Electron Neutrino Identification in NOvA Detectors

contents of the poster to be presented at April APS meeting

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Overview

I will present a poster at April APS meeting on electron neutrino identification in NOvA detectors

This will describe the various PIDs developed in nue event identification

Poster Layout

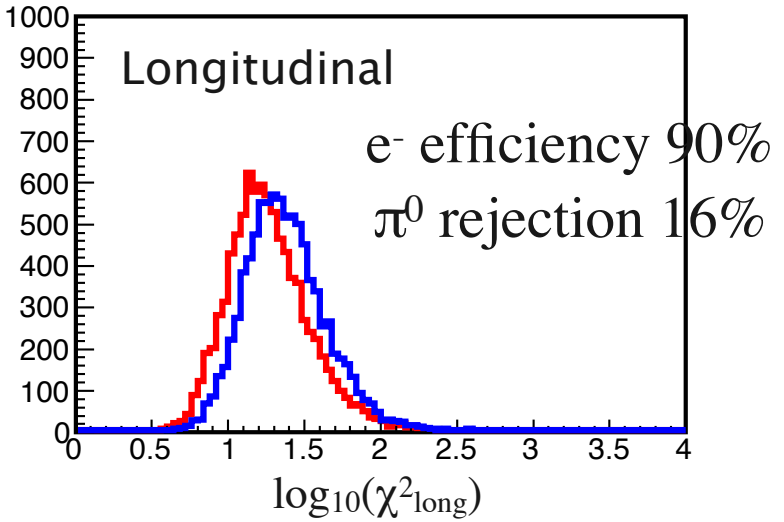
I plan to divide the poster in the following five sections.

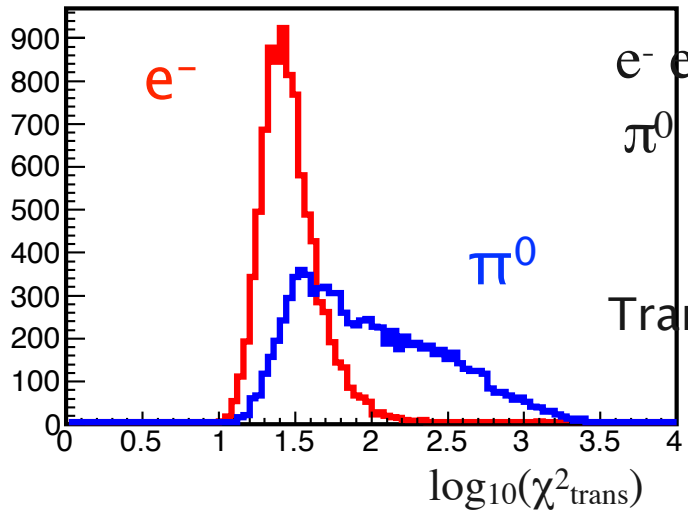
1. General introduction about NOνA experiment.
2. Neutrino event signatures from simulation.
3. NOνA physics sensitivities.
4. HMatrix method to separate electrons from pi_zero.
5. Nue CC event selection techniques.
    1. EID
    2. RVP
    3. LEM

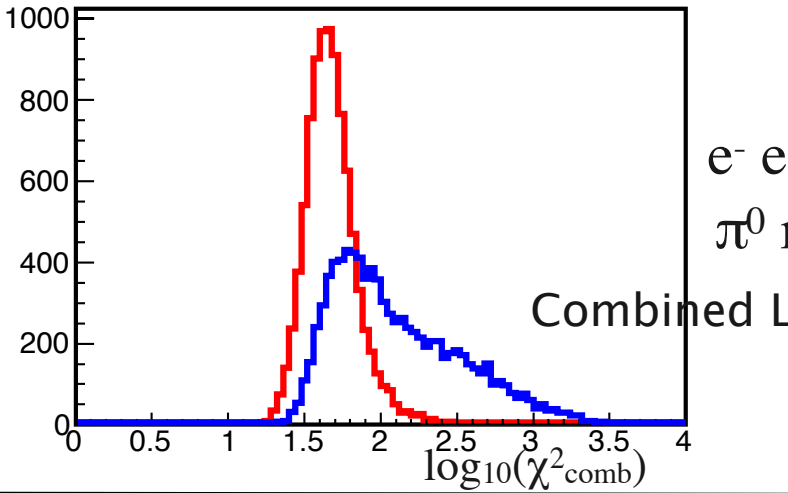
HMatrix Method

A matrix relating energy fractions to means in test beam (or MC) captures known correlations in EM showers. For NOvA, longitudinal, transverse and combined shower correlations are tested against simulated electrons. This is sensitive to e-/pi0 separation.

χ2 distribution for e- and pi0 from single particles are shown here.

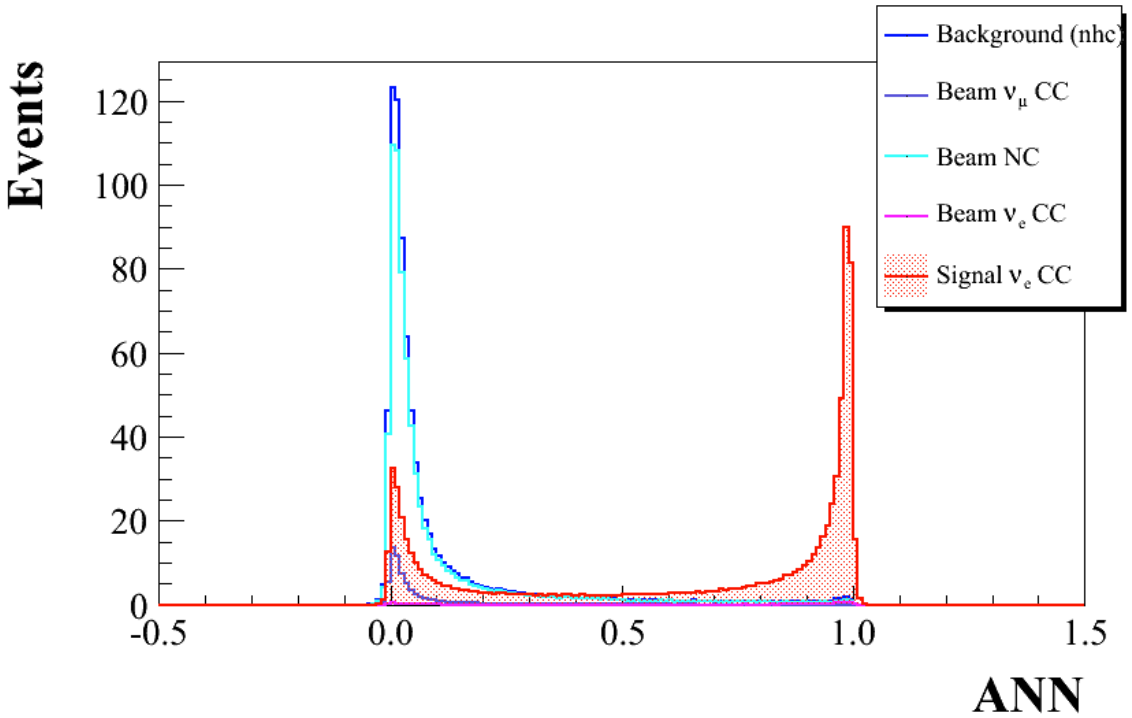




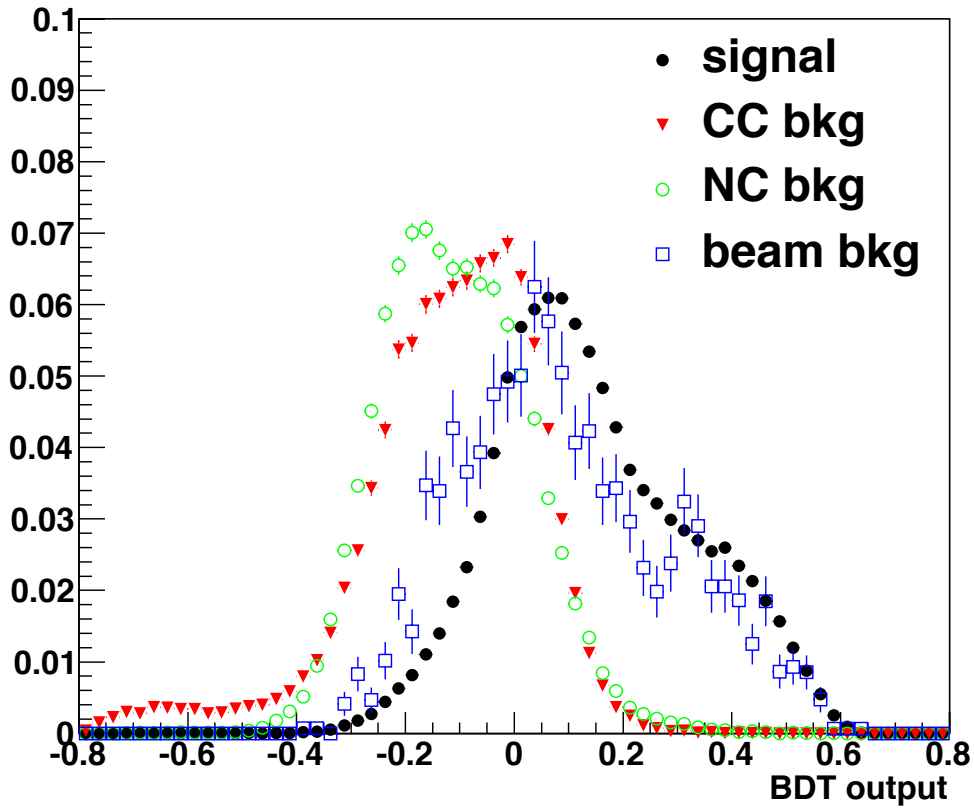


EID

Electrons are identified using their shower energy profiles. Longitudinal and transverse log likelihoods for each particle hypothesis are calculated based on dE/dx information (electron energy resolution ~10% at 2.0 GeV). An artificial neural network (ANN) has been applied in the ν_e CC event selection



We use Boosted Decision Trees to combine various reconstructed variables like the reconstructed energy, length of the track, maximal energy density in the longitudinal direction and transverse energy shower width as well as the energy balance of the fuzzy shower clusters.



LEM

Each data event is compared to a large library of Monte Carlo events. The fraction of best matches that are signal, plus other properties of the matched events are fed into a decision tree.