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First Experimental Constraint of the ^{141}Ba(n,γ)^{142}Ba Reaction Rate for the Astrophysical i-Process

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One of the biggest questions in Nuclear Astrophysics is how elements are synthesized in stars. In the traditional nucleosynthesis picture, elements are thought to be created by one of the two traditional neutron-capture processes, namely the slow (s) and rapid (r) processes. Recent observations of carbon-enhanced metal poor stars (CEMP), however, show that observed abundance patterns cannot be reproduced by these traditional processes, and indicate that an additional process known as the intermediate neutron-capture process (i-process) is needed to describe these abundances. Occurring at intermediate neutron densities, the majority of nuclear physics properties (mass, half-life, etc.) are well constrained, however the neutron-capture cross sections and reaction rates remain largely unmeasured. In a sensitivity study by the NuGrid Collaboration, ^{141}Ba(n,γ)^{142}Ba was identified as a high-priority measurement due to its impact on the production of praseodymium in CEMP-i stars. In this talk, I will discuss the first experimental constraint of the ^{141}Ba(n,γ)^{142}Ba using the β-Oslo method. The experiment took place at Argonne National Laboratory's CARIBU facility where a ^{142}Cs beam was delivered into the SuN detector and SuNTAN tape transport system. Results on the nuclear level density and γ-ray strength function following the decay of ^{142}Cs to ^{142}Ba will be presented along with ^{141}Ba(n,γ)^{142}Ba reaction rate results.

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