IJCLab

Laboratoire de Physique des 2 Infinis Irène Joliot-Curie

8 April 2021

IJCLab: New Laboratory born in 2020 from the merger of CSNSM, IMNC, IPNO, LAL, LPT

https://www.ijclab.in2p3.fr/fr/home/

740 Membres
220 Chercheurs & Enseignants Chercheurs
370 Ingénieurs & Techniciens
4 Divisions Administratives
8 Services support

140 Doctorants & Postdoctorants
50 Bourses de Recherche Européennes & Internationales
150 Bourses de Recherche Nationales & Locales

150 Titulaires de HDR

600 Articles dans des revues internationales

7 Pôle Scientifiques

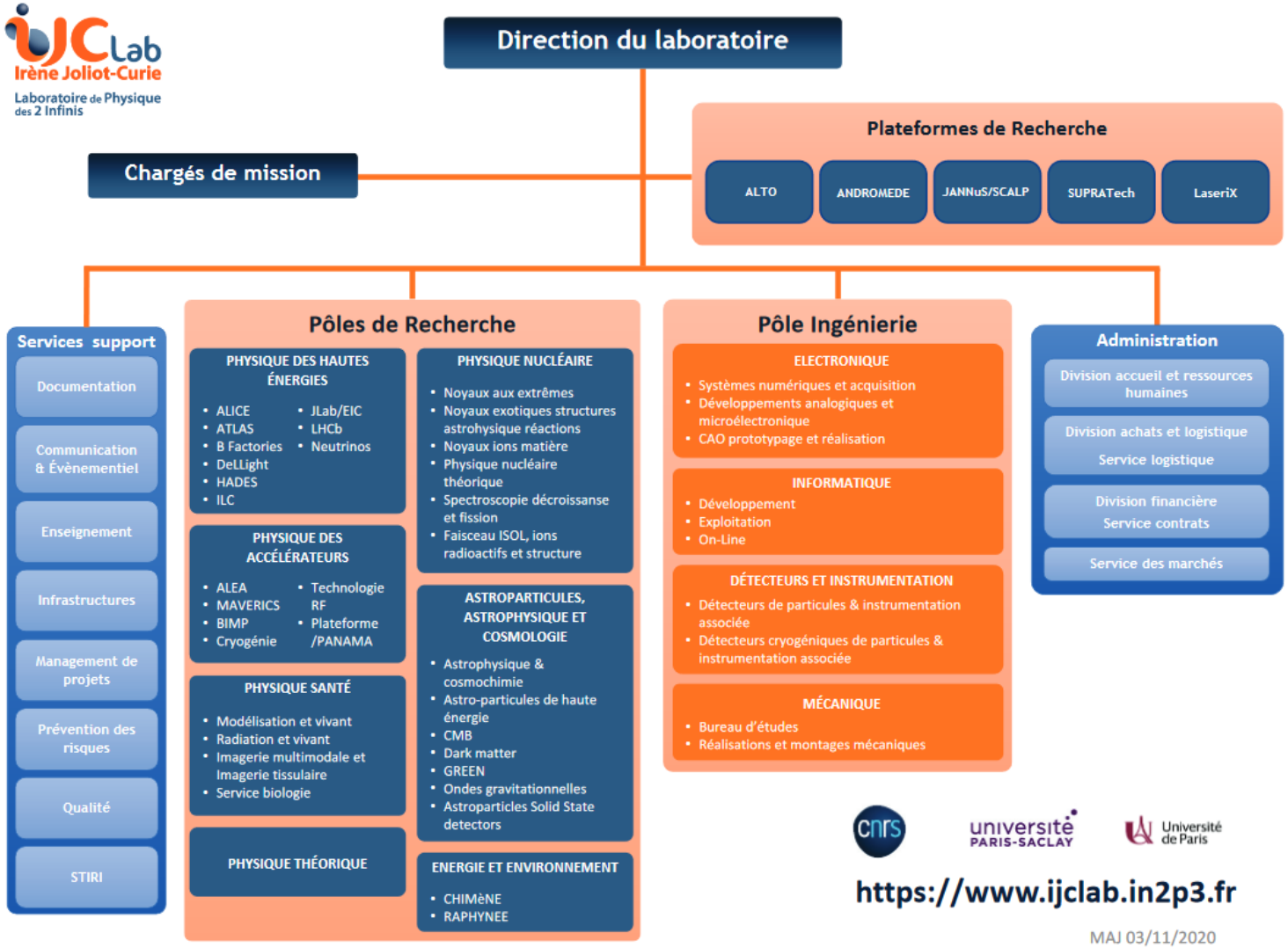
1 Pôle Ingénierie
4 Départements

5 Plateformes de Recherche

3 Plateformes Techniques

50000 m² de bâtiments
dont 20000 m² Ateliers & Infrastructures de Recherche

IJCLab Organisation



https://www.ijclab.in2p3.fr

MAJ 03/11/2020

~720 people (530 permanents)

- One of the largest CNRS & Paris Saclay lab
- In the network of 8 major European lab

7 Research Poles

31 research teams + 2 departments

1 Engineering Pole

4 Departments

11 Services

1 Administrative Pole

3 Divisions

1 Service

8 Support services

5 Research Platforms

7 Research poles

all the themes of "the physics of the two infinities" with the presence of
of historical/existing strong poles, emerging poles and activities at the interfaces

HIGH ENERGY PHYSICS

NUCLEAR PHYSICS

ASTROPART,ASTROPHYS COSMOLOGY

~ 114 PhD

ENERGY & ENVIRONNEMENT

ACCELERATORS PHYSICS

Talk by Frederico Garrido

THEORETICAL PHYSICS

HEALTH PHYSICS

Talk by Walid Kaabi

Talk by Philippe Lanièce

IJCLab / Science and Technique

PHE
- Hadronic Physics
- Patricle Physics
- Neutrino (reactors/acc.)

NUCLEAR PHYSICS
- Nuclear Structure
AstroNuclear

ASTRO/COSMO
- Astroparticles
- Astro/AstroCh.
- Cosmology
- Dark Matter
- Neutrinos

CALVA*
Myrtho

ENERGY & ENVIRONMENT
- Nuclear Data
- Nuclear System and Scenarios
- Material and irradiation
- Radiochimistry

ACCELERATOR
- Beal Dynamics
- Laser/Electron
- Material sciences
- RF
- Cryogenics

Panama *

Talk by Walid Kaabi

Talk by Frederico Garrido

THEORY
Flavour, QCD, SM and beyond, mathematical, statistical physics, gravitation, cosmology…

HEALTH
- Radiotherapy
- Imaging
- Modelisation

Pimpa *

Talk by Philippe Lanièce

*platforms in the poles

HIGH ENERGY PHYSICS : The opened questions – the projects

- New particles and symmetries beyond the Standard Model
- Origin of the mass
- Particle-antiparticle asymmetry

Particle Physics

- HL-LHC (ATLAS, LHCb)
- Belle II

- Structure of nucleon (and of hadrons)
- Medium effects
- Quark Gluon Plasma

Hadronic Physics

Jlab, EIC, ALICE

- Mixing matrix U_{PMNS} and CP violation in neutrinos
- Masses and mass hierarchy of neutrinos
- Nature of neutrinos (Majorana or Dirac)

Neutrinos @accelerators/reactors

DUNE, JUNO, CUPID-MO, SUPERNEMO

And many sites in the world :
CERN, Japan-KEK, Fermilab, Jefferson Lab, Modane, Gran Sasso (Italy), Daya Bay (China)

NUCLEAR PHYSICS – The opened questions – the projects

- Complexity of nuclear structure arise from the interaction among nucleons
- Limits on nuclear stability
- Production of chemical elements in the Universe
- Properties of nuclei and strongly-interacting matter at high energies (shortly after the Big Bang, catastrophic cosmic events, compact stellar objects…)

Nuclear Physics

AstroNuclear Physics

And many sites in the world :
GANIL , ALTO, CERN-ISOLDE, FAIR-GSI, Riken, Jyväskylä, Argonne, LNG, Dubna…

ASTROPARTICLES and COSMOLOGY: The opened questions – the projects

- Gravitational waves : discovery and new astronomy
- Multi-messenger astronomy : transient sky, acceleration mechanisms and dynamics of the violent Universe

Astroparticles

- Origin of the elements / nuclear processes at work in astrophysical sites
- Matter in the stellar envelopes, journey in the interstellar medium, incorporation into protoplanetary disk

AstroNuclear/ Astro chemistry

- Tests of fundamental physics: (modified)Gravity, Lorentz Invariance.
- Model of Primordial Universe. knowledge of cosmological parameters; CMB
- Search for (primordial) GW of inflation through CMB B modes
- Elucidating the Dark Energy

Cosmology

- Search for Dark Matter directly and indirectly : WIMPS, Dark Photons, Axions…

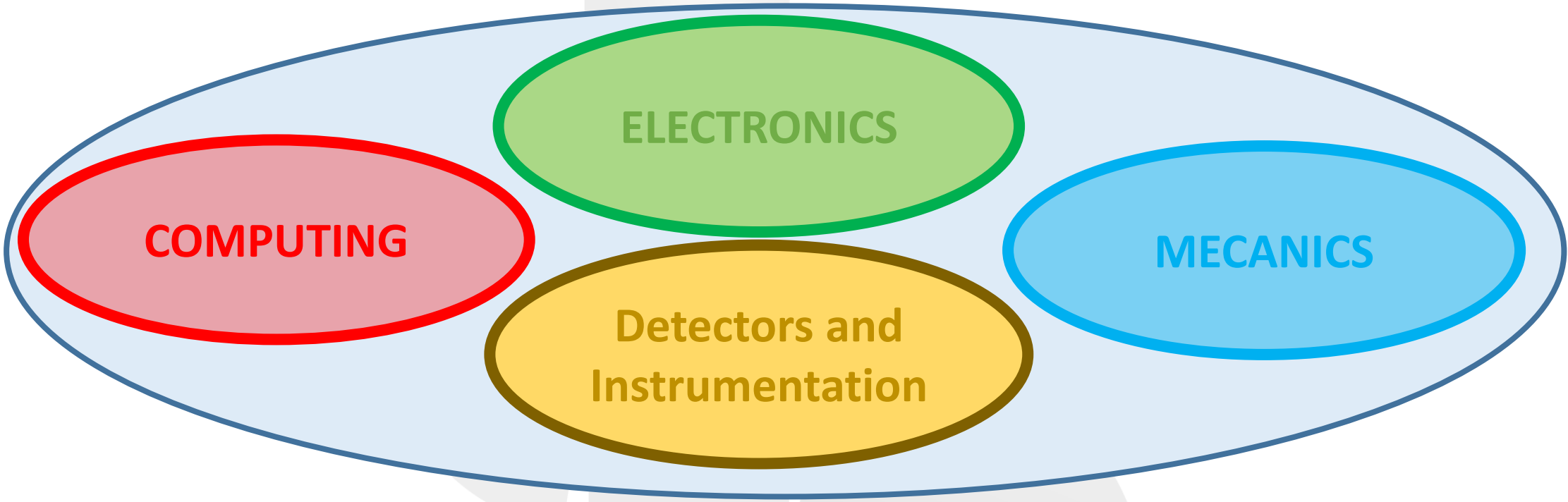
Dark Matter

- Neutrino Physics : masses, sterile neutrinos, interactions

Neutrino

1 ENGINEERING POLE : 4 Technical Department with 11 Services

A strong center of competence, essential pillars for the laboratory to conceive, design and build the instruments.

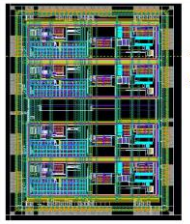


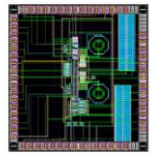
A lot of projects and realisations !

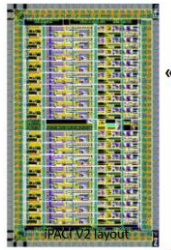

Alice


Nectar CAM CTA

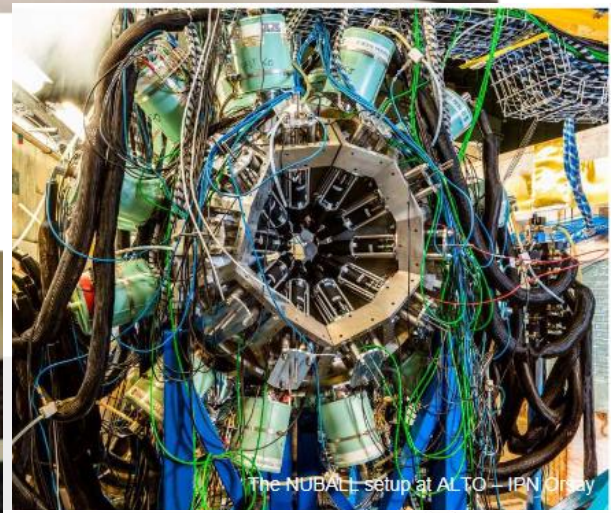

Alert JLab


« CROC » 6 x 3.8 mm2
AMS CMOS 0.35µm 5V

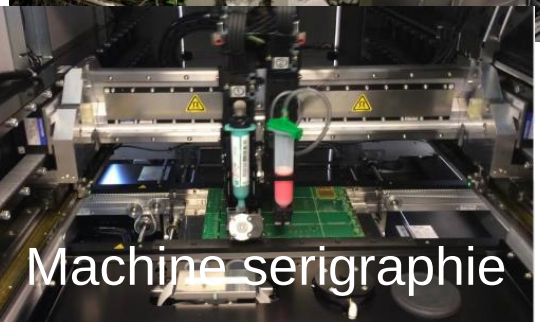


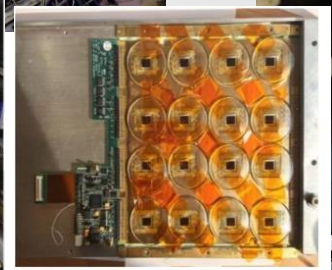

« lojic130 » , 1x1 mm²
TSMC 130nm

"iPACI" v2,
12mm2
AMS 0.35µm 5V


The NUBALL setup at ALTO – IPN Orsay

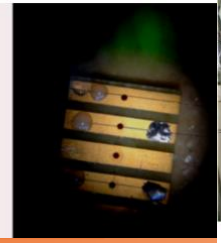

LHCb

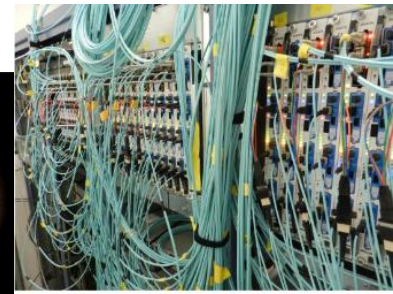

Machine serigraphie


ILC CALICE : ASU (chip on board)


Cold Stage (12 mK)


Project CHANGE




AGATA

The Platforms - I

5 Platforms are directly attached to the direction

The **ALTO** platform with two accelerators unique in France :

- **15 MV Tandem type electrostatic** accelerator for accelerating stable beams from proton to aggregates
- **electron linear accelerator for producing radioactive beams by photofission**.

10 physics lines (nuclear physics, astrophysics and multidisciplinary studies…), 4000 hours/year, 30 experiments/ year.

ALTO
Accélérateur Linéaire et Tandem à Orsay

in the process of obtaining the status of national platform

Equipment delivering specific beams:

- Stable light beams with heavy ions
- Radioactive beams
- Aggregate bundles
- Neutron beams

The Platforms - II

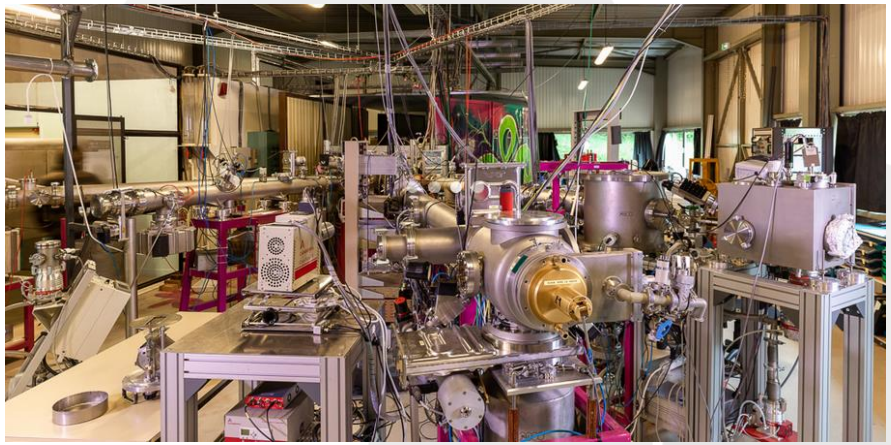
Andromede : **multidisciplinary platform, unique in the range of beams of several MeVs delivered**: protons, multicharged atomic ions, gold molecules and nanoparticles. Including an "ion source" R&D activity. It is equipped with two beam lines (90° and 1°29).

JANNuS-SCALP : interdisciplinary platform for fields ranging from materials sciences to astrophysics, including geology and nuclear physics.

Different equipments for ion irradiation / implantation and analysis . Coupling of Transmission Electron Microscope with ARAMIS and IRMA lines unique in the world due to the diversity of elements and energies accelerated in situ inside the MET.

Synthesis & Characterization using ion AcceLerators for Pluridisciplinery research

JANNuS-SCALP founding member of the EMIR & A federation included in the national roadmap for research infrastructures.



ongoing extension in CPER and Equipex+ DIAPASON

The Platforms - III

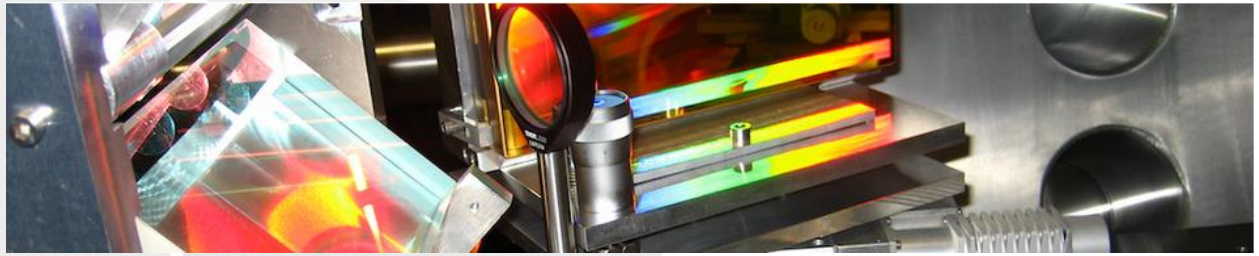
SUPRATECH platform dedicated **to R&D on the superconducting cavities** of the future high-energy, high-power particle accelerators. Equipment to prepare, package, assemble and test superconducting RF cavities for IJCLab projects.

- ✓ a chemistry room
- ✓ an ISO4 clean room (80 m2, with 50 m2 class10)
- ✓ an assembly hall, for the integration of cryostats
- ✓ two experiment halls (with vert. & hor. cryostats)

and equipped with :

- RF power sources at frequencies of 88, 350, 700 MHz,
- a helium installation comprising a helium liquefier
- a 400 kW cooling system (HF sources)

LASERIX : laser platform providing **coherent, intense and brief** (50fs to 10 ps) **sources in the near-infrared** (800 nm) **and EUV** (30 to 90 eV) domains. Will be completed including the electron photo-injector (PHIL).



The Platforms - IV

But more platforms : Two examples of platforms inside the Engineering Pole

Virtual Data datacenter recently extended

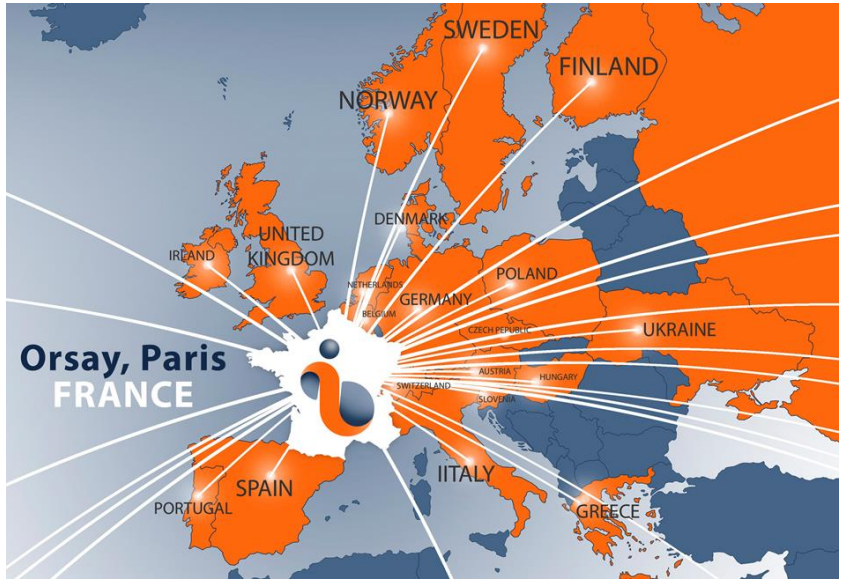
- 51 racks (capacity = 2000 servers)
- up to 600 kW

CAPTINNOV. Reinstalled and working since 1/3/2020
Test bench white room for Detector characterization.
Essential in the next years for *ATLAS ITK* and *HGTD*

+ Platforms in the scientific poles

Map of international collaborations at IJCLab

Partnerships with a current agreement or under discussion.

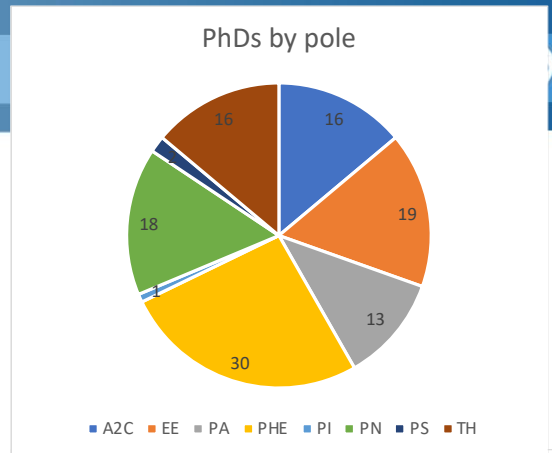


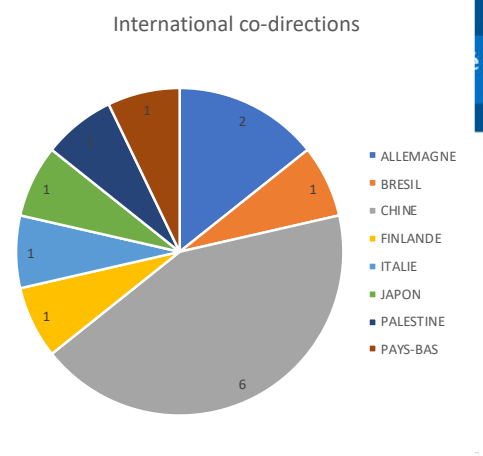
PhD @ IJCLab

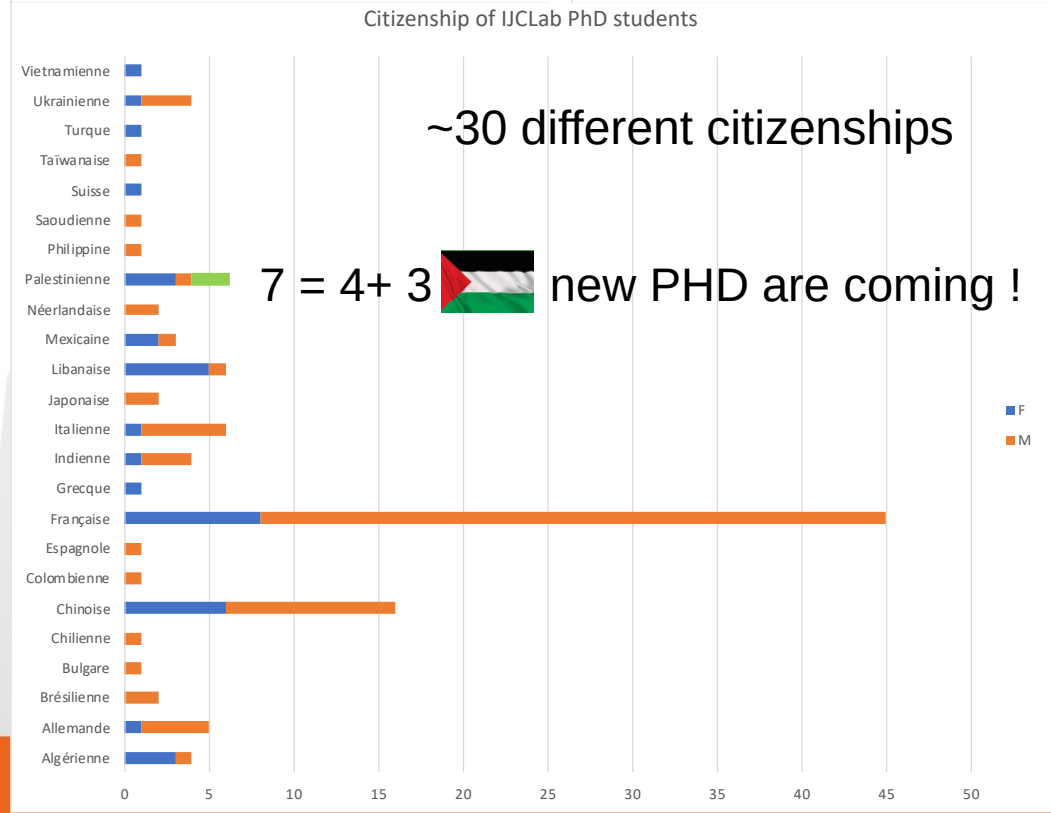
114 PhD students today @ IJCLab

Students are central @ IJCLab:
1/6 of the IJCLab
1/3 of the researchers

Pole	1st year	2nd year	3rd year	4th year	Total
A2C (Astro)	2	6	4	3	15
EE (Energy)	5	6	7	1	19
PA (Accelerators)	4	1	4	4	13
PHE (High-Energy)	16	5	6	3	30
PI (Engeneering)	1				1
PN (Nuclear)	5	5	7	1	18
PS (Health)	1		1		2
TH (Theory)	5	6	5		16
Total	39	29	34	12	114







Looking forward to continue and to increase the collaborations with Palestine and An-Najah University !