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Probing Gluon Dynamics and Hadronization with Heavy Flavor Production at the Future Electron Ion Collider

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Heavy quarks, due to their large external masses, are produced predominantly through initial hard scatterings involving gluons in high energy ion-ion and electron-ion collisions. This makes them unique probes to study QCD emergent properties of the hot QGP as well as of the cold nuclear medium. Measurements of heavy quark hadron production also offer new insights into the hadronization mechanisms in these collisions. With high luminosity electron-ion collisions for a range of ions at the future Electron Ion Collider (EIC), a new generation of experiments will enable precision investigations of gluon dynamics and hadronization in nucleons and nuclei.

In this talk, we will present physics simulation studies utilizing a silicon tracker optimized for heavy quark measurements at the future EIC. These studies include projections for heavy quark production with polarized and unpolarized beams to constrain parton distribution functions, correlation measurements to study hadronization, and baryon to meson ratios to study hadrochemistry. In addition, we will discuss the detector and luminosity requirements for these measurements to be able to extract the science.

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