

XVth Quark Confinement and the Hadron Spectrum



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Spatial imaging of the proton from a light-front Hamiltonian approach

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I will report the three-dimensional structure of the proton obtained from a recently constructed nonperturbative approach based on the light-front Hamiltonian formalism, named Basis Light-front Quantization (BLFQ). First, we obtain the light-front wave function of the proton through solving the eigenvalue problem of the light-front Hamiltonian of QCD in $|qqq\rangle + |qqqg\rangle + |qqqq\bar{q}\rangle$ Fock sectors. Next we calculate the generalized parton distribution functions (GPDs) of the proton in momentum space based on the overlap of the obtained light-front wave functions. Finally, by Fourier transforming the proton GPDs into the impact parameter space we obtain the spatial imaging of the proton in terms of its constituent quarks, gluons and anti-quarks. In this talk, I will present our numerical results on the three-dimensional distribution of the valence quarks, the gluon as well as the sea quarks inside the proton.

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