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Opportunities with light ions at the EIC

The Electron-Ion Collider (EIC) is intended to be the next-generation US facility for the study of the strong interaction. Its unique capability to accelerate beams of polarized protons and light nuclei, as well as unpolarized nuclei over the full mass range, will, for the first time, make it possible to directly probe the gluon fields that bind nuclei. Excellent near-beam detection of scattered ions and spectator particles will also provide particularly rich physics opportunities with light ions. These will not only include precise measurements of neutron structure through precise tagging of the proton spectator(s), but also coherent diffractive processes on light nuclei, where the intact nucleus can be detected directly, making the separation from incoherent backgrounds straightforward. Here it is of interest to note that light nuclei span a very wide range of density, with deuterium being the least dense nucleus and He-4 being comparable to the heaviest ones). But equally compelling is that He-3, and possibly deuterium, could also be polarized, making it possible to measure the 3D structure of nuclei (e.g., nuclear GPDs), in a way analogous to that of the proton. And while scatting on light nuclei does not provide as large a boost to gluon density ("oomph factor") as for heavy nuclei, the detailed understanding of the light nuclei allows for a more precise description of shadowing and the onset of gluon saturation. This talk will give an overview of the physics opportunities with light ions at an EIC and discuss the experimental requirements for the various processes.

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