Outline

- Overview of the Experiment
  - Geographical Layout
  - Neutrino Beam
  - MINOS Detectors
- Physics Sensitivity of the Experiment
  - CC Rate and Spectrum Test
  - NC/CC Test
- Recent Progress / Current Activities
  - Conventional Construction
  - Neutrino Beam
  - Detector Developments
- Prognosis for the Future / Schedule
- Conclusions

Status of the MINOS Project

Presentation at the Neutrino2000 Conference
Sudbury, Canada
June 17, 2000

Stanley Wojcicki
Stanford University
Stanford,Ca

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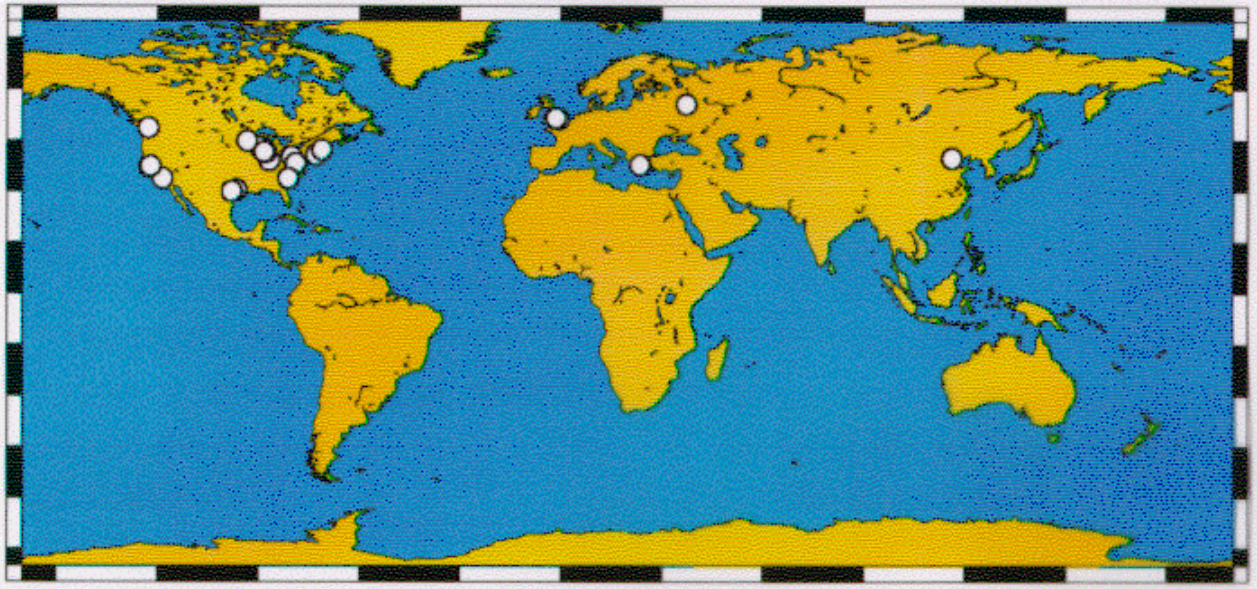
The MINOS Collaboration



Over 250 Physicists and Engineers

IHEP-Beijing •Athens • Dubna • ITEP-Moscow • Lebedev • Protvino • Oxford • Rutherford • Sussex • University College London • Argonne • Brookhaven • Caltech • Chicago • Elmhurst • Fermilab • James Madison • Harvard • Indiana • Livermore • Minnesota • Northwestern • Pittsburgh • South Carolina • Stanford • Texas-Austin • Texas A&M • Tufts • Western Washington • Wisconsin

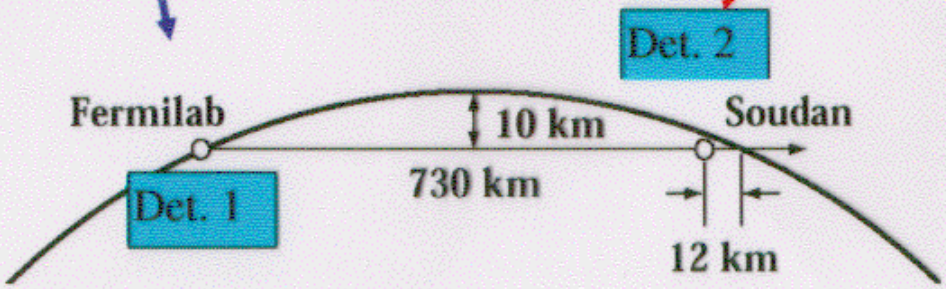
Wojcicki - 0

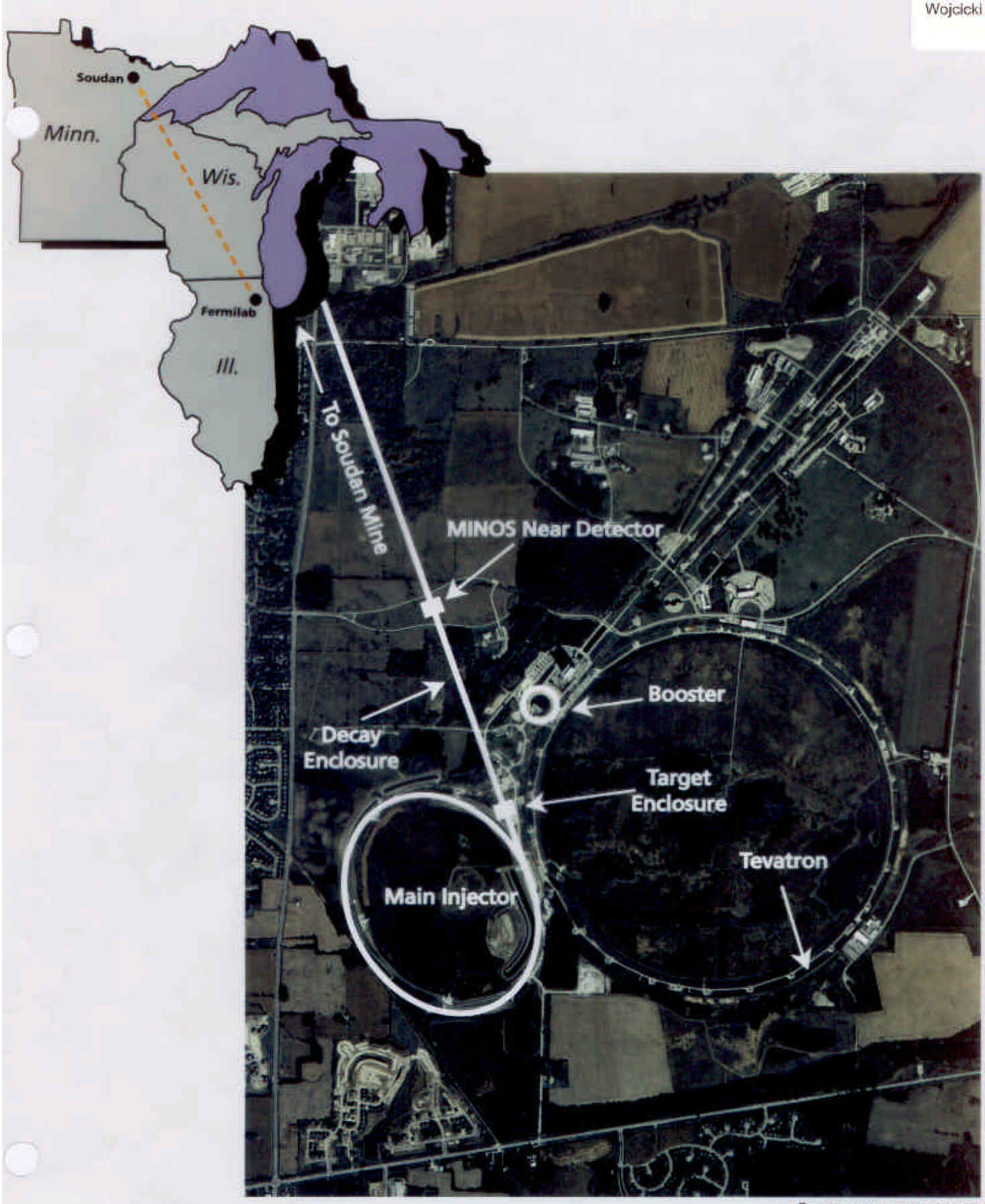
MINOS Experiment

Two Detector Neutrino Oscillation Experiment (Start 2003)

Near Detector: 980 tons

Far Detector: 5400 tons





FERMILAB #98-1321D

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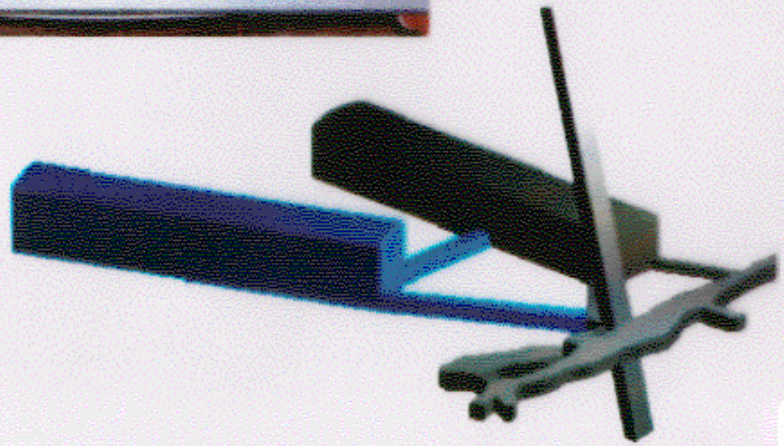
MINOS

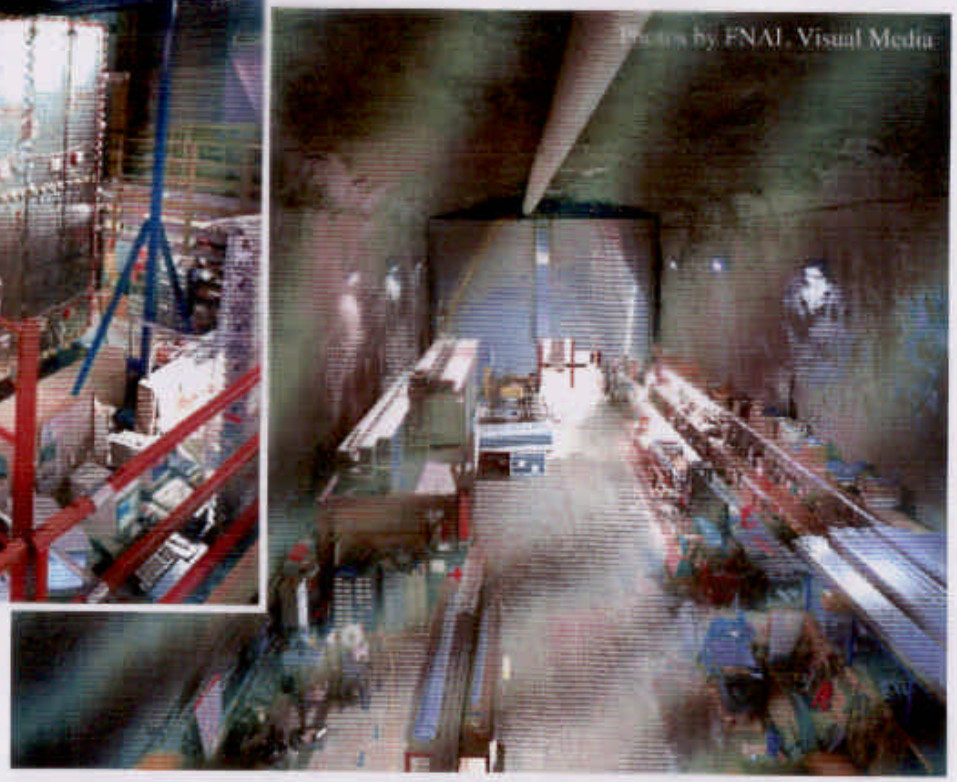
Soudan Underground Laboratory

Photos by Jerry Meier

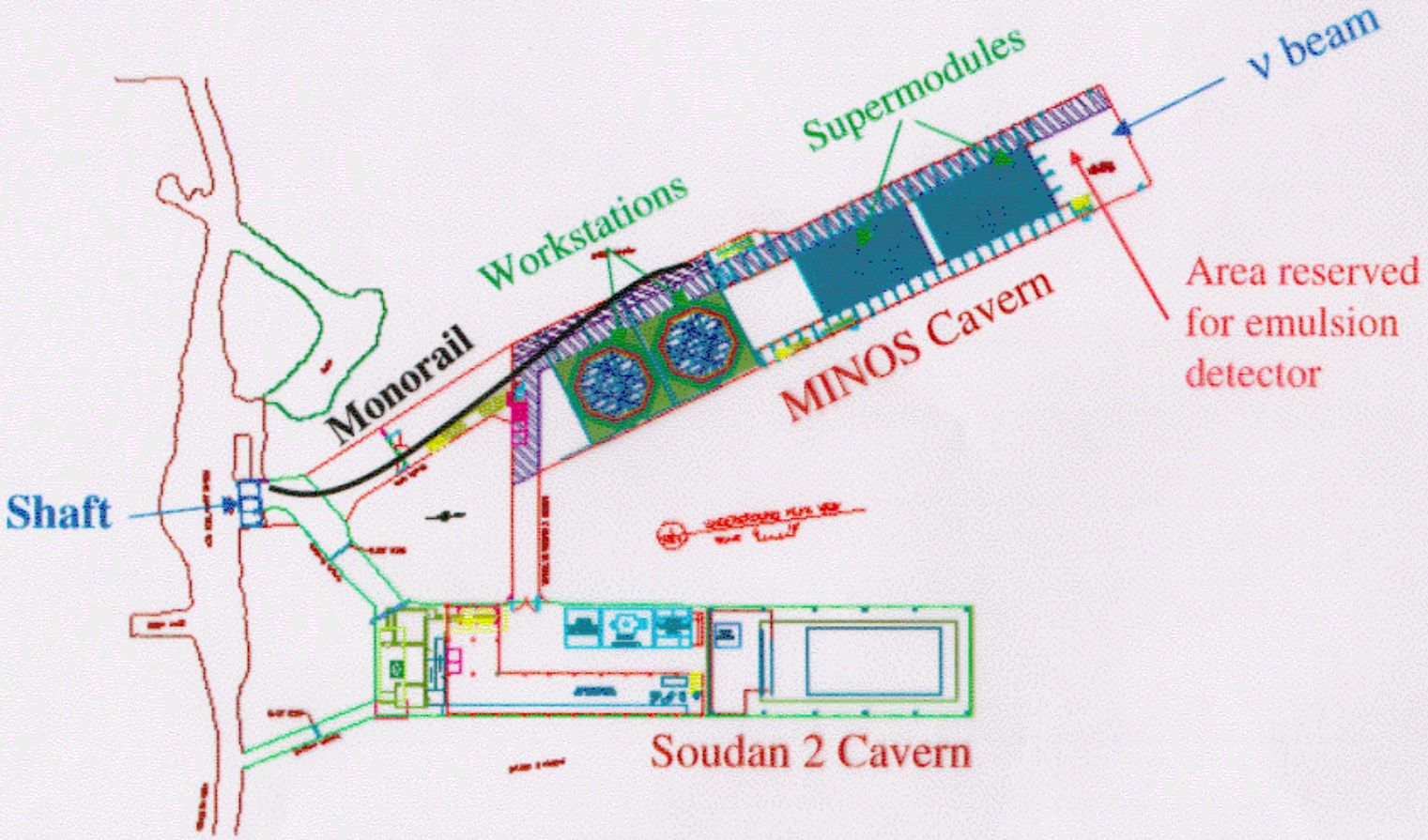
The Soudan shaft limits objects to a maximum size of 1m by 2m by 9m



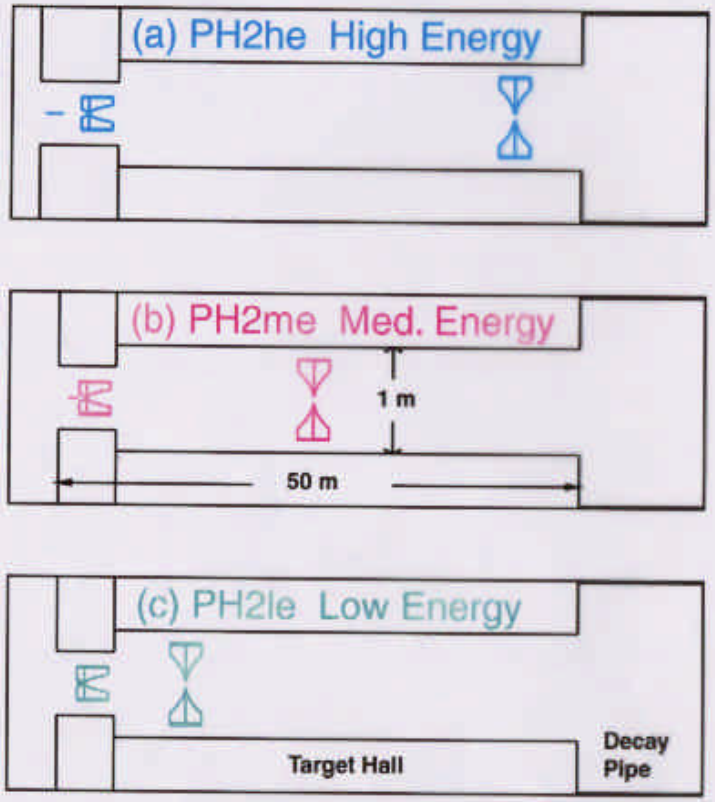
Soudan-2 Laboratory

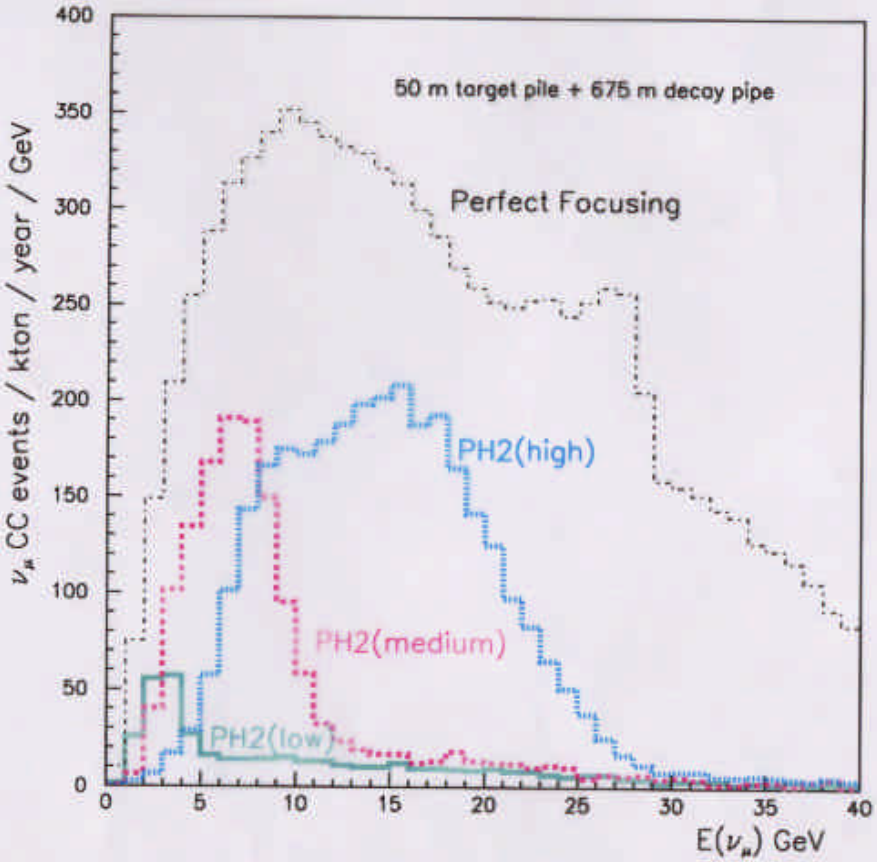


Far Detector Cavern Layout



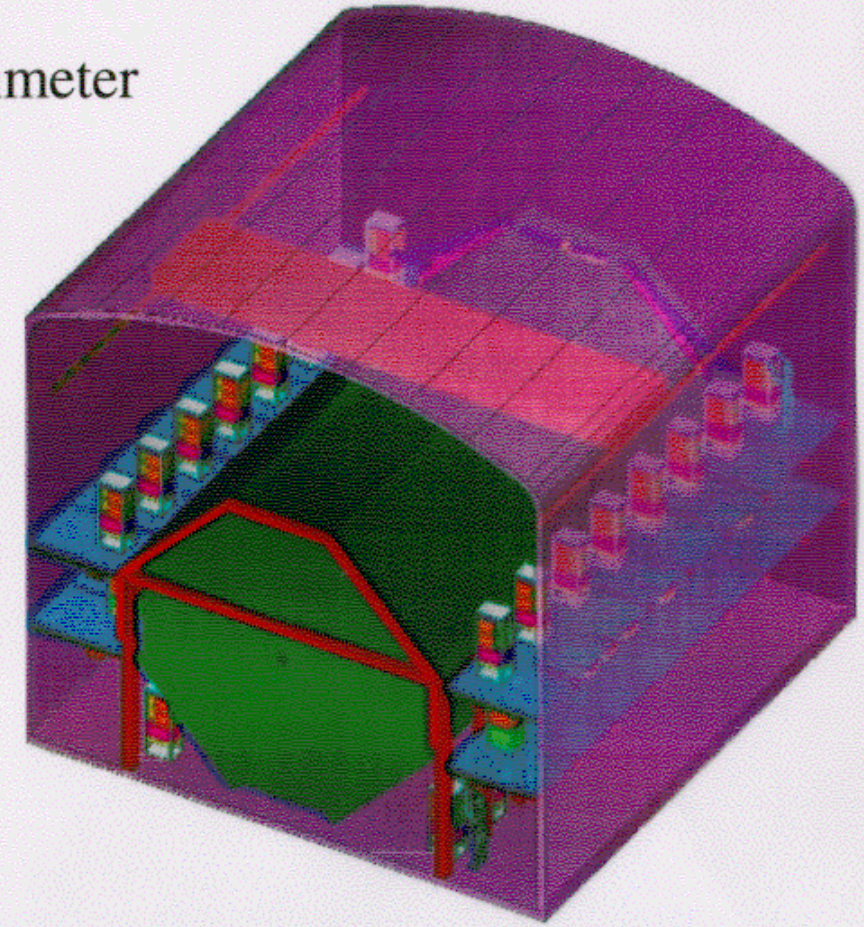
Tuning Neutrino Spectra by Horn/Target Reconfiguration





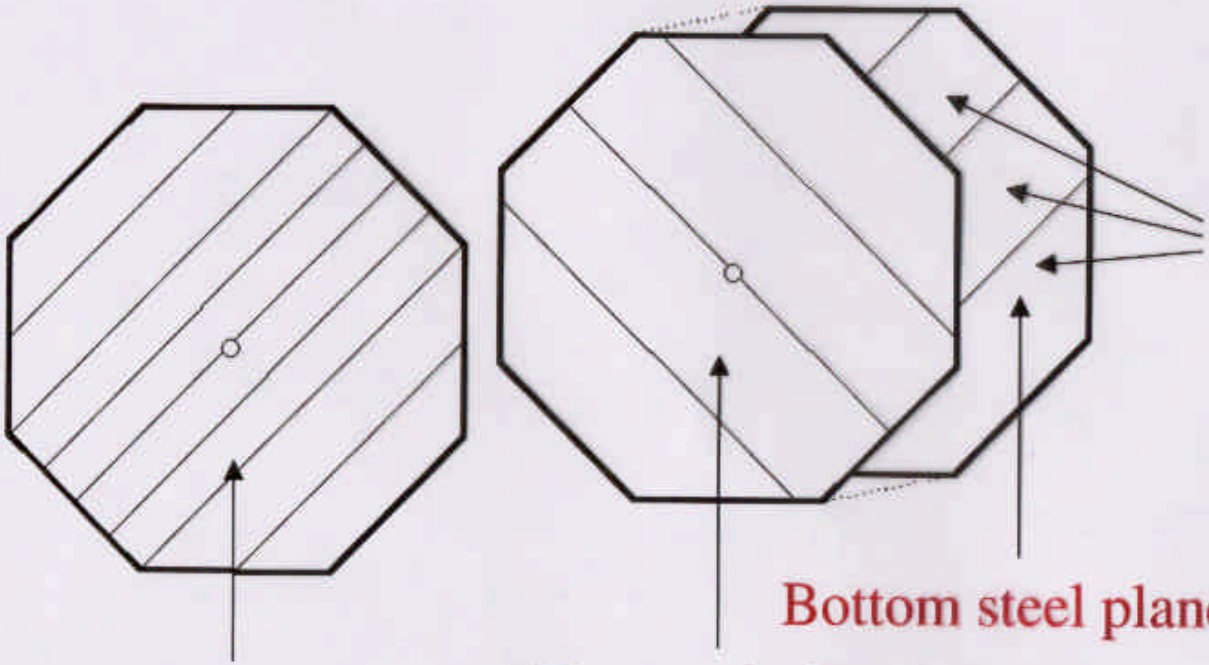
MINOS Far Detector

- 8m Octagonal Tracking Calorimeter
- 486 layers of 2.54cm Fe
- 2 sections, each 15m long
- 4.1cm wide solid scintillator strips with WLS fiber readout
- 25,800 m^2 active detector planes
- Magnet coil provides $\langle B \rangle \approx 1.3T$
- 5.4kt total mass



Half of the MINOS Far Detector

Steel & Scintillator Plane Layout



2-m wide,
0.5-inch thick,
steel plates

Bottom steel plane layer

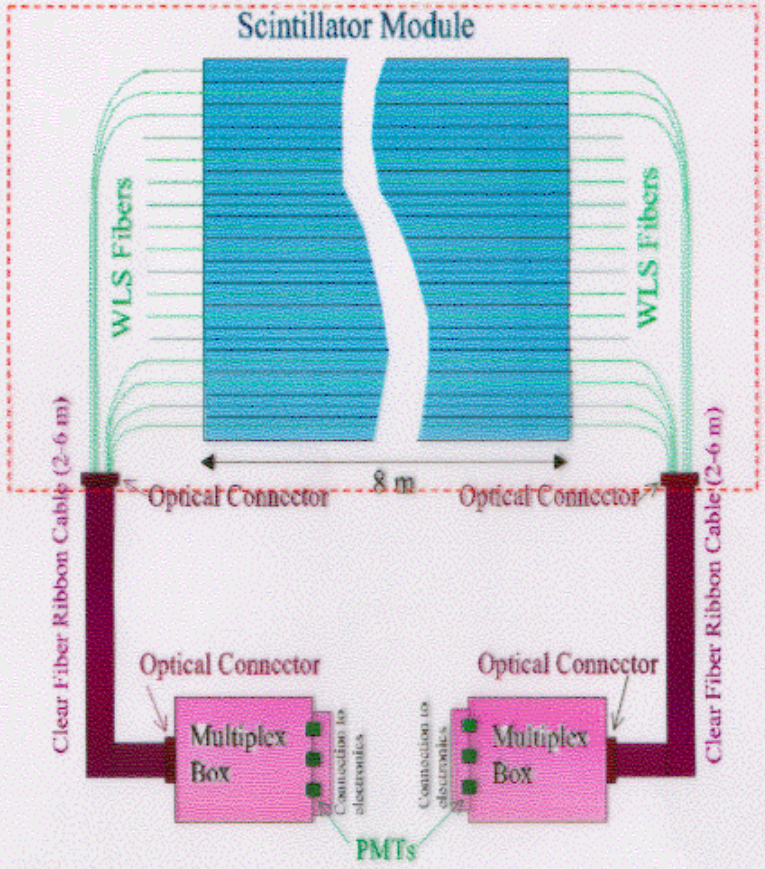
Top steel plane layer

Scintillator plane

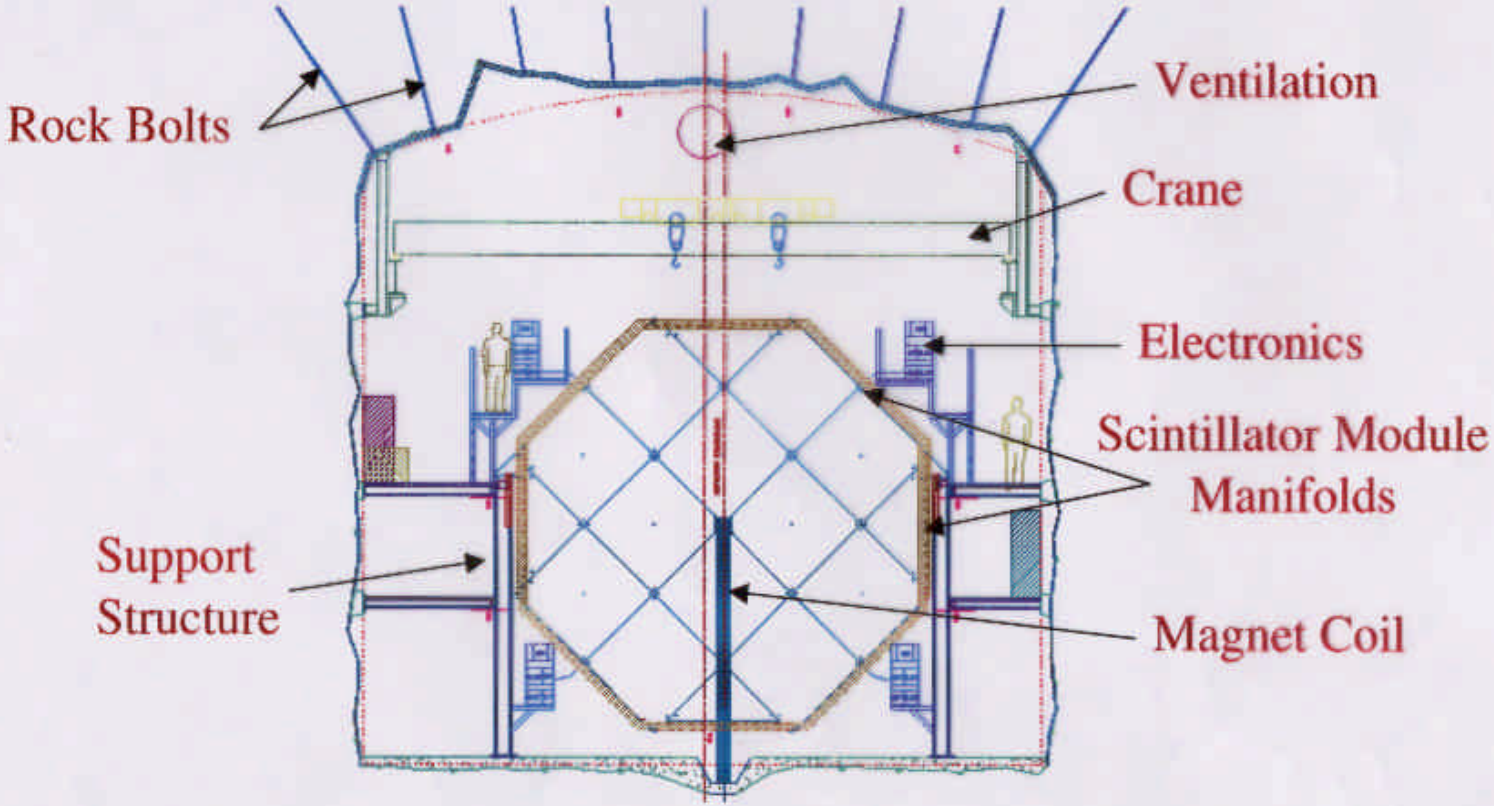
Orientations alternate ±90°
in successive planes

Scintillator Readout Schematic

- Strips assembled into 20- or 28-strip "modules"
- Fire resistant aluminum light cases
- 2-ended WLS fiber readout
- WLS to clear fiber cables at module connectors
- MUX boxes route 8 fibers to one PMT pixel



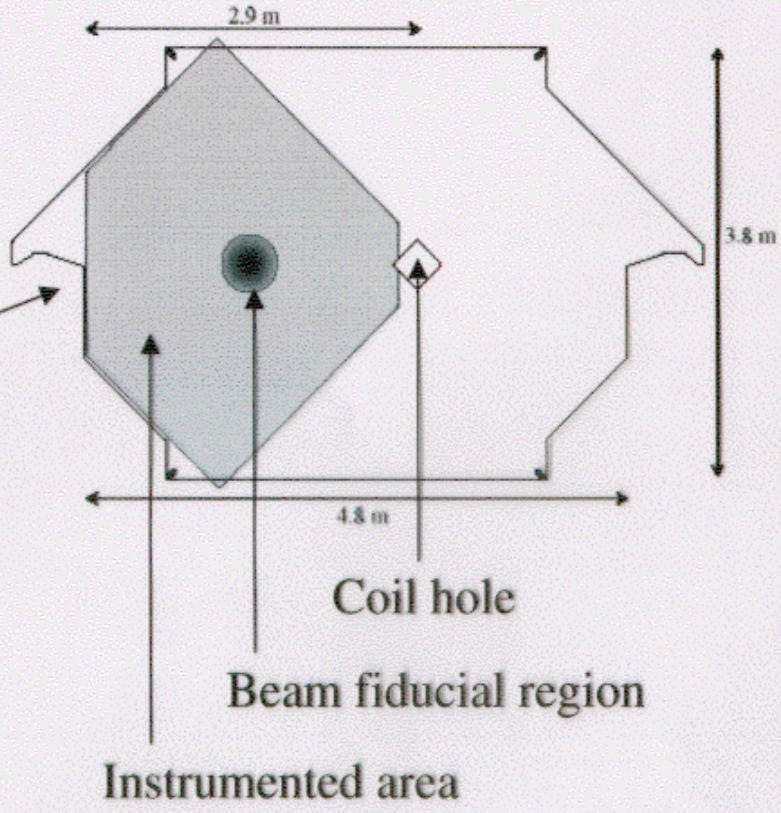
Far Detector Cross Section



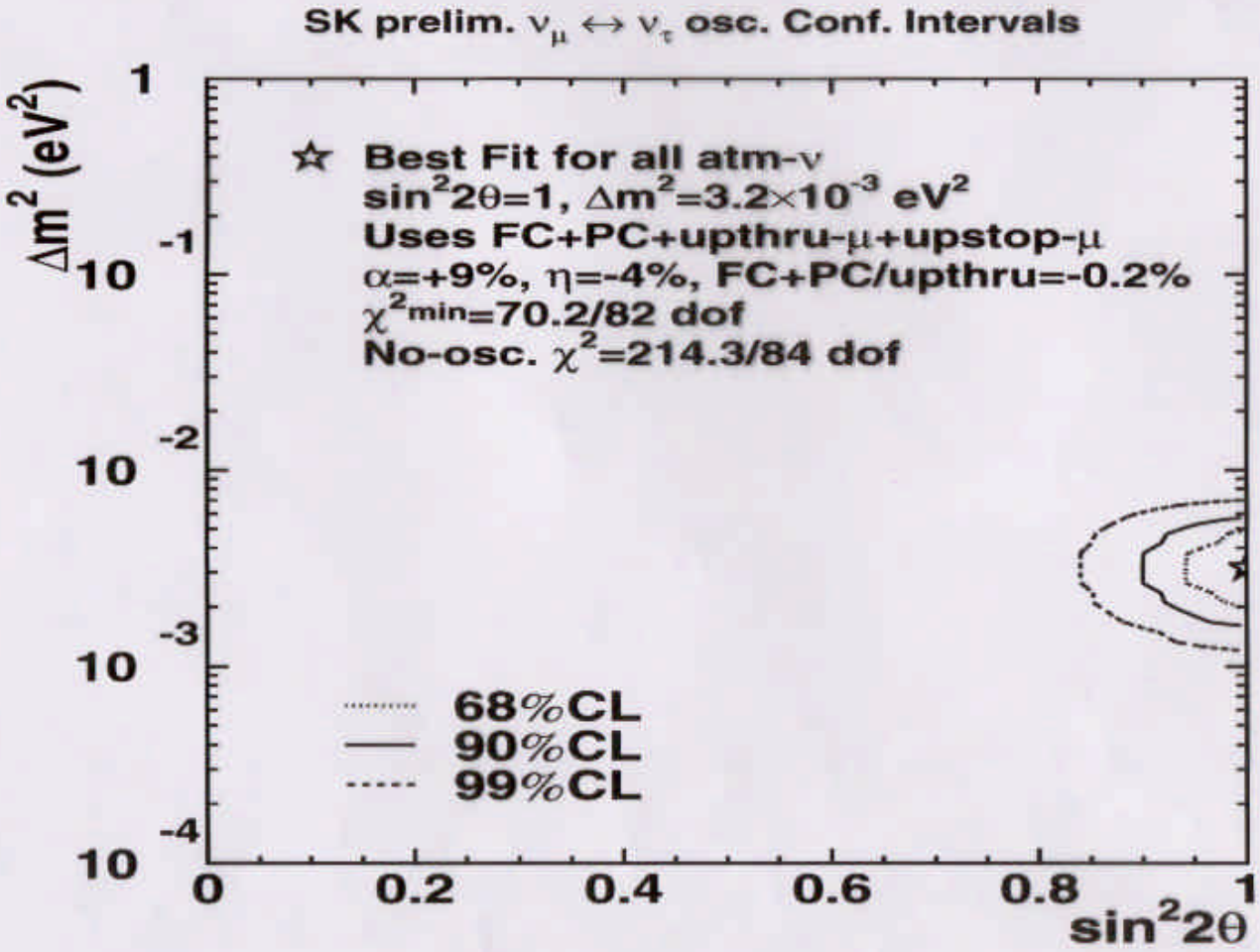
MINOS Near Detector

MINOS Near Detector

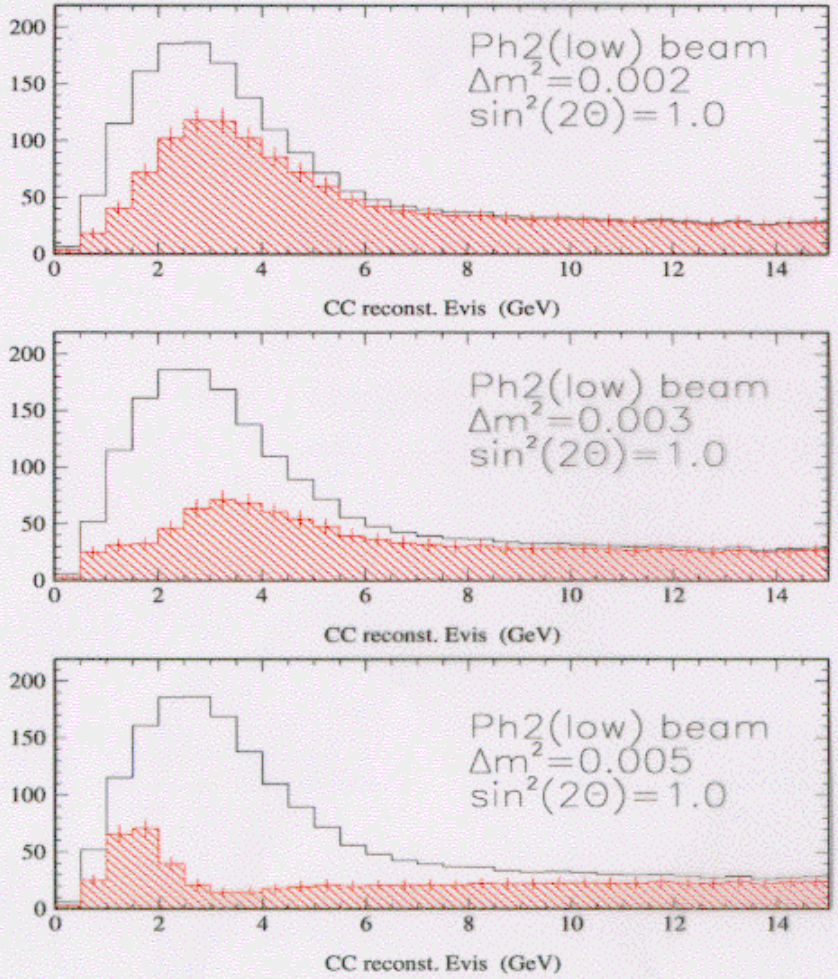
- 16.6 m long, 980 tons
- 280 "squashed octagon" planes
- Forward section: 120 planes
  - 4/5 partially instrumented
  - 1/5 planes: full area coverage
- Spectrometer section: 160 planes
  - 3/4 planes not instrumented
  - 1/4 planes: full area coverage



SuperK Overall Best Fit



MINOS Energy Spectra

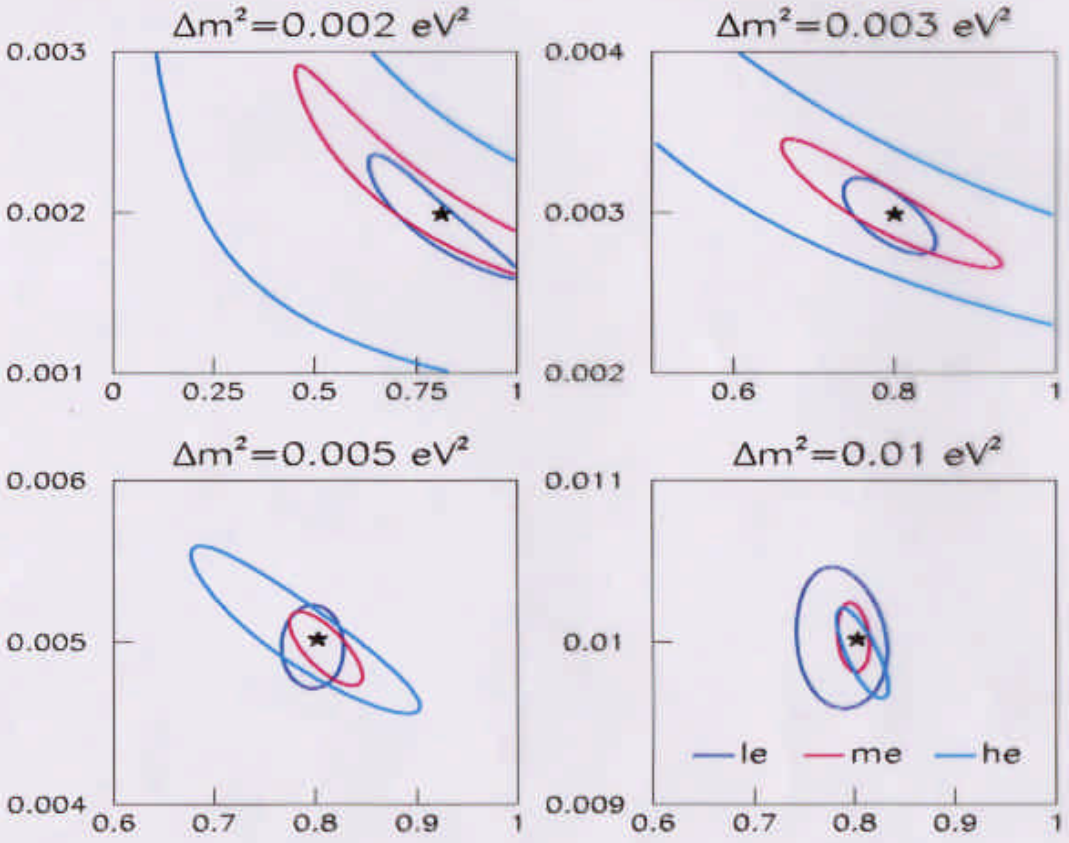


10 kt-yr Exposure

Solid lines - energy spectrum without oscillations

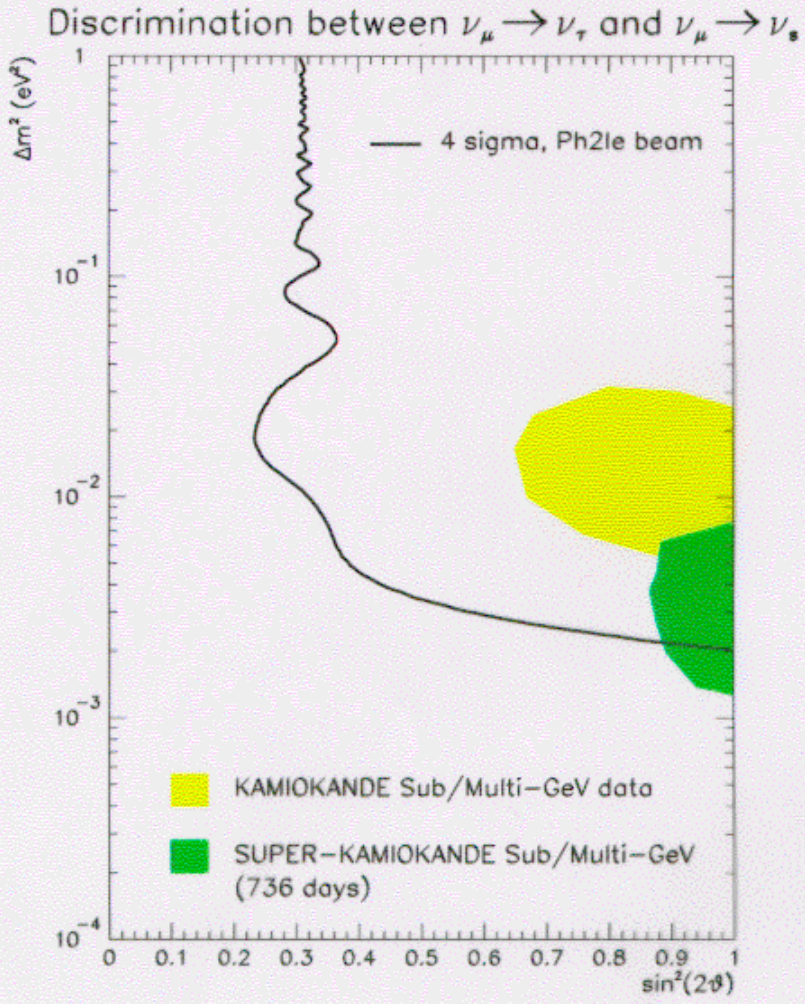
Dashed histogram - spectrum in presence of oscillations

Comparison of Different Beams



CC Energy Spectru
68% Contours
10kt-yr exposure

MINOS Oscillation Mode Sensitivity



From T test measurement

(NC-like/CC-like ratio)

10 kt yr exposure

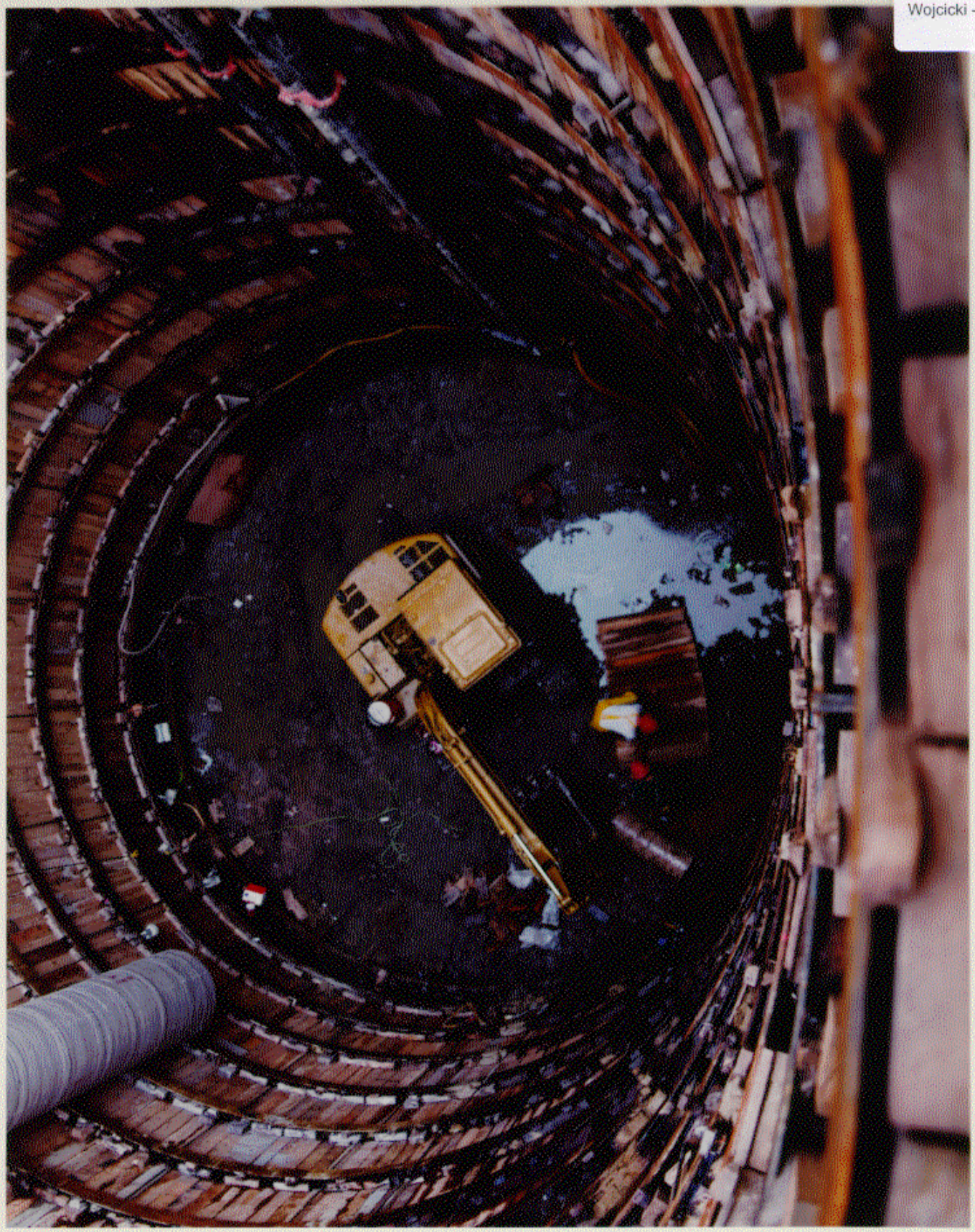
Determination of oscillation mode from the T test becomes more difficult at low Δm^2

Cavern Excavation

Drill

Blast

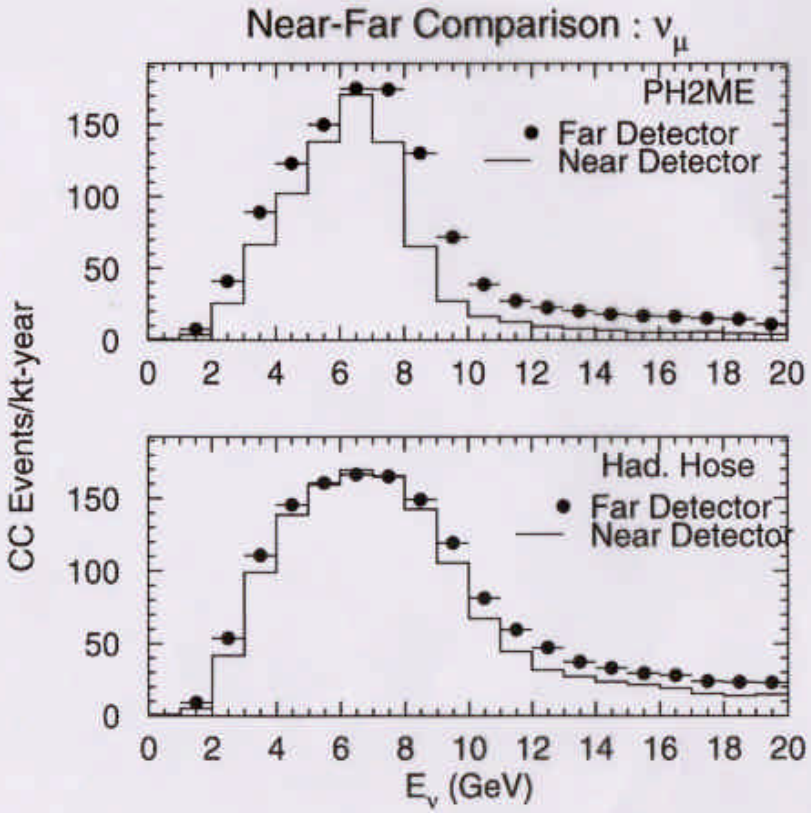
Muck



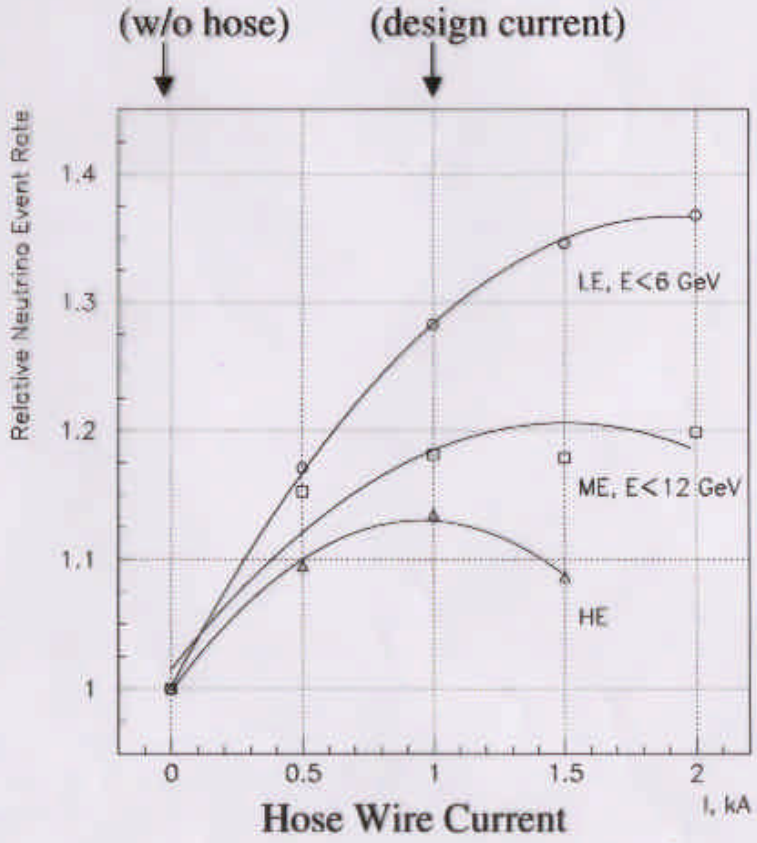
Wojcicki - 21

Advantages of Hadronic Hose

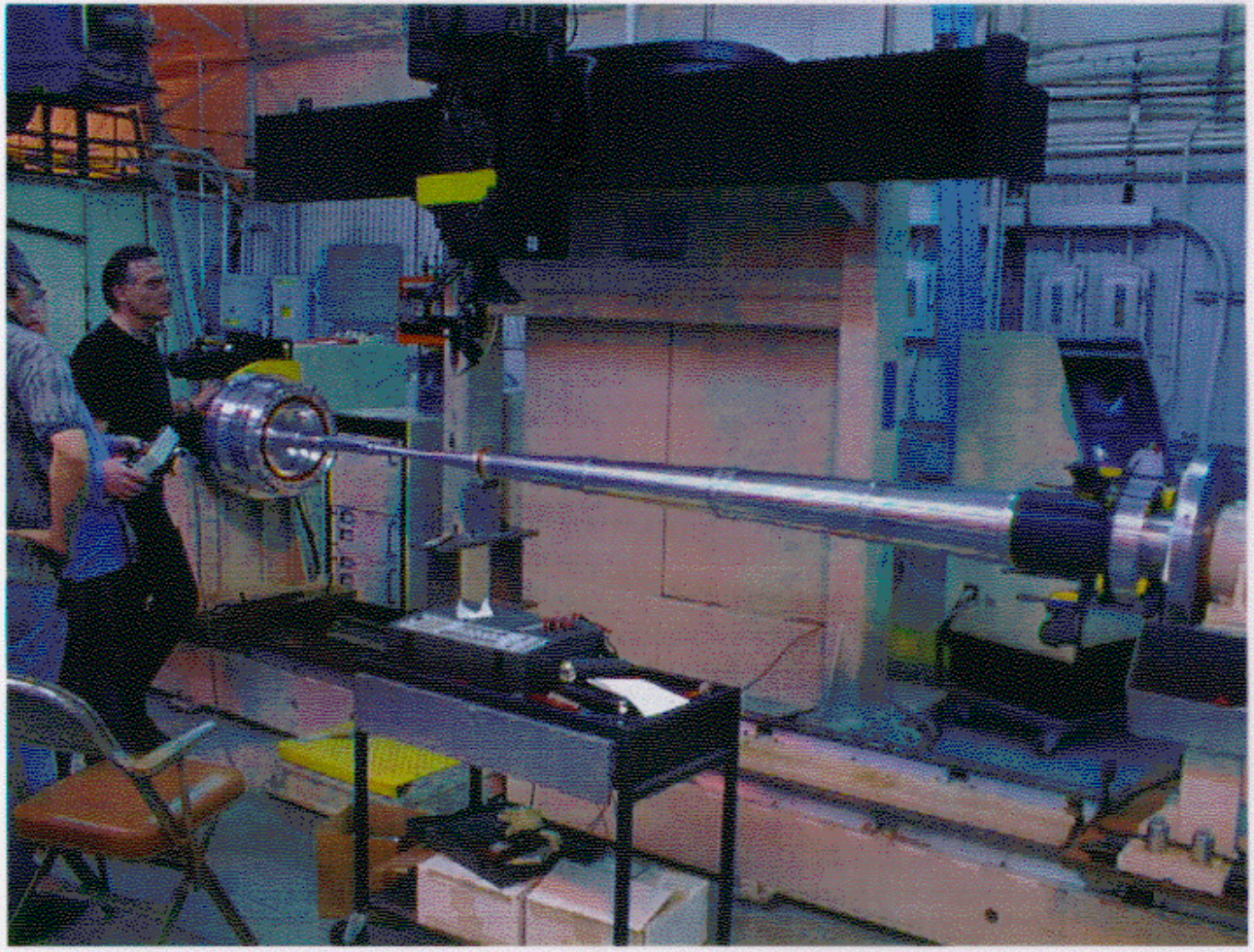
Makes Near spectrum similar to Far
Reduces Beam Systematics



Increases Event Rate



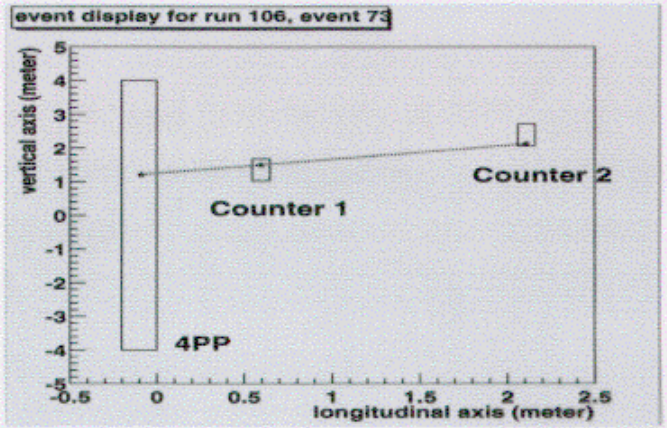
Inner First Horn Conductor

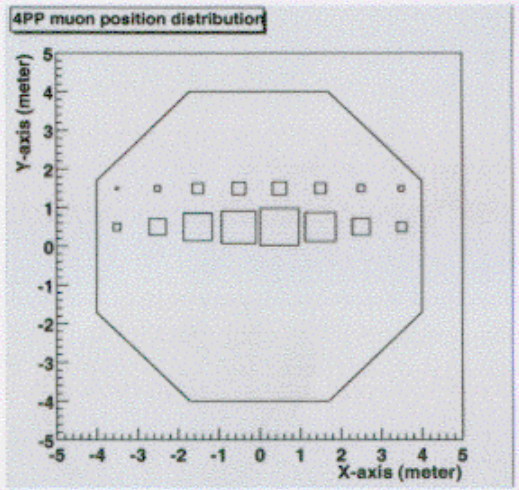


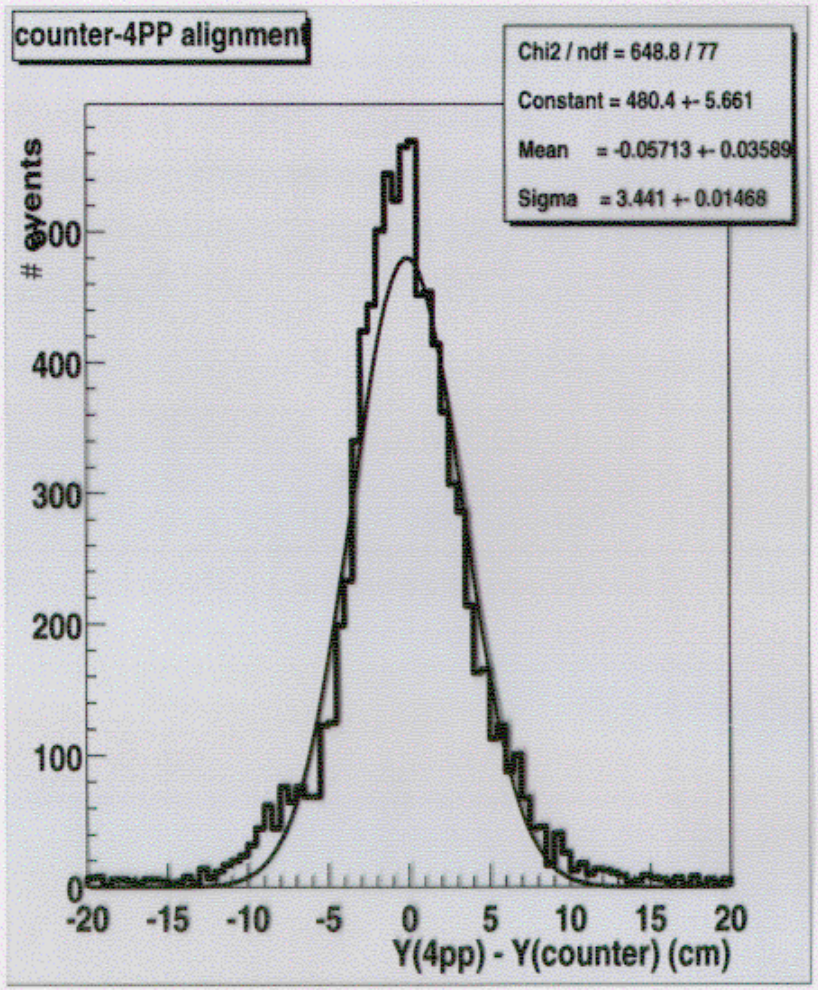
4 Plane Prototype

Built last Summer at Fermilab

Cosmic rays in 4PP





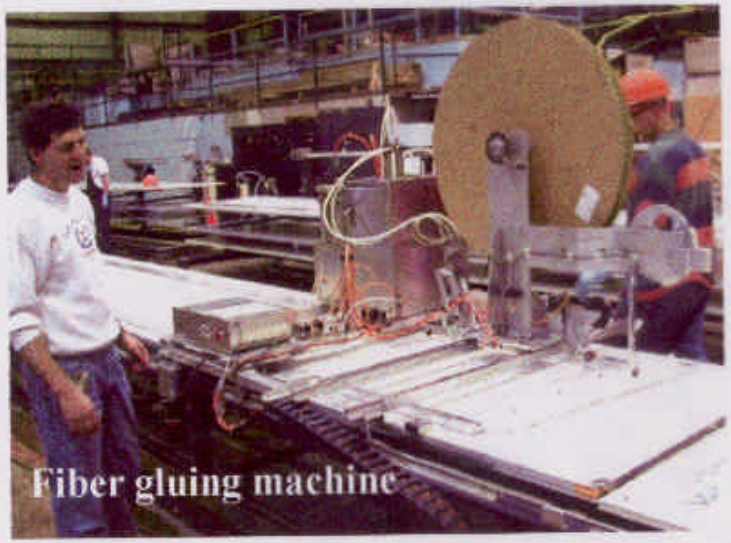


Machines and Testing

Over 700 miles of scintillator

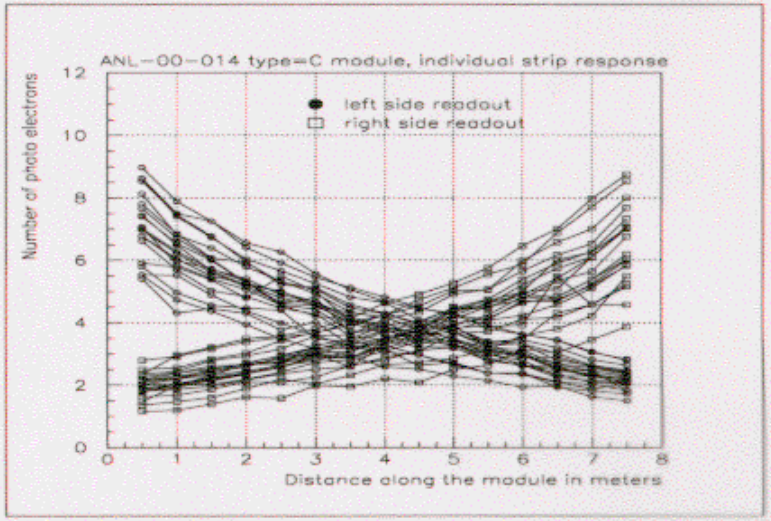
Over 1500 miles of fiber optics

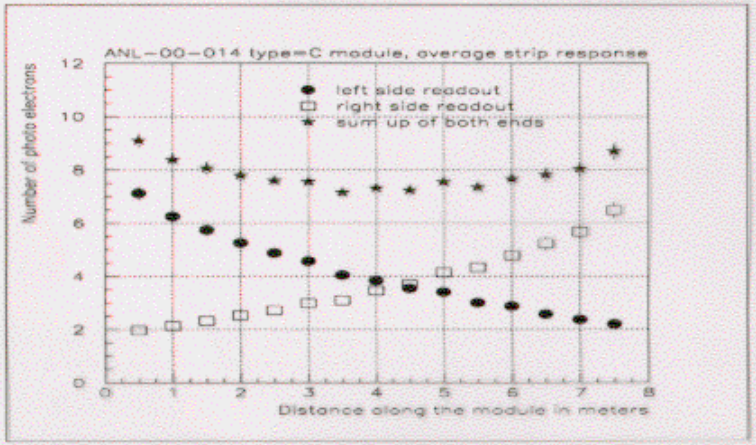
Over 1250 trips down the shaft

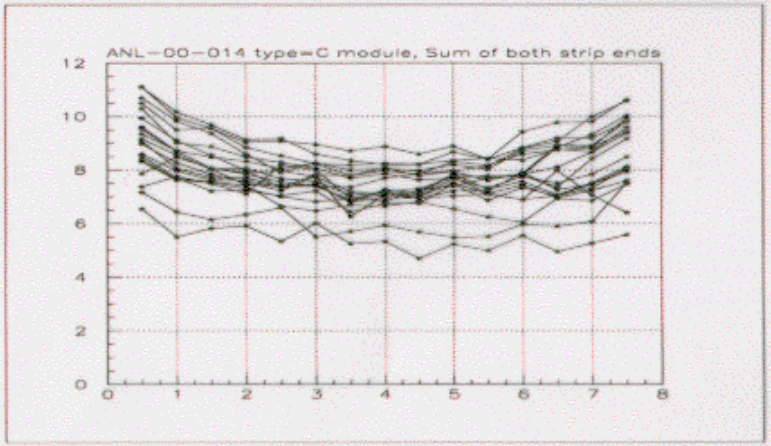

Fiber gluing machine

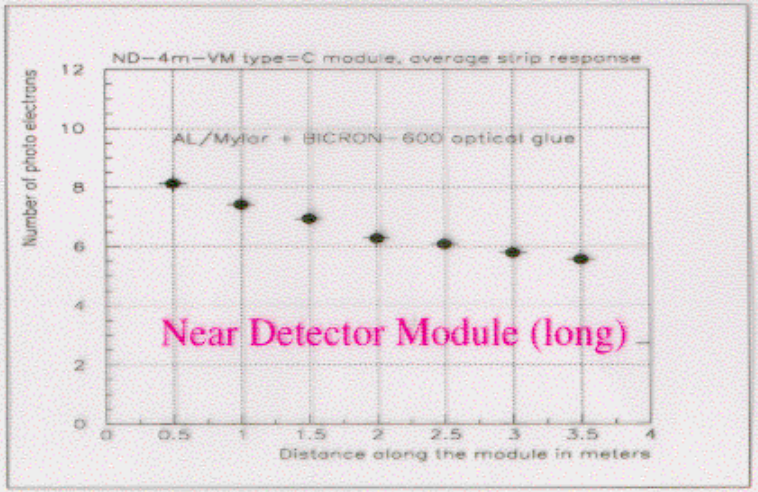

Materials handling tests with 6tons of steel... make sure it's safe before we try it over a half mile hole!

Latest Scintillator Results









Schedule

- September, 2000 – Soudan Cavern Excavation Complete
- October, 2000 – Start of Scintillator Module Production
- March, 2001 - Start of Far Detector Installation
- September, 2002 – Completion of 1st MINOS SuperModule
- October, 2002 –Start of Installation of Beam Components and Near Detector
- June, 2003 – Start of System Commissioning
- July, 2003 – Completion of Detector Installation
- October, 2003 – Start of Physics Data Taking

Summary

- Physics of ν Oscillations over a long baseline continues to be a "hot" topic
- MINOS is well positioned to make significant contributions in this area
- Over the last year good progress has been made in all technical areas
- The schedule is tight and the financial situation continues to have uncertainties
- Nevertheless, we are hopeful of achieving our goal of start of data taking in October, 2003

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