SYUA 2 Optical Lattices

Zeit: Mittwoch 14:00–16:00 Raum: HU Audimax

Hauptvortrag SYUA 2.1 Mi 14:00 HU Audimax

BEC of 6Li2 molecules: Exploring the BEC-BCS crossover — •Johannes Hecker-Denschlag — Universität Innsbruck, Technikerstrasse 25, A-6020 Innsbruck, Austria

We report on recent experiments with an ultracold degenerate Fermi gas of 6Li atoms. We start with Bose-Einstein condensation of Li2 molecules in an optical trap. Using a Feshbach resonance we can then investigate the BEC-BCS crossover where the molecular condensate is transformed into a strongly interacting gas of fermions. We probe the crossover with several methods like measurements of the trapped cloud size, collective oscillation excitations and binding energy measurements with radio frequency. In these measurements we have been able to show the existence of a pairing gap on the BCS side of the resonance. This strongly suggests the presence of a superfluid phase on the BCS side of the crossover.

Hauptvortrag SYUA 2.2 Mi 14:30 HU Audimax

Nonlinear matter waves in periodic potentials: From Adiabaticity to Zener — •Oliver Morsch — Dipartimento di Fisica, via Buonarroti 2, I-56127 Pisa, Italy

Since the early days of laser cooling, optical lattices have been a versatile toolbox for atomic physics. These periodic one-, two- or three-dimensional structures allow the creation of light-bound atomic crystals which can be easily tailored and manipulated. The advent of Bose-Einstein condensates in 1995 led naturally to the extension of optical lattice studies to the regime of nonlinear coherent matter waves. In this seminar, I shall briefly review the efforts made in that direction and then report on experiments done in our laboratory in Pisa. After some general observations on the dynamics of loading a condensate into an optical lattice, I shall present studies of nonlinear effects in Landau-Zener tunneling and of dynamical instabilities of a nonlinear matter wave inside a periodic potential.

Hauptvortrag SYUA 2.3 Mi 15:00 HU Audimax

Ultracold atomic gases in optical lattices: A bridge between Quantum Optics and Condensed Matter Physics — •Luis Santos — Institut für Theoretische Physik III, Universität Stuttgart, Pfaffenwaldring 57 V, 70550 Stuttgart, Germany

During the last few years a new research field has rapidly developed, namely that of strongly-correlated atomic gases. This new field constitutes a fascinating bridge between quantum optics, atomic physics and condensed-matter physics. In this talk I will review our recent works on the physics of ultracold atomic gases in optical lattices. I will discuss in particular atomic mixtures in optical lattices, disordered lattices, and coupled 2D gases in 2D optical lattices.

Hauptvortrag SYUA 2.4 Mi 15:30 HU Audimax

Superfluid-insulator transition in a moving system of interacting bosons — •Eugene Demler — Lyman Laboratory, Department of Physics, Harvard University, MA 02138, USA

Stability of superfluid currents in a system of strongly interacting ultracold atoms in an optical lattice will be discussed. It will be shown that the system undergoes a dynamic, irreversible phase transition at a critical phase gradient that depends on the interaction strength between atoms. Smearing of the transition boundary in low dimensional systems by quantum fluctuations will be discussed. Implications of the results to realistic experiments will be reviewed.