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A proposal to use neutron captures as a source of ultra-low energy nuclear-recoils in liquid xenon

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We propose a technique for an ultra-low energy nuclear-recoil measurement in liquid xenon using thermal neutron capture. The measurement uses the recoils imparted to xenon nuclei during the de-excitation process following neutron capture, where the promptly emitted γ cascade can leave the nuclei with up to 0.3 keV_{nr} of recoil energy. A successful measurement of the quanta yields below this point will contribute to a greater sensitivity for liquid xenon experiments that will benefit from a lower energy threshold, mainly those searching for light WIMPs and coherent neutrino-nucleus scattering. We describe the proposed measurement and its feasibility for a small (sub-kilogram) LXe detector that is optimized for a high scintillation gain, and a pulsed neutron source.

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