

The Stellar $^{72}\text{Ge}(n, \gamma)$ Cross Section for weak s-process: A First Measurement at n_TOF

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The slow neutron capture process (s-process) is responsible for producing about half of the elemental abundances heavier than iron in the universe. Neutron capture cross sections on stable isotopes are a key nuclear physics input for s-process studies. The $^{72}\text{Ge}(n, \gamma)$ Maxwellian Averaged Cross Section (MACS) has an important influence on production of isotopes between Ge and Zr in the weak s-process in massive stars [1] and so far only theoretical estimations are available [2].

An experiment was carried out at the neutron time-of-flight facility n_TOF [3] at CERN to measure the $^{72}\text{Ge}(n, \gamma)$ reaction for the first time at stellar neutron energies. At n_TOF, the neutron beam has a large energy range (few meV to several GeV). The capture measurement was performed using an enriched $^{72}\text{GeO}_2$ sample at a flight path length of 184 m, which provided high neutron energy resolution. The prompt gamma rays produced after neutron capture were detected with a set of liquid scintillation detectors (C_6D_6). The neutron capture yield is derived from the counting spectra taking into account the neutron flux and the gamma-ray detection efficiency using the Pulse Height Weighting Technique [4].

Over 70 new neutron resonances were identified, providing an improved resolved reaction cross section to calculate MACSs. I will present the experiment, data analysis and first results for MACSs, including their impact on stellar nucleosynthesis.

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