

# Recent Results on $\pi^- / \pi^+$ Ratio for Constraining the High Density Behavior of the Nuclear Symmetry Energy

Ming Zhang, Zhi-Gang Xiao and Sheng-Jiang Zhu

Department of Physics, Tsinghua University, Beijing, China

1. Based on IBUU04 transport model, the differential  $\pi^- / \pi^+$  ratio has a much sensitive dependence on the nuclear symmetry energy  $E_{\text{sym}}(\rho)$  especially at smaller angles in laboratory system (Fig.1 and Fig.2).

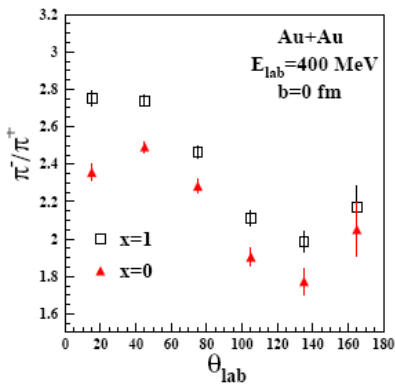


Fig.1 Differential  $\pi^- / \pi^+$  ratio as a function of angle in laboratory system

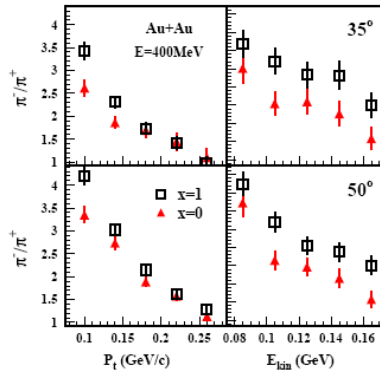


Fig.2 Differential  $\pi^- / \pi^+$  ratio as functions of transverse momentum and kinetic energy with different angles cut

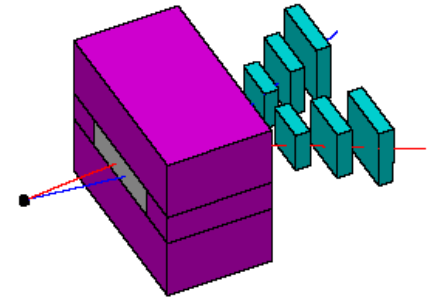


Fig.3 Profile of ETF at HIRFL-CSR

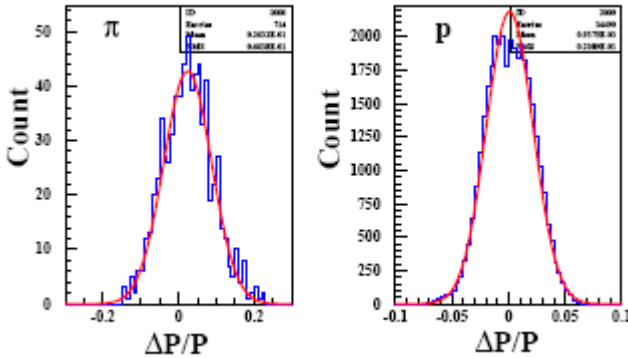


Fig.4 Momentum reconstruction for pion (left) and proton (right)

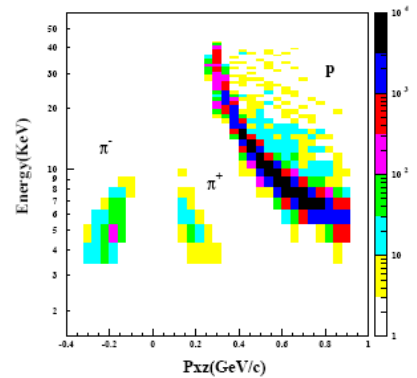


Fig.5 Particle identification for charged pion and proton

2. The External Target Facility (ETF) including MWDCs and TOF Wall coupled with a dipole magnet placed at forward angle at HIRFL-CSR in China provide a good platform to detect charged pions (Fig.3). The results on the momentum reconstruction and particle identification based on Geant4 is shown in (Fig.4 and Fig.5).