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Wave function of valence of the pion from QCD

In this work, we are studying the usual formalism of quantum field theory of quantum field theory in Light-Front formalism, with the goal of applying the properties of quantum chromodynamics (QCD) in the scheme nonperturbative.

The electromagnetic structure of the pion, which is a pseudoscalar meson composed of a quark-antiquark bound state with total spin zero, is our first object of study. Our proposal is to obtain a wave function from QCD, which describes the internal structure of the pion. So that can in particular calculate such as the electromagnetic form factor and mean square radius in energy low and intermediate.

In this case of the particle the wave function can be achieved using a model with constituent quark. In this model the quark mass range (running mass) according to the Dyson-Schwinger techniques. Specifically, we performed the calculations in the Light-Front formalism with a model for the constituent quarks bound state of the quark-antiquark pair.

The calculations will be compared with other models in the literature, which on the other hand, are different designs using different wave functions for the pion.

In the case of particles of spin-0 as the pion can obtain a wave function, separating it in terms of the Dirac's matrices. In a first approximation we consider the function wave without the Dirac's structure, and thus make the first estimate of how should be the behavior. The presence of poles in the Bethe-Salpeter amplitude caused us to resort to the Nakanishi representation. Due to the presence of the poles at the vertex of the Bethe-Salpeter amplitude, according to the proposal by reference hindered our attempt to use Nakanishi representation. For this reason we are analyzing the poles in the Bethe-Salpeter amplitude in the Light-Front formalism, which we integrate into terms of energy, via Cauchy's theorem, and thus obtain a wave function analytically.

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