EUROPHOTONICS-POESII MASTER COURSE

PROPOSAL FOR A MASTER THESIS

Dates: April 1st, 2016 – September 30th, 2016

Research group : Dynamics, Nonlinear Optics and Lasers
City, Country : Terrassa, Barcelona, Spain (the work involves numerical simulations that can be done remotely)

Title of the master thesis: Generation of extreme pulses in optically injected semiconductor lasers

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Summary of the subject (maximum 1 page) :

Objective: The goal of this thesis is to determine the optimal operating conditions of an injected semiconductor laser in order to generate, via small controlled perturbations, ultra-intense light pulses.
Description: Extreme pulses are of great interest since they occur in many physical systems. In a semiconductor laser, ultra-intense pulses of light (called "optical rogue waves") may be emitted occasionally and randomly, when the laser receives light from another laser. The aim of the thesis is to perform computer simulations in order to determine the optimal operating conditions for which a small perturbation causes a giant transient response consisting of the emission of an ultra-intense pulse of light.
Methodology: A simple rate-equation model will be used to simulate the response of a semiconductor laser to perturbations in the injected light. Model simulations can be done by using Matlab or any other programming language (Fortran, C, python, etc.).
Impact: The proposed study is relevant because ultra-intense light pulses generated in a controlled manner can be used for multiple applications, for example in biomedicine where the new technologies of high resolution images require controlled and intense light pulses.

Keywords : extreme light pulses, optical rogue waves, semiconductor lasers

Additional information :
* Required skills : Good computer skills are desirable
* Miscellaneous : To supervise the progress, weekly meetings with the supervisor will be arranged either in Terrassa or in Barcelona or via skype. More info: www.fisica.edu.uy/~cris