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Heavy flavor and jet studies for the future Electron Ion Collider

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The proposed high luminosity high energy Electron Ion Collider (EIC) will explore the proton/nuclear structure, search for gluon saturation and precisely determine the nuclear parton distribution functions (nPDFs) in a wide x - Q^2 phase space. Heavy flavor and jet measurements at the future EIC will allow us to better constrain the nPDFs within the poorly constrained high Bjorken- x region, precisely determine the quark/gluon fragmentation processes and directly study the quark/gluon energy loss within the nuclear medium. We propose to develop a new physics program to study the flavor tagged hadrons/jets, heavy flavor hadron-jet correlations and flavor dependent jet fragmentation processes in the nucleon/nucleus going direction (forward region) at the EIC. These proposed measurements will provide a unique path to explore the flavor dependent fragmentation functions and energy loss in heavy nuclei, which can constrain the initial state effects for previous and ongoing heavy ion measurements at the Relativistic Heavy Ion Collider (RHIC) and the Large Hadron Collider (LHC). To realize these measurements, a forward (proton/nuclei going direction) silicon tracking detector is proposed and the detector R&D and detector design are ongoing with the Los Alamos National Laboratory Lab Directed Research and Developments (LDRD) supports. Details of the proposed new physics program, progresses of the detector and physics simulation studies and the status of the detector R&D will be discussed in this presentation.

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