



## PhD position in experimental nuclear physics

---

### Development of a multi reflection time of flight spectrometer for mass measurement at the DESIR Facility

---

#### Description

The DESIR (Decay, Excitation and Storage of Radioactive Ions) low-energy beam facility is currently under installation at GANIL in Caen, France. It is designed to deliver high-impact science across nuclear structure, nuclear astrophysics, fundamental interactions, and related fields. The beam preparation and purification devices are the first devices expected to be available at the DESIR facility. These include a general purpose ion buncher and cooler (GPIB [1]) and a double Penning trap (PIPERADE [2]) both currently undergoing commissioning at LP2i Bordeaux and scheduled for installation at GANIL in 2027. Complementing these, a multi-reflection time-of-flight mass spectrometer (MR-TOF-MS) will be developed. The MR-TOF-MS is a versatile and powerful instrument that will play a dual role at DESIR: as a fast isobaric purification stage, capable of separating exotic ion species in just a few milliseconds, and as a standalone high-precision mass measurement device.

The successful candidate will contribute to both instrumentation development and forefront nuclear physics research with:

-The **development of the MR-TOF-MS**: designing, assembling, and commissioning the spectrometer in close collaboration with LPC Caen, optimizing its ion-optical performance, and integrating it into the DESIR beam line infrastructure.

-The **data collection and analysis related to astrophysical phenomena**. A key question addressed concerns the explosion mechanism of core-collapse supernovae. Uncertainties in the nuclear reactions governing the production and destruction of  $^{44}\text{Ti}$  represent a significant bottleneck in our understanding of these events. Precise mass measurements of  $^{43}\text{Sc}$  and  $^{46}\text{Cr}$  are essential to constrain the relevant reaction rates. These measurements will be carried out at the IGISOL facility (University of Jyväskylä, Finland), using the JYFLTRAP Penning trap and their operational MR-TOF-MS — giving the candidate direct exposure to a mature system that mirrors in several respects the one they will be building at GANIL.

In addition, the student will have the opportunity to participate in **the installation and commissioning of PIPERADE and the GPIB** at GANIL, carried out in collaboration with the LP2i Bordeaux group. This will give the candidate direct experience with complementary trapping and cooling technologies central to the DESIR facility.

The student will be encouraged to present the results in national and international conferences and in peer reviewed journals. We aim to provide an open, inclusive, and respectful working environment, and to help students build a solid foundation for their future career, both within and beyond academia.

The candidate will join the FINDS (Fundamental Interactions aNd Dark Sectors) group within the DPHY division at GANIL. This 36 months PhD position is funded by the CaeSAR project, which benefits from state funding managed by the Agence Nationale de la Recherche under the France 2030 programme (reference ANR-23-EXES-0001), and from the Normandy region.

Expected skills:

A master degree in physics is required. Experience in experimental nuclear physics, simulation or data analysis is desirable.

The candidate must have good communication skills and the ability to work in collaborative, multidisciplinary projects. Fluency in spoken and written English is essential.

Contact: Laetitia Canete

Phone: +33 (0)2 31 45 45 24

Mail: [laetitia.canete@ganil.fr](mailto:laetitia.canete@ganil.fr)

[1] "The General Purpose Ion Buncher: a radiofrequency quadrupole cooler-buncher for DESIR at SPIRAL2": M. Gerbaux et al., NIM A 1046, 167631 (2023) - <https://hal.science/hal-03815181v1>

[2] "PIPERADE: A double Penning trap for mass separation and mass spectrometry at DESIR/SPIRAL2": P. Ascher et al., NIM A 1019, 165857 (2021) - <https://hal.archives-ouvertes.fr/hal-03390279>