

Thesis

Presented to obtain the degree of
"Docteur en Physique de l'Université PARIS 13" by

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Room: Amphi. A - Institut Galilée

Ultra high resolution spectroscopy of sublimated molecules in supersonic jet: towards the observation of parity non conservation in chiral molecules by laser spectroscopy

The work presented consisted in the elaboration of an experimental set up dedicated to the observation of parity violation (PV) in a supersonic beam of chiral molecules. Remarkably enough, the molecules considered which are currently being synthesized are in the solid phase at 300 K. We thus built a set up which enables to obtain a vapour phase of the molecules of interest by heating to realise a supersonic expansion via a pickup method with helium as a carrier gas. We tested our set up with methyltrioxorhenium (MTO), a molecule from which chiral derivatives are being synthesized. We built up an experimental procedure to obtain the molecular parameters of the studied molecule. For that purpose we used saturated absorption spectroscopy in a cell at 300 K. Then a supersonic expansion of MTO in helium was obtained showing very good results. Indeed a ~10% molar fraction of MTO could be reached. Finally we recorded linear absorption spectra of MTO in beam on the experimental set up dedicated to the PV observation. The experimental data analysis enabled to simulate the theoretical spectrum of MTO. These results are very promising results with respect to the future experiments planned with chiral molecules.

Board of examiners

Anne AMY KLEIN, LPL, Université PARIS 13, thesis director

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Key words: parity violation, chiral molecules, ultrastable CO₂ laser, frequency stabilisation, supersonic jet, two-photon Ramsey fringes interferometer, linear absorption spectroscopy, saturated absorption spectroscopy.

A get together drink will follow in D102 "Institut Galilée".

Post please