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KbarNN bound state search at J-PARC

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The possible existence of strongly-bound $\bar{K}$ nuclear-states has been widely discussed as a consequence of the strongly attractive $\bar{K}N$ interaction in I = 0 channels. Experimentally, however, available information is not sufficient to discriminate between a variety of conflicting interpretations so far. In this situation, we have performed an experimental search for the simplest kaonic nuclear bound state, $\bar{K}NN$, by the in-flight $K^- + {}^3$He reactions at 1 GeV/c (J-PARC E15). The experiment investigates the $\bar{K}NN$ state both in the formation via ${}^3\mathrm{He}(K^-, n)X$ missing-mass spectroscopy and its decay via invariant-mass spectroscopy using ${}^3\mathrm{He}(K^-, \Lambda p)n$ channel, respectively. The first physics data-taking was performed at the K1.8BR beam-line in 2013. With this data-set, we have observed a significant bump structure around the K^-pp mass-threshold in the Λp invariant-mass spectrum in the exclusive ${}^3\mathrm{He}(K^-, \Lambda p)n$ analysis [PTEP(2016)051D01]. We will discuss the possible existence of the $\bar{K}NN$ states by combining the production- and the decay-channel analyses. In addition, we will present the latest results of the second data-taking performed in 2015, where much improved data statistics of the ${}^3\mathrm{He}(K^-, \Lambda p)n$ channel was accumulated.

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