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Non-collinear XUV-IR four-wave-mixing to study the dynamics of dark states.[1] SERGIO YANEZ-PAGANS, NATHAN HARKEMA, ISLAM SHALABY, ARVINDER SANDHU, University of Arizona — Ultrafast electron dynamics associated with dark states, i.e., excited states that are not accessible through single-photon transitions, cannot be probed using traditional photo-absorption techniques. Characterization of the dynamical evolution of these states is possible through the use two-photon excitations; however, greater insights can be gained through noncollinear four-wave mixing (NFWM). By using tunable near-infrared (NIR) femtosecond pulses and extreme ultraviolet (XUV) attosecond pulse trains we invoke nonlinear parametric processes for investigations of dark state dynamics. The noncollinear configuration for wave-mixing provides versatility and has the advantage of yielding background-free signals. We use these studies investigate the lifetimes of autoionizing states in argon and oxygen.

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Sergio Yanez-Pagans
University of Arizona

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