

# Azimuthal anisotropy measurement of $\phi$ mesons in Au+Au collisions at $\sqrt{s_{NN}} = 27$ and 54.4 GeV at STAR

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## Abstract

The hadronic interaction cross section for  $\phi$  mesons is expected to be small. Hence, the study of azimuthal anisotropy of  $\phi$  mesons allows one to access the collective properties of the medium at the early stage in heavy-ion collisions. The STAR experiment recently recorded high statistics data for Au+Au collisions at the new centre-of-mass energies ( $\sqrt{s_{NN}}$ ) of 54.4 GeV ( $\sim 600$  million events) and 27 GeV ( $\sim 350$  million events). The newly installed Event Plane Detectors (EPDs) allow one to measure the azimuthal anisotropy of particles with high precision and less non-flow contributions using event planes with large gaps in rapidity.

In this talk, we will present the second-order azimuthal anisotropy ( $v_2$ ) of  $\phi$  mesons measured at midrapidity ( $|y| < 1.0$ ) as a function of transverse momentum ( $p_T$ ) and centrality at  $\sqrt{s_{NN}} = 27$  and 54.4 GeV. Measurement will be carried out using event planes from both Time Projection Chamber ( $|\eta| < 1.0$ ) and EPDs ( $2.1 < |\eta| < 5.1$ ). A high precision test of the number of constituent quark scaling of  $\phi$  meson  $v_2$  (by including measurements for other hadrons) will be shown. The results will be compared to transport-based model calculations. Finally, the physics goals of such measurements at the other collision energies  $\sqrt{s_{NN}} = 19.6, 11.5, 9.2$  and 7.7 GeV of the RHIC beam energy scan phase II will be discussed.