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A new underground measurement of the ^{14}N(p,γ)^{15}O reaction at Bellotti Ion Beam Facility

An accurate understanding of the slowest reaction of the CNO cycle, the ^{14}N(p,γ)^{15}O, is essential for estimating the lifetimes of massive stars and globular clusters. Additionally, it plays a crucial role in determining the CNO neutrino flux emitted by the Sun. Despite the significant efforts over the last twenty years, including pioneering underground measurements made by the LUNA collaboration, this reaction remains a predominant source of uncertainty when assessing the solar chemical composition.

As a pilot project for the LNGS Bellotti Ion Beam Facility, the LUNA collaboration has performed a measurement of ^{14}N(p,γ)^{15}O cross section with a focus on its angular distribution using Tantalum Nitride solid targets, developing novel approaches to limit the beam-induced background contributions. An excellent sensitivity was achieved in synergy with the high beam current provided by the Bellotti Ion beam facility 3.5~MV accelerator in its deep-underground location.

New angular distribution data have been obtained in the energy range from {0.3} to {1.5}~MeV, including also the weaker transitions, many of them not observed by previous authors. In this talk I will present new results obtained for the differential cross section that provides a novel comprehensive picture of the reaction at astrophysical energies.

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