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Study of neutron-rich systems 6H, 7H and 4n in 8He+d interactions at ACCULINNA-2

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An experiment at the ACCULINNA-2 fragment separator was conducted using a 8He beam and a deuterium target to study neutron-rich systems 6H, 7H, and 4n [1, 2, 3]. This work provided comprehensive insights into their decay modes and interaction mechanisms. For 7H, we report the first experimental evidence of five-body decay. For 6H, sequential decay through 5H g.s.was established [4]. The 4n system was studied as a product of two independent transfer reactions, with low-lying structures observed at 3.5 MeV above the decay threshold. These findings align with the results of work [5].

The experiment relied on an efficient use of ultra-thin silicon strip detectors (20 μm) for precise detection of □=1,2,3 isotopes across a wide energy range. The approach enabled detailed analysis despite the setup's limited neutron detection efficiency. This methodological framework is discussed in [5-9], including studies of 6H,7H, and other isotopes, along with the optimization of charged particle detection at ACCULINNA-2.

Recognizing the experiment's limitations, simulations within the ExpertRoot framework [10] were performed to enhance the detection efficiency of reaction products. The results demonstrate that detector modifications can improve statistics for the studied systems by a factor of ~2.5 under identical beam parameters.

The presentation will detail experimental techniques, including the use of ultra-thin detectors, methods for particle reconstruction, and the impact of simulation-based optimizations. Key results and future perspectives for extending studies of neutron-rich systems will also be presented.

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