LHRS trigger efficiency

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Overview

- S0&S2 efficiency;
- S0 efficiency;
- S2 efficiency;
- Cherenkov detector efficiency;
- Trigger logic module efficiency;

S0&S2 efficiency

T1: S0 & S2
T2: (S0 & S2) & Cer
T3: (S0 || S2) & Cer

- (S0&S2) efficiency

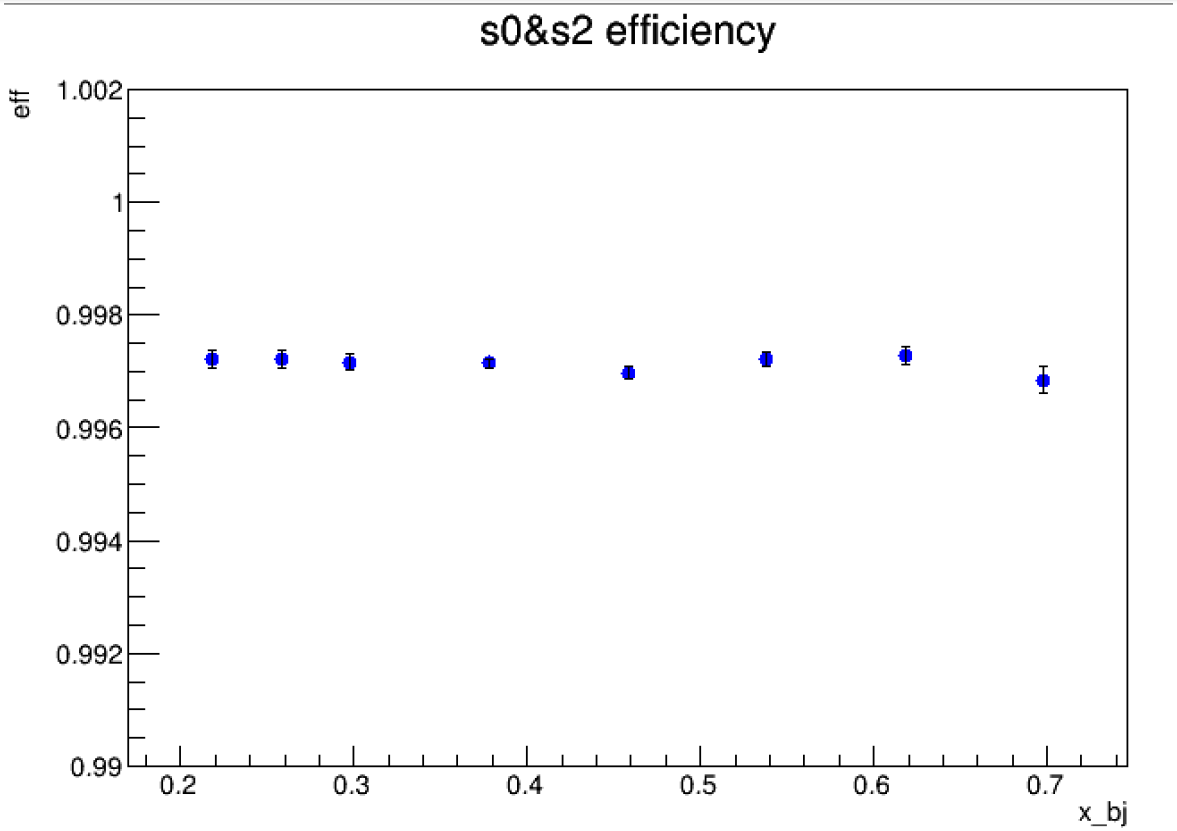
1. Select good electron samples:

- TRK: one track;
- ACC: abs(L.gold.th)<0.04 && abs(L.gold.ph)<0.02 && (L.gold.dp)<0.035;
- PID: Cherenkov sum && E/p

} good electrons

2. $$s0\&s2 = \frac{\text{good electrons with T2 fired}}{\text{good electrons with T3 fired}}$$

S0&S2 efficiency



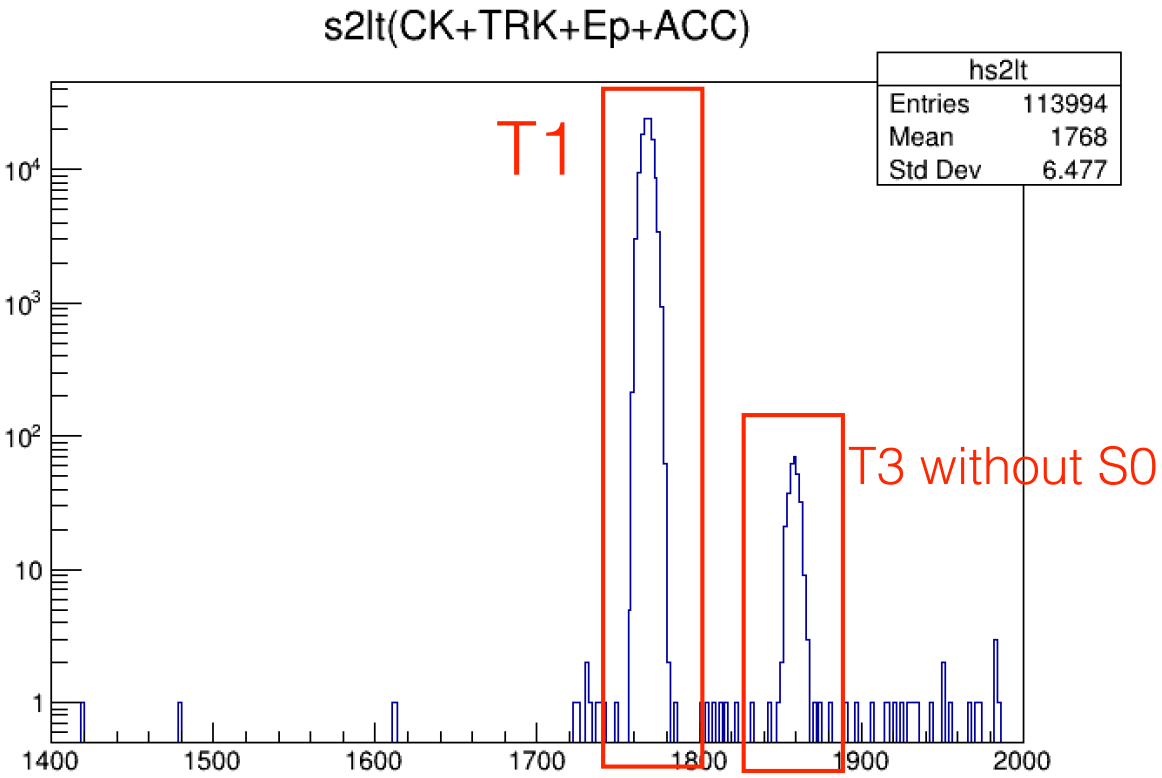
	kin1	kin2	kin3	kin5	kin7	kin9	kin11	kin13
s0&s2 eff	0.9972	0.9972	0.9972	0.9971	0.9970	0.9972	0.9973	0.9969

S0 efficiency

- S0 efficiency:

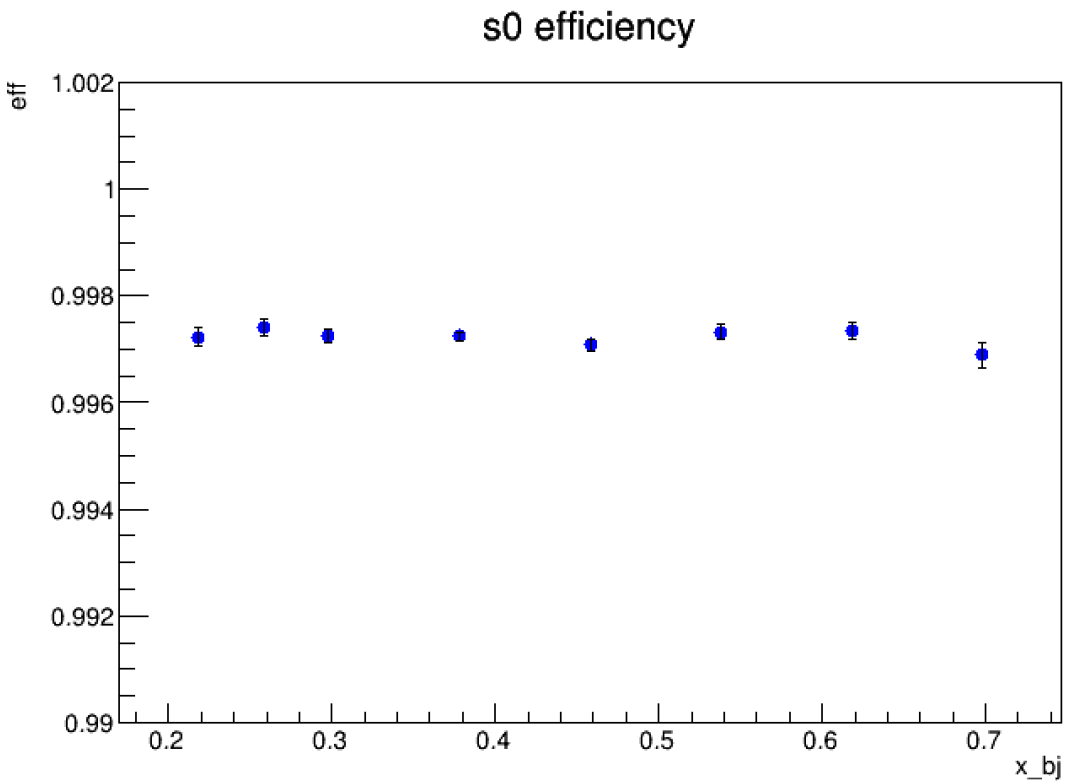
1. Good electrons samples:
2. S2 TDC sum:

T1: S0 & S2
T2: (S0 & S2) & Cer
T3: (S0 || S2) & Cer



$$\text{s0 eff} = \frac{1st \text{ peak}}{1st \text{ peak+2nd peak}}$$

S0 efficiency



	kin1	kin2	kin3	kin5	kin7	kin9	kin11	kin13
s0 eff	0.9972	0.9974	0.9973	0.9972	0.9971	0.9973	0.9973	0.9969

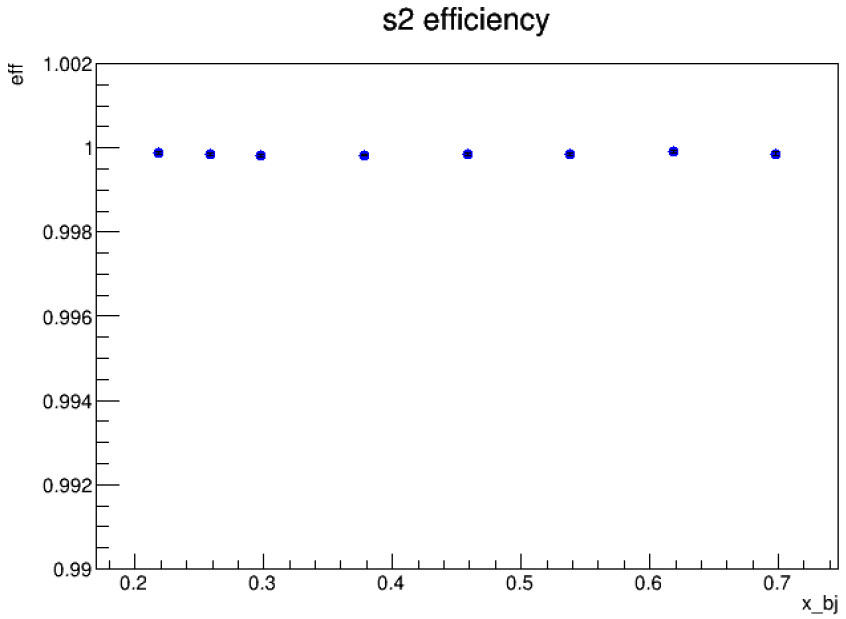
S2 efficiency

- S2 efficiency:

1. Good electrons samples:

2. $$\text{s2 eff} = \frac{\text{good electrons with T3 fired and tS2coinc>0}}{\text{good electrons with T3 fired}}$$

T1: S0 & S2
T2: (S0 & S2) & Cer
T3: (S0 || S2) & Cer



	kin1	kin2	kin3	kin5	kin7	kin9	kin11	kin13
s2 eff	0.9999	0.9998	0.9998	0.9998	0.9999	0.9999	0.9999	0.9998

Cherenkov detector Efficiency

T1: S0 & S2
T2: (S0 & S2) & Cer
T3: (S0 || S2) & Cer

- Cherenkov detector efficiency:

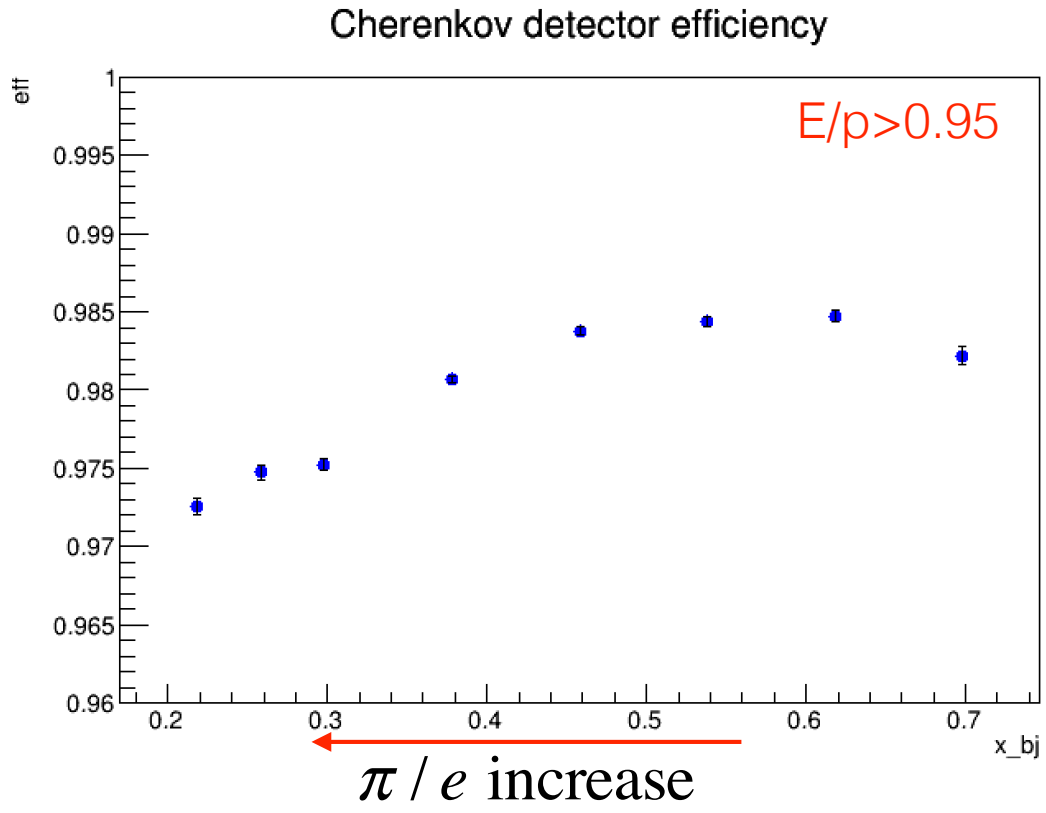
1. Select good electron samples without Cherenkov cut:

- TRK: one track;
- ACC: abs(L.gold.th)<0.04 && abs(L.gold.ph)<0.02 && (L.gold.dp)<0.035;
- E/p

} good electrons

2. $$\text{cer\_dec} = \frac{\text{good electrons with T2 cut}}{\text{good electrons with T1 cut}}$$

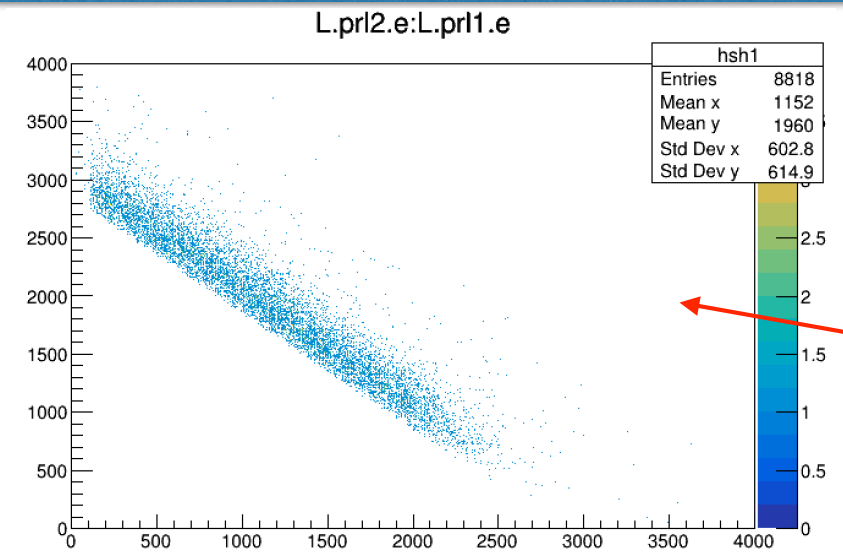
Cherenkov detector Efficiency

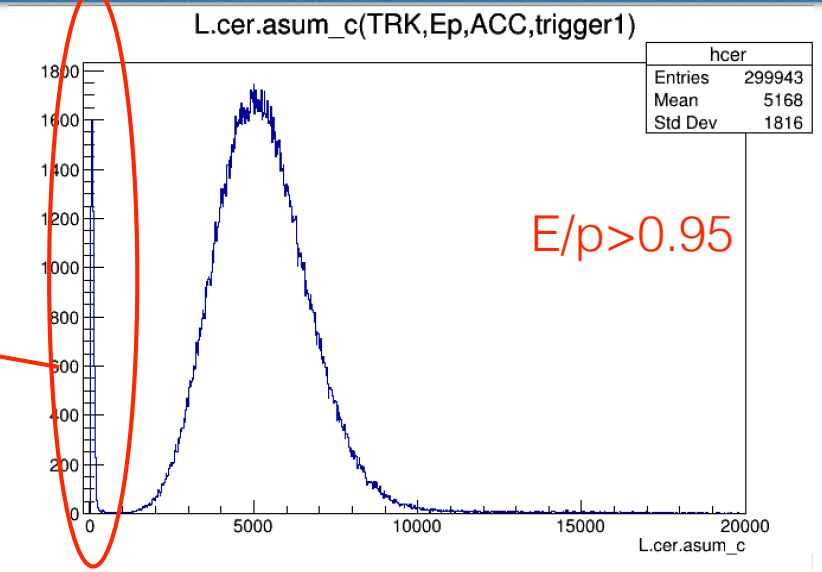


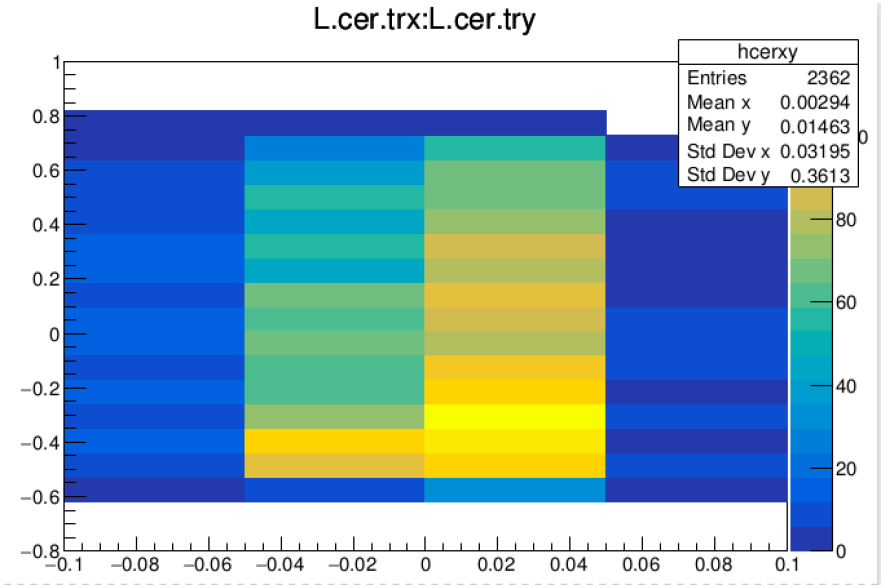
Not sure if it's Cherenkov detector inefficiency or contamination

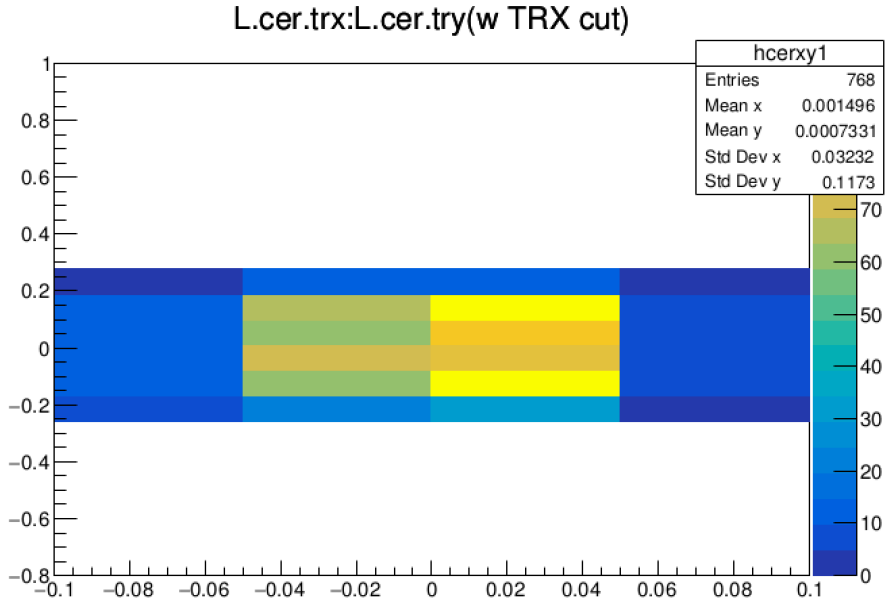
	kin1	kin2	kin3	kin5	kin7	kin9	kin11	kin13
cer eff	0.9726	0.9747	0.9752	0.9807	0.9838	0.9844	0.9847	0.9822

Cherenkov detector Efficiency



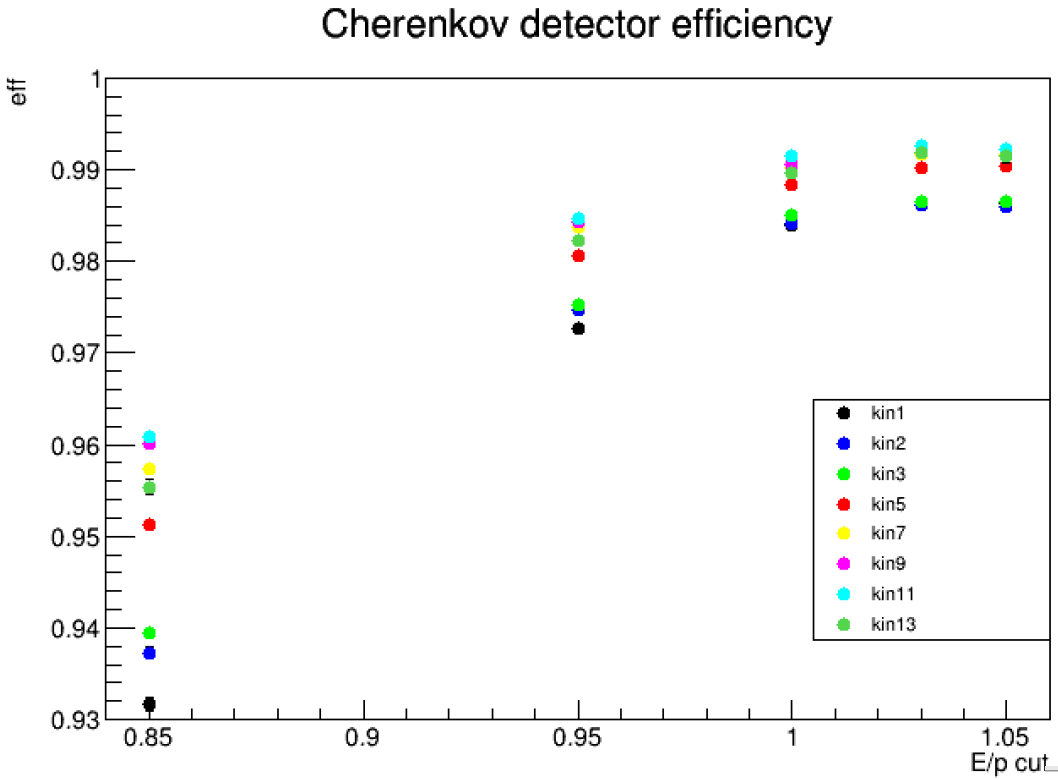




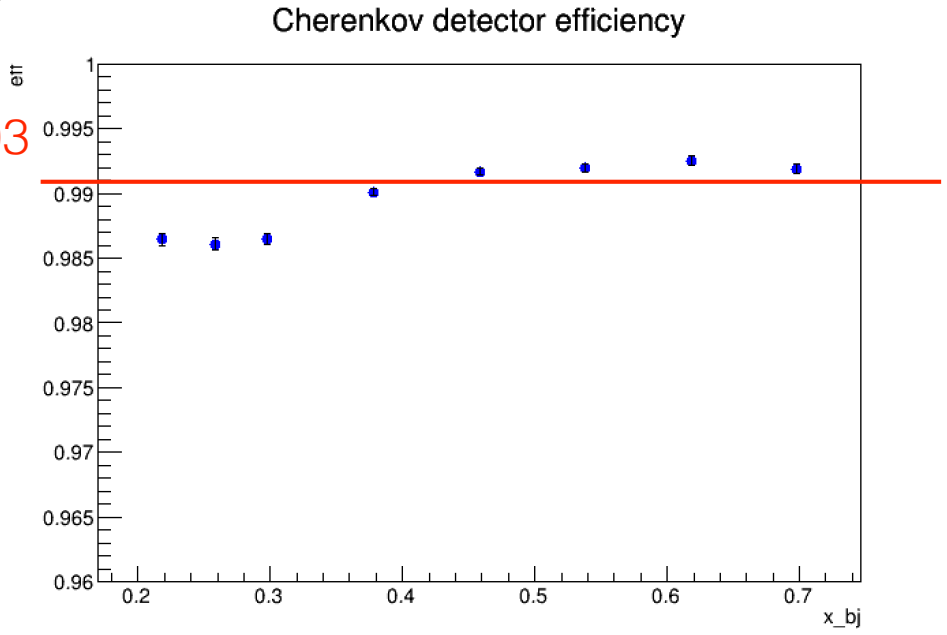


Cer eff (without central track cut): 0.98072+0.0002
Cer effe (with central track cut): 0.980948+0.0003

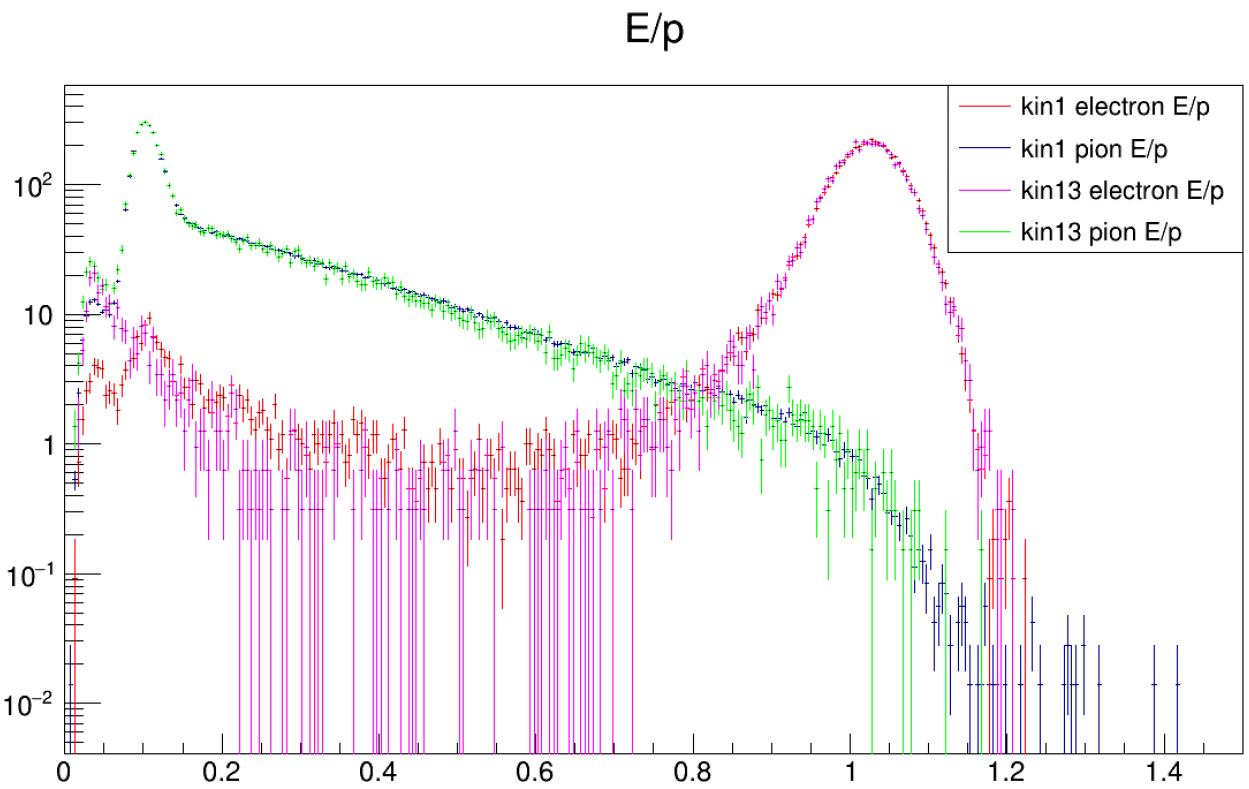
Cherenkov detector Efficiency



E/p>1.03



Cherenkov detector Efficiency



pion: TRK, ACC, T1 only, CK<100;
electrons: TRK, ACC, T2, CK>4000;

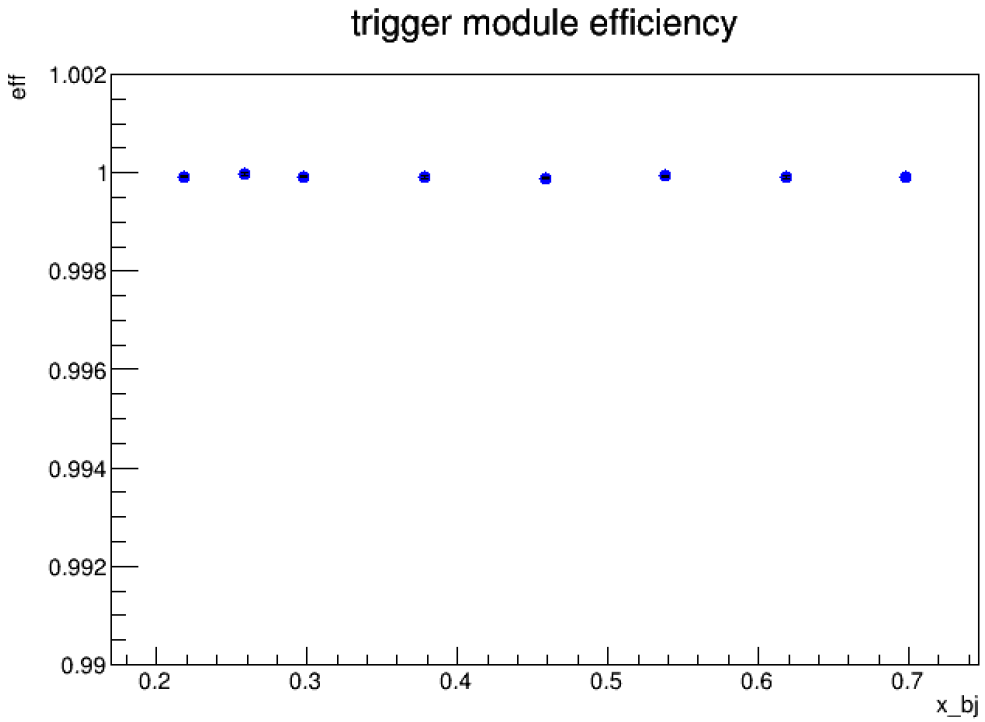
With E/p>0.95:

	kin1	kin2	kin3	kin5	kin7	kin9	kin11	kin13
π / e	0.0295	0.0257	0.0274	0.0180	0.0133	0.0127	0.0095	0.0084
error	0.0007	0.0007	0.0010	0.0005	0.0005	0.0007	0.0006	0.0007

assume Cherenkov 100% efficiency to electrons

(s0&s2)&Cer Logical module Efficiency

1. Select good electron samples with Cer sum cut;
2. $$\text{cer\_log} = \frac{\text{good electrons with CerADC cut with T2 cut}}{\text{good electrons with CerADC cut with T1 cut}}$$



Conclusions

- (S0&S2), S0, S2 efficiency are all above 99% for all kinematics;
- Cherenkov detector efficiency is around 99% for high kinematics;
- Cherenkov detector inefficiency is highly because of contamination rather than real detector inefficiency;