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The study of the ^{21}Ne(p,γ)^{22}Na reaction at LUNA

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The ^{21}Ne(p,γ)^{22}Na reaction is expected to be the main producer of the radioactive isotope ^{22}Na ($t_{1/2}$ = 2.602 years) in novae. Novae explosions are the result of a thermonuclear runaway occurring on the surface of a white dwarf accreting material from a less evolved companion star in a close binary system that ejects a significant amount of nuclear-processed material into the interstellar medium. Amongst the isotopes synthesized during such explosions, radioactive nucleus ^{22}Na is specifically produced in white dwarfs made of O and Ne, the progeny of stars with initial mass in the range of 8-10 solar mass. Once produced, ^{22}Na beta decays to an excited state of ^{22}Ne, which de-excites by emitting a 1275 keV gamma ray [1]. If detected by satellite telescopes, this signal can provide information on the amount of ^{22}Na produced in novae, and thus place direct constraints on the nucleosynthesis in these explosions.
Predictions of the ^{22}Na abundance in novae strongly depend on the ^{21}Ne(p,γ)^{22}Na reaction rate. In the novae temperature range ($0.2 < T_9 < 0.5$), ^{21}Ne(p,γ)^{22}Na reaction is dominated by resonances at proton beam energies E_p = 126 and 272 keV [2]. In this contribution, we will report on the direct and precise measurement of the E_p = 272 keV resonance strength performed at the Laboratory for Underground Nuclear Astrophysics (LUNA) [3] located at Gran Sasso National Laboratory in Italy, benefiting from the low background conditions. The experimental setup, techniques, and results will also be described in detail in the talk.

References:

M. Hernanz *et al.,* ESA Special Publication **588**, 351 (2005).

J. Görres *et al.,* Nuclear Physics A **385**, 57-75 (1982).

M. Aliotta *et al.,* Annual Review of Nuclear and Particle Science **72**, 177-204 (2022).

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