MINERvA is a neutrino scattering experiment, located upstream of the FERMILAB beam line at MINOS.\(^{2}\) The detector is designed to study nuclear effects in neutrino interactions using active scintillator tracking and nuclear targets (He, C, Fe, Pb, CH) for study of quasi-elastic and deep inelastic scattering.

### Detector Design

**Fully Active Scintillator Target Region**

- NuMI Beam
- 8.3 tons (~3 tons fiducial)
- Side VCal (400)
- Detector

**Passive Nuclear Target Region with Pb, Fe, C**

- 6.2 tons (including 40% Scintillator)

### PHYSICS GOALS OF MINERvA

- More Precise Cross Section Measurements
  - Axial mass (mA) for a variety of target nuclei
  - Q2 dependence of the axial form factor (FA)
- Determination of the A dependence of quasielastic and deep inelastic scattering
- Scattering off different nuclei Targets: Fe, Pb, C, CH, He.
- MINERvA is expected to see roughly 14M charge current muon scattering off different nuclei.

### PMT Cross Talk Calculations

We calculated the PMT cross talk values using two different Test Stand at Rutgers and Fermilab in order to check the values after and before the PMT box assembly. The next results coming from the Rutgers Test Stand.

#### Formulas Used

- Histo_qdark(entry) = (qlo.ADC(entry) – qlo.PedestalMean).
- \( F_{\text{cross}} = \frac{100}{\text{PMT}} \times \text{PMT} \times \text{cross talk} \)

#### PMT Cross Talk Calculations

Every entry of the XT calculated per pixel flushed. We took 36 pixels per PMT.

#### PMT Relative Gains

- Relative difference between 100 mV and 5 V PMTs.
- Relative difference between the PMT gain values.

### Summary and Conclusions

- **MINERvA** is a neutrino scattering experiment and covers the energy range for MINOS, Nova, DUSEL, and CNGS.
- **MINERvA** will play an important and potentially decisive role in helping current and future precision oscillation experiments.
- Full detector installed mid-March 2010.
- We processed more than 300 PMTs to calculate the XT and Gain using charge information, and more than 400 PMTs using ADC information. Still need additional studies to improve our data.