Bose-Einstein condensated atoms into a high finesse optical cavity.

Fact Sheet

Project Information

BECCAVITY

Grant agreement ID: 23612

Funded under
FP6-MOBILITY

Start date
1 January 2006

End date
31 December 2006

Overall budget
€ 0

EU contribution
€ 144 860

Coordinated by
SWISS FEDERAL INSTITUTE OF
TECHNOLOGY ZURICH

Switzerland

Objective

The proposed project will enter a novel physical regime which becomes accessible when a Bose-Einstein condensate (BEC) is placed inside a high finesse optical cavity. On the one hand, the BEC allows the creation of well controlled few atom samples and of mean field dominated many-body systems. On the other hand, high finesse cavities, which have been so far been used in the field of quantum electrodynamics (QED), offer the possibility of single atom detection and of atom-photon entanglement.

In a first experimental step it is planned to measure the arrival time statistics of atoms extracted from a BEC, thereby giving access to the intensity correlations of an atom laser. The next experimental challenge will be to bring the condensate into the optical cavity. A moving optical lattice, created by phase controlled counter propagating
lasers, will act as a conveyor belt for the atoms. The condensate will then be used as a zero temperature thermal bath to constantly cool one or few atoms in a different internal state. These can be manipulated with methods of QED. Entangled states between several atoms or atoms and photons can be engineered. Cavity QED in this regime is as yet unexplored and will give access to questions of decoherence, which is crucial for quantum information processing with neutral atoms. In particular, we plan to entangle internal states of two atoms, forming a non-classical state which is expected to be long lived in this environment.

The project stands at the border line of two quickly developing domains, dilute quantum gases and quantum information processing. These two domains recently show a convergence and training a researcher with such a dual experience is certainly of interest for the future.

Programme(s)

Topic(s)

Call for proposal

FP6-2004-MOBILITY-5

Funding Scheme

EIF - Marie Curie actions-Intra-European Fellowships

Coordinator

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