# Fermilab AEM: MiniBooNE

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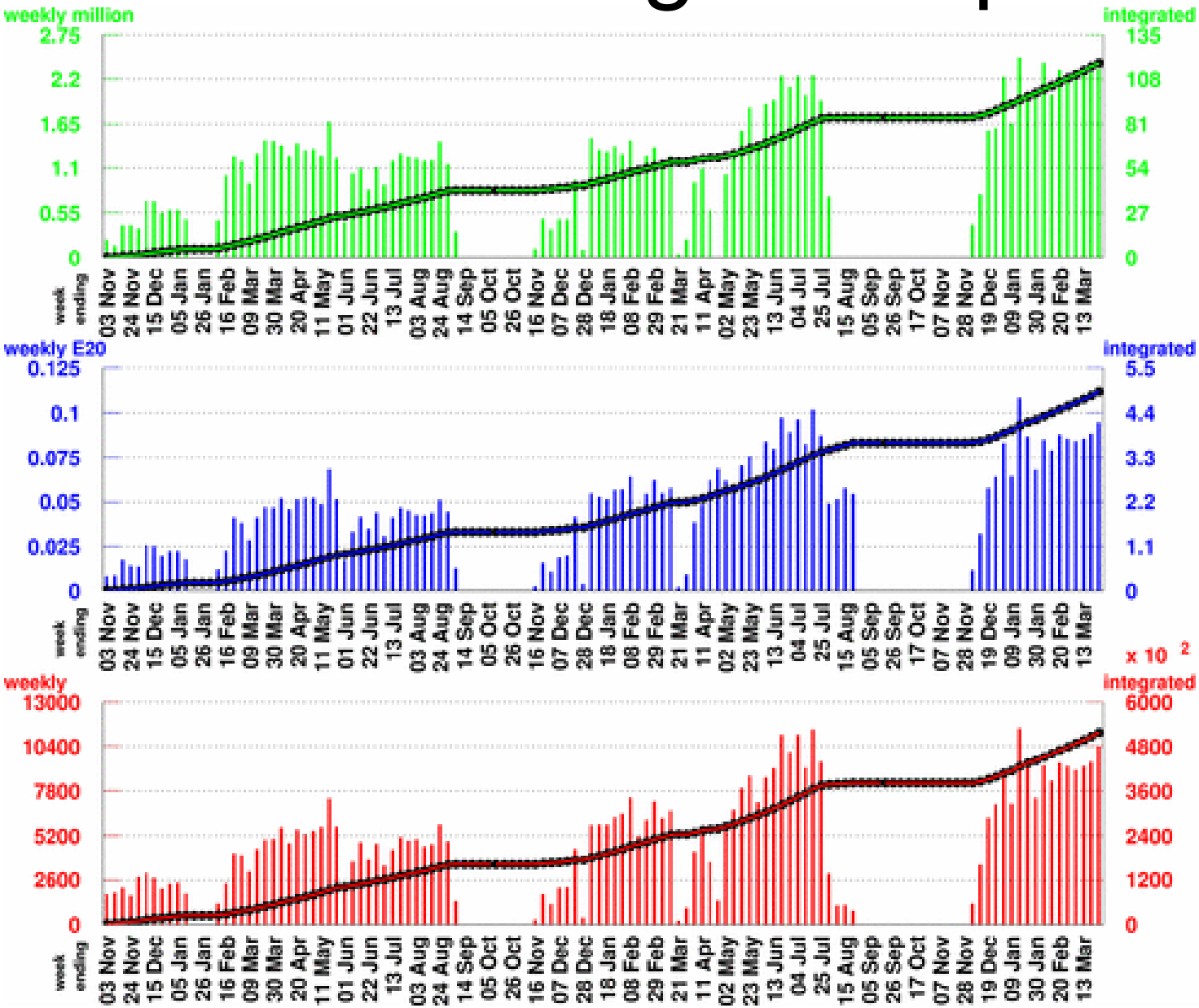
Fermilab

3/28/05

# MBooNE beamline protons

# Progress Update




**Number of Horn Pulses**

To date: 117.65 million

Largest week: 2.46 million

Latest week: 2.32 million

(both horns)

**Number of Protons on Target**

To date: 4.924 E20

Largest week: 0.1084 E20

Latest week: 0.0945 E20

**Number of Neutrino Events**

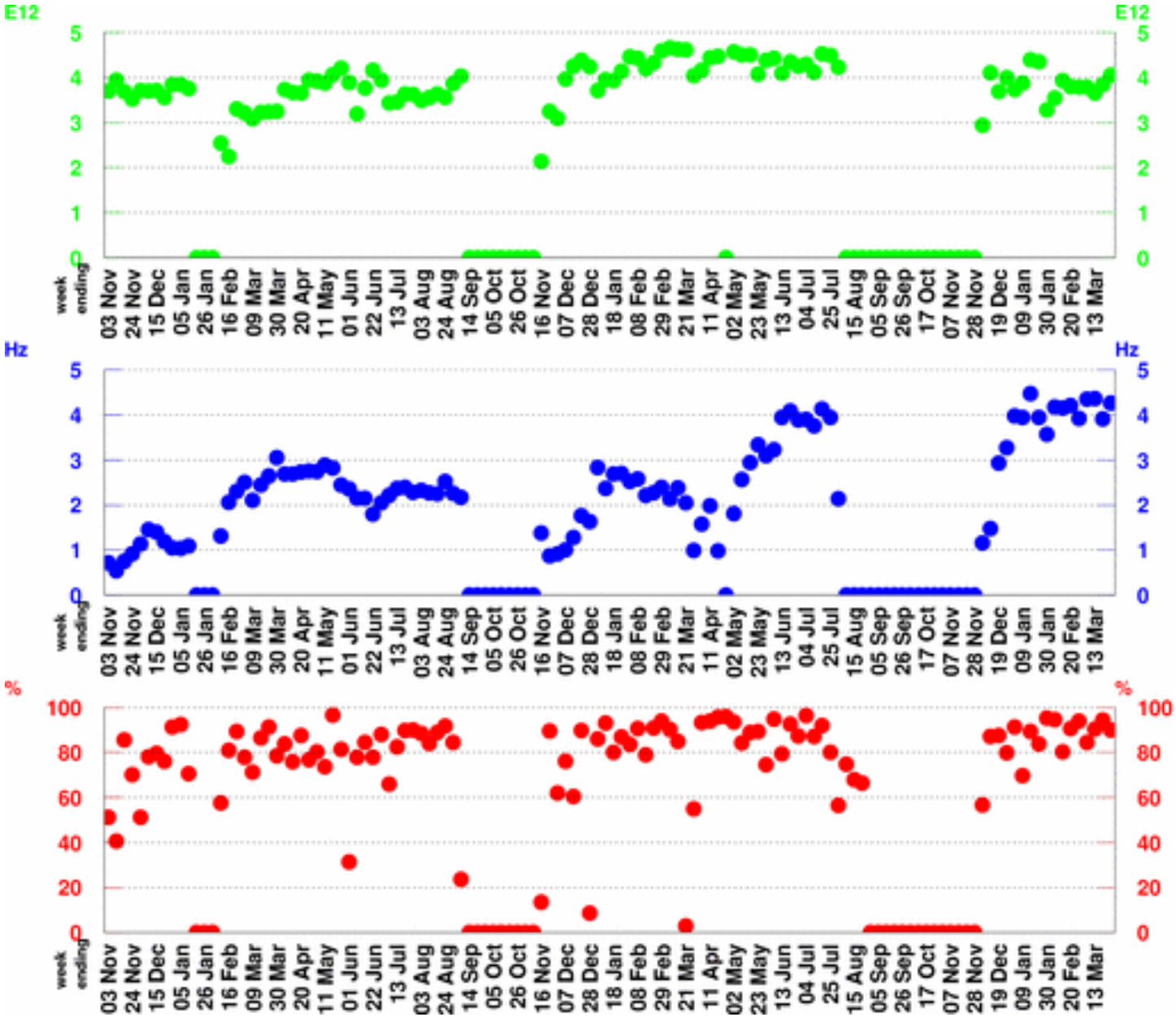
To date:517326

Largest week: 11447

Latest week: 10392

**4.924E20**

# Proton Delivery




## POT per Horn Pulse

Largest week: 4.66 E12

Latest week: 4.06 E12

## Horn Rate

(for time periods with beam)

Largest week: 4.48 Hz

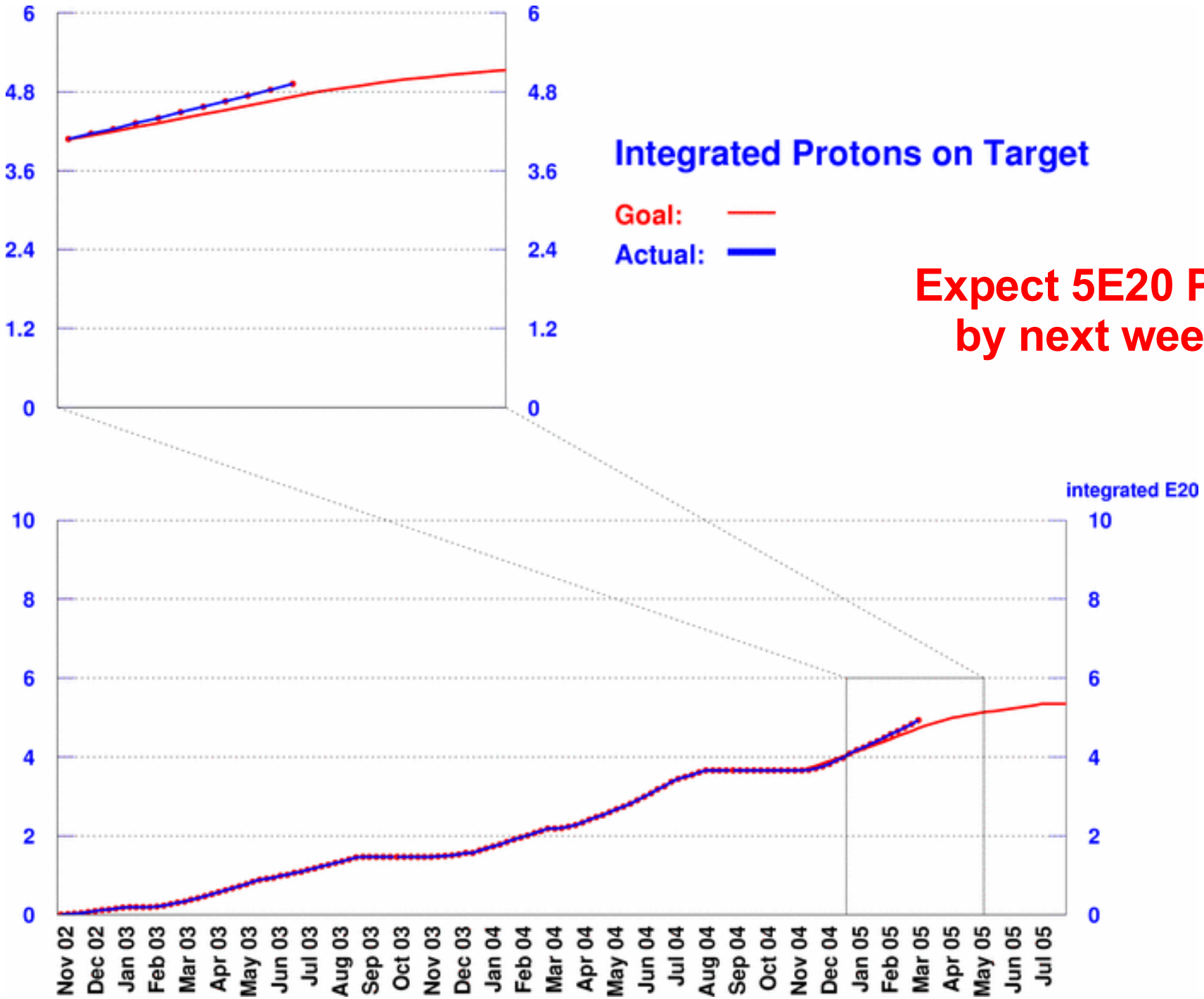
Latest week: 4.27 Hz

## Beam Uptime Fraction

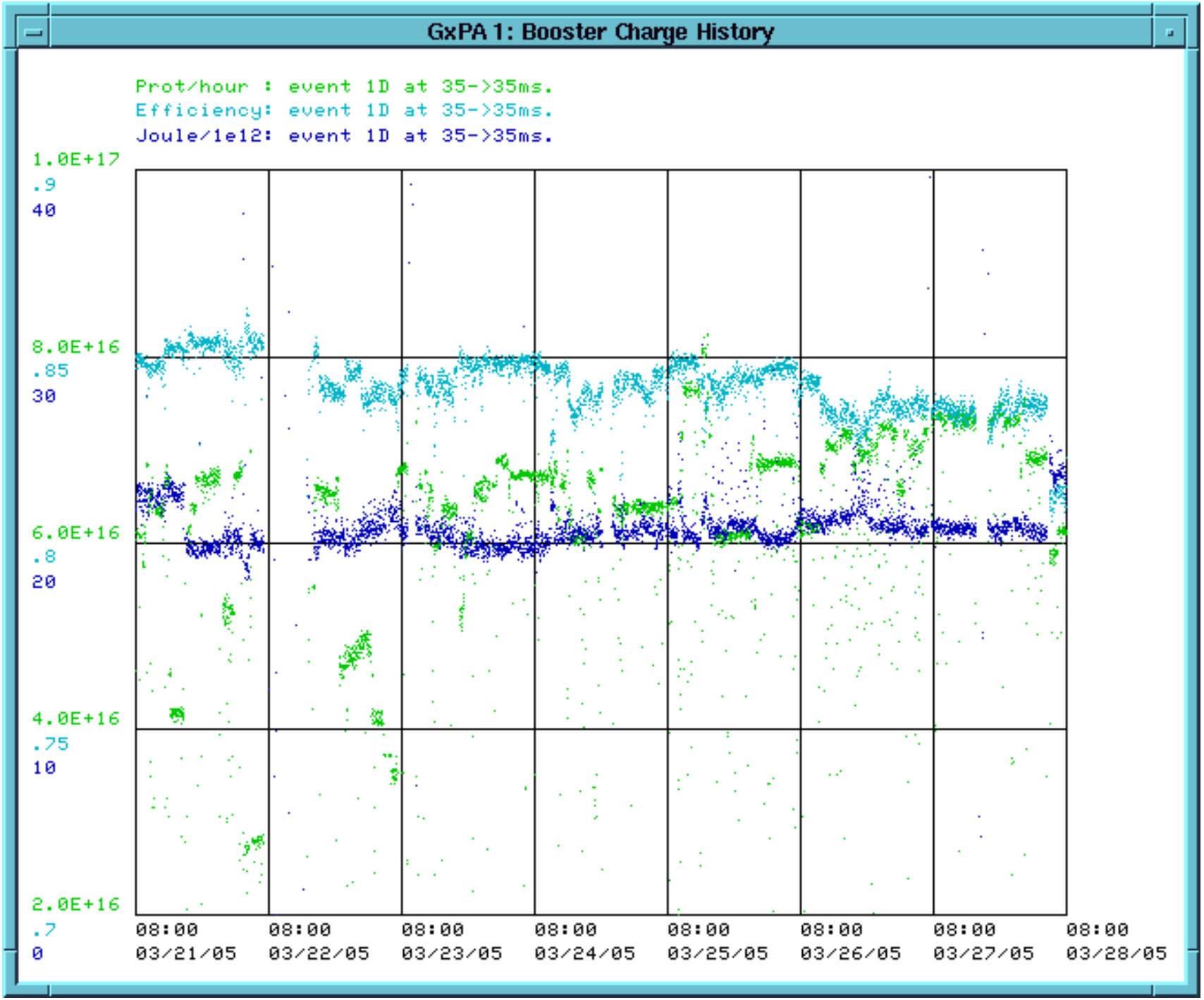
(fraction of time with beam)

Largest week: 96.6 %

Latest week: 90.1 %




**Expect 5E20 PoT by next week**


GxPA 1: Booster Charge History
Prot/hour : event 1D at 35->35ms.
Efficiency: event 1D at 35->35ms.
Joule/1e12: event 1D at 35->35ms.
1.0E+17
.9
40
8.0E+16
.85
30
6.0E+16
.8
20
4.0E+16
.75
10
2.0E+16
.7
0
08:00 03/21/05
08:00 03/22/05
08:00 03/23/05
08:00 03/24/05
08:00 03/25/05
08:00 03/26/05
08:00 03/27/05
08:00 03/28/05

# NuMI beamline protons

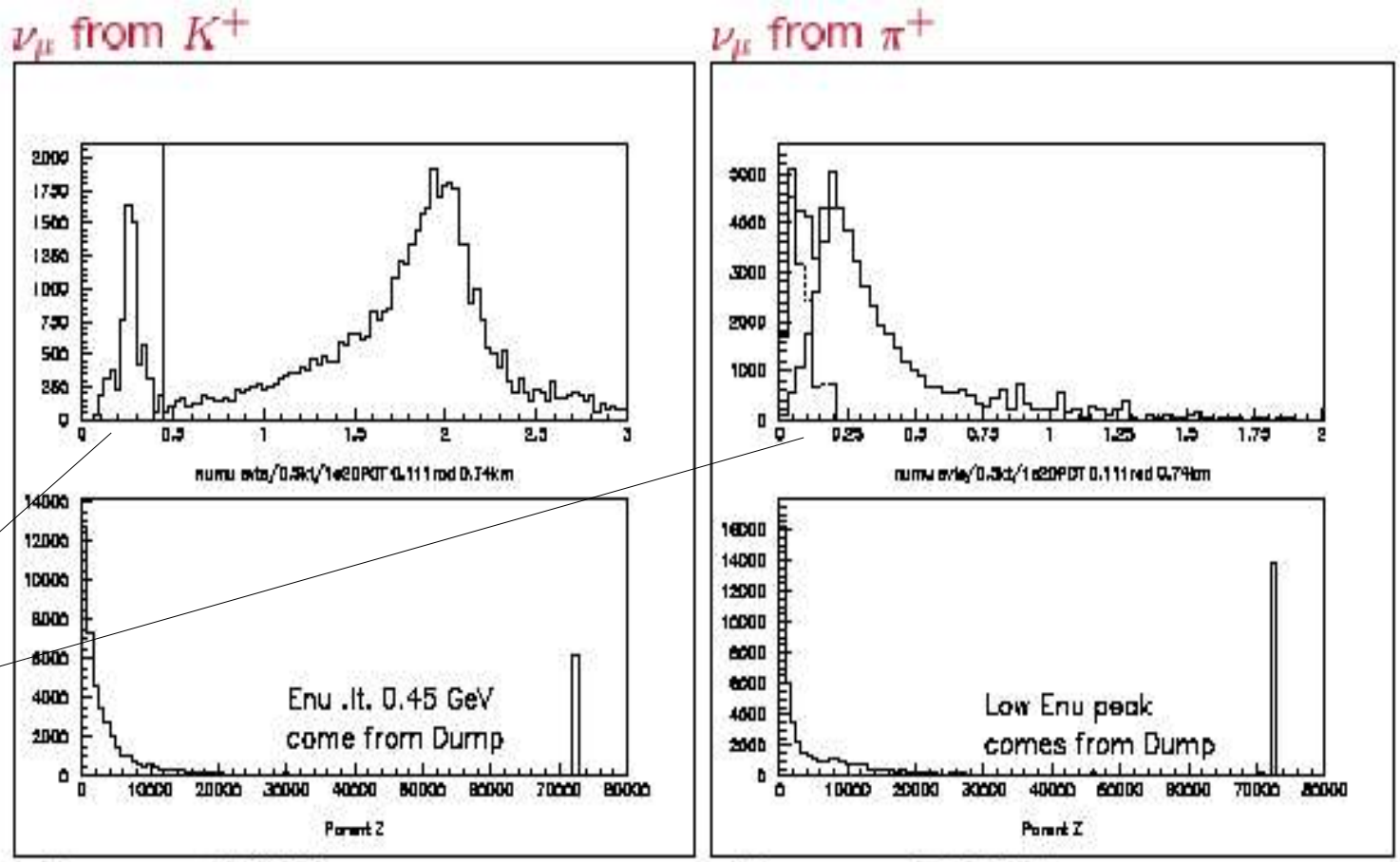
# NuMI events in MBooNE

NuMI beam dump events: useful calibration source

Muon neutrino flux from NuMI beamline @ the MbooNE detector. Detector smearing not included

Source: NuMI MC

Dump contribution



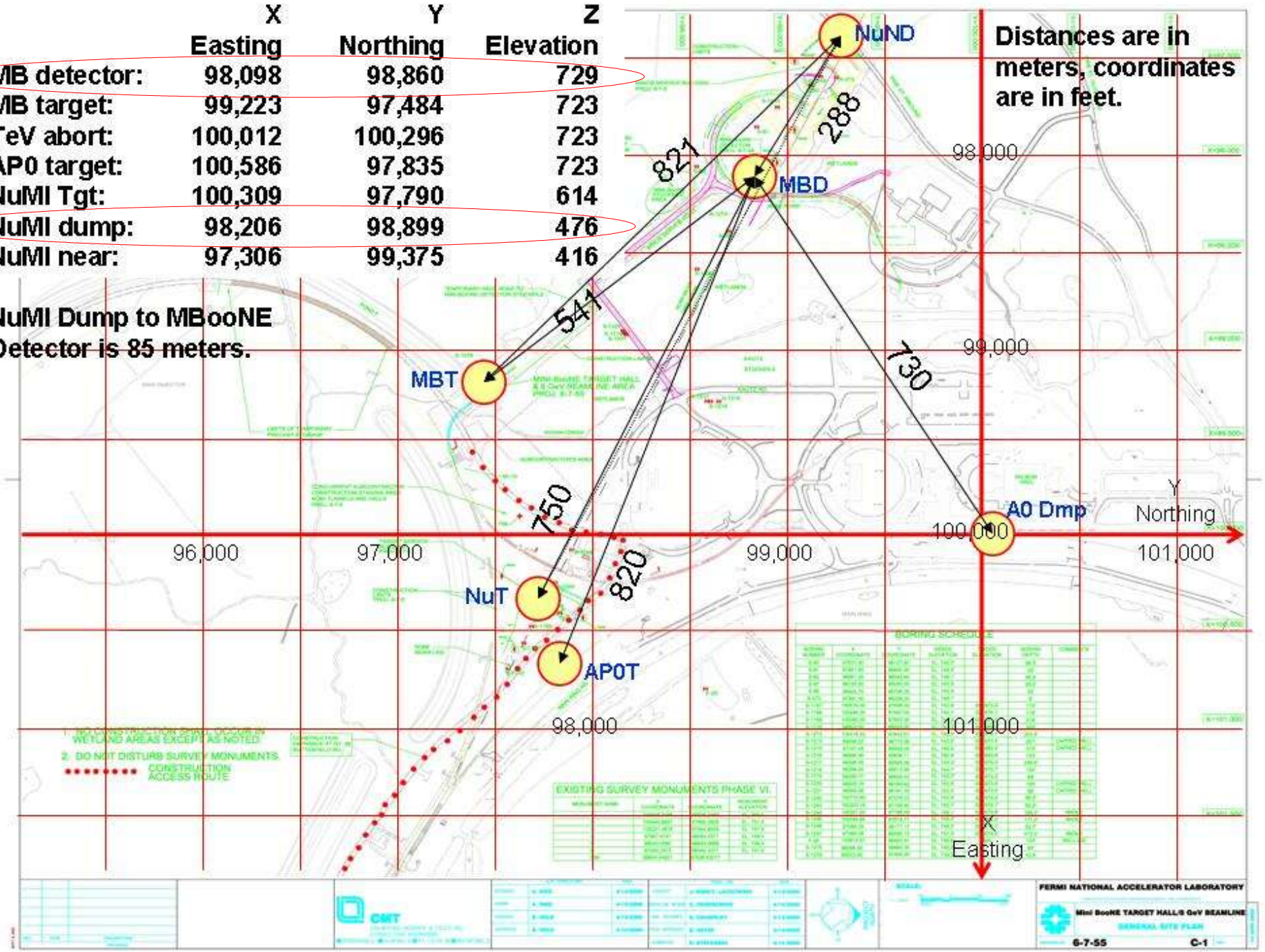

| | |
|---|---|
| Dump | 6,239 |
| Else | 44,650 |
| | 50,889 |

| | |
|---|---|
| Dump | 13,858 |
| Else | 48,830 |
| | 62,688 |

Total: 113,577 for 1E20 P.O.T.

| | X Easting | Y Northing | Z Elevation |
|---|---|---|---|
| MB detector: | 98,098 | 98,860 | 729 |
| MB target: | 99,223 | 97,484 | 723 |
| TeV abort: | 100,012 | 100,296 | 723 |
| AP0 target: | 100,586 | 97,835 | 723 |
| NuMI Tgt: | 100,309 | 97,790 | 614 |
| NuMI dump: | 98,206 | 98,899 | 476 |
| NuMI near: | 97,306 | 99,375 | 416 |

► NuMI Dump to MBooNE Detector is 85 meters.




Angle between beamlines in X-Z plane is ~25°

A lot more data since our last presentetion

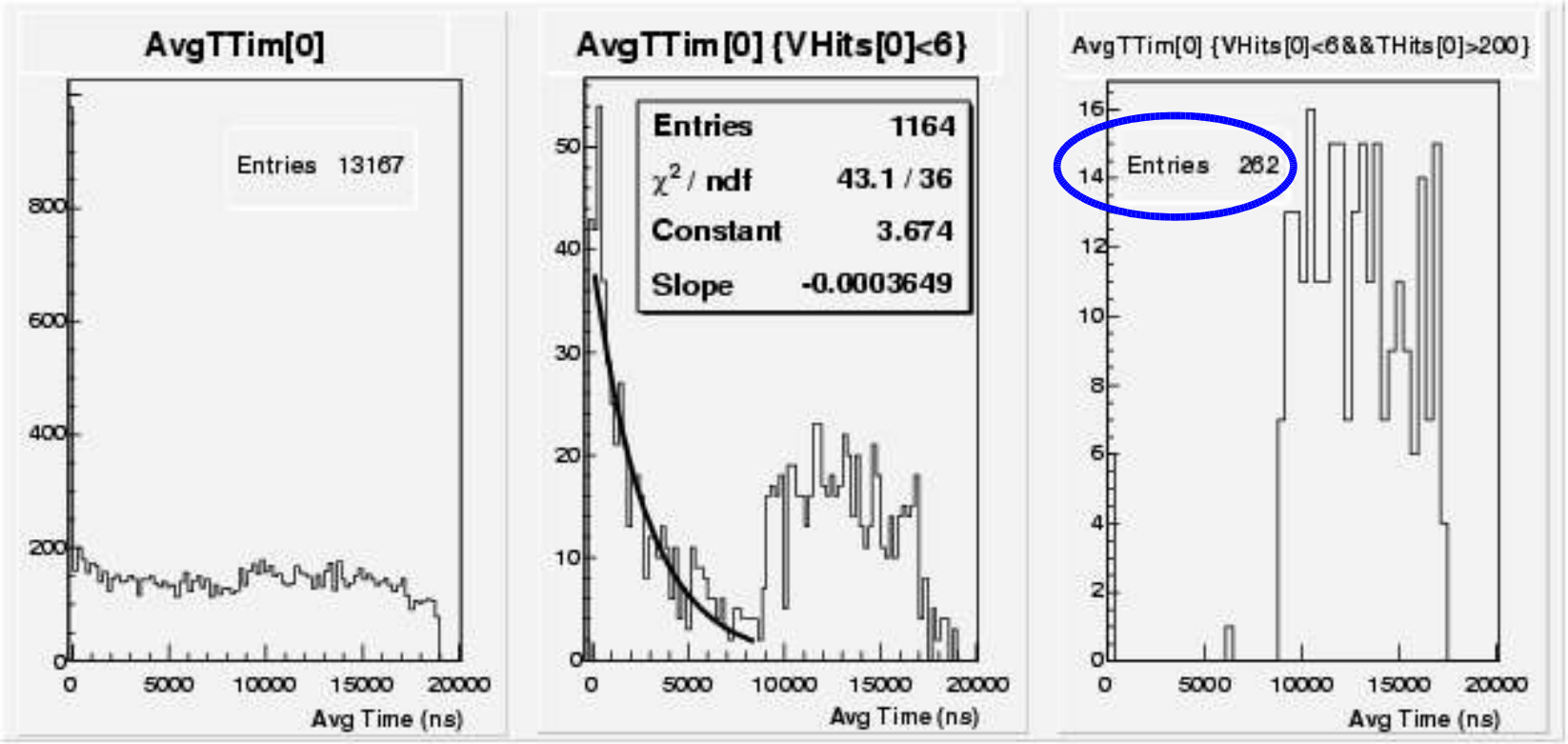
**MiniBoonE Runs 11058-11099**

~from Th MAR 17, 20:13 to Mo MAR 21, 02:02

- $\sum_{TORTGT} \approx 484.79 \times 10^{15}$ POT (Datalogger)
- Saw: 262 $\nu$ candidates (THits[0]>200 and VHits[0]<6)
- Observed rate of these candidates is: $0.54 \times 10^{-15}$ $\nu$/POT

## NuMI $\nu$ Timing distributions

Veto hit cut  Veto & tank hit cut

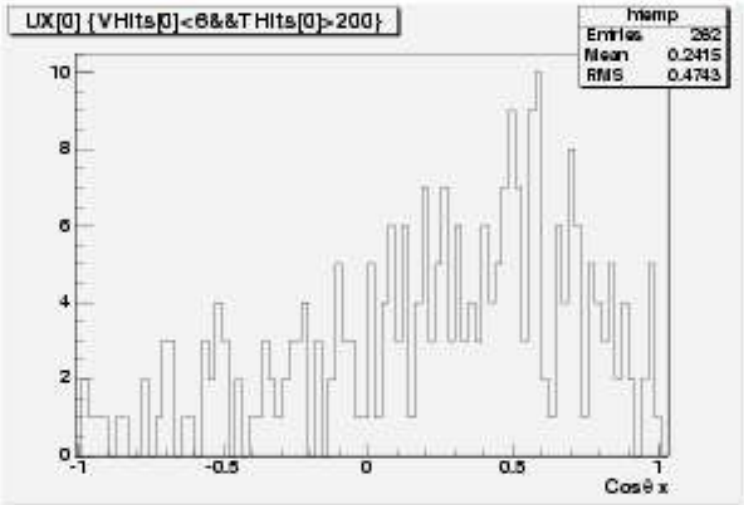


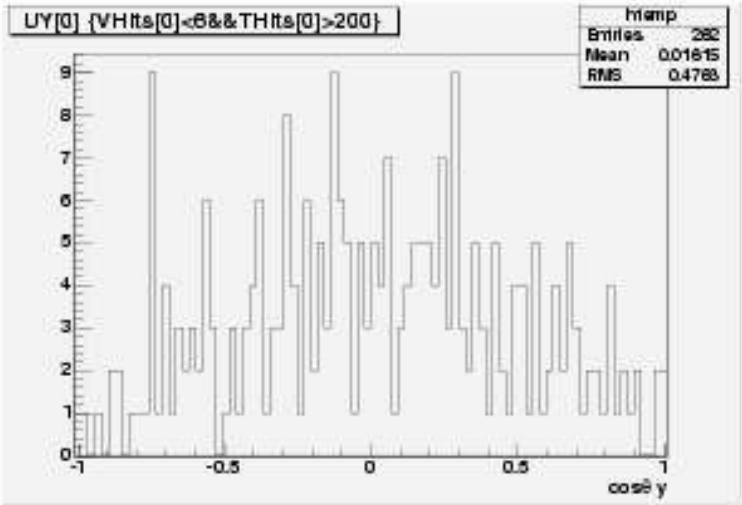

- Spill is $\sim 8\ \mu$s long. 5 Batch structure washed out.
- Cosmic activity dominates but excess is visible.

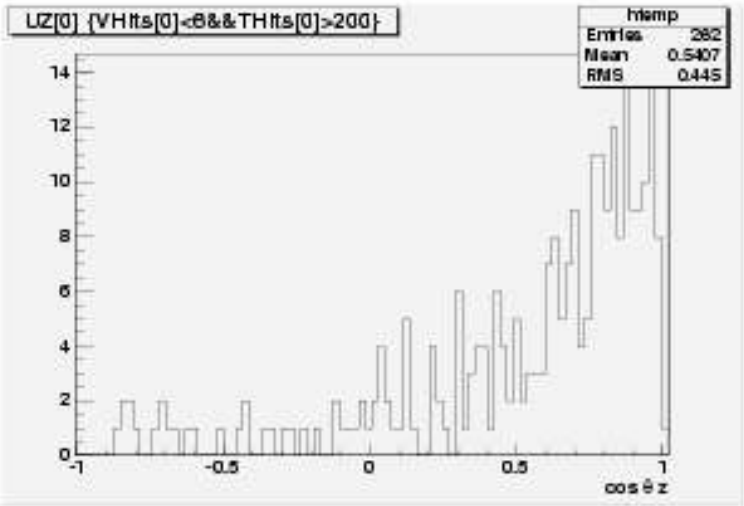
# Using the 262 events:

**NuMI $\nu$ Direction reconstruction:** (Detector Coordinates)

Z-Along MiniBooNE Beamline, Y-Upwards




UX peak $\approx 0.55$

UZ peak $\approx 0.95$

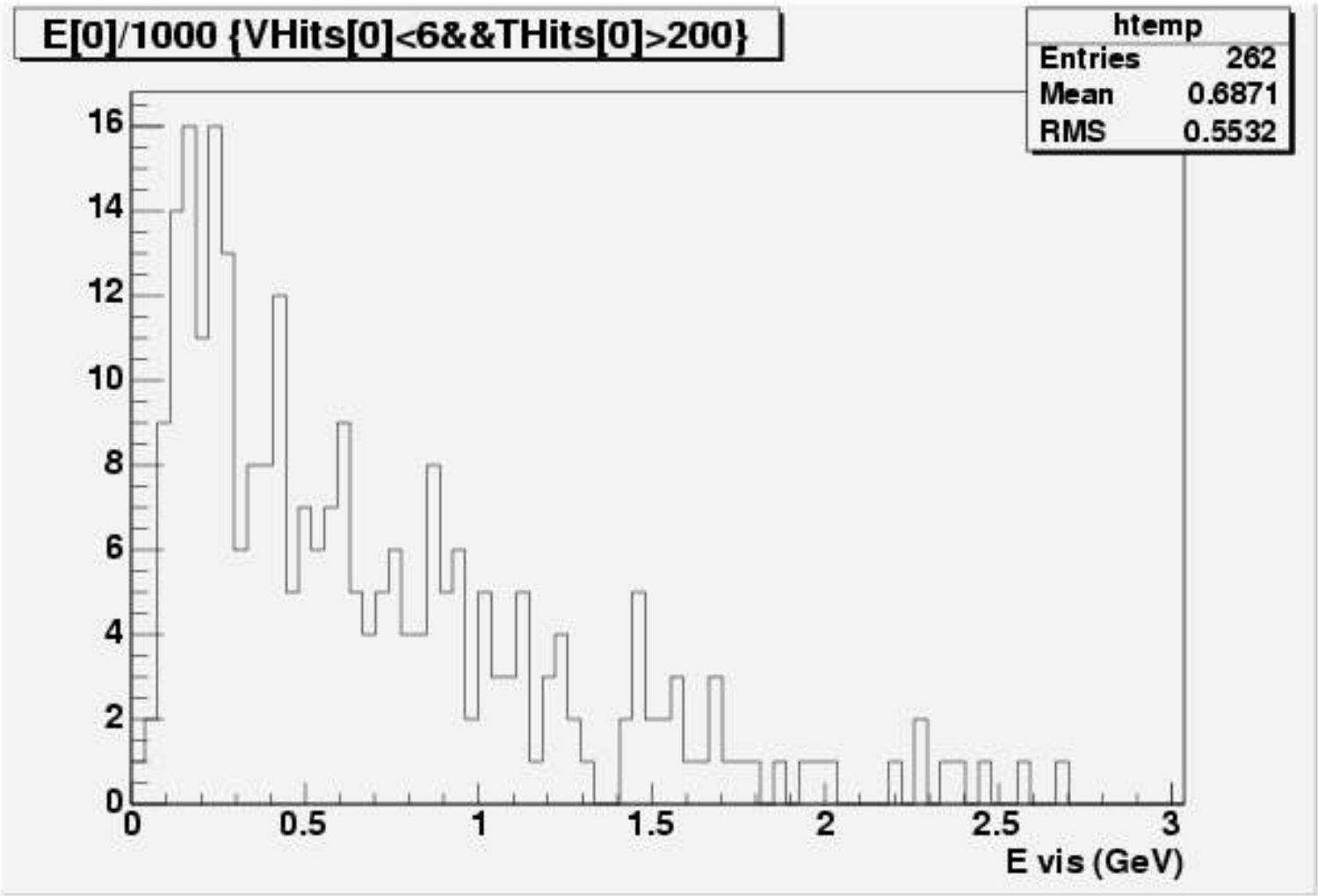
$\mathrm{Tan}^{-1}(0.55/0.95) = 30^o$

$\nu$'s pointing towards X+ at $30^o$ relative to MiniBooNE Beamline

UY more uniform, but preferentially upward (MEAN=0.016)

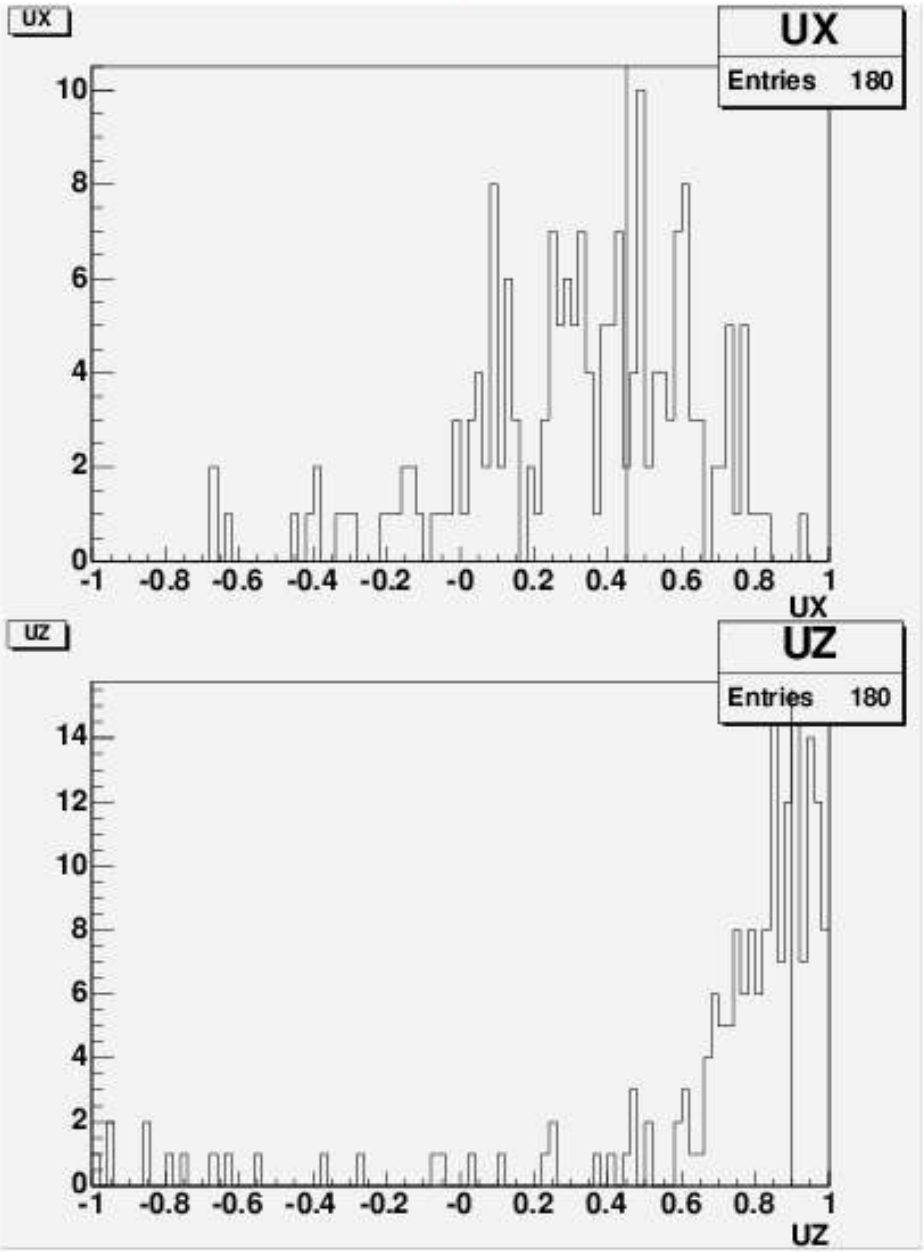
Qualitatively consistent with MC prediction (remember, higher energy events will fire the veto)

NuMI $\nu$ Visible energy Spectrum:



## NuMI $\nu$ Direction reconstruction: (Exiting Events-Higher energy)

MiniBooNE X-Z plane,




180 in-time events

Exiting Events:

Events with a Cluster of Hits in the Veto in in the direction of the reconstructed track

Closer to neutrino direction,

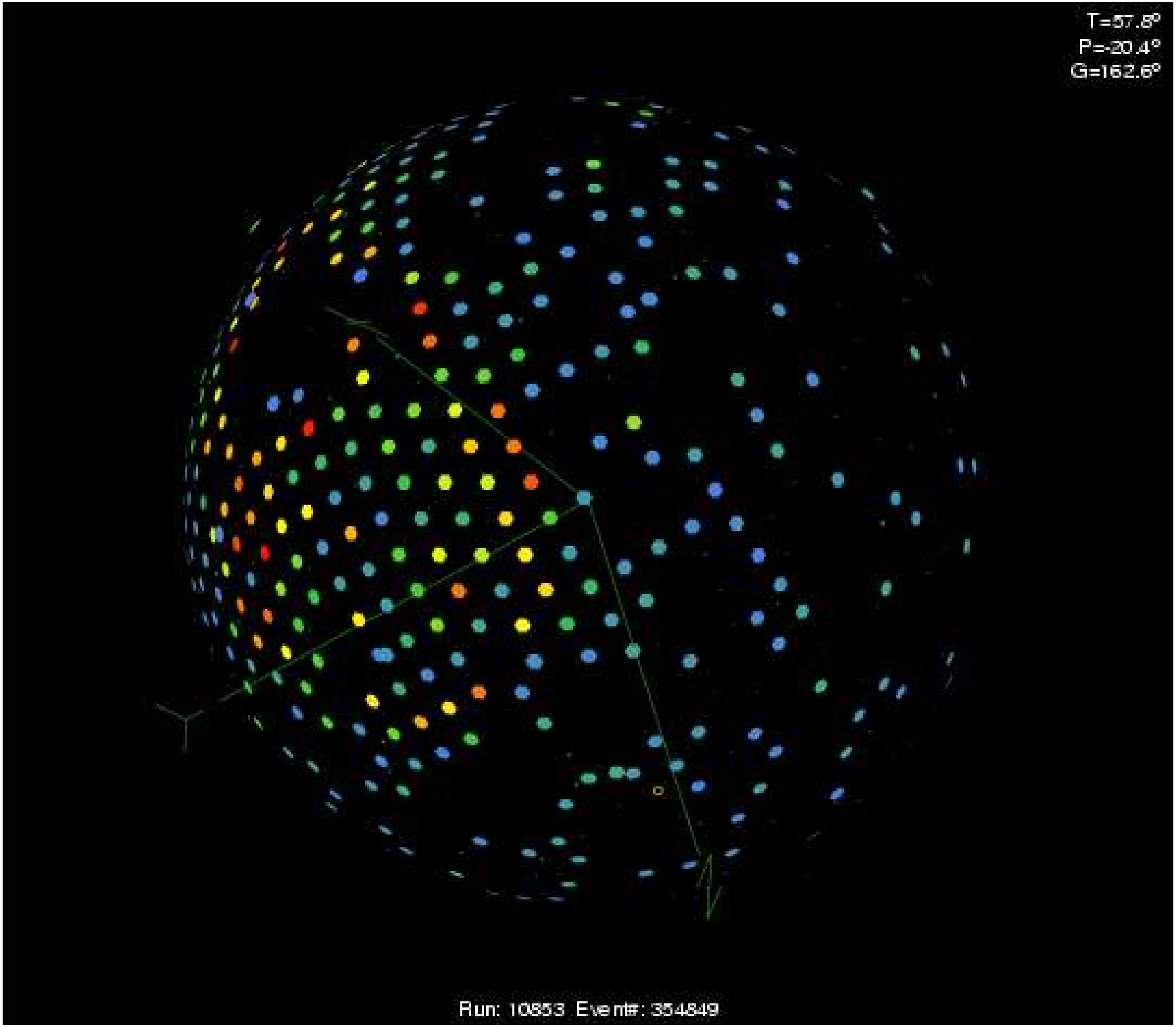
UX peak $\approx 0.45$

UZ peak $\approx 0.90$

$\mathrm{Tan}^{-1}(0.45/0.90) = 26^o$

$\nu$'s pointing towards X+ at $26^o$ relative to MiniBooNE Beamline

Angle Between beamlines is $\sim 25^o$ (see map)


T=57.8°
P=-20.4°
G=162.6°
Run: 10853 Event#: 354849

# Summary

- We have ~4.924E20 PoT
  - Our “first 5E20” by next week!
- NuMI off-axis beam trigger & analysis coming together
  - To be used as calibration source
- Zelimir Djurcic takes over for me next week
  - So, in anticipation of 5E20 P0T: ***thanks!***
  - Looking forward for more in '05 and '06!