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Exploring Free and Bound Nucleon Structure Using Deuteron DIS with Spectator Tagging at the EIC¹ ALEXANDER JENTSCH, ZHOUDUNMING TU, Brookhaven National Laboratory, CHRISTIAN WEISS, Jefferson Lab — Measurements of DIS on the deuteron with detection of the spectator nucleon in the final state (spectator tagging) represent a unique method for extracting the free neutron structure functions and studying the nuclear modifications of bound nucleons. The detection of the spectator nucleon (with typical momenta ~ 100 MeV/c in the deuteron rest frame) fixes the nuclear configuration during the DIS process and permits differential studies of the nuclear modifications. In electron + deuteron measurements at the EIC the spectator nucleon moves forward with $\sim 1/2$ the beam momentum and can be detected using detectors in the so-called “far-forward region ($\eta > 4.5$). We study the feasibility of tagged DIS measurements with the baseline EIC far-forward detector design using realistic detector simulations for both proton and neutron detection. We then use the smeared data to study the extraction of the free neutron structure through on-shell extrapolation in the spectator proton momentum and the characterization of bound nucleon structure with tagging at the EIC.

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