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JABLONTRON
CREATING ALARMS



FAU
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UNIVERSITÄT
ERLANGEN-NÜRNBERG

Iba

The ARDENT European Union project

Advanced Radiation Dosimetry European Network Training initiative



www.cern.ch/ardent



Marco Silari (CERN)

on behalf of the ARDENT consortium



UNIVERSITY OF
HOUSTON



UOIT

SEIBERSDORF
LABORATORIES

UNIVERSITY OF
WOLLONGONG
AUSTRALIA



INFN
Istituto Nazionale
di Fisica Nucleare
Laboratori Nazionali di Legnaro



ARDENT and the Politecnico



POLITECNICO DI MILANO

150^o

1863/2013

POLITECNICO DI MILANO









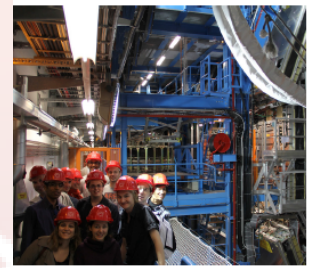









JABLOTRON



Nell'ambito delle celebrazioni per il 150° anniversario del Politecnico di Milano sarà possibile ascoltare la testimonianza di quindici giovani ricercatori, provenienti da diversi Paesi (Italia, Inghilterra, Australia, Svezia, Colombia, Mauritius, Grecia, Germania, Slovacchia, India) che, grazie al **Progetto ARDENT Marie Curie ITN** (finanziato dall'Unione Europea), studiano nuovi strumenti per misurare le radiazioni per applicazioni mediche, industriali, nella ricerca e nello spazio.

I giovani ricercatori del progetto ARDENT - Advanced Radiation Dosimetry European Network Training initiative - spiegheranno personalmente la loro ricerca e illustreranno le possibilità offerte dall'Università e dall'Unione Europea per accedere a questa carriera.

Racconteranno come, nel corso di questa affascinante esperienza, studiano lo sviluppo di nuovi rivelatori, ossia di strumenti di misura delle radiazioni sempre più accurati, per poter migliorare i trattamenti dei pazienti e limitare i rischi di danno alla salute degli astronauti e alla strumentazione elettronica nelle missioni spaziali.

Nella stessa occasione sarà possibile visitare l'area espositiva, dove verranno mostrati i rivelatori sviluppati nell'ambito del progetto.

PROGRAMMA

9:30 Saluti di benvenuto

9:45 Il programma ARDENT della Unione Europea
(Marco Silari, CERN e coordinatore del Progetto ARDENT)

10:30 ARDENT per tutti
(Silvia Puddu, ricercatrice ARDENT al CERN)

11:00 - 12.30 incontri con i ricercatori ARDENT e dimostrazione delle attività di ricerca

14:30 ARDENT per tutti
(Silvia Puddu, ricercatrice ARDENT al CERN)

15:00 - 16.30 incontri con i ricercatori ARDENT e dimostrazione delle attività di ricerca

Mercoledì 16 ottobre 2013 ore 9.30
Politecnico di Milano
Aula De Donato

Contacts
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Dipartimento di Energia
stefano.agosteo@polimi.it
Marco Silari, CERN, Ginevra, Svizzera :
marco.silari@cern.ch



ARDENT

February 2012 – January 2016



Marie Curie Initial Training Network under EU FP7 – 4 M€

8 Full Partners and **6 Associate Partners**

Coordinator: CERN, Scientist-in-Charge: Dr. M. Silari

CERN (coordinator), Geneva, Switzerland
AIT Vienna, Austria
CTU - IAEPR Prague, Czech Republic
IBA Dosimetry, Schwarzenbruck, Germany
Jablotron, Jablonec nad Nisou, Czech Republic
MI.AM, Piacenza, Italy
Politecnico of Milano, Italy
Seibersdorf Laboratories, Austria

INFN Legnaro National Laboratories, Italy
ST Microelectronics, Italy
University of Erlangen, Germany
University of Houston, USA
University of Ontario, Canada
University of Wollongong, Australia





Marie Curie ITN

Initial Training Networks



Embarking on a research career is not always easy. And yet today's young researchers are vital to Europe's future. At Marie Curie Actions, we are well aware of that. So we want to make research careers more attractive to young people.





Marie Curie ITN

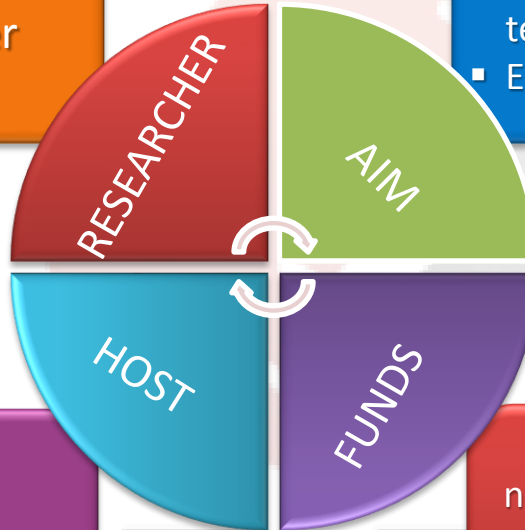
Initial Training Networks



Researchers within the first five years of their career



- Improving skills
- Integration in established research teams
- Enhancement of career prospects



- Universities
- Research Centres
- Companies
- Small and Medium Enterprises



Successful proposals from a network receive funding for up to 4 years to cover costs of the researchers and for network activities including conferences and equipment



Further information:

European Commission – Marie Curie Actions:
<http://ec.europa.eu/research/mariecurieactions>

Marie Curie Actions at CERN:
<http://jobs.web.cern.ch/join-us/marie-curie-actions>



The ARDENT researchers



Eleni Aza – ESR 1



Andrej Sipaj – ESR 6



Alvin Sashala Naik
ESR 13



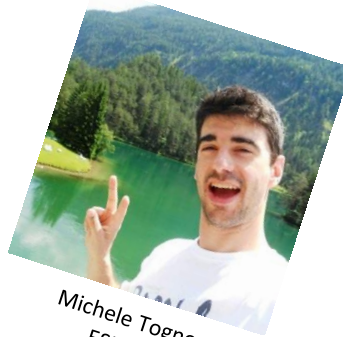
Elena Sagia – ESR 14



Benedikt Bergmann
ESR 9



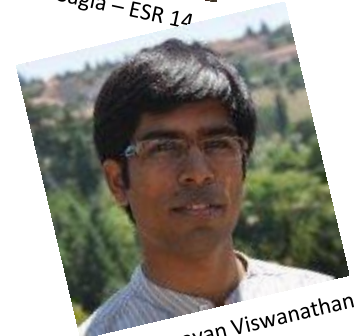
Silvia Puddu – ESR 3



Michele Togni
ESR 11



Jayasimha V. BAGALKOTE
ESR 5



Vijayaragavan Viswanathan
ESR 12



Kevin Loo – ESR 8



Stuart George – ESR 4



Ivan Caicedo – ESR 7



Francesca Bisello – ESR 10



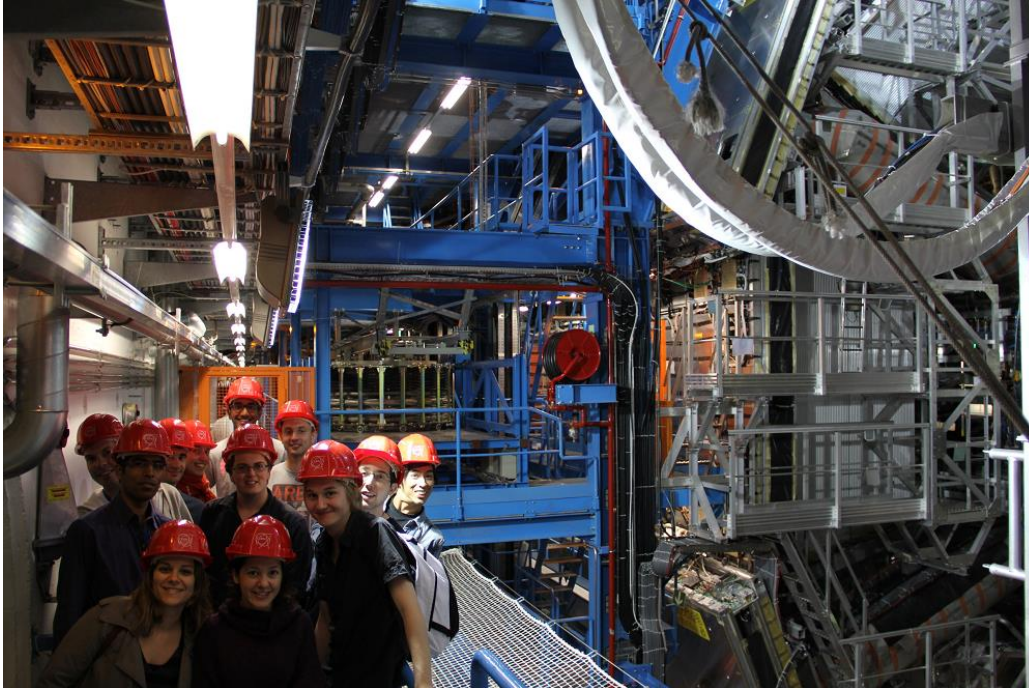
Erik Frojd – ESR 2



Chris Cassel – ESR 15



The ARDENT researchers



The ARDENT researchers visiting the ATLAS experiment at CERN



Stuart and Silvia at a conference (yeah...yeah...) in Disneyland



ARDENT institutes





What do we do in ARDENT?



What we do in ARDENT is to develop techniques to better measure radiation

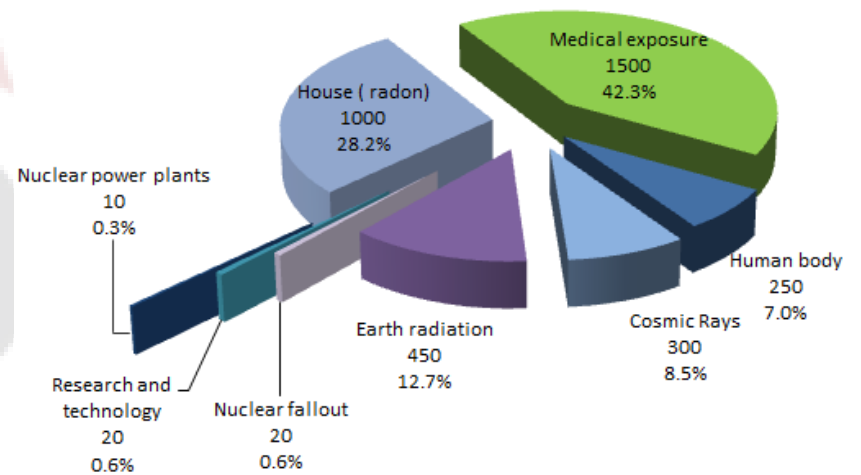
Radiation is everywhere around us!

- ✓ Natural
- ✓ Artificial

Dosimetry = measurement of radiation dose
(amount of radiation absorbed by the body, or more precisely, the amount of energy deposited in tissue)



Radiation is all around us





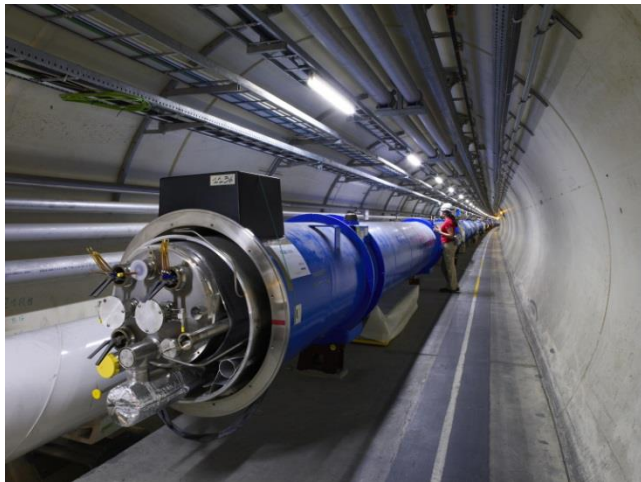
Peaceful uses of radiation



Energy production



Medicine: diagnostics and therapy



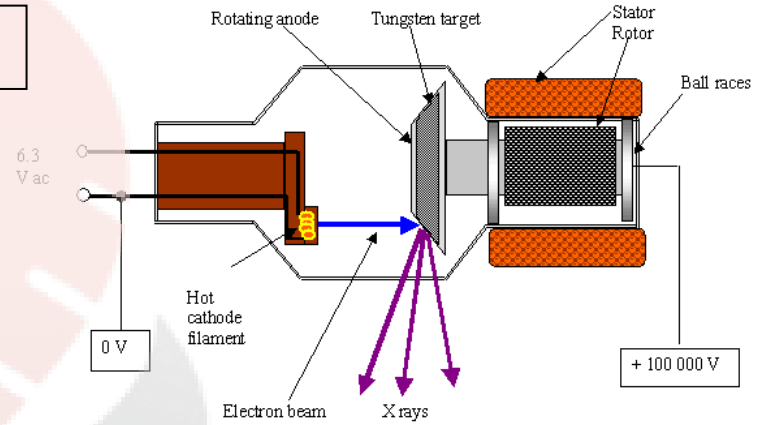
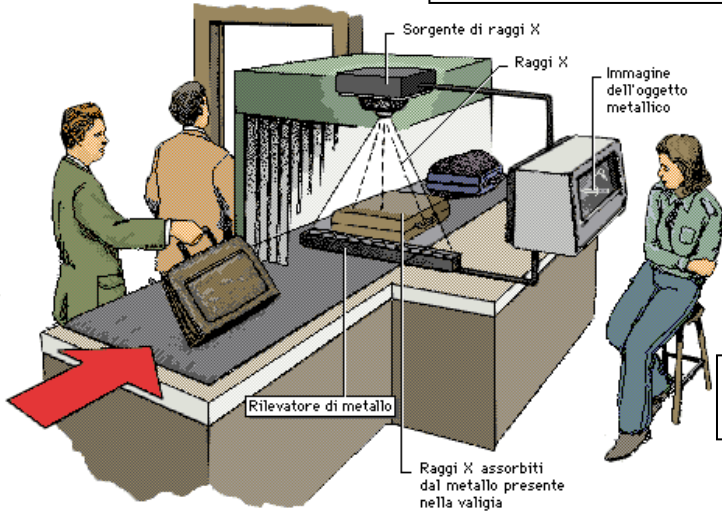
Scientific research / particle accelerators



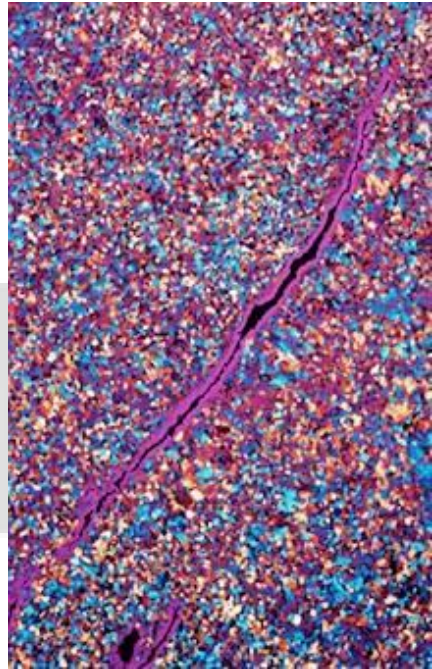
Peaceful uses of radiation



Safety in airports



Industrial radiography



Sterilization of food and medical material



What is Radon (^{222}Rn)?



Produced naturally from Uranium products such as Radium (^{226}Ra)

Colourless and odourless gas

Radon is highly radioactive and is a carcinogen. Its decay products, such as Polonium are toxic and radioactive

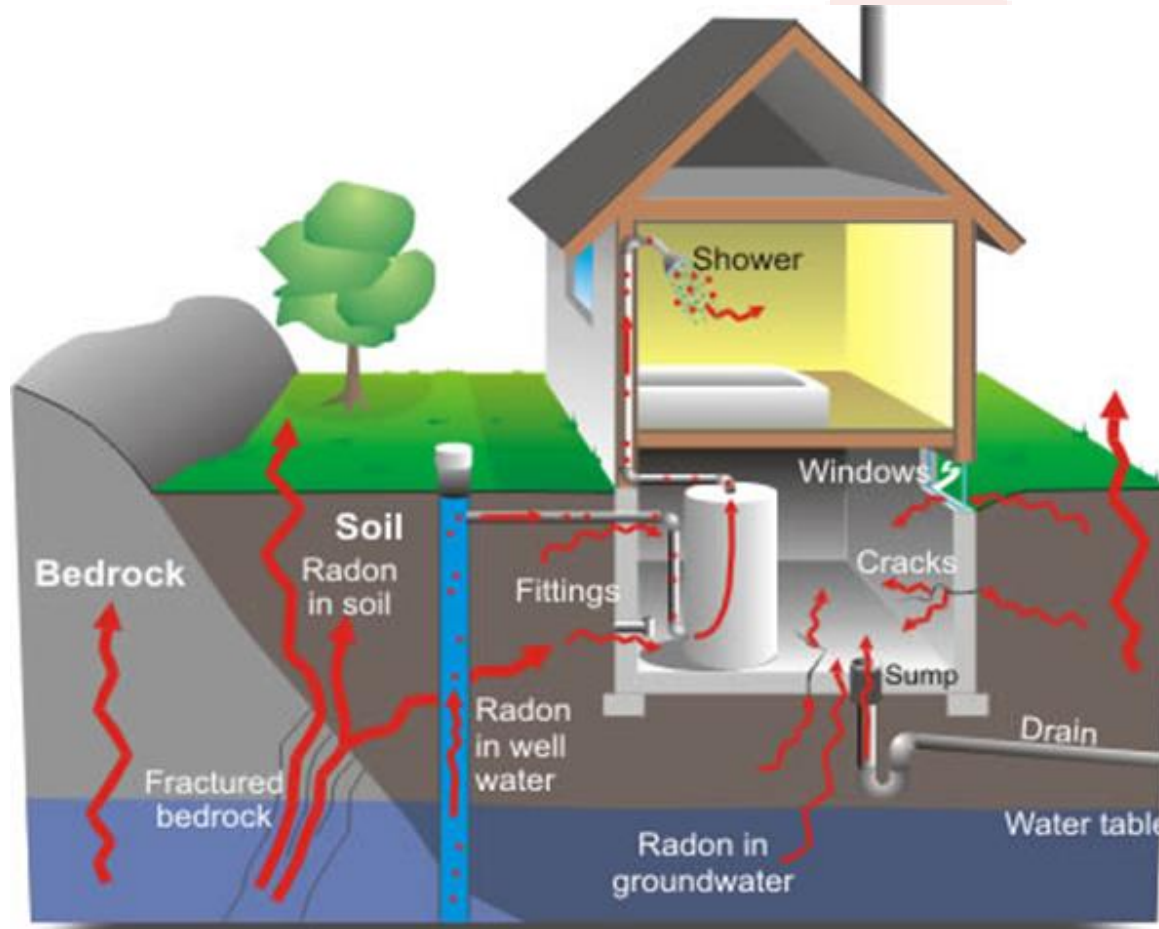
Radon is present in most homes and is the second cause of lung-cancer after smoking, with 15,000 to 22,000 lung cancer deaths in the United States each year related to radon

www.cancer.org/radon

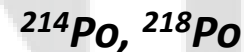
Radon and Cancer, Fact sheet N°291, World Health Organisation



Where do we find Radon?



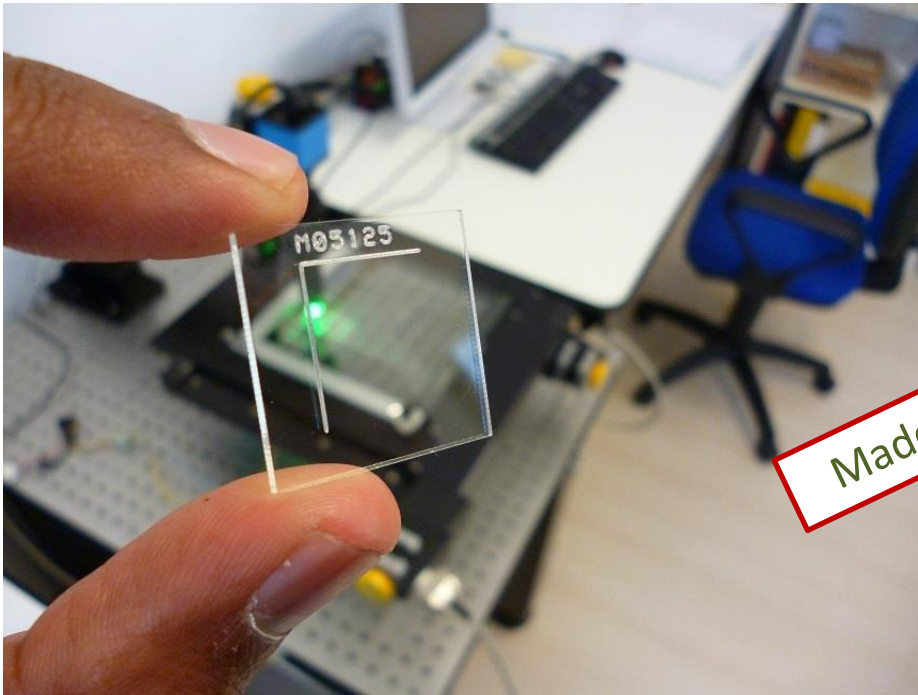
- Radon is emanated from the Uranium rich soil or rocks
- Radon can also be found in water
- Radon escapes easily from the ground into air where it decays into its *progeny*



Radon and Cancer, Fact sheet N°291, World Health Organisation

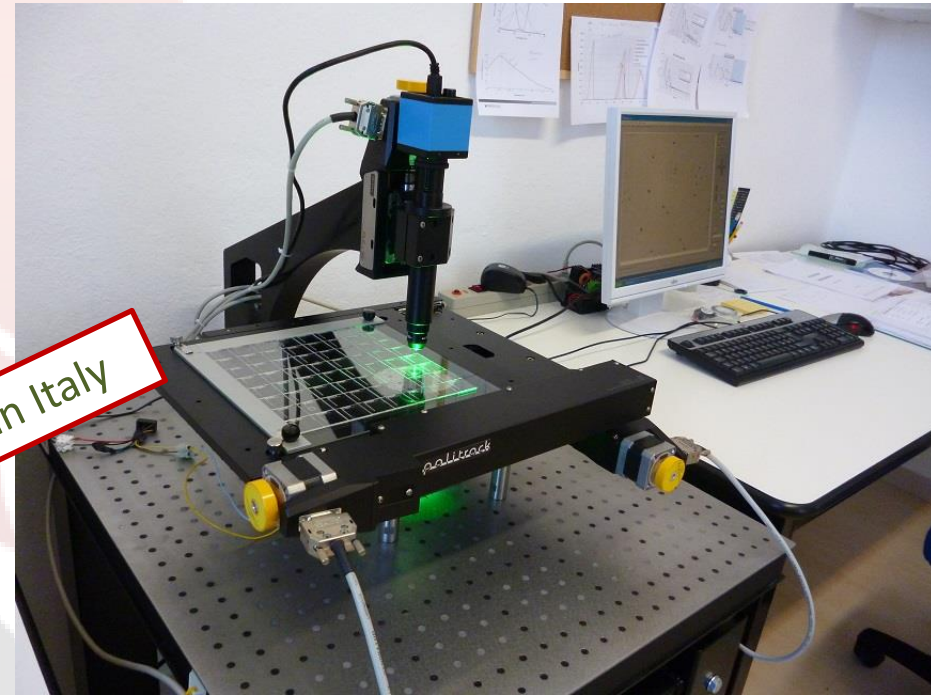


Measuring Radon exposure at home



Intertrack™ CR-39 detector

Made in Italy



Politrack™ Reader

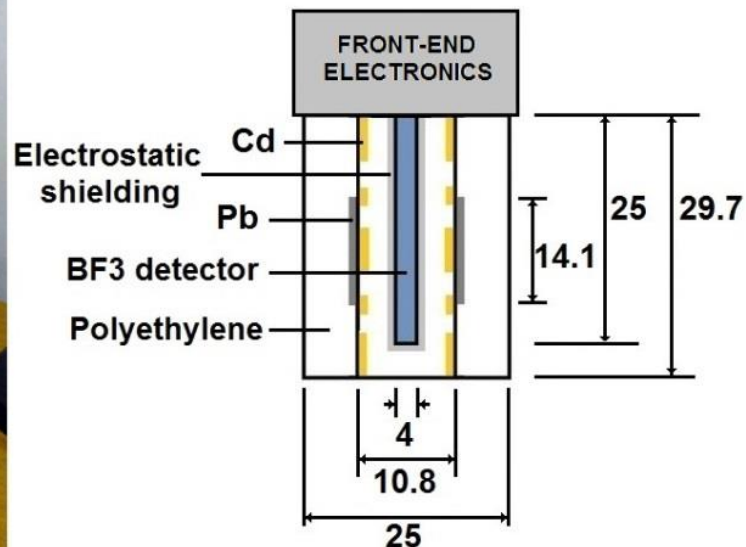


LUPIN



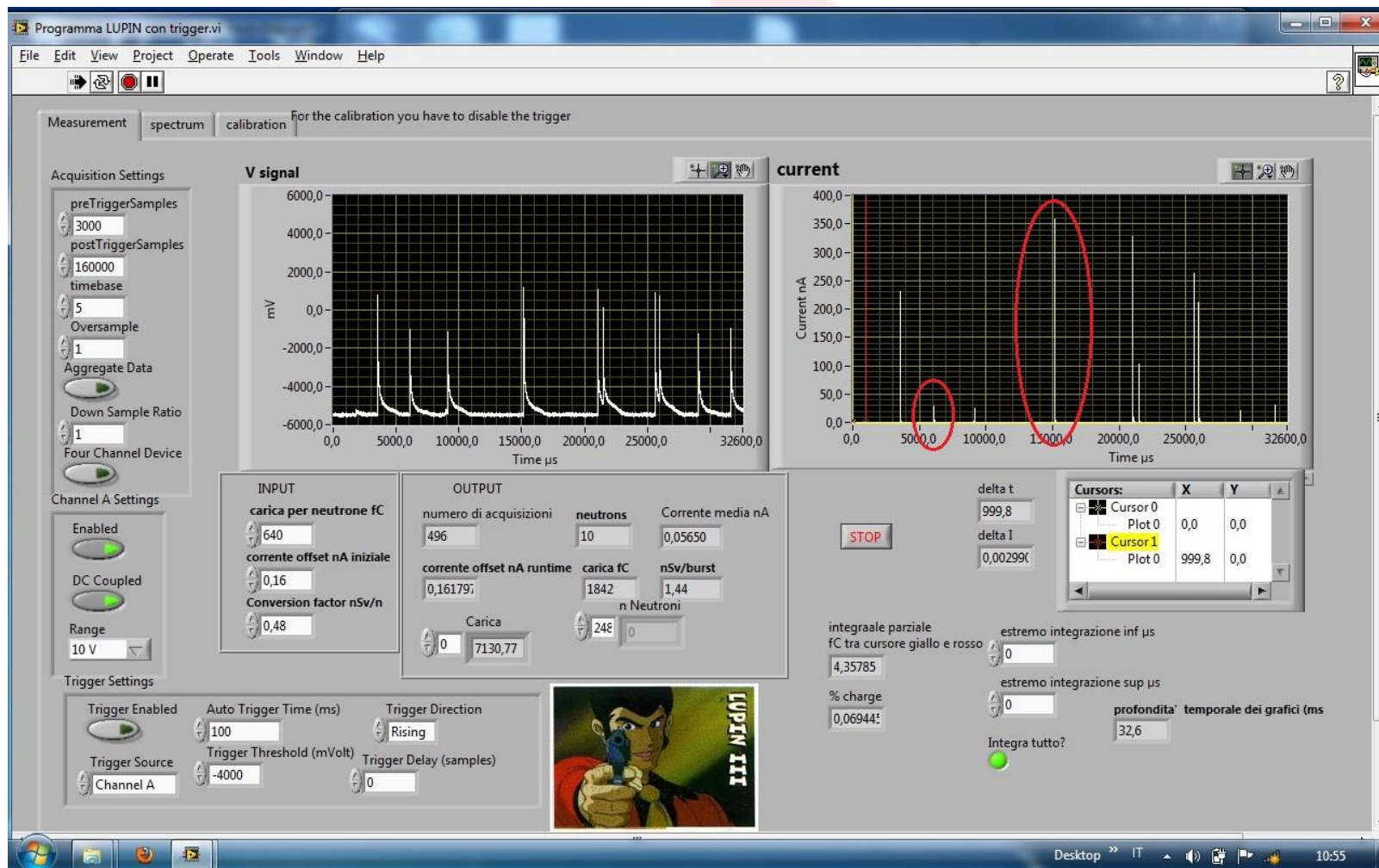
A **radiation safety device** for measuring radiation field around particle accelerators

- Designed to detect **neutrons** produced during accelerator operation
- The incoming neutron is slowed by the outer material, then interacts with the gas (BF_3) inside the detector, which causes an increased current in the circuit
- This is then acquired with a laptop, and the number of neutrons are counted





LUPIN



Screenshot of the acquisition software. The peaks in the right side plot are neutrons interacting with the detector



Medipix



MX-10

Digital Particle Camera

See a different world ..

- Radiation detecting device based on Timepix technology
- Can see invisible particles which are all around us
- Application can be used for
 - educational, research, medical and industrial purpose
- Technology has been developed at CERN
- Outcome of more than 10 years of research
- Goal: take research outcome to Society



JABLOTRON
CREATING ALARMS



Medipix



Basic MX-10 edukit

MX-10

- Unique educational aid for students
- Developed at JABLOTRON ALARMS a.s
- Collaboration:
CERN/IEAP/Medipix/ARDENT
- Product launched in the market

Features

- 256 x 256 pixels, Pixel size: 55 x 55 μm^2
- Active area 14 x 14 mm^2
- Recognition of particles ($\alpha, \beta, \gamma, \text{MIP}$)
- Real time display using Pixelman
- Experimental guide for teachers
- Portable



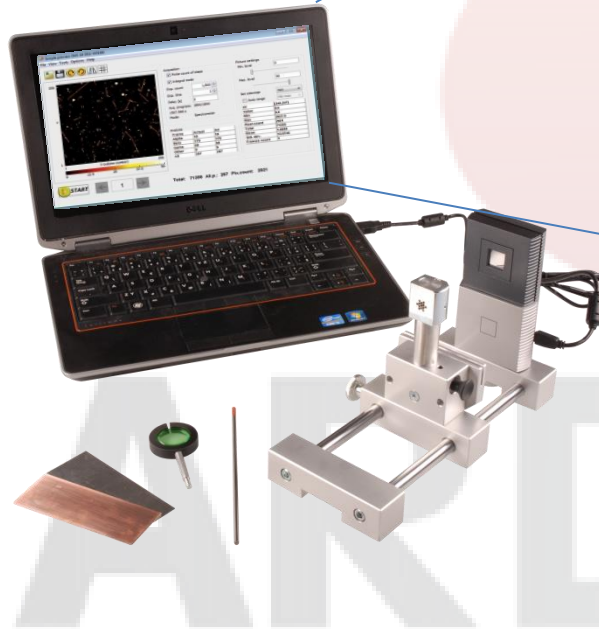


Medipix

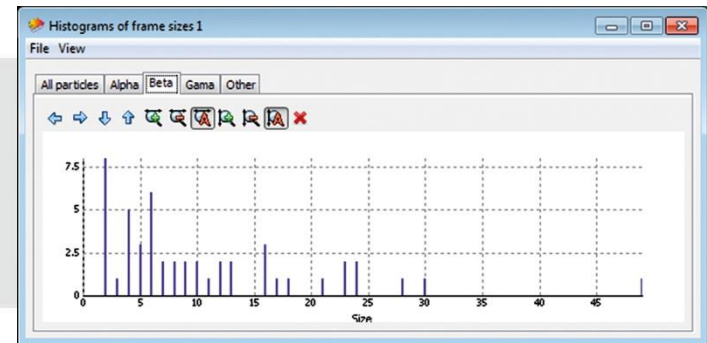
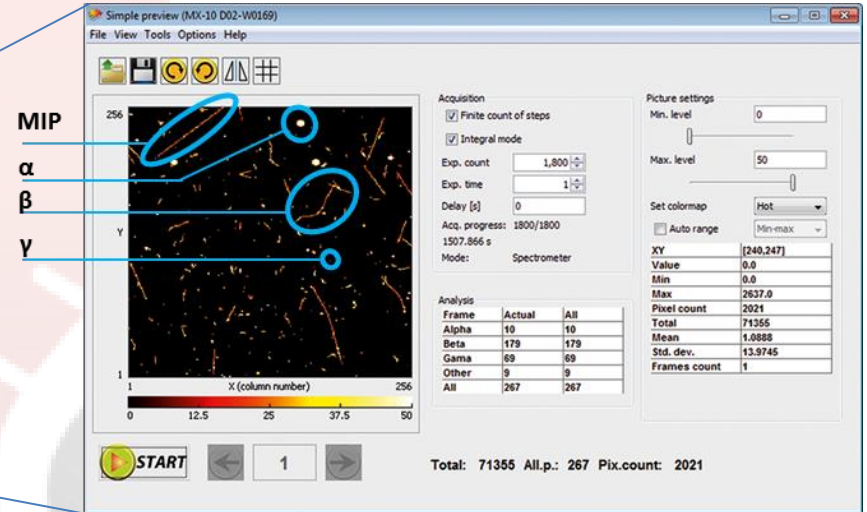


Educational kit setup

- MX-10 – digital particle camera
- Test bench with source
- Pixelman software

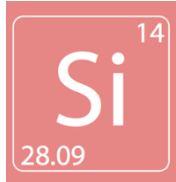


Pixelman software output

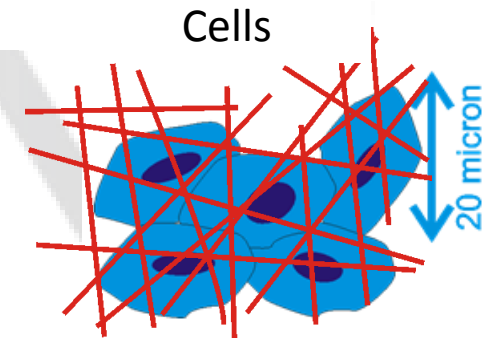
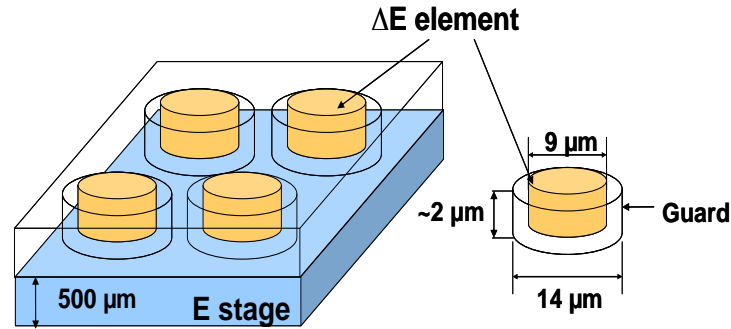
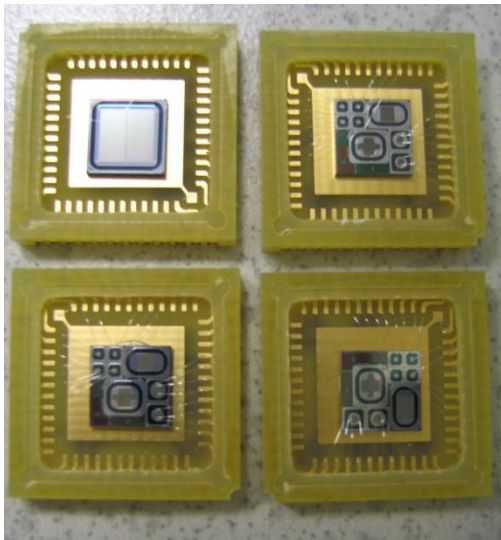
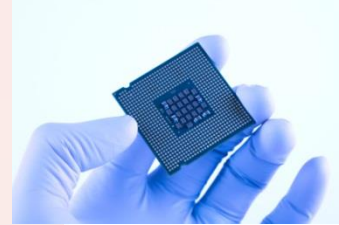




Silicon microdosimeter



Common material



Courtesy of P. Colautti, INFN-LNL, Italy

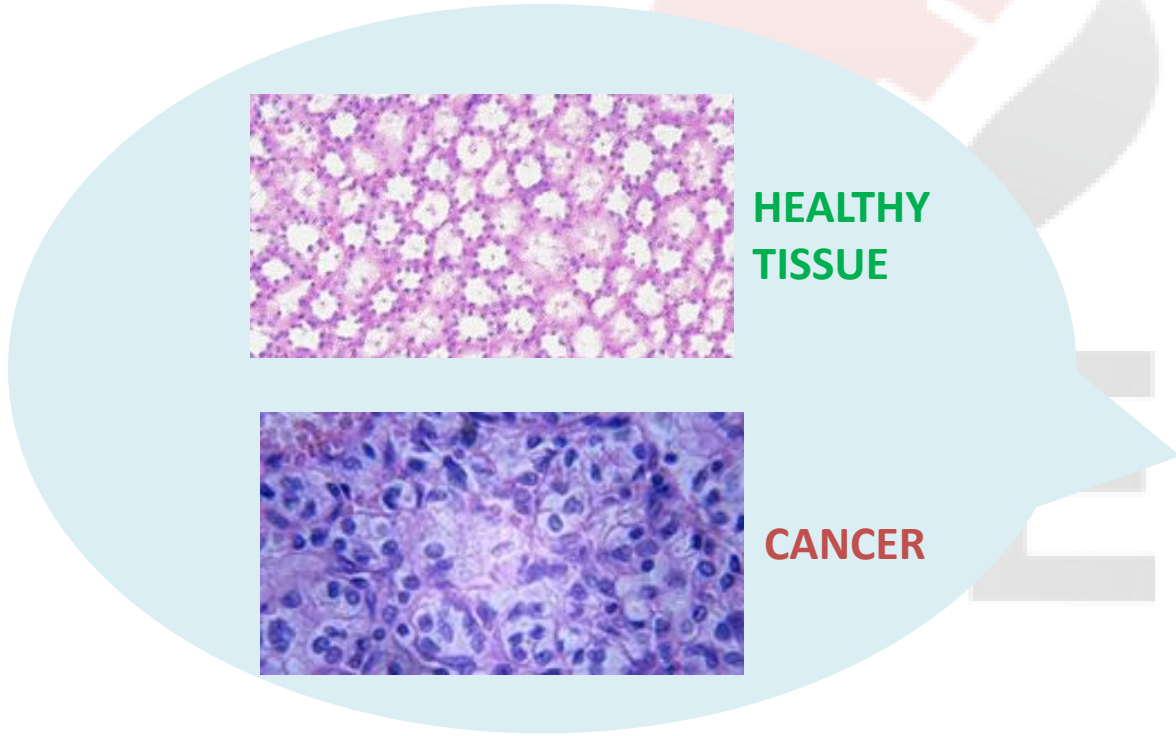


Silicon microdosimeter



Dosimetry in micrometric scale

$1 \mu\text{m} = 0,000001 \text{ m}$
1 millionth of a metre





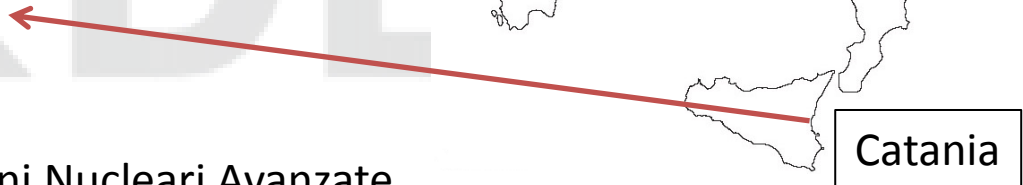
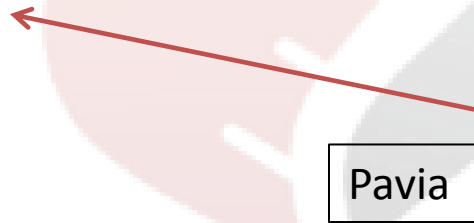
Cancer radiation therapy



Radiation can be a useful tool used for cancer treatment by killing the cancer cells through a procedure called radiotherapy

Radiotherapy is performed in specialized facilities

The application of **microdosimetry** helps for more effective treatment



Centro di AdroTerapia e Applicazioni Nucleari Avanzate



EDUCATION AND RESEARCH

Knowledge and Training at CMRP



70% of medical physicists
in NSW were trained at CMRP

Technology
Solutions

Excellence in
Education

Partnerships in
Business

ARDENT

Sensors for Real-time Solutions in Radiotherapy and Nuclear Medicine

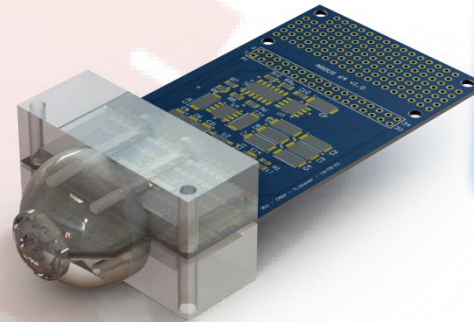


Live Longer, Live Healthy

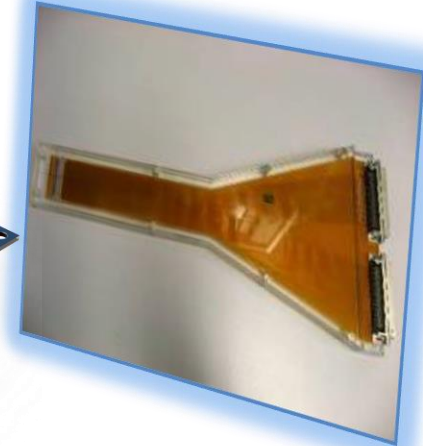
Magic Plate-
cancer fighter



Panoptes-eye cancer
fighter



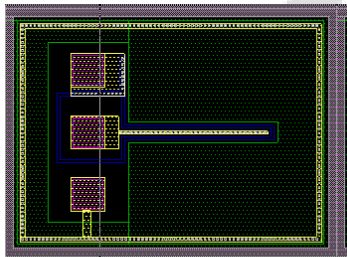
Dose Magnifying Glass-
Brain tumor fighter



SSD-child cancer
fighter

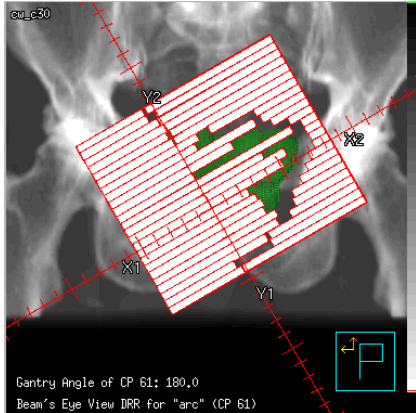
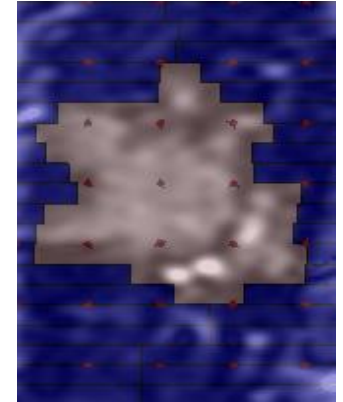
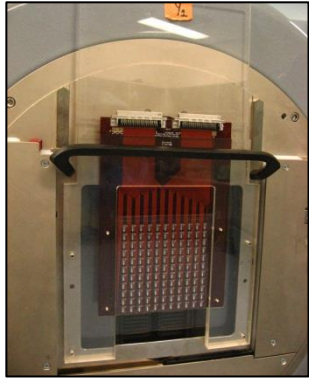


MOSkin –prostate cancer
fighter

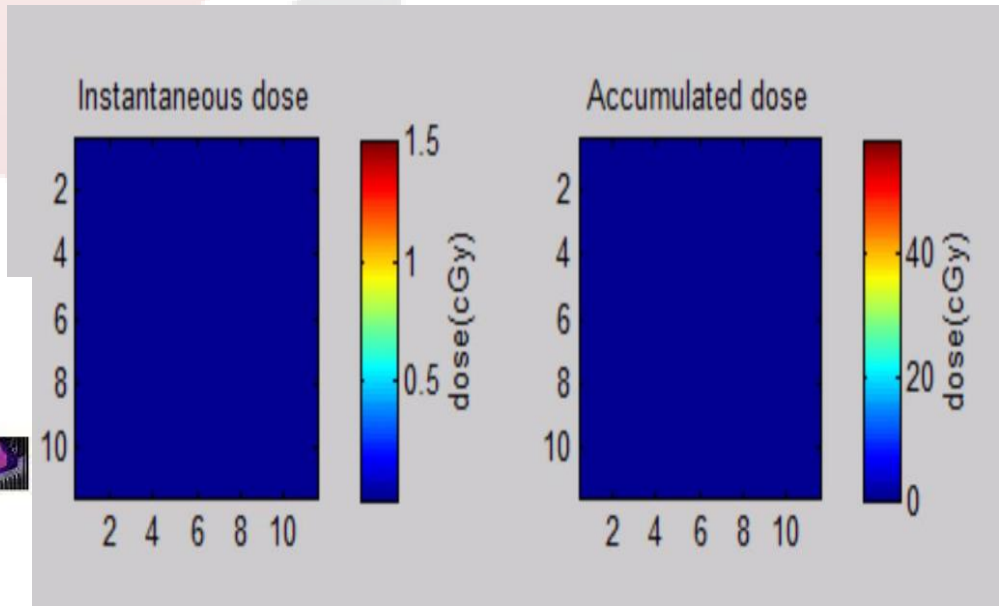




Photon Therapy: MiniDosimetry



COPYRIGHT ©2000 VARIAN MEDICAL SYSTEMS
Milnerium MLC: Clnac® EX with MLC-120





CMRP Radiation Sensor Systems



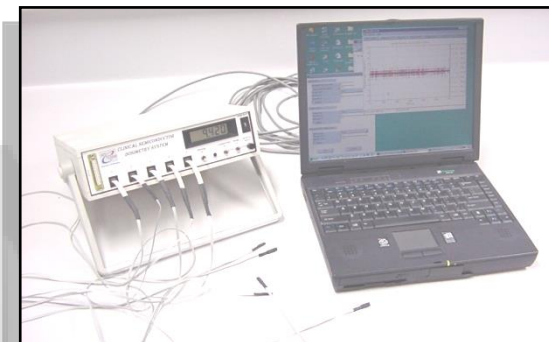
Radio-guided
Surgery Probe



Microbeam Dosimetry



Microdosimeter



MOSkin Dosimetry



Urethra Probe



Sponsorships and partnerships



AFRICAN SCHOOL OF FUNDAMENTAL PHYSICS AND ITS APPLICATIONS

July 15-Aug 04, 2012

KNUST, Kumasi, Ghana

africanschoolofphysics.web.cern.ch/AfricanSchoolOfPhysics/

In connection to APS2012, a dedicated Grid School will follow on August 6-8, 2012



African School of Physics
Stellenbosch (SA) –August 2010

African School of Physics 2012
Kumasi, Ghana – July 2012

African School of Physics 2014
Dakar, Senegal, August 2014



AFRICAN SCHOOL OF FUNDAMENTAL PHYSICS AND ITS APPLICATIONS

University Cheikh Anta Diop
Dakar, Senegal
August 3-23, 2014



Application: ASP2014-Registration@cern.ch

Deadline: Open for application from Dec 1st, 2013 to March 1st, 2014. Partial or full support to cover participation costs may be requested on the application form. Please provide a CV and a motivation letter with your application.

Contact: Asp2014-loc@cern.ch

Website: <http://www.africanschoolofphysics.org/>

Physics Topics:

- Theoretical Particle Physics
- Experimental Subatomic Physics
- Accelerators and Technology
- Grid and Computing

For more details visit the website.



International Organizing Committee:

- B. Acharya (ICTP), K. Assamagan (BNL)
- C. Darve (FNAL), S. Muozna (CPM)
- J. Ellis (King's College & CERN, CH)

Local Organizing Committee:

- O. Ki (UCAD), S. B. L. Amar (UCAD), M. Biaye (UCAD), D. Boye (UCAD), N. Boye-Faye (UCAD), M. Faye (UCAD), Y. Gning (UCAD), F. K. Gueye (UCAD), D. Kobor (UZ), A. Ndiaye (UGB), A. Taya (UCAD), C. Thiandourme (UCAD), A. Wague (UCAD)

International Advisory Committee:

- E. Auge (CNRS-IN2P3), V. Breton (CNRS-IN2P3), J. Cleymans (UCT), S. Connell (UJ), C. Diop (CEA), T. Ekelof (UJ), E. G. Ferreira (USC), H. Gordon (BNL), J. Govaerts (UCL), N. Holtkamp (SLAC), Y. K. Kim (FNAL), G. Margaritondo (EPFL), B. Masara (SAIP), H. Montgomery (TJNAF), B. Mueller (BNL), F. Quevedo (ICTP), V. Rivasseau (U of Paris-Sud XI), L. Rivkin (PSI), E. Tsesmelis (CERN), T. Vickey (Wits), Z. Vlakazi (Themba LABS)

Application: ASP2012-registration@cern.ch

Deadline: Open for application from Dec 1, 2011 until March 1, 2012

Partial or full support to cover participation costs may be requested on the application form, please also provide a CV and a letter of motivation.

Contact: ASP2012-loc@cern.ch

Physics Topics:

- Theoretical Physics
- Foundations of Nuclear and Particle Physics
- Standard Model of Particle Physics
- Beyond The Standard Model
- Astro-Particle Physics
- Experimental Sub-Atomic Physics
- Heavy Ion Physics
- Nuclear and Particle Physics
- Particle Detectors
- HEP Computing
- Accelerators and Technology
- Instrumentation
- Beam Optics
- Particle Accelerators
- Medical Applications
- Light Sources
- Laser
- Energetics
- Transfer of Technology
- GRID Computing
- Application in Particle Physics Experiments

International Organizing Committee:

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- K. Assamagan (BNL, USA)
- C. Darve (FNAL, USA)
- S. Muozna (CPM, Moravia, FR)

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- F. K. A. Akye (MRS, Legon-Accra)
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- L. K. Donnell (Director of National IBS)
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- H. Gordon (BNL, USA)
- J. Govaerts (UCL, BE)
- N. Holtkamp (SLAC, USA)
- J. Huston (BNL, USA)
- M. Kado (CNRS, IN2P3, FR)
- Y.-K. Kim (FNAL, USA)
- H. Lindner (ISIS, GB)
- G. Margaritondo (EPFL, CH)
- B. Masara (SAIP, SA)
- H. Montgomery (TJNAF, USA)
- F. Quevedo (ICTP, IT)
- L. Rivkin (PSI, CH)
- E. Tsesmelis (CERN, CH)
- T. Vickey (U. of the Witwatersrand, SA)
- S. Vignier (BNL, USA)
- Z. Vlakazi (Themba LABS, SA)
- R. Voss (CERN, CH)



ARDENT



CERN national teacher programme



The **National Teacher Programmes** are held in the mother tongue language of the participants from CERN member states:

http://education.web.cern.ch/education/Chapter1/Page3_IT.html

Italian Teacher Programme September/October 2013:

<http://indico.cern.ch/conferenceDisplay.py?confId=266032>

<http://indico.cern.ch/conferenceDisplay.py?confId=275120>

About 80 high-school teachers took part

CERN takes care of the organization, there is no fee, only travel and accomodation expenses has to be covered by the school



What you are going to see next...



- A presentation by Silvia Puddu, ARDENT researcher at CERN, Geneva:
«ARDENT for all» (*ARDENT per tutti*)
- You will meet our ARDENT researchers who will show you their scientific activities on:
 - Instrumentation for dosimetry and microdosimetry
 - How to measure radon
 - Medipix, LUPIN,...
 - How to measure radiation employed to kill cancer
- And you can ask them all sorts of questions (sometimes in English – good exercise for you!)