INTERNSHIP PROPOSAL

Laboratory name: Laboratoire de Physique des Lasers (LPL)
CNRS identification code: UMR7538
Internship director'surname: Perrin
e-mail: aurelien.perrin@univ-paris13.fr Phone number: 0149403203
Web page: https://bec.lpl.univ-paris13.fr/
Internship location: Laboratoire de Physique des Lasers,
99 av. J.B. Clément, 93430 Villetaneuse

Thesis possibility after internship: YES
Funding: YES - type of funding: PEPR Technologies Quantiques

Manipulation of quantum gases with oscillating magnetic fields

Oscillating magnetic fields are a formidable tool for coupling different spin states of atoms endowed with magnetic moment. At resonance, for example, they enable Rabi oscillations between two different Zeeman sublevels. Close to resonance, the strong coupling also makes it possible to obtain adiabatic potentials of various shapes, such as double wells. At even higher amplitudes and off-resonance frequencies, the AC Zeeman shift is significant and can strongly affect the trapping potential of the atoms.
The BEC group at LPL has developed an experiment in which degenerate gases of sodium atoms are trapped in the static magnetic field induced by micro-wires, at the top of an atom chip, in a highly elongated confinement. The chip includes a microwave waveguide and additional wires that can produce radio-frequency magnetic fields with arbitrary polarization. The aim of the internship is to extend the capacity of the radiofrequency and microwave source to enable better control of the atom's spin state and trapping potential.

The internship may be followed by a PhD thesis focusing on the study of one-dimensional Bose gases. These systems emerge in very elongated trapping potentials when two of the three degrees of freedom of a quantum system are frozen.

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

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