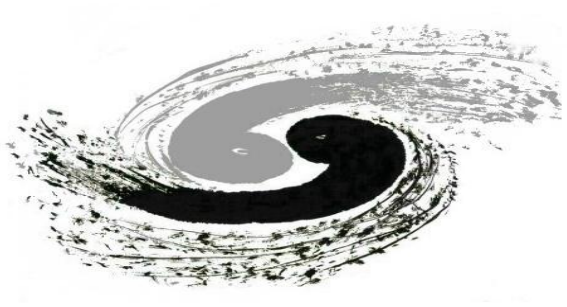


CEPC

Kaili Zhang

zhangkl@ihep.ac.cn

CEPCSW Latest: 25.3.6

- 3.5 fix pfa algo, default pid as pion.
- 3.6 add muon hit time resolution (2ns)
- Please make consistent: Sample/CEPCSW/Script Version
  - Use old version script will use incorrect parameters. Please check in

    Detector/DetCRD/scripts/TDR_o1_v01/*.py
  - https://code.ihep.ac.cn/zhangkl/cepcsampleproduction (may not up to date)

Sample Production

High priority for my account zhangkl

- List: https://docs.ihep.ac.cn/link/AA7C0D8C58B13644FCA8F5C6E757B63657
  - Limited memory setting, higher fail rate. Use carefully.
  - Reco jobs will be merged to 500 events each in the following production.
- Trial: Selection at gen level.
  - Enhence bkg production? Unfinished.
  - Script for transform generator to MCParticle, for reading truth information:

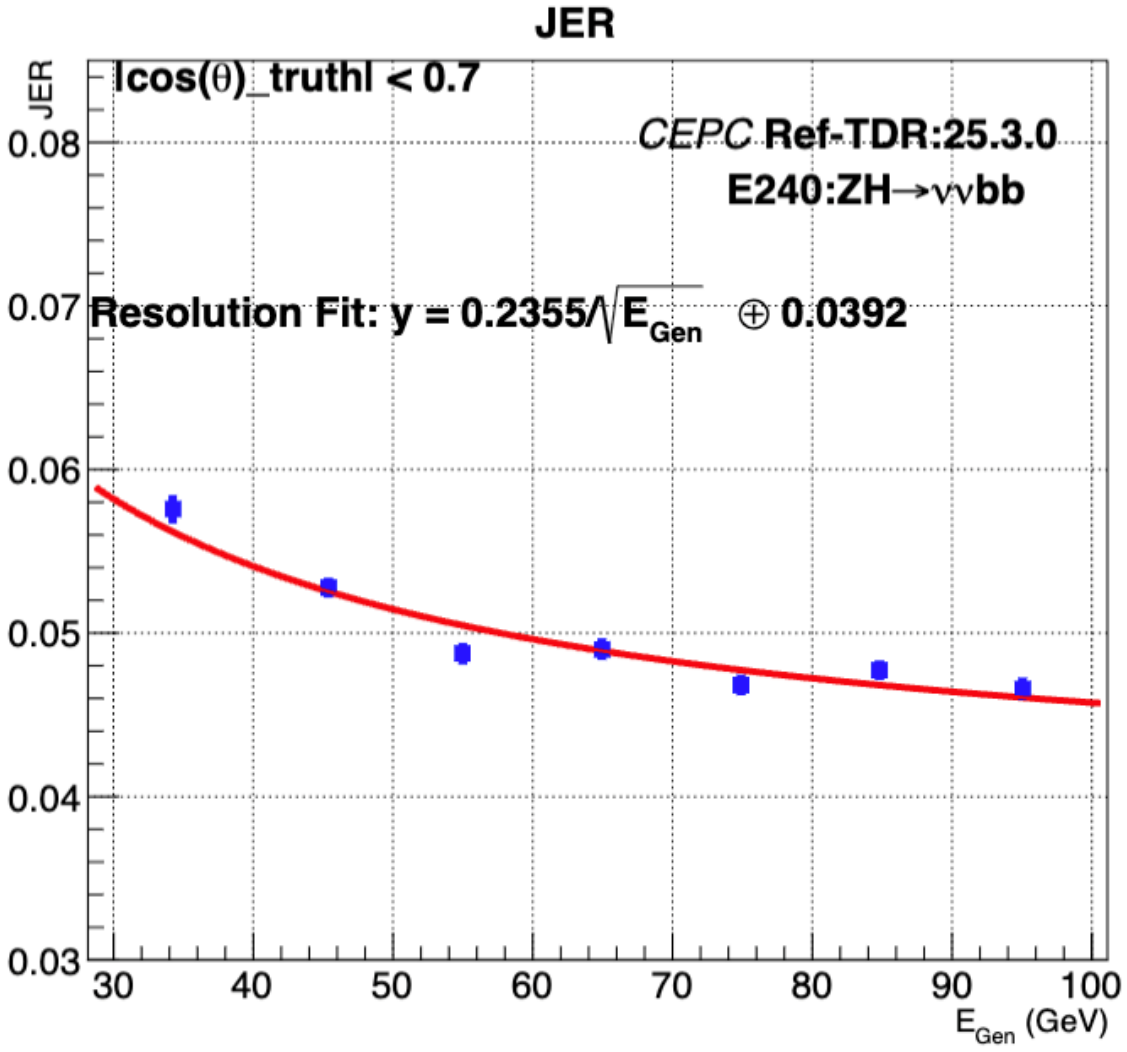
https://code.ihep.ac.cn/zhangkl/cepcsampleproduction/-/blob/main/temp_MC.py

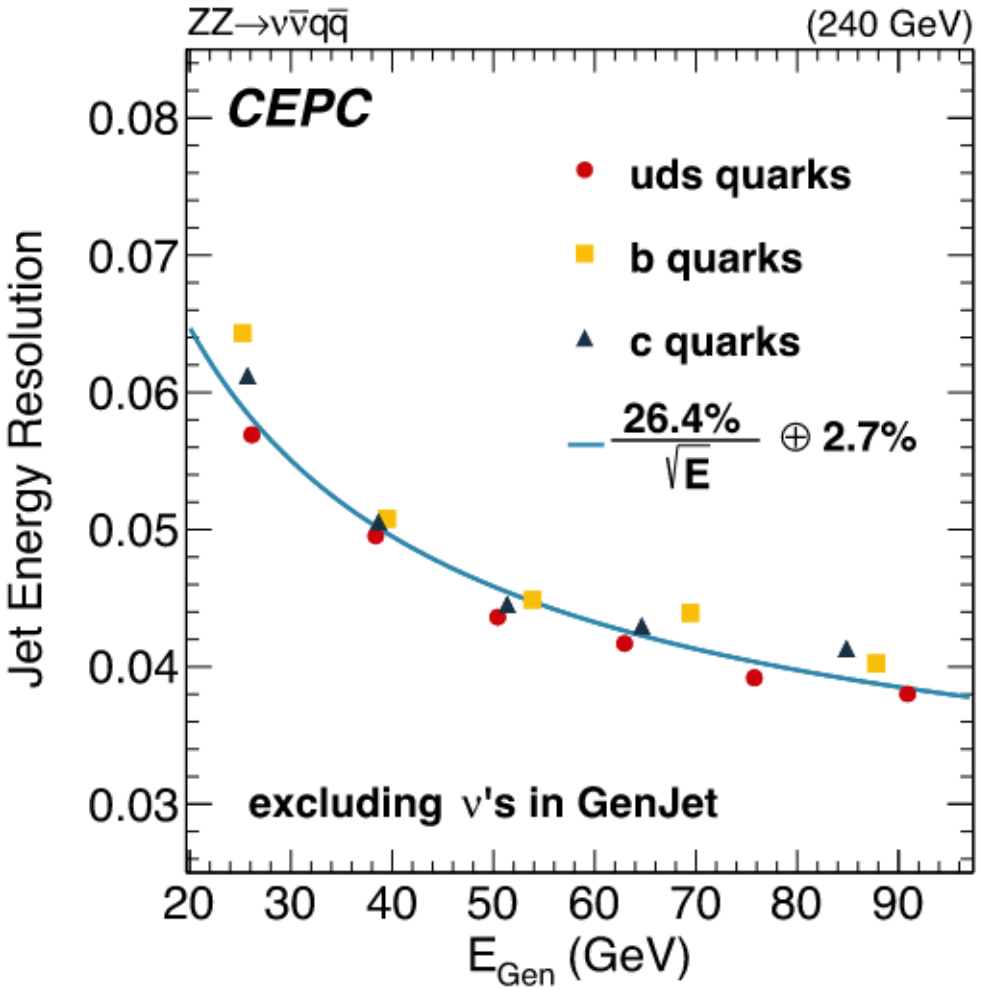
JER

Last Report shows the boundary region for jet1/2 leading unexpected behavior from jet clustering. Fit with 2 pattern:
Despite the ZZ/ZH, b/uds quark difference,
TDR has better energy related term and worse constant term.

@Yingqi

TDR JER curve flatter.





PID status

- Currently, TOF/TPC pid available
- Muon hit info, lepton ID (Ecal over P, Hcal over P, Rhad) under testing, plan to in use this week.
- One unified service package for ID.

PID in Jets

Tdr25.3.6; ZH->vvbb; stats: 100w events, 200w b jets.

@Haoyue Xu, Kaili Zhang

Tracks per jet						
Endcap:	e	mu	pi	k	p	Tot
Init	0.05	0.03	1.46	0.21	0.07	1.81
Tpc	0.03	0.02	0.83	0.14	0.05	1.07
Tof	0.02	0.02	0.58	0.11	0.03	0.76
Pt>1	0.01	0.02	0.34	0.09	0.02	0.49
Barrel:	e	mu	pi	k	p	Tot
Init:	0.33	0.19	9.83	1.33	0.42	12.10
Tpc	0.23	0.18	8.26	1.21	0.40	10.29
Tof	0.18	0.17	5.65	0.97	0.33	7.31
Pt>1	0.17	0.16	4.96	0.93	0.31	6.53

In average, for one b jet, initially it has 14 tracks: 11.19 Pion, 1.5 Kaon, 0.49 Proton. 0.38 electron and 0.22 muon.
For those 7 “good” tracks, it has 5.30 Pion, 0.96 Kaon, 0.33Proton, 0.18 electron and 0.18 muon.

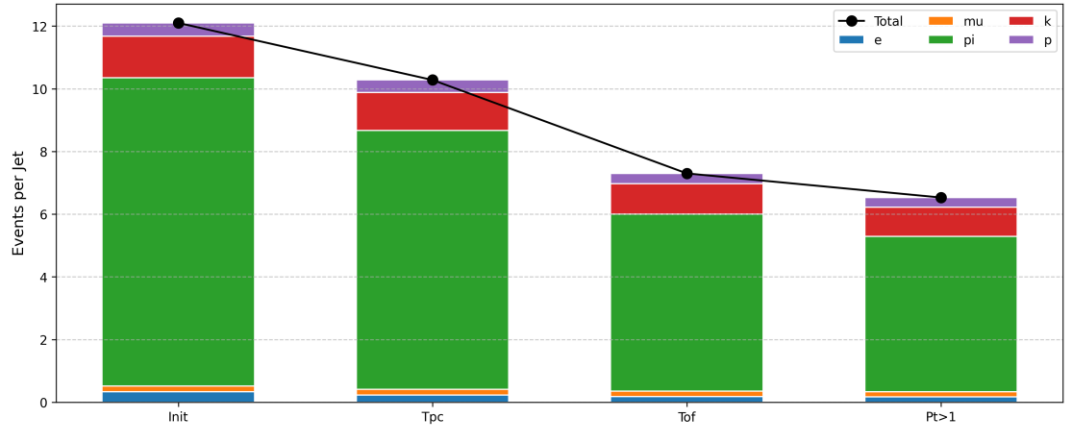
Charged track ratio

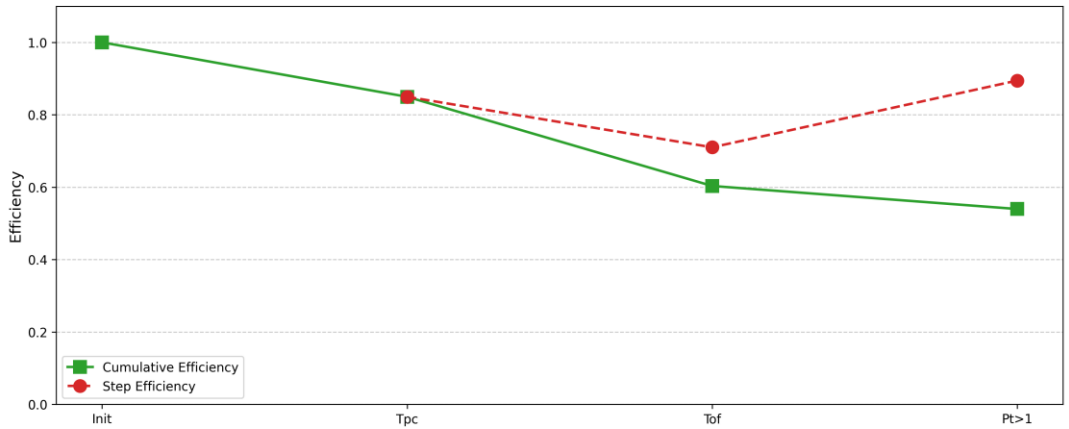
per jet						
Endcap:	e	mu	pi	k	p	Tot
Init	2.49%	1.70%	80.73%	11.50%	3.58%	100%
Tpc	2.41%	2.23%	77.40%	13.45%	4.51%	100%
Tof	2.39%	2.73%	76.27%	14.07%	4.54%	100%
Pt>1	3.07%	3.63%	70.46%	17.71%	5.13%	100%
Barrel:	e	mu	pi	k	p	Tot
Init:	2.72%	1.59%	81.23%	10.96%	3.50%	100%
Tpc	2.26%	1.79%	80.29%	11.76%	3.90%	100%
Tof	2.47%	2.30%	77.37%	13.29%	4.57%	100%
Pt>1	2.63%	2.48%	75.91%	14.21%	4.77%	100%

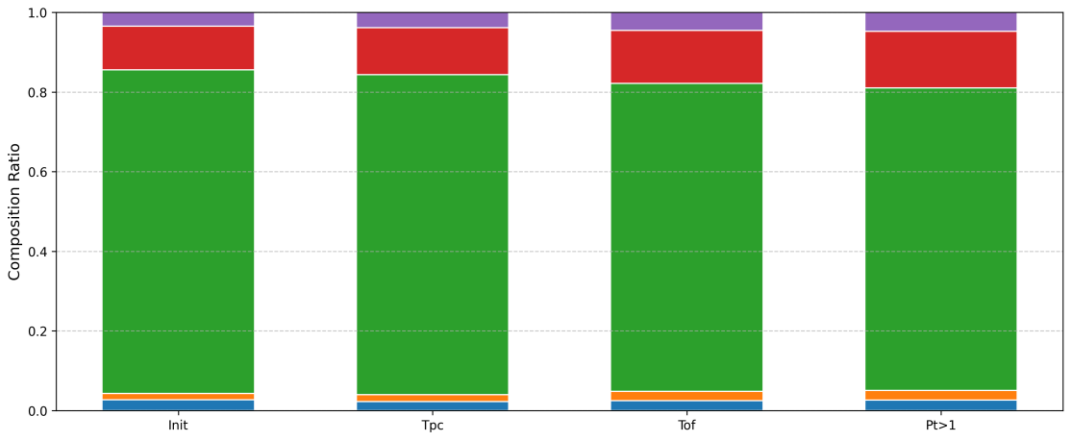
Charged track eff

per jet						
Endcap:	e	mu	pi	k	p	Tot
Init	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Tpc	57.12%	77.79%	56.73%	69.24%	74.49%	59.17%
Tof	40.17%	67.42%	39.56%	51.26%	52.99%	41.88%
Pt>1	32.95%	57.28%	23.35%	41.20%	38.26%	26.75%
Barrel:	e	mu	pi	k	p	
Init:	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Tpc	70.59%	95.91%	84.00%	91.19%	94.73%	84.99%
Tof	54.66%	87.60%	57.52%	73.24%	78.93%	60.39%
Pt>1	52.10%	84.28%	50.41%	69.94%	73.67%	53.95%

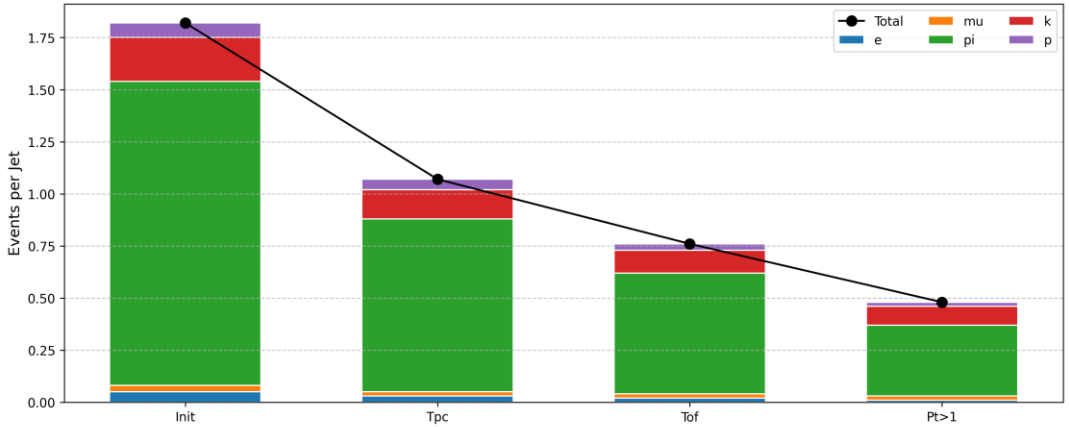
Particle Analysis - Barrel

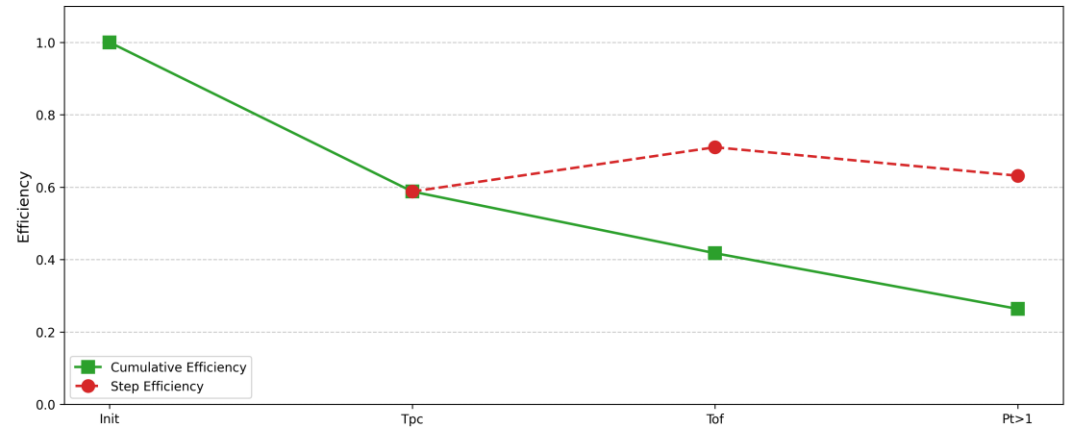


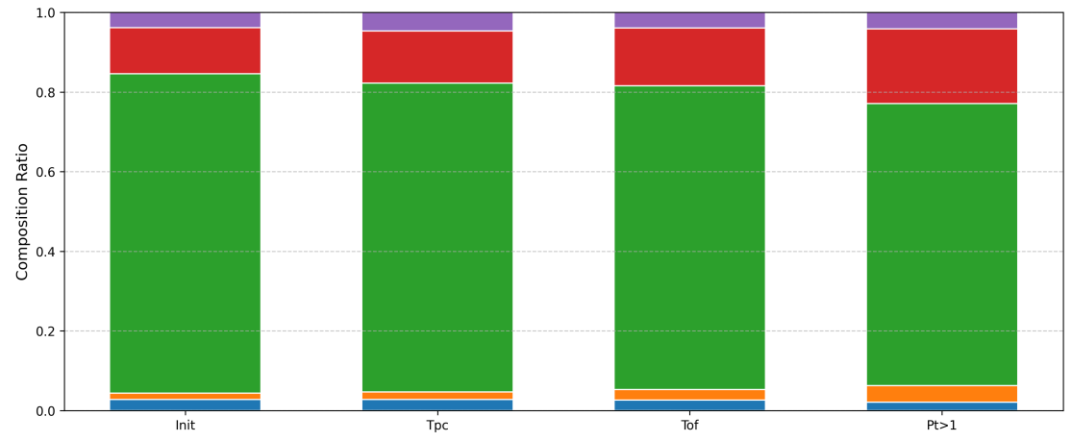




Particle Analysis - Endcap



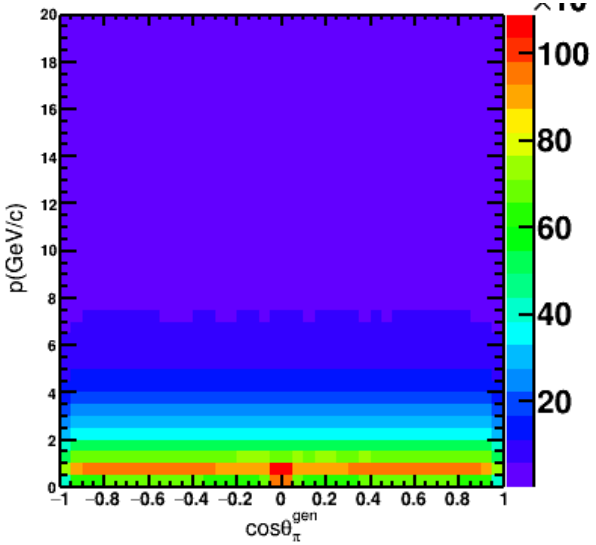


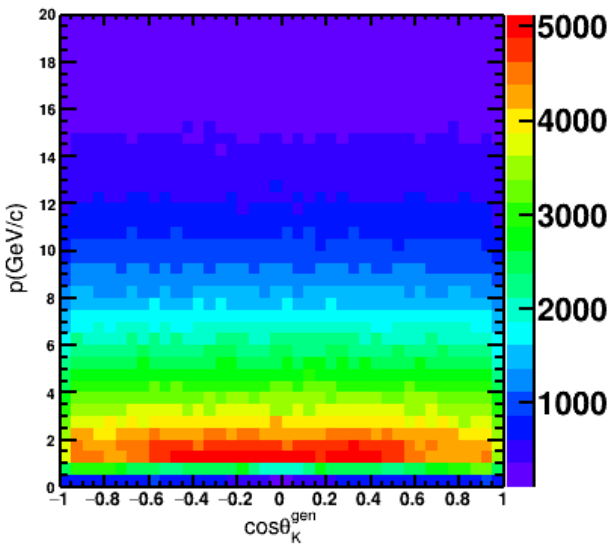


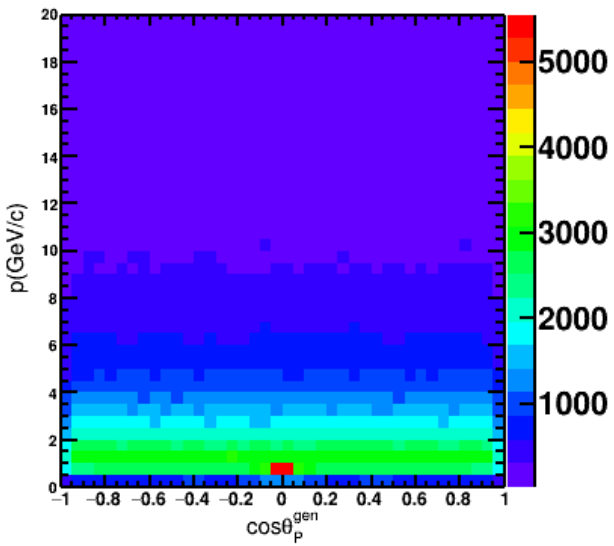
p/k/pion

Tdr25.3.6; ZH->vvbb; stats: 100w events.

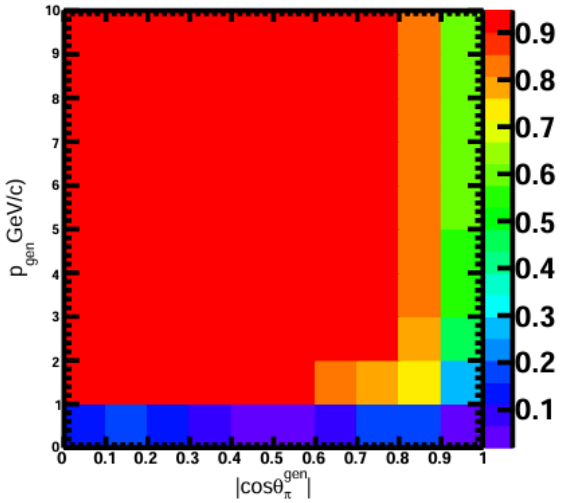
Phase Space: almost < 4 GeV

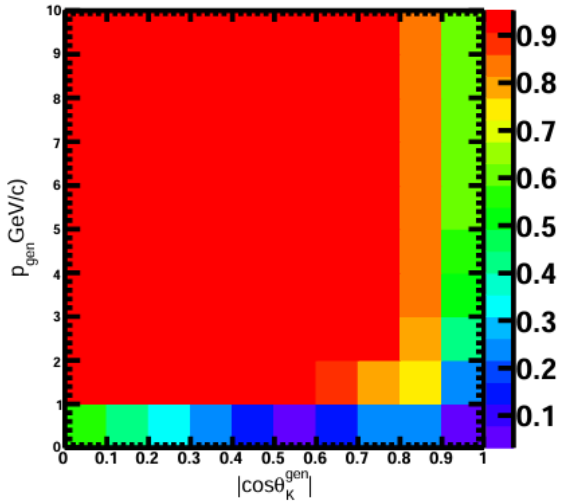


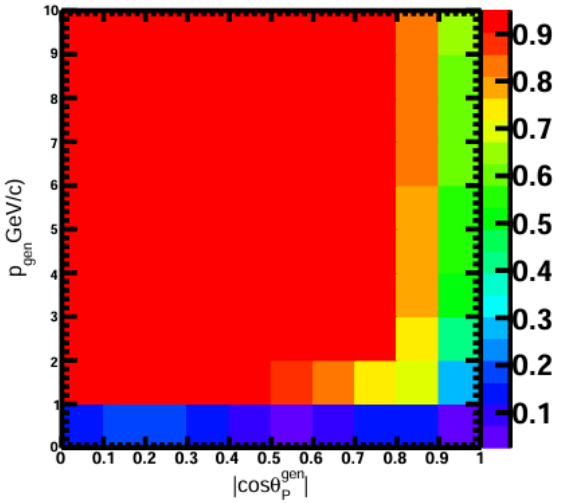




Trk eff: p>1, costheta<0.85

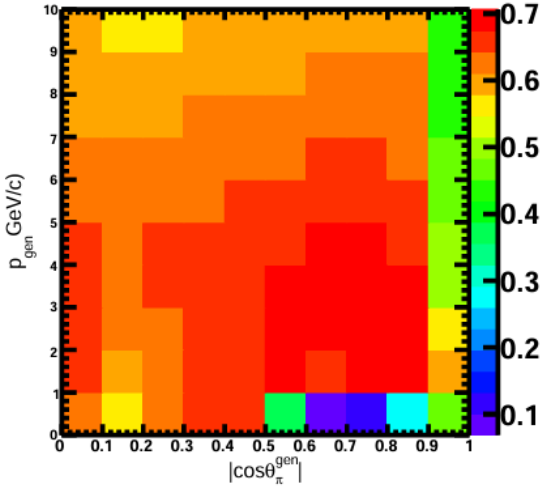


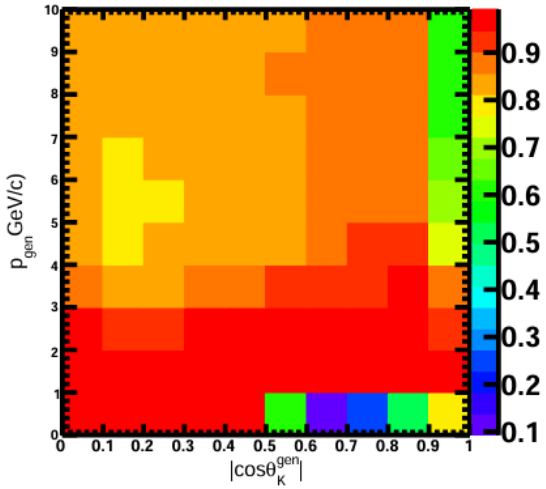


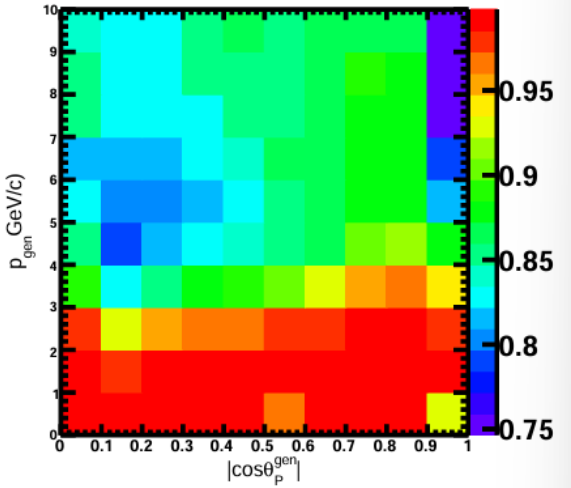


p/k/pion

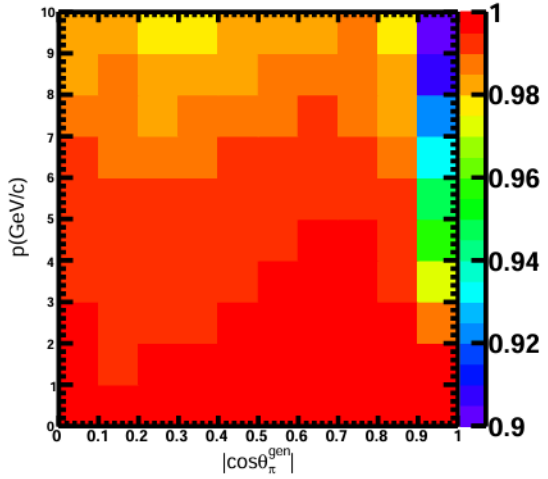
Pid eff

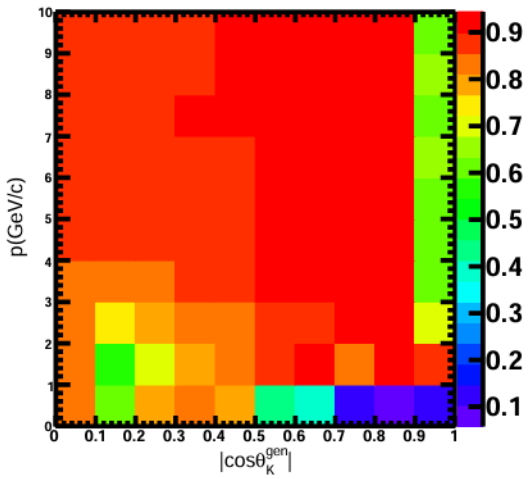


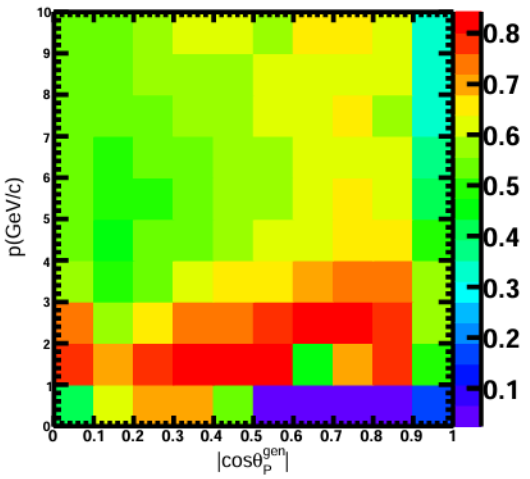




Pid purity







PID Strategy

Tdr25.3.6; ZH->vvbb; stats: 100w events.
Selection: Gen_P>1, with TOF, with TPC, without decaying

	π	K	p
Barrel eff	64.9%	88.3%	91.1%
Barrel $purity$	99.3%	86.2%	68.3%
Endcap eff	58.6%	80.9%	89.7%
Endcap $purity$	97.8%	76.5%	62.2%

$$\text{Eff}=\frac{truth(\pi,)\left(without\ decay\&\text{tpc}\&\&\text{tof}\&\&\left(\text{端盖或者桶部}\right)\right)\&\&rec(\pi)}{\text{truth}(\pi)\left(without\ decay\&\text{tpc}\&\&\text{tof}\&\&\left(\text{端盖或者桶部}\right)\right)}$$

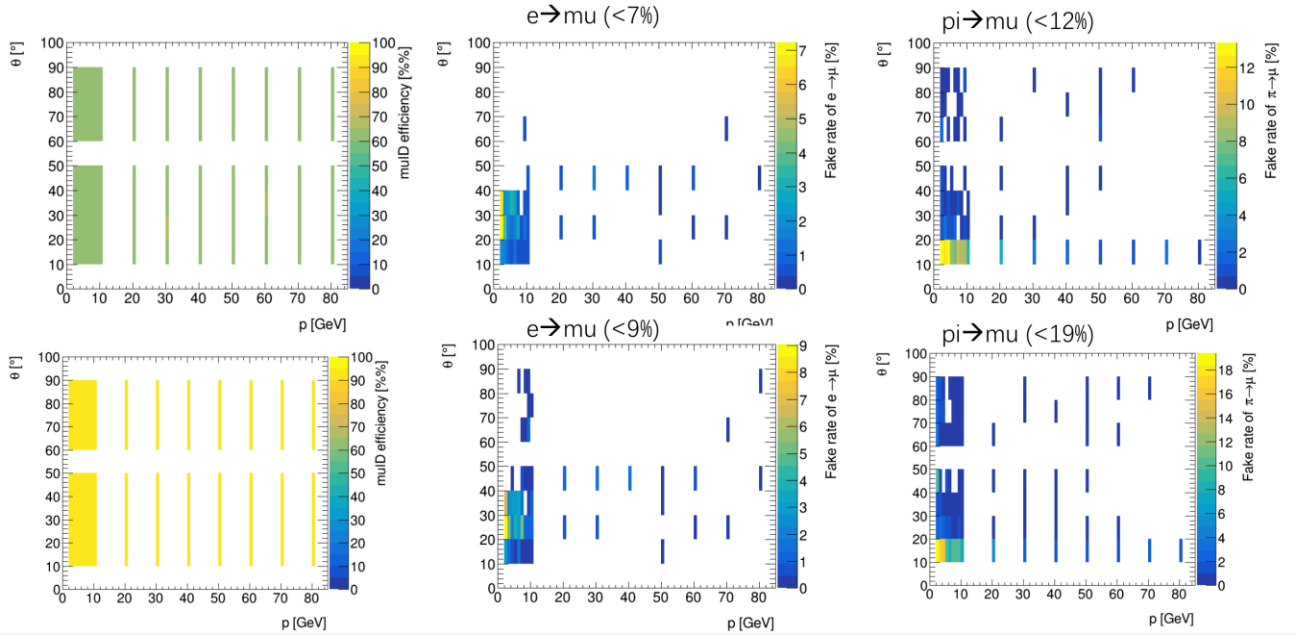
$$\text{Purity}=\frac{rec(\pi)\left(without\ decay\&\text{tpc}\&\&\text{tof}\&\&\left(\text{端盖或者桶部}\right)\right)\&\&\text{truth}(\pi)}{truth(\pi||k||p)\&\&rec(\pi)\left(without\ decay\&\text{tpc}\&\&\text{tof}\&\&\left(\text{端盖或者桶部}\right)\right)}$$

- Pion eff ~60%
  - High migration rate pion to others;
- Plan:set default to pion. (including all tracks without enough information)
- Plan to use exclusion selection for e/mu/K/pion/p.

Roughly: lepton PID in jet

@Xia Ligang, Last Friday;

muID: 60%WP (top) and 90% WP (bottom)



In jet, charged tracks P ~<10GeV.

From charged track ratio, for one good track in jet,

N_Pion: N_Muon: 30:1. (2.48%:75.91%. For raw track, 50:1)

Pion to muon mistarget ratio, assuming 10%

Reco PID Pio purity < 1/(30*10%+1) = 25%

One good to use lepton ID require purity > 90% -> Mistarget ratio <1%.

purity > 99% -> Mistarget ratio <0.1%.

@Geliang, Muon chamber information also inefficient in low pt region.

Difficult to tag lepton in jet.

Lepton yield in jet; Impact?