

Studies of (alpha,p) reactions important for X-ray bursts using radioactive beams from RESOLUT

J. C. Blackmon¹, L. Afanasieva¹, L. Baby², D. W. Bardayan³, J. Belarge²,
C. M. Deibel¹, E. D. Johnson², E. Koshchiy⁴, A. N. Kuchera², A. Lauer¹,
L. E. Linhardt¹, J. Lai¹, K. T. Macon¹, M. Matos^{1,5}, B. C. Rasco¹, G. V. Rogachev⁴,
D. Santiago-Gonzalez^{1,2} and I. Wiedenhover²

¹ Louisiana State University, Baton Rouge, LA 70803 USA

² Florida State University, Tallahassee, FL 32306 USA

³ University of Notre Dame, Notre Dame, IN 46556

⁴ Texas A & M University, College Station, TX 77843 USA

⁵ International Atomic Energy Agency, 1220 Wien, Austria

X-ray bursts (XRBs) are the most common stellar explosions in the Galaxy. Certain (alpha,p) reactions on proton-rich nuclei have been shown to influence energy generation at the beginning of these bursts as well as the final elemental abundances of the nuclei that are created. We are performing direct studies of (alpha,p) reactions using the Array for Nuclear Astrophysics and Structure with Exotic Nuclei (ANASEN), an array of charged-particle detectors designed for use as an active gas target/detector. We will report on commissioning measurements of ANASEN using stable beams and a first measurement of the $^{18}\text{Ne}(\alpha,p)^{21}\text{Na}$ reaction performed at the John D. Fox Superconducting Linear Accelerator Laboratory at Florida State University using a radioactive ^{18}Ne beam produced by the in-flight technique using RESOLUT. We are also using radioactive ion beams from RESOLUT to provide complementary information important for improving our understanding of (alpha,p) reactions through measurements of proton elastic and inelastic scattering probing nuclear level structure of the same compound nucleus. We will also present measurements of $^{17}\text{F}+p$ and $^{25}\text{Al}+p$ scattering to study the nuclear structure important for the $^{14}\text{O}(\alpha,p)^{17}\text{F}$ and $^{22}\text{Mg}(\alpha,p)^{25}\text{Al}$ reaction rates. The work was supported by U.S. National Science Foundation (by awards PHY-0821308, PHY-0820941, and PHY-1064819) and by the U.S. Department of Energy (by award DE-FG02-96ER40978).