

Status of the NO ν A Experiment

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University of Sussex

EPS-HEP Stockholm, July 19th, 2013

The NO ν A Experiment



NO ν A Far Detector

MINOS Far Detector

$$\nu_{\mu} \rightarrow \nu_e, \nu_{\mu} \rightarrow \nu_{\mu}$$

$$\bar{\nu}_{\mu} \rightarrow \bar{\nu}_e, \bar{\nu}_{\mu} \rightarrow \bar{\nu}_{\mu}$$

Wisconsin

Milwaukee

Fermilab

Chicago

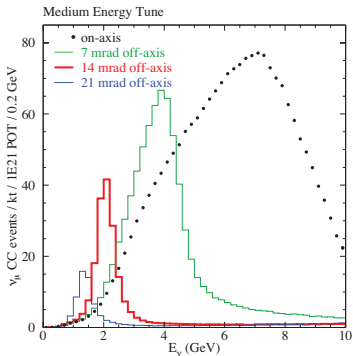
Michigan

© 2007 Europa Technologies
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Image © 2007 NASA

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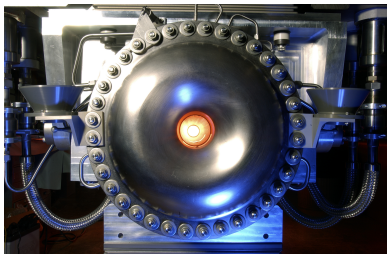


The NuMI Beam

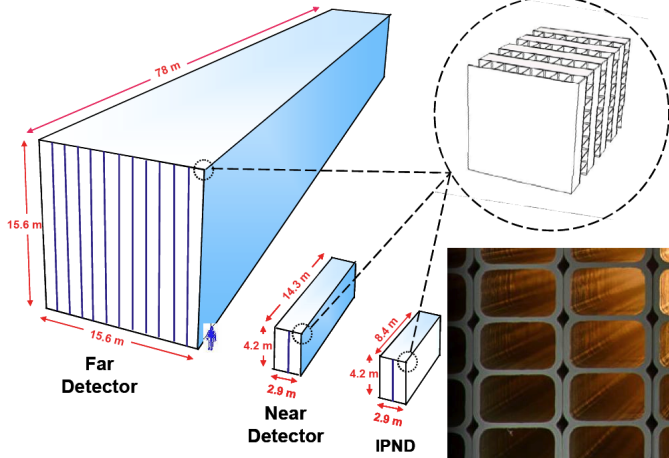


Medium energy tune, 7 GeV peak on-axis,
2 GeV peak 14.6 mrad off-axis to Ash River

- ▶ Upgrade from 350 kW to 700 kW
- ▶ Final preparations complete, expect beam in Main Injector later today!
- ▶ Beam to neutrino line estimated in next week

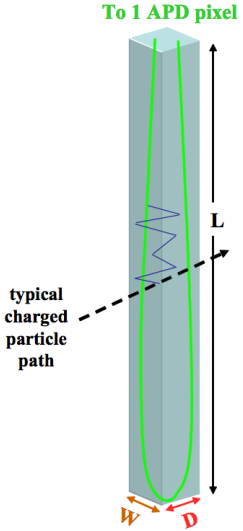


The NO ν A Detectors

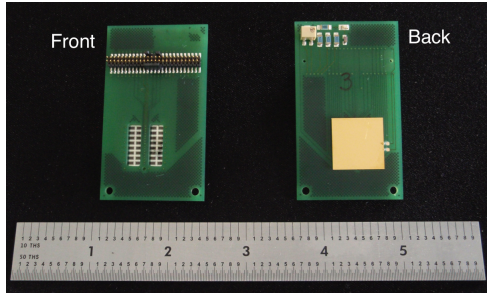


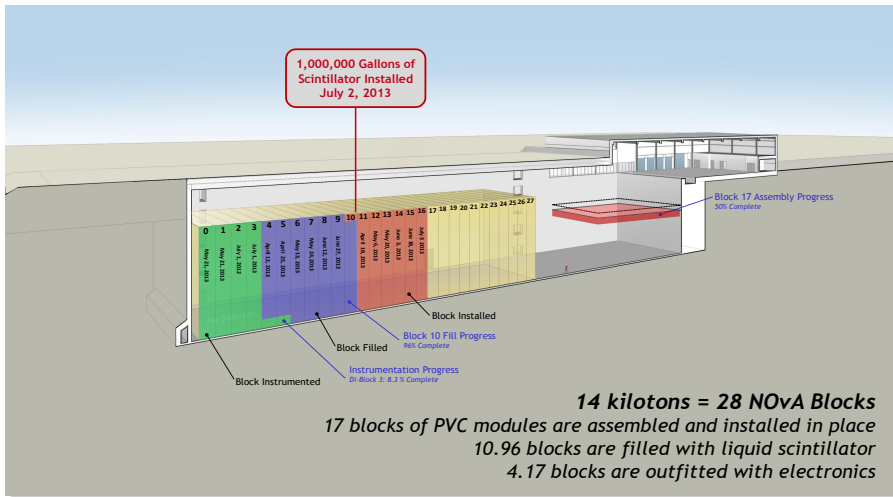
14 kt, 65% active far detector, 15.6 m plastic cells filled with liquid scintillator, each plane just $0.15 X_0$.

Detector Readout

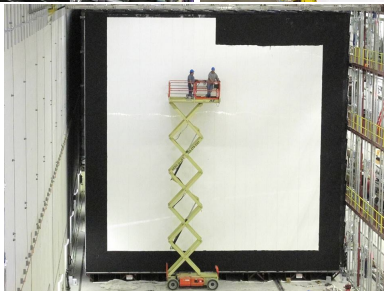
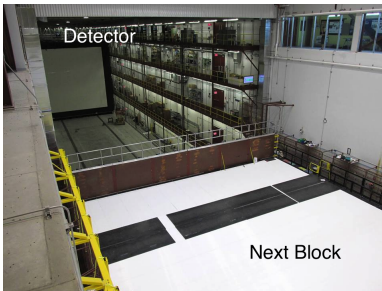
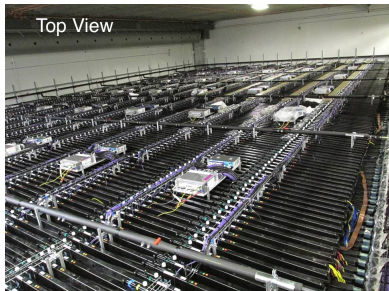


Each cell readout by a looped wavelength shifting fibre connected to an avalanche photodiode.





Far Detector Construction

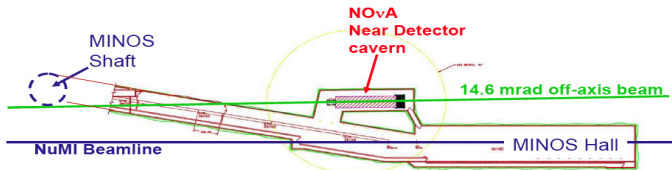
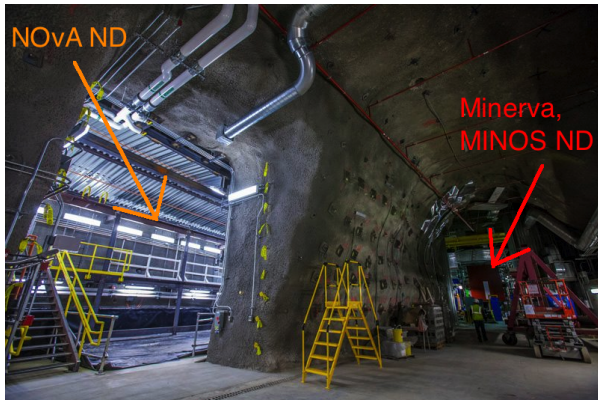


Far Detector Construction Schedule

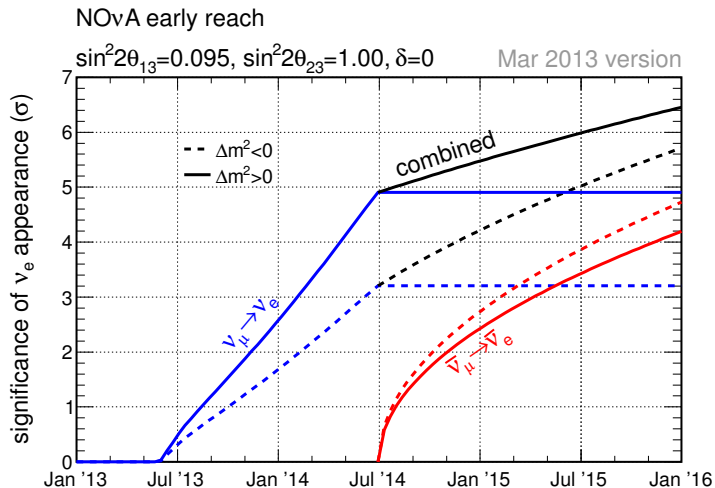


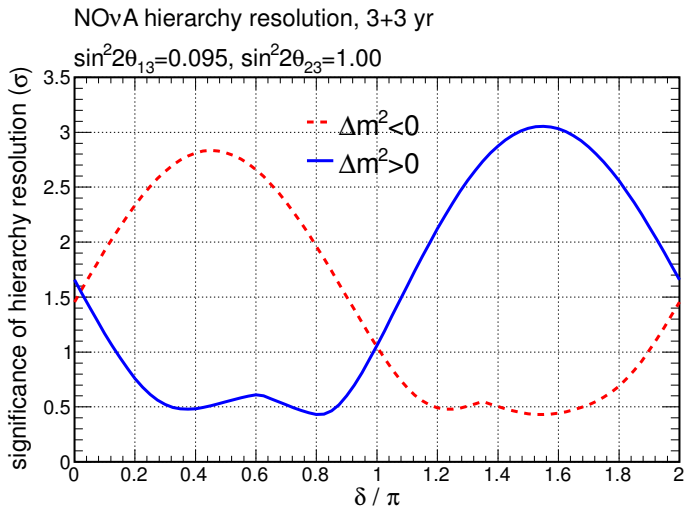
- ▶ Over 2 kt (out of 14 kt) now instrumented
- ▶ Over 1 million US gallons of scintillator filled
- ▶ More than half of the blocks are now in place
- ▶ Expected to complete in April/May 2014

Near Detector Construction Starting...

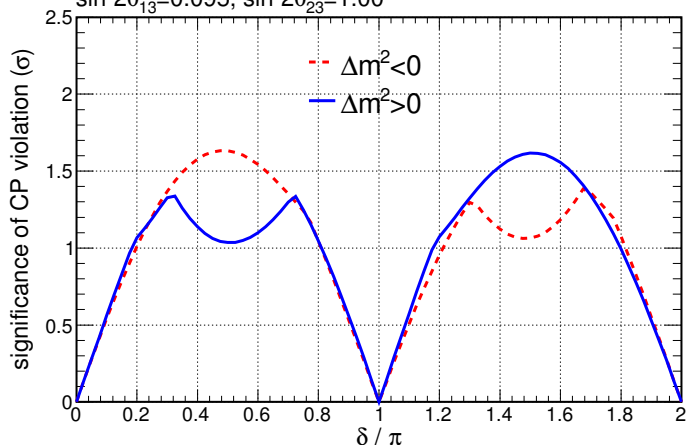


Sensitivity to $\nu_e/\bar{\nu}_e$ Appearance

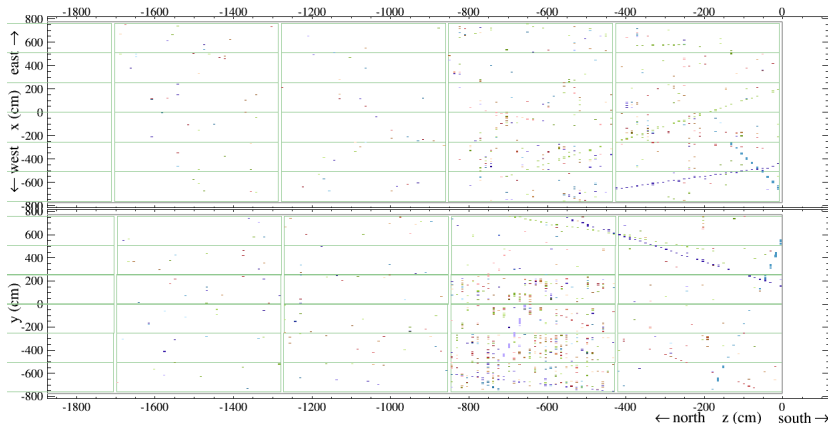




NOvA CPV determination, 3+3 yr

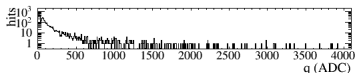
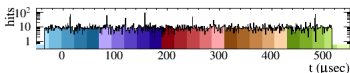
 $\sin^2 2\theta_{13}=0.095$, $\sin^2 2\theta_{23}=1.00$ 

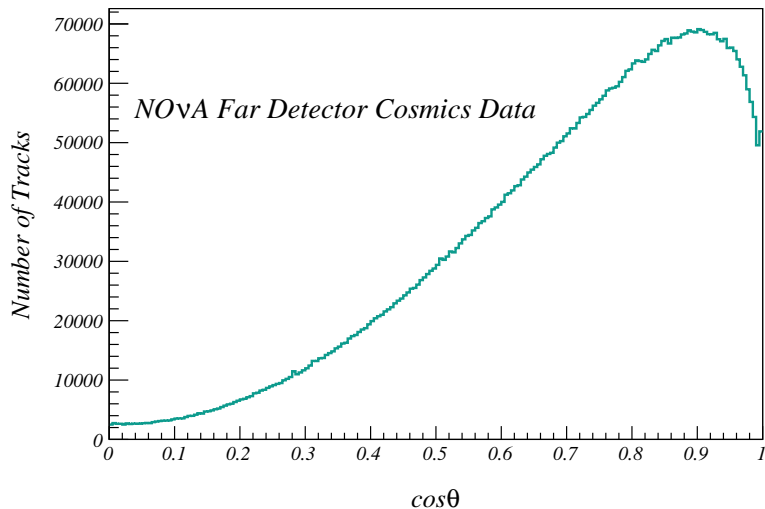
Far Detector Cosmic Events

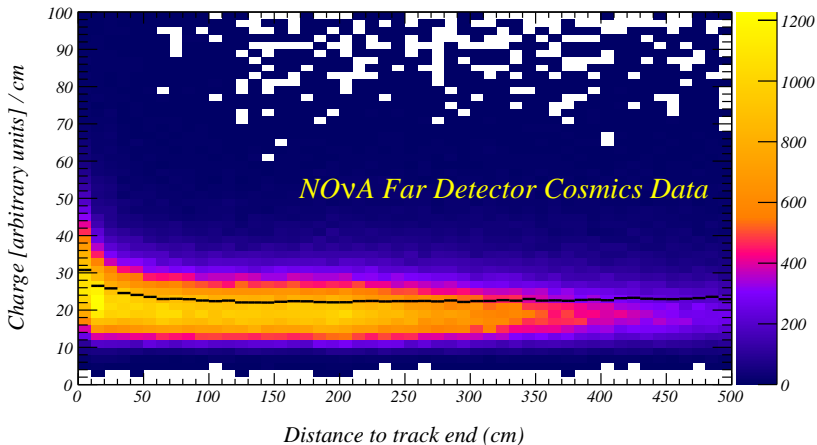


NOvA - FNAL E929

Run: 10537 / 0
Event: 6635 / CAL
UTC Thu Jul 4, 2013
08:59:48.412835008







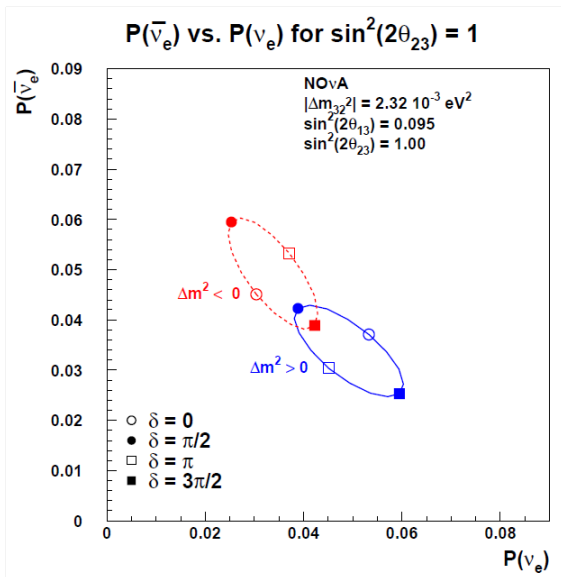
Where we are now:

- ▶ Over 2 kt of NOνA far detector instrumented, taking cosmic data
- ▶ Near Detector construction started
- ▶ First beam to NOνA estimated July 24th
- ▶ On track to 14 kt, 700 kW Summer 2014

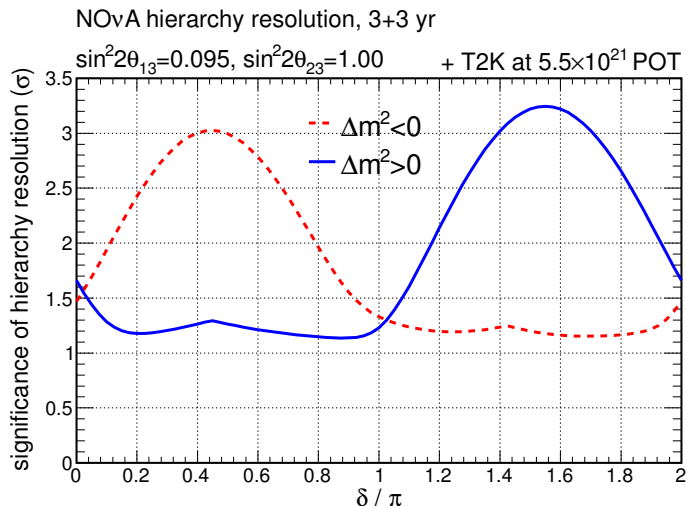
Main physics goals:

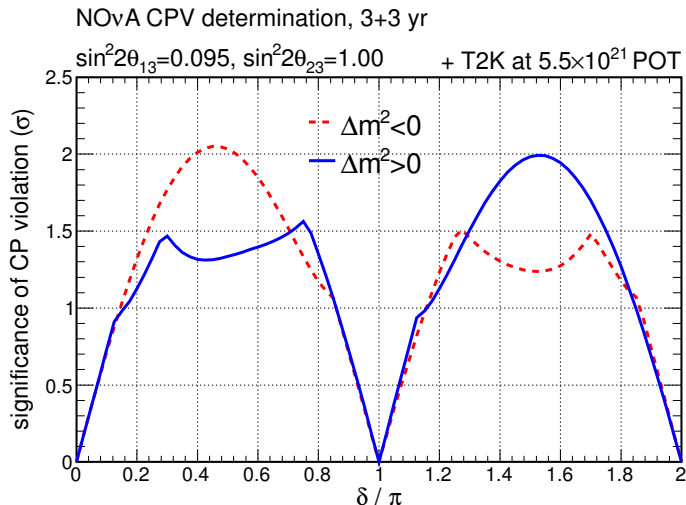
- ▶ Sensitivity to mass hierarchy
- ▶ Observe $\nu_\mu \rightarrow \nu_e$ and first observation of $\bar{\nu}_\mu \rightarrow \bar{\nu}_e$



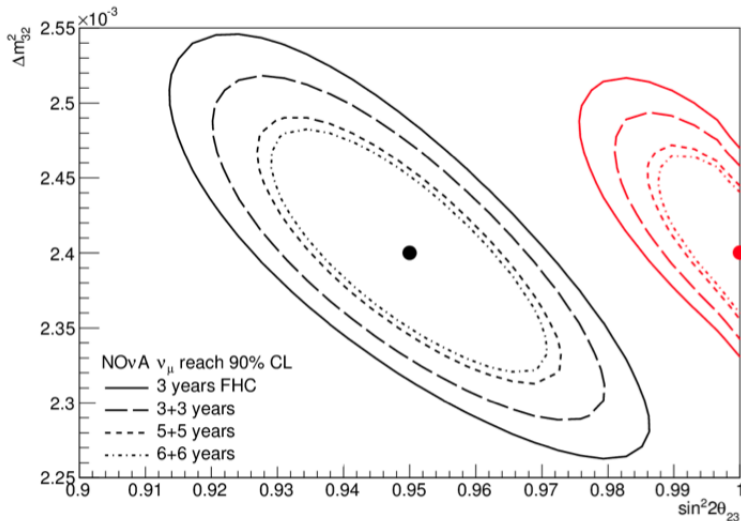


Sensitivity to Hierarchy (combined with T2K)





Sensitivity to Δm_{32}^2 and $\sin^2 2\theta_{23}$





Fermilab image from Fermilab today:

http://www.fnal.gov/pub/today/archive/archive_2013/images/fermilab-scenes.jpg

Tevatron Photo with annotation:

http://www.fnal.gov/directorate/plan_for_discovery/images/ch6_04.jpg

Various plots from NOVA TDR:

http://www-nova.fnal.gov/nova_cd2_review/tdr_oct_23/tdr.htm