

The International Iberian Nanotechnology Laboratory



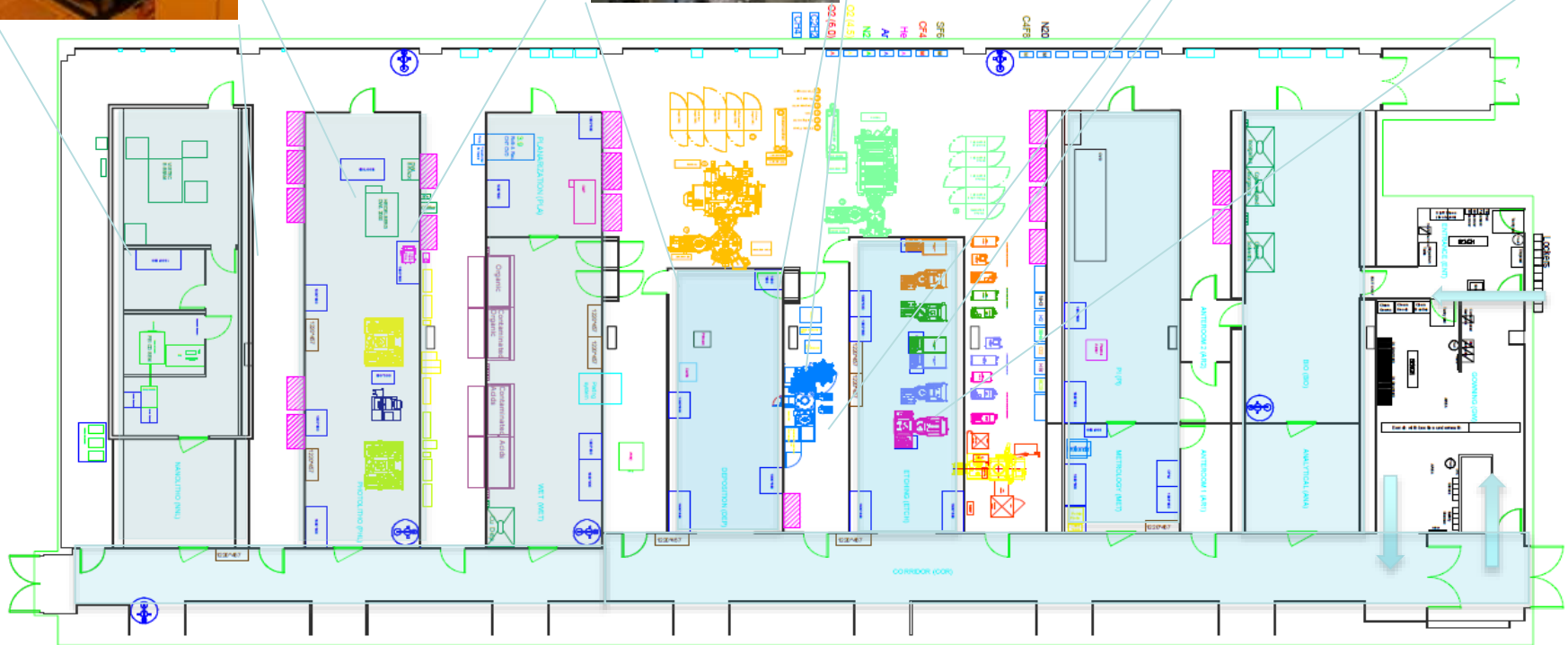
Where, how large, status

International Iberian Nanotechnology Laboratory

- 1) Location: **Braga- Portugal**
- 2) Status: **Intergovernmental Organization**
- 3) Built area: **26,000 m²**
- 4) Total Staff: ~ **400 people (220, 34 countries)**
- 5) Research Space: **40 PI labs (25)**



CLEAN ROOM



e-beam
Litho
SEM

Optical
litho

Wet bay
CNT
CMP

PVD II

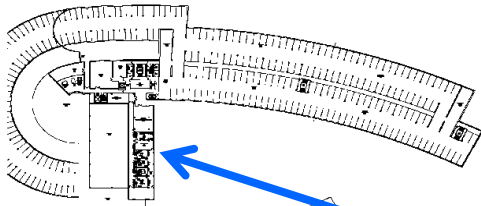
RIE
PVD I
PECVD
Ion Mill+SIMS

Anal.
character,
Thin Film SC
Graphene

BIO Gowning

HIGH ACCURACY LABS (VC-D, VC-E)

200 kV Cryo+Tomography TEM/JEOL



STM/MBE

spare

-XRD films
SAXS

-AFM Lab

-Env. SEM

-XPS, ATR-FTIR

-200kV Cs TEM/STEM

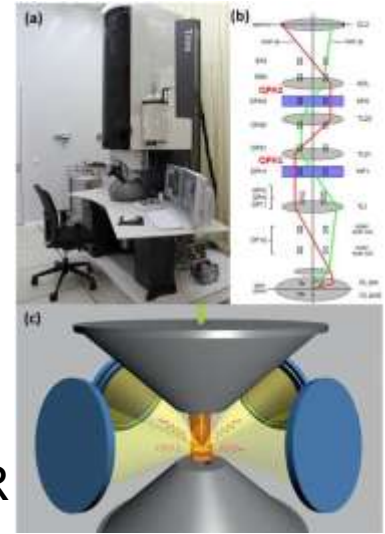
-DUAL FIB/HRSEM

-SHIELDED ROOM

(low noise measurements)

300kV Probe and Image corrected
HRTEM/FEI Themis

Sample prep



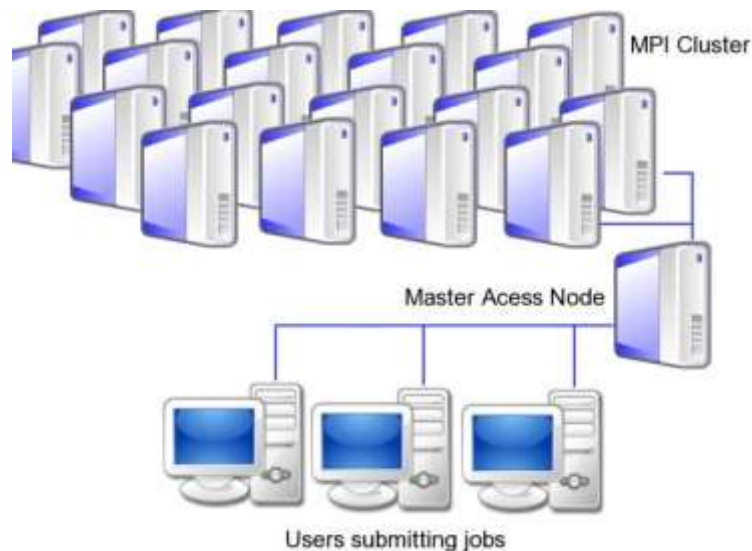
16 nodes

384 CPU

Investment (in 2013): 130k€

Used by 2 groups:

- J. Fernández-Rossier
- Zonchang Wang



Operational computation resources



- Computational Operations Cluster with:
 - 1.5TB Ram
 - 80TB Storage
 - 100TB Backups
 - 206GHz Processing Power
- Network:
 - 1Tb/s backbone bandwidth
 - 10Gb/s Internet Uplink to RCTS network
- Servers and Services
 - 154 Servers
 - 2635 Running service



Possible shared future node (Quanta Lab) for a Quantum Computing Network

MICRO and NANO FABRICS@PT

(INL, INESC MN, CMEMS-UM)



Lisbon

INL (2011)



- Class 1000/Class100 1200m² cleanroom
- 8" line, down to 30nm features
- ICT, energy, health, food@environment
- nanocharacterization labs
- circa 100 M euro investment

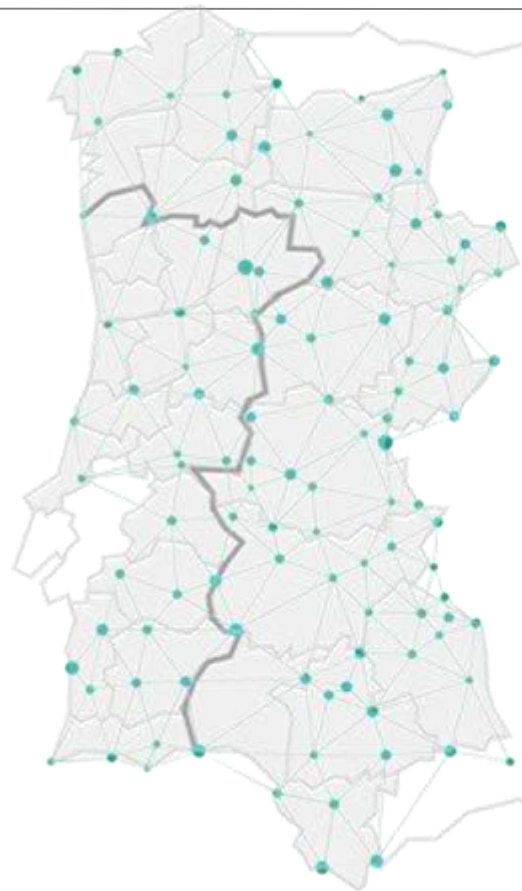
INESC MN (1994)



- Class 100/Class 10 350m² cleanroom,
- 6" line (some 8" capability), 30nm features
- ICT/Heath Spintronics, thin film MEMS, biochips
- Circa 12 M euro investment



POCTEP Crossborder Area



ESPAÑA	PORTUGAL
Ourense, Pontevedra, Zamora, Salamanca, Cáceres, Badajoz y Huelva.	Minho-Lima, Cávado, Alto Trás-os-Montes, Douro, Beira Interior Norte, Beira Interior Sul, Alto Alentejo, Alentejo Central, Baixo Alentejo y Algarve
A Coruña, Lugo, Ávila, León, Valladolid, Cádiz, Córdoba y Sevilla.	Ave, Tâmega, Grande Porto, Dão-Lafões, Serra da Estrela, Cova da Beira, Pinha Interior Sul y Alentejo Litoral.

RESEARCH DEPARTMENTS

P.P.Freitas

Nano Engineering (200mm Spintronics pilot line, systems and IC design, Sensors / Biosensors)

J.Rossier

Quantum materials and technologies (Theory, 2D materials, solar cells, fuel cells, NPs)

L.Pastrana

Life Sciences (Health-diagnostics and therapeutics; food, environment)

J Gaspar

NanoFab (200mm pilot line; MEMS, polyimide and SOI technologies)

J Nieder

BioPhotonics (Ultra Fast Laser Lab, Plasmonics, Bioimaging, Nano Photonics)

P Ferreira

HRTEM and Spectroscopies Lab

FOOD SECURITY, WATER RESOURCES, SUST. AGRICULTURE

Systems for grape maturation control With Sogrape, INL, INESC MN

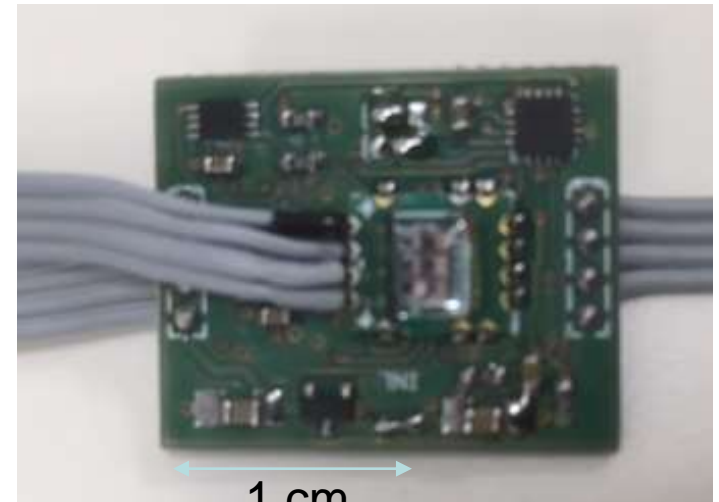


Integrated microspectrometers
for grape maturation follow-up

Field tests:

Douro valley, PT(July-September 2017)

Argentina (Feb- March 2018)

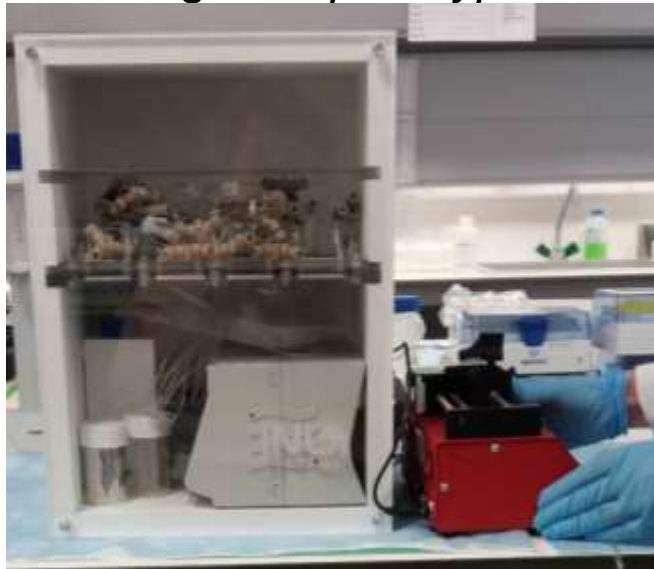


IP protected

FOOD SECURITY, WATER RESOURCES, SUST. AGRICULTURE

Biosensors for automated water biotoxin monitoring

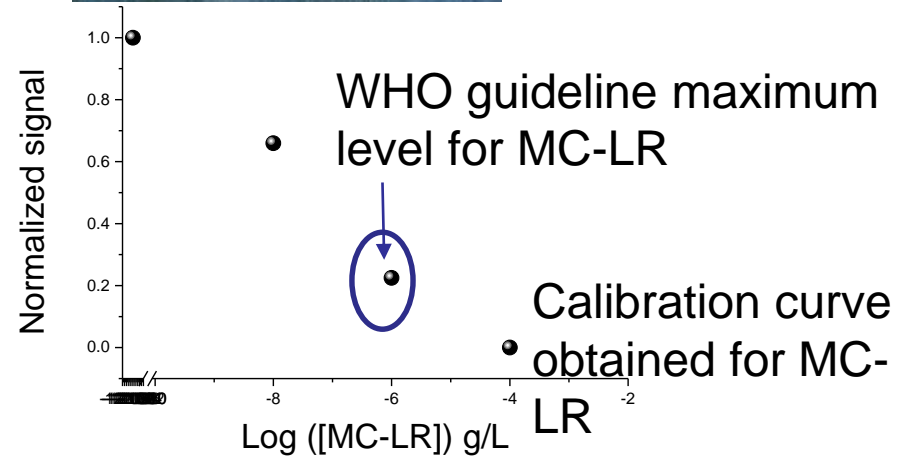
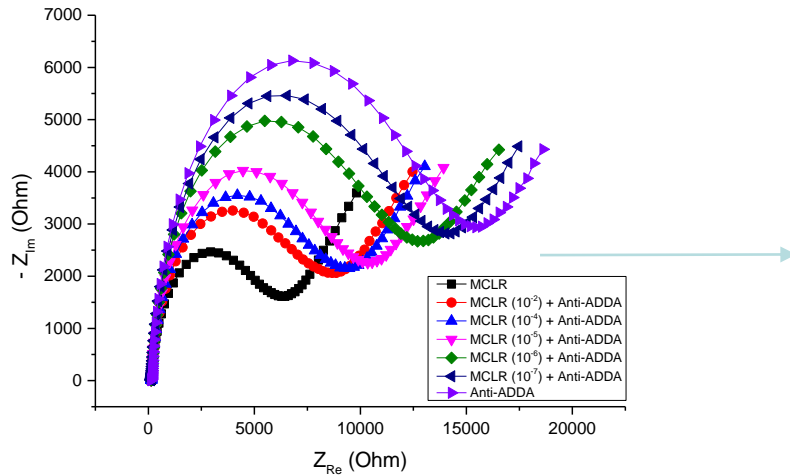
Integrated prototype



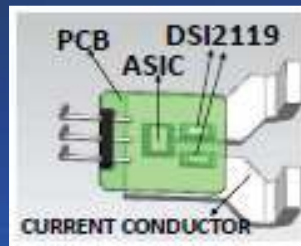
On-field validation (ongoing)



Nquist plots (impedance measurements)



9 Current Measurement Solution



SINOMGAS CURRENT MEASUREMENT SOLUTIONS

inverter power	PV string	DC(MPPT)	AC	leakage Current
1kW-10kW	PL	PL	PL	SPG
	LTS	LTS	KSR	
	CTS	CTS	CAS	
	BFD		HA	
10kW-50kW	PL	PL	KSR	SPG
	LTS	LTS	CAS	
	CTS	CTS	LA	
	BFD			
50kW-120kW	PL	PL	LA	SPG
	LTS	LTS		
	CTS	CTS		
	BFD			
300kW+	PL	PL	LA	SPG
	LTS	LTS		
	BFD	CTS		
		BS		

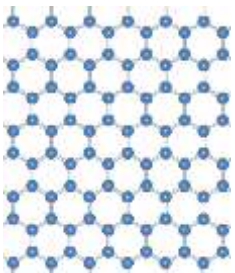
10 Catalogue

current sensor	nominal current range	maximium current range	supply voltage	accuracy @25°C	image
CTS series	15...25A	1.2*I _{nom}	+5V	1.0%	
LTS series	15...25A	1.2*I _{nom}	+5V	1.0%	
PL series	10...50A	2.5*I _{nom}	+5V	0.8%	
HDseries	5...20A	1.2*I _{nom}	+5V	0.8%	
KSR series	15...50A	3*I _{nom}	+5V	0.8%	
LA series	50...200A	1.7*I _{nom}	±15V	0.65%	
BS series	50...600A	1.5...3*I _{nom}	±15V	1.0%	
BBS series	50...600A	1.5...3*I _{nom}	+5V	1.0%	
SFG series	0.3...1.5A	2*I _{nom}	+5V	1.0%	
HA series	3...50A	3*I _{nom}	±15V	0.5%	
LBS series	50...700A	1...3*I _{nom}	+5V	1.0%	
GB series	50...750A	1...3*I _{nom}	+5V	1.0%	
600 series	50...200A	1...3*I _{nom}	+5V	1.0%	
BFB series	5...25A	1...3*I _{nom}	+5V	1.0%	
BFD series	5...30A	1...3*I _{nom}	+5V	1.0%	
SCT-ZB series	15...25A	-	passive device	-	

Today in production with Lertech CN

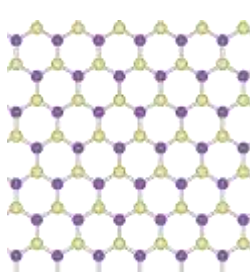
- Main use: Density functional calculations to compute electronic structure
- Simulated systems:
 - Surfaces
 - Multilayers
 - 2D Materials
- Unit cells with up to 100 atoms
- Calculations running up to several days in tens of CPU's
- Ab-initio codes: Quantum Espresso, ELK, Vasp

Graphene



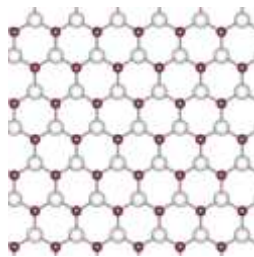
Conductor

h-BN



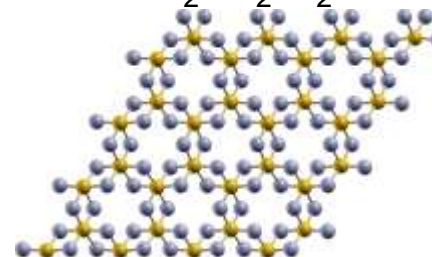
Insulator

MoS₂, MoSe₂

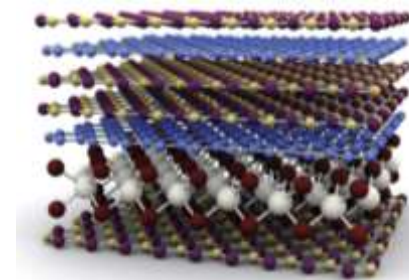


Semiconductor

CrI₃,
Cr₂Ge₂Te₂



Magnetic



Heterostructures

THANKS

