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Inclusive and exclusive processes with a leading neutron in ep collisions

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The color dipole formalism is extended to the study of exclusive processes associated with a leading neutron in ep collisions at high energies. We discuss the leading neutron production in $e + p \to e + n + X$ collisions at high energies and estimate the related observables, which were measured at HERA and may be analysed in future electron-proton (ep) colliders. We show that the recently released H1 leading neutron spectra can be reproduced using the color dipole formalism and that these spectra could help us to observe more clearly gluon saturation effects in future ep colliders. Moreover, the exclusive ρ, Φ and J/Ψ production, as well as the Deeply Virtual Compton Scattering, are analysed assuming a diffractive interaction between the color dipole and the pion emitted by the incident proton. We compare our predictions with the HERA data on ρ production and estimate the magnitude of the absorption corrections. We show that the color dipole formalism is able to describe the current data. Finally, we present our estimate for the exclusive cross sections which can be studied at HERA and in future electron-proton colliders.

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