J-PARC E27 experiment to search for a K^-pp bound state.

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An antikaon and a nucleus may form a bound state (a kaonic nucleus), due to the strong attraction of K^{bar}-N in I=0. A K^-pp bound state, which is the bound state of an antikaon and two nucleons, with the total charge +1 and the isospin 1/2, is expected to be the simplest kaonic nucleus. Various theoretical calculations for a K^-pp bound state have been carried out and the existence of the bound state is supported in these calculations. However, the binding energy and the decay width depend on the K^{bar}-N interactions and the calculation methods [1]. Several experiments have been performed to look for a signal of kaonic nuclei [2,3]. However, any firm experimental evidence has not been found.

An experimental search for the K^-pp bound state is performed by using the $d(\pi^+, K^+)$ reaction at J-PARC K1.8 beam line (J-PARC E27experiment). Fig.1 shows the experimental setup of this experiment. The first data taking as a pilot run was carried out in June, 2012. The missing-mass spectrum of this reaction studied at the beam momentum of 1.7 GeV/c, which allows the production of Λ(1405), was obtained for the first time and a significant peak shift by ~30 MeV was observed in the Y^* region. In a preliminary proton-coincidence analysis, a sharp spike due to the ΣN-ΛN coupling and a broad enhancement around 2.3 GeV/c^2, which might be attributed to the K^-pp bound state, was clearly observed. At this symposium, the preliminary results of the inclusive and coincidence analysis will be discussed.

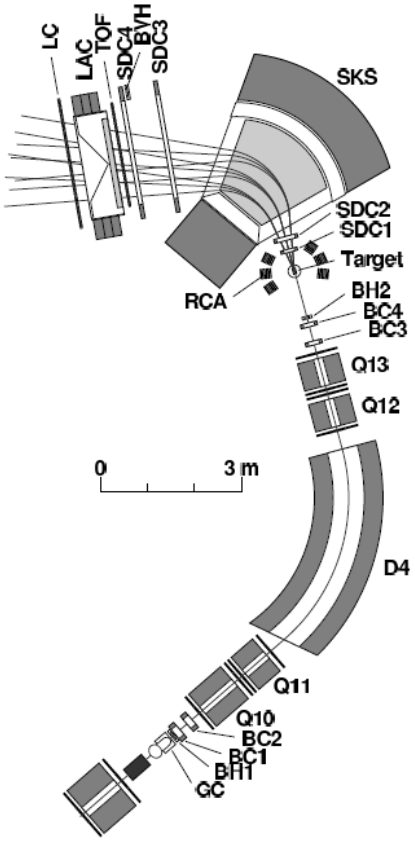

Fig.1 Schematic view of the K1.8 beam line, the target area and SKS spectrometer.

References
[1] A. Gal, Nucl. Phys. A, **914**, 270 (2013).
[2] M. Agnero, *et al.*, Phys. Rev. Lett., **94**, 212303 (2005).
[3] T. Yamazaki, *et al.*, Phys. Rev. Lett., **104**, 132502 (2010).