Abstract Submitted
for the DAMOP13 Meeting of
The American Physical Society

Phase diagram of Rydberg atoms in a nonequilibrium optical lattice[1] JING QIAN, GUANGJIONG DONG, LU ZHOU, WEIPING ZHANG, Quantum Institute for Light and Atoms, Department of Physics, East China Normal University, Shanghai, China, WEIPING ZHANG'S GROUP TEAM — We study the quantum nonequilibrium dynamics of ultra-cold three-level atoms trapped in an optical lattice, which are excited to their Rydberg states via a two-photon excitation with non-negligible spontaneous emission. Rich quantum phases, including the uniform phase, the antiferromagnetic phase, and the oscillatory phase are identified. We map out the phase diagram and find these phases can be controlled by adjusting the ratio of intensity of the pump light to the control light and that of two-photon detuning to the Rydberg interaction strength. When the two-photon detuning is blueshifted and the latter ratio is less than 1, bistability exists among the phases. Actually, this ratio controls the Rydberg-blockade and Rydberg-antiblockade effects, thus, the phase transition in this system can be considered as a possible approach to study both effects.

[1]This work was supported by 973 Program under Grants No. 2011CB921604, the NSFC under Grants No. 11104076, No. 11004057, No.11034002, No. 10974057, and No. 10874045, Specialized Research Fund for the Doctoral Program of Higher Education No. 20110076120004

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Date submitted: 28 Dec 2012 Electronic form version 1.4