



Felicitats a la nova graduada de doctorat de l'ICFO

La Dra. Natalia Domingues Alves s'ha graduat amb una tesi titulada 'Single-atom motional dynamics in an optical dipole trap'

June 16, 2023

Felicitem la Dra. Natalia Domingues Alves que avui ha defensat la seva tesi a l'auditori de l'ICFO.

La Dra. Domingues Alves va obtenir el seu master en Física Atòmica i Molecular per la Universitat Federal de Pernambuco, a Brasil. Es va unir a l'ICFO com a estudiant de doctorat al grup de recerca de Atomic Quantum Optics dirigit pel professor ICREA Dr. Morgan Mitchell. La tesi de la Dra. Domingues Alves titulada 'Single-atom motional dynamics in an optical dipole trap' ha estat supervisada pel professor ICREA Dr. Morgan Mitchell.

RESUMEN

This thesis studies, using simulation and experiment, the motional dynamics of a single atom in an optical dipole trap. The optical dipole trap we study is a single-beam, red-detuned, far-off-resonance trap (FORT). This FORT is located at the centre of an arrangement of four

high-NA lenses in the "Maltese cross" geometry, which facilitates measurements based on atomic fluorescence.

We make a detailed study, combining simulation with experimental measurements, of the temperature of the atom in this system. We note reasons why a single-temperature description could fail to describe the motional statistics of the atom in the trap.

We then study the sensitivity of an established method, the release-and-recapture, to a possible anisotropic temperature distribution of the atom.

We also measure the optical extinction produced by the atom, from which we extract a lower bound on the strength of interaction.

Finally, we show with simulation results and experiments, how parametric excitation of the atom in the FORT can be used to manipulate its phase-space distribution, which can lead to an effective decrease or increase of the atom's kinetic energy.

Comissio de Tesi:

Prof. Dr. Hugues de Riedmatten, ICFO

Prof. Dr. Axel Kuhn, University of Oxford

Dr. Raul Celistrino Teixeira, Universidade Federal de Sao Carlos