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ENS CACHAN

LABORATOIRE DE PHOTONIQUE QUANTIQUE ET MOLECULAIRE

ENS Cachan - 61 avenue du Président Wilson 94230 Cachan

Séminaire interne

Lundi 16 Avril à 14h00

Salle 231 du bâtiment de l'institut d'Alembert

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Nanoscale magnetic imaging using single spins in diamond

Abstract:

The study of magnetism has led to numerous fundamental discoveries and technological advances over the last decades. Today, the exploration of novel magnetic phenomena and materials is partly hindered by the difficulty to detect weak magnetic fields with nanometer spatial resolution. Recently, the nitrogen-vacancy (NV) center in diamond has been identified as an efficient nanoscale magnetic field sensor, which could relax these limitations and enable magnetic imaging with a unique combination of high field sensitivity and spatial resolution [1,2].

In this talk, we will present our recent experimental progress in such NV-based nanoscale magnetic field imaging. In particular, we will describe our approach to scanning probe magnetometry, which consists of using an all-diamond AFM tip, containing a single NV-center, for magnetic field sensing [3]. Using this device, we imaged magnetic domains down to 25nm in size and demonstrated magnetic field sensitivities better than 50nT/sqrt(Hz). As an ultimate test for the performance of our apparatus, we applied our scanning-probe magnetometer to magnetically image the dipole field of a single electron spin. After a detailed presentation of these results, we will conclude by discussing some more generalized sensing-schemes based on scannable single quantum systems, such as single photon imaging or nanoscale magnetic resonance imaging.

[1] G. Balasubramanian et al., **Nature** 455, 648 (2008).
[2] J. Maze et al., **Nature** 455, 644 (2008).
[3] P. Maletinsky, et al., **Nature Nanotechnology** (in print) (arXiv:1108.4437v1).

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