Nuclear Astrophysics at ISAC with DRAGON: Initial Studies

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The new DRAGON recoil separator facility, designed and built to measure directly the rates of radiative proton and alpha capture reactions important for nuclear astrophysics is now in operation at the TRIUMF-ISAC radioactive beams facility in Vancouver, Canada. Experiments have been conducted for the first time on the ^{21}Na(p,γ)^{22}Mg reaction. The evolution of nova explosions, and particularly their ^{22}Na abundance, depends sensitively on this reaction rate. The radioactive ^{21}Na beam with an intensity of up to 5 x 10^8 /s was directed onto a windowless hydrogen gas target (3.6 x 10^{18} H atoms/cm^2). Prompt reaction gamma rays were detected using a BGO array and separated reaction products detected using a silicon strip detector at the end of the 20.8 m recoil mass separator. Yield measurements recording simultaneously singles and coincident signals were performed by scanning in energy over the known resonance reported previously in ^{22}Mg at E_{cm} = 212 keV, and in addition, over a strong resonance observed at E_{cm} $\approx$822 keV. Known resonances in the ^{21}Ne(p,γ)^{22}Na, ^{20}Ne(p,γ)^{21}Na, and ^{24}Mg(p,γ)^{25}Al reactions have been used to calibrate the DRAGON. Studies are in progress to further define the performance of the DRAGON facility. Status of the data analysis and results from system performance studies will be presented along with a brief description of the new ISAC and DRAGON facilities.