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Master thesis in Experimental Physics

Development of the PUMA offline ion source

A Master thesis project is offered at the Institute of Nuclear Physics (IKP) of TU Darmstadt.

Project description:

The PUMA project, hosted at the TU-Darmstadt, aims to utilize antiprotons to further our understanding of radioactive nuclei. This will be performed by transporting antiprotons in a Penning-trap from CERN's antiproton decelerator (AD) facility to the ISOLDE facility where the exotic ions of interest are produced. The radioactive ions will be injected into the trap system to interact with the antiprotons. That leads to an annihilation of the antiprotons with the nucleons on the surface of the nucleus. The subsequent pion decay will be detected by a Time Projection chamber (TPC), which is part of the PUMA setup. We will thus be able to study the distribution of neutrons and protons on the outer surface of the nucleus.

Before these experiments can take place, a thorough characterization of the involved mechanisms and their detection characteristics in the PUMA setup will be performed. An off-line ion-source arrangement consisting of different ion-source types to produce a broad variety of stable ions, a multi-reflection time-of-flight (MR-ToF) device for purification and a quadrupole bender will be built to deliver pure samples to the PUMA traps. These ions will then be used to study the annihilation process within PUMA at the AD prior to moving the hole setup to the ISOLDE facility.

Within the master project, an MR-ToF device (based on an existing design) will be set-up and tested together with an ion-source. This will take place in close collaboration with the University of Greifswald where experience with already operating MR-ToF devices can be gathered along the with the installation of the ion source arrangement.

Candidate profile:

Only candidates holding a bachelor's degree in physics or engineering may apply.

Interested candidates should contact Dr. Frank Wienholtz, fwienholtz@ikp.tu-darmstadt.de, or Prof. Alexandre Obertelli, aobertelli@ikp.tu-darmstadt.de.

The preparation period for the Master thesis can start as soon as 01/02/2020. It is expected to start at the latest in 06/2020.
