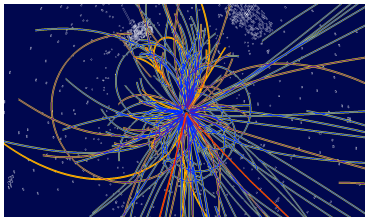
Particle accelerators for hadron therapy

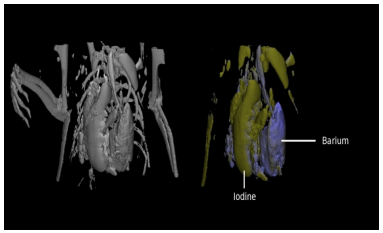


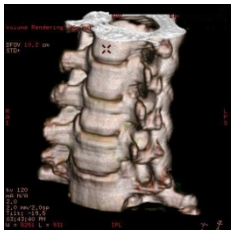


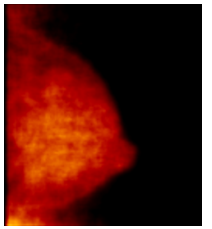


Particle detectors for medical imaging

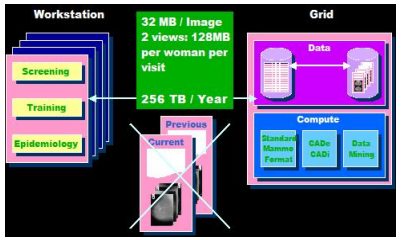






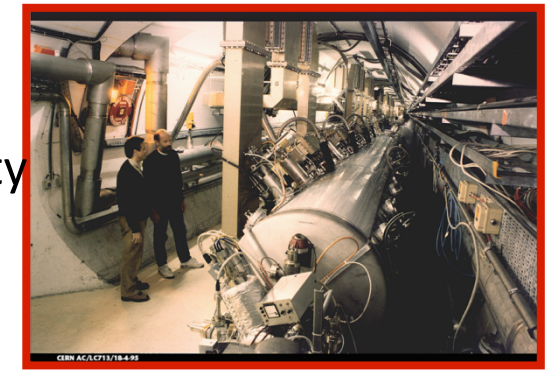


Grid computing for medical data management and analysis

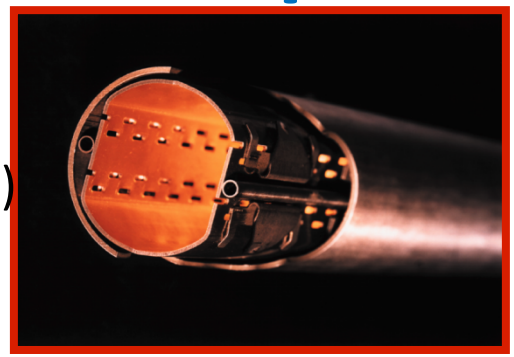


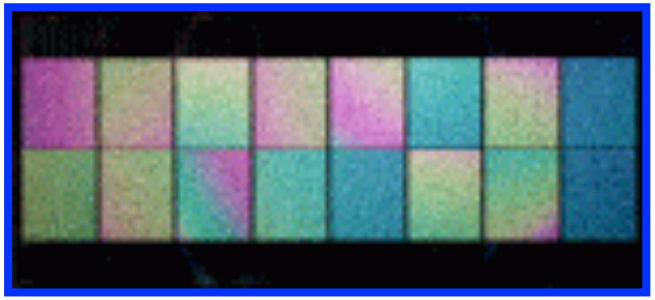
Core Competences

Super-conductivity (13kA, 7MJoules)

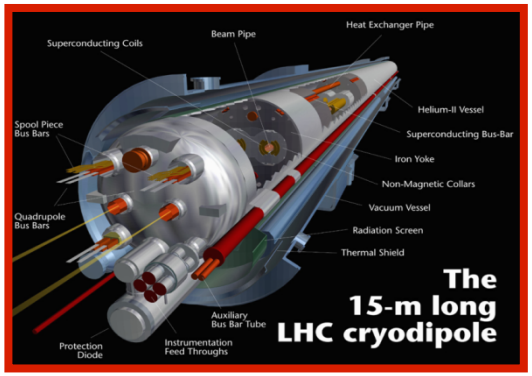


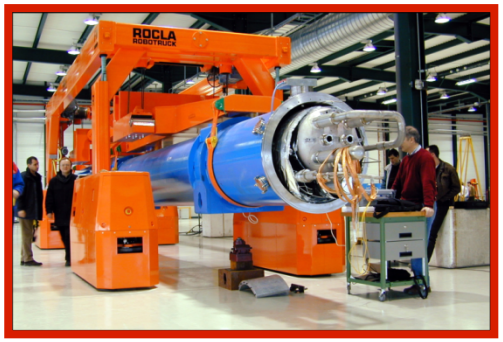
Vacuum (10^{-12} Torr)





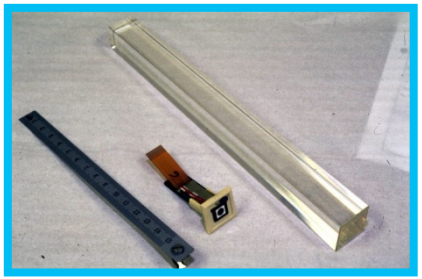
Cryogenics (1.9 K)



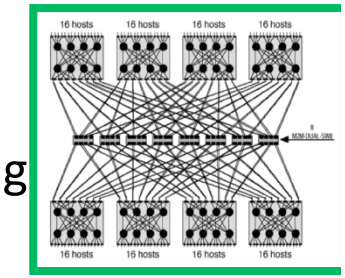


Magnets (10 T)

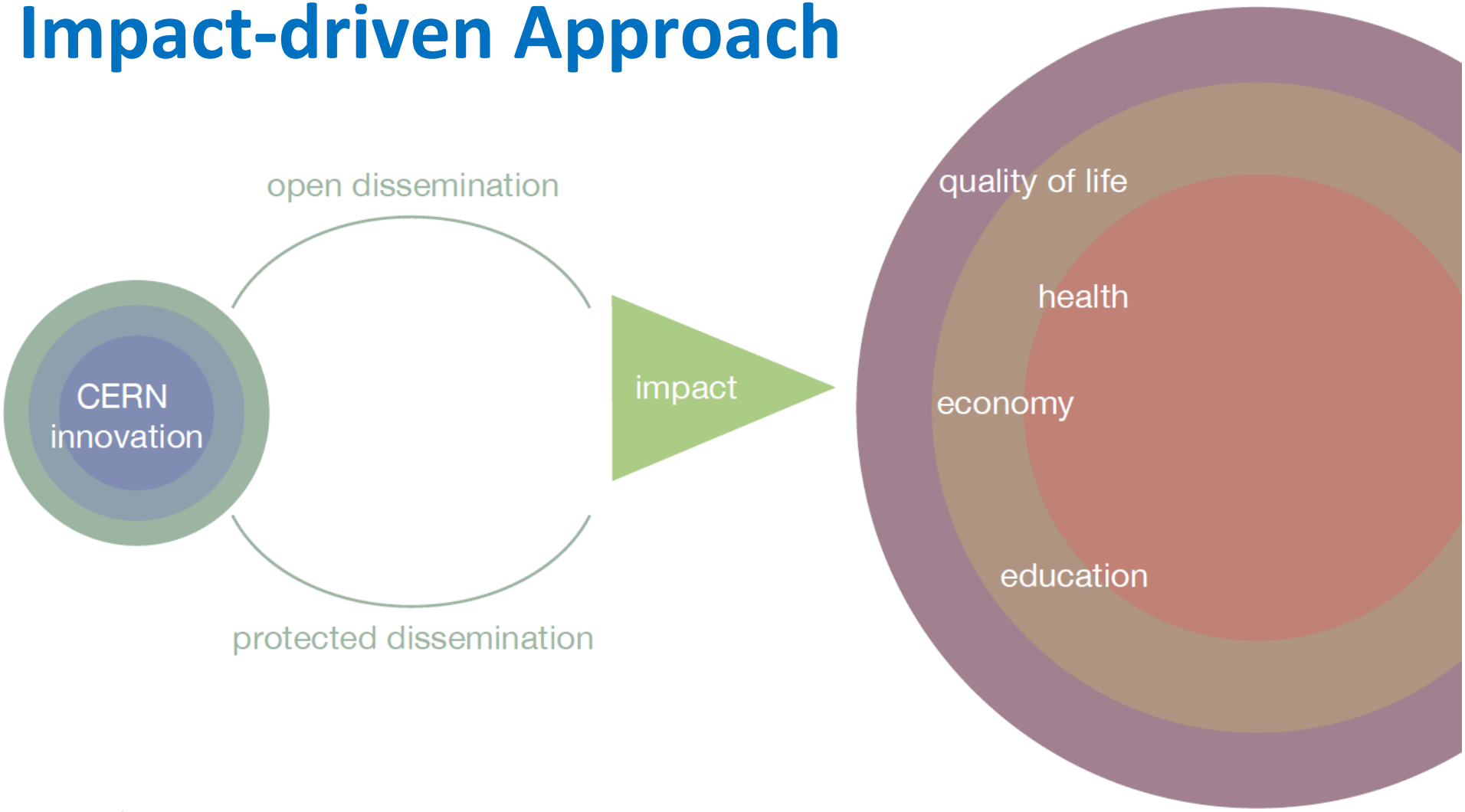
Very high performance detectors and electronics



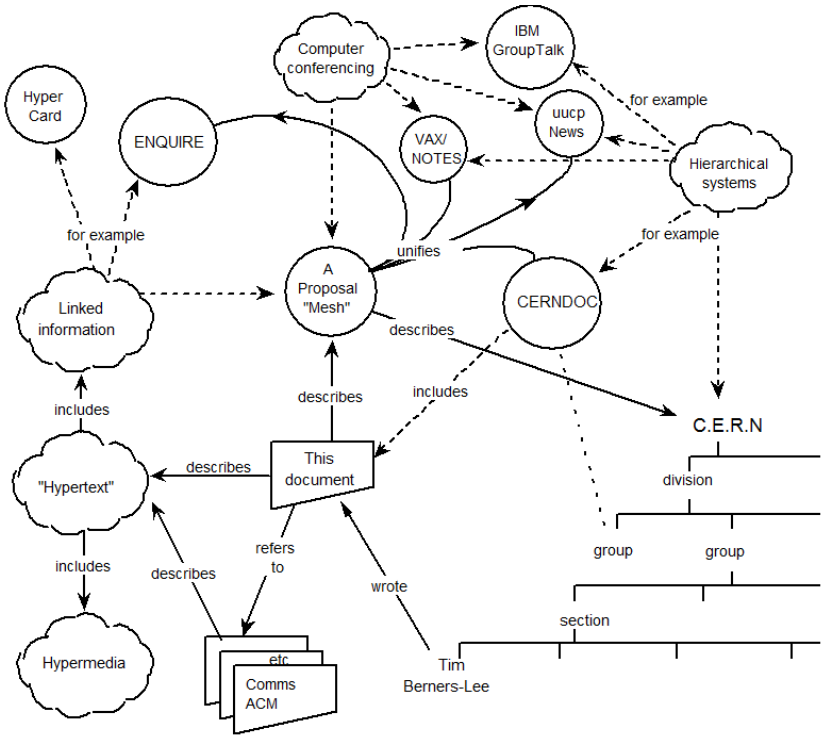
Data processing (15 PB/year)



Impact-driven Approach



Where the World Wide Web was born



CERN Open Hardware License

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.

Hardware design documentation includes schematic diagrams, designs, circuit or circuit-board layouts, mechanical drawings, flow charts and descriptive texts, as well as other explanatory material.

- CERN OHL v1.1 Launched in 2011, great interest from the worldwide community
- More than 50 hardware designs licensed under CERN OHL
- 16 companies involved!
- 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 are improving the license and preparing v1.2
- Visit: http://www.ohwr.org

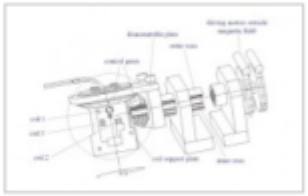
CERN Easy Access IP

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]

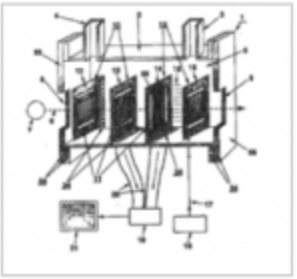
Thermally insulatable vessel

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.

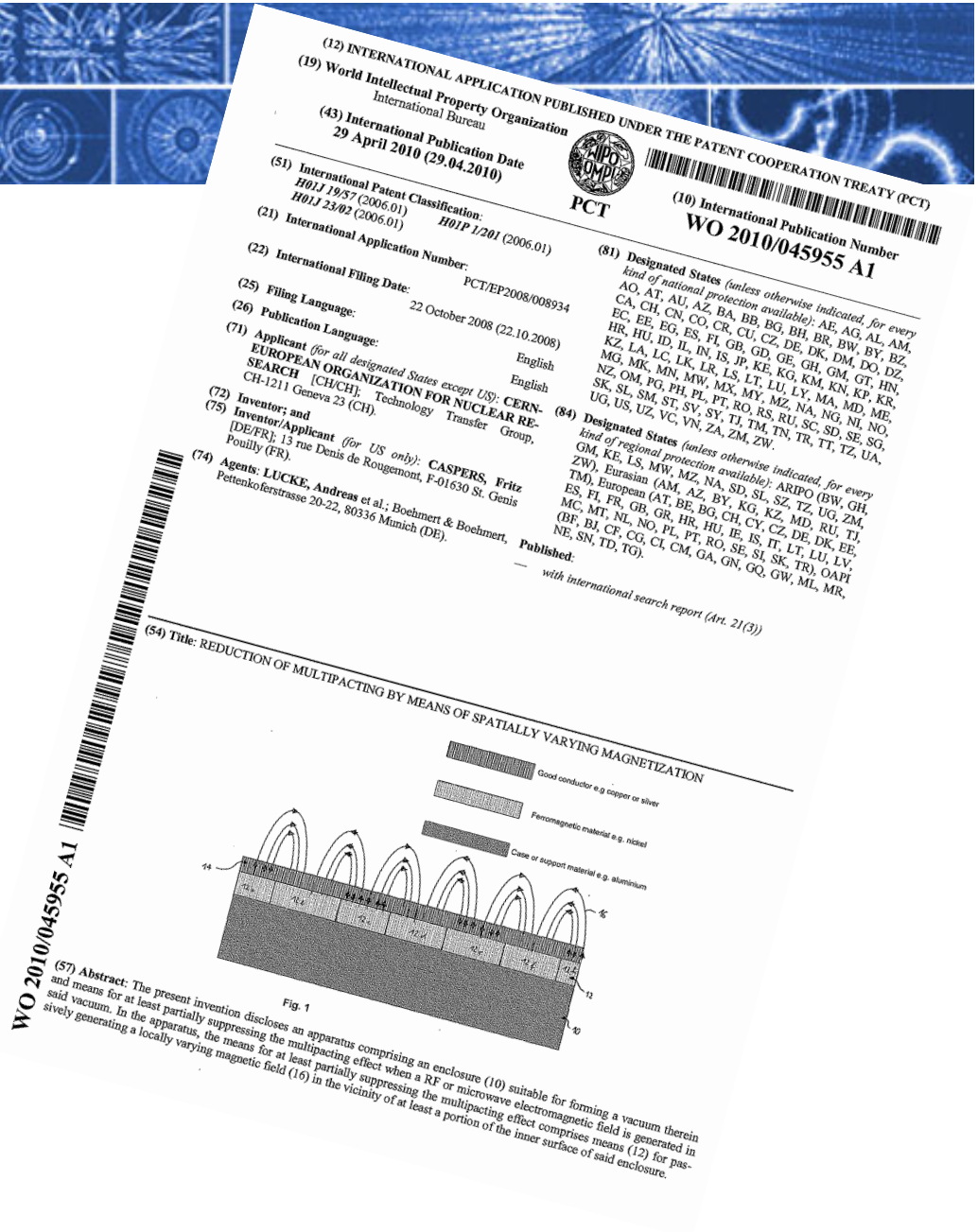
[read more]

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

Patents are taken in order to:

- Increase the probability of having the technology transferred
- Significantly enhance the commercial value of the technology
- Ensure CERN's recognition as the originator of an invention



(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

PCT

(10) International Publication Number
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(43) International Publication Date
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(51) International Patent Classification:
H01J 19/57 (2006.01) *H01P 1/201* (2006.01)
H01J 23/02 (2006.01)

(21) International Application Number: PCT/EP2008/008934

(22) International Filing Date: 22 October 2008 (22.10.2008)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant *(for all designated States except US)*: CERN-EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH [CH/CH]; Technology Transfer Group, CH-1211 Geneva 23 (CH).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: CASPERS, Fritz [DE/FR]; 13 rue Denis de Rougemont, F-01630 St. Genis Pouilly (FR).

(74) Agents: LUCKE, Andreas et al.; Boehmert & Boehmert, Pettenkoferstrasse 20-22, 80336 Munich (DE).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report (Art. 21(3))*

(54) Title: REDUCTION OF MULTIPACTING BY MEANS OF SPATIALLY VARYING MAGNETIZATION

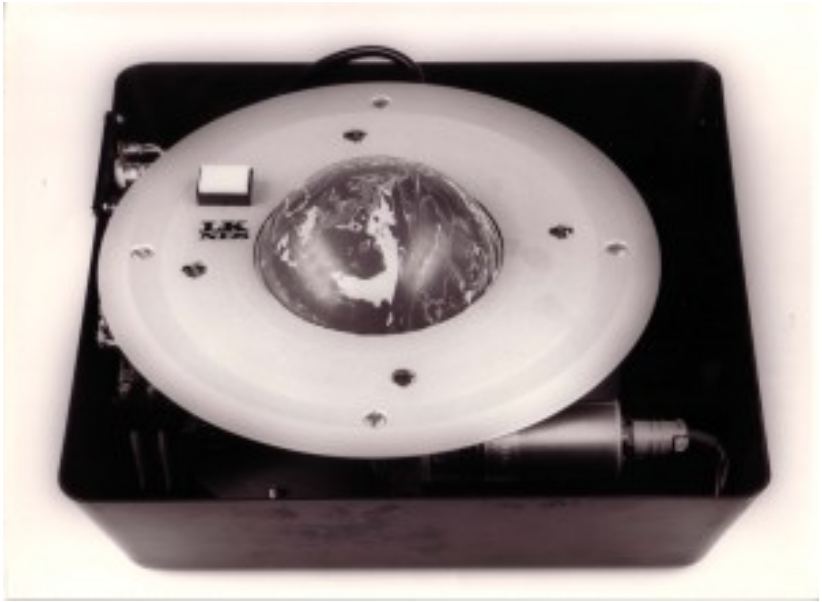
WO 2010/045955 A1

Fig. 1

(57) Abstract: The present invention discloses an apparatus comprising an enclosure (10) suitable for forming a vacuum therein and means for at least partially suppressing the multipacting effect when a RF or microwave electromagnetic field is generated in said vacuum. In the apparatus, the means for at least partially suppressing the multipacting effect comprises means (12) for passively generating a locally varying magnetic field (16) in the vicinity of at least a portion of the inner surface of said enclosure.

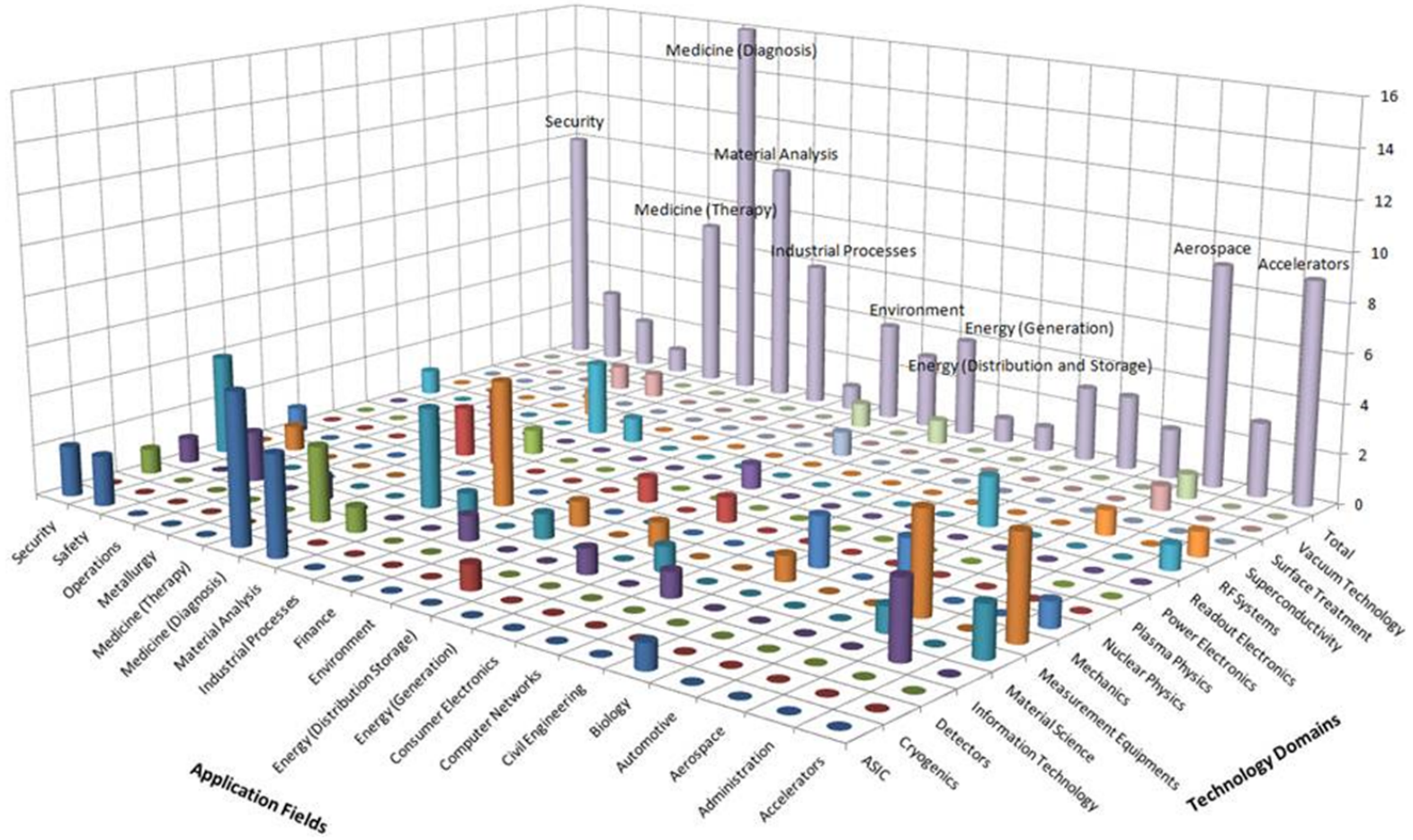
TT: not a trivial process…

First «Touch-Screen»



First «Mouse»

… but can be rewarding

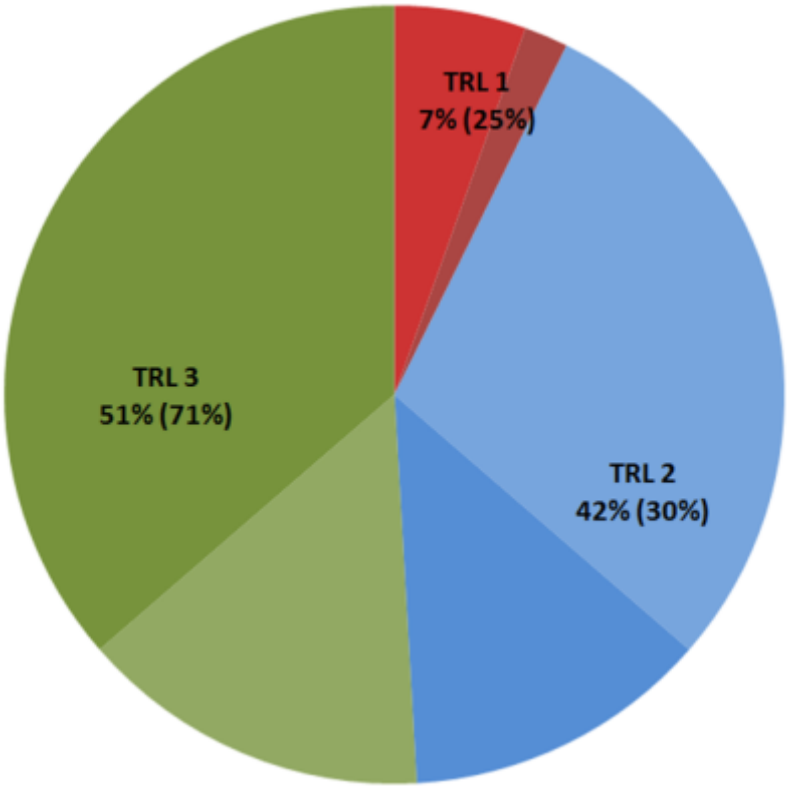


Technology Portfolio

Some approximate numbers:

- 200 TT cases (30% open)
- 20 invention disclosures per year
- 40 patent families (50% exploited)

Technology Readiness Levels	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)

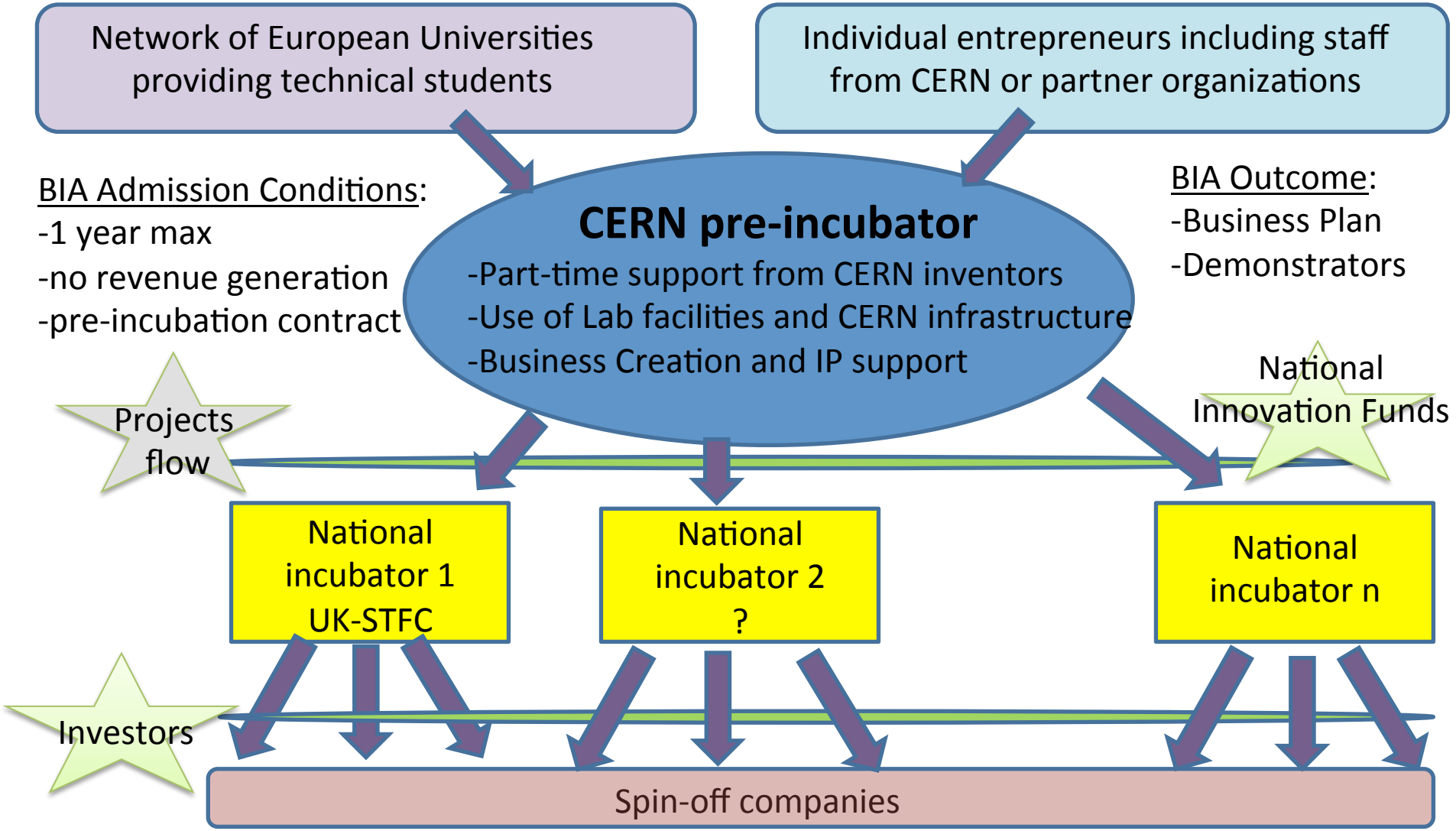


Technology Readiness and "Exploitation" Levels

Example of an effective TT tool: the KT Fund

- Financial tool introduced 2 years ago, using resources generated by the exploitation of CERN IP portfolio (1/3 of generated revenues)
- Typically, it can be used to fund internal projects to build proof of concepts or prototypes; overall target: bringing CERN technologies closer to the market
- The requests are evaluated by a Committee composed by all the Department Heads
- 6 projects were approved and financed in 2011, 6 more in 2012
- Requests can be submitted anytime, the selection committee usually meets in Autumn
- Can be considered as an incentive tool

CERN Business Ideas Accelerator (BIA) Concept



Importance of TT professional networks

EIROforum

enterprise europe network

Business Support on Your Doorstep

tto circle

CERN KT

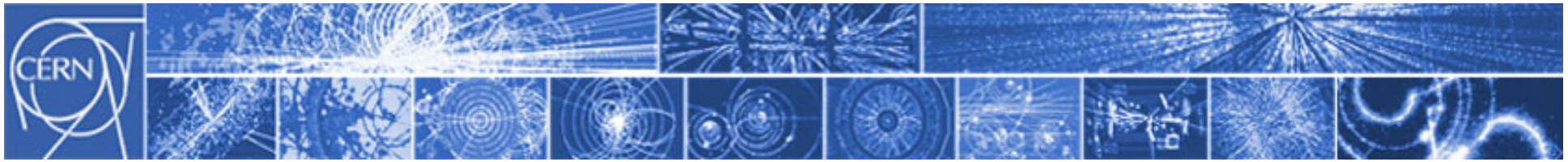
INET/ENET

ENLIGHT

HEPTech

Leading HEP technologies for industry

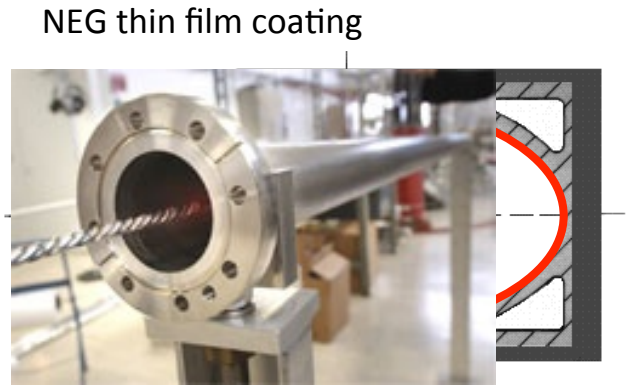
Technology Transfer opportunities



Examples

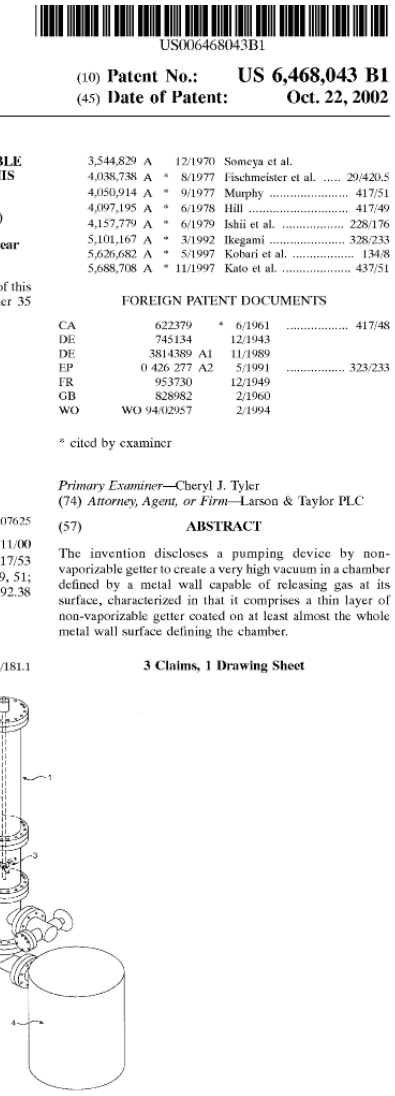
NEG

- **N**on-**E**vaporable **G**etter thin film coatings
- Used to create and maintain ultra-high vacuum in accelerators by absorbing gas molecules in vacuum chambers
- Have multiple other applications in addition to accelerators



NEG

- CERN most successful patent!
- 8 non-exclusive licenses
- 3 Service/Consultancy agreements
- 1 Spin-Off Company



US006468043B1

(12) **United States Patent**
Benvenuti

(10) **Patent No.: US 6,468,043 B1**
(45) **Date of Patent: Oct. 22, 2002**

(54) **PUMPING DEVICE BY NON-VAPORISABLE GETTER AND METHOD FOR USING THIS GETTER**

(75) Inventor: **Cristoforo Benvenuti**, Moens (FR)

(73) Assignee: **European Organization For Nuclear Research**, Geneva (CH)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/202,668**

(22) PCT Filed: **Jun. 18, 1997**

(86) PCT No.: **PCT/EP97/03180**

§ 371 (c)(1),
(2), (4) Date: **Dec. 18, 1998**

(87) PCT Pub. No.: **WO97/49109**

PCT Pub. Date: **Dec. 24, 1997**

(30) **Foreign Application Priority Data**

Jun. 19, 1996 (FR) 96 07625

(51) **Int. Cl.**[7] **F04B 37/02**; F04F 11/00
(52) **U.S. Cl.** **417/48**; 417/53
(58) **Field of Search** 417/48, 49, 51; 252/181.1, 181.6; 204/192.38

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GB	828982	2/1960	
WO	WO 94/02957	2/1994	

* cited by examiner

Primary Examiner—Cheryl J. Tyler
(74) *Attorney, Agent, or Firm*—Larson & Taylor PLC

(57) **ABSTRACT**

The invention discloses a pumping device by non-vaporizable getter to create a very high vacuum in a chamber defined by a metal wall capable of releasing gas at its surface, characterized in that it comprises a thin layer of non-vaporizable getter coated on at least almost the whole metal wall surface defining the chamber.

3 Claims, 1 Drawing Sheet

NEGs Application to UHV Pumps

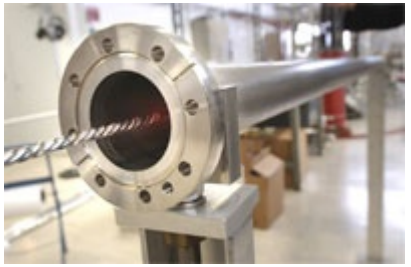
Integrating Vacuum Pump with Vacuum Chamber

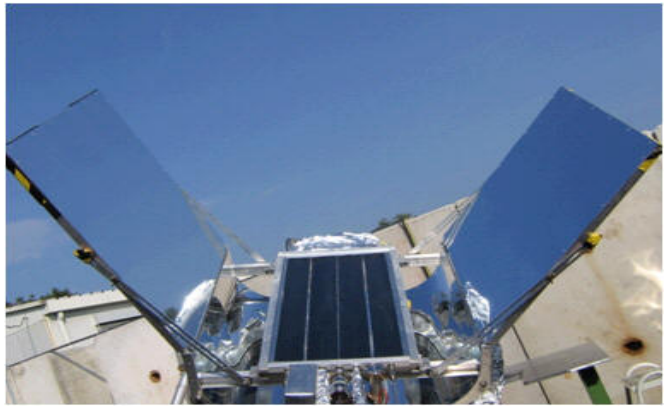
The technique of sputtering thin-film coatings of Non-Evaporable Getters (NEG) for use as vacuum pumping for particle accelerators was originally developed and patented at CERN, in order to meet specific needs which emerged in the Large Hadron Collider (LHC) project. Thanks to a specific license agreement, and after a successful technology transfer process, this technology is now commercially available under the brand name of IntegraTorr through the SAES Getters Group.

IntegraTorr is a revolutionary way to integrate non-evaporable getter pumping into a particle accelerator vacuum chamber. It is achieved by depositing a Sputtered Non-Evaporable Getter (SNEG) coating onto the surface of the vacuum chamber. The result is that the surface of the vacuum chamber, normally an outgassing source, becomes a vacuum pump.
IntegraTorr thus provides an ideal UHV pumping solution, especially for the highly conductance-limited vacuum chambers, such as those utilized in Insertion Devices.

SRB Energy

- Spin-off company
- Uses NEG to create ultra high vacuum flat panel solar collectors
- Captures diffused or indirect light
- Solar thermal with very high temperatures up to 300 degrees
- Six additional patents filed and jointly owned by SRB Energy and CERN:





Device for vacuum tight soldering an evacuated solar collector
Solar panel collector with cooling conduits comprising thermal expansion means
Protective device for a solar panel collector
High efficiency evacuated solar panel
Evacuated solar panel with non evaporable getter pump
Sealing mechanism for an evacuated device

Evacuated Solar Panels for Geneva Airport

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A major contract has been signed for the supply of solar panels derived from CERN technology

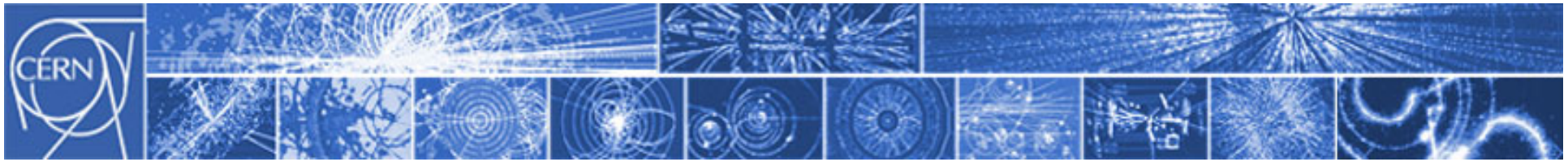
PR07.12
09.03.2012

Geneva, 9 March 2012. At Geneva International Airport today SRB Energy delivered the first of the solar panels that will form one of the largest solar energy systems of Switzerland. Ultimately, some 300 high-temperature solar thermal panels will cover a surface of 1200 square metres on the roof of the airport's main terminal building. The panels, which will be used to keep the buildings warm during the winter and cool in the summer, are derived from vacuum technology developed at CERN for particle accelerators.

SRB Solar Panel - Solar field from Valencia

"We are delighted that Geneva International Airport has opted for this technology," says Cristoforo Benvenuti, the inventor of the panels, who has been working on vacuum technology at CERN since the 1970s. *"The panels emerged from vacuum technologies that were developed for fundamental physics purposes, and it is highly gratifying to see them put to use for renewable energy."*

"This new generation of solar panels is an innovative green technology that is the fruit of a partnership between CERN and industry", explains Enrico Chesta, head of the Technology Transfer Section of CERN's Knowledge Transfer Group.



Thank you for your attention!

…and many thanks to Elettra / ERF for organizing this very interesting workshop!