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Investigations of the longitudinal broadening of two-particle transverse momentum correlations from STAR

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Two-particle transverse momentum correlator is a powerful technique for understanding the dynamics of relativistic heavy-ion collisions. Among these, the transverse momentum correlator $G_2\left(\Delta\eta, \Delta\varphi\right)$ is of particular interest for its potential sensitivity to the shear viscosity per entropy density η/s of the quark-gluon plasma formed in heavy-ion collisions~[1,2]. We used Au–Au at $\sqrt{s_{\mathrm{NN}}}$ = 200~GeV data to investigate: (i) the self-correlations associated with the definition of the collision centrality[3], (ii) the longitudinal broadening of the $G_2\left(\Delta\eta, \Delta\varphi\right)$ correlator, (iii) the long range azimuthal dependence of the $G_2\left(\Delta\eta, \Delta\varphi\right)$. We will present the centrality and event shape dependence of the longitudinal width $\sigma\left(\Delta\eta\right)$ and the azimuthal harmonics $a_n^{p_T}$ of the $G_2\left(\Delta\eta, \Delta\varphi\right)$ correlator. Our measurements are compared to similar LHC measurements as well as with calculations using the UrQMD, AMPT, and EPOS models~[4]. These comparisons are expected to reflect the efficacy of the $G_2\left(\Delta\eta, \Delta\varphi\right)$ correlator to differentiate among theoretical models as well as to constrain the η/s.

[1] S. Gavin and M. Abdel-Aziz, Phys. Rev. Lett. 97, 162302 (2006)
[2] V. Gonzalez, et al., Eur.Phys.J.C 81 (2021) 5, 465
[3] N. Magdy, et al., arXiv:2101.01555
[4] N. Magdy, et al., arXiv:2105.07912

Preferred track

Collectivity & Multiple Scattering

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