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Measurements of β -delayed one and two neutron emission probabilities south-east of ^{132}Sn within the BRIKEN project at RIKEN

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Recent observations of metal-poor star elemental and isotopic abundances [Roe22, Wen18] have sparked new interest in the nucleosynthesis of elements around the second r -process abundance peak, as it may shed light on the r -process conditions. To understand the r -process conditions and link these observations to astrophysical models, it is crucial to have information on the nuclear properties of the radioactive progenitors of the second r -process peak.

Following r -process freezeout, the final abundances of the second peak are the result of various competing reactions, such as neutron capture, photodisintegration, fission, and β -delayed neutron emission. The latter has been the main focus of our experiment, conducted within the BRIKEN project [Tol19] at the RIBF facility of RIKEN (Japan).

In the present contribution, we will present new experimental results on β -delayed one and two neutron emission probabilities of very neutron-rich nuclei located south-east of ^{132}Sn [Pho20] and compare them with recent macroscopic-microscopic and self-consistent global models with the inclusion of the statistical treatment of neutron and γ emission [Kaw08, Min21]. The impact of our results on the odd-even staggering of the final r -process abundance around the second r -process peak, as well as the observed odd-mass isotopic fractions of Ba in metal-poor stars [Wen18] will be presented. Continuing our experimental program on r -process nuclei, we will present a new experimental setup that will allow β -decay and β -delayed neutron spectroscopy studies to be conducted in parallel with MR-TOF mass measurements program at RIKEN RIBF.

References

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Auteur: Dr VI, Phong (RIKEN Nishina Center, Japan and University of Science, Vietnam National University, Hanoi, Vietnam)

Co-auteurs: Prof. ESTRADA, Alfredo (Central Michigan University, USA); Dr MONTE, Fernando (National Superconducting Cyclotron Laboratory, USA); Dr LORUSSO, Giuseppe (National Physical Laboratory, UK, University of Surrey, UK and RIKEN Nishina Center, Japan); NISHIMURA, Shunji (RIKEN Nishina Center)

Orateur: Dr VI, Phong (RIKEN Nishina Center, Japan and University of Science, Vietnam National University, Hanoi, Vietnam)

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