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Probing gluon saturation via hard inelastic diffraction at the Electron-Ion Collider

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We demonstrate that hard dijet production via inelastic diffraction is a promising channel for probing gluon saturation at the Electron-Ion Collider. Diffraction refers to a process in which there is a large rapidity gap between the produced jets and the nuclear target, while inelastic means that the two hard jets - a quark-antiquark pair generated by the decay of the virtual photon - are accompanied by a softer gluon jet, emitted by the quark or the antiquark.The recoil due to this gluon emission is responsible for transverse momentum imbalance between the 2 hard jets. This diffractive process can be described as the elastic scattering between an effective gluon-gluon dipole and the nucleus. The dominant contribution comes from the black disk limit, where the scattering is as strong as possible. Hence the dijet imbalance is of the order of the nuclear saturation momentum Q_s evaluated at the rapidity gap. Measuring the imbalance of the dijet distribution for various rapidity gaps, one can study gluon saturation in the nuclear target. Integrating out the dijet imbalance, we obtain a collinear factorization where the initial condition for the DGLAP evolution is set by gluon saturation.

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