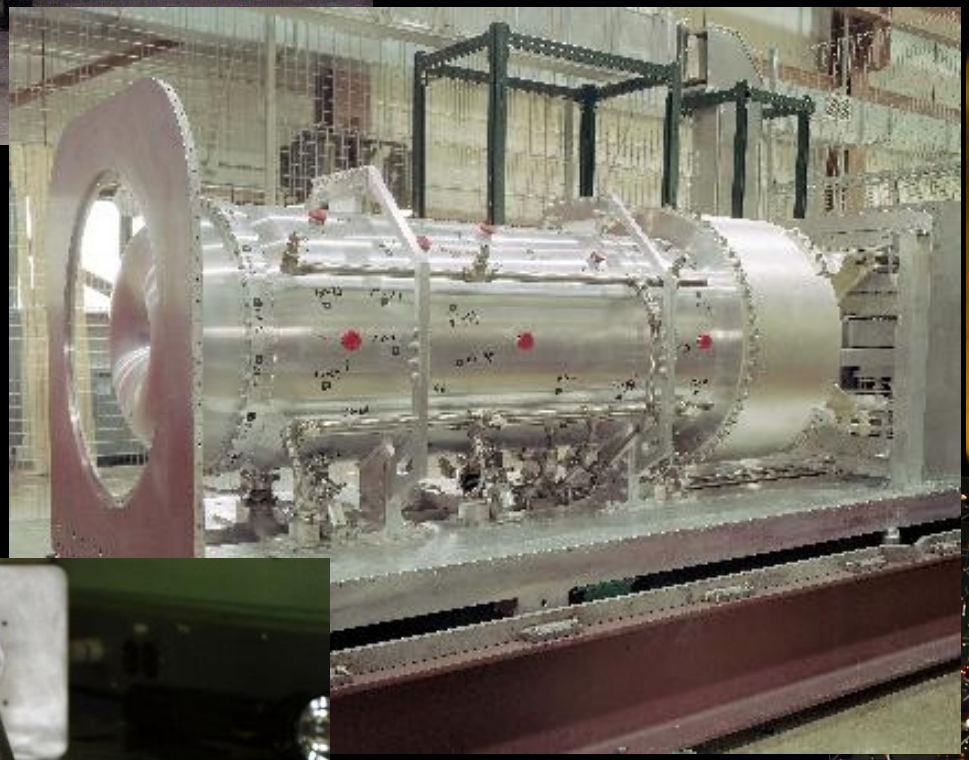
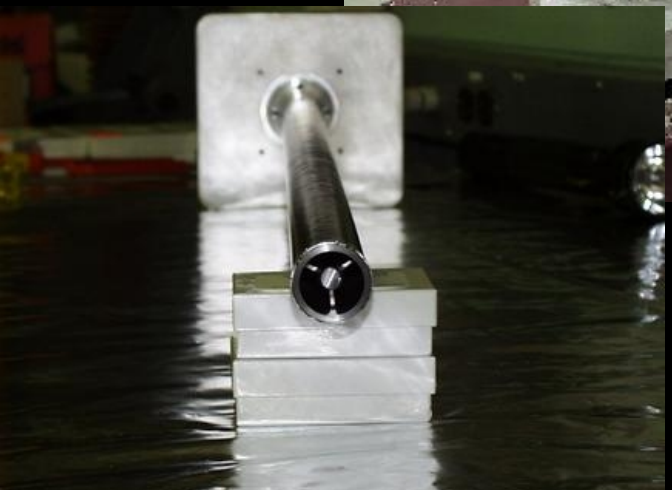
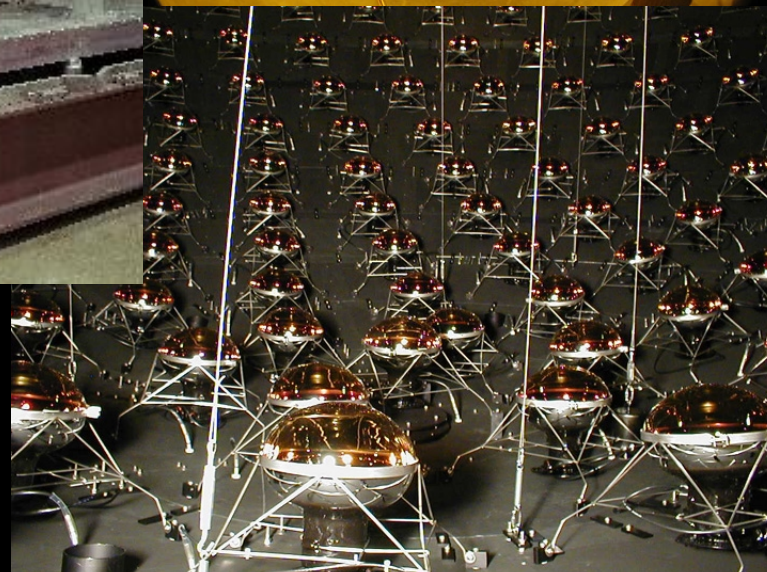
MiniBooNE Status

Chris Polly, Fermilab







FNAL Personnel Active on MiniBooNE

	FTE*	Dept	MiniBooNE Responsibilities
Steve Brice (P)	~0.15	PPD	former spokes, organization, publications
Bruce Brown (P)	~0.15	AD	analysis input, shifts
Rick Ford (P)	~0.15	PPD	analysis input, shifts
Fernanda Garcia (P)	~0.15	AD	shifts
Tom Kobilarcik (P)	~0.2	AD	slow monitoring/ACNET, beamline,shifts
Craig Moore (P)	~0.15	AD	analysis input, shifts
Chris Polly (P)	~0.5	PPD	oscillation analysis coordinator, shifts
Al Russell (P)	~0.15	PPD	analysis input, shifts
Ray Stefanski (P)	~0.4	PPD	computing infrastructure, timing analysis
Sam Zeller (P)	~0.5	PPD	cross-section analysis coordinator, shifts

- Total Head Count: 10, FTE Count: 2.5

* My estimations

2009-2010 MiniBooNE Graduates

- Dissertations
  - Michael Wilking
    "Measurement of Neutrino Induced, Charged Current, Charged Pion Production"
    PhD Thesis, Colorado University, 2009
  - Kendall Mahn
    "A Search for Muon Neutrino and Antineutrino Disappearance with the Booster Neutrino Beam"
    PhD Thesis, Columbia University, 2009
  - Denis Perevalov
    "Neutrino-Nucleus Neutral Current Elastis Interaction Measurement in MiniBooNE"
    PhD Thesis, University of Alabama, 2009
  - Bob Nelson
    "A Measurement of Neutrino-Induced Charged-Current Neutral Pion Production"
    PhD Thesis, University of Colorado, 2010
  - Georgia Karagiorgi
    PhD Thesis, Massachusetts Institute of Technology, 2010
- Still have 2-3 PhD students finishing anti-neutrino analyses

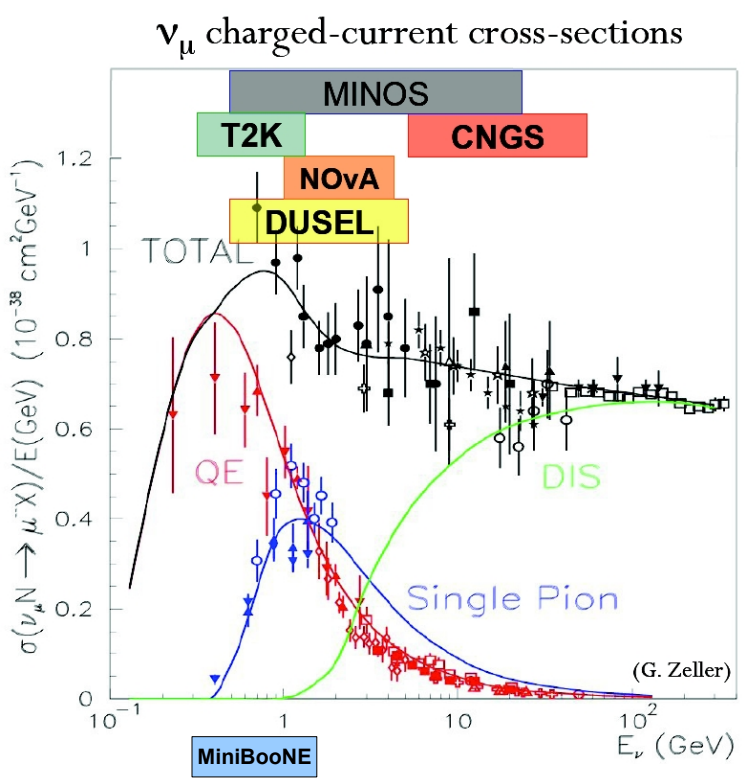
2009-2010 MiniBooNE Publications

- A.A. Agular-Arevalo et al., Measurement of the Neutrino Neutral-Current Elastic Differential Cross Section, arXiv:1007.4730 [hep-ex], submitted to Phys. Rev. D.
- A.A. Agular-Arevalo et al., Observed Event Excess in the MiniBooNE Search for Muon Antineutrino to Electron Antineutrino Oscillations, arXiv:1007.1150 [hep-ex], submitted to Phys. Rev. Lett., Result of the Week, Press
- A.A. Aguilar-Arevalo et al., First Measurement of the Muon Neutrino Charged Current Quasielastic Double Differential Cross Section, arXiv:1002:2680 [hep-ex], Phys. Rev. D81, 092005 (2010), Result of the Week, Data release
- A.A. Aguilar-Arevalo et al., "Measurement of ν_μ and $\bar{\nu}_\mu$ induced neutral current single π^0 production cross sections on mineral oil at E_ν~O(1 GeV)", arXiv:0911.2063 [hep-ex], Phys. Rev. D81, 013005 (2010), Result of the Week, Data release
- A.A. Aguilar-Arevalo et al., "A Search for Core-Collapse Supernovae using the MiniBooNE Neutrino Detector", arXiv:0910.3182 [hep-ex], Phys. Rev. D81, 032001 (2010), Result of the Week
- A.A. Aguilar-Arevalo et al., "Measurement of the ν_μ CC pi+/QE Cross Section Ratio on Mineral Oil in a 0.8 GeV Neutrino Beam", arXiv:0904.3159 [hep-ex], Phys. Rev. Lett. 103, 081801 (2009)
- A.A. Aguilar-Arevalo et al., "A Search for Electron Anti-Neutrino Appearance at the Δm^2 ~1 eV^2 Scale", arXiv:0904.1958 [hep-ex], Phys. Rev. Lett. 103, 111801 (2009), Result of the Week, Data release
- A.A. Aguilar-Arevalo et al., "A Search for Muon Neutrino and Anti-Neutrino Disappearance in MiniBooNE", arXiv:0903.2465 [hep-ex], Phys. Rev. Lett. 103, 061802 (2009), Data release
- A.A. Aguilar-Arevalo et al., "Unexplained Excess of Electron-Like Events From a 1 GeV Neutrino Beam", arXiv:0812.2243 [hep-ex], Phys. Rev. Lett. 102, 101802 (2009), Data release
- P. Adamson et al., "First Measurement of ν_μ and ν_e Events in an Off-Axis Horn-Focused Neutrino Beam", arXiv:0809.2447 [hep-ex], Phys. Rev. Lett. 102, 211801 (2009)
- A.A. Aguilar-Arevalo et al., "The MiniBooNE Detector", arXiv:0806.4201 [hep-ex], Nucl. Instr. Meth. A599 (2009) 28-46
- A.A. Aguilar-Arevalo et al., "The Neutrino Flux Prediction at MiniBooNE", arXiv:0806.1449 [hep-ex], Phys. Rev. D79, 072002 (2009), Data release

- 12 publications
  - 6 PRL's
  - 5 PRD's
  - 1 NIM

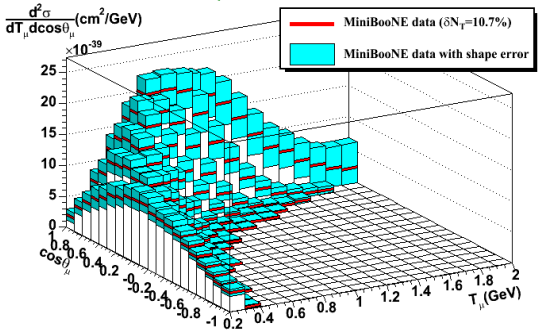
Physics Highlights: Cross-Sections

- Two crucial items that make MiniBooNE cross-sections unprecedented
  - Flux determined to 8%, due to dedicated HARP measurement
  - Immense statistics, 500 ton mineral oil target at 500 m

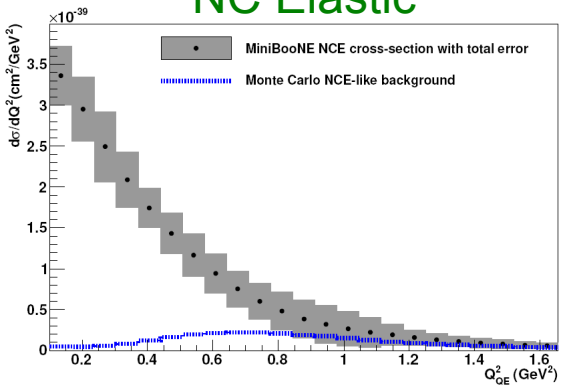


MiniBooNE spans transition region from QE to single-pion, important for osc expts

CC Quasi-Elastic



NC Elastic



CC $^+$/CCQE

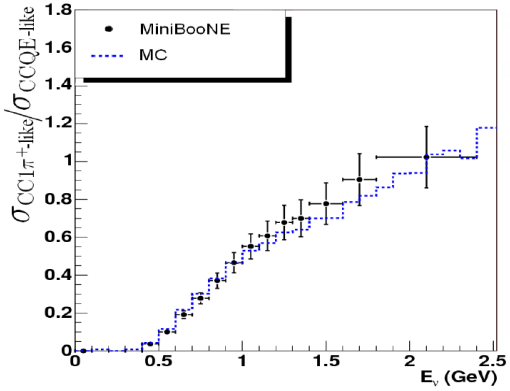
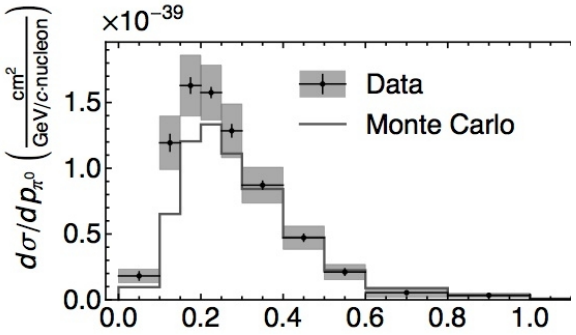


FIG. 1: Observed CC1π^+-like/CCQE-like cross section ratio on CH_2, including both statistical and systematic uncertainties, compared with the MC prediction [6]. The data have not been corrected for hadronic re-interactions.

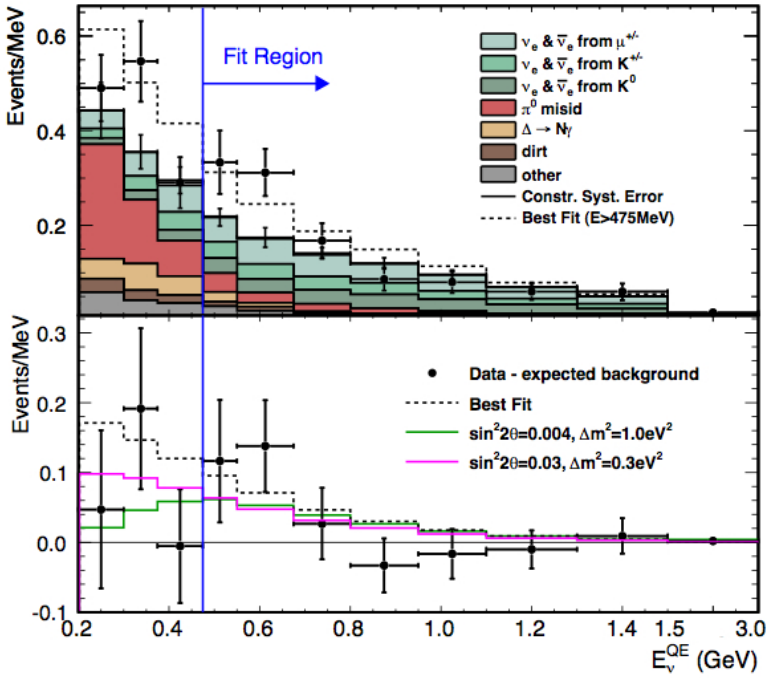
NC ^{0}



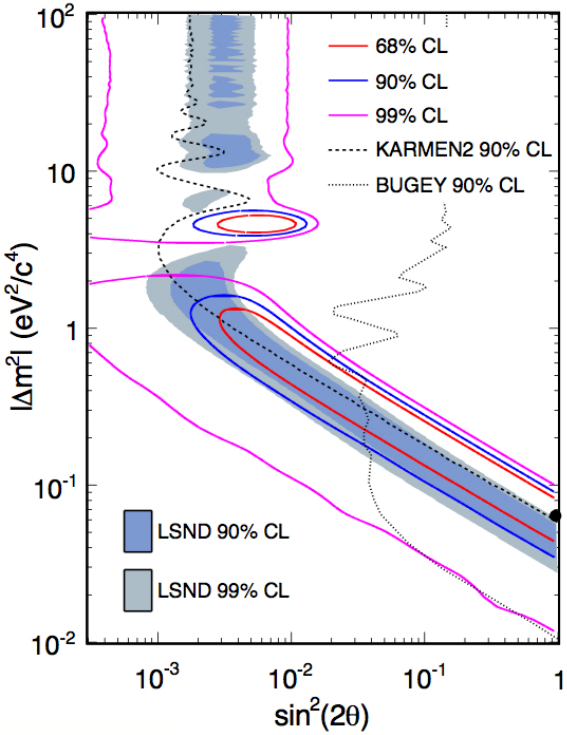
Paper references on pg 4.
Other cross-sections nearing publication CC ^{0}, CC $^+$, and antineutrinos equiv.

Physics Highlights: Antineutrino Oscillation Search

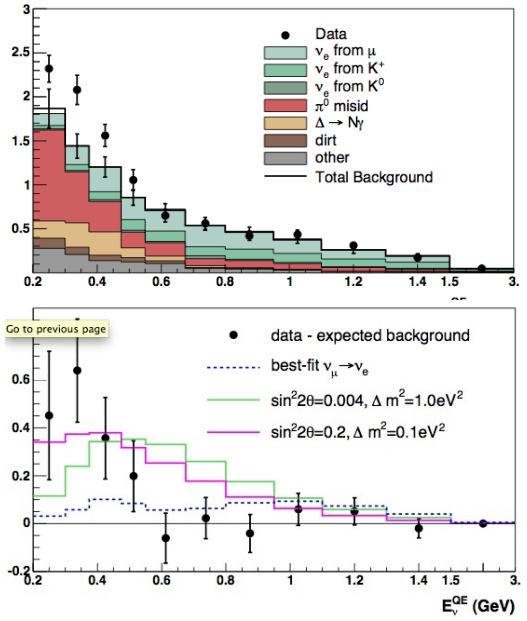
anti-ν results



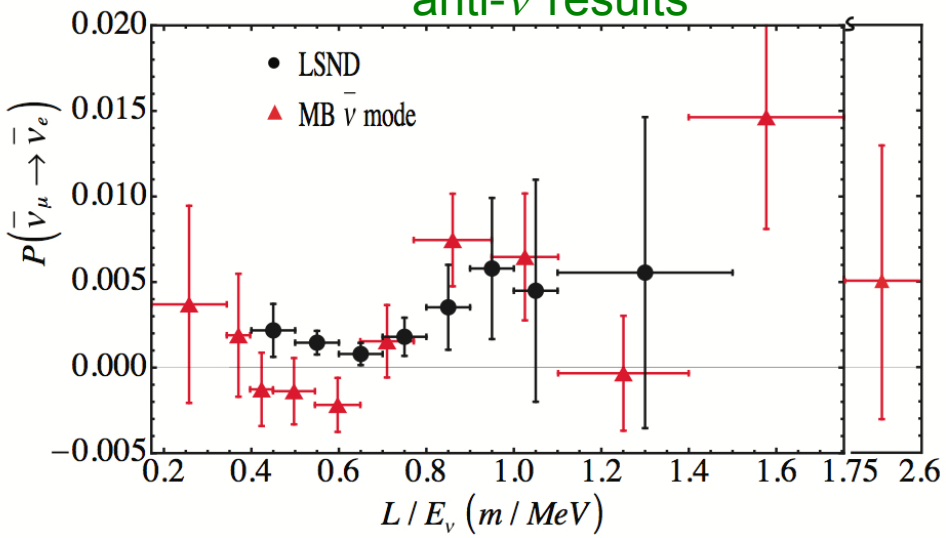
anti-ν results



Reminder: ν results

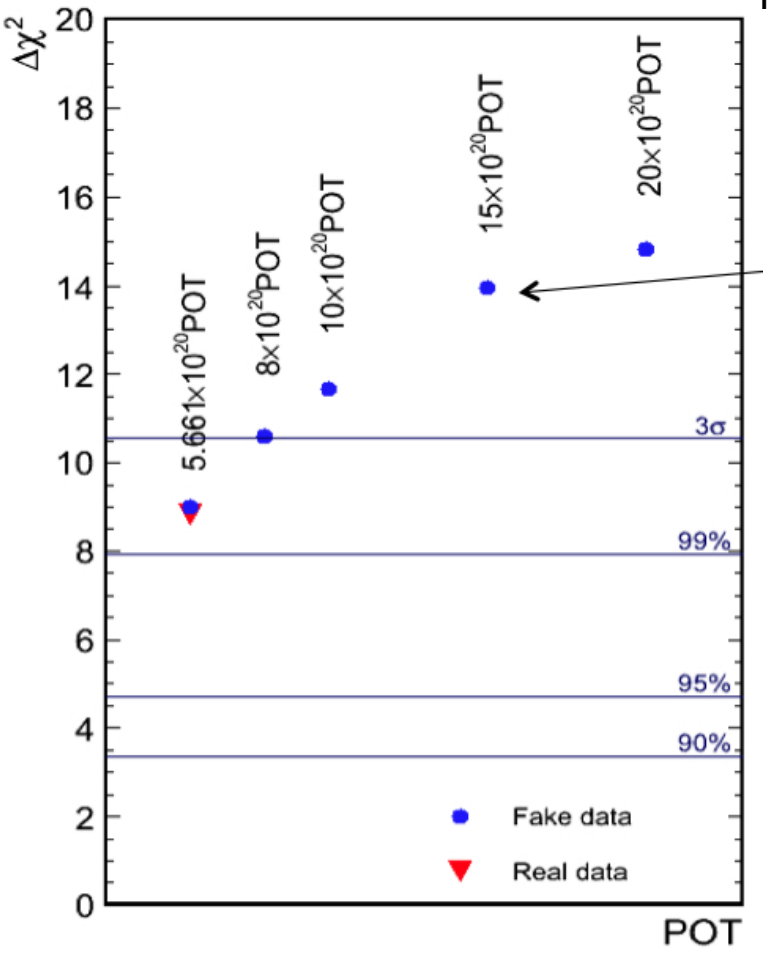


anti-ν results



- New anti-neutrino results (5.7e20 POT) seem to differ from results with neutrino beam
  - LSND-like signal preferred at 99.5% CL
  - Chi-square of best fit only 10% probable
  - Need more data to be definitive

Future Plan for MiniBooNE



- Fair amount of uncertainty now as to if/when MiniBooNE will be decommissioned
  - Current schedule calls for decommissioning in May 2011 to allow hall to be reused for MicroBooNE
  - In conflict with MiniBooNE's goal to acquire more anti-ν statistics
  - Collaboration preparing a request to run the experiment until 15e20 POT collected
  - With those statistics, the current 2.7σ indications could grow to be 3.7σ (assuming current best fit)
  - Important to understand if this is just a fluctuation
    - Is MiniBooNE really seeing the LSND effect in an anti-neutrino beam?
    - Is the low-energy excess observed for the neutrino beam indicating CP violation?
    - Is there just a conventional explanation? Low-energy excess is due to some background, and higher-energy antineutrino results is a statistical fluctuation