

Simulations Update

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Procedure

Photoproduction of ρ mesons using 9 GeV photons

- t-channel production using the genr8 program
- Reactions and decay chains
 - $\gamma p \rightarrow p\rho$ with $\rho \rightarrow \pi^+\pi^-$
- ρ parameters:
 $m = 770$ MeV and $\Gamma = 150$ MeV
- t-channel slope parameter: $5 (\text{GeV})^{-2}$
- Swim particles through GlueX detectors using HDGeant (minimal control.in file with HADR==0)
- Standard reconstruction and PID from the offline software
- Use hd_root with phys_tree plugin to produce root file with trees

Procedure

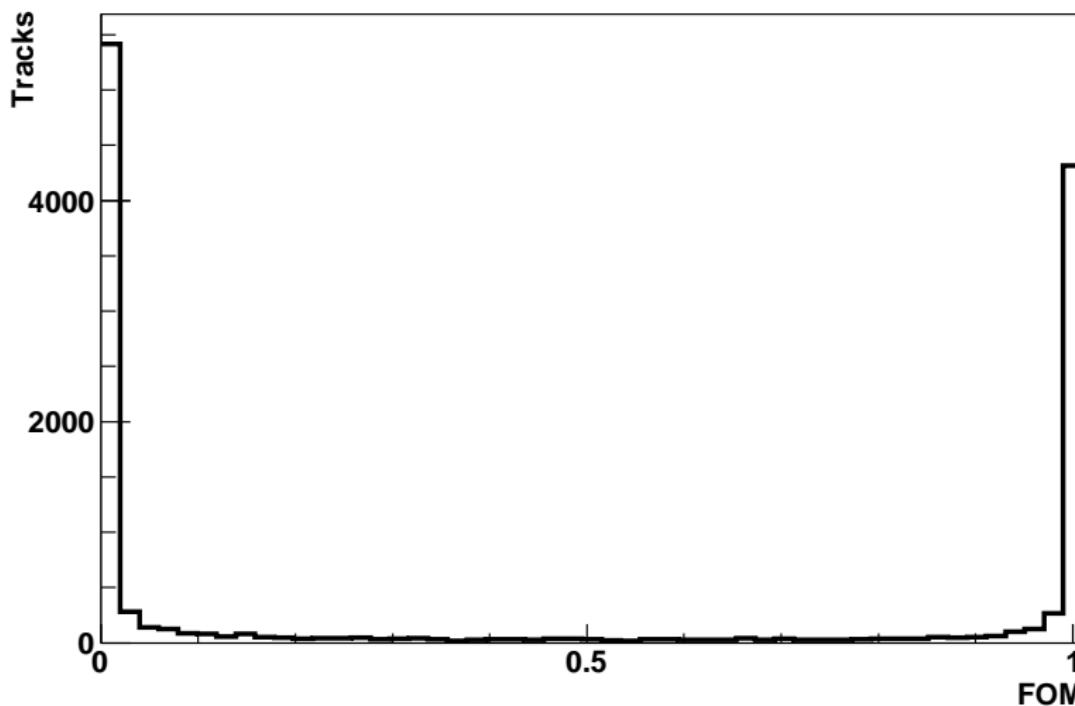
- Determine final state particle combo kinematically
 - If all particles detected, choose combo that best conserves c.m. energy
 - If one particle is missing, choose combo that gives the best missing mass
 - If there are multiple particles of the same type, use mass constraints
 - 3σ mass cut, 750 MeV change in c.m. energy cut (all detected)
- Investigate tracking and PID FOM cuts
- Compare results of normal offline PID and PID_FORCE_TRUTH

PID_FORCE_TRUTH (configuration parameter)

- Forces the correct PID, based on hit matching to the truth info., within DTrackTimeBased_factory when there is a correct track available (requires at least 50% of hits matched)

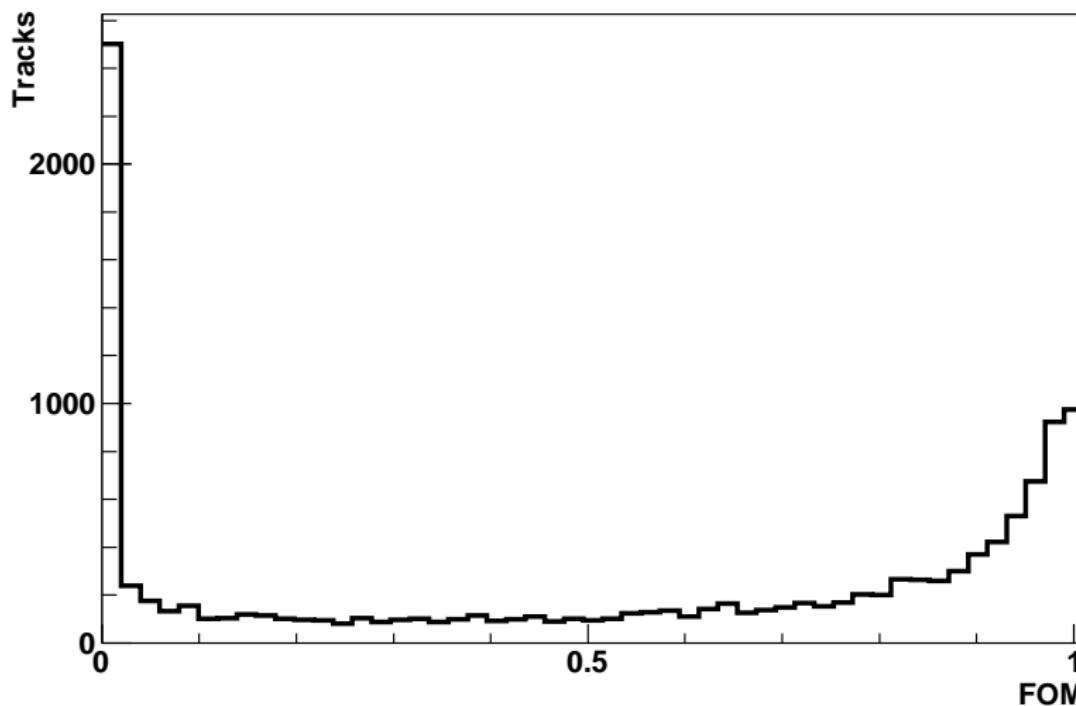
Tracking FOM cut of 0.001

Tracking FOM

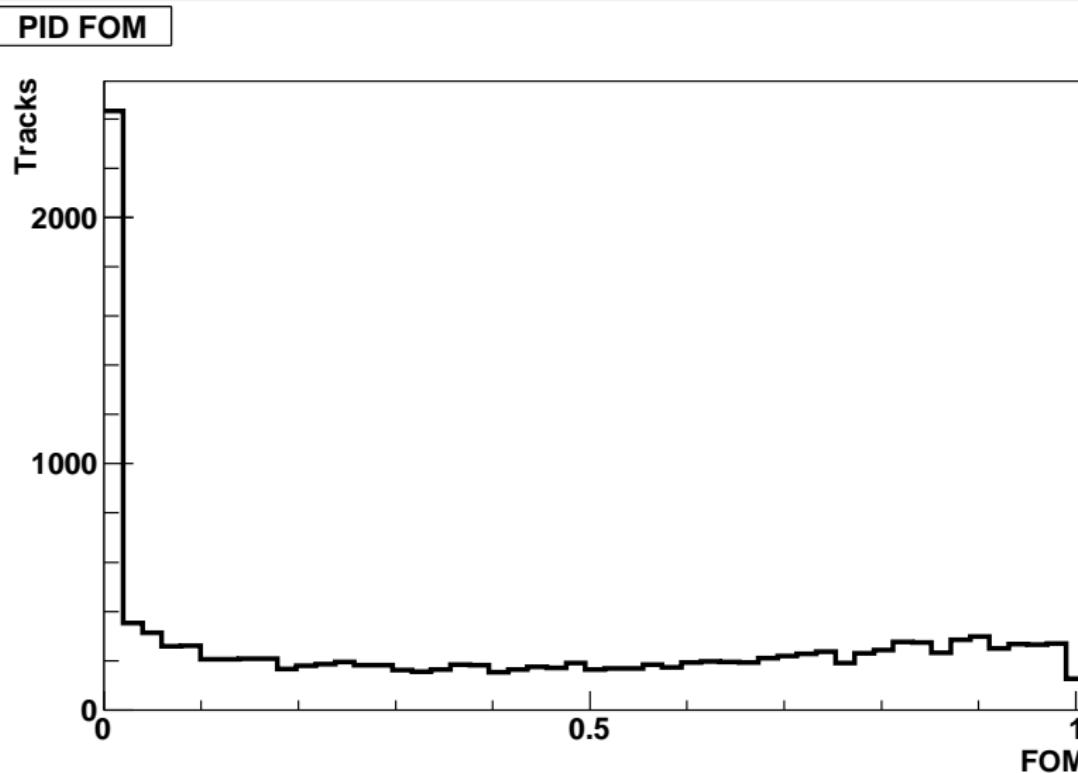


Force Truth PID FOM cut of 0.001

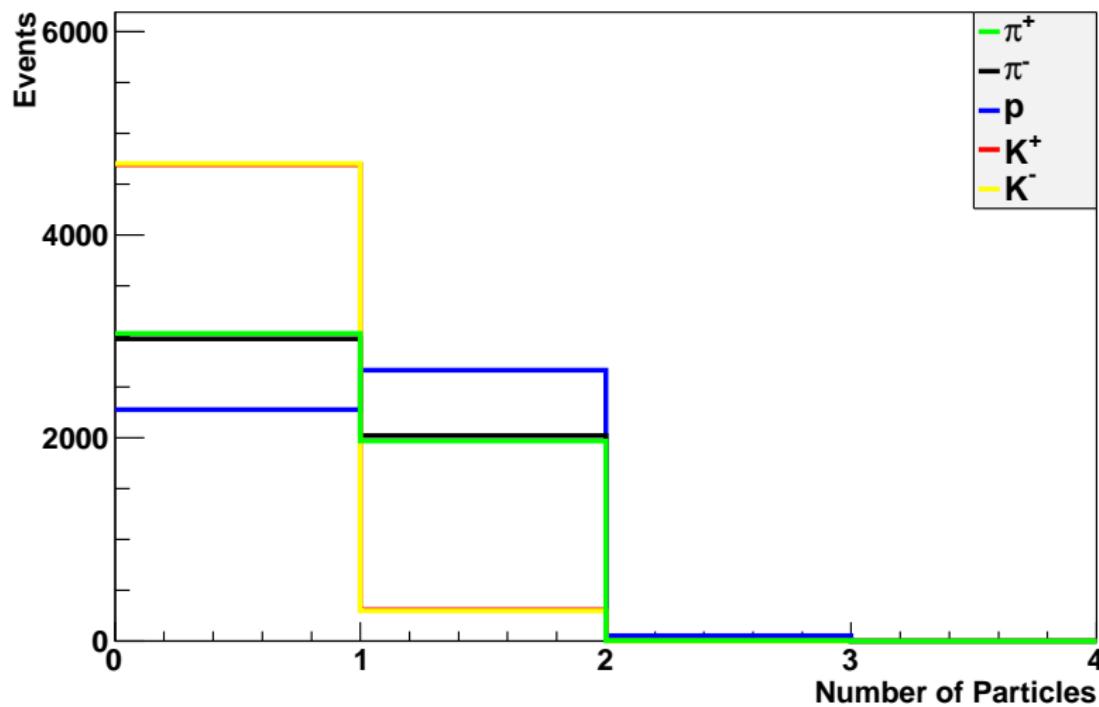
PID FOM



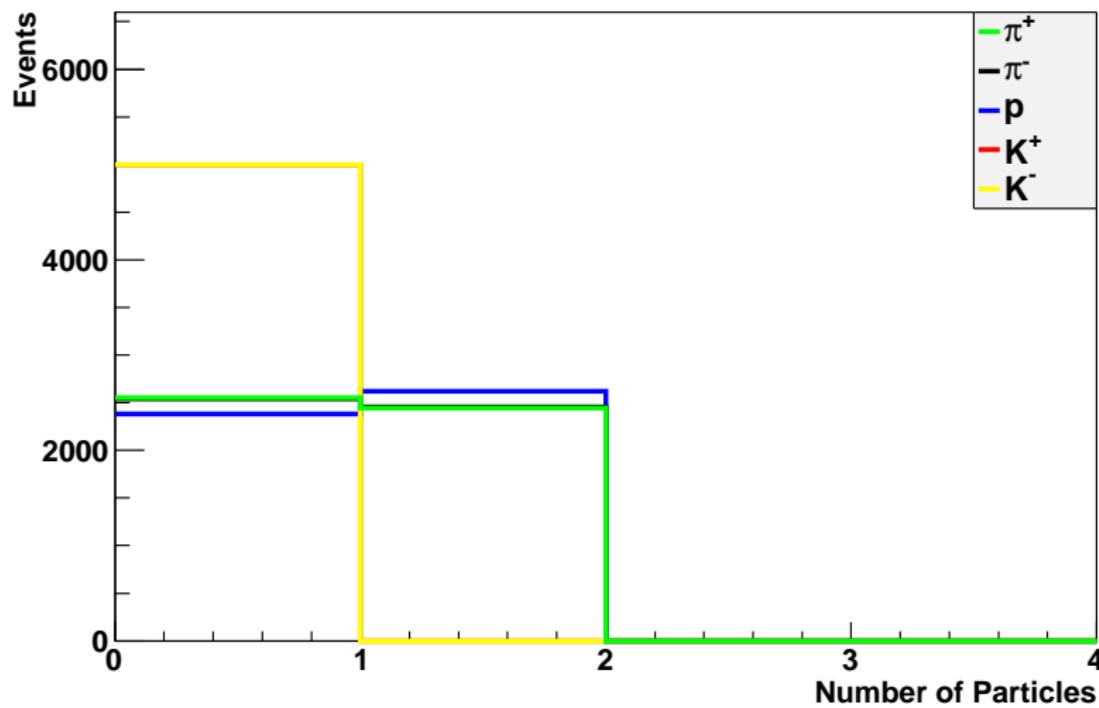
Normal PID FOM cut of 0.001

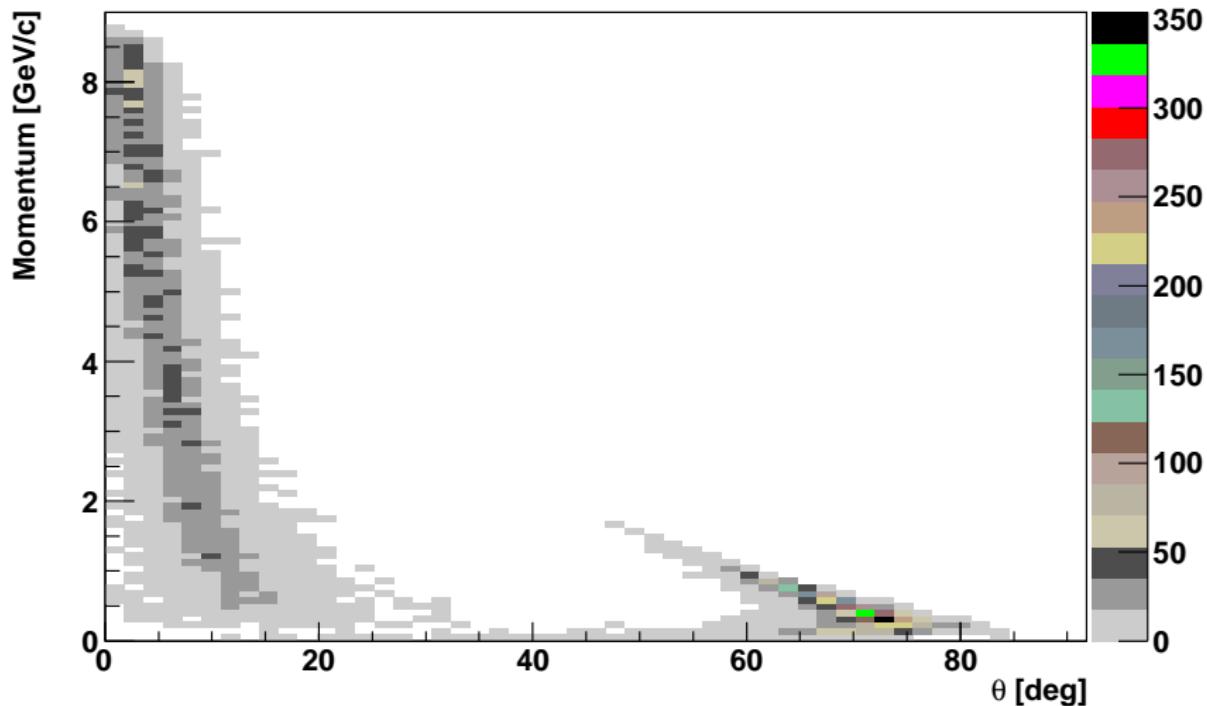


Normal PID



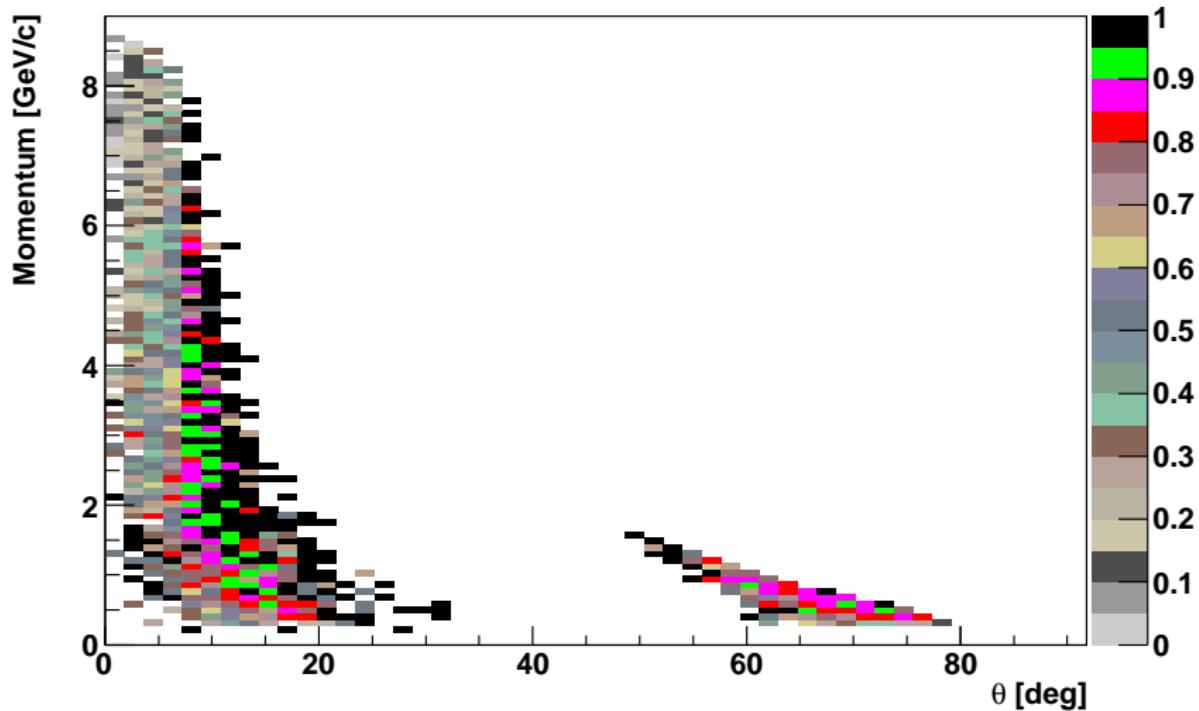
PID Force Truth



Generated

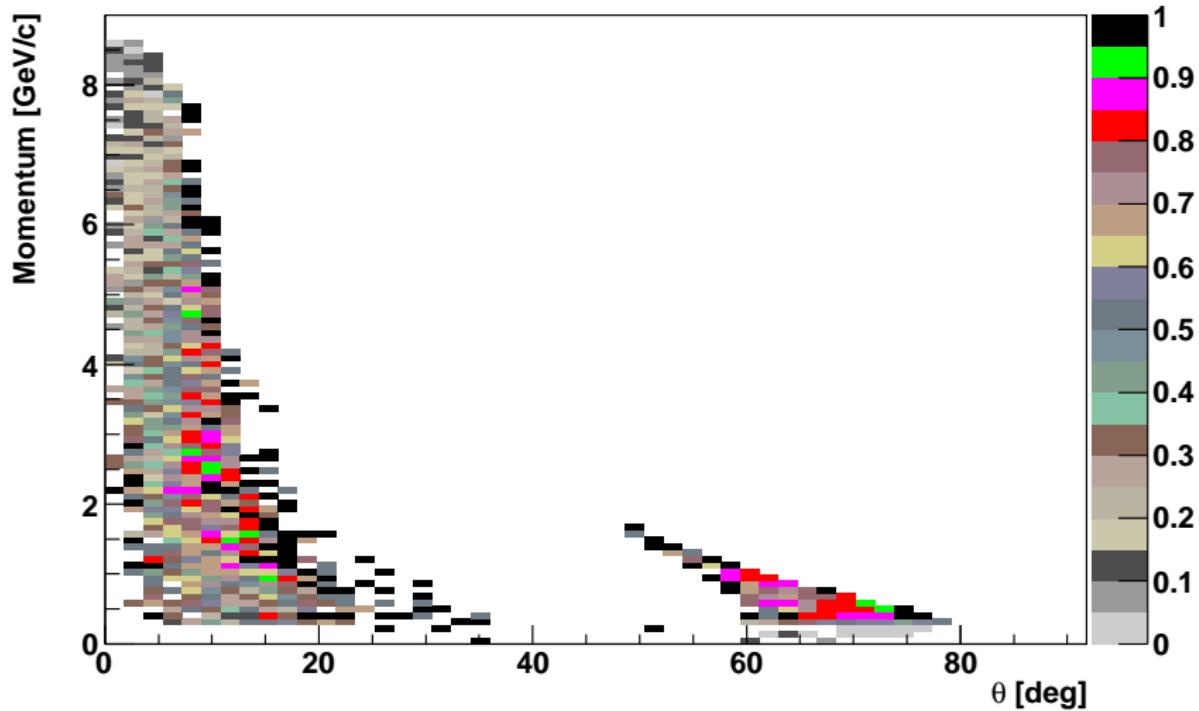
PID Force Truth

Acceptance

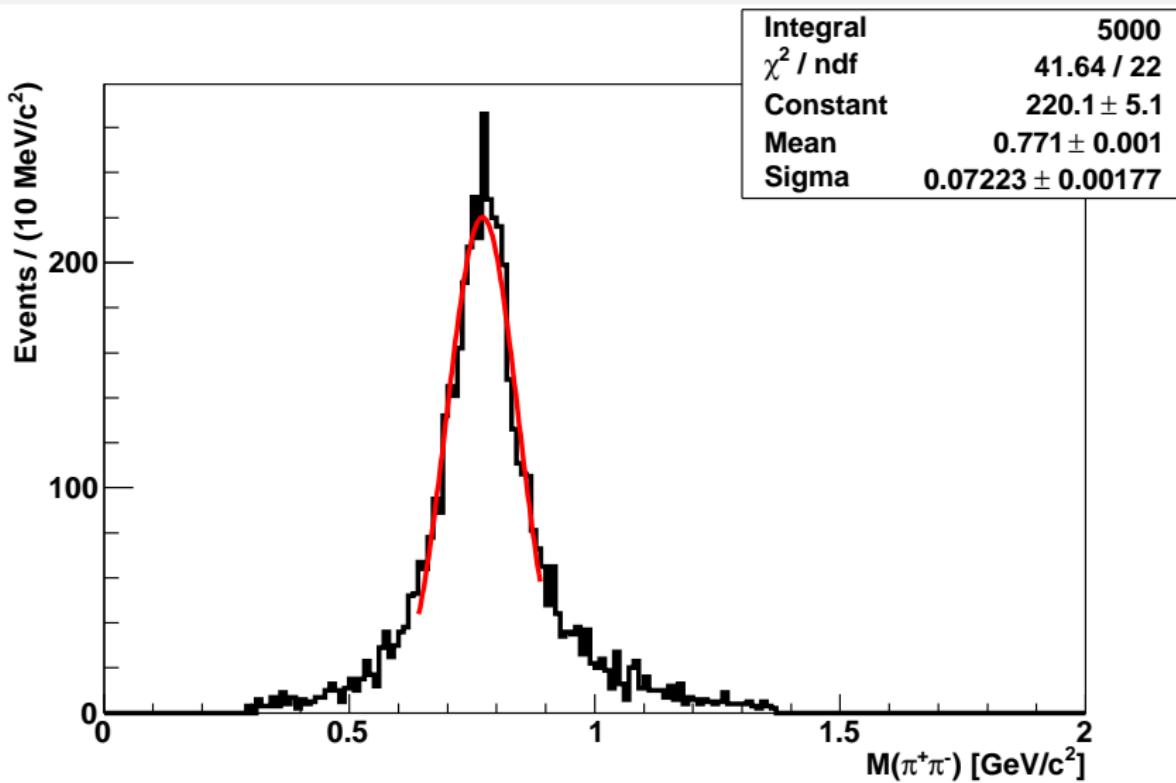


Normal PID

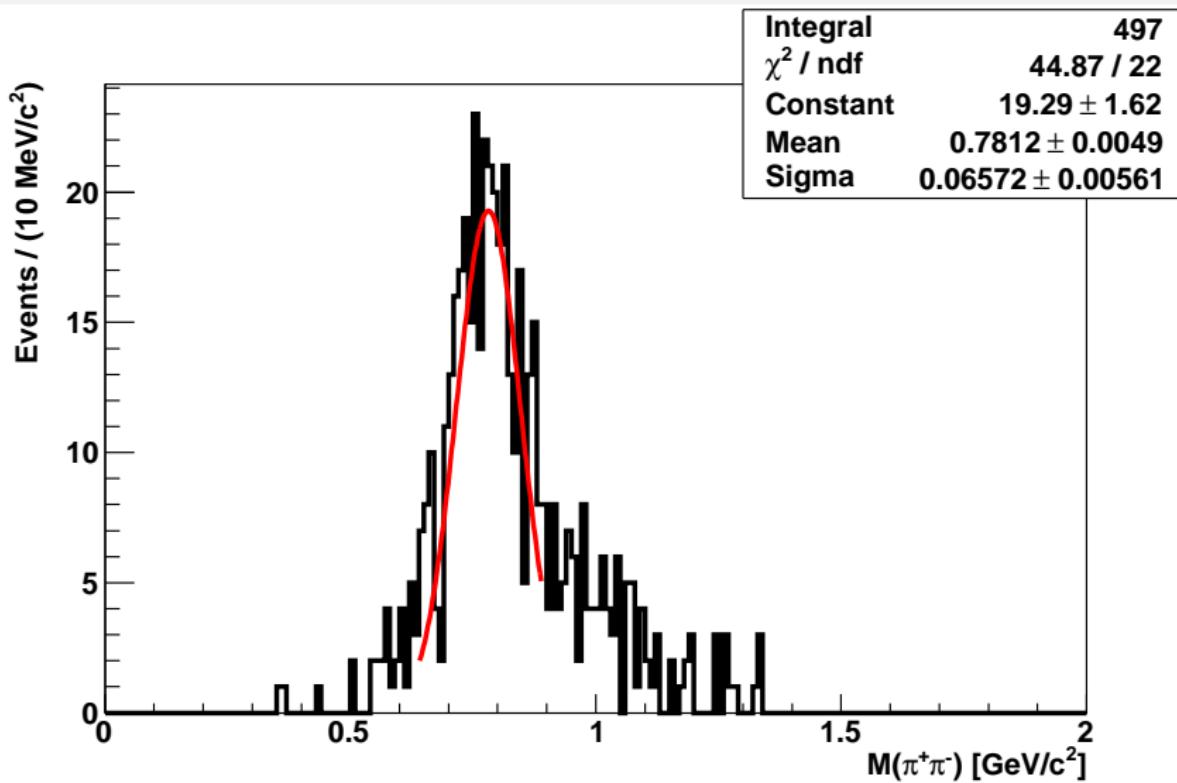
Acceptance



Thrown Mass

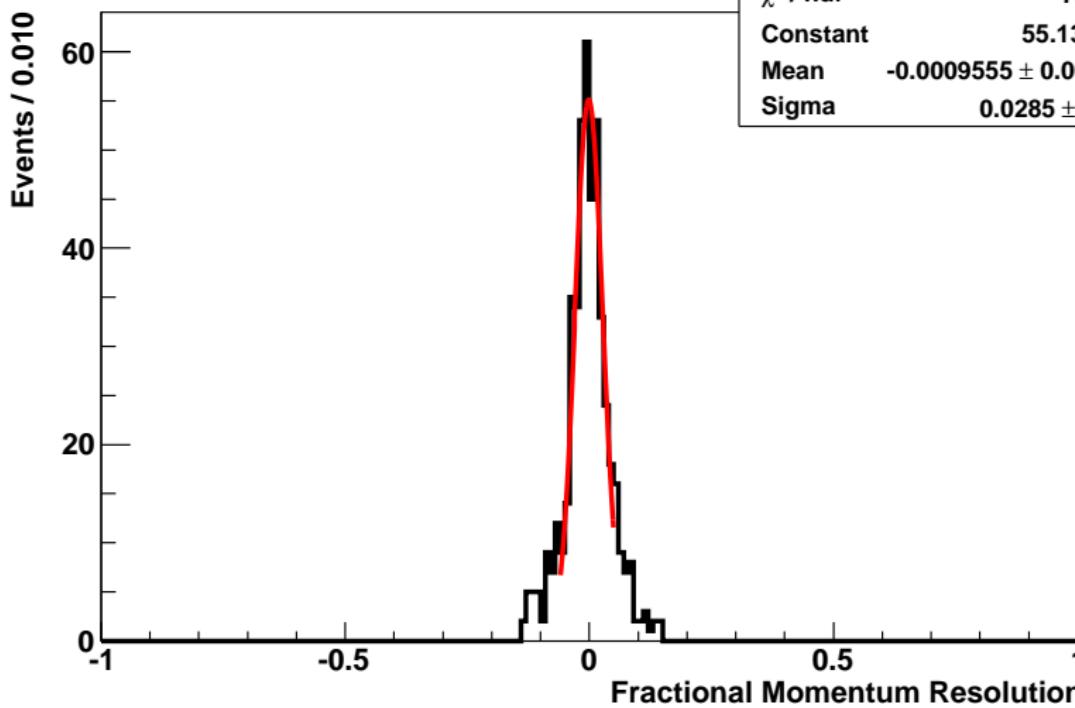


PID Force Truth



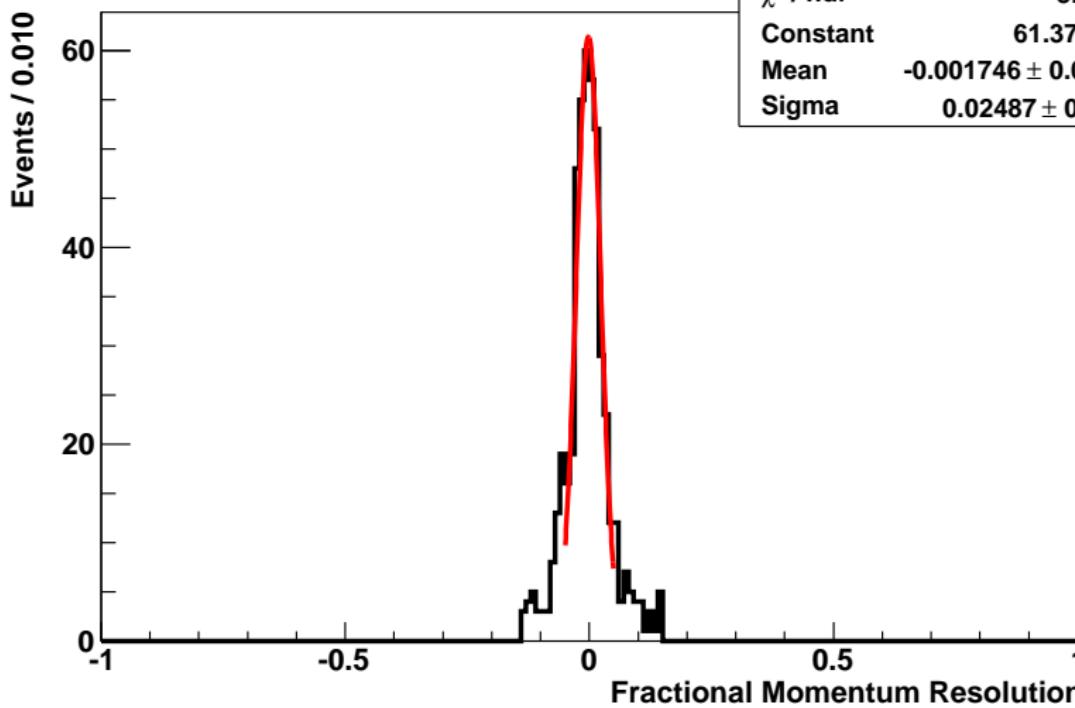
PID Force Truth

π^+ from ρ Decay



PID Force Truth

π^- from ρ Decay



PID Force Truth

Proton

Events / 0.010

60

40

20

0

Fractional Momentum Resolution

Integral	478
χ^2 / ndf	7.455 / 8
Constant	67.53 ± 4.50
Mean	-0.01535 ± 0.00152
Sigma	0.0268 ± 0.0016

Comparison of momentum resolutions (Force Truth, all detected)

	$R(p)$	$R(\pi^-)$	$R(\pi^+)$
FOMs>0.001	2.7	2.5	2.9
FOMs>0.	2.8	3.2	3.1

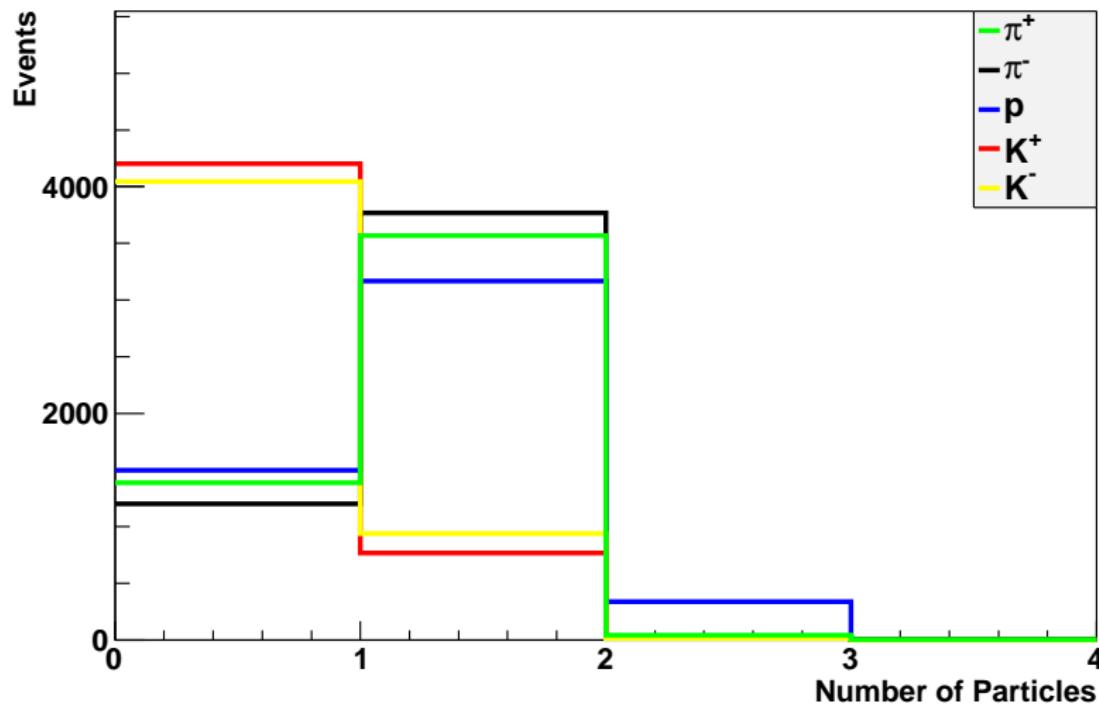
R: momentum resolution in %

Comparison of reconstruction efficiencies

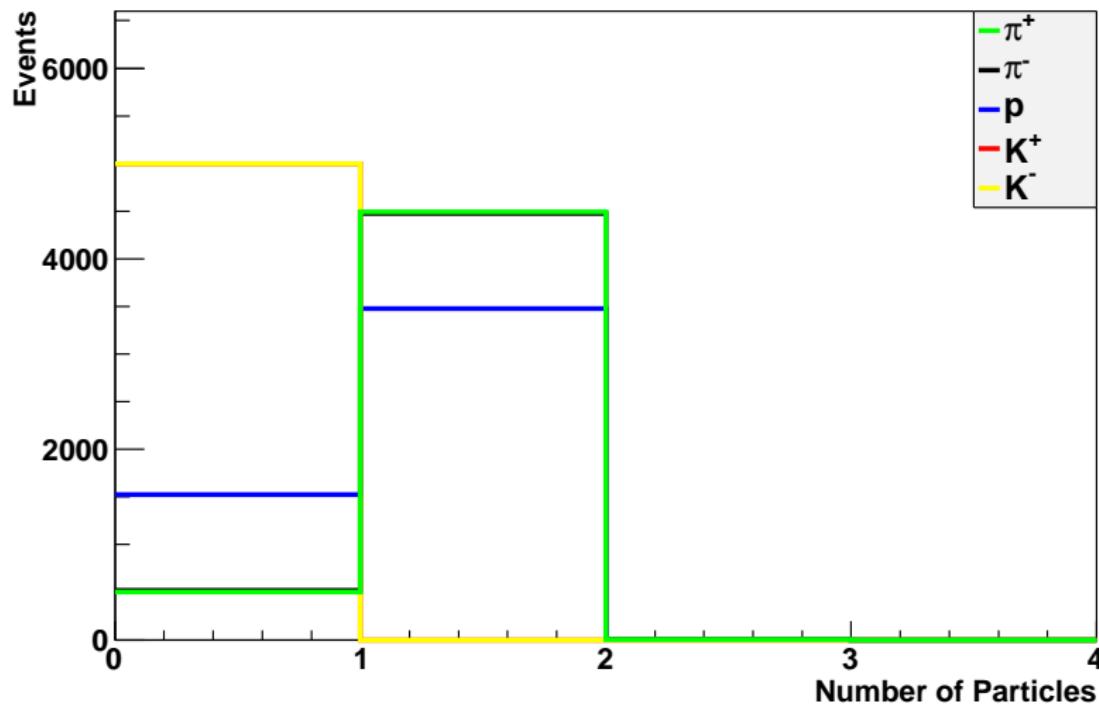
FOMs>0.001	force truth	normal PID
detect all	9.6%	7.8%
proton missing	16.1%	12.7%

FOMs>0.	force truth	normal PID
detect all	55%	37%
proton missing	78%	54%

Normal PID: FOMs>0.

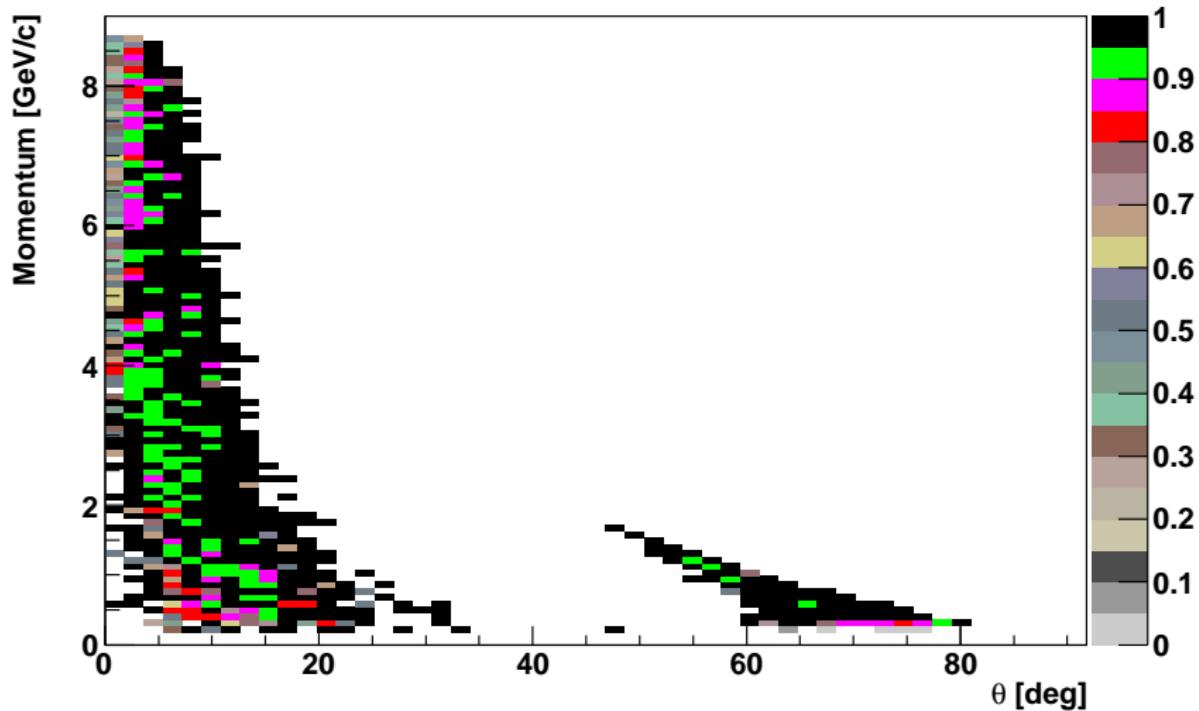


PID Force Truth: FOMs>0.

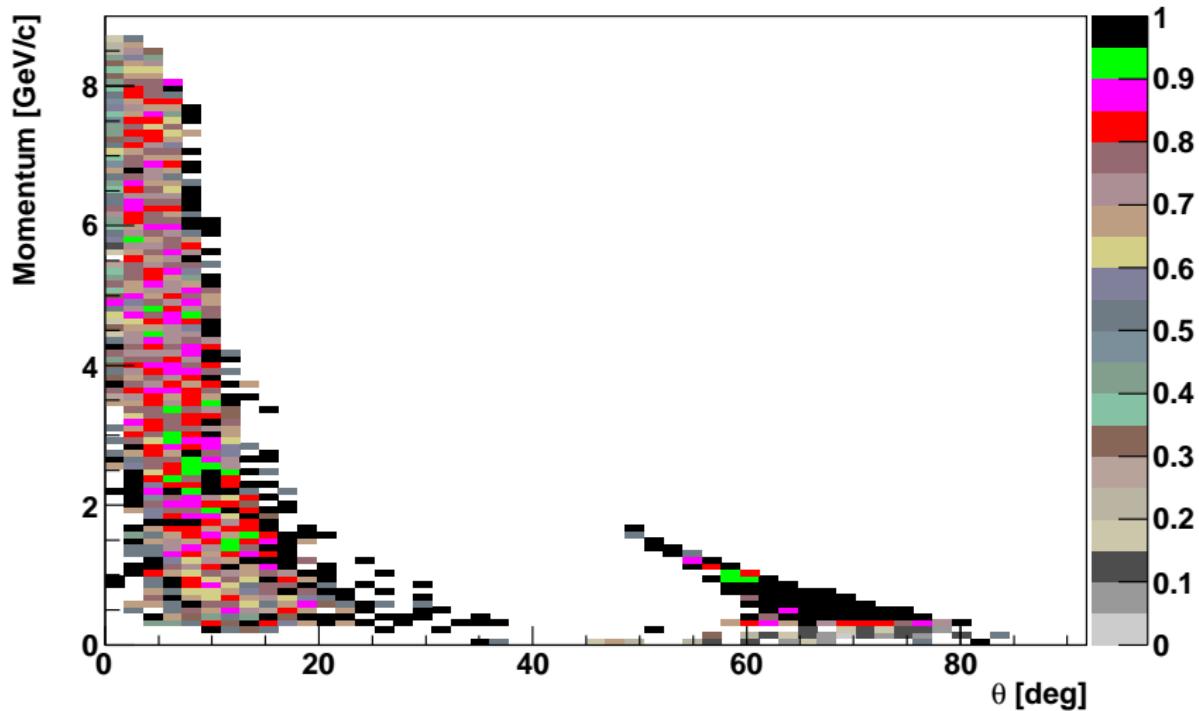


PID Force Truth: FOMs>0.

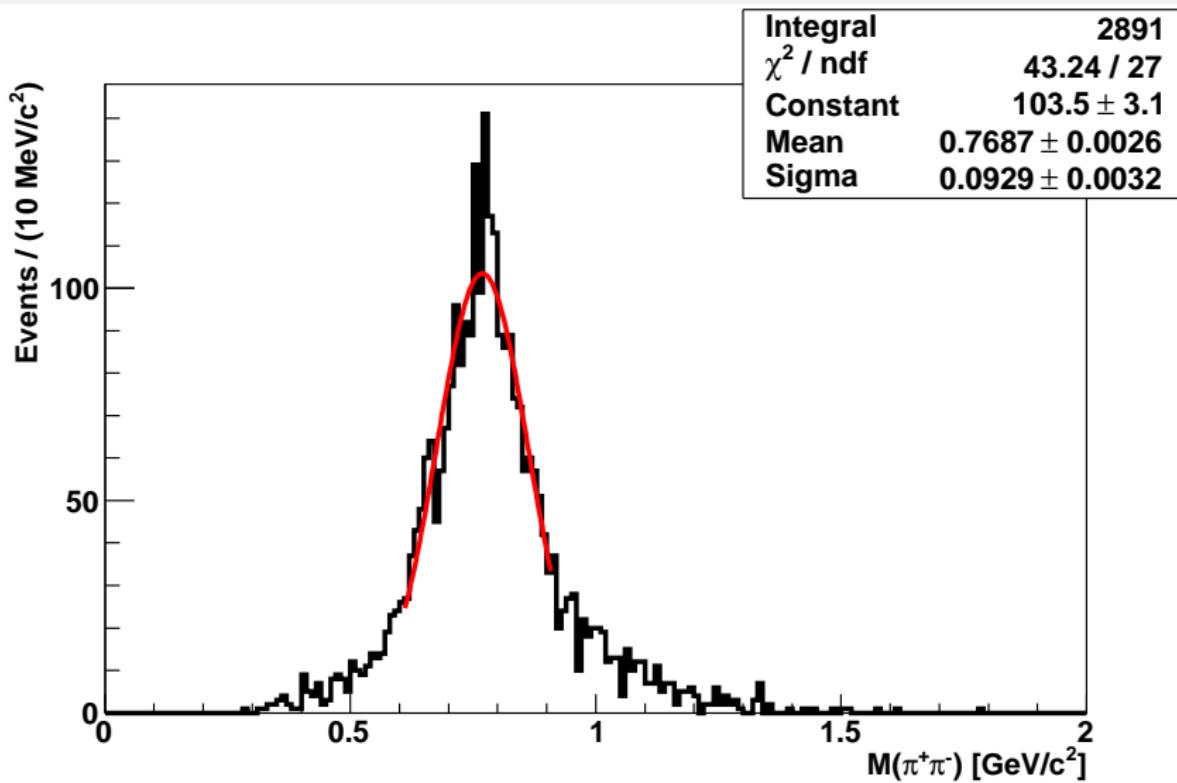
Acceptance



Normal PID: FOMs>0.

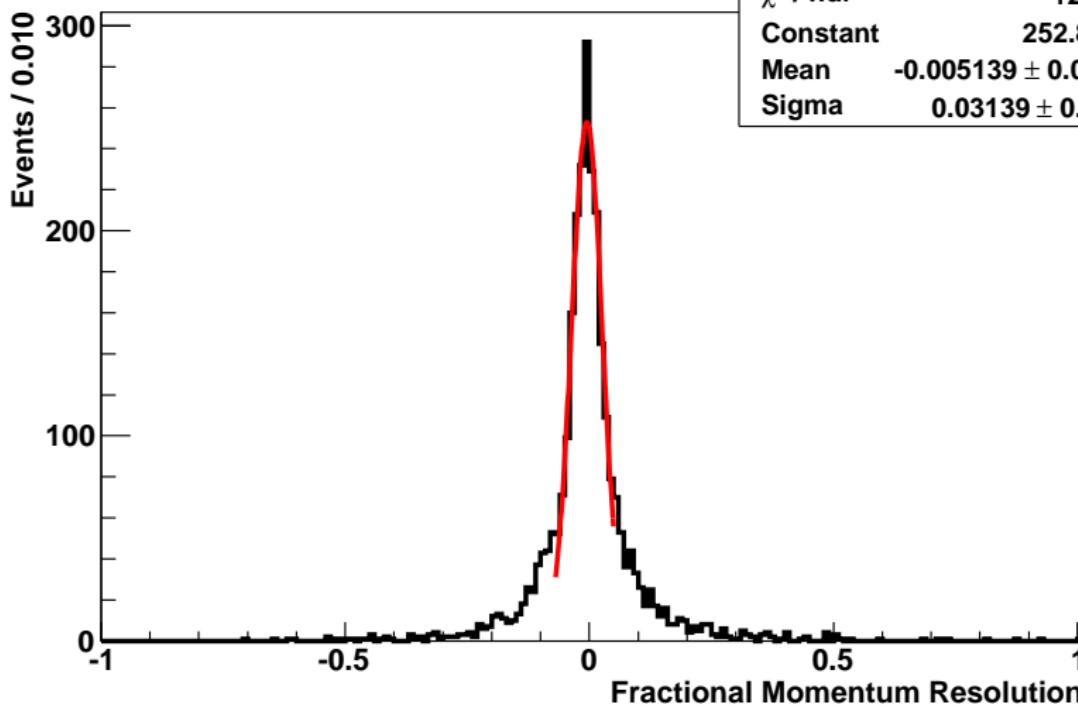
Acceptance

PID Force Truth: FOMs>0.



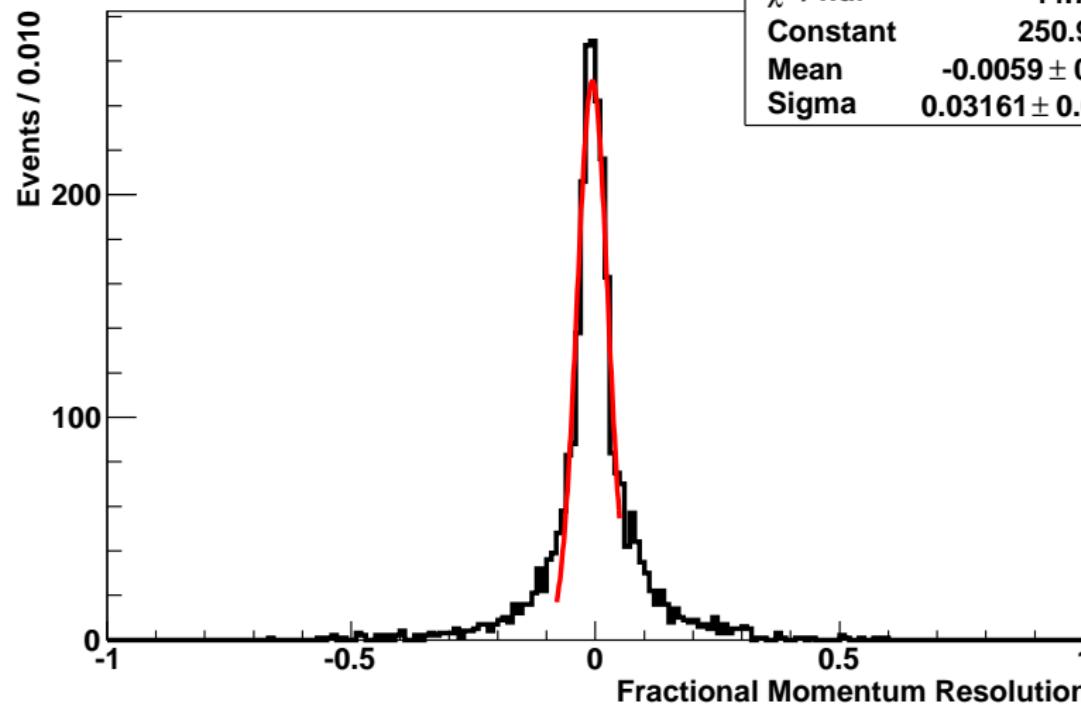
PID Force Truth: FOMs>0.

π^+ from ρ Decay



PID Force Truth: FOMs>0.

π^- from ρ Decay



PID Force Truth: FOMs>0.

