PhD /Post doc : Femtosecond laser induced Waveguide Bragg Gratings in the VISible range (WBG-VIS)

Description of LAPHIA – Cluster of Excellence (IdEx Bordeaux program)

The Cluster of Excellence LAPHIA (IdEx) brings together teams belonging to 11 research laboratories in Bordeaux. The LAPHIA project is expected to have a long-term structuring role in both the academic and economic spheres through the production and transfer of cutting-edge knowledge in laser and photonics.

The LAPHIA project aims to create a consortium around sciences of light – optics, photonics, lasers. The Bordeaux pole in optics is already recognized as leading in several fields: high energy lasers, hot plasmas laser-matter interaction physics, material science. The industrial dynamics is really impressive in the Bordeaux and Aquitaine areas, with a rapidly growing cluster of research centers and industrial companies dealing with optical and laser technologies.

In this favorable context, the LAPHIA project aims to federate the whole relevant academic community around coherent and innovative projects in lasers and photonics, while strengthening the links with CEA. The unique Centre of excellence structure will promote Bordeaux to among the most visible centers in Lasers and Photonics at European and international levels, resulting in a strong attractivity for students, researchers and private companies.

For more information: laphia.labex-u-bordeaux.fr/en/

Duration **12 months**

Job statuts **Junior post-doctoral position (less than 3 years after PhD)**

LOCATION : CELIA laboratory (UMR5107), group « *Short Lasers, Applications & Materials* »
DATE : start : September, 1st 2018
Salary : Net salary around 2300 € /month, for 1 year (depending on experience)

Description

Refractive index modifications of transparent materials under tightly-focused ultrafast laser beams has brought the possibility to write optical waveguides by simply moving the sample through the beams focus. Such approach allows now for the fast, efficient and versatile fabrication of 3D integrated architectures of waveguides, leading to mature technologies with many applications as optical sensing, photonic integrated circuits for quantum information or astro-photonics… Among the strategic photonic bricks, waveguide Bragg gratings (WBGs) are of prime importance because they can manage the selective reflexion of wavelengths in waveguides. Such behavior results from the periodic perturbation of the effective refractive index of the waveguides, which is fully achievable from ultrafast laser inscription. Laser-based fabrication of WBGs is getting common in the near-IR range, and state-of-the-art results start to access the red spectral range. Indeed, it is highly challenging to achieve efficient WBGs in the visible range because it requires very small periodicities (below 200 nm). Thanks to the optimized ultrafast laser inscription in our non-conventional photosensitive glasses, the **WBG-VIS** project proposes a breakthrough approach to demonstrate a new type of WBG based on laser-induced spatially-distributed silver clusters, so as to provide high pay-off versatile WBG fabrication process in the visible spectral range, as needed

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as a key enabling technology to further create integrated distributed feedback waveguide lasers in the visible range with very high spectral purity & brightness.

The candidate will conduct femtosecond laser irradiation experiments of mature and currently under development silver-containing non conventional glasses shaped as bulk or fibered materials, to as to achieve modulated waveguides with embedded spectrally-selective Bragg grating behavior. He will perform the characterization of the transmission of the induced wave guiding structures, as well as other properties with spatially-resolved linear/nonlinear spectroscopies. The modeling of such structures with sub-wavelength features will be addressed. Integrated laser-created cavities with distributed feedback reflective architectures will be investigated, potentially leading to integrated laser devices while considering co-doping with fluorescent rare-earth elements. The candidate will evolve in a highly multi-disciplinary environment involving chemists for material material science and physics for laser irradiation.

Profile of applicant

The candidate will have hands-on experience in experimental physics related to laser physics and optical techniques. Experience in laser-induced modifications of optical materials will be carefully considered. Knowledge of ultrafast optics techniques, beam spatial shaping or super-resolution microscope imaging and instrumentation is also a strong asset. Expertise in characterizing and modeling waveguides, periodic index-constrasted structures (possibly with sub-wavelength features) and/or integrated optical Fabry-Perot & laser resonators will also be appreciated.

Supervisors/Contact

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Application deadline : June, 25th 2018