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Experimental Opportunities for Few Body Physics at an Electron Ion Collider¹

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A high energy electron-ion collider (EIC) is proposed as the next major facility in the United States for studying the QCD structure of matter. I will discuss the following key few-body physics topics enabled by an EIC:

- Spatial imaging of quarks and gluons in the nucleon via deep virtual exclusive reactions (DVES). Momentum imaging of quarks and gluons via Semi-Inclusive Deep Inelastic Scattering (SIDIS) in both the current and projectile fragmentation regimes. These experiments will span the kinematic range from large x_{Bj} where the nucleon can be fruitfully described as a few-body quark system, to low x_{Bj} , where the structure is dominated by the quark-gluon sea;
- Spectator nucleon tagging of Deep Inelastic Scattering (DIS) in light nuclei and DVES with identification of the nuclear final state are probes of both neutron structure and the quark-gluon structure of nuclear binding;
- Evaporation and projectile fragmentation in DIS on nuclei as a probe of the dynamic generation of mass of a fast quark or gluon as it propagates through the nuclear medium and evolves into a final state hadron.

I will also discuss proposed detectors to implement this program.

¹U.S. Dept of Energy