NC Cross Section Comparison with HERA and Theory

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Inclusive Physics WG
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DJANGHO Comparison with HERA

- Energy
  - 27.6 GeV (e-) on 920 GeV (p), $\sqrt{s} = 318.7\ GeV$
- 100,000 NC trials
- Cuts
  - Generator: $2\times10^{-3} < x < 0.65, 150GeV^2 < Q^2 < 30000\ GeV^2, 2.2\times10^{-3} < y < 1.0,$
    - Note: DJANGHO modifies x_{min} and y_{min} for consistency with Q^2_{min}
  - Analysis: $W^2 > 225\ GeV^2$

- Reduced cross section

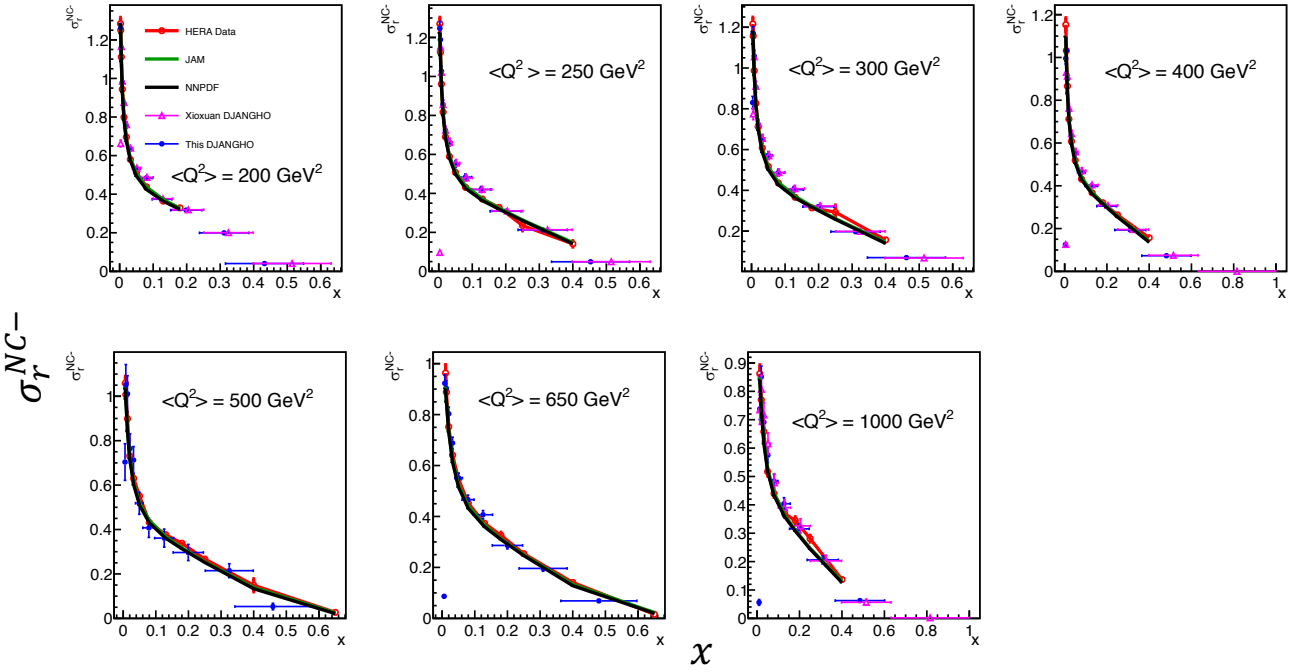
$$\frac{d\sigma}{dxdQ^2} = counts(x, Q^2) \cdot \left(\frac{\left(\frac{\sigma_{tot}^{DJANGHO}}{trials}\right)}{\Delta x \Delta Q^2} \right)$$

$\Delta x, \Delta Q^2 =$ respective bin widths

$$f = \frac{Q^4 x}{2\pi\alpha_{em}^2(1 + (1-y)^2)}$$

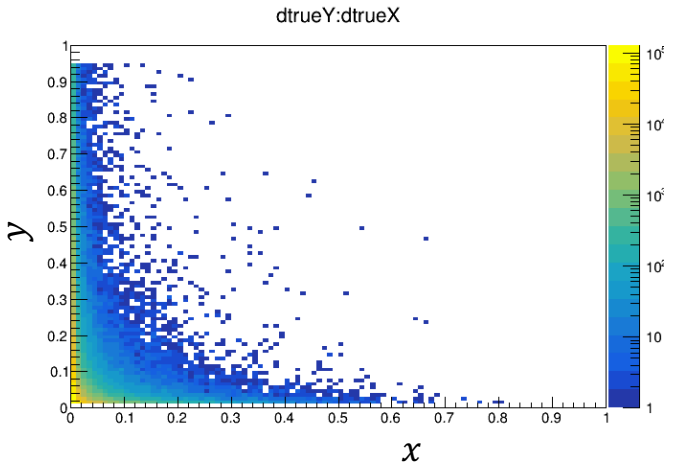
$C =$ barn conversion constant

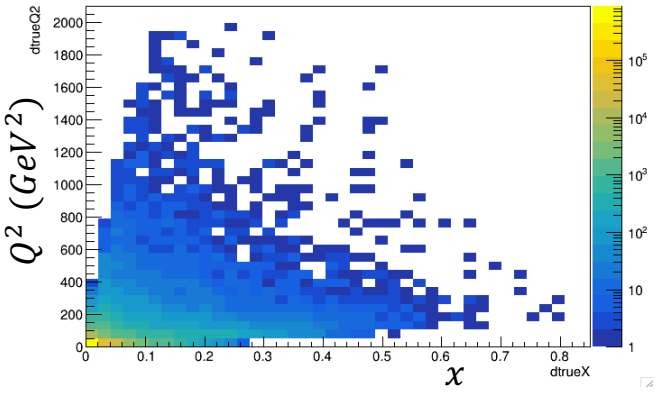
$$\sigma_r = f \cdot \left(\frac{d\sigma}{dxdQ^2}\right) \cdot \frac{1}{C}$$

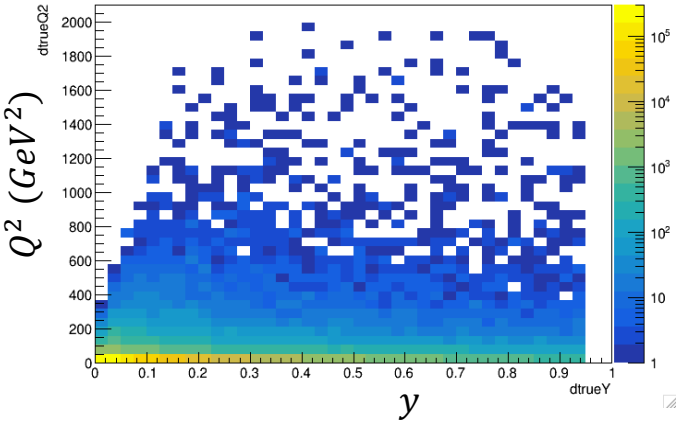


DJANGHO Comparison with Theory

- Energy
  - 18 GeV (e-) on 275 GeV (p), $\sqrt{s} = 140.7\ GeV$
- 1,000,000 events
- Cuts
  - Generator: $1\times10^{-3} < x < 0.99, Q^2 < 1.0\ GeV^2, 0.01 < y < 0.95, W^2 > 1.96\ GeV^2$
    - Note: DJANGHO modifies ${Q^2}_{min,max}$ for consistency with $W_{min}, x_{min}, y_{min}$
  - Analysis: matches cuts above, lowest x-bin edge is 0.0025 (could go lower)



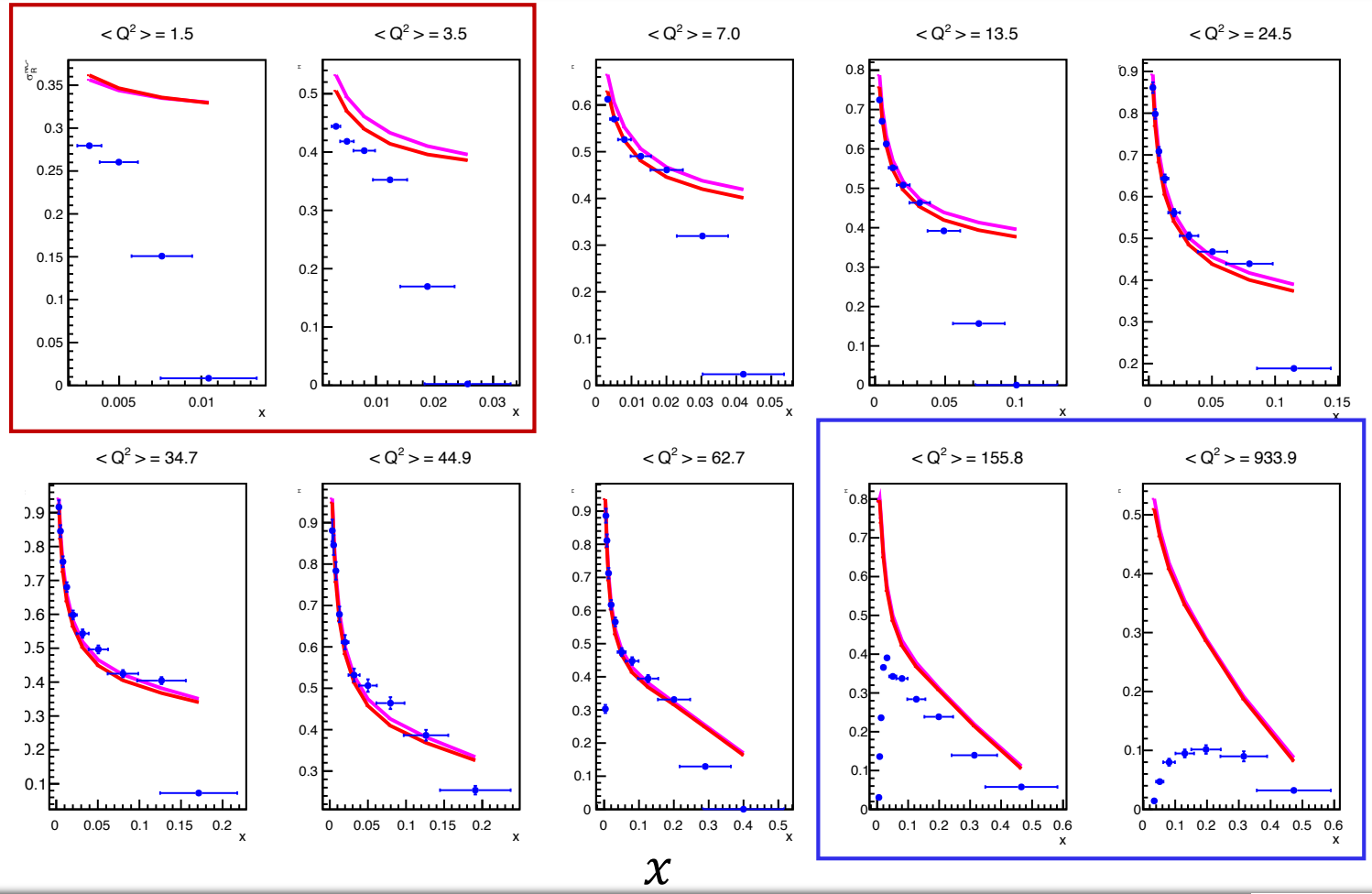




DJANGHO Comparison with Theory

- Reduced Cross Section
  - See slide 2 for def.

σ_r^{NC-}

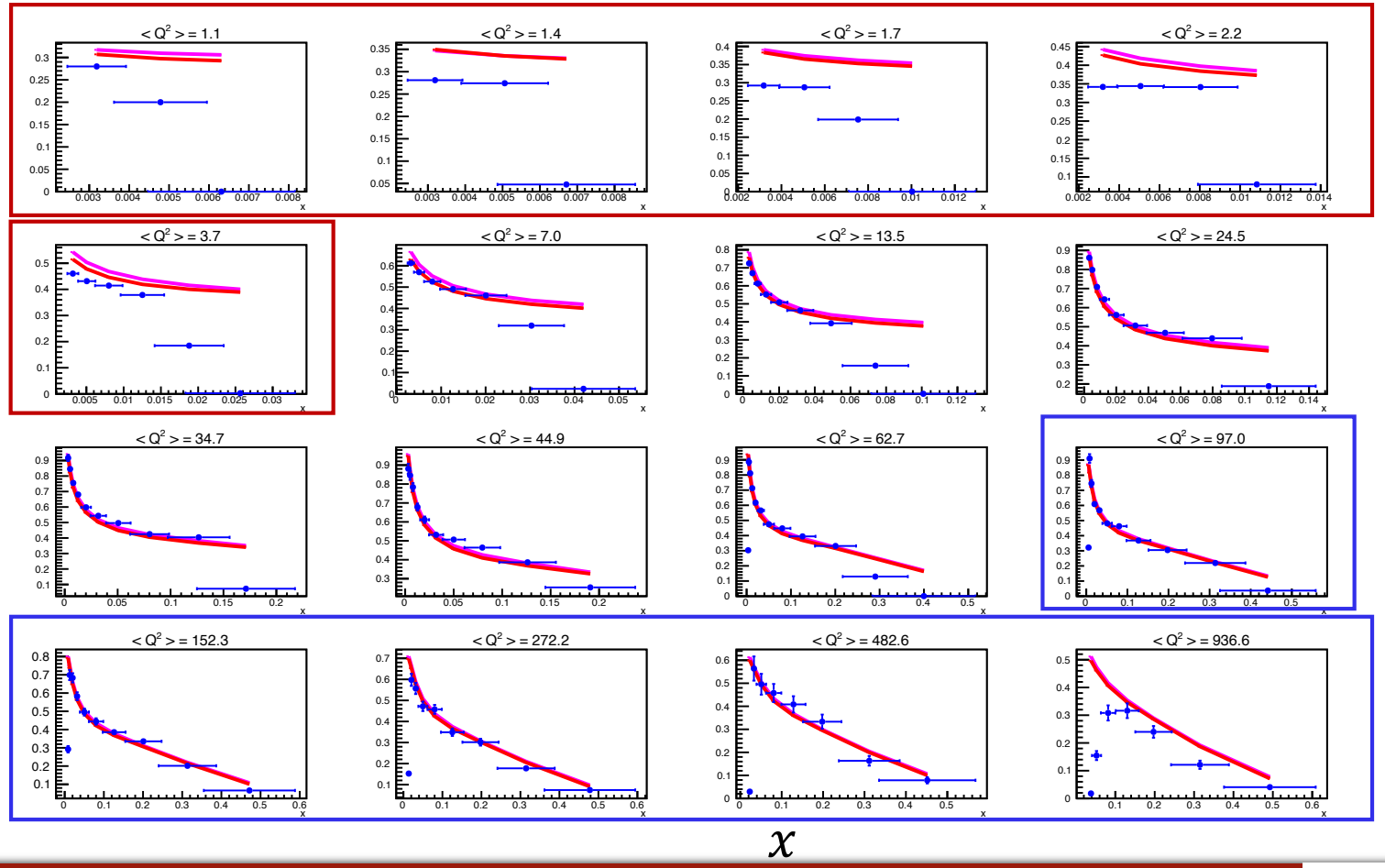


DJANGHO Comparison with Theory

- Reduced Cross Section:

No Radiative Effects

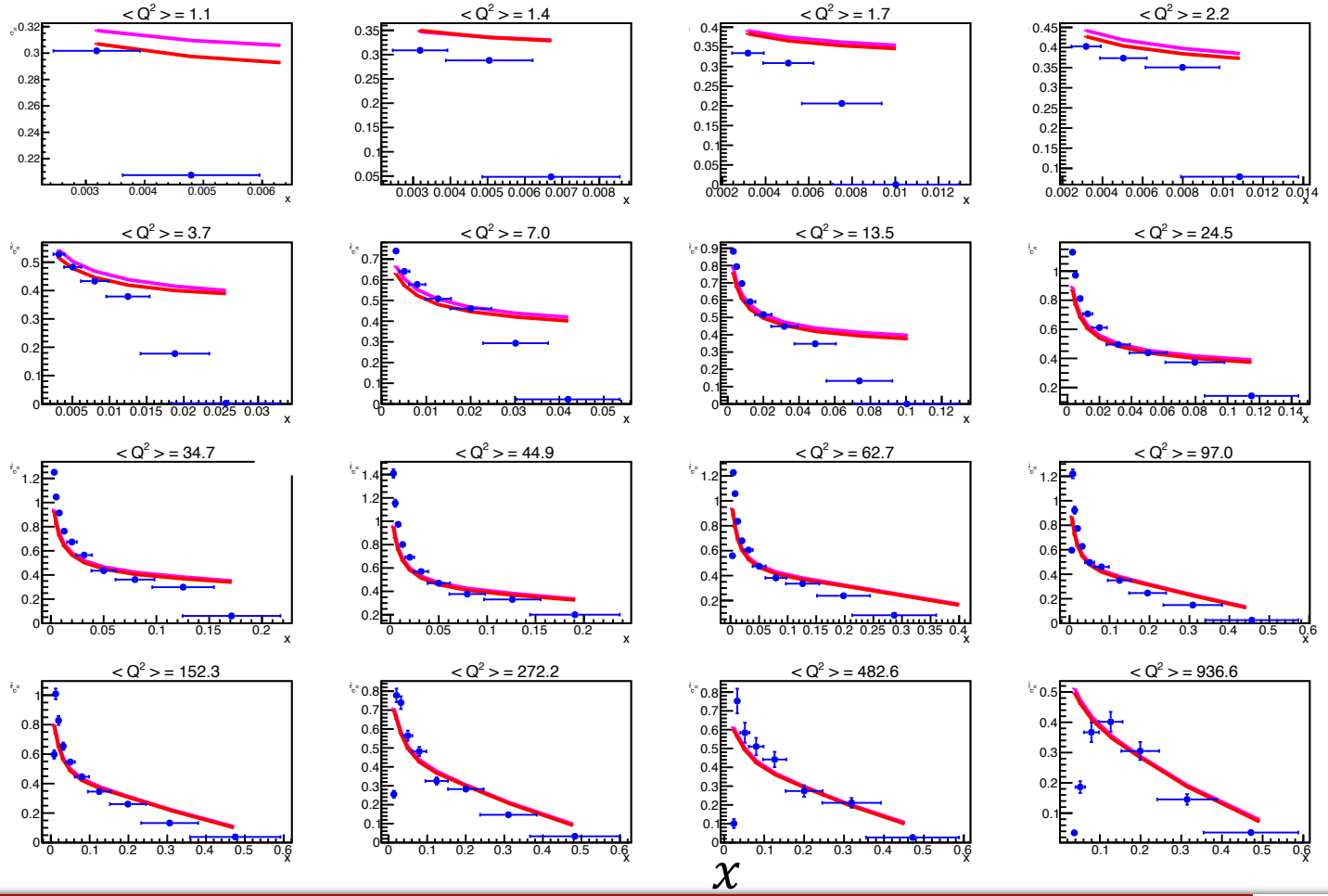
σ_r^{NC-}



DJANGHO Comparison with Theory

- Reduced Cross Section: Radiative Effects

σ_r^{NC-}

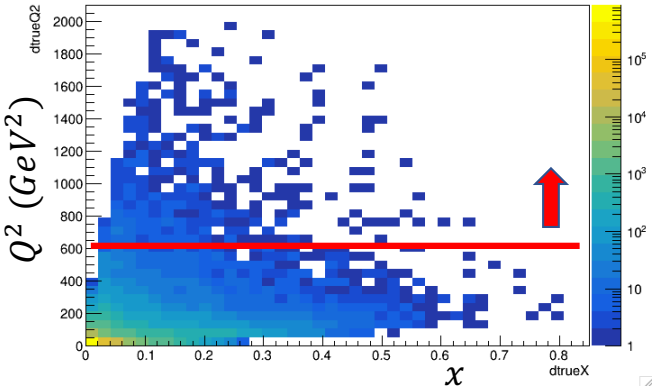


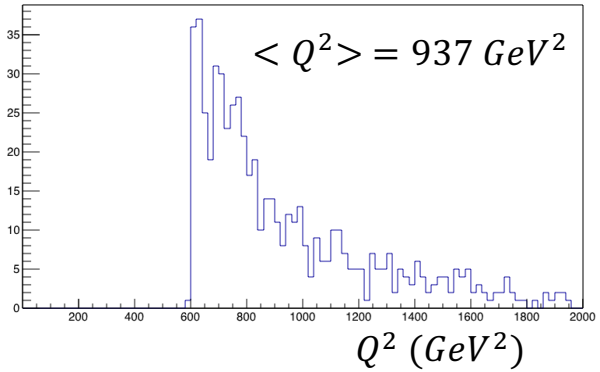
Summary and Next Steps

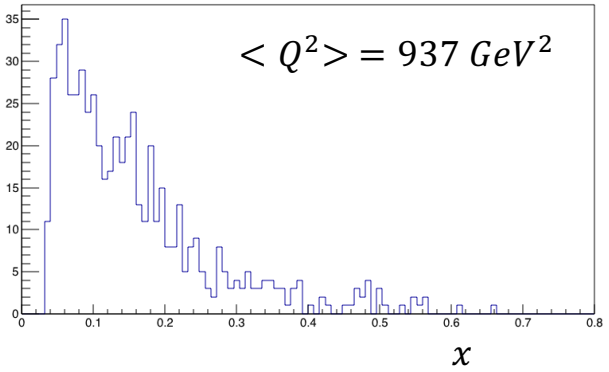
- Summary
  - Good agreement between DJANGHO and theory with HERA data
  - Poor agreement between DJANGHO and theory at low Q^2
  - Good agreement between DJANGHO and theory at mid-to-larger Q^2
  - Cross sections with no radiative events are in better agreement overall with theory than cross sections with radiative events.

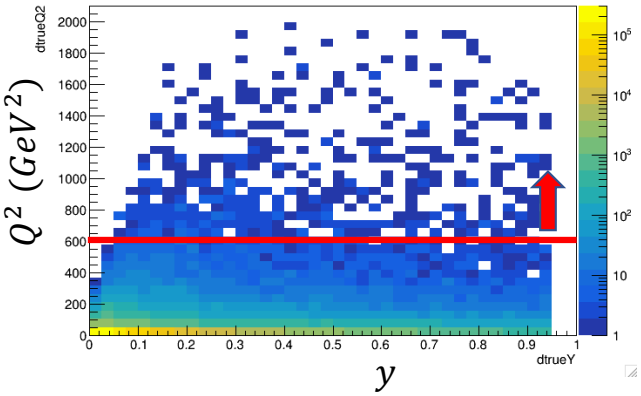
- Next Steps
  - Apply reweighting to shown DJANGHO results
  - Reproducing g1 results from white paper using DJANGHO
    - 18x275: with rad cor. (currently running)

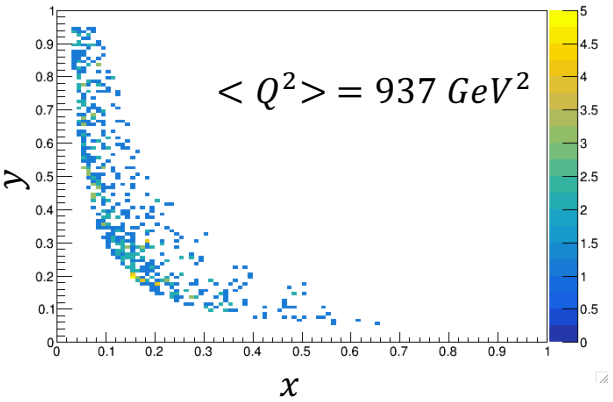
DJANGHO Comparison with Theory

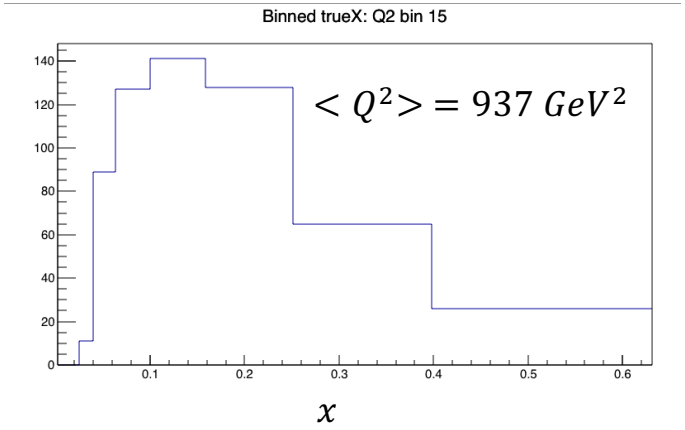












DJANGHO Comparison with Theory: Kinematics