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Small-x asympototics of GPDs

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We study the small-x asymptotics of unpolarized generalized parton distributions (GPDs). Unlike the previous works in the literature, we consider the case of non-zero skewness. We show that the unpolarized GPDs at small x are related to the eikonal dipole amplitude N, whose small-x evolution is given by the BK/JIMWLK evolution equations. We show that the effect of non-zero skewness $\xi \neq 0$ is to modify the value of the evolution parameter (rapidity) in the argument for the dipole amplitude from $Y = \ln(1/x)$ to $Y = \ln \min\{1/x, 1/|\xi|\}$.

Further, we address the question of calculating the real part of the scattering amplitude at high energies, corresponding to the imaginary part of the dipole amplitude N. In phenomenology, this real part is often accounted for by a multiplicative R-factor, often used in elastic vector meson production calculations. We study the origin of the R-factor in the shock wave picture and find that the real part of the scattering amplitude originates from multiple t-channel gluon exchanges in the initial conditions for the small-x evolution. We show that such exchanges are the origin of the signature factor in the scattering amplitudes in the shock wave approach to high-energy scattering.

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