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Invariant-mass spectroscopy of 10He

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10He is an unique quantum many-body system which has the largest N/Z ratio in the nuclear chart. Measuring the properties of 10He can provide a stringent test of shell-model and ab initio calculations. Starting from the pioneering work of Korsheninnikov et al. [1], several experiments have been carried out to study the resonance states in 10He. However, up to now, the energy of 10He ground state resonance is still under debate. The results from the 11Li(-p) [1, 2] and 14Be(-2p2n) [3] knockout reactions, provide a ground-state resonance lying at 1.2(3) MeV [1], 1.54(11) MeV [2] and 1.60(25) MeV [3], respectively, while the results from 3H(8He, p)10He transfer reaction suggest a much higher ground state at 2.1(2) MeV [4]. Recently, the inconsistency between these two methods has been investigated by theoretical calculations considering sudden removal of a proton from 11Li populating a three-body 10He continuum [5]. It has been discussed that the strong initial-state-structure (ISS) effects in 11Li knockout reaction altered the excitation spectrum of 10He, and the final state interaction (FSI) was found to play a minor role. It is evident that more exclusive measurements with higher statistics are needed to clarify the deviations between different methods. Therefore, we performed a new 11Li(p, 2p) knockout reaction at 250 AMeV at RIBF, RIKEN, using the MINOS device and SAMURAI spectrometer. A recoil proton detector (RPD), covering 30-65 degrees of polar angle, was used to measure the recoil and knocked-out protons. The invariant mass of 10He was reconstructed by the momentum of fragments and neutrons. In this talk, the preliminary results will be discussed.

References

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