MIPP Update

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for the MIPP E907 Collaboration

Review

MIPP : ***Main Injector*** Particle Production

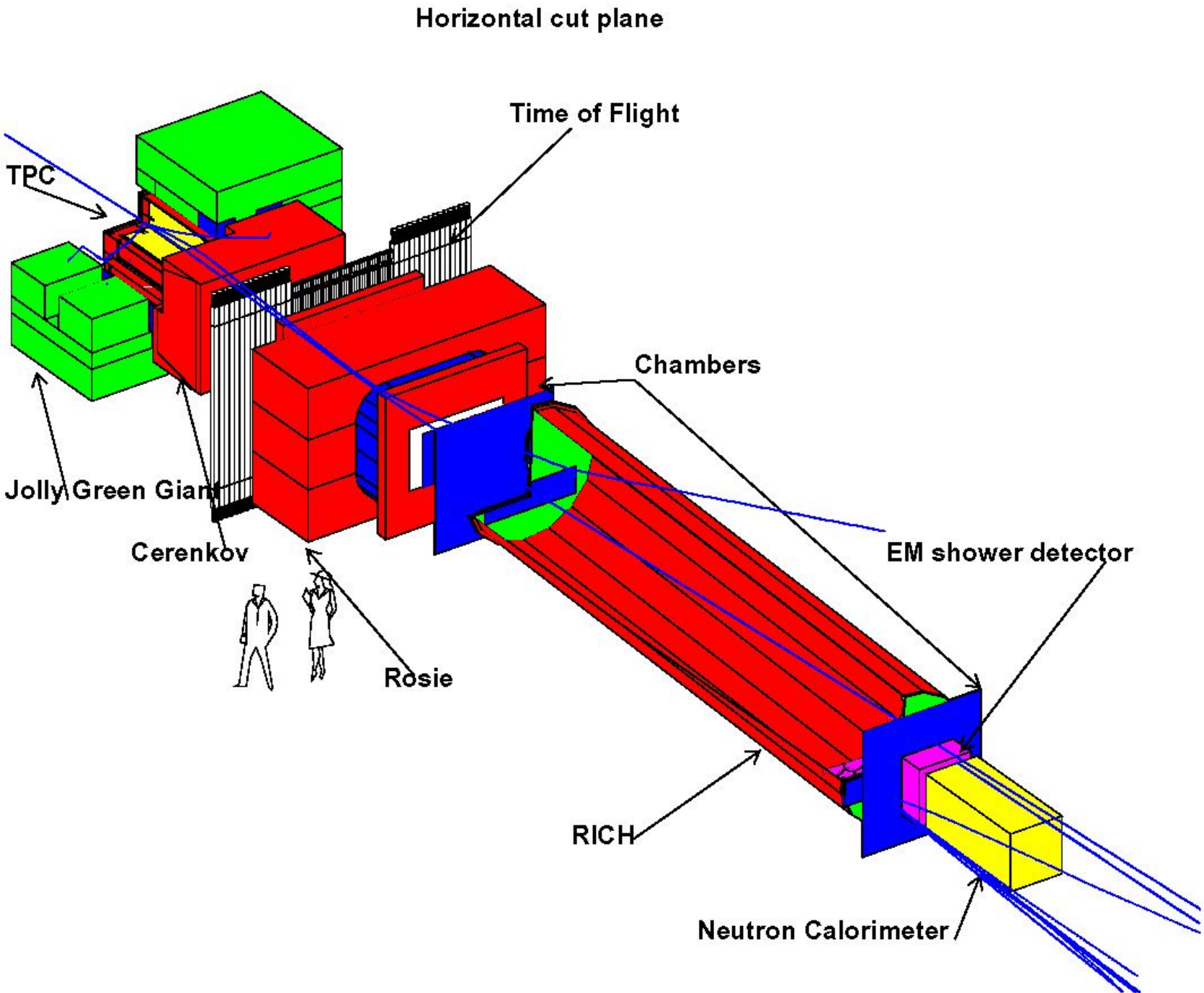
Goals:

- Collect a comprehensive hadron production cross section data set
- *Measure the particle production off the NuMI target using 120 GeV/c protons*

Features:

- Full acceptance spectrometer
- Complicated trigger system
- Excellent particle ID (3 sigma separation)

Detector:	TPC	ToF	DCkov	RICH
Momentum:	< 1 GeV/c	1-3 GeV/c	3-17 GeV/c	20-80 GeV/c



Outline

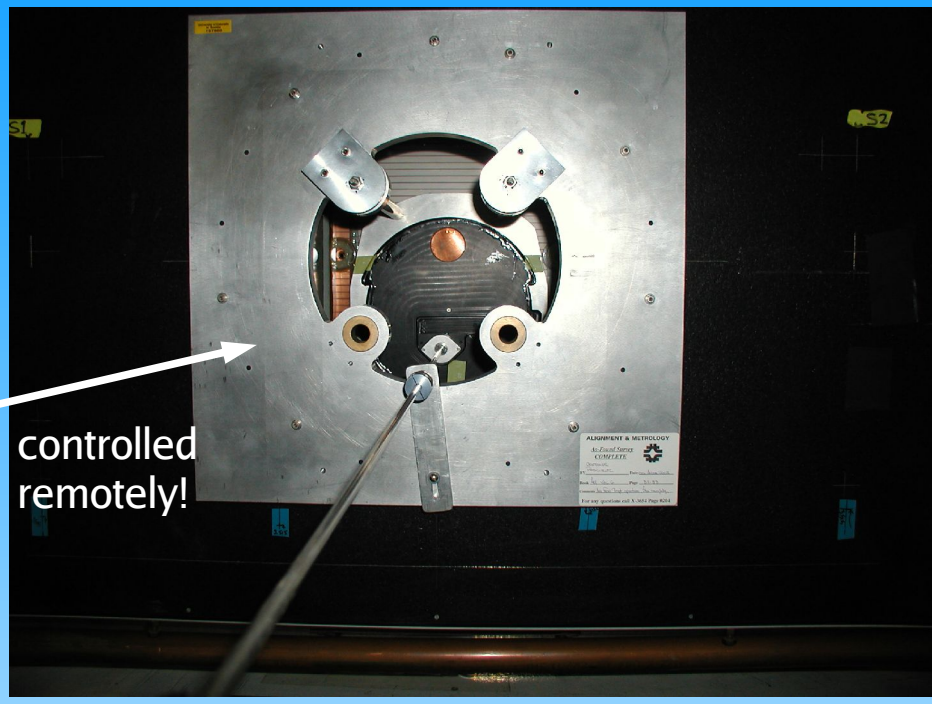
- Where we are:
  - Hardware/experimental status
  - Software: reconstruction, tracking

- Where we're going:
  - Run plan for the next few months
  - NuMI target measurement plans

Current Hardware Status

Progress in the last month:

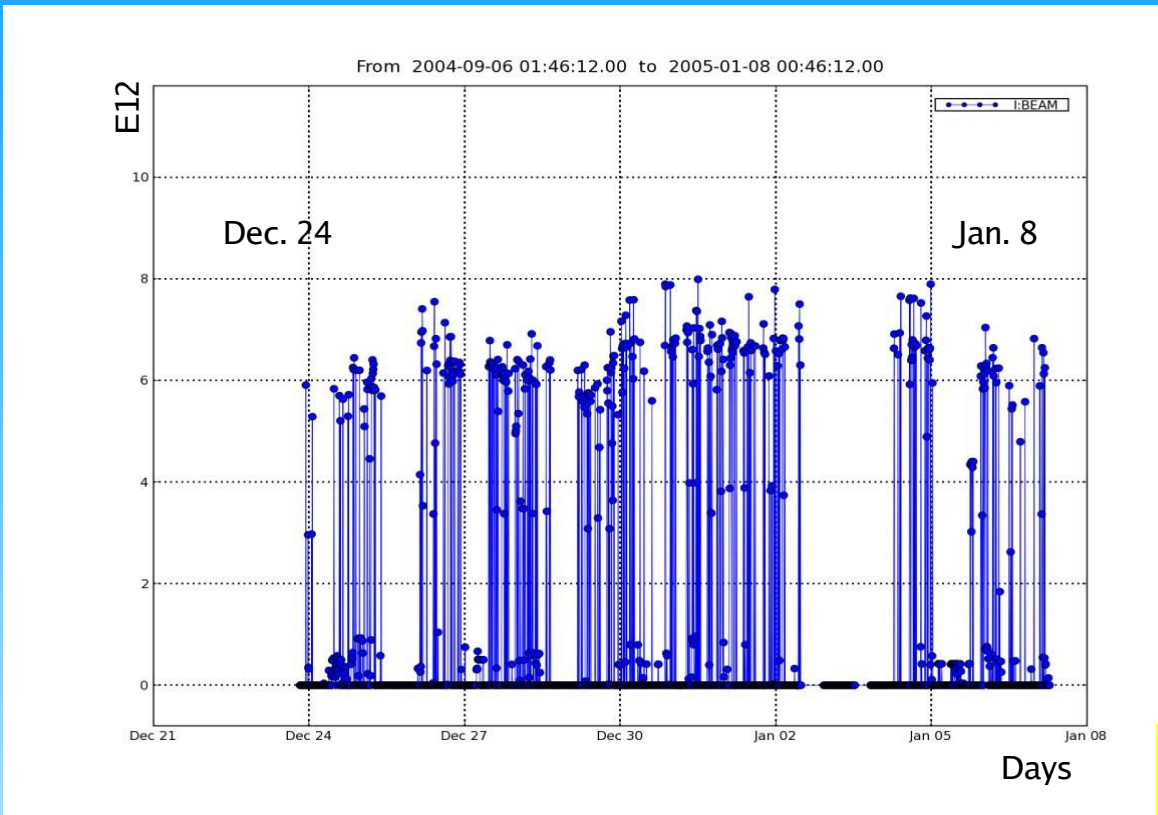
- Beamline commissioning/tuning
- Trigger (re)commissioning
- Target wheel installed
- All detectors operational!

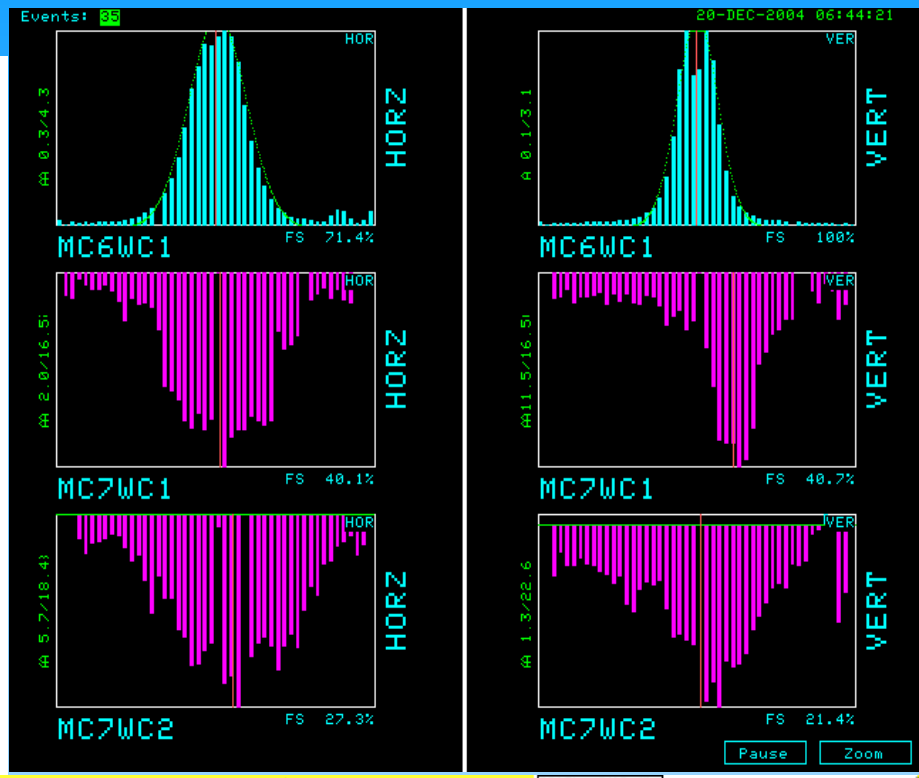


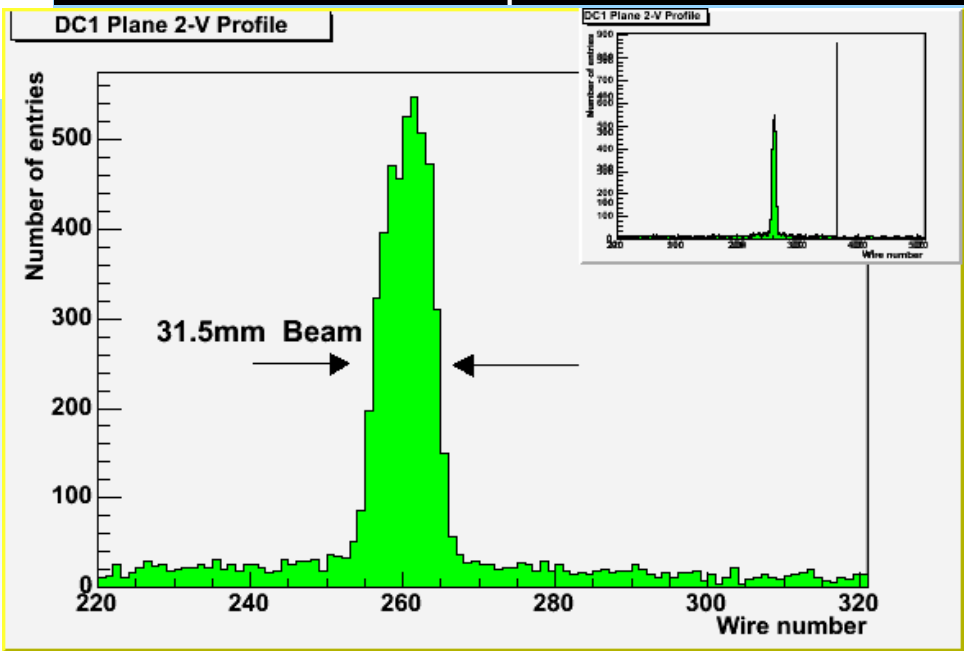
Sources of delay in getting up and running:

- More or less complete re-build of our trigger system (~ 1 week)
- Installation and commissioning of liquid hydrogen target taking a bit longer than expected (~ 2 weeks)
- Broken wires in the TPC (~ 1 - 1 ½ weeks)
- Lack of man-power

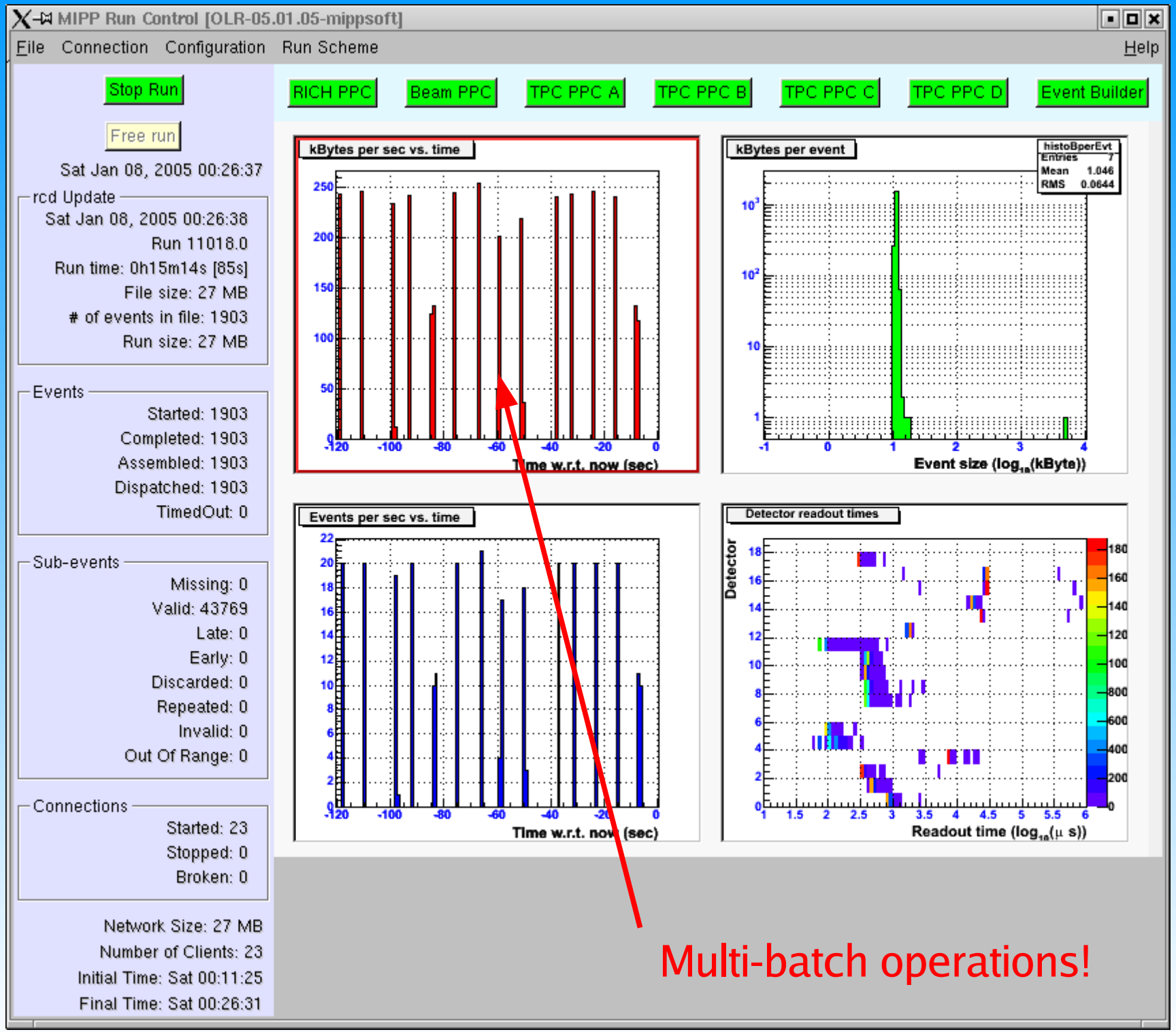
Beam Status







Recent lab-wide power issues aside, we have been getting beam fairly steadily, and we are very close to finishing the tuning of our beam.


MIPP Run Control [OLR-05.01.05-mippsoft]
File Connection Configuration Run Scheme Help
Stop Run
Free run
Sat Jan 08, 2005 00:26:37
rcd Update
Sat Jan 08, 2005 00:26:38
Run 11018.0
Run time: 0h15m14s [85s]
File size: 27 MB
# of events in file: 1903
Run size: 27 MB
Events
Started: 1903
Completed: 1903
Assembled: 1903
Dispatched: 1903
TimedOut: 0
Sub-events
Missing: 0
Valid: 43769
Late: 0
Early: 0
Discarded: 0
Repeated: 0
Invalid: 0
Out Of Range: 0
Connections
Started: 23
Stopped: 0
Broken: 0
Network Size: 27 MB
Number of Clients: 23
Initial Time: Sat 00:11:25
Final Time: Sat 00:26:31
RICH PPC
Beam PPC
TPC PPC A
TPC PPC B
TPC PPC C
TPC PPC D
Event Builder
kBytes per sec vs. time
Time w.r.t. now (sec)
kBytes per event
histoBperEvt
Entries 7
Mean 1.046
RMS 0.0644
Event size (log10(kByte))
Events per sec vs. time
Time w.r.t. now (sec)
Detector readout times
Detector
Readout time (log10(μ s))
Multi-batch operations!

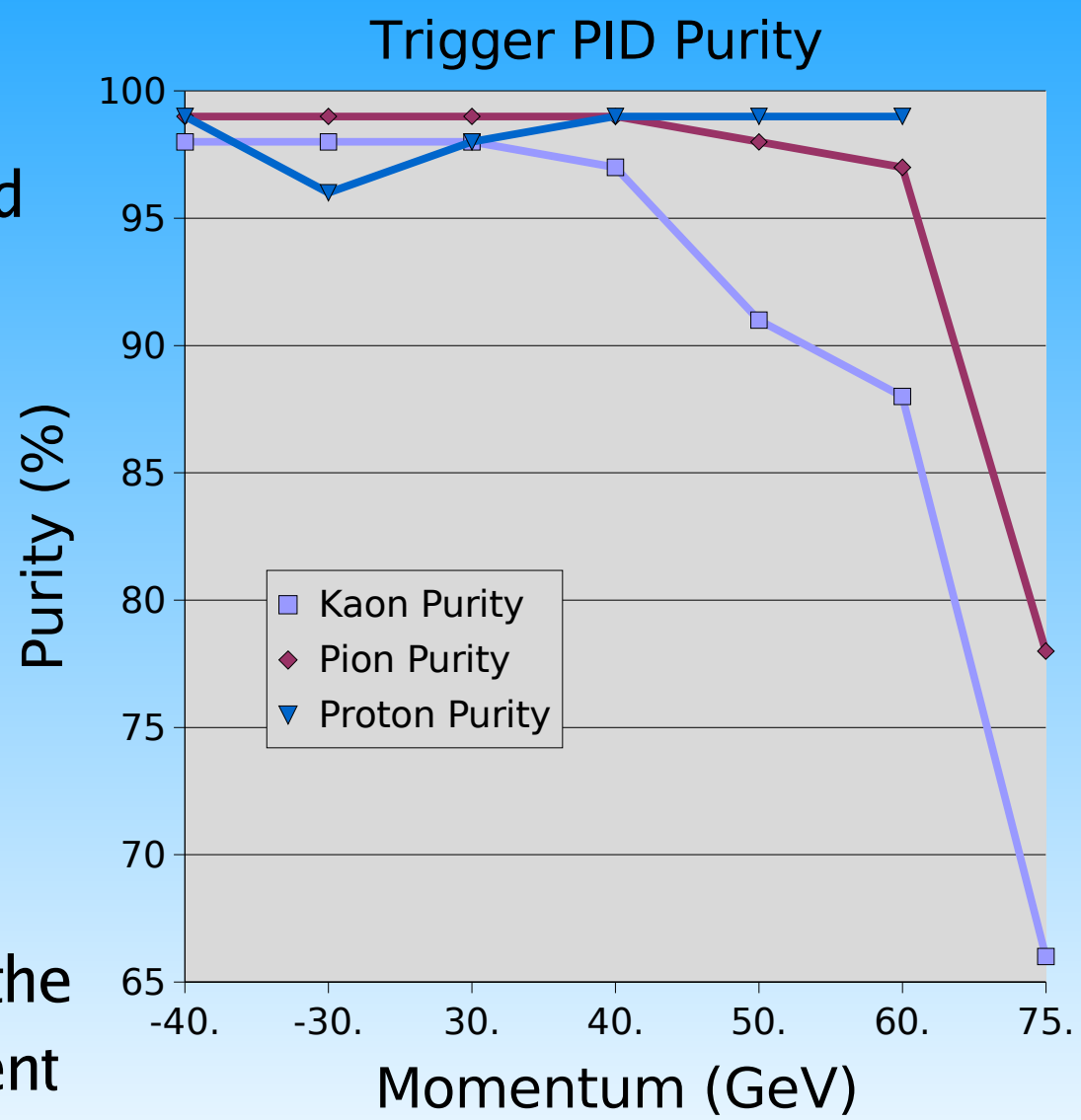
DAQ and Trigger Status

Improvements in DAQ:

- Increase in TPC readout speed (currently the bottleneck in the data rate) by factor > 2
- Improved detector controls

Trigger Update:

- Added out-of-spill calibration
- Cleaned up timing
- Verified Beam Cerenkov PID
- Multiplicity trigger to enhance the data sample is under development



Detector Status

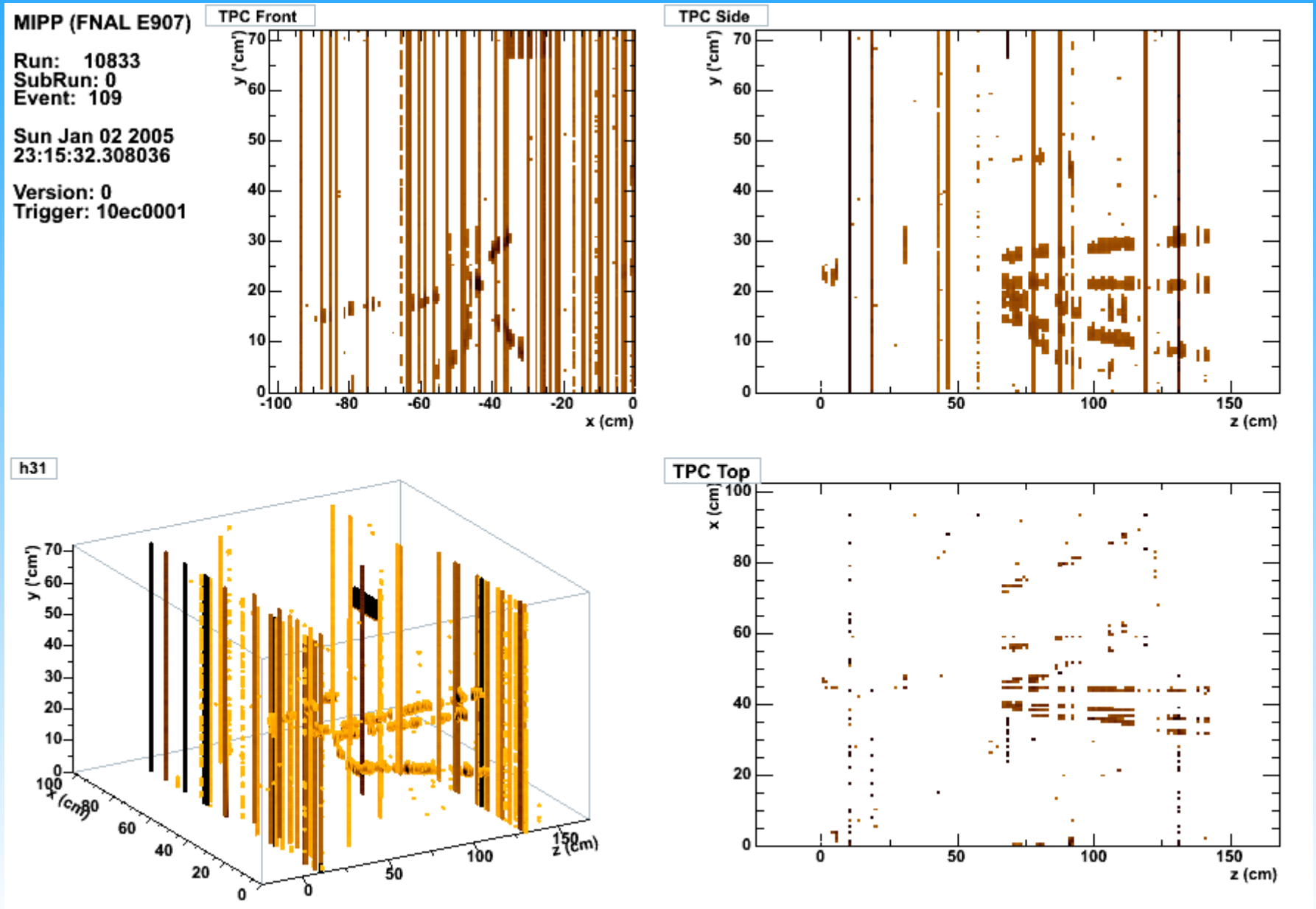
- All detectors now operational! Compared to last summer when:
  - only 4/6 wire chambers were working
  - DCkov not operational
- Physics data collection about a week away!

Current Software Status

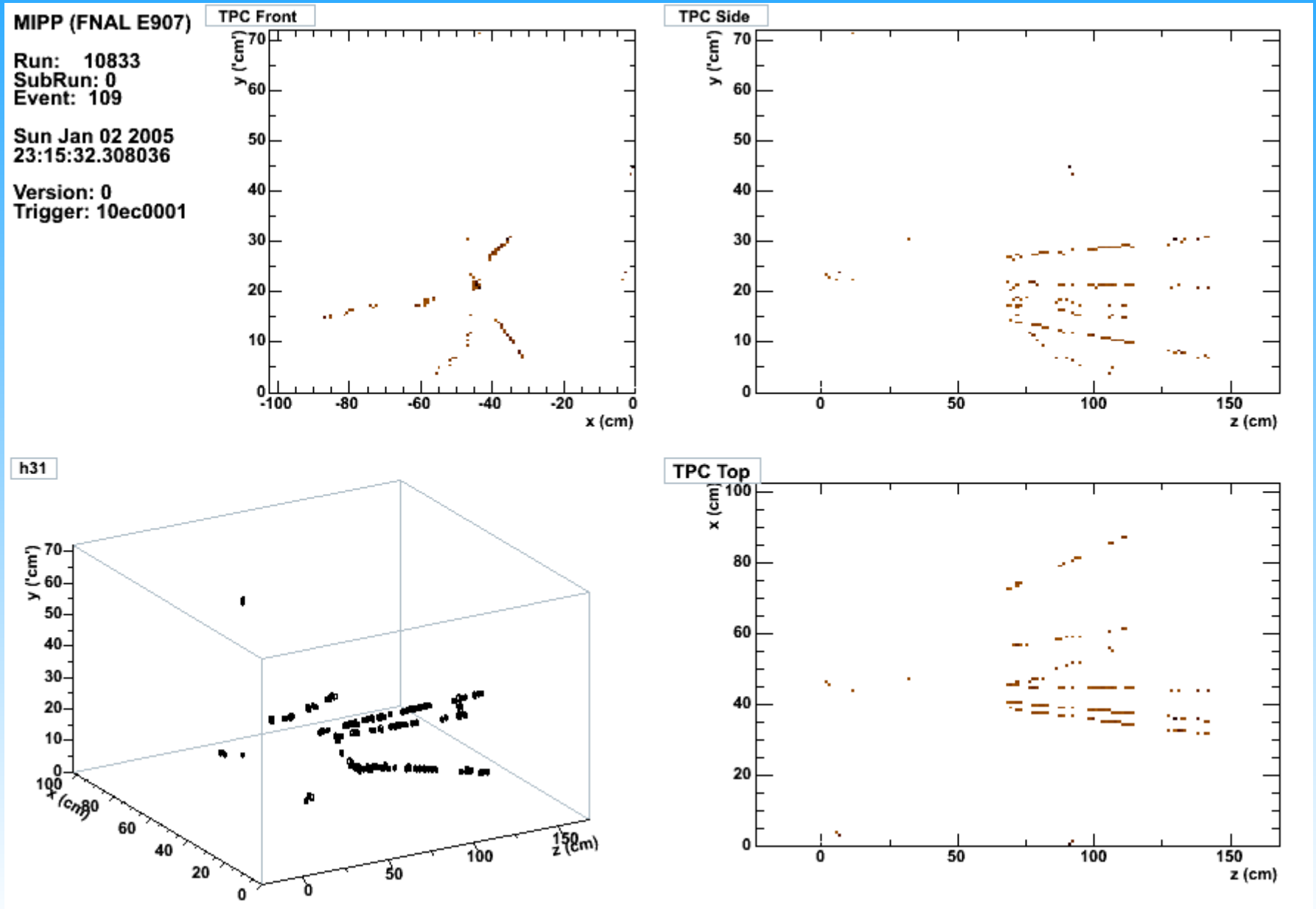
Software Status:

- Reconstruction software for the TPC, Beam Chambers, ToF and RICH detectors exists
- TPC track and vertex reconstruction mostly working
- Software for the other detectors is under development
- Full tracking through the spectrometer is a work-in-progress
- Lack of man-power and higher-priority hardware issues have hampered progress in the offline software development

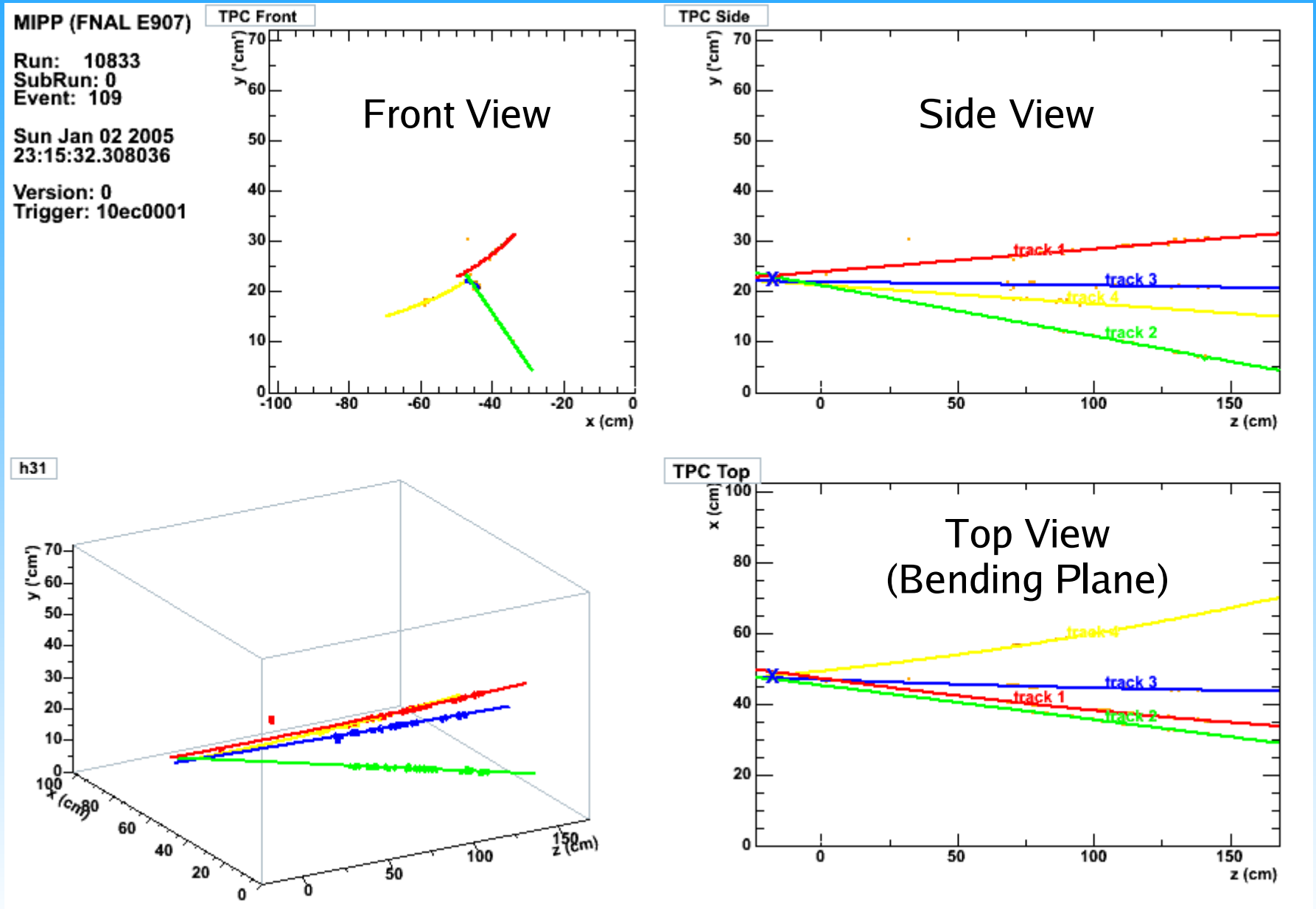
TPC Track and Vertex Reconstruction



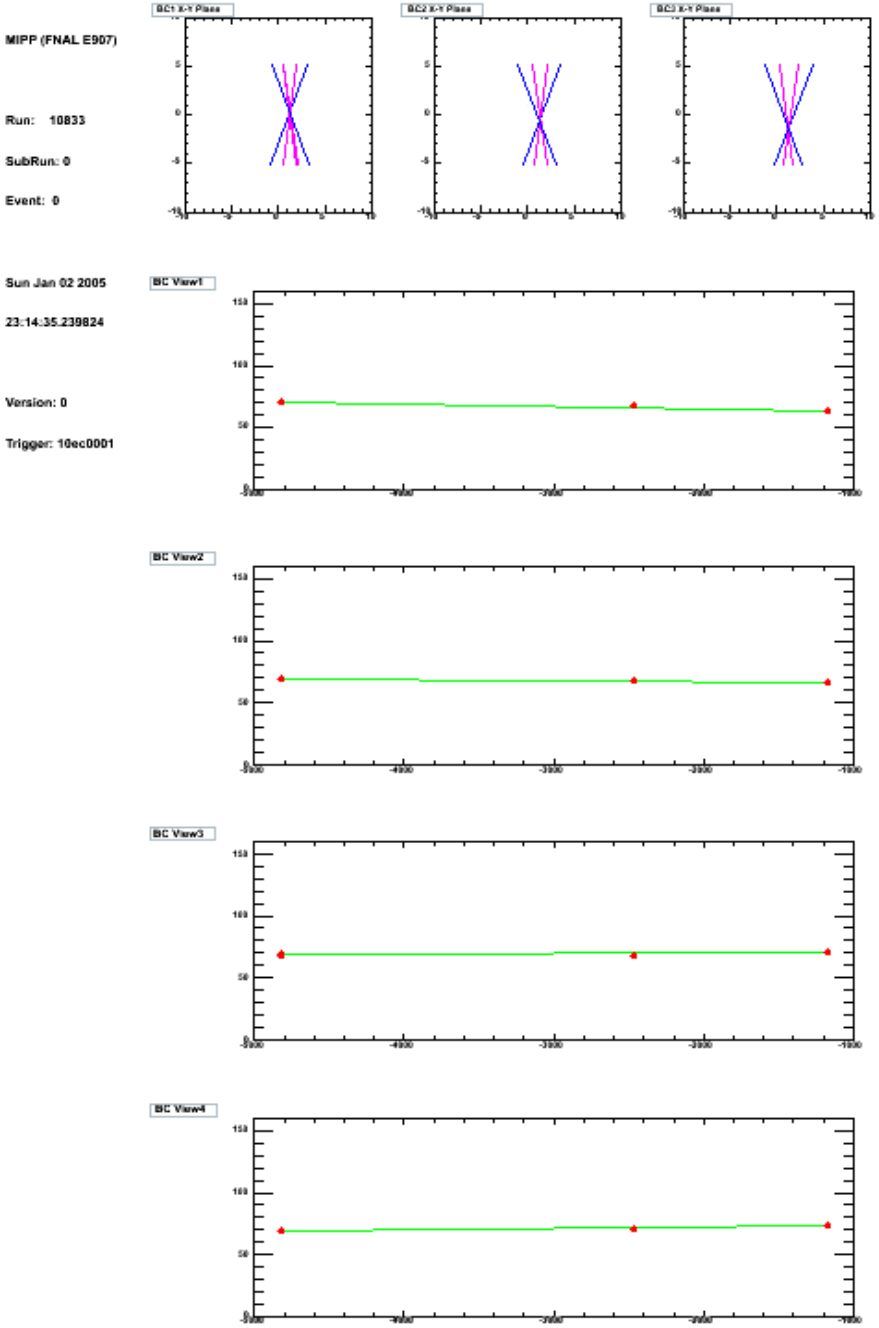
TPC Track and Vertex Reconstruction

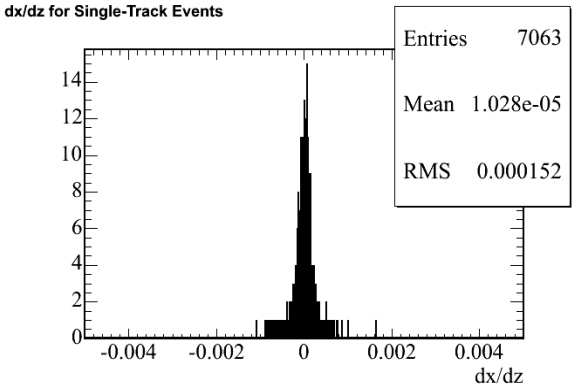


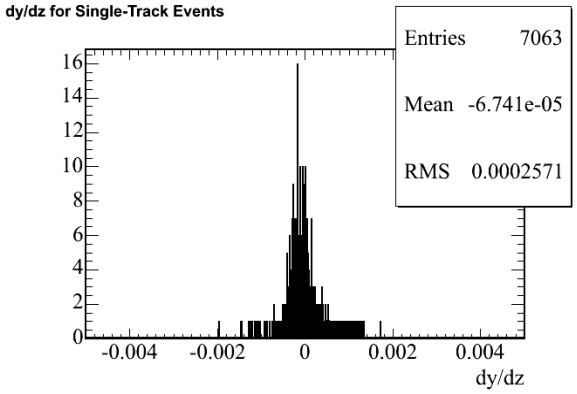
TPC Track and Vertex Reconstruction

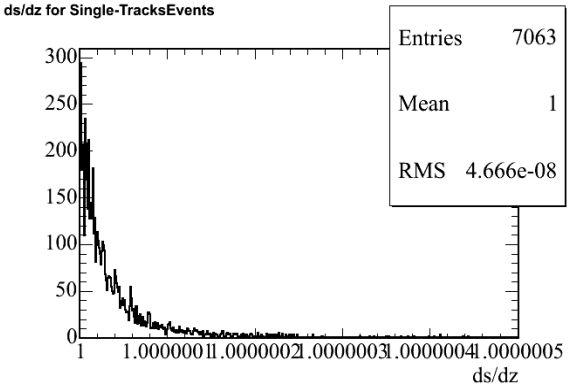


Beam Chamber Reconstruction



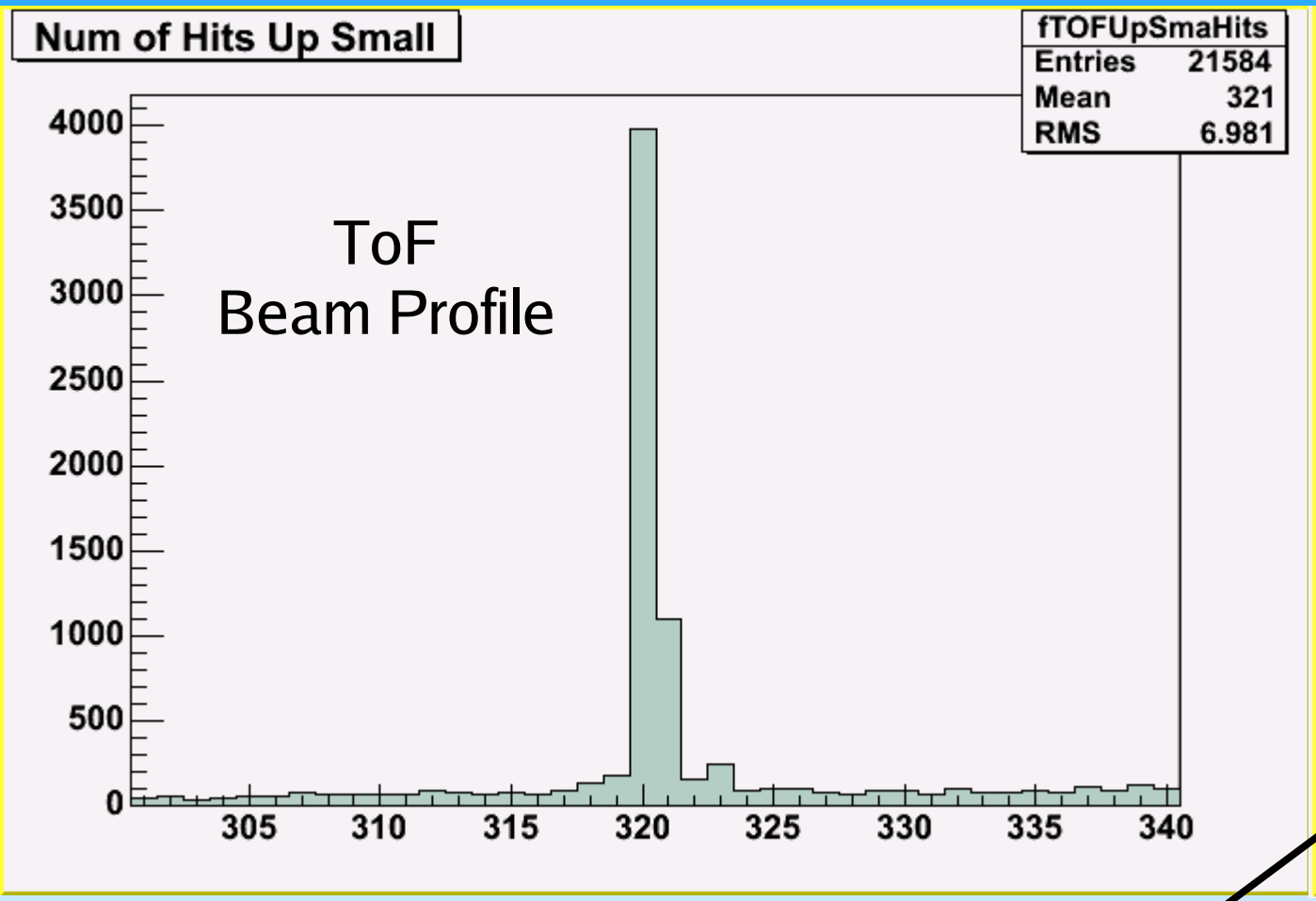


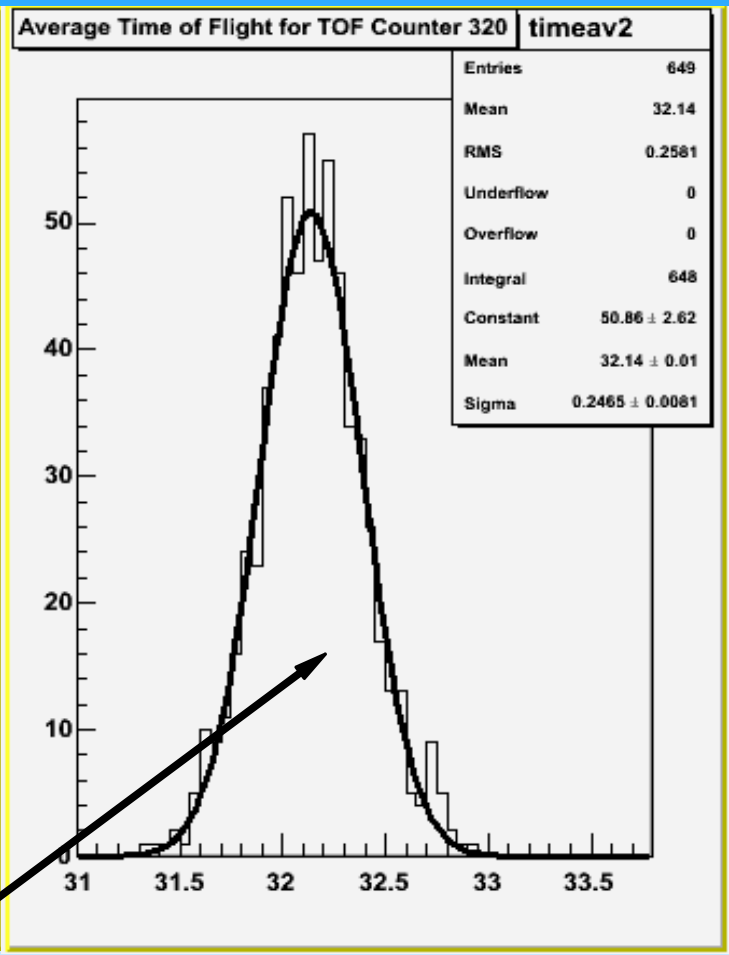




Beam Chambers upstream of the target will help constrain the fitted interaction vertex position.

ToF Data Analysis

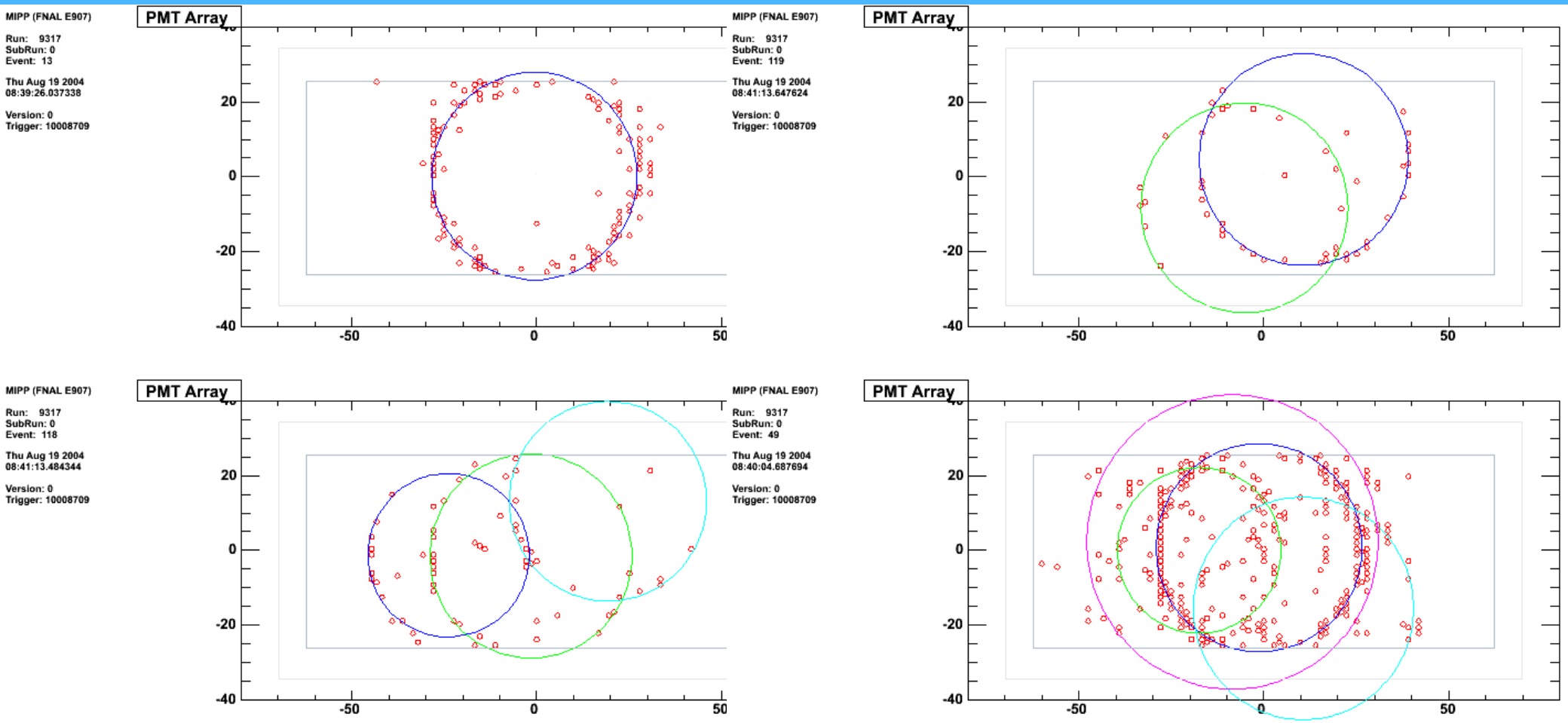




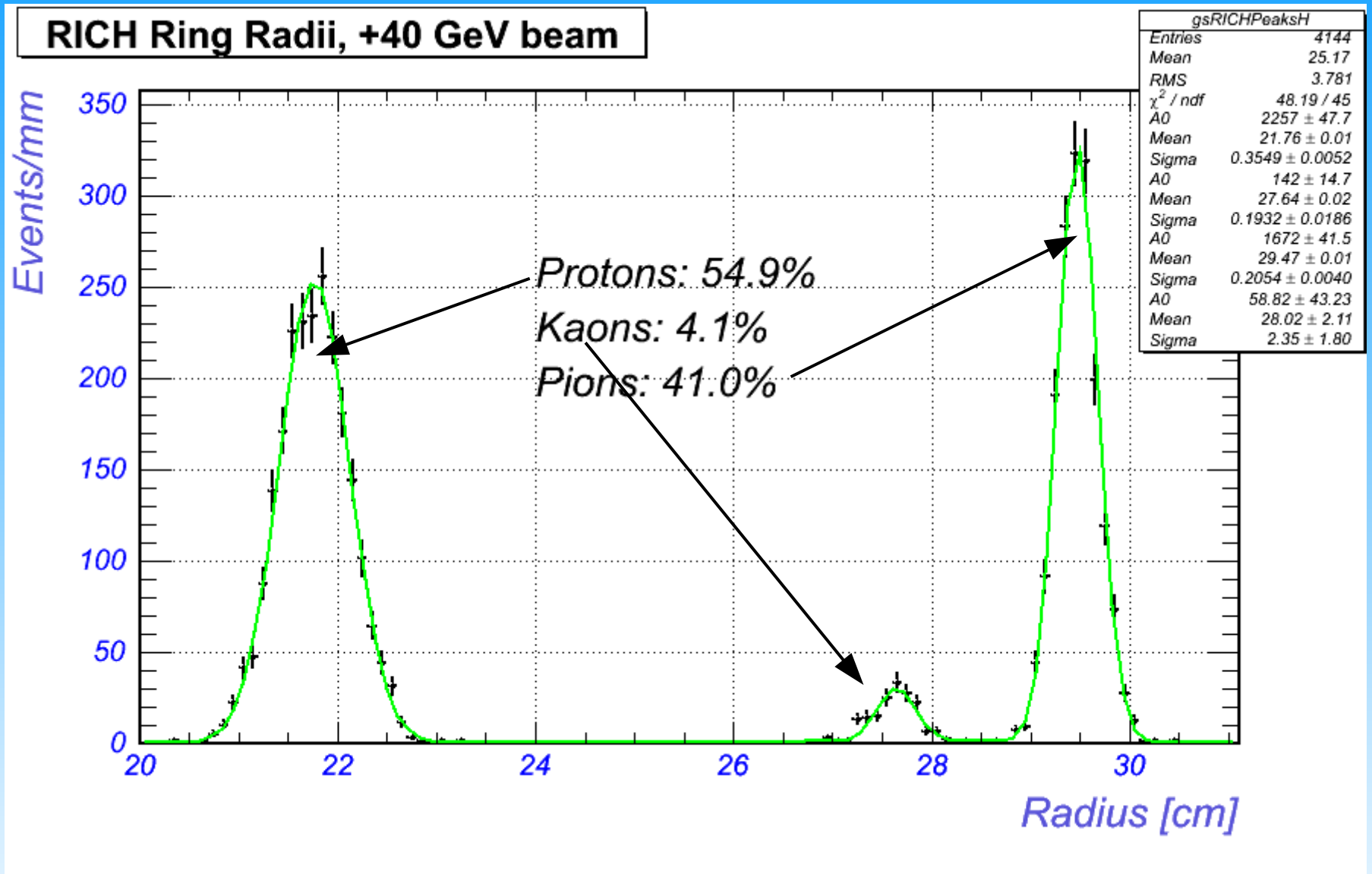
Resolution: ~250 +/- 8 ps

RICH Reconstruction

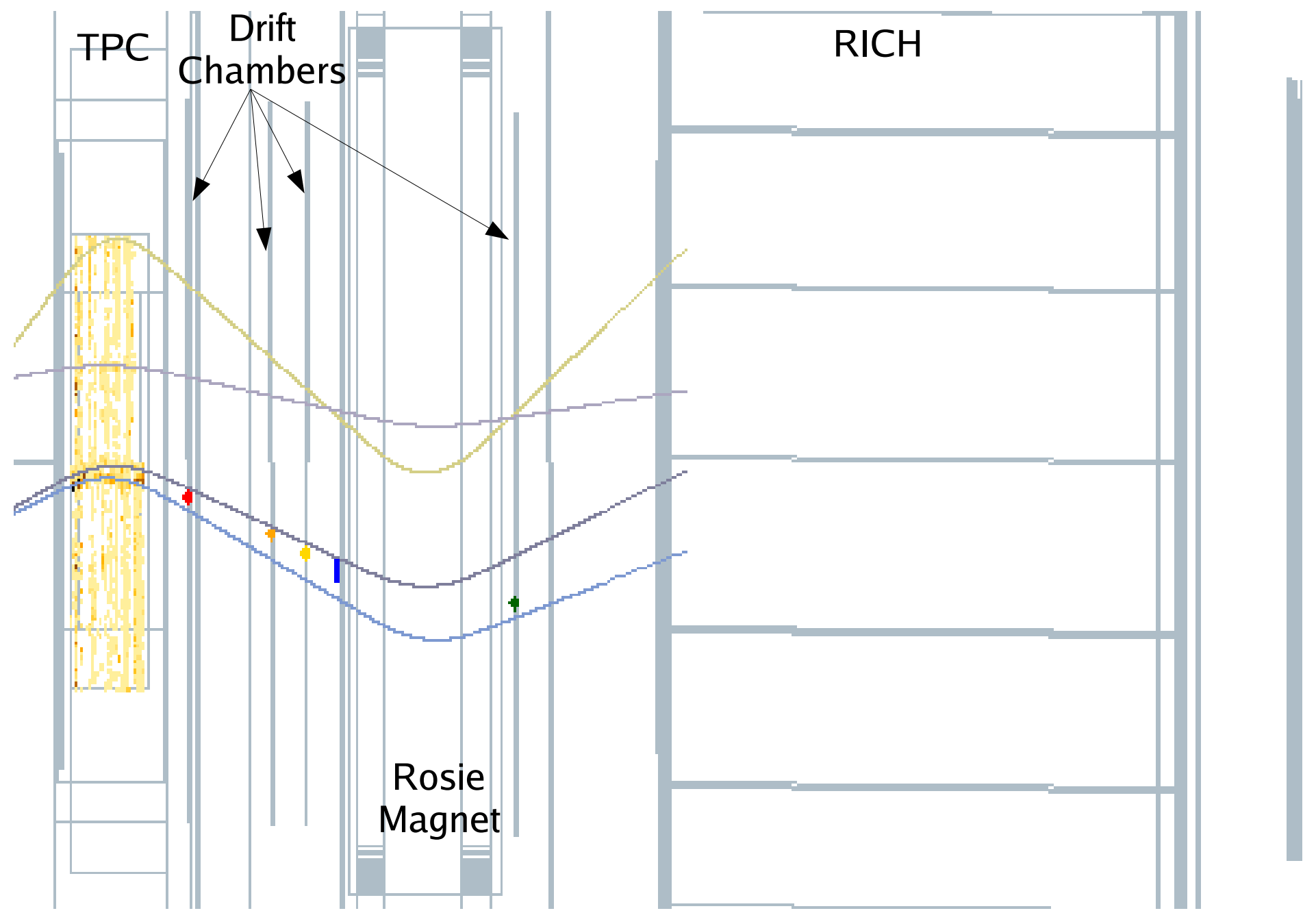
Stand-alone analysis package finds and fits RICH rings:



Estimation of the beam particle content:



Top View



2005 Run Plan

- 2005 run plan established with input from both the directorate (Director's Review in Nov. '04) and the entire MIPP collaboration
- Running will be split up into 26 “data points” according the three main physics interests:
  - Scaling law (liquid H_2)
  - Thin targets
  - NuMI
    - includes thin C-target measurements at various momenta
    - 5-10 x 10^6 total events split between thin C-target and full NuMI target measurements

NuMI Target Measurement

- Original plan: each of the three physics interests gets 20% of their data set in the initial data-taking period.
- However, setting up our beamline for 120 GeV protons is not

an easy task!

- Current plan:
  - Thin C-target data will be collected in the first 11 weeks between 13.3 and 90 GeV.
  - NuMI target measurement will be delayed by 11 weeks (currently looking at April)
- Work still remains to be done to make the NuMI measurement:
  - Reduction of the flux in our beamline (<100k protons per spill)
  - Safety approval to run the 120 GeV beam down our line
  - Establishment of a beam tune
  - Mounting of the spare NuMI target in the E907 experimental hall

Conclusions

- All detectors are working, interaction trigger upgrade under development

- Physics data are days away!

- Progress is being made, but limited by man-power! (Anyone interested? Mark will buy you a beer! ;-)