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Interference effects in one- and two-photon ionization by femtosecond VUV pulses[1] ELENA V. GRYZLOVA, EKATERINA I. STAROSELSKAYA, ALEXEI N. GRUM-GRZHIMAILO, Lomonosov Moscow State University, JOEL VENZKE, KLAUS BARTSCHAT, Drake University — Investigations of coherent control of atomic and molecular processes have rapidly developed since the advent of coherent light sources such as X-ray free electron lasers (XFELs) and achievements in high harmonic generation. In practice, radiation from XFELs contains a small fraction of the second harmonic, which is difficult to filter out but can strongly influence experimental data on the two-photon ionization process, such as the angular distribution. Specifically, the direct first-order second-harmonic ionization process may interfere with, and possibly even dominate a second-order two-photon process caused by the fundamental. While this interference has been investigated in the optical regime with many-cycle pulses, possible effects due to short pulses, as well as a physical intermediate resonance state that may serve as a stepping stone for the second-order process, need a careful study for particular experimental conditions. Here we consider the photoionization of atomic hydrogen for photon energies near the excitation energy of the 2p state (0.375 a.u. or 121.6 nm). We compare results obtained from a direct numerical solution of the time-dependent Schrödinger equation and second-order perturbation theory.

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Klaus Bartschat
Drake University

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