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Multiphoton adiabatic population transfer in Rydberg atoms: Classical versus Quantum picture TURKER TOPCU[1], FRANCIS ROBICHEAUX, Auburn University — Coherent population transfer in Rydberg atoms by multiphoton Adiabatic Rapid Passage (ARP) has recently been experimentally realized by Maeda *et al* [prl **96**, 073002 (2006)]. In this process, only one single multiphoton transition is required to coherently transfer population, as opposed to many concurrent single photon transitions. We present results of our classical and fully three dimensional quantum mechanical simulations for efficient multiphoton population transfer in a highly excited Li atom between several pairs of high n-manifolds via chirped microwave pulses. We were able to achieve as much as $\sim 70\%$ population transfer from 72p $\rightarrow$ 80p state through a single 8 photon transition. We also discuss the (n, l)-distribution of the transferred population, and compare the results from our quantum and classical simulations. We have found that population transfer through multiphoton transitions are classically suppressed compared to the quantum mechanical case and do not require chirping of the microwave pulse. We have also studied the classical phase space for this system in action-angle variables, and found that the physics behind the population transfer can be explained in terms of a hopping scheme over the islands of stability, by mixing into the chaotic sea.

[1]Current address: Kansas State University, Manhattan, KS, 66506-2601

Turker Topcu
Kansas State Univeristy

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