

Le Laboratoire de Physique Subatomique & Cosmologie

Presentation of the LPSC
Organization
Scientific programs



General overview of the LPSC

numerous collaborations with local partners...



...35 mins away from the campus

Presentation of the LPSC : context

Funding agencies

Unité mixte de recherche UMR 5821

CNRS : IN2P3 (+INSU, INSIS)

Univ. Grenoble-Alpes and engineer school Grenoble INP

Personnels

A total of 230 personnes + ~50 stagiaires / an

67 Permanent staff physicists (39 CNRS, 28 teacher-researchers : 19 UGA + 9 INP)

87 permanent staff Engineers/Technicians/Administrative (80 CNRS + 6 UGA+ 1 G-INP)

~35 doctorants, 15 postdocs

Buildings and infrastructures

UGA site (« west campus »)

20,000 m² buildings (9 buildings)

Installations

Mounting Halls, workshops, accélérateur beam lines (6)

Technological plateforme

Scientific context of large international collaborations

Large size : a few thenth to thousands of members (ex. LHC / 3000 people)

Long duration : R&D, construction, commissioning, data taking can take... 30 years

Computing Grid : distributed computing

Presentation of the LPSC : local context

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Local and regional Synergies

Univ. Grenoble-Alpes (UGA), CNRS labs and Grands Instruments (ILL, ESRF, LNCMI)

Pôle IN2P3-INSU (OSUG, LPSC, LAPP, LSM, LAPTh)

Physics des origines et des 2 infinis

Labex ENIGMASS (LAPP, LAPTh, LSM)

Labex FOCUS (IPAG, Néel, IRAM) + ANR (NIKA)

Interdisciplinary fields (theory, health, energy)

Centre de Théorie en Physique de Grenoble (LAPTh, IPN/ENS Lyon..)

Labex PRIMES (France, CHU), ANR AAP Cancer

Carnot Energie: molten salts (GEN-IV, SIMAP), Materials study (Néel, LETI..), Plasmas

Computing Grid (European Grid GEI, LHC Grid, local CIMENT grid)

Equipex BEDOFIH (EUROFIDAI, IdG, LPSC...)

Strong collaborations on specific areas with ILL, LNCMI, INAC, Néel, IPAG, SIMAP, etc...

Technological platforms at the LPSC

Computing grid (LCG, Institut des grilles)

Tier-2 : ATLAS, ALICE + biomed, ILC, regional grid since 2008

Performance: 95 serveurs 900 cores, 1.7 Po storage, 10 Gb/s networking

Neutronic platform

Générateur of pulsed neutron beam (GENEPI)

Nuclear chemistry Platform

Devoted to Molten salts research: loop FFER

Plasma platform IA3P (Procédés et Plasma Avancés)

Plasma multi-dipolaires reactors (déposition), plasma réacteurs (engraving Si, Ge, Sn..)

DECR6 reactors (Ionic Implantation using plasma)

Academic training in plasma for UGA/INP, test bench (~50 students/year)

Accelerator Beam lines & ion sources

Clean rooms (coupleurs for GANIL)

6 electrostatic beam lines

Laboratoire de Basse Activité

IN2P3 Becquerel Network, agreement with the french Nuclear Safety Authority

Radioactivity determination for industrials and academics

Academic Teachings at the LPSC

Physics field : 29th section

Lecturers in Nuclear physics, particle physics, astroparticles, cosmology, fundamental physics, nuclear energy, data analysis, medical physics etc...

- Experimental Techniques : L2, L3, M2R and M2Pro
- Data analysis : L3, M2R and M2Pro
- Theoretical Physics : L3, M2R
- Interdisciplinarity (radio-protection, medical physics) : all levels up to Master's

Teachings and responsibility at the Master level : UGA, G-INP

Responsibilities of Master in

- Subatomic physics, Astroparticule & cosmologie (UGA, Master)
- Energetics & Nuclear physics (G-INP PHELMA school, Master)
- Nuclear engineering (UGA, Master)
- Medical application and radioprotection (Master Medical physics)
- EEATS (electronic, electro-technics etc...)

Platform for subatomic & nuclear physics

UGA/G-INP : 400 students/year (Master & 2nd/3rd engineer years)

- PLATINE : Nuclear and subatomic physics (alpha, beta, gamma, neutron, muons etc...) and associated detectors (Germanium, Silicium, gaseous detectors, crystals etc...)
- SIREP (pilotage de réacteurs à Eau Pressurisée)

European School

- Accelerator school JUAS + Instrumentation school ESIPAP in CERN area

Organization Chart at the LPSC



A futuristic space landscape. In the foreground, a dark, cratered surface with some glowing blue and green patterns. In the background, a large, dark planet with a bright blue horizon line. A bright star with a lens flare is in the center, with two smaller planets or moons orbiting it. The sky is dark with many stars.

Scientific program in four axes

Axis 1 : from particles to nuclei

Particle physics in LHC Experiments at CERN

ATLAS : Higgs boson physics, Beyond Standard Model;

ALICE : Quark & gluon plasma characterisation

Future Detector at e+e- colliders team

CALICE : R&D in calorimetry for ILC

ILC : preparation to precision measurement in top quark physics

Nuclear Structure team

Study of heavy nuclei (nuclei enriched in neutrons) at GANIL, ILL, Rikhen etc...

Ultra Cold Neutron team (ILL and PSI)

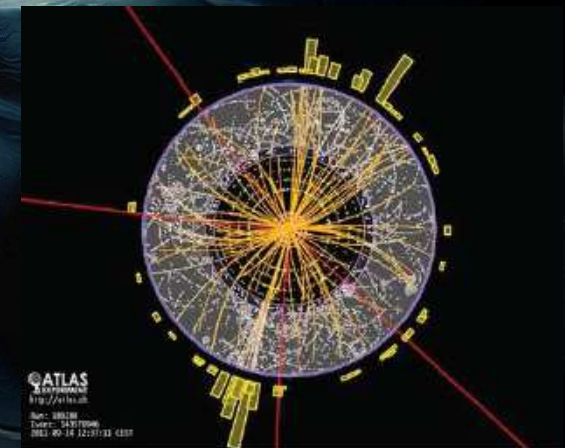
nEDM : Search for neutron electrical dipolar momentum

GRANIT: Study of neutron quantum states in gravitational field (ILL)

Theoretical Particle Physics team

Beyond Standard Model theories

Precision measurement in QCD, nuclear PDFs



Axis 2: astroparticle, cosmology, neutrinos

DARK team (AMS-CREAM-LSST)

Experiments on ISS (AMS, CREAM) : *High energy (1 GeV – 300 GeV) cosmic rays study*,
Future Telescope Large Survey Synoptic Telescope (LSST): *cosmology and dark energy*

Cosmology and CMB team (PLANCK-NIKA)

Cosmic Microwave Background (CMB) as a probe : cosmology
PLANCK satellite, NIKA telescope at IRAM

Implications on future CMB satellites (2030) with new technology : KIDS

AUGER team

Ultra High Energy Cosmic rays study, radio-detection at the GHz

AUGER experiment : 3000 km² detector array : *Determination of CR composition; high energy photons*

Dark Matter experiments

NEWS experiment : *Low mass dark matter particles detection*

MIMAC experiment : *Direct directional Détection of dark matter*

→ *New international collaboration forming (LSM, China...)*

Neutrinos team

STEREO experiment : *Search for sterile neutrinos*

→ *Developements around Genoble : LAPP ,ILL, LPSC...*



Axis 3 : energy and health

Reactor Physics team

Interdisciplinary Mission framework of CNRS (CEA, IRSN EDF, ...)

Axis "Transmutation" : Accelerator Driven System, Guinevere

→ Contributions to Myrrha program

Axis solid state fuel, Thorium cycle:

→ Scenarios, Thorium in actual reactors

Axis "Réactors of 4th generation" : molten salts, Thorium; design by safety

→ Modelling, neutronics-thermo-hydraulics couplings, ...

Transverse experimental activities: nuclear data, FFFER for molten salt research

→ Nuclear data experiments @ ILL, etc..., operating of FFFER loop at high temperature (600 C.)



Medical Application for Physics

Project : beam profiler : tight collaboration with Hospital Center CHU-Grenoble and ESRF

→ Validation of scale-1 prototype (2 licenses, patents); CHU-Grenoble; Labex PRIMES

Project : ABNCT with Nanoparticles/Boron

→ Main développements in Grenoble : IN2P3 & MI2B, labex PRIMES with l'ESRF, INSERM, CHUG

Project : Beam Monitoring for hadron-therapy

→ Developments around diamond detectors : MI2B, IPNL (IN2P3) and Labex PRIMES

Axis 4 : accélérateur, ion sources, plasma

Accelerator & ion sources Department

- Neutron line for Accelerator Driven Systems, ion sources, ECR, boosters
- Ion sources for Spiral2 @ GANIL (PHOENIX)
- 1+n+ Booster
- High frequency ECR ion sources (5.8 GHz, 60 GHz)
- Generator of pulsed neutrons for Guinevere (GENEPI)
- Power Coupling devices for Spiral-2
- Low Energy Line for Spiral-2

Plasma & materials team

- Cold Plasmas, applications to thin layers depositions
- Plasma micro-waves etc...
- Ions H- production for Iter

Key elements towards civil society

- numerous licenses, patents...
- Start-up @ LPSC since 2014
(application of ion sources)



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Welcome to our labotaroy !