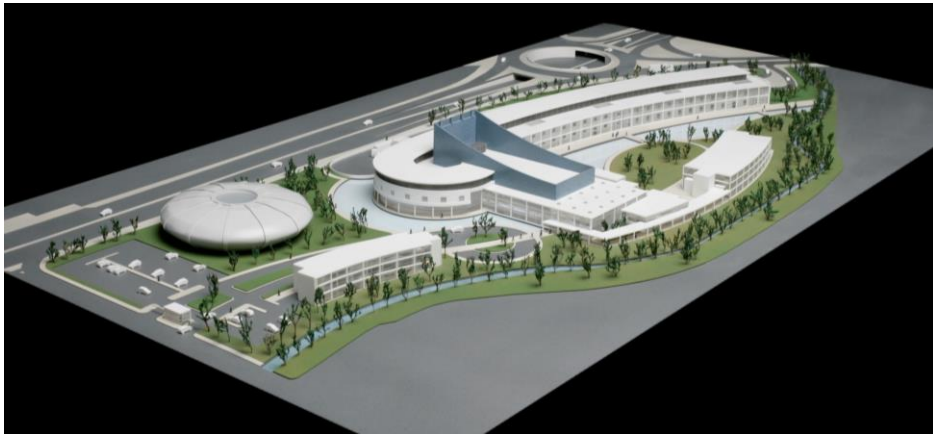


The International Iberian Nanotechnology Laboratory

2007



P.P.Freitas

2014



Santiago, October 2014

Steps in INL creation

November 2005: creation and the joint management of a Portuguese and Spanish Institute of R&D (Portuguese and Spanish International Research Laboratory).

November 2006: Approval of the legal statutes, conferring an international character to the Institute

January 2008: Headquarters Agreement. The INL is an Intergovernmental Organization registered in the United Nations

August 2008: Construction started

October 2010: Approval INL Staff Rules & Regulations. Essential document to recruit and manage INL personnel.

February 2011: Research personnel started working at the new premises



Where, how large, status

International Iberian Nanotechnology Laboratory

- 1) Location: Braga- Portugal
- 2) Status: Intergovernmental Organization
- 3) Built area: 26,000 m²
- 4) Total Staff: ~ 400 people (110)
- 5) Research Space: 40 PI labs (15)



RESEARCH AREAS

HEALTH

Food and
Environmental
safety

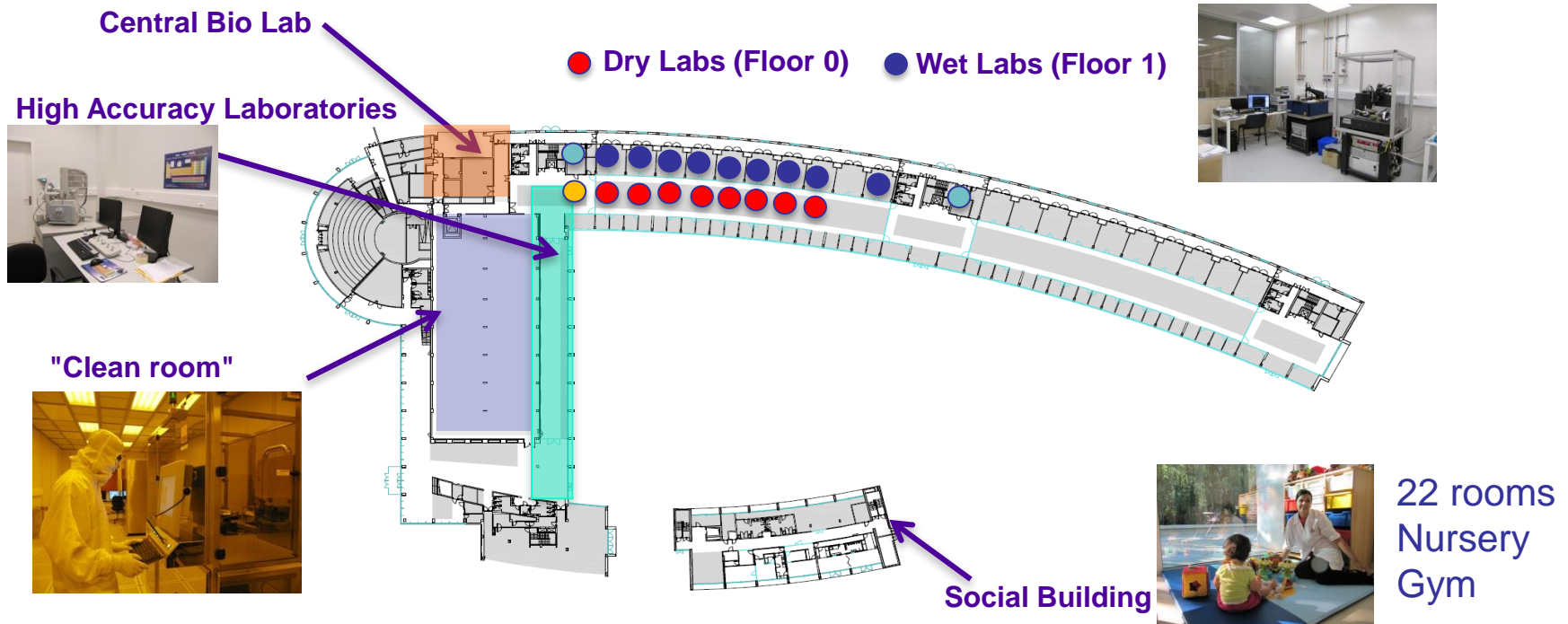
Inf. And Comm.
Technology

Energy

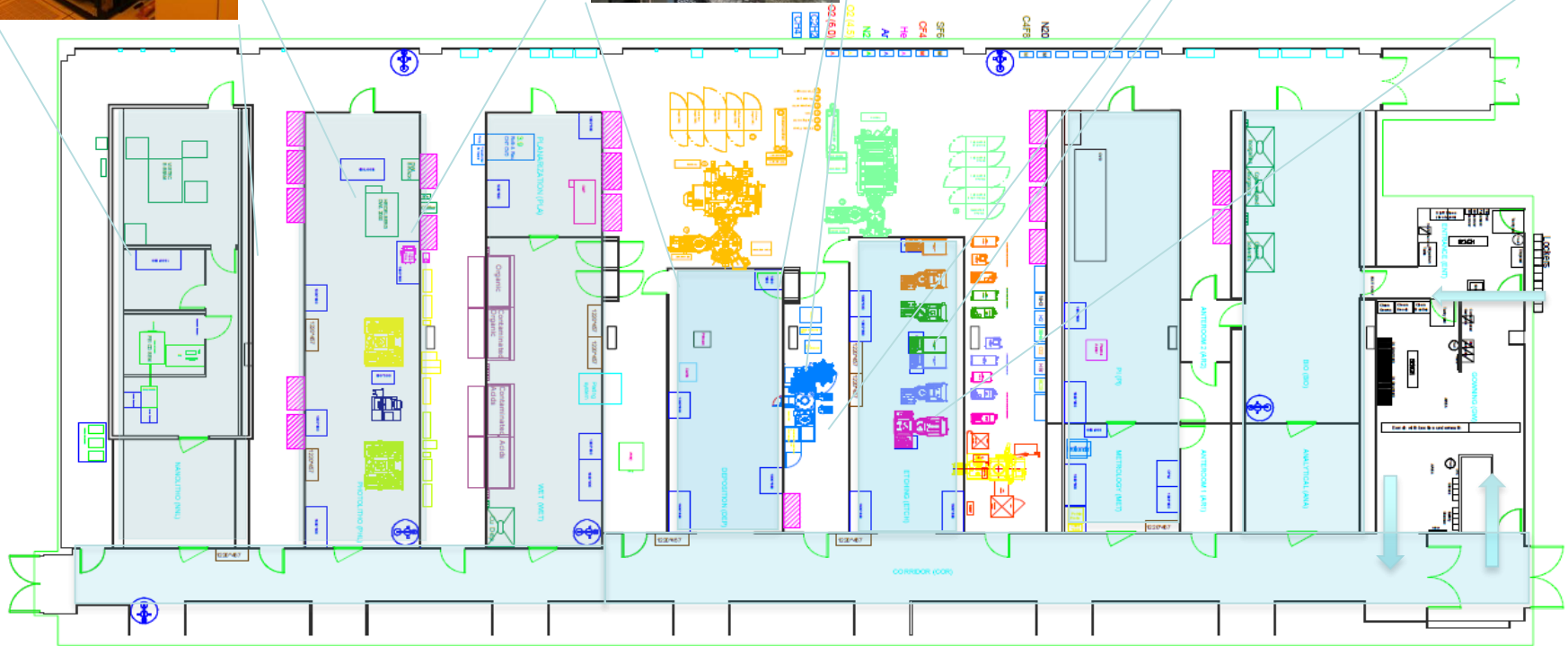
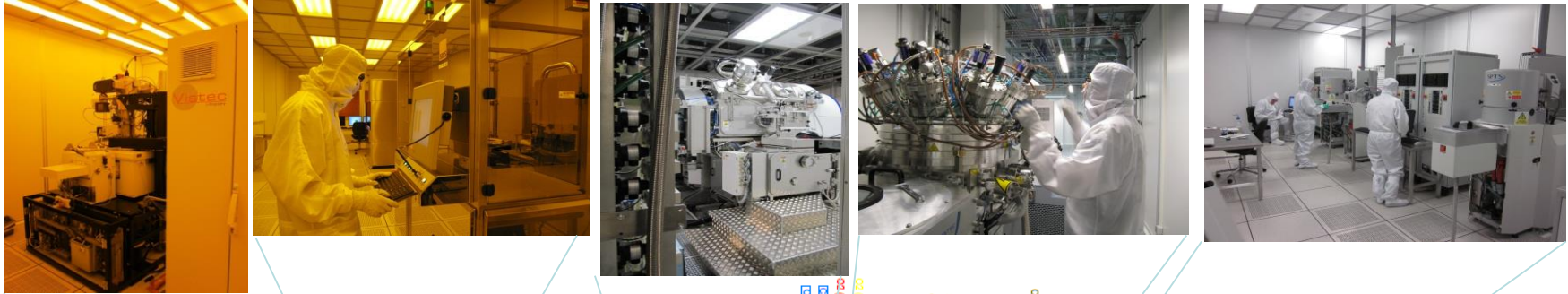
	HEALTH	Food and Environmental safety	Inf. And Comm. Technology	Energy
Nanofabrication (top-down)	✓	✓	✓	✓
Nanomaterials Synthesis (bottom up)	✓	✓	✓	✓
Nanocharecterization	✓	✓	✓	✓
Nanoengineering and systems integration	✓	✓	✓	✓
Modelling	✓		✓	

Scientific Building

- The scientific infrastructure comprises central laboratories (providing services for the INL resident research personnel and visiting scientists) and specialized laboratories associated with individual Principal Investigators (PIs) or research groups and research topics.
- The Scientific building includes: Cleanroom, High Accuracy Laboratory, Wet and Dry PI laboratories, Biochemistry laboratory and other support labs.



CLEAN ROOM 200mm process line



e-beam

Optical
litho

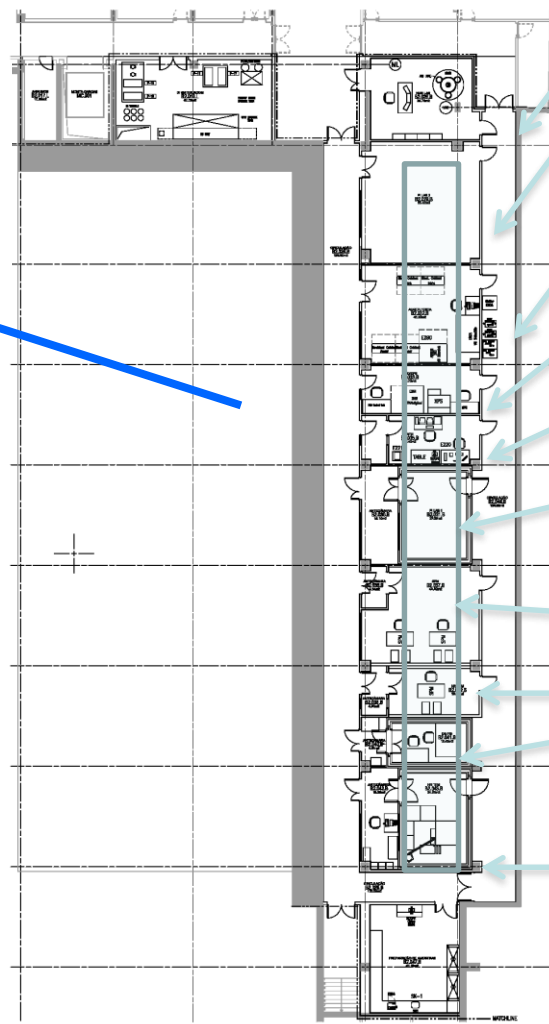
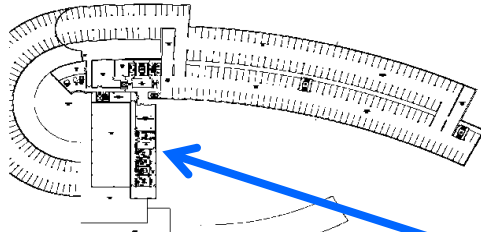
Wet bay
CNT
CMP

PVD II

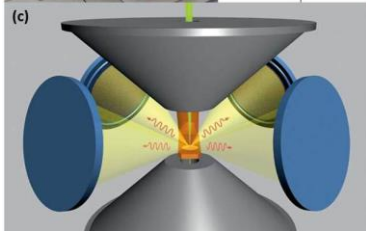
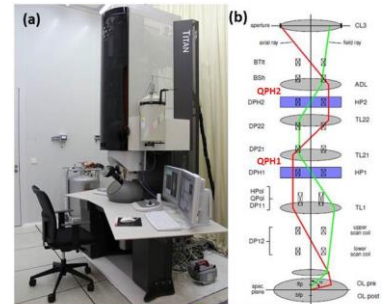
RIE
PVD I
PECVD
Ion Mill+SIMS

Anal.
character,
Thin Film SC

BIO Gowning



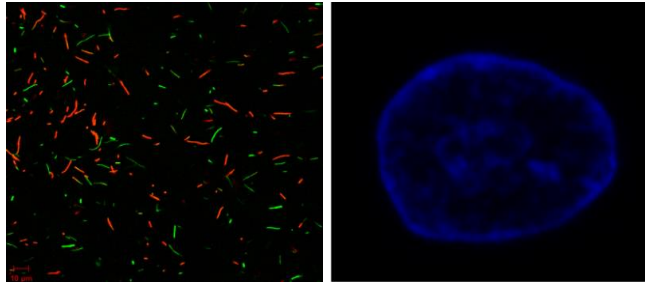
- STM/MBE
- spare
- XRD films
- SAXS
- AFM Lab
- Env. SEM
- XPS
- 200kV Cs TEM/STEM
- DUAL FIB/HRSEM
- SHIELDED ROOM (instrumentation)
- Spare (300kV HRTEM)



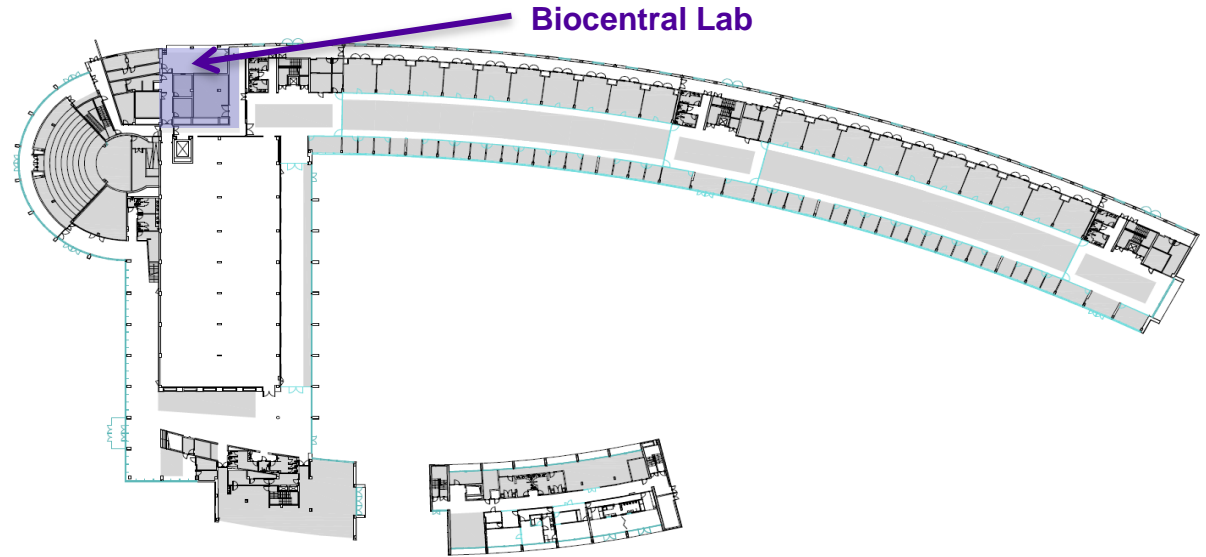
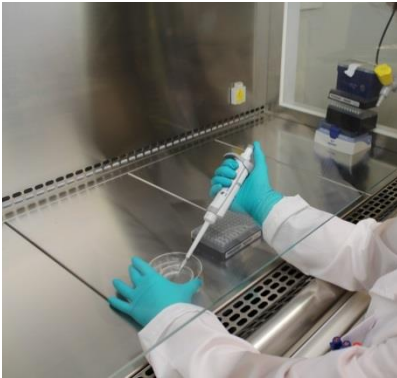
Sample prep



- Bio imaging laboratory

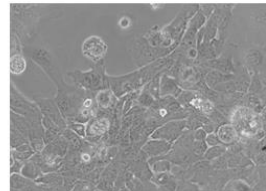


- Microbiology laboratory

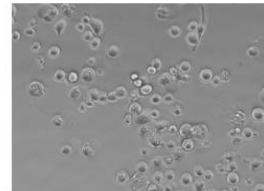


- Animal cell laboratory

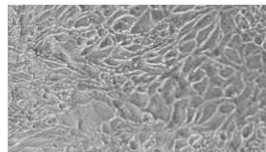
24h serum-free



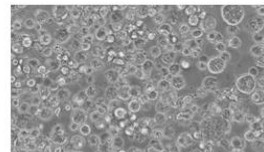
24h PBS



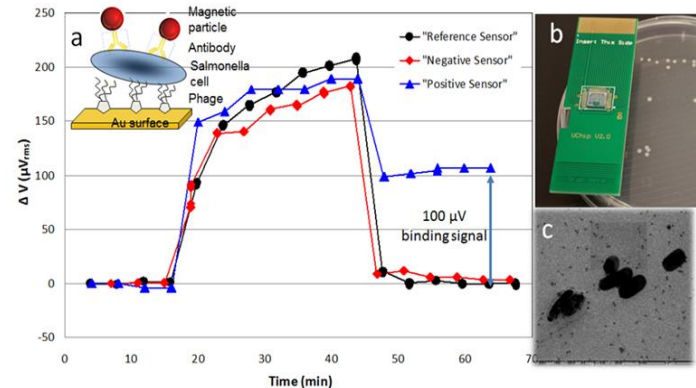
48h serum-free



48h PBS



- Central biochemistry laboratory



Nanoelectronics

- MEMS/NEMS
- Nano for energy conversion & storage
- Nano optics
- Graphene and 2D semiconductors
- Spintronics/sensors
- Nano Ics
- Nanostructured solar cells
- Nanodevice theory

Nanomedicine and Nano in food

- Biointerfaces
- Biosensors/diagnostic tools
- Biomarkers/OCT/cardio
- Flexible Microelectrode arrays for Neuroscience applications
- Hyperthermia
- NPs for enhanced MRI contrast
- Detection of CTCs in blood
- Detection of biomarkers for brain ischemia
- Toxins (marine, others)
- Allergen detection in food
- Detection of bacteria in milk
- Drug synthesis and microfluidics

Nanostructure synthesis & characterization

- NP synthesis
- Polymers/NPs
- Nanostructure characterization

FP7: COFUND, 2MC, 4 others
Other FEDER: ON.2, Invennta



BC Materials, CIC nanoGUNE, Cic BiomaGune, CNM-CSIC Barcelona, Inesc-MN Lisbon, Institut Català de Nanotecnologia-ICN, Fundacion IDICHUS Santiago, Instituto Madrileño de Estudios Avanzados – IMDEA, Instituto Universitario de Investigación en Nanociencia de Aragón-INA, Universidade de Aveiro, Universidade de Santiago de Compostela - CAMPUS VIDA, Universidade do Minho, Universidade do Porto, Universidad Vigo, Universidad Salamanca, Universidad de Valladolid, CIBER BBN, Parque científico de Madrid, Instituto Superior Tecnico, CSIC

Establishing International collaborations



UPSud-Thales, CEA Leti-Grenoble, Red Argentina de Nanotecnologia, Universidad Nacional Autónoma de Mexico (UNAM), PECET -University of Antioquia, MINTEK RSA, Universidad de los Andes, MIT Massachusetts Institute of Technology , University of Texas at San Antonio, University of Texas at Austin, Center for Functional Nanomaterials-Brookhaven National Laboratory, Max Planck Institute for Chemistry- Gottingen, Max Planck Institute for Microstructure Physics- Halle, CBPF-Rio de Janeiro, USP



Agreement Brazil-Portugal-Spain to promote Brazil- INL Scientific cooperation

<http://inl.int/files/assets/0000/3386/img-320172616-0001.pdf>



First step initiative: “Edital”/Call CAPES/INL for development of Brazil-INL projects
http://www.capes.gov.br/images/stories/download/editais/Edital_015_2013_Nanotecnologia_INL.pdf

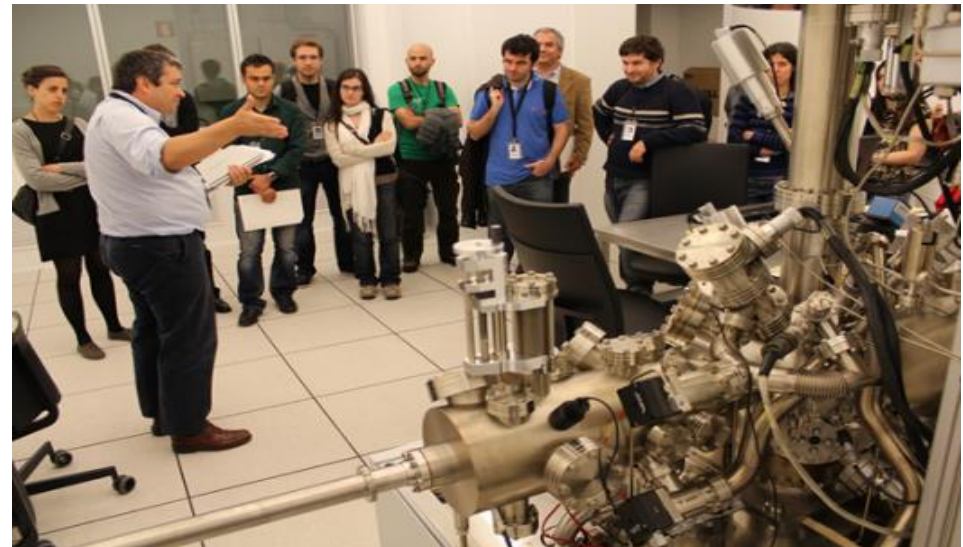
- a) Use of Facilities
- b) PhD, Postdoctoral and Professional Training
- c) Research projects (10 approved, Oct 2013)
- d) Technology Transfer to the Industry
- e) Creation of Collaborative networks
- f) Outreach and Dissemination



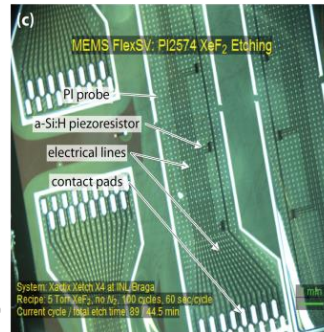
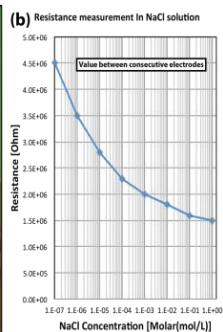
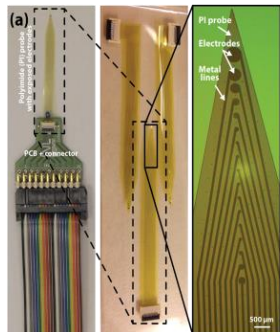
First researchers arrived Jan 2014

Training activities

- INL funded PhD programs in SP and PT in Nanotechnologies (30 students 2008-2012)
- INL Summer Scholarship Program (over 60 students till now)
- Doctoral programs:
 - a) Nanomedicine doctoral program (INL, USC, U Vigo, U Coruna)
 - b) Advanced Integrated Microsystems (with U.Lisbon, INESC, INL)

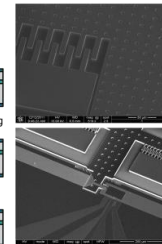


- Services offered to external users :
- micro and nanofabrication (a la carte)
- Multi Project Wafer (MEMS, Spintronics, polyimide, ...)
- NP synthesis
- Nanocharacterization (HRTEM, XPS, 2FIB/HRSEM, ENV SEM, spectroscopies,)
- Access through web page



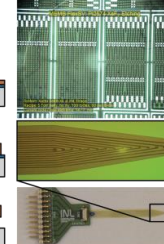
(a) SOI front-/backside micromachining

- (1) Definition of etch mask
- (2) Deep reactive ion etching
- (3) HF vapor release



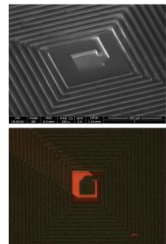
(b) Flexible PI/Kapton technology

- (1) PI coating on SAC layer
- (2) Sensor fabrication
- (3) Flexible probe release



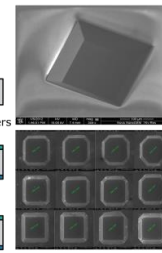
(c) Si-embedded Cu microcoils

- (1) Machining + seed layer
- (2) Cu electroplating
- (3) Insulation and top metal



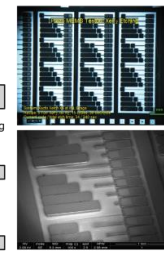
(d) TMAH anisotropic Si wet etching

- (1) Silicon substrate
- (2) Structural and mask layers
- (3) Wet etch



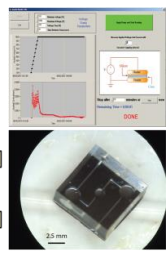
(e) XeF₂-based Si release etch

- (1) Sensor definition
- (2) Deep reactive ion etching
- (3) XeF₂ gas release



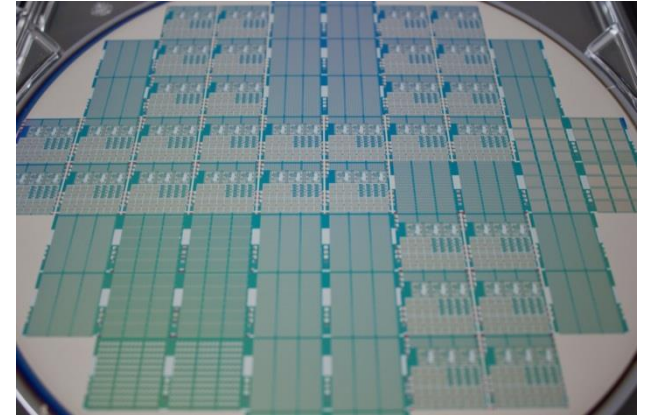
(f) Si/glass wafer anodic bonding

- (1) Machined Si substrate
- (2) Glass substrate
- (3) Bonding 400 °C



SOME EXAMPLES:

- Magnetic Sensor technology (companies)
- MEMS (Valencia-SP, companies)
- Advanced Packaging (Nanium PT)



OTHER INDUSTRIAL CONTACTS (2011-2013)

- Electronics
- Health
- Food
- Materials
- Energy
- Automobile

