

# Inclusive WG update

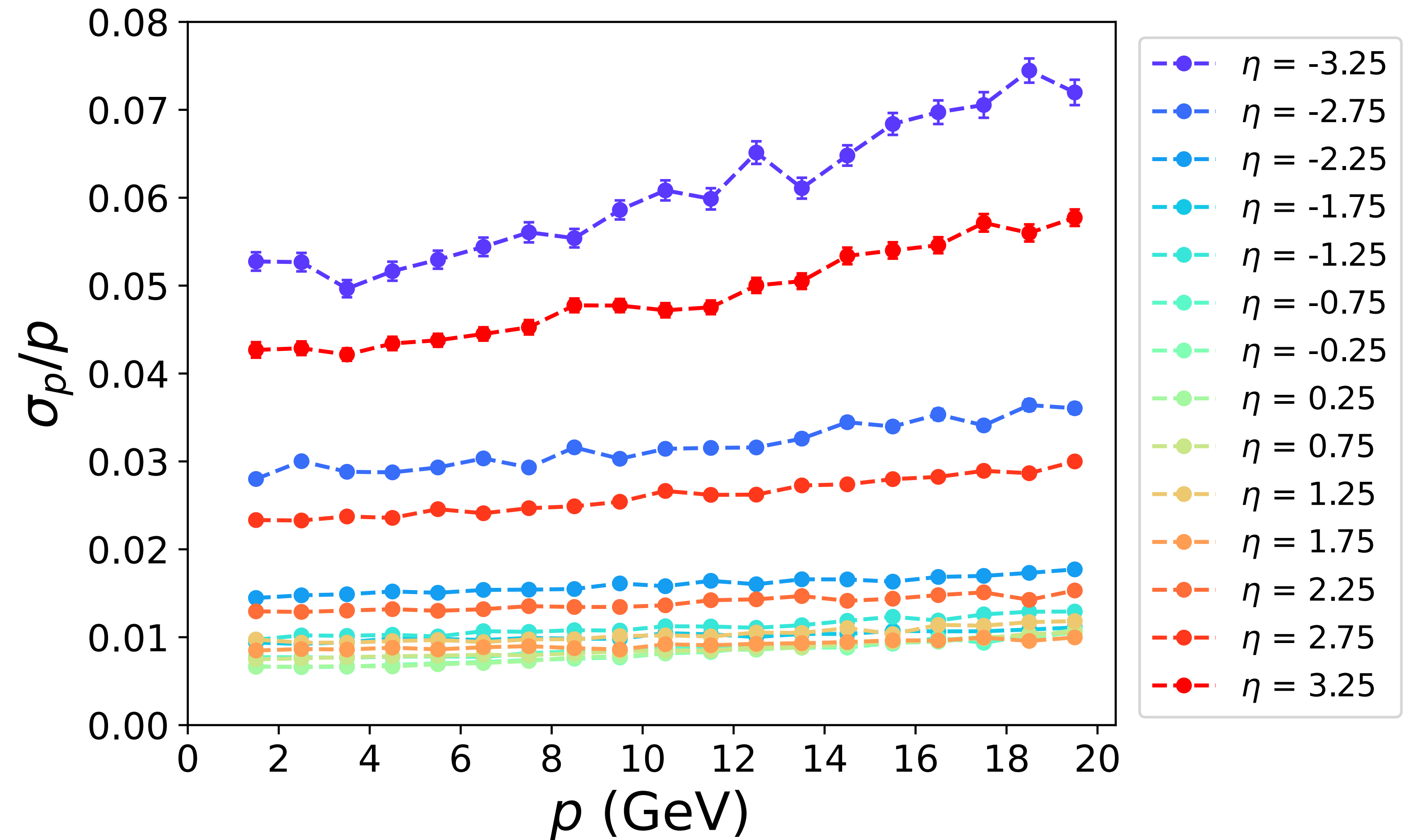
Claire Gwenlan, Tyler Kutz,  
Paul Newman, Barak Schmookler

EIC Detector 1 WG conveners meeting

July 15, 2022

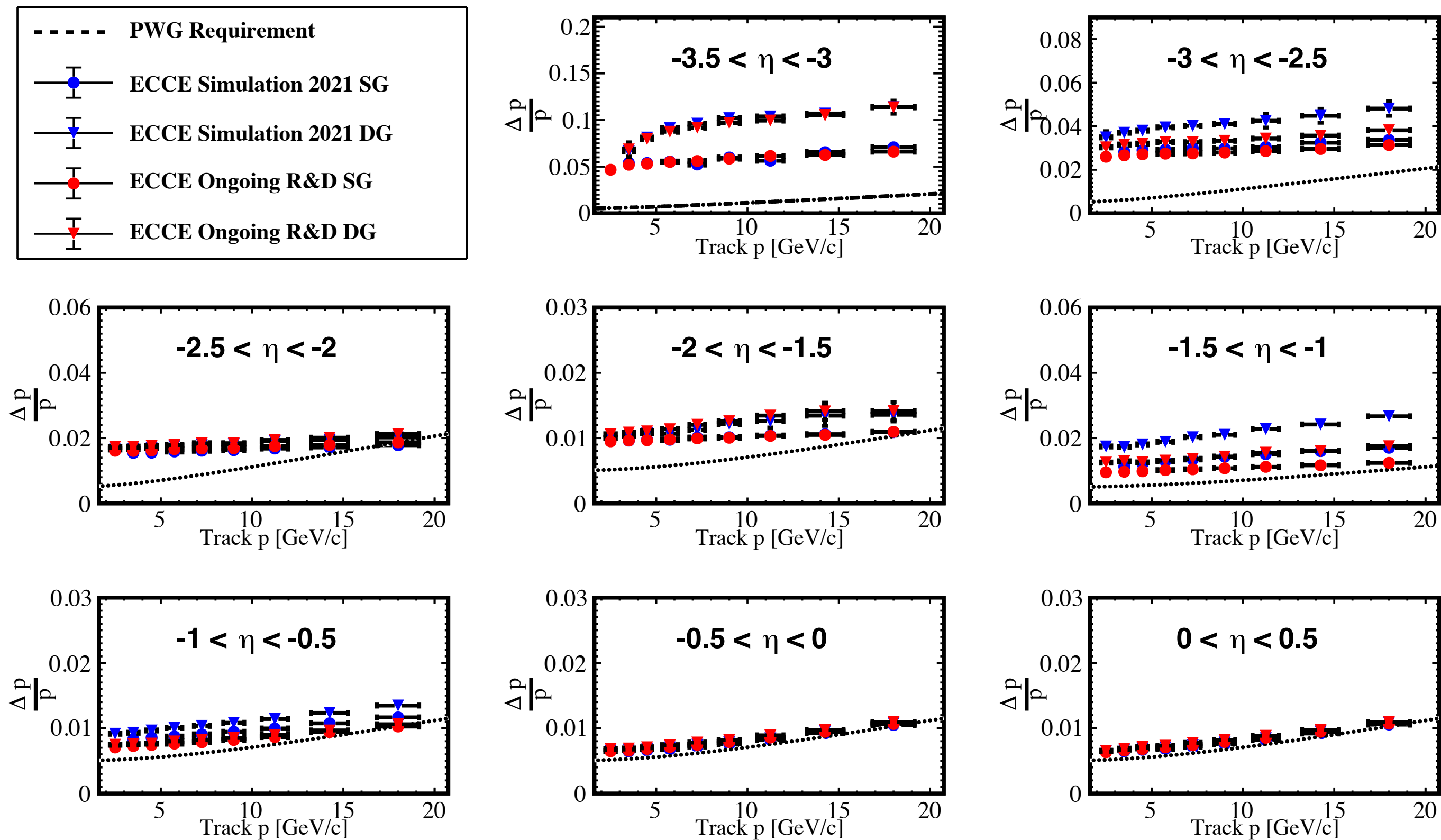
# First look at simulation campaign 22.1!

- Single electron events
- Tracking resolution vs.  $p$ ,  $\eta$
- In progress: include calorimeter information in electron reconstruction

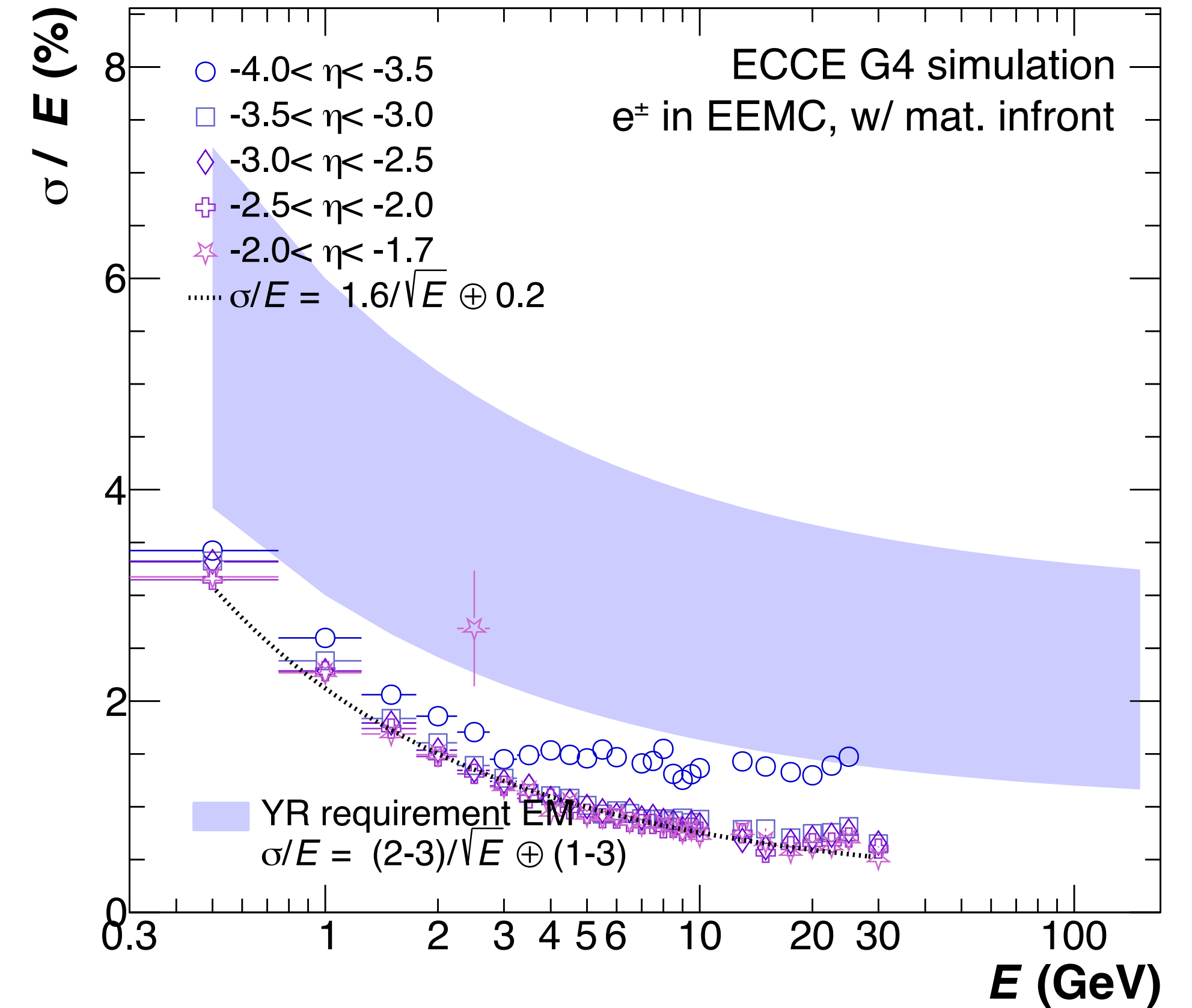


# Calorimeter achieves better energy resolution than tracking in backward endcap

## Tracking



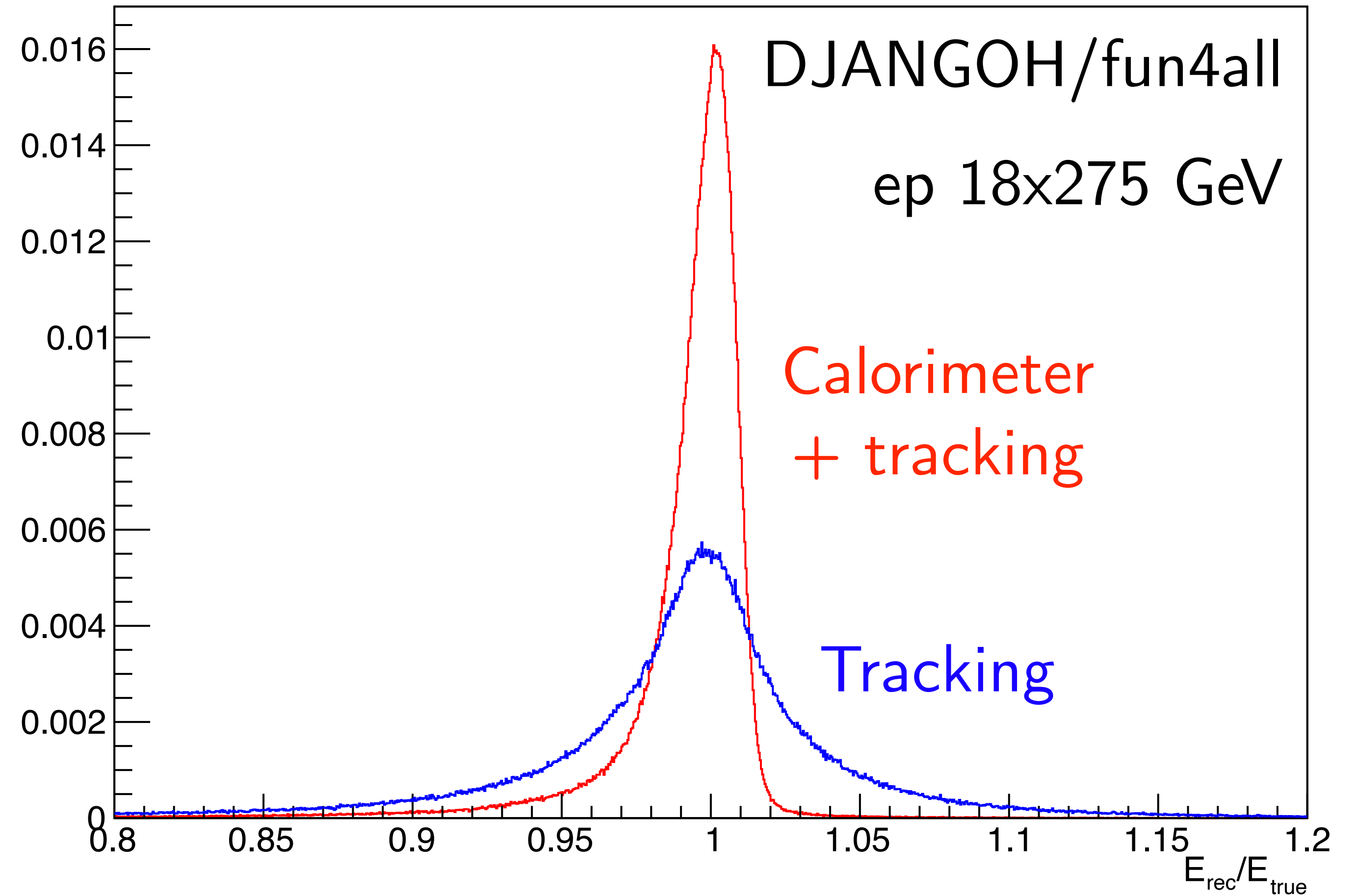
## Calorimeter



# Exploit calorimeter resolution in electron reconstruction

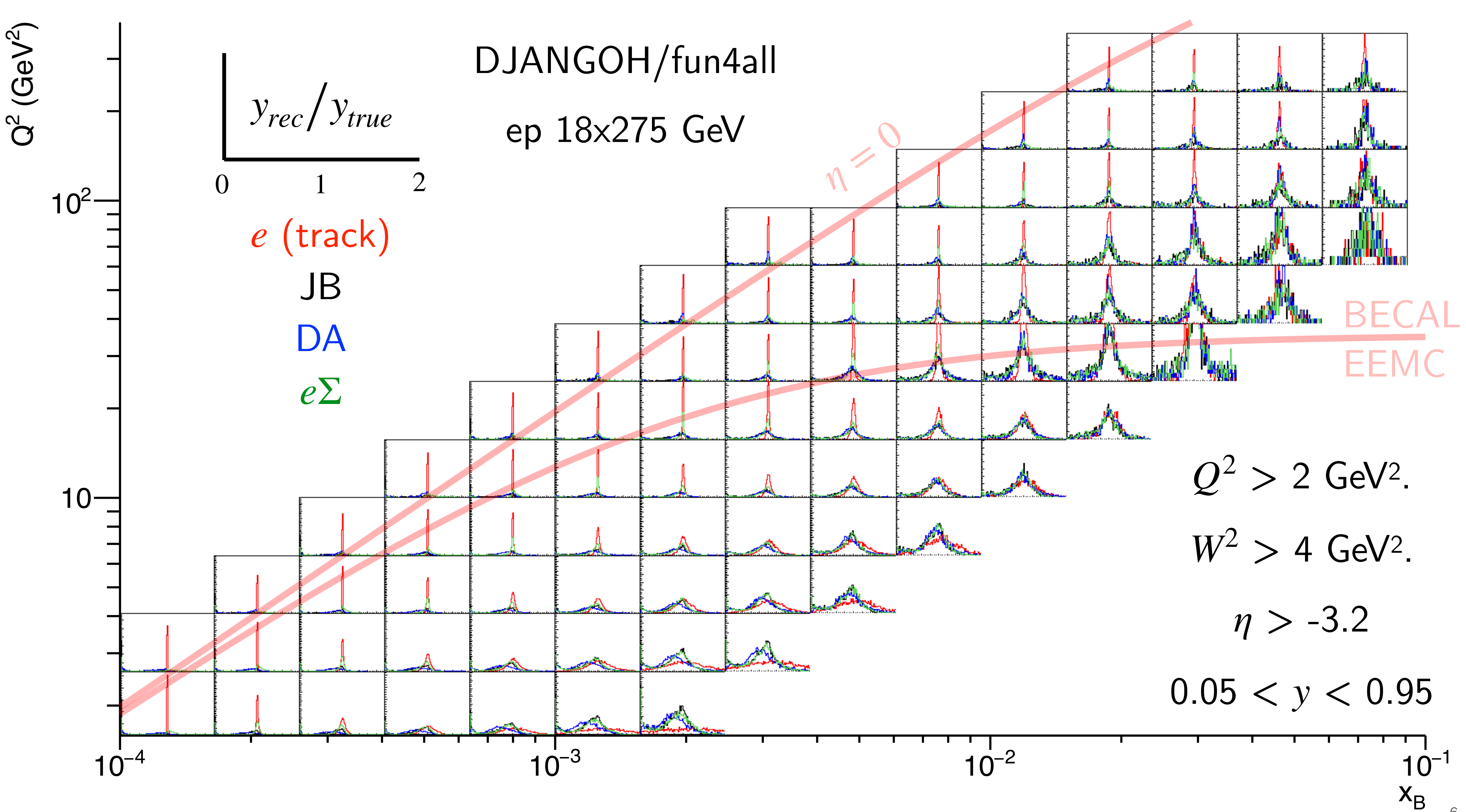
- Weighted average of tracking and calorimeter energies to determine electron energy:

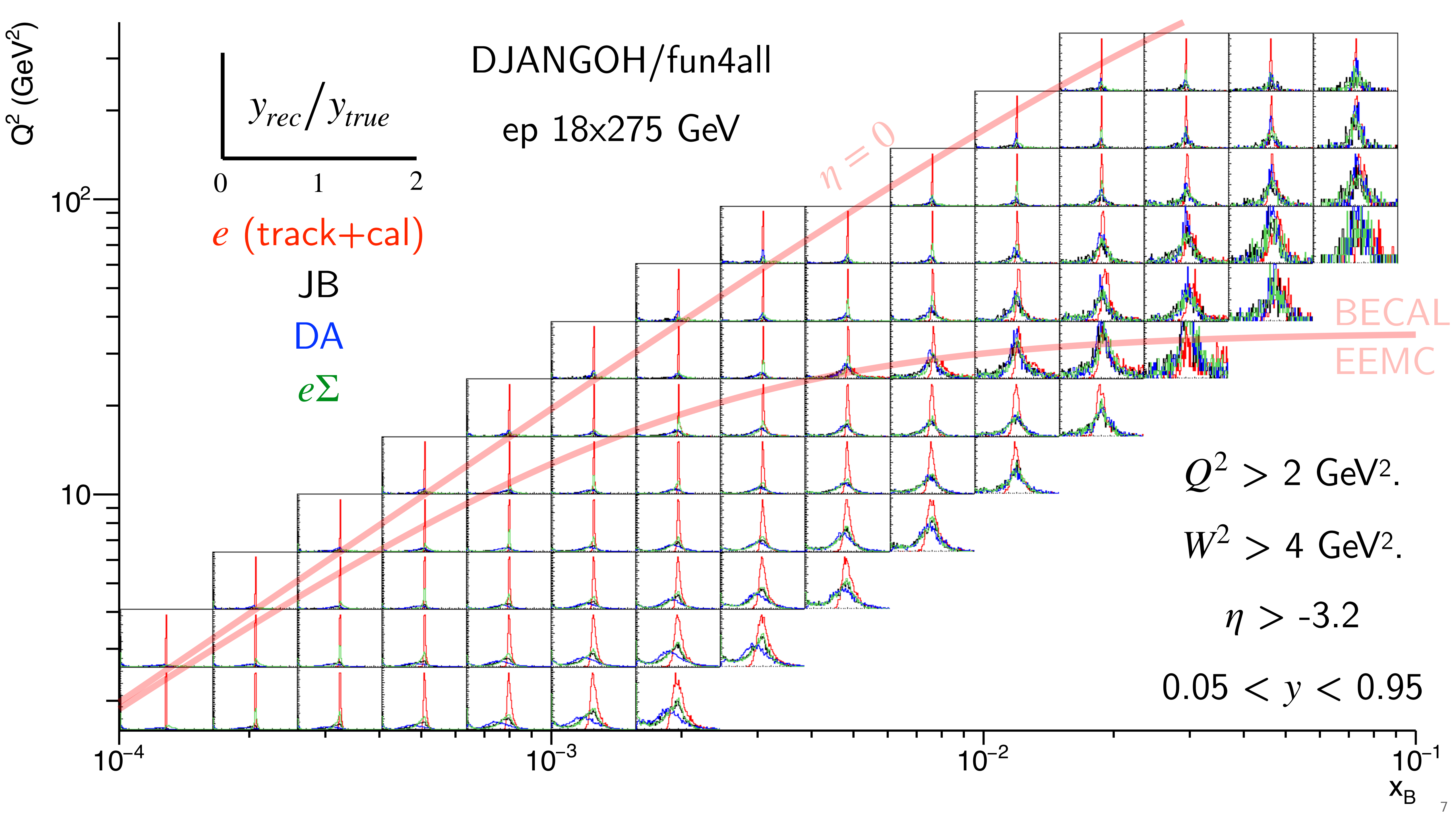
$$E' = \frac{E_{tr} / \sigma_{tr}^2 + E_{cal} / \sigma_{cal}^2}{1 / \sigma_{tr}^2 + 1 / \sigma_{cal}^2}$$

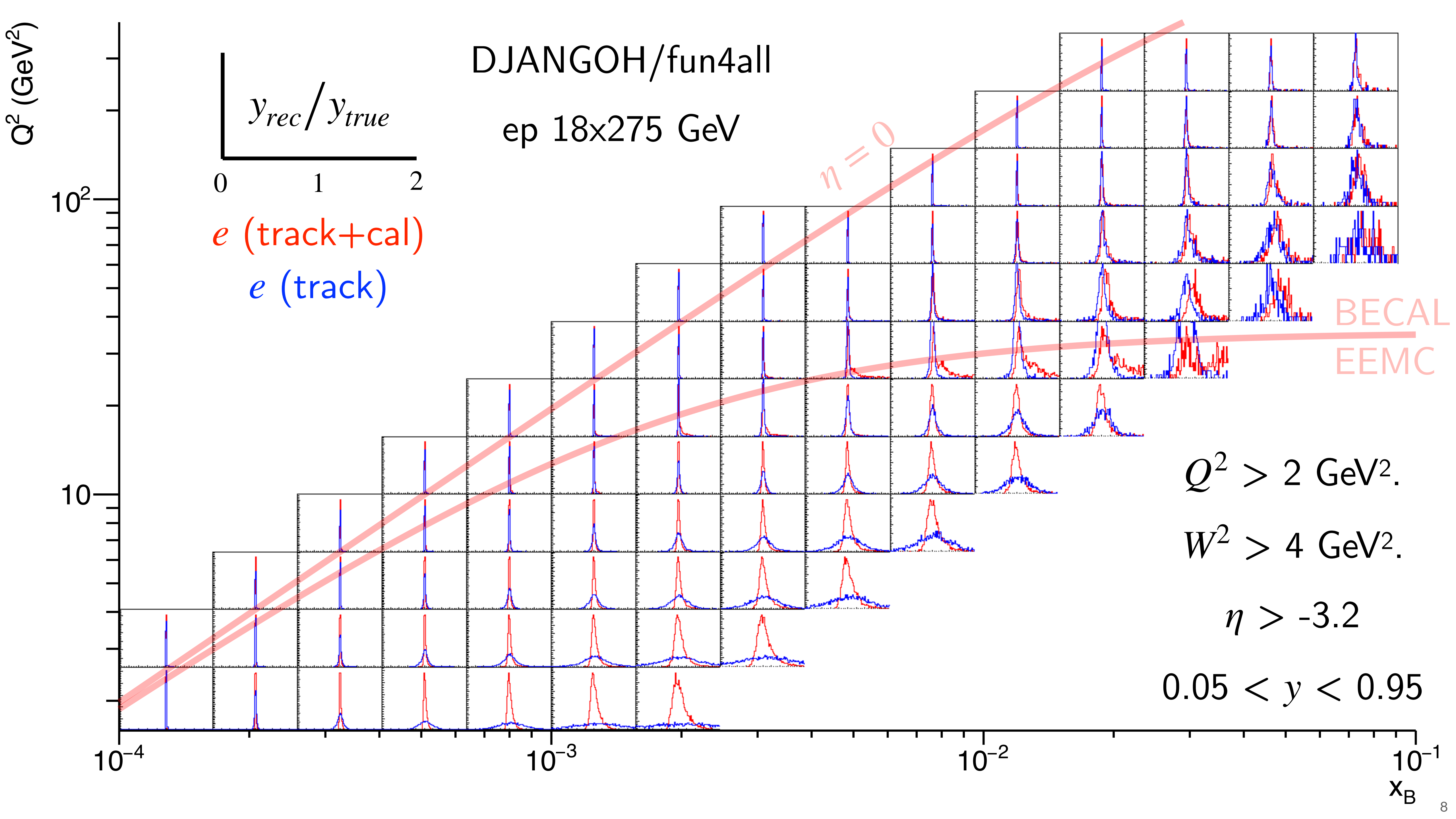


# Impact on kinematic reconstruction

- Study four reconstruction methods:
  - Lepton
  - Jacquet-Blondel
  - Double-angle
  - $e\Sigma$
- Repeat reconstruction twice to show impact of including calorimeter energy



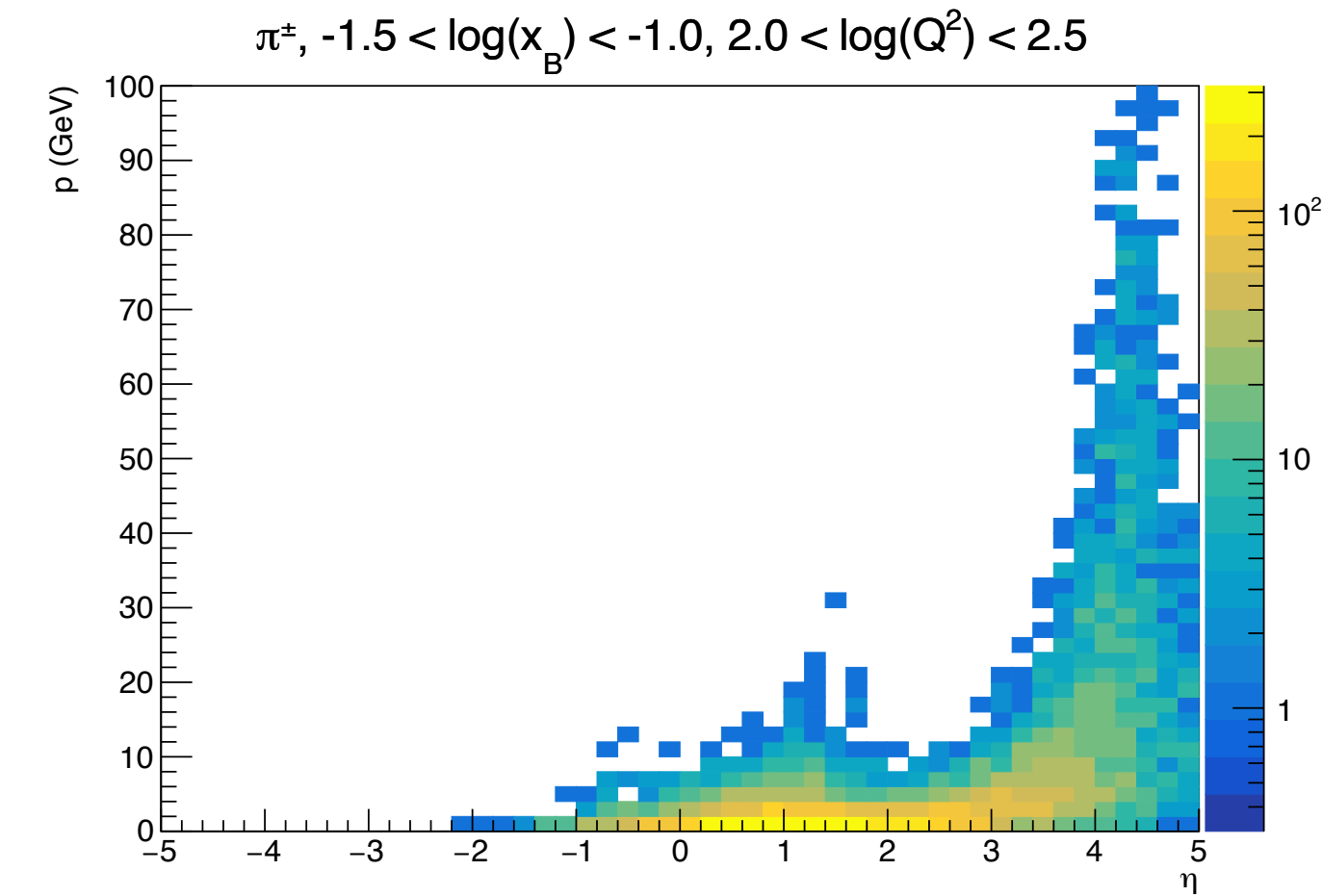
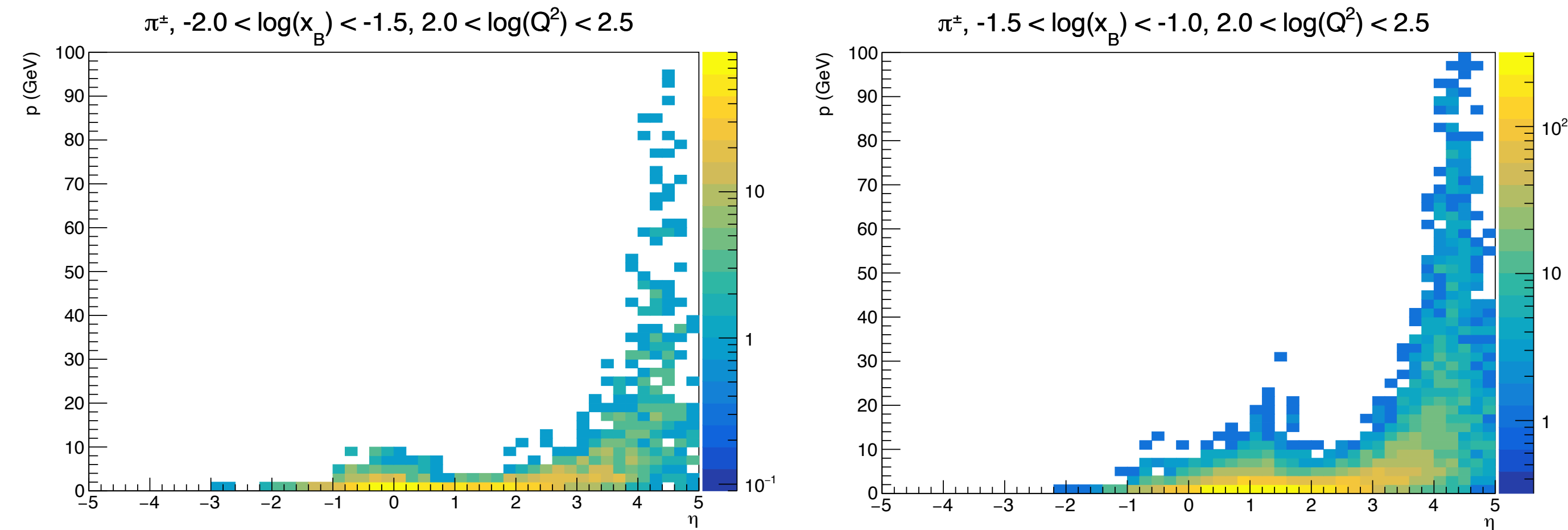
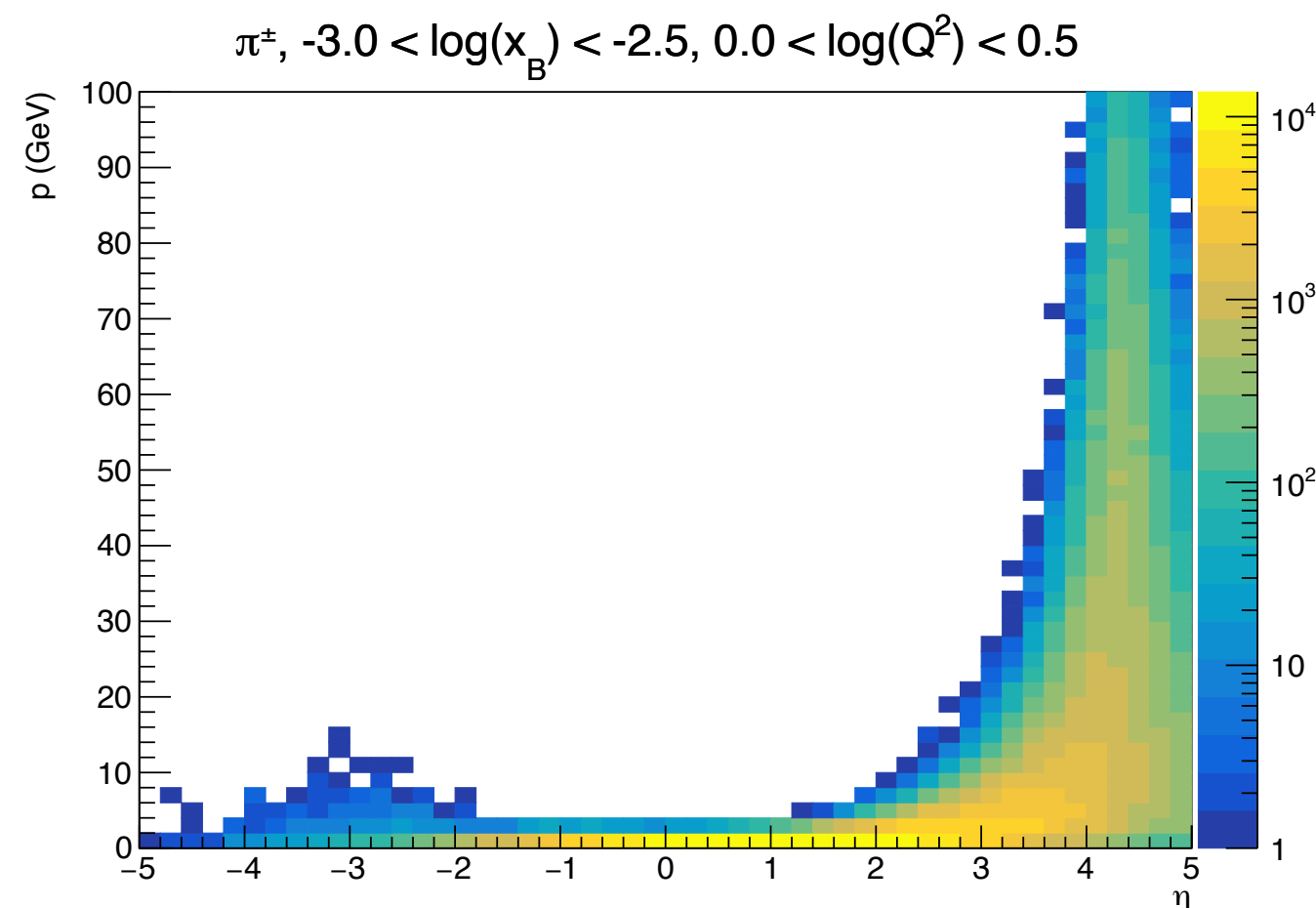
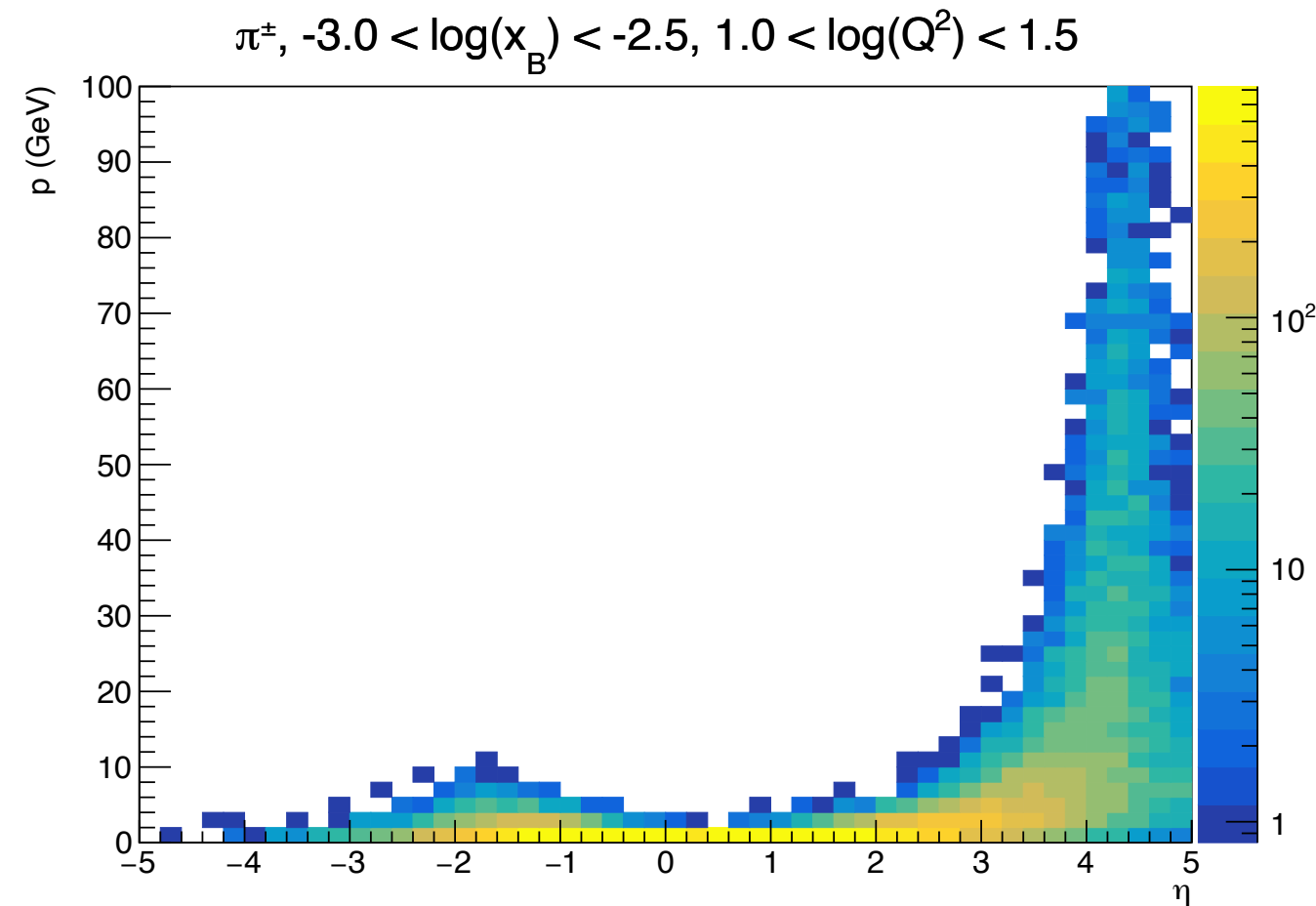




# Tracking is more important for hadronic quantities

$Q^2$

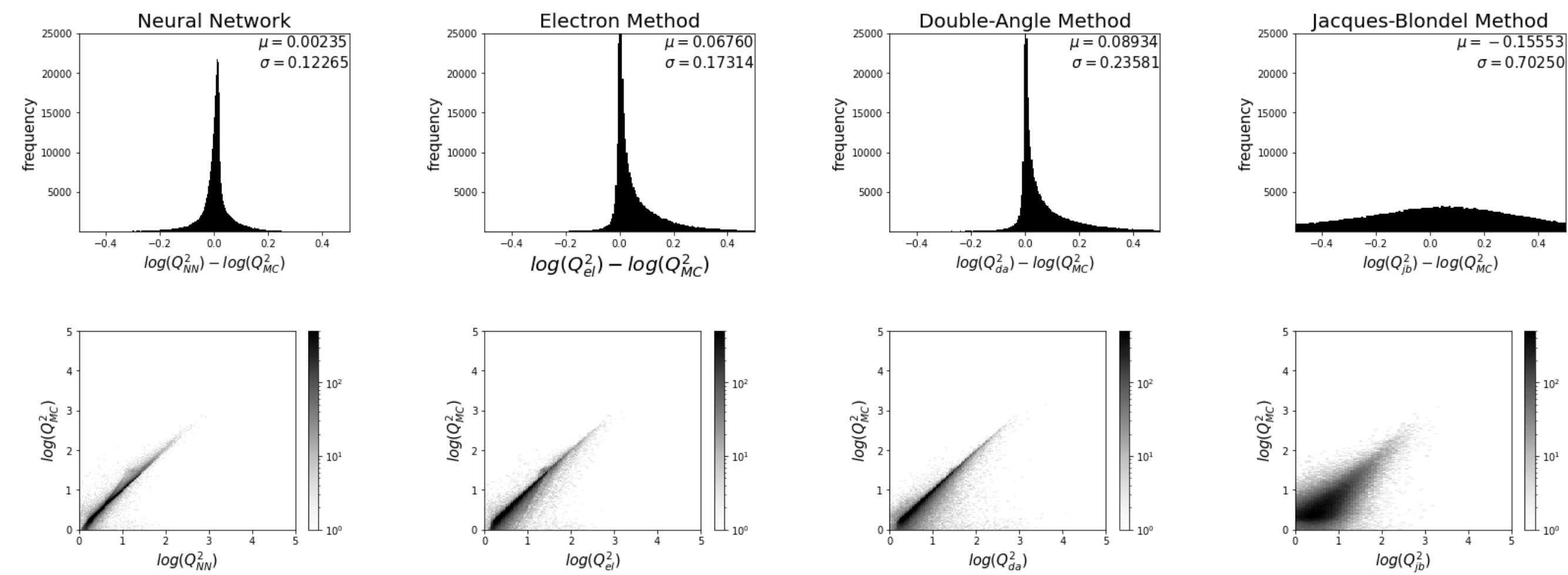
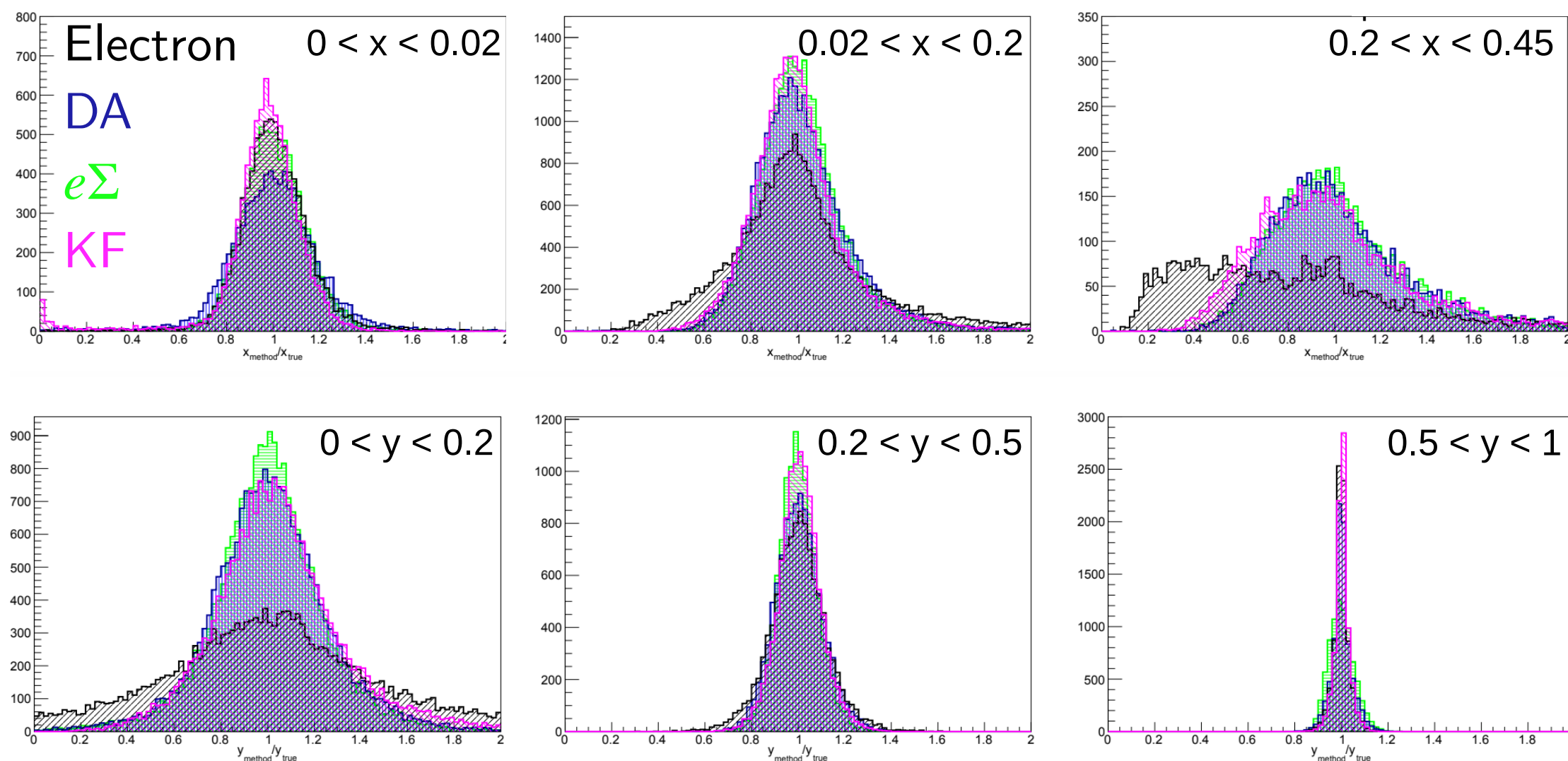
$x_B$



- Large concentration of final-state hadrons in barrel region
- Better performance of hadronic reconstruction methods when using tracks vs. clusters

# Moving to more advanced reconstruction methods

- Use full information  $\{E_e, \theta_e, \delta_h, P_{t,h}\}$  for each event
- Kinematic fitting: Bayesian analysis with assumed prior and likelihood function
- Machine learning: use simulation to train neural network



[See talk from inclusive WG meeting by Stephen Maple](#)

[M. Diefenthaler, A. Farhat, A. Verbytskyi and Y. Xu](#)

# Next steps

- Define “golden metrics” for inclusive analysis
  - Physics performance needs to integrate information from *all detectors!*
- Simulation analysis
  - Physics events pending
  - Photoproduction background (including  $\pi^-$ ,  $e^-$ )
- Electron ID