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3D Topological Reconstruction in Liquid Scintillator Detectors

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The precise reconstruction of charged particle tracks in unsegmented liquid scintillator (LSc) neutrino detectors, e.g., from muons, is an important prerequisite for the efficient rejection of cosmogenic background events or the analysis of multi-GeV neutrino interactions. Topological information on such events, i.e., the reconstructed 3D density distribution of isotropically emitted scintillation photons, opens up new ways to accomplish these tasks. Especially future multi-kiloton LSc detectors will profit from improved (muon) track reconstruction possibilities, both regarding their low- and high-energy neutrino physics programs.

Furthermore, the method presented here can also give valuable information on events traditionally thought as point-like (MeV). This offers the potential for particle discrimination at energies relevant for solar- or reactor-neutrino programs. Cherenkov-light presents a challenge, but also an opportunity in this context.

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