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Hadronic Structure and Contour Deformations

The internal structure of hadrons can be described in terms of structure functions that encode, for example, the momentum and spin distributions of their constituents. Parton distribution functions (PDFs) and Transverse Momentum Distributions (TMDs), for example, describe the quark and gluon momentum distributions inside a hadron. These distribution functions are, however, not easy to calculate, because they are defined on the light front, whereas most hadron calculations are performed in a Euclidean metric. We are developing a new method to compute the parton distributions (TMDs and PDFs) from hadronic matrix elements using contour deformations. We will illustrate the method for a simple system of two interacting scalar particles of equal mass, using an handbag approximation to the matrix element, that includes the two-body Bethe-Salpeter amplitude as input (calculated from its Bethe-Salpeter Equation) and the four-scalar scattering amplitudes. We finally consider the application of our method to QCD, which includes mesonic Bethe-Salpeter amplitudes and quark four-point functions.

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