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TECHNISCHE  
UNIVERSITÄT  
DARMSTADT

PhD Thesis in Nuclear Physics

## **Hypernuclei Spectroscopy at GSI/FAIR: High-resolution tracking of charged particles in an inhomogeneous magnetic field**

A PhD thesis is open in the group of Prof. Alexandre Obertelli at the Institut für Kernphysik (IKP) of TU Darmstadt. The position is expected to start from January 1st, 2020.

Studies of hypernuclei which carry a new strangeness quantum number, shed a new light on the world of traditional nuclei by revealing new symmetries and new phenomena. So far only about 40 hypernuclei have been synthesized and studied using pion, kaon or electron beams by the missing mass spectroscopy. As first pioneered by the HypHI collaboration at GSI, heavy-ion beams induced reactions offer new opportunity to produce and study exotic (proton-rich or neutron-rich) hypernuclei by the invariant mass spectroscopy. We are starting a program at GSI/R<sup>3</sup>B via high-intensity heavy-ion beam bombarding a thick hydrogen target. The detection system consists of two time projection chambers (TPC) to be inserted into the GSI/R<sup>3</sup>B GLAD magnet: the kTPC and the  $\pi$ TPC for the detection of the kaon mesons and pion mesons, respectively. The proposed thesis will focus on investigating the inhomogeneous magnetic-field effects for particle tracking in a TPC inside of the GLAD magnet. The candidate will perform simulations and develop analysis tools to recover the tracking information and extract the momentum and vertex of the charged particles emitted from the reactions and decays. He/She will implement a laser system in the TPC version0 to perform precise drift velocity calibration. He/She will take a leading part in the on-site laser test of the TPC version0 and will analyze the first experimental data on the production of hypernuclei from hydrogen in inverse kinematics.

### **His/Her tasks will focus on**

- 1) Simulations and analysis tools to for the analysis of tracks in inhomogeneous magnetic field.
- 2) Development of a laser system for reference measurements on tracks in inhomogeneous fields.
- 3) Active participation of the experimental program at R<sup>3</sup>B, GSI/FAIR.
- 4) Analysis of first data taken with the TPC version0 for the hypernuclei program.

### **Candidate profile:**

Only candidates holding a Master degree in physics will be considered. The ideal candidate speaks English fluently and has experience in experimental nuclear physics. Good skills with C/C++ programming would be assets.

### **Salary:**

The salary will be according to the tariff contract of the TU Darmstadt (TV-TUD), following a 2/3 E13 position. TU Darmstadt is an equal opportunity employer and we especially encourage applications from women. Disabled people with a degree of disability of at least 50% will be preferred if equally qualified.

### **Contact:**

Interested candidates should directly contact Prof. Alexandre Obertelli via e-mail ([aobertelli@ikp.tu-darmstadt.de](mailto:aobertelli@ikp.tu-darmstadt.de)).