Institute of Semiconductor and Solid State Physics
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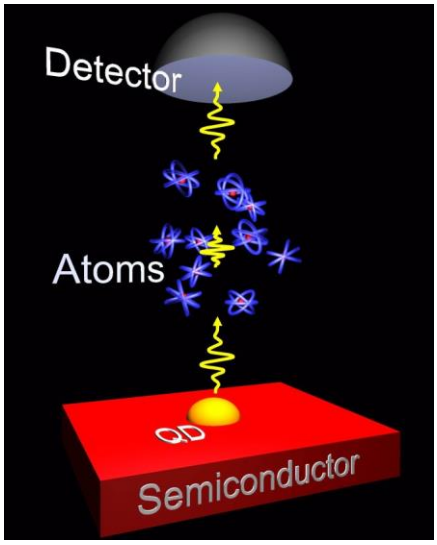
Bachelor thesis available at the Institute of Semiconductor and Solid State Physics on:

Connecting Artificial and Natural atoms

The development of quantum information communication and processing will bring about a revolution in the power, security and efficiency of information processing and transmission. Quantum cryptography systems where quantum information is transmitted at the level of single photons are now commercially available and the physical requirements for quantum computation are well understood [1]. However, in order to fabricate quantum computers and to boost the communication distance via quantum cryptography to large distances, new devices operating with yet untested topologies need to be developed. In this project, we aim at developing a new conceptual platform for quantum information and communication technologies by bridging two fields that have evolved in relative isolation: solid state [2] and atomic optics [3].



The bachelor thesis focuses on the fabrication and spectroscopic study of novel quantum dot devices, where external strain and electric fields [4] are used to engineer the emission properties of the quantum emitters in a way that they can be combined with rubidium or caesium atomic vapours, see the figure [5]. The student must prove a strong attitude towards experimental physics and show interest for technological work and optics.

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[1] D. Loss, and D. Di Vincenzo, Phys. Rev. A **57**, 120 (1998).
[2] C. L. Salter, *et al. Nature* **465**, 594-597 (2010).
[3] S. Ritter *et al.* Nature **484**, 195 (2012)
[4] R. Trotta *et al*. **101**, 111912 (2012); R. Trotta *et al*., *Adv. Mat.* **24**, 2668 (2012).
[5] N. Akopian *et al.*, Nature Photonics **5,** 230 (2011).