



Welcome in the Paris Sud Campus

Welcome to LAL

Fabien Cavalier
LAL deputy director

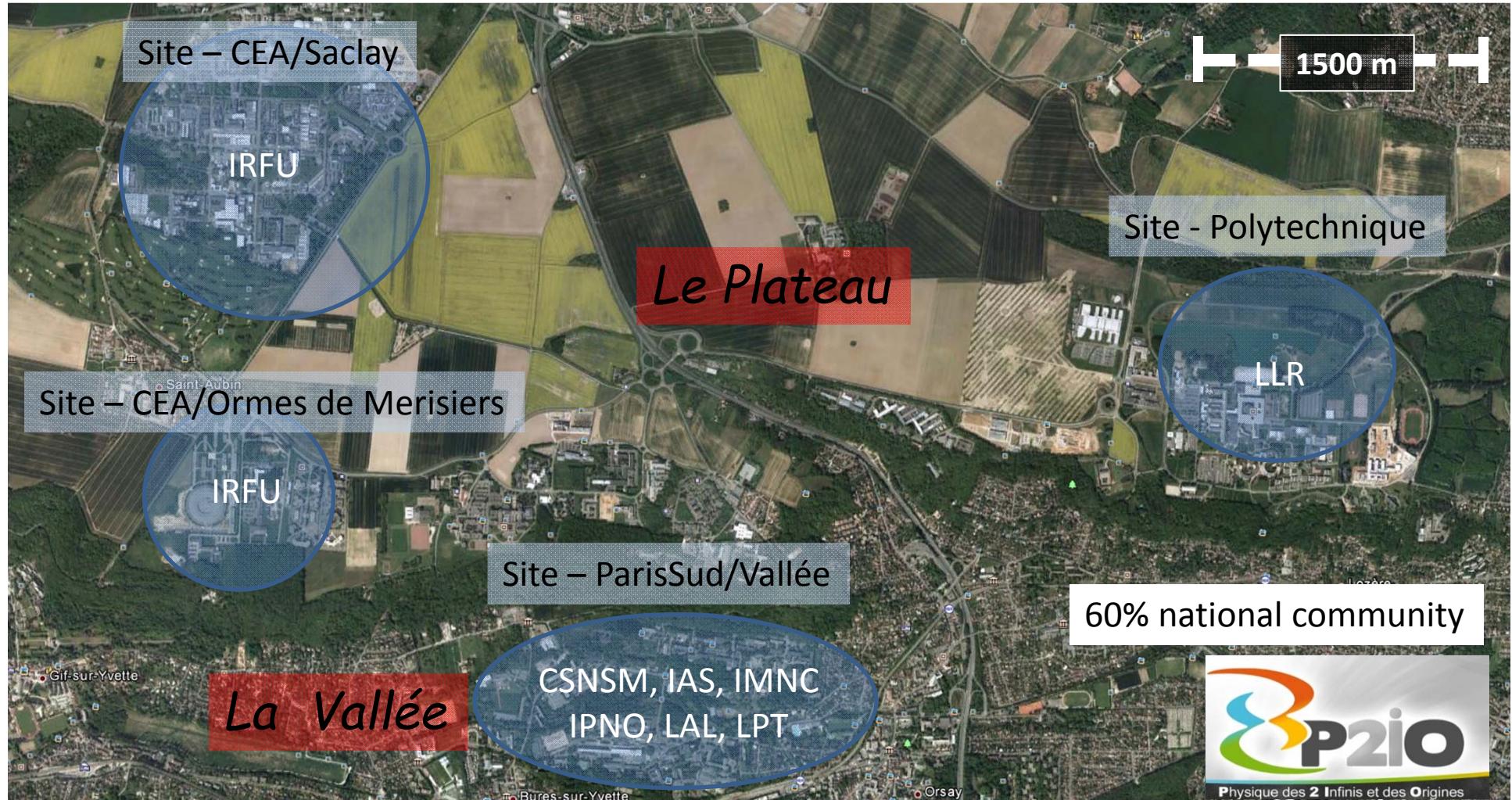


16th June 2014

The Site where you are

Personnel ~ 2000
Superficies ~ 100000m²

The Labs : CSNSM, IAS, IMNC, IPNO, IRFU, LAL, LLR, LPT



Labs grouped under P2IO label and belonging to 4 agencies : Paris Sud, CNRS, CEA and Ecole Polytechnique

Laboratoire de l'Accélérateur Linéaire (LAL) (IN2P3/CNRS and Paris Sud University)



www.lal.in2p3.fr

Located at the Paris Sud University campus between Orsay and Bures-sur-Yvette

Historical name: big linear e+e- accelerator was stopped in 2004.

Instead new facilities have been built (see later)



- Biggest CNRS HEP laboratory in France:
~120 physicists
~220 engineers/technicians
Annual budget ~10 Meuros
+ ~20MEuros (salary)
- Hosting ~10-15 PhD thesis / year

- Surface of 18 000 m², including 7 000 m² of halls, workshops and clean rooms

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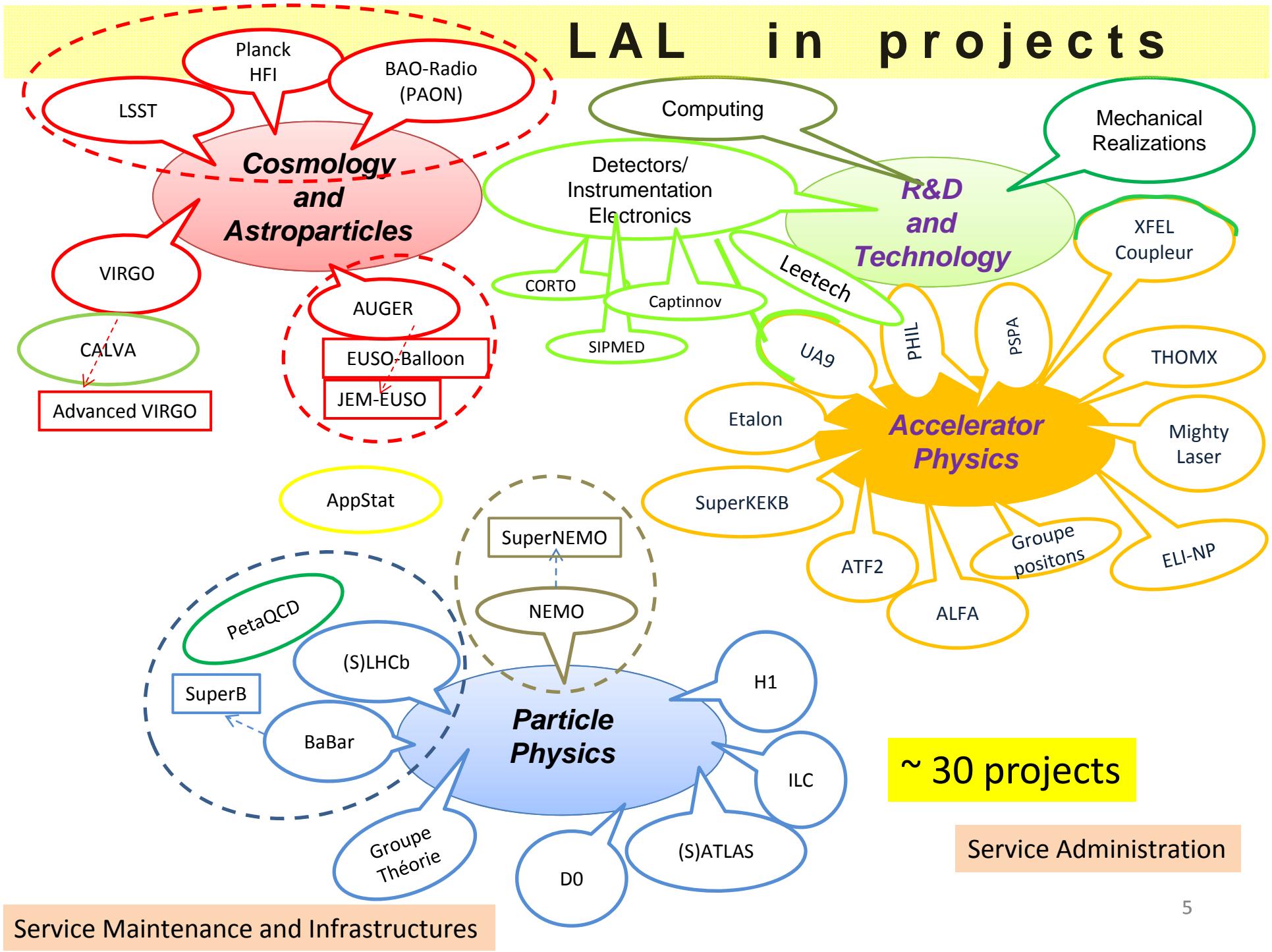


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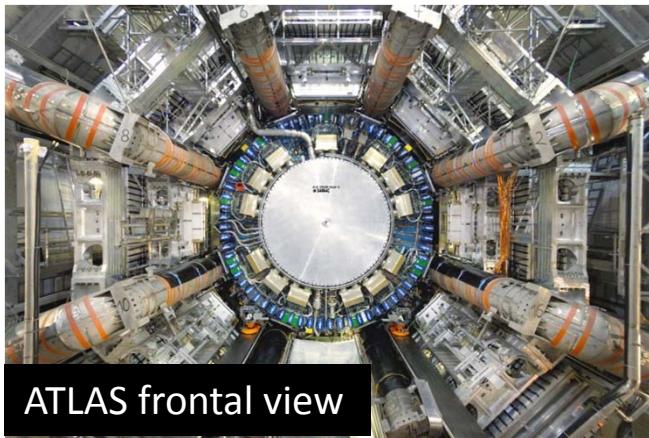
The LAL is member of the 8 “Large European National Laboratories in particle physics” and thus is part of the «Strategy Group » and has participated to the elaboration of the Strategy

LAL in projects

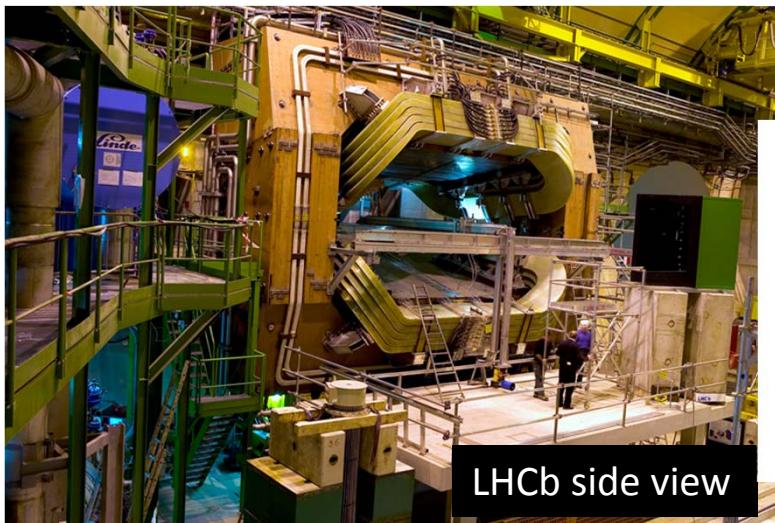


Few example of experimental program at LAL

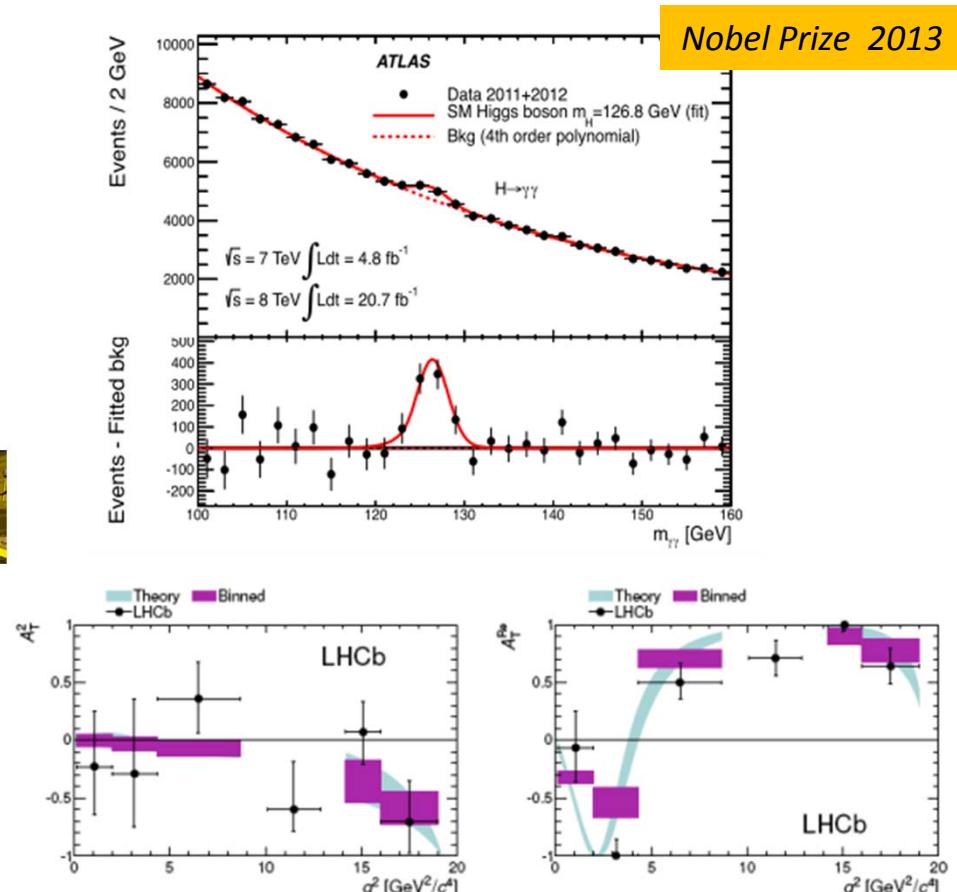
- Main projet: LHC at **CERN**
 - ~40% of physicists implied in two experiments **ATLAS** and **LHCb**
 - Important technical contribution for **detectors** and **accelerator**



ATLAS frontal view



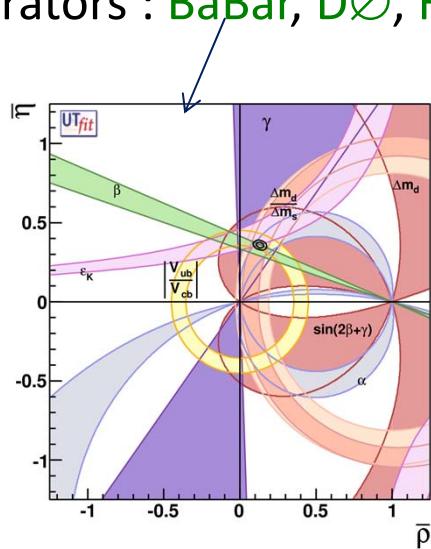
LHCb side view



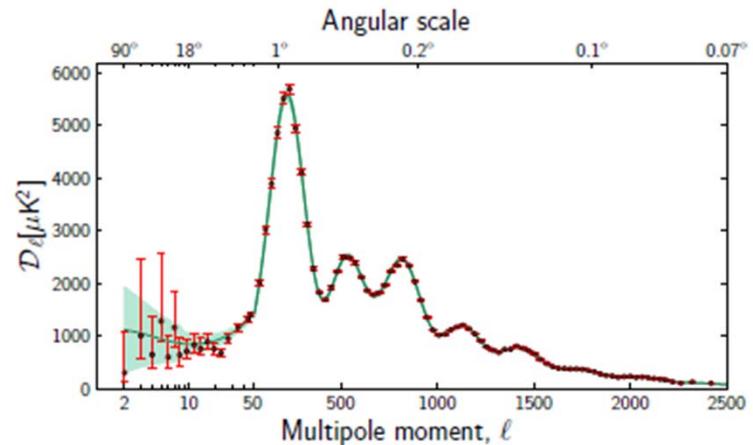
Example of other projects

- Experiments on accelerators : BaBar, DØ, H1

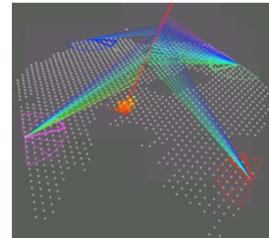
Prix Nobel 2008



- Planck satellite



- Auger Observatory and JEM/EUSO for cosmic rays at ultra high energy



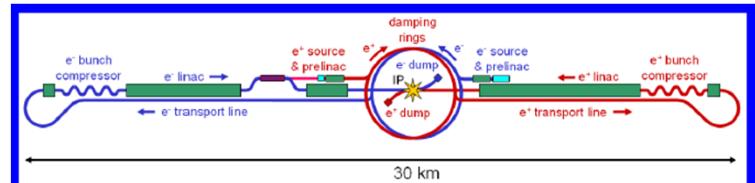
- Studies of neutrino physics with the NEMO detectors.

- Direct search for gravitational wave using the interferometer Virgo

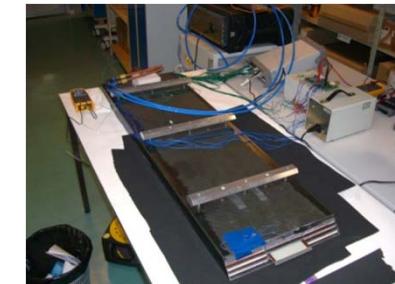
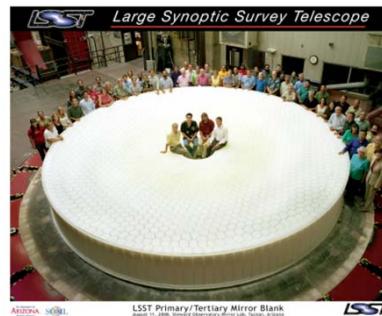
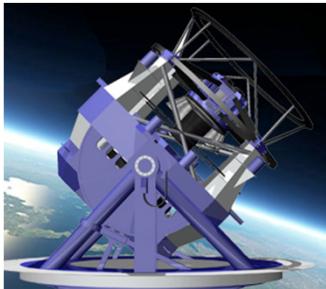
- Accelerators : XFEL in Germany, PHL at LAL, ATF/ATF2 in Japan, UA9 (LHC).. (see⁷ later)

Implications in future projects

- Next generation of electron-position linear colliders
→ Projets ILC (Japan) and CliC



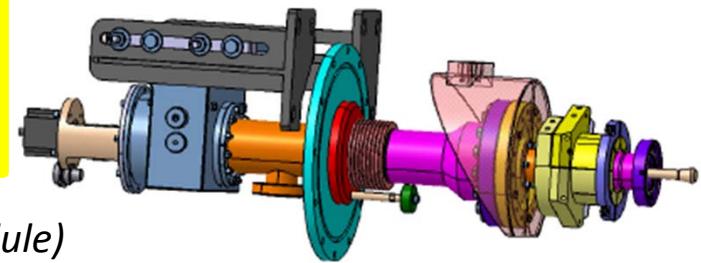
- Future telescopes LSST



- LHC upgrades !

XFEL

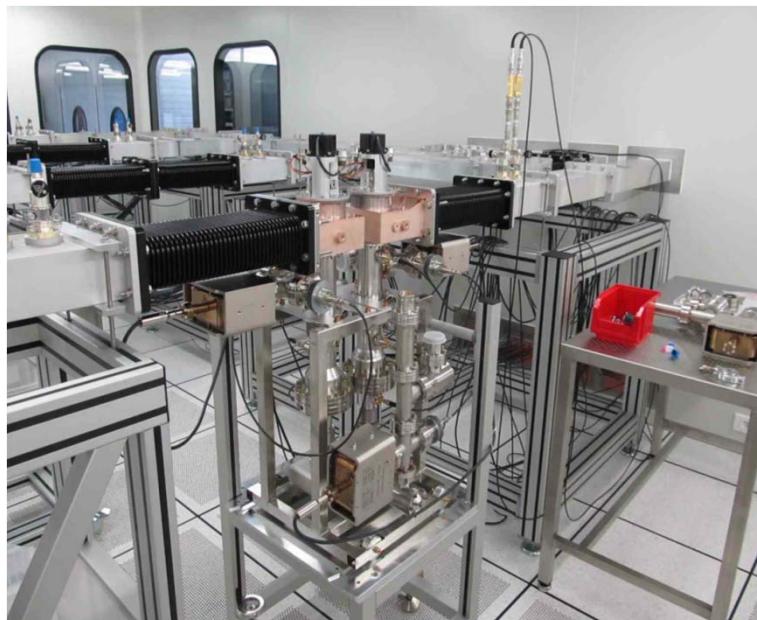
Very high flux of X-rays produced from accelerated electrons sent on undulators.
XFEL is installed at DESY-Hambourg



Project – Couplers at LAL (*IRFU responsible of the cryomodule*)

Serie production **COUPLES 1.3GHz**

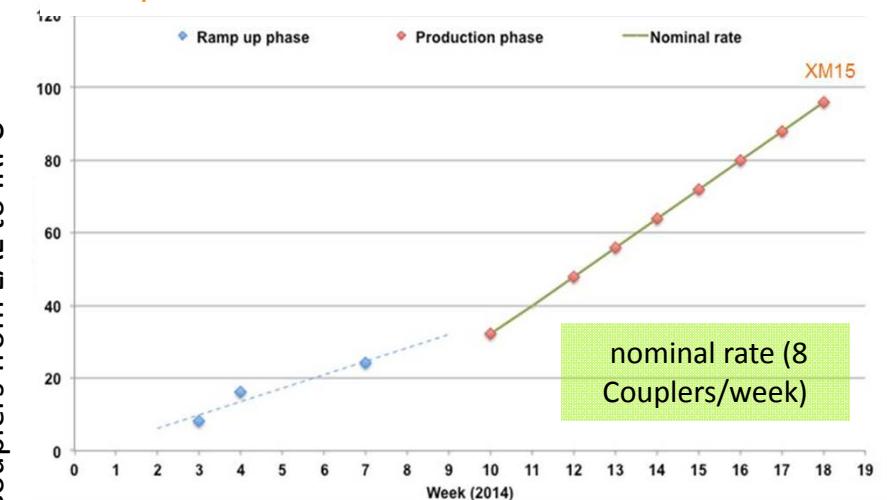
Couplers : assure the transmission of the HF-waves from (klystrons) to superconductive cavities



Production is now launched !
(visit after this session)

Projet of ~ 20 MEuros (Thales)

Coupleurs conditionned and sent to IRFU in 2014





Compact Source of X-rays(50-90 KeV) At high flux($\sim 10^{12}$ ph/s)

Compton back-scattering
Electron beam of 50 MeV
laser amplified with a Fabry-Perot cavity

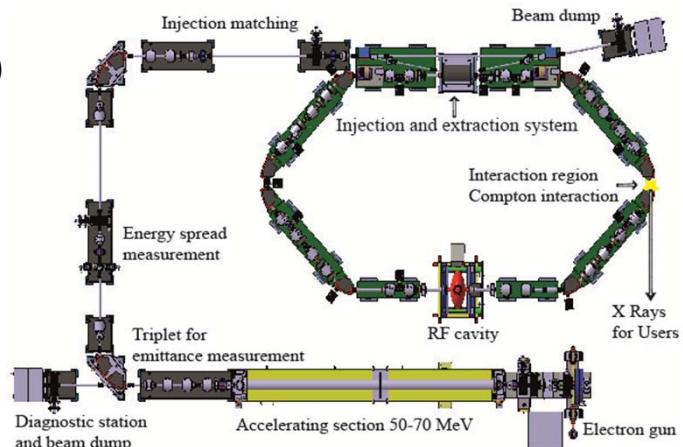
Collaboration : CELIA, C2RMF,LAL, NEEL,
SOLEIL,THALES, ESRF, INSERM, UPS,UB1.

LAL leads the project
EQUIPEX Project =12MEuros

LAL participates to the
e/ γ facility
in Romania ELI-NP.

Project ~66MEuros (our part ~15MEuros)
(French industry Amplitude, Alsyom...).
Collaboration Italy-France-UK

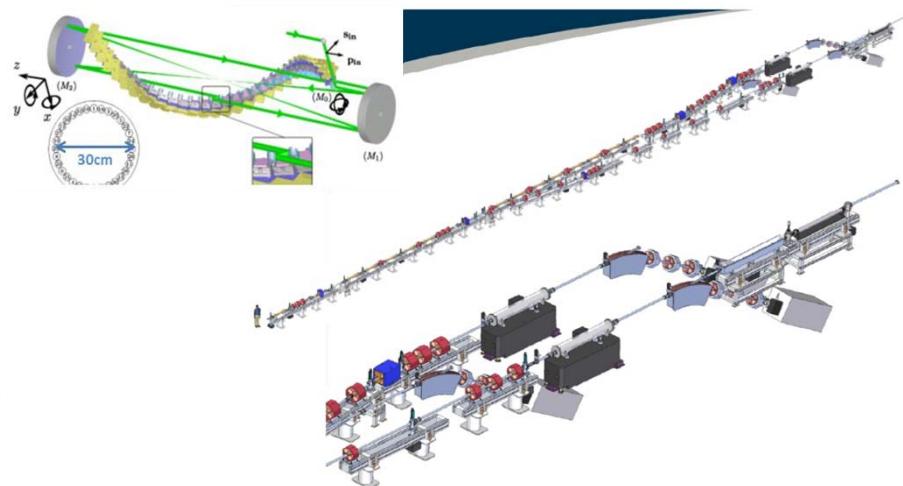
Leaded by : INFN and University Roma Sapienza

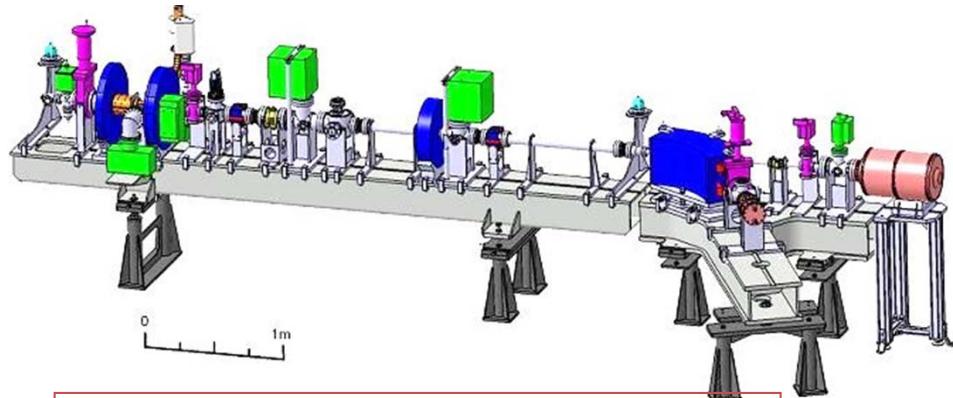


~2016 first interactions



Compton back-scattering
Electron beam of 300 and 700 MeV
Against a ricirculated laser





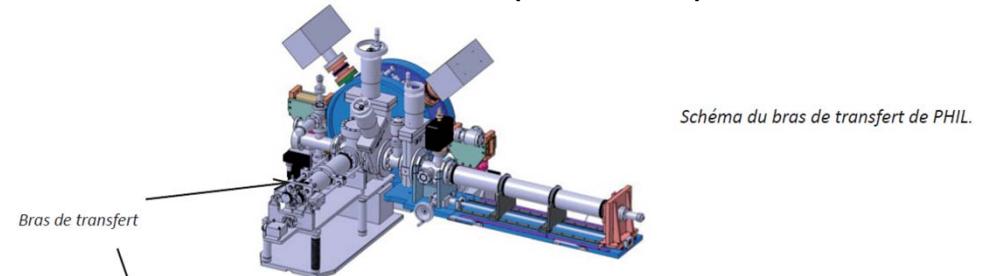
- canon RF
gradient ~ 90 MV/m - 2011
- Photocathode
-cathode Mg – 2011 – for THOMX
-transfert arm +valise Cs₂Te – 2013
- Beam Diagnostics
ps pulse, emittance 5 μm.rad – 2013
BPM strip line – 2013 – for THOMX
- Influence of laser
top Hat spatial – 2013
laser 100 fs - ?
- Energy Upgrade 9 MeV (2013)

Today
électrons at 3 MeV@5Hz, Q ~ 100 pC

Ambitious program for using PHIL as a detector facility. Work in progress



News : transfert arm to change photocathode.
collaboration CTF (CLIC-CTF)



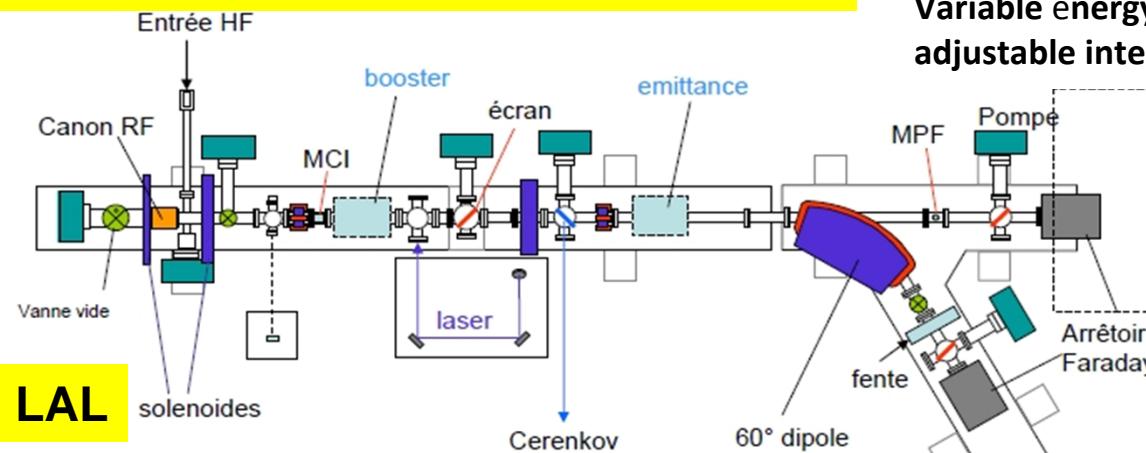
Le bras de transfert en salle de montage.



Le bras de transfert monté sur PHIL.

Three “common” PLATEFORMES to test detectors are in preparation

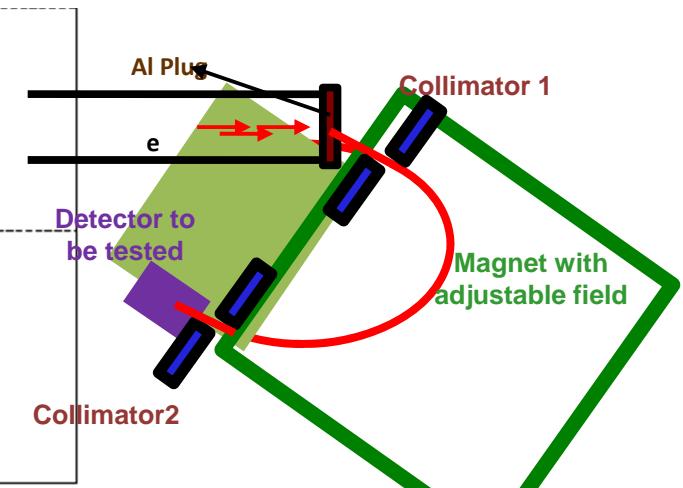
LEETECH :– Platform for testing detector @PHIL



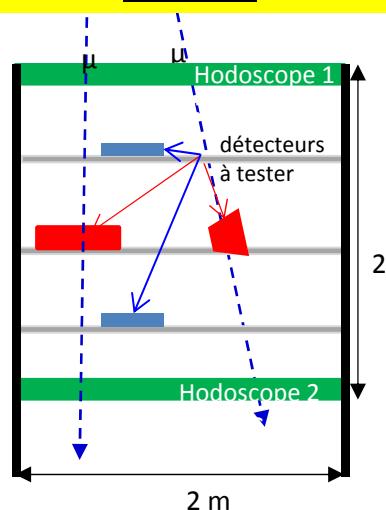
First run Summer 2014

Sample of “monochromatic” electrons

Variable energy $\sim 100 \text{ keV}$ and 5 MeV
adjustable intensity 10^4 electrons $\sim 1 \text{ fC} \rightarrow \dots$



CORTO: COsmic Ray Telescope @ Orsay



LAL, IPNO

First run beginning 2014

CORTO en cours de développement

Captinnov : platform P2IO for innovative captors



@ LAL



@ IRFU

Bonding Machine

- ✓ To characterize the circuits and the detectors in prototyping or pre-production phases
- ✓ Integrating hybrids systems (det/PCB/electronics) with large density of channels and/or large dimensions

CSNSM, IAS, IMNC, IPNO, IRFU, LAL, LLR, LPT

« Virtual Data » CENTER

New DATA Center of about 300m² in construction grouping 8 laboratories :

- 7000 cores, 3 PB of disk, 1 tier2 HPC, 1 important net infrastructure
- An important expertise (130 people) covering operation, development, instrument controls).

With :

- Cloud technology
- very good PUE (Power Usage Efficiency) of 1,3

Actual situation

650 m² of informatics room within 8 labs fragmented in more than 10 rooms (from 25 à 100 m²) hosting 900 KW

Very inefficient and expensive (1 M€/an)



Final Phase

250m² / 1,5MW / 84 racks

Total Cost : 3M€

Preliminary phase concluded !

100m² / 400KW IT / 30 racks,

cost ~ 1M€

with a new room here close by

