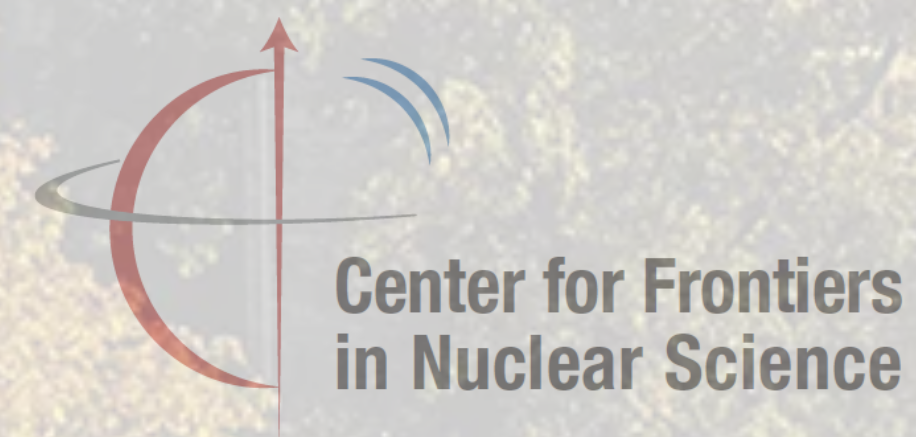


Diffractive DIS: LATEST PROGRESS

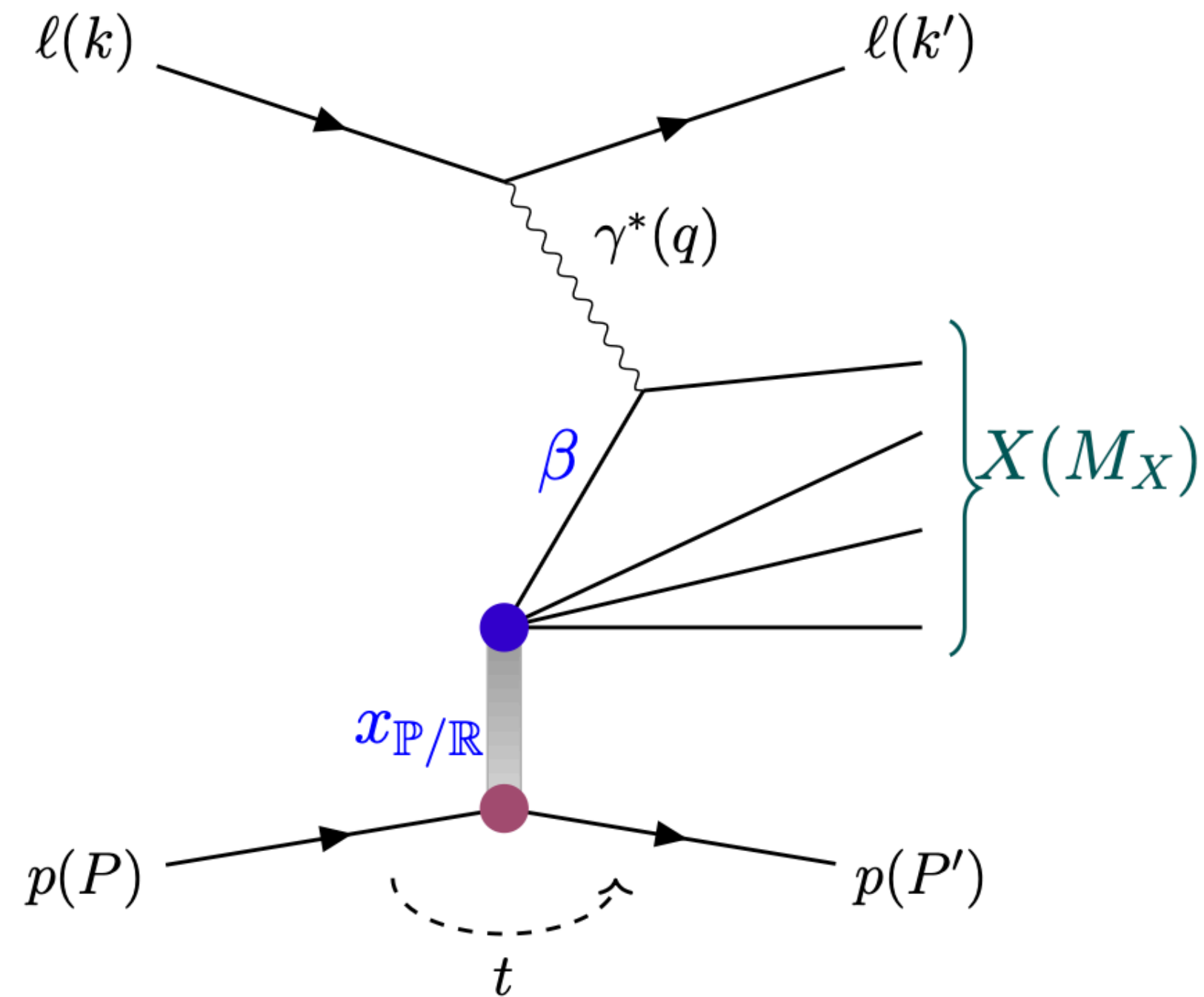
Exclusive, Diffraction, Tagging Physics Working Group

Joint ePIC/EICUG Meeting, July 2026

Arjun Kumar



Inclusive diffraction on proton



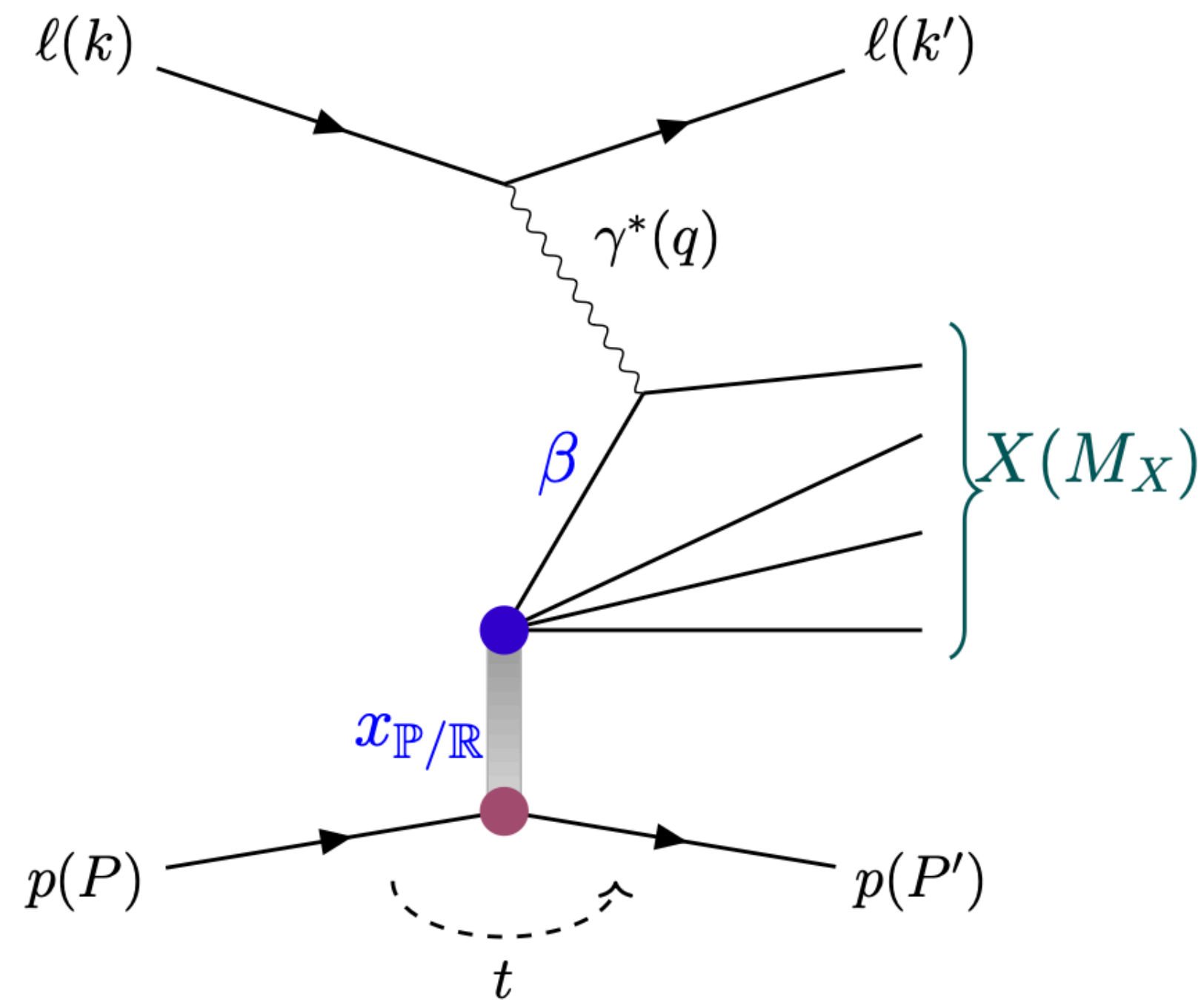
- $e + p \rightarrow e' + X + p'$
- Measure the scattered electron and the forward proton
- Motivation: Baseline measurement for studying nuclear suppression of diffractive structure

function i.e $R_{\text{diff}}^A = \frac{F_{2,A}^D}{A F_{2,p}^D}$

Inclusive diffraction is special:

whole target wavefunction must stay coherent, a bridge between long distance physics and calculable parton dynamics

Inclusive diffraction on proton



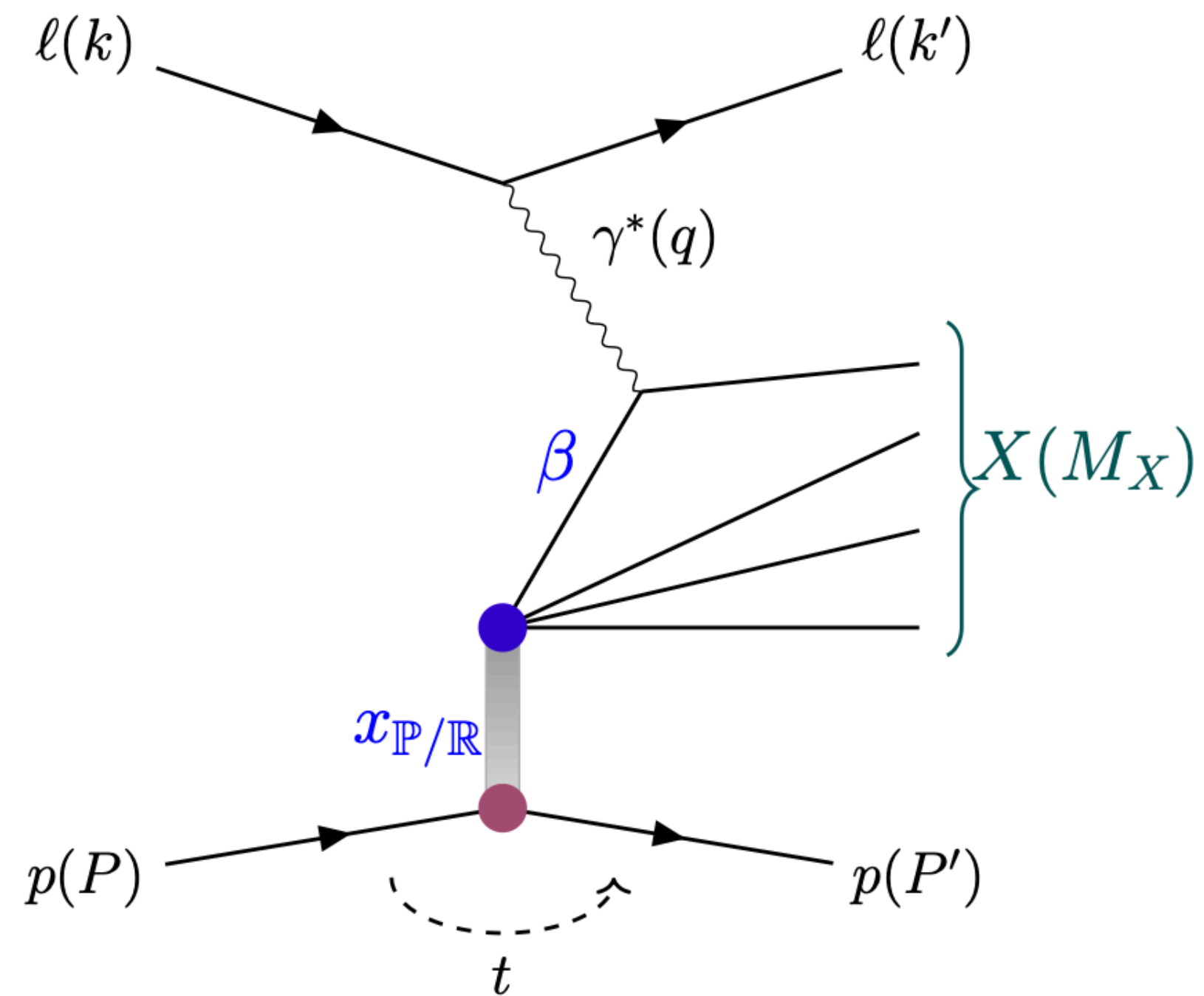
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Inclusive diffraction is special:

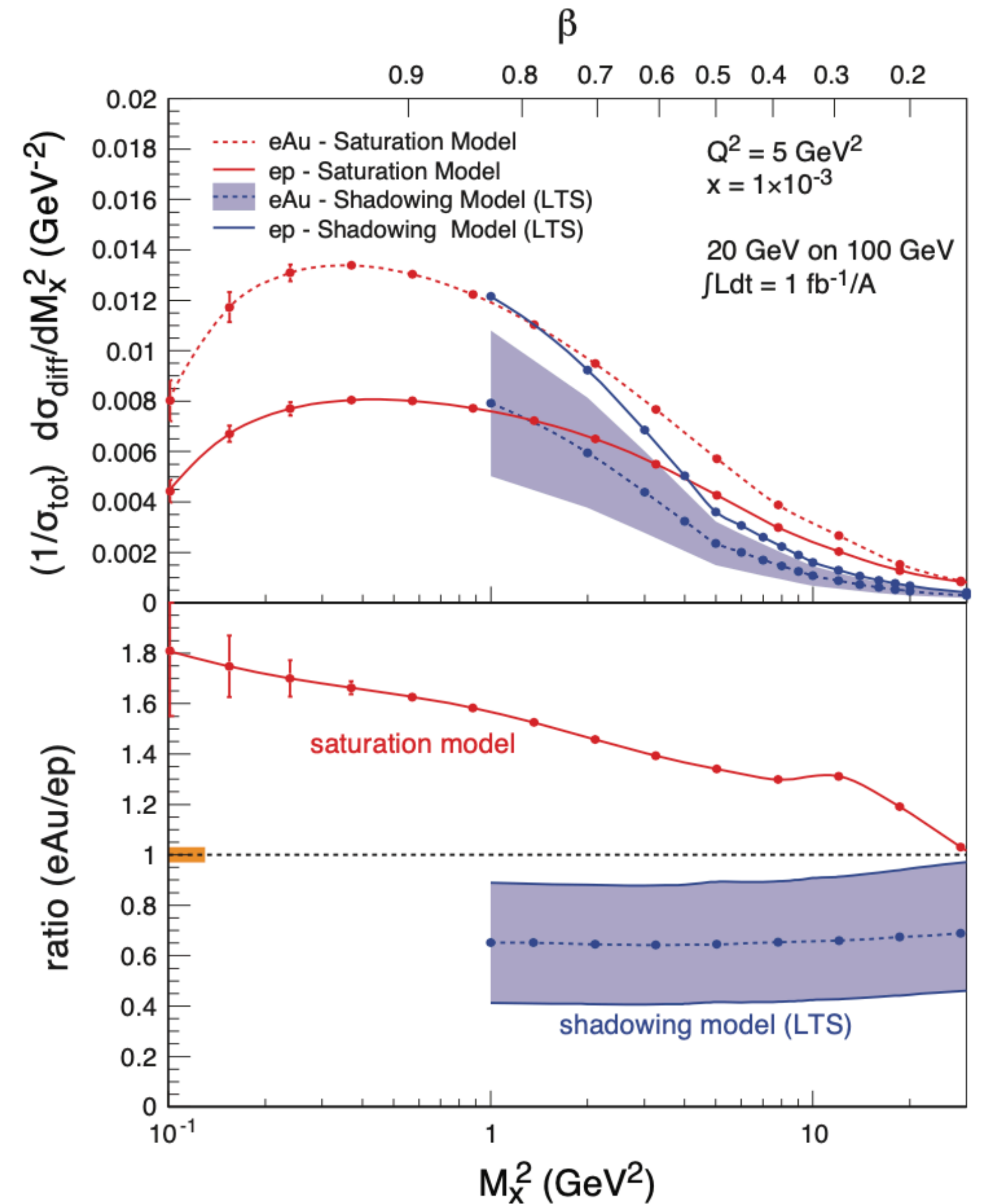
Important observable for Imaging and Saturation program at EIC

Inclusive diffraction on proton



Inclusive diffraction is special:

Important observable for Imaging and Saturation program at EIC



Electron-Finder for scattered electron

- **MC ID:** MC outgoing electron using initial beam electron genealogy
- **Truth ID:** Reconstructed electron using truth MC electron link
- **Det ID:** Using cluster and tracking to find the electron

Current detector-based electron ID

```
edm4eic::ReconstructedParticleCollection ElectronID::FindScatteredElectron()
```

- Loop over all reconstructed particles, and apply cuts on:

- Require negative tracks
- $0.9 < E/p < 1.2$
- Isolated cluster

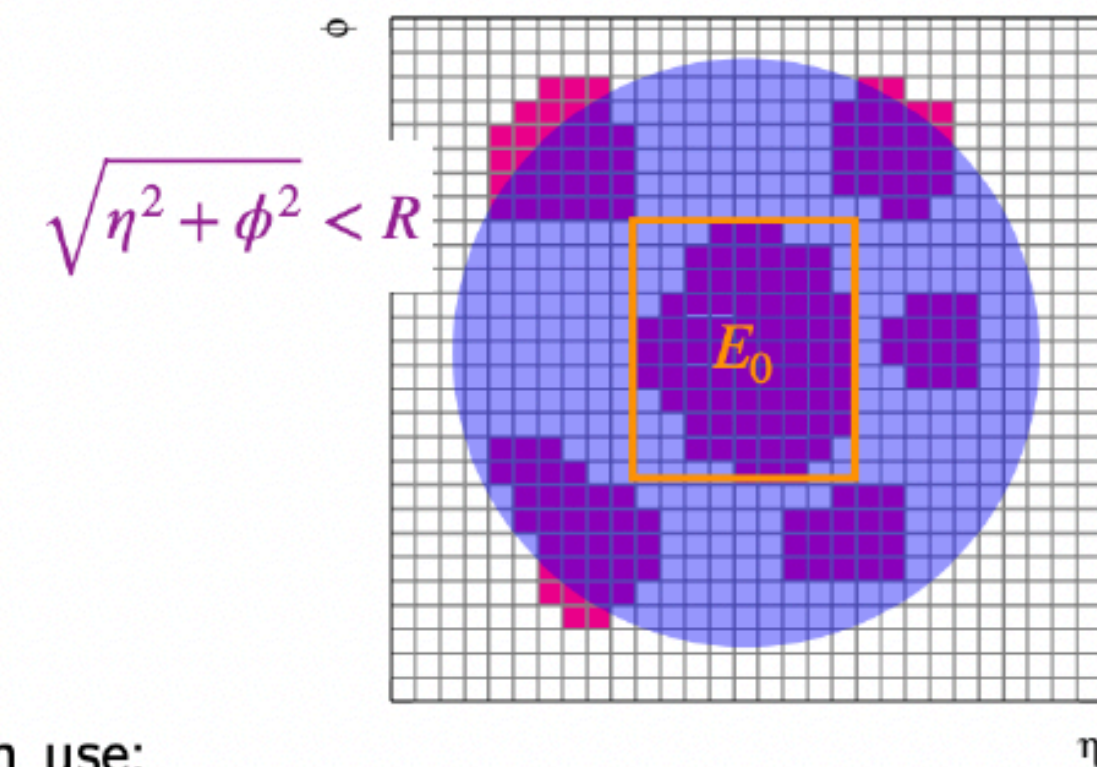
$$R = 0.4$$

$$E_0 / \Sigma E_R < 0.9$$

- If > 1 particles in collection, can use:

```
edm4eic::ReconstructedParticle
```

```
SelectHighestPT(edm4eic::ReconstructedParticleCollection)
```



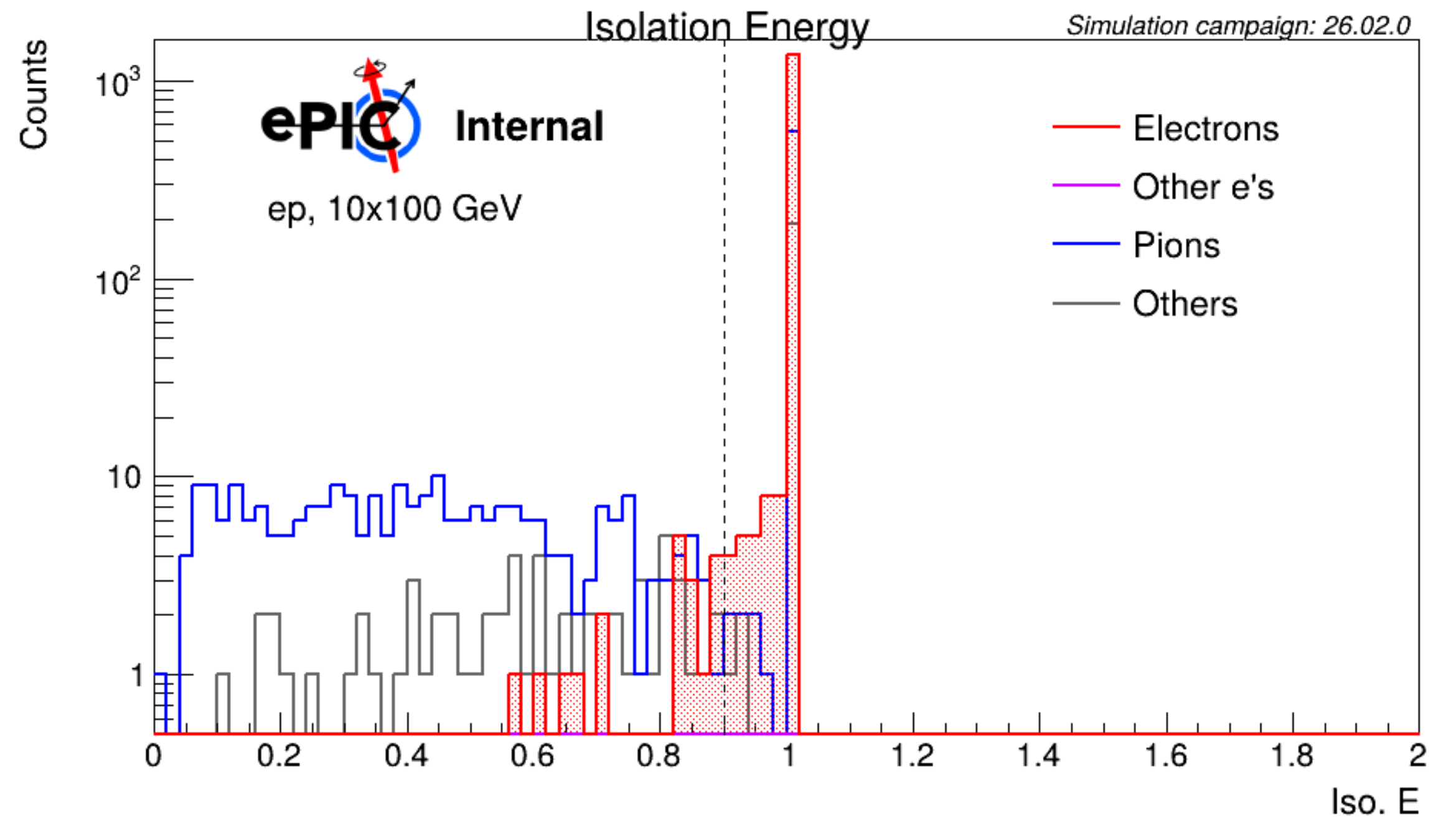
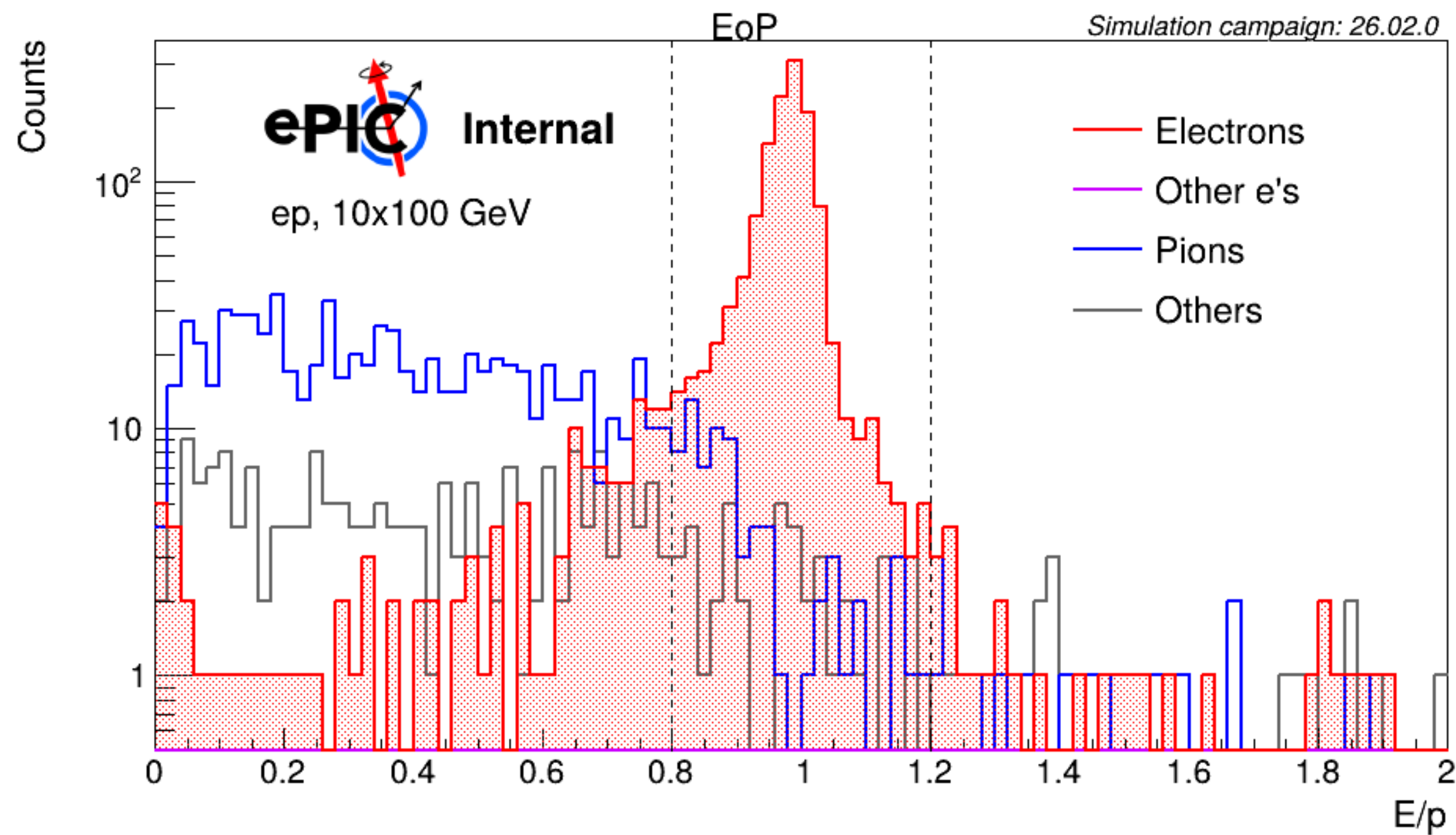
Tyler K. (JGU Mainz)

Identification of Forward proton

- **MC Particles:** MC truth Particles
- **ReconstructedTruthSeededChargedParticles:** B0 reconstructed charged tracks
- **ReconstructedTruthSeededChargedParticlesAssociations:** MC-to-reco matching for B0
- **ForwardRomanPotRecParticles:** Roman pot reconstructed particles
 - Looping over all particles and require positive charge
 - Selection based on $5.5 \text{ mrad} \leq \theta \leq 20 \text{ mrad}$ for B0
 - RP theta cut : 0-5mrad

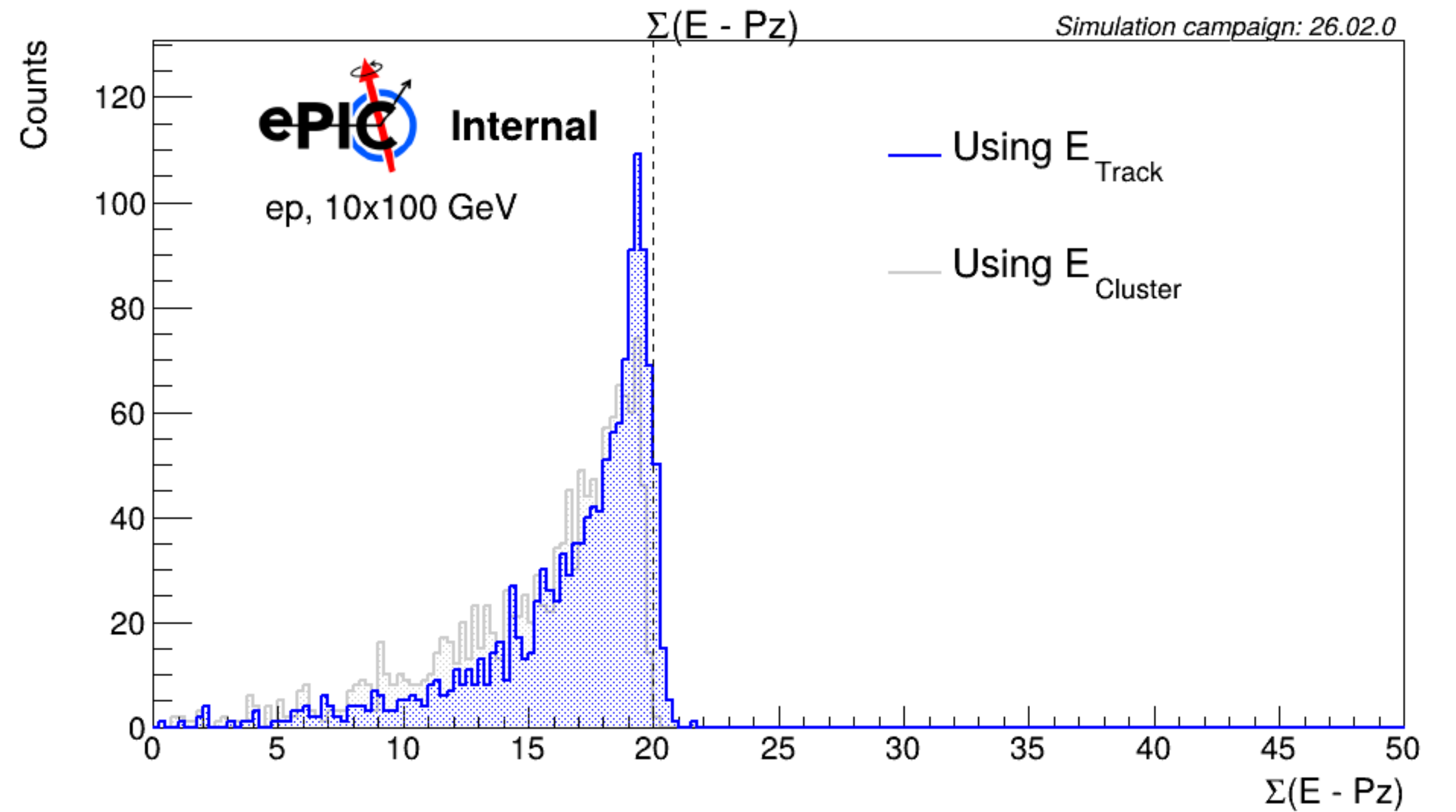
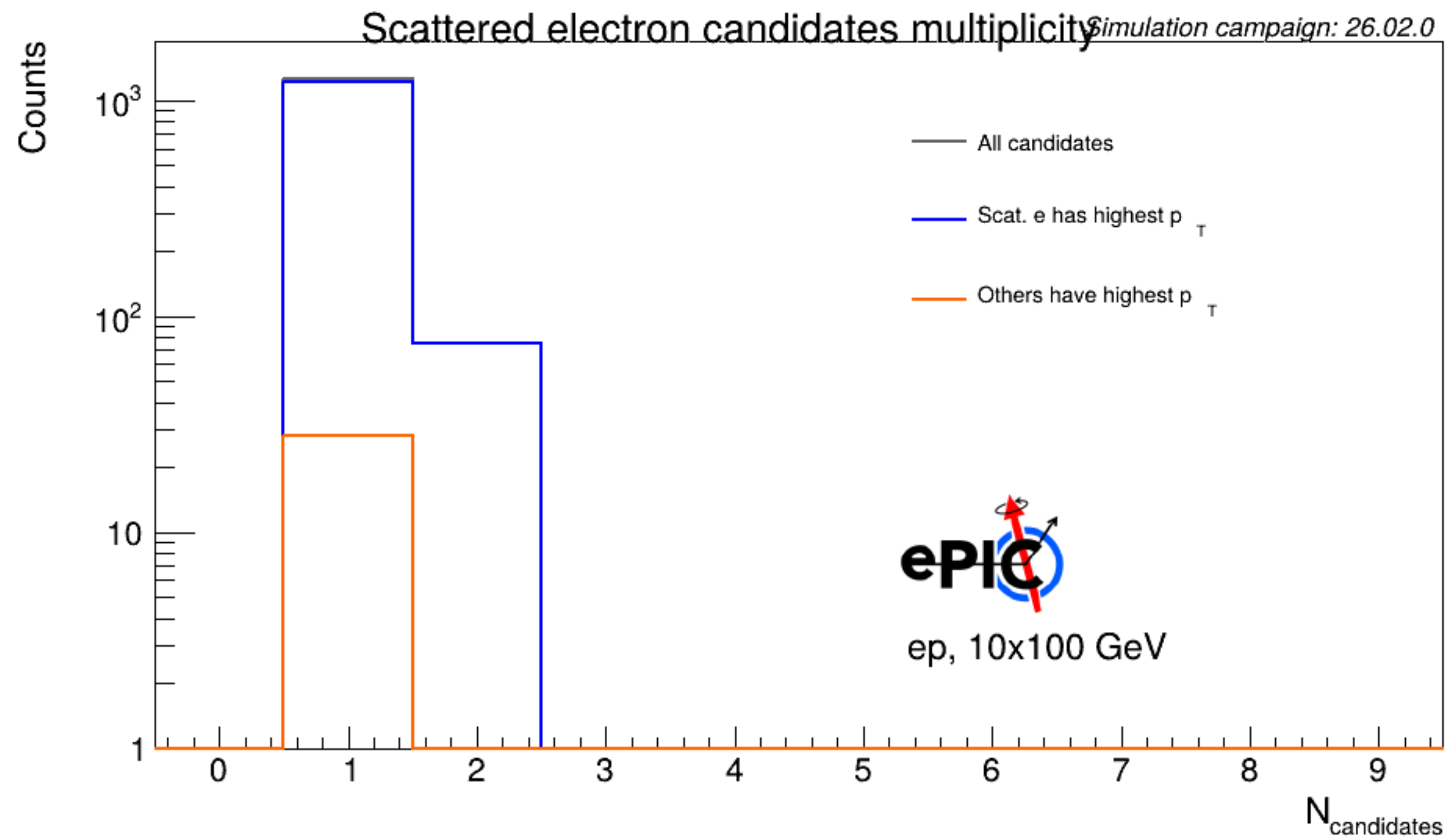
*RP reconstructed particles already in head-on frame in simulation file

Electron-Finder for scattered electron

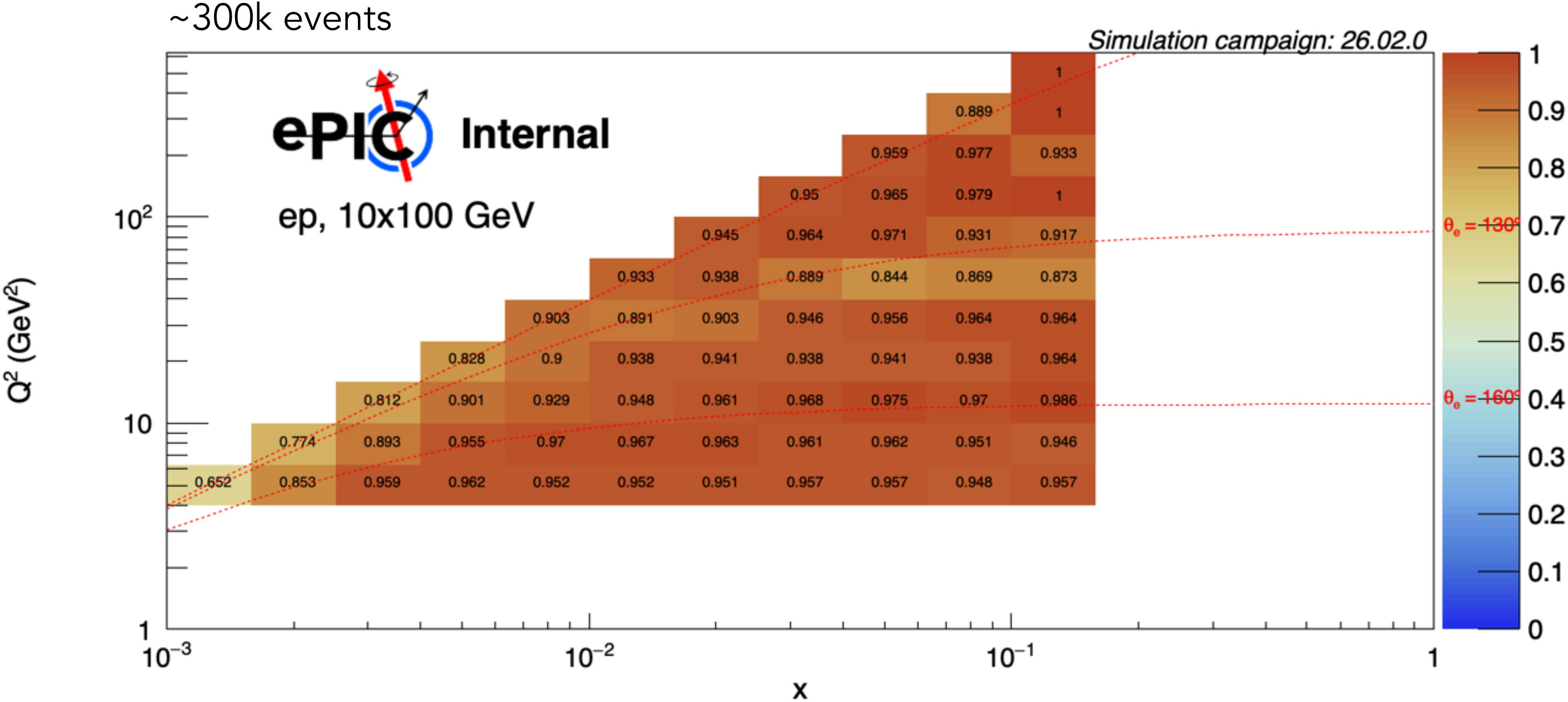


Using Rapgap for samples from 26.02.0 campaign

Electron-Finder for scattered electron

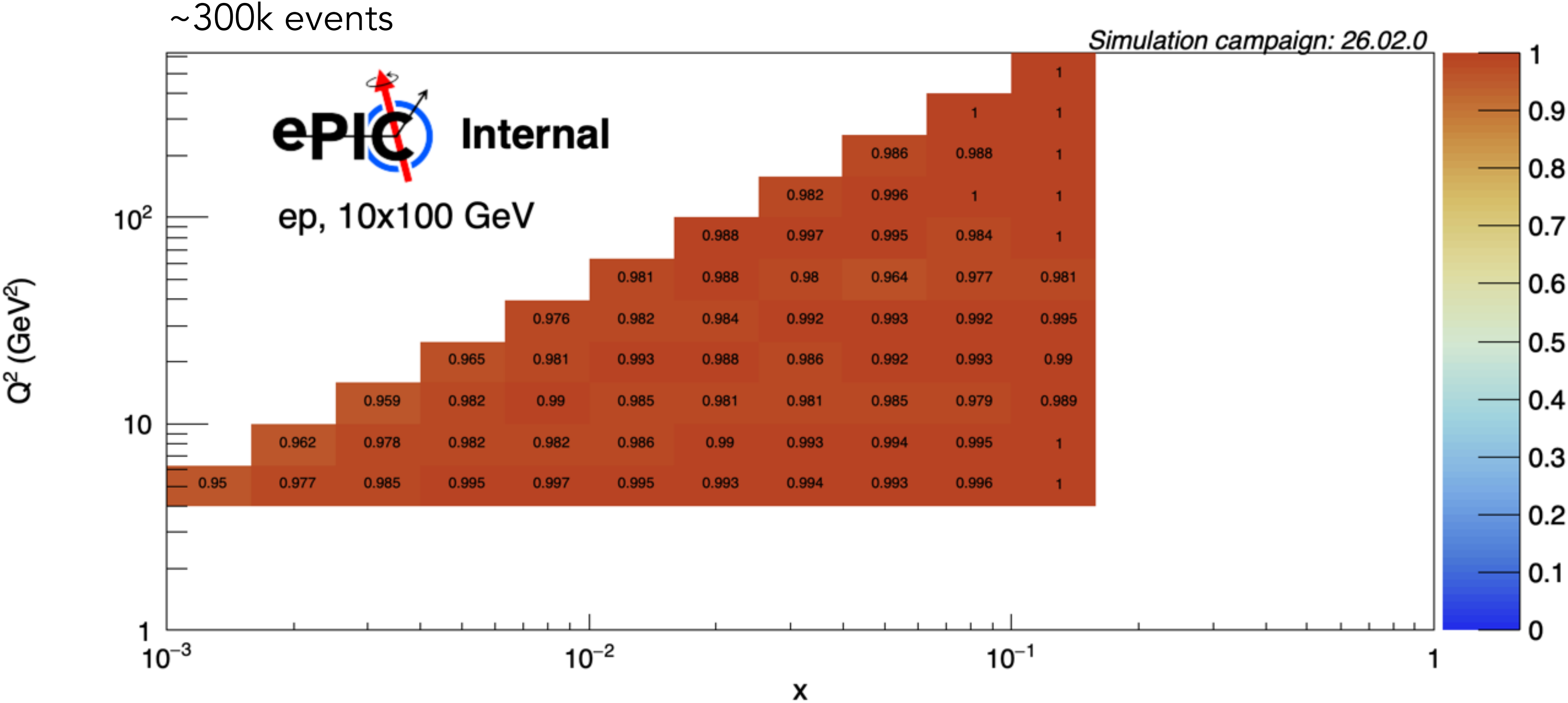


Efficiency



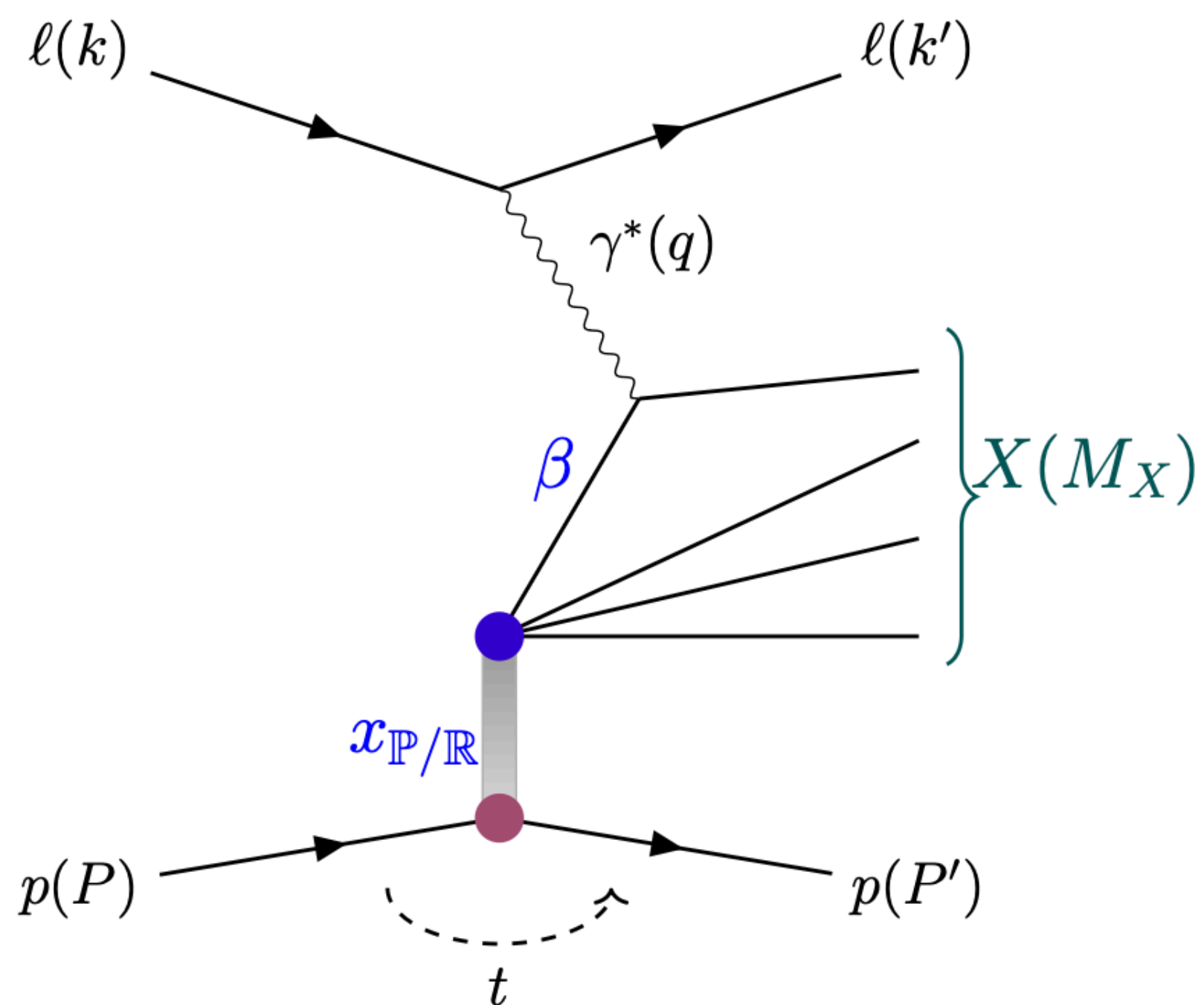
No. of Reconstructed electrons
Total MC Electrons

Purity



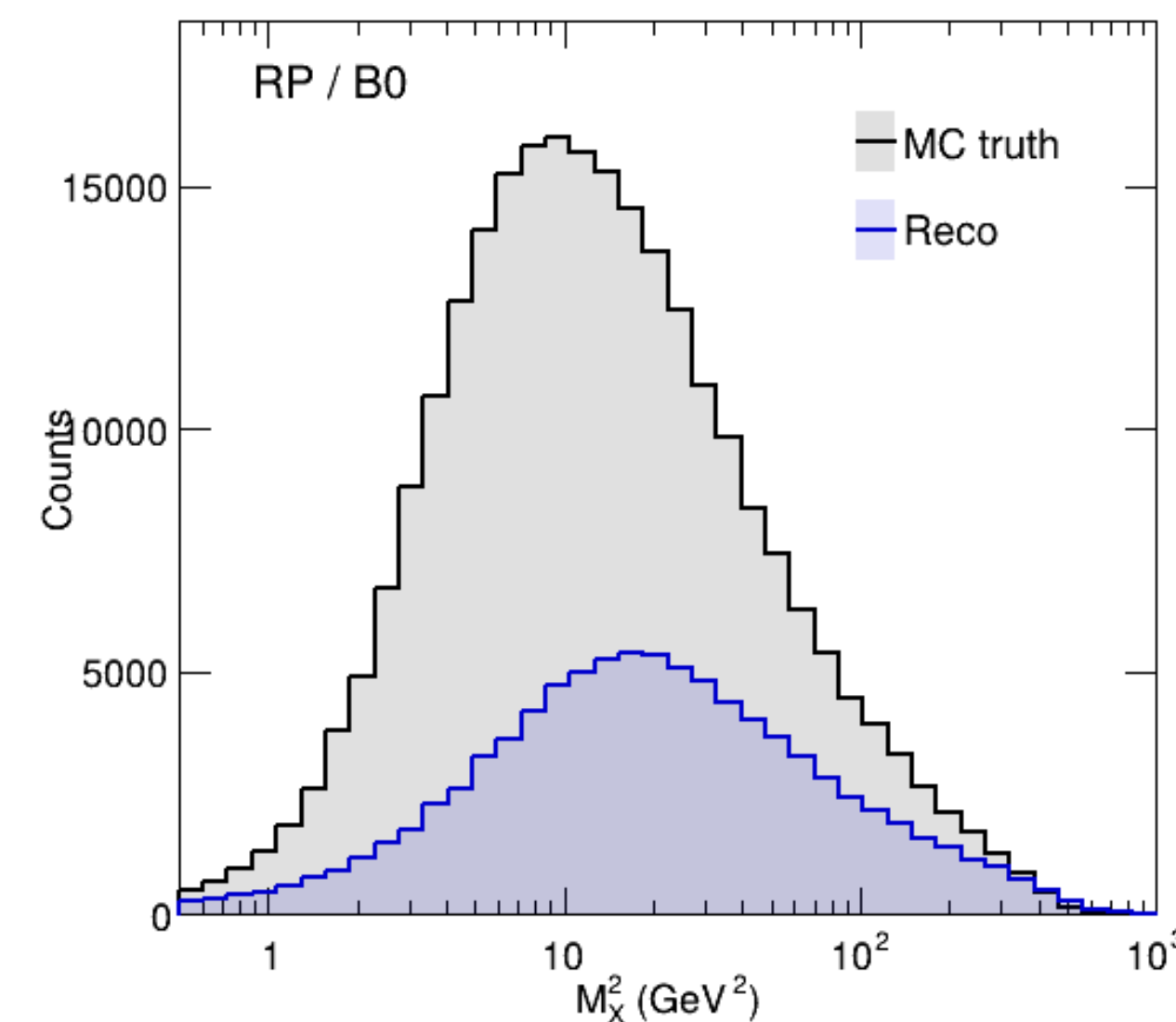
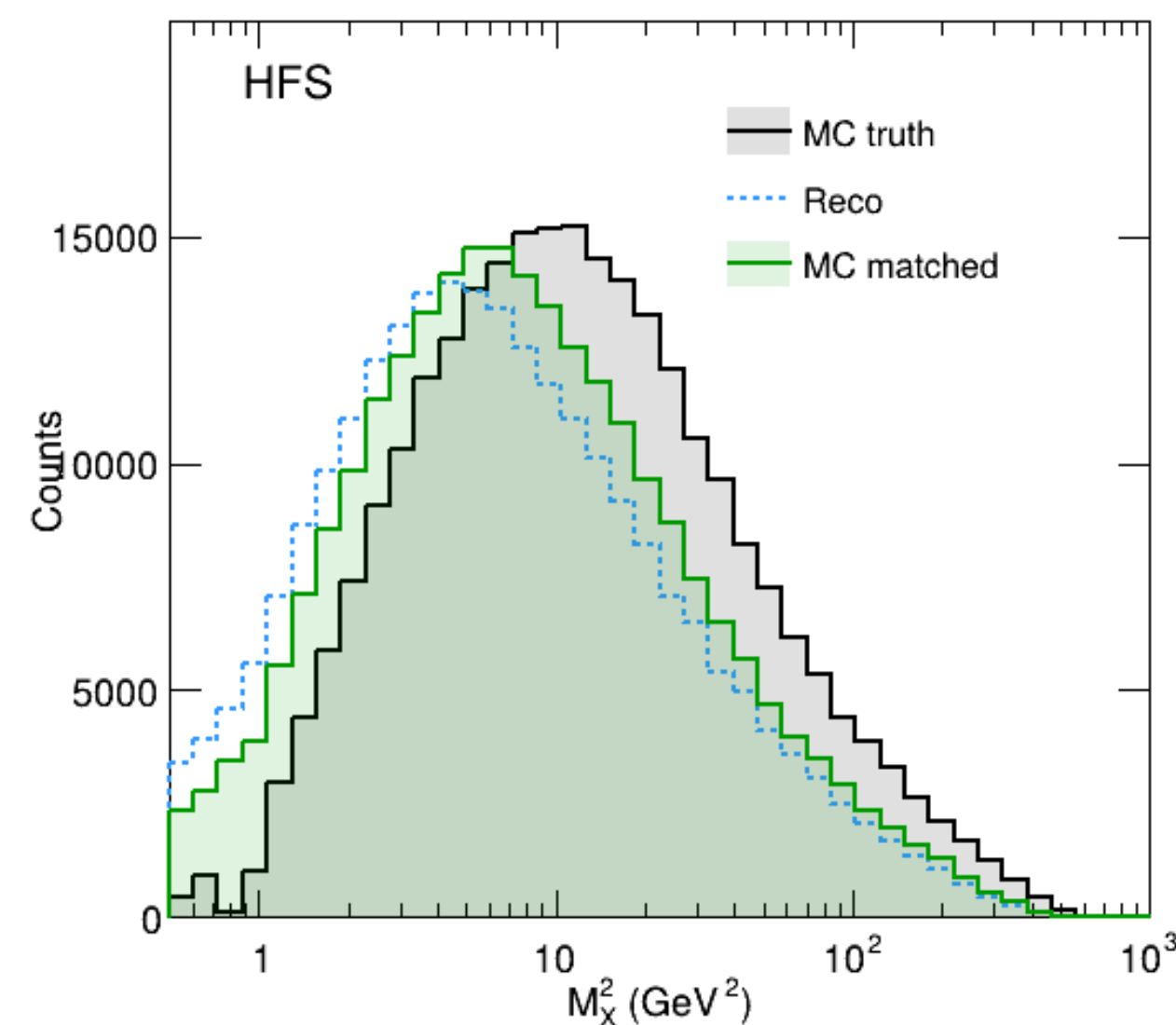
eID Reconstructed electrons
Reconstructed electrons

Hadronic final state



$$M_{X,\text{EFO}}^2 = \left(\sum E_i \right)^2 - \left(\sum p_{X,i} \right)^2 - \left(\sum p_{Y,i} \right)^2 - \left(\sum p_{Z,i} \right)^2,$$

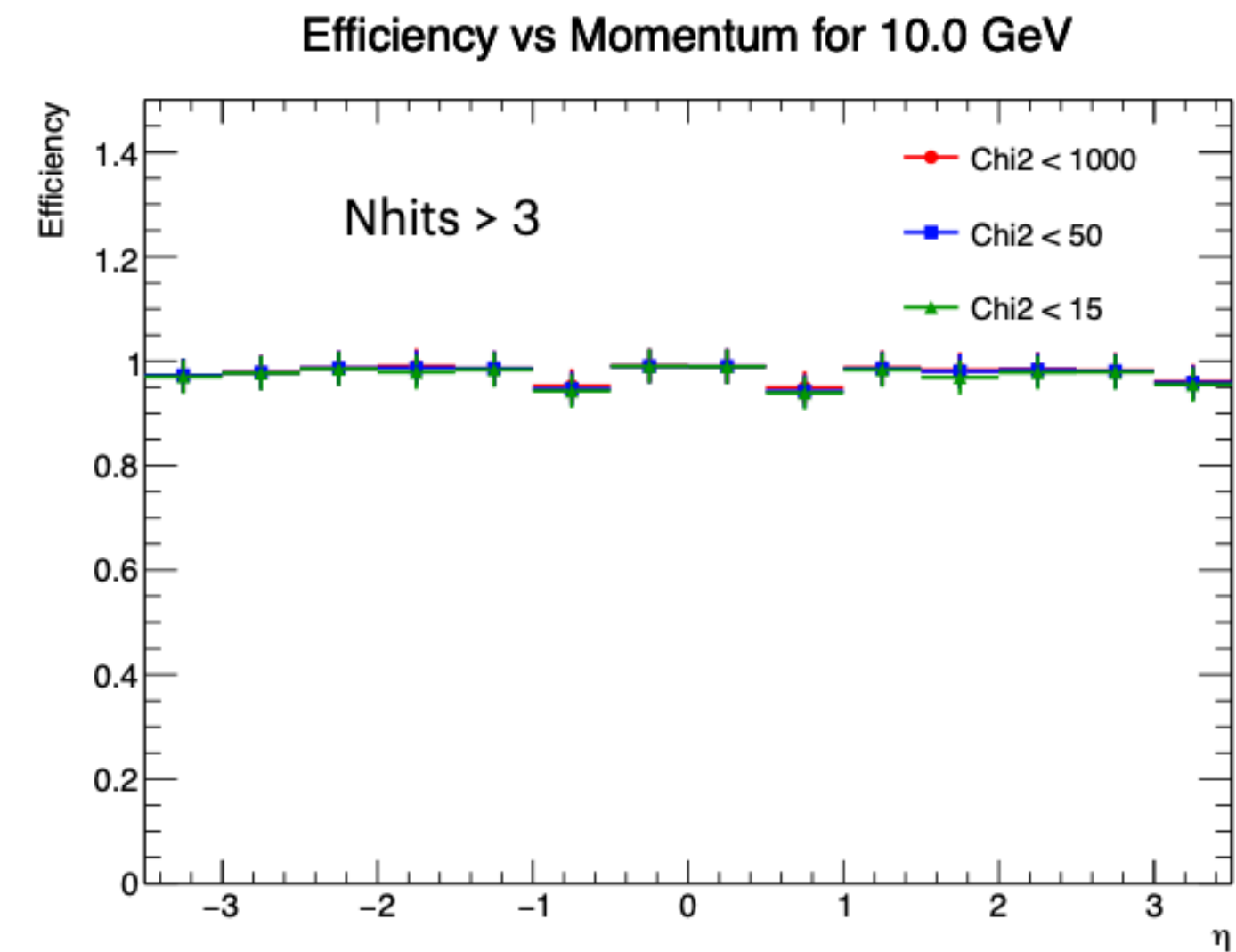
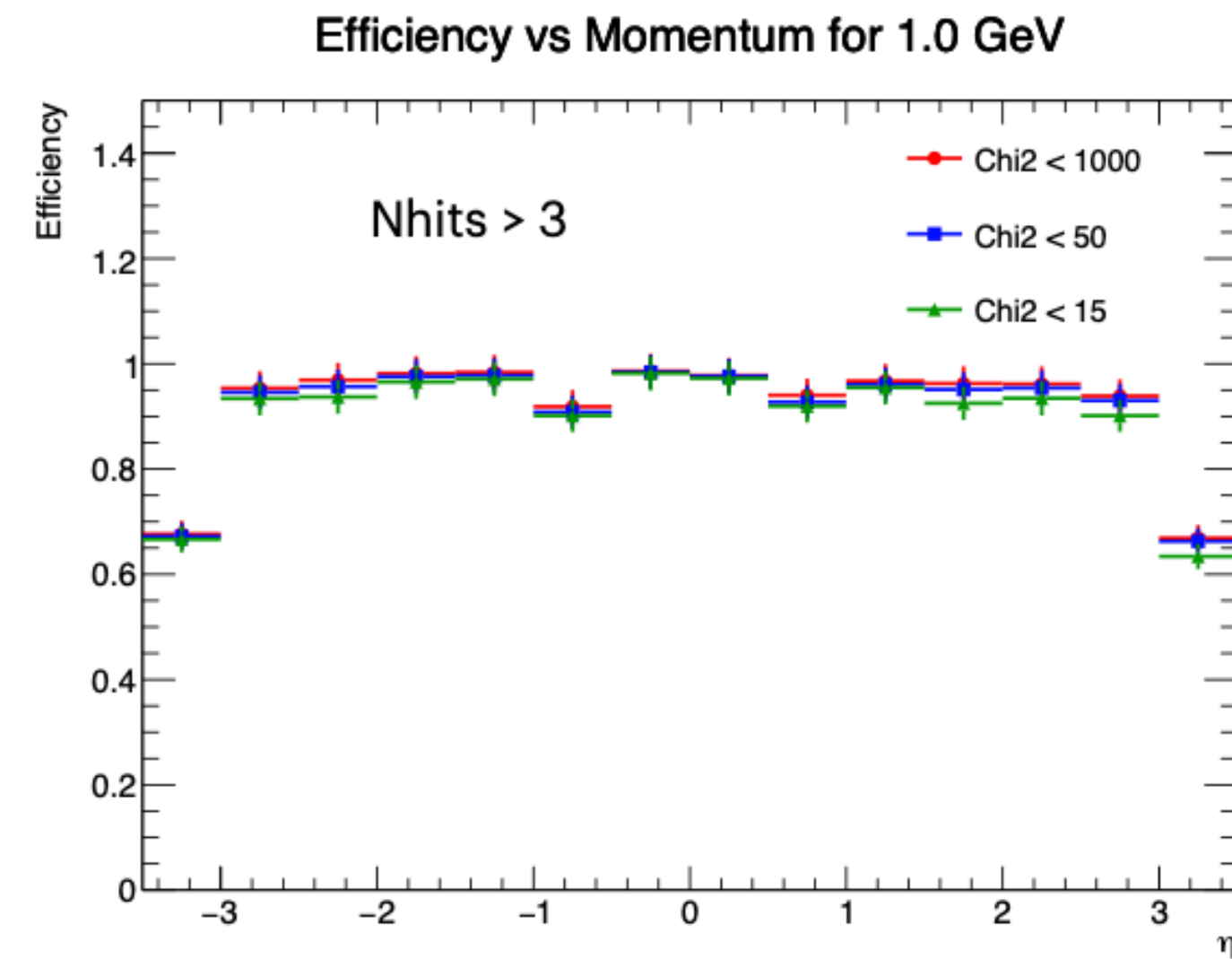
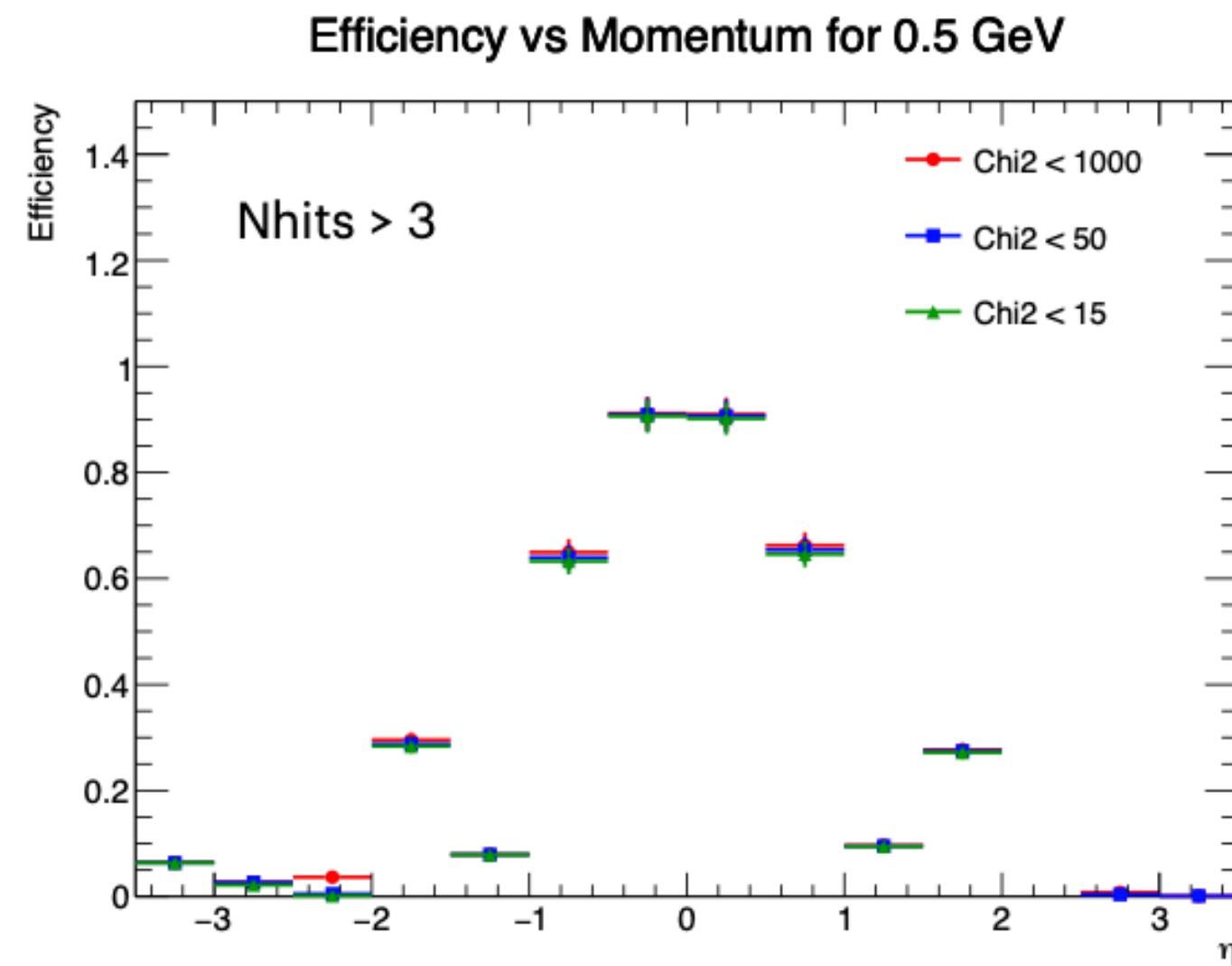
$$M_X^2 \approx [1 - x_L(1 + x)]W^2.$$



$$x_{\mathbb{P}} = \frac{(P - P') \cdot q}{P \cdot q} = \frac{Q^2 + M_X^2 - t}{Q^2 + W^2 - M_p^2},$$

$$\beta = \frac{Q^2}{2(P - P') \cdot q} = \frac{Q^2}{Q^2 + M_X^2 - t}.$$

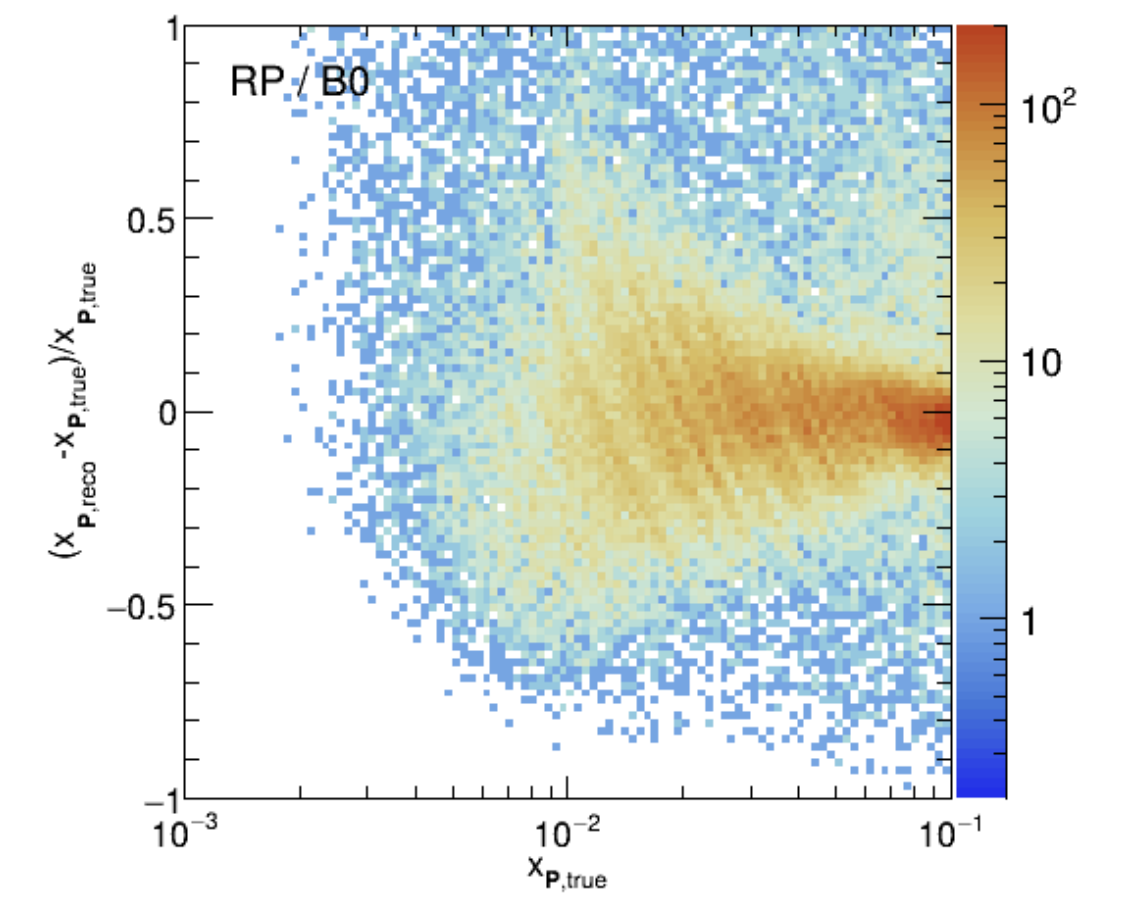
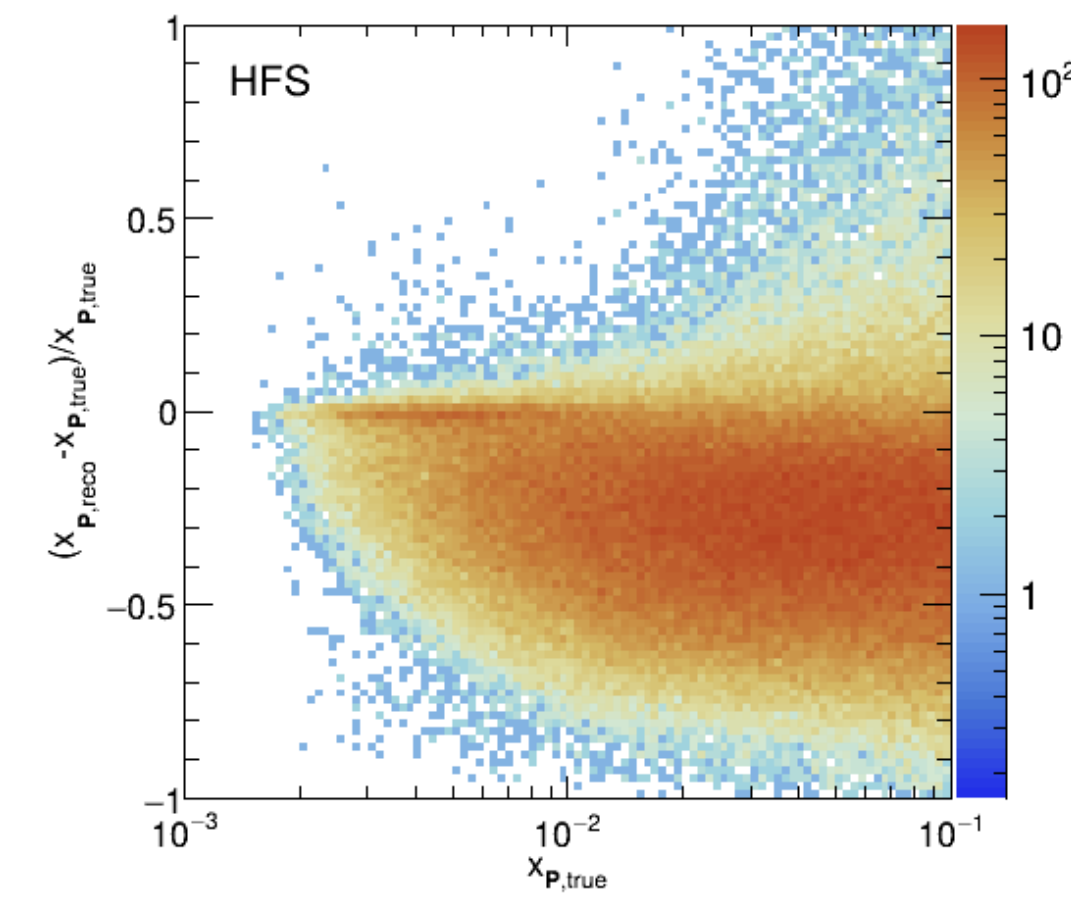
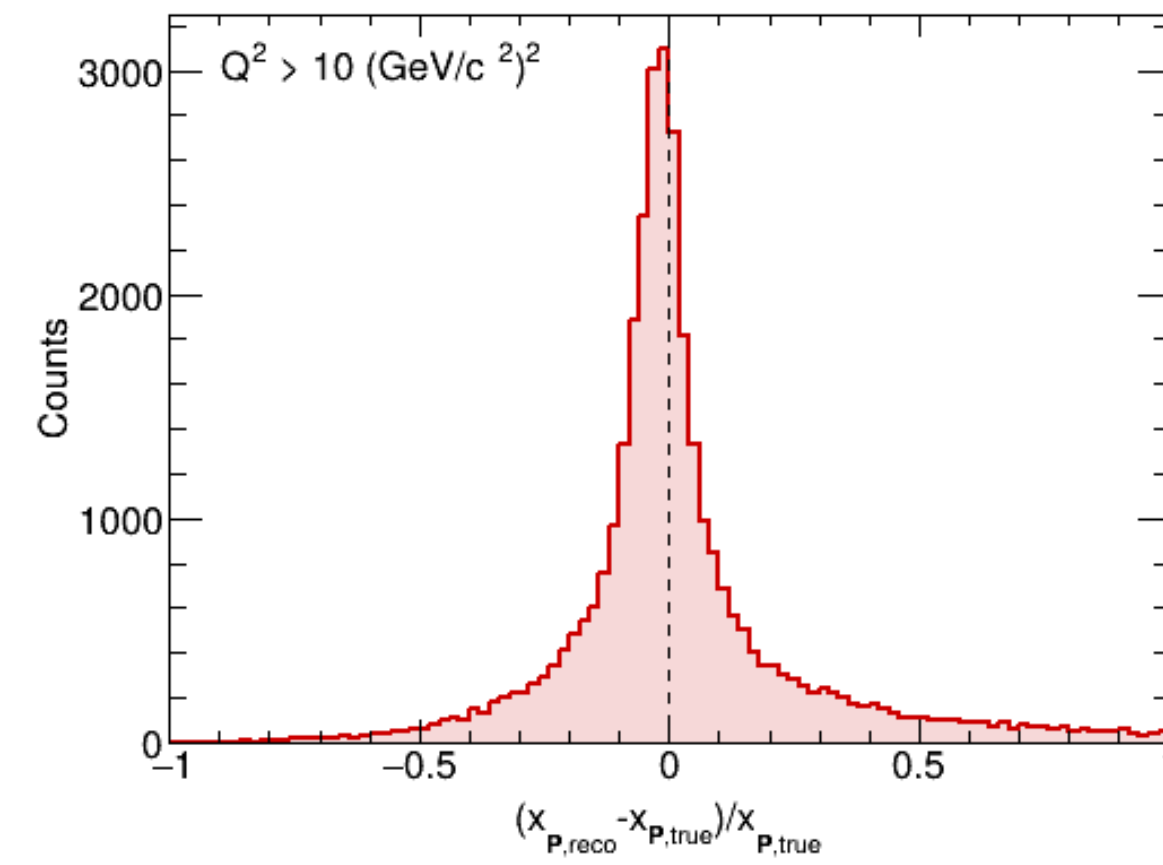
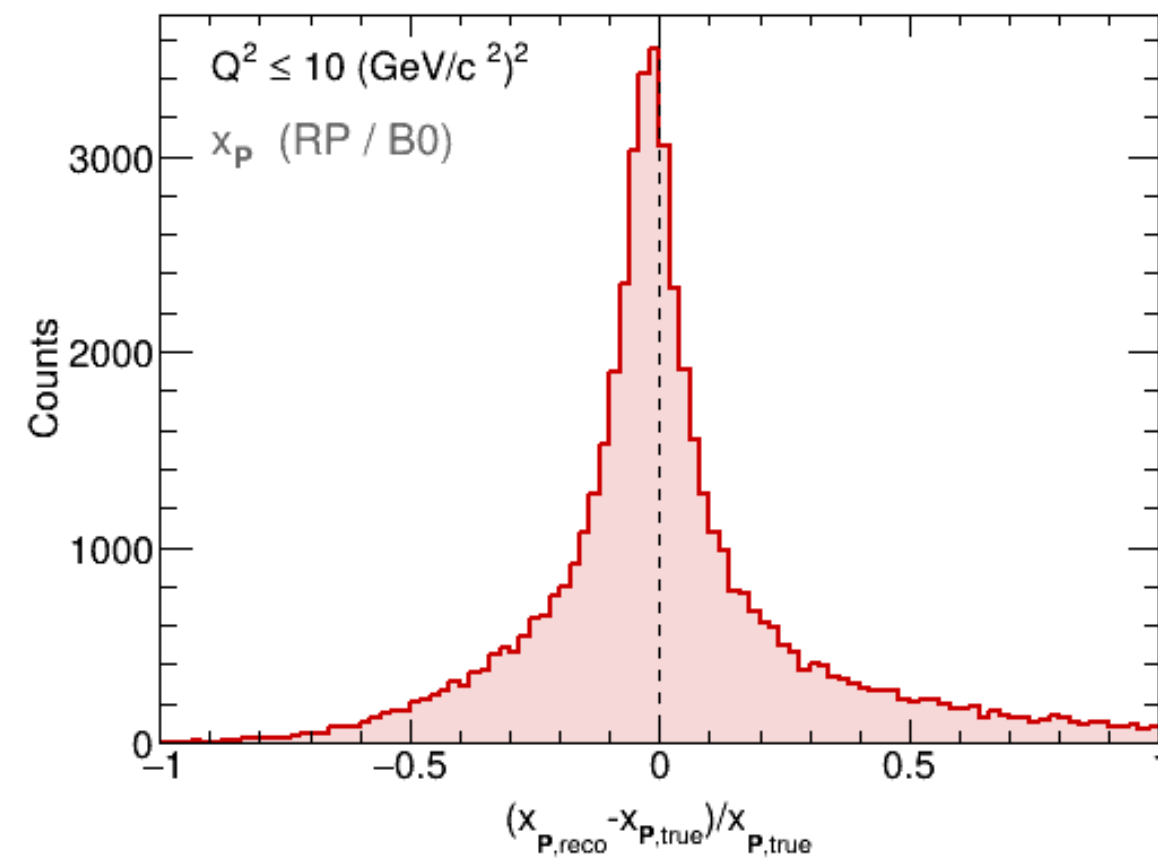
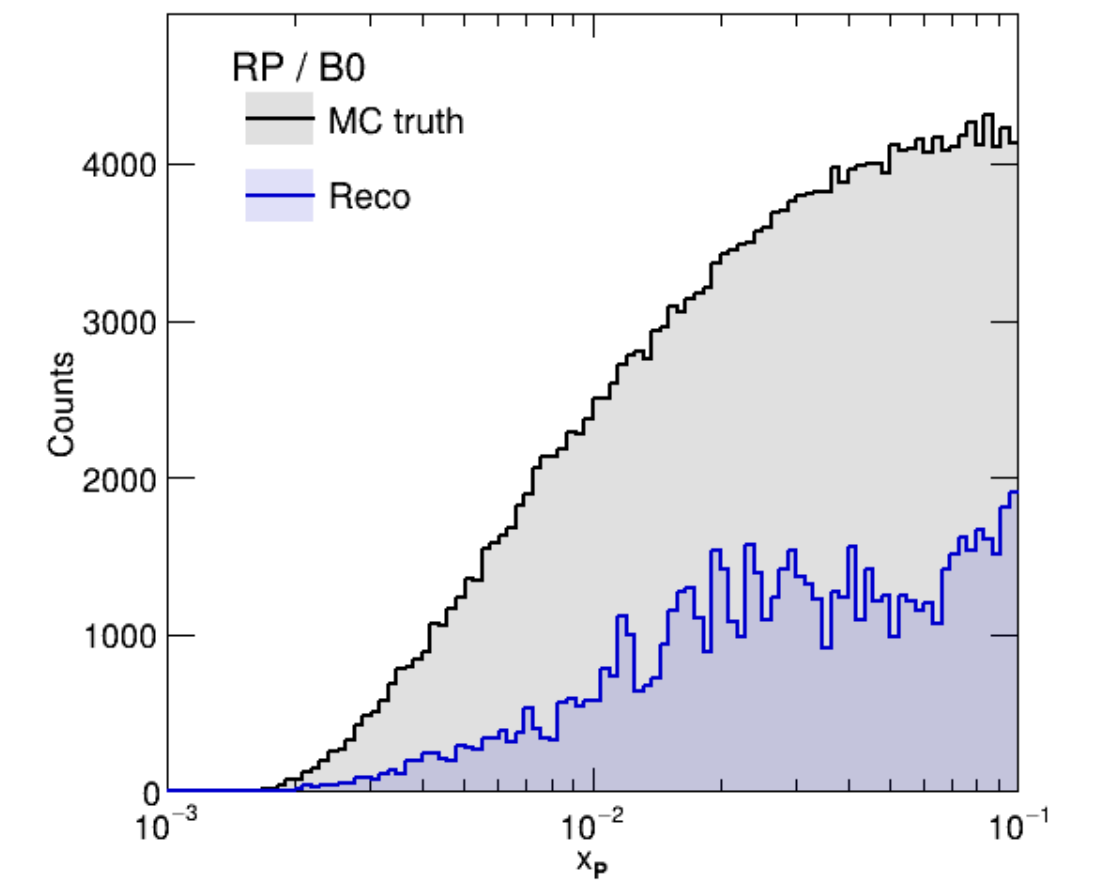
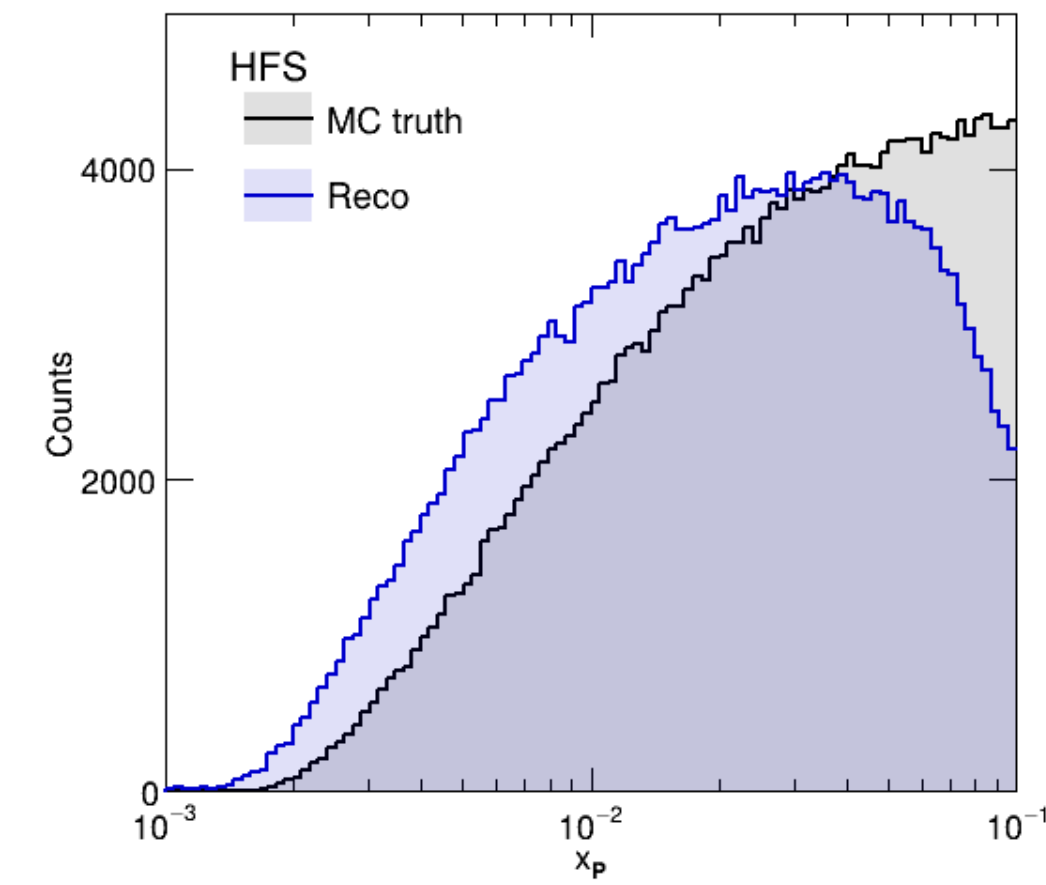
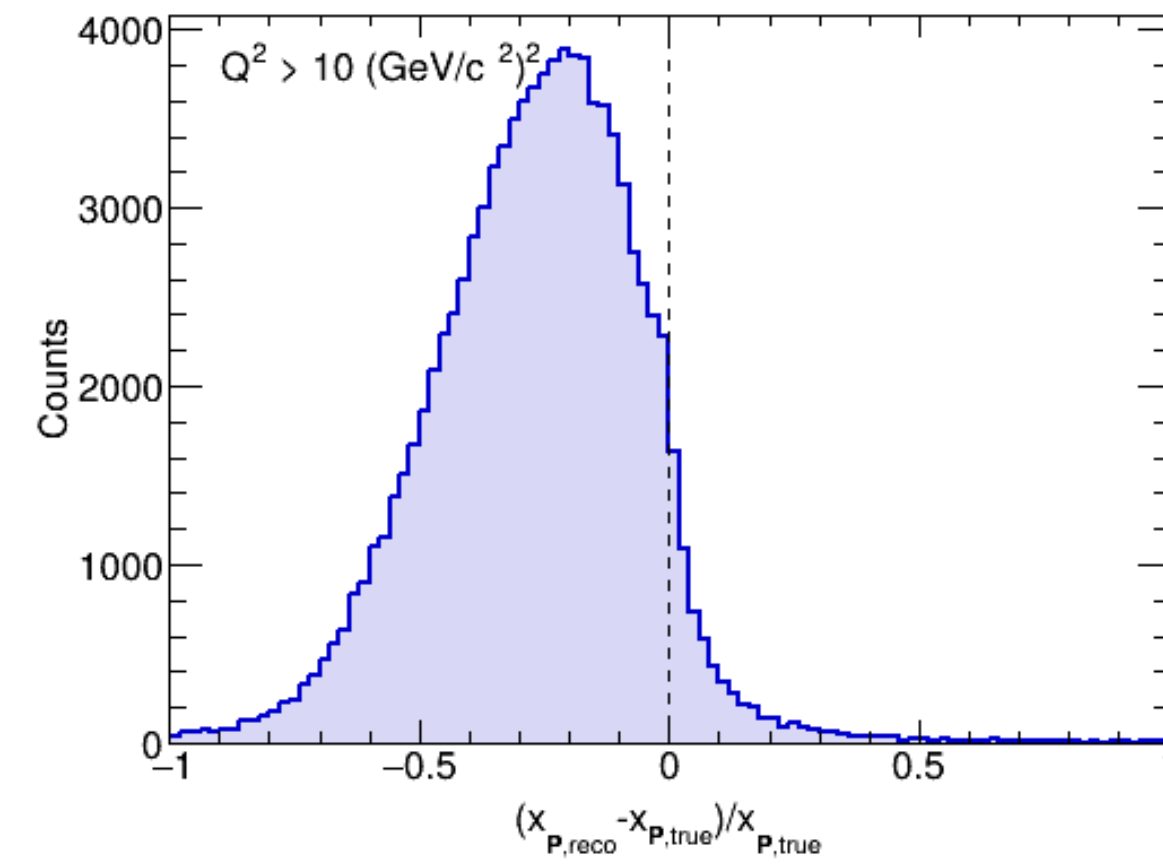
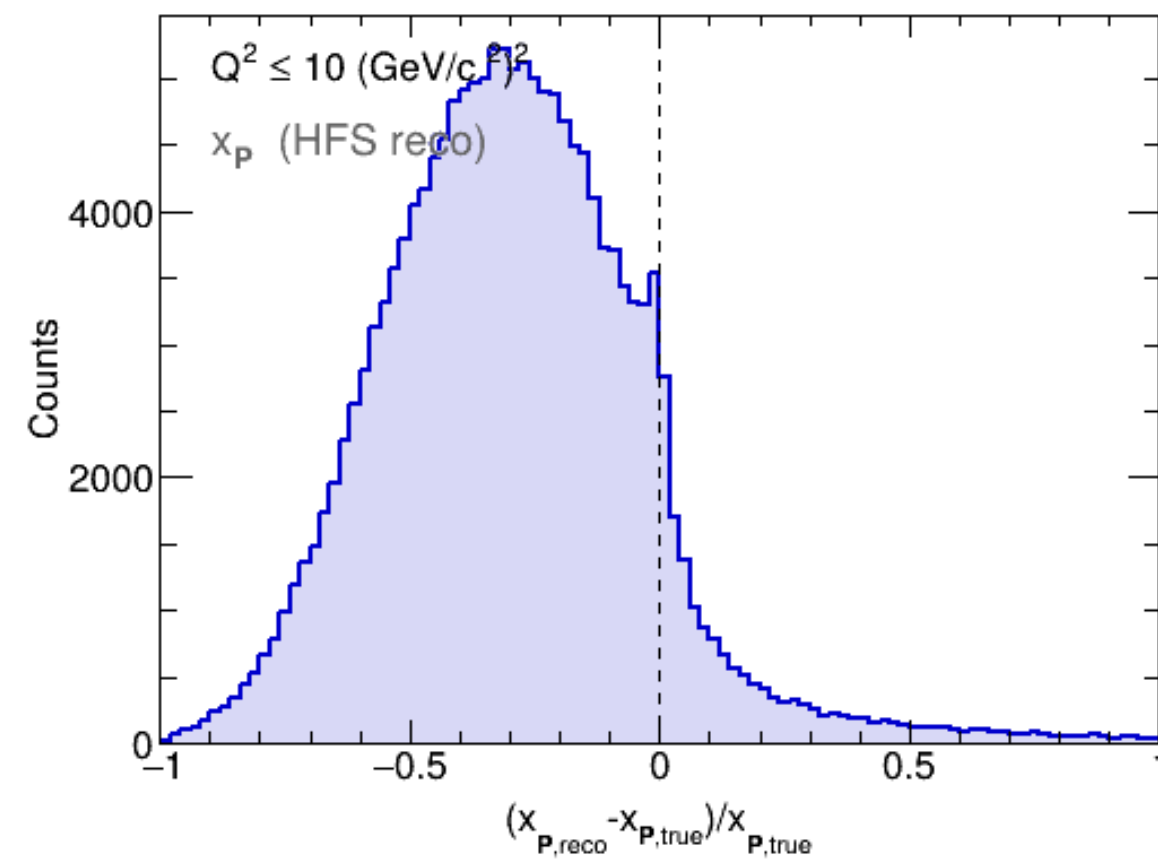
Recap from single pion simulations



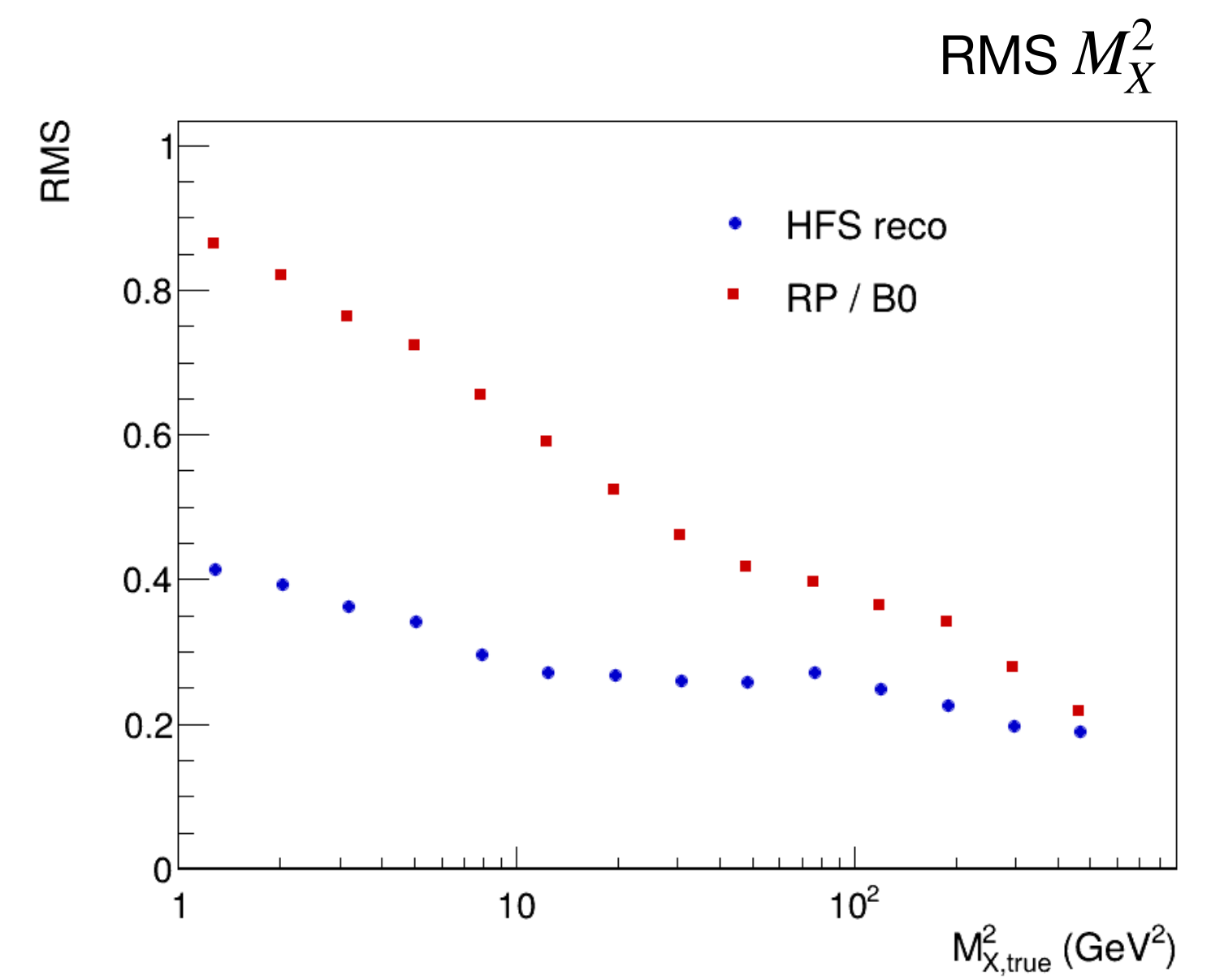
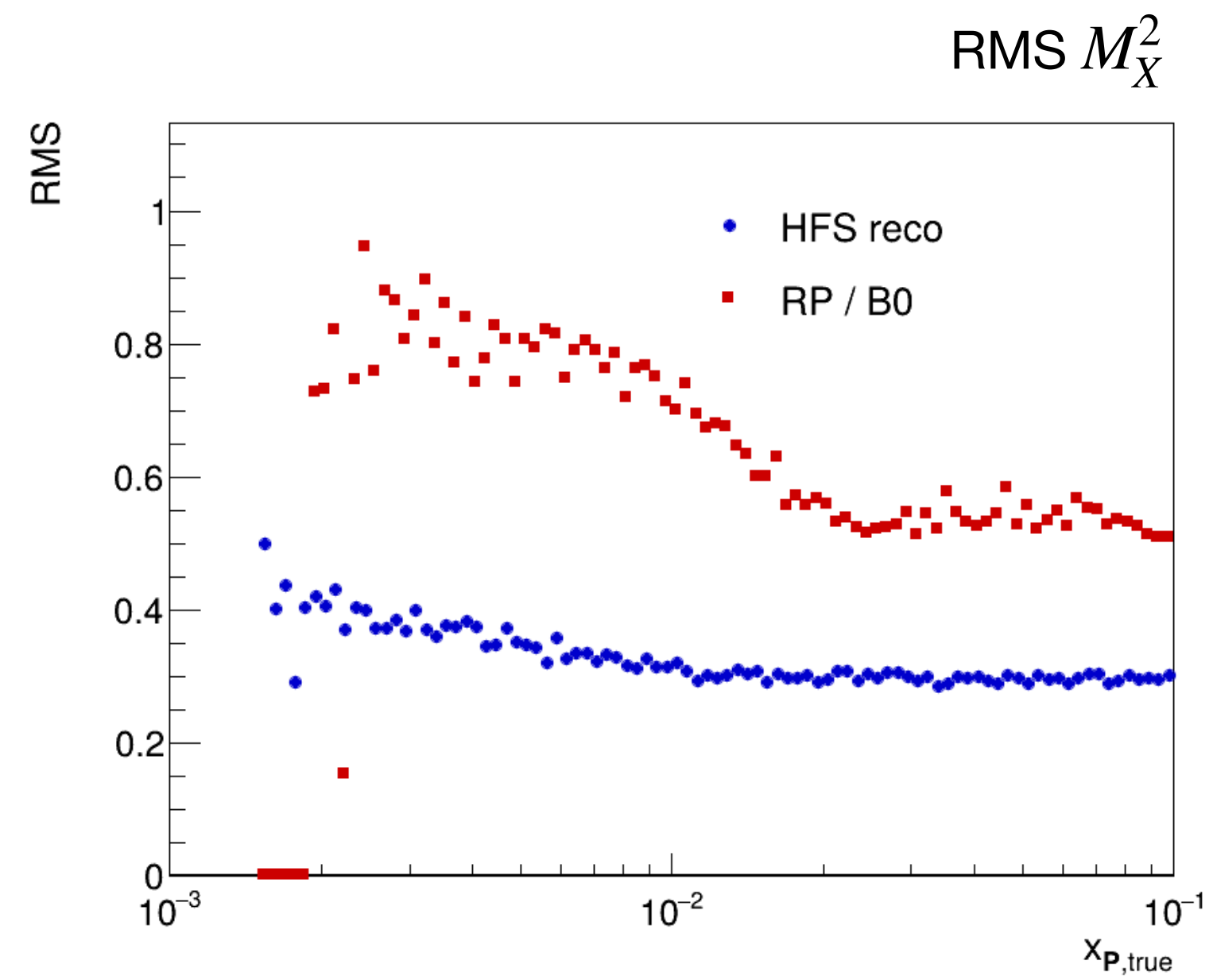
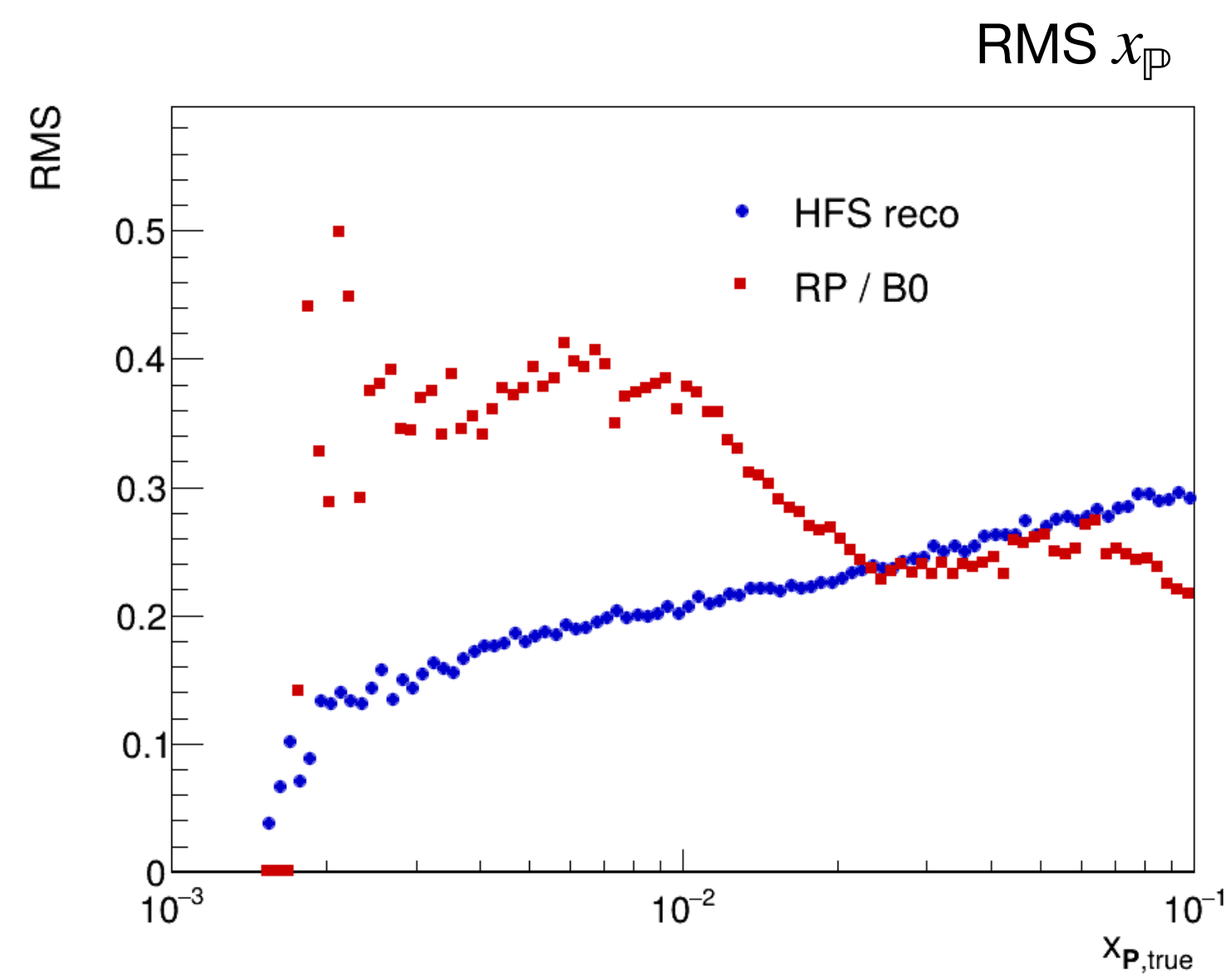
ePIC Tracking WG Meeting,
Vassu Doomra, UC Berkeley
June 18, 2026

xPom

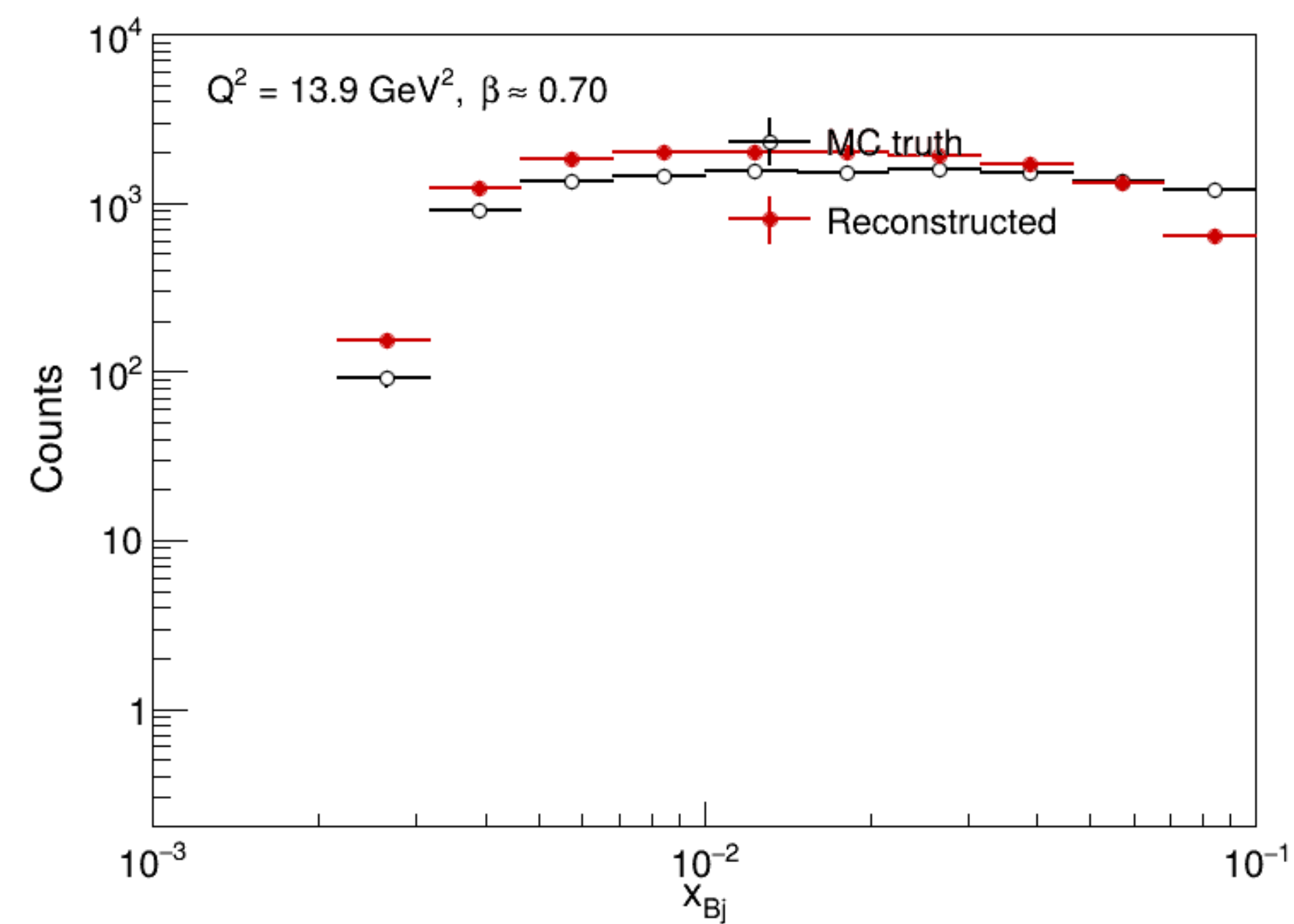
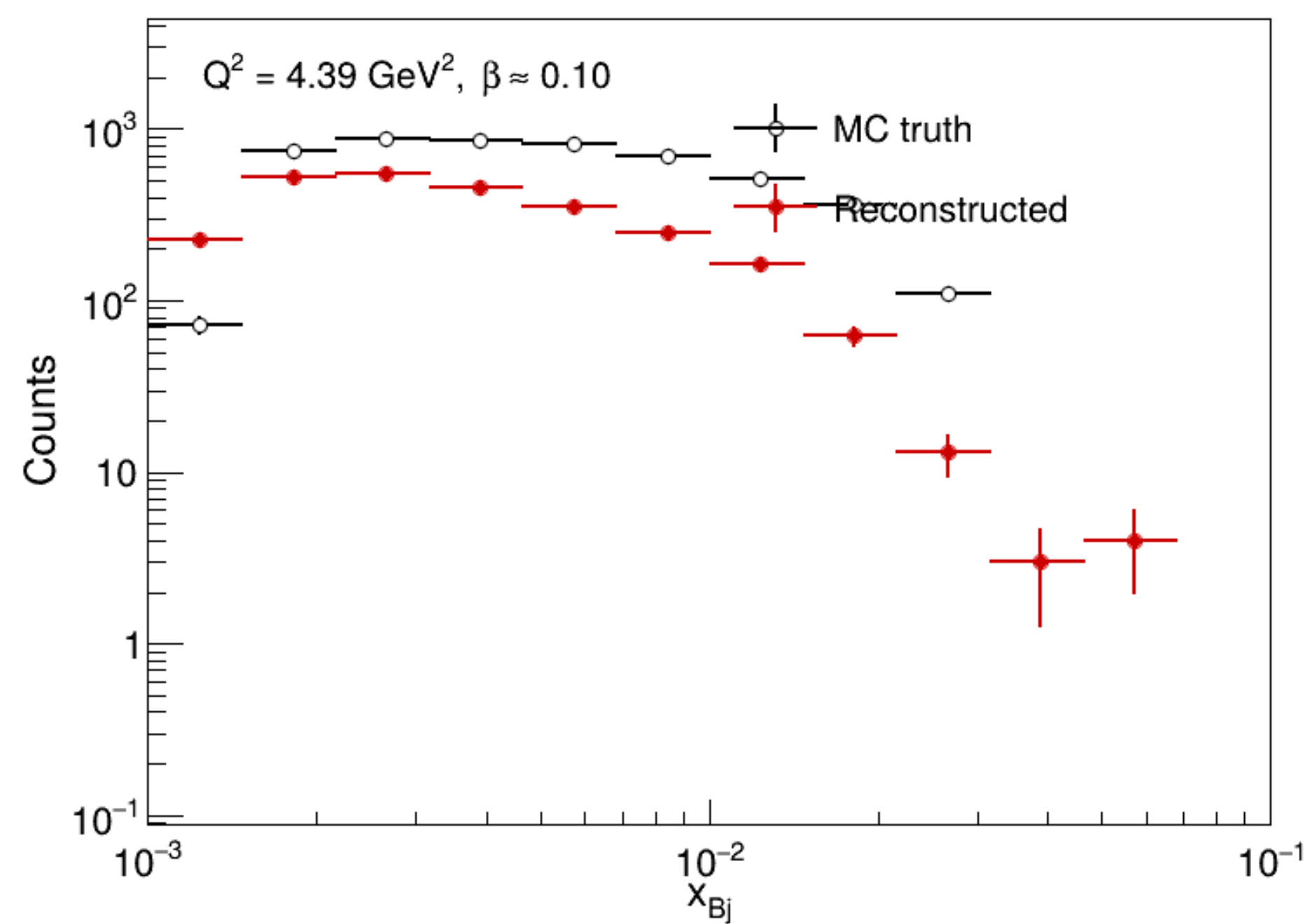
$p_T > 0.25 \text{ GeV}^2, |p| > 0.4 \text{ GeV}^2$ (for reconstructed particles for HFS)



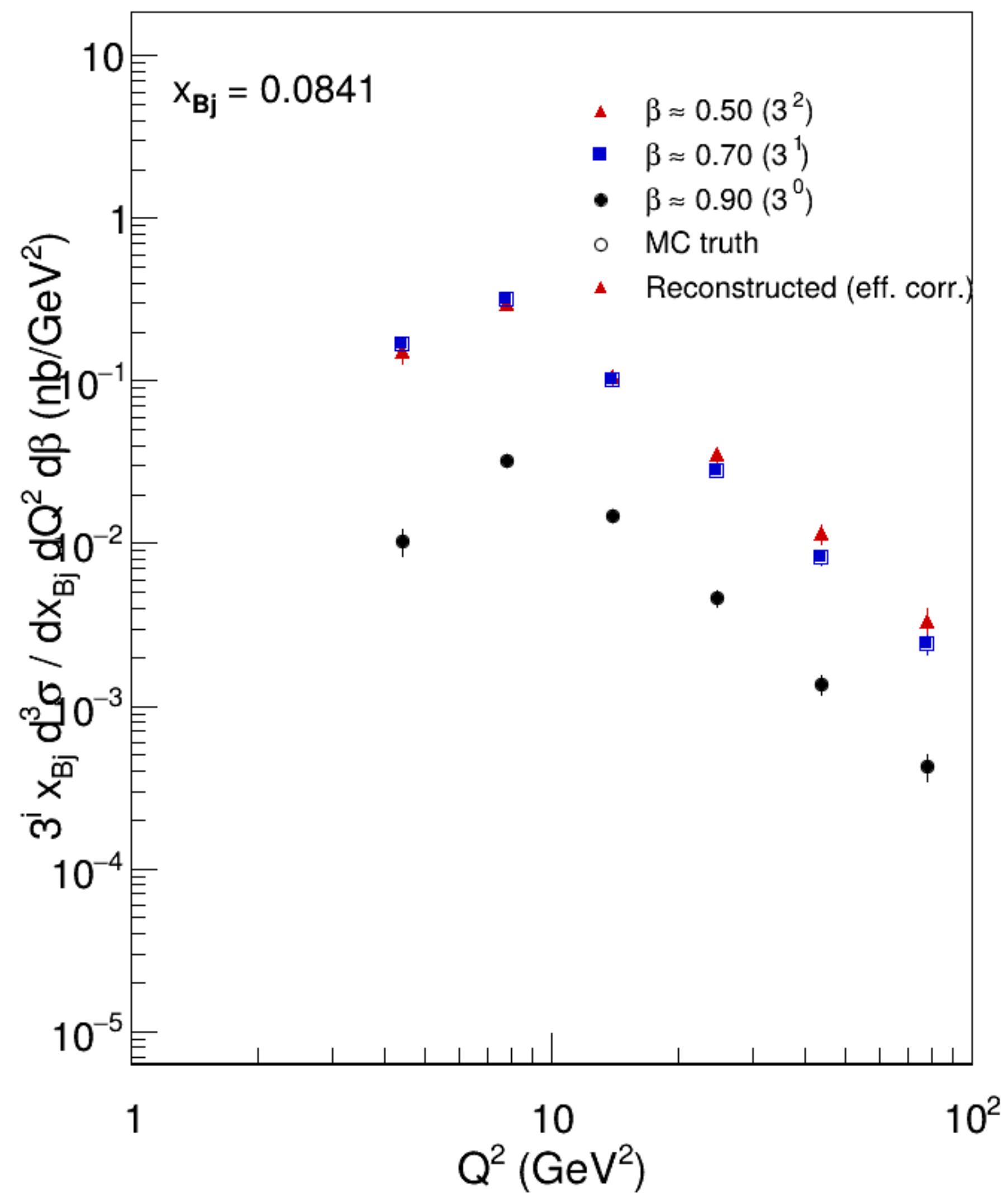
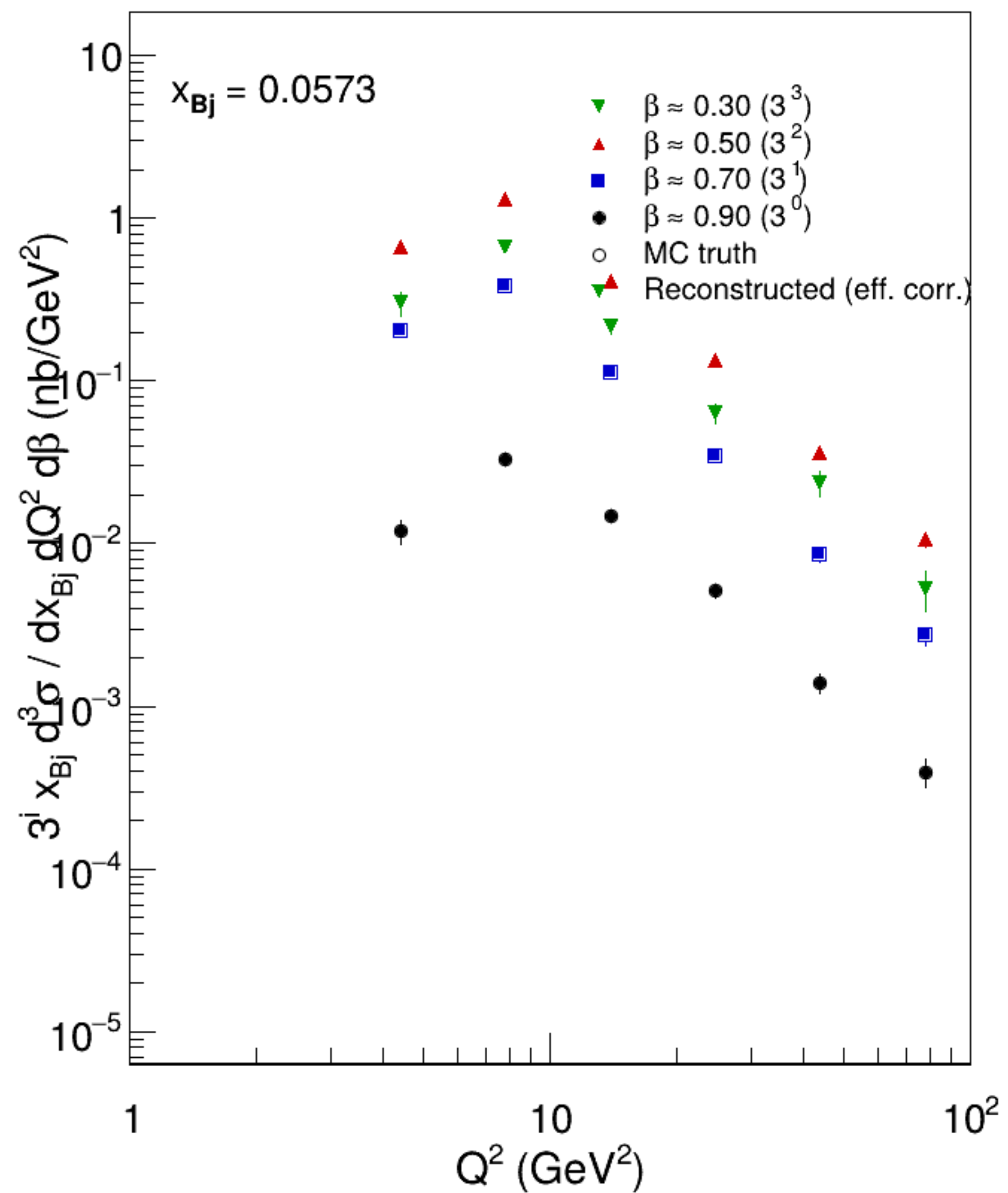
Resolution



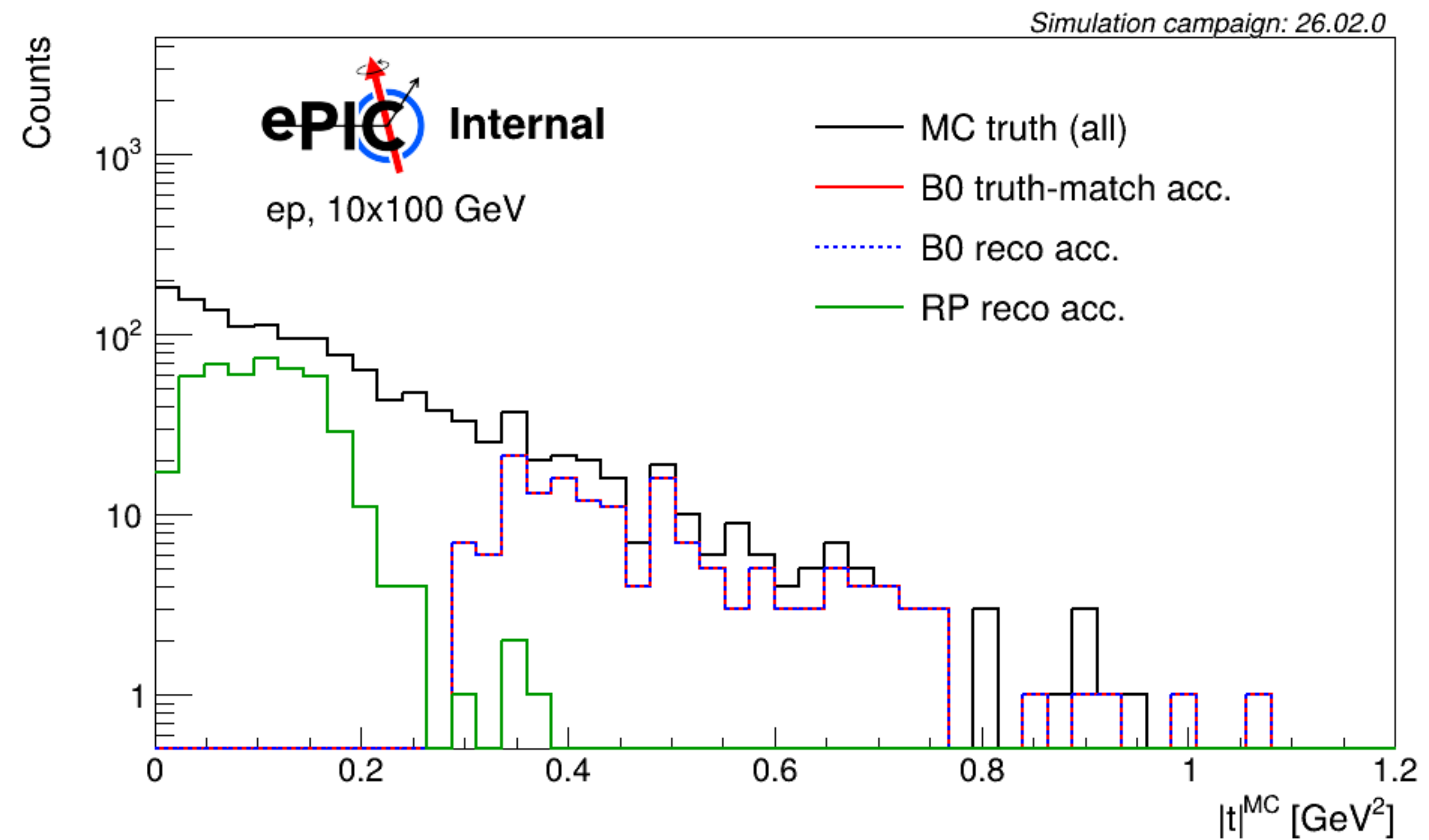
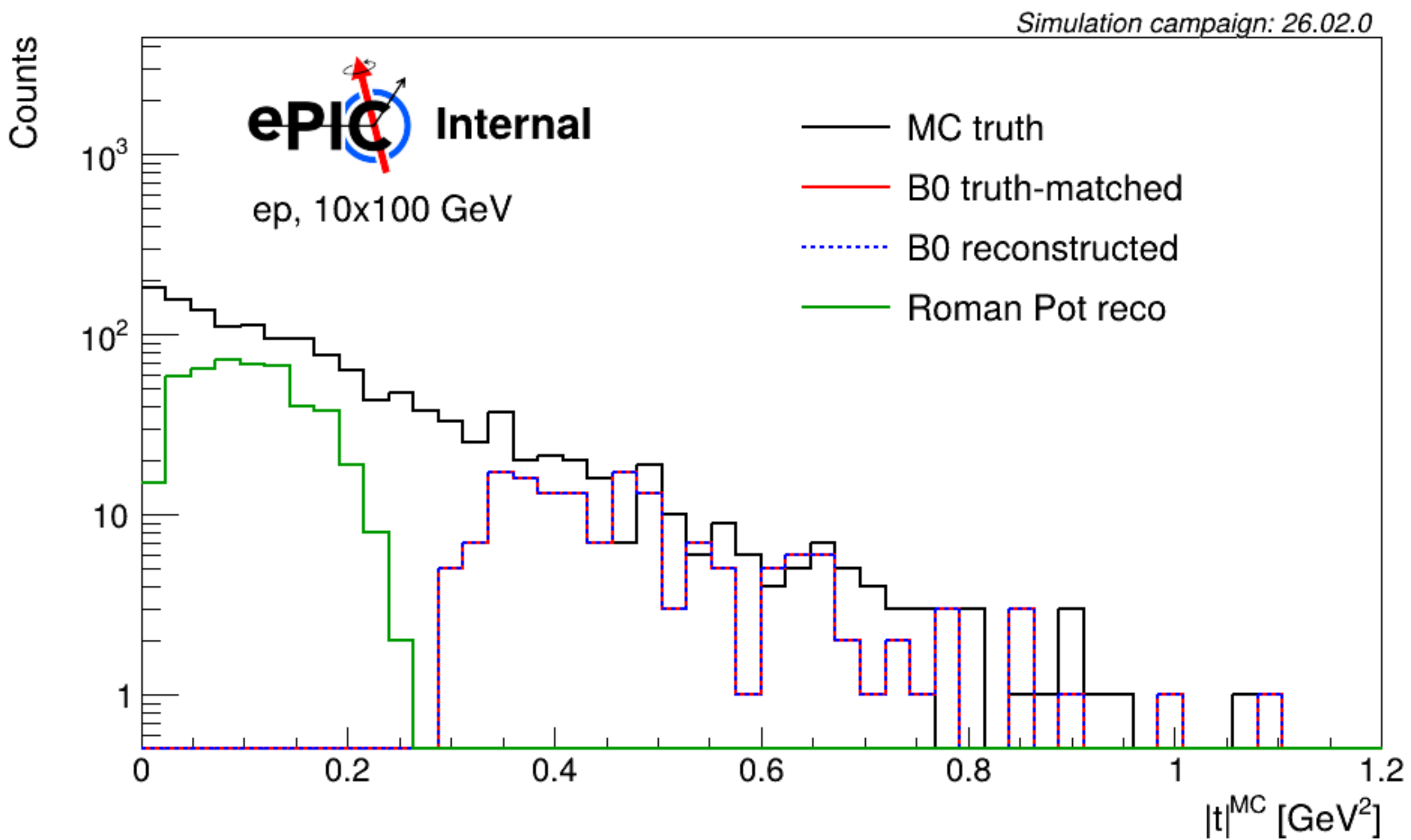
Bin Migration



Cross section



Identification of Forward proton



Outlook and Next Steps

Inclusive diffraction on Silver

- Worked with Sartre authors for final state state generation in desired format and fixing some bugs in output
- First time ever samples submitted for production (eAg , 10x115)

Whats Next

- Effect of Radiative Corrections
- ePIC Performance for the Double ratio (eAg/ep)

