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First measurement of the neutron-argon cross section between 100 and 800 MeV

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The DUNE experiment directs a neutrino beam from Fermilab towards a 40 kiloton liquid argon time-projection chamber (TPC) 1300 km away in the Sanford Underground Research Facility in South Dakota. By measuring electron neutrino and anti-neutrino appearance from the predominantly muon neutrino and anti-neutrino beams, DUNE will determine the neutrino mass ordering and explore leptonic CP violation. The neutrino oscillation phenomena explored by DUNE require robust determinations of the (anti-)neutrino energies by reconstructing the particles produced in charged current reactions. Among the particles emerging from the interaction which carry significant energy, neutrons are the most challenging to reconstruct. The CAPTAIN collaboration has made the first measurement of the neutron-argon cross section between 100 and 800 MeV of neutron kinetic energy - an energy regime crucial for neutrino energy reconstruction at DUNE. We made the measurement in a liquid argon TPC with 400 kg of instrumented mass. I describe the measurement, its importance to DUNE, and discuss future plans.

Collaboration name

CAPTAIN Collaboration

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