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Measurement of the neutron capture cross section on argon with ACED

Liquid argon is becoming a popular medium for particle detection, with applications ranging from low-background dark matter searches to high-energy neutrino detection.

Because neutrons represent both an important source of background (e.g., for dark matter experiments) and a product of signal events (e.g., neutrino-induced spallation neutrons), a good understanding of their interactions in argon is a requirement for precision physics measurements.

Despite being one of the most basic quantities needed to describe low-energy neutron transport, the thermal neutron capture cross section on argon remained poorly understood, with the existing activation measurements showing significant disagreements.

The Argon Capture Experiment at DANCE (ACED) collaboration has performed a differential measurement of the $^{40}\text{Ar}(n, \gamma)^{41}\text{Ar}$ cross section using a Time-Of-Flight neutron beam and the Detector for Advanced Neutron Capture Experiments (DANCE), a $\sim 4\pi$ gamma spectrometer at Los Alamos National Laboratory.

A fit to the differential cross section from 0.015 – 0.15eV, assuming a $1/v$ energy dependence, yields $\sigma^{2200} = 673 \pm 26$ (stat.) ± 59 (sys.)mb.

Collaboration name

ACED Collaboration

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