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Emission angle and particle mass dependence of HBT Interferometry in Au+Au collisions at $\sqrt{s_{NN}} = 200$ GeV

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The initial density distribution in a heavy ion collision fluctuates due to the finite number of participating nucleons, which leads to higher harmonic flow as recently measured at RHIC and the LHC. Such spatial fluctuations may be preserved until kinetic freeze-out, depending on the strength of the initial fluctuations, the flow profile, the expansion time, and viscosity of the created matter.

Hanbury Brown and Twiss (HBT) interferometry is a powerful tool to study the space-time extent of a particle emitting source in heavy ion collisions. PHENIX has measured the azimuthal angle dependence of HBT radii with respect to the 2nd and 3rd-order event planes in Au+Au collisions at $\sqrt{s_{NN}} = 200$˜GeV.

The results for the 2nd-order dependence indicate that the initial eccentricity is reduced during the medium evolution, but not reversed in the final state, which is consistent with previous results. In contrast, the results for the 3rd-order dependence indicate that the initial triangular shape is signicantly reduced and potentially reversed by the end of the medium evolution, and that the 3rd-order oscillations are largely dominated by the dynamical effects from triangular flow. The measurement of the HBT radii from different particle correlations such as charged kaons over the wide m_T ranges give deeper insight on the emission source dynamics. We will report and discuss these new comprehensive HBT measurement in Au+Au collisions at $\sqrt{s_{NN}} = 200$˜GeV.

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