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Investigating e- Light Yield in Scintillating Media

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An understanding of the electron light yield of organic scintillators is important for a variety of high energy physics (HEP) applications, from neutrino studies to the detection of exotic matter. However, measurements of the electron light yield in organic scintillators are scarce, and there is a general misunderstanding that the electron light yield is linear above 40 keV. This misconception often results in poor light output calibration, biasing organic scintillator ionization quenching studies and response simulations. No theoretical model can predict the response of ions in organic scintillators, particularly at low energies, possibly due in part to poor treatment of the contribution of secondary electrons to the light output. Given the widespread use of organic scintillators in dark matter, antineutrino studies, and other HEP applications, accurate light calibration and understanding of the response to nuclear recoils is needed. The goal of this work is to establish a platform for measuring the light output of scintillating media as a function of electron energy in collaboration with Lawrence Berkeley National Laboratory (LBNL). To this end, simulations have been conducted to design and optimize an experimental setup to measure the electron light yield over a broad energy range using an array of organic scintillators and Compton scattering kinematics. It is expected that this investigation will help to adjudicate controversial measurements in literature while also providing the community with new low energy electron light yield data for a wide range of scintillating media including new classes of scintillators such as organic glasses, triple-mode plastic scintillators, and water-based liquid scintillators.

Early Career

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