

Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Two-dimensional nanoscale imaging of gadolinium spins via scanning probe relaxometry with a single spin in diamond MATTHEW PELLICCIONE, BRYAN MYERS, LAETITIA PASCAL, ANAND DAS, ANIA JAYICH, University of California, Santa Barbara — Spin-labeling of molecules with paramagnetic ions is an important approach for determining molecular structure, however current ensemble techniques lack the sensitivity to detect few isolated spins. In this talk, we demonstrate two-dimensional nanoscale imaging of paramagnetic gadolinium compounds using scanning relaxometry of a single nitrogen vacancy (NV) center in diamond. Gadopentetate dimeglumine attached to an atomic force microscope tip is controllably interacted with and detected by the NV center, by virtue of the fact that the NV exhibits fast relaxation in the fluctuating magnetic field generated by electron spin flips in the gadolinium. We demonstrate a reduction in the T_1 relaxation time of the NV center by over two orders of magnitude, probed with a spatial resolution of 20 nm, limited by thermal drift in ambient conditions. We discuss the importance of mitigating drift to reach truly nanoscale imaging and present progress towards cryogenic scanning magnetometry, along with utilizing chemically functionalized tips to gain greater control over the Gd distribution on the tip. Our result exhibits the viability of the technique for imaging individual spins attached to complex nanostructures or biomolecules, along with studying the magnetic dynamics of isolated spins.

Matthew Pelliccione
Univ of California - Santa Barbara

Date submitted: 13 Nov 2014

Electronic form version 1.4