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Quark / Antiquark Correlations in Heavy-Light Ion Collisions

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The correlation length associated with color-charge fluctuations, known as the inverse saturation momentum, plays a fundamental role in the initial conditions of heavy-ion collisions. With state-of-the-art hydrodynamic codes tailored for the finite-baryon-density physics of the Beam Energy Scan, it is interesting to study the analogous role of correlations between quarks and antiquarks. While recent work has studied the quantum statistical effects of Bose enhancement for gluons and Pauli blocking for quarks, we will present here new results on the quark / quark, quark / antiquark, and antiquark / antiquark correlation functions in asymmetric “heavy-light” ion collisions. The correlation function is dominated by qualitatively different mechanisms at different length scales, and quantum entanglement between two sets of quark / antiquark pairs leads to highly nontrivial correlations. The results of this work can be used to construct initial state models for heavy-ion collisions which incorporate nontrivial spatial fluctuations of quarks and antiquarks.

Content type

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