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Next-generation neutron structure measurements with spectator tagging at EIC

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DIS on the deuteron with detection of a proton in the nuclear fragmentation region (”spectator tagging”) represents a unique method for extracting the neutron structure functions and their spin dependence. The measured proton recoil momentum (˜ few 100 MeV in the deuteron rest frame) controls the nuclear configuration during the DIS process and allows one to eliminate nuclear binding effects by extrapolating to the on-shell point (free neutron). Such measurements could be performed at a future Electron-Ion Collider (EIC) with suitable forward detectors. We report about recent progress in the theory and simulation of neutron structure measurements with spectator tagging at EIC. This includes (a) development of a theoretical model of nuclear final-state interactions in spectator tagging at intermediate x (˜0.1-0.5), caused by the exposure of the spectator nucleon to slow hadrons produced in the DIS process on the active nucleon [arXiv:1706.02244]; (b) calculation of the proton recoil momentum distribution, as determined by initial-state deuteron structure (S and D-waves) and final-state interactions; (c) simulations of recoil momentum measurements and neutron structure extraction at EIC under realistic conditions (beam momentum spread, resolution of forward detectors).

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