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Conceptual design of the DIRC detector for EicC experiment

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The Electron-Ion Collider in China (EicC) has been proposed as a future high-intensity heavy-ion and electron accelerator experiment. It aims at the precise measurement of nucleon structure in the sea quark region, including the 3D tomography of nucleon, the partonic structure of nuclei, parton interactions with the nuclear environment, and investigation of exotic states, particularly those containing heavy flavor quarks. Furthermore, issues fundamental to understanding the origin of mass could be addressed by measurements of heavy quarkonia near-threshold production at EicC. To achieve these physics goals, a hermetic particle identification (PID) detector system with high resolution and large momentum coverage is essential.

One major challenge associated with the EicC spectrometer is to achieve precise hadron identification with a large momentum coverage within the limited space of high luminosity accelerator. In the barrel region of EicC, a compact DIRC (Detection of Internally Reflected Cherenkov lights) detector referring to PANDA and EIC schemes is designed at a radius around 70cm, with a inner layer of LGAD (Low Gain Avalanche Detector) close to it. The LGAD can measure the incident particles'hit position and time as ToF detector, which will effectively enhance the Cherenkov angular reconstruction capability of DIRC. The GEANT4 simulation shows that DIRC can achieve 3σ π/K separation up to 6GeV/c with the angular resolution $\leq$ 1mrad. The detailed conceptual design and simulation of DIRC detector will be presented in the paper.

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