Q 5 Stark korrelierte Systeme

Zeit: Montag 11:40–12:40 Raum: HII

Q 5.1 Mo 11:40 HII

Time-dependent phenomena in ultracold atoms confined by optical lattices — •Corinna Kollath — DPMC, University of Geneva, Quai Ernest-Ansermet 24, CH-1211 Geneva

The good tunability of the system parameters in the experimental realization of ultracold atoms in optical lattices opens the possibility to investigate time-dependent phenomena. We study the response of the ultracold atoms in the optical lattice to external time-dependent perturbations. We calculate the time-evolution of the perturbed system using the recently developed adaptive time-dependent DMRG (density-matrix renormalization group method).

Q 5.2 Mo 11:55 HII

Inducing frustration in optical lattices — •Juan Jose Garcia-Ripoll[1] and Jiannis Pachos[2] — [1]Max-Planck-Institut für Quantenoptik, Hans-Kopfermann-Str. 1, Garching b. München, Germany — [2]DAMTP, Center for Mathematical Sciences, Wilberforce Road, Cambridge, CB3 0WA, United Kingdom

In this work we consider a simple model of cold bosonic atoms trapped in 1D optical lattices, and design a setup to induce frustration by means of Raman-assisted tunneling. We have studied numerically and analytically the quantum phases of this system and found that, apart from the Mott-Insulator to superfluid transition, there appear additional phase transitions into gapped phases with localized atoms and short-range correlations, similar to a Bose-glass. We speak then of a breakdown of superfluidity due to the frustration.

Q 5.3 Mo 12:10 HII

Quantum Phases and Dynamics of Ultracold Atomic Gases in 1D Superlattices — •Markus Hild, Felix Schmitt, and Robert Roth — Institut fuer Kernphysik, Technische Universitaet Darmstadt

We discuss the properties of ultracold atomic gases in inhomogeneous 1D optical lattices in the theoretical framework of the Hubbard model. Static and dynamic properties are addressed via an exact numerical solution using a basis of Fock-states. The restriction of the many-body Hilbert space to the physically relevant states allows us to handle moderate system sizes and to access all important observables. We study the phase diagram of quantum gases in disordered- and superlattices to gain information on the characteristics of the various quantum phases, including the Mott-insulator- and the Bose-glass-phase. In particular, the dynamical response of the system in time-dependent lattice potentials provides signatures of the quantum phases which are directly accessible by experiment.

Q 5.4 Mo 12:25 HII

Wigner crystallization in dipolar gases — •H. Fehrmann[1], M. Baranov[2], and M. Lewenstein[3] — [1]Institut für Theoretische Physik, Universität Hannover, Appelstraße 2, 30167 Hannover, Germany — [2]Van der Waals-Zeeman Instituut, Universiteit van Amsterdam, Valckenierstraat 65-67,Netherlands — [3]ICFO, Av. del Canal Olimpic,08860 Castelldefels (Barcelona), Spain

We analyze the possibility to observe a Wigner crystal phase in a 2D rapidly rotating polarized dipolar fermionic gase in the lowest Landau level. We demonstrate that for small filling factors ($\nu < 1/7$) the Wigner crystal state with the triangular lattice has lower energy than the Laughlin state, and therefore, is the ground state of the system. To find the critical value ν_{cr}, at which the quantum phase transition from liquid to crystal takes place, we perform self-consistent numerical calculations of the Wigner crystal phonon spectra with the account of anharmonic effects. The value $\nu_{cr} = 0.154$ is found as the point below which these spectra become unstable.