CEPC

Samples, Jets, and summary for Wednesday working meeting

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CEPCSW

- Latest: 25.3.7

```
detsim_anatool.IsTrk2Primary = False # True: primary; False: ancestor
# Set to primary, always fall back to primary track in generator level.
# Set to ancestor, fall back to the first ancestor of the track. Can be the particle generated in simulation.
```

- Add one switch:
  - Truth link will have different behavior before&after.
- MCP.getSimulatorStatus()
  - isCreatedInSimulation()
  - isDecayedInTracker()
  - isDecayedInCalorimeter()
  - daughters_size()

Onnx in CEPCSW

@Yongfeng, Mohan, Tao

- Load the onnx model in CEPCSW and predict
  - See example: https://code.ihep.ac.cn/pimohan/onnxreader
  - Possible to load JOI model in analysis.
  - Scripts for run: https://code.ihep.ac.cn/zhangkl/cepcsampleproduction/-/tree/main

Sample list

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
240		mm	ss	/cefs/higgs/zhangkl/Production/25035/E240_mmHss	25.3.6	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	D	
240		tautau	inclusive	/cefs/higgs/zhangkl/Production/25036/E240_tautauHX	25.3.6	1M	D	D	
240	2f	ee		/cefs/higgs/zhangkl/Production/25036/E240_e1e1	25.3.6	100k	D	D	
		mm		/cefs/higgs/zhangkl/Production/25036/E240_e2e2	25.3.6	100k	D	D	
		tautau		/cefs/higgs/zhangkl/Production/25036/E240_e3e3	25.3.6	100k	D	D	
		qq		/cefs/higgs/zhangkl/Production/25036/E240_qq	25.3.6	500k	D	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	D	
91.2		uu		/cefs/higgs/zhangkl/Production/25036/E91.2_eeuu	25.3.6	2M	D	D	
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		25.3.7	15k	D	D	
	H124.95	mm	inclusive		25.3.7	15k	D	D	
	H125.05	mm	inclusive		25.3.7	15k	D	D	
	H125.2	mm	inclusive		25.3.7	15k	D	D	

240	4f	zz_h0utut		/cefs/higgs/zhangkl/Production/25036/4fermions	25.3.6	400k	D		
		zz_h0dtdt			25.3.6		D		
		zz_h0uu_notd			25.3.6		D		
		zz_h0cc_nots			25.3.6		D		
		ww_h0cuxx			25.3.6		D		
		ww_h0uubd			25.3.6		D		
		ww_h0uusd			25.3.6		D		
		ww_h0ccbs			25.3.6		D		
		ww_h0ccds			25.3.6		D		
		zzorww_h0ududd			25.3.6		D		
		zzorww_h0cscs			25.3.6		D		
		zz_sl0nu_up			25.3.6		D		
		zz_sl0tau_down			25.3.6		D		
		zz_sl0mu_down			25.3.6		D	D	
		zz_sl0nu_down			25.3.6		D		
		zz_sl0tau_up			25.3.6		D		
		zz_sl0mu_up			25.3.6		D	D	
		ww_sl0tauq			25.3.6		D		
		ww_sl0muq			25.3.6		D	D	
		zz_ll04tau			25.3.6		D		
		zz_ll04mu			25.3.6		D	D	
		zz_l0taumu			25.3.6		D	D	
		zz_l0mumu			25.3.6		D	D	
		zz_l0tautau			25.3.6		D		
		ww_ll0i			25.3.6		D	D	
		zzorww_l0mumu			25.3.6		D		
		zzorww_l0tautau			25.3.6		D		
		sze_l0tau			25.3.6		D		
		sze_l0mu			25.3.6		D		
		sze_l0e			25.3.6		D		
		sze_sl0dd			25.3.6		D		
		sze_sl0uu			25.3.6		D		
		sze_l0nunu			25.3.6		D		
		sw_sl0qq			25.3.6		D		
		sw_l0tau			25.3.6		D		
		sw_l0mu			25.3.6		D		
		sznu_l0mumu			25.3.6		D		
		sznu_l0tautau			25.3.6		D		
		sznu_sl0nu_up			25.3.6		D	D	
		sznu_sl0nu_down			25.3.6		D		
240		vv	bb	/cefs/higgs/zhangkl/Production/25037/joi	25.3.7	1M	D	D	
		vv	cc	/cefs/higgs/zhangkl/Production/25037/joi	25.3.7	1M	D	D	
		vv	gg	/cefs/higgs/zhangkl/Production/25037/joi	25.3.7	1M	D	D	
		vv	uu	/cefs/higgs/zhangkl/Production/25037/joi	25.3.7	1M	D	D	
		vv	ss	/cefs/higgs/zhangkl/Production/25037/joi	25.3.7	1M	D	D	
		vv	dd	/cefs/higgs/zhangkl/Production/25037/joi	25.3.7	1M	D	D	

Some 4f bkg ready.(Mainly mumu related)

Sample name convention, cross section:
https://docs.ihep.ac.cn/link/AA749814584F654E8FBAADA4D766223B1F

https://docs.ihep.ac.cn/link/AR7D1FA68DEEB54F6782D63CF312B747C1

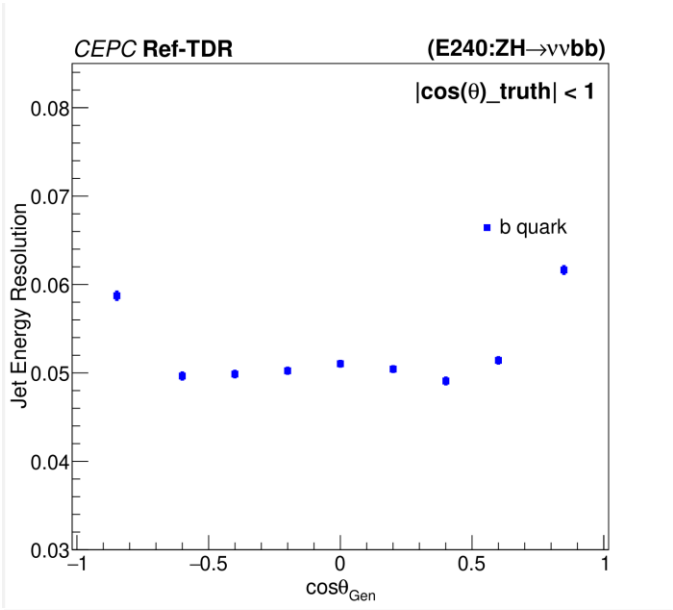
Gen Filter

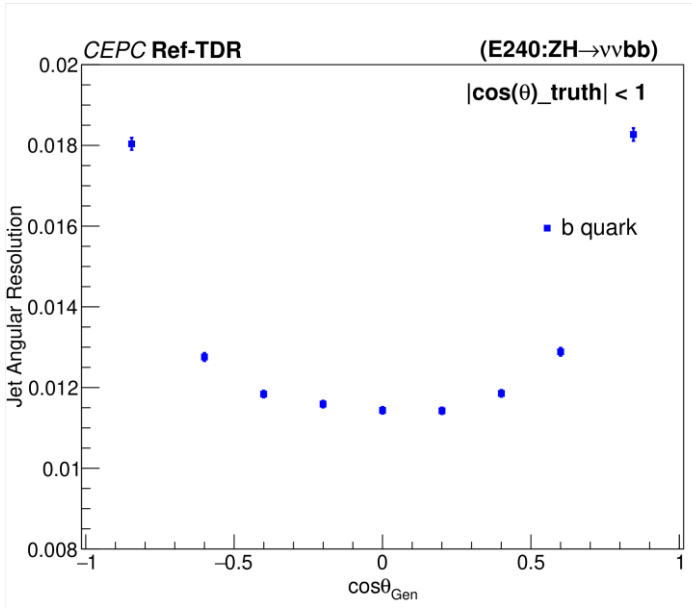
@Wanghan

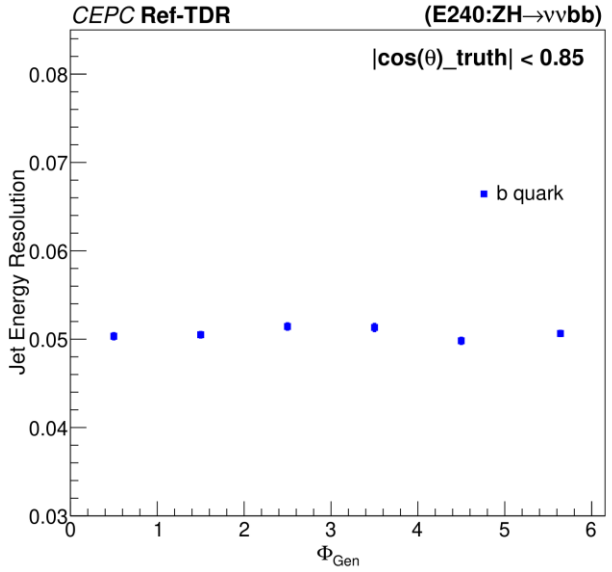
- https://code.ihep.ac.cn/wanghan/modify_stdhep
  - Filter used in processes like smuon, diphoton …… to filter background.
  - Large statistics->filter-> small amount with eff.

JER

@Yingqi, Hao







- JES, JER, JAS, JAR provided.

A_{FB} : Assemetry $Z \to \mu\mu$

@Jiawei, Shuo

CEPCSW 25.3.6	91.2GeV Z ->mumu	Z->bb	Z->tautau
Total	984488	44550	197845
PID selection	879328	3222	9799
Z mass window	826419(93.98%)	0	9
Wrong selection	24(0.003%)	0	4
costheta > 0	420746	0	1
costheta < 0	405649	0	4

- Largest uncertainty:
- The deviation of PFO from MCP ,5e-5

PFO Results

- Events: 826418
- Forward: 420774
- Backward: 405644
- AFB:0.0183079

MCP Results

- Events: 826418
- Forward: 420754
- Backward: 405664
- AFB: 0.0182595

We currently consider 5 errors:

mis-identification: 5e-6

background comtamination: 5e-6

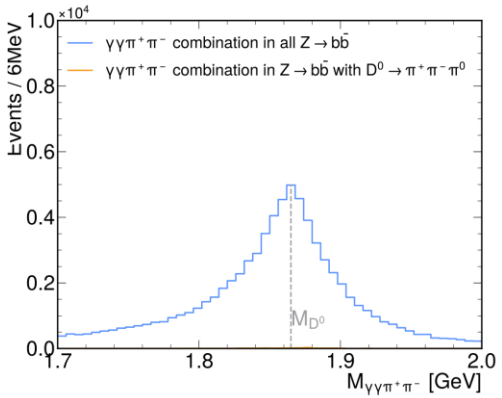
charge mis-identification: 0

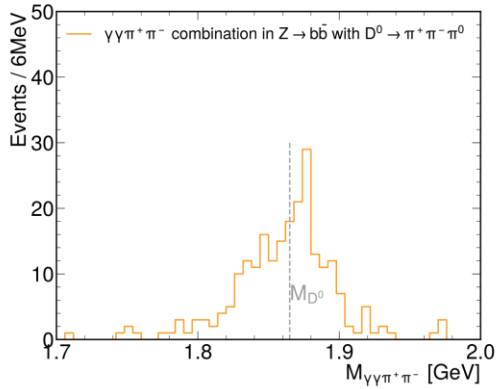
angular reconstruction (delta_theta): 5e-5

energy spread uncertainty: 2e-5

D0->pi0pi+pi-

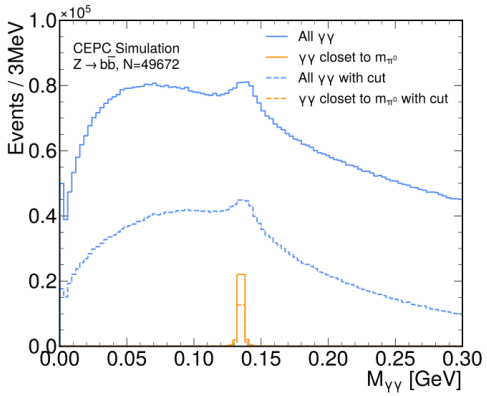
@Jinfei



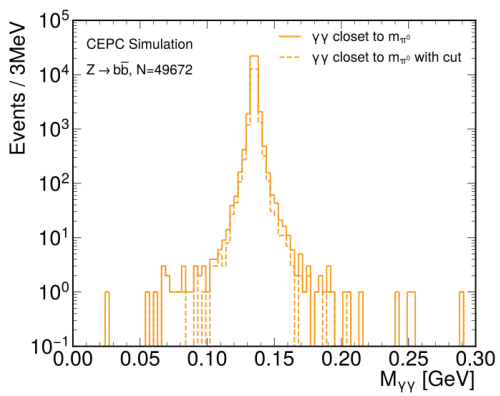


Cuts	Efficiency [%]	Purity[%]
Vertex reconstructed	63	1e-2
charged pair	62	2e-2
Kinematic > 0	61	3e-2
Chi2 < 4	52	9e-2
PID	51	9e-2
$E_{\gamma 1} > 0.5$ GeV	38	0.16
$\angle_{\gamma\gamma} < 20^{\circ}$	31	0.21
$0.11 < M_{\gamma\gamma} < 0.16$ GeV	24	0.28
$1.8 < M_{\gamma\gamma\pi^+\pi^-} < 1.9$ GeV	20	0.40

Pi0 can be successfully constructed. However, difficult to tag out.



All of $\gamma\gamma$ combination



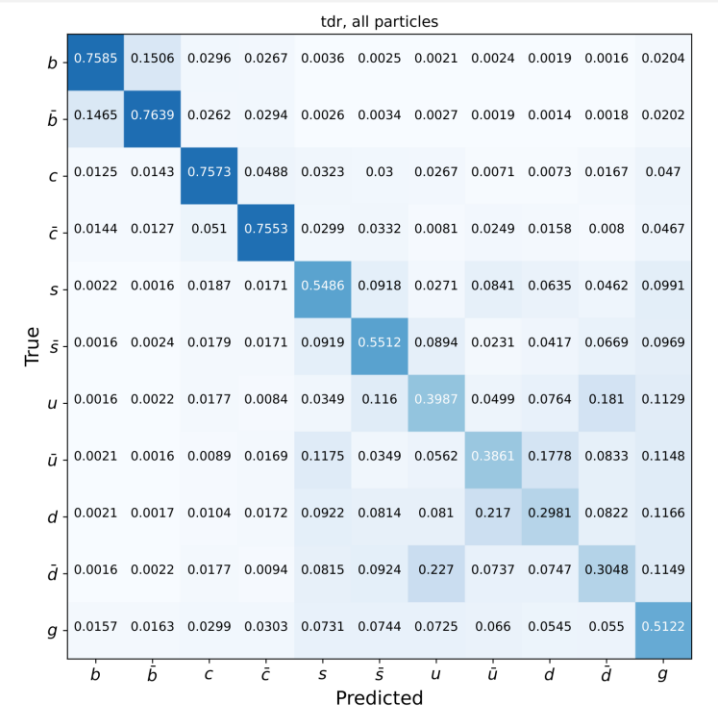
The combination with smallest $|M_{\gamma\gamma} - m_{\pi^0}|$

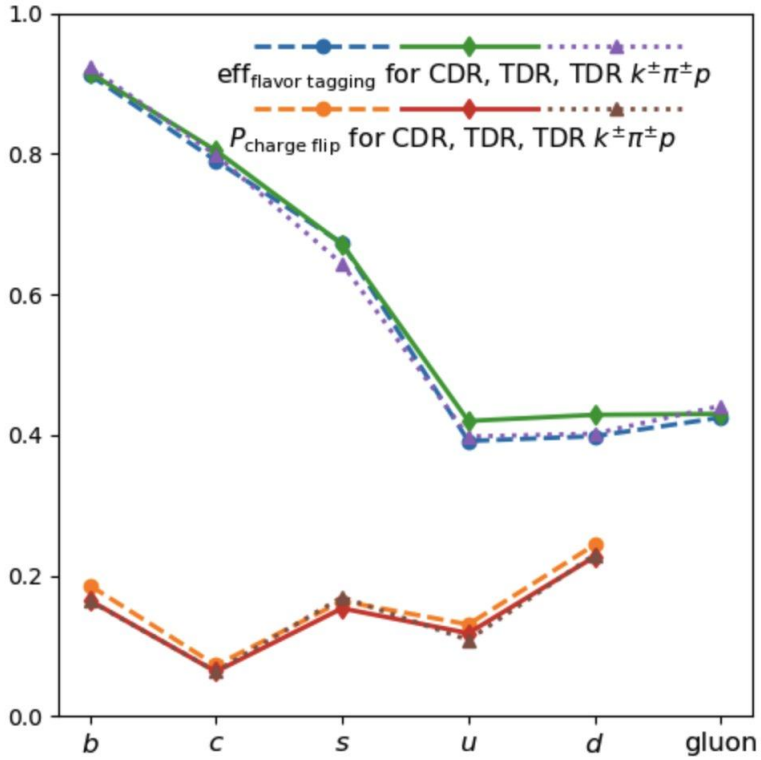
The efficiency is calculate by $\frac{N_{selected}(D^0 \to \pi^+\pi^-\pi^0)}{N_{truth}(D^0 \to \pi^+\pi^-\pi^0)}$. The purity is calculated by $\frac{N_{selected}(D^0 \to \pi^+\pi^-\pi^0)}{N_{selected}(Z \to b\bar{b})}$, which is much smaller than previous result.

PID & JOI

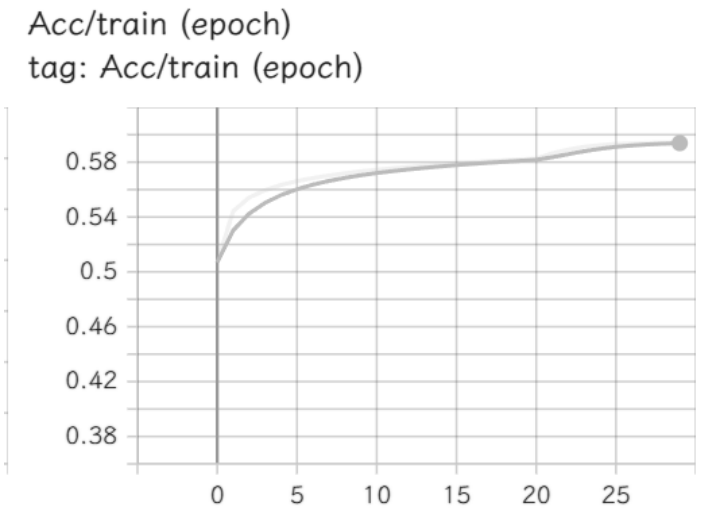
Input: https://code.ihep.ac.cn/zhangkl/jetorigin/-/tree/master?ref_type=heads

- Now truth PID, reco PID implemented in JOI.
  - Lepton ID (90% and noLep) specified.





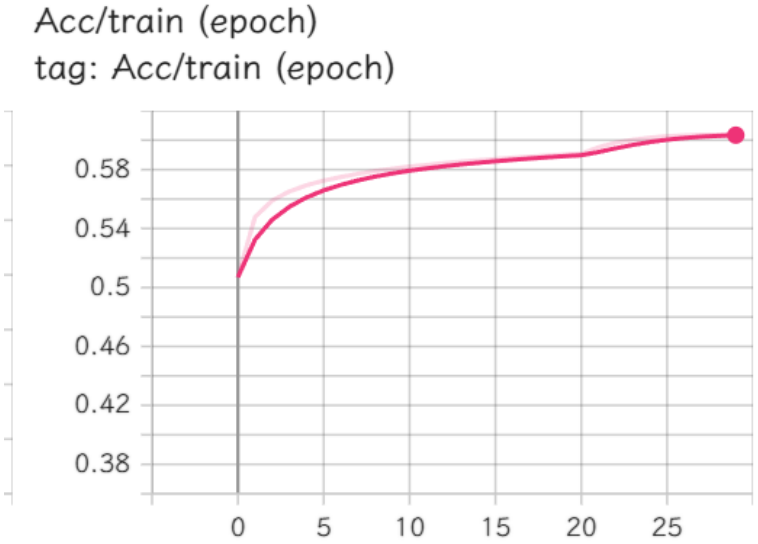
Prefect PID.



TDR, reco PID (only p, k, pi)

Name	Smoothed	Value	Step	Time	Relative
Mar30_05-56-27_gpu033.ihep.ac.cnJet_0320reco_higgs_full_ParT	0.5939	0.5945	29	Mon Mar 31, 11:03:35	1d 3h 56m 55s

Lepton id still under tuning.



TDR, prefect PID

Name	Smoothed	Value	Step	Time	Relative
Mar14_04-57-27_gpu029.ihep.ac.cnJet_0314_higgs_full_ParT	0.6034	0.6041	29	Sun Mar 16, 00:19:28	1d 17h 48m 8s

backups

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 have (generatorstatus=1) 14.3 truth tracks: 11.7Pion, 1.51 Kaon, 0.50Proton, 0.41 electron and 0.23 muon.
Then, it has 14 reco 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%