Title:	Widely tunable XUV harmonics using double IR pulses
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Abstract:	Tunable attosecond pulses are necessary for various attosecond resolved spectroscopic applications, which can potentially be obtained through the tuning of high harmonic generation. Here we show theoretically, using the time-dependent Schrödinger equation and strong field approximation, a continuously tunable spectral shift of high-order harmonics by exploiting the interaction of two delayed identical infrared (IR) pulses within the single-atom response. The tuning spans more than twice the driving frequency (~2ω) range, for several near-cutoff harmonics, with respect to only one control parameter: the change in delay between the two IR pulses. We show that two distinct mechanisms contribute to the spectral shift of the harmonic spectra. The dominant part of the spectral shift of the harmonics is due to the modulation of the central frequency of the composite IR-IR pulse with respect to delay. The second contribution comes from the non-adiabatic phase-shift of the recolliding electron wavepacket due to the change in amplitude of the subcycle electric field within the double pulse envelope. For optical few-cycle pulses this scheme can produce tunable attosecond pulse trains (APT), and in the single-cycle regime the same can be used for tuning isolated attosecond pulses (IAP). We quantify the dependence of tuning range and tuning rate on the laser pulse duration. We envision that the proposed scheme can be easily implemented with compact in-line setups for generating frequency tunable APT/IAP.
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