Seminar

Dr. Murray K. Olsen
(University of Queensland)

Homodyne measurements of an atom laser beam

We propose a method which allows for the indirect measurement of atomic quadratures via homodyne measurements on a light field. This work is based on a Raman output coupler for an atomic laser, but working in reverse.
Hope and Haine have previously shown how the Raman output coupling process can transfer the statistics of a light beam to an atomic laser output, resulting in squeezed and entangled atomic beams. However, the problem of measuring the quantum statistics of the atomic beam, which needs phase-sensitive techniques, was not covered. We show here that, given the appropriate experimental conditions, it is possible to transfer the atomic statistics back into a light field, for which homodyne measurements are a developed technique. This technique can also be used as a "quantum noise eater", which can shrink the noise of a chaotic atomic beam towards that of a coherent state. Since quadrature measurements of the electromagnetic field allow for the quantum statistics to be probed beyond what is possible in first and second-order interference experiments, we expect that the development of these techniques for atoms will allow for a fundamental leap in the investigation of the quantum nature of matter fields.

A.S. Bradley and M.K. Olsen
ARC COE for Quantum-Atom Optics, University of Queensland, Brisbane, Australia.

S.A. Haine and J.J. Hope
ARC COE for Quantum-Atom Optics, Australian National University, Canberra, Australia

Wann? Donnerstag, 11.05.2006, 11:00 Uhr

Wo? Universität Ulm, Raum 025/306