

Spécialité de Master « Optique, Matière, Plasmas »

Stage de recherche (4 mois minimum, à partir de début mars)

Proposition de stage (**ne pas dépasser 1 page**)

Date de la proposition :

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Lieu du stage / internship place: LABORATOIRE AIME COTTON			

Titre du stage / internship title: Ultranarrow Linewidth CW Optical Parametric Oscillators
<p>Periodically poled nonlinear optical materials, such as, e. g., PPLN, PPSLT, PPKTP, have been available for a few years. These crystals exhibit a strong nonlinearity, a broad spectral acceptance, and have a relatively large damage threshold for cw operation. They have opened many perspectives for the development of new light sources covering broad spectral domains in cw and pulsed operations. Our lab (Laboratoire Aimé-Cotton) in Orsay has played a pioneering role in several aspects of these developments. For example, LAC has developed a singly resonant OPO which delivers several hundreds mW of cw visible light tunable over more than 80 nm, with a linewidth in the kHz range, for applications to quantum information processing in rare earth ions and to high resolution spectroscopy. This source constitutes a good candidate to replace dye lasers in applications requiring a tunable cw laser with a very good spectral purity. Besides, we have developed solid-state lasers pumped by blue diode lasers which emit about 100 mW at orange wavelengths.</p> <p>In the near future, we wish to orient this research in the following directions:</p> <ul style="list-style-type: none">- Doubly resonant OPOs based on so-called "dual" cavities have led to promising results in pulsed regime (large infrared tenability, low thresholds, single-frequency operation,...). We wish to develop similar cavities for cw operation. The theoretical and experimental study of the operation regimes of such dual cavities should be exciting. Such a source should also require the development of original servo-locking schemes.- We wish to develop diode-pumped or fiber-laser-pumped compact optical parametric oscillators broadly tunable in the infrared for the optical sensing of polluting molecules.- We wish to develop new strategies for the stabilization of the wavelength of the OPO while maximizing its output power, and/or to improve its tunability for spectroscopy applications. <p>THIS WORK WILL BE PERFORMED IN COLLABORATION WITH A START UP COMPANY SPECIALIZED IN AIR ANALYSIS</p> <p>•Some recent publications of the group in the field:</p> <ul style="list-style-type: none">- T. H. My, C. Drag, and F. Bretenaker, "Single-frequency and tunable operation of a continuous intracavity frequency doubled singly resonant optical parametric oscillator," <i>Optics Letters</i> 33, 1455-1457 (2008).- T. H. My, O. Robin, O. Mhibik, C. Drag, and F. Bretenaker, "Stimulated Raman scattering in an optical parametric oscillator based on periodically poled MgO-doped stoichiometric LiTaO₃," <i>Optics Express</i> 17, 5912-5918 (2009).- O. Mhibik, T. H. My, D. Pabœuf, F. Bretenaker, and C. Drag, "Frequency stabilization at the kHz level of a continuous intracavity frequency doubled singly resonant optical parametric oscillator," <i>Optics Letters</i> 35, 2364 (2010).- D. Pabœuf, O. Mhibik, F. Bretenaker, P. Goldner, D. Parisi, and M. Tonelli, "Diode-pumped Pr:BaY₂F₈ cw orange laser," <i>Optics Letters</i> 36, 280-282 (2011).- O. Mhibik, D. Pabœuf, C. Drag, and F. Bretenaker, "Sub-kHz-level relative stabilization of an intracavity doubled continuous wave optical parametric oscillator using Pound-Drever-Hall scheme," <i>Optics Express</i> 19, 18049 (2011).

Ce stage pourra-t-il se prolonger en thèse ? Possibility of a PhD ? : Yes			
Si oui, financement de thèse envisagé/ financial support for the PhD: EDOM or CIFRE			
Lasers, Optique, Matière	X	Lumière, Matière : Mesures Extrêmes	X
Plasmas : de l'espace au laboratoire			

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