Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Superfluid - Insulator transition for bosons in disordered and quasi-periodic potentials THIERRY GIAMARCHI, DQMP, University of Geneva, CHIARA D'ERRICO, ELEONORA LUCIONI, LUCA TANZI, LORENZO GORI, LENS and Dipartimento di Fisica e Astronomia, Università di Firenze, GUILLAUME ROUX, LPTMS, Universite Paris-Sud, IAN P. MCCULLOCH, Centre for Engineered Quantum Systems, University of Queensland, MASSIMO INGUSCIO, GIOVANNI MODUGNO, LENS and Dipartimento di Fisica e Astronomia, Università di Firenze — On the theory side, one dimensional bosons in random [1] and quasiperiodic potentials [2] have been shown to undergo superfluid to insulator phase transitions, upon variation of the strength of the disorder or of the interactions. We discuss here such a transition in connection with the experiments in a system of $^{3}9$K atoms for which both the disorder (quasiperiodic potential) and the interactions can be experimentally varied in a controlled way [3]. We analyze three probes of the nature of the system, namely a measurement of the coherence, the transport and the excitation spectrum obtained by shaking of the lattice. The combination of these measurements shows evidence of an insulating regime extending from weak to strong interaction and surrounding a superfluid-like regime, in general agreement with the theory. [1] T. Giamarchi and H. J. Schulz, Phys. Rev B **37** 325 (1988). [2] G. Roux, T. Barthel, I. P. McCulloch, C. Kollath, U. Schollwöck and T. Giamarchi, Phys. Rev. A **78** 023628 (2008). [3] Chiara D'Errico, Eleonora Lucioni, Luca Tanzi, Lorenzo Gori, Guillaume Roux, Ian P. McCulloch, Thierry Giamarchi, Massimo Inguscio and Giovanni Modugno Phys. Rev. Lett. **113**, 095301 (2014).

Thierry Giamarchi
University of Geneva

Date submitted: 14 Nov 2014 Electronic form version 1.4