INSTYTUT FIZYKI JĄDROWEJ
IM. HENRYKA NIEWODNICZAŃSKIEGO
POLSKIEJ AKADEMII NAUK

Laboratoire de Physique des 2 infinis Irène Joliot-Curie

IFJ PAN - IJCLab Workshop

General Presentation of IJCLab

CSNSM, IMNC, IPNO, LAL, LPT → IJCLab
~4 years of gestation at a glance

- Laboratories sharing the same history, the same way of working (CNRS/University)
- Unique opportunity: thematic coherence and geographical proximity (ellipse of 600m, 300m)
- All the themes of "the physics of the two infinities
- All the technical and support forces unified in IJCLab

April 2016 → September 2018 Prematuration Phase

Discussions / Inter-laboratory council / Working groups (science, technical, support) / Dedicated workshops / Consultation.

September 2018 → September 2019 Phase Project

Work in project mode to propose the structure and organization of the future laboratory.

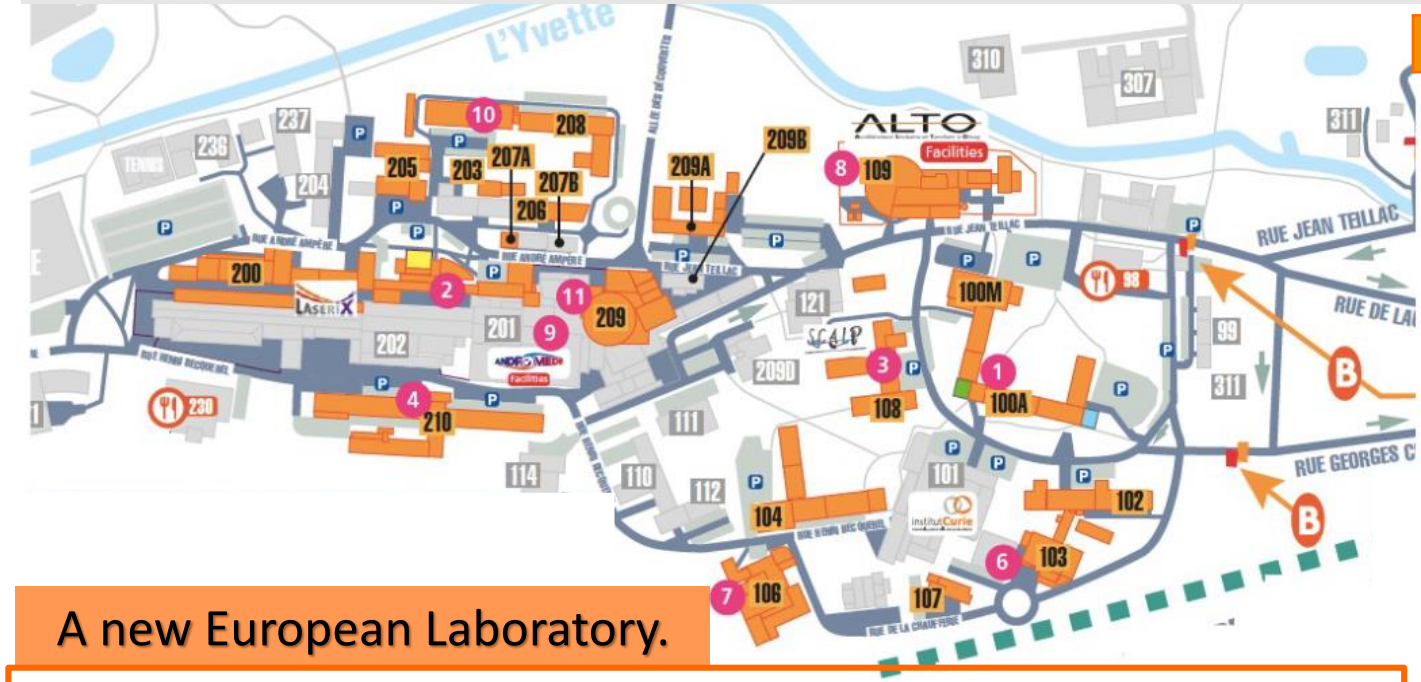
September 2019 → End 2019 Transition Phase

Coexistence of the new management and the old laboratories

1st january 2020 : creation of IJCLab

IJCLab : Located in Orsay Campus, 30 Km South-Paris, Campus Paris-Saclay

IJCLab is occupying a large part of the Orsay Campus (~50000m²)



A new European Laboratory.

Formed on 2020 by the merging of 5 Laboratories in Orsay-France

CSNSM	*Centre de Sciences Nucléaires et de Sciences de la Matière*
IPN	*Institut de Physique Nucléaire*
IMNC	*Imagerie et Modélisation en Neurobiologie et Cancérologie*
LAL	*Laboratoire de l'Accélérateur Linéaire*
LPT	*Laboratoire de Physique Théorique*

1st january 2020 : creation of IJCLab

The transformation of the Valley's urban planning

Renovation and new urban planning in the Orsay Valley

The transformation of the Orsay Valley accompanied the creation of IJCLab.
Today it has taken on a new lease of life after the creation of IJCLab.

Extension bâtiment 108

Ateliers bâtiment 100

Restructuration du Hall D1-D2, de l'IGLOO, bat 201

Ateliers bâtiment 200

Entrée du laboratoire – Bâtiment 100

Cafeteria – Bât.102

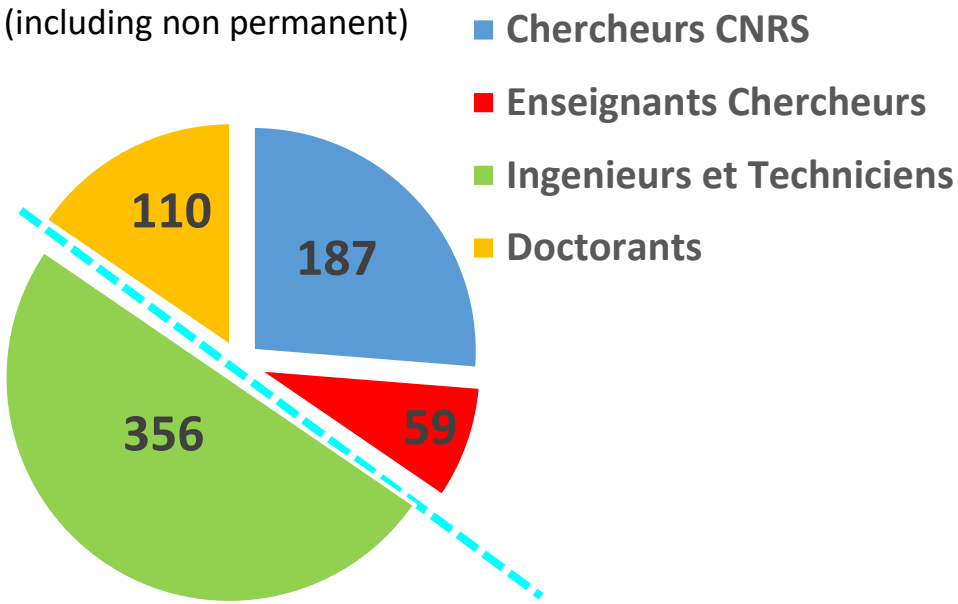
Hall D3-D4 Bâtiments 201

Salle blanche bâtiment 200

Extension Virtual Data bâtiment 206

IJCLab staff and guardianships

IJCLab :
Personnel Status
(including non permanent)



120+ internships/year
~800 people present in the laboratory

CNRS (Centre National de la Recherche Scientifique)

- ~17000 researchers + 16000 technical staff
- 10 institutes among them **IN2P3** **(Institut national de physique nucléaire et de physique des particules)**
- IN2P3 composed by ~20 large-scale laboratories
- IJCLab mainly linked to IN2P3.
- **IJCLab (~700 people) ~1/4 of HR of the IN2P3.**

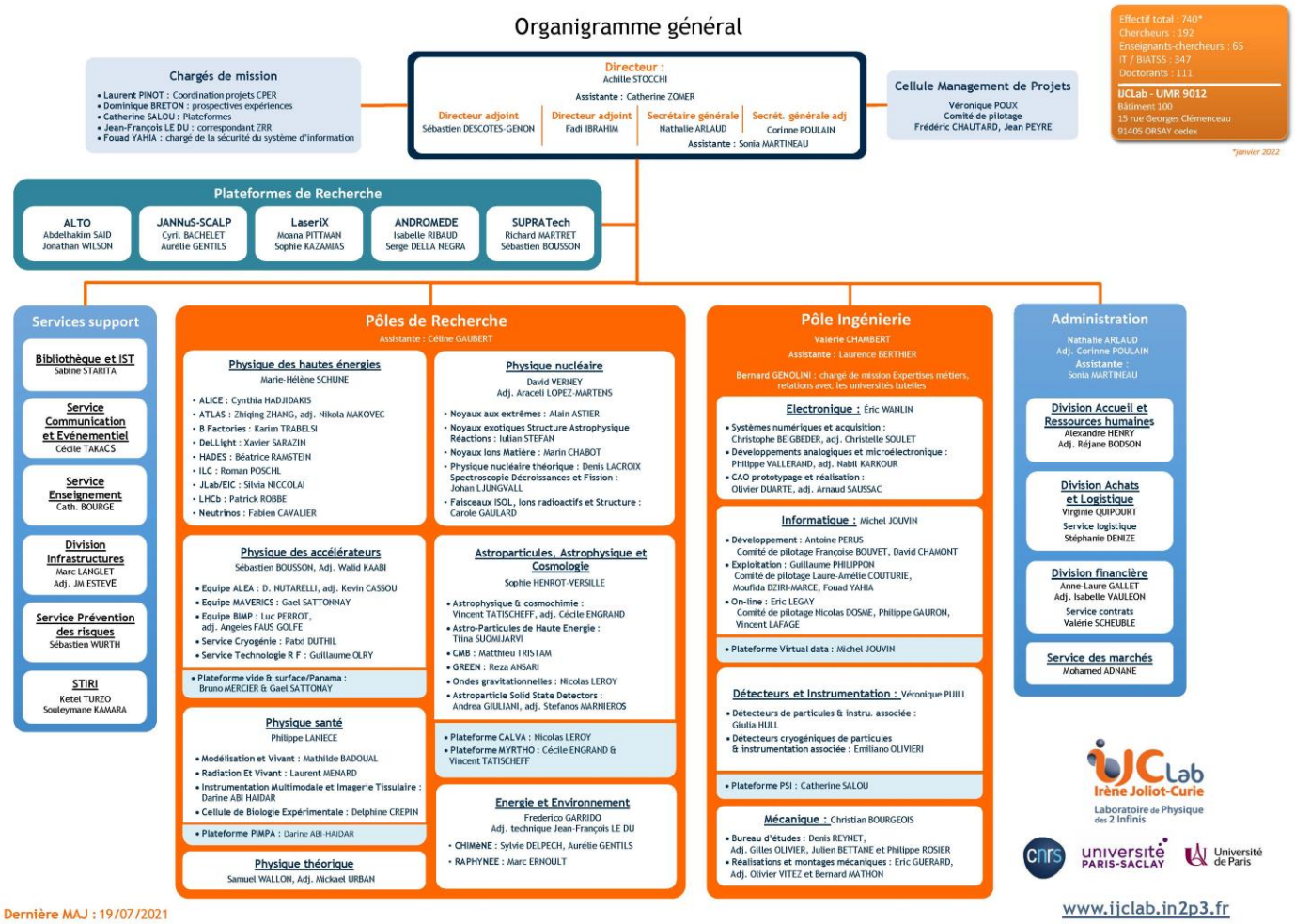
University Paris-Saclay

- 275 laboratories : 9000 researchers, 11000 IT *(University and research organism altogether, comprising CNRS and CEA)*
- 13th Shanghai ranking (Physics : 9th World, 1st Europe)
- 48000 students (with 9000 Master, 4000 PHD)

University de Paris

- Specific links with IJCLab in Health Physics

IJCLab : Organisation in 1 page !



7 Research Poles

31 research teams and 2 Departments

1 Engineering pole

4 Departments with 10 Services

1 Administration Pole

3 Divisions + 1 Service

6 support Services

5 Platforms

(with external users)

+ several technical platforms

6 GROUPES TRANSVERSES

Saveurs: Quarks et Leptons
Yasmine Amhis(PHE), Thibaut Louis (A2C), Olcyr Sumensari(TH)

QCD
Jean-Philippe Lansberg(TH), Laure Massacrier(PHE).

Fabrication Additive Technologies Innovantes (FATI)
Stéphane Jenzer(PI-Mécanique), Nicolas Delerue (PA)

Calculs et Données
David Chamont(PI-Informatique), David Rousseau (PHE)

Cosmologie et Physique des Hautes Energies (COSPT)
Eugeny Babichev(TH), Thibaut Louis (A2C), Dirk Zerwas(PHE)

Physique nucléaire dans le cosmos
Nicolas Leroy (A2C),Nicolas de Séréville(PN), Michael Urban(TH)

ARCO (Accelerator Research Center Orsay) pour animer la recherche et le développement en Accélérateurs

IJClab in a nutshell

7 Pôle Scientifiques

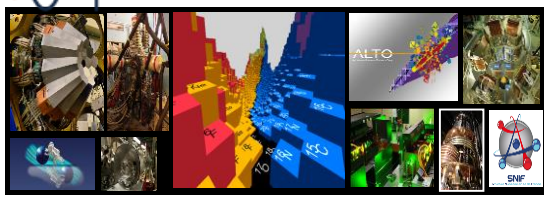
All the themes of the "physics of the two infinities" with the presence of strong historical/existing poles, emerging poles and activities at the interfaces.

A2C Astroparticles, Astrophysics & Cosmology

~ 58

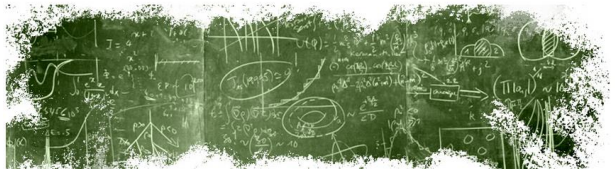
PHYSIQUE NUCLÉAIRE NUCLEAR PHYSICS

~ 61



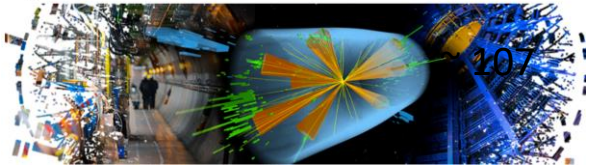
Theory

~ 72



PHE Physique des Hautes Energies High Energy Physics

~ 106



Health Physics

~ 25

Accelerator Physics

~ 87

Including RF and cryogenic services

Energy and Environnement

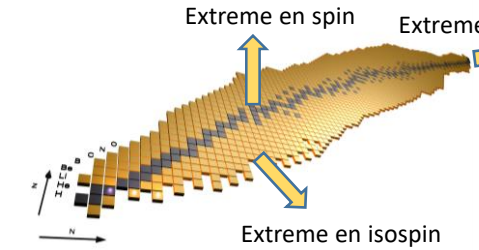
~ 34

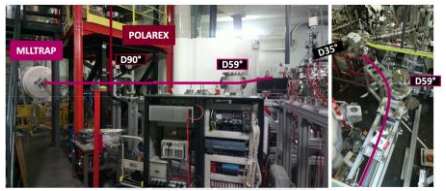
~ 110 PhD

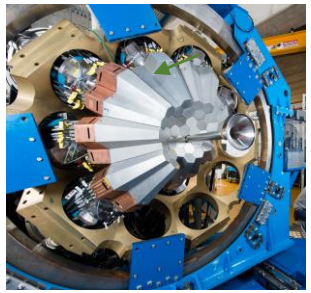
IJCLab : The Research Themes

Probing matter at small distances/high energy $E=hc/\lambda$, discover new particles $E=mc^2$

emergent properties of an effective interaction

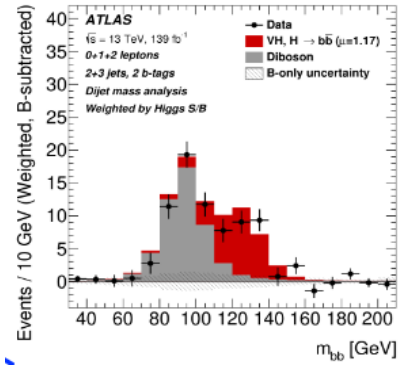






Nuclear Physics

The standard model and the discovery of the Higgs boson!
The missing piece of the standard model



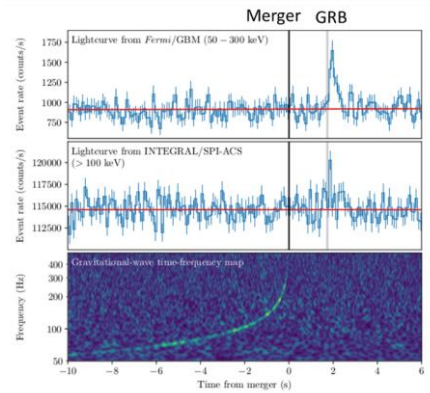
Particle/Hadronic

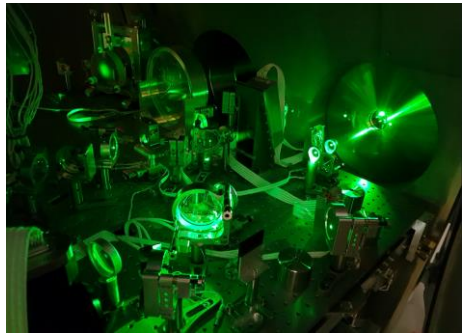
Understand the constituent elements of matter, their interactions
and how the properties of matter are derived from them

IJCLab : The Research Themes

To understand the evolution of the Universe and to study the violent phenomena that occur in it, in connection with high energy physics

The observation of gravitational waves LIGO/VIRGO
Space-time waves, direct observation of black holes / other compact objects

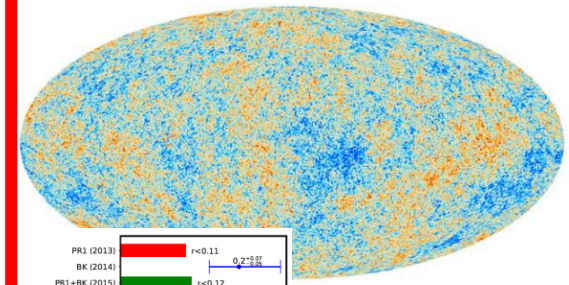


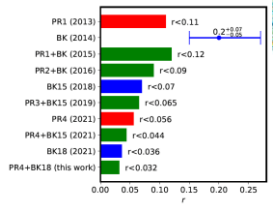


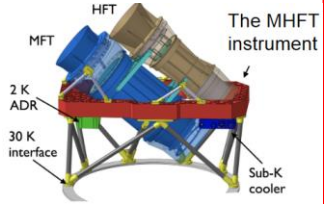
ASTROPARTICLES

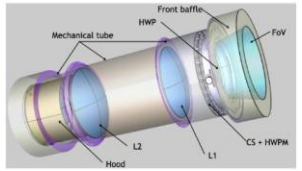
Astrophysical events (high energy cosmic rays, black hole fusion, general relativity...)

The early universe seen by the CMB!
The first picture of the universe









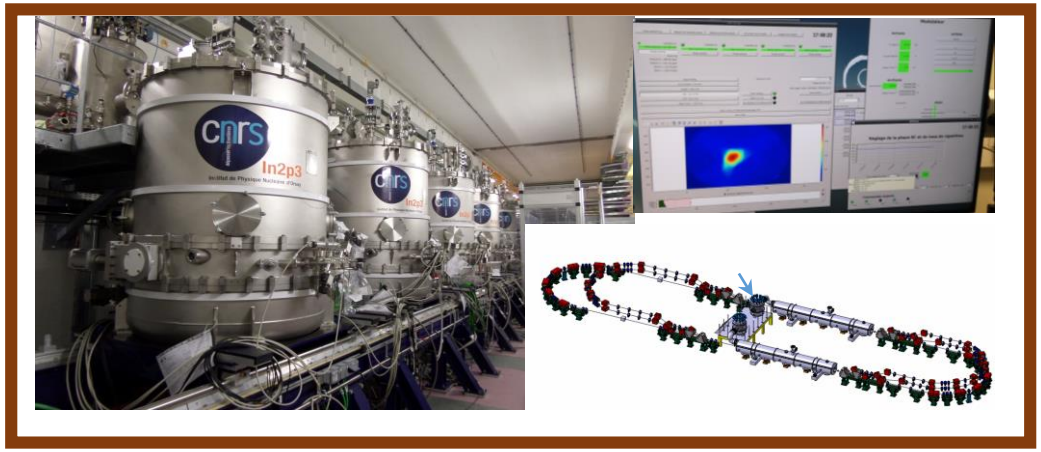
Cosmology

(evolution of the Universe, inflation, large structures, dark matter and energy)

Liens avec le cnes CENTRE NATIONAL D'ÉTUDES SPATIALES

IJCLab : The Research Themes

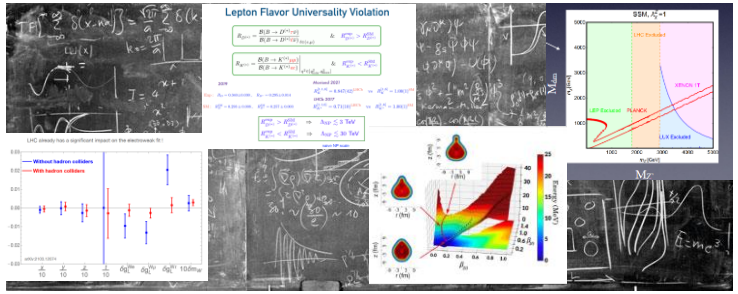
Design, develop and build tools to carry out this research



Accélérators

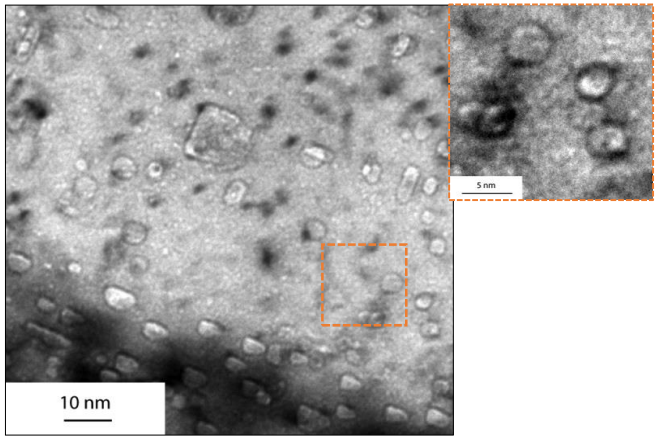
Detectors/Instrumentation

Theory

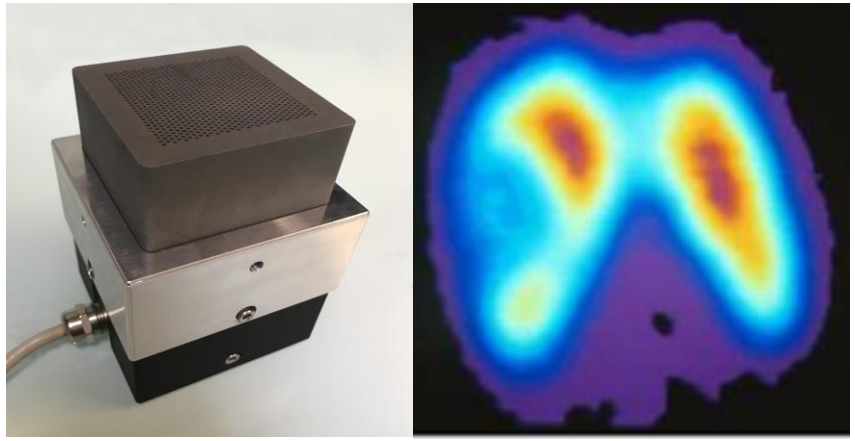


IJCLab : The Research Themes

Tools and concepts applied in areas that have an impact on society



Energy and environment: nuclear energy, radiochemistry and materials



Health physics:
Imaging, radiation therapy, life modeling

IJClab in a nutshell : Technical Skills

1 Pôle Ingénierie 4 Départements

~180 staff members

4 Departments :

Electronics / Computing
Instrumentation / Mechanics

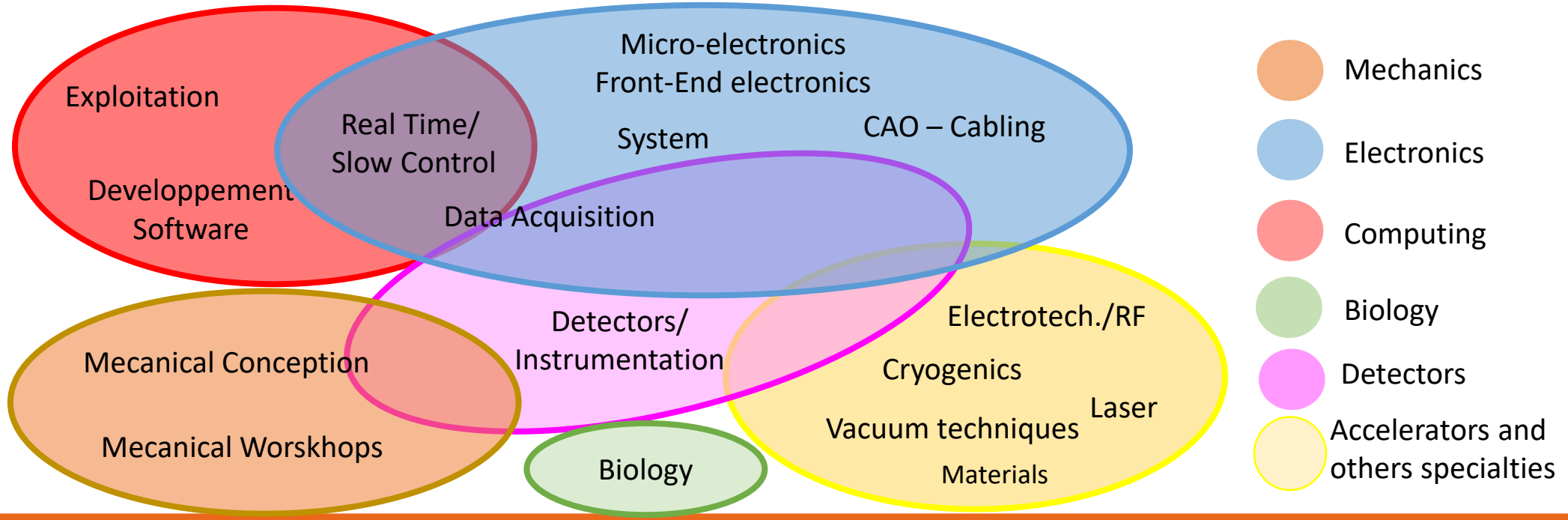
with 10 Services

Services in accelerator Pole
- **RF**
- **Cryogenics**

~30 staff members

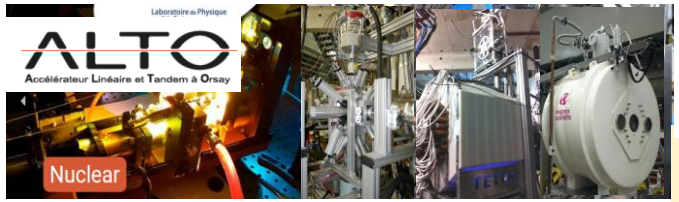
Technical staff with technical skills/expertise
essential pillars for the laboratory to design, draw and build instruments.

- Technical services are fuelled by the challenges of research (R&D and projects)
- The proximity of technical and research teams (integrated teams)
- The ability to combine and make coexist versatility and specialization



IJClab : The Plateformes in a nutshell

~30 permanent staff operating/ working on the platforms



- **15 MV Tandem** (from protons to agregats)
- **Electron linac** -> radioactive beams by photofission

Nuclear, Health Physics, Irradiation

Open to external users

Multi-MeV protons, multi-charged atomic ions, gold molecules and nanoparticles

Nuclear/A2C, Health Physics, Irradiation

Open to external users

Irradiation / ion implantation and in situ characterization techniques (TEM, IBA)

Energy, nuclear materials, health physics, irradiation physics and chemistry

IJClab : The Plateformes in a nutshell

PSI
Silicon Detector
Characterization/Production

VIRTUAL DATA
Advanced computing
resources infrastructure
Grid / Cloud

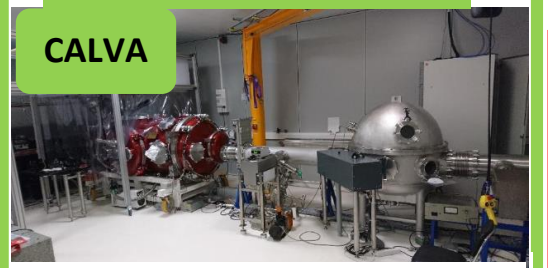
Research topics Health Physics

PIMPA
Plateforme d'imagerie Multiphotonique du Petit Animal

non linear optical biphotonique imaging

Research topics A2C

CALVA



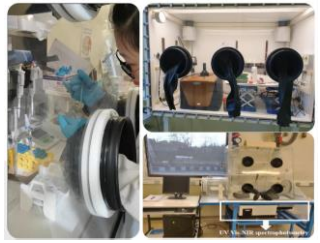
Cavity locking/Squeezing for VIRGO and ET

Preparation/analysis Micrometeorites

Myrtho

detector for astro gamma

Laboratoire de radiochimie
Actinides - Bat 107

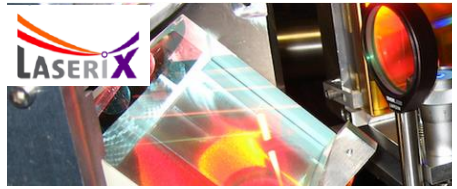


Research topics/accelerator technologies

Open to Materials, atomic physics, detectors

SUPRATECH

R&D on superconducting cavities
preparation, packaging, assembly and testing of superconducting RF cavities



LaseriX

coherent, intense and brief sources (50fs to 10 ps) in the near infrared (800nm) and EUV (30 to 90 eV)

Vacuum and Surfaces

IJCLab in a nutshell: Support Services Support

The Support Services are essential to support all scientific and technical activities of the laboratory

Administration

- Division accueil et ressources humaines
- Division achats et logistique
  Service logistique
- Division financière
  Service contrats
- Service des marchés

47 members

A strong and newly structured administrative department
3 divisions
2 departments

3 **CeMaP**

Project Management Unit. Accompanies and supports project leaders, provides input and advises IJCLab management.

38 members

Management of libraries, common digital library, simplified access to all documentary resources and laboratory productions.

National/international visibility of the IJCLab: external and internal communication, organization of events, heritage activities...).

Support to teaching activities: make the IJCLab a meeting place for students.

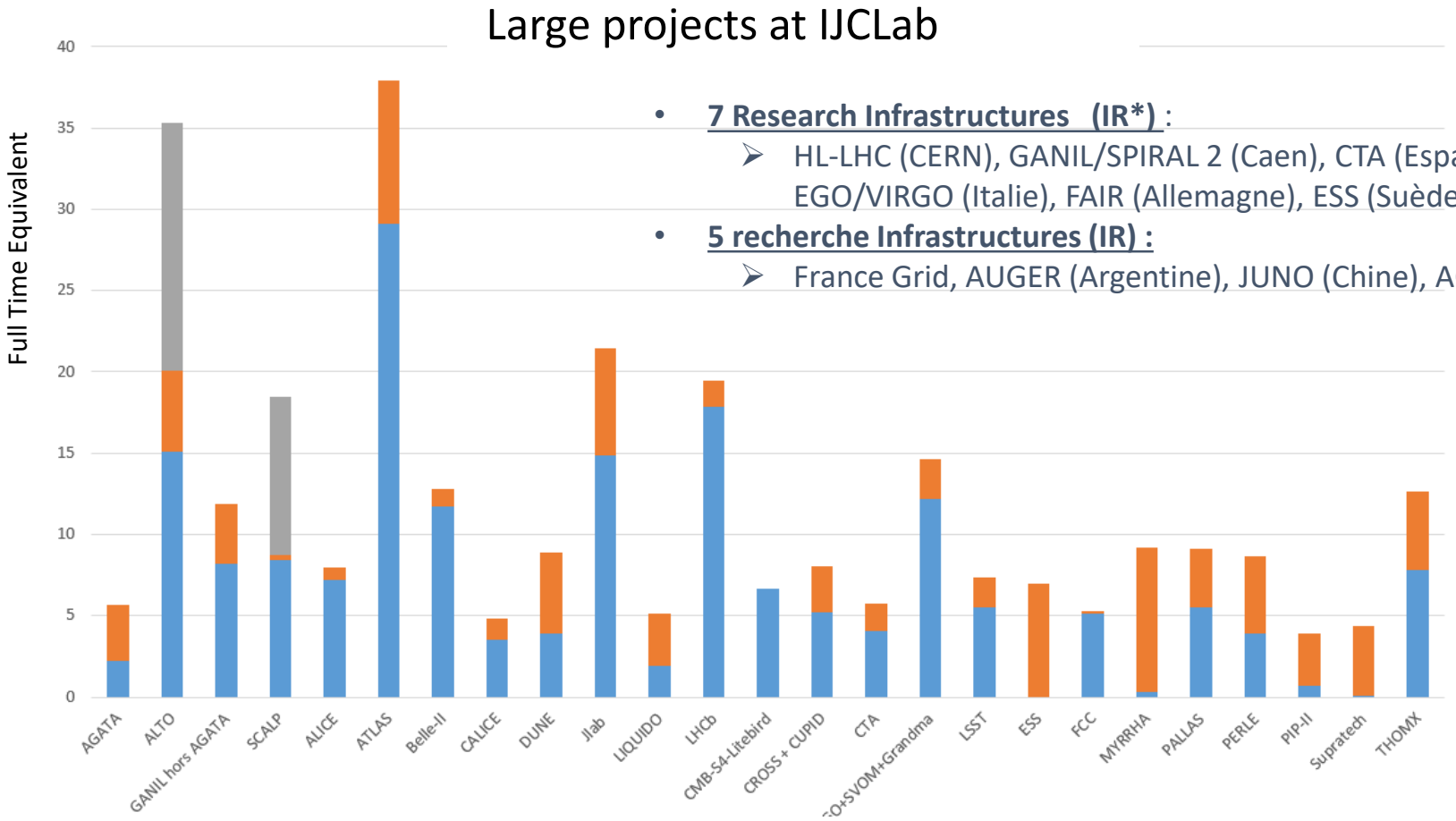
Essential for a "laboratory builder". for the success of the new implementation of IJCLab.

Key role, given the specificity of our research activities and all the facilities involved.

International cooperation and links with companies: two pillars of IJCLab

Services support

- Documentation
- Communication & Événementiel
- Enseignement
- Infrastructures
- Prévention des risques
- STIRI



- **7 Research Infrastructures (IR*)** :
  - HL-LHC (CERN), GANIL/SPIRAL 2 (Caen), CTA (Espagne et Chili), EGO/VIRGO (Italie), FAIR (Allemagne), ESS (Suède), DUNE (États-Unis)
- **5 recherche Infrastructures (IR) :**
  - France Grid, AUGER (Argentine), JUNO (Chine), AGATA, EMIR&A

IJCLab : “A Year budget”

Assigned by governing bodies	Laboratory operation	~4.5M€
	Specific programs	~3.5M€
Contracts : ANR/Europe/industry/Region…		~4.5M€
Own Resources (overheads, services, ..)		~2.5M€
TOTAL RESOURCES		**~15M€**

Salary of permanent staff	~40.5M€
Salary of non permanant	~2.5M€
The salaries of the permanent staff are not in the laboratory budget : directly payed by the employers (CNRS/Universities)	

The valorization of our research with a strong economic and social impact, links with the industrials

Opening of the platformes to industrials

~1M€ (PIA- filiere BPI/Region)
IT transfert

1

Know-how Transfert

1

Assembly of cryomodules (accelerators)
CNIM

1 Start up

Beams Gamma Camera (Health Physics)
(hosted at IJCLab)

Recall : Spin-off of lab: **ACS**

6 Technological Transferts

from DECLIC (TRL1-2) to Maturation (TRL 8)

~3.0M€

19 Contrats with industrials

(13 on going)
~2M€
8 PHD CIFRE

IJCLab a student place : Attractiveness based upon education / research

Teaching

Academic, Technical, Platforms

*~60 **Researchers-Teachers + ~30 Researches-CNRS** are involved in University teaching.*
*~60 **Technical staff** teach different skills and specialities (university / Schools..)*
Research Installations/ Platforms -> Educational platforms with dedicated lines

Internships for students

Internships: the gateway for students to discover research

Internships at different level (from L1 to M2 and international.) :
~180 internships in 2022 corresponding to approximatively ~500 months

Thesis

PhD Training by research and for research

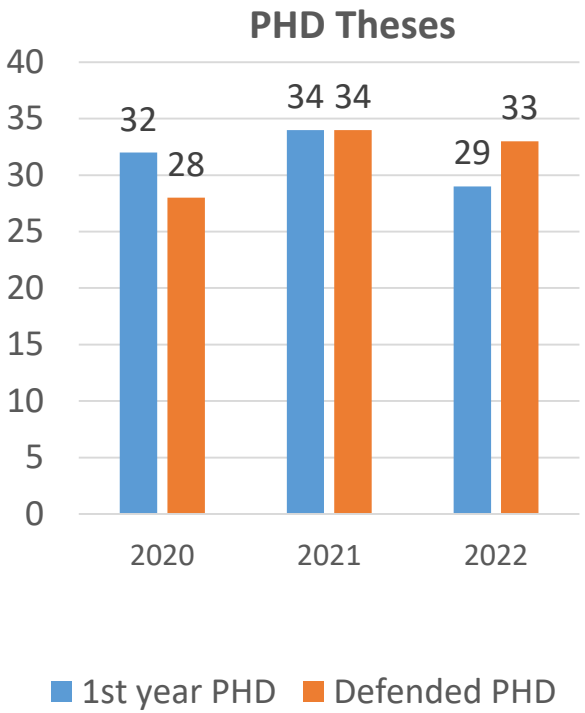
~110 PhD students in the ensemble of the laboratories (from 30 different nationalities)
Number of technical theses rapidly increasing

International Schools

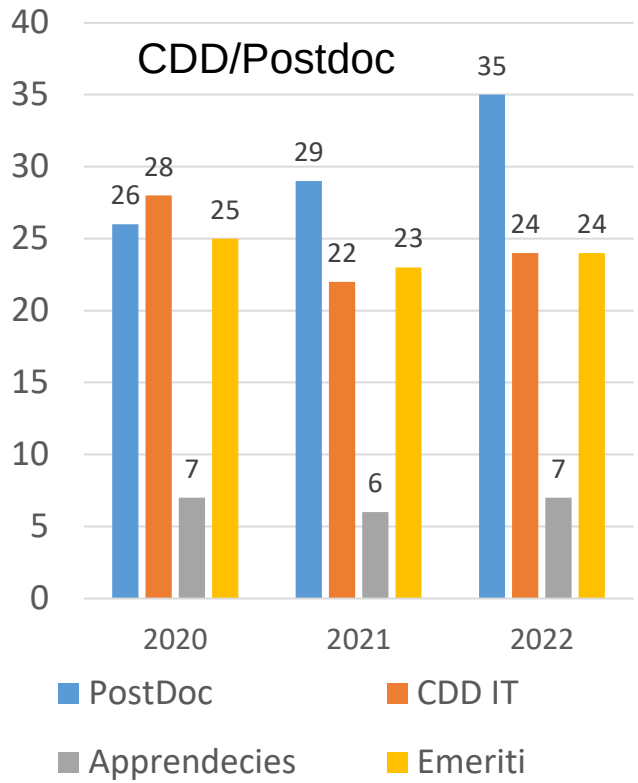
Participation and creation of international/national schools

Participation/creation of international/national schools
*School : **WISHEPP (Palestine), TESHEP (Ukraine…), QCD, School at** L3 level…*
*IJCLab leads **Erasmus+ MIC Colombia / Georgia / Ukraine / Palestine and Erasmus Mundus Lascala***

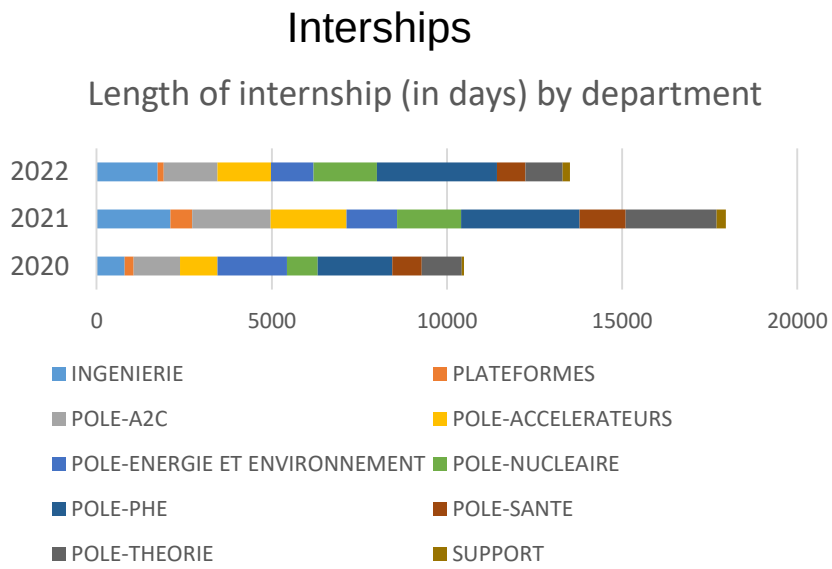
Some significant figures/stats



~30 PHD student incoming/year
~30 PHD defences/year



A timid increase of PostDoc, to be confirmed with the increasing success of the different national/European calls



	2020	2021	2022
Number of internships	125	213	178
Number of months	375	641	483
% L	24%	32%	34%
% M1	28%	36%	32%
% M2	47%	32%	34%

Internships – Visible Strategy of the laboratory

In conclusions, our Manifesto

- **Contributing to projects at all stages**: proposal, design, construction, operation, data analysis, theory
- **Playing a major role in the conception, design and construction of current and future accelerators**.
- **Developing and operating research infrastructures and technological platforms** supporting these research areas as well as original research in health physics and energy
- **Promoting the development of new technologies for science for the benefit of society** and thus supporting national and European industrial competitiveness
- **Welcoming students that the laboratory trains through and for research** in the heart of a world-class academic environment.