UNIVERSITÉ CÔTE D'AZUR

INPHYNI
INSTITUT DE PHYSIQUE DE NICE

cnrs

Master internship position (M2)

Internship location: Institut de Physique de Nice (INPHYNI)
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Salary: ~ 600 €/months
PhD thesis possibility after internship: **YES** (Funding under review)

Fabrication and magneto-optical characterization of a gadolinium doped silica optical fiber

Context Light transport is in general reciprocal, and therefore the statement "if I see you, you see me" is in general true. The magneto optical Faraday effect is one way to break reciprocity, and it is used in optical isolators for instance. In our group, we are interested in more fundamental questions raised by the presence or not of reciprocity and its consequences on multiple scattering, and we work in particular with optical fibers as the propagation medium. The Faraday effect, and thus reciprocity breaking, is proportional to the external applied magnetic field and to the length of the Faraday active medium. The proportionality constant—called the Verdet constant—is for most materials quite low, meaning that reciprocity can only be substantially broken over very large distances for the magnetic fields achievable in the lab. We would therefore like to fabricate an optical fiber with a large Verdet constant.

Objectives Silica optical fibers doped with a small concentration of Gadolinium seem to be good candidates, as the Verdet constant of Gd-doped fibers was reported to be 2 orders of magnitude larger than standard telecom optical fibers, with reasonably low losses[1]. For this work, we propose to fabricate Gd-doped optical fibers, and then characterize then both optically and magneto-optically.

Work program The intern will first participate in the fabrication of the fiber (fabrication of the Gd-doped preform, drawing of the fiber) under the guidance of the 'Fibre Optics and Applications' group at INPHYNI. The samples will then be characterized using standard optical fibers characterization techniques (number of modes, numerical aperture, propagation losses), as well as magneto-optically using an in-house magneto-optical setup developed in the frame of the wider project studying the interplay of light transport and reciprocity.

Supervision and environment Hosted at INPHYNI (Université Côte d'Azur, Nice), the intern will work in collaration with the Fibre Optics and Applications and the Waves in Complex Systems groups. The internship will combine training in fiber fabrication techniques, and optical / magneto-optical characterization, offering the student a solid introduction to modern photonics.

Profile We are looking for candidates who are highly motivated to conduct research and have a keen interest in material sciences and fundamental physics, particularly in the field of photonics.

[1] R. Ismaeel, A. Masoudi, Y. Wang, W. Talataisong, N. Chiodini, T. Lee, M. Beresna, and G. Brambilla. *Optical Fiber Communication Conference Postdeadline Papers*. Th4B.2 (2018).