

**Stephan Ritter**  
(MPQ Garching/ETH Zürich)

### **Cavity optomechanics with a Bose-Einstein condensate**

In our experiment we have coupled a Bose-Einstein condensate with an ultrahigh-finesse optical cavity. The tremendous degree of control over atomic gases achieved in Bose-Einstein condensates combined with the rich field of cavity quantum electrodynamics opens access to a wealth of new physics. In the dispersive regime, our system realizes a model of cavity optomechanics. This research field typically studies the coupling of the mechanical motion of one of the cavity mirrors to the light field. In our case, the mechanical oscillation is given by a coherent and periodic density modulation of the atomic cloud. We have observed this density modulation and very strong optical nonlinearities, present even at the single photon level. Furthermore our micromechanical oscillator naturally starts in its ground state, from which a single motional excitation can cause a shift of the cavity resonance on the order of the cavity linewidth. The system is promising to study the quantum regime of cavity optomechanics.



**23. Oktober 2009, 15:00 Uhr**

**Universität Stuttgart, NWZII, Raum 2.136  
Pfaffenwaldring 57, 70569 Stuttgart**