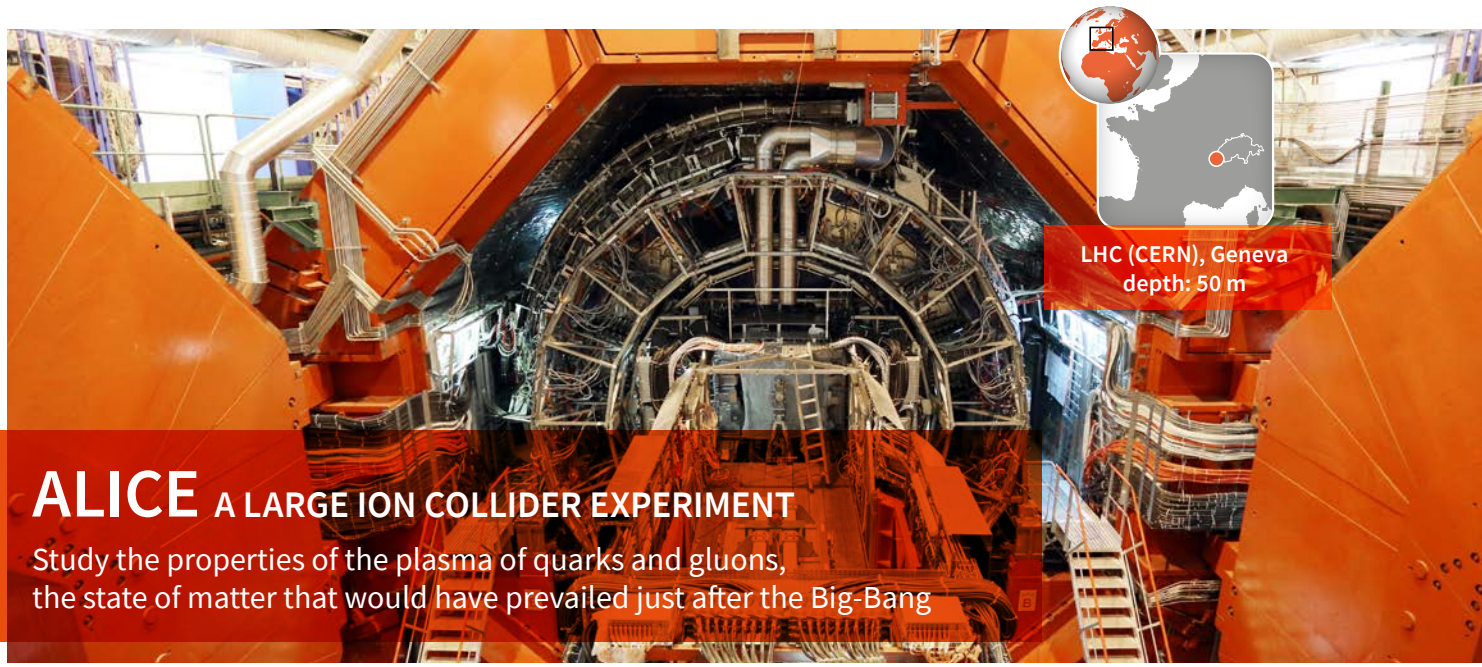
National Institute of Nuclear and Particle Physics

Study of the properties of the plasma of quarks and gluons



ALICE A LARGE ION COLLIDER EXPERIMENT

Study the properties of the plasma of quarks and gluons, the state of matter that would have prevailed just after the Big-Bang

- **Scientific leader:** Boris Hippolyte (IPHC) *
- **Laboratories involved:** CC-IN2P3 (Lyon), IJCLab (Orsay), IPHC (Strasbourg), IP2I (Lyon), LPC (Clermont-Ferrand), LPSC (Grenoble), Subatech (Nantes)
- **Nature:** research infrastructure
- **Status:** international project in operation based at the CERN. The ALICE experiment is installed in the French part of the LHC in Sergy.
- **Websites:** http://alice-collaboration.web.cern.ch, site for general public http://lhc-france.fr

10K tonnes

20 years of design

39 participating countries

20 years of operation

1 935 scientists

132 million euros (construction cost)

SCIENTIFIC OBJECTIVES

The ALICE experiment studies a particular phase of matter: the plasma of quarks and gluons. Scientists are creating this plasma using collisions of heavy ions and are seeking to recreate and characterise this state of matter that would have prevailed for a few microseconds just after the Big Bang. The properties of this phase are key points in the theory of the strong interaction that describes, among other things, the confinement of quarks, i.e. the way in which they have lost their freedom to combine into more complex particles called "hadrons".

RESOURCES DEPLOYED

- The world's largest time projection chamber: diameter 5 m and length 5 m, for a total volume of about 90 m³.
- The highly transparent internal trajectometer with about 10% radiation length, with improved and extended acceptance in the front region for "Run 3".
- A muon spectrometer to study the full spectrum of quarkonia J/Ψ, Ψ', Υ, Υ', Υ'' in the pseudorapidity interval $2.5 \leq \eta \leq 4$.

IN2P3 CONTRIBUTIONS

- Participation in the design and construction of the trigger detectors, electromagnetic calorimetry, internal trajectometer and muon spectrometer.
- First measurements of strange hadrons from the test collisions (in 2009) during the commissioning of the LHC, and then of the production of multi-strange hadrons.
- Characterisation of quarkonia outflow and discovery of J/psi regeneration.
- Characterisation of QGP hard probe production (jets, gamma, W and Z).
- First measurements of the elliptical Υ flow at the LHC
- Participation in the design and construction of the new ITS and the Muon Forward Tracker (MFT).

OTHER FRENCH LABORATORIES INVOLVED

Irfu (CEA Saclay)

1993 Declaration of intent for the ALICE project

2010 First "Run 1" data taken

2015 The LHC ramps up to 13 TeV for proton-proton collisions and 5 TeV for lead-lead collisions

2018 Construction of the MFT, which extends the acceptance of the inner trajectometer in front of the muon spectrometer

2019-2021 Upgrades of ALICE detectors and electronics. Installation of the MFT.

2022 Start of LHC "Run 3"

2030 Expected end of "Run 4" and ALICE operations

* Since 2019

April 2022