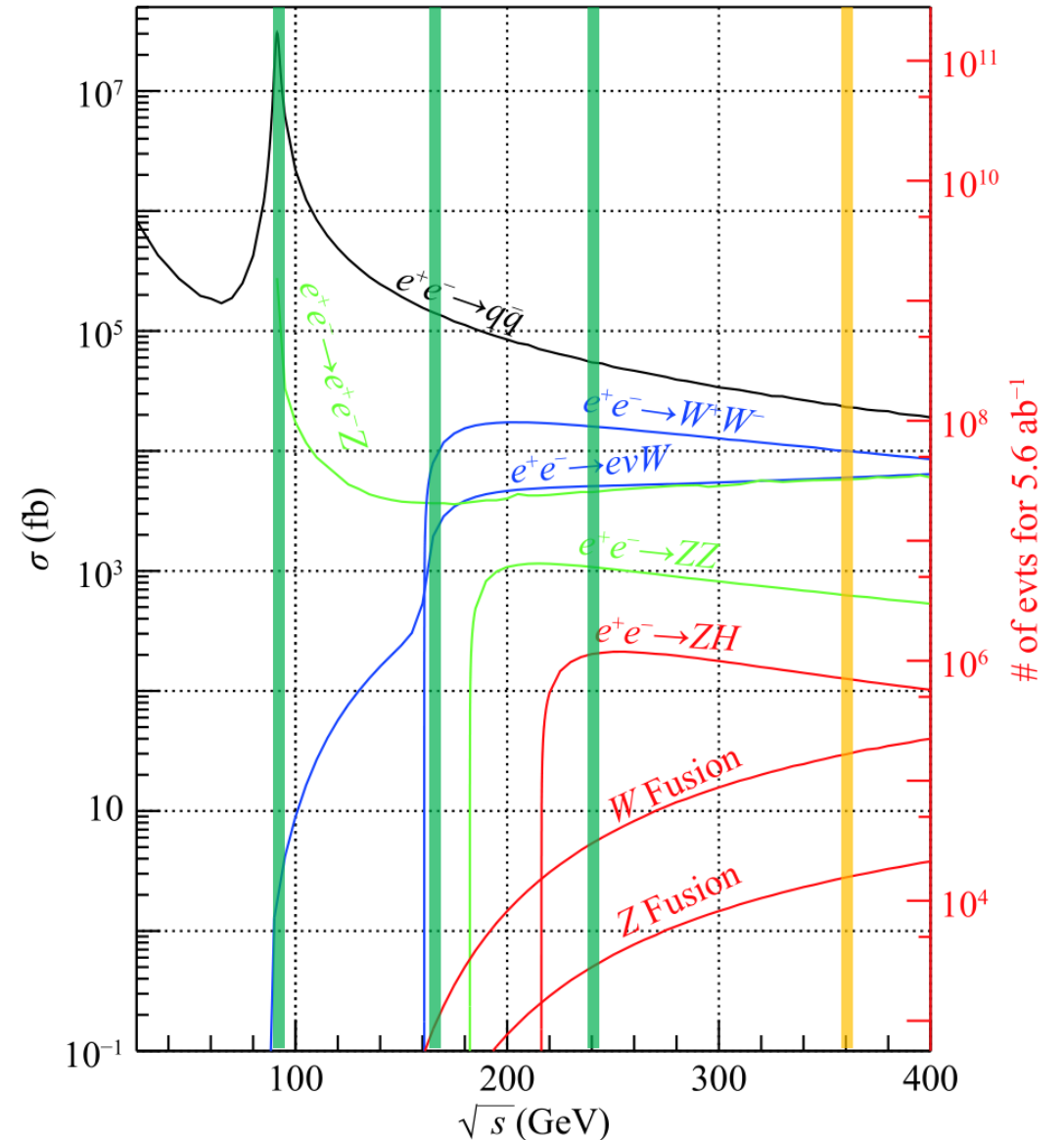
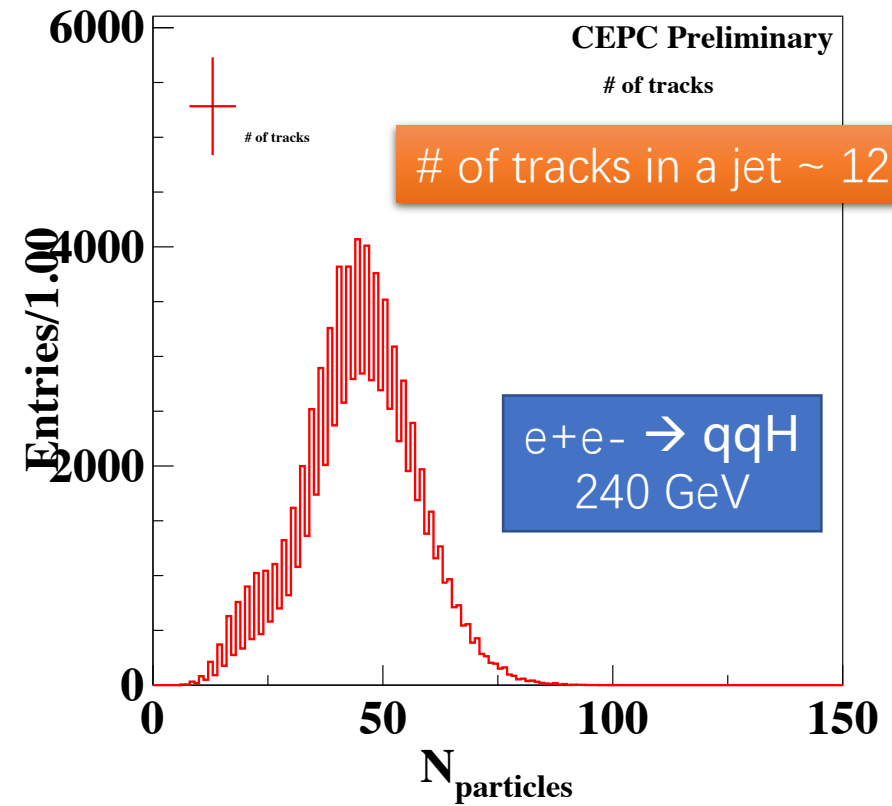
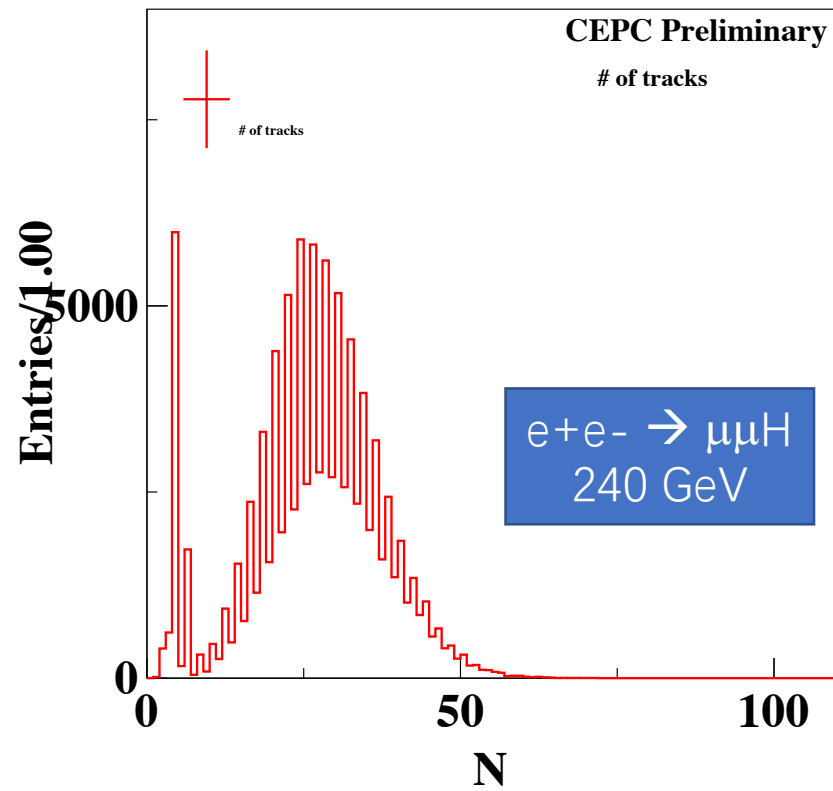


Physics at CEPC

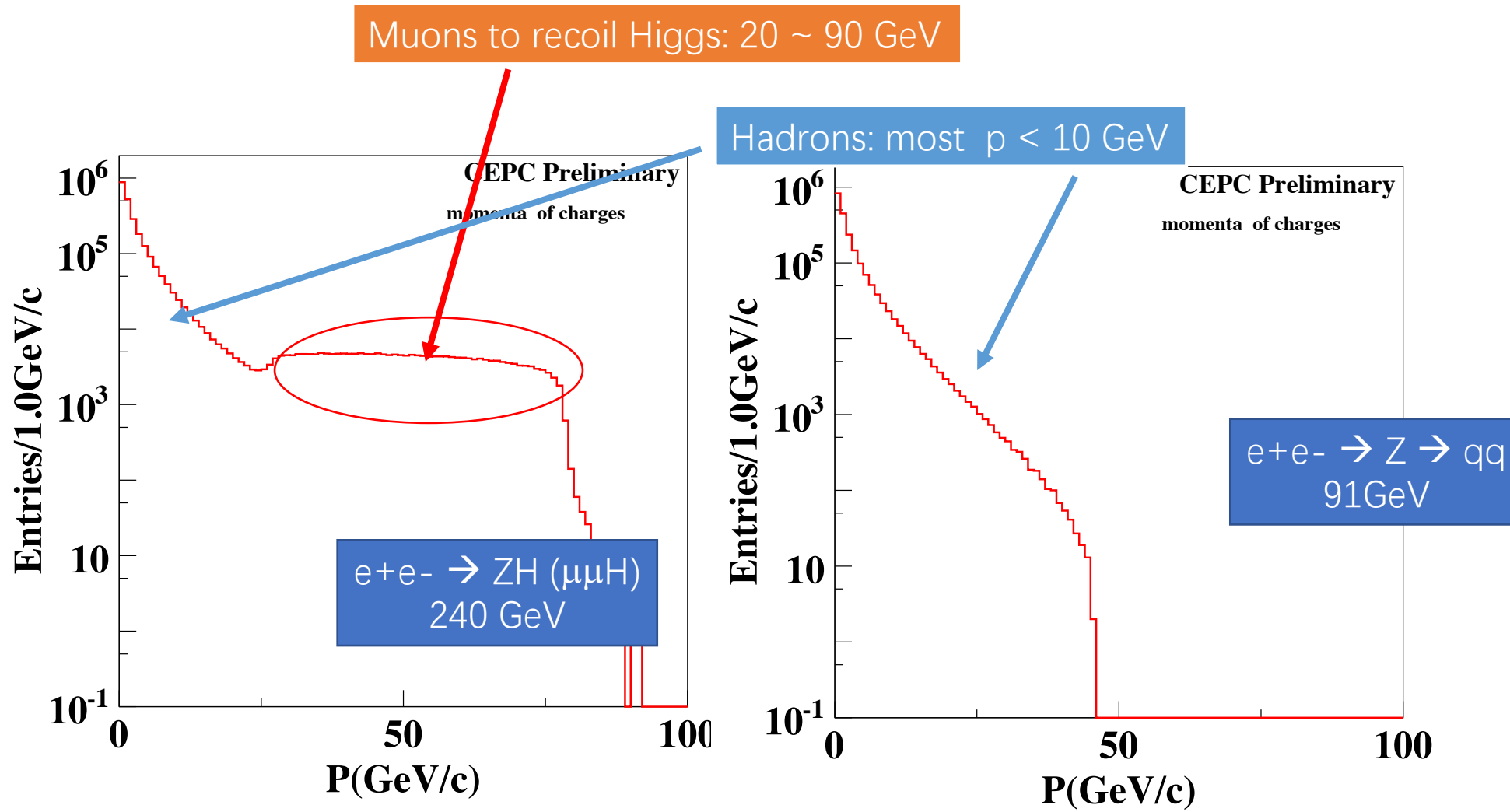
- Higgs @ 240 GeV
 - 4 fermion final states of interest
 - 2 fermion final state: the largest X-section $\sim 300 \times \sigma(\text{ZH})$
- Z pole physics @ 91 GeV
 - 2 fermion final states dominant
 - Huge rate $\sim 1000 \times \sigma(240\text{GeV})$ and much higher lumi.
- W threshold ~ 160 GeV



Number of tracks in a event

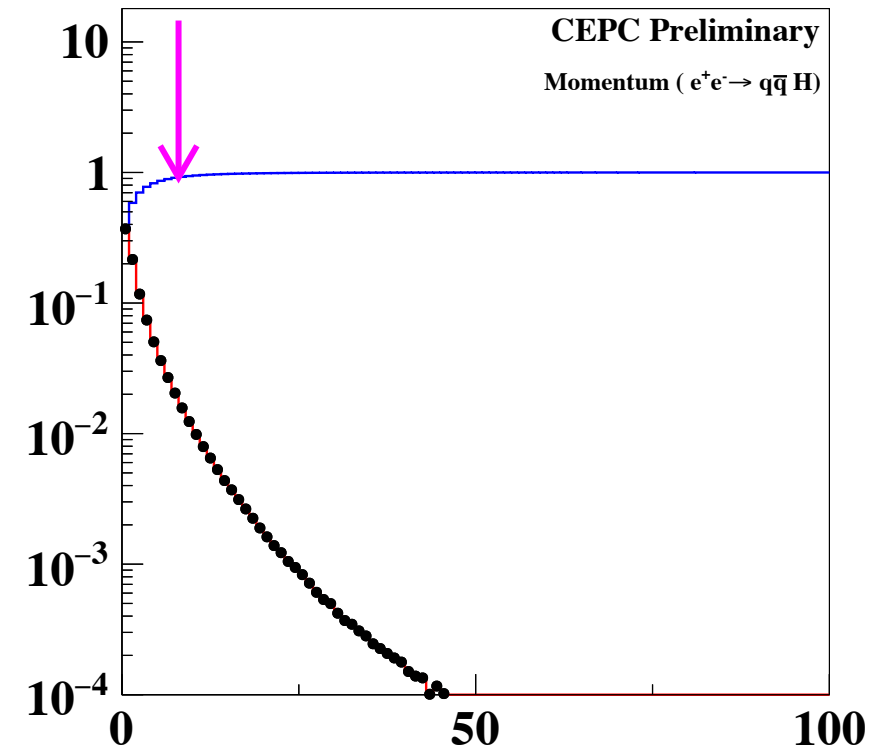
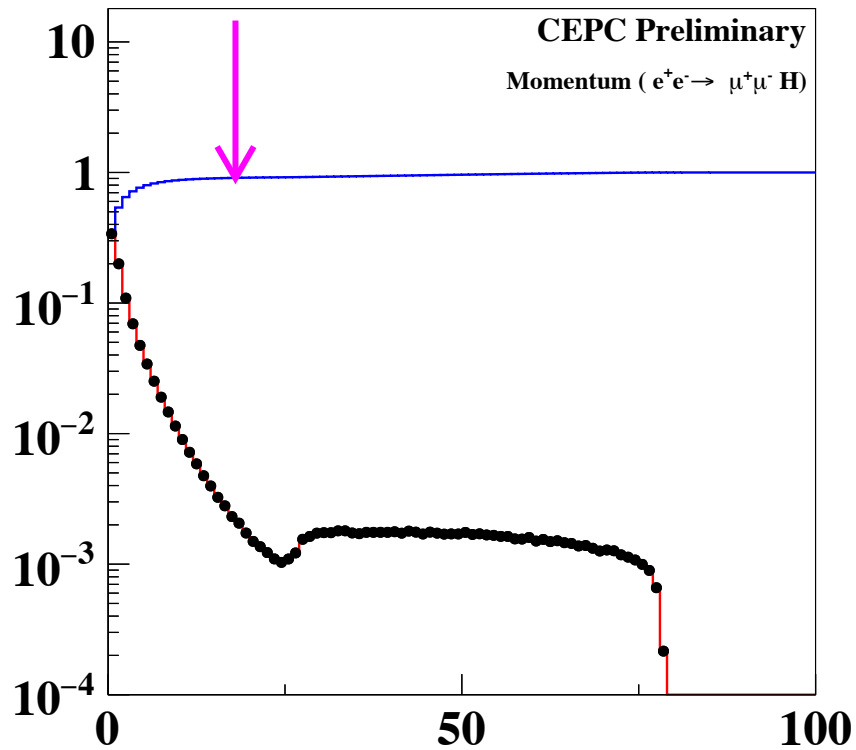


Momenta of tracks @ 240 & 91 GeV

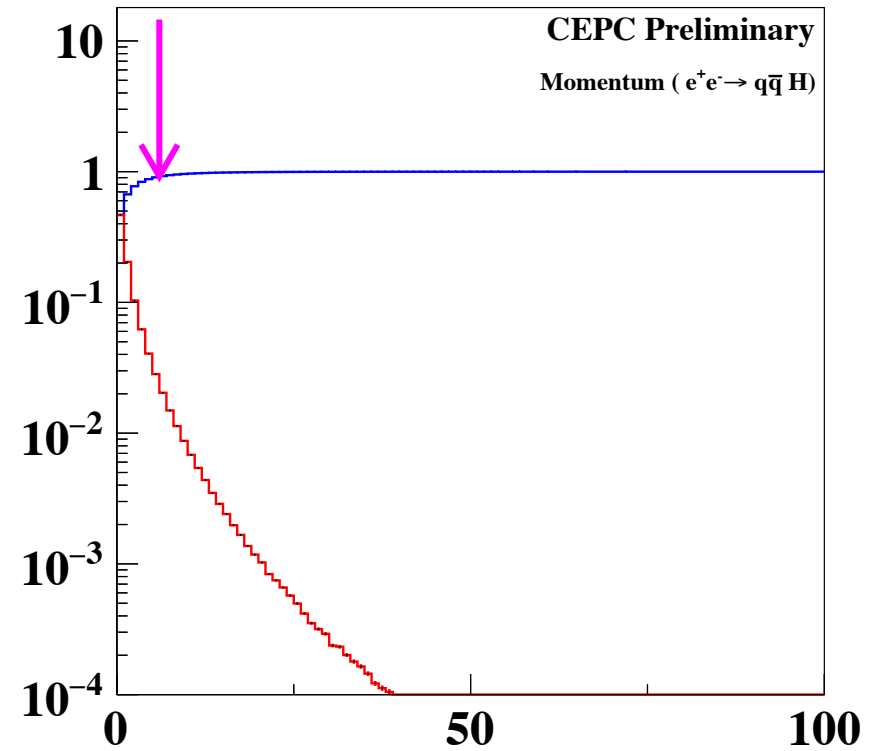
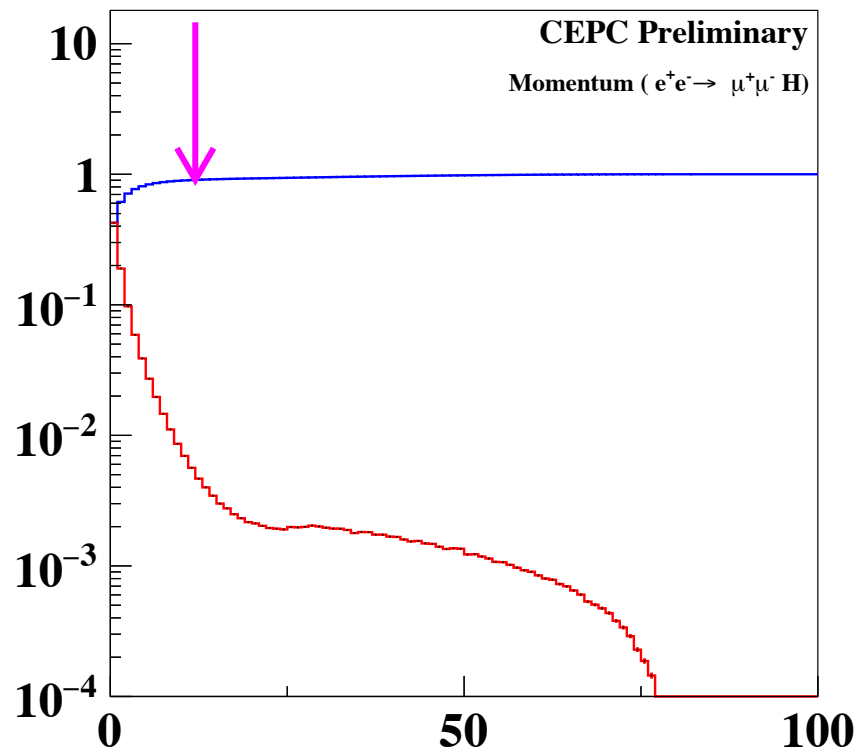


P of tracks

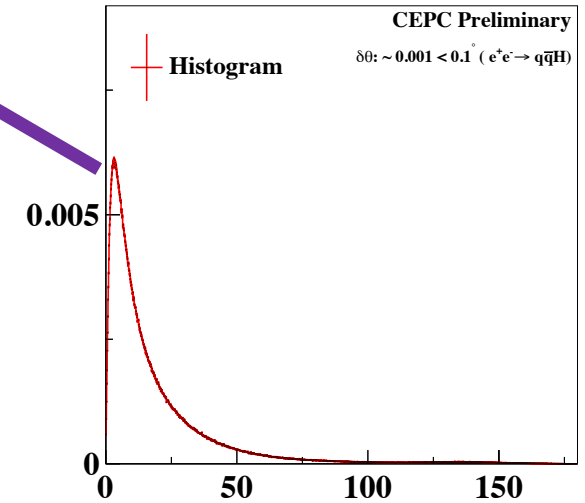
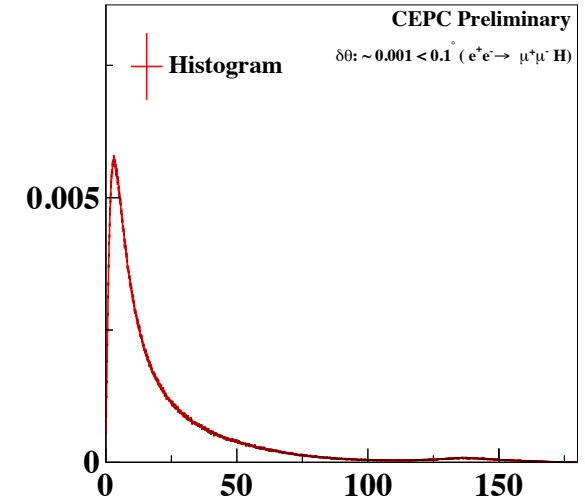
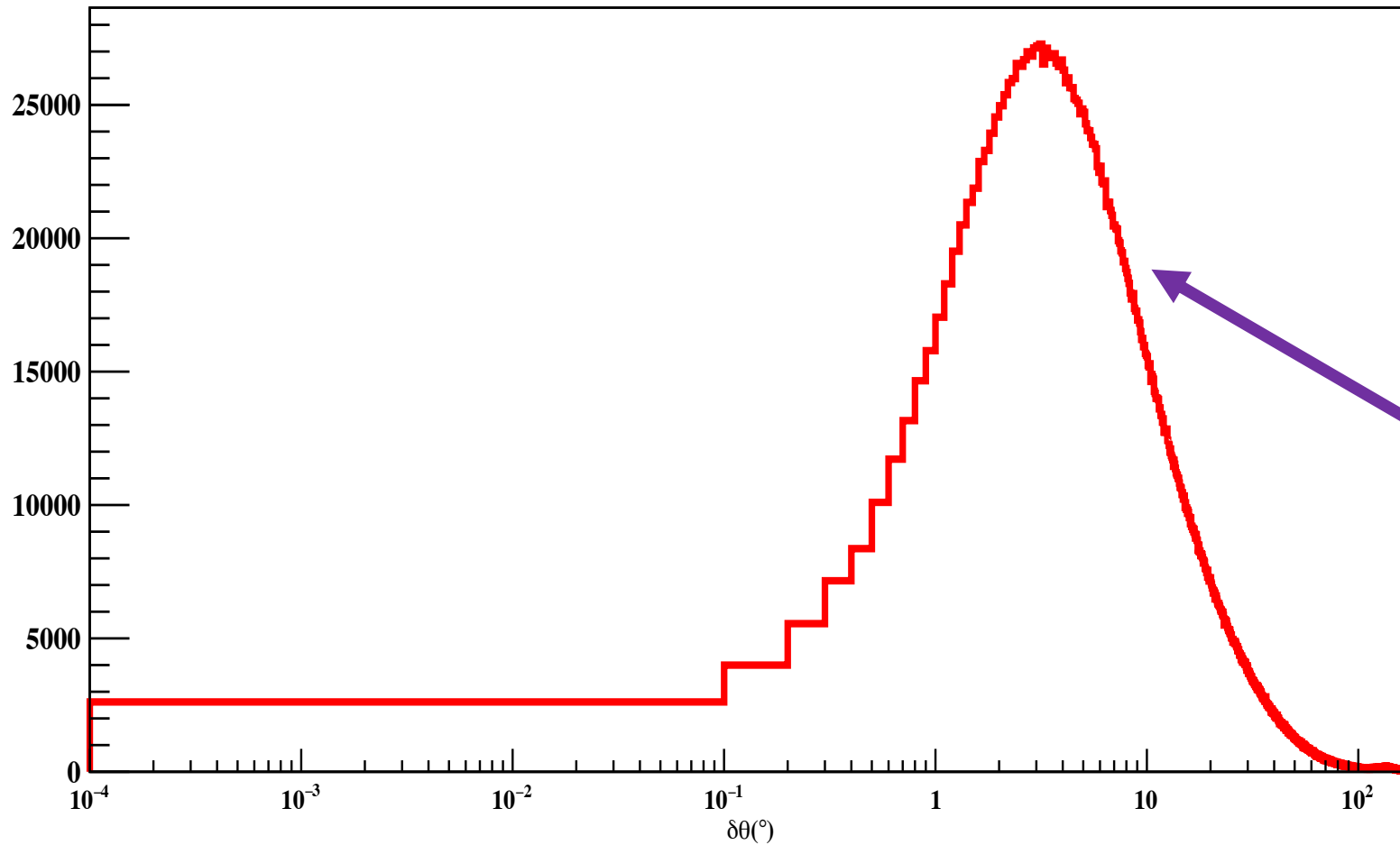
18(45), 8 (12) GeV for 90% (95%)



Pt of tracks
12(32), 6(9) GeV for 90% (95%)



Minimum angles between tracks



0.1° ~ 1.7 mRad

1st : Golden process: mu mu recoil

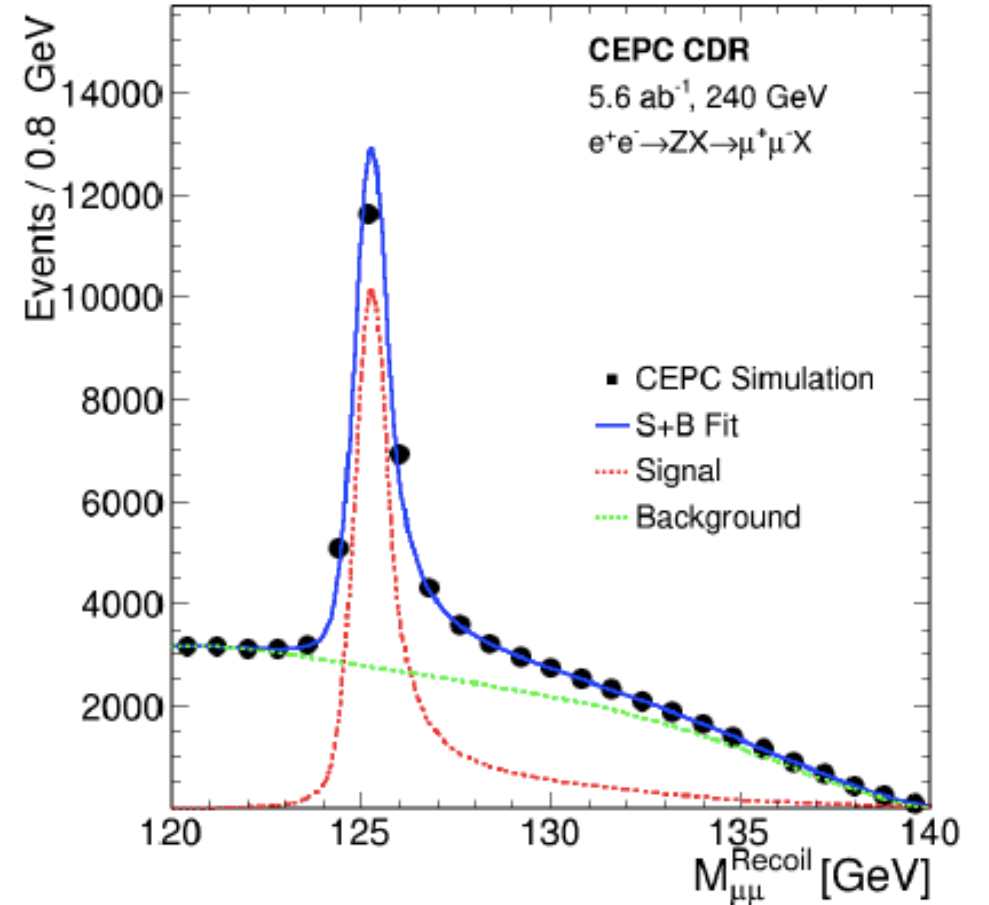
Typical mass resolution ~ 300 MeV (0.002 of 125 GeV)

$$M_{\text{recoil}}^2 = (\sqrt{s} - E_{ff})^2 - p_{ff}^2 = s - 2E_{ff}\sqrt{s} + m_{ff}^2$$

$$\Delta m_H = -\Delta m_{CM\mu^+} - \Delta m_{CM\mu^-} + \Delta m_{\mu^+\mu^-}$$

~ 200 MeV

$$\delta p/p \sim (0.001, 0.002) \rightarrow a \sim 2e-5, b \sim 0.001$$



2nd : jet energy resolution

Negligible, compared with typical calo resolution $\sim 10\%$

3rd : flavor physics

Need more investigation

Remarks

- Processes of interest usually contain 4 fermions (leptons or quarks), whose average energy $240/4$ ($91/2$) ~ 40 -70 GeV
- Full hadronic decays (4 jets) : 95% of tracks has $P_t < 10$ GeV
- Semi-Leptonic decays(2 leptons 2 jets): 95% of tracks has $P_t < 32$ GeV
- Minimum angle between two tracks: MPV ~ 3 degrees, 0.001 of tracks < 0.1 degree
- Momentum range 20 – 90 GeV of special interest
- But low p_t tracks dominant, whose significance need more investigation

Tracker Dimension (Barrel)

Components	Radius(mm)	Half Z (mm)	$\sigma_{R\phi}$ (μm)	σ_z (μm)	Thickness(X_0 %)
Beam Pipe	10.35	-	-	-	0.172
VTX (3 double layers)	12.3/14.4/35.5/37.5/58.3/60.3	200	2.8/6/4/4/4/4	2.8/6/4/4/4/4	0.155
VTX-shell	65		-	-	0.139
SITs (4 layers)	150/350/460/570	461/691/1013/1225	7.2	86.6	0.650
DC inner wall	610	2980	-	-	0.110
DC cell (66 x18x18)	612-1800	-	100	2828	0.00127×66
DC outer wall	1802	-	-	-	1.349
SET	1815	2980	7.2	86.6	0.182

Tracker Dimension (End caps)

Components	Inner radius(mm)	Outer radius (mm)	$\pm Z$ (mm)	σ_U (μm)	σ_V (μm)	Thickness(X_0 %)
FTD (7 pair of disks)	Depends on theta coverage	150/150/155/466/696/1018/1340/1820	205/305/466/696/1018/1340/2986			

- ✓ On charged tracks in region-of-interest (ROI), for Higgs and Z-pole respectively
 - full pT distribution of interesting processes
 - pT of 95% lower, upper and mid quantile
 - most probable value of pT, for optimising a, b in the resolution formula : how to define it ?
 - track multiplicity, i.e. number of tracks per event

- ✓ For tracks in jets, e.g. $e^+ e^- \rightarrow ZH$
 - number of tracks per jet
 - number of tracks per solid angle: Need time to perform jet-clustering firstly
 - distribution of minimum angle between tracks