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Measurements of β-delayed neutron emission probabilities around the medium-mass mid to the doubly-closed shell region

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Beta-delayed neutron emission (βn) is the prevalent decay mode in very neutron-rich nu- clei that are involved in the nucleosynthesis via rapid (r-) neutron capture process [1]. Characterized as a two-step decay mechanism, it involves β-decay feeding into excited states beyond the neutron separation energy in the daughter nucleus, succeeded by neu- tron emission, resulting in a lower-mass nucleus. The probabilities of βn (Pxn-values) are intricately tied to factors such as Qβn windows, decay strength distribution, de-excitation, and neutron emission models [2], emphasizing the critical need for precise experimental data on βn emitters. Such data not only deepen our understanding and modeling of βn processes but also serve as vital inputs for nucleosynthesis models. Yet, a dearth of reliable experimental information persists, particularly regarding multi-neutron emission channels process [3]. In this contribution, we will present recent experimental results on the Pxnvalues, with a focus on the neutron-rich mid-shell region around mass A=110 and around doubly-closed shell region at 132Sn [4]. The experiments were conducted within the BRIKEN project at RIKEN RIBF, an extensive survey program of the Pxn values. The systematic of the results shows discernible odd-even and shell effects, underscoring the sensitivity of Pxn values to nuclear structure information and their important role in benchmarking theoretical models. Additionally, we will introduce a new experimen- tal program at RIKEN's RIBF, employing neutron time-of-flight and γ-ray spectroscopy setups in tandem with MRTOF mass measurements, aimed at further elucidating the βn.
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