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Nonperturbative Renormalization Approach to Hamiltonian Light-Front Field Theory

In this talk I will report our recent progress on nonperturbative renormalization scheme in Hamiltonian light-front theory. Our study is based on Basis Light-front Quantization (BLFQ), a nonperturbative method in Hamiltonian formalism and with Fock-sector truncation. So far our study has been focusing on the physical electron system (in |e>+|egamma>) and the positronium system (in |e+e->+|e+e-gamma>). For the physical electron system we adopt the sector-dependent renormalization scheme together with wavefunction rescaling. I will show that the obtained observables such as the form factors and the parton distributions agree with those from perturbation theory. In the positronium system, we extend the sector-dependent renormalization scheme to a basis state-dependent scheme and evaluate the needed counterterms from a series of parallel single electron systems with truncation parameters matched to those in the positronium system. We will compare the resulting mass spectrum and the associated wavefunctions with those from an earlier calculation based on an effective interaction restricted to the leading Fock sector.

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