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Performance of the backward hadronic calorimeter (nHCal) of the ePIC experiment at EIC based on simulations

The planned Electron Ion Collider will be a unique, high-luminosity, high-precision accelerator to yield collisions of electrons and protons/nuclei. The ePIC experiment will be the first general-purpose detector planned for EIC. It will cover a wide area in $x - Q^2$ plane at different center of mass energies. Low-x physics are going to be central to the EIC mission of probing gluon saturation and the 3D structure of nucleons and nuclei. The backward hadronic calorimeter, here called nHCal (meaning Negative-eta/Neutral Hadronic Calorimeter) will be crucial for studying the low-x physics, diffractive processes, and neutral hadron detection. To be installed in the electron-going negative-z direction as a tail catcher, this detector will enhance hermeticity, improve scattered electron tagging by serving as a hadronic veto, and facilitate studies of diffractive events such as vector meson and dijet production.

To meet these objectives, the nHCal must provide extensive coverage in the backward direction, efficient separation of muons and pions, high detection efficiency for low-energy neutrons, and excellent spatial resolution for distinguishing neutral and charged clusters. In this presentation, we explain the design of this backward hadronic calorimeter made of layers of steel and plastic scintillator tiles. We also report ongoing Monte-Carlo studies of the properties of the calorimeter. Studies of the neutron and pion separation and response have been conducted using simulations. Preliminary results indicate that neutral and charged hadron shower energies can be distinguished when their respective clusters are approximately 30 cm apart.

Secondary track

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