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Resonant elastic scattering experiments with active and non-active targets

This talk will present two resonant elastic scattering experiments addressing questions in nuclear astrophysics and nuclear structure. The first experiment focuses on the production of ^{18}F in classical novae, critical for gamma-ray emissions from β^+ decay. The reaction $^{18}\text{F}(\alpha, \alpha)^{15}\text{O}$, which destroys ^{18}F , remains uncertain due to limited spec-

troscopic data for ^{19}Ne in the Gamow window. To address this, the $^{15}\text{O}(\alpha, \alpha)^{15}\text{O}$ reaction was studied to measure excitation energies, spins, and Γ -widths of ^{19}Ne levels near the proton threshold. The experiment, conducted at GANIL with a SPIRAL1 beam, a gaseous target, and silicon detectors, achieved <17 keV FWHM resolution and could refine ^{18}F production rates by up to 3.5 times.

The second experiment explored clustering phenomena in ^{12}Be through the $^4\text{He}(^8\text{He}, ^8\text{He})^4\text{He}$ reaction. Earlier studies identified a resonance at 12.1 MeV near key particle thresholds. Using ACTAR TPC, filled with helium gas and isobutane, excitation energies between 11.5 and 13 MeV were probed with <100 keV resolution, significantly improving on previous work. This approach also enabled the measurement of angular distributions and resonance spin-parity characterization. These results provide insight into clustering dynamics in light nuclei near multi-particle thresholds, which have implications for understanding nuclear structure and reaction mechanisms.

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