



## Kolloquium

**Prof. Dr. Michael Fleischhauer**  
(Uni Kaiserslautern)

### **Light induced Abelian and non-Abelian gauge fields for ultracold atoms**

The adiabatic motion of ultra-cold, multi-level atoms in spatially varying laser fields creating a dark state can give rise to effective gauge potentials. We show that these potentials lead to effective magnetic fields if the light fields possess a relative orbital angular momentum. This allows to study quantum-Hall like effects in ultra-cold atomic gases in various geometries. If the atom-light interaction creates several degenerate adiabatic eigenstates, the associated gauge potentials are non-Abelian. A pair of such degenerate dark states emerges e.g. if laser fields couple three internal states of an atom to a fourth common one under pairwise two--photon-resonance conditions. For this so-called tripod scheme we derive general conditions for truly non-Abelian gauge potentials and discuss special examples. In particular we show that using orthogonal laser beams with orbital angular momentum an effective magnetic field can be generated that has a monopole component.

**Wann?** Freitag, 14.07.2006, 14:00 Uhr

**Wo?** Universität Ulm, Raum N24/252