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Probing gluon saturation via semi-inclusive deep inelastic scattering at the EIC

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Within the dipole picture for electron-nucleus (eA) deep inelastic scattering (DIS) at small Bjorken x, we consider special, "aligned jet", configurations, which are very asymmetric: one of the quarks from the dipole fluctuation of the virtual photon carries most of the longitudinal momentum of its parent. We argue that such configurations correspond to relatively large dipole sizes and thus can be sensitive to saturation effects in the nuclear target even for relatively hard processes, where the photon virtuality Q^2 is considerably larger than the target saturation momentum Q_s^2. This offers a possibility to push the physics of saturation to larger values of Q^2, or to higher values for x. We propose to explore this possibility at the future Electron Ion Collider via special measurements of semi-inclusive DIS in which the longitudinal momentum of the tagged jet (or hadron) is measured as well. We predict new phenomena associated with gluon saturation in the very-forward regime, where the longitudinal momentum fraction z of the measured jet is close to one. In particular, we predict the emergence of a Cronin peak in the nuclear modification factor for $1 - z \ll 1$ and moderate $x \sim 0.01$, and disappearance of this peak when further decreasing x, or increasing $1 - z$. We also predict a very strong z-dependence of the SIDIS cross-section near $z = 1$: a power in $1/(1 - z)$.

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