Abstract number: I10
Invited

Sub-Doppler Spectroscopy and Resonance Shape

Dupré P.[†1]
[1] *Laboratoire Interdisciplinaire Carnot de Bourgogne, 9 Avenue Alain Savary, BP 47870, 21078 Dijon, France*
[†]pdupre@gmx.com

The observations of "non-standard" behaviors of molecule line shape under Saturated Absorption spectroscopy (like Lamb dip) have generated an abundant literature. Molecular spectroscopy for metrology applications, as well as for probing the Physics beyond the Standard Model or for benchmarking the quantum chemistry codes are the core of recent and highly accurate experiments. However, the available interpretations of the observed resonance shapes of weak transitions remain largely controverted. The interaction potential between the considered species plays probably a key role, but it remains extremely difficult to investigate, and only simplified collisional models can be test experimentally. Nevertheless, the low pressure regime emphasizes the relative role of the spectral "broadening" due to the finite interaction-time.

A tentative to bring another brick to the wall will be presented. More specifically, recent progresses in the simulation of the line profile to evaluate the relative contributions of the following effects will be addressed:

- The crossover resonances arising when 2 close energy levels are coupled by counter propagating pump/probe electromagnetic fields through a third level: this regards typically with molecular systems exhibiting fine and/or hyperfine structures, even when weak transitions are involved.
- The collisional regime under Gaussian (at the opposite of purely monochromatic) electromagnetic field: such conditions are currently obtained at low pressure when sensitive absorption techniques are used (decreasing the effective collisional rates).
- Collisional quadratic speed dependence (broadening and frequency shift), and velocity changing collision (VCC) can exhibit profile asymmetry.

The density matrix formalism associated with the development of semi-analytical solutions are the background of all the simulations which will be discussed for real molecular systems.