

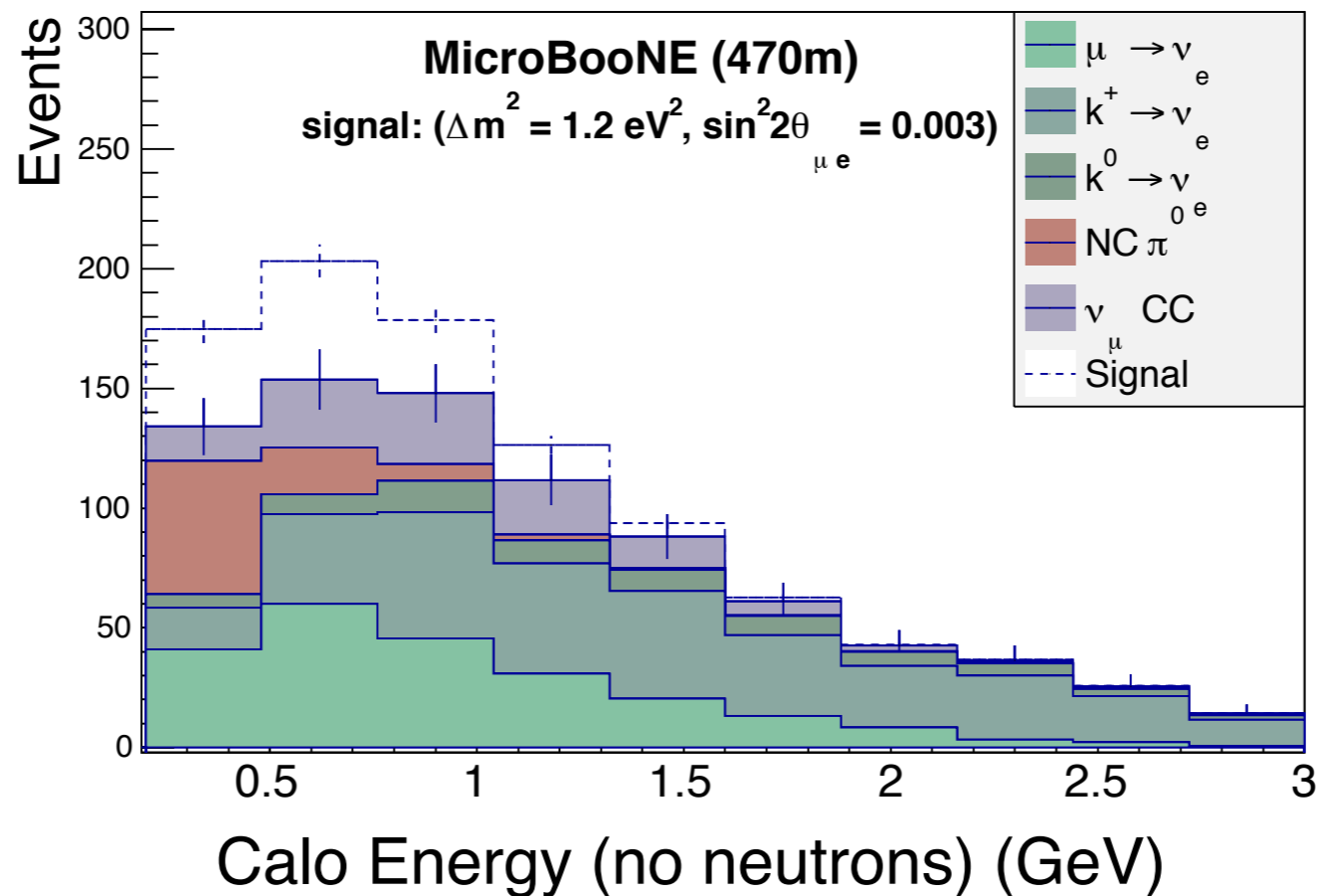
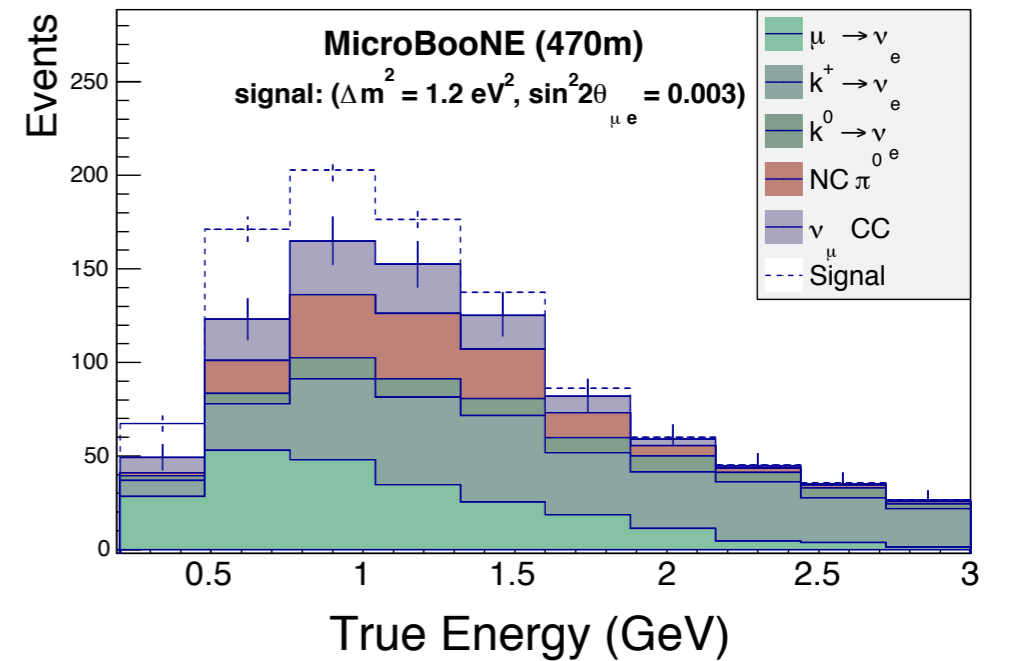
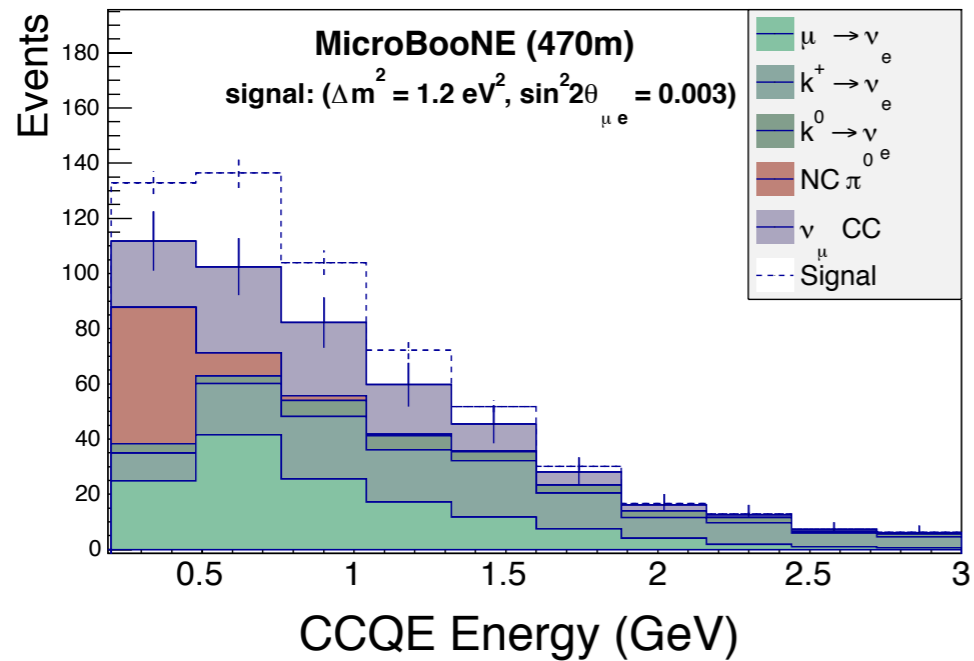
# Plots approval Presentation

Corey Adams  
5/28/2014

# Plots to be presented

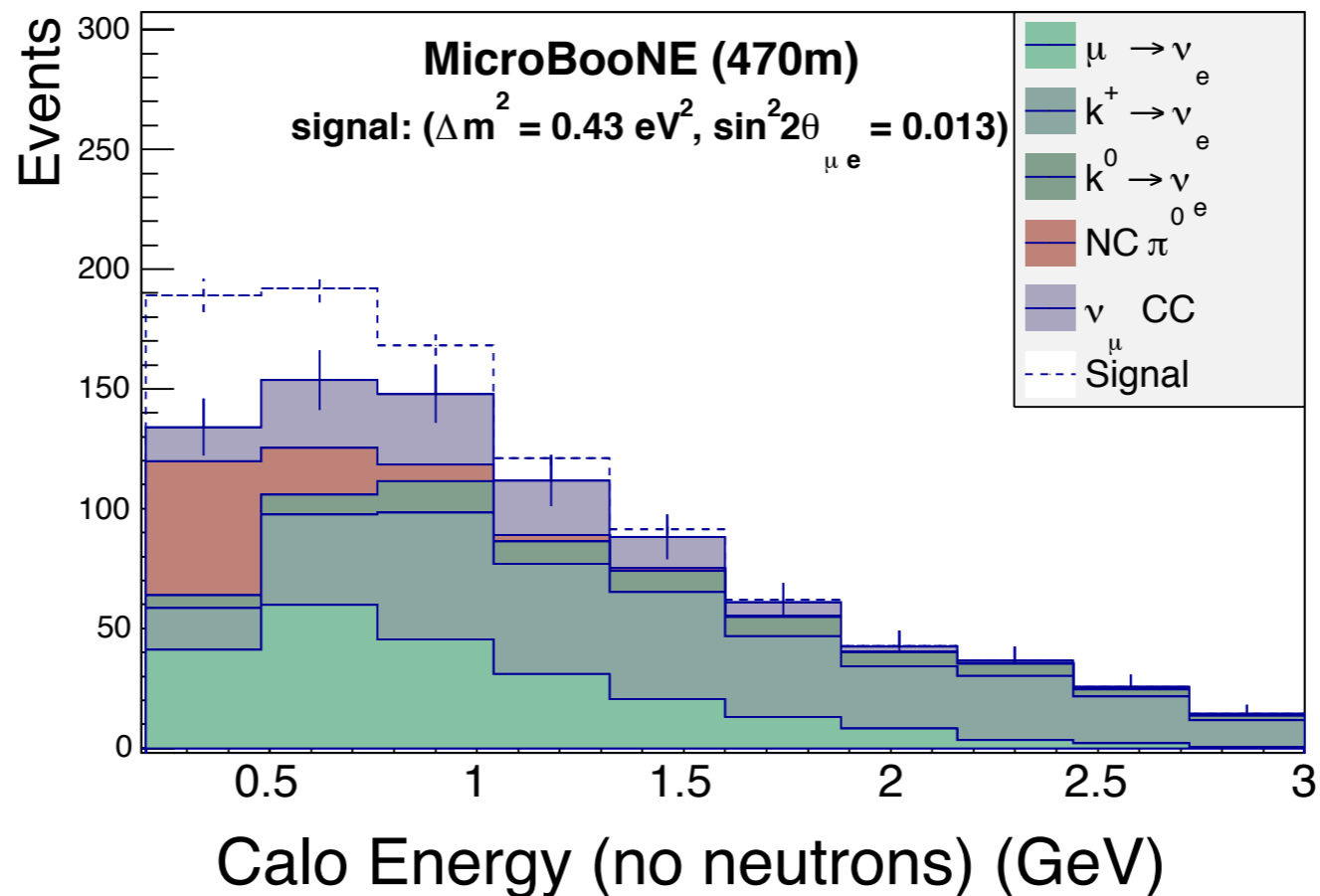
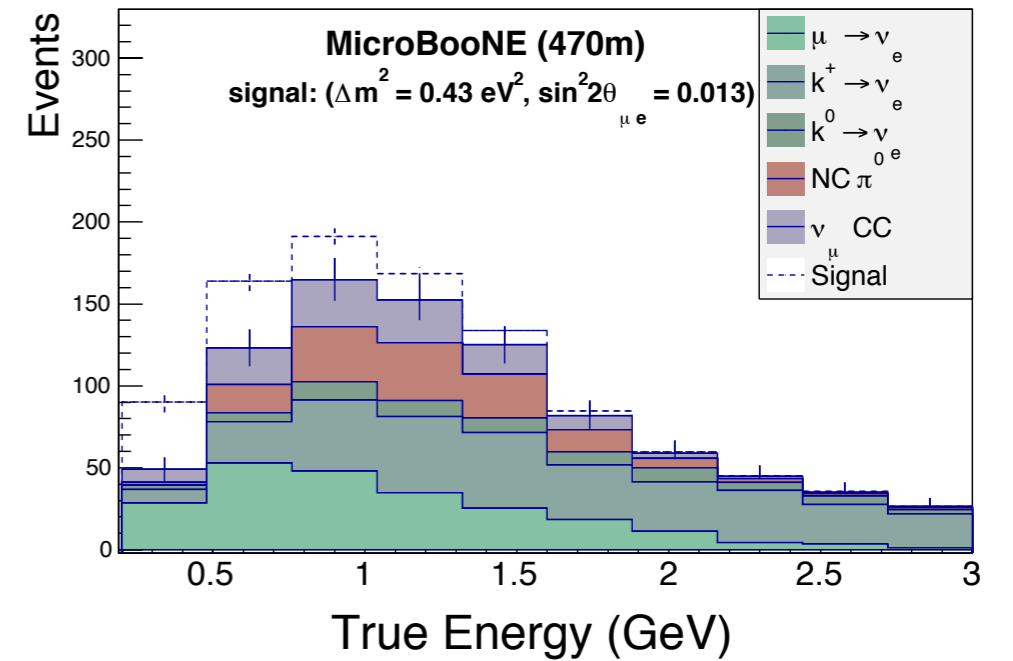
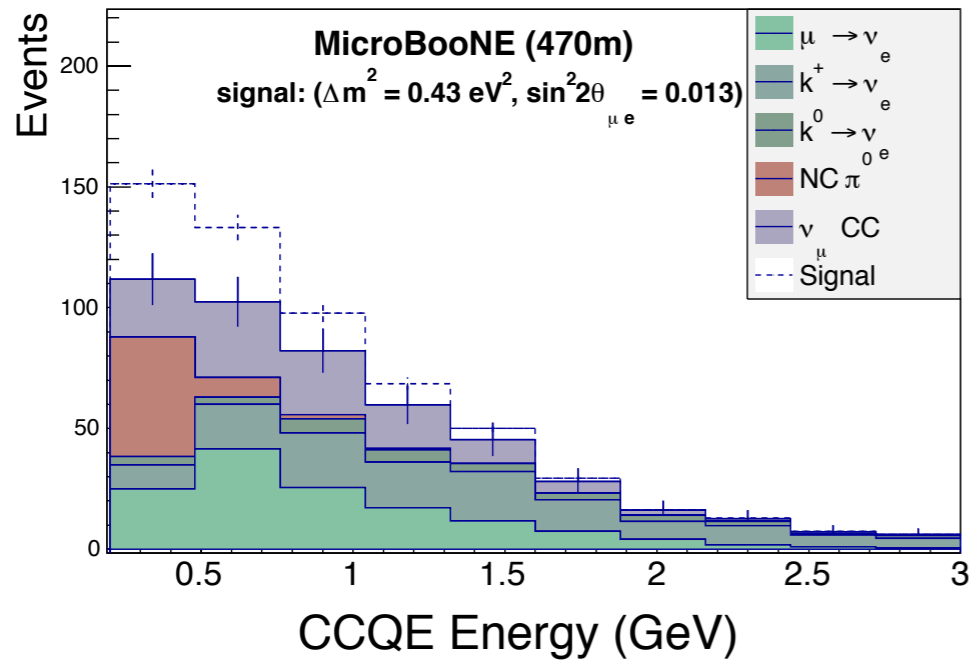
- Electron like Background predictions for Microboone
  - Including LSND best fit signal
  - Including Global Best fit signal
- 3+1 sensitivity of Microboone using above background
- 3+1 sensitivity of Microboone + LAr1-ND (shape only analysis)

# Event Rate Plots - LSND BF



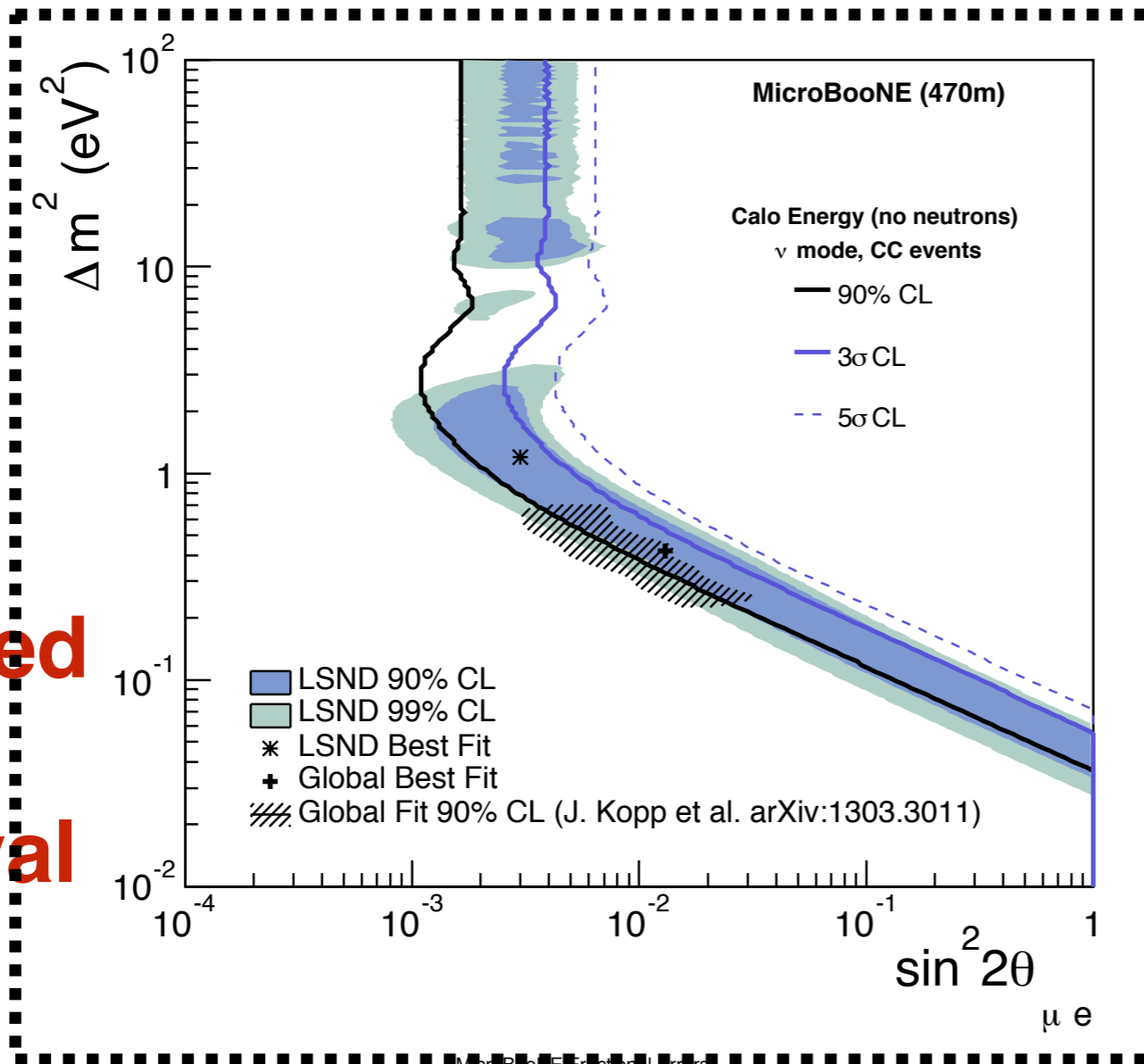
**Proposed for  
Approval**

# Event Rate Plots - GBF

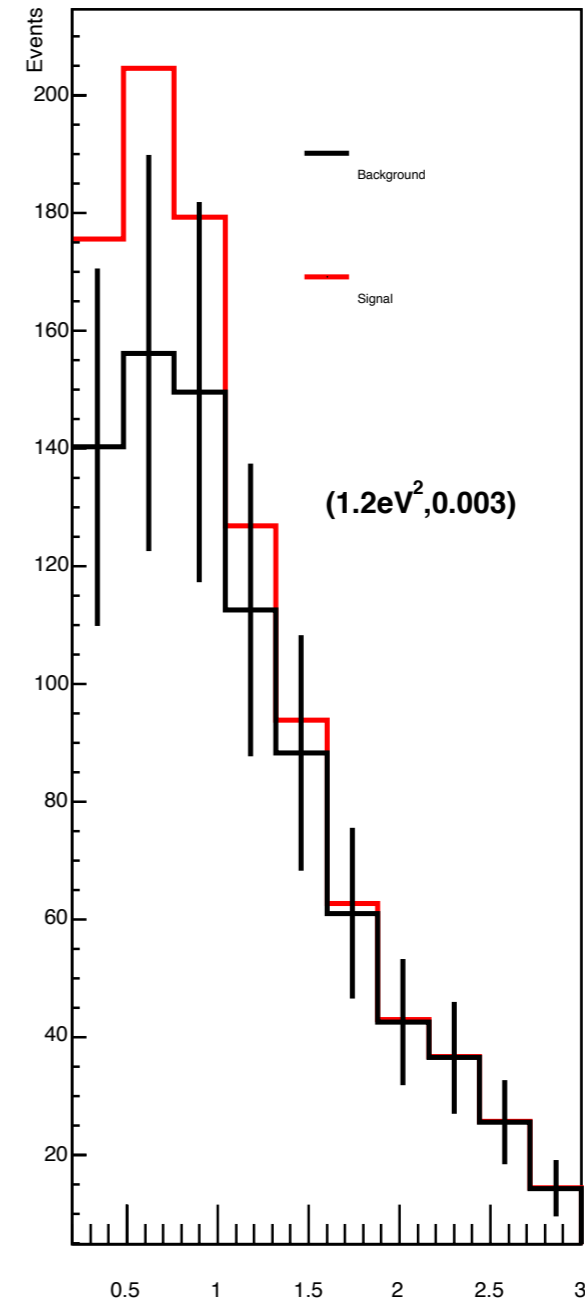


**Proposed for  
Approval**

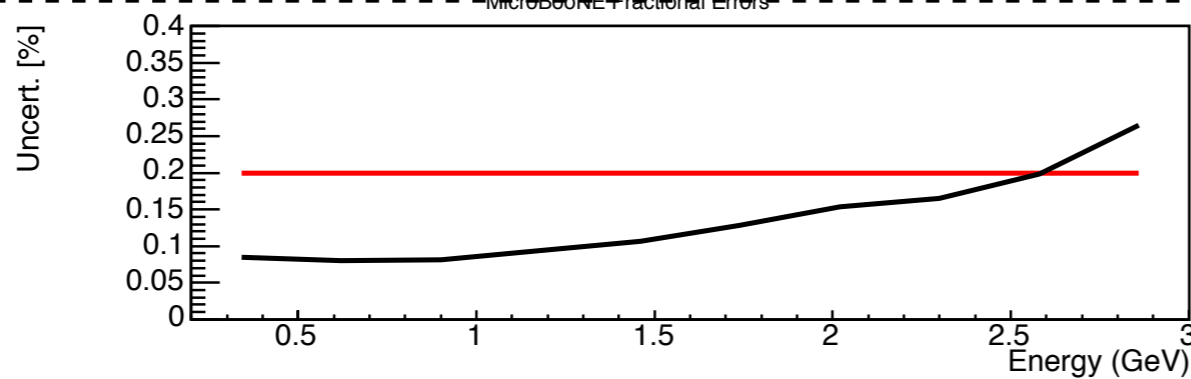
# Sensitivity Plots



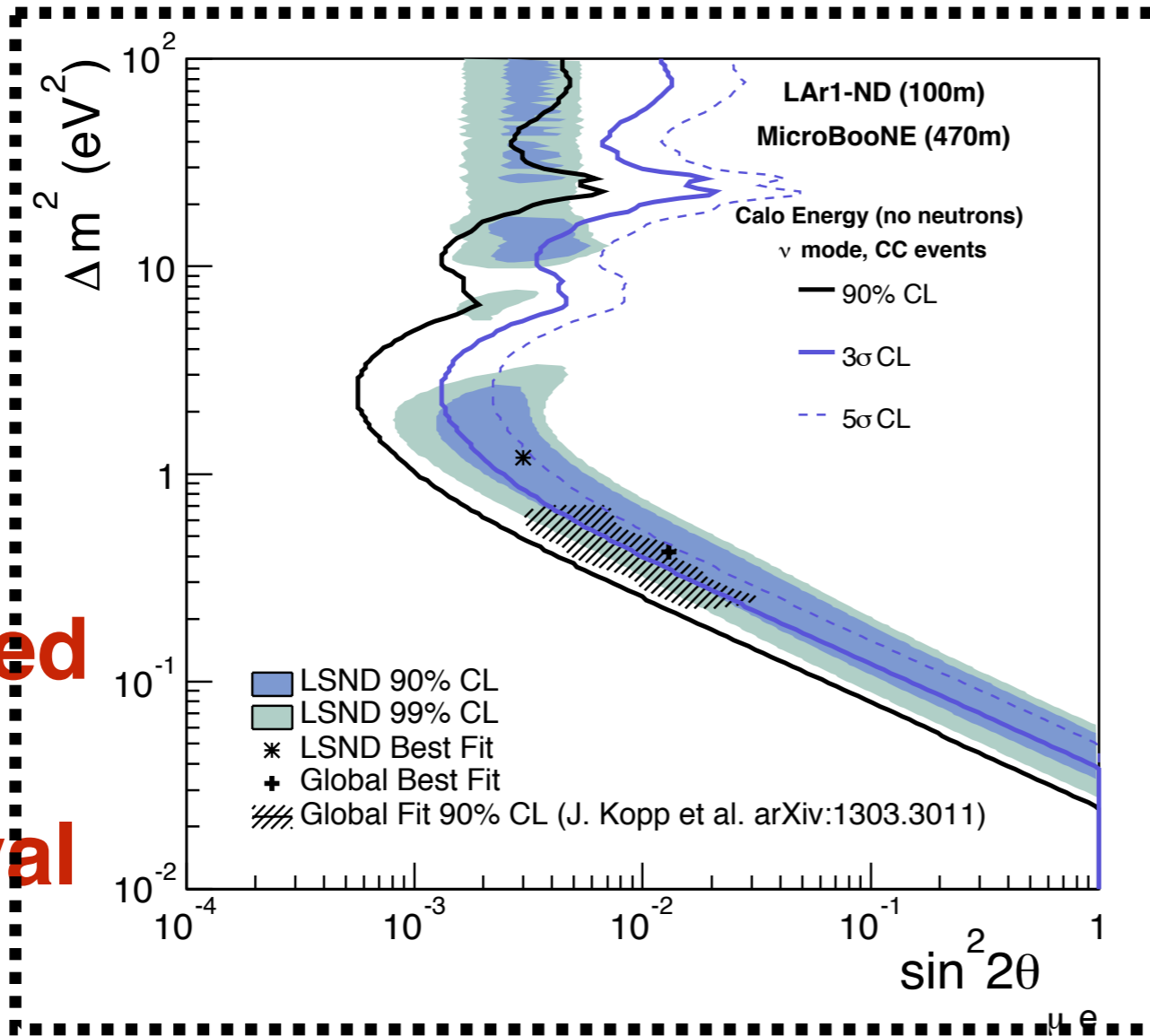
MicroBooNE Signal and Background



**Proposed  
for  
Approval**

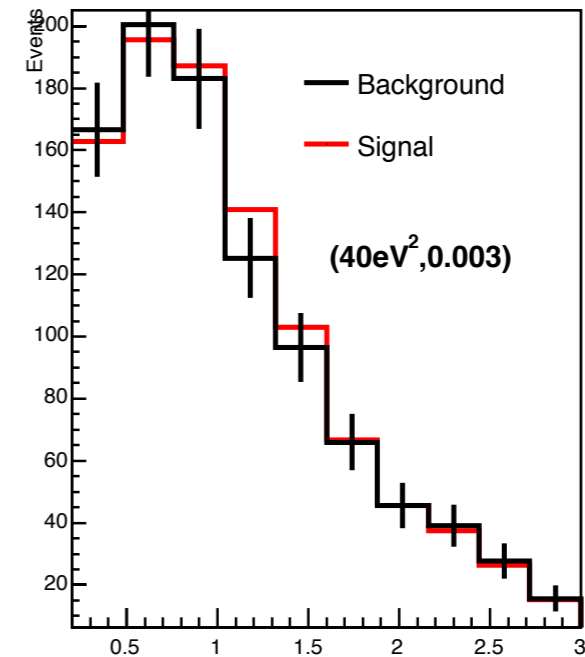


# Sensitivity Plots

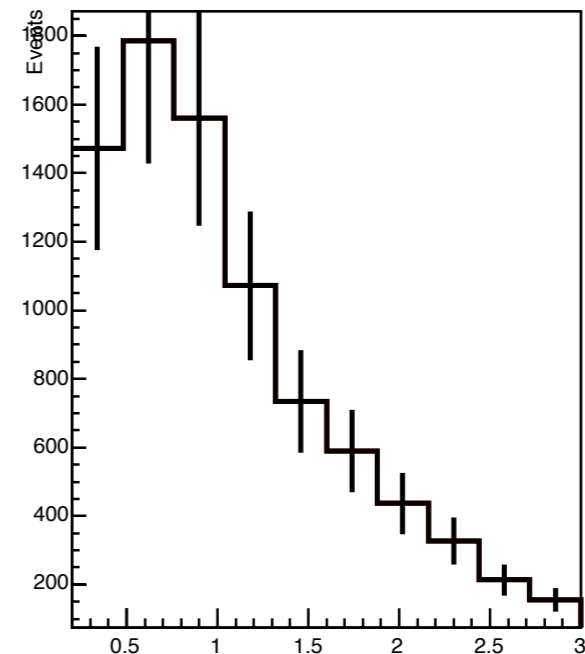


**Proposed  
for  
Approval**

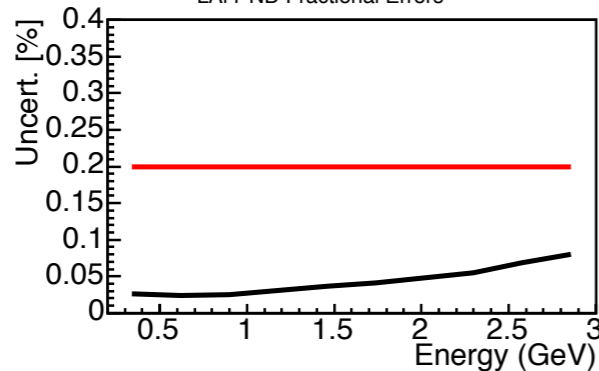
MicroBooNE Signal and Background



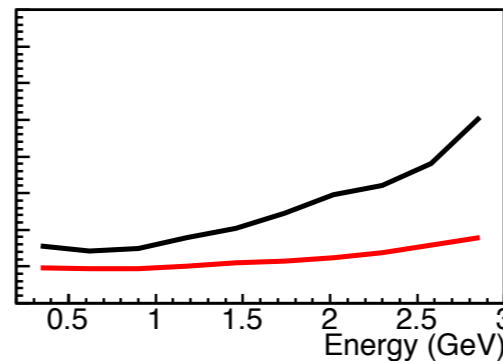
LAr1-ND Signal and Background



LAr1-ND Fractional Errors

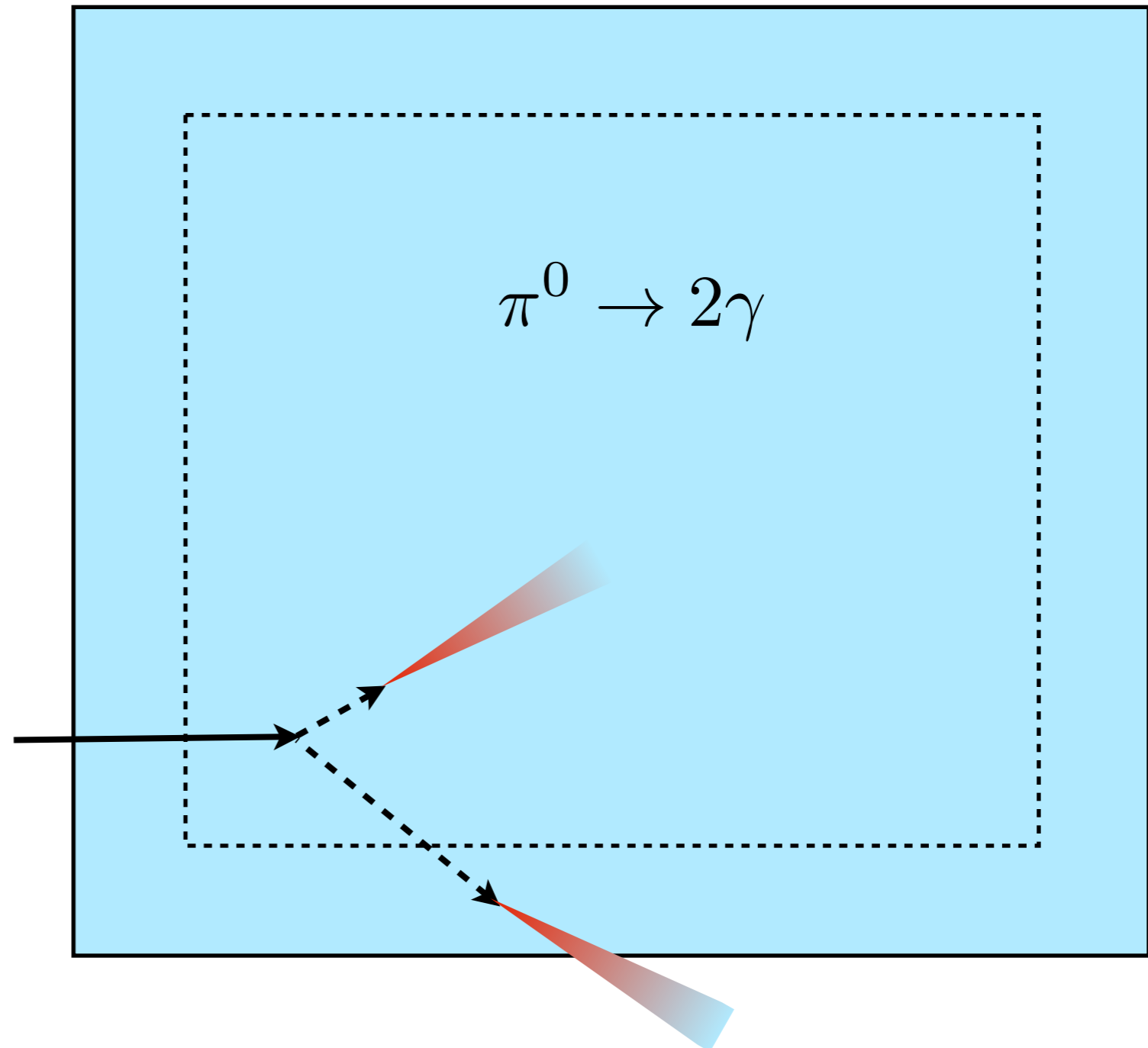


MicroBooNE Fractional Errors



# Details - Event Rates

- Done with MB beam monte carlo, genie event generator, and larg4 to simulate detector physics. No reconstruction.
- Includes intrinsic nue samples at 80% efficiency, fiducial cut at 17cm on all sides **except** 1m on the downstream edge (for containment).
- Includes a flat, 0.1% misID rate for numu CC events - not quite realistic, but we have not focused on this yet.
- Includes single photon backgrounds, especially from pi0. Single photons are rejected at 94% - based on preliminary dE/dX.
- **No** topological information about photons is used. We decided to be pessimistic and assume only calorimetric cuts.



# Details - Energy Reconstruction

- True Energy is just the generated neutrino energy
- CCQE energy is using the CCQE formula. This makes the assumption that single photons are used as the leptons in the CCQE formula.
- Calorimetric energy is the sum of visible energy:  $E_{lep} + KE_{hadronic}$  (no “missing energy” is added)



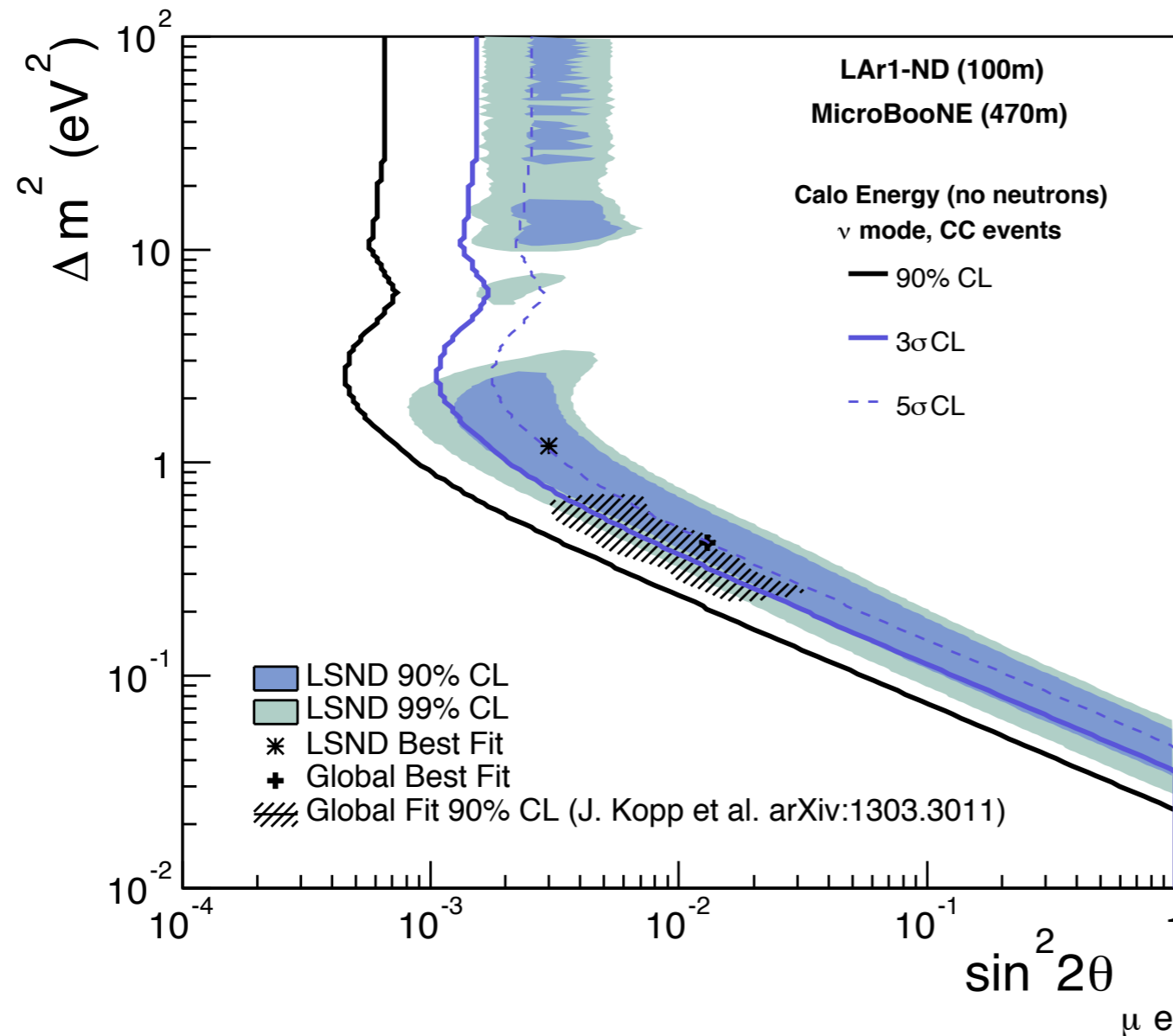
# Details - Sensitivity Calculation (uBoone only)

- Simple chi<sup>2</sup> sum of (data - background)/(total error on background) in each bin
- Error is statistical error + 20% uncorrelated, flat systematic error. Our intent was that this would be a realistic to pessimistic estimate of the error. Attempts to fold in all systematic errors in a crude way.
- Uses calorimetric energy reconstruction in both background and simulated signal.
- Signal is simulated by using a fully oscillated set of events - all  $\nu_{\mu}$  become  $\nu_{\tau}$  - and interactions are simulated with genie.
- Oscillation probability is given with the usual 2 flavor formula as a function of  $\sin^2(2\theta)$  and  $\Delta m^2$ .

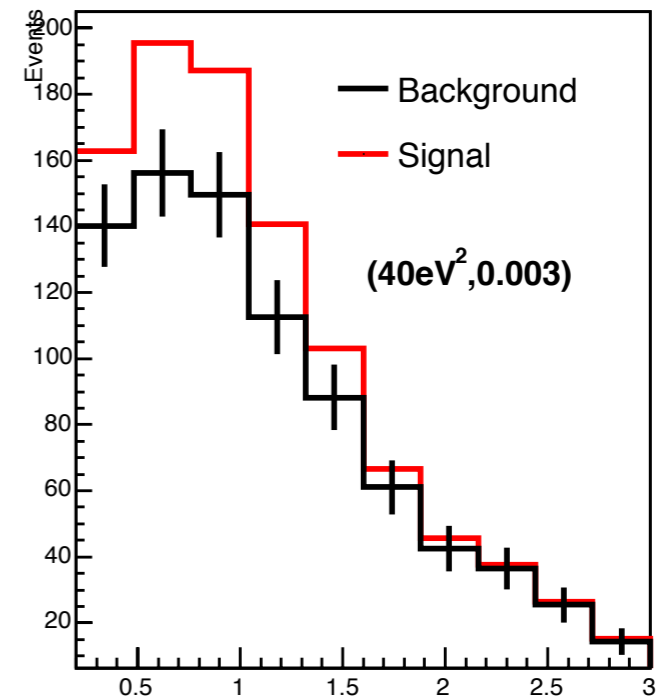
# Details - Sensitivity Calculation (uBoone + ND)

- By definition, no signal is expected in the near detector. Therefore, normalize far detectors by the same amount as near detector that is need to remove signal in near detector. Affects high  $dm^2$  region. See next 2 slides for comparison.
- Error is statistical error + systematic, but systematic errors in microboone are calculated as the statistical error in near detector. This is making the assumption that all uncertainties are correlated and cancel, which is not 100% correct. We are developing a better extrapolation now in the context of LAr1-ND. **For the mean time, we added back 4% systematic uncertainty to the microboone systematic uncertainty.**
- Same energy reconstruction and signal simulation as before.

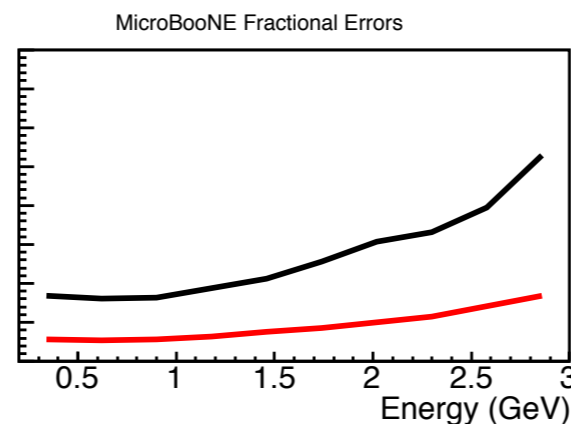
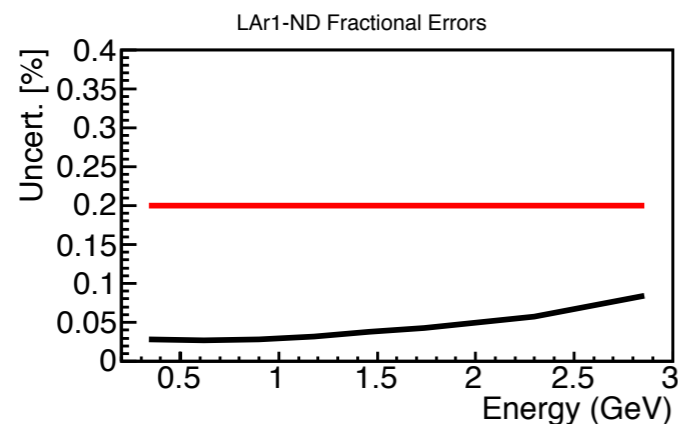
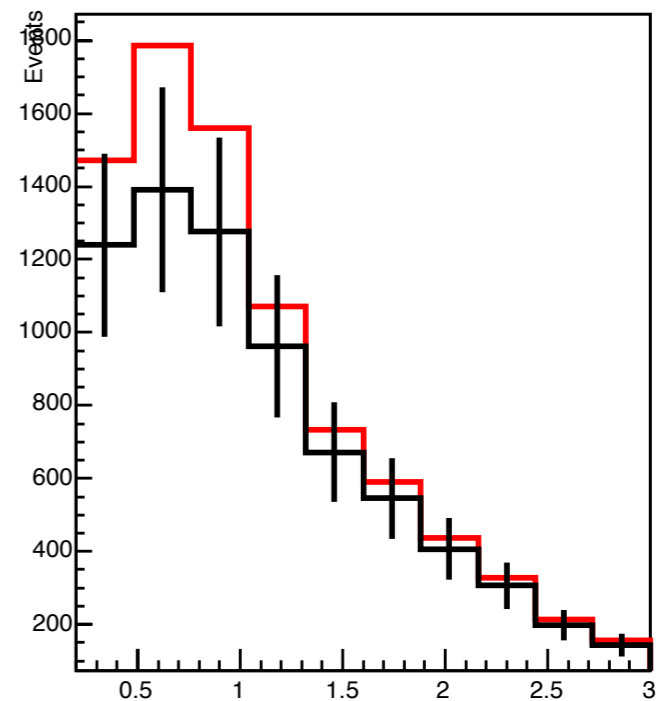
# Shape And Rate Analysis - Near Det sees Signal



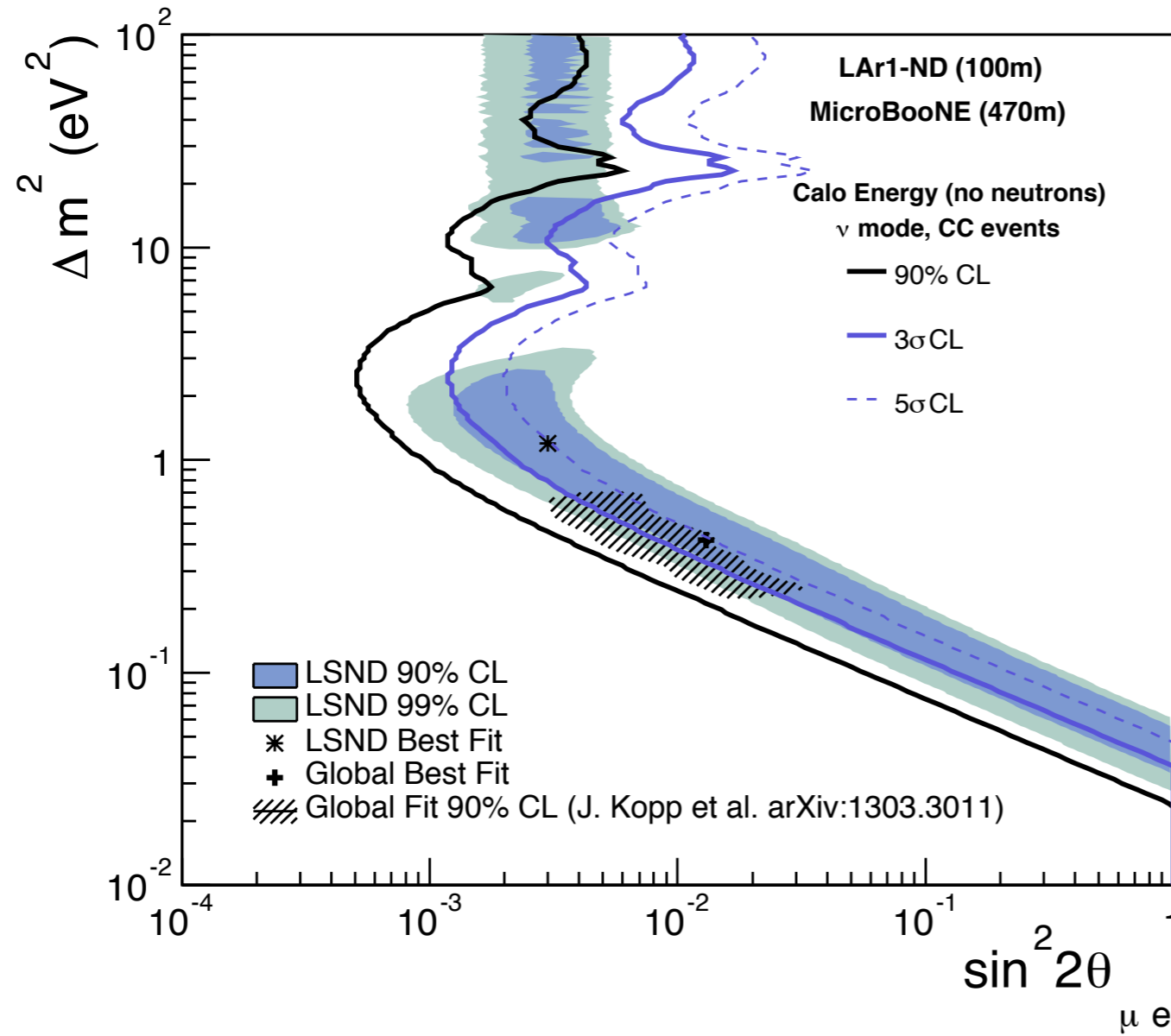
MicroBooNE Signal and Background



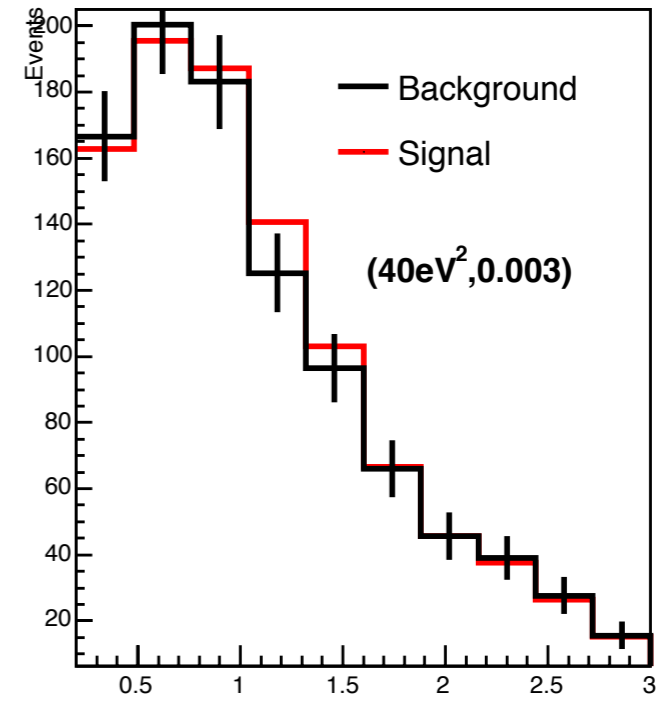
LAr1-ND Signal and Background



# Shape Only Analysis



MicroBooNE Signal and Background



LAr1-ND Signal and Background

