Coherent DVCS on light nuclei at EIC 1

C. Weiss (JLab), Topical meeting 17-Mar-2020, Introduction

- Coherent exclusive scattering on light nuclei e + A → e' + M + A'

    M = vector meson $J/\psi, \phi, \rho^0$; photon (DVCS); other mesons   ← this meeting DVCS

    Coherent scattering and/or nuclear breakup into nucleons

- Physics interest

    Nuclear GPDs: Nuclear matrix elements of QCD operators,
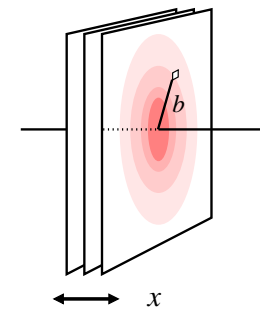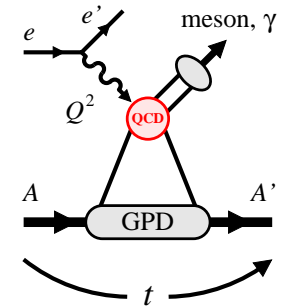   "quark/gluon imaging" of nucleus

    Nuclear form factors of QCD energy-momentum tensor:
    Forces, D-term

    Systems with variable spin: 4He Spin-0, 3He Spin-1/2, D Spin-1

    $x \ll 0.1$: Nuclear shadowing of gluons as function
    of impact parameter or nuclear thickness

    [Spin filter for nucleon GPDs: Nucleon helicity non-flip/flip
    changes nuclear breakup amplitude

    [Connection between coherent scattering and breakup:
    Final-state interactions

Coherent DVCS on light nuclei II

- Fixed-target experiments

  CLAS 6 GeV DVCS on 4He; CLAS12 ALERT DVCS/ϕ
  Hattawy etal PRL 119 (2017) 202004. Armstrong etal E12-17-012

- Kinematic variables

  $$x_A \equiv Q^2/(2p_A q), \quad 0 < x_A < 1 \quad \text{x-variable of nucleus as a whole}$$

  $$x \equiv A x_A, \quad\quad\quad 0 < x < A \quad \text{effective x-variable for scattering on bound nucleon,}$$
  coincides with nucleon x in unbound limit

- EIC measurements: Kinematics

  Consider both $x \gtrsim 0.1$ for quark GPDs, and $x \ll 0.1$ for gluons/shadowing

  Momentum transfer to nucleus $|\boldsymbol{\Delta}_T| \lesssim$ few 100 MeV, $|t| \lesssim 0.1$ GeV^2

- EIC measurements: Forward detection

  Rigidity(recoil) = Rigidity(beam): Favorable situation, same as in exclusive scatt on proton

  $|\boldsymbol{\Delta}_T|$ values substantially smaller than in exclusive scattering on proton

  Ion beam momentum spread affects $|\boldsymbol{\Delta}_T|$ reconstruction

  Light ions – positive detection of coherent recoil; heavy ions – veto detection of breakup

Coherent DVCS on light nuclei III

- Generator for coherent nuclear DVCS at EIC

    Start from fixed-target ep DVCS generator?

    Adapt MILOU DVCS generator for small x?

    Develop generic DVCS generator – PARTONS?

    Include beam smearing effects?

- This meeting

    Summarize/discuss status of physics models

    Summarize/discuss available DVCS generators for ep

    Discuss development of DVCS generator for eA and next steps