LHRS PID preliminary study

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Cherenkov Sum cut scan:

1. Select good electron sample and pion sample from Calorimeter:

1). good electron:

TRK+ACC+VZ+T1+(0.95<E/p<1.03)+(-1000<(L.prl2.e-L.prl1.e)<600);

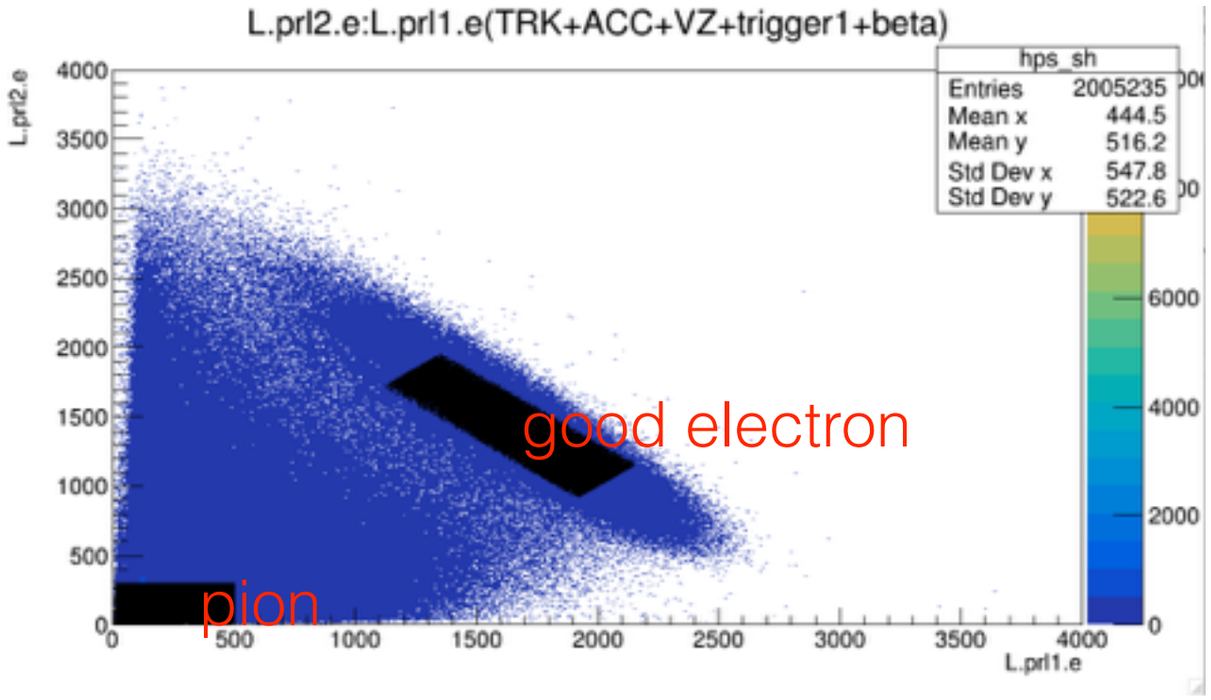
2). pion:

TRK+ACC+VZ+T1+(E/p<0.1 || (L.prl1.e<500 && L.prl2.e<300));

2. Apply different L.cer.asum_c cut to good electron samples and pion samples

$$\text{electron CK cut eff}=\frac{\text{good electrons with L.cer.asum\_c cut}}{\text{good electrons}}$$

$$\text{pion CK rejected eff}=1-\frac{\text{pions with L.cer.asum\_c cut}}{\text{pions}}$$



TRK: L.tr.n==1 && L.tr.beta>0;
ACC: -0.05<L.gold.th<0.06
&& abs(L.gold.ph)<0.03
&& abs(L.gold.dp)<0.04;
VZ: -0.095<L.tr.vz[0]<0.1;
T1: (DL.evtypebits>>1)&1;

E/p cut scan:

1. Select good electron sample and pion sample from Cherenkov:

1). good electron:

TRK+ACC+VZ+T1+(3800<L.cer.asum_c<5800);

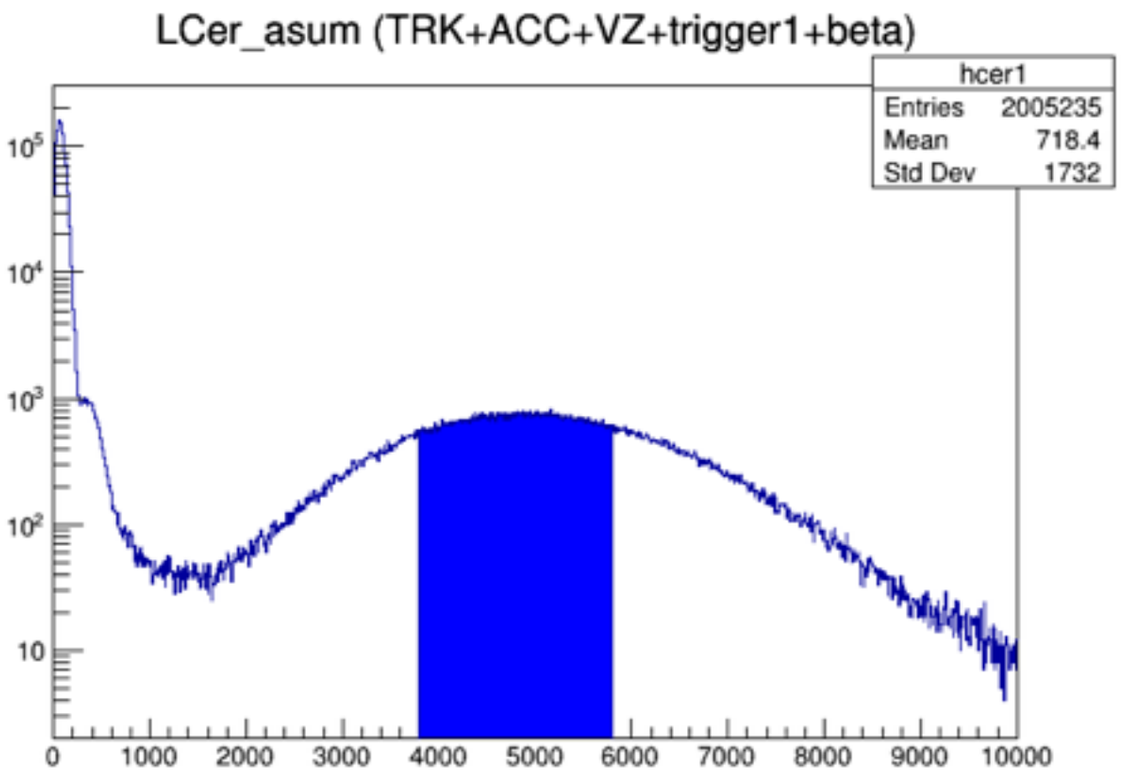
2). pion:

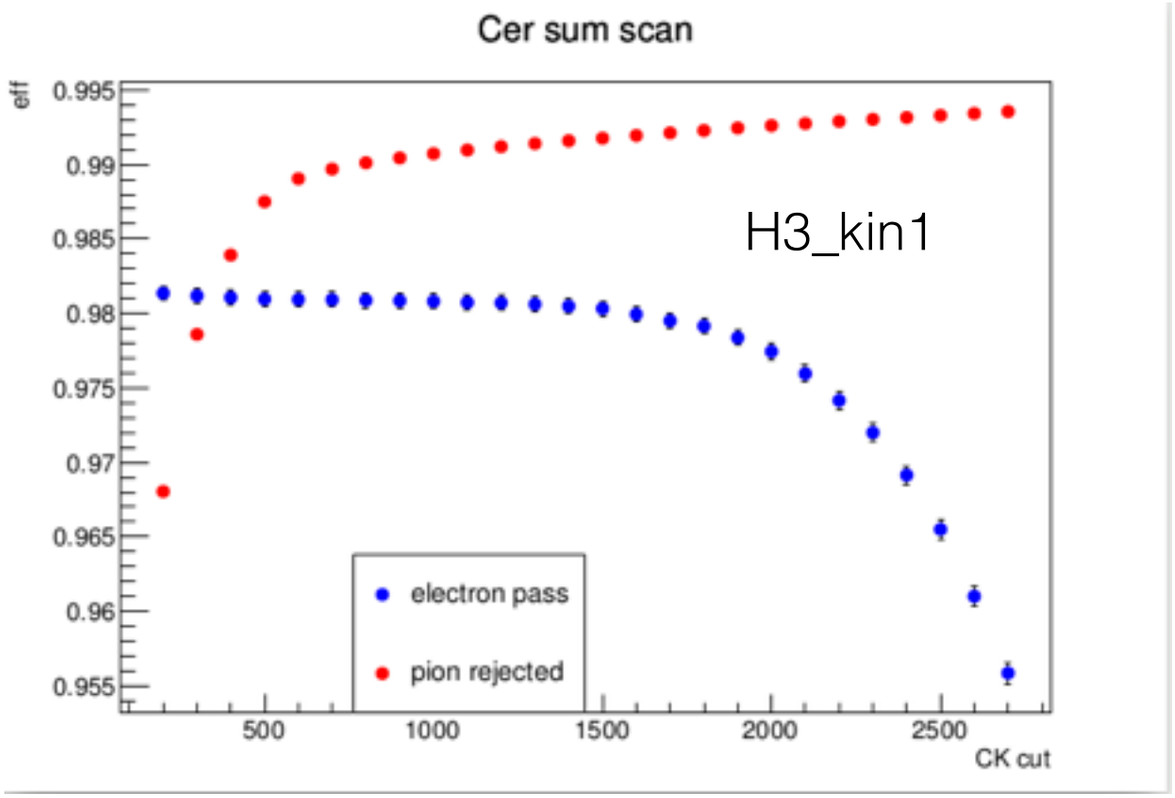
TRK+ACC+VZ+(DL.evtypebits==2 && L.cer.asum_c<100);

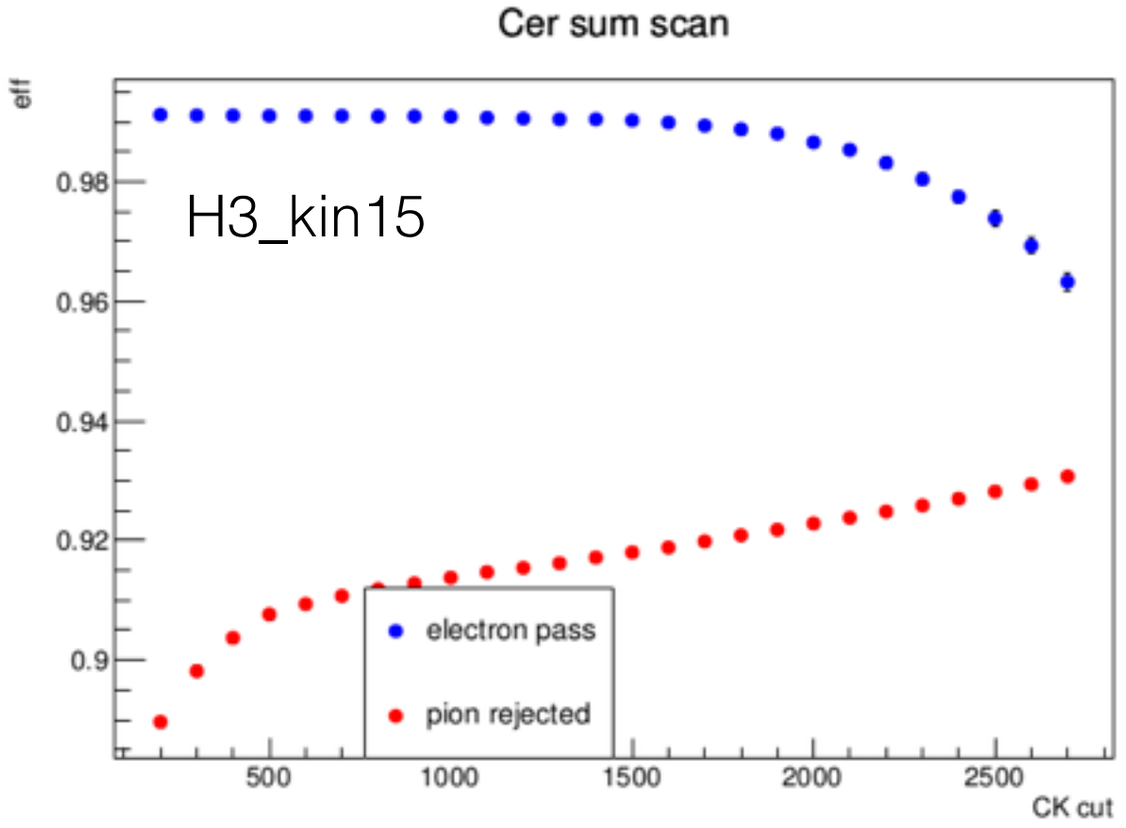
2. Apply different E/p cut to good electron samples and pion samples

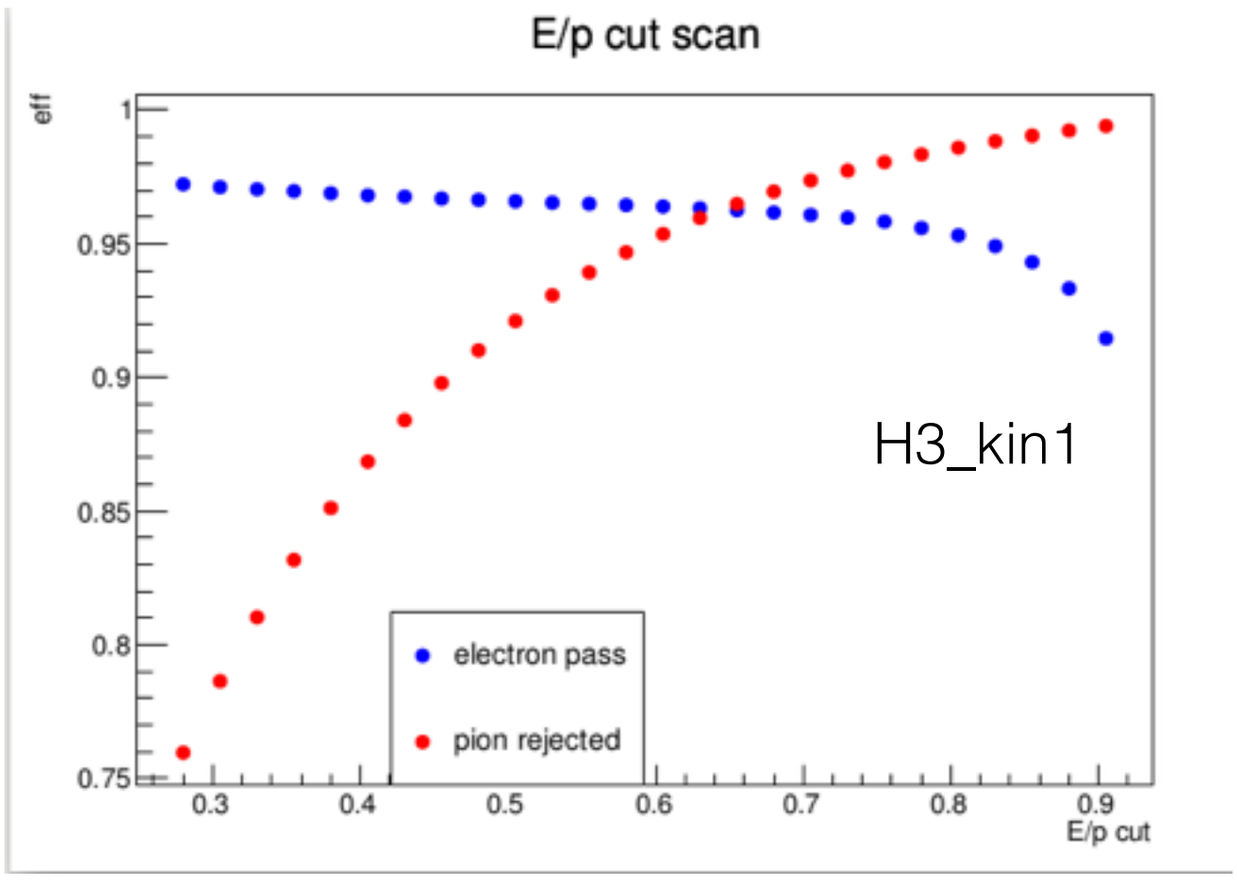
$$\text{electron E/p cut eff}=\frac{\text{good electrons with E/p cut}}{\text{good electrons}}$$

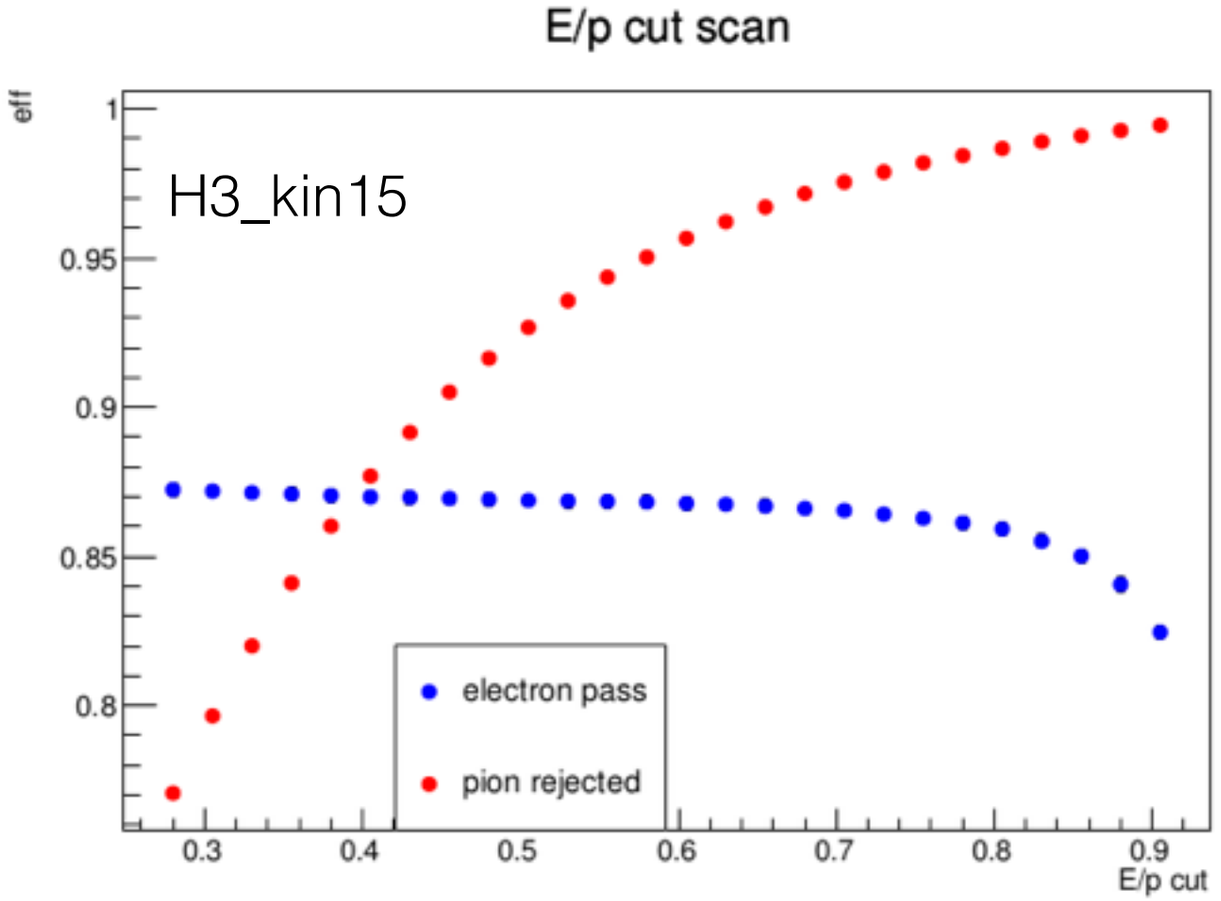
$$\text{pion E/p rejected eff}=1-\frac{\text{pions with E/p cut}}{\text{pions}}$$




Cer sum scan
eff
0.995
0.99
0.985
0.98
0.975
0.97
0.965
0.96
0.955
H3_kin1
electron pass
pion rejected
500
1000
1500
2000
2500
CK cut

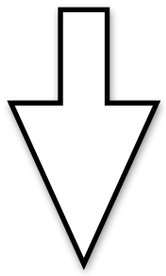

Cer sum scan
eff
0.98
0.96
0.94
0.92
0.9
H3_kin15
electron pass
pion rejected
500
1000
1500
2000
2500
CK cut


E/p cut scan
eff
1
0.95
0.9
0.85
0.8
0.75
H3_kin1
electron pass
pion rejected
0.3
0.4
0.5
0.6
0.7
0.8
0.9
E/p cut


E/p cut scan
eff
1
0.95
0.9
0.85
0.8
H3_kin15
electron pass
pion rejected
0.3
0.4
0.5
0.6
0.7
0.8
0.9
E/p cut

CK sample -> E/p cut
- pion rej no change
- electron eff reduce a lot

Cali sample -> CK cut
- pion rej reduce a lot
- electron eff slightly increase ← pion contamination reduce at high kinematic settings

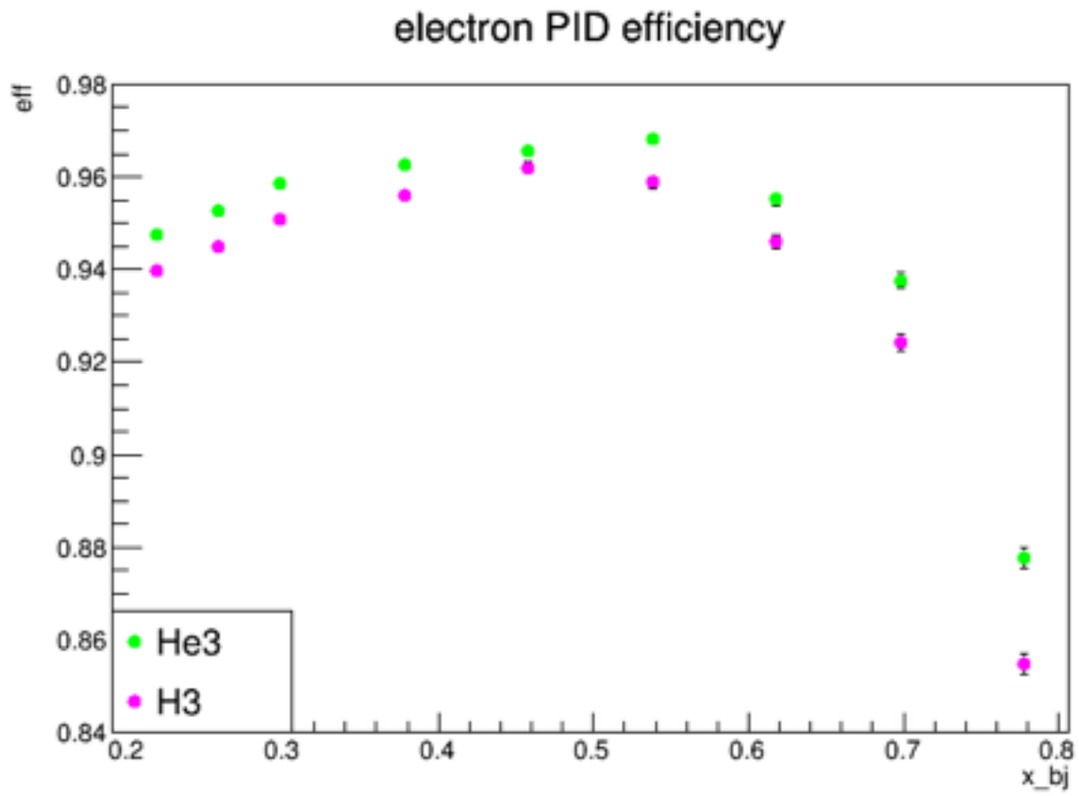


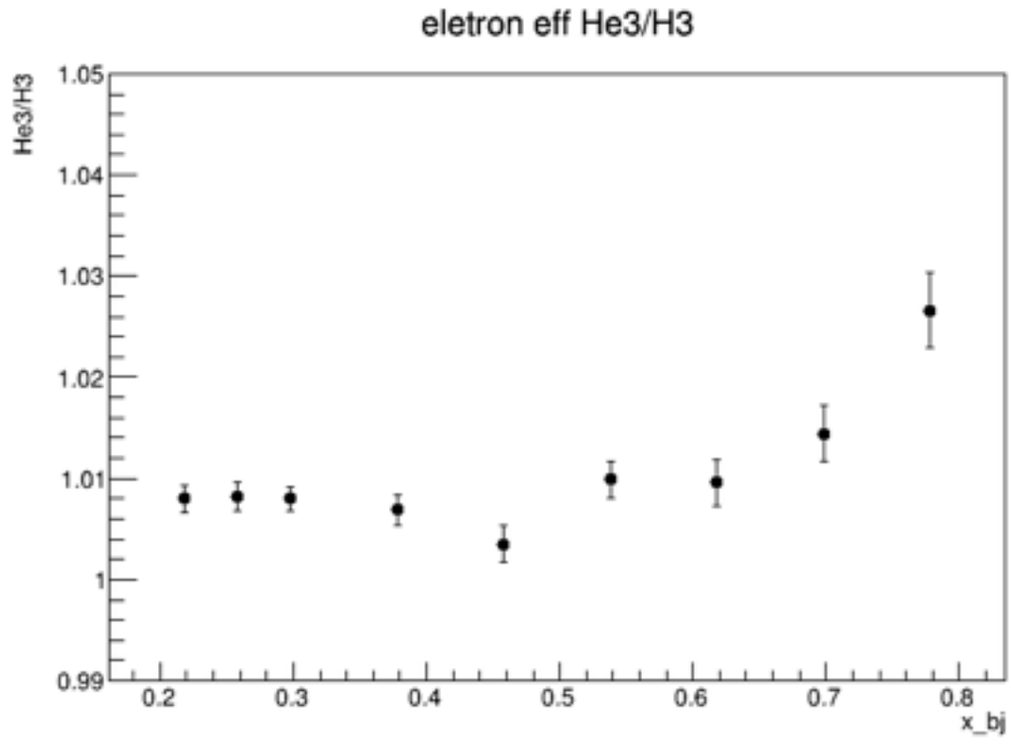
lots of events fire CK with low E/p

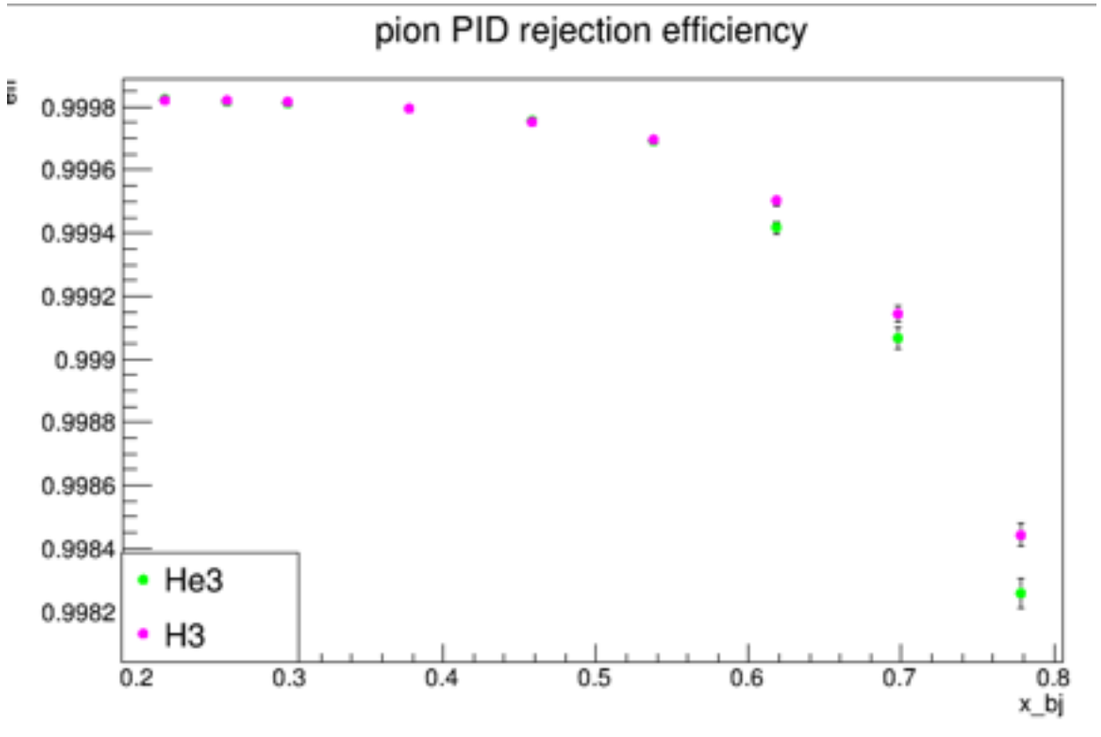
electron PID eff= eletron CK cut eff × electron E/p cut eff

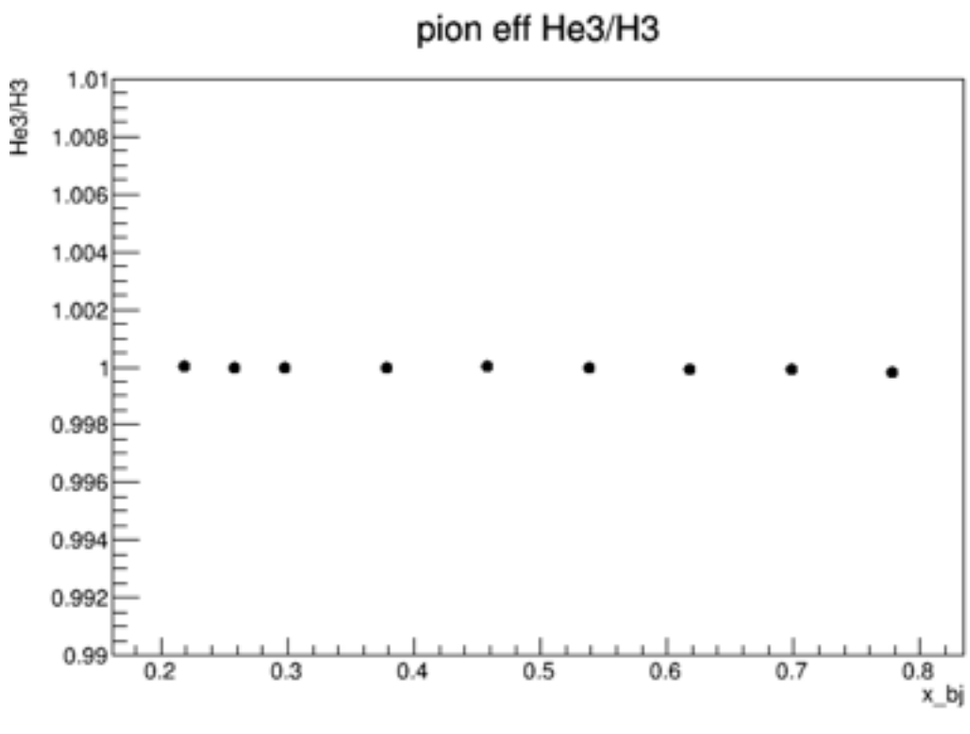
pion PID rejected eff= 1-(1-pion CK rejected eff) × (1 – pion E/p rejected eff)

PID cut eff for kin1-15 at CK>1000 && E/p>0.755

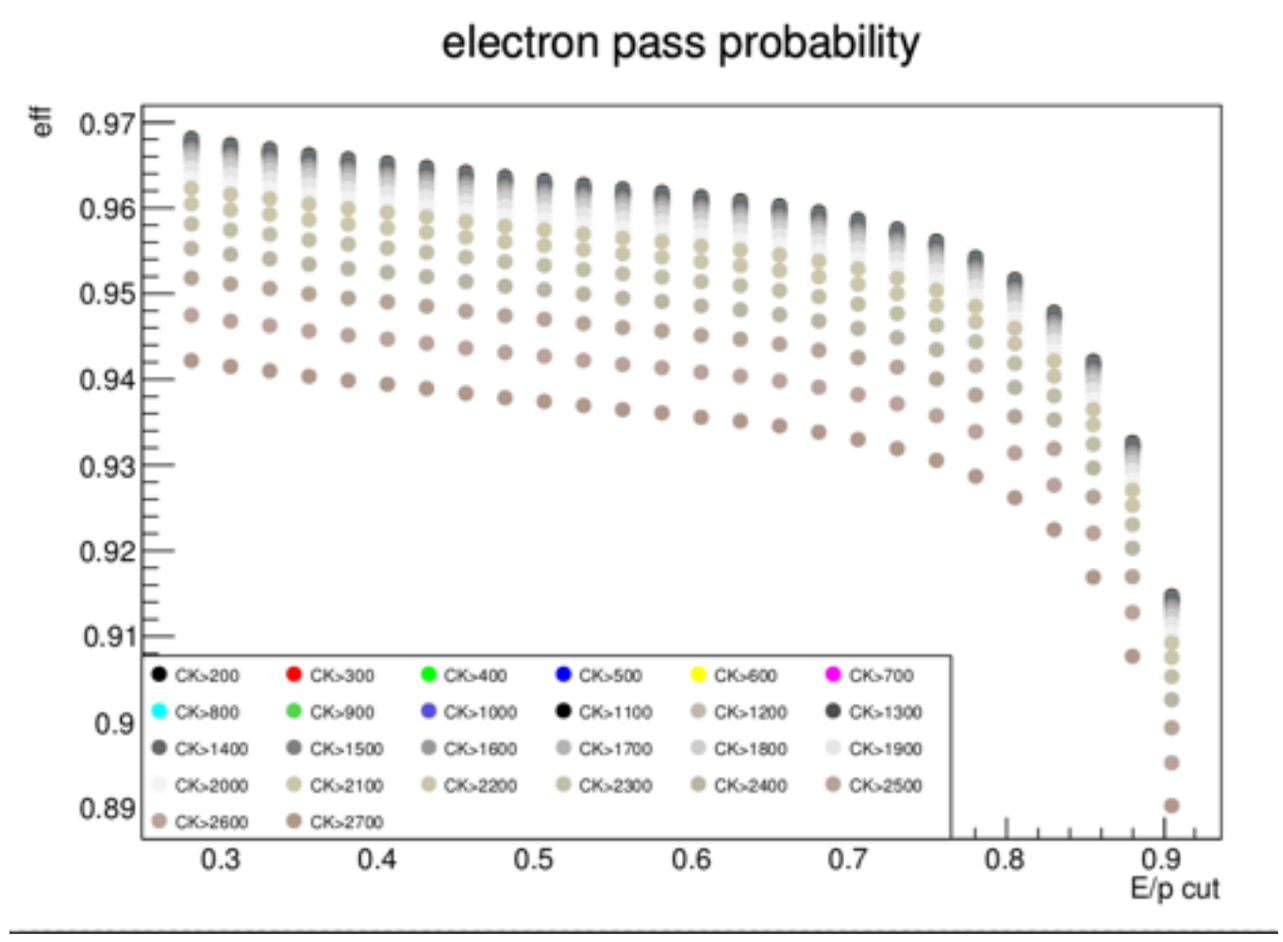








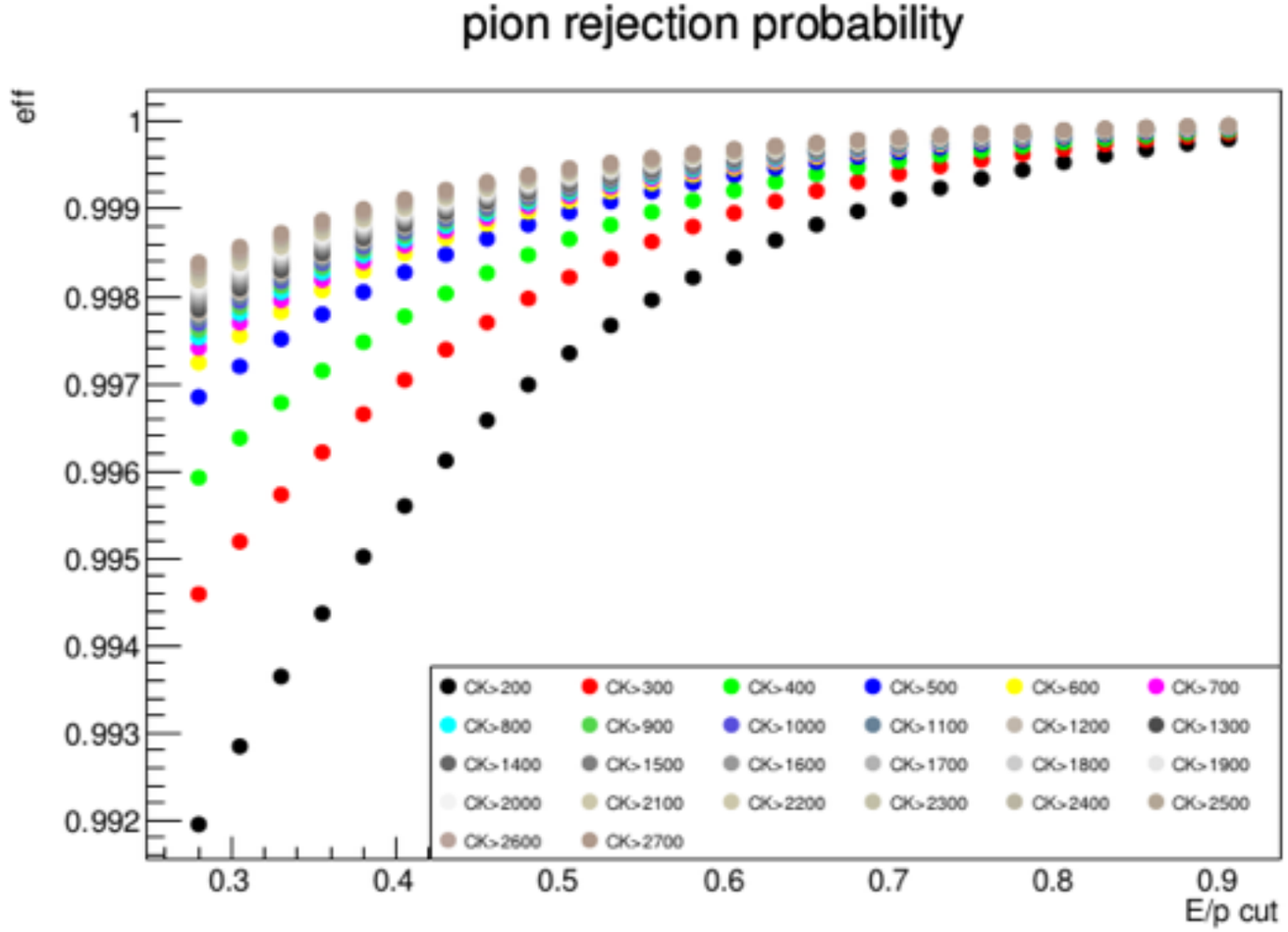
backup

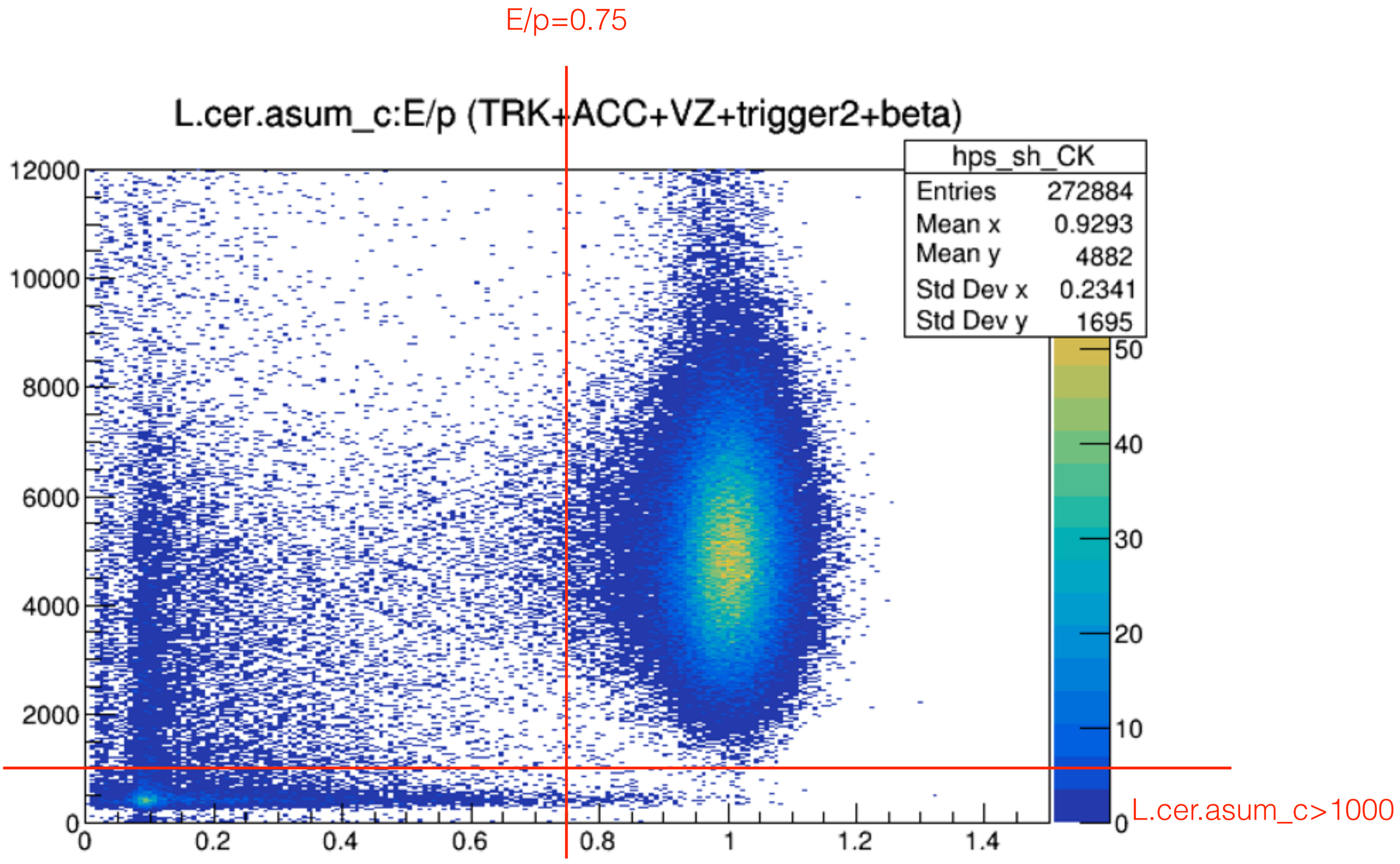


electron PID eff= eletron CK cut eff × electron E/p cut eff

pion PID rejected eff= 1-(1-pion CK rejected eff)
×(1 – pion E/p rejected eff)

suggest PID cut:
E/p>0.75;
L.cer.asum_c>1000




E/p=0.75
L.cer.asum_c:E/p (TRK+ACC+VZ+trigger2+beta)
hps_sh_CK
Entries 272884
Mean x 0.9293
Mean y 4882
Std Dev x 0.2341
Std Dev y 1695
12000
10000
8000
6000
4000
2000
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
50
40
30
20
10
0
L.cer.asum_c>1000