

Requirements from the Inclusive Reactions Group

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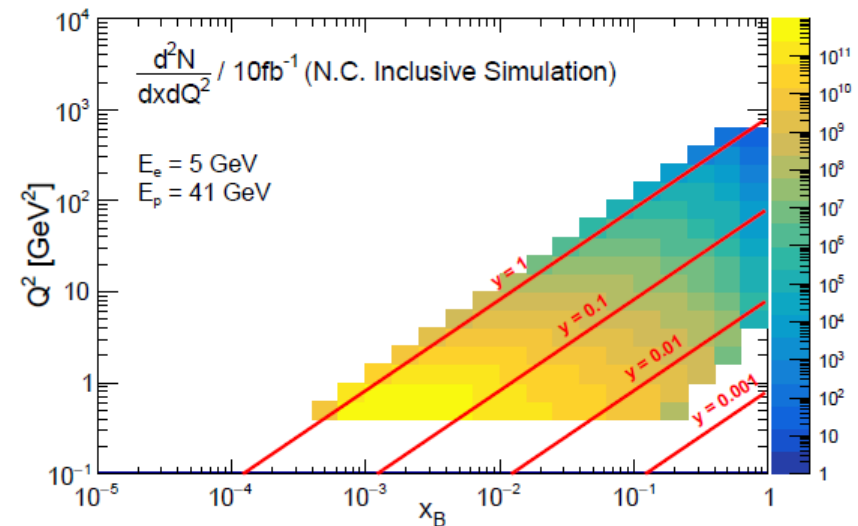
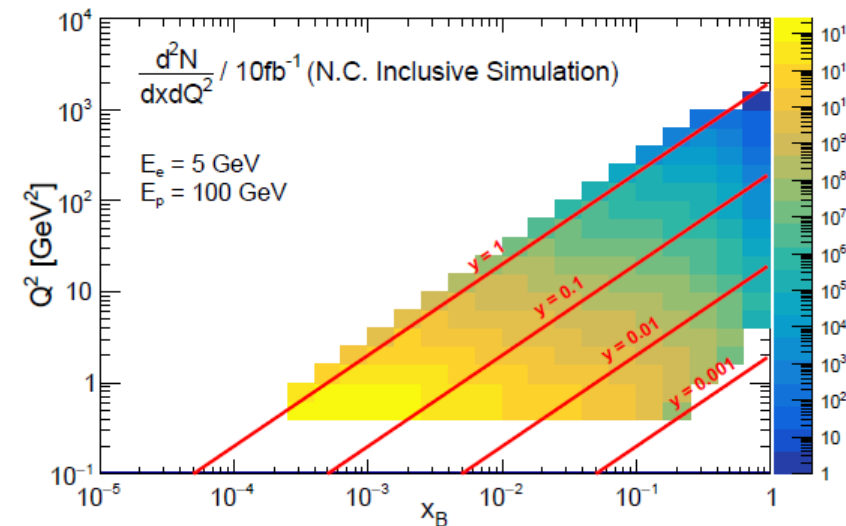
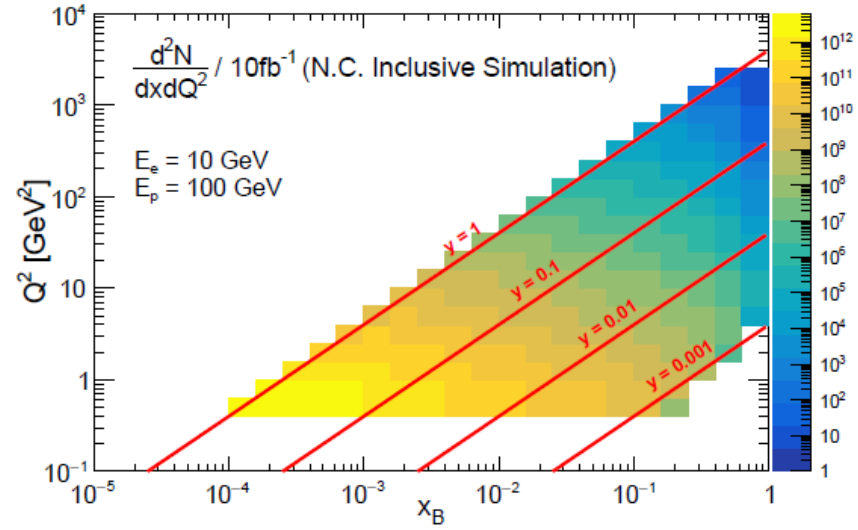
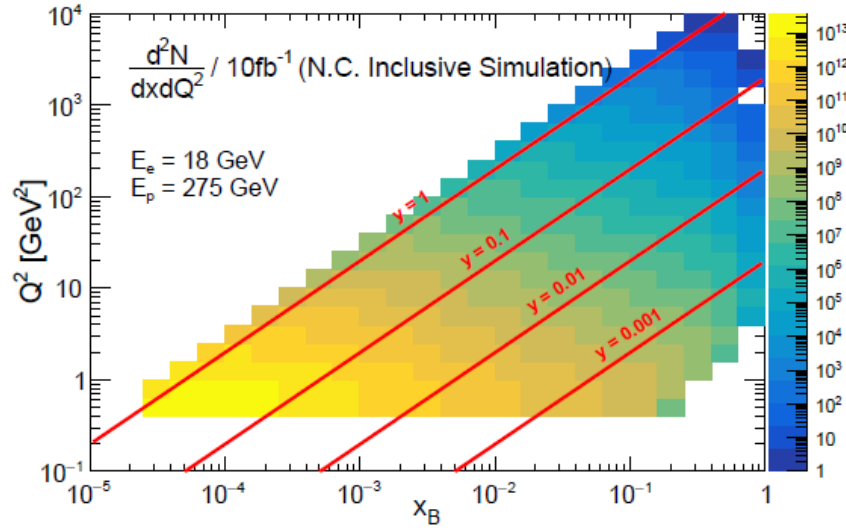
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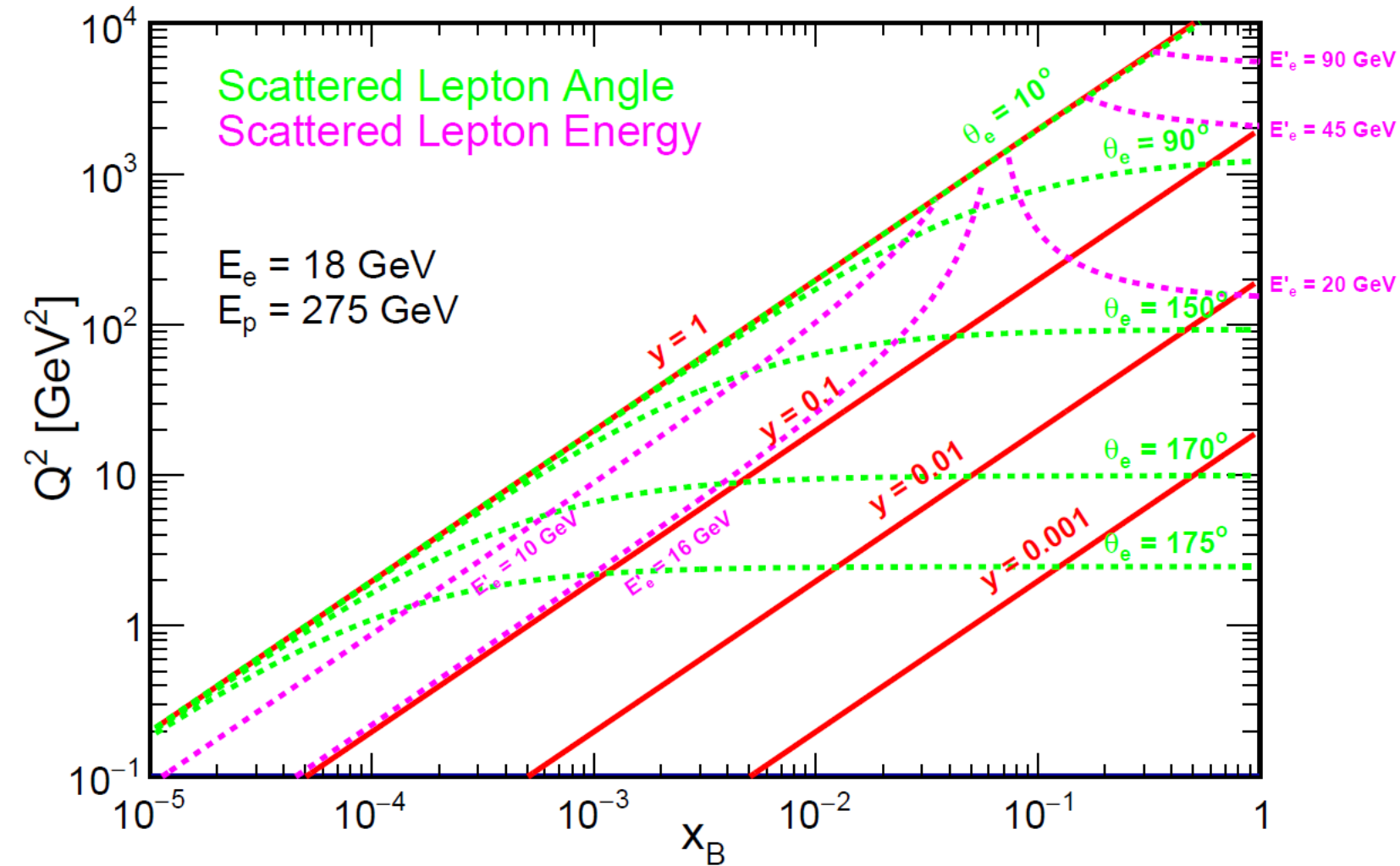
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N.C. Kinematic Phase Space and Yields



Scattered Electron Kinematics

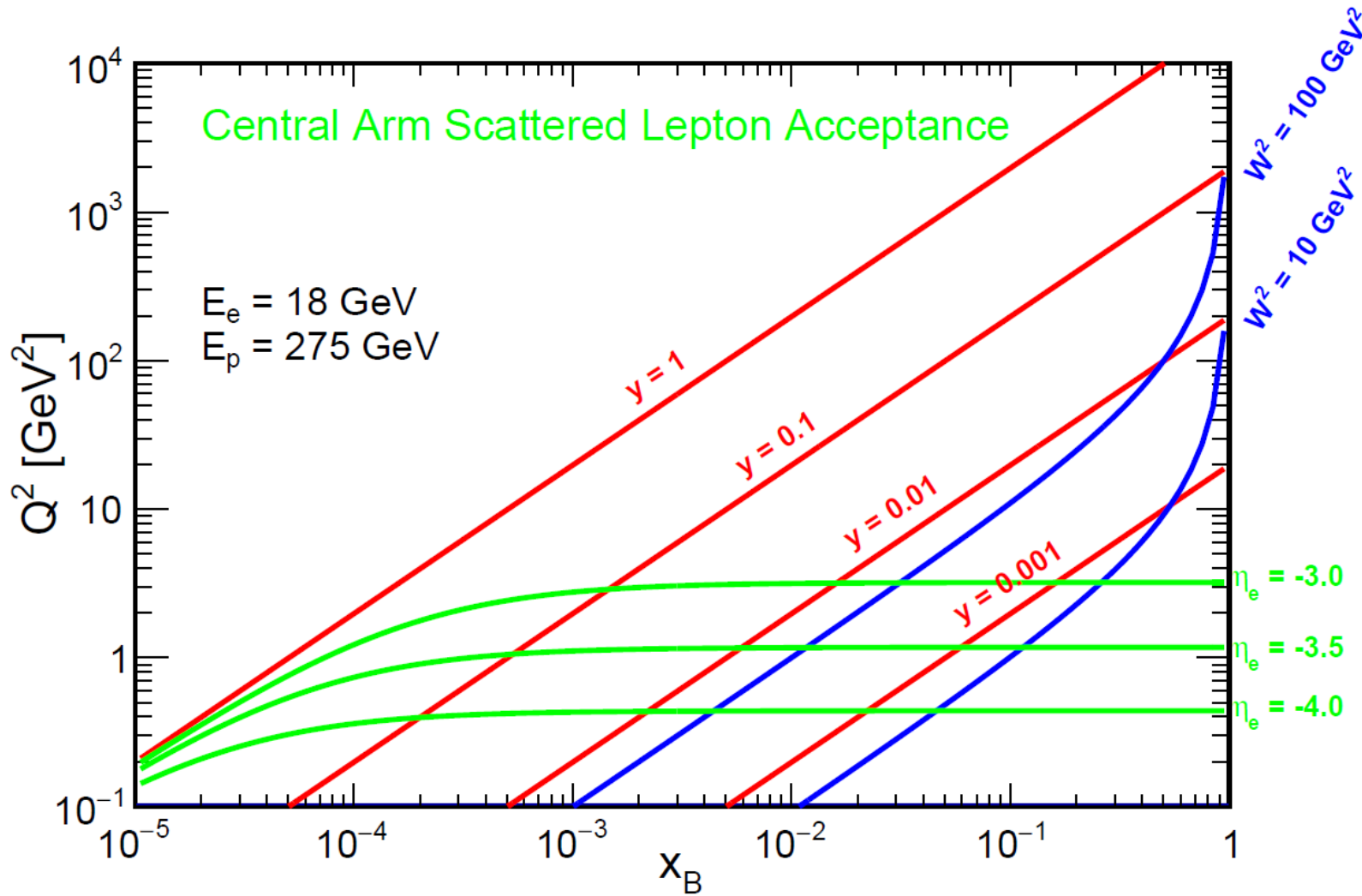


$$Q^2 = 4EE' \cos^2(\theta_p^{e'}/2)$$

$$y = 1 - \frac{E'(1 - \cos \theta_p^{e'})}{2E}$$

$$x = \frac{Q^2}{sy}$$

Scattered Electron Kinematics

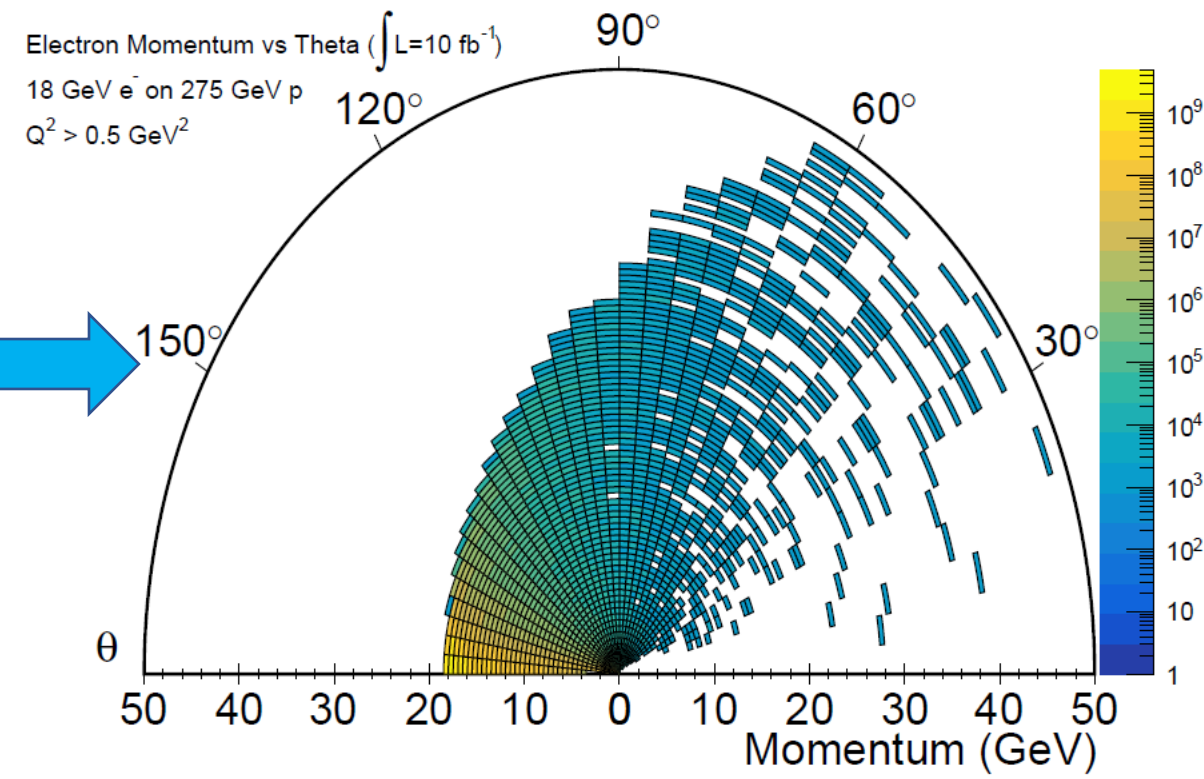
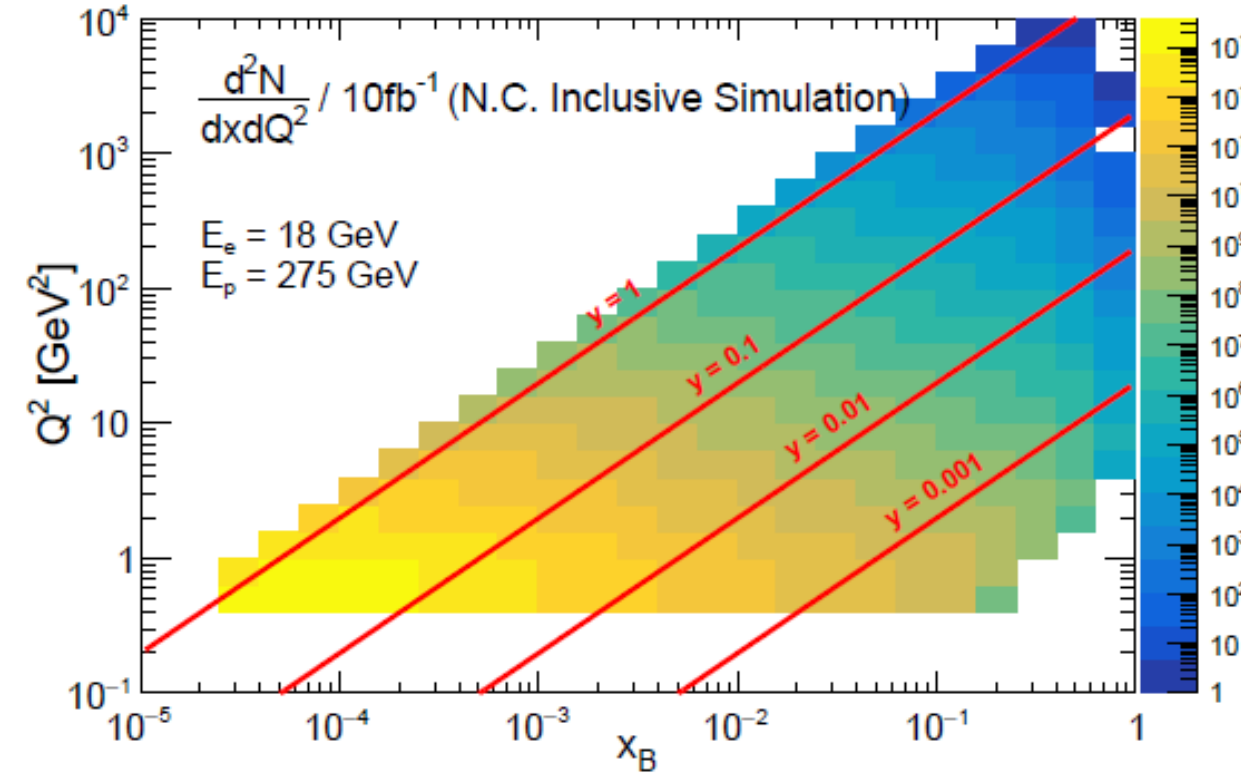


$$Q^2 = 4EE' \cos^2(\theta_p^{e'}/2)$$

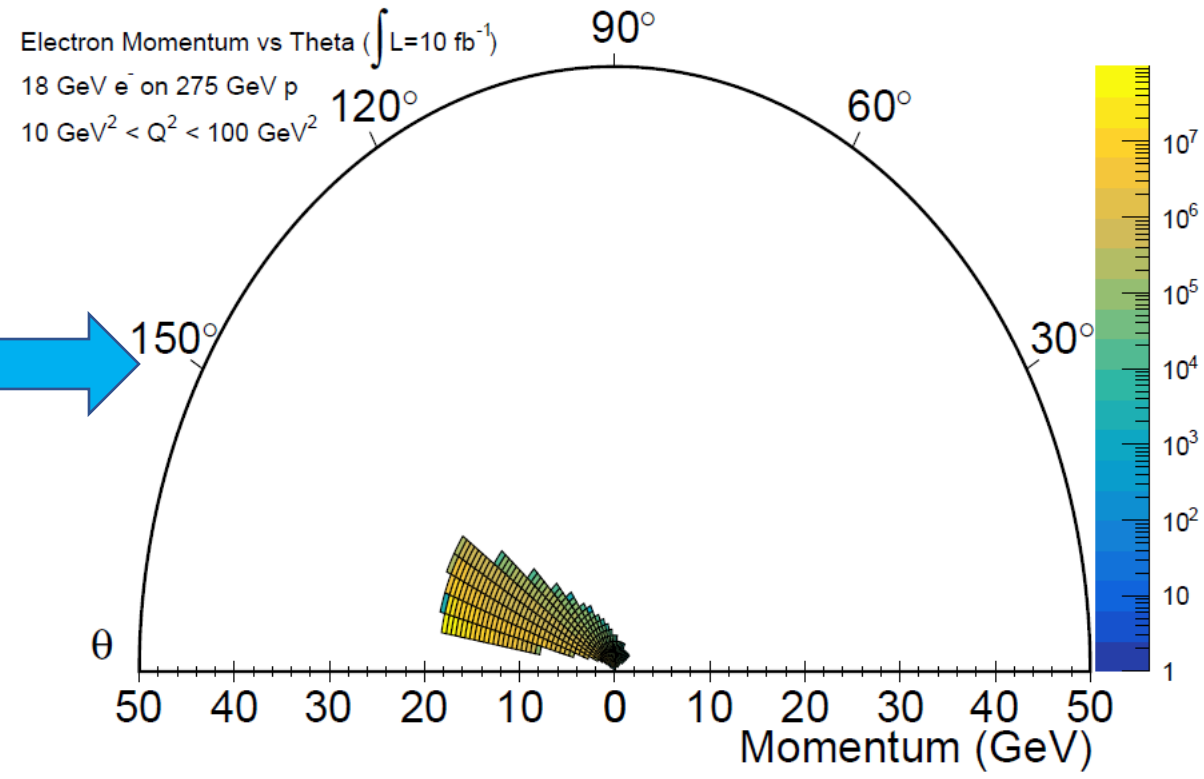
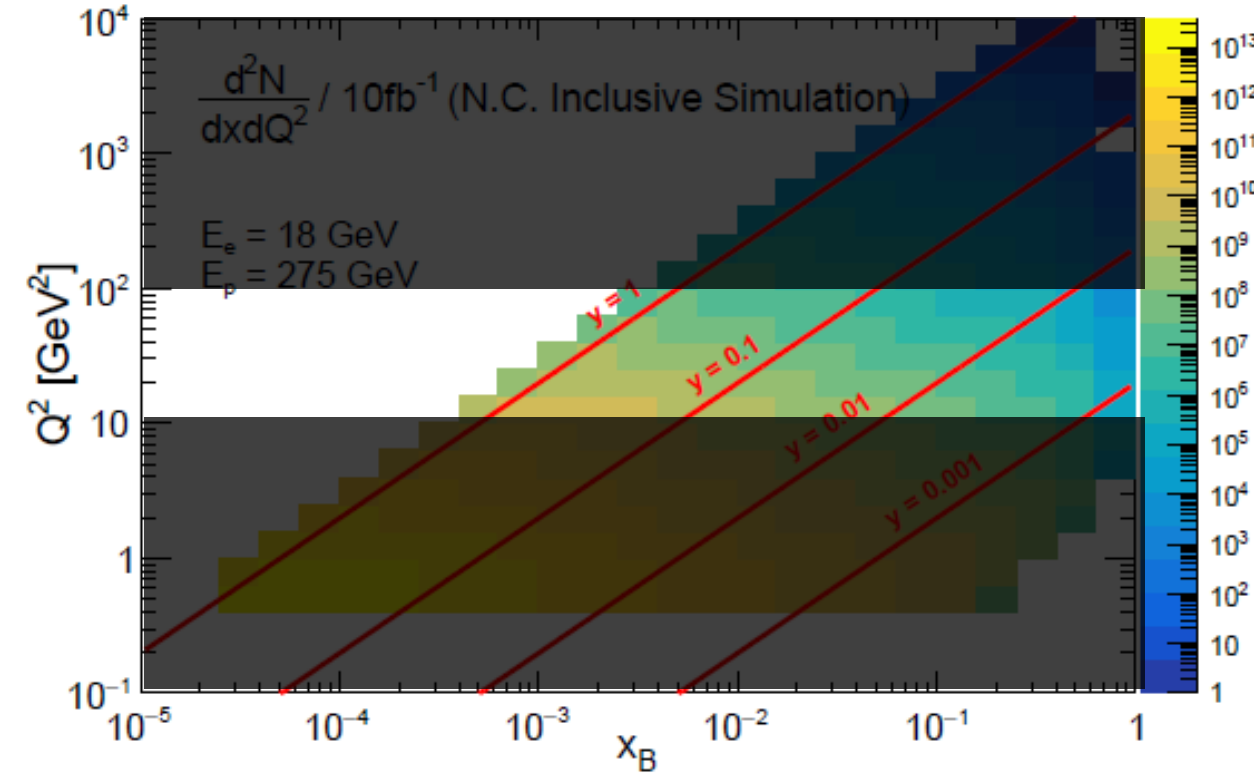
$$y = 1 - \frac{E'(1 - \cos \theta_p^{e'})}{2E}$$

$$x = \frac{Q^2}{sy}$$

Scattered Electron Kinematics and Yields

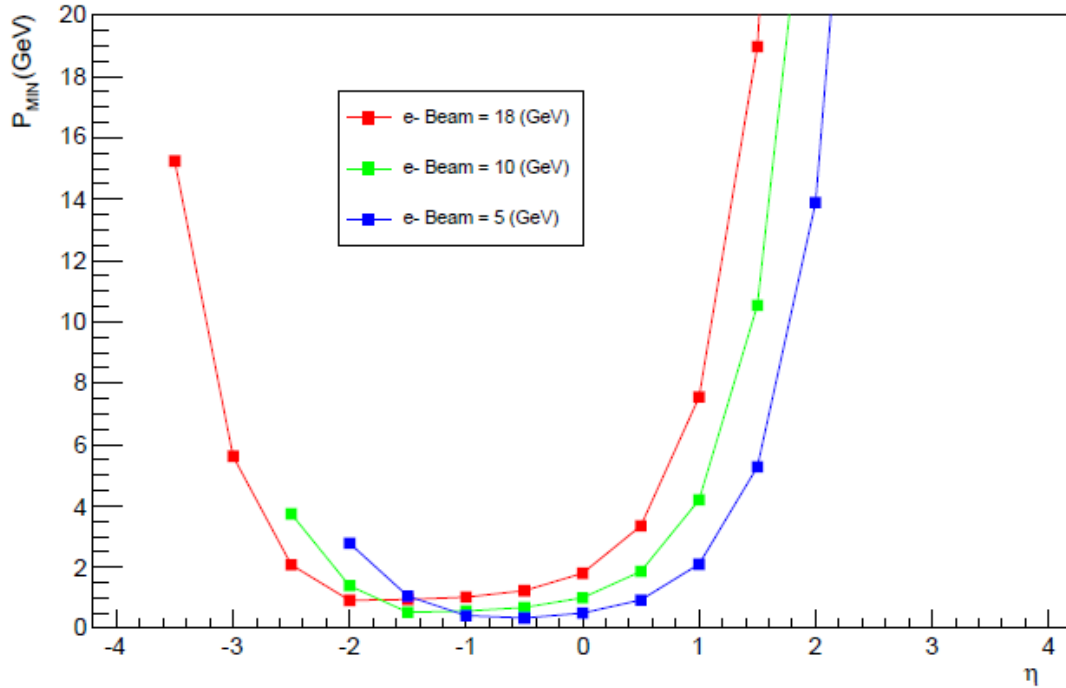


Scattered Electron Kinematics and Yields



Electron Momentum Acceptance

η vs Minimum P



$Q^2 > 1 \text{ GeV}^2$ and $y < 0.95$ constraints applied

$E_{beam}^{e^-}$ (GeV)	η bin	$p_{min}^{e^-}$ (GeV)
18	(-3.5,-2)	0.9
18	(-2,-1)	0.9
18	(-1, 0)	1.0
18	(0, 1)	1.8
10	(-3.5,-2)	1.4
10	(-2,-1)	0.5
10	(-1, 0)	0.6
10	(0, 1)	1.0
5	(-3.5,-2)	2.8
5	(-2,-1)	0.4
5	(-1, 0)	0.3
5	(0, 1)	0.5

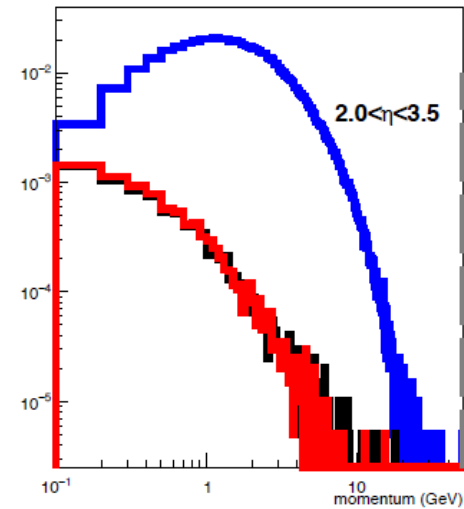
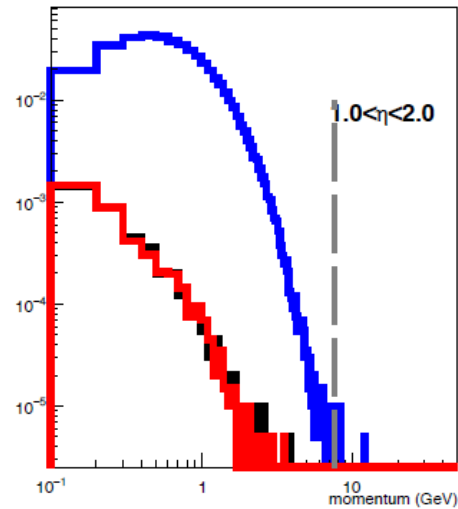
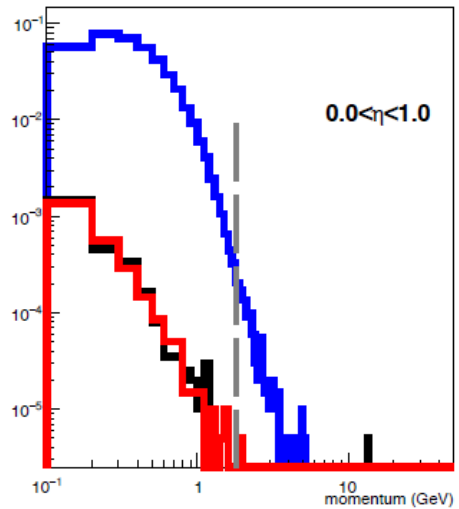
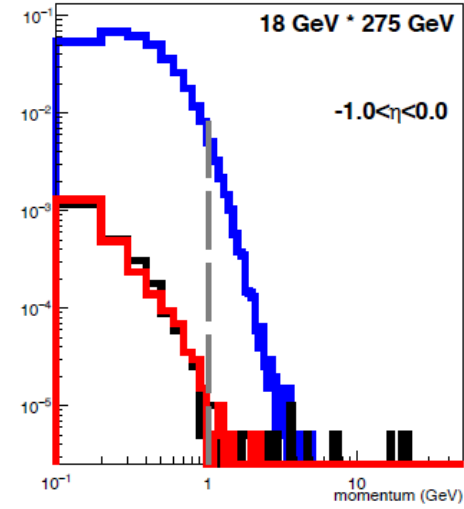
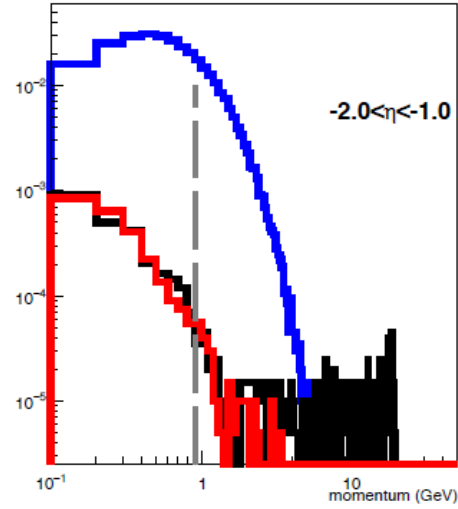
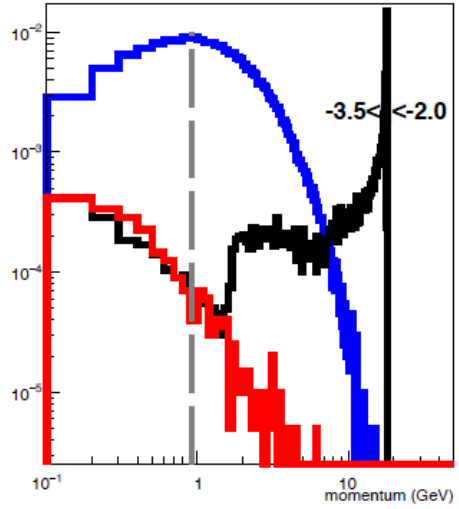
Scattered Electron Background

18x275 GeV

Electrons

Pions

Positrons



Estimated π/e Ratios

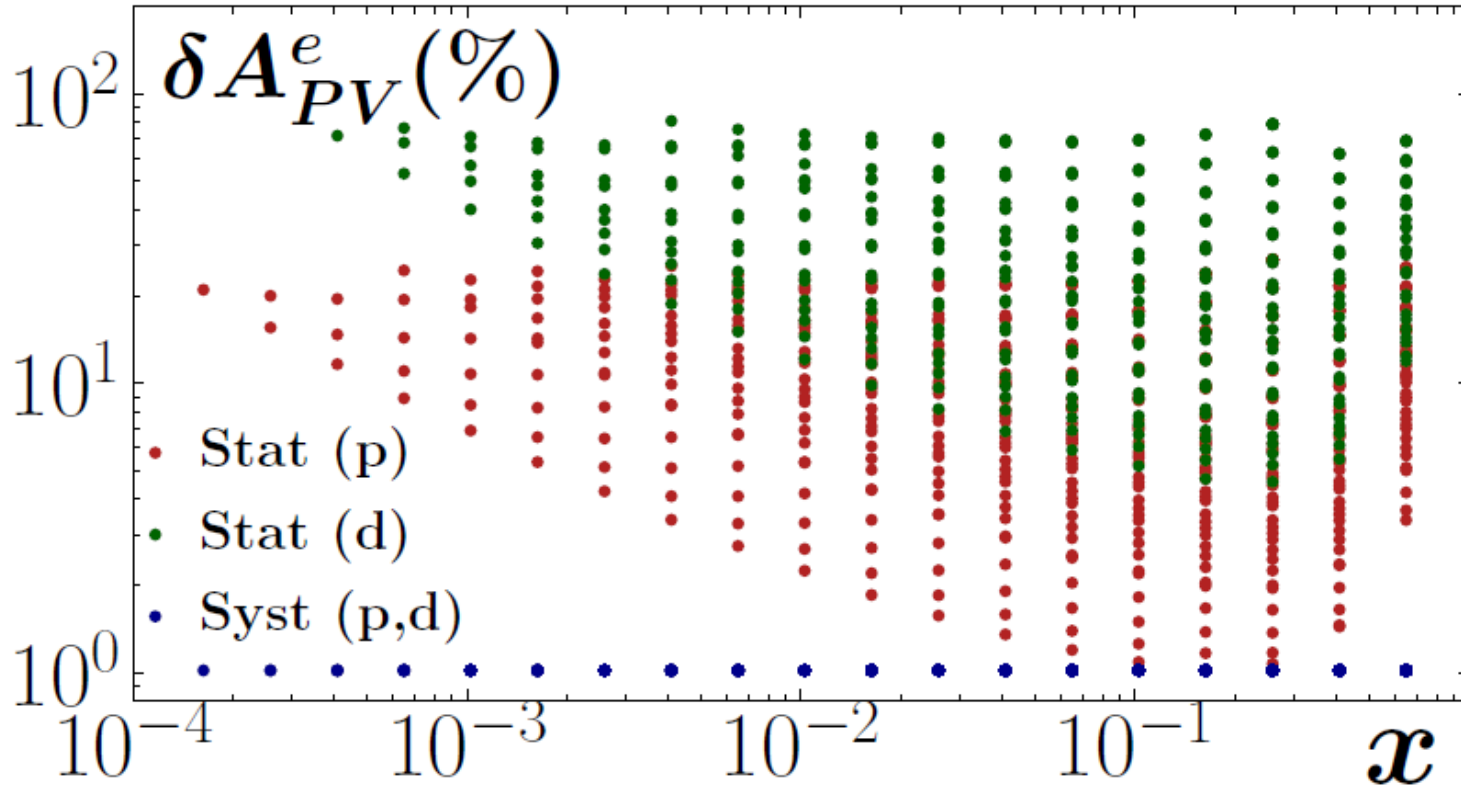
$E_{beam}^{e^-}$ (GeV)	η bin	$p_{min}^{e^-}$ (GeV)	Max π^- / e^-	final π^- / e^- ratio
18	(-3.5,-2)	0.9	200	0.02
18	(-2,-1)	0.9	800	0.08
18	(-1, 0)	1.0	1000	0.1
18	(0, 1)	1.8	100	0.01
10	(-3.5,-2)	1.4	10	0.001
10	(-2,-1)	0.5	400	0.04
10	(-1, 0)	0.6	800	0.08
10	(0, 1)	1.0	1000	0.1
5	(-3.5,-2)	2.8	0.1	0.00001
5	(-2,-1)	0.4	100	0.01
5	(-1, 0)	0.3	500	0.05
5	(0, 1)	0.5	1000	0.1

Pion contamination

- 1) Inflates statistical errors because it is typically treated as a dilution
- 2) Incurs $\sim 1\%$ systematic error

Tightest constraints come from electron parity violating asymmetries $A_{PV}^{e^-}$

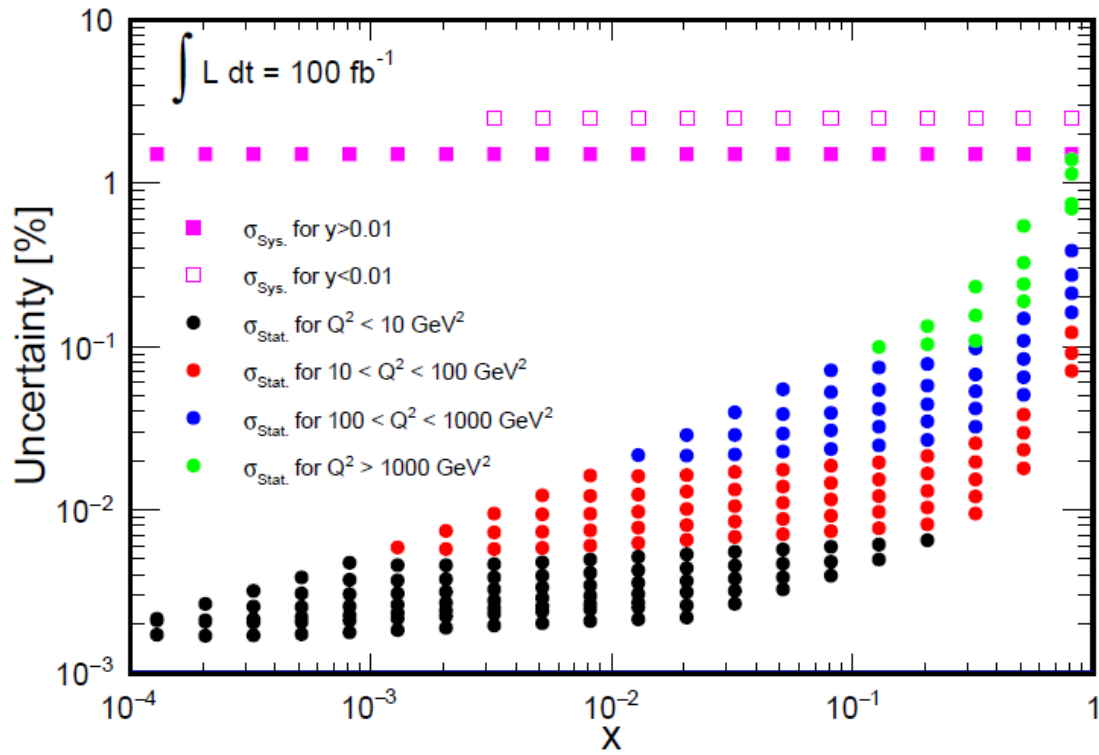
Requirement on final π/e Contamination



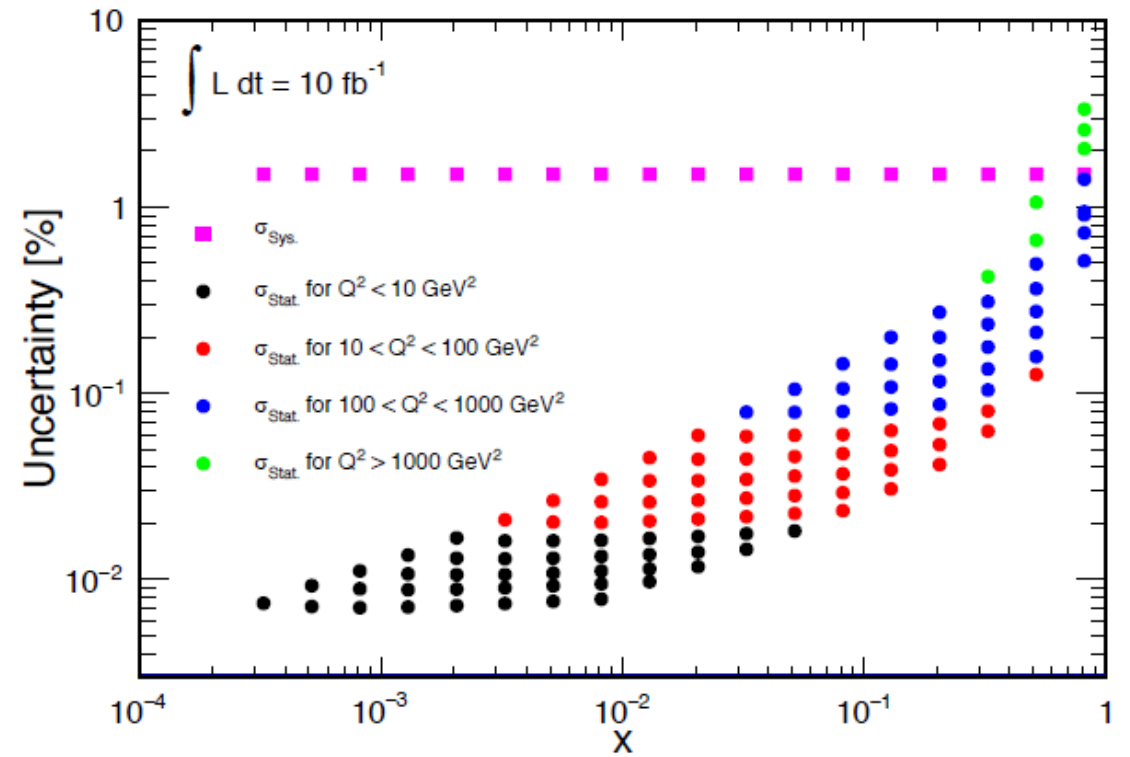
- 1) Limit pion contamination systematic error to be $\sim 10\%$ of statistical error.
- 2) Translates into a requirement of $\pi/e = 1 \times 10^{-3}$
- 3) This requirement is never met in the central region ($-2 < \eta < 1$)
- 4) Room for improvement with implementation of PID algorithms.

Estimated uncertainties for N.C. Cross sections

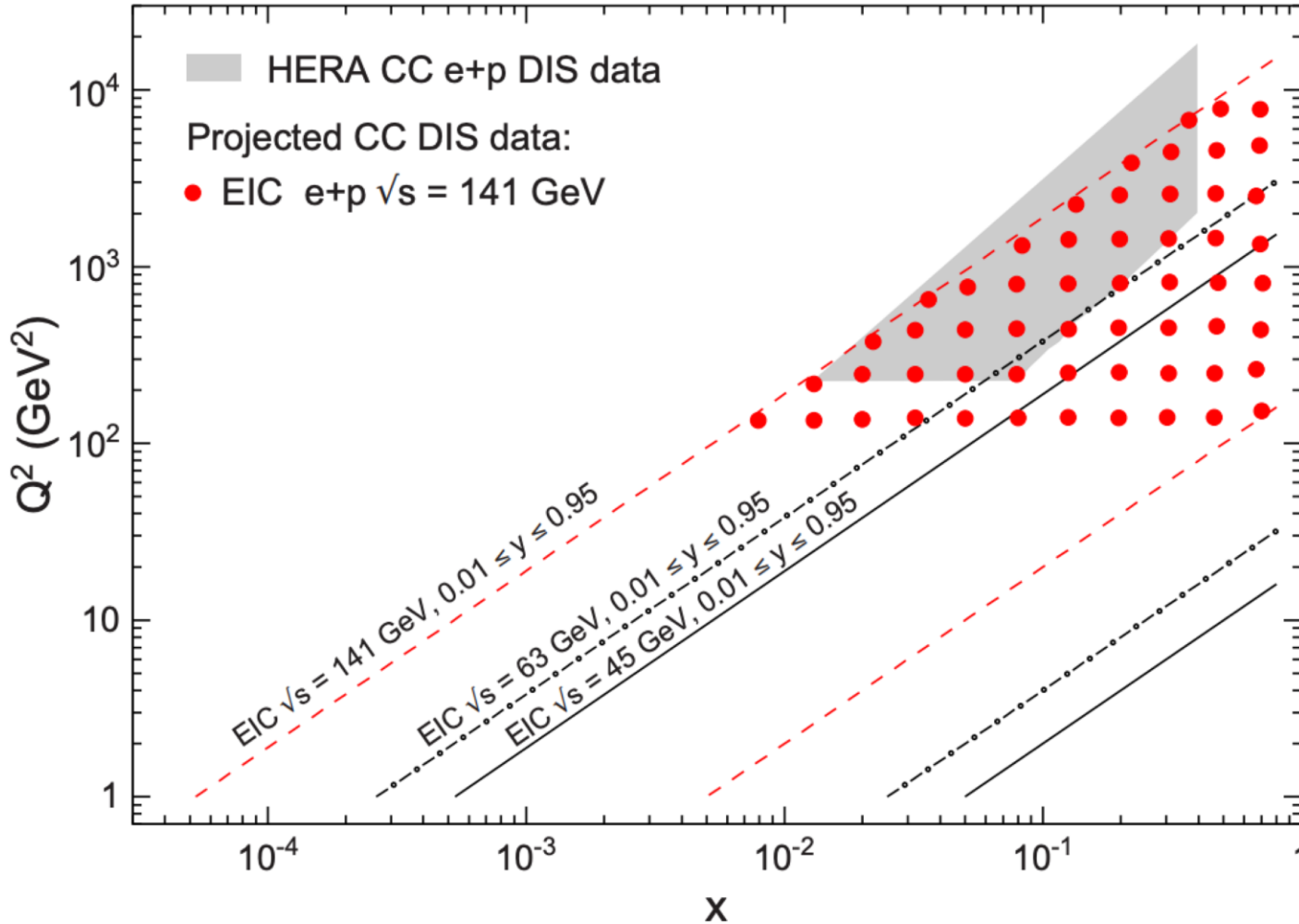
18x275 e-p N.C. Uncertainties



18x110 e-A N.C. Uncertainties



C.C. Phase Space and Reconstruction

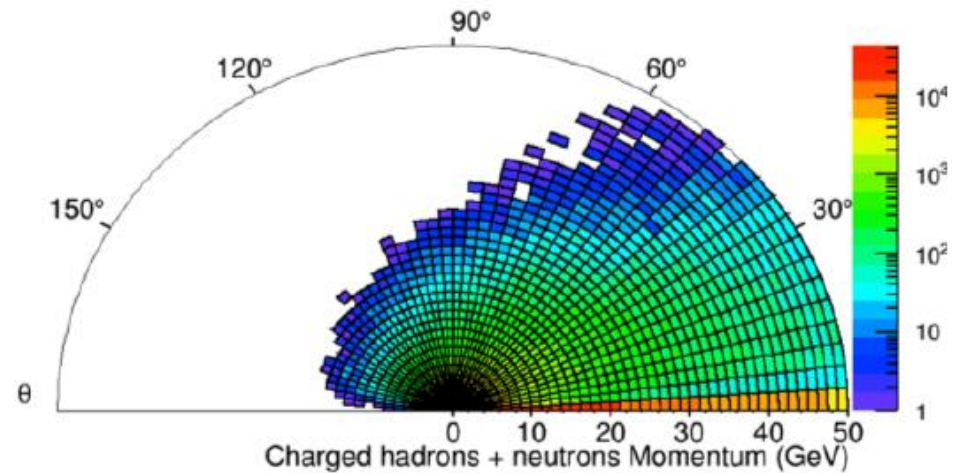
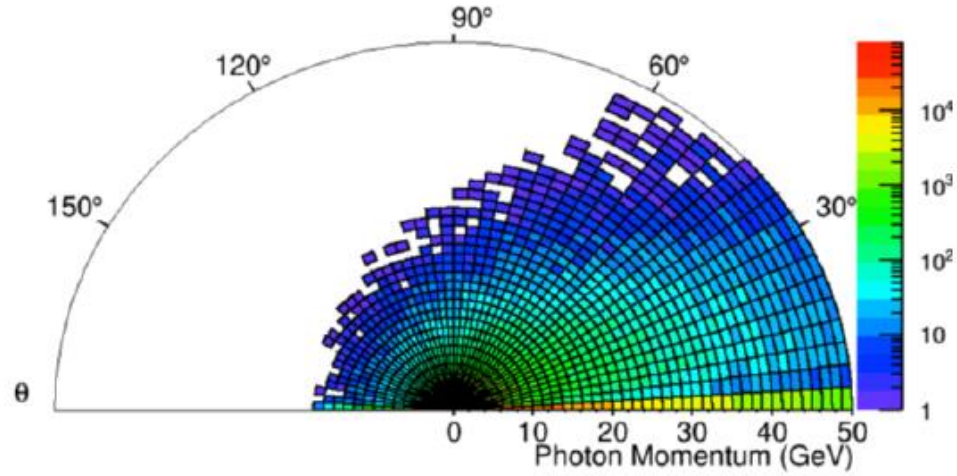


$$Q_{JB}^2 = \frac{p_T^2}{1 - y_{JB}}$$

$$y_{JB} = \frac{(E - p^z)}{2E}$$

$$x_{JB} = \frac{Q_{JB}^2}{s y_{JB}}$$

Hadronic Reconstruction



$$Q_{JB}^2 = \frac{p_T^2}{1 - y_{JB}}$$

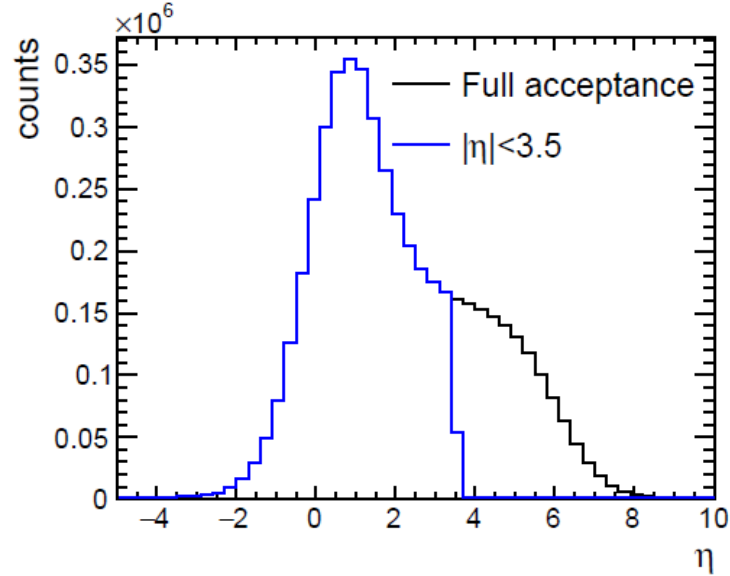
$$p_T^2 = (\sum_h P_h^x)^2 + (\sum_h P_h^y)^2$$

$$y_{JB} = \frac{(E - p^z)}{2E}$$

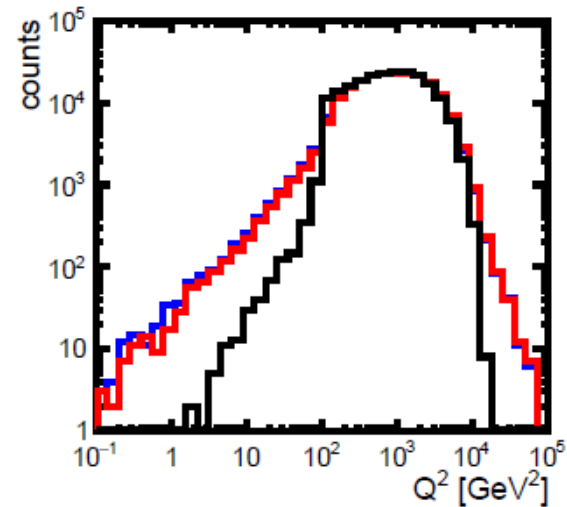
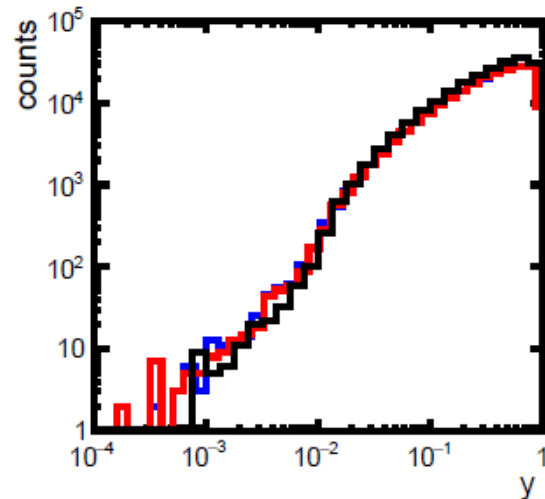
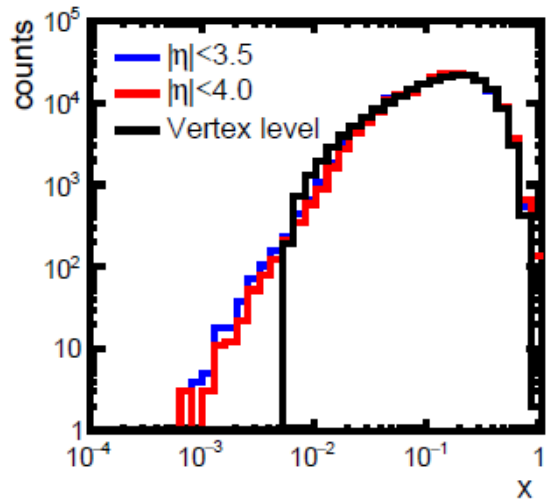
$$(E - p^z) = \sum_h (E_h - p_h^z)$$

$$x_{JB} = \frac{Q_{JB}^2}{s y_{JB}}$$

Hadronic Reconstruction



Angular distribution of hadrons and photons show that J.B. reconstruction is affected by central detector forward acceptance.



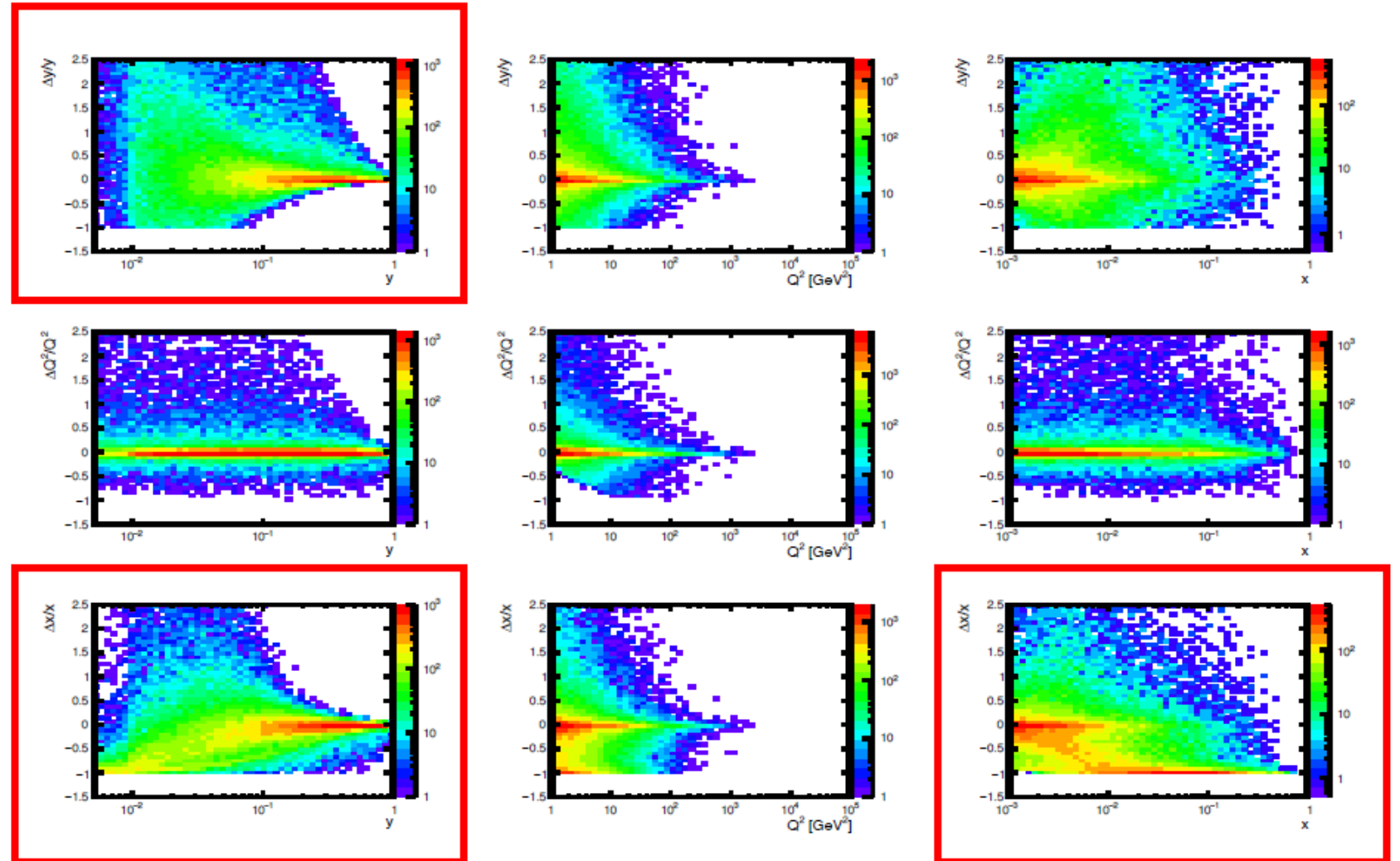
But increasing acceptance to $\eta = +4$ seems to have minimal impact on the kinematic reconstruction resolutions

J.B. reconstruction requires inelasticity > 0.01 cut

$\Delta x/x$ and $\Delta y/y$ diverge as $y \rightarrow 0$

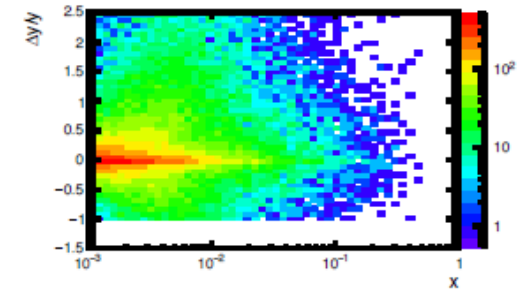
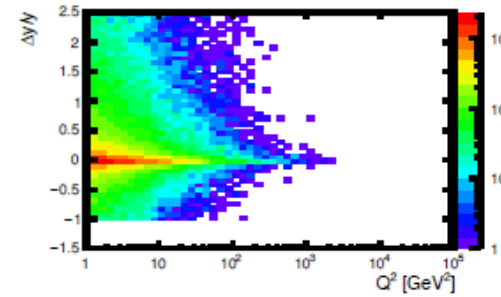
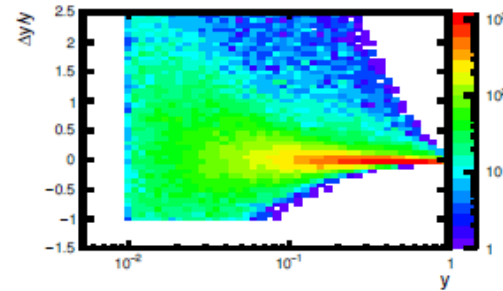
$\Delta x/x$ develops systematic offset at $x \sim 10^{-2}$.

Caused by large positive fluctuations in y that then suppress x .

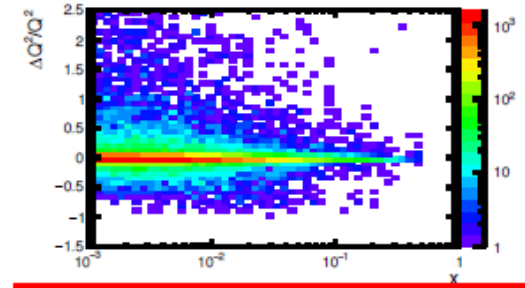
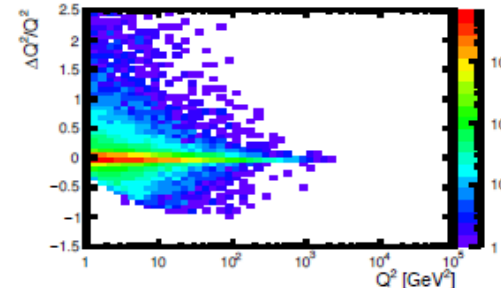
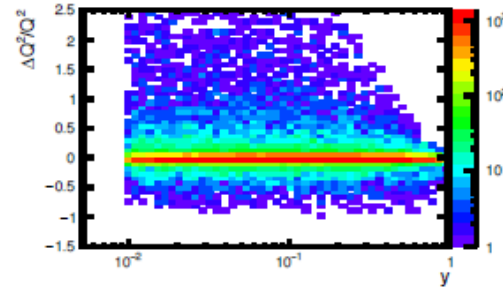


J.B. reconstruction requires inelasticity > 0.01 cut

$\Delta x/x$ and $\Delta y/y$ diverge as $y \rightarrow 0$



$\Delta x/x$ develops systematic offset at $x \sim 10^{-2}$.



Caused by large positive fluctuations in y that then suppress x .

Removed by $y > 0.01$ cut

