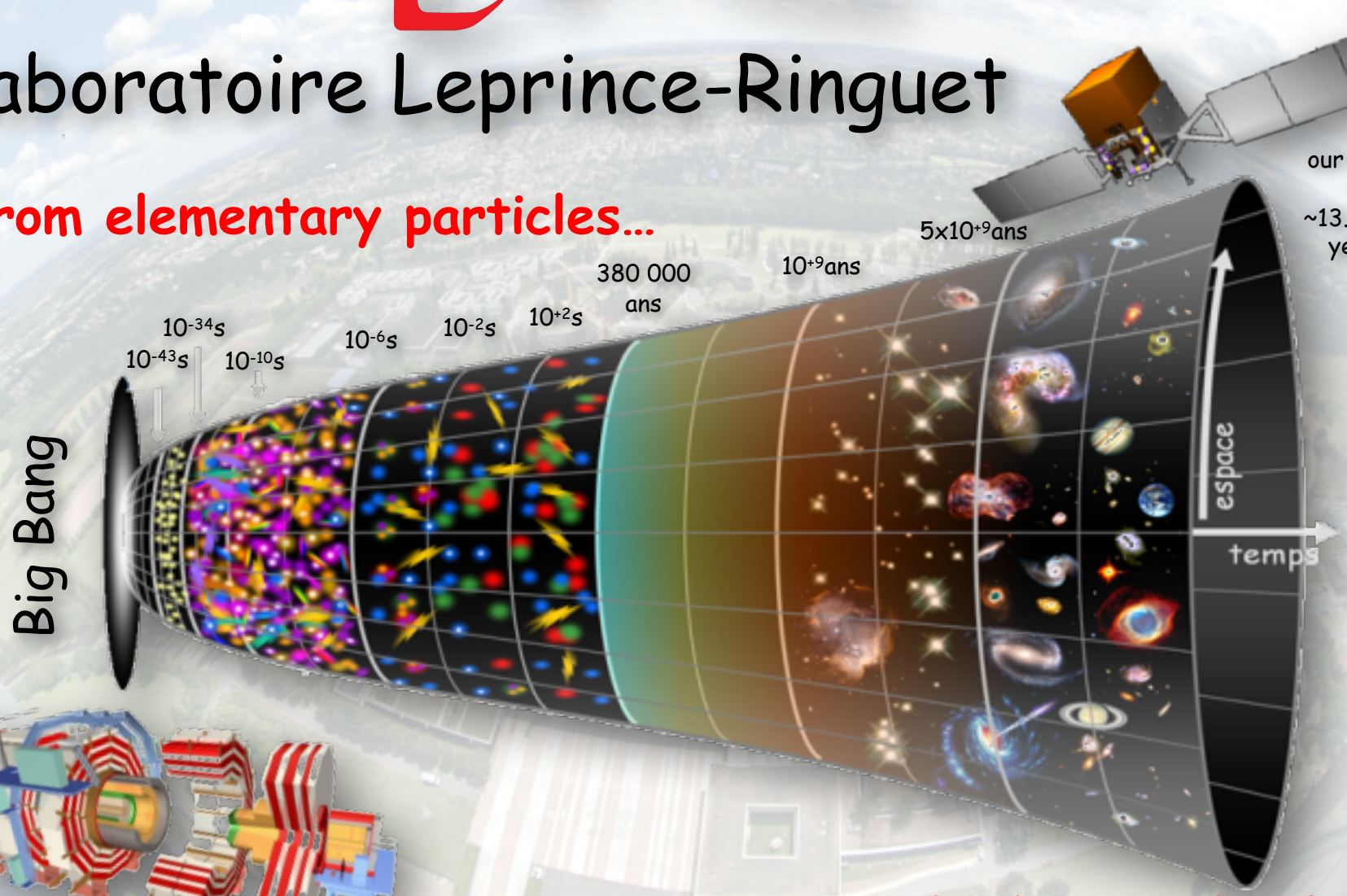
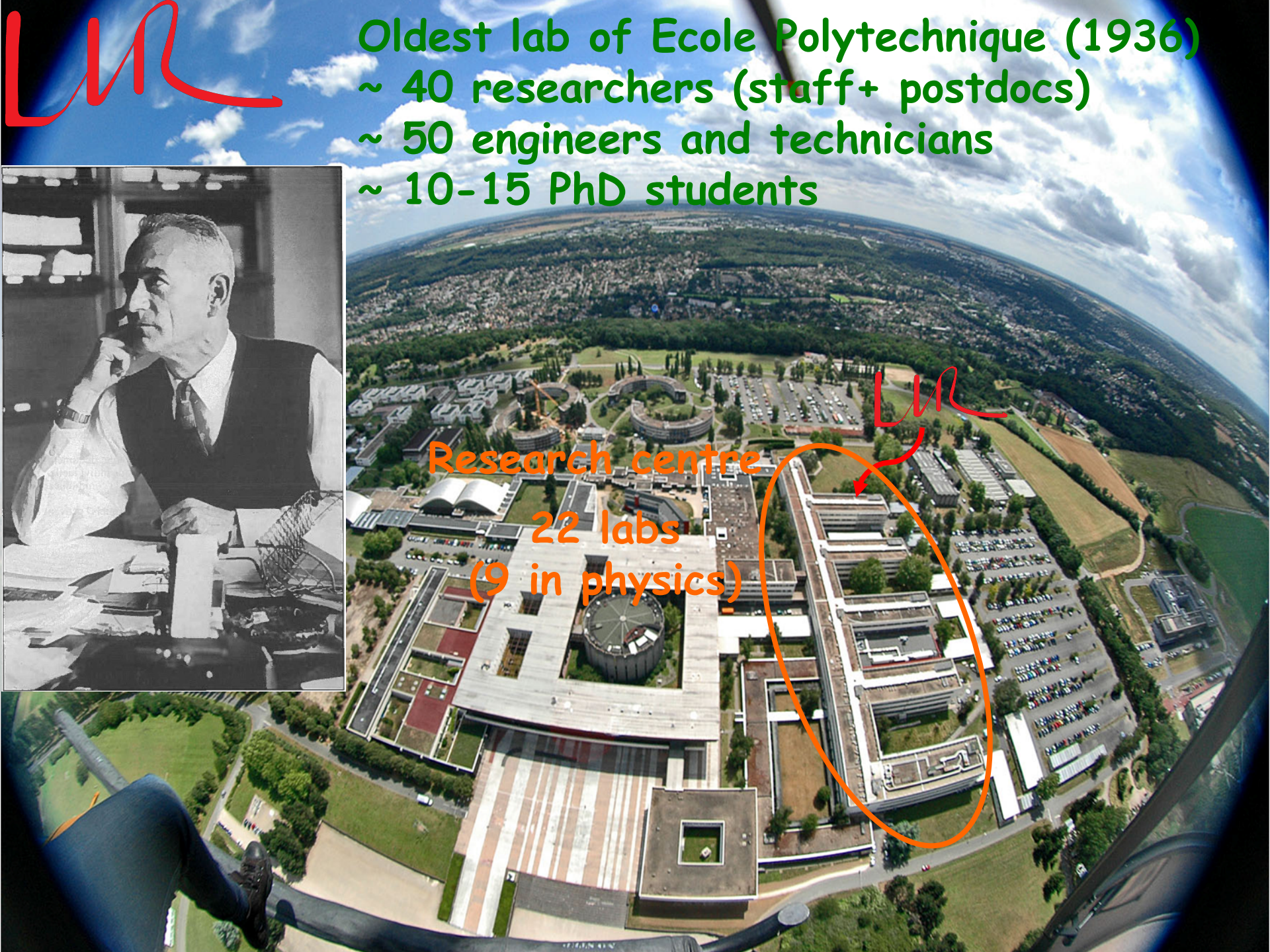
Laboratoire Leprince-Ringuet

From elementary particles…



… to the heart of galaxies


Oldest lab of Ecole Polytechnique (1936)
~ 40 researchers (staff+ postdocs)
~ 50 engineers and technicians
~ 10-15 PhD students
Research centre
22 labs
(9 in physics)

Laboratoire Leprince-Ringuet

The research themes

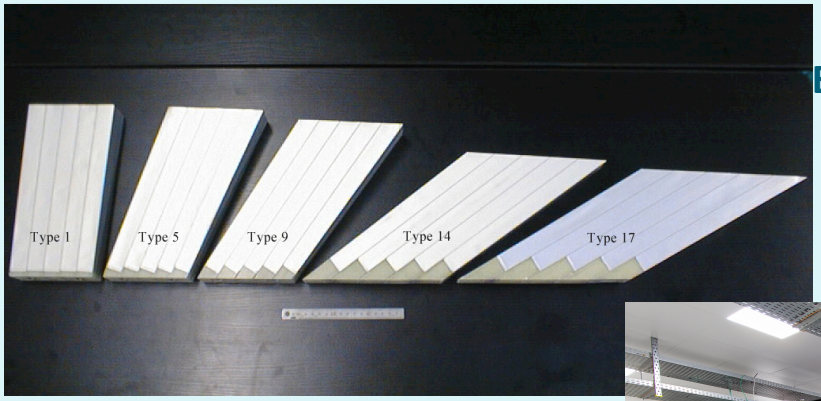
- Particle physics
  - CMS at LHC (CERN)
  - CALICE for the future linear collider ILC
  - Neutrino: T2K in Japan, joining JUNO in China
- Astroparticles
  - HESS gamma telescope in Namibia
  - FERMI satellite
  - CTA project
  - HARPO project

} not shown here

- Applications and transverse activities
  - New acceleration technics: acceleration of electrons with laser/plasma
  - Medical applications: profiler of beam for the hadrontherapy

CMS

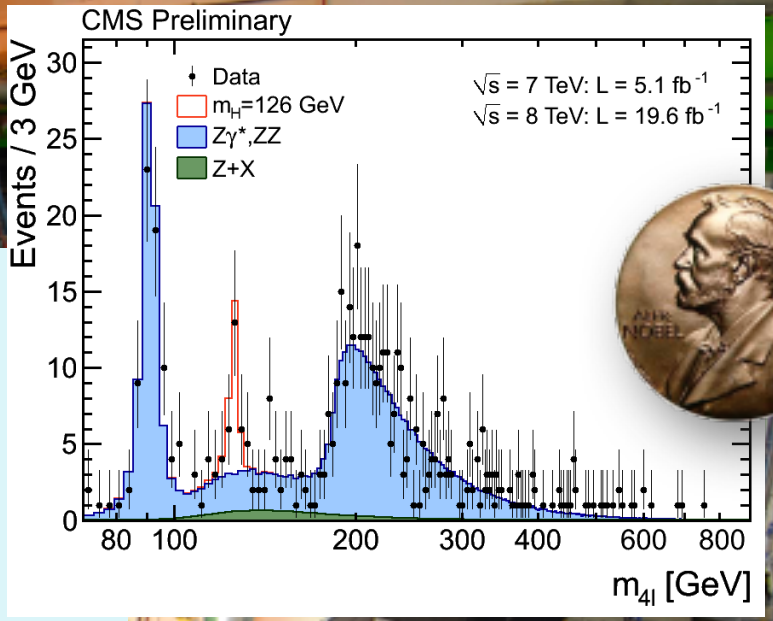
Past and running achievements

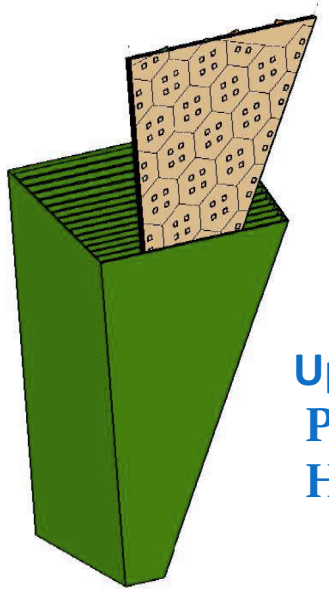


ECAL alveolar structure

Grid node at Ecole Polytechnique

Higgs boson discovery

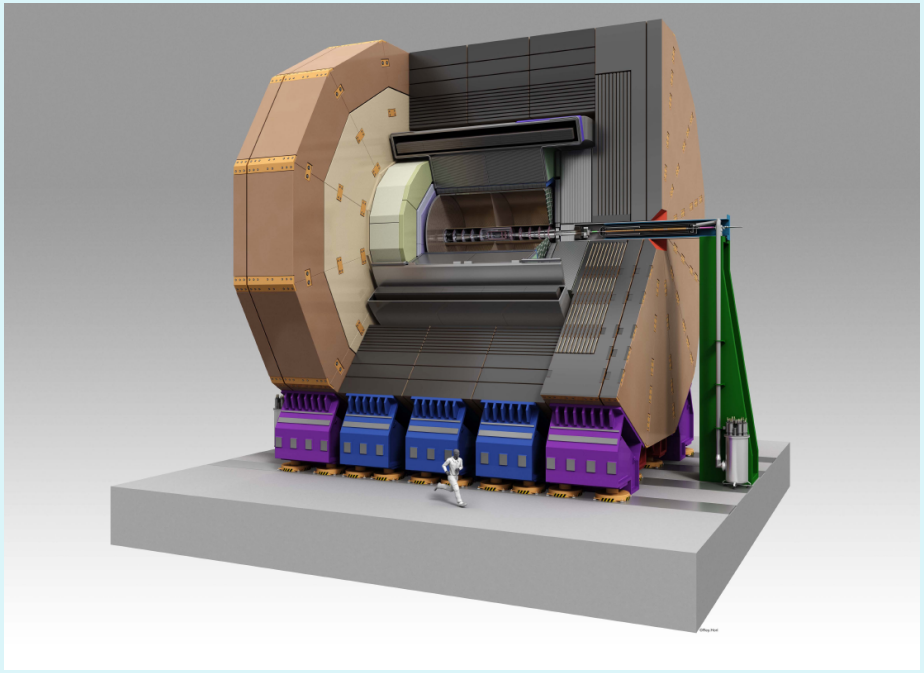


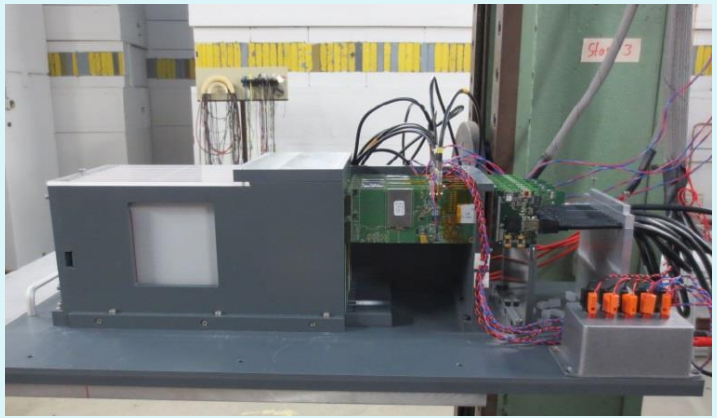


Upgrade Phase 2 HGCal

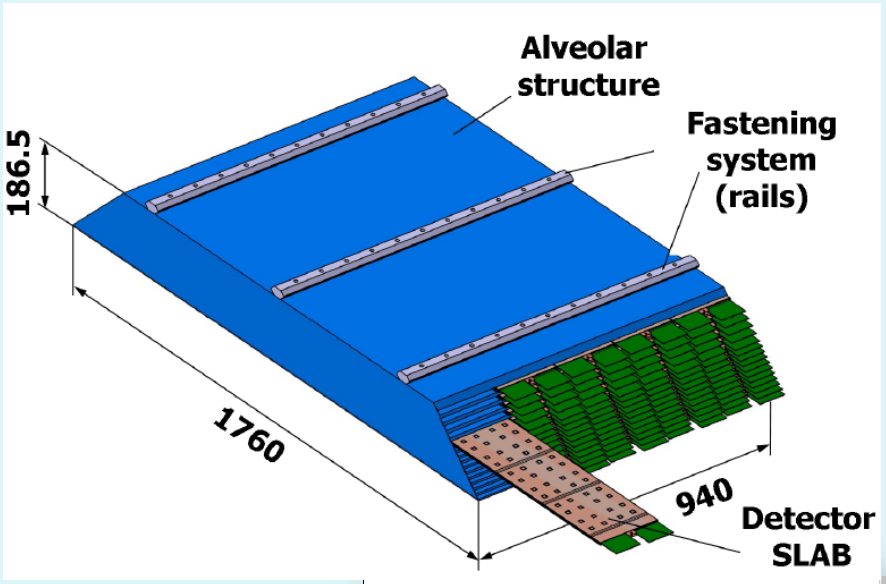
Future detectors: Ultra-granular calorimetry for e^+e^- (linear) collider

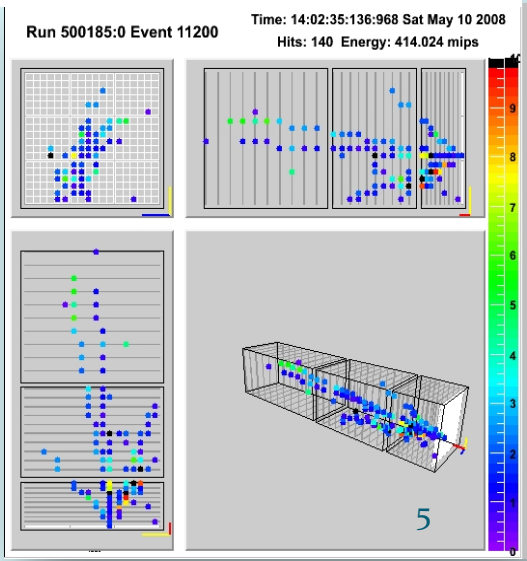
CALICE Calorimeter for ILC





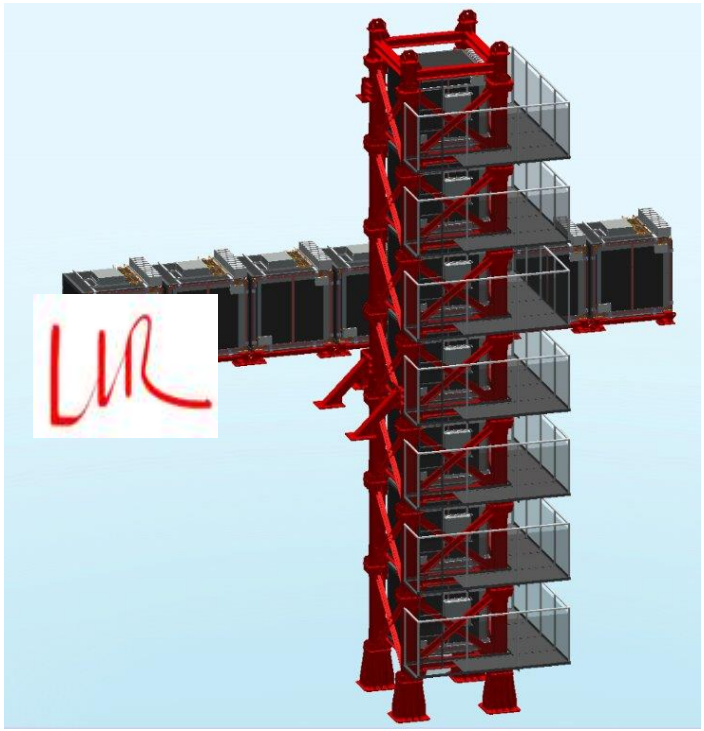
Calorimeter silicon-tungsten





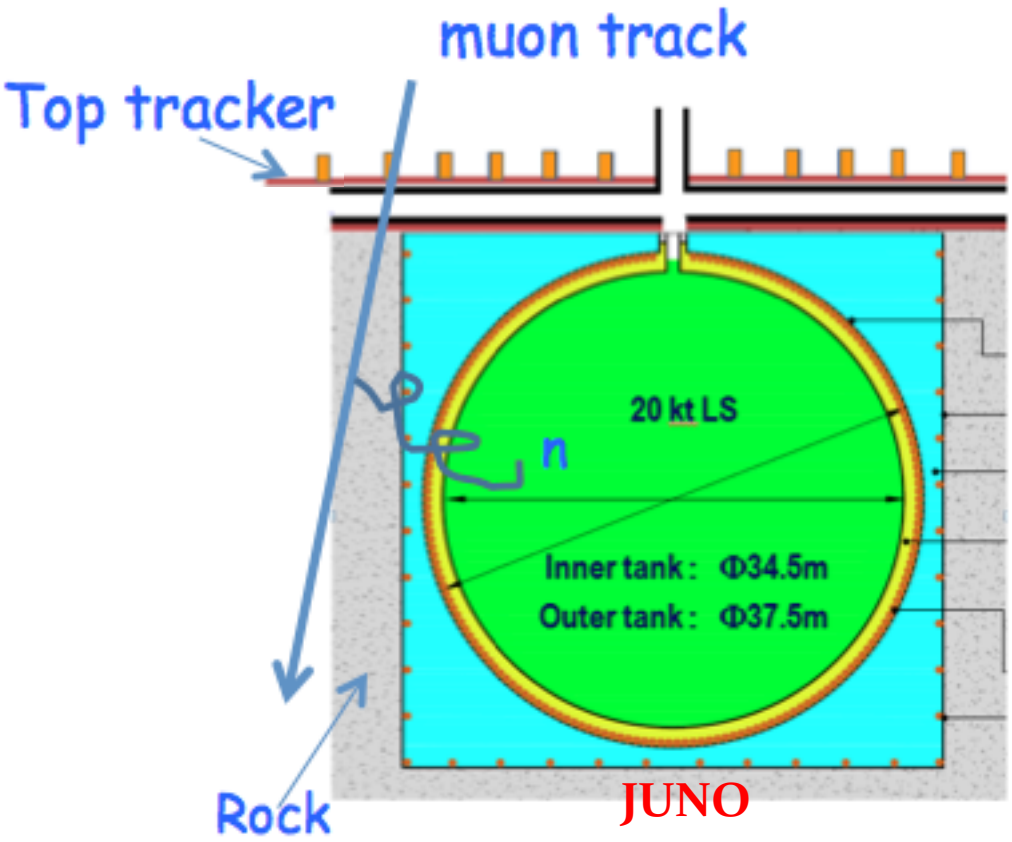
Neutrino physics

T2K : Tokai to Kamiokande



- Detector of neutrinos INGRID
  - Mechanics
  - Calibration

Neutrinos in JUNO



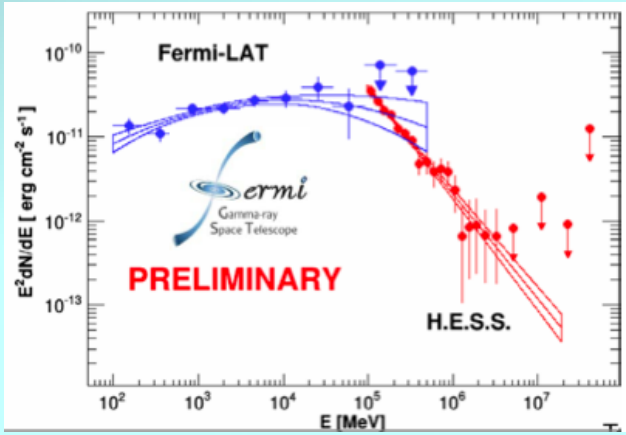
LLR joining JUNO effort (physics driven by mass hierarchy determination)

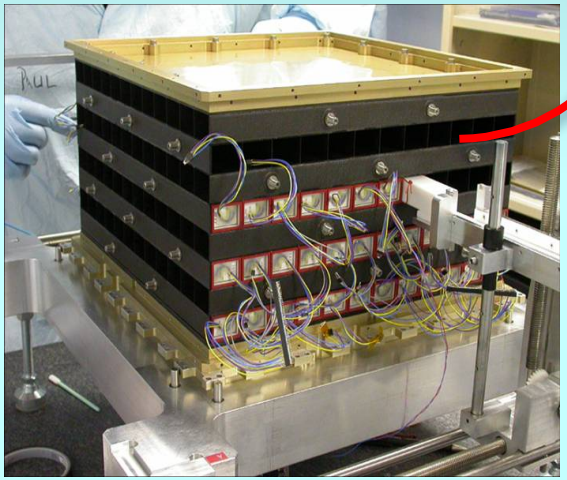
HESS in Namibie

Conception and realisation of the mechanical structure of the « cameras »

The spatial FERMI telescope

Modules of the FERMI calorimeter





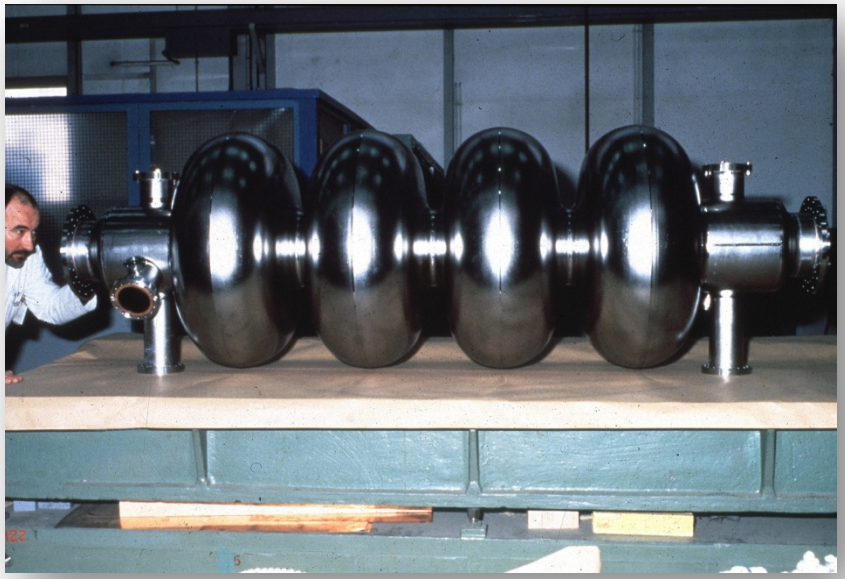
The future accelerators: Laser-Plasma

CILEX
Centre Interdisciplinaire Lumière EXtrême

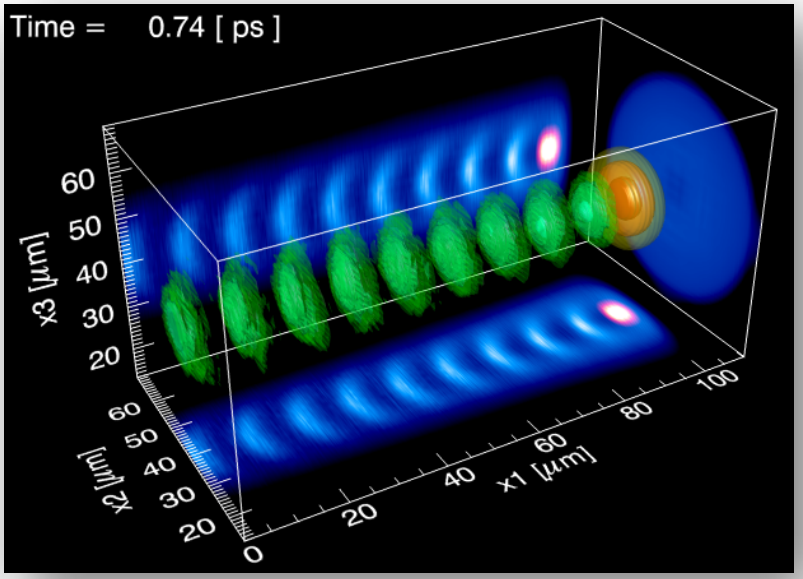
laboratoire d'optique appliquée

Radiofrequency wave (RF) v/s plasma waves

resonator = RF cavity



resonator = plasma



ILC : E_z 30 MV/m

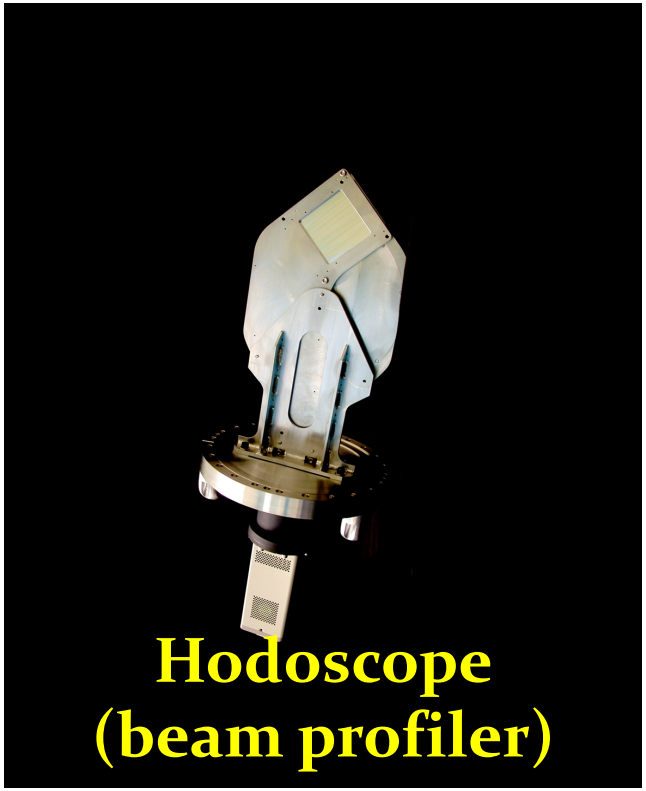
CLIC : E_z 100 MV/m

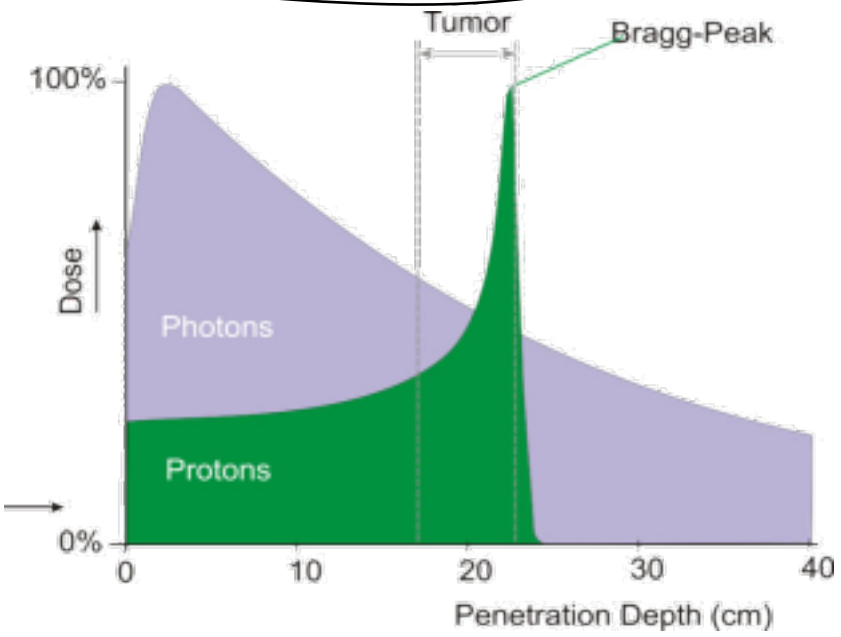
~ 300 000 MV/m

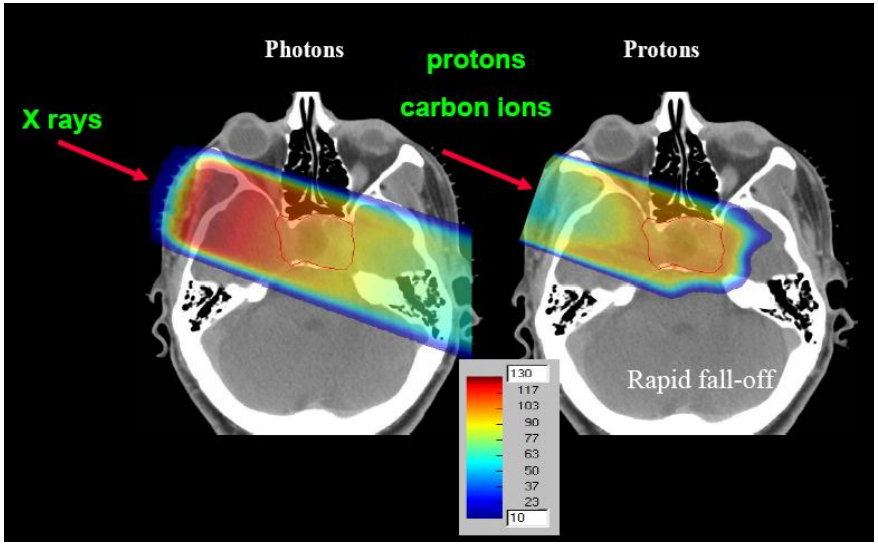
Simulations extremely CPU-intensive (see A. B.'s talk)

Medical applications

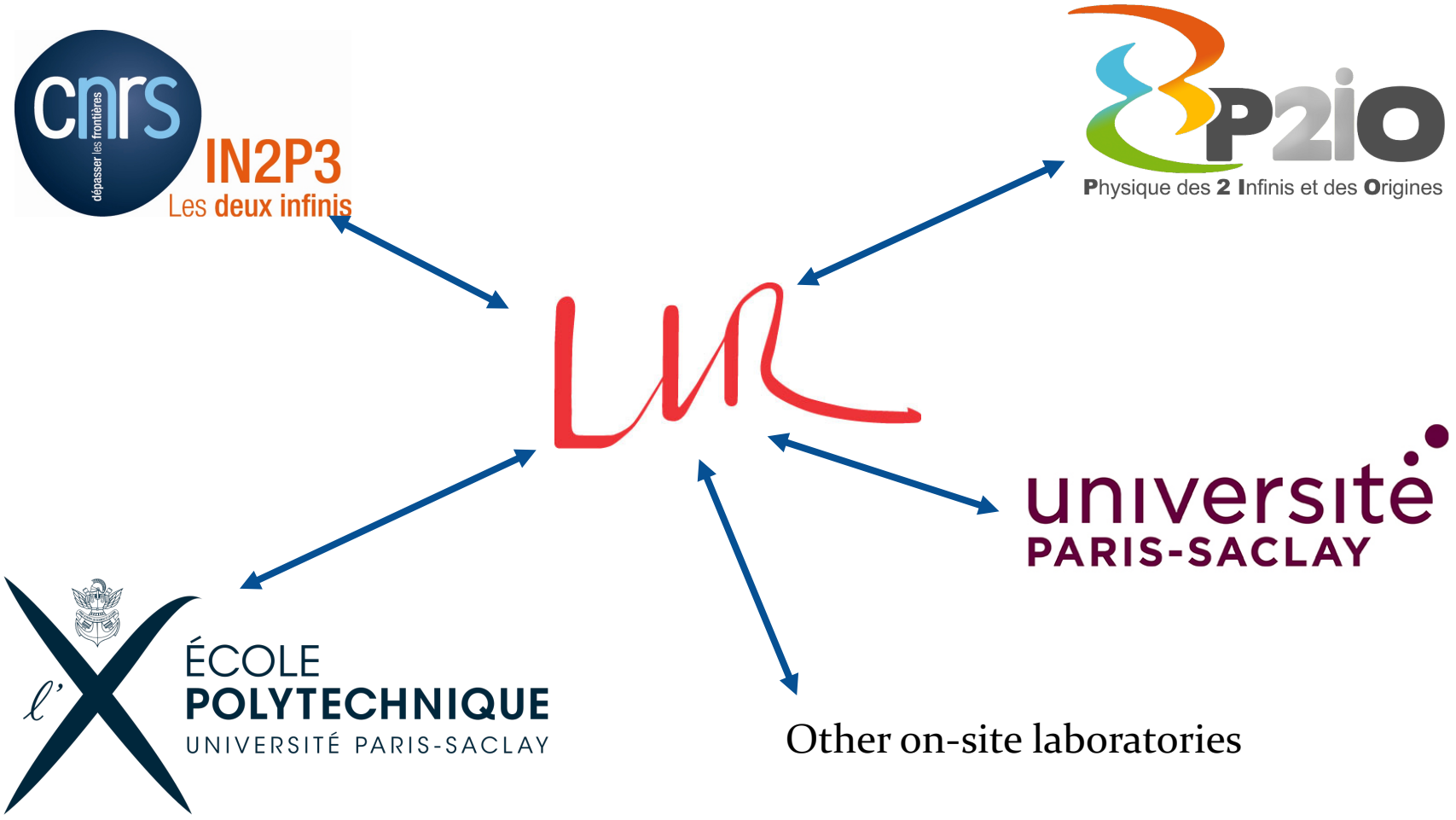
- Energy deposit of protons and ions more localized than for photons







LLR and its partners



LLR computing strategy (1)

- The LLR being founding member of the CMS experiment, it early took the road of the HTC
- A GRID computing farm has been setup as early as 2005. It is part of Grif and has a remarkable stability/availability (cf. A.S's talk)

- Polytechnique's site particularity:
- The machines are hosted in the "aile ø"
  - → Cooling and electrical power taken in charge by the Ecole
  - → Financial contribution to purchase hardware

LLR computing strategy (2)

- Technology watch : we saw the parallel computing becoming a promising solution to tackle the increasing computing needs of the simulation/reconstruction/analysis

- Decided to launch R&D in the lab on HPC end of 2011
  - Manpower
  - Hardware

- See G.G.'s and A.B.'s talks

Local collaborations

- LLR is not the only on-site lab with HPC needs, but undoubtedly the most expert in terms of developments
- The lab initiated a collaboration with the *Laboratoire des Solides Irradiés* and proposed to share the resource of a HPC cluster
- The idea of creating a mésocentre “Ecole Polytechnique” is currently emerging. (3 labs decided to go alone)
- On-going discussions on the possibility of shared storage capabilities between different labs

Future

- Clearly we will look simultaneously at two different scales
  - Global (WLCG, European projects) in coordination with IN2P3
  - Local (X, UPSay), especially for HPC