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Transverse Dynamics of Hadrons Produced in Au-Au Relativistic Collisions

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The study of relativistic heavy-ion collisions serves as a valuable tool for investigating the structure of nuclear matter and its behaviour under extreme conditions. Over the past two decades, this domain of nuclear physics has led to several significant discoveries, including the quark-gluon plasma at RHIC, in 2005, the Higgs boson at CERN, in 2012, and exotic hadrons by the LHCb collaboration. In such collisions, a multitude of different types of particles are produced. By analysing their properties, such as energy and momentum, we can gain insight into the evolution of the system formed during the collision. An important phenomenon observed at kinetic freeze-out is the development of a transverse collective flow of matter. The characteristics of the flow are highlighted through the study of the average transverse momentum p_T obtained from the transverse momentum spectra of the particles. This work presents an analysis of p_T of identified strange hadrons (K^0_S, Λ, $\bar{\Lambda}$, Ξ^-, $\bar{\Xi}^+$, ϕ, Ω^-, $\bar{\Omega}^+$) and bulk hadrons obtained in Au-Au collisions at RHIC-BES energies ($\sqrt{s_{NN}} = 7.7$ GeV, 11.5 GeV, 19.6 GeV, 27 GeV and 39 GeV). Special emphasis is placed on the dependence of mean transverse momentum on particle species and event centrality at various incident energies. In order to enhance our interpretation of the experimental results, comparisons were made with model calculations using AMPT (A Multi-Phase Transport) simulations, taking into consideration two distinct scenarios: the string melting version and the default version, which does not include the quark-gluon plasma phase. These combined approaches will be presented and discussed in order to enhance our understanding of the properties of the system produced in relativistic heavy-ion collisions.

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