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Study of the K^-pp bound state in the FINUDA experiment¹

HIROYUKI FUJIOKA, Department of Physics, Kyoto University

The possible existence of antikaon-nuclear bound states has been suggested by many theoretical studies in this decade, after the first quantitative calculations on few-body systems by Akaishi and Yamazaki [Phys. Rev. C 65, 044005 (2002)]. Experimental searches, including reanalyses of old experiments, on such a bound state has been carried out in several institutes up to now. The FINUDA experiment also investigated the existence of light kaonic nuclei, produced by stopped K^- absorption. It was carried at a ϕ -factory DAΦNE at INFN-LNF (Italy), which supplies very slow kaons (~ 16 MeV) as decay particles of ϕ mesons produced by the electron-positron collision. In 2005, we reported the first result on the invariant mass spectrum of back-to-back Λ - p pairs, emitted from light nuclear targets [Phys. Rev. Lett. 94, 212303 (2005)]. Their invariant mass distributes far below the $K^- + p + p$ threshold around 2.37 GeV/ c^2 , and we proposed a possibility that a K^-pp bound state with its binding energy ~ 115 MeV and width ~ 67 MeV was produced by kaon absorption, and decayed into a Λ and a proton. However, there are alternative interpretations on the Λ - p invariant-mass spectrum, such as the effect of final state interaction, pointed out by Magas *et al.* [Phys. Rev. C 74, 025206 (2006)] In order to distinguish them experimentally, we analyzed three kinds of back-to-back hyperon-nucleon pairs (Λ - p , Λ - n , Σ^- - p) with about one order of magnitude more statistics taken in 2006–2007. We observed a large difference, especially between the Λ - p and Λ - n pairs, with regard to the distribution near the threshold. It may originate from a strong isospin dependence of $\bar{K}N$ interaction, and reinforce the assumption of the K^-pp production in kaon absorption. In this talk, the current status of the analysis on hyperon-nucleon pairs will be presented.

¹on behalf of the FINUDA collaboration