PhD position in Foton laboratory
(Photonic Systems Team)

Parametric sources based on coupled chalcogenide glass micro-resonators (SPIROU)

Foton laboratory:
The FOTON Laboratory is a research unit of the French National Centre for Scientific Research (CNRS) associated to University of Rennes 1 and the National Institute for Applied Sciences (INSA) of Rennes. FOTON is composed of two research teams: the Optoelectronics, Heteroepitaxy and Materials team, located in Rennes, and the Photonic Systems team located in Lannion, one of the strongholds of the French telecommunications industry. The two cities are located approximately 170 km apart, in the province of Brittany, Western France. Within the Photonic Systems team, the main research activities of the Guided Optics and Sensors (GOS) group (~25 people) are directed towards optical coupling techniques and the development of photonics integrated circuits based on emerging materials (carbon nanotubes, chalcogenides, porous silicon) for optical signal processing, (mid-) infrared (IR) light sources and sensors. The research topics of the Laser Physics and Applications (LPA) group encompass: semiconductor or fiber lasers physics and development, microcavity physics and nonlinear optics.

The successful candidate will carry out research in the Photonic Systems team based in Lannion in collaboration with members of the two groups GOS and LPA and will benefit from the laboratory expertise in integrated circuits modelling, technological processing and optical characterizations.

More information about FOTON can be found at: http://foton.cnrs.fr.

Project description:
The aim of the project SPIROU is to develop and study nonlinear coupled optical micro-resonators made of chalcogenide glasses. The final objective is to demonstrate parametric oscillations in these original photonic structures. In comparison with a single resonator, the coupling between resonators gives an additional degree of freedom to reach the phase matching condition or to tune the oscillation frequencies. The GOS group has already demonstrated four wave mixing in chalcogenide-based micro-ring resonators processed in FOTON clean room facilities, the present project will capitalize on these experimental results. The resonators will be made from chalcogenide thin films obtained thanks to a long-term collaboration with the Glass and Ceramics Team (ISCR laboratory) from the University of Rennes 1.

It is expected that the design and development of multi-frequency integrated optical sources will find applications in optical telecommunications and wavelength division multiplexing. The coupling between resonators offers a high flexibility of the generated optical frequencies which could also be used to directly generate tuneable microwave signal on optical carriers.

The PhD candidate will therefore be involved in the:
- modelling of nonlinear effects in coupled resonators systems,
- design of coupled resonators structures using commercially available tools,
- technological processing of waveguides and integrated resonators using clean room facilities,
- optical characterizations: coupled resonator transfer functions measurement, four wave mixing experiments, bistability or multistability studies,
- optical signal stability and noise measurements.

Qualifications:
As this project will cover a wide panel of scientific fields (materials, advanced optical characterizations, spectroscopy, nonlinear optics, laser physics, design and processing of integrated circuits), a strong background in physics and in particular in optics and materials is required. Interest for both experimental and modelling/simulation work is essential. Experience in optical characterization and/or microelectronics fabrication in clean room environment would be an asset. The successful candidate should have excellent written and oral communication skills (in French and/or English) and be able to smoothly integrate into the project team and to interact with project partners working in different scientific disciplines.
Application procedure:
Please submit you application at your earliest convenience by e-mail to: yannick.dumeige@univ-rennes1.fr, joel.charrier@univ-rennes1.fr and loic.bodiou@univ-rennes1.fr
The position will be filled as soon as a suitable candidate has been identified. Please clearly indicate the reference SPIROU in the subject field of your application e-mail. Your application should include:
- cover letter,
- detailed CV,
- copy of M.Sc. degree or equivalent,
- grade transcripts,
- list of publications, if applicable,
- contact details of two references.
All qualified candidates are invited to apply.