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J//ψ-pair production at the LHC to study gluon TMD distributions

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J/ψ-pair production at the LHC is currently the most promising tool to probe the unknown gluon transverse momentum distributions. Data from LHCb at low transverse momenta was already available and recently more data has been released.

In this presentation, I will revise previous theoretical results by discussing predictions of transverse-momentum distributions at invariant J/ψ-pair masses that were recently measured including various pair rapidities. Moreover, I explain that we implemented a novel nonperturbative Sudakov factor in the transverse momentum evolution formalism that relies on a new method to separate perturbative and nonperturbative physics in the computations. This is due to the identification of certain issues with a simple Gaussian ansatz for the nonperturbative Sudakov factor. Because the uncertainty associated to this novel Sudakov factor is found to be small, we have incorporated the PDF error as the primary source of uncertainty in our updated predictions.

I will present and discuss the normalized cross section, the azimuthal modulations that arise from linearly polarised gluons in the proton and investigate the corresponding hard scale dependencies. We note that the EIC can expand our understanding of the gluon transverse momentum distributions in the future through the study of J/ψ color octet production (Phys.Rev.D 106 (2022) 1, 014030).

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