ee->mumu forward-backward asymmetry at CEPC

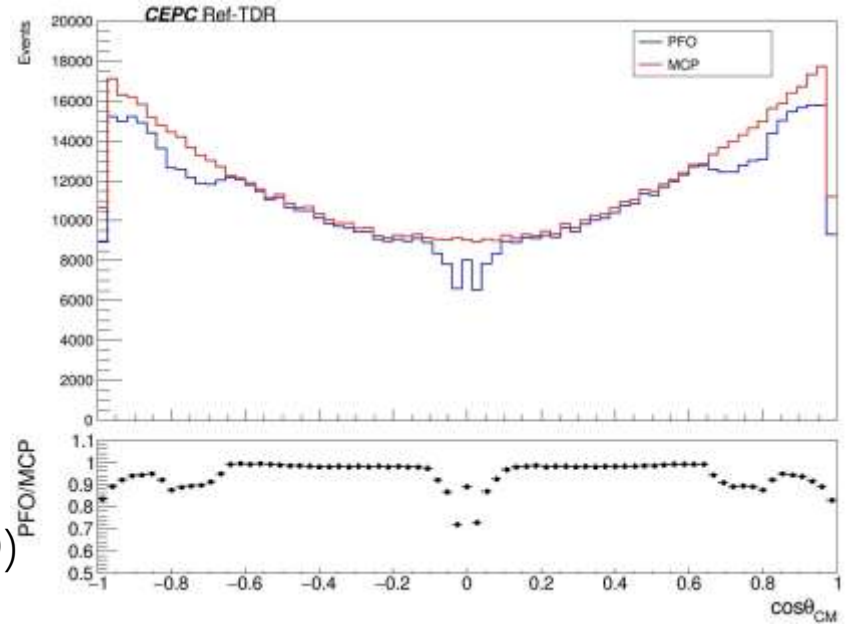
Jiawei wan , Shuo Han

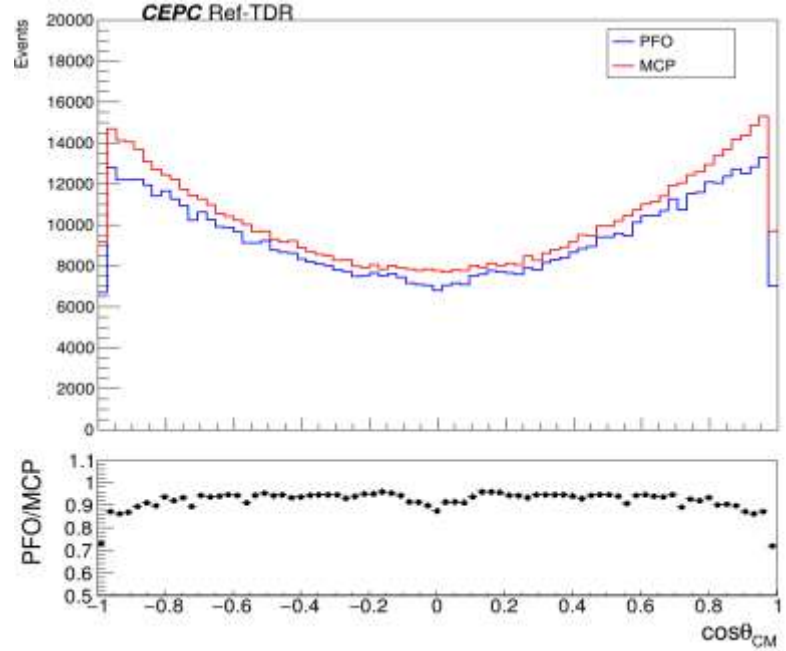
Sample Production

- We utilized the PID from Geliang's updated XGBoost.
- Compare the costheta distributions of PFO and MCP at WP 90, WP 98, and best efficiency.
- Produce five datasets (200,000 events) at collision energies of: :
  - 91.0216 GeV (Z mass- 1.4σ)
  - 91.1248 GeV (Z mass- 0.53σ)
  - 91.1876 GeV (Z mass)
  - 91.2504 GeV (Z mass + 0.53σ)
  - 91.3536 GeV (Z mass + 1.4σ)

Costheta Distribution

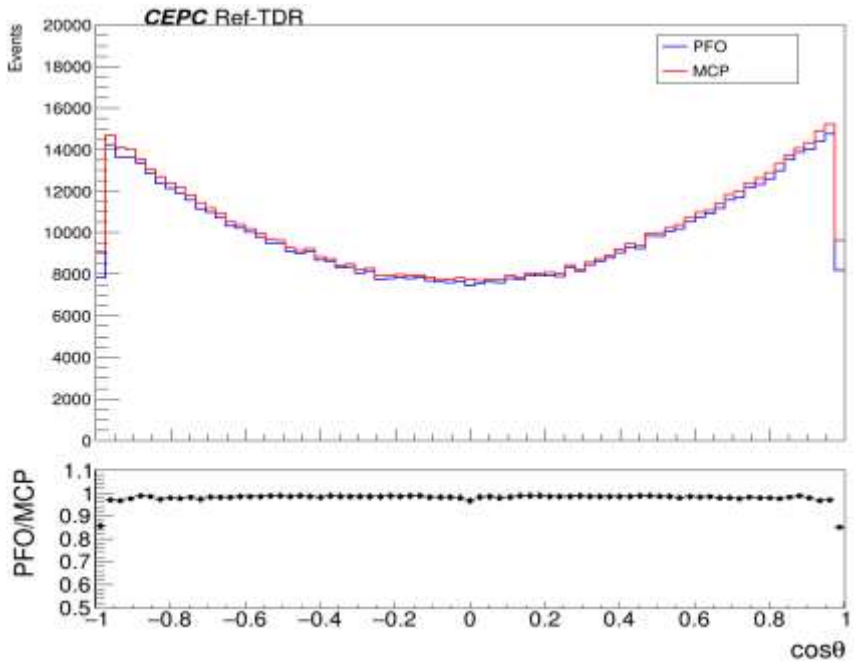
Wp 90
(previous PID)

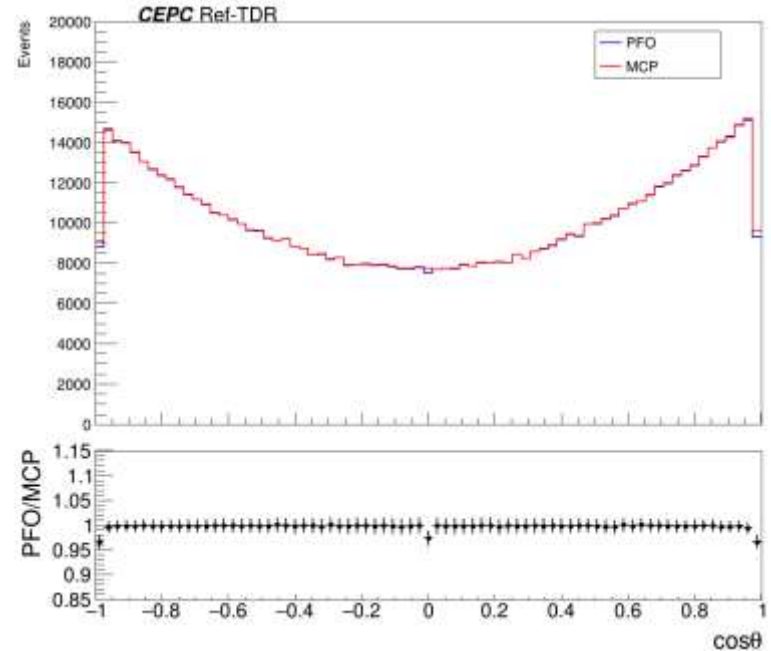




Wp 90

Wp 98

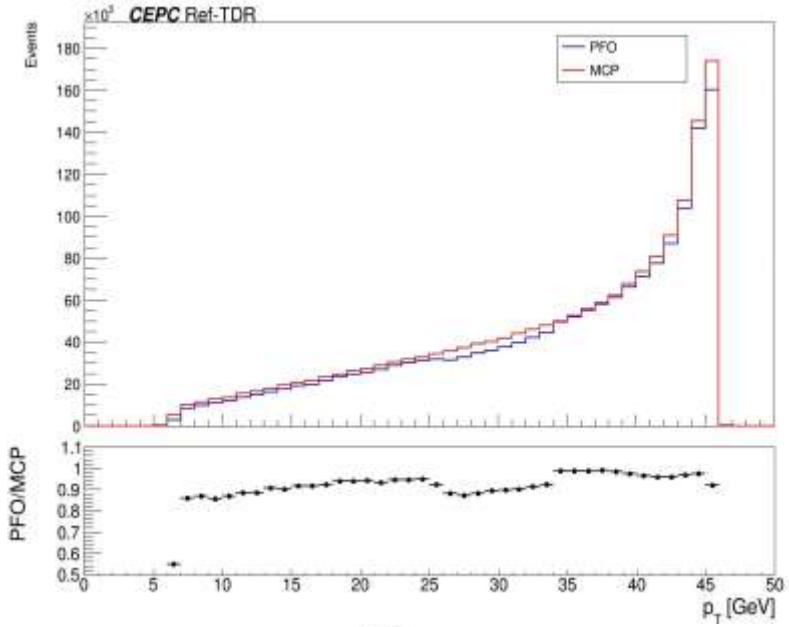


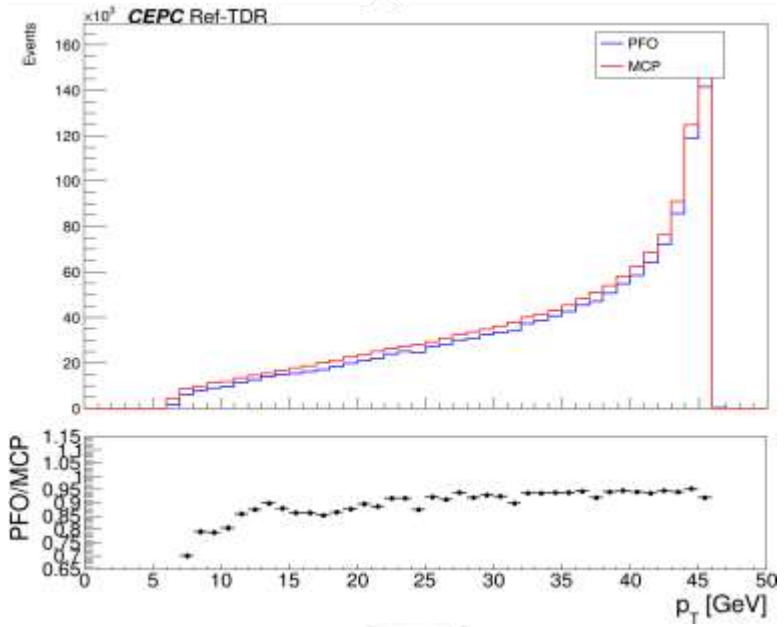


Best

PT Distribution

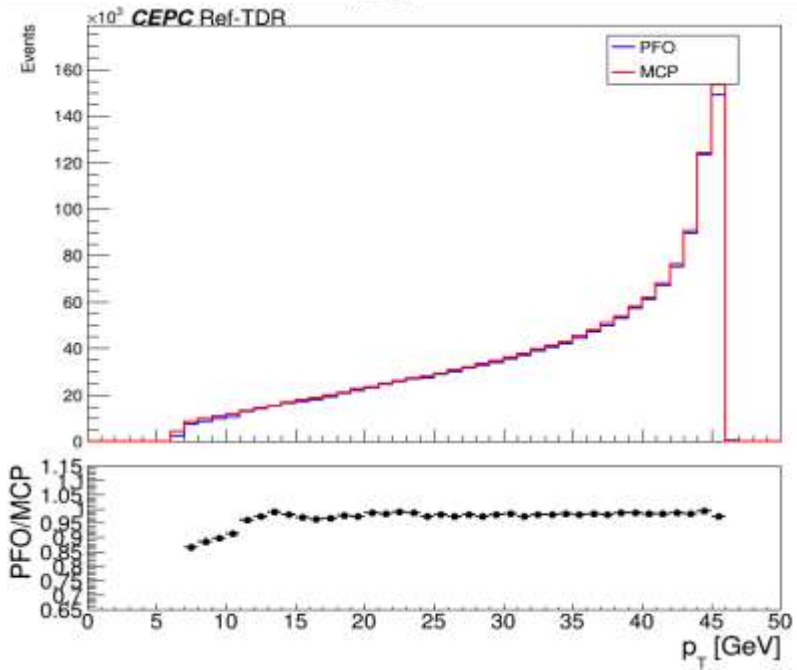
Wp 90
(previous PID)

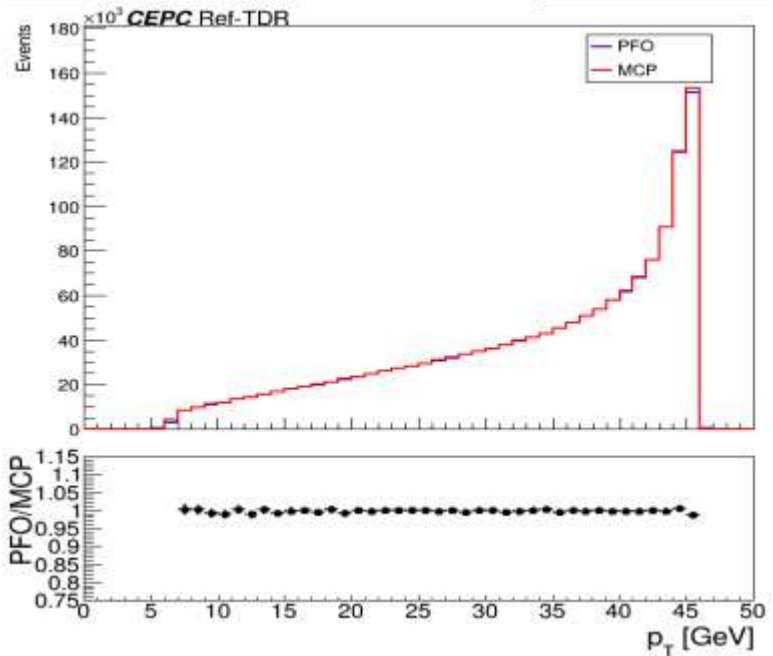




Wp 90

Wp 98





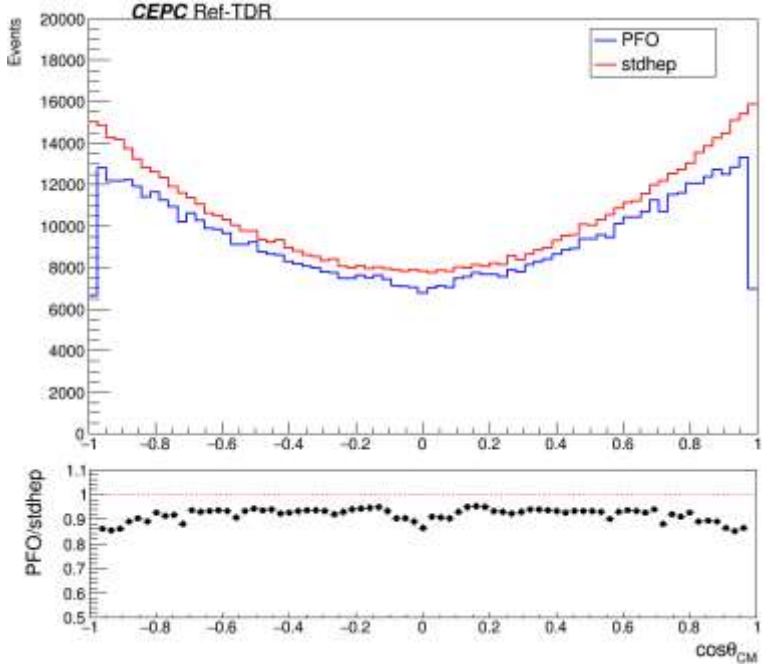
Best

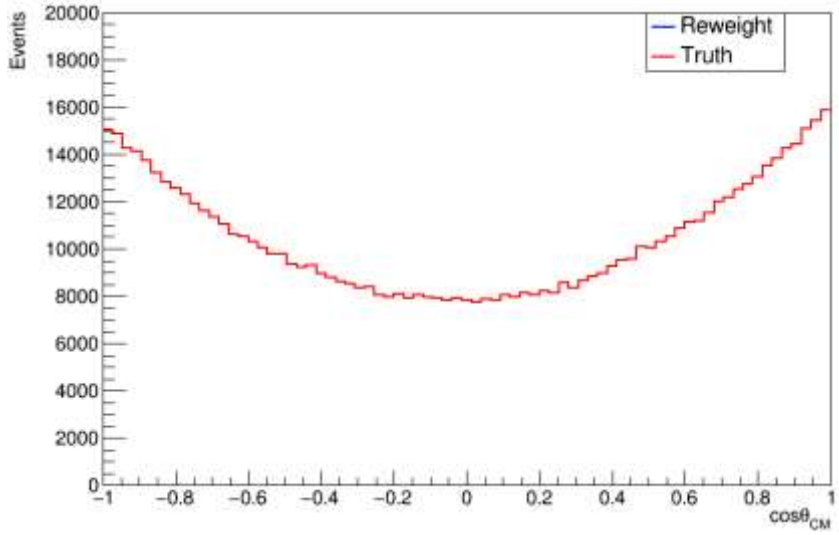
Reweight PFO

- Reweight the PFO histogram to match the distribution of stdhep
- fit to stdhep AFB: 0.017552662+-0.001055595
- 1.get stdhep/pfo ratio

  2.reweight pfo to stdhep

  3.fit to reweighted pfo AFB : 0.017552662+-0.001055595
- The statistical uncertainty for low-luminosity Z events during one month of the first year of ZH data-taking is estimated to be statistical uncertainty × sqrt(sample statistic / expected data statistic)=0.001055 × sqrt(1/1350)=2.9e-5.





Discussion of uncertainties

	Cut-based Method	Fitting to CosTheta
Statistical uncertainty (3e-5)	Norm to 1350M muon pairs during 1st year ZH	Same but though fitting CosTheta
Energy Spread (2e-5)	Obtained from AFB vs energy function	Same but though fitting CosTheta
Impact of y* (1e-5)	Obtained from S+B fit on mass	N/A
The acceptance of $\|\cos(\theta)\| > 0.05$ and other kinematic cuts (7e-6)	Difference between MCP / PFO with same kinematic cuts	$\|\cos(\theta)\| > 0.05$ is removed now, only need to estimate the $\|\cos(\theta)\|<0.99$ and pT > 1 GeV impact (negligible)
The θ_CM resolution (5e-6)	Difference between PFO and dR<0.05 matched MCP	Same but though fitting CosTheta
Mis-ID & backgrounds (<1e-6)	with / wo mis-ID muons, or with / wo background events	Same but though fitting CosTheta
The reweighting uncertainty	N/A	The non-close of using re-weighting function from another set of sample