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Measurements of low-energy nuclear recoils in liquid argon

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The sensitivity of noble liquids detectors to light WIMPs and coherent neutrino-nucleus scattering is a result of detector threshold and low-energy ionization yield for nuclear recoils. We measured for the first time sub-keV electron recoils in a dual-phase argon ionization chamber by observing the peaks peaks in the energy spectrum at 2.82 keV and 0.27 keV, following the K- and L-shell electron capture decay of Ar-37 respectively. Detection of single ionization electrons was also achieved. We also measured the ionization yield of 7 keV nuclear recoils in liquid argon induced by scattering of quasi-monoenergetic neutrons from a collimated and filtered 7Li(p,n) source. We will discuss the detector characterization and performances, the neutron source design, and the ionization yield experimental results, along with their implications for coherent neutrino scattering and dark matter searches.

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