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Dynamical properties of Coupled Cavity Arrays and the Bose Hubbard Model HANS GERD EVERTZ, PETER PIPPAN, Technical University Graz, Austria, MARTIN HOHENADLER, OSRAM Opto Semiconductors — We study a system of cavity arrays coupled by photons. It can be described by a model based on the Jaynes-Cummings Hamiltonian. It resembles the Bose Hubbard model, which describes recent experiments on cold atoms in optical traps. Dynamical properties like the dynamical structure factor have recently been observed there using Bragg spectroscopy or lattice modulation. Employing an exact QMC algorithm, we calculate excitation spectra of both coupled cavities and the Bose Hubbard model. We examine the Mott insulator to superfluid phase transition and monitor single-particle excitations and polariton-density excitations. We study both the phase transition with fixed polariton density and the transition with fixed chemical potential. Finite tempererature and detuning effects are discussed. The excitation spectra of coupled cavities and the Bose Hubbard model turn out to closely resemble each other. Bose Hubbard physics can therefore be investigated in coupled cavities.

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