

Integration of Light and Atom Optics on an Atom Chip

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In the last few years a very simple and elegant technique to manipulate neutral atoms has rapidly developed. Various atom optical elements (e.g. trap, guides, beamsplitters) have been realized using magneto- and electrostatic potentials created by surface mounted microscopic wire structures, so called atom chip. These devices are produced by standard nanofabrication techniques. Very recently Bose-Einstein Condensation has been reached in these chip micro-traps. We are now working on a next step to make these atom chips become a universal toolbox for fundamental experiments in quantum optics as well as for possible applications like quantum information processing. We have recently started to investigate possibilities to integrate light onto atom chips for atomic state preparation, manipulation, and detection. One possible way to couple to the atoms are integrated micro cavities. Here we present our ongoing experiments, where we try to build a fibre cavity on a chip serving as a single atom detector. The concepts will be introduced, theoretical estimates for expectable signals will be presented and first setups will be shown. Beyond this we will discuss future perspectives of this technology.