Contrats doctoraux 2026

Titre du projet de thèse : Oscillateurs Mamyshev fibrés

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Résumé du projet de thèse (en 20 lignes maximum) :

Mamyshev oscillators are a type of pulsed laser architecture whose cavity consists of a pair of wavelength-shifted filters separated by amplifying fibers. Mode locking is ensured by the fact that only pulses with high peak power are sufficiently broadened spectrally by the Kerr effect to be able to pass successively through the two filters. Mamyshev oscillators offer interesting performance characteristics, as it is possible to generate femtosecond pulses with a peak power of several MW after recompression. These oscillators are therefore good candidates for non-linear biomedical imaging or materials processing.
However, even though the architecture of a Mamyshev cavity may seem simple, it is possible to observe different regimes: fundamental, harmonic, but also multiple bound-state pulses or chaos. In addition, starting the oscillator is often tricky and it may be necessary to inject a pulse from another laser or generated by an auxiliary arm. Finally, the fundamental repetition rate is generally low (a few tens of MHz) because spectral broadening due to the Kerr effect requires a significant fiber length.
The numerical study of the oscillator in transient regime coupling the nonlinear Schrödinger equation with the population inversion rate equations should provide a better understanding of the formation of the different regimes. This study will also provide ideas (concerning the characteristics of fibers and filters, addition of specific components in an arm, etc.) that will be tested experimentally to obtain the desired regime or to enable easier startup of the oscillator.

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Remarques/commentaires supplémentaires :