Contribution ID: **93** Type: **talk**

Search for the K̄NNN bound state in the Λdn final states of the in-flight K^- reaction on helium-4

Monday 27 June 2022 18:10 (15 minutes)

In recent years, the possible existence of deeply-bound $\bar{K}$ nuclear bound states has been widely discussed as a consequence of the strongly attractive $\bar{K}N$ interaction in I = 0 channels. Very recently, J-PARC E15 experiment reported an observation of the simplest kaonic nuclei, $\bar{K}NN$, in the Λp invariant-spectrum of the in-flight K^- reaction on helium-3 [PLB789(2019)620, PRC102(2020)044002]. If the observed structure is truly the kaonic nuclear state, we can expect other kaonic nuclei can be produced in the same K^- induced reaction. Observation of other kaonic nuclei would provide a further support for the existence of such exotic states. Furthermore, mass-number dependence of kaonic nuclear systems would be of great importance to study interplay between the $\bar{K}N$ attraction and the NN repulsion at short distances.

Here, we focus on the second simplest system, $\bar{K}NNN$ with I = 0. This state could be populated by simply replacing the helium-3 target in J-PARC E15 with helium-4. Although the branching ratio is not known, one of the expected decay modes is Λd, whose final particles are charged ones only. By detecting the Λd pair and by identifying neutron via the missing-mass method, we can exclusively study the Λdn final states in the same manner of Λpn in E15.

We already had a chance to collect K^--induced data on helium-4 as a feasibility test of a lifetime measurement of light hypernuclei (J-PARC T77). Approximately 6×10^9 K^- particles at 1 GeV/c are delivered to the helium-4 target in $\sim$3-day beam time in June 2020. This number corresponds to $\sim$1/7 of that in E15. The decay particles are detected with the same cylindrical detector system as E15. In a preliminary analysis, we successfully reconstructed several hundreds of Λdn events.

In this contribution, we would like to present the latest results of the Λdn analysis described above, and discuss future prospects towards more comprehensive investigation of the $\bar{K}NNN$ system.

Author: HASHIMOTO, Tadashi (Japan Atomic Energy Agency)

Presenter: HASHIMOTO, Tadashi (Japan Atomic Energy Agency)

Session Classification: 1; Mon-IV