IQ ST | INTEGRATED QUANTUM SCIENCE AND TECHNOLOGY

ulm university universität ulm | Universität Stuttgart | Max Planck Institute for Solid State Research

Invitation to IQST Seminar

on Wednesday, March 14, 2018, 2pm
University of Stuttgart, NWZII
Pfaffenwaldring 57
Room 3.123

Jan Mika Jacobsen
formerly at
Institut für Laser-Physik, Universität Hamburg

A Reconstruction Algorithm for Fluorescence Images of Lithium Atoms in a Triangular Optical Lattice

At the Lithium Microscope project a quantum gas microscope for small ensembles of ^{6}Li or ^{7}Li atoms in a 2d triangular optical lattice is currently being built up. The distance between neighboring lattice sites of 713 nm will be smaller than the Rayleigh resolution of the imaging system of approx. 820 nm. Coupled with the spatial uncertainty of the atoms in their potential wells as well as camera noise this will make the signals of individual atoms hard to discern.
Reconstruction of the underlying lattice occupation thus requires an algorithm making use of the point spread function of the imaging system and the fact that atoms can only occupy discrete locations in the lattice. For my master's thesis such an algorithm was written in Matlab and its performance was tested on simulated quantum gas microscope images of varying parameters, such as detected photons per atom, background light level and the magnification of the imaging system. A range of parameters were found in which the algorithm can reconstruct a lattice occupation with an acceptably low error rate.

(a) (b)

Figure 1: Example of a simulated quantum gas microscope image (a) and its reconstructed lattice occupation (b)

Host: Prof. Dr. Tilman Pfau, 5. Phys. Institut; University of Stuttgart