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Final Attempt to Search for the $S=+1$ Pentaquark at J-PARC

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The discussion of light pentaquarks, which was once sparked by the good agreement between the theoretical prediction[1] and the first measurement of the Θ^+ [2], has become dormant after the subsequent null results of the Θ^+ baryon from worldwide experiments. However, the recent observation of heavy pentaquarks by the LHCb Collaboration[3] has revitalized interest in pentaquark physics. Although the Θ^+ is most unlikely to exist, we believe that a final attempt should be made for a definitive exclusion. In this talk, we will present the idea to search for the $S = +1$ pentaquark in $K^+d \rightarrow K^0 pp$ reaction using K^+ beam with a momentum of $p_{K^+} = 0.5$ GeV/c at J-PARC. Our novel detector system, Hyperon Spectrometer, consisting mainly of a time projection chamber and a 1-T superconducting magnet, will be utilized to exclusively measure the decay products of Θ^+ , such that $\Theta^+ \rightarrow K^0 p$, followed by $K^0 \rightarrow \pi^+ \pi^-$. The simulation results will be also presented to discuss the feasibility of the experiment.

[1] D. Diakonov, V. Petrov, and M. V. Polyakov, *Z. Phys. A* 359, 305 (1997).

[2] T. Nakano et al., (LEPS Collaboration), *Phys. Rev. Lett.* 91, 012002 (2003).

[3] R. Aaij et al. (LHCb Collaboration), *Phys. Rev. Lett.* 115, 072001 (2015).

session

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