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Two-Pion and Two-Kaon Femtoscopic Correlations in Au+Au Collisions at $\sqrt{s_{NN}}=14.6$ and 19.6 GeV from EPOS4

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Femtoscopic correlations of identical particles provide a powerful tool for probing the space-time structure and dynamical evolution of the particle-emitting source created in relativistic heavy-ion collisions. Measurements of femtoscopic radii constrain the characteristic homogeneity lengths of the expanding system and their dependence on collision geometry and particle momentum, thereby providing sensitivity to collective expansion and freeze-out dynamics. The intermediate collision-energy region is particularly important, as it bridges the high-energy, low-baryon-density regime and the baryon-rich matter produced at lower energies, offering an opportunity to study how the space-time evolution of the system changes with collision energy. Comparing different particle species, in particular pions and kaons, provides additional constraints because of their different masses, production mechanisms, and contributions from resonance decays.

We present a systematic femtoscopic study of identical charged pion and kaon pairs in Au+Au collisions at $\sqrt{s_{NN}} = 14.6$ and 19.6 GeV simulated with the EPOS4 model. Three-dimensional two-particle correlation functions are constructed in the Bertsch–Pratt decomposition of the relative momentum into the out, side, and long components. The femtoscopic parameters are extracted as functions of collision centrality and pair transverse momentum, k_T , for both pion and kaon pairs. The centrality and k_T dependences of the extracted R_{out} , R_{side} , and R_{long} radii are compared between pions and kaons and between the two collision energies. These results characterize the space-time structure and momentum dependence of particle emission predicted by EPOS4 in the intermediate-energy regime and provide a baseline for comparisons with experimental femtoscopic measurements.

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