

EIC SIDIS simulation study at Duke

EIC Yellow Report SIDIS working group meeting

Duke University

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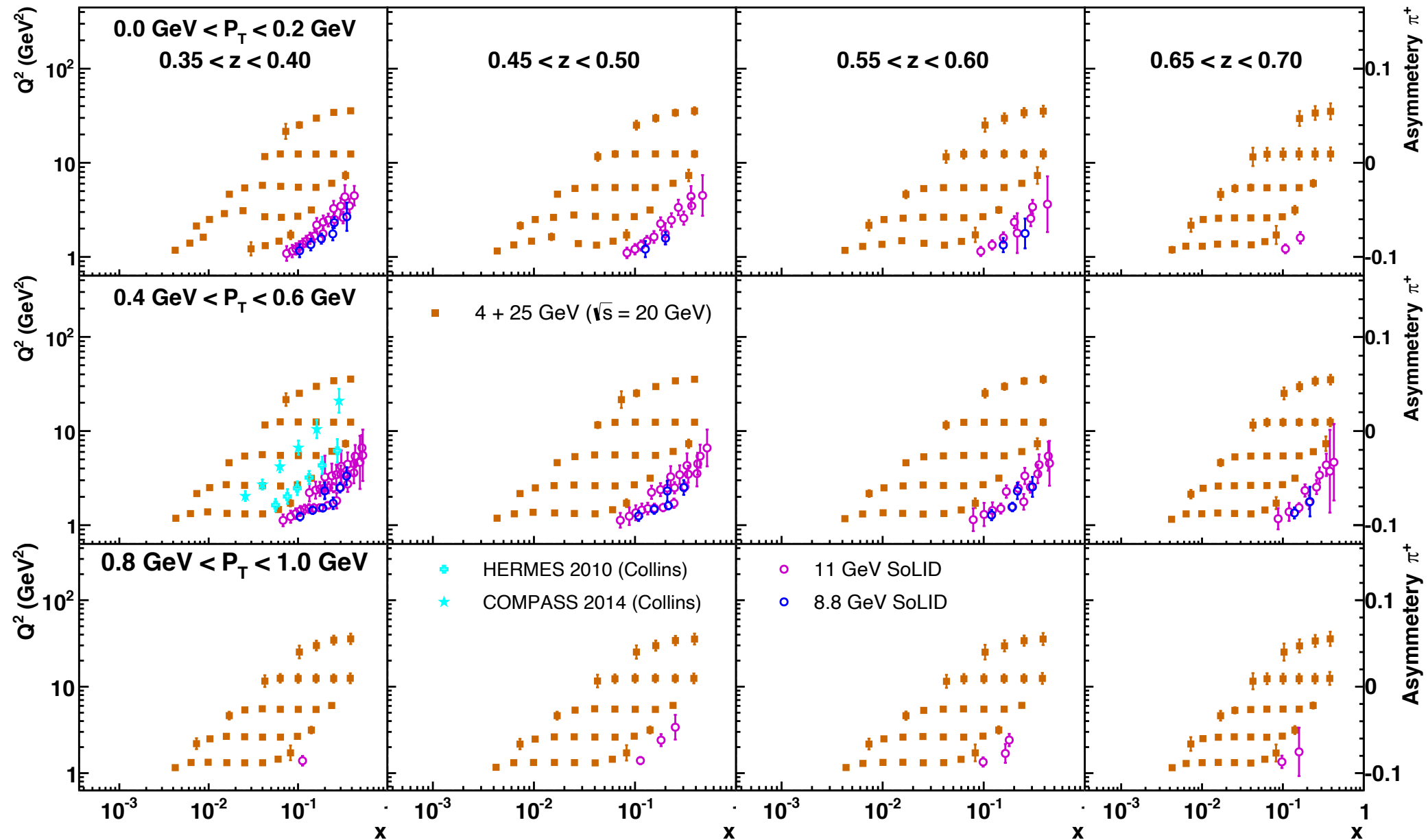
SIDIS @ EIC requirements

- A variable – low to moderately high – center of mass energy (E_{cm})
 - Kinematic coverage: from JLab 12 GeV (also HERMES & COMPASS) valence quark region to EIC sea quark/gluon region
- High luminosity
 - Extractions of TMDs rely on high-precision multidimensional bins
 - Factorization, transition from low-Pt to high-Pt
 - Q^2 evolution
 - Model dependence
 - ...
 - High statistics allow to reduce certain systematic uncertainties (radiative corrections, model dependence, etc.)
- Simulations conducted with various E_{cm} values and high luminosity

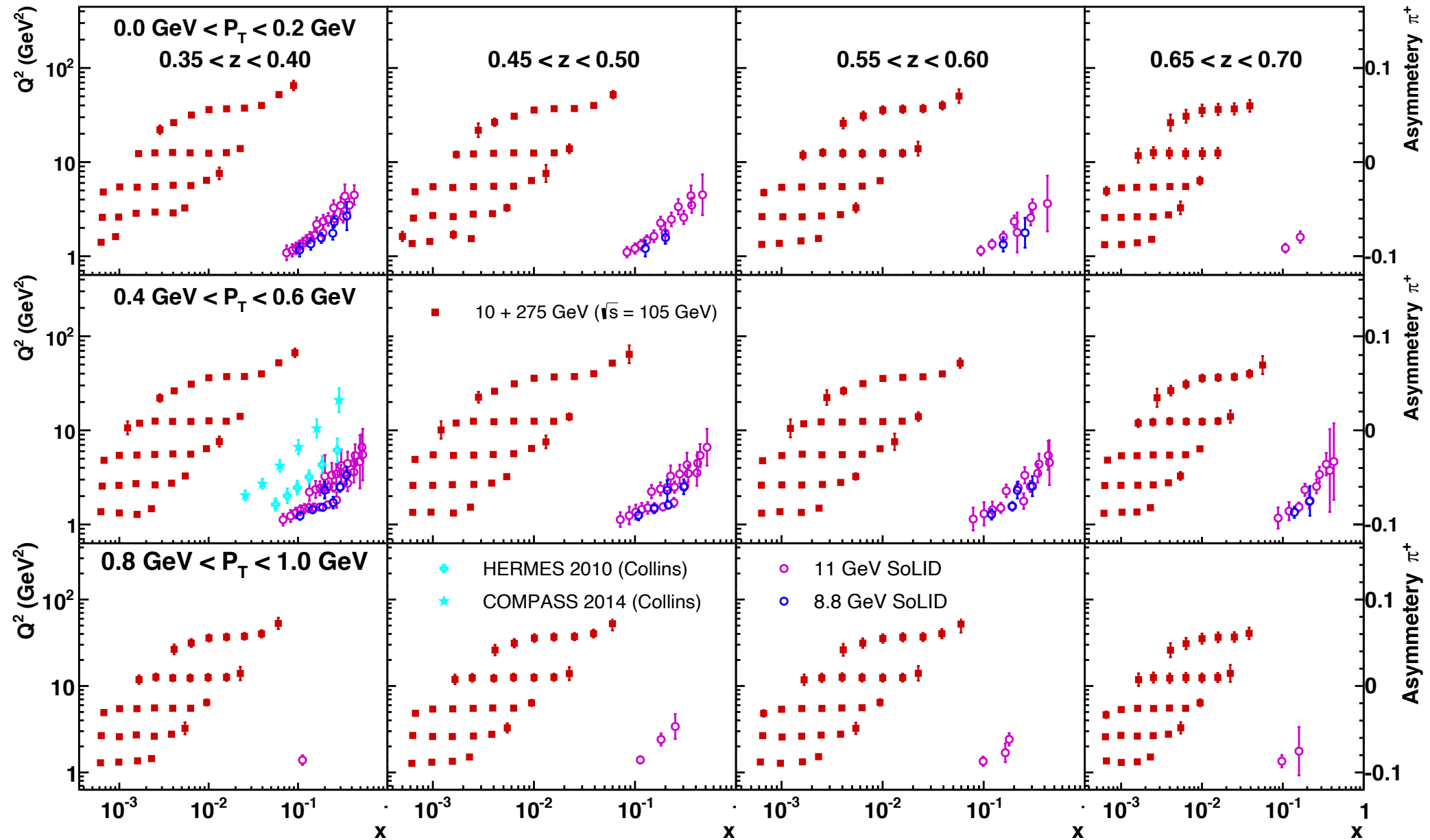
Overview of the simulation parameters

- SIDIS event generator: updated version of the SoLID SIDIS generator
- Integrated luminosity: $1 \times 10^{41} \text{ cm}^{-2}$ (100 fb^{-1})
- Cuts applied:
 - $0.05 < y < 0.8$
 - $W > 2.3 \text{ GeV}$
 - $M_x > 1.6 \text{ GeV}$
 - $0.7 \text{ GeV} < P_h < 10 \text{ GeV}$
 - $P_e > 0.7 \text{ GeV}$
 - $2.5^\circ < \theta_e < 150^\circ$
- Polarization of proton beam = 80%
- Combined detection efficiency = 50%

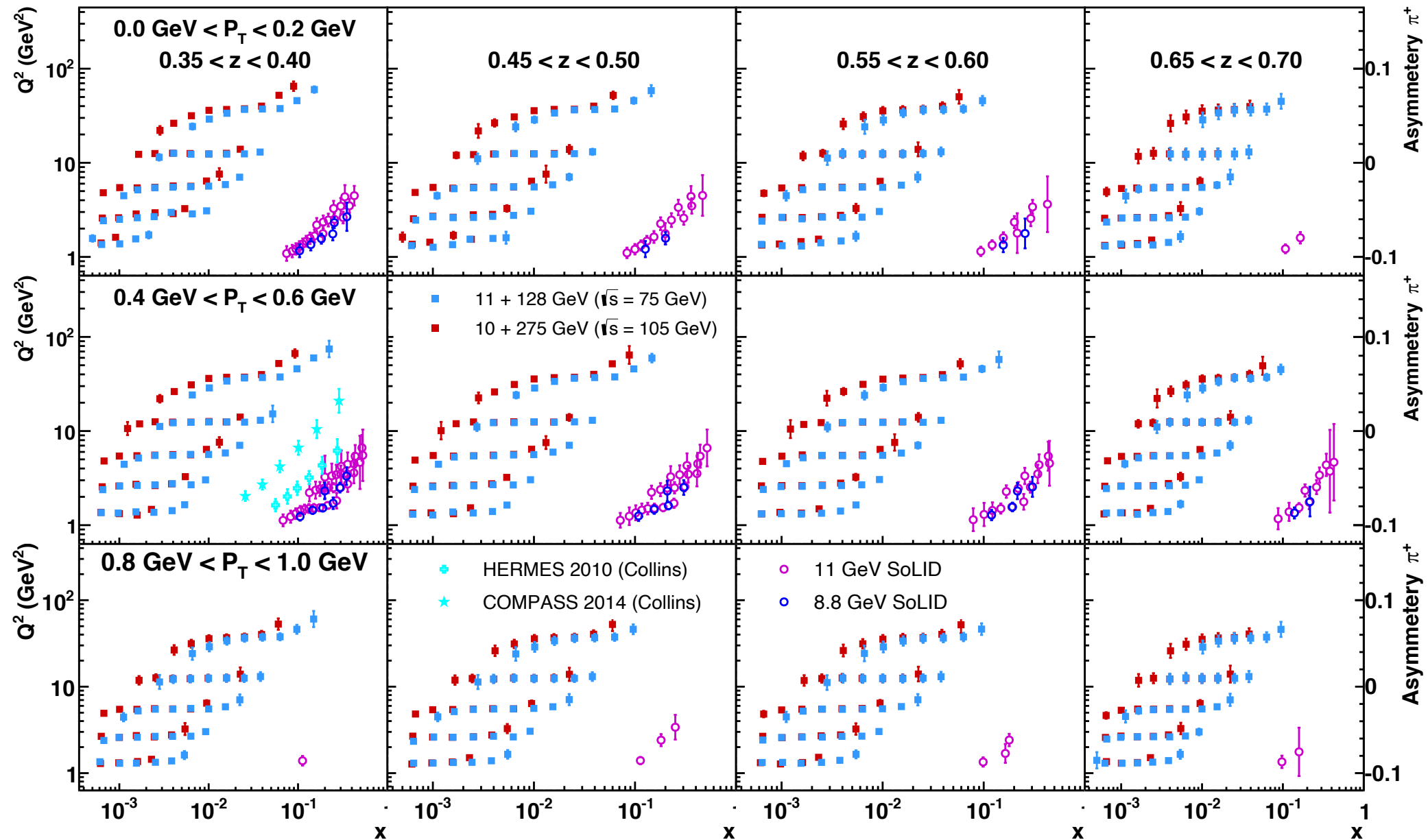
EIC SIDIS statistical projections on single spin asymmetry of π^+



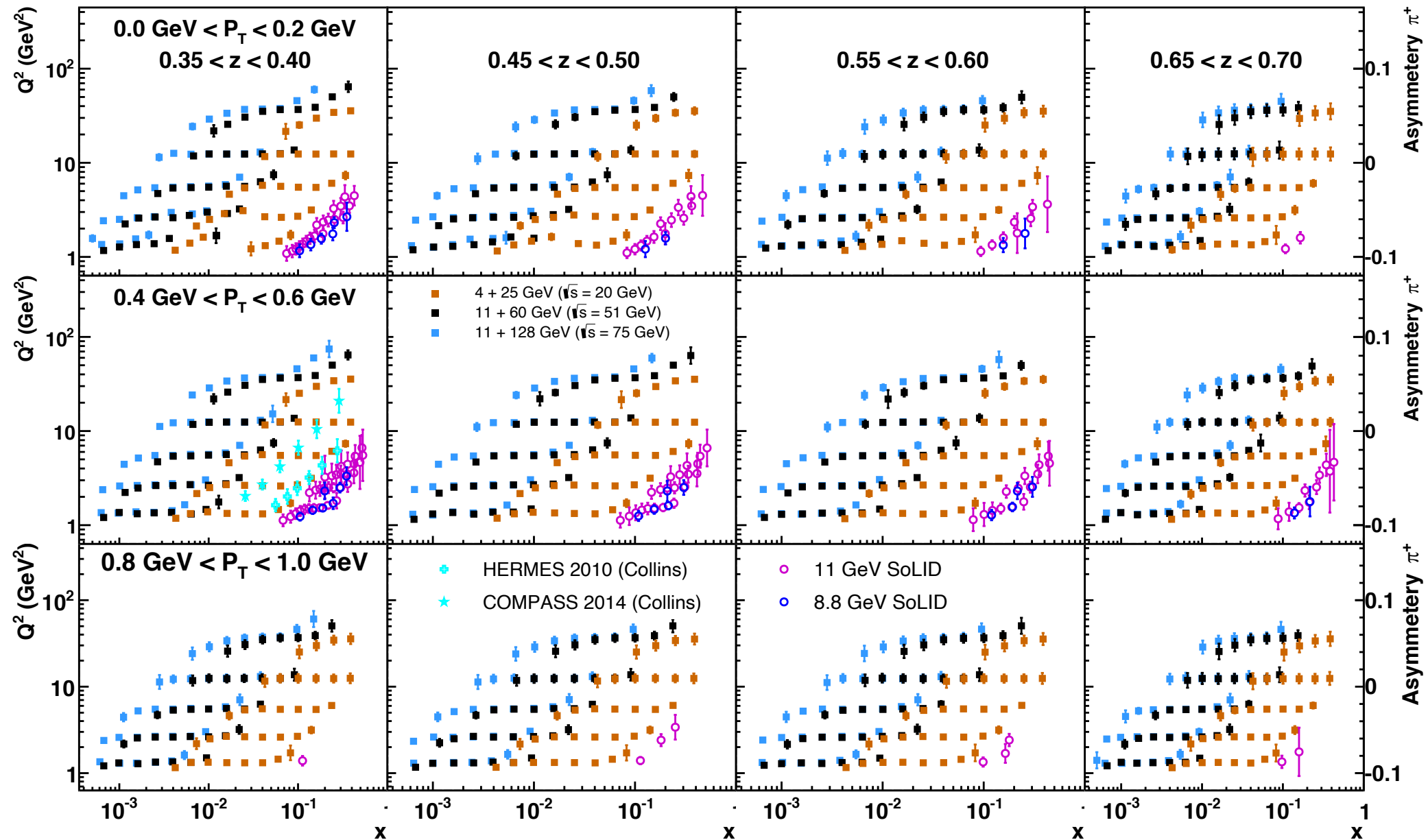
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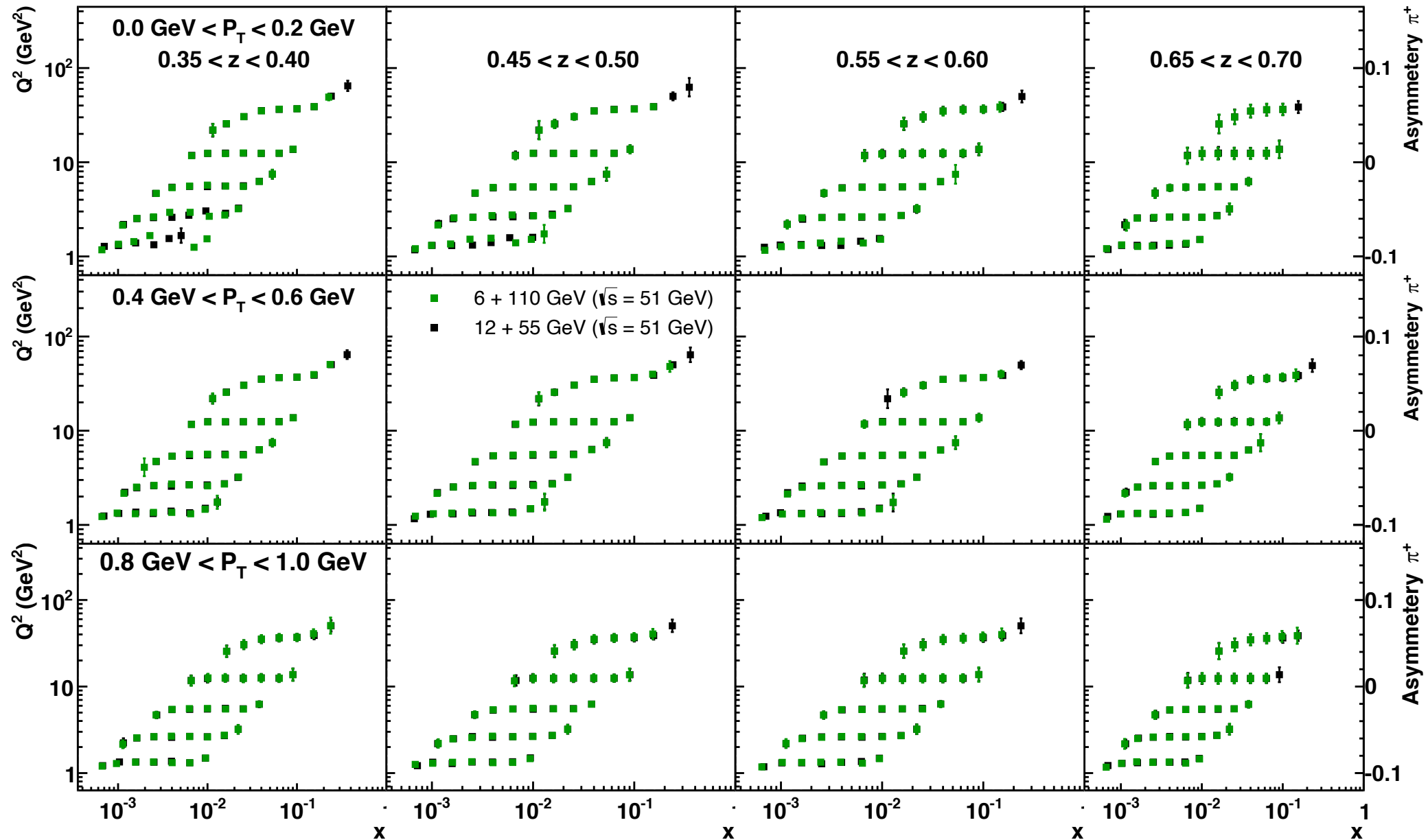
EIC SIDIS statistical projections on single spin asymmetry of π^+



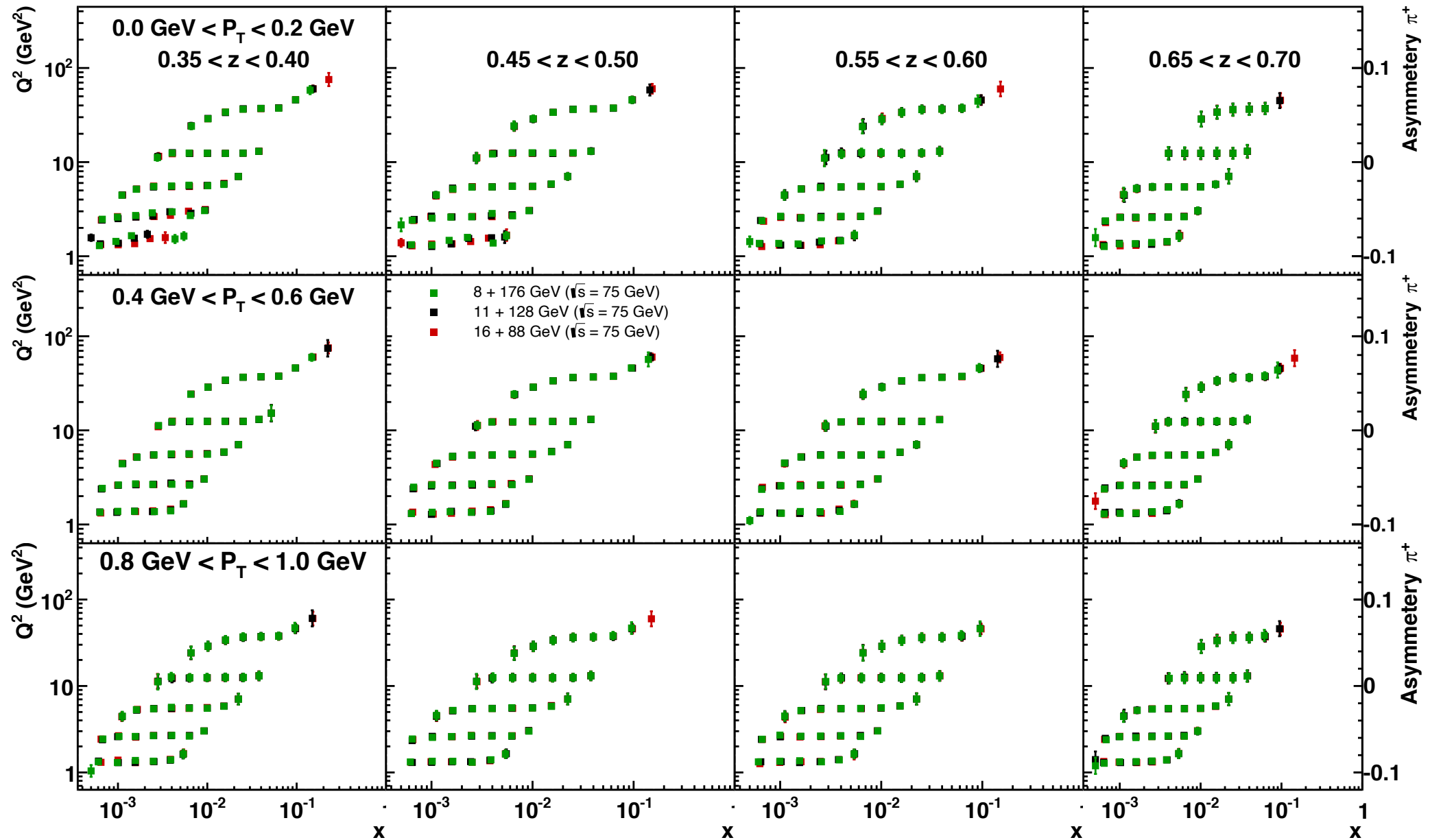
EIC SIDIS statistical projections on single spin asymmetry of π^+



Comparison of different $(E_e + E_p)$ configurations for $E_{cm} = 51$ GeV



Comparison of different $(E_e + E_p)$ configurations for $E_{\text{cm}} = 75$ GeV



Takeaway: the **low E_{cm} curve** for luminosity is highly favored for the EIC SIDIS study

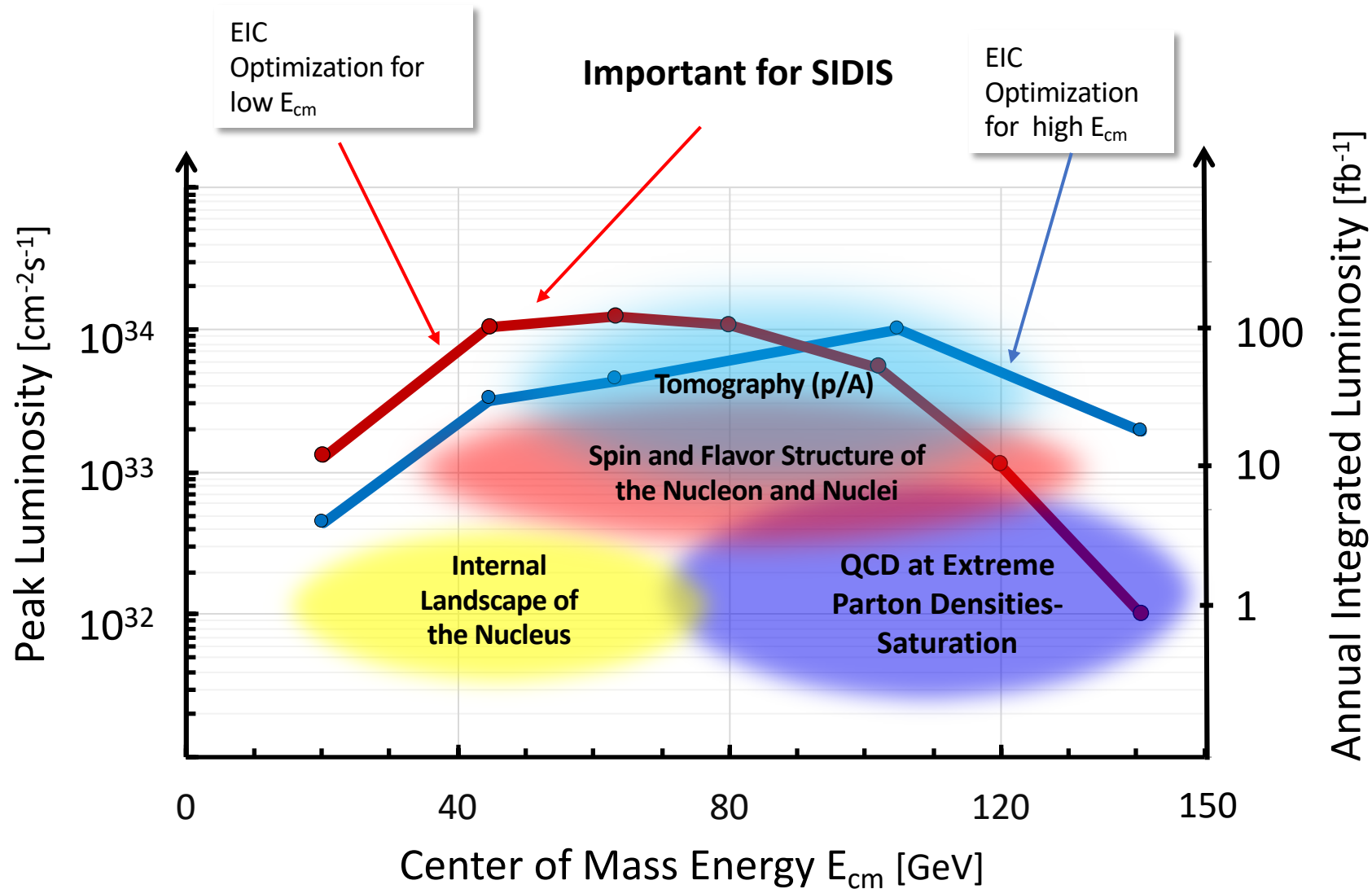


Figure from F. Willeke's slides at EICUG Temple Meeting, Mar 18, 2020