JOHANNES KEPLER UNIVERSITÄT LINZ

http://ltstm.jku.at

HFP | Institut für Halbleiter- und Festkörperphysik

PhD Position for 3 years

(in experimental physics, nano science) starting 2017

Radio-Frequency Scanning Tunneling Microscopy

Topic: After our successful demonstrations, to date, still many experimental challenges remain, concerning both fundamental physics as well as technological aspects. The PhD work addresses unsolved problems of microscopy and spectroscopy by **radio frequency scanning tunneling microscopy (rf-STM)**, including, in particular, the effect of nano-mechanical excitations at the tunnel junction, **single spin spectroscopy**, and intramolecular spin chemical probing. Due to the large manifold of unexplored challenges in the young field of rf-STM, this position offers plenty of room for creativity for the enthusiastic and talented experimentalist.

Background: The investigation **of single** electron and nuclear **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, we have recently pioneered a novel and **worldwide unique** spectroscopic technique based on a radio frequency (rf) STM system at 5 K. It 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. [see: Phys. Rev. Lett. **112**, 117201 and **113**, 133001]

Benefits: Monthly remuneration follows the guidelines of the Austrian Science Fund for PhD positions, see: http://www.fwf.ac.at/en/research-funding/personnel-costs/

Offer Requirements: Education level: Physics, Master Degree or equivalent. Languages: English (excellent). Skills/Qualifications: talented experimentalist, enthusiastic, pro-active, high-frequency engineering skills.

Contact: Prof. Stefan Müllegger (*stefan.muellegger@jku.at*)
Institute of Semiconductor and Solid State Physics,
Johannes Kepler University Linz, Altenberger Strasse 69, 4040 Linz, Austria.