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Femtoscopy correlation functions and mass distributions from production experiments

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We discuss the relation between the Koonin-Pratt femtoscopic correlation function (CF) and invariant mass distributions from production experiments. We show that the equivalence is total for a zero source-size and that a Gaussian finite-size source provides a form-factor for the virtual production of the particles. Motivated by this remarkable relationship, we study an alternative method to the Koonin-Pratt formula, which connects the evaluation of the CF directly with the production mechanisms. The differences arise mostly from the T−matrix quadratic terms and increase with the source size. We study the case of the D0D+ *and* *D+D*0 correlation functions of interest to unravel the dynamics of the exotic Tcc(3875)+, and find that these differences become quite sizable already for 1 fm sources. We nevertheless conclude that the lack of coherence in high-multiplicity-event reactions and in the creation of the fire-ball source that emits the hadrons certainly make much more realistic the formalism based on the Koonin-Pratt equation. We finally derive an improved Lednicky-Lyuboshits (LL) approach, which implements a Lorentz ultraviolet regulator that corrects the pathological behavior of the LL CF in the punctual source-size limit.

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