Getting the best from the EIC for future PDF, SPDF and FF analysis

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Jefferson Lab
EXPLORING THE NATURE OF MATTER

JAM Jefferson Lab Angular Momentum Collaboration

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Opportunities at EIC

- α_S
  - PDF
    - DIS (c, large–x g)
    - TDIS (F_2^p, F_2^n)
    - PVDIS (s)
    - SIDIS ($q, \bar{q}$)
  - ΔPDF
    - PVDIS (Δs)
    - ΔSIDIS ($\Delta q, \Delta\bar{q}$)
  - FF
    - SIDIS ($q, \bar{q}$)
    - ΔSIDIS ($\Delta q, \Delta\bar{q}$)

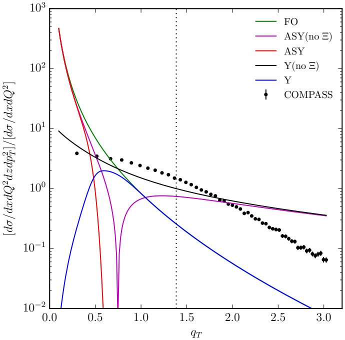
- flavor separation for all light quark distributions
- quark, anti-quark separation
- goal $\rightarrow$ simultaneous fit of PDF, ΔPDF, FF
- EIC can provide SIDIS data consistent with factorization theorems

SIDIS at low Q^2

Formal QCD description of TMD cross sections

$$\Gamma = \mathbf{T}_{\text{TMD}}\Gamma + [\Gamma - \mathbf{T}_{\text{TMD}}\Gamma]$$
$$\approx \underbrace{\mathbf{T}_{\text{TMD}}\Gamma}_{\mathbf{W}} + \underbrace{\mathbf{T}_{\text{coll}}[\Gamma - \mathbf{T}_{\text{TMD}}\Gamma]}_{\mathbf{Y}}$$

- FO is too small.
- $\mathrm{Y} = \mathrm{FO} - \mathrm{ASY}$ is too big.
- Improved matching was recently considered. (Collins, et al.)
- Do we have the correct physical picture?



$Q^2 = 1.92\mathrm{GeV}^2, x = 0.0318, z = 0.375$

Issues with SIDIS talk by O. Gonzalez

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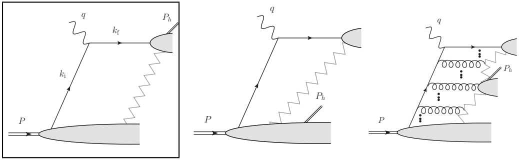

$$p_h \cdot k_i = \mathcal{O}(m^2)$$
$$p_h \cdot k_f = \mathcal{O}(Q^2)$$

- Define a *collinearity* parameter

$$R = \frac{(p_h \cdot k_f)}{(p_h \cdot k_f)} = \mathcal{O}(m^2/Q^2)$$

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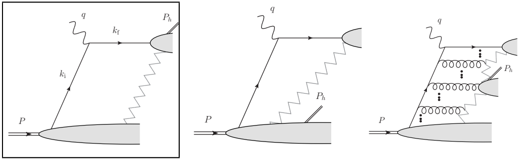

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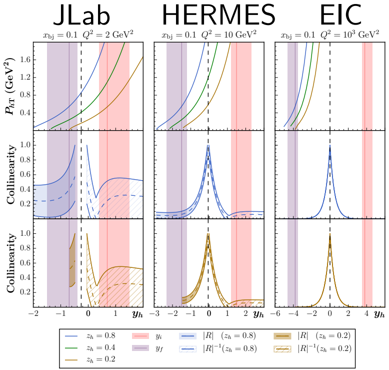

- Factorization seems to be optimal for EIC kinematics