

## Master 2: *International Centre for Fundamental Physics*

### INTERNSHIP PROPOSAL

Laboratory name: Laboratoire Aimé Cotton  
CNRS identification code: FRE 2038  
Internship director's surname: Daniel Comparat  
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Internship location: Laboratoire Aimé Cotton, bât 221, Campus d'ORSAY, 91405 Orsay Cedex

Thesis possibility after internship:      YES  
Funding: NO

#### **Electron Electric Dipole Moment using Cs in cryogenic matrix**

Electric Dipole Moments (EDMs) of electrons, neutrons or nuclei are sensitive probes for new physics beyond the Standard Model of particle physics. In the present project (EDMMA: Electric Dipole Moment with atoms and molecules in Matrix), we propose to measure the electron EDM using embedded particles in a cryogenic solid matrix of rare gas or hydrogen. Matrices offer unprecedented sample sizes while maintaining many characteristics of an atomic physics experiment, such as manipulation by lasers. An EDM experiment on atoms and molecules in inert gas matrices has the potential to reach a statistical sensitivity in the order of  $10^{-36}$  e.cm; a value several orders of magnitude beyond that of any other proposed technique. In a strong collaboration between experimental (LAC, ISMO) and theoretical (CIMAP) groups, we seek to perform a detailed investigation of all limiting effects (trapping site dependence of optical pumping and coherence times mainly) using metal atoms (Cs typically) in argon and parahydrogen matrices in view of a first proof of principle EDM measurement. This will pave the way toward unprecedented sensitivity.

During this internship (that can continue in a PhD) we propose to setup the cryostat with argon and make the first test of cesium embedded in an argon matrix.

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