

## Superconducting Vortex Lattices for Ultracold Atoms

Fri, 2013-05-10 14:48 - [Mattia Giardini](#) [1] **Date:** 2013-02-14

### Author(s):

O. Romero-Isart, C. Navau, A. Sanchez, P. Zoller, J. I. Cirac

### Reference:

arXiv:1302.3504v1

### URL:

<http://arxiv.org/abs/1302.3504> [2]

The ability to trap and manipulate ultracold atoms in lattice structures has led to a remarkable experimental progress to build quantum simulators for Hubbard models. A prominent example is atoms in optical lattices where lasers are used to create lattices with spacing set by the laser wavelength as well as to control and measure the many-body states. In contrast, here we propose and analyze a nanoengineered vortex array in a thin-film type-II superconductor as a magnetic lattice for ultracold atoms. This proposal addresses several of the key questions in the development of atomic quantum simulators. By trapping atoms close to the surface, tools of nanofabrication and structuring of lattices on the scale of few tens of nanometers become available with a corresponding benefit in energy scales and temperature requirements. This can be combined with the possibility of magnetic single site addressing and manipulation together with a favorable scaling of superconducting surface induced decoherence.

- [12.10.+i Simulations of many-body interactions](#) [3]
- [41.95.+m Quantum magnetometry](#) [4]
- [AQUTE](#) [5]
- [Result](#) [6]
- [15.10.Ne Neutral atoms: electronic states](#) [7]
- [17.80.+h Hybrid systems](#) [8]
- [15.20.Mc Magnetic atom chips](#) [9]
- [16.20.-e Condensed Matter: Experimental system](#) [10]

**Source URL:** <http://qurope.eu/db/publications/superconducting-vortex-lattices-ultracold-atoms>

### Links:

[1] <http://qurope.eu/users/giardini>

[2] <http://arxiv.org/abs/1302.3504>

[3] <http://qurope.eu/category/qics/10-quantum-computation/12-simulations/1210i-simulations-many-body-interactions>

[4] <http://qurope.eu/category/qics/40-quantum-information-technologies/41-metrology/4195m-quantum-magnetometry>

[5] <http://qurope.eu/category/projects/ips/aqute>

[6] <http://qurope.eu/category/attribute/result>

[7] <http://qurope.eu/category/qics/10-quantum-computation/15-implementations-quantum-optics/1510ne-neutral-atoms-electron>

[8] <http://qurope.eu/category/qics/10-quantum-computation/17-other-implementations/1780h-hybrid-systems>

[9] <http://qurope.eu/category/qics/10-quantum-computation/15-implementations-quantum-optics/1520mc-magnetic-atom-chips>

[10] <http://qurope.eu/category/qics/10-quantum-computation/16-implementations-condensed-matter/1620%E2%80%93e-condensed-matter-exp>

