



Interdisciplinary Physics with Small Accelerators at LNL







28 years ago







TOPICS

Radiation Interaction and Damage Surface Modification **Materials** Science Nuclear Data Acquisition and Analysis Ion Beam Analysis and Channeling **Environmental Sciences** Art and Archaeology Dosimetry, Microdosimetry, Nanodosimetry Radiation Biophysics and Medicine.

LIST OF INVITED SPEAKERS

Preliminary list of invited speakers

D.K. Avasthi (IUAC, New Delhi, India) L.C. Feldman (Institute for Advanced Materials, Devices and Nanotechnology, Rutgers University, USA) M. Hill (CRUK/MRC, Gray Inst. for Radiation Oncology and Biology, Oxford, UK) W. Möller (Helmholtz-Zentrum Dresden-Rossendorf, Germany) C. Pacheco (C2RMF-Centre de recherche et de restauration des musées de France, Palais du Louvre, Paris, France)

- H. Rabus (Physikalisch-Technische Bundesanstalt, Braunschweig, Germany)
- M. Toulemonde (CIMAP Laboratory, Caen, and GANIL, France)
- R. Webb (Surrey Ion Beam Centre, University of Surrey, Guildford, UK)
- A. Zucchiatti (Centro de Micro Analisís de Materiales, Universidad Autónoma de Madrid, Spain)



Nuclear Physics with Ion Beams

Legnaro (PADOVA). Italy

6th- 8th June 2012 INFN

di Fisica Nucleare

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Presentations of Italian Ion Beam Facilities

- M. Banconi (CNR-IWM, Bologna, Itoly) L. Calcognile (Cantro Detacione e Diagnostica, Università del Solanto, Lacce, Itoly) L. Cancopiole (Diportimento di Scienze Fischer, Università di Napoli frederico il and INFN Sec. di Napoli, Itoly)
- G. Cuttore (14EN Laboration Nacionali del Sud, Catania, Italy) M. G. Grinnoldi (Dipartimento di Fisico e Astronomia, Università di Catania, and MATIS CNR-IMM, Catania, Italy
- R Manda (Università di Firenze and INFN LABEC Firenze, Italy) V. Rapito (INFN Laboration Hazonali di Legnoro, Italy) F. Farrazi (OELE, INNOVA and Dept. of Environmental Sciences Sec. Università di Napoli, Italy)
- C. Ur (INFN Podovo, Italy)

CONTACT ADDRESS

http://ionbeums12.InLinfs.it ti olei lelittementee

Scientific Committe

E Brodo, Institut of Nuclear Physics, Krakow, Poland M. Corpinelli, INFN Cogliori, Itoly A. Climent Font, CNAM and Universit G. Della Mea, Trento University, Italy J.C. Dran, C2RMF-Centre de recherche et de restauration des musées de france, Palais du Louvre Paris, france D. Goodhead, Medical Research Council, Horwell, UK R Mondù, Florence University and UABEC, Florence, Italy R Mazzaldi, Padova University, Italy G Maschini, Padava University, Italy G. Ottaviani, Modera and Reggio Emilia Univ R. A. R.cci, INFN Legnaro, Italy V. Rigoto, INFN Legnaro, Italy E. Runini, CNR-Istituto per la Microelettranica e Microsistemi, Catania, Italy

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Cristina Componese, INFN Legnaro, Italy Anna D'Este, INFN Legnaro, Italy Cristina Miletti, INFN Padava, Italy Donielo Zone, INFN Leonoro, Itoli







Accelerators used for interdisciplinary studies today







XYZ stars

Accelerators used for interdisciplinary studies today

<complex-block>

(Gerardi, et al., Radiat. Res. 164(2005)586-590; 161(2004)93; 158(2002)371)

CN Van de Graaff

TANDEM- XTU - ALPI





AN2000 Van de Graaff

Oxford micro-beam



CN (oper. since **1961**)

7 beam lines (1-6MV pulsed/cont, ¹H,²H,³He,⁴He,¹⁴N,

¹⁵N)

- Radio-Biology (broad beam in air, single ion microbeam in air resolution: 5μm)
- Neutron dosimetry (monoenergetic ⁷Li(p,n))
- Neutron Spectrometry (Be(p,n))
- Radiation Damage
- Ion Beam Analysis (NRA, EBS, IBIL, PIXE)
- Nuclear experiments / target activation / nuclear
 +30°astrophysics







5 beam-lines (0.25-2.2MV ¹H,³He,⁴He)

- Micro-beam (resolution: 1 μm)
 - + MicroPIXE, microIBICC, microIBIL
 - + Ion Beam Writing
 - + Ultra rarefied beam / single event)
- Ion Beam Analysis
 - + NRA, RBS, ERD, IBIL
 - + Ion Channelling
- PIXE
 - + Archaeology
 - + Environmental





Research groups and institutions involved in the interdisciplinary activities at LNL (AN2000 and CN)

CN	
YEAR 2011	
EXPERIMENTS/YEAR	27
External Institutions	12
Univ. Firenze, Modena e Reggio, Pisa, Padova, Roma3, Trento, Torino;	

CNR-Pd, CNR-Trieste, INAF-IASF Bologna, Politecnico Milano e Torino

YEAR 2011EXPERIMENTS/YEAR26External Institutions14Univ. Bologna, Firenze, Modena e Reggio, Padova, Trento, Torino,
Venezia, Verona; CNR-ICIS-Pd, CNR-ISAC-Bo, CIEMAT, (Spain),
Nat. Inst Nucl. Phys. Bucharest (Romania), IUAC (India)

AN2000





The LNL Detector Materials Laboratory

Laboratory mission:

- Develop new materials for novel radiation detectors
- Support materials development in new particle accelerating devices
- Complex nuclear targets preparation







The Detector Materials Laboratory

Advanced materials process development and synthesis



1)

2)

- Soft X-ray multilayers
- Optical multilayers
- High Performance Plastics
- Passivating layers (HPGe...)
- Scintillator materials
- Low Friction, High Hardness Nanoscaled Materials and Multilayers



- Reactive Plasma Sputtering Deposition
- CVD and Glow Discharge
- Liquid phase/ sol-gel deposition
- Ion Implantation







The Detector Materials Laboratory

Characterization of Physical Properties



Composition / depth profile / structure

- Ion Beam Analysis (RBS, NRA, ERD, PIXE)
- Micro-PIXE 2-D trace element analysis
- Micro-EBS, micro IBIL, IBICC
- FT-IR, XRD
- Porosity

2000 nm

Other physical properties

- Nano-Hardness, Elastic modulus
- Adhesion (Micro-Scratch)
- Residual Stress
- Atomic Force Microscopy & SEM









SUMMARY

- The Laboratori Nazionali of Legnaro provide MeV ion beams to internal INFN projects and to many external institutions involved in cross disciplinary fields since many decades
- Ion beams methods are of great importance for the development of new nuclear materials, devices and technologies

Announcement

14th International Conference on Nuclear Microprobe Technology & Applications Will be held in Padova in 2014