Recent results of the $\bar{K}NN$ search via the in-fight ^{3}He(K^-,N) reactions at J-PARC

F.Sakuma[1], for the J-PARC E15 collaboration

[1]RIKEN Nishina Center, RIKEN, Wako, 351-0198, Japan

We will present the recent results of the first attempt to search for the $\bar{K}NN$ bound states via the in-flight ^{3}He(K^-, N) reactions at J-PARC.

The experiment was performed at the K1.8BR beam-line with 5.3×10^9 incident 1 GeV/c kaons on a ^{3}He target as the first-stage experiment of J-PARC E15 in 2013 [1,2]. In the semi-inclusive neutron missing-mass spectrum at $\theta_n^{lab} = 0$ degrees, *i.e.*, the measurement via the production channel, no significant peak was observed in the K^-pp deeply-bound region larger than 80 MeV binding energy where a bump structure has been reported in the $\Lambda p/\Sigma^0 p$ final states in different reactions. By contrast, in the loosely-bound region, definitive excess of the yield above backgrounds was observed, which can not be explained by any elementary reactions of K^-N [3]. For further investigation on the $\bar{K}NN$ bound states in decay channels, we also performed an exclusive analysis of the Λpn final-state by reconstructing a Λp pair and requiring a missing particle to be a neutron. In the Λpn exclusive analysis, the significant bump structure around the K^-pp mass-threshold was observed in the Λp invariant-mass spectrum [4].

In this contribution, 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 $p/d(K^-, N)X$ measurements performed in spring 2015 aiming to obtain a further understanding of the ^{3}He(K^-, N) reactions.

[1] E15 proposal, `http://j-parc.jp/NuclPart/pac_0606/pdf/p15-Iwasaki.pdf`.

[2] K. Agari *et al.*, Prog. Theor. Exp. Phys., 02B011 (2012).

[3] T. Hashimoto *et al.*, arXiv:1408.5637 to be published in Prog. Theor. Exp. Phys.

[4] Y. Sada *et al.*, to be submitted soon to Prog. Theor. Exp. Phys.