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A new experimental method to study beta-delayed multiple-neutron emissions of neutron-rich nuclei

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Beta-delayed multiple-neutron emission of neutron-rich nuclei is crucial for studying the structure of n-rich nuclei as well as the origin of heavy elements. We propose a new experimental method to study this process via (p,n) charge-exchange reactions of n-rich nuclei in inverse kinematics. It decouples the beta-delayed neutron emissions into two parts: beta-decay and neutron emissions, and can be used to determine precisely the beta-delayed neutron emission branching ratios and furthermore to identify new beta-delayed multiple-neutron emitters. We propose to make the first proof-of-principle experiment using the well-known beta-delayed neutron emitters $^{29-31}\text{Na}$, then seek for about 5 new beta-delayed two-neutron and three-neutron emitters including $^{31-34}\text{Na}$ (or others) and determine the branching ratios. The high-resolution and large-acceptance SAMURAI spectrometer coupled with the WINDS detector and the standard beam tracking detector system, is the ideal facility to perform such experiments. In this presentation, the principle of the new method and some details on the proposed experiment will be discussed.

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