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Constraining neutron capture rates far from stability and astrophysical implications

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The astrophysical r-process is responsible for the synthesis of about half of the isotopes of the heavy elements. Despite its well-known role in nucleosythesis, the astrophysical site where it takes place has not been unambiguously determined. Efforts for the better understanding of this important process span across many fields, from astronomical observations of metal-poor stars, and modeling of the possible scenarios, to sensitivity studies to input parameters, nuclear theory calculations and nuclear experiments. The present talk will focus on the experimental efforts for providing nuclear input information to help improve our understanding of the r-process. One of the important inputs, that is practically unconstrained by experiment, is neutron capture reactions. The talk will focus on the development of a new technique (β-Oslo) to experimentally constrain these important (n,γ) reaction rates far from stability. The experiments were done at the National Superconducting Cyclotron Laboratory (NSCL) at Michigan State University using the γ-calorimeter SuN. The validation of the β-Oslo technique, first physics results and implications for astrophysical calculations will be presented.

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