# Data-driven Techniques for $\nu_e$ Signal and Background Predictions in NO$\nu$A

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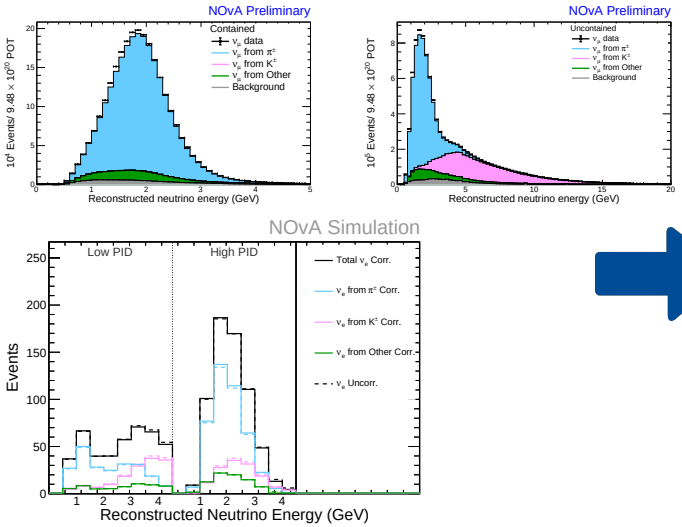
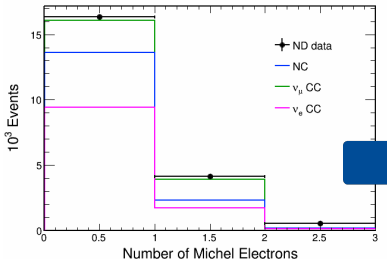
# Background Decomposition

## Neutrino Mode

Beam $\nu_e$ constrain

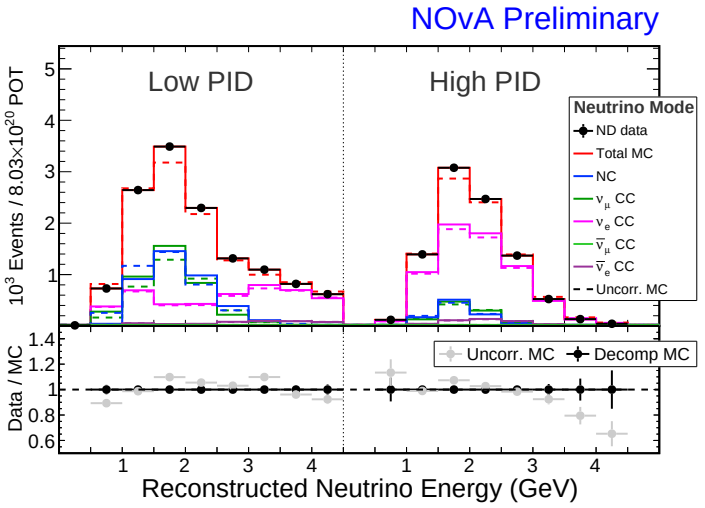



Michel




Constrain $\nu_\mu$ by inspecting Michels

Decomposition Result

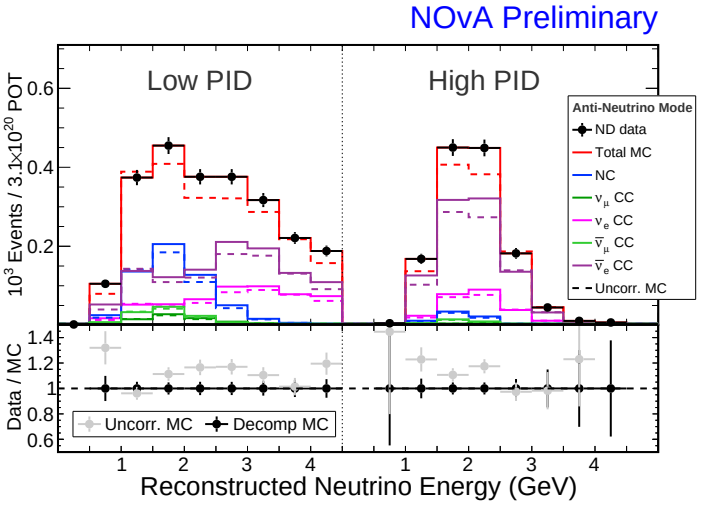



$$\pi^+ \rightarrow \nu_\mu + \mu^+ \rightarrow e^+ + \nu_e + \bar{\nu}_\mu$$

## Anti-neutrino Mode

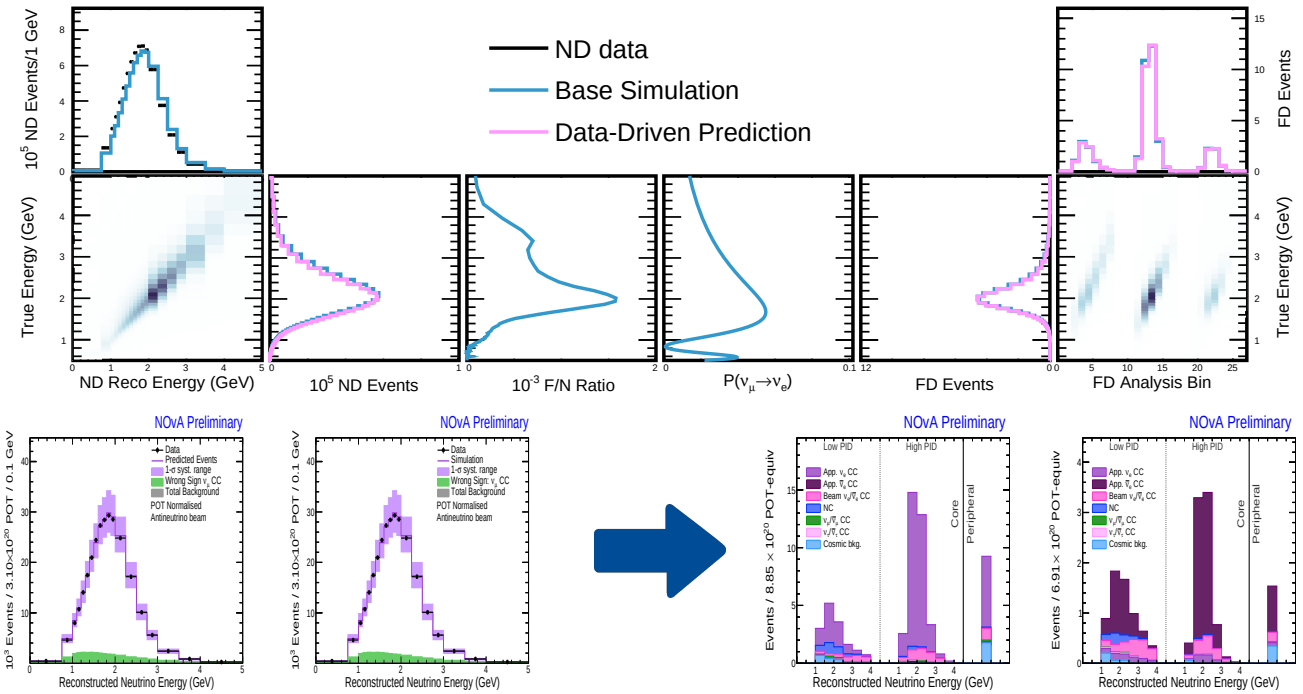
Proportional Decomposition

- All components sized proportionally by any Data/MC discrepancy in each analysis bin



# Signal Prediction

- Functionally identical detectors
- 'Extrapolate' ND to predict FD
- ND $\nu_\mu$ CC $\rightarrow$ FD $\nu_e$
- ND $\nu_e$ CC $\rightarrow$ FD bkg
- Reducing impact of systematic uncertainties, flux and cross-sections




$$\text{FD Bkg. Prediction} = \frac{\text{ND Decomposed}}{\text{ND Uncorr. MC}} \times \text{FD MC}$$

$$\text{FD Sig. Prediction} = \frac{\text{FD MC}}{\text{ND MC}} \times \text{ND } \nu_\mu \text{ data}$$