

## **Fixed-term contract Researcher**

### **Magnetic characterisation of superconducting magnets for S3 spectrometer**

#### **General Information**

Contract type : Technical Fixed-term contract  
Typical job : Researcher  
Contract length : 24 months  
Expected date of recruitment : February 3<sup>rd</sup> 2020  
Working hours: Full-time  
Level of study : Ph.D.  
Expected experience : between 2 and 5 years  
Salary: between 2 643 € and 3 766 € monthly gross salary

#### **Missions**

Located in Caen, the Large National Heavy Ion Accelerator (GANIL) is one of the foremost research centres in the world, specialized in the production of rare isotope beams for the study of the properties of atomic nuclei far from stability. Combined with beam production, state-of-the-art detection systems are needed. SPIRAL2, a new accelerator project, is being installed to provide very intense ion beams.

This position is part of the S3 spectrometer project. It aims to ensure the quality of superconducting triplets (SMTs) that will be an essential part of the equipment and will guarantee its unique performance for carrying out experiments in nuclear physics.

Assigned to the Beam Equipment Group, the selected candidate will be in charge of these different missions:

- Operation of the magnetic measurement bench, and assessment of the results according to ion optics models and simulations
- Development and operation of magnetic alignment bench.
- Error studies

#### **Activities**

- Bibliography about 3D magnetic characterization of accelerator magnets using latest-generation 3D Hall probes, including error studies
- Participation in the definition of the magnetic alignment system of the SMT
- Definition of Hall probes calibration procedures
- If required, participation in the qualification of the measurement bench defined by Argonne National Laboratory (ANL)
- Magnetic measurement and qualification of an SMT at GANIL (measurement and data analysis), including strong interaction with ANL regarding the expected Bench performances
- Decisive role in the alignment of the 7 magnets at GANIL.
- Error studies on both the Magnetic characterization and the 7 Magnet Alignments.
- Beam optics simulations of the spectrometer, taking into account the magnet qualification, under supervision of experts in the domain from GANIL and CEA/Saclay.

## Skills

Metrology, magnetism, accelerator physics, spoken and written technical English, some knowledge in cryogenics and superconductivity would be appreciated.

Education level : post-doctoral or engineer with experience in the domain.

Knowledge : Labview developments, electromagnetic and beam dynamics simulations, ideally magnetic measurements, ideally some experience from a reference accelerator or lab (CERN, ...).

Behaviour : team working, cooperation (with US Laboratory), meticulous-minded

## Context

GANIL is today one of the four large laboratories in the world in the field of nuclear physics using accelerated heavy ions. Its domains of interest are varying from radio therapy, to atomic physics, nuclear physics, condensed matter and astrophysics. Regarding the nuclear physics researches, GANIL has made many discoveries about nuclear structure, thermal and mechanical properties of the nuclei, and regarding the so-called “exotic nuclei”: nuclei that do not exist on earth under natural conditions

The laboratory, which employs around 250 people, is located in Caen, France. It is funded by CEA/DRF and CNRS/IN2P3, and act as a national facility serving the French, European and Worldwide scientific communities.

In the context of the S3 spectrometer project at GANIL, it is imperative to ensure the quality of the superconducting triplets (SMTs) which constitute an essential part of the equipment and which guarantee its unique performances for carrying out experiments in nuclear physics. The characterization of at least one SMT is a long and delicate metrology operation, which requires knowledge of the magnetic environment (superconducting magnet cooled to 4.2 ° K, effects on the detection system) and at the same time the use of the Hall probe (variation of the current, mechanical positioning, temperature of the probes, noise, ...). In order to carry out this task, the person in charge will have to develop their skills on the system developed by Argonne, and skills on the data processing software (Labview). In addition, the positioning system that will be developed requires to understand beam dynamics problematics and mechanical constraints on those equipments. The job requires working for long periods in the underground S3 cave, in a potentially risky environment (cryogenics, high currents), in a regulated nuclear zone.