SFB/TRR 21 - Seminar

9. December 2014, Stuttgart

Thomas Karg
(ETH Zürich)

Production and Optical Transport of an Ultracold Rubidium Gas

The combination of quantum gases and cavity quantum electrodynamics has lead to the observation of optomechanical phenomena and dynamical quantum phase transitions. In order to study a Bose-Einstein condensate coupled to optical cavities of variable geometry a highly flexible experimental system has been set up. It allows to interchange different cavity setups while maintaining ultra high vacuum. Ultracold atomic clouds of 87-Rubidium are produced by laser cooling and further evaporative cooling in a hybrid trap formed by a quadrupole magnetic field and an optical dipole potential. From the production chamber the atoms are transported into an optical cavity by means of a novel technique involving focus-tunable lenses. This compact scheme allows to control both the focus position and the waist of the dipole beam. By shifting the focus position at constant waist uniform trapping conditions over the full transport length are provided. Transport measurements have demonstrated efficiencies close to unity with heating in the range of a few micro Kelvin.

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Universität Stuttgart, NWZII, Raum 3.123
Pfaffenwaldring 57, 70569 Stuttgart

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