



PID w.r.t. High P_T

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Outline:

- **Basic Approach**
- **pVPD & TOFp Calibrations
Run-4, 62 GeV data**
- **HM observables**
- **PID w.r.t. HM observables**

Approach:

- “tofp match” - primary track striking singly-struck TOFp slat(s) (see **StTOFpMatchMaker**)
- must be at least one match in the event to keep it
 - all matches in each event saved with event & trigger detector information track information (TPC, + qtys extracted w/ TOF geometry info) start information (pVPD) stop information (TOFp)

added code snippet to **StTOFpNtupleMaker** to:

look through all primary tracks in the event and locate

- highest pT track with Nfitpts>15 & pT<20 & anywhere → **HM0_...**
- highest pT track with Nfitpts>15 & pT<20 & $|\eta|<0.9$ → **HM1_...**
- highest pT track with Nfitpts>15 & pT<20 & $-0.75<\eta<-0.2$ → **HM2_...**

and, using variable length arrays, all tracks w/ pT>3.0....

for each “HM track,” save **trackID, px, py, pz, Nfitpts, & charge sign.**

specific axes defined by the various kinds of highest pT particles for each match.

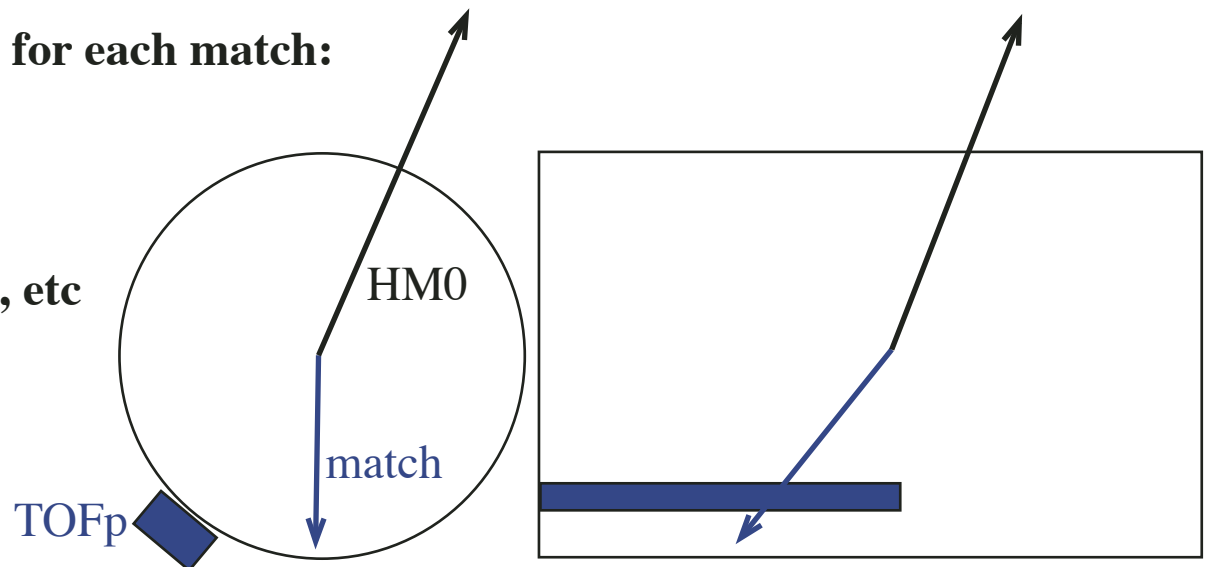
using the 2 mom’n vectors, then form for each match:

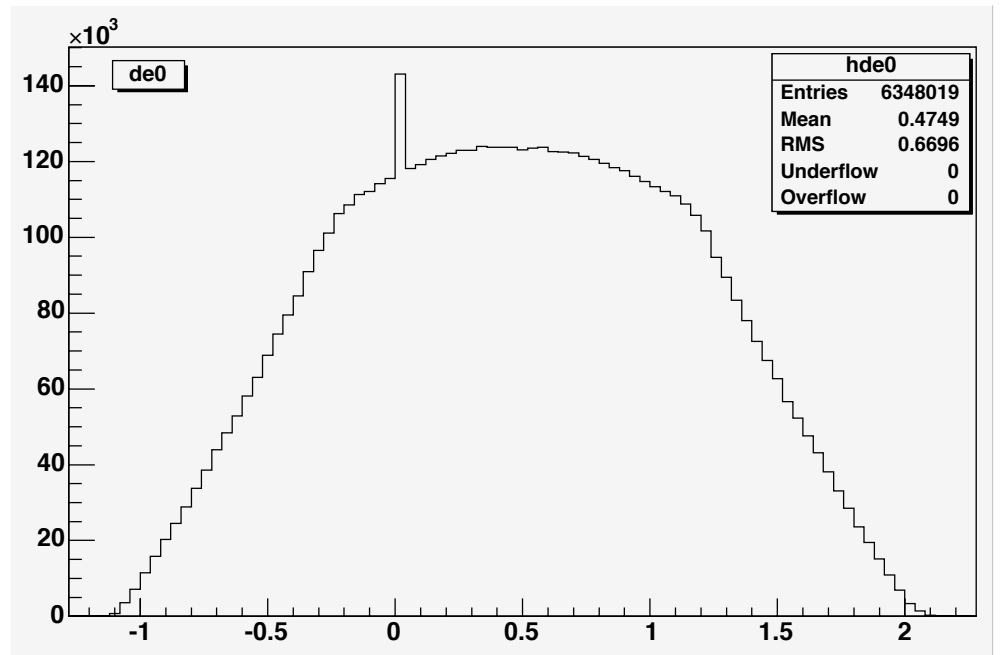
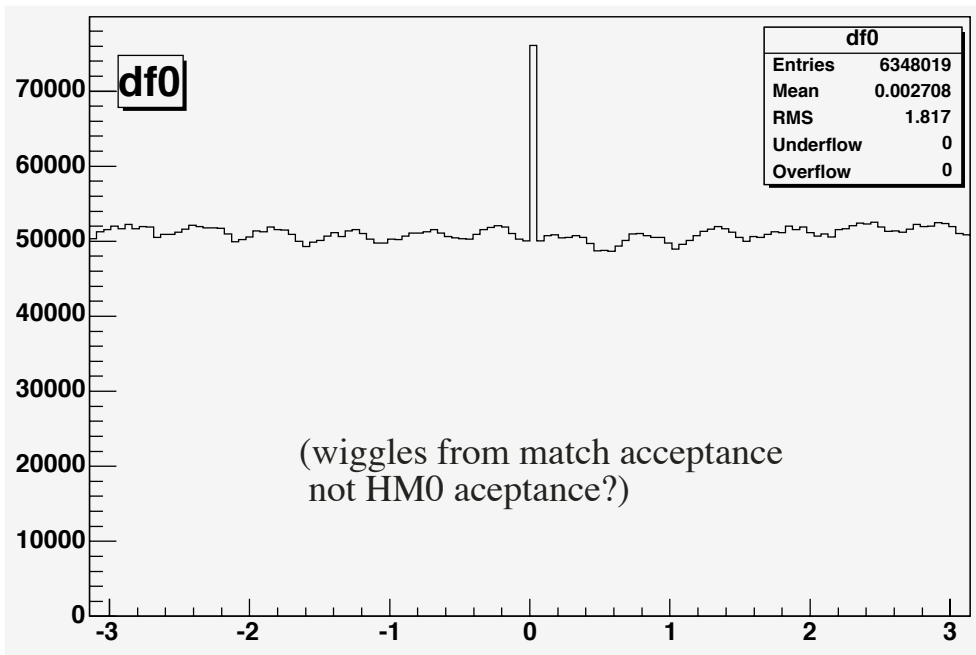
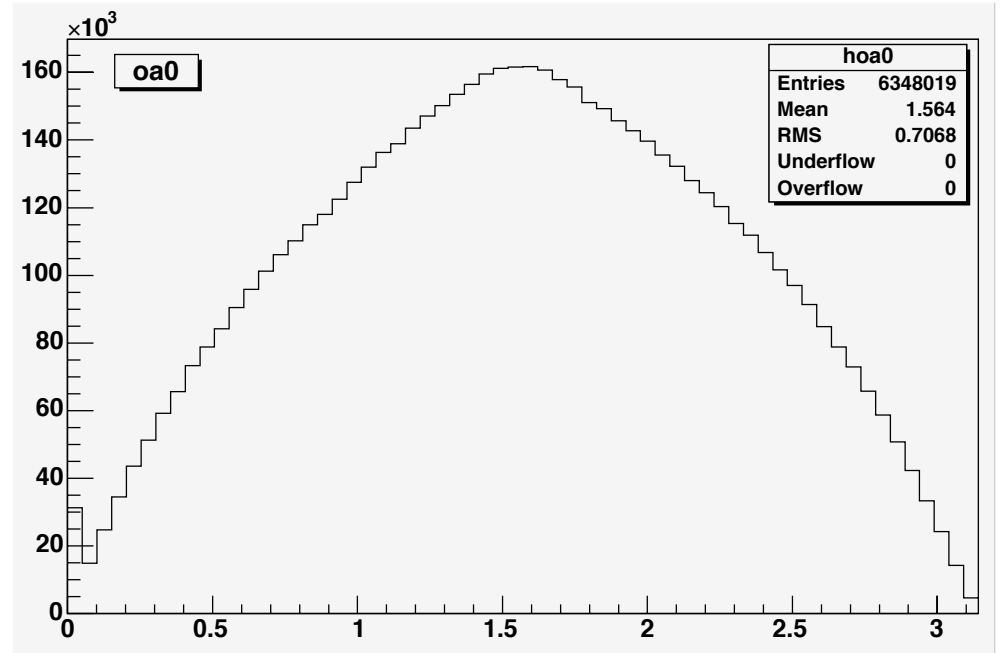
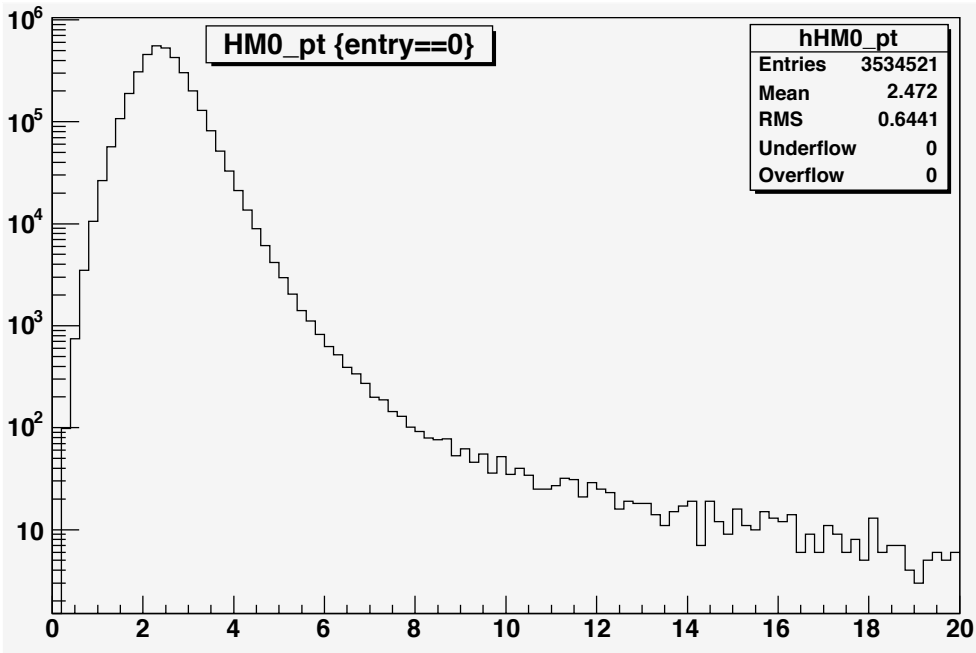
$\Delta\eta, \Delta\phi, \theta$ (opening angle)

plot TOF observables

versus $\Delta\eta, \Delta\phi, \theta, \text{HM0_pt}, \text{etc....}$

i.e. **-/+ ratios, PID ratios, RCP ratios, etc**

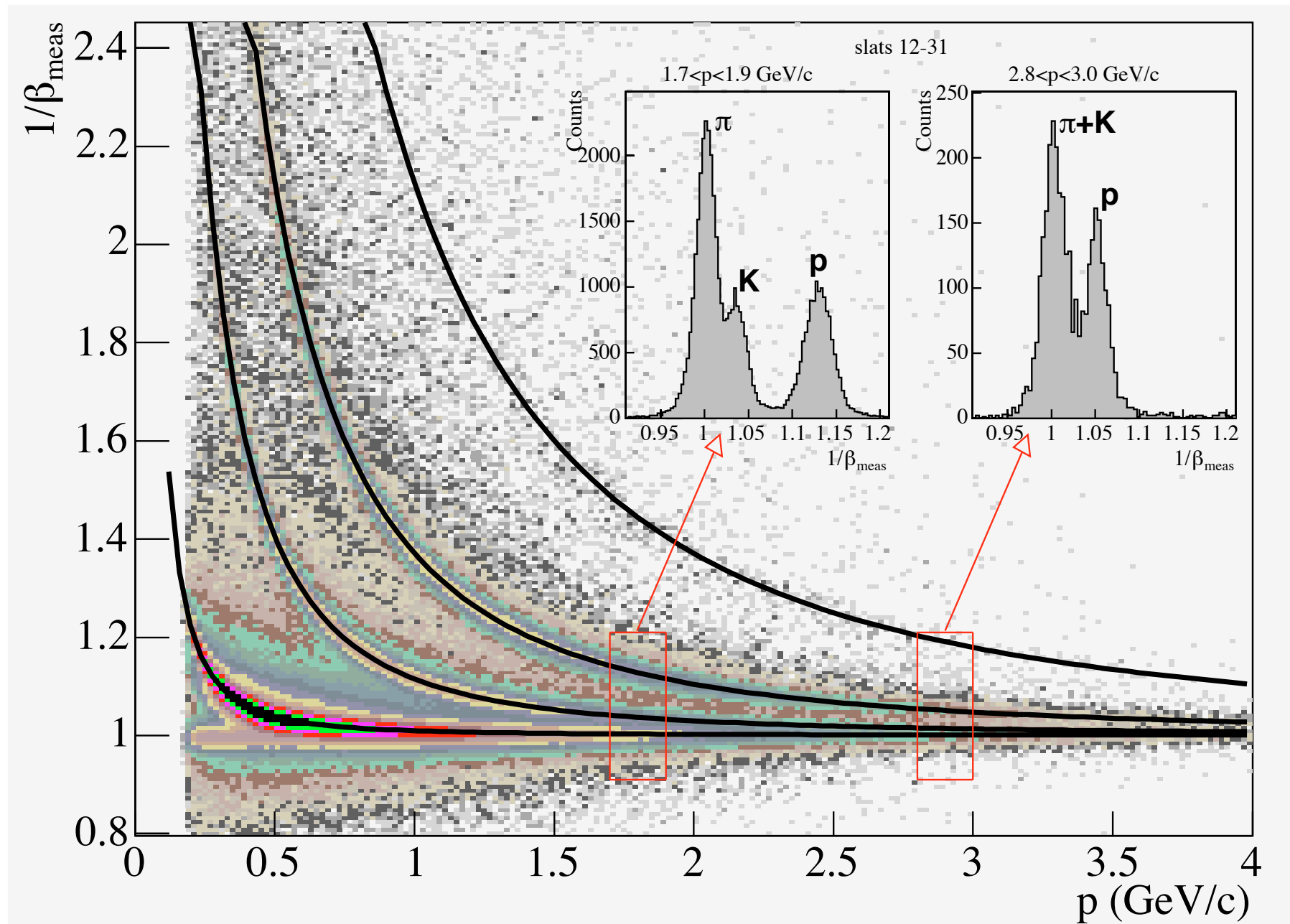


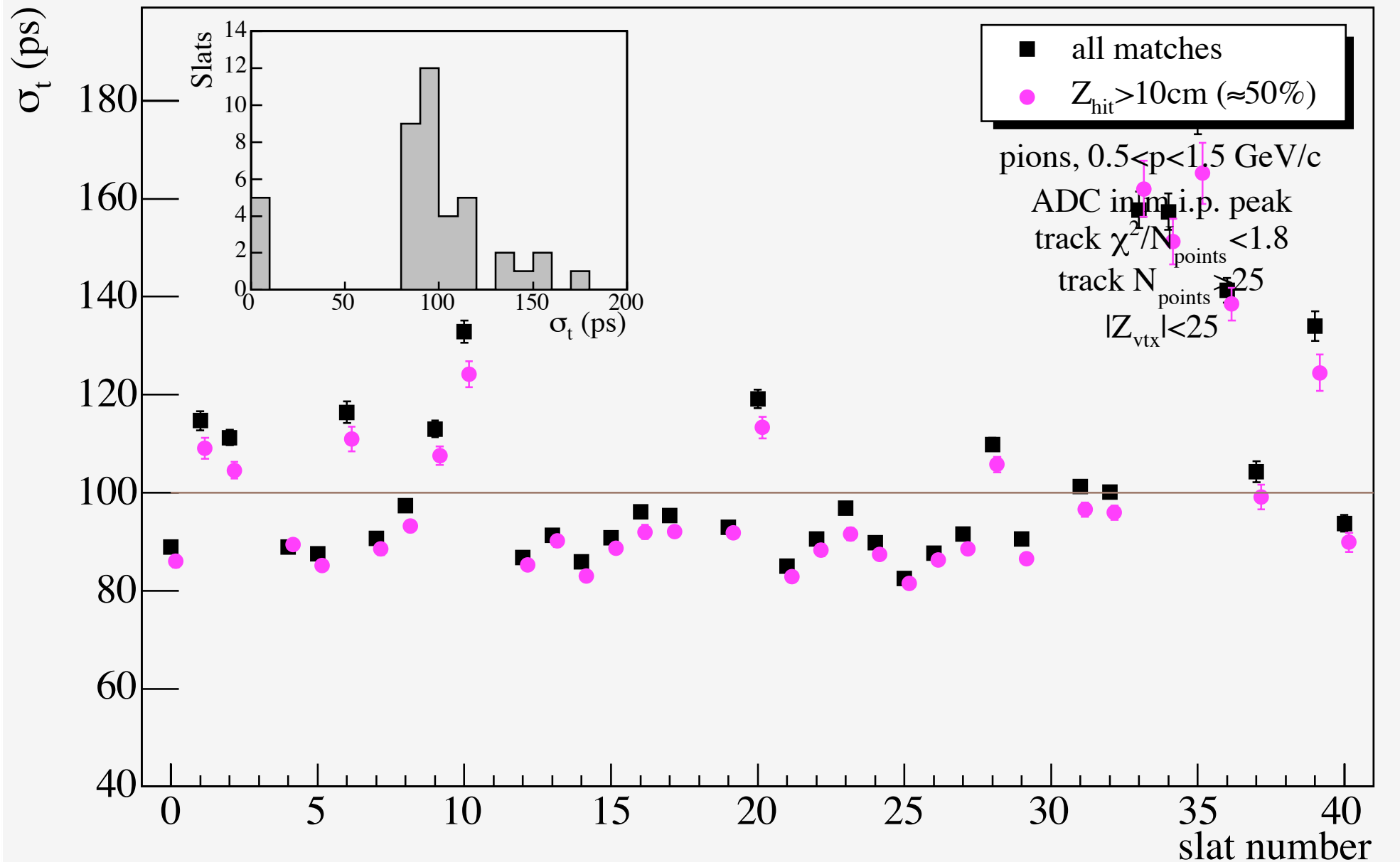


(spikes at zero are the case where HMO particle is also a TOFp match...)

Start- and Stop-Side calibrations....

use “usual” TOFp technique - entirely in $1/\beta$ -space... (NIM A **522**, 252, 2004)
w/ a specific set of track and match quality cuts, one gets

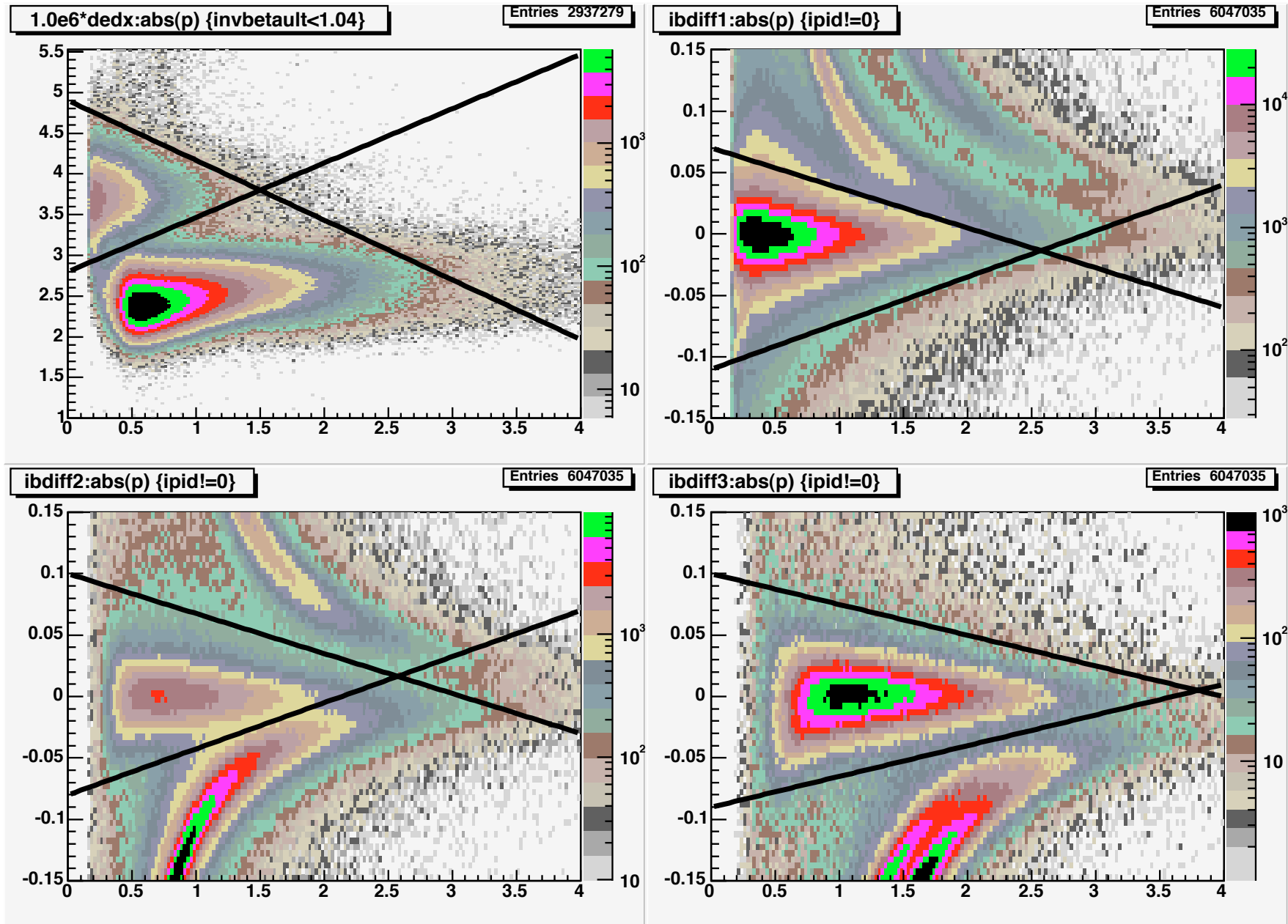




one can shift the resn up & down by a few ps depending on exactly what event, track, start side, & stop side cuts are used....

tighter cuts practically always result in better timing (and lower PID efficiency)

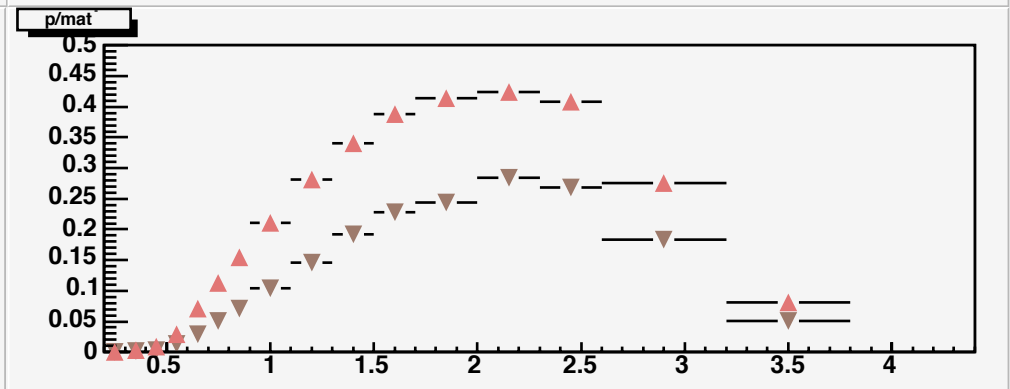
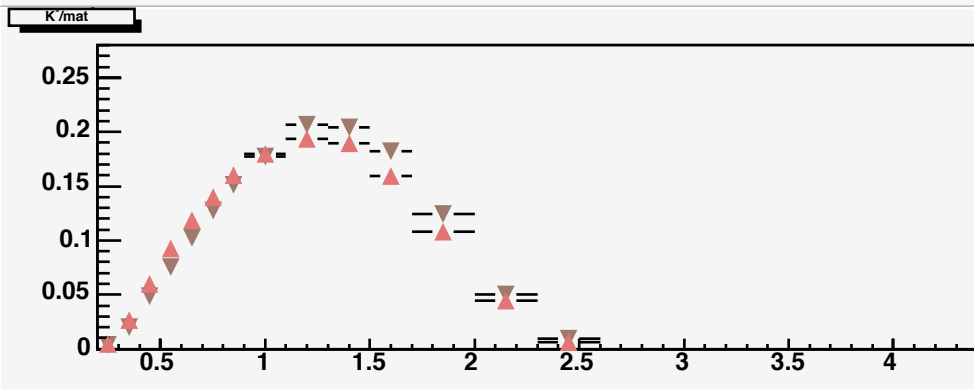
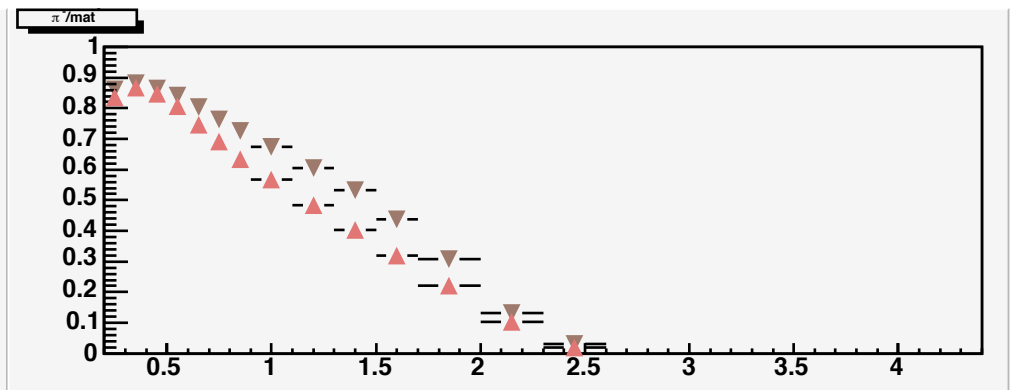
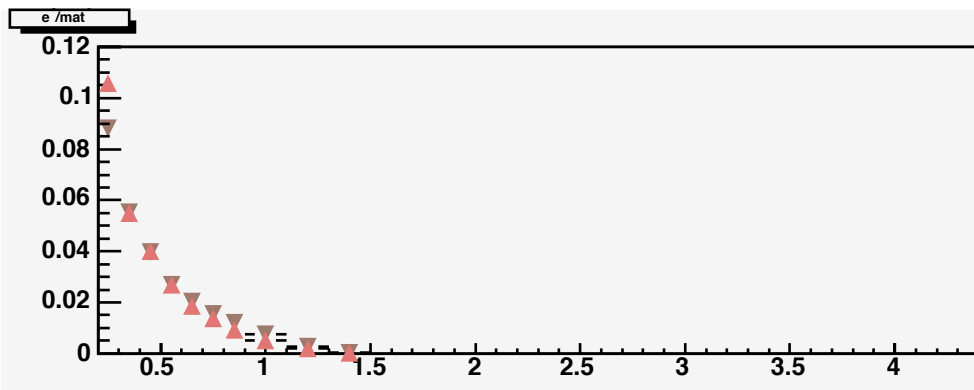
PID Assignment



there are many other ways to define “ipid” using TPC+TOF info ($1/\beta$ -space, m^2 -space, ...)
eventually will need to compare results from different PID methods (each w/ specific match \rightarrow ipid efficiency)

Probability(PID) wrt all matches vs pT

up triangles: positive
down triangles: negative



Centrality measure...

based on refmult...

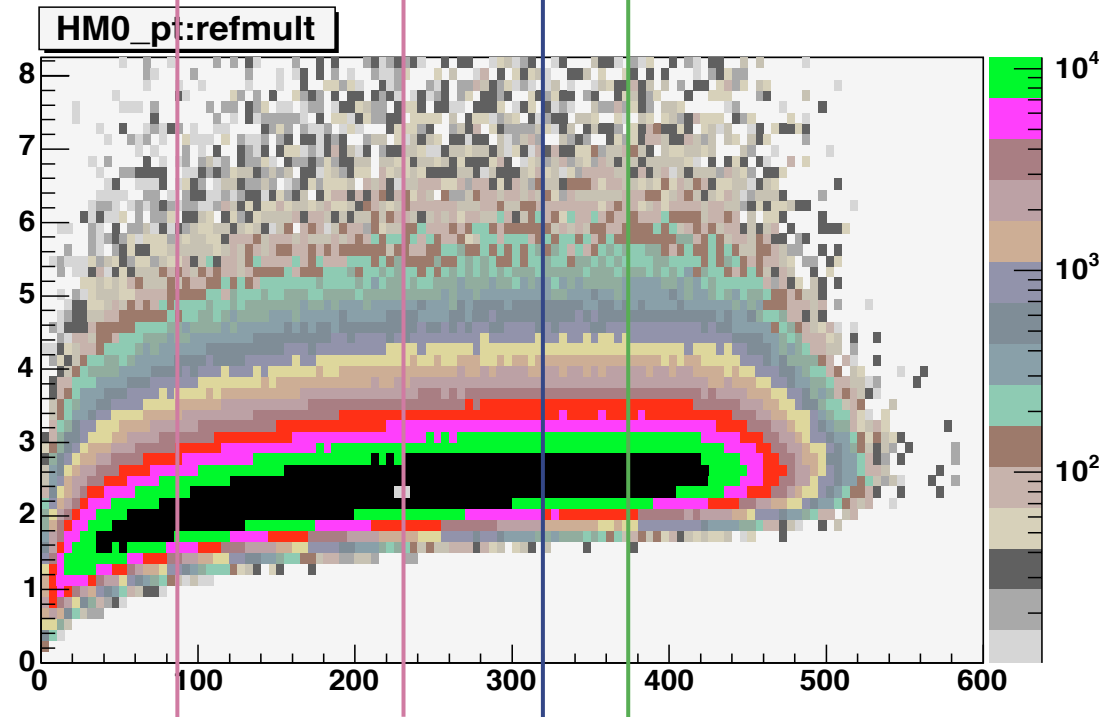
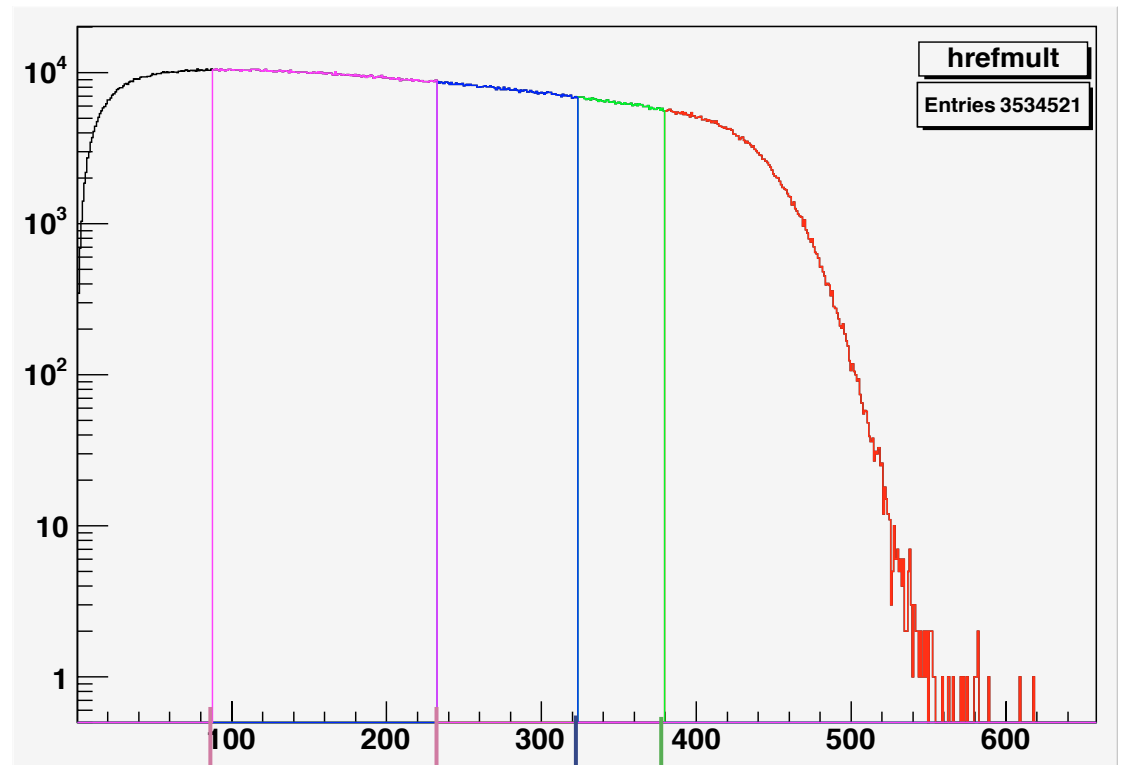
40-80% peripheral

40-20%

20-10%

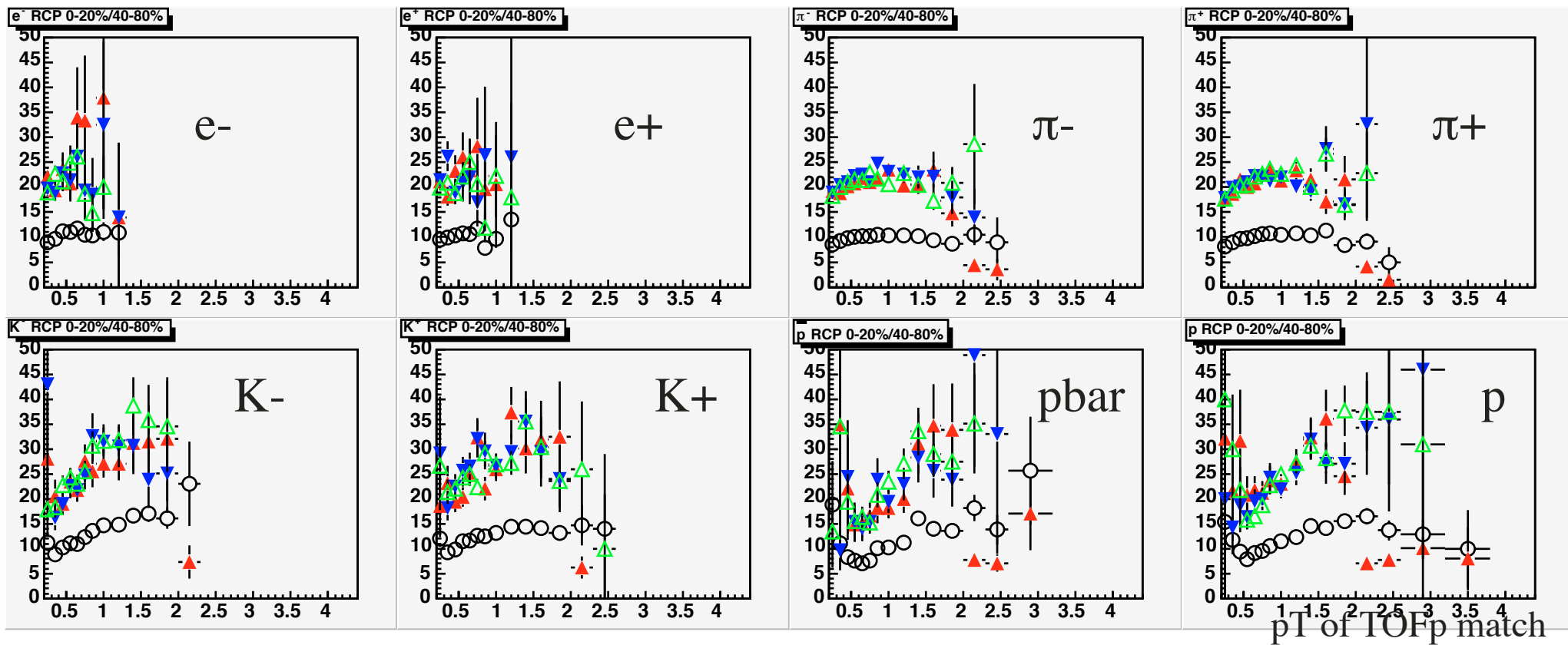
10- 0% central

$$\text{“RCP”} = \frac{[20-10\%] + [10-0\%]}{0.5 * [40-80\%]}$$



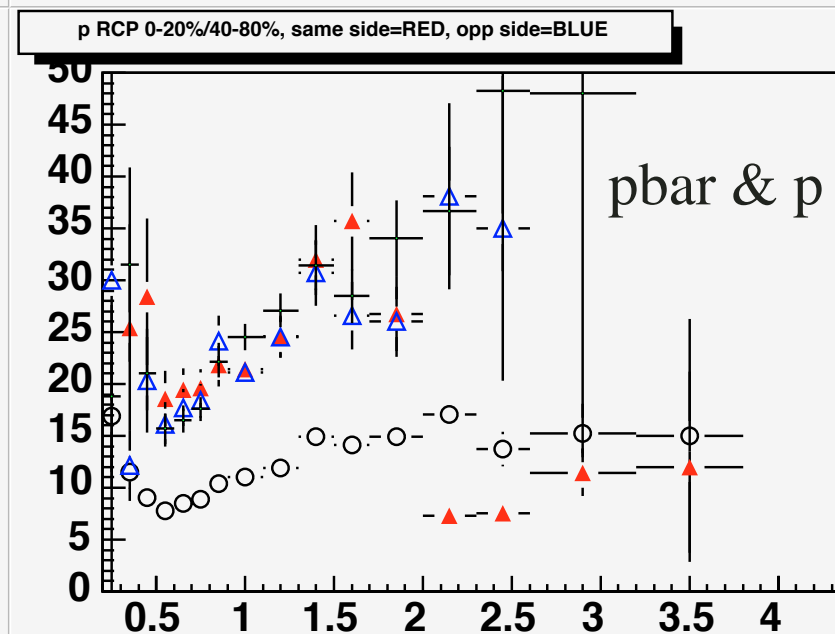
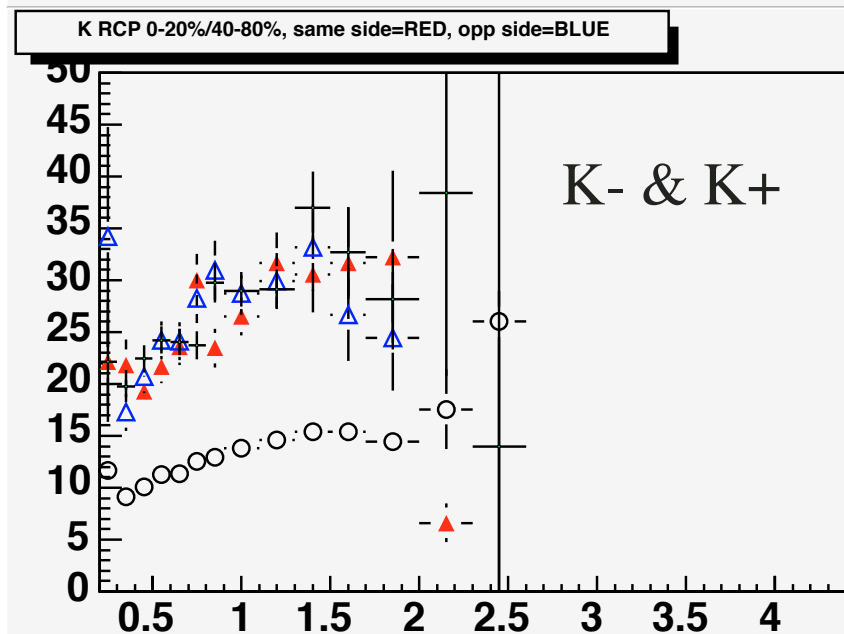
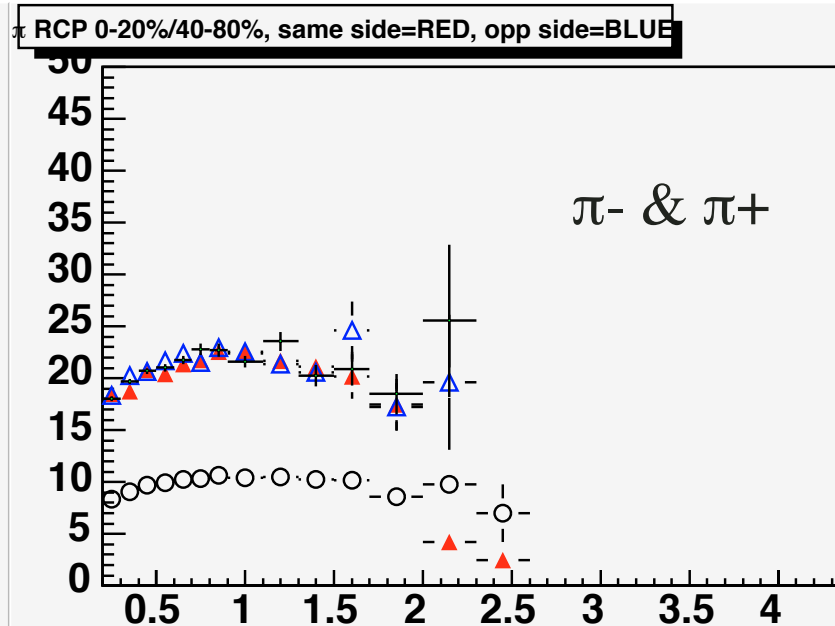
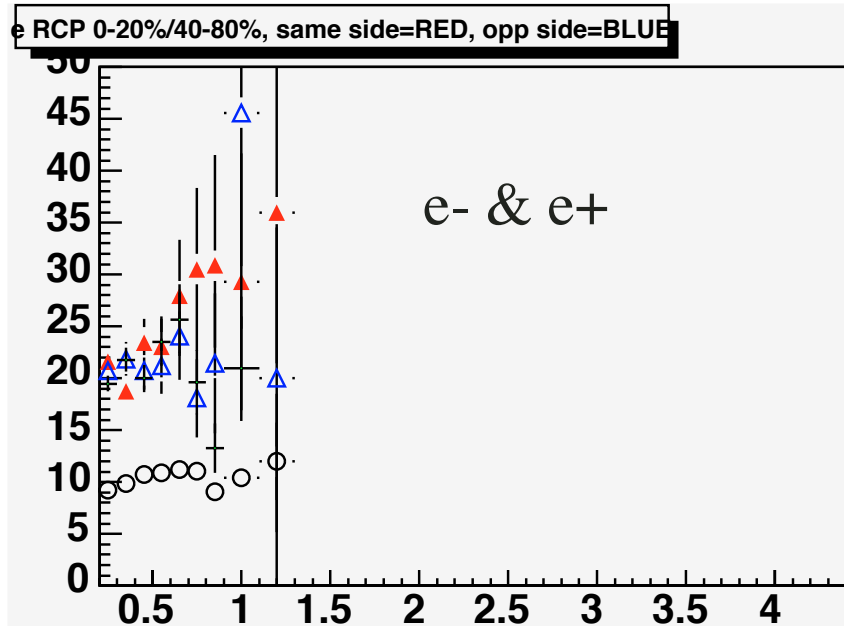
RCP vs PT by particle

black all matches
 red HM0_pt>2.0 and $0 < \theta < \pi/3$
 green HM0_pt>2.0 and $\pi/3 < \theta < 2\pi/3$
 blue HM0_pt>2.0 and $2\pi/3 < \theta < \pi$

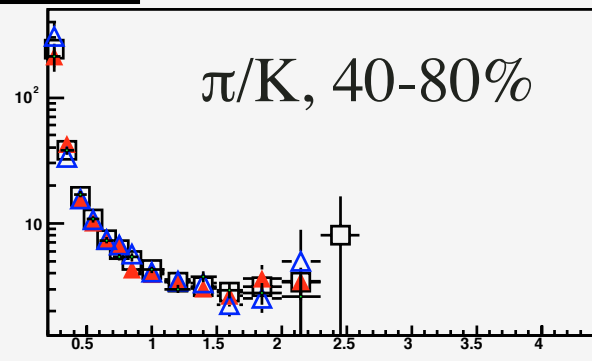


RCP vs PT by species

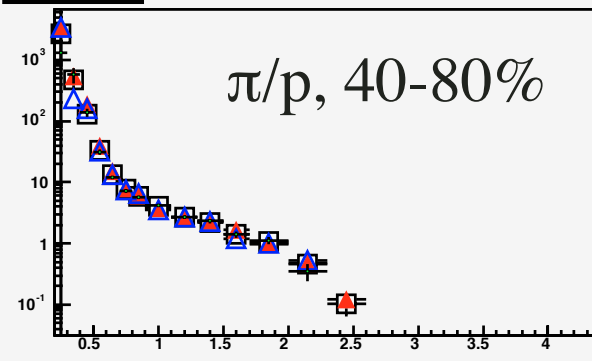
- black all matches
- red HM0_pt>2.0 and $0 < \theta < \pi/3$
- green HM0_pt>2.0 and $\pi/3 < \theta < 2\pi/3$
- blue HM0_pt>2.0 and $2\pi/3 < \theta < \pi$



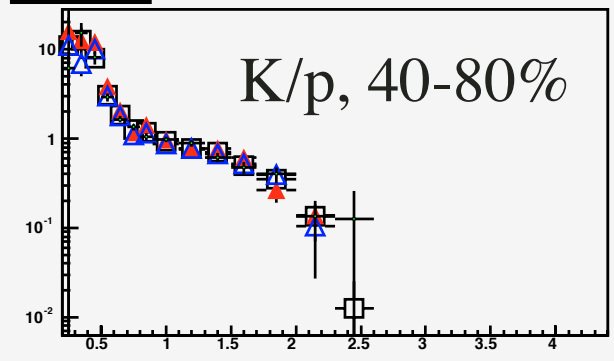
π/K Peripheral



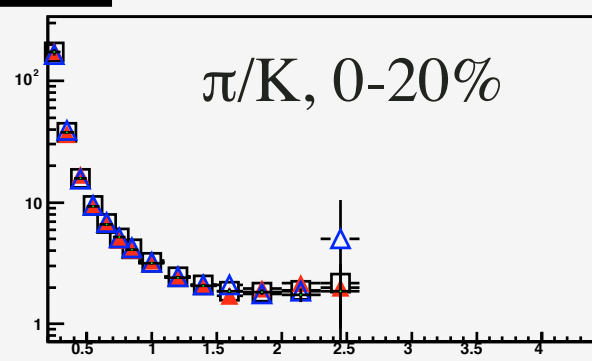
π/p Peripheral



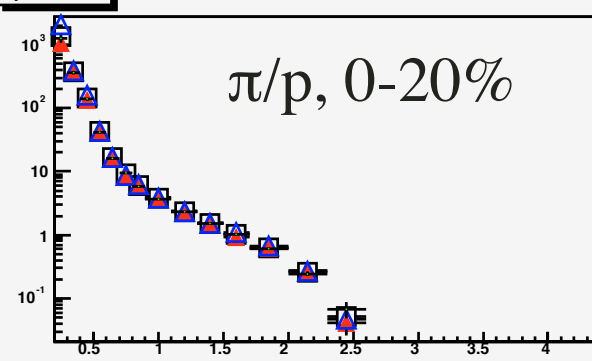
K/p Peripheral



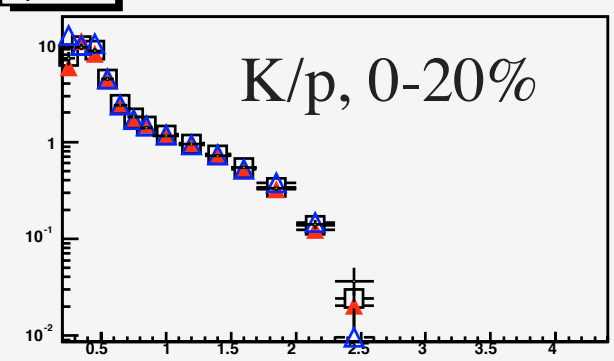
π/K Central

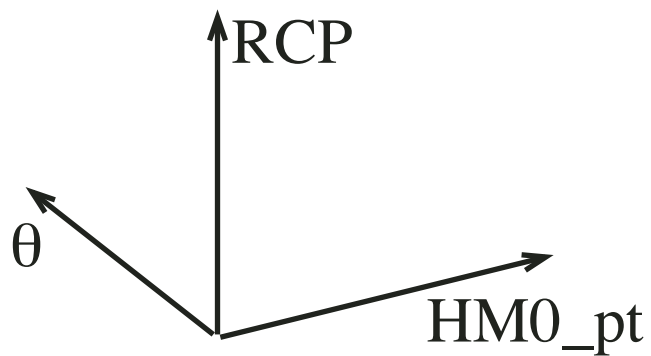


π/p Central

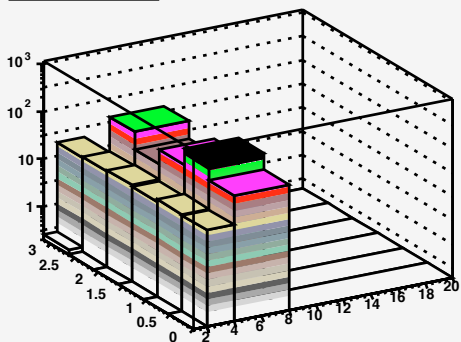


K/p Central

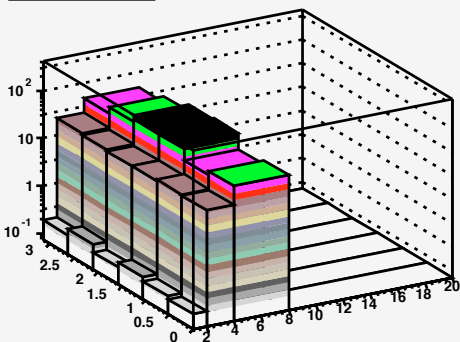




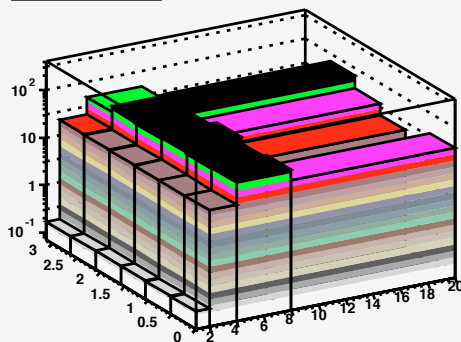
rcp_hm0pt_0a00



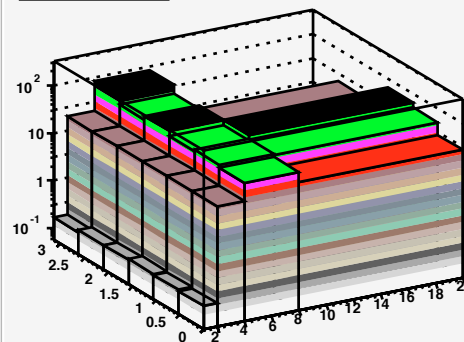
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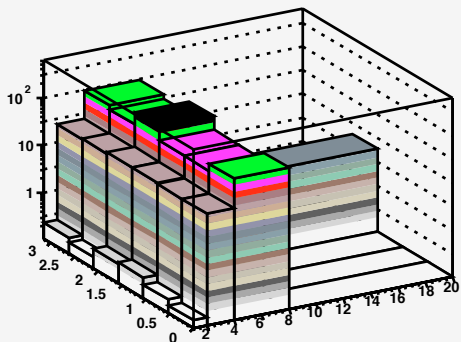
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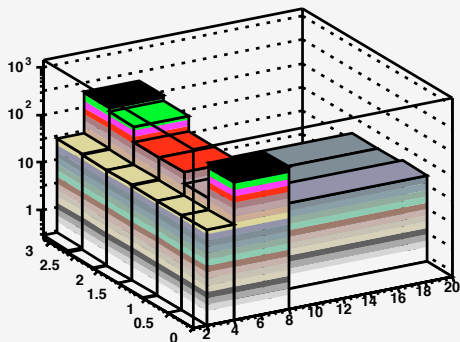
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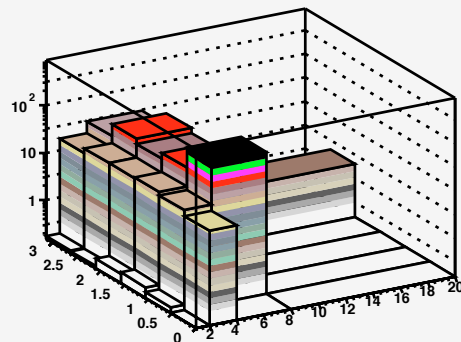
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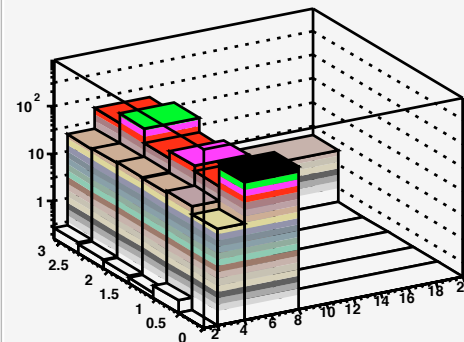
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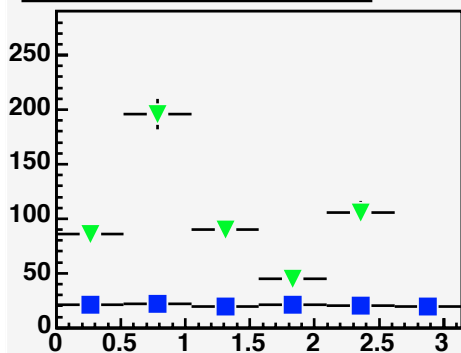
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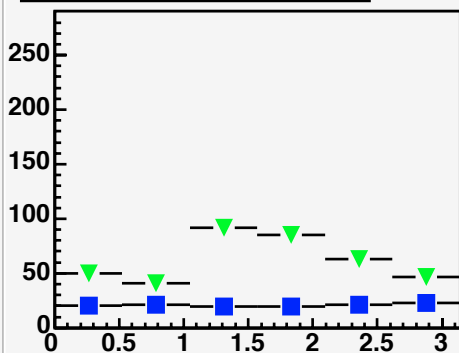
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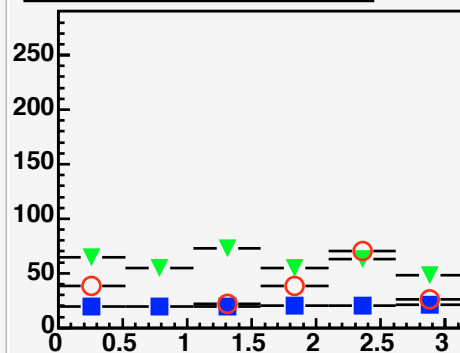
e RCP 0-20%/40-80% vs OA in HM0_pt bin



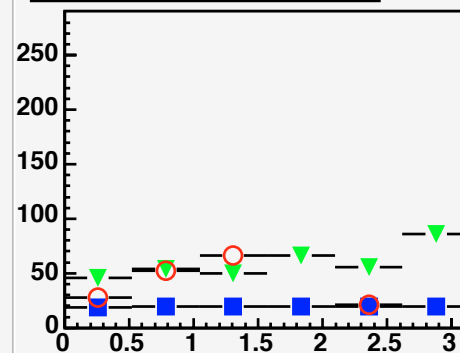
e RCP 0-20%/40-80% vs OA in HM0_pt bin



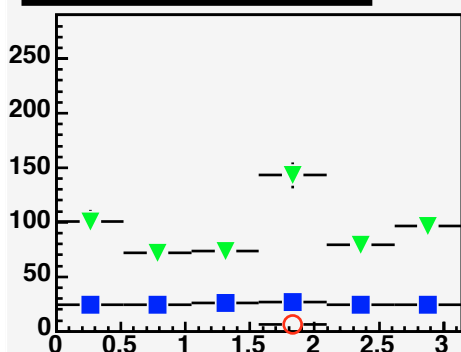
f RCP 0-20%/40-80% vs OA in HM0_pt bin



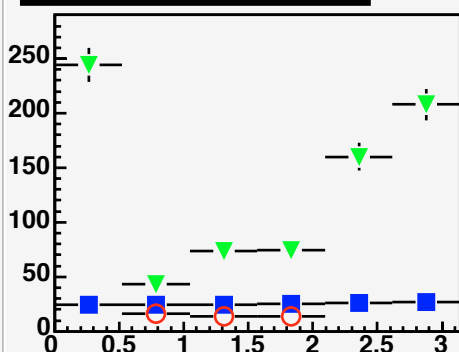
π RCP 0-20%/40-80% vs OA in HM0_pt bin



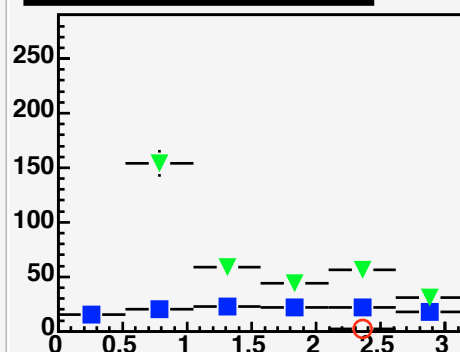
K RCP 0-20%/40-80% vs OA in HM0_pt bin



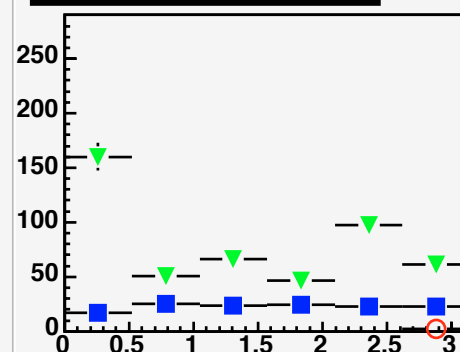
K RCP 0-20%/40-80% vs OA in HM0_pt bin



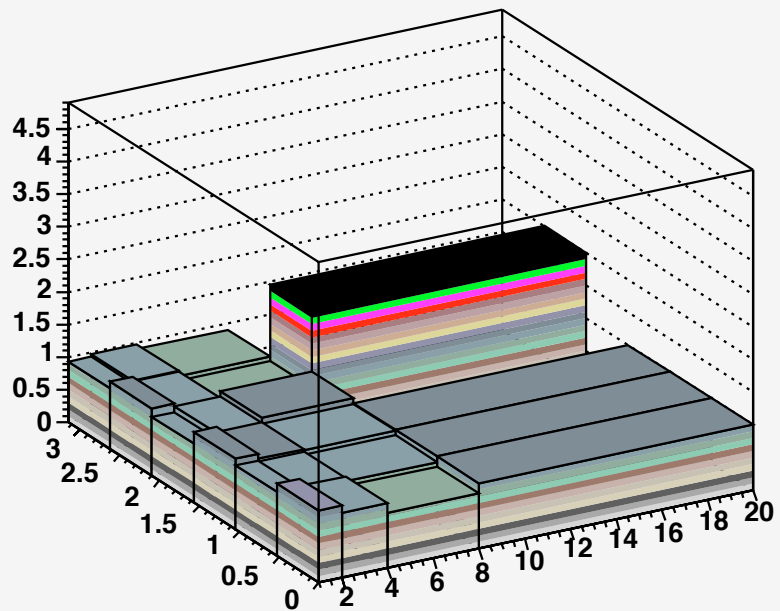
b RCP 0-20%/40-80% vs OA in HM0_pt bin



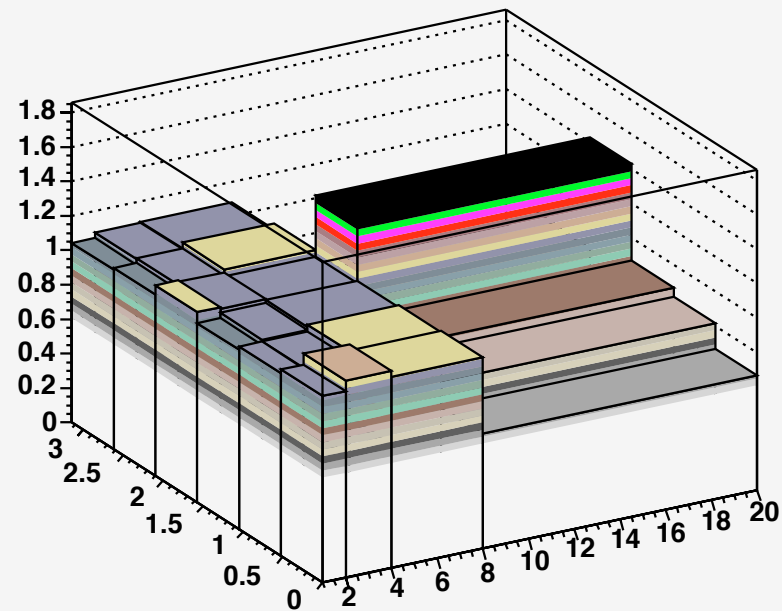
b RCP 0-20%/40-80% vs OA in HM0_pt bin



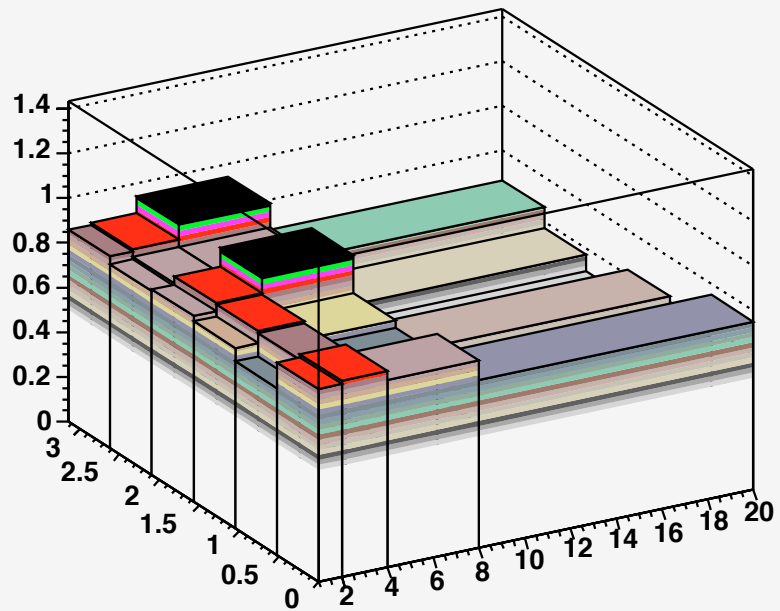
e^-/e^+ vs. X=HM0_pt,Y=OA0



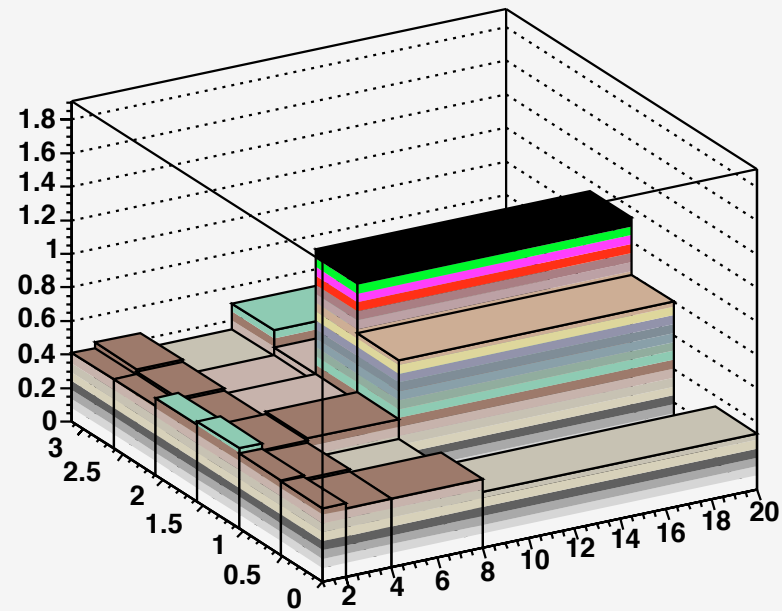
π^-/π^+ vs. X=HM0_pt,Y=OA0



K^-/K^+ vs. X=HM0_pt,Y=OA0



\bar{p}/p vs. X=HM0_pt,Y=OA0



Main goal: compare 62 GeV and 200 GeV data

wondering about significance issues....

200 GeV set a factor of ~ 5.5 times 1-something bigger than this 62 GeV set....

BTW: TOFp d+Au \rightarrow ~ 550 k matches, ~ 120 ps resn w/ “open” cuts....

directions...

Highest-pT particle specification now only uses TPC primaries w/ Nfitpts >15

\rightarrow include (B&E)EMC to also define “High-pT” axes using highest pT γ &e...

PID'd particle specification now only uses TOFp matches w/ specific cuts...

\rightarrow include Λ & Ks from some StStrange... maker

present approach defines a highest-pT particle then studies only tracks seen by TOFp

\rightarrow include in some way tracks near TOFp

(i.e. these may have perfectly relevant PID from dE/dx)...

present approach also

averages over reaction plane angles leading to TOFp matches...

studies pid info when adding together both charges of highest pT track....