Beta delayed neutron emitters - exploring decays of unexplored nuclei

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Access to exotic neutron-rich nuclei, provided by the new radioactive beam facilities, is changing our understanding of beta-delayed neutron emissions (βn). This multi-step decay mode is dominant for most yet-to-be-discovered neutron-rich nuclei, especially those relevant for the r-process nucleosynthesis. Only now can experiments access the relevant βn precursors with properties similar to those on the r-process paths. The nuclei involved have very large Q-beta values and decreasing neutron separation energy. In this context, we must reconsider the assumptions made to describe the decays of these nuclei. Our experiments at ISOLDE, RIBF RIKEN, and FRIB investigated a broad range of nuclei using various experimental methods, examining the impact of nuclear structure and the validity of the statistical model on beta-delayed neutron emission. These measurements are needed not only to provide data for astrophysics but also to understand the physics of nuclei in previously unexplored territories.

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