First Data from SciBooNE

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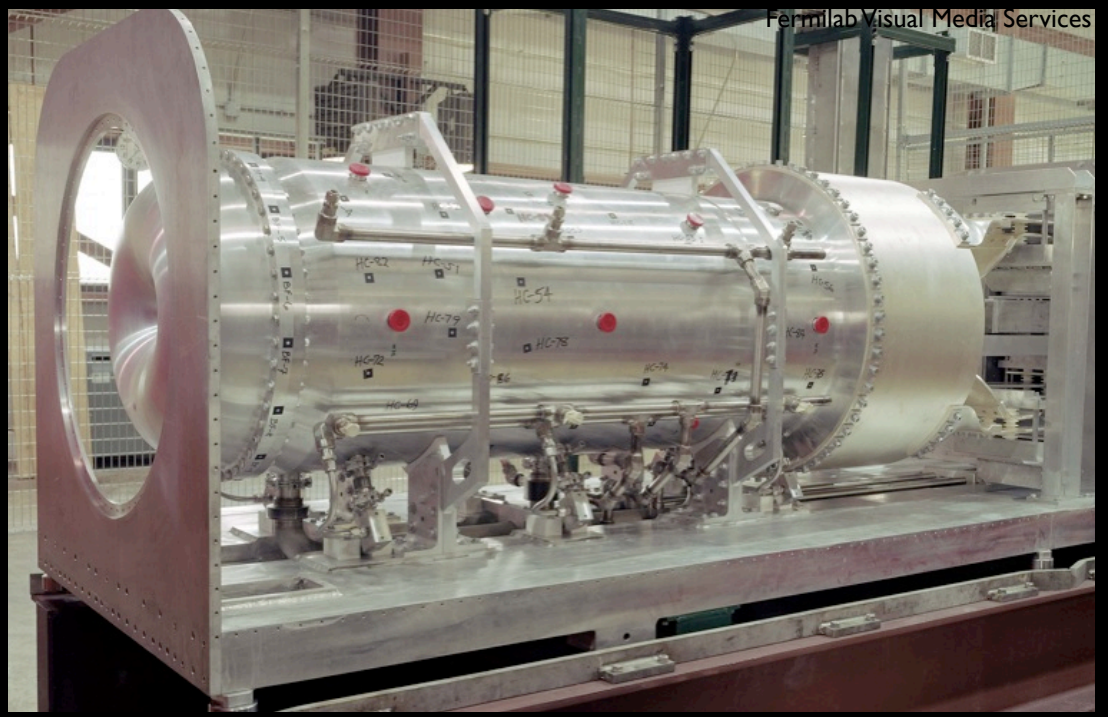
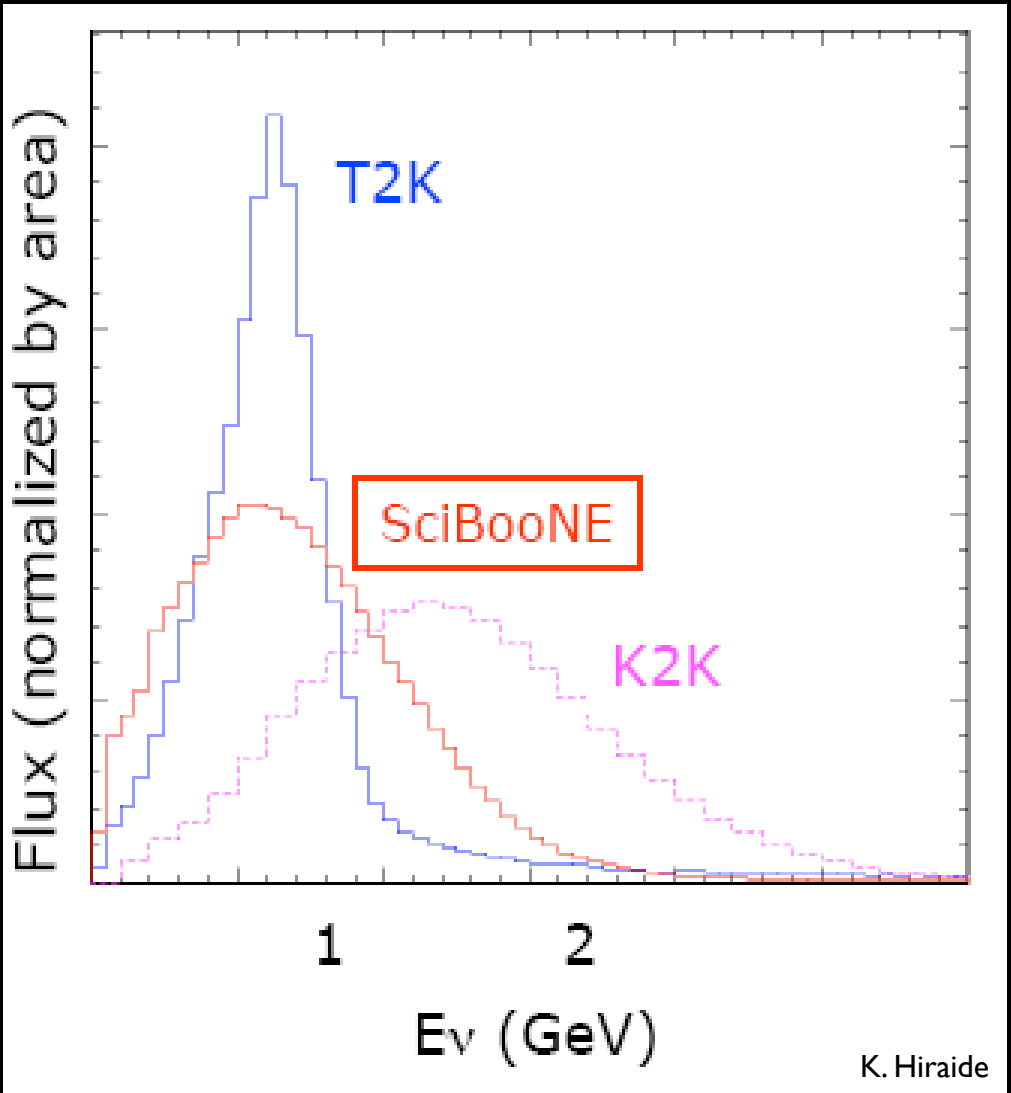
Introduction

- New experiment at Fermilab (E954)
- Near Detector in BNB
- $\nu_\mu, \bar{\nu}_\mu$ cross-section measurements at 1 GeV
  - important for T2K
- Check MiniBooNE's background estimates
- Data run started in June



Fermilab Visual Media Services

Neutrino Flux

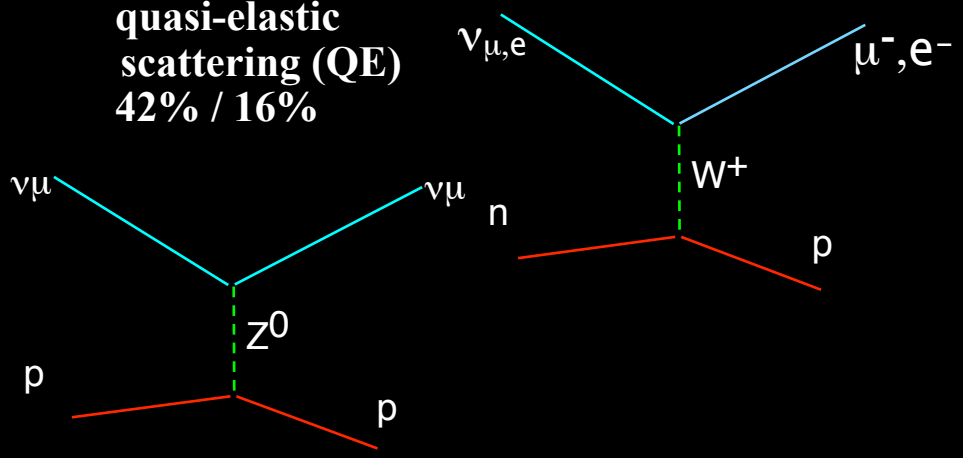


- Near detector (100m) in Booster Neutrino Beam
  - HARP data crucial!
- Similar flux shape to MiniBooNE
  - Antineutrino mode too
- Good match to T2K

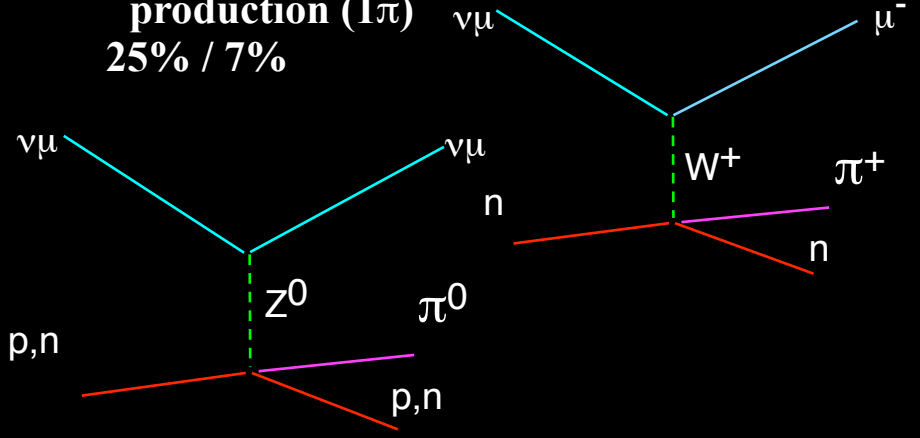
SciBooNE

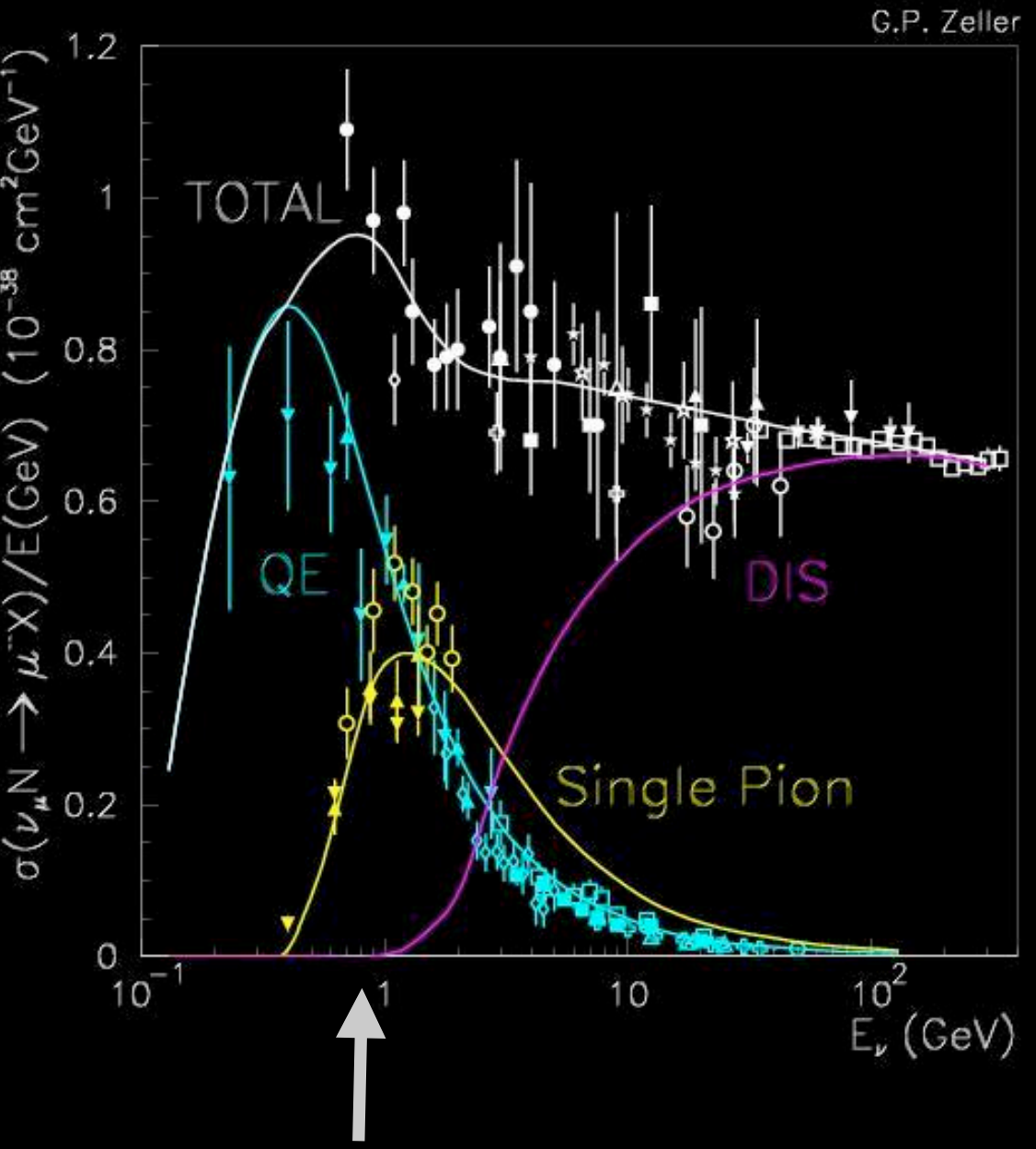
ν Cross-sections

CC / NC quasi-elastic scattering (QE) 42% / 16%

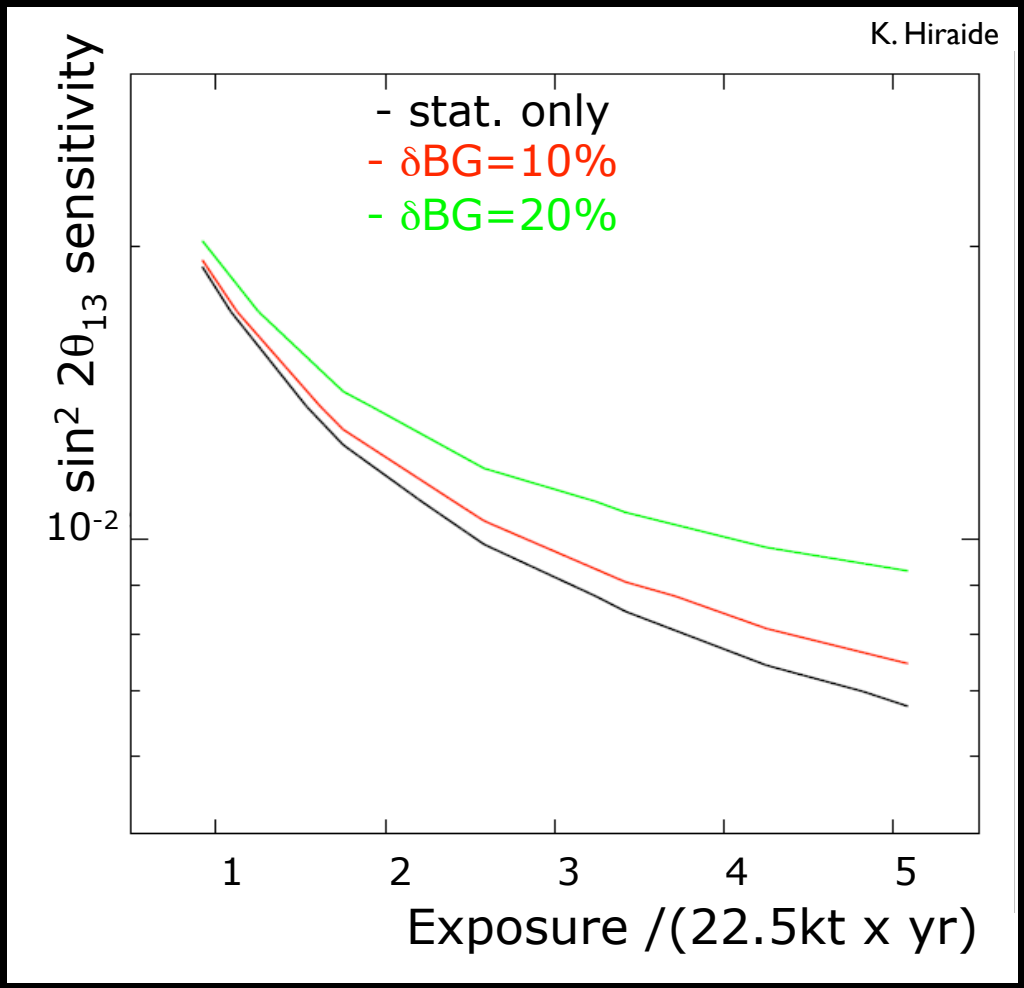


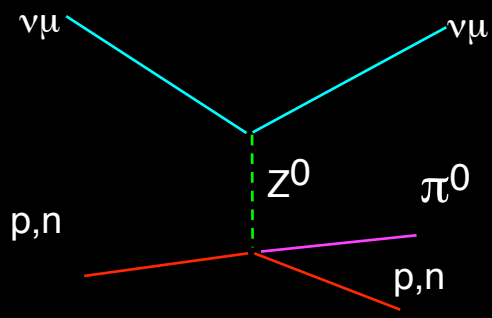
CC / NC resonance production (1π) 25% / 7%





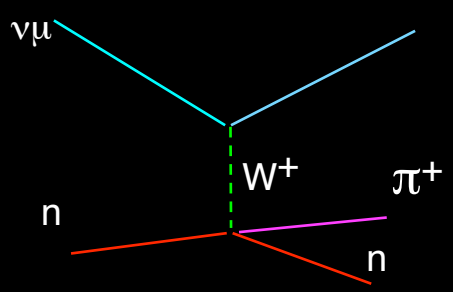
Impact of SciBooNE



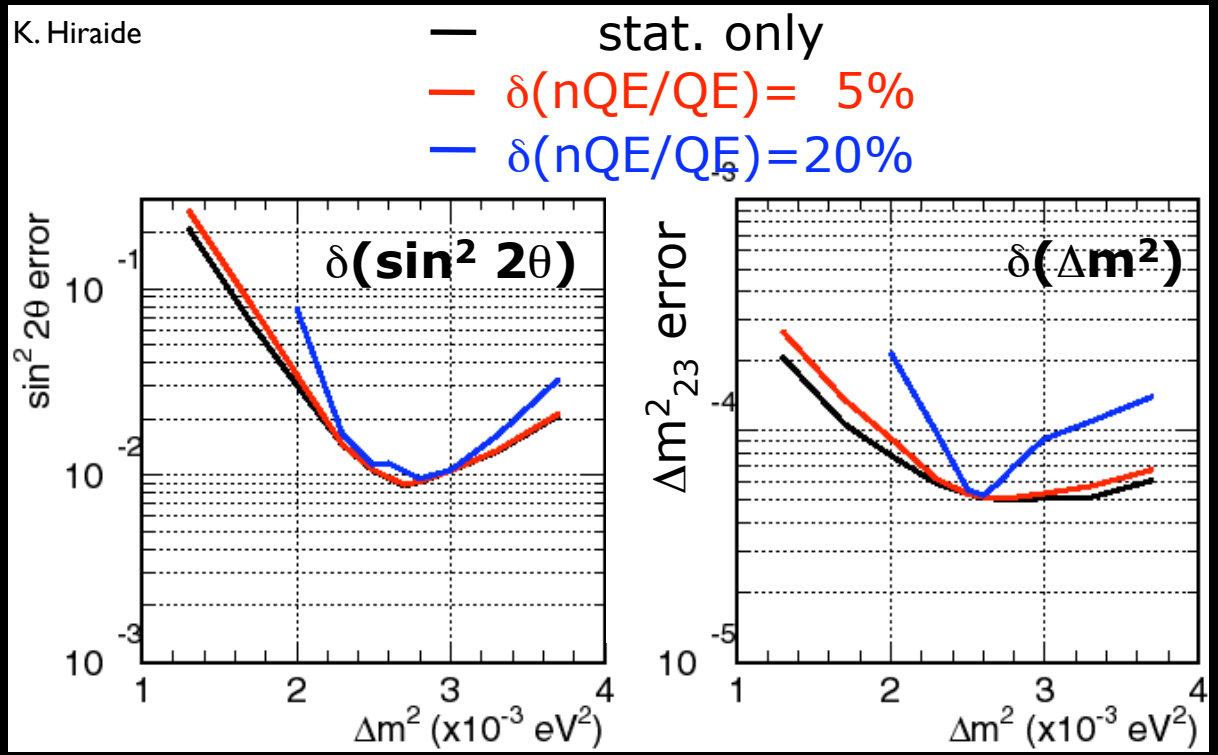


- SciBooNE will reduce uncertainty in $\sigma(NC\pi^0)$ from 20% to 10%
  - improvement of factor of 2 in ultimate T2K sensitivity to θ_{13}
  - or 3 years vs. 5 years to 10^{-2}

Impact of SciBooNE

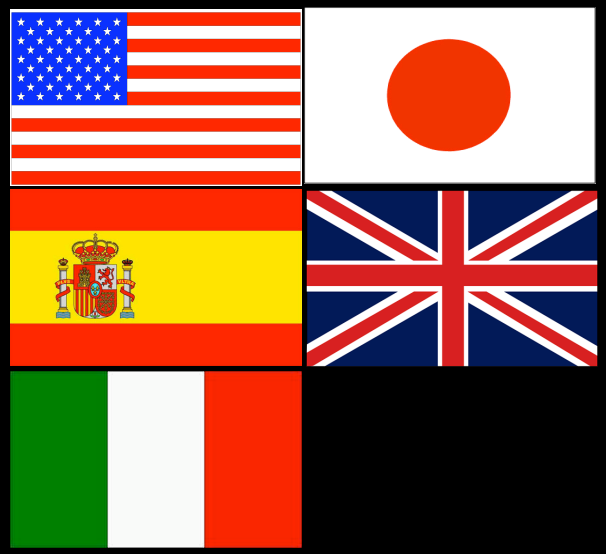


- SciBooNE will reduce uncertainty in σ(CC1π+) from 20% to 5%
- Reduces bias in oscillation parameter extraction



SciBooNE Collaboration

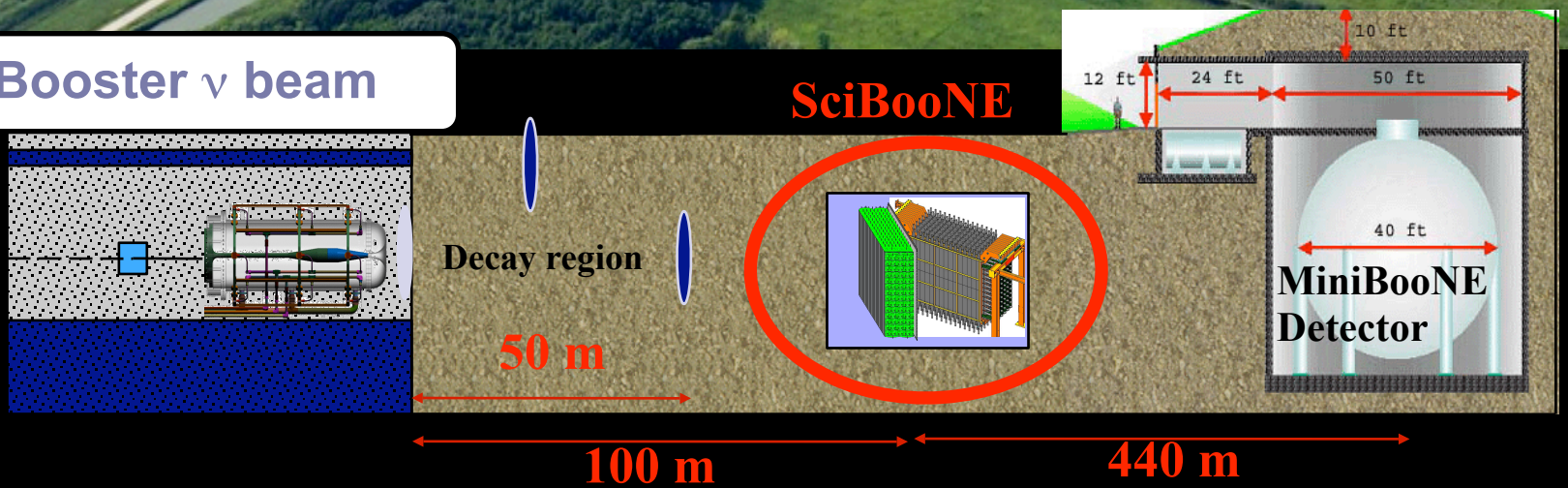
- Universitat Autonoma de Barcelona
- University of Cincinnati
- University of Colorado
- Columbia University
- Fermi National Accelerator Laboratory
- High Energy Accelerator Research Organization (KEK)
- Imperial College London*
- Indiana University
- Institute for Cosmic Ray Research
- Kyoto University*
- Los Alamos National Laboratory
- Louisiana State University
- Purdue University Calumet
- Università degli Studi di Roma and INFN-Roma
- Saint Mary's University of Minnesota
- Tokyo Institute of Technology
- Universidad de Valencia



Spokespeople:
T. Nakaya, Kyoto University
M.O. Wascko, Imperial College

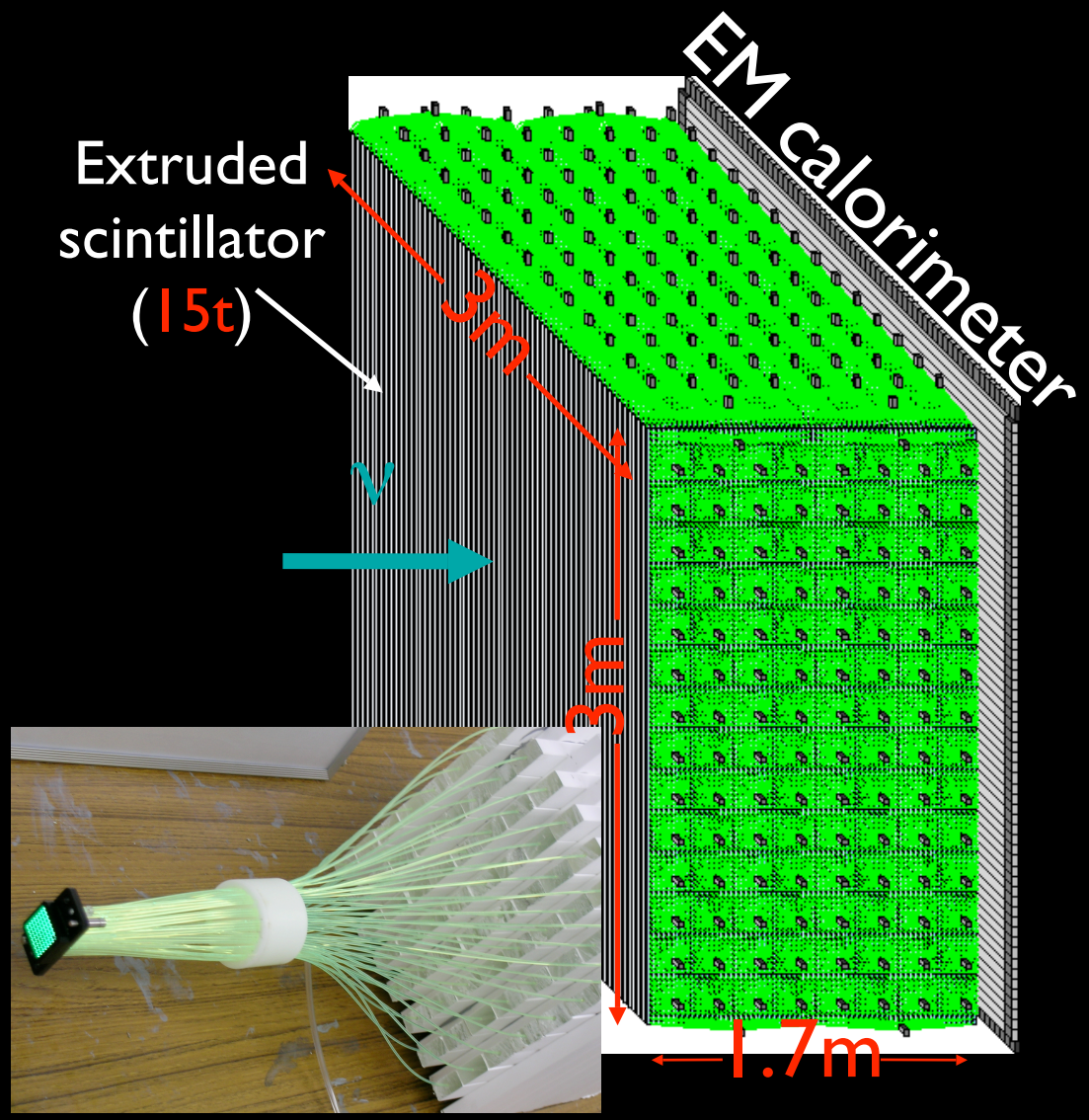
Overview

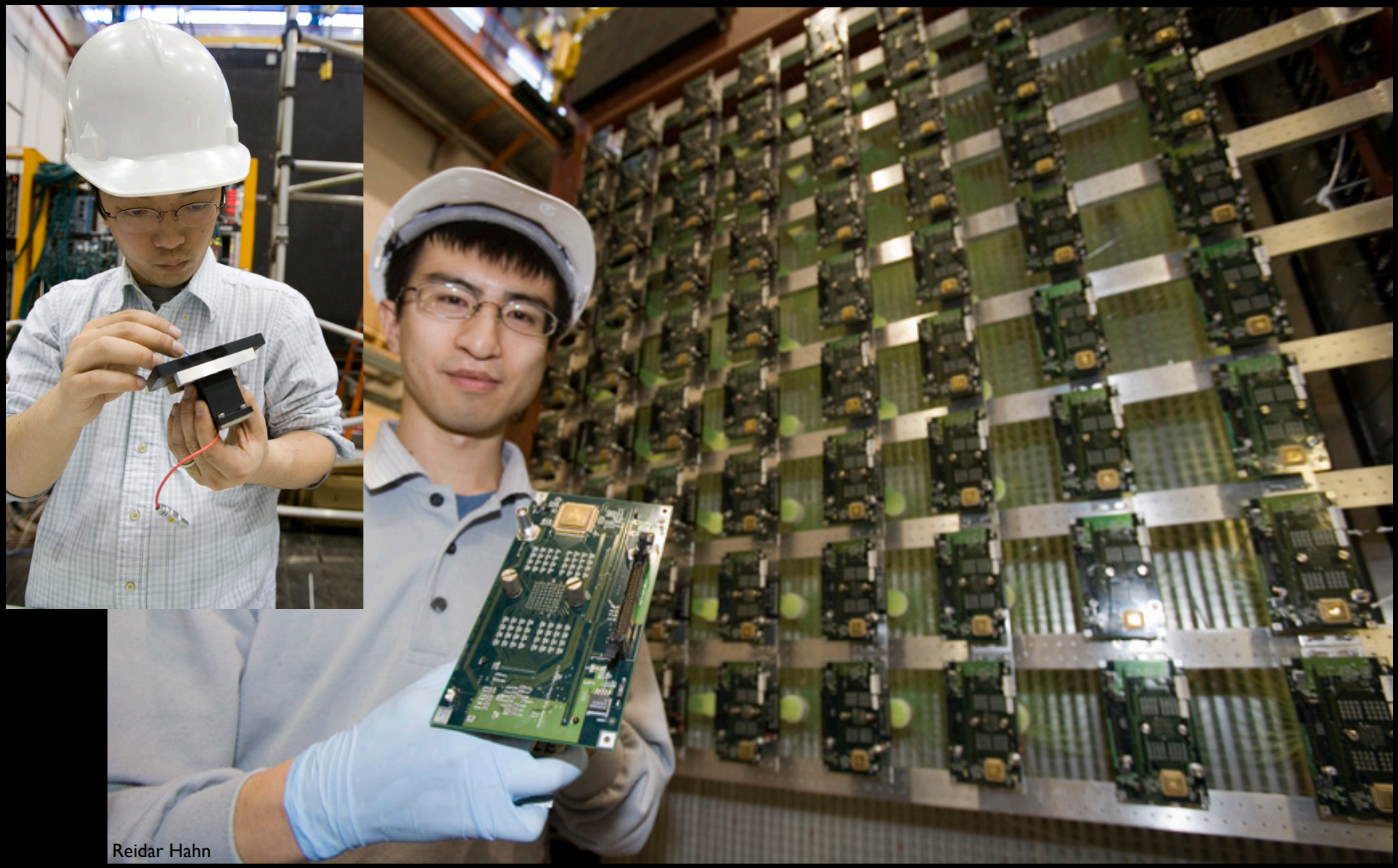
Booster ν beam



SciBar Detector

- Extruded plastic scintillator with WLS fibres
  - 64 channel MAPMTs
  - ~15k channels
- 15 t total mass
- Originally used in K2K experiment in Japan

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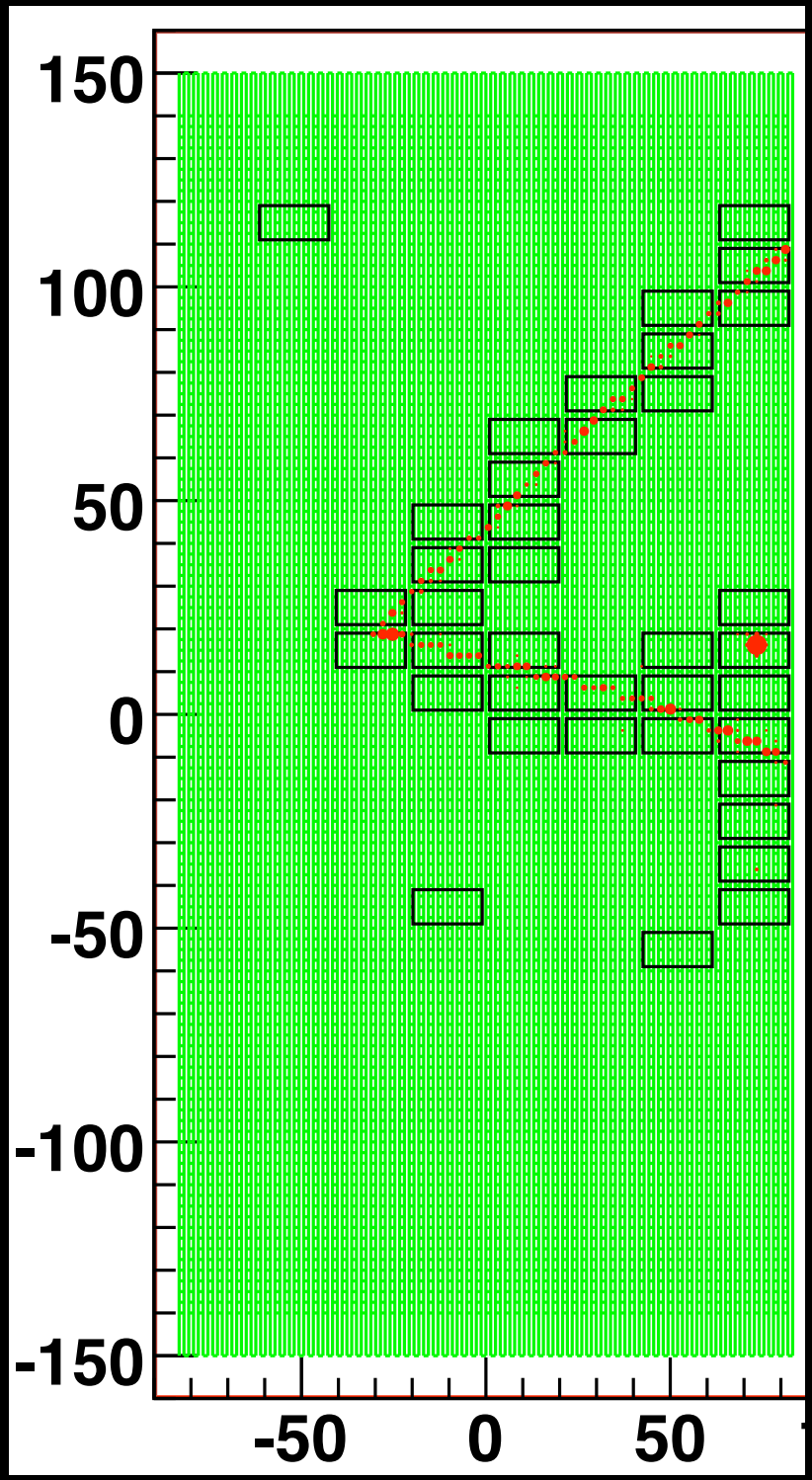
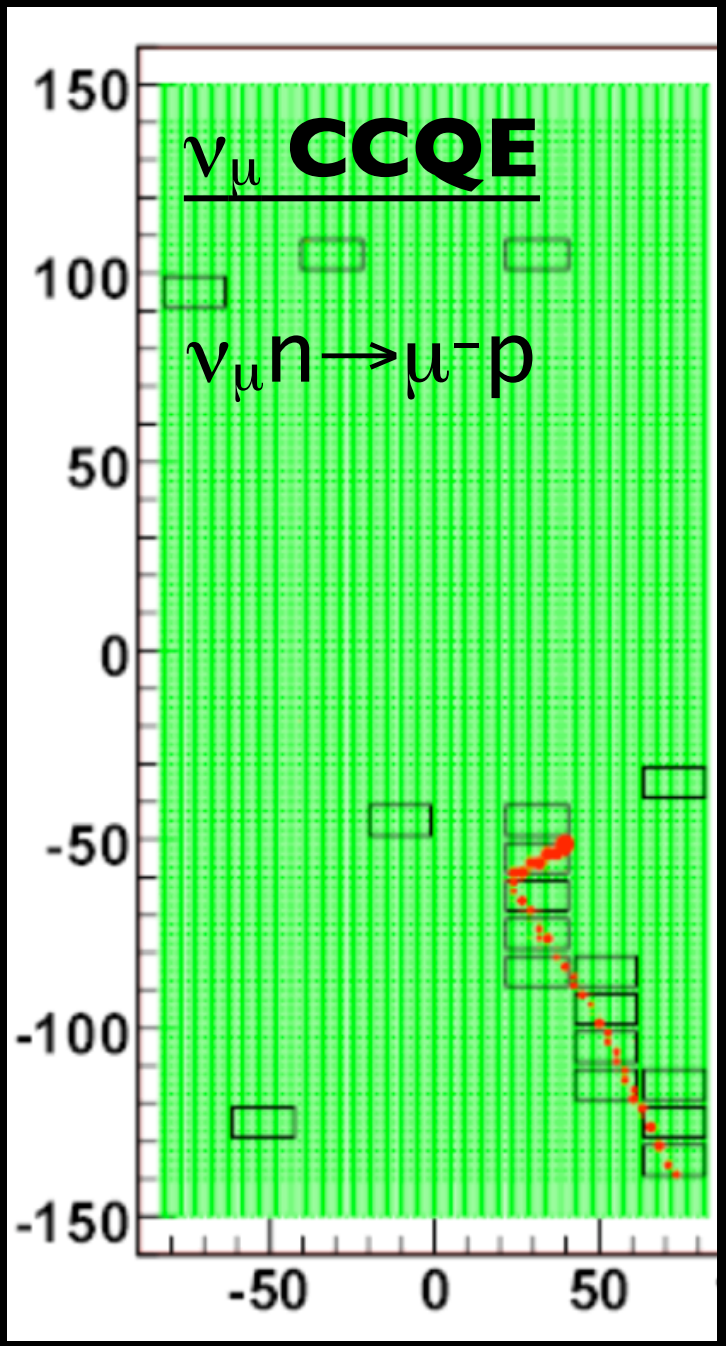
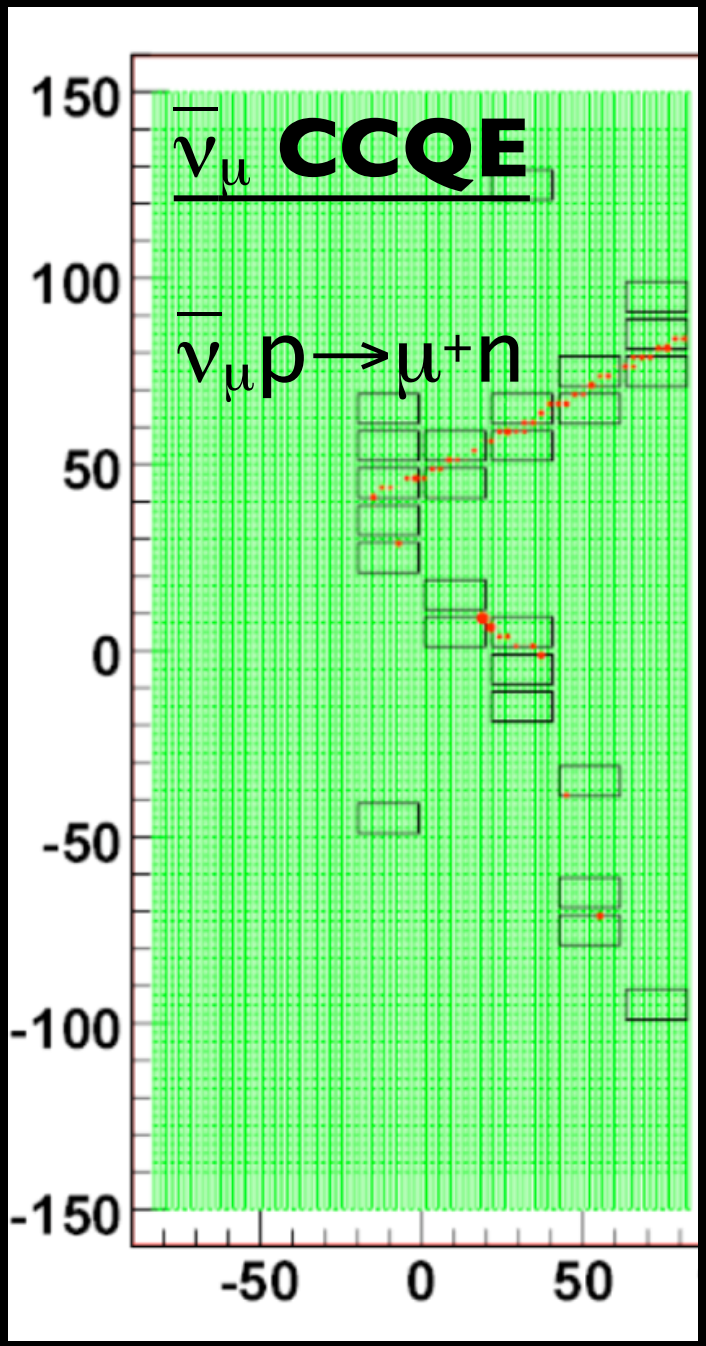
Tracks in SciBar

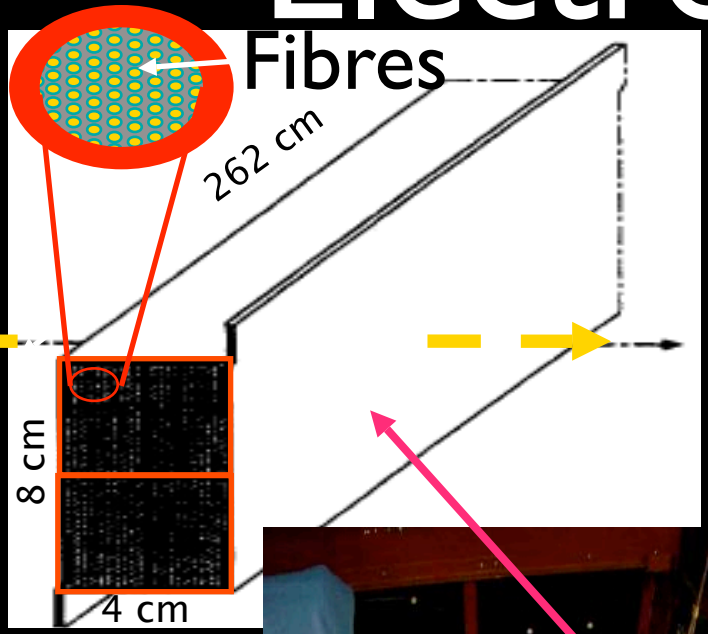
- Energy deposit from charged particles confined to individual cells
  - Use dE/dx for particle ID
- Clear identification of interaction process



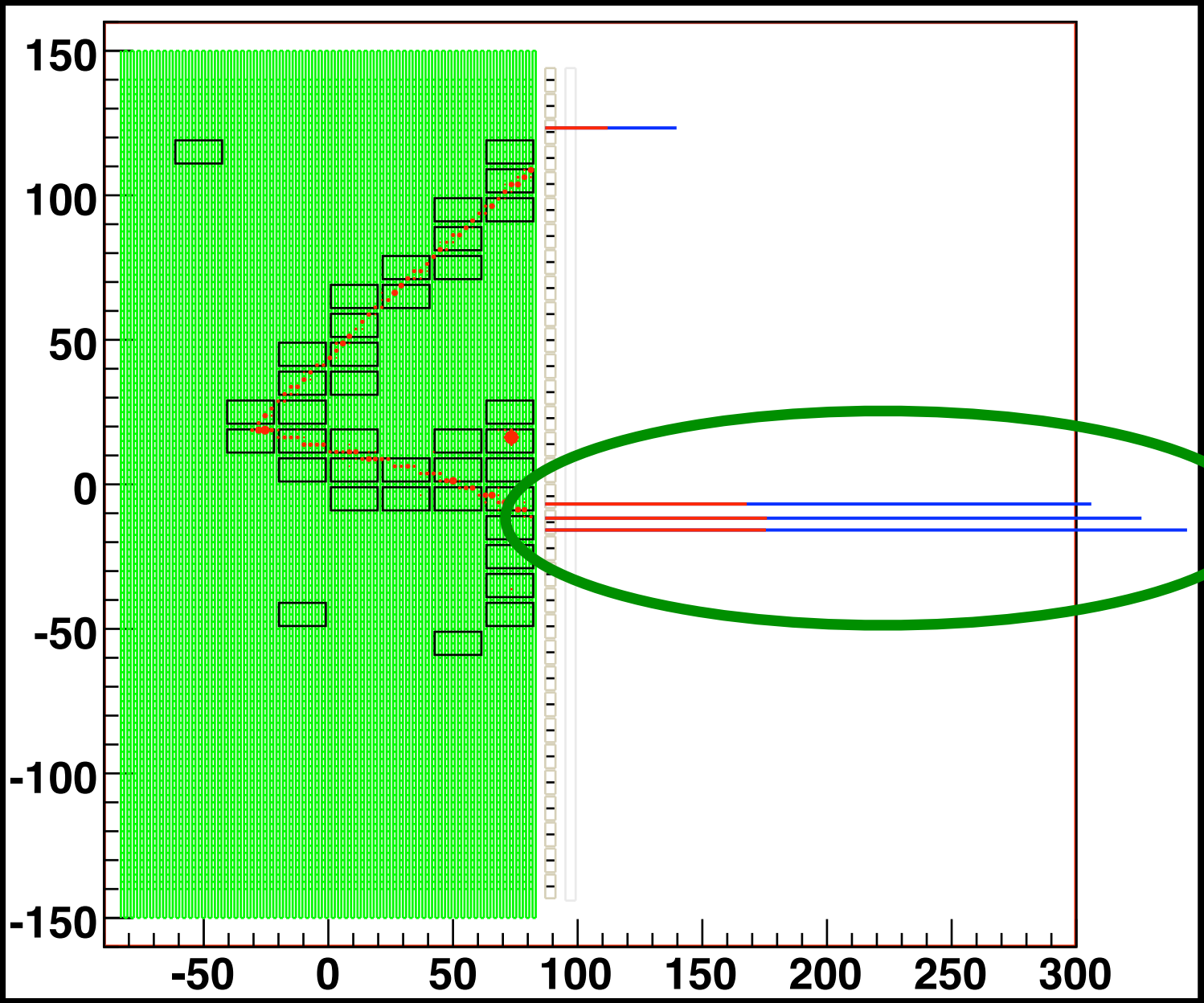

ν_μ CCQE
$\nu_\mu n \rightarrow \mu^- p$
150
100
50
0
-50
-100
-150
-50
0
50

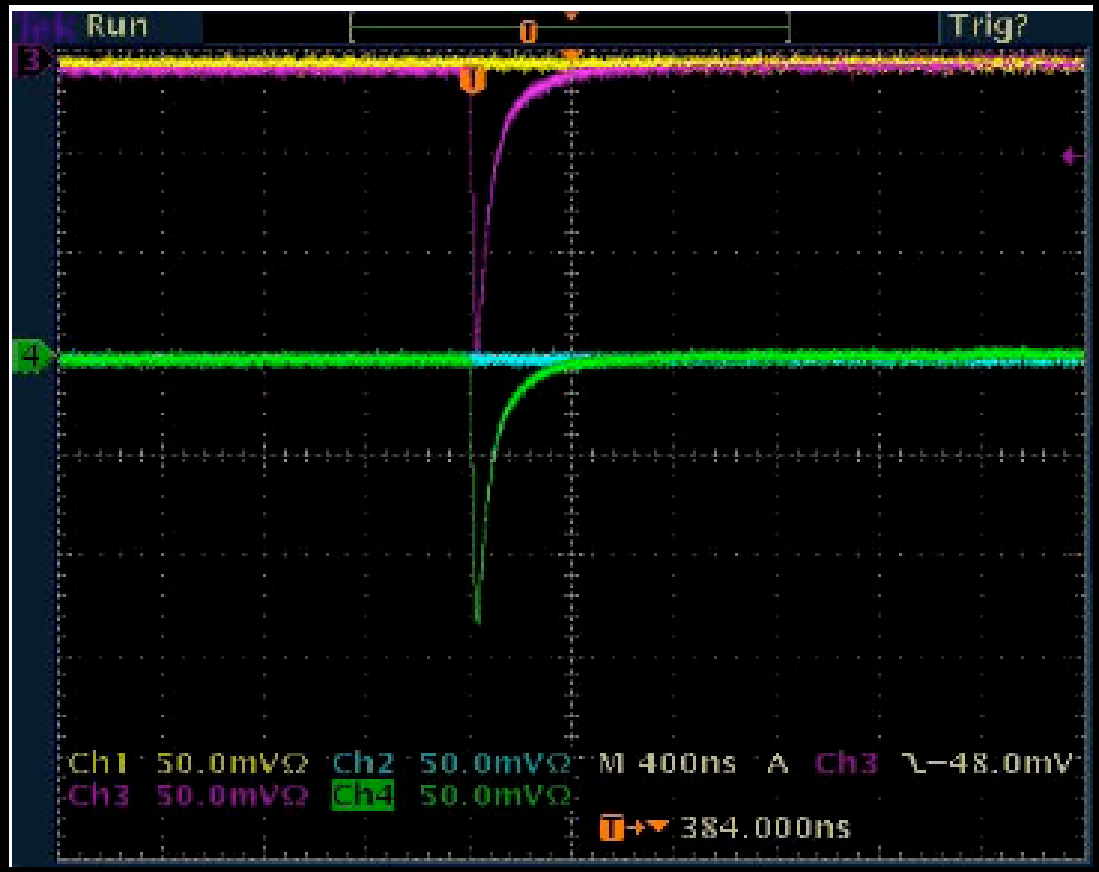

$\bar{\nu}_\mu$ CCQE
$\bar{\nu}_\mu p \rightarrow \mu^+ n$
150
100
50
0
-50
-100
-150
-50
0
50

Electron Catcher (EC)



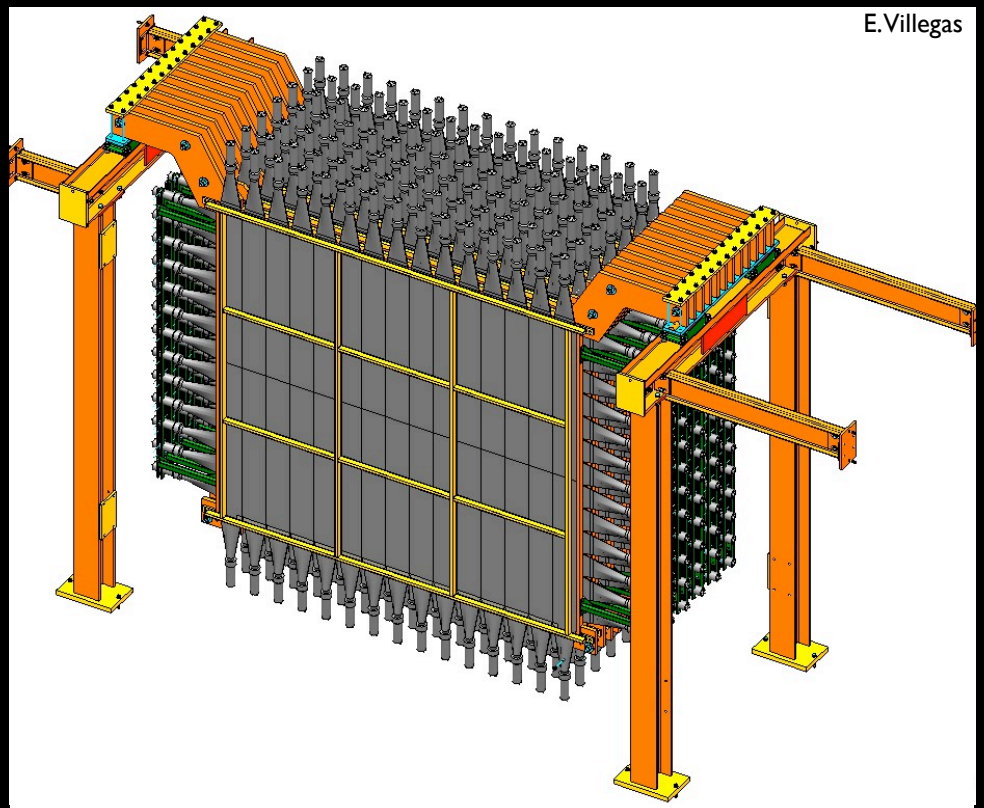
- "Spaghetti" calorimeter
  - Scintillating fibres sandwiched in lead foils
  - PMT readout at both ends
- good energy resolution and linearity
- 11 X_0 thick
- Originally built for CHORUS; used in K2K

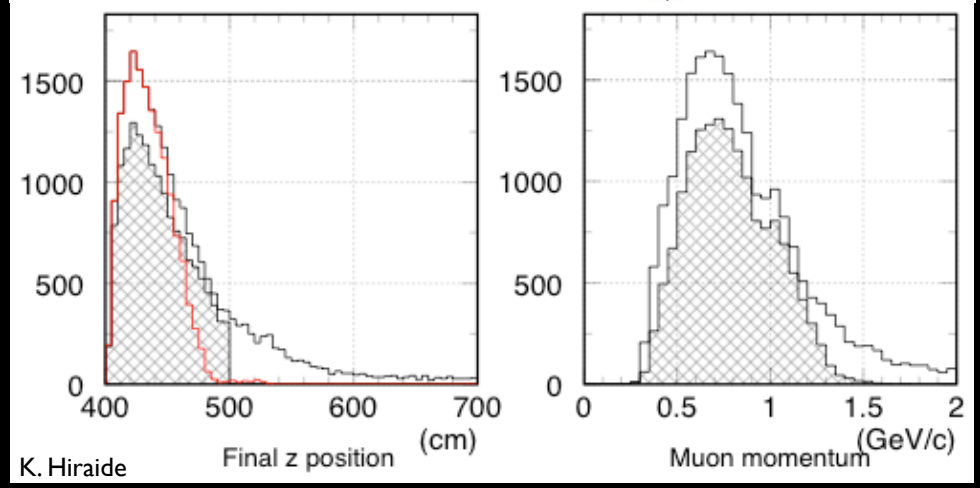

150
100
50
0
-50
-100
-150
-50
0
50
100
150
200
250
300



SciBooNE's first cosmic data

Muon Range Detector(MRD)





- Iron plates (5cm) with scintillation counters
  - Will stop <0.9 GeV muons
  - ~10% momentum resolution
- Recycled from past FNAL experiments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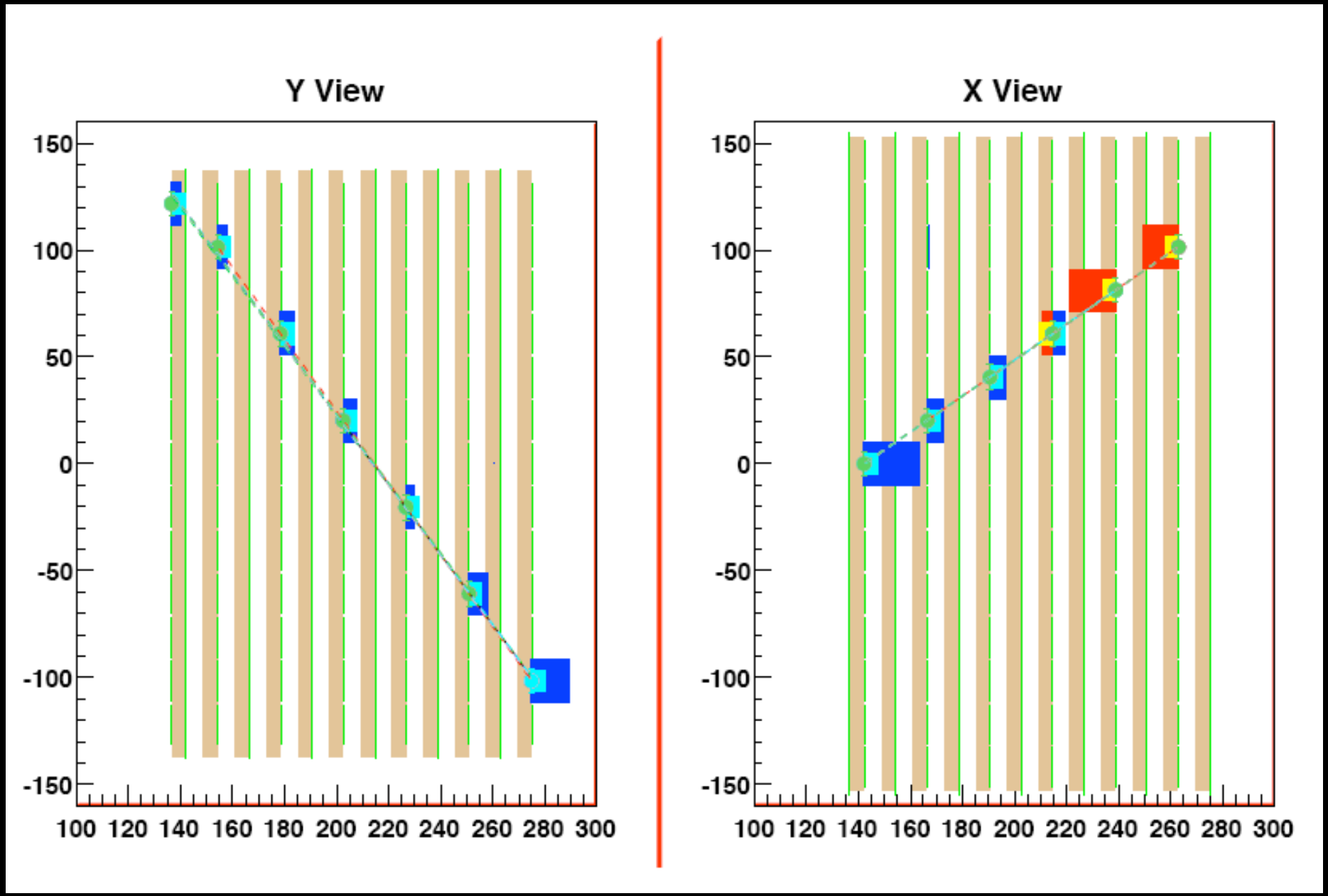
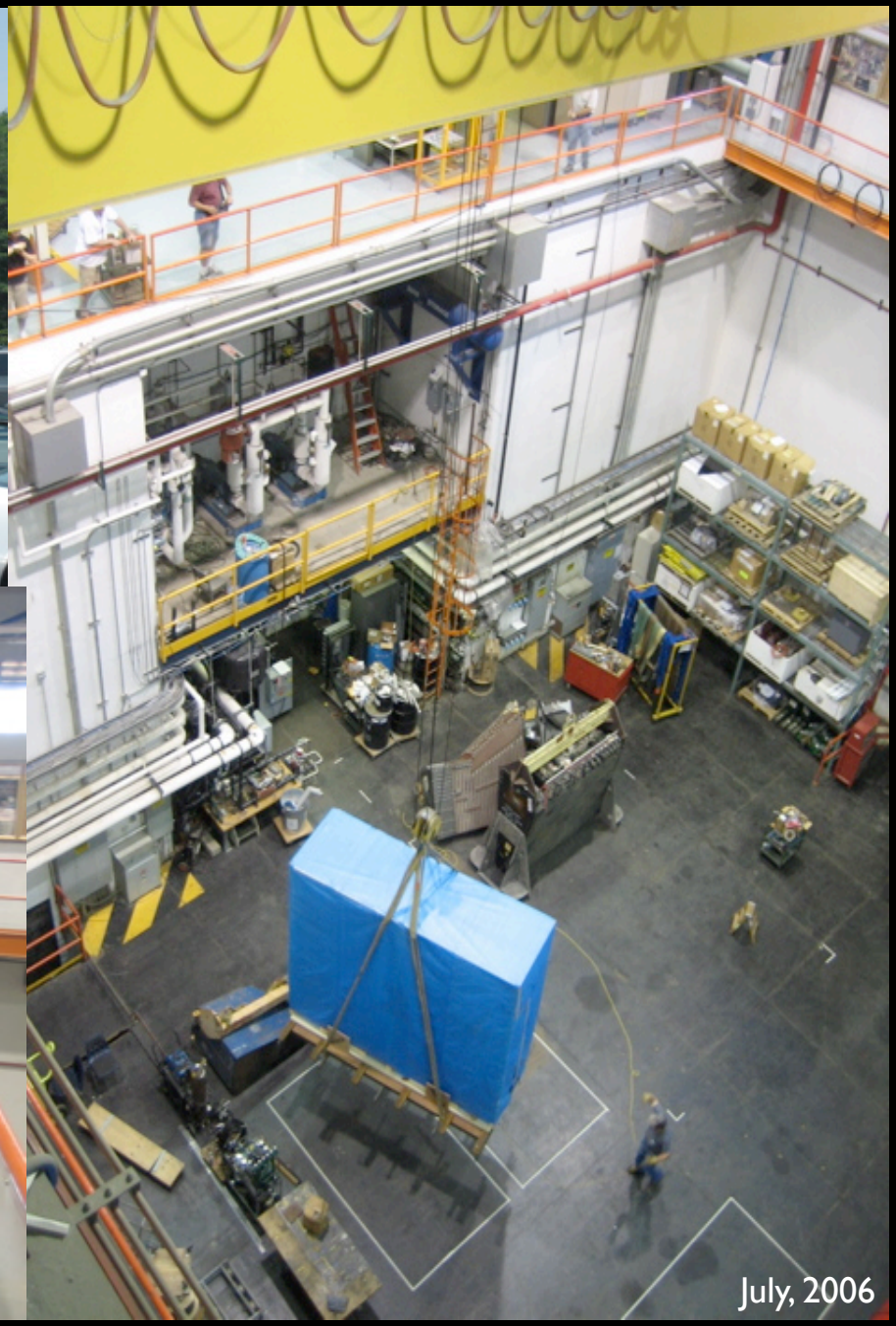
MRD Cosmic Data



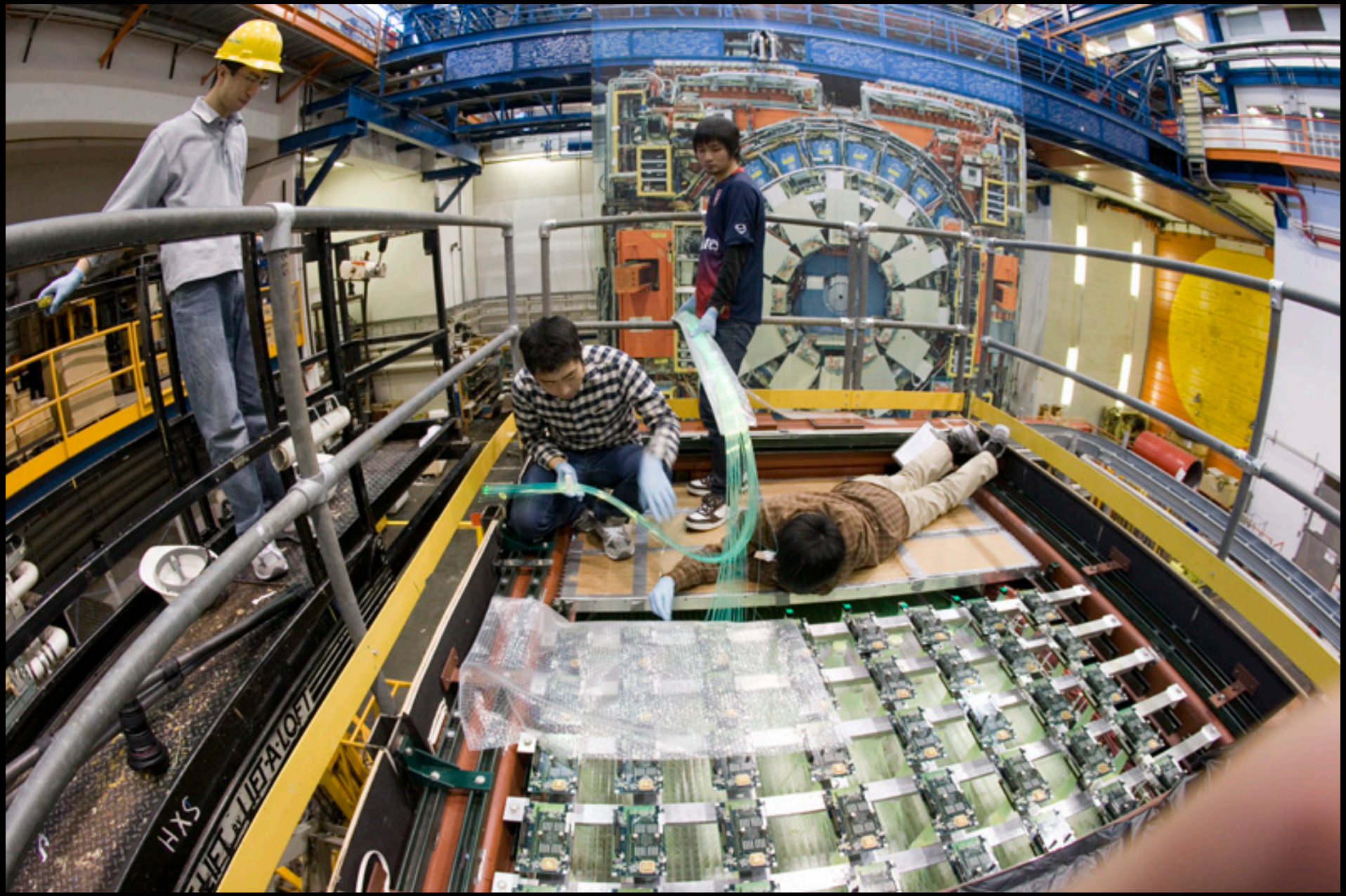
SciBooNE Timeline

- 2005, Summer - Collaboration formed
- 2005, Dec - Proposal
- 2006, Jul - Detectors move to FNAL
- 2006, Sep - Groundbreaking
- 2006, Nov - EC Assembly
- 2007, Feb - SciBar Assembly
- 2007, Mar - MRD Assembly
- 2007, Mar - Cosmic Ray Data
- 2007, Apr - Detector Installation
- 2007, May - Commissioning
- 2007, Jun - Neutrino Data Run

Two years from formation to first data!


July, 2006

September, 2007



January, 2007

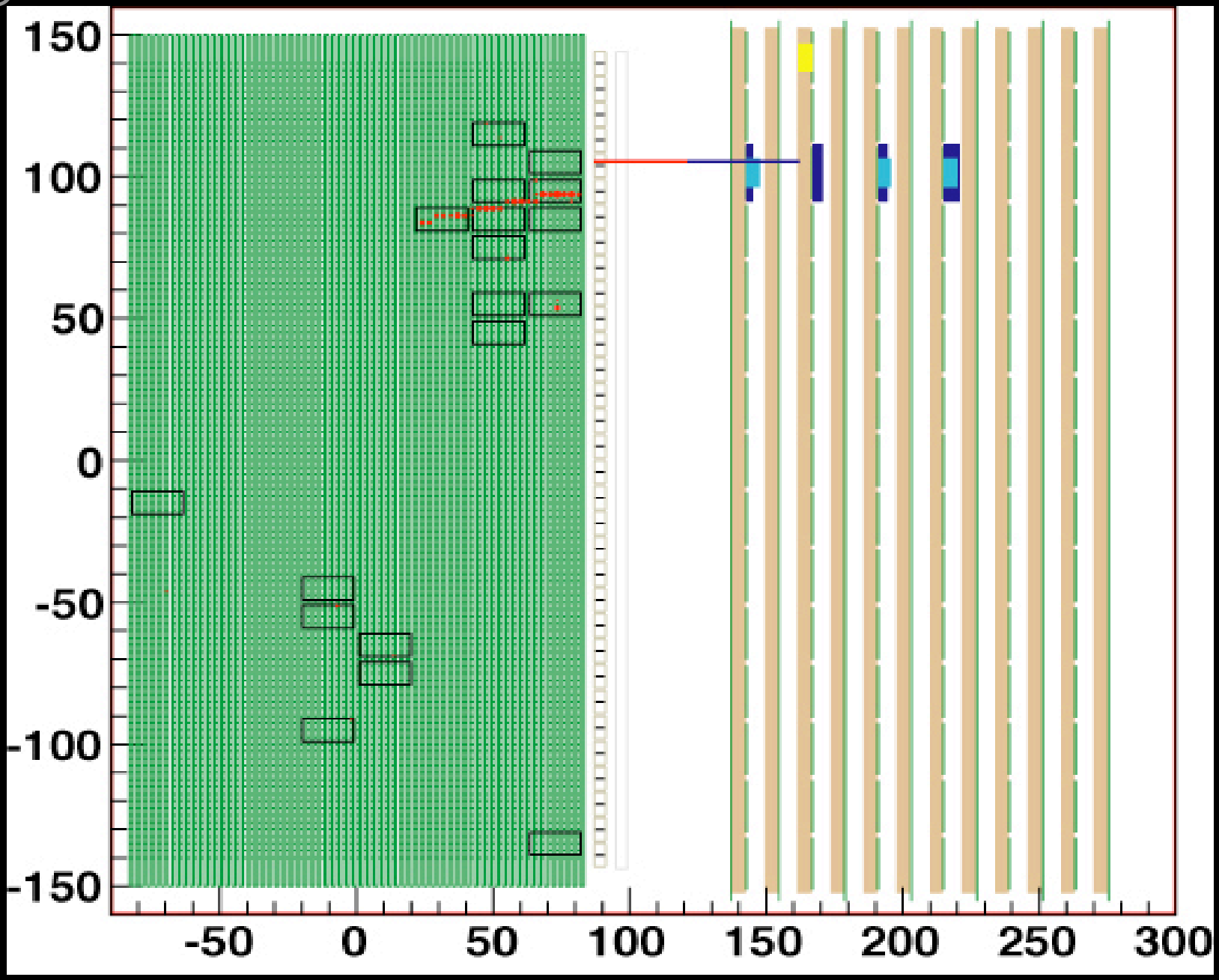
SciBooNE students worked hard to ensure the success of the installation!

April, 2007

May, 2007

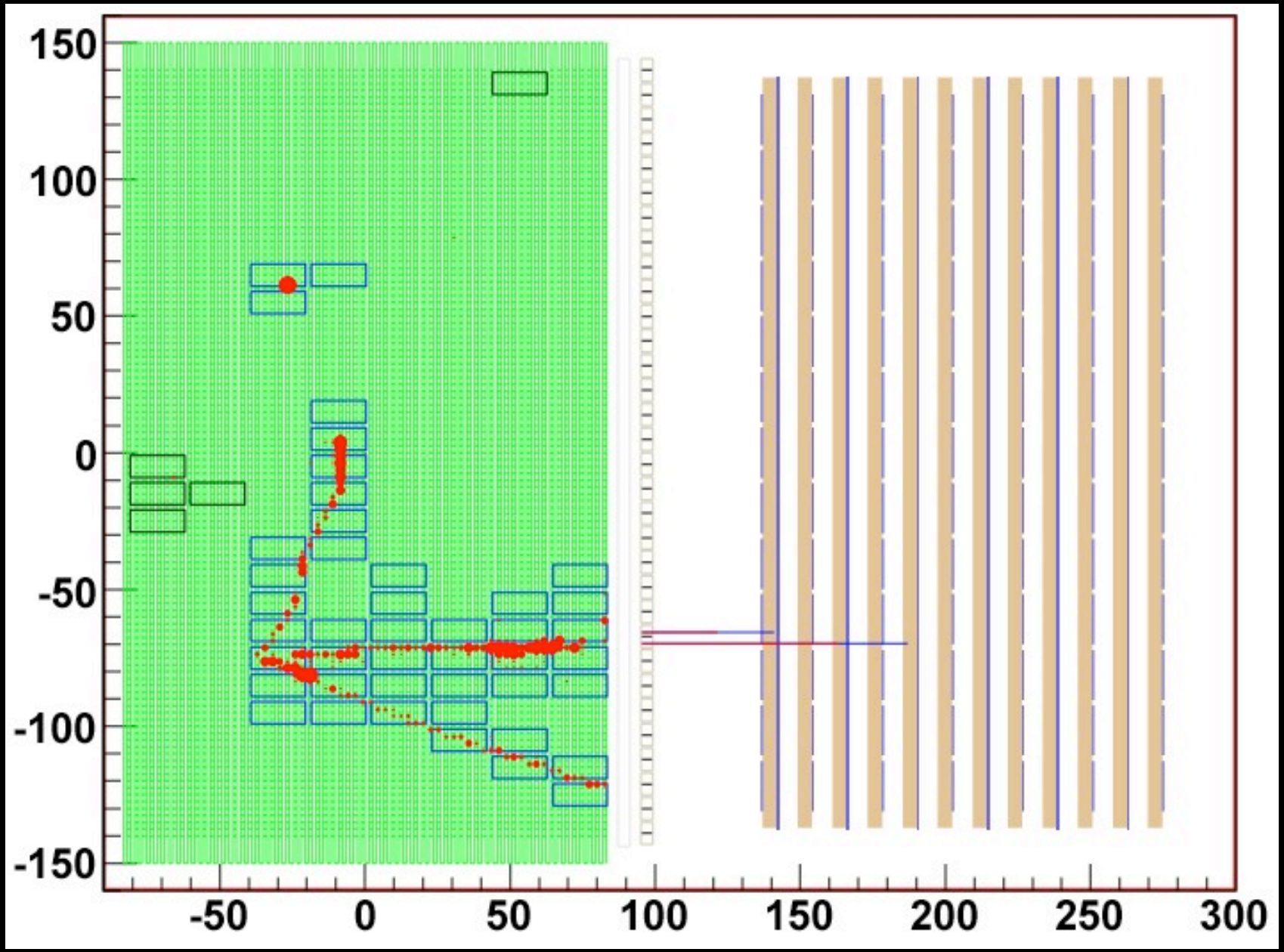
SciBar/EC Detectors

Muon Range Detector



SciBar/EC Detectors

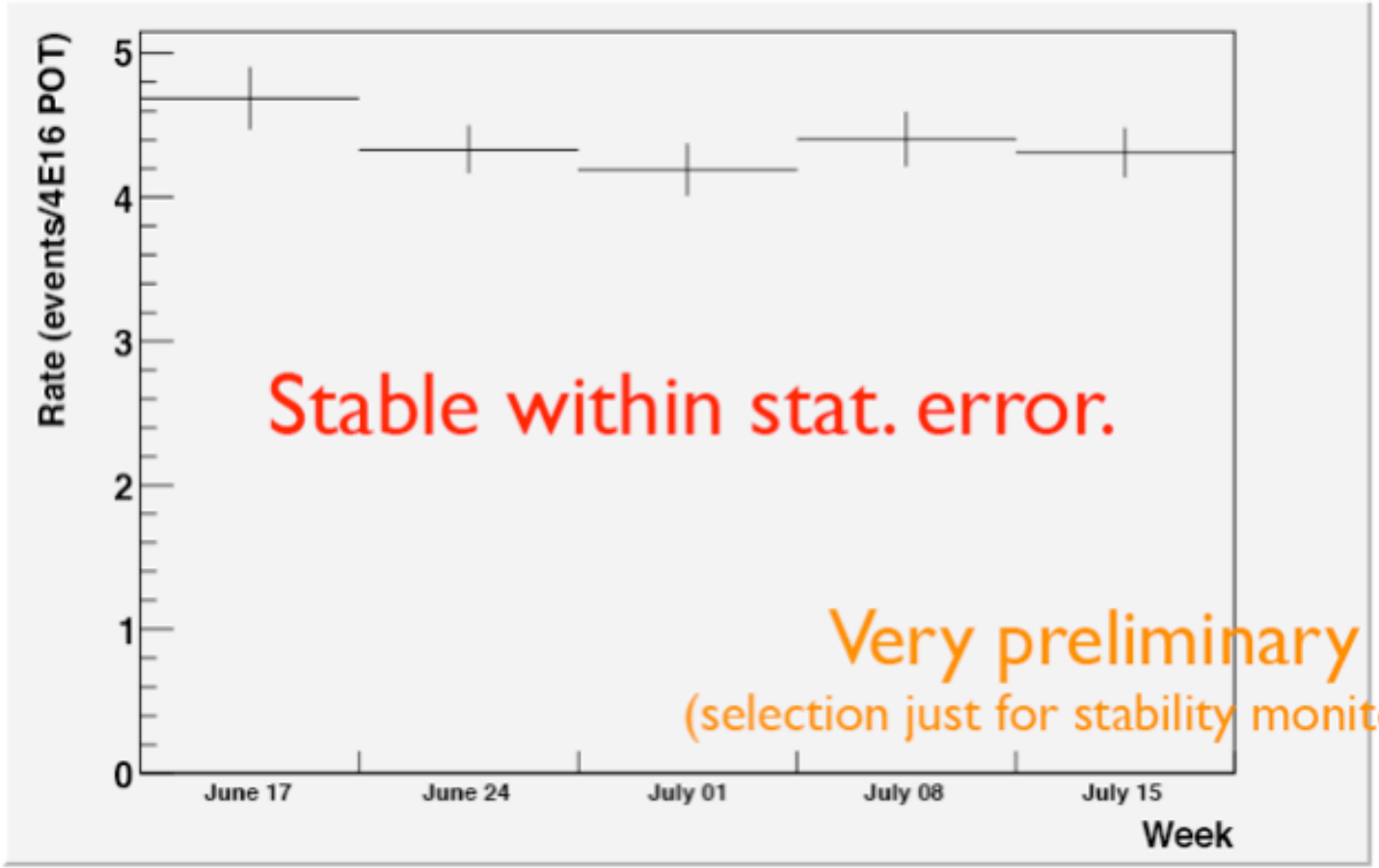
Muon Range Detector



SciBar/EC Detectors

Muon Range Detector

Event rate / POT for each week



Jun. 17 Jul. 15

M. Yokoyama, SciBooNE status : FNAL AEM 07/16/2007

SciBooNE

~~Conclusion~~ Introduction

- Useful and important measurements of ν_μ & $\bar{\nu}_\mu$ cross-sections on carbon near 1 GeV
- 2e20 POT data run
  - Currently running in antineutrino mode
- More information: http://www-sciboone.fnal.gov

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