Strange baryons and antibaryons in nuclei: unique opportunities for PANDA@FAIR

Josef Pochodzalla[1,2] on behalf of the PANDA Collaboration

[1]*Helmholtz Institute Mainz, Germany*
[2] *Johannes Gutenberg-Universität, Mainz, Germany*

E-mail pochodza@kph.uni-mainz.de

PANDA is a key experiment of the FAIR facility in Darmstadt. It will study fundamental questions of hadron physics and QCD by exploring interactions between an antiproton beam and a fixed proton or nuclear target. Because of the relative large production cross section of hyperon-antihyperon pairs in antiproton-nucleus collisions, PANDA is an ideal instrument to study hyperons and antihyperons in nuclear medium.

The spectrum of excited particle stable states of doubly strange hypernuclei will be explored at the PANDA experiment by performing precision γ-spectroscopy. This approach nicely complements experiments at J-PARC which use kaon beams and nuclear emulsions to determine ground state masses of double hypernuclei as well as heavy ion reaction studies where two-particle correlations between single-hypernuclei and Λ-hyperons offer a chance to produce particle-unstable resonances in double hypernuclei.

The exclusive production of hyperon-antihyperon pairs close to their respective production threshold offer a unique opportunity to study the nuclear potential antihyperons in nuclei quantitatively. In the case of Λ–$\overline{\Lambda}$ and Σ–$\overline{\Lambda}$ production in antiproton-neon collisions around 1 GeV incident energy, calculations using the Gießen BUU transport model indicate a strong sensitivity of transverse momentum correlations on the depth of the $\overline{\Lambda}$ potential in nuclei. The expected sensitivity of the PANDA setup obtained from a realistic Monte Carlo simulation using the simulation framework of the experiment will be presented and further options of this novel method will be discussed.