Nuclear Physics of Stellar Explosions

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The ^{34}S(p, γ)^{35}Cl reaction cross section at the temperature range characteristic of explosive hydrogen burning in classical novae suffers from a large uncertainty as a result of inconclusive experimental data. This uncertainty translates to large variations in the theoretical abundances of ^{34}S resulting from models of classical novae on oxygen-neon white dwarfs. ^{34}S abundances have the potential to aid in distinguishing the presolar grains of nova origin from those created in supernovae.

We have performed an experiment to investigate the nuclear structure of ^{35}Cl, above the proton threshold, via high-resolution charged-particle spectroscopy using the ^{32}S(α, p)^{35}Cl reaction. The experiment was carried out at Triangle Universities Nuclear Laboratory (TUNL) using the TUNL Enge split-pole spectrograph facility.

In my presentation, I will describe in details the facility together with our experiment and will present the experimental results.

In addition, I will briefly summarize a few experiments to investigate nuclei significant for understanding explosive nucleosynthesis in novae and supernovae. Such studies can be carried out using the various facilities available at Florida State University, as well as those that will come online in near future at the Facility for Rare Isotope Beams in Michigan State University.