First direct measurement of ^{56}Ni(α,p)^{59}Cu to constrain X-Ray burst models

Louis Wagner[1] and the JENSA Collaboration[2]

[1] *National Superconducting Cyclotron Laboratory, Michigan State University, East Lansing, MI, USA*

[2] *http://www.jensajet.org/collaboration/authors*

For a deeper understanding what drives nucleosynthesis in extreme astrophysical scenarios like X-Ray bursts, a variety of reaction rates of proton and alpha capture reactions with unstable isotopes have to be known. To a large extend they rely only on theoretical models with large uncertainties. Radioactive ion beam accelerators like at the Facility for Rare Isotope Beams (FRIB) at Michigan State University (MSU) provide great opportunities to study these reactions experimentally. The Jet Experiments in Nuclear Structure and Astrophysics (JENSA) gas target system was constructed to take advantage of these low intensity beams at the National Superconducting Cyclotron Laboratory (NSCL) at MSU for direct measurements of capture and transfer reactions.

Sensitivity studies of Type I X-Ray burst models show that the reaction ^{59}Cu(p,α)^{56}Ni competes with the rp-process and has one of the greatest impacts on the burst light curve. The cross section of the reaction can be constraint by the time-inverse reaction ^{56}Ni(α,p)^{59}Cu, because it is predicted that only the ground state is populated at astrophysical energies. The contribution presents preliminary results of the recent alpha capture experiment on ^{56}Ni with JENSA that can constrain the uncertainty of nuclear physics input of X-Ray burst models. As an outlook the JENSA hydrogen operation upgrade for day-one experiments once FRIB is running will be discussed.

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