



Probing the infinites: from particles to cosmos

CNRS Nucléaire & Particules, also called National Institute of Nuclear and Particle Physics (IN2P3) coordinates French research & development activities in the fields of nuclear physics particle and astroparticle physics. The institute contributes to the developments of associated technologies and applications, most notably in the health, energy and environment sectors. These researches aim primarily at understanding fundamental interactions and the physics of the infinitely small and the infinitely large scales.

Scientific fields

- Particle and hadronic physics
- Nuclear physics and astrophysics
- Astroparticle physics and cosmology
- Research and development of particle accelerators
- Interdisciplinary research linked to ionizing radiations for the benefit of society, in health, energy and environment

Strategic priorities

• Understanding matter and the Universe

Subatomic physicists from CNRS Nucléaire & Particules and their colleagues across the world strive to answer three fundamental questions : what are the elementary constituents of the subatomic world and how do they interact ? What is the structure of nuclear matter ? What is the Universe made of and which forces govern its behaviour ?

Strengthening ties with other disciplines

CNRS Nucléaire & Particules' scientific and instrumental expertises are shared to advance various fields of research such as astrophysics, chemical sciences, materials physics, and life sciences.

• Developing closer relationships with society

CNRS Nucléaire & Particules is involved in the design of new instruments for medical diagnosis and therapy, in research on radioactive waste management and future nuclear energy techniques, and in transferring high-tech development to the private sector. The institute also provides its expertise in the computer processing of very large volumes of data.

• Training future researchers and engineers

The institute plays an active role in training young scientists. It contributes to teaching at universities and engineering schools, and welcomes numerous interns and PhD students to its laboratories.

Large international projects and instruments

CNRS Nucléaire & Particules conducts large-scale theoretical and experimental research, which requires deploying very large instruments. This research is most of the time carried through large collaborative projects pursued at the European or international levels. The basic instruments used in the discipline are :

- particle and nuclei accelerators ;
- particle detectors located at high-energy accelerators or in underground laboratories ;
- instruments for space-based, ground-based or undersea observation of high energy cosmic rays and neutrinos, to study violent phenomena in the Universe ;
- vast arrays of ultra-sensitive sensors to observe the Universe in its largest dimensions in relation to particle physics and cosmology.

CNRS Nucléaire & Particules

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Test device for the electronic signal digitisation system associated with the photomultipliers of the JUNO detector by LP2i Bordeaux. © Jean Jouve

To facilitate the pooling and optimisation of its resources and expertise, CNRS Nucléaire & Particules is organized in a limited number of large laboratories and research infrastructures, located in or near France major universities. Its technological platforms are often operated in collaborations with other CNRS institutes, CEA or INSERM laboratories, as well as CNES and major international universities or research organisations.

Technological transfer and industrial partnerships

Through a network of laboratory experts, CNRS Nucléaire & Particules provides its scientific and technical expertises to areas such as health improvement, in particular medical imaging and radiotherapy, aerospace industry and electronics, as well as radioactivity measurements in the environment with, for example, the measurement of low radioactivities through the Becquerel network.

Key figures

1 050 permanent researchers including	10 national platforms and infrastructures
600 CNRS 450 faculties	16 large research infrastructures
1 600 permanent staff including 600 research engineers	13 interdisciplinary platforms
800 doctoral and post-doctoral fellows	28 international actions and research projects
15 startups	21 national and international laboratories

Cover image : The ATLAS detector before the start of the data acquisition of spring 2024.
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