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Physics opportunities in electron-hadron collisions at the future eRHIC

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Our understanding of the structure of nucleons is described by the properties and dynamics of quarks and gluons in the theory of quantum chromodynamics. With advancements in theory and the development of phenomenological tools we are preparing for the next step in subnuclear tomographic imaging at a future electron-ion collider. A large range of center-of-mass energies ($\sqrt{s} \approx 77 - 141$ GeV) in combination with extremely high luminosities ($\sim 10^{33}$ cm^{-2}s^{-2}) will open a unique opportunity for very high precision measurements, allowing for a detailed investigation of the proton and nuclear hadronic substructure in multi-dimensions.
In addition, highly polarized nucleon ($P \approx 70\%$) and electron ($P \approx 80\%$) beams can probe the parton polarizations in previously unexplored kinematic regions and with unprecedented accuracy, as well as address the role of orbital angular momentum with respect to the nucleon spin. This talk will summarize the eRHIC physics case for electron-proton collisions, the expected impact over the current knowlege and some of the technical challenges of such a versatile experimental endeavor.

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