Contribution ID: **259** Type: **Oral Presentation**

Direct Measurement of the ^{59}Cu(p,α)^{56}Ni reaction with the Multi Sampling Ionization Chamber Detector (MUSIC)

We report the preliminary results from a direct cross-section measurement of the ^{59}Cu(p, α) ^{56}Ni reaction, performed in inverse kinematics using the high-efficiency MUSIC active-target detector at the ReA6 facility at FRIB. This reaction is critical in explosive astrophysical environments. In type I X-ray bursts, where rapid proton capture and α-induced processes drive the thermonuclear runaway, the competition between the ^{59}Cu(p, α) and ^{59}Cu(p, γ) reactions governs the breakout from the NiCu cycle. This breakout is essential for synthesizing heavier nuclei and ultimately shapes the X-ray burst light curves and the composition of burst ashes. Similarly, in the νp-process—operating in the proton-rich ejecta of core-collapse supernovae—the ^{59}Cu(p, α) reaction rate strongly influences the formation of heavy, proton-rich isotopes that are observed in the aftermath of these stellar explosions.

Our measurement used a ^{59}Cu beam delivered at 8.41 MeV/u with an intensity of ~1×10^{4} pps, covering the center-of-mass energy range from 2.38 to 5.57 MeV. This energy window lies within the Gamow range for temperatures above 2 GK—a regime critically relevant for both X-ray bursts and the νp-process. The experiment employed methane gas in the MUSIC chamber to enable high-rate detection and event-by-event identification was achieved through characteristic energy-loss patterns, allowing a clear separation of (p, α) events from potential contaminants.

Author: LOPEZ SAAVEDRA, Eilens (Argonne National Laboratory)

Presenter: LOPEZ SAAVEDRA, Eilens (Argonne National Laboratory)

Session Classification: Parallel session

Track Classification: Nuclear Astrophysics