Electron reconstruction and A_1^n, $A_1^{^3\mathrm{He}}$ update

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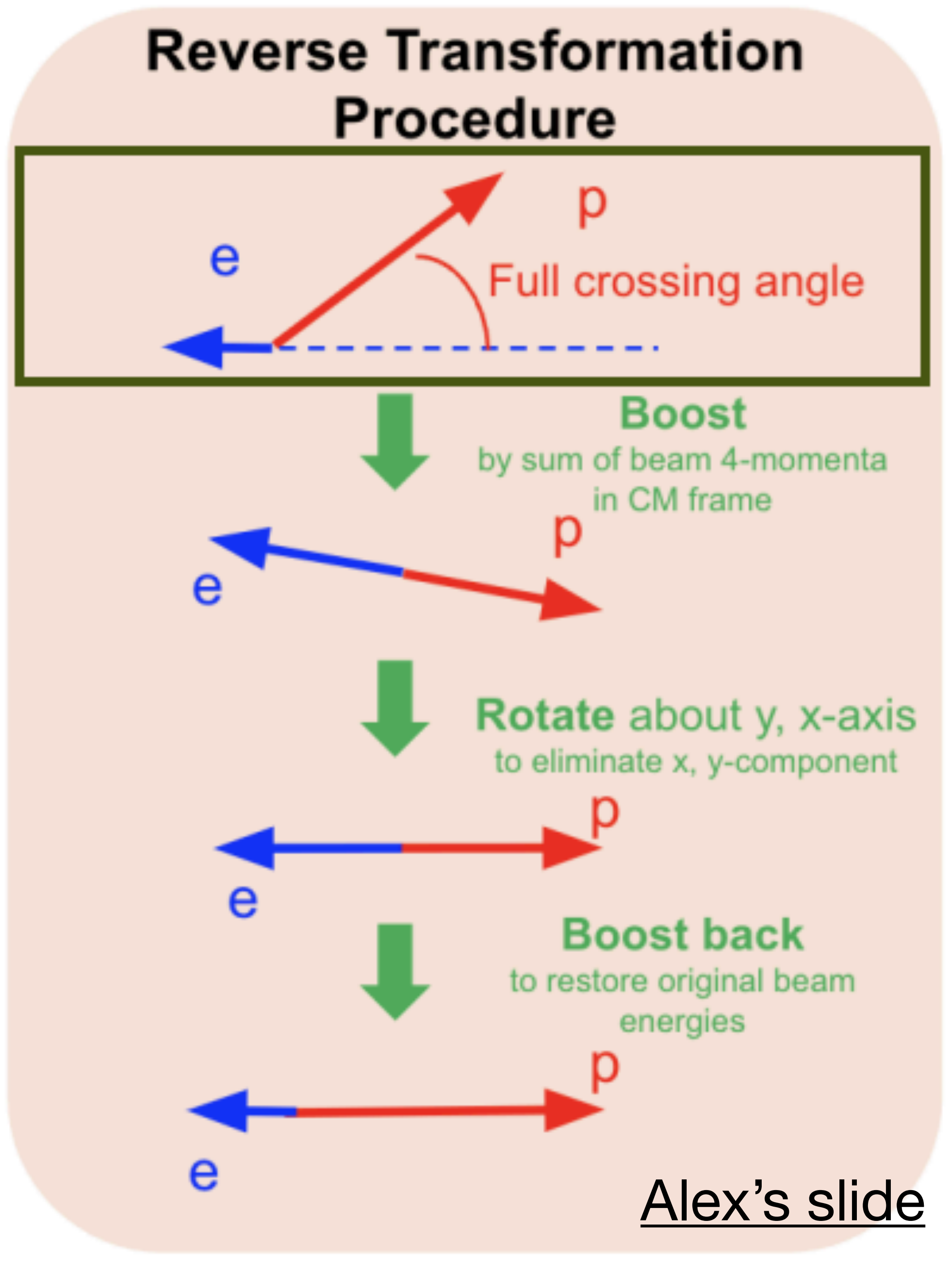
Inclusive electron reconstruction

Testing more realistic electron reconstruction:

- new analysis is based on Tyler's electron finer library and Stephen's inclusive kinematic reconstruction tutorial
- Tried all reconstruction methods available in EICrecon
- mcID: use all generator information, including incoming beam, no detector info
- TruthID: use generator info for eID, then use rec. info for kinematic reconstruction
- det. based ID: use detector recon. Info for eID and reconstruction

I also use my own boost.h instead of the existing one in EICrecon

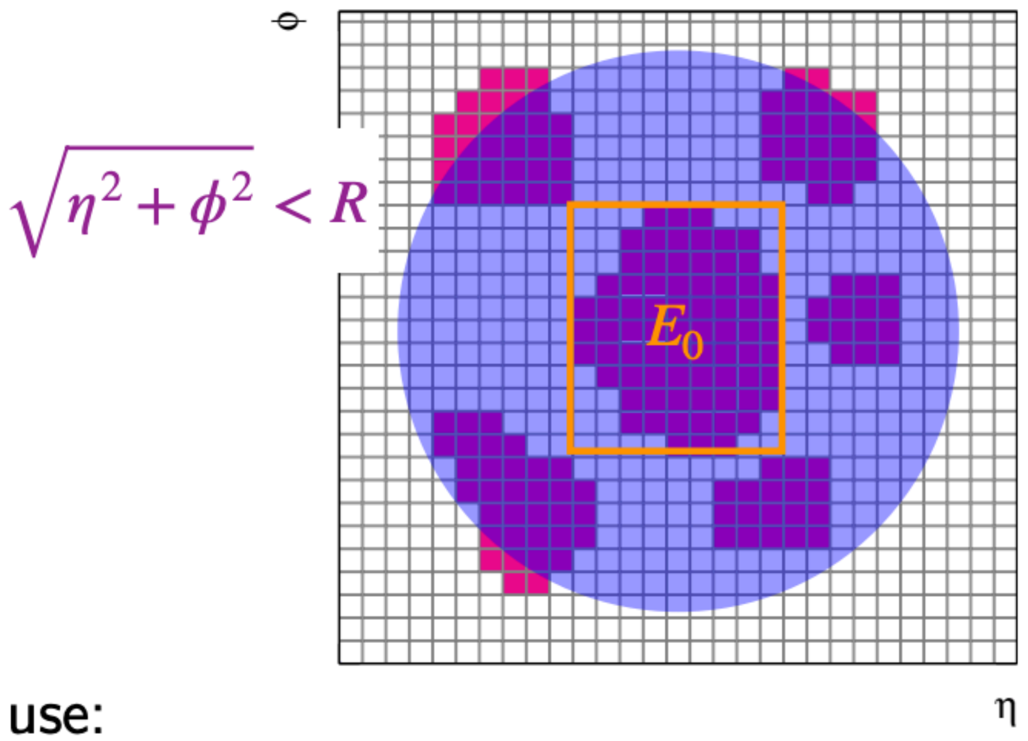


Current detector-based electron ID

Tyler's slide

```
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:

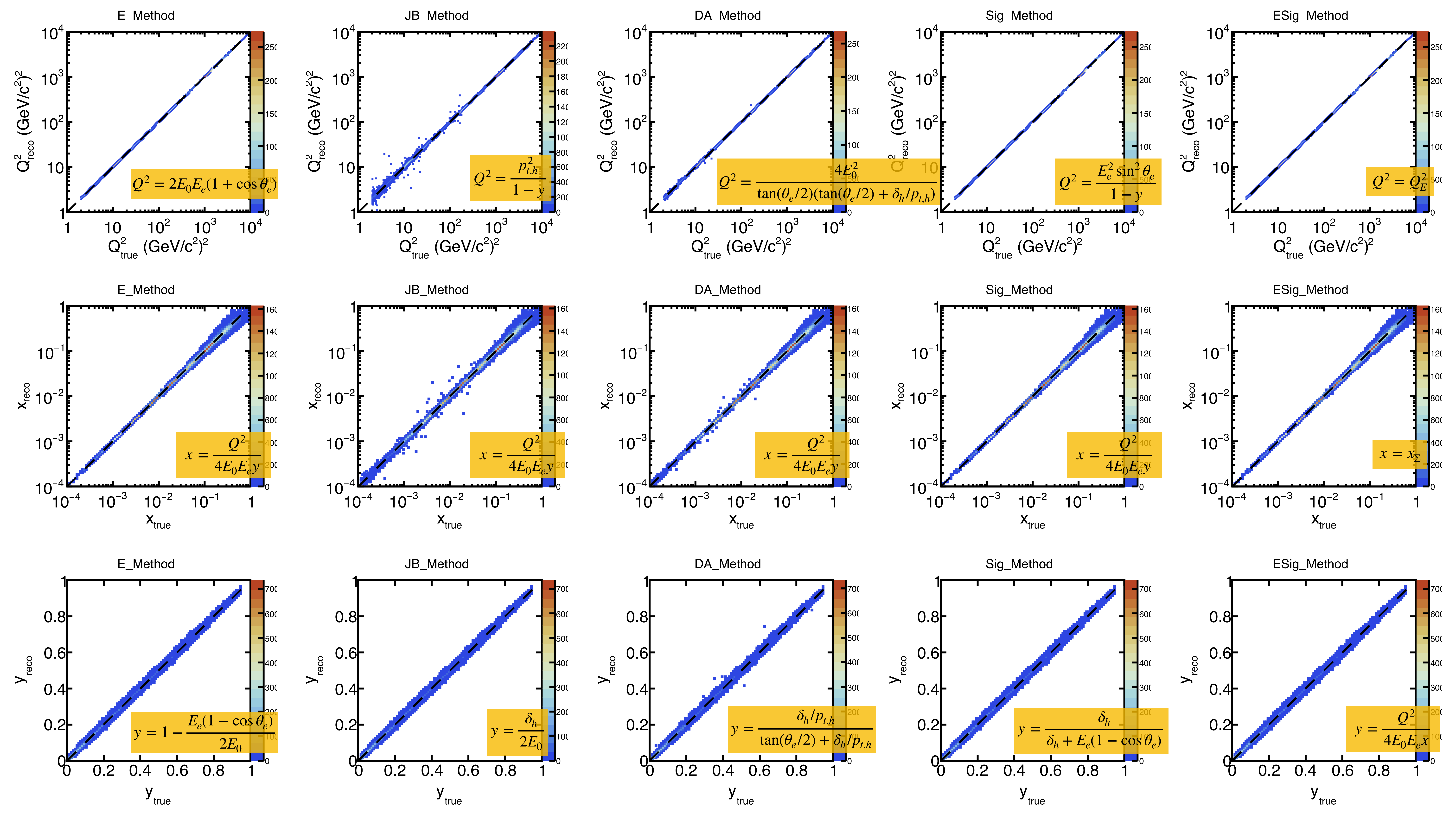
```
edm4eic::ReconstructedParticle
SelectHighestPT(edm4eic::ReconstructedParticleCollection)
```

6

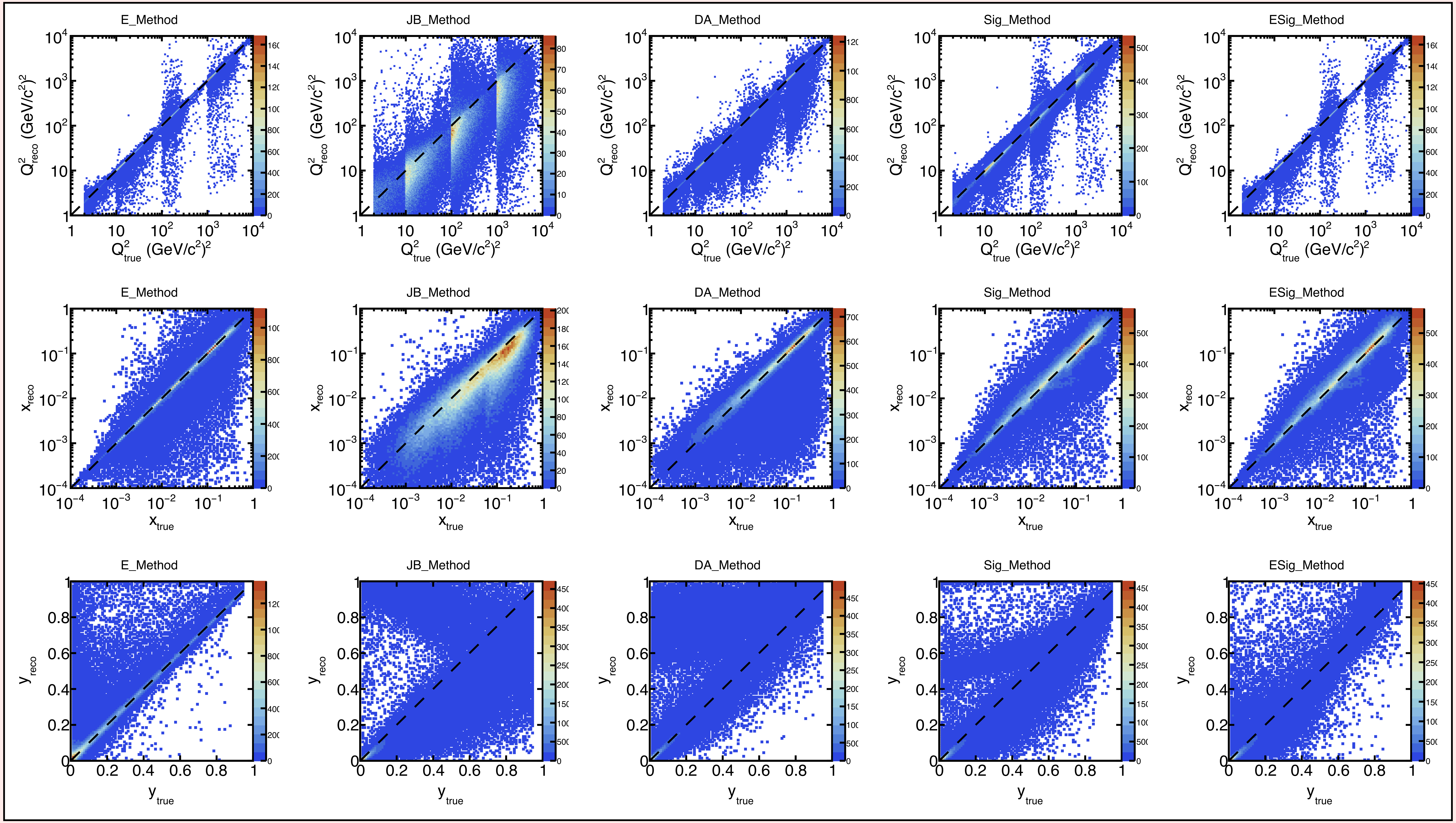
e recon. (mcID)

* EPIC 25.03.01 DIS NC 18x275 Sim.

$$p_{t,h}^2 = (\sum_h p_{x,h})^2 + (\sum_h p_{y,h})^2 \qquad \delta_h = \sum_h E_h - p_{z,h}$$



e recon. (Truth ID)



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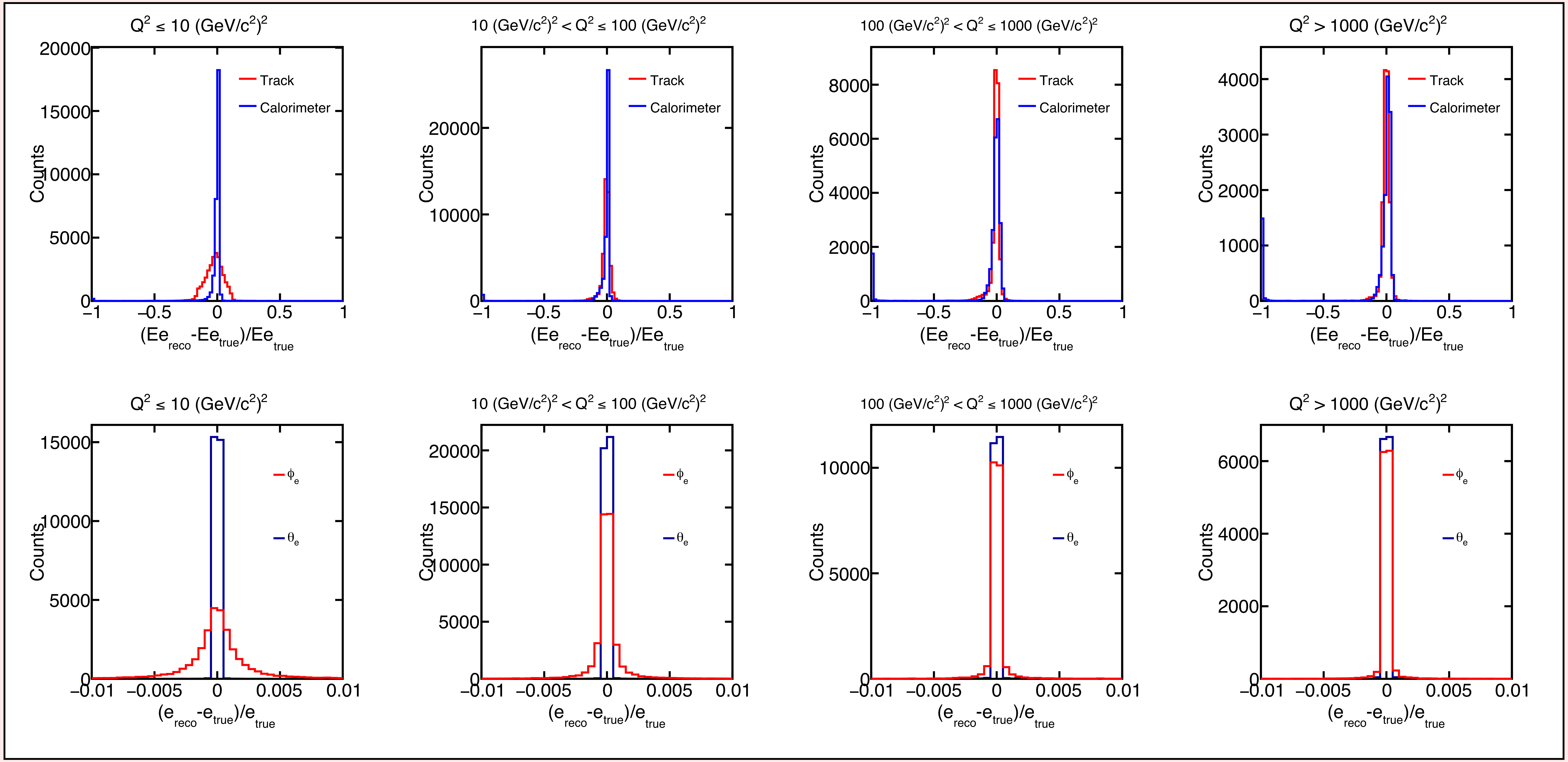

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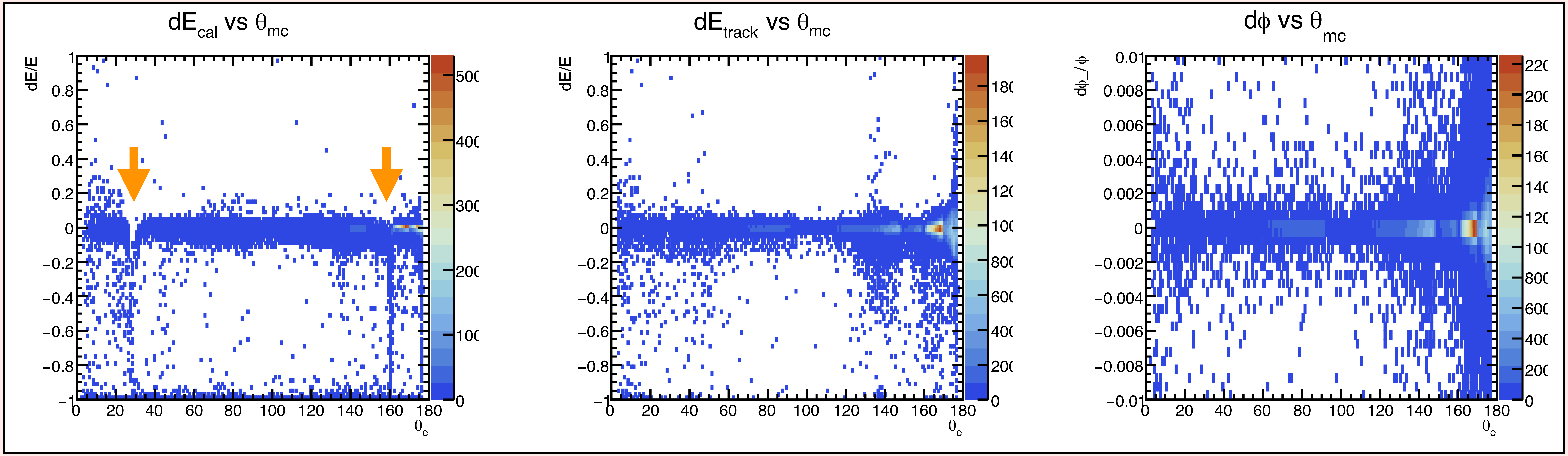

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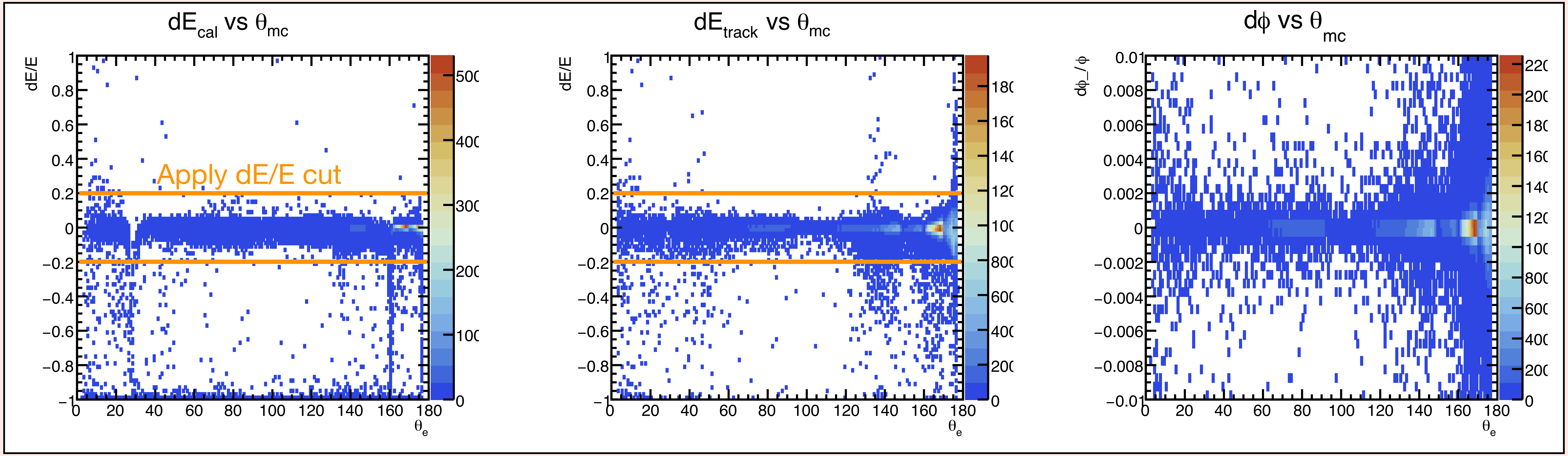
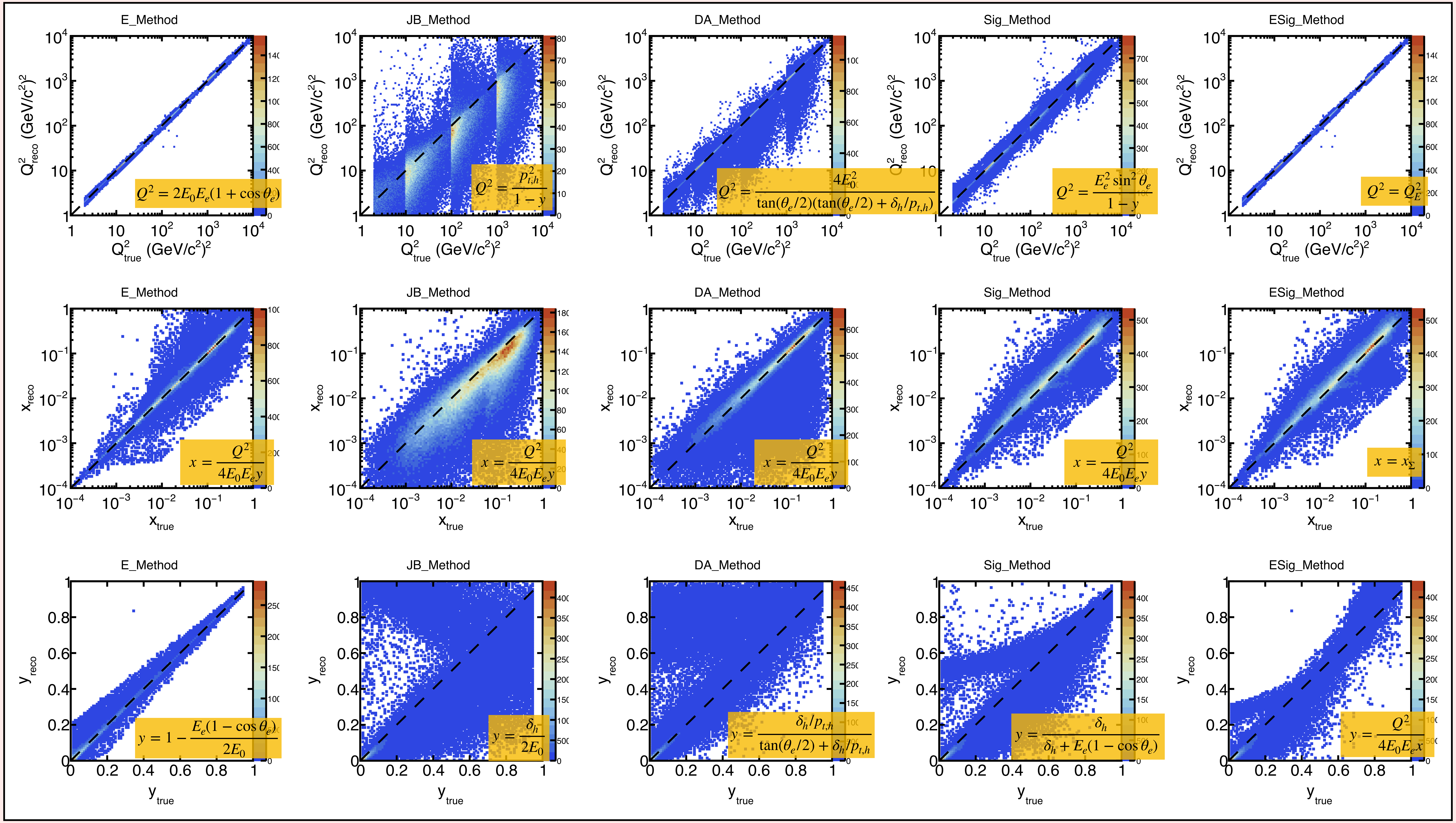


e recon. (Truth ID) - with dE/E cut

$p_{t,h}^2 = (\sum_h p_{x,h})^2 + (\sum_h p_{y,h})^2 \qquad \delta_h = \sum_h E_h - p_{z,h}$



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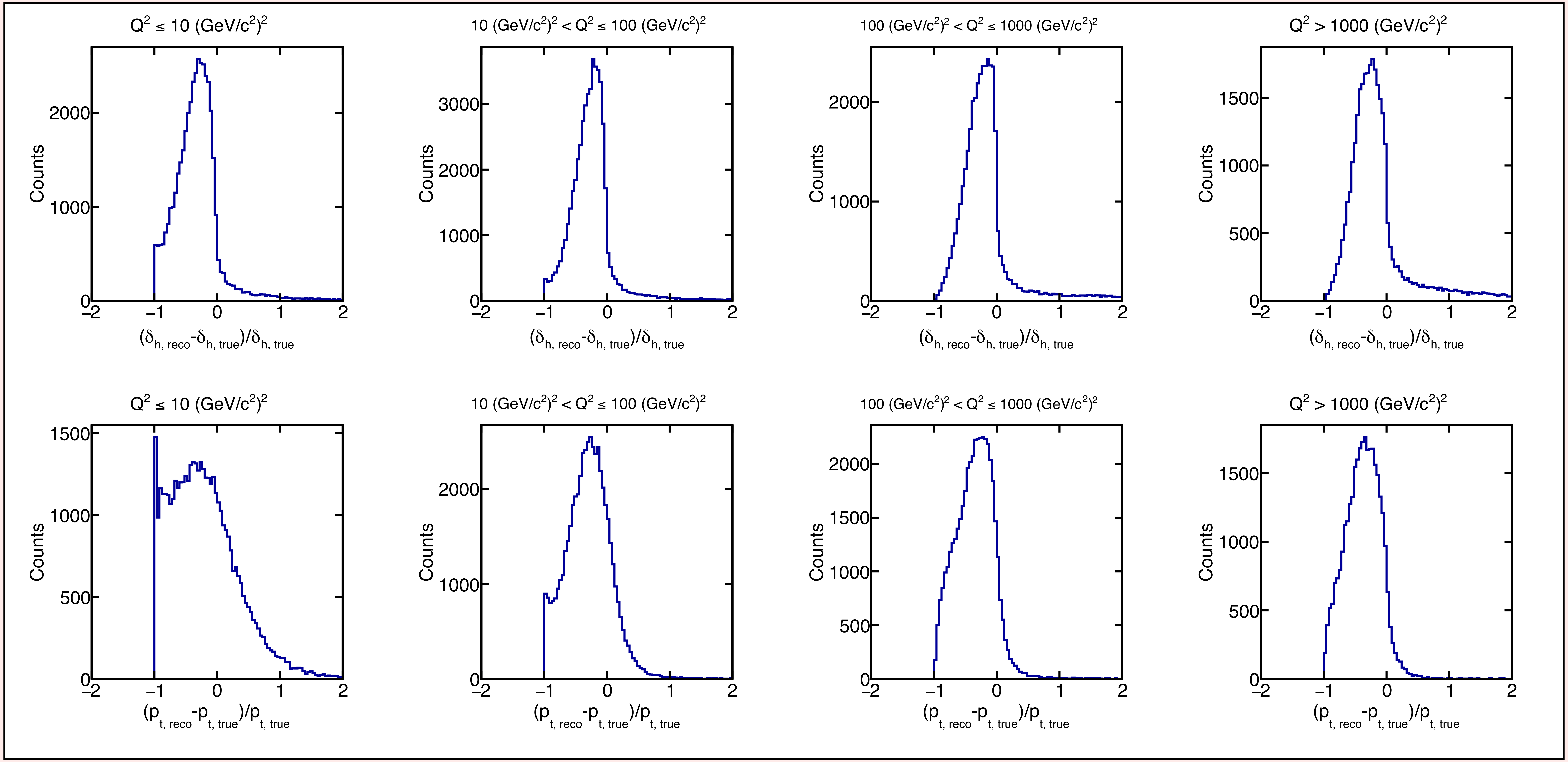

e recon. (det. based ID)

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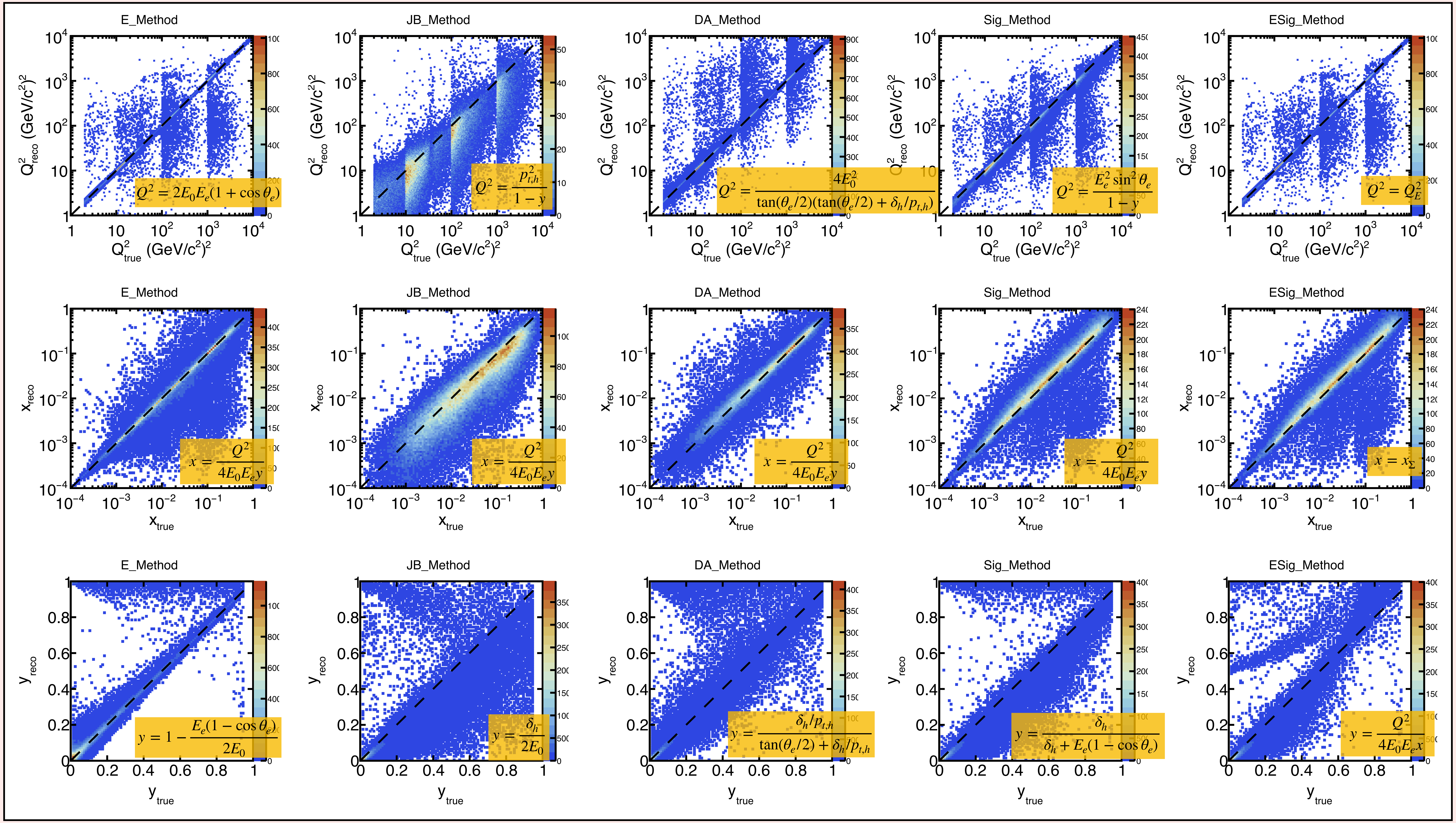

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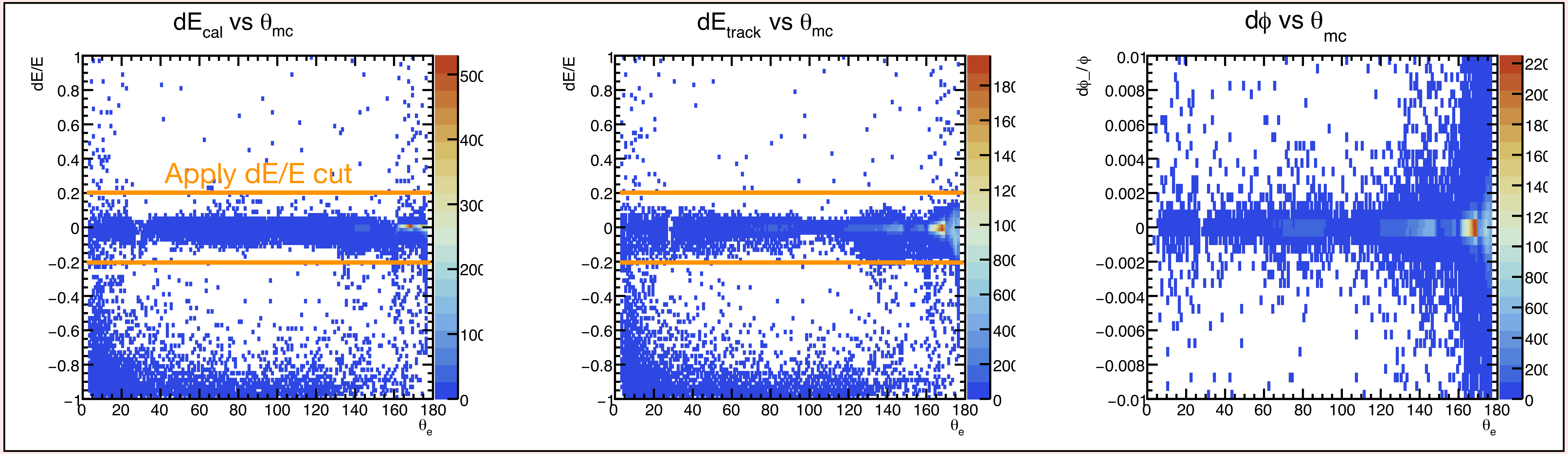

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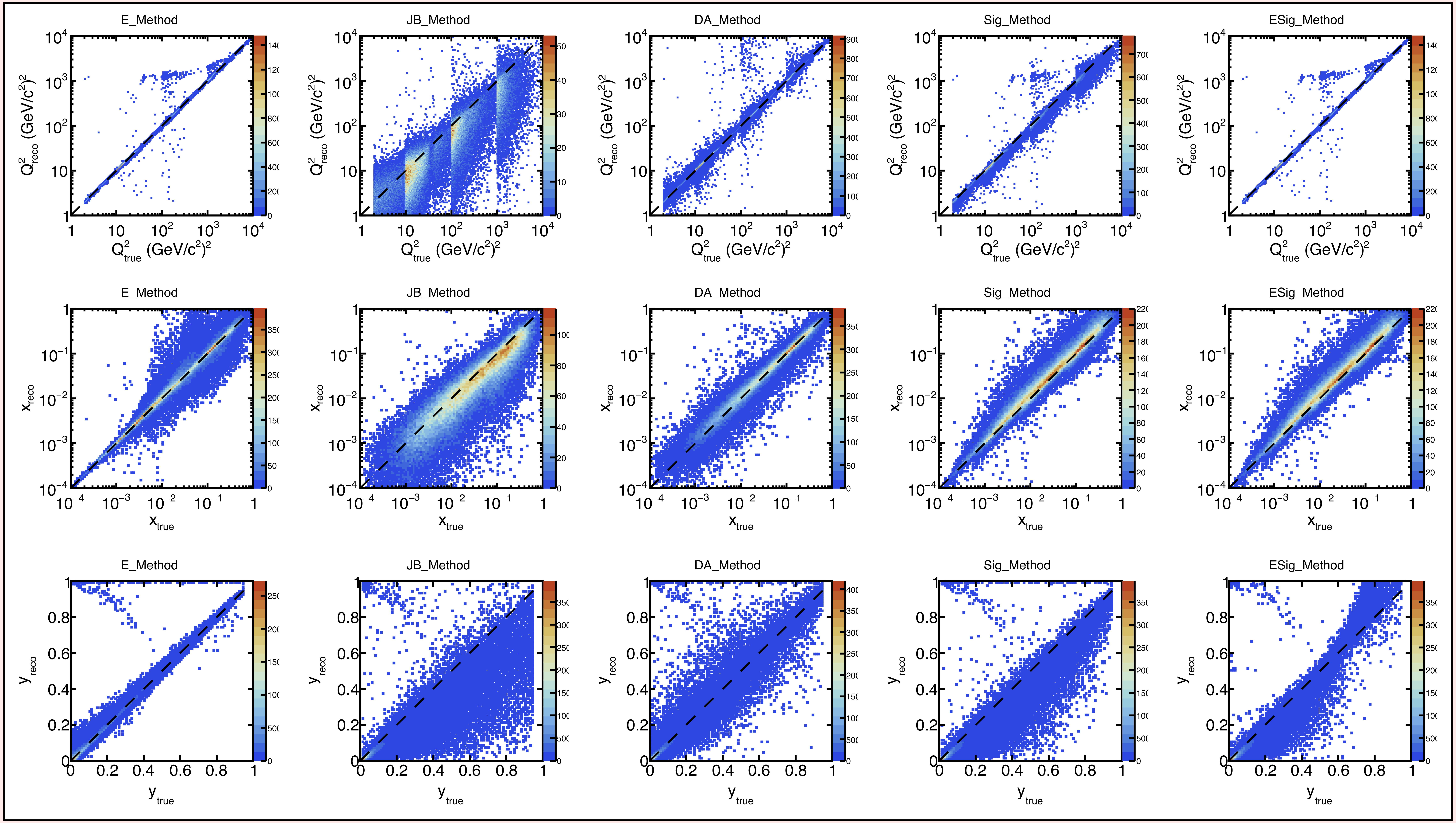
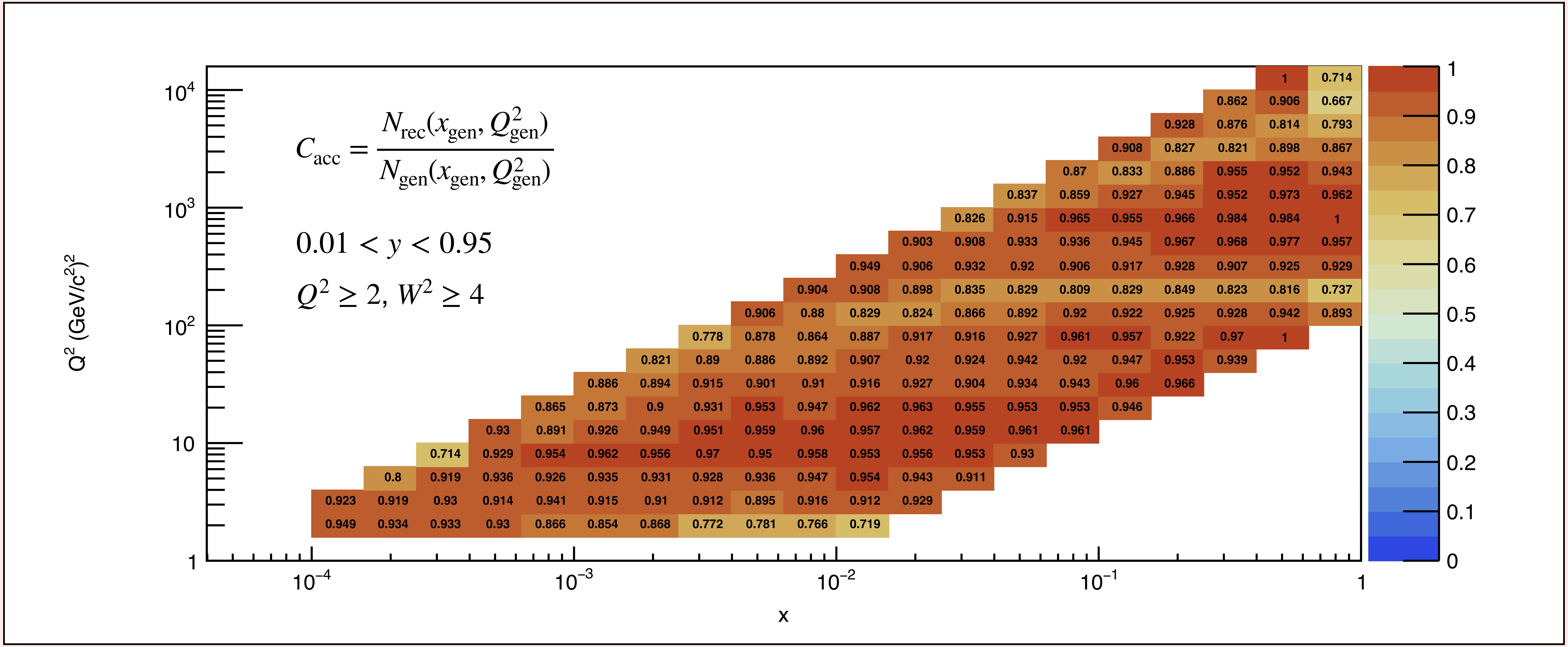
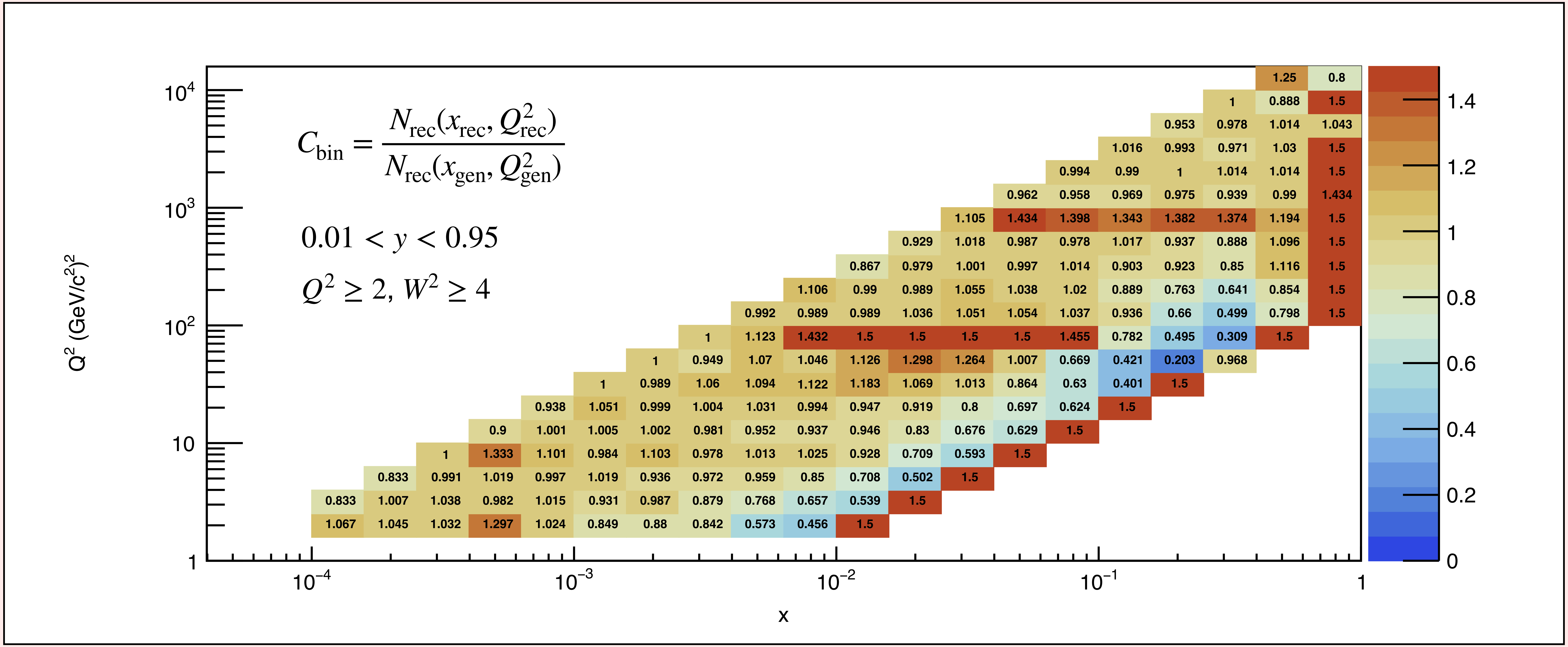


TruthID eMethod bin acceptance

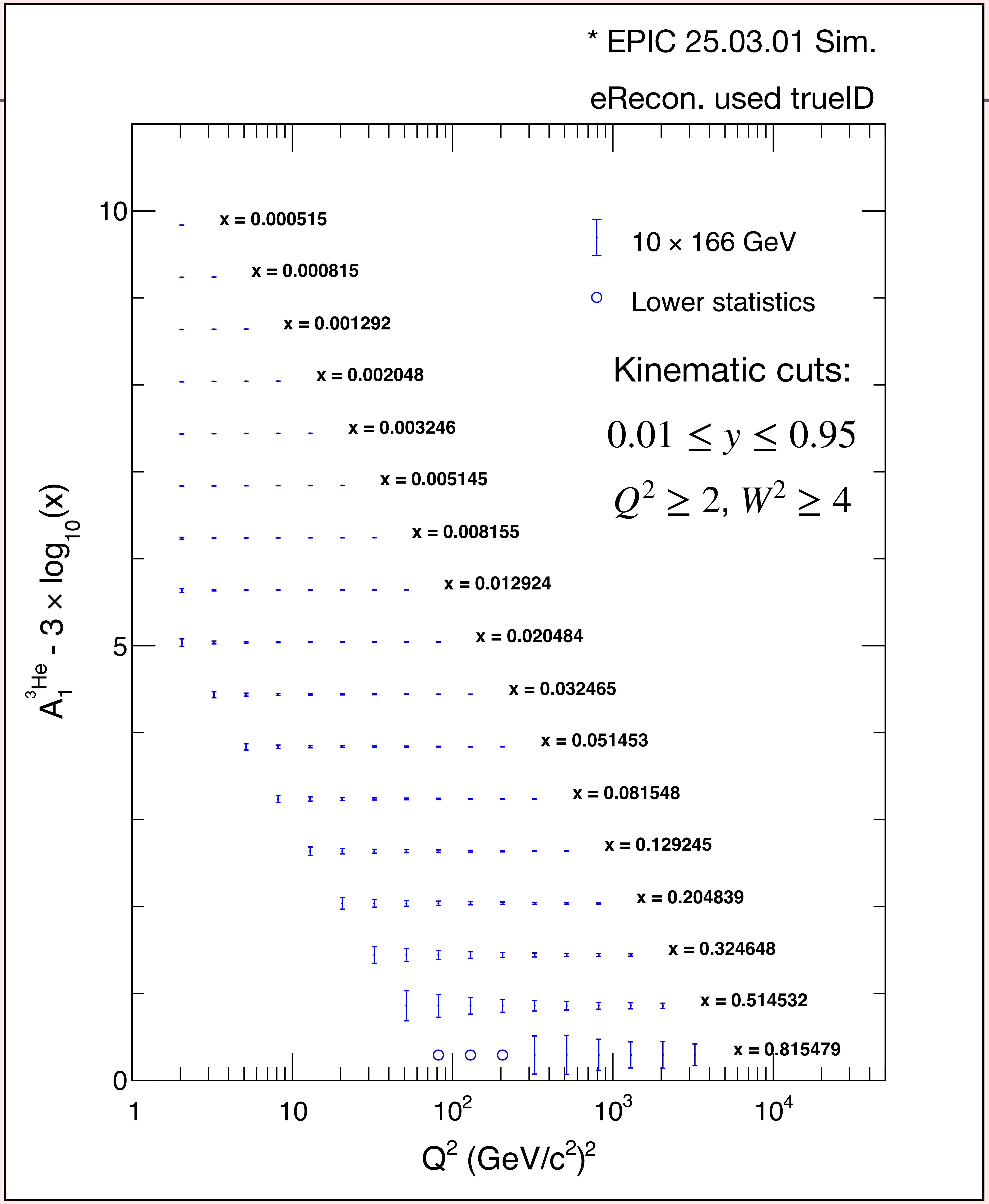


TruthID eMethod bin migration



$A_1^{^3\mathrm{He}}$ for early science

- $A_1(x, Q^2) \equiv \dfrac{\sigma_{1/2} - \sigma_{3/2}}{\sigma_{1/2} + \sigma_{3/2}} = \dfrac{A_\parallel}{D(1+\eta\xi)} - \dfrac{\eta A_\perp}{d(1+\eta\xi)}$
- $\mathscr{L} = 8.65\ \mathrm{fb}^{-1}$, $P_e = P_n = 70\,\%$
- Data split evenly between $A_\parallel$ and $A_\perp$
- $\delta A_{\parallel,\perp} = \dfrac{1}{\sqrt{N} P_e P_N}$
- $A_1^{^3\mathrm{He}} = P_n \dfrac{F_2^n}{F_2^{^3\mathrm{He}}} A_1^n + 2P_p \dfrac{F_2^p}{F_2^{^3\mathrm{He}}} A_1^p$
- Bin A_1^n calculated from: Doi: 10.2172/824895
- $F_2^{^3\mathrm{He}} = F_2^D + F_2^p$, all F_2's are taken from JAM22
- Statistical uncertainty only, correction not yet applied



A_1^n from e^3He DIS:

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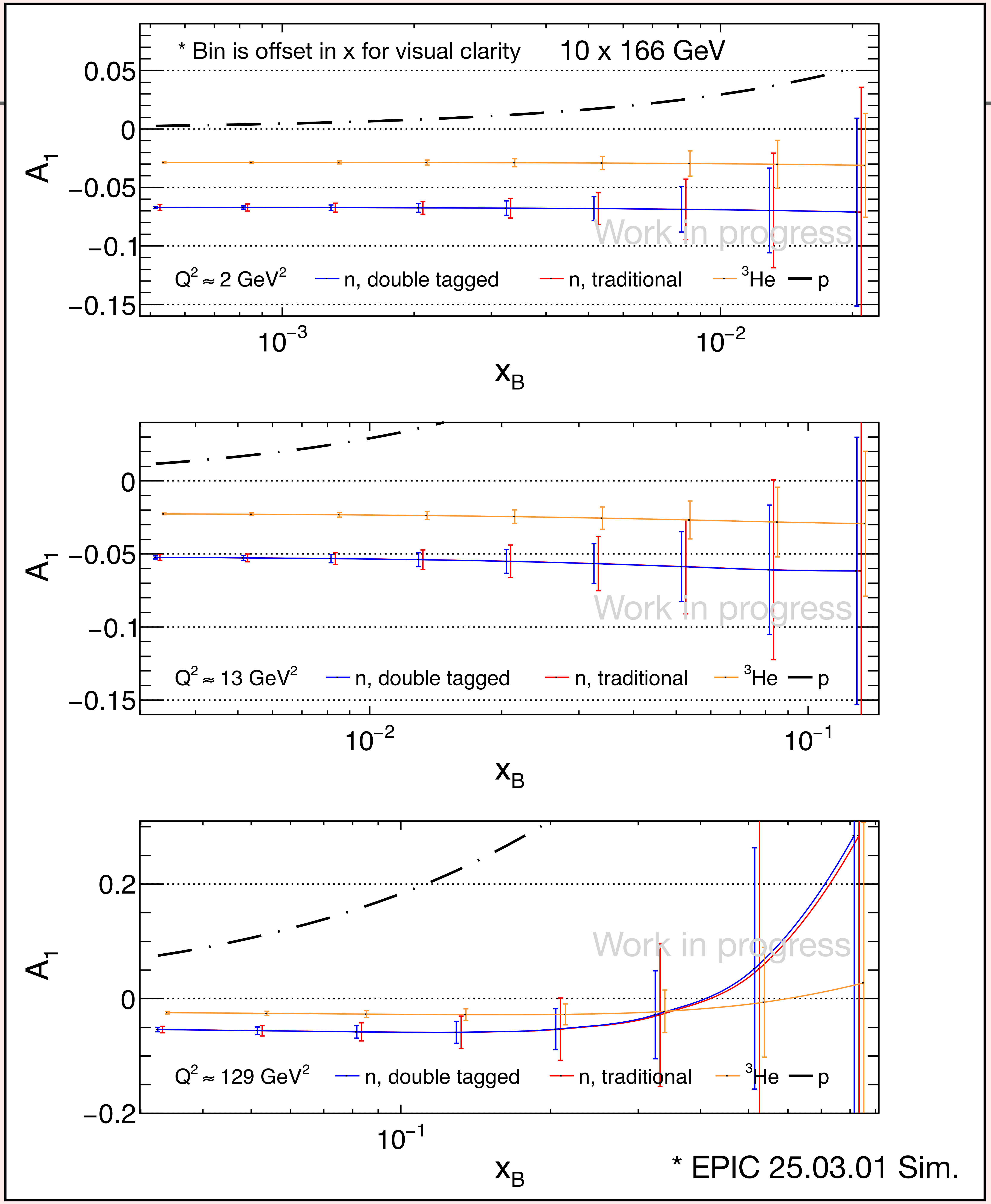
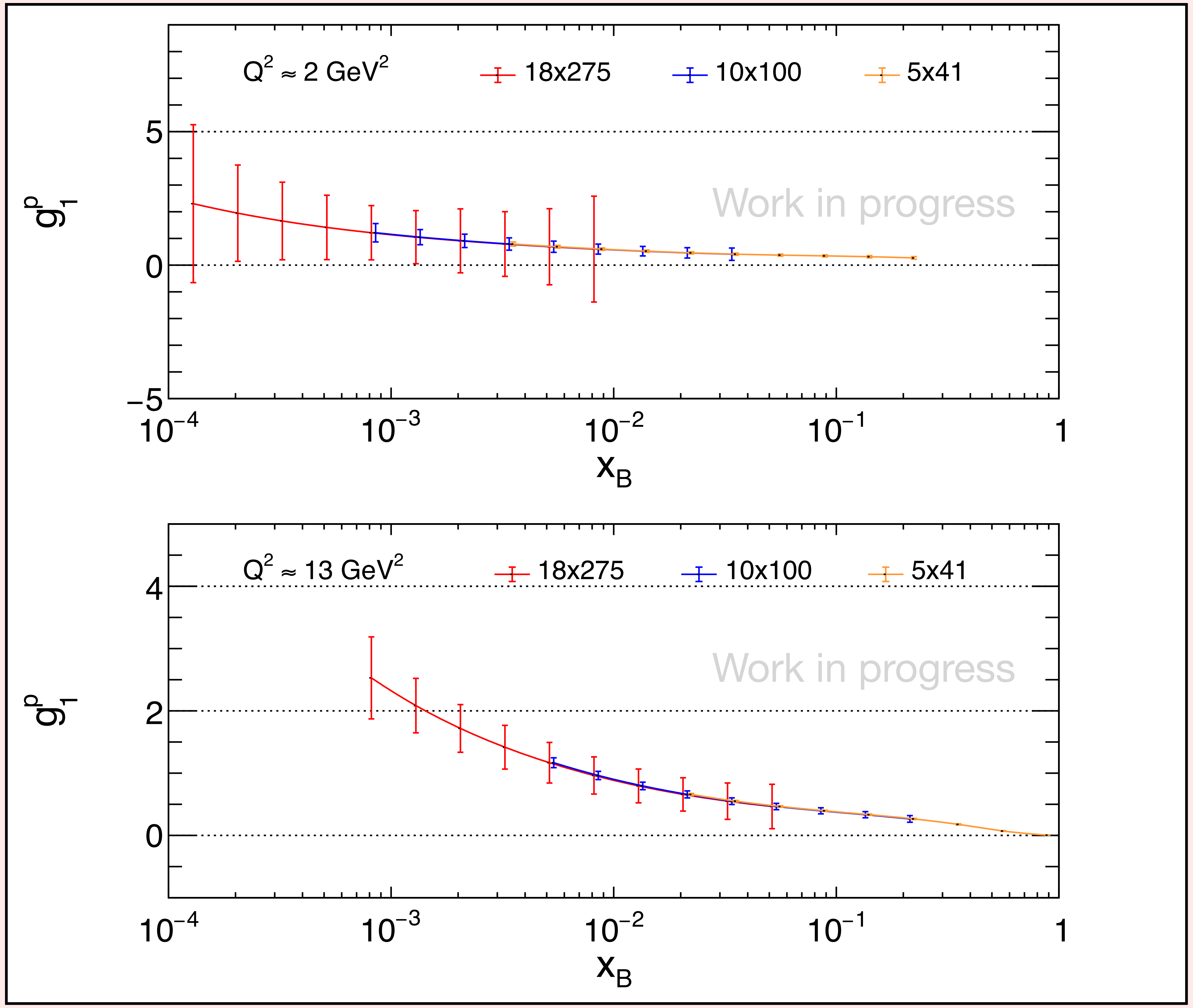
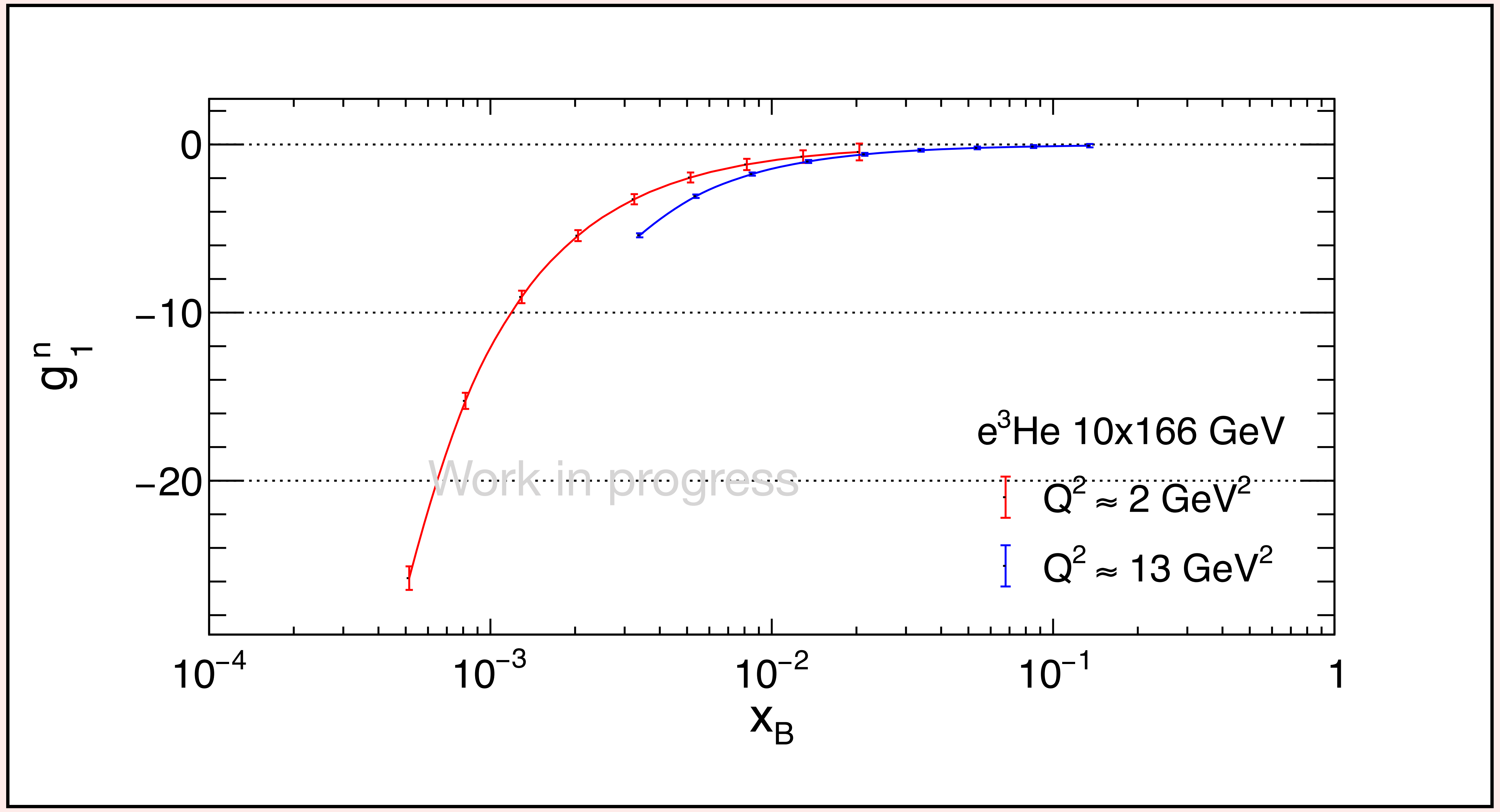


g_1^p and g_1^n

- $A_1 \approx g_1/F_1$ with F_1 calculated from JAM22
- Statistical + F_1 uncertainties. Other uncertainties and corrections are not yet applied





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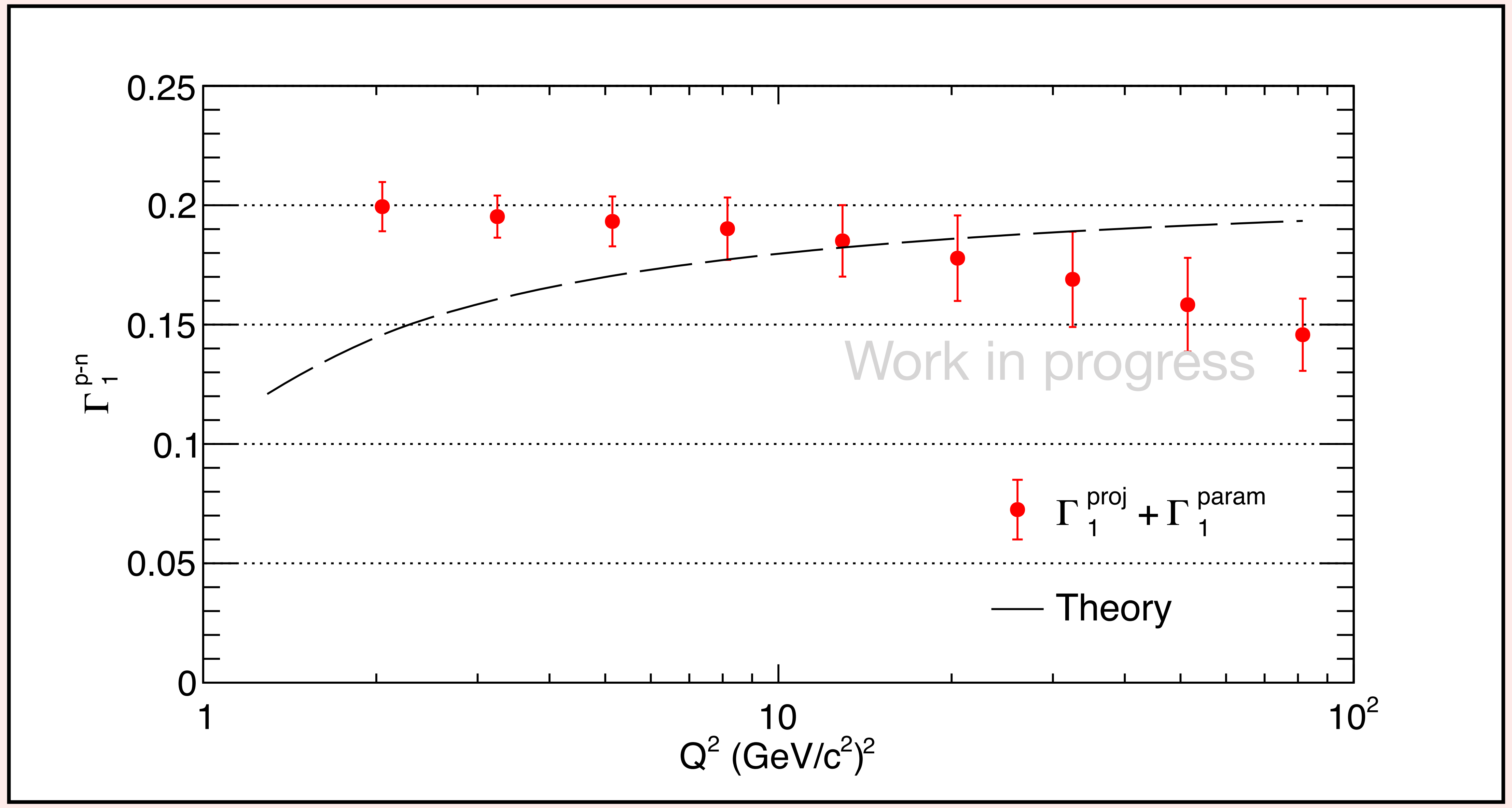
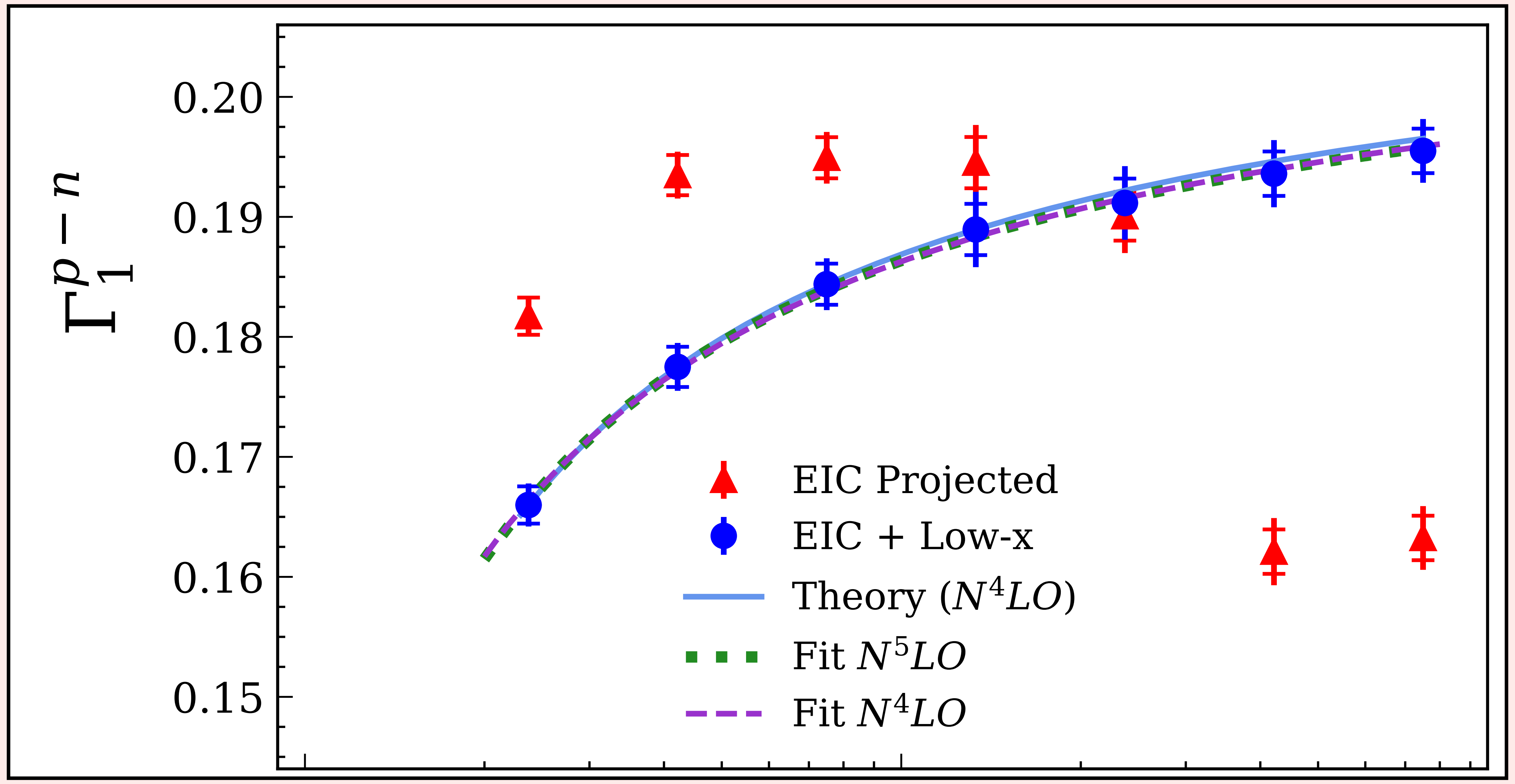
- $\Gamma_1^{\mathrm{p-n}} \equiv \int_0^{1^-} (g_1^p - g_1^n)\, dx$





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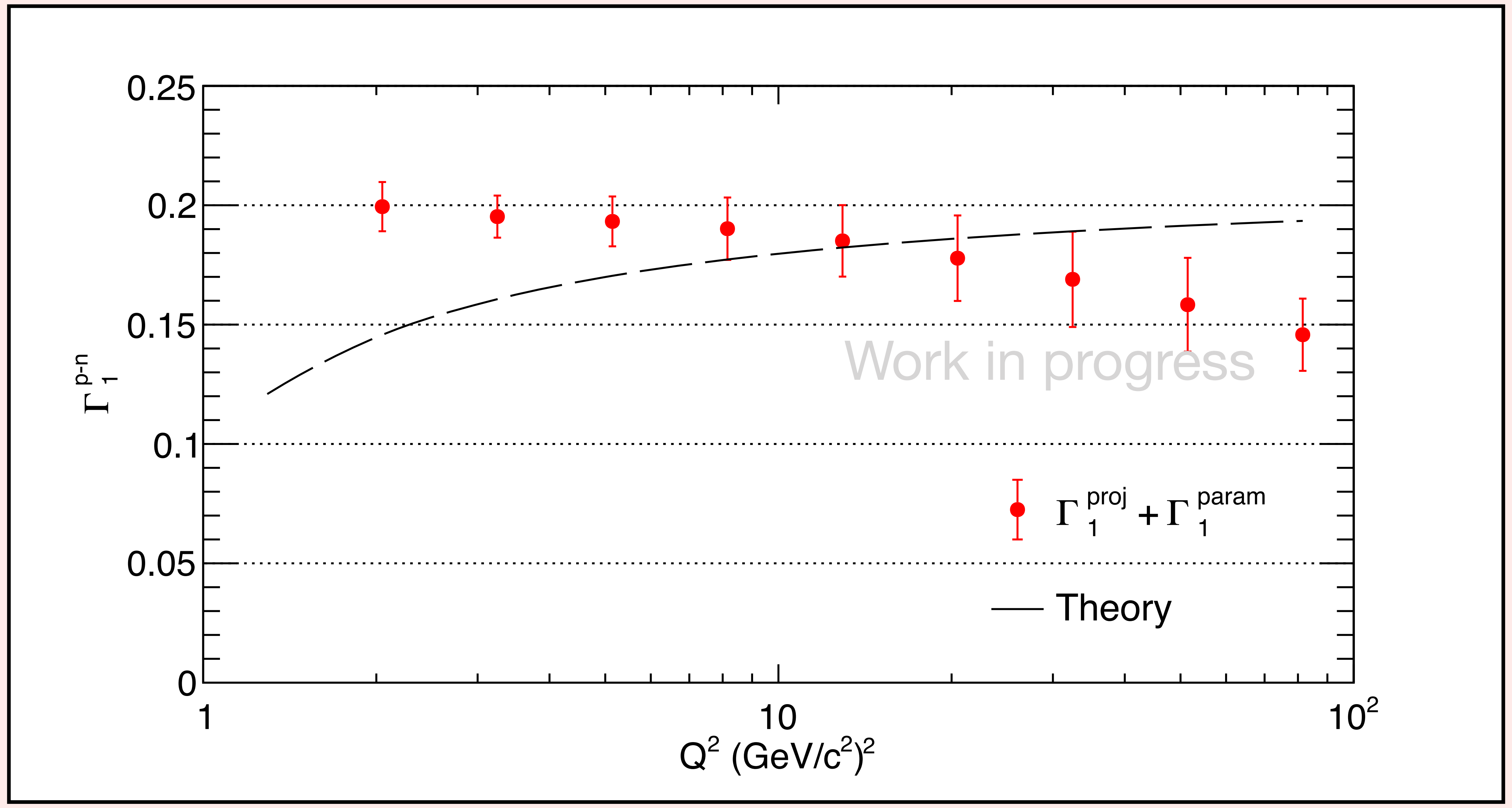

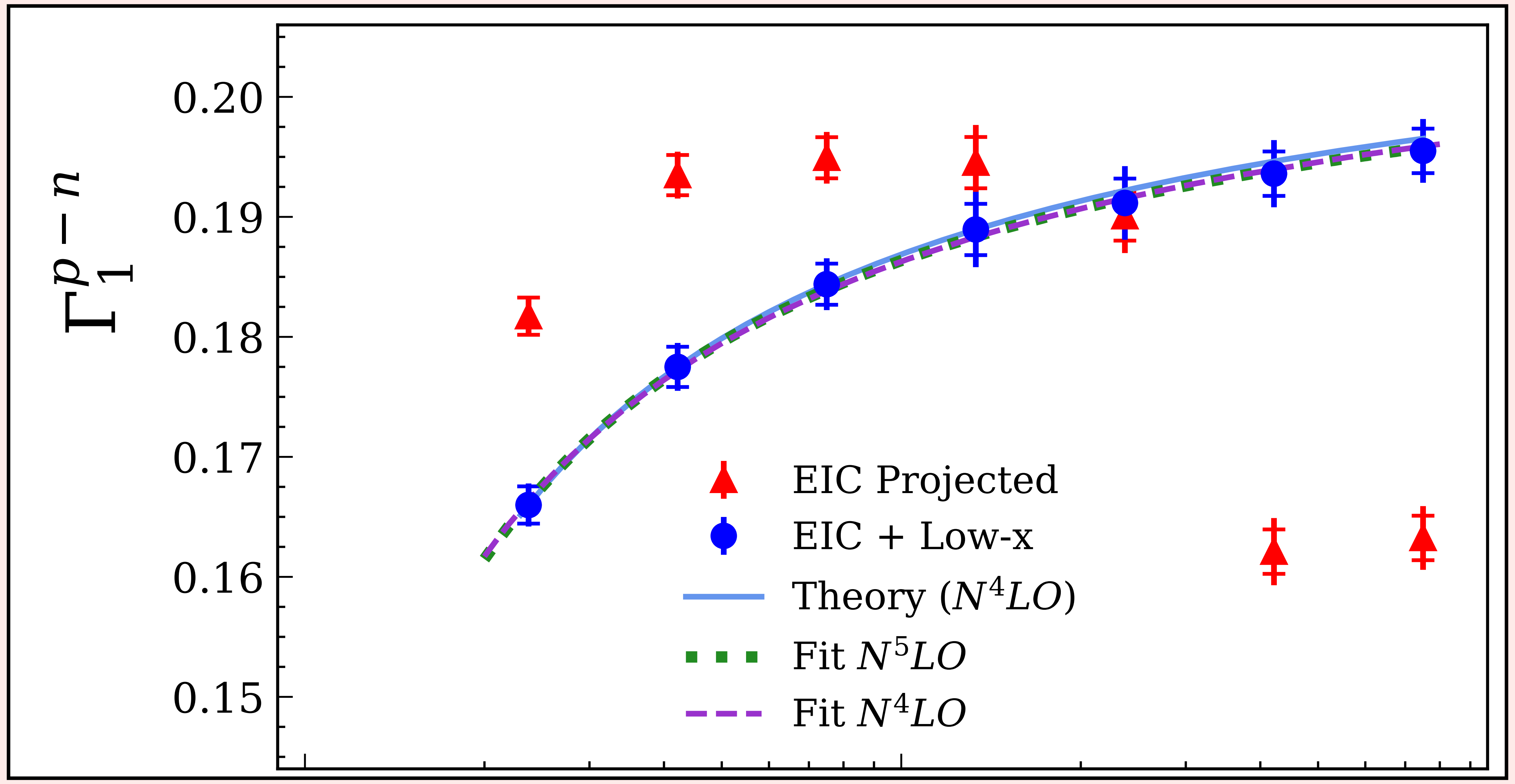

Systematic uncertainty?

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