

PID efficiencies

Shuo Jia

Basic cuts

cointime:2.5(fall)/1.5(spring)

HMS(SHMS) delta:-8,8(-10,20)

HMS(SHMS) acceptance constrain

SHMS pi cut

accidental background: 6 peaks

HMS Calorimeter

Cherenkov cut: 12

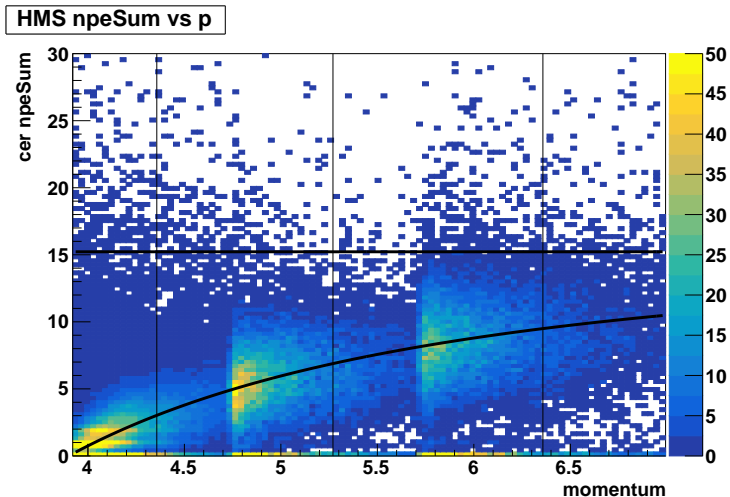
Calorimeter cut: varies

HMS Cherenkov

Cherenkov cut: varies

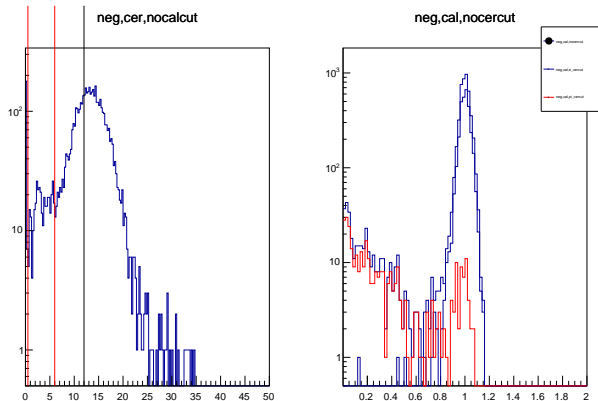
Calorimeter cut: 1

HMS Cer, not a good pion rejector



HMS Cherenkov detector has pion threshold 3.8, which is not a good pion rejector. To select good electron sample, I use cernpe greater than 12.

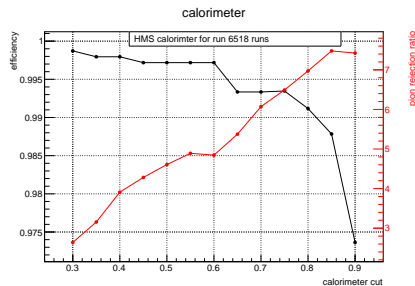
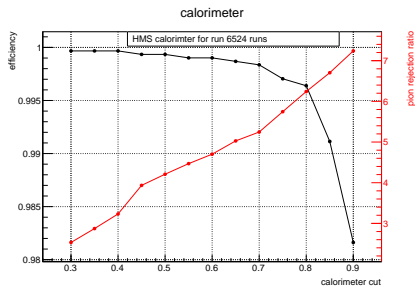
efficiency with cut



RunNumber 6524, in run group 360, momentum 4.736, neg

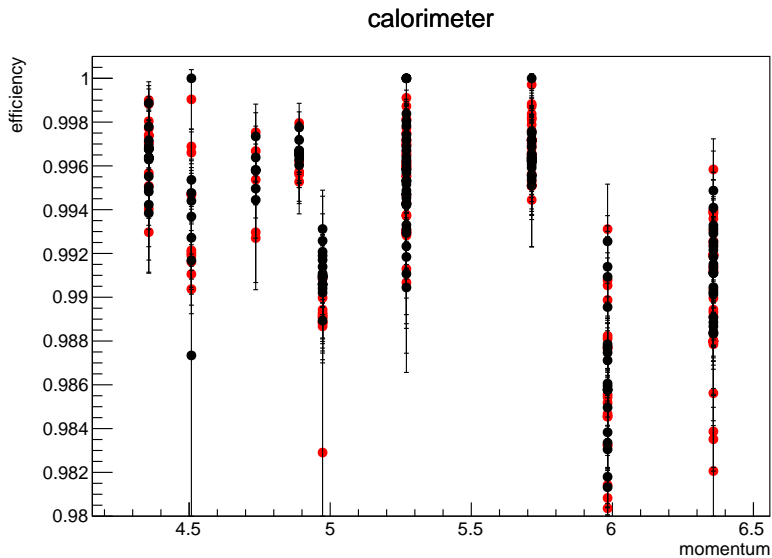
$$cal_eff = \frac{e_did[cer_cut\&cal_cuts]}{e_sample[cer_cut]}$$

efficiency with cut



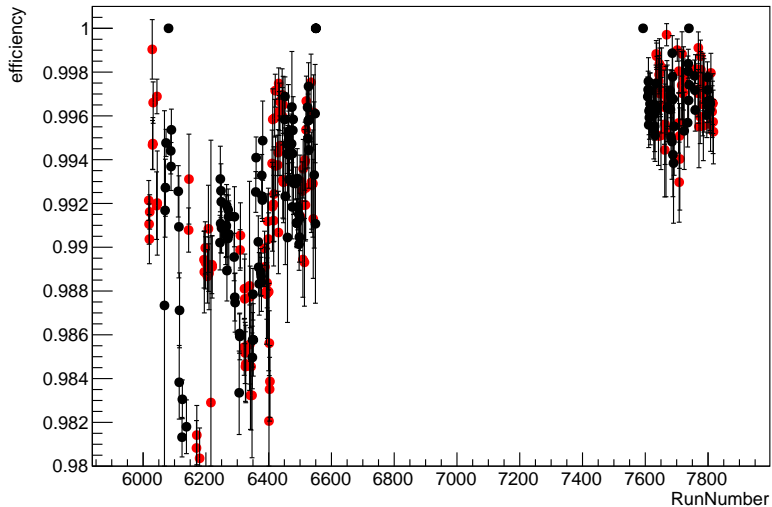
left is neg run 6524, right is pos run 6518, in run group 360, momentum 4.736

HMS Detector efficiency verse momentum

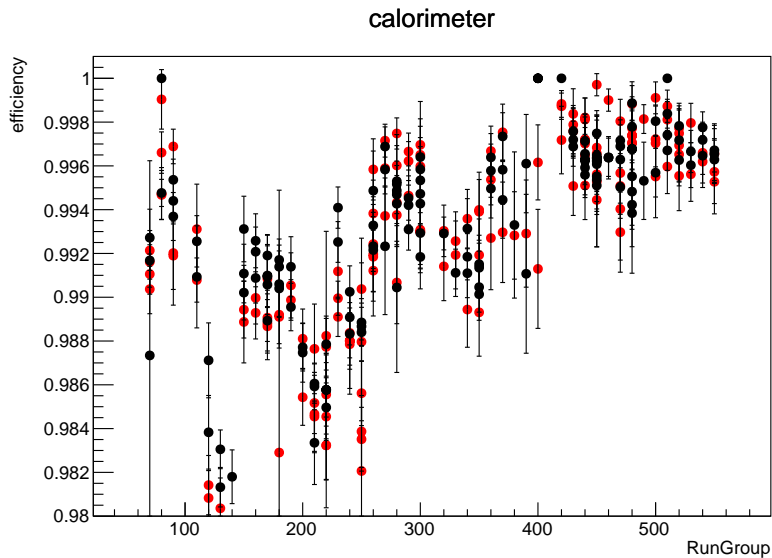


HMS Detector efficiency verse RunNumber

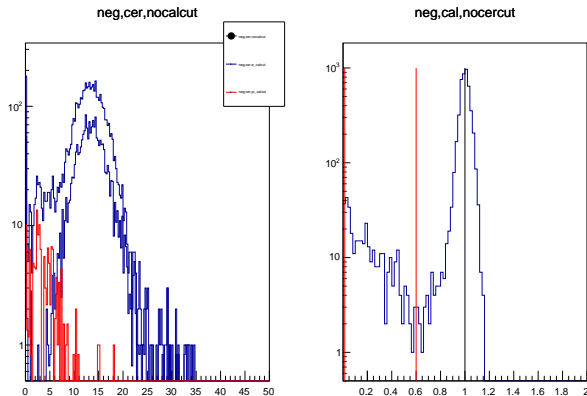
calorimeter



HMS Detector efficiency verse RunGroup



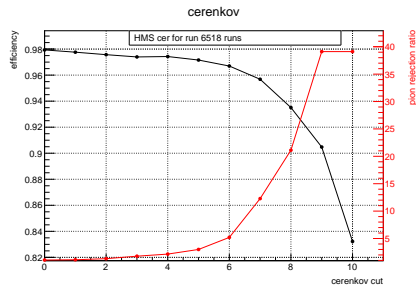
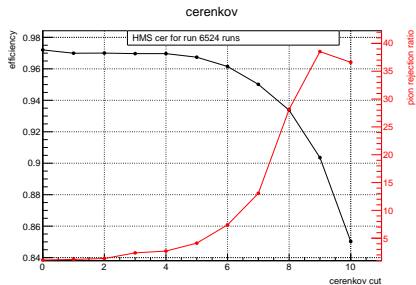
efficiency with cut



RunNumber 6524, in run group 360, momentum 4.736, neg, cal cut greater than 1

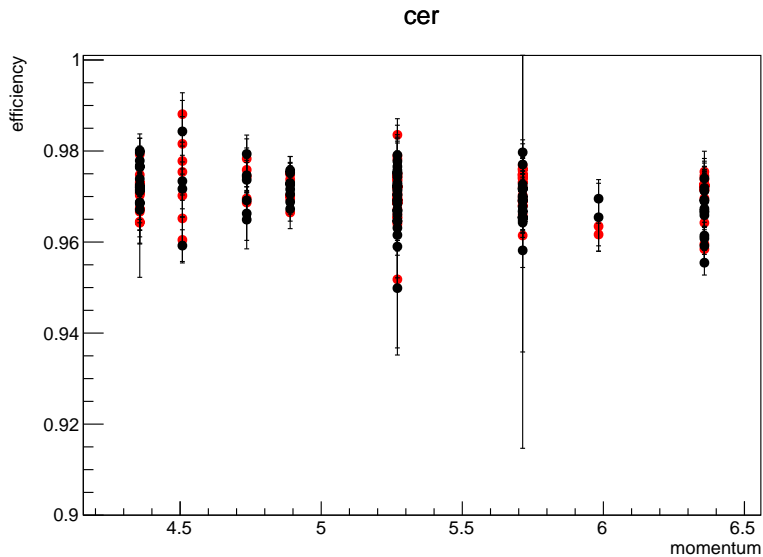
$$cer_eff = \frac{e_did[cal_cuts\&cer_cuts]}{e_sample[cal_cut]}$$

efficiency with cut

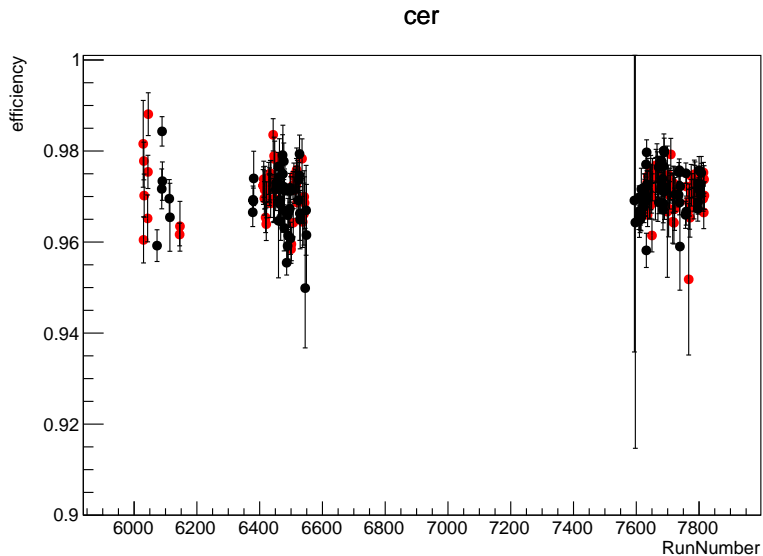


left is neg run 6524, right is pos run 6518, in run group 360, momentum 4.736

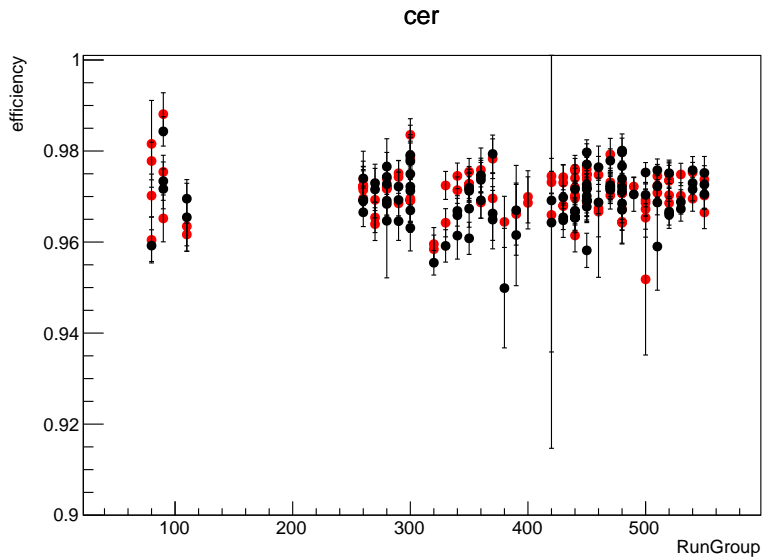
HMS Detector efficiency verse momentum



HMS Detector efficiency verse RunNumber



HMS Detector efficiency verse RunGroup



Basic cuts

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HMS(SHMS) acceptance constrain

HMS e cut

accidental background: 6 peaks

SHMS Calorimeter

Aerogel Cherenkov cut: 2

rftime cut: 0.5, 1.5

Calorimeter cut: varies

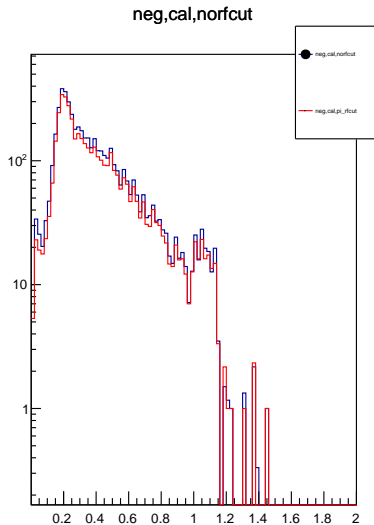
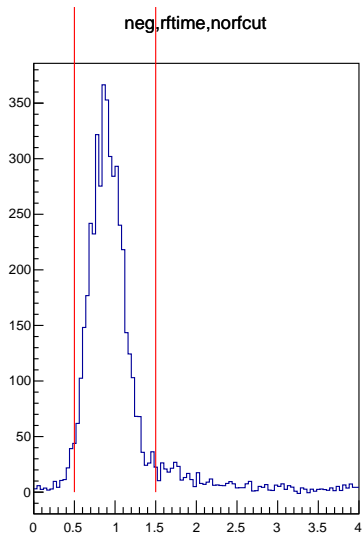
SHMS aerogel Cherenkov

Aerogel Cherenkov cut: varies

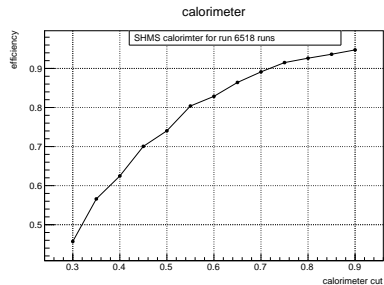
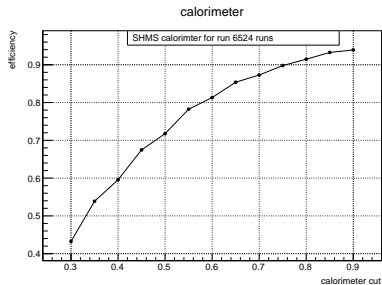
rftime cut: 0.5, 1.5

Calorimeter cut: 0.05, 0.85

SHMS efficiency with cut



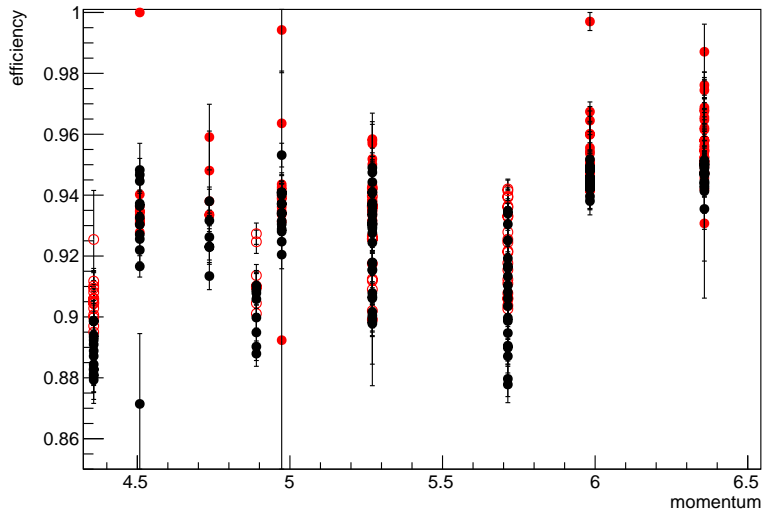
SHMS efficiency with cut



left is neg run 6524, right is pos run 6518, in run group 360, momentum 4.736

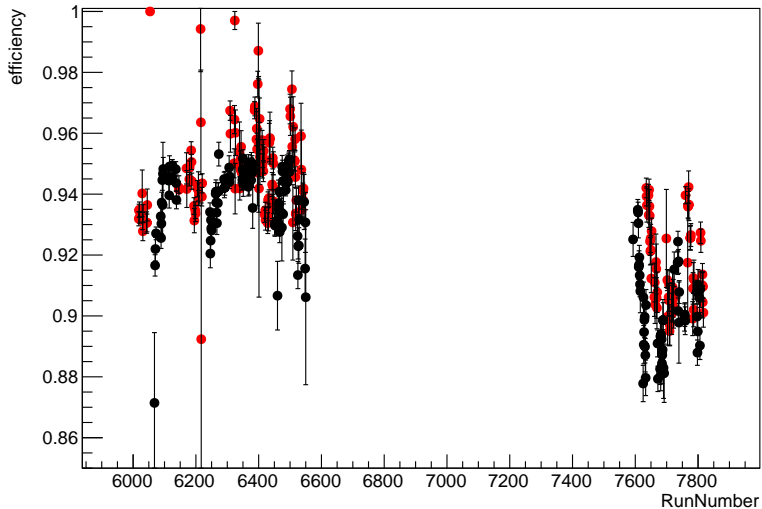
SHMS cal efficiency verse momentum

rfcut,cal_pi<0.8

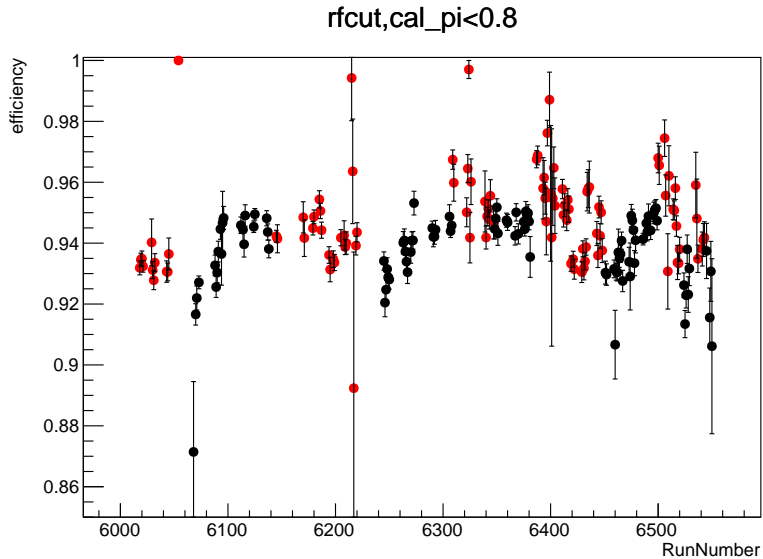


SHMS cal efficiency verse RunNumber

rfcut,cal_pi<0.8

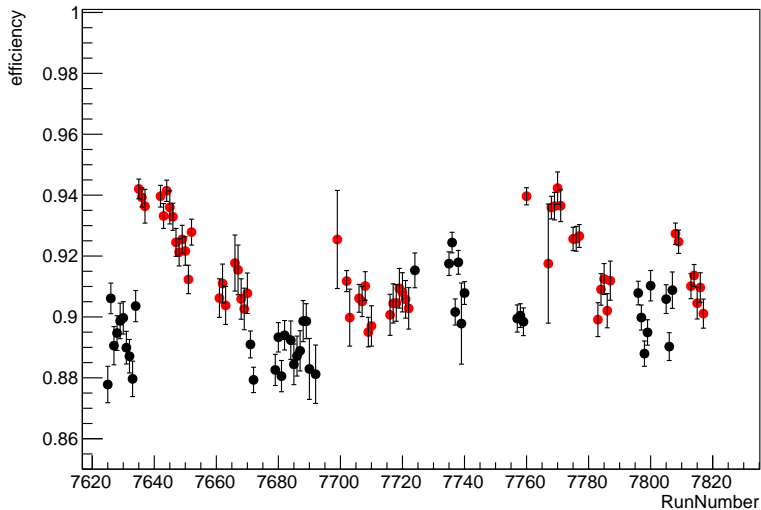


SHMS cal efficiency verse RunNumber

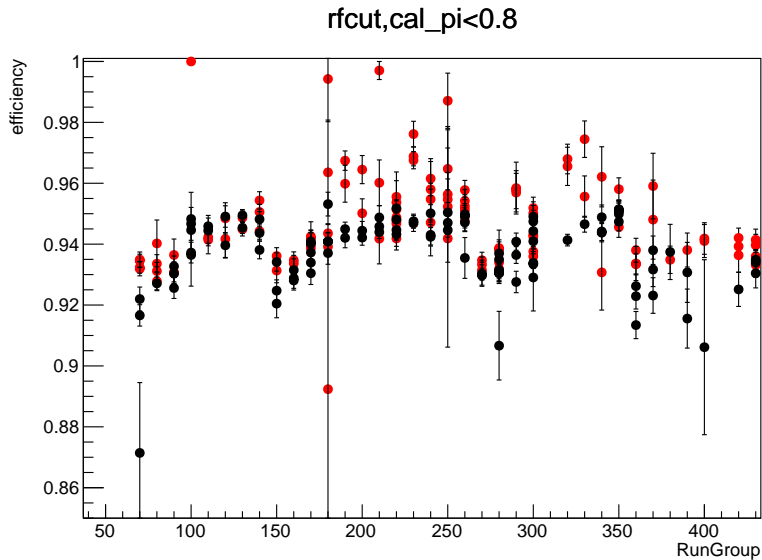


SHMS cal efficiency verse RunNumber

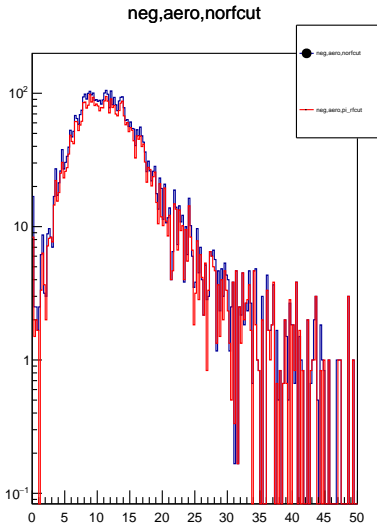
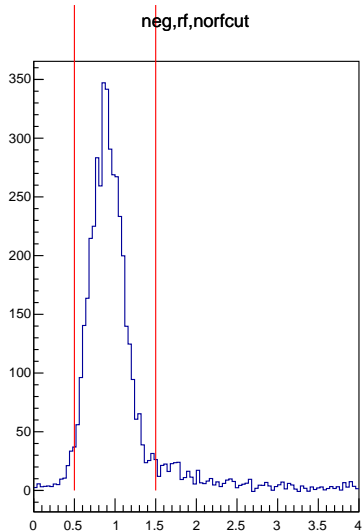
rfcut,cal_pi<0.8



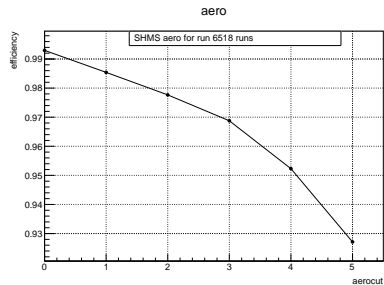
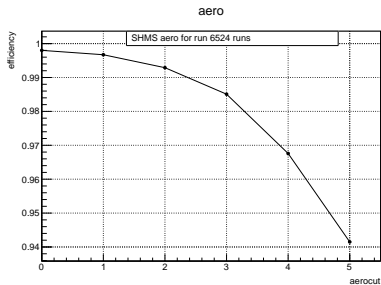
SHMS cal efficiency verse RunGroup



SHMS efficiency with cut



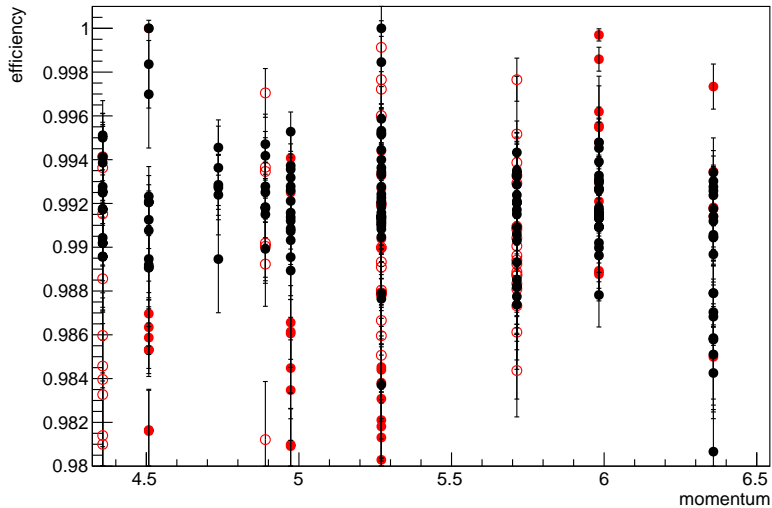
efficiency with cut



neg run 6524,in run group 360, momentum 4.736

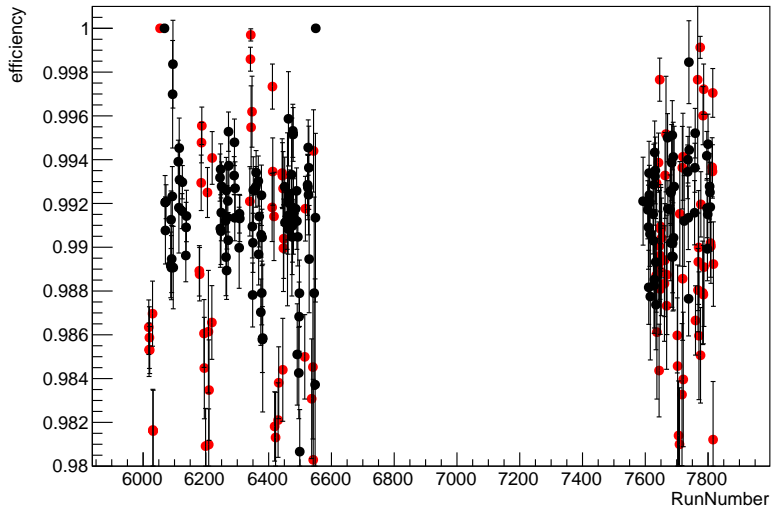
SHMS aero efficiency verse momentum

rfcut,aero_pi>2



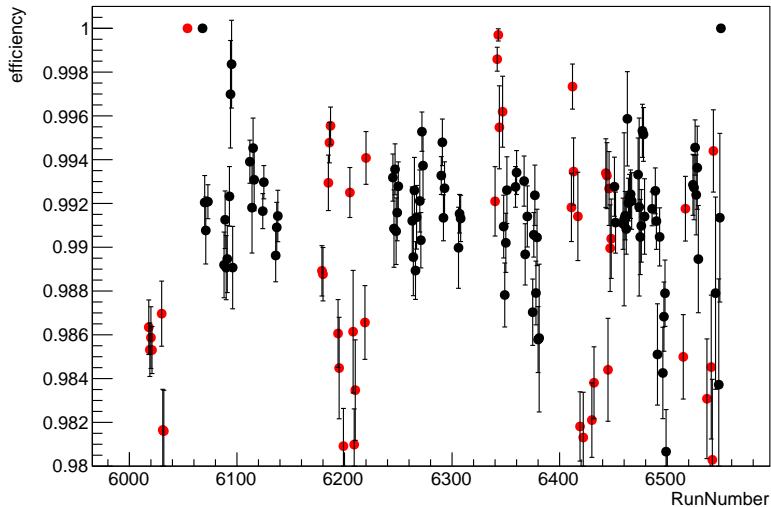
SHMS aero efficiency verse RunNumber

rfcut,aero_pi>2



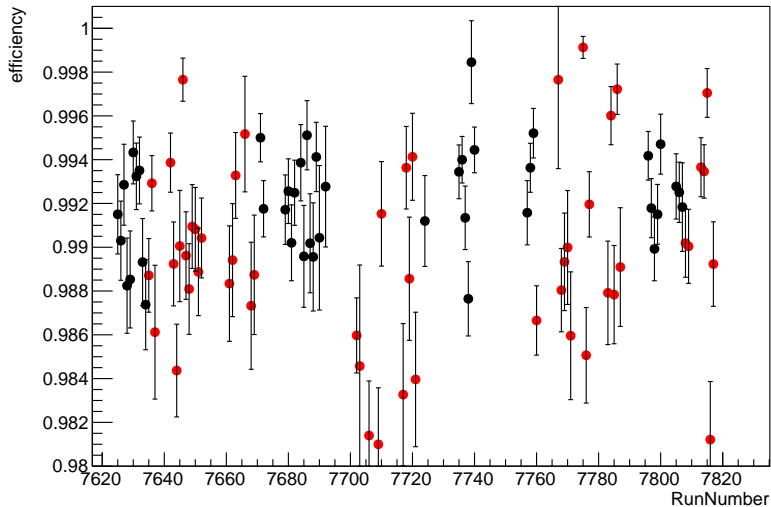
SHMS aero efficiency verse RunNumber

rfcut,aero_pi>2



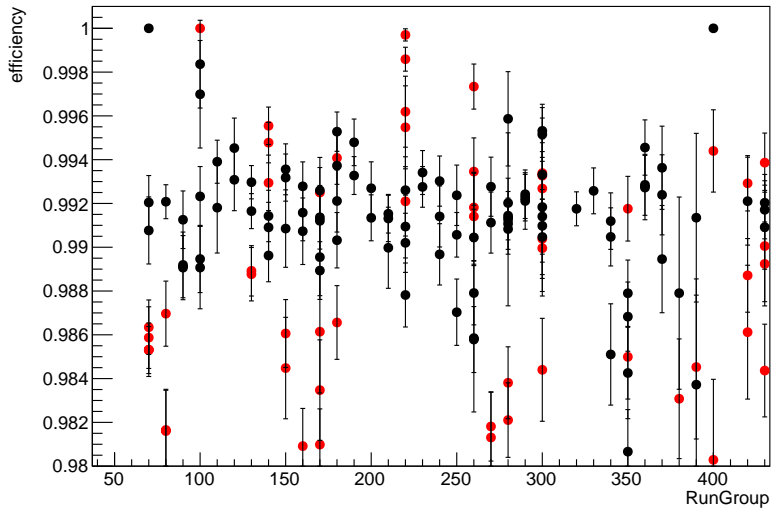
SHMS aero efficiency verse RunNumber

rfcut,aero_pi>2

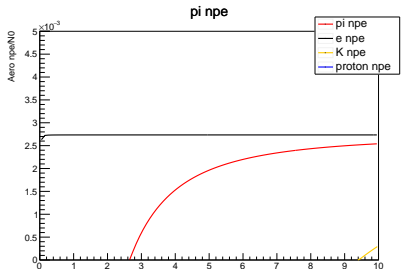


SHMS aero efficiency verse RunGroup

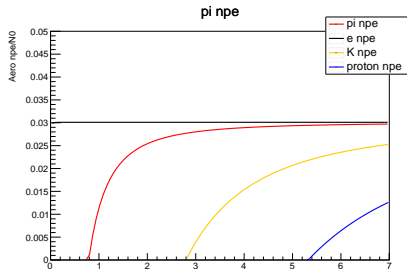
rfcut,aero_pi>2



SHMS rftime cut, pion efficiency and kaon contamination



hgcer npe verse momentum



aero npe verse momentum

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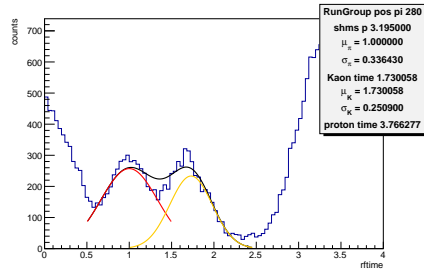
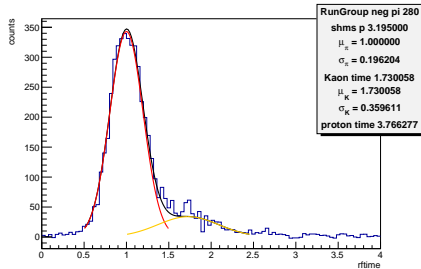
Calorimeter cut: 0.05,0.85

SHMS rftiming

0.5,1.5

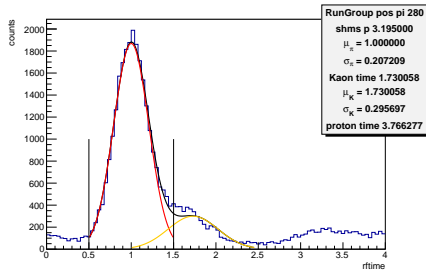
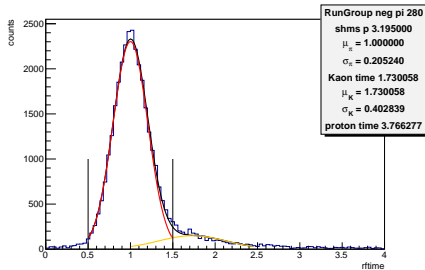
$-3\sigma, 3\sigma$

rf cut, pion efficiency and kaon contamination



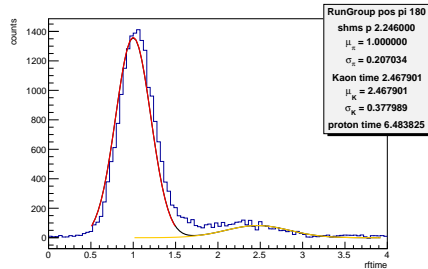
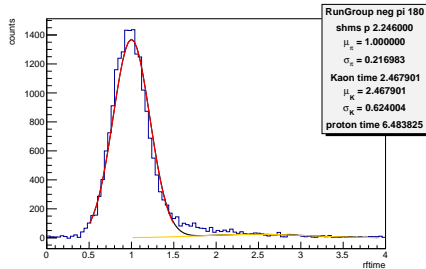
HGcer greater than 2. Cut pions to show kaons here.

rf cut, pion efficiency and kaon contamination



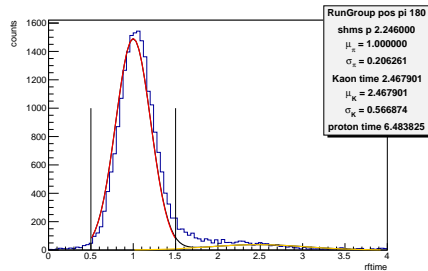
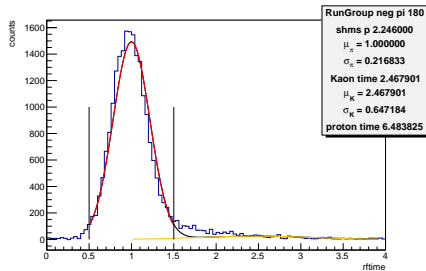
pi_eff from gaussian distribution
$$\text{kaon con} = \frac{\text{kaonfitintegral}[\text{rfcut}]}{\text{allfitintegral}[\text{rfcut}]}$$

rf cut, pion efficiency and kaon contamination

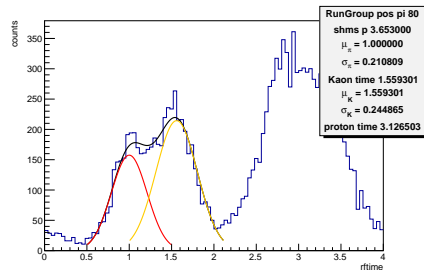
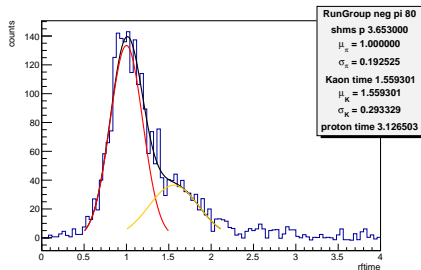


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rf cut, pion efficiency and kaon contamination

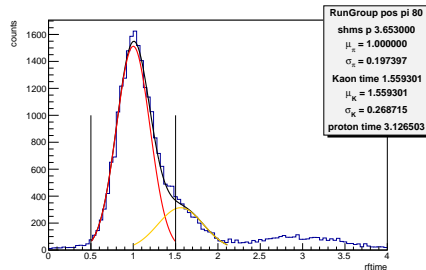
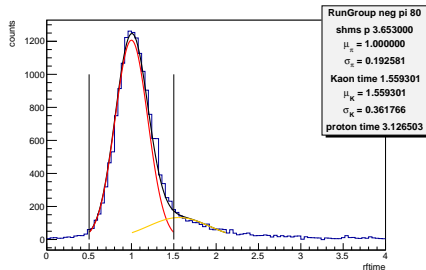


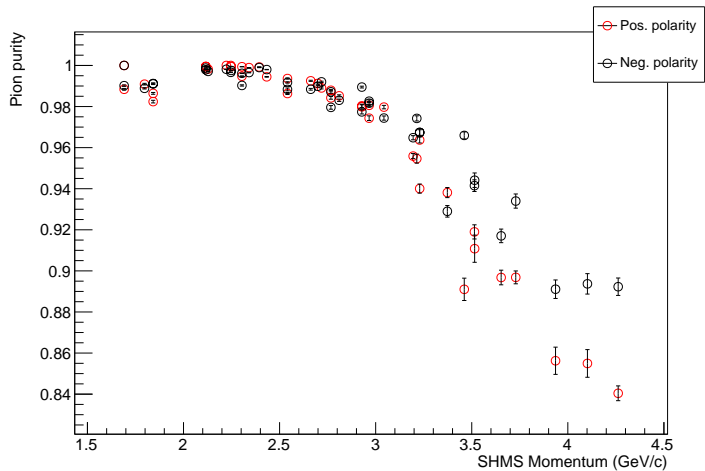
rf cut, pion efficiency and kaon contamination



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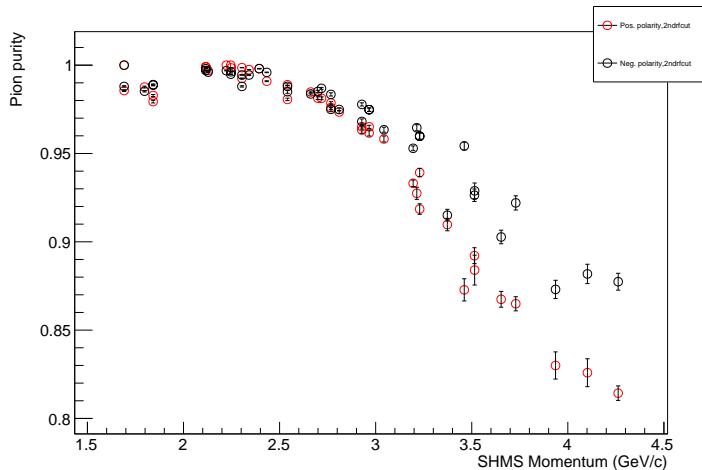




pion eff from gaussian fit sigma estimate

$$\text{kaon con} = \frac{\text{kaonfit}[\text{newrfcut}]}{\text{allfit}[\text{newrfcut}]}$$

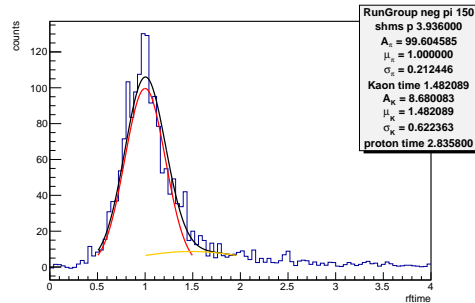
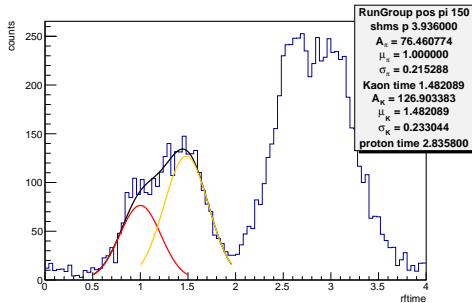
What if I use 3 sigma cut on pi fit



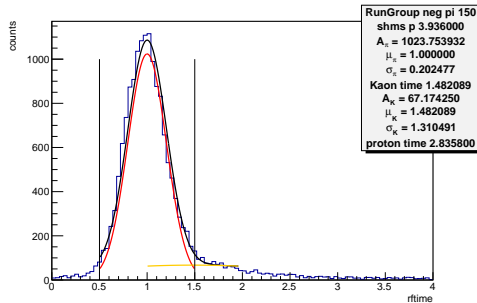
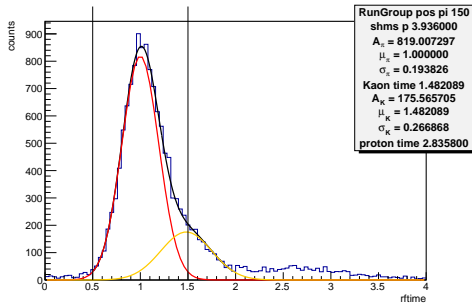
pion eff = 99.7

$$\text{kaon con} = \frac{\text{kaonfit}[\text{newrfcut}]}{\text{allfit}[\text{newrfcut}]}$$

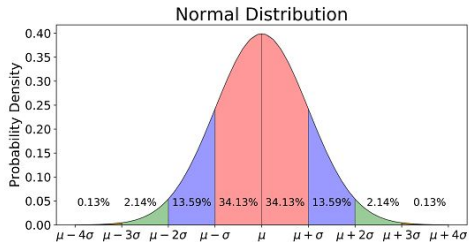
150, SHMS momentum 3.936



150, SHMS momentum 3.936



Some definition

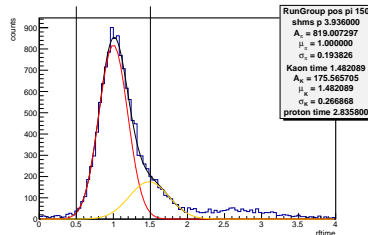


$$\text{pion efficiency} = \frac{\text{pionfit}[rfcut]}{\text{pionfit}[allrange]}$$

For different rf timing cut,

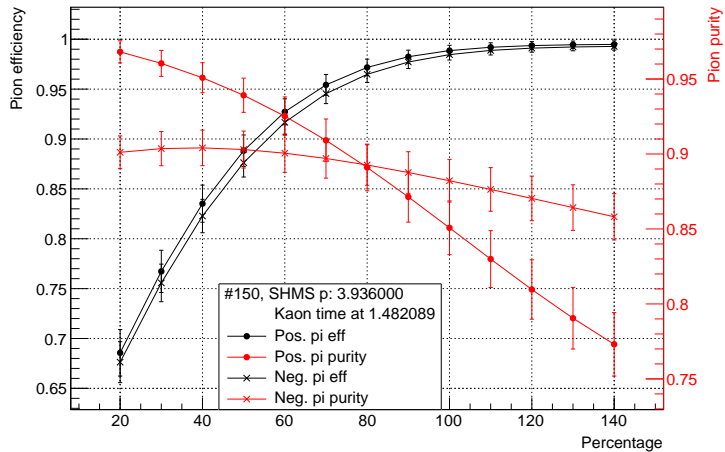
percentage: $(K_{\text{peak}} - P_{\text{peak}}) * \text{percentage} + 1$

eg. pion peak at 1, kaon peak at 1.6, then percentage 80 means $(1.6-1)*80\%+1 = 1.48$, rf right hand side cut is at 1.48



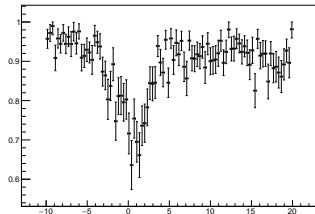
$$\text{Kaon con.} = \frac{\text{kaonfit}[rfcut]}{\text{pionfit}[rfcut]}$$

150, SHMS momentum 3.936

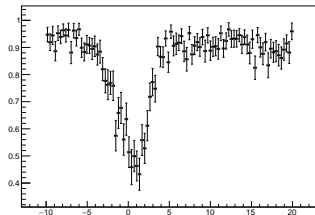


pion purity = 1-kaon con.

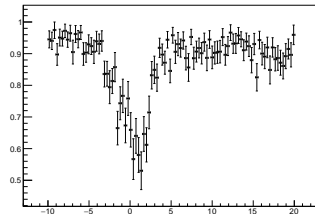
HGC cut 0



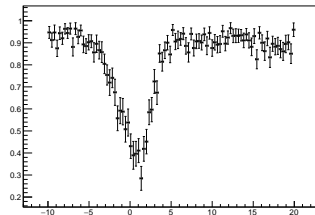
HGC cut 2



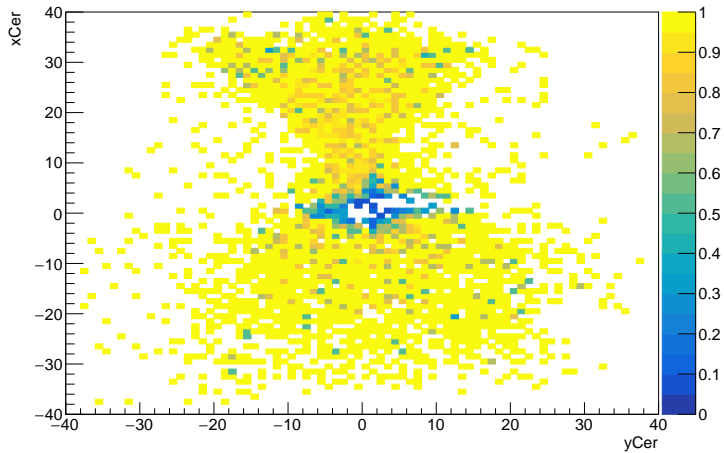
HGC cut 1



HGC cut 3

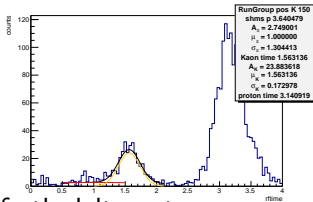


150, SHMS momentum 3.936

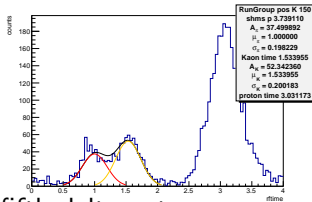


HGC less than 2, no aero cut

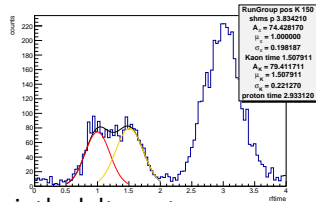
first delta cut



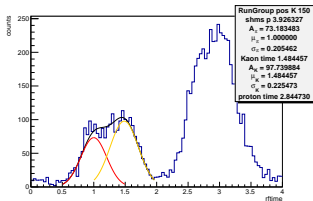
second delta cut



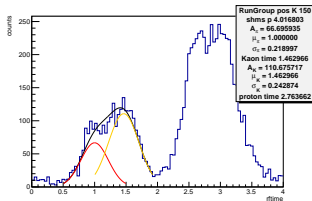
delta cut



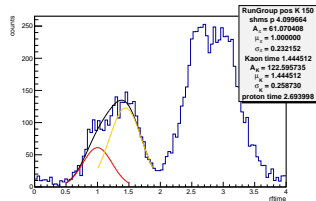
forth delta cut



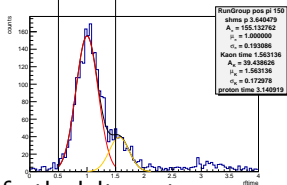
fifth delta cut



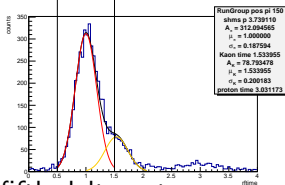
sixth delta cut



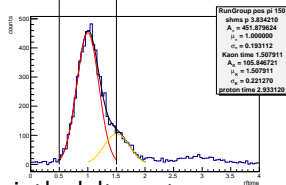
first delta cut



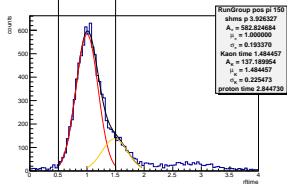
second delta cut



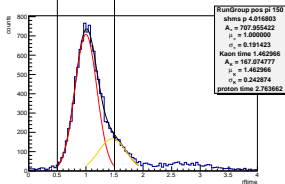
third delta cut



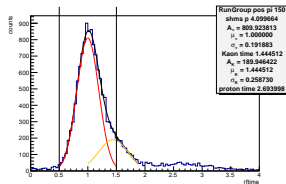
forth delta cut



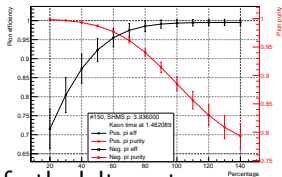
fifth delta cut



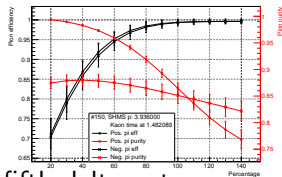
sixth delta cut



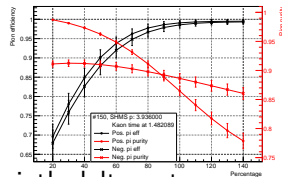
first delta cut



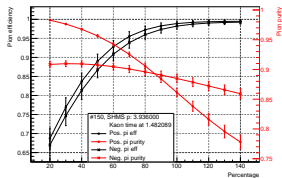
second delta cut



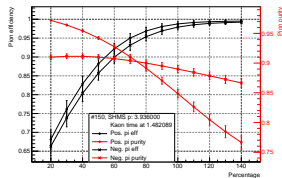
third delta cut



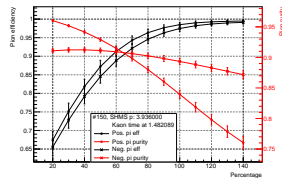
forth delta cut



fifth delta cut



sixth delta cut



backup