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A Proposal for an Ultra-Low Energy Nuclear-Recoil Calibration in Liquid Xenon using Neutron Capture RUBEN CORONEL, CHAMI AMARASINGHE, DONGQING HUANG, University of Michigan — In recent years, much effort has been made to better understand the low energy nuclear recoil (NR) response in liquid xenon (LXe), allowing experiments to be increasingly sensitive to light dark matter. We propose a technique for ultra-low energy NR calibration using the recoils imparted to xenon nuclei during the de-excitation process following thermal neutron capture, where the instantaneous gamma cascade leaves the nuclei with less than 0.3 keV of recoil energy. A successful measurement of the quanta yields below this point will contribute to a greater sensitivity for LXe experiments that will benefit from a lower energy threshold, mainly those searching for light dark matter and coherent neutrino-nucleus scattering. We describe the calibration technique, including simulation and signal optimization, and its feasibility for a small LXe detector using a pulsed neutron source.

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