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Nichtgleichgewichtsdynamik kondensierter Materie in der Zeitdomäne

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High Frequency Magnetization Dynamics of Individual Atomic-Scale Magnets

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Nucleation, annihilation and domain wall propagation are the most fundamental microscopic processes of magnetization reversal [1,2]. Understanding and controlling these mechanisms is crucial for the development of future high-speed spintronic applications. In previous time-resolved spin-polarized scanning tunneling microscopy (SP-STM) studies it was shown that the thermally activated magnetization reversal of Fe/W(110) nanomagnets consisting of less than 100 atoms is realized by nucleation and propagation instead of a coherent rotation of all magnetic moments [3].

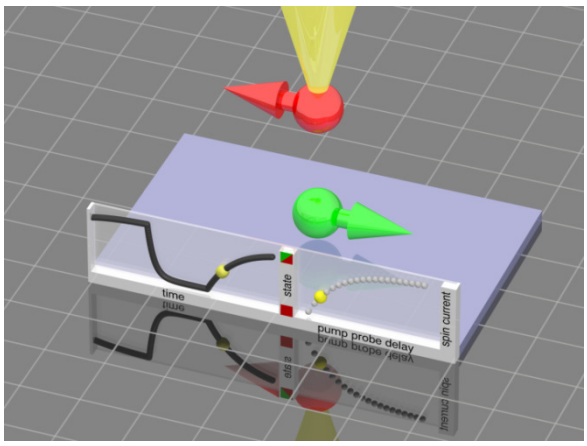

Abb.: Schematics of a pump-probe experiments on an atomic scale magnet using SP-STM.

Within the present study we use SP-STM to investigate the magnetic ground state dynamics of individual nanomagnets with uniaxial magnetic anisotropy over a very wide temperature (30 K..70 K) and switching rate (100 mHz..10 MHz) regime, combining telegraphic noise analysis and pump-probe schemes. With increasing temperature a transition between two Arrhenius regimes is observed, resulting in switching rates that are by orders of magnitude lower than expected from an extrapolation from the low temperature regime. The time-resolved SP-STM experiments will be presented and interpreted in terms of an analytical model that accounts for the complex interplay of temperature-dependent nucleation, annihilation and propagation rates [4].

[1] W. Wernsdorfer et al., Phys. Rev. Lett. 77, 1873 (1996). [2] S. S. Parkin et al., Science 320, 190 (2008). [3] S. Krause et al., Phys. Rev. Lett. 103, 127202 (2009). [4] S. Krause et al., Phys. Rev. B 93, 064407 (2016).

Für diese Zeit steht eine Kinderbetreuung nach vorheriger Anmeldung zur Verfügung.

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