

TMD Measurements: Single Hadrons

Status / Work in Progress

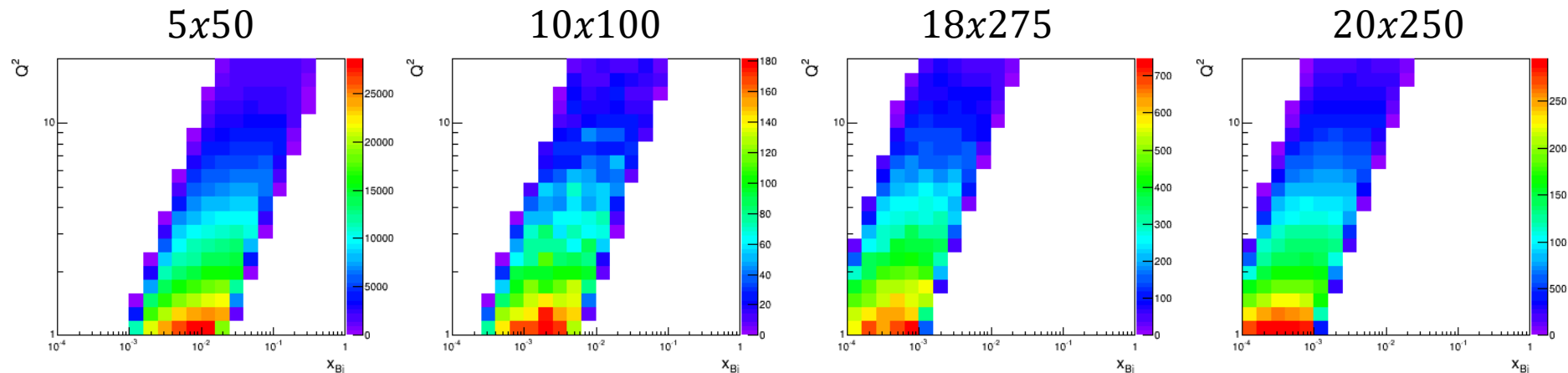
Oleg Eyser (BNL)

EIC Yellow Report – SIDIS PWG
April 20, 2020



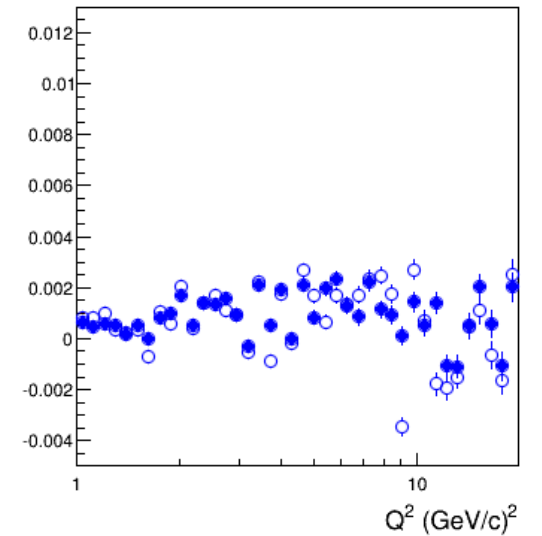
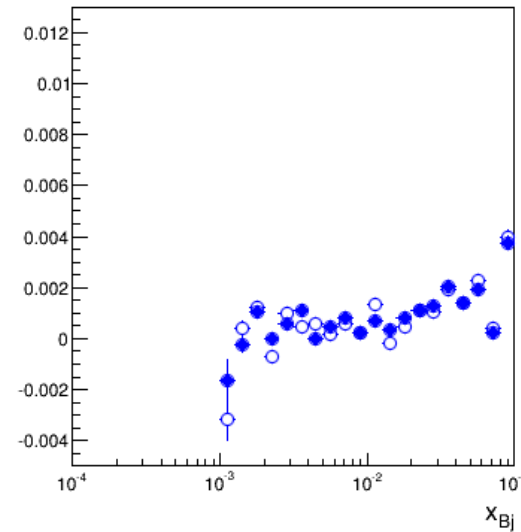
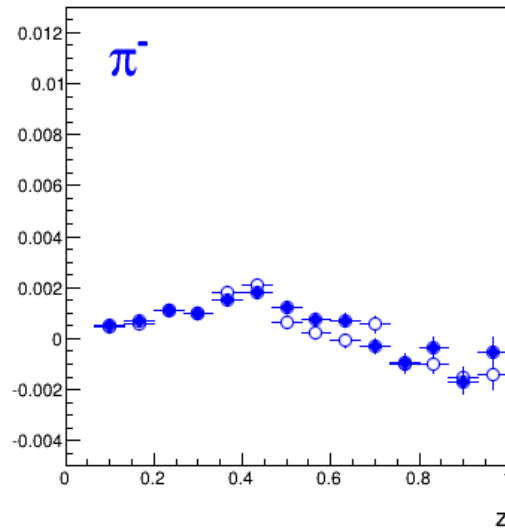
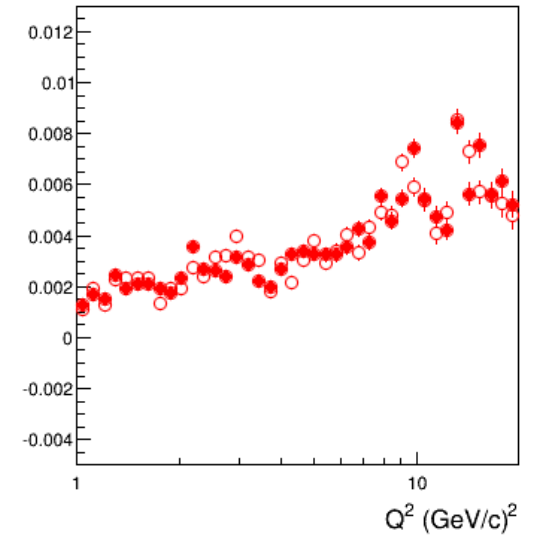
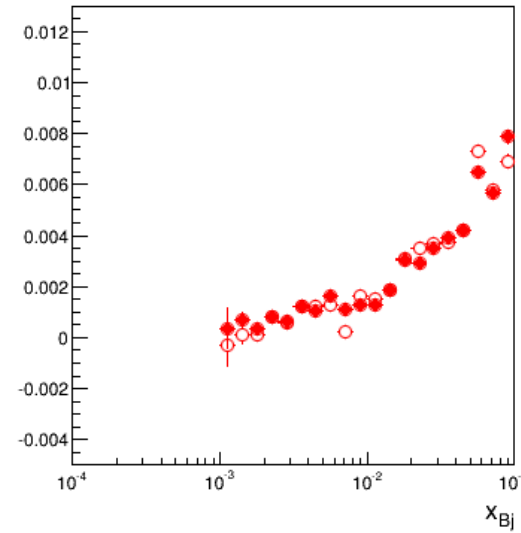
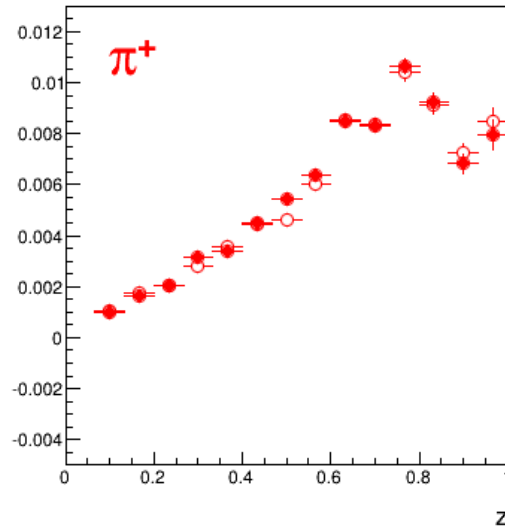
Event / Hadron Selection

- pythia+RHIC
- MSEL 2
- Event cuts
 - $Q^2 > 1.0 \text{ (GeV}/c)^2$
 - $0.05 < y < 0.9$
- Hadron cuts
 - $z > 0.1$
 - $|\eta_h| < 4.5$
 - $p_{T,h} > 0.1 \text{ GeV}/c$
- Asymmetry weight from the scattered parton
- Phys. Rev. **D98** (2018) 3, 034011
arxiv:1805.05290
- Many thanks to Liang!
- $A_{SIDIS}^{Sivers} = \langle 2 \sin(\phi_h - \phi_S) \rangle \propto \Delta f(x, k_t, Q^2) / f(x, k_t, Q^2)$
- Randomized spin direction ϕ_S
- Current model from arxiv:1506.03078
SIDIS1: u/d quark fits



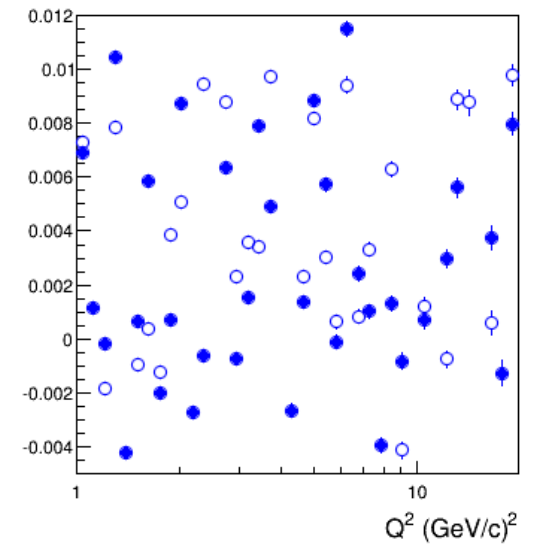
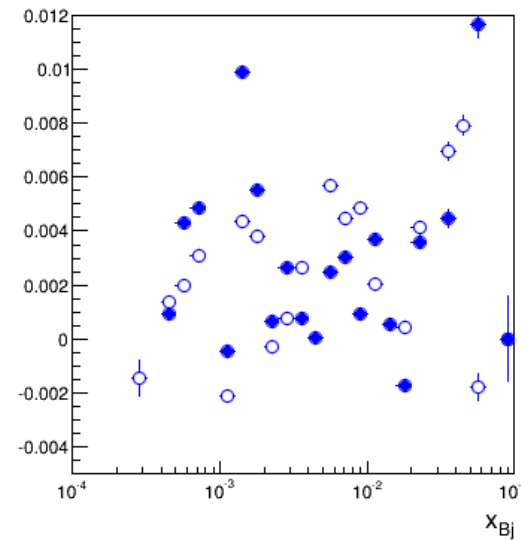
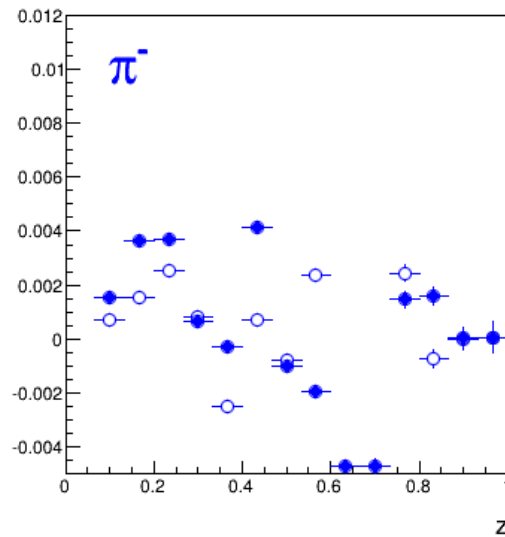
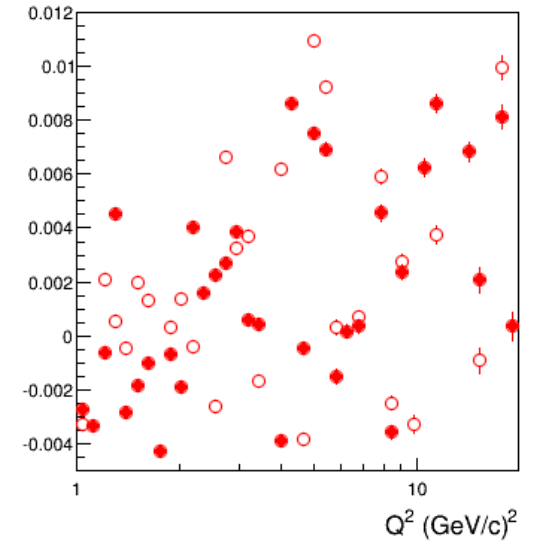
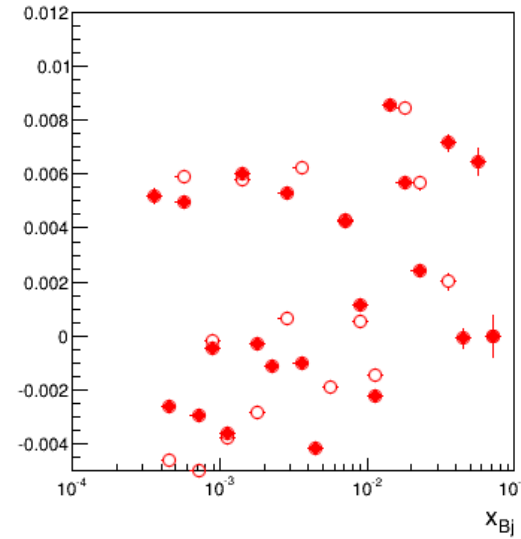
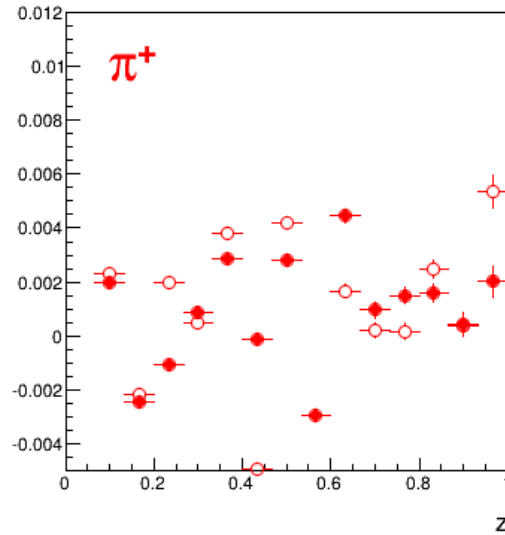
Asymmetry Snapshot

- $ep @ 5 \times 50$
- Proj. lumi 10 fb^{-1}
- \circ/\bullet PYTHIA 4.40 pb^{-1}
- \bullet/\bullet $100 \phi_S$ repeats



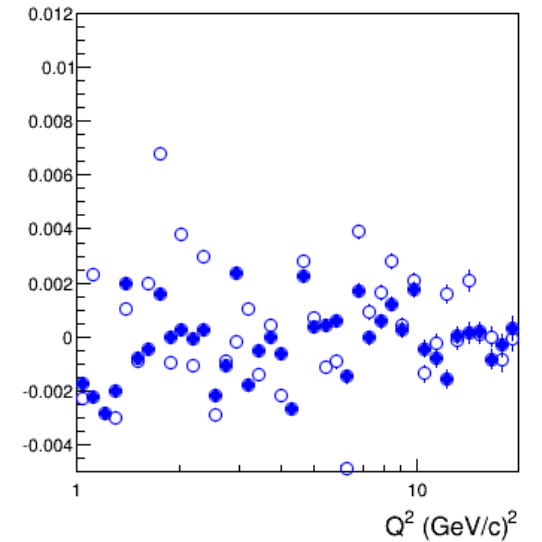
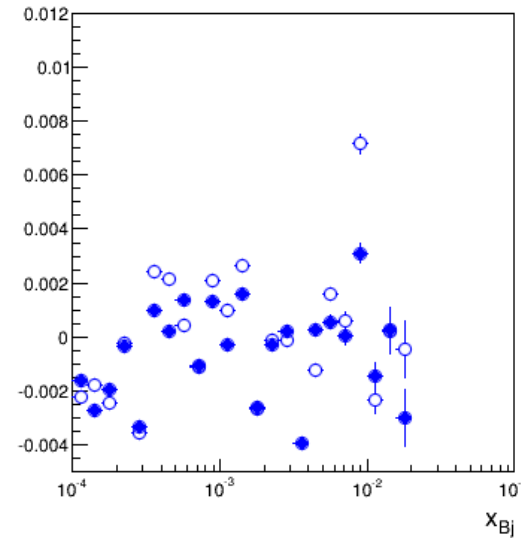
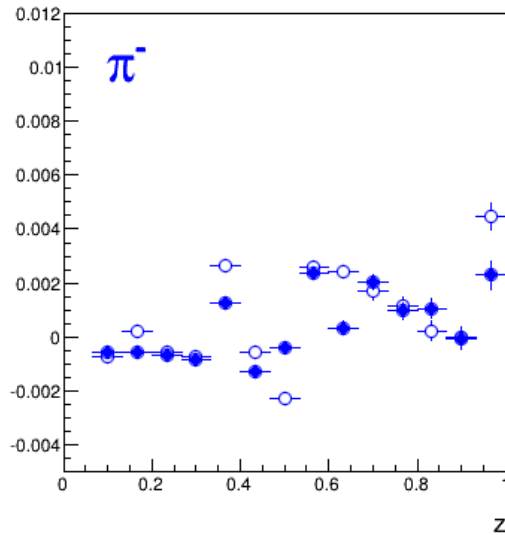
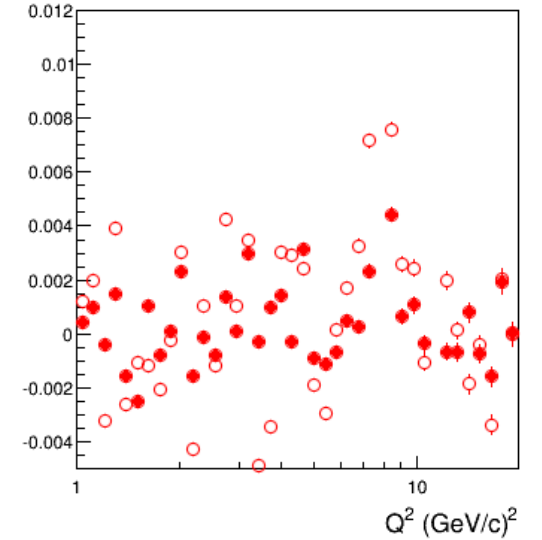
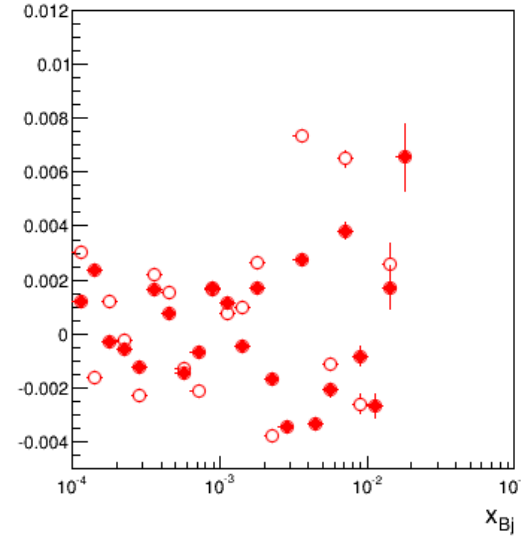
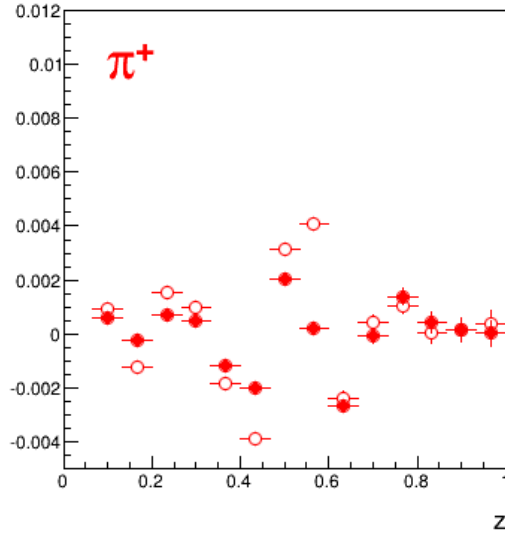
Asymmetry Snapshot

- $ep @ 10 \times 100$
- Proj. lumi 10 fb^{-1}
- \circ/\bullet PYTHIA 24 nb^{-1}
- \bullet/\bullet $100 \phi_S$ repeats



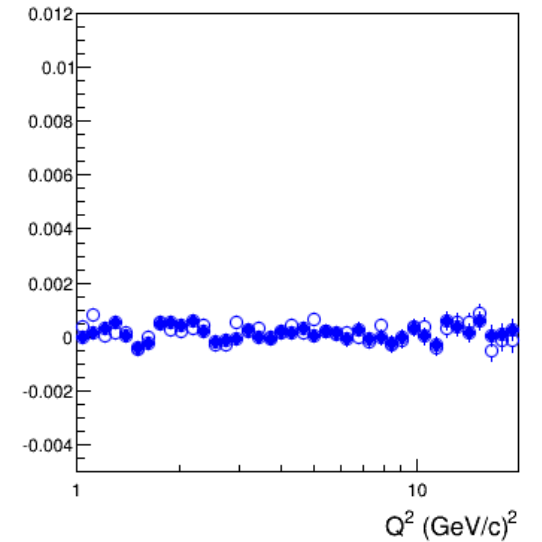
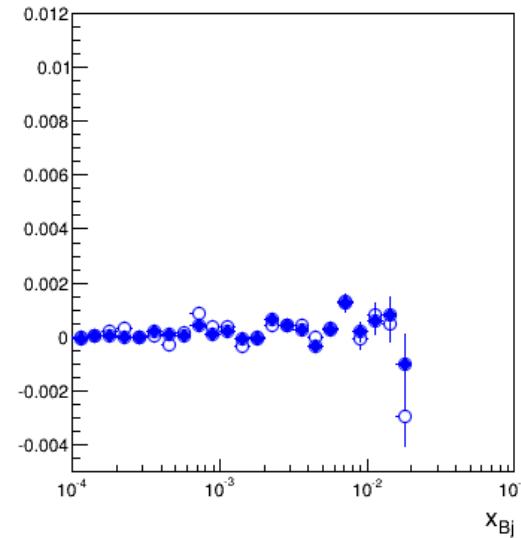
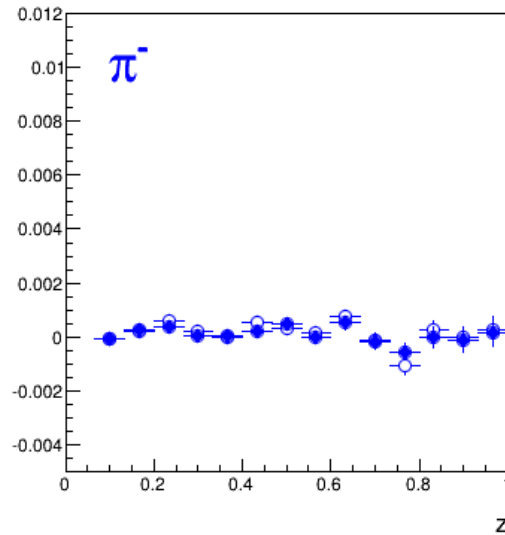
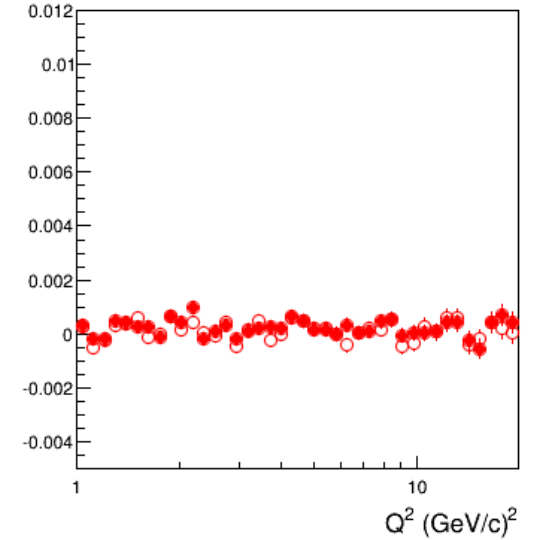
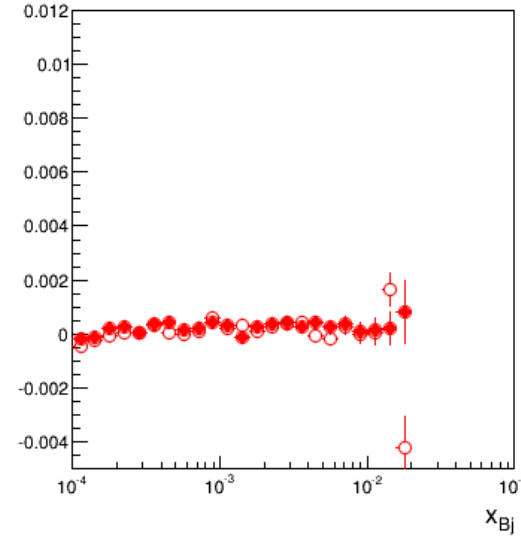
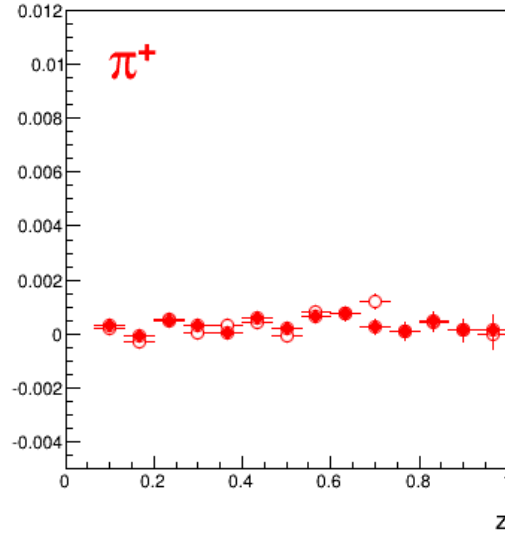
Asymmetry Snapshot

- ep @ 18×275
- Proj. lumi 10 fb^{-1}
- \circ/\square PYTHIA 91 nb^{-1}
- \bullet/\blacksquare $100 \phi_S$ repeats



Asymmetry Snapshot

- $ep @ 20 \times 250$
- Proj. lumi 10 fb^{-1}
- \circ/\circ PYTHIA 3.46 pb^{-1}
- \bullet/\bullet $100 \phi_S$ repeats



Next Steps

- Update PYTHIA simulation samples
- eic_smear with particle identification
- Multidimensional binning
Align with proposed grid
- Updated polarized TMD-PDF input

