Current results on light hypernuclei in the WASA-FRS HypHI experiment

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Content

The current understanding of light hypernuclei, which are sub-atomic nuclei exhibiting strangeness, is being actively examined by various collaborations [1, 2, 3, 4, 5, 6]. Recent studies of hypernuclei conducted using high-energy heavy ion beams have revealed unexpected results regarding the three-body bound state 3ΛH, known as the hypertriton. The experimental measurement of its lifetime [1,2,3,7,8,9,10] and binding energy [4,11,12] from multiple experiments have led to a puzzling situation referred as the "hypertriton puzzle". This puzzle is the central focus of our European-Japanese collaboration between CSIC (Spain), GSI-FAIR (Germany), and RIKEN (Japan) through the analysis of data from the WASA-FRS HypHI experiment at GSI-FAIR.

In the WASA-FRS collaboration of the SuperFRS Experiment collaboration, we are investigating light hypernuclear states using heavy ion beams at 1.97 GeV/u impinged on a fixed carbon target, in conjunction with the WASA detector system and the Fragment separator FRS at GSI-FAIR [6]. The WASA-FRS experimental campaign was carried out during the first quarter of 2022, and data analysis is currently underway. The primary objective of the experiment is the measurement of the lifetime of 3ΛH and 4ΛH. The possible observation of the nnΛ state constitutes the second part of the WASA-FRS research program.

This contribution will provide an overview of our investigation into hypernuclei and the current results. Focusing on the WASA-FRS HypHI experiment, details of the current status of the analysis of the experiment will be presented. Additionally, the possibility of determining the hypernuclear radii through the estimation of the interaction cross section of produced hypernuclei will also be discussed.

Reference

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