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Superfluid to Mott-Insulator Transition in Thermodynamic Limit of 1D Coupled Cavity Array ADAM G. D'SOUZA, BARRY C. SANDERS, DAVID L. FEDER, IQIS, University of Calgary — In recent years, there has been great interest in simulating condensed matter models with quantum optical systems, which are usually characterized by a high degree of experimental control. One such model is the Jaynes-Cummings-Hubbard (JCH) model, an analog for the Bose-Hubbard (BH) model, in which mobile photons interact with atoms localized within a regular lattice of weakly coupled cavities. Finite system Density Matrix Renormalization Group (DMRG) studies have predicted a superfluid (SF) to Mott insulator (MI) transition in the phase diagram of the JCH model, and finite-size scaling has been used to determine the phase boundary in the thermodynamic limit. In this work, we directly numerically investigate the JCH model in the thermodynamic limit using infinite-system DMRG. The preliminary results indicate that the properties of the expected SF state are not wholly consistent with those of a conventional superfluid.

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