

Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Control of atomic currents using a quantum stirring device

MORITZ HILLER, MPI for Dynamics and Self-Organization, Goettingen, Germany and Department of Physics, University of Goettingen, Germany, TSAMPIKOS KOTTOS, Department of Physics, Wesleyan University, CT, USA and MPI for Dynamics and Self-Organization, Goettingen, Germany, DORON COHEN, Department of Physics, Ben-Gurion University, Beer-Sheva, Israel — We propose a BEC stirring device which can be regarded as the incorporation of a quantum pump into a closed circuit. It produces a DC circulating atomic current in response to a cyclic adiabatic change of the on-site potentials and the tunneling rates between adjacent sites of an optical trap. We show that the nature of the transport process depends crucially on the sign and on the strength of the interatomic interactions, ranging from a one-by-one transport of atoms (for strong repulsive interaction) to a regime where the particles are glued together and behave like a huge classical ball that rolls from site to site (for strong attractive interaction). We demonstrate the feasibility of this concept and point out that such device can be utilized in order to probe the interatomic interactions.

Moritz Hiller
MPI for Dynamics and Self-Organization, Goettingen, Germany and
Department of Physics, University of Goettingen, Germany

Date submitted: 02 Dec 2007

Electronic form version 1.4