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Spectral Signatures of Resonantly Enhanced High Harmonic Generation and the Influence of Quantum[1] SETH CAMP, Louisiana State University, SAMUEL BEAULIEU, Universite de Boreaux, Institut National de la Recherche Scientifique, YANN MAIRESSE, Universite de Bordeaux, KENNETH SCHAFER, METTE GAARDE, Louisiana State University — Near the ionization threshold of argon, a new feature has been observed in the high harmonic generation (HHG) spectrum. This feature is due to emission occurring much later in time than the driven HHG response at the peak of the driving pulse, and is red-shifted relative to the main peak of harmonic 13. We present a theoretical framework for understanding this delayed emission process in terms of multiphoton resonances between the ground state and Stark shifted excited states, leading to resonantly enhanced HHG. We numerically solve the TDSE for an Ar atom in the single active electron approximation to calculate the HHG spectrum. By investigating the temporal properties of resonant harmonics as functions of the driving pulse duration and peak intensity, we find that the emission of such resonantly enhanced harmonics will temporally shift so that it occurs at a particular (constant) intensity. This can lead to late, red-shifted, harmonic emission, as well as early, blue-shifted, harmonic emission. We also find that the resonantly enhanced emission is delayed in time at the sub-cycle level relative to the non-resonant emission and we discuss the interplay between the pictures of semi-classical electron trajectories leading to HHG and multiphoton, resonantly excited states.

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Seth Camp
Louisiana State University

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