NuMI Data/MC Comparison & RICHPID Study

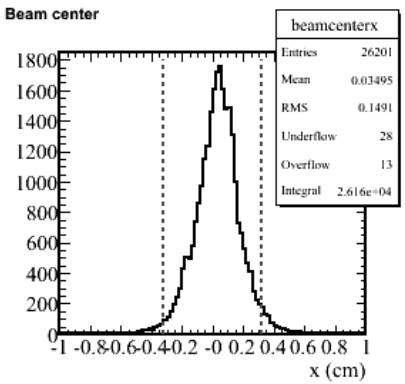
Sharon Seun

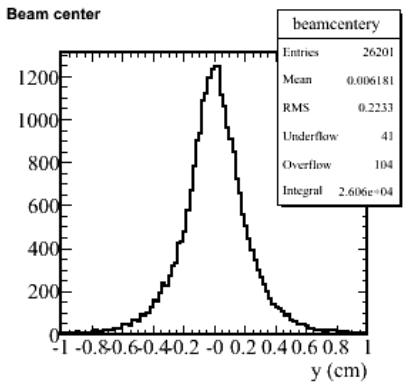
May 24, 2007

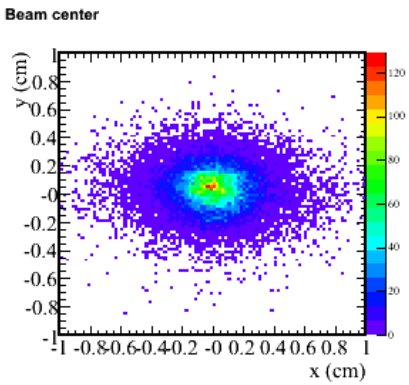
- NuMI Data/MC comparsion
  - Data: Run 13203, 7 subruns, 34096 events
  - MC: 2M events
- RICHPID Study
  - Purity for π, K
  - Efficiency for π, K

Beam Position

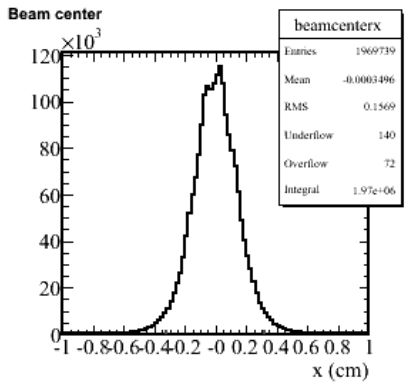
Data

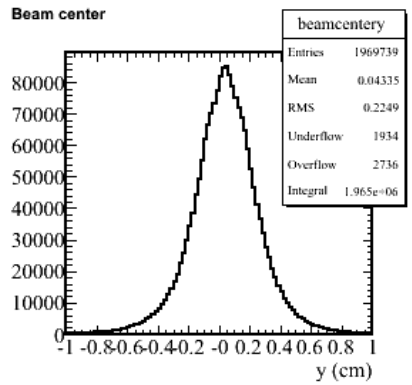


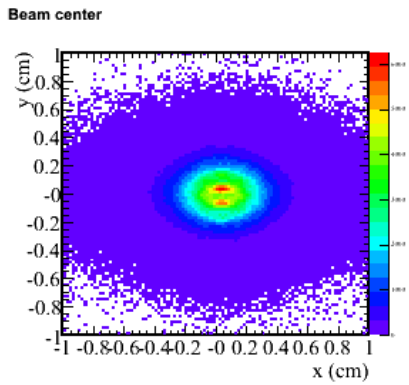




MC

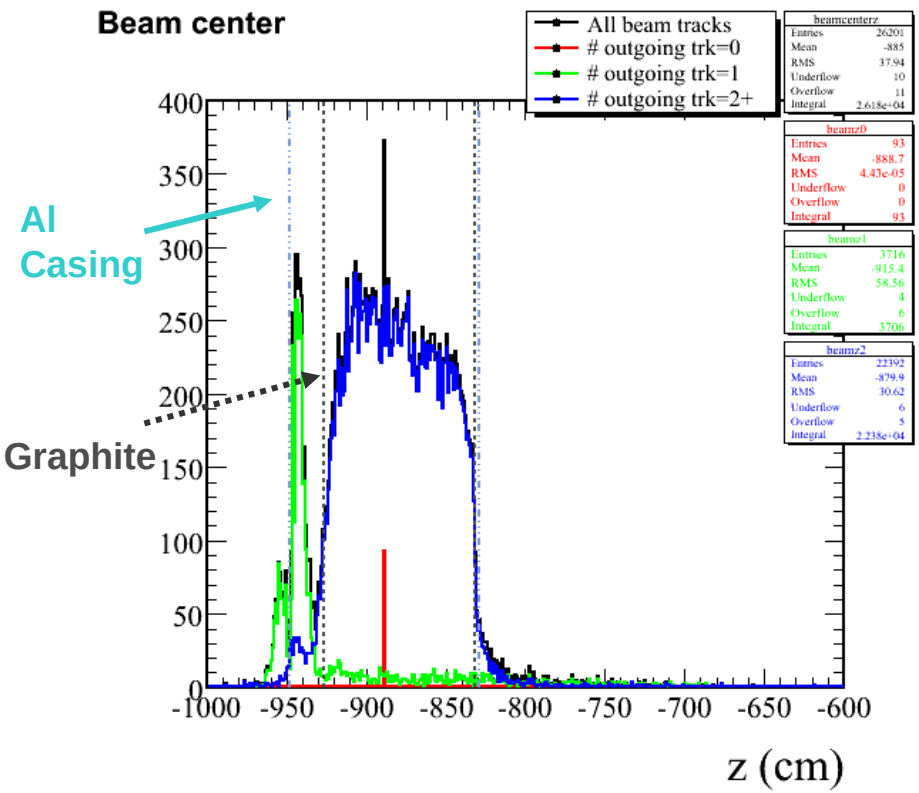




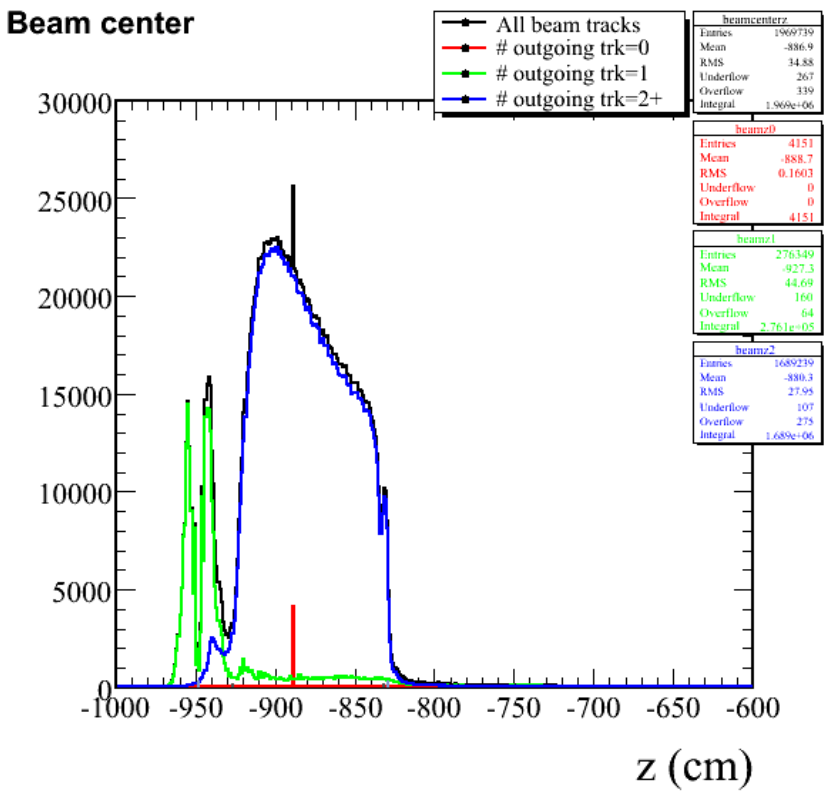


Beam Position

Data



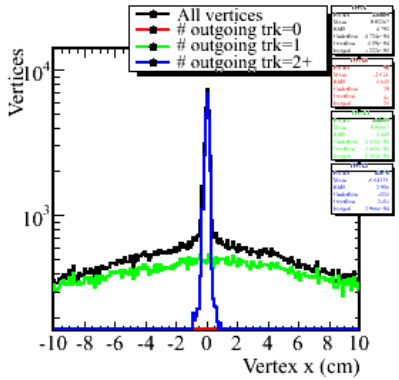
MC

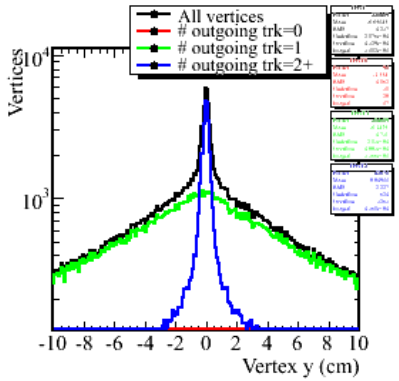


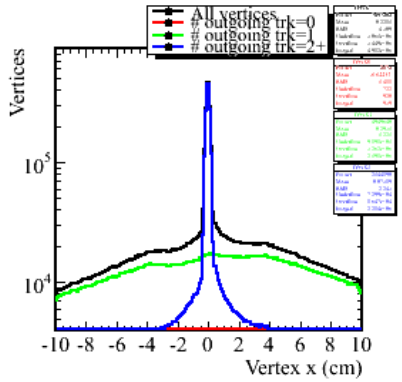
Vertex Position

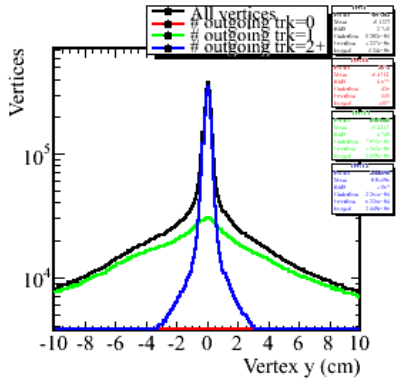
Data

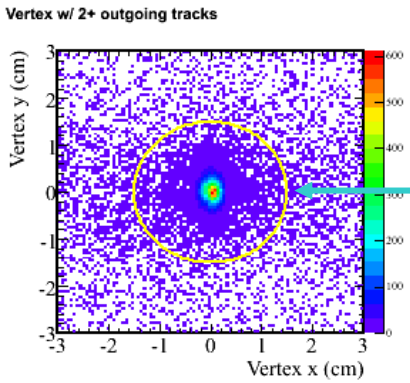
MC



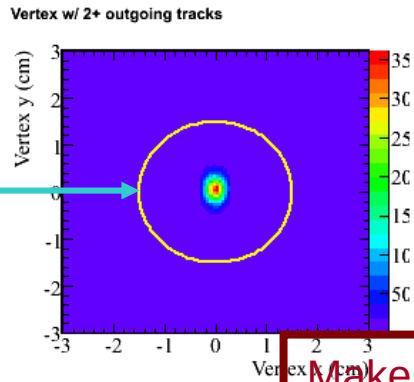








Al Casing



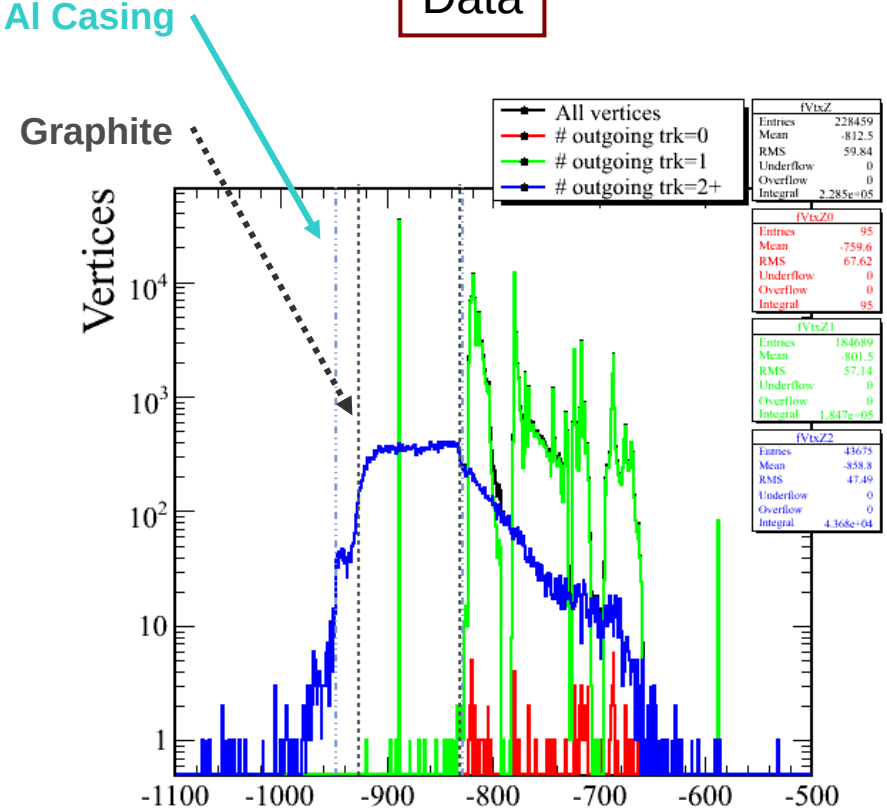
Make sure vertex is from graphite target in.

Cuts on vertices:

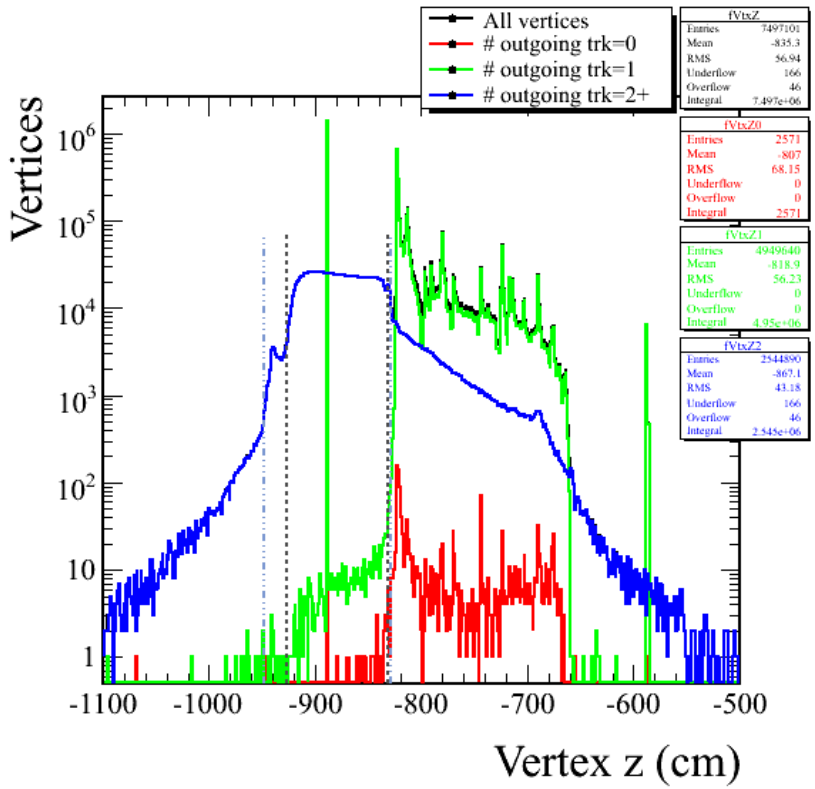
$(x-x_{center})^2+(y-y_{center})^2 < 1.50cm$

Vertex Position

Data



MC



Make sure vertices are from target area.

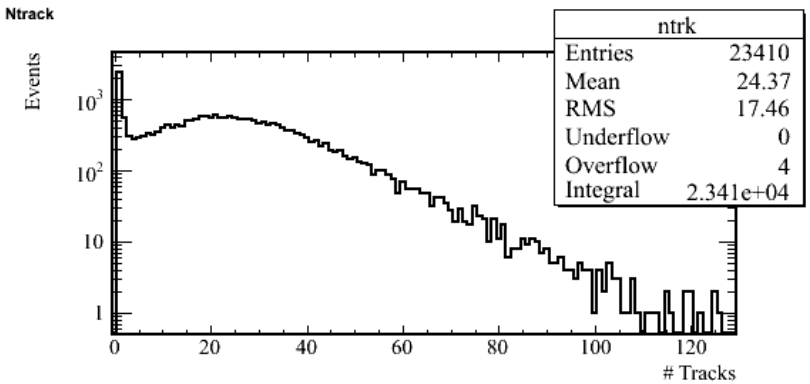
Cuts on vertex:

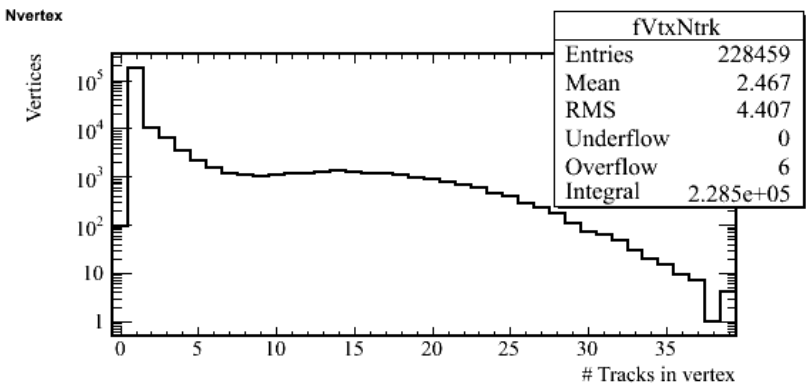
$|z - z_{center}| < 59.535$ *cm*

 # outgoing tracks > 1

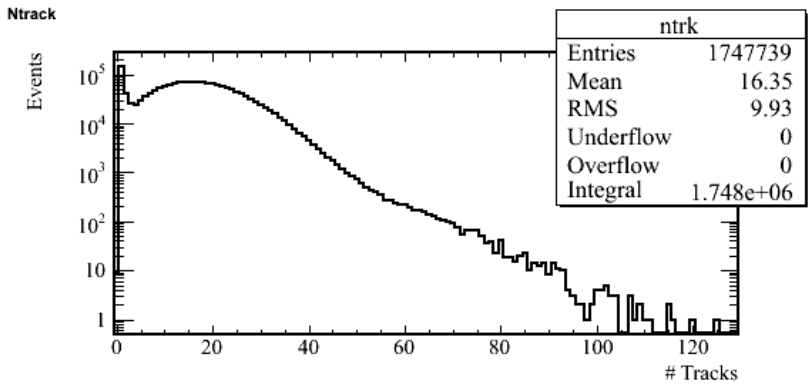
Multiplicity

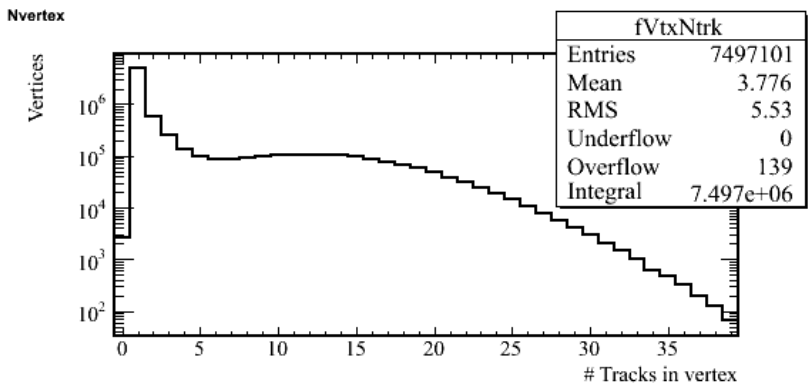
Data





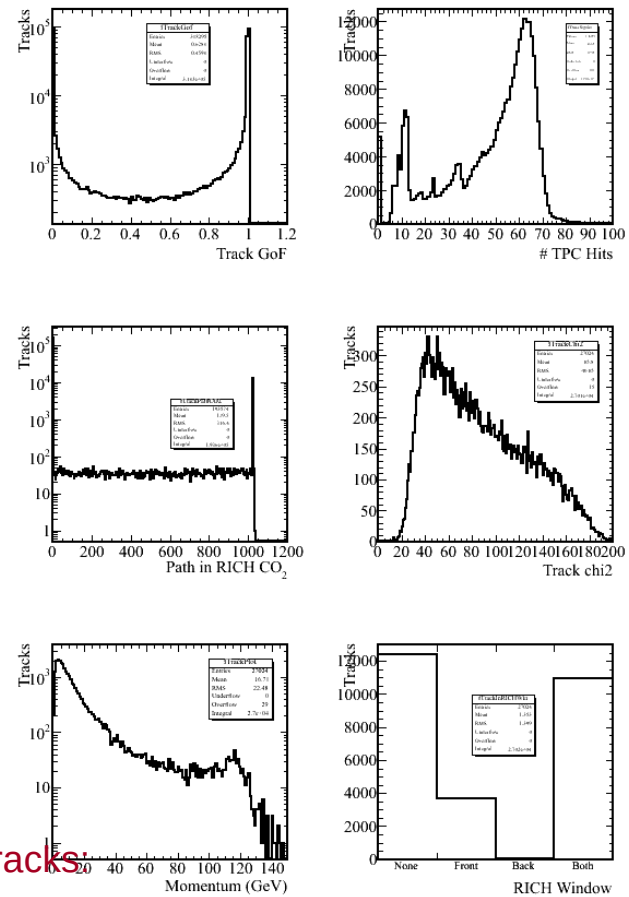
MC



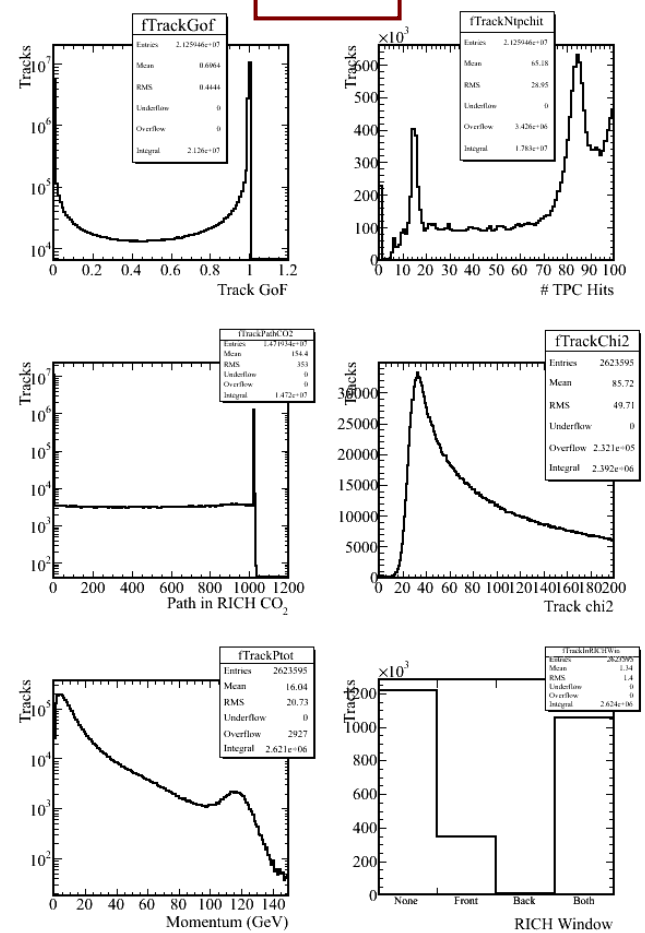


Track Properties

Data



MC



Cuts on tracks:

GoF > 0.01

TPC hits > 15

Path in RICH CO_2 > 0

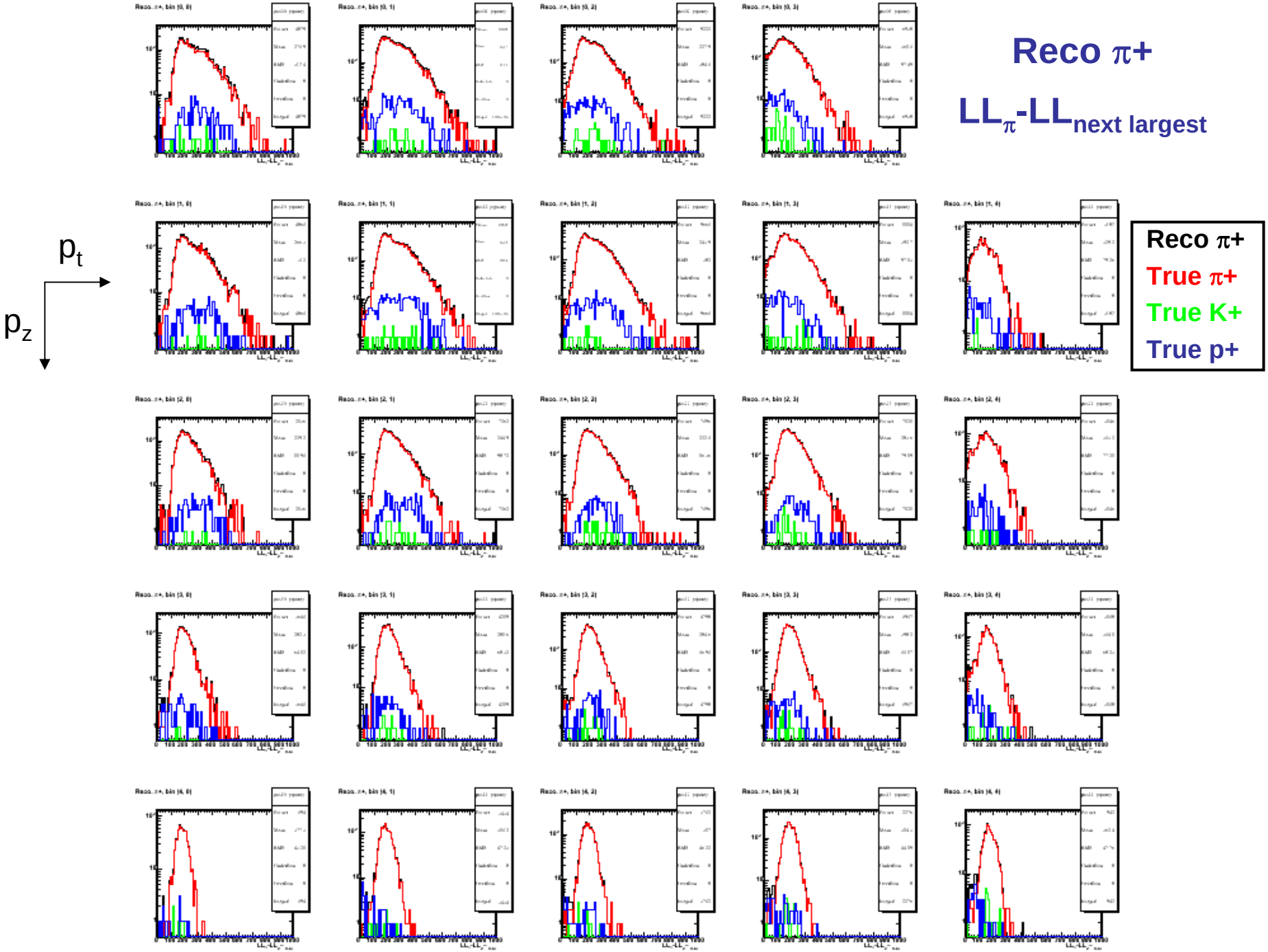
RICH PID Purity & Effiencity

- Using same momentum *(p_z, p_t)* bins as Andre's
- Purity: Given reconstructed PID, compare with MC true PID
- Effienciency: Given MC true PID, compare with reconstructed PID
- Reco PID definition

$$\mathrm{Max}(LL_{\pi}, LL_{K}, LL_{P}, LL_{background})$$

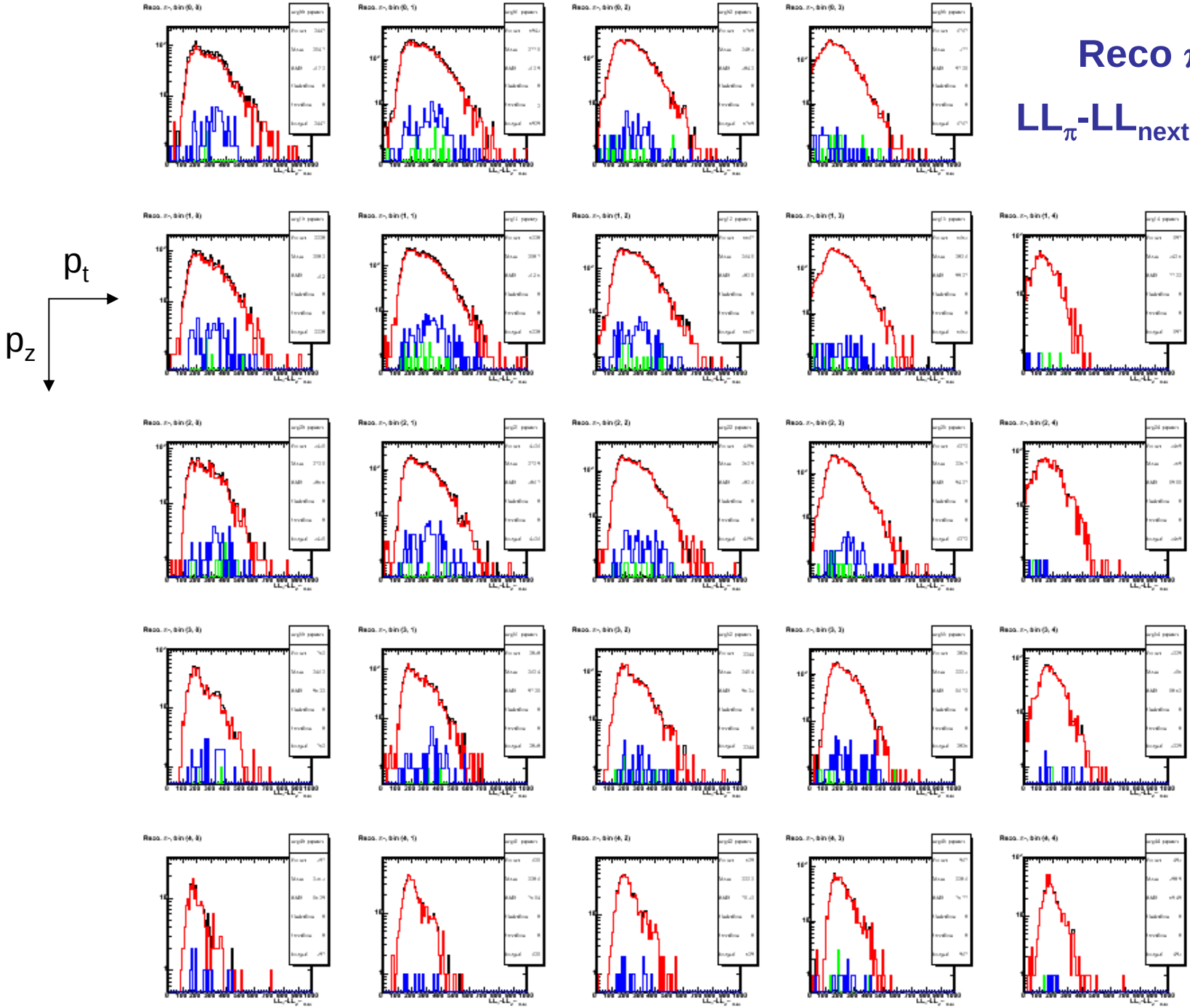
$$0 < \mathrm{richchi2} < 100$$

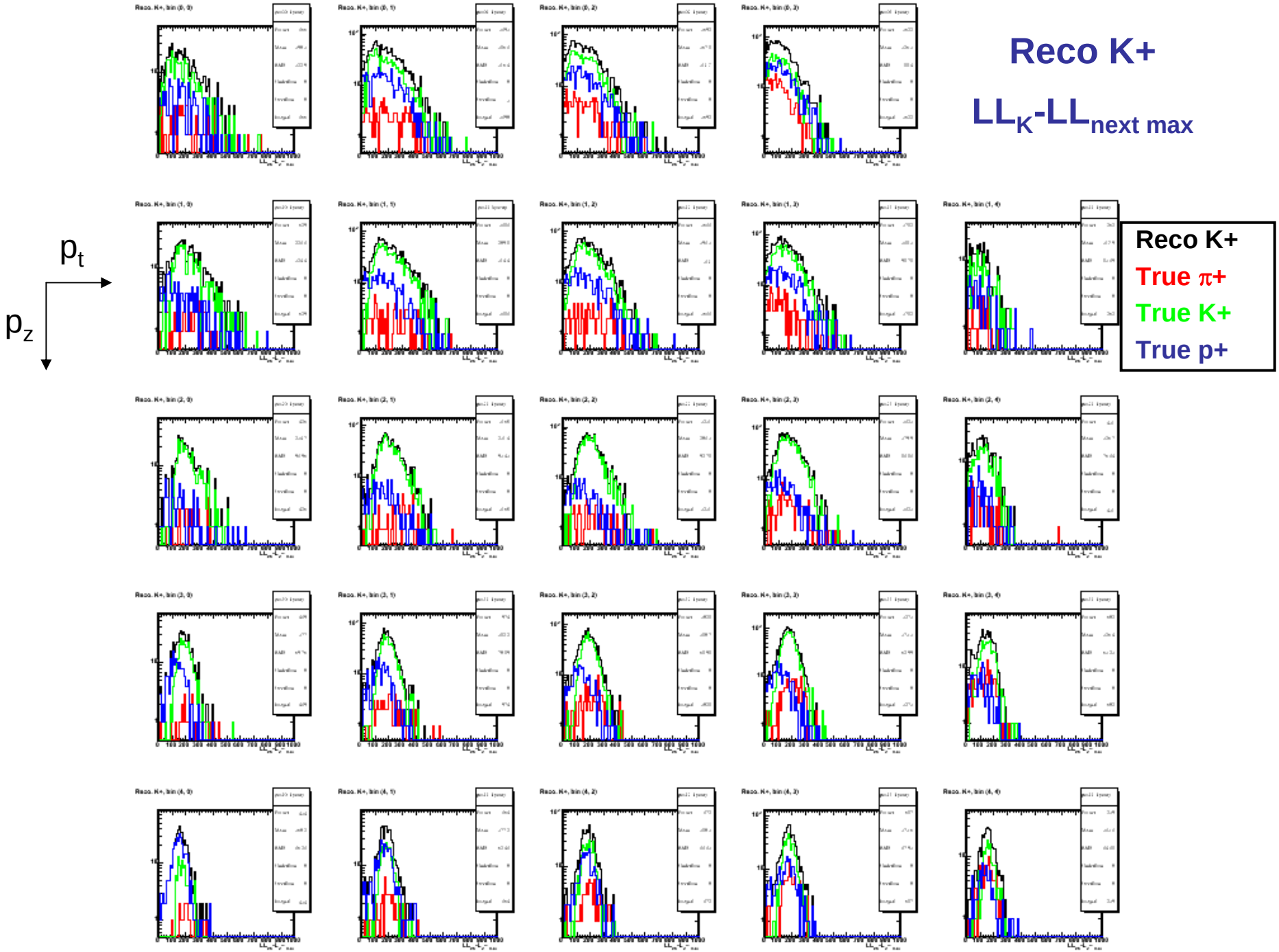
- Purity and Efficiency vary with richchi2 cut

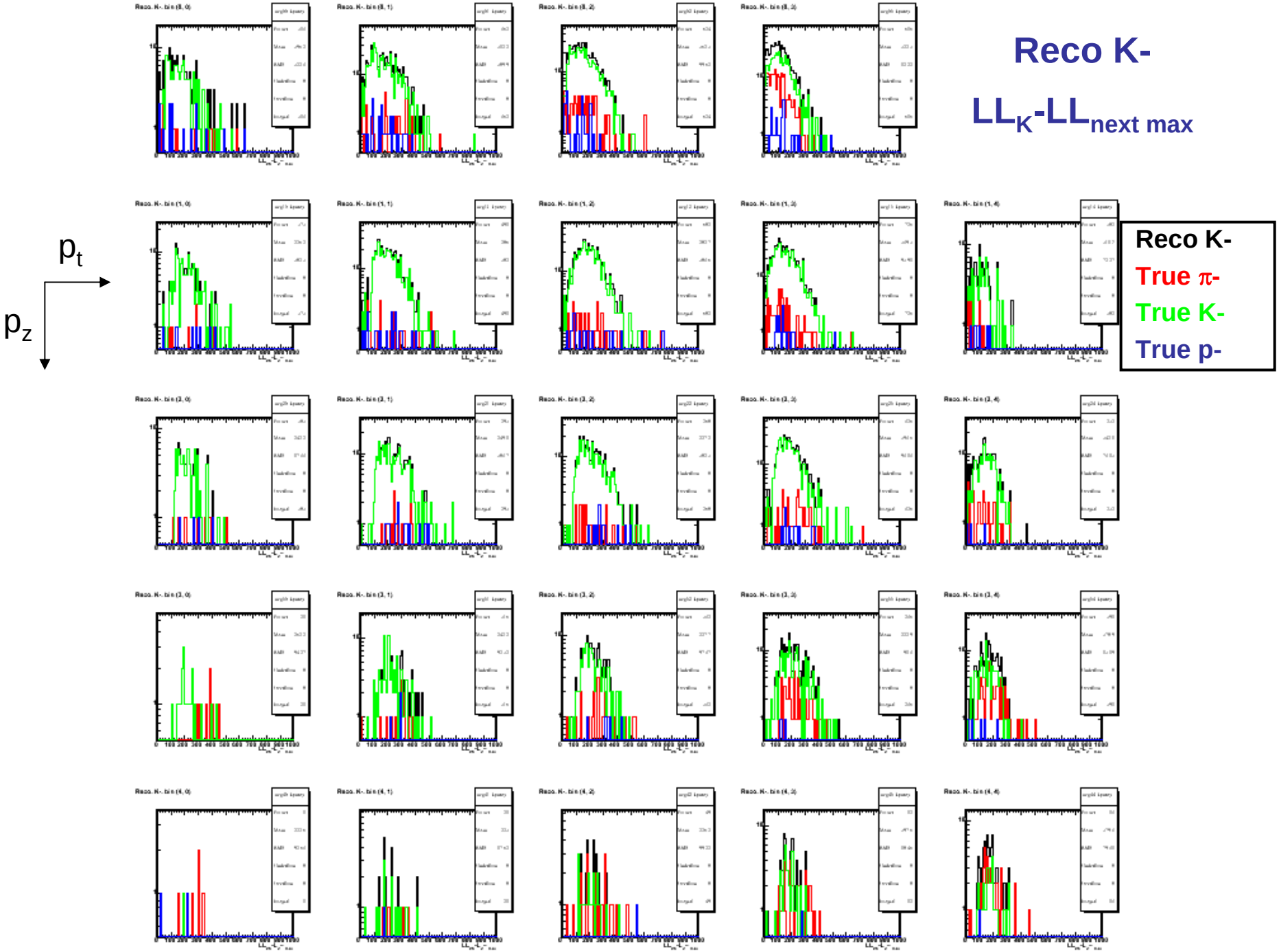

Reco π+
LLπ-LLnext largest
pt
pz
Reco π+
True π+
True K+
True p+

Reco π-

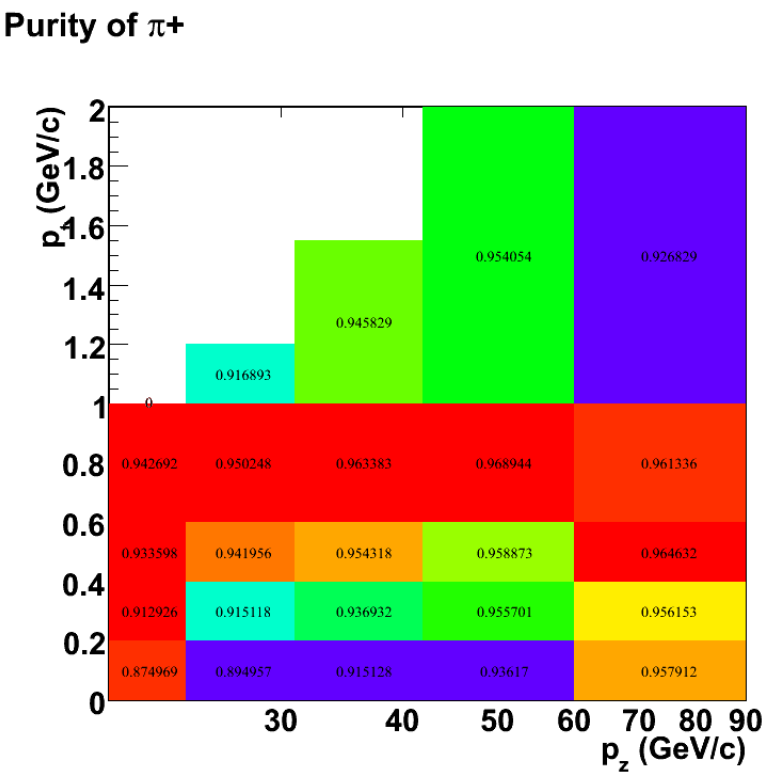
LL_{π}-$LL_{next\ largest}$

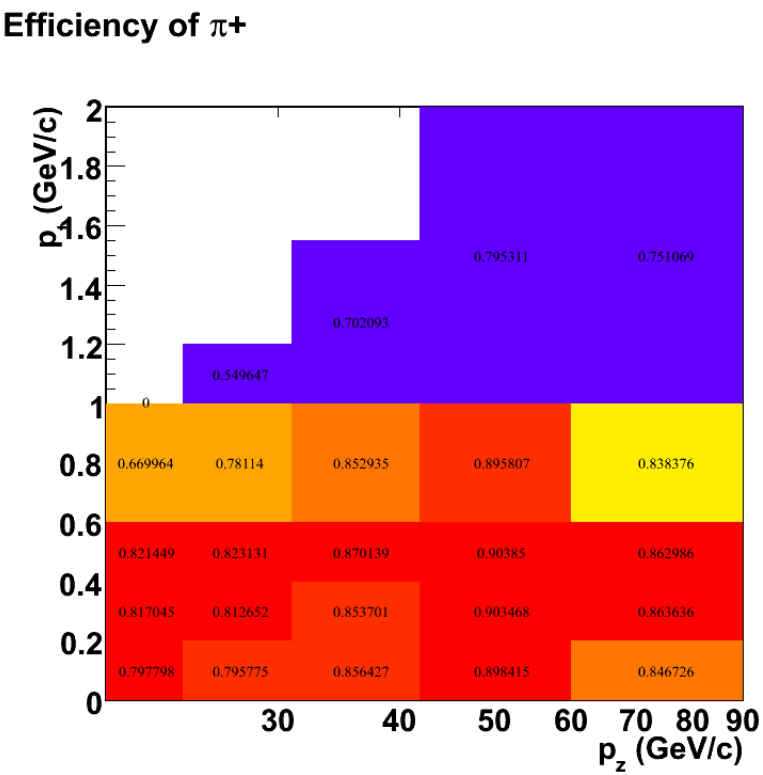



Reco K+
LL_K-$LL_{next\ max}$
p_t
p_z
Reco K+
True π+
True K+
True p+


Reco K-
LL_K-$LL_{next\ max}$
p_t
p_z
Reco K-
True π-
True K-
True p-

π+ Purity & Efficiency

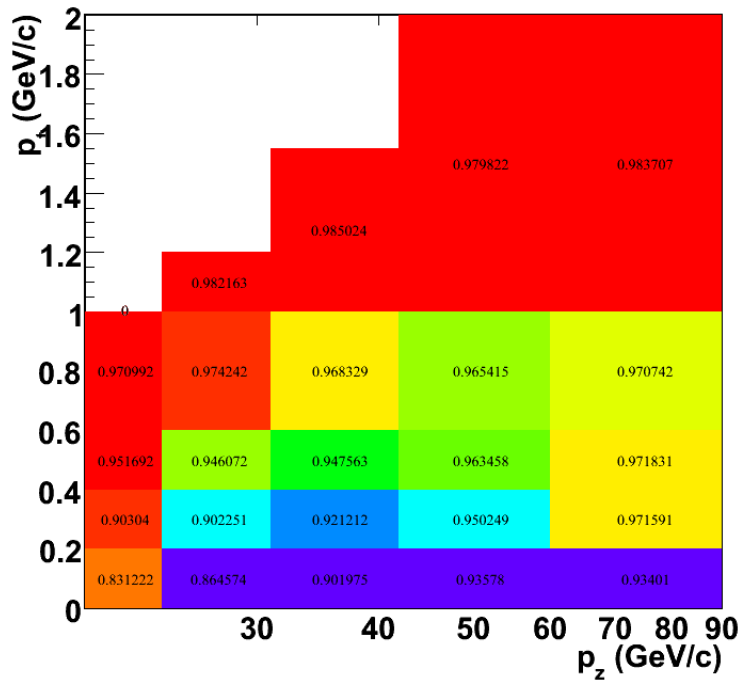




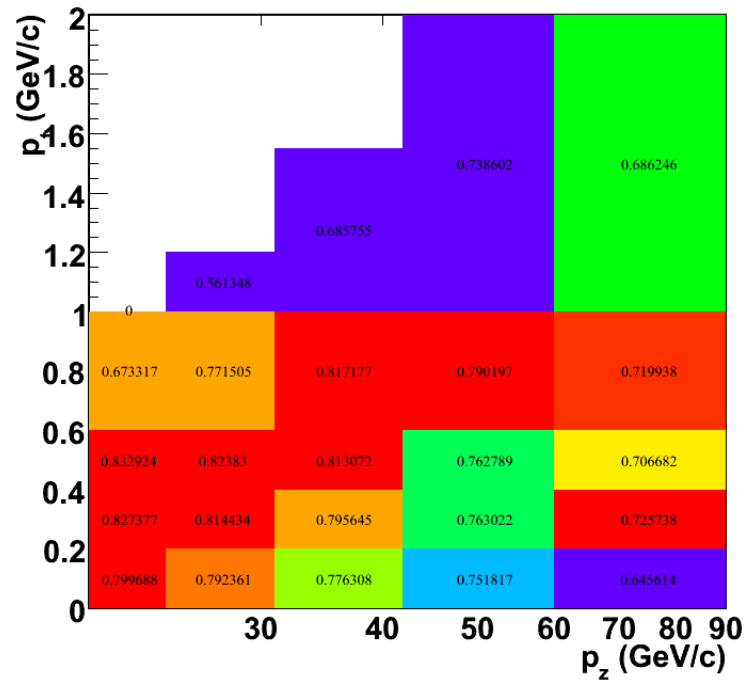
High Purity & High Efficiency

π- Purity & Efficiency

Purity of π-

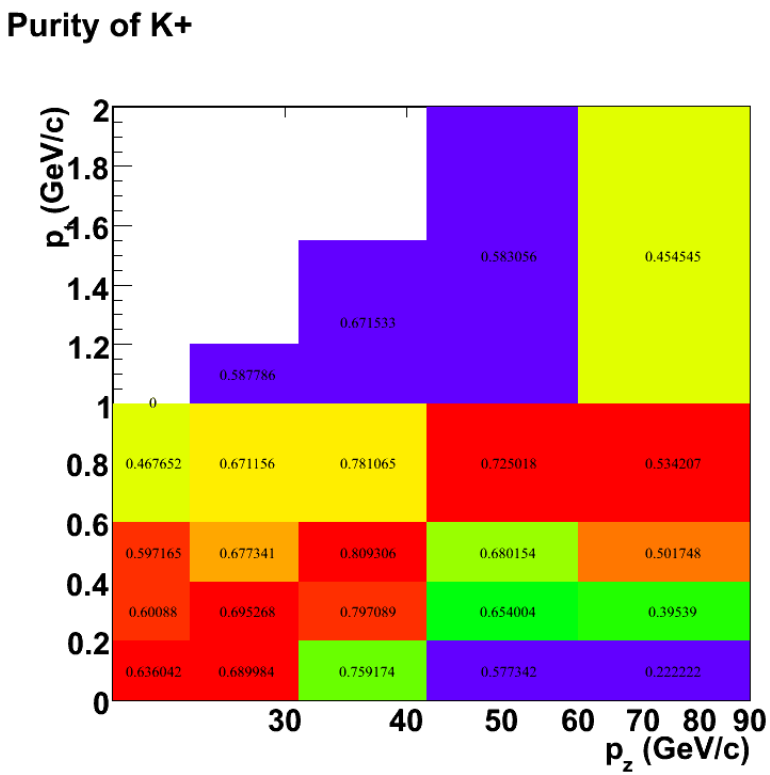


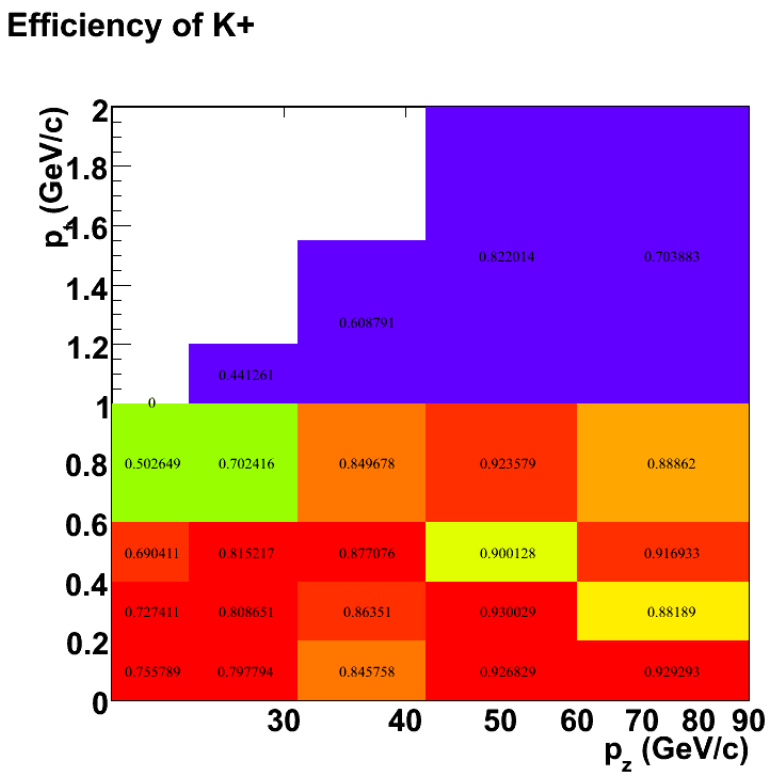
Efficiency of π-



High Purity & Medium Efficiency

K+ Purity & Efficiency

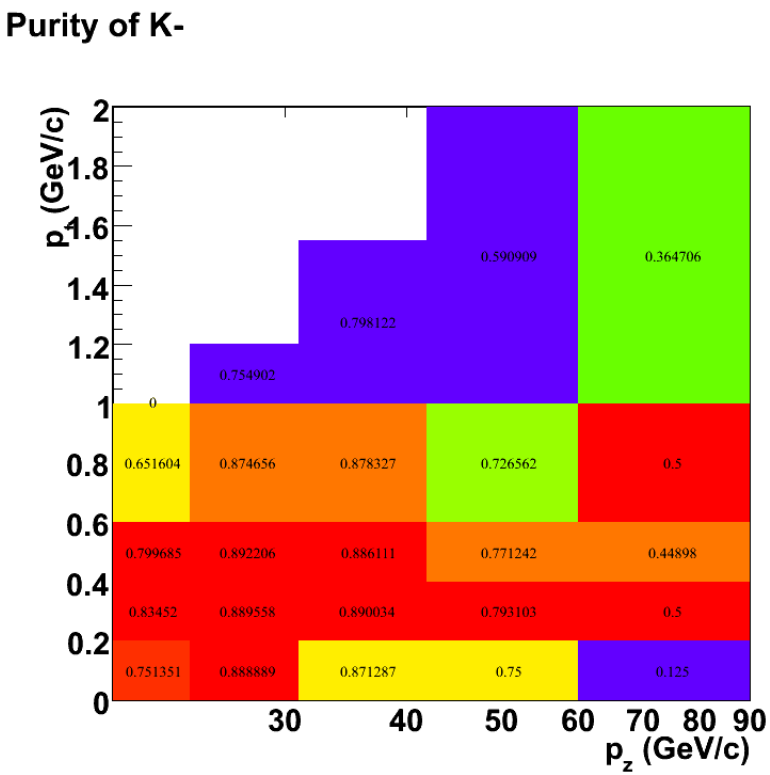


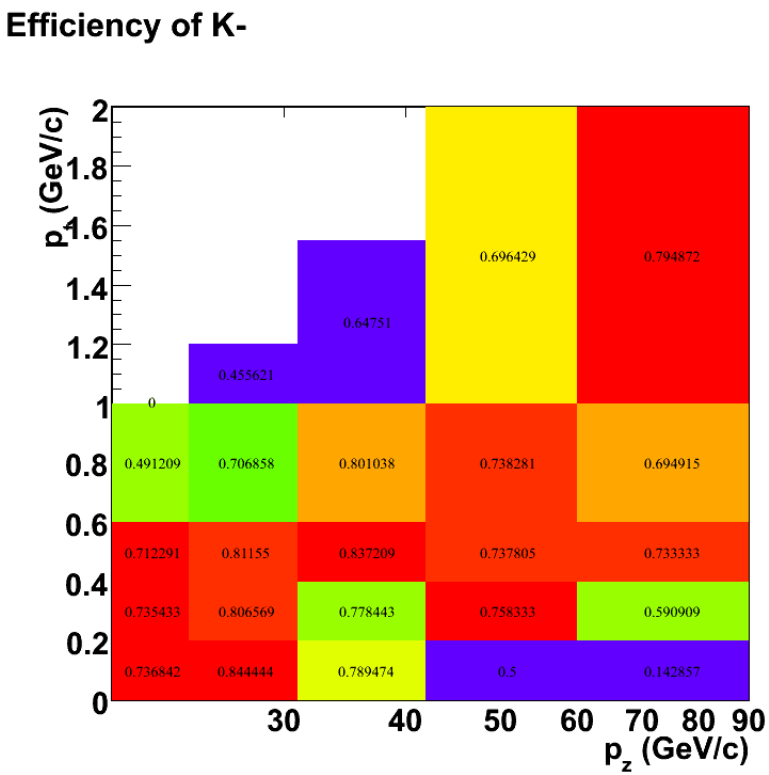


Medium Purity & High Efficiency

Low Purity at high p_z

K- Purity & Efficiency





Lower Purity & Efficiency at high p_t and p_z
– low statistics?

Conclusion

- NuMI Data/MC look reasonable
- Next step
  - Need more MC statistics to determine K-Purity and Efficiency at high momentum
  - Set richchi2 to maximize PID Purity and Efficiency