





PhD GRANTS 2024

PhD project title: Fiber optical parametric amplification in the picosecond range: application to contrast improvement for Ultra High Power laser chains

PhD Supervisor: G. Bouwmans / F. Scol

PhD project summary (max. 20 lines):

The CESTA High Power Lasers department has been carrying out work for several years on the generation and nonlinear amplification and characterization of ultrashort (broad spectrum) laser pulses. This work is carried out for the benefit of the pilot of the PETAL installation, which is the laser system generating and preparing the pulse before its injection into the power chain. Today, controlling the temporal contrast of the pulses at the driver output remains one of the key challenges for controlling the performance of an ultra-high intensity laser installation such as PETAL. In this context and within the framework of the SyLFE (common research laboratory between the CEA/CESTA and the PhLAM laboratory of the University of Lille), we wish to study the potential of fiber optic parametric amplification in the picosecond range (FOPA ps) for improving the temporal contrast of the pulses. This technique consists of amplifying the pulses coming from a mode-locked laser oscillator via a nonlinear process of 4-wave mixing type within a specially made optical fiber. Thus, the nature of the chosen amplification process and the duration of the pulses in the amplifier must make it possible to obtain pulses with very good temporal contrast. The objectives of the thesis will be to produce a FOPA ps and to quantify the impact of its use on the performance of a laser system currently under development in the laboratory and which will ultimately deliver short pulses (< 500 fs) of high energy (> 200 mJ) at a recurrence of 2 Hz. To do this, the first part of the thesis will be devoted to the characterization of nonlinear optical fibers dedicated to parametric amplification as well as to the sizing and creation of the FOPA ps. The second part will be devoted to the integration of FOPA ps into the high energy laser system currently under development and to the study of the impact of its use on the contrast of the pulses delivered. This subject, predominantly experimental, will allow the candidate to broaden their skills in laser, optical fibers, nonlinear optics, manipulation and characterization of ultrashort laser pulses. This work will be carried out on the CESTA site in close collaboration with the photonics team of the PhLAM laboratory. In accordance with the commitments made by the CEA in favor of the integration of people with disabilities, this job is open to everyone.

Expected date of recruitment : 1st September 2024 Contact (e-mail address) : geraud.bouwmans@univ-lille.fr Additional remarks/comments: The thesis will be carried out at CEA/CESTA (near Bordeaux)