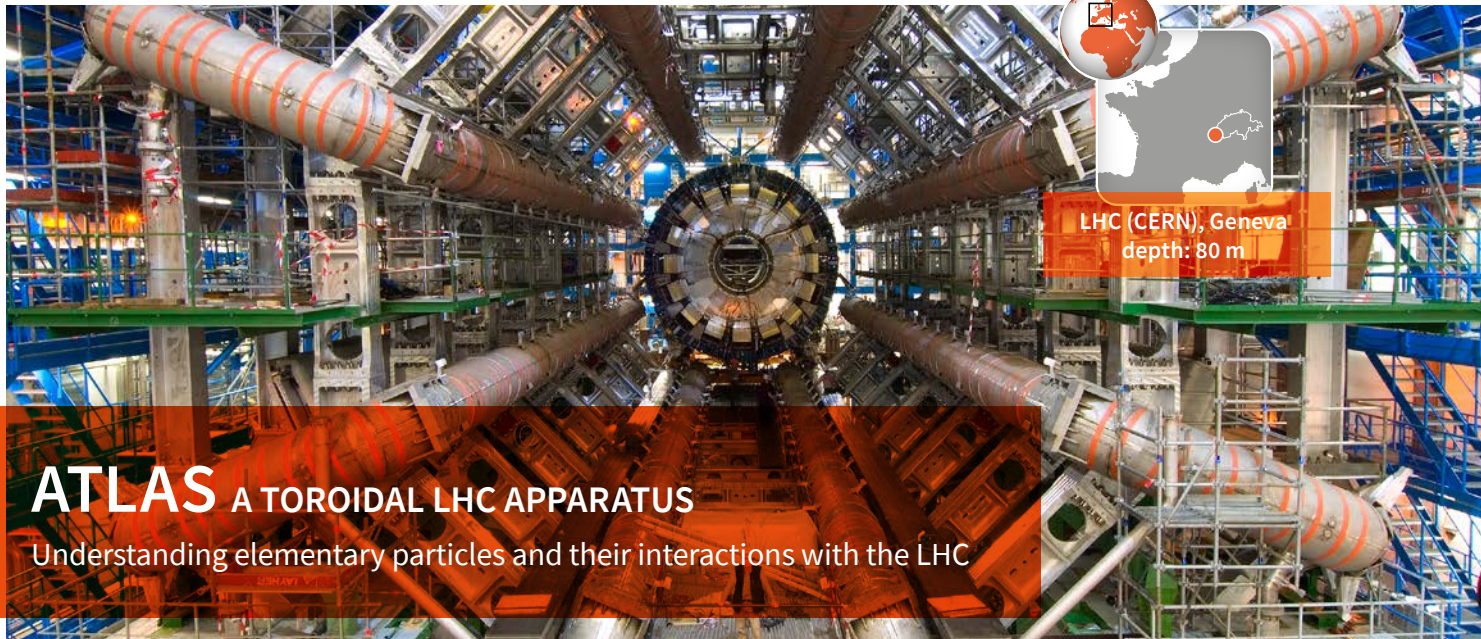Elementary particles

ATLAS A TOROIDAL LHC APPARATUS
Understanding elementary particles and their interactions with the LHC

LHC (CERN), Geneva
depth: 80 m

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- **Scientific leader:** Laurent Serin (IJCLab) *
- **Laboratories involved:** CC-IN2P3 (Lyon), CPPM (Marseille), IJCLab (Orsay), LAPP (Annecy), L2IT (Toulouse), LPC (Clermont-Ferrand), LPNHE (Paris), LPSC (Grenoble), OMEGA (Palaiseau)
- **Nature:** research infrastructure
- **Status:** international project based at the LHC Point 1 (Meyrin, Switzerland) on the CERN site. France and Switzerland are the host countries of the LHC.
- **Websites:** https://atlas.cern/ and http://lhc-france.fr

183 institutes

38 participating countries

3 000 physicists

3 000 km of cables

450 Petabytes of data stored to date

1 200 PhD students

SCIENTIFIC OBJECTIVES

ATLAS is one of the four major experiments at the LHC. This versatile detector is designed to exploit the full physics potential of the accelerator by answering fundamental questions about the ultimate constituents of matter, the forces that govern them, and the underlying symmetries that govern our universe. To this end, ATLAS continues to study the Higgs boson after having co-discovered it, and is looking for possible new particles, such as those that might indicate additional dimensions of space-time or dark matter particles.

RESOURCES DEPLOYED

ATLAS is built at CERN in a cavern 100 m underground next to the LHC, the world's most powerful particle accelerator. At 46 m long and 25 m both high and wide, ATLAS is the largest particle detector built to date. Each of its six sub-detectors measures a particular parameter: trajectory, nature, energy of the particles. These detection systems provide 100 million measurements at a time, which ATLAS can activate at a rate of 40 million per second. A "trigger" system is used so that only interesting events are retained.
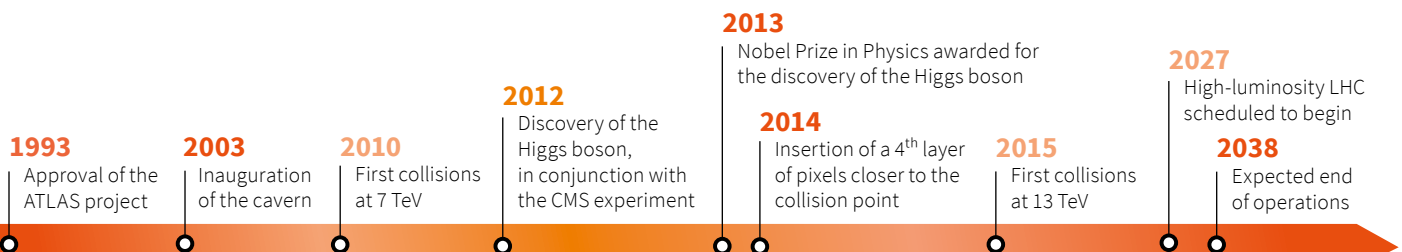
IN2P3 CONTRIBUTIONS

- Design and construction of the ATLAS detection systems: central and front liquid argon accordion calorimeters, innovative R&D and construction of the pixel detector (then of its 4th layer), hadronic tile calorimeter, triggering system.
- Analyses of data leading to the discovery of the Higgs.
- Establishment of a T1 computing infrastructure on the grid for the processing of LHC data at the IN2P3 CC in Lyon.
- Robust involvement in the ongoing refurbishment of the main sub-detectors for the high luminosity phase of the LHC.

OTHER FRENCH LABORATORIES INVOLVED

Irfu (CEA Saclay)

1993
Approval of the ATLAS project

2003
Inauguration of the cavern

2010
First collisions at 7 TeV

2012
Discovery of the Higgs boson, in conjunction with the CMS experiment

2013
Nobel Prize in Physics awarded for the discovery of the Higgs boson

2014
Insertion of a 4th layer of pixels closer to the collision point

2015
First collisions at 13 TeV

2027
High-luminosity LHC scheduled to begin

2038
Expected end of operations