

Abstract Submitted  
for the DAMOP17 Meeting of  
The American Physical Society

**Excitation dynamics in a lattice of Rydberg superatoms and steady-state bistability**<sup>1</sup> FABIAN LETSCHER, MICHAEL FLEISCHHAUER, Department of Physics and research center OPTIMAS, University of Kaiserslautern, Germany — Due to the strong and long-range interactions between Rydberg atoms, a mesoscopic atomic ensemble within a certain blockade volume suppresses more than one optical excitation. This so called superatom was realized in recent experiments. In the limit of strong dephasing during laser excitation, the superatom excitation probability reaches unity allowing for a much stronger driving strength beyond a two-level system. We study the many-body excitation dynamics of superatom lattices and observe interesting phases and phase transitions of open many body systems. In particular, we investigate the possibility of bistability in the steady state of the open many body system and explore signatures thereof. We clarify the role of long range correlations and a thermodynamic limit on the phase transition to a bistable regime. In a 2D lattice with nearest neighbor blockade, we observe an antiferromagnetically ordered phase with broken sublattice symmetry.

<sup>1</sup>DFG/SFB TRR 185

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Date submitted: 27 Jan 2017

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