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**Optical pumping of multiple atoms in the single photon subspace of two-mode cavity QED** KA WA YIP, JAMES CLEMENS, Miami University — We consider $N$ four level atoms coupled to an orthogonally polarized, degenerate two-mode optical cavity. Starting with the atoms prepared in one of the degenerate ground states a single photon introduced into the driven cavity mode will be recycled to pump multiple atoms to the other ground state. For two atoms we analytically calculate the steady state using quantum trajectory equations and show that the system makes stochastic transitions between two different subspaces with the transition correlated with the emission of a polarized photon from one of the two modes of the cavity. In this way the long time evolution of the atomic state can be monitored by direct photodetection of the cavity decay passed through a polarizing beam splitter. We also investigate the dynamics of the approach to the steady state by numerical simulations carried out using the Quantum Toolbox in Python (QuTiP).

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