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Gamma-Particle Coincidence Studies of 93Sr(d,p)94Sr via the Surrogate Reaction Method

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Neutron-capture cross sections play a vital role in our understanding of heavy element nucleosynthesis. In astrophysical processes such as the intermediate neutron-capture process and rapid neutron-capture process, element formation occurs in neutron-rich environments and involves short-lived isotopes for which capture cross sections cannot be measured via direct techniques. Instead reaction rates in these regions rely on calculations that have uncertainties up to a few orders of magnitude. Recent measurements of the β-decay of ^{94}Rb [1], which compared the neutron-to gamma-ray-branching ratio of state decays above the neutron separation energy in ^{94}Sr, suggest an enhanced γ-ray branch which would in turn lead to an unexpectedly large ^{93}Sr(n,γ) cross section. If confirmed, such an enhancement could have a strong impact on our understanding of nucleosynthesis processes involving nuclei in this region. In order to investigate this potential enhancement of the ^{93}Sr(n,γ) cross section, an experiment was performed at TRIUMF using an 8~MeV/u ^{93}Sr beam impinging on a CD_2 target. The (d,pγ) coincidence data was measured using the SHARC and TIGRESS arrays. Experimental details from the measurement of ^{93}Sr(d,p)^{94}Sr will be presented along with preliminary gamma-particle coincidence analysis using the Surrogate Reaction Method [2,3].

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