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Basel

## Research Project

### Many-particle entanglement on atom chips

#### Third-party funded project

**Project title** Many-particle entanglement on atom chips

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**Organisation / Research unit**

Departement Physik / Experimentelle Nanophysik (Treutlein)

**Department**

**Project Website** <http://atom.physik.unibas.ch>

**Project start** 01.10.2013

**Probable end** 30.09.2016

**Status** Completed

Entanglement is one of the most fascinating and at the same time puzzling concepts of physics. Besides being of fundamental interest, it is at the heart of quantum technologies such as quantum information processing and quantum metrology, which are expected to have a strong impact on our future way of computing and measuring. While entanglement of two particles is a relatively well-studied concept, entanglement in many-body systems is much less understood. Many different classes of entangled states exist and it is important to investigate which classes offer advantages in performing a given technological task, such as a high-precision measurement. In this project, we use small atomic Bose-Einstein condensates on an atom chip – an exceptionally well-controlled quantum many-body system – to perform fundamental studies of many-particle entangled states and to explore their usefulness for quantum technology. Moreover, we will investigate the fundamental limits of phase coherence in atomic Bose-Einstein condensates and study the implications of these limits. The concepts and technologies investigated in this project are relevant for compact atomic clocks and atom interferometers measuring electromagnetic fields, gravity, and other fundamental quantities.

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**Follow-up project of** [375994 Entanglement on Atom Chips](#)

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