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Improving Tau Neutrino Background Rejection using the LBNE Fast Monte Carlo MATTHEW HOGAN, Colorado State Univ, LONG BASELINE NEUTRINO EXPERIMENT COLLABORATION — The Long Baseline Neutrino Experiment (LBNE) science collaboration is planning an experiment built around a $\mathcal{O}(10)$ kt liquid Argon TPC (LAr TPC) neutrino detector 1300km downstream of a wide band neutrino beam from Fermi National Accelerator Lab. Since a full Monte Carlo (MC) simulation is still under development, a Fast MC has been implemented. The Fast MC incorporates simulations of the neutrino beam flux and neutrino interactions while replacing the detector response and event reconstruction with parameterizations. The current Fast MC event selection algorithms, based on the identification of final-state lepton candidates, have a high background acceptance from charge-current (CC) tau neutrino interactions producing taus which decay leptonically (branching ratios of 17-18%). In this work an improvement in CC tau neutrino background rejection is explored for electron neutrino appearance and muon neutrino disappearance event samples. A multivariate analysis (MVA) based discriminator built from reconstructed kinematic variables has been shown to significantly improve background rejection with little loss in signal efficiency. Techniques for constructing the discriminator and estimates of the resulting improvements in background rejection will be presented.

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