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Direct measurement of the ^{26m}Al(p,γ)^{27}Si reaction at DRAGON using an isomeric radioactive ion beam

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The investigation of radiative capture reactions involving the fusion of hydrogen or helium is crucial for the understanding of stellar nucleosynthesis pathways as said reactions govern nucleosynthesis and energy generation in a large variety of astrophysical burning and explosive scenarios. However, direct measurements of the associated reaction cross sections at astrophysically relevant low energies are extremely challenging due to the vanishingly small cross sections in this energy regime. Additionally, many astrophysically important reactions involve radioactive isotopes, which pose challenges for beam production and background reduction.

One of the key aspirations in experimental nuclear astrophysics is the determination of the stellar origin of the cosmic γ-ray emitting isotope ^{26}Al, which is still posing an experimental challenge.
The observation of the characteristic 1.809 MeV γ-ray signature throughout the interstellar medium as well as isotopic excesses of ^{26}Mg found in meteorites provided evidence for the existence of ^{26}Al in the early Solar System, however, its exact origin is still being discussed. Understanding the stellar nucleosynthesis of ^{26}Al is complicated by the presence of a 0^+ isomer located 228.31 keV above the ground state. Since said level undergoes super-allowed β^+ decay directly into the ^{26}Mg g.s., the emission of the 1.809 MeV γ-ray is bypassed, and the isomer does not contribute to the directly observed galactic ^{26}Al abundance, however, influences the ^{26}Al:^{27}Al ratio in presolar grains. Thus, only by studying the reactions involved in the production and destruction of both, ^{26}Al and ^{26m}Al, one can identify how various astrophysical environments contribute to the ^{26}Al γ-ray flux.

To date, the available experimental information on the rate of the ^{26m}Al(p,γ)^{27}Si reaction is rather limited and considerable uncertainties still remain. In this contribution, I will present results obtained from a recent analysis of an inverse kinematics study performed with DRAGON (Detector of Recoils And Gammas Of Nuclear Reactions) using isomeric ^{26m}Al beam to investigate the 448 keV resonance in ^{26m}Al(p,γ). Additionally, a brief overview of other recent experimental activity at DRAGON will be presented.

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