

Measurement of the $^{27}\text{Al}(\text{p},\alpha)^{24}\text{Mg}$ reaction at astrophysical energies via the Trojan Horse Method

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The source of ^{26}Al in the Galaxy is an important issue in nuclear astrophysics. The detection of the 1809 keV gamma emission proves that ^{26}Al nucleosynthesis is occurring the Galaxy as well as the over abundances of ^{26}Mg (the ^{26}Al daughter nucleus) found in pristine meteorites indicate that the ^{26}Al nucleosynthesis was very efficient even in the past. By measuring the ratios of the abundances $^{26}\text{Mg}/^{24}\text{Mg}$ and $^{26}\text{Mg}/^{27}\text{Al}$ it is possible to estimate the $^{26}\text{Al}/^{27}\text{Al}$ ratio in the ancient Galaxy and date meteorites (or early solar system solids) [1,2].

It is then crucial to know the nucleosynthesis process with high precision not only of ^{26}Al but also of ^{27}Al and ^{24}Mg . However, at present the uncertainties affecting the $^{27}\text{Al}(\text{p},\alpha)^{24}\text{Mg}$ reaction rate (at $T \leq 10^8\text{K}$) span almost an order of magnitude. This fact makes astrophysical predictions unreliable because the $^{27}\text{Al}(\text{p},\alpha)^{24}\text{Mg}$ reaction drives the destruction of ^{27}Al and the production of ^{24}Mg closing the so-called Mg-Al cycle in the high temperature H-burning [3].

We present here the first results of the investigation of the $^{27}\text{Al}(\text{p},\alpha)^{24}\text{Mg}$ reaction by applying the Trojan Horse Method [EPJ,5] to the three-body quasi-free reaction $^2\text{H}(^{27}\text{Al},\alpha^{24}\text{Mg})\text{n}$. So far, this has allowed us to perform high precision spectroscopy on the compound nucleus ^{28}Si , from which extract important information on the $^{27}\text{Al}(\text{p},\alpha)^{24}\text{Mg}$ reaction cross section in the energy region of interest for astrophysics, not accessible to direct measurements [6]. In the future, we will be able to deduce the astrophysical factor within the Gamow window with no

need of extrapolation.

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