

Measurement of K^{*0} and $K^{*\pm}$ in Au+Au Collisions at RHIC BES-II

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Abstract

Isospin symmetry, one of the fundamental symmetries underlying the strong interaction, predicts similar production rates of charged and neutral kaons in high-energy collisions. However, recent measurements by the NA61/SHINE Collaboration indicate an excess production of charged over neutral kaons, suggesting significant isospin symmetry breaking that challenges the expectation, and the underlying origin of this effect remains unresolved [1]. Such deviations could arise from Landau-level splitting under intense magnetic fields, which can lift the degeneracy between hadrons containing up and down quarks [2]. The study of neutral and charged vector mesons in heavy-ion collisions may serve as a probe of possible isospin-symmetry-breaking mechanisms triggered by strong magnetic fields in QCD matter. A notable example is the $K^{*0}(d\bar{s})$ and $K^{*\pm}(u\bar{s})$ pair, which share the same isospin but have quarks with magnetic moments differing by nearly a factor of five.

In this presentation, we present precise measurements of the transverse momentum (p_T) spectra, p_T -integrated yields (dN/dy), and average transverse momentum ($\langle p_T \rangle$) of K^{*0} and $K^{*\pm}$ at mid-rapidity in Au+Au collisions at $\sqrt{s_{NN}} = 7.7 - 27$ GeV, using data from the STAR Beam Energy Scan II (BES-II) program at RHIC. Centrality- and p_T -dependent yield ratios, such as $K^{*\pm}/K^{*0}$ and $K^*/K^\pm$, will be used to assess medium effects and possible isospin-violating trends.

References

- [1] The NA61/SHINE Collaboration. Giacosa, F., Gorenstein, M. *et al.*, “Evidence of isospin-symmetry violation in high-energy collisions of atomic nuclei”, Nat Commun 16, 2849 (2025).
- [2] K. Xu *et al.*, “Extracting the magnitude of magnetic field at freeze-out in heavy-ion collisions”, Phys. Lett. B 809, 135706 (2020).