also an advantage as the developed methods are expected to be rather independent of the specific molecule chosen. The observed inteference patterns agree perfectly with calculations based on the known complex polarizabilities of these molecules. *This work is supported by the* FWF (SFB F1505).

### Evaporative cooling of cold atoms in a surface trap

M. Hammes, D. Rychtarik, R. Grimm
Institut für Experimentalphysik, Universität Innsbruck



Trapping cold atom close to a surface is a promising route for attaining a two-dimensional quantum gas. We present our *gravito-optical surface trap* (GOST) [1], which consists of a horizontal evanescent-wave atom mirror in combination with a blue-detuned hollow beam for transverse confinement. Optical pre-cooling based on inelastic reflections from the evanescent wave provides good starting conditions for subsequent evaporative cooling, which can be realized by ramping down the optical potentials of the trap. Already our preliminary experiments (performed at the MPI für Kernphysik in Heidelberg) show a 100-fold increase in phase-space density and temperature reduction to 300 nK. Substantial further improvements can be expected in our greatly improved set-up after the recent transfer of the experiment to Innsbruck. By eliminating heating processes, optimizing the evaporation ramp, polarizing the atoms and by using an additional far red-detuned laser beam we expect to soon reach the conditions of quantum degeneracy and/or two-dimensionality.

### Levitated atoms in a CO2 laser trap: towards BEC with cesium

J. Herbig, T. Weber, H.-C. Nägerl, R. Grimm
Institut für Experimentalphysik, Universität Innsbruck



Since the standard approach towards Bose-Einstein condensation has failed for cesium, we are exploring a novel concept employing an optical dipole trap formed by intense CO2 lasers. These provide a conservative and large-volume trapping potential. In order to compensate the gravitational force, a magnetic field gradient along the vertical axis is applied. This counterbalances gravitation for the absolute internal ground state of Cs (F=3, mF=3), effectively levitating those atoms. Other spin states are expelled from the trap, opening up a path for rf evaporation. Our approach to trap the lowest spin state at low densities minimizes inelastic processes. The free choice of a magnetic bias field allows exploration of Feshbach resonances to tune scattering properties.

### Resonator-enhanced optical dipole trap for fermionic lithium atoms