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Probing the glasma with heavy quark azimuthal correlations

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The Glasma is produced in the pre-equilibrium stage of high-energy heavy-ion collisions within the Color Glass Condensate framework. These strong, classical, out-of-equilibrium gluon fields significantly influence the dynamics of heavy quarks, which are created early in the collision. Our study shows that the azimuthal correlations of $c\bar{c}$ and $b\bar{b}$ pairs are strongly modified by the Glasma, with the magnitude of this effect being comparable to that observed in the Quark Gluon Plasma phase [1].

To investigate this, we solve numerically the Glasma classical Yang-Mills equations together with the collisionless Boltzmann-Vlasov transport equations for heavy quarks [2]. We simulate the evolution of $Q\overline{Q}$ pairs produced back-to-back in Glasma fields and extract their two-particle correlation function $\mathcal{C}(\Delta\phi, \Delta\eta)$. Focusing on the azimuthal $\mathcal{C}(\Delta\phi)$, we determine the correlation width $\sigma_{\Delta\phi}$ as a function of the initial quark transverse momentum p_T and the Glasma saturation scale Q_s. We find that for pairs with moderate p_T in a Glasma characterized by sufficiently large Q_s, a pronounced decorrelation develops already within the first $\tau = 0.3\,\mathrm{fm/c}$.

[1] D. Avramescu, V. Greco, T. Lappi, H. Mäntysaari, D. Müller - Phys. Rev. Lett. 134 (2025) 17, 172301 and Phys. Rev. D 111 (2025) 7, 074036
[2] D. Avramescu, V. Băran, V. Greco, A. Ipp, D. Müller, M. Ruggieri - Phys. Rev. D 107, 114021

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