



Universität
Basel

Research Project

Quantum coherence, quantum statistics, and superconductivity in mesoscopic systems.

Third-party funded project

Project title Quantum coherence, quantum statistics, and superconductivity in mesoscopic systems.

Principal Investigator(s) [Bruder, Christoph](#) ;

Organisation / Research unit

Faculty of Science

Departement Physik

Departement Physik / Physik

Departement Physik / Theoretische Physik (Bruder)

Department

Project start 01.10.2009

Probable end 30.09.2011

Status Completed

A. Quantum coherence and statistics of mesoscopic systems

We want to generalize current theoretical models of quantum point contact (QPC) position detectors in nanomechanical systems by considering a scattering theory of the QPC where tunneling is no longer assumed to be small. We plan to investigate the possibility of generating entanglement between two nanomechanical oscillators by simultaneous measurement of the position of the two oscillators by a single tunnel junction. We will study the perspectives of a suspended nanomechanical device as a detector of frequency-dependent quantum noise. We will study the dynamics of ultra-cold atoms in optical superlattices and the entanglement in such multipartite systems. We will also investigate the single-atom staircase for double-well lattices containing a mixture of bosonic and fermionic atoms. We will study the weak measurement theory of solid-state qubits.

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B. Mesoscopic superconductivity

We will investigate the onset of the Josephson effect between two fermionic reservoirs (superconductors/superfluids) using a number-conserving theory. We will investigate current cross-correlations in a superconducting beam splitter if the superconductor is characterized by a non-trivial state.

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Keywords Condensed-matter theory, quantum coherence, noise and full counting statistics, correlations and entanglement in ultracold atomic systems, nanomechanics, mesoscopic superconductivity.

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Follow-up project of [5837 Quantum coherence, quantum statistics, and superconductivity in mesoscopic systems](#)

Add publication

Add documents

Specify cooperation partners

ID	Kreditinhaber	Kooperationspartner	Institution	Laufzeit - von	Laufzeit - bis
97224	Bruder, Christoph	Fazio, Rosario, Professor	Scuola Normale Superiore Pisa	01.10.2009	30.09.2011
170487	Bruder, Christoph	Averin, Dima, Professor	SUNY, Stony Brook	01.10.2006	30.11.2011
170490	Bruder, Christoph	Belzig, Wolfgang, Professor	University of Konstanz	01.10.2005	31.10.2013