



Contribution ID: 20 Contribution code: 1

Type: **not specified**

Going to the light-front with contour deformations

Wednesday, 6 July 2022 15:16 (7 minutes)

We present a novel method for the calculation of Light-Front Wavefunctions (LFWF) from the hadronic Bethe-Salpeter Wavefunctions.

This problem is of great importance, for example, in the study of hadrons —the particles composed of quarks and gluons described by Quantum Chromodynamics (QCD). The study of hadrons on the light-front allows for the calculation of several hadronic structure functions that encode, for example, the momentum and spin distributions of their constituents, like the parton distribution functions (PDFs) which describe the momentum distribution inside the hadron.

We propose a new method to calculate the valence LFWF for a system of two interacting particles based on the use of contour deformations in the solution of the Bethe-Salpeter equation, combined with analytic continuation methods for projecting of the obtained BSWF onto the light front.

We show that the contour deformation method is capable of handling the introduction of particles of different masses and complex conjugate mass poles in the propagators of the particles. Finally, we go through ways of calculating parton distributions from non-perturbative functional methods.

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Session Classification: Scientific session