



We advertise the opening of three PhD positions funded by a University doctoral contract at the Laser Physics Institute (Paris Nord University), in the field of ultra-cold atoms. These PhD positions are to start in September 2021. Related internships can start from March 2021 on.

Cold atoms for giant Casimir-Polder effect

We propose a hybrid experiment with cold atoms passing through a home-made 100 nm period nanogratings. Such a situation is unprecedented and opens advance studies on Casimir-Polder atom surface interactions below 50 nm. Fundamental theoretical physics can be confronted with experiment as e.g. random quantum walk or a novel 5th force constraint. A material compact interferometer (laser free) is envisaged.

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<http://www-lpl.univ-paris13.fr/UK/EQUIPE-OIA-PAGE-01.awp>

Quantum magnetism of large-spin fermions

We propose to study the magnetic properties of ultra-cold strontium atoms trapped in periodic potentials made of a 3D optical lattice. Compared to $s=1/2$ electrons, strontium atoms possess an enlarged spin degrees of freedom, due to its nuclear spin $F=9/2$. This allows to explore quantum many-body physics and quantum magnetism in a completely new situation, where, for example, the magnetic phases at low temperature are expected to crucially depend on an interplay between the number of spin states and the lattice topology.

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Fast rotating 2D superfluids

We propose to investigate the physics of fast rotating two-dimensional superfluids. In particular the PhD student will study the stability of a supersonic flow, recently obtained in the group [1], by implementing a non destructive in-situ imaging technique and recording the density profile evolution in the presence of a perturbation. A complex nonlinear dynamics is expected, involving for example shock waves formation. He/she will acquire a state of the art know-how on atom cooling, trapping, manipulation with radio-frequency fields and data analysis.

[1] Y. Guo, et al., PRL 124 (2020) 025301

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