



## 2020 HGF – GSI – OCPC – Programme for the involvement of postdocs in bilateral collaboration projects

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**Title of the project:**

Time-of-flight mass spectrometry of thermalized exotic nuclei

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**Helmholtz Centre and institute:**

GSI Helmholtz Centre for Heavy Ion Research

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**Project leader:**

Wolfgang Pläß

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**Contact Information of Project Supervisor: (Email, telephone)**

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**Department: (at the Helmholtz centre or Institute)**

NUSTAR

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**Description of the project (max. 1 page):**

The study of exotic (short-lived) nuclei far off stability and their properties is an intense, world-wide effort. These nuclei are synthesized in Nature in nuclear reactions during the burning phases of stars or in thermo-nuclear runaways during star explosions and neutron star mergers. These macroscopic environments are governed by the microscopic properties of short-lived nuclei. In the laboratory, short-lived nuclei are produced and studied at accelerator facilities.

The FRS Ion Catcher experiment at GSI enables mass and lifetime measurements of exotic nuclei produced by projectile fragmentation or fission. The fragments are produced at relativistic energies in the target at the entrance to the fragment separator (FRS), spatially separated and energy-bunched in the FRS, slowed down and thermalized in a cryogenic stopping cell. A versatile RFQ beamline and diagnostics unit and a high-performance multiple-reflection time-of-flight mass spectrometer (MR-TOF-MS) enable a variety of experiments, including high-precision mass measurements, isomer measurements and mass-selected decay spectroscopy. At the same time the FRS Ion Catcher serves as a test facility for the Low-Energy Branch of the Super-FRS at FAIR. Several experiments will be performed with the FRS Ion Catcher in FAIR Phase-0 at GSI. Experiments and developments for FAIR will continue until the full start of FAIR, when the different components will be installed in the Low-Energy Branch of the Super-FRS.

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The successful candidate will play a leading role in the currently ongoing upgrade program of the FRS Ion Catcher. He will work on the further development of the MR-TOF-MS and of the RFQ beamline, increasing the transmission efficiency, selectivity and accuracy of the setup. He will also be involved in the operation of the facility, in the preparation and execution of experiments, and in the data analysis.

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**Description of existing or sought Chinese collaboration partner institute (max. half page):**

We are looking for Chinese partners with strong interest in mass spectrometry (in particular time-of-flight mass spectrometry and RF quadrupole mass spectrometry) and/or experimental nuclear physics. It is anticipated that the collaboration will strengthen the research on exotic nuclei, and that synergies for the collaboration partners in the field of mass spectrometry instrumentation and software will arise, from which both partners will profit.

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**Required qualification of the post-doc:**

- PhD in physics, engineering, or equivalent
- Experience with mass spectrometry or experimental nuclear physics
- Additional skills in some of the following fields would be desirable: vacuum technology, electronics, CAD, scientific simulations, ion optics, computer programming
- Willingness and ability to work in a team
- Language requirement: fluent in English