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S E M I N A R
aus
Halbleiterphysik und Nanotechnologie

Di, 5.6.2018, 11:00 Uhr, Hörsaal für Physik

"Radio-frequency STM on molecular and atomic resonators"

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Modern nanoscience approaches the atomic scale: Individual atoms, rather than ensembles, carry the functionalities of man-made devices (switching, storing, calculating, catalyzing, etc). While single-atom imaging is routine since the advent of the scanning tunneling microscope (STM) in the '80s, their chemical identification is difficult. I develop a "6th sense" that turns the STM from an imaging- to an identification tool with atomic resolution. To benefit from, both, the high spatial resolution of low-temperature (LT) scanning tunneling microscopy (STM) and the exceptional energy resolution (< µeV) of magnetic resonance techniques, we have developed a spectroscopic radio frequency (rf) STM system. Our method enables the detection and excitation of mechanical [1,2], spin [3,4], and plasmonic [5] degrees of freedom on solid surfaces and adsorbates at cryogenic temperatures, maintaining sub-nanometer real-space resolution. After introducing the distinctive features of our experimental rf-LT-STM setup, I report on the resonant excitation of molecule-related eigenmodes of helicene derivatives adsorbed on Ag(111) observed at excitation frequencies between 1 and 40 GHz.

[1] S. Müllegger et al, Phys. Rev. Lett. 112, 117201 (2014). [2] S. Müllegger et al, Nanotechnology 25, 135705 (2014). [3] S. Müllegger et al, Phys. Rev. Lett. 113, 133001 (2014). [4] S. Müllegger et al, Phys. Rev B 92 (2015) 220418(R). [5] G. Serrano et al., Sci. Rep. 7, 9708 (2017).