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Tracking Performances Studies for the Experimental Setup at the Electron-Ion Collider

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The proposed Electron-Ion Collider (EIC) at the Brookhaven National Laboratory will study the collisions of polarized electrons with polarized protons and ions. The measurement of scattered electrons and charged particles will provide the main ingredients to achieve the physics objectives given below.
 Distribution of sea quarks and gluons, and their spins inside the nucleon, basically 3D imaging of a nucleon.
 The state of hadronic matter at extremely high gluon density (low-x regime).
 Interaction of color-charged quarks and gluons, and colorless jets, with a nuclear medium.
In this way, the EIC will answer several important questions of QCD Physics. A Totally Hermetic Electron-Nucleus Apparatus (ATHENA) detector is one of the proposed configurations to study collisions at the EIC with very high tracking and particle identi cation performances. The ATHENA tracking detector consists of barrel, forward, and backward detectors to have a wide pseudo-rapidity ( ) coverage. The central detector relies on three innermost silicon layers with a very small material budget (0.05% X0 per layer), two silicon barrel layers (0.55 % X0 per layer) and four micro-megas layers (0.40% X0 per layer) at larger radii.
The silicon layers are based on new-generation MAPS in 65 nm CMOS imaging technology. Forward and backward disks allow for reconstructing particles at larger. In this presentation, the tracking performance as studied in a full simulation of the ATHENA configuration will be described. A new collaboration is going to be formed by combining ATHENA and EIC Comprehensive Chromodynamics Experiment (ECCE) proto-collaborations and detector proposals (known as Detector-1 Collaboration): we are currently studying and optimizing the tracking performances for this setup in view of the Technical Design Report activity expected in the next year.

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