MINERvA

Sees Its First Antineutrino Beam

Fermilab All Experimenters' Meeting

November 23, 2009

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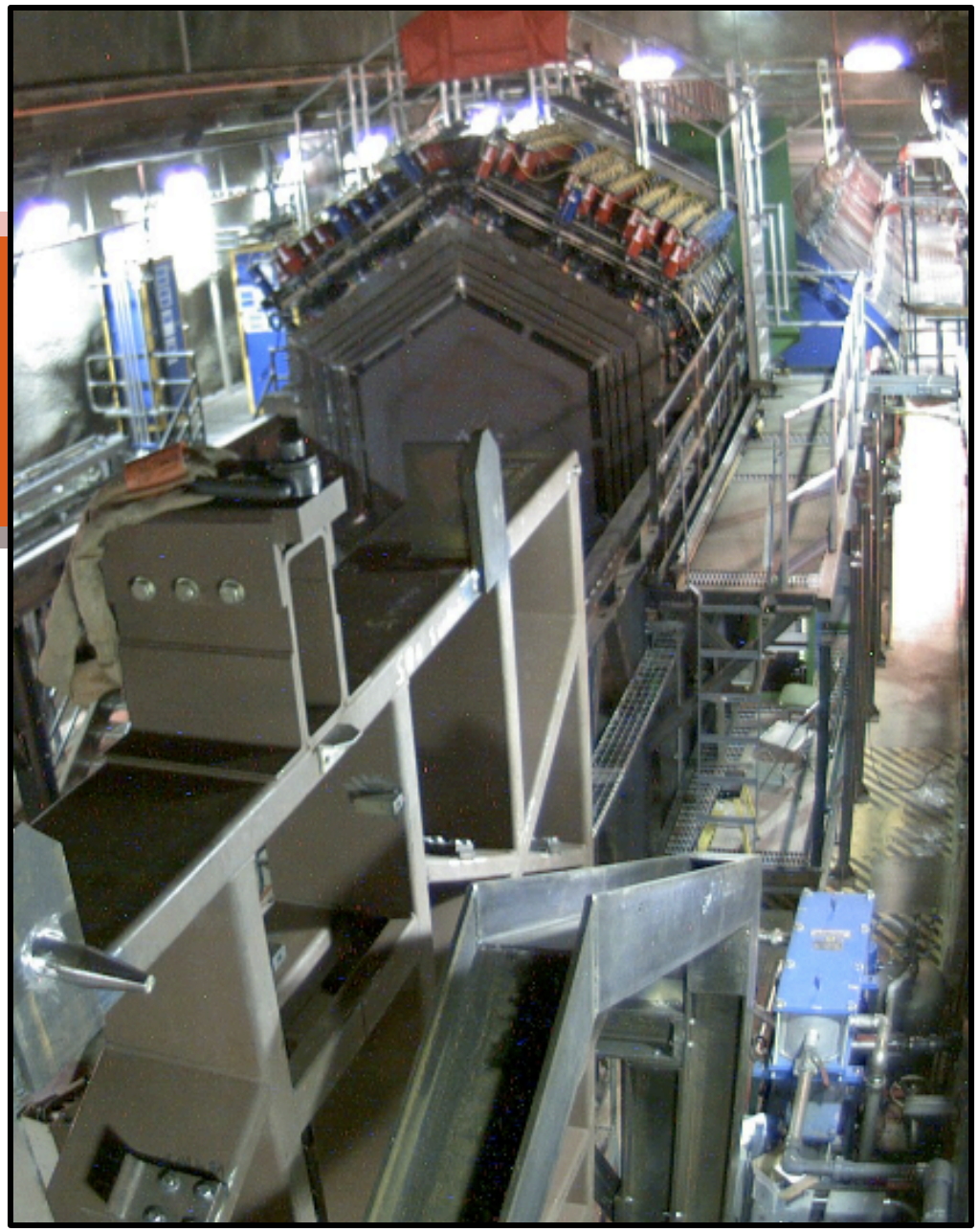


MINERvA net cam, 11/22/09

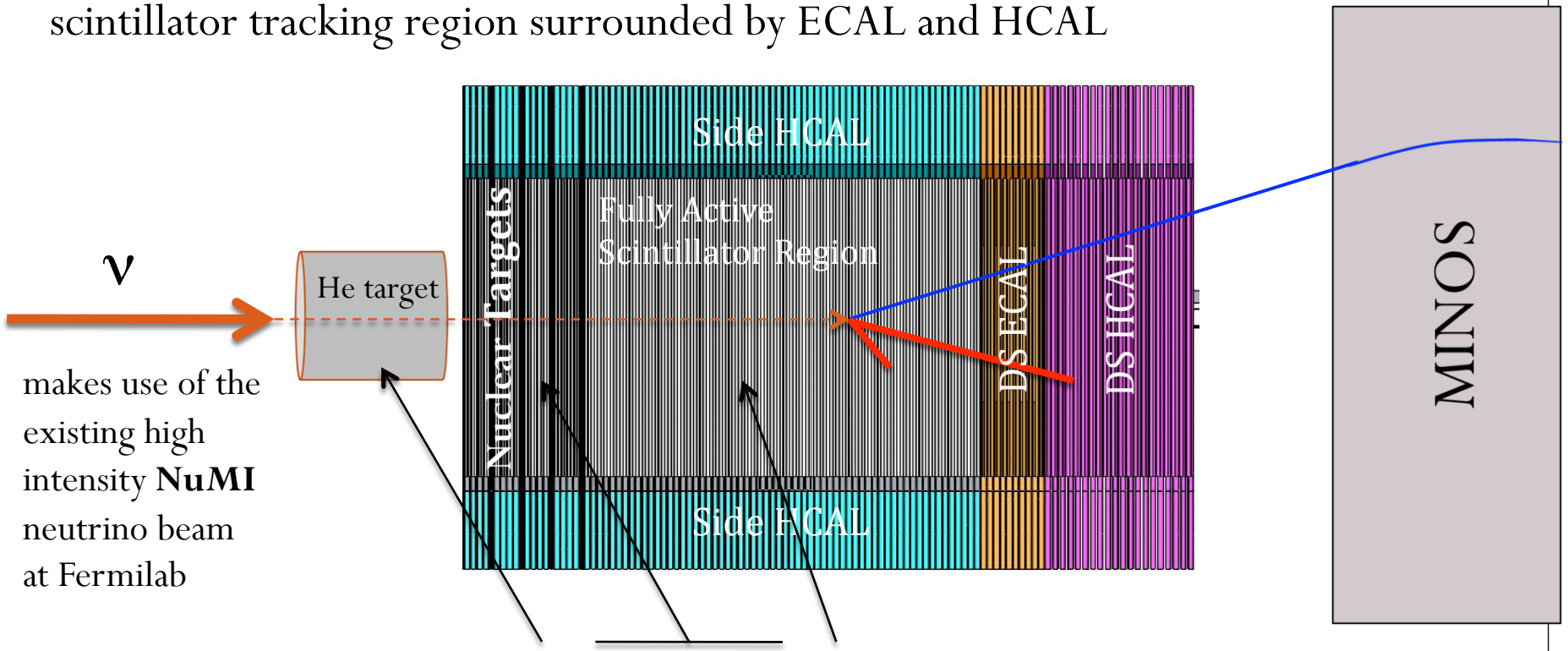
MINERνA: Evolution of a Detector

- Reminder of the **Tracking Prototype** detector
- Current status of the **full detector installation**
- Plans for taking **antineutrino beam data**
- Plans for **completing the detector** construction

MINERνA Detector

- MINERνA is a dedicated **neutrino-nucleus cross-section** experiment

116 stacked detector modules. Finely segmented, fully active scintillator tracking region surrounded by ECAL and HCAL

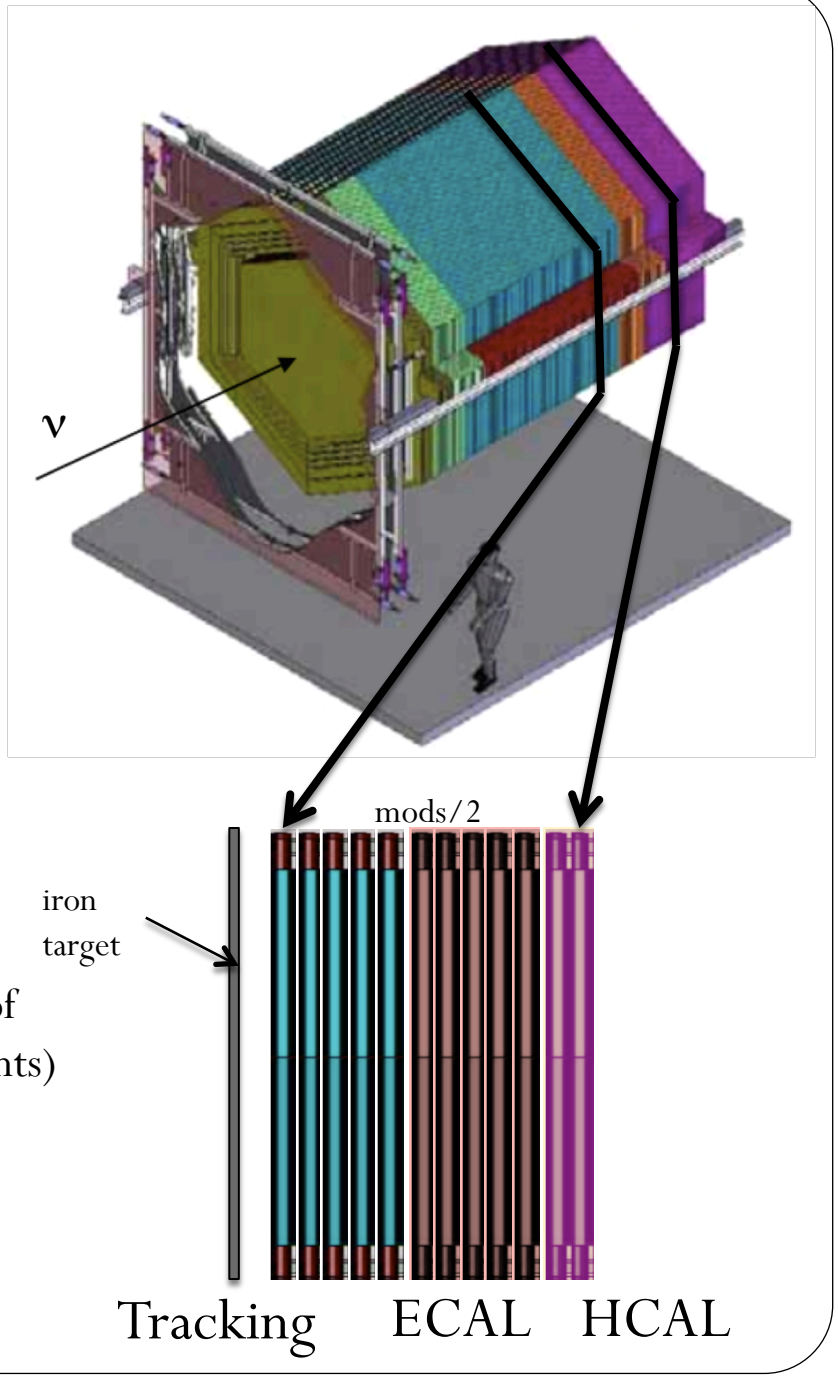


makes use of the existing high intensity **NuMI** neutrino beam at Fermilab

range of nuclear targets **(He, C, Fe, Pb, CH)** for study of **nuclear effects** in neutrino interactions. Exploring addition of water target volume.

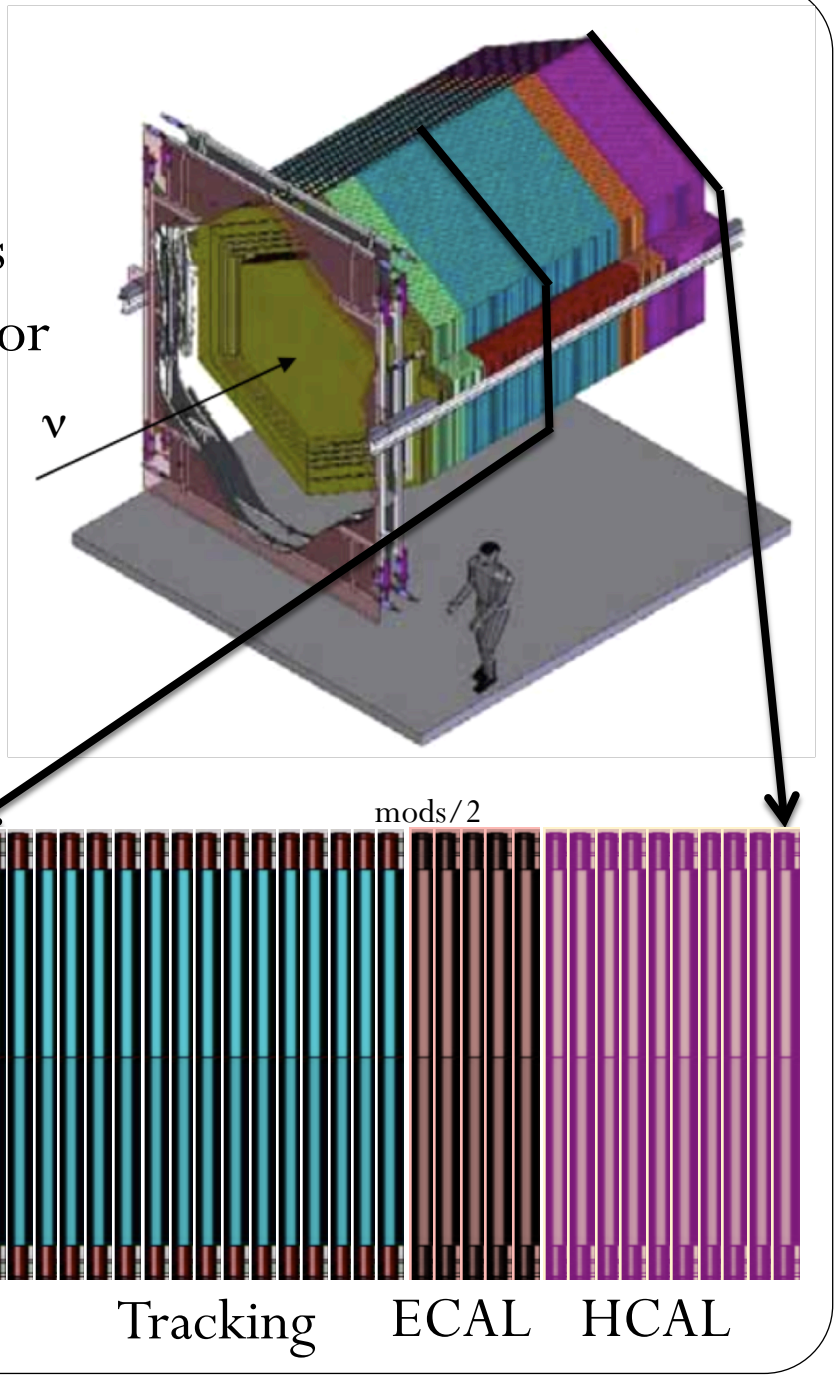
Tracking Prototype

- installed **24 modules** in NuMI beam for two month prototype run (April-June, 2009)
- have been analyzing TP data for past several months
  - comprehensive test of detector design and performance
  - develop calibration techniques and software implementations
  - track reconstruction and neutrino event selection
  - large, coordinated effort to perform a visual scan of neutrino candidates in tracking volume (~20k events)
  - results being fed back to inform, evaluate software reconstruction
  - **physics analysis of these data is on-going**



Current Detector

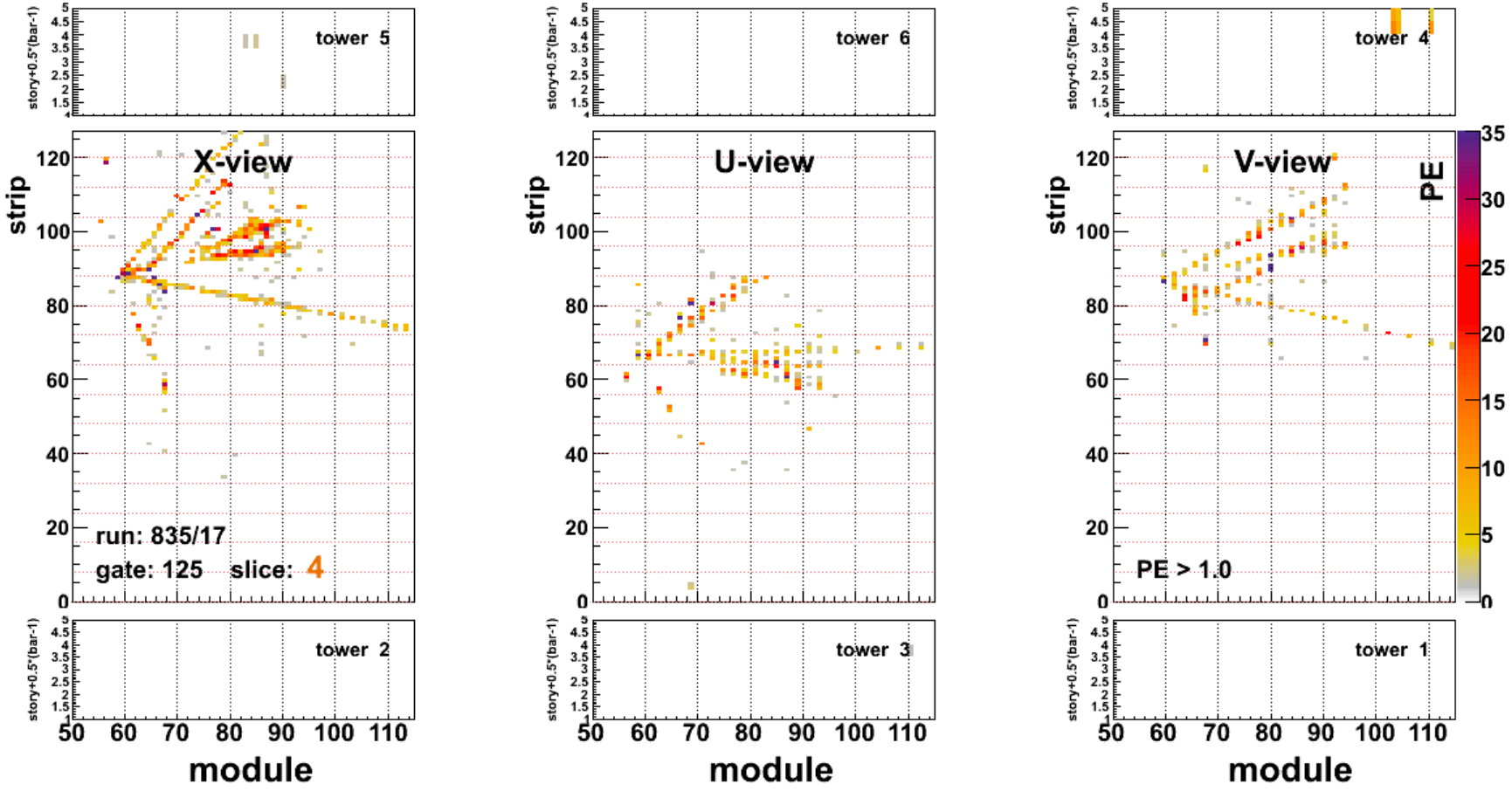
- removed Tracking Prototype modules and started installation of final detector during summer shutdown
- currently **64 modules**
  34 tracking+10 ECAL+20 HCAL
- froze detector installation on November 12 to collect NuMI antineutrino beam data
- One nuclear target module (Fe, Pb) included in installation



Current Detector Data Collection

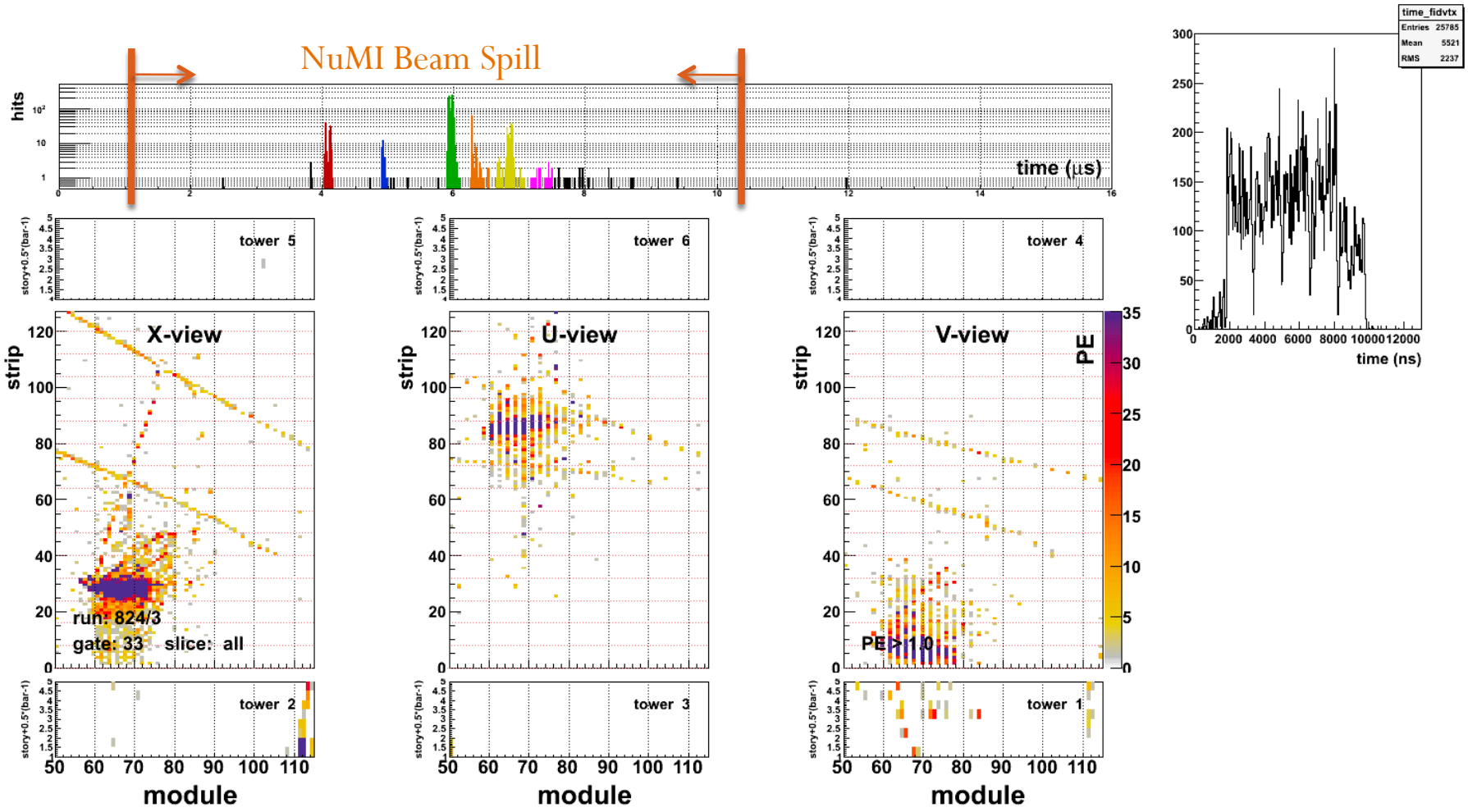
- began 24 hour control room (WH12NW) shifts on November 12
- collecting calibration data (pedestals, light injection) and NuMI anitneutrino beam data for **detector commissioning**
  - HV tuning of all 272 PMTs complete
  - light leak checking of all 272 x 64 = 17,408 channels complete
  - gain determination using in situ light injection system for all 17,408 channels complete
  - quickly caught and fixed small timing offset in different regions of the detector
  - no other obvious issues spotted so far
- now taking advantage of **record breaking NuMI beam intensities!**

Current Detector Data Collection



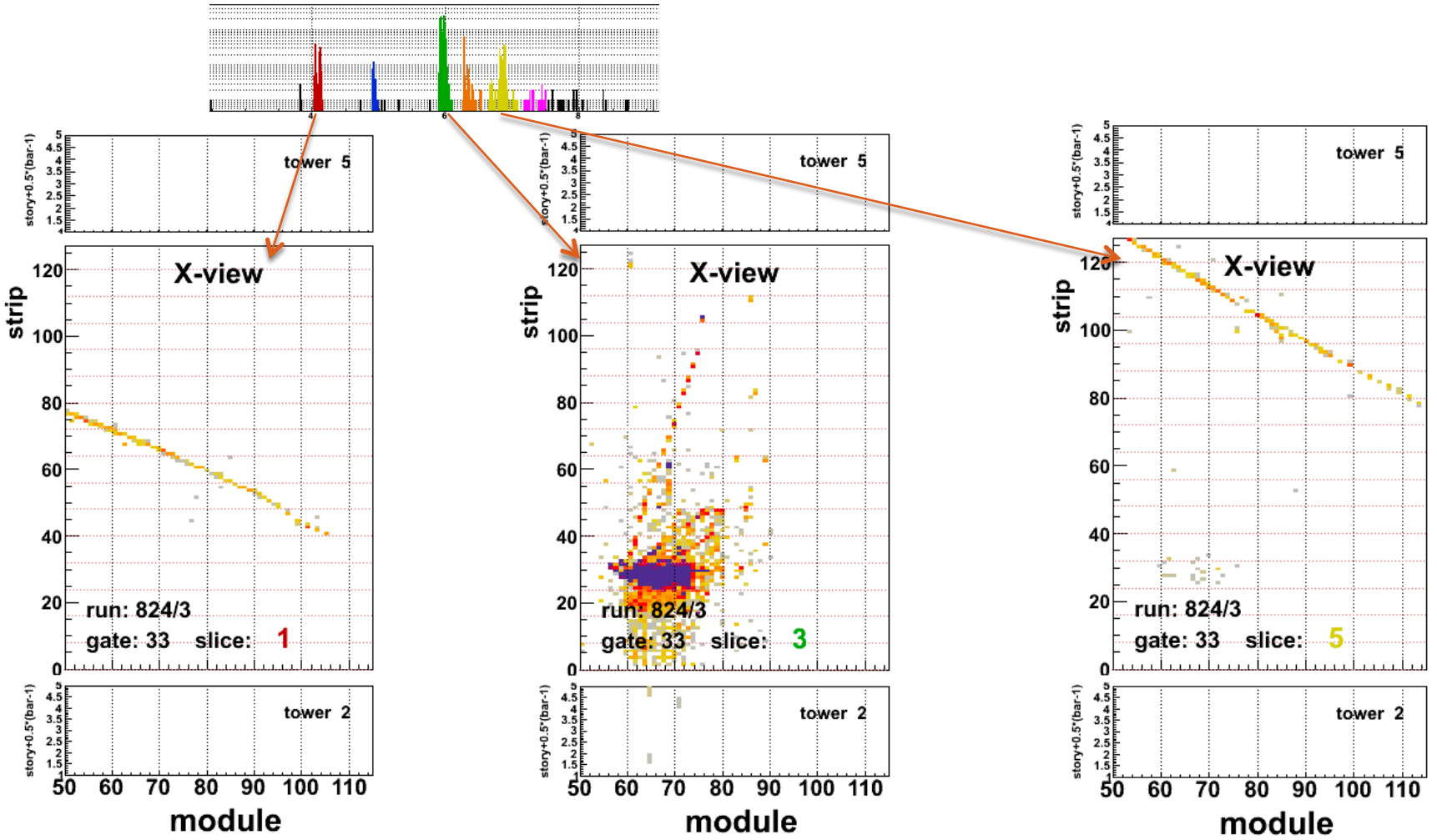
Good visibility of tracks in multiple particle final states and secondary interactions. Will be a lot of fun (and a challenge) to reconstruct!

Current Detector Data Collection



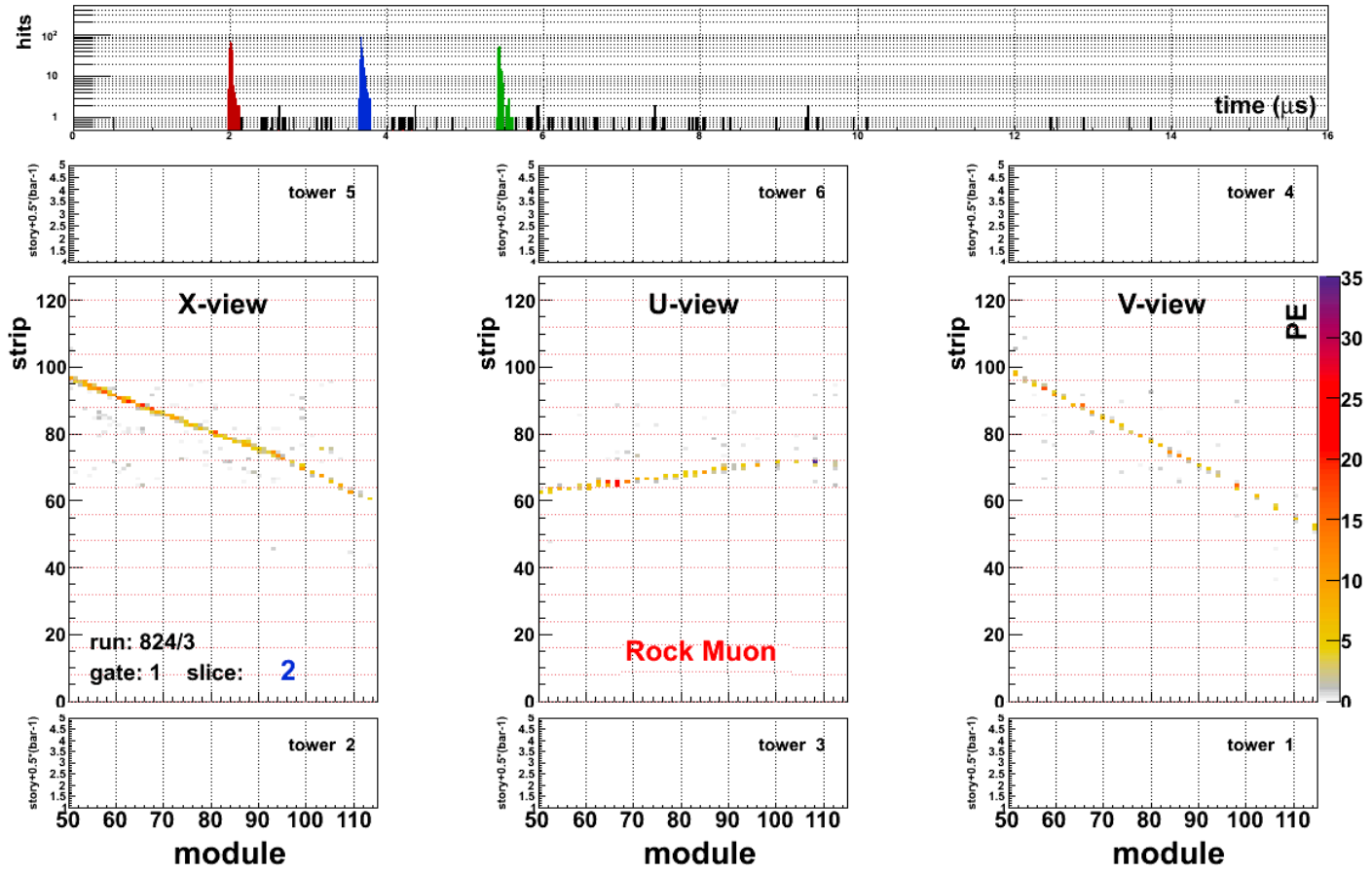
Beam is very intense. Lots of overlapping activity within a beam spill.

Current Detector Data Collection



Use timing information to separate detector events in same beam spill (all shown in X-view only)

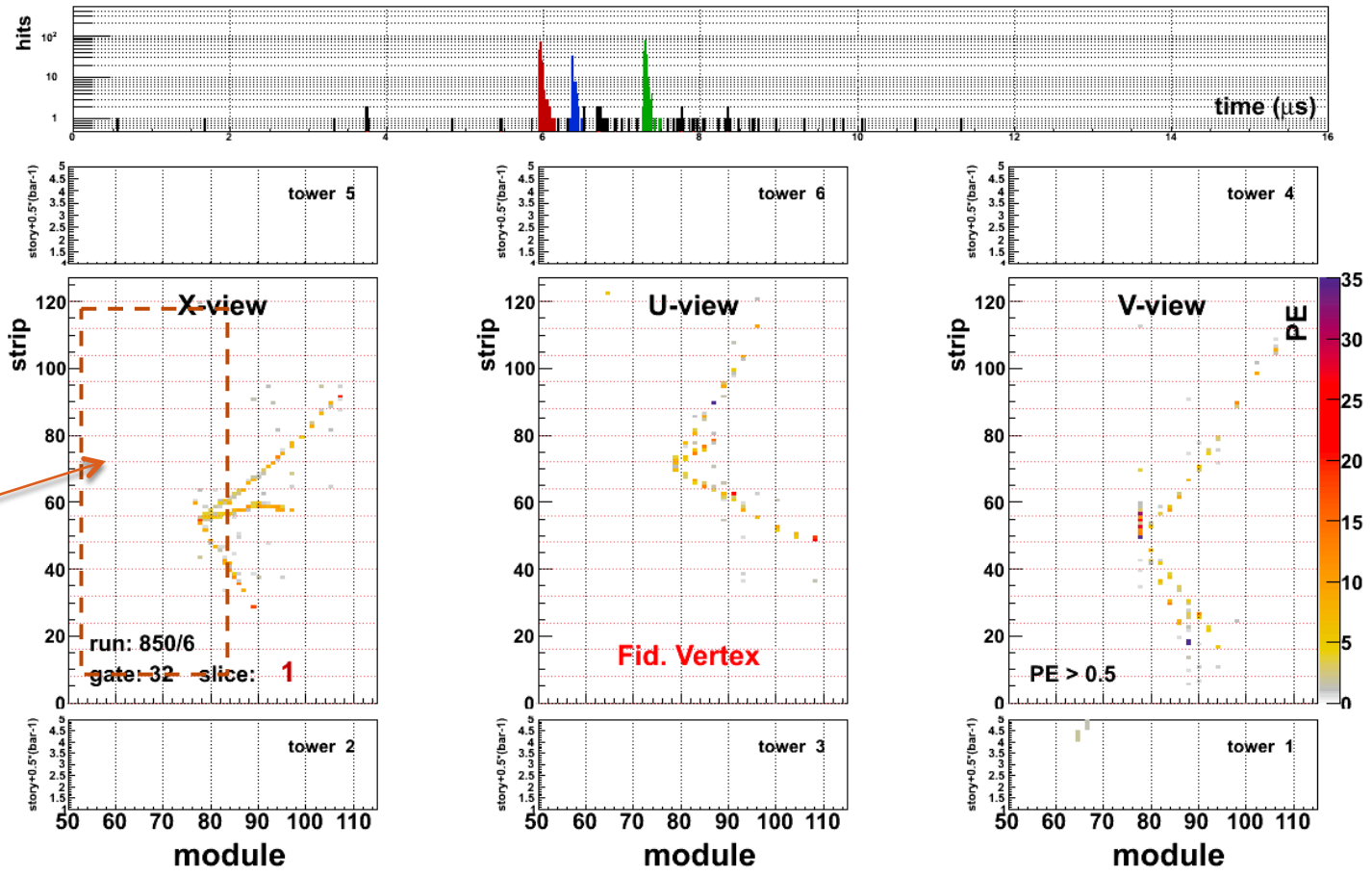
Current Detector Data Collection



Preliminary software filters in offline reconstruction for finding certain topologies

Current Detector Data Collection

scintillator tracking region



Preliminary software filters in offline reconstruction for finding certain topologies

Summary

- **About 55% of full MINERvA** detector is installed in near detector hall
- froze detector installation on **November 12** to collect antineutrino data
- currently **collecting data 24 hours a day, 7 days a week** in the NuMI beam
- detector installation will resume in January and **complete in March, 2010**
- will continue to collect antineutrino data with the current portion of the detector during the winter installation period
- of course, we continue to work on **reconstruction and analysis** using both Tracking Prototype neutrino beam data and our new antineutrino data