Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Superfluid Insulator transition of two species ultracold bosons in an optical lattice K. SENGUPTA, Department of Physics, University of Toronto, 60 St. George Street, Toronto M5S1A7, ON, Canada, M-C CHA, Department of Physics, Hanyang University, Seoul, Korea, A. ISSACSON, NORDITA, Blegdamsvej 17, Copenhagen Ø, DK-2100, Denmark, S.M. GIRVIN[1], Yale University — We analyze the superfluid-insulator (SI) transition for a two-species, ultracold bosonic atoms confined in an optical lattice for odd filling at commensurate densities. We find that in contrast to the even-filling case, the SI transition, for most experimentally accessible parameter ranges, occurs either a) with complete depopulation of one species or b) with simultaneous onset of superfluidity for both species or c) with superfluidity of one species and Mott insulator of another species. The analysis consists of a analytical mean-field study of the SI transition using a variational wave function and numerical treatments which includes canonical transformation method and a quantum Monte Carlo study. The numerical studies allow us to study the effect of quantum fluctuations on the SI transition and point out the domain of applicability of the mean-field theory.

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Date submitted: 30 Nov 2004 Electronic form version 1.4