Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Bose/Anderson glass and re-entrant superfluidity in strongly correlated bosons in a disordered optical lattice TOMMASO ROSCILDE, IGNACIO CIRAC, Max-Planck-Institut fuer Quantenoptik - Germany — We investigate the one-dimensional Bose-Hubbard model in presence of a random bimodal on-site chemical potential, modeling strongly correlated bosons in an optical lattice in presence of a second species of bosons randomly frozen in the minima of the optical potential [U. Gavish and Y. Castin, Phys. Rev. Lett. 95, 020401 (2005)]. Making use of quantum Monte Carlo simulations, we investigate both the strongly and the weakly interacting regime. In the strongly interacting case, superfluidity is found to be robust against disorder, due to effective screening of the disorder potential. Close to commensurate filling disorder is seen to promote superfluidity vs. Mott insulating behavior, leading to re-entrant superfluid order. Moreover the presence of disorder introduces a disordered Anderson-glass phase for small interparticle repulsion and a Bose-glass phase for large repulsion, separated by the superfluid phase. Clear signature of these phases are observed on realistic sizes (~ 60 lattice sites) making the above scenario amenable to experimental realization.

Tommaso Roscilde
Max-Planck-Institut fuer Quantenoptik - Germany

Date submitted: 03 Dec 2005 Electronic form version 1.4