A 14: Ultra-Cold Atoms, Ions and BEC I (with Q)

Zeit: Dienstag 16:30–18:00 Raum: VMP 6 HS-C

Hauptvortrag A 14.1 Di 16:30 VMP 6 HS-C

Squeezing and enanglement in a Bose Einstein condensate — •Markus Oberthaler — Kirchhoff Institut für Physik, University of Heidelberg, Im Neuneheimer Feld 227, 69120 Heidelberg

Generation of spin squeezed states for matter waves is the first step pushing atom interferometry beyond the classical limit due to projection noise. We report on our recent experimental results obtained with a new very stable double well setup combined with high spatial resolution imaging which allows the generation and characterization of number squeezed atomic states. The direct observation of the conjugate variable – the relative phase – allows the experimental confirmation of a successfully generated spin squeezed atomic state. The results show that a many particle quantum state has been produced which can improve the precision of Ramsey type interferometer. Furthermore, with the observed squeezing a sufficient criterion for pairwise entanglement can be constructed confirming that for our experimental parameters pairwise entanglement between the atoms exist even at finite temperature. In the conclusion a short overview of the recent group activities will be given.

Fachvortrag A 14.2 Di 17:00 VMP 6 HS-C

Coherent collapse dynamics of dipolar Bose-Einstein condensates for different trap geometries — •Jonas Metz, Thierry Lahaye, Bernd Fröhlich, Ashok Mohapatra, Axel Griesmaier, and Tilman Pfau — 5. Physikalisches Institut, Universität Stuttgart

We present the collapse dynamics of dipolar chromium Bose-Einstein condensates in different harmonic trap geometries, from prolate, via almost spherical to oblate. The evolution of the condensates in the unstable regime are compared to three-dimensional simulations of the Gross-Pitaevskii equation including three-body losses. In order to probe the phase coherence of the collapsed condensates we interfere several copies and observe high fringe contrast.

A 14.3 Di 17:30 VMP 6 HS-C

A Trapped-Ion Phonon Laser — •S Knünz[1], V Batteiger[1], M Herrmann[1], T Udem[1], T W Hänsch[1], and K Vahala[2] — [1]MPQ, Hans Kopfermann-Strasse, 85748 Garching — [2]California Institute of Technology, Pasadena, CA 91125

Red-detuned laser pumping is a well known and powerful cooling technique. The opposite regime of blue-detuned pumping widely known as heating is investigated in this talk. A theoretical framework as well as experimental results on a single, laser-cooled Magnesium ion are presented. We show that this regime is stimulated emission of center-of-mass phonons instead, which can lead to coherent vibrational motion in analogy to a laser.

A 14.4 Di 17:45 VMP 6 HS-C

Atom-Dimer Scattering in Ultracold Gases — •Kerstin Helfrich and Hans-Werner Hammer — Helmholtz-Institut für Strahlen- und Kernphysik and Bethe Center for Theoretical Physics, Universität Bonn, 53115 Bonn, Germany

Three-body systems with large scattering length display so-called Efimov physics – universal phenomena associated with a discrete scaling symmetry. These phenomena include resonant enhancement of three-body loss rates when an Efimov resonance is at the scattering threshold. In particular, there can be resonant peaks in the atom-dimer relaxation rate for large positive scattering length.

We compute the atom-dimer relaxation rate as a function of temperature using calculations of the atom-dimer scattering phase shifts from effective field theory. A comparison to experimental data is shown.