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Electron in Strong Time-Dependent Laser Field[1] XINGBO ZHAO, Iowa State University, ANTON ILDERTON, Umeå University, Sweden, PIETER MARIS, JAMES VARY, Iowa State University — The basis light front quantization (BLFQ) approach has recently been developed as a nonperturbative method for addressing forefront problems in QED and QCD [1,2]. This approach represents the quantum field in an optimal basis exploiting the symmetries of the underlying dynamics and is therefore numerically efficient. In the present work we extend BLFQ to the time-dependent regime. As an example we study the interaction of a single electron with a strong time-dependent laser background field, which necessitates a nonperturbative treatment. We study a process called "nonlinear Compton scattering," in which the electron is excited by the laser field and emits a photon. We present numerical results for the time-evolution of the average invariant mass of the one-electron-one-photon system and show explicitly the invariant mass distribution of the system at intermediate times and at pulse termination. Hopefully, these observables can be tested in experiments at planned strong laser facilities [3]. Finally we compare our results in the weak laser field limit with those obtained in perturbation theory.

[1] J. P. Vary, et al, Phys. Rev. C 81, 035205 (2010)
[2] X. Zhao, et al, LC2011 Proceedings, Few-Body Systems (accepted)
[3] T. Heinzl, A. Ilderton, Eur.Phys.J. D55 (2009) 359.

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