



Institut national de physique nucléaire et de physique des particules



Sonder les infinis : des particules au cosmos

ILANCE kick-off workshop

Patrice Verdier – patrice.verdier@in2p3.fr – March 7th, 2021

ILANCE at the University of Tokyo



Institut National de
Physique Nucléaire et
de Physique des Particules



In Tokyo, on

For UTokyo

Takaaki Kajita
30 March, 2021
Prof. Takaaki Kajita, Director, Institute for
Cosmic Ray Research (ICRR)

Hiroshi Ooguri
31 March, 2021
Prof. Hiroshi Ooguri, Director, Kavli Institute
for the Physics and Mathematics of the Universe
(Kavli IPMU)

Shoji Asai
31 March 2021
Prof. Shoji Asai, Director, International
Center for Elementary Particle Physics (ICEPP)

M. Masahiro Hoshino
31 March 2021
Prof. Masahiro Hoshino, Dean, School of
Science

AGREEMENT FOR THE CREATION OF AN
INTERNATIONAL RESEARCH LABORATORY
International Laboratory for Astrophysics, Neutrino and Cosmology Experiments
ILANCE

BETWEEN

The CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE, hereinafter referred to as "CNRS", a public scientific and technological institution, with headquarters at 3, rue Michel-Ange 75794 Paris Cedex 16, France, represented by its Chairman – Chief Executive Officer, Antoine Petit,

AND

THE UNIVERSITY OF TOKYO, hereinafter referred to as "UTokyo", a national university corporation, whose registered address is 7-3-1 Hongo, Bunkyo-ku, Tokyo, Japan, represented by:

- Prof. Takaaki Kajita, Director of the Institute for Cosmic Ray Research (ICRR);
- Prof. Hiroshi Ooguri, Director of the Kavli Institute for the Physics and Mathematics of the Universe (KAVLI IPMU) under the UTokyo Institute of Advanced Studies (UTIAS);
- Prof. Shoji Asai, Director of the International Center for Elementary Particle Physics (ICEPP);
- Prof. Masahiro Hoshino, Dean of School of Sciences.

In Paris, on 31/03/2021

For CNRS

Antoine Petit, Chairman – Chief Executive
Officer

The laboratory was officially created on April 1st, 2021



MINISTÈRE DE L'ÉDUCATION NATIONALE, DE L'ENSEIGNEMENT SUPÉRIEUR
ET DE LA RECHERCHE

Arrêté du 29 avril 2016 relatif à l'Institut national de physique nucléaire
et de physique des particules du Centre national de la recherche scientifique

IN2P3 MISSION : RESEARCH IN THE FIELDS OF **NUCLEAR, PARTICLE** and **ASTROPARTICLE PHYSICS**

OPERATE

Research Units,
many in partnership
with Universities
and/or Research
Organisations

COORDINATE

National Research
Programs and French
participations in major
Research Infrastructures

EXPLORE

*The physics of the two
infinities : from elementary
particles to cosmology*

DEVELOP

Associated technologies,
Applications and Interdisciplinary
research

PROVIDE

Expertise
Teaching Training



**In 2021, IN2P3 celebrates
its 50th anniversary !**

16 Avril 1971

JOURNAL OFFICIEL DE LA REPUBLIQUE FRANÇAISE

3665

Décret n° 71-279 du 14 avril 1971 portant création d'un institut national de physique nucléaire et de physique des particules.

Le Premier ministre,

Sur le rapport du ministre de l'économie et des finances, du ministre de l'éducation nationale et du ministre du développement industriel et scientifique,

Vu la loi n° 68-978 du 12 novembre 1968 d'orientation de l'enseignement supérieur ;

Vu le décret du 25 octobre 1935 instituant le contrôle financier des établissements publics autonomes de l'Etat ;

Vu le décret n° 53-1227 du 10 décembre 1953 relatif à la réglementation comptable applicable aux établissements publics nationaux à caractère administratif, ensemble le décret n° 62-1587 du 29 décembre 1962 portant règlement général de la comptabilité publique et l'article 60 de la loi n° 63-156 du 13 février 1963 ;

Vu le décret n° 59-1398 du 9 décembre 1959, modifié par le décret n° 66-187 du 31 mars 1966, portant organisation générale du centre national de la recherche scientifique, notamment ses articles 5 bis et 5 ter ;

Vu le décret n° 59-1399 du 9 décembre 1959, modifié en dernier lieu par le décret n° 66-188 du 31 mars 1966, relatif au fonctionnement du centre national de la recherche scientifique ;

Vu le décret n° 66-1070 du 30 décembre 1966 relatif à l'exécution des actions spécifiques de recherches menées par le centre national de la recherche scientifique ;

Vu le décret n° 69-612 du 14 juin 1969 relatif au budget et au régime financier des universités et autres établissements publics à caractère scientifique et culturel régis par la loi du 12 novembre 1968 d'orientation de l'enseignement supérieur ;

Vu la proposition du conseil d'administration du centre national de la recherche scientifique ;

Après avis du comité de coordination de la recherche scientifique au ministère de l'éducation nationale,

Décrète :

Art. 1^{er}. — Il est créé un institut national du centre national de la recherche scientifique dénommé Institut national de physique nucléaire et de physique des particules qui a pour objet de développer et de coordonner les recherches poursuivies dans le domaine de la physique nucléaire et de la physique des particules au sein des organismes placés sous l'autorité ou la tutelle

du ministre de l'éducation nationale, ou le cas échéant, au sein des autres organismes liés à l'institut par des accords particuliers.

More informations on : <https://50ans.in2p3.fr>



10⁻¹⁸m

10⁺²⁵m

Particles and hadronic physics

Matter's most elementary constituents and fundamental interactions

Nuclear physics and Applications

Structure of nuclear matter, nuclear energy and medical applications

Astroparticle physics and Cosmology

Universe's composition and behaviour

Accelerators & Technologies Major R&D domains

Computing and Data Data Science and Computing research

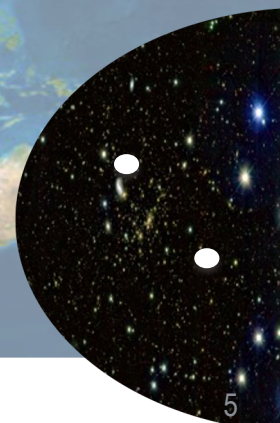
1000 CNRS and University researchers,
1500 engineers, technicians and administrative staff
700 postdocs and Ph.D students

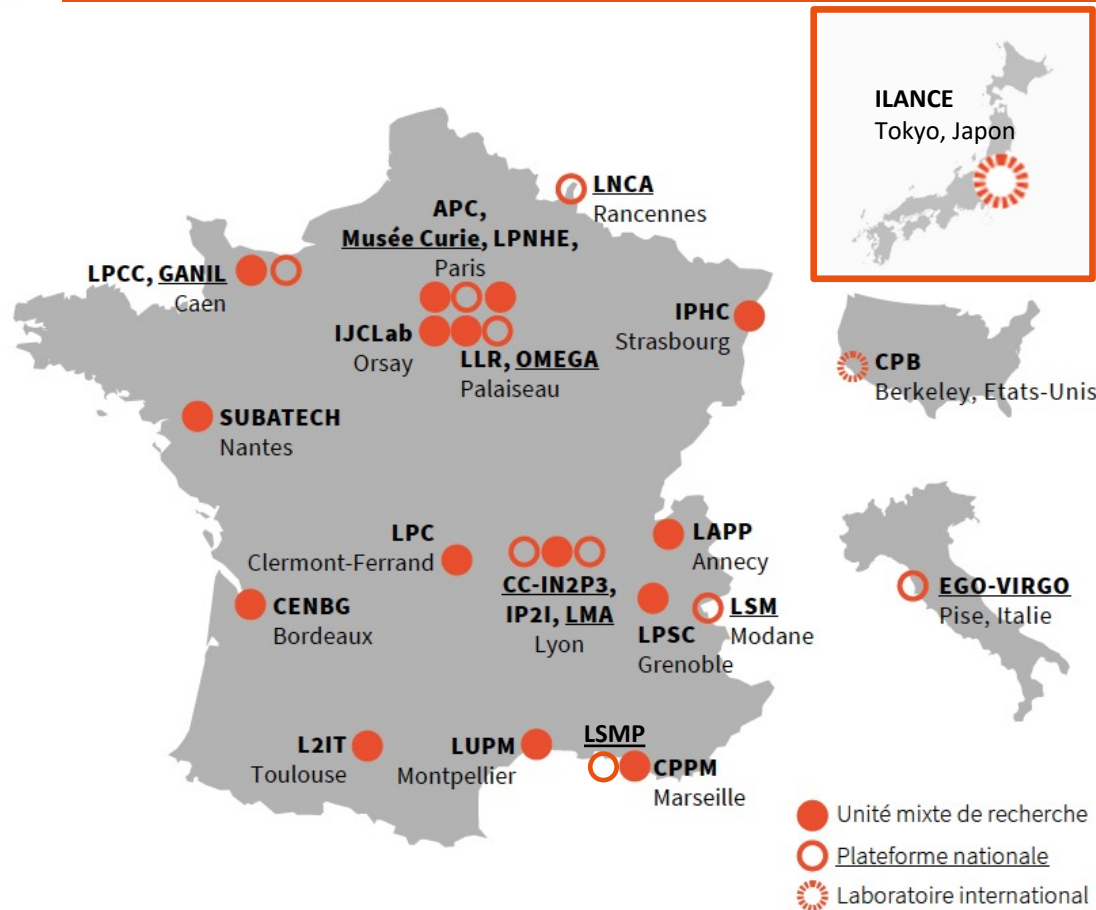
25 laboratories and technical support labs
18 joint with Universities,
2 with CEA, 1 with Italy*
8 interdisciplinary accelerator based platforms

30 major research programs (TGIR/IR)
50 International collaborative research agreements

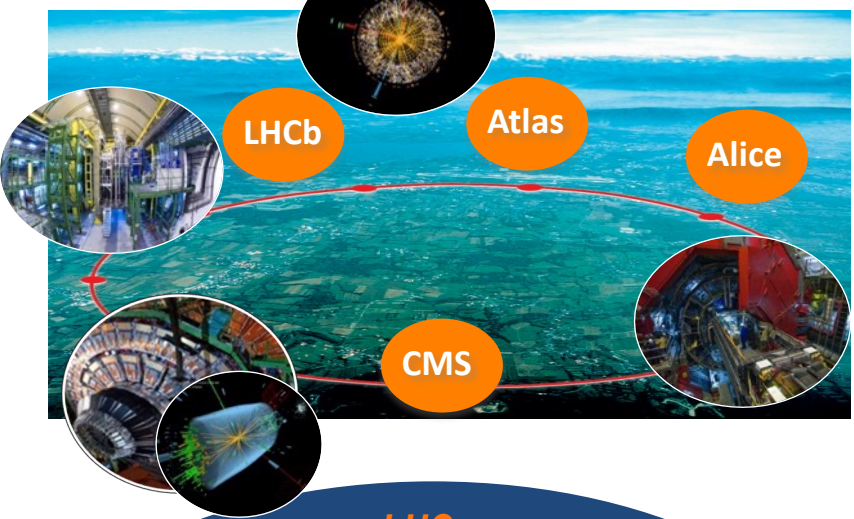
ATLAS

* EGO and CNRS participations in CERN, FAIR and CTA





+ another new international laboratory in 2021 in association with Helmholtz in Germany

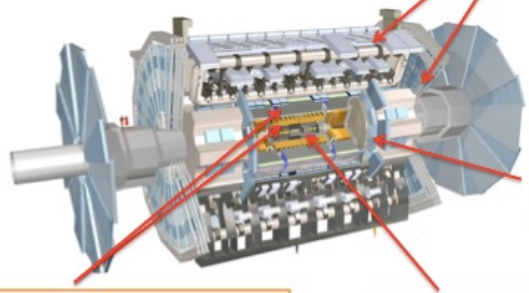


France contribution to ATLAS & CMS
upgrades for the HL-LHC were approved in 2017:
**140 M€ investment
over 10 years for IN2P3**

Example: ATLAS upgrade for the HL-LHC (2027-2036)

Déclenchement et acquisition
• ~10 kHz de données enregistrées

Chambres à Muons
• Nouvelle électronique
• Remplacements de
chambres
• Couverture étendue à
l'avant



Détecteur de temps à haute granularité
• Nouveau détecteur

Calorimètres : argon liquide et tuiles
• Nouvelle électronique de lecture

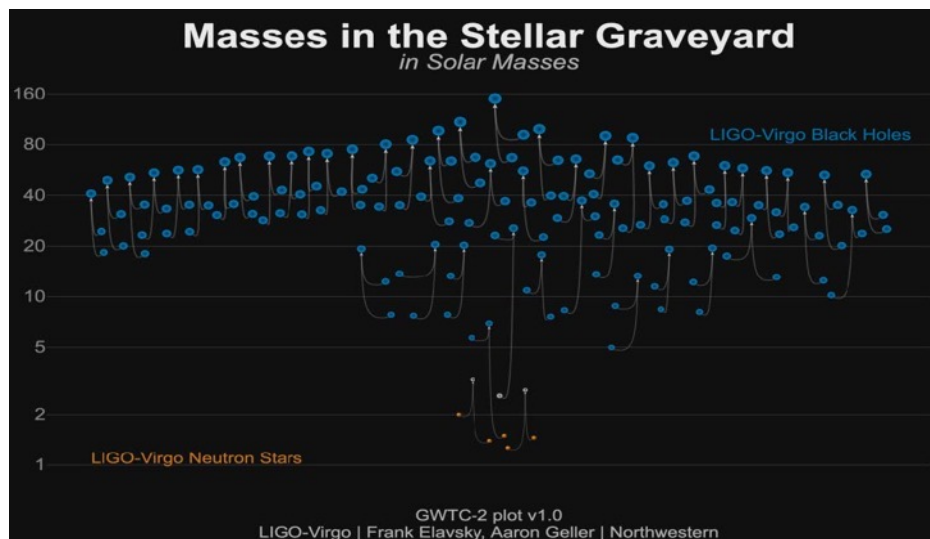
Nouveau trajectographe
• Tolérant aux radiations, granularité, léger
• Couverture étendue à l'avant

LHC :
IN2P3 PARTICIPATION
110 M€ (experiments construction)
> 500 engineers, technicians/year (over
6-8 years of construction)
106 FTE.year (accelerator)
330 researchers
85 PhD students



Physics of gravitational waves: LIGO-Virgo

- ⇒ Gravitational waves detection opened in a new era emergence of multimessenger **astroparticle** physics
- ⇒ Unique expertise at LMA in Lyon on **mirror coating** for GW interferometers





Dark energy : LSST

- IN2P3 is involved in the construction
- CC-IN2P3: computing centre will host LSST data



Filter Autochanger



Filter loader on
transport cart



5 Filter capacity carousel

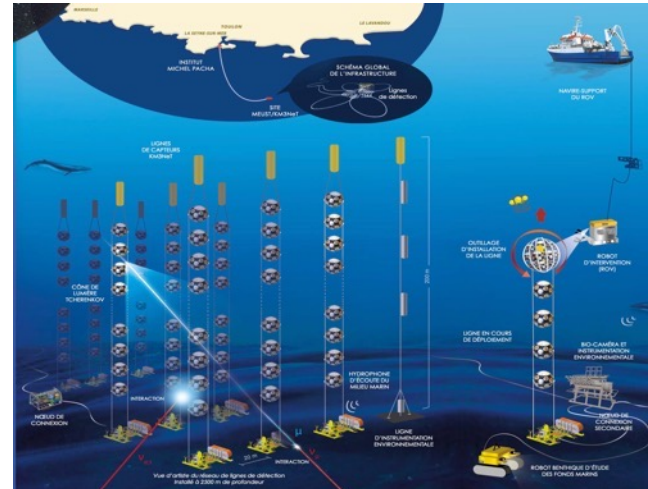
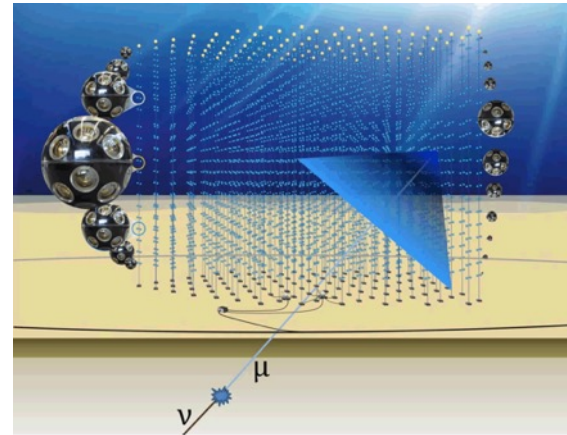


ORCA : Oscillation Research with Cosmics in the Abyss

40 km off-shore of Toulon

Dense array of detection unit to study neutrino
oscillation parameters and in particular to determine
the neutrino mass hierarchy

*First detection unit successfully deployed in March 2019
Phase 1 with 6 lines completed in February 2020*






University of Tokyo and IN2P3 have a long-term collaborations in the domains of particle and astroparticle physics

We are involved in several projects like

- T2K and SK collaborations : neutrino physics
- SCP collaboration and Dark Energy programs on SUBARU: supernova cosmology
- LiteBird : cosmological microwave background, JAXA mission supported by CNES
- VIRGO and KAGRA (gravitational waves), CTA on the LST (telescope structure and camera)
- ATLAS collaboration (particle physics) or detector and accelerator R&D for the ILC



IN2P3 visit at Univ. of Tokyo in **October 2019**
where we discussed the project with
Prof. S. Shirahase, Executive vice president in
charge of international relation

The laboratory was officially created on April 1st, 2021



東京大学
THE UNIVERSITY OF TOKYO



International Laboratory for Astrophysics, Neutrino and Cosmology Experiments

Michel Gonin (LLR), Takaaki Kajita (ICRR)

CNRS - IN2P3 Labs: APC, CPPM, LPNHE, IJCLab, IP2I, IPHC, LAPP, LLR, LPSC

University of Tokyo: ICCR, Kavli-IPMU/UTIAS, ICEPP, School of Sciences, Department of Physics, Department of Astronomy, Research Center for the Early Universe, Institute of Astronomy

Neutrino, particle and cosmic messenger: Michel Gonin and Masato Shiozawa

The primordial universe : Josquin Errard and Tomotake Matsumura

The Dark Universe : Nicolas Regnault and Naoki Yasuda

Gravitational waves physics : Matteo Barsuglia and Masaki Ando

Particle physics and detectors : Tetiana Hryn'ova and Toshinori Mori



Direction: 2 co-directors and 5 PI-coPI managing joint UTokyo-IN2P3 scientific teams
=> Michel Gonin is leaving for Tokyo in May 2021

ILANCE: Utokyo-IN2P3 joint laboratory

- CNRS structure supporting **strategic institutional partnership**, with a duration of 5 years (renewable)
- Lab operations supported by UTokyo and IN2P3:
 - ✓ UTokyo provides offices on the Kashiwa campus and funds for ILANCE-led activities, hosting visitors, organization of professional meetings, etc...
 - ✓ IN2P3 funds for operating costs, travel, expenses, organization of scientific events + salaries for **CNRS** staff who will make extended stays in Kashiwa, including residence allowances, Grant for PhD student, Eligibility of UTokyo researchers of ILANCE to IN2P3's call for postdoc funding
- Colleagues and students from UTokyo will also have the possibility to visit IN2P3 laboratories in France

Expected Staff:

- 4 to 5 CNRS researchers and engineers on site
- ~30 Japanese professors and collaborators
- ~30 French permanent physicists (+PDs and docs) visiting the lab for short periods of time
- Postdoc fellows & PhD Students



IN2P3 would like to warmly thank colleagues from University of Tokyo for welcoming us in Japan !

Many thanks also for the considerable effort made in recent months to finalize in time the scientific document and the lab agreement.

ILANCE is a great opportunity to strengthen Utokyo-IN2P3 scientific collaborations: there are many big projects in preparation and certainly several new projects will emerge in the next 5 years



Backup



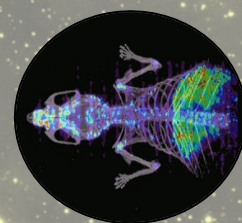
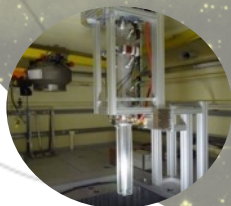
Particles and hadronic physics
Matter's most elementary constituents and fundamental interactions



Nuclear physics and Applications
Structure of nuclear matter, nuclear energy and medical applications



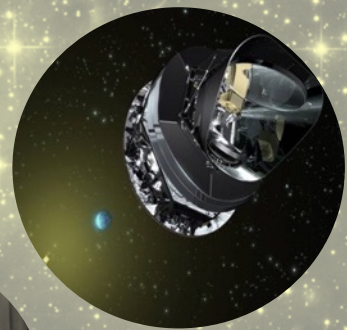
Accelerator & Technology
Major R&D domains



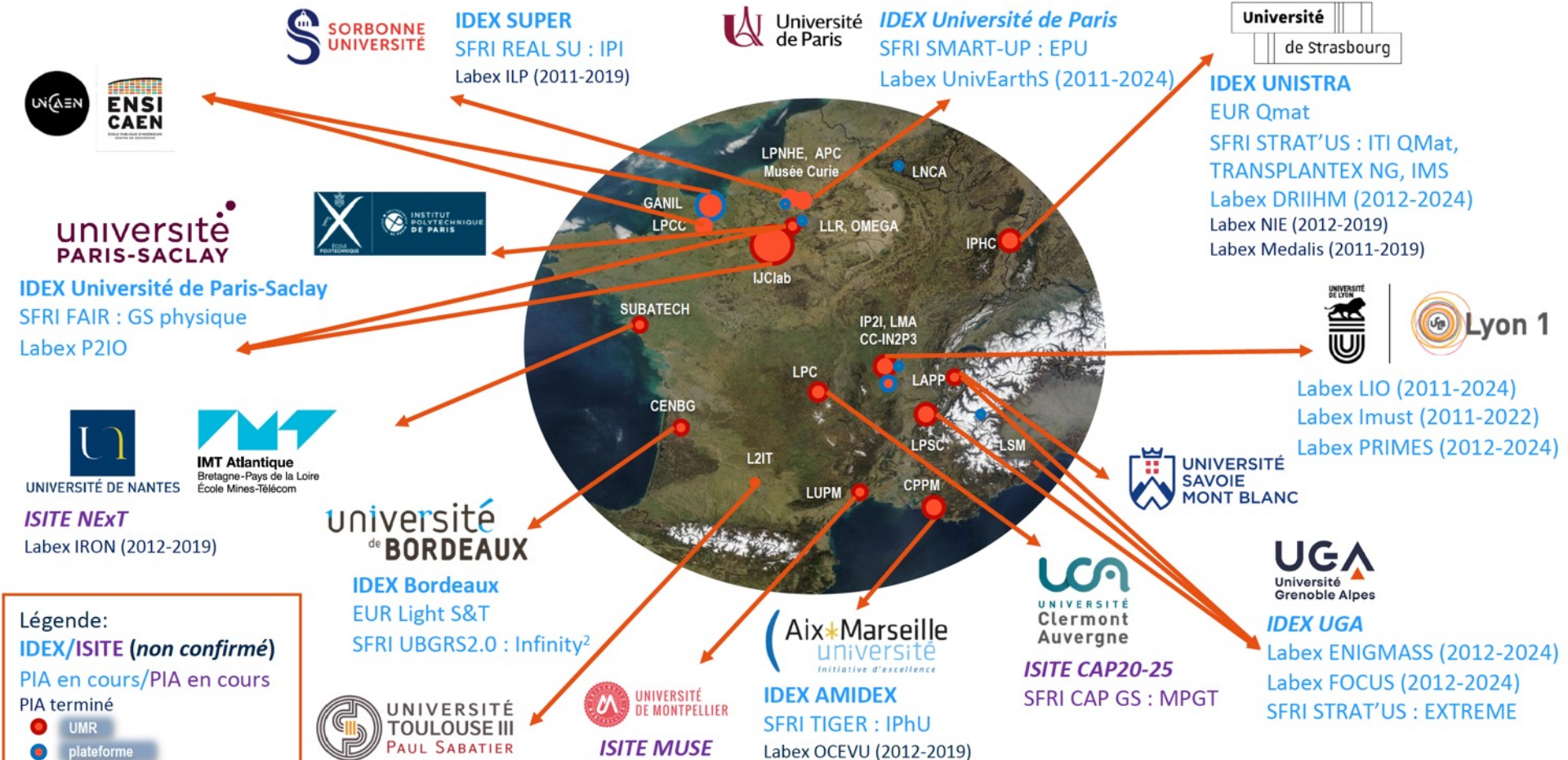
Computing and Data
Data Science and Computing research



Astroparticle physics and Cosmology
Universe's composition and behaviour



IN2P3 : A "distributed" laboratory





25 laboratories and
technical support labs
(18 joint with Universities,
2 with CEA, 1 with Italy*)
8 interdisciplinary accelerator
based platforms

30 major research
programs
50 *International
collaborative research
agreements*

1000 CNRS and University
researchers,
1500 engineers, technicians
and administrative staff
700 postdocs and
Ph.D students

70 M€ annual budget
(excluding salaries)
including **20** M€ in
very Large Research
Infrastructures

* EGO and CNRS participations
in CERN, FAIR and CTA