Beam-energy dependence of transverse momentum and flow correlations in STAR

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Extraction of the transport properties of the quark-gluon plasma (QGP) is a central objective of the heavy-ion program at the Relativistic Heavy-Ion Collider (RHIC). Measurements that are selectively sensitive to both initial-state effects and final-state viscous attenuation can provide invaluable constraints for temperature (T) and chemical potential (μ_B) dependence of the specific shear viscosity η/s. The transverse momentum correlator $G_2\left(\Delta\eta, \Delta\varphi\right)$ has been shown to be sensitive to η/s [1,2]. Correspondingly, the $\rho(v_2^2, \langle p_T \rangle)$ correlator, that measures the strength of the correlation between an event's mean-transverse momentum [$p_{\rm T}$] and its v_2 magnitude, indicates more sensitivity to the initial-state than to final-state effects [3,4]. A comprehensive set of $G_2\left(\Delta\eta, \Delta\varphi\right)$ and $\rho(v_2^2, \langle p_T \rangle)$ measurements for Au+Au collisions spanning the beam energy range $\sqrt{s_{\rm NN}}$ = 11.5-200 GeV, will be presented for several centralities and event shape selections. The results, which show characteristic beam-energy-dependent trends, are compared to similar LHC measurements and calculations from several theoretical models [2,4]. The data-model comparisons indicate that the measurements provide significant constraints for the respective influence of initial-state fluctuations, system-size, system-shape, and $\eta/s(\mu_B, T)$.

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