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Reconstruction Techniques in ANNIE - Neutrino 2022 Poster

The Accelerator Neutrino Neutron Interaction Experiment (ANNIE) is a 26-ton Gd-doped water Cherenkov detector installed in the Booster Neutrino Beam (BNB) at Fermilab. The experiment has two complementary goals: (1) make a unique measurement of the neutron yield from neutrino-nucleus interactions to improve the systematic uncertainties in oscillation experiments and (2) demonstrate the power of new fast-timing, position-sensitive photodetectors by making the first deployment of Large Area Picosecond PhotoDetectors (LAPPDs) in a physics experiment. To realise these goals the ANNIE collaboration has developed several reconstruction techniques using the arrival time and position of photons in the detector photomultipliers (PMTs) and LAPPDs. A maximum-likelihood fit is used to reconstruct the neutrino interaction vertex and direction. Machine and Deep Learning techniques are used for the energy reconstruction, the particle identification and the ring counting. We present recent progress on ANNIE reconstruction techniques.

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