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Study of Ar^{39} Beta Decays in DUNE's Prototypes

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The Deep Underground Neutrino Experiment (DUNE) is a next generation long baseline neutrino experiments. It is a Liquid Argon Time Projection Chamber (LArTPC) detector. While its main physics goals (measuring the δ_{CP} phase, resolving θ_{23} octant and the mass hierarchy) are focused on a GeV-scale physics DUNE has also a low energy (MeV-scale) program. This includes observing for the first time hep solar neutrino or measuring a SuperNova Burst (SNB). To successfully detect these low-energy events, a precise understanding and quantification of the background is needed. This background is mainly Ar^{39} beta decays with an activity of 1 Bq/kg but also other radiologicals (K^{40}, Rn^{222}, Th-chain ...) and neutrons. It can provide a variety of different information: like testing the reconstruction of point-like events (useful for SNB) or measuring some of the detector characteristics (purity, space charge effect, recombination). Here is a study on reconstructing Ar^{39} beta decays in the ProtoDUNE-HD (PDHD) detector, the obtained spectrum is compared to Monte-Carlo simulations. Additionally, a Bi^{207} source, introduced for charge response calibration, is used to test the spatial and energy reconstruction capabilities of the algorithm.

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