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Proton-Endcap Electromagnetic Calorimeter of the ePIC Experiment at Electron-Ion Collider

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The proton-endcap Electromagnetic Calorimeter (pECal) of the ePIC experiment at the future Electron-Ion Collider (EIC) will cover the pseudorapidity range of $1.3 < \eta < 4$ in the hadron-going direction. In semi-inclusive deep inelastic scattering, the pECal is essential for measuring jets and heavy quarks in the hadron-going direction. These physics measurements require the pECal to have a moderate energy resolution, fine granularity, and a compact structure. We will present the current design of the pECal, a sampling calorimeter with a W-powder/ScFiber (W/ScFi) structure initially developed at UCLA. The W/ScFi detector design has unique features, such as a close-to-one e/h ratio suitable for hadron compensation, which is required for jet measurements. The simulated pECal performances match the requirements of the EIC scientific program very well. This design has been adopted by the current EIC detector plan (ePIC) and implemented in the ePIC software frameworks. I will discuss the design, advantages, and performances of the W/ScFi pECal detector based on the results of GEANT4 simulations. I will present the performances of the pECal in terms of separation of high-energy π^0 decay photons, identification of electrons, and measurements of jets and heavy-flavor jets.

Category

Experiment

Collaboration (if applicable)

ePIC pECal detector consortium (BNL, Fudan, Shandong University, Tsinghua, South China Normal University, Indiana University, UCLA, and UCR)

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