



The NOvA Experiment

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On behalf of the NOvA Collaboration



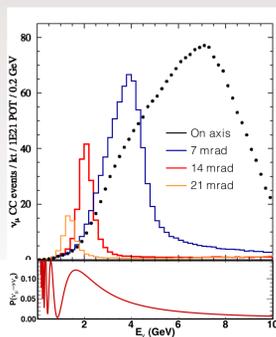
Introduction

- ❖ Long-baseline neutrino oscillation experiment currently under construction
- ❖ Primary goal: observe and study $\nu_\mu \rightarrow \nu_e$ and $\bar{\nu}_\mu \rightarrow \bar{\nu}_e$ oscillations at the atmospheric oscillation L/E
 - Gives NOvA sensitivity to θ_{13} , mass hierarchy, δ_{CP}
 - Secondary goal: measure $\sin^2\theta_{23}$ and Δm^2_{32} to better precision

Off-Axis Feature

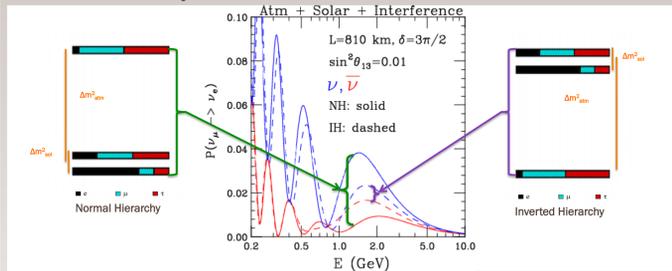
Both detectors will be sited 14 mrad off the NuMI beam axis.

- ❖ Increase low-energy neutrino flux
- ❖ Narrow band beam peaked at 2 GeV, well matched to oscillation probability peak
- ❖ Enhance background rejection

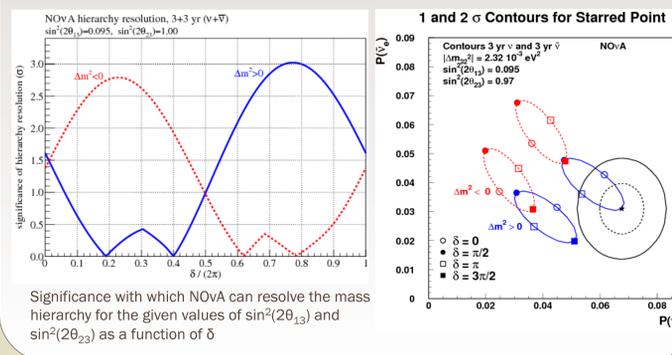


ν_e Appearance Accelerator Experiments

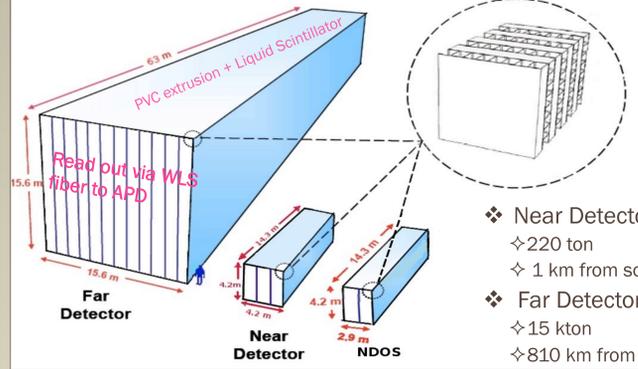
- ❖ Oscillation probability depends on $\sin^2\theta_{13}$, $\sin^2\theta_{23}$, δ_{CP} and mass hierarchy
- ❖ Probability can differ between ν and $\bar{\nu}$



Physics Sensitivity

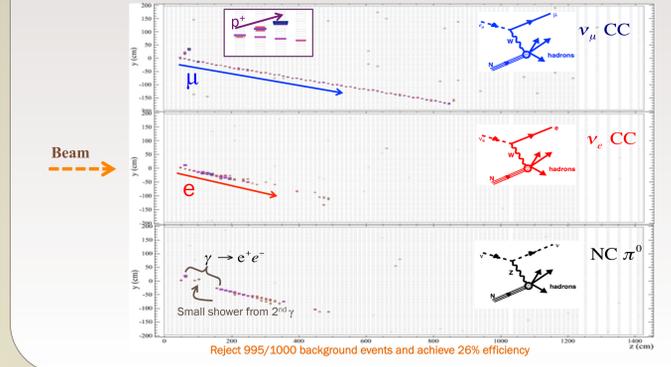


The NOvA Detectors



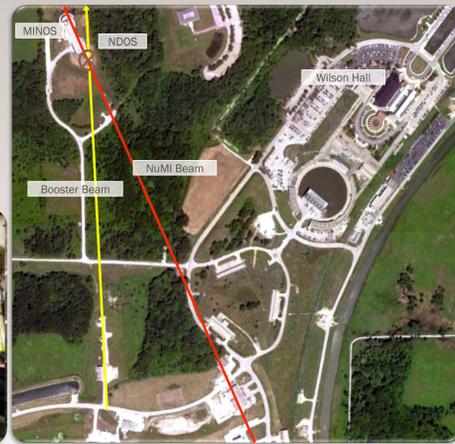
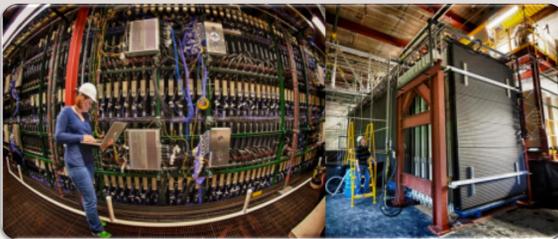
- ❖ Near Detector
 - ❖ 220 ton
 - ❖ 1 km from source
- ❖ Far Detector
 - ❖ 15 kton
 - ❖ 810 km from source

MC Events in NOvA



The Near Detector Prototype (NDOS)

- ❖ The Near Detector prototype constructed on the surface in Fall 2010
- ❖ Uses the same materials and technologies as the Near and Far Detectors
- ❖ ~6° off the NuMI beam axis and on the Booster beam axis



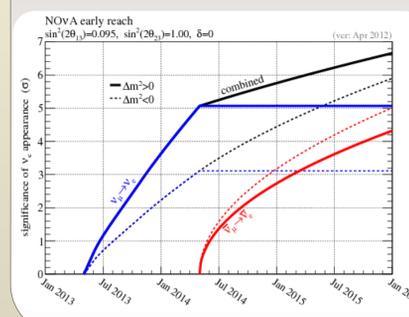
Goals:

- ❖ Test assembly techniques for the Near and Far Detectors
- ❖ Install, operate, test the NOvA electronics and DAQ
- ❖ Develop reconstruction and calibration methods, and physics analyses

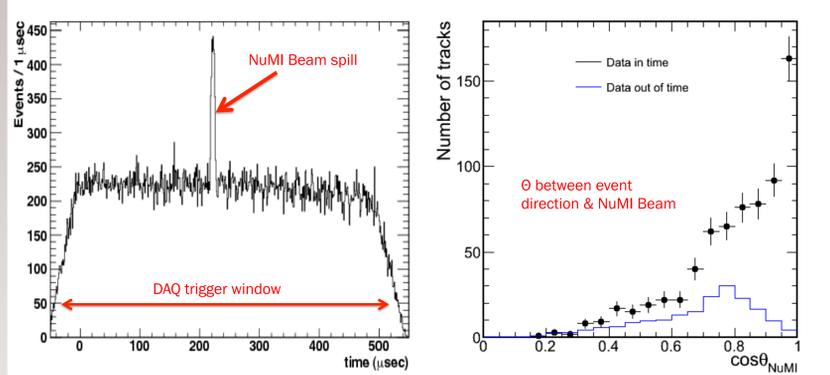
The Far Detector Construction



FIRST DATA
~ 1 YR. FROM NOW !!!



NDOS Neutrino Data from NuMI Beam



- ❖ After subtracting the background and selecting events with long track, we obtain neutrino candidate distributions
- ❖ Comparisons to simulated neutrinos matched well in direction and length
- ❖ All plots are POT normalized

- ❖ DAQ reads out 500 μsec around the 10 μsec beam spill
- ❖ The angle between the track and the NuMI beam shows a clear peak for the data in time
- ❖ The data corresponds to 9.6×10^{18} protons on target (POT)

