



CEPC

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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.
 - Now most Zqq, 2f, 4f samples are ready.

ECM	Z process	H process	Path	CEPCSW Release	EvtNumber	Sim+Digi+Trk	Rec	Status
240	mm	bb	/cefs/higgs/zhangkl/Production/25035/E240_mmHbb	25.3.5	500k	D	D	D
240	mm	cc	/cefs/higgs/zhangkl/Production/25035/E240_mmHcc	25.3.5	500k	D	D	D
240	mm	tautau	/cefs/higgs/zhangkl/Production/25035/E240_mmHe3e3	25.3.5	500k	D	D	D
240	mm	ww(fullhad)	/cefs/higgs/zhangkl/Production/25035/E240_mmHww	25.3.5	500k	D	D	D
240	mm	zz(fullhad)	/cefs/higgs/zhangkl/Production/25035/E240_mmHzz	25.3.5	500k	D	D	D
240	mm	gg	/cefs/higgs/zhangkl/Production/25035/E240_mmHgg	25.3.5	500k	D	D	D
91.2	bb		/cefs/higgs/zhangkl/Production/25035/E91.2_eebb	25.3.6	100k	D		
91.2	cc		/cefs/higgs/zhangkl/Production/25035/E91.2_eecc	25.3.6	100k	D		
91.2	dd		/cefs/higgs/zhangkl/Production/25035/E91.2_eedd	25.3.6	100k	D		
91.2	uu		/cefs/higgs/zhangkl/Production/25035/E91.2_eeuu	25.3.6	100k	D		
91.2	ss		/cefs/higgs/zhangkl/Production/25036/E91.2_eess	25.3.6	100k	D		
240	ee	inclusive	/cefs/higgs/zhangkl/Production/25036/E240_eeHX	25.3.6	1M	D	D	
240	mm	inclusive	/cefs/higgs/zhangkl/Production/25036/E240_mmHX	25.3.6	1M	D	D	
240	qq	inclusive	/cefs/higgs/zhangkl/Production/25036/E240_qqHX	25.3.6	3M	D	D	
240	vv	inclusive	/cefs/higgs/zhangkl/Production/25036/E240_vvHX	25.3.6	1M	D		
240	tautau	inclusive	/cefs/higgs/zhangkl/Production/25036/E240_tautauHX	25.3.6	1M	D	D	
240 4f	43 final states each 2C			/cefs/higgs/zhangkl/Production/25036/4fermions				
240 2f	ee		/cefs/higgs/zhangkl/Production/25036/E240_e1e1	25.3.6	100k	D		
	mm		/cefs/higgs/zhangkl/Production/25036/E240_e2e2	25.3.6	100k	D		
	tautau		/cefs/higgs/zhangkl/Production/25036/E240_e3e3	25.3.6	100k	D		
	qq		/cefs/higgs/zhangkl/Production/25036/E240_qq	25.3.6	500k	D		
341 ttbar	semi-lep			25.3.6	100k			
342.75 ttbar	semi-lep			25.3.6	600k			
344 ttbar	semi-lep			25.3.6	200k			
346 ttbar	semi-lep			25.3.6	100k			
91.2	bb		/cefs/higgs/zhangkl/Production/25036/E91.2_eebb	25.3.6	2M	D	D	
91.2	dd		/cefs/higgs/zhangkl/Production/25036/E91.2_eedd	25.3.6	2M	D		
91.2	uu		/cefs/higgs/zhangkl/Production/25036/E91.2_eeuu	25.3.6	2M	D		
240 smuon								
80	ee->bb(withoutISR)		/cefs/higgs/zhangkl/Production/25036/E80_eebb_woisr	25.3.6	100k	D	D	
120	ee->bb(withoutISR)		/cefs/higgs/zhangkl/Production/25036/E120_eebb_woisr	25.3.6	100k	D	D	
160	ee->bb(withoutISR)		/cefs/higgs/zhangkl/Production/25036/E160_eebb_woisr	25.3.6	100k	D	D	
200	ee->bb(withoutISR)		/cefs/higgs/zhangkl/Production/25036/E200_eebb_woisr	25.3.6	100k	D	D	
240	ee->bb(withoutISR)		/cefs/higgs/zhangkl/Production/25036/E240_eebb_woisr	25.3.6	500k	D	D	
240 H124.8	mm	inclusive			15k	D		
	H124.95	mm	inclusive		15k	D		
	H125.05	mm	inclusive		15k	D		
	H125.02	mm	inclusive		15k	D		

Note:

D=Done

some broken files

Muon hit information available after 25.3.6.

@liyeyan

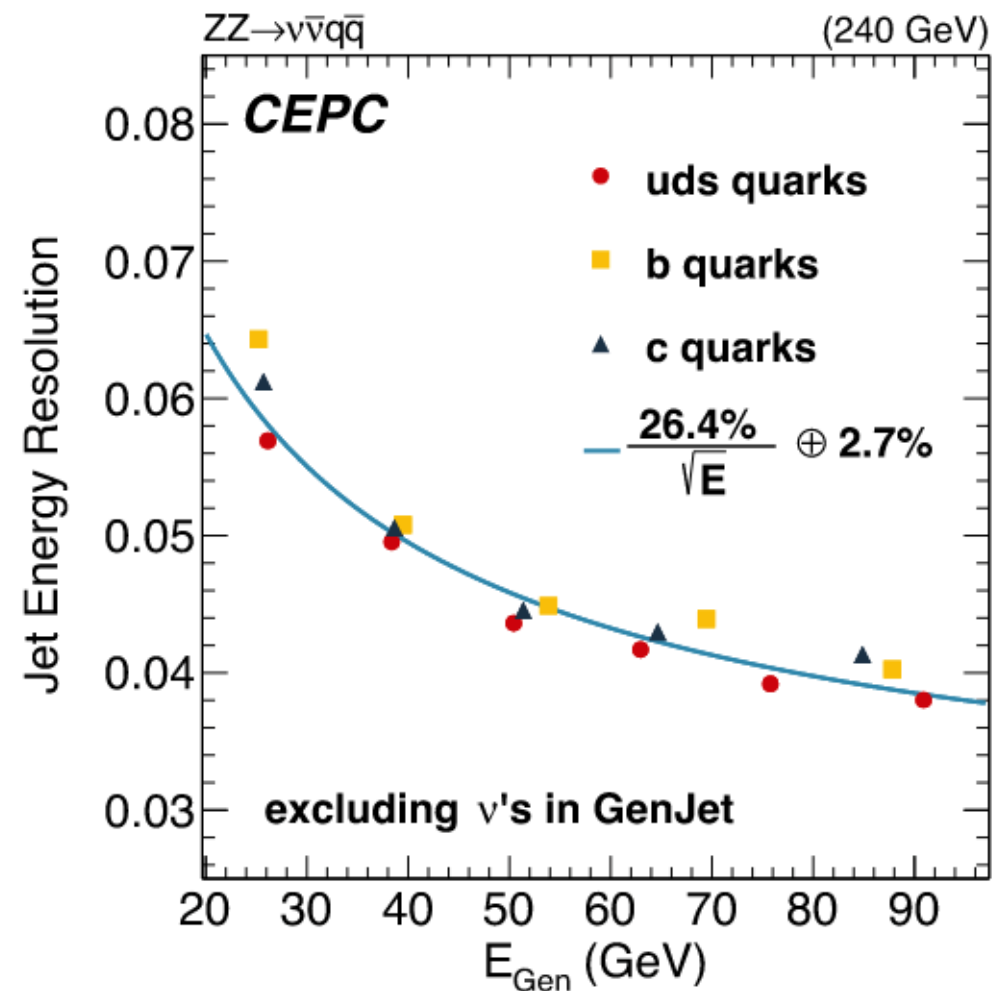
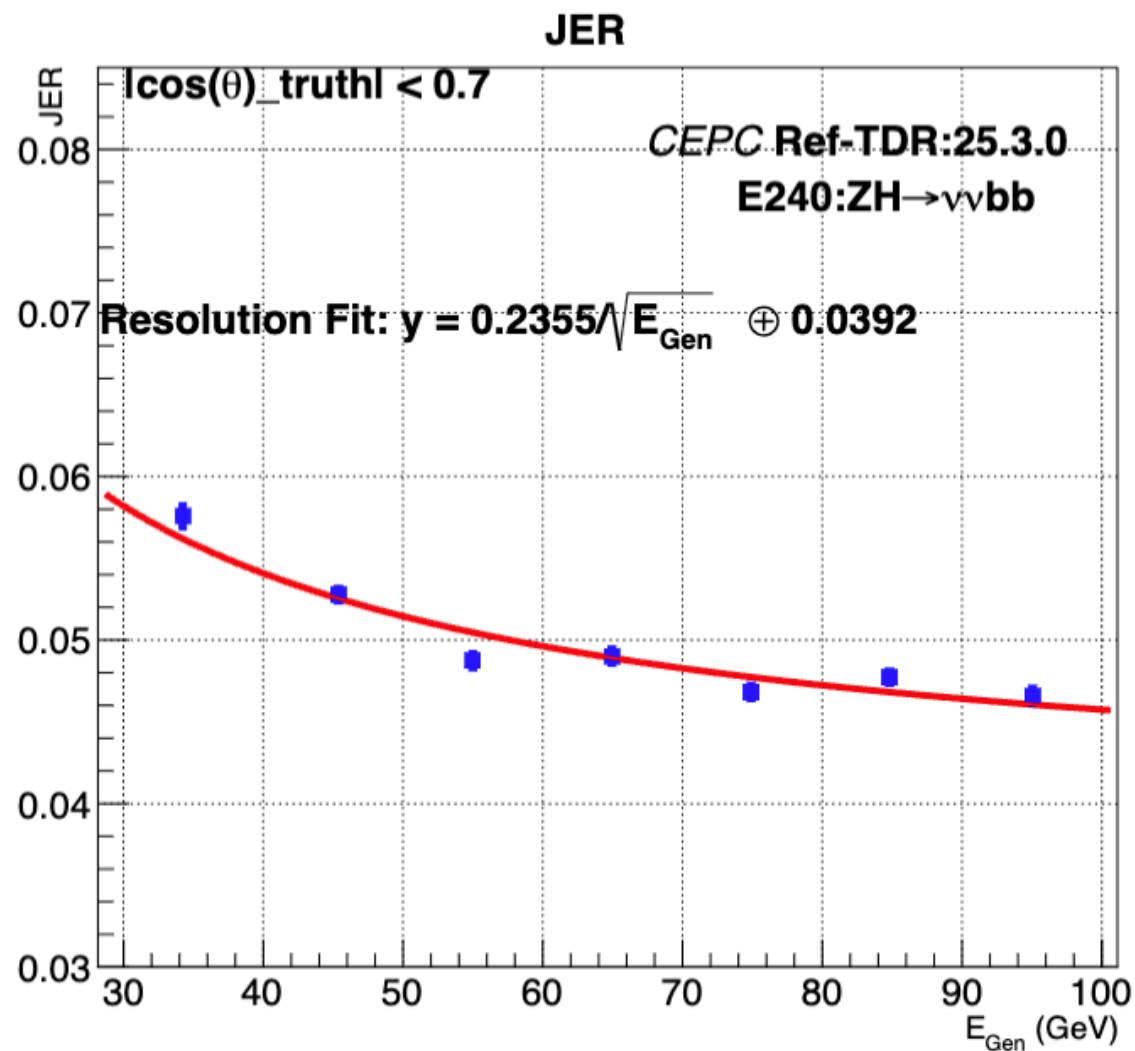
@xuai, done by Shiyl.



backup

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.

TDR JER curve flatter.



- 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

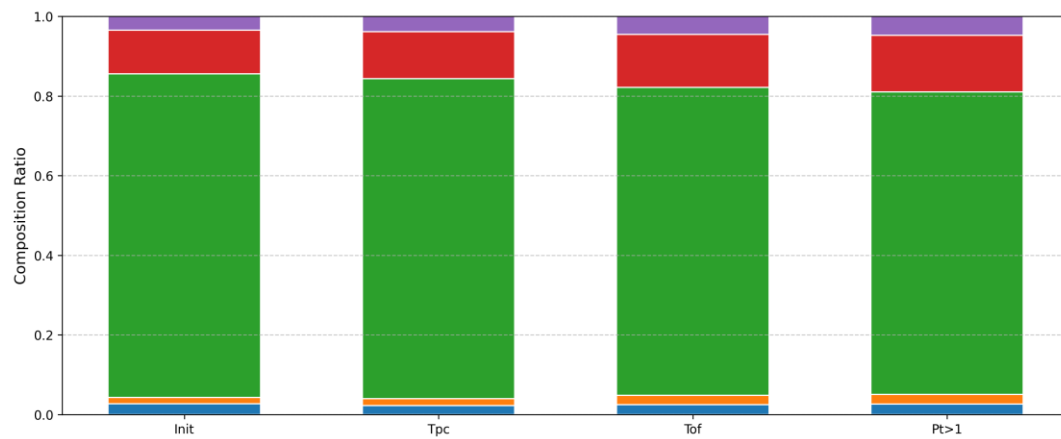
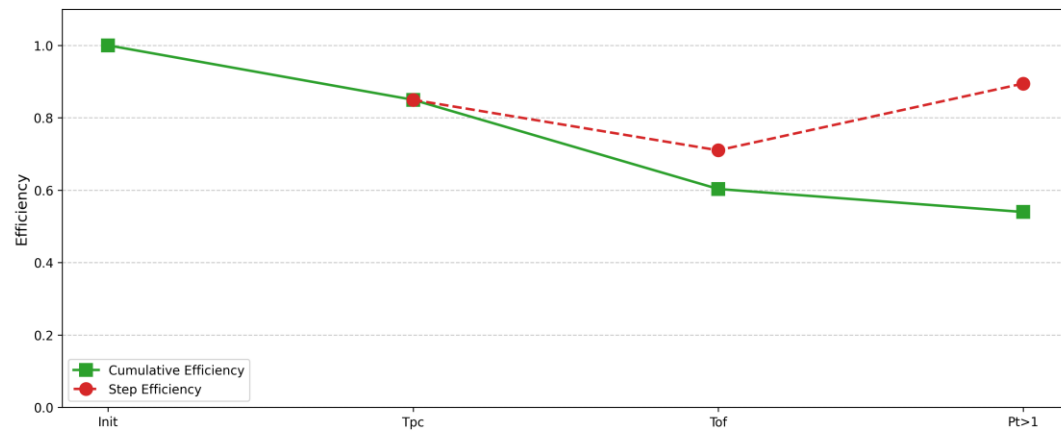
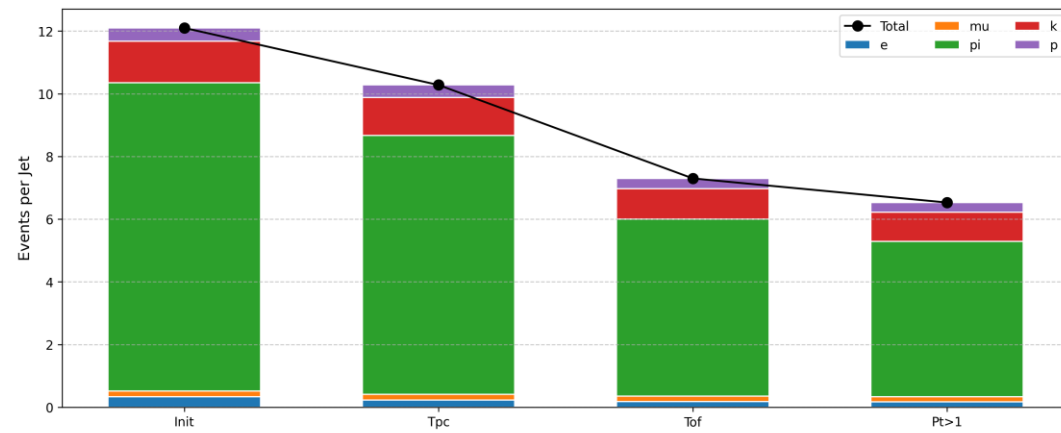


per jet						
Endcap:	e	mu	pi	k	p	Tot
Init	2.49%	1.70%	80.73%	11.50%	3.58%	100%
Tpc	2.41%	2.23%	77.40%	13.45%	4.51%	100%
Tof	2.39%	2.73%	76.27%	14.07%	4.54%	100%
Pt>1	3.07%	3.63%	70.46%	17.71%	5.13%	100%
Barrel:	e	mu	pi	k	p	Tot
Init:	2.72%	1.59%	81.23%	10.96%	3.50%	100%
Tpc	2.26%	1.79%	80.29%	11.76%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

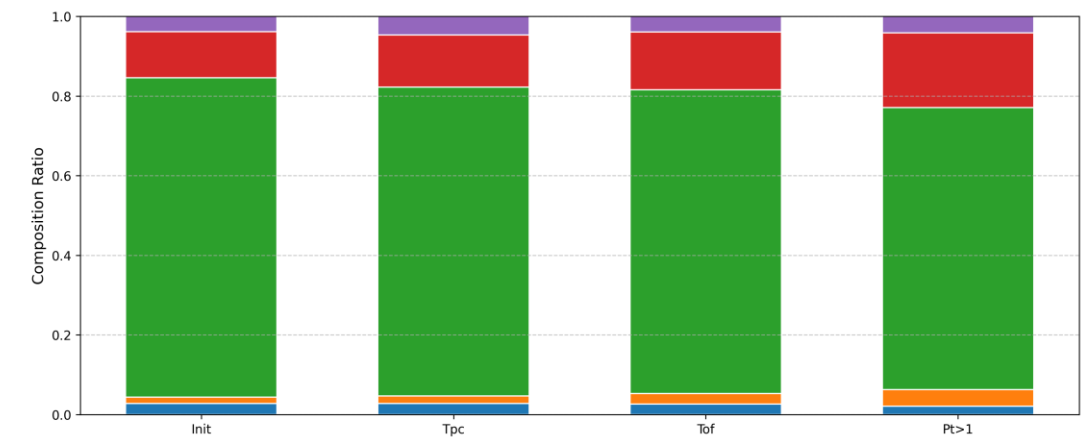
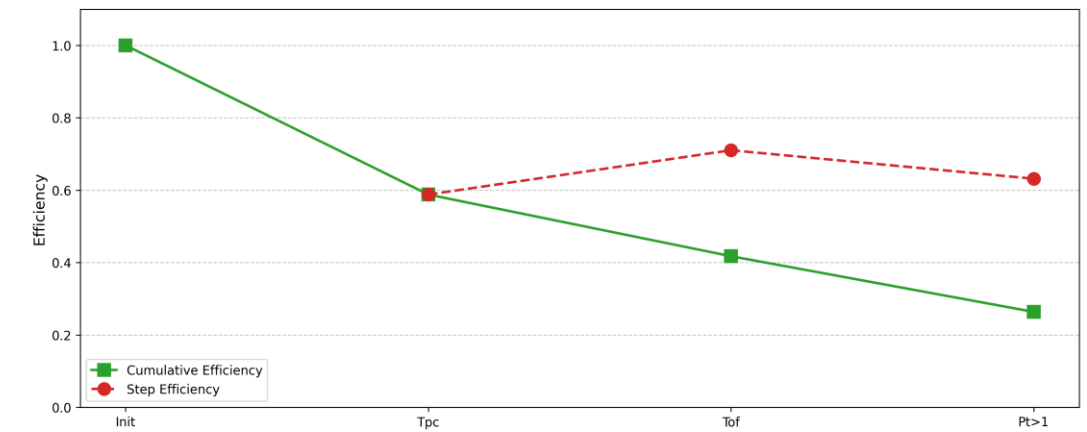
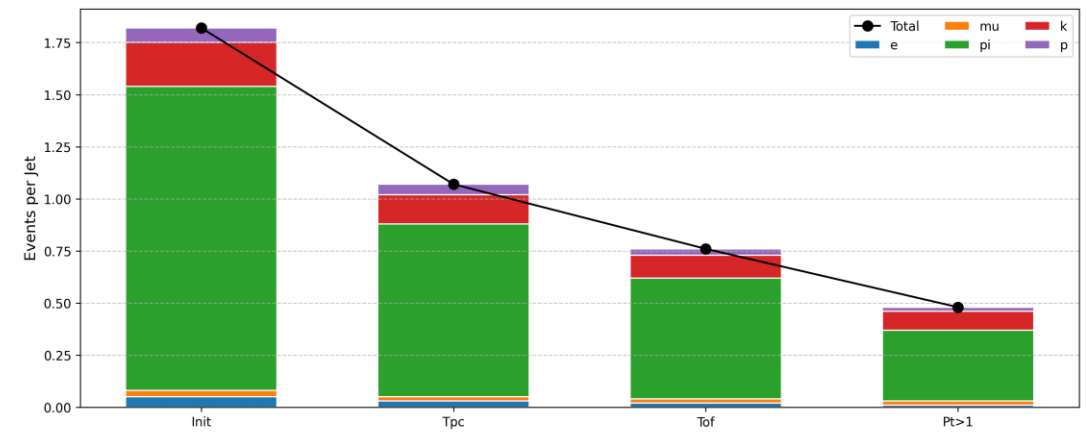
Charged track eff

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%

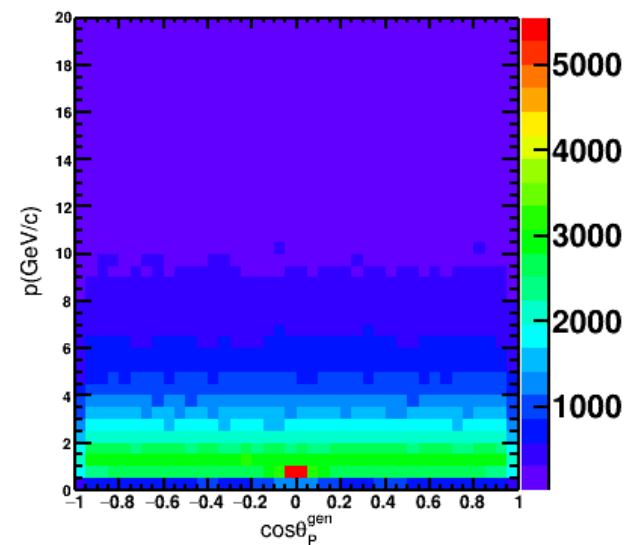
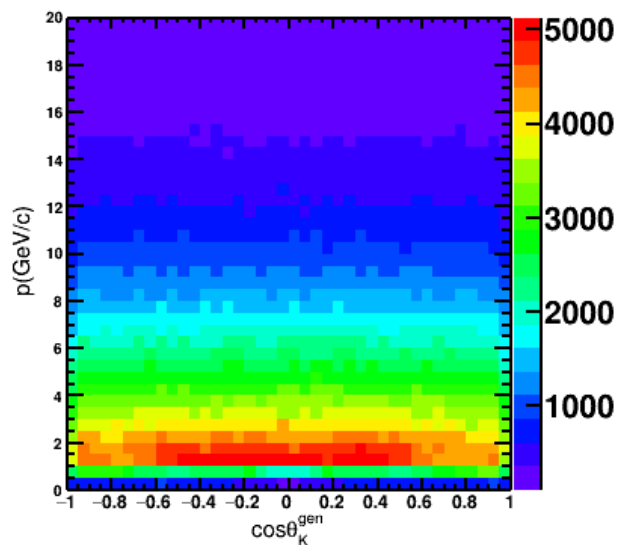
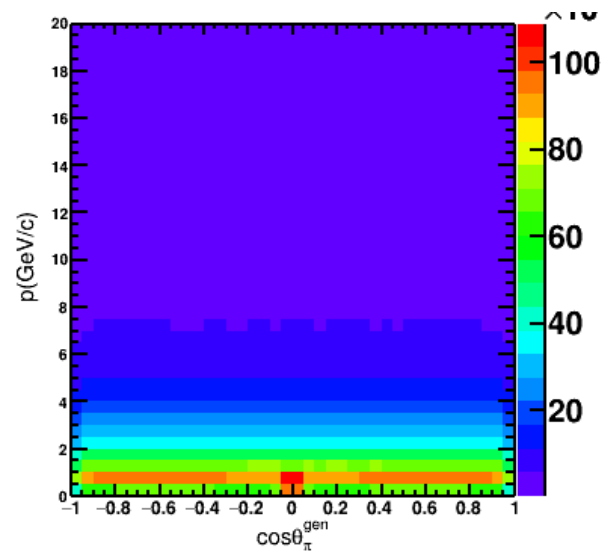
Particle Analysis - Barrel



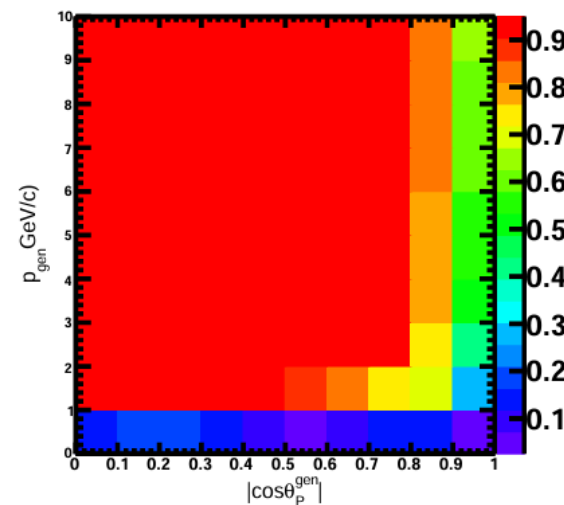
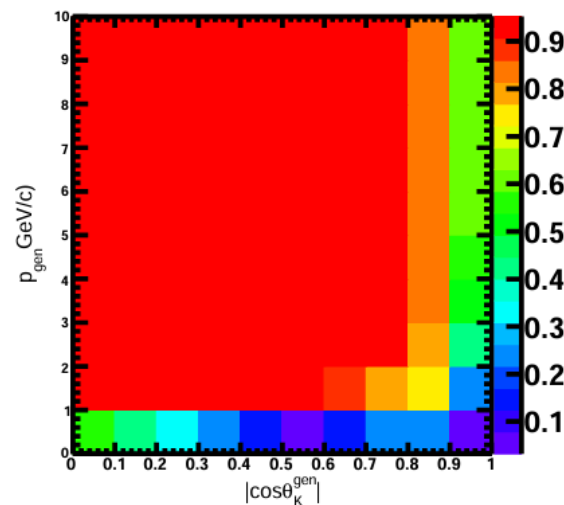
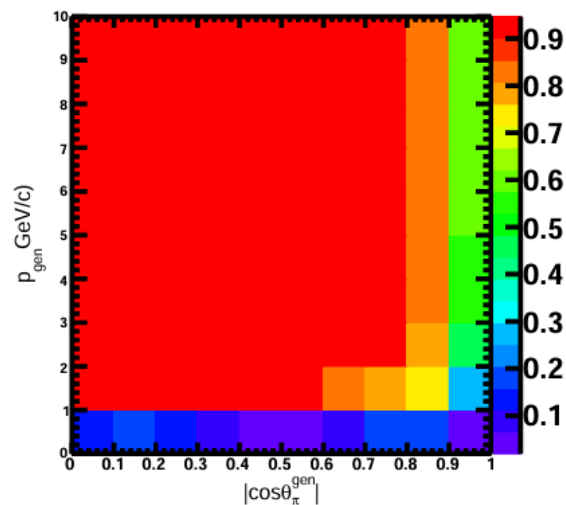
Particle Analysis - Endcap



Phase Space: almost < 4 GeV

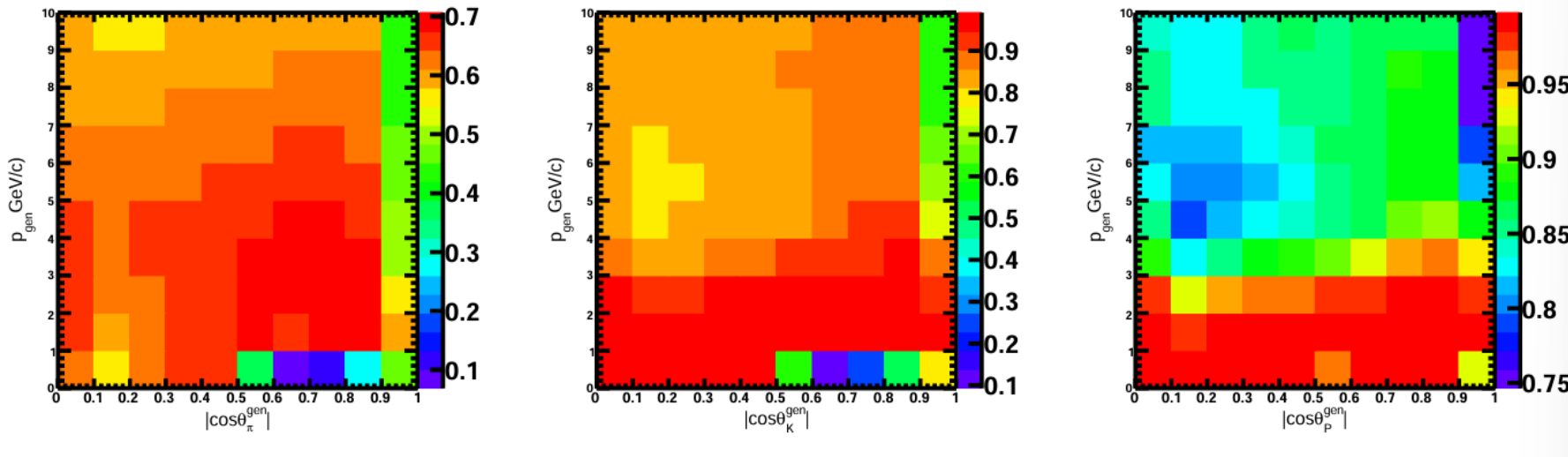


Trk eff: $p > 1$, $\cos\theta < 0.85$

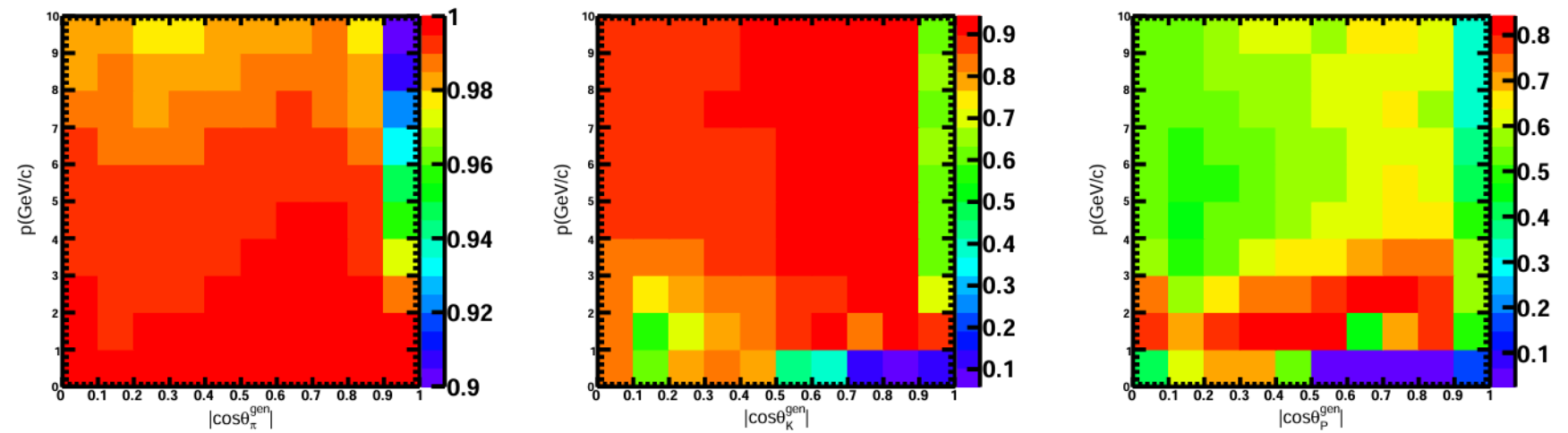


p/k/pion

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 <i>eff</i>	64.9%	88.3%	91.1%
Barrel <i>purity</i>	99.3%	86.2%	68.3%
Endcap <i>eff</i>	58.6%	80.9%	89.7%
Endcap <i>purity</i>	97.8%	76.5%	62.2%

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

Purity=

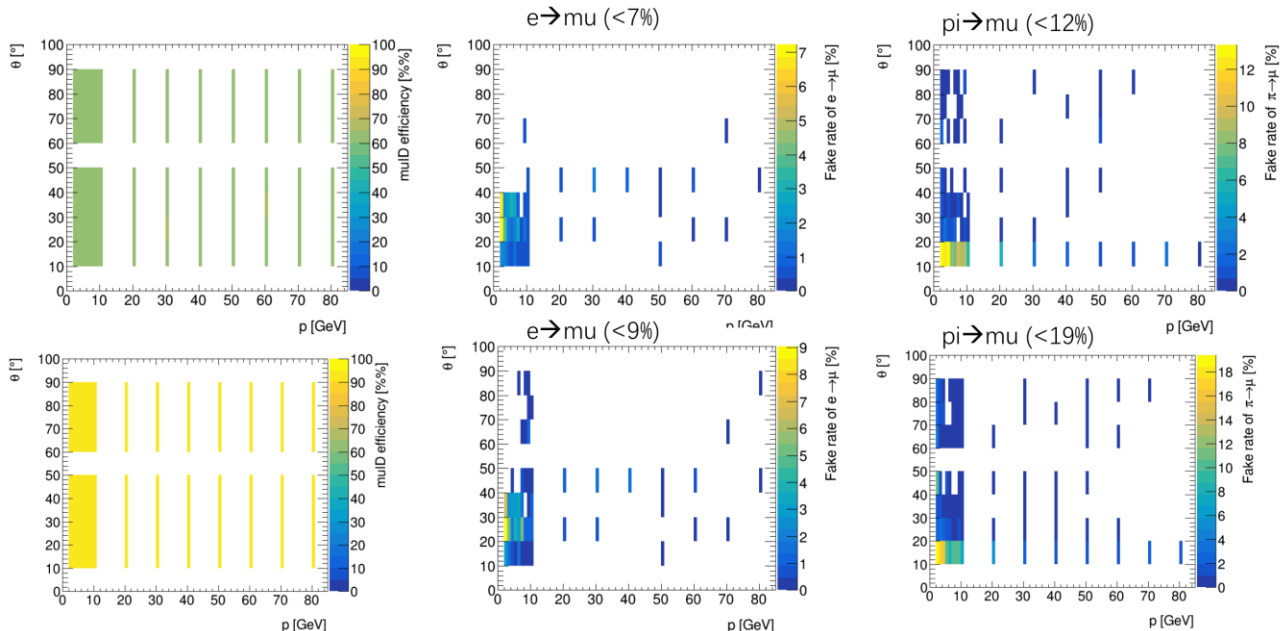
$$\frac{\text{rec}(\pi) \left(\text{without decay} \& \text{tpc} \& \text{tof} \& \left(\text{端盖或者桶部} \right) \right) \& \text{truth}(\pi)}{\text{truth}(\pi | k | p) \& \text{rec}(\pi) \left(\text{without decay} \& \text{tpc} \& \text{tof} \& \left(\text{端盖或者桶部} \right) \right)}$$

- 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 $P \sim < 10 \text{ GeV}$.

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

$N_{\text{Pion}} : N_{\text{Muon}} : 30 : 1$. (2.48% : 75.91%. For raw track, 50 : 1)

Pion to muon mistarget ratio, assuming 10%

Reco PID Pion 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?