SATURATED ABSORPTION SPECTROSCOPY AND RESONANCE SHAPE OF HD AROUND 1.4 μm

PATRICK DUPRÉ, *Laboratoire Interdisciplinaire Carnot de Bourgogne, 9 Avenue Alain Savary, BP 47870, 21078 Dijon Cedex, France*

The observations of "non-standard" molecular resonance shapes 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 on simple systems. However, the available interpretations of the observed resonance shapes of weak transitions remain largely controverted. The interaction potential between species plays probably a key role, but it remains extremely difficult to investigate, and only simplified collisional models can be tested experimentally. Nevertheless, the low pressure regime emphasizes the relative role of the spectral "broadening" due to the finite interaction-time versus the collisional relaxations.

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 electromagnetic fields through a third level (V- or Λ-configuration), this regards typically with molecular systems exhibiting fine and/or hyperfine structures, even when weak dipole moments are involved.
- The collisional regime under Gaussian (at the opposite of purely monochromatic) electromagnetic fields, such conditions are currently obtained at low pressure when sensitive absorption techniques are employed.
- Collisional quadratic speed dependence (broadening and frequency shift) can generate asymmetry profiles (among other options).

p-number: p165 **Submitted on Thu, 15 Jun 2023 09:36:01 +0200**