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The Detector Design of the Jefferson Lab EIC

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The Electron-Ion Collider (EIC) is envisioned as the next-generation U.S. facility to study quarks and gluons in strongly interacting matter. The broad physics program of the EIC aims to precisely image gluons in nucleons and nuclei and to reveal the origin of the nucleon spin by colliding polarized electrons with polarized protons, polarized light ions, and heavy nuclei at high luminosity.

The Jefferson Lab EIC (JLEIC) design is based on a figure-8 shaped ring-ring collider. The luminosity, exceeding 10^33 $cm^{-2}s^{-1}$ in a broad range of the center-of-mass energy and maximum luminosity above 10^34 $cm^{-2}s^{-1}$, is achieved by high-rate collisions of short small-emittance low-charge bunches made possible by high-energy electron cooling of the ion beam and synchrotron radiation damping of the electron beam. The polarization of light ion species (p, d, ^3He) can be easily preserved and manipulated due to the unique figure-8 shape of the collider rings.

The focus of this presentation is put on the JLEIC primary detector that has been designed to support the full physics program of the EIC and to provide essentially full acceptance to all fragments produced in collisions. The detector has been fully integrated with the accelerator and extended to the forward electron and hadron regions to achieve exceptional small-angle acceptance and resolution as well as high-precision electron polarimetry and low-Q^2 tagging. The central-detector design allows for excellent tracking up to small angles and excellent hadron PID resulting and offers a great performance, in particular for semi-inclusive and exclusive measurements.

The combination of high luminosity, highly polarized lepton and ion beams, and a full acceptance, multipurpose detector fully integrated with the accelerator will allow JLEIC a unique opportunity to make breakthroughs in the investigation of the strong interaction.

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