

# Probing the QCD Phase Structure with Elliptic Flow in Au+Au Collisions at $\sqrt{s_{NN}} = 3.0\text{-}19.6$ GeV at RHIC

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1 In heavy-ion collisions, the elliptic flow ( $v_2$ ) represents the second harmonic coefficient  
2 in the Fourier expansion of the azimuthal distribution relative to the reaction plane. It  
3 serves as a sensitive indicator of the interaction strength among the system's constituents  
4 and offers a valuable means to explore its degrees of freedom.

5 In this poster, we will present  $v_2$  measurements for a variety of hadrons, including  $\pi^\pm$ ,  
6  $K^\pm$ ,  $p$ ,  $\bar{p}$ ,  $K_S^0$ ,  $\phi$ ,  $\Lambda$ ,  $\bar{\Lambda}$ ,  $\Xi^\pm$  and  $\Omega^\pm$  in Au + Au collisions, based on high-statistics datasets  
7 from the second phase of the RHIC Beam Energy Scan (BES-II) program measured by  
8 STAR. The scaling of  $v_2$  according to the Number of Constituent Quarks (NCQ) for both  
9 particles and antiparticles will be examined. In addition, the NCQ-scaled  $v_2$  ratios of  
10 particles such as  $\pi^+/K^+$ ,  $p/K^+$ ,  $\pi^-/K^-$ ,  $\bar{p}/K^-$ ,  $\phi/K^-$ ,  $\Lambda/K_S^0$  and  $\bar{\Lambda}/K_S^0$ , across the  
11 energy range  $\sqrt{s_{NN}} = 3.0\text{-}19.6$  GeV will be presented. The inferred information related  
12 to the QCD phase structure will be discussed.