

On the possibility of measuring the polarization of a ^3He beam at EIC by the HJET polarimeter

Thursday 12 January 2023 14:50 (20 minutes)

The requirements for hadron polarimetry at the future Electron Ion Collider (EIC) include measurements of the absolute helion (^3He , h) beam polarization with systematic uncertainties better than $\lesssim 1\%$. Here, we consider a possibility to utilize the Polarized Atomic Hydrogen Gas Jet Target (HJET) for precision measurement of polarization of the $\sim 100\text{ GeV/n}$ helion beam. HJET, which serves to determine absolute proton beam polarization at the Relativistic Heavy Ion Collider, provides the accuracy of about $\lesssim 0.5\%$. To adapt the HJET method for the EIC helion beam, the experimentally determined ratio of the beam and target (jet) spin correlated asymmetries should be adjusted by the ratio of $\uparrow h$ and $h\uparrow$ analyzing powers $A_{\text{N}}^h(\uparrow)/A_{\text{N}}^h(h\uparrow)$ which, in the leading order approximation, is predefined by magnetic moments of the proton and helion, $(\mu_p - 1)/(\mu_h/2 - 1/3)$. However, to achieve the required accuracy in the measured polarization, the corrections due to hadronic spin-flip amplitudes and due to possible beam ^3He breakup should be considered. Preliminary results of an analysis discussed here indicate that (i) the proton-helion hadronic spin-flip amplitudes can be related, with sufficient precision, to the proton-proton one and (ii) the breakup corrections are small and cancel in the ratio. So, the EIC helion beam absolute polarization can be measured by HJET with the required accuracy.

Presenter: POBLAGUEV, Andrei (Brookhaven National Laboratory (US))

Session Classification: Parallel Session D

Track Classification: Particle Detectors and Instrumentations