

Abstract Submitted  
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**Photon mediated transport and crystallization in optically driven Rydberg gases** JOHANNES OTTERBACH, Harvard University, Cambridge, MA, USA, ACHIM LAUER, DOMINIK MUTH, MICHAEL FLEISCHHAUER, TU Kaiserslautern, Kaiserslautern, Germany — We show that excitations in a gas of atoms driven to Rydberg states by near-resonant laser radiation in a two-photon coupling scheme experience a photon mediated transport. Thus even if the center-of-mass motion of the atoms can be neglected, this results in a kinetic Hamiltonian for the Rydberg excitations. The corresponding mass is identical to that of the dark-state polaritons of the optical coupling scheme. The kinetic energy competes with the Rydberg dipole-dipole interactions and can prevent the formation of quasi-crystal structures. Using DMRG simulations we calculate the Luttinger parameter for a one-dimensional gas of resonantly driven Rydberg atoms taking into account the photon mediated transport and derive conditions under which quasi-crystallization can be observed.

Johannes Otterbach  
Harvard University, Cambridge, MA, USA

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