The Vienna Doctoral Programme on Complex Quantum Systems
invites you to a

Seminar Talk

by

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Quantum atom optics with spinor Bose-Einstein condensates

The creation of coherent particle pairs provides a basic method to generate highly nonclassical quantum states. In optics, photon pairs can be created by optical parametric down-conversion, allowing for a large variety of fascinating quantum optics experiments. In our experiments, we employ Bose-Einstein condensates (BECs) of ultracold Rubidium atoms with a spin degree of freedom. In these spinor BECs, pairs of atoms in the BEC collide and produce entangled atom pairs with two different internal states. This process is perfectly analogous to optical parametric down-conversion and thus offers the possibility to generate entangled many-body quantum states with neutral atoms.
More specifically, these spin-changing collisions allow for the creation of a many-particle state that is entangled in the sense of Einstein, Podolsky and Rosen (EPR). The correlations of the state can be efficiently probed with atomic homodyning. For the first time with massive particles, this method allows to show that the created correlations fulfill the continuous-variable EPR criterion. The homodyning results can be exploited to obtain a full Maximum-Likelihood reconstruction of the underlying quantum state. Finally, the created state is also useful for atom interferometry. We show that the state can be employed to surpass the Standard quantum limit in a prototypical atomic clock sequence.

Monday, 21 November 2016,
16:30h get-together with coffee and snacks!

Lise Meitner Hörsaal, Strudlhofgasse 4, 1st floor, Vienna

The seminar talk will be preceded by a CoQuS Student talk at 17:00h
by

Christian Knobloch
University of Vienna
Tailored gratings for matter-wave diffraction

Hosted by: Jörg Schmiedmayer