PhD Position in experimental physics

"Radio-Frequency Scanning Tunneling Spectroscopy"

Start: As soon as possible. **Duration:** 3 Years. **Teaching duties:** None.

Topic: The successful candidate will perform radio-frequency (rf) scanning tunneling spectroscopy (STS) experiments at cryogenic temperatures (typically 5 K) on single functional molecules deposited in-situ by standard ultra-high vacuum (UHV) techniques onto single-crystal metal substrates. The frequency bandwidth is typically 100 MHz to several GHz. The goal is to investigate the effect of (i) nano-mechanical excitations and (ii) single-spin excitations in individual single functional molecules. This position requires an enthusiastic and talented experimental physicist. At the same time, the position offers plenty of room for the candidates scientific creativity.

Background: 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 magneto-reception, 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. To benefit from both, the high spatial resolution (~Å) of scanning tunneling microscopy (STM) and the exceptional energy resolution (< µeV) of magnetic resonance spectroscopy, my group has recently pioneered a novel and worldwide unique spectroscopic technique based on a radio frequency (rf) STM system at 5 K (for details see ltstm.jku.at). The method enables the detection and excitation of mechanical as well as spin degrees of freedom in individual single atoms and functional molecules adsorbed on a surface with sub-nanometer spatial resolution. Our recently successful showcases of rf-STM based spectroscopy include the concerted mechanical oscillations of single molecules in the 100 MHz regime as well as the resonant excitation of single nuclear and electronic spin transitions up to 4 GHz in individual molecular quantum dots. To date, still many experimental challenges remain, concerning both fundamental physics as well as technological aspects.

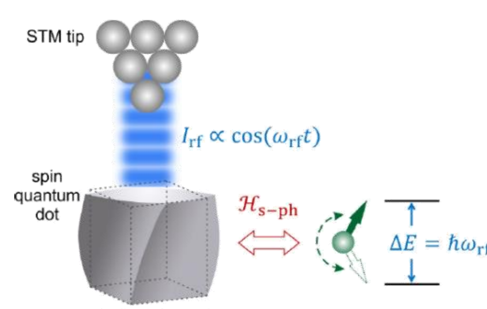
Contact: Assoz. Univ.Prof. Dr. Stefan Müllegger (*stefan.muellegger@jku.at*)
Department of Solid State Physics, JKU Linz, Halbleiterphysikgebäude, 2. Stock, Raum 215.

Funded by:

ERC Consolidator Grant, 771193, SARF:
Single-atom radio frequency fingerprinting

LIT Advanced Project: LIT-2016-1-ADV-002

LINZ INSTITUTE OF TECHNOLOGY



http://ltstm.jku.at