Abstract Submitted
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Density-based one-dimensional model potentials for strong-field simulations of simple atomic and molecular systems[1] ATTILA CZIRJÁK, SZILÁRD MAJOROSI, FERENC BOGÁR, GÁBOR PARAGI, MIHÁLY BENEDICT, University of Szeged — We present accurate strong-field simulation results based on novel one-dimensional (1D) atomic model potentials that we derive from the corrections proposed earlier using the reduced ground state density of a three-dimensional (3D) single-active-electron atom [Sz. Majorosi et.al., Phys. Rev. A, 98 (2018) 023401]. The correction involves a change of the asymptotics of the 1D model potentials while maintaining the correct ground state energy. We construct correct 1D models of the H and He atoms and of H_2^+ and H_2 using improved parameters of existing soft-core Coulomb potential forms [Sz. Majorosi et.al., Phys. Rev. A, (2020) accepted (arXiv:1907.13619)]. We test these 1D models by comparing the corresponding simulation results with their 3D counterparts in typical strong-field physics scenarios with near- and mid-infrared laser pulses, having peak intensities in the $10^{14} - 10^{15}\,\mathrm{W/cm^2}$ range, and we find an impressively increased accuracy in the dynamics of the most important atomic quantities on the time scale of the excitation. We also present the high-order harmonic spectra of H, He and Ne, computed using our 1D atomic model potentials. They show a very good match with the structure and phase obtained from the 3D simulations.

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