PhD position – Nonlinear topological photonics in direct-laser-written optical fibers

This PhD offer is proposed in the framework of a joint program (co-tutelle) between the *Institut de Physique de Nice* (INPHYNI), Université Côte d'Azur (Nice, France) and the *Centre d'Optique Photonique et Laser* (COPL), Université Laval (Québec, Canada).

Context & Objectives

Topological material properties are ruled by topological invariants – a global property that can only take integer values and, therefore, is robust to certain deformations and disorder in the system. Such a topological protection is actually not restricted to electronics and has been recently brought to the photonics realm. Photonics provides a remarkable framework for the study of fundamental topological phenomena with potential applications in the fabrication of robust optical devices with unidirectional transport properties and novel topologically-based functionalities. So far, the vast majority of observed topological phenomena arise from topological invariants defined in the *linear* regimes. The main goal of the project is to study, implement and exploit novel *nonlinear* topological phases of light.

We aim at using a photonic experimental platform which consists in coupled-cores arrays inscribed in optical fibers via a unique continuous direct-laser-writing technique. We target, among other, the experimental observation of long-lived topological solitons, the generation of robust supercontinuum from topological laser filaments and we will consider the fabrication of robust optical isolators as an applied perspective. The project will make a significant step forward in the development of nonlinear topological photonics and is also expected to have a large impact in the laser micro-fabrication and optical fibers communities.

The PhD candidate will be in charge of i) the design, fabrication and characterization of the complex arrangement of direct-laser-written coupled core optical fibers (mainly performed at COPL) and ii) the experimental study of the nonlinear topological properties of light in such multicore optical fibers (mainly performed at INPHYNI). The candidate will equally share his time between each research center.

Required profile

This project is mainly experimental and is at the edge between applied photonics and fundamental topological physics. We are looking for a highly-motivated candidate with a master's degree in physics or photonics and, ideally, a good knowledge of fiber optics, lasers, nonlinear optics, optical instrumentation with a strong interest in condensed-matter and topological physics.

Application procedure

Inquiries and applications should be sent by email to Matthieu Bellec and Martin Bernier. Applications should include a CV, a cover letter, academic transcripts and grades (if applicable) of the master's degree and the names of two referees.

The call is opened until June 5th 2020 and the PhD is expected to start as soon as possible before June 2021. The gross salary is 2500€/month.

Contact

Dr. Matthieu Bellec, Institut de Physique de Nice, Université Côte d'Azur & CNRS, Nice, France
matthieu.bellec@inphyni.cnrs.fr
Prof. Martin Bernier, Centre d'Optique Photonique et Laser, Université Laval, Québec, Canada
martin.bernier@copl.ulaval.ca