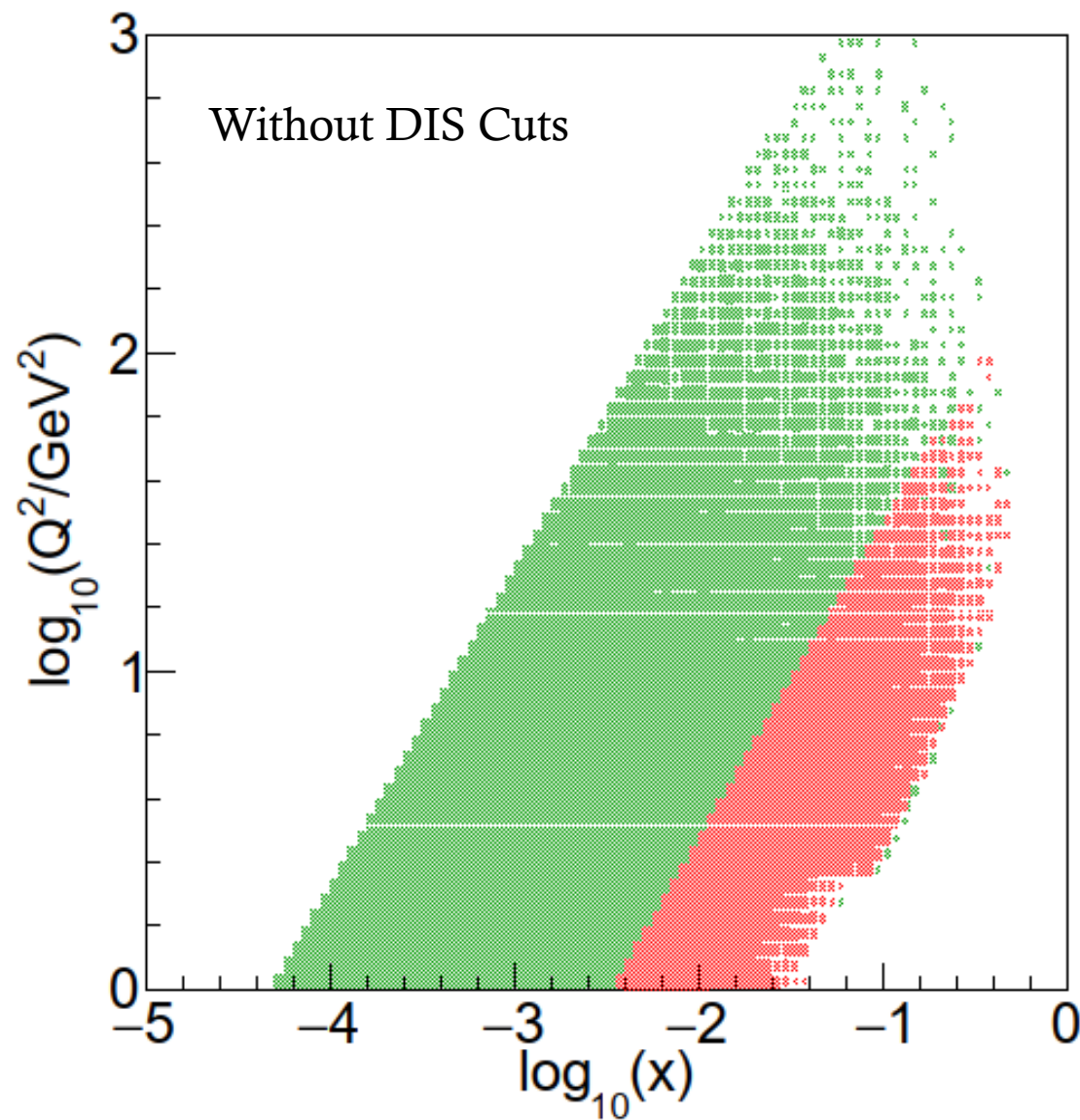# Simulation for Charm Sivers

- Kinematic Selection
- Theoretical Prediction
- Detector Configuration
- Statistical Uncertainty Projection
- Conclusions
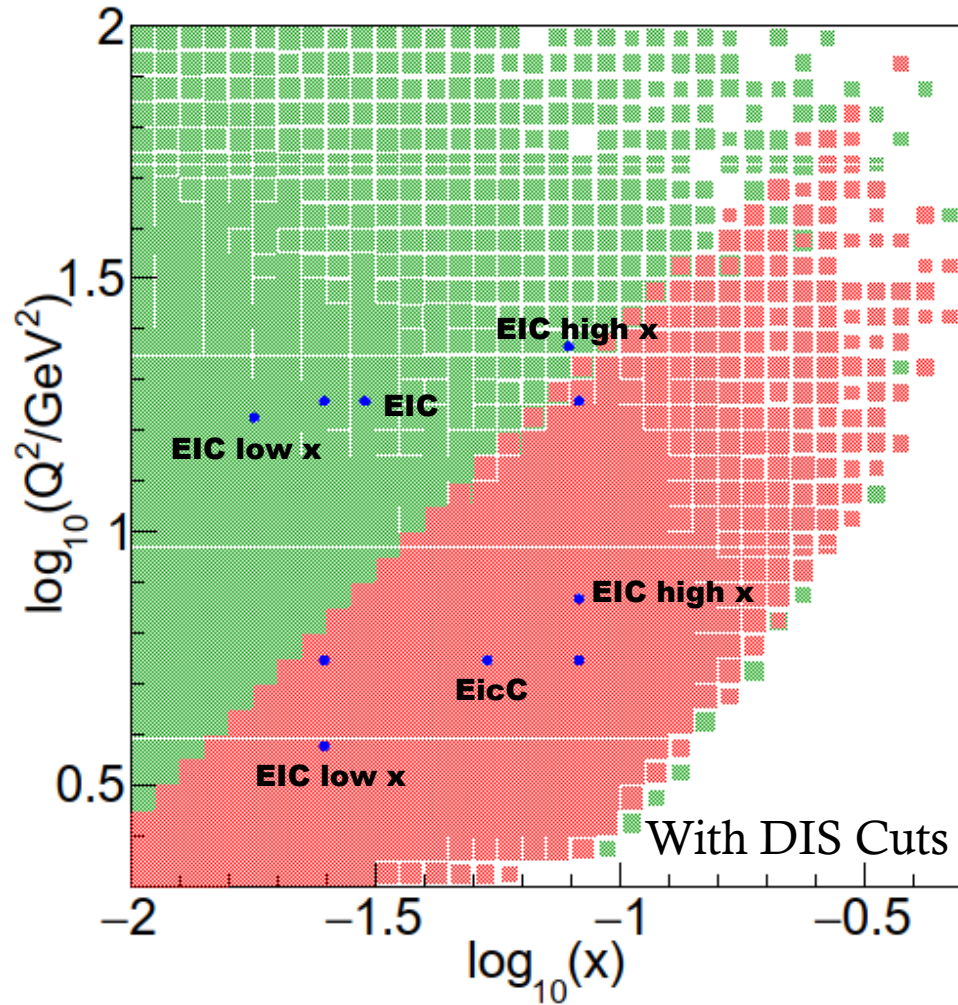
Senjie Zhu, Lei Xia, Duxin Zheng

Collision System

- **EIC**: 18 GeV electron×275 GeV proton

- **EicC**: 3.5 GeV electron×20 GeV proton

- DIS kinematic cuts for both

  - $Q^2 > 2$ GeV^2

  - $y < 0.85$

  - $x > 0.00843$ (only at EicC coverage)

Kinematic Selection

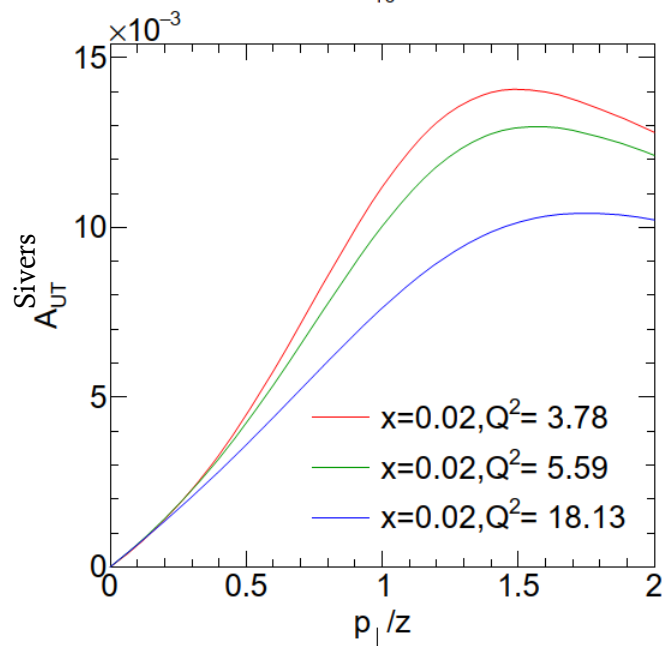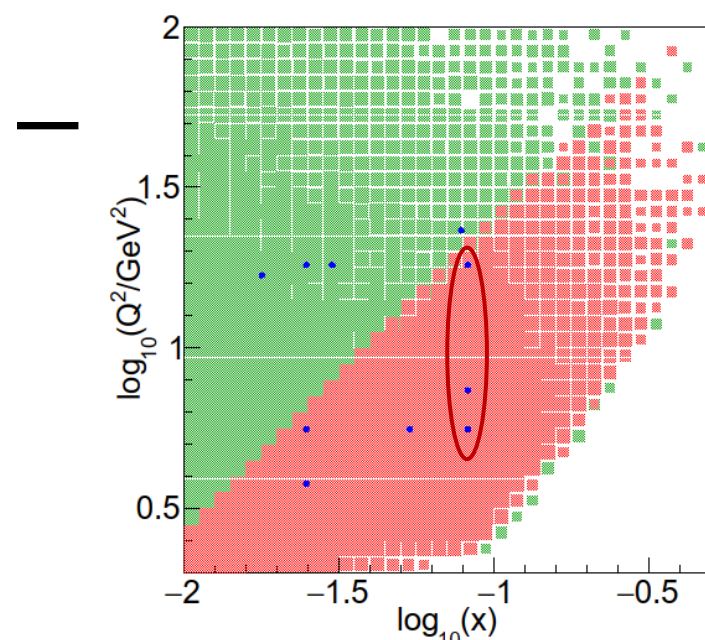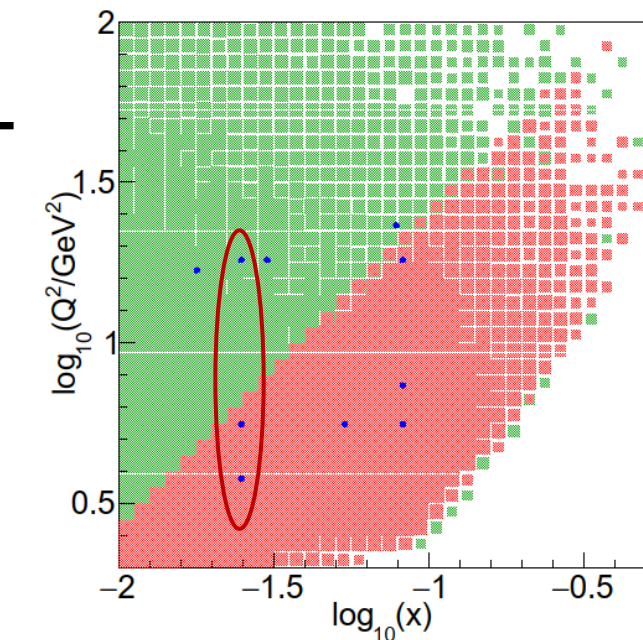|	x	Q^2
EicC average	0.05367	5.5895
low x average for EicC	0.024878	3.78348
high x average for EicC	0.0825	7.3876
EIC average	0.03015	18.129
low x average for EIC	0.01788	16.8431
high x average for EIC	0.07863	23.233

Requiring $N_{EicC\ low\ x}^{c\bar{c}} = N_{EicC\ high\ x}^{c\bar{c}}$, there're
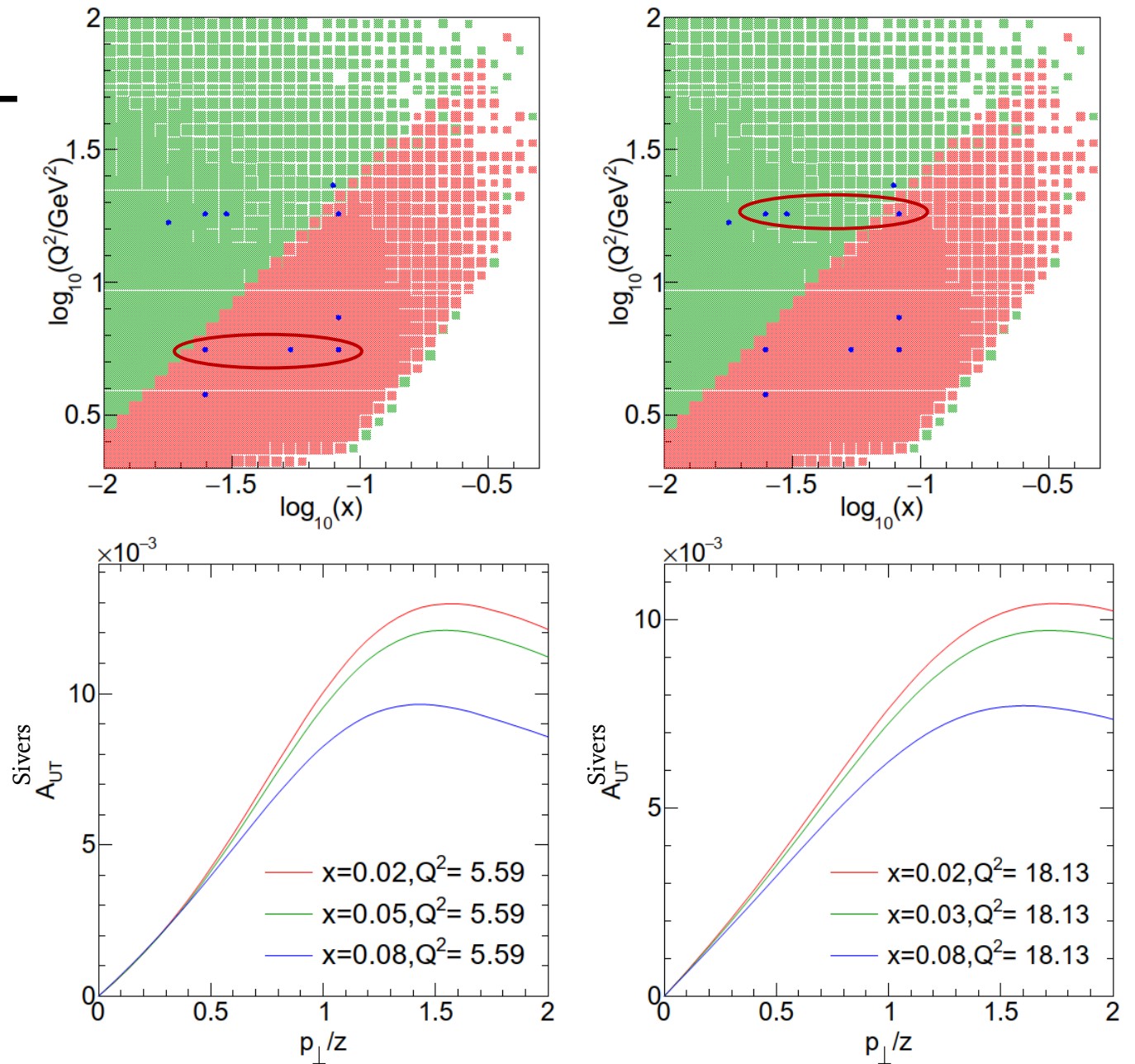Low x: $x_{min} < x < 0.0407$
High x: $0.0407 < x < x_{max}$

Other points are for comparison.

Theory Prediction
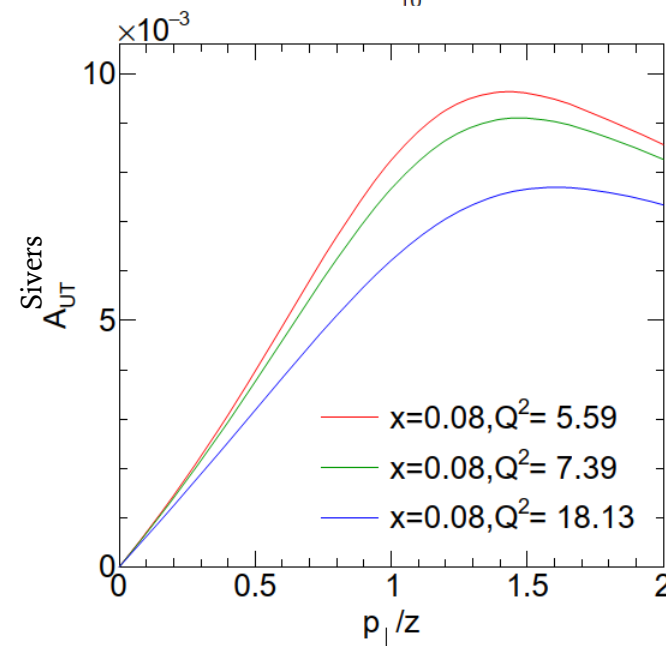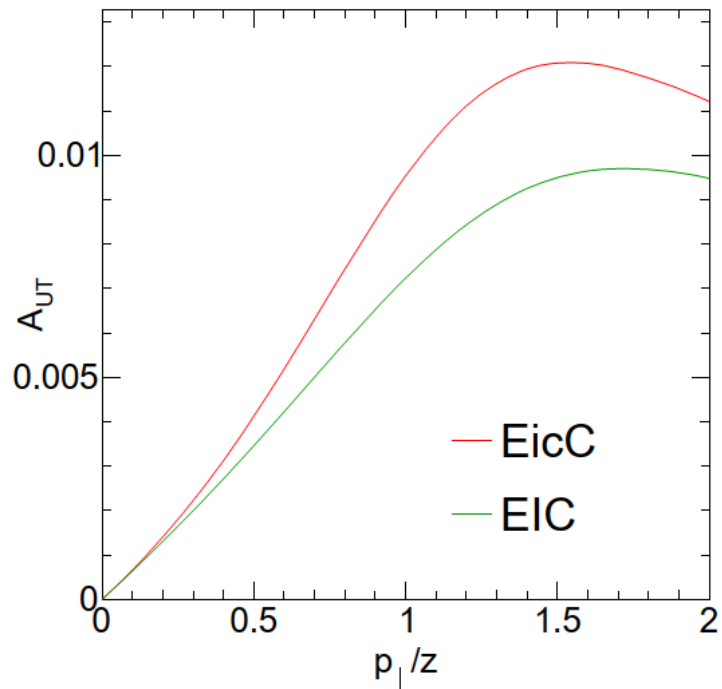
Signal down as Q2 up, at both low and high x

Theory Prediction

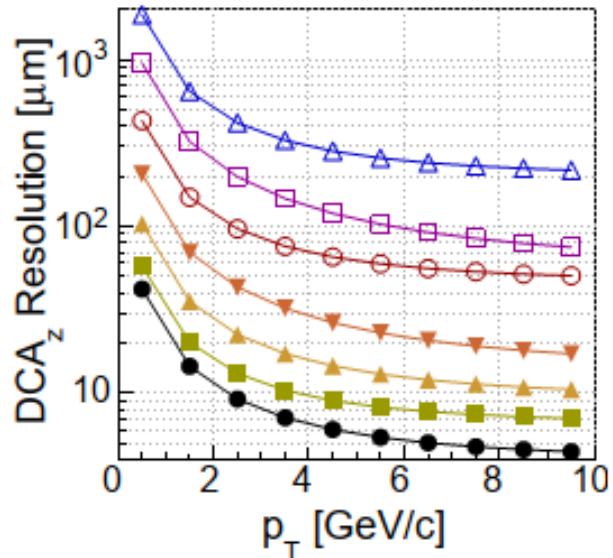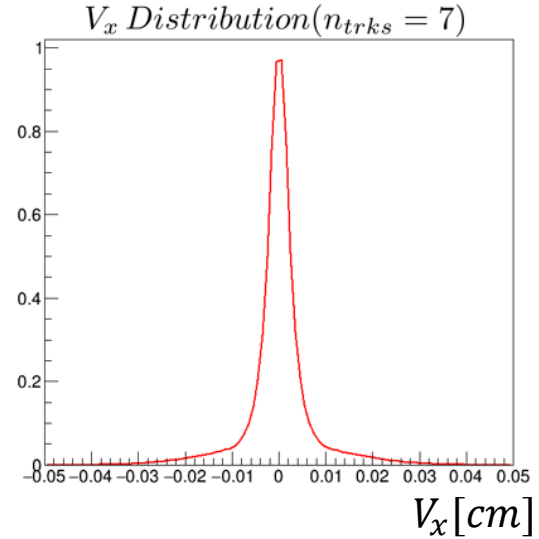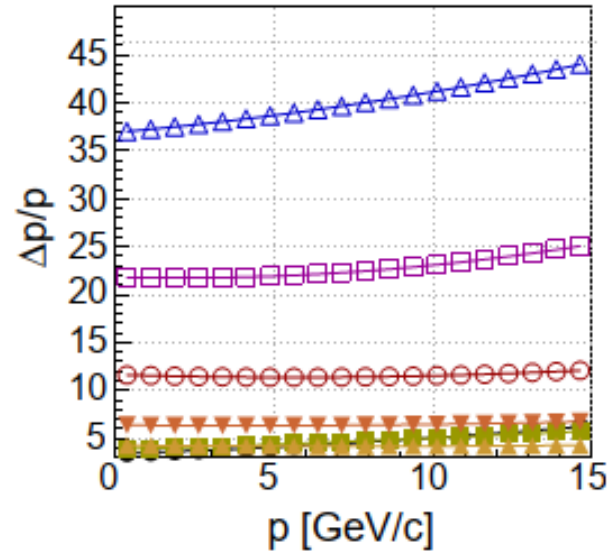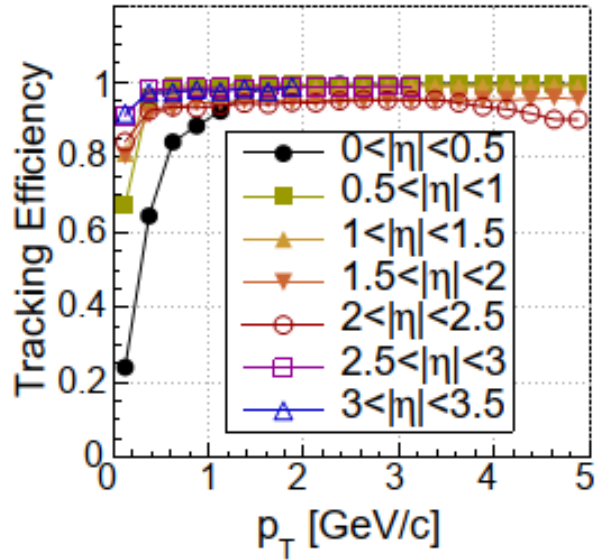Signal down as x up, at both low and high Q2

EicC Detector Configuration(Det_v3)

arXiv:2307.16135
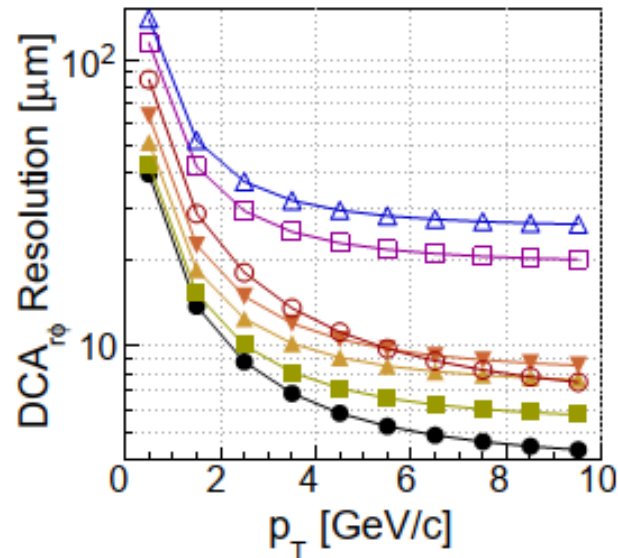
- Tracking Detectors & Vertex Detectors
  - Latest resolutions applied

- eID Acceptance(3σ separation)
  - $p_e > 0.35 GeV/c, p_e < 20 GeV/c$
- PID Acceptance ($\pi\backslash K\backslash p$) ($3 \sigma$ separation)

η	$[-3.5,1]$	$(-1,1)$	$(1,3.5)$
p_{max}	$4\ GeV$	$6\ GeV$	$15\ GeV$

$p_{hadron} > 0.3 GeV/c$

η	σ_p/p—3.0 T (%)	$\sigma(\mathrm{DCA}_{r\phi})$ (μm)	$p_{\max}^{\mathrm{PID}}$ (GeV/c)
$(-3.0, -2.5)$	$0.1 \cdot p \oplus 2.0$	$60/p_T \oplus 15$	10
$(-2.5, -2.0)$	$0.02 \cdot p \oplus 1.0$	$60/p_T \oplus 15$	10
$(-2.0, -1.0)$	$0.02 \cdot p \oplus 1.0$	$40/p_T \oplus 10$	10
$(-1.0, 1.0)$	$0.02 \cdot p \oplus 0.5$	$30/p_T \oplus 5$	6
$(1.0, 2.0)$	$0.02 \cdot p \oplus 1.0$	$40/p_T \oplus 10$	50
$(2.0, 2.5)$	$0.02 \cdot p \oplus 1.0$	$60/p_T \oplus 15$	50
$(2.5, 3.0)$	$0.1 \cdot p \oplus 2.0$	$60/p_T \oplus 15$	50

Missing $\sigma(DCA_z)$ found from EIC Yellow Report Requirement

dca(z) ~ 100/pT μm ⊕ 20 μm

dca(z) ~ 30/pT μm ⊕ 5 μm
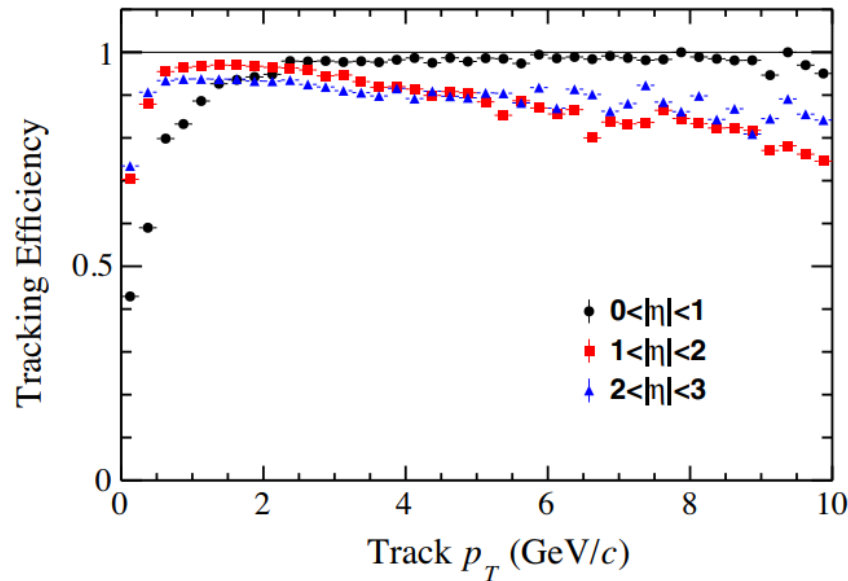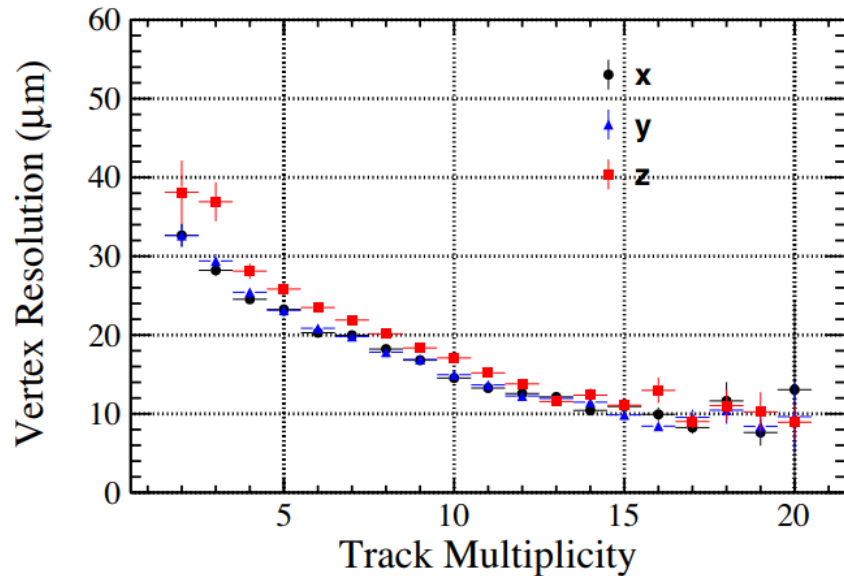
dca(z) ~ 100/pT μm ⊕ 20 μm

https://indico.bnl.gov/event/9984/contributions/43066/attachments/31173/49186/YR_Detector_Matrix_Tracking_only_10282020.xlsx

Projection For EicC
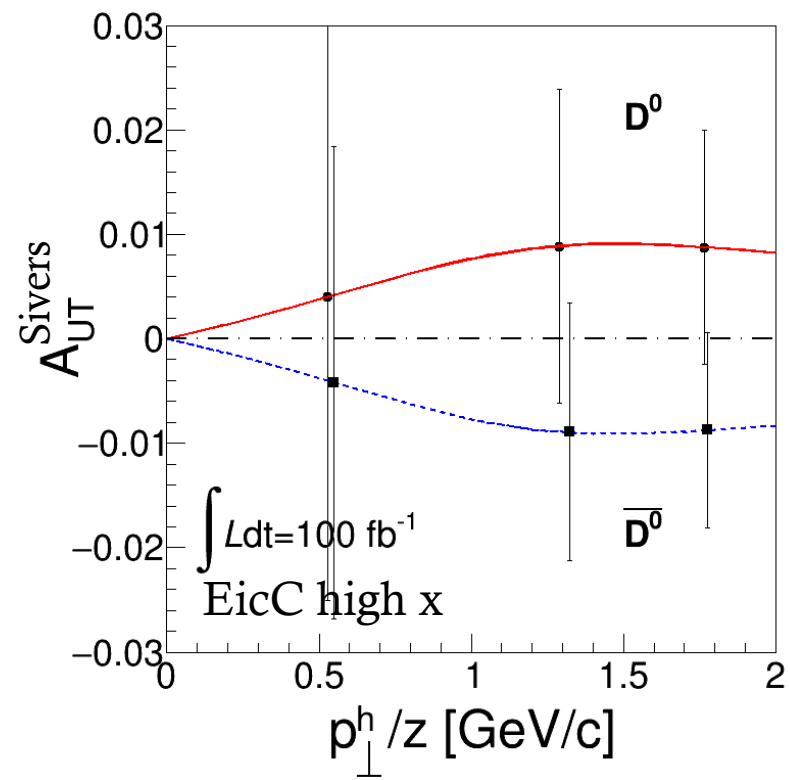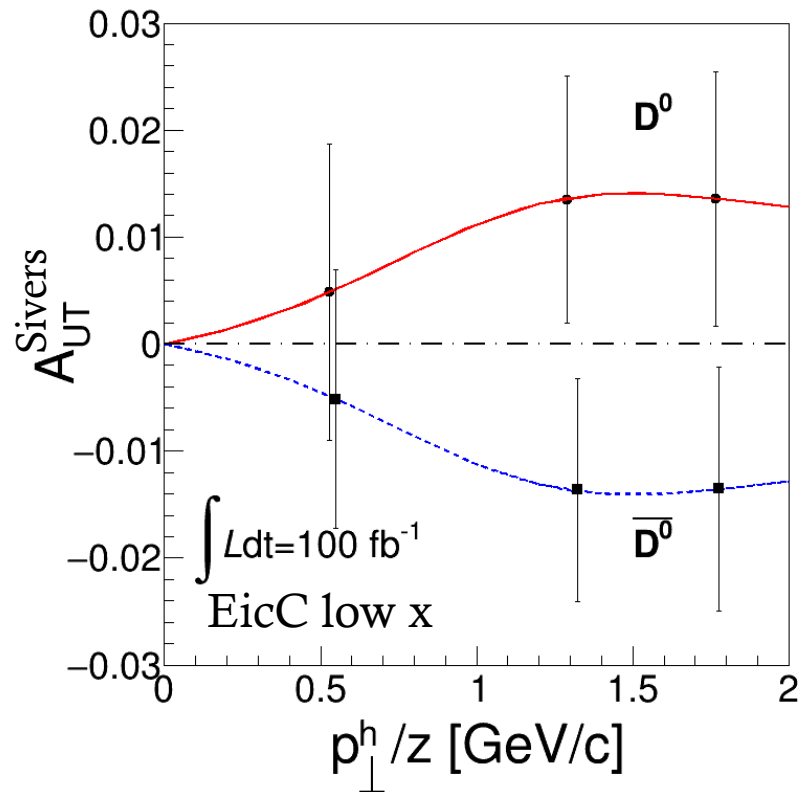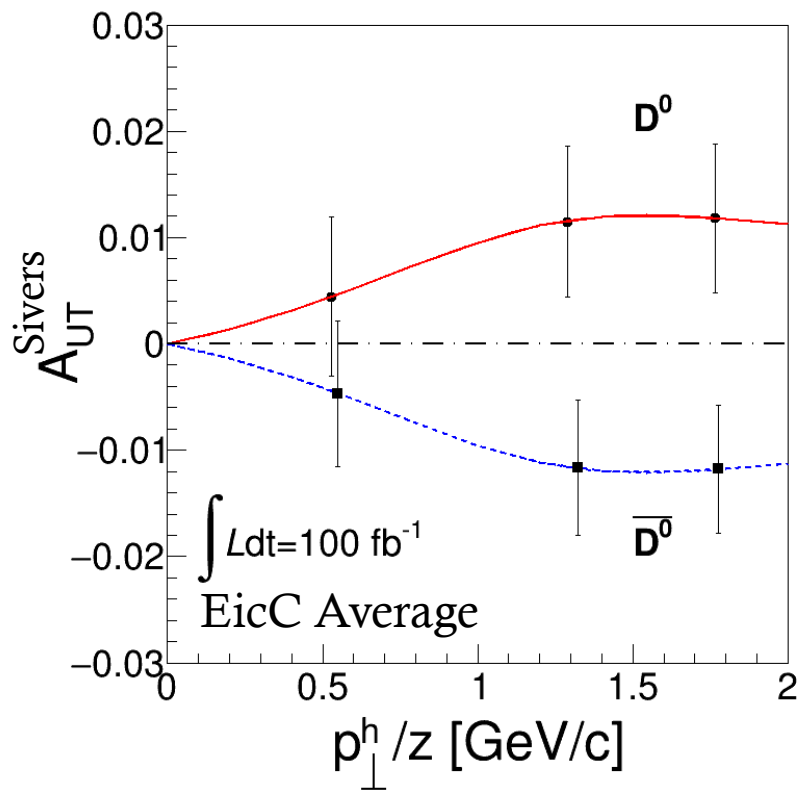
- Impossible to separate D0-D0bar A_{UT} at high x
- EIC is still on-going.

Conclusion

- Smearing Framework for EIC has been set.

- At EicC region, it's impossible to separate D0-D0bar A_{UT} at high x

- Projection of EIC is still on-going.