

IJCLab Yearly Report 2021

The Directorate

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1. IJCLab Year 2021: introduction

The structure and the range of the scientific and technical activities of IJCLab were described in the first document submitted to the Scientific and Strategic Council (SSC) in May 2021 and all documents and presentations are available [on the indico page of the event](#).

The present document aims at providing complementary information by reporting the main achievements and evolutions of Year 2021 for IJCLab : Scientific and Technical highlights and events (Chapter 2), Manpower distribution and evolutions (Chapter 3), Budget with a focus on the success of the various external calls (Chapter 4), Focus on the Platforms (Chapter 5), CPER: Operations on the Renovation of Infrastructures (Chapter 6), Educational matters (Chapter 7). Appendices are devoted to various structural aspects (organizational chart, institutional bodies and committees).

2. Scientific and Technical highlights and events in 2021

On a global level, the IJCLab organization which has been built during 2020 has not significantly changed in 2021. The laboratory is structured according to the skills and activities of its members, with:

- 7 Research Departments (or poles): High Energy Physics (PHE), Accelerator (PA), Nuclear Physics (PN), Astroparticles, Astrophysics and Cosmology (A2C), Theory (TH), Energy and Environment (EE), and Health Physics (PS)
- 1 Engineering pole (PI), featuring 4 Technical Departments gathering 10 Technical Services,
- an Administrative pole with 6 Support Services
- and 5 Research Platforms.

The fully updated organizational chart of IJCLab is given in Appendix 1.

The Technical Services vary greatly with size (from a few people to thirty or so), fully mixing people from the five laboratories merged into IJCLab. On the other hand, the composition of the research teams often reflects the research activities of the previous laboratories, even if the teams linked to new emerging activities may be more mixed.

2.1 Structuring activities

Important events have occurred at IJCLab in 2021, involving the laboratory as a whole, and connecting the activities taking place in its various components. The « **Journées de Perspectives IJCLab** » featured [a two-day program](#) in April with 40 talks which led to [a summary document](#). In September we organized [four half-days](#) of the « **Journées de Perspectives Techniques IJCLab** » to discuss the technical R&D activities with 17 talks.

During 2021 we created six transverse groups with the aim of developing further scientific transverse to the laboratory's poles. They are listed below together with the current coordinators.

- Flavors, Quarks and Leptons (Yasmine Amhis (PHE), Thibaut Louis (A2C), Olcyr Sumensari (TH))
- QCD (Jean-Philippe Lansberg (TH), Laure Massacrier (PHE))

- Additive Manufacturing Innovative Technologies - FATI (Stéphane Jenzer (PI-Mechanics), Nicolas Delerue (PA))
- Computing and Data David Chamont (PI-Informatics), David Rousseau (PHE))
- Cosmology and High Energy Physics - COSPT (Eugeny Babichev (TH), Thibaut Louis (A2C), Dirk Zerwas (PHE))
- Nuclear physics in the cosmos Nicolas Leroy (A2C), Nicolas de Séréville (PN), Michael Urban (TH)

They are regularly organizing workshops: we will discuss their impact in the next report.

More specific thematic meetings were also organized. A full meeting day was dedicated to present and discuss the activities and projects at IJCLab using lasers¹. It allowed IJCLab members to exchange around the different techniques used inside the laboratory, to identify the synergies and the technical skills present at IJCLab and possibly to share experiences. In the same spirit, the platforms (ALTO, SCALP, Vacuum and Surfaces, LaseriX) organized a thematic day on irradiation and analysis topics.

2.2 Scientific and technical highlights

In September a whole day was dedicated to celebrating the **50 years of ALTO**. The newly created² **PAC-ALTO** met for the first time at the same moment. Many proposals were submitted and accepted adding up to more than 4000 hours of beam time. The RadioGraff setup recently brought from IP2I-Lyon was installed at ALTO and the first experiment for dosimetry using this device took place. Many improvements to the platform were performed: one can highlight on one hand the installation of the new FRISAL front-end and on the other hand a series of upgrades to allow ALTO to offer services to a wider scientific community and an access to enterprises. The latter is one of the main objectives of the **SPACE ALTO** project, which aims at opening the platform to multidisciplinary activities (detector tests, physical materials, health physics, etc.) and strengthening the relations with industry.

An experiment performed at **ALTO** with the nu-Ball spectrometer has been published in Nature and has made it possible to answer a long-standing question: what is the mechanism that generates the spin of the fragments during fission. At the **SPIRAL2-GANIL** facility, the IJCLab teams were heavily involved in the development of the **S3-LEB** experiment in 2021. In addition, IJCLab has taken on the coordination of the project to increase the beam intensities at the SPIRAL2 linear accelerator: **Newgain**.

AGATA was labelled by Ministry as a national Research Infrastructure in 2021. The goal of AGATA is to finalize the construction of a 4π gamma-ray spectrometer of 180 germanium crystals by

¹ PALLAS and DeLLight with LASERIX, RIALTO and LINO at ALTO, S3-LEB at GANIL, CALVA/Exsqueez, PIMPA, Fabry-Perot Cavities, ThomX and the Laser Spectrofluorimetry with temporal resolution for Actinides studies.

² Members of ALTO PAC: Augusto O. Macchiavelli [president] (LBL-US), Mikael Block (GSI/Mainz-Germany), Denis Dauvergne (LPSC-Grenoble), Paul Greenlees (Jyu-Finland), Denis Lacroix (IJCLab), Silvia Leoni (Milano-Italy), Beatriz Jurado (Bordeaux), François De Oliveria Santos (Ganil), Magdalena Kowalska (CERN), Caterina Michelagnoli (ILL-France), Patton Regan (Surrey-UK), Adam Maj (Ifj-Cracow-Poland).

2030. IJCLab is very much involved in this experiment with very important responsibilities in the collaboration (data acquisition, electronic, instrumentation) and the national technical coordination

In Year 2021 the **Andromède** platform started the new campaign for the international **STELLA** experiment which will fully continue in 2022. The preparation for **New-JEDI** experiment campaign went well and it is ready to start in 2022 together with the more local and interdisciplinary activities on the 1-degree line.

In 2021, the LHC experiments ALICE, ATLAS and LHCb have finalized their preparation and have entered into the commissioning phase for the Run3 period. On top of these upgrade activities, important efforts on data analyses have taken place. All in all, ~ 62 FTE (with 18 FTE Engineers) has been devoted for LHC experiments at CERN in year 2021. The electronics for the **ALICE** muon spectrometer have been completed and installed. For **LHCb** we mention the rare decay $b \rightarrow sll$ decay channels which are still showing an intriguing discrepancy indicating a possible violation of the lepton flavor universality. A new luminometer for LHCb, **PLUME**, was built, assembled and installed by IJCLab, whereas all front-end and control boards for the **LHCb-ECAL & HCAL** were installed in the cavern. For **ATLAS** we mention the steady improvements in the analysis on Higgs couplings and production, the measurement of precision electroweak observables and the searches for supersymmetric particles. All results so far confirm SM predictions. The work is continuing for the upgrade both for the **front-end calorimeter HGTD** and the **ITK tracking** system and we underline here the important progress in organizing the new **PSI Platform at IJCLab** so that it can be ready for the production phase.

In September 2021, the **SuperNEMO** demonstrator recorded its first two-track event. The construction and the installation of the detector in Modane was performed with a very strong implication of the IJCLab technical teams. The participation to **DUNE** has been growing with hardware contributions. The ColdBox at CERN has been put in operation and we participated in the Cathode Test with more than 500 000 traces recorded. Studies and works are in progress around the new **LIQUIDO** technology of opaque scintillators with several financial supports being obtained to study its applicability and impact for neutrino physics, health (LPET) and energy (AMOTech). The headquarter of all these national activities is at IJCLab.

IJCLab drove the proposal of maintaining the infrastructure of the **LNCA (Laboratoire National Champagne Ardenne) at Chooz**. The LNCA became a UAR (Unité d'Appui à la Recherche) of CNRS/IN2P3, providing a MeV neutrino facility to test new detection technologies at early stages of demonstration and physics. This is done in close collaboration and with a signed partnership with EDF. The new director of LNCA is Jean-François Le Du (IJCLab).

Continuing a long engagement and effort, a third version of the **LIGO and Virgo** gravitational wave detections catalogue was edited with about 100 events, adding 35 new ones, collected between November 2019 and March 2020. In parallel, the final review of the MXT (SVOM) scientific partition has been done and accepted by CNES. First results were obtained with the Single Photon Electron calibration system designed at IJCLab on **NectarCam** for **CTA**. In cosmic rays to notice the refinements of the data analyses with the full set of **AUGER** data and a publication showing that cosmic ray probably originates in galactic areas bathed in a cloud of ionized gas at more than a million degrees from the winds of massive stars and supernovae (superbubbles).

The physics analysis studying the primordial Gravitational waves footprint in the **CMB** is constantly improving the limit on the tensor/scalar ratio and on the interpretation of the H_0 tension. IJCLab is also strongly involved in the preparation of the space instrument LiteBIRD, and ground-based CMB-S4.

In **LSST** holograms were developed, allowing the AuxTel to measure more efficiently the absorption of the atmosphere for a better control of systematics on the dark energy related cosmological parameters.

FINK, a big data platform for monitoring the transient sky and science, developed by the IT department, was selected as a broker by LSST/Vera Rubin observatory (2024-2034) to be able to monitor more than 1 TB/night of alerts (100-1000x current streams).

We achieved our important contribution to **ESS** with the supply of the Spoke Cryomodules. In 2021, 10 (over 13) were assembled, 6 tested and validated in Uppsala, 6 delivered to Lund. In addition, the 13 cryogenic distribution boxes and the cryogenic lines are installed on site. The first prototype of **PIP-2** cavity designed by IJCLab and FermiLab is almost completed at the Zanon factory. For **MYRRHA**, the first prototype power couplers were conditioned at nominal RF power and the cryogenic tests of the prototype cryomodule assembly were successfully completed at SupraTech. **ThomX** obtained the first beam in October 2021 and is starting the linac commissioning by reaching 50 MeV, 10 Hz, 100pC. **PALLAS** obtained in December 2021 the first structured plasma produced in the new targets tested on the dedicated test bench on the **LASERIX platform**. **Perle@Orsay** was structured as an international collaboration, with a reinforcement of the French implication with the arrival of new collaborators from LPSC. In 2021 we achieved success in our answer to an Equipex+ call with the **PACIFICS** project with CEA. This 6-year project includes 2.7M€ of equipment for IJCLab for the PALLAS project and for R&D materials for accelerators.

Two of IJCLab platforms (JANNuS-SCALP and Andromède) are part of the **EMIR&A** federation, a national network of 11 platforms on 6 sites for the irradiation and analysis of molecules and materials, which has become a Research Infrastructure (2021-2025). The extension of the **JANNuS-Orsay** experimental hall is being finalized. Significant upgrades were performed for the **SIDONIE** platform (for projects of radionuclei production for health physics). The research of simulation and modeling has continued with important results on the irradiation effects in specific materials, ODS steels, UO₂ fuels, apatites). The first phase of the rehabilitation works for Bâtiment 107 (the Actinide Lab) has been completed allowing researches on chemistry of actinides. Research devoted to the chemistry of molten salts for SMR reactors gained a new impetus as a possible concept of nuclear reactor for the future.

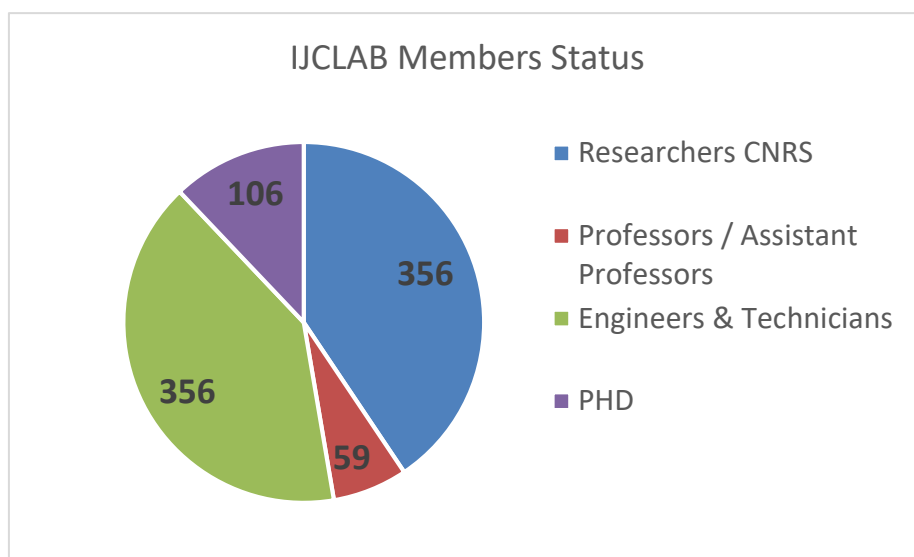
Theory activities have been particularly developed in flavour physics around b-quark anomalies, new models of dark matter in cosmology and particle physics, black holes in modified gravity, precision observables for the partonic content of nucleons and nuclei, the study of nuclear decays involving Gamow-Teller resonances or producing two alpha particles.

IMOP (pre-surgery imaging) has realised a prototype of an endomicroscope dedicated to surgical assistance for the treatment of brain tumors. **THIDOS** (Internal Dosimetry project) has also progressed well with the development and optimization of the first clinical prototype (wide field) dedicated to vectorized therapy (thyroid treatment monitoring). Both projects have significant potential for medical applications and the second one could benefit from the startup company, Beams, which has just been created within the health pole).

3. Human resources

3.1 Manpower: global picture and evolutions

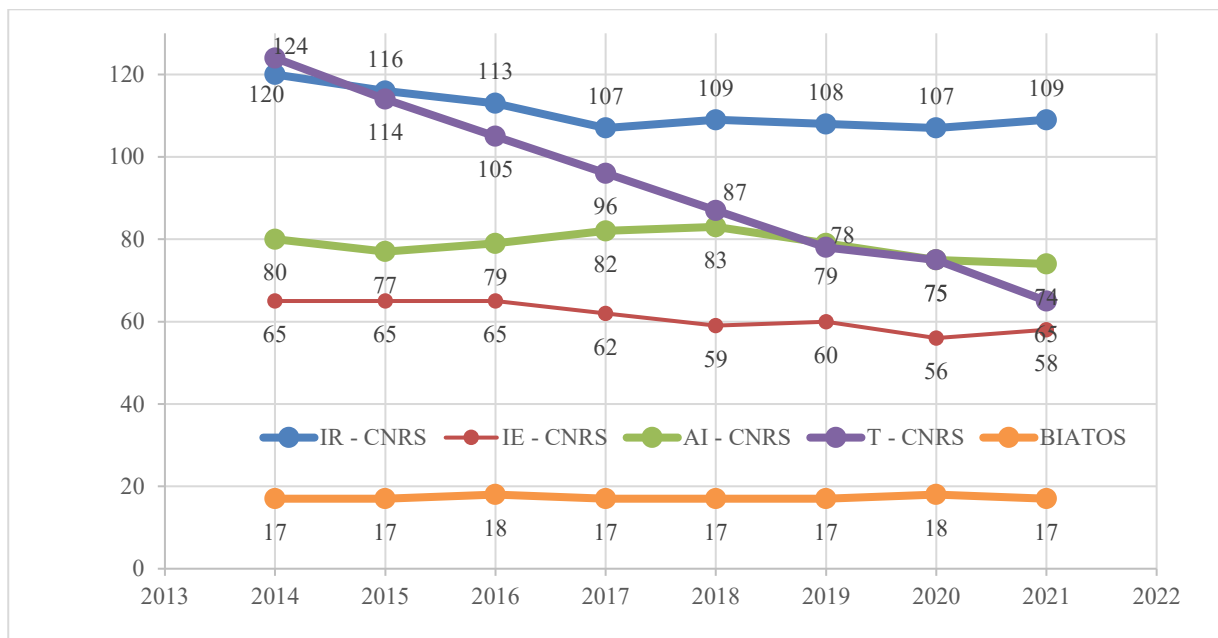
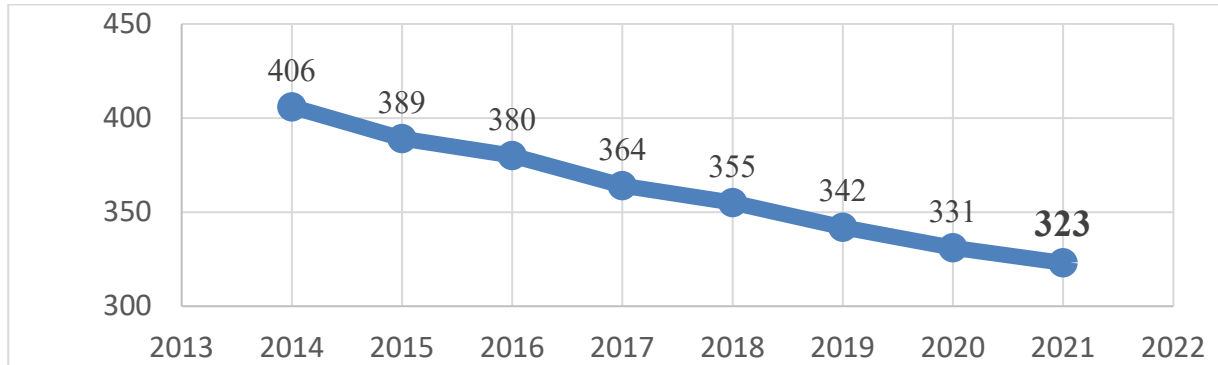
IJCLab staff and status is broadly summarized in the following figure



IJCLab staff status. In addition, one should add about 100 internship students and about 6 apprentices which are present at the same time in laboratory.

Around 710 people work at IJCLab, among which about 530 permanent staff. Among the non-permanent members, there are about 110 PhD student on three-year contracts. In addition, on average and mainly during the spring/summer period, about 100 more people (mainly young student internships) are present at IJCLab. Obviously, these numbers can slightly fluctuate over time and depend on the moment of discussion (here at the end 2021).

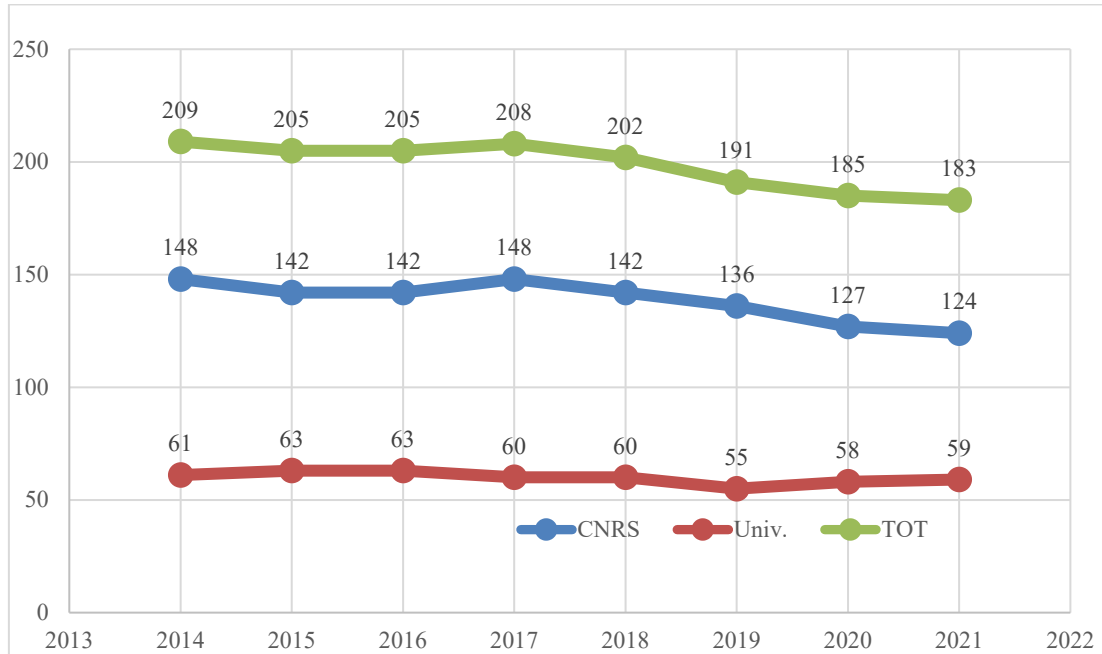
The yearly evolution of the research and technical staff is shown in the following figures.



Yearly evolution of the technical staff. For CNRS staff : IR = Ingénieur de Recherche (blue), IE = Ingénieur d'étude (red), AI = Assistant Ingénieur (green), T= Technicien (violet). For University staff: BIATSS include all categories (orange).

For the Technical staff and for several years before the IJCLab creation, there was a -13 balance on average between hiring and departures. This is mainly due to retirements which are impossible to compensate with the current level of recruitment at CNRS and University. This loss is essentially driven by the decrease in the number of the T (technician) staff due to the lack of hiring on one side and the promotions to higher categories on the other side.

In Year 2021 we had fewer departures and more recruitments. The average balance after the creation of IJCLab creation reaches -9 with a -8 balance for Year 2021.

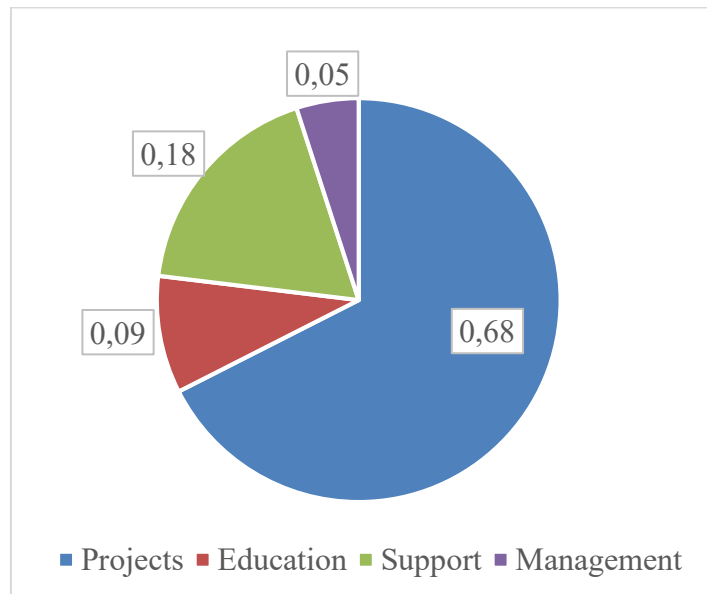


Yearly evolution of the research staff. In brown (blue) for CNRS researchers (University lecturers/professors), in green for the total.

Prior to the creation of IJCLab we had a period of stability (until 2017) in terms of HR, followed by a loss of about 6-7 researchers per year due to retirements and mobilities to other laboratories. The Year 2020 was quite particular in terms of movements due to the creation of the laboratory with a net balance of -6. The Year 2021 was quite positive with 7 hirings which allowed us to have a balance of -2 (consider that 3 new recruitments are arriving beginning of Year 2022 and thus not yet counted in this plot).

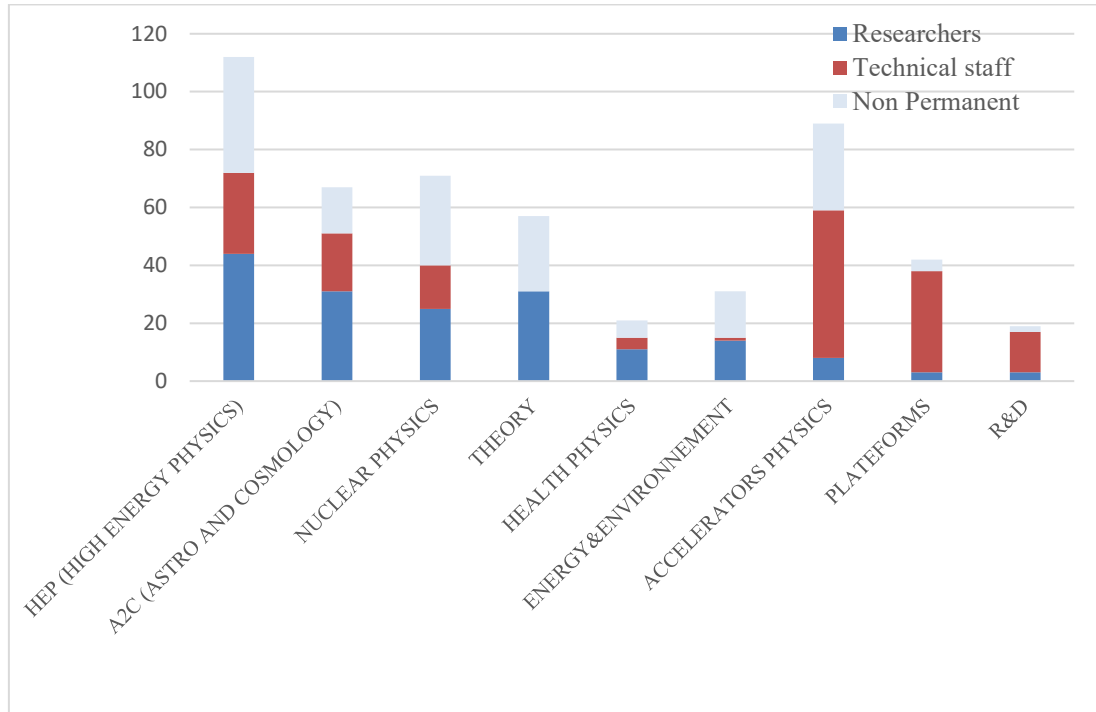
3.2 Distribution according to activities and projects

We show the time distribution of the activities of IJCLab members: about 2/3 on projects, 20% on support and 9% on educational matters.

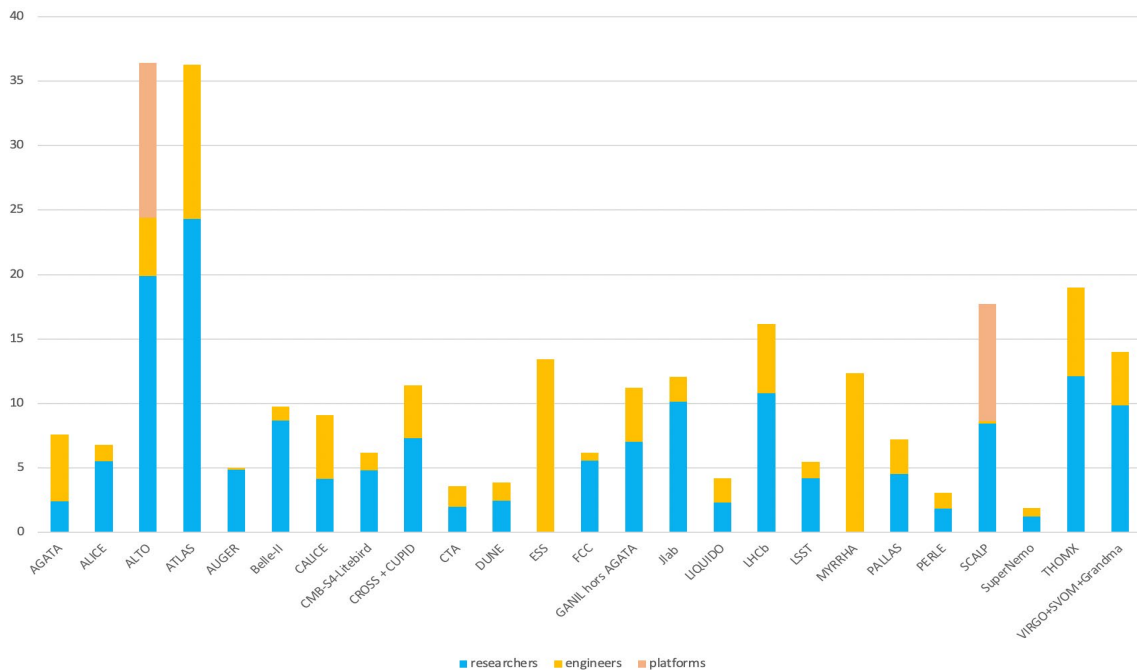


Time distribution for IJCLab members according to their various activities

The global distribution of the IJCLab members in the research activities and in the main IJCLab projects is shown below. This global picture for Year 2021 will be discussed in more depth next year, with a semestrial evolution of the FTE distributions over the poles and project activities.



FTE distributions over the activities in the IJCLab poles.



Distribution of FTE between researchers (blue), engineers (orange) and platform staff (yellow) for the projects with the highest demand for human resources at IJCLab.

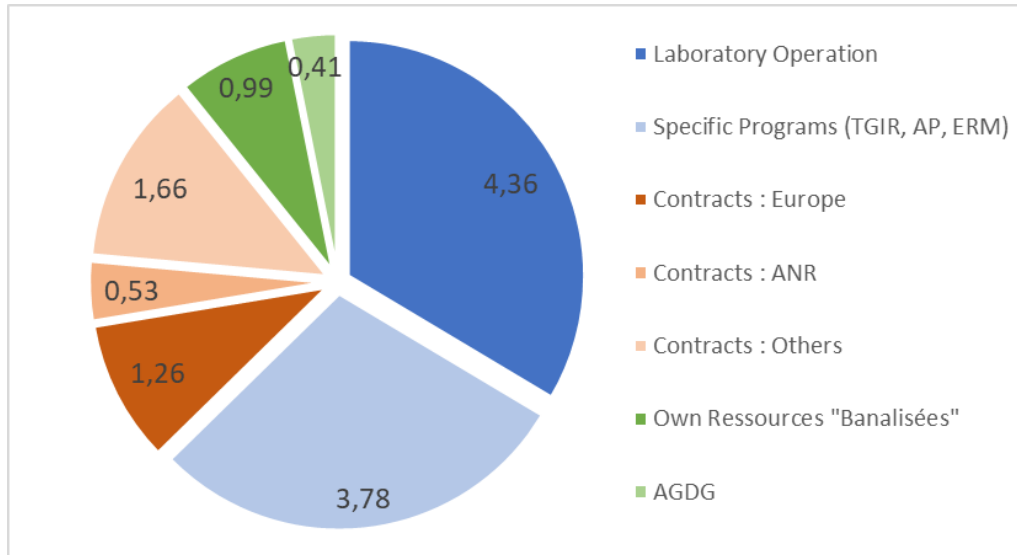
4. Budget

4.1 Global Budget

The budget of 2021 is shown in the table below and compared with the budget for Year 2020 (without the salaries). The first part of the budget is the one attributed by IJCLab Governing Bodies ("tutelles") every year. It is dedicated to the normal functioning of the laboratories (infrastructures, equipment and missions) and for the execution of the specific research/project activities. In Year 2021 this part of the budget amounted to 8.14M€ (90% from CNRS/IN2P3, 9% from Université Paris-Saclay and 1% from Université Paris Cité).

Budget spent [M€]		Y2020	Y2021
Assigned by Governing Bodies	Laboratory Operation	4.24	4.36
	Specific Programs (TGIR, AP, ERM)	3.57	3.78
Contracts	Europe	0.52	1.26
	ANR	0.89	0.53
	Industry, BPI IDEX, PIA, CNES, DIM, SESAME, LabEx	2.04	1.66
Own Resources (overheads, services...)	“Ressource propres banalisées” (all-purpose budget obtained by the laboratory outside pre-assigned fundings and contracts)	0.99	0.99
	AGDG (indirect costs from contracts)	0.72	0.41
TOTAL		12.97	12.99

IJCLab budget implemented in Year 2021 as compared to Year 2020. The numbers are rounded to the nearest 2 digits in M€ units.



Budget implemented in 2021 as shown in the previous table: 62% is assigned from Governing Bodies, 27% from Contracts and 11% from Own Resources ("Ressources propres").

This budget is complemented by the one coming from different contracts (ANR, Europe, Industry, Region...), which must be spent on pluriannual basis: in Year 2021, 3.45M€ were used. The IJCLab budget is completed by what we call "own resources" ("Ressources propres"), which comes from the contract overheads and from the different services given by the laboratory. This last budget is mainly used for hiring personnel (technical and research, theses, internships), to impulse/help rising projects punctually and to acquire new equipment outside of the project fundings. In Year 2021, 1.39M€ of these resources were used to complete the IJCLab budget.

The table below show the IJCLab "masse salariale" (total payroll) for Year 2021 from CNRS and Universities for permanents and non-permanents personnel.

	Year 2021	
	Permanent staff [M€]	Non-Permanent [M€]
CNRS	36.302	3.221
Université Paris-Saclay	5.074	2.547
Universite Paris-Cité	0.842	0
TOTAL	42.218	5.768

IJCLab "masse salariale" (total payroll)

4.2 Focus on the success to different external calls in Year 2021

We would like to focus here on the obtention of external contracts due to the success of IJCLab teams to some important calls. Our success rate has significantly increased in 2021 and it will impact the global budget positively for years to come.

Contracts	Title	Budget [M€]
ANR	CUPID-1, TEP-Otech, TTRIP, FRIENDS3, INSPIRER, NECTAR, ATRAPP, BENEFICIA, CHESS, CRYOSEL, PIMENT	2.7
	EQUIPEX+ : PACIFICS, NEWGAIN, T-REFIMEVE	2.9
Europe	ERC : Chiaroscuro	2.2
	EIC : TWAC, AmoTech	4.25
P2IO	TEM-Camera (JANNUS-SCALP), RIALTO-ALTO (Laser-ALTO), Post-docs and PhD Students	0.7
CNRS	MemScan, Dosimoens	0.16
Industry	4 contracts, 3 service deliveries	0.48
Ile-de-France Region	MSCA Cofund post-docs	0.12
TOTAL		13.5

Contracts obtained in Y2021. The budget is to be spent in a pluriannual basis.

- **ANR** : CUPID-1 (neutrino-double-beta), TEP-Otech (Liquido-LPET), TTRIP (Radionuclei-SCALP), FRIENDS3 (Nuclear-GANIL), INSPIRER (Positron beams-Accelerator), NECTAR (Nuclear Theory), ATRAP (Computing-PHE), BENEFICIA (Nuclear Materials E&E-SCALP), CHESS (Radiochemistry Actinides), CRYOSEL (R&D bolometers), PIMENT (R&D on ps electronics).
- **ANR-EQUIPEX+**: PACIFICS (R&D accelerators), NEWGAIN (Nuclear – GANIL)
- **ERC** : CHIAROSCURO (LHCb),
- **EIC** : TWAC (short-bunch accelerators), AmoTech (LiquidO-neutrino)
- **P2IO**: TEM-Camera (JANNUS-SCALP), RIALTO-ALTO (Laser-ALTO), Post-docs and PhD Students
- **CNRS**: MemScan (miniature endoscope), Dosimoens (real-time dosimetry)

5. Focus on the Platforms

We indicate the budget needed in 2021 in terms of electricity and M&O for the major platforms and technical plateaus at IJCLab. These costs do not include any investments on the platforms from the projects.

Platforms	Building	Fluids (mainly electricity). Estimated cost [k€] (rounded)	M&O [k€]	TOTAL [k€]
ALTO	109	177	248	425
LaseriX	200	32.4	133	155.4
Andromède	SuperAco	20	12.5	32.5
JANNuS SCALP	108	38.4	85.8	124.2
SUPRAtech	106	150	65	215
Vacuum and Surfaces	IGLOO-D3/D4	30.2	53.6	83.6
Virtual DATA	206	210	19.0	229.0
CALVA/Exsqueez	200	10.0	7,2	17.2
Myrtho	104	5.0	16.9	21.9
PSI	200	10.0	9.8	19.8
PIMPA	440	3	8.8	11.8
TOTAL		686	659	1345

Budget spent in 2021 for the functioning of the main IJCLab platforms and technical plateaus.

6. Integration in the local, national and international context

6.1 Université Paris Saclay

In addition to the involvement of IJCLab staff in training and teaching (see below), there is also an involvement inside the structures of the Université Paris-Saclay :

- Science Faculty: president of the Physics department
- Graduate School "Physics»: deputy directors for research and for training, director of the axis "Physics of the two infinities"
- Commissions for hiring and promoting Université Paris-Saclay, renewed in 2021: representants in 3 commissions (section 29 elementary constituents, section 30 diluted media and optics, section 33 chemistry of materials).

All scientific directors of the poles are members of the Direction Committee of the P2IO LabEx and of the Physics Graduate School.

Specific partnerships are currently developed with other laboratories of Université Paris-Saclay. A recent example is provided by the recent inclusion of IJCLab in the Comb'Idf network, a project (3 M€ for 5 years) to equip a dozen of laboratories of Paris area with frequency combs connected to a reference signal (and in particular the CALVA/ExsqueeZ platform at IJCLab).

6.2 CNRS/IN2P3 and French partners

Gathering 1/4 of IN2P3 HR, IJCLab is naturally a major player in the national CNRS/IN2P3 strategy in its field of expertise involved in the national strategy, and many of the highlights presented above are all illustrative of the deep links between IJCLab and CNRS/IN2P3.

IJCLab teams are involved in projects benefitting from a special recognition by the French Ministry of Research (MESRI) and by CNRS/IN2P3:

- all 7 Special Research Infrastructures (IR*) with special fundings: HL-LHC (CERN), GANIL/SPIRAL 2 (Caen), CTA (Spain and Chile), EGO/VIRGO (Italy), FAIR (Germany), ESS (Sweden), DUNE (USA) (added in year 2021).
- 5 Research Infrastructures (IR): France Grid, AUGER (Argentina), JUNO (China), AGATA (labelled as IR in Oct 2021), EMIR&A (labelled as IR in 2021)

Ongoing collaborations are developed with all other laboratories of IN2P3 as well as CNRS laboratories from other institutes. In Year 2021, one can mention in particular

- The installation of a new line at ALTO dedicated to radiobiology in collaboration with the **IP2I** in Lyon
- A joint study with **GANIL** carried out at the IJCLab "vacuum & surfaces" platform dedicated to the plasma cleaning of the SPIRAL2 linear accelerator cavities

- **GANIL:** A mission was entrusted by IN2P3 to study the rapprochement of the two French facilities in nuclear physics and its applications: GANIL and ALTO. A report was submitted outlining a strategy towards a common future for these two facilities
- More generally, IJCLab members are strongly involved in many “Groupement de recherche” (national networks) : QCD, Terascale, Intensity Frontier, Neutrino, Gravitational waves, Deep Underground Physics.

There are many collaborations with CEA in all the important national projects (TGIR, IR..) In Year 2021 we would like to mention in particular the obtention of the PACIFICS funding will increase the joint activities concerning accelerator physics (magnets and cavities), and there have been discussions to submit a new application (Programmes et Equipment Prioritaire de Recherche Exploratoire) to stimulate this dynamic even further.

The laboratory received the visit of a delegation from CNES in September 2021, in connection with the CNES projects involving IJCLab (SVOM, LiteBIRD, micrometeorites, MeV Gamma-ray astronomy). IJCLab teams are regularly involved in CNES activities and discussions.

6.3 International partners

Many international partnerships are going on between IJCLab and foreign institutions, among which

- CERN: in addition to the analyses and upgrades for ATLAS and LHCb upgrades, and the studies for ILC, we can mention the development of the PERLE project, featured in the update of the strategy for particle physics
- Fermilab: IJCLab teams (PHE and PI) have started contributing significantly to DUNE with the vertical one-phase detector. In Year 2021 started also PIP-II (Proton Improvement Plan-II) aiming at providing an intense neutrino beam to the future DUNE involving IJCLab together with Fermilab.
- JAXA: the CMB team (A2C) is working with JAXA on the LiteBIRD project
- Germany: DMLab (Dark Matter Laboratory) is a new international laboratory created by CNRS and led by IN2P3 with several German associated partners. The director of the laboratory is Dirk Zerwas (PHE)

IJCLab members are strongly involved in international collaborations and committees and take important responsibilities such as: Karim Trabelsi is Belle-II deputy spokesperson, Roman Poschl is CALICE spokesperson and Silvia Niccolai and Marie-Helene Schune are respectively LHCC and CERN Scientific Policy Committee members.

7. CPER: Operations for the renovation of infrastructures

IJCLab is located in the Orsay Campus of Université Paris-Saclay in buildings that belong mainly to the University (a few are CNRS property), dating back to 1960-70. A financial support has been obtained in 2015 in the framework of CPER (Contract Pluriannuel État Region) for the period 2015-2021 for a total amount of 20.6M€. This project was essentially oriented towards the extension/renovation of different buildings to host scientific equipment. Most of the operations have been achieved and the last ones will be finalized in 2022-beginning 2023. The list of the operations is given in the table below.

Operation	Budgeted used [M€]	Budget still available [M€]	End date
IGLEX (D1-D2)	3.6		May-21
Renovation of Building 104	1.9	2.4	Apr-23
Virtual DATA (Bat 206)	2.2		Aug-20
Workshop "Vacuum & Surface" (D3-D4)	1.2		Apr-22
Mechanical Workshops (Bdg 100, 200)	2.4		Apr-22
Extension SCALP-JANNuS Platform (Bdg108)	1.5		Apr-22
Construction of the PSI Platform (Bdg 200)	0.4		Jul-19
Renovation Bdg 100, 102, 103, 200, 208	1.6		Dec-21
Laser area in bdg 200	1.4		Feb-21
Renovation "Theory" bdg 100		0.5	Sep-23
Renovation Construction Hall bdg 106	0.5		Mar-20
TOTAL	16.7	2.9	

Implementation of the budget for the operation of CPER 2015-2022. We mention here that a 1.0M€ of this program was used for renovating a building for IAS laboratory

In 2021 we have obtained an additional financial support of 9.1 M€ in the framework of the next CPER 2022-2027. This project is currently under review to determine the specific operations to be implemented but it will be mainly oriented to the renovation/restructuring of different IJCLab buildings to improve the environment and quality of work inside the buildings (better office spaces, improved meeting rooms, renovated common areas...) as well the outside environment (new paths, signs, building entrances...).

8. Training activities

60 Lecturers and professors as well as a significant number of CNRS researchers are involved in teaching activities at Université Paris-Saclay at all levels. We have in particular important responsibilities in the following Master programs

- M2 NPAC (Nuclei Particles Astroparticles and Cosmology) (around 35 students/year)
- M2 Grands Instruments/PLATO (around 15 students/year)
- M1 Nuclear Energy (around 20 students/year)
- M2 Nuclear Energy (around 50 students/year with 5 different majors)
- M1 General Physics (around 40 students/year)

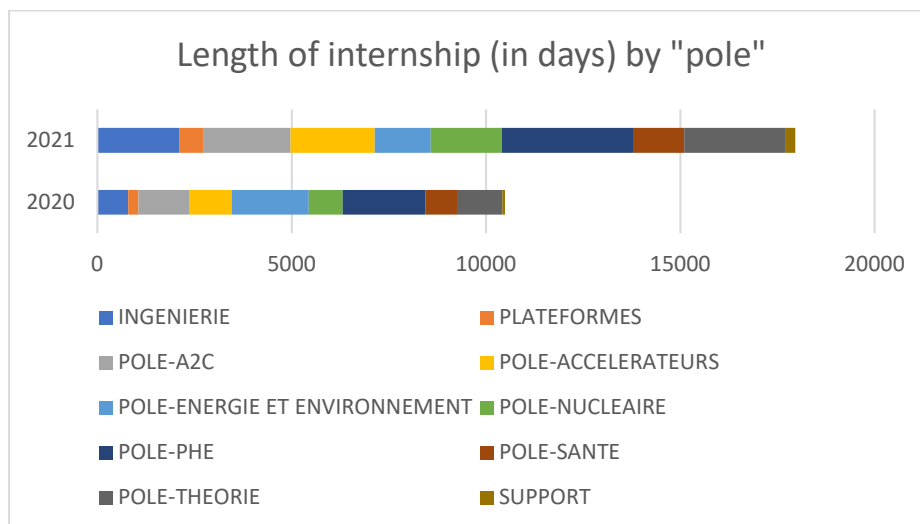
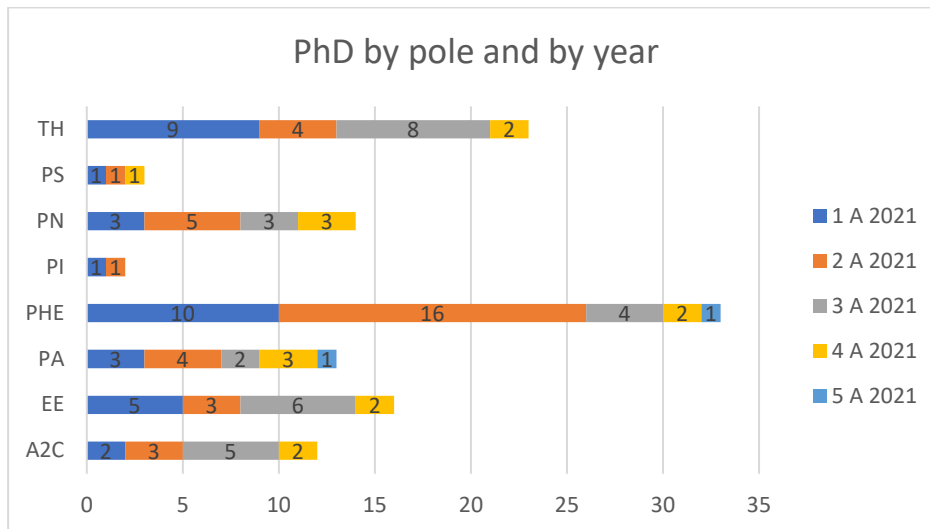
IJCLab members continue to manage also one of the main Doctoral Schools in Physics of Université Paris-Saclay, ED PHENIICS, with a total of 200 PhD students registered. This Doctoral School is one of the 4 Doctoral Schools of the Graduate School Physics of Université Paris-Saclay (more than 500 PhD students registered).

There is also a significant involvement of the Health Physics pole in teaching activities at Université Paris-Cité, with the management of L1/L2 Physics, L2 MedPhy, and Master 2 Biological Systems and Physical Concepts, as well the responsibility for several teaching units in bachelor and master programs linked with physics and biology.

Several international training activities are also led by IJCLab researchers:

- international schools: Trans-European School in HEP (mostly East European countries), Winter School in HEP (Palestine), International QCD school.
- international student exchange networks: Erasmus+ MIC Colombia, Erasmus+ MIC Georgia, Erasmus+ MIC Ukraine,
- Erasmus Mundus Lascala (large-scale instruments) and Quarmen (quantum research)

IJCLab has currently 138 staff members with “Habilitation à Diriger les Recherches” (HDR), with 6 defended in 2020 and 5 in 2021. In 2021, 29 PhD theses were defended at IJCLab (vs 25 in 2020) and 39 new theses started (vs 29 in 2020), indicating a substantial increase in the population of PhD students. At the end of 2021, 116 PhD students were present at IJCLab.

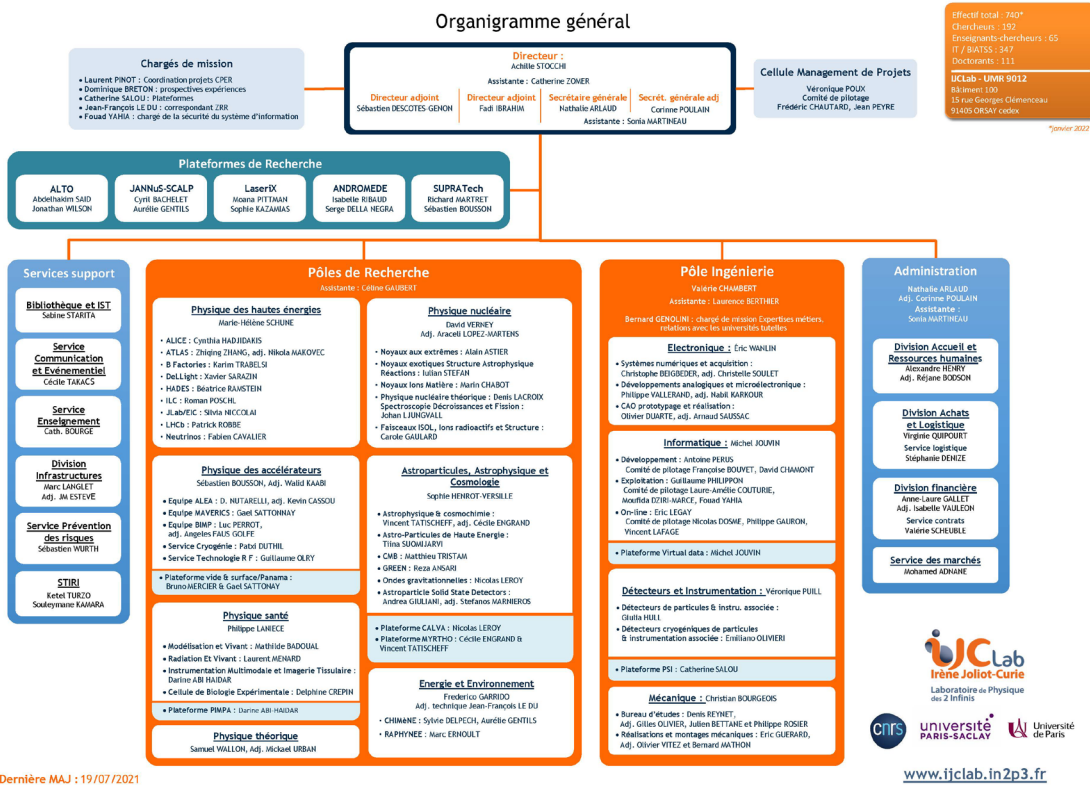


Number of PhD students and days of internships according to their main Pole of activity: TH Theory, PS : Health Physics, PN : Nuclear Physics, PI : Engineering, PHE : High-Energy Physics, PA : Accelerators, EE : Energy and Environment, A2C : Astroparticles, astrophysics and cosmology.

IJCLab has also a strong involvement in internships as a gateway to research for students. 232 internships were performed in 2021 with a sharing of 23% M2, 40% M1, 20% L3 and 17% L2 and younger students. This number has significantly increased with respect to the 124 internships of 2020, mainly due to the increase of the M1 students which could not do their stage abroad. There were also 7 apprenticeships in 2020 and 6 in 2021.

In Year 2021, funding has been obtained from EDF by members of the Energy and Environment pole in order to design and build a pedagogical platform centered around the Energy themes.

Appendix 1 – IJCLab organisational chart



Plateformes de Recherche

ALTO
Abdohakim SAID
Jonathan WILSON

JANNUS-SCALP
Cyril BACHELET
Aurélien GENTILIS

LaserIX
Moros PITTMAN
Sophie KAZANIAS

ANDROMEDE
Isabelle RIBAUD
Serge DELLA NEGRA

SUPRAtech
Richard MARFRET
Sébastien BOUSSON

Services support

- Bibliothèque et IST**
Sabine STARITA
- Service Communication et Événementiel**
Cécile TABACS
- Service Enseignement**
Cath. BOURGE
- Division Infrastructures**
Auric LANGLET
Adj. JM ESTEVE
- Service Prévention des Risques**
Sébastien WURTH
- STIRI**
Ketel TURZO
Soudymane RAHARA

Pôles de Recherche
Assistante : Céline GAUBERT

Physique des hautes énergies
Marie-Hélène SCHUNE

- ALICE : Cynthia HADJIDAKIS
- ATLAS : Zhiqing ZHANG, adj. Nikola NAKOVICEK
- B Factories : Karim TRABELSI
- DELSIGN : Xavier SABONIN
- HADES : Beatrice KAUSTEN
- ILC : Roman POSKIL
- LArBDC : Simon MICKELAJI
- LHCb : Patrick ROBBE
- Neutrinos : Fabien CAVALIER

Physique nucléaire
David VERNEY
Adj. Araceli LOPEZ-MARTENS

- Noyaux aux extrêmes : Alain ASTIER
- Noyaux exotiques Structure Astrophysique Réactions : Julian STEFAN
- Noyaux Ions Matière : Marin CHABOT
- Physique nucléaire théorique : Denis LACROIX
- Spectroscopie, Résonance et Fission : Johan L JUNGWALL
- Faisceaux ION, Ions radioactifs et Structure : Carole GAULARD

Pôle Ingénierie
Valérie CHAMBERT
Assistante : Laurence BERTHER

Bernard GENCLINI, chargé de mission Exporteurs métiers, relations avec les universités locales.

Électronique : Eric WIANLIN

- Systèmes numériques et acquisition : Christophe BEIGODER, adj. Christelle SOULET
- Développements analogiques et microélectronique : Philippe VALLEBAND, adj. Habi KARROUR
- CAO prototypage et réalisation : Olivier DUARTE, adj. Arnaud SAUSSAC

Informatique : Michel JOUIN

- Développement : Antoine PERUS
- Comité de pilotage Françoise BOUVET, David CHAMONT
- Exploitation : Guillaume PHILIPPON
- Contrôle de pilotage Laure-Aurélien COULFURE, Aurélien DIZI, MARCE, Fouad YAHIA
- On-line : Eric LEGAY
- Comité de pilotage Nicolas DOSME, Philippe GAURON, Vincent LAFAGE

Détecteurs et instrumentation : Veronique FULL

- Détecteurs de particules & Instru. associée : Guillaume
- Détecteurs cryogéniques de particules & instrumentation associée : Emiliano OLIVERI

• Plateforme PSI : Catherine SALOU

Mécanique : Christian BOURGEOIS

- Bureaux d'études : Denis REYNET, adj. Gilles OLIVIER, Julien BETTANE et Philippe ROSIER
- Réalisations et montages mécaniques : Eric GUERARD, adj. Olivier VITEZ et Bernard MATRON

Administration
Nathalie ARLAUD
Adj. Corinne POULAIN
Assistante : Senia MARTINEAU

Division Accueil et Ressources Humaines
Alexandre HENRY
Adj. Réjane BODSON

Division Achats et Logistique
Virginie QUIPOURT
Service logistique
Stéphane BONCE

Division financière
Anne-Laure GAILLET
Adj. Isabelle VAUDON
Service contrats
Valérie SCHEUBLE

Service des marchés
Mohamed ANANE

Physique des accélérateurs
Sébastien BOUSSON, Adj. Walid KAABI

- Equipe ALBA : D. NUTARELLI, adj. Kevin CASSOU
- Equipe MAVERICS : Gaël SATTONNAY
- Equipe BIMP : Luc PERROT, adj. Angélique FAUS OCFE
- Service Cryogénie : Patric DUTHIL
- Service Technologie R.F. : Guillaume OURY

Physique santé
Philippe LANCEE

- Modélisation et Vivant : Mathilde BADOUAL
- Radiation Et Vivant : Laurent MENARD
- Instrumentation Multimodale et Imagerie Tissulaire : Dorian AB HADJAN
- Cellule de Biologie Expérimentale : Delphine CREPIN

• Plateforme PIMPA : Dorian AB HADJAN

Physique théorique
Samuel WALLON, Adj. Michael URBAN

Astroparticules, Astrophysique et Cosmologie
Séphie HENROT-VERSILLE

- Astrophysique & cosmochimie : Vincent TATSCHEFF, adj. Cécile ENGBRAND
- Astro-Particules de Haute Énergie : Titus SUOMIJARVI
- CMB : Mathilde TRISTAN
- GREEN : Faza ANSARI
- Ondes gravitationnelles : Nicolas LEROY
- Astroparticule Solid State Detectors : Andrea GIULIANI, adj. Stefano MARREROS

Énergie et Environnement
Frédéric GARRIDO
Adj. technique Jean-François LE DU

- CHIMANE : Sylvie DELPECH, Aurélie GENTILIS
- RAPHYNEE : Marc ERHOULT

Services des marchés
Mohamed ANANE

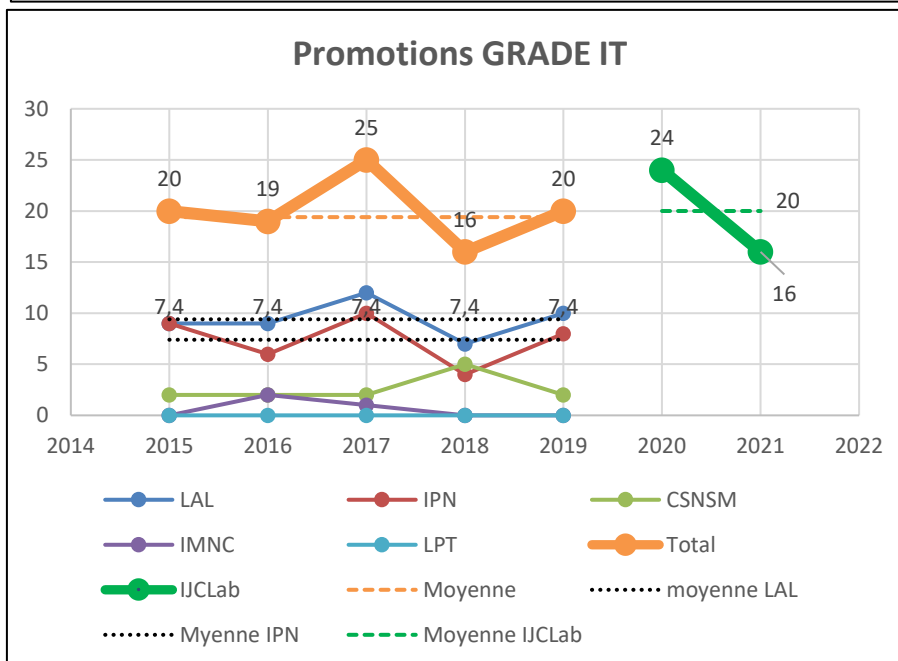
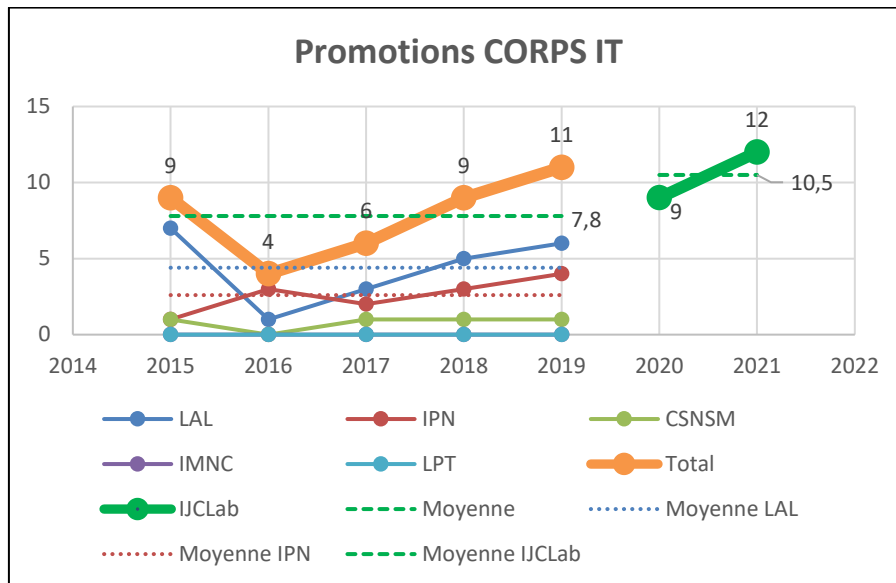
www.ijclab.in2p3.fr

Appendix 2 – IJCLab Institutional Bodies

- CL (Conseil du Laboratoire): Consisting of 25 participants, it gathers staff representatives and is a place of discussion and exchange concerning the life of the laboratory.
- CPL (Commission Paritaire du Laboratoire): It takes part in the discussion in the promotion of the technical staff of the laboratory.
- CSS (Conseil Scientifique et Stratégique): It supports the direction in elaborating the scientific strategy of the laboratory. It consists of a CS (Conseil Scientifique) in charge of the examination of projects/activities of the laboratory and which meets in average three times a year and an IAC, which meets once a year to provide advice on more strategic matters
- CLHSCTE (Commission Locale d'Hygiène, de Sécurité, des Conditions de Travail et d'Environnement): The local commission for health and safety, work conditions and environment supports the direction in improving health and safety in the laboratory and in promoting safety training.
- CAT (Comité Accompagnement Thèses): Consisting of IJCLab staff members, it aims at checking the quality of the work relationships between PhD students and supervisors.

- ASTech: Gathering all laboratory managers (around 70 people), it aims at facilitating the flow of information between scientific teams, technical services and management

Appendix 3– Careers at IJCLab. Promotion of the Technical Staff



Appendix 4– Conseils Scientifiques

Several project and activities have been examined by the Conseil Scientifique. Here the list

- Conseil Scientifique 19 November 2020
 - Participation to EIC (Electron Ion Collider) experiment
 - The activities in laser/plasma project PALLAS
- Conseil Scientifique 12 Mars 2021
 - Participation to DUNE
GRIT and Direct Nuclear Reactions
- Conseil Scientifique 13-14 October 2021
 - The activities on BAO-Radio
 - The project PARIS
 - The participation to MYRRHA
- Conseil Scientifique 15-16 December 2021
 - The activities on Material under Irradiation for Energy
 - The activities on Material for Accelerators
 - R&D Bolometers and the CUPID project.