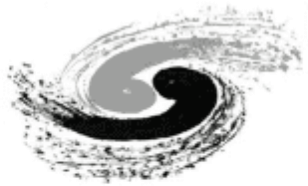
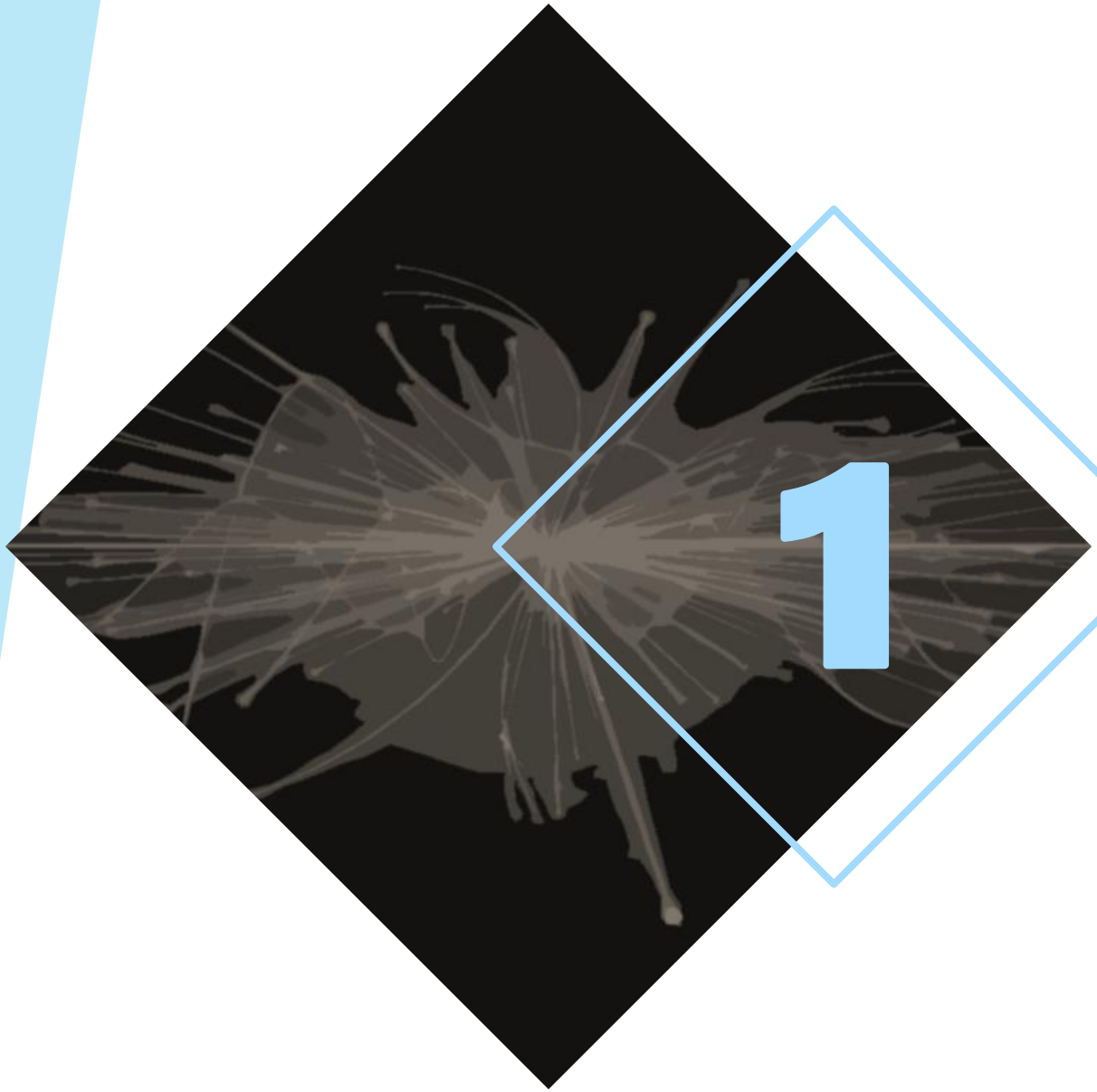


中国科学院高能物理研究所
Institute of High Energy Physics
Chinese Academy of Sciences

Updates on PID

Geliang Liu

Mar. 31st, 2025

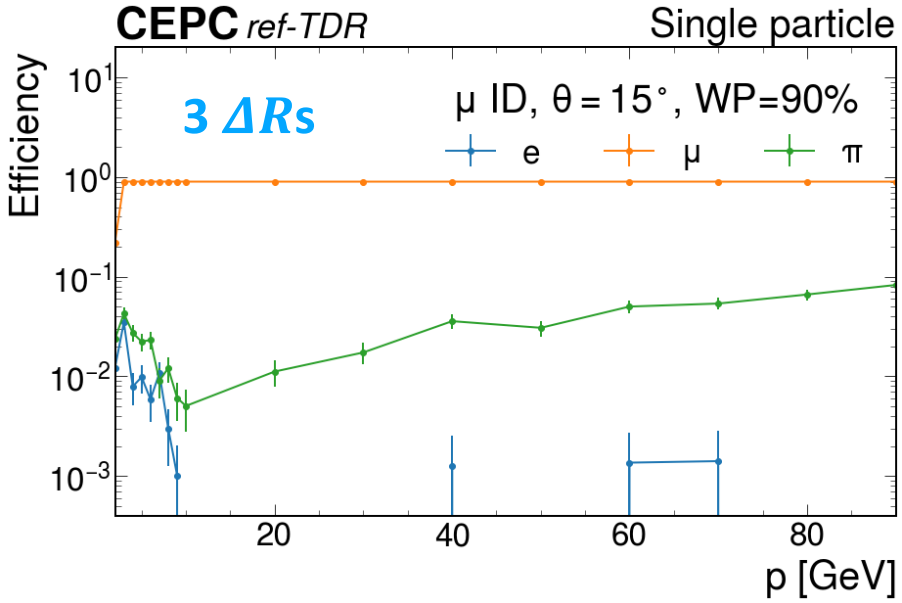


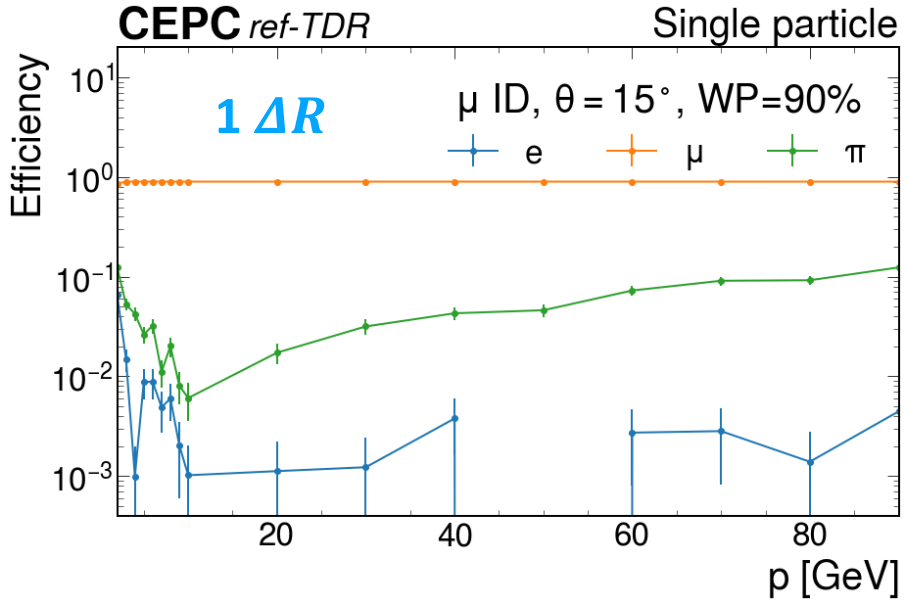
1 Lepton PID

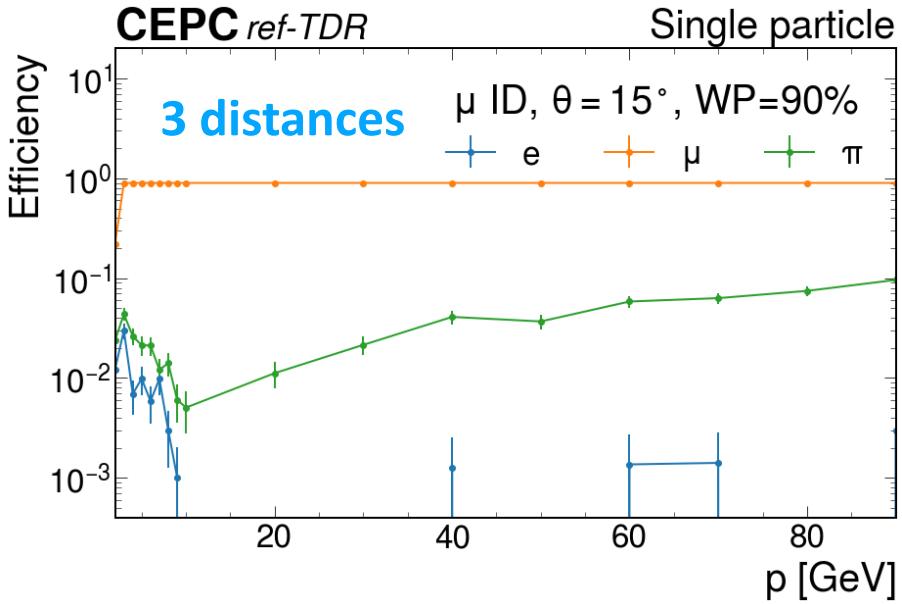
Muon ID

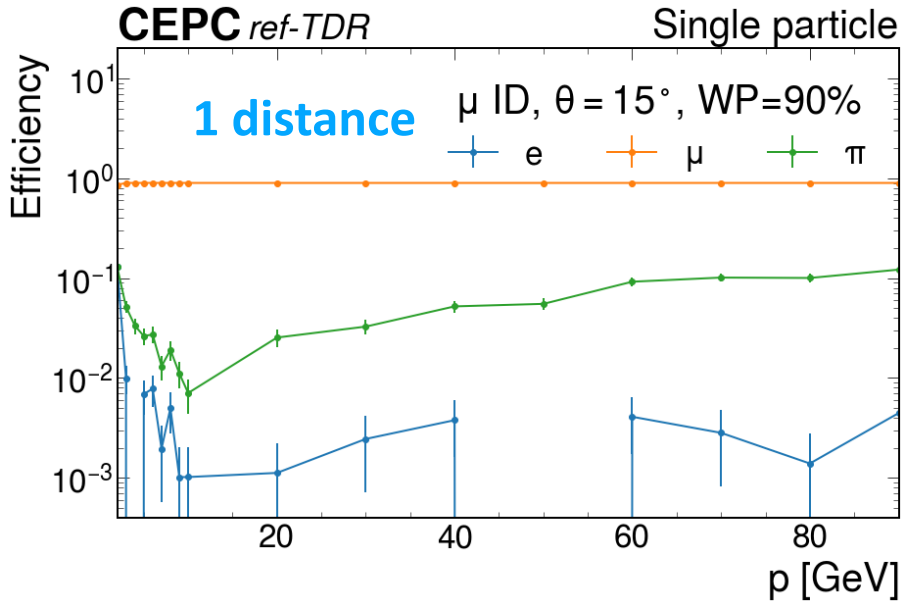
- **Compare results using different muon hit variables**
  - 1 ΔR
  - 3 ΔRs
  - 1 distance
  - 3 distances

Muon ID



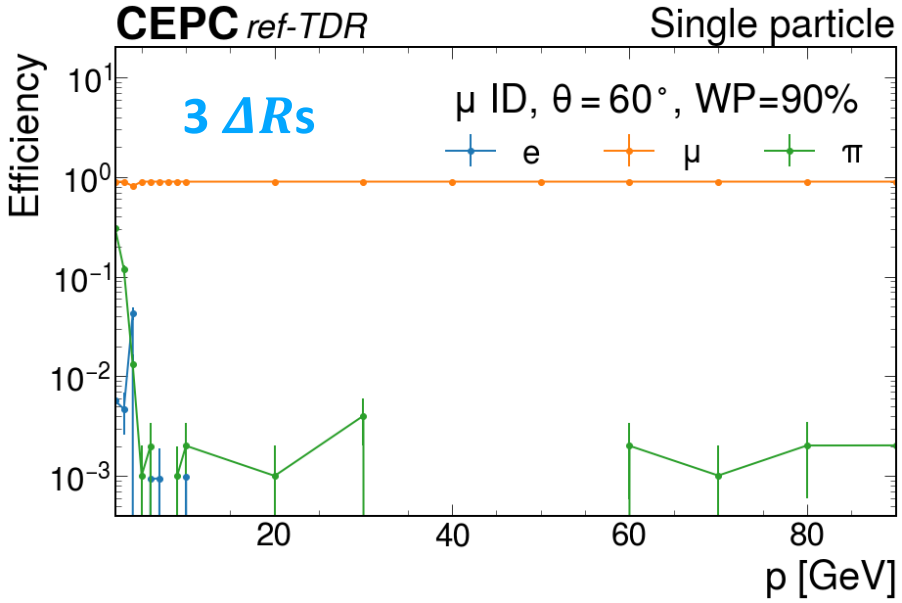


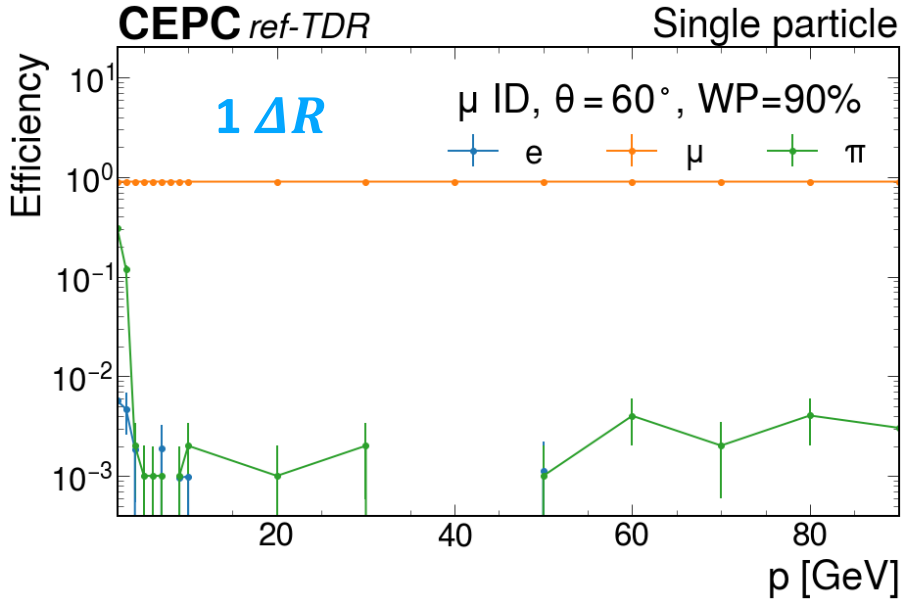


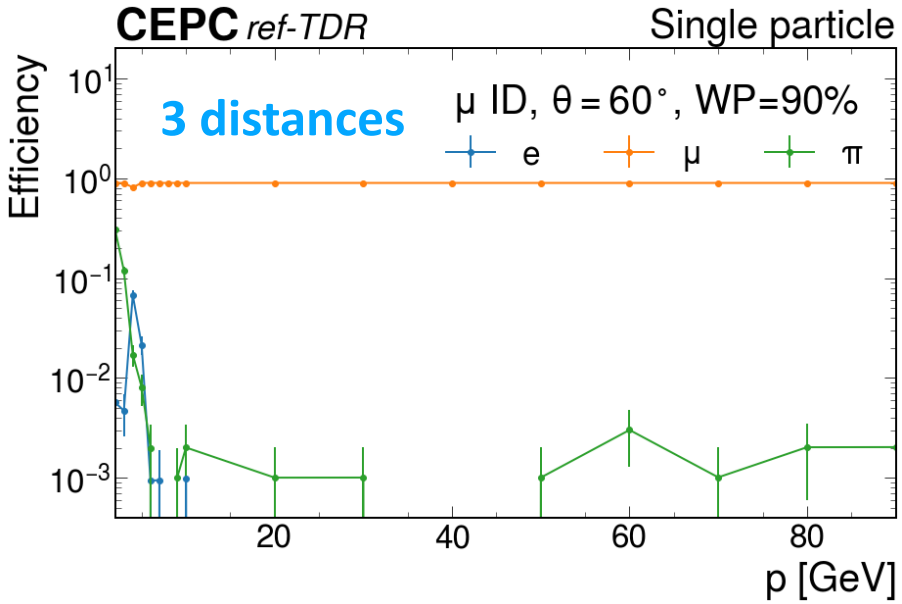


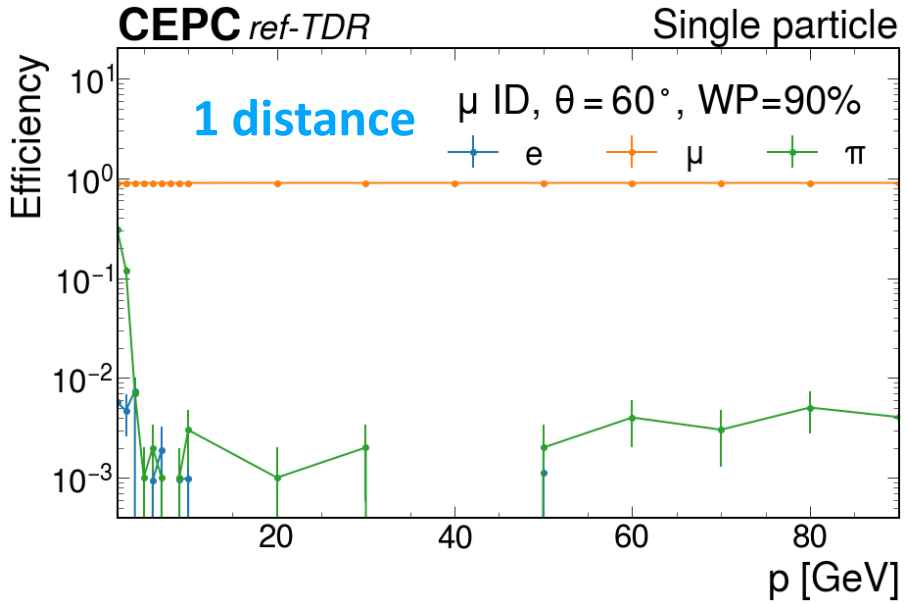
- Three variables are slightly better than one.
- ΔR and distance show similar results.
- Take 3 ΔRs as default.

Muon ID





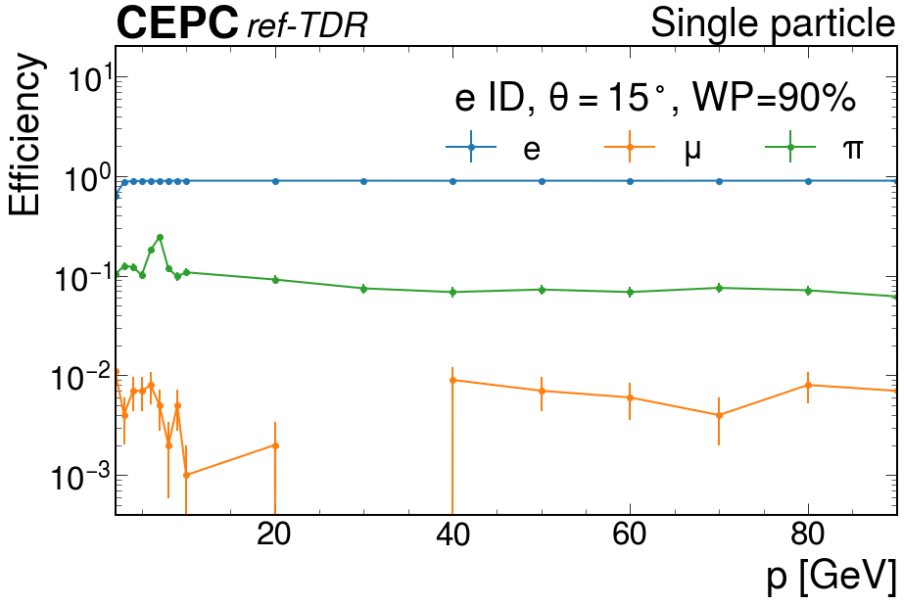


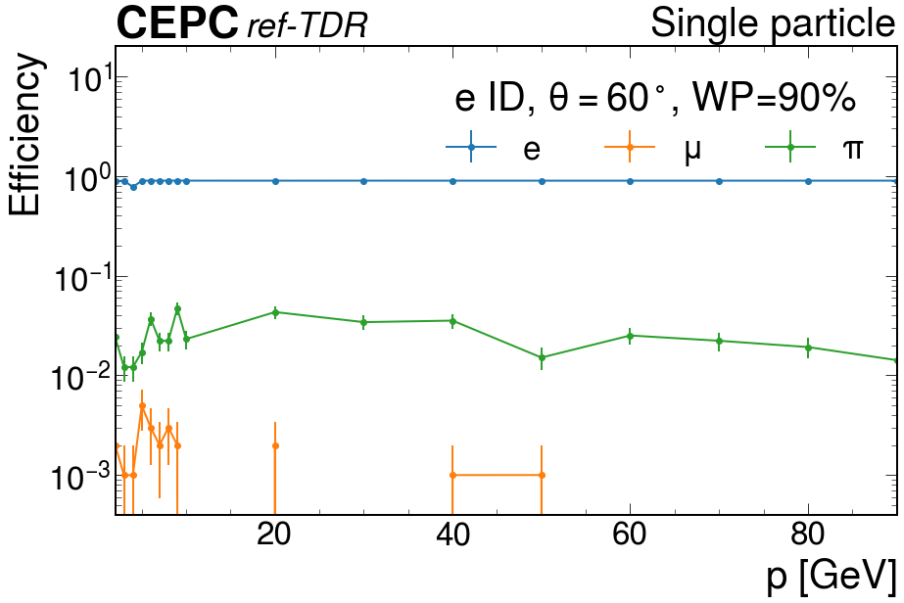


- Three variables are slightly better than one.
- ΔR and distance show similar results.
- Take 3 ΔRs as default.

Overall electron ID performances

With particle gun samples

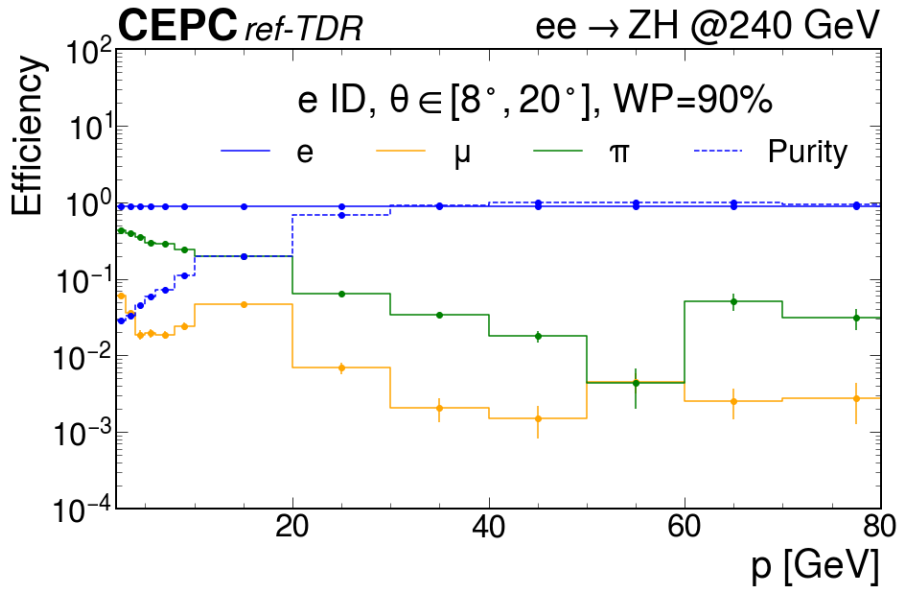


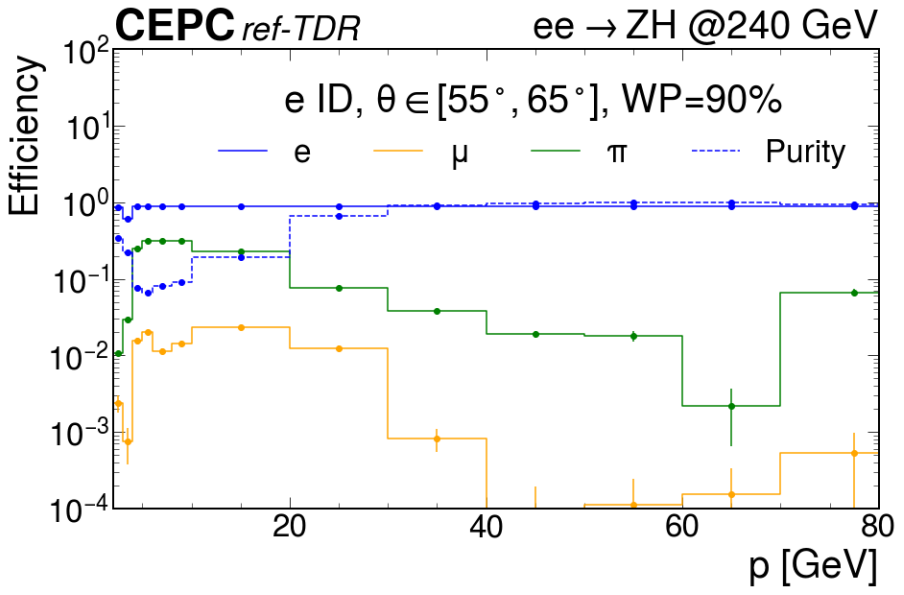


With ZH samples:

Both inclusive Z and H.

/cefs/higgs/zhangkl/Production/25036/E240_*HX





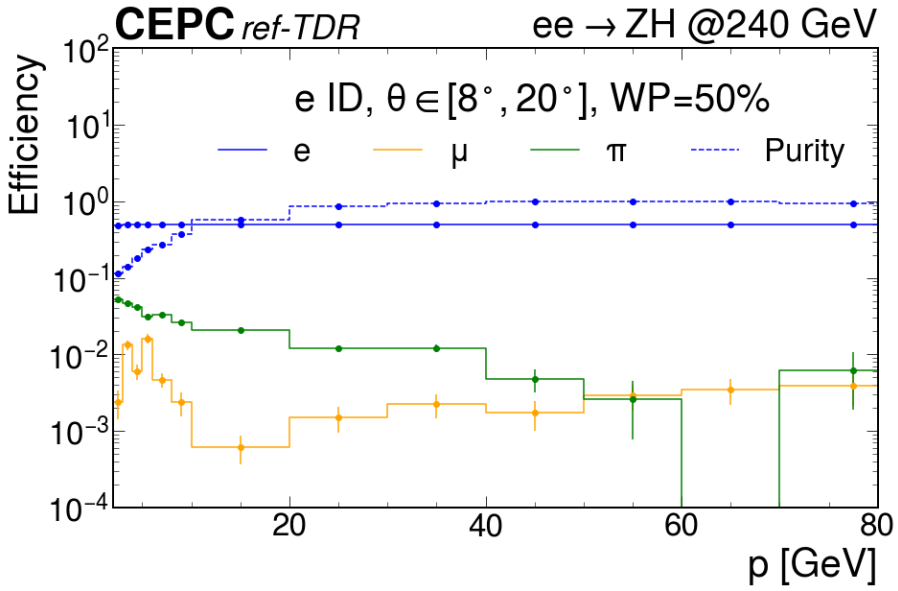
Overall electron ID performances

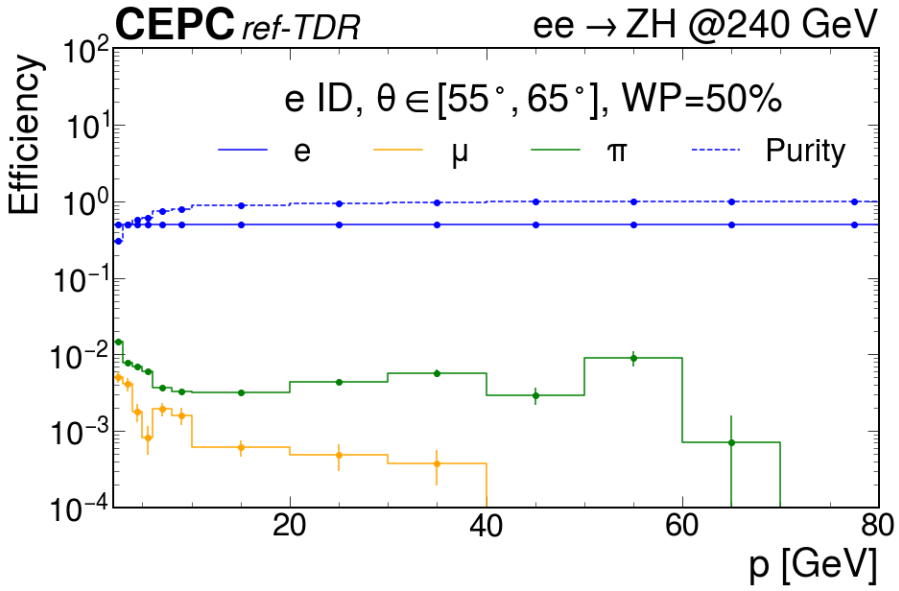
With ZH samples:

Both inclusive Z and H.

/cefs/higgs/zhangkl/Production/25036/E240_*HX

50% WP



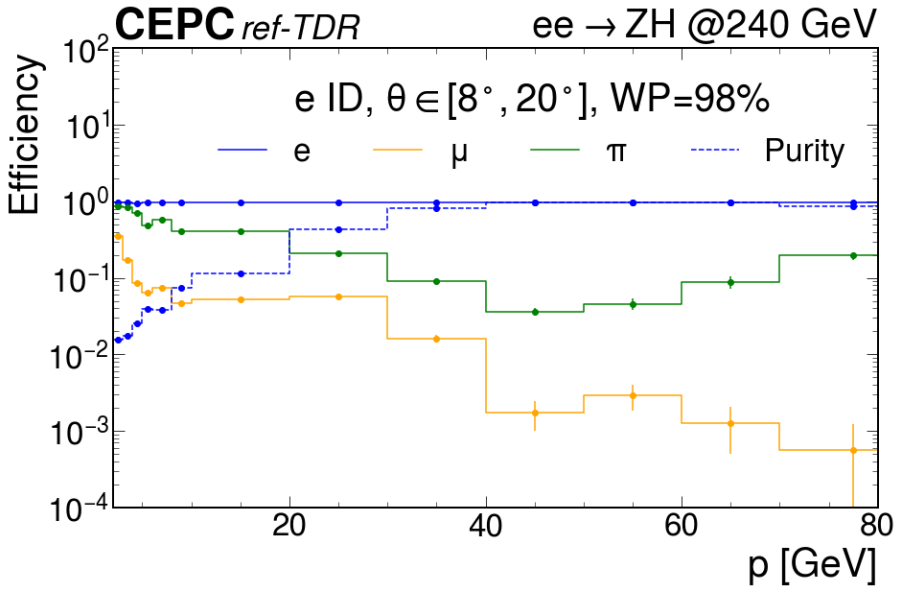


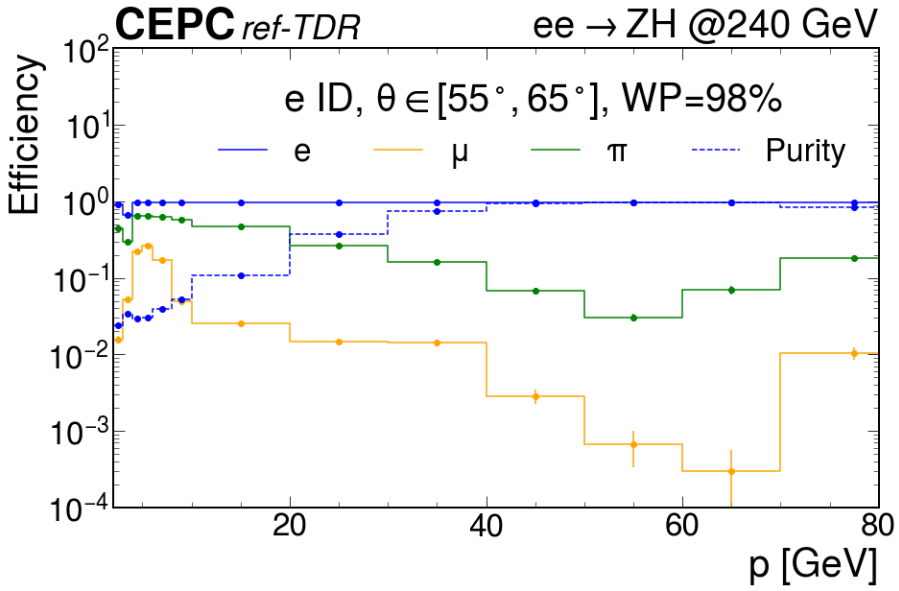
With ZH samples:

Both inclusive Z and H.

/cefs/higgs/zhangkl/Production/25036/E240_*HX

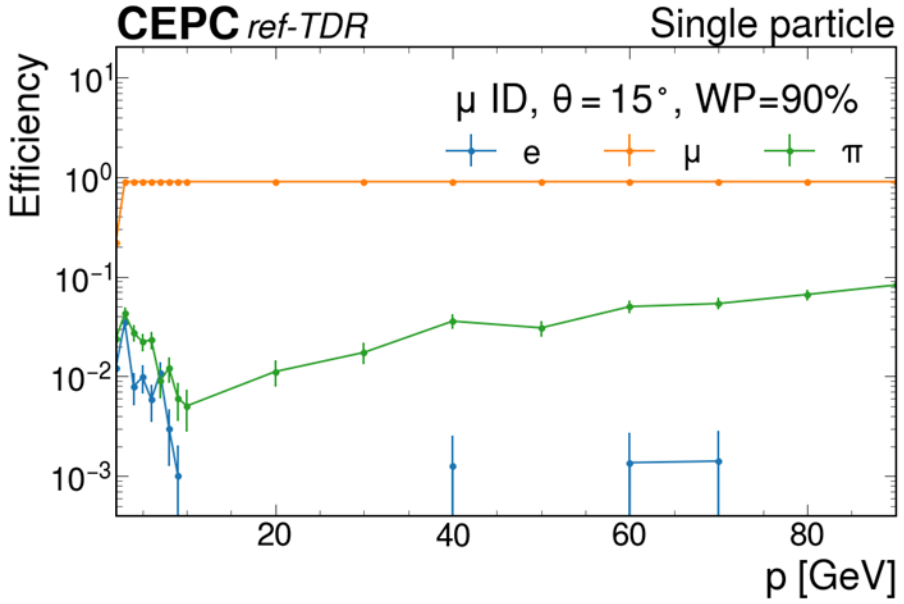
98% WP

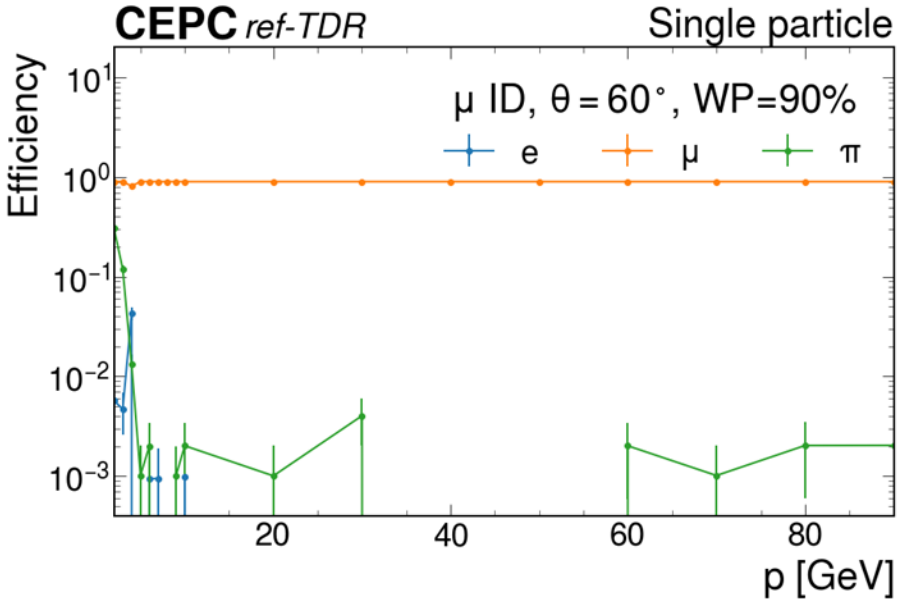




Overall muon ID performances

With particle gun samples





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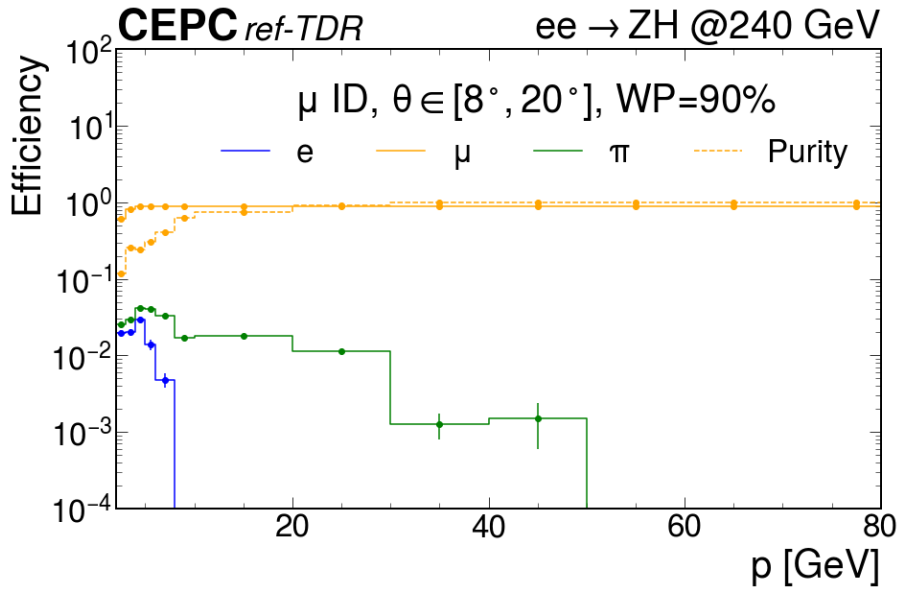
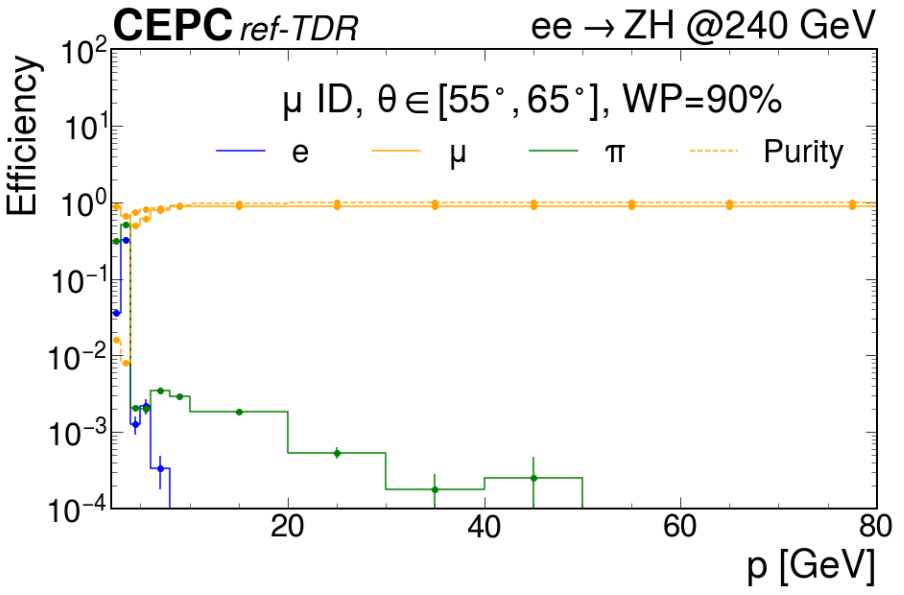
/cefs/higgs/zhangkl/Production/25036/E240_*HX





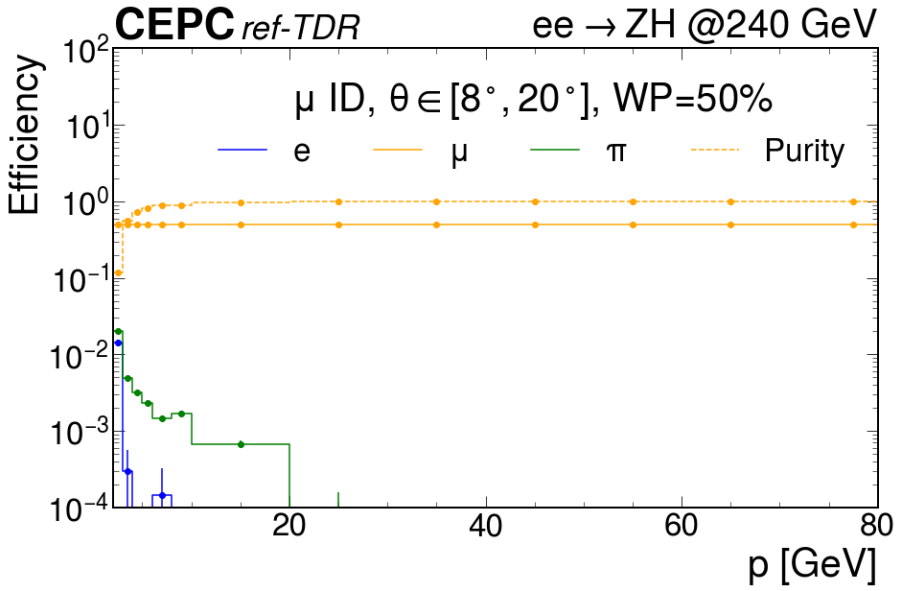
Overall muon ID performances

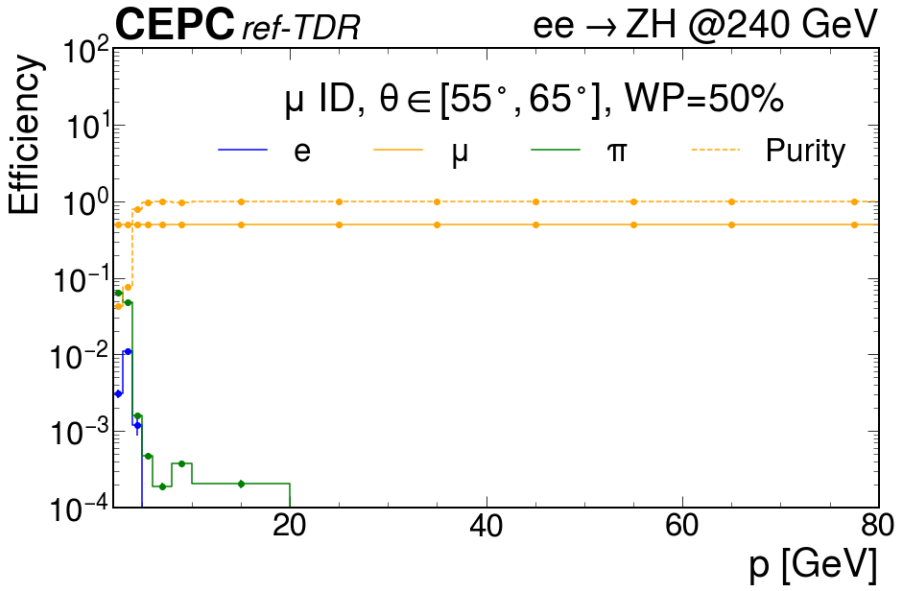
With ZH samples:

Both inclusive Z and H.

/cefs/higgs/zhangkl/Production/25036/E240_*HX

50% WP





With ZH samples:

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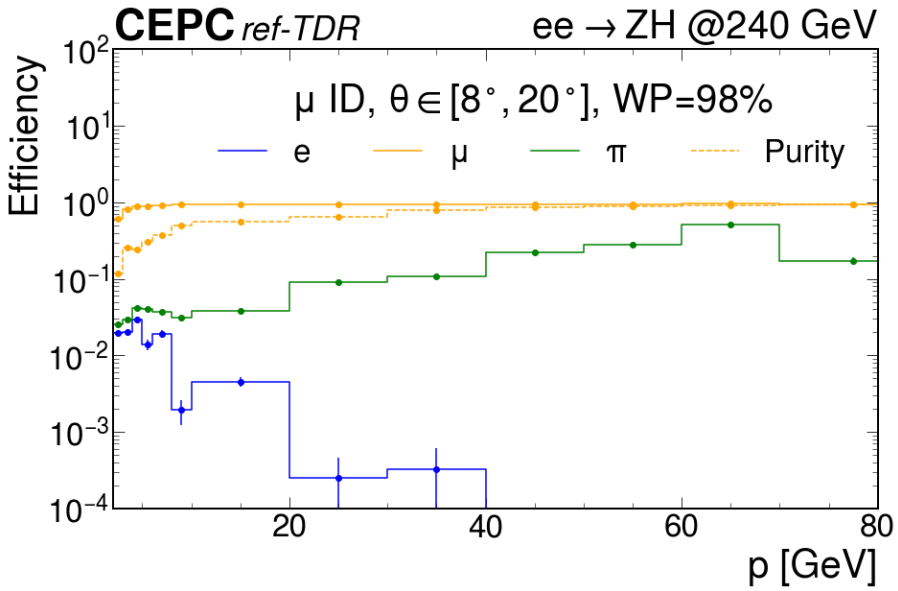
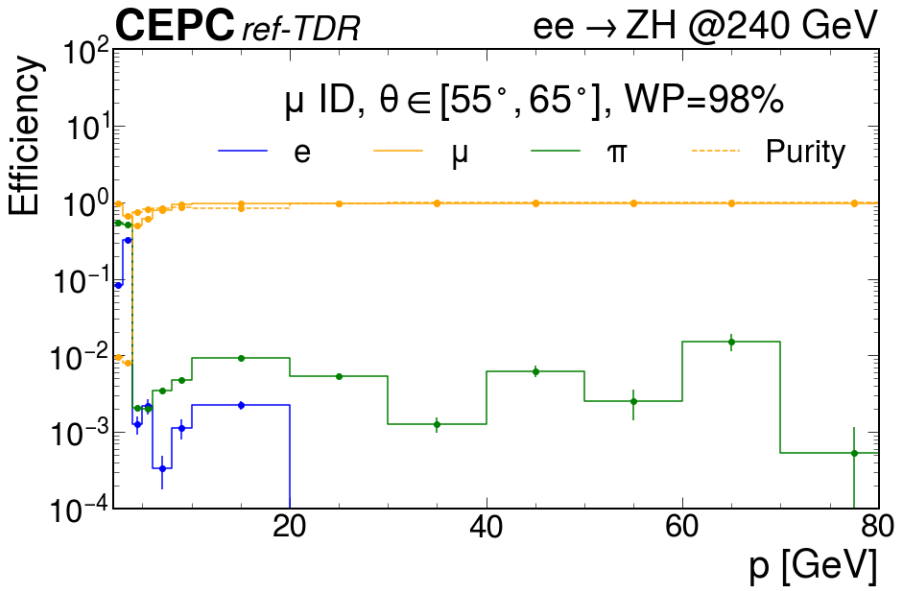
98% WP

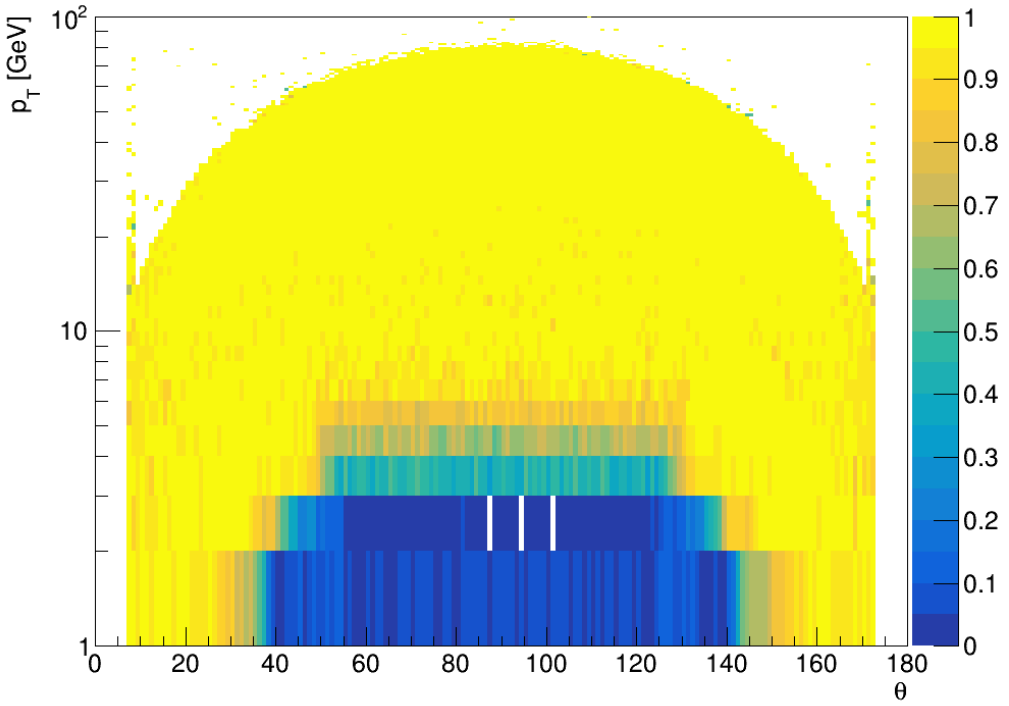




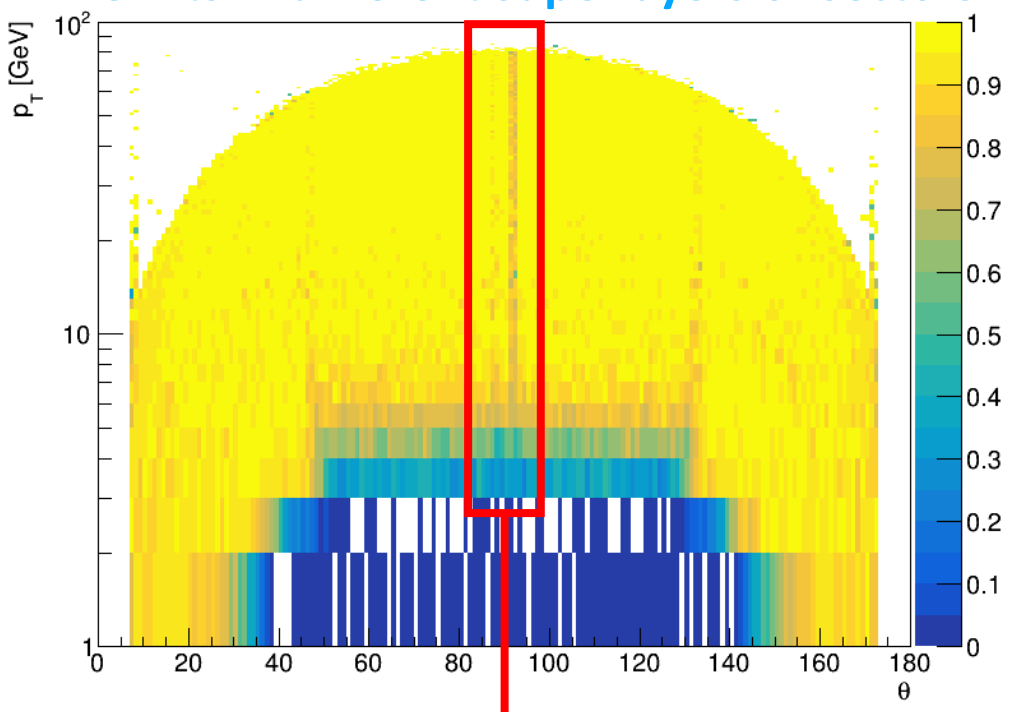
Muon hit matching efficiency

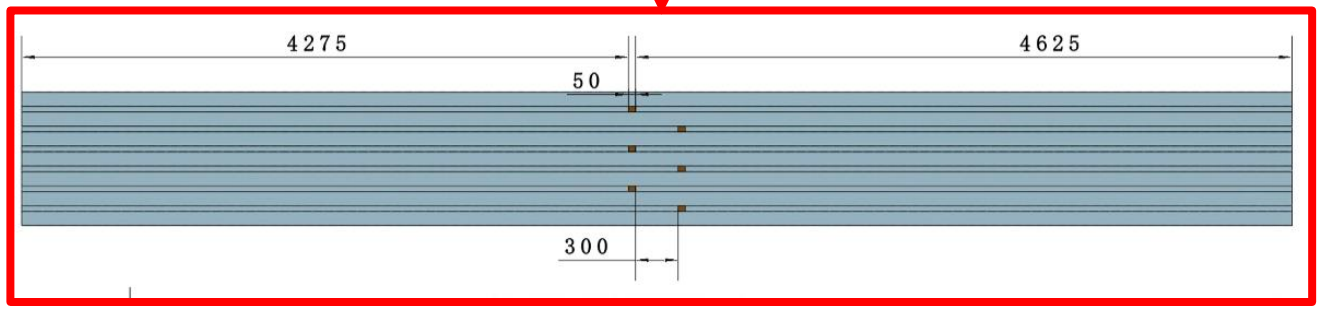
- Illustrated with mmHbb samples.

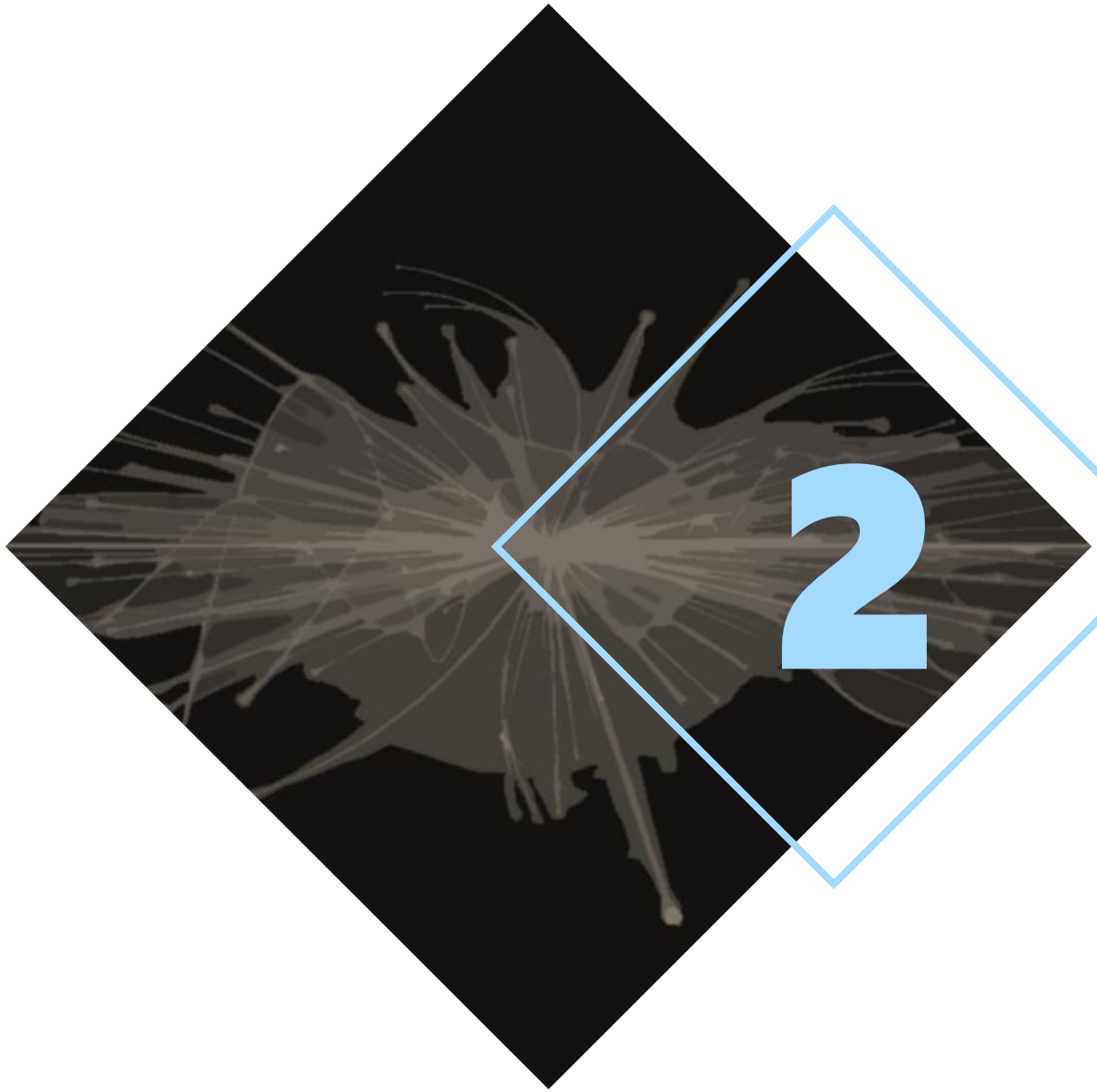
1 hit



3 hits in different superlayers or sectors







2 Photon PID

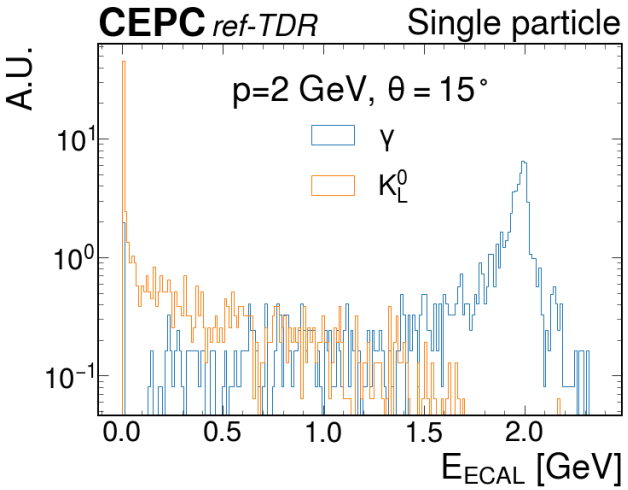
Preliminary studies on photon ID

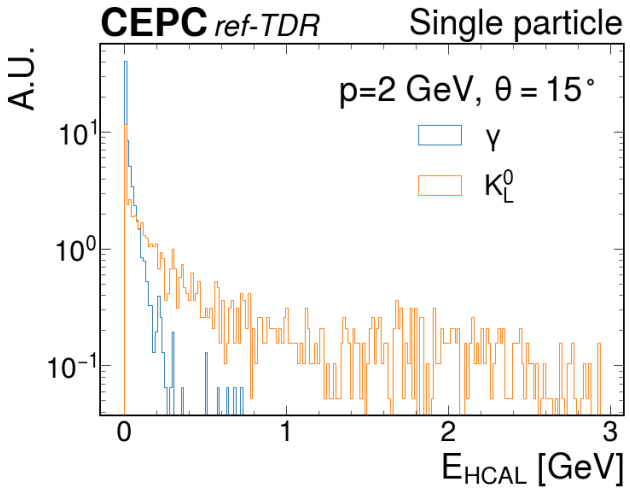
Identify photons against neutral hadrons

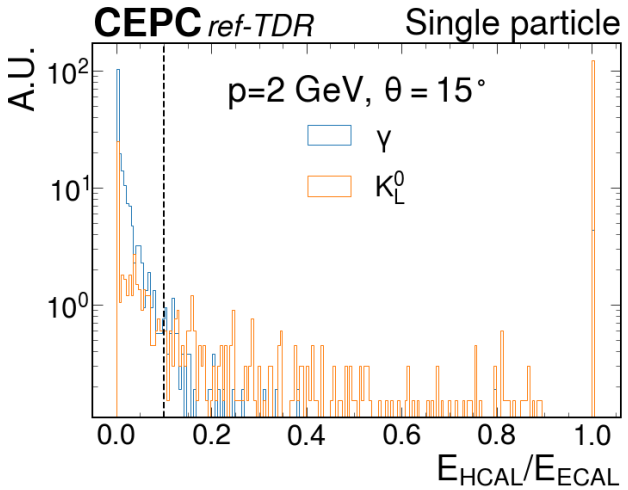
- Neutral hadrons: π^0 not considered; mostly K_L^0
- Use calorimeter information
- Studies with particle gun samples, generated at fixed p from 1 to 90 GeV, and fixed θ from 10 to 85°
  - /cefs/higgs/liugeliang/CEPC/202503/Production/ParticleGun/photon*
  - /cefs/higgs/liugeliang/CEPC/202503/Production/ParticleGun/klong*
- Consider calorimeter information
  - $\mathrm{E_{ECAL}}$
  - $\mathrm{E_{HCAL}}$
  - $\mathrm{r_{CALO}}$
  - $\mathrm{E_{HCAL}/E_{ECAL}}$

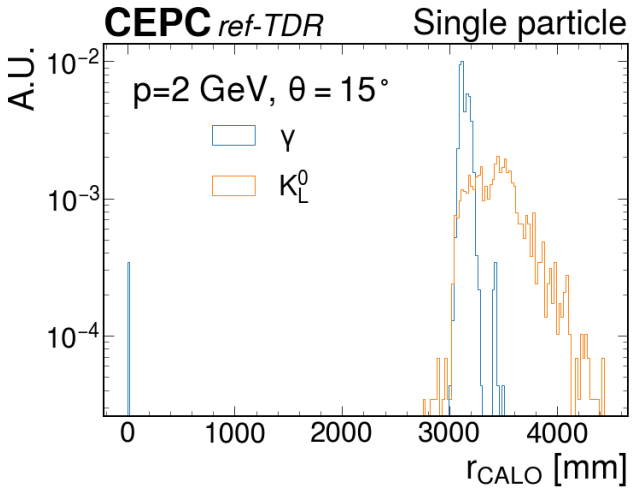
Distributions of variables

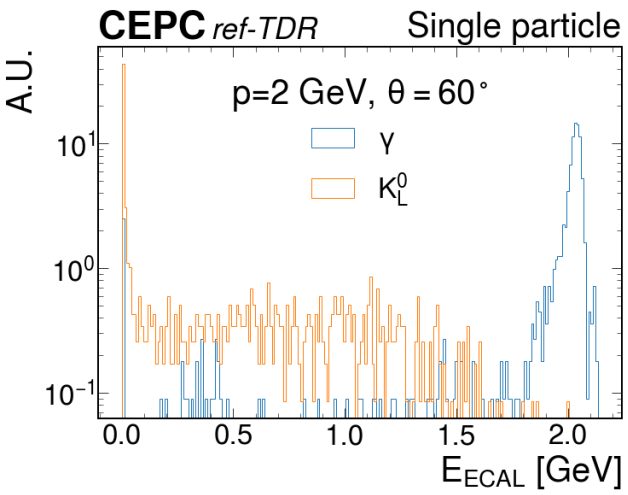
p = 2 GeV

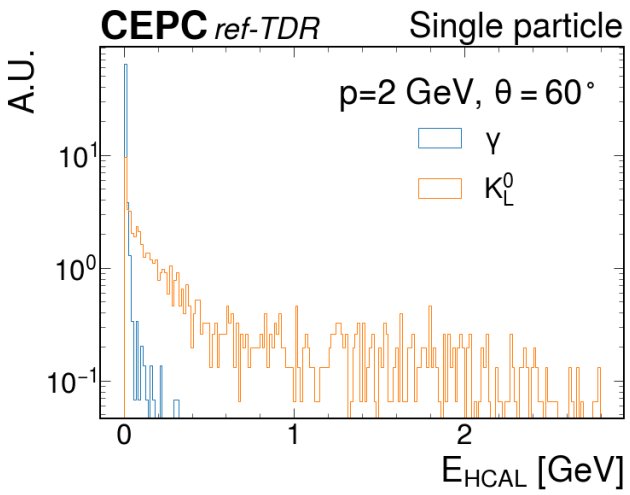


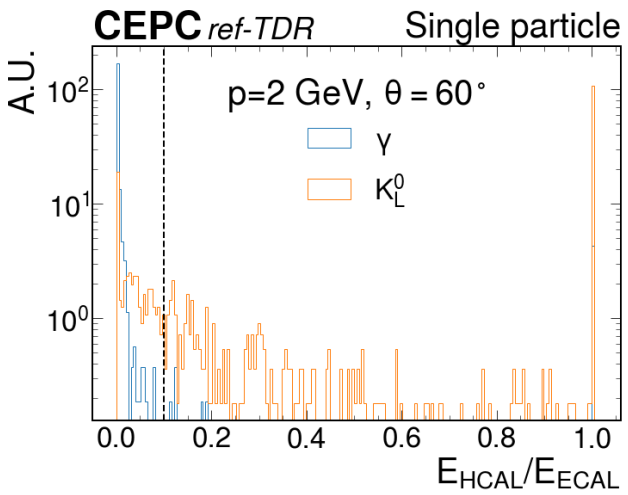


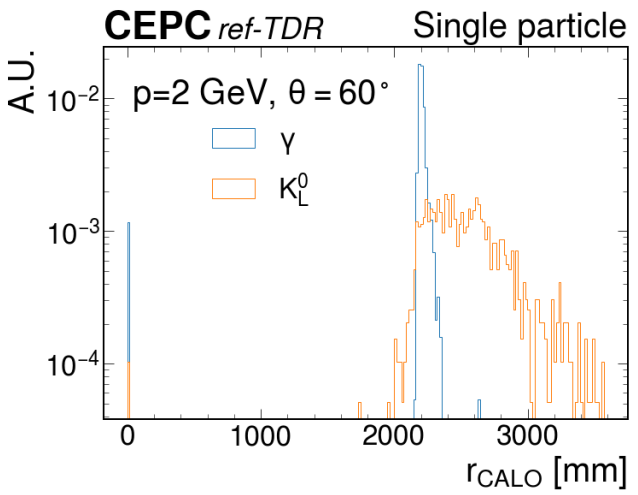






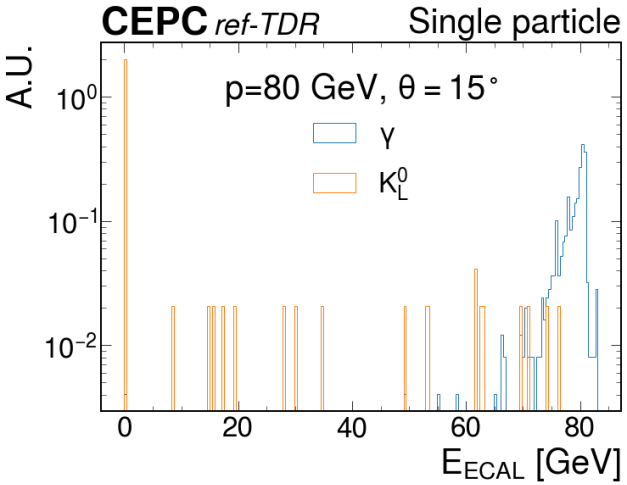


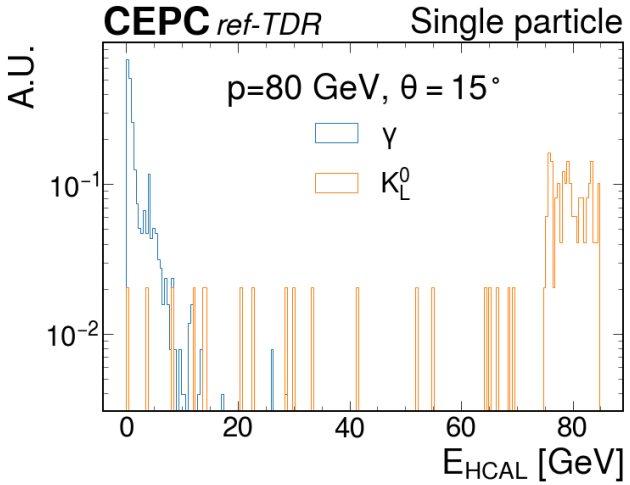


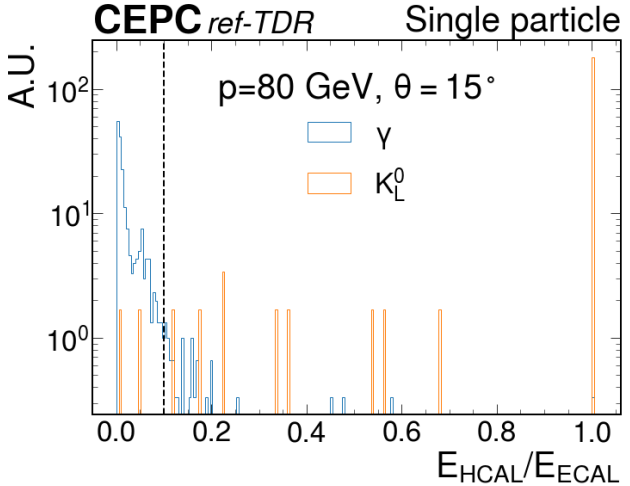


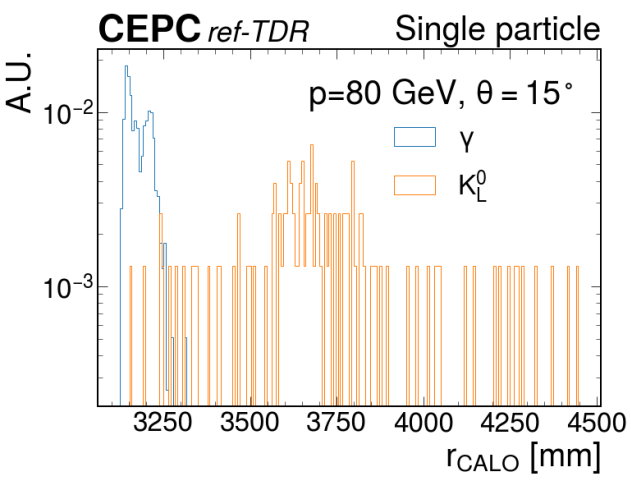
Distributions of variables

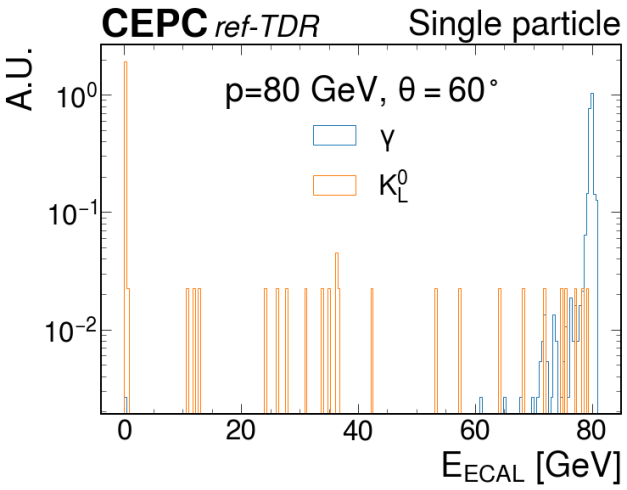
p = 80 GeV

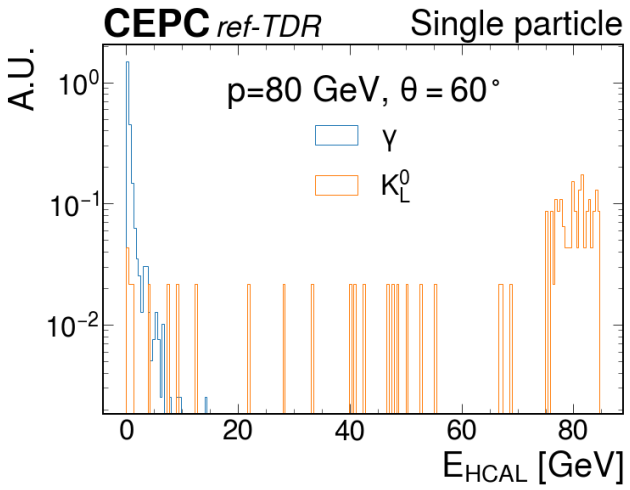


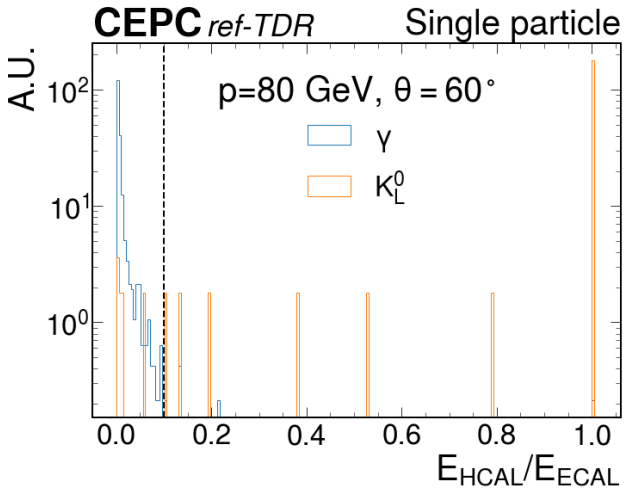


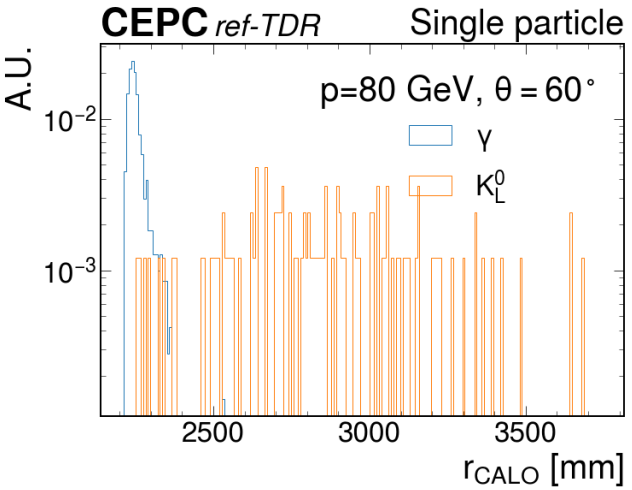




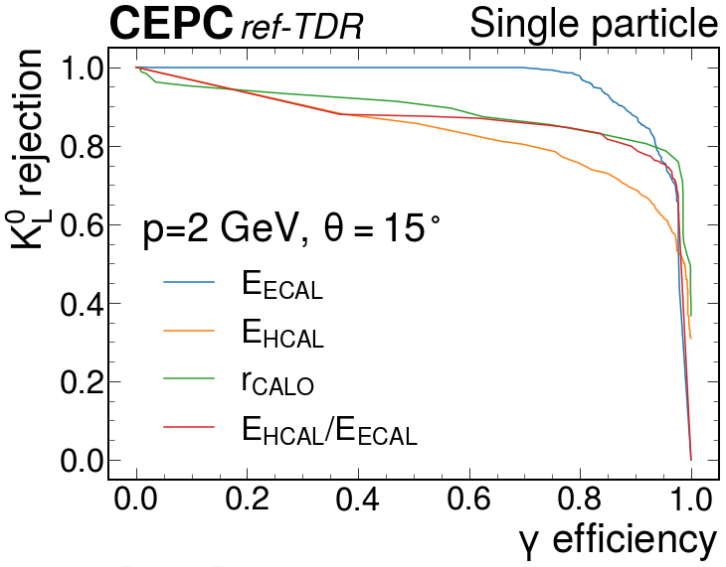


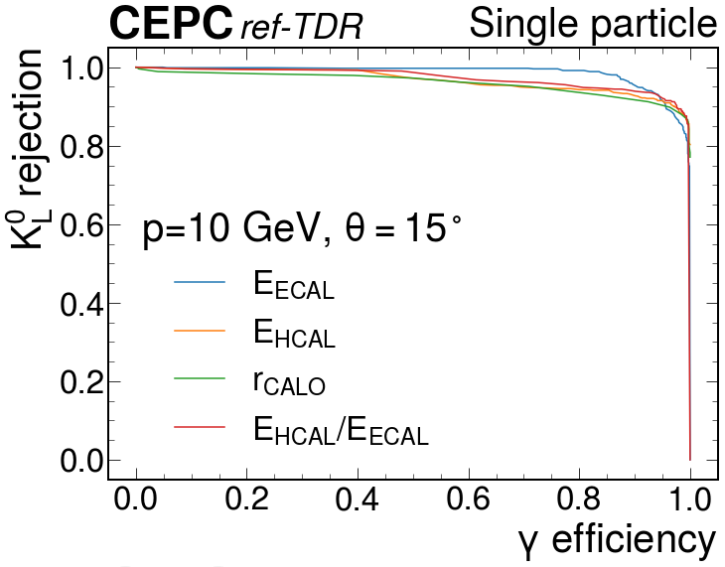


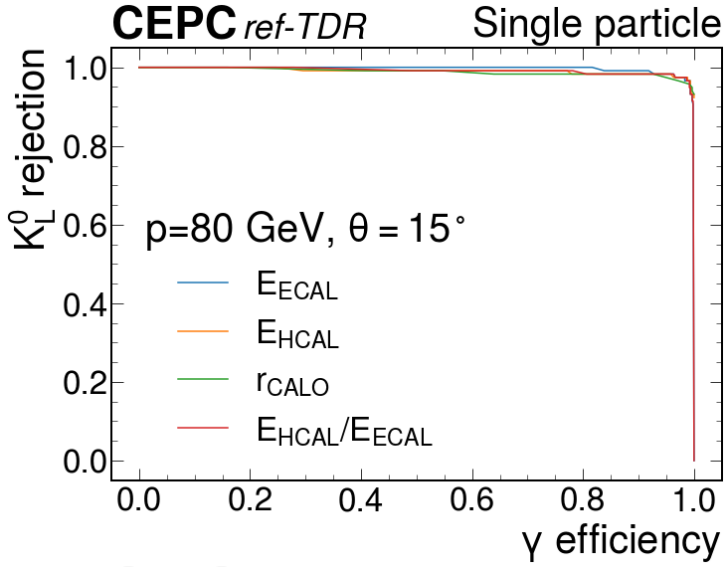


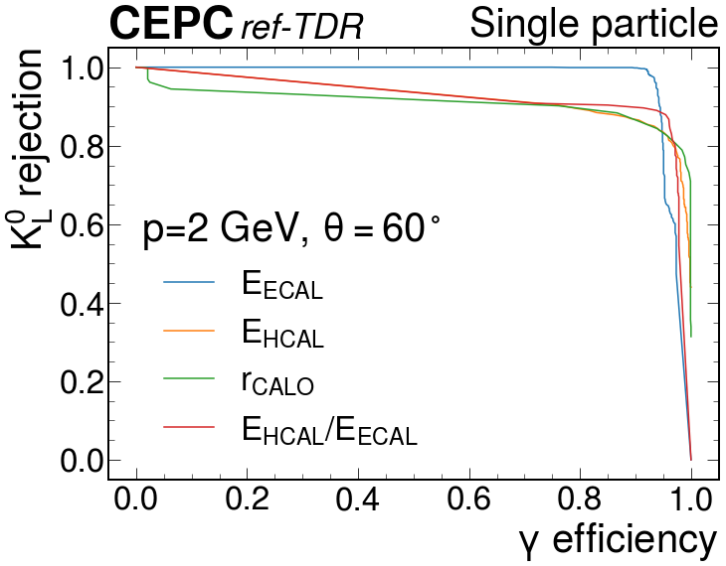


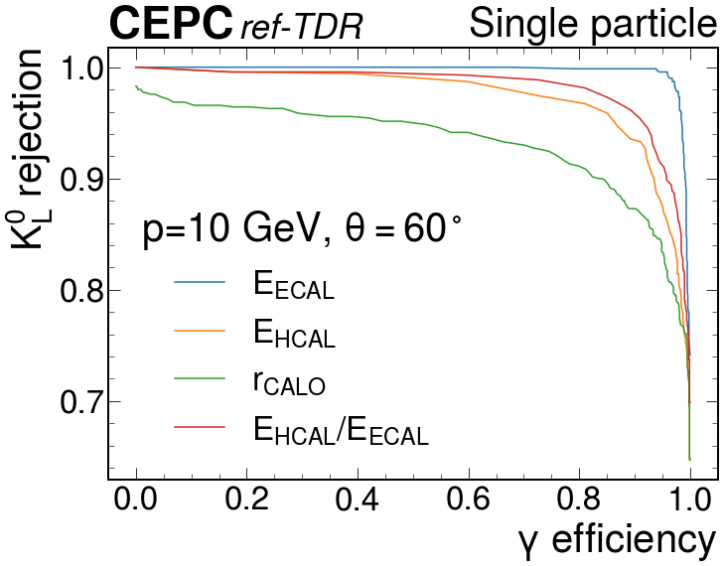
ROC curves for different variables

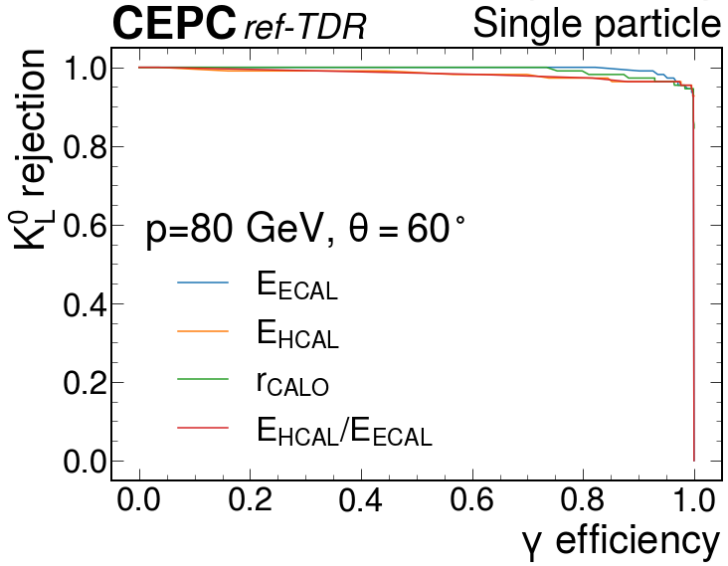












- **E_{HCAL}/E_{ECAL} is not necessarily the best variable; E_{ECAL} itself is in many cases.**

Efficiencies at fixed WPs