



HCERES evaluation of Laboratoires de la vallée d'Orsay

- CSNSM
- IMNC
- IPNO
- LAL
- LPT



Director: Cavalier Fabien

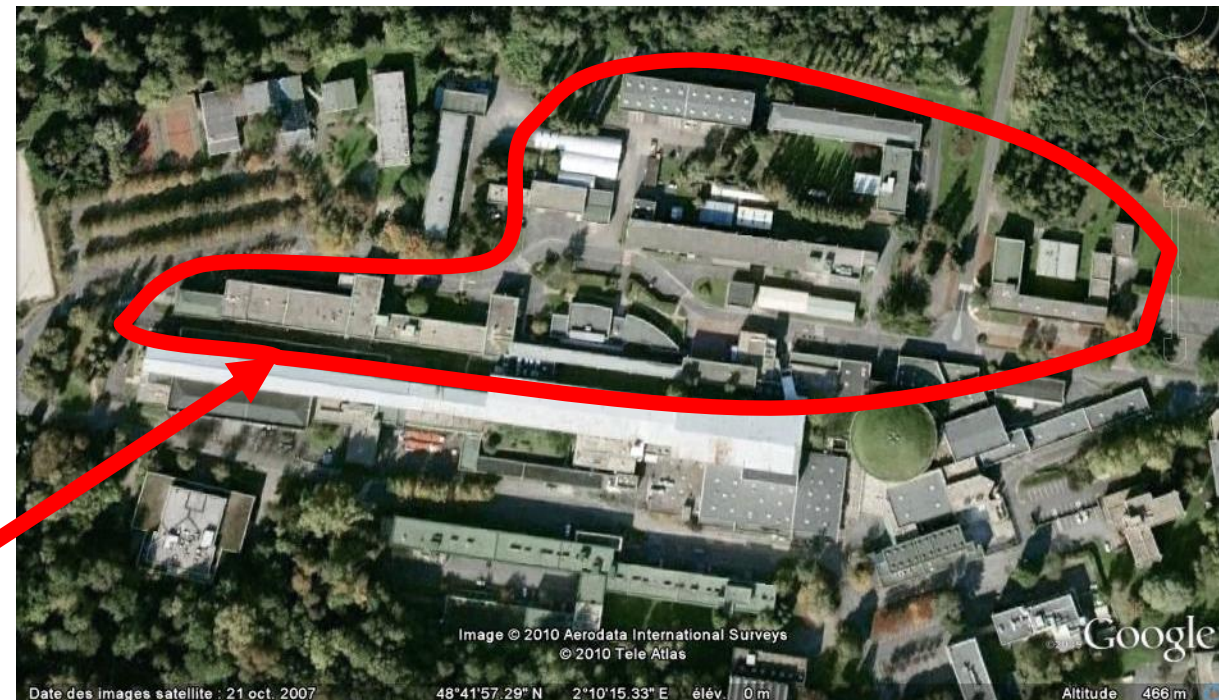
14-17 january 2019

OUTLINE

- I. Global view of the laboratory and main data
- II. Structure and scientific policy
- III. Technical infrastructures
- IV. Highlights of the last contract (2015-2019)
- V. International, national and local environments
- VI. Conclusions

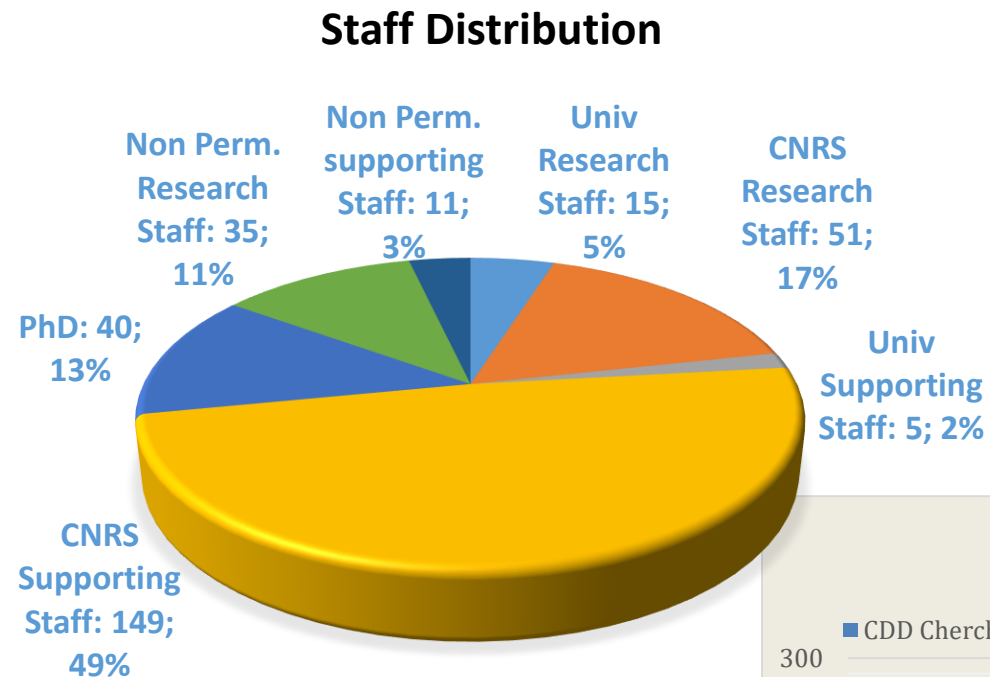
Overall presentation of the laboratory

- LAL has two supporting institutions
 - Université Paris-Sud
 - CNRS (and more specifically IN2P3 (Institut National de Physique Nucléaire et de Physique des Particules))
- Laboratory founded in 1956 at the creation of the Orsay campus
- Implantation over several buildings in Orsay Campus: 200, 203, 205, 208, 209
- Largest IN2P3 lab dedicated to
 - Particle Physics
 - Astroparticles and Cosmology
 - Accelerators Physics
- Member of the European Strategy Group in Particle Physics



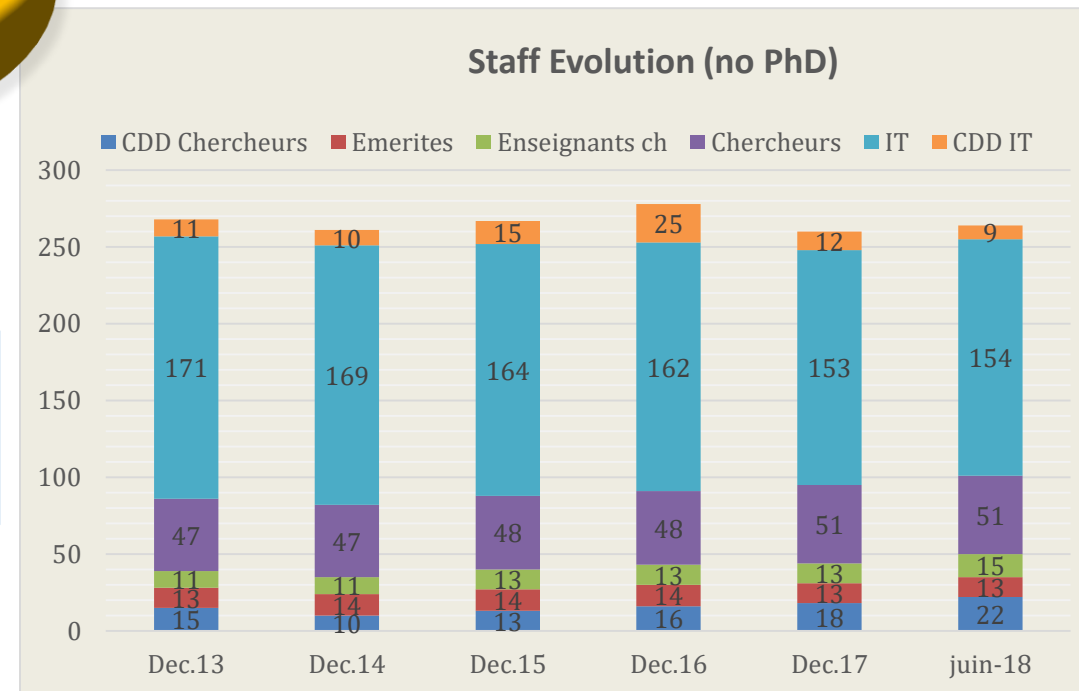
Main data: Human resources

Active staff 30/06/18	CNRS	Univ	Total
Full professors		7	7
Assistant professors		8	8
Full time research directors	28		28
Full time research associate	23		23
Other scientists	0		0
High school teachers	0		0
Supporting personnel (ITAs, BIATSS...)	149	5	154
Permanent staff	200	20	220
Non-permanent professors			
Non-permanent full time scientists		75	75
<i>out of which PhD Students</i>		40	40
non-permanent supporting personnel (4)		11	11
Non permanent staff		86	86
Total			306



- Increasing number of researchers and professors
- Decreasing number of supporting personnel

- Perm. Univ. / CNRS $\approx 1/10$
- Perm. Research / Support $\approx 1/2$
- Non Perm. / Perm. $\approx 1/2$

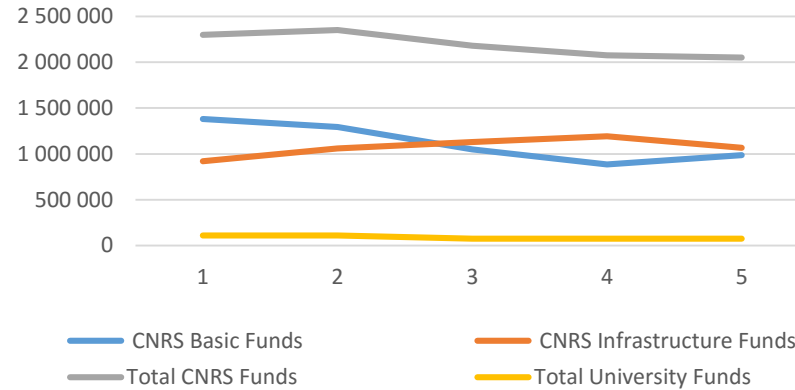


Main data: Budget

Basic and Infrastructure funds:

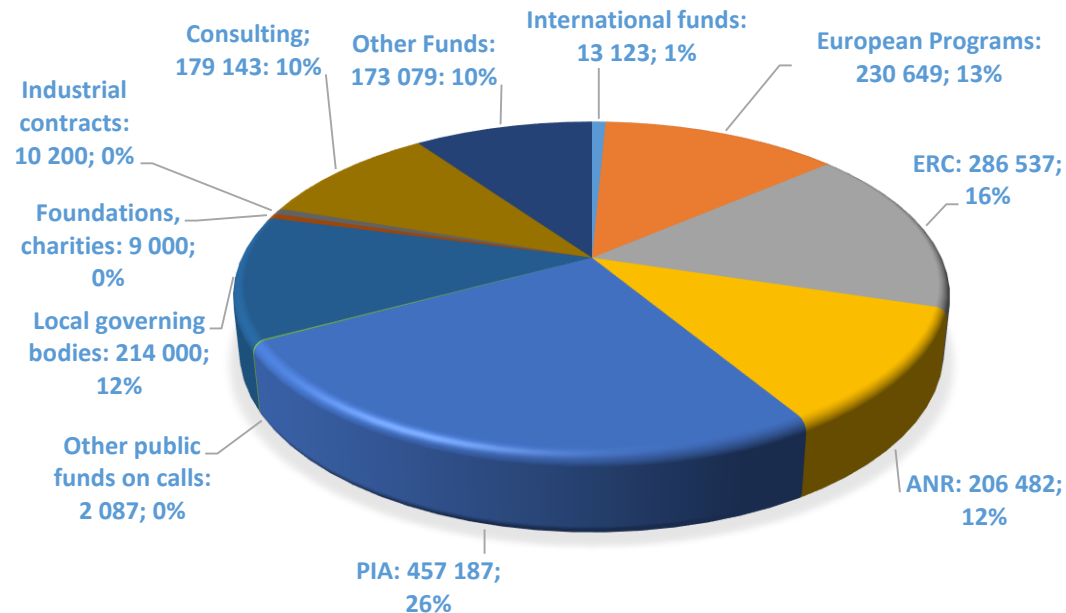
- ≈ 2 M€/year in 2017
- Mainly coming from CNRS
- Decrease in past years

Tutelles: Basic and Infrastructure Funds



Contracts:

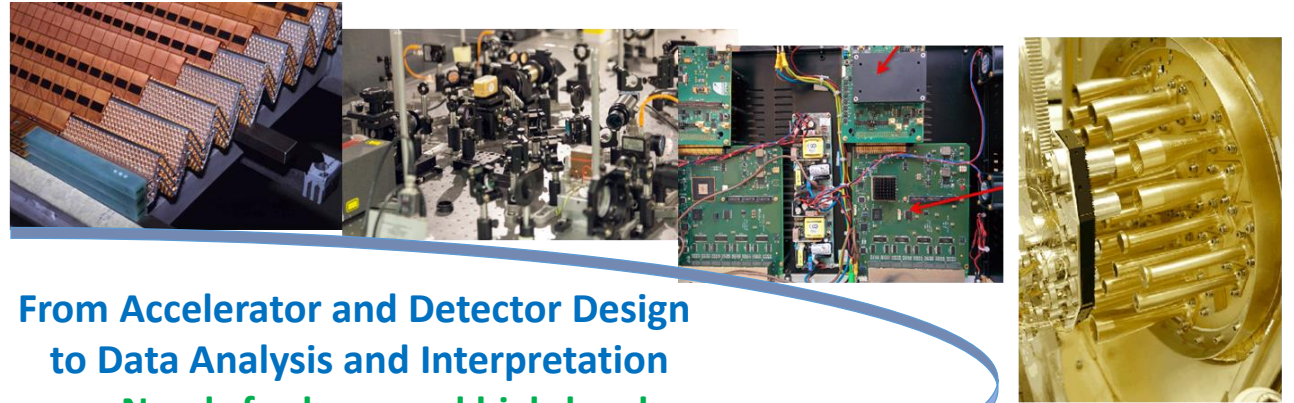
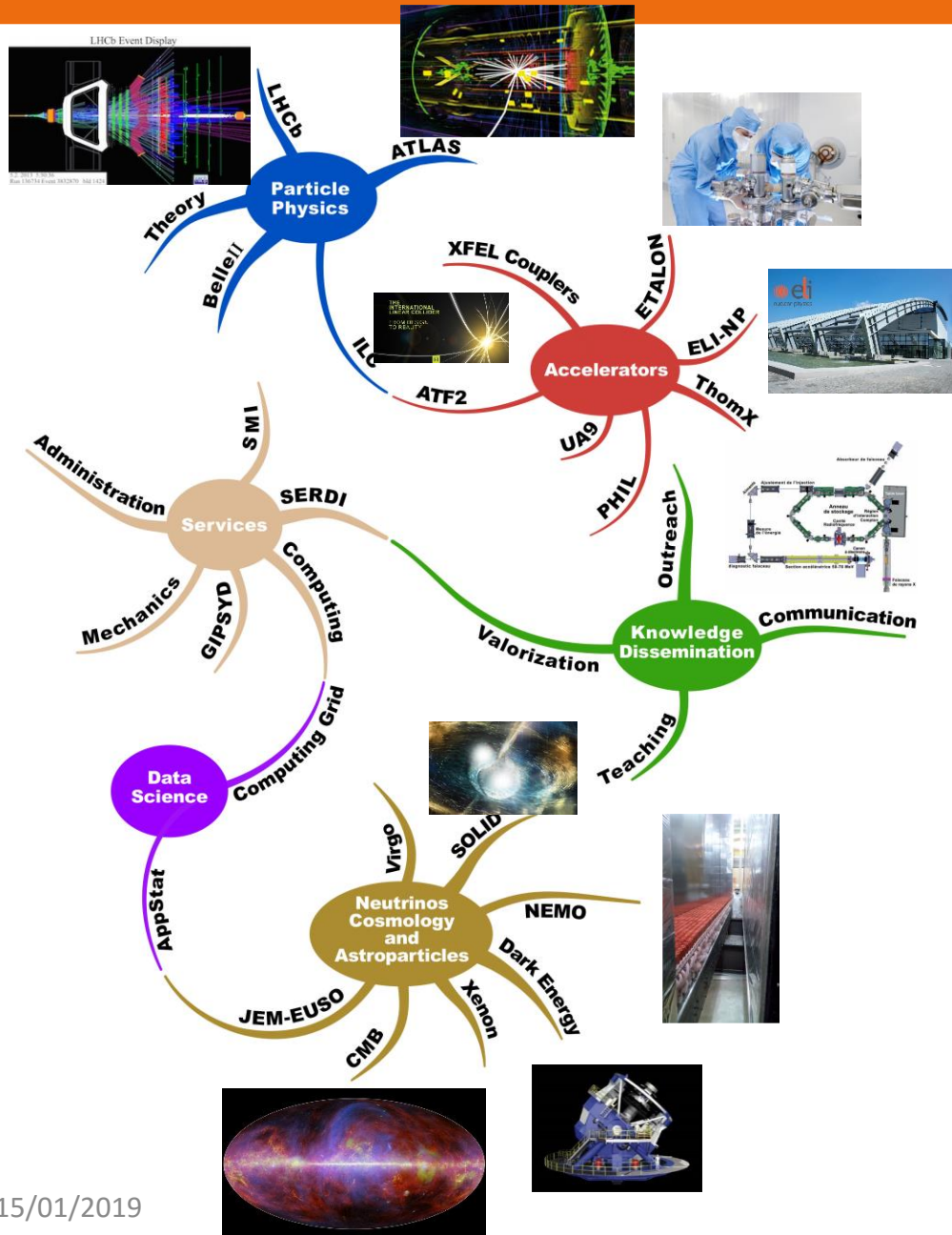
$\approx 1,8$ M€/year in average over 2013-2017 period



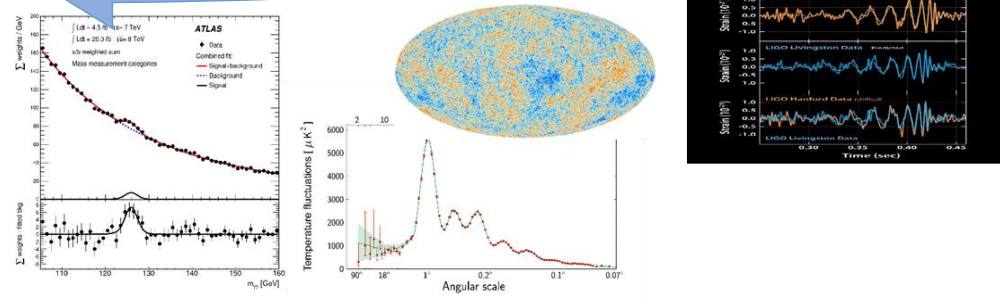
Tutelles	2017
Basic funds	1060200
Specific funds	20000
Calls	220400
Infrastructure	1065000
Total tutelles	2365600

Contracts	2017
International funds	10600
European programs	348425
ERC	
European structural funds	
ANR (not PIA)	204500
PIA	
Other public funds on calls	
Local governing bodies	
CPER	
Foundations, charities	
Industrial contracts	
Consulting	171 708
Institut Carnot	
Innovation (SATT, BPI, ...)	
Patents	
Other funds	152 349
Total contracts	887 582

Structure: Main themes and groups (1)



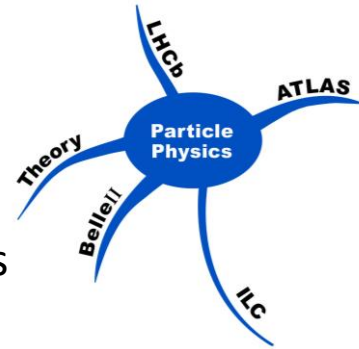
From Accelerator and Detector Design
to Data Analysis and Interpretation
⇒ Needs for large and high-level
administrative/technical services



Structure: Main themes and groups (2)

Particle Physics: Challenging the Standard Model (Energy and Intensity frontiers)

- Measurements of Higgs properties
- Searching for direct production of New Particles (Supersymmetry ...)
- W mass measurements
- Rare and semileptonic B decays
- Better understanding of QCD (c and b-hadrons studies, Quark Gluon Plasma)
- Measuring CP violation processes



Neutrinos

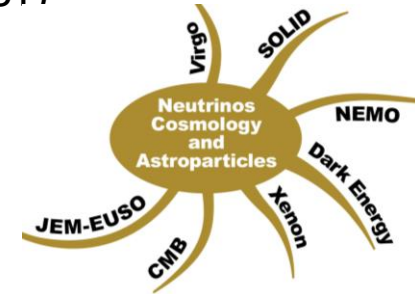
- Nature of the neutrino: Dirac or Majorana ? (NEMO3, SuperNEMO)
- A Sterile Neutrino ? (SOLID)

Cosmology

- Cosmological Microwave Background (Planck, ACTPOL, QUBIC, LiteBird)
- Baryonic Acoustic Oscillations (BAORadio, LSST)
- Dark Energy (LSST)

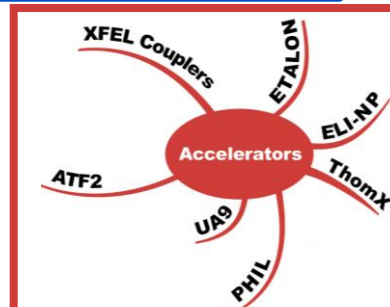
Astroparticles

- Ultra High Energy Cosmic Rays (EUSO)
- Gravitational Waves (Virgo)

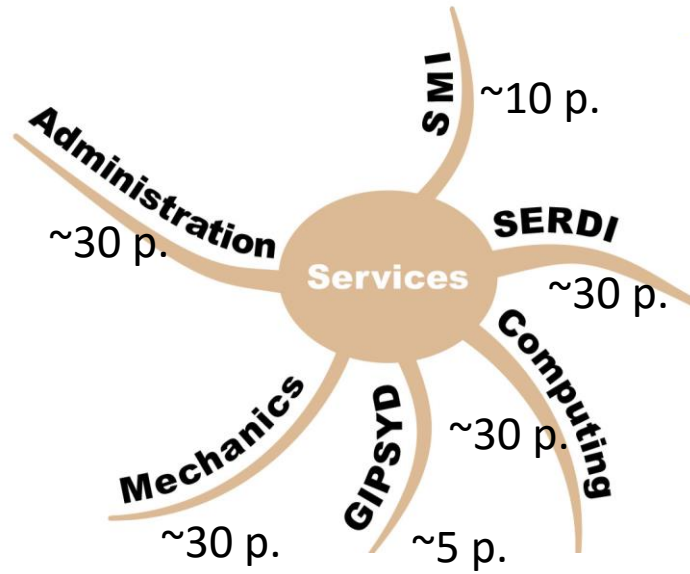


Accelerators

- Laser- Electron Beam interaction for light production (ThomX, ELI-NP)
- Couplers (XFEL, Myrrha, Lucrece)
- Photoinjector (PHIL)
- Beam Dynamics and Monitoring (ATF2, SuperKEKB, UA9, FCC)
- Laser Plasma and Short Beams (LX-DRUM, ETALON, ESCULAP)
- Leptotherapy (PRAE)

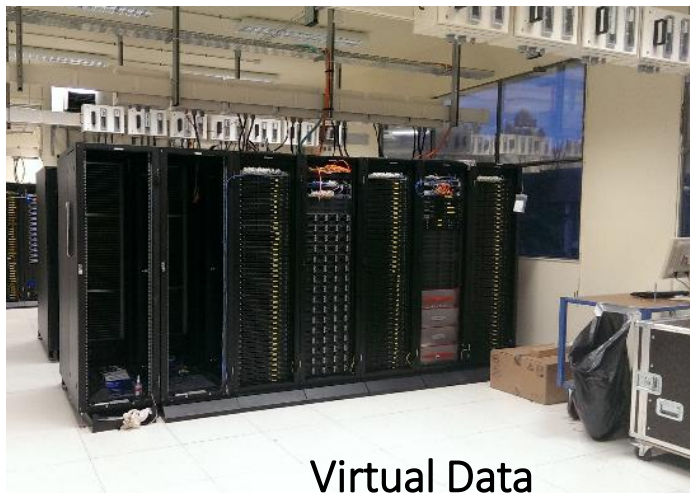


Structure: technical infrastructures



Platforms

- CORTO (Cosmic Ray Telescope at Orsay)
- PHIL: 2-5 MeV electron source
- Leetech @PHIL: Spectrometer @ PHIL
- Captinnov (wafer prober)
- CALVA for Gravitational Wave Detector R&D
- Coupler Station for cleaning, assembly and RF conditioning
- PANAMA: analysis and characterization of accelerator materials
- Virtual Data: computing (already a joint effort)



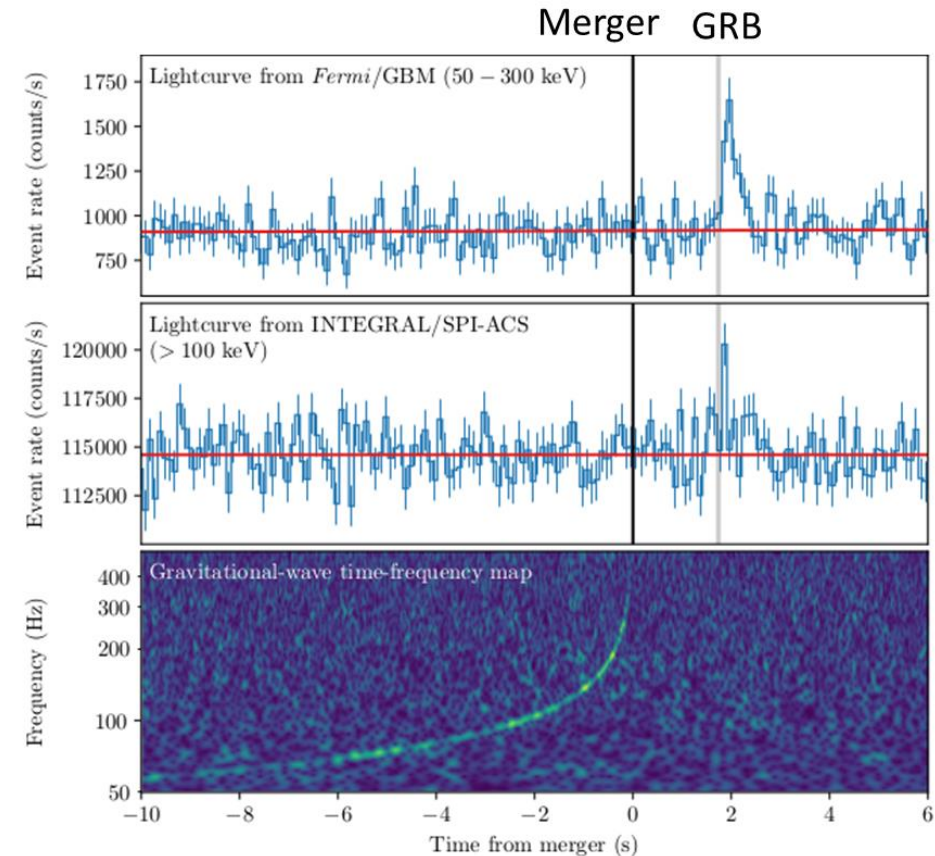
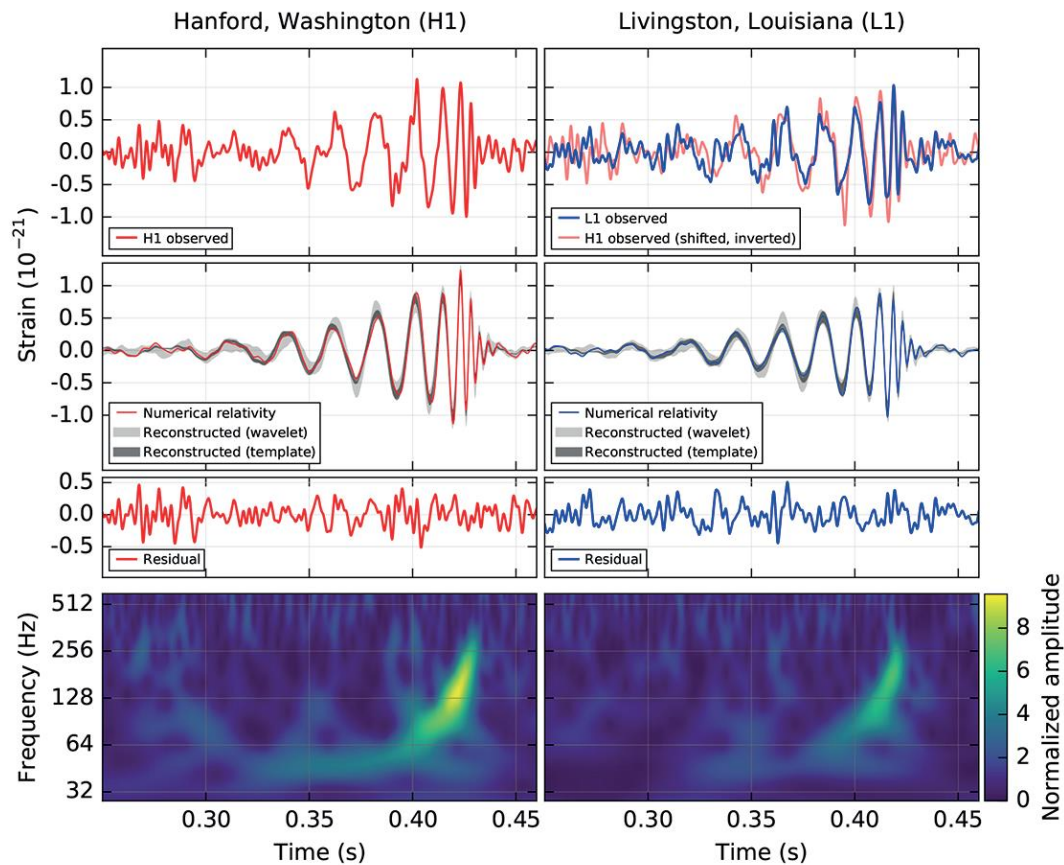
Structure: scientific policy

- **Increase our visibility in “IN2P3” Science**
 - Global policy presented during LAL general meeting or LAL Scientific Council (3/year with LAL and international experts)
 - Implications in upgrades (LHC, Gravitational Waves ...)
 - Diversification in neutrino physics (SOLID, DUNE) and new implication in direct dark matter searches (XENON)
 - New projects (BELLE II, LiteBird ...) or implications in existing projects scrutinized by LAL Scientific Council (~40 during 5 years) to insure global scientific coherence
 - Monthly meetings with Heads of services and with Project Leaders to check the sharing of personpower
- **Implication in Local Structures**
 - Presence in Paris-Sud bodies (Département de Physique, Conseils ...) and UPSay départements (P2I, Labex P2IO)
 - Scientific projects with local labs through Labex and Idex
 - Refondation project first started with CPER Plan-Vallée
- **Sharing the knowledge**
 - Responsibilities in Paris-Sud teaching units (Licence, Master and PhD)
 - CNRS researchers and IT also involved in teaching activities
 - Internships from L3 to M2, worldwide open
 - Outreach (high-school pupils, teachers, general public) at LAL or outside (high-school, conferences, radio ...)



Highlights 1

LIGO/Virgo: First detection of Gravitational Waves and First multi-messenger detection of a GRB

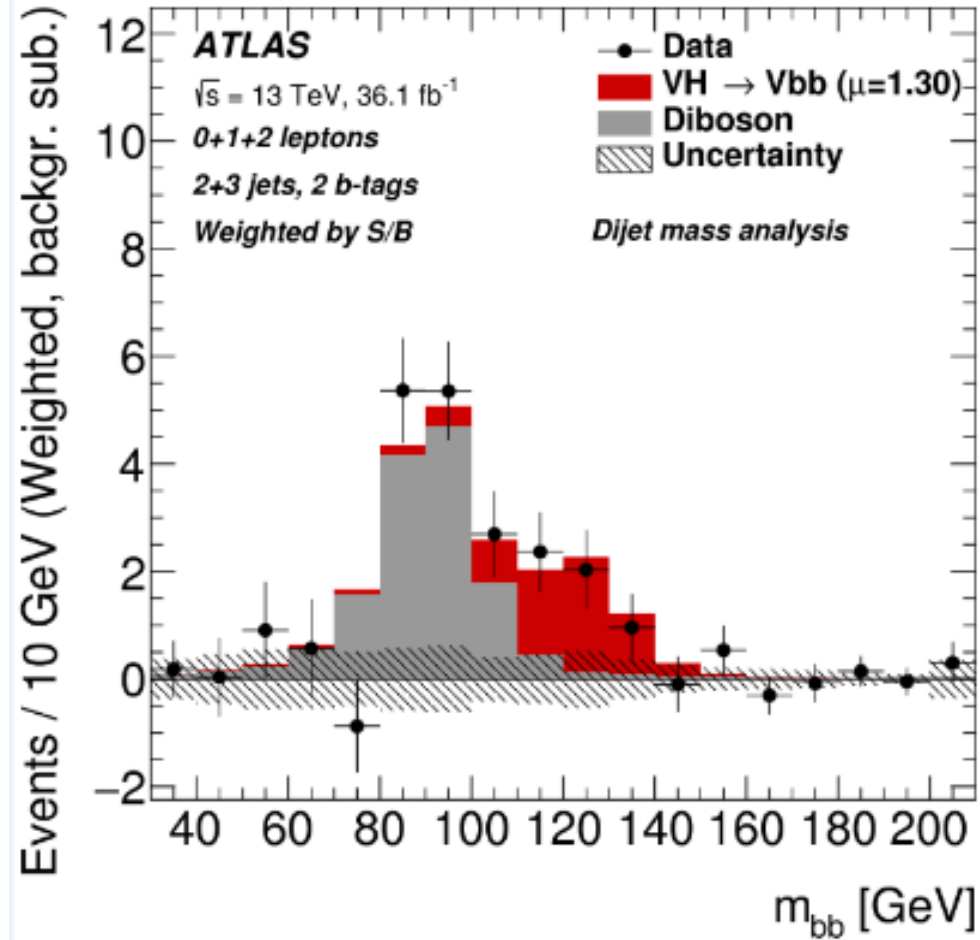


- A **25-years effort** at LAL: construction, commissioning, data analysis and R&D
- Validation of Detections through **Detector Characterization** expertise
- Major Actor in low latency alerts for **multi-messenger astronomy**

Highlights 2

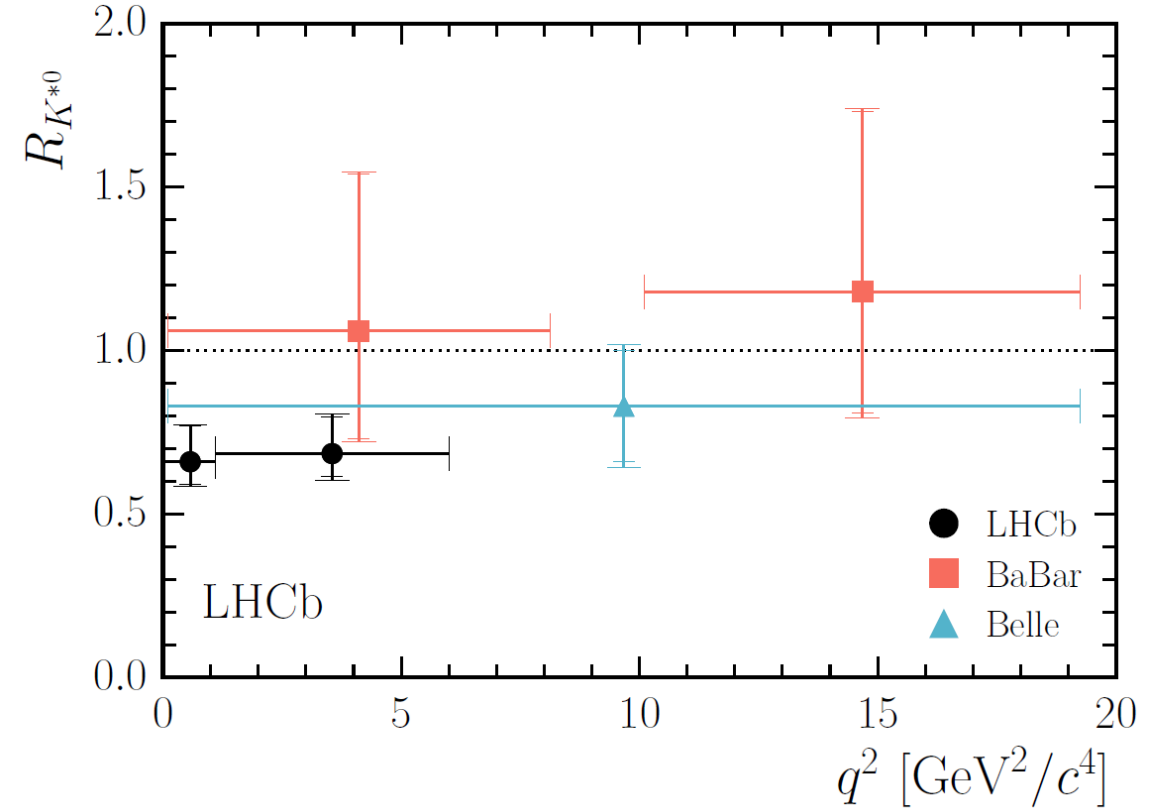
Atlas

First observation of the BEH boson decaying into a bb -bar pair



LHCb

Tensions in $b \rightarrow sll$ transitions wrt SM predictions



- **Keystones** of LAL scientific program for several decades
- Contributing to **detector** (design, construction, commissioning, operation)
- Leading **data analysis** on hot topics

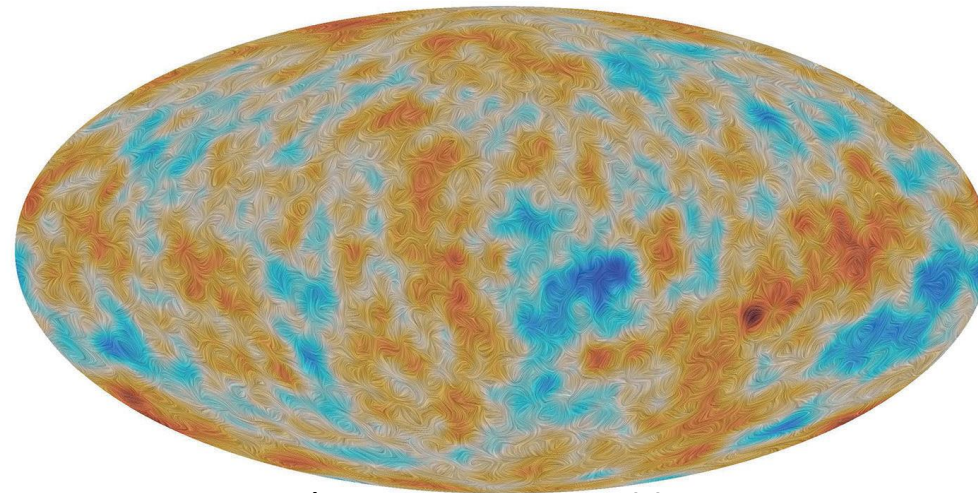
Highlights 3

XFEL



- Contribution to a **large accelerator**
- Building **unique infrastructure**
- Developing **reusable expertise** (ILC, LCLS-II, ESS, Myrrha, PIP-II ...)

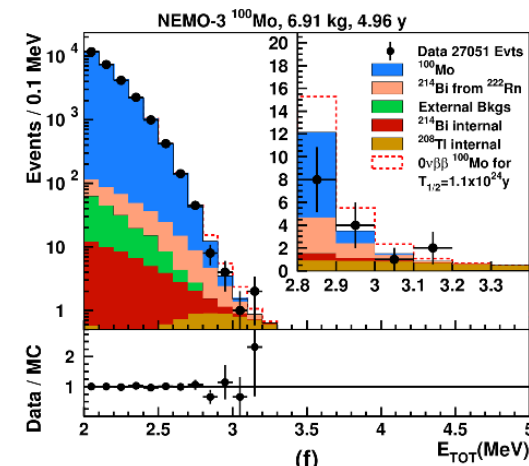
Planck



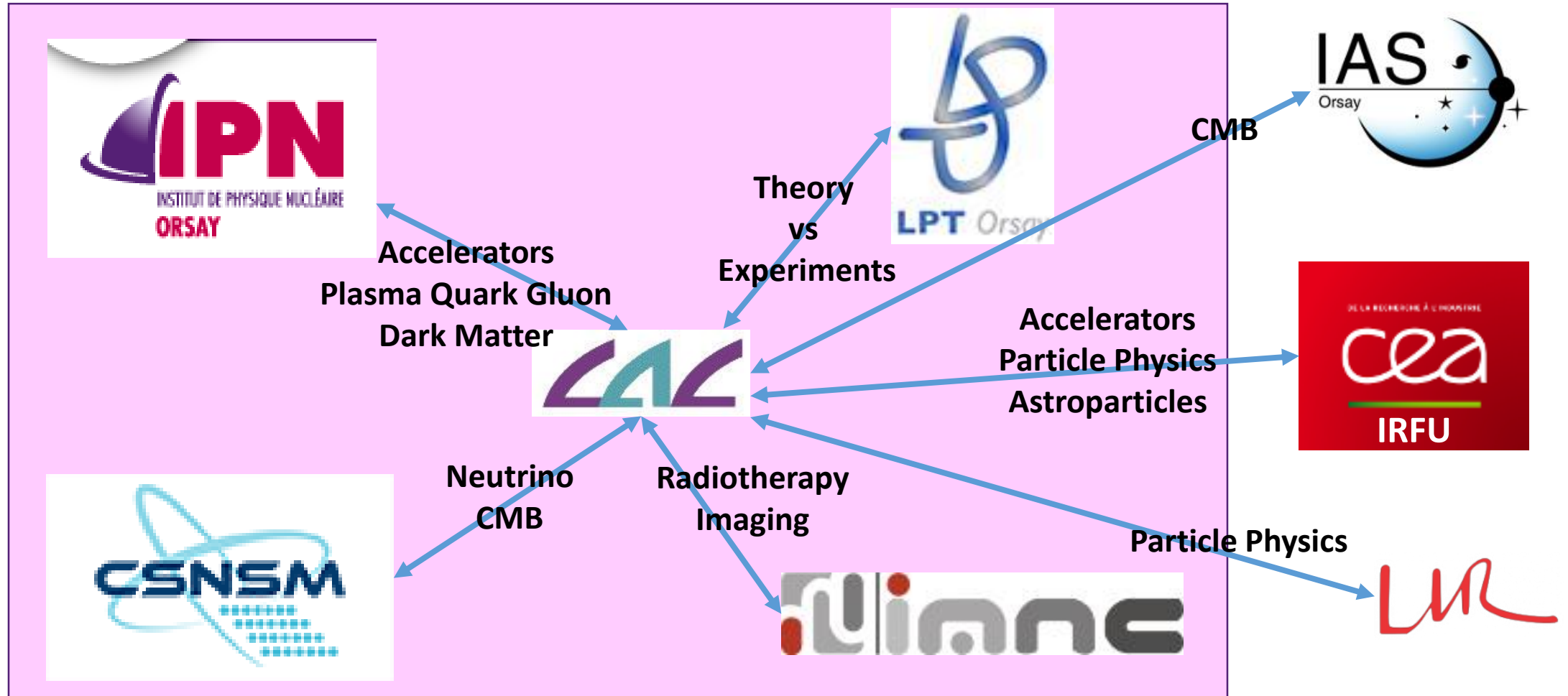
- **First spatial experiment** at LAL (construction, calibration, map making ...)
- Cosmology with a **Particle Physics approach**
- Setting **constraints** using Cosmological and Particle Physics inputs

NEMO-3

- **Historical** LAL effort on neutrinos
- Unique **Calorimeter-Tracker** approach
- **Several isotopes** (Molybdenum, Selenium ...)
- Limit on neutrino mass: **0.3-0.8 eV/c²**



Local environment



Vallée Labs

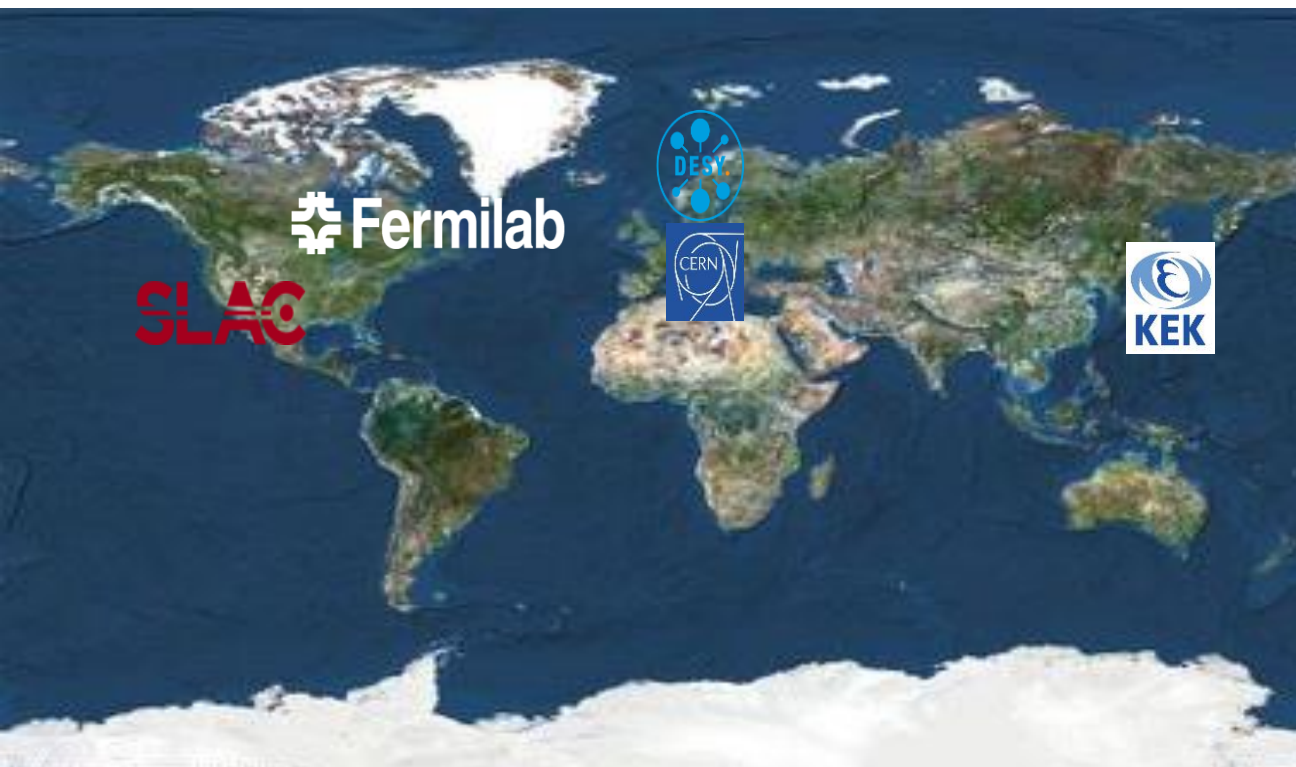
- Collaborations for years in science and teaching (NPAC, GI ...)
- Common Scientific Council CSNSM-IPNO-LAL since 2018
- IPNO/LAL as joint lab in AMICI H2020

UPSAY

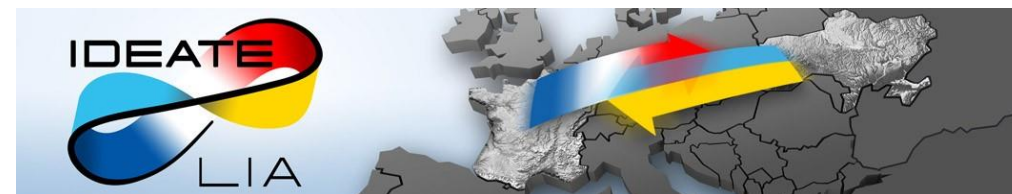
- P2IO Labex
- P2I Department
- PHENIICS Doctoral School



International and national environments



- Active in **France-Japan/China/Korea** Particle Physics Labs
- **Initiator** of **France-Ukraine** links (Laboratoire International Associé IDEATE and TESHEP school since 2007)



- Starting **partnership** with **Palestine** (since 2016)

- **Historical links** with **Accelerator Centers** dedicated to **Particle Physics**: CERN, DESY, SLAC, FERMILAB, KEK ...
- Most of LAL projects are **world-wide collaborations**
- National connections to **IN2P3 labs**
- **Increasing** links with **INSU** labs (IRAP, LAM ...), mainly through **CNES** for space missions and **INP** labs (LKB, CELIA, ...) for Virgo and Accelerator-based Light Sources



Conclusions

A 60-year old Lab, dynamic, internationally recognized with exciting scientific challenges

- Involved in the **main experiments** of our field (Atlas, LHCb, Virgo, Planck ...) and the construction of **novel international accelerators** (ILC, XFEL, SuperKEKB, LCLS II, PIP II ...) and **local facilities** (ThomX, PHIL/Laserix, PRAE ...)
- Increasing **diversification** with **scientific** and **technical impacts** (Belle II, Solid, Xenon, Qubic, LiteBird ...)
- **Large scientific production**: ~1500 articles, ~250 conferences
- **9** European Grants and **22** National ones
- **50** defended PhDs, **10** defended HDR, **375** internships
- Labex and CPER experiences show the **advantages** of a **Vallée-coherent strategy**

But:

- **Lifetime** and **Rarefaction** of Experiments in Particle Physics on Accelerators and in Astroparticles/Cosmology
- **Changing** French **panorama** for research and clustering in progress in several countries
- **Decrease** of the **personpower** in technical services (isolated expertise)

Need for a **reboot
with a **larger scientific scope** and
gathered means
at the level of the **Orsay Vallée****