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Development of a β-delayed charged particle detector for studying novae and x-ray bursts[1] MOSHE FRIEDMAN, TAMAS BUDNER, MARCO CORTESI, MADISON HARRIS, MOLLY JANASIK, DAVID PEREZ-LOUREIRO, Nt'l Superconducting Cyclotron Laboratory, Michigan State Univ., EMMANUEL POLLACO, IRFU, CEA Saclay, Gif-sur-Yvette, France, MICHAEL ROOSA, PRANJAL TIWARI, CHRIS WREDE, JOHN YURKON, Nt'l Superconducting Cyclotron Laboratory, Michigan State Univ. — Classical novae and type I x-ray bursts are energetic and common thermonuclear astrophysical explosions. However, our ability to understand these events is limited by the lack of comprehensive nuclear data on proton-rich nuclei. Specifically, constraining the $^{30}P(p,\gamma)^{31}S$ and $^{15}O(\alpha,\gamma)^{19}Ne$ reaction rates has been found to be crucial to the understanding of nucleosynthesis and energy generation in these events. As direct measurements of these reactions are not technically feasible at the present time, a gas-filled detector of β-delayed charged particles has been designed and built to measure the $^{31}Cl(\beta p)^{30}P$ and $^{20}Mg(\beta p\alpha)^{15}O$ decay sequences at NSCL, providing an indirect probe of resonances in the radiative capture reactions above. The detector is coupled with the Segmented Germanium Array (SeGA) to enable coincidence detection, as an additional probe of interaction details and for normalization purposes. The first phase of the detector functions as a proton calorimeter and it is currently being tested and optimized. We will describe the technical status of Phase I, including the concept, simulations, design, assembly, and first offline measurements using radioactive sources.

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