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Strong Field Coherent Control of Atomic Population Transfer STEPHEN CLOW, UVO HOLSCHER, Stony Brook University, CARLOS TRALLERO, Stony Brook University & National Research Council, Canada, THOMAS WEINACHT, Stony Brook University, WEINACHT GROUP TEAM — There is significant interest in controlling atomic and molecular dynamics using shaped ultrafast laser pulses, an important aspect of which is selectively populating a particular target state with high efficiency. In order to achieve this beyond the limits of single photon excitation, one has to consider multiple interfering pathways and dynamic Stark shifts (DSS), which make resonance conditions time-dependent and substantially modify the phase advance of the bare states during the atom/molecule-field interaction. In this work, we demonstrate strong field atomic population transfer in a three level system via three-photon absorption from a single shaped ultrafast laser pulse. The optimal pulse shape for efficient population transfer is discovered using closed-loop learning control and interpreted via pulse shape parameter scans and numerical integration of the Schrödinger equation. We show a population inversion can be achieved and measured using a combination of spontaneous and stimulated emission. Our results illustrate the importance of dynamic Stark shifts in coherent multi-photon excitation and give rise to the possibility of lasing in the deep ultraviolet.

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