Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Measurement of Magnetic Anisotropy for Individual Atomic Spins on Surfaces CYRUS F. HIRJIBEHEDIN, IBM Almaden Research Center, ALEXANDER F. OTTE, IBM Almaden Research Center and Leiden University, MARKUS TERNES, IBM Almaden Research Center and EPF Lausanne, CHRISTOPHER P. LUTZ, ANDREAS J. HEINRICH, IBM Almaden Research Center — We measure the effects of magnetic anisotropy on individual magnetic atoms on a thin-insulating surface. Using the inelastic electron tunneling spectroscopy capabilities of a scanning tunneling microscope, we probe the spin excitation spectra of Mn and Fe atoms adsorbed on a single copper nitride layer. Magnetic anisotropy is directly manifested as finite-energy spin excitations that exist even in the absence of a magnetic field. The effects of anisotropy are found to be relatively weak for Mn atoms but are substantially larger for Fe atoms, in which spin-orbit coupling is prominent. When a magnetic field is applied to the Fe atoms, the spin excitations shift in a manner that is strongly dependent on the direction of the applied field. These shifts in energy can be understood both qualitatively and quantitatively with a Hamiltonian containing in-plane and out-of-plane magnetic anisotropies.

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Date submitted: 20 Nov 2006 Electronic form version 1.4