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Vector tracking in low-energy nuclear recoils

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Gaseous Time Projection Chambers (TPCs) can be used in Directional Dark Matter (DDM) searches to unambiguously identify a galactic origin for Dark Matter candidates. Directional sensitivity at low recoil energies is limited by diffusion, dispersion during amplification, and digitization effects such as charge pileup. We discuss a new algorithm that models and partially removes these effects for a model TPC based on current technology. Furthermore, we show that it is possible to largely recover the primary 3D ionization charge distribution, leading to a reduction in reconstruction errors. These results have implications for the next generation of DDM detectors, which we will briefly discuss.

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