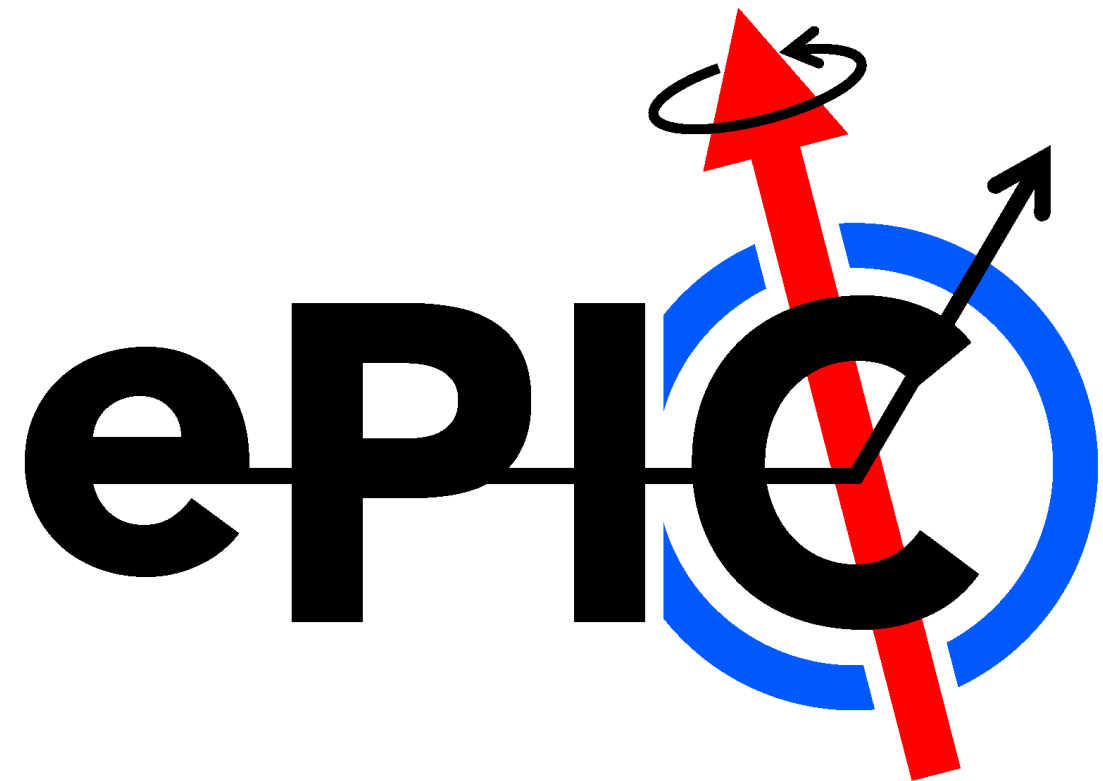


# Inclusive NC reduced cross sections

ePIC inclusive PWG meeting

April 29, 2024



# Cross section from simulation files

$$\frac{d\sigma}{dx_B dQ^2} = \frac{N}{C_{acc} \cdot C_{bin} \cdot L \cdot \Delta x_B \Delta Q^2}$$

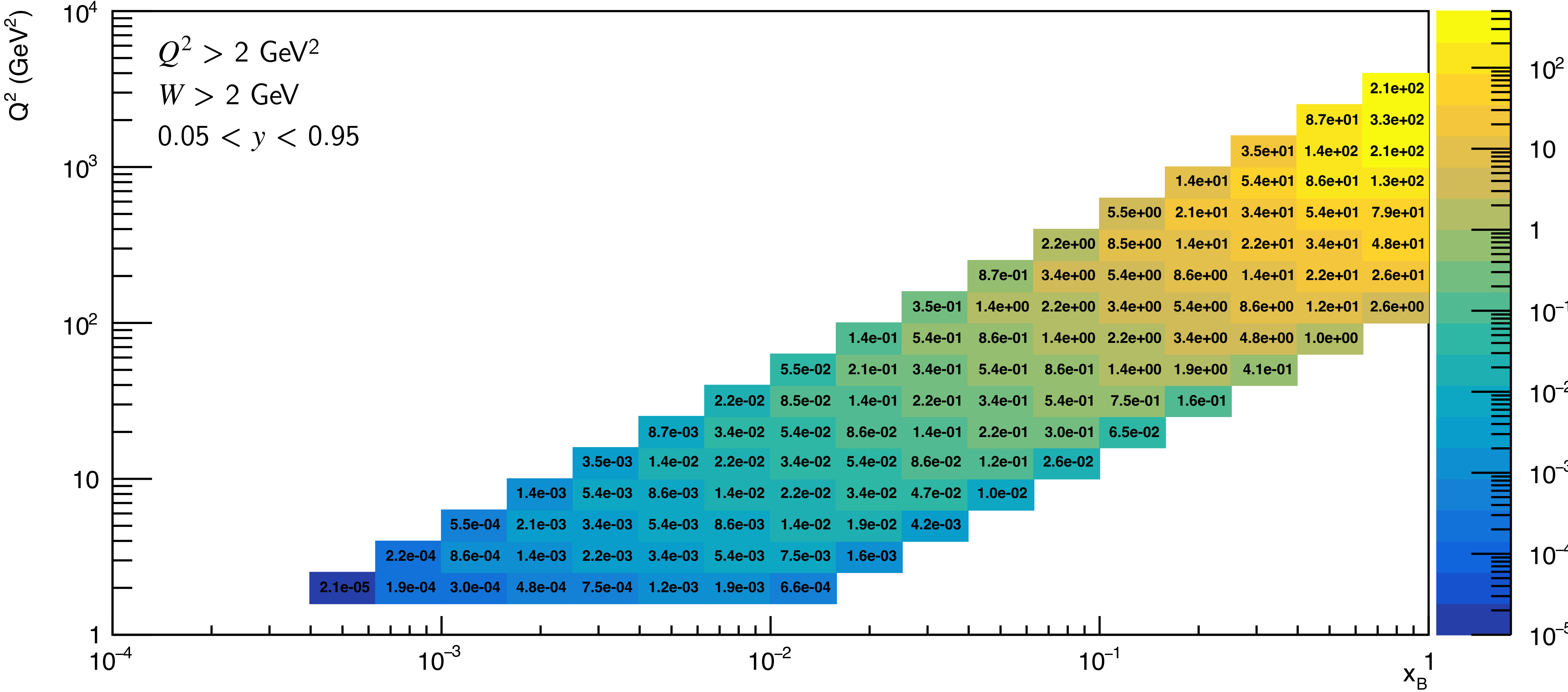
$$\sigma_{red} = \left( \frac{d\sigma}{dx_B dQ^2} \right) \cdot \frac{Q^4 x_B}{2\pi\alpha^2 Y_+ \hbar^2 c^2}$$

$$Y_+ = 1 + (1 - y)^2$$

- Acceptance and bin migration corrections from simulation
  - Keep separate to assess size of resolution effects
  - Applying corrections to same MC events used for corrections...obtain exact generated distributions
- Obtain bin volumes from Monte Carlo (account for cuts)
- Scale counts to integrated luminosity of  $10 \text{ fb}^{-1}$  .
- Currently only using electron track reconstruction
  - Combination of tracking/calorimetry for electron reconstruction in-progress
  - Working on fix to hadronic final state reconstruction methods

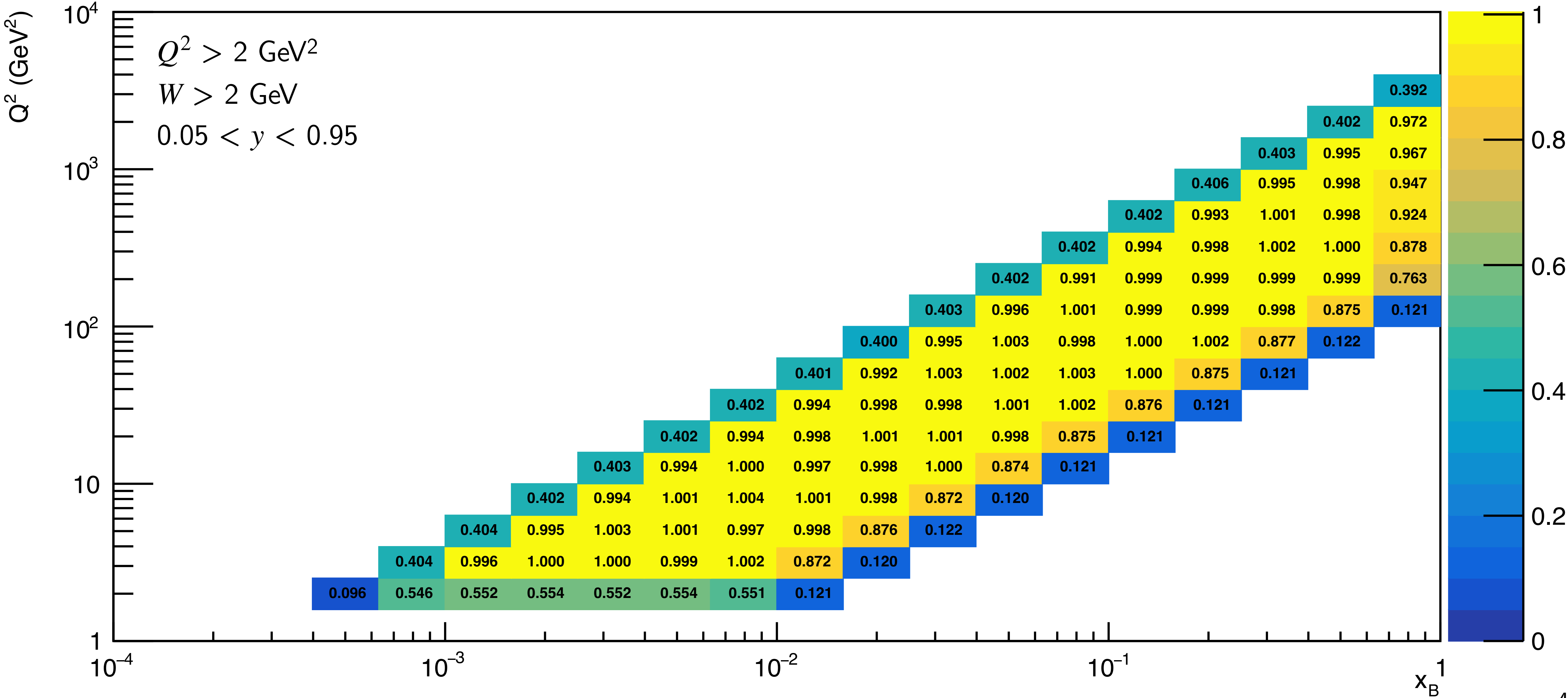
# Bin volumes with kinematic cuts

$dx_B dQ^2$  (10x100 GeV)



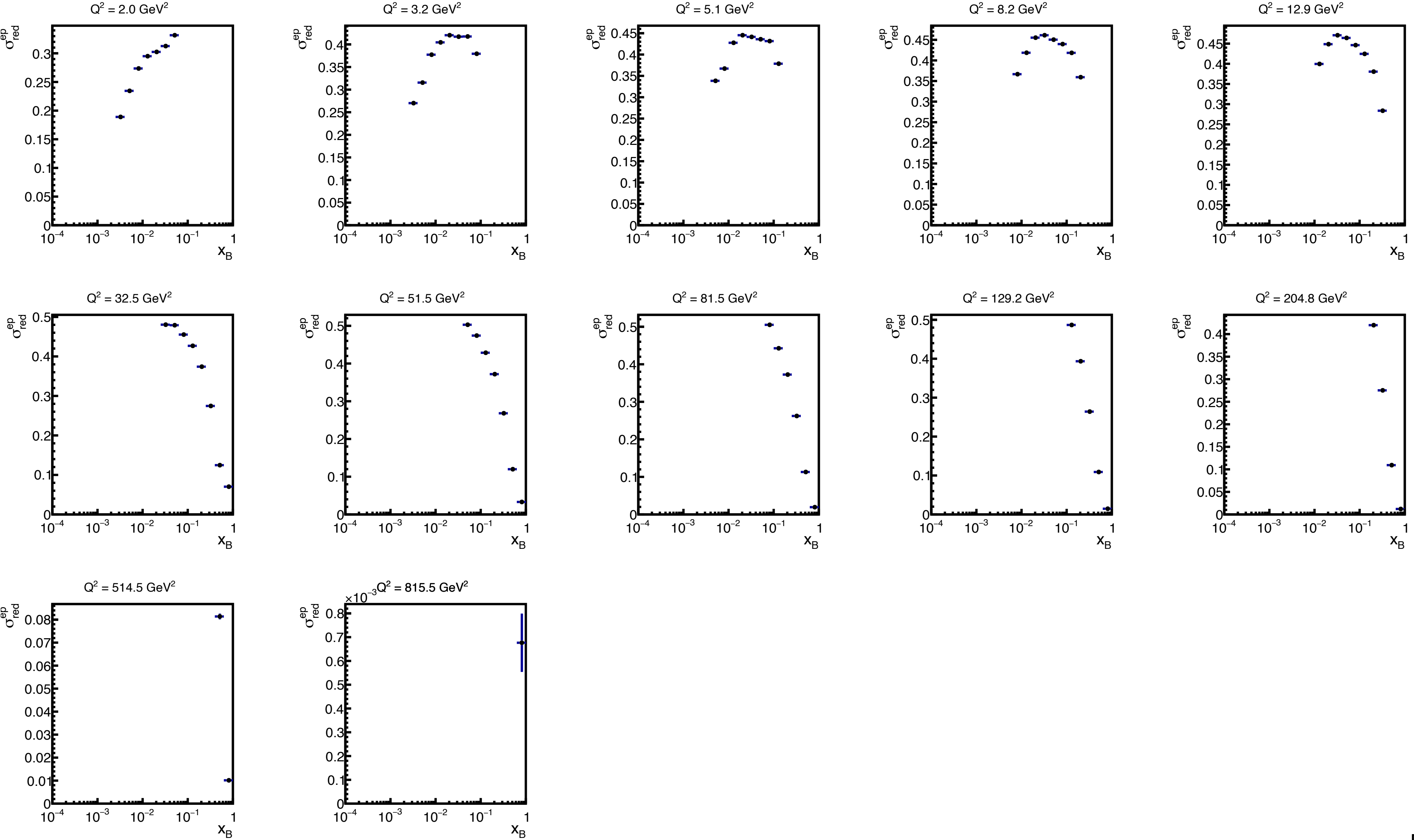
# Bin volumes relative to no kinematic cuts

$$\frac{dx_B dQ^2}{dx_B dQ^2_{\text{no cuts}}} \quad (10 \times 100 \text{ GeV})$$



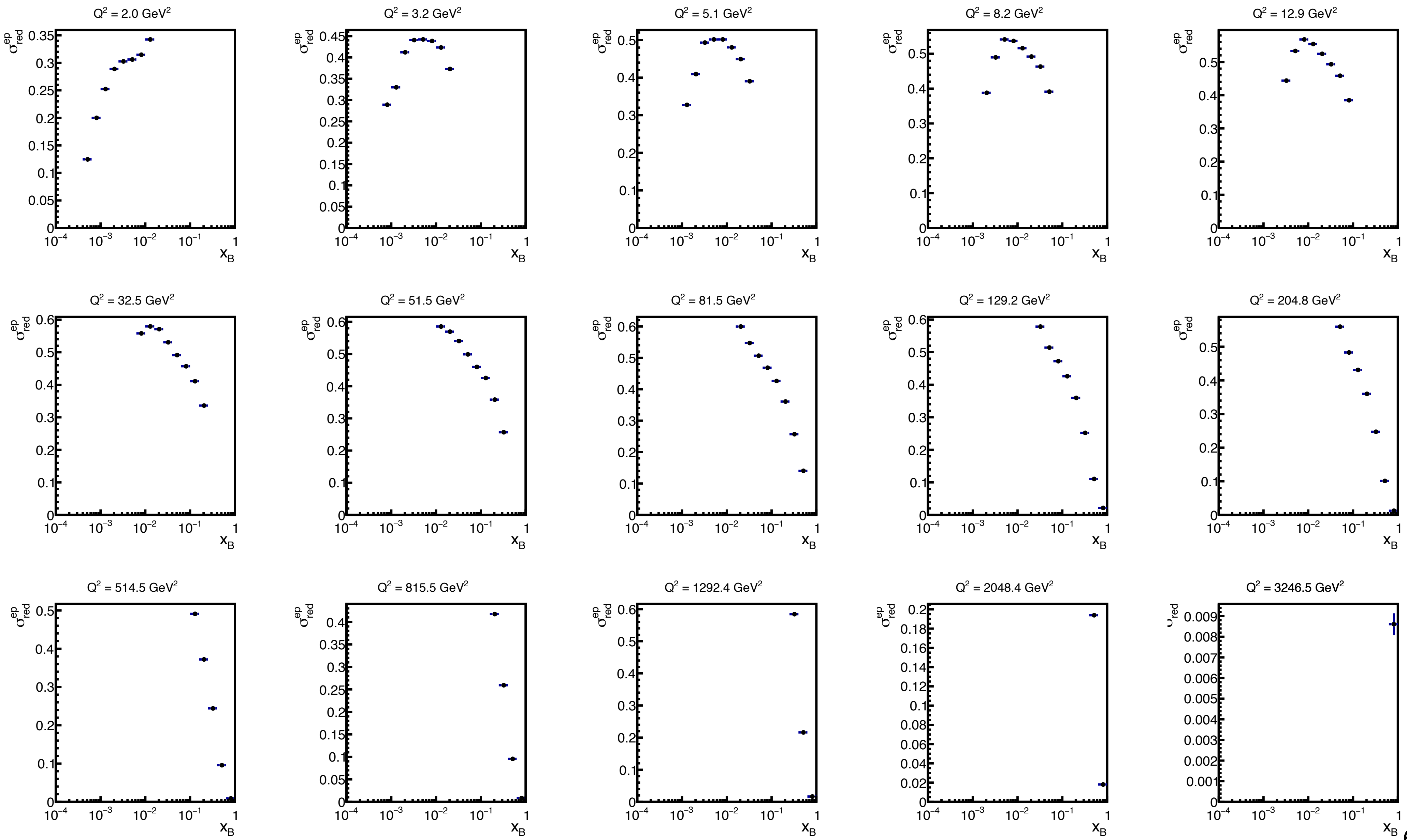
# Reduced cross section (5x41, electron track)

$Q^2 > 2 \text{ GeV}^2$   
 $W > 2 \text{ GeV}$   
 $0.05 < y < 0.95$



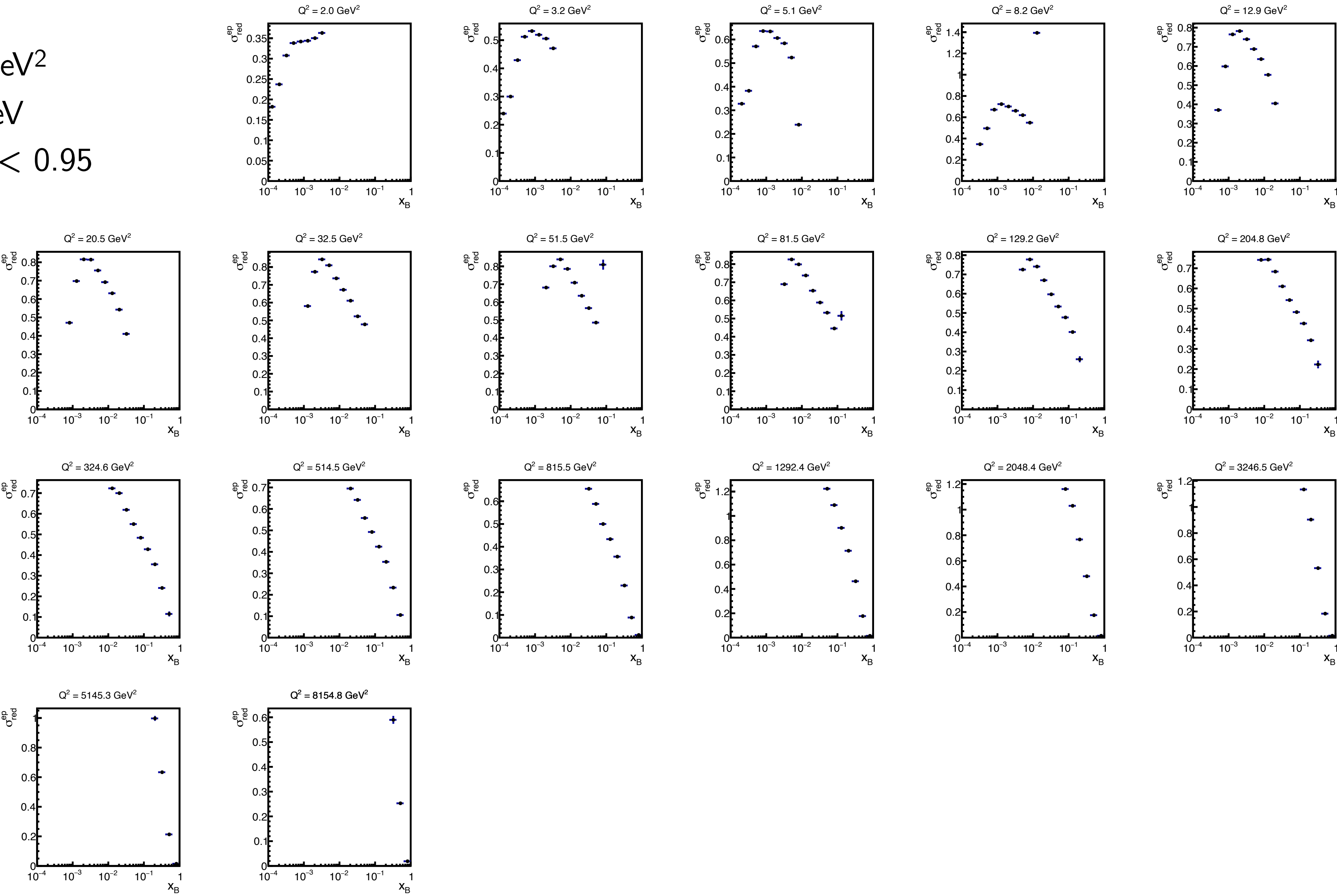
# Reduced cross section (10x100, electron track)

$Q^2 > 2 \text{ GeV}^2$   
 $W > 2 \text{ GeV}$   
 $0.05 < y < 0.95$



# Reduced cross section (18x275, electron track)

$Q^2 > 2 \text{ GeV}^2$   
 $W > 2 \text{ GeV}$   
 $0.05 < y < 0.95$



# Next steps

## Reconstruction

- Still working on hadronic reconstruction methods

## Systematics!

- Resolution
- Energy calibration
- MC/generator uncertainty?
- Need electron ID to assess purity