

Abstract Submitted
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Polaritons and Pairing Phenomena in Bose-Hubbard Mixtures¹

A.O. SILVER, M.J. BHASEEN, M. HOHENADLER², B.D. SIMONS, University of Cambridge, Cavendish Laboratory — Motivated by recent experiments on cold atomic gases in ultra high finesse optical cavities, we consider the two-band Bose-Hubbard model coupled to quantum light. Photoexcitation promotes carriers between the bands and we study the interplay between Mott insulating behaviour and superfluidity. The model displays a $U(1) \times U(1)$ symmetry which supports the coexistence of Mott insulating and superfluid phases, and yields a rich phase diagram with multicritical points. This symmetry is shared by several other problems of current experimental interest, including two-component Bose gases in optical lattices, and the bosonic BEC-BCS crossover for atom-molecule mixtures induced by a Feshbach resonance. We corroborate our findings by numerical simulations. [M. J. Bhaseen, M. Hohenadler, A. O. Silver, and B. D. Simons, Phys. Rev. Lett. **102**, 135301 (2009)]

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²Present Address: OSRAM Opto Semiconductors GmbH, 93055 Regensburg, GER

Alex Silver
University of Cambridge, Cavendish Laboratory

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