INTERNSHIP PROPOSAL

(One page maximum)

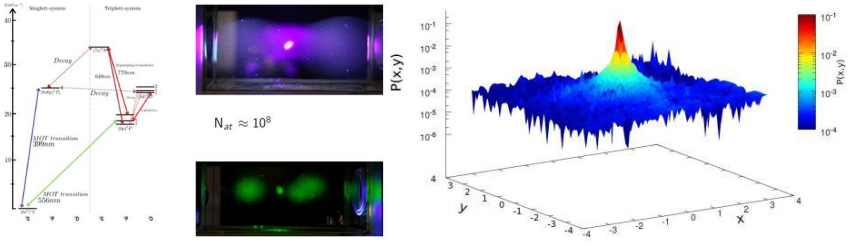
Laboratory name: INPHYNI
CNRS identification code: UMR 7010
Internship director'surname: Kaiser
e-mail: robin.kaiser@univ-cotedazur.fr Phone number: 04.89.15.27.69
Web page: https://inphyni.univ-cotedazur.eu/sites/cold-atoms
Internship location:Nice

Thesis possibility after internship: YES
Funding: YES If YES, which type of funding: ERC/ANR

Anderson localization of light in three dimensions with cold atoms

After the prediction by Anderson of a disorder-induced conductor to insulator transition for electrons, light has been proposed as ideal non interacting waves to explore coherent transport properties in the absence of interactions. Previous studies on Anderson localization of light using semiconductor powders or dielectric particles have shown that intrinsic material properties, such as absorption or inelastic scattering of light, need to be taken into account in the interpretation of experimental signatures of Anderson localization. Laser-cooled clouds of atoms avoid the problems of samples used so far to study Anderson localization of light. Ab initio theoretical models have shown that a high spatial density of the scattering sample might allow to observe Anderson localization of photons in three dimensions. An alternative proposal suggests to use additional diagonal disorder, which can be realised via a speckle field. In this project, we propose to study experimentally these routes towards Anderson localization of light in three dimensions.

In the framework of the ERC project Andlica, we have started a new experiment using cold Ytterbium atoms, whose specific level structure and linewidths are particularly well suited for the study of Anderson localization of light in three dimensions. At present, all the necessary equipment is in place and we have realized a magneto-optical trap (MOT) on both the 1S0-1P1 line (at 399nm) as well as on the intercombination line 1S0-3P1 (at 566nm). The next steps include implementation of novel protocols to implement in-site excitation of atom in the center of the cloud.



Techniques/methods in use: Lasers, atomic vapor cells, spatial light modulators
Applicant skills: Experiments in optics and laser physics, basic knowledge of atomic physics

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics: YES Soft Matter and Biological Physics: NO
Quantum Physics: YES Theoretical Physics: NO