SuperBIND Simulations with Thick Plates

Ryan Bayes

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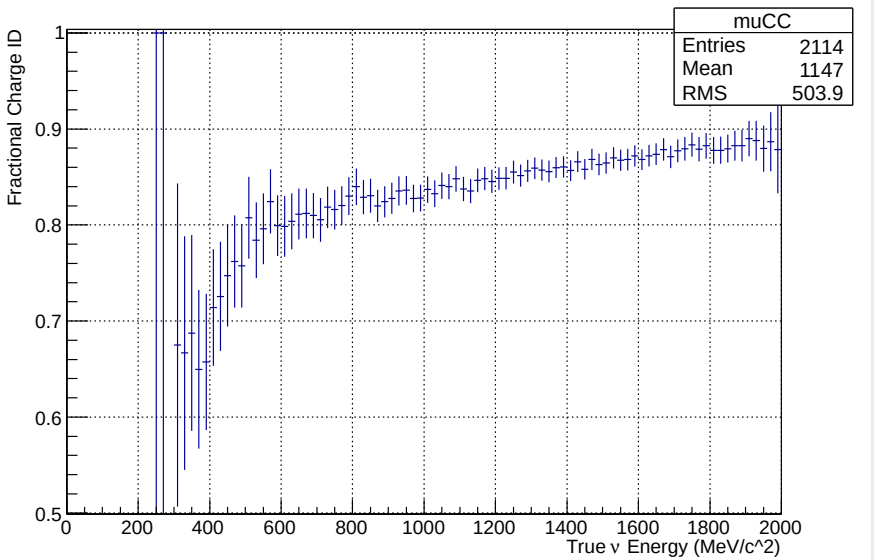
Why Thicker Plates?

- Charge selection is a premium for SuperBIND.
  - Can achieve increase effective magnetic field by 3/2 if plate thickness is doubled.
  - Larger magnetic field results in more bending.
  - Less scattering if the number of scintillator interfaces is decreased.
- Can also decrease the number of channels for a given fiducial volume.
  - Number of channels a major driver for the costing of a detector
- What do we gain(lose) by assuming thicker steel plates?

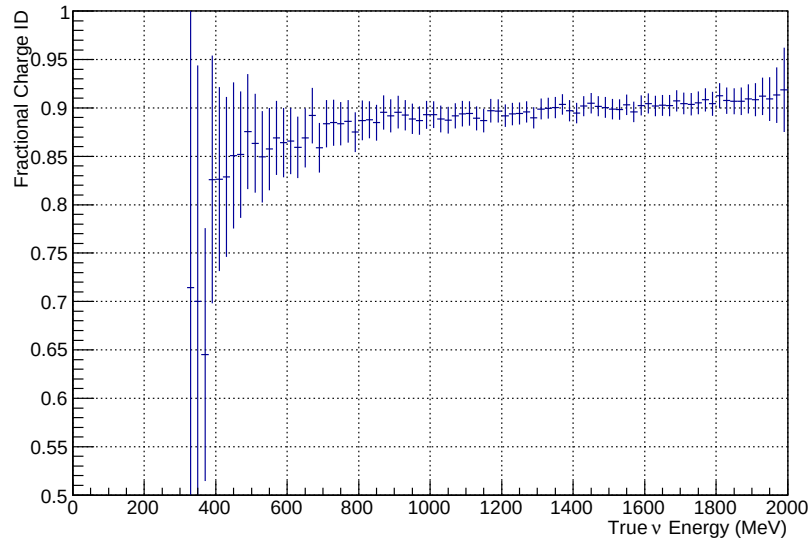
SuperBIND with 2 cm Plates

- Generated GENIE simulations of SuperBIND with 2 cm plates
  - Used same detector dimensions— 5 m$\times$ 5 m$\times$20 m.
  - Same octagonal cross-sectional geometry.
  - Used same magnetic field— empirical fit of model, toroidal geometry.
  - Using μ^- focussing field.
- Consider simple charge cuts.
  - Of reconstructed ν_μ CC event, what fraction have correct charge?

1 cm Steel plate, μ^- focussed



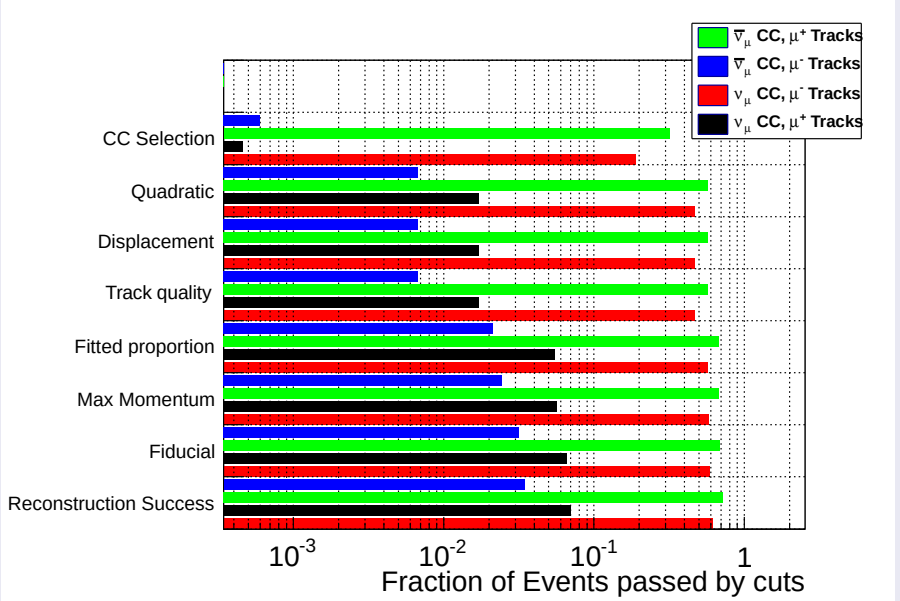
2 cm Steel plate, μ^- focussed



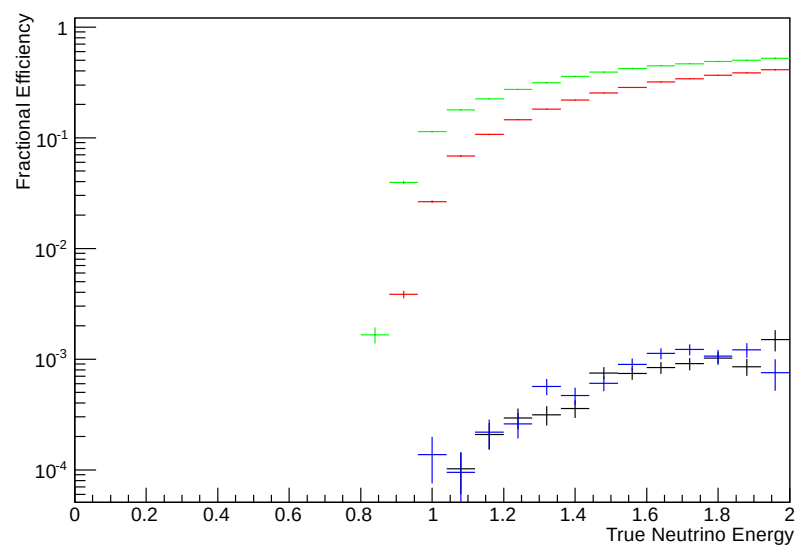
More complicated Charge Current Selection Analysis

- Can apply slightly less restrictive cuts than before.
  - Charge current selection reduced from 6.5 to 4.0.
  - Other cuts are the same as before.
- ν_μ CC efficiency significantly incease.

Event Survival After Cuts



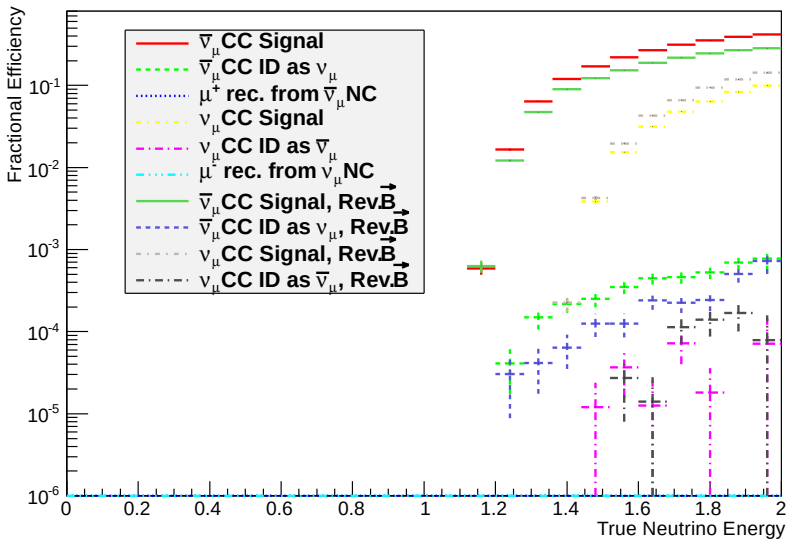
Final Efficiency



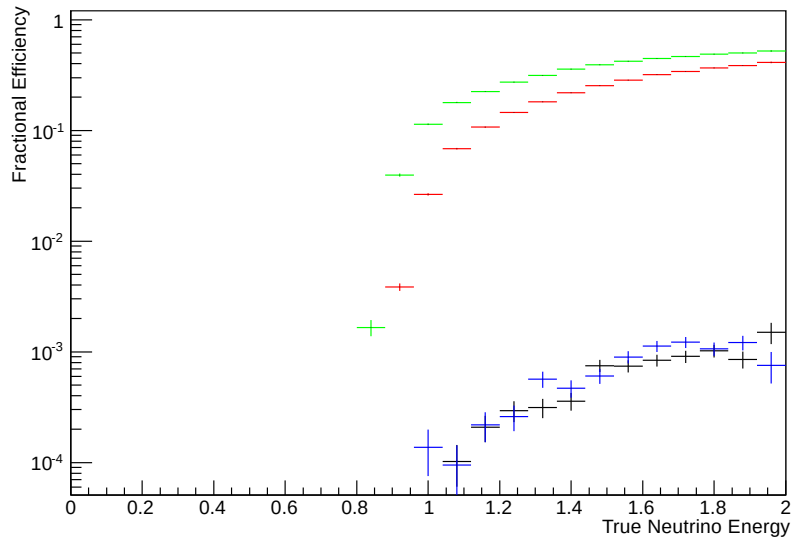
More complicated Charge Current Selection Analysis

- Difference between this simulation and previous simulation is significant
- ν_μCC efficiency more than doubles.
- Further improvements needed to get to efficiency goals.

1 cm Fe plates



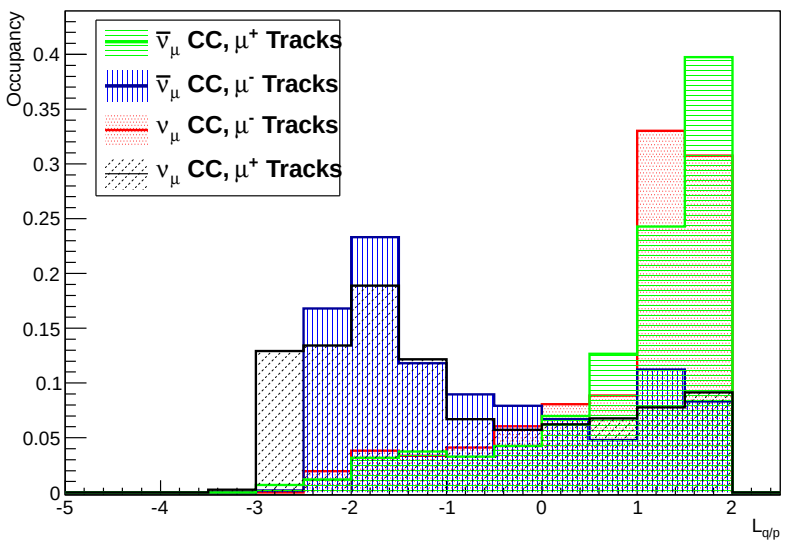
2 cm Fe plates



Likelihood Distributions

- Very different from distributions produced by 1 cm Fe plate simulations.

Likelihood distributions for $\sigma_{q/p}/(q/p)$



Charge Current Likelihood Selection