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Momentum transfer dependence of heavy quarkonium electroproduction

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We investigate the momentum transfer dependence of differential cross sections $d\sigma/dt$ in diffractive electroproduction of heavy quarkonia.

The calculations have been performed within the light-front QCD dipole formalism using realistic quarkonium wave functions determined from various potential models in the $Q\bar{Q}$ rest frame.

Model predictions for $d\sigma/dt$ including a proper correlation between the impact parameter $\vec{b}$ of a collision and color dipole orientation $\vec{r}$ are compared with available HERA data.

We analyze the impact of a realistic $\vec{b}$-$\vec{r}$ correlation on results for $d\sigma(t)/dt$ by comparing with conventional dipole models including only additional factorized b- dependent part and with recent calculations based on a popular Balitzky-Kovchegov model, where such a correlation is not incorporated accurately.

We have demonstrated that the effect of $\vec{b}$-$\vec{r}$ correlation is boosted in the production of radially excited charmonia due to the nodal structure of their radial wave functions.

Experimental investigation of the $\psi'(2S)$-to-$J/\psi(1S)$ ratio of t-dependent differential cross sections can shed more light on the onset of $\vec{b}$-$\vec{r}$ correlation within various dipole models, as well as on manifestation of saturation effects at small x.

Primary author: KRELINA, Michal (FNSPE Czech Technical University in Prague)

Co-author: NEMCHIK, Jan (FNFPE, Czech Technical University in Prague)

Presenter: KRELINA, Michal (FNSPE Czech Technical University in Prague)

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