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Comparison of 3ΛH/4ΛH production cross section via (K^-,π^0) reaction at J-PARC

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The hypertriton ($^3_\Lambda$H) lifetime puzzle stands for the deviation between the physical picture derived from the binding energy in the old emulsion experiment and the measured lifetime in heavy-ion experiments. To pin down the hypertriton lifetime puzzle, it is clear that an independent experimental approach is needed to improve the situation. We plan to populate and measure the hypertriton lifetime using strangeness exchange reaction, $^3\mathrm{He}(K^-,\pi^0)\,^3_\Lambda\mathrm{H}$, as J-PARC E73 experiment at the J-PARC K1.8BR beamline in Japan.

Besides the direct lifetime measurement, the E73 experiment can also provide important information for the hypertriton binding energy. A recent theoretical calculation suggests that the ratio ($\sigma_{^3_\Lambda\mathrm{H}}/\sigma_{^4_\Lambda\mathrm{H}}$) of the production cross section can be used to study the binding energy of the hypertriton [1]. From this ratio, it is possible to place a limit on the binding energy. We will show the production cross sections of $^3_\Lambda$H and $^4_\Lambda$H in the (K^-,π^0) reaction for the first time and compare these results with theoretical calculation deduced from DWIA.

[1] T. Harada, Y. Hirabayashi, Nucl. Phys. A 1015 (2021) 122301.

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