Institute of Nuclear Physics of Lyon

A.Deandrea, Lyon 1 & IUF

LIA and CEFIPRA Bangalore meeting, May 4th 2016

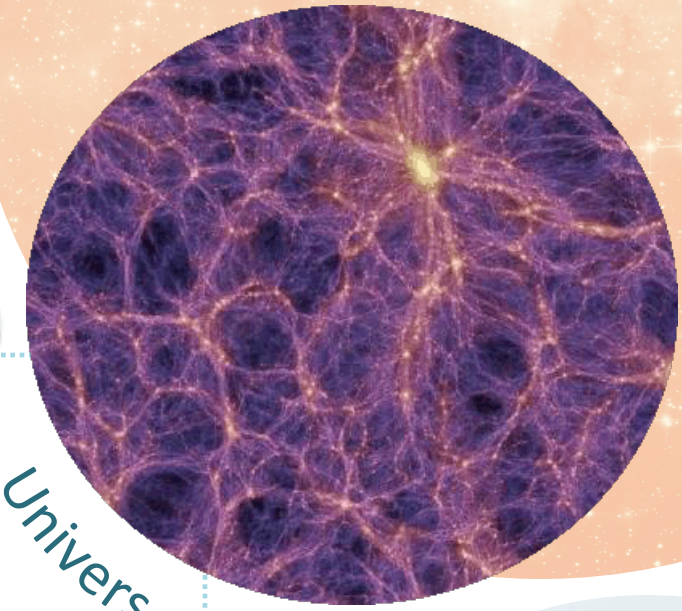
Lyon 1

Institut de Physique Nucléaire de Lyon

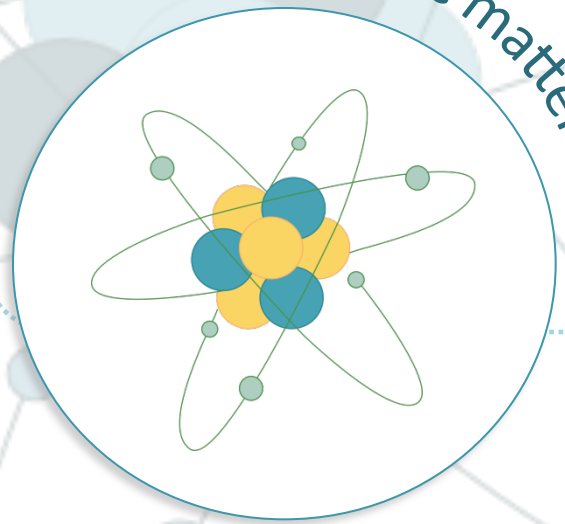
IUF

Research Institute

From small to large scale physics



Subatomic matter structure



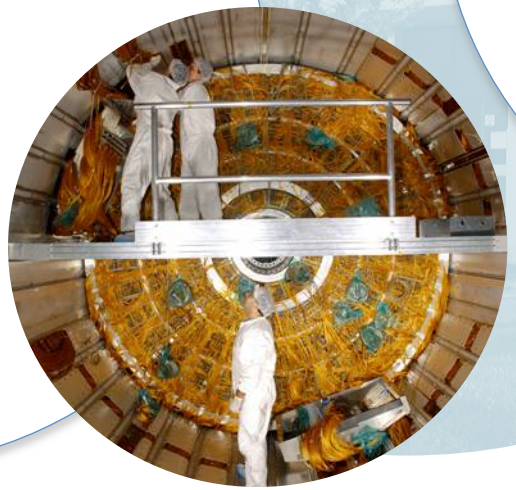
Univers structure

Applications

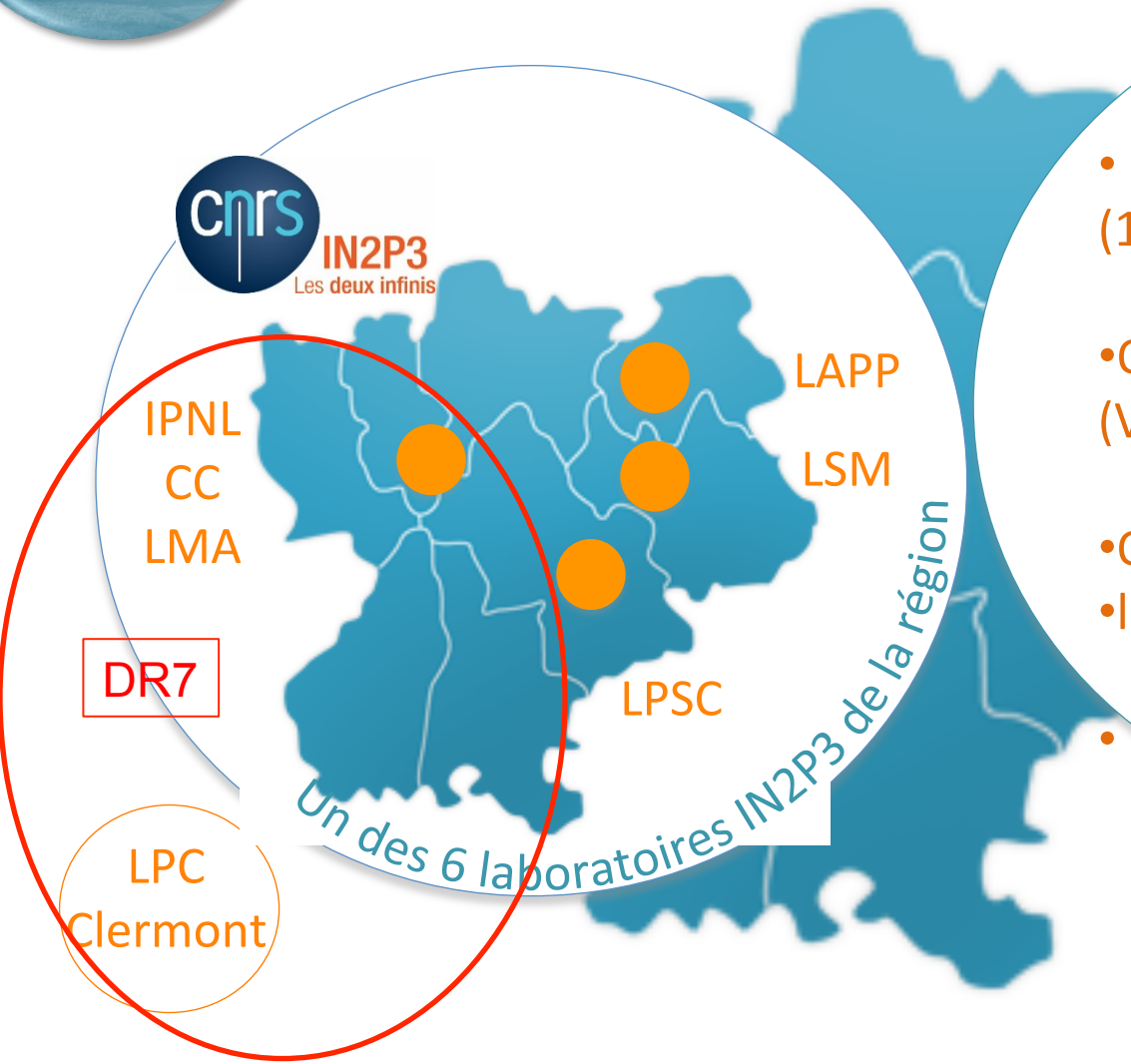
Research and education Institutions

Institute for Nuclear and Particle Physics of CNRS

University Claude Bernard Lyon 1



IPNL location



IN2P3
Les deux infinis

- Largest CNRS structure in DR7 (100 PP CNRS)
- On the Doua University Campus (Villeurbanne)
- One of the largest
- laboratories on campus
-

Lyon 1

IPNL Manpower

229 people

157 staff

30 *CNRS researchers*
43 *University staff*
84 *engineers, technicians, administrative*

72 non-permanent staff

40 *PhD student*
24 *PostDocs*
7 *Long term visitors*
1 researcher from CEA

IPNL structure

Research and services

5 main scientific subjects

***12** research groups*

7 technical services for the experimental research groups

6 services for research

Budget (wages excluded) 2,5 M€

RESEARCH

Elementary constituents and interctions.

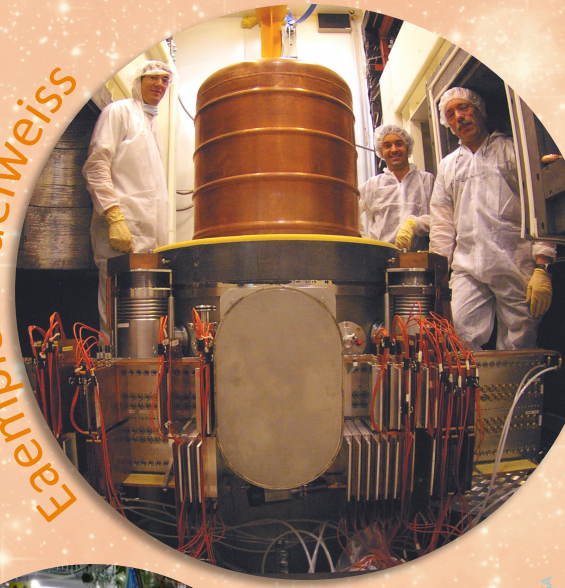
States of Matter: from atoms to quark-gluon plasma

Example : ALICE

Fundamental constituents of matter and theoretical models.

Theoretical Physics

Structure and evolution of the Universe :
Dark matter and Dark Energy



Example : Edelweiss

Antimatter production

RESEARCH

To the smallest scales:

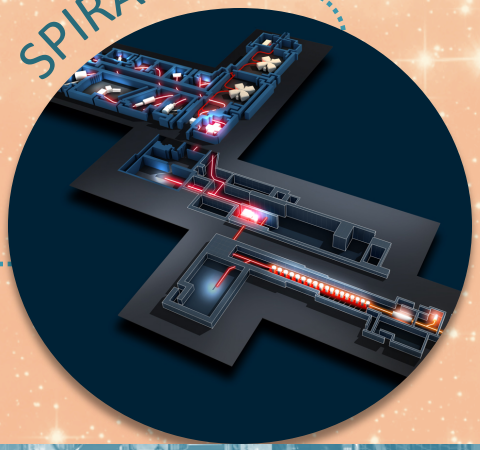
Elementary constituents of matter and their interactions

CMS/LHC

Studies from the atomic nucleus up to quark-gluon plasma

ALICE/LHC

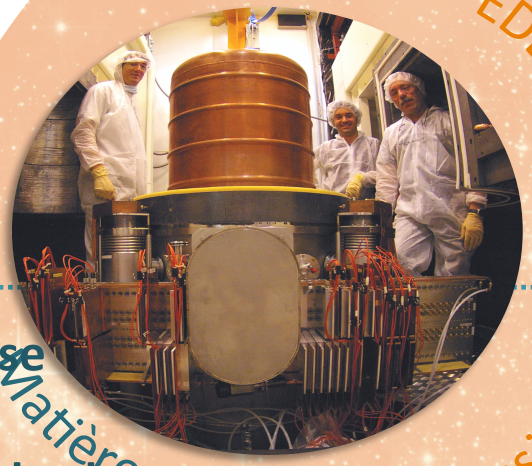
SPIRAL2



RESEARCH

To the largest scales:

Structure and evolution of the Universe
Neutrino oscillations
Windows on physics beyond the Standard Model

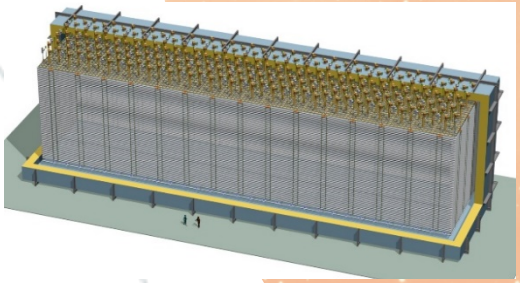


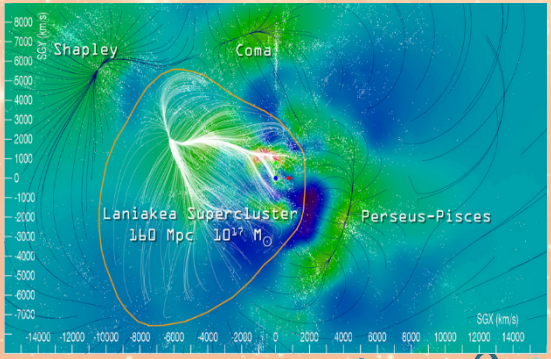
EDELWEISS

Matière noire

Mission EUCLID

WA105/DUNE





Laniakea

Neutrinos

RESEARCH

Theoretical Physics

Theoretical models use and predict physics at both small and large scales.

AEGIS

Production and gravitational properties of anti-matter

BOTH SCALES:

THEORY GROUP @ IPNL

14 permanent staff (IPNL) and 2 permanent visitors (CRAL), 3 PostDoc, 7 PhD students

3 main research lines: High energy particle theory, Hadronic and nuclear physics, mathematical physics

LIA-CEFIPRA involvement: 4 permanent:

G.Cacciapaglia and A.Deandrea (IPNL)
A.Arbey and N.Mahmoudi (CRAL)

Key subjects: Collider Physics, Higgs physics, Model building, flavour, dark matter particle candidates

RESEARCH

LHC and in particular CMS

IPNL participate in the LHC project with a large CMS group

CMS experiment at the LHC

CMS

LHC collider at CERN

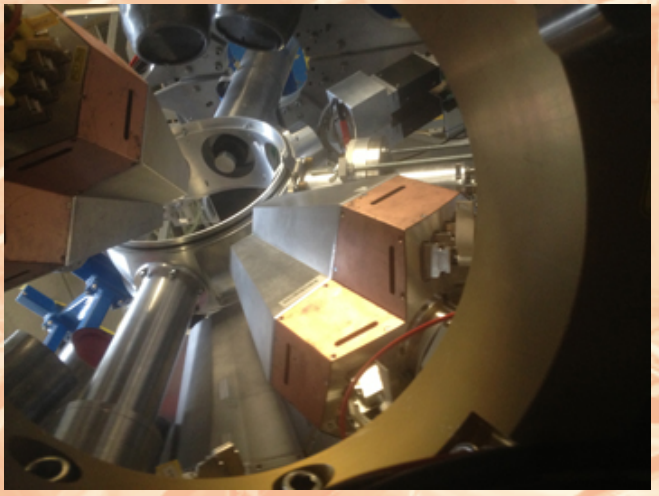
MATTER AND STRONG INTERACTIONS

Heavy Ion collisions

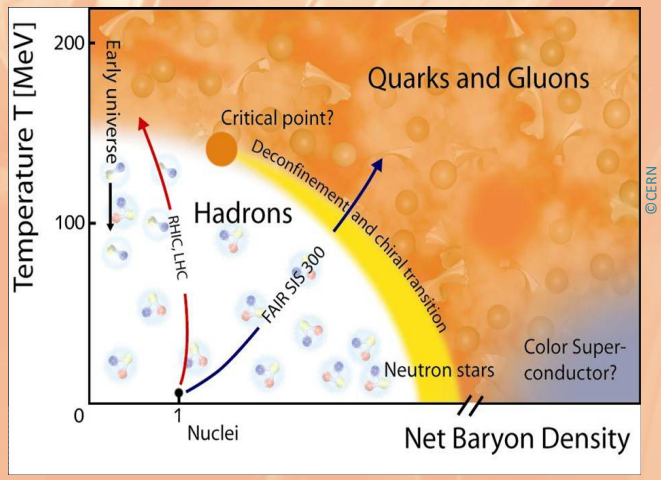
Nuclei in extreme conditions

Phase transitions and phase diagram

Quark-Gluon Plasma



AGATA at GANIL



RADIATION SCIENCE

- **Stockage of nuclear reactor waste**
  Environnement and energy

- Microscopic effects of radiation on living matter
- Biology and technology

- **Light ions interactions with matter for cancer therapies**
- Biomedical applications

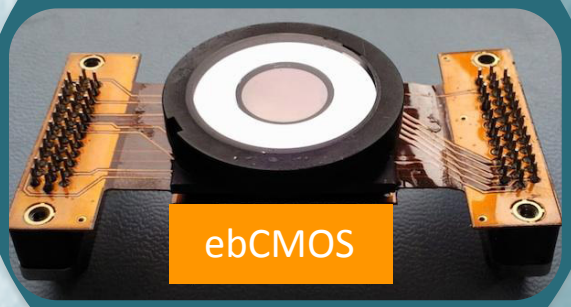
ENVIRONNEMENT TECHNOLOGIE SANTÉ
BIOLOGIE MONDE INDUTRIEL BIOMÉDICAL

PLURIDISCIPLINARY APPLICTIONS

R&D DETECTORS

ANAFIRE, LABRADOR

- ✓ R&D new fast and more sensitive photo detectors
- ✓ Rdioactivity metrology
- ✓ ion beams for radiobiology and environment

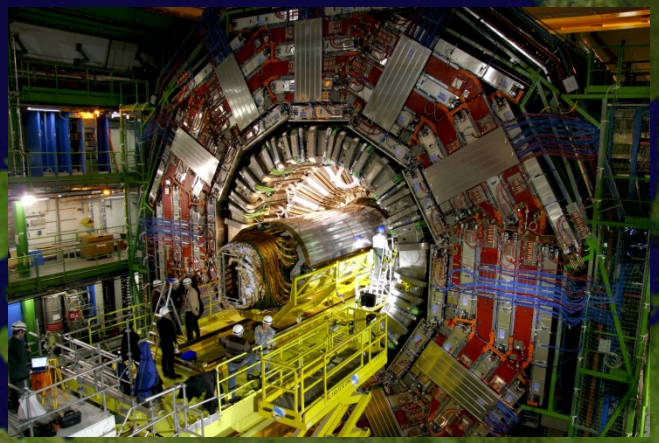


ENVIRONNEMENT TECHNOLOGY SANTE

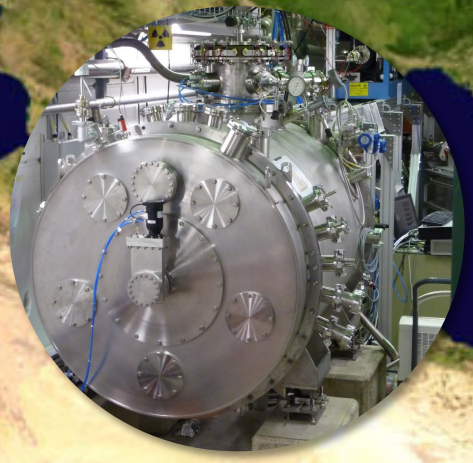
BIOLOGY MONDE INDUTRIEL BIOMEDICAL

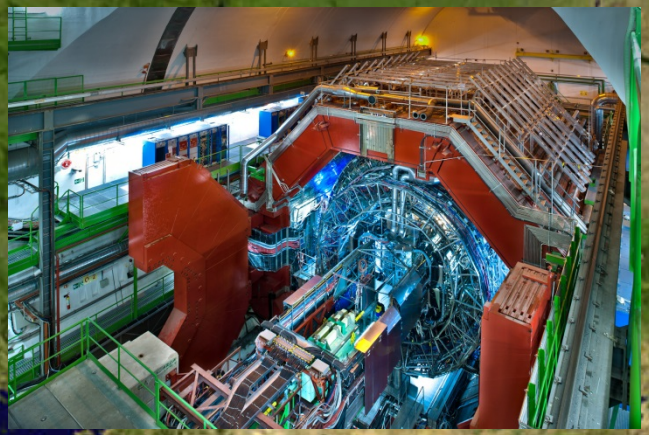
INTERNATIONAL COLLABORATIONS

INTERNATIONAL COLLABORATIONS

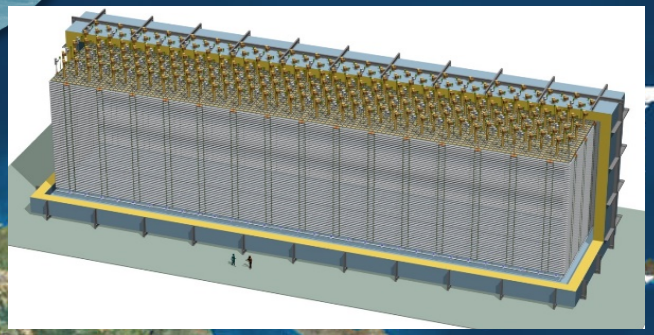


CERN
CMS/ALICE
AEGIS
WA 105

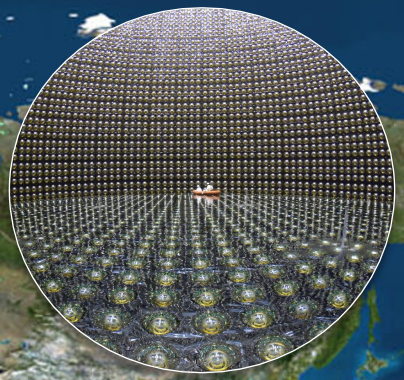




INTERNATIONAL COLLABORATIONS



DUNE: longBaseline neutrino detector



SNFactory (Hawaï)

EUCLID (Espace)

T2K (Japon)

CALICE (ILC)