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Incomplete Thermalization and Two-Particle Correlations

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We propose a set of correlation and fluctuation observables that, taken together, could indicate the level of equilibration of the matter produced in relativistic nuclear collisions. Theoretical models of the expansion and cooling of QGP used to estimate properties like viscosity and the shear relaxation time generally assume that the QGP reaches local thermal equilibrium. However, it is not likely that experimental systems fully reach this equilibrated state. As a consequence, experimental estimates of QGP properties that rely on theoretical models might yield inaccurate results. We argue that multiplicity fluctuations, transverse momentum correlations, multiplicity-momentum correlations, and correlations of momentum fluctuations are all influenced differently by various physical mechanisms including particle production, viscous forces, initial state fluctuations, and temperature fluctuations. We use simulated proton-proton and nucleus-nucleus collision events to test the behaviors of these observables with respect to the number of particles created in these collisions and attempt to constrain an estimate of the level of equilibration of the matter created in high energy nuclear collisions.

Collaboration (if applicable)

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