JKU JOHANNES KEPLER UNIVERSITÄT LINZ TNF

http://ltstm.jku.at

INSTITUTE OF SEMICONDUCTOR AND SOLID STATE PHYSICS

Master Thesis 2015/16

"Radio-Frequency Pulses for Single Spin Spectroscopy with a Novel Scanning Tunneling Microscope"

The investigation of single spins in individual single atoms and molecules is crucial for many current fields of science and technology, since they determine chemical reaction pathways in catalysis, biology and medicine, mediate energy transfer in photosynthetic routes crucial for light harvesting, enable avian magnetoreception, control the transport and recombination of charge carriers in sensors and devices, act as sensitive local probes of molecular structure and for chemical identification, and play the central role in novel molecular (quantum) spintronics applications.

Recently, our group has pioneered a novel and worldwide unique spectroscopic technique denoted as radio-frequency (rf) scanning tunneling spectroscopy (rf-STS), which operates at 5 K and readily achievable magnetic fields of only a few milli-Tesla. Our technique combines STM with resonance concepts successfully applied in the field of magnetic resonance spectroscopy. After the successful demonstration of rf-STS on single molecular magnets [1], to date, still many open questions remain. They concern, for instance, the applicability of rf-STS to different classes of molecules, the underlying physical mechanism, its potential, broadness and scope of application, and many more.

The present thesis investigates the possibility of applying resonant rf pulses to achieve controlled switching of the z-component of individual electron and nuclear single spins.

[1] ... Phys. Rev. Lett. 113, 133001 (2014).

Contact:

Stefan Müllegger (room 215, 2nd floor, stefan.muellegger@jku.at)