Habilitationsvortrag

Kolloquium

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Exploring the Proton’s Innermost Structure at the Electron-ion Collider

physikalisches

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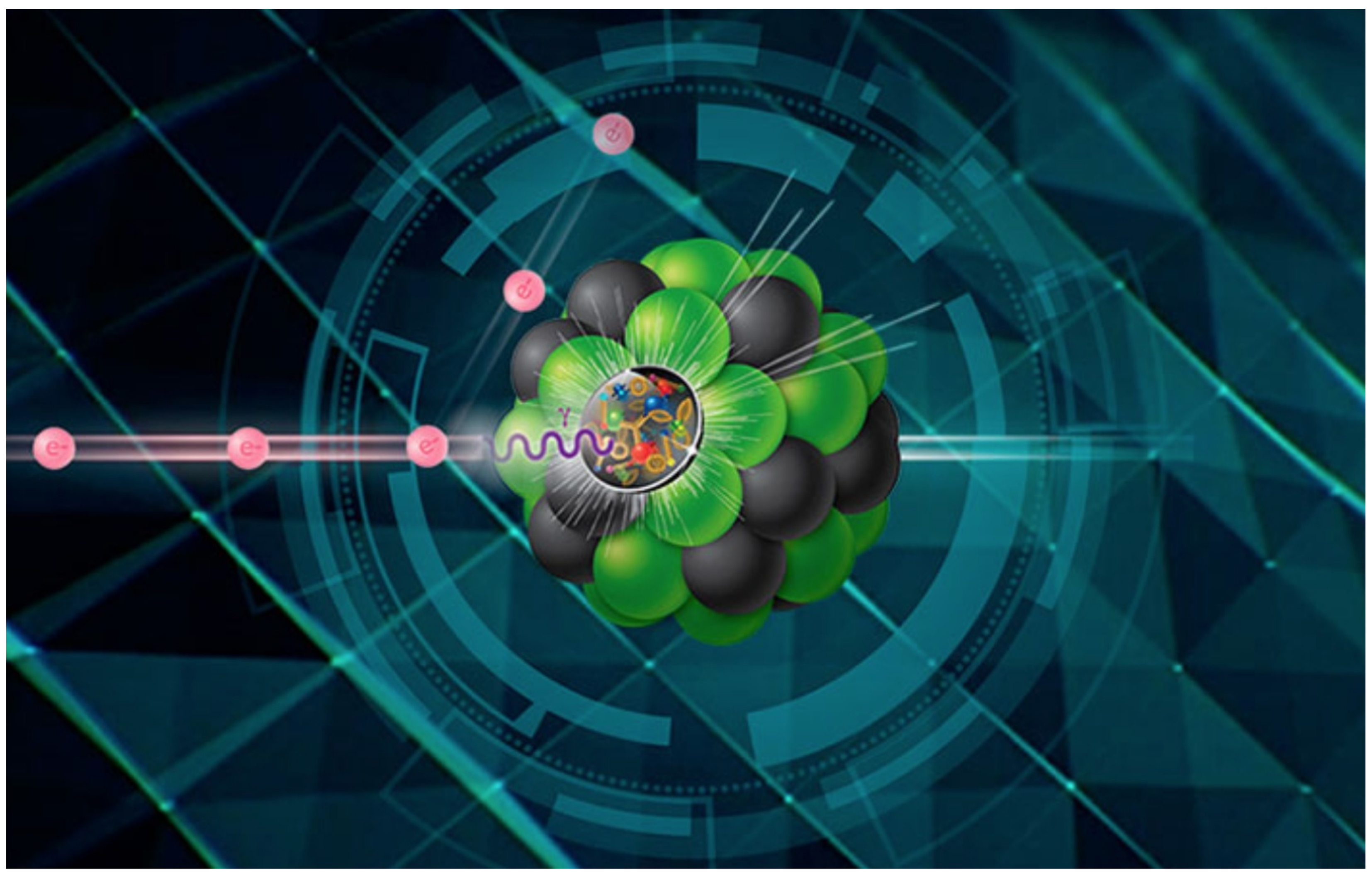
The future Electron-ion Collider (EIC) represents a significant step forward in theoretical physics, offering new avenues to explore high-energy quantum chromodynamics (QCD). This exploration is crucial for understanding the complex dynamics of quarks and gluons, especially in contexts of high-parton density and non-linear dynamics.

A key focus of the EIC will be investigating the elusive proton spin, a fundamental aspect of particle physics that has long intrigued researchers. Additionally, the EIC’s investigations will enhance our comprehension of the saturation scale, a concept vital in high-parton density environments. Perturbative corrections at higher orders, along with eikonal and sub-eikonal approximations, are essential for refining theoretical models.

These corrections are particularly important for ensuring that theoretical predictions align more accurately with experimental results. Experiments at the Large Hadron Collider (LHC) have already provided valuable data, and the EIC is expected to complement these findings. The integration of sub-eikonal and higher-order corrections in theoretical frameworks is not just a technical detail; it is crucial for the robustness and accuracy of our understanding of quantum phenomena.



At the Electron-Ion Collider, a stream of electrons (e-) collides with a beam of protons or atomic nuclei, producing virtual photons. These particles of light penetrate into the proton or nucleus, revealing the intricate dynamics of quarks and gluons inside. Credits: Brookhaven National Laboratory

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