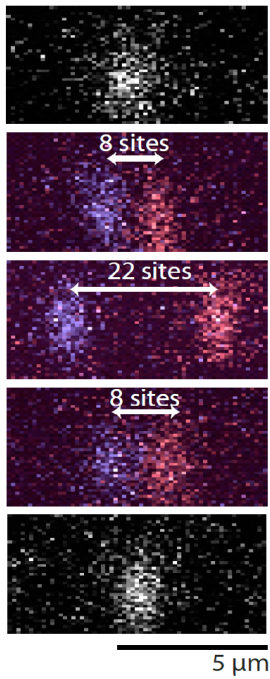


Dieter Meschede
 Universität Bonn

“Bottom up to discrete Quantum simulation with neutral atoms

Thursday, December 15th, 2011, 4:15 p.m.
Building C6 3, Lecture Hall II



The creation and application of controlled quantum systems is a challenging topic of current research in atomic and optical physics. Atomic many body quantum systems promise to provide experimental tools that can be used to realize so called quantum simulators or to implement processes in quantum information science.

Current methods based on systems of neutral atoms can be roughly divided into two classes: The top-down approach begins with a large ensemble of ultracold atoms, e.g. a Bose-Einstein condensate. In contrast, the bottom-up approach seeks to initially prepare individual atoms and construct many body systems step by step. Here, one of the most interesting topics is the creation, investigation and application of many body quantum correlations.

I will discuss the necessary tools for preparing, trapping, selectively addressing and transporting atoms, for storing and retrieving information from the atomic qubits. We will then discuss matter wave interferences at the single trapped atom level including a realization of the quantum analogue of Brownian motion, the quantum walk. Further topics include a microwave method for atom cooling and a dispersive method to read out the spin quantum states of individual atoms, and coherent control of the refractive index of a single atom. Finally, I will discuss the perspectives of realizing controlled atom-atom interactions in our experiments.

The image shows shows single atoms split by about 10 μm .

Giovanna Morigi (57472) and Marc Bienert (6590) take care of the guest

Interested people are cordially invited

Coffee at 4:00 p.m. in front of the Lecture Hall