Studies of β-delayed neutron emission in neutron-rich r-process nuclei with the BRIKEN detector array

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β-delayed neutron emission probabilities of exotic nuclei, along with nuclear masses and β-decay half-lives, are of key importance in the stellar nucleosynthesis of heavy elements via the rapid neutron-capture process (r-process). Not only does β-delayed neutron emission lead to a redistribution of material as neutron-rich nuclei β-decay towards stability, it also acts as a source of late-time neutrons which increase the neutron-to-seed ratio and can be recaptured during the freeze-out phase. Both of these processes influence the final r-process abundance distribution and obtaining a more complete description of this process is vital to developing a deeper understanding of observed elemental abundances.

The β-delayed neutrons at RIKEN (BRIKEN) project [1, 2] combines the world's most efficient neutron detector array with the highly-segmented silicon implantation detector AIDA and two HPGe clover detectors for γ spectroscopy. In operation since 2016, several experiments have already been conducted studying βn-emission in 231 nuclei from ^{64}Cr to ^{151}Cs and measuring many βn-emission probabilities and decay half-lives for the first time. With further experiments planned to study $A > 190$ and $A < 50$ nuclei in the coming years, the BRIKEN campaign will contribute a wealth of new results which are critical in reducing the uncertainty in r-process abundances obtained using astrophysical nucleosynthesis network calculations.

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[1] A. Tarifeño-Saldivia et al., J. Inst. **12.04**, (2017).

[2] A. Tolosa-Delgado et al., NIMA **925**, 133-147, (2019).