Two-electron mechanism of high harmonic generation in intense infrared field and attosecond pulse

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We propose a two-electron mechanism for the formation of a high-energy plateau in the spectrum of high harmonic generation (HHG) in an intense infrared (IR) field and an attosecond pulse. This mechanism is realized when an attosecond pulse excites a resonance between the valence and deeper shells of the atom and consists of tunneling of the valence electron in an IR field, the transition of a second electron from the deeper shell to the valence shell under the action of the attosecond pulse, and the propagation of the released electron in the continuum, followed by recombination into a vacancy in the deeper shell. We demonstrate this mechanism using a numerical solution of the time-dependent Kohn-Sham equations for the xenon atom. The contributions to HHG from the single-electron [1] and two-electron mechanisms are analyzed for different durations and carrier frequencies of the attosecond pulse. Conditions have been found for the dominance of the two-electron mechanism, leading to a significant increase in the yield of harmonics beyond the cutoff of the IR-induced plateau in the HHG spectrum [2].

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[1] Sarantseva T S, Frolov M V, Manakov N L, Silaev A A, Vvedenskii N V and Starace A F 2018 *Phys. Rev. A* **98** 063433

[2] Romanov A A, Silaev A A, Vvedenskii N V and Frolov M V 2024 *JETP Lett.* (accepted)