

Measurements of Hypernuclei with the WASA detector and the Fragment Separator at GSI

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The next phase of hypernuclear experiment with heavy ion beams proceeding the HypHI experiment will contribute to solve two significant puzzles in few-body physics, that are revealed by the results of the HypHI Phase-0 experiment at GSI Helmholtz Centre for Heavy Ion Research (Darmstadt, Germany) in 2009. The first puzzle is on the possible unprecedented existence of the nnLambda (two neutrons and Lambda hyperon) bound state, that cannot be reproduced by the current theoretical models. The second puzzle is related to the measured short lifetime of hypertriton and the discrepancies in the experimental results obtained previously by HypHI, STAR and ALICE collaborations. The next experiment proceeding the HypHI experiment will implement a unique idea based on production of the hypernuclei resulting from reaction of Lithium beam on Carbon target at 2 A GeV at the mid-focal plane (S2) of the FRagment Separator (FRS) at GSI. Hypernuclei of interest will be observed by detecting particles produced by their two-body decay with creation of pi- and positively-charged residues. The second half of the FRS will be employed as a forward high momentum-resolution spectrometer to measure positively-charged residues with a momentum resolving power of 10^{-4} , while pi- will be measured by using a magnetic spectrometer with large acceptance and good momentum resolution located at the mid-focal plane. As a magnetic spectrometer at S2 we employ the central part of the WASA detector which was previously operated at the CELSIUS ring in Uppsala (Sweden) and COSY ring in Jülich (Germany) and the preparation and the commissioning of all devices are in progress. The central part of the WASA detector consists of the superconducting solenoid magnet, the Mini Drift Chamber (MDC), the Plastic Scintillator Barrel (PSB), plastic scintillator endcaps (PSFE) and the Scintillator Electromagnetic Calorimeter (SEC). In addition, six stations of scintillating fiber detector arrays have already been developed to measure charged particles in front and behind the WASA detector. The hypernuclear experiment with the WASA and the FRS will be conducted in cooperation with the eta-prime experiment both scheduled to be performed in 2022 at GSI. In this presentation, the status and the outlook of the hypernuclear project with the WASA and the FRS will be discussed.

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