

Track vs shower discrimination in the event reconstruction of the ICARUS experiment

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The ICARUS collaboration has employed the 760-ton T600 liquid argon TPC detector in a successful three-year physics run at the underground LNGS laboratory, performing a sensitive search for LSND-like anomalous ν_e appearance in the CERN Neutrino to Gran Sasso beam, which contributed to the constraints on the allowed neutrino oscillation parameters to a narrow region around 1 eV^2 . After a significant overhaul at CERN, the T600 detector has been installed at Fermilab. The detector commissioning phase lasted until June 2022, then ICARUS moved to data taking for neutrino oscillation physics collecting events from the Booster Neutrino Beam (BNB) and the Neutrinos at the Main Injector (NuMI) beam off-axis. The initial experiment goals are to either confirm or refute the claim by Neutrino-4 short-baseline reactor experiment, perform measurements of neutrino cross sections with the NuMI beam and several Beyond Standard Model searches. Then, ICARUS will jointly search for evidence of sterile neutrinos with the Short-Baseline Near Detector (SBND). In this contribution, we discuss recent changes to the standard TPC event reconstruction that uses Pandora, a pattern recognition software common to liquid argon-based detectors. In particular, we performed a new training of the Boosted Decision Tree (BDT) employed to separate track-like and shower-like reconstructed particles using Monte Carlo simulations of neutrino events from BNB in ICARUS. We compare the discrimination capabilities of the old and new BDT training and discuss further improvements of this algorithm.

Poster prize

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Classificazione della track: New technologies for neutrino physics