



## Postdoctoral position available on Instabilities in Magneto-Optical Traps

Published on Monday July 1, 2019

View online : <https://www.france-science.org/Postdoctoral-position-available-on,10165.html>

### Mission

The aim of this project is to study the spatio-temporal instabilities observed in a dense magneto-optical trap. From the theoretical point of view, the mechanisms leading to these instabilities are well known: absorption of the beam light and multiple scattering. In 1D, the equations describing this system are the Vlasov-Fokker-Planck equations: they are highly nonlinear and are difficult to solve. From the experimental point of view, the instabilities can be observed and analyzed with a high-speed video camera (up to 10 000 frames/s).

The first analyses show some global deformations of the cloud, together with some local instabilities that affect only a fraction of the cloud. In order to understand well the origin of these instabilities and the underlying mechanisms, it is essential to characterize all the existing dynamics, possibly in 3D. Note also that these studies could take into account the results from other fields of physics, as astrophysics or plasma physics, where similar dynamics are observed.

### Activities

- Adjustment of the existing cold atom experiment to reach conditions where instabilities are easily observed
- Optimization of the acquisition system and analyses of spatio-temporal instabilities.
- Analysis and interpretation of the results.
- Comparison with theory

### Skills

- Solid knowledge in laser cooling physics
- Good experience in laser cooling experiments
- Knowledge in signal and image processing
- Excellent team work and demonstration of independent thinking
- Experience in nonlinear dynamics would be an asset.

### Work Context

This activity takes place at the Laboratoire PhLAM (Physique des Lasers, Atomes et Molécules, UMR 8523 CNRS/Université de Lille), in Villeneuve d'Ascq, within the Cols Atoms team, in the « Instability » group. The postdoctoral fellow will work with 2 CNRS searchers and a PhD. The project is supported by the CEMPI labex and the Photonics 4 Society CPER.

Expected date of employment : 1 September 2019

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