Quantum Memory

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The upcoming quantum revolution relies on a successful implementation of a new network based on quantum mechanics. To realize such a network the information transmitted via single photons need to be stored in a coherent way. Hot rubidium vapor cells are capable of performing such a storage with high efficiency.

In this project the student will work together in a team with a PhD student and postdoc to optimize and characterize the storage efficiency of a novel and compact quantum memory based on rubidium vapor. The total efficiency not only depends on the quantum memory itself but also on the quantum optical properties of the photons stored. The first tests will be performed with attenuated coherent light sources and finally with true single photons emitted from a resonantly exited semiconductor quantum dot. If the quantum memory efficiency is sufficient the student will have the possibility to store for the first time a true single photon, a milestone for the realization of quantum networks.

This projects combines classical optics, atom and semiconductor physics, as well as quantum optics. The student will learn how to build and characterize complex optical setups working at the quantum mechanical fundamental limit of single photons as well as the theory behind the working principle of quantum memories based on atomic vapor cells. The project is at the cutting edge of science, demanding but extremely reward full; and in a good team no bar can be set too high.