SFB/TRR 21 - Colloquium

22. Oktober 2010, Ulm

Prof. Dr. Selim Jochim

(Universität Heidelberg)

Deterministic preparation and control of a few fermion system

Systems consisting of only few interacting fermions play a fundamental role in nature with atoms and atomic nuclei being the most prominent examples, While their internal degrees of freedom can be studied and manipulated with high precision, their properties cannot be tuned at wish. During the past decades, researches created tunable artificial microscopic quantum systems like atomic clusters or quantum dots, which constitute in most cases tunable systems, but it has remained challenging to make their coupling to the environment negligible. In our experiments with ultracold atoms we have recently been able to prepare and control few-atom quantum states consisting of 1-10 fermions. We prepare such a system using ultracold 6Lithium atoms in an optical dipole trap in which the interparticle interaction can be tuned over a wide range using a Feshbach resonance. By spilling all atoms occupying higher energy quantum states we can deterministically prepare samples from 1-10 particles in the ground state with fidelities exceeding 90%. In my talk I will present our first experiments controlling the interaction between two particles in the ground state of the trap.

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