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Particle Identification and Kaon Physics in LArIAT

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Kaon physics in liquid argon time projection chambers (LArTPCs) is important for future proton decay searches in large-scale LArTPCs, such as DUNE. Using LArIAT, a LArTPC test beam experiment at Fermilab, we have selected—with traditional beam line instrumentation—around 3E3 kaon candidate events, creating the first kaon data sample in a LArTPC. This sample allows us to perform the first studies of kaons in this detector, including the kaon total cross section on argon, automatic reconstruction performance of kaon topologies, and LArTPC-based kaon identification efficiencies. Further, we explore ways to improve this LArTPC-based particle identification through the use of data-driven machine learning techniques, work beneficial to all future automatic LArTPC reconstruction.

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