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Radial Flow of Strange and Multi-strange Hadrons in Heavy-Ion Collisions at RHIC–STAR

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We present recent STAR measurements of the newly proposed radial flow fluctuation coefficient, $v_0(p_T)$, for strange and multi-strange hadrons in heavy-ion collisions at RHIC. The $v_0(p_T)$ of strange and multi-strange hadrons is of great interest because these particles are less affected by late-stage hadronic interactions, making them good probes of the early partonic stage. The analysis covers both the top RHIC energy and the Beam Energy Scan (BES) program, spanning $\sqrt{s_{NN}} = 11.5$–200 GeV.

As a measure of the isotropic component of collective expansion, $v_0(p_T)$ provides direct sensitivity to the strength and fluctuations of radial flow. We investigate its behavior in hadrons of different masses, such as Λ, $\bar{\Lambda}$, K^0_S, Ξ^-, $\bar{\Xi}^+$ and ϕ mesons. In addition, we explore the Number-of-Constituent-Quark (NCQ) scaling of $v_0(p_T)$ to examine whether the radial flow originates from partonic collectivity, as has been established for elliptic flow. The energy dependence of $v_0(p_T)$ is further examined to trace the evolution of collective expansion across the collision energies. The observed patterns, together with comparisons to transport and hydrodynamic model calculations, provide new insights into the development of radial flow and its event-by-event fluctuations across the QCD phase diagram.

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