



## P2IO LabEx Administrative Council

November 5th, 2013

### Summary of objectives and actions

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## Introduction: Outlines of P2IO Project

### **1. LabEx outlines**

P2IO includes 9 laboratories and 3 teams, located in the geographical area of Paris-Saclay University, focusing on the study of the universe at infinitely small and large scales (nuclei, particules, galaxies and cosmology) and on the question of the origins of stars and life. The involved laboratories have a staff of about 1,800 persons, making up to ~ 30 - 90% (depending on the research field) of the national effort.

The P2IO labex aims at developing key scientific and technological areas or themes within its laboratories. We summarize these areas below:

- 4 scientific areas (P1 to P4)
  - P1 : symmetries in the subatomic world,
  - P2: dark components of the Universe and violent phenomena,
  - P3: strongly coupled nuclear matter,
  - P4: formation of stars, planets and conditions of life emergence.
- 3 technological areas (R1 to R3)
  - R1: innovations in accelerator science and their applications,
  - R2: new generation sensors and their applications,
  - R3: data mining and simulation.
- 2 transverse axes
  - Energy: nuclear energy for the future.
  - Health: new imaging methods and therapies.

We note that after discussion within the Labex and with the scientific council, it has been recognized that high-energy and gamma-ray astronomy is a lively and important research field within the P2IO laboratories, involving several teams and instrumental and as well as theoretical developments. The P2 theme was accordingly extended to include this research.

The distribution of staff according to laboratories and teams, on the one hand, and, on the other hand, the priorities defined previously, is summarized in the tables below (C=researcher, engineer, teacher-researcher; T=technician, D=PhD, P=post-doc).



## 2. LabEx objectives

The P2IO project has three missions: explore, transform, structure.

- The mission « **Explore** » includes actions financed by the LabEx (in particular R&D, post-docs and PhDs), described later in this document. These actions are carried out and implemented by teams of different P2IO laboratories. The LabEx particularly encourages the emergence of innovative projects and also projects at the interface between several research fields.
- The mission “**Transform**” aims at strengthening synergies between the laboratories of the LabEx. The emergence and development of new mutualized innovative platforms -described later- particularly illustrates this mission.
- The mission “**Structure**” has the ambition to make the LabEx a single contact point to strengthen all scientific collaborations with and within P2IO, but also to stimulate new interdisciplinary actions defined in an inter-LabEx framework. In addition, the answers to various national or international calls for projects will benefit from a stronger impact if they are coordinated at P2IO’s level.

During the initial definition of the project, the LabEx identified a number of success criteria summarized below:

P2IO success criteria after 5 and 10 years are listed in the table below.

Success criteria	2015	2020
<b>1. Academic Excellence</b>		
Number of international scientists attracted to France by P2IO	2	8
Number of national and international contracts awarded to P2IO	5	10
<b>2. "Explore" Activity</b>		
Number of publications after P2IO sponsorship	25	60
Number of colloquia organised by P2IO	5	10
Number of technological breakthroughs	3	8
<b>3. "Transforme" Activity</b>		
Number of shared platforms	4	8
Number of P2IO common bids	3	8
<b>4. "Structure" Activity</b>		
Number of partnership with other LABEX	3	5
Number of interdisciplinary partnerships	2	5
Number of industrial partnerships	2	5

### 3. Steering and appraisal of the LabEx

The Labex is steered by a Steering Committee (COPIL) including all directors (or representatives) of P2IO laboratories and teams, as well as the LabEx coordination team (coordinator and deputy coordinator). The present members of the COPIL are given in the table below. The COPIL formally meets once a month in order to define and select the LabEx various calls, actions and funding, but also to discuss scientific orientations. Decisions are taken by consensus.

Establishments	Partner Units	Full members
Ecole Polytechnique/CNRS	UMR 7644; CPhT (team)	Bernard Pire
Univ. Paris-Sud/ CNRS	UMR 8609; CSNSM	Jean-Antoine Scarpaci
Univ Paris-Sud/CNRS	UMR 8617; IAS	Don Hassler
Univ Paris-Sud/ CNRS	UMR 8165; IMNC	Yves Charon
CEA/ CNRS	URA 2306; IPhT (team)	Stéphane Lavignac
Univ Paris-Sud/CNRS	UMR 8608; IPNO	Faiçal Azaiez
CEA	IRFU	Philippe Chomaz Anne Decourchelle
CNRS	UPS 3364; IRSD	Nicolas Pauwels
Univ Paris Sud/CNRS	UMR 8607; LAL	Achille Stocchi
Ecole Polytechnique/CNRS	UMR 7638; LLR	Jean-Claude Brient
Univ Paris Sud/CNRS	UMR 8627; LPT	Sébastien Descotes-Genon
CEA	SERMA (team)	Jean-Christophe Trama

*P2IO laboratories and teams, and representatives within COPIL*

The LabEx administrative support (publication of calls, project monitoring, reports and minutes of meetings) is provided by C. Desailly-Guyard, executive secretary, put at the disposal of the LabEx by Irfu, 50% of her time.

P2IO communication actions, involving all our labs, are coordinated by C. Cougrand, put at the disposal of the LabEx by IAS, 50% of her time.

Training activities are coordinated by L. Verstraete.

The LabEx activity is evaluated each year by the ANR, an international scientific council and by the LabEx administrative council. The ANR return, formally given during a meeting in September 2013 with her representative, is very positive. The most recent report of the scientific council appears at the end of this document.

## Post-doc and PhD project calls

### 1. Post-doc calls

Once a year, the LabEx calls for the definition of post-doc positions, open to the whole scientific community of P2IO. Three calls have thus been issued since the beginning of the LabEx, with an average number of funding offered from 6 to 8. Since 2013 and with the same funding, P2IO decided to issue each year a call to define PhD subjects. As a result the number of post-doc positions funded per year is from now on limited to 6. The funding allocated for a post-doc is 100 k€, distributed over 2 years.

The pressure is strong and still grows, e.g., in 2013, 47 applications were received for only 6 fundings.

#### a. Project selection

The projects are selected in two stages:

- Review by a committee (Post-Doc Selection Committee, or CSPD) of all applications received. This committee consists of 24 members, half elected by our community, half appointed. Among the appointed members, we can find a number of reporters external to P2IO.
- Selection criteria:
  - Research excellence and quality of the proposing team(s)
  - Adequacy with P2IO research themes
  - Synergy with P2IO laboratories (essential if several teams exist on the proposed theme within P2IO, not discriminating if necessary)
  - Adequacy with the call objectives (added value of a post-doc over the funded period)
  - Impact for the LabEx visibility in France and abroad
- CSPD presents a list of projects likely to be retained by COPIL which then performs the final selection. During the next six months, project leaders look for candidates, select the best and have it endorsed by the COPIL. We do our best for the post-doctoral offers to be spread as widely as possible.
- Successful applicants should not have been employed in a P2IO laboratory during the previous two years (as a PhD or a post-doc), and should have defended their thesis at most 6 years before being recruited as a P2IO post-doc. Finally, COPIL encourages supervisors to select candidates for a first or second post-doc.

b. Review of selected projects from 2011 till 2013

Projects selected by the LabEx are summarized below. Initially issued separately because of different agenda cycles, calls for experimental and theoretical projects are now treated jointly. 19 post-docs funded by P2IO (including 2 of one year) are presently in our laboratories. 65% of them come from foreign laboratories, showing the attractivity of our laboratories.

Supervisor	Laboratory	Subject
<b>2011</b>		
ARNAUD	IRFU	Analysis of the cosmological clusters in the Planck catalogue
DELIOT	IRFU	Search for top quark
GROSDIDIER	LAL	QCD network computing
MUNOZ	IPN	DVCS and extraction of GPD
POULET	IAS	Mars climatic evolution and search of habitability conditions
VAN TENT	LPT	Modied gravity and cosmological perturbations
<b>2012 (Post-Docs Théorie)</b>		
MOREAU	LPT	Higgs Bosons beyond the standard model
PETROPOULOS	CPHT	Black hole : microscopical and holographical aspects
WALLON	LPT	Theory and phenomenology of hard and exclusive QCD reactions
<b>2012 (Post-Docs Expérimentateur)</b>		
ARMENGAUD	IRFU	Search for WIMPs with EDELWEISS-III detectors
DELLA-NEGRA	IPNO	Meteorites, exobiology and the Andromeda project
LJUNGVALL	CSNSM	Electromagnetic moments in exotic nuclei
MARTINET	IPNO	Superconducting materials : an alternative to massive niobium in cavities
POESCHL	LAL	Pattern recognition and machine learning for imaging calorimeters
<b>2013 (Post-Docs)</b>		
BERNARD	LLR	HARPO
CANNES	IPNO	Electro-deposition of actinides in ionic liquids
CAPRINI	IPhT	Gravitational waves as a new probe of the dark side of the Universe
COUDERC	IRFU	CMS : spin-parity of the new boson
D'HOSE	IRFU	COMPASS : measuring the transverse radius of the proton
OLLIVIER	IAS	Instrumentation for characterizing planetary atmospheres
GIULIANI	CSNSM	Optimization of optical bolometers for dark matter and double beta decay experiments



Following two years of LabEx operation, the distribution of post-docs according to themes and laboratories can be established: this is shown below (the name indicated is the one of the main project supervisor, in partnership with a secondary supervisor working in another P2IO laboratory, not shown in this table).

	CSNSM	IAS	IPNO	IRFU	LAL	LLR	LPT	CPhT	IPhT
P1				Deliot Couderc	Grosdidier Poeschl		Moreau	Petro- poulos	
P2	Giulani			Armengaud Arnaud		Bernard	VanTent		Caprini
P3	Ljungvall		Munoz	D'hose			Wallon		
P4		Poulet Ollivier	Della Negra						
R1			Martinet						
Ener- gy			Cannes						

### *c. Selected projects follow-up*

An annual report, reviewed by CSPD, is requested from our post-docs, as well as a poster presentation of their work at the LabEx Scientific Council. The report summarizes the progress of the project but must also state how this project has strengthened or created an inter-laboratories or inter-communities collaboration within P2IO.

The first post-docs appointed by P2IO will come to the end of their contract in early 2014 and we will follow their next professional track.

## **2. Doctoral calls for tenders**

In 2013, the LabEx has wished to extend its call for post-doctoral projects to PhD projects, thus meeting the need expressed by our whole community. P2IO has offered half-fundings which were all complemented to a full PhD funding: this illustrates the leverage effect of our PhD call to multiply the number of students in our laboratories. We emphasize that the examination of selected PhD's is carried out in close collaboration with the relevant Doctoral Schools.

(a) Subjects selection

As for post-docs, PhD projects are selected in two stages:

- Pre-selection by CSPD, on the same criteria, except the criterion of collaboration between two separate teams, not required for a PhD. At this stage, the projects retained must already have been validated by the Doctoral School to which the PhD supervisor is affiliated.
- Selection by COPIL.

PhD supervisors have then 6 months to submit to their Doctoral Schools the successful candidate, who should then be accepted by the Doctoral School and by COPIL.

(b) Selected subjects

The 2013 call initially provided the funding for 3 half-PhD's grants. The recent modification of the landscape of Doctoral Schools in the Paris region having induced increased pressure on PhD fundings, COPIL decided to double in 2013 the number of fundings allocated by the LabEx. This effort, that will remain exceptional, allowed the recruitment of excellent students coming from Ile-de-France region Masters.

All the selected projects are summarized below. Being the first call of this type in P2IO, a thorough assessment of the topics and laboratories representation is premature.

Porteur	Laboratoire	Sujet	complément
<b>2013 (Docs)</b>			
<b>DESCOTES-GENON</b>	LPT	Search for right weak currents in the quark sector	1/2 INP
<b>RIMBAULT</b>	LAL	Fast luminosity monitoring using diamond sensors for super luminous B meson factories	1/2 ED 517
<b>URBAN</b>	IPNO	Collective modes in the internal crust of a neutron star	1/2 IN2P3
<b>LANGER</b>	IAS	Magnetic fields at very large cosmologic scales	alloc. Pleine
<b>GRANA</b>	IPhT	String theory	1/2ED 107

## R&D Calls

Once every two years, the LabEx publishes a call for projects dedicated to Research and Development (R&D) upstream or downstream, with a total budget of 500 k€. Two calls were issued since the launch of the LabEx, allowing the funding of 18 projects in progress, jointly completed by at least two teams from P2IO different laboratories. Pressure on these calls is of the order of 35% (9 selected files for 25 files received).

### 1. Projects selection

The projects are selected in two stages:

- Review by a committee (R&D Selection Committee, or CSRD) of all applications received. This committee consists of 24 members, half elected by our community, half appointed. Among the appointed members, we can find a number of reporters external to P2IO. This committee is representative of all instrumental themes of the LabEx.
- Selection criteria:
  - Excellence of the project (innovation, technological interest, team quality, clear specifications, detailed budget, expected opportunities).
  - Adequacy with P2IO priority themes of research.
  - Synergy with P2IO laboratories (essential if several teams exist on the proposed theme within P2IO, not discriminating if necessary).
  - Project impact on the LabEx visibility.
- CSRD presents a list of projects likely to be retained by COPIL which eventually selects among these.

### 2. Selected projects

Selected projects in 2011 and in 2013 are summarized in the table below.

The person name indicated is that of the main project supervisor; however, most of these projects (17 out of 18) involve at least two P2IO laboratories. The preliminary assessment of the distribution of these projects according to the research field, as well as the laboratory, is also presented.

### 3. Selected projects follow-up

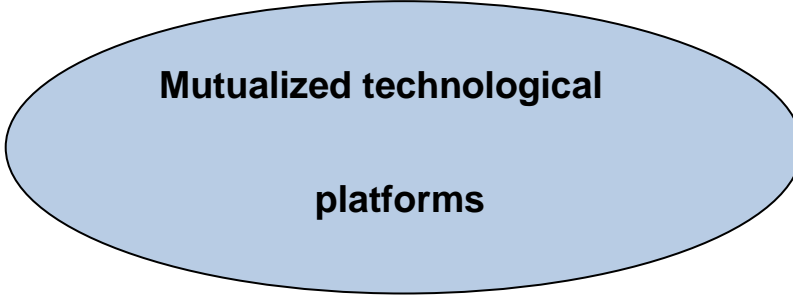
An annual report, reviewed by CSRD, is requested from project supervisors, as well as a poster presentation of their work to the LabEx Scientific Council. The report summarizes the progress of the project but also describes how this project has strengthened or created an inter-laboratories or inter-communities collaboration within P2IO.

R&D projects funded by P2IO

AO 2011				
Porteur	Laboratoire	Sujet	Budget attribué (k€)	
Bambade	LAL	Développement et implémentation de capteurs semi-conducteurs pour mesurer le halo du faisceau d'ATF2 et détecter les électrons de recul Compton après le point d'interaction	55	
Bernard	LLR	Astronomie de haute précision angulaire et polarimétrie, au-dessus du seuil de création de paires, MeV - TeV	81	
Chamont	LLR	GridCL	61	
Delagnes	IRFU	SAMPIC	70	
Lunney	CSNSM	A novel anti-proton-decelerator concept	96	
Mamieros	CSNSM	Capteurs cryogéniques de nouvelle génération pour l'observation en Astrophysique et Cosmologie.	70	
Martinet	IPNO	Superconducting Thin Film multilayered for SRF accelerating cavity	80	
Tatischeff	CSNSM	Développement d'un petit prototype de télescope Compton à rayons gamma	40	
Yvon	IRFU	Détecteur à ionisation pour le projet CALIPSO	40	
AO 2013				
Porteur	Laboratoire	Sujet	Budget attribué (k€)	
Blumenfeld	IPNO	Identification de particules légères basse énergie par analyse de forme pour multi-détecteurs strippés Si à très haute granularité (Spiral 2 Phase 2). Electronique + traitement du signal.	67	
Brunetto	IAS	Irradiation de glaces et météorites analysées par réflectance VIS-IR	74.5	
Delerue	LAL	Diagnostics and compact beam transport for multistages laser plasma accelerator	50	
Gunsing	IRFU	Micromégas 2D avec grille segmentés pour imagerie neutron (NTOF)	43	
Leroy	LAL	Cavités avec miroirs déformables compatibles au vide pour laser de forte puissance	58	
Ménard	IMNC	Nouvelles sondes miniaturisées pour la détection de particules chargées en imagerie moléculaire basées sur des SIPMS	65	
Nones	IRFU	Electronique cryo à HEMT ultra bas bruit pour bolomètres (Edelweiss)	76	
Schwenling	IRFU	Nouvelle électronique digitale pour générer les primitives de trigger L1 d'ATLAS	56	
Zabi	LLR	Sélection en ligne et couplage du Boson de Higgs aux leptons (CMS).	42.5	

R&D projects funded by P2IO: thematic and laboratory distribution (allocated amount)

	CSNSM	IAS	IMNC	IPNO	IRFU	LAL	LLR
R1	Lunney (96)			Martinet (80)		Delerue (50)	
R2	Marnieros (70)  Tatischeff (40)	Brunetto (74.5)		Blumenfeld (67)	Schwemling (56)  Nones (76)  Delagnes (70)  Gunsing (43)	Leroy (58)  Bambade (55)	Bernard (81)  Zabi (42.5)
R3							Chamont (61)
Health			Ménard (65)		Yvon (40)		



**Mutualized technological  
platforms**

Once every two years, alternating with the R&D call, the LabEx emits a call for the creation of new technological platforms mutualized between P2IO laboratories. This call is endowed with 500 k€ and is sent to the 5 instrumental working groups of LabEx: **AccelTech** (accelerators), **CaptInnov** (innovative detectors), **RadioMatter** (radiochemistry), **SpaceTech** (instruments and systems for space missions), **Virtual Data** (data processing and simulations). The task of these groups, composed of experts from our laboratories, is to define new, attractive and federative projects in their respective fields which are then submitted to the COPIL after CSRD consultative opinion.

Thus, in 2012, P2IO funded two projects: CaptInnov (realization and characterization of integrated detection systems with semiconductors) and Virtual Data (data processing). P2IO funds CaptInnov up to 55% (200 k€), the remainder of the project being supported by the Ile-de-France Region (SESAME): this is again an illustration of the leverage strategy followed by the LabEx. Virtual Data was provided with 300 k€, to which were added funding from the laboratories involved.

A progress report of these two platforms, 9 months after the provision of P2IO fundings, is summarized in this document.

## CaptInnov platform Progress status, October 2013

Coordinator: R. CORNAT (LLR)

### Platform proposal

CaptInnov group proposes the creation, within P2IO, of a technological platform for the realization and characterization of integrated detection systems with large and highly segmented semiconductors. This proposal is part of EQUIPEX PH2ELICE file among which two main equipments have been considered as priority:

- a pin system dedicated for testing semi-conductors detectors, micro-circuits and also printed circuit boards (PCB),
- a semi-automated bonding machine (2<sup>nd</sup> priority in this proposal) to integrate detectors and/or chips on PCBs.

This equipment is selected to meet the very specific needs of R&D and prototyping phases for which it is essential to have facilities for local implementation:

- Wide field operation (0.3 m wafers) allowing in particular the testing and development Of detectors or hybrid systems (multi-detecteurs + ASICs) on PCB scale
- EMC shield and possibility to perform very low noise measurements (fA)
- Optical test bench
- Diversified test probes and bonding heads
- Possibility to heat or cool the plate (thermal group)
- Semi-automated functions (for short series and repeated structure test).

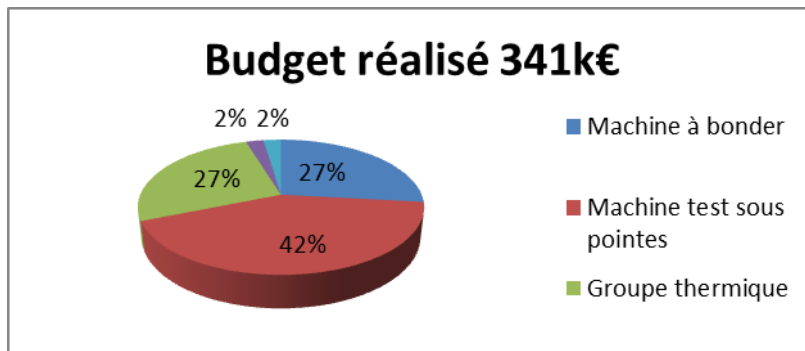
The platform aims at being evolutionary and opened to the entire community of P2IO, partners and external structures.

### Implementation status

#### Materials purchase

A first phase of requirements definition ended with the writing of the call for tenders issued in May 2013. This phase, punctuated with numerous meetings, allowed building links between the teams of the different laboratories and established a vector of exchange around our respective projects.

Materials were selected following the opening of folds end of June 2013 and orders issued end of July 2013 (management by LLR - Ecole Polytechnique / CNRS-IN2P3). The entire allocated budgets were incurred to date i.e. 341 000€. They come from two sources: P2IO on the one hand and the Ile-de-France Region on the other hand (SESAME project supported by the LLR - Ecole Polytechnique / CNRS-IN2P3). The budget includes training actions in the use of the machines and two years of preventive maintenance.



Tests de réception de la machine à bonder. CEA – 09/10/13

### Installation and commissioning

Bonder machine was delivered and installed beginning of October 2013 in clean room at CEA Saclay – l'Orme des Merisiers. Some tests on a sample of integrated circuit were successful.

The delivery of the machine of « tests sous pointes » and its thermal group are expected mid-December 2013. The works of implementation of the clean room at LAL-Université Paris-Sud/CNRS-IN2P3 are ongoing.

### Operation

An important effort is to be pursued to finalize the agreement of operation and use of the platform. If a document for internal use exists, this one must be diverted into an official agreement validated by the Administrative Council. This step is under consideration at CNRS-DR5 (Meudon).

The platform will be managed by a management committee under the authority of P2IO steering committee. Expert staff: 1 CDD under recruitment at LAL (0.5 FTE) and two people at CEA (25% FTE), trained in the use of machines, will accompany the users and will implement maintenance actions.

Access requests will be arbitrated by the management committee, access fees could be charged to externals (CYSTREL company has already expressed interest).

### Evaluation and perspectives

P2IO-CAPTINNOV group federated around this equipment project of high technicality corresponding to needs shared by many projects well distributed over all involved laboratories. These shared interests were used for a first phase of implementation of an ambitious technical platform for the integration and testing of our detectors or microcircuits just like the already existing in big research centers (CERN-Geneva, INFN, FERMILAB ...).

Within the framework of our administrative supervisors' scientific politics, numerous projects involving realizations requiring advanced techniques and technologies are ongoing or emerging. Examples include R&D for high luminosity LHC, calorimetry for a future linear collider, new technologies for particle acceleration, medical valuation, large micro-structured gas detectors, silicon detectors for nuclear physics, microcircuits integrating numerous ways of measurement...If both machines acquired this year meet the most priority needs, CAPTINNOV platform, promoted by P2IO Scientific Council, aims at gaining new ways of test and diagnosis.



## Virtual Data platform Progress Status - October 2013

**Coordinator : M. Jouvin (LAL)**

P2IO's VirtualData action, corresponding to one of the technological axes of the LabEx, aims at building a common IT platform for eight P2IO laboratories around needs in simulation, processing and storage of large amounts of data. Since 2010, this action is animated by a working group of about fifteen people including participation of the eight P2IO laboratories.

On the basis of an inventory of the existing made at the creation of the LabEX, P2IO laboratories IT includes, in particular:

- 130 people, whose job is IT, with approximately 60% involved in applications development and 40% in resources implementation. Development covers varied expertise: database, parallelism, visualization, numerical, software, online (data acquisition and control systems). Operation represents a large range of skills, from laboratories IT to distributed computing infrastructures (grids and clouds), including networks and storage.
- A large part of GRIF resources (~80%), the biggest French site of EGI/WLCG grid after CCIN2P3 and one of the biggest Tier2 in Europe. Today, GRIF represents approximately 8000 calculation cores and 4 disk PB, i.e. 6000 cores and 3 disk PB housed in P2IO.
- A cloud prototype for scientific needs, based on StratusLab distribution issued from a FP7 European project (2010-2012), operated by LAL. It represents a still modest resource of about 500 cores and tens of disks TB but this cloud is increasingly successful and LAL is working on the fusion with the grid resource.
- IDOC (International Data and Operation Centre): a distribution data processing center for the astrophysics community, operated by IAS. IDOC represents approximately 1000 cores and 1.2 disks PB.
- A parallel machine for Astrophysics of mesocentre type, COAST, operated and mainly used by CEA and presently in extension (1200 cores).
- Several local calculation clusters representing a thousand of cores.

From this observation, since P2IO's creation, VirtualData decided to focus on the three following objectives:

- *Develop the synergy between all IT skills* available in our laboratories. 130 people represent a significant potential for our communities. At the same time, the distribution of these skills in eight laboratories does not always allow having the necessary visibility to assume responsibilities in the IT experiments. Through these people, P2IO was present for several years in R&D actions on calculation infrastructures and new processor architectures as well as on software challenges induced by these new infrastructures.

- *Optimize resources hosting cost* present in P2IO. Indeed, current resources are hosted in small rooms, distributed in various laboratories, energetically inefficient and sometimes inappropriate in the density (thermal waste, weight) of current materials. The proposed optimization consists in gradually combining, on two complementary sites, with possibilities of redundancy, most of P2IO's computing resources. Both chosen sites were the University Paris-Sud (Vallée Room) and the Ecole Polytechnique (Plateau Room), due to the presence of existing buildings usable to build a new infrastructure directed to energy efficiency.
- *Maximize the use of the various resources* through the development of common platforms. With the quantity of resources displayed in P2IO, another way of optimizing the operating cost of resources is to maximize their use by allowing a dynamic sharing of the resources between the various needs to be satisfied. These last years, the maturation of virtualization technologies, and more particularly of the cloud technology, allows the construction of a common platform adapted to P2IO various needs. This common platform will also allow revitalizing the synergy between the various IT skills, in particular for resources operation.

Year 2013 marks a major milestone in the realization of Virtual Data objectives, in particular for the optimization of hosting costs:

- Vallée Room: in 2012, the decision was taken to initiate the development of a new machine room with high energy efficiency (PUE  $\leq$  1.3). The technical solution adopted consisted in reorganizing an existing technical building. The first phase, the commissioning of which starts in mid-October 2013 and which will gradually replace the existing machine rooms of six laboratories of the valley, consists of 100 m<sup>2</sup> which can accommodate 30 racks for a total of 400 kW IT. This first phase may be later extended to host 84 racks, consuming up to 1.5 MW IT per section of 300 kW IT. The first phase was completed in due time from the beginning and respected the budget planned during the APD (€ 1 million).
- Plateau Room: the idea is to participate in the financing of Ecole Polytechnique IT room renovation and, in return, get the possibility of using 70 m<sup>2</sup> in this room for P2IO's needs. This capability will be used for hosting resources operated by LLR and provide redundancy for critical services hosted in the Vallée room (and vice versa).

These two rooms, including the ones rather at Irfu « state of art » (presently dedicated for hosting Irfu resources), will allow P2IO facing its needs in the coming years. The solution chosen for Plateau Room will allow expecting the emergence of a more perennial and extensible solution within the framework of Paris-Saclay University, in collaboration with other partners.

For these two realizations, the LabEx played an important catalyst role, particularly through a 300 k€ funding obtained in 2012 within the framework of the «platforms R&D» call for tenders (210 k€ for the Vallée Room and 90 k€ for the Plateau Room). Particularly, for the Vallée Room, this budget was important to initiate an operation jointly funded by six of P2IO's laboratories. Laboratories funding represents 80% of the operation amount.

Work on both room machine projects allowed structuring the working group animating P2IO's Virtual Data action. Since 2012, the group met every 15 days to define and follow the progress of both projects, particularly the Valley Room project, entirely led by P2IO's teams. This working group also initiated the work on synergies between P2IO's different IT skills. In particular, two general meetings with P2IO's IT specialists were organized in 2012 and 2013, with around 50 people. Discussions are ongoing to better structure the collaboration on some of the topics such as online or developments in physics.

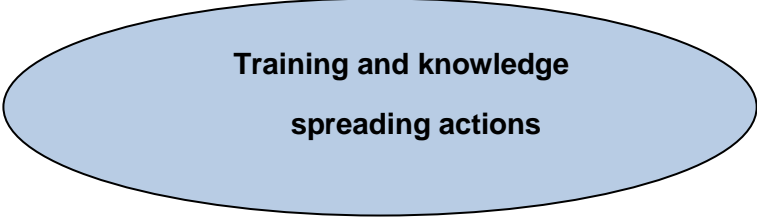
The next deadline for resources implementation deals with the construction of a common platform. The common work achieved for two years and the availability of both mutualized rooms should facilitate the development of this platform. To this end, the governance of P2IO Virtual Data is under definition in order to provide a framework allowing the involvement of all the people motivated in this project.

P2IO VirtualData is a project carried out by IT specialists coming from our eight laboratories. As such, it is particularly sensitive to the needs and challenges of an IT close to physicists and other users. In this sense, it is a very complementary initiative of national centers. We think that this anchoring in laboratories is crucial. This is the reason why the chosen model is a networking of the existing skills which are and will remain in laboratories, in contact with users, and not eventually become an autonomous service unit.

The conviction of the complementarity with national resources led us looking for and developing contacts with our immediate environment at Paris-Sud University, Ecole Polytechnique and in the framework of Paris-Saclay University to register our action in coherence with other initiatives present in this scope and consider a larger collaboration with partners who would be interested in our infrastructure and our dynamics. These contacts were developed in 2013, especially in the two following contexts:

- Paris-Sud University: a working group on scientific IT was created within the framework of the preparation of the next quinquennial, including all the University components. One of the challenges is to evaluate how to take advantage of Virtual Data's dynamics in order to initiate a mutualization dynamics at the level of the University and define the role of each one in such a dynamic (P2IO not willing to replace Paris-Sud University's DI).
- Paris-Saclay University: a working group on the initiatives of "data center" type was created in April 2013. Two meetings were already organized and confirmed that needs rather close to P2IO exist at several partners', although it is often a smaller scale. In coherence with its strategy for intensive calculation, CNRS appears as a major partner to initiate a mutualization dynamics for scientific IT hosting at the scale of Paris-Saclay University with IDRIS on the one hand for the needs regarding the HPC calculation, and P2IO Virtual Data on the other hand, for the needs related to storage and processing of important amounts of data.

Another advantage of P2IO Virtual Data in its scientific environment is the links established for ten years between some P2IO laboratories and the IT research community structured around DIGITEO. It has already led to much fruitful collaboration that could be strengthened within the framework of Data Science Institute, currently proposed within the framework of 2014 Research AAP of IDEX.



**Training and knowledge  
spreading actions**

Since its launch, P2IO LabEx regularly carried out training and outreach actions. The purpose of these actions is (i) to make a wide audience aware about the scientific questions and results of P2IO, (ii) to encourage students to get involved in P2IO research and technological developments and (iii) to have new trainings emerge closer to P2IO skills and jobs. The average annual budget dedicated to these actions is 120 kEuros (does not include the funding for PhDs).

- **Training actions:** mainly directed towards students with physics or engineering training at master level.

Every year, late July, we organize a school entitled "Meeting of the two infinities" gathering approximately 30 students who will start their master. A selection of current research themes is presented to students by researchers of P2IO laboratories and other institutions as well (Paris-Centre, Switzerland, Belgium). Students also visit P2IO research platforms and take part in debates on topical issues (e.g. energy, Higgs boson, cosmic radiation ...). Students and participants feedback is very positive and following three sessions of this school, we have noticed that it had triggered several vocations for P2IO research.

The website address of 2013 session is the following:  
<https://indico.in2p3.fr/conferenceDisplay.py?confId=7293> .

For students in master 2 tracks related to P2IO, we fund the implementation of practical work next to research platforms in order to train students to the skills and practices in current research and its technological developments (e.g. irradiation and material characterization, training and behavior of load beams, detection of cosmic rays ...). Still for master 2 students, we fund educational trips to international research facilities (CERN, observatories). These trips allow the students to discover these facilities and to place them in the context of data collection and their analysis within the framework of small projects.

Moreover, every year, the LabEx provides scholarships for master 2 students (2 this year).

- **Outreach actions:** designed for the general public, schools and bachelors, these actions allow talking on a playful and interactive mode about research and technology questions arising in P2IO.

Every year, we organize a « *Night of the 2 infinities* » in order to show the latest P2IO scientific results as well as the jobs and techniques implemented in our research (e.g. accelerators, cryogenics).

In November 2013, we organized for the « *ZOOM* » exhibition to settle in Orsay, allowing schools and general public to browse the questions related to the 2 infinities through a numerical and interactive stroll.

Public supervision was largely provided by P2IO PhD students, representing for them a rich experience of scientific diffusion and popularization, also valuable for their future career.

## Other actions

### **1) 2012 inter-LabEx call for projects: « Physics in its interfaces »**

In 2012, with the support of IdEx Paris-Saclay, the Triangle of Physics and 6 LabEx from «Plateau de Saclay», launched an inter-LabEx call for projects « Physics in its interfaces ». This call aimed at offering a new funding opportunity for interdisciplinary projects concerning physics and gathering teams from different LabEx around common interests, thus promoting the development of interfaces and the construction of interdisciplinary bridges. Submitted projects had to involve at least two different LabEx from Plateau de Saclay, including a physics one.

The total amount allocated for this call for tenders was 900 k€, brought by the LabEx (50 k€ each), the Triangle (300 k€), and FCS (300 k€).

This call was rather successful, with 52 applications received, including 16 involving a P2IO laboratory as main or secondary holder.

Ten applications were selected, 4 of them implying P2IO:

- NdS-NbSi: New superconducting devices with NbSi  
(P2IO-CSNSM/PALM)  
Funding for a post-doc at CSNSM from the end of 2013 for a duration of two years (1 year on this Call for Tenders).
- PulseSynth: Coherent combination and synthesis of femtoseconds impulses  
(P2IO- LAL/PALM)  
R&D funding.
- QEAGE: Quantum Effects in Analogue Gravity Experiments  
(P2IO-LPT/PALM/NanoSaclay)  
Funding of a post-doc at LPT for 2 years, and R&D for the realization of the experiment carried out in two laboratories (LCF & LPN).
- VKStars: Fundamental Dynamo mechanisms: from VKS experiment to stellar magnetism (P2IO-IRFU/LASIPS/PALM)  
Funding of an 18 month post-doc who will be working in several laboratories of Paris-Saclay.

### **2) Platforms update**

The LabEx publishes an annual call dedicated to P2IO platforms update mutualized between laboratories. A pre-selection is done among the applicants by the LabEx technological working groups, prior to final selection by the COPIL. An annual amount of 90 k€ is devoted to this action. In the future, part of this sum will be dedicated to update of platforms funded by P2IO, such as Virtual Data and CaptInnov.

### **3) Welcome of visitors, conferences**

The LabEx provides grants for conferences organized by members of P2IO laboratories as well as for welcome of visitors coming from foreign laboratories. These visitors promise to give seminars during their stay, which can benefit to our whole community.

The annual amount dedicated to these actions is from 15 to 20 k€.

## BUDGET

The LabEx annual budget (1.58 M€ till the end of the probationary phase) focuses on the following budget lines:

- 1) Post-doc & PhDs calls: 700 k€
- 2) R&D or platforms calls: 500 k€
- 3) Training: 130 k€
- 4) Platforms update: 90 k€ (funding of platforms update mutualized between P2IO laboratories)
- 5) Enhancement: 50 k€ → uncommitted until now, postponed on the 2 calls
- 6) Steering: 20 k€ (visit of Scientific Council)
- 7) Attractivity: 30 k€

Detail of AE and CP, presented in the two following pages, shows that the LabEx is compatible with the expected long-term provisional budget; some uncommitted budget lines, such as enhancement, were, up to now, spread on the lines corresponding to the recruitment of post-docs and PhDs, or to the R&D call for tenders.



# P2IO long-term budget (AE)

Typologie	Axe scientifique	Type de charge	Budget 2012 A	Arrêté 2012 B	Budget 2013 C	Consommation 2013 D	Budget prévisionnel 2014 E	Budget prévisionnel 2015 F	Budget prévisionnel 2016 G	TOTAL phase probatoire A+C+E+F+G
RECHERCHE	Appel d'offre post doc	Frais de personnel	1 250	1 251	800	800	800	700	45	3 595
RECHERCHE	Appel d'offre post doc	Equipement	-	-	-	-	-	-	-	-
RECHERCHE	Appel d'offre post doc	Autres dépenses	-	-	-	-	-	-	-	-
RECHERCHE	Appel d'offre post doc	Prestations de service	-	-	-	-	-	-	-	-
RECHERCHE	Appel d'offre post doc	Missions	-	-	-	-	-	-	-	-
RECHERCHE	Total Appel d'offre post doc	Refacturations internes	1 250	1 251	800	800	800	700	45	3 595
RECHERCHE	Appel d'offre R&D	Frais de personnel	90	-	290	590	200	200	-	90
RECHERCHE	Appel d'offre R&D	Equipement	433	971	150	590	150	150	-	1 123
RECHERCHE	Appel d'offre R&D	Autres dépenses	330	52	150	590	150	150	-	780
RECHERCHE	Appel d'offre R&D	Prestations de service	-	-	150	-	-	-	-	-
RECHERCHE	Appel d'offre R&D	Missions	330	18	150	-	150	150	-	780
RECHERCHE	Appel d'offre R&D	Refacturations internes	-	-	-	-	-	-	-	-
RECHERCHE	Total Appel d'offre R&D	Refacturations internes	1 183	1 041	590	590	500	500	-	2 773
RECHERCHE	INTERLABEX	Frais de personnel	-	-	-	50	-	-	-	-
RECHERCHE	INTERLABEX	Equipement	-	-	-	-	-	-	-	-
RECHERCHE	INTERLABEX	Autres dépenses	-	-	-	-	-	-	-	-
RECHERCHE	INTERLABEX	Prestations de service	-	-	-	-	-	-	-	-
RECHERCHE	INTERLABEX	Missions	-	-	-	-	-	-	-	-
RECHERCHE	INTERLABEX	Refacturations internes	-	-	-	-	-	-	-	-
RECHERCHE	Total INTERLABEX	Refacturations internes	-	-	50	50	-	-	-	50
Total RECHERCHE			2 433	2 292	1 990	1 440	1 300	1 200	45	6 368
FORMATION	Formation	Frais de personnel	16	-	20	20	16	16	-	68
FORMATION	Formation	Equipement	126	-	85	85	54	54	-	319
FORMATION	Formation	Autres dépenses	74	62	10	-	25	25	-	134
FORMATION	Formation	Prestations de service	-	-	10	-	-	-	-	-
FORMATION	Formation	Missions	68	34	10	9	34	34	-	146
FORMATION	Formation	Refacturations internes	-	-	-	-	-	-	-	-
FORMATION	Total Formation	Refacturations internes	284	96	125	114	129	129	-	667
VALORISATION	Valorisation	Frais de personnel	284	96	125	114	129	129	-	667
VALORISATION	Valorisation	Equipement	50	-	-	-	50	50	-	150
VALORISATION	Valorisation	Autres dépenses	-	-	-	-	-	-	-	-
VALORISATION	Valorisation	Prestations de service	-	-	-	-	-	-	-	-
VALORISATION	Valorisation	Missions	-	-	-	-	-	-	-	-
VALORISATION	Valorisation	Refacturations internes	-	-	-	-	-	-	-	-
VALORISATION	Total Valorisation	Refacturations internes	50	-	-	-	50	50	-	150
Total VALORISATION			50	-	-	-	50	50	-	150
GOUVERNANCE	Gouvernance	Frais de personnel	-	-	-	-	-	-	-	-
GOUVERNANCE	Gouvernance	Equipement	-	1	5	2	5	5	-	20
GOUVERNANCE	Gouvernance	Autres dépenses	5	12	5	5	5	5	-	20
GOUVERNANCE	Gouvernance	Prestations de service	-	-	20	20	15	15	-	65
GOUVERNANCE	Gouvernance	Missions	15	1	20	20	15	15	-	65
GOUVERNANCE	Gouvernance	Refacturations internes	-	-	-	-	-	-	-	-
GOUVERNANCE	Total Gouvernance	Refacturations internes	20	14	25	27	20	20	-	85
Total GOUVERNANCE			20	14	25	27	20	20	-	85
ATTRACTIVITE-INNOVATION	Attractivité - Innovation	Frais de personnel	20	86	25	27	20	20	-	85
ATTRACTIVITE-INNOVATION	Attractivité - Innovation	Equipement	-	49	15	12	18	18	-	137
ATTRACTIVITE-INNOVATION	Attractivité - Innovation	Autres dépenses	-	-	25	8	12	12	-	73
ATTRACTIVITE-INNOVATION	Attractivité - Innovation	Prestations de service	24	48	25	24	12	12	-	73
ATTRACTIVITE-INNOVATION	Attractivité - Innovation	Missions	-	6	-	-	-	-	-	-
ATTRACTIVITE-INNOVATION	Attractivité - Innovation	Refacturations internes	-	-	-	-	-	-	-	-
ATTRACTIVITE-INNOVATION	Total Attractivité - Innovation	Refacturations internes	110	103	40	44	30	30	-	210
Total ATTRACTIVITE-INNOVATION			110	103	40	44	30	30	-	210
SUPPORT ET PLATEFORME	Support et Plateforme	Frais de personnel	-	-	-	-	-	-	-	-
SUPPORT ET PLATEFORME	Support et Plateforme	Equipement	-	104	90	15	90	90	-	450
SUPPORT ET PLATEFORME	Support et Plateforme	Autres dépenses	180	90	90	-	-	-	-	450
SUPPORT ET PLATEFORME	Support et Plateforme	Prestations de service	-	-	-	-	-	-	-	-
SUPPORT ET PLATEFORME	Support et Plateforme	Missions	-	-	-	-	-	-	-	-
SUPPORT ET PLATEFORME	Support et Plateforme	Refacturations internes	-	-	-	-	-	-	-	-
SUPPORT ET PLATEFORME	Total Support et Plateforme	Refacturations internes	180	194	90	15	90	90	-	450
Total SUPPORT ET PLATEFORME			180	194	90	15	90	90	-	450
Total général			3 077	2 700	1 720	1 689	1 619	1 519	45	7 980

## P2IO long-term budget (CP)

Typologie	Axe scientifique	Type de charge	Budget 2012 A	Arrêté 2012 B	Budget 2013 C	Consommation 2013 D	Budget prévisionnel 2014 E	Budget prévisionnel 2015 F	Budget prévisionnel 2016 G	TOTAL Phase probatoire A+C+E+F+G
RECHERCHE	Appel d'offre post doc	Frais de personnel	400	1 251	625	113	830	830	790	3 475
RECHERCHE	Appel d'offre post doc	Equipement								-
RECHERCHE	Appel d'offre post doc	Autres dépenses								-
RECHERCHE	Appel d'offre post doc	Prestations de service								-
RECHERCHE	Appel d'offre post doc	Missions								-
RECHERCHE	Appel d'offre post doc	Refractions internes								-
<b>Total Appel d'offre post doc</b>			<b>400</b>	<b>1 251</b>	<b>625</b>	<b>113</b>	<b>830</b>	<b>830</b>	<b>790</b>	<b>3 475</b>
RECHERCHE	Appel d'offre R&D	Frais de personnel			45		45			90
RECHERCHE	Appel d'offre R&D	Equipement	80	483	340	828	250	250	240	1 160
RECHERCHE	Appel d'offre R&D	Autres dépenses	59	2	260		168	150	143	780
RECHERCHE	Appel d'offre R&D	Prestations de service								-
RECHERCHE	Appel d'offre R&D	Missions	150	18	330	3	150	150		780
RECHERCHE	Appel d'offre R&D	Refractions internes								-
<b>Total Appel d'offre R&amp;D</b>			<b>289</b>	<b>503</b>	<b>975</b>	<b>831</b>	<b>613</b>	<b>550</b>	<b>383</b>	<b>2 810</b>
<b>Total RECHERCHE</b>			<b>689</b>	<b>1 754</b>	<b>1 600</b>	<b>944</b>	<b>1 443</b>	<b>1 380</b>	<b>1 173</b>	<b>6 285</b>
FORMATION	Formation	Frais de personnel	5	26	27	4	16	16		64
FORMATION	Formation	Equipement	26	26	134	75	74	54		288
FORMATION	Formation	Autres dépenses	74	56	25	17	25	25		149
FORMATION	Formation	Prestations de service								-
FORMATION	Formation	Missions	68	42	34	9	34	34		170
FORMATION	Formation	Refractions internes								-
<b>Total FORMATION</b>			<b>173</b>	<b>124</b>	<b>220</b>	<b>104</b>	<b>149</b>	<b>129</b>	<b>-</b>	<b>671</b>
<b>Total VALORISATION</b>			<b>173</b>	<b>124</b>	<b>220</b>	<b>104</b>	<b>149</b>	<b>129</b>	<b>-</b>	<b>671</b>
VALORISATION	Valorisation	Frais de personnel								-
VALORISATION	Valorisation	Equipement			50		50	50	50	200
VALORISATION	Valorisation	Autres dépenses								-
VALORISATION	Valorisation	Prestations de service								-
VALORISATION	Valorisation	Missions								-
VALORISATION	Valorisation	Refractions internes								-
<b>Total VALORISATION</b>			<b>-</b>	<b>-</b>	<b>50</b>	<b>-</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>200</b>
GOUVERNANCE	Gouvernance	Frais de personnel								-
GOUVERNANCE	Gouvernance	Equipement		1						-
GOUVERNANCE	Gouvernance	Autres dépenses	5	10	5	7	5	5		20
GOUVERNANCE	Gouvernance	Prestations de service								-
GOUVERNANCE	Gouvernance	Missions	15	0	15	11	15	15		60
GOUVERNANCE	Gouvernance	Refractions internes								-
<b>Total GOVERNANCE</b>			<b>20</b>	<b>11</b>	<b>20</b>	<b>18</b>	<b>20</b>	<b>20</b>	<b>-</b>	<b>80</b>
ATTRACTIVITE-INNOVATION	Attractivité - Innovation	Frais de personnel	20	11	20	18	20	20		80
ATTRACTIVITE-INNOVATION	Attractivité - Innovation	Equipement	86	49	18	8	18	18		140
ATTRACTIVITE-INNOVATION	Attractivité - Innovation	Autres dépenses	24	47	13	7	12	12		61
ATTRACTIVITE-INNOVATION	Attractivité - Innovation	Prestations de service								-
ATTRACTIVITE-INNOVATION	Attractivité - Innovation	Missions		6						-
ATTRACTIVITE-INNOVATION	Attractivité - Innovation	Refractions internes								-
<b>Total ATTRACTIVITE-INNOVATION</b>			<b>110</b>	<b>102</b>	<b>31</b>	<b>15</b>	<b>30</b>	<b>30</b>	<b>-</b>	<b>201</b>
<b>Total SUPPORT ET PLATEFORME</b>			<b>110</b>	<b>102</b>	<b>31</b>	<b>15</b>	<b>30</b>	<b>30</b>	<b>-</b>	<b>201</b>
SUPPORT ET PLATEFORME	Support et Plateforme	Frais de personnel								-
SUPPORT ET PLATEFORME	Support et Plateforme	Equipement		104		15				-
SUPPORT ET PLATEFORME	Support et Plateforme	Autres dépenses	90	90	90		90	90		450
SUPPORT ET PLATEFORME	Support et Plateforme	Prestations de service								-
SUPPORT ET PLATEFORME	Support et Plateforme	Missions								-
SUPPORT ET PLATEFORME	Support et Plateforme	Refractions internes								-
<b>Total SUPPORT ET PLATEFORME</b>			<b>90</b>	<b>194</b>	<b>90</b>	<b>15</b>	<b>90</b>	<b>90</b>	<b>90</b>	<b>450</b>
<b>Total général</b>			<b>1 082</b>	<b>2 185</b>	<b>1 082</b>	<b>1 096</b>	<b>1 782</b>	<b>1 699</b>	<b>1 313</b>	<b>7 887</b>