Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Relaxometry imaging of superparamagnetic magnetite nanoparticles at ambient conditions AMIT FINKLER, DOMINIK SCHMID-LORCH, THOMAS HÄBERLE, 3. Physikalisches Institut, Universität Stuttgart, FRIEDEMANN REINHARD, Technische Universität München, ANDREA ZAPPE, 3. Physikalisches Institut, Universität Stuttgart, MICHAEL SLOTA, 1. Physikalisches Institut, Universität Stuttgart, LAPO BOGANI, Department of Materials, University of Oxford, JÖRG WRACHTRUP, 3. Physikalisches Institut, Universität Stuttgart — We present a novel technique to image superparamagnetic iron oxide nanoparticles via their fluctuating magnetic fields. The detection is based on the nitrogen-vacancy (NV) color center in diamond, which allows optically detected magnetic resonance (ODMR) measurements on its electron spin structure. In combination with an atomic-force-microscope, this atomic-sized color center maps ambient magnetic fields in a wide frequency range from DC up to several GHz [1], while retaining a high spatial resolution in the sub-nanometer range [2]. We demonstrate imaging of single 10 nm sized magnetite nanoparticles using this spin noise detection technique. By fitting simulations (Ornstein-Uhlenbeck process) to the data, we are able to infer additional information on such a particle and its dynamics, like the attempt frequency and the anisotropy constant [3]. This is of high interest to the proposed application of magnetite nanoparticles as an alternative MRI contrast agent or to the field of particle-aided tumor hyperthermia. [1] E. Schäfer-Nolte et al., Phys. Rev. Lett. **113**, 217204 (2014) [2] P. Maletinsky et al., Nat. Nanotech. **7**, 320 (2012) [3] D. Schmid-Lorch et al., Nano Lett. **15**, 4942 (2015)

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Date submitted: 14 Sep 2015 Electronic form version 1.4