Charged-to-neutral kaon production as a probe of isospin dynamics in Ru+Ru, Zr+Zr, and O+O collisions at RHIC

Aswini Kumar Sahoo (for the STAR Collaboration)
Institute of Modern Physics, Chinese Academy of Sciences, Lanzhou, China

Abstract

High-energy nuclear collisions provide a unique environment to study isospin transport in strongly interacting QCD matter. While the strong interaction approximately conserves isospin, collisions involving nuclei with different neutron-to-proton (N/Z) ratios offer a direct way to investigate how the initial isospin of the system is reflected in final-state hadron production. Charged-to-neutral kaon ratio $[(K^+ + K^-)/2K_s^0]$ is particularly sensitive to these effects, and recently, the NA61/SHINE collaboration has reported an enhanced charged-to-neutral kaon ratio in central collisions beyond current theoretical expectations [1, 2].

We present the first precision measurements of charged ($K^{\pm}$) and neutral (K_s^0) kaon production in Ru+Ru, Zr+Zr, and O+O collisions at $\sqrt{s_{NN}} = 200$ GeV with the STAR experiment. The charged-to-neutral kaon ratio is measured as a function of transverse momentum and collision centrality. In addition, transverse momentum spectra and integrated yields of charged and neutral kaons will be presented. The results will be compared with state-of-the-art thermodynamic and transport models, and their implications for isospin dynamics and strange-hadron production will be discussed.

References

[1] H. Adhikary *et al.* (NA61/SHINE), Nature Commun. 16 (2025) 1, 2849.

[2] M. Gazdzicki *et al.*, arXiv.2604.16005.