A Roadmap to EIC Impact Studies

Kemal Tezgin

Brookhaven National Lab

kemaltezgin@gmail.com

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What do we want to achieve?

Goal: Assess the impact of EIC data on the extraction of CFFs or GPDs

Work at the level of
- CFFs
- GPDs

What type of data to work with?
- DVCS
- DVCS + TCS
- DVCS + DVMP
- DVCS + TCS + DVMP

Timeframe ≈ 1 year

Three types of fits

Three types of fits:

- Local fit: fitting individual kinematic bins
- QCD inspired models: fitting only model-allowed parameters
- Global fit: flexible parametrization

KM and PARTONS fits: global fits

No global fit of GPDs (including valence quarks, sea quarks and gluons) has been performed yet.

Relation between DVCS and TCS CFFs

- TCS is related to DVCS at the CFF level as follows:

$$^{T}\mathcal{H} \overset{\text{LO}}{=} {}^{S}\mathcal{H}^{*},$$

$$^{T}\widetilde{\mathcal{H}} \overset{\text{LO}}{=} -{}^{S}\widetilde{\mathcal{H}}^{*},$$

$$^{T}\mathcal{H} \overset{\text{NLO}}{=} {}^{S}\mathcal{H}^{*} - i\pi\, \mathcal{Q}^{2} \frac{\partial}{\partial \mathcal{Q}^{2}} {}^{S}\mathcal{H}^{*},$$

$$^{T}\widetilde{\mathcal{H}} \overset{\text{NLO}}{=} -{}^{S}\widetilde{\mathcal{H}}^{*} + i\pi\, \mathcal{Q}^{2} \frac{\partial}{\partial \mathcal{Q}^{2}} {}^{S}\widetilde{\mathcal{H}}^{*}$$

[Muller, Pire, Szymanowski, Wagner 2012]

PARTONS proposal

- Generate pseudo data on a wide range of kinematics with EpIC.
- Perform Artificial Neural Network global fits [Moutarde, Sznajder, Wagner 2019] at the CFF level and assess
  - DVCS global fits without EIC data
  - DVCS global fits with EIC data
  - DVCS and TCS global fits without EIC data
  - DVCS and TCS global fits with EIC data
- Use the real and imaginary parts of the CFF $\mathcal{H}$ in the computation of the subtraction constant which allows us to access the mechanical forces inside the nucleon.
- The whole study can be performed at NLO.

GePaRD proposal (informal discussion)

- GPD impact study along the lines of [Aschenauer, Fazio, Kumericki, Muller 2013]
- Previous work:
  - Already assessed the EIC impact on GPDs at LO
  - Extraction of GPDs H and E (sea quarks and gluons)
  - Unpolarized DVCS cross section and single transverse proton beam asymmetry
- A possible path:
  - Work on GPDs at NLO
  - DVCS + DVMP
  - Extraction of gluon GPDs more reliably
  - Extraction of the mechanical forces