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Measurement of the 7Be(p,γ)8B reaction cross section at astrophysical energies with the recoil mass separator ERNA

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The $^{7}\mathrm{Be}(\mathrm{p},\gamma)^{8}\mathrm{B}$ represents one of the more important reaction for the prediction of high energy component of solar neutrino spectrum. The importance of this reaction triggered an intense experimental work over the last decades, where discrepancies were observed between the results of different measurements.
The origin of this discrepancy limit the overall precision and accuracy of the estimate of the astrophysical rate of $^{7}\mathrm{Be}(\mathrm{p},\gamma)^{8}\mathrm{B}$ reaction. In addition, there is a question about possible common systematic effects, considering that all measurements performed so far share the same experimental approach, i.e. an intense proton beam impinging on a $^{7}\mathrm{Be}$ radioactive target. A direct measurement using a radioactive $^{7}\mathrm{Be}$ ion beam on a pure hydrogen gas target by means of the detection of the $^{8}\mathrm{B}$ recoils, can shed light on such systematic effects. Efforts attempted so far were limited by the low $^{7}\mathrm{Be}$ beam intensity.
Here we present the results obtained using the intense $^{7}\mathrm{Be}$ beam in combination with a windowless gas target available at the Tandem Accelerator Laboratory at CIRCE (Center for Isotopic Research on Cultural and Environmental heritage), University of Campania, Italy coupled to the recoil mass separator ERNA (European Recoil mass separator for Nuclear Astrophysics) in the energy range $E_{cm} = 367$ to 812 keV 1.

[1] *Buompane, R. et al., Determination of the* $^{7}\mathrm{Be}(\mathrm{p},\gamma)^{8}\mathrm{B}$ *cross section at astrophysical energies using a radioactive* $^{7}\mathrm{Be}$ *ion beam, Physics Letters B, 824, 136819, 2022, 10.1016/j.physletb.2021.136819*

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