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Correlation Analysis Tool using the Schrödinger equation

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Femtoscopy is a method used to investigate particle correlations by using the experimentally accessible two-particle momentum correlation function C_k. This function can be mathematically obtained by integrating the product of the source function and the two-particle wave function. The main goals of femtoscopy are to investigate the properties of the emission source and the interaction potential between particles.

Currently there is a lot of focus on investigating hyperon-nucleon interactions, e.g. by using experimental data collected by ALICE at LHC and by HADES at GSI. In order to interpret the results one should be capable of obtaining the theoretical C_k for a given source and interaction potential. Presently there are tools capable of performing those tasks, however most of them are not tuned to work with very small sources (below 1-1.5 fm) or are not flexible enough to be incorporated without significant modifications into any external analysis framework. This motivated the development of a C++ software tool called "Correlation Analysis Tool using the Schrödinger equation" (CATS) which relies entirely on numerical methods to evaluate the correlation function. The tool is designed to handle any short-range potential with or without the inclusion of the Coulomb interaction and/or quantum statistics. The wave function is computed by solving the Schrödinger equation fully numerically and thus obtaining an accurate solution for any source size. Furthermore CATS is capable of working with either an analytical or a data-defined source. This allows to extract the emission source from transport models.

The methods used by CATS and the first results obtained using this tool will be presented in this talk. There will be a detailed discussion of those results and how they relate to experimental data and other theoretical calculations of the correlation function, e.g. using the Correlation Afterburner (CRAB) or the Lednický model.

List of tracks

Femtoscopy in A+A, p+p , p+A and e+-e- collisions at relativistic, intermediate and low energies

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