Erasmus Mundus Master QuanTEEM
Research Project

TITLE	Ultrafast fiber laser at 2 µm wavelength. Application to the generation of supercontinuum.
SUPERVISORS	Aurélien Coillet, Mostafa Mohamed, Philippe Grelu
INSTITUTION	Université de Bourgogne
LAB / DEPARTMENT / TEAM	ICB / Photonics Department / Teams SAFIR, PRISM
COLLABORATIONS	
TYPE OF PROJECT (theory / experiment)	Experiment

Summary

In this lab project, we will investigate the capabilities of a new fiber laser architecture to generate high-energy ultrashort pulses in the spectral window around 2 µm. Light emission at this wavelength is enabled by thulium(Tm)-doped fibers. Tm fiber lasers have several advantages compared to erbium (1550 nm) and ytterbium (1050 nm) lasers, such as a wider gain bandwidth, and a proximity to the mid-infrared where one finds the spectroscopic fingerprints of numerous molecular substances.

These key advantages are motivating the research and development of versatile, high-power, ultrafast, compact Tm fiber lasers, despite increased technological difficulties.

The project will focus on two main tasks:

- Optimize the fiber laser and characterize its pulsed dynamics: find which parameters influence most the pulse energy, duration, in which parameter range can its central wavelength be tuned, where and how is stability lost, etc. This entails learning how to manipulate fibers, polarization controllers, pump lasers, spectrometers and various other lab instrumentation.

- Use the optimized laser source to generate new wavelengths through nonlinear propagation effects, in a highly nonlinear waveguide. At first, a highly nonlinear fiber will be used, but nanophotonics waveguides in materials optimized for nonlinearity in the infrared (silicon, chalcogenide glasses) will also be investigated. These tasks will involve the manipulation of sensitive fiber and nanophotonics chips, and critical know-how for coupling light in and out of such devices.

The internship is part of an ongoing technology transfer project and will therefore be subject to confidentiality clauses.

Additional Information

Applications for this lab project should be sent to aurelien.coillet@u-bourgogne.fr with a full CV including undergraduate details, and a transcript of your academic records.

Required skills: knowledge in wave propagation, fiber optics and lasers, basic data processing in Matlab/Python

Duration: from 13/05/2024 to 21/06/2024