

Spécialité de Master « Optique, Matière, Paris »

Stage de recherche (4 mois minimum, à partir de début mars)

Proposition de stage (ne pas dépasser 1 page)

Date de la proposition :

Responsable du stage / internship supervisor:		
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Code d'identification :	UMR 8551	Organisme : ENS
Site Internet / web site: http://www.lpa.ens.fr/spip.php?rubrique32		
Adresse / address: 24, rue Lhomond 75005 Paris		
Lieu du stage / internship place: ENS, nano-optics team		

Titre du stage / internship title: Spin mechanics with single atoms in levitating diamonds

Résumé / summary

Being able to prepare arbitrary motional quantum states of massive oscillators will be an important step forward for modern quantum science. Tremendous efforts are made towards this goal with experimental platforms ranging from clamped nanofabricated devices to levitating objects. One recently proposed way to engineer motional states consists in coupling atomic spins to the motion of macroscopic objects using magnetic fields.

The idea is to exploit the pointlike character of single atomic electrons and their magnetic sensitivity to detect and also to couple them to the motion of the oscillator. The resulting spin-dependent force on the object could for instance be used to cool the oscillator motion down, to generate motional cat states, or to entangle the spin with the mechanical oscillator. The platform can then be employed for sensing the mechanical zero-point fluctuations and for more fundamental tests of quantum mechanics.

Our group has recently been investigating the coupling between atomic spins in a diamond and the diamond motion when it is levitating. The levitation is done using a Paul trap and the coupling is mediated via homogeneous magnetic fields in the laboratory frame [1].

The objective of the internship will be to study an experimental system consisting of dense ensemble of NV centers in a levitating diamond and to displace the diamond using the spins.

[1] Delord *et al.* Physical Review Letters 121, 053602 (2018)

Toutes les rubriques ci-dessous doivent obligatoirement être remplies

Ce stage pourra-t-il se prolonger en thèse ? Possibility of a PhD ? : Yes

Si oui, financement de thèse envisagé/ financial support for the PhD: Yes

Lumière, Matière, Interactions

Yes

Lasers, Optique, Matière

Yes

Fiche à transmettre (fichier pdf **obligatoirement**) sur le site <http://stages.master-omp.fr>