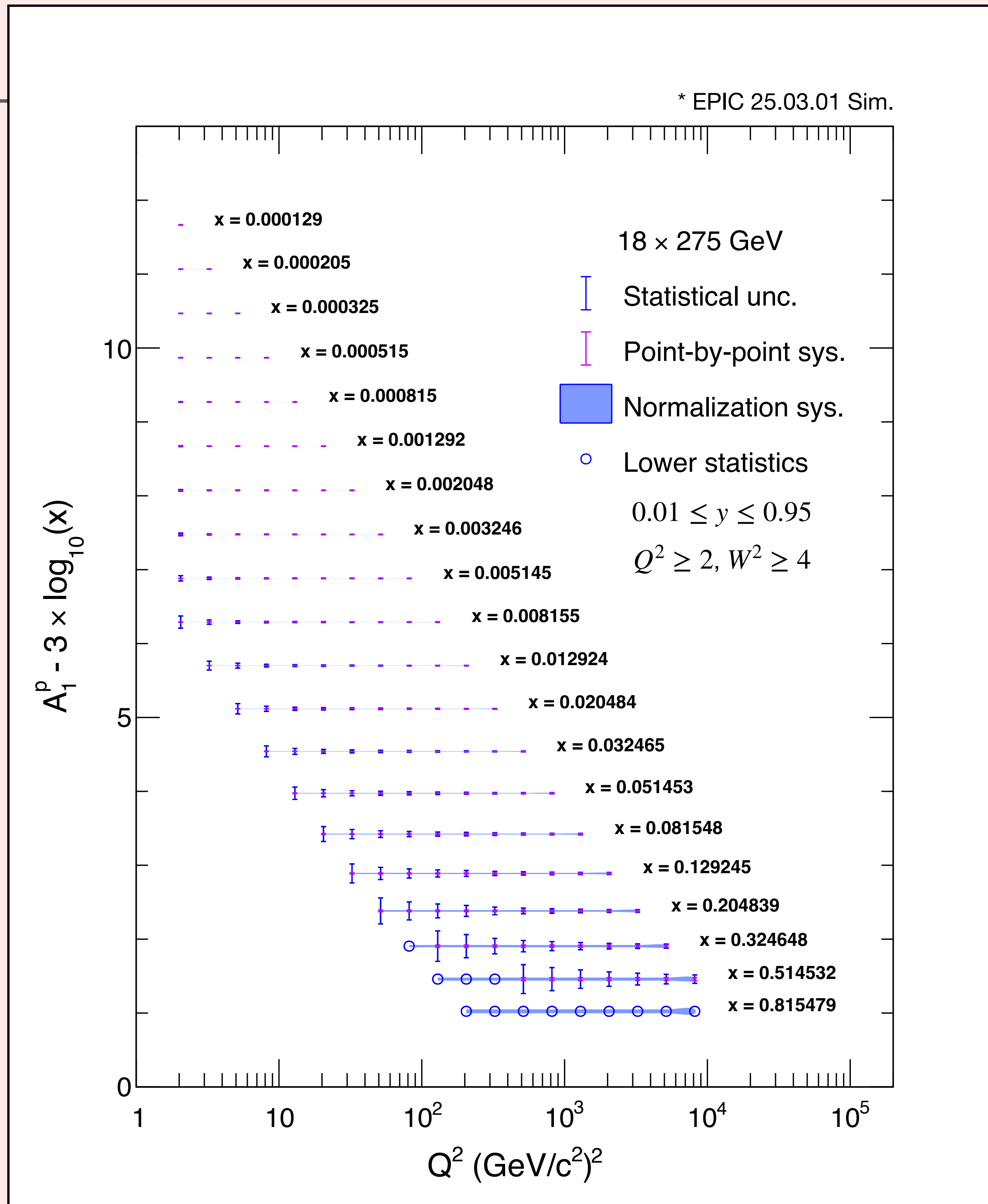
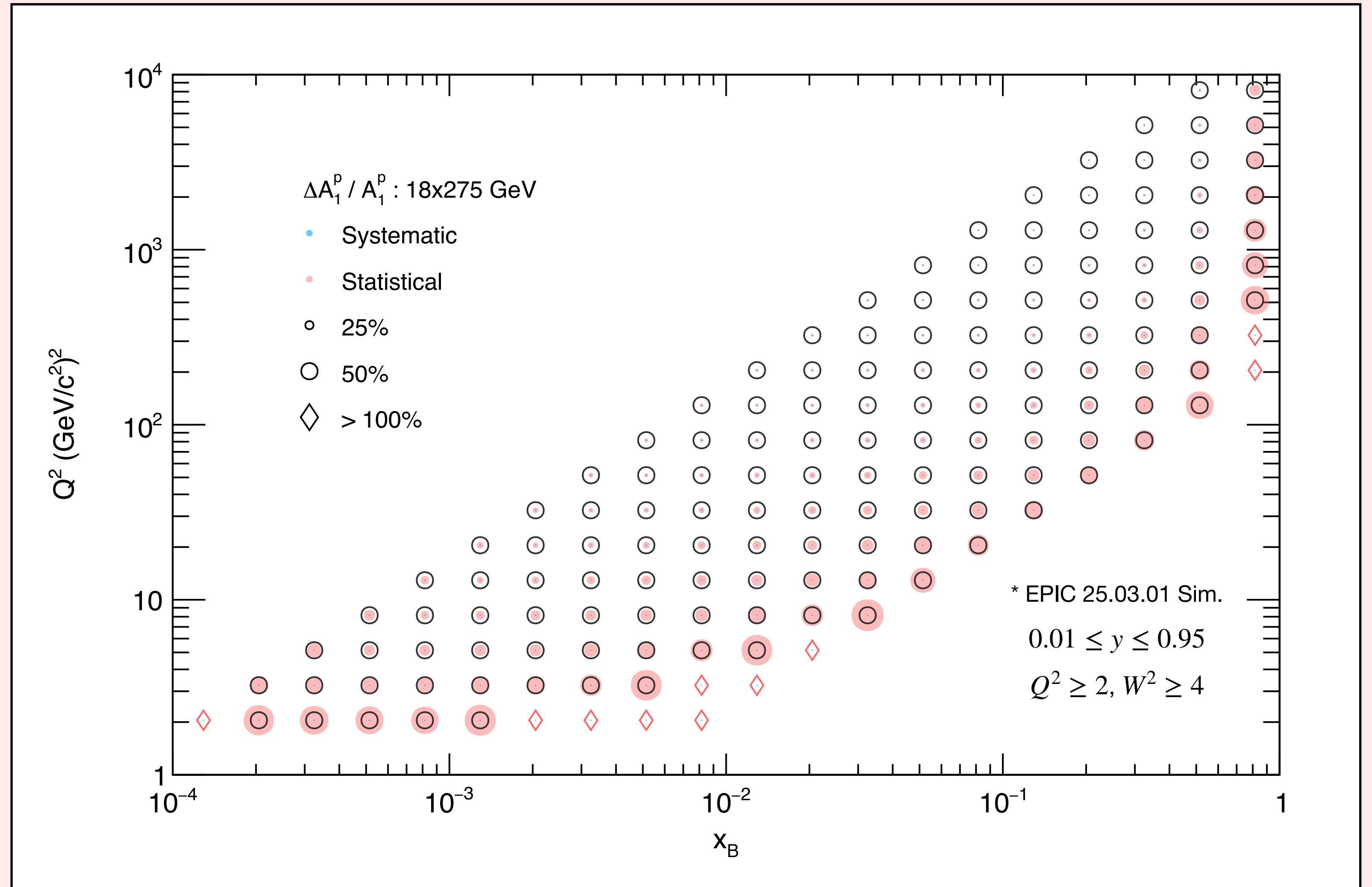


# $A_1^p$ systematics

- Statistical:  $\delta A_{\parallel,\perp} \approx \frac{1}{\sqrt{N}P_e P_N}$
- Systematics is using Barak's estimate for ATHENA for  $A_{\parallel}$ 
  - 1.5% point-by-point uncorrelated
  - 3% pion contamination
  - 3.5% normalization
    - 2%  $\delta P_e$ , 2%  $\delta P_N$
    - 1-2% detector effects
- Estimated using  $A_1 \approx \frac{A_{\parallel}}{D}$



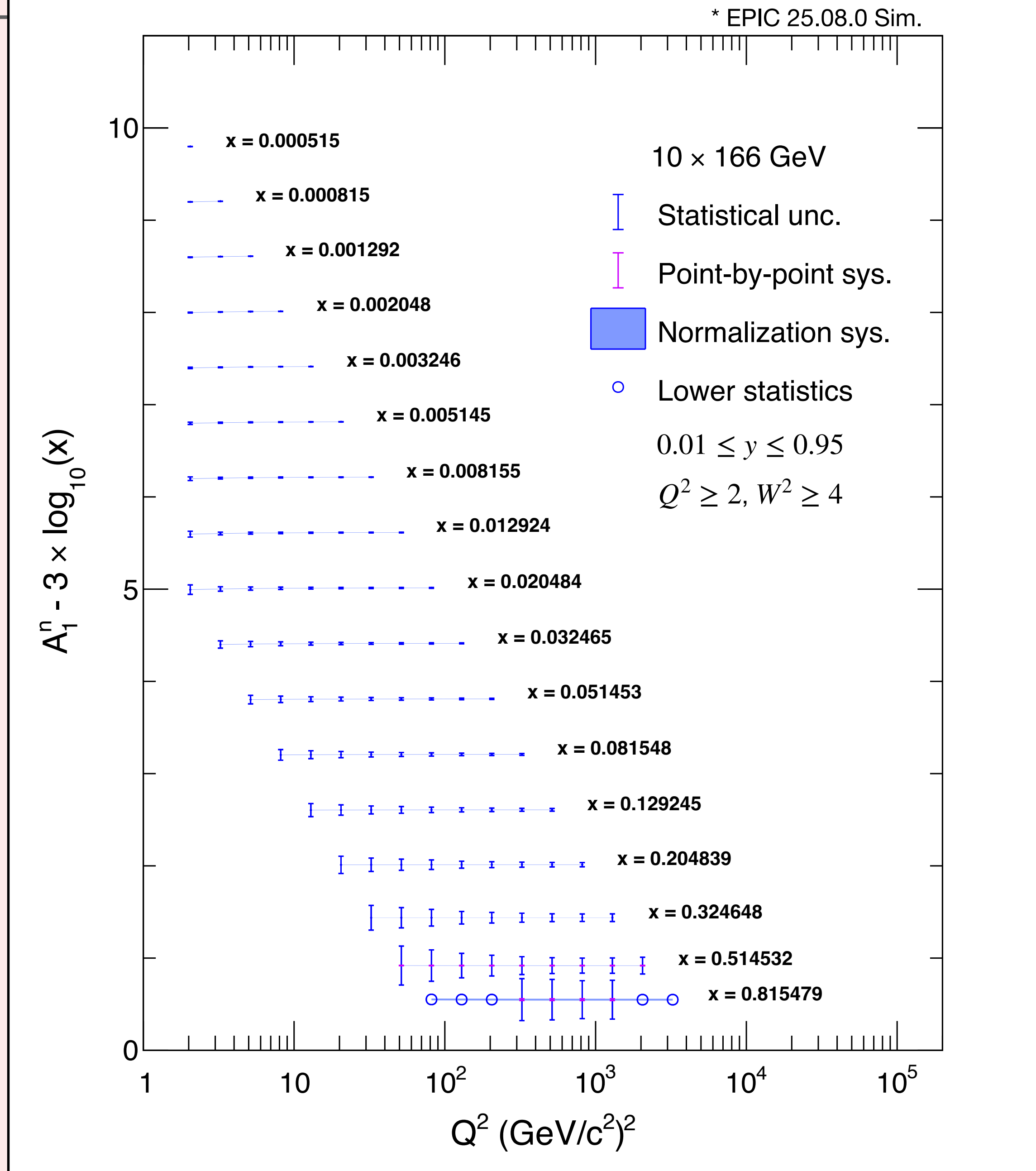
- Statistical:  $\delta A_{\parallel,\perp} \approx \frac{1}{\sqrt{N}P_e P_N}$
- Systematics is using Barak's estimate for ATHENA for  $A_{\parallel}$ 
  - 1.5% point-by-point uncorrelated
  - 3% pion contamination
  - 3.5% normalization
    - 2%  $\delta P_e$ , 2%  $\delta P_N$
    - 1-2% detector effects
- Estimated using  $A_1 \approx \frac{A_{\parallel}}{D}$



# $A_1^n$ systematics

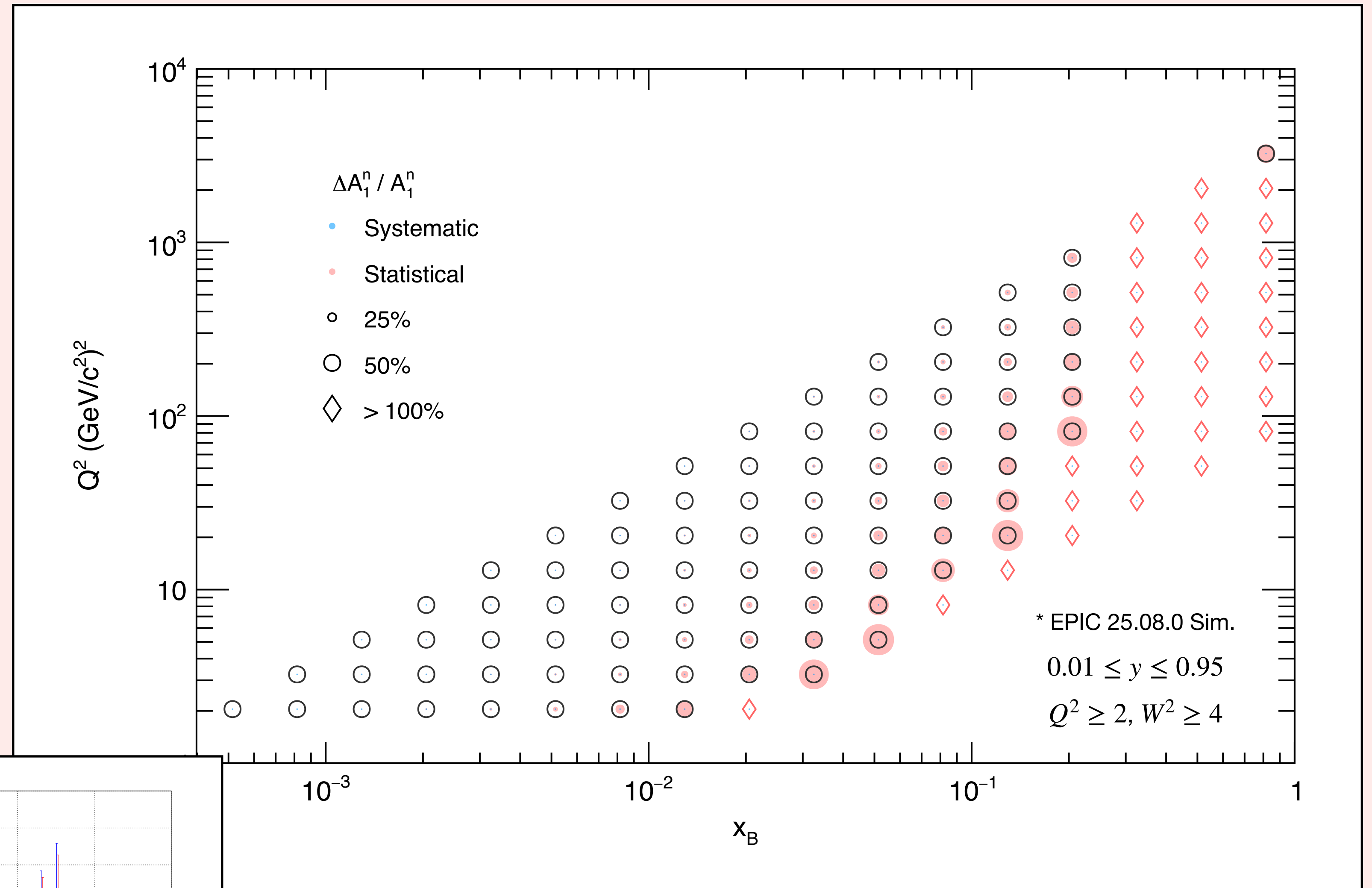
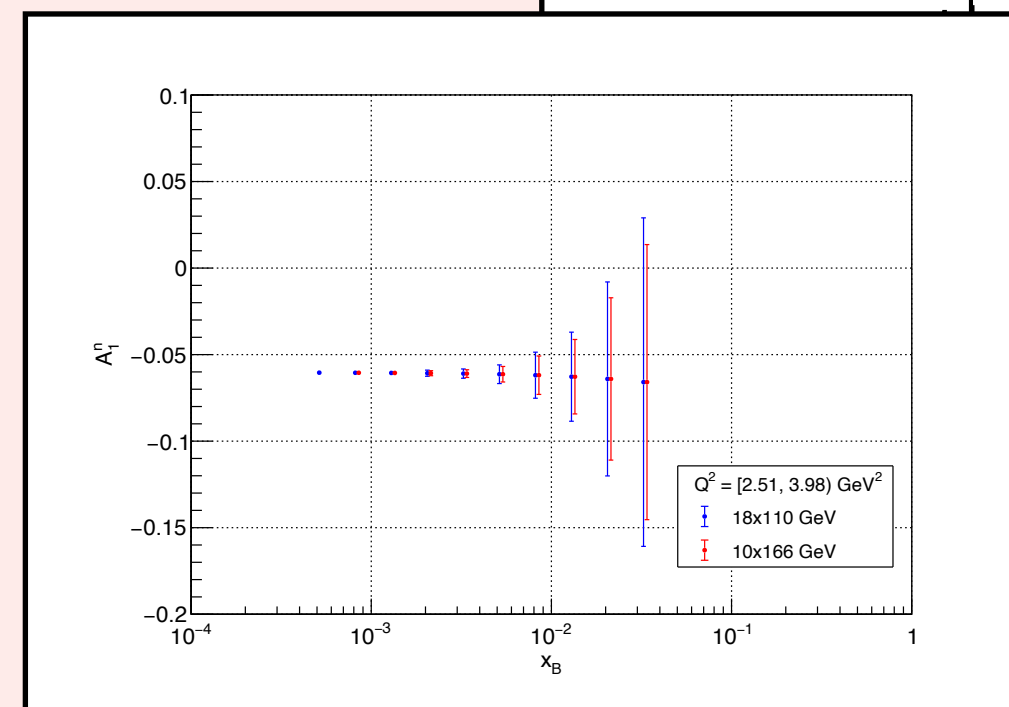
- Statistical:  $\delta A_{\parallel,\perp} \approx \frac{1}{\sqrt{NP_e P_N}}$
- Systematics is using Barak's estimate for ATHENA for  $A_{\parallel}$ 
  - 1.5% point-by-point uncorrelated
  - 3% pion contamination
  - 3.5% normalization
    - 2%  $\delta P_e$ , 2%  $\delta P_N$
    - 1-2% detector effects

- Estimated using  $A_1 \approx \frac{A_{\parallel}}{D}$





- Statistical:  $\delta A_{\parallel,\perp} \approx \frac{1}{\sqrt{NP_e P_N}}$
- Systematics is using Barak's estimate for ATHENA for  $A_{\parallel}$ 
  - 1.5% point-by-point uncorrelated
  - 3% pion contamination
  - 3.5% normalization
    - 2%  $\delta P_e$ , 2%  $\delta P_N$
    - 1-2% detector effects
- Estimated using  $A_1 \approx \frac{A_{\parallel}}{D}$

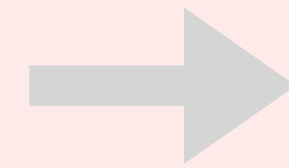


Treat contamination as dilution factor:

$$A_{\text{meas.}}^e = (1 - f_{\pi/e})A^e + f_{\pi/e}A^\pi$$

$$A^e = \frac{1}{1 - f_{\pi/e}} (A_{\text{meas.}}^e - f_{\pi/e}A^\pi)$$

$$\left(\frac{\sigma A^e}{A^e}\right)_\pi = \sqrt{(\Delta f_{\pi/e})^2 + \left(f_{\pi/e} \frac{|A^\pi| + \Delta A^\pi}{A^e}\right)^2}$$



$$A^e \text{ is large, } |A^\pi| \text{ is small: } \left(\frac{\sigma A^e}{A^e}\right)_\pi \approx \Delta f_{\pi/e} \sim 0.1 f_{\pi/e}$$

$$A^e \text{ is small, } |A^\pi| \approx 0: \left(\frac{\sigma A^e}{A^e}\right)_\pi \approx \left(f_{\pi/e} \frac{|A^\pi| + \Delta A^\pi}{A^e}\right) \approx f_{\pi/e}$$

$$\left(\frac{\sigma A^e}{A^e}\right)_\pi \text{ is then } \sim 0.1 \text{ to } 1 \text{ of } f_{\pi/e}$$

Assume 90% electron purity, fractional uncertainty due to pion contamination could be 1% to 10%.

# Pion contamination

