Q 75 Kurzvorträge zum Symposium Mesoskopische Physik ultrakalter Atome (SYUA)

Zeit: Mittwoch 16:00–17:00 Raum: HU Audimax

Q 75.1 Mi 16:00 HU Audimax

Coherent control of mesoscopic tunneling — •C. Weiss and T. Jinasundera — Institut für Physik, Carl von Ossietzky Universität, 26111 Oldenburg, Germany

For a weakly interacting Bose-Einstein condensate in a double well, an appropriate time-dependent modulation of the trapping potential can effectively switch off the interaction among the particles. It is demonstrated numerically that this effect can be employed for transferring the condensate from one well to the other in a controlled way. Moreover it allows the production of non-classical Schrödinger cat-like states on short time scales.

Q 75.2 Mi 16:15 HU Audimax

Simple models of ordinary conductivity with cold atoms in optical lattices — •Andrey Kolovsky[1,2], Javier Madroñero[1], and Andreas Buchleitner[1] — [1]Max-Planck-Institut für Physik komplexer Systeme, Nöthnitzer Str. 38, D-01187 Dresden — [2]Kirensky Institute of Physics, Ru-660036 Krasnoyarsk

Ordinary (Ohm) conductivity results from the nontrivial interplay between the coherent dynamics of the carriers (manifest in Bloch oscillations) and relaxation processes (i.e., some interaction with the environment). We discuss two simple models for the conductivity of neutral atoms across optical lattices. In the first model, the effect of the environment is realized through (experimentally easily tunable) spontaneous emission. The second model studies the dynamics of spin-polarized (and, hence, non-interacting) Fermi atoms, upon admixure of a small fraction of bosonic atoms. The latter induces the collisional relaxation of the Bloch oscillations of the spin-polarized sample.

Q 75.3 Mi 16:30 HU Audimax

Density correlations in ultracold Fermi gases at the BEC-BCS transition — •Christian Schroll, Wolfgang Belzig, and Christoph Bruder — Universität Basel, Department fuer Physik, Klingelbergstr. 82, 4056 Basel, Schweiz

We use the method of full counting statistics, successfully applied in quantum optics and mesoscopic transport, to study the BEC-BCS crossover. This method allows us to investigate the density fluctuations as well as higher-order correlations. Based on the BCS-wavefunction ansatz for the crossover [1], we find a smooth transition from Poissonian statistics in the BEC regime to binomial statistics in the BCS regime. Finite temperature effects on the statistics are discussed.

[1] A. J. Leggett, in *Modern Trends in the Theory of Condensed Matter*, edited by A. Pedalski and J. Przystawa (Springer, Berlin, 1980).

Q 75.4 Mi 16:45 HU Audimax

Interacting ultracold atoms with disorder confined to one dimension — •M. Thorwart[1], V. Peano[1], C. Mora[1], A. De Martino[1], R. Egger[1], and R. Graham[2] — [1]Universität Düsseldorf — [2]Universität Duisburg-Essen

We investigate ultracold atom gases with strong interaction which are confined to one dimension. First, a novel nanoscale waveguide is proposed which is based on doubly-clamped suspended multiwall carbon nanotubes. A non-parabolic trapping potential for weak-field seeking atoms is formed. Various estimates on time scales for possible sources of imperfection show that decoherence for this setup is weak. In addition, we show that the non-parabolic confinement leads to novel confinement-induced resonances. Furthermore, we include weak disorder and study one-dimensional bosons with strong repulsive interactions. In analogy to the clean Tonks-Girardeau gas, a Bose-Fermi mapping expresses this problem in terms of disordered non-interacting fermions. Thereby many known exact results apply. We also analyze the so-far unknown bosonic momentum distribution, and comment on the experimental observability of these predictions in ultracold atomic gases.