



ID de Contribution: 18

Type: Non spécifié

Protons femtoscopy with 3D source in Au +Au collisions at $\sqrt{s_{NN}} = 2.4$ GeV

vendredi 8 novembre 2024 14:20 (25 minutes)

The availability of multidimensional and multivariate data on femtoscopic radii in heavy-ion collisions (HIC) is marginal at centre-of-mass energies of a few GeV. It impairs the development of theoretical models that describe the particle dynamics of HIC at those energies. The currently available femtoscopic radii were primarily extracted from the measurement of identically charged pions, which are limited in statistics at these energies. Proton-proton correlations are more promising at these low energies. The high nuclear stopping in the few-GeV collisions implies a high abundance of protons and extends the possibilities of investigating particle production mechanisms. Aside from primordial and decay protons, we can expect participants to contribute significantly to the final correlation function.

In this work, we introduce the measurements of proton-proton femtoscopic correlations for $\sqrt{s_{NN}} = 2.4$ GeV Au+Au collisions as measured by the HADES collaboration. We present the one-dimensional femtoscopic radii's dependence on transverse pair momentum and rapidity. Moreover, we introduce three-dimensional correlation functions with their dependence on the transverse momentum of a pair, pair rapidity, and pair azimuthal angle w.r.t. the event plane.

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