

Properties of atomic nuclei



NFS Neutrons For Science

Providing GANIL with a pulsed beam of high-energy neutrons

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- **Scientific leader:** Xavier Ledoux (GANIL) *
- **Laboratories involved:** GANIL (Caen), IPHC (Strasbourg), LPCC (Caen), IJCLab (Orsay)
- **Nature:** Research infrastructure
- **General Status:** Experiment room of the SPIRAL2 project at GANIL, which started operating in 2021.
- **Website:** <https://www.ganil-spiral2.eu/scientists/ganil-spiral-2-facilities/experimental-areas/nfs/> (in English)

SCIENTIFIC OBJECTIVES

The Neutrons For Science (NFS) room exploits the intense neutron fluxes created by the interaction of protons and deuterons accelerated by the LINAC on a conversion target. It is designed to accommodate detectors of different sizes to measure basic nuclear parameters observed after neutron impact on a target. The results of these experiments will be used for fundamental physics and for applications as varied as the design of future nuclear reactors, the treatment of radioactive waste, or nuclear medicine.

RESOURCES DEPLOYED

The neutrons, with a maximum energy of 40 MeV, are produced by nuclear reactions induced by the beams delivered by the SPIRAL2 linear accelerator on a Beryllium or Lithium converter. Depending on the converter used, the conversion reaction produces neutrons with a continuous or quasi mono-energetic spectrum. The neutron beam extracted from a 3 m long collimator passes through a 28 meter-long room. As the beam is pulsed, the energy of the neutrons can be measured by time of flight. Several experiments can be set up simultaneously.

19 European laboratories in the collaboration

10^{13} neutrons per second produced at the converter

30 metres: the available flight base

$8 \cdot 10^7$ neutrons per second per cm^2 in the time-of-flight room

8 funding partners

IN2P3 CONTRIBUTIONS

- Main architect of NFS through GANIL (GIE 50% CNRS/IN2P3 and 50% CEA/IRFU)
- Fabrication of the second collimator essential for the realisation of precision experiments at great distances.
- Development of the deflection magnet downstream of the converter.
- Development of a high precision neutron monitor.
- Installation of experiments at NFS.

OTHER FRENCH LABORATORIES INVOLVED

Irfu (CEA Saclay), DIF (CEA Bruyères-le-Châtel)

2007

1st presentation of the project to the SPIRAL2 scientific committee

2010

Decision to build

2019

1st LINAC SPIRAL2 beam received in the hall

2020

1st neutron beam: September

2021

1st experiments