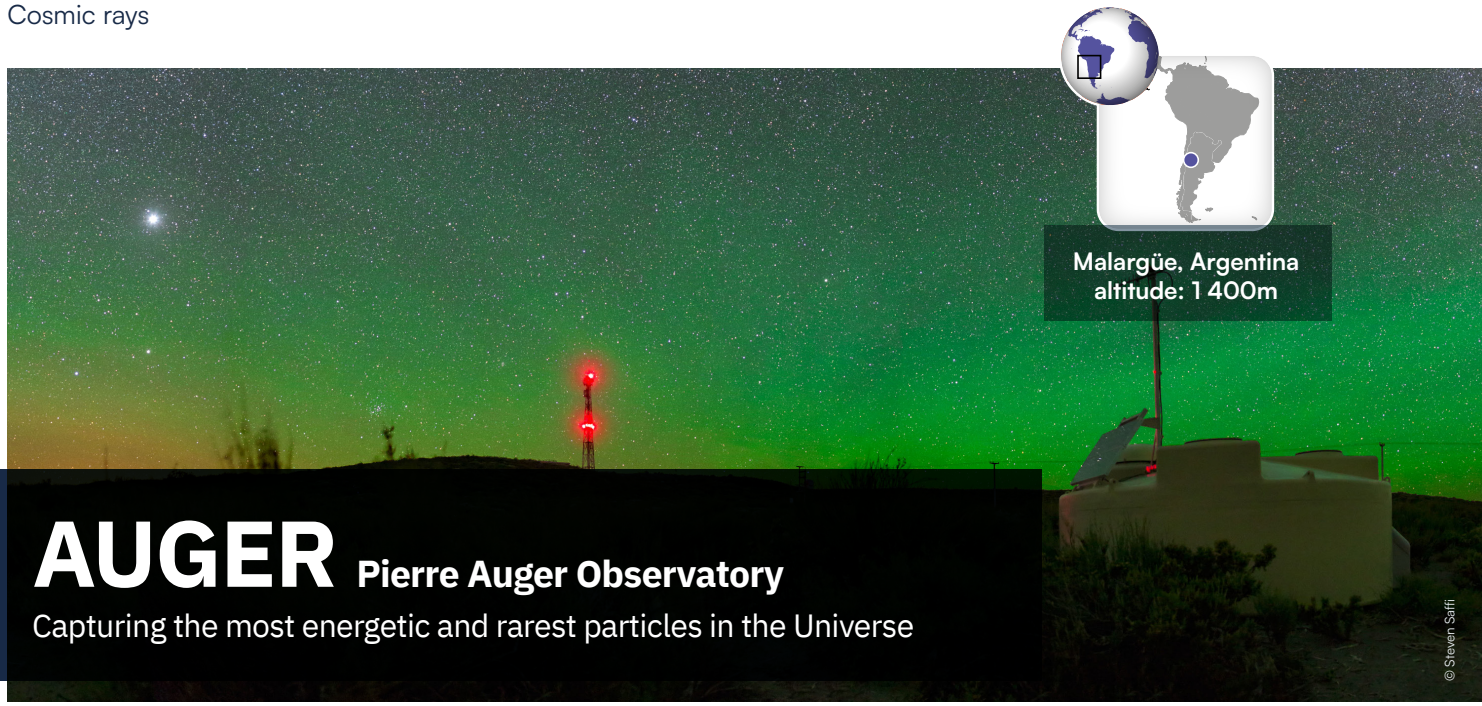
NUCLÉAIRE & PARTICULES

National institute of nuclear and particles physics

Cosmic rays



AUGER Pierre Auger Observatory

Capturing the most energetic and rarest particles in the Universe

Scientific leader: Olivier Déligny (IJCLab) *

Laboratories involved: CC-IN2P3 (Lyon), IJCLab (Orsay), LPNHE (Paris), LPSC (Grenoble)

Nature : research infrastructure

Status: project mainly funded in 2020 by Germany, Argentina, France, Italy and the Netherlands

Website: https://www.auger.org/

Scientific objectives

The Earth is continuously bombarded by particles from the cosmos, the so-called "cosmic rays". The Pierre Auger Observatory studies the most energetic and mysterious of these particles: their energy exceeds 10^{18} electronvolts and can even exceed 10^{20} electronvolts. This is a phenomenal energy that far exceeds that involved in the LHC collisions. For the past 20 years, the observatory has been observing these cosmic rays through the immense cascades of particles that they form when they collide with the atmosphere. It has tackled the enigmas of their origin and nature, and its results have led to remarkable advances. To go even further, the Pierre Auger collaboration is currently reinforcing the performance of its detectors with the AugerPrime improvement programme.

Resources deployed

- The world's largest atmospheric cosmic ray detector. It covers an area of 3 000km^2 on the Pampa Amarilla plateau at an altitude of 1 400 metres, in Argentina.
- It comprises an array of 1 660 stand-alone particle detectors, overlooked by 27 fluorescence telescopes.
- Complementary detection systems were deployed: a 17km^2 antenna array and buried muon detectors.
- Remote control rooms have been developed in some fifteen laboratories around the world.

450 PhDs

72 research institutions

18 participating countries

25 years of operation

3 000 km^2 of surface instrumented

IN2P3 CONTRIBUTIONS

- Development of the majority of the Cherenkov detector electronics, and of the essential computer programs: processing of the detector data including the central triggering system of the network, and the central data acquisition system.
- Participation in the first on-site radio detection network and the AugerPrime project.
- CCIN2P3 stores the Auger data, IN2P3 researchers analyse and interpret them. They play a major role in studies of the distribution of cosmic ray arrival directions and their energy spectrum.

1995 The Auger collaboration chooses a site in the province of Mendoza in Argentina

2001 The first detector is installed and first data from this detector are collected

2003 The observatory becomes the largest one ever built for cosmic ray detection

2008 Confirmation of flux suppression at 4.10^{19}eV

2017 A publication appears showing the extragalactic origin of cosmic rays above 8.10^{18}eV

2019 Twenty years since the observatory begins operations

2024 End of the AUGER Prime upgrade deployment

* Since 2022

April 2024