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# The SOCIAL project: measurement of the $^{14}\mathrm{N}(p,\gamma)^{15}\mathrm{O}$ cross section

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Solar neutrinos play a significant role in constraining physical conditions in the interior of the Sun and are a unique tool to investigate its core composition. The $^{14}\mathrm{N}(p,\gamma)^{15}\mathrm{O}$ cross section is the dominant error source on neutrino flux predictions. At solar energies ($15-50\,\mathrm{keV}$) such a cross-section is too low to be measured directly, therefore current estimates are based on extrapolations of higher-energy data. The SOCIAL project aims at determining the $^{14}\mathrm{N}(p,\gamma)^{15}\mathrm{O}$ reaction rate at astrophysical energies with $5\%$ precision, as requested by Solar models. We take advantage of the much suppressed gamma-ray background achievable in the underground Gran Sasso laboratory to measure the $^{14}\mathrm{N}(p,\gamma)^{15}\mathrm{O}$ cross section in the $50-370\,\mathrm{keV}$ energy range. We deliver an intense proton beam from the LUNA accelerator to a solid nitrogen target. Gamma-rays are detected with a high-efficiency $4\pi$-BGO detector composed of 6 independent segments. The data analysis technique will lead to determine the total and the partial cross sections for individual gamma transitions. An overview of the experimental setup and the preliminary data analysis will be presented.

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