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Identification of multiple neutrons with MoNA

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The Modular Neutron Array (MoNA) has been used extensively to study neutron-unbound nuclei with invariant mass spectroscopy. The measurements have extended to nuclei which have two neutrons beyond the drip-line including ^{10}He, ^{13}Li, ^{16}Be, and ^{26}O. Two-neutron emitters have multiple mechanisms in which they can decay. The decay mode can be determined by the three-body correlations. A recent experiment at the NSCL populated excited states in ^{24}O through inelastic excitation on a liquid deuterium target. A state with excitation energy of 7.65 MeV was observed to decay sequentially through an intermediate state in ^{23}O before decaying to the ground state of ^{22}O. This result shows the first observation of two-neutron sequential decay, determined by angular and energy correlations, in the ^{22}O+2n system. The next challenge is to identify decays by three and four neutrons. Recent work has taken the first steps for the MoNA collaboration in identifying decays by more than two neutrons. An analysis of two-proton removal from a ^{17}C beam searched for resonances in ^{15}Be which could decay sequentially through ^{14}Be to ^{12}Be. It was found that a new state was not required to fit the data, however, limits on the strength and decay energy of a new state were determined. Details on these and other recent results will be presented.

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