

Plenary Talk (SKM) PV XXV Fri 9:15 HSZ 01
Probing the energetics and dynamics of individual atomic spins on surfaces — ●ANDREAS HEINRICH — IBM Almaden Research Center

The scanning tunneling microscope has been an extremely successful experimental tool because of its atomic scale spatial resolution. In recent years this has been combined with the use of low temperatures, culminating in microvolt energy resolution. However the time resolution of typical STM experiments is limited to about one millisecond for spectroscopy on a single atom. In this talk we will discuss the use of inelastic tunneling spectroscopy with low-temperature STM for the study of spins, a technique coined spin-excitation spectroscopy. With

this approach it is possible to measure the energy eigenstates of the quantum spin Hamiltonian that describes spins on surfaces with very high precision. We will briefly discuss its application to the measurement of the Zeeman energy and to magneto-crystalline anisotropy. We will focus on a new way of achieving fast time resolution based on an all-electrical pump probe spectroscopy. In this approach, a strong voltage pulse applied between tip and sample drives a spin out of thermal equilibrium (the pump pulse) [Nature Physics 6, 340 (2010)]. A short time later (typically a few nanoseconds) a smaller voltage pulse (the probe pulse) is applied which probes the state of the system. I will demonstrate this technique for the measurement of the spin relaxation time of individual magnetic atoms on a surface [Science 329, 1628 (2010)].