

Direct measurement of the low-energy cross section of $^{22}\text{Ne}(\alpha,n)^{25}\text{Mg}$

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The reaction plays a crucial role in the nucleosynthesis of heavy elements, in both the main and the weak s processes. In addition, its stellar reaction rate (and that of the competing channel $^{22}\text{Ne}(\alpha,g)^{26}\text{Mg}$) determine the ratio of the Mg isotopes that can be directly observed in stellar atmospheres. To provide input for stellar and nucleosynthesis models, the cross section needs to be known between the neutron threshold at 565 keV and about 800 keV. Due to the very low experimental rates (counts/h) it has so far been impossible to measure directly besides at one resonance at $E_{\alpha} = 830$ keV.

The ERC-funded project SHADES aims at measuring the reaction directly in the stellar energy range by exploiting the strong background suppression of the deep underground Gran Sasso national laboratory (LNGS) in Italy and a high-current beam from the new MV accelerator at the Bellotti Ion Beam facility. Limited energy sensitivity by using a combination of ^3He counters and EJ-309 scintillators will help identify possible beam-induced backgrounds. The aim is to cover the entire energy range from threshold to and including the 830 keV resonance with an increased sensitivity over the state of the art by at least two orders of magnitude. The setup has been installed at the LNGS and we will present the current status of the experiment.

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