HFP INSTITUTE OF SEMICONDUCTOR AND SOLID STATE PHYSICS

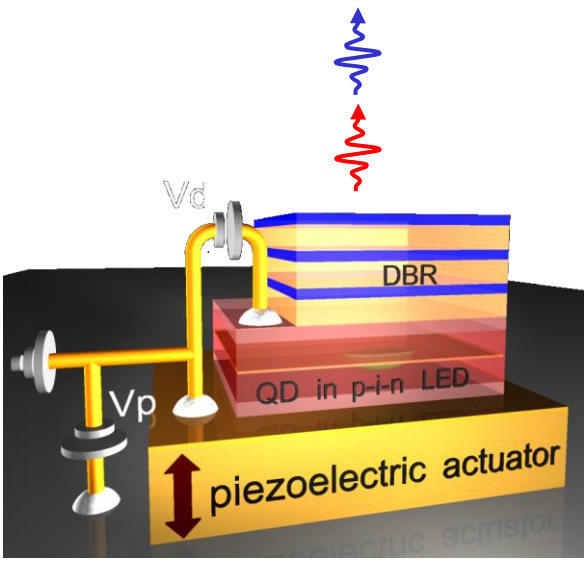
JKU JOHANNES KEPLER UNIVERSITÄT LINZ

At the Institute of Semiconductor and Solid State Physics of the Johannes Kepler University of Linz, Austria a **Bachelor thesis** is **available** on:

Entangled Photons from Semiconductor Quantum Dots

Semiconductor quantum dots (QDs) are nanostructures made of several thousand of atoms which can confine electrons and holes in all spatial directions. Coulomb and quantum interactions cause the motion of these charged carriers to be correlated, and the resulting electron-hole pairs (known as excitons) can recombine with the emission of single photons. QDs can confine even the more exotic *biexciton*, composed of two electrons and two holes. In 2000, it has been theoretically predicted that during the radiative decay biexciton-exciton-ground state, QDs can emit two polarization-entangled photons. This has led to an explosion of research interest, mainly motivated by the possibility to use these solid-state quantum emitters in quantum communication and information technology. However, after the first experimental demonstration in 2006, it became suddenly clear that only rare and "highly symmetric" QDs have this capability. The structural asymmetries occurring during growth complicate indeed their electronic structure, finally degrading the degree of entanglement.
Very recently, our group has demonstrated that a combination of external strain and electric fields to single QDs (in a device design sketched in the figure) can correct for the structural asymmetries that usually prevent QDs from emitting entangled photons, thus opening the way for the exploitation of QDs in real applications and in advanced quantum optics experiments.

Within this thesis the candidate will be involved in the characterization of such devices by means of optical spectroscopy techniques. The goal of the thesis will be to measure the degree of entanglement between the emitted photons. Therefore, we expect the candidate to have basic knowledge of semiconductor physics and optics, and strong attitude toward experimental work. The measurement will take place in our new laboratories, with state of the art equipment. We will provide on our side a highly motivated working atmosphere within a young team.



Please feel free contact us, or pass by in our office for further information.

Rinaldo Trotta rindaldo.trotta@jku.at
Johannes Wildmann johannes.wildmann@jku.at