

## Post-doctoral position for HRS development at CENBG Bordeaux

CENBG is involved in technical developments for the DESIR facility [1] at different levels. One of these developments presently being pursued is the commissioning of a high-resolution mass separator HRS [2]. The HRS, a 180° separator with two dipole sections, is now completely mounted at CENBG and will be commissioned in the next 2 to 3 years before its transfer at the entrance of the DESIR facility at GANIL/SPIRAL2, the construction of which should be terminated in 2022. Different stable beams, either from a small surface ion source or from a plasma ion source feeding an RFQ cooler and buncher called GPIB, can be injected into the HRS at CENBG for commissioning and testing the HRS.

CENBG is looking for a 2-year post-doctoral fellow to participate in this program. Candidates should have completed the PhD in Nuclear Physics or a related subject since less than 5 years. They are expected to have good knowledge in experimental techniques, ion optics and ion optics simulation tools (e.g. ZGOOBI, COSI INFINITY, SIMION etc.) as well as scientific programming. They will work in a highly competitive international environment. The main tasks for the successful candidate will be to drive the commissioning of the HRS by performing ion beam measurements and comparing them with ion optical codes in order to match measurements and simulations. The final aim of the development is to reach a mass resolution of  $\Delta m/m$  in excess of 15000.

The fellow will integrate either the Instrumentation department or the Exotic Nuclei research group of CENBG and will also be given the opportunity to participate in the experiments the group carries out on various facilities (GANIL, JYFL, RIKEN, ISOLDE...) on DESIR related physics.

Researchers or research engineers interested in the position are requested to submit a motivation letter, a CV as well as support letters to Bertram Blank ([blank@cenbg.in2p3.fr](mailto:blank@cenbg.in2p3.fr)) before March 15, 2019.

[1] <https://www.ganil-spiral2.eu/en-GB/scientists/ganil-spiral-2-facilities/experimental-areas/desir/>  
<http://www.cenbg.in2p3.fr/desir/>

[2] T. Kurtukian Nieto et al., Nucl. Instrum. Meth. B 317 (2013) 284

## Post-doctoral position for the PIPERADE-GPIB setup at CENBG Bordeaux

CENBG is involved in technical developments for the DESIR facility [1] at different levels. One of these developments presently being pursued is the construction and commissioning of the PIPERADE facility [2-3], an ensemble of equipments consisting of a RFQ cooler-buncher, called the General Purpose Ion Buncher (GPIB), and the PIPERADE double Penning-trap system.

The GPIB will be installed in the central beam line of DESIR and will therefore take beams from the S3 facility and the upgraded SPIRAL1 facility. It will deliver cooled ion bunches to the different experimental setups of DESIR. The PIPERADE trap setup will act as a mass separator to deliver large and clean ion samples to the setups of DESIR (such as tape stations for decay spectroscopy), or as a mass spectrometer. Mass measurements will allow investigating the nuclear structure far from stability, to constrain the stellar nucleosynthesis models as well as to study the weak interaction.

While the construction of an offline ion source and the GPIB have been completed in 2017, the Penning trap system is presently finalised. CENBG is looking for a 2-year post-doctoral fellows to participate in characterizing the GPIB, in terms of transverse and longitudinal emittances. First tests have already been achieved, with very promising performances, but this has to be more systematically investigated. In particular, different bunching modes have to be optimized. In addition, the beam will be transported between the GPIB and the Penning trap at 3 keV through an electrostatic deflector (either straight through or turning at 90°) and a transfer line. Optics studies (simulations and measurements) will therefore be performed for these elements as well.

The fellow will integrate the Exotic Nuclei group of CENBG and will also be given the opportunity to participate in the experiments the group carries out on various facilities (GANIL, JYFL, RIKEN, ISOLDE...) about exotic decays (2p radioactivity,  $\beta$  delayed proton emission, ...) or weak interaction studies with nuclear beta decay.

Candidates should have completed a PhD in Nuclear Physics or a related subject since less than 3 years. They are expected to have a good knowledge in experimental techniques, ion optics and ion optics simulation tools (e.g. SIMION), ion trapping and detection techniques, as well as scientific programming. They will work in a highly competitive international environment.

Researchers or research engineers interested in the positions are requested to submit a motivation letter, a CV as well as support letters to Pauline Ascher (ascher@cenbg.in2p3.fr) and Mathias Gerbaux (gerbaux@cenbg.in2p3.fr) before March 15, 2019.

[1] <https://www.ganil-spiral2.eu/en-GB/scientists/ganil-spiral-2-facilities/experimental-areas/desir/>  
<http://www.cenbg.in2p3.fr/desir/>

[2] P. Ascher *et al.*, EPJ Web of Conf. 66, 11002 (2014)

[3] E. Minaya Ramirez *et al.*, NIMB 376, 298 (2016)

## Post-doctoral position for the PIPERADE setup at CENBG Bordeaux

CENBG is involved in technical developments for the DESIR facility [1] at different levels. One of these developments presently being pursued is the construction and commissioning of the PIPERADE facility [2-3], an ensemble of equipments consisting of a RFQ cooler-buncher, called the General Purpose Ion Buncher (GPIB), and the PIPERADE double Penning-trap system.

The GPIB will be installed in the central beam line of DESIR and will therefore take beams from the S3 facility and the upgraded SPIRAL1 facility. It will deliver cooled ion bunches to the different experimental setups of DESIR. The PIPERADE trap setup will act as a mass separator to deliver large and clean ion samples to the setups of DESIR (such as tape stations for decay spectroscopy), or as a mass spectrometer. Mass measurements will allow investigating the nuclear structure far from stability, to constrain the stellar nucleosynthesis models as well as to study the weak interaction.

While the construction of an offline ion source and the GPIB have been completed in 2017, the Penning trap system is presently finalised. CENBG is looking for a 2-year post-doctoral fellows to test for the first time the Penning traps and characterize them. Mass measurement schemes will be tested as well as different mass separation methods. In particular, the first trap of PIPERADE being larger than usual ( $r_0 = 32\text{mm}$ ), mass separation techniques will be tested with a large number of ions, and push the limits further in terms of space charge effects. Higher-resolution methods with fewer ions in the second trap will also be investigated.

The fellow will integrate the Exotic Nuclei group of CENBG and will also be given the opportunity to participate in the experiments the group carries out on various facilities (GANIL, JYFL, RIKEN, ISOLDE...) about exotic decays ( $2p$  radioactivity,  $\beta$  delayed proton emission, ...) or weak interaction studies with nuclear beta decay.

Candidates should have completed a PhD in Nuclear Physics or a related subject since less than 3 years. They are expected to have a good knowledge in experimental techniques, ion optics and ion optics simulation tools (e.g. SIMION), ion trapping and detection techniques, as well as scientific programming. They will work in a highly competitive international environment.

Researchers or research engineers interested in the positions are requested to submit a motivation letter, a CV as well as support letters to Pauline Ascher (ascher@cenbg.in2p3.fr) and Mathias Gerbaux (gerbaux@cenbg.in2p3.fr) before March 15, 2019.

[1] <https://www.ganil-spiral2.eu/en-GB/scientists/ganil-spiral-2-facilities/experimental-areas/desir/>  
<http://www.cenbg.in2p3.fr/desir/>

[2] P. Ascher *et al.*, EPJ Web of Conf. 66, 11002 (2014)

[3] E. Minaya Ramirez *et al.*, NIMB 376, 298 (2016)

## Post-doctoral position in the WISArD experiment at CENBG Bordeaux

WISArD (Weak-Interaction Studies with  $^{32}\text{Ar}$  Decay) [1,2] is a high precision experiment mounted at the radioactive ion beam facility ISOLDE at CERN. Its aim is the test of the Standard Model in the weak-interaction sector, using nuclear  $\beta$  decay, as a complement to high energy physics experiments. Exotic currents in the weak interaction are searched for in the beta-neutrino angular correlation coefficient, usually called  $a_{\beta\nu}$ , which will be measured at the 0.1% precision level.

The  $a_{\beta\nu}$  correlation coefficient governs the kinematics of the  $\beta$  decay: depending on its value, the recoil energy of the nucleus varies. Direct measurements of this energy are possible but very challenging, as it does not exceed a few keV. The approach chosen in the WISArD experiment is the measurement of the energy distribution of protons emitted in flight by the daughter nucleus of  $^{32}\text{Ar}$ . As the protons are emitted in flight, the Doppler effect modifies the measured energies which thus reflect the nuclear recoil.

After a successful proof-of-principle experiment in November 2018, before CERN's long shut-down, the short-term aim is the design and mounting of the final set-up for a series of measurements once CERN restarts experiments in 2021.

The NEX group of CENBG seeks candidates for a three-year post-doctoral position to work on WISArD. Candidates should have completed their PhD in Nuclear Physics or a related subject since less than 5 years. They are expected to have good knowledge in experimental techniques, experiment electronics, data acquisition systems, analysis tools (e.g. ROOT), simulation tools (e.g. GEANT4, SIMION etc.) as well as scientific programming. They will work in a highly competitive international environment. The position can be either at CENBG in Bordeaux or at ISOLDE/CERN. This will be decided together with the candidate selected. The main tasks include Monte-Carlo simulations to optimise the experimental set-up as well as the tests and mounting of the silicon detector set-up for proton detection and of the plastic scintillators for the  $\beta$ -particle detection. Interest and participation in other development and experiments of our research group will be strongly supported.

Researchers interested in the position are requested to submit a motivation letter, a CV as well as support letters to Bertram Blank ([blank@cenbg.in2p3.fr](mailto:blank@cenbg.in2p3.fr)) before March 15, 2019.

[1] <http://isolde.web.cern.ch/experiments/wisard>

[2] N. Severijns, B. Blank, J. Phys. G: Nucl. Part. Phys. 44 (2017) 074002

## PhD position in the WISArD experiment at LPC Caen

WISArD (Weak-Interaction Studies with  $^{32}\text{Ar}$  Decay) [1,2] is a high precision experiment mounted at the radioactive ion beam facility ISOLDE at CERN. Its aim is the test of the Standard Model in the weak-interaction sector, using nuclear  $\beta$  decay, as a complement to high energy physics experiments. Exotic currents in the weak interaction are searched for in the beta-neutrino angular correlation coefficient, usually called  $a_{\beta\nu}$ , which will be measured at the 0.1% precision level.

The  $a_{\beta\nu}$  correlation coefficient governs the kinematics of the  $\beta$  decay : depending on its value, the recoil energy of the nucleus varies. Direct measurements of this energy are possible but very challenging, as it does not exceed a few keV. The approach chosen in the WISArD experiment is the measurement of the energy distribution of protons emitted in flight by the daughter nucleus of  $^{32}\text{Ar}$ . As the protons are emitted in flight, the Doppler effect modifies the measured energies which thus reflect the nuclear recoil.

After a successful proof-of-principle experiment in November 2018, before CERN's long shut-down, the short-term aim is the design and mounting of the final set-up for a series of measurements once CERN restarts experiments in 2021.

The GRIFON group of LPC Caen seeks candidates for a three-year PhD position on WISArD. Candidates should have completed their Master in Nuclear Physics or a related subject. They are expected to have a strong taste for experimental techniques as well as scientific programming and data analysis. They will work in a highly competitive international environment.

The position will be for about 1 year at CENBG in Bordeaux and then at ISOLDE/CERN. The main tasks include the characterization and mounting of the silicon detector set-up for proton detection and of the plastic scintillators for the  $\beta$ -particle detection. Interests in other projects of our collaboration will be strongly supported.

Students interested in the position are requested to submit a motivation letter, a CV as well as support letters to Xavier Flécharde ([flecharde@lpccaen.in2p3.fr](mailto:flechard@lpccaen.in2p3.fr)) before April 30, 2019.

[1] <http://isolde.web.cern.ch/experiments/wisard>

[2] N. Severijns, B. Blank, J. Phys. G: Nucl. Part. Phys. 44 (2017) 074002