

# Search for the $K^-pp$ bound state via the in-flight ${}^3\text{He}(K^-, n)$ reaction

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## Collaboration

J-PARC E15

## Abstract content

Over the last decade, kaonic nuclear states have been studied extensively. In particular, the simplest state,  $K^-pp$ , is widely discussed in terms of its binding energy and width, since such simplest state is quite sensitive to the  $\bar{K}N$  interaction. There are various theoretical predictions of the  $K^-pp$  state at present, thus it is quite important to compare the theoretical calculations with experimental studies. However, the experimental situation is also controversial; the DISTO and FINUDA collaborations have claimed observations of the deeply-bound  $K^-pp$  state, while the HADES and LEPS groups recently reported null results of the  $K^-pp$  searches. Therefore, we need to investigate the  $K^-pp$  state in different reactions and to understand background process, such as multi-nucleon absorption processes of  $K^-$ . In the J-PARC E15 experiment, the  $K^-pp$  search is performed via the  ${}^3\text{He}(K^-, n)$  reaction at 1.0 GeV/c. A forward-going neutron is detected by a neutron counter with 15 m flight length, and decay particles from  $K^-pp$  are simultaneously measured by a cylindrical detector system that surrounds a liquid  ${}^3\text{He}$  target system. In March and May, 2013, we carried out the first physics data-taking with  $5 \times 10^9$  incident kaons on the  ${}^3\text{He}$  target, and we have obtained the missing-mass spectrum of  ${}^3\text{He}(K^-, n)$  and the exclusive analysis result of  ${}^3\text{He}(K^-, \Lambda p)n$  reaction. We have also examined not only the expected  $K^-pp \rightarrow \Lambda p$  decay but also multi-nucleon absorption processes of in-flight  $K^-$  by reconstructing the exclusive  ${}^3\text{He}(K^-, \Lambda p)n$  channel. In this talk, we present the latest analysis results of the first physics data of J-PARC E15.

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