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Mid-IR laser frequency control with a comb: application to HCOOH spectroscopy and H₂⁺ spectroscopy at the sub ppt level

Laboratoire Kastler Brossel, Sorbonne Université, ENS, CNRS ; 4 place Jussieu, Case 74, 75005 Paris, France
Département de Physique, Univ EVRY Université Paris Saclay, rue du père André Jarlan, 91025 Evry, France

The work presented in this poster focusses on the stabilisation of a mid-IR laser against a frequency comb which is optically locked to the ultrastable REFIMEVE signal and on first tests performed on formic acid (HCOOH) by saturation spectroscopy.

The poster first presents the laser stabilization signals (laser beam management, sum frequency efficiency, comb to comb beatnote characteristics), laser phase lock loops and resulting stability properties.

The poster also presents recent HCOOH optical frequency measurements at 9.166 μm with a detailed line-shape analysis. Systematic effect analysis allows to extract relevant line parameters (line center, light shifts, pressure shifts, modulation shifts, as well as pressure and power broadening) and show the spectrometer has a sub ppt (10⁻¹²) resolution.

The poster also discusses the application to state selected cold H₂⁺ molecular ion spectroscopy.

Affiliation de l'auteur principal

Laboratoire Kastler Brossel - Université d'Evry val d'Essonne

Auteurs principaux: MBARDI, Abdessamad (Laboratoire Kastler Brossel); Dr ARGENCE, Bérengère (Laboratoire Kastler Brossel); M. KARR, Jean-Philippe; Prof. HILICO, Laurent (Laboratoire Kastler Brossel - Université d'Evry Val d'Essonne); LEULIET, Maxime (Laboratoire Kastler Brossel)

Orateur: Prof. HILICO, Laurent (Laboratoire Kastler Brossel - Université d'Evry Val d'Essonne)

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