Contribution ID: **80** Type: **not specified**

Effects of collision dynamics on pϕ femtoscopy

Wednesday 15 January 2025 14:28 (18 minutes)

Femtoscopy in high-energy nuclear collisions is a novel phenomenological tool to study low-energy hadron interactions, and active studies in the past decade have demonstrated its usefulness [1]. Thus, hadron interaction study via femtoscopy is now advancing to unravel less understood interactions, such as baryon-vector meson interactions. However, since existing studies have assumed simple static Gaussian source functions, the influence of collision dynamics and kinematics has not yet been fully understood.

In this study, we utilized a state-of-the-art dynamical model, DCCI [2], to investigate the influence of collision dynamics and kinematics on the pϕ correlation function in high-multiplicity p+p collisions. Regarding pϕ femtoscopy, a recent study using a Gaussian source [3] indicated the possible existence of a bound state from the ALICE correlation data. We reanalyzed the correlation function using DCCI and found that the collision dynamics, such as collectivity and hadronic rescattering, leads to a non-Gaussian momentum-dependent source [4]. Consequently, the correlation function slightly differs from that obtained using a Gaussian source. This emphasizes the importance of considering collision dynamics and kinematics for future high-precision femtoscopic studies.

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Session Classification: Parallel A

Track Classification: 8. New theoretical developments