Muon neutrinos and anti-neutrinos in the NOvA experiment

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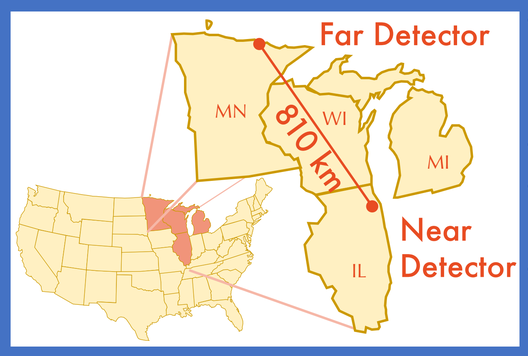
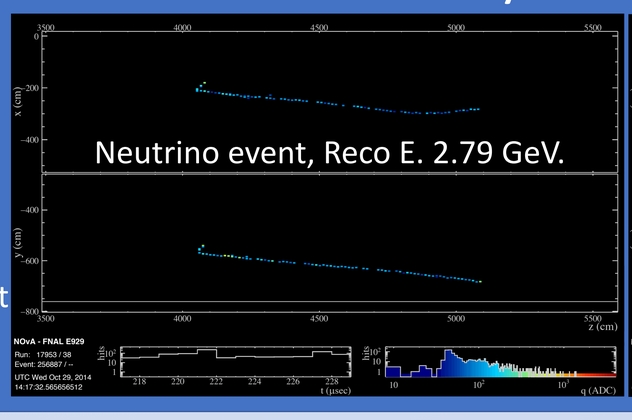
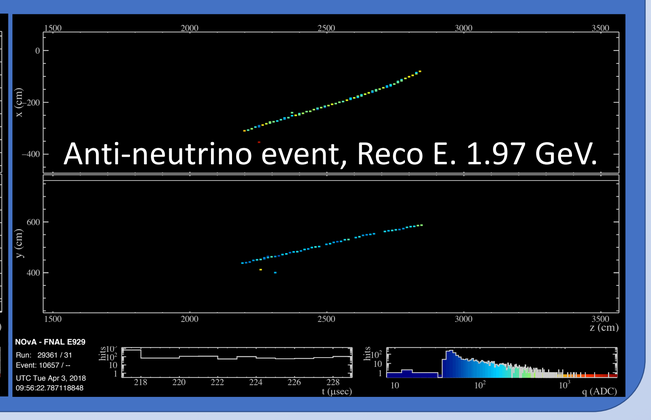
The NOνA Experiment and the 2018 analysis

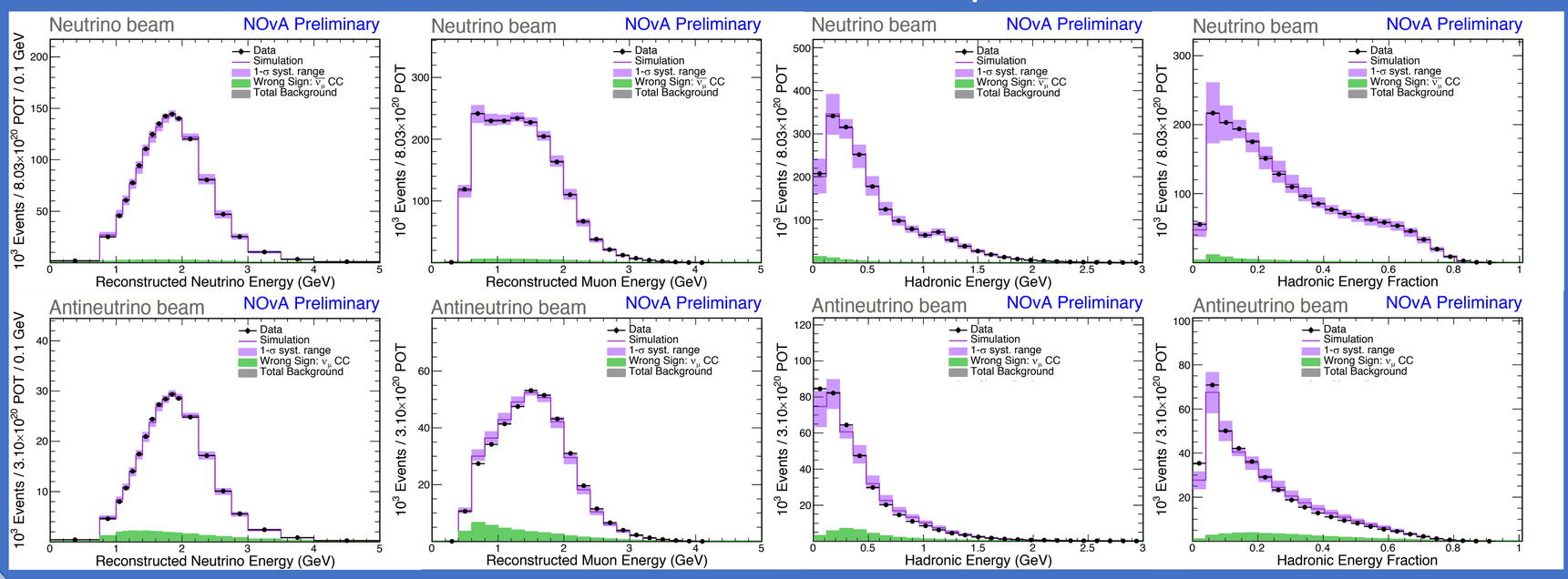


- Two finely segmented, liquid scintillator detectors, 14 mrad off the NuMI beam axis.
- Near Detector mass of 0.3 kton.
- Far Detector mass of 14 kton, 810 km from target.
- The 2018 analysis is the first NOvA result to have both neutrino and antineutrino data.





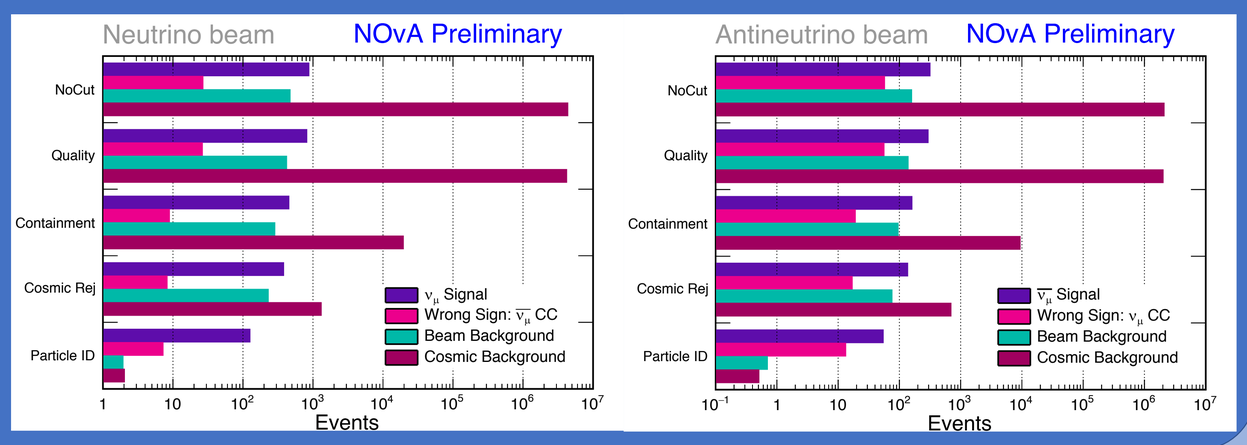
Data / Monte Carlo comparisons in the Near Detector (ND)



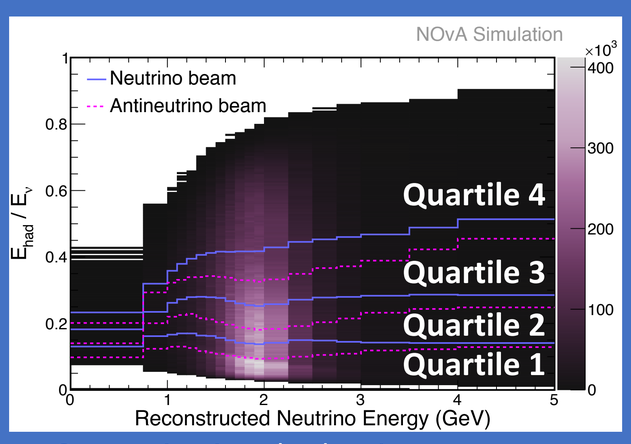
- A new cross-section tune for this year has improved Data / Monte Carlo agreement. See Poster #60 for more details.
- All plots are area normalised, with shape only systematics. The reconstructed neutrino energy is also bin width normalised.
- Shape only systematics considered as the extrapolation handles flux systematics well. See Posters #81 & 88 for detailed info on the treatment of systematics.
- Remaining differences propagated to FD.

Event selection in the Far Detector (FD)

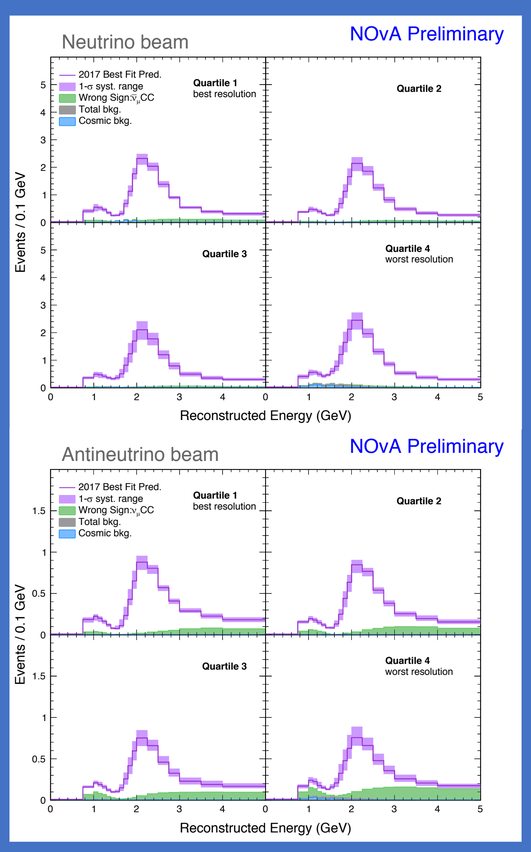
- Quality, containment, and neutrino PID cuts are applied at both detectors.
- An additional cosmic rejection is applied to the FD.
- The combination of all cuts reduce the cosmic background by over 6 orders of magnitude.
- Events which pass all cuts are found to be ν_μ to a very high purity.
  Neutrino mode: Efficiency of contained events 74.1%, Purity 98.7%.
  Antineutrino mode: Efficiency of contained events 82.7%, Purity 98.9%.



Quartile treatment in the Far Detector



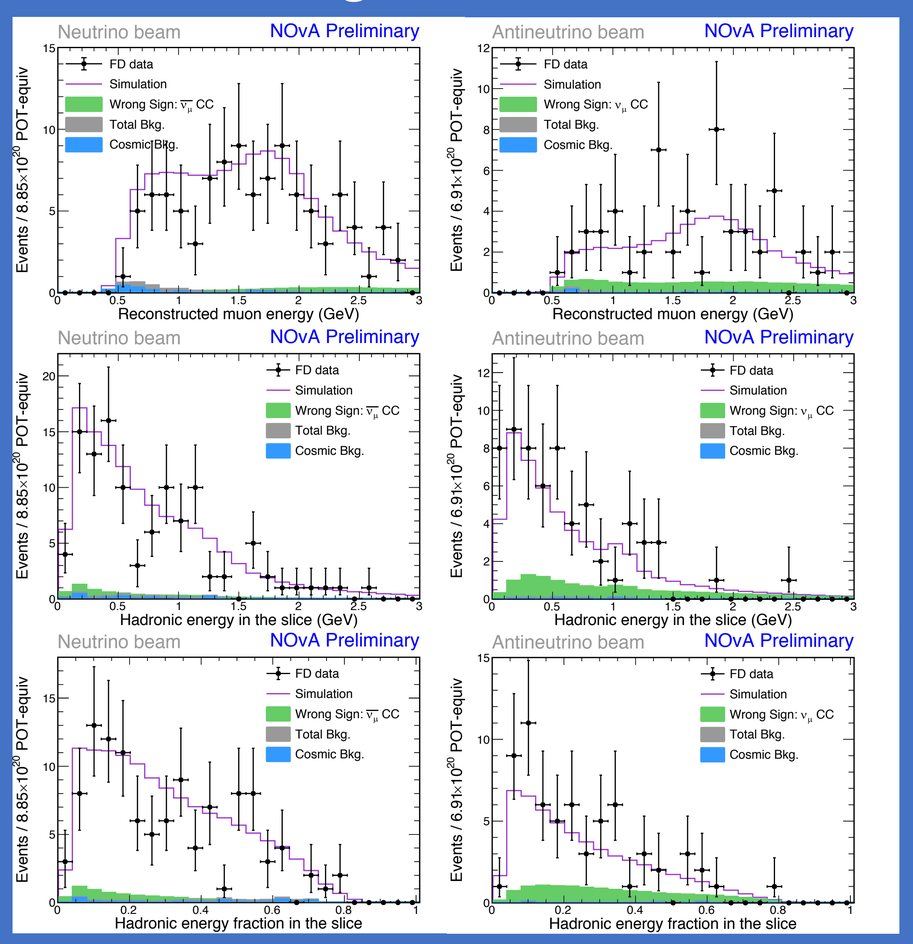
- Separating into hadronic energy quartiles allows for best reconstructed events to be considered separately.
- The proportion of Quasi-Elastic, Resonant, Deep Inelastic Scatter and Coherent events are different in each quartile.
- Separating by quartile gives us a better handle on extrapolating each component, as each quartile is extrapolated separately.



- Background events are generally more common in the 4th quartile.

Data / Monte Carlo agreement in the FD

- Good agreement between Data and Monte Carlo in both neutrino and antineutrino beam.
- Beam and cosmogenic backgrounds are shown along with the wrong sign contamination in the selected event sample.



Muon neutrino disappearance Results

See Poster #66 by Diana Mendez for details on our selected neutrino and anti-neutrino events.

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