

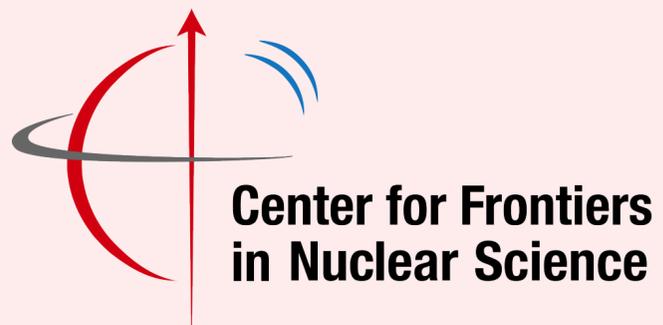
Scattered Electron Identification at ePIC

Win Lin 

Stony Brook University

CFNS Friday Meeting

11/14/2025



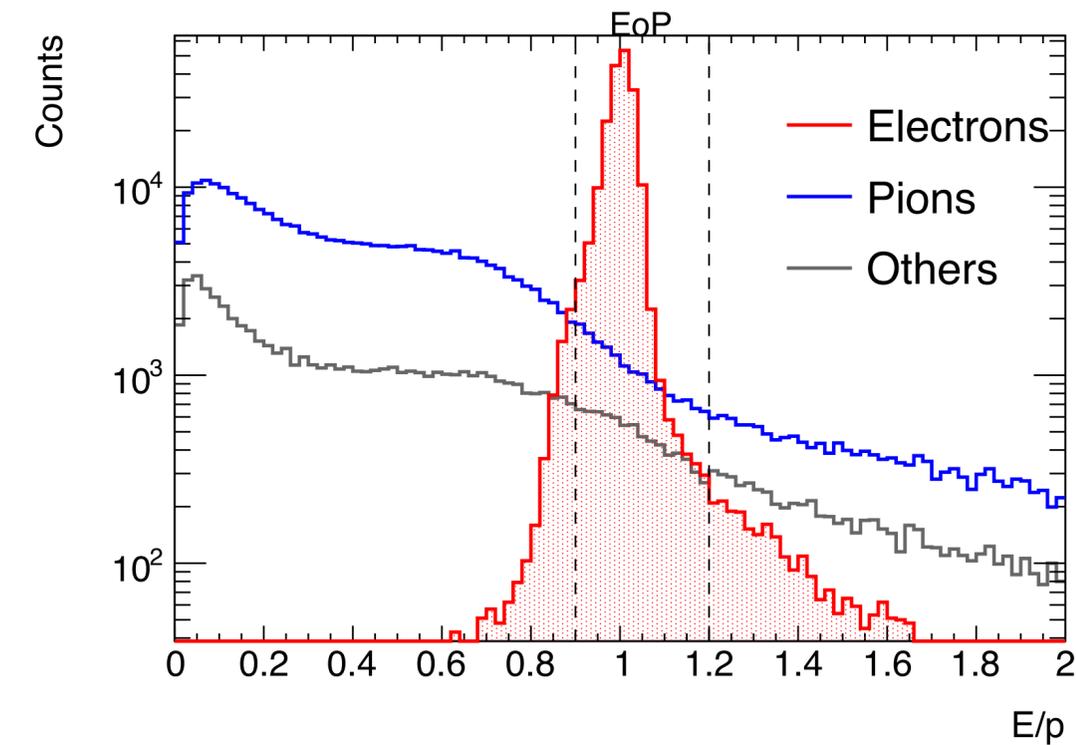
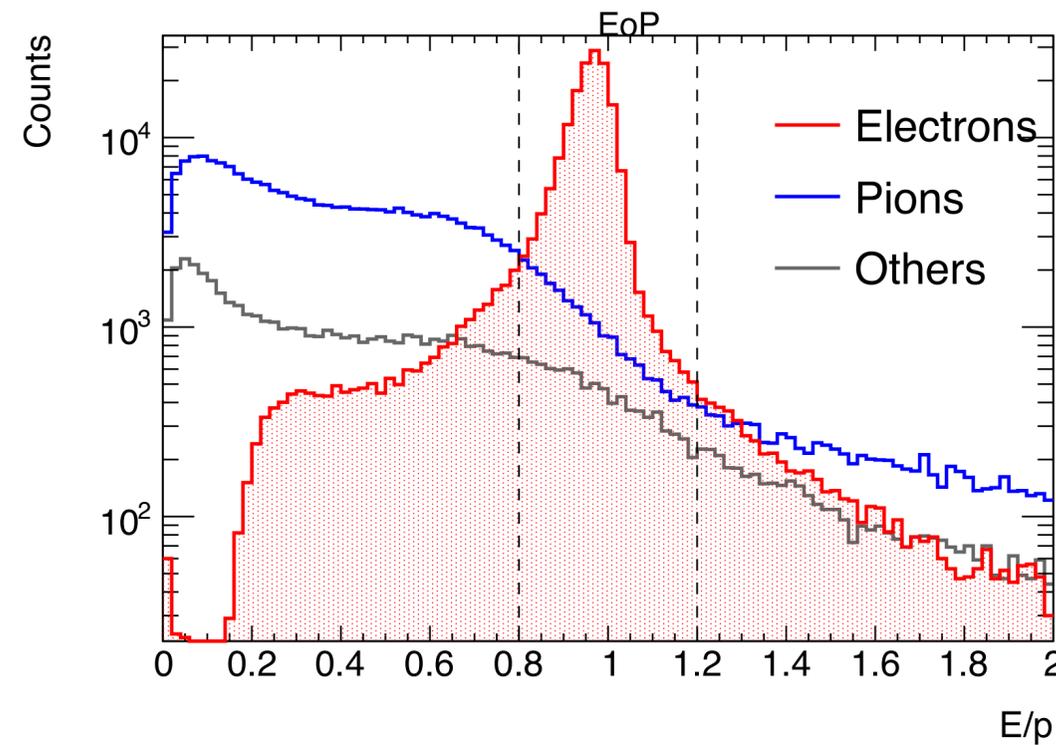
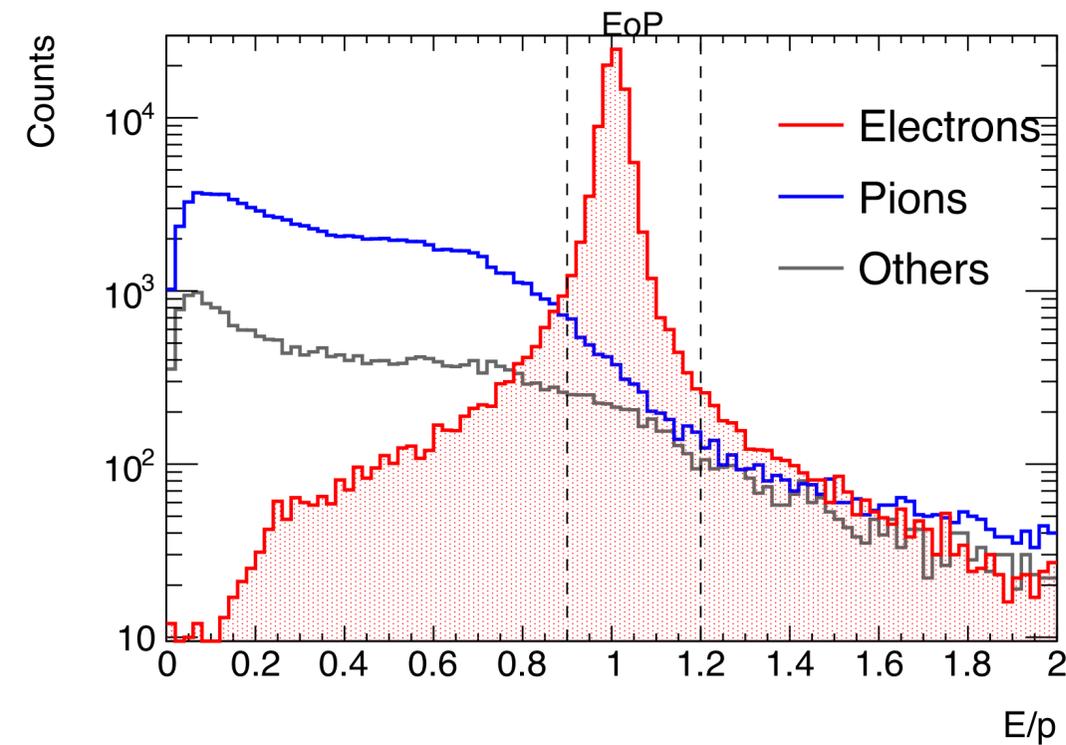
eID procedure and performance

- ▶ Start from “ReconstructedParticleCollection” ← Currently still using MC to match clusters and tracks
- ▶ Require negative tracks with at least a track and a cluster
- ▶ 0.9 (or 0.8) $< E/p < 1.2$

$$2 \leq Q^2 \leq 10 \text{ GeV}^2$$

$$10 \leq Q^2 \leq 100 \text{ GeV}^2$$

$$Q^2 \geq 100 \text{ GeV}^2$$

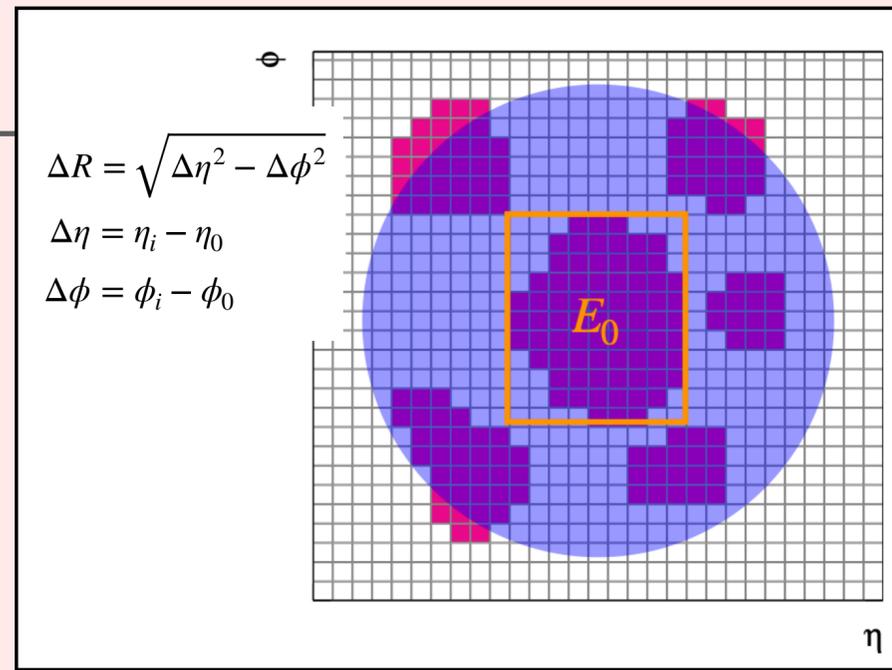


* EPIC 25.05.0 Sim. eHe3 10x166

CAL sim. had issues in 07 and 08 campaign, eID efficiency were low

eID procedure and performance

- ▶ Start from “ReconstructedParticleCollection”
- ▶ Require negative tracks with at least a track and a cluster
- ▶ $0.9 \text{ (or } 0.8) < E/p < 1.2$
- ▶ Isolated cluster: $\delta R < 0.4, E_0/\Sigma E_{\delta R} > 0.9$

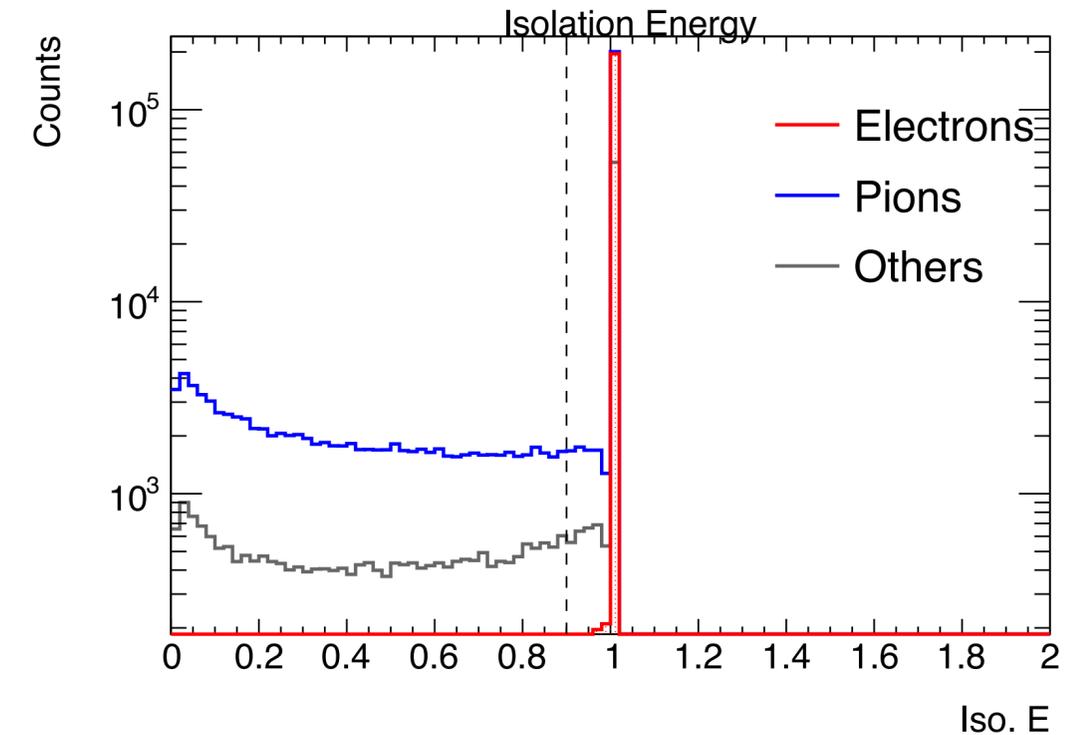
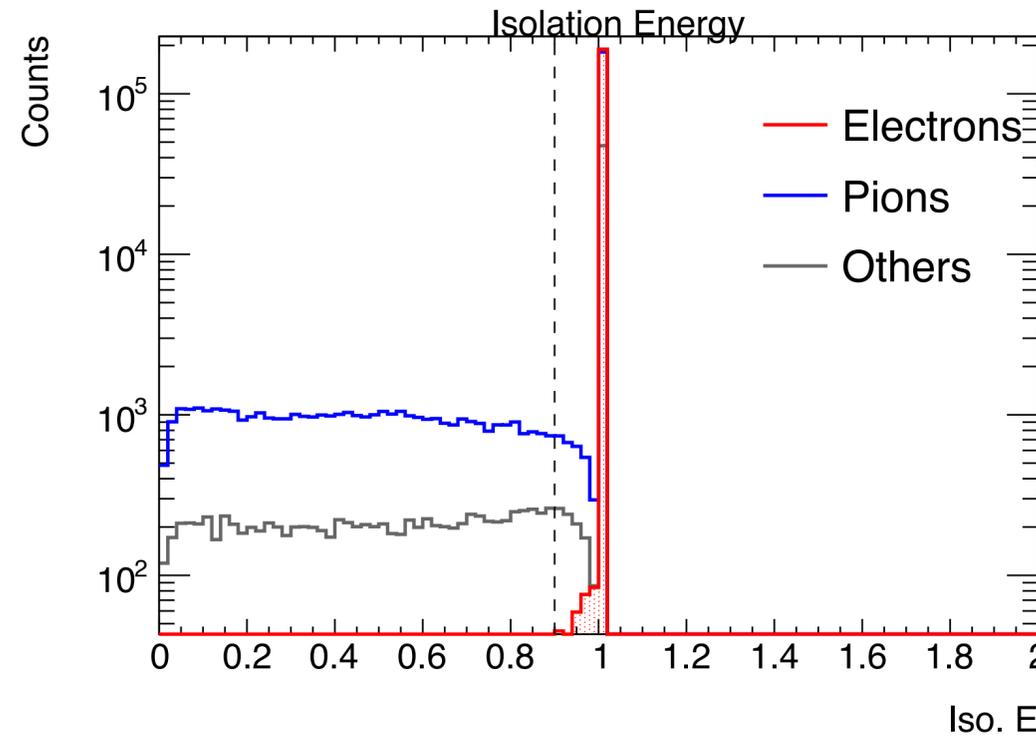
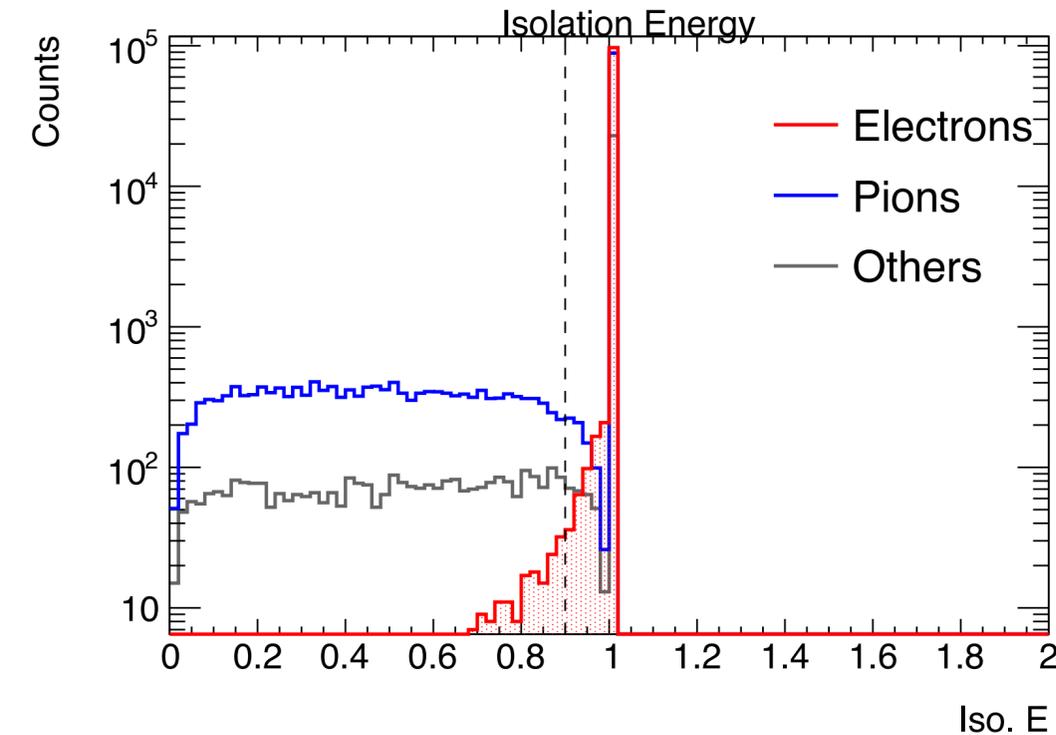


E_0 : energy of leading cluster of a particular particle

$2 \leq Q^2 \leq 10 \text{ GeV}^2$

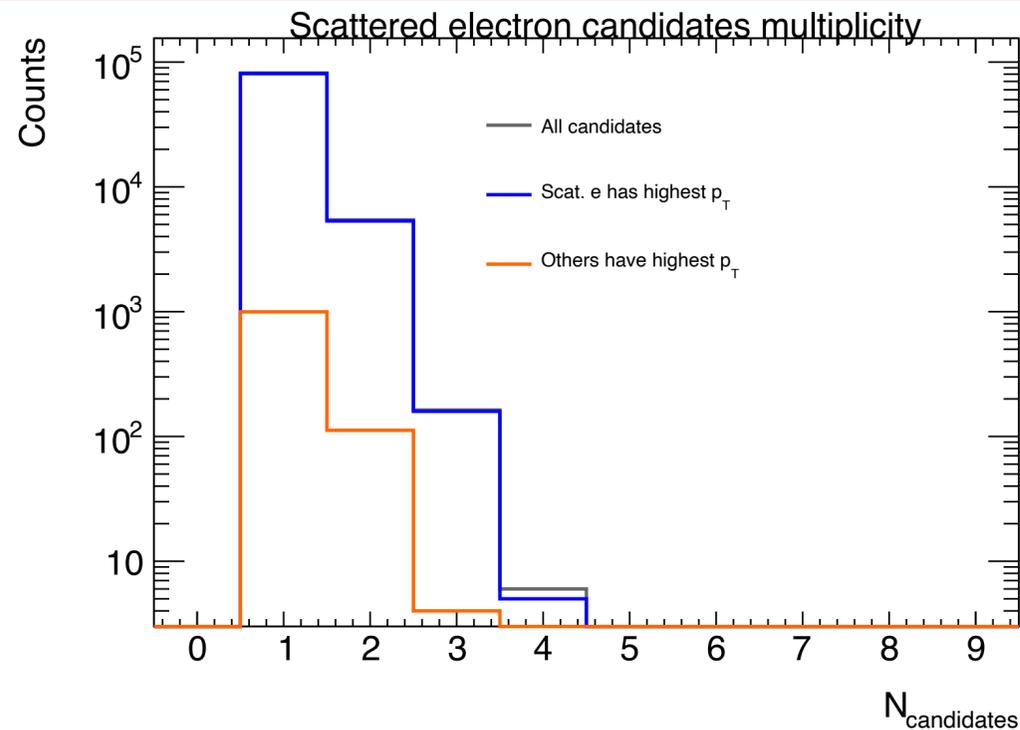
$10 \leq Q^2 \leq 100 \text{ GeV}^2$

$Q^2 \geq 100 \text{ GeV}^2$

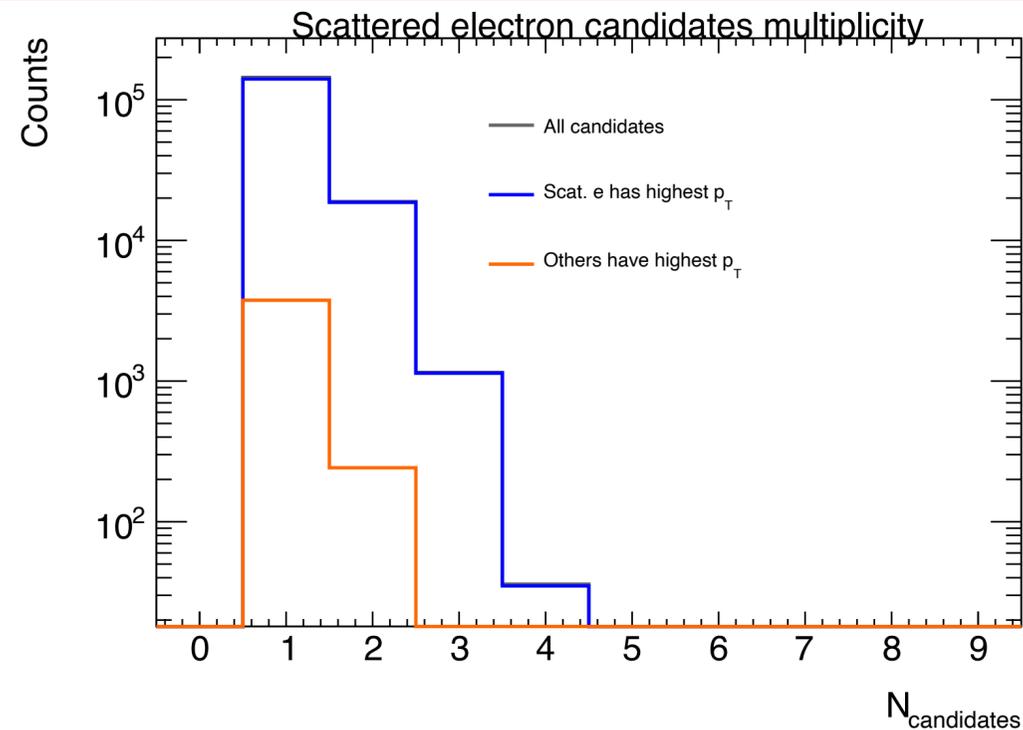


- ▶ Start from “ReconstructedParticleCollection”
- ▶ Require negative tracks with at least a track and a cluster
- ▶ 0.9 (or 0.8) $< E/p < 1.2$
- ▶ Isolated cluster: $\delta R < 0.4$, $E_0/\Sigma E_{\delta R} > 0.9$
- ▶ Select the highest P_T particle

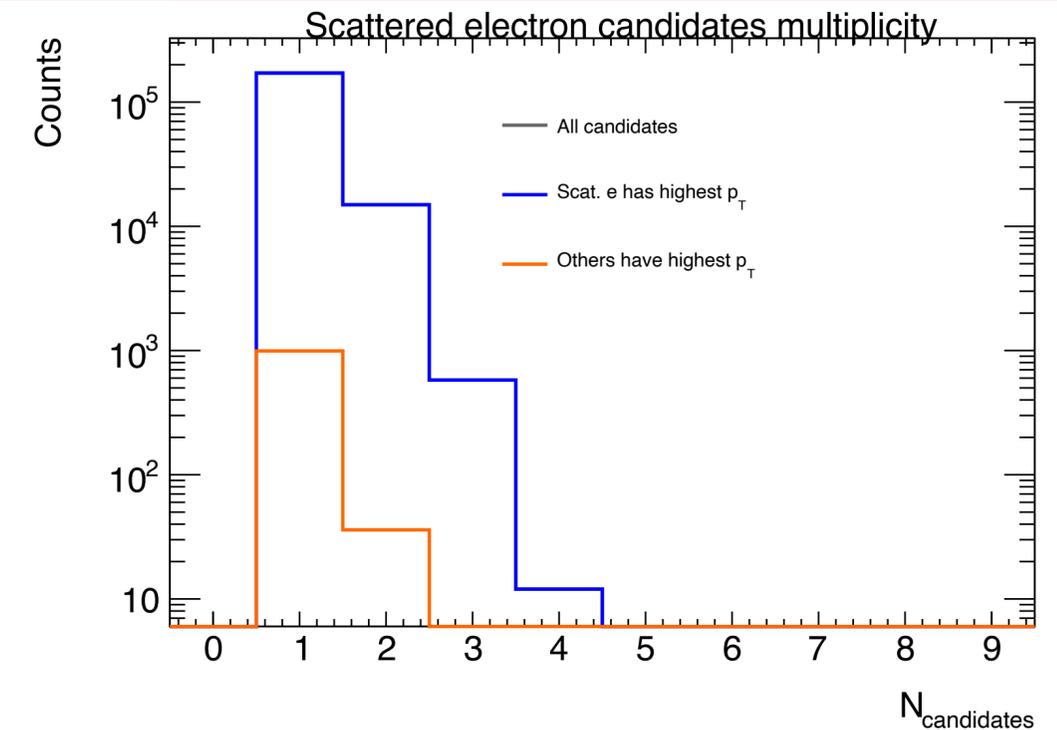
$$2 \leq Q^2 \leq 10 \text{ GeV}^2$$



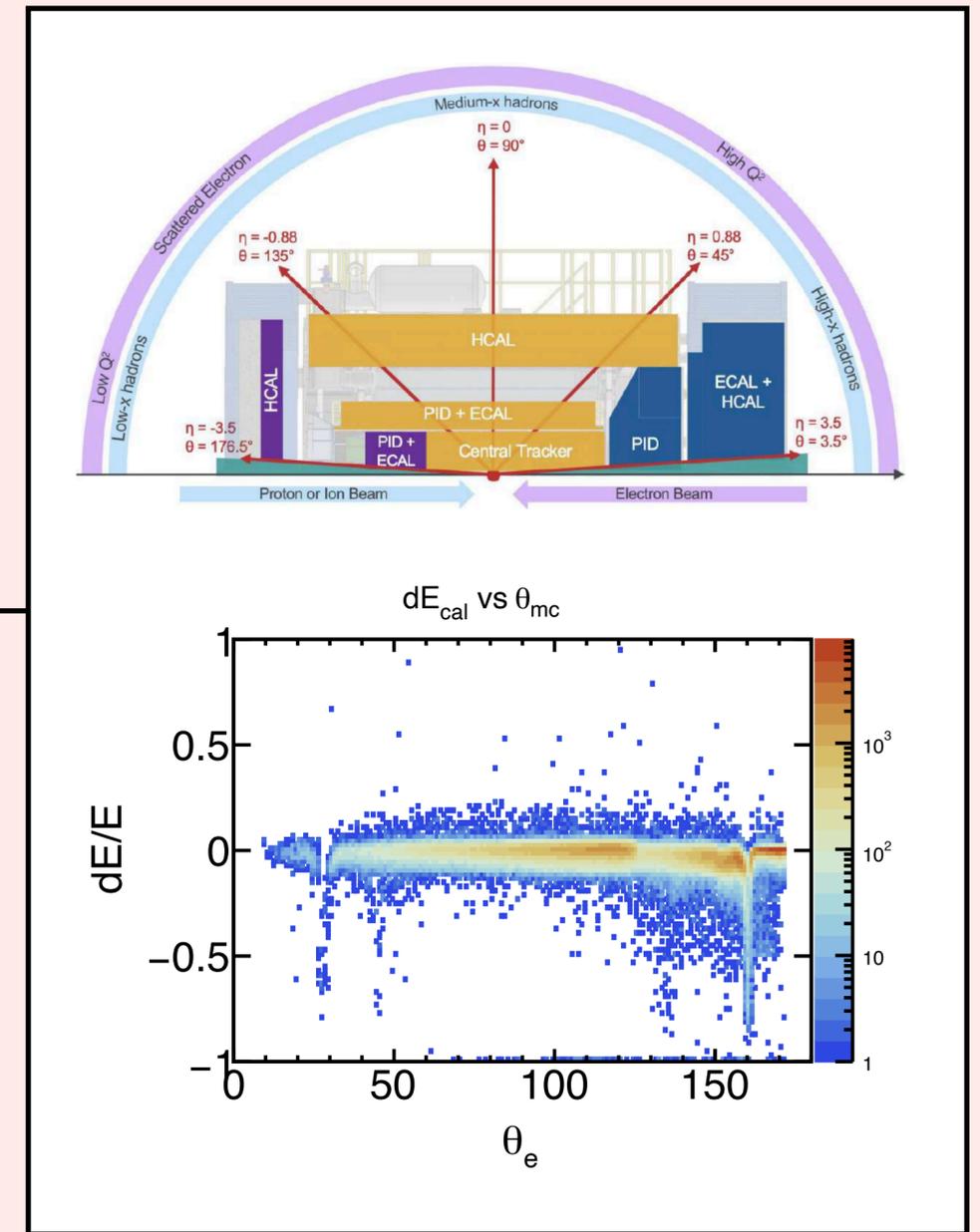
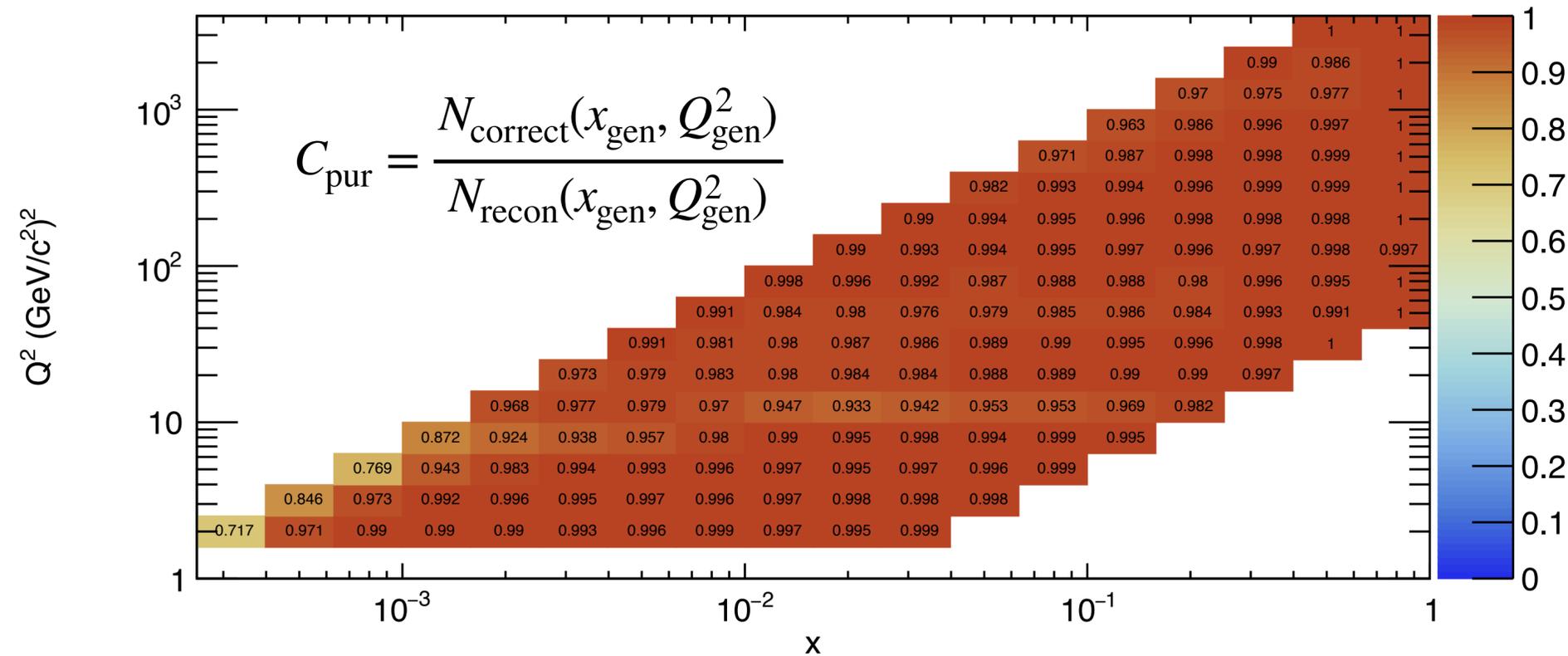
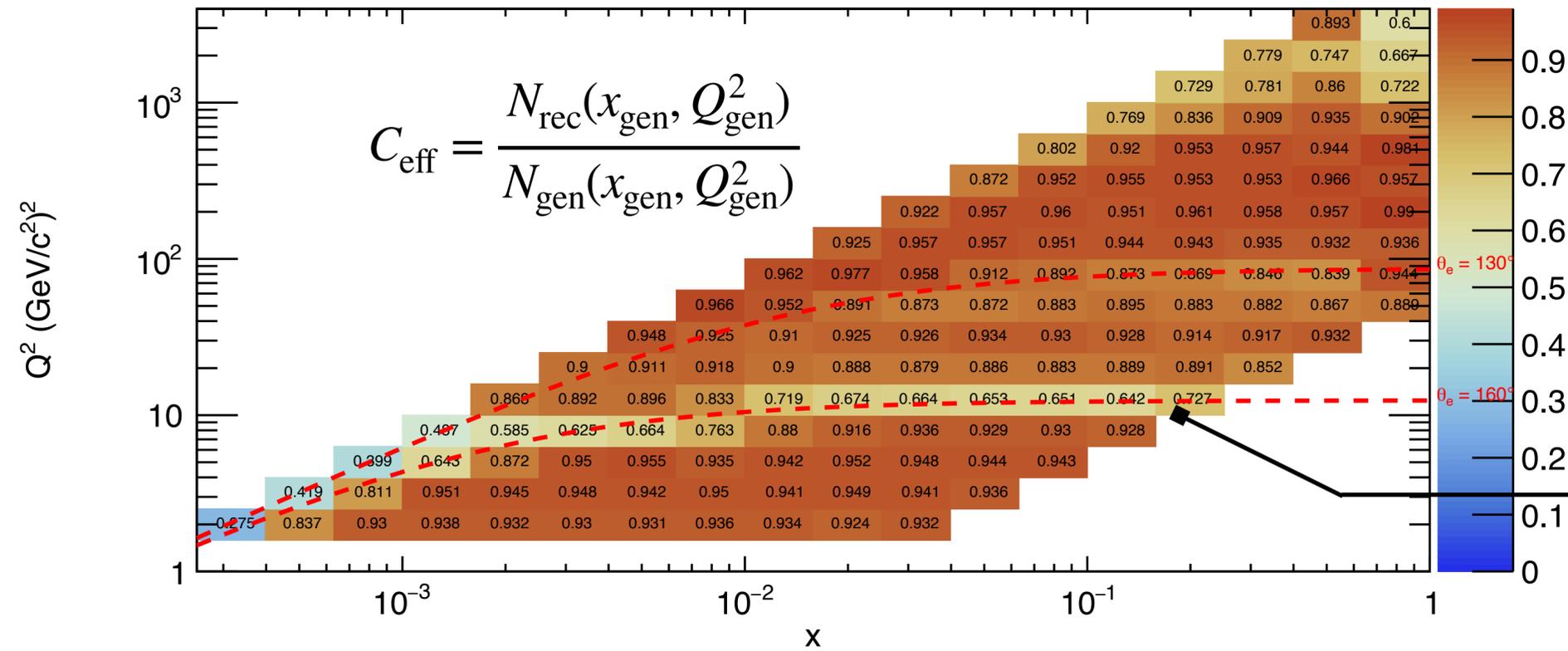
$$10 \leq Q^2 \leq 100 \text{ GeV}^2$$



$$Q^2 \geq 100 \text{ GeV}^2$$



eID efficiency and purity (No background)



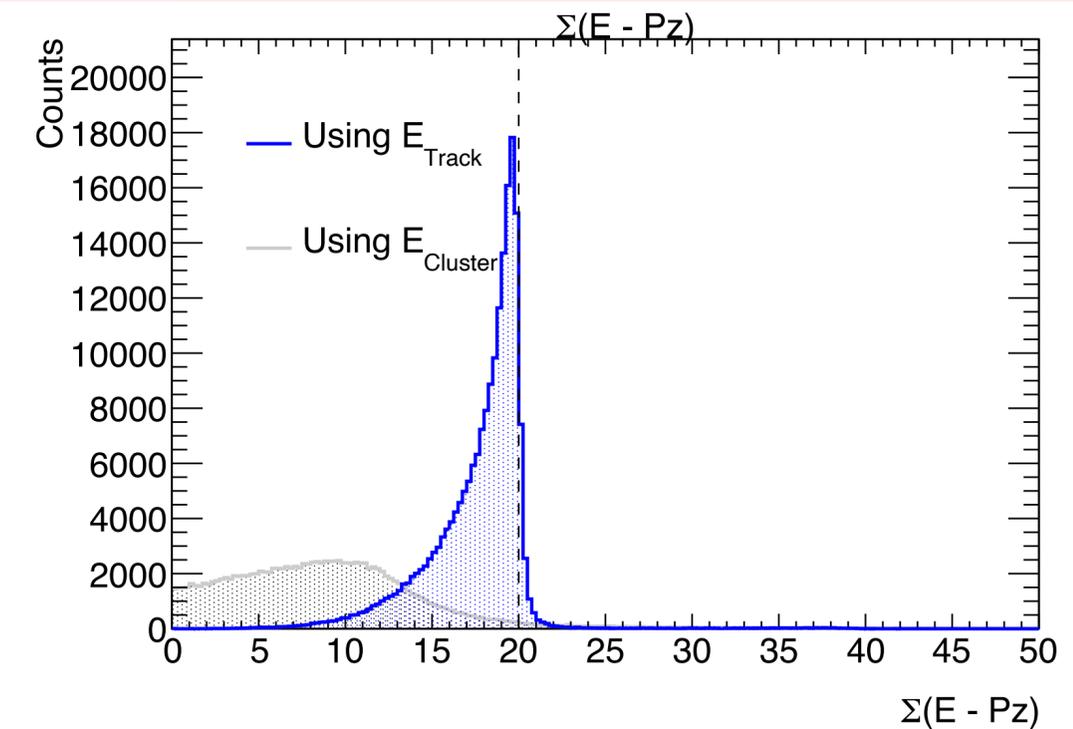
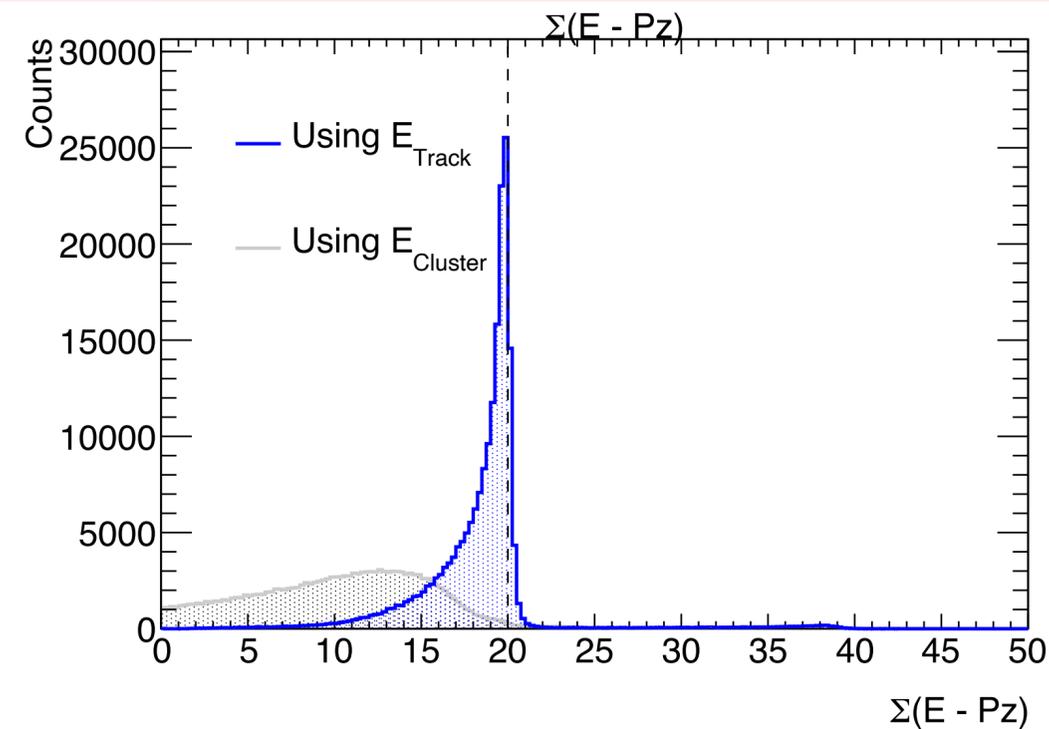
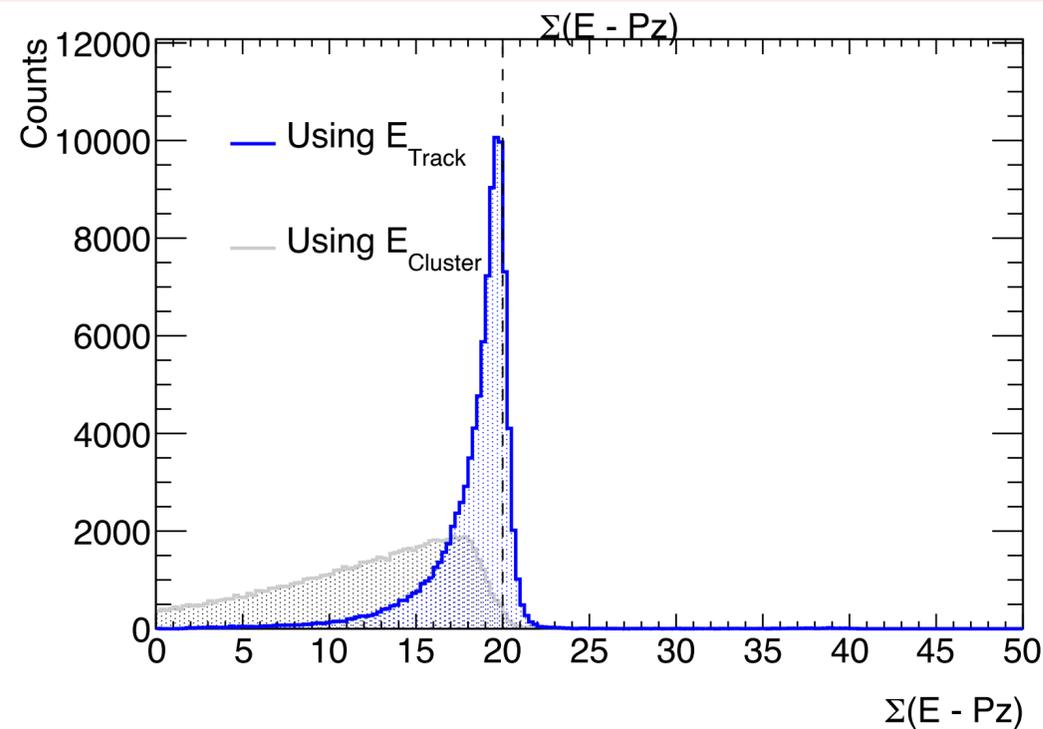
* EPIC 25.05.0 Sim. eHe3 10x166

- ▶ $\Sigma(E - P_z) \approx 2E_e$, smaller for QED ISR, photoproduction events
- ▶ This value can be calculated using Electron Finder, but it is not in the default cut
- ▶ E_{Track} : prioritize to use track information

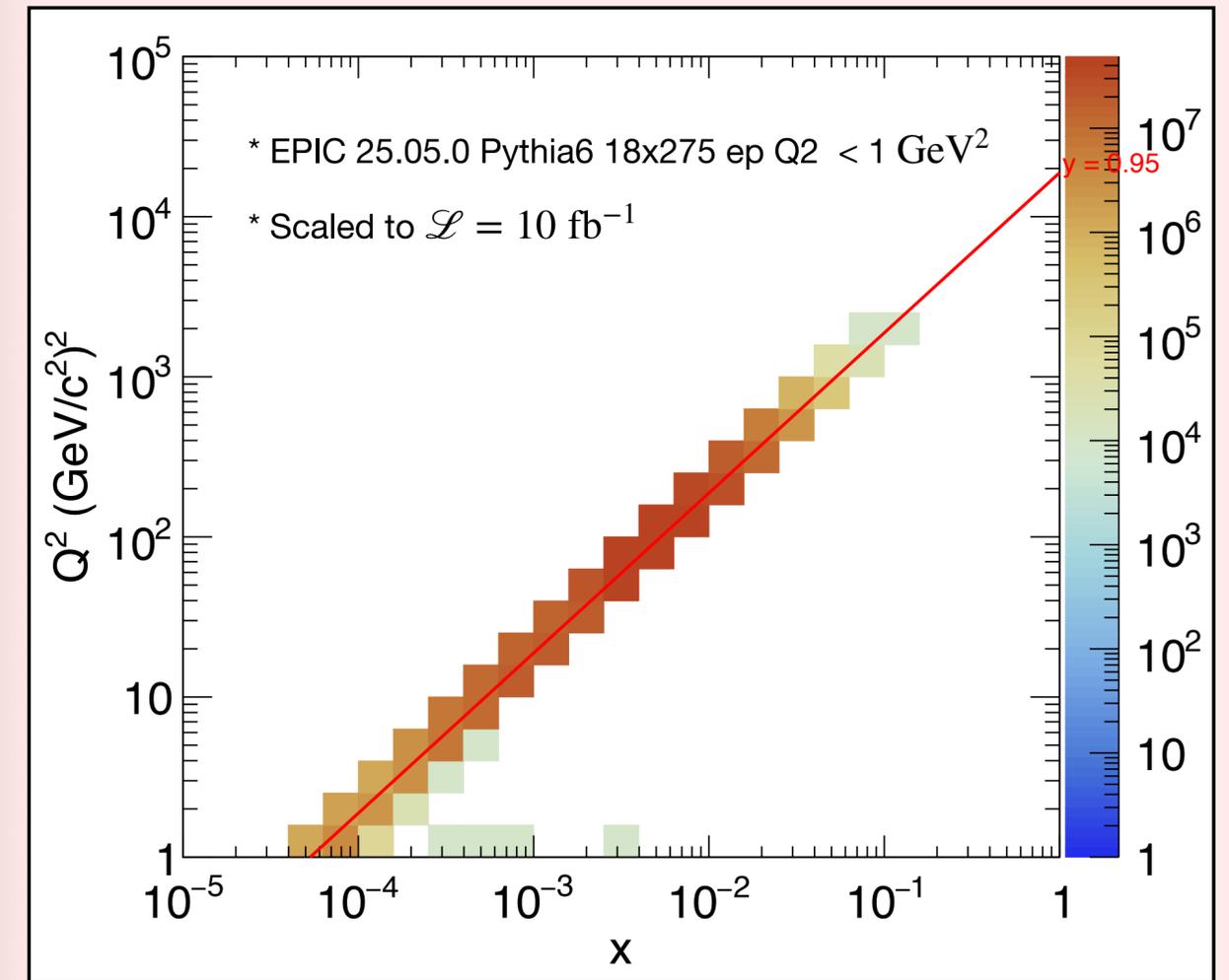
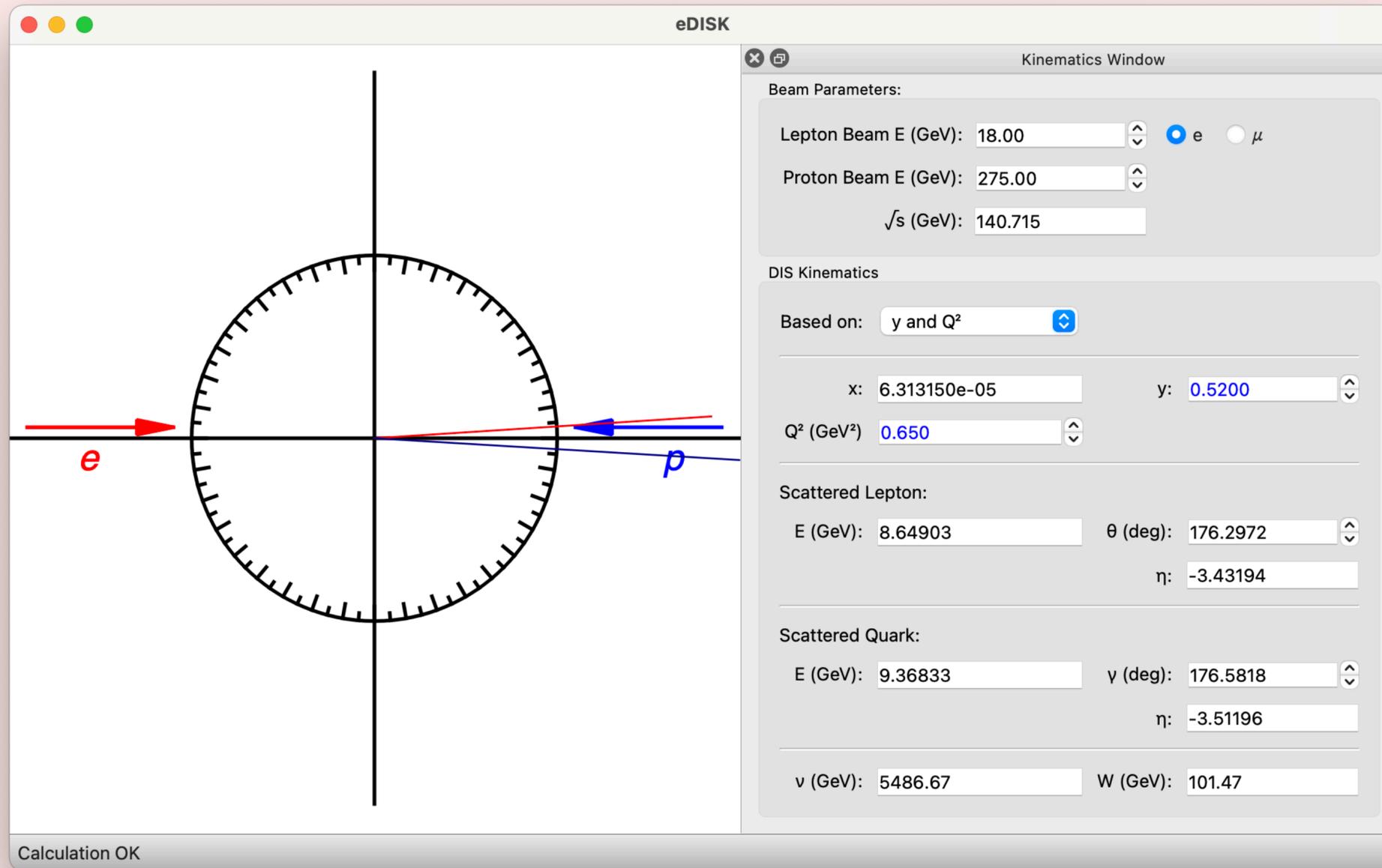
$$2 \leq Q^2 \leq 10 \text{ GeV}^2$$

$$10 \leq Q^2 \leq 100 \text{ GeV}^2$$

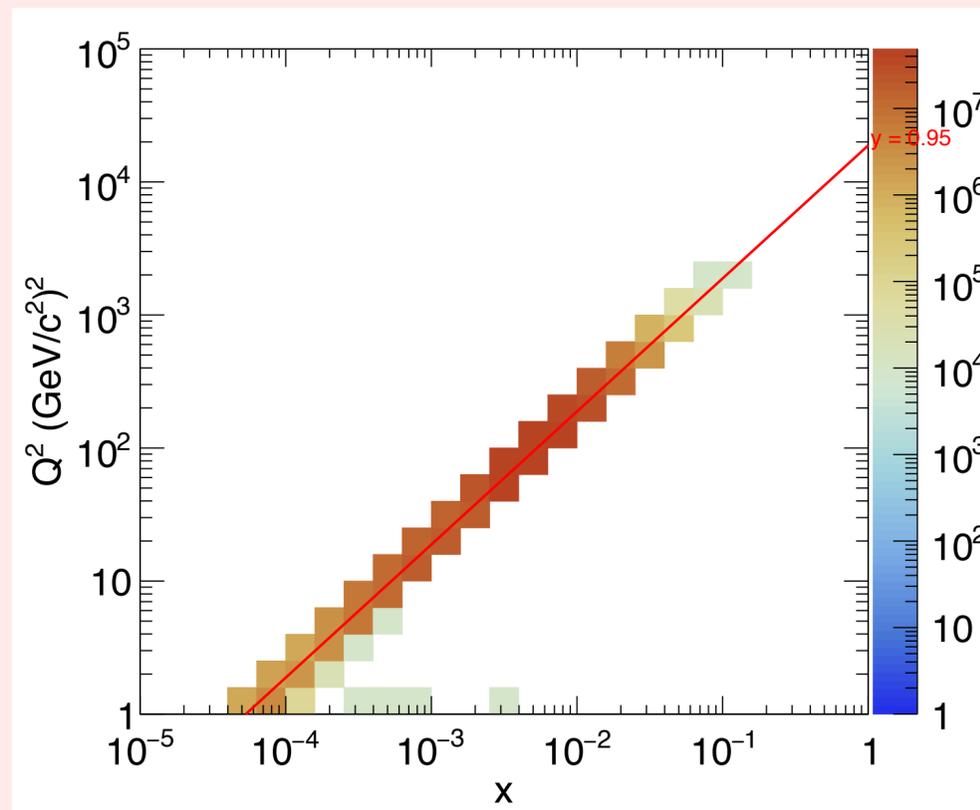
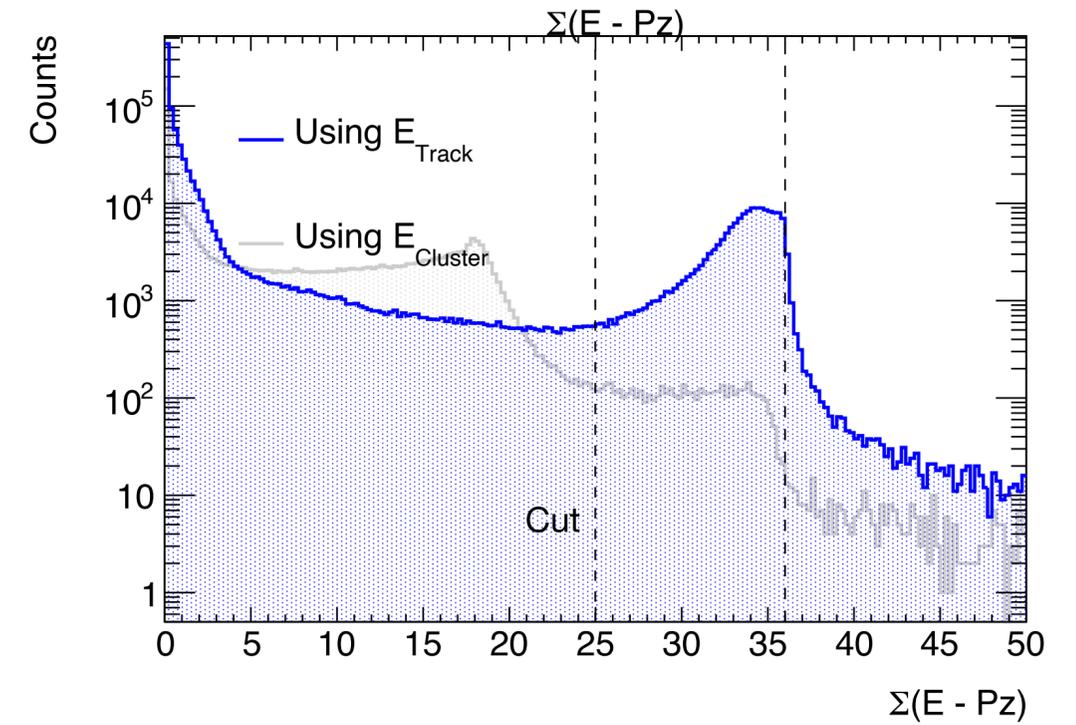
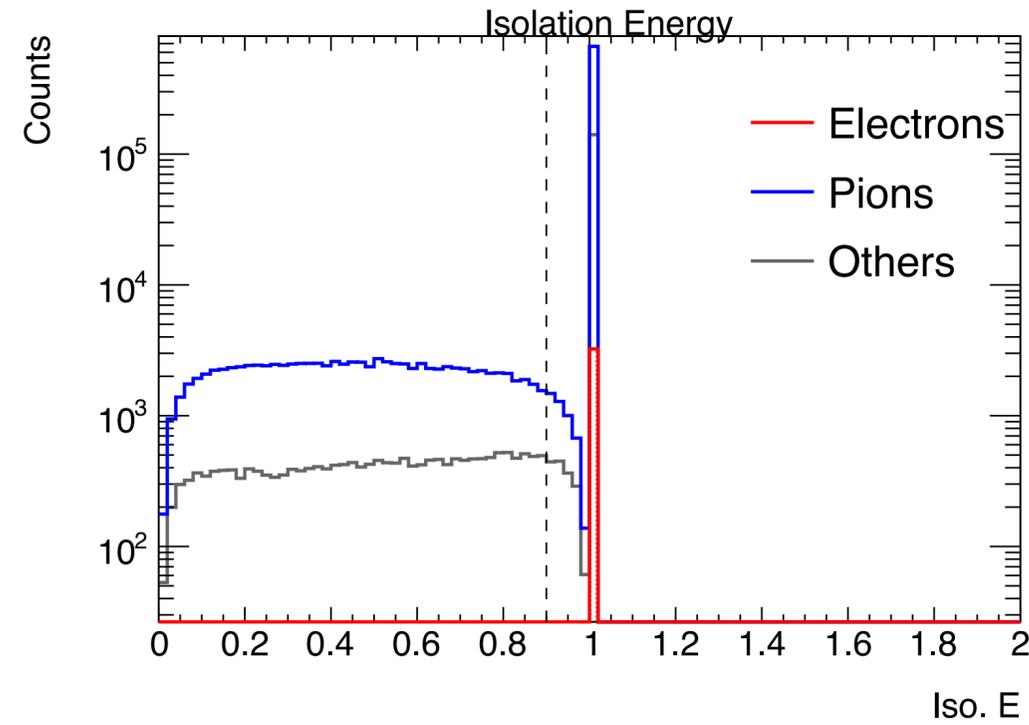
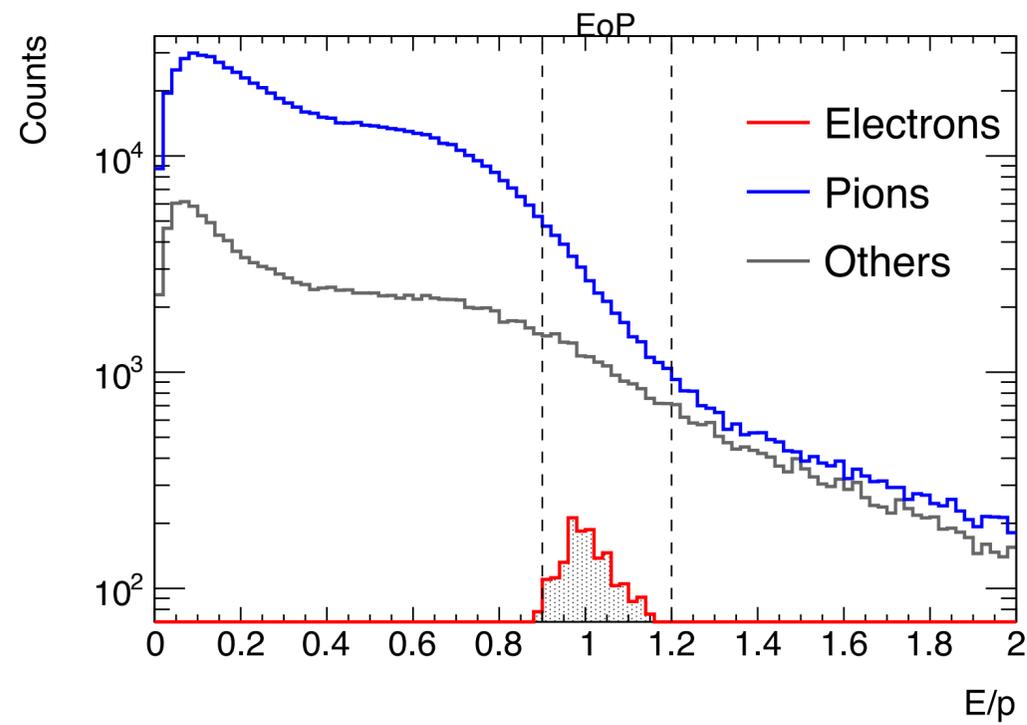
$$Q^2 \geq 100 \text{ GeV}^2$$



Photoproduction background

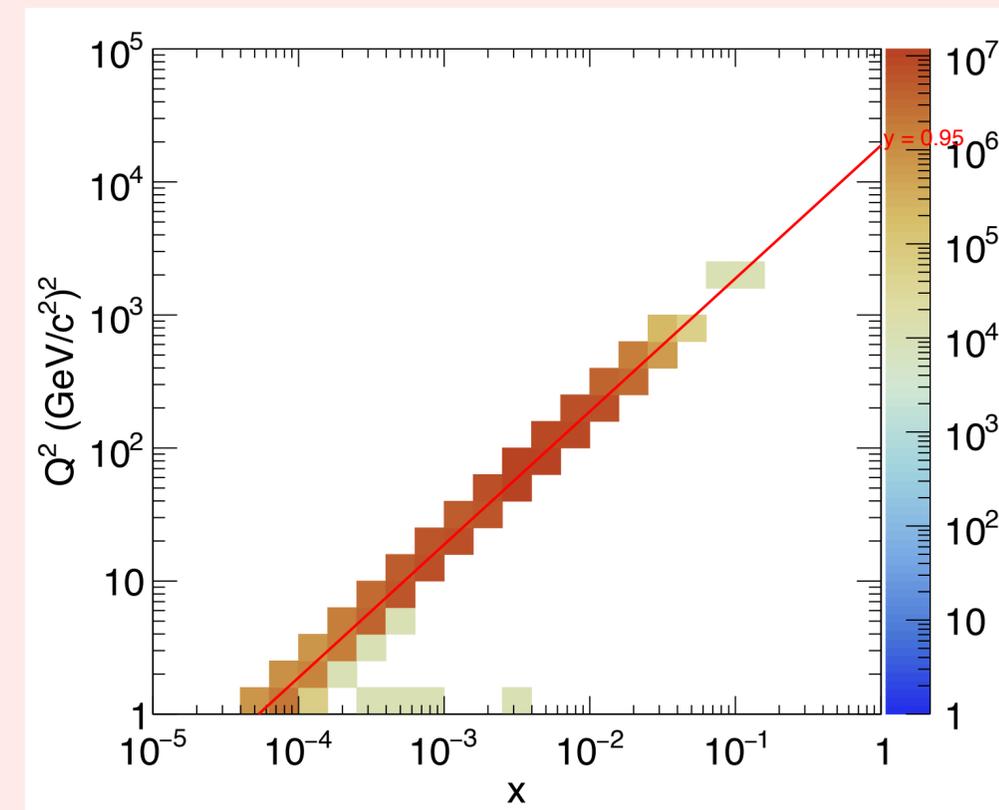


Photoproduction background



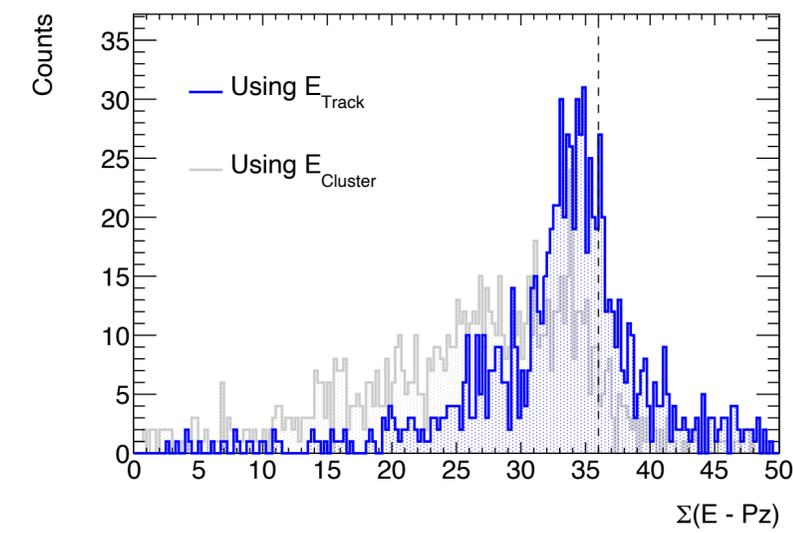
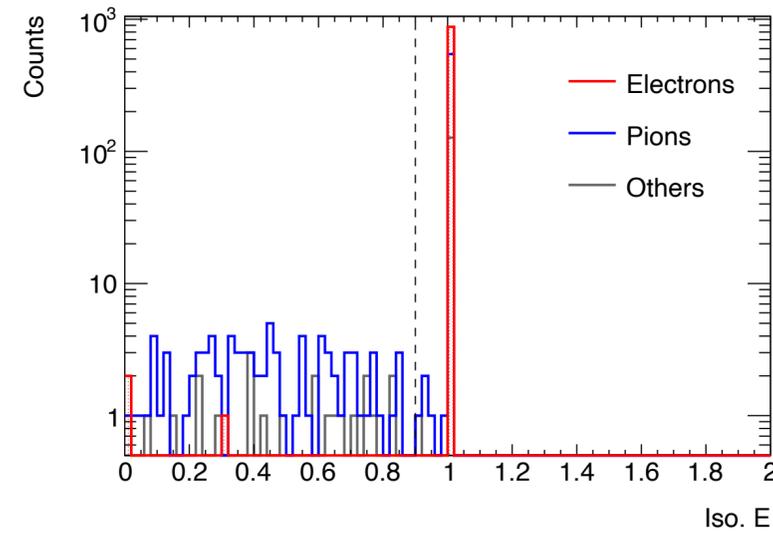
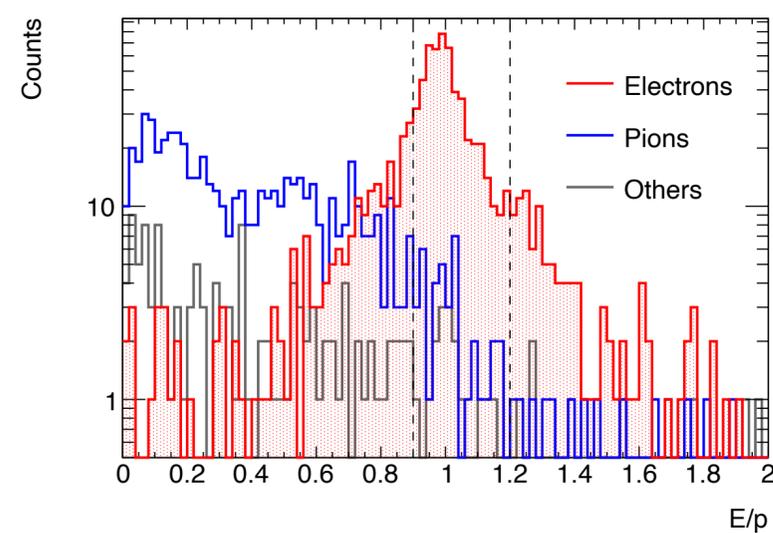
Reduced by
~70.4%

→

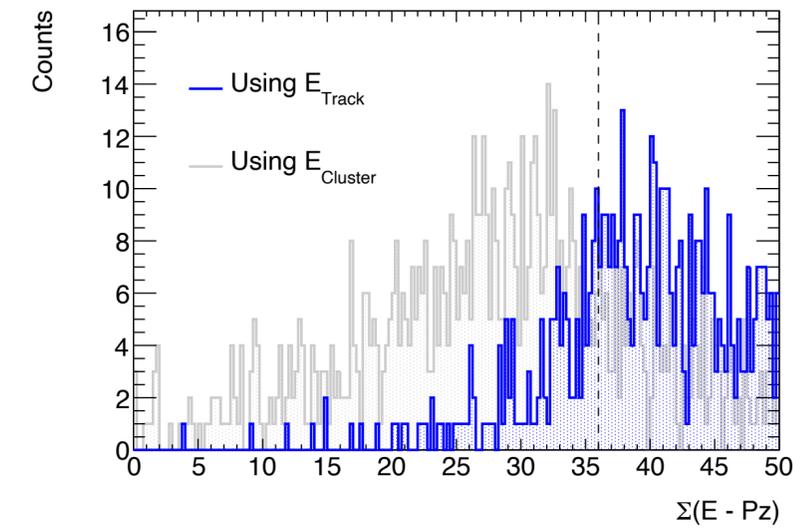
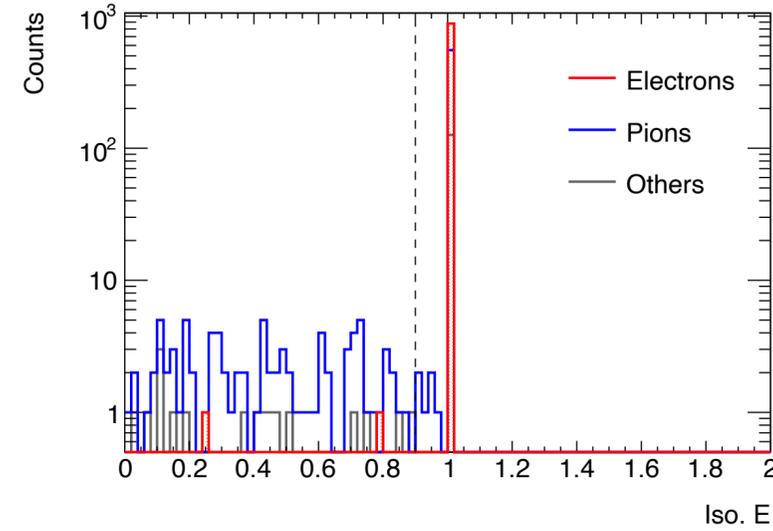
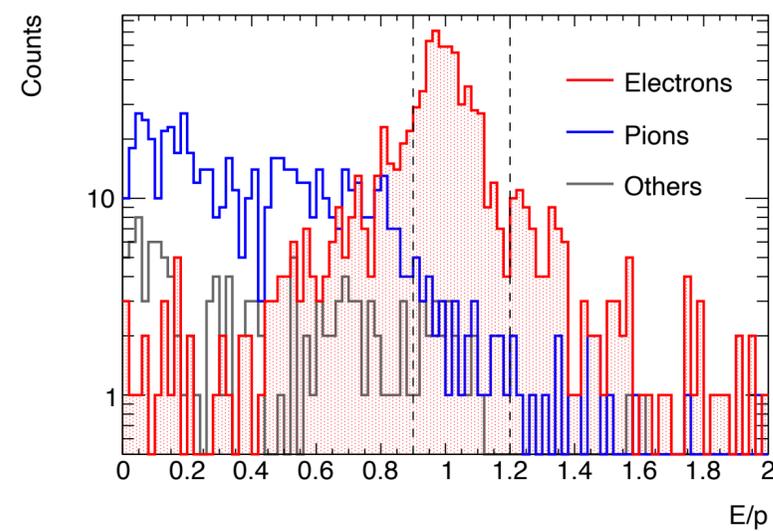


eID with beam background (1 DIS event w. $2\mu s$ bg.)

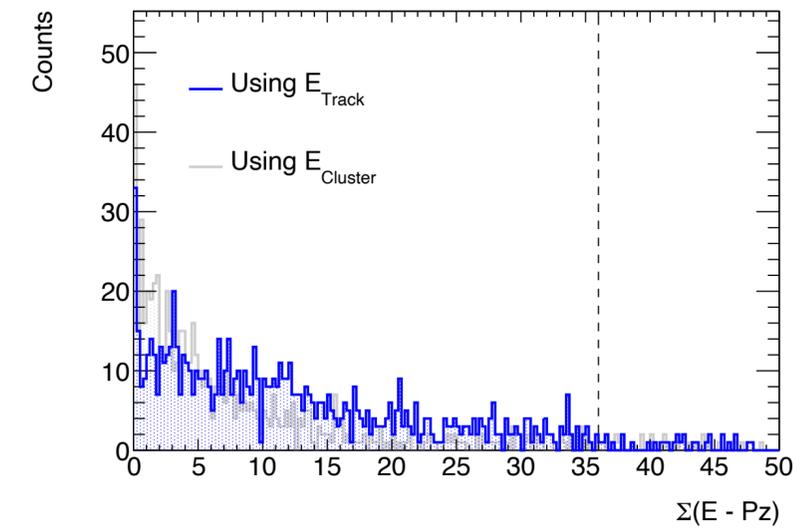
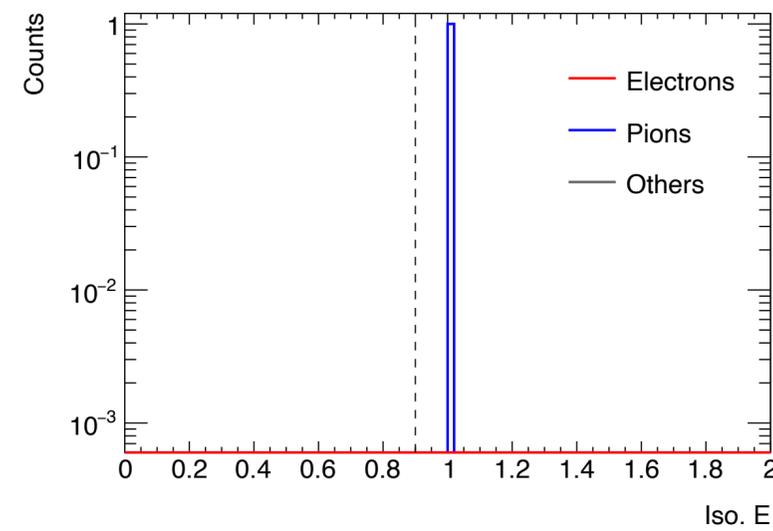
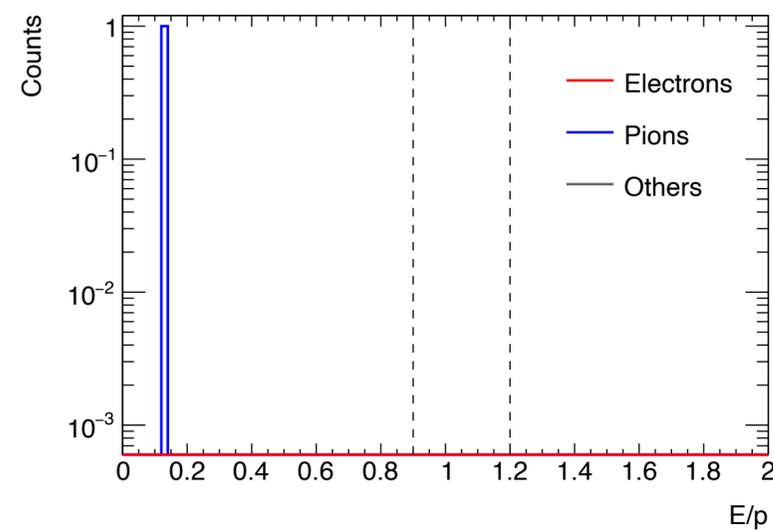
► DIS, no background



► DIS + Background



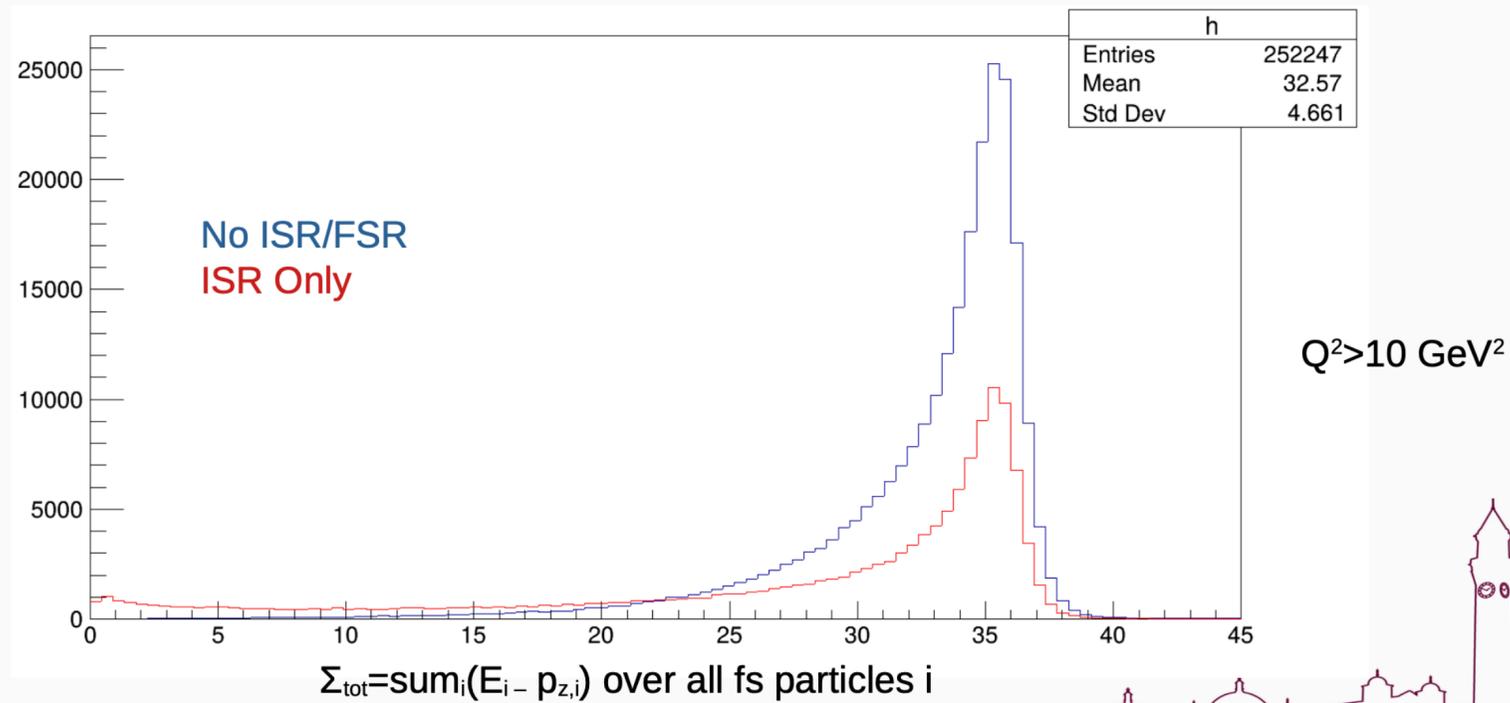
► Background only



* 18x275 ep samples with 1000 events

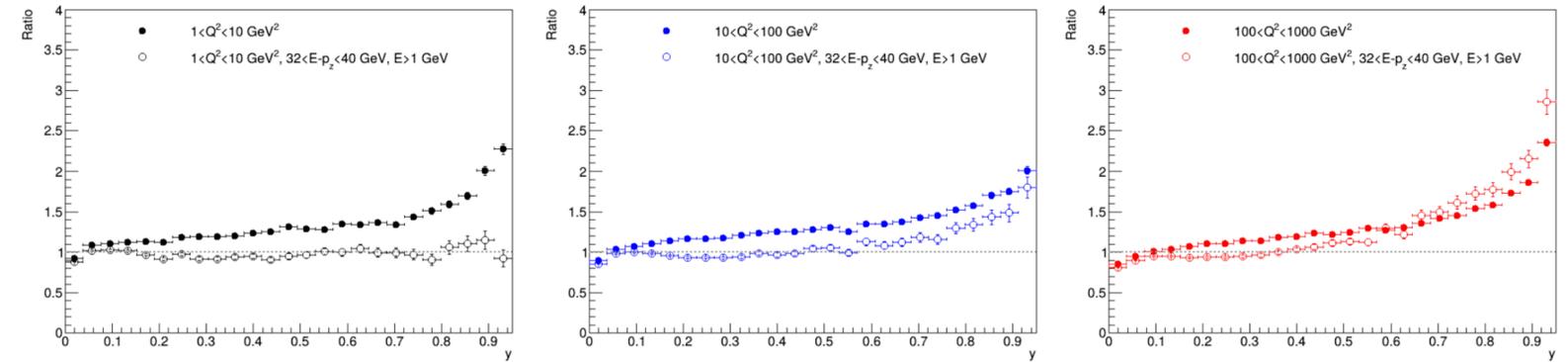
Total E-pz

For now I'll cut on $32 < \Sigma_{tot} < 40$ GeV



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Ratio with and without E-pz cut: Truth (vs y)



- Low Q^2 looks pretty good \rightarrow E- p_z cut corrects to ~ 1
- For higher Q^2 the ratio starts at 1 with the E- p_z cut then increases with y from $y \sim 0.5$
- E- p_z cut actually increases ratio at high y for $Q^2 > 100$

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Study done by Stephen Maple (Birmingham)