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Computational analysis of population transfer via STIRAP in sodium vapor MATT TILLEY, J. BRUCE JOHNSON, CHAKREE TANJAROON, SUSAN ALLEN, Arkansas State University — We present a theoretical and computational analysis of STIRAP and SEP population transfer in sodium vapor as measured by fluorescence emission imaged onto a spectrometer. Calculations include 1) a careful analysis of the fraction of measured fluorescence output over all spatial positions in the incident beams and due to experimental geometry, 2) calculations of an unexpectedly strong effect on the STIRAP transfer efficiency with beams detuned between the D1 and D2 Fraunhofer lines, 3) a study of the relative efficiency of STIRAP and SEP on resonance at the D1 and D2 transitions, 4) the effects of varying pulse parameters (such as spatial shape, energy, focus) on transfer efficiencies, and 5) explorations of population transfer in sodium as a function of the pump-Stokes energy landscape. The system states are calculated utilizing a Hamiltonian which includes fine and hyperfine structure (two nine-state and four five-state transitions) of the 3s, 3p and 5s levels in sodium. The findings are compared to experimental results obtained using a picosecond laser system with linewidth very near the transform-limit (±15%).

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