

## Atom chip group – Ben-Gurion University of the Negev

Group head: Ron Folman

Our group deals with the theoretical and experimental study of atom physics, many body physics, material science and quantum phenomena. We utilize ultra-cold atoms (BECs), cold atoms, hot atoms and even atoms within a solid lattice.

Our web site is [www.bgu.ac.il/atomchip](http://www.bgu.ac.il/atomchip), where one may find among other things a brief account of our experiments, copies of our student theses, a description of our latest news, a collection of our papers, a list of our visitors, and the group head CV.

We have recently received several awards including:

The MRS (International Material Research Society) graduate excellence award

The Zabey prize for an excellent MSc work (twice)

The Willis E. Lamb award (<http://www.lambmedal.org/2011/index.html>).

The Miller visiting professor award (Berkeley)

The rector prize for excellent PhD work.

A popular account of the atom chip and our vision is given in:

<http://www.azonano.com/article.aspx?ArticleID=2904>

See also an animated film about our work on quantum clocks and general relativity ([link](#)).

Our fundamental studies include interferometry, coherent control, atomic structure, light-matter, atom-surface interactions and atom-atom interactions. We are very much interested in noise and its relation to dephasing of quantum states, a topic related to the border between the quantum and the classical worlds. We are very much interested in foundations of quantum mechanics (QM) and the interplay between QM and general relativity. We collaborate with a number of groups around the world such as the Kruger group in Nottingham, the Budker group at Berkeley or the Schmidt-Kaler group in Mainz. We are a part of several international collaborations including a European collaboration aimed at realizing compact interferometers and a collaboration with Germany to realize hybrid quantum devices. Recently we initiated an international collaboration aimed at creating and trapping anti-hydrogen on an atom chip.

Aside from fundamental studies, we have numerous collaborations with the industry such as projects with the IAI and NATO concerning magnetic sensing, and a project to realize a compact cold atomic clock with AccuBeat. Another project was awarded to

us for constructing a miniature cold atom source. On the far reaching application of quantum computing we refer the interested reader to a book recently edited by RF:  
<http://www.springerlink.com/content/1570-0755/10/6/>

Finally, for the purposes of the atom chip, we have constructed at BGU a cutting edge fabrication facility (<http://in.bgu.ac.il/en/nano-fab/Pages/default.aspx>) which is now being used not only by numerous BGU researchers, but also by researchers in other universities in Israel and around the world, as well as by many Israeli industries. Our unique knowhow in chips for quantum optics has led groups around the world to request samples from us. For example, in 2008, a high quality chip made by us gave rise to the discovery of a new phenomenon in electron transport (this was published in Science). Atom chips were sent to Germany, England, Italy and the Netherlands.