Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Atomic-scale antiferromagnets with stable Neel states ANDREAS HEINRICH, IBM Research — A macroscopic antiferromagnet is characterized by long-range magnetic order, for example with the spin of neighboring atoms alternating their direction. Here we will discuss how far such concepts can be extended towards the atomic scale. We use low-temperature scanning tunneling microscopy with spin-polarized tips to investigate antiferromagnets consisting of a small number of Fe atoms on a thin Cu2N substrate. As few as 8 Fe atoms show two stable magnetic states in which the spin between neighboring atoms alternates. The STM can be used to switch between these two magnetic states. When heating the spins to about 10K, spontaneous switching occurs from which the switching dynamics is deduced. Small structures show a second switching mechanism that is not dependent on temperature but strongly dependent on the length of the antiferromagnetic chain, suggesting switching by quantum tunneling of magnetization (the Neel vector).

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Date submitted: 09 Nov 2011 Electronic form version 1.4