An International Research Organization on Nanotechnology for Europe and the World

EPoSS Annual Forum

IST, Lisboa, 8th October 2010

Luis Magalhães
President of **INL Council**
INL – International Iberian Nanotechnology Laboratory

INTERNATIONAL IBERIAN NANOTECHNOLOGY LABORATORY

INL Layout

INTERNATIONAL IBERIAN
NANOTECHNOLOGY
LABORATORY

INL Building Inauguration, 17 Jul 2009

INTERNATIONAL IBERIAN
NANOTECHNOLOGY
LABORATORY

INL Campus

General Concept

International research organization (1st in World dedicated to nanotechnology 1st in Iberian Peninsula in any area, relationship with industry from beginning)
Decided to be created jointly by Portugal and Spain in Nov 2005 Summit.
200 researchers, 400 people. Scientific staff recruited worldwide.
Open to membership of other countries from any continent

Founding requisites:

- ➔ Assure world class research excellence in all areas of activity
- ➔ Develop partnerships with the industry and foster the transfer of knowledge into economic value and jobs
- ➔ Train researchers and contribute to the development of a skilled workforce for the nanotechnology industry
- ➔ Prevent and mitigate nanotechnology risks

"The ambition of both countries is to create a research site of world scale relevance, capable of attracting scientists and technicians from all points of the world"
José Mariano Gago, *Minister of Science, Technology and Higher Education, Portugal*

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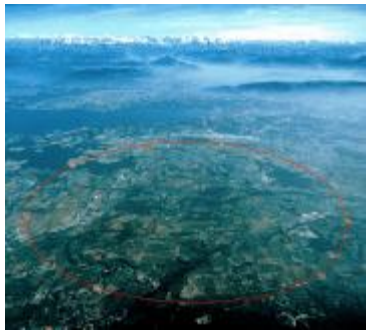
Legal, Governance and Administrative Matters

Building on the Experience Obtained in Other International Laboratories

Legal Framework and Governance

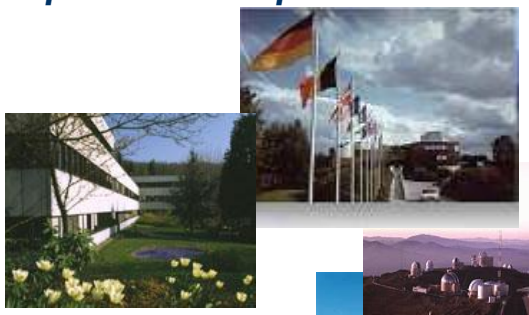
Jean-Marie Dufour, Professor at University of Geneva Law School, President of the Geneva International Academic Network, was a legal advisor of



CERN – *European Organization for Nuclear Research* at Geneva, Switzerland, founded in 1956,

and was involved in the creation of the main international research laboratories in Europe, namely:

ESO – *European Southern Observatory* with headquarters at Garching, Germany, where it also houses the joint *ESO/ESA European Coordination Facility for the Hubble Space Telescope* and with facilities also in the *La Silla Paranal Observatory* in Chile, created in 1962,



EMBL – *European Molecular Biology Laboratory* at Heildelberg, inaugurated in 1978,

ESRF – *European Synchrotron Radiation Facility* at Grenoble, France, created in 1988.

Administrative Issues

Helmut Krech, Head of Administration of the

ESRF – *European Synchrotron Radiation Facility* at Grenoble, France, which was created in 1988.

International Advisory Board

Knowledgeable and Credible Advice

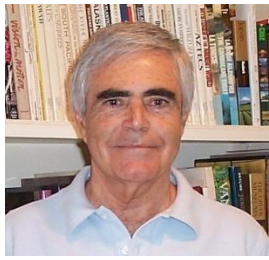
Roberto G.M. Caciuffo
Head Actinide Research, JRC, Institute for Transuranium Elements, Karlsruhe, Germany

Thomas Jovin
Head of Department of Molecular Biology, Max-Plank Institute for Biophysical Chemistry, Göttingen, Germany

Emilio Mendez
Prize *Príncipe de Asturias* of Scientific and Technical Research 1998, Department of Physics and Astronomy, SUNY at Stony Brook, NY, USA

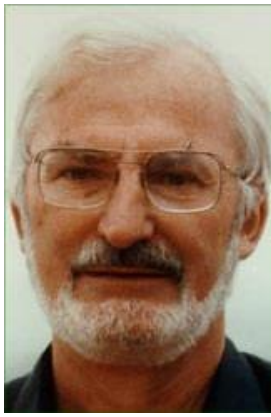
Christopher B. Murray
American Chemical Society's Nobel Laureate Signature Award in 1997, Manager, Nanoscale Materials and Devices, IBM, T.J. Watson Research Ctr., Yorktown Heights NY, USA

Aristides A. G. Requicha
Gordon Marshall Professor of Computer Science and Electrical Engineering, Director of the Laboratory for Molecular Robotics, USC, Los Angeles, USA



Mihail C. Roco
Carl Duisberg Award, Burgers Professorship Award, Engineer of the Year Award (1999, 2004), Chair of US NSTC Subcommittee on Nanoscale Science, Engineering and Technology, Coordinator of the NSF initiative Grant Opportunities for Academic Liaison with Industry, Senior Advisor for Nanotech-nology, NSF, Arlington, Virginia, USA

Heinrich Rohrer
Nobel Prize in Physics 1986 for the invention, with Gerd Binnig, of the Scanning Tunnelling Microscope while working at the IBM Zürich Research Laboratory, Wollerau, Switzerland



Conception and Development

Decided in Nov 2005 ● Conceptualized in 2006 ● Decision on site in Oct 2006 ● Convention w/ Statutes signed at Summit of Nov 2006 ● Treaty ratified by the parliaments in 2007 ● Basis of Design and preliminary construction project in 2007-08 ● Council, Director-General and Deputy Director-General appointed in May 2008 ● Construction started in Jul 2008 ● Inauguration of building in 17 Jul 2009 ● International recruitment of researchers initiated in Apr 2009 ● Beginning of research activities in house end 2010.

Scientific Areas: Nanomedicine (drug delivery, nanotechnology for diagnostics) ● Environmental Applications ● Food and Water Quality Control Applications ● Electronic Nanosystems (NEMS/MEMS, Spintronics, Photonics, Organic electronics) ● Nanomachines and Nanomanipulation ● Nanotechnology Safety and Impact in Society.

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Other Timelines

- June 2007, first PhD grant program launched (17)
- July 2007, meeting with first architect teams (Zander, HDR, Wilson Architects)
- February 2008 , BOD project chosen (Zander)
- March 2008, 1st construction tender out
- July 2008 , construction (1st phase) begins
- November 2008 , First Post Doc campaign (7)
- February 2009, 2nd construction tender out
- May 2009, first technicians hired (6)
- May 2009, construction (2nd phase) begins
- May 2009, first PI recruitment campaign started
- June 2009 , Second Post Doc campaign (8)
- September 2009, 1st tender for central lab equipment
- July 2010, 2nd tender for central lab equipment
- September 2010, moving into new building

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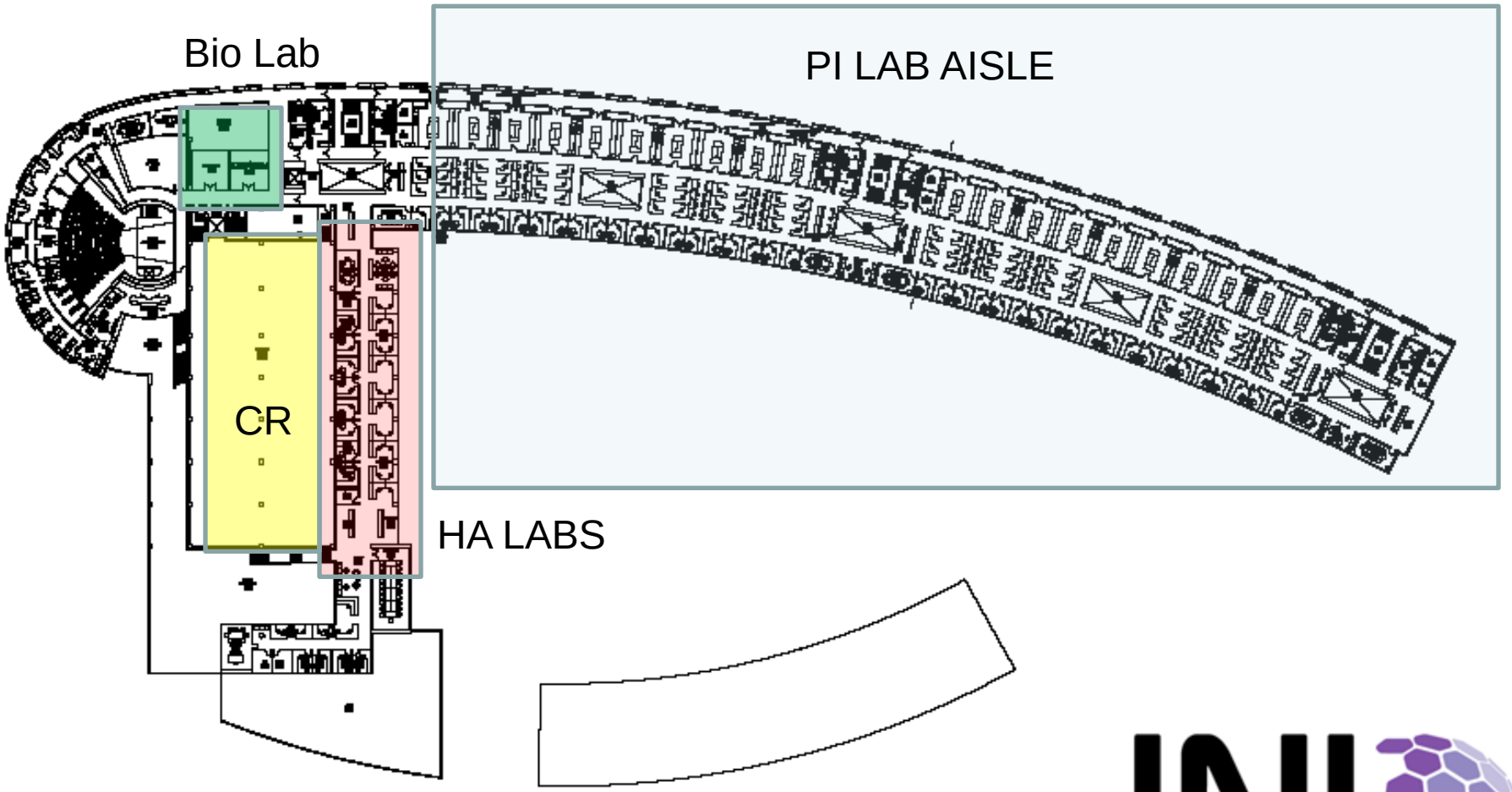
Clean Room, PI Labs, Central Labs



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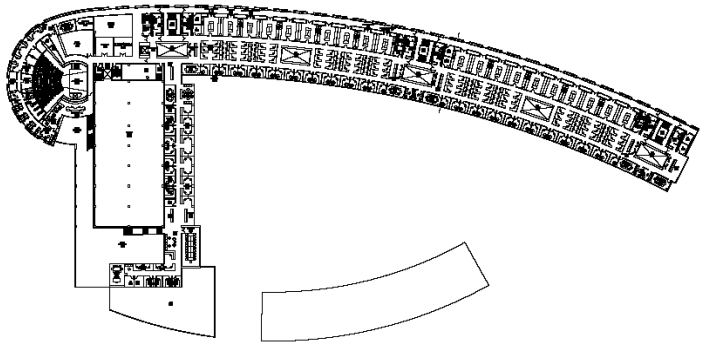
PI Labs Aisle



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Research Infrastructure

- High Accuracy Labs (on ground slab)

  HRSTEM, dual FIB, SPM, XPS/AUGER/SIMS, shielded rooms, NMR, others

  (All labs up to NIST-A vibration specs, very low EMI, acoustics control)

- Class 100 and Class 1000 Cleanroom

  VC-E, nano litho, 400m^2 , 1st phase, extendable to 600m^2

  (including biochemistry and MEMS bay, and PI bay)

- Central support labs

  biology and cell culture lab, packaging lab, RF lab, workshops

- Central computing facility

  interface with existing SC facilities

- PI labs (40 , wet and dry)

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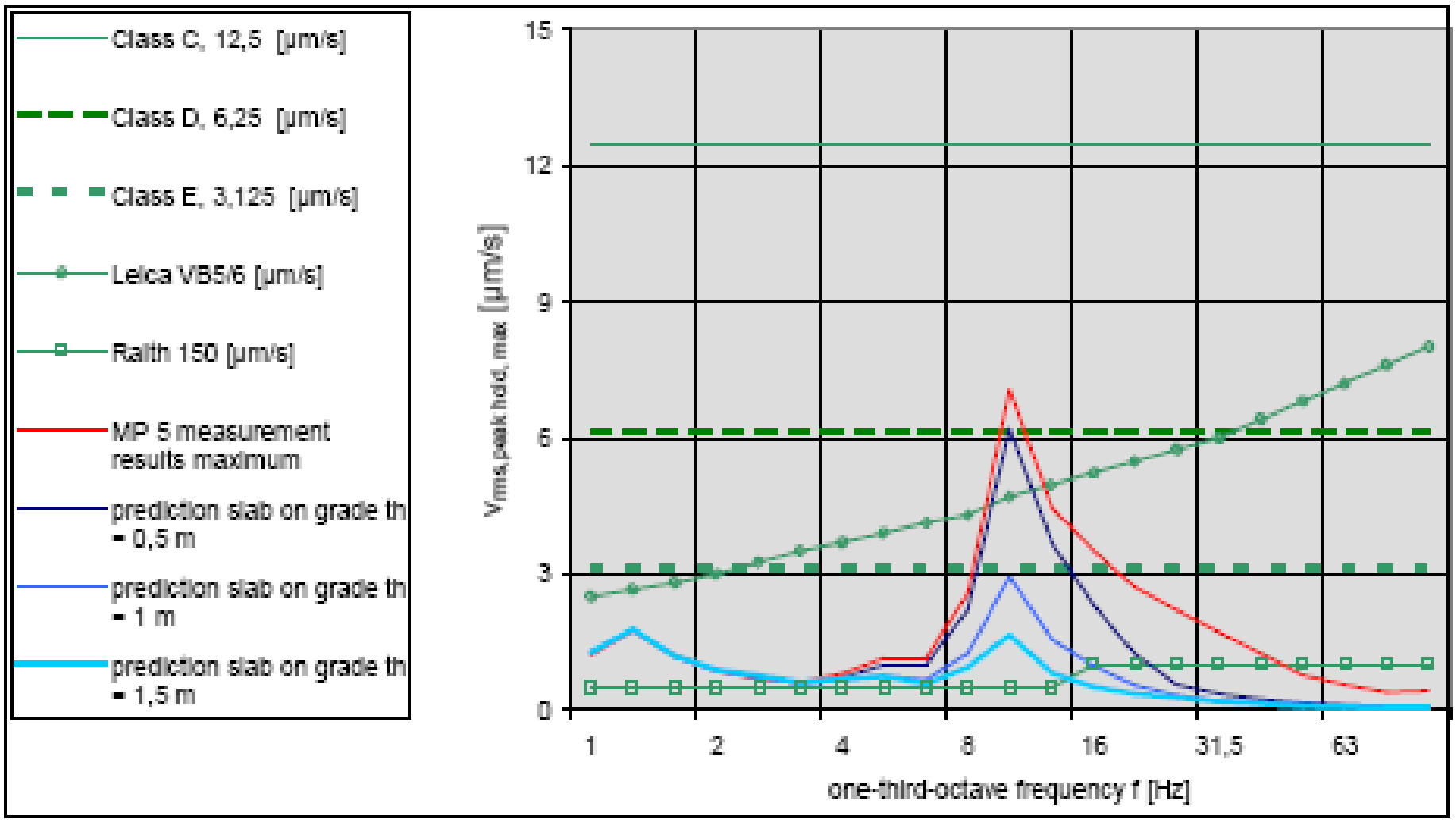
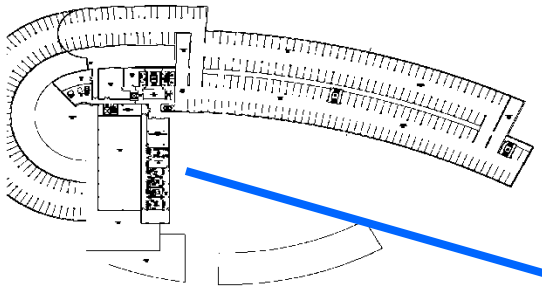
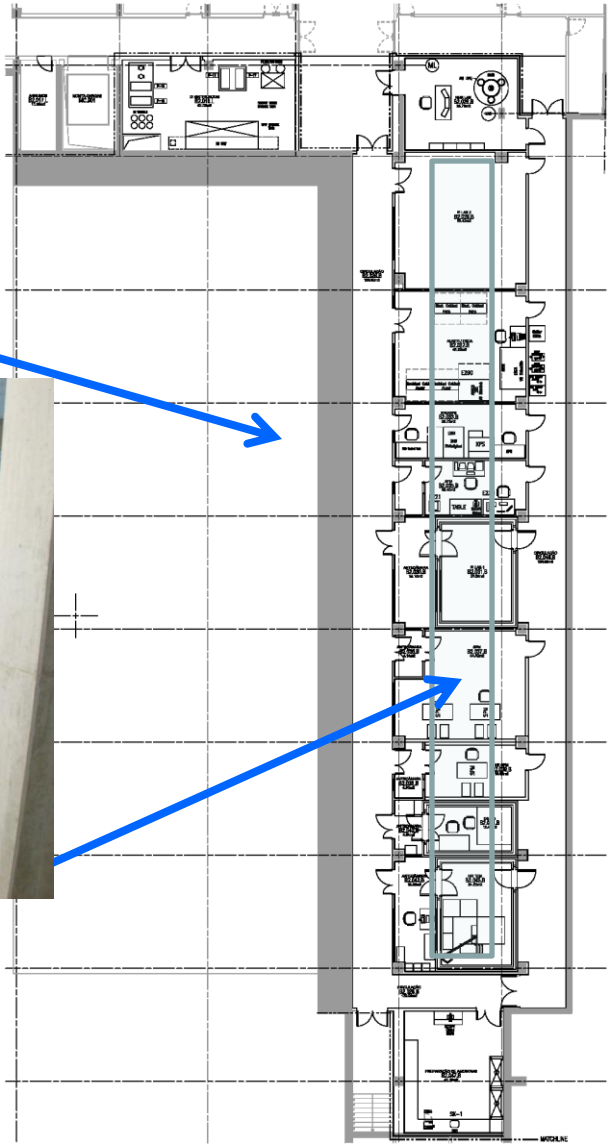
Vibration studies for slab design

Measurement results and predicted vibrations (based on the maximum measured vibrations))



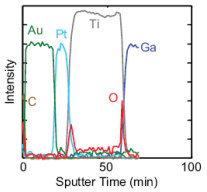
High Accuracy Labs





X ray,SAXS

Surface/interface Characterization



SHIELDED ROOM (instrumentation)

Central SPM

UHV SPM

DUAL BEAM FIB

HRSEM

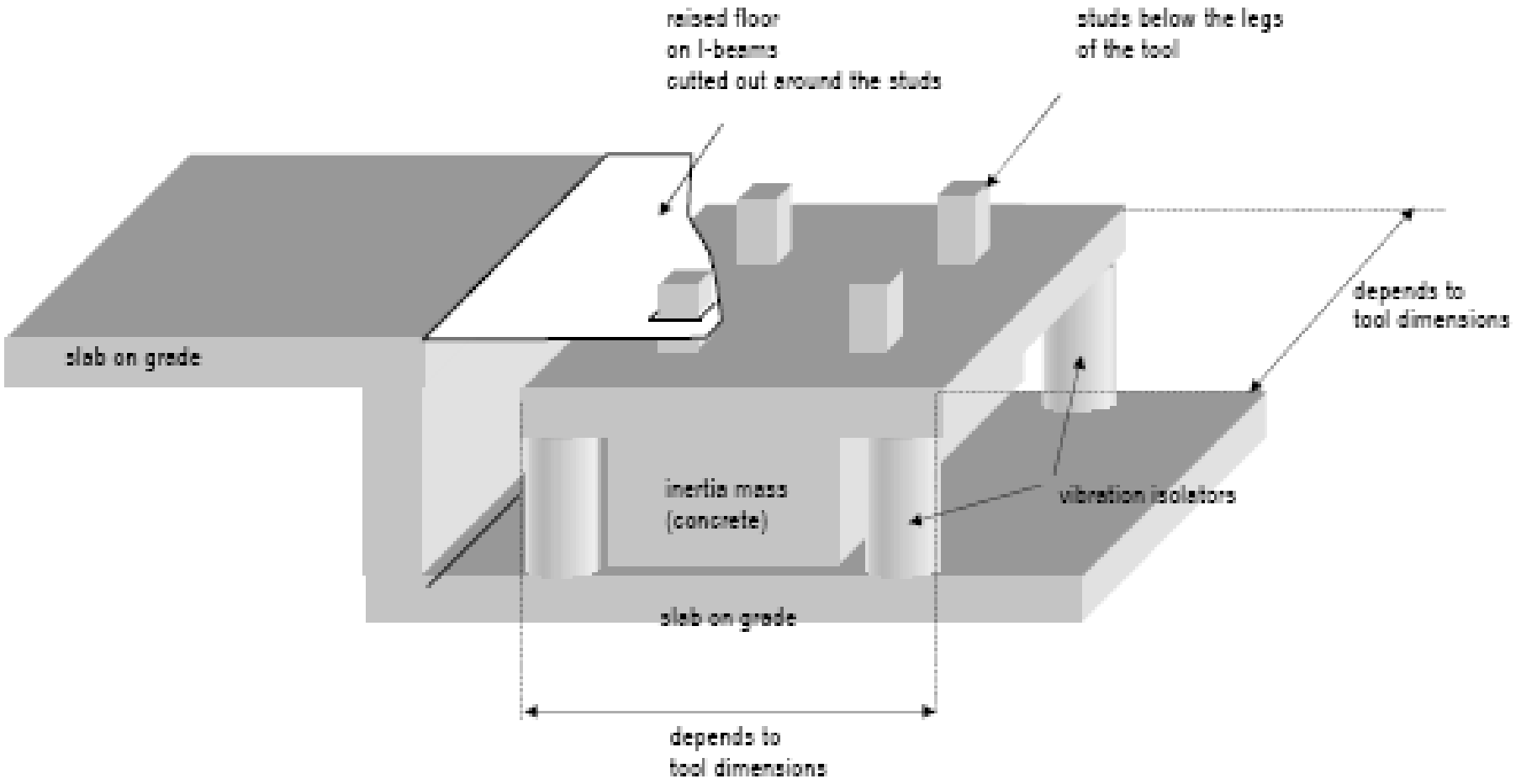
HRTEM/STEM

Sample prep

Inertial mass pit

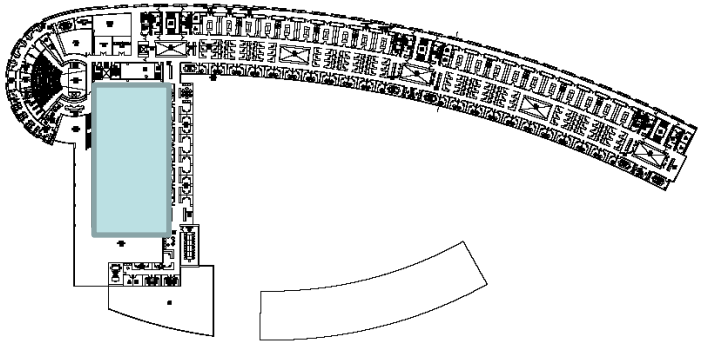
Additional Vibration Isolation Required for Some Tools

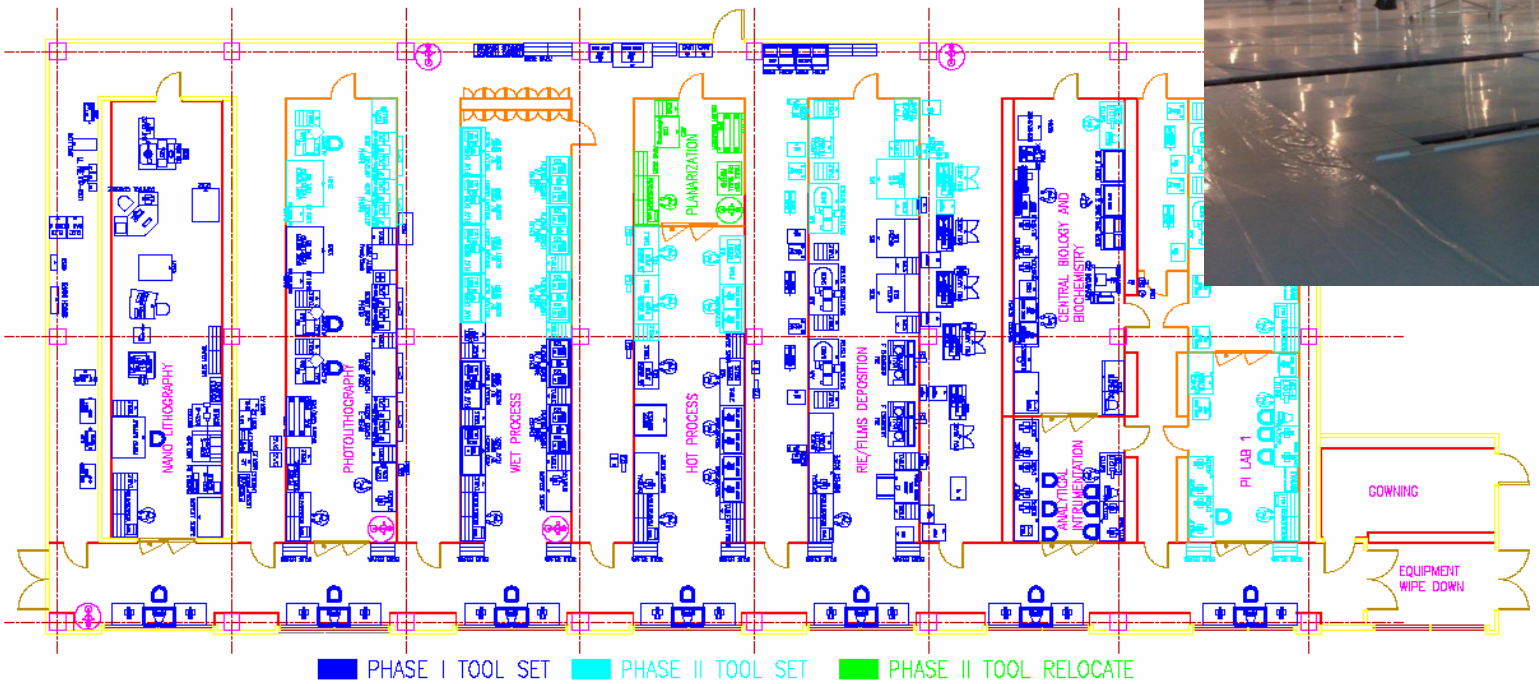
Sketch of the additional vibration isolation:

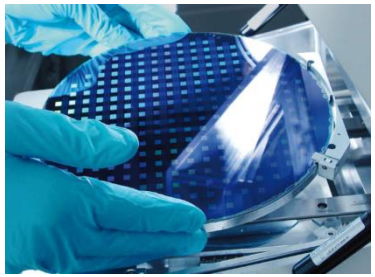


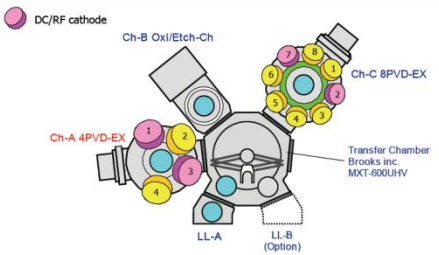
All high accuracy labs and nanolitho bay provided with pitsfor inertia mass placement

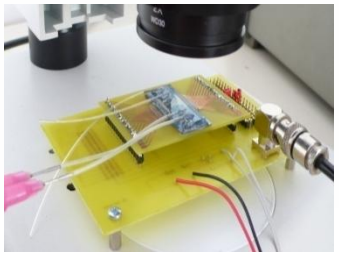
Clean Room Plan
Phase I+II

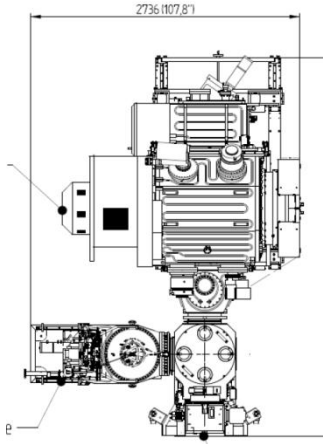












Present Recruitment Areas

- Nanoparticle biomarkers
- Surface functionalization and characterization
- Lab on chip microsystems for health, food, and environemental applications
- Nanolithography based on bio-molecular templates
- Nanostructures for energy storage
- PZT based MEMS/NEMS for energy harvesting devices
- Graphene based devices for biomolecular recognition
- Nanophotonics and nanobiotechnology
- Neuroelectronics
- Simulation of hybrid organic/inorganic interfaces
- Nanoparticles for water cleaning
- Single molecule manipulation

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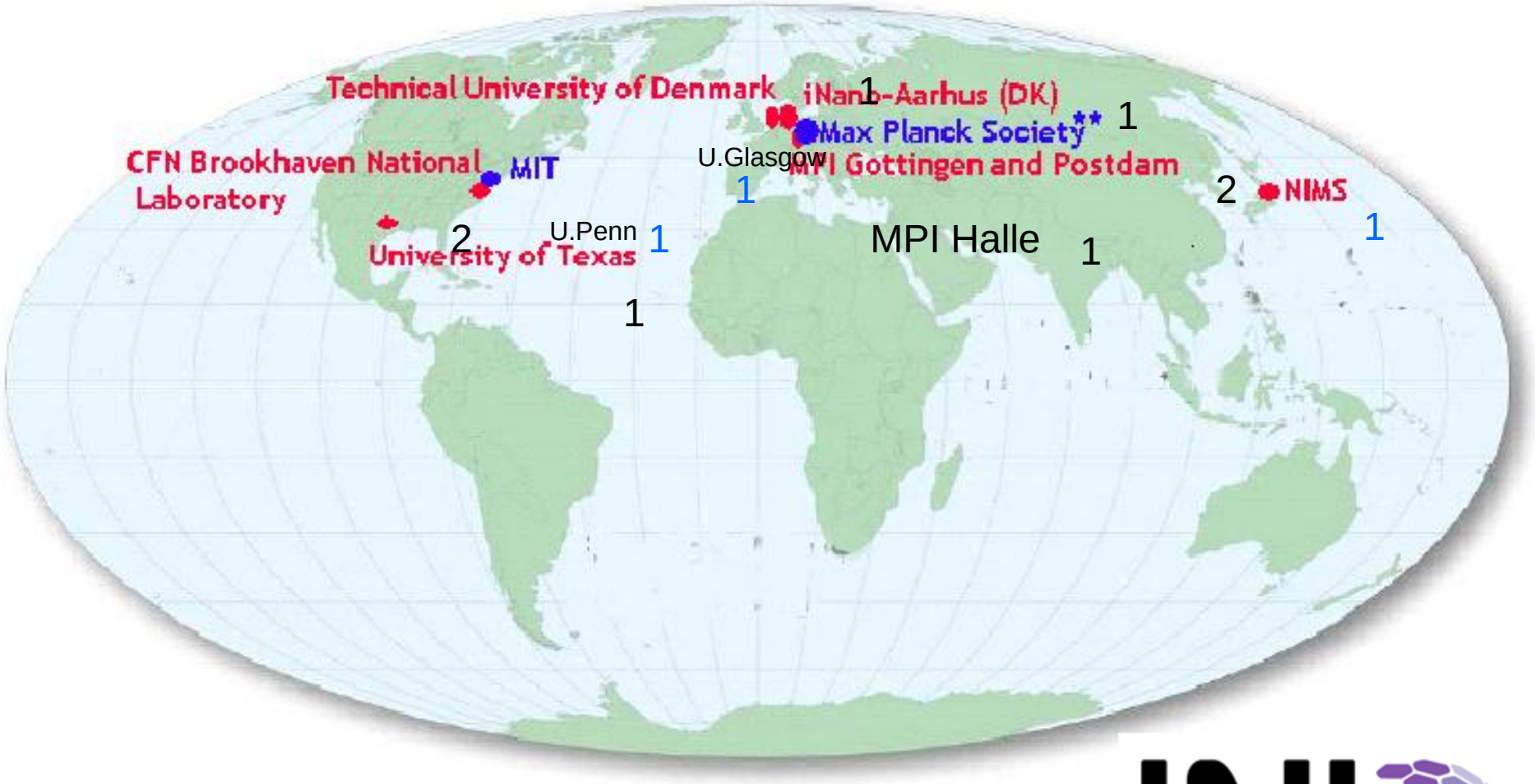
Post Docs



10 Collaboration Agreements signed

INTERNATIONAL IBERIAN NANOTECHNOLOGY LABORATORY

Increase Portugal-Spain Capacity & Cooperation Joint Projects

72 applications, 10 approved projects with 36 Portuguese research teams + 36 Spanish research teams

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INL PhD Program

17 PhD students in Portuguese and Spanish Labs

PhD student	*Institution*	*Topic*
Rita Albuquerque	FCTUNL	Biomolecular Recognition
Mª Fernanda Cardinal	U. Vigo	Assembly of Metal nanoparticles
Ana Cardoso	INEB	Nanotechnology-base therapeutical applications
Daniel Carmona	U. de Zaragoza	New Nanomaterials for biomedical applications
Joan Comenge	ICN/Barcelona	Nanoparticles for biomedical applications
Silvia Ferreira	U.Minho	Develpment of multifunctional nanoparticles
Josefa García	U.Autonoma Madrid	Scanning Probe Microscopy
Laura González	ICM Madrid	Nanoparticles and Magnetic Polymers
Diogo Martins	INESC MN	Microfluidics
Mónica Faria	IST-U.T Lisboa	New blood oxygenation devices
Gil Gonçalves	U. Aveiro	Nanocomposites for biomedicine
Raquel Maia	INEB	Nanostructures to direct stem cells behaviour
Diana Martín	INEB	Nanostructures chracterization
Gustavo Rama	USC	DNA binding agents
Clarisse Ribeiro	U. Minho	Nanocomposites for biomedical applications
Marilia Santos	IBEC/Barcelona	Nano-based multianalyte devices
Noelia Vilar	USC	Metal nanoparticles with biocide properties

INL Lab Technicians Program

5 technicians training in Portuguese and Spanish Labs

Technician	*Institution*
Helder Fonseca	Centro Nacional de Microelectrónica Barcelona
Margaret Barbosa da Costa	Centro Nacional de Microelectrónica Barcelona
Adelaide Carvalho Miranda	IMDEA Nanociencia - Madrid
Ainhoa Gorroño Salvador	INESC-MN-Lisbon
Yolanda Mª Atienza García	INESC-MN-Lisbon

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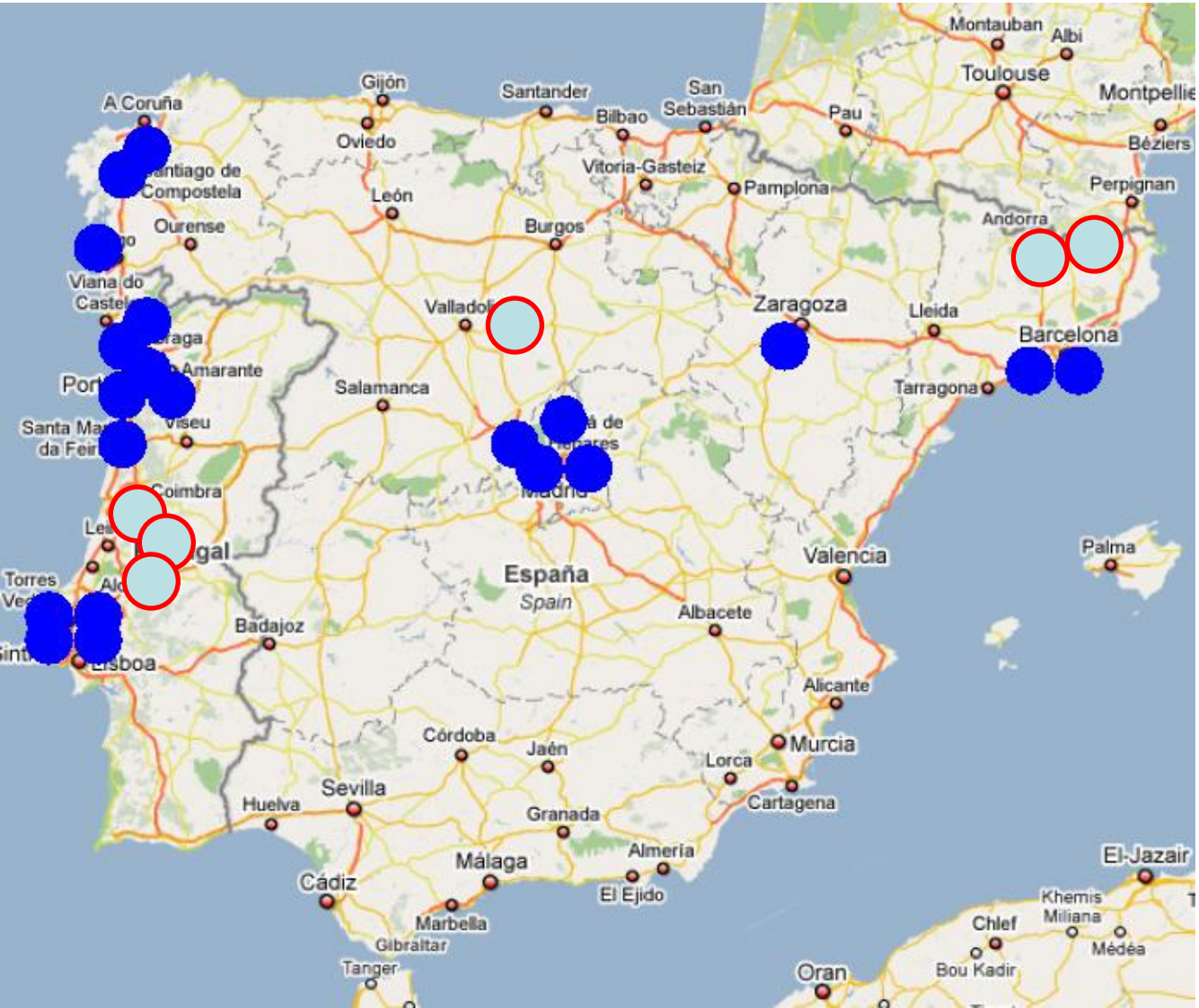
PhD students ● and technicians ○



18 PhD students Carrying out their thesis in 18 Research groups

9 Portuguese Laboratories And 9 Spanish Laboratories

Covering different research areas and topics

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