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Phenomenological Quantum Model for Ionization in Strong, Time Dependent, Electric Fields[1] T.C. RENSINK, T.M. ANTONSEN, JR., J.P. PALASTRO, University of Maryland, College Park — Laser pulse propagation simulations typically involve simplified ionization models where plasma generation is treated via rate laws following each ionization state. These models neglect the fact that the bound electronic response of the atom, ionization, and ionization damping are all part of one continuous process. In particular, the phase of an electron's dipole oscillation with respect to the electric field varies continuously from zero to pi depending on whether the electron is bound or free respectively. The rate law treatment neglects this transitional phase of the electron, treating the electron as either bound to its parent ion or free. For ultrashort laser pulses this transitional phase may play an important role in propagation. Here we present a phenomenological 3D quantum model of ionization. Based on the Schrodinger equation, this model uses a non-local binding potential in place of the Coulomb potential. By reducing the 3+1D Schrodinger equation into a set of 0+1D integral equations, the model promises to offer computational savings eventually leading to implementation in propagation simulations.

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