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

Niseem Magdy (For the STAR Collaboration)

Extraction of the transport properties of the quark-gluon plasma (QGP) is one of the central objectives 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 on temperature (T) and chemical potential (μ_B) dependence of the specific shear viscosity η/s. The transverse-momentum-flow correlations $\rho(v_n^2, \langle p_T \rangle)$, that measures the strength of the correlation between an event's mean-transverse momentum $\langle p_T \rangle$ and its flow magnitude v_n^2, is expected to be more sensitivity to the initial-state than to final-state effects [1,2]. A comprehensive set of $\rho(v_n^2, \langle p_T \rangle)$ measurements for Au+Au collisions spanning the beam energy range of $\sqrt{s_{\rm NN}}$ = 19.6-200 GeV, will be presented for several centralities and event shape selections. The results, which show characteristic beam-energy-dependent trends, are compared to results at the LHC and calculations from several theoretical models. The data-model comparisons indicate that the measurements provide significant constraints on the respective influences of initial-state fluctuations, system-size, system-shape, and $\eta/s(\mu_B, T)$.

[1] P. Bozek, Phys. Rev. C 93, 044908 (2016).
[2] N. Magdy, et al., Phys. Lett. B 821 (2021) 136625