Q 52: Quantengase (Tunneln II)

Zeit: Donnerstag 12:00–13:00 Raum: 6J

Q 52.1 Do 12:00 6J

Collective and Quantum Dynamics in 0-π Josephson Junctions — •Oliver Crasser, Reinhold Walser, and Wolfgang P. Schleich — Institut für Quantenphysik, Universität Ulm, 89069 Ulm

A fluxon is the quantized magnetic flux in a single one-dimensional superconducting junction. By subdividing this junction into a 0 and a π domain, we obtain a 0-π junction. Now, semifluxons are localized phase jumps at the 0-π interface and are an intensively investigated subject of superconductivity [1,2].

In this presentation, we will examine an analogous system, implemented with cold bosonic quantum gases (BEC), using a double well potential as well as a phase dependent Rabi coupling, which leads to a four-mode model. We will shortly discuss the semi-classical equilibrium configuration which is doubly degenerated. Within the four-dimensional Fock space we study various quantum mechanical features such as macroscopic tunneling.

[1] W. Buckel and R. Kleiner, Superconductivity: Fundamentals and applications, Wiley-VCH, Berlin (2004)

[2] E. Goldobin et al., Phys. Rev. B 72, 054527 (2005)

Q 52.2 Do 12:15 6J

Coherently controlled entanglement generation in a binary Bose-Einstein condensate — •Christoph Weiss[1] and Niklas Teichmann[2] — [1]Groupe Atomes Froids, Laboratoire Kastler Brossel, Ecole Normale Superieure, 24 rue Lhomond, F-75231 Paris, Frankreich — [2]Institut für Physik, Carl von Ossietzky Universität, D-26111 Oldenburg

Considering a two-component Bose-Einstein condensate in a double-well potential, a method to generate a Bell state consisting of two spacially seperated condensates is suggested. For repulsive interactions, the required tunnelling control is achieved numerically by varying the amplitude of a sinusoidal potential difference between the wells. Both numerical and analytical calculations reveal the emergence of a highly entangled mesoscopic state.

Q 52.3 Do 12:30 6J

Quantum and thermal phase fluctuations of two Bose Einstein Condensates coupled through a tunneling barrier

— •Alexej Schelle[1], Andrey Kolovsky[1,2], Ming-Chiang Chung[1], and Andreas Buchleitner[1] — [1]Max-Planck-Institut für Physik komplexer Systeme, Nöthnitzer Strasse 38, 01187 Dresden, Germany — [2]L. V. Kirensky Institute of Physics, 660036 Krasnoyarsk, Russia

We study the coherence properties of two Josephson-coupled Bose Einstein Condensates loaded into the local minima of a double-well potential, at finite and at zero temperature. The quantum mechanical phase distributions are derived in the angular momentum representation of the two-mode Hamiltonian. Within our treatment we explain thermally and quantum mechanically induced decoherence effects recently observed in experiments [1]. In particluar, we analyse the behavior in the Fock, Josephson, and Rabi regime. [1] Oberthaler et al., cond-mat/0606281

Q 52.4 Do 12:45 6J

Many-body Landau-Zener tunnelling — Andrea Tomadin[1], Riccardo Mannella[1], and •Sandro Wimberger[2] — [1]Dipartimento di Fisica, Università degli Studi di Pisa, Largo Pontecorvo 3, I-56127 Pisa — [2]Dipartimento di Fisica, Politecnico di Torino, Corso Duca degli Abruzzi 24, I-10129 Torino

A perturbative treatment of the Landau-Zener decay out of the ground-state band of a Bose-Hubbard model is presented. The decay channels are derived from a full two-band model in the presence of an additional linear Stark force. The dynamics of the ground-state band can be switched from a regular to a chaotic regime. The choice of the dynamical regime strongly influences the nature of the many-body Landau-Zener decay, which is mediated by the atom-atom interaction and the Stark force simultaneously.