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Incorporating Critical Beam Effects into Physics and Detector Simulations for the Electron-Ion Collider

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The proposed Electron-Ion Collider (EIC), to be built at Brookhaven National Laboratory, will enable an unparalleled exploration of how the observed properties of nucleons and nuclei emerge from the interactions of their constituent partons. This program will be made possible both by a state-of-the-art machine, capable of colliding polarized electrons with either polarized protons or unpolarized heavy ions with high luminosity and the highly optimized integration of the detector and interaction region with the rest of the collider. One of the key design features of the EIC is the presence of a crossing angle between the colliding beams that reduces the prevalence of parasitic collisions, allowing for the small bunch spacing needed for high luminosity. This crossing angle, either 25 or 35 milliradians depending on interaction region, and other beam conditions such as angular divergence will affect how the beams are oriented in relation to the detector as well as the distribution of particles arising from collisions. It will therefore be essential to include these effects in event simulations for physics and detector studies at the EIC. This contribution will outline two methods for including the crossing angle and other relevant beam effects in simulation: a generator independent afterburner and a scheme based on the internal functionality of the Pythia-8 Monte Carlo event generator. The impact of all beam effects on final state particle distributions will be discussed and procedures to correct for these distortions when performing analyses will be presented.

Submitted on behalf of a Collaboration?

No

Author: PAGE, Brian (Brookhaven National Laboratory)

Presenter: PAGE, Brian (Brookhaven National Laboratory)

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