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Study of the two-neutron decay of 13Li via the invariant mass method with SAMURAI@RIBF

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^{13}Li is a neutron-rich unbound nucleus that decays into the halo nucleus ^{11}Li via the emission of two neutrons. Studying such a system can lead to a better understanding of neutron-neutron correlations in the atomic nucleus. This study has been performed using the SAMURAI facility [1] at RIBF, RIKEN, Japan, with a high-intensity beam and a setup with large acceptance, allowing a better resolution and efficiency than achieved in past measurements at GSI [2] and NSCL [3].

A beam of 14Be impinges on the liquid hydrogen MINOS target [4], producing the ^{13}Li isotopes via a (p,2p) reaction. The vertex of interaction is then reconstructed thanks to the tracking system around the target. The two decay neutrons are detected in the NEBULA array, and the remaining ^{11}Li is detected in a hodoscope [5]. Thanks to the reconstruction of the momenta of all the decay products with the aforementioned detectors, the invariant masses of the ^{11}Li-n-n system, the ^{11}Li-n system and the n-n system are computed. With this quantity, more information on the spectroscopy of ^{13}Li, such as the energy of the neutron resonances, can be provided. Using correlation plots of the Jacobi coordinates of the system [6], information on the nature of the decay (e.g. sequential or direct) can also be deduced.

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Topic

Experiment

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