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Magnetic Dipole-Dipole Sensing at the Atomic Scale

Monday 13 June 2016 16:15 (15 minutes)

High-resolution magnetometry is an essential tool used across the sciences. The recent development of electron spin resonance scanning tunnelling microscopy (ESR-STM) opens the door on a new type of magnetometry, one with the ability to coherently manipulate quantum spins with neV energy resolution and subnanometre spatial resolution [1]. In this talk I will show recent results obtained from ESR-STM experiments of Fe and Co atoms deposited on an MgO thin film. By characterizing the magnetic dipole-dipole interaction between atoms we are able to determine their magnetic moment to within 40 neV [2]. Combining this energy resolution with the STM's ability to manipulate atoms we then create and characterize the properties of magnetic nanostructures. Lastly, I will discuss the development of a pulsed ESR-STM scheme and it's relevance for future experiments in quantum computing and quantum simulation.

[1] S. Baumann, W. Paul, T. Choi, C.P. Lutz, A. Ardavan, and A.J. Heinrich, Science 350, 417 (2015)

[2] T. Choi et al., in preparation

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