

Energy Colloquium

Atomtronics: Computing With Neutral Atoms

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Skolkovo Innovation Center

Technopark, Building 3, Room 403



ABSTRACT:

State-of-the-art experiments with ultra-cold atoms offer a unique setting for quantum simulation of interacting many-body systems. The high degree of controllability, the novel detection possibilities and the extreme physical parameter regimes that can be reached in these ‘artificial solids’ provide a complementary set-up as compared with natural condensed-matter systems. We review recent advances in technology and discuss the progress in the implementation of structures and currents consisting of single atoms to a few million atoms, covering the cross over from microscopic to macroscopic matter. New forms of atomic transport, including materials with negative differential resistivity, driven by many-body correlation effects have already been realized in the laboratory. The current control by ‘external voltages’ is the basic ingredient of atomtronic transistors still to be implemented. This opens many frontiers for the design of new quantum matter and the use of atomtronics in scalable integrated quantum networks as future technological platforms of computing.

Non-Skoltech attendees should request access to the building in advance by sending their passport details to energy.colloquium@skoltech.ru

Colloquium schedule and information on how to get to the colloquium can be found at <http://www.skoltech.ru/en/energy-colloquium/>