First Look at NuMI Data from Pass4a

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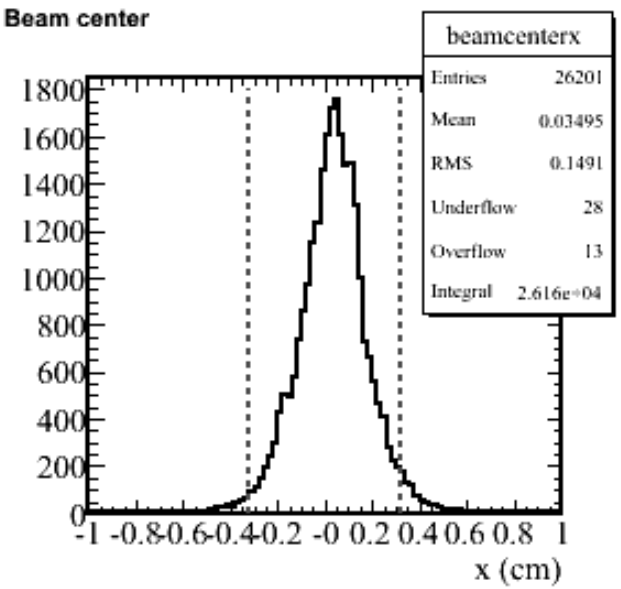
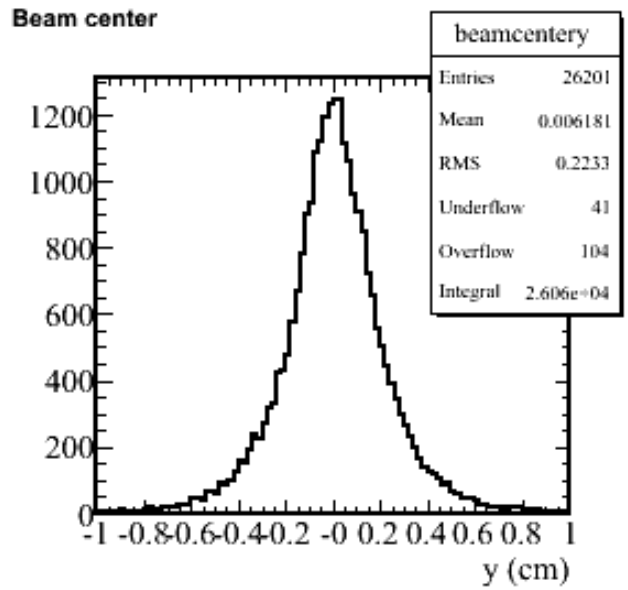
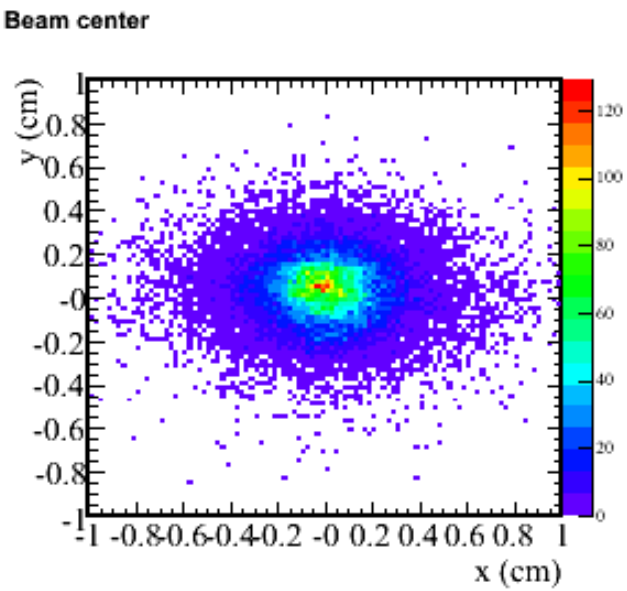
- Study NuMI data using Run 15203
  - 7 subruns; 34096 events
- Set cuts on beam/vertex/track to extract useful information
- First set of cuts:
  - DSTUtil::HavePileUp120()
  - 1 beam track events

Beam Position







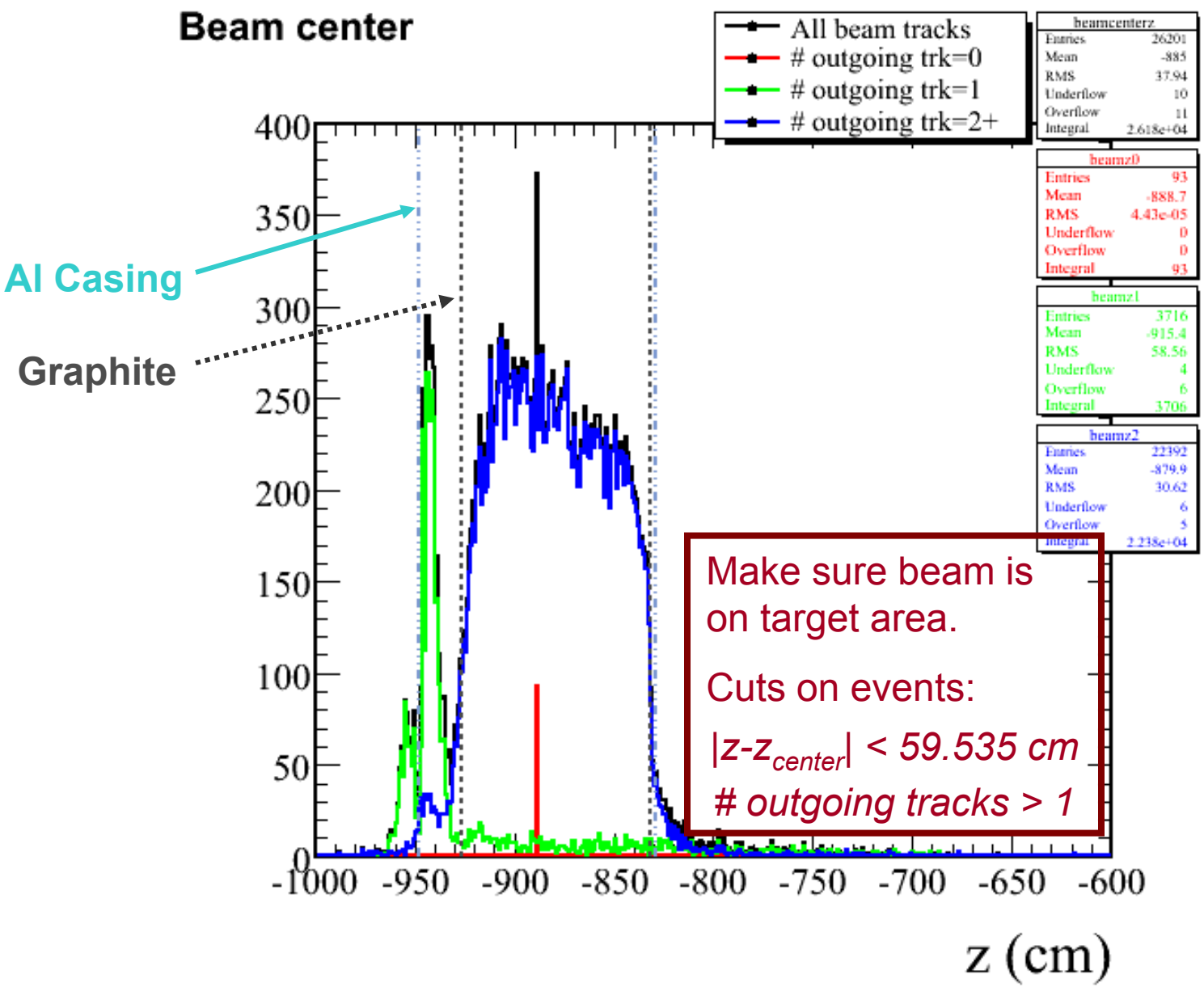
Make sure beam is on graphite target in (*x*,*y*).

Cuts on events:

$|x-x_{center}| < 0.32cm$

$|y-y_{center}| < 1.01cm$

Beam Position



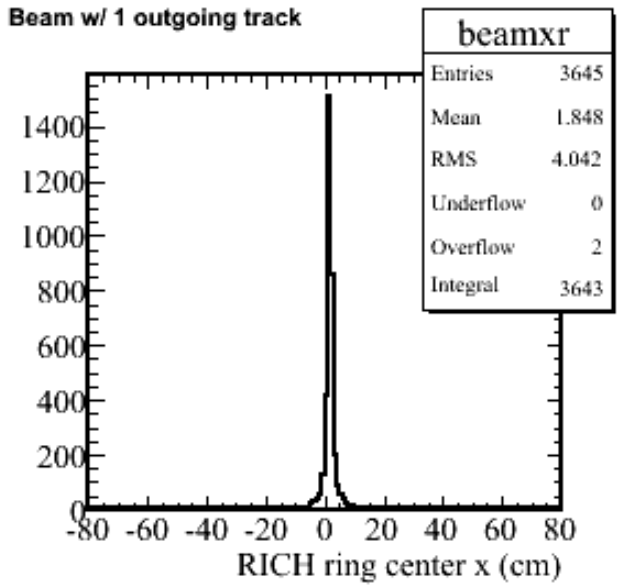
Make sure beam is on target area.

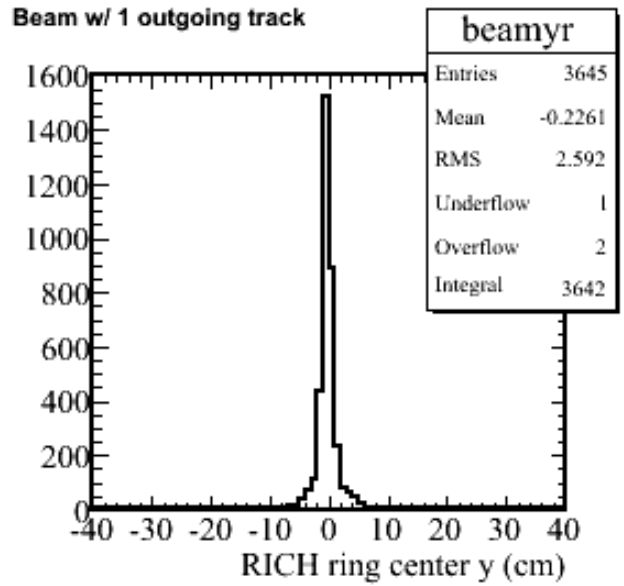
Cuts on events:

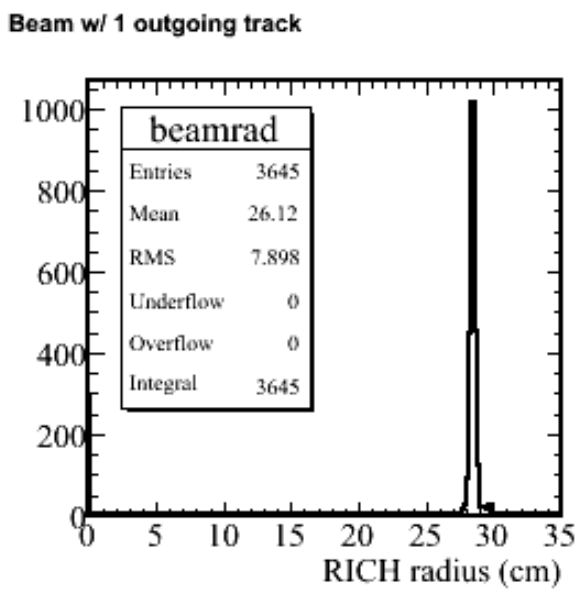
$|z-z_{center}| < 59.535$ cm

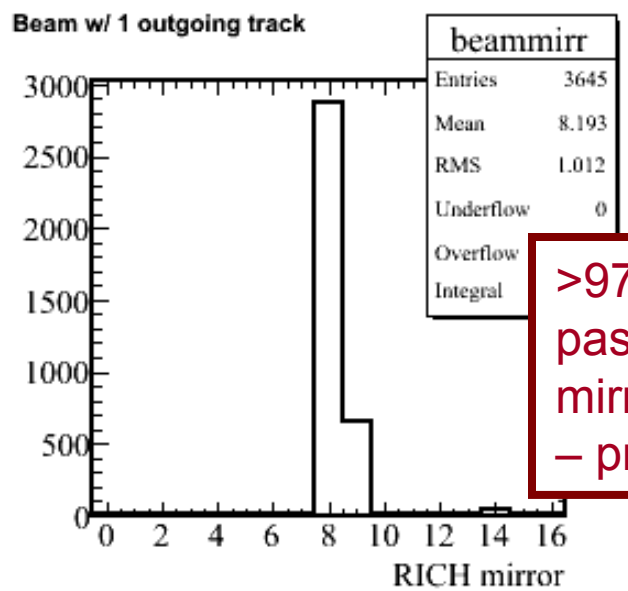
 # outgoing tracks > 1

Beam w/ 1 Outgoing Track



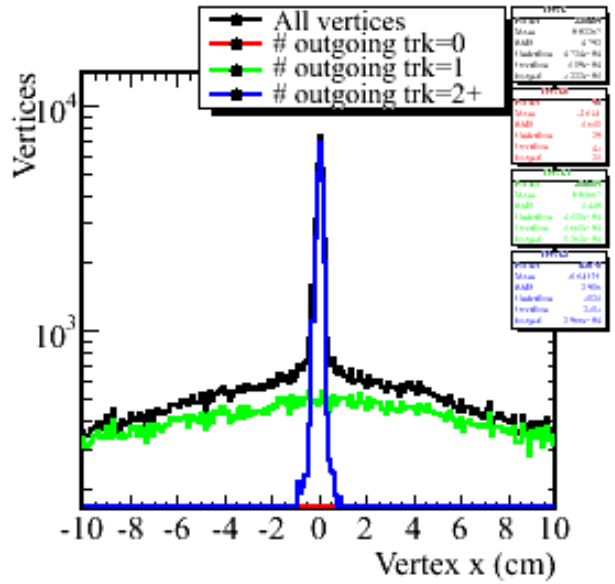


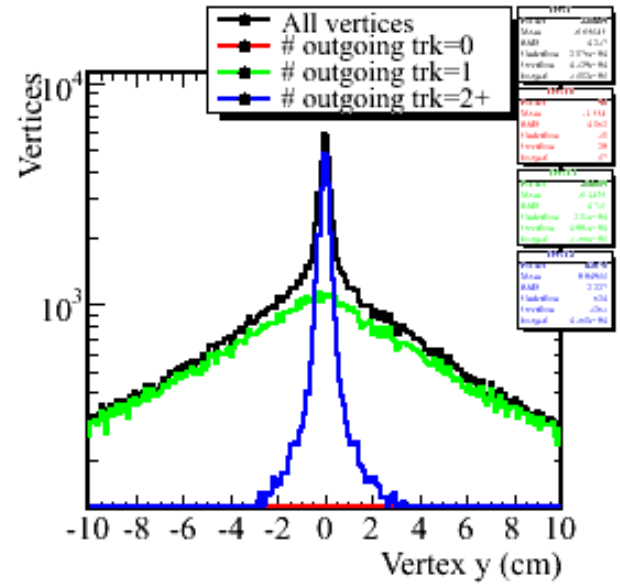


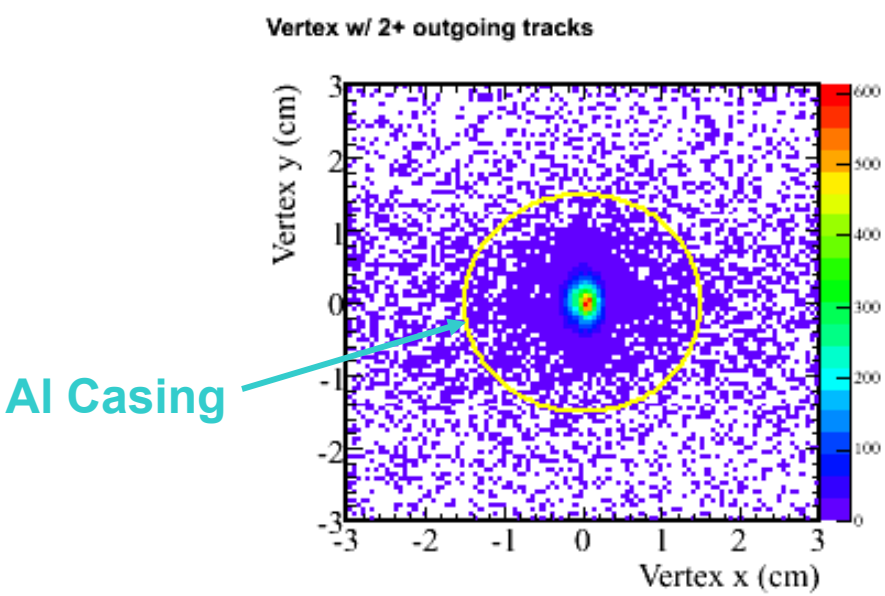


>97% tracks passing through mirrors #8 or #9 – proton beam.

Vertex Position





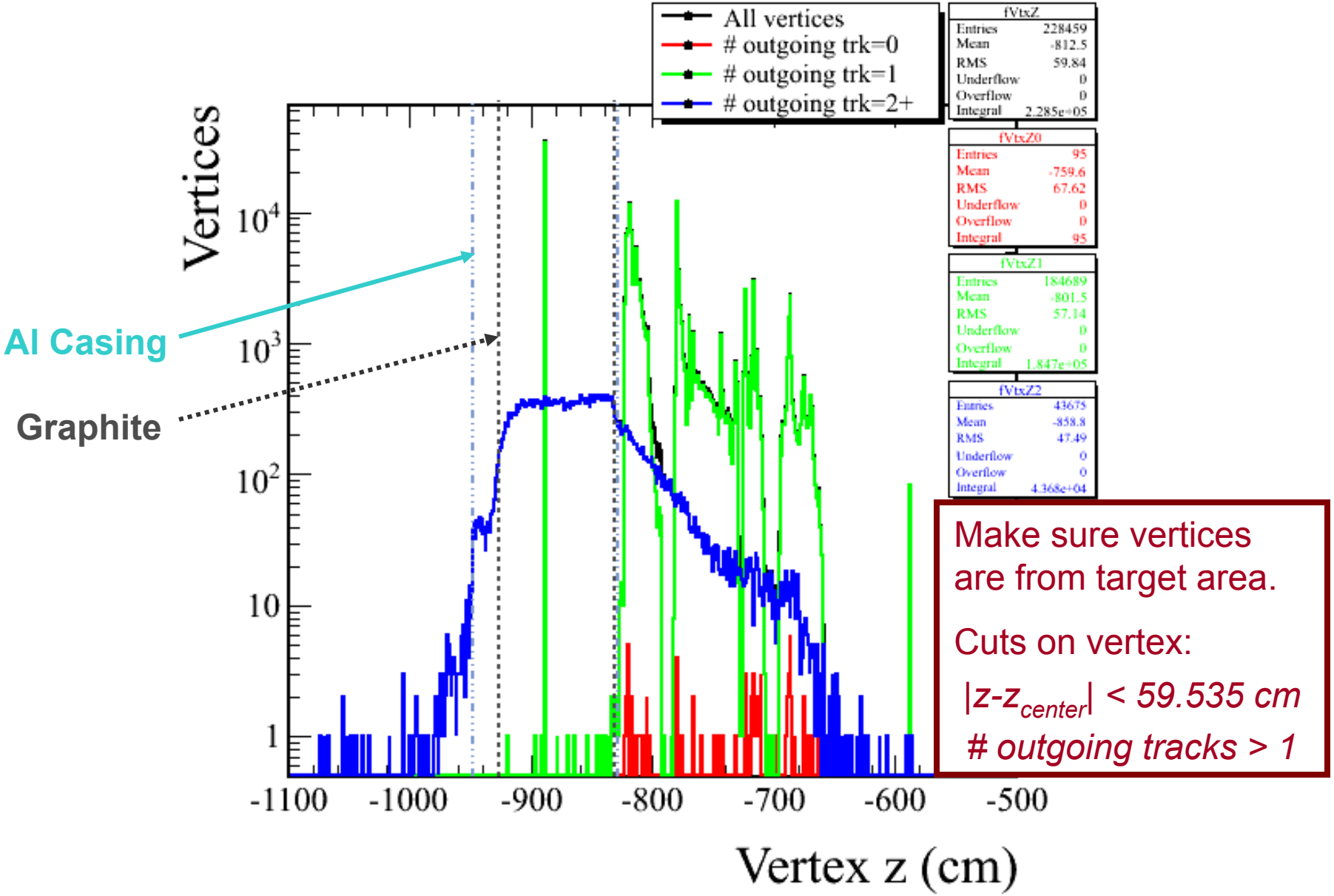


Make sure vertex is from graphite target in.

Cuts on vertices:

$(x-x_{center})^2+(y-y_{center})^2 < 1.50cm$

Vertex Position



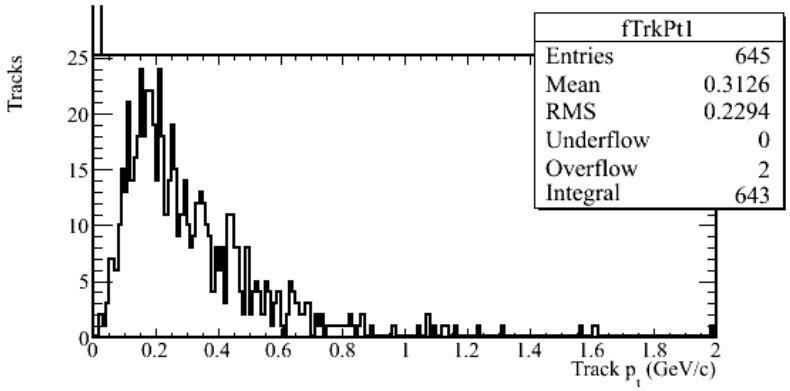
Make sure vertices are from target area.

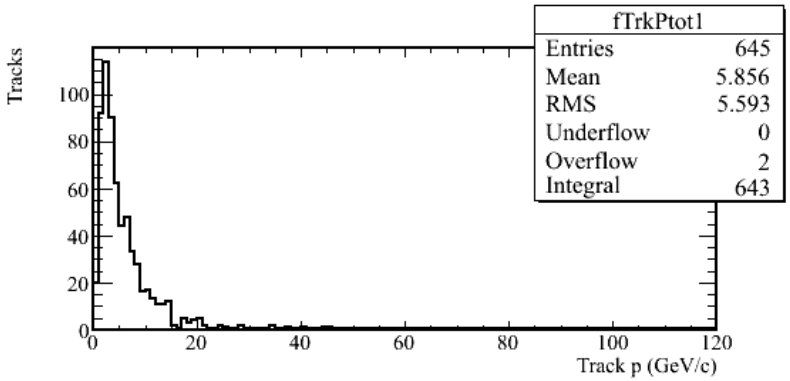
Cuts on vertex:

$|z-z_{center}| < 59.535$ cm

 # outgoing tracks > 1

Vertex w/ 1 Outgoing Track





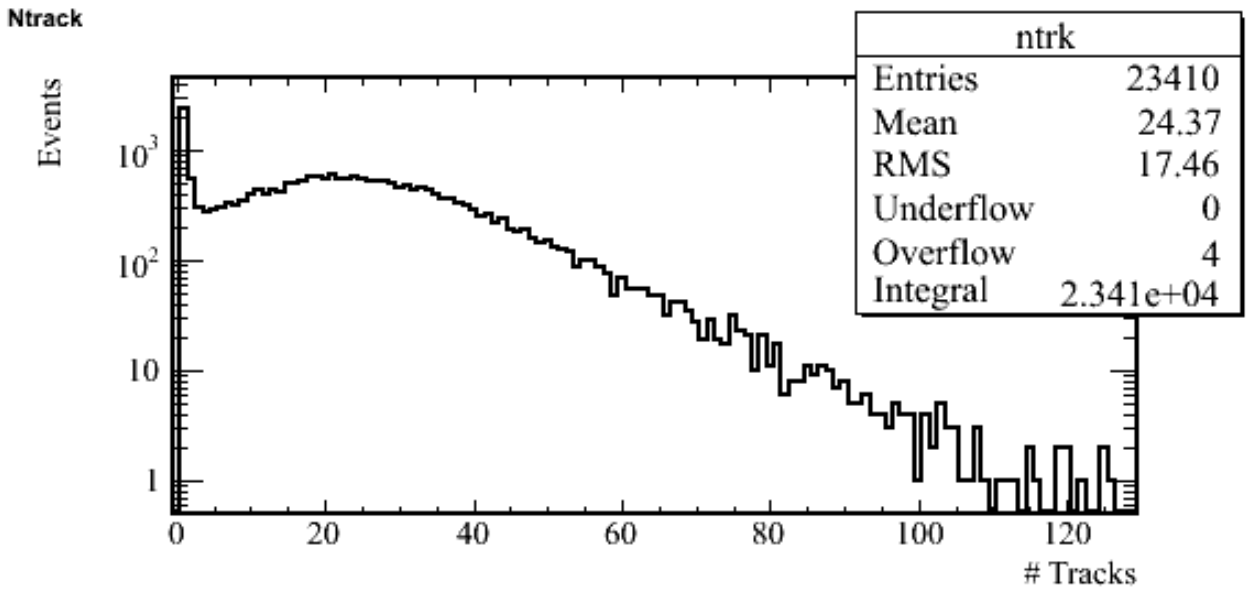
- Only 645 vertices with 1 outgoing tracks pass the following cuts (discussed later)

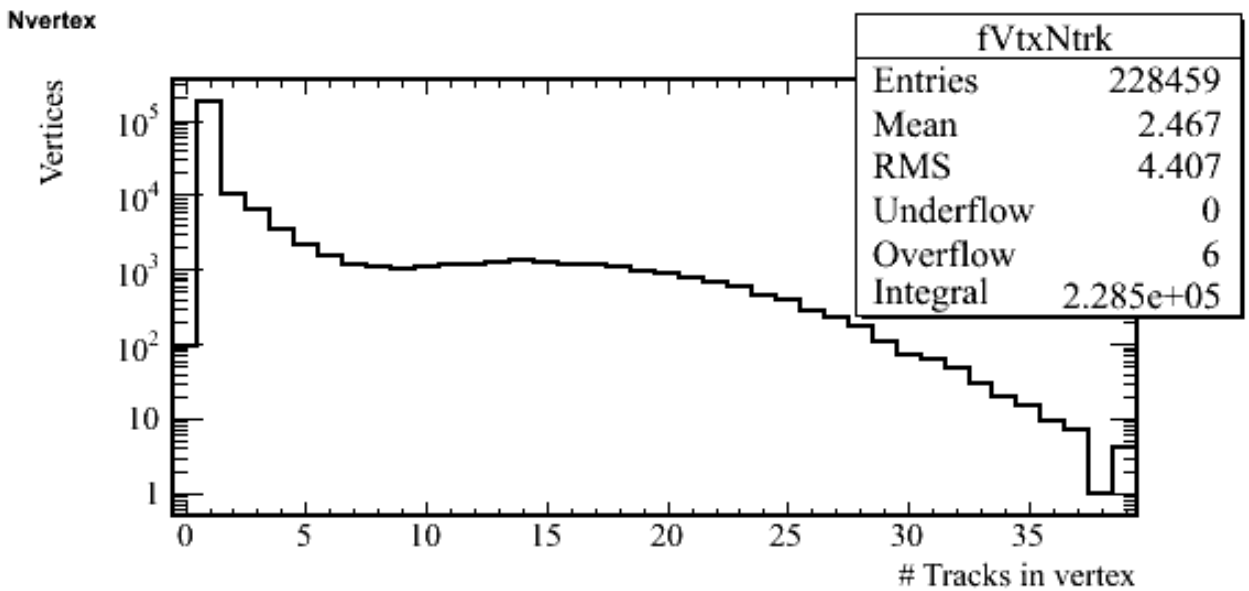
  Track GoF > 0.01

  Path in RICH CO_2 > 0

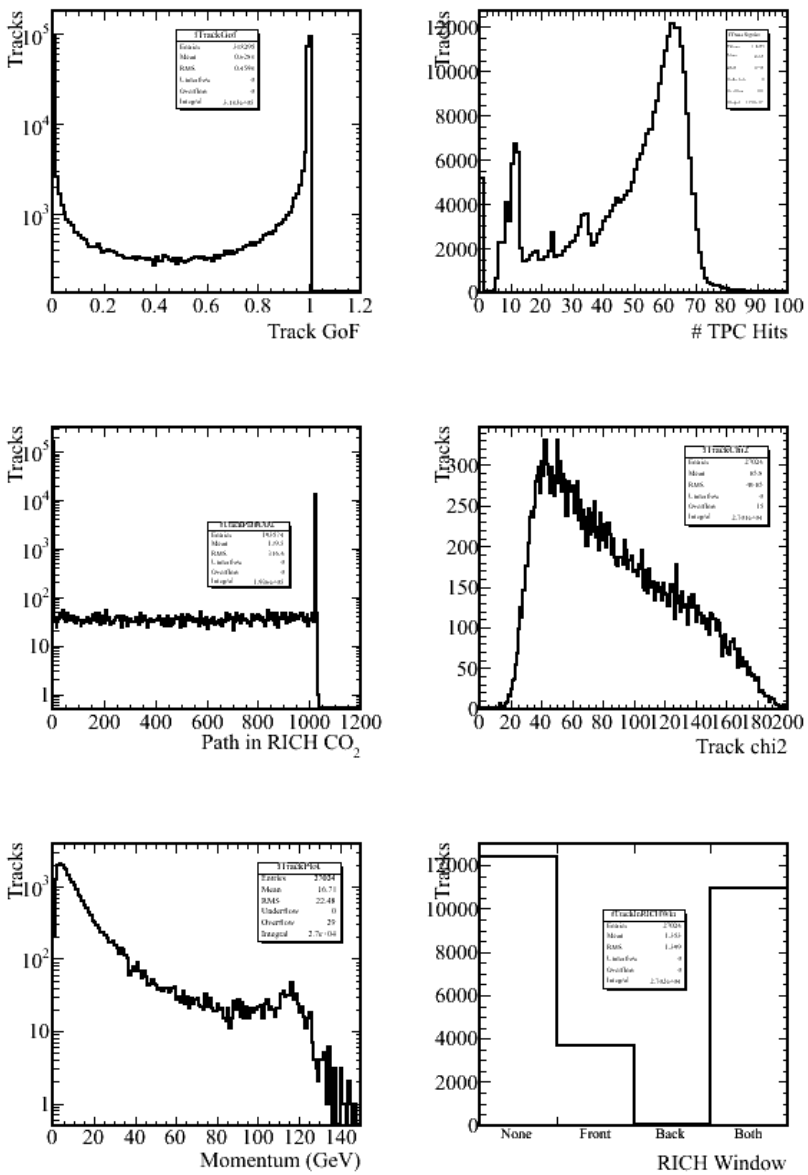
- Most of these tracks have p < 20GeV

Multiplicity





Track Properties



- Cuts on tracks:

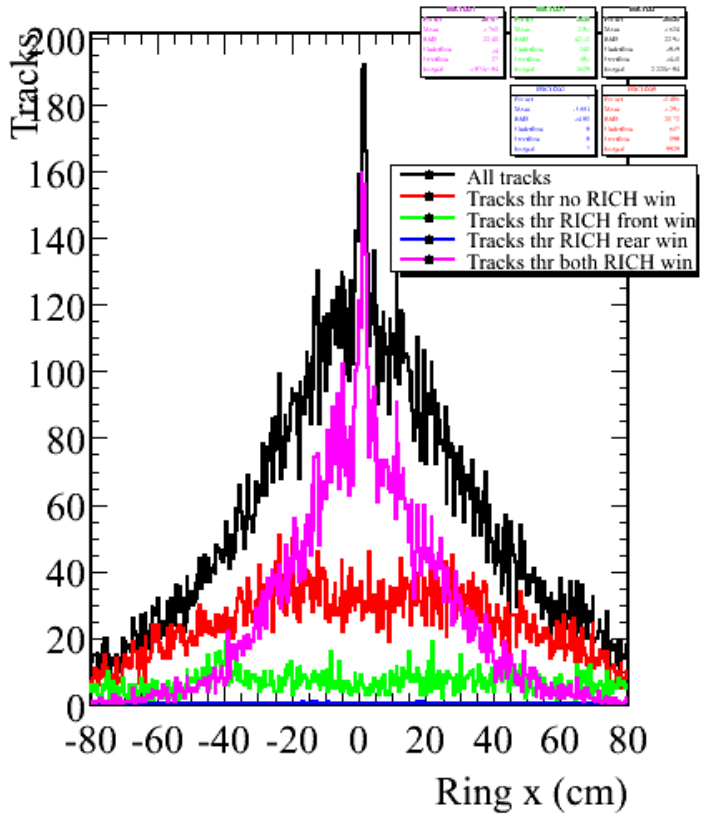
  GoF > 0.01

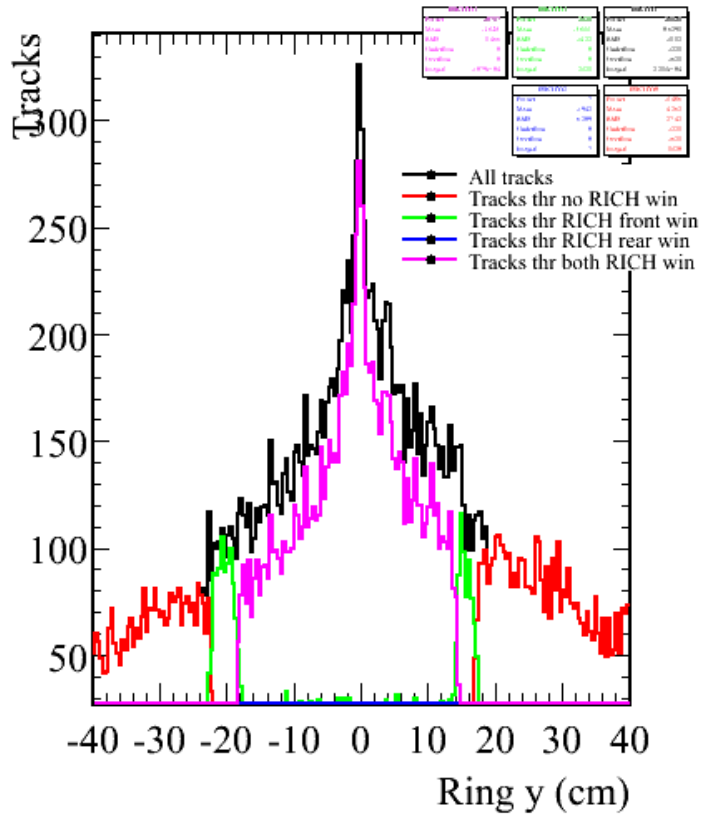
  # TPC hits > 15

  Path in RICH CO_2 > 0

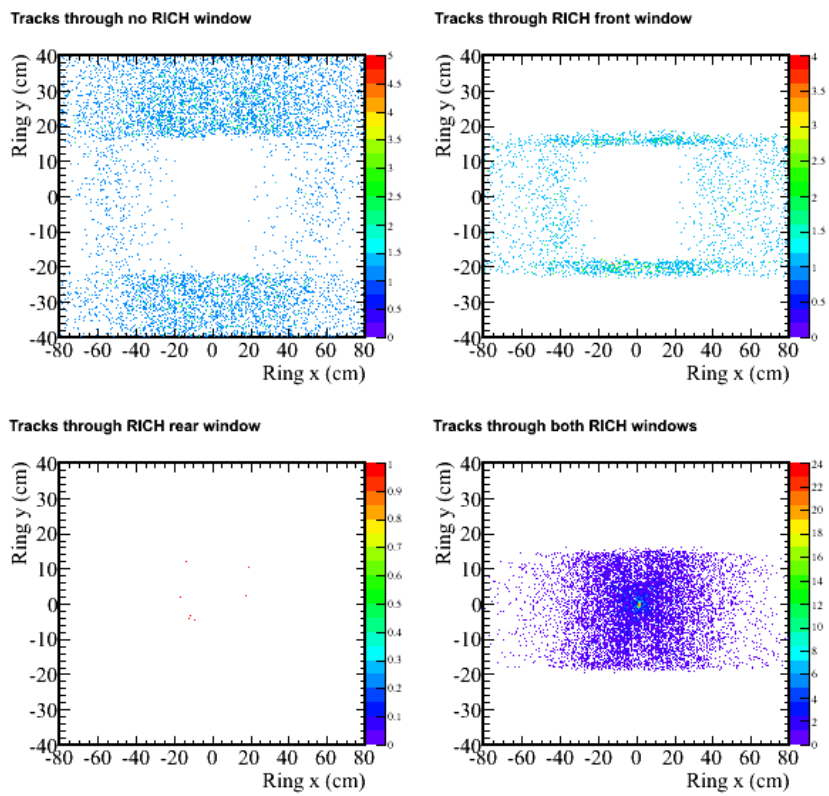
- Look more closely at tracks passing through no/front/rear/both RICH windows

Track/Ring Position





Track/Ring Position

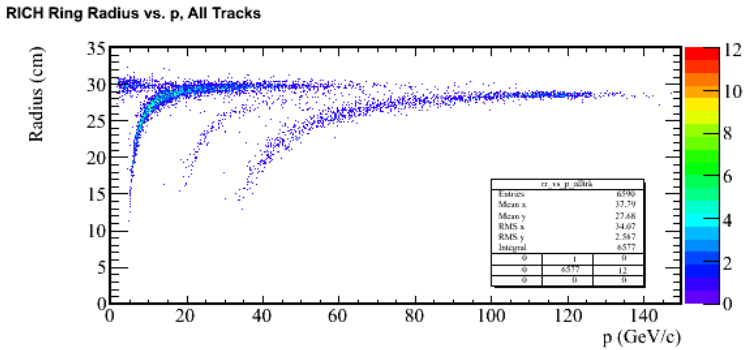


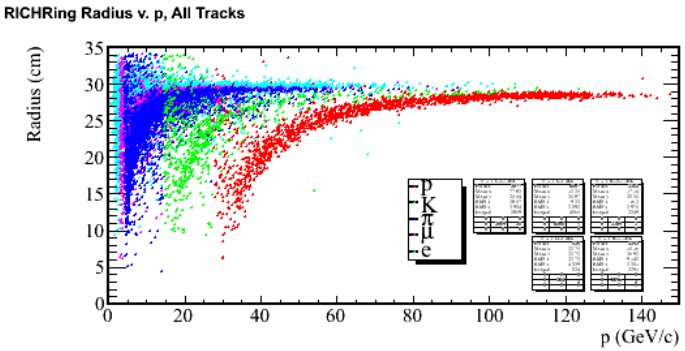
- As expected, tracks passing through both RICH front and rear windows reflected onto the center of the PMT array.
- Most tracks through RICH front window only fall in specific y range.

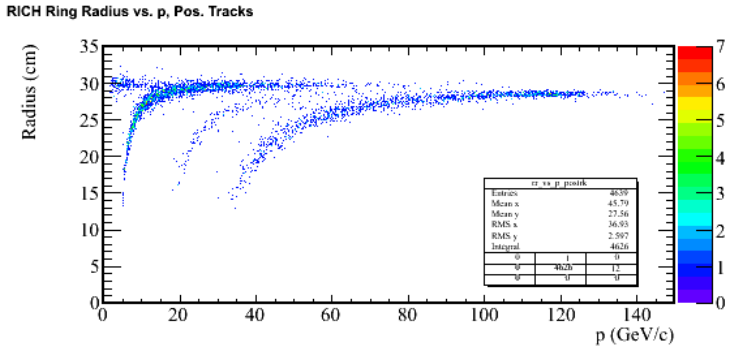
RICH Rings – Radius vs. p

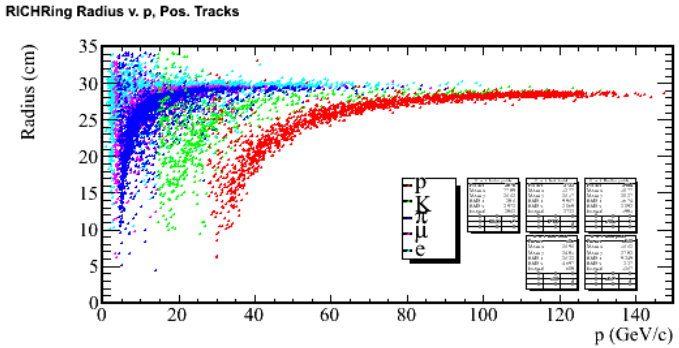
RadFit

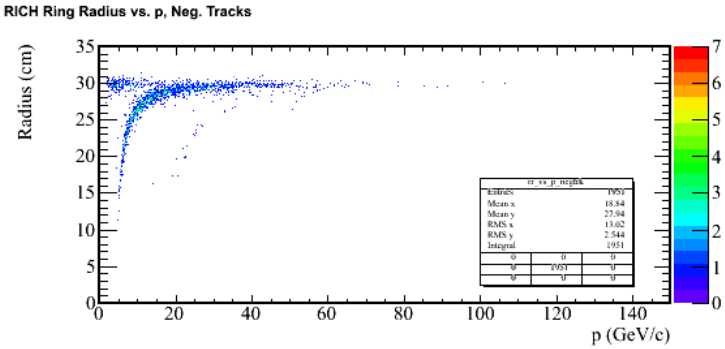
RadReco

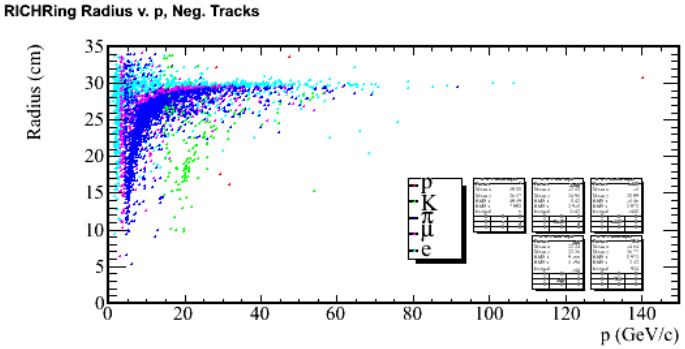








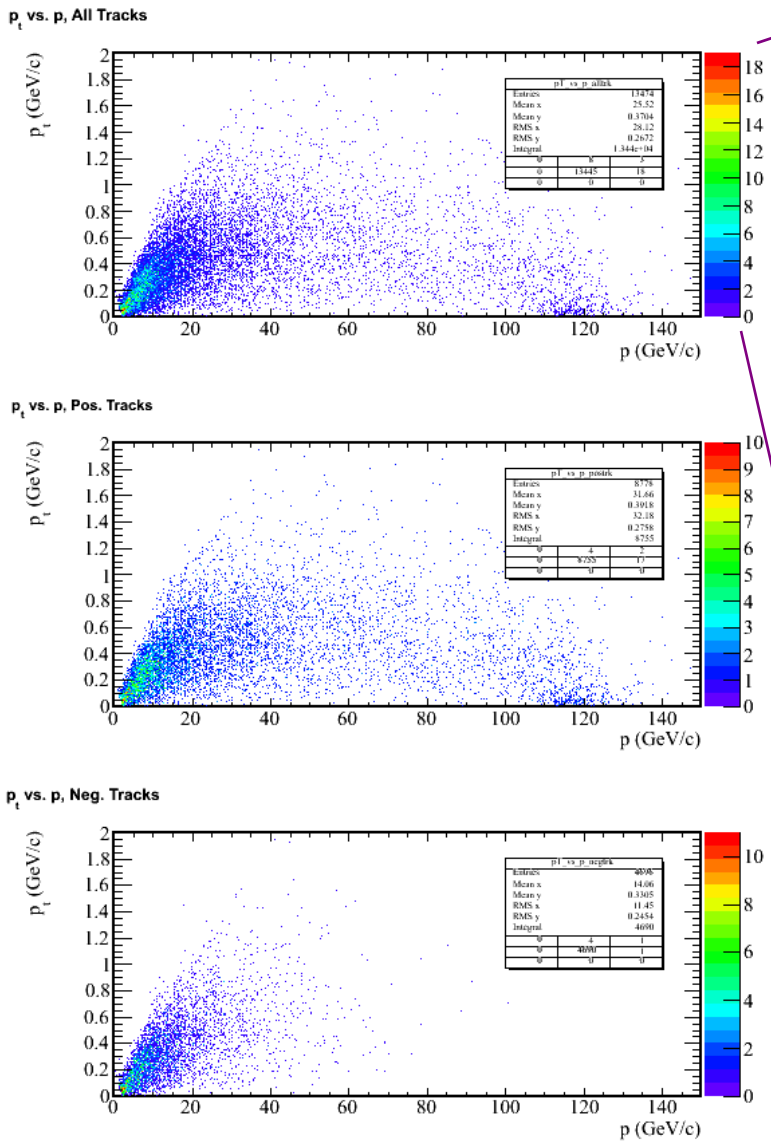


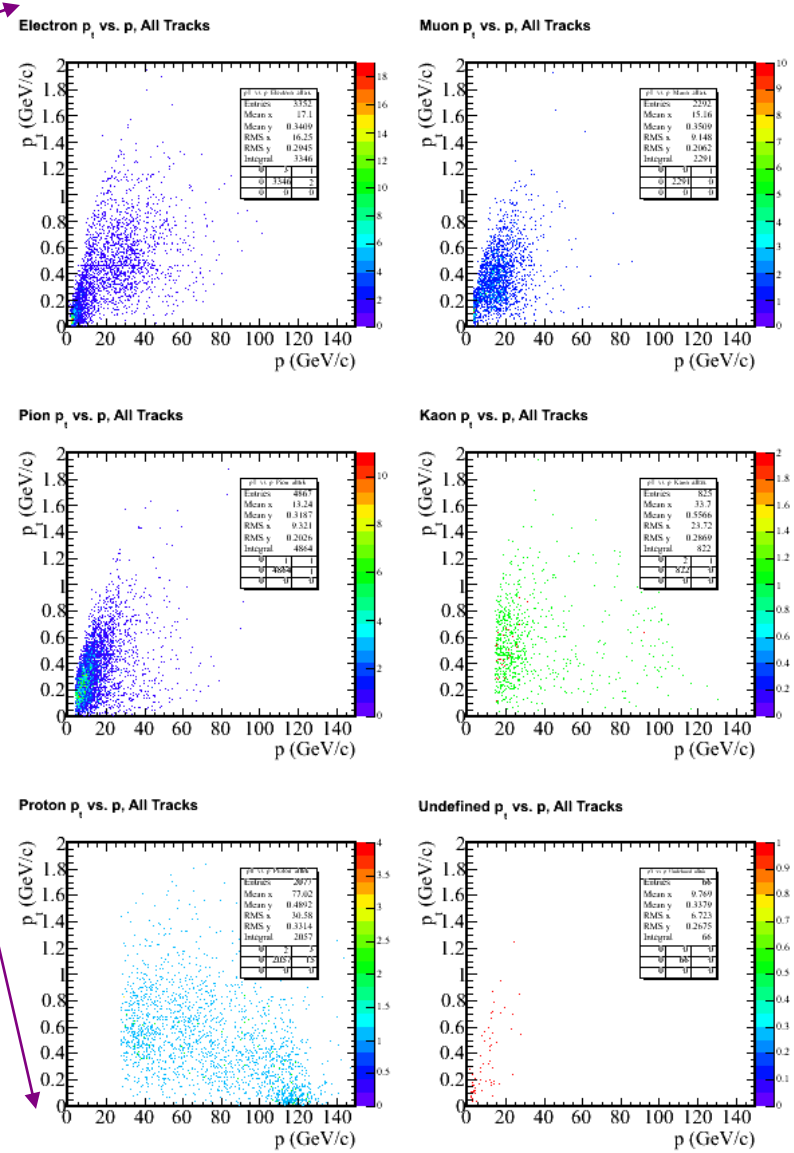


RICH Rings – p_t vs. p

All PID types

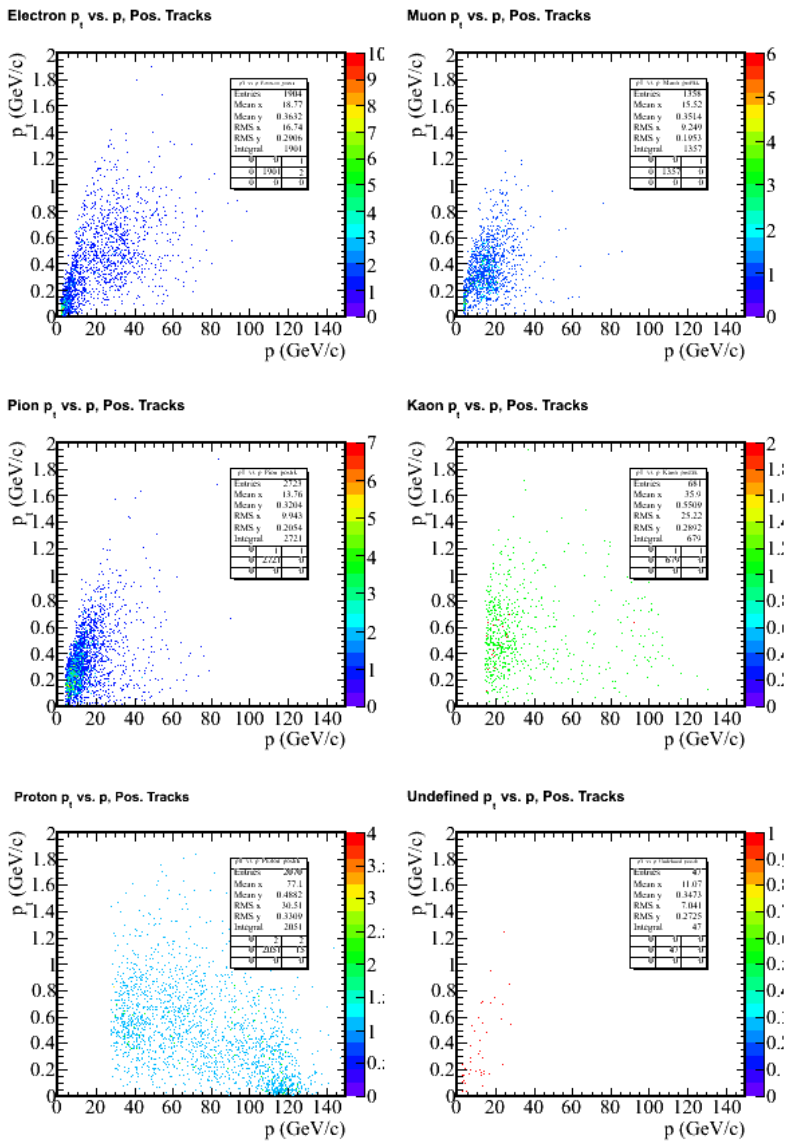
For each PID



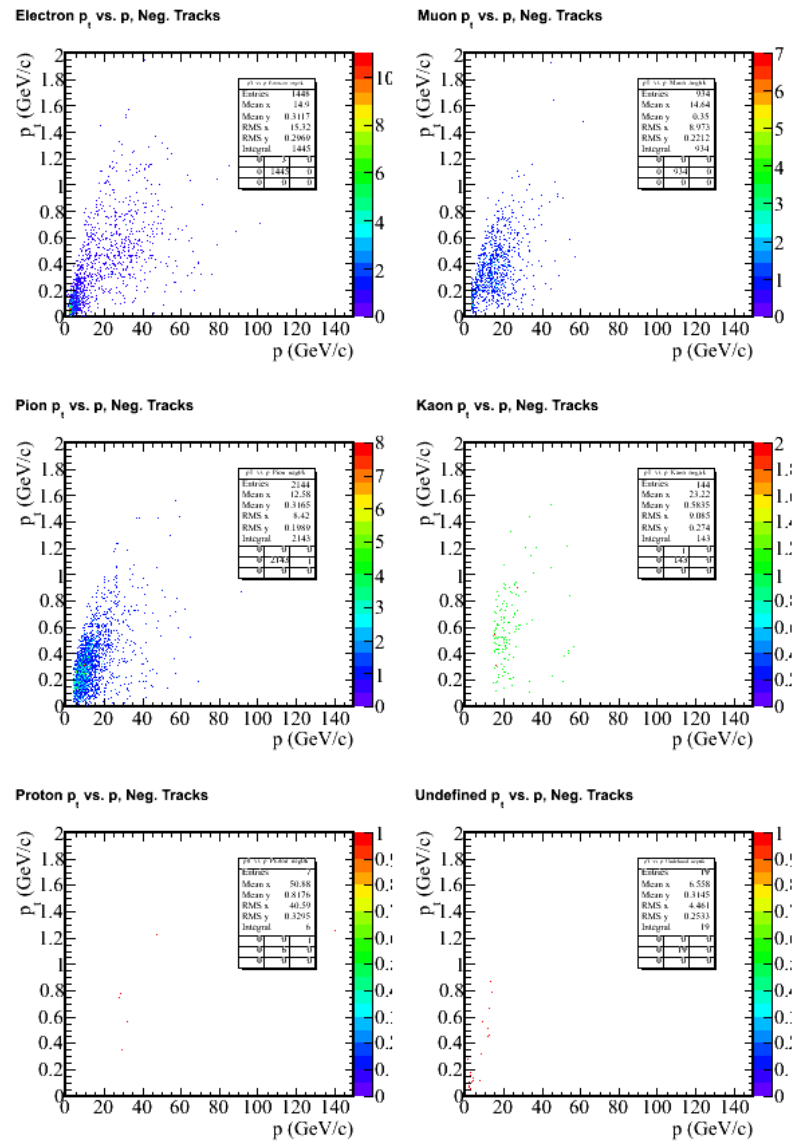


RICH Rings – p_t vs. p

Positive particles



Negative particles



Conclusion

- Results from this NuMI data set look reasonable
- Next step
  - Take a closer look at the 1 outgoing track vertices & multi-track vertices downstream of the target: can we simulate this with MC?
  - Use MC to study PID efficiency